



# Cumulative Changes from Mainframe Express to Micro Focus Enterprise Developer for Eclipse 10.0

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# Cumulative Changes from Mainframe Express to Enterprise Developer for Eclipse

Welcome to Enterprise Developer for Eclipse. This document combines information on Enterprise Developer for Eclipse releases from the first release to the most recent release, and on upgrading from Mainframe Express to Enterprise Developer. This information is taken from the various releases' Release Notes and other sources, and brought together here for your convenience.

You can use this document:

- If you are migrating from Mainframe Express, to see everything that has changed in the life of Enterprise Developer for Eclipse.
- If your Enterprise Developer installation is up to date, to see the changes made in the latest release.
- If you already use Enterprise Developer but your installation is not entirely up to date, to see the changes made over several updates, together in one place.

## About this Guide

We recommend that you read all the sections of this publication, looking for information on the release that is most relevant to your needs. The main sections are as follows:

<b>What was New</b>	This section describes new functionality that was introduced in each successive release.
<b>Significant Changes</b>	This section describes, for each successive release, the changes in behavior or usage that could affect the behavior of existing applications or impact the way the tools are used.
<b>Unsupported or Deprecated Functionality</b>	This section describes any functionality that was discontinued or deprecated at a given release.
<b>Known Errors and Restrictions</b>	This section describes known errors affecting the latest release, and restrictions in its use.
<b>Upgrading from Mainframe Express to Enterprise Developer</b>	This section gives guidance on upgrading from earlier Micro Focus products.

Within each section, we recommend reading in the reverse chronological order in which it is presented here - that is, reading about the most recent release first, and then going back through the development of the products. That way, you can more easily see if anything was added in an earlier release and subsequently removed.

## Changes to Compiler Directives, Run-Time Tunables, Library Routines and Environment Variables

This section provides an index of items added, deprecated and changes since the first version of Enterprise Developer. The changes are presented in a number of tables according to the type of feature involved. The first set of tables lists changes in alphabetical order. A second section lists changes in order of release.

# Changes in Alphabetical Order

The changes are presented in the following tables:

- [Compiler Directives](#)
- [Run-Time Tunables](#)
- [Library Routines](#)
- [Environment Variables](#)

For each change, the table lists:

- The name of feature that changed,
- The type of change,
- The version of Enterprise Developer in which the change was introduced,
- A link to more information.

**Table 1: Changes to Compiler Directives**

Name	Change	At Product Version	See
<b>01SHUFFLE</b>	Deprecated	Enterprise Developer Base release	<a href="#">Unsupported or Deprecated at 2010</a>
<b>64KPARA</b>	Deprecated	Enterprise Developer Base release	<a href="#">Unsupported or Deprecated at 2010</a>
<b>64KSPECT</b>	Deprecated	Enterprise Developer Base release	<a href="#">Unsupported or Deprecated at 2010</a>
<b>ACU-UNDERSCORE</b>	New	2.2	<a href="#">What was new in 2.2</a>
<b>ALPHA-LIT-CONT</b>	New	9.0	<a href="#">What was new in 9.0</a>
<b>AMODE</b>	New parameter	8.0	<a href="#">What was new in 8.0</a>
<b>ANIM</b>	Changed default	5.0	<a href="#">Significant changes in 5.0</a>
<b>AUXOPT</b>	Deprecated	Enterprise Developer Base release	<a href="#">Unsupported or Deprecated at 2010</a>
<b>CHANGE-MESSAGE</b>	Changed scope	2.2	<a href="#">What was new in 2.2</a>
<b>CHECKDIV</b>	New parameter	4.0	<a href="#">What was new in 4.0</a>
<b>CHECKREFMOD</b>	New parameter	6.0	<a href="#">What was new in 6.0</a>
<b>CHIP</b>	Deprecated	Enterprise Developer Base release	<a href="#">Unsupported or Deprecated at 2010</a>
<b>COMMAND-LINE-LINKAGE</b>	New	2.3 Update 2	<a href="#">What was new at 2.3 Update 2</a>

Name	Change	At Product Version	See
COMP1	New	2.1	<a href="#">What was new in 2.1</a>
COMP2	New	2.1	<a href="#">What was new in 2.1</a>
CONVERTRET	Deprecated	3.0	<a href="#">Unsupported or Deprecated at 3.0</a>
DECLARE	New	9.0	<a href="#">What was new in 9.0</a>
DIALECT"RM"	Changed effect	2.2	<a href="#">What was new in 2.2</a>
DISPLAY	New	2.1	<a href="#">What was new in 2.1</a>
DISPLAY-AT	New	6.0	<a href="#">What was new in 6.0</a>
DISPLAY-PICU	New	8.0	<a href="#">What was new in 8.0</a>
DISPSIGN	New	4.0	<a href="#">What was new in 4.0</a>
DATALIT	Deprecated	Enterprise Developer Base release	<a href="#">Unsupported or Deprecated at 2010</a>
DATAMAP	New parameter	2.1	<a href="#">What was new in 2.1</a>
DBSPACE	New parameter	2.3	<a href="#">What was new in 2.3</a>
DPC-IN-DATA	New	6.0	<a href="#">What was new in 6.0</a>
EANIM	Deprecated	Enterprise Developer Base release	<a href="#">Unsupported or Deprecated at 2010</a>
EBC-COL-SEQ	New	2.3 Update 2	<a href="#">What was new at 2.3 Update 2</a>
EDITOR	Deprecated	Enterprise Developer Base release	<a href="#">Unsupported or Deprecated at 2010</a>
ENSUITE	Deprecated	Enterprise Developer Base release	<a href="#">Unsupported or Deprecated at 2010</a>
EOF-1A	New	2.3	<a href="#">What was new in 2.3</a>
EXECSQL-FLAG	New	7.0	<a href="#">What was new in 7.0</a>
EXITPROGRAM	New	2.2	<a href="#">What was new in 2.2</a>
EXPANDDATA	Deprecated	Enterprise Developer Base release	<a href="#">Unsupported or Deprecated at 2010</a>
FIXING	Deprecated	Enterprise Developer Base release	<a href="#">Unsupported or Deprecated at 2010</a>
FLAG-CHIP	Deprecated	Enterprise Developer Base release	<a href="#">Unsupported or Deprecated at 2010</a>
GNTLITLINKSTD	New	4.0	<a href="#">What was new in 4.0</a>

Name	Change	At Product Version	See
HIDE-MESSAGE	Changed scope	2.2	<a href="#">What was new in 2.2</a>
HOSTSIGNS	Unsupported	3.0	<a href="#">Unsupported or Deprecated at 3.0</a>
IDXFORMAT8	New option	Enterprise Developer Base release	
IDXFORMAT12	New option	2.3 Update 1	
IDYSRCPATH	Deprecated	3.0	<a href="#">Unsupported or Deprecated at 3.0</a>
ILCONDITIONPARAM	New	6.0	<a href="#">What was new in 6.0</a>
IEXPONENTIATION	New	2.2	<a href="#">What was new in 2.2</a>
IEXPOSEALPHA	New	9.0	<a href="#">What was new in 9.0</a>
IEXPOSEGROUP	New	9.0	<a href="#">What was new in 9.0</a>
ILCLR"2"	Deprecated	7.0	<a href="#">What was new in 7.0</a>
ILMAIN	New	2.3 Update 1	<a href="#">What was new in 2.3 Update 1</a>
ILNORMALIZENAMES	New	5.0	<a href="#">What was new in 5.0</a>
ILOBJECTIFY	Deprecated	3.0	<a href="#">Unsupported or Deprecated at 3.0</a>
ILPARAMS	New	2.2 Update 1	<a href="#">What was new in 2.2 Update 1</a>
ILPOINTER-REFERENCE	New	10.0	<a href="#">What was new in 10.0</a>
ILSHOWPERFORMOVERLAP	New	2.2	<a href="#">What was new in 2.2</a>
ILSMARTRESTRICT	New	2.1	<a href="#">What was new in 2.1</a>
ILSMARTTRIM	New	4.0	<a href="#">What was new in 4.0</a>
ILSTRINGLOAD	New	9.0	<a href="#">What was new in 9.0</a>
INIT-BY-TYPE	New	2.2 Update 1	<a href="#">What was new in 2.2 Update 1</a>
INITIAL	New	9.0	<a href="#">What was new in 9.0</a>
JAVA-CALLABLE	New	9.0	<a href="#">What was new in 9.0</a>
JAVA-GEN-PROGS	New	9.0	<a href="#">What was new in 9.0</a>
JAVA-GEN-STRG	New	9.0	<a href="#">What was new in 9.0</a>
JAVA-OUTPUT-PATH	New	9.0	<a href="#">What was new in 9.0</a>
JAVA-PACKAGE-NAME	New	9.0	<a href="#">What was new in 9.0</a>
JAVA-SHAREABLE	New	9.0	<a href="#">What was new in 9.0</a>
JVMDECIMAL	New	2.3	<a href="#">What was new in 2.3</a>
JVMTARGET	New	5.0	<a href="#">What was new in 5.0</a>
MAINFRAME-FLOATING-POINT	New	4.0	<a href="#">What was new in 4.0</a>
MANAGED-FNC-PARAM-BY	New	9.0	<a href="#">What was new in 9.0</a>
MASM	Deprecated	Enterprise Developer Base release	<a href="#">Unsupported or Deprecated at 2010</a>



Name	Change	At Product Version	See
<b>MODEL</b>	Deprecated	Enterprise Developer Base release	<i>Unsupported or Deprecated at 2010</i>
<b>NATIONAL</b>	New	2.3 Update 2	<i>What was new at 2.3 Update 2</i>
<b>NLS-CURRENCY-LENGTH</b>	New	2.3	<i>What was new in 2.3</i>
<b>NULL-ESCAPE</b>	New	2.3	<i>What was new in 2.3</i>
<b>NUMPROC</b>	New parameter	4.0	<i>What was new in 4.0</i>
<b>OCTRL</b>	New	2.3 Update 1	<i>What was new in 2.3 Update 1</i>
<b>OCTRL</b>	New parameter	4.0	<i>What was new in 4.0</i>
<b>OPTIMIZECURSORS</b>	New	3.0	<i>Significant changes in 3.0</i>
<b>OPTION</b>	Deprecated	3.0	<i>Unsupported or Deprecated at 3.0</i>
<b>OPTSIZE</b>	Deprecated	Enterprise Developer Base release	<i>Unsupported or Deprecated at 2010</i>
<b>OPTSPEED</b>	Deprecated	Enterprise Developer Base release	<i>Unsupported or Deprecated at 2010</i>
<b>PANVALET-INCLUDES-IN-COMMENTS</b>	New	7.0	<i>What's new in 7.0</i>
<b>PARAS</b>	Deprecated	Enterprise Developer Base release	<i>Unsupported or Deprecated at 2010</i>
<b>PRESERVECASE</b>	Changed scope	2.2	<i>What was new in 2.2</i>
<b>PROTMODE</b>	Deprecated	Enterprise Developer Base release	<i>Unsupported or Deprecated at 2010</i>
<b>PROTOTYPE</b>	New parameter	6.0	<i>What was new in 6.0</i>
<b>REGPARM</b>	Deprecated	Enterprise Developer Base release	<i>Unsupported or Deprecated at 2010</i>
<b>RESTRICT-GOTO</b>	New	2.1	<i>What was new in 2.1</i>
<b>RM-FILE-ERRORS</b>	New	7.0	<i>What's new in 7.0</i>
<b>SEGCROSS</b>	Deprecated	Enterprise Developer Base release	<i>Unsupported or Deprecated at 2010</i>
<b>SEGSIZE</b>	Deprecated	Enterprise Developer Base release	<i>Unsupported or Deprecated at 2010</i>

Name	Change	At Product Version	See
<b>SIGNCOMPARE</b>	Deprecated	Enterprise Developer Base release	<a href="#">Unsupported or Deprecated at 2010</a>
<b>SMALLDD</b>	Deprecated	Enterprise Developer Base release	<a href="#">Unsupported or Deprecated at 2010</a>
<b>SPZERO</b>	Deprecated	Enterprise Developer Base release	<a href="#">Unsupported or Deprecated at 2010</a>
<b>TABLESEGCROSS</b>	Deprecated	Enterprise Developer Base release	<a href="#">Unsupported or Deprecated at 2010</a>
<b>TRICKLE</b>	Deprecated	3.0	<a href="#">Unsupported or Deprecated at 3.0</a>
<b>TRICKLECHECK</b>	Deprecated	Enterprise Developer Base release	<a href="#">Unsupported or Deprecated at 2010</a>
<b>WB2</b>	Deprecated	Enterprise Developer Base release	<a href="#">Unsupported or Deprecated at 2010</a>
<b>WB3</b>	Deprecated	Enterprise Developer Base release	<a href="#">Unsupported or Deprecated at 2010</a>
<b>WB</b>	Deprecated	Enterprise Developer Base release	<a href="#">Unsupported or Deprecated at 2010</a>

**Table 2: Changes to Run-time Tunables**

Name	Change	At Product Version	See
<b>command_line_linkage</b>	Deprecated	2.3 Update 2	<a href="#">Unsupported or Deprecated at 2.3 Update 2</a>
<b>default_cancel_mode</b>	New default value New parameter	2.3	<a href="#">What was new in 2.3 - Tunables</a>
<b>entry_point_mapper_disable_auto_aliasing</b>	New	10.0	<a href="#">What was new in 10.0</a>
<b>putenv_interface</b>	New	2.3	<a href="#">What was new in 2.3 - Tunables</a>
<b>reduce_java_signals</b>	New	2.2 Update 2	<a href="#">Significant changes in 2.2 Update 2</a>
<b>strict_file_locking</b>	New	2.3	<a href="#">What was new in 2.3 - Tunables</a>
<b>subsystem_cancel_mode</b>	New New parameter	2.0 2.3	<a href="#">What was new in 2.0 - Run-time Tunables</a> <a href="#">What was new in 2.3 - Tunables</a>

**Table 3: Changes to Library Routines**

Name	Change	At Product Version	See
CBL_CREATE_CORE	New	5.0	<a href="#">What was new in 5.0</a>
CBL_CTF_COMP_PROPERTY_GET	New	2.0	<a href="#">What was new in 2.0</a>
CBL_CTF_TRACE	New	2.0	<a href="#">What was new in 2.0</a>
CBL_CTF_TRACER_LEVEL_GET	New	2.0	<a href="#">What was new in 2.0</a>
CBL_CTF_TRACER_GET	New	2.0	<a href="#">What was new in 2.0</a>
CBL_CTF_LEVEL	New	2.0	<a href="#">What was new in 2.0</a>
CBL_CODESET_SET_MAPPING	New	2.3 Update 1	<a href="#">What was new in 2.3 Update 1</a>
CBL_GET_DEBUG_START	New	4.0	<a href="#">What was new in 4,0</a>
CBL_GET_DEBUG_STOP	New	4.0	<a href="#">What was new in 4,0</a>
CBL_GET_ERROR_INFO	New	7.0	<a href="#">What's new in 7.0</a>
CBL_GET_EXIT_INFO	Enhanced	6.0	<a href="#">What was new in 6.0</a>
CBL_GET_OS_INFO	New	4.0	<a href="#">What was new in 4,0</a>
CBL_LOCATE_FILE	New parameter	2.3	<a href="#">What was new in 2.3</a>
CBL_MANAGED_SESSION_GET_USERDATA	New	2.3	<a href="#">What was new in 2.3</a>
CBL_MANAGED_SESSION_SET_USERDATA	New	2.3	<a href="#">What was new in 2.3</a>
CBL_RUNTIME_ERROR	New	2.3 Update 1	<a href="#">What was new in 2.3 Update 1</a>
CBL_SEMAPHORE_ACQUIRE	New parameter	2.0	<a href="#">What was new in 2.0</a>
CBL_CREATE_CORE	New	5.0	<a href="#">What was new in 5.0</a>
MFU_GET_FILE	New	6.0	<a href="#">What was new in 6.0</a>
MFUGETF	New	6.0	<a href="#">What was new in 6.0</a>
PC_PRINTER_SET_FONT	Enhanced	8.0	

**Table 4: Changes to Environment Variables**

Name	Change	At Product Version	See
COB_LIVE_RECORD_SIZE	New	5.0	<a href="#">What was new in 5.0</a>
ES_CAT_RETRY_COUNT	New	4.0	<a href="#">Configuring Multiple Catalogs</a>
ES_CAT_RETRY_WAIT	New	4.0	<a href="#">Configuring Multiple Catalogs</a>
ES_DSENQSHR	New	8.0	<a href="#">What was new in 8.0</a>
ES_IMS_APARM_DLI	New	10.0	<a href="#">What was new in 10.0</a>
ES_IMS_DISPLAY_NEW	New	9.0	<a href="#">What was new in 9.0</a>
ES_IMS_LINKAGE_NULL	New	10.0	<a href="#">Significant Changes in 10.0</a>
ES_IMS_TLOG_FLUSH	Deprecated	2.2 Update 2	<a href="#">Significant changes in 2.2 Update 2</a>

Name	Change	At Product Version	See
ES_IMS_MFS_OPT2_LEGACY	New	10.0	<a href="#">Significant Changes in 10.0</a>
ES_JES_ENFORCE_EXPIRE_DATE	New	8.0	<a href="#">Significant changes in 8.0</a>
ES_JES_LISTCAT_YMD	New	8.0	<a href="#">Significant Changes in 8.0</a>
ES_RDO_MAX_RESOURCES	New	7.0	<a href="#">What's new in 7.0</a>
ES_SNATRC_DIR	New	5.0	<a href="#">Significant changes in 5.0</a>
ES_ZOS_SYSPRINT_DCB	New	8.0	
FSWRKDIR	New	3.0	<a href="#">What was new in 3.0</a>
FCHKLFH	New	3.0	<a href="#">What was new in 3.0</a>
HCOBND	Deprecated	3.0	<a href="#">Unsupported or Deprecated at 3.0</a>
MFALLOC_PCFILE	Default value changes	2.2 Update 2	<a href="#">Significant changes in 2.2 Update 2</a>
MFFTPXIT	New	9.0	<a href="#">Significant changes in 9.0</a>
MFJ_LEX_LOCATION	New	8.0	<a href="#">Significant Changes in 8.0</a>
SPOOL_TIMEOUT	New	8.0	
strictvsam	New	2.2 Update 1	<a href="#">What was new in 2.2 Update 1</a>

## Changes in Order of Release

The changes are presented in the following tables:

- [Compiler Directives](#)
- [Run-Time Tunables](#)
- [Library Routines](#)
- [Environment Variables](#)

For each change, the table lists:

- The version of Enterprise Developer in which the change was introduced, starting with the earliest,
- The name of feature that changed,
- The type of change,
- A link to more information.

**Table 5: Changes to Compiler Directives**

At Product Version	Name	Change	See
Enterprise Developer Base release	<b>01SHUFFLE</b>	Deprecated	<a href="#">Unsupported or Deprecated at 2010</a>
Enterprise Developer Base release	<b>64KPARA</b>	Deprecated	<a href="#">Unsupported or Deprecated at 2010</a>
Enterprise Developer Base release	<b>64KSPECT</b>	Deprecated	<a href="#">Unsupported or Deprecated at 2010</a>

At Product Version	Name	Change	See
Enterprise Developer Base release	<b>AUXOPT</b>	Deprecated	<i>Unsupported or Deprecated at 2010</i>
Enterprise Developer Base release	<b>CHIP</b>	Deprecated	<i>Unsupported or Deprecated at 2010</i>
Enterprise Developer Base release	<b>DATALIT</b>	Deprecated	<i>Unsupported or Deprecated at 2010</i>
Enterprise Developer Base release	<b>EANIM</b>	Deprecated	<i>Unsupported or Deprecated at 2010</i>
Enterprise Developer Base release	<b>EDITOR</b>	Deprecated	<i>Unsupported or Deprecated at 2010</i>
Enterprise Developer Base release	<b>ENSUITE</b>	Deprecated	<i>Unsupported or Deprecated at 2010</i>
Enterprise Developer Base release	<b>EXPANDDATA</b>	Deprecated	<i>Unsupported or Deprecated at 2010</i>
Enterprise Developer Base release	<b>FIXING</b>	Deprecated	<i>Unsupported or Deprecated at 2010</i>
Enterprise Developer Base release	<b>FLAG-CHIP</b>	Deprecated	<i>Unsupported or Deprecated at 2010</i>
Enterprise Developer Base release	<b>IDXFORMAT8</b>	New option	
Enterprise Developer Base release	<b>MASM</b>	Deprecated	<i>Unsupported or Deprecated at 2010</i>
Enterprise Developer Base release	<b>MODEL</b>	Deprecated	<i>Unsupported or Deprecated at 2010</i>
Enterprise Developer Base release	<b>OPTSIZE</b>	Deprecated	<i>Unsupported or Deprecated at 2010</i>
Enterprise Developer Base release	<b>OPTSPEED</b>	Deprecated	<i>Unsupported or Deprecated at 2010</i>
Enterprise Developer Base release	<b>PARAS</b>	Deprecated	<i>Unsupported or Deprecated at 2010</i>
Enterprise Developer Base release	<b>PROTMODE</b>	Deprecated	<i>Unsupported or Deprecated at 2010</i>

At Product Version	Name	Change	See
Enterprise Developer Base release	<b>REGPARM</b>	Deprecated	<a href="#">Unsupported or Deprecated at 2010</a>
Enterprise Developer Base release	<b>SEGCROSS</b>	Deprecated	<a href="#">Unsupported or Deprecated at 2010</a>
Enterprise Developer Base release	<b>SEGSIZE</b>	Deprecated	<a href="#">Unsupported or Deprecated at 2010</a>
Enterprise Developer Base release	<b>SIGNCOMPARE</b>	Deprecated	<a href="#">Unsupported or Deprecated at 2010</a>
Enterprise Developer Base release	<b>SMALLDD</b>	Deprecated	<a href="#">Unsupported or Deprecated at 2010</a>
Enterprise Developer Base release	<b>SPZERO</b>	Deprecated	<a href="#">Unsupported or Deprecated at 2010</a>
Enterprise Developer Base release	<b>TABLESEGCROSS</b>	Deprecated	<a href="#">Unsupported or Deprecated at 2010</a>
Enterprise Developer Base release	<b>TRICKLECHECK</b>	Deprecated	<a href="#">Unsupported or Deprecated at 2010</a>
Enterprise Developer Base release	<b>WB2</b>	Deprecated	<a href="#">Unsupported or Deprecated at 2010</a>
Enterprise Developer Base release	<b>WB3</b>	Deprecated	<a href="#">Unsupported or Deprecated at 2010</a>
Enterprise Developer Base release	<b>WB</b>	Deprecated	<a href="#">Unsupported or Deprecated at 2010</a>
2.1	<b>COMP1</b>	New	<a href="#">What was new in 2.1</a>
2.1	<b>COMP2</b>	New	<a href="#">What was new in 2.1</a>
2.1	<b>DISPLAY</b>	New	<a href="#">What was new in 2.1</a>
2.1	<b>DATAMAP</b>	New parameter	<a href="#">What was new in 2.1</a>
2.1	<b>ILSMARTRESTRICT</b>	New	<a href="#">What was new in 2.1</a>
2.1	<b>RESTRICT-GOTO</b>	New	<a href="#">What was new in 2.1</a>
2.2	<b>ACU-UNDERSCORE</b>	New	<a href="#">What was new in 2.2</a>
2.2	<b>CHANGE-MESSAGE</b>	Changed scope	<a href="#">What was new in 2.2</a>
2.2	<b>DIALECT"RM"</b>	Changed effect	<a href="#">What was new in 2.2</a>
2.2	<b>EXITPROGRAM</b>	New	<a href="#">What was new in 2.2</a>

At Product Version	Name	Change	See
2.2	<b>HIDE-MESSAGE</b>	Changed scope	<a href="#">What was new in 2.2</a>
2.2	<b>IEXPONENTIATION</b>	New	<a href="#">What was new in 2.2</a>
2.2	<b>ILSHOWPERFORMOVERLAP</b>	New	<a href="#">What was new in 2.2</a>
2.2	<b>PRESERVECASE</b>	Changed scope	<a href="#">What was new in 2.2</a>
2.2 Update 1	<b>ILPARAMS</b>	New	<a href="#">What was new in 2.2 Update 1</a>
2.2 Update 1	<b>INIT-BY-TYPE</b>	New	<a href="#">What was new in 2.2 Update 1</a>
2.3	<b>DBSPACE</b>	New parameter	<a href="#">What was new in 2.3</a>
2.3	<b>EOF-1A</b>	New	<a href="#">What was new in 2.3</a>
2.3	<b>JVMDECIMAL</b>	New	<a href="#">What was new in 2.3</a>
2.3	<b>NLS-CURRENCY-LENGTH</b>	New	<a href="#">What was new in 2.3</a>
2.3	<b>NULL-ESCAPE</b>	New	<a href="#">What was new in 2.3</a>
2.3 Update 1	<b>IDXFORMAT12</b>	New option	
2.3 Update 1	<b>ILMAIN</b>	New	<a href="#">What was new in 2.3 Update 1</a>
2.3 Update 1	<b>OOCTRL</b>	New	<a href="#">What was new in 2.3 Update 1</a>
2.3 Update 2	<b>EBC-COL-SEQ</b>	New	<a href="#">What was new at 2.3 Update 2</a>
2.3 Update 2	<b>COMMAND-LINE-LINKAGE</b>	New	<a href="#">What was new at 2.3 Update 2</a>
2.3 Update 2	<b>NATIONAL</b>	New	<a href="#">What was new at 2.3 Update 2</a>
3.0	<b>CONVERTRET</b>	Deprecated	<a href="#">Unsupported or Deprecated at 3.0</a>
3.0	<b>HOSTSIGNS</b>	Unsupported	<a href="#">Unsupported or Deprecated at 3.0</a>
3.0	<b>IDYRCPATH</b>	Deprecated	<a href="#">Unsupported or Deprecated at 3.0</a>
3.0	<b>ILOBJECTIFY</b>	Deprecated	<a href="#">Unsupported or Deprecated at 3.0</a>
3.0	<b>OPTIMIZECURSORS</b>	New	<a href="#">Significant changes in 3.0</a>
3.0	<b>OPTION</b>	Deprecated	<a href="#">Unsupported or Deprecated at 3.0</a>
3.0	<b>TRICKLE</b>	Deprecated	<a href="#">Unsupported or Deprecated at 3.0</a>
4.0	<b>CHECKDIV</b>	New parameter	<a href="#">What was new in 4.0</a>
4.0	<b>DISPSIGN</b>	New	<a href="#">What was new in 4.0</a>
4.0	<b>GNTLITLINKSTD</b>	New	<a href="#">What was new in 4.0</a>
4.0	<b>ILSMARTTRIM</b>	New	<a href="#">What was new in 4.0</a>
4.0	<b>MAINFRAME-FLOATING-POINT</b>	New	<a href="#">What was new in 4.0</a>
4.0	<b>NUMPROC</b>	New parameter	<a href="#">What was new in 4.0</a>
4.0	<b>OOCTRL</b>	New parameter	<a href="#">What was new in 4.0</a>
5.0	<b>ILNORMALIZENAMES</b>	New	<a href="#">What was new in 5.0</a>
5.0	<b>JVMTARGET</b>	New	<a href="#">What was new in 5.0</a>
5.0	<b>ANIM</b>	Changed default	<a href="#">Significant changes in 5.0</a>

At Product Version	Name	Change	See
6.0	DISPLAY-AT	New	<a href="#">What was new in 6.0</a>
6.0	DPC-IN-DATA	New	<a href="#">What was new in 6.0</a>
6.0	ILCONDITIONPARAM	New	<a href="#">What was new in 6.0</a>
6.0	CHECKREFMOD	New parameter	<a href="#">What was new in 6.0</a>
6.0	PROTOTYPE	New parameter	<a href="#">What was new in 6.0</a>
7.0	EXECSQL-FLAG	New	<a href="#">What's new in 7.0</a>
7.0	ILCLR"2"	Deprecated	<a href="#">What's new in 7.0</a>
7.0	PANVALET-INCLUDES-IN-COMMENTS	New	<a href="#">What's new in 7.0</a>
7.0	RM-FILE-ERRORS	New	<a href="#">What's new in 7.0</a>
8.0	AMODE	New parameter	<a href="#">What was new in 8.0</a>
8.0	DISPLAY-PICU	New	<a href="#">What was new in 8.0</a>
9.0	ALPHA-LIT-CONT	New	<a href="#">What was new in 9.0</a>
9.0	DECLARE	New	<a href="#">What was new in 9.0</a>
9.0	IEXPOSEALPHA	New	<a href="#">What was new in 9.0</a>
9.0	IEXPOSEGROUP	New	<a href="#">What was new in 9.0</a>
9.0	ILSTRINGLOAD	New	<a href="#">What was new in 9.0</a>
9.0	INITIAL	New	<a href="#">What was new in 9.0</a>
9.0	JAVA-CALLABLE	New	<a href="#">What was new in 9.0</a>
9.0	JAVA-GEN-PROGS	New	<a href="#">What was new in 9.0</a>
9.0	JAVA-GEN-STRG	New	<a href="#">What was new in 9.0</a>
9.0	JAVA-OUTPUT-PATH	New	<a href="#">What was new in 9.0</a>
9.0	JAVA-PACKAGE-NAME	New	<a href="#">What was new in 9.0</a>
9.0	JAVA-SHAREABLE	New	<a href="#">What was new in 9.0</a>
9.0	MANAGED-FNC-PARAM-BY	New	<a href="#">What was new in 9.0</a>
10.0	ILPOINTER-REFERENCE	New	<a href="#">What was new in 10.0</a>

**Table 6: Changes to Run-time Tunables**

At Product Version	Name	Change	See
2.0	subsystem_cancel_mode	New	<a href="#">What was new in 2.0 - Run-time Tunables</a>
2.2 Update 2	reduce_java_signals	New	<a href="#">Significant changes in 2.2 Update 2</a>
2.3	default_cancel_mode	New default value New parameter	<a href="#">What was new in 2.3 - Tunables</a>
2.3	putenv_interface	New	<a href="#">What was new in 2.3 - Tunables</a>
2.3	strict_file_locking	New	<a href="#">What was new in 2.3 - Tunables</a>



At Product Version	Name	Change	See
2.3	<b>subsystem_cancel_mode</b>	New parameter	<a href="#">What was new in 2.3 - Tunables</a>
2.3 Update 2	<b>command_line_linkage</b>	Deprecated	<a href="#">Unsupported or Deprecated at 2.3 Update 2</a>
10.0	<b>entry_point_mapper_disable_auto_aliasing</b>	New	<a href="#">What was new in 10.0</a>

**Table 7: Changes to Library Routines**

At Product Version	Name	Change	See
2.0	<b>CBL_CTF_COMP_PROPERTY_GET</b>	New	<a href="#">What was new in 2.0</a>
2.0	<b>CBL_CTF_TRACE</b>	New	<a href="#">What was new in 2.0</a>
2.0	<b>CBL_CTF_TRACER_LEVEL_GET</b>	New	<a href="#">What was new in 2.0</a>
2.0	<b>CBL_CTF_TRACER_GET</b>	New	<a href="#">What was new in 2.0</a>
2.0	<b>CBL_CTF_LEVEL</b>	New	<a href="#">What was new in 2.0</a>
2.0	<b>CBL_SEMAPHORE_ACQUIRE</b>	New parameter	<a href="#">What was new in 2.0</a>
2.3	<b>CBL_LOCATE_FILE</b>	New parameter	<a href="#">What was new in 2.3</a>
2.3	<b>CBL_MANAGED_SESSION_GET_USERDATA</b>	New	<a href="#">What was new in 2.3</a>
2.3	<b>CBL_MANAGED_SESSION_SET_USERDATA</b>	New	<a href="#">What was new in 2.3</a>
2.3 Update 1	<b>CBL_CODESET_SET_MAPPING</b>	New	<a href="#">What was new in 2.3 Update 1</a>
2.3 Update 1	<b>CBL_RUNTIME_ERROR</b>	New	<a href="#">What was new in 2.3 Update 1</a>
4.0	<b>CBL_GET_DEBUG_START</b>	New	<a href="#">What was new in 4,0</a>
4.0	<b>CBL_GET_DEBUG_STOP</b>	New	<a href="#">What was new in 4,0</a>
4.0	<b>CBL_GET_OS_INFO</b>	New	<a href="#">What was new in 4,0</a>
5.0	<b>CBL_CREATE_CORE</b>	New	<a href="#">What was new in 5.0</a>
6.0	<b>CBL_GET_EXIT_INFO</b>	Enhanced	<a href="#">What was new in 6.0</a>
6.0	<b>MFU_GET_FILE</b>	New	<a href="#">What was new in 6.0</a>
6.0	<b>MFUGETF</b>	New	<a href="#">What was new in 6.0</a>
7.0	<b>CBL_GET_ERROR_INFO</b>	New	<a href="#">What was new in 7.0</a>
8.0	<b>PC_PRINTER_SET_FONT</b>	Enhanced	

**Table 8: Changes to Environment Variables**

At Product Version	Name	Change	See
2.2 Update 1	<b>strictvsam</b>	New	<a href="#">What was new in 2.2 Update 1</a>
2.2 Update 2	<b>ES_IMS_TLOG_FLUSH</b>	Deprecated	<a href="#">Significant changes in 2.2 Update 2</a>
2.2 Update 2	<b>MFALLOC_PCFILE</b>	Default value changes	<a href="#">Significant changes in 2.2 Update 2</a>
3.0	<b>FSWRKDIR</b>	New	<a href="#">What was new in 3.0</a>
3.0	<b>FSCHKLFH</b>	New	<a href="#">What was new in 3.0</a>

At Product Version	Name	Change	See
3.0	HCOBND	Deprecated	<a href="#">Unsupported or Deprecated at 3.0</a>
4.0	ES_CAT_RETRY_COUNT	New	<a href="#">Configuring Multiple Catalogs</a>
4.0	ES_CAT_RETRY_WAIT	New	<a href="#">Configuring Multiple Catalogs</a>
5.0	COB_LIVE_RECORD_SIZE	New	<a href="#">What was new in 5.0</a>
5.0	ES_SNATRC_DIR	New	<a href="#">Significant changes in 5.0</a>
7.0	ES_RDO_MAX_RESOURCES	New	<a href="#">What was new in 7.0</a>
8.0	ES_DSENQSHR	New	<a href="#">What was new in 8.0</a>
8.0	ES_JES_ENFORCE_EXPIRE_DATE	New	<a href="#">Significant changes in 8.0</a>
8.0	ES_JES_LISTCAT_YMD	New	<a href="#">Significant Changes in 8.0</a>
8.0	ES_ZOS_SYSPRINT_DCB	New	
8.0	MFJ_LEX_LOCATION	New	<a href="#">Significant Changes in 8.0</a>
8.0	SPOOL_TIMEOUT	New	
9.0	ES_IMS_DISPLAY_NEW	New	<a href="#">What was new in 9.0</a>
9.0	MFFTPXIT	New	<a href="#">Significant changes in 9.0</a>
10.0	ES_IMS_APARM_DLI	New	<a href="#">What was new in 10.0</a>
10.0	ES_IMS_LINKAGE_NULL	New	<a href="#">Significant Changes in 10.0</a>
10.0	ES_IMS_MFS_OPT2_LEGACY	New	<a href="#">Significant Changes in 10.0</a>

## What was New

This section describes the new features that were introduced in each successive release of Enterprise Developer.

## What was New in Enterprise Developer 10.0

### New Features in Enterprise Developer 10.0

Enhancements are available in the following areas:

- [Rocket COBOL Extensions for Visual Studio Code](#)
- [Application Workflow Manager](#)
- [.NET Support](#)
- [COBOL Language](#)
- [Code Analysis and a Natural Language Assistant](#)
- [Compiler Directives](#)
- [Customer Experience Improvement Program](#)
- [Data Tools](#)
- [Eclipse Integration](#)
- [Enterprise Server](#)
- [Enterprise Server Common Web Administration \(ESCWA\)](#)
- [Enterprise Server Security](#)
- [IMS Support](#)
- [Interface Mapping Toolkit](#)

- [Licensing Changes](#)
- [Mainframe Access](#)
- [Micro Focus Unit Testing Framework](#)
- [OpenTelemetry](#)
- [PL/I Support](#)
- [Terminal Emulation](#)

## Rocket COBOL and Enterprise Extensions for Visual Studio Code

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The Micro Focus COBOL and Enterprise extensions for Visual Studio Code have been repackaged by Rocket Software on the Microsoft Visual Studio Marketplace.

- The Rocket COBOL extension for Visual Studio Code (formerly Micro Focus COBOL Extension for Visual Studio Code) provides COBOL edit, compile and debug support for Visual COBOL and Enterprise Developer users in Visual Studio Code.
- The Rocket Enterprise extension for Visual Studio Code (formerly Micro Focus Enterprise extension for Visual Studio Code) provides PL/I edit, compile and debug support for Enterprise Developer users in Visual Studio Code. This extension installs the Rocket COBOL extension.
- The Rocket JVM COBOL extension for Visual Studio Code (formerly Micro Focus JVM COBOL extension for Visual Studio Code) provides support for debugging JVM COBOL code in Visual Studio Code.
- The Learn COBOL extension for Visual Studio Code provides all training materials for the Micro Focus COBOL Fundamentals Training course.

New enhancements in this release are:

- Support for accepting command-line arguments in COBOL notebooks.
- New debug launch options - console and integrated Terminal support for platform specific values in the `launch.json` file.
- Support is available for fine-tuning the colors of different parts of the code in the editor via Visual Studio Code's `settings.json` file. This requires a minimum release 10.0 of Enterprise Developer.



**Note:** These extensions are not included with the Enterprise Developer installer. They are available from the Microsoft Visual Studio Marketplace website. All of the extensions are available on Windows and Linux.

## Application Workflow Manager

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This release includes the following improvement:

- Two new tools, Get Editor Content and Set Editor Content, have been added to the Eclipse function package. These tools enable you to copy or set the content of an Eclipse text editor to or from a string or file. For example, you can use these tools to change the editor content by an external script written in Python or PowerShell.

## .NET Support

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This release provides the following enhancements to *.NET* support:

- *.NET* COBOL projects now target *.NET* 8. You can use *.NET* 8 SDK or Visual Studio Code to build *.NET* 8 COBOL projects. Earlier versions of *.NET* are not supported.

## COBOL Language

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This release includes the following enhancements:

- The **FREE** statement - under the MF dialect, you can now free memory, allocated via the ALLOCATE statement, directly by using `FREE ADDRESS OF data-name`. This negates the need to specify a returning pointer during allocation (i.e. `ALLOCATE data-name RETURNING my-pointer`) and then freeing the pointer.
- **COBOL/Java interoperability** - the following features have been added to the COBOL and Java interoperability for native COBOL code:
  - Support for the use of dynamic length COBOL items when running under an MF dialect.
  - User-defined exception handling when calling Java static methods.
- The **entry\_point\_mapper\_disable\_auto\_aliasing** run-time tunable - this new tunable has been introduced to determine whether the Entry Point Mapping facility should *not* emulate the alias function of an IBM mainframe linkage editor, and instead generate a `COBRT173 Called program file not found in drive/directory` run-time system error.
- **Enterprise COBOL support** - the following enhancements provide greater compatibility with IBM Enterprise COBOL version 6.4:
  - The STRING and UNSTRING statements now support USAGE UTF-8 data items.
  - The ENCODING phrase of the JSON-GENERATE and JSON-PARSE statements is now supported.
  - The ENTRY-NAME and ENTRY-INTERFACE clauses of the Function-ID paragraph are now supported; however, these clauses are strictly documentary.
- **New MF Level** - this release includes a new default level (MF"23") of reserved words.
- **Pointer dereferencing** - improvements have been made in the ability to dereference pointers using both the `DATA...AT` and `::` (colon-colon) syntax.

## Code Analysis and a Natural Language Analysis Assistant

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This release includes the following enhancements related to integration with COBOL Analyzer and Enterprise Analyzer:

- Natural Language Analysis Assistant in the IDE - integration with COBOL Analyzer and Enterprise Analyzer now provides a natural language **Analysis Assistant** chat window in the IDE. You can type queries about a COBOL workspace in a COBOL Analyzer or an Enterprise Analyzer repository. From the Analysis Assistant window results you can open Program Flow Graphs, view Complexity Reports, and open COBOL source files.
  -  **Note:** This functionality requires a licensed copy of either COBOL Analyzer 10.0 or Enterprise Analyzer 10.0.
- Complexity reports - you can now generate a Complexity Report for a workspace in the **Application Server Explorer** view. A complexity report enables you to view and compare various metrics of files in your workspace.
- On Windows, the Program Flow Graph (a Windows-only feature) is now available from Server Explorer for workspaces and source files in COBOL Analyzer and Enterprise Analyzer in the Eclipse IDE.

## Compiler Directives

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The following Compiler directive is new in this release:

- **ILPOINTER-REFERENCE** - Determines how a pointer used as a method parameter is passed if BY VALUE or BY REFERENCE is not specified as part of the parameter.

## Customer Experience Improvement Program

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Starting this release, the Customer Experience Improvement Program collects high-level, anonymous information on how Micro Focus products are used. The information collected includes product name and version, OS in use, and features used with the purpose to improve the products and, consequently, the customer experience.

Customer Experience Improvement Program participation is enabled by default. You can opt out with the help of the `mfcceipconfig` command-line utility.

## Data Tools

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This release includes the following enhancements in the Enterprise Developer and Enterprise Server products:

 **Attention:** This feature is in Early Adopter Program (EAP) release status. We intend to provide the finalized feature in a future release. Please contact OpenText Support for Micro Focus Products if you require further clarification.

- A new Data Tools utility, an Eclipse-based RCP (Rich Client Platform) application, is available. The new Data Tools is designed to overcome several restrictions in the existing Data File Tools and Classic Data File Tools. The new Data Tools application is a multi-line editor where the previous Data File Tools support editing one line at a time. Changes are made in the editor window, not in a separate line at the bottom of the editor.
- A new REST-based file service API is now available. This enables you to access Micro Focus formatted data sets as follows - get dataset attributes, open or close datasets, get or set a dataset's content, and to create datasets. The API commands can be used in customer scripts to access datasets with Micro Focus formats to automate application development processes. The REST-based file service API is used by the new Data Tools utility.

Features of the new Data Tools include:

- Open/save of Enterprise Server-cataloged datasets of the following Micro Focus formats: Fixed blocked, Variable blocked, and Indexed
- Multi-line editing support
- Insert, delete, update of lines or records
- Different coloring of changed lines/records to highlight changes
- Undo/redo
- Page-based navigation
- Toggle HEX on/off
- EBCDIC/ASCII switch
- Options for specifying the fonts and colors
- Display file information in a separate view
- Comprehensive logging and tracing capabilities

## Eclipse Integration

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This release provides the following enhancements:

- Enterprise Developer supports, and is shipped with, Eclipse 4.28 (2023-06). Versions of Eclipse prior to this one are not supported.
- **Quick fixes** - quick fix functionality has been enhanced to provide a list of possible fixes that can automatically be applied from the popup box displayed when hovering over an error in the editor; this is similar to the functionality provided when working with Java.

- **Session profiles when using Reflection Desktop or Rumba+ Desktop as your TN3270 emulator** - you can specify an existing session profile to automatically use when you connect to your emulator when running or debugging your mainframe subsystem project.
- **Pre- and post-build processing events** - script files used as part of build processing events (**Properties > Micro Focus > Build Configurations > Events**) can now be coded to affect the outcome of the COBOL build process, and also introduce error messages into the IDE. See *Pre- and post-build processing events*.
- Copybook Graph support - you can now see a graph of the copybook dependencies of COBOL files. The graph enables you to see any incoming and outgoing dependencies.
- **Copybook Paths** preference - a new preference page has been introduced to help locate copybook files, referenced in standalone files, when debugging. Use this page if your copybook files (or the files that call them) have been moved from their original (built) location. The list is searched in order until a match is found.
- **Conditional breakpoints** when debugging JVM COBOL now support the use of the following operators: <, >, <=, and >= within expressions.
- **Formatting preferences applied on sentence termination** - a new formatting preference (**Window > Preferences > Micro Focus > COBOL > Editor > Typing > Format sentence on period**) formats the current sentence as per the current formatter profile settings, when it is terminated by a period.

## Enterprise Server

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This release provides the following enhancements:

- Remote File Access - it is now possible to remotely access files using a configured Remote File Access (RFA) MFCS Connector. You can access ordinary files, cataloged datasets, and spool output. This also enables remote editing of COBOL data files using the new Data Tools utility. This enables you to download and upload files, datasets, and spool output locally or remotely using the existing Enterprise Server Security configuration. Various security features make this solution a more secure alternative to more generic solutions such as FTP and SSH.

## Enterprise Server Common Web Administration (ESCWA)

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This release includes the following enhancements:

- Catalog view has improved filtering options and now includes paging. A new **Load on navigation** check box enables you to filter based on the previously selected conditions.
- A new Configuration Report page enables you to visualize potential security vulnerabilities in the ESCWA and MFDS configurations. Each domain and configuration attribute combination has its own help dialog.
- Role-based security configuration. You can now configure a users view of ESCWA. If a user does not require specific roles then you can hide corresponding pages and API. You can configure the role-based access from the **Role Options** page. Click **Security**, expand **ESCWA Configuration** followed by the ESM, and then click **Roles**.



**Note:** Role-based security is an ESCWA only feature that works on top of existing product security.

- It is now possible to remove Locks, if necessary, to fix applications that are broken due to a lock that has not been removed. You can enable this feature from the **Locks** page. Click **Native > Monitor > Locks**, and then click **Remove Locks**. This functionality is controlled by the casstop resource entity in the OPERCMD5 resource class.



**Caution:** Incorrectly removing locks can result in system instability and corruption or loss of data.

- Region verification - ESCWA can now verify the configuration of selected components for an enterprise server region. You can use this feature to identify potential start up or configuration issues for the selected region. The verification process uses the casverify utility to perform the verification action.

- Improved CICS resource navigation. Active resources can now be filtered by group and large sets of filtered data can be paged.
- The API return codes have been improved. Previously, when the region monitor and control APIs were called, they would return a HTTP 200 code, with the error specified in the JSON output. The return codes have been improved to give more information. You can configure the API to use the new or old behavior.
- The ESCWA user interface is now more responsive and can be used with a greater variety of smaller Web browsers.

## Enterprise Server Security

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This release includes the following enhancements:

- Enterprise Server security features provided by the VSAM External Security Manager (ESM) module are enabled by default. You will need to supply valid credentials when you interact with ESCWA, the Micro Focus Directory Server and regions in the browser based UI or in the IDE, use certain utilities from the command line, use TN3270 emulator to access regions, log into or with FileShare. See *After Installing > Enterprise Server Security Features* for details on how to configure this product.
- TLS Certificate Checking Utility - a new executable in the product that can be used to help diagnose problems with TLS certificates. It can check the validity of certificates, verify certificate chains, check that certificates and private keys match and check that a certificate contains a SAN that matches a provided hostname/address. Improves TLS usability by diagnosing TLS certificate problems. See *CertChecker Utility* for more information.
- The VSAM ESM Module, which provides file-based security for Enterprise Server is now a GA quality.
  - User authentication and resource authorization control can be enabled through a simple file-based security mechanism.
  - Security data can be imported from YAML or LDIF and exported to YAML for portability and ease of editing / scripting.
- Additional optional security features are available for HTTP and MFBINP conversations, for the Web Services and J2EE, Web, and Remote File Access conversation types. Listeners can be configured to require user authentication and/or to restrict access to specific types of requests. See *Enhanced Security for HTTP and MFBINP* for more information.

## IMS Support

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This release provides the following new features:

- APARM handling has been updated to use EBCDIC APARMS obtained from EBCDIC applications. In addition, the APARM positional parameter for DLI has been changed from 19 to 20 to be consistent with the IBM IMS documentation. The APARM positional parameter for BMP applications remains at 19.
- The ES\_IMS\_APARM\_DLI environment variable has been added to enable the APARM handling behavior of previous releases.

## Interface Mapping Toolkit

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This release provides the following enhancement:

- The `imtkmake -defmap` command now support the following new parameters that enhance the default mapping support for service interfaces - endpoint, method, and path.

## Licensing Changes

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- The SafeNet Sentinel licensing system that was available with previous releases of this product has been deprecated and is no longer available in release 10.0. This product also uses the Micro Focus AutoPass licensing technology which was introduced in release 8.0. Starting with release 10.0, AutoPass is the only licensing technology available in this product.
- The SafeNet Sentinel licenses are no longer supported, and you need to use AutoPass licenses starting with release 10.0. Contact your account manager to replace your existing SafeNet Sentinel with AutoPass licenses.



**Note:** Installing 10.0 on a machine where there are other Micro Focus products or versions installed that use SafeNet Sentinel licensing might result in some compatibility issues. While the 10.0 installation process has been designed to address such issues, you should be aware of the following scenarios and if any action might be required to ensure licensing works as expected. See *Advanced Installation Tasks > Licensing Coexistence when Upgrading to Release 10.0* in the *Installation* section.

## Mainframe Access

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This release includes the following new features:

- z/OSMF support - MFDAS and Syncmon now have access to mainframe-hosted PDS files using the z/OSMF interface. This enables you to list and download PDS files without having to install Mainframe Access Server.
- MFDAS on UNIX platforms now supports USS commands.

## Micro Focus Unit Testing Framework

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This release includes the following enhancement:

- A new configuration file format has been introduced that enables you to use environment variables in your unit test code for tests that are compiled for more than one scenario. A portable environment file can provide environment variables for a test case that has been compiled in multiple ways (for Windows/UNIX, 32-bit/64-bit, etc...).

## OpenTelemetry

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This release includes support for OpenTelemetry on UNIX platforms. OpenTelemetry provides observability of Enterprise Server applications by collecting telemetry data. You can configure OpenTelemetry to emit the information that you require and in a form that can be consumed by third-party monitoring software, such as Prometheus, Grafana, and Dynatrace. This can enable you to visualize processes and workflow performance and behavior.

## PL/I Support

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This release provides improvements in the following areas:

Open PL/I compiler:

- Support for ORDINAL data types.
- Support for ORDINALNAME, ORDINALPRED and ORDINALSUCCEED ordinal built-ins.
- New `-gen_entry_dcl` compile option which will automatically generate ENTRY declarations and write them to the specified file.
- Improved mainframe compatibility of E and F edit FORMATS.
- Optimizer inlining support to improve performance. The new `-noinline` compiler option prevents the optimizer from attempting to inline PROCEDURE or BEGIN blocks.



- Support for UPTHRU and DOWNTHRU in loop iterations.
- Support for the TRANSMIT condition.
- Compiler cross-reference listings now indicate which variables and other identifiers are unreferenced and where they are declared within include files. Compiler cross-reference listing also include unique statement IDs to help correlate diagnostics to ambiguous line numbers within generated macro expansion.
- Support for static data structures and arrays exceeding 2GB in size (with the -largedata compile option).

#### Open PL/I debugger:

- Support for ORDINAL data types.
- Simplified debugger experience in Enterprise Server by removing PL/I tab from ESCWA.
- Support for asterisk (\*) variable names in PL/I structures.
- Improved overall debugger performance when handling large arrays and/or structures.

#### Open PL/I Run-Time System:

- Improved support for controlled storage in CICS transactions running in Enterprise Server.
- Support for the TRANSMIT condition.
- Improved support for ENDPAGE emulation.

#### Terminal Emulation

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This release includes the following enhancements:

- Host Access for the Cloud shipped with this product is now version 3.0.0.2. The HACloud configuration file has changed is now the `application-userprefs.properties` file in `%ALLUSERSPROFILE%\Micro Focus\Enterprise Developer\hacloud (Windows)` or `$COBDIR/etc/hacloud (UNIX)`. If there is an existing `hacloud.properties` file in from an earlier Enterprise Developer release in `%ALLUSERSPROFILE%\Micro Focus\Enterprise Developer`, this file is backed up the first time you start the HACloud session server. Micro Focus recommends that you migrate any non-default settings from the older configuration file over to the `application-userprefs.properties` file after the upgrade. See *HACloud Configuration File* for details.
- For secured ESCWA scenarios, HACloud now retrieves credentials for the ESCWA connection from a default secret shipped with the product (in `microfocus/common/readonly`). You can override the default user credentials by supplying an `escwacreds` and/or an `mfdscreds` secret. If these secrets do not exist then the default supplied user will be used.

## What was New in Enterprise Developer 9.0

### Features Added in Enterprise Developer 9.0

Enhancements are available in the following areas:

- [Learn Micro Focus™ Learn COBOL extension and Micro Focus™ COBOL Fundamentals Course](#)
- [Micro Focus Enterprise Extension for Visual Studio Code](#)
- [Micro Focus COBOL Extension for Visual Studio Code](#)
- [.NET Support](#)
- [Application Workflow Manager](#)
- [AppMaster Builder](#)
- [COBOL Language](#)
- [Compiler Directives](#)
- [Data Modernization Advice](#)
- [Debugging](#)

- [Eclipse Integration](#)
- [Enterprise Server](#)
- [Enterprise Server Common Web Administration \(ESCWA\)](#)
- [Enterprise Server Security](#)
- [HCO for PostgreSQL](#)
- [IMS support](#)
- [Interface Mapping Toolkit](#)
- [JCL Support](#)
- [Mainframe Access](#)
- [Micro Focus Unit Testing Framework](#)
- [OpenESQL](#)
- [OpenTelemetry](#)
- [PL/I Support](#)
- [Terminal Emulation](#)
- [Tracing](#)

## Learn Micro Focus™ COBOL Extension for Visual Studio Code and Micro Focus™ COBOL Fundamentals Course

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Micro Focus has released a new video-based training course in COBOL, Micro Focus™ COBOL Fundamentals Course. The course teaches the fundamentals of the COBOL language, introduces the Micro Focus™ COBOL syntax, and usage of Micro Focus COBOL tools.

The course is ideal for developers familiar with C, Java, or .NET who want to learn COBOL. It doesn't matter what language you know, as long as you have experience of standard programming concepts, this course is for you.

A new Learn Micro Focus™ COBOL Extension for Visual Studio Code is available. The extension comes with the training materials for the COBOL training course. For information about the COBOL course, and the Learn Micro Focus™ COBOL Extension for Visual Studio Code, visit [www.cobol.com](http://www.cobol.com).




**Note:** This extension is not included with the Enterprise Developer installer.

## Micro Focus Enterprise Extension for Visual Studio Code

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The following features are now available in the Micro Focus Enterprise Extension for Visual Studio Code when you use it with Enterprise Developer 9.0:

- A PL/I Language Server is available. This enables the following advanced features in the PL/I editor - Find All References, Peek, **Outline** view, collapsible regions, Rename, Navigate To, background error reporting, variable highlights.
- A new button, , **Debug PL/I Program** or **Run PL/I Program** in the top right corner of the editor, is present for the current PL/I program.
- You can now specify the PL/I main file context for include files if an include copybooks is referenced in more than one program.




**Note:**

- This extension is not included with the Enterprise Developer installer.
- This extensions also installs the Micro Focus COBOL Extension for Visual Studio Code.

## Micro Focus COBOL Extension for Visual Studio Code

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The following features are now available in the Micro Focus COBOL Extension for Visual Studio Code when you use it with Enterprise Developer 9.0:

- JVM COBOL debugging
- COBOL notebooks where you can have text and executable blocks of COBOL code in the same file.
- Colorization for COBOL directives files, `cobol.dir`.
- A new button, , **Debug COBOL Program** or **Run COBOL Program** in the top right corner of the editor, present for the current COBOL program.
- Configuration setting for custom tab stops.
- A Micro Focus COBOL terminal in the TERMINAL pane.
- You can now specify the COBOL main file context for copybooks if a copybooks is referenced in more than one program.



**Note:** This extension is not included with the Enterprise Developer installer.

## .NET Support

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This release provides the following enhancements to *.NET* support:

- This release installs several NuGet packages each of which contains the assemblies for a specific Enterprise Developer functionality. New *.NET* projects, as well as existing projects you edit or build in 9.0 are linked to a core package, `MicroFocus.COBOL.Runtime.Core`, that includes the basic functionality for the projects. You need to add any additional packages (such as a specific file handler, COBOL Accept/Display etc.) manually to the projects. The new packages enable better granularity of distributions, and provide more flexibility and control over what is packaged with the application.
- New SDK version - the Micro Focus SDK version has changed to version 2.1. See *Upgrading existing .NET COBOL project files* for details on how to upgrade your existing projects.

## Application Workflow Manager

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This release offers the following improvements:

- A new Git Function Package - provides tools that support common Git interactions such as Clone, Add, and Commit. This function package provides tool types to integrate the distributed revision control system Git into your AWM model and enabling you to build a development workflow that includes Git version control actions within the **AWM Team Developer** perspective.

## AppMaster Builder

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This release includes new functionality to support long and spacey paths. This affects the following:

- 8dot3 short-name creation behavior is no longer required on your computer file systems. See your Windows documentation for more information about enabling and disabling 8dot3 short-name creation.
- AMB file-tailoring skeleton files no longer require modification (usually these modifications consisted of enclosing paths within quotes) to use long and spacey file names.
- You must compare and reintegrate any customizations applied to file-tailoring skeleton files used in earlier versions of AMB into the new skeleton files provided with this release. These files are found in your `%ProgramFiles(x86)%\Micro Focus\Enterprise Developer\etc\ispslib` directory, and include:

```
SSMSISP  
SSMSDLG
```

SSMSMFS  
SSMCHK  
SSMPCOM  
SSMSCGEN  
SSMCOMP  
SSMOXGEN  
SSMCBL  
SSMMBMS  
DVSQ2  
DVSQLR  
DVSYMS  
DVSYMSX  
DVBAT  
DVVSM2  
DVMAIN  
DVJOBVSM  
DVJOBDDG  
DVJOBIMS  
DVJOBSQL  
DVCHECK  
DVIMS2  
DVCOPY

## COBOL Language

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**This release provides the following new features and enhancements to the COBOL language:**

- Double-colon, `::`, qualification is now available as a qualifier for data names and when dereferencing pointers.
- PERFORM frame local variables - variables that are DECLARED are now properly scoped. Reentering the SECTION, whether recursively or after leaving, gives a new instance of such variables. This provides better locality of data, and helps with writing of better structured code.
- Parameterized sections - syntax that allows program sections to accept arguments and return values.
  - PERFORM of a SECTION can now pass arguments to that SECTION.
  - A result can be returned to the code that PERFORMED the SECTION.
  - Sections that return a value can be used as functions, in contexts where an identifier is expected.
- Compiler can identify platform at compile time - the compile-time constants `__unix`, `__windows`, `__dotnet`, `__jvm`, and `__native` have been introduced. These can be tested in `$if` statements to tailor code to the platform being used.
- Enhanced CBL\_STRING\_CONVERT library routine - CBL\_STRING\_CONVERT can now convert strings to and from Base64.

**The following enhancements add further support for the IBM Enterprise COBOL version 6.4:**

- User-defined functions - user-defined functions are now available in an Enterprise COBOL dialect for version 6.4 compatibility. Reference the product Help, *General Reference > COBOL Language Reference > Part 3. Additional Topics > Additional Dialect Support > Enterprise COBOL Syntax Support > User-Defined Functions* under ENTCOBOL dialect. A new Compiler directive, `MANAGED-FNC-PARAM-BY`, enables you to specify whether the managed behavior of numeric function parameters should default to `BY VALUE` or `BY REFERENCE`.
- Enhanced mechanism for interoperation between Java and COBOL - The COBOL and Java interoperability has been enhanced to extend the capabilities of your COBOL applications with Java. It

removes the need to write object-oriented (OO) COBOL, as your native COBOL and Java programs can now interoperate in the following scenarios:

- COBOL programs can be marked as JAVA-CALLABLE, meaning that they can be called from Java as though they were Java static methods.
- COBOL program can call Java static methods using the `java.class.method` call.
- COBOL data can be shared with Java programs by marking it as JAVA-SHAREABLE.
- Comprehensive support for automatic conversion between a wide variety of popular Java data types and their corresponding COBOL types so that parameter passing and returned value handling require no special processing in user code.

## Compiler Directives

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This release provides the following enhancements.

### A new mechanism for setting Compiler directives (Technology Preview):

- Common directives files - this release introduces common directives files, `directives.mf` files, that enable you to automatically provide all required directives needed to compile multiple and Mainframe Subsystem applications without having to specify the directives individually. This feature is not available for Assembler or IMS.



**Note:** This is a technology preview feature only. It is being made available to allow you to test and provide feedback on this new capability; however, this feature is not intended for production use and it is not supported as such. Furthermore, Micro Focus does not guarantee that this feature will be delivered at a GA level and if it is, then the functionality provided might differ considerably from this technology preview.

### New Compiler directives:

- ALPHA-LIT-CONT - determines whether the right margin or the end-of-line is used to delimit the continuation of a non-numeric literal.
- DECLARE - defines the behavior of locally declared variables.
- ILEXPOSEALPHA/ILEXPOSEGROUP - these two directives can expose alphanumeric or group items passed by value to parameterized sections or methods in JVM COBOL programs as byte arrays (the default is to expose as string objects).
- ILSTRINGLOAD - where JVM COBOL programs with a very large number of distinct alphanumeric literals cause internal limits to be exceeded, use this directive to create these literals in a backing file, which can then be converted to strings at run time.
- MANAGED-FNC-PARAM-BY - determines whether user-defined function parameters are passed BY VALUE or BY REFERENCE by default when compiled with JVMGEN.
- INITIAL - determines how Working-Storage is initialized for programs marked as IS INITIAL.

A family of new Compiler directives has been introduced to support the new mechanism for interoperation between Java and native COBOL:

- JAVA-SHAREABLE - use the JAVA-SHAREABLE ON and JAVA-SHAREABLE OFF directives to bracket one or more WORKING-STORAGE data items to indicate that they are to be made read and write accessible from Java applications interoperating with this COBOL program.
- JAVA-CALLABLE - instructs the Compiler to make the COBOL program automatically callable from Java.
- JAVA-GEN-PROGS, JAVA-GEN-STRG, JAVA-OUTPUT-PATH, and JAVA-PACKAGE-NAME - control the behavior of COBOL programs that interoperate with Java through the JAVA-CALLABLE or JAVA-SHAREABLE directives or by calling Java static methods using the CALL statement.

## Data Modernization Advice

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The product Help now includes advice on moving your COBOL data files, such as flat files, VSAM, indexed or sequential files, etc. to a relational database (RDBMS). The documentation lists the solutions included in Enterprise Developer that enable you to achieve this, including advice on the best option for your application as well as performance considerations.

## Debugging

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This release provides the following new feature:

- In Eclipse, new Debug and Run configurations have been added for debugging and running COBOL/Java Interoperability applications. These enable you to debug COBOL programs calling Java static methods. To debug Java code calling a COBOL program, you must create a **Java Application** launch configuration and manually define the **VM arguments** property `-Djava.library.path` with a value representing the output path to the native library produced from the COBOL builder.

## Eclipse

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Enhancements are available in the following areas:

### Eclipse IDE:

- Eclipse 4.24 (2022-06) support, which is shipped and installed with Enterprise Developer. Versions of Eclipse prior to this one are not supported.
- Exporting code coverage results - an option has been added to the **Code Coverage** view to allow you to export the current code coverage results to a `.tcz` file.
- The Problems view now displays a sequence number column.
- A new project template is available for COBOL/Java interoperability applications. The project enables you to compile both COBOL and Java sources at the same time.

### COBOL editor:

- Auto-indenting on `end-*`.
- Collapsible regions for EVALUATE statements, and for 01 group items - a new option, **Enable folding for group level items**, has been added to the Eclipse preferences (**Window > Preferences > Micro Focus > COBOL > Editor > Folding**).
- Local variables support.
- Parameterized sections - support is available in the editor for parameterized sections.
- Paste JSON as COBOL classes - you can now copy JSON data and do a **Paste JSON As Classes** into a JVM COBOL file. This generates COBOL classes which enable you to deserialize the data in those classes.
- A Quick Fix is available for end of scope termination. To enable this, your project must have the NOIMPLICITSCOPE Compiler directive set, and error level to warning as errors.
- Renumber lines on save - line numbers can be automatically applied to a source file when it is saved, by selecting **Perform line numbering on save** from **Window > Preferences > Micro Focus > COBOL > Editor > Line Numbering**.
- Case preference for COBOL keywords on code clean up. A new preference in the code clean up profiles enables you to convert all COBOL keywords to uppercase or lowercase, if required.

## Enterprise Server

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This release provides the following enhancements:

- A new `casverify` command-line utility is available. This utility enables you to verify the configuration of a specified enterprise server region without attempting to start it, and also enables you to create

immediate diagnostics information in JSON or human-readable output. Verification stages are modular, enabling you to specify which validation checks to run.

- You can now list job steps to enable users to perform advanced restarts. Job steps can be output to JSON by specifying `casout /%jnumber` or output to a table by specifying `casout /%tnumber`. See *casout* for more information.
- Installation improvements on UNIX - when upgrading from releases 6.0, 7.0, or 8.0 on UNIX, Enterprise Developer now preserves more configuration details. During the installation of the product, a set of configuration files are moved to a config location before the upgrade occurs. These are linked back to the product install location on completion. When you reinstall the full product, install a patch update, or install an upgrade to the same location, the previous configurations settings are maintained.

Previously, the upgrade process required manual intervention to redeploy existing configuration settings. This now occurs automatically.

- Enterprise Developer CICS now supports the MAPPINGDEV option of SEND MAP and RECEIVE MAP commands.
- Application diagnostic reporting now enables you to collect JCL process failures. See *Application Diagnostic Reporting for Enterprise Server* for more information.

## Enterprise Server Common Web Administration (ESCWA)

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Enhancements are available in the following areas:

- Accessibility improvements - provide improved compliance with 508 and WCAG 2.1 standards.
- API, version 2 extensions - includes updated versions of some of the existing API version 1 endpoints, and has been extended to contain more endpoints.
- Merged Archived Spool - you can now configure an enterprise server region to view a merged archived spool in the UI. You can view multiple archived spools from a single region, and view old spool information for multiple jobs that have ran under a previous name
- Page search facility - you can now search for a page that contains a specified search string. This enhancement is part of the WCAG 2.1 requirements for accessibility.
- PAC clients - the ESCWA UI lists all TN3270 clients connected to a PAC. This enables you to administer and monitor clients across the entire PAC from a single PAC region.
- TLS-enabled Redis connections. ESCWA now supports administering and monitoring PACs with a TLS Redis SOR.

## Enterprise Server Security

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This release provides the following new features and enhancements:


- Demo CA - the component has been completely redesigned and is now included as part of Enterprise Developer. Demo CA supports multiple installations, uses up-to-date cryptographic support, and generates modern version 3 certificates with SANS, PKIDs, AKIDs, etc. signed by an intermediate CA. Demo CA is now easier to use and has improved interoperability with third-party SSL/TLS systems.



**Note:** Micro Focus strongly recommends that Demo CA is only used for SSL/TLS development and testing and is not intended for use in a production environment.

- `esfupdate` support for the Vault Facility - the `esfupdate` utility now supports the use of the Vault Facility for credentials it needs to connect to MFDS.
- OpenSSL 3.0 - OpenSSL has been updated to use the current Long Term Supported OpenSSL cryptographic library.
- VSAM External Security Manager (EAP) - the VSAM ESM Module is a new option for Enterprise Server security which is simpler and more convenient than using LDAP-based security. The VSAM ESM Module provides a security manager for Enterprise Server which keeps security data in COBOL data (VSAM) files. It provides many of the features of the MLDAP ESM Module but does not require an LDAP

server or other third-party solution. Security data can be imported from a YAML file, facilitating the securing of Enterprise Server and the modification of its security data.

 **Attention:** This feature is in Early Adopter Program (EAP) release status. We intend to provide the finalized feature in a future release. Please contact OpenText Support for Micro Focus Products if you require further clarification.

## HCO for SQL Server

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This release includes support for the following:

- The Define Lists tool in the HCOSS UI has been enhanced to enable you to select a dependency mode to use when creating a transfer list. The available modes are:

<b>Default</b>	Automatically include all parent objects of the selected object.
<b>Family tree</b>	Automatically include all parent objects of the selected table. Automatically include the child objects of each parent object. Repeat until no more parents and children are found.

**No dependency handling** Include the selected table only (do not include any parent or child objects).


- The Transfer Data Tool now includes the start and end date and time for each table transfer.

## HCO for PostgreSQL

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This release includes support for the following:

- PostgreSQL Global Development Group (GDG) community edition and Amazon AWS via new options for the TARGETDB directive.
- Migration of z/OS DB2 COBOL programs to PostgreSQL GDG community edition.

 **Attention:** Support for PostgreSQL Global Development Group (GDG) community edition is in Early Adopter Program (EAP) release status. We intend to provide the finalized feature in a future release. Please contact OpenText Support for Micro Focus Products if you require further clarification.

## IMS Support

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This release includes the following new features for IMS:

- A new environment variable, `ES_IMS_DISPLAY_NEW`, has been added to enable the new z/OS / `DISPLAY` timestamp output format.
- APARM handling has been updated to use EBCDIC APARMS obtained from EBCDIC applications. In addition, the APARM positional parameter for DLI has been changed from 19 to 20 to be consistent with the IBM IMS documentation. The APARM positional parameter for BMP applications remains at 19.
- The `ES_IMS_APARM_DLI` environment variable has been added to enable the APARM handling behavior of previous releases. See `ES_IMS_APARM_DLI` for details.

## Interface Mapping Toolkit

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This release provides the following enhancements:

- YAML support is now available for COBOL client generation. OpenAPI schemas can now be in YAML, in addition to JSON format.



- A new option, **Refresh Service**, has been added to the **Web Services** and **Java Interfaces** context menus. Use the **Refresh Service** option to update the bitism of the program for an existing Web Service or Java interface after changing the bitism of the Eclipse project or the COBOL program.

## JCL Support

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- In this release the security around running programs from JCL jobs has been enhanced to enable you to limit:
  - The location of the programs to load
  - Permission to run particular programs based on user ID

This release writes several additional messages to the job log as a JCL job runs, including the location from which each program is loaded. For example:

```
JCLCM0303I Program IDCAMS (MFJAMS) loaded from library
SYS1.LOADLIB
```

When running one of your own programs, you might see messages such as:

```
JCLCM0305I Failed to find program JCLREAD in private libraries
and SYS1.LNKLIB.
JCLCM0306I Number of SYS1.LNKLIB entries: 0.
JCLCM0303I Program JCLREAD loaded from library SYS2.LOADLIB.
```

Combined, these three messages indicate that the program was not found in the main program search path (SYS1.LNKLIB) but has been loaded from the JES Program Path (SYS2.LOADLIB).

For more information about increased JCL security checks including a configuration example, see *JCL Enhanced Security Checks*. For information about suppressing security check messages in the job log, see *ES\_JES\_HIGHER\_SECURITY\_LEVEL*.

- The MF\_SPLJNO\_LOCK environment variable has been added. Using this variable, you can change the process by which the JES engine accesses the job number of a JCL submission to enable enqueueing, which can increase throughput, reduce latency, and reduce disk/file access. For details, see *MF\_SPLJNO\_LOCK*.

## Mainframe Access

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This release includes the following new features for:

- Mfdaemon vault usage - the Mfdaemon persistent stored secrets are now stored in the vault.
- TAUZCAPP master configuration file location from JCL - MFA Server now enables you to specify the location for the master configuration file, required by TAUZCAPP, to be performed via JCL instead of having to edit a REXX script.
- UNIX support for WebAPI USS - the MFDAS command-line USS functionality is now supported on UNIX.

## Micro Focus Unit Testing Framework

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The Micro Focus Unit Test Seam pre-processor (mfupp) has been enhanced to aid the creation of self-contained unit tests that contain EXEC CICS or EXEC SQL statements. These EXEC statements can be removed or mocked depending on the requirement of the test case.

The Micro Focus Unit Test Runner has also been enhanced to aid the development of these styles of unit tests by the addition of new code generation arguments available from the command-line interface.

## OpenESQL

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In this release, OpenESQL applications now support z/OS DB2 syntax for the community version of PostgreSQL provided by the Global Development Group (GDG).

## PL/I

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This release includes enhancements in the following areas:

### Open PL/I Compiler:

The following enhancements make the migration of existing applications to new platforms easier. They also provide an improved functionality when using Open PL/I to develop z/OS applications.

- The QUICKSORT and QUICKSORTX built-in functions are now supported.
- Restricted expression evaluation now also takes place on AUTOMATIC, DEFINED, and BASED declarations in addition to STATIC which was added previously.
- Support is available for the XMLCONTENT attribute.
- The use of the RELEASE statement now implies OPTIONS(FETCHABLE).
- Improvements have been made to the support for factored lists used in the INIT attribute of a variable declaration.
- DEFAULT RANGE(\*) with no attributes no longer causes the compiler to abort.
- Support is available for the FIXEDOVERFLOW condition.
- Support is available for the FOFLONASGN, FOFLONDIV, FOFLONMULT, FORCEODD Fixed Decimal behaviors.
- Support is available for validation of FIXED DECIMAL data.
- Support has been added for more than 2GB of static data in a single procedure.
- Support has been added for placing uninitialized static data in the .BSS section.
- Improved diagnostics when passing an array to a procedure which expects an array with differing attributes.
- Improved diagnostics when passing CONTROLLED variables as parameters and attributes are in conflict.
- PL/I FETCH xxxx SET() syntax supports setting a PL/I ENTRY LIMITED.
- Support has been added for the -dc, -dc\_append, and -dcfout compiler options for data collections, which enhance IDE and Debugger functionality. See *-dc*, *-dc\_append*, and *-dcfout* for details.
- A new utility, *mfplcnv*, has been added to convert embedded hex values to hex literal constants. See *mfplcnv Syntax* for details.

### Open PL/I Debugger:

- Performance improvements on the display of arrays and complex structures.
- Support for arrays declared with negative array bounds.
- Improved debugger performance when watchpoints are set but not active.
- Improved breakpoint clean-up and handling in-between debugger sessions under Enterprise Server.
- Added a message to PLIDUMP to print {cond static external} for CONDITION declarations in the locals section rather than printing a generic "variable not found" message.
- Added support for decorated symbol/variable names in PLIDUMP on Windows.
- New watch points are now honored after a CONVERSION condition was raised.
- Remote debugging is supported on Solaris (SPARC).


### Open PL/I EXEC Preprocessor:

- It is now possible to specify DB2 LUW OPT guidelines within static SQL.
- The stability of CICS API calls on 64 Bit Solaris (SPARC) has been improved.

### Open PL/I Macro Preprocessor:

- The COMMENT built-in function now supports comments larger than 100 bytes in length.
- The -tagmin preprocessor option supports skipping of %SDEBUG; and %RDEBUG; statements when the replacement text fits on the same line as the macro invocation without wrapping.
- The conditional statements processing has been improved.

### Open PL/I Language

 **Note:** These features are in Early Adopter Program (EAP) release status. We intend to provide the finalized features in a future release. Please contact Micro Focus OpenText Support for Micro Focus Products if you require further clarification.

- Open PL/I now supports ordinals via the DEFINE ORDINAL statement, the ORDINAL attribute for the DECLARE statement, and the ORDINALNAME, ORDINALPRED, and ORDINALSUCC built-in functions.
- The DO statement now supports UPTHRU and DOWNTHRU.

### Open PL/I Run-Time System:

The following enhancements are available:

- Support for more than 2GB of static data in a single procedure.
- Support for placing uninitialized static data in the .BSS section.
- JSONPUTMEMBER now supports quotation marks within its input.
- Support for the XMLCONTENT attribute.
- The PL/I Run-Time System optionally provides the ability for ERROR to be driven in place of STRINGRANGE and SUBSCRIPTRANGE.
- PLIDUMP display of the offset within prologue code a signal is received within the prologue of a PL/I procedure.
- Support for FIXEDOVERFLOW condition.
- Support for FOFLONASGN, FOFLONDIV, FOFLONMULT, FORCEODD Fixed Decimal Behaviors.
- Support for validation of FIXED DECIMAL data.
- The speed for FIXED DECIMAL operations has been improved.
- The stability of CICS API calls on 64 Bit Solaris (SPARC) has been improved.

### Product Help:

- The product Help includes a new section on Open PL/I Conditions.
- A new section, *Open PL/I Problem Determination* is available. Reference this section to learn how to mitigate execution, link, and debugger problems, how to use PLIDUMP to resolve issues, and also to learn about specific PL/I-related information pertaining to the use of the Consolidated Tracing Facility. This new documentation also includes a list of data items you need to collect before raising a PL/I problem with Micro Focus OpenText Support for Micro Focus Products.

### Terminal Emulation

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This release provides the following new features.

- Enterprise Developer and Enterprise Server now incorporate Host Access for the Cloud (HACloud) to provide 3270 emulation. HACloud is the leading Web-based emulator and requires no additional desktop installation. HACloud replaces the Rumba+ Desktop emulator previously supplied with Enterprise Developer. Customers that have Rumba+ Desktop entitlement can continue to use it within Rumba+ Desktop.
- In this release, Host Access for the Cloud supports session configuration options, as well as creating and using macros.

- IDE support for Micro Focus Reflection Desktop - you can now select Reflection Desktop as the default TN3270 display to open from the IDE when you run or debug your TN3270 applications. You can now play Reflection or Rumba+ Desktop macros with Reflection Desktop.

## Tracing

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This release provides the following enhancements and new features:

- Improvements have been made to the to the Common Communications Interface (CCI) tracing. CCI tracing can now be enabled using only the Consolidated Trace Facility (CTF) configuration, without needing to set trace options in CCI.INI or the environment as well. SSL/TLS trace points have been added to the CCI CTF trace, making it easier to control. It uses the same mechanism as other components such as the COBOL RTS. SSL/TLS tracing is now incorporated into CTF, placing all communications trace output in one place and adding timestamps and other useful information to these tracepoints. See *Enabling CCI Tracing* for more information.

# What was New in Enterprise Developer 8.0

## Features Added in Enterprise Developer 8.0

Enhancements are available in the following areas:

- [Micro Focus Enterprise Extension for Visual Studio Code](#)
- [.NET 6 Support](#)
- [Application Workflow Manager](#)
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## Micro Focus Enterprise Extension for Visual Studio Code

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The Micro Focus Enterprise extension for Visual Studio Code provides the following enhancements:

- The use of the Extension Enterprise extension with Enterprise Developer 8.0 provides PL/I editor, compiler and debug support. The PL/I debug support includes data breakpoints, conditions, and signals.



**Note:** The Micro Focus Enterprise extension is available from the Microsoft Visual Studio Marketplace - [click here](#).

## .NET 6 Support

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This release provides the following enhancement:

- In all supported environments, you can use the .NET 6 SDK or Visual Studio code to build .NET 6 COBOL projects.  
Support for .NET Core 3.1 has been discontinued.

## Application Workflow Manager

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This release offers the following improvements:

- A new "Select Element List" button in the action bar of the Table Results view enables you to directly select an existing list. Navigation in the history using the backward and forward arrows is now per Eclipse session.
- A new relationship for an action, Create Element List.
- A new JES function package - enables you to define tools in an AWM model to browse, cancel, or delete z/OS jobs.
- The IDz Function Package Tools now support the new tool interface introduced with release 5.0.
- A new Filter Data Tool in the AWM function package.

## CICS Support

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This release introduces the following new features in Eclipse:

- A **CICS Resources** context menu command for CICS-enabled native enterprise server regions in Server Explorer - enables you to manage the PCT, FCT, and PPT resources.
- Enterprise Server validation in the IDE for CICS Web Services.
  - Reports validation errors where the associated enterprise server region configuration requires adjustments to support the CICS Web service.
  - Enables you to change the current configuration of the enterprise server region.
  - Validates that the enterprise server region supports the CICS Web service when all validation errors are resolved.

## COBOL Language

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The following enhancements have been made to the Micro Focus COBOL language:

- Further support for IBM Enterprise COBOL 6.3:
  - JSON PARSE and JSON GENERATE statements - for JSON GENERATE, anonymous objects can be generated using the OMITTED key word; the SUPPRESS phrase has been enhanced; the CONVERTING phrase is supported. For JSON PARSE, anonymous objects can be parsed using the OMITTED key word; the CONVERTING phrase is supported.
  - Intrinsic functions - the following list of functions is now supported: COMBINED-DATETIME, FORMATTED-CURRENT-DATE, FORMATTED-DATE, FORMATTED-DATETIME, FORMATTED-TIME, INTEGER-OF-FORMATTED-DATE, SECONDS-PAST-MIDNIGHT, SECONDS-FROM-FORMATTED-DATE, TEST-FORMATTED-DATETIME, and UUID4.

- The AMODE Compiler directive has been enhanced to allow COBOL programs full access to the 64-bit address space (AMODE"64"). This emulates the LP"64" option in Enterprise COBOL.
- The DYNAMIC LENGTH clause, introduced in the last product release, is now supported in JVM COBOL (as well native COBOL).
- JVM COBOL enhancements:
  - When no explicit type is declared for a variable, but the value is a non-integer numeric (for example `declare var1 = 1.23`), it is assumed to be of type float-long.
  - The NAME OF expression has been introduced. It returns the unqualified name of the type or member specified.

## Code Analysis

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The Application Analysis Server enables you to access either Enterprise Analyzer or COBOL Analyzer from the IDE. This release includes the following enhancements to this feature:

- A generate code search report and a single code search reports are available.
- An improved Get Direct References report.

Enhancements to the Analysis Services include:

- An enhanced Program Flow Graph
- Support for displaying the Data Flow analysis as a Graph.
- A new Eclipse preference page, **Application Wide Knowledge** in **Window > Preferences > Micro Focus > COBOL > Code Analysis**. This enables you to adjust certain timeout settings for certain long-running queries executed against a remote Enterprise Analyzer or COBOL Analyzer server.

Enhancements in the Rule-Based analysis include:

- The **Rules** preference page in **Window > Preferences > Micro Focus > COBOL > Code Analysis** now supports nested rules.

## Compiler Directives

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The following Compiler directive is new in this release:

- DISPLAY-PICU - defines the way PIC U data items are displayed: either as ANSI or UTF-8.

The following Compiler directive has been enhanced in this release:

- AMODE - a new parameter "64" stores pointers in 64-bit format - see *COBOL Language Enhancements* for more details.

## Data File Tools

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The following enhancement has been made to the Data File Tools:

- The Data File Editor now supports opening and editing KSDS VSAM files stored in an MFDBFH datastore.

## Debugging Applications

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This release includes the following enhancement:

- Enterprise Server debug configurations can now configure the **Program breakpoint on main entry point only** option, which if selected, only breaks execution when the Procedure Division entry point is called.

## Eclipse

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Enhancements are available in the following areas:

### Product:

- Enterprise Developer for Eclipse is now available on Linux platforms. Includes features such as:
  - Building and debugging of mainframe COBOL projects
  - Support for PL/I background parse, running and debugging
  - CICS Web services
  - Server Explorer
  - IMS support for PSB, DBD, and MFS Files
  - Data File Editor
  - Code analysis using the Application Analysis server
  - Host Access for the Cloud
- This release supports Eclipse 4.20 (2021-06), which is shipped and installed with Enterprise Developer. Versions of Eclipse prior to this one are not supported.

### Projects:


- Apache Maven support - native COBOL and native COBOL Unit Testing projects can be incorporated into your Maven-based lifecycles. They now accept a `pom.xml` file, which can be configured to run the Maven AntRun plugin, which allows Ant-based projects to work with Maven.
- Automatic directives determination - it is now possible to specify if this should run and if you will be prompted to perform it from **Perform automatic directives determination** preference, available from **Window > Preferences > Micro Focus > COBOL|PL/I > Directives Determination**.
- **Code Clean Up** - you can configure code clean up preferences, which you can apply to your code to ensure consistency throughout your COBOL code (for example consistent use of the PIC or PICTURE keyword). These preferences are stored in profiles, which allows them to be shared among development teams.
- Multi-file compilation - right-click a selection of files, and click **Compile** when **Automatic Build** is disabled. This utilizes the **Maximum compilations/links to execute concurrently** option (available from **Window > Preferences > Micro Focus > Builder > Project**) for native COBOL projects.
- Order of the Dependency Paths list - it is now possible to control the initial position of the new directory in the list. Use the **Insert to the beginning of dependency paths list** or **Append to the end of dependency paths list** options to determine the position. These options are available from **Window > Preferences > Micro Focus > Builder > Project**.

### COBOL Editor:

- COBOL code mining - code minings are additional content shown in the COBOL editor to give extra context to certain code elements. Use the **Window > Preferences > Micro Focus > COBOL > Editor > Code Minings** page to enable an indicator showing the number of times that a section or a paragraph is called in your native or procedural JVM COBOL code. Select the link shown to show a list of references in the Search view, where you can use the matches shown to jump to the actual call within your code.
- `end-` delimiter tooltips - within the COBOL editor, if you hover over the `end-` delimiter of a statement such as an IF or an EVALUATE statement, a tooltip showing the opening clause of the statement is displayed. You can enable/disable this behavior from the **Block matching** section in the COBOL editor preferences.

### Enhanced BMS tools integration with Eclipse on Windows and Linux:

- A **BMS Preview** view inside Eclipse enables you to preview the BMS screens on Windows and now on Linux where the standalone Micro Focus BMS Painter utility is not supported.

To invoke the preview, open a BMS file in the editor and click **Toggle the BMS previewer view**  in the Eclipse toolbar.

- The BMS text editor in Eclipse now offers enhanced writing support with smart editing and smart tabs, smart **Home/End** caret support, collapsible sections in the BMS code, and initial syntax checking and error reporting on background parse.
- The tree structure inside the **Outline** and **Program Outline** views now includes the mapsets and maps, and any macro attributes and strings. Hovering an element in the views shows their properties.
- Enhanced navigation - when you navigate inside the BMS source file, the relevant fields in the **BMS Preview** view are highlighted. The same fields are highlighted in the tree view inside the **Outline** and **Program Outline** views and this works both ways - clicking on any of the nodes in the tree view highlights the line in the editor that includes the relevant field.

### Host Access for the Cloud integration

You can now use Host Access for the Cloud as your TN3270 display when interacting with MSS-enabled enterprise server regions.

Use the **Window > Preferences > Micro Focus > COBOL > Enterprise Server > TN3270** preferences pane to configure an HACloud session to be the default connection type.

### Enterprise Server

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This release provides enhancements in the following areas:

- EZ Sockets now supports up to 4096 sockets on Linux, up from 1024, and enhanced tracing.
  - EZ Sockets applications, including ones that use the CICS listener CSKL (EZACIC02), can have more simultaneous connections.
  - EZ Sockets tracing now has options for logging the recent history only when any error or one of a set of particular errors occurs. This makes it easier to use tracing to diagnose EZ Sockets issues.
- Enterprise Server dataset management - dataset maximum retention period with the ability to alter and create reports:
  - ES\_JES\_ENFORCE\_EXPIRE\_DATE - helps determine whether or not to check the expiration date when deleting a catalogued dataset, and if expired, delete the dataset. If it hasn't expired and the PURGE option has not been specified, the dataset is not removed. The PURGE keyword is required to delete non-expired datasets. PURGE removes the underlying physical dataset file unless it is referenced by another catalog entry. SMS MANAGEMENTCLASS now supports maximum RETAIN days. See *Using SMS MGMT Classes* and the %SMS example command in the same topic.
  - ES\_JES\_LISTCAT\_YMD - helps determine the date format used in the HISTORY report generated when the IDCAMS LISTCAT command specifies the ALL option.
  - The EXPDT entry in a DD statement must be a four-digit year (YYYY); otherwise 1900 is the default, which is in-line with the mainframe processing, and prevents unexpired datasets from being erroneously removed (as was the case with the previous default of 2000). The ALTER command now takes the TO and FOR options to enable specification of the retention period for the entry being altered. The maximum retention period might be limited by the management class. The IDCAMS LISTCAT command ALL parameter now generates a separate HISTORY report that shows the creation date time and job, the last changed date time and Job, and the expiration date.
- HTTP compression - the Communications Server supports compressing large HTTP responses with gzip, and handles gzip-compressed HTTP requests. The Common Client supports gzip-compressed HTTP responses. Some large HTTP responses are compressed automatically if the client supports it. Large HTTP messages can be compressed, saving network bandwidth and improving performance.
- Task-cleanup performance - the performance of post-processing for tasks in MFCS has been improved.



- ICETOOL emulation - now supports the COUNT+*n* and COUNT-*n* syntax during trailer processing, where *n* is a numeric between 0-999. This adds to or subtracts from the COUNT value.
- DSNRLI now implements one-phase commit optimization where appropriate.
- Listing DEQ errors - a new caspac action, CasDEQs, enables you to list all errors that might have occurred on DEQs either at the end of a task or while a job or a transaction was executing.
- Enterprise Server configuration - you can now change the recording directory of the dump, trace, HSF, and the `console.log` files of each region..
- CICS API support - the CICS API GET CONTAINER option BYTEOFFSET is now supported.
- Compression on ECI calls via CASBNCCL Client - when using the Micro Focus External Call Interface (ECI) over TCP/IP, the request and response data flows are now compressed using RLE.

## Enterprise Server Common Web Administration (ESCWA)

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This release includes the following enhancements:

- Oracle Coherence is now available as a PAC Scale-Out repository as an alternative to Redis.
- Reduced number of Redis instances required when a PAC incompatible upgrade is performed - it is now possible to have multiple PSORs in one REDIS instance. This allows for the REDIS instances provisioned in the PAC to be reused.
- Enhanced PAC diagnostics via CTF - a new option on the ES Control page is now available to enable or disable CTF for a running region without the need to recycle the region.
- ESCWA API, version 2 - includes updated versions of some of the existing API, version 1 endpoints, with improved JSON property names, more sensible URIs. The version 2 API is a single API standard across API endpoints. It includes a number of usability enhancements, has a better readability and discoverability, and includes an improved API documentation.
- Enterprise Server Configuration Manager
  - A variety of configuration options are available in ESCWA on the **General >Advanced** page for a region.
 

The property grid in ESCWA shows the full list of configurable properties, categorized by group, along with help text and some additional meta-information. Properties marked as dynamic in the property grid can also be updated in a running region.
  - A number of properties that were previously set with environment variables are now available in the ESCWA UI. The environment variables are still supported for backward compatibility.
- Accessibility enhancements - the ESCWA UI includes a number of improvements in the areas of usability with screenreaders, color contrast, and text and icon sizing and alignment. This is to give it an improved compliance with the 508 and WCAG 2.1 standards.

## Enterprise Server Security

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This release includes the following enhancements:


- AWS Secrets Manager - support is available for using an AWS Secrets Manager, `mfsecretsaws`, as a remote vault.
- Protection for sensitive data - some sensitive data is now protected in the memory. This helps reduce the risk of exposing sensitive data such as passwords in core dumps and similar scenarios.
- An option to update short names - the ESF Update mechanism enables you to change between OS users ("long names") and ES userids ("short names") in running regions. This requires a non-default configuration setting.
- Caching improvements - ESF caching now caches more types of requests. This helps improve the Enterprise Server latency and throughput when external security is configured with caching.
- Support for Argon2 in password history - when Micro Focus passwords are used with the MLDAP ESM Module and password history is enabled, use Argon2 password verifiers in the history to avoid the

potential exposure of passwords via weaker verifiers. This helps improve the security of the password-history mechanism.

- The product Help includes a new section, *Securing Enterprise Server*, which provides guidance on improving the security of Enterprise Server installations and the applications they host. This includes information on security and how to reduce security exposure.

## HCO for PostgreSQL

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 **Attention:** This feature is in Early Adopter Program (EAP) release status. We intend to provide the finalized feature in a future release. Please contact OpenText Support for Micro Focus Products if you require further clarification.

Patch Update 3 of this release includes the HCO for PostgreSQL (HCOPG) feature, which provides tools for migrating DB2 applications to use databases created with AWS Aurora PostgreSQL or RDS for PostgreSQL. With this release, only AWS Aurora PostgreSQL and AWS RDS for PostgreSQL, version 14.3 and later are supported. For details, see *HCO for PostgreSQL (HCOPG)*.

## IMS Support

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This release provides the following enhancement:

- The JES aliasing feature can be used with IMS DLI and BMP applications run from JCL.
- APARM handling has been updated to use EBCDIC APARMS obtained from EBCDIC applications. In addition, the APARM positional parameter for DLI has been changed from 19 to 20 to be consistent with the IBM IMS documentation. The APARM positional parameter for BMP applications remains at 19.
- The ES\_IMS\_APARM\_DLI environment variable has been added to enable the APARM handling behavior of previous releases. See *ES\_IMS\_APARM\_DLI* for details.

## Interface Mapping Toolkit

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This release includes the following enhancement:

- Support has been added to Enterprise Developer for Eclipse on Windows and UNIX for creating JSON (RESTful) Web Services using API resources.

## JCL Support

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This release provides the following enhancements:

- In Eclipse, a **Show Spool** and a **Show Catalog** context-menu command are available in Server Explorer for MSS-enabled enterprise servers. These enable you to display and manage the regions' JES spool queues and catalogs, respectively.
- Support is available for the DSENQSHR JOB statement parameter with options of ALLOW, USEJC, and DISALLOW. You can configure the use of this parameter with the new ES\_DSENQSHR environment variable for Enterprise Server.
- The MF\_SPLJNO\_LOCK environment variable has been added. Using this variable, you can change the process by which the JES engine accesses the job number of a JCL submission to enable enqueueing, which can increase throughput, reduce latency, and reduce disk/file access. For details, see *MF\_SPLJNO\_LOCK*.

## Mainframe Access

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This release introduces:

- UNIX client support (EAP) - a subset of the MFDAS command-line functionality is now supported on UNIX. Features include:
  - Download, upload, and administration of data sets and JES.
  - Client post-processing such as DFCONV conversion.
  - UNIX Vault storage for user credentials



**Attention:** This feature is in Early Adopter Program (EAP) release status. We intend to provide the finalized feature in a future release. Please contact OpenText Support for Micro Focus Products if you require further clarification.

## The Micro Focus Database File Handler

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The Micro Focus Database File Handler offers the following enhancements:

- PostgreSQL and Microsoft SQL Server now support storing datastores, region databases, and cross-region databases in a single physical database, instead of storing them in separate databases.
- Configurations that use a single physical database can now use a single database connection to access all MFDBFH resources stored within.

## Micro Focus Unit Testing Framework

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The following enhancement has been made to the Micro Focus Unit Testing Framework in the IDE:

- IDE support has been added for self-contained tests.

The following enhancement has been made to the command-line version of the Micro Focus Unit Testing Framework:

- You can now use the Micro Focus Unit Testing Framework to build and run test cases from within a .NET 6 environment. Install the NuGet package supplied with Enterprise Developer to enable the mfunittest extensions to the `dotnet` command line utility.

## OpenESQL

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This release includes the following enhancement:

- The new SQL Error Mapping feature enables you to customize how error information is returned in SQLCODE, SQLSTATE, SQLERR and MFSQLMESSAGETEXT.

## PL/I Support

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Enhancements are available in the following areas:

### PL/I compiler compatibility:

Support has been added for the following:

- Decimal Floating Point (IEEE-754-2008) when running on Intel architectures. This enables data to be held in Densely Packed Decimal (DPD) format or in Binary Integer Decimal (BID) format. This feature is in Early Adopter Program (EAP) release status.
- NOEXECOPS when running under the control of JCL.

- PL/I built-in functions including: ENDFILE, EPSILON, EXPONENT, ISFINITE, ISINF, ISNAN, ISZERO, MAXVAL, MINVAL, PLACES, PRECVL, PRED, RADIX, ROUNDAYFROMZERO, ROUNDTOEVEN, SCALE, SQRTF, SUCC, and XMLSCRUB.
- The IEEE attribute on a FLOAT DECIMAL variable declaration.
- Patch Update 1 provides a new compiler option, `-directive`, which sets the conditions under which a FIXEDOVERFLOW is raised for a FIXED DECIMAL overflow.

#### **PL/I compiler listing enhancements:**

PL/I compiler listings now include:

- Display of options in effect and option defaults
- Unreferenced variables
- The OPTIONAL attribute for parameters

#### **PL/I debugging:**

PL/I debugging now supports:

- Hardware breakpoints in the IDE.
- STEP out of a CICS LINK level
- Much larger call stacks
- Remote debugger support on AIX and Solaris for PL/I programs running under the control of Enterprise Server.
- Callstack generation using DWARF debug information on Linux.

#### **PL/I EXEC Preprocessor:**

- Early adopter support for an EXEC SQL statement that specifies a compiler-generated exit.

#### **PL/I Language**

- Starting with Patch Update 1, the default behavior of the FIXEDOVERFLOW condition used with the PL/I ON statement has been changed for FIXED DECIMAL variables that specify an even precision. The new behavior matches that of mainframe PL/I, which uses the extra high order nibble in arithmetic operations and assignments even though it exceeds the defined precision.

#### **PL/I Macro Preprocessor:**

- COMPILETIME/COMPILEDATE builtin functions now output without %SDEBUG/%RDEBUG pairs
- New GETENV built-in function
- Support for CALL within a PL/I Macro
- Support for ITERATE, DEPRECATE, DEPRECATENEXT

#### **PL/I Run-time System:**

- Improved performance of JSON builtin functions
- Improved PLIDUMP callstack accuracy on the newest Redhat and SUSE releases
- PLIDUMP Display of the offset within prologue code a signal is received within the prologue of a PL/I Procedure
- FIXEDOVERFLOW generated upon assignment to FIXED DECIMAL variables where truncation occurs
- Support for NOEXECOPS when running under the control of JCL
- PLIHSSR now allows for use of PCB in addition to PCB Pointer in call

#### **Terminal Emulation**

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- This release installs the Session Server component of Micro Focus Host Access for the Cloud (HACloud). HACloud provides browser-based HTML5 access to 3270 host applications on Windows and Linux for multiple connected users. HACloud is configured to work out-of-the-box with the default configuration for ESCWA and MFDS and might need to be configured before you start using it.

- Patch Update 1 provides the following enhancement to the HACloud support:
  - On Windows, a new Windows service, **Micro Focus HA Cloud**, enables you to start the HACloud session server from the Windows Management Console. Before you can use the service, you need to deploy it with the `hacloudserviceinstall` script available from an Enterprise Developer command prompt.
  - Host Access for the Cloud is available as a setting in the Eclipse preferences . You can enable it as the default TN3270 display to use when you run or debug your applications.

## What was New in Enterprise Developer 7.0

### Features Added in Enterprise Developer 7.0

Enhancements are available in the following areas:

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#### Micro Focus COBOL Extension for Visual Studio Code

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The new Micro Focus COBOL extension for Visual Studio Code is available on the Microsoft Visual Studio Marketplace. This provides edit, compile and debug support for Visual COBOL and Enterprise Developer users in Visual Studio Code.



**Note:** The new Micro Focus COBOL extension is not included with the Enterprise Developer installer.

#### .NET Core Support

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Support has been added for creating, building and running .NET Core projects using the `dotnet` command.

## Application Workflow Manager

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Improvements have been made in the following areas:

- Modelling support for tool process logic under an action:
  - You can now model loops and conditional execution of tools under an action, making the modeling of complex tool logic under an action easier and more transparent. See *Action Descriptor* for more information.
- Icon support:
  - Icons can be specified to consist of several layers which, for example, enables you to model icons with decorators. The decorators can be displayed depending on conditions. See *Relationship Element Has Icon*, *Relationship Action Has Icon*, and *Relationship Filter Has Icon* for more information.
  - Additional icons have been added to AWM. See *Icons for the AWM Function Package* for more information.
  - You can now specify and use your own icons.
  - You can now specify icons for filter definitions. See *Relationship Filter Has Icon* for more information.
- Filter definitions view:
  - You can now export and import filter definitions to and from another workspace.
  - The filter definition view's structure has been changed to a tree design enabling you to group corresponding filters.
- "Micro Focus z/Server" connection type:
  - Now supports drag & drop of a data set from the connection to an enterprise server instance's catalog entry.
  - You can now compress a z/OS PDS data set.
- New Micro Focus DevHub connection type function package:
  - Provides a tool to send commands to a Micro Focus DevHub connection and receive the output returned by the command so that it can be processed by other tools. See *Micro Focus DevHub Connection Type Function Package* for more information.

## Assembler Support

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This release includes the following enhancements:

- Support for Assembler data table generation on UNIX and Linux - a new command-line executable, `MFMODGEN`, is available on these operating systems to generate an Assembler data table (`.MOD` file) from an Assembler source file.

This feature is the only Assembler functionality currently supported on UNIX systems. The rest of the Micro Focus Assembler functionality is supported for 32-bit Windows only.

## CICS Support

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CICS support in development has the following new features:

- A 64-bit BMS Compiler on Windows and UNIX - the command-line utility, MFBMSCL, is now available in 64-bit format on Windows as part of Enterprise Developer and on UNIX as part of Micro Focus Enterprise Developer UNIX Components.

On Windows, Eclipse now uses the 64-bit BMS Compiler by default.

The availability of the compiler on UNIX means that in remote development scenarios using Eclipse, BMS files are compiled directly on the UNIX machine. It is no longer necessary to copy the BMS files to your local Windows machine to compile them. There is no longer a requirement to only use SAMBA connections if your remote projects include BMS files.

## COBOL Language

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The following enhancements have been made to the Micro Focus COBOL language:

- **JVM COBOL data type to hold strings of utf-8 characters** - support is now available in JVM COBOL for the PIC U data type. This was already available for native COBOL, to support its introduction by IBM in Enterprise COBOL version 6.3.
- The DYNAMIC LENGTH clause, which enables a data item to vary in length at run time, is supported for native COBOL code. Again, this is in response to its introduction by IBM in Enterprise COBOL version 6.3.
- The following date-format-checking intrinsic functions have been added: TEST-DATE-YYYYMMDD and TEST-DAY-YYYYDDD.

## Code Analysis

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This release includes the following enhancements:

- **Get Direct References** command - you can use this command to see if changing a file will affect the other files in your project as well as the files in the whole application. In Eclipse, you can access this from the context menu or from the Analysis Server Explorer.
- Import points of interest - the Code Analysis view now includes a new button,  (**Import points of interest**).

## Code Set Support

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The following enhancements have been made to the integrated code set translation support:

- Arabic support for Enterprise Server applications is available.

If you are building Arabic support into Enterprise Server applications, your terminal emulator must support the Arabic EBCDIC 420 code page.

Support is added by building your applications and configuring your enterprise server regions with the MFCODESET variable set to the supported country code (0420). Your product's in-built code set translation utility performs translations between the ASCII 1256 Arabic code page on your enterprise server region, and a terminal emulator that supports the Arabic EBCDIC 420 code page (for example, IBM's Personal Communications emulator).

There are some considerations when working with a bi-directional language such as Arabic; these are discussed in *Arabic support considerations*.

## Compiler Directives

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The following Compiler directives are new in this release:

- PANVALET-INCLUDES-IN-COMMENTS - This directive controls whether ++INCLUDE statements in comments are actioned or not.
- EXECSQL-FLAG - This directive defines whether syntax reporting should emulate that of the DB2 preprocessor, the DB2 coprocessor, or to allow all syntax variations of both.
- RM-FILE-ERRORS - This directive generates run-time system errors for certain file conditions, even when a FILE STATUS clause is present; this is to emulate RM/COBOL behavior.

The following Compiler directive option has been deprecated:


- ILCLR(2) - this is as a result of deprecating support for versions 3.0 and 3.5 of the .NET Framework. Applications that have this option set will produce an E level message when compiled in this release of Enterprise Developer.

## Database Access - HCOSS Manage Connections Tool

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This release includes:

- Enhanced usability features around connection error diagnosis and SQL Server connection/installed ODBC driver selections.


 **Attention:** This feature is in Early Adopter Program (EAP) release status. We intend to provide the finalized feature in a future release. Please contact OpenText Support for Micro Focus Products if you require further clarification.

## Database Access - MBDT Utilities

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This release introduces:

- The SQLTUL utility, which is equivalent to the z/OS DB2 DSNTIAUL program.

 **Attention:** This feature is in Early Adopter Program (EAP) release status. We intend to provide the finalized feature in a future release. Please contact OpenText Support for Micro Focus Products if you require further clarification.

## Database Access - OpenESQL

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This release provides the following enhancement:

- New OpenESQL TRACELEVEL=5 option - native OpenESQL applications can now trace ODBC calls to the database vendor's ODBC driver, recording the start and stop times of each call's execution. OpenESQL tracing can now provide more detail on where an SQL application is spending execution time, in the OpenESQL layer or the underlying ODBC driver layer.

## Data File Tools

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This release includes the following enhancements in the Data File Editor:

- **New Data Explorer for working with data sets** - a new Data Explorer enables you to connect to either an ESCWA service or directly to an enterprise server region to access a catalog when working with data sets in the editor.
- **Multiple record selection**- you can select multiple records and, where appropriate, can perform certain actions on more than one record at once.
- **Cut, copy, and paste functionality** - traditional cut, copy, and paste functionality (including the standard Ctrl+X, Ctrl+C, and Ctrl+V shortcuts) is now available throughout the editor.



- **New filter creation** - a new process for creating filters has been introduced. A filter consists of one or more sets of conditions, and the resulting filter can include or exclude those records selected. The previous filter process is still available, but has been marked as deprecated.
- **Remote filtering** - functionality has gone into Fileshare Server which allows filtering to occur server side when opening data sets on remote enterprise server regions. The filter process results in only those filtered records being downloaded to the data file editor client.
- **Find/replace functionality** - you can search records in a data file to identify specific strings, and then if required, replace them.

## Eclipse Integration

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This release includes enhancements in the following areas:

- **Supported Eclipse versions** - this release supports Eclipse 4.16 (2020-06), which is shipped and installed with Enterprise Developer.  
Versions of Eclipse prior to this one are not supported.
- **Micro Focus Search** - the search has been enhanced to filter results on the build action: in the **Limit To** section, select **Files configured for compilation** to only include files in the search results that have a build action set to **Compile**. The search results also include a new column, **Build Action**, that shows the current action for each file.
- **Formatting profiles** - the formatting and clean up preferences for your COBOL code are now stored in profiles. You can have many profiles per workspace, allowing you to easily switch between different sets of formatting for different projects. The profiles can also be shared between local workspaces and to other users, allowing developers to format code consistently throughout their team.
- The following new preferences have been added:
  - **Force native line endings when pasting with Ctrl + Shift + V**, available from **Micro Focus > COBOL > Editor**: this option produces line endings native to the local operating system.
  - **Show Compiler directive summary in editor**, available from **Micro Focus > COBOL > Editor > Compiler Directives summary**: this option shows a summary of the Compiler directives in effect, in the editor.
- **Spool and Catalog views** - you can now use Server Explorer to control the spool queues and catalogs for JCL-enabled enterprise server regions. You can submit JCL jobs to the enterprise server, and then view the spool queues as those jobs are processed. Also, you can manage the associated catalog, displaying and editing the attributes and content of data sets within.

## Enterprise Server

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This release includes the following enhancements:

- **Multiple Network Interface support** - there is improved support for multiple network interfaces in some components, including better awareness of network interfaces and control over networking. This is a partial implementation and will be enhanced in future releases.
- **Extended IPv6 support** - support is available in Micro Focus Directory Server (MFDS) and in the Micro Focus Communications Server (MFCS) listener for multiple IPv6 addresses.

In release 6.0, you could only configure MFDS and MFCS listeners to listen on a single IPv6 address. In release 7.0, by default, MFDS and MFCS now listen on all configured IPv4 and IPv6 addresses, and can also be configured to listen on a combination of specific addresses.

- **HTTP improvements**:
  - Additional security measures for HTTP, such as security-related headers.
  - Chunking support for large HTTP messages makes it possible to retrieve very large files from Enterprise Server regions.

- Enhancements to CICS Web Interface and CICS Web Services.
- Application Diagnostic Reporting for Enterprise Server - Application diagnostic reporting collects and packages a number of reports, trace, and log files into a single report file. See *Application Diagnostic Reporting for Enterprise Server* for more information.
- Enterprise Server now supports automatic reconnection to the standby Queue manager in an Multi-Instance Queue Manager. See *Reconnecting to an MQ Server in a Multi-instance Queue Manager* and *Enterprise Server XA Reconnect* for more information.
- The casmgr process has been optimized to improve the use of initiators when dispatching jobs across a PAC. In addition, improvements have been made to the way it manages the queue of jobs waiting to be dispatched.
- Information has been added describing the best practice and the recommended approach you should adopt when performing a Patch Update to your PAC environment. See *Performing a Product Upgrade to a PAC Environment* for more information.
- New operating modes , *upgrade* and *quiesce*, have been introduced for Performance and Availability Clusters (PACs). These operating modes can be used to facilitate the installation of product updates that introduce incompatibilities between PSOR data structures. You can check for incompatibilities using the new caspac utility option CheckCompat. An upgrade mode can be set when starting the first enterprise server region in a new PAC using the new casstart utility *start-type* option *u*. This upgrade mode will prevent participating enterprise server regions from processing batch workloads as part of its normal operation, and any EXEC CICS START requests will be rejected. See *casstart* and *caspac* in your product Help for more information.

When enough enterprise server regions have been switched over to the new PAC, the old PAC can be set to operate in the quiesce mode. This prevents further batch workload and EXEC CICS START from being processed.

The new PAC can now be switched to running mode so that batch workload and EXEC CICS START are enabled for processing again.



**Note:** Before setting the new PAC mode to running, you must switch enough enterprise server regions to the new PAC to enable it to service the expected workload.

## Enterprise Server Common Web Administration (ESCWA)

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This release offers the following improvements:

- MFDS User Interface functionality replacement - ESCWA now replaces the MFDS inside the IDE as the engine that provides access to and management of regions. ESCWA provides all the functionality that was previously available from MFDS. This release includes the following enhancements:
  - Delete all regions.
  - Session list.
  - Renew listening addresses.
- ESMAC User Interface functionality replacement - the following ESMAC features have been implemented in ESCWA:
  - Resource Filtering. See *CICS Resources* for more information.
  - Millisecond support. See *Threshold*, *Monitor*, and *Active PCT* for more information.
  - Control the scope for all changes to timeouts, trace flags, and memory strategy when applied to regions in a PAC. See *ES Control* for more information.
  - Enable Application Diagnostic reporting. See *ES Control* and *Application Diagnostic Reporting for Enterprise Server* for more information.
  - Submission of local jobs from the JES Control page when CASRDO44\_NEWSUB=OFF has been specified. See *JES Control* for more information.
  - View and reply to pending ACCEPT FROM CONSOLE statements. See *Pending Replies* for more information.

- The messages after a JCL job has been submitted are now correctly JSON formatted. This page now works in ESCWA when MFJUXIT is enabled.
- Import, export, and copy regions - you can now use the UI to export and import regions in various formats, including use JSON. You can:
  - Copy regions between Directory Servers
  - Import and export regions in JSON, XML or in the `.dat` legacy format. The legacy format can be converted to a modern format.
- Mainframe Access (MFA) administration - ESCWA provides a modern Web UI and does not require you to use a separate terminal application. Features include:
  - Log in or off from MFA.
  - Change your MFA password.
  - View MFA server tasks.
  - Retrieve the XDBOUT log (Web UI).
  - Retrieve the JES spool files by DD Name (API).
  - Set the MFA and JES tracing level.
  - View the active MFA users.
  - Invalidate active user sessions.
  - View mainframe/MFA statistics.

See *Mainframe* in the Enterprise Server Common Web Administration chapter for more information.

The MFA API library has been exposed to enable you to test and use the requests that are provided. See *MFA Interactive API Library* for more information.

- CICS resource support - the following resources are supported:
  - Resource Name List (RNL) CICS resource.
  - Thresholds CICS resource.
  - Extended Architecture Table (XAT) CICS resource.
- Scale-Out and PAC administration - you can now:
  - Monitor Redis Sentinel and Cluster instances when used for Scale-Out Repositories.
  - Specify that all changes to timeouts, trace flags, and memory strategy can be applied to one of three options:
    - Only the local region.
    - All members of a PAC except the regions where local changes have been made.
    - All members of a PAC.

You can configure this in ESCWA with the **Apply Scope** field on the ES CONTROL page.

Alternatively, you can use the `casutl` utility with the `/w` option. See *casutl* for more information.

- Multi-Network Interface Card support - ESCWA now enables you to configure Communications Servers and Listeners to listen on multiple IPv4 and IPv6 addresses. Previously, they were limited to listen on either all IPv4 addresses, or a single IPv4 or IPv6 address. Now a combination of any of the following can be used:
  - One or more specific IPv4 addresses.
  - One or more specific IPv6 addresses.
  - All IPv4 addresses.
  - All IPv6 addresses.
- A new filter field **resFilter** has been added to the following ESCWA and ESMAC resource listing modules:
  - Every resource in By Type
  - Every resource in By Start L
  - Resource lists under Groups

Every active resource type except Locks

This parameter will filter the list of resources displayed by ESCWA and ESMAC. In addition, a new environment variable `ES_RDO_MAX_RESOURCES` has been added that enables you to specify a limit to the number of records displayed. For JSON requests, the list being truncated is indicated by the addition of the JSON property "truncated": true.

## Enterprise Server Security

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This release includes the following enhancements:

- MLDAP ESM caching - the MLDAP ESM Module now implements LDAP search-result caching. This is controlled by the existing Security Manager cache settings, so that many installations will have this activated automatically. See the product Help for details.
- Vault Hashicorp support - support is available for using a Hashicorp KV2 vault server as a local or remote vault.

## IMS Support

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This release includes the following enhancements:

- An IMS Automated Operator Interface (AOI) - allows an application program to send IMS commands to, and receive responses from IMS Transaction Manager using the DL/I CMD and CGMS functions. This support includes:
  - Enterprise Developer and Enterprise Server support IMS DL/I functions CMD and GCMD across all language interfaces. These functions are used to send IMS commands and receive responses.
  - Commands can be sent from applications compiled either ASCII or EBCDIC.
  - Commands sent using AOI are limited to those supported in Enterprise Developer and Enterprise Server.
  - You can install an exit program that enables programming support for commands not directly supported by Enterprise Developer and Enterprise Server.
  - The `IMSAO.CBL` and **`IMSAO.JCL`** sample files, located in `%PUBLIC%\Documents\Micro Focus\Enterprise Developer\Samples\Mainframe\IMS\Classic\Examples (Windows)` or `/opt/microfocus/EnterpriseDeveloper/demo/ims/examples (UNIX)`, are provided to demonstrate the use of AOI.
  - The `AOEXIT.CBL` program, located in the same place as the other AOI sample files, is an example of an installed exit routine for processing of AOI commands. Instructions for this interface are described in the program source.
- The JES aliasing feature can be used with IMS DLI and BMP applications run from JCL.
- APARM handling has been updated to use EBCDIC APARMS obtained from EBCDIC applications. In addition, the APARM positional parameter for DLI has been changed from 19 to 20 to be consistent with the IBM IMS documentation. The APARM positional parameter for BMP applications remains at 19.
- The `ES_IMS_APARM_DLI` environment variable has been added to enable the APARM handling behavior of previous releases. See `ES_IMS_APARM_DLI` for details.

## Library Routines

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The following library routines are new:

- `CBL_GET_ERROR_INFO` - enables error processing routines to establish the location of the error that occurred to cause the error processing routine to execute. This is available on a restricted range of platforms.

- CBL\_CREATE\_STACKDUMP - generates a stackdump file.

## Licensing

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### AutoPass licensing technology

In this release, Micro Focus brings in the power of the in-house Micro Focus AutoPass licensing technology alongside Sentinel RMS. AutoPass has the following additional benefits compared to Sentinel RMS:

- Usage logging which enables you to monitor the product usage. You need to install the AutoPass License Server in order to do this.
- Ongoing support for all platforms that this product is available for.

Features include:

- Installing this release installs both the Micro Focus AutoPass Daemon and the Sentinel RMS License Manager. Both of them are available in the Micro Focus License Administration tool.
- You can have both AutoPass and Sentinel RMS licenses installed on the same machine. Optionally, you can switch off the licensing technology you do not use.
- If you are an existing user of a Visual COBOL or an Enterprise Developer product, you only need an AutoPass license if you want to utilize usage logging or if you want to use your product on a platform on which Sentinel RMS is not supported.
- If you are a new user of the Micro Focus COBOL products, you will normally be issued an AutoPass license.
- Micro Focus will continue to provide Sentinel RMS in future releases of this product.
- AutoPass licenses should be installed into the existing Micro Focus License Administration tool, and not in the AutoPass License Server.



**Important:** The SafeNet Sentinel licensing system that was available with previous releases of this product has been deprecated and is no longer available in release 10.0. This product uses the Micro Focus AutoPass licensing technology, first introduced in release 8.0, and AutoPass is now the only licensing technology available in this product.

The SafeNet Sentinel licenses are no longer supported, and you need to use AutoPass licenses starting with release 10.0. Contact OpenText Support for Micro Focus Products to replace your existing SafeNet Sentinel with AutoPass licenses.

### Installing licenses at the command line

On Windows, Micro Focus License Administration is now also available as a command-line utility.

For more about AutoPass and usage logging, and about Micro Focus License Administration, see *Managing Licenses*.

### Mainframe Access (MFA)

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This release includes the following enhancements:

- Improved file download and upload speeds - offers over seven times faster speeds for compressed files larger than 64K, and almost four times faster speeds for uncompressed files over 64K. This requires that you update both the Mainframe Access client and server, if you are using an older version of them.
- Endeavor transaction performance improvements - transactions with Endeavor have been improved and are now around two times faster.
- Support for MFDAS load and unload - load and unload-specific load library members are now available from the MFDAS command line. This enables you to interact remotely with Load libraries from the MFDAS command line.

- SCLM export protection - you can now configure the MFA components to respect the SCLM managed flags. In this way, you can prevent outside source control changes to your managed datasets.
- Drag and drop from the MVS Explorer to Catalog Explorer in Eclipse - you can now drag files to the ES Catalog from MVS Explorer instead of having to use the Mainframe Explorer connection.

### The Micro Focus Database File Handler

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This release includes the following enhancements to the Micro Focus Database File Handler:

- **Oracle support:** support has been added for use with Oracle databases (version 19c and later). Support is mostly equivalent to that of the existing databases, except that ODBC connectivity is not supported; connections must be made directly with the databases, using Oracle's OCI interface.
- **The `dbfview` command line utility:** a command line utility that generates database views from your Data File Editor structure files. These views allow you to view your data once it's stored in a datastore.
- **The `mfdbcatc` command line utility:** a command line utility that helps you to relocate a disk-based catalog to a database. It can scan the current catalog, then generate a deployable response file that attempts to maintain the current structure of the catalog.
- **COBOL Run-Time System support for datastores:** Library routines and variables that typically deal with files and folders on disk are now capable of also handling the SQL URLs required to reference file and folders in a datastore. Where appropriate, this is noted in the library routines documentation, and the topic 'The Datastore URL' gives full details of the SQL URL required.
- Support has been added for Microsoft SQL Server and PostgreSQL users to host datastore, region and cross-region database resources in a single physical database. This support was already available for Db2 and Oracle users. See *Using a Single Database* for more details.
- Datastores, regions, and cross-regions being hosted within the same physical database can now share connections. This greatly reduces the number of connections an MFDBFH application would require at any one time. See *Sharing Database Connections* for more details.

### The Micro Focus Unit Testing Framework

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The following enhancements have been made to the Micro Focus Unit Testing Framework:

- The MFUPP preprocessor has been introduced to provide a seam between your program and a unit test. This seam lets you access the internals of a program under test, allowing you to create granular unit tests from paragraphs or sections. The MFUPP preprocessor also provides the ability to mock programs or stub programs out to create a unit test.
- In Eclipse, remote unit test projects for native COBOL can now be stored and run from Micro Focus Enterprise Developer UNIX Components.

### Micro Focus Rumba

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Support for Micro Focus Rumba inside Eclipse has the following enhancements:

- Multiple views for embedded Rumba connections - it is now possible to have multiple Rumba Mainframe Display views opened in the IDE, each having a different connection. You can enable multiple views from the **TN3270** preferences for the IDE.
- Connections to a server are now secured using SSL/TLS.
- Import and export connection details - it is now possible to export and import connection details and share them between client machines.

### PL/I Support

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Enhancements are available in the following areas:

**PL/I debugger:**

- Much larger call stacks are now supported.

**PL/I compiler compatibility:**

- New statements supported - DEFINE STRUCTURE, LOCATE.
- Improved compatibility for the DEFAULT RANGE statement.
- New built-in functions - AUTOMATIC, ENTRYADDR built-in function and pseudovvariable, HEXDECODE, INLIST, ISLL, ISRL, REPLACE, and TIMESTAMP.
- Support for the DIMACROSS attribute and for the PARM attribute on a declaration.

**PL/I compiler functionality:**

- You now receive warnings when redundant WHEN clauses appear in a SELECT statement.
- DWARF line number information is now generated on Linux and Solaris.
- Improved compiler listings to show more attributes for parameters.
- The editor in Eclipse is now sensitive to EXEC SQL Host variables, references, and modifications.
- The PL/I Compiler and preprocessors are now used by default for background parsing in Eclipse.
- In Eclipse, you can now format the code inside a PL/I program or only format selected sections.
- The PL/I error messages in the product Help are now in sync with the messages shown in the product.

**PL/I EXEC Preprocessor:**

- Provides information about host variable references/modifications for the background parsing.
- Support for DB2 style comments in EXEC SQL Statements.

**PL/I Macro Preprocessor:**

- The SCAN option of the ANSWER statement is now supported.
- Improved compatibility of COMPILEDATE and COMPILETIME built-in functions.

**PL/I Run-Time System:**

- The behavior of PL/I ON FINISH now matches IBM's behavior.
- Improved compatibility for the JSONPUTVALUE built-in function - it now supports multi-dimensional arrays within structures.
- Improved compatibility for the XMLCHAR built-in function.
- PLIDUMP now checks the allocated memory chains for corruptions.
- PLIDUMP can now display much larger automatic variables and parameters without consuming excess memory and CPU resources.
- Support for the L format PUT EDIT directed I-O.

## What was New in Enterprise Developer 6.0

### Features Added in Enterprise Developer 6.0

Enhancements are available in the following areas:

- [Application Workflow Manager](#)
- [Building Applications](#)
- [COBOL Application Console Size](#)
- [COBOL Language Enhancements](#)
- [Code Analysis](#)
- [Code Analyzer Refactoring](#)
- [Compiler Directives](#)

- [Containers](#)
- [Database Access - HCO for DB2 LUW](#)
- [Data File Tools](#)
- [Debugging](#)
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- [File Handling](#)
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- [Micro Focus Database File Handler](#)
- [Micro Focus Unit Testing Framework](#)
- [Microsoft Build Tools and Windows SDK Configuration Utility](#)
- [Multi-Threaded Applications](#)
- [PL/I Support](#)
- [New Platform Support](#)
- [Problem Determination](#)
- [Product Documentation](#)

## Application Workflow Manager

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Improvements have been made in the following areas:

- REST modelling - the REST function package now supports the following:
  - HTML formatted text fields.
  - Copying and pasting of JSON format template into a JSON structured file descriptor in the AWM model editor.
  - Specify a general status code handling, which is applicable for all tools from the REST function package.
  - Handling loops when specifying a status code handler.
  - Uploading and downloading text files to and from a REST based application.
  - Automatic retrieving of valid values for a dialog input field without the need to click **Retrieve**.
  - Auto-completion in dialog input fields.
  - Specify clearing dependencies between dialog input fields.
- Local Java development - the following features supporting local projects for Java development have been added:
  - A Java function package with the corresponding property, element types, and tools
  - A sample AWM model for local Java development
- The function package developer guide now provides more details.
- AWM extension templates are now available
- AWM model editor improvements:
  - The AWM model properties now only display the relevant attributes in the **Properties** view.
  - Auto-completion of fields which enable you to specify property references.
  - The **Used by** dialog now displays property reference usage.



## Building Applications

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This release includes the following new functionality:

- Maven build support - you can use the Apache Maven support in Eclipse to build COBOL JVM projects and COBOL JVM Unit Test projects.

## COBOL Application Console Size

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The maximum console size of a COBOL application has increased. It can now be 255 lines by 255 columns, configurable using the `screen_lines` and `screen_cols` run-time tunables.

## COBOL Language Enhancements

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The following enhancements are available:

- **Enterprise COBOL 6.2 Update** - new syntax, library routines, and the respective analysis tooling are available for compatibility with IBM's Enterprise COBOL 6.2 Update:
  - New intrinsic functions are supported: BIT-OF, BIT-TO-CHAR, BYTE-LENGTH, HEX-OF, HEX-TO-CHAR, NUMVAL-F, TEST-NUMVAL, TEST-NUMVAL-C, TEST-NUMVAL-F, and TRIM
  - A number of intrinsic functions now support national data (especially surrogate pairs): REVERSE, ULENGTH, UPOS, USUBSTR, USUPPLEMENTARY, UVALID, and UWIDTH.
  - A LOC phrase has been added to the ALLOCATE statement to define whether memory is allocated above or below the 16MB line.
- **CONSTANT qualifier** - it is now possible to define data items as constants. This improves the code readability and usability, and helps detect programming errors. The ability to create constant items is already in .NET COBOL and JVM COBOL, and many other languages.
- **Local variable declarations in native COBOL** - it is now possible to declare data items inline in the code and not only in a separate DATA DIVISION. This provides better locality of data, making the source code easier to reason about.
- **Native data type to hold strings of utf-8 characters** - in native COBOL, support is now available for the PIC U data type as introduced by IBM in Enterprise COBOL version 6.3. Direct support is available for utf-8 data.
- **Performance improvements** - this release provides various performance improvements, most significantly on 32-bit Intel x86 platforms. When using the highest optimization level, `opt(4)`, the performance of native code generated by the COBOL Compiler has improved. A number of cases are affected, most particularly those where it is beneficial to locate PERFORM ranges inline.

## Code Analysis

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Support is provided in Enterprise Developer for accessing the Application Analysis Server which is part of the Micro Focus Enterprise Analyzer and Micro Focus COBOL Analyzer products.

If you have one of these products installed, you can connect to the Application Analysis Server from Server Explorer and access the Enterprise Analyzer web client. Enterprise Analyzer web client provides quick searches for repository objects, detailed code searches, diagrams, reports, and data item impact analysis and other features such as viewing and editing of business rules (separate license required).

## Code Analyzer Refactoring

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Support is now available for extracting program logic from COBOL code and moving it to a new program. The following commands are available from the editor context menu:

- Create program from Section
- Create program from Computation
- Create program from Condition

In Eclipse, you can now refactor your code using the **Extract to Section** command available from the **Refactor** menu.

## Compiler Directives

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The following Compiler directives are new in this release:

- DISPLAY-AT - specifies a default foreground and background color for DISPLAY AT and ACCEPT AT statements that do not specify any color attributes.
- DPC-IN-DATA - controls whether the DECIMAL-POINT IS COMMA clause (if specified) is applied to the output from the XML GENERATE and JSON GENERATE statements.
- ILCONDITIONPARAM - switched on by default. Enables the support for conditional expressions as method parameters.



**Important:** Applications that use the old COBOL syntax for specifying named parameters as custom-attributes will not compile with the ILCONDITIONPARAM specified. This can result in any older applications failing to compile in the current version of the product. See *ILCONDITIONPARAM* in your product Help for details about how to work around this issue.

The following Compiler directives have new options:

- CHECKREFMOD - now takes an additional parameter (NOZEROLENGTH), which acts as CHECKREFMOD, but does not permit reference modifier lengths of zero.
- PROTOTYPE - now supports options that specify whether prototypes are required, and the severity of error messages issued for prototype mismatches.

## Containers

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Support has been added to enable you to work with containers from the IDE. In particular you can now create a Dockerfile for a COBOL project, and build, debug and run a COBOL project in a container, all from the IDE.

## Database Access - HCO for DB2 LUW

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Support for the following has been added to this release:

- Multi-row fetch (MRF) and insert (MRI) statements with or without the FOR ROWS clause
- Array update and delete statements



### Notes:

- These new features are supported for DB2 LUW version 11.1 Mod 4 Fix Pack or newer.
- For coding examples, see the IBM DB2 LUW documentation: [Embedded SQL/COBOL Support for MRI and MRF](#).

## Database Access - XA Switch Modules

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Support for the following has been added to this release:

- XA switch modules have been enhanced to enable storage of sensitive information in the Micro Focus Vault Facility. This new functionality includes a customizable program, ESXAEXTCFG.CBL, you can use to obfuscate xa-open strings by storing them as secrets.

## Data File Tools

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The following enhancements have been made to the Data File Editor:

- Double-byte character sets are now supported within the editor.
- Insert mode is now available when editing a formatted record, except for numeric fields.
- When editing DBCS data in EBCDIC files, the required Shift-out and Shift-in characters are automatically added when editing a formatted record and you are editing in Insert mode.
- You can now load and unload structure files for an open data file.
- A ruler at the top of the editing pane can be toggled on/off.

## Debugging

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The following enhancements are available:

- Breakpoints - in JVM COBOL, you can now access a breakpoint's properties from the breakpoint's context menu in the editor.
- Expressions - you can now specify complex expressions in the **Expressions** view. The supported expressions are: normal numeric arithmetic expression with intrinsic functions and the single use of alphanumeric intrinsic functions. See *Views in the Debug Perspective* in the product Help for details.

## Deploying Applications

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This release supports easier deployment of native COBOL applications from an Eclipse project. A new page in the project's properties, **Micro Focus > Build Configuration > Deploy**, enables you to specify a deploy folder and which files will be deployed. Building the project deploys certain executables and supporting files to this folder. In addition, you can archive and deploy the files on application servers, cloud storage such as AWS buckets and access the application files with AWS services, and so on.

## Eclipse Integration

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The following enhancements are available:

- COBOL compile settings summary - this pane, which is displayed when viewing the COBOL project settings at the project, folder, and file level, now indicates the settings that are inherited and the ones that are set at that level. Settings inherited from the level(s) above are shown in <>.
- Deploy folder - a new build configuration feature in the project's properties enables you to copy build artifacts and supporting files essential for deployment, to a particular folder.
- Context menu improvements - the editor context menu has been reorganized, where certain options have been grouped together under a logical heading, and other redundant options removed.
- Copybook tooltips - hovering COPY statements in the editor now displays the path to the referenced copybook.
- Collapsible statements - it is now possible to collapse IF, EVALUATE, and PERFORM statements in the editor.
- Dark theme with COBOL - you can enable the dark theme from **Window > Preferences > General > Appearance > Theme**.

## Enterprise Server

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The following enhancements are available:

- **Definition Import/Export Tool** - a new utility, `casesxml`, has been added to enable you to import and export enterprise server definitions. Using `casesxml` you can do the following:
  - generate `.xml` files, in `casesxml` export format, that contain structured definitions of a region, a CICS resource definition file, and the catalog
  - import a `casesxml` export format `.xml` file to update the definitions of a region, a CICS resource definition file, and the catalog
- **IPv6 support (EAP)** - This feature is in Early Adopter Program (EAP) release status. Some Enterprise Server components and features now support Internet Protocol version 6 (IPv6) network addressing and connectivity. Due to limitations with IPv4, IPv6 is becoming more common within corporate networks and on the public Internet. In some cases, the use of IPv6 can improve interoperability and simplify network configuration.
- **Administrative Commands** - the `add` command in `cascertreg` now contains new options (`-cwi` setting, `-dcas` setting, `-issuer`, and `-subject`).

## Enterprise Server Security

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This release provides the following enhancements:

- **Micro Focus Secrets file storage permissions**

The Micro Focus Secrets Vault provides centralized storage for sensitive information such as passwords, with some protection against accidental disclosure or discovery by unauthorized users. Prior to this release, the only supported storage mechanism was a conventional file containing encrypted data. In this release, the permissions on the storage file and on the Secrets configuration file are set more restrictively to help protect the secrets.

- **Certificate wildcard support**

The X.509 digital certificates used to identify servers when making TLS (SSL) connections permit the use of fully-qualified domain names with wildcards for some parts of the name. This enables administrators to use a single certificate issued to, for example, `*.mycorp.com` for any number of servers with fully-qualified names like `www.mycorp.com`, `server1.mycorp.com`, and so on. These wildcard-bearing certificates are now supported by client programs using Micro Focus communication technology when validating a server's certificate.

- **Improved ACL wildcard support**

In the Access Control Lists used for resource access control with LDAP-based security in Enterprise Server, the `"**"` wildcard sequence now behaves more similarly to mainframe RACF. A number of additional options for wildcard processing are also available.

- **PAM ESM module**

On Linux platforms, Enterprise Server now includes an External Security Manager module which integrates with the Pluggable Authentication Modules (PAM) operating system feature. The PAM ESM module can be used to authenticate Enterprise Server users with the same mechanism used for Linux users, or with any other mechanism available through PAM.

- **PKIX compliance for TLS certificate validation**

The standard for using X.509 digital certificates to authenticate servers when making TLS (SSL) connections is known as PKIX, for Public Key Infrastructure (X.509). It is defined by a series of IETF RFC documents, currently RFC 5280 and others. In previous releases, the certificate validation performed by this product did not conform to PKIX in a number of ways, most notably in using DNS address-to-name resolution in an attempt to match a certificate to a host. With this release, clients using Micro Focus Common Client technology, such as COBOL web service proxy programs, CAS utility

programs, and customer applications that use the CICS Web Services Interface feature, will by default, use stricter procedures for validating certificates which more closely conform to PKIX. This improves TLS security and interoperability.

- **Security improvements for XML parsing**

In this release the third-party components used for parsing XML data have been updated, or have had bug fixes integrated into the version used by Micro Focus, to address published security vulnerabilities. Also, XML external-entity support has been disabled except where it is required by a particular product feature; this prevents XML External Entity (XXE) attacks on customer systems by attackers who can trick a customer application into parsing a malicious XML document.

## Enterprise Server Common Web Administration (ESCWA)

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This release offers the following new features and improvements:

- **MFDS User Interface functionality replacement** - ESCWA can now communicate with remote MFDS instances, and displays the equivalent pages of MFDS. Configuring regions, and their IMS, PL/I, MQ, and XA options, and security, is now available.
- **ESMAC User Interface functionality replacement** - ESCWA can communicate with remote ESMAC instances, and can replicate functionality and display all the information provided by ESMAC.
- **Configurable User Interface access** - you can now configure the ESCWA security manager to control user and group access to certain aspects of the user interface, such as, native, and security menu items.
- **Usability improvements**
  - Starting and stopping regions from the navigation tree.
  - The native menu items are not displayed if the region features are not configured correctly.
  - Configuration of the display colors for MFDS hosts and regions to distinguish them with ease.
- **CICS resource support** - the following resources are supported: ICEs, DocTemp, TCPIPService, URIMap, Bundle, Pipeline, and WebServices.
- **Scale-Out support** - ESCWA has improved the way it displays a Scale-Out Repositories (SORs) association with its PAC and member regions.
- **Redis support** - Redis is supported as a SOR when running this product in a PAC. Features include:
  - Redis cluster support
  - A Mfredis configuration file - enables you to configure reconnection when any network errors occurs. You can also use the file to configure Lua scripts tracing on servers.
  - Authentication support for the standalone Redis server.
- **Kubernetes support** - when ESCWA is run in a Kubernetes cluster, it is now possible to configure it to automatically discover the pods hosting MFDS within the cluster, and display them in the ESCWA user interface.

## File Handling

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Fileshare password files can now be stored in the Vault Facility, ensuring that sensitive user credentials are encrypted. Firstly, create the password file in the usual way, and then upload it, with a path of `microfocus/fh`, using the `mfsecretsadmin` utility.

To ensure the Fileshare server uses the file stored in the vault, start the server with the `/uv` option.

## IMS Support

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Improvements are available in the following areas:

- **BMP inbound and outbound message processing** - full support is available for BMP inbound and outbound message processing. Batch message processing programs (BMPs) can now access the IMS message queue for input and output, in addition to their batch-type processing and data-access capabilities.
- **Commands** - the following commands are now supported: - /START TRAN ALL, /DISPLAY Q TRAN, and /DISPLAY STATUS TRAN.
- **DB Control SUSPEND / RESUME commands in an active system** - IMS DB Control supports the SUSPEND command while transactions are active. DB Control will block any new units of work and allow active UOWs to complete during a quiesce. Once DB Control reaches a state with no outstanding UOWs it suspends. Note a long running BMP may prevent a system from suspending.

This enables support for administrative tasks such as database and transaction log archiving. It also enables the creation of new transaction logs when roll forward recovery is enabled.

- **IMS BTS trace** - IMS BTS trace is now visible from active SSTM and batch jobs. WIDTH and NOHEX options have been added for additional control of trace output format.

This enables BTS output to be viewed when debugging a batch IMS application. Previously the job step had to complete before the trace was visible. This also enables you to view the trace output in an active SSTM job. Previously the MPR had to be stopped to make trace output visible.

- **User DB handler exit** - database exit support has been added for GSAM databases. This provides programmatic control of the DB Catalog setting for a database instead of using the defined DB Catalog. Also, this exit can process DL/I calls completely, for example, to map DL/I calls into VSAM I/O requests. Previously, this exit was available only for full function databases.

To assist you with writing an exit, a template file, USERDB.CBL, and an explanatory text file, USERDB.TXT, are available with your IMS classic samples.

- **JES Alias support** - the JES aliasing feature can be used with IMS DLI and BMP applications run from JCL.

## Interface Mapping Toolkit

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Improvements are available in the following areas:

- **Resource-based REST APIs** - the following enhancements enable the creation of resource-based REST APIs:
  - Operations in JSON RESTful Web services can now have a customizable URI path that identifies a resource. Operation paths have support for dynamic templating.
  - API resources can now be automatically identified from COBOL groups in a COBOL program, and a set of operations can be generated for each API resource.
  - It is now possible to specify the location of interface fields in the service request or response. An interface field can either be a parameter in the URI path, a query parameter, or be in the JSON message body.
- **Summary support for OpenAPI** - the IMTK now supports the OpenAPI Specification (originally called Swagger) which is the most widely-accepted format for REST API specifications. Features include:
  - Consumption of OpenAPI 3.0 and Swagger 2.0 files for purposes of client and service generation.
  - Generation of OpenAPI 3.0 files to describe the APIs of a JSON RESTful Web service.
- **REST service output filtering and field selection** - Enterprise Server JSON RESTful Web services now include the following features:
  - Automatic filtering of the JSON response body of a Web service by path and query parameters received in the request URI.
  - A special query parameter "\$fields" that can be used to indicate that the JSON response body is to contain only certain specified fields, and to exclude all other fields.
- **REST API discovery** - Enterprise Server API discovery is now supported. For a JSON RESTful Web service, a list of all its available operations, and their URI paths, can be retrieved. This enables a client

to efficiently navigate an Enterprise Server REST Web service without having information about the service's operations ahead of time.

## JCL Support

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The following features have been added to the JCL support:

- The sample printer exit in the product has been enhanced to retrieve extended information. The structure defined by `idadoutp.cpy` now contains two new entries `(ws)-extended-output` and `(ws)-extended-data`. The item `(ws)-extended-output` contains the version of the extended output data; currently, this should be set to 1. The item `(ws)-extended-data` is a pointer, that if null means there is no extended data; otherwise, it points to a new structure defined in `outpext.cpy`. That structure contains the extended output information for a given job. This is demonstrated in the provided sample - `sampprnx`.

## Library Routines

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The following library routines are new:

- **MFU\_GET\_FILE** and **MFUGETF** - both these routines are used with data-driven tests in the Micro Focus Unit Testing Framework. If the `.csv` file under test references external data in one of its cells (using the `@file-name` notation), use either of these routines to load that external file into memory before such tests are run.

The following library routine contains new functionality:

- **CBL\_GET\_EXIT\_INFO** - this library routine has been enhanced to better detect the circumstances in which an exit procedure has been invoked.

## The Micro Focus Database File Handler

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Support for Db2 and Microsoft Azure databases has been added to the Micro Focus Database File Handler (MFDBFH). This support is equivalent to that of the existing databases.

The following features have been added for all databases:

- I-O optimizations for sequential, line sequential, and ESDS/KSDS/RRDS files opened for output.
- Using direct connection strings to make a database connection (as an alternative to using ODBC DSNs).
- Creation of databases using script files.
- Maintaining database configuration files with a command line utility, `dbfhconfig`.
- Using the `dbfhdeploy` utility to delete data files from a datastore.
- Database configuration files can now store confidential information in the Vault Facility.
- CTF tracing of ODBC and Vault operations.
- Recovering of locked processes or files can with the `dbfhadmin` utility.
- The `dbfhconfig` and `dbfhdeploy` utilities are now capable of executing commands batched up in a response file.

## The Micro Focus Unit Testing Framework

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The following enhancements have been made to the Micro Focus Unit Testing Framework:

- You can now run unit tests against an executable file from both the IDE (new in Eclipse) and the command line. Before you run such tests from the command line, you must initially rebuild the executable in order to link it into the testing framework.
- The `.csv` source files used in data-driven tests can now reference external data: use the `@file-name` notation in a cell to use the contents of `file-name` in the tests. The external source files must be loaded into memory, using the `MFU_GET_FILE` or `MFUGETF` library routines, before the tests are run.
- Two new elements are available for data-driven tests: a data-driven setup and a data-driven teardown. Conventional setup and teardown entry points would run multiple times during a data-driven test; these two entry points run only once per test run.

## The Microsoft Build Tools and Windows SDK Configuration Utility

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On Windows, the Enterprise Developer setup file now installs the Microsoft Build Tools and the Windows SDK packages, as these are dependencies for a number of features and operations of the product.

You can use the Microsoft Build Tools and Windows SDK configuration utility to view the package versions in use in your COBOL environment. You can also use this utility to set the environment to use other versions of these packages that you have installed.

## Multi-Threaded Applications

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This release includes the following improvements:

- Improved validation of detached threads on UNIX - the reliability for applications with many threads, when using the `CBL_THREAD_KILL` routine and during abnormal process termination, such as when an error occurs, has been improved.
- Thread local storage optimizations - the thread termination in applications with many threads has been optimized.

## PL/I Support

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Enhancements are available in the following areas:

### PL/I compiler

Improvements in the compiler make it easier to migrate existing applications to new platforms. Support is available for:

- The `GENERIC` attribute on an `ENTRY` declaration.
- The `COPY` option of the `GET` statement.
- Assignment of an `ENTRY` to an `ENTRY LIMITED` variable.
- The `INONLY` attribute.
- Support for a `SELECT` with no `WHEN` or `OTHERWISE` modified to match IBM's behavior.
- Support for new compile option which allows specification of the `FIXED DECIMAL` precision for intermediate operations.
- The ability to use `LIKE` on a structure that contains `*` for element names.
- Built-in functions:
  - New functions - `FIXEDDEC` and `FIXEDBIN`
  - The `TRIM` built-in function to support its usage with structures.
  - The `VALID` function - improved support when used with `FIXED DEC` arguments.
  - Function precision of 15 or 31 (see the `-bifprec` compiler option)



- PL/I bytestream IO via FILEREAD, FILEWRITE, FILETELL and FILESEEK statements.
- Improved compatibility - when using DEFAULT RANGE with patterns; for use of the STRING pseudovvariable.
- Improved support for - structures declared with the LIKE attribute where the referenced structure members contained NOINIT attribute(s).

Improved functionality for customers using Open PL/I to develop z/OS applications is available:

- Improved compiler listing to show attributes of parameters to an ENTRY declaration.
- Improved expanded listing showing line numbers for code generated by preprocessors.
- Improved compiler diagnostics when trying to use BIT operators on non-BIT operands.
- Improved compiler diagnostics when an unqualified name is resolved to a structure member rather than a matching non-member declaration of the same name in a parent block - Informational (I-level) diagnostic (MFPLI01305I).
- A string indicating which compiler was used to generate the object code is now embedded in every compiled routine to facilitate ease of upgrading and troubleshooting by customers.
- \*PROCESS statements are now mapped to the equivalent Open PL/I compiler options where appropriate.

### **PL/I debugger in Eclipse**

Support is available for the following features:

- STEP out of the end of an ON Unit.

When stepping off the end of a PL/I ON-unit, the debugger attempts to determine the next debuggable statement, and then pause execution. This allows you to continue stepping through the program upon completion of the ON-unit. Stepping through a PL/I GOTO statement from an ON-unit continues to be supported as well.

- Improved monitoring of variables that is not based on the procedure in which they are declared.
- Support for debugging PL/I application using Solaris (SPARC) 11.4 or later.
- PLIDUMP now generates information for STATIC variables and displays the HEAP data storage.
- Changes have been made to remove the variable scoping limitation which existed in previous releases. Prior to this version, variable watches were limited to the procedure in which they were declared/used. If a variable was passed to another subroutine, the debugger would only stop after returning from that subroutine and recognizing that the variable value had been changed - so it wasn't possible to know exactly where in the subroutine it had happened unless an additional variable watch was set in the subroutine itself.

In this release, the variable's address and size are now being stored away for watch instead of the procedure name and variable name. This allows the address/size to be monitored from the time it is established until you cancel the watch. By doing this, the debugger is stopped as soon as it recognizes a change of value - regardless of where it is in the user program.

Since the watch is active until you cancel it, it is possible to be watching an address/size which is no longer allocated or active depending on the flow of the user program. In this situation, execution will be stopped if/when the memory space is reused for some other reason.

### **PL/I EXEC preprocessor**

- Information about host variable references and modifications is now available for the background parsing.
- %SDEBUG and %RDEBUG statements now indicate the line and column where the macro invocation starts or ends.

## Macro preprocessor

- Supports the new SOURCEFILE() built-in function
- Improved compatibility for %DO statements
- %SDEBUG and %RDEBUG statements now indicate the line and column where the macro invocation starts or ends

## Run-Time System

- Support is available for bytestream IO via FILETELL, FILESEEK, FILEREAD and FILEWRITE for RECFM(U) files.
- Support for the COPY option of the GET statement.
- It is now possible to use a STATIC FIXED BIN(31) variable to control the RECSIZE of a file at OPEN time.
- The JCL utility IKJEFT01 can now be driven from PL/I as a callable interface.

## New Platform Support

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Support is now available for Enterprise Developer UNIX Components for the following additional platforms to the same level that other UNIX platforms (different than Linux) are supported:

- Ubuntu Linux 18.04.x (LTS) on 64-bit Intel (x86-family)
- CentOS v7 and v8 on Intel x86-64

For a full list of the supported operating systems, check the *Product Availability* section on the Micro Focus OpenText Support for Micro Focus Products Web site: <http://supportline.microfocus.com/prodavail.aspx>.

## Problem Determination

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The following enhancement is available:

- **Consolidated Tracing Facility (CTF) on UNIX** - CTF is now always present during process termination, such as when an application, or a third-party code, calls exit() directly.

## Product Documentation

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The following functionality is new in this release:

- Online context help in Eclipse - online context Help is now the default setting for Enterprise Developer. Requesting F1 help from within Eclipse now opens the documentation available on the Micro Focus OpenText Support for Micro Focus Products website: <https://www.microfocus.com/en-us/support/documentation/>. You can configure Eclipse to show either local or online help. See *Viewing the Product Help*.

# Features Added in Enterprise Developer 5.0

Enterprise Developer 5.0 provided enhancements in the following areas:

- [Amazon Web Services Quick Start for Enterprise Server](#)
- [COBOL Formatting](#)
- [Code Analysis](#)
- [Enterprise Server and Scale Out Architecture](#)
- [Enterprise Server Common Web Administration](#)

- [Application Workflow Manager](#)
- [AppMaster Builder](#)
- [CICS Support](#)
- [COBOL Language Enhancements](#)
- [Compiler Directives](#)
- [Consolidated Trace Facility](#)
- [Data File Tools](#)
- [Database Access](#)
- [Debugging](#)
- [Eclipse Integration](#)
- [Enterprise Server Security](#)
- [IMS Support](#)
- [JCL Support](#)
- [Mainframe Access](#)
- [Micro Focus Native Database File Handler](#)
- [Micro Focus Rumba](#)
- [Micro Focus Unit Testing Framework](#)
- [PL/I Support](#)
- [Platform Support](#)
- [Product Documentation](#)

## Amazon Web Services Quick Start for Enterprise Server

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Micro Focus has worked with Amazon Web Services (AWS) to create an AWS Quick Start for Enterprise Server. The Quick Start includes AWS CloudFormation templates and a deployment guide with step-by-step instructions that enable you to deploy Enterprise Server into a new or existing virtual private cloud (VPC) on the AWS Cloud in about 1 hour and 15 minutes.

For full information see *Enterprise Server on AWS*.

## COBOL Formatting

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You can now reformat your COBOL code in the editor according to your preference and standards. Formatting sets the indentation based on the configuration options which you can set in **Windows > Preferences > Micro Focus > COBOL > Editor > Formatter** (for Eclipse).

You can find the COBOL formatting features on the editor context menu (for Eclipse) menu.

## Code Analysis

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You can now create the following views for your code:

- **Program Flow Graph** - enables you to view the overall structure of the COBOL program with nodes representing sections and paragraphs. PERFORM statements between them which affect the program flow are represented by links joining the nodes. External calls to other programs are shown but cannot be expanded in the Program Flow Graph view. Hovering over the nodes shows a tooltip containing the code representing the respective sections or paragraph. Clicking a node or a link joining said nodes positions the code editor to that point in the source, allowing quick and easy navigation of the program.
- **Data Flow Analysis Tree** - enables you to select a data item and then either statically trace what might change its value or what other data items it might affect.

## Enterprise Server and Scale Out Architecture

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 **Note:** This feature is in Early Adopter Program (EAP) release status.

This release offers an enhanced and improved availability, and serviceability of Enterprise Server through the ability to administer and maintain a cross-system group of regions as a single system image with the new Performance and Availability Cluster (PAC).

In order for different Enterprise Server instances to be able to work together, they need to be able to share data. This is achieved through the use of a Scale Out Repository (SOR). All ES instances in a PAC will have a common SOR (PSOR) which is used to store CICS resources (limited to PCTs, PPTs, FCTs, DCTs and TSTs in this release) as well as internal system data to facilitate synchronisation between instances. Temporary Storage Queues and Transient Data Queues can also be shared between Enterprise Server instances by directing them to a SOR. Benefits of using PACs and SORs in this way include:

- Reduced hardware costs - taking advantage of the PAC to scale-out rather than scaling-up for more efficient use of processor resources.
- Easier maintenance - Dynamically adding or removing of regions to the PAC for system maintenance.
- Increased availability - in the event of the failure of an Enterprise Server instance, the PAC can continue to operate with reduced capacity. Enterprise Server instances can reside on different machines, improving availability further.
- Dynamic scaling - Enterprise Server instances can be added to, or removed from, the PAC depending on demand.
- Better performance - throughput is no longer restricted by the resources on a single machine (scale-up).
- Improved serviceability - you can now administer the PAC and any associated regions as a single image from a new contemporary web-based administration interface (ESCWA).

## Enterprise Server Common Web Administration

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 **Note:** This feature is in Early Adopter Program (EAP) release status.

Enterprise Developer now includes a new Enterprise Server Common Web Administration interface (ESCWA). ESCWA is a web user interface and server for modern administration, monitoring and control of Enterprise Server. It offers improved usability that consolidates the different Enterprise Server user interfaces so that native and managed regions, and security stores can be managed in one place. Features include:

- Administering directory servers across multiple hosts.
- Monitoring and control of CICS and JES Enterprise Server instances.
- Configuring and administering a security store, defined in an LDAP-compatible security manager such as Microsoft Active Directory or OpenLDAP.
- Administering the Scale-Out features - enable you to specify logical groups of Enterprise Server instances, and configure and run Performance Availability Clusters (PACs) and their related Scale-Out Repositories (SORs).
- Administering, monitoring and control of Enterprise Server for .NET regions and listeners.
- The use of current web frameworks that have a greater focus on security.
- (Included with 5.0 Patch Update 2 ) - support for Enterprise Server XA, MQ and PL/I configuration and monitoring. This includes support for XA resources, configuring MQ, Listeners and Writers, PL/I, MFCS console, Region Trace options, displaying the current ESMs on logon page and Local/loopback connections warning changes.

## Application Workflow Manager

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Improvements have been made in the following areas:

- Tools from the AWM, Eclipse, and ISPF Function Packages have been restructured and improved:
  - Tool parameters are now named so that the position of the parameter is not significant anymore.
  - You can only specify parameters which are supported by the tool.
  - Only the parameter types String and File are now supported.
  - Mass Processing is now an attribute of a tool parameter and is no longer a special input/output parameter type.
  - The tool relationship "Resource Operation Value" replaces the parameter type "ToolDefinedResourceOperation".
- A new REST Function Package has been added. It provides support for the following functions - DELETE, HEAD, GET, PATCH, POST, and PUT.

The new JSON File Descriptor has been provided to support REST payloads. This function package enables you to integrate RESTful API with your AWM workflow. See *REST Function Package*.

- New tools in the Eclipse Function Package enable you to store and retrieve information from the Eclipse secure store:
    - Save To Secure Storage; Read From Secure Storage; Delete From Secure Storage
- You can use these tools to securely store login credentials to a remote system and reuse the information for subsequent access.
- A new attribute is now available to enable you to add comments to every model component in the AWM model editor. See *Comments in the AWM Model Editor*.

## AppMaster Builder

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The AppMaster Builder Data View Explorer tab has been redesigned in this release make it easier to create and maintain data views. Features include:

- Creating SQL data views directly from the mainframe DB2 catalog
- Creating IMS and VSAM data views without the requirement for a global DDIFILE
- Generating data views using new DDIMETA files located in the DDIMETA folder in the AMB project
- A data view import process is provided to create DDIMETA files from existing DDISYMB files

## CICS Support

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**Note:** This feature is in Early Adopter Program (EAP) release status.

This release includes the following enhancements:

- CRCN CICS transaction - this new in-built CICS transaction monitors the state of XA connections for each resource manager (RM) entry defined in the system. If CRCN finds that connections have become unavailable, it will attempt to reconnect at regular intervals. (The frequency of the monitoring is controlled by the ES\_XA\_RECONNECT environment variable.) CRCN will emit messages to the console to warn of connections lost and regained.

## COBOL Language Enhancements

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The following enhancements have been made to the COBOL syntax:

- ISO2002 conditional compilation - an additional mechanism for conditional compilation, the ISO2002 Conditional Compilation method, is now available. This has been implemented as part of the support for Enterprise COBOL 6.2.

The following compiler directing statements are supported:

```
>>DEFINE
```

```
>>IF/>>ELSE/>>END-IF
```

```
>>EVALUATE/>>WHEN/>>WHEN OTHER/>>END-EVALUATE
```

- The JSON PARSE statement enables you to convert JSON text into COBOL data formats. This has been implemented as part of the support for Enterprise COBOL 6.2.
- INSPECT statement - the performance of INSPECT... CONVERTING has been improved, particularly for cases where `source-alphabet` is long.
- Support has been added for the portable syntax for SET - `set[string]`.

## Compiler Directives

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The following Compiler directives are new in this release:

<b>JVMTARGET</b>	Specifies the JVM version number targeted by the class files generated in this compilation unit.
<b>ILNORMALIZENAMES</b>	Determines the program elements that are normalized when a program is compiled to .NET or JVM COBOL. Normalization in this context results in replacing all \$ and - (hyphen) characters with _ (underscore) characters in the name of the generated class file.

## Consolidated Trace Facility (CTF)

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This release provides the following enhancements:

- Availability of CTF from the Eclipse interface - a new property tab, CTF, in the Eclipse launch configuration dialog box helps to enable CTF tracing and specify a CTF configuration file. By default, the trace files are then saved in a **Logs** subfolder within the project's folder.
- Dynamic CTF - it is now possible to configure the CTF dynamically from outside the process being traced. This feature is only currently available on Windows platforms.

Using a new command line utility - `cblctd` - you can alter the tracing events of running applications that already have CTF tracing enabled. You can alter trace levels, add or remove components to or from the trace, and also configure the emitters in effect.

Additionally, there is also a new component that you can trace - `mf.mfdbfh` enables you to trace activity of the Micro Focus Native Database File Handler.

## Data File Tools

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This release provides the following enhancements:

- The Data File Editor now includes a Compare Files tool that enables you to compare the contents of two data files side-by-side.
- Structure files, and the layouts within them, can now be created within the Data File Editor; you no longer need to use the Classic Data File Tools utility to manage your layouts.
- When connecting to a VSAM dataset stored in an enterprise server region, you can store any passwords required for access, for the duration of your current session.

- You can view archived JES spool jobs that have been merged into one spool file using the merging archived spool files process.
- You can now quickly duplicate records in non-indexed files, using the Duplicate Record option.

## Database Access

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Enhancements are available in the following areas:

### SQL Option for DB2

- XML data type support - the following XML scalar functions are now supported - XMLATTRIBUTES, XMLCOMMENT (add), XMLCONCAT, XMLDOCUMENT, XMLELEMENT, XMLAGG(delete), XMLNAMESPACES, XMLPARSE, XMLPI, XMLSERIALIZE, XMLTEXT, XMLQUERY.
- Initial XDB Server (**add**) support for z/OS DB2 V11 - includes support for archive tables and ALIAS on sequences (delete).
- XDB Link support for z/OS DB2 V10/V11/V12 (**add**)

## Eclipse Integration

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This release includes enhancements in the following areas:

- Supported Eclipse versions - this release supports Eclipse 4.7 (Oxygen) and 4.8 (Photon). The setup file installs Eclipse 4.8.

Eclipse 4.6 (Neon) is no longer supported.

- Java support - the 64-bit Java 8 is required to run the Eclipse IDE. The setup file installs Adopt OpenJDK 8 (u202) with Hotspot. Java 8 (32 or 64-bit versions), and Java 11 (64-bit version only) are supported for executing JVM COBOL code and for native COBOL and Java interoperability. For full details on the supported Java versions, see *Software Requirements*.
- COBOL editor:
  - Automatic insertion of END statements - Eclipse now automatically inserts the end clause for IF, EVALUATE, PERFORM, EXEC and TRY statements.
  - Automatic insertion of closing symbols - by default, Eclipse now automatically adds closing quotes and brackets where required.
  - Search text positioned between specified columns - the **Micro Focus Find/Replace** dialog box now includes options to search between specified columns in the code.
- Directive sets - Compiler directives for your projects are now saved in language-specific `.mfdirset` XML files stored within a `.settings` subfolder in the project's folder. You can create your own versions of `.mfdirset` files and verify them against an XML schema that Micro Focus supplies.

Previously, all settings were stored in a single, proprietary IDE project file. Existing projects which currently specify directives and other similar settings in the `.cobolproj` file will be upgraded to use the new `.mfdirset` files when imported or loaded in Enterprise Developer 5.0. If you are storing your source code in a source control system, ensure that you add the `.mfdirset` files to source control as well.

- Remote connections - support is available for automatic SSH tunnelling of Micro Focus Enterprise Developer UNIX Components network traffic. You can route most Micro Focus Enterprise Developer UNIX Components network traffic using SSH port forwarding. This makes developing on a remote UNIX host running a firewall easier to configure. In addition, the network traffic is encrypted as it is being sent within an SSH tunnel.
- User Interface:
  - The **COBOL Explorer** view uses an icon overlaid with P to indicate COBOL programs that will not be built because they are preceded by another of the same name on the build path.

- Improved settings UI - the COBOL, IMS, and the Run-time Configuration settings pages now use a property grid that also shows the definitions of the settings.

## Debugging

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This release includes the following enhancements:

- Animate - Eclipse now includes an additional menu option when debugging a COBOL program for setting the speed and toggling Animate mode. When active, the program will automatically step through each line of source code, updating the source code in the editor, the Debug Stack, Outline and Variables Views. See *Debugging Commands and Options*.
- Conditional watchpoints - you can now specify conditions and hit counts for COBOL watchpoints. A condition can be in the form of an expression or it can be a hit count (for the number of times memory associated with a data item has been updated). The condition is evaluated each time the data item being watched changes. If the condition evaluates to true, then program execution stops. This enables more fine-tuning of the current watchpoint support and is useful when debugging large, complex programs.
- Dynamic core dumps - you can now invoke a core dump programmatically and continue execution of your program. A new library routine, CBL\_CREATE\_CORE, enables you to produce a core file for the current process or a process owned by the same user that owns the current process.
- Improved visibility of the PERFORM stack - the PERFORM stack and PERFORM range names are visible in system debuggers such as gdb in many cases on 32-bit Linux with Intel architecture and Solaris with Intel architecture. This was already the case on AIX, 64-bit Solaris-Intel, and all other Linux platforms (including 64-bit Linux-Intel).
- Live Recording - a new environment variable, COB\_LIVE\_RECORD\_SIZE, is now available to aid performance during the creation of a live recording file. Use it to specify the amount of memory (in MB) that is to be used to store events that are to be written to the live recording file. When the limit is reached, the buffer is cycled so that the oldest events are removed to make space for the most recent events.
- In order to include source line numbers in run-time error messages, which makes the diagnosis of issues in your program easier, the COBOL compiler now produces `.idy` files by default when building from the command line, unless the NOANIM directive is specified. You can safely remove `.idy` files after compilation if you do not need them; they do not need to be distributed with your application unless you want to debug your code. However, unless you specify the ANIM directive, generated executables such as `.dll` and `.gnt` will not be debuggable, which is consistent with prior behavior.



**Note:** Behavior has not changed if you are using an IDE or build scripts generated by an IDE.

- Stackdump files (Linux Intel 64-bit, Solaris Intel 64-bit, and Linux/390 platforms only) - you can produce a stack trace for applications in a production environment that encounter a Run-Time system error. Use the `stackdump_on_error` and `stackdump_filename` tunables to configure the production of a stackdump file when an error occurs, from which you can locate the exact line of failing code in your program.
- A new configurable tool is now available that dumps to a file stack traces of all threads in process on any Run-Time System error. [Linux Intel, Solaris Intel, zLinux only – requires ANIM on 32-bit Linux Intel]. This is only supported for native COBOL.
- Line number information is now being output for optimized builds (on Linux Intel 64-bit, Solaris Intel 64-bit, PowerLinux, zLinux, and Solaris SPARC platforms only). This is only supported for native COBOL. Because of what optimization does, the information is imperfect, but it remains highly indicative. This gives the following advantages:
  - Enables the use of the stackdump utility (where available) for optimized builds.
  - Provides location information should a signal occur when running in a system debugger such as gdb.
  - Provides some limited ability to step through optimized code in system debuggers.



# Enterprise Server Security

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This release includes the following enhancements:

- Security - security features can now be employed when developers and administrators install new COBOL services (web services and EJBs) into an enterprise server instance over the network. There are a number of authentication and authorization options that can be enabled. See *Deployment Listeners* and *The .mfdeploy File*.
- Vault Facility - a new security feature has been added that enables some Enterprise Server components to keep certain sensitive information in a form of storage defined as a vault, accessible via a configurable vault provider. The default vault provider stores data in encrypted format on disk.
- OpenSSL 1.1.1 - the OpenSSL security provider has been updated to OpenSSL version 1.1.1.

This is the stable Long Term Support version of OpenSSL.

- Added support for the ratified TLS protocol version 1.3. TLS 1.3 benefits include:
  - Much shorter initial connection negotiation sequence. This reduces the time taken to establish a link before starting to transmit data.
  - Using only the most secure ciphers and hash methods.
  - TLS 1.3 will be negotiated in preference to the older TLS protocols.
- Added support for new Ciphers and Key Exchange groups in line with TLS 1.3 requirements.
- The default security level for previously configured endpoints has been moved from Security Level 0 to Security Level 1. This removes the ability to accidentally make use of known-weak elements such as SSL3 and MD5. Similar changes to the default Security Level have recently happened to Java, Chrome, Firefox, and other systems providing secure connections.
- Fileshare Security - the Fileshare Secure TCP/IP transport provider now supports the trusted use of X509 certificates bearing the name of the Fileshare service as the Common Name element of the certificate.

In previous releases, a secure connection to a Fileshare server was made using a certificate that represented the network location upon which the Fileshare service was located. This method is still supported, but does not distinguish between the exact Fileshare server that is being connected to when more than one service can exist on a single host system. With this change, individual Fileshare services can identify themselves by using a unique certificate. While running on the same host and registered with the same network endpoint.

- Support for Active Directory user groups and group name mapping - the Enterprise Server External Security Facility's MLDAP ESM Module can now use Active Directory user group objects for Enterprise Server user groups. Also, the module can now map long group names to the 8-character-maximum names required for mainframe emulation.
- Selective auditing - administrators can audit only security activity of particular interest, reducing audit overhead and the volume of events. The Enterprise Server External Security Facility's MLDAP ESM Module can now enable ESF Audit events only for particular users, groups, and resources.
- Improved interaction with LDAP client libraries resulting in fewer LDAP-related issues and easier diagnostics - the Enterprise Server External Security Facility's MLDAP ESM Module has improved interoperation with LDAP client libraries:
  - The client library vendor and version information is logged after the library is loaded
  - The module has better heuristics for loading the correct library supplied by the OS vendor, so the "provider" configuration option can generally be omitted
  - For OpenLDAP, the module sets its proprietary "connect timeout" option
- SNI support (requires 5.0 Patch Update 1 or later) - support has been added in Patch Update 1 for the Server Name Identification (SNI) extension to TLS. This helps to avoid connectivity issues related to a growing number of Web services being hosted on SNI servers.

## Enterprise Server for .NET

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This release includes the following enhancements:

- Improved CICS compatibility - CICS EIBRCODE handling in Micro Focus Enterprise Server for .NET now matches the mainframe specification. CICS BMS support in Micro Focus Enterprise Server for .NET now matches the behavior on the mainframe and in native Enterprise Server more closely.
- MMC administration UI support for ESF security - the MMC snap-in for Micro Focus Enterprise Server for .NET administration now supports the External Security Facility. This means you can use LDAP-based or custom security solutions to provide administrator authentication and access control.
- TLS (SSL) support - the seelistener utility now supports TLS (also known as SSL) for its TCP communications channels. These include all channel types except MQ. The Micro Focus Enterprise Server for .NET client classes also have been enabled for TLS. For example, the seeout utility can now be used with a TLS-enabled MFBINP channel.
- Performance improvements - this release comes with an improved performance in WCF, system database operations, and VSAM database operations.

## IMS Support

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This release includes the following new feature:

- Checkpoint and restart are now available for output GSAM files in addition to input GSAM files.

## JCL Support

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This release includes the following enhancements:

- Spool file housekeeping - you can now merge your archived spool files to a central location where they can be viewed using the Micro Focus Data File Editor. This copies the archived spool files and merges them into a new, combined archive. It does not change the original archive, so the audit trail remains untouched, but the combined archive allows viewing of all the jobs that have been merged. The merge process is carried out using a JCL job or by using a command line utility.
- A new user exit MFJFAXIT - this user exit allows you to receive notifications when 'file open' events are processed by the JCL engine. A sample exit can be found in the `src\enterpriseserver\exits` sub-directory of your product install directory. You can enable this exit by using the MFJFAXIT environment variable, to point to the exit program.

## Mainframe Access

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This release provides enhancements in the following areas:

- Full support for the z/Server functionality - MFA Server now has the capability to service all z/Server requests. This means it is no longer necessary to configure z/Server, and the number of started tasks running on the mainframe is reduced. Installing and configuring MFA Server becomes easier as z/Server is no longer required.
- Browse dataset using IDCAMS dump - when using the MFDAS BROWSE command, it is now possible to view the output of the IDCAMS DUMP command on the specified dataset in hex and printable characters side-by-side.
- Improved JES support for executing jobs and input datasets - it is now possible for MFA Server to interact with JES jobs that are in executing phase, and to list and download input datasets.
- Retrieve binder information for load modules - when executing the MFDAS BINDER command, it is now possible to view the binder information from a load module.

- TSO command server - MFA Server includes a new type of application server to support executing TSO commands as the current user. The address space is spawned as your user id and any valid TSO command can be executed.
- UNIX sub-system (USS) support - MFA Server can now operate on files stored on a USS file system. The available functions are - edit, browse, rename, delete, and copy USS files and directories.

## Micro Focus Native Database File Handler

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The Micro Focus Database File Handler (MFDBFH) is a file handler that enables your native CICS and batch enterprise server applications to interact with data files and certain infrastructure files stored within a database.

VSAM files may experience logical and/or physical corruption in the event of a hardware failure. This is due to a single COBOL I-O operation consisting of multiple physical I-O operations. If all the physical I-O operations that make up the COBOL I-O operation are not performed, the file can be left without integrity. In previous releases you could guard against such occurrences with Fileshare and logging, but they required some manual intervention and came with performance cost.

In this release, configuration options have been added that allow the I-O operations to be routed to an RDBMS to take advantage of the availability and performance characteristics of the database. This can be achieved with no changes required to the application. The file will be routed to the SQL database simply by changing the filename prefix to `sql://`.

Features include:

- CICS and batch Cobol file I-O can now be routed to an RDBMS with only simple configuration changes. No application changes are required.
- Supports all Micro Focus file formats
- Files can be routed to an RDBMS on a file by file basis.
- Utilities are provided to enable data to be moved between disk files and RDBMS.
- Support for PostgreSQL 10.x, Amazon Aurora PostgreSQL, Db2<sup>1</sup>, and MS SQL Server (on Windows and Linux Intel)

## Micro Focus Rumba

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This release comes with Micro Focus Rumba+ Desktop version 10.2 SP2 which you can choose to install with Enterprise Developer. This will enable embedded Rumba+ Desktop support within the IDE.

## Micro Focus Unit Testing Framework

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This release provides support for the following functionality:

- Data-driven unit tests - a new type of test suited to testing data where values read from a source are passed through the same tests.
- JCL unit tests - two types of test that interact with the JES engine on an enterprise server region. These tests are run from the command line.
- Test output colorization - test output can now include basic colorization for supported terminal emulations. This feature must be run from the command line.

## PL/I Support

Enhancements are available in the following features:

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<sup>1</sup> Db2 support was introduced in the 5.0 Patch Update 2 release

- Code coverage in Eclipse - code coverage data can now be generated for PL/I programs in the Eclipse IDE using the same mechanisms as for COBOL programs.
- Compiler:
  - Full support for GET DATA.
  - Built-in functions:
    - New built-in functions - ALLOCATE, INDEXR, MEMCONVERT, MEMINDEX, ONCONDCOND, PLIFREE, REM, REPLACEBY2
    - The HEX built-in function now matches its z/OS version.
    - The PROCNAME and PROCEDURENAME functions used without trailing open/close parents.
  - Allow the use of VALUE to initialize members of a PL/I Data Structure.
  - Support for INONLY, NONASSIGNABLE attribute.
  - Diagnostics when a supplied parameter to a call is larger than the entry declaration.
  - Diagnostics when the Compiler detects that a loss of precision occurs as a result of operations on FIXED DECIMAL operands.
  - Compiler listings now provide additional information about arrays.
  - OPTIONS(REORDER) is now parsed but ignored.
  - \*PROCESS OPT(TIME); is now supported.
  - Support for larger concatenations when initializing variables or making assignments.
  - Support for named constants of numeric PICTURE type in static structure dimensions and initializations.
  - Diagnostics when the concatenation of two strings results in a string that is larger than the target variable.
  - Support for the DUMMY ALIGNED and DUMMY UNALIGNED arguments.
  - Support for the XML case asis and XML case Upper.
  - Diagnostics if code attempts to use bitwise operators on non-bit variables.
  - (Added in 5.0 Patch Update 1) A new option, `-fdmaxp 15,31`, has been added. With this one specified, arithmetic operations with fixed decimal operands with precision  $\leq 15$  produce a result with a maximum precision of 15. For arithmetic operations with fixed decimal operands with precision  $\leq 31$ , they produce a result with a maximum precision of 31.  
 The options `-fdmaxp 15,15` and `-fdmaxp 31,31` are allowed, and correspond to `-fdmaxp 15` and `-fdmaxp 31`, respectively.
- PL/I debugger in Eclipse:
  - Variables surrounding current point of execution now displayed in Variables view.
  - A Console view for PL/I programs that are being remotely debugged outside the control of Enterprise Server, and in Eclipse.
  - Data watchpoint setting using a variable declaration in the debugger.
  - PLIDUMP now emits STATIC variables in addition to AUTOMATIC and Parameters when documenting the callstack.
- The Macro preprocessor now supports %INSCAN and %XINSCAN.
- The EXEC preprocessor now supports the following:
  - SQL statements embedded within PL/I packages
  - The `-maxmsg` option for setting the maximum number of errors to be generated before terminating the compilation
  - Up to 4000 include files in a signal program
- PL/I Run-Time System - support is now available for:
  - Optionally generating Windows "Mini-Dumps" or a Linux coredump off the back of a call to PLIDUMP.
  - Dynamic allocation of datasets using the TITLE option(s).
  - Raising an ERROR condition when a called subroutine raises a COBOL RTS error.

- FILE variables can have differing DCB when used in differing contexts.
- STATIC FIXED BIN(31) variable accessed at open within the RECSIZE() attribute of the ENVIRONMENT.

## Platform Support

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Support is now available for the following additional or updated operating systems:

- SUSE (Power) 11 SP3, 12
- Red Hat (Power) 7.2, 7.3
- Windows Server 2019

For a full list of supported platforms, check [HTTPS://SUPPORTLINE.MICROFOCUS.COM/PRODAVAIL.ASPX](https://supportline.microfocus.com/prodavail.aspx).

## Product Documentation

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The following is new in this release:

- The *Comparison of COBOL with Other Managed Languages* document has been updated to reflect the recent enhancements in the .NET and JVM COBOL support.

## What was New in Enterprise Developer 4.0

This release provides enhancements in the following areas:

- [Integration with Eclipse](#)
- [Application Server JCA Support for Enterprise Server](#)
- [Application Workflow Manager](#)
- [AppMaster Builder](#)
- [Build Tools for Windows](#)
- [Code Coverage](#)
- [Codeset support](#)
- [Compiler directives](#)
- [Data File Tools](#)
- [Debugging](#)
- [Docker](#)
- [Documentation on working with large applications](#)
- [Enterprise Server](#)
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- [JCL support](#)
- [Mainframe Access](#)
- [Managed COBOL](#)
- [Library routines](#)
- [Micro Focus Unit Test Framework](#)
- [OpenESQL](#)
- [Platform support](#)
- [PL/I support](#)
- [Web Service Clients](#)

- [XML Extensions](#)

## Integration with Eclipse

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This release provides the following general enhancements:

- Support for Eclipse 4.7 Oxygen (64-bit) and 64-bit project templates - the 64-bit Eclipse 4.7 is now installed by default. Project templates are available for both 32-bit and 64-bit applications. You can set a default project template (either 32-bit or 64-bit) to use so that all future new projects will use that as the preference. On platforms only capable of building to 64-bit, the 64-bit templates are the default ones.

The 32-bit Eclipse is still supported on 64-bit Windows platforms, however you need to manually install it and a 32-bit Java.

Support for Eclipse 4.4 and 4.5 has been discontinued.

- Starting with release 4 Patch Update 4, you can plug Enterprise Developer into Eclipse 4.8 (either 32-bit or 64-bit) installed on your machine. On Red Hat, this requires that you have Red Hat 7 or later.
- Support for SUSE 12 - only the 64-bit SUSE 12 platform is supported and you can only use the 64-bit Eclipse with 64-bit projects on it.
- (Native COBOL projects only) The **Project Settings** page in the project's properties now include a search option. This enables you to find files and build configurations that have settings different from the ones set at project level.
- **Remove File Directives** - a context menu command in the explorer view enables you to reset a file's directives.
- IVP diagnostic tool enhancements - it is now possible to run the server-side IVP diagnostic tool for diagnosing issues with a remote connection from within Eclipse installed at the client side. The IVP tool now also performs a check for whether XTERM is installed on the remote machine.
- IMTK service mappings are now automatically regenerated if you make a change to the interface fields in the underlying program.

The following enhancements are available for JVM COBOL projects and package handling:

- New wizards for creating ENUM, DELEGATE and VALUETYPE types.
- Additional code snippets for Method-Id and Property-Id.
- Showing and grouping packages in the COBOL Explorer view - use the **COBOL JVM Project Presentation** command from the **View** menu in the explorer to either display COBOL categories or packages.
- Refactoring by renaming the package name - available from the context menus in the COBOL Editor and in COBOL Explorer.
- Refactoring by moving source folders, packages or compilation units - available from the explorer context menu.
- Support for switching off the package name mapping using the **Each part of the package name corresponds to a subdirectory** option in the **Build Configuration** page.
- Support for packaging .class files in a .jar file when building COBOL JVM projects.
- **Open Type Hierarchy** and **Open Call Hierarchy** context menu commands - available in the COBOL editor, COBOL Explorer and in the outline views while seeing the packages presentation in the IDE.

The following editor improvements are available:

- A **Properties** context menu command - enables you to access a file's properties directly from the editor.
- A **Show In** context menu command - enables you to locate the file in the COBOL or the PL/I Explorer.
- **Edit > Convert Tabs to Spaces** command - enables you to convert any tabs in your COBOL source files to a specified number of spaces.

Automatic relinking of applications created with Enterprise Developer 3.0:

- Enterprise Developer 4.0 can automatically relink existing projects created with Enterprise Developer 3.0 that have executable link artifacts. Eclipse displays a warning in the Problems view that the project

requires relinking. It then offers a Quick Fix action for you to execute that will link your project with the most recent version of the run-time system.

For more information see [Related Information](#) at the end of this topic.

## Application Server JCA Support for Enterprise Server

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This release includes the following enhancements:

- COBOL Resource Adapters now support WebSphere 9.0 and WebLogic 12.2.1.
- Tomcat 7.0 support for servlet generation with J2SEBeans.
- NullSearch utility - for COBOL resource adapters, this new utility provides assistance in locating NULL fields in mappings passed to Enterprise Server. When a large number of arguments is provided in the parameters passed to Enterprise Server, it is difficult to locate NULL fields, which are not allowed. The NullSearch utility isolates NULL fields, so the Java application can be corrected.

For more information see [Related Information](#) at the end of this topic.

## Application Workflow Manager

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Improvements have been made in the following areas:

- Model editor - now includes:
  - A new **Edit** action. Enables you to edit any model component instead of working with the Properties view. The new action enables you to change the attribute values of several model components at a time.
  - An Outline and a Relationship Hierarchy view.
  - Improved backwards and forwards navigation in the model.
  - Automated sequence numbering in the model.
  - The context menu of the model editor has been restructured for more clarity.
  - Context help.
  - Tool creation has been improved. Dependent components are generated from the function package tool definition.
- Development of models:
  - Newly created empty models now contain all categories. The new models also validate without any errors or warnings.
  - A new AWM system type, "Custom System", is available. This system type supports the model development process by facilitating the creation, change, load and reload of a model.
- New modelling features:
  - The "Return Property Value" tool in the function package now supports several additional use cases.
  - The "Transfer File" tool in the function package offers improved support for mass processing.
  - Support for properties with an application-wide scope.
  - A modelling capability to structure the local file cache for copybooks and include files downloaded by the background parser in the editor. Additional tools are provided to check the existence of or clear the file cache for copybooks and include files.
- The product help includes some tutorials showing how to create new models and extend the functionality of existing models. See the *Tutorials Guide*.
- A number of template models are now available and can be used as a base to develop your own models.

For more information see [Related Information](#) at the end of this topic.

## AppMaster Builder

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This release includes the following new features:

- AppMaster Builder is now available in the Team Developer Perspective - this perspective provides a development environment for your AMB projects that includes much of the functionality available from the AppMaster Builder perspective plus access to the AMB Endeavor Interface.
- AMB Endeavor Interface - enables you to share and synchronize resources between an AMB project and mainframe Endeavor datasets.
- A re-number/un-number feature in the Data Structure Editor.

For more information see [Related Information](#) at the end of this topic.

## Build Tools for Windows

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This release includes Enterprise Developer Build Tools for Windows, a separately-installable component of Enterprise Developer that has been designed to be used in environments where you want to work with your COBOL and PL/I projects but you don't want the overheads associated with the Eclipse IDE.

Build Tools provide a lightweight, easy-to-install development environment that is well-suited for use in Docker containers and continuous integration or continuous delivery systems.

For more information see [Related Information](#) at the end of this topic.

## Code coverage

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This release provides the following enhancements:

- Support has been added in Eclipse for code coverage for procedural copybooks.

For more information see [Related Information](#) at the end of this topic.

## Codeset support

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Support has been added to enable codeset mapping to additionally be configured to use IBM's Conversion Tables directly instead of the Micro Focus supplied tables. You need to download IBM's conversion tables from IBM's Web site. Then you can use the MFCODESET environment variable to convert between IBM's CCSIDs.

For more information see [Related Information](#) at the end of this topic.

## Compiler directives

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The following Compiler directives are new in this release:

- **DISPSIGN** - determines the display output of numeric fields with included signs, under an IBM mainframe dialect only.
- **GNTLITLINKSTD** - stops the suppression of call-convention 8 when both call-convention 2 and call-convention 8 are in effect for a `.gnt` file in an Intel x86 32-bit environment.
- **ILSMARTTRIM** - trims any trailing spaces from a string item returned by the get property associated with an alphanumeric item processed by ILSMARTLINKAGE.
- **MAINFRAME-FLOATING-POINT** - specifies the format of a program's floating point data items: either IBM hexadecimal format or IEEE format. This directive is supported in managed code only.



The following Compiler directives contain new parameters in this release:

- **CHECKDIV** - a new parameter 'ACOS' now emulates a divide by zero operation on an ACOS mainframe system: the quotient and the remainder are set to the value of the dividend.
- **OOCTRL** - a new parameter, **L**, specifies whether to include directory location comments in `.cls` and `.ins` inheritance files.
- **NUMPROC** - a new parameter 'ACOS' provides partial compatibility with the behavior of NEC ACOS COBOL processing of invalid data in USAGE DISPLAY data items and invalid sign information in USAGE COMP-3 data items.

For more information see [Related Information](#) at the end of this topic.

## Data File Tools

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It is now possible to export any filtered results. When filtering a data file, you can use the results to create a new data file - click **Search > Export Results** when a filter is applied to save the filtered records to a new file. You can:

- Save the filtered records to a new file.
- Save the records that match the specified filter (such as customer information or orders).
- Download a subset of the data from a remote file.
- Save a small portion of the data for testing purposes.

For more information see [Related Information](#) at the end of this topic.

## Debugging

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This release includes the following enhancements:

- Debugging CICS channels and containers - you can now debug CICS COBOL applications that use channels and containers. The debugger now enables you to view the contents of any channels and containers, and to change content as you debug.

The following enhancements have been made to reverse debugging and live recording:

- Reverse debugging and live recording have been enhanced significantly, and are now considered GA features. You can now debug using watchpoints and conditional breakpoints, and reset execution points. Debugging multi-threaded applications is now supported, and so are programs that contain OSVS performs and nested programs.
- A command line utility, `cobeslr`, has been introduced to enable you to configure live recording for particular services or application instances of an enterprise server region.
- You can now use the `CBL_DEBUG_START` and `CBL_DEBUG_STOP` library routines to start and stop a live recording session.

For more information see [Related Information](#) at the end of this topic.

## Docker

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This release provides support to enable you to run your COBOL and PL/I applications in Docker containers, taking advantage of the many benefits offered by the Docker platform such as portability, performance, agility, isolation, and scalability.

For more information see [Related Information](#) at the end of this topic.

## Documentation on working with large applications

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The product help now includes a new section, *Working with a Large Code Base*, that includes recommendations and best practices for working with large applications inside the IDE. It includes tips on how to structure your projects, how to optimize the performance of the IDEs, and step-by-step workflow showing how to move an existing legacy application into Enterprise Developer.

For more information see [Related Information](#) at the end of this topic.

## Enterprise Server

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The following enhancements have been made to Enterprise Server:

- Conversation filtering - the Enterprise Server Communications Process (MFCS) can now restrict access to listeners by client address. You can specify any permitted or forbidden addresses either by IP address, network mask, or domain name, and use wildcards. Filters can be applied to individual listeners, communications processes, or to entire regions. More specific filter rules override any general ones.
- The Enterprise Server Security Facility now starts throttling Verify requests when it receives more than 100 requests per second.

This can be used to limit the effectiveness of denial-of-service and brute force attacks. You can configure the value where throttling occurs. See *Verify Request Throttling* for more information.

- (Technology Preview only) Support for adding, deleting, and modifying XA resources in a live Enterprise Server region.

It is now possible to add, edit, or delete XA resources while an enterprise server instance is running. Any changes made come into effect after any in-flight transactions have completed. The ability to make these changes in a live environment comes under the control of the existing enterprise server permissions.

- XA-compliant Resources (XARs) - this release provides enhanced CTF tracing that allows more flexible reporting of warnings and errors on the RM switch module level.
- A new Communications Server resource class - enables you to control the access to the Enterprise Server Console Log and Communications Server Log when external security is in effect for an enterprise server region; see *Resource Classes for Communications Server* for more information.
- Improved catalog availability - there is now an improved resilience to temporary communication issues with the catalog and error reporting enabling a region to stay active if a region has multiple catalogs defined and one of the catalogs is not available.
- Enhanced SSL/TLS certificate support - for communications with TLS (formerly SSL), additional certificate and key file formats are supported. Servers may now be configured with both an RSA and an ECC key and certificate.
- Enhanced SSL/TLS cipher configuration - for communications with TLS (formerly SSL), the permitted cipher suites and their preferred order can now be configured. The minimum size of Diffie-Hellman groups for DH key exchange can also be configured. The defaults have been made more secure.
- The Historical Statistics Facility (HSF) now enables you to write user-defined data to the records produced within a `.CSV` file. Use the `ES_WRITE_CUSTOM_HSF` or `ESCSTHSF` library routines within your COBOL programs to define the custom data, and use the `ES_HSF_CFG` environment variable to configure up to five custom fields in the generated record.
- You can also use the `ES_HSF_CFG` environment variable to configure the number of CICSFS, TSQ, and TDQ fields that are written to the record.

For more information see [Related Information](#) at the end of this topic.

## File Handler

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This release provides the following enhancements:

- The DFSORT and SYNCSORT emulations now support the NULLOFL parameter of the OUTFIL statement.
- The **ASCIISOSI** configuration option is now available. It adds the required SOSI characters to the relevant EBCDIC DBCS character strings in order for them to be displayed or written out correctly.

For more information see [Related Information](#) at the end of this topic.

## HCO for DB2 LUW

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This release includes the following new features:

- Support for CHARSET EBCDIC COBOL stored procedures
- Seamless integration with DB2 LUW SBCS databases, providing various EBCDIC collation sequences
- 64-bit HCO command-line tools are now available across all supported platforms
- HCO DCLGEN enhancements that provide more copybook generation options

For more information see [Related Information](#) at the end of this topic.

## IMS support

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This release introduces the following new features:

- The IMS Database Forward Recovery feature has been updated to provide point-in-time forward recovery that enables you to recover all database transactions completed up to a specified point in time, including date and time of day.
- IMS support now includes MFS code for Light Pen devices. In your MFS, include a DEV statement with the FEAT=PEN parameter, and set the ATTR property on appropriate fields to DET or IDET to make them detectable by a light pen. See your IBM documentation for details.



**Note:** MFS that contains light pen code must be regenerated to take effect if the MFS is part of an Enterprise Developer project created using an earlier release.

- Support for export and import of IMS-configured enterprise server regions through Server Explorer.
- Support for the same IMS user ID to be signed on to multiple LUs simultaneously by using the ES\_IMS\_SINGLE environment variable and optionally the ES\_LTERM\_PREFIX environment variable.



**Note:** This is a technology preview feature only. It is being made available to allow you to test and provide feedback on this new capability; however, this feature is not intended for production use and it is not supported as such.

For more information see [Related Information](#) at the end of this topic.

## JCL support

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This release introduces the following new features and enhancements:

- Micro Focus FTP utility - you can now configure MFFTP to not process trailing blank spaces for a GET command, by setting the new control variable MFFTP\_PROCESS\_TRAILS\_ONGET=FALSE and setting the LOCSTAT value TRAILINGBLANKS=FALSE.
- A new API has been introduced - MVSSPLPB - that enables you to search all job information held in the JES spool control files. It is more comprehensive than the existing MVSCASPB API, and should instead be used for all new spool enquiries.

- A number of new environment variables have been introduced that enable you to configure the JES startup behavior with regards to opening user catalog files. You can configure JES to open user catalog files only when they are required (and not during system startup), and you can configure JES to retry opening a catalog file that has failed to open. These changes increase the resilience of the JES system, as you can mitigate against JES startup failures if the user catalog files are not readily available whilst the region starts. See *Configuring Multiple Catalogs* for more information.
- The public catalog API, MVSCATPB, has been enhanced to better report on file errors when opening catalog files. The following new functions have been added to `mfpubcat.cpy`: GCFS, GNFS, STNI, GCFE, and GNFE. See *Functions* for more information.

For more information see [Related Information](#) at the end of this topic.

## Library routines

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The following library routines contain new functionality:

- **CBL\_GET\_OS\_INFO** - this library routine can now detect if the program is running within a Docker container: `cblte-osi-rts-capabilities` parameter, bit 7.
- **CBL\_DEBUG\_START** and **CBL\_DEBUG\_STOP** - these library routines have been enhanced to start and stop a live recording session.

For more information see [Related Information](#) at the end of this topic.

## Mainframe Access

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The installation process has been changed as follows:

- A single installer for both Mainframe Access and the Mainframe Access z/Server support is provided.
- There is now only one XML configuration file for Mainframe Access. There is also a new configuration utility that guides you through the configuration process.
- Specify your own JES console character - it is now possible to configure the Mainframe Access installation to use a different JES console character instead of the default ("\$"). To achieve this, use the new JES\_CONCHAR configuration parameter.

Enhancements are available in the following areas:

- The Mainframe Call Generator now runs in an independent address space. Previously, it was possible for code run in the MFA address space to enter a supervisor state. MCGLIB is now the new address space's STEPLIB. This enables other user modules to be called without placing them in MFA's STEPLIB, as was previously necessary. See *Mainframe Call Generator: Calling Programs on the Mainframe* for more information.

## Managed COBOL

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Deploying JVM COBOL to an Application Server:

- Running JVM COBOL under WebSphere 9.0 and WebLogic 12.2.1 is now supported.

For more information see [Related Information](#) at the end of this topic.

## Micro Focus Unit Test Framework

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This release provides support for the following functionality:

- Generation of unit test stubs for selected entry points within your program.

For more information see [Related Information](#) at the end of this topic.

## OpenESQL

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This release provides the following new features:

- Support for SQL Server 2017.
- The SQL(TRANSACTION) compiler directive has been enhanced to clearly define transaction boundaries.
- A new SQL(NOWHERECURRENT) compiler directive that allows you to define updateable cursors that do not do positioned updates or deletes with PostgreSQL or MySQL.
- Larger communication area (PID) that accommodates longer plan and program names.
- SQL(OPTIMIZECURSORS) has been enhanced for consistent and better cursor performance across all OpenESQL backends.

For more information see [Related Information](#) at the end of this topic.

## Platform support

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Note the following changes in platform support for this release:

- Windows 8 and Windows Server 2012 are no longer supported for developing applications. They are still supported for deployment.
- SUSE platforms - this release only supports SUSE Linux 12 SP2, 64-bit.

On this platform, you can only build COBOL and PL/I programs to 64-bit executables. This applies when using Eclipse on SUSE or with remote projects when Micro Focus Enterprise Developer UNIX Components is installed on SUSE.

For more information see [Related Information](#) at the end of this topic.

## PL/I support

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**Note:** PL/I applications that were created using Enterprise Developer 3.0 and earlier must be recompiled in Enterprise Developer 4.0 to ensure they will compile and execute properly.

Support has been added for the following features in PL/I debugging:

- Displaying complex data structures in the Expressions and Variables views.
- Viewing the console window on non-Windows platforms so that output and input can be seen or entered.
- The Outline view in the default Debug perspective.
- Watchpoints on variables on the line where the variable has been declared.
- Conditional breakpoints.
- Skipping variables a defined number of times before the execution stops.
- Adding expressions to the Expressions view from the Outline view.
- Inspecting variables when referenced as part of a macro argument.
- Signals and conditions.

PL/I compiler and Run-Time System enhancements:

- Support for the following built-in functions - CHARVAL(), COMPARE(), CURRENTSIZE(), EDIT(), PICSPEC(), SOURCEFILE() and SOURCELINE().

- Support for additional DATETIME() format strings.
- Support for the FLUSH FILE(\*), ITERATE, and RESIGNAL statement.
- Support for the XMLIMIT and XMOLATTR attributes on variable declarations.
- Support for the MARGINI compiler option.
- Support for the SIZE and STRINGSIZE prefix conditions.
- Improved support for the repeat factor on arrays of AREA variables.
- Improved pointer arithmetic on 64-bit platforms.
- Where necessary, MFPLX now recognizes selected \*PROCESS statements and passes them to the appropriate preprocessors.

PL/I EXEC preprocessor:

- The EXEC preprocessor now honors the -margins setting for the output MDECK in addition to the input file. This provides an improved experience in the Eclipse IDE when using the Outline view and other PL/I features provided by the background parser.

PL/I macro preprocessor:

- The Micro Focus macro preprocessor now provides a new default behavior that mimics IBM's RESCAN(ASIS) behavior. In addition, a new option, rescan\_upper, has been introduced to enable you to optionally mimic IBM's RESCAN(UPPER) behavior.

Improvements in compatibility with IBM's Macro Preprocessor:

- Allows OTHER as an acceptable abbreviation for OTHERWISE on a macro SELECT statement.
- Supports the SCAN/NOSCAN option on declaration of macro variables.
- Implements the NOSCAN option on ANSWER statements.
- The %NOTE message format has been modified to match IBM's behavior.
- The SYSVERSION built-in function has been modified to always return a value of 22 bytes in length (space padded, if necessary).
- Relaxed diagnostics for scenarios where Enterprise Developer is generating a warning message and IBM does not.

(Technical Preview) Generating PL/I test coverage reports:

- The PL/I Compiler and Run-Time System now support capturing of information showing which lines in the program have been executed, and the generation of human-readable reports at the conclusion of a run.

(Technical Preview) Interaction with COBOL AMODE and 370 Assembler programs (Windows 32-bit only):

- A new compiler option is available which enables Open PL/I to interact with 370 Assembler, and with COBOL programs compiled with AMODE. See the product help for the current limitations to this support.

For more information see [Related Information](#) at the end of this topic.

## Web service clients

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This release provides the following enhancements for Web service clients:

- Improved support for larger, more-complex WSDL files, including:
  - Configurable generation of variable arrays and repeated structures by specifying the Inline-Array-Size-Limit parameter.
  - Generation selection for service, port, and one or more operations.
- Support for SOAP version 1.2 in addition to version 1.1.

## XML Extensions

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Two new state management statements have been introduced, XML GET WHITESPACE-FLAGS and XML SET WHITESPACE-FLAGS, that enable you to control how whitespace is handled when importing data; refer to the topic *Handling spaces and whitespace in XML* for more information.

For more information see [Related Information](#) at the end of this topic.

## What was New in Enterprise Developer 3.0

Enterprise Developer 3.0 provided enhancements in the following areas:

- [Integration with Eclipse](#)
- [Application Server JCA support for Enterprise Server](#)
- [Application Workflow Manager](#)
- [Building applications](#)
- [Character encoding](#)
- [CICS Web services](#)
- [COBOL language enhancements](#)
- [Code analysis](#)
- [Code coverage](#)
- [Compiler control](#)
- [Data File Tools](#)
- [Database access - HCO for DB2 LUW](#)
- [Database access - HCOSS](#)
- [Database access - MySQL](#)
- [Database access - OpenESQL](#)
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- [Documentation](#)
- [Enterprise COBOL 6.1 compatibility](#)
- [Enterprise Server](#)
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- [Mainframe Access \(MFA\)](#)
- [Micro Focus Unit Testing Framework](#)
- [PL/I support](#)
- [Rumba terminal emulator](#)
- [Transaction Classes](#)
- [XML processing](#)
- [z/Server](#)

### Integration with Eclipse

Enterprise Developer 3.0 provided enhancements in the following areas:

- Support for Eclipse 4.6 - Enterprise Developer now ships with the 64-bit Eclipse 4.6. By default, Eclipse is configured to compile applications for 32-bit and the default target platform for new projects is 32-bit.



**Note:** Applications that were created using Enterprise Developer 2.3 Update 2 and earlier must be recompiled in Enterprise Developer 3.0 to ensure they will compile and execute properly.

The 32-bit Eclipse is still supported on 64-bit Windows platforms and you need to manually install the 32-bit IDE and a 32-bit Java

You can install the Enterprise Developer plugin in other instances of Eclipse (32-bit or 64-bit). Support for Eclipse 4.2 and 4.3 has been discontinued.

- Rename refactoring - enables you to rename COBOL elements such as variables and identifiers, section and paragraph names, classes, and methods across a program or a workspace. Renaming helps improve the readability of an item or make its purpose clearer. Two preferences for renaming are supported in Eclipse - directly in the editor or using a **Rename** dialog box that offers a preview.
- Dependency paths - it is now possible to specify dependency paths to folders that are outside the project folder.
- Standalone files:
  - It is now possible to specify the locations where the IDE will search for the program symbol files (.idy) for standalone files: **Window > Preferences > Micro Focus > COBOL > Standalone Files > Program Symbols (.IDY)**.
  - It is now possible to use the Eclipse debug configurations to debug standalone files, including core dump files.

In previous versions of Enterprise Developer, standalone files were known as "single files". References to "single files" in the IDE and the product help have been changed to "standalone files".

- Error reporting - errors reported in the **Console** view now include a link for opening the source file at the line where the error originates.
- Editor improvements - an option for removing trailing whitespaces has been added to the IDE preferences for the COBOL and the PL/I editor.

### Application Server JCA support for Enterprise Server

In Enterprise Developer 3.0, EJBGEN has been updated to generate an EAR file as a part of the COBOL deployment process, which enables you to deploy EJBs to Java Application Server.

### Application Workflow Manager

Enterprise Developer for Eclipse now provides the Application Workflow Manager (AWM) feature. AWM enables you to customize and extend the Eclipse UI and workbench functionality to create application workflows that meet your requirements.

The features comes with:

- A standard project model for local COBOL development that reflects the features available in COBOL Explorer. You can modify this model by adding or removing project features.
- **Application Explorer**, **Filter Definitions**, **Properties**, and **Table Results** views in the COBOL perspective.

Enterprise Developer 3.0 includes improvements in the following areas:

- Application Workflow Manager model editor:
  - The definition of linked element types and properties has been improved. Some required model objects and relationships are now generated automatically.
  - The editor now detects unused references in a model.
- Application Workflow Manager modeling:
  - Basic resource processing has been extended to support mass processing where appropriate.
  - The AWM function package now includes the following new tools:
    - "Return Property Value" - enables you to map the values of input parameters to output parameters.
    - "Validate Value" - enables you to validate a filename against a specified naming convention.
  - You can now specify enabling conditions in a more granular way. An additional condition type has been introduced to hide actions or properties. For example, hiding an action from the context menu of an element.



- The Eclipse linked element type now enables the label and label decorator to be automatically set to mirror their representation in other Eclipse views if they are not explicitly modeled.
- Table columns can be modeled as a combination of two or more properties - for example, to combine a date and time property value.
- Additional standard icons.
- Mainframe Access (MFA) integration and the MVS function package:
  - MVS resources are now available as linked element types.
  - The following tools have been added to the MVS function package:
    - Delete MVS data set or member
    - Rename MVS data set or member
    - Copy MVS file to clipboard, Paste MVS file from clipboard
    - Get data set or member attributes
  - Improvements have been made to copy and paste support in the MVS Explorer.
  - File mapping between z/OS and local files now supports additional local code pages.
  - The editor context menu contains a "Submit to Mainframe" action when a file is opened from the MVS Explorer with an extension which is mapped to JCL in the File Mappings view.
  - Some of the new MVS function package tools replace existing ISPF function package tools resulting in improved performance of the tools.
  - The sample model "MVS Projects Sample Application" has been improved by including some of the new AWM MVS function package features.
- AWM is now available as a standalone feature which you can install into a separate instance of the Eclipse IDE installed on your machine.

## Building applications

Enterprise Developer 3.0 provided the following improvements:

- Support for faster, parallel building on multi-CPU machines - support has been added for multi-processor compilation of the sources in native COBOL projects on multi-CPU machines.

You can specify the maximum number of concurrent compilations from the IDE preferences - **Window > Preferences > Micro Focus > Builder**.

## Character Encoding

A new utility, `cobutf8`, is available. `cobutf8` enables you to seamlessly run applications that require non-UTF-8 character encodings in a UNIX environment that is using a UTF-8 locale.

## CICS Web Services

From Enterprise Developer 3.0, CICS Web Services was made generally available; it had previously been available (from Enterprise Developer 2.2 Update 2) as a Technology Preview feature.

From Enterprise Developer 3.0, support also includes the following additional features:

- CICS JSON Web services for request/response and RESTful JSON. CICS Web Services support has been extended to allow JSON/REST requests to be used in both requestor and provider mode.
- Use of container-based mappings

## COBOL language enhancements

Enterprise Developer 3.0 includes the following enhancements to the COBOL syntax:

- The `DISPLAY-OF` and `NATIONAL-OF` intrinsic functions are now able to process conversions using any IBM CCSID value. See *To install a CCSID Table* for details on installing the required CCSID table.

The following enhancements are available in managed COBOL:

- To avoid an exception being thrown if an explicit conversion fails, use the AS IF syntax, which results in the target object being set to null and no exception thrown. See *cast expressions* in the *Expressions* topic for more information.

## Code analysis

Enterprise Developer 3.0 provided the following improvements:

- A new group of predefined rule sets for 64-bit readiness is now included in Enterprise Developer.
- Support for importing code analysis reports produced with one of Micro Focus's advanced tools for code analysis, Enterprise Analyzer or COBOL Analyzer.

## Code coverage

The following improvements are available within the IDE:

- Information about unexecuted programs - the code coverage reports in the **Code Coverage** window now show the unexecuted programs.
- Code coverage support for standalone COBOL files - you can import existing code coverage reports in the **Code Coverage** window and use it to supply code coverage information for standalone files.
- Remote code coverage files - in the **Code Coverage** window in Eclipse, it is now possible to import code coverage report files that are stored in remote locations.
- Test coverage files - it is now possible to use a test coverage file to debug applications.

If you are using Test Coverage from the command line, you can now use the following features:

- A new Compiler directive, COLLECTION - the directive enables test coverage to gather information about unexecuted programs. In the IDE, this directive is automatically set on a project when you enable code coverage for it.
- A new command line utility, tcutil - the utility enables you to convert the test coverage binary results file into XML format.
- It is now possible to integrate test coverage in a Continuous Integration (CI) system. You can use tcutil and an XSLT processor to transform test coverage data into a format suitable for including in a CI.

## Compiler control

The following Compiler directive are new in this release:

- COLLECTION - provides a mechanism for code coverage to identify unexecuted programs.

The following Compiler directives have been updated:

- ALIGN - this directive has new parameters (FIXED and OPT) that can be used in conjunction with the integer taken, which can aid performance. The default is ALIGN"8 OPT"; see the Comments section of the *ALIGN* Compiler directive topic for details of its affect on memory boundaries.
- ARITH - this directive emulates the IBM mainframe option of the same name. Defines the maximum number of digits for numeric data items.
- FASTINIT - this directive is now on by default when setting the MF dialect; it remains not set by default for other dialects.
- SSRANGE - this directive now has an additional option (3), which permits zero-length reference modified items at run time when bounds checking.
- XMLPARSE - includes a change in the way entities are processed when XMLPARSE"COMPAT" is set

## Data File Tools

The Data File Tools editor previously provided (from Enterprise Developer 2.3) as a Technology Preview item was supported at GA level from Enterprise Developer 3.0.

Enterprise Developer 3.0 provided the following enhancements to Data File Tools:

- Opening files in shared mode - it is now possible to switch between read-only shared and edit modes. While a file is open in shared mode, others users can only open it in shared mode to ensure data consistency between users.
- Enterprise Server-level of security when accessing files - there is an improved level of security when exchanging data between Data File Tools and the targeted enterprise server instance. Users must now provide a user ID, group and a password when they try to access and view datasets in enterprise server instances. These are used for authentication and authorization checks to provide the same access level as Enterprise Server.
- Opening datasets using SSL - communication to a region is now possible using SSL. To enable the SSL communication, you need to provide a Java trust store which contains either a CA root certificate or a self-signed certificate of the region that it is communicating to. Java and the targeted region SSL configurations need to meet each other's standards in order for the communication to succeed.

This feature enables you to secure the information exchange between Data File Tools and the targeted enterprise server.

- Auditing of access and updates on datasets - Audit Manager now audits the access and updates on datasets via Data File Tools.
- Support for existing .pro files - enables you to use your existing editor profiles.
- Support for existing .str files - enables you to use your existing COBOL and PL/I structure files.
- Automatic timeout - if no internal operations or external actions (such as a mouse click) have been detected for 30 minutes, Data File Tools now displays a countdown message. If the user does not take any decision within the specified period, Data File Tools closes all opened files.

#### **Database access - HCO for DB2 LUW**

Enterprise Developer 3.0 provided a new DB2"QUALIFY-CALL" Compiler directive that enables stored procedure invocations to include a schema name.

#### **Database access - HCOSS**

Enterprise Developer 3.0 provided a new Offline Schema Extract feature – a batch solution that migrates a z/OS DB2 catalog to SQL Server without direct access to z/OS DB2.

#### **Database access - MySQL**

Enterprise Developer 3.0 provided support for MySQL with ODBC.

#### **Database access - OpenESQL**


Enterprise Developer 3.0 provided the following new features:

- Statement prefixes for the SQL"CHECK" Compiler directive that enable the creation of temporary tables and other SQL objects at compile time, ensuring full SQL syntax checking during compilation.
- SQL"OPTIMIZECURSORS" Compiler directive that enhances processing for traditional embedded SQL cursors that use WITH HOLD and FOR UPDATE clauses.
- SQL"CLOSE\_ON\_COMMIT" Compiler directive to leave cursors open for further result set processing after a commit.
- SQL"GEN-SQLCA" Compiler directive that generates an SQLCA similar to the z/OS DB2 directive STDSQL"YES".

#### **Debugging applications**

Enterprise Developer 3.0 provided the following new features:

- Debugging core dump files without a project.
- Reverse debugging (Technology Preview) - it is now possible to step backwards through an application to view a recording of the previous steps executed in the current debug session. Input is not accepted while viewing recorded execution.


 **Restriction:** Reverse Debug and Live Recording functionality is licensed and installed separately from [undo.io](#). You can enable reverse debug functionality by downloading the extension from the [Micro Focus Marketplace](#).

This functionality is only supported on the following platforms:

- Red Hat Linux (x86 and x64)
- SUSE Linux Enterprise Server (SLES) 12 SP2 (x64 only)
- Ubuntu Linux 20.04.x (LTS) (x64 only)

Additional restrictions apply. For details, see the *Reverse Debug and Live Recording* topic in the *Known Issues and Restrictions* section of this documentation.

- COBOL Live Recording debug configuration (Technology Preview) - it is now possible to record an application execution and view its execution path in the debugger. This method of debugging enables stepping both forwards and backwards, but does not accept input.

 **Restriction:** Reverse Debug and Live Recording functionality is licensed and installed separately from [undo.io](#). You can enable reverse debug functionality by downloading the extension from the [Micro Focus Marketplace](#).

This functionality is only supported on the following platforms:

- Red Hat Linux (x86 and x64)
- SUSE Linux Enterprise Server (SLES) 12 SP2 (x64 only)
- Ubuntu Linux 20.04.x (LTS) (x64 only)

Additional restrictions apply. For details, see the *Reverse Debug and Live Recording* topic in the *Known Issues and Restrictions* section of this documentation.

## Deployment on multiple platforms

Enterprise Developer 3.0 provided support for deploying JVM COBOL applications on multiple platforms. You can compile an application on one platform (such as Windows) and then deploy its class files to a different platform (such as Linux or UNIX).

Some features of the COBOL language, however, are platform-specific and their behavior on different platforms might vary. See *Multi-Platform Deployment of JVM COBOL Applications* for details.

## Documentation

The following new sections have been added to the product help:

- *Where do I start?* - located on the launch page of the product help, this section provides the information you need in order to get started depending on which aspects of the product you need to get to grips with first.
- *Multi-Platform Deployment of JVM COBOL Applications* - includes information about how to ensure the portability of your JVM COBOL applications between Windows and UNIX or Linux platforms.
- *Configuring an SSL Client Connection to a Mainframe* - includes instructions about how to configure client applications to connect to MFA and z/Server mainframe via AT-TLS in a zOS environment.

## Enterprise COBOL 6.1 compatibility

The following features have been added to support Enterprise COBOL 6.1:

- A new statement, JSON GENERATE, which enables you to convert data to JSON format.
- A new special register, JSON-CODE, and its resulting exception codes to support the new statement.
- Two further new statements, ALLOCATE and FREE, to obtain and release dynamic storage.
- A new MF level, MFLEVEL"19", which contains the following new additions to the reserved words list:
  - JSON

- END-JSON
- ALLOCATE
- FREE
- INITIALIZED (context-sensitive reserved word)



**Note:** These keywords are also in effect under the ENT dialect.

- The SSRANGE Compiler directive has an additional option "3", which permits zero-length reference modified items at run time when bounds checking.
- Support for the INITIALIZE statement under the ENT dialect has been enhanced.

## Enterprise Server

Improvements are available in the following areas:

### Integration with Eclipse

- Exporting an enterprise server definition from the IDE in XML format.
- Importing an enterprise server into the IDE using its definition file.

### iFileshare

iFileshare is no longer considered an Early Adopter Program, and contains the following enhancements in this release:

- An improved failover and recovery process. iFileshare now supports full recovery of nodes in the group. For high availability (HA-VSAM) groups, servers can now rejoin the group without the entire group having to be restarted. In addition:
  - A primary failover now results in a takeover from the most suitable node.
  - If configured, external clients will automatically reconnect to the new primary and will issue a notification if the transaction has been lost.
  - A failed node, when restarted, will rejoin the group, recover its files and request a log update from the current primary. Once this task has completed it will be considered an active hot-standby and will continue to process replication requests as normal.
  - Users will experience a higher level of uptime/availability with their Fileshare configuration and will be able to recover from errors more easily.
- A new exit procedure, `ifsexitproc.cbl`, can be configured to automate some aspects of iFileshare behavior.
- The iFileshare Control page in ESMAC contains details of the current iFileshare high availability group.
- The following new iFileshare-specific environment variables are available:
  - `FSWRKDIR` - enables you to specify the Fileshare working directory, overriding the default, which is the system directory of the region.
  - `FSCHKLFH` - determines if a check is performed when a high availability group is started, to test the consistency of the data files within the group.
- The database reference file (`dbase.ref`) now supports wildcard matching for filenames, allowing you to perform operations on multiple files at once; for example: `fs /d dbase.ref /f data\*` adds the entire contents of the data directory to the database reference file.

### EXEC CICS TRANSFORM:

- Enterprise Server now supports the XMLTODATA and DATATOXML options of this API.

### JCL spool

The JCL spool repository infrastructure has been redesigned to significantly improve its performance. The improvements include:

- A more disk-efficient infrastructure, reducing the space required by the spool files by up to 75% in some cases.

- Improved internal indexing, resulting in quicker generation of messages and sysout records during processing.
- Improved navigation of spool queues: job status **Complete** replaces the **Output**, **Out Hold**, and **Printed** statuses, and completed jobs with any combination of sysout files can be displayed in a single list.
- Increased range of job numbers, from five digits to seven digits.



**Important:** These changes are automatically in place for new enterprise servers that you create. To enable these updates to existing enterprise servers, you must run a conversion utility before any JCL processing is permitted. Follow the **To run the spool conversion utility** process, detailed in *Significant Changes in Behavior*, for each existing JES-enabled enterprise server you have.

#### Long user IDs and passwords:

- Enterprise Server now supports user IDs and passwords of up to 100 characters. It is possible to map IDs from long to short (or vice versa) to enable compatibility with programs that do not support long names.

#### Multi-factor sign-on:

- Multi-factor authentication enables users to sign on to Enterprise Server CICS without entering a username and password. A secure user identifier, such as a certificate, is mapped to a username and is used to generate a passtoken. It is possible to use smartcards, biometrics, or other authentication systems to identify yourself to the system. The username and passtoken can then be used to log on to CICS in an automated way.

The supported sign-on mechanisms are Express Logon Feature (ELF) and Automated Sign-On for Mainframe (ASM).

#### SHA-256 support in DemoCA:

- By default, the Demonstration Certificate Authority (CA) now signs certificates with SHA-256. This ensures that the demonstration or evaluation certificates will be accepted by modern browsers and other software that has enhanced security requirements.

#### Syslog auditing:

- Enterprise Server now supports auditing using syslog events, which can be consumed by a wide range of Security Information and Event Management (SIEM) products. This replaces the Audit Manager auditing solution. Syslog auditing provides a much more efficient auditing mechanism, with significantly less impact on overall speed.

#### IMS support

A new MFSGEN Compiler directive, CONTMVS, has been added to enable the compiler to parse MFS continuation lines (those continued without a terminating comma) by treating the line that follows as a comment line, just as is done on the mainframe.

#### Mainframe Access (MFA)

Enterprise Developer 3.0 provided the following improvements:

- Running MFA client in 64-bit processes - you can now call the MFA client modules from 64-bit applications and take advantage of the wider memory addressing available to those modules.
- MFA client CTF tracing - MFDAS now supports CTF tracing. This provides better diagnostics of issues and helps increase turnaround on issues. CTF is common to a number of Micro Focus modules so cross-component logging can be turned on from a single place.
- MFA and z/Server holder close coupling - MFA server can now start the z/Server holder as a subtask in its own address space. This helps improve the performance as MFA can hand-off AWM sessions directly to the z/Server scheduler without instructing AWM to redirect them.

- Endeavor functions - the following functions are now available to Enterprise Sync and MFDAS: DELETE, DIRX, GENERATE, GETENQI, LIST, MOVE, SIGNIN and TRANSFER.

### **The Micro Focus Unit Testing Framework**

The Micro Focus Unit Testing Framework is now available from within the IDE. It includes much of the architecture you would expect of an xUnit framework to create, compile, run and debug unit tests, including the following features:

- A unit test project template.
- A test creation wizard that enables you to generate tests from your source code.
- Code templates for each element of a test case.
- Support for running tests with Code Coverage enabled.
- The Micro Focus Unit Testing view, where you can manage your test runs and view test output.

There has been a number of enhancements to the command line version of the Micro Focus Unit Testing Framework. Support has been added for:

- Running test fixture files using Apache Ant.
- Applying traits to your test cases, then performing a test run based on those traits.
- Applying a high, medium, or low priority to test cases, which affects the order in which they are run.
- Adding coded command line options directly into your test code.
- Using a test run-specific configuration file, in which you can set environment variables.

### **PL/I support**

Enhancements are available in the following areas:

#### **PL/I debugging**

- New Eclipse-based PL/I debugger - the CodeWatch debugger has been replaced with the debugger within the industry standard Eclipse User Interface. New features such as true remote debugging are now available along with a much simplified user debugging experience that works in exactly the same way as the debugger works for COBOL (and Java). This can help improve the productivity of PL/I application developers who are adding new features or migrating existing applications to a distributed world.

A selection of features which are now supported includes:

- Attaching to a running PL/I process, waiting for attachment from a PL/I process
- Breakpoint-setting in the editor
- Stepping through PL/I code and querying the contents of PL/I data items
- Viewing the execution stack, resetting the executions point, and running to a selected line
- Remote debugging of PL/I applications running on Linux or AIX machines

#### **PL/I compiler and run-time system**

Support has been added to enable the following:

- The UNSIGNED data type - the PL/I Compiler now supports the UNSIGNED attribute for FIXED BINARY data items. In addition to the basic language support, the SIGNED, UNSIGNED, ISIGNED, and IUNSIGNED new built-in functions have been implemented. These features offer an improved compatibility with other languages such as C or C++.
- New built-in functions - UTF8(), UTF8TOCHAR(), UTF8TOWCHAR(), and SUBTRACT(). These new built-in functions make it easier to modernize migrated PL/I applications.
- The ENTRY LIMITED data attribute - the Open PL/I Compiler now accepts and fully supports the LIMITED attribute on ENTRY declarations. This increases the compatibility of the Micro Focus PL/I Compiler with IBM's PL/I for applications that you are migrating from the mainframe.

- Support for processing of JSON data - a number of new built-in functions are available for processing JSON text. This enables you to modernize your PL/I applications by enabling them to interpret, create and process JSON data.

JSONGETARRAYEND	JSONPUTARRAYEND	JSONGETMEMBER
JSONGETARRAYSTART	JSONPUTARRAYSTART	JSONGETVALUE
JSONGETCOLON	JSONPUTCOLON	JSONPUTMEMBER
JSONGETCOMMA	JSONPUTCOMMA	JSONPUTVALUE
JSONGETOBJECTEND	JSONPUTOBJECTEND	JSONVALID
JSONGETOBJECTSTART	JSONPUTOBJECTSTART	

### PL/I macro preprocessor

A number of enhancements have been made to improve the compatibility between the PL/I macro preprocessor and IBM's macro preprocessor which helps ease the effort required to migrate PL/I applications to new platforms. Support is available for:

- RESCAN in the ANSWER statement.
- The shorthand "<>" syntax for indicating "Not Equal To".
- Break characters in hex literal constants to improve readability of code.
- A new option, -tagdbg, that annotates macros and %FILE/%ENDFILE statements with line numbers and the source file which injected them.
- The -caseasis option which allows source code to flow through to the `mdeck.pp` file retaining the case as entered.
- Macros with a null parameter list.
- The LEAVE statement.
- Improved macro preprocessing speed.
- New built-in functions: SYSENDIAN() and MFPHOSTNAME().

### Rumba terminal emulator

Enterprise Developer now ships with Micro Focus Rumba 9.5.

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### Transaction Classes

Transaction classes, which provide a mechanism to limit the number of CICS® tasks in your system and were previously a Technology Preview item, was supported at GA level from Enterprise Developer 3.0.

### XML processing

XML PARSE now works in a purely managed COBOL environment. It is now supported in JVM COBOL and, in both .NET and JVM COBOL, it has a fully managed implementation. XML PARSE working without calling out to native code ensures it can be used in restricted rights environments.

### z/Server

The z/Server configuration has been simplified through the use of a unified scheduler. This replaces the three different types of scheduler, STC, CEA and JOB, that were used previously for starting different types of user servers.

## What was New in Enterprise Developer 2.3 Update 2

Enterprise Developer 2.3 Update 2 provided enhancements in the following areas:



- [Integration with the Eclipse IDE](#)
- [Application Workflow Manager \(AWM\)](#)
- [COBOL language enhancements](#)
- [Classic Data File Tools](#)
- [Compiler directives](#)
- [Database access - DSNREXX](#)
- [Editor writing assistance](#)
- [File handling](#)
- [IMS support](#)
- [Interface Mapping Toolkit](#)
- [Library routines](#)
- [PL/I support](#)
- [Tutorials](#)

## Integration with the Eclipse IDE

Enterprise Developer 2.3 update 2 provided enhancements in the following areas:

- The following settings have been added to the BMS page in the project's and file properties - Redefine Input, SDF Map Size, and Hyphenate Field Suffix.
- Using the search facility, **Search > Micro Focus**, you can now limit the search to the copybooks used by the current program rather than all copybooks in the project or the entire workspace.
- The editor provides a new context menu command, **Extract COBOL code to copybook**, that enables you to move a selected segment of the code to a new copybook file in your project. The segment of code moved to a copybook is replaced with a COPY statement in the original program.
- Support for Eclipse 4.5 - after installing Enterprise Developer, you can add it as a plugin into a separate instance of Eclipse 4.5. See your product's *Installation* notes.

## Application Workflow Manager (AWM)

Enterprise Developer 2.3 update 2 provided enhancements in the following areas:

### AWM model editor:

- It is now possible to use drag and drop not only for objects of the same type but in all cases where this is relevant. For example, it is now possible to drag tool descriptors onto an action descriptor which will create an "Action Descriptor has Tool" relationship. Dragging a File\_Descriptor\_has\_Property relationship onto an element list structure will create an Element\_List\_Structure\_has\_Column relationship.
- It is now possible to group any major modelling objects such as action descriptors, properties and tool descriptors in the AWM model editor.

### AWM modelling:

- The Eclipse function package includes a new tool, "Build Project", and the MVS function package includes a new tool, "Refresh DataSet".
- "Edit MVS File" now provides a parameter to the editor ID.
- The AWM meta model has the following enhancements:
  - New model objects for configuring the decoration of labels displayed in the Team Developer Tree view.
  - Visible conditions for enabled conditions. You can use the visible conditions to specify whether an action should be shown on an element's context menu.
  - A new application-specific attribute, INITIAL\_PARSE, enables you to specify whether the background parse process of the editor should start when a file is opened in the editor.
  - The Eclipse function package includes a new category of linked properties that support the Eclipse team properties.

- The Eclipse linked element types now support the "Run As", "Debug As" and "Profile As" context menu actions.

#### **AWM z/OS extensions:**

- The Micro Focus z/Server connection now provides an Owner filter.
- The Micro Focus z/Server connections support case sensitive input of passwords.
- The IDz function package provides a new tool which opens MVS resources depending on the RSED connection defined in the Micro Focus z/Server connection. This now enables you to download copybooks in IDz environments using the Micro Focus z/Server connection.

#### **Micro Focus model extensions:**

Support is available in the Micro Focus model extensions (the Enterprise Development Projects model and the SCM models for Endeavor, ChangeMan, SCLM and SVN) for:

- The Eclipse team linked properties
- Grouping modelling objects in the editor
- Visible conditions
- The "Run As", "Debug As" and "Profile As" commands

#### **COBOL language enhancements**

Numeric, edited and external floating point items can now specify USAGE NATIONAL when the NATIONAL"2" Compiler directive is in effect. Signed numeric items must be specified with the SIGN IS SEPARATE clause.

#### **Classic Data File Tools**

A new command line utility is available which enables you to initiate the following actions: open data files, create or open record layout files, create or open segment layout files, and open IMS databases using a DBD or PSB file. Note that although you can initiate these actions from the command line, you must complete them from within the IDE.

#### **Compiler directives**

The following Compiler directives are new in this release:

- COMMAND-LINE-LINKAGE - enables you to call a program and pass the command line to the main program as a parameter to be accessed via the Linkage Section. This offers equivalent functionality to the command\_line\_linkage tunable, which has now been deprecated.
- EBC-COL-SEQ - controls the behavior of an EBCDIC collating sequence, specified in a NATIVE"EBCDIC" program. EBC-COL-SEQ"1" (the default) maintains use of the long-standing fixed (platform-independent) EBCDIC collating sequence. EBC-COL-SEQ"2" prompts use of the latest CODESET table, which varies according to platform and user-controlled MFCODESET environment variable setting.
- NATIONAL - enables you to specify numeric, edited and external floating point items as USAGE NATIONAL.

#### **Database access - DSNREXX**



**Note:** This is a technology preview feature only. It is being made available to allow you to test and provide feedback on this new capability; however, this feature is not intended for production use and it is not supported as such.

DSNREXX support is available for use with Enterprise Server using DB2 LUW and SQL Server. See *DSNREXX Support* for more information.

## Editor writing assistance

Enterprise Developer 2.3 update 2 provided the following enhancements:

- Colorization of conditional compilation regions - by default, inactive code is now colored the same as Compiler directive elements. Inactive code is defined as code within conditional blocks that do not evaluate with the applied Compiler settings.
- \$REGION statement - support is provided for the \$REGION Compiler-control statement. You can use \$REGION - \$END-REGION to surround blocks of code that you want to fold or expand in the editor.
- AutoCorrect - you can configure the editor to automatically fix the most frequently misspelled words. You use the IDE preferences to specify a list of words that you sometimes mistype, and the correct spellings for them. Whenever you misspell that word, the editor automatically replaces it with correct version. This feature is enabled by default and can be configured from a new preference page in **Window > Preferences > Micro Focus > COBOL > Editor > AutoCorrect**.

For more information see *Related Information* at the end of this topic.

## File handling

MFJSORT ICETOOL now supports the USING parameter in the SELECT operator.

For more information see *Related Information* at the end of this topic.

## IMS support

Enterprise Developer 2.3 update 2 supports the PROMPT keyword in MFS source files.

For more information see *Related Information* at the end of this topic.

## Interface Mapping Toolkit

Enterprise Developer 2.3 update 2 supports JSON schemas for the generation of REST Web service clients in the Eclipse IDE.

For more information see *Related Information* at the end of this topic.

## Library routines

The following library routine contains new functionality:

- CBL\_GET\_PROGRAM\_INFO - a new function (function 10) has been added for native COBOL which returns the path and program name, or the program name only of a particular program.

For more information see *Related Information* at the end of this topic.

## PL/I support

Enterprise Developer 2.3 update 2 provided the following enhancements:

- New built-in functions - support has been added for the ONCONDID() and SAMEKEY() built-in functions.
- Support for strings declared with the VARYINGZ attribute - the Open PL/I compiler and run-time system now support the use of VARYINGZ strings as variables, parameters, and targets for built-in functions. This provides an improved compatibility with IBM's mainframe compiler, and the ability to more easily interact with other languages such as ANSI C.
- Improved PL/I macro preprocessor compatibility - the Open PL/I compiler now supports all macro preprocessor built-in functions used by IBM's PL/I Macro Preprocessor.
- Improved compatibility with IBM's Structure Alignment rules - the -zalign option of the Open PL/I compiler now maps structure elements of the BIT data type that do not consume a full byte to the same boundaries as IBM's PL/I compiler. This helps make the migration of mainframe data files to a distributed platform easier and improves the program execution compatibility.

- Improved floating point support - the Open PL/I Code Generator now utilizes the newer Intel floating point operands for improved speed. In addition, the Code Generator now provides improved compatibility with passing parameters between C and COBOL.
- PL/I editor improvements:
  - A new context menu command in the editor, **Extract PL/I code to an include file**, which enables you to move a selection of code in the editor into a new include file. The extracted code is replaced with an %INCLUDE statement which references the include file.

For more information see *Related Information* at the end of this topic.

## Tutorials

The product help includes the following new tutorials:

- *Tutorial: SQL - Deploying an Enterprise JavaBean Containing JVM COBOL to a JBoss Application Server* - that walks you through the process of deploying an EJB that contains JVM COBOL code.
- *Tutorial: DSNREXX*, that walks you through the process of executing DB2 LUW queries using DSNREXX.

# What was New in Enterprise Developer 2.3 Update 1

Enterprise Developer 2.3 Update 1 provided enhancements in the following areas:

- [Integration with the Eclipse IDE](#)
- [Application Server JCA support for Enterprise Server](#)
- [Application Workflow Manager \(AWM\)](#)
- [CICS Web services \(Technology Preview\)](#)
- [Code Analysis](#)
- [Code Coverage](#)
- [Compiler directives](#)
- [Database Access - HCO for SQL Server](#)
- [Database Access - Mainframe Batch Database Tools \(MBDT\)](#)
- [Data File Tools](#)
- [Editor writing assistance](#)
- [Enterprise COBOL 5.2](#)
- [File Handling](#)
- [Library routines](#)
- [Managed COBOL Syntax](#)
- [Native COBOL Syntax](#)
- [PL/I support](#)
- [Rosetta Stone for COBOL, .NET and Java Developers](#)
- [SourceConnect](#)
- [z/Server](#)

## Integration with the Eclipse IDE

Enterprise Developer 2.3 Update 1 provides the following enhancements in the integration of Micro Focus COBOL with the Eclipse IDE:

### Editors:

- COBOL editor:
  - You can now specify the increment for the COBOL and the standard line numbering from **Window > Preferences > Micro Focus > COBOL > Editor > Line numbering**.

- You can now toggle single or multiple lines between commented and uncommented states.
- JCL editor - the Unnumber and Renumber commands are now supported for the JCL editor. You can specify the line number increments from the IDE preferences in **Window > Preferences > Micro Focus > JCL > Editor > Line numbering**.
- PL/I editor:
  - The Unnumber and Renumber commands are now supported for the PL/I editor. You can specify the line number increments from the IDE preferences in **Window > Preferences > Micro Focus > PL/I > Editor > Line numbering**.
  - You can now toggle single or multiple lines between commented and uncommented states.

#### **Building applications:**

- Environment variables - a new page, **Build Environment**, in the project's properties enables you to specify environment variables for your applications. You can also specify environment variables that only apply at run time on the run or debug configuration for the application.

#### **Application Server JCA support for Enterprise Server**

This release provides support for:

- Automatic connection recovery to an active Java application server when an enterprise server region is restarted. This applies to:
  - COBOL resource adapters
  - CICS resource adapters
  - All CICS API based programs
- The IBM implementation of CICS resource adapter for WebSphere 8.5 and JBoss 7.1.1.

#### **Application Workflow Manager (AWM)**

Enterprise Developer 2.3 Update 1 provides enhancements in the following areas:

New features and enhancements are available in the following areas:

- AWM modelling:
  - It is now possible to associate keyboard shortcuts with modeled actions. The key sequence is displayed in the corresponding context menu at run time.  
Currently, it is not possible to persistently overwrite any modelled key bindings with user key bindings.
  - Support is provided for table row updates in modeled AWM dialogs - it is now possible to use table row actions in the modeled AWM dialogs to modify table rows similarly to how this is done in the Team Developer Tree or in the Table views. The supported modifications are copy, delete, insert and update of selected rows.
  - It is now possible to hide element properties in an AWM element's property view using the "Element Type has Property" condition.
  - The "Get Children" attribute of an element type has been replaced by the "Element Type has Get Children Action" relationship between an element type and an action descriptor which enables you to check whether an AWM container element can be expanded.
- Full support and a seamless integration is now available in the IDE for the AWM SCM models for ChangeMan, Endeavor and SCLM. You can now check out sources from the SCM system directly into your COBOL or PL/I projects in the IDE and vice versa.
- AWM Run-Time:
  - A single port for server connection - starting with this release you now only need to specify one port, the Mainframe Access (MFA) server port, for the **Micro Focus z/Server** connection type in the Remote System view. All other required ports are configured centrally in the server configuration on the mainframe. You must install the latest version of z/Server.

It is still possible to connect to an earlier supported version of z/Server. There is a backward compatibility flag that must be enabled to be able to specify the three ports that are required with the earlier z/Server version.

- SSL support - it is now possible to specify a SSL/TLS configuration when defining a new **Micro Focus z/Server** connection in the Remote System view. The client then uses the configured SSL/TLS certificates for the communication with the server. The mainframe must support SSL/TLS tunneling (such as AT-TLS from IBM).
- RACF passticket support - AWM clients now include an extension point which you can use to provide user credentials from an external application. When connecting to a Micro Focus mainframe server system (either MFA or z/Server), the password dialog is then bypassed. This enhancement enables you to integrate a login mechanism that uses RACF passtickets instead of RACF passwords.
- Support for binary download and upload of files - it is now possible to specify a Transfer Mode (either text or binary) in the file mapping dialog of the File Mappings view when transferring files between the mainframe and the local machine such as when editing files or during a drag and drop operation:
  - Text - the configured code pages are respected.
  - Binary - no code page translation is applied. You must use binary mode when transferring mainframe load modules.
- The SVN attachment is now an integrated part of the Enterprise Developer and is installed as part of the product. This enables you to use the tools from the SVN function package in an AWM model. For example, you can extend an existing model by adding the check-in and check-out functions for sources in an SVN repository. A sample model that includes a full integration of SVN support in the Enterprise Development Project model is available.
- A new AWM "MVS Projects Sample Application" is available with the installation of z/Server. The application uses the tools from the MVS and ISPF function package and is designed as a template AWM application for project-based access to MVS data.
- The AWM Enterprise Development Projects Application now provides the following enhancements:
  - Web Services support for COBOL applications in the Team Developer perspective.
  - Context menu commands for performing code analysis on demand of the sources in your projects from the Team Developer Tree and Table views.
  - An **Open in context** action for COBOL copybooks in the Team Developer Tree and Table views.
  - An Import and Export are wizards from the context menus of the Team Developer Tree and Table views.
  - Error markers in the Team Developer Tree and Table view on project, folder and file level when the sources compile with errors.
  - A "Link with Editor" function in the Team Developer Tree view for such files that you viewed when you expanded the tree view.
  - Support for using filters (using **Customize View > Filters**) in the Team Developer Tree and Table views to specify what entries should be displayed.
  - An improved support for drag and drop between the Team Developer Tree and Table view and the standard Eclipse views (such as Project Explorer and the Navigator view), the Remote Systems view (from the local and the Micro Focus z/Server connections), and Microsoft's Windows Explorer.
- The product help now includes a new section, *AWM API Programming and Extension Points*, that describes the published AWM API classes and interfaces and the extension points provided by the AWM client. Use cases for the usage of the AWM API and extension points and a detailed tutorial showing how to extend the main AWM extension point, `com.microfocus.awm.model.extension`, are also available.

### CICS Web services (Technology Preview)



**Note:** This was introduced as a technology preview feature only. It is being made available to allow you to test and provide feedback on this new capability; however, this feature is not intended for production use and it is not supported as such.

This release provided an initial support for CICS Web services (CWS) using an SOAP-based provider and requester modes and using HTTP or MQ as the transport mechanism. CICS Web services support the

Coded Character Set Identifier (CCSID) and configuring the CCSID is a prerequisite for CWS in all environments.



**Restriction:** Security and Web Service Atomic Transactions (WSAT) are not currently supported.

## Code Analysis

This release provides support for performing code analysis at the command line using Ant which enables the integration of code analysis in CI frameworks. Features include:

- Support for performing code analysis at the command line using the project's `.cobolBuild` Ant script and specifying a target.
- New Ant targets for code analysis - `analyze` and `build.and.analyze`. These enable you to only run analysis and produce analysis data or to build and produce build artifacts as well as analysis data.
- New Micro Focus Ant task, `analysis`, for the `.cobolBuild` file. A parameter for this task enables you to specify whether the build fails or continues when code analysis results are received.
- New parameters for code analysis for the `cobol` Ant task - `analysisData`, `analysisDataDir`.
- New Ant type, `ruleList`, for the `.cobolBuild` file - enables you to specify the rules to execute.
- Support for running analysis using a custom `.cobolBuild` file from outside of the project directory or the workspace.

See the [Micro Focus Ant User Manual](#) for more details on the new task, types and parameters.

## Code coverage

The code coverage reports are now integrated with the IDE and with the editor. Features include:

- A new Code Coverage view (Eclipse) showing the statistics of what percentage of the code has executed.
- Navigation from the Code Coverage view (Eclipse) to the missed and covered blocks in the editor.
- Colorization in the editor of blocks that were executed (covered blocks) or not (missed blocks).

## Compiler directives

The following Compiler directives are new in this release:

- `ILMAIN` - you now specify the main entry point for the executable program, which can be specified either as `class-name::method-name`, or just as `method-name`. For example, `ILMAIN"classA::methodB"` or `ILMAIN"methodB"`. The first format can be used to distinguish between multiple methods with the same name in different classes.

This directive is now available for JVM COBOL.

- `OOCTRL` - a new parameter, `+/-A`, as been added. Set this parameter to `-A` to allow ActiveX controls in your COBOL application to use classes and methods in the OLE class library. The default is `+A`, which does not allow it

## Database Access - HCO for SQL Server

This release provides the following new features:

- End-to-end demonstrations that show several methods for submitting a JCL batch job that calls COBOL stored procedures. To view these demos, see the *SQL* demonstrations in the Mainframe Samples browser.
- The `SPCALLLOCAL` SQL compiler directive option, used to convert an `EXEC SQL CALL` into a call to a local COBOL subroutine instead of a call to a SQL Server `SQLCLR` stored procedure.
- Extended support for conversion of the DB2 `CONCAT` function.

## Database Access - Mainframe Batch Database Tools (MBDT)



**Note:** This is a technology preview feature only. It is being made available to allow you to test and provide feedback on this new capability; however, this feature is not intended for production use and it is not supported as such.

This release provides MBDT support for DB2 LUW partitioned tables.

It also provides support for 32-bit MBDT for use with DB2 LUW on the following platforms:

- IBM System p running AIX
- x86-64 running SUSE Linux
- x86-64 running Red Hat Linux

## Database Access - SQL Option for DB2

This release provides the following new features:

- Import/export of XML with SQLWizard/DSNUTILB(XUTLB)
- New XDBSetup utility for TS/Citrix environments
- Using Migrate to move XML tables from z/OS DB2 to XDB
- Support for Temporal Tables

## Data File Tools

This release provided improved security and increased support for more file types. Features include:

- Certain aspects of Enterprise Server security are honored when you attempt to access data sets. If the Enterprise Server region has security enabled, logon details must be authenticated before you can access the data set. If the details are unable to be authenticated, access is denied.
- When using a record layout, certain data is now validated at field level (to ensure the contents is compatible with its picture string ) and record level (to ensure the record length matches the layout size).
- Full editing support has been added for variable block sequential files and relative files. Full editing is also available for line sequential files, as long as they do not contain any binary data

## Editor writing assistance

Enterprise Developer 2.3 Update 1 provides the following enhancements:

- Colorization of conditional compilation regions - by default, inactive code is now colored the same as Compiler directive elements. Inactive code is defined as code within conditional blocks that do not evaluate with the applied Compiler settings.
- \$REGION statement - support is provided for the \$REGION Compiler-control statement. You can use \$REGION - \$END-REGION to surround blocks of code that you want to fold or expand in the editor.
- AutoCorrect - you can configure the editor to automatically fix the most frequently misspelled words. You use the IDE preferences to specify a list of words that you sometimes mistype, and the correct spellings for them. Whenever you misspell that word, the editor automatically replaces it with correct version. This feature is enabled by default and can be configured from a new preference page in **Window > Preferences > Micro Focus > COBOL > Editor > AutoCorrect**.

## Enterprise COBOL 5.2

With the introduction of Enterprise COBOL 5.2, the following features were supported:

- The VOLATILE keyword is supported within the data entry description; although, this is treated as documentary. It has also become a reserved word when under the ENTCOBOL dialect.
- Format 2 of the SORT statement no longer treats the COLLATING SEQUENCE clause as documentary-only.



- The SUPPRESS clause of the XML GENERATE statement has been enhanced.
- The IBM z/OS JSON parser API, as documented for the IBM z/OS client web enablement toolkit.

### File Handling

- A new indexed file format, IDXFORMAT12, has been introduced to improve file maintenance and recovery procedures when using the rebuild utility. This file format is similar in structure and use to IDXFORMAT8. Where the two formats differ is that an IDXFORMAT12 file has an accompanying side file (.idx file) containing the indexed key information.

You can use this type of file with the new `rebuild /q` option. This rebuild process is considerably quicker than other rebuild processes such as a data scrape or `rebuild /p`.

- Faster SORT operations for fixed block records - when using the DFSORT emulation, the performance when sorting fixed block records has greatly improved.

### Library routines

The following library routine were new at this release:

- CBL\_CODESET\_SET\_MAPPING - enables you to change the codeset in effect.
- CBL\_RUNTIME\_ERROR - forces an application to terminate with a run-time error condition.

### Managed COBOL syntax

The following enhancements have been made to the managed COBOL syntax:

- A new command line utility, `mFjarprogmap`, is available to allow you to create the necessary Java property file when calling COBOL programs that have been compiled as part of a package.
- You can now create generic iterators.
- You can now use the Profiler utility to obtain detailed statistics on the run-time performance of managed COBOL applications.

### Native COBOL Syntax

The following items are new features of the native COBOL syntax:

**Class condition tests** New and updated class condition tests are available for DBCS, KANJI, and JAPANESE.

### PL/I support

Enterprise Developer 2.3 Update 1 provides the following enhancements:

- FIXED BIN(63) data type - PL/I programs that utilize FIXED BIN data types that are larger than FIXED BIN(31) are now supported which enables you to migrate such programs more easily to distributed platforms.
- TRIM() built-in functions - the Open PL/I macro preprocessor now supports the TRIM() built-in function.
- A 64-bit Open PL/I peephole optimizer - when compiling 64-bit Open PL/I programs optimization for speed, a peephole optimizer is now run against the intermediate code to improve your applications' performance. Any code which has attributes that benefit from peephole optimizations will then run faster.

### Rosetta Stone for COBOL, .NET and Java Developers

The product Help now includes a quick and easy to use syntax guide for developers who need to learn OO COBOL syntax when modernizing COBOL applications for the Java or .NET platforms. The guide includes side-by-side equivalent syntax for COBOL, C#, VB and Java.

## SourceConnect

It is now possible to use SourceConnect to link to mainframe locations and to define mainframe datasets and members. The datasets and members then appear in your project's directory structure within the IDE.

## z/Server

The z/Server Configuration Utility is now installed as part of Enterprise Server and is not a Technology Preview download. The user interface has been streamlined for the creation of a default working configuration.

# What was New in Enterprise Developer 2.3

Enterprise Developer 2.3 provided enhancements in the following areas:

- [Integration with the Eclipse IDE](#)
- [General IDE enhancements](#)
- [Building JVM COBOL Projects Incrementally](#)
- [COBOL Editor in Eclipse](#)
- [Code analysis](#)
- [Code coverage](#)
- [Command Line Compilation and Linkage](#)
- [Compiler directives](#)
- [Data File Structure command line utility](#)
- [Data File Tools \(Technology Preview\)](#)
- [Database access](#)
- [File locking](#)
- [File handling](#)
- [Library routines](#)
- [Managed COBOL syntax](#)
- [Micro Focus Unit Testing Framework](#)
- [Preprocessors](#)
- [Profiler](#)
- [Remote Connections](#)
- [REST service interfaces](#)
- [RM/COBOL Compatibility](#)
- [Single file support](#)
- [Tunables](#)
- [Updated run-time system](#)

## Integration with the Eclipse IDE

This release shipped with Eclipse version 4.4.2.

Support for Eclipse versions 3.7 and 3.8 has been deprecated. This affects any applications that were created using an earlier version of Enterprise Developer that have a JVM COBOL part. Such applications must be rebuilt using Enterprise Developer 2.3 to avoid receiving errors during compilation or execution.

In addition, when Enterprise Developer is installed, you can optionally install the Enterprise Developer plugin in other instances of Eclipse installed on your machine (supported versions of Eclipse are 4.2, 4.3 and 4.4 for the 32-bit IDE).

## General IDE enhancements

In Eclipse:

- The **Variables** view now shows the file status of an internal file name.
- The **Find All References** and **Go To Definition** commands are now supported for JVM COBOL applications.
- Support is provided for the SOCKS5 proxy server for debugger communication over SSL.

### Building JVM COBOL Projects Incrementally

To minimize the number of modules to compile when building JVM COBOL projects, Enterprise Developer now enables you to configure your projects so that they are built incrementally - the IDE only rebuilds the files that have changed.

To enable incremental builds for JVM COBOL applications that contain namespaces, check the **Use incremental build (Technical preview feature)** option on the project build configuration tab in the project's properties.

For JVM COBOL applications that do not contain namespaces, you can use the **Use dynamic calls** option available on the build configuration tab in the project's properties. When the project is built with this setting, calls to modules are resolved at run time rather than during compilation. This has the effect of not requiring every module to be compiled when rebuilding the application.

### COBOL Editor in Eclipse

Content Assist support for COBOL includes various enhancements and is now also available in JVM COBOL:

- Context sensitive proposal - Content Assist only shows proposal that are relevant for the position of the cursor in the code or for the type of project
- Enhanced proposal lists - lists include any relevant COBOL verbs, clauses and words, copybooks, code templates, data items and section and paragraph names
- Intelligent assistance with completing statements - when you have entered a COBOL verb, Content Assist shows proposals for the relevant clauses and identifiers that you can use to complete the statement.
- Automatic completion for items - Content Assist automatically inserts single suggestions in the code.
- Qualifying non-unique names - Content Assist qualifies data items whose names are not unique.
- Configuration preferences for Content Assist - enable you to configure what suggestions appear in the completion lists, whether suggestions are added in insert or overwrite mode, and the case of the inserted words.
- Code templates - code templates are now included in the Content Assist proposals.

### Code analysis

Enterprise Developer now offers more advanced code analysis features and enables you to run various analysis queries (rules and groups of rules called rule sets) against your code to ensure adherence to standards such as standards for coding or performance.

You can run analysis rules against programs in a project in the IDE at user request or you can run analysis rules at the end of a project's build.

### Code coverage

Enterprise Developer now provides support for code coverage of native COBOL applications directly from within the IDE where code coverage uses the Test Coverage functionality. You can produce code coverage reports for applications running in the COBOL run-time and for applications that run in Enterprise Server.

To produce reports, you need to enable code coverage in a project's, a build configuration's, or a file's properties, compile your application and then run your application with code coverage to produce the relevant reports. For applications that require an Enterprise Server instance, you start the enterprise server with code coverage.

## Command Line Compilation and Linkage

When using the `cbllink` command to compile and link, there is a new `-y` option. Use this option to create an executable that includes support to be able to run on Windows XP and Windows Server 2003.

## Compiler directives

The following Compiler directives are new in this release:

<b>EOF-1A</b>	Treats a 0x1a character in the source file as the end of file.
<b>JVMDECIMAL</b>	Determines the type in which certain items are exposed. This directive affects COBOL data items of type 'decimal' and non-integral numeric items exposed as a result of either ILSMARTLINKAGE usage or the PROPERTY keyword.
<b>NLS-CURRENCY-LENGTH</b>	Specifies the number of bytes to allocate for the currency symbol in a PIC field.
<b>NULL-ESCAPE</b>	Treats a 0x00 character in the source file as an escape character for other non-printable characters in the source code.

The following Compiler directives contain new parameters in this release:

**DBSPACE** The new parameter "MIXED" extends the DBSPACE directive to be able to evaluate data items in programs that contain a mix of single-byte and double-byte strings.

## Data File Structure command line utility

The Data File Structure Command Line (DFSTRCL) utility is a DOS-based command line utility that enables you to create record layout (`.str`) files from COBOL debug information (`.idy`) files. You can use the utility to process a single `.idy` file or batch process up to 100 `.idy` files.

## Data File Tools (Technology Preview)



**Note:** This is a technology preview feature only. It is being made available to allow you to test and provide feedback on this new capability; however, this feature is not intended for production use and it is not supported as such. Furthermore, Micro Focus does not guarantee that this feature will be delivered at a GA level and if it is, then the functionality provided might differ considerably from this technology preview.

The Data File Tools (Technology Preview) is a new standalone text editor in which you can create and edit data files. By nature of it being a 'technology preview' product, it does not currently include all the functionality that was available in the previous version of Data File Tools - now referred to as Classic Data File Tools. If you require any of the functionality not provided in this version, you can still use the classic version by accessing it in the usual way.

To run Data File Tools (Technology Preview), type `mfdatatools2` from Enterprise Developer's command prompt (Windows) or a terminal (UNIX).

To use the new editor directly from the Eclipse IDE, use the **Open with** option on the shortcut menu when selecting a data file or structure file, and select **Data File Tools**. Eclipse remembers the last tool used for a particular file type, and so will use Data File Tools (Technology Preview) until you select a different editor.

## Database Access

Enterprise Developer version 2.3 provides the following enhancements to database access:

- COBSQL** Enterprise Developer version 2.3 provides:
- Selection and configuration of the Oracle Pro\*COBOL preprocessor for compiling COBSQL applications in project properties on the **SQL Preprocessor** tab and in the build configuration settings.

- Support for COBOL directives SOURCEFORMAT=TERMINAL and SOURCEFORMAT=VARIABLE for Pro\*COBOL applications.

**HCO for DB2 LUW** Enterprise Developer version 2.3 provides:

- GUI versions of data migration tooling (Windows platforms)
- A new tool that enables you to bind or rebind all packages. See *BindAll Packages Tool* for details.
- Support for MFHCO mode across all platforms by default via the new HCO "NOHCO" DB2 compiler directive option. See the *HCO DB2 compiler directive option* topic for details.
- A new DB2 compiler directive option, OPTPER "NOOPTPER", that enhances performance for CHARSET EBCDIC processing. See the *OPTPER DB2 compiler directive option* topic for details.
- A new DB2 directive option, BINDDIR, which specifies an alternative directory in which to write the DBRM file created during compilation. You can set BINDDIR from the command line or specify it in your project properties. See the *BINDDIR DB2 compiler directive option* topic, and the *Binding* topic for details.
- 64-bit support for PL/I on appropriate platforms. See *Additional Software Requirements on Windows* and *Additional Software Requirements on UNIX* for details.

**HCO for SQL Server** Enterprise Developer version 2.3 provides:

- Support for the DATA-CHANGE-TABLE-REFERENCE clause.
- Context Help is now provided for:
  - Options for HCO for SQL Server tools
  - For each tool in the HCO for SQL Server user interface

**OpenESQL**

**Date/Time Processing** This release provides streamlined datetime processing for ODBC and JDBC.

**OpenESQL Assistant** OpenESQL Assistant Options are now set via the Eclipse IDE from **Window > Preferences > Micro Focus > Database > OpenESQL Assistant** (applies to Windows environments only).

**Performance** This release includes a new SQL compiler directive option, OPTPER "NOOPTPER", that enhances performance for CHARSET EBCDIC processing. See the *OPTPER SQL compiler directive option* topic for details.

**PL/I** This version provides 64-bit support for PL/I on appropriate platforms. See *Additional Software Requirements* for details.

**PostgreSQL** In this release, PostgreSQL 9.4 has been tested with OpenESQL and OpenESQL Assistant with the following PostgreSQL software:

**Server software** PostgreSQL EnterpriseDB version 9.4.1-3

- Client software**
- psqLODBC driver version 09.03.04.00
  - JDBC41 PostgreSQL driver version 9.4-1201

PostgreSQL 9.4 has been tested with OpenESQL and OpenESQL Assistant on the following Windows platforms:

- Windows 32-bit
- Windows 64-bit

PostgreSQL 9.4 has been tested with OpenESQL on the following UNIX platforms:

- X86-64 running Red Hat Linux, 32- and 64-bit
- X86-64 running SuSE Linux, 32- and 64-bit



**Note:** Micro Focus provides compatibility for PostgreSQL but does not directly contribute to or support the PostgreSQL open source project. Any issues relating to PostgreSQL functionality should be addressed through an open source support vendor.

**SQL Server** Enterprise Developer version 2.3 provides support for the SQL Server OUTPUT clause.

**Mainframe Batch Database Tools (MBDT)** Windows only. Enterprise Developer version 2.3 includes mainframe batch utilities that provide the following functionality for Oracle, DB2 LUW, and SQL Server agnostically, as well as specifically for HCO for SQL Server:

- DSNTEP2
- DSNUTILB LOAD
- DSNUTILB UNLOAD
- 32-bit and 64-bit support
- New batch configuration utility

**SQL Option for DB2** Enterprise Developer version 2.3 provides the following z/OS DB2 version 10 enhancements:

- Extended support for implicit casting
- Greater timestamp precision for applications
- Support for TIMESTAMP WITH TIME ZONE

This release provides initial XML support for the XDB engine.

**XA Switch Modules** In this release, the XA interface has been redesigned to provide:

- Consistent look and feel for SQL Server, DB2, and Oracle user personalization
- Consistent look and feel for both RM dynamic and static registration (SQL Server, DB2, Oracle, generic one-phase commit)
- Additional support for two instances of the same switch module using Web Services applications via the new XAID compiler directive
- Using a specified XA resource only with batch applications executing under Enterprise Server

## File handling

This release contains the following new configuration options:

**ACUFH** Enables or disables the use of the ACU file handler (ACUFH), which is required to handle Vision and RM/COBOL indexed files.

**ESACUFH** Enables or disables the use of the ACU file handler (ACUFH) for file handling operations running under Enterprise Server. ACUFH must also be enabled for this option to take effect.

## File Locking

In versions prior to Enterprise Developer 2.3, the semantics of the sharing phrase specified in an OPEN statement or used within a call to CBL\_OPEN\_FILE were not correctly applied in some cases on UNIX and

Linux platforms. From version 2.3 onwards, the sharing phrase is correctly honored when the tunable `strict_file_locking=true` is set, which is the default setting.

Example of potential changes in behavior:

- *Process-A* opens a file with read-only access and a sharing mode that denies other processes write access (SHARING WITH READ ONLY).
- *Process-B* then attempts to open the file with read-only access and a sharing mode that denies other processes read access (SHARING WITH NO OTHER).

With `strict_file_locking=true`, *Process-B* is unable to open the file, because *Process-A* has successfully opened the file allowing only read access.

With `strict_file_locking=false`, *Process-B* successfully opens the file.

If your application encounters unexpected OPEN conditions or fails to open files, it might be as a result of the new file locking behavior. In such circumstances, we recommend that you review the file locking and sharing requirements of your application and refactor your source code to work with the default setting. The original file locking and sharing behavior can be restored by setting `strict_file_locking=false`.

## Library routines

The following library routines are new in this release:

- |   |   |
|---|---|
| <b>CBL_MANAGED_SESSION_GET_USERDATA</b> | Retrieves user data saved in the current RunUnit. |
| <b>CBL_MANAGED_SESSION_SET_USERDATA</b> | Sets user data in the current RunUnit.            |

The following library routines contain new parameters in this release:

- |                        |   |
|------------------------|---|
| <b>CBL_LOCATE_FILE</b> | You can now specify a file name that is a null-terminating string, which has resulted in three new values available for the <code>user-mode</code> parameter. |
|------------------------|---|

## Managed COBOL syntax

The following enhancements have been made to the managed COBOL syntax:

- The `TYPE OF type-name[ANY...]` syntax enables you to obtain the `System.Type` (.NET) or `java.lang.Class` (JVM) object for a generic class, interface, or delegate.
- The `self::` or `super::` syntax is no longer required to access inherited data within a subclass.
- The `ATTRIBUTE-ID` syntax enables you to define new attribute types, which can be used in various contexts.

## Micro Focus Unit Testing Framework



**Note:** This is a technology preview feature only. It is being made available to allow you to test and provide feedback on this new capability, but it is not intended for production use and is not supported as such. Furthermore, Micro Focus does not guarantee that this feature will be delivered at a GA level and if it is, then the functionality provided might differ considerably from this technology preview. During the preview, you are encouraged to share your feedback and experiences via the Micro Focus community forum - <https://community.microfocus.com/t5/Enterprise-Developer-User/bd-p/forumid-9>.

The Micro Focus Unit Testing Framework is an xUnit style testing framework, available from the command line, for procedural COBOL applications.

It includes much of the architecture you would expect in an xUnit framework. The test runner is a 32- or 64-bit executable that you run from an Enterprise Developer command or shell prompt. A test fixture or suite is a COBOL program compiled to `.dll` (Windows) or `.so` (UNIX) that can include the setup, the test case code, and the teardown associated with the test case.

Test results are available in a number of formats. By default, results are displayed to screen and to a `.txt` file, but you can use additional parameters on the command line to produce reports in JUnit format.

## Preprocessors

Support has been added in the IDE for enabling and using multiple preprocessors with your projects.

A new page, **Additional Preprocessors**, has been added to the project's and the files' properties of native COBOL applications to enable you to choose one or more preprocessors to use when building your application and to specify their order of execution.

New reporting capability is now available for user preprocessors: resp-main code 18 indicates that a buffer contains a data name to be marked as modified by the immediately preceding preprocessed line. The data name may be qualified and resp-more contains the column information for the reference.

## Profiler

Enterprise Developer now provides support for Profiler for native COBOL applications directly from within the IDE. To produce reports, you need to:

1. Enable Profiler in the COBOL property page for a project, a build configuration, or a file.
2. Compile your application to apply the changes.
3. Create a run configuration that has Profiler enabled.
4. Run your application with Profiler to produce the relevant reports.

## Remote Connections

This release provided the following enhancements:

- An improved diagnostic tooling to help determine connection problems - enhancements are available for both the client and the server installations.
- It is now possible to specify the Remote System Explorer (RSE) type of connections to create remote mainframe COBOL and PL/I projects. This is to cater for scenarios when it is not possible to use SAMBA or NFS connections within your environment.



**Note:** The following features and utilities are not supported when remote projects use the RSE connection type:

- The file layout editor and the file editor in the Classic Data File Tools and Data File Tools (Technology Preview) utilities.
  - The BMS compiler and painter.
  - The IMS layout editor and the IMS database editor.
  - Mainframe Assembler.
- Changing the type of a remote connection - it is now possible to change the type of the remote connection from RSE to NFS and vice versa using the **Remote Settings** for remote projects.

## REST service interfaces

RESTful service interfaces utilizing JSON as the media type in request and response messages are now supported using the Interface Mapping Toolkit. This enables you to extend COBOL applications using modern transport payloads and protocols.

## RM/COBOL Compatibility

This release includes improved support for RM dialect applications. Please consult with Micro Focus before considering a transition from RM/COBOL to Enterprise Developer.

## Single file support

The recommended way to work with files within Enterprise Developer is to include them in a project. For situations where you might want to quickly open edit a single file, Enterprise Developer now provides support for native COBOL files in the IDE when the file is not opened as part of a project. There is limited support for the IDE editing, compiling and debugging features as full support requires a project file.



## Tunables

Enterprise Developer version 2.3 contains the following new tunables:

- putenv\_interface** Provides backward compatibility for UNIX systems in which the operating system's `putenv()` function is required when setting environment variables.
- strict\_file\_locking** Enables a new, more reliable method of file locking for UNIX systems. See *File Locking* for more information.

Enterprise Developer version 2.3 contains the following updates to tunables:

- default\_cancel\_mode** A new parameter, and default, has been introduced for this tunable; see *default\_cancel\_mode* for more information.
- subsystem\_cancel\_mode** A new parameter has been introduced for this tunable; see *subsystem\_cancel\_mode* for more information.

## Updated run-time system

Enterprise Server has been updated to provide an execution environment capable of running applications that were each built using different development products. A consequence of this is that if your application has a main COBOL executable (`.exe`) that was built with a previous version of Enterprise Developer, you should ensure that the executable is rebuilt and packaged with the new run-time system. This does not affect mainframe subsystem projects deployed to Enterprise Developer. You can rebuild from the IDE or the command line.

Other COBOL subprograms built with previous versions of Enterprise Developer are not required to be rebuilt.

# What was New in Enterprise Developer 2.2 Update 2

Enterprise Developer 2.2 Update 2 provided enhancements in the following areas:

- [Eclipse](#)
- [Character Set Enhancements](#)
- [Code Analysis](#)
- [AppMaster Builder](#)
- [Database Access](#)
- [Enterprise COBOL 5.1 compatibility](#)
- [External Call Interface \(ECI\)](#)
- [Micro Focus COBOL enhancements](#)
- [External Security Facility \(ESF\)](#)
- [Enterprise Server MQ-IMS Bridge](#)
- [IMS Connect](#)
- [PL/I General Enhancements](#)
- [PL/I Editor Enhancements](#)
- [RUMBA 9.2](#)
- [Transaction Classes \(Technology Preview\)](#)
- [Tunables](#)

## Eclipse

Enterprise Developer 2.2 Update 2 provides the following new functionality and improvements:

- Support for Eclipse 4.2 and 4.3 - Enterprise Developer 2.2 Update 2 ships with Eclipse 3.8 but also supports Eclipse 4.2 and 4.3 (the 32-bit IDE only). To use Enterprise Developer with a newer version of Eclipse, you need to install Enterprise Developer first and then use the

installeclipseplugins.bat script in %ProgramFiles(x86)%\Micro Focus\Enterprise Developer\installer (UNIX). See *Installing into other instances of Eclipse* for more details.

- Remote JVM COBOL projects - this release provides enhanced support for remote JVM COBOL projects.
- Remote project connections - the diagnosis tool for remote connection issues has been improved. There is now a client-side diagnosis tool and a server-side diagnosis tool for diagnosing connection problems to remote projects and connections to your Micro Focus Enterprise Developer UNIX Components. You should run both tools for a complete diagnosis.

### Character Set Enhancements

The following character sets, available using the MFCODESET environment variable, have been enhanced or added in this release:

- Thai Extended (0066) - new
- Korean (0082)
- Simplified Chinese (0086)
- Traditional Chinese (0886)

There are also a number of double-byte character sets that are now capable of mixed single-byte and double-byte character conversion; see the definition of MFCODESET in *Environment Variables in Alphabetical Order* for more information.

### Code Analysis

Enterprise Developer version 2.2 Update 2 provides Dead Code analysis for COBOL programs that enables you to find unreferenced items or any piece of code that can't be reached .

### AppMaster Builder

The AppMaster Builder Database View and maintenance support (known as Data Views) is now provided within the Eclipse framework for Enterprise Developer, rather than relying on invoking the AMB database view interface that was part of Mainframe Express Enterprise Edition. You must install the AMB Eclipse plug-in to be able to use this feature.

Data Views enable you to create and maintain database views, as well as add and compile PSB and DBD sources in a COBOL project, all while working within the Eclipse framework.

### Database Access

The following new features are available in database access support:

- |                                   |   |
|-----------------------------------|---|
| <b>COBSQL</b>                     | In Eclipse, the new KEEPCOMP directive resolves COMP/COMP-5 issues with Oracle applications on little-endian platforms.   |
| <b>HCO for DB2 LUW</b>            | Enterprise Developer version 2.2 Update 2 introduces GEN-HV-FROM-GROUP - a new DB2 ECM compiler directive option, that generates host variables for all elementary data items when a multiple-level group variable is used in a FETCH or singleton SELECT DB2 statement.  |
| <b>HCO for SQL Server (HCOSS)</b> | Enterprise Developer 2.2 Update 2 provides the following new HCOSS features: <ul style="list-style-type: none"><li>• DATE/TIME formatting - the OpenESQL Configuration Utility now supports DATE/TIME formatting for HCOSS batch utilities.</li><li>• Multi-row INSERT - supports a multi-row INSERT statement.</li></ul> |
| <b>OpenESQL</b>                   | This version provides the following new OpenESQL features: <ul style="list-style-type: none"><li>• Support for SQL Server 2014.</li><li>• New SQL Compiler directive options:</li></ul>   |

- DETECTDATE=SERVER - resolves host variables alignment with column data types in an SQL table.
- GEN-HV-FROM-GROUP - generates host variables for all elementary data items when a multiple-level group variable is used in a FETCH or singleton SELECT SQL statement.
- Sample applications - the following native COBOL SQL sample applications are new with this version:
  - Get Diagnostics - demonstrates how to use GET DIAGNOSTICS EXEC SQL calls to get diagnostic information from various DBMSs.
  - LOB Data Types - Demonstrates how to INSERT and SELECT LOB data in a native application using various DBMSs.

#### SQL Option for DB2

Support for the following has been added in this version:

- DSNUTILB LOAD LOG=NO option
- RID scalar function
- XML data type via XDB Link to mainframe DB2

#### XA switch modules

The following XA switch module updates are available in this version:

- Oracle switch module - Windows and UNIX platforms :
  - Supports User Impersonation when statically registered.
  - Enables you to specify which XA resource definitions use User Impersonation.
  - Now compiled with one source file, rather than two.
- SQL Server switch module - Windows platforms only:
  - Enables you to specify which XA resource definitions use User Impersonation.
  - Now compiled with one source file, rather than two.

### Enterprise COBOL 5.1 compatibility

There have been a number of enhancements to make this version of Enterprise Developer more compatible with Enterprise COBOL 5.1.



**Note:** These enhancements are available under both DIALECT(MF) and DIALECT(ENTCOBOL).

- The following phrases have been added to the XML GENERATE statement:
  - NAME
  - SUPPRESS
  - TYPE
- The following intrinsic functions have been added:
  - ULENGTH
  - UPOS
  - USUBSTR
  - USUPPLEMENTARY
  - UVALID
  - UWIDTH
- A number of reserved and context-sensitive reserved words have been added; see the topics *Reserved Words Table* and *Context-sensitive Words Table* for complete lists.

### External Call Interface (ECI)

Enhancements to the ECI include:

- The ECI for Java clients is no longer restricted to the 32K Commarea. You can now transfer virtually unlimited containers of any size in a channel to a CICS server program. See *ECI Java Interface* for more information.
- Java support for IBM's implementation of ECI, which, in turn, uses the Micro Focus implementation.
- A ECI RA for WebSphere; however, in this release, no IMTK tooling is provided for servlets or JSP.

### Micro Focus COBOL enhancements

The following enhancements have been made to Micro Focus COBOL:

- The following phrases have been added to the XML GENERATE statement:
  - NAME
  - TYPE
  - SUPPRESS
- The following intrinsic functions have been added:
  - ULENGTH
  - UPOS
  - USUBSTR
  - USUPPLEMENTARY
  - UVALID
  - UWIDTH

### External Security Facility (ESF)

The Enterprise Server External Security Facility (ESF) now supports caching the results of some security queries. This can improve the performance of enterprise server instances and of the MFDS when they are configured to use external security.

To enable caching, you need to set non-zero values for the **Cache limit** (maximum size of the cache) and **Cache TTL** (Time To Live, or how long before a cached result expires) settings on the **MFDS Security** tab, the **Default ES Security** tab, or on the **Security** tab for an individual enterprise server. (Currently, the cache settings for Security Managers have no effect; you need to set cache parameters on one of the three Security pages mentioned earlier.)

For more information, see <http://supportline.microfocus.com/examplesandutilities/doxygen/caching.html>.

### Enterprise Server MQ-IMS Bridge

At Enterprise Developer 2.2 Update 2 the Enterprise Server MQ-IMS Bridge was supported at GA level. It had previously (from Enterprise Developer 2.2 Update 1) been available as a Technology Preview item only.

### IMS Connect

Visual COBOL 2.2 Update 2 now supports Java IMS Connect messages except when also using the IBM-supplied HWSJAVA0 I/O exit, excluding customizations to that exit.

### PL/I General Enhancements

Enhancements are provided in the following areas:

- Attributes - the PL/I DECLARE statement now supports the OPTIONAL attribute as part of the parameter-descriptor list or as an attribute in a parameter declaration. This provides an improved functionality and a greater language compatibility for customers looking to migrate applications from z/OS environments.
- Built-in functions - the PL/I Compiler and run-time system now support the PRESENT and OMITTED built-in functions which provides an improved functionality and a greater language compatibility if you are looking to migrate applications from z/OS environments.

- CodeWatch - this release includes the following enhancements:
  - CodeWatch is now supported in native 64-bit environments which ensures that the CodeWatch debugger runs properly in native 64-bit mode. This enables the PL/I debugger to take advantage of faster speeds and to debug larger programs which have access to larger amounts of storage.
  - Notifications for the CodeWatch conditions - you can use the command line and the UI to turn notifications on or off for all of the currently documented PL/I conditions. The use of notifications enables you to investigate the state of programs and optionally set breakpoints before continuing program execution.
- Compound operators - the PL/I macro preprocessor now supports the compound operators += , -=, \*=, and /= within macro assignment statements.
- Error handling - you can now use the EXEC CICS HANDLE ABEND check which provides a consistent error handling technique for PL/I programs running under CICS that is consistent with error handling on the mainframe. EXEC CICS HANDLE ABEND determines error handling for programs running under CICS. Conditions detected by CICS cause an abend if established using EXEC CICS HANDLE ABEND, and PL/I ON units do not get control. If EXEC CICS HANDLE ABEND is not established, CICS defines that the action taken will be as defined by CICS, which normally leads to a transaction abend.
- PL/I data structures - this release provides enhanced support for PL/I data structures in the Data File Tools. You can now easily generate a PL/I structure map (.str) from within the IDE, and the Data File Tools can then use to generate a formatted layout for a PL/I data file. This enables you to see what is in each field within a PL/I Data File Record, and to modify the records in a logical way without having to know the offset, length and raw format of the data item.

### PL/I Editor Enhancements

Enterprise Developer 2.2 Update 2 provides a new and improved PL/I editor within Eclipse. Features include:

- Configurable background syntax parsing.
- Syntax error reporting - uses red squiggles to denote errors in the code.
- Configuration settings for the editor - you can hide or show the horizontal ruler, turn on or off visible lines for the margins (at columns 2 and 72 for Mainframe Subsystem projects, and only at column 72 for native projects), and configure the syntax coloring and the smart edit mode.
- Smart edit mode - defines the word wrapping behavior when breaking lines or around margins, moving the cursor using the **Home** and **End** keys.
- Folding - support for collapsing and expanding regions for procedures and blocks within procedures.
- Content Assist - provides assistance with inserting PL/I keywords, variables and syntax templates.
- Syntax templates for the most commonly used PL/I statements.
- Block selection - use the button from the toolbar to toggle the mode.
- Breadcrumbs navigation - enables you to quickly navigate between source programs and the dependent include files.
- Outline view - shows a structure of the procedure and structure declarations within a program. Clicking on an item in the Outline view positions the cursor on that item in the code and vice versa.
- Include Dependency View - shows where in the source file's structure the INCLUDE statements appear, and which include files they reference.
- Opening include files directly from the editor using **F3**.
- Task creation - inserting a TODO or a FIXME in a comment in the code automatically creates a task that appears in the Task view.

### Rumba 9.2

Visual COBOL 2.2 Update 2 of Enterprise Developer includes Micro Focus Rumba 9.2 which you can optionally install as part of the setup process. The license for Enterprise Developer will license all components of Rumba.

## Transaction Classes (Technology Preview)

Transaction classes provide a mechanism to limit the number of CICS® tasks in your system. By spreading your tasks across a number of transaction classes and configuring the maximum number of tasks that can be dispatched within each transaction class, you can control resource contention between tasks and limit the number of tasks that CICS considers eligible for dispatching at task attach.

## Tunables

Enterprise Developer 2.2 Update 2 includes the following new tunable:

- `reduce_java_signals` - specifies the options that are passed to a JVM when mixing Java and COBOL.

# What was New in Enterprise Developer 2.2 Update 1

Enterprise Developer 2.2 Update 1 provided enhancements in the following areas:

- [Micro Focus Heartbleed Update](#)
- [ACUCOBOL-GT Compatibility](#)
- [AppMaster Builder](#)
- [Assembler Support](#)
- [Btrieve Support](#)
- [COBOL Source Information](#)
- [Compare and Synchronization Monitor](#)
- [Compiler Directives](#)
- [Database Access](#)
- [Eclipse IDE](#)
- [Enterprise Server Integration in the IDE](#)
- [Enterprise Server MQ-IMS Bridge \(Technology Preview\)](#)
- [Environment Variables](#)
- [Fileshare Recovery](#)
- [Line Numbering for COBOL Programs](#)
- [Local Catalog](#)
- [IMTK](#)
- [Working with the Mainframe](#)
- [Mainframe Emulation](#)
- [Mainframe Subsystem](#)
- [Managed COBOL](#)
- [Managed COBOL Syntax](#)
- [PL/I](#)
- [Preprocessors](#)
- [Project and Item Templates](#)
- [Remote Connection](#)
- [Rumba Integration with Eclipse](#)
- [Run-time Launch Configuration Files](#)
- [Terminfo Files](#)

## Micro Focus Heartbleed Update

The OpenSSL library used in this product was updated to version 1.0.1g to fix the "Heartbleed" vulnerability with TLS heartbeat requests.

## ACUCOBOL-GT Compatibility

The following ACUCOBOL-GT support has been added in this release:

**-Di compiler option** The -Di compiler option, which initializes Working-Storage data items based in their type, is now supported.

### AppMaster Builder

Enterprise Developer 2.2 Update 1 provided updated AppMaster Builder support that integrates more fully into the Eclipse IDE. In addition, the following enhancements have been added:

- Code generation and compilation in an Eclipse COBOL project
- Enhanced Program Painter
- Enhanced Job Queue

### Assembler Support

Enterprise Developer 2.2 Update 1 provided Assembler support from within the IDE. Features include:

- Support for creating Assembler programs (.mlc extension), macro files (.mac or .cpy extensions) or Assembler linker files (.lin) from within the IDE.
- Support for building Assembler programs and for linking Assembler linker files from within the IDE. You can choose to exclude certain files from the build.
- Assembler editors for Assembler and macro files - includes content assist for reserved words and colorization.
- Support for using Ant for building .asm, .mlc and .cap files and for linking .lin files.
- IDE support for configuring the Assembler compiler and linker options on project, build configuration and file levels.
- Configuring the macro paths.

### Btrieve Support

Support for the Btrieve file handling system from Pervasive Software Inc. has been added into Enterprise Developer.

Support is restricted to native COBOL, in a Windows environment.

### COBOL Source Information

The **Quick Browse** option is now available as a context menu command in the editor.

### Compare and Synchronization Monitor



**Note:** This feature is only available in a Windows environment.

With the release of Enterprise Developer 2.2 Update 1, the Compare and Synchronization Monitor has been updated to version 2.

Version 2 is greatly improved in terms of performance, especially during initial checkout of partitioned data sets or when synchronizing a large number of members. Also, the user interface has been improved, and some of the functions available in the old version have now changed or become obsolete.

### Compiler Directives

The following Compiler directives have been added in this release:

**ILPARAMS** Determines the way in which you call a method that contains an array as its last receiving parameter.

**INIT-BY-TYPE** Initializes Working-Storage Section data items to a default value, according to their type.

- Alphabetic, alphanumeric, alphanumeric edited, and numeric edited items are initialized to spaces.



**Note:** For an OSVS dialect, numeric edited items are initialized to zeroes.

- Numeric items are initialized to zero.
- Pointer items are initialized to null.
- Index items are initialized to the value 1.

## Database Access

The following new features have been added as part of database access support:

### HCO for DB2 LUW

- Support added for DB2 LUW version 10.5.
- Enhanced RETURN-CODE processing.
- The HCO DDL processor now accepts column names with a length greater than 18 characters.
- The HCO Import Data tool now processes CLOB data less than 32K in size.
- The HCO Import Data tool can now convert DSNTIAUL import files to delimited format, enabling the actual import to be done by DB2 LUW IMPORT and LOAD utilities. This is done using the new SAVEDEL and CHARDEL parameters.

### HCO for SQL Server (HCOSS)

- Support for the mainframe SET CURRENT SQLID statement.
- Support for the mainframe LEFT and RIGHT scalar functions.
- Data Migration tools now support the mainframe ALIAS and SYNONYM objects.

### OpenESQL

- Enhanced internationalization support for UNICODE, DBCS and MBCS.
- Enhanced GET DIAGNOSTICS statement support.
- Enhanced LOB support for CLOB, BLOB and DBCLOB data types.
- Enhanced IDE support for OPTION directives.
- Now provides support for the creation of save points and rolling back to save points.

### XA Switch Modules



**Restriction:** This feature applies only when the Enterprise Server feature is enabled.

- New two-phase commit module for SQL Server based on Microsoft's XA switch. This provides support for xa\_recover.
- Support for DB2 LUW version 10.5.
- Support for Oracle version 12.1.

## Eclipse IDE

### Assigning memory to Linkage Section items

If the debugger steps on a line with an unassigned linkage item (for example, if you are debugging only a part of your application and no memory has been allocated to that linkage item), debugging terminates. To assign linkage to that data item and continue debugging, you need to select the data item, right-click it and click **Inspect COBOL**. When prompted, confirm and assign a value to the data item. Alternatively, to assign linkage, you can right-click the data item in the **Variables** view and click **Change Value**.

### Debugging Windows Services

It is now possible to debug Windows services. You must be logged on to the console of the computer running the service and can debug either using just-in-time debugging and a CBL\_DEBUGBREAK call, or using library routines and a "COBOL Wait for



Application Attachment" debug session having added a call to CBL\_DEBUGBREAK or CBL\_DEBUG\_START to the application.

**Indicating that a file is a copybook or a COBOL program** In COBOL Explorer, you can now use two new file context menu commands to indicate that a COBOL program is a copybook (**Transform Program to Copybook**) and that a copybook is a COBOL program (**Transform Copybook to Program**). You may need to use these in situations when you imported existing COBOL source code in the Eclipse IDE and some of the files were incorrectly identified as either a copybook or a COBOL program.

## Enterprise Server Integration in the IDE

You can now use the context menu for the servers in Server Explorer to enable the display of the Enterprise Server log information in the Console view.

## Enterprise Server MQ-IMS Bridge (Technology Preview)



**Note:** At Enterprise Developer 2.2 Update 1 this was provided as a technology preview feature only. It was made available to allow you to test and provide feedback on this new capability; however, this feature was not intended for production use and was not supported as such.

Enterprise Developer version 2.2 Update 1 provided support that enables WebSphere MQ applications to communicate with IMS applications in an Enterprise Server region.

## Environment Variables

The following environment variable has been added in this release:

**strictvsam** strictvsam enables strict mainframe emulation when processing VSAM files.

When set to ON and running under mainframe emulation, file status 37 is returned for an existing VSAM file when opened for OUTPUT if the file has data or previously had data written to it, or if the file is of a different format to the file on disk. When set to OFF, file status 0 is returned and a new file is created when an existing VSAM file is opened for OUTPUT. This variable is set to OFF by default.

## Fileshare Recovery

Recovery of Fileshare data files has been enhanced.

Rollback recovery is a faster process that aims to fix the files from their failed state.

This process cannot be used in all scenarios, but a new user exit has also been introduced that allows you to programmatically control which files you wish to recover with this process.

Hot backups are also a new introduction, which allow you to perform a backup without having to shut down Fileshare.

## Line Numbering for COBOL Programs

Enterprise Developer version 2.2 Update 1 provided options for auto-inserting or removing line numbers in source files open the editor. Features include:

- COBOL numbering - line numbers are inserted in the sequence area of the code (columns 1 - 6), starting by default at 000100 at the first line, incrementing by 100 by default.

Micro Focus recommends that you use COBOL numbering only if your files are in fixed or variable source format.

- Standard numbering - line numbers are inserted immediately to the right of area B, in columns 73 - 80, starting by default at 00000100 at the first line, incrementing by 100 by default.

Micro Focus recommends that you use Standard numbering only if your files are in fixed format.

- The **Renumber** and **Unnumber** commands available from the context menu in the editor.

## Local Catalog

From within Server Explorer in the IDE, you can add one or more local catalogs, and then use them in conjunction with Drag and Drop to drag down data set items from your mainframe, edit them and then move them back to the mainframe or to your testing environment.

## IMTK

You can now use the Interface Mapping Toolkit to create Web Services and Java Interfaces for remote COBOL projects.

## Working with the Mainframe

Enterprise Developer version 2.2 Update 1 includes the “Launch ISPF” functionality as a technical preview. This feature is supported only under z/OS 1.13.

## Mainframe Emulation

Previously, MGMTCLAS was supported by simply saving it on the catalog record when a dataset was allocated in JCL using the MGMTCLAS parameter on the DD statement. Starting with this release, you can use batch jobs to define MGMT classes and to specify the EXPIRE AFTER time (in days).

## Mainframe Subsystem

**New editors** Enterprise Developer now provides special editors for REXX, TSO CLIST and Easytrieve programs. The editors include colorization and content assistance. Syntax checking is not available.

## Managed COBOL

Enterprise Developer now provides support for Java managed beans (MBean) in JVM COBOL code that enable you to manage and monitor RunUnits, and to identify certain issues such as leaks and long-running RunUnits.

- You can enable an MBean only for a particular RunUnit level or for all RunUnits you create.
- You can view and use MBeans from programs such as Oracle's Java Mission Control or JConsole.
- MBeans include the `LogicalRunUnitCount` and `LiveRunUnitCount` attributes that enable a visual indication of how many RunUnits are live. If the values of these two attributes are different, this might indicate some issues.

Visual COBOL 2.2 Update 1 also includes the following tutorials for JVM COBOL:

**Deploying JVM COBOL to an Application Server** Using some ready-made sample projects, this tutorial guides you through implementing your JVM COBOL code into an Enterprise JavaBean (EJB), then deploying it to a JBoss application server. Instructions are also included on how to deploy the application to WebSphere and WebLogic application servers.

## Managed COBOL Syntax

Enterprise Developer version 2.2 Update 1 includes the following enhancements to the managed COBOL syntax:

**Specifying parameters in the method signature** You can now specify passing parameters and returning items in the method signature, instead of using a Procedure Division header. This applies to methods, indexers, iterators, constructors and delegates.

**CONSTANT keyword** Use the CONSTANT keyword on a field to protect it from being altered.

## Operations on string fields

You can now use the STRING, UNSTRING and INSPECT statements on fields of type string.

## PL/I

PL/I support within the IDE now includes the following enhancements:

- Support for new built-in functions

The PL/I Compiler and Runtime now support the following new built-in functions:

```
DAYS
DAYSTODATE
SECSTODATE
SECS
WEEKDAY
DAYSTOSECS
ONSUBCODE
REPATTERN
IAND
IOR
INOT
OMITTED
XMLCHAR
```

This provides an improved functionality and a greater language compatibility when you migrate applications from a z/OS environment.

- Support for %OPTION in the PL/I macro preprocessor

You no longer need to modify application code that uses %OPTION in order for it to compile successfully.

- Support for QUOTE() and COMMENT() built in functions.

This enables the use of PL/I macros that generate code using these built-in functions.

- Support for IBM Style %INCLUDE(s) that utilize PDS name as part of include file names.

The PL/I macro preprocessor now parses the %INCLUDE syntax of the form shown below and utilizes the –isuffix and –ipath Compiler directives to locate the “member”.

```
%INCLUDE MYPDS(MYMEMBER) ;
```

This provides an improved language compatibility with the application code without the need to modify the original underlying source code.

- Support for PL/I AREA data items up to 2Gb.

Open PL/I now supports the declaration and usage of variables of type AREA up to 2Gb in size. This provides you with improved functionality and greater language compatibility when migrating applications from a z/OS environment as there is no need to modify the code in order to deal with a maximum area size of 32Kb.

- Enhanced compatibility with the DISPLAY() REPLY() syntax.

The PL/I Compiler and runtime now provide a DISPLAY() REPLY() syntax that is no longer dependent upon the use of the SYSIN and SYSOUT DD's and that no longer causes behavioral differences if stream IO to SYSIN/SYSOUT is intermingled with programs using DISPLAY() REPLY().

- Support for big-endian style bit strings on little-endian platforms.

Using a new Compiler directive –bitstr to compile programs that have logic that is dependent on big-endian bitstring ordering enables you to utilize the code unchanged on Open PL/I little-endian platforms (such as Windows, Red Hat Linux, SUSE Linux). This enables you to migrate applications that make an

assumption about bit ordering on the underlying operating system or hardware and to run them unchanged.

- Support for the `-initcall` Compiler directive.

Compiling a PL/I program with the `-initcall` directive causes the specified program to be invoked prior to any user logic. This enables you to customize your environments and do things such as tracking which routines have been invoked, detect memory corruption prior to routine startup, establish database connectivity.

- Support for the “F” option in PLIDUMP.

A PLIDUMP which was generated using the “F” option will now attempt to list all known information about files which have been accessed during the execution of the program and includes information about the last IO operation, key values, and a dump of buffers, if available. This enables you to identify more easily the cause of file-related failures and what file operations were in progress at the time of failure.

- Technology Preview support for PL/I data structures Data File Tools.

In the IDE, you can now generate a PL/I structure map (.str) which can be utilized by the Data File Tools utility to generate a formatted layout for a PL/I Data File. The PL/I data structure must be compiled in advance with the `-adt` Compiler directive. This enables you to see what is in each field within a PL/I data file record, and to modify them in a logical way without having to know the offset, length and raw format of the data item.

- Support for PL/I debugger notification for ON Unit invocation.

You can now request that the debugger stops when a PL/I ON Unit is about to be triggered. This enables you to locate the ON Unit, establish appropriate breakpoints within the ON Unit and determine the cause of the ON Unit being triggered.

- Support for PL/I debugger notifications for the load of shared libraries and .dll files.

You can now request that the debugger issues a notification when a shared object or a .dll file has been dynamically loaded. This enables you to stop a program when a dynamic program has been loaded and to establish the appropriate breakpoints, watch lists, etc.

- Alternative Index Performance Improvements for the CASSPOOL command.
- Support of the SHAREOPTIONS property in a VSAM cluster.
- Support for setting directives automatically for PL/I files.

In Eclipse, click **Window > Preferences > Micro Focus > PL/I > Directives Determination**.

- A new page in the project and file properties enables you to set SQL directives on PL/I source files.

## Preprocessors

A guide for third-party vendors and administrators showing how to integrate additional preprocessors with Enterprise Developer is now available in the product help in the *General Reference > Integrated Preprocessor Interface* section.

## Project and Item Templates

Support is now available for using existing projects and files as custom templates to create new projects and files. You create and configure projects that include the files and settings you would like to use as templates.

## Remote Connections

Enterprise Developer now provides a new connection type, **Micro Focus DevHub using SSH**, that uses a Secure Shell daemon process to launch a server on the remote host.

You can use this type of connection when the UNIX machine you are connecting to uses LDAP authentication which is not supported by the DevHub daemon.

Using this connection also means you do not need to run the DevHub daemon process with root privileges. It also gives you greater flexibility in setting environment variables needed for building or debugging on the remote server.

### Rumba Integration with Eclipse

Enterprise Developer 2.2 Update 1 provided enhanced integration with the Micro Focus Rumba application for running and debugging Mainframe Subsystem applications that require a TN3270 emulator to run. You can now configure Eclipse to launch a Rumba mainframe display embedded in the IDE or a mainframe session of Rumba Desktop.

### Run-time Launch Configuration Files



**Note:** This feature is only supported in a Windows environment.

Use a run-time launch configuration file to ensure an application can be launched when it is deployed in a separate location to the run-time system (in the case of dynamically bound applications), or when the licensing daemon is not already running.

### Terminfo Files

The following terminfo files have been added:

- *ansi80x25* - this is based on the old *ansi* file. A newer version of *ansi* exists in this release that has no function key support, which is consistent with *ansi* terminfo files on various other UNIX platforms. If you currently use *ansi* and require function key support, you should instead set the TERM environment variable to *ansi80x25* to continue previous behavior.
- *xterm-color* and *kterm-color* - these are now available on all UNIX platforms - previously, they were only available on Linux.
- *aixterm-old* (AIX systems only) - this has similar capabilities to the AIX OS terminfo file of the same name. It differs from the existing *aixterm* file, because it has no line drawing capability. Line drawing is only possible with *aixterm* if it is displayed on an appropriate display (X server).
- *vt220-w* - this is the wide (132-column) version of the vt220 file, and is based on the vt100-w file. For more information, see *Wide Terminal Mode* in the documentation referenced at the bottom of this section.

There have been a number of additions and fixes to existing terminfo files; refer to the *Terminfo Database and Terminal Devices* section of the documentation for full details.

There have also been a number of terminfo files that have been removed; refer to the *Backward Compatibility* section for a complete list.

## What was New in Enterprise Developer 2.2

Enterprise Developer 2.2 provided enhancements in the following areas:

- [ACUCOBOL-GT Compatibility](#)
- [RM/COBOL Compatibility](#)
- [Application Configuration](#)
- [COBOL Source Information \(CSI\)](#)
- [Compiler Directives](#)
- [Consolidated Tracing Facility](#)
- [Enhanced Accept and Display Statements](#)
- [Debugging](#)
- [Grouping Files in Virtual Folders in Solution Explorer](#)
- [File Handling](#)

- [Interface Mapping Toolkit](#)
- [Managed COBOL](#)
- [Problems View](#)
- [Upgrading from Net Express to Visual COBOL](#)
- [XML Extensions](#)

### ACUCOBOL-GT Compatibility

The following enhancements are applicable to Enterprise Developer:

- Accessing data files through AcuServer - You can now access your ACUCOBOL-GT data files, both sequential and Vision files, through AcuServer.
- Standard library routines - Support for the following library routines has been added:
  - C\$GETPID
  - C\$JUSTIFY
  - C\$LIST-DIRECTORY
  - C\$LOCKPID
  - C\$REGEXP
  - C\$RUN
  - C\$SLEEP
  - C\$SYSTEM
  - C\$TOLOWER
  - C\$TOUPPER
  - I\$IO
- Using Vision files with Micro Focus Data File Tools - You can now use some of the Data File Tools functionality with Vision files. You can:
  - Convert Vision files to Micro Focus format using the Data File Converter and the DFCONV command line utility.
  - Edit Vision files using the Data File Editor.



**Note:** For more information about the **Data File Tools** utility, see *Data Tools*.

### RM/COBOL Compatibility

The following support has been added to Enterprise Developer in this release:

- Subprograms - Support for the following subprograms (referred to as library routines in Enterprise Developer) has been added:
  - C\$OSLockInfo
  - C\$SecureHash
- recover1 - The recover1 utility, RM/COBOL's indexed file recovery utility, is now distributed with Enterprise Developer. Refer to the *RM/COBOL File Handling* section of *RM/COBOL Compatibility* for details of its use.

### Application Configuration

You can now set environment variables for when you run native projects from within the IDE from the project's properties - click **Environment** on the **Application** tab in the project properties.

### COBOL Source Information (CSI)

COBOL Source Information (CSI) provides a quick and easy way of providing you with information about your program when you are working on it. You enter a query in the **Quick Browse** dialog box and CSI returns the results of the query in the Search view.

## Compiler Directives

The following Compiler directives are new:

- ACU-UNDERSCORE** This directive treats underscores in COBOL words as hyphens.
- ILSHOWPERFORMOVERLAP** This managed COBOL-only directive generates a warning when an overlapping PERFORM range is detected in the program.
- IEXPONENTIATION** This managed COBOL-only directive enables you to optimize exponential arithmetic operations by specifying the calculation method used.
- EXITPROGRAM** This directive determines how the EXIT PROGRAM statement is executed.

The following Compiler directives have changed

- CHANGE-MESSAGE** The scope of this directive has been widened to allow you to change the severity of different types of error messages, not just syntax checking messages.
- DIALECT"RM"** DIALECT"RM" now sets PERFORM-TYPE"RM". If you recompile an application that uses DIALECT"RM", the behavior may change for nested PERFORM statements. If that is the case, explicitly set PERFORM-TYPE"MF" after DIALECT"RM" to continue with the previous behavior.
- HIDE-MESSAGE** The scope of this directive has been widened to allow you to hide different types of error messages, not just syntax checking messages.
- PRESERVECASE** This directive now defaults to PRESERVECASE when compiling native COBOL; managed COBOL compilation already defaults to PRESERVECASE. This results in externally visible identifiers preserving their case instead of being converted to uppercase.

## Consolidated Tracing Facility

The following changes have been made to the Consolidated Tracing Facility (CTF):

- CTF for JVM COBOL application** CTF tracing is now supported in JVM COBOL applications.
- New emitters** A new emitter, JVALOGGER, is available for JVM COBOL web applications. This emitter passes details to the Java logging API that is available through your web server. Use this emitter if you are unable to configure the TEXTFILE or BINFILE emitters due to web server permission restrictions.
- New properties and variables for existing emitters** The following support has been added to existing emitters.
- Properties** The following property has been added to the BINFILE emitter:
- | Property  | Description  |
|-----------|--|
| RunUnitID | Controls whether the RunUnit information is included in the trace. |
- Variables** Four new pseudo-variables for the FILE property have been added to the BINFILE and TEXTFILE emitters:

pseudo-variable	Description
\$(PLATFORM)	A platform specific constant, useful when two run-time systems are in the same process, and you require separate trace files
\$(RUNUNIT)	A unique number that represents the managed RunUnit ID
\$(RUNUNIT_SESSIONNAME)	The session name passed to the managed RunUnit
\$(RUNUNIT_GUID)	The globally unique identifier associated with the managed RunUnit

### Enhanced Accept and Display Statements

Two of the existing Enhanced ACCEPT and DISPLAY settings available through Adis have additional values, which are aimed at RM/COBOL users migrating their source code to Enterprise Developer. The new values are:

- Emulation of RM/COBOL-85 style data entry for numeric data entry on ACCEPT statements.
- Emulation of an RM/COBOL backspace in free format fields when in replacement editing mode, in that deleted characters are removed and characters to the right are shifted left, the same as when in insertion editing mode.

For more information on how to set these values, refer to *Configuring Enhanced ACCEPT and DISPLAY*.

### Debugging

#### Displaying debug information for managed applications

You can set the DEBUG constant for managed COBOL projects on the **COBOL** tab in the project properties. This enables you to use the System.Diagnostics.Debug class in your applications to ensure they write diagnostic information in the Output window for projects compiled for Debug but not for projects compiled for Release.

#### Changing the display format for individual items in the Watch window

It is now possible to change the display format for individual items in the Watch window in COBOL. To do this, click a row, press **F2**, and type: *Variable,h* or *Variable,x* to always display the values in hexadecimal format; *Variable,d* to always display the values of variables in decimal format, and of strings - as text.

### Grouping Files in Virtual Folders in Solution Explorer

Enterprise Developer now provides a Virtual View of a project within Solution Explorer. In the Virtual View you use virtual folders to improve navigation by logically grouping the files that make up the project. You can also create your own virtual folders to group files of your choice (a file can only belong to one virtual folder). The files can be of different file types.

### File Handling

New features include:

- Converting and editing Vision and RM/COBOL indexed data files using the Data File tools is now supported.
- Access to data files (either sequential or indexed) through AcuServer is now supported.
- Access to Vision and RM/COBOL indexed data files through Enterprise Server is now supported.



## Interface Mapping Toolkit

Enterprise Developer now supports the creation and deployment of COBOL program-based services using the Interface Mapping Toolkit (IMTK).

## Managed COBOL

**Documentation** A guide that provides a basic introduction to Object-Oriented Programming (OOP) for COBOL developers, *An Introduction to Object-Oriented Programming for COBOL Developers*, with examples is now available from the *Product Documentation* section on the [OpenText Support and Services Documentation Web site for Micro Focus products](#).

### Named and optional parameters

Two new types of parameter have been introduced for use during method invocation:

#### Named parameters

As part of the invocation expression, you can define a value for a parameter named in the method definition. The named argument must be specified after any positional arguments, and must not correspond to any of those preceding arguments.

#### Optional parameters

Optional parameters are parameters defined with a default value in the procedure division header of the invoked method. If none of the arguments passed in during invocation correspond to this parameter, the default value is used in the method; if an argument does correspond, the value that was passed in is used.

### Delegates and events

A number of new features have been added that relate to delegates and events:



**Note:** Some of these features were also available in previous versions of Enterprise Developer.

#### The ATTACH and DETACH statements

Use these statements to attach or detach a delegate, method group or an anonymous method to or from an event.

#### The RUN statement

Use this statement to invoke a delegate once it has been created.

#### Combining delegates

Use the '+' operator to add a method group, anonymous method or another delegate to a delegate, and use the '-' operator to remove a method or another delegate from a delegate.

#### Method groups conversions

Use the METHOD keyword to specify a compatible method from a method group, and convert it to a delegate.

## Problems View

The **Problems** view now has a 'Program' column that displays the name of the program in which the problem occurred. Click this column heading to sort the errors by program.

Program	Description	Resource	Path
	Errors (200 of 262 items)		
ZBNKE15.CBL	COBCH0008S Unknown copybook CABENDD spec...	ZBNKE15.CBL	/Mainframe1
SBANK00P.CBL	COBCH0008S Unknown copybook CBANKDAT spe...	SBANK00P.CBL	/Mainframe1
SBANK00P.CBL	COBCH0217S Preceding item at this level has zero ...	SBANK00P.CBL	/Mainframe1
SBANK00P.CBL	COBCH0008S Unknown copybook CBANEXT spe...	SBANK00P.CBL	/Mainframe1
SBANK00P.CBL	COBCH0217S Preceding item at this level has zero ...	SBANK00P.CBL	/Mainframe1
SBANK00P.CBL	COBCH0008S Unknown copybook CABENDD spec...	SBANK00P.CBL	/Mainframe1
SBANK00P.CBL	COBCH0012S Operand BANK-ENV-CICS is not dec...	SBANK00P.CBL	/Mainframe1
SBANK00P.CBL	COBCH0012S Operand BANK-COLOUR-SETTING i...	SBANK00P.CBL	/Mainframe1

If the column is not present in the view by default, you can add it through the **Configure Columns** dialog box in the **View Menu**.

## Support for SOA



**Restriction:** This topic applies only when the Enterprise Server feature is enabled.

Enterprise Developer now includes support for creating Web service and Enterprise Java Bean applications using the Interface Mapping Toolkit (IMTK) in conjunction with Enterprise Server. If you are upgrading to this release from an earlier version of Enterprise Developer, you may need to apply for a new authorization code in order to access the functionality - please contact Micro Focus OpenText Support for Micro Focus Products to receive an updated authorization code. Note that the Enterprise Developer Personal Edition license does not support the IMTK functionality.

## Upgrading from Net Express to Enterprise Developer

A new section in the product help, *Upgrading from Net Express to Enterprise Developer for Eclipse*, provides guidance on how to move existing applications either developed or debugged in the Net Express IDE into the Eclipse IDE.

## XML Extensions

You can now use XML Extensions in your managed COBOL projects.

Use XML Extensions to import and export XML documents to and from COBOL working storage. Specifically, XML Extensions allows data to be imported from an XML document by converting data elements (as necessary) and storing the results into a matching COBOL data structure. Similarly, data is exported from a COBOL data structure by converting the COBOL data elements (as necessary) and storing the results in an XML document.

While importing or exporting data to or from XML documents, you can apply XSLT transforms to the data by using XSLT stylesheets.

For more information, refer to the *XML Extensions User's Guide*.

# What was New in Enterprise Developer 2.1 Update 1

Enterprise Developer 2.1 Update 1 provided enhancements in the following areas:

- [Compiler Directives](#)
- [DB2 ECM](#)
- [Enterprise Server](#)
- [HCO for SQL Server](#)
- [Mainframe Compatibility](#)
- [OpenESQL Assistant](#)
- [PL/I Support](#)
- [SQL Option for DB2](#)
- [Debugging Enhancements](#)

## Compiler Directives

You can now set SQL and PL/I-related Compiler directives and their values more easily, using a table of tick boxes in a project's Properties dialog box.

## DB2 ECM

- Support for 64-bit DB2 ECM

- Support for 64-bit compile and runtime
- Support for DB2 10.1
- New DB2 SQL compiler directive option, BGP, to enable background parsing

## Enterprise Server

The following new features and enhancements are available:

<b>Clustering</b>	Enterprise Server Clustering allows the scaling-out of work units, so that an increased number of operating system images can share the workload, resulting in high-performance, multi-system data sharing across all platforms.
<b>Historical Statistics Facility</b>	The Historical Statistics Facility has been extended to include the generation of JCL file records, increasing the amount of information customers have available to assist them in monitoring and tuning their Enterprise Server installations.
<b>Recovery of in-doubt XA transactions</b>	Some events in XA environments can result in 'in-doubt' transactions, where all parts of a composite transaction are not committed through all participating resource managers. The recovery of such in-doubt transactions is now supported.
<b>SSL Support for the CICS Web Interface</b>	Enterprise Server now allows clients and servers to identify themselves through X.509 certificates and participate in SSL-enabled conversations.

## HCO for SQL Server

- Data Transfer tool enables you to:
  - Specify the number of error rows to identify before committing them to the log file.
  - Transfer tables in one SSIS package instead of one package per table (optional).
  - Execute DDL for tables
  - Transfer DDL
- The Generate DDL tool provides you the option of using SQL Server database collation or preserving mainframe DB2 collation with SQL Server.
- Migration of DB2 temporary tables has been enhanced.

## Mainframe Compatibility

### OpenESQL Assistant

Support for generation of PL/I SQL queries and copybooks.

### PL/I Support

This release of Enterprise Developer includes support for developing, compiling and debugging PL/I applications, including PL/I-specific project types, file categories, and editors.


- Support for executing PL/I programs using IBM MQ Series software
- DEFINE ALIAS support for the Open PL/I Compiler for XML
- Support for TSO/IDCAMS
- Improved PLISRTD performance on UNIX/Linux
- Improved file I/O speed when using the PL/I language to read or write sequential, indexed and relative record files
- To enable PL/I for CICS, JCL, IMS you only need to set `ES_PLI_SUPPORT=Y`. You no longer need to set `ES_PL1_MFFH_JCL=Y`.
- Support for character picture data types A,X
- Support for %XINCLUDE (macro preprocessor and compiler)

- Support for %OPTION (macro preprocessor)
- Tolerance for source code containing INLINE and ABNORMAL attributes.
- Support for the TINY and HUGE built-in functions
- New PLICTF and PLICTFHX built-in functions
- Support for the PARAMETER attribute
- Support for the NONINIT attribute

### SQL Option for DB2

- Background parsing support
- Enhanced XDB engine LOB support
- UTF-8 support for client-side expressions
- Support for indices on expressions

### Debugging Enhancements

You can create a breakpoint for any program in the workspace that your application uses by clicking **Run > Add Program Breakpoint**, or clicking the  icon in the Breakpoints view, and entering the name of the file.

## What was New in Enterprise Developer 2.1

Enterprise Developer 2.1 provided enhancements in the following areas:

- [ACUCOBOL-GT Data Types in Managed Code](#)
- [ACUCOBOL-GT Library Routines in Managed Code](#)
- [Compiler Directives](#)
- [.int, .gnt and .lbr File Types Support](#)
- [IMS Support](#)
- [Just-in-time Debugging](#)
- [Managed code enhancements](#)
- [OpenESQL](#)
- [UNIX Platforms Support](#)
- [Automatic Directives Detection and Setting](#)

### ACUCOBOL-GT Data Types in Managed Code

ACUCOBOL-GT data types and sign() variants that were previously only available in native code are now supported in managed code. Use the Compiler directives COMP1 and COMP2 to set ACUCOBOL-GT behavior for those particular data types.

### ACUCOBOL-GT Library Routines in Managed Code

ACUCOBOL-GT library routines that were previously only available in native code are now supported in managed code.

### Compiler Directives

The following new Compiler directives are now available:

<b>DISPLAY</b>	Defines the default behavior of standard DISPLAY statements.
<b>COMP1</b>	Specifies the behavior of a COMP-1 data item.
<b>COMP2</b>	Specifies the behavior of a COMP-2 data item.

- RESTRICT-GOTO** Generates a syntax error for GO TO statements that transfer control to outside of the current section.
- ILSMARTRESTRICT** Limits the generation of properties in ILSMARTLINKAGE classes to non-redefining elementary items.

The following Compiler directive has changed:

- DATAMAP - Two new parameters allow you to display either the address or offset values for data items in your program.

### **.int, .gnt and .lbr File Types Support**

Support has been added within the IDE for compiling native COBOL applications to the Micro Focus legacy formats `.int` and `.gnt`, and to package these files as a Micro Focus library file (`.lbr`). Improvements include:

- An option to compile all native COBOL projects to `.int` and `.gnt` code. You can set this in your project's properties.
- An option to package the `.int` and `.gnt` files produced by the project as a Micro Focus `.lbr` library files.
- Improvements to the Net Express Project Import wizard that enable you to convert existing Net Express projects to Enterprise Developer projects that compile to `.int` and `.gnt` code.

### **IMS Support**

Mainframe projects contain categories for IMS resources (`.dbd`, `.mfs`, and `.psb` files), in which files with these extensions are automatically put when you add them to the project. Each file type has its own editor that colorizes tokens to aid development. Building a project containing these file types automatically generates DBD, PSB, and MFS files.

### **Just-in-time Debugging**

Enterprise Developer now supports "Just-in-time" debugging: when a run-time error occurs, or an application calls `CBL_DEBUGBREAK`, the IDE can start automatically with the debugger attached to the failed process.

### **Managed code enhancements**

- Delegates and Events** Delegates and events are now implemented on the JVM platform. This release provides support for combining delegates, using the `METHOD` keyword to specify method groups, and implicit conversion from a method group or an anonymous method to the suitable delegate type.
- Handling Invalid Numeric Data** The handling of invalid numeric data is controlled by a number of Compiler directives: `HOSTNUMMOVE`, `HOSTNUMCOMPARE` and `SIGNFIXUP`. These directives were previously only available in native code but are now supported in managed code.
- Resolving Types** In this release, the Compiler attempts to resolve types to those defined in the current compilation unit wherever possible. The Compiler will attempt to resolve such types to an external name only if no suitable type exists in the current compilation unit. For example:

```
$set ilusing"System"
class-id MyNamespace.EventHandler.
01 o type EventHandler.
end class.
```

In this release, `Of type EventHandler` resolves to `MyNamespace.EventHandler` and not to `System.EventHandler`.

### Specifying Properties

In previous versions of the products, properties declared using the PROPERTY keyword on a data item were generated as final properties. Starting with this release, they are generated as virtual properties by default. In order to make the properties final, you need to specify the word FINAL following PROPERTY. This change may affect the generation of Proxy classes, for example, if you are using WCF.

## OpenESQL

### JDBC

JDBC has been enhanced to support two new directives:

**JNDI** Enables you to specify a JNDI class that looks up connection strings.

**JNDIENC** Enables applications to use the JNDI Environment Naming Context (ENC) when looking up JDBC data source names using JNDI.

### ODBC

Added support for a generic one-phase commit for ODBC XA switch module.

### SQL Compiler Directive Options

OpenESQL has been enhanced to support the following new SQL compiler directive options:

**DATE** Controls the reformatting of date values in output parameters and in input parameter character host variables when DETECTDATE is also specified.

**TIME** Controls the reformatting of date values in output parameters and in input parameter character host variables when DETECTDATE is also used.

**DATEDELIM** Specifies a single character as the delimiter between the year, month, and day components to override the default delimiter determined by the HCOSS DIALECT or DATE directive specification.

**TIMDELIM** Specifies a single character as the delimiter between the hour, minute, and second components to override the default delimiter determined by the HCOSS DIALECT or TIME directive specification.

**TSTAMPSEP** Specifies a single character as the separator between the date and time parts of timestamp and date/time data.

### OpenESQL Assistant

OESQL Assistant now supports updateable cursors.

### SQL Server

We now support Microsoft SQL Server 2012.

## UNIX Platforms Support

Support for remote development and deployment of projects is now available on UNIX and Linux.

### Automatic Directives Detection and Setting

The IDE automatically determines and sets the COBOL dialect, and the CICS and SQL directives on local or remote native COBOL projects. You can also start a directives scan from within COBOL Explorer - select **Determine Directives** from the context menu for the projects or the COBOL source files. This triggers a scan to determine the COBOL dialect, the CICS and SQL settings, and sets them as Compiler directives on a file or project level respectively. At the end of the scan, you view the results and choose to apply the changes.

# What was New in Enterprise Developer 2.0

Enterprise Developer 2.0 provided enhancements in the following areas:

- [Automatic Directives Detection and Setting](#)
- [COBOL Explorer view](#)
- [COBOL File Search](#)
- [Compiler Directives](#)
- [Compiling Single Files](#)
- [Enhancements to Developing Applications on a Remote Machine](#)
- [Converting Projects](#)
- [Copybook Context](#)
- [Debugging Enhancements](#)
- [Eclipse 3.7](#)
- [JVM COBOL File Handler](#)
- [Library Routines](#)
- [Managed COBOL Language Features](#)
- [Data Access](#)
- [Remote COBOL JVM Projects - Early Release](#)
- [Run-Time Tunables](#)
- [Samples](#)
- [Vision Data File Searching](#)

## Automatic Directives Detection and Setting

It is now possible to automatically determine and set the COBOL dialect and SQL directives on native COBOL source code. In the COBOL Explorer, select **Determine Directives** from the context menu for the projects or the COBOL source files. This triggers a scan to determine the COBOL dialect and SQL settings and sets them as Compiler directives on a file or project level respectively. At the end of the scan, you view the results and choose to apply the changes.

This feature works with local or remote native COBOL projects only.

## COBOL Explorer View


Enterprise Developer now includes the COBOL Explorer view in the Eclipse IDE. This allows you to navigate around COBOL projects in a more useful and convenient way than Eclipse's own Navigator view.

The COBOL Explorer view includes the following features to help you manage your projects:

- For COBOL Project, Remote Project, and Mainframe COBOL Project types, COBOL Explorer adds category folders that automatically group together your project's COBOL programs, copybooks, and output files. (These folders are not physical folders on the disk, but effectively headings for certain file types.)
- To simplify navigation around your project, you can hide some files that are part of the project, such as the `.cobolBuild`, `.cobolProj`, and `.project` files, and the `.settings` folder and its content in JVM projects. You do this by opening the view menu, selecting **Customize View** and choosing from the options.

**Filters** Choose types of content to hide in COBOL Explorer.

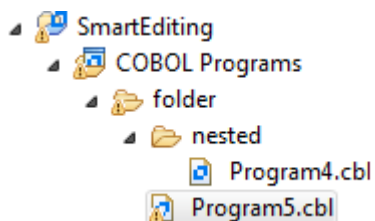
Option	Description
<code>.*resources</code>	Any files of type <code>.*</code> such as <code>.cobolBuild</code> , <code>.cobolProj</code>

Option	Description
Closed projects	Resources in closed projects never display, but you can choose to hide all closed project icons  too
Empty folders inside COBOL categories	Folders mapped to the COBOL Programs and Copybooks that contain no COBOL program or copybook files
Non-COBOL projects	Projects of types other than those under Micro Focus COBOL - for example AspectJ, Plug-in, or Update-site projects
RSE Internal projects	Projects generated by the RSE plug-in

**Content** Choose types of content to show in COBOL Explorer.

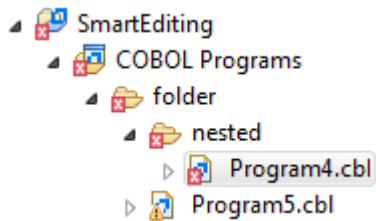
Option	Description
Working Sets	Working sets are subsets of workspace resources you can choose to show or perform options on. To define a working set, click <b>Project &gt; Build Working Set &gt; Select Working Set &gt; New</b> .
COBOL Elements	Non-resource types that are COBOL-specific: <ol style="list-style-type: none"> <li>1. x</li> <li>2. category folders, including those for COBOL programs and copybooks, and BMS macro source files</li> <li>3. icons for the different types of COBOL files.</li> <li>4. overlays for build errors and warnings</li> <li>5. some context menu items</li> </ol>
Resources	COBOL projects, COBOL programs and copybooks. Has effect only if the <b>COBOL Elements</b> option is unchecked.

- COBOL Explorer helps you fix problems by using icons to identify files and containers that cause build errors and warnings.
- A file that generates a warning, and any containing folders and categories, is marked with a yellow warning sign. For example:

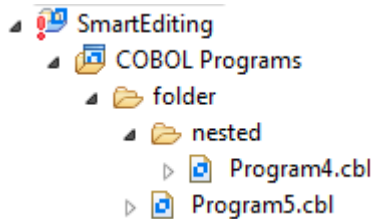


- A file that causes an error, and any containing folders and categories, is marked with a cross. In this example the icons indicate the most severe problem is the error caused by `Program4.cbl`, and the folders are marked with error icons despite `Program5.cbl` generating a warning:





- A project that suffers from a dependency error is marked with a red exclamation mark; its contents remain unmarked. In this example the project depends on another project that is closed, causing a build path problem:



Also, the context menus are reorganized and include some additional tasks such as the **Determine Directives** command.

You access COBOL Explorer in the same way as other Eclipse views, by selecting **Window > Show View**.

### COBOL File Search

Enterprise Developer now includes the COBOL File Search feature in the Eclipse IDE.

You can use the Micro Focus search feature to make it easier to find files within your projects:

- Select **Search > Micro Focus**, and type the file search pattern.

You can filter results based on:

- File type: choose from COBOL programs, copybooks, PL/I files, JCL files, and BMS and macro source files.
- Only those files that cause build errors.
- Only those files that cause build warnings.

You can control the scope of your search:

- Workspace - searches entire workspace.
- Selected resources - searches only the resource currently being edited or highlighted in the tree view.
- Enclosing projects - if the editor is focussed on a resource or resources are highlighted in the tree view, then the search is within the entire project containing the resources.
- Current program - searches the resource currently being edited, as well as within any copybooks or include files used by the resource.
- Working set - see *Working Sets* for more information.
- Select **Search > Run Stored Micro Focus Search Query** and choose to find either:
  - Only those files that cause build errors.
  - Only those files whose properties override the project's properties (for example **Language dialect** or **Compile for debugging** settings).

Whichever way you use the Micro Focus search the results are shown in the **Search** view.

After you have performed a search you can edit the properties of any of the program files listed in the search view. You can even simultaneously edit the properties of multiple program files which have

compilation settings available on them, that is program files rather than copybooks or include files. Highlight the files you want to change, right-click **Properties**, and then check **Enable file specific settings**. Change the file properties as required and then click **OK**.

You can save your search criteria and give it a label which is added to the list of stored queries available when you select **Search > Run Stored Micro Focus Search Query**:

1. In the Search tab, click  **Save the Current Search**.

This opens the **Add Micro Focus Search** dialog box.

2. In the **Search label** field, type a search label.

- You can assign a keyboard shortcut by typing the required keystrokes in the **Binding** field.
- Optionally, you can modify the current search criteria.

3. Click **OK**.

The search label is added to the list under **Search > Run Stored Micro Focus Search Query**.

You can also add, edit, and remove your searches from **Window > Preferences > Micro Focus > Search**.



**Note:** Do not open the **Keys** preferences page (**Window > Preferences > General > Keys**) while editing the binding in the **Search** preferences page. Opening the **Keys** preferences page will prevent any changes you make to the search bindings from being saved.

## Compiler Directives

The following new directives are now available:

- **COPYSEARCH** - enables you to specify how copybooks are located. You can choose between usual Micro Focus COBOL behavior or usual RM/COBOL behavior.
- **ILSMARTNEST** - enables you to nest **ILSMARTLINKAGE** classes inside the program class in which they are defined. This makes it possible to have multiple programs in a single compilation unit that include linkage records with the same name.

The following directives have been changed:

- **DIALECT(RM)** - now accepts a new parameter, **RM**, which enables the RM-compatible functionality that the **RM** directive used to enable.
- **ILREF** - can only specify a **.class** as a parameter, and not a **.jar** file or other file types.
- **ILUSING** - when set on a single file using the **SET** statement, `$set ilusing`, the directive only affects that file.

## Compiling Single Files

It is now possible to compile individual COBOL source files without rebuilding your entire project. **Build Automatically** on the **Project** menu must be turned off.

## Enhancements to Developing Applications on a Remote Machine

Previously, this product depended on Samba or NFS to transfer and manage the project files on a remote UNIX machine. Remote Server Explorer (RSE) was only used to build the applications on remote machines.

"Remote file system (RSE)" is now the default option in the Create Remote COBOL project wizard for managing the files of remote COBOL projects. RSE establishes a connection with the remote machine and is used to transfer and manage the project files on it.



### Important:

- You must use SSH connection and not DStore for remote COBOL projects created with Remote file system (RSE).

- You can still use Samba and NFS as file system providers. On system where SSH is not allowed, you can use SAMBA and DStore connection to transfer and manage the files on the remote system.

## Converting Projects


It is now possible to convert Net Express projects into Eclipse projects and use them with Enterprise Developer. To do this, use the Net Express Project Import and Convert Wizard available from **File > Import > Convert NetExpress Projects to COBOL Projects**. The wizard analyzes the Net Express project file and its configuration settings, creates Eclipse projects based on this information, imports the existing source code into them, and sets the requisite project and file properties from the original Net Express project.

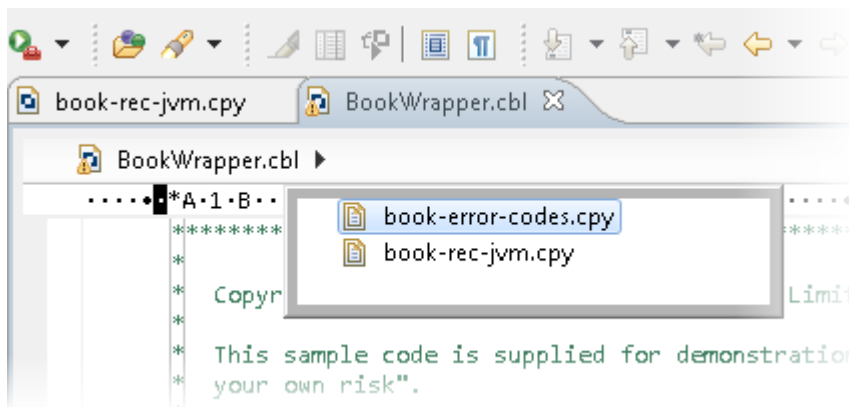


**Note:** If you import a Net Express project that uses functionality that is not supported in Enterprise Developer, the wizard will still produce an Eclipse project. In some cases you might be able to perform additional steps (such as editing source files, installing AddPacks, or reworking parts of the application) in order to successfully compile and run it. See *Converting Net Express Projects to Eclipse Projects* for more information about the limitations of the wizard.

## Copybook Context

When you view or edit a copybook, you need to see it in the context of the program that references it, as its appearance and usage can change depending on the program. For example, data items that are not used in the program are struck through, and horizontal lines indicating the start and end of code lines can show depending on the source format of the program. The Program Outline view can differ between contexts too.

A breadcrumb trail at the top of the Editor indicates which program and copybooks are the current context - click **Toggle Context Breadcrumbs**  in the Eclipse toolbar and use the drop-down list to view and open the dependent copybooks.



## Debugging Enhancements


Enterprise Developer 2.0 provides the following enhancements to debugging:

### Program Breakpoints



**Note:** Program breakpoints are supported in native COBOL only, and are not supported with nested programs.

You can now set program breakpoints, which break into a program whenever it or one of its entry points is called.

To set or toggle a program breakpoint, double-click in the left margin, next to the Procedure Division heading. The  icon appears when the program breakpoint is set.

**Step out of OSVS perform statements** You can now step out of a perform statement when PERFORM-TYPE(OSVS) or DIALECT(OSVS) is set.

### Eclipse 3.7

Enterprise Developer 2.0 uses Eclipse 3.7.1 Indigo.

### JVM COBOL File Handler

Use the JVM COBOL File Handler, a File Handler written in purely JVM COBOL managed code, when you are deploying to environments that do not allow the use of native code such as the default Micro Focus File Handler.

### Library Routines

The following CTF library routines are now available in COBOL for JVM:

```
CBL_CTF_COMP_PROPERTY_GET
CBL_CTF_TRACE
CBL_CTF_TRACER_LEVEL_GET
CBL_CTF_TRACER_GET
CBL_CTF_LEVEL
```

The following routine has been enhanced:

- The CBL\_SEMAPHORE\_ACQUIRE routine now accepts a `timeout` parameter.

### Managed COBOL Language Features

The following new syntax elements are now available in managed COBOL:

<b>Local Variables</b>	In managed COBOL, Data items can now be declared in the procedure division, using the DECLARE statement. In addition, they can be declared inline as the iterator in a PERFORM statement, or as an exception message in a TRY ... CATCH ... FINALLY statement block.
<b>Collections</b>	There are two new collection types in managed COBOL: LIST and DICTIONARY. For a LIST, you can add elements to a list, retrieve the nth element of the list, replace the nth element, iterate through the list and clear the list. For a DICTIONARY, you can add key value pairs, retrieve a value corresponding to a key, to replace the value corresponding to a key, iterate through the dictionary and clear the dictionary.
<b>Properties</b>	In managed COBOL, a property can now be defined using PROPERTY-ID and GETTER and SETTER phrases to access to the property. The previous technique of specifying the keyword PROPERTY on a data declaration is still available.
<b>Indexers</b>	In managed COBOL, an indexer can now be defined using INDEXER-ID and GETTER and SETTER phrases to access the indexer value. Indexers are similar to properties, except that their accessors take parameters. Indexers allow instances of a class or valuetype to be indexed just like arrays.
<b>Zero-based Indexing</b>	The managed COBOL syntax for arrays now uses zero-base indexing to access arrays when square brackets are specified. For backward compatibility, one-base indexing is used when round parentheses are specified.

The Help now contains code examples comparing managed COBOL and Java.

### Data Access

Enterprise Developer version 2.0 provides the following enhancements:

- Improved IDE integration with SQL directives - now supports handling of deprecated and removed directives. Also supports filtering of the choices offered to the user by product type, project type, and platform.
- OpenESQL has been enhanced and it now:
  - defaults to optimal performance
  - supports 64bit ODBC across all platforms
  - OpenESQL now supports JDBC across all platforms

### Remote COBOL JVM Projects - Early Release

You can use Eclipse to develop COBOL JVM projects on a remote UNIX/Linux machine. The source code resides and is being compiled and debugged on the remote machine.

### Run-Time Tunables

Enterprise Developer 2.0 provides the following new tunable:

- `subsystem_cancel_mode` - use this to override the default cancel mode when you use the `CBL_SUBSYSTEM` library routine to cancel a subsystem.

### Samples

The following new samples are now available:

- Collections - demonstrates the managed COBOL collections syntax
- Local Variables - shows how to declare data items in the procedure division in the `DECLARE`, `PERFORM` and `TRY` statements
- The code in the Properties sample has been enhanced to use the new `PROPERTY-ID` syntax. The sample also includes a sample program for Indexers which illustrates the new `INDEXER-ID` syntax.

### Vision Data File Searching

Enterprise Developer 2.0 provides the following new ACUCOBOL-GT compatible environment variables to help search for Vision data files at run time:

```
APPLY_FILE_PATH
FILE_CASE
FILE_PREFIX
FILE_SUFFIX
```

## What was New in Enterprise Developer 2010

Enterprise Developer 2010 provided enhancements as part of the following releases:

- [New Features in Enterprise Developer 2010 R4 Update 2](#)
- [New Features in Enterprise Developer 2010 R4](#)

## Features Added in Enterprise Developer 2010 R4 Update 2

### New Platforms Support

Support for Enterprise Developer for Eclipse has been added for the following platforms:

- x86-64 running Red Hat Enterprise Linux 5.7/6.1
- x86-64 running SuSE SLES 11 SP1

Support for Enterprise Developer Development Hub has been added for the following platforms:

- x86-64 running Red Hat Enterprise Linux 5.7/6.1
- x86-64 running SuSE SLES 11 SP1

Support for COBOL for JVM has been added for the following platforms:

HP IA 11.31 - 32/64-bit  
 x86-64 running Red Hat Linux 5.6/6.1 - 32/64-bit  
 SPARC running Solaris 10 - 32/64-bit

### Native OO COBOL Class Library Reference

On Windows, Help for the following native OO COBOL class libraries is available:

Base class library  
 GUI class library  
 OLE class library  
 OLE Automation class library

The Help is available in the file `nrxclr.chm`, which is installed in the Help folder of your installation. The default location is `%ProgramFiles(x86)%\Micro Focus\Enterprise Developer\Help`.

To open the help, double-click `nrxclr.chm` in File Explorer.

Help for the native OO COBOL class libraries are available from the Micro Focus Web site, as follows:

1. Go to the [Server Express documentation](#).
2. In the *Reference* section, click *OO COBOL*.
3. Expand *OO COBOL Class Library Reference*.

### OpenESQL

OpenESQL now includes the JDBC preprocessor option that you can use to access databases for applications running under the Java Virtual Machine (JVM).

## Features Added in Enterprise Developer 2010 R4

### ACUCOBOL-GT Compatibility

The Compiler and run-time continue to provide support for ACUCOBOL-GT. The directive ACU is the main switch for turning on ACUCOBOL-GT compatibility. The ACU directive enables various ACUCOBOL-GT syntax extensions and other language elements. Additional ACUCOBOL-GT compatibility features include the following:

- When using a CALL statement, the USING and GIVING/RETURNING phrases can now appear in either order.
- The following ACUCOBOL-GT standard library routines can now be used with Enterprise Developer in native code:
  - C\$CALLED BY
  - C\$CALLERR
  - C\$CHDIR
  - C\$MAKEDIR
  - C\$MEMCPY
  - C\$MYFILE
  - C\$PARAMSIZE
  - C\$RERR
  - M\$ALLOC
  - M\$FREE

- M\$COPY
- M\$FILL
- M\$GET
- M\$PUT
- WIN\$VERSION
- The following ACUCOBOL-GT 'ccbl' compiler options can now be used with Visual COBOL:
  - -E, -V
  - -Cv
  - -Da, -Db, -Dd31, -DL1/2/4/8, -Dq, -FpRounding
  - -La, -Li, -Lc, -Lf, -Ll, -Lo, -Ls, -Lw

Note: The output that these list options provide differs in Visual COBOL.

  - -Qm
  - -Rc, -Rn, -Rw
  - -Sa, -St, -Sd, -Sp, -S1...-S9
  - -noTRUNC, -truncANSI, -Dz
  - -Td, -Te
  - -Vc
  - -Za, -Zc, -Zl, -Zn, -Zs, -Zi, -Zr1, -Zy, -arithmeticVSC2

Full ACUCOBOL-GT compatibility is documented under the *Programming* section in the product help.

### **COBOL for Java Virtual Machine (JVM) Support**

In this release you can compile COBOL applications to JVM byte code (.class files) so that they can be run on a JVM. There is support in the IDE to edit, compile and debug JVM COBOL applications. This release includes Managed COBOL - COBOL with extensions to support the JVM framework plus OO syntax support.

Features include support for

- New managed COBOL syntax:
  - The SYNC statement, which marks a statement block as a critical section by obtaining the mutual-exclusion lock for a given object, executing a block of statements, and then releasing the lock.
  - Extension methods, enabling you to extend an existing class with new methods without the need to recompile the existing class
  - Java style inner classes, which define a nested class within another class. These follow all the methods belonging to the containing class.
  - The STATIC keyword, enabling you to mark methods and data as static.
  - Enumerators, which represent a list of constant values. You can declare an enum type that defines the values and symbolic names for them, and refer to the values by name in your code.
- Seamless interoperation between JVM COBOL and native COBOL
- The ability to add Java projects to the classpath for COBOL JVM projects, and COBOL JVM projects to the classpath for Java projects
- Red Hat, AIX and SUSE platforms

### **Embedded HTML**

We now support the use of Embedded HTML (EHTML) in COBOL CGI programs, which enables you to output HTML directly from your applications.

### **HCO for SQL Server (HCOSS)**

Host Compatibility Option for SQL Server (HCOSS) is a new component in Enterprise Developer for Eclipse. However, it was previously available in the Visual COBOL 2010 Enterprise Option product. The

following are HCOSS features that are new since its previous release in Visual COBOL 2010 Enterprise Option:

- HCOSS supports client-based applications compiled with the DBMAN=ADO and DIALECT=MAINFRAME compiler directives when the application targets .NET Framework versions 2.0, 3.0 and 3.5, or .NET Framework version 4.0, but only when the application does not contain dynamic SQL that uses an SQLDA structure.
- HCOSS supports dynamic SQL that uses the SQLDA structure in client-based applications compiled with the DBMAN=ADO and DIALECT=MAINFRAME compiler directives, but only when the application is built to target .NET Framework version 4.0.

### Improved Usability

The following improvements to COBOL development in Eclipse have been made:

- |  |  |
|--|--|
| <b>Dialog box improvements</b>           | The dialog boxes governing build configuration, debug configuration, and launch configuration are redesigned to make them easier to use. |
| <b>Autocompletion and Content Assist</b> | The IDE now includes autocompletion and content assist editing features.   |

### Language Improvements

The following improvements have been made to managed COBOL:

- |  |  |
|--|--|
| <b>Extension methods and extending operators</b> | Managed COBOL now supports extension methods. This feature enables you to add methods to existing types without the need to edit or recompile the code. You can also extend operators.   |
| <b>The SYNC modifier for methods</b>             | The SYNC modifier locks the values of the arguments sent to the method, so that they do not change while the method is processing.   |
| <b>Nested classes</b>                            | In managed COBOL, a nested class can now be defined so that it can access the instance fields, properties and methods in its containing class. To allow this, you add the optional SHARING PARENT phrase to the nested class definition. |

### Renamed Color Preferences

The COBOL Editor syntax-coloring scheme called "Micro Focus Net Express" is now called "Micro Focus Traditional".

The syntax-coloring element called "Identifiers" is now called "Identification Division Names".

Any existing settings for these options will not change.

### Reporting of Linker Errors

Errors relating to linking, such as undefined entry points and libraries not being found, are now logged in Eclipse's Problems view.

### RM/COBOL Compatibility

The Compiler and run-time continue to provide support for RM/COBOL. Additional RM/COBOL compatibility features include the following:

- The following RM/COBOL standard library routines can now be used with Enterprise Developer in native code:
  - C\$Century
  - C\$ConvertAnsiToOem
  - C\$ConvertOemToAnsi



- C\$DARG
- C\$Delay
- C\$GetEnv
- C\$GetNativeCharset
- C\$LogicalAnd
- C\$LogicalComplement
- C\$LogicalOr
- C\$LogicalShiftLeft
- C\$LogicalShiftRight
- C\$LogicalXor
- C\$NARG
- C\$SetEnv
- C\$RERR
- DELETE
- RENAME
- The RM/COBOL file handler can now be used with Enterprise Developer, enabled by using the CALLFH"ACUFH" Compiler directive, and then configuring an add-on to the Vision file handler.

Full RM/COBOL compatibility is documented under the *Programming* section in the product help.

### XML Extensions



**Note:** This functionality is supported in native COBOL only.

You can now use XML Extensions, the system that enables your COBOL applications to interact with XML documents, with Enterprise Developer.

XML Extensions has many capabilities. The major features support the ability to import and export XML documents to and from COBOL working storage. Specifically, XML Extensions allows data to be imported from an XML document by converting data elements (as necessary) and storing the results into a matching COBOL data structure. Similarly, data is exported from a COBOL data structure by converting the COBOL data elements (as necessary) and storing the results in an XML document.

For more information about XML Extensions, refer to the *XML Extensions User's Guide*, available from the RM/COBOL product documentation set, in the OpenText Support for Micro Focus Products section of the Micro Focus Web site.

## Significant Changes

This section describes significant changes in behavior or usage in each successive release. These changes could potentially affect the behavior of existing applications or impact the way the tools are used.

### Significant Changes in Enterprise Developer 10.0

This section describes significant changes in behavior or usage. These changes could potentially affect the behavior of existing applications or impact the way the tools are used.

- [Licensing Changes](#)
- [Significant Changes in Behavior or Usage - Enhancements](#)
- [Significant Changes in Behavior or Usage - Fixes](#)

#### Licensing Changes

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- With release 10.0, the SafeNet Sentinel licensing technology has been deprecated. This can result in some compatibility issues if you install 10.0 on a machine where there are other Micro Focus products or versions installed that use SafeNet Sentinel licensing. While the 10.0 installation process has been designed to address such issues, you should be aware of the following scenarios and if any action might be required to ensure licensing works as expected. See *Advanced Installation Tasks > Licensing Coexistence when Upgrading to Release 10.0* in the *Installation* section.

## Significant Changes in Behavior or Usage - Enhancements

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The numbers that follow each issue are the Support Case Numbers followed by the Issue number (in parentheses).

- [Data Tools](#)
- [Eclipse IDE](#)
- [Enterprise Server](#)
- [File Handling](#)
- [IMS Support](#)
- [PL/I Support](#)
- [SQL: HCO for SQL Server](#)
- [SQL: Mainframe Batch Database Tools](#)

### Data Tools

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- In the new Data Tools Editor, positioning is no longer lost when switching between character and HEX mode.  
02526087 (410104)
- The new Data Tools Editor has a preference page that allows users to adjust the font size of various editor parts.  
02315408 (285050)

### Eclipse IDE

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- A new smart editing preference - Format sentence on period - which formats a sentence according to the current formatter profile when it is terminated with a period, can be configured from **Window > Preferences > Micro Focus > COBOL > Editor > Typing**.  
(8294)

### Enterprise Server

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- Enterprise Server's PAM ESM Module now has a group-filter option that can be used to ignore all user groups that do not matching a specified pattern. See *PAM ESM Module Custom Configuration Information* in your product Help for more information.  
3176983 (12500)
- In ESCWA, the **Enable Single Sign-On for Unsecured Resources** has been renamed to **Single Sign-On Behavior** which has three options:
  - **Disabled** - This disables all single sign-on including live enterprise server regions.
  - **Only Secure and Loopback** - This is the old 'default' behavior, single sign-on will be enabled for secured and localhost resources.

- **Allow Insecure (All)** - Single sign-on will be enabled for everything. This list controls two boolean configuration attributes specified in the `commonwebadmin.json` file:
  - **InsecureAutoSignOn** - this is an existing attribute.
  - **DisableAutoSignOn** - this is a new attribute, if this is set to true then **InsecureAutoSignOn** will have no effect and all single sign-on will be disabled. If set to false then **InsecureAutoSignOn** will operate as before.

02663941 (658042)

- In ESCWA, on the **Spool** page you can now specify default filters for all users. See *Spool* in your product Help for more information.

02497901 02573796 (465005)

- In ESCWA, you can now set table column defaults for users. This can be configured from the column filtering option of the table in ESCWA. If an administrator has not set table defaults then the table columns displayed will match the ESCWA defaults. You can specify which users are able to configure default columns. This can be performed by modifying the **Table Column Configuration** security resource entity. See *Security Resources to Control ESCWA* and *API Access* in your product Help for more information.



**Note:** If **Table Column Configuration** is not specified then ESCWA will use the configuration specified for the **Common Web Administration** resource class.

02618280 (532051)

- The `casverify` utility has been improved with new functionality and additional verification stages. See *casverify* in your product Help for more information.



**Note:** The changes to its text and JSON output formats are incompatible with earlier versions.

(527008)

## File Handling

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- ICETOOL emulation now supports WRITE, DIGITS and WIDTH for the COUNT operator.

02650300 (539002)

- A new EXTFH config option, FLUSHSYSOUT, has been introduced. FLUSHSYSOUT=ON (which is the default setting) enables you to view records for an active spool job as they are written/opened. This new setting is not as performant as the previous behavior (which you can reinstate using FLUSHSYSOUT=OFF) where records for an active spool job would only be displayed after a determined buffer size was written to.

02641736 02658226 (528102)

## IMS Support

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- The new ES\_IMS\_LINKAGE\_NULL environment variable has been added to handle a scenario in which more linkage items are passed by the program than there are PCBs in the PSB. When ES\_IMS\_LINKAGE\_NULL=Y, extraneous linkage items are assigned a value of NULL.

02796708 (665033)

- APARM handling has been updated to use EBCDIC APARMS obtained from EBCDIC applications. In addition, the APARM positional parameter for DLI has been changed from 19 to 20 to be consistent with the IBM IMS documentation. The APARM positional parameter for BMP applications remains at 19. The ES\_IMS\_APARM\_DLI environment variable has been added to enable the APARM handling behavior of previous releases.

02709072 (614050)

- You can now configure MFS to support input type option 2 just as it supports option1. To enable this, set the new ES\_IMS\_MFS\_OPT2\_LEGACY environment value to Y. This enables legacy MFS input type option 2 behavior. When set to N, MFS input type option 2 behavior is like on MFS on z/OS mainframes. The default is N.

02614651 (515070)

## PL/I Support

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- The internal consistency error in the PUT EDIT statement with a DO-loop that was never iterated has been fixed; however, we recommend avoiding dead DO-loops in PUT EDIT statements as they result in redundant code.

02518315 (407194)

- The DO UPTHRU and DO DOWNTHRU options are now supported for both arithmetic and ordinal types.

00366167 (11718)

- PL/I now supports the ORDINALNAME, ORDINALPRED, and ORDINALSUCC built-in functions. This support is provided in this release as an Early Adopter Product (EAP) feature.

00366176 (12535)

- Support for the PL/I FORMAT statement has been updated. The repetition value limit for the repeat field has been increased from 255 to 999999.

02382223 (333007)

- The Open PL/I compiler now supports the -initautuo, -initbased, -initctl, and -initstatic options.

02725021 (623003)

- The Open-PLI compiler now supports unique statement ID numbers in the compiler listing file. The -stmt compiler option (or \*PROCESS STMT) enables this feature. The statement ID numbers are enclosed in curly braces, e.g. {367} for easy identification in the listing. Likewise, the associated statement ID for a given line is included in compiler listing diagnostics. This can be particularly effective during macro expansion when line numbers in the listing file are held constant and a compilation error occurs due incorrect PLI code in the expansion of the macro.

02501000 (401114)

## SQL: HCO for SQL Server

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- The HCOSS **Define Lists** UI has been enhanced to enable you to select a dependency mode to use when creating a transfer list. The available modes are:
  - **Default** - Automatically include all parent objects of the selected object.
  - **Family tree** - Automatically include all parent objects of the selected table and the child objects of each parent object
  - **No dependency handling** - Do not include any parent or child objects of the selected table. In addition, the start and end date and time for each table transfer is now part of output when transferring data.

02544930 (440008)

## SQL: Mainframe Batch Database Tools

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- The SQLTUL tool has been updated to enable you to specify that the return code (RC=04) for execution of non-SELECT \* statements should match the mainframe DSNTIAUL return code. The default is to not

match the return code, but to return RC=0. In addition, the `-r` option has been added to the `mbdtconfig` command to enable the same functionality from the command line.

02669700 (547020)

## Significant Changes in Behavior or Usage - Fixes

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The numbers that follow each issue are the Support Case Numbers followed by the Issue number (in parentheses).

- [Application Workflow Manager](#)
- [CICS Support](#)
- [Compiler](#)
- [Eclipse IDE](#)
- [Enterprise Server](#)
- [File Handling](#)
- [Host Access for the Cloud](#)
- [IMS Support](#)
- [Interface Mapping Toolkit](#)
- [JCL Support](#)
- [Mainframe Access](#)
- [Micro Focus Batch Scheduler Integration](#)
- [Micro Focus Directory Server](#)
- [PL/I Support](#)
- [Run-Time System](#)
- [SQL: Mainframe Batch Database Tools](#)

### Application Workflow Manager

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- The name of the connection type **Micro Focus z/Server** in the **Remote Systems** view has been changed to **Micro Focus z/OS**.

(58344)

### CICS Support

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- When an FCT entry had the start empty property set either in the definition itself or via a SET FILE EMPTYSTATUS(EMPTYREQ) command, the file was emptied on every OPEN. This was not in line with mainframe behavior. In this release, setting the start empty property now causes the file to be emptied only on the next OPEN, which aligns with mainframe behavior.

02746607 (633025)

### Compiler

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- **C++ compiler and runtime updates on AIX platforms (AIX platforms only)**

If your applications contain C++ code or they rely on third-party applications containing C++ code, you will be affected by a change IBM have made to their AIX platforms.

IBM has changed the C++ compiler and C++ runtime on AIX from the old xIC compiler and runtime to the new Clang-based C++ compiler (`ibm-clang++_r`) and runtime, and your COBOL development system has been built to work with these new versions .

As you cannot mix C++ code that has been compiled using the xLC compiler with C++ code compiled with the `ibm-clang++_r` compiler, this will result in you being required to recompile any xLC-compiled C++ code with the new compiler, so it can run in the new Clang C++ runtime.

Before recompiling, ensure that you install the Open XL C/C++ 17.1 (or later) runtime environment and utilities package; see <https://www.ibm.com/support/pages/ibm-open-xl-cc-utilities-aix-1711#DNLD> for more information.

If you are unsure of your reliance on C++ code, you can run the `checkbin` script, available from `$COBDIR/bin: run checkbin -h` for details. This utility will scan a directory structure or file and report any dependence on the xLC C++ runtime, which would indicate code that needs recompilation.

- The intrinsic function `LENGTH` and special register `LENGTH OF` were not always returning the correct result for PIC N NATIONAL fields. These have been updated to the correct behavior, namely returning the number of characters for the former and number of bytes for the latter. If your legacy code has been relying on the previously incorrect behavior, results might now differ.

(613039)

- Generated code only (excluding Intel x86 32-bit platforms): an error when moving from a COMP-6 item to another COMP-6 item when the `SIGNFIXUP` Compiler directive is specified has been fixed.

(665005)

## Eclipse IDE

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- The **Skip all breakpoints** option, available in the **Breakpoints** view for COBOL programs, can now be toggled on and off during an active debug session.

(429042)

- From the **Server Explorer** in Eclipse, remote catalog entries can now be opened in the **Data File Editor** when they are running through a Fileshare server.

(485063)

- A new preference can be set within Eclipse to add search paths for copybooks within standalone files. Select **Windows > Preferences > Micro Focus > COBOL > Standalone Files > Copybook Paths**, and then add one or more paths (or environment variables containing paths) to be searched when debugging. When the paths in a symbols file cannot be found (for example, source has moved and debugged from a different location) the missing copybooks are searched for along these paths until a match is found.

02598103 (517053)

- A new preference, **Preserve Ant build file for Maven projects** has been added to the **Micro Focus > Builder** preference page. Select this option to automatically create a build file (`.cobolBuild`) when importing a Maven project.

02540902 (443016)

- The PL/I launch configuration for remote projects using the **SSH Only** connection now allows the **Use X-Server** setting to be unchecked, and the output of a program to be displayed in the Eclipse console. This is permitted when running an application, but the use of an X-Server is still necessary when debugging, and so this option must be selected for that scenario, otherwise an error is shown.

(420024)

- For new workspaces, the **Server Explorer** view no longer contains a connection to the local ESCWA server by default. You must add the connection manually, when required.

(656022)

- When launching Rumba Desktop or Reflection Desktop (as your TN3270 emulator) from within Eclipse, you can now select a custom profile with which to start the session; see [Choosing a TN3270 Mainframe Display](#) within the product documentation for more details.

02498222 (403108)

- New COBOL projects created under a Japanese locale now default to a source encoding of UTF-8. This new default can be changed by a new preference setting in **Preferences > General > Workspace > Source** encoding directives. Also, within each project, this setting can be overridden at the usual project levels (project settings, build config, etc...) by using the SOURCE-ENCODING directive. Additionally, the COBOL project settings (**Properties > Micro Focus > COBOL**) contain a new setting - source-encoding - which also explicitly passes through the file encoding to the Compiler. This setting can be used instead of the previous method of specifying the SOURCE-ENCODING directive within **Additional directives**.

(481005)

- The option to specify a script file for environment variables has been removed from the Enterprise Server runtime launch configuration, as it is not supported for this type of configuration.

02661247 (543073)

- The **Generate Client** wizard now enables you to select YAML files, and use them to generate web service clients.

(648043)

## Enterprise Server

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- An APPC DPL from an enterprise server region to TX Series would result in an ASRA abend on the enterprise server side.

02686079 (566028)

- When performing a Distributed Program Link (DPL) to a remote system through an intermediate enterprise server region using a transaction ID that declared a TWA, the program did not run under that ID and therefore the TWA was not available. This has been fixed and the transaction ID now propagates through the chain.

02645043 (542077)

- When running with TRANCLASS active, TD Queue transaction triggering was not working.

02737664 (629076)

- In ESCWA, the Catalog list view and the API failed to honor the time value for filters that use date and time. This has been fixed. Output time values for "created" and "referenced" have been changed in the Catalog list view to match the format in the Catalog DCB view.

(588011)

- CICS paging is now supported for function shipping. When a SYS62 connection is used, an additional configuration to the IBM Comms Server is required. A CPMI TP definition is required on the originating region.

02667779 (583002)

- ASSIGN INVOKINGPROG did not behave correctly when a CALL was involved.

02662244 (543070)

- A DPL over a SYNCLEVEL2 connection could result in an XA start being driven out of sequence resulting in a protocol error.

02583717 (477027)

- In a TRANCLASS enabled enterprise server region with a high volume of XA transactions, the logging overhead could cause performance degradation. This has been improved.

02560536 (468059)

- When a transaction invoked across an Inter System Communications link (Transaction Routed) executed a RETURN IMMEDIATE TRANSID(...), the specified transaction did not run without an AID key being pressed.

02695470 (665161)

- Running a transaction that produced paged BMS output over a remote connection would incorrectly result in an AEXJ abend.

02796589 (662007)

- The PAC compatibility checks that run at startup have now been relaxed. Consistent platform and bitism are still checked, but product version checks are no longer carried out. The ES\_PAC\_MIN\_COMP\_CHECK environment flag has now been deprecated.



**Note:** Enterprise Server will still carry out record compatibility checks during start up.

(19756)

- The statusCodes flag has been added to some ESCWA API endpoints which can be used to enable ESMAC to return appropriate HTTP error status codes instead of embedding failure messages in successful responses. In a future product release, the new behavior will be enabled by default in the version 2 of the API and the flag will be removed. The version 1 of the API will maintain the current behavior.

02601489 (506061)

- ESCWA now limits the session timeout to 20 days. If an existing configuration is greater than that it will be limited to that value.

(665130)

- In ESCWA, the **Listener Properties** page now limits user inputs when the **smem** protocol is selected. Multiple host names are not permitted, and port selection is also not permitted.



**Note:** API functionality remains the same.

(665044)

- Remote file and remote SYS ID options can now be modified when adding or editing FCTs with Use Catalog.

(683164)

- CICS programs referenced the EXCI LINK statement now run under the same user as the corresponding JCL job.

02747263 (637024)

- On UNIX platforms, the `casverify` utility no longer lacks the detailed file and folder path checking previously only supported on Windows platforms.

(407163)

- Runaway timeout was intermittently incorrectly calculated.

02529887 (468050)

- The JSON output format for the `casverify` utility has changed. Messages specific to `casverify` itself are no longer identified by "msgout" but under a "messages" array.

(570009)

- For Enterprise Server application failure reports and storage dumps generated by runtime errors, the RTS error code is now taken into account during `es-dump-limit` (ES\_DUMP\_LIMIT) processing. Runtime errors with differing error codes will now be treated as distinct.

02660093 (561067)

- The **Allow no-password signon for default users** property has been added to the ESCWA **Advanced Region Properties** page. If this property is set to `false`, an explicit signon request with no password matching an enterprise server default user account will no longer be treated as a no-password verify, and will instead result in a not authenticated failure.

02728103 (625033)

- Previously, a successful call from JCL to EXCI might result in a ROLLBACK instead of COMMIT.



(504150)

- When no connection string is supplied through ESCWA/MFDS/esfadmin the vsam\_esm module will default to C:\ProgramData\Micro Focus\Enterprise Developer\es\_esm\_file\_directory. This directory will have been configured through running mfseconv init, which is called by the product installer in 10.0 and later.

(545065)

- The es\_default\_security.yaml file is now supplied with the product and is located at %ProgramFiles(x86)%\Micro Focus\Enterprise Developer\etc (Windows) or \$COBDIR/etc/vsam\_esm (UNIX). You can use this file as a template to configure the VSAM ESM Module. See the *VSAM ESM Module* topic in your product Help for more information.

(613052)

- Client connection to Micro Focus Directory Server (MFDS) would sometimes convert a fully qualified host name to just the simple host name. This could result in TLS connection issues if this did not exactly match the host names specified in the certificate.

02587914 (486048)

## File Handling

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- If the SORTOUT was a VSAM data set defined with the NOREUSE option and with DISP=SHR, MFJSORT was removing existing records (as if the REUSE option was in use). This behavior has been corrected, and MFJSORT now appends records to an existing NOREUSE VSAM file, regardless of the disposition.

02583983 (480002)

- During a SORT, SORT-EBCDIC is no longer (incorrectly) converting HEADER, TRAILER FIELDS to EBCDIC.

02596813 (503043)

- For various ICETOOL operations, the limits for the BI format have been corrected - SPLICE/SELECT operations limit the BI format to 1500 bytes; for all the other ICETOOL operations, the limit is 8 bytes.

02827146 (662089)

- For SORT operations, an issue in which E15/E35 user exit record flags weren't being set correctly after returning from the exit, to perform an insert, has been fixed. This particular issue only occurred when an insert was performed while the user exit record flags were set to 0 (first record). The flags are now set correctly to align with mainframe behavior.

02725254 (630030)

- During a SORT operation, SORT-EBCDIC PARM no longer (incorrectly) converts INREC FIELDS to EBCDIC.

02602838 (505058)

- The Micro Focus file handler now passes correct information to the third-party file handlers for the implementation of the FS\_RENAME\_FILE routine.

02794472 (559042)

- When writing records to a sequential spool file, it will not come under the affect of a semaphore. Additionally, use the FLUSHSYSOUT=OFF configuration option to improve performance when writing to the spool file; see FLUSHSYSOUT in the documentation for more details.

02805692 (651167)

## Host Access for the Cloud

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- The `hacloud.properties` file is now deprecated and the HACloud configuration details are stored in an `application-userprefs.properties` file. After installing 10.0, the HA Cloud `startsessionserver` script will rename any existing `hacloud.properties` to `hacloud_backup.properties`. You need to port over any configuration settings from the old file to the new `application-userprefs.properties` file.

(661065)

- The `hacloud.properties` file now includes a setting for the default location of a log file with information about starting the session server as well as other logging fields.

(502005)

- This release includes version 3.0.0.2 of the HACloud TN3270 emulator. HACloud uses a new configuration file, `application-userprefs.properties` in `%ALLUSERSPROFILE%\Micro Focus\Enterprise Developer\hacloud` (Windows) or `$COBDIR/etc/hacloud` (UNIX). If you are upgrading from a previous Enterprise Developer release, and the old `hacloud.properties` configuration file from the previous installation still exists, then the settings in this file take precedence, with the exception of the setting to enable HTTPS communications to the session server endpoint. If TLS was previously enabled, then after 10.0 the setting `server.ssl.enabled=true` needs to be applied to `application-useprefs.properties`. It is recommended to migrate your configuration settings over to the `application-userprefs.properties` file after the upgrade, and delete the `hacloud.properties` file.

(656064)

- In this release, Host Access for the Cloud will now attempt to retrieve credentials for the ESCWA connection from a secret which will be shipped with the product by default (in `microfocus/common/readonly`). You can override the default user credentials by supplying an `escwacreds` and/or an `mfdscreds` secret. If these secrets do not exist then the default supplied user will be used.

(658050)

## IMS Support

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- A problem that caused a GSAM read error on restart when restoring a GSAM input file to a particular CheckPointID has been fixed.

02686182 (566027)

- Corrected the MFS handling of PFKEYS pressed with no terminal data on segments in formats with OPT=2 to make the behavior compatible with MFS on the mainframe.

02615830 (515062)

## Interface Mapping Toolkit

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- The base path is no longer part of the **Service name** field in the **Properties** dialog box of **REST Web service Deployment Server** tab. (It is only visible in the **Advanced Settings** of the service name.)

02795415 (651091)

## JCL Support

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- This release provides support for up to DSNAME10 dataset name elements in `ES_ALLOC_OVERRIDE` rules.

02800575 (651099)

- Restarted batch jobs now update the condition codes used when evaluating further restarts of the same job. To this end, the recording of the result from a job restart has been changed to show the latest result from steps that are within the restart range rather than the results from all steps in the job.

02575437 (477008)

## Mainframe Access

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- Performing an action in AWM that required a PDS DIR or CATDCB could result in an exception.  
(487033)
- On UNIX platforms, the MFDAS command FINDMEM failed to return multi-part forms.  
(496020)

## Micro Focus Batch Scheduler Integration

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- The CASAPI function for MFBSI is now ON by default, which improves performance and security. To turn it off, meaning that CASSUB/CASOUT external commands submit the job, monitor the JCL region, and retrieve the JEYSYMSG output, edit the CASAPI entry in the `mfbsi.cfg` file, or specify `CASAPI=OFF` on the command line.  
(544087)
- Control-M (CTM) for z/OS does not support embedded spaces in variable values. The CTM behavior of MFBSI supports spaces, and in the case of AutoEdit variable values, removed the spaces and assigned the rest of the value to the variable. This caused a problem when executing jobs that used AutoEdit variables that contained a space at the end of the line followed by a character because the character was concatenated to the value of the last Autoedit variable. To accommodate spaces in AutoEdit variables, this release introduces the `CTM_SPACE` variable, which enables you to change the default MFBSI behavior to instead mimic the z/OS behavior: `CTM_SPACE={ [ON|YES] | [OFF|NO] }ON|YES` - Allow embedded spaces in CTM variables. Default is `OFF|NO` - Do not allow embedded spaces in CTM variables.

02608301 (526024)

## Micro Focus Directory Server

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- When starting or stopping an enterprise server region using MFDS or the ESCWA user interface, the `casstart` and `casstop /m` parameter would use the MFDS IP address rather than the host name, which could result in an issue if TLS certificates were used that required a particular host name.  
(505074)
- An issue introduced Patch Update 1 resulted in ESCWA not listing all enterprise server regions for legacy import if they contained script data and the MF Directory Server was not sufficiently authorized to import script data.

(636060)

- The Micro Focus Directory Server (MFDS) **Start on System Start** enterprise server region option on the ESCWA General Properties page was not working because the **Automated Execution Control Enterprise Server Credentials** were not being applied correctly.

02795649 (652065)

- When exporting enterprise server regions registered in the MF Directory Server using XML format, regions for which the user did not have read/write access could also be exported.

(526005)

- Issues existed with importing enterprise server regions saved in JSON, XML, and Legacy format into a MF Directory Server, which resulted in incorrect listener states and counts.

(559058)

- You can now control the execution and update permission for an enterprise server region's start and stop, and on unrespondent scripts, by using a new LDAP Enterprise Server Administration security resource class **Scripts** entity. If this security resource entity has been specified with appropriate access control entries, the MFDS session will require Update permission in order for the authorized user to modify a region's script or to enable or disable it. In addition, for a script to execute, then you must specify Execute permission. See *Class - Enterprise Server Administration* in your product Help for more information.



**Note:** This is not a region restriction, but applies to the MFDS instance where the region is specified. If no security or MFDS Internal Security is configured for use then region scripts will not be executed nor will they be able to be modified. The Scripts resource is not a security resource created by default. It can be created by the ESCWA interface or other LDAP administration configuration tools.



**Important:** In future product versions, the access control that uses the Scripts security resource will be a requirement in order for any region's scripts to be executed or modified.

02822038 (499063)

- The default **UI Session Timeout** value for MF Directory Servers has changed from -1 (no timeout) to 600 seconds (10 minutes). The default value for the MF Directory Server **API Session Timeout** has been reduced from 3600 seconds (an hour) to 1200 seconds (20 minutes).

(628068)

## PL/I Support

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- In -noopt mode, the Open PL/I compiler failed to short circuit IF comparisons involving the NOT prefix operator. This has been corrected.

(567011)

- Running CONTROLLED storage in a PL/I CICS program required that **Force Phase-In** be enabled to prevent a SIGSEGV upon the second invocation of the PL/I Program. This has been corrected.

02260472 (258078)

- The Open PL/I compiler erroneously allowed OFFSETVALUE(POINTER)), namely offsetvalue(sysnull()). The correct usage is: offsetvalue(binarvalue(sysnull())).

(386070)

- The precision of floating point arithmetic on x86 RedHat has been decreased from 63 to 52 to match mainframe behavior.

(506106)

- The data type for the Signal1 field in the MQGMO structure (cmqp.inc) has been changed from: `3 Signal1 fixed bin(31) bigendian init(0)` to `3 Signal1 pointer init(null())`. This data type change maintains a proper byte alignment in both 32- and 64-bit environments and better aligns with the same field/structure on the mainframe.

02746362 (632026)

- A problem that prevented the EZASOKET interface from correctly interpreting when the caller was PL/I has been fixed.

02851309 (681021)

- A problem that occurred when using the Windows API SetEnvironmentVariableA() to set an environment variable in a language other than PL/I caused the PL/I GETENV() built-in function return an incorrect modified environment variable value.

02605819 (505140)

## Run-Time System

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- The Java/COBOL application launcher - `cobjrun` - now supports Java command-line argument files. See <https://docs.oracle.com/en/java/javase/17/docs/specs/man/java.html#java-command-line-argument-files> for details on how these files should be constructed.

02744842 (636023)

- AIX 7.3 only: a dependence on Open XL C to create COBOL executables or shared objects has been removed.

02674547 (565031)

## SQL: Mainframe Batch Database Tools

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- An error that occurred in SQLUTB UNLOAD when the specified size of an LRECL was less than required for the row size has been fixed. The LRECL is now adjusted to accommodate the actual row size.

02445817 (612038)

- A problem with unloading GRAPHIC data using DSNTIAUL has been fixed.

02677441 (550046)

# Significant Changes in Enterprise Developer 9.0

This section describes significant changes in behavior or usage. These changes could potentially affect the behavior of existing applications or impact the way the tools are used.

The numbers that follow each issue are the Support Case Number followed by the Defect number (in parentheses).

- [.NET Support](#)
- [Application Workflow Manager](#)
- [AppMaster Builder](#)
- [Compiler](#)
- [Data Tools](#)
- [Documentation](#)
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- [Enterprise Server](#)
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- [Micro Focus Directory Server](#)
- [PL/I Support](#)
- [Runtime System](#)
- [Setup Issues \(Windows\)](#)

## .NET Support

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- The 9.0 release installs several .NET 6 NuGet packages each of which contains the assemblies for a specific Micro Focus functionality. New .NET projects, as well as existing projects you edit or build in 9.0 are linked to a core package, `MicroFocus.COBOL.Runtime.Core`, that includes the basic

functionality for the projects. You need to add any additional packages (such as a specific file handler, COBOL Accept/Display etc.) manually to the projects.

Building existing .NET COBOL projects created prior to 9.0 might result in build errors. You can ensure compatibility by enabling the use of the `MicroFocus.COBOL.Runtime` metapackage. Alternatively, you need to add any required NuGet packages manually to the older projects.

See *Upgrading existing .NET COBOL project files* in the product Help for details on how to upgrade.

## Application Workflow Manager

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- The related AWM resource (required to perform the resource operation) of the open file is now cached.  
02307586 (278005)

## AppMaster Builder

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- In this release, AMB file-tailoring skeleton files no longer require modification (usually these modifications consisted of enclosing paths within quotes) to use long and spacey file names. If you use customized file-tailoring skeleton files, you must compare and reintegrate any customizations applied to these files into the new skeleton files provided with this release. File-tailoring skeleton files are found in your `%ProgramFiles(x86)%\Micro Focus\Enterprise Developer\etc\ispslib` directory, and include:

- SSMSISP
- SSMSDLG
- SSMSMFS
- SSMCHK
- SSMPCOM
- SSMSCGEN
- SSMCOMP
- SSMOXGEN
- SSMCBL
- SSMMBMS
- DVSQL2
- DVSQLR
- DVSYMS
- DVSYMSX
- DVBAT
- DVVSM2
- DVMAIN
- DVJOBVSM
- DVJOBDDG
- DVJOBIMS
- DVJOBSQL
- DVCHECK
- DVIMS2
- DVCOPY

## Compiler

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- Preprocessor options of more than 256 bytes are now supported, and no longer cause the Compiler to crash.

02289875 02308713 (272069)

## Data Tools

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- A new print function available from the **File** group and the **File** menu enables you to print the records shown in the editor.

00367084 (12432)

- An enhancement to the **Compare Files** function has been added, so that when a comparison is made, the **File Information** option shows a statistics overview of the comparison being displayed.

02200177 (222157)

- In the Data File Editor, the **Compare Files** function has been enhanced to allow you to select start and end columns in which to compare, so only a subset of a record is compared, rather than the entire record.

02306654 (222159)

- A **Quick final page access** option has been added to the **Preferences** dialog box of the Data File Editor. When selected, large variable sequential files (files > 10,000 records) immediately jump to the last page of the file when it is opened.

02330923 02365033 02399254 (294002)

## Documentation

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- When using the cob command to link PL/I programs targeting Enterprise Server, you must include the `-lmfpdftpz` parameter in your link command to avoid problems in multi-step jobs.

02451241 (386064)

- **FIXEDOVERFLOW** conditions are now implemented and will occur when detected.

02163371 (203207)

## Eclipse IDE

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- When creating a new remote project using the SSH file system, the wizard now allows you to create a new **Micro Focus DevHub using SSH** connection. (Previously, only the **Micro Focus DevHub SSH Only** connection was available.)

(301058)

- The **Import Server option** (from within **Server Explorer**) is now working correctly with an XML if the XML file type is known. If the XML file is in an unknown format, an error message is displayed, and import is not possible.

02345573 (310017)

## Enterprise Server

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- A new option to uninstall a PAC installed on an enterprise server region before deleting the region has been added to ensure that all PAC components are properly removed.

01907370 (124107)

- ESCWA now validates the TLS properties to help prevent errors on entry.



**Note:** If ESCWA has an invalid TLS configuration, it reverts to starting without TLS enabled.

01983736 (203178)

- In ESCWA, a **Stop** for IMS MPRs, JES Initiators, and JES Printers now operates correctly.

02311796 (286178)

- An issue with not being able to update or navigate the ESCWA UO though the job output in the spool while it is still running has been resolved.

02322494 (286142)

- In ESCWA, the default dashboard can now be modified for all users of a server.

02458710 (392040)

- In ESCWA, the FCT Fix Up button has been added to the Active FCT page. See *Active FCT* in your product Help for more information.

(374021)

- The **Job View** page in ESCWA now includes a list of job steps that have run during the current enterprise server region up time.

(347033)

- A new configuration property has been added to ESCWA to enable the default language the UI displays to be overridden from the user's browser locale.

02227239 02307446 (260128)

- ESCWA now supports TLS enabled Redis repositories.

(306097)

- In ESCWA, the **Process ID** column has been added to the table on the **Dynamic Debug** page. See *Dynamic Debug* in your product Help for more information.

(350029)

- In ESCWA, the **Spool** page can now display multiple **Spool Output** types.

02503214 (401184)

- ESCWA now supports Expiration Dates for Catalog DCB.

02159515 (202201)

- In ESCWA, a new PAC **Client List** page has been added. This page displays a list of PAC members and associated information. See *PAC Client List* in your product Help for more information.

(384037)

- ESCWA now supports merged archive spool. See *Spool* in your product Help for more information.

(245050)

- An alternate index has been added to the non-recoverable temporary storage file TXTSNR. This is to enable queues to be returned in alphabetical order when browsing with INQUIRE. When warm starting non-recoverable TS, if TXTSNR has only a single key then the file will automatically be upgraded to include the alternate index. If there is a problem during the upgrade process then message CAS11405S will be written to the console indicating the failure and that the enterprise server region will fail to start. In this case, the file will either need to be repaired or temporary storage will need to be cold started.



**Note:** Once TXTSNR has been upgraded it can no longer be used on an older version of the product that does not contain this fix.

02441509 (389045)

- Corrected the spelling for the **db\_server\_name** Configuration Manager property. You will need to update existing 8.0 enterprise server region configurations by either applying any change on the ESCWA **General >Advanced** page, or by updating the **mfConfigManagerData** MFDS property through the ESCWA API. If this is not performed, the warning message `CASCF0071W`



Configuration Manager - The requested property (`db_sever_name`) was not found will be displayed in the Console log during region initialization. This will not cause any issues if the **Region Database Server Name** property was not previously used, or if it was set though the `ES_DB_SERVER` environment variable. Otherwise, you will need to reset this property using the above methods as the previous configuration for **Region Database Server Name** will not be honored, which might result in the region failing initialization.

(350050)

- A recent change resulted in EXEC CICS TIME(...) expiring immediately. This has been fixed.

02525957 (411120)

- In the context of a multi-hop Distributed Program Linking (DPL), if the last stage used the default mirror transaction, its back-end could be left hanging if a SYNCPOINT was invoked by the upstream partner. This has been fixed.

02432614 02434318 (377071)

- You can now list job steps to enable users to perform advanced restarts. Job steps can be outputted to JSON by `casout /%jnumber`. Job steps can be output to a table by `casout /%tnumber`. See `casout` in your product Help for more information.

(401023)

- When submitting JCL by content via ESCWA or the JCL command `cassub`, Enterprise Server will now authorize the request against a new `cassub.content` resource class under OPERCMDS. If this class is not specified then Enterprise Server will revert to existing behavior. See Resource Classes for ESMAC and Operator Command Security in your product Help for more information. A prototype definition has been provided in the standard LDIF files shipped with the product.

(313048)

- A new parameter, `-i` has been added to the `cassub` utility. This parameter enables the user to specify a correlator up to 32-bytes long comprised of ASCII printable characters. The JCL engine will ensure this correlator has not previously been supplied for a JCL JOB. If a duplicate correlator is detected, the job submission will be rejected and the previous JOB ID will be returned. See `cassub` in your product Help for more information.

02462072 (394004)

- The Redis server supplied with the product is now version 6.2.6. In ESCWA, you must now specify the **Certificate Authority Filepath**, **Certificate Filepath**, and **Private Key Filepath** properties on the **Advanced Region Properties** page for all enterprise server regions that are members of a PAC that has a TLS-enabled Redis Scale-Out Repository (SOR). See *Scale-Out Repositories* in your product Help for more information.

00373756 (12618)

- When a CICS abend occurs, the 4 letter abend code now appears after the Transaction ID in HSF records. There has been no change in behavior in the case of an RTS abend, where the transaction name followed by ABEND still appears.

(246037)

- EXEC CICS INQUIRE TASK LIST now includes dispatchable (queued) tasks in the returned LISTSIZE parameter.

(365089)

- When performing a DPL targeting a program that had an installed PPT specifying that it was remote, the use of the TRANSID option on the LINK would be ignored. This has been fixed.

02434323 (386136)

- During XA recovery, if a resource manager reports an in doubt transaction which has no log entry, a CASX00040W message will now be displayed in the console.

(425081)

- If a SOR cannot be connected during enterprise server region start up, then the region no longer starts. Previously, this only applied to the PSOR, but now applies to other SORs which were only used for TS

and TD queues. This change was made because the previous behavior could lead to queues being written to different locations (SORs or disk) across the PAC. If a PSOR cannot be connected during a process start up when the region is already running, then the process will be blocked until the connection can be established. Retries will be attempted at increasingly longer intervals. If a (non-PSOR) SOR cannot be connected to at process start up when the enterprise server region is already running, then the process will continue to start up. At queue access time, for a queue that must go to that SOR, the connection will be retried. If this is unsuccessful then the command will receive an IOERR.

02399193 (356005)

- ESMAC is disabled by default. ESMAC can be enabled from the **Advanced Region Properties** page in ESCWA.

(397027)

## File Handling

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- The SQL Server ENQ/DEQ implementation has been modified to eliminate any possibility of ENQ request failures occurring due to an intermittent Service Broker problem. The new implementation introduces a new ENQ stored procedure, and modification of the existing DEQ one to allow it to work with both the Service Broker and non-Service Broker implementations.

(285197)

- The OPEN EXTEND operation now follows the behavior expected from the OPEN statement as documented.

02454638 (386087)

- ICETOOL emulation now supports the RESIZE operator.

(350035)

## HA Cloud

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- The default color scheme for HA Cloud in Enterprise Server has been updated to cyan on black.

(291041)

- The bundled Host Access for the Cloud (HACloud) Session Server has been updated to 2.7.0.6.

(375012)

- Micro Focus Host Access for the Cloud shipped with Enterprise Developer now offers session customization options such as connection, and display options, and the functionality to record, and run macros.

(392026)

## IMS Support

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- A problem that occurred when a restart call (XRST) referencing a checkpoint ID received checkpoint data that originated from a different program when a shared checkpoint log file was used and the other program issued the same checkpoint ID has been fixed. IMS now requires that the name of the program issuing the XRST must match the name of the program that issued the checkpoint.

(310065)

- The JES alias feature is now supported for IMS application main programs executed from JCL.

02356855 (308032)

## JCL Support

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- After the release of Enterprise Developer 7.0 PU17 and 8.0, the structure of the M\_SPL\_JOB.dat file was updated. If you are upgrading to this release from a release that does not contain the update, you must rebuild M\_SPL\_JOB.dat using the following command, and then replace M\_SPLJOB.dat with NEW\_M\_SPLJOB.dat before executing the merge spool job.rebuild M\_SPLJOB.dat,NEW\_M\_SPLJOB.dat /r:v344-604  
02516141 (407126)
- When performing an IDCAMS REPRO on a cluster with the LIKE parameter set, if the LIKE cluster has data or index references associated with it, then similar data and index references are now created for the new cluster.  
02358077 (363063)
- If an XA switch module failed while a DSNRLI program was using it then there was no way to programmatically restart the switch module. This has been corrected. If a module fails with an TX\_FAIL error code (-7) the module can be reassociated with the unit of work by calling DSNRLI IDENTIFY. In this case the check for the correct DSNRLI call ordering has been suspended so that IDENTIFY can be called after an TX\_FAIL error. The TX\_FAIL return code will be passed back to the calling program so that it is aware of the error. TX\_FAIL is -7 and will replace the normal DSNRLI return code (8).  
02364792 (323018)
- System symbols, defined in SYS1.PARMLIB(IEASYM00) can now be filtered by use of the LPARNAME entry. See INITSYS.JCL in the jcl-symbols examples.  
(387029)
- Security for loading utility programs, either supplied by the user or any Micro Focus utilities, has been increased. Users can now specify a number of libraries that hold program modules and who can use them. See JCL Enhanced Security Checks in the product Help for more information.  
PSEC:103014 (86177)
- When a dataset is required by MFFTP to be sent (put) or received (get), then MFFTP issues a dataset lock that remains in effect until the end of the step. The location of the physical files used by MFFTP are also validated against the PHYSFILE rules (if implemented). This access validation could cause security errors if access is not allowed to the location of the FTP input and output file and might require that the location be changed. This is usually the default allocation location, but may also be specified by MFFTP\_TEMP\_DIR, or by adjusting the PHYSFILE rules to accommodate the location.  
02210700 (244030)
- A step running IKJEFT01 was incorrectly returning the highest return code of all commands executed instead of the return code of the last command executed. The MF\_IKJEFT\_KEEP\_MAX has been added to correct this problem. Its default setting is MF\_IKJEFT\_KEEP\_MAX=N. However, if the new behavior leads to a change in the COND CODE, and this is a problem for your application, you can return to the original behavior by setting MF\_IKJEFT\_KEEP\_MAX=Y.  
02532126 (415094)
- When the return code from an IKJEFT step exceeded 4095 it could be incorrectly adjusted depending on the IKJEFT program called. To remedy this, the return code when IKJEFT01 is called is changed to 12. Also, when IKJEFT1A or 1B is called, the return code is adjusted to RC modulo 4096.  
02514544 (406145)
- DSNRLI return codes did not always correctly reflect the outcome of the SRRCMIT and SRRBACK functions. This has been fixed.  
(408001)
- When the result of a SRRCMIT or SRRBACK call was a MIXED status, meaning that some XA modules committed or rolled back and some did not, then DSNRLI issue either commit or rollback upon shutdown at the end of the step. This was incorrect. DSNRLI will not issue commit or rollback at step end. The XA Recovery processing maybe able to recover the 'in doubt' transaction.

02512717 (406089)

- MFFFTP has been enhanced to pass relevant file transfer information for FTP operations such as PUT, GET, and DEL, to a user exit defined by the new environment variable, MFFFTPXIT. To enable the exit, set MFFFTPXIT to a user-exit program file, for example, the provided `MFFFTPXIT.cbl` sample file. A list of valid parameters is in the provided `mffftpexit.cpy` copybook. When the user exit is enabled and an FTP step returns a non-zero code, a copy of the `*.op` FTP output file is created using the `*.out` extension in either the defined `MFALLOC_LOC` or `MFFFTP_TEMP_DIR` location. Use the `*.out` file to determine the cause of FTP operation failures.

02287628 (259117)

## Micro Focus Directory Server

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- The External Security Manager (ESM) checks did not occur when an enterprise server region started or stopped. This has been fixed.

02402188 (355001)

- To query Enterprise Server security configuration information (details of configured external Security Managers and so forth) from the Micro Focus Directory Server when access is restricted, the authorized Enterprise Server user must have at least **Read** permission for the **Enterprise Server Administration** resource class **User Administration** entity.

(285199)

- Micro Focus Directory Server now restricts access to enterprise server regions that a signed-on user is not authorized to view.

02305916 (285169)

- Four new MFDS-only audit event codes (2 300, 2 301, 2 302, and 2 303) have been added. See *Audit Event Codes* in your product Help for more information.

02412285 (365149)

## PL/I Support

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- When assigning a PICTURED item into a FIXED DECIMAL, `FIXEDOVERFLOW` is now triggered if enabled and the target source or precision is not large enough to fit the PICTURED representation.

(400099)

- The Open PL/I compiler erroneously allowed `OFFSETVALUE(POINTER)`, namely `offsetvalue(sysnull())`. The correct usage is: `offsetvalue(binarvalue(sysnull()))`.

(386070)

- The internal consistency error in the PUT EDIT statement with a DO-loop that was never iterated has been fixed; however, we recommend avoiding dead DO-loops in PUT EDIT statements as they result in redundant code.

02518315 (407194)

- The Open-PLI compiler now performs Restricted Expression Evaluation on `AUTOMATIC`, `DEFINED`, and `BASED` declarations in addition to `STATIC` declarations as in previous releases.

00368483 (11358)

- The `OPTIONS` and `LIMITED` attributes now imply type `ENTRY` to correct a problem wherein type was not specified and the default type was set by applying the I-N rule to the variable name.

02048549 (165087)

- The behavior of the `PRECISION` built-in was incorrect for most data types, except `FIXED BIN`, `FIXED DECIMAL`, and `PICTURE`. This has been corrected.

(363237)

- When passing an array argument to a procedure with differing array dimensions or extents of the corresponding parameter descriptor, a dummy argument was created. To correct this, a Severe diagnostic message is now generated instead. In addition, when an array argument with variable extents was passed to a procedure whose corresponding parameter descriptor had constant extents, a dummy argument was created. To correct this, the array argument is now passed by reference and a Warning diagnostic is generated. Both of these issues apply to passing arrays without surrounding parentheses.

02310772 (286006)

- Previously OPTIONS(FETCHABLE) was not implied by the coding of a RELEASE statement for an ENTRY. This has been fixed.

01862366 (120035)

- Data exception 8097 now occurs when the sign nibble of a fixed decimal value does not contain a valid sign 0x0A thru 0x0F during an arithmetic operation, conversion, or assignment.

02198788 (222107)

## Run-Time System

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- By default, CTF information no longer appears in AUX Trace of an enterprise server region. To enable it, you now need to set `mftrace.emitter.es#level` in the MFTRACE\_CONFIG.

(328008)

- If an error occurs during thread clean-up, the runtime will now attempt thread clean-up again. If it fails for a second time the runtime will call `_exit()` to terminate the process immediately.

02286519 (258130)

- On UNIX platforms, when linking using the `cob` command in place of `ldpli`, you must include all of the specified `ldpli -l` options on the `cob` command line.

(410018)

- Attempting to call COBOL functionality after calling the `cobtidy()` API, to de-initialise the COBOL RTS, will now result in a COBRT090 error message. Previously it was documented that the results were undefined and it could cause subsequent problems, and/or errors, especially in a threaded environment. The aim of this change is to give a more meaningful error message, earlier, to help diagnose such issues.

(301136)

- The limit for the MAXGENERATION emitter property (for both BINFILE and TEXTFILE) has been increased from 10 to 100. The file size limit for each of these generations, as set by the MAXFILESIZE property, is 1000000KB.

02405466 (359001)

## Setup Issues (Windows)

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- Micro Focus Host Access for the Cloud emulator replaces the Micro Focus Rumba+ Desktop emulator previously supplied with the installer for Enterprise Developer for Eclipse or Visual Studio. Customers that have Rumba+ Desktop entitlement can continue to use it within Rumba+ Desktop.

(335003)

- In Windows 11 it is now possible to open COBOL 32-bit and 64-bit command prompts from the Terminal application.

(421016)

- On Windows, you must uninstall earlier versions of this product before installing 9.0.

(380028)

- 32-bit Windows is no longer supported.  
(382034)

## Significant Changes in Enterprise Developer 8.0

This section describes significant changes in behavior or usage. These changes could potentially affect the behavior of existing applications or impact the way the tools are used.

The numbers that follow each issue are the Support Case Number followed by the Defect number (in parentheses).

- [Code Analysis](#)
- [Common Communications Interface](#)
- [Compiler](#)
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- [Run-time System](#)
- [SQL: OpenESQL](#)
- [SQL Option for DB2](#)

### Code Analysis

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- Rules in nested folders are now correctly processed, as well as rules with the same name.  
(207020)

### Common Communications Interface

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- For improved security, SSL/TLS connections are now restricted to TLS versions 1.2 and 1.3 by default. This is an industry best practice. If you need to use older, less-secure protocol versions with legacy clients or servers you should consult the product online help for instructions on configuring TLS protocol versions.  
PSEC:103001 (87188)

### Compiler

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- When a RELEASE or RETURN statement is executed in an input or output procedure of a sort statement, if the SORT-RETURN special register is found to contain a value of 16, then the sort should be aborted, even in a case where the RELEASE or RETURN statement is at a lower perform level than the input or output procedure itself. Previously, this was not happening for programs compiled to JVM or .NET COBOL, but this erroneous behavior is now fixed.

01723392 (104114)

- When a variable is defined in a DECLARE statement with no explicit type, but a value that is a non-integer numeric literal, the type is assumed to be float-long (i.e. a 64 bit floating point).

(148103)

## Containers

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- The containers image build tool now supports custom Java run-times which helps to keep the size of Java-based applications smaller.

(182004)

## Eclipse IDE

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- COBOL formatter functionality has been enhanced with the introduction of a 'Code Clean Up' feature. The code clean up preferences are stored in profiles, similar to the COBOL formatter preferences, and are also applied in a similar way, within the COBOL editor. See *Formatting COBOL code* in the documentation for more details.

(123034)

## Enterprise Server

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- The Security Manager passwords no longer appear in the `commonwebadmin.json` configuration file.  
(203052)
- The X-XSS-Protection header will now be set on all requests instead of only on API requests.  
01938835 (138176)
- In ESCWA, the colors and contrast have been adjusted to improve visual accessibility.  
01995403 (158071)
- ESCWA now displays an improved message if there is an issue with loading the application, especially in the case where there is a browser incompatibility.  
(241013)
- ESCWA now handles enterprise server regions that use character encodings other than windows-1252.  
00370773 (11742)
- In ESCWA, the **Console Log** page now enables you to easily traverse and navigate the log. The new paging feature uses an API call from the Communications Server group documented in the Enterprise Server Administration Server API, typically located at `http://localhost:10086/docs/#/Communications_Server` on the machine where you have the product installed.  
02085456 (191017)
- ESCWA now supports multiple PACs in a single Redis store.  
(248003)
- ESCWA now handles enterprise server regions that use character encodings other than windows-1252.  
(91001)
- In ESCWA, the IMS MPR Processes table on the Monitor > SEPs page now displays the new IMS Type and PROCLIM columns from MPR PWFI support.  
(182066)
- In ESCWA, on the **Communications Process** page you can now specify a Requested Status for the communications process.

00669779 OCTCR50A69378 (69378)

- In ESCWA, the CICS DCT resource now displays all fields regardless of the type. See *Transient Data Queue* in your product Help for more information.

(173056)

- In ESCWA, the **Catalog DCB** page now displays the file size in bytes.

01909652 (138002)

- ESCWA now supports Circular Logging. On the **Tracing and Logging Settings** page you can now specify the **Log Max File Size** and the **Log File Count** fields. By default, these fields are set to 1024kB and 5 respectively. See *Tracing and Logging Settings* in your product Help for more information.

02083633 (191019)

- In ESCWA, a new optional **Logon security resource** has been added. This can be used to control users' ability to log on. See *Security Resources to Control ESCWA and API Access* in your product Help for more information.

01886579 (124022)

- CICS THRESHOLDS now support IMS. Notes modified in the following three topics: CICS Defined THRESHOLDThresholdActive Threshold

(246113)

- You can now define and install shared SOR Models. In the **SOR Model** dialog box, check **Shared** to enable the SOR Model to be shared between PACs.

(244088)

- CICS Resources can now only be created via the group if they are appropriate for the functionality of the enterprise server region.

01858819 (148068)

- For LDAP-based security in Enterprise Server, the processing of password changes has been modified to address security issues, inconsistencies among configurations, and other issues. See *Understanding passwords with LDAP-based security* in your product Help for more information.

(118088)

- Enterprise Server with LDAP-based security now denies a sign-on attempt by default if it includes a password-change request (a new password is supplied), and the password change fails. This was the existing behavior in some configurations but not in others. It is now consistent and configurable. See *MLDAP ESM Module Custom Configuration Information* in your product Help for more information.

(108046)

- A change has been made to the way that TS queues and TD queues are stored in a PAC. This was to ensure that deleting a 0TSQ did not also delete all queues that had a 0TSQ\_ name prefix.



**Note:** After the update is applied you must cold start your PAC.

(183044)

- In a PAC, the SIT setting is now honored when a TS or TD is to be applied to the enterprise server region if the TS or TD is not under a SOR, MFDBFH, or Fileshare. This means that if a SIT has to cold start for TS or TD and the files are either in the workarea or on disk then the SIT settings will be applied, otherwise the PAC-wide settings will be applied.

02149316 (204020)

- EZASOKET traffic will now be assigned to Communications Process instance #1. You might need to consider this if you use load balancing.

02060014 (201009)

- When a PAC is cold started, the configuration file specified by MFDBFH\_CONFIG will be uploaded to the PSOR and a temporary file created in the enterprise server region's workarea. This temporary file will be used by all the processes for that enterprise server region. Subsequent enterprise server regions joining the PAC will then create a temporary file in its workarea for the MFDBFH\_CONFIG from the



PSOR store. If an enterprise server region in the PAC is killed or is terminated abruptly than the restart of the enterprise server region will try to recover the previous UUID left in the PAC and DEQ all remaining ENQs in MFDBFH that were created from the previous run. New messages will be created in the `console.log` identifying if the recovery was initiated and successful, if the enterprise server region could not be recovered automatically, the region will stop. A log file will be created in the workarea with the following file naming convention:

```
Caspac_Recover_UUID_XXXXXXXXXXXXX.log
```

For example: CASCD4012W Region was not stopped properly, recovering previous region UUID 14BAAA87B4C010BFBDE278A5F65B350C 18:15:17CASCD4014I UUID recovery file log `C:\Users\mag.CORPDOM\Documents\Micro Focus User\Enterprise Developer\WORKAREA\RAS1\Caspac_Recover_UUID_14BAAA87B4C010BFBDE278A5F65B350C.log 18:15:18`. Using the `caspac` utility with the `-aStatus` parameter will display if the enterprise server region in a PAC has lost its connection to the PSOR. If you determine that the region is no longer in the PAC, then you can run the `caspac` utility with the `-aRecoverUUID` parameter to recover the enterprise server region. If the `-aRecoverUUID` parameter is used, then a file will be created in the current directory with the following file naming convention:

```
02081952 02123645 (182093)
```

```
Caspac_Recover_UUID_XXXXXXXXXXXXX.log.
```

See `caspac` in your product Help for more information.

- Functions have been added to `file_utilities` which check a given file name against either a default blacklist containing operating system reserved file names, or a passed blacklist. Read, write, and delete in AES and MSCPD use this function to disallow secret names which are inappropriate names.

```
OCTCR50A7844 (112022)
```

- The default users are now able to access only the corresponding areas:

```
mfuser -- esmaccicsuser -- CICS and enterprise server region start and stop.
```

```
jesuser -- JES related operations and areas.imsuser -- IMS related operations and areas.
```

```
01990931 (138369)
```

- Fileshare is no longer used to locate the Resource Definition and CNV file.

```
00468648 (69010)
```

- MQ updates did not rollback on step failure. This has been fixed.

```
01976727 02161235 (155010)
```

- PSOR stores are now prefixed by the PAC NAME and a version number enabling you to run multiple PACs in the same PSOR, simplifying the incompatible upgrade process. The `caspac` utility enables you to add the PAC Name as part of the command line parameters using `-pPACName` or if not specified using the `ES_PAC` environment variable. See `caspac` in your product Help for more information.

```
(202162)
```

- The XA reconnect mechanism now attempts to reconnect to all XA entries marked as "enabled" at the start up of the enterprise server region. To prevent the reconnect attempts, do one of the following:

- Remove the XA manager from the enterprise server region definition.
- Set the XA manager as disabled before starting the enterprise server region.

```
01991481 02003277 (151008)
```


- A new MLDAP ESM custom configuration section has been added. The `[Prefix Search]` option enables the Prefix Search wildcard optimization for limiting the scope of wildcard resource entities checked under a resource class. See *MLDAP ESM Module Custom Configuration Information* in your product Help for more information.

```
00726158 (73180)
```

- For LDAP-based security in Enterprise Server, the processing of password changes has been modified to address security issues, inconsistencies among configurations, and other issues. See *Understanding passwords with LDAP-based security* in your product Help for more information.  
(118088)
- Enterprise Server with LDAP-based security will now by default deny a signon attempt if it includes a password-change request (a new password is supplied), and the password change fails. This was the existing behavior in some configurations but not in others. It is now consistent and configurable. See *MLDAP ESM Module Custom Configuration Information* in your product Help for more information.  
(108046)

## File Handling

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- The connection registration process has been enhanced to rectify a problem where XA registrations sometimes failed to register with MFDBFH in an Oracle RAC environment.  
 **Note:** This fix is dependent upon the Oracle XA switch module being recompiled with the latest XA switch sources.  
02214893 (246077)
- SYMNames support has been added to the ON operand in the SELECT statement of ICETOOL.  
02040047 (167028)
- When using the SELECT operator of the ICETOOL emulation, a validation check has been implemented to ensure that when making use of the DISCARD operand, the data set opened for output does not have an LRECL greater than the LRECL that ICETOOL is expecting. If it does, the job will fail. This check may now cause jobs that previously ran successfully to now fail, but this behavior is now consistent with that of the mainframe.  
01978959 (199001)
- Micro Focus' ICETOOL emulation now sends carriage control characters in the LIST data set by default. The RECFM of the LIST data set will be FBA. If NOCC is set, the carriage control characters are suppressed and the RECFM of the LIST data set will be FB.  
01685295 (97066)
- There have been some performance improvements for files opened exclusively (i.e. DISP=OLD, DISP=NEW, and DISP=MOD), in batch jobs running under Enterprise Server.  
00780741 (101034)
- The dbfhadmin utility has been enhanced to allow the integrity of a datastore to be verified, and optionally, fixed up: use the `dbfhadmin -verify -list|-recover` options. See *The dbfhadmin Command Line Utility* in your product Help for more information.  
00778044 (90143)
- The dbfhadmin command-line utility has been enhanced to provide the capability for verifying and optionally repairing (cross-)region databases.  
02123645 (193071)
- The cross-region database heartbeat interval can now be configured using the `dbfhconfig -add|-update -heartbeat interval-in-seconds` command. The default heartbeat interval remains as 5 seconds. A warning message is now output to the Enterprise Server console during region database start-up if the heartbeat interval is configured to be >15 seconds. The larger the heartbeat interval, the longer the time that is required to be able to recover (cross-)region database resources. Recovery can only take place for a process if its associated heartbeat record has not heartbeat within the last "heartbeat-interval + 5" seconds.  
02155269 (202149)
- The performance of PostgreSQL optimized I/O has been improved. If you use the `psqlodbc` device driver, you will need to ensure that you are running with version 12.02.0000 or later. This change has

been tested with version 13.01.0000. To take advantage of the performance benefits of this change, specify `BatchSize=100` for each of your ODBC DSNs. Using a version of the driver earlier than 12.02.0000 could result in a performance degradation when deploying large files to datastores.

(125032)

- Table record locking and database record locking are incompatible and may lead to data corruption if used together by separate processes when processing the same file. MFDBFH has been enhanced to ensure that if a file is already opened in a process with table locking, all other processes attempting to open the same file, even if requesting database locking, will also use table locking. However, if a process has a file opened using database locking, other processes attempting to open the file will only be allowed to do so if they are transactional files (i.e. database record locking can only be used for transactional files). An attempt to open the file as non-transactional will fail. Refer to the *Record Locking Strategies* documentation for more information.

(102011)

- MFDBFH now enforces the existing requirement that a region database used by a PAC, or a region database used by an ES region configured to use `ES_LOCK_DB`, is not used by any other PAC or `ES_LOCK_DB` regions. This is necessary to avoid problems such as jobs with the same name submitted to two separate regions, but erroneously using the same region database, from being blocked by waiting on `SYSZJOB` and/or `SYSZJOB` ENQs. A check is now performed during region start-up to ensure that the region database is not already being used by another region. If it is, the region start up will fail, with error messages indicating the cause of the failure output to the ES console. Existing ES PACs/regions will need to be stopped and restarted for these new region database state checks to take effect. The `dbfhadmin -region -status [-reset]` command has been introduced to allow a region database's state to be displayed and, optionally, reset. See *Resource Locking* in your product Help for more information..

(121030)

## JCL Support

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- The User Exit event has been updated to contain the date and time of the job submitted when the job-ready event occurred in the past. To make use of this functionality, you must recompile the CAS User Exit Event Manager. See *mfjdjevt.cpy* for more information.

(177018)

- A new environment variable, `ES_JES_ENFORCE_EXPIRE_DATE`, has been added to determine whether or not to check the expiration date when deleting a catalogued dataset, and if expired, delete the dataset. If it hasn't expired and the `PURGE` option has not been specified, the dataset is not removed. The `PURGE` keyword is required to delete non-expired datasets. `PURGE` removes the underlying physical dataset file unless it is referenced by another catalog entry. `SMS MANAGEMENTCLASS` now supports maximum `RETAIN` days. See the example of the `%SMS` command in the *Using SMS MGMT Classes* topic in your documentation. The `EXPDT` entry in a `DD` statement must be a four-digit year (YYYY); otherwise 1900 is the default, which is in-line with the mainframe processing, and prevents unexpired datasets from being erroneously removed (as was the case with the previous default of 2000).

3190103 00368441 (12368)

- A change in behavior of the evaluation of step `COND CODES` has been made. The new behavior is that step `ABENDS` now take precedence over normal return codes. This corrects a problem that caused a step that returned a higher decimal value than an earlier step `ABEND` code to take precedence and become the job `COND CODE`.

02210859 (244066)

- It was possible to run a job without required enques. To correct this, an error now occurs at the start of a job if the required enques are missing, and the job does not run.

02164345 (203249)

- SYSOUT datasets that were referenced in later steps were incorrectly marked as temporary, and therefore 'PASSED' on in the job. This caused them to be deleted at the end of the job. To correct this, those SYSOUT datasets are now 'RETAINED'.  
00713567 (69460)
- The ALTER command now takes the TO and FOR options to enable specification of the retention period for the entry being altered. The maximum retention period may be limited by the management class.  
3190103 00368441 (12249)
- The IDCAMS LISTCAT command ALL parameter now generates a separate HISTORY report that shows the creation date time and job, the last changed date time and Job, and the expiration date. A new environment variable, ES\_JES\_LISTCAT\_YMD, has been added to determine the date format used in the HISTORY report generated when the IDCAMS LISTCAT command specifies the ALL option.  
3190103 00368441 (11429)
- The validation of configuration settings used by JES has been improved, together with more detailed error messages.  
02041040 (165046)
- Support for DSENQSHR has been added to JES via the ES\_DSNQSHR environment variable. See the *ES\_DSENQSHR* topic in your product documentation for full details.  
01818520 (111002)
- Two new spool housekeeping performance options, USE\_DISK\_HK and DISABLE\_LOCK\_FOR\_BULK\_DELETE, have been added to enable spool housekeeping to be processed on a local disk instead of the server. See *Configuring the MVSSPLHK Housekeeping Process* in your product Help for more information.  
00367284 (79030)
- GDG model support has been updated to support the assignment of an empty subdirectory value in the allocation override configuration (see the *JCL - Allocation Override sample* in the Mainframe Samples Browser).  
02177846 (209041)
- In a security-enabled region, the REXX SYSEXEC or SYSPROC dataset used by IRXJCL was not validated for user access. This has been corrected. If the user does not have permission to access (READ) the dataset, an S913 security violation abend is generated, and "MVSAF0222S Insufficient authority to read dataset '<DATASET NAME>'." is written to the SYSTSPRT. A message is also written to the job log: "\*MSG User not authorised to access SYSEXEC <DATASET NAME>". This fix might require updates to the DATASET access rules.  
02144158 (248013)
- In a security-enabled region, the dataset containing a REXX or TSO command was not validated for user access. This has been corrected. If the user does not have permission to access (READ) the dataset, an S913 security violation abend is generated, and "MVSAF0222S Insufficient authority to read dataset '<DATASET NAME>'." is written to the SYSTSPRT. This fix might require updates to the DATASET access rules.  
02144158 (208030)
- A problem that erroneously caused some user-supplied parameters to translate from EBCDIC to ASCII when calling DSNRLI has been corrected. The *dsnrli.cpy* copybook and *dsnrli.inc* PL/I include file have been revised to have the full declaration of ACCOUNT-STRING. You must recompile copybooks that use either of these modules.  
(161065)
- The JCL spool file has a new format. Starting with this release, you must use the *mfsplcnv* tool to convert spool files created using a previous release from the old format to the new. See *Spool Files* and *mfsplcnv Spool Conversion Utility* in your product Help for more information.  
(113011)

- An excess of 999 duplicate DD statements per step caused a hang in JCL processing. This has been corrected and an error message indicating that this number has been exceeded is now generated (JCLCM0640U).  
00775329 (90002)
- The new MFJ\_LEX\_LOCATION JCL environment variable enables you to specify an alternative location for the storage of JCL lexicographical files, which are created when a job is parsed, and stored in the same directory as the job log by default. The alternative directory location must be accessible by all regions that both submit and run jobs.  
(116002)
- The layout, including the position of fields, in the IHAPSA.MAC and IKJTTCB.MAC copybook files used to hold information for the JCL control blocks for PLI programs has changed. To apply this fix to existing applications, recompile and validate all PLI programs that include these copybooks.  
(105043)
- MFFTP now converts from EBCDIC to ASCII in PUTs and from ASCII to EBCDIC in GETs, for files cataloged as EBCDIC when a TYPE A or ASCII sub-command is issued and when the new environment variable MFFTP\_ASCII\_CMD\_XLATE is set to Y (default is N).  
02157927 (202176)
- JCL job behavior has been updated to address an issue that caused the generation of a //SYSIN entry when non-JCL statements, such as blank lines, preceded the first step. The generated //SYSIN entry is now marked as invalid, and a JCLCM0642U parsing error is issued.  
00368443 (11497)

## Machine Administration

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- A problem with using the .NET 3.5 framework has been fixed.  
(204144)
- A problem with CPU conversion has been corrected.  
(199042)

## Mainframe Access

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- Previously when authenticating with the mainframe, login failure messages provided too much information which could potentially be exploited for username enumeration. Login failure messages will now only state that invalid credentials were provided. This applies to MFDAS, MFDASMX, Mainframe Explorer in Eclipse and Visual Studio, MVS Explorer in Eclipse, and SyncMon.  
01868545 (119073)

## Micro Focus Communications Server

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- When an enterprise server region is configured to use External Security, access to the Communications Server's "statistics" Web page is now restricted, just as access to the Communications Server log is. To permit access to this page for secured enterprise servers do one of the following:
  - Disable Communications Server control listener security by adding the following to the **Configuration Information** field for the communications server:

```
[security]control listener=noInstruct
```

Users must provide Enterprise Server credentials when prompted. This can occur when you attempt to view the page, and when **Allow unknown resources** is checked in the region security configuration (use this with caution)

- Add a resource security definition named "Statistics" to the "Communications Server" class, with an ACL that grants READ permission to those users who should have access to the page

00368582 (11442)

## Micro Focus Batch Scheduler Integration

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- The Micro Focus Batch Scheduler Integration (MFBSI) no longer hangs while waiting for a response from the license manager.

02006571 (162055)

## Micro Focus Directory Server

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- The `mfd` `/s` option supports the specification of the optional Enterprise Server `user id` and `password` parameters using a configured Micro Focus Vault Facility location rather than using literal strings for credentials. For example:

```
mfd /s 1 mfsecret:user/user_001/id mfsecret:user/user_001/pwdwhere user/  
user_001/id and user/user_001/pwd
```

Are secrets stored in the default-configured vault. These values can be populated and administered using the `mfsecretsadmin` utility. See *Vault Facility* in your product Help for more information. The `mfd` `/x` and `/g` command-line options also support credentials stored in the vault.

02131532 (193088)

- If MFDS is configured to store sensitive values in the vault (for example, XA openstring or autostart credentials), these values were not being included in legacy data format or XML export of Enterprise Server configuration information. Subsequently, these values could not be reimported. These sensitive values are now included in the exported data. Micro Focus recommends that you protect the exported files with appropriate access control.

(202272)

## PL/I Support

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- Previously, if STRINGRANGE had been enabled by the `-prefix stringrange` compiler option, and a user program did not contain an `ON STRINGSIZE` statement, there was no message printed out indicating that STRINGRANGE had been triggered. The message now appears in this scenario.

00696776 (73031)

- Nested TYPEs (TYPE of TYPEs) are now supported.

00366179 (11649)

- Nested LIKEs (LIKE of LIKEs) are now supported.

00366181 (13419)

- A problem that prevented the `CONTROLLED` parameter from displaying correctly in the compiler listing has been fixed.

01916288 (130002)

- The compiler listing file has been updated to provide enhanced output when the `-xref` compiler option (cross-reference listing) is in effect. The listing file now indicates which variables and other identifiers, such as procedures and labels, are unreferenced, and where they are declared. This helps you to

eliminate unnecessary declarations, thus reducing storage requirements and improving code readability. Where a member of a structure is referenced, this flags the entire structure as referenced. External variables and procedures are not flagged as unreferenced. To accommodate include files, the nomenclature for a definition (DEF) or reference (REF) in the cross-reference listing is a number of the form *n.m*, where *n* is the line number and *m* is a file identifier. A list of file indenters and corresponding file names is generated at the end of the cross-reference listing.

02159460 (203162)

- The compiler listing file has been enhanced to indicate which variables and other identifiers, such as procedures and labels, are unreferenced, and where they are declared. This helps you to eliminate unnecessary declarations, thus reducing storage requirements and improving code readability. Where a member of a structure is referenced, this flags the entire structure as referenced. External variables and procedures are not flagged as unreferenced. To accommodate include files, the nomenclature for a definition (DEF) or reference (REF) in the cross-reference listing is a number of the form *n.m*, where *n* is the line number and *m* is a file identifier. A list of file indenters and corresponding file names is generated at the end of the cross-reference listing.

01858879 (120030)

- An application doing a WebSphere MQ SIGNON caused an invalid result from a PL/I exponentiation calculation if WebSphere MQ was using a locale other than C/Posix. This has been corrected for the `de_DE` or derivative locale.

01991479 (155012)

- I/O directed by PUT LIST now uses BX format for type OFFSET.

(195051)

- A problem with PLIDUMP prevented control from being returned to the ON ERROR after completing the dump when PLIDUMP was driven with the H option from an ERROR on unit that had established ON ERROR SYSTEM. This has been fixed.

02134496 (194112)

- The dumping of H(eap) memory in a PLIDUMP now checks for patterns of three or more identical lines and issues a "same as above" message indicating the memory range instead of printing the entire batch of lines.

02160703 (204151)

- When using the PLIDUMP facilities H option on a system that had an artificial limit on maximum file sizes, an infinite loop sometimes occurred if that maximum file size was reached. This has been corrected. The PLIDUMP is now truncated at its maximum allowed size.

02162046 (203155)

- Previously, when using PLISAXA, the document length as driven to the Start of Document event was incorrect if the XML document contained characters that exceeded hex 7F. This has now been fixed.

00381945 (61228)

- A new built-in function. SQRTF, has been added to generate an ERROR condition if its condition operand is negative. The SQRT function has been updated to do the same. Previously, SQRT sometimes returned a floating-point NaN.

(193100)

- In previous releases, FIXEDOVERFLOW was not raised when an attempt was made to assign a value to a FIXED DECIMAL variable that was too large, causing the value to be truncated. The behavior has been changed to raise an error if FIXEDOVERFLOW is not present.

02163371 (204181)

- The PL/I run-time system has been enhanced to honor the READ FILE(xx) IGNORE(x) syntax for sequential files.

02047425 (183067)

- The OPTIONS(NOEXECOPS) attribute of a procedure statement is no longer ignored, but is now honored for programs running under the control of JCL.

3238380 (11686)

- A new feature, PL/I data breakpoints has been added. A data breakpoint breaks execution when a specified memory location is written. Use of data breakpoints assumes expert-level knowledge of how memory works, how variables are allocated, and how data is written to memory. For complete details, see the Using Breakpoints topic in your product documentation.

00370003 (12178)

## REXX Support

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- In a security-enabled region, the REXX SYSEXEC or SYSPROC dataset used by IRXJCL was not validated for user access. This has been fixed. You do not have permission to access (READ) the dataset, an S913 security violation abend is generated, and "MVSAF0222S Insufficient authority to read dataset '<DATASET NAME>'." is written to the SYSTSPRT. A message will be written to the job log: "\*MSG User not authorized to access SYSEXEC <DATASET NAME>". Note: This fix might require updates to the DATASET access rules.

(247033)

- EXECIO \* DISKW was stopping on the first line containing no characters, writing out no further records. Now after encountering an empty record, a line with only a linefeed is written and processing stops.

01991499 (158007)

## Run-time System

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- The native COBOL multi-threaded demo is now available for Windows development products.

(3765)

- Basic support for xterm-256color has been implemented.

(57591)

## SQL: OpenESQL

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- A performance problem in a SQL program using fixed-length character arrays when compiling a COBOL program and using array fetch has been resolved.

02152406 (203060)

- A new feature to assist migration between databases has been added. SQL error codes and messages may be mapped to different values or suppressed to match those expected by the application.

(193003)

## SQL Option for DB2

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- An incorrect SQLCODE of -406, indicating a decimal value was too large, has been resolved by an update that ensures flag bits for query constants are full initialized within the query common space.

00739861 (86050)

# Significant Changes in Enterprise Developer 7.0

This section describes significant changes in behavior or usage. These changes could potentially affect the behavior of existing applications or impact the way the tools are used.



The numbers that follow each issue are the Support Case Number followed by the Defect number (in parentheses).

- [Application Workflow Manager](#)
- [Assembler Support](#)
- [Common Communications Interface](#)
- [Communications Server](#)
- [Compiler](#)
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- [Reverse Debug and Live Recording](#)
- [REXX Support](#)
- [Run-time System](#)
- [SQL: Mainframe Batch Database Tools](#)
- [SQL: OpenESQL](#)

## **Application Workflow Manager**

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- The checkout tool has been extend with the new input parameter "Resource Depth" which indicates how the checkout will be performed. Allowed values are:

- 5 Infinite (all files and folders are check out recursively).
- 4 Immediate (direct files and empty folders are check out).
- 3 File (only files are check out).
- 2 Empty (the selected resource is check out without content).

See *Checkout* in your product Help for more information.

00486821 (71096)

- The ChangeMan attachment model now enables you to define job cards by a context menu action on the application level. The action "Set Job Cards" is provided under the group "Quick ChangeMan Access". If job cards are set, they are used in ChangeMan actions which submit a job, for example, the build action.

(10698)

- There are now new import/export functions available in the filter definitions view. The import/export functions are available as context menu and tool bar actions.

00371941 (13136)

- The Endeavor attachment model now displays an error message when an attempt is made to open a nonexistent element for editing.

3221338 (12418)

## Assembler Support

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- Define Constant character items are now filled with EBCDIC spaces when you specify a null character string to match the IBM HLASM behaviour. For example:

```
ALAB 40C'' or ALAB CL40''
```

DC C" instructions are now IBM HLASM compatible. This should not affect any customer but some may notice cobol like DEFAULTBYTE(X'40') values in their DC C... data items now. Such a change should be innocuous for existing customer programs.

3237050 (12504)

- On Unix/Linux environments assembler data tables (.MOD files) can now be generated entirely from the command line with the new MFMODGEN utility:

```
mfmodgen filename.MLC
```

This assembles and links *filename.MLC* to *filename.MOD* suitable for use in EXEC CICS LOAD COBOL statements.

00367288 30004 00377337 (11608)

## Common Communications Interface

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- The default TLS Security Level has been increased from 0 to 1. This change will not affect you if you have specified your own security options. If you rely upon the default TLS security options you might find that some old clients that are restricted to the use of weak ciphers will no longer be able to connect. See *Security Levels* and *Specifying a Server Protocol and Cipher Suite Preference* in your product Help for more information on the change to Security Level 1.

(8453)

## Communications Server

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- The functionality of GIVE and TAKESOCKET have been modified to make them more similar to the documented IBM behavior:
  - If a caller issues a GIVESOCKET specifying a subtask, then only a caller will be allowed to take the socket if they specify the same subtask.
  - A caller can supply an empty (spaces) subtask on the client parameter to indicate that anyone can take the socket. In order to achieve this, a dummy client is inserted during a GIVESOCKET call if the subtask name does not match an existing client entry.

00422057 (59129)

## Compiler

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- Programs with file records greater than the documented limit of 62KB will now generate an error that they previously did not (COBCH0649) - although being an E level message, the program can still be executed and will work if it did so previously.

3227892 (12447)

- Two of the available Ant parameters for compiling COBOL programs have been renamed as follows (functionality remains the same):
  - `forceCompile` becomes `mf.forceCompile`

- threadCount becomes mf.buildThreadCount

3230709 (12665)

## Data Tools

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- The editor now automatically selects the first record in comparison when first loaded. The Editor will automatically select first record in comparison when first loaded

3212848 (11362)

- Data File Tools now provides the Data Explorer, which is a catalog view that can connect to either ESMAC or ESCWA. When connecting to ESCWA, it enables you to open multiple data sets.

(70242)

- The scrolling speed for formatted records has been increased.

00366018 (11378)

## Eclipse IDE

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- In Server Explorer, the "associate with project" option is no longer available for remote servers. Remote servers are defined as any belonging to a remote directory server or remote ESCWA.

(57093)

- When using the embedded Rumba display in Eclipse, three new features have been added:

- Secure server connections using SSL/TLS.
- Multiple TN3270 display views: one view per connection.
- Import and export connection details. Additionally, the connection information is now retained between workspace restarts.

See *Running Applications in a TN3270 Mainframe Display* in the product documentation for more details.

(9212)

- The Format Program option is no longer available for projectless files. Instead, select the Format option and the text you want to format.

(8743)

- Customers using Eclipse on Windows who connect to a Development Hub on UNIX can now create remote unit test projects. Remote unit test projects are available for native COBOL when you use a Samba or RSE connection to the DevHub.

3164533 (13318)

- Within a debug configuration for a remote project, you can now specify source files and debug symbol files that reside on remote hosts other than the one containing the remote project.

00363627 (12609)

- When starting a server from Server Explorer, if that server is unsecured, you are not prompted to add any credentials.

(62136)

## Enterprise Server

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- The structure returned by EXEC CICS ADDRESS ACEE now conforms to the IBM IHAACEE definition.

3241109 (11667)

- There are more security checks performed in addition to the verification against `casout` under the OPERCMDS class. Depending on what options are used, checks are also performed to ensure that the user has access to a particular job - such as for restarting, modifying, or viewing datasets. The corresponding rules are under the JESSPOOL class. When trying to retrieve a dataset, additional checks are made for the particular dataset being accessed. This is also under the JESSPOOL class.

3234588 (11576)

- Previously, there was no security check performed when an ESMAC user tries to access the console, traces, or dumps. This is no longer the case. If you use LDAP-based security you can now add the new DIAGS resource under OPERCMDS class and provide access to ESMAC users accordingly.

3231918 (12556)

- When locks are being stored in a database (for example, when running in a PAC), a CICS ENQ will, by default, be stored in the region database. ENQs are directed to the cross-region database if they match an ENQMODEL that has an ENQSCOPE value that is not equal to spaces. This enables ENQs to be shared outside of the region (or PAC). There is a performance overhead to storing ENQs in the database. If an application uses ENQs and does not need them to be shared outside of the region, then you can specify the new attribute in the ENQMODEL resource to direct matching ENQs to shared memory, this can improve performance. For example, this might be used for an application running in a PAC that issues multiple STARTs to each ENQ on the same resource. In this case, the STARTed transactions will all run in the same region and it would be safe to store those ENQs in shared memory provided that the resource being ENQed on is unique to these STARTed transactions. Note: An EXEC CICS START that uses the TERMID option might not run in the same region as the STARTing program. When running in a PAC, the transaction will be transferred to whichever region the terminal is connected to. In this case, it would NOT be safe for ENQs taken by the STARTed transaction to be stored in shared memory. You can now specify the `_SHAREDMEM` option in the ENQMODEL resource to enable matching ENQs to be stored in shared memory when running in an environment where locks are normally stored in a database, such as a PAC: `_SHAREDMEM(YES | NO)` The default value is NO. Specifying an ENQMODEL with `_SHAREDMEM(YES)`, will store matching CICS ENQs in shared memory. Caution: This option should only be used if the ENQed resource will not be accessed by any other region.

00367119 (13432)

- An abend in the service provider CICS application was not being propagated back to the soap client when CICS WEB SERVICES were used. This has been fixed.

00365431 (13583)

- The "Requested Licenses" field has been removed from the ESCWA General Properties page as it is not used.

(3956)

- If `CASRDO44_NEWSUB=OFF` has been specified in the region's Configuration Information field of the General Properties page or as an environment variable, then the JES control page will submit only local jobs, rather than remote jobs. Behaviour Change: When `CASRDO44_NEWSUB=OFF` is specified in the region environment, the JES control page will allow for submission of local jobs, rather than remote jobs.

(9431)

- Added the option to delete the associated package when the service has an associated package and that service is the only one with that associated package.

00370971 (22264)

- When a new region is created in ESCWA, the Web listener's conversation type is now correctly set to "Web" instead of "SOAP and J2EE (legacy)".

3244594 (21270)

- The Group can now be specified when starting or stopping a region using ESCWA.

00371543 (12436)

- For Enterprise Developer 6.0 and later, the installer on Windows has automatically started the Enterprise Server Common Web Administration (ESCWA) service as part of the installation process. When using the Japanese system locale on the Windows operating system, the ESCWA service does not start automatically. During the installation process you might be required to press Retry to complete a successful product install. Even after a successful product install, ESCWA does not start until you have installed a valid license.  
00368527 (12747)
- Added StepCC to the Spool DD Display page in ESCWA.  
3236954 (13587)
- The Initial Tran field on the region ES Control page has changed from a list to a text box field.  
3232139 (11506)
- In ESCWA, the Security Manager properties could be set too long, causing a crash. This has now been fixed.  
(61192)
- This fixes an issue with the change to the behavior introduced with the passtoken changes in previous patch updates. An issue might occur in a stacked environment with OS ESM and MLDAP\_ESM. Job dispatch would issue a deny when `casub` was used.  
3229601 (11524)
- An issue when using a secured MFDS, with an LDAP ESM as first in the stack, and a PAM ESM as second in the stack, and with federation enabled, has been resolved. Previously, if the security was reinitialized through any means (such as clicking the apply button, or reordering the ESMs and changing them back), the MLDAP ESM would not be able to correctly determine that the PAM ESM user `user1` in `group1` matched the LDAP resource rule which described `group1` within the resource rule. This should have worked because the group information is shared when federation is enabled. With this fix, the resource rule in LDAP correctly identifies that the `group1` rule applies to the PAM ESM user `user1`, on both initialization and reinitialization. Behaviour Change: When SAFMGR was reinitialized, PAM ESM was pointing to the old shared groups table, so MLDAP ESM and PAM ESM ended up pointing to different shared groups tables. It should have been the same table as federation was enabled. PAM ESM groups table is now cleared on initialization, so that the ESMs will now point to the same groups table.  
3221760 (11697)
- EZA Socket transactions failed under load. To fix this a new version of the CSKL transaction has been supplied with the product (EZACIC02.cbl).  
00422057 (51114)
- ESMAC now includes cross-site request forgery protection. A 403 Forbidden page is now returned whenever a user attempts to bypass the protection. If you want to access more than one region in ESMAC at the same time, it can no longer be done in the same browser session. You can access the regions in separate private browsing sessions.  
3216052 (13208)
- A new resource class, DCBINFO, enables you to control who can access the DCB information for cataloged datasets in ESMAC for a LDAP secured region. DCBINFO must be created for existing users to be able to access the DCB information in ESMAC.  
3231918 (13300)
- We now take note of VALUE clauses for fields and properties defined in a JVM attribute (annotation), and output the default value to the class file. When using an attribute, any field that does NOT have a default value must now be specified explicitly.  
(30021)
- The call format of the first parameter of CEEGTJS has been corrected to be "call by reference" rather than "call by value".  
3231324 (12494)

- MQ commands did not work because Windows installations of MQ are client, not server. This has been corrected.  
(46022)
- MFDS now correctly uses the specified region user in the ESCWA Directory Server Scripts page or Directory Server user in the ESCWA Directory Server Configuration page. Otherwise, it defaults to the current user.  
(8727)
- If MFDS is set to "Restricted Access" and the MFDS "Anonymous access" option is off (the default), then valid authorized credentials will be required to access information stored in the Directory Server either via the legacy UI, ESCWA, or utilities such as mdump.  
(62100)
- When MFDS is TLS enabled and a client connects on the non-TLS port, it will now send a HTTP 302 Found response to the client to redirect it from the non-TLS port to the TLS-enabled port. This is seamless to the Web browser.  
(46024)

## File Handling

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- The key definitions of newly-created database-hosted files and existing files deployed to a database will now be honored. Previously, all alternate keys were being created by MFDBFH as "with duplicates" irrespective of how they were specified in the key definition area of the FCD. This affected files both created directly by COBOL programs, and those deployed into datastores from disk. One of the side effects of this problem was that if a catalog and associated SPL\* .dat files were extracted from a datastore, and a CAS JCL region configured to use them, JES failed to initialize during region start-up due to a file status 3/9 occurring on the SPLJOB .dat file. The dbfhdeploy utility has been enhanced to allow the keys of existing files to be listed, and to be changed from "with duplicates" to "without duplicates" if required. It is strongly recommended that if you are using a database-hosted catalog and associated spool files for an Enterprise Server JES region, that you update the SPLJOB .dat file's alternate keys by running the following commands:

```
dbfhdeploy keys 1:dup=n sql://MYSERVER/MYFILES/SPLJOB.dat?folder=/MyFolder
dbfhdeploy keys 2:dup=n sql://MYSERVER/MYFILES/SPLJOB.dat?folder=/MyFolder
dbfhdeploy keys 3:dup=n sql://MYSERVER/MYFILES/SPLJOB.dat?folder=/MyFolder
dbfhdeploy keys 4:dup=n sql://MYSERVER/MYFILES/SPLJOB.dat?folder=/MyFolder
dbfhdeploy keys 5:dup=n sql://MYSERVER/MYFILES/SPLJOB.dat?folder=/MyFolder
dbfhdeploy keys 6:dup=n sql://MYSERVER/MYFILES/SPLJOB.dat?folder=/MyFolder
```

See *The dbfhdeploy Command Line Utility* in the documentation for more details and examples.

- 00372425 (69057)
- Within MFDBFH, enhancements have been made to optimized I/O to further improve performance. Enterprise Developer 6.0 and Enterprise Developer 7.0 only: The dbfhconfig utility has been enhanced with the addition of the -optiokeyreads and -optioseqreads command-line options. These options are used to override the default number of records read ahead by MFDBFH when optimized I/O is enabled.  
00726932 (83019)
- MFJSORT now supports RESTART in SEQNUM processing. The format RESTART=(p,m) is supported.  
00368449 (13606)
- The SFF (Signed Free Form numeric) input field is now supported in the TRAILER3 operand.

3217597 (12477)

- A File Handler limit on the maximum record size (62KB) has resulted in the documented limits for data-driven unit tests to be revised. See *Restrictions in the Micro Focus Unit Testing Framework*.  
(25064)

## Header-to-COPY Utility

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- When h2cpy is used to convert C header files to COBOL copy files, function prototypes with const \*, which produce BY REFERENCE parameters in the ENTRY statement for the COBOL call prototype, will now include the CONSTANT reserved word. In this context, it means the variable is read-only in the callee, just like in C.

(10214)

## Interface Mapping Toolkit

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- Headers are no longer mapped in the output of WS2LS.  
3235120 (12606)
- Top-down CWS generation from WSDL now properly marks hexBinary fields in the generated WSBIND.

3236069 (11690)

- WS2LS now assigns usage COMP-3 to items mapped from decimal and integer types in the WSDL. Behaviour Change: WS2LS will now assign usage COMP-3 to items mapped from decimal and integer types in the WSDL. This will affect the generated copybooks and WSBIND. Previously-generated files will still work, and users should be using the WSBIND and copybooks from a single execution of WS2LS in their environment anyway, since changing one results in (or reflects) changes to the other.

3235120 (13494)

- In copybooks generated by WS2LS, several data types now have mappings that are closer to those generated by IBM's DFHWS2LS. Behaviour Change: In copybooks generated by ws2ls, several data types will now have mappings closer to those generated by IBM's DFHWS2LS.

00365433 (11693)

## JCL Support

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- The IDCAMS DEFINE ALIAS command has been added to enable you to create an ALIAS, or, for a PO member, the TSO RENAME ALIAS command. When referencing an ALIAS, the related dataset is resolved. You can also use SYMBOLICRELATE datasets, and the symbol is resolved at run time using system symbols defined in SYS1.PARMLIB(IEASYM00).

00368450 (13425)

- The IDCAMS DELETE command has been enhanced to now accept % and \* wildcards with the use of the "MASK" keyword. Because support for multiple wildcards has been enhanced, IDCAMS commands that previously reported a JCLAM0163S error and set CC to 12 may now be accepted and processed.

00375690 00367509 00368440 (12180)

- The support for wildcards when using the IDCAMS LISTCAT command has been improved: both \* and % are accepted within the data set name, and multiple wildcards may be used; for example:

```
LISTCAT LEVEL(MFI01.MFI%%%.D*.DAT)
```

00366749 (11515)

- When a job contains duplicate step names, you can now specify which step to start.  
(69229)
- You can now restart a JCL job by specifying a value for MF\_UCC11.  
(71227)
- A new topic, *Advanced Restart Functionality*, has been added to the JCL documentation to document the use of the `casout /jrestart` option, which enables you to restart a job with additional parameters. The `#t` parameter identifies the step on which to end a restarted job. See your product documentation for details.  
(70223)
- A new topic, *Advanced Restart Functionality*, has been added to the JCL documentation to document the use of the `casout /jrestart` option, which enables you to restart a job with additional parameters. The `#k` parameter enables you to specify whether or not ABEND and COND codes from a previous run are used or not. In addition, the `#k` parameter enables you to specify the COND code to use for a specific step. See your product documentation for details.  
(70224)
- By default, a non-zero return code from a commit at the end of a unit of work for DSNAL or IKJEFT\*\* will now be reported and set a step abend code of S482. You can control this behavior by using the MF\_JES\_ABEND\_CAF\_COMMIT environment variable; see JCL-specific Environment Variables in the documentation for more details.  
**Behaviour Change:** A non-zero return code from the commit issued at the end of a unit of work, i.e. when the program run as part of the step returns control to the JES system, will now generate a message in the syspsrt and cause the step to abend with the cond code S482. This behaviour is configurable using the environment variable MF\_JES\_ABEND\_CAF\_COMMIT. A value of 'NO' will provide the current behaviour, i.e. we ignore the return code. A numeric value (up to 3 digits) would cause that value to be used as the return code from running the program.  
3239642 (11750)
- If a MGMTCLAS is defined for a dataset, it will be included in the MGMTCLAS field of the MFJCTLBP control block.  
**Behaviour Change:** The mfjctlbp dataset control block will now include the MGMTCLAS if it is defined in the catalog record for the dataset  
3231081 (13361)
- A problem that set the wrong parameter override value for a step in a procedure because of the alphanumeric ordering of the step names was not consistent has been corrected.  
3235581 (12478)
- When changing a GDG roll disposition to EMPTY, the number of rolled-in data sets was incorrect. Now, if a NONVSAM data set is defined in IDCAMS that is a GDG version, it will be included in the GDG set.  
3238565 (12731)
- A problem that caused the incorrect resolution of output statements in steps with duplicate names has been corrected. An output statement class of "\*" is now replaced by the msgclass of the job.  
(30104)
- The value of the ALTER NEWNAME will now be checked to ensure it conforms to naming convention before trying to update the catalog. An error message, JCLAM0105S(12) - Invalid entry name syntax or length, will be issued if the check fails.  
**Behaviour Change:** As per readme  
3236388 (12641)
- When running in a PAC or with the MFDBFH database locking for multiple regions, active jobs are not flushed at region start-up.  
**Behaviour Change:** As per ReadMe  
3227362 (12487)
- It is now possible to include a set of default ON conditions in the VSE configuration file and these will be added to all VSE jobs.  
3230967 (11486)



- User labels (DLBL & TLBL) are now removed when a new one is assigned following the running of a program.

3213728 (12340)

- The system symbols file, SYS1.PARMLIB(IEASYM00), can use the EBCDIC encoding. Support for EBCDIC programs calling the system symbol entry point, IEFSJSYM, has been added.

3226132 (11503)

## Licensing requirements

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- The following platforms - Solaris, Red Hat on IBM Z System, SUSE on IBM Z System, and Ubuntu - are now licensed using a new licensing model called AutoPass. These platforms and licenses are not available from the Software Licenses and Download portal ([sld.microfocus.com](http://sld.microfocus.com)) if you are using the existing SafeNet license technology. To obtain AutoPass licenses for the aforementioned platforms, contact your account manager to discuss your actual requirements, and also raise a support incident to track the request.

## Mainframe Access

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- Users will now be able to specify a volume when cataloguing a data set.

(41007)

## Micro Focus Batch Scheduler Integration

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- The %%LIBSYM/%%MEMSYM Control-M function variable value is now delimited by the first ending space. For values that request one or more embedded spaces, use the %%BLANKnn Control-M function.

00422148 (51104)

## PL/I Support

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- DEFINE STRUCTURE statements are now supported.

00368478 (12186)

- Previously, if STRINGRANGE had been enabled by the -prefix stringrange compiler option, and a user program did not contain an ON STRINGSIZE statement, there was no message printed out indicating that STRINGRANGE had been triggered. The message now appears in this scenario.

00696776 (73031)

- A performance bottleneck present in Enterprise Developer 5.0 and 6.0 has been resolved to provide faster record I/O.

00669680 (71440)

- Previously, if a job was cancelled while in an active state, PL/I would, as part of RTS cleanup, attempt to RELEASE all fetched routines. This resulted in a problem because some of the fetchables had the potential to be active on the callstack and be in a non-cancellable state. This no longer occurs.

00368471 (27328)

- Previously, if using PLISAXA() and XML Element's content contained a character greater than x"7F" (ASCII), the CONTENT\_CHARACTERS event would be driven twice - once for the characters that preceded the x"7F", and once for the remainder. This no longer occurs and the CONTENT\_CHARACTERS event is driven for the entire XML Element's contents.

00381945 (30084)

- Previously, when using PLISAXA, the document length as driven to the Start of Document event was incorrect if the XML document contained characters that exceeded hex 7F. This has now been fixed.

00381945 (61228)

- The diagnostic MPLIE0056 has been changed from a "Severe" level diagnostic to an "Error" level diagnostic. This provides you with the ability to tailor behavior to your environments. If you wish compiles to fail in this scenario, you can use the compiler message exit to bump severity back to "S" level. If you do not wish to have an "Error" level diagnostic in this scenario, you can use the compiler message exit to reduce severity to "W". Behaviour Change: The diagnostic MPLIE0056, which tells the customer they have SQLCA declared in an internal procedure, has been changed from a "Severe" level diagnostic to an "Error" level diagnostic. If the customer desires the old behavior they can bump this diagnostic to an "S" level diagnostic using the compiler message exit, or if they intend to have the potential confusion from having multiple SQLCA's declared they can bump the severity down to a "Warning" level using the same compiler message exit.

3239052 (12538)

## Reverse Debug and Live Recording

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- Reverse Debug and Live Recording functionality is licensed and installed separately from [undo.io](#). From this release forward, you can enable reverse debug functionality by downloading the extension from the [Micro Focus Marketplace](#).

## REXX Support

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- EXECIO \* DISKW was stopping on the first line containing no characters, writing out no further records. Now after encountering an empty record, a line with only a linefeed is written and processing continues with the remaining records.

00366667 (27187)

## Run-time System

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- When defining the file name for CBL\_CREATE\_STACKDUMP, %f now expands to basename of the program correctly when used cross-process.
- When CTF trace level is set to info (for post-offset values only) or debug (for pre-offset, offset and post-offset values) and component rts#process is set to true, the API will now dump the captured metrics to the output CTF file.

(27040)

## SQL: Mainframe Batch Database Tools

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- An equivalent of the mainframe DB2 utility DNSTIAUL, SQLTUL, is now available in the MBDT utility suite.

2148818 (10857)

## SQL: OpenESQL

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- An issue with compiling native programs that use SQL TYPE IS XML AS CLOB has been resolved.  
3240037 (12679)

## Significant Changes in Enterprise Developer 6.0

The numbers that follow each issue are the Support Incident Numbers followed by the Reported Problem Incident (RPI) number (in parentheses).

- [Adis](#)
- [Application Workflow Manager](#)
- [AppMaster Builder](#)
- [Assembler Support](#)
- [Call prototyping in library routines](#)
- [Common Communications Interface](#)
- [Communications Server](#)
- [Compiler](#)
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- [Enterprise Server](#)
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- [File Handling](#)
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- [IDE](#)
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- [JCL Support](#)
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- [Micro Focus Directory Server](#)
- [National data items in JVM COBOL code](#)
- [PL/I Support](#)
- [Rebuild required for projects unable to locate the Windows Resource Compiler](#)
- [Run-Time System](#)
- [SQL Option for DB2](#)
- [VALUE clause not permitted to follow items that use the OCCURS DEPENDING ON clause when ODOSLIDE in effect](#)

### Adis

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- In RM/COBOL, the ACCEPT of a screen with an input field beyond the end of the screen would operate as if the field was at the last character of the screen. Previously, ADIS would ignore any fields past the end of the screen. Now, with Dialect"RM" set and the appropriate ADISCTRL settings, behavior will now match RM/COBOL in this case.  
3138718 (1112690)

### Application Workflow Manager

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- REST Connection function package attribute has been added, and Status Handlers for REST tools. See "REST Function Package" in your product Help for more information.

- If the Search button is used in the Endeavor attachment application, duplicate values are no longer displayed in the resulting list.

3201329 (1117831)

## AppMaster Builder

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- Data View preferences have been enhanced to provide a setting that limits Data View generation searches to a single SQLDDL member instead of searching for all SQLDDL members identified by the full SQLDDL path saved in the SQLSCHEMA file. When searching for an SQLDDL member, the generation process searches the primary project path first, followed by SQLDDL workgroup paths.
- In the SQL Schema Maintenance dialog box, the SQLDDL members were not always sorted alphabetically. This has been corrected. In addition, the SQL Schema Maintenance dialog box has been updated with "LOAD" and "Filter" buttons that enable filtering.

3216343 (1119348)

3215756 (1119133)

## Assembler Support

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- A problem with the MFASM command-line processor program caused RC=4 warnings that prevented the linker from being invoked. To correct this, the MFASM.EXE and MF370CHK.DLL modules have been updated to produce .390 executable modules even when warnings occur during assembly.
- A problem that caused the &SYSNEST macro processor to be incompatible with mainframe assembler has been fixed by reducing the system value by 1.
- A problem that caused National Language Characters in assembler listings to be echoed to the console during assembly and appear as box drawing characters has been fixed.
- MNOTE errors are no longer treated as fatal errors. If only MNOTE errors are reported at assembly time, the Assembler .obj file will be produced and the linker will be invoked.

3224507 (1119933)

3204758 (1118136)

- Invalid parameters specified in the Additional Directives text box are no longer treated as fatal errors by the Assembler command-line processor. Previously, invalid parameters would prevent the Assembler linker from being invoked even if the assembly was successful.

3204319 (1118090)

## Call prototyping in library routines

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The copybooks `cbotypes.cpy` and `cbproto.cpy`, provided by this system for call prototyping in library routines, include features of the latest syntax, specifically the `CONSTANT` keyword. If these files are used in conjunction with the `MF` directive, it should be set to the current level, 21; otherwise, you should remove the directive, or do not use these copybooks.

## Common Communications Interface

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- The default TLS Security Level has been increased from 0 to 1. This change will not affect any user that has specified their own security options. Users relying upon the default TLS security options might find that some old clients that are restricted to the use of weak ciphers will no longer be able to connect. See "Security Levels" and "Specifying a Server Protocol and Cipher Suite Preference" in your product Help for more information on the change to Security Level 1.

## Communications Server

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- The optional Digital Certificate Authentication Service (DCAS) feature of Enterprise Server, most commonly used to provide single-sign-on for TN3270 clients, has been updated to address a severe security issue. Customers using DCAS should refer to the topic "DCAS security" in the product documentation. To determine whether your enterprise server regions use DCAS, look for listeners with the "dcas" conversation type. DCAS listeners now require client certificate authentication by default. If you are using DCAS with an external DCAS client such as Host Access for Cloud (formerly Host Access MSS), and that client does not supply a certificate, you need to add the following setting to your DCAS listener configuration: [Operation] allow unauthenticated clients=yes

## Compiler

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- "file not found" error messages now provide more information about the key the user needs to press. The new format of the messages is as follows: "File name.cpy not found - Press [S]top/[R]etry/[C]ontinue/[A]lter-path".

## Data Tools

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- You are no longer able to modify data in a structured record that is identified as comp-2 floating point - an alert is displayed if attempted. This is in order to prevent the data becoming corrupted.  
3213037 (1118867)
- Data File Tools now utilizes the configurable codesets facility to use a variety of character sets - see 'Working with Different Character Sets' in the documentation for more information.  
3161243 (1114482)

## Database Access - OpenESQL

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Just like other DBMS SQL COBOL precompilers, OpenESQL now follows embedded SQL standards and disallows the use of group host variables in WHERE <column> = :hostvar clauses. In the past, this was not flagged at compile-time, and would lead to unpredictable results when executed.

## Documentation

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- The information about the -flag and warn compiler options has been updated.  
3190928 (1120000)

## Early warning of compatibility issues with current operating systems

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In order to better support modern operating systems, we are aligning closely with their operability guidelines. We now detect previously-undefined behavior when interacting with OS level functions.

Error RTS096 alerts you to any calls to the operating system's fork() API, in a process that has directly or indirectly called COBOL functionality, in your code.

The error gives you an early diagnosis of a situation which, if left unchecked on modern operating systems, could lead to deadlocks, crashes or other failures at run time. These problems would often occur intermittently and be very challenging to track down.

See the KB article <https://community.microfocus.com/t5/Visual-COBOL-Knowledge-Base/fork-rt64-Error-96-encountered-in-child-process/ta-p/1771191> for more details.

## Enterprise Server

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- IF an XA open string uses the BATCHONLY option, CRCN will not monitor the XA connection to the resource manager. If the BATCH SEP encounters a severe XA error, the batch SEP will be recycled until the connection is recovered. This emulates the previous version of the XA reconnect feature when ES\_XA\_????\_NB\_RETRIES=-1 was set. Consequently, if an open string contains BATCHONLY, only a batch SEP will be able to access the resource manager and, as CRCN is a CICS transaction, it will not monitor this entry.

3213379 (1118913)

- The initPac option for the caspac command line utility has a change in behavior. Prior to PU5, if the command detected that there were active regions in the PAC, the command would return an error and not initialize the PAC. This only occurred when: 1. There are active regions in the PAC. 2. There are no active regions in the PAC, but a region has shutdown without notifying the PAC SOR (PSOR), for example, if the region was killed. In this case, it was not possible to cold start a PAC without manually correcting the appropriate value in the PSOR. The initPac option will now prompt for confirmation on whether you really wants to initialize the PAC, giving you the option to cancel. CAUTION: Only use this option for scenario 2, ensuring that no cas\* or mfcs processes remain for regions within the PAC. If it is used when there are active regions in the PAC, the regions will no longer function correctly.

(642125)

- Enterprise Server now supports Redis Cluster as a SOR. See "Prerequisites" in the "Scale-Out Performance and Availability Clusters" chapter in your product Help for more information.
- When compiled with the XAID Compiler directive, JCL batch SQL applications now work correctly when MFDBFH is enabled.

3223257 (1119804)

- Deferred work elements for cancel will not be processed until the End of Task. This means that the cancel will not be processed during a user syncpoint.

3193871 (1117144)

- A problem where a failed syncpoint did not result in a failed transaction, leading to incorrect commit states, has been fixed by changes in syncpoint processing. A syncpoint involving XA resource managers can fail in one of three ways: 1 - During phase 1 - xa-prepare. When one of the RMs enrolled in a LUW returns an error on the prepare, the LUW is rolled back. An application can now intercept the EIBRESP and EIBRESP2 using the NOHANDLE option: EIBRESP = 78-EIBRESP-is-ROLLEDBACK - 82 EIBRESP2 = 78-EIBRESP2-sync-prepare - value 124 Otherwise the transaction abends with abend code AEXJ - ROLLEDBACK. 2 - During phase 2 - xa-commit or xa-rollback. When one of the RMs enrolled in a LUW returns an error on the commit, the LUW is left as is, and a severe error is sent to the console. The application cannot handle this failure. (This is mainframe-compatible behavior.) 3 - A syncpoint can also fail during the systematic xa-start called after the completion of the syncpoint commit phase 2. Behavior in this case is unchanged; the transaction will abend with system code AEIJ - NOSTART. This failure cannot be handled by the application.

3193283 (1117153)

- For regions that are not TRANCLASS-enabled, the EXPIRYINTMIN attribute of the TSMODEL resource is now supported. In addition, the LASTUSEDINT option is now supported on the INQUIRE TSQNAME and INQUIRE TSQUEUE commands. Note that this changes the queue control record and will affect any existing queues that were created with earlier versions of the product (affects non-TRANCLASS regions only). As a result of this, you need to cold start the Temporary Storage and Transient Data after applying this Patch Update. You also need to cold start any PACs that have existing TS\TD queues.

## Enterprise Server Common Web Administration

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- By default, ESCWA now runs on port 10086.
- When using the Vault Facility, the ESM passwords are now accessed by the ESM's Universal Unique Identifier (UUID) which makes the key for the vault. If this UUID cannot be found it uses the old name based mechanism as the key for the vault. Note: All new ESMs have a UUID that conforms to 4122 RFC. The earlier ESM UID standard is still supported.
- PAC names are now limited to eight characters or fewer in ESCWA.
- The default ESCWA configuration file now sets ESCWA to run in loopback-only mode.

## Enterprise Server Security

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- The MLDAP ESM Module for Enterprise Server now interprets the ".\*\*" wildcard sequence in a manner closer to that of mainframe RACF. This behavior is configurable. See "Wildcards for Resource, User, and Group Names" and "MLDAP ESM Module Custom Configuration Information" in your product Help for more information.

3206992 (1118359)

## File Handling

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- The supervisor password is no longer displayed when cobfsclose is executed from the command line.

3195772 (1117571)

- Usernames in the Fileshare password file are no longer obfuscated; they are shown in plain text.

3120656 (641976)

- Fileshare can now read a password file stored in the Vault Facility. Use the /uv option when starting Fileshare to read the specified password file from the vault. Note: You must have uploaded the password file to the vault before starting Fileshare.

- The SFF (Signed Free Form numeric) input field is now supported in the TRAILER3 operand.

3217597 (1119504)

- The calculated output length of SORT and the memory required could be calculated incorrectly when symbols were used.

3203471 (1118031)

- File and folder names that are deployed to PostgreSQL datastores are now case-insensitive. This ensures consistency of behavior with DB2 and SQL Server datastores.

## Handling of anonymous root field in JSON

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For JSON (RESTful) service interfaces, the IMTK no longer forces the outermost (root) structure of a JSON message body to always be a JSON object, but now also supports a root JSON array or primitive. Though the root is obligatorily nameless in the JSON message, in the Interface Mapper the anonymous root must now be defined in the operation's interface fields as the top-level body field. Consequently, since there cannot be more than one input top-level body interface field nor more than one output top-level body interface field in an operation, all interface fields that appear in the body of a message must now be children of the top-level body field. Any non-conforming pre-6.0 JSON service interface is still supported as-is, but conformance would be required upon any modification in the Interface Mapper.

## HCO for DB2 LUW

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- There is no longer a problem using an XML CLOB host variable in COBOL and PL/I program SQL statements when compiling with the DB2 ECM Compiler directive.

3204413 (1118115)

## IDE

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- A bug that prevented adding multiple Program Breakpoints has been fixed.
- Environment variables with the format `#{env.<name>}` are now handled correctly during compilation and background parse.

3222576 (1119722)

- A new option has been added to the Window> Preferences> Micro Focus> Debug dialog box: Ignore breakpoints in resources within unrelated projects. When selected, this option guards against the situation where you have identically-named programs within your workspace, and setting a breakpoint in one could cause the other programs to break when they are debugged (if the corresponding lines are debuggable). To continue current behavior, this option is not selected by default.

3211196 (1118694)

- Populated folders can now be used as output folders for JVM COBOL projects.

3210830 (1118646)

- A new option has been added to allow you to edit the location of a remote linked folder. It opens the same wizard as when creating a new remote linked folder, but in edit mode.

3200758 (1117951)

- It is now possible to access a breakpoint's properties from the breakpoint's context menu in JVM COBOL code.

## Interface Mapping Toolkit

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- The COPYEXT directive on remote projects now works correctly.

3206621 (1118324)

## JCL Support

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- The wrong Symbol value was used when a symbol was assigned a different value following a procedure.
- When replacing symbols in in-stream data, space-separated elements will be taken into account, and if possible, the original position will be maintained.

3223719 (1119901)

- An issue where procedure COND statements were applied to the wrong procedure steps when the procedure was called multiple times, notably the steps from the first call to the procedure when they should be applied to steps from the specific call, has been resolved.

3222081 (1119699)

- The JCL JOB JOBRC parameter is now honored, and the correct return code set for the job.



3218927 (1119420)

- The MFFTP LCD, MGET and MPUT commands have been enhanced to process the members of a partitioned data set.

3216865 (1119242)

- The removal of datasets with DISP=NEW because MF\_UCC11=YA or MF\_UCC11=M is set has been restricted so that the DSORG, if defined on the DD Card, must match the catalog attribute. The removal of a GDG Base by this method is prohibited. If the dataset cannot be removed and recreated, an error message JCLCM0200S is issued.

3216471 (1119195)

- You now receive a correct error code, if an error occurs while processing the TSO RENAME command.

3215386 (1119281)

- The JCL File Action exit, MFJFAXIT, is now notified of the deletion of cataloged data sets.

3212961 (1118856)

- A problem in the public catalog API, mvscatpb, where the LRECL values for variable length files were not validated correctly, producing false errors, has been corrected. The API will now return the catalog record that has been changed.

3212769 (1118940)

- The incorrect changing of a VSAM data set file status from pristine to used when REPROing an empty data set has been corrected. When REPROing records into a data set, if the source data set is empty, the destination data set is not opened.

3212733 (1118839)

- GDG restart information is usually created only when ES\_JES\_RESTART=Y and MF\_UCC11=Y or M; however, by setting environment variables GDG\_RESTART\_UCC11\_ONLY=N and ES\_JES\_RESTART=Y results in the restart information for GDGs to be created. This ensures that the dynamic setting of MF\_UCC11, via the MFJUXIT user exit, can be applied to GDG versions. The MFJUXIT user exit has been enhanced to provide a new event call, event-job-restart, which is called when a job is restarted, and provides the option for the user exit to be notified of future event calls - one of which is 'event-job-ready', where the user exit can set the MF\_UCC11 value for the job (see mfjdxit.cpy for user exit event information).

3207134 (1118753)

- If a JOB CARD includes a USER ID and a PASSWORD that are different from the ones for the user submitting the job, the credentials specified in the JOB CARD will be used to validate the permissions to submit a job in place of the surrogate user.

3207055 (1118326)

- LISTDS now returns 8 if the requested dataset does not exist. Previously, it would return zero.

3204627 (1118102)

- PDS directories (PO) identified by environment values (the path to the directory starts with \$<ENV-NAME>), are now removed in the same way as those that do not use an environment value. The last member is removed and the directory is empty.

3196118 (1117345)

- The MFJPTPCH module now supports the PREFORM and CNTRL parameters.

3194158 (1117171)

- Using MFFTP, a GET request that used SENDEOL no longer attempts EOL processing if the file is not found. This now emulates the behavior on the mainframe. Previously, processing would cause unexpected errors in cases where the file was not found.

3192989 (1117084)

- If the catalog properties of a data set are updated using MVSCATPB, and the data set is not opened during the JCL step it is assigned to, then the updated catalog properties are not written at the end of step disposition processing.

3186942 (1116611)

- It is now possible to export symbols from Enterprise Server and to use them in in-stream data. You can also pass symbols on jobs submitted using the Internal Reader.

3164066 (1114816)

- When trying to export entries from a catalog that does not exist, mfcatsxml will now report an error and exit with a value of 12. Previously, it returned zero and created the catalog.
- An issue with error conditions incorrectly carried forward from one VSE job to the next one has been resolved.

3220394 (1119913)

- The length of a SYSIN is no longer being checked unnecessarily.

3201488 (1117900)

## Micro Focus Batch Scheduler Integration

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- When running against an Enterprise Server PAC environment, mfbsijcl could return an invalid return code to the scheduler. This has been resolved. Note that both of the following environment variables must be present in the mfbsi.cfg configuration file in order for mfbsijcl to work with the Enterprise Server PAC environment: ES\_PAC and ES\_PAC\_ENDPOINT.

3215408 (1119254)

## Micro Focus Directory Server

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- UNC paths are no longer supported when importing or exporting to MFDS by default. To re-enable them, set the environment variable MFDS\_ALLOW\_UNC to 'Y'.

## National data items in JVM COBOL code

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JVM COBOL code that uses IS NUMERIC tests on NATIONAL or NATIONAL NUMERIC data items, or uses NATIONAL NUMERIC data items in programs compiled with the CHECKNUM Compiler directive must be recompiled in this release. Compiled code from earlier products that uses such constructs will generate a `MissingMethodException` error when run under this release.

## PL/I Support

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- A problem with allocation of BASED, CONTROLLED, and AUTOMATIC structures has been corrected. This problem was limited to structures where the last member field was of type BIT. Specifically, the problem only occurred for BASED, CONTROLLED, and AUTOMATIC structures when the last member field is of type BIT, resulting in incorrect code generation for BASED and CONTROLLED storage at the point of allocation (i.e., an ALLOCATE statement), and for AUTOMATIC storage, incorrect stack frame allocation for the declared structure. Naturally, any module affected by this problem needs to be recompiled. To ensure that no problems arise, the user should identify all modules that use a structure or structures where the last member is of type BIT, and recompile those modules. This applies to users who have compiled code with versions of Enterprise Developer earlier than ED 4.0 HF 10. Note: BIT means a bit-string of any length, including BIT(1). It does not apply to BIT ALIGNED.

3192381 (1117048)

- The macro preprocessor loop no longer occurs when there is a "DO" statement with "BY" and without "TO". For example, statements such as "DO J=1 BY 1" are treated as infinite loops.

3216391 (1119216)

## Rebuild required for projects unable to locate the Windows Resource Compiler

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Projects that were last built in a version prior to 6.0, and that rely on the Windows Resource Compiler (RC.exe) need to be rebuilt in Eclipse, otherwise they may produce an error. This is due to the relocation of RC.exe in this version of the product. Affected projects will be those that explicitly reference a manifest file (used to include such things as cursors, fonts, and icons), and that are built directly from the command line.

The problem is fixed if you open and build the project within the Eclipse IDE (as .cobolBuild is rebuilt to find the new location of RC.exe). Alternatively, you should ensure that PATH contains a reference to RC.exe if you continue to run projects from the command line.

## Run-Time System

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- Previously, the value of the fill character and the option to use it were ignored in the RM window control block. With this fix, the character will be used if Dialect"RM" is set and an appropriate ADISCTRL configuration is used.

3138692 (1112552)

## SQL Option for DB2

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- The XDB Service name has been shortened.

3195822 (1119897)

## VALUE clause not permitted to follow items that use the OCCURS DEPENDING ON clause when ODOSLIDE in effect

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If your Working Storage contains a data item with the OCCURS DEPENDING ON phrase, and ODOSLIDE is in effect, any subsequent data items at the same or higher level must not contain a VALUE clause. If they do, an error (COBCH1962) is now generated.

If you cannot remove the VALUE clauses from your source code or remove ODOSLIDE, contact SupportLine.

# Significant Changes in Enterprise Developer 5.0

Where present, the numbers that follow each issue are the Support Incident Numbers followed by the Reported Problem Incident (RPI) number (in parentheses).

- [Common Communications Interface](#)
- [Communications Server](#)
- [Compiler](#)
- [Data Tools](#)
- [Documentation](#)
- [Eclipse IDE](#)
- [Enterprise Server](#)
- [Enterprise Server Auditing](#)
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- [Interface Mapping Toolkit](#)
- [JCL Support](#)
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- [Micro Focus Batch Scheduler Integration](#)
- [Micro Focus Directory Server](#)
- [MFCRYPTLIB](#)
- [PL/I Support](#)
- [Request Packet Interface API](#)

## Common Communications Interface

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- Certificate subject names are now correctly checked against the name the client is attempting to connect to. Certificates registered to "localhost" should now work as expected.
- The default Cipher Suites List now includes @SECLEVEL=0. This indicates that backwards compatibility with old certificates such as MD5 is to be retained. As a result of this change, you need to review your use of the Cipher Suites List and of any old certificates.
- If using Micro Focus Common Client(MFCC) or Micro Focus Communications Server(MFCS) to connect to a non-existent remote host, it was possible to create a connection to a server listening on the same port on the local system. This is no longer possible and a bad address error is reported in the error logs.
- By default, in this and previous releases an SSL/TLS CCI client can trust a server which resides on an IP address that is not an intended connection target. You can now specify the `ssl_only_verify_literally` option in your CCI.INI file to restrict the certificate check to improve security. See "CCITCP Security Options in the CCI.INI File" in your product Help for more information. When connecting to a non-CCI protocol server, all clients perform strict certificate checking as the new default behavior

## Communications Server

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- Passphrases specified in the mf-server.dat file can now contain spaces.  
2832222 (1100976)
- Configuring MFCC when run under MFCS now works as expected.

## Compiler

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- The Search order has been updated, to allow the Compiler to find Java.

## Data Tools

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- Accessing a dataset through the Data File Editor now obtains a shared lock on Enterprise Server when you open the file in shared mode.  
3170479 (1115346)

## Documentation

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- The ANIM Compiler directive has changed its default when compiling from the command line on Windows platforms. The default is now ANIM. (Compiling from the IDE still defaults to ANIM.)
- The validation of server certificates for TLS (also known as SSL) connections has been corrected. This is likely to cause connection failures in cases where previously connections were incorrectly allowed.

For example, if Fileshare is secured with TLS, client applications must be configured to use the hostname of the Fileshare server as it appears in the server's certificate. If the Micro Focus Directory Server is secured with TLS, then MFDS clients, such as the casstart command-line utility, will need to connect to it using a hostname that appears in the certificate MFDS is using. (Note that a certificate can contain multiple hostnames.) Consult your Certification Authority administrator for more information.

3192497 (1117068)

## Eclipse IDE

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- In the Expressions view, there has been a change to the way that the number of characters displayed is controlled. The Hex part now always displays the same number of characters as the raw data part (note that Eclipse enforces the character limit, so the number entered by the user will include those used to display the hex values). A maximum length entry of 0 is now correctly interpreted as "no limit".

3161694 (1114658)

- Eclipse now colorizes files that it will not build because they are preceded by other files of the same name on the build path. The icon of such files is overlaid by an I or P and Eclipse shows a tooltip with an explanation. This is to clarify the difference between this scenario and build-action-ignored.

3161416 (1114607)

- Micro Focus Find/Replace now provides a Column Scope group that enables you to limit searches between columns. You can specify columns or alternatively you can search only in the main code area for the file type open in the editor. By default, it searches in all columns.

3142899 (1112931)

- Compiler directives are now stored in .mfdirset files which can be specified for particular languages, at project/config/folder/file level.

2853665 (1104556)

- By default, COBOL, COBOL JVM, and Mainframe COBOL Projects have the EXITPROGRAM"ANSI" directive set in the Project Settings > COBOL Properties. This specifies that if the EXIT PROGRAM statement is executed in a program that is not under the control of a calling program, it causes execution of the program to continue with the next executable statement. See EXITPROGRAM in your product Help for more information.
- The COBOL JVM method breakpoint can now be toggled on the heading of the method.
- The Eclipse IDE has an improved user interface for settings. The COBOL, IMS, and the Run-time Configuration settings pages now use a property grid that also displays the definitions of the settings. As part of these changes the **Output path**, **Target type**, and **Bitism** are now specified in the project's Link properties, click **Micro Focus > Build Configurations > Link**.

## Enterprise Server

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- A number of audit events now contain some additional information.

3140310 (1112666)

- Previously, the /x option of the CASRDTEX utility had been duplicated to drive XML output. This prevented the export of transactions which was the original meaning of /x. To generate an XML export, you must now specify the option /xm.

3180233 (1116108)

- casfhsf could hang when processing HSF files that contain records from tasks that ran in different months.

3177385 (1115884)

- A new system transaction, CRCN, is now available to monitor the state of XA connections for each resource manager (RM) entry defined in the system. CRCN is a replacement for the former XA

Reconnect facility that recycled SEPs on connection loss. The XA Reconnect facility was configured by setting the ES\_XA\_RECONNECT environment variable. CRCN also uses this environment variable, although its usage differs slightly. For more information see your product Help.

3174272 (1115727)

- On Windows, any casout and cassub messages are displayed on cassub and casout API invocation if the environment variable ES\_CAS\_API is not set to "ON".

3160400 (1114458)

- A new environment variable, ES\_SNATRC\_DIR, is available for configuring the location of the SNA traces written by IMB's communication manager. To ensure that the SNA trace files are written to a valid directory, ES\_SNATRC\_DIR must be set before you start the region.

3173516 (1115523)

- When defining CICS term in ESMAC, if the terminal definition includes a user ID, Enterprise Server honors the terminal user ID, and you can leave the User ID field blank. Caution: When the terminal definition includes a user ID, this logs you into the terminal without password verification. Use with care!

3158468 (1114309)

## Enterprise Server Auditing

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- Auditing on big-endian platforms now correctly interprets numeric audit data.

## File Handling

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- RELFORMAT=MF|RM is now enabled for FOLDER and other filename tags.

3164916 (1114803)

- The SORT-CONTROL special register is now supported during a SORT statement.

3159740 (1114389)

- To direct the handling of relative files to a particular file handler (either MF COBOL or RM/COBOL), use the RELFORMAT=MF or RELFORMAT=RM configuration options within the [REL-DEFAULT] tag of the EXT FH.CFG file. (The default is RELFORMAT=MF.)

3157247 (1114149)

- The FORMAT parameter is now correctly ignored when the format is explicitly set in the Include statement. Also, an error is now returned if a numeric item is compared with a quoted value in an Include statement.

3186371 (1116564)

- For MFJSORT, the SORT-EBCDIC instruction is now supported through the PARM parameter of an EXEC statement.

3165343 (1114824)

- When reading continuation lines from SYSIN for MFJSORT, if line 1 breaks at column 71 with a nonblank in column 72, and columns 2-15 of line 2 are blank, DFSORT continues on line 2 with whatever character it finds in column 16 (blank or nonblank).

3159842 (1114565)

## HCO for SQL Server

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- HCOSS DB2 schema extraction has been updated to use the DB2 system default of EBCDIC SBCS CCSID <value> for DB2 columns in tables with a CCSID value of 0 (zero, CHAR family types). This has

been done to appropriately handle the CCSID value for tables created using DB2 version 8 or earlier, and that have been migrated to a newer version of DB2. In addition, HCOSS DDL generation maps Euro collection sequences to the nearest match to a supported SQL Server collation sequence.

3163636 (1114937)

## IMS Support

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- A performance delay that occurred when rapidly writing checkpoint records to the IMSLOGR file has been corrected by updating the method used to verify the uniqueness of the timestamp in the key.

3131126 (1112901)

- The IMS Support feature has been updated to support checkpoint/restart for output GSAM processing.

3107543 (1109558)

## Interface Mapping Toolkit

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- If you try to deploy a stateful EJB SVI from the Visual Studio IDE after unchecking the “Reuse container after application termination” check box (in the Deployment Characteristics tab of the Runtime Environment Configuration dialog box), you receive a warning message informing you that the “Reuse container after application termination” setting will be set to true for the deployment in order to prevent the crash. In the Eclipse IDE, the unchecking of this option will just be ignored, and the option re-selected. A warning to not uncheck the option for stateful EJB SVIs is also displayed on the prior page (to the dialog box).

2663812 (1090987)

- WSDL and JSON Schema files generated for bottom-up CICS Web services now include a "maxLength" parameter for all string fields.

3175039 (1116241)

## JCL Support

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- If the catalog properties of a data set are updated using MVSCATPB, and the data set is not opened during the JCL step it is assigned to, then the updated catalog properties are not written at the end of step disposition processing.

3186942 (1116611)

- When security is enabled and a JCL job includes either JOBLIB or STEPLIB entries, the system now checks that the user has READ access to each of the Partition Datasets (PO). If the user does not have the required access, the job abends with a COND CODE of S913.

3176759 (1115814)

- The DATACLAS and MGMTCLAS attributes are now applied to a DATASET when it is added to the catalog and SMS support is enabled (MF\_SMS=ON).

3174534 (1115630)

- The DSNRLI reason-code value will be hexadecimal 0x00000000 when the return-code is zero. This is a change from the previous value of decimal zero, '0000'.

3171133 (1115344)

- MFFTP quote handling has been reworked to support IBM behavior. Filenames that contain spaces are now required to be defined within double quotes ("). This change is required to support mainframe hosted files, where single quotes (') will no longer append the user ID to start of the filename as the first node.

3168300 (1115058)

- If JES security is enabled, when a JCL job is submitted that uses a PROC or INCLUDE file that is part of a cataloged Partitioned Dataset (PO), READ access for the dataset will be checked, and if the user does not have permission to read the dataset then an error will be reported.

3166921 (1114955)

- When restarting a job, the COND CODES for steps prior to the restart step will not be evaluated. This is a change in the behavior where previously the values of the COND CODES from the previous run was checked. You can revert to the old behavior by setting the environment variable MFJ\_ALL\_STEP\_CHECK=Y.

3163358 (1114688)

- The Spool Housekeeping history file, INDEXO, can now support 7-digit job numbering. A conversion utility, MFHKHCOV, is supplied to convert any existing dataset to the new format. Run this utility using the sample JCL job CONVERT.JCL. Once converted, the newly formatted dataset supports both 5- and 7-digit job numbering. If you only use 5-digit job numbering, you do not need to run the conversion. See the 'MVSSPLHK Spool Housekeeping Process' section in the Help for more information.

3162868 (1114648)

- When performing an IEBCOPY to a partitioned data set (PDS), a check is now made to ensure that the user has DATASET ALTER permission for the PDS.

3159837 (1114347)

- The DSNRLI functionality for the TERMINATE THREAD call has been improved so that it now calls tx\_end and then tx\_close for a particular XA resource. A ROLLBACK call will not be issued prior to the tx\_close. If an error is returned from the tx\_end function, it is reported back to the calling program as return code 12, reason code 0X00F30093.
- Missing and incorrect key values in the MF\_JCL\_AUDIT event output have been corrected. Also, the audit event code resulting from MF\_JCL\_AUDIT has also been changed from '2 1' to '5 5' to avoid conflict with the same code being used by other components.
- For RISC-based systems when running JCL jobs, you might need to set COBMAINSTACK to a high value such as 8000000.
- An issue resulting in a Run-Time System error "RTS 119 Name is not unique" when calling 'setenv' to dynamically assign a dataset from a COBOL program on a UNIX platform has been resolved. The call to "SETENV" must be made in uppercase characters.

## Mainframe Access

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- By default, VSAM files whose average LRECL are the same as the maximum LRECL are now treated as Variable when generating a .PRO file. You can override this with the existing /FIXEDVSAM flag, or by specifying a fixed VSAM import type (ESDS-FIXED, KSDS-FIXED, or RRDS-FIXED).

3181871 (1116216)

- SyncMon2 now uses the Endeavor "Source Date" and "Source Time" information to determine if a file has changed since the last synchronization.

3177475 (1115904)

## Micro Focus Batch Scheduler Integration

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- When using MFBSI, the message JES000020W (JOB number warning percentage exceeded) is now correctly handled, and no longer results in an invalid MFBSIJCL 208 return-code (JCL error).

3186963 (1116620)



## Micro Focus Directory Server

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- The event codes for several MFDS audit points have changed.
- On Windows, by default, the Enterprise Server Administration Web interface can only be contacted using the loopback address (localhost or 127.0.0.1). You can enable remote access to the Web interface by turning off the loopback mode. See "Using the Loopback Address" in your product Help for more information.

## MFCRYPTLIB

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- Passing an incorrect keyfile passphrase no longer results in receiving an RTS115 error in MFDS.  
3181743 (1116186)

## PL/I Support

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- A problem with allocation of BASED, CONTROLLED, and AUTOMATIC structures has been corrected. This problem was limited to structures where the last member field was of type BIT. Specifically, the problem only occurred for BASED, CONTROLLED, and AUTOMATIC structures when the last member field is of type BIT, resulting in incorrect code generation for BASED and CONTROLLED storage at the point of allocation (i.e., an ALLOCATE statement), and for AUTOMATIC storage, incorrect stack frame allocation for the declared structure. Naturally, any module affected by this problem needs to be recompiled. To ensure that no problems arise, the user should identify all modules that use a structure or structures where the last member is of type BIT, and recompile those modules. This applies to users who have compiled code with versions of Enterprise Developer earlier than ED 4.0 HF 10. Note: BIT means a bit-string of any length, including BIT(1). It does not apply to BIT ALIGNED.  
3192381 (1117048)
- The Open PL/I compiler now generates a W-Level diagnostic if a constant array dimension or extent is of type CHAR or BIT. This is usually unintended coding.
- The macro preprocessor now supports the use of %INSCAN and %XINSCAN.  
2880348 (1107310)
- Previously, if a condition prefix for STRINGRANGE was enabled and a STRINGRANGE condition occurred, it was raised to ERROR after being processed. This no longer occurs.  
3182428 (1116254)
- PLISAXA, PLISAXB, and PLISAXC processing has been enhanced to use ENTRY LIMITED functions and procedures which utilize OPTIONS(BYVALUE).  
3150969 (1113745)
- A problem causing the SQL pre-compiler to hang has been fixed.  
3165345 (1114825)
- SQL is now supported in a PL/I PACKAGE. A SQLCA declaration (usually via include of SQLCA) in a nested block (PROCEDURE or BEGIN) is not allowed. It is allowed only in the outermost block(s) or in a PACKAGE.  
3159844 (1114355)
- The PL/I Eclipse debugger now supports double-clicking in the left margin on a DCL line to set a watch on the variable for the content to change during execution.
- The PL/I Eclipse debugger now supports displaying the current value of a variable by placing the cursor over a variable name in the PL/I source.

## Request Packet Interface API

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- The default behaviour for TLS certificate Common Name (CN) matching has changed for release 5.0. It now requires a strict match on the CN value or any Subject Alternate Name (SAN). For example, 127.0.0.1 and localhost are no longer implicitly equivalent, nor are hostname and its IP address or fully-qualified domain name (FQDN) variants. When starting a region from the Enterprise Server Administration Web interface, a resolved IP address is used for the `casstart -m` parameter value. A resolved IP address is also used even if a hostname is specified on a command line startup.

To change this behavior and use a resolved hostname value (as determined by the machine TCP configuration, for example, hosts file entries.) set the environment variable `MFDS_DNS_RESOLVE=Y`. To use an unresolved string literal hostname, for example, a value explicitly passed in via the `casstart -m` command line parameter, set `MFDS_DNS_RESOLVE=N`.

3194613 (1117203)

## Significant Changes in Enterprise Developer 4.0

This section describes significant changes in behavior or usage in Enterprise Developer 4.0. These changes could potentially affect the behavior of existing applications or impact the way the tools are used.

Where present, the numbers that follow each issue are the Support Incident Numbers followed by the Reported Problem Incident (RPI) number (in parentheses).

- [Application Server JCA Support](#)
- [Application Workflow Modeller](#)
- [CICS Support](#)
- [Code Coverage](#)
- [Codeset Support](#)
- [Common Communications Interface](#)
- [Communications Server](#)
- [Compiler](#)
- [Data Tools](#)
- [Documentation](#)
- [Enterprise Server](#)
- [Enterprise Server Auditing](#)
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- [IDE](#)
- [Interface Mapping Toolkit](#)
- [JCL Support](#)
- [Mainframe Access](#)
- [MF Server Administrator \(GUI\)](#)
- [Micro Focus Directory Server](#)
- [PL/I Compiler](#)
- [Run-Time System](#)

### Application Server JCA Support for Enterprise Server

- With this release, all CICS-related Java artifacts have been delivered using a new directory structure under the `javaee-ccl` directory of your Enterprise Developer installation directory. The `javaee-ccl` directory structure mimics the structure of the `javaee` directory. For example, `mfcc1.jar` is no longer located in the `bin` subdirectory, but can be found in the `javaee-ccl\common` directory.

## Application Workflow Modeller

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- Source or listing files are now opened in read-only mode when a browse action is executed in the ChangeMan attachment model.  
3138354 (1112546)
- A new function package, Micro Focus Background Parser, enables you to define the SYSLIB or PROCLIB concatenation in which to search for COBOL copybooks, PL/I or JCL include files on the mainframe or on network drives. The package also enables you to define any identifiers which determine the structure of the local cache for COBOL copybooks, PL/I or JCL include files.  
3132249 (1111922)
- The Endeavor attachment application now validates the input of a CCID or a comment. They must not be blank.
- Added the new "Modeled Edit Sessions Only" AWM model attribute to control whether modeled editor actions should be available in non-modeled edit sessions.

## CICS Support

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- Starting with version 4.0 Patch Update 2, all applications that use WEB CONVERSE or WEB SEND SESSTOKEN explicitly with the AUTHENTICATE, BASICAUTH, or NONE options, and that do not use a URIMAP that specifies the AUTHENTICATE attribute, must be recompiled. (This does not affect applications that use a URIMAP that specifies the AUTHENTICATE attribute.)
- Client ECI timeouts now propagate CTG requests to ABEND AITH the ECI server program.
- The update resource definition file utility, CASRDTUP, now supports the DELETE command. Note that the REMOVE option is not currently supported.  
2885020 (1108004)

## Code Coverage

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- Schema changes that affect the test coverage results generated from the `tcutil` utility mean that if you propagate the results to a third-party application (for example, an XSLT processor), and rely on the `<copyFileCoverage>` element, you need to alter your transformations to focus on `<sourceFileCoverage>` instead. The element was renamed to more appropriately reflect its contents, as `tcutil` now gives global coverage for all source files (not just copybooks).

## Codeset Support

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- Code-set mappings between ASCII and EBCDIC have been updated when Simplified Chinese is the language in effect. ASCII table 5210 now maps to EBCDIC CCSID 836 for SBCS conversions. This replaces the previously conversion (where ASCII table 1042 was used), which would convert the “\” character to “\$”.  
3124321 (1111464)
- New single-byte character set tables for MFCODESET have been added in order to improve support for DB2 LUW - both for off-mainframe databases and for access to z/OS DB2. A number of existing MFCODESET mappings have also been updated. See 'Supported Country Codes' for a full listing of ASCII/ANSI <-> EBCDIC mappings.  
3111843 (1109984)

## Common Communications Interface

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- You can now configure the Micro Focus Directory Server and enterprise server region's listeners to only use the server's configured SSL and TLS protocols and define a priority ordered cipher suite collection. This forces connecting clients to use the server's preferred ordered list of cipher suites when using the specified protocols.

2866265 (1105526)

- In some circumstances it was possible for a connection to incorrectly accept the identity of an SSL/TLS peer and allow a connection to complete when the connection should have been denied. This occurred due to a failure to check the peer's entire identity certificate chain. This has now been fixed. NOTE: You might need to correct your system's configured certificate chains that fail verification checks at secure connection creation time.
- In some circumstances it was possible to crash the CCITCP module when it was attempting to obtain detailed error information about a closed connection. This has been fixed.

## Communications Server

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- TN3270 conversations to Enterprise Server now correctly handle the receive (idle) timeout setting configured for the listener. There are also two new settings for configuring TN3270 timeouts, "Printers time out" and "Output resets timeout". See the online product documentation for more information.

3144133 (1113024)

- Web access to the Enterprise Server Console Log and Communications Server Log is now restricted when the region is secured using external security. Users will be required to provide a valid username and password in order to view either log file. Web access to the logs can be controlled using the standard ACL definitions under the new "Communications Server" Resource Class, with resources "Enterprise Server Console Log" and "Communications Server Log". If these resources exist, users require read access to be allowed to view the logs. If they do not exist, the default behavior is to allow read access. The new resource class and resource definitions can be found in the "es\_default\_ldap(\_msuser/\_unix).ldf" file in the bin or etc sub-directory of your product install directory.

3113539 (1110155)

- MFCS listeners can now be SSL-enabled without the need to have DemoCA installed.

2868627 (1105777)

- MFCS no longer initializes the Security Facility if there are no External Security Managers defined for the region.

## Compiler

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- Programs containing EVALUATE statements of the form: EVALUATE true | false WHEN conditional-expression where conditional-expression included inline method invokes would give an RTS 114 error when run as .int code, and an "Illegal .int code" error when generated. This has been fixed. Also, short circuit evaluation is now correctly observed, such that when evaluating condition-1 AND condition-2, if condition-2 contains an inline method invoke and condition-1 is false, then the inline method invoke is not executed. Previously, despite being correctly evaluated, the inline method invoke in condition-2 was being executed. Similar behavior relating to OR evaluations has also been corrected.

3138510 (1112492)

- During compilation, characters within literals that are unknown in the current locale are now less likely to cause spurious errors. However, the correct (and safest) solution is to ensure that the locale has been set correctly, to match the source encoding of these characters. On UNIX, this means setting LANG, LC\_CTYPE, or LC\_ALL appropriately; each of these variables takes precedence over the former. On Windows, this means setting the system locale in the 'Region and Language' section of Control Panel.

3123935 (1111148)

- The Compiler now produces an E level message - COBCH1888 Typedef is defined differently in another external program - if different external programs have conflicting definitions of the same typedef name. (To restore the previous behavior, where the earlier definition was ignored, use the directive HIDEMESSAGE"1888".)
- An issue with the Compiler has been fixed so that in the RECORD VARYING clause, if the minimum and maximum lengths are specified, the maximum length must be greater than the minimum length.

## Data Tools

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- Records with an invalid value for a conditional field will no longer result in a match for that conditional layout.

2853226 (1103406)

## Documentation

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- You can use 'byte' or 'BYTE' as a synonym for the binary-char unsigned data type. As a result, 'byte' and 'BYTE' are now reserved words in Managed COBOL. Use the REMOVE"BYTE" Compiler directive to prevent an error being produced for existing programs that use the reserved word as a user-defined word.

3147576 (1113323)

- As of version 3.0, references to types within an assembly other than mscorlib need to be explicitly referenced. You can achieve this by using the ILREF Compiler directive. (Previously, in certain circumstances, the Compiler would allow access to types within the System.dll assembly without the need for an ILREF"System" directive.)

3121002 (1111373)

## Enterprise Server

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- The External Security Facility (ESF) can now be configured to throttle large volumes of incoming Verify (user authentication / signon) requests to improve resilience to denial-of-service and brute force attacks. See "Verify Request Throttling" for more information.

3113639 (1110160)

- The LDIF files used to create the sample configuration for Enterprise Server LDAP-based security no longer create an empty "PHYSFILE" resource class. Changes in the JCL engine as of ES 3.0 caused most jobs to fail when submitted to a security-enabled region using such a configuration. See the product help for more information.
- The MLDAP ESM Module, part of the Enterprise Server External Security Facility, now supports the Argon2 hash algorithm for creating password verifiers. See MLDAP ESM Module Custom Configuration Information in the product help for more information. NOTE: The Argon2 hash is optional and not enabled by default.
- The MQ pages in ESMAC are now controlled by a new security resource, MQL. This enables you to either restrict or grant users access. 'MQL\*' is a new resource that needs to be added under MFESMAC similar to existing resources such as 'PCT\*' or 'XAT\*'. The following is a sample export of the LDAP repository:

```
*****
# Sample security definitions for ESMAC MQ Listeners/Writers pages

#####
##### MQL*          ##
```

```
#####
dn: CN=SQL*,CN=MFESMAC,CN=Enterprise Server Resources,CN=Micro
Focus,CN=Program Data,DC=X
changetype: add
cn: SQL*
objectClass: microfocus-MFDS-Resource
microfocus-MFDS-Resource-Class: MFESMAC
microfocus-MFDS-Resource-ACE: allow:SYSADM group:alter
microfocus-MFDS-Resource-ACE: deny:*:execute
microfocus-MFDS-UID: mfuid
#description: Allow full access any ESMAC MQ Listeners/Writers Screen

*****
```

3143258 (1112990)

- You can now use the `ECIResponse.getReturnCode()` method to obtain the return code for any errors from Enterprise Server.

3142092 (1113248)

- Communication with the console daemon has been improved. Messages are displayed more quickly and requests are being processed more efficiently and, as a result, times for initialization and shutdown might be reduced.

3136867 (1112483)

- Administrators can now add, delete or modify XA resources in the Enterprise Server Administration Web UI while a region is running.

2589624 (1085625)

- CICS Web services has been updated to include the `ES_TRANCLASS_CWI` environment variable, which enables you to prioritize and limit Web requests in a TRANCLASS-enabled region. When the `ES_TRANCLASS_CWI` environment variable has been set to either `TCPIPSERVICE` (default) or `URIMAP`, a TRANCLASS-enabled region processes the elected transaction according to its priority and associated TRANCLASS.



**Note:** When using CICS® Transaction Server for z/OS®, Version 3 Release 1, and IBM CICS initiates the ATTACH transaction followed by the ALIAS transaction for a single Web request, this is intended to enable the application of different limitations and priorities on these transactions. Enterprise Server does not support this. Instead, a TRANCLASS-enabled region processes the requests as a single ATTACH transaction, and uses the ALIAS transaction for security checks.

3126381 (1111349)

- Web access to the Enterprise Server Console Log and Communications Server Log is now restricted when the enterprise server region is secured using external security. Users will be required to provide a valid username and password in order to view either log file.

Web access to the logs can be controlled using the standard ACL definitions under the new **Communications Server** resource class, with resources **Enterprise Server Console Log** and **Communications Server Log**. If these resources exist, users require 'read' access to be allowed to view the logs. If the resources do not exist, the default behavior is to allow 'read' access on entry of a valid username and password.

An example of the new resource class and resource definitions can be found in the `es_default_ldap_msuser.ldf` (Windows), or `es_default_ldap_unix.ldf` (UNIX) file, which is located in the `bin` (Windows), or `etc` (UNIX) sub-directory of your product directory.

- In UNIX environments, DB2 and ODBC switch modules can now be enabled together in the same region if the DB2 switch is built with the "-o" option.

3137455 (1112398)

## Enterprise Server Auditing

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- The maxRetryTime value in the audit configuration file now treats 0 as a no timeout time, and any negative number as an infinite timeout.  
3150566 (1113592)
- Any extra information that was added to the syslog messages will now correctly appear in the structured data items.

## Executables require relinking or recompiling



**Note:** Windows-only.

- Due to an internal change in version 4.0 of your product, you must at least relink any executable programs compiled prior to this version, to make them compatible with the latest run-time system. However, a full recompilation of your source code is the recommended action, to allow your executables to benefit from the product's latest programming and performance enhancements.  
  
Relinking an executable without recompiling means using the original object code with the `cblink` utility. Original object code is typically the binary file output (usually containing the `.obj` extension) produced during the original compilation process. An application can contain one or more binary files.

## File Handling

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- In some cases the ESF LDAP Security Administration Web Interface inadvertently removed users from groups when changing their password. This has been fixed.  
3124294 (1111259)
- The ESF LDAP Security Administration Web Interface can now filter by Class and Resource name, description, and ACL. Previously, you could only filter on Class name.  
2871549 (1106119)
- Setting the configuration option `ASCIISOSI=ON` will add the required SOSI characters to the relevant EBCDIC DBCS character strings, in order for them to be displayed or written out correctly.  
3113802 (1110183)
- The OPEN mode of SYSOUT files now honors the DISP specified in the JCL.  
3109432 (1109745)
- OPEN I-O of a virgin ESDS file now correctly returns a file status of 35, as it does on the mainframe.  
2887724 (1108443)
- The TO parameter is now supported for TOT|TOTAL, MIN, MAX, and AVG in the TRAILER3 trailer item.  
3135298 (1112194)
- The UTFIL statement of a SORT operation now supports the NULLOFL parameter.  
3110364 (1109822)
- The MFJSORT UTFIL emulation now supports the VLTRIM parameter.  
3107105 (1109820)

## HCO for Microsoft SQL Server

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- The HCOSS Manage Connections tool was incorrectly limited to using the default CCSID for mainframe DB2 connections, causing problems when mainframe database did not use the default CCSID of 37.

This has been corrected by the addition of a text box that enables the setting of a specific CCSID value for the connection.

3130137 (1112180)

- When using the DIALECT=MAINFRAME setting, the OpenESQL STRICTPARSE SQL compiler directive option is now turned on by default for ODBC (DBMAN=ODBC). This ensures strict compliance with z/OS DB2 syntax.

If your applications require the OpenESQL preprocessor to behave as it did in an earlier release, compile using NOSTRICTPARSE.

## IDE

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- New functionality to support the debugging of CICS channels and containers has been added to this release.

2810448 (1098047)

- Code blocks in PL/I editor can now be folded. You can configure the PL/I editor to fold various block types. To do this, click Window > Preferences > Micro Focus > PL/I Editor > Folding, and check the options that you require.

2867993 (1105654)

## Interface Mapping Toolkit

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- Refresh Resources functionality has been added to regenerate existing service interfaces for COBOL programs whose linkage section has been updated after the service interface was initially created.

2849403 (1103036)

- Due to changes made to the **Configure Runtime Environment** dialog box in this release, after you upgrade your system, you must reenter all previously set values on this dialog box before running a service.

## JCL Support

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- You can now configure MFFTP to not process trailing blank spaces for a GET command, by setting the new control variable MFFTP\_PROCESS\_TRAILS\_ONGET=FALSE and setting the LOCSTAT value TRAILINGBLANKS=FALSE.

3138375 (1112486)

- ICEGENER now does not copy the RECFM from SYSUT1 to SYSUT2 if SYSUT2 RECFM is not specified in JCL and when SYSUT1 is VSAM. It defaults to F/FB if SYSUT2 is non-VSAM, or V/VB if SYSUT2 is VSAM.

3131268 (1111805)

- An error in identifying the IDENT in IEBGENER when the record included high values at the start of the record has been corrected.

3109443 (1109759)

- FOR ED 2.3.2 HF7: The following changes have been made to the MF\_UCC11 environment variable: MF\_UCC11=Y - when running a job with DISP=(NEW,CATLG), it will not result in job failure caused by the data set already being cataloged. MF\_UCC11=YR - when restarting a job with DISP=(NEW,CATLG), it will not result in job failure caused by the data set already being cataloged. For ED 3.0 HF1: The following changes have been made to the MF\_UCC11 environment variable: The default behavior of MF\_UCC11=Y has changed: DISP=NEW is changed to DISP=MOD only when the



job is restarted. MF\_UCC11=YA reverts to the old behavior of changing DISP=NEW to DISP=MOD even when the job is first run.

3107409 (1109722)

- The introduction of a new environment variable, ES\_OLD\_DYN\_PDS, has changed the resulting behavior of dynamic PDS members when specified in a JCL DD statement. Default behavior (ES\_OLD\_DYN\_PDS=N) no longer creates physical files or catalogs the PDS members when specified in a JCL DD statement. Set this variable to Y to enable the previous default behavior of creating the physical files and cataloging PDS members when specified in a JCL DD statement.

2845176 (1102528)

- To prevent unintended deletion of a GDG Bias, a GDG in use by one job may not be accessed by a second job until the first job has completed.

2816745 (1101569)

## Mainframe Access

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- Calling mfmon2.exe with the following options has the given effect:
  1. If you do not specify "EXTENSION" or specify "EXTENSION=" it will result in files downloaded without an extension.
  2. If you specify "EXTENSION=\*" you will get an extension that matches the last part of the data set name. For example, if the source data set is a.b.c.d then the file extension will be .d.
  3. Everything else results in the extension specified. For example, "EXTENSION=txt" will result in files downloaded with a .txt extension.

## MF Server Administrator (GUI)

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- The total number of active sessions or clients in MFDS is now limited to 2000.

## Micro Focus Directory Server

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- The mfds -g options D, O, and S have been added to the product Help.  
2848627 (1102864)
- On UNIX, specifying an invalid user ID in the MFDS "General" options value for "Default process user ID" no longer causes the child process (such as a region start or stop request launched from the Web interface) to fail. The user ID under which the MFDS process was started will be used instead.
- MFDS now disables and limits the scope of Web listeners on add. It also emits a warning if any insecure Web listeners are displayed in the validate and listener tables.

## PL/I Compiler

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- Previously, storing PL/I named constants in big-endian form was incorrect and impaired some instances of restricted expression evaluation. In ED 4.0, named constants are stored in native form when the -bigendian compiler option is in effect.  
3150931 (1113613)
- Open PL/I now supports the FLUSH statement.  
3134294 (1112117)
- The %PROCESS statement now includes new compile-time options, -pporder and -options. See the product help for more information.

3107667 (1109861)

- Pointer subtraction in 64-bit mode now works as expected.

## Run-Time System

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- The run-time system now produces a more precise error message if a shared object of the wrong bitism is loaded.
- scan64 is no longer available. This has been superseded by the COBOL Analysis functionality in the IDE.

# Significant Changes in Enterprise Developer 3.0

Enterprise Developer version 3.0 includes significant changes in the following areas:

- [AppMaster Builder](#)
- [CICS Support](#)
- [Compatibility AddPack](#)
- [Compiler](#)
- [Documentation](#)
- [Enterprise Server](#)
- [File Handling](#)
- [IDE](#)
- [IMS Support](#)
- [JCL Support](#)
- [JES-enabled Enterprise Server Regions](#)
- [Micro Focus Batch Scheduler Integration](#)
- [Micro Focus Directory Server](#)
- [OpenESQL](#)
- [PL/I Support](#)
- [Reserved words](#)
- [SQL: HCO for SQL Server](#)
- [HCO for DB2 LUW](#)

## AppMaster Builder

- A new parm "STS" can be passed into the Program Generator. This parm tells the Program Painter to issue an error when it encounters a STUB keyword and the stub program is not specified in the application definition. This new parm is specified in the ISPSLIB\SSMPCOM file tailoring skeleton. Do a search for "STUBSCAN" to see where this parm is specified. By default, this new option is not in effect. To turn it on uncomment the line where the value is set to "YES". This feature is only available when generating programs via the IDE. When using the Distributed Generation Server (DGS) this setting is ignored.

2988372 (1108572)

## CICS Support

- The value specified in the LENGTH field of the SEND TEXT command is now honored when the target terminal has its SOSI or PS attributes switched on. This means that trailing spaces will no longer be removed for SOSI/PS terminals.

2884877 (1107983)

## Compatibility AddPack for Visual COBOL

Compatibility AddPack for Visual COBOL is now deprecated and will not be available with release 3.0 and later.

The Dialog System GUI and run-time components and Dialog System Character Mode (on Windows and UNIX) which were part of the AddPack are now installed as part of Enterprise Developer for Visual Studio. The run-time components are installed as part of Enterprise Server. These are only included for backward compatibility and Micro Focus does not recommend that you use them for new development.

The other components which were part of the AddPack, the Character-Based Data File Editor, CSBIND and Screens, will be available upon request from Micro Focus SupportLine.

## Compiler

- Replacing a partial token no longer causes the second part of the token to appear on a new line. This could happen if the new text was larger than the text being replaced.

2869185 (1105763)

## Documentation

- There have been a number of new reserved words added to the language in this release; these are all in effect under MFLEVEL"19", which is the default level when running under the MF dialect. Any of the following words are now not allowed under default conditions, and you will need to remove/rename them, or specifically configure your environment to allow them: ALLOCATE FREE JSON END-JSON

## Enterprise Server

- WEB CONVERSE now supports a value of 0 for the USERLEN and PASSWORDLEN options which matches the behavior on the mainframe. There is no change to the behavior of WEB SEND (client) which is to return LENGERR 139/140 when USERLEN or PASSWORDLEN are 0.

2989188 (1108602)

## IDE

- You can now open data files in RSE configured remote projects using the mfdatatools2 on the remote machine displaying back to an X display. You can configure the remote tools display by clicking Window > Preferences > Micro Focus > X Display. In the X Display (DISPLAY) field, type the display details. In addition, COBOL Explorer displays the Open With Remote Data File Editor context menu item for remote data files.

2852872 (1104085)

- Enterprise Server sign on credentials which were created on Windows when using the 32-bit versions of Enterprise Developer or Visual COBOL for Eclipse are not compatible with the 64-bit versions of those products, and vice versa. Users are required to re-enter credentials which are not compatible with the current version of the product. You only need to do this the first time they are used in the current product.

(625819)

## File Handling

- Under certain circumstances, retry-lock requests on UNIX systems were sleeping for a second before re-attempting to acquire the lock. This no longer happens.

2988222 (1108521)

- A problem that generated a 39 error when attempting to access a VSAM file via an alternate index PATH element has been fixed.

2874622 (1106562)

- Under Mainframe emulation, when an empty virgin VSAM file is opened for input or for input/output, a file status of 35 is returned, regardless of the access mode specified.  
2692826 (1093604)
- New PARM option SIGN-EBCDIC documented for MFJSORT.  
2880037 (1107256)
- The MFJSORT ICETOOL emulation now supports the USING parameter in the SELECT operator.  
2821176 (1099529)
- An empty, space-filler record is no longer produced at the end of an ICETOOL listing file.  
(622789)


### IMS Support

- Inconsistent results returned to a GET call issued from a PROCOPT=GO application when segments within the same database record were updated and locked by another session. Symptoms included an invalid (GE) status code or the wrong segment returned to a GN call. This has been fixed.  
2862879 (1104899)
- The IMS control page is now secured according to the IMS\* entity in MFESMAC.  
2877405 (1107099)

### JCL Support

- An emulation of the LE run-time option CBLQDA has been implemented in the form of the environment variable MF\_CBLQDA. The default is OFF, but when set ON, QSAM files can be dynamically created.  
3104665 (1109251)
- A new event call to the JCL user exit (MFJUXIT) has been included. The event 'job-queued' (event code 27) occurs when a JCL job has been parsed and put on either the Input Ready queue or the Input Hold queue.  
2990395 (1108734)
- When reading commands, MFFTP now checks the charset (EBCDIC or ASCII) of each concatenated INPUT dataset to determine if it should be translated. The output is written in the charset which appropriate for the dataset.  
2876407 (1106795)
- The PHYSFILE security setting will now be checked when a dataset entry is inserted into the catalog, or when a dynamic PDS member is created.  
2857819 (1104844)

### JES-enabled Enterprise Server Regions

 **Important:** Existing JES-enabled Enterprise Server regions must perform this upgrade to continue using JES functionality. If you start a region without upgrading, the following message is displayed in the console log, and JES functionality is disabled:

```
JES000058E JES validation - Product requires new spool control files. Run
spool conversion utility, splconv, to create them.
```

In this release, the infrastructure of the JES spool repository has been upgraded in order to improve performance (see the *Enterprise Server* section of *What's New* for more details). For each JES-enabled region, before you can submit any jobs to JES, you must run the spool conversion utility; any newly created regions will automatically be configured to use the new spool files.

The conversion process converts the information in the existing spool files to a set of new files required under the new system. There should be no loss of data in moving to the new system.



**Important:** After converting to the new JES spool infrastructure, we recommend that you do not employ the increased range of job numbers until you have thoroughly tested the new infrastructure. Reverting back to the previous JES spool files is possible, but requires that you remove all job entries using more than 5 digits, for which there is no easy process.

### To run the spool conversion utility

1. At the Enterprise Developer command prompt, set the following environment variables, as required:

Variable	Description
MFSYSCAT	The location and name of the current JES catalog. This is mandatory.  If multiple catalog files are being used (that is, one or more user catalogs are defined), this environment variable should point to the catalog where JES spool datasets are cataloged.
MVSSPOOLDIR	The location of the current JES spool files. This is only mandatory if the location is different to the location of the JES catalog.
NEWSPOOLDIR	The location for the resulting JES spool files (that is, the SPL* files if running the conversion, or the old-style spool files if running the regression). This is only mandatory if the location is to be different to the location of the existing spool files.
MFSYSCAT_ERRS	The number of catalog errors that will be tolerated during the conversion process before the conversion is terminated. This is optional, and defaults to 100.  If the process is terminated, the following error is produced:  MVSCATIO Error limit exceeded = <i>nnnn</i> (where <i>nnnn</i> is the error count)

2. Type `splconv`, then press **Enter**.

The conversion process runs, and details of the files and records converted are displayed to screen.

3. If `MVSSPOOLDIR` and `NEWSPOOLDIR` were set to different locations prior to running the conversion, you must now set `MVSSPOOLDIR` to the value of `NEWSPOOLDIR`.



**Note:** If you do not perform this step, you will receive the following error when you start your region, and JES fails to initialize:  
JES000058E JES validation - Product requires new spool control files. Run spool conversion utility, `splconv`, to create them.

4. You can now start the region identified by the variables, and begin to submit jobs.

### Reverting to the previous JES spool repository

If you plan to downgrade to an older version of your current product, any enterprise server region that has been converted or created with the current product will not be compatible. Before you can use them, they must be reverted to using the old JES spool repository.

Use this process if you are wanting to use a JES-enabled region in a previous version of the product:

1. At the Enterprise Developer command prompt, set the environment variables listed in the *To run the spool conversion utility* process, as required.
2. Set an additional variable, `SPLREGR_TARGET`, to `PRE30`.
3. If the region has started to use 6- or 7-digit job numbers (an enhancement new to version 3.0 of the product), then before you run the regression, you must remove the jobs that are using these numbers,

and ensure that the MF\_MVSJOB environment variable (or the SPLJNO.dat file if the variable is not used) does not specify an upper limit greater than 5 digits.



**Note:** If using the MF\_MVSJOB environment variable, to revert to 5-digit job number support, set MF\_MVSJOB=<low number>+<high number>, where *high number* is less than 0099999, and ensuring that the + sign is used to separate the low and high values.

4. Type `splregr`, then press **Enter**.

The regression process runs, and details of the files and records converted are displayed to screen.

You can now use the region identified by the variables in previous versions of Enterprise Developer.

### Exporting the spool files to Enterprise Server for .NET

If you plan to export a region to Enterprise Server for .NET, any enterprise server region that has been converted or created with the current product will not be compatible. Before you can use them, they must be reverted to using the old JES spool repository.

Use this process if you are exporting a JES-enabled region to Enterprise Server for .NET:

1. At the Enterprise Developer command prompt, set the environment variables listed in the *To run the spool conversion utility* process, as required.

2. Set an additional variable, SPLREGR\_TARGET, to the appropriate value:

**DOTNET5**

Create spool files for use on Enterprise Server for .NET, using a maximum of 5 digits for job numbers.

**DOTNET7**

Create spool files for use on Enterprise Server for .NET, using a maximum of 7 digits for job numbers.

3. Type `splregr`, then press **Enter**.

The regression process runs, and details of the files and records converted are displayed to screen.

You can now use the region identified by the variables in Enterprise Server for .NET.

### Micro Focus Batch Scheduler Integration

- MFBSI no more requires that the name of the last folder specified in the path in MFBSI\_DIR matches the name of the target Enterprise Server region. It is now possible to specify any directory path in MFBSI\_DIR. You must use the same value for MFBSI\_DIR in both the Enterprise Server configuration and for MFBSIJCL execution. When the name of the last folder specified in the path in MFBSI\_DIR does not match the name of the target Enterprise Server region, you need to specify the region name in one of the following ways: 1. From the mfbsijcl command line, using the parameter REGION=ESRegionName. 2. In an MFBSI configuration file, in a line containing REGION=ESRegionName. You can specify this either in the default configuration file, mfbsi.cfg located using the path specified by MFBSI\_DIR, or using a custom location or configuration file and the following parameter: CFG=[path]/name[.ext] See your product help for more details.

2869805 (1105939)

### Micro Focus Directory Server

- In the Enterprise Server Administration HTML GUI, the "Scripts" page functionality is only available if administration access is restricted and the logged on user has sufficient authority.

3101625 (1109025)

- Some additional CSRF security measures have been added to the Enterprise Server Administration HTML GUI.

3101205 (1108916)

## OpenESQL

The new OpenESQL OPTIMIZECURSORS SQL compiler directive option is turned on by default for ODBC (DBMAN=ODBC). This ensures that embedded SQL cursors that use WITH HOLD and FOR UPDATE clauses have the same data integrity across all databases.

If your applications require the OpenESQL preprocessor to use the behavior provided in an earlier release, compile them using OPTIMIZECURSORS=NO.

## PL/I Support

- PUT output-items of type POINTER are now output as a hexadecimal string rather than a fixed bin integer value.  
(623184)
- Enterprise Developer 3.0 includes some changes that result in a significant performance improvement when assigning a null character string " to arithmetic data items, pointers, and structures. In versions of the product earlier than 3.0, pointer = "; assigned the value sysnull(). This has been fixed and null() is now assigned. See the product help for details about the -setnull compiler option.  
(627517)
- Previously, if writing output to a CTLASA (PRINT) file with the optional LINE(x) parameter having a value of x that was less than the current line, PL/I did not generate ASA Control characters to end of page and emit the output on the first line of the new page. This no longer occurs.  
2871278 (1106114)

## Reserved words

- There have been a number of new reserved words added to the COBOL language; these are all in effect under MFLEVEL"19", which is the default level when running under the MF dialect. Any of the following words are now not allowed under default conditions, and you will need to remove/rename them, or specifically configure your environment to allow them:

ALLOCATE  
FREE  
JSON  
END-JSON

## SQL: HCO for SQL Server

- The HCOSS Assess Application Migration tool now enables you to view the original DB2 SQL and the converted TSQL together in both the HCOSS tool itself and in any exported CSV files.

## HCO for DB2 LUW

- Help buttons previously available on the XDB Server Configuration Utility, XDB Service Controller, Options Dialog, Bind Utility, and Linker Config (Link Profile) UIs have been removed with the exception of error messages in the SQLWizard, Migrate, and Declaration Generator.

# Significant Changes in Enterprise Developer 2.3 Update 2

Enterprise Developer version 2.3 update 2 includes significant changes in the following areas:

- [AppMaster Builder](#)
- [Compiler](#)

- [Eclipse IDE](#)
- [Enterprise Server](#)
- [MF Directory Server](#)
- [Monitoring and Management](#)
- [JCL Support](#)
- [PL/I Support](#)
- [Run-Time System](#)

### **AppMaster Builder**

- To correct a problem with generating programs when no APRPROG member is present, a new Output Generation preference has been added that, when enabled, creates a temporary APSPROG member at generation time if none is found. In addition, a new customizable APRPROG template is available to enable customization of the temporary APSPROG member.

2849347 (1103014)

### **Compiler**

- Replacing a partial token no longer causes the second part of the token to appear on a new line. This could happen if the new text was larger than the text being replaced.
- 2869185 (1105763)
- There is no longer a problem opening an RM/COBOL indexed file when the program has a RECORD CONTAINS n CHARACTERS clause and there are record descriptions with lengths less than n. This situation previously caused a 39 error on the OPEN (other than OPEN OUTPUT) because there was a mismatch in the minimum record length.

### **Eclipse IDE**

- This update modifies any existing connections defined in an Eclipse workspace. If the connections had any non-default values, those values could revert to their original default setting. After installing this release, before you use any remote connections for the first time, you need to check the settings and amend them as necessary.

2852872 (1103699)

### **Enterprise Server**

- Previously, it was possible to install groups that should not have been installed. If a group name, as defined in the Startup List, did not exist in the list of Groups then the next Group in the alphabetical order would be loaded instead. Now, if a Group is not defined in the list of Groups, a warning that the Group could not be loaded is issued.

2869848 (619107)

- On UNIX, if the "File Path" setting was not specified in the configuration of an Enterprise Server, the environment variable TXFILEP was defaulting to \$COBDIR/etc/cas. This has been changed and TXFILEP is not populated when the "File Path" is not specified.

(618668)

### **MF Directory Server**

- The "-n" option for the mfd command now supports hostnames as the network addresses in addition to IPv4 addresses.

2816871 (1099564)



## Monitoring and Management

- Messages that are written to the console log by applications that perform "display upon console" now contain a standard message ID (CASMG0001!).  
2854207 (1103659)

## JCL Support

- A printer exit can now evaluate the spool copybook field lk-dest-source-is to find the source of the value in the spool DEST-NODE and DEST-USERID fields, to determine if it is from a SYSOUT 'DEST=' value or from a /\*ROUTE PRINT value.  
2852302 (1103304)

## PL/I Support

- A problem with PUT STRING when compiled with the -bigendian option in effect has been fixed. Note that when upgrading to ED 2.3 U2 you must recompile any program using PUT SPRING.  
2857374 (1104039)
- Previously, if using the -incafter option of the macro preprocessor to infuse a %INCLUDE with macro logic, you were required to schedule a second macro pass to preprocess the contents of the %INCLUDE. This is no longer necessary and the macro logic will be preprocessed on the first macro pass as if it was part of the original source.
- Previously, if writing output to a CTLASA (PRINT) file with the optional LINE(x) parameter having a value of x that was less than the current line, PL/I did not generate ASA Control characters to end of page and emit the output on the first line of the new page. This no longer occurs.  
2871278 (1106114)
- Previously, if SIGPIPE was triggered when a PL/I program was in the callstack, then PL/I error handling got control and processed the ERROR. This no longer occurs. Users who rely upon catching SIGPIPE can re-enable it by adding a call to cobpostsighandler() to their code to turn it back on.  
2859980 (1104399)

## Run-Time System

- The command\_line\_linkage tunable has been deprecated; equivalent functionality can be achieved by using the COMMAND-LINE-LINKAGE Compiler directive instead.  
2838118 (1101539)

# Significant Changes in Enterprise Developer 2.3 Update 1

Enterprise Developer version 2.3 update 1 includes significant changes in the following areas:

- [Application Workflow Modeller](#)
- [AppMaster Builder](#)
- [Communications Server](#)
- [Data Tools](#)
- [Editor Writing Assistance](#)
- [Enterprise Server](#)
- [IBM Language Environment for OS/390 & VM Support](#)
- [IDE](#)
- [JCL Support](#)

- [Run-Time System](#)
- [SQL: OpenESQL](#)
- [SQL Option for DB2](#)

### Application Workflow Modeller

- Tools used in the File\_Descriptor\_Has\_Action relationship now support Resource Processing. This means tools defined within a dialog table action can modify properties of the selected table rows.  
2835290 (1101493)
- The standard ED project model now contains additional context menu actions under "Open With..." for IMS DBD and PSP files to open either the DBD, the PSP or the IMS Database editors.
- You no longer receive a REXX error when recompiling a component from a baseline.

### AppMaster Builder

- A new checkbox, "Use File Tailoring for Dataview generation", has now been added to the Database View dialog box in the AppMaster Builder (AMB) preferences. When checked, the Database Views will be generated using File Tailoring files and the AMB Builder Server.  
2820090 (1099354)

### Communications Server

- A new option, [Operation] `synchronous=yes` (or 1, or Yes, or y or Y) is now supported in the Fileshare listener configuration.

### Data Tools

- When filtering a data file, if there is no valid temporary directory set, you are prompted to set one using the option in the Preferences dialog box.
- The editor no longer allows you to open a file if the file size (without header size) is not a multiple of the record size on disk; an error is produced instead.
- The editor no longer allows you to open a file if the file size without header size is not a multiple of the record size on disk; an error is produced instead.
- The level numbers displayed in a record layout correspond to the levels used in the .idy file that was used when the structure file was created.

### Editor Writing Assistance

- IntelliSense (Visual Studio) or Content Assist (Eclipse) suggestions are no longer offered if you start typing numbers and automatic triggering of suggestions is enabled.

### Enterprise Server

- In situations where the crossregion option of the shareoptions parameter is either 1 or 2, both a CICS and a JCL job could have the same file open for IO. This has been fixed. In addition, the '-oo' (and the synonymous '-o ') option of the casfile command has been deprecated. If '-oo' is used, you will now receive a return code 4 (warning). Instead of '-oo', you need to use the '-ooi' option (open immediate). If -oo is used with a region configured for VSAM shareoption use, the '-ooi' option is now forced.  
2839272 (1101672)
- When using an external security manager to secure a region, the EXEC CICS START TRANSID API now works as expected and honors the USERID option. Previously, the started transaction would run under the authority of the user that executed the EXEC CICS START API.  
2835112 (1101201)

## IBM Language Environment for OS/390 & VM Support

- When calling SETENV, SYSOUT(?) can be specified. This designates the file as a spool file but will not update its CLASS.

2841220 (1101955)

## IDE

- When compiling to multiple executables from the command line, you must specify the -logger parameter to enable the correct log to be output to the console.

2848855 (1102932)

- For a file added to a JVM COBOL project by adding the folder that stores the file (using the **Source** tab on the **Micro Focus > JVM Build Path > Source page** in the projects' properties), there is now a new context-menu command, **Copy to Output Directory**, in COBOL Explorer. Choosing this command on a file triggers a build of the project and copies the file into the output directory.

2699374 (1094326)

## JCL Support

- The return code from a JCL printer exit will now be checked. If it is non-zero, the dataset that was sent to the printer exit will be moved to the OUT-HOLD queue rather than to the PRINTED queue. To release the dataset, click "Release" in the ESMAC view - this will also present the dataset again to the printer exit.

2834206 (1101079)

- Under Enterprise Server, flushing an active job previously resulted in all associated spool records for the job being deleted, but left the job running. A subsequent attempt to kill the running job using casout/seeout failed due to the job spool record no longer existing. This change causes the flush request to fail if the job is active. You must kill the active job first before attempting to flush it.
- The catalog search facility has been enhanced to provide a quicker return when using wildcards in the dataset name selection.

2698700 (1094266)

- REXX can now be executed in VSE via IKJEFT01 and IRXJCL using in-stream data.

2831984 (1100883)

## Run-Time System

- The Audit Manager contains a new TIMEOUT option. When a client sends an audit event using the 'CBL\_AUDIT\_EVENT' API, the event gets placed in the next available slot in a shared memory block. If shared memory is full (i.e. no slots are available), the event is re-tried until a slot becomes available.

If no Audit Manager is running, no events are removed from shared memory, and no slots will ever become available. Therefore, use the new TIMEOUT option so that a client will only retry sending until the TIMEOUT duration is reached; after which, it will stop sending audit events. If Audit Manager is recycled, events will start to be sent again.

To set the TIMEOUT for all Audit Manager clients, specify the following line in the Audit Manager configuration file:

```
mfaudit.timeout = n
```

Where n is the timeout value in milliseconds.

To set the TIMEOUT for an individual Audit Manager client, use the 'CBL\_AUDIT\_CONFIG\_PROPERTY\_SET' API. It takes an integer property-value, which should be the timeout value in milliseconds.

If TIMEOUT is set using both methods, the client property TIMEOUT takes precedence, unless this property is set to zero; in such cases, the TIMEOUT in the configuration file is used. If you use the

'CBL\_AUDIT\_CONFIG\_PROPERTY\_GET' API on the 'TIMEOUT' property, it only returns the TIMEOUT value for the client property; it does not return the value set in the configuration file.

2838689 (1101685)

- Several changes have been made to the implementation of IS DBCS, IS KANJI and IS JAPANESE class condition tests:

- IS [NOT] DBCS

When CHARSET"EBCDIC" is in effect, the IS DBCS test returns true when each character in the string is deemed to be a valid DBCS character. A valid character has its first byte in the range 0x41 through 0xFE, and the second byte in the range 0x41 through 0xFE, or the character is an EBCDIC space (0x4040). When CHARSET"ASCII" is in effect, the DBCS test uses an OS call to determine if the string contains only valid double-byte character, and returns true if valid.

- IS [NOT] KANJI

When CHARSET"EBCDIC" is in effect, the IS KANJI test returns true when each character in the string is deemed to be a valid Kanji character. A valid character has its first byte in the range 0x41 through 0x7F, and the second byte in the range 0x41 through 0xFE, or the character is an EBCDIC space (0x4040). When CHARSET"ASCII" is in effect, the IS KANJI test uses an OS call to determine if the string contains only valid Kanji character, and returns true if valid.

- IS [NOT] JAPANESE

When CHARSET"EBCDIC" is in effect, the IS JAPANESE test is not supported, and will generate a COBCH1806 Feature not supported in selected charset message on compilation.

When CHARSET"ASCII" is in effect, the IS JAPANESE test returns true when the string contains only double-byte Japanese characters or single-byte Japanese Katakana characters, and returns true if valid. When NSYMBOL"NATIONAL" is in effect, these class tests are not supported, and will generate a COBCH0303 Operand has wrong data-type message on compilation.

2812895 (1098401)

### SQL: OpenESQL

- The DB2 CONCAT function and operator now convert to SQL Server using the HCOSS-supplied dbo.CONCAT for character, numeric and datetime data. If you are using BINARY or VARBINARY data, you must apply the HCOSS-supplied dbo.CONCAT\_BINARY function. HCOSS applications deployed with earlier versions of Enterprise Developer are affected, if they use string or binary concatenation. The mainframe dialect DB2 || operator and CONCAT function now call a new SQL Server scalar function dbo.CONCAT(). All existing programs with dialect=mainframe that use DB2 concatenation syntax should be recompiled. All existing SQL Server databases that are accessed by these programs must have dbo.CONCAT installed. To create the new function in your application's SQL Server database, you can either:

- Run a DSN bind against the customer database. Or:
- Execute the %ALLUSERSPROFILE%\Micro Focus\Enterprise Developer\hcoas\nInstallDigitsFunction.sql script.

This is a one-time only change to the database.

2843818 (1102248)

### SQL Option for DB2

- Spurious errors were sometimes returned while querying using an ALIAS.

2830383 (1100609)

## Significant Changes in Enterprise Developer 2.3

Enterprise Developer version 2.3 includes significant changes in the following areas:

- [AMB](#)
- [Assembler Support](#)
- [CAS Security](#)
- [CAS XA Switch modules](#)
- [Compiler](#)
- [Data Tools](#)
- [Discontinued Support for cwgui](#)
- [File Handling - External File Handler](#)
- [File Locking](#)
- [IDE](#)
- [J2EE Connector](#)
- [JCL Support](#)
- [Mainframe Access](#)
- [MF Server Administrator \(GUI\)](#)
- [PL/I Support](#)
- [SQL - HCO for SQL Server](#)
- [Updated Run-Time System](#)

### **AMB**

- Loading PSBs sometimes caused an error that prevented the building of DDI symbols required for generation.

2813119 (1098471)

### **Assembler Support**

- Previously, the Assembler run-time error SOC4 (Invalid 370 address abend) was mapped to the COBOL run-time error 200 (Internal logic error) which was misleading. It is now mapped to the COBOL run-time error 205 (COBRT205 Invalid mainframe pointer value (Fatal)). Note that, in most cases, you receive an Assembler SOC4 abend if the calling COBOL program was compiled without the AMODE"24" or the AMODE"31" Compiler directives.

2806239 (1097738)

### **CAS Security**

- The Enterprise Server External Security Facility now includes MLDAP ESM Module 2.0, with a new algorithm for identifying the best-matching resource-access rule and ACE for resource-access security checks. This algorithm is faster and matches most customers' expectations. The new algorithm also provides an optional "username substitution" feature. It can be enabled by setting "rule substitutions" to "yes" in the [Operation] section in the Security Manager configuration text area. When this is enabled, the string "\${user}" in a resource-rule name will be replaced with the name of the user that makes the request. For example, a DATASET rule named "USERS.\${user}.\*" would apply to datasets with the requesting user's name as the second qualifier. In rare cases, customers with complex, ambiguous resource-access security rules might see experience changes in behavior as a result of the new algorithm. The old algorithm is still supported and can be enabled by setting "version 1 authentication" to "yes" in the [Operation] section of the Security Manager configuration.

2807531 (1097783)

### **CAS XA Switch modules**

- The XA switch modules now support dynamic registration.

2682101 (1092325)

- The XA switch modules now support batch-only operations when multiple XA Resource Managers have been defined.

2664675 (1091082)

- In Enterprise Developer 2.2 update 2, Micro Focus identified undefined run-time behavior when the following combination of directives was specified: SIGN"EBCDIC", CHARSET"ASCII", and one of the following: HOST-NUMMOVE, HOST-NUMCOMPARE or SIGN-FIXUP. Previously (Enterprise Developer 2.2 update 1 and earlier), if this combination was specified, the SIGN"EBCDIC" directive should have been ignored, to avoid a mixture of ASCII and EBCDIC characters; however, SIGN"EBCDIC" was still being honored, resulting in undefined run-time behavior. Therefore, this combination of directives is now invalid for Enterprise Developer 2.2 update 2 or later, and if specified, will be rejected at compile time.

2786397 (1095265)

## Compiler

- For native COBOL, the size limit of the Data Division now stands at 2GB -1.

2796076 (1096384)

- COBDATA has no effect on compilation. The output of the Compiler is the same location regardless of whether COBDATA is set.

Previously, it was not possible to specify sign(EBCDIC) with sign-fixup, host-num-move or with host-num-compare. This combination is now supported in native COBOL but remains invalid for managed COBOL code. This is applicable to version 2.2 U2 HotFix 10 onwards.

2824577 (1100823)

## Data Tools

- DFCONV now returns the correct return-code; previously, it would always return 0.

## Discontinued support for cwgui

The cwgui debugger is no longer available. You can now use the cw\_java debugger which provides a richer graphical debugging experience.

## File Handling - External File Handler

- Custom file handlers (using DYNREDIR) are now called for each part of a concatenated file.

2795077 (1096322)

## File Locking

- In versions prior to Enterprise Developer 2.3, the semantics of the sharing phrase specified in an OPEN statement or used within a call to CBL\_OPEN\_FILE were not correctly applied in some cases on UNIX and Linux platforms. From version 2.3 onwards, the sharing phrase is correctly honored when the tunable `strict_file_locking=true` is set, which is the default setting.

Example of potential changes in behavior:

- *Process-A* opens a file with read-only access and a sharing mode that denies other processes write access (SHARING WITH READ ONLY).
- *Process-B* then attempts to open the file with read-only access and a sharing mode that denies other processes read access (SHARING WITH NO OTHER).

With `strict_file_locking=true`, *Process-B* is unable to open the file, because *Process-A* has successfully opened the file allowing only read access.

With `strict_file_locking=false`, *Process-B* successfully opens the file.

If your application encounters unexpected OPEN conditions or fails to open files, it might be as a result of the new file locking behavior. In such circumstances, we recommend that you review the file locking and sharing requirements of your application and refactor your source code to work with the default

setting. The original file locking and sharing behavior can be restored by setting `strict_file_locking=false`.

## IDE

- Enterprise Developer for Eclipse now ships with Eclipse 4.4.2 (Luna). If your applications contain JVM COBOL code that was built with a previous version of the product, those parts of your application must be rebuilt; otherwise you will experience errors at either compilation or run time.  
(609469)
- A project can have one of two connection modes: NFS/Samba, where the target location is mounted as a local drive, and RSE, which is a purely remote connection to the target location. For project types such as Mainframe COBOL, NFS/Samba is required to use some tools which do not support RSE. For most other projects, it is possible to switch between connection modes using the **Remote Settings** context menu option. In the dialog box, there are radio buttons allowing for selection of connection modes. On changing mode, you must select an existing connection of the appropriate type, or create a new one. If switching to NFS/Samba mode, you must specify the local path to the project.  
2792882 (1096196)
- By setting "-Denable.projectrepair=true" in the eclipse.ini file, .cobolProj and .pliProj files will be repaired to reflect the workspace on project refresh.  
2696707 (1095994)

## J2EE Connector

- Enterprise Developer version 2.3 provided a new command-line argument to Java, `mf.ssl.algorithm`, which can be set to an appropriate algorithm.  
2799213 (1096684)

## JCL Support

- When allocating a dataset to a step using MVSCTLBP, the values returned for the dataset attributes are those defined in the catalog. If these are unset in the catalog, then the values defined in the MVSCTLBP call are returned.  
2816179 (1098882)
- The program attributes for the SSTM job have been changed to default to a mainframe dialect, AMODE 31 program. These attributes will be used when constructing the MVS Control Blocks for the job, which means that the pointers to the sub-block areas will be in mainframe format rather than native format.  
2815695 (1098825)
- Any OUTPUT statement information passed to the printer exit now includes the correct class of that statement.  
2814249 (1098636)
- In ESMAC, when deleting the Spool, the physical spool files and the entries in `casspool.dat` are deleted.  
2812899 (1098412)
- New functionality has been added to the printer exit interface that enables you to delete the printer spool file after a file has been printed. Set `(ws)-prn-file-disp`, which is defined in `cascbprn.cpy`, to 1 to delete the spool file after printing. Additionally, the environment variable `ES_JESYSMSG_OUTPUT=Y` now correctly routes spool files to the Output queue. Previously, ESMAC still showed the job on the HELD display, even when there were no spool files HELD.  
2812899 (1099966)
- A new environment variable has been introduced - `ES_JESYSMSG_RESTRICTED`. JESYSMSG spool files are normally routed to HELD. This can be overridden by setting the environment variable `ES_JESYSMSG_OUTPUT=Y`, which causes all JESYSMSG spool files to be routed to OUTPUT. If

ES\_JESYSMSG\_OUTPUT=Y is set but you require specific classes to be held, set the environment variable ES\_JESYSMSG\_RESTRICTED to a string containing the classes to be HELD.

2812878 (1098417)

- The IEBDG PICTURE value length must match the length specified. The value can now contain any characters including quotes as on the mainframe.

2794881 (1096221)

- Changes to the IDCAMS ALTER processing prohibit applying MGMTCLASS changes to GDGs and to a VSAM element other than a Cluster. Shareoption settings in a SMS DATACLASS are now applied to the VSAM elements correctly.

2789939 (1095803)

## Mainframe Access

Mainframe Access is now built using the IBM XL/C compiler rather than the SAS/C compiler that was used previously. This change requires you to update your production JCL procedures with reference to the supplied samples MFA, MFAS, and MFAAS. In each JCL procedure, change the STEPLIB DD statement and add a new one, CEEOPTS.

The web administration feature is no longer available in Enterprise Developer.

To use the Mainframe Access support for Endeavor you must be using Endeavor R14 or later. CA stabilized the Endeavor API at R14, so if you upgrade from R14 to a later version you will not need to update the support module that Mainframe Access uses.

## MF Server Administrator (GUI)

- Passwords that entered through either the MFDS or the ESMAC interface now use the same encoding.

2792382 (1096011)

## PL/I Support

- For BASED variables declared using the form BASED (ADDR(x)), storage checking is now performed on the base reference "x". This behavior requires the compiler option `-nolaxbased`. See the Open-PLI User guide for more information on the options `-[no]laxbased` and `-[no]laxdefined`.

2819663 (1099293)

- The behavior of the `-zp1` option has been reverted to that of before Enterprise Developer 2.2 Update 1, with an additional correction relating to Char Varying data items. For a full description of the `-zp1` option, refer to the Open-PLI User's Guide in your product help. If you are installing ED 2.2 U1 HF5 as an upgrade to ED 2.2 U1, you must rebuild any applications that are compiled using the `-zp1` option after the upgrade.

2789213 (1095636)

- Previously, when using any of the compiler options `-mvs`, `-dli`, `-ims`, or `-cics`, the BINARY attribute was incorrectly applied if the FIXED attribute is specified without BINARY or DECIMAL. The default attribute DECIMAL is now applied.
- The BIGENDIAN attribute, when explicitly applied to a structure, is now propagated to its CHAR VARYING and WIDECHAR VARYING members.
- Declarations using DEFINED storage are now checked for compatible types between the DEFINED variable and its base variable. This behavior requires the compiler option `-nolaxdefined`. See the Open-PLI User guide for more information on the options `-[no]laxbased` and `-[no]laxdefined`.
- The PL/I Macro preprocessor has been enhanced to support the use of the ANSWER statement from within a PL/I Macro.

2698537 (1094243)

- The macro preprocessor has been enhanced to support arrays of CHAR and FIXED variables. New macro builtin functions have been implemented (HBOUND, LBOUND, DIMENSION).



2696129 (1094011)

### **SQL: HCO for SQL Server**

- The return type for the HCOSS DB2 CHAR() function has changed from CHAR(255) to VARCHAR(255).

2804069 (1097253)

### **Updated Run-Time System**

- Enterprise Server now provides an execution environment capable of running applications that were each built using different development products. A consequence of this is that if your application has a main COBOL executable (.exe) that was built with a version of Enterprise Developer prior to version 2.3, you should ensure that the executable is rebuilt and packaged with the new run-time system. This does not affect mainframe subsystem projects deployed to Enterprise Server. You can rebuild from the IDE or the command line.

Other COBOL subprograms built with previous versions of Enterprise Developer are not required to be rebuilt.

## **Significant Changes in Enterprise Developer 2.2 Update 2**

Enterprise Developer version 2.2 update 2 includes significant changes in the following areas:

- [Compiler](#)
- [Compiler Front-end](#)
- [Documentation](#)
- [Enterprise Server](#)
- [File Handling - External File Handler](#)
- [J2EE Connector](#)
- [MTO: CICS Communications](#)
- [MTO: IMS DB](#)
- [MTO: IMS MFS](#)
- [MTO: JCL MVS](#)
- [MTO: JCL Utils](#)
- [Open PL/I Compiler](#)
- [Open PL/I Debugger](#)

### **Compiler**

- When using the HOSTRW directive with the mainframe dialect, Report Writer will now produce the full range of ASA control characters and will emulate mainframe print files.

2697615 (1094527)

### **Compiler Front-end**

- Fixed Binary (p<=7) is now an 8-bit, signed, 2's complement binary integer by default.

### **Documentation**

- The default setting for the MFALLOC\_PCFILE environment variable has changed; the default is now set to Y, which means that when cataloguing a file that has a DCB attribute of DSORG=PS, a physical file is created for it if one does not exist. Previously, the default was set to N, which meant that a file was not created.

## Enterprise Server

Starting with this release, IMSCONFG.DAT is no longer used for configuring enterprise servers. Instead, you need to use environment variables to control the following fields:

Field	Environment Variable
LANG=PL/I PCB address lists	ES_IMS_PLI_INDIRECT_PCBADDR=D Y N Where: <b>D</b> Dynamic (default) use indirect PCB address list when PSB language is PL/I and main program is PL/I. <b>Y</b> Always use indirect PCB address list if PSB language is PL/I. <b>N</b> Never use indirect PCB address list.
IBM Platform	ES_IMS_IBMPLATFORM=M D Where: <b>M</b> MVS (default) <b>D</b> DOSVS Required by some DOS/VS customers.
Secondary Index Sparse exit language	ES_IMS_SPARSE_EXIT_LANG=C A Where: <b>C</b> COBOL <b>A</b> Assembler <b>Not set (default)</b> Sparse exits disabled

## File Handling - External File Handler

- The ES\_IMS\_TLOG\_FLUSH environment variable is now deprecated. To control TLOG flushing, use the following environment variable: ES\_IMS\_DB\_TLOG\_WRITETHRU=0|1

**0** Forces the flushing of TLOG buffers to disk on COMMIT only (default)

**1** Forces the flushing of TLOG buffers to disk on all database I/O

To control database flushing, use the following environment variable: ES\_IMS\_DB\_COMMIT\_FLUSH=0|1

**0** Forces the flushing of database buffers to disk on CLOSE only (default)

**1** Forces the flushing of database buffers to disk on COMMIT only

Depending on the number of database updates, the frequency of COMMITs, and other concurrent computer activities, use of these environment variables could cause significant performance degradation.

2784949 (1095190)

- The use of the environment setting MFJ\_INPUTDS\_ERROR=N has been extended so that an input file for a JCL step is now considered as optional and you no longer receive an error when the file is missing.

2784622 (1095971)

### **J2EE Connector**

- The listSystem.properties file in package com.ibm.ctg.client was missing documentation for some sections.

(606556)

### **MTO: CICS Communications**

- In CRTE mode, the transactions are now run using the correct userid if the user has signed on after running CRTE.

2663890 (1091979)

### **MTO: IMS DB**

- The NODCX mfims dbdgen directive has been added to enable you to compile DBD source without executing data capture exit routines contained in the DBD source. Previously, data capture exit routines contained in the DBD source but that were not found during compilation were ignored. The new default behavior is to process all data capture exit routines unless NODCX has been specified.

2579600 (1084675)

### **MTO: IMS MFS**

- All existing IMS Global Physical Terminal edit routines (DFSGPIX0) in use must be recompiled with charset EBCDIC instead of charset ASCII.

(606142)

### **MTO: JCL MVS**

- Following the detection of an unrecoverable file status error on the casspool file, a message is displayed on the console and an ACCEPT statement is issued. This stops processing, allowing you to fix the underlying file problem, before continuing the job.


2651654 (1090287)

### **MTO: JCL Utils**

- You can now activate support for the VSAM Shareoption for batch jobs and for CICS files that use a catalog entry. For more details, see your product help.

2660651 (1091290)

## Open PL/I Compiler

-  **Important:** If you are installing this release as an upgrade to Enterprise Developer 2.2 Update 1, after the upgrade you must rebuild any applications that are compiled using the `-zp1` option.

The behavior of the `-zp1` option has been reverted to that of versions of Enterprise Developer earlier than 2.2 Update 1, with an additional correction relating to Char Varying data items. For a full description of the `-zp1` option, refer to the Open PL/I User's Guide in the product help

This fix restores the behavior in Enterprise Developer versions earlier than 2.2 where, when compiling with `-zp1`, all parameters are treated as unaligned. (In Enterprise Developer 2.2 Update 1, the behavior when compiling with `-zp1` was to not treat parameters as if unaligned).

When using the `-zp1` compiler option, all Character Varying data items are now treated as if unaligned. In previous versions of Open PL/I, for Character Varying data items, the `-zp1` unaligned requirement was applied only to structure members and parameters.

To illustrate the change, consider the following example:

```
zptest: proc options(main);

    dcl 1 st1,
        2 c char,
        2 x(4) char(7) var init ('a', 'xx', 'yyy', 'zzzz');

    dcl y(4) char(7) var init ('a', 'xx', 'yyy', 'zzzz');

    dcl sub entry ((4) char(7) var);

    call sub (x);

    call sub (y);

end;

sub: proc (z);

    dcl z(4) char(7) var;

    dcl i fixed bin(31);

    do i = 1 to hbound(z);
        z(i) = 'x';
    end;

end;
```

Where:

- For `x` and `z`, each `char (7) var` item is 7 plus 2 bytes which equals 9 and then multiplied by 4 equals 36.
- If `y` were aligned on half-word by default, each array element is half-word aligned and each equals 10 bytes (9 + 1 pad byte), and the total size equals 40 bytes.
- At `call sub (x)`, the calling argument and parameter are matched.
- At the `call sub (y)`, the `y` element size (10 bytes) is mismatched against the parameter `z` element size (9 bytes) due to `-zp1`. This is incorrect and causes unexpected program behavior.

Due to this correction of treating all Char Varying data items as if unaligned when using `-zp1`, the size of CHAR VARYING arrays now differs from previous versions of Open-PL/I. For example:

```
dcl X(4) char(7) var;

    Put skip list (size(X)) /* size is 36 bytes vs. 40 bytes in previous
versions of Open-PL1 */
```

2789213 (1095636)

### Open PL/I Debugger

- Previously, the SRC list in the debugger only included the source filename without the path to the file. If a source file did not exist in the current directory, the debugger could not find it using the filename as it always expects a fully qualified filename. The SRC list now contains the fully qualified file name which includes the path. Also, when changing the SRC or ENV values the source is updated correctly.

2783734 (1094988)

## Significant Changes in Enterprise Developer 2.2 Update 1

Enterprise Developer version 2.2 update 1 includes significant changes in the following areas:

- [MTO - JCL ESMAC](#)
- [MTO - JCL MVS](#)
- [MTO - JCL System Catalog](#)
- [MTO - JCL Utils - IDCAMS](#)
- [Open PL/I Compiler](#)
- [Open PL/I Debugger](#)
- [Open PL/I RTS](#)
- [SQL: COBSQL](#)

### MTO - JCL ESMAC

- As part of an enhancement to improve performance of the spool display function, several new indices have been added to the `casspool.dat` file. If you are upgrading from a previous release, you must convert the `casspool.dat` file of any enterprise server created before Enterprise Developer 2.2 Update 1 to the new format before starting any JES-enabled enterprise server and submitting jobs to it.

Enterprise Developer version 2.2 update 1 provided the following scripts that convert the `casspool.dat` file to the new format:

- On Windows: `fixcasspool.bat` in `%COBDIR%\bin` or `%COBDIR%\bin64`
- On UNIX/Linux: `fixcasspool.sh` in `$COBDIR/bin`

,

To convert the `casspool.dat` file, run the appropriate script from an Enterprise command prompt using the following syntax:

- On Windows:  
`fixcasspool.bat <old-location>casspool.dat <new-location><backup_filename>`
- On UNIX/Linux:  
`fixcasspool.sh <old-location>casspool.dat <new-location><backup_filename>`

Where:

- `<old-location>` - the fully or partially qualified location of the existing `casspool.dat` file, if not in the current directory. Optional.
- `casspool.dat` - the spool file that will be updated. The file is located in the same directory as the enterprise server's system catalog.
- `new-location` - the fully or partially qualified location where the backup file will be created, if not in the current directory. Optional.
- `backup_filename` - the name of the file that will be a back-up of the old `casspool.dat` file. If the file name already exists, the script terminates without converting the `casspool.dat` file.

If you do not convert `casspool.dat`, attempts to start the enterprise server fail with the following messages:

```
JES000011E Batch Spool File Error; Status [39]
      JES000130E Note JES000011 Error - New casspool indexes may need
generating. See error
      description in product docs
```

2654417 (1090421)

### MTO - JCL MVS

- The final disposition processing of temporary datasets has been corrected to be in line with the mainframe processing, with a default value of PASS unless DELETE has been specified in the DD card. Previously, the default value was DELETE.

2671175 (1091627)

- When running batch programs, receiving an "Out of Space" error requires operator intervention to continue processing.

2642115 (1089055)

### MTO - JCL System Catalog

- You can now use MGMTCLAS to provide an EXPIRE AFTER number of days. This is used to calculate an expiry date for datasets allocated using the MGMTCLAS parameter.

2664639 (1090992)

- MFLEX\*.DAT files were not being moved with spool files. Spool housekeeping now deletes LEX files when it deletes JESYSMSG. Also, to identify any remaining orphan LEX files, the MF\_SPOOL\_HK\_LEX\_SCAN environment variable sets spool housekeeping to scan the data directory for LEX files older than the max retain period.

2659555 (1090759)

- Spool housekeeping has been rewritten to provide a number of new features. These will be described in the product documentation.

(592452)

### MTO - JCL Utils - IDCAMS

- The state of VSAM virgin files is now being correctly processed.

2686149 (1093587)

- A REPRO COUNT of zero is now processed as zero records to be included in the REPRO operation.

2665006 (1091034)

### Open PL/I Compiler

- On Intel platforms, the `-bitsltr` Compiler option can be used to store bit strings left-to-right within each byte. This is similar to Big Endian bit ordering on Intel platforms. The Intel default is to store bit strings right-to-left within each byte similar to the Intel hardware bit ordering.

2675860 (1092098)

- The libraries `libmf.so`, `libespli.so` and `libespliz.so` are no longer delivered. This is transparent if linking PL/I objects using `mfplx` or `ldpli`, and no changes are needed to your build process.

However, if linking PL/I objects using either the UNIX `ld` command or the Enterprise Developer `cob` command, you must include the libraries `libmfpli.so` when linking stand-alone Open PL/I objects (executed outside of Enterprise Server), or `libmfpliz.so` when linking PL/I objects executed under the control of Enterprise Server.

To do this, use the option -lmfpli for stand-alone Open PL/I objects or -lmfpliz, respectively, for PL/I executed under Enterprise Server. These options replace the -lmf option.

- Open PL/I applications must be recompiled and re-linked in order to use them with this release.

### **Open PL/I Debugger**

- The debugger now stops before an ON UNIT triggers. This lets you perform debugging on the ON UNIT itself. You can configure the ON UNITS the debugger stops on.

2674783 (1092319)

### **Open PL/I RTS**

- Writing to SYSPRINT when running outside of Enterprise Server now drives output directly to the terminal and does not buffer the I/O.

2477031 (1076203)

### **SQL: COBSQL**

- COBSQL now displays appropriate COBOL syntax errors after encountering EXEC SQL statement errors.

2673619 (1093197)

## **Significant Changes in Enterprise Developer 2.2**

Enterprise Developer version 2.2 included significant changes in the following areas:

- [ASM Compiler: HLL Macro Assembler](#)
- [CAS \(COBOL App Server\) General](#)
- [CCI Session Layer Code](#)
- [Compiler](#)
- [Eclipse IDE](#)
- [File Handling - Sort / JCL Sort](#)
- [Interface Mapping Toolkit](#)
- [JCL System Catalog - Dataset Allocation](#)
- [MF Directory Server](#)
- [MF Server Administrator \(GUI\)](#)
- [MFBSI](#)
- [MTO - IMS Other](#)
- [MTO - JCL MVS](#)
- [MTO - JCL System Catalog](#)
- [Open PL/I Compiler](#)
- [Open PL/I Debugger](#)
- [Open PL/I RTS](#)
- [Request Handler](#)

### **ASM Compiler: HLL Macro Assembler**

- A "." (dot) specification is no longer ignored in the SYSIN environment variable or in the mf370ctl.cfg file when used to specify an output directory, and indicates the current directory. This is a change in behavior from Mainframe Express, where the "." (dot) character in the SYSIN environment variable or in the mf370ctl.cfg file is still ignored and assembler output files are placed in the directory specified by the SYSIN environment variable.
- Assembler Build Output will now be sent to the location specified in the COBOL output path project setting. Previously, all Assembler build output went to the project directory.

## CAS (COBOL App Server) General

- Previously, on cancelling an active JCL job on UNIX (after you have used STOP on the ESMAC > SEPs page to stop the INITIATOR that it is running in), the INITIATOR was terminated and a new one was restarted in its place. Now, the new INITIATOR will not be started, as the STOP request was received before the CANCEL.

2559087 (1084226)

## CCI Session Layer Code

- A new option, use\_global\_namespace, is available for the cci.ini file in the Windows %SystemRoot% folder. If use\_global\_namespace is set, all the ccishared memory objects are created in a system-wide address space, and the applications hosted by different users, including system services, can communicate. To use this facility, edit the cci.ini file and ensure use\_global\_namespace is set to "yes". [ccismem-base] # Allow interaction between users on a # single system. Using this option reduces security as # all users will have access to the same name space. use\_global\_namespace=yes If the value of this option is anything other than "yes", or if the option is missing, no change is made to the existing behavior.

2195519 (1062800)

## Compiler

- The default for the NSYMBOL directive under DIALECT(ENTCOBOL) has been changed to NSYMBOL(NATIONAL) to emulate the equivalent IBM default.

2657471 (1090355)

- To improve RM/COBOL and ACUCOBOL compatibility, the SIGN clause at a group level is no longer applied to non-DISPLAY usage signed numeric data items within the group, just as it is not applied to unsigned numeric data items and non-numeric data items within the group.

2549904 (1082171)

- Previously, even though no code was generated, the Compiler allowed the ON EXCEPTION and NOT ON EXCEPTION phrases in the DISPLAY statement in formats that do not allow these phrases. As a result, if the DISPLAY statement was in the ON EXCEPTION phrase of another statement, the NOT ON EXCEPTION phrase would bind incorrectly with the DISPLAY statement instead of with the intended containing statement - for example, ACCEPT or CALL.

## Eclipse IDE

- The Problems view now has a 'Program' column that displays the name of the program in which the problem occurred. If the column is not present in the view by default, it can be added through the Configure Columns dialog box in the View Menu.

2608496 (1088530)

- The outline of the ruler in the COBOL editor now changes on modelChanged depending on the current source format.

2488419 (1077143)

- Deleting a Web service or a Java interface mapping now deletes the files relating to it from the repos directory and, if it is empty after the files have been deleted, will remove the repos directory itself.
- The IDE now performs an automatic directive determination when files are added to a project. You can also use a command to perform directive determination of the project manually.

## File Handling - Sort / JCL Sort

- When used with MFJSSTRICTSORT=ON, MFJSORT now errors (return code 16) if the input RECFM is different to a SORTOUT RECFM. It also errors if the input RECFM is different to an OUTFIL RECFM when FTOV or VTOF/CONVERT has not been specified.



2643384 (1088993)

### **Interface Mapping Toolkit**

- For program-based Service Interfaces, if the program-id name in the COBOL source is in lowercase and is not surrounded by quotes, its corresponding entry-point name is now forced to uppercase when used in a Service Interface Operation. Previously, the case was preserved. As a result of this change, existing Service Interfaces will become invalidated if you refresh their program's annotations because of the new spelling of the entry-point name. To avoid this, you need to surround the program-id name in the COBOL source with quotes before you refresh the annotations.
- The default for previous releases was to create a catalog entry with no physical file until data was actually written to the catalog. Now, a PC file is allocated for non-VSAM files by default. You can emulate the previous behavior if you set the environment variable MFALLOC\_PCFILE to N.

### **MF Directory Server**

- The mfds command line option for exporting registered Enterprise Server definitions to an XML file now supports the "\*" option. This exports all registered servers rather than a specified server. Multiple server definitions are now exported into the target directory and saved into a file with the default name ALLSERVERS.xml. The import option now also supports the import of multiple server definitions from a single XML file.

2641890 (1088838)

- mdump now supports a new option, -e, to help you query the Security Manager configuration details. The possible values of the option are: "1" - shows security configuration that applies to any returned enterprise servers; "2" - shows security configuration for MFDS and the default Enterprise Server security configuration. This requires MFDS version 1.15.00 or higher; "3" - returns the properties of all configured external Security Managers.

2487164 (1081693)

### **MF Server Administrator (GUI)**

- When adding a user to an external security manager, you can now include a password expiry time in the Advanced Configuration section of the Add New User wizard in Enterprise Server Administration. The field value is specified using generalized time format (YYYYMMDDHHMMSS.0Z), and can be used by the MLDAP ESM for calculating whether a user's password has expired and requires updating. This value may only be specified using this page when adding a user. You need to use an external directory services configuration tool to edit it.

2562118 (1083203)

### **MFBSI**

- casout now correctly sets return-code to the job status for the sysout retrieval when the file is less than 65K. Also, MFBSI now considers return codes of 0, 7 or 8 to be successful for JESYSMSG retrieval where, previously, it only considered 0 as successful.

2655482 (1090444)

### **MTO - IMS Other**

- The DBDCPY, MFSCPY, and PSBCPY environment variables are no longer required and have been deprecated. Use the IMSCPY environment variable to specify copybook locations.

### **MTO - JCL MVS**

- Empty values for the USER or NOTIFY parameters on the JCL JOB card no longer cause an error when parsing the JCL.

2646770 (1089380)

- The disposition processing of PASSEd datasets has been revised to be consistent with mainframe processing. Particularly, received datasets are removed at the end-of-step processing, unless they are to be passed on to another step in the job. Any passed datasets that were not received at the end of the job may be removed if they conform to the mainframe conditions for this.

2610362 (1087601)

### **MTO - JCL System Catalog**

- The value for the JCL DD UNIT=device parameter is now stored in the system catalog entry for the dataset.

2619050 (1089095)

### **Open PL/I Compiler**

- Open PL/I applications must be recompiled and re-linked in order to use them with this release.

2675860 (1092098)

- If using the -cics, -ims, or -mvs options when compiling on a little endian platform, the possibility for errors existed. Starting with this release, using the -cics, -ims, or -mvs options automatically uses -bigendian, thereby eliminating the possibility for these errors. Evaluate any applications that were built with a prior release to determine any impact on any data files being used, or where programs compiled with the -mvs option pass data to sub-programs compiled without it. The -bigendian option can be suppressed by adding the -native option after the -cics, -ims, or -mvs options.

### **Open PL/I Debugger**

- CodeWatch no longer attempts to use an incorrect directory when starting. Also, CodeWatch is now the default debugger when no other debugger is specified, and is the only debugger available when using -optexec plitest.

2655906 (1090193)

- Support for the evaluation of X, NX, Z, A, and E constants has been added to CodeWatch.

### **Open PL/I RTS**

- A problem with possible truncation or trailing zeroes within PICTURE assignments has been fixed. As the fix depends on changes to both the Compiler and the run-time, you must perform a complete rebuild of all your source code (recompile and relink) in order to apply it.

2662261 (1090768)

- Previously, when taking a PLIDUMP, if the .PDB file needed for a PLIDUMP was not in the same directory as the .DLL and the .STB files, and they were not in the first CAS\_BATCH\_PATH subdirectory, then the PLIDUMP was not successfully generated and an SOC4 abend could occur.

2615412 (1090483)

- The Open PL/I debugger no longer loses its place and behaves erratically when debugging code containing the same PL/I macro multiple times within the same source routine, even if the -nodebuginfo and -pp options are not specified.

2612530 (1087809)

### **Request Handler**

- A problem that caused BIS to create log files in a directory named C:\ProgramData\AcuCorp\BIS\LogFiles was fixed. BIS no longer creates log files unless specified and the BIS logging service is now disabled by default. To enable it, you need to use the following global environment variable:  
BIS\_LOG=[ OFF | ON | <directory> ] Where the values are:

- OFF - disables logging (the same as if BIS\_LOG is not specified or is left blank)
- ON - enables logging and directs the log files into the default location, which must not be read-only.
- <directory> - enables logging and directs the log files into the specified directory. The user must ensure that the BIS request handler has write rights for this directory. The directory must be an absolute path or network path. If the specified directory does not exist, BIS will attempt to create it. The containing directory must exist.

The BIS\_LOG variable is only examined when the BIS application pool is started or recycled. After setting or changing BIS\_LOG, IIS must be restarted in order for the variable to take effect.

## Significant Changes in Enterprise Developer 2.1 Update 1

Enterprise Developer version 2.1 update 1 includes significant changes in the following areas:

- [Documentation](#)
- [IDE](#)
- [JCL Support](#)

### Documentation

- To ensure no loss of functionality when accessing Vision and RM/COBOL data files, you should use the appropriate IDXFORMAT Compiler directive setting or file handling option, and not use the CALLFH(ACUFH) Compiler directive. See 'Configuring Access to Vision Files' and 'Configuring Access to RM/COBOL Data Files' for more information.

### IDE

- You can now set program breakpoints as follows - click "Add Program Breakpoint" in the Run menu or on the Breakpoints view toolbar, and enter the program name in the dialog that is displayed.
- Local Enterprise Server regions without secure user credentials are now started with casstart and stopped with casstop commands.

### JCL Support

- Input files are no longer optional so you can receive errors if you catalog a file without creating the physical file. To help avoid failures of JES job steps because of a missing input file, you can use one or both of the following environment variables: 1) MFALLOPCFILE=Y - results in the creation of a catalog file if DSORG=PS is set in the DCB parameters. 2) MFJ\_INPUTDS\_ERROR=N - results in IEBDG, IEBCOMPR and IEBCOMPR utilities to treat missing input files as though they were present but empty files.

## Significant Changes in Enterprise Developer 2.1

Enterprise Developer version 2.1 includes significant changes in the following areas:

- [CICS Support](#)
- [IDE](#)
- [Run-Time System](#)
- [Vision File System](#)

### CICS Support

- If external security is configured (MLDAP) and the default ESMAC user is not allowed to login, the region does not startup.

2550800 (1082337)

## IDE

- You can now specify in the IDE whether directories that you add to the project should be added to the copypath. You configure this in the project's properties under Micro Focus COBOL > Build Paths, and on the Copybook Paths tab.

(589096)

## Run-Time System

- When running a full-screen application inside a terminal emulator on Linux, the actual size of the terminal is read at startup and reread when the terminal is resized. This behaviour is also supported on AIX, HP/UX, and Solaris. The Micro Focus vt220 terminfo entry now correctly describes a 24-line display. A vt220-25 terminfo entry is included for compatibility with the previous behaviour.

2579335 (1084817)

## Vision File System

- When you configure your application to return RM/COBOL file status codes, by setting COBFSTATCONV=rmstat, the codes returned are ANSI'85 codes.

2553438 (1082469)

# Significant Changes in Enterprise Developer 2.0

Enterprise Developer version 2.0 includes significant changes in the following areas:

- [Compiler](#)
- [HCO for DB2 LUW](#)
- [File Handling](#)
- [IDE](#)
- [Run-Time System](#)

## Compiler

- The scope of the ILUSING Compiler directive when used in a \$set command has changed. The scope of the directive is now limited only to the source file it is set in, and not globally. This new behavior may mean that your source files no longer compile. To resolve this, add the required ILUSING statements to the required individual source files, or add the ILUSING directive on the command line. Alternatively, use the IDE to achieve the required behavior: in Visual Studio, use the Namespaces tab; in Eclipse, set the directive in the Additional Directives field.

## HCO for DB2 LUW

- The DB2 ECM has been updated to resolve run-time errors returned when compiling against mainframe databases in 64-bit mode.

2549058 (1082441)

## File Handling

- When reading a file cataloged as DISP=SHR the file handler now buffers the read for better performance.

2518330 (1079491)

- Using SKIP=nL in the SECTIONS section of SORT will now cause the following behavior: 1) Under a mainframe sort, (n/3 rounded up) blank lines (when n>0) will be skipped and the appropriate carriage control character will be placed in column 1 of each blank line. 2) For sequential file organizations, the

same behavior will occur but no carriage-control characters will be printed. 3) For line sequential files, n blank lines will be skipped.

2525670 (1080092)

## IDE

- Typing in the sequence area moves text after the cursor to the right and doesn't delete the characters at area end. To overwrite characters in the area, switch to insert mode by pressing the Insert key. Pressing the Tab key in the sequence area indents the text if the option "Pressing Tab in the sequence number area moves caret to area A" is not selected. Pressing the Tab key when there is a multiline selection aligns the text to the area margins.
- Typing in the sequence area now works like typing in a regular text editor - it moves to the right all the text after the cursor and doesn't delete the characters at area end. If you want to overwrite characters in the area, you can switch insert mode to overwrite by using "Insert" key.

## Run-Time System

- On Windows 7, building 64-bit native COBOL applications always rebuilt the entire project. This was caused by the Microsoft FileTracker tool, used by the COBOL projects to track dependencies, not working because of Windows 7 security updates. This product now includes a fix to work around this issue.

# Unsupported or Deprecated Functionality

The following topics describe functionality that was removed or deprecated at each product release.

## Unsupported or Deprecated at Enterprise Developer 10.0

The following features or functionality are no longer supported or are deprecated at version 10.0:

- The SafeNet Sentinel licensing system has been deprecated. This product uses the Micro Focus AutoPass licensing technology. Contact your account manager to replace your existing SafeNet Sentinel with AutoPass licenses. Also, see *Advanced Installation Tasks > Licensing Coexistence when Upgrading to Release 10.0* in the *Installation* section.
- The HOSTSIGNS Compiler directive is no longer supported. Micro Focus recommends that you use the following Compiler directives instead: SIGN-FIXUP, HOST-NUMMOVE, and HOST-NUMCOMPARE. This is a change since version 3.0 of this product.

## Unsupported or Deprecated at Enterprise Developer 9.0

The following features or functionality are no longer supported or are deprecated at version 9.0:

- The SafeNet Sentinel licensing system has been deprecated and will be not available in this product starting with the next major release after release 9.0. The SafeNet Sentinel licenses will not be supported after release 9.0 and you need to use AutoPass licenses if you use these releases.  
You can replace your SafeNet Sentinel licenses with AutoPass licenses starting with release 8.0. Contact Micro Focus Customer Care for further information.
- The HOSTSIGNS Compiler directive is no longer supported. Micro Focus recommends that you use the following Compiler directives instead: SIGN-FIXUP, HOST-NUMMOVE, and HOST-NUMCOMPARE. This is a change since version 3.0 of this product.

## Unsupported or Deprecated at Enterprise Developer 8.0

- Data File Editor - The method used to filter data files has been deprecated and replaced with new functionality.
- Application Workflow Model - Legacy Element List Creation using a Boolean type is deprecated. Starting in this release, you must create an element list using an explicit **Create Element List** step specified under an action.

## Unsupported or Deprecated at Enterprise Developer 7.0

The following Compiler directive option has been deprecated:

- ILCLR(2) - this is as a result of deprecating support for versions 3.0 and 3.5 of the .NET Framework. Applications that have this option set will produce an E level message when compiled in this release of Enterprise Developer.

## Unsupported or Deprecated at Enterprise Developer 6.0

No additional features were unsupported or deprecated at version 6.0.

## Unsupported or Deprecated at Enterprise Developer 5.0

No additional features were unsupported or deprecated at version 5.0.

## Unsupported or Deprecated at Enterprise Developer 4.0

There are no features or functionality unsupported or deprecated at version 4.0.

The following features or functionality are no longer supported or are deprecated at version 4.0:

- Support for Eclipse 4.4 and 4.5 has been discontinued.

## Unsupported or Deprecated at Enterprise Developer 3.0

The following features or functionality are no longer supported or are deprecated at version 3.0:

- The HOSTSIGNS Compiler directive is no longer supported. Micro Focus recommends that you use the following Compiler directives instead: SIGN-FIXUP, HOST-NUMMOVE, and HOST-NUMCOMPARE.
- Compatibility AddPack for Visual COBOL - this is now deprecated and will not be available with release 3.0 and later.

The Dialog System GUI and run-time components and Dialog System Character Mode (on Windows and UNIX) which were part of the AddPack are now installed as part of Enterprise Developer for Visual Studio. The run-time components are installed as part of Enterprise Server. These are only included for backward compatibility and Micro Focus does not recommend that you use them for new development.

The other components which were part of the AddPack, the Character-Based Data File Editor, CSBIND and Screens, will be available upon request from Micro Focus SupportLine.

- Audit Manager is deprecated and provided for backward compatibility only. We recommend that you use syslog events instead. See *Enterprise Server Auditing* for more information.
- The following DB2 environment variables are deprecated at version 3.0, and provided for backward compatibility only.
  - HCOBND - Micro Focus recommend you use either the BIND or the BINDDIR compiler directive option.
- The following compiler directives are deprecated at version 3.0, and provided for backward compatibility only.
  - CONVERTRET
  - IDYSRCPATH
  - IOBJECTIFY
  - OPTION
  - SPZERO
  - TRICKLE
- The following file handling options are deprecated at version 3.0, and provided for backward compatibility only. Micro Focus recommend you use IDXFORMAT"8" instead:
  - STRIPING
  - MAXSTRIPEDIGITS
  - MAXSTRIPEFILES
  - MAXSTRIPESIZE
  - STRIPE-X
  - STRIPENAMETYPE

## Unsupported or Deprecated at Enterprise Developer 2.3 Update 2

The following features or functionality are no longer supported or are deprecated at version 2.3 Update 2:

- The command\_line\_linkage tunable has been deprecated; equivalent functionality can be achieved by using the COMMAND-LINE-LINKAGE Compiler directive instead.

## Unsupported or Deprecated at Enterprise Developer 2.3 Update 1

The following features or functionality are no longer supported or are deprecated at version 2.3 update 1:

## Unsupported or Deprecated at Enterprise Developer 2010

The following Net Express features or functionality were not supported or were deprecated from the first version of Enterprise Developer:

These Net Express compiler directives are not supported by Enterprise Developer :

01SHUFFLE	EXPANDDATA	REGPARM
64KPARA	FIXING	SEGCROSS
64KSECT	FLAG-CHIP	SEGSIZE
AUXOPT	MASM	SIGNCOMPARE

CHIP	MODEL	SMALLDD
DATALIT	OPTSIZE	TABLESEGCROSS
EANIM	OPTSPEED	TRICKLECHECK
EDITOR	PARAS	WB2
ENSUITE	PROTMODE	WB3
		WB



**Note:** The directive SPZERO was already deprecated from Net Express 5.0 onwards, and is provided for backward compatibility only. You should instead use *SIGN-FIXUP*.

and the pseudovariabes of the following Net Express environment variables are obsolete and cannot be used:

BASENAME  
FILENAME  
PATH  
TARGETDIR

## Known Errors and Restrictions

Refer also to the *Known Issues and Restrictions* topic in the *Product Information* section of your product Help.

The following errors and restrictions are known to apply to Enterprise Developer version 10.0:

- JVM COBOL applications that run on AIX7.3 using Java versions 21.0.1 or 21.0.2 (IBM Semeru Runtime Open Edition) show intermittent errors in the Java runtime ('java.lang.SecurityException: SHA-256 digest error') resulting in the application not running as expected. The product .jar files are signed.
- The information available from **Help > Help Contents** in the new Data Tools client is out-of-date. For an up-to-date information for the utility, check the Enterprise Developer or Enterprise Server product Help hosted on the [Enterprise Developer documentation pages](#).
- In Enterprise Developer 4.0 and 5.0 in an extremely small and limited set of cases, an issue could occur with running .NET executables and .dll files, or JVM .class files, created with an earlier version of the product. This issue only occurred if:
  1. The application performs an IS NUMERIC condition test on a variable declared with USAGE NATIONAL.
  2. The application has been created with Enterprise Developer 3.0 or earlier, then executed in Enterprise Developer 4.0 or 5.0.

In these rare cases, the IS NUMERIC test could provide the wrong answer.

In order to resolve this issue, in Enterprise Developer 6.0 and later, the .NET COBOL and JVM COBOL run-times reject any program using IS NUMERIC on a NATIONAL item which was compiled with a version 5.0 or earlier of the product. You receive a "missing method" exception. To resolve the issue, you need to recompile any programs that use this construct in the newer versions of Enterprise Developer.

Program that do not use NATIONAL data, or those that have been recompiled in Enterprise Developer 6.0 or later are not affected.

- The ChangeMan Attachment models of release 5.0 and earlier are not working in the expected manner under Enterprise Developer 8.0 or later. This is a result of several tools that are called with a static value=``*`` in the input parameter CMG\_PROP\_STATIC\_SUBSYSTEM. If you want to run a ChangeMan attachment model 5.0 and earlier under the current version of Enterprise Developer, you must remove the static value=``*`` from all CMG\_PROP\_STATIC\_SUBSYSTEM input parameters.



# Upgrading from Mainframe Express to Enterprise Developer

## An introduction to the process of upgrading your COBOL applications

Enterprise Developer enables you to develop applications that run on the mainframe or offload applications from the mainframe and develop them locally on Windows. If you are upgrading from Mainframe Express, you can move your existing applications to Enterprise Developer and continue to develop them in the new environment.

Once you have familiarized yourself with the basics of the Enterprise Developer IDE, you can import your existing code in Enterprise Developer.

See the *Upgrading to Enterprise Developer* guide for full details on upgrading your applications from Mainframe Express to Enterprise Developer, the changes between the two products and what technologies are not supported or have been superseded.

## How to create an application created with Mainframe Express to Enterprise Developer

The following provides an outline of the incremental approach to upgrading a Mainframe Express application to Enterprise Developer where you use both development products to maintain the application while gradually moving the sources to the new IDE.

### 1. Review your Mainframe Express application:

- Create an inventory of the sources it uses, the copybook dependencies, data files, SQL, JCL and IMS files, third party utilities, integrated preprocessors.
- Check what workgroups are used and what the workflow processes are, what repositories are used to store the sources, what the build scripts and command line parameters are, how the application accesses the mainframe.



**Note:** Use the MFECL command line utility of Mainframe Express to export the project details to an .xml file which will include all project details at a glance - files in use, workgroups, output and dependency folders, Compiler directives, project and file options. The command to use is:

```
mfecl /exportxml project-name.mvp [ xml-filename.xml ]
```

- Review the XML file to see what information it includes:

```

2  <project name="bankdemo.MVP">
3  <projectsettings>
83 <workgroups>
84   <level description="System">
94   <level description="Production">
101  <level description="Development">
118 </workgroups>
119 <component name="UDATECNV.MLC" type="source assembler">
125 <component name="UTWOSCMP.MLC" type="source assembler">
131 <component name="MBANK10.BMS" type="source bms">
139 <component name="MBANK20.BMS" type="source bms">
147 <component name="MBANK30.BMS" type="source bms">
155 <component name="MBANK40.BMS" type="source bms">
156   <folder location=".\\BMS\\MBANK40.BMS" type="source bms" />
157 </settings>

```

The file provides details about the project and file settings, as well as of the workgroup levels. You are going to use this information when you are configuring the new projects in Enterprise Developer.

- Analyze the strengths and weaknesses of your application in the Mainframe Express environment and to what extent it meets the business requirements. The application might be a good candidate for being modernized by upgrading it to Enterprise Developer.
2. Define a small selection of the source files of your Mainframe Express application that you will move across to Enterprise Developer as a start – this could be the files responsible for a single operation of the application.

See *Considerations* for whether the files need to be recompiled in the new environment.

3. Prepare your original application:
  - Replace any hard-coded paths in your Mainframe Express project with concatenated ones – to do this, in Mainframe Express, click **Project > Convert Paths to Relative**.
  - Backup the sources.
4. Create mainframe subsystem projects in Enterprise Developer.

In Eclipse:

- a. Click **File > New > Mainframe COBOL Project**.

To emulate workgrouping behavior in Eclipse, you can use copybook projects that will define the copybook paths for each level, and you can add these projects as dependency projects to the ones for the source files. See *Emulating workgroups in Eclipse* in this guide.

5. Configure the projects in Enterprise Developer.

In Eclipse, to specify project properties:

- Navigate to the project properties, expand Micro Focus and set the project properties as taken from the `xml-filename.xml` file.

6. Import the source files and establish a product baseline – use linking to add the files to the new projects in order to store the files in their original location:

In Eclipse:

- a. Right-click the project, and click **New > Folder** if you wish to add an entire folder, or **New > File**.
- b. Click **Advanced**, and click **Link to alternate location (Linked Folder)** or, respectively **Link to File in the file system**.
- c. Browse to the folder in your Mainframe Express project that includes the files you wish to add, select the folder or the file to add, and click **Finish**.

7. Set individual file properties:

- Right-click a file in your project, and click **Properties**.
  - Set individual file properties as taken from the `xml-filename.xml` file.
8. Compile the sources in Enterprise Developer.
 

In Eclipse:

    - By default, Eclipse performs a build automatically as you are adding the source files. Check the **Console** view to see if there are any errors.
  9. Create and configure an enterprise server instance for the projects.
 

Check the `xml-filename.xml` file to see what regions the original application uses, and what its settings are.
  10. Run the application.
    - Run JCL applications by submitting the JCL file – right-click the JCL file in your project, and click **Submit JCL** (in Visual Studio) or **Submit to Enterprise Server** (Eclipse).
 

Use the Micro Focus Rumba emulator supplied with Enterprise Developer to connect to the enterprise server instance you have created. Run the application in Rumba.
  11. Debug and perform thorough testing.
  12. Configure MFA and the **Mainframe Explorer** window or the **Remote Systems** view.
  13. Plan for rolling out Enterprise Developer project and servers to your development and QA teams. Also, organize relevant training for them.
    - a. As a first step, ensure your project is configured as desired and that it builds successfully.
    - b. Distribute the project:

In your Eclipse workspace, copy the project folder with all the files. You can store this on a shared network location. Users need to import the existing project and sources locally in their workspaces.

Enterprise Server templates:

Create your own templates using the following command at an Enterprise Developer command prompt:

```
mfds -x [repository type] [repository address] [server name] <options>
<user id> <password>
```

Distribute the server .xml files across your development teams. The file should be saved in the `%ProgramFiles(x86)%\Micro Focus\Enterprise Developer\etc\ServerTemplates` subfolder in the local Enterprise Developer installation folders.

## Change the Defaults to Replicate Your Existing Project Structure

### Change the location of source files

To add an existing COBOL source file to your project, right-click the project in Solution Explorer and choose **Add > Existing item**. You can then browse to the sources you want to add.

- If you click **Add**, Enterprise Developer makes a copy of the file, which it saves in the project folder. Any edits you make to this file do not get applied to the original.
- If you click **Add As Link**, a reference to the original file, rather than a copy of it, is added to the project in Solution Explorer. If you then open the file in Visual Studio, any edits are applied to the file in its original location.

You can also drag files from Windows Explorer and drop them into your project in Solution Explorer. This also makes a copy of the file and leaves the original in place.

To remove a file from your project, but not delete the file on disk (whether added as a link or not), right-click the file in Solution Explorer and choose **Exclude From Project**.

## Change the location of built files

By default, built artefacts for the Debug configuration are created in the `..\Location\Solution\Name\bin\x86\Debug` folder.

You might want to change this, so that several developers can save built items in the same folder for example. To do this, right-click the project in Solution Explorer and choose **Properties**. In the COBOL tab, change the value of the **Output path** field to the preferred folder. (We recommend you always use relative paths when entering this value.) When the project builds, the output files will be saved in this folder, and the folder created if it doesn't already exist.

To change the output path for the Release configuration, select **Release Configuration** in the COBOL property page and change the value of the output path.

## Change the type of built files

The default output and target types when you create a project depend on the project type. You can change these settings on the project **Properties** page. Use the following table to show the default output and target types for each project and the possible changes once the project has been created :

Project type	Output type	Target type	Possible output types	Possible target type	
Native	Console application	.exe	single	.dll, .exe	single, multi
	Windows application	.exe	single	.dll, .exe	single, multi
	Link library	.dll	single	.dll, .exe	single, multi
	Enterprise Server application	.dll	multi	.dll, .exe	single, multi
	INT/GNT application	.int	multi	.int, .gnt	multi
Managed	Console application	.exe	single	.dll, .exe	single
	Windows application	.exe	single	.dll, .exe	single
	Link library	.dll	single	.dll, .exe	single
	Procedural multi-output project	.dll	multi	.dll, .exe	multi

# Best Practice in Enterprise Developer Development

## Break down large projects

Projects with a large number of source files and build artefacts can be hard to navigate and slow to build. If you find this the case, we recommend that you review the contents of large projects and split them into separate projects (and possible separate solutions) in which you group items that are logically related. These projects can still be built in the same output folder if required.

For example:

- If you have different versions of a product for different customers, keep common source in one project and a separate project for each customer. You could also have a master solution into which you add projects from other solutions by right-clicking a solution and selecting **Add > Existing Project**.
- If you have core code that is rarely changed or recompiled, keep that in one project and have separate projects for those areas that change regularly.

## Referencing common sources

To avoid repetition and reduce maintenance effort, you should consider keeping all your Compiler directive settings in a directives file and reference this file in each project. Similarly you should keep copybooks in a single project and add this project as a dependency to your COBOL projects.

If using .NET COBOL code and multiple projects, use project references rather than file references.

## Create templates

After creating and configuring a project, you can save the settings as a template that can be reused and distributed to other users. It can be added to the list of project types available when clicking **File > New > Project** and then .

To create a template of the open project, click **File > Export Template** and follow the steps explained in the Export Template Wizard.

## Use relative paths

Keep source relative to a base path and avoid full paths so that code is portable and easy to use with source control systems. You should also avoid using network shares or drives.

# Modernize Your Applications and Processes

## Following industry standard development practices

Many source code control systems and Agile tools can be integrated into the Visual Studio IDE.

You should also consider using continuous integration, which involves the automatic building and testing of an application after a change occurs to the source code. This method traps errors sooner in the development life cycle and can greatly improve efficiency and reduce costs.

## Interface modernization

Enterprise Developer enables you to use Visual Studio's built-in design tools to create more intuitive user interfaces. By wrapping existing procedural COBOL in an wrapper class you can integrate your code into Windows Forms (WinForms) and Windows Presentation Foundation (WPF) technology, and WebForms for ASP.NET browser-based applications.

## Multi-user applications

Enterprise Developer includes a Run Unit API to enable multiple users to simultaneously use an application based on COBOL code that was designed originally for a single user.

## Developing Web-based applications

You can use Enterprise Developer to migrate existing, core applications to a service oriented architecture as Web services, and deploy them using Micro Focus COBOL Server and Enterprise Server, so that you can develop COBOL-based software components to be invoked across the Web.

You can do this by creating an Enterprise Server application

## Developing .NET applications

Both new and existing COBOL can be compiled as .NET code. This enables you to:

- Reuse existing COBOL business logic and data access across the .NET environment
- Access .NET Framework classes and features from COBOL applications including Windows Forms and Web Forms
- Create and extend composite applications consisting of COBOL, C#, VB.NET, C++ and ASP.NET

- Reuse and extend Open ESQL applications

Both procedural and native OO COBOL are supported within the .NET framework. Native OO COBOL classes can inherit classes written in other Microsoft .NET languages and vice versa.

The .NET COBOL syntax includes many extensions to the COBOL language to support .NET features; for example, the TRY ... CATCH syntax to enable exception handling in COBOL.

There are also certain directives that help integrate your .NET COBOL with other languages in the .NET environment. For example, you can now expose the Linkage section and entry points in your COBOL to other managed languages by compiling with the ILSMARTLINKAGE directive.

### Modernizing Dialog System applications

Enterprise Developer provides the following support for Dialog System applications:

- Dialog System run-time system and run-time components.
- Panels V2.
- Dialog System painter.
- GUI class library and OLE class library. These libraries are needed if you migrate an existing Dialog System application that was extended using those libraries.

Projects for building the GUI and OLE class libraries from source are also supplied. Additionally, a project file for the Base class library was added in Enterprise Developer 2.0.

- Visual Studio plug-in to associate screensets in Visual Studio with Dialog System. Double-clicking a screenset in Solution Explorer in Enterprise Developer starts the Dialog System painter.
- Sample applications demonstrating a range of modernization techniques.
- Supporting documentation in this Help explaining the significant elements of the sample code.

You can modernize Dialog System applications within Enterprise Developer. You migrate an application to Enterprise Developer and from there you can run the application without change, or modernize it over time.

Modernization techniques include:

- A Windows Forms form replacing a Dialog System dialog, where the form can contain .NET controls. See the Customer + .NET WinForm sample `CustomerWinForm.sln`.
- A Windows Forms control wrapped as an ActiveX control and used on a Dialog System dialog. See the Customer + .NET GridView User Control sample `custgrid.sln`.
- A WPF user control hosted by a Windows Forms user control, which is then exposed as ActiveX ready for use by Dialog System. See the Customer + .NET WPF GridView User Control sample `CustGridWPF.sln`.
- A .NET code application interacting with Dialog System as native COBOL `.dll`. See the .NET COBOL Customer sample `ManagedCustomer.sln`.

### Data File Tools

Enterprise Developer comes with two versions of the Data File Tools utility: Data File Tools and Classic Data File Tools.

The Classic Data File Tools is the utility that was previously available in Net Express. It includes the Data File Converter, Data File Editor, IMS Database Editor, Segment Layout Editor and the Record Layout Editor. This utility is only available on Windows.

Data File Tools is a new version of the utility and comprises the Data File Editor and the Structure File Editor. This utility is available on both Windows and UNIX.

# Procedural COBOL Compared with JVM COBOL



**Note:** Enterprise Developer for Eclipse supports JVM COBOL. To develop applications for .NET COBOL, install one of our Enterprise Developer for Visual Studio products.

Procedural COBOL is regular COBOL without any of the new syntax that has been added for .NET and JVM. Procedural COBOL is still actively supported today and is being enhanced. Since the days of Net Express, Server Express, and Mainframe Express, it now supports inline local declarations (as in DECLARE). It also supports new syntax such as XML PARSE, JSON GENERATE, UTF-8, and more.

You can compile to native or (in most cases) JVM COBOL. The core COBOL syntax is supported in JVM COBOL. However, there are some features that are not supported (for example Panels V2, Dialog System and ACUCOBOL-GT). This means that you can take most existing COBOL applications and recompile to create JVM COBOL applications.

## JVM COBOL

JVM COBOL is COBOL with extensions to support the JVM. It offers OO syntax support and syntax to allow access to the available class libraries.

When you compile JVM COBOL, the compiler generates code: `.class` or `.jar` for JVM that runs on the Java Virtual Machine.

## JVM COBOL and Native COBOL

You can compile your COBOL program to JVM COBOL code using the `jvmgen` compiler directive. From within the IDE this happens automatically if you are using a JVM COBOL project.

The compiler has now created an intermediate language (JVM byte code `.class/.jar`).

COBOL and all other JVM languages (for example Java, JRuby and Jython) compile to this format, which makes mixed language applications easy to write.

You can also create native code applications. In Eclipse, the default COBOL project compiles to native code.

The compiler generates `.exe/.dlls` as the result of a native compilation.

The native COBOL application has to call the appropriate management services available for the operating system, whereas a *managed* application can take advantage of the management services provided by the run time such as exception handling, garbage collection, and thread management.

## Run Time

The JVM byte code (`.class/.jar` files) can be deployed to a Java Virtual Machine for execution.

The JVM's just-in-time (JIT) compiler compiles the byte code into code native to the operating system. The JVM provides additional services including memory management, exception handling, garbage collection and thread management.

## Developing Native and JVM COBOL Applications

You use the IDE to develop, compile and debug both native and JVM COBOL applications. You can write new COBOL code or you can recompile existing COBOL applications to native or JVM COBOL code, potentially without any code changes.

You can deploy and further debug the application under the run-time system provided by Enterprise Server.

JVM COBOL applications are deployed to a Java Virtual Machine for execution.