Cumulative Changes from Mainframe Express to Micro Focus Enterprise Developer for Visual Studio 8.0

Contents

Cumulative Changes from Mainframe Express to Enterprise Developer for Visual Studio

Welcome to Enterprise Developer for Visual Studio. This document combines information on Enterprise Developer for Visual Studio 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 Visual Studio.
- 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:

What was New	This section describes new functionality that was introduced in each successive release.
Significant Changes	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.
Unsupported or Deprecated Functionality	This section describes any functionality that was discontinued or deprecated at a given release.
Known Errors and Restrictions	This section describes known errors affecting the latest release, and restrictions in its use.
Upgrading from Mainframe Express to Enterprise Developer	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
01SHUFFLE	Deprecated	Enterprise Developer Base release	*Unsupported or Deprecated at 2010*
64KPARA	Deprecated	Enterprise Developer Base release	*Unsupported or Deprecated at 2010*
64KSPECT	Deprecated	Enterprise Developer Base release	*Unsupported or Deprecated at 2010*
ACU-UNDERSCORE	New	2.2	*What was new in 2.2*
AMODE	New parameter	8.0	*What was new in 8.0*
ANIM	Changed default	5.0	*Significant changes in 5.0*
AUXOPT	Deprecated	Enterprise Developer Base release	*Unsupported or Deprecated at 2010*
CHANGE-MESSAGE	Changed scope	2.2	*What was new in 2.2*
CHECKDIV	New parameter	4.0	*What was new in 4.0*
CHECKREFMOD	New parameter	6.0	*What was new in 6.0*
CHIP	Deprecated	Enterprise Developer Base release	*Unsupported or Deprecated at 2010*
COMMAND-LINE-LINKAGE	New	2.3 Update 2	*What was new at 2.3 Update 2*
COMP1	New	2.1	*What was new in 2.1*

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

Name	Change	At Product Version	See
HOSTSIGNS	Unsupported	3.0	*Unsupported or Deprecated at 3.0*
IDXFORMAT8	New option	Enterprise Developer Base release	
IDXFORMAT12	New option	2.3 Update 1	
ILCONDITIONPARAM	New	6.0	*What was new in 6.0*
ILEXPONENTIATION	New	2.2	*What was new in 2.2*
IDYSRCPATH	Deprecated	3.0	*Unsupported or Deprecated at 3.0*
ILCLR"2"	Deprecated	7.0	*What was new in 7.0*
ILLOADSTRING	New	8.0	
ILMAIN	New	2.3 Update 1	*What was new in 2.3 Update 1*
ILNORMALIZENAMES	New	5.0	*What was new in 5.0*
ILOBJECTIFY	Deprecated	3.0	*Unsupported or Deprecated at 3.0*
ILPARAMS	New	2.2 Update 1	*What was new in 2.2 Update 1*
ILSHOWPERFORMOVERLAP	New	2.2	*What was new in 2.2*
ILSMARTANNOTATE	New	2.1	*What was new in 2.1*
ILSMARTRESTRICT	New	2.1	*What was new in 2.1*
ILSMARTTRIM	New	4.0	*What was new in 4.0*
INIT-BY-TYPE	New	2.2 Update 1	*What was new in 2.2 Update 1*
MAINFRAME-FLOATING-POINT	New	4.0	*What was new in 4.0*
MASM	Deprecated	Enterprise Developer Base release	*Unsupported or Deprecated at 2010*
MODEL	Deprecated	Enterprise Developer Base release	*Unsupported or Deprecated at 2010*
NATIONAL	New	2.3 Update 2	*What was new at 2.3 Update 2*
NLS-CURRENCY-LENGTH	New	2.3	*What was new in 2.3*
NULL-ESCAPE	New	2.3	*What was new in 2.3*
NUMPROC	New parameter	4.0	*What was new in 4.0*
OOCTRL	New	2.3 Update 1	*What was new in 2.3 Update 1*
OOCTRL	New parameter	4.0	*What was new in 4.0*
OPTIMIZECURSORS	New	3.0	*Significant changes in 3.0*
OPTION	Deprecated	3.0	*Unsupported or Deprecated at 3.0*
OPTSIZE	Deprecated	Enterprise Developer Base release	*Unsupported or Deprecated at 2010*

Name	Change	At Product Version	See
OPTSPEED	Deprecated	Enterprise Developer Base release	*Unsupported or Deprecated at 2010*
PANVALET-INCLUDES-IN-COMMENTS	New	7.0	*What's new in 7.0*
PARAS	Deprecated	Enterprise Developer Base release	*Unsupported or Deprecated at 2010*
PRESERVECASE	Changed scope	2.2	*What was new in 2.2*
PROTMODE	Deprecated	Enterprise Developer Base release	*Unsupported or Deprecated at 2010*
PROTOTYPE	New parameter	6.0	*What was new in 6.0*
REGPARM	Deprecated	Enterprise Developer Base release	*Unsupported or Deprecated at 2010*
RESTRICT-GOTO	New	2.1	*What was new in 2.1*
RM-FILE-ERRORS	New	7.0	*What's new in 7.0*
SEGCROSS	Deprecated	Enterprise Developer Base release	*Unsupported or Deprecated at 2010*
SEGSIZE	Deprecated	Enterprise Developer Base release	*Unsupported or Deprecated at 2010*
SIGNCOMPARE	Deprecated	Enterprise Developer Base release	*Unsupported or Deprecated at 2010*
SMALLDD	Deprecated	Enterprise Developer Base release	*Unsupported or Deprecated at 2010*
SPZERO	Deprecated	Enterprise Developer Base release	*Unsupported or Deprecated at 2010*
TABLESEGCROSS	Deprecated	Enterprise Developer Base release	*Unsupported or Deprecated at 2010*
TRICKLE	Deprecated	3.0	*Unsupported or Deprecated at 3.0*
TRICKLECHECK	Deprecated	Enterprise Developer Base release	*Unsupported or Deprecated at 2010*
WB2	Deprecated	Enterprise Developer Base release	*Unsupported or Deprecated at 2010*

Name	Change	At Product Version	See
WB3	Deprecated	Enterprise Developer Base release	*Unsupported or Deprecated at 2010*
WB	Deprecated	Enterprise Developer Base release	*Unsupported or Deprecated at 2010*

Table 2: Changes to Run-time Tunables

Name	Change	At Product Version	See
command_line_linkage	Deprecated	2.3 Update 2	*Unsupported or Deprecated at 2.3 Update 2*
default_cancel_mode	New default value	2.3	*What was new in 2.3 - Tunables*
	New parameter		
printer_raw_redirection	New	2.0	*What was new in 2.0 - Run-time Tunables*
reduce_java_signals	New	2.2 Update 2	*Significant changes in 2.2 Update 2*
subsystem_cancel_mode	New	2.0	*What was new in 2.0 - Run-time Tunables*
	New parameter	2.3	*What was new in 2.3 - Tunables*

Table 3: Changes to Library Routines

Name	Change	At Product Version	See
CBL_CREATE_CORE	New	5.0	*What was new in 5.0*
CBL_CODESET_SET_MAPPING	New	2.3 Update 1	*What was new in 2.3 Update 1*
CBL_GET_DEBUG_START	New	4.0	*What was new in 4,0*
CBL_GET_DEBUG_STOP	New	4.0	*What was new in 4,0*
CBL_GET_ERROR_INFO	New	7.0	*What's new in 7.0*
CBL_GET_EXIT_INFO	Enhanced	6.0	*What was new in 6.0*
CBL_GET_OS_INFO	New	4.0	*What was new in 4,0*
CBL_LOCATE_FILE	New parameter	2.3	*What was new in 2.3*
CBL_MANAGED_SESSION_GET_USERDATA	New	2.3	*What was new in 2.3*
CBL_MANAGED_SESSION_SET_USERDATA	New	2.3	*What was new in 2.3*
CBL_RUNTIME_ERROR	New	2.3 Update 1	*What was new in 2.3 Update 1*
CBL_SEMAPHORE_ACQUIRE	New parameter	2.0	*What was new in 2.0*

Name	Change	At Product Version	See
CBL_CREATE_CORE	New	5.0	*What was new in 5.0*
MFU_GET_FILE	New	6.0	*What was new in 6.0*
MFUGETF	New	6.0	*What was new in 6.0*
PC_PRINTER_SET_FONT	Enhanced	8.0	
PC_PRINTER_INFO_DOTNET	New	2.3 Update 1	*What was new in 2.3 Update 1*

Table 4: Changes to Environment Variables

Name	Change	At Product Version	See
ES_CAT_RETRY_COUNT	New	4.0	*Configuring Multiple Catalogs*
ES_CAT_RETRY_WAIT	New	4.0	*Configuring Multiple Catalogs*
ES_DSENQSHR	New	8.0	
ES_IMS_TLOG_FLUSH	Deprecated	2.2 Update 2	*Significant changes in 2.2 Update 2*
ES_JES_ENFORCE_EXPIRE_DATE	New	8.0	
ES_JES_LISTCAT_YMD	New	8.0	
ES_RDO_MAX_RESOURCES	New	7.0	*What's new in 7.0*
ES_SNATRC_DIR	New	5.0	*Significant changes in 5.0*
ES_ZOS_SYSPRINT_DCB	New	8.0	
FSWRKDIR	New	3.0	*What was new in 3.0*
FSCHKLFH	New	3.0	*What was new in 3.0*
HCOBND	Deprecated	3.0	*Unsupported or Deprecated at 3.0*
MFALLOC_PCFILE	Default value changes	2.2 Update 2	*Significant changes in 2.2 Update 2*
MFJ_LEX_LOCATION	New	8.0	
SPOOL_TIMEOUT	New	8.0	

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	**01SHUFFLE**	Deprecated	*Unsupported or Deprecated at 2010*
Enterprise Developer Base release	**64KPARA**	Deprecated	*Unsupported or Deprecated at 2010*
Enterprise Developer Base release	**64KSPECT**	Deprecated	*Unsupported or Deprecated at 2010*
Enterprise Developer Base release	**AUXOPT**	Deprecated	*Unsupported or Deprecated at 2010*
Enterprise Developer Base release	**CHIP**	Deprecated	*Unsupported or Deprecated at 2010*
Enterprise Developer Base release	**DATALIT**	Deprecated	*Unsupported or Deprecated at 2010*
Enterprise Developer Base release	**EANIM**	Deprecated	*Unsupported or Deprecated at 2010*
Enterprise Developer Base release	**EDITOR**	Deprecated	*Unsupported or Deprecated at 2010*
Enterprise Developer Base release	**ENSUITE**	Deprecated	*Unsupported or Deprecated at 2010*
Enterprise Developer Base release	**EXPANDDATA**	Deprecated	*Unsupported or Deprecated at 2010*
Enterprise Developer Base release	**FIXING**	Deprecated	*Unsupported or Deprecated at 2010*
Enterprise Developer Base release	**FLAG-CHIP**	Deprecated	*Unsupported or Deprecated at 2010*
Enterprise Developer Base release	**IDXFORMAT8**	New option	
Enterprise Developer Base release	**MASM**	Deprecated	*Unsupported or Deprecated at 2010*
Enterprise Developer Base release	**MODEL**	Deprecated	*Unsupported or Deprecated at 2010*
Enterprise Developer Base release	**OPTSIZE**	Deprecated	*Unsupported or Deprecated at 2010*

At Product Version	Name	Change	See
Enterprise Developer Base release	**OPTSPEED**	Deprecated	*Unsupported or Deprecated at 2010*
Enterprise Developer Base release	**PARAS**	Deprecated	*Unsupported or Deprecated at 2010*
Enterprise Developer Base release	**PROTMODE**	Deprecated	*Unsupported or Deprecated at 2010*
Enterprise Developer Base release	**REGPARM**	Deprecated	*Unsupported or Deprecated at 2010*
Enterprise Developer Base release	**SEGCROSS**	Deprecated	*Unsupported or Deprecated at 2010*
Enterprise Developer Base release	**SEGSIZE**	Deprecated	*Unsupported or Deprecated at 2010*
Enterprise Developer Base release	**SIGNCOMPARE**	Deprecated	*Unsupported or Deprecated at 2010*
Enterprise Developer Base release	**SMALLDD**	Deprecated	*Unsupported or Deprecated at 2010*
Enterprise Developer Base release	**SPZERO**	Deprecated	*Unsupported or Deprecated at 2010*
Enterprise Developer Base release	**TABLESEGCROSS**	Deprecated	*Unsupported or Deprecated at 2010*
Enterprise Developer Base release	**TRICKLECHECK**	Deprecated	*Unsupported or Deprecated at 2010*
Enterprise Developer Base release	**WB2**	Deprecated	*Unsupported or Deprecated at 2010*
Enterprise Developer Base release	**WB3**	Deprecated	*Unsupported or Deprecated at 2010*
Enterprise Developer Base release	**WB**	Deprecated	*Unsupported or Deprecated at 2010*
2.1	**COMP1**	New	*What was new in 2.1*
2.1	**COMP2**	New	*What was new in 2.1*
2.1	**DISPLAY**	New	*What was new in 2.1*
2.1	**DATAMAP**	New parameter	*What was new in 2.1*
2.1	**ILSMARTANNOTATE**	New	*What was new in 2.1*

At Product Version	Name	Change	See
2.1	**ILSMARTRESTRICT**	New	*What was new in 2.1*
2.1	**RESTRICT-GOTO**	New	*What was new in 2.1*
2.2	**ACU-UNDERSCORE**	New	*What was new in 2.2*
2.2	**CHANGE-MESSAGE**	Changed scope	*What was new in 2.2*
2.2	**DIALECT"RM"**	Changed effect	*What was new in 2.2*
2.2	**EXITPROGRAM**	New	*What was new in 2.2*
2.2	**HIDE-MESSAGE**	Changed scope	*What was new in 2.2*
2.2	**ILEXPONENTIATION**	New	*What was new in 2.2*
2.2	**ILSHOWPERFORMOVERLAP**	New	*What was new in 2.2*
2.2	**PRESERVECASE**	Changed scope	*What was new in 2.2*
2.2 Update 1	**ILPARAMS**	New	*What was new in 2.2 Update 1*
2.2 Update 1	**INIT-BY-TYPE**	New	*What was new in 2.2 Update 1*
2.3	**DBSPACE**	New parameter	*What was new in 2.3*
2.3	**EOF-1A**	New	*What was new in 2.3*
2.3	**NLS-CURRENCY-LENGTH**	New	*What was new in 2.3*
2.3	**NULL-ESCAPE**	New	*What was new in 2.3*
2.3 Update 1	**IDXFORMAT12**	New option	
2.3 Update 1	**ILMAIN**	New	*What was new in 2.3 Update 1*
2.3 Update 1	**OOCTRL**	New	*What was new in 2.3 Update 1*
2.3 Update 2	**EBC-COL-SEQ**	New	*What was new at 2.3 Update 2*
2.3 Update 2	**COMMAND-LINE-LINKAGE**	New	*What was new at 2.3 Update 2*
2.3 Update 2	**NATIONAL**	New	*What was new at 2.3 Update 2*
3.0	**CONVERTRET**	Deprecated	*Unsupported or Deprecated at 3.0*
3.0	**HOSTSIGNS**	Unsupported	*Unsupported or Deprecated at 3.0*
3.0	**IDYSRCPATH**	Deprecated	*Unsupported or Deprecated at 3.0*
3.0	**ILOBJECTIFY**	Deprecated	*Unsupported or Deprecated at 3.0*
3.0	**OPTIMIZECURSORS**	New	*Significant changes in 3.0*
3.0	**OPTION**	Deprecated	*Unsupported or Deprecated at 3.0*
3.0	**TRICKLE**	Deprecated	*Unsupported or Deprecated at 3.0*
4.0	**CHECKDIV**	New parameter	*What was new in 4.0*
4.0	**DISPSIGN**	New	*What was new in 4.0*
4.0	**GNTLITLINKSTD**	New	*What was new in 4.0*
4.0	**ILSMARTTRIM**	New	*What was new in 4.0*
4.0	**MAINFRAME-FLOATING-POINT**	New	*What was new in 4.0*

At Product Version	Name	Change	See
4.0	**NUMPROC**	New parameter	*What was new in 4.0*
4.0	**OOCTRL**	New parameter	*What was new in 4.0*
5.0	**ILNORMALIZENAMES**	New	*What was new in 5.0*
5.0	**ANIM**	Changed default	*Significant changes in 5.0*
6.0	**DISPLAY-AT**	New	*What was new in 6.0*
6.0	**DPC-IN-DATA**	New	*What was new in 6.0*
6.0	**ILCONDITIONPARAM**	New	*What was new in 6.0*
6.0	**CHECKREFMOD**	New parameter	*What was new in 6.0*
6.0	**PROTOTYPE**	New parameter	*What was new in 6.0*
7.0	**EXECSQL-FLAG**	New	*What's new in 7.0*
7.0	**ILCLR"2"**	Deprecated	*What's new in 7.0*
7.0	**PANVALET-INCLUDES-IN-COMMENTS**	New	*What's new in 7.0*
7.0	**RM-FILE-ERRORS**	New	*What's new in 7.0*
8.0	**AMODE**	New parameter	*What was new in 8.0*
8.0	**DISPLAY-PICU**	New	*What was new in 8.0*
8.0	**ILLOADSTRING**	New	

Table 6: Changes to Run-time Tunables

At Product Version	Name	Change	See
2.0	**printer_raw_redirection**	New	*What was new in 2.0 - Run-time Tunables*
2.0	**subsystem_cancel_mode**	New	*What was new in 2.0 - Run-time Tunables*
2.2 Update 2	**reduce_java_signals**	New	*Significant changes in 2.2 Update 2*
2.3	**default_cancel_mode**	New default value New parameter	*What was new in 2.3 - Tunables*
2.3	**subsystem_cancel_mode**	New parameter	*What was new in 2.3 - Tunables*
2.3 Update 2	**command_line_linkage**	Deprecated	*Unsupported or Deprecated at 2.3 Update 2*

Table 7: Changes to Library Routines

At Product Version	Name	Change	See
2.0	**CBL_SEMAPHORE_ACQUIRE**	New parameter	*What was new in 2.0*

At Product Version	Name	Change	See
2.3	**CBL_LOCATE_FILE**	New parameter	*What was new in 2.3*
2.3	**CBL_MANAGED_SESSION_GET_USERDATA**	New	*What was new in 2.3*
2.3	**CBL_MANAGED_SESSION_SET_USERDATA**	New	*What was new in 2.3*
2.3 Update 1	**CBL_CODESET_SET_MAPPING**	New	*What was new in 2.3 Update 1*
2.3 Update 1	**CBL_RUNTIME_ERROR**	New	*What was new in 2.3 Update 1*
2.3 Update 1	**PC_PRINTER_INFO_DOTNET**	New	*What was new in 2.3 Update 1*
4.0	**CBL_GET_DEBUG_START**	New	*What was new in 4,0*
4.0	**CBL_GET_DEBUG_STOP**	New	*What was new in 4,0*
4.0	**CBL_GET_OS_INFO**	New	*What was new in 4,0*
5.0	**CBL_CREATE_CORE**	New	*What was new in 5.0*
6.0	**CBL_GET_EXIT_INFO**	Enhanced	*What was new in 6.0*
6.0	**MFU_GET_FILE**	New	*What was new in 6.0*
6.0	**MFUGETF**	New	*What was new in 6.0*
7.0	**CBL_GET_ERROR_INFO**	New	*What was new in 7.0*
8.0	**PC_PRINTER_SET_FONT**	Enhanced	

Table 8: Changes to Environment Variables

At Product Version	Name	Change	See
2.2 Update 2	**ES_IMS_TLOG_FLUSH**	Deprecated	*Significant changes in 2.2 Update 2*
2.2 Update 2	**MFALLOC_PCFILE**	Default value changes	*Significant changes in 2.2 Update 2*
3.0	**FSWRKDIR**	New	*What was new in 3.0*
3.0	**FSCHKLFH**	New	*What was new in 3.0*
3.0	**HCOBND**	Deprecated	*Unsupported or Deprecated at 3.0*
4.0	**ES_CAT_RETRY_COUNT**	New	*Configuring Multiple Catalogs*
4.0	**ES_CAT_RETRY_WAIT**	New	*Configuring Multiple Catalogs*
5.0	**ES_SNATRC_DIR**	New	*Significant changes in 5.0*
7.0	**ES_RDO_MAX_RESOURCES**	New	*What was new in 7.0*
8.0	**ES_DSENQSHR**	New	
8.0	**ES_JES_ENFORCE_EXPIRE_DATE**	New	
8.0	**ES_JES_LISTCAT_YMD**	New	
8.0	**ES_ZOS_SYSPRINT_DCB**	New	
8.0	**MFJ_LEX_LOCATION**	New	
8.0	**SPOOL_TIMEOUT**	New	

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 8.0

New Features in Enterprise Developer 8.0

Enhancements are available in the following areas:

- *Micro Focus Enterprise Extension for Visual Studio Code*
- *COBOL Language Enhancements*
- *Code Analysis*
- *Compiler Directives*
- *Data File Tools*
- *Debugging*
- *Enterprise Server*
- *Enterprise Server Common Web Administration*
- *Enterprise Server Security*
- *JCL Support*
- *Micro Focus Unit Testing Framework*
- *Open ESQL*
- *PL/I Support*
- *Terminal Emulation*
- *Visual Studio Integration*

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 Micro Focus 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*.

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 .NET COBOL (as well native COBOL).
- .NET 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

The Application Analysis Server enables you to access either Micro Focus 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.

Enhancements in the Rule-Based analysis include:

- The **Micro Focus Code Analysis** project's properties page, and the **Micro Focus Code Analysis Manager** dialog box now support subfolders in the rulesets.

Compiler Directives

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

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

This release includes the following enhancement:

- **Locals** window support for native COBOL - during debugging, the **Locals** window now displays the names of the variables available on the current statement.

Enterprise Server

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)

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.

JCL Support

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This release provides the following enhancement:

- 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.

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 mfunit extensions to the `dotnet` command line utility.

OpenESQL

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

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, PRECVAL, PRED, RADIX, ROUNDAWAYFROMZERO, ROUNDTOEVEN, SCALE, SQRTF, SUCC, and XMLSCRUB.
- The IEEE attribute on a FLOAT DECIMAL variable declaration.

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

PL/I debugging in Visual Studio has been enhanced as follows:

- The debugger operates with PL/I code just as it does with other languages such as COBOL. The following features are included to enhance the PL/I debugging experience:

  - Add, modify, and delete monitors on PL/I signals and conditions
  - The **Wait for debuggable attachment** feature enables you to use the PLITEST() API in conjunction with the "wait for attach with ID" mode.
  - The setting of key/value pair environment variables in project properties

PL/I EXEC Preprocessor:

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

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.

Visual Studio

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- Support is now available for Visual Studio 2022.
- Syntax coloring for COBOL in the editor had been improved for identification divisions, copybooks references using COPY... REPLACE statements, and EXEC blocks.

What was New in Enterprise Developer 7.0

Features Added in Enterprise Developer 7.0

Enhancements are available in the following areas:

- *Micro Focus COBOL Extension for Visual Studio Code* on page 23
- *Assembler Support*
- *CICS Support*
- *COBOL Language Enhancements*
- *Code Analysis*
- *Code Set Support*
- *Compiler Directives*
- *Containers Support*
- *Database Access - HCOSS Manage Connections Tool*
- *Database Access - MBDT Utilities*
- *Database Access - OpenESQL*
- *Data File Tools*
- *Enterprise Server*
- *Enterprise Server Common Web Administration*
- *Enterprise Server for .NET*
- *Enterprise Server Security*
- *IMS Support*

- *JCL Support*
- *Library Routines*
- *Licensing Technologies*
- *Mainframe Access*
- *Micro Focus Database File Handler*
- *Micro Focus Unit Testing Framework*
- *PL/I Support*
- *Visual Studio Integration*

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.

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.

CICS support in deployment has the following new features:

CICS support inside Visual Studio:

- The support for viewing CICS (PCT, PPT and FCT) resources inside Visual Studio is now a full support and no longer a Technical Preview.

COBOL Language

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

- **.NET COBOL data type to hold strings of utf-8 characters** - support is now available in .NET 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 Visual Studio, you can access this command from the context menu for COBOL files in Solution Explorer or from the **Analysis Server** window.

- The Data Flow Analysis is now available in both a tree and a graph view.
- The Code Analysis functionality is now available for the Procedural Multi-Output Project (.NET Framework) type.

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.

Containers Support

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Support for containers in Visual Studio has the following enhancements:

- You can now add a Dockerfile to native Micro Focus Unit Testing projects in Visual Studio and run the tests in a container.
- Projects with Docker support now include an additional **Containers** property page. From it you can:
  - Specify any build, debug and run arguments for the image that will override the arguments specified in the project's dockerfile.
  - See all command-line arguments that will be applied when you build the image.
  - See the arguments that will apply when you run the container, or debug an application running in a container.
- The **Add COBOL Docker Support** dialog box now shows all available images, and supports images provided with a Patch Update release of this product suite.

  The versions of the **Runtime Image** and the **Built Tools Image** must match therefore the dialog box only shows the **Built Tools Image** that match the one for the runtime. For example, if you use a Patch Update 1 Build Tools image, the dialog box only shows the relevant Patch Update 1 Runtime image.

  The dialog box shows only the images that match the major release version (or a Patch Update of it) of your installed product. They must target the same platform (x64 or x86) as well. If you want to specify images from different major product versions, you need to edit the Dockerfile manually.

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 Micro Focus Customer Care 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 Micro Focus Customer Care 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.

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 for .NET

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This release includes the following enhancements:

- CICS time calculations - ABSTIME, EIBDATE, EIBTIME, FORMAT TIME, and CONVERT TIME have been improved.
- CICS condition handling has been improved.
- A new option, **console message maximum**, enables you to specify how many console messages are retained. Previously, this value was fixed at 10000.

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`, 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 IMS editor in Visual Studio now offers Renumber and Unnumber commands for PSB files.

JCL Support

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This release includes the following enhancement:

- New Spool and Catalog windows - the Spool and Catalog windows have been updated and are now based on ESCWA functionality. You can view and modify the details of a job and a catalog, create new items, all in one page of the window.

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.

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 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.

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.
- Endevor transaction performance improvements - transactions with Endevor 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.

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 `dbfhview` 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.

PL/I Support

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Enhancements are available in the following areas:

PL/I debugger:

- PL/I integrated debugger support has been added to the Visual Studio IDE, which provides a much improved user experience for PL/I developers. The CodeWatch debugger has been removed.
- PL/I projects now support debug profiles, a feature of Visual Studio, where a debug profile stores a set of properties which specify how to start debugging the application. You can create and manage multiple debug profiles available on the **Debug** tab in the project's properties.
- 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 pseudovariable, 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.
- Improved compiler listings to show more attributes for parameters.
- 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.

Visual Studio Integration

This release includes enhancements in the following areas:

Editor:

- **Code cleanup** - Visual Studio now supports a variety of code cleanup options for COBOL which you can apply during formatting. These enable you to update any existing code, or enforce rules for new code for specific keywords or operators.
- **EditorConfig file support** - you can now create `.editorconfig` files with the code style settings in the IDE, and share the file within your organization to ensure consistency of the code.
- The **Force uppercase** command is now available for Assembler, BMS, and JCL files opened in Visual Studio.

What was New in Enterprise Developer 6.0

Features Added in Enterprise Developer 6.0

Enhancements are available in the following areas:

- *.NET Core*
- *Building Applications*
- *CICS Support*
- *COBOL Application Console Size*
- *COBOL Language Enhancements*
- *Code Analysis*
- *Code Analyzer Refactoring*
- *Compiler Directives*
- *Containers*
- *Database Access - HCO for DB2 LUW*
- *Database Access - OpenESQL*
- *Database Access - XA Switch Modules*
- *Data File Tools*
- *Debugging*
- *Enterprise Server*
- *Enterprise Server for .NET*
- *Enterprise Server Security*
- *Enterprise Server Common Web Administration*
- *File Handling*
- *IMS Support*
- *Interface Mapping Toolkit*
- *JCL Support*
- *Library Routines*

- *Micro Focus Database File Handler*
- *Micro Focus Unit Testing Framework*
- *Microsoft Build Tools and Windows SDK Configuration Utility*
- *Multi-Threaded Applications*
- *PL/I Support*
- *Visual Studio Integration*

.NET Core

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Support has been added for .NET Core 3.1, and a number of new .NET Core project templates have been added.

Note: Because Enterprise Developer requires *.NET* version 6 and *.NET* version 6 is not supported by Visual Studio 2017 and Visual Studio 2019, you must be using Visual Studio 2022 or later to be able to use Enterprise Developer to create COBOL applications to be deployed for use with *.NET*.

Building Applications

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This release includes the following new functionality:

- Compiling Mainframe Subsystem Application projects now continues on error - all compiler tasks for the different file types will now continue to run, if one of the tasks reports an error.

CICS Support

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This release provides the following enhancement:

- **Viewing CICS Resources inside Visual Studio (Technical Preview)**

  You can now view CICS PCT resources from within Visual Studio. You can do this with the help of a context menu command, **Show CICS Resources**, for an enterprise server in Server Explorer.

  A context-menu command, **New PCT**, is available in Solution Explorer for COBOL programs which are part of a Mainframe Subsystem Application project associated with an enterprise server instance.

  In 6.0 Patch Update 4, support has been added in the **CICS Resources** window for FCT and PPT CICS resources .

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

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. Currently, IBM does not support either of these features with DB2 LUW 11.5.
> - For coding examples, see the IBM DB2 LUW documentation: *Embedded SQL/COBOL Support for MRI and MRF*.

Database Access - OpenESQL

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Support for the following has been added to this release:

- .NET Core 3.1 with the COBOL .NET Core project templates "Console Application" and "Class Library" using OpenESQL directive DBMAN=ADO.

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

The following enhancements are available:

- Debug profiles - COBOL projects now support debug profiles, a feature of Visual Studio, where a debug profile stores a set of properties which specify how to start debugging the application. You can create and manage multiple debug profiles available on the **Debug** tab in the project's properties.
- Expressions - you can now specify complex expressions in the **Watch** window. The supported expressions are: normal numeric arithmetic expression with intrinsic functions and the single use of alphanumeric intrinsic functions. See *Watch Window* for details.
- Debugging MSS applications - a new Visual Studio configuration option, **Do not stop on program entry**, is available. With this option enabled, the debugger does not stop execution on any entry to a program in a native Mainframe Subsystem Application and continues to run until it detects a breakpoint.

Enterprise Server

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 for .NET

This release includes the following improvements:

- **SOAP web services for CICS (EAP)** - an Early Adopter Program (EAP) feature. Enables you to create SOAP web services for CICS transactions. This enables you to expose CICS transactions as SOAP web services using IIS, including translating data between SOAP and COBOL formats, and applying security rules.
- **ELF and DCAS** - Enterprise Server for .NET now provides the Digital Certificate Authentication Service (DCAS) and supports the TN3270 Express Login Facility (ELF), also known as Certificate Express Login (CEL).

  CICS users can be signed on to the region using TN3270-over-SSL and a client certificate. Enterprise Server for .NET can also be integrated with DCAS-based mainframe SSO technologies such as Micro Focus Host Access for Cloud (formerly Host Access Management and Security Service).
- **EXCI enhancements** - the External CICS Interface (EXCI) feature now supports channels and containers, which allows larger requests and responses. It also includes some additional security features. This provides an improved integration between Enterprise Server for .NET CICS and external applications, whether standalone programs or application code running under other servers such as IIS.
- **Administration ESF and LDAP-based security** - the MMC Administration console now uses the External Security Facility to control access to administration functions. The role-based security provided

with earlier versions of the MMC UI has been integrated into ESF as the default security option for the MMC UI, but it is now also possible to use LDAP-based security and/or Windows authentication. This provides you with more administration security options, including using the same security manager and schema for region and administration security.

- **LDAP-based security enhancements** - the LDAP ESM Module for Enterprise Server for .NET offers a number of enhancements, including fixes for bind-mode user authentication, support for the "user ID attribute" configuration setting, support for long passwords, and the passtoken/passticket feature. This provides a greater flexibility for organizations using LDAP-based security with Enterprise Server for .NET. Passtoken and passticket support was also used to enable the DCAS feature.

Enterprise Server Security

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This release provides the following enhancements:

- **Micro Focus Secrets file storage permissions**

  The Micro Focus Secrets feature (also known as the Vault feature) 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.

- **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, Enterprise Server for .NET, 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.

File Handling

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

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.
- **Visual Studio IDE support** - a new context menu command, **Show DBD List**, for Visual Studio projects enables you to view a list of all generated databases used by the project.

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 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.
- You can now produce a report file that can be opened and viewed in Microsoft Visual Studio. Use the `-report:trx` command line option to generate a `.trx` file.
- 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:

* 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 pseudovariable.
* 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 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.

Visual Studio Integration

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The following enhancements are available:

- Support for the Visual Studio CodeLens feature (Visual Studio 2019 and later only) - CodeLens is a clickable visual adornment (❶, ✅) above entry points or number of references above class, section, or paragraph names.

  In Run Units, CodeLens provides the number of entry points, and also enables you to run and debug directly from the editor.
- New formatting options - you can now specify different indents for the parent and child items in group item data in **Tools > Options > Text Editor > Micro Focus COBOL > Formatting > Data Division**.
- Tooltips for END delimiters - tooltips are available for END delimiters such as end-if, end-perform, or end-of-statement period. The tooltips show the opening statements.
- Code style preferences - a new category of preferences, **Tools> Options > Text editor > Micro Focus COBOL > Code Style**, combines all Visual Studio preferences for the format and style of your COBOL code.
- Lightbulbs - quick actions are available for inserting an end-of-scope terminator (such as END-IF), and for extracting sections to new programs.
- Snippets - a new snippet for indexers is available.
- Editor navigation bar - now shows the project that includes the file opened in the editor:
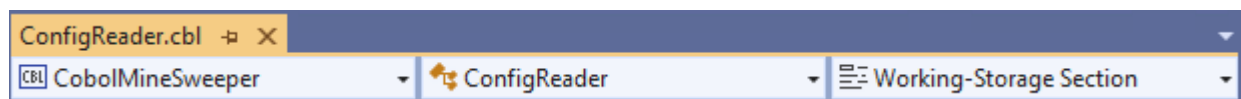
- Uppercase mode in the COBOL editor - to toggle uppercase mode, click ⬆A (**Force upper case in the editor**) in the COBOL toolbar, or enable it from **Tools > Options > Text Editor > Micro Focus COBOL > Text Casing**). With this option enabled, code you insert or paste in the editor, including snippets, is forced to upper case. This functionality must not be used with .NET COBOL.
- Uppercase mode in the Assembler, BMS, IMS, and JCL editors - you can enable upper case from **Edit > Advanced > Force Uppercase**, or in **Tools > Options > Text Editor**, and from the pages of the specific programming language. This option applies to all code inserted into the source file, whether typed, pasted or automatically inserted.

- QuickInfo - information in the QuickInfo details is now colorized.
- Copybook properties - the **Properties** window now displays the full path for copybooks that are stored outside of the project.

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*
- *CICS Support*
- *COBOL Language Enhancements*
- *Compiler Directives*
- *Consolidated Trace Facility*
- *Data File Tools*
- *Database Access*
- *Debugging*
- *Enterprise Server for .NET*
- *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*
- *Visual Studio Integration*

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 *Micro Focus 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 **Tools > Options > Text Editor > Micro Focus COBOL > Formatting > Indentation** (for Visual Studio).

You can find the COBOL formatting features on the **Edit > Advanced** menu (for Visual Studio) menu.

Code Analysis

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

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

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.

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.
- Async and await syntax (.NET COBOL only) - support is available for asynchronous programming in .NET COBOL using the async and await syntax.
- 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:

ILNORMALIZENAMES 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:

- Dynamic CTF - it is now possible to configure the CTF dynamically from outside the process being traced.

  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**)

OpenESQL ADO.NET Connection Editor Toolbar

- A new "i" (information) button is available that provides all the details of any installed .NET provider. Provides additional information mitigating resource definition and use within the ADO.NET Connection editor
- Static XA switch modules "Reconnect" - At the beginning of a global transaction, the XA switch will attempt to reconnect temporarily broken connections to the database. If there is a temporary disconnect to the database, there is no need to manually re-enable the XA switch to run transactions.

Debugging

This release includes the following enhancements:

- COBOL Visualizer - a new window in Visual Studio enables you to view and edit a data item during debugging in either text or HEX forms. You invoke the window from the DataTip for the data item.

- 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).

- 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.

Enterprise Server Security

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 Enterprise Server for .NET now matches the mainframe specification. CICS BMS support in 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 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 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

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

This release provides enhancements in the following areas:

- 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

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[1], 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 10.29.5 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:

- 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 <= 15 produce a result

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[1] Db2 support was introduced in the 5.0 Patch Update 2 release

with a maximum precision of 15. For arithmetic operations with fixed decimal operands with precision <= 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.

- 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*.

Product Documentation

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The following is new in this release:

- Online context help in Visual Studio - online context Help is now the default setting for Enterprise Developer and opens the documentation available on Micro Focus SupportLine.

  Enterprise Developer local help is still supported and can be installed manually, if required. See *After Installing* for details.
- The *Comparison of COBOL with Other Managed Languages* document has been updated to reflect the recent enhancements in the .NET and JVM COBOL support.

Visual Studio Integration

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This release includes enhancements in the following areas:

COBOL editor:

- Code snippets - new snippets are available for `$if` and `$region` statements, and for specifying `*cblformat off` which indicates the area of code that is unaffected by formatting.
- Collapsible regions - outlining is now available for IF, EVALUATE and PERFORM statements.

- **Peek Definition** context menu command - this invokes a pop-up window, embedded in the editor, showing the data item definition. You can use the feature both while editing and while debugging.
- IntelliSense suggestions - IntelliSense suggestions for the COPY statement now include directories to add.
- (Introduced in 5.0 Patch Update 1) Choosing a separator for qualified field names - you can configure IntelliSense to either use OF or IN as a separator in qualified field names - e.g. A-COUNT OF A-WORK-1 or A-COUNT IN A-WORK-1. You can specify this in **Tools > Options > Text Editor > Micro Focus COBOL > IntelliSense**, and on the **Completion Lists** page.
- Find All References - the **Find All References** output window for COBOL has been enhanced, so you can now filter results, group results, order results and search results.
- Quick actions - the editor now displays light bulbs for creating a missing section or a paragraph, for adding and sorting $ILUSING statements, and for removing or commenting out dead code.

Visual Studio tool windows:

- The **Error List** window now includes a column for the **Sequence Number**.
- You can use Visual Studio's **Find All References** tool window to search for references in your COBOL projects.

New settings in the project property pages:

- The **Debug** project properties page for managed projects now includes settings for either generating a portable symbol file (.PDB) or for embedding the portable symbol information directly in the assembly.
- The **Smart Linkage** section in the properties of managed projects now offers two new settings for enabling the ILSMARTTRIM and ILSMARTANNOTATE Compiler directives.

New project template categories:

- The COBOL project templates are organized in a new set of categories that better represent the tasks and workloads used in modern development. Some of the categories, such as Azure or .NET Core, only show if you have installed the support for these features in Visual Studio. For more information, see *To install missing features from the IDE*.

What was New in Enterprise Developer 4.0

This release provides enhancements in the following areas:

- *Integration with Visual Studio*
- *Application Server JCA Support for Enterprise Server*
- *Build Tools for Windows*
- *Code Coverage*
- *Codeset support*
- *Compiler directives*
- *Data File Tools*
- *Debugging*
- *Docker*
- *Documentation on working with large applications*
- *Enterprise Server*
- *Enterprise Server for .NET*
- *File Handler*
- *HCO for DB2 LUW*
- *IMS support*
- *JCL support*
- *Mainframe Access*
- *Library routines*
- *Micro Focus Unit Test Framework*

- *OpenESQL*
- *Platform support*
- *PL/I support*
- *Web Service Clients*
- *XML Extensions*

Integration with Visual Studio

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This release includes the following editor improvements:

- Inline rename refactoring - overwriting a variable name directly in the editor now invokes rename refactoring so you no longer need to select **Refactor** from the editor context menu.
- **Extract to section** - a new quick action (Visual Studio 2015 and later only) is available in the editor. It enables you to refactor your code by adding more sections in the code. This can help you create more entry points that you can use during unit testing.
- Automatic insertion of END-EXEC, END-TRY and END-PERFORM statements - the closing statements are now automatically inserted after you have typed the opening statements.
- IntelliSense filters (Visual Studio 2017 and later only) - when IntelliSense displays a list of suggestions, a number of icons at the bottom of the IntelliSense window now enable you to filter the suggestions.

Working with files:

- Copybook graphs - a context menu command, **Show Copybook Graph**, in Solution Explorer enables you to display the graphical representation of the copybook dependencies of COBOL programs.
- **Open Folder** mode (Visual Studio 2017 only) - support is now available for editing, compiling and debugging files opened in Solution Explorer in Open Folder mode without having to create projects.
- The file property pages now display a list of all Compiler directives that apply to the file.

New IDE configuration option:

- You can use the **Limit IntelliSense Search Scope** setting in **Tools > Options > Text Editor > Micro Focus COBOL > Advanced** that helps improve the editor performance.

Relinking existing applications:

- You can now configure Enterprise Developer to check whether applications created with older releases must be relinked. If the application uses an older version of the C run-time, Enterprise Developer can automatically relink the existing executable or .dll to the new version of the C run-time without the need to recompile the application first.

  If a project needs relinking, Visual Studio displays a message in the status bar (Visual Studio 2015 and 2017) or a dialog box (Visual Studio 2013) providing an option for you to choose and relink the project.

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.

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 Visual Studio 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:

- In Visual Studio, the Micro Focus Code Coverage window now offers a File View in addition to the existing Program View.

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.
- **ILSMARTANNOTATE** - adds attributes to the items generated by ILSMARTLINKAGE, based on their data type, which can be used to identify the size or range of the item in COBOL.
- **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

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

This release includes the following enhancements:

- Enhanced .NET debugging in Visual Studio 2017 - a number of advanced debug features are now available when debugging .NET COBOL code. Features include support for performance tips, backwards debugging, an expression evaluator, integration with the Diagnostic Tools window, remote debugging of .NET COBOL applications, as well as support for IntelliSense in the debug windows (such as the Immediate, Watch, and QuickWatch windows).

- 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.

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

Docker

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

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

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 CICSF, TSQ, and TDQ fields that are written to the record.

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

Enterprise Server for .NET

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This release provides the following enhancements:

- Limited support has been added for TLS (SSL) - you can now configure TN3270 and MFBINP listener channels for TLS (SSL). The seeout command-line utility and the JES public class API also now support TLS.

- Enterprise Developer for Visual Studio includes a new wizard that enables you to convert native MSS projects to managed MSS ones. The wizard is invoked using the **Create Managed Mainframe Project** context-menu command at project level in Solution Explorer.

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 that 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.

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.

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.
* Support has been added to Visual Studio for unit testing of managed procedural projects.

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.

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.

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 XMLOMIT 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 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) 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 Visual Studio*
- *Application Server JCA support for Enterprise Server*
- *Azure support*
- *Building applications*
- *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*
- *Debugging applications*
- *Documentation*
- *Enterprise COBOL 6.1 compatibility*
- *Enterprise Server*
- *Enterprise Server for .NET*
- *Interface Mapping Toolkit*
- *IMS support*
- *Mainframe Access (MFA)*
- *Micro Focus Unit Testing Framework*

- *PL/I support*
- *Rumba terminal emulator*
- *Transaction Classes*
- *XML processing*

Integration with Visual Studio

Enterprise Developer 3.0 provided enhancements in the following areas:

- Integration with Microsoft's Visual Studio 2017, the most recent version of the world's most popular integrated development environment (IDE) for the Windows platform, offering significant benefits for developers and businesses developing software for Windows.
- COBOL Editor:

  - Brace completion - a closing quote mark or bracket is automatically inserted when you type the opening quote mark or bracket at the end of a line.
  - Brace matching for IF and EVALUATE statements - clicking on any of the clauses of these statements highlights the opening and closing statements and all clauses. Use **CTRL +]** to move the cursor to the next clause in the statement.
  - Collapse to definitions - closes all sections, entry points and methods in an open file. Use the **Outlining > Collapse to Definitions** editor context menu command.
  - Colorization is now available for QuickInfo, completion tooltips and signature help.
  - Completion of statements - IF and EVALUATE statements are now automatically aligned and completed.
  - Indentation - smart indentation is now available to control how lines indent within IF and PERFORM statements and after continuation statements.
  - Locate definition, ⟳, on the COBOL toolbar enables you to search for data items and identifiers by specifying any string of characters that might be part of their name. This command replaces **Edit > Go To Location**.
  - Outlining - outlining is now available for 01 level group items (for expanding and collapsing the entire group) and for EXEC blocks
  - Quick actions - Enterprise Developer now supports Visual Studio's quick actions for setting the CICSECM Compiler directive, rename refactoring, and finding or creating missing copybooks.
  - Tooltips are now available for managed COBOL members.
- COBOL toolbar - the commands on the COBOL toolbar have been updated in order to optimize your editing experience. A number of commands (renumber and unnumber) have been removed from the context menu in the editor and are now only available from the toolbar.
- Directives determination - there is now a preview dialog box when the IDE scans your sources for Compiler directives. This enables you to review and approve the directives before they are set.
- Error reporting - you can now sort the errors and warnings in the **Error List** window by their COBOL error code.
- Import, export and synchronization of the IDE options - you can now export a number of the COBOL and PL/I global options as a Visual Studio .settings file. You can import the file into other instances of Enterprise Developer.

  Enterprise Developer for Visual Studio 2015 and later now supports the automatic synchronization of a number of COBOL settings across the copies of Visual Studio installed on different machines. The settings are synchronized through your MSDN account. See the MSDN for more details and for information on any restrictions to the functionality.
- **Project Details** window - provides a number of enhancements, including performance improvement. It is now possible to filter on project or solution, perform a search, and sync with Solution Explorer. Tooltips are available in the Overrides column to show the override directives.
- Net Express import wizard - provides a new option for including copybooks in a project.
- Rename refactoring - this release introduces rename refactoring for COBOL code that can help to improve the readability of COBOL elements or make their purpose clearer. You can rename elements

such as variables and identifiers, section and paragraph names, classes, and methods across a program or a solution.

- Support for standalone files - various improvements have been made to how you work with files that are not part of a project:

    - When you first open a standalone file, the editor displays an alert bar with options to browse for a symbols (`.idy`) file to use to compile the standalone file or to configure the Compiler directives.
    - You can now use the file's properties window to edit the Compiler directives and to specify options for debugging.

    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".

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.

Azure support

Enterprise Developer now supports the following versions of Microsoft Azure SDK - version 2.9.6 with Visual Studio 2013 and version 3.0 with Visual Studio 2015 and later.

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 - **Tools > Options > Micro Focus > Projects**. In Visual Studio, multi-processor compilation must also be enabled in the project's properties.

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.

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 directives are new in this release:

- COLLECTION - provides a mechanism for code coverage to identify unexecuted programs.
- ILSTDLIB - helps you to ensure that your .NET COBOL code compiles with the correct version of the .NET Framework Microsoft Common Object assembly `mscorlib.dll`. When building from Visual Studio or using MSBuild to compile a COBOL project, the NOILSTDLIB directive is set, and an ILREF is generated pointing at the version of mscorlib appropriate for the target framework selected in the project's properties.

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:

* A new drop-down option, **Any** on the **Debug** tab in the project's properties of native Mainframe Subsystem application projects, enables you to debug without specifying the type of application.

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.

- *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 Visual Studio

- Exporting an enterprise server definition from the IDE in XML format.
- Importing an enterprise server into the IDE using its definition file.
- In Visual Studio, it is now possible to configure an enterprise server to produce a core dump file directly from the IDE, from the server properties.

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.

Enterprise Server for .NET

Enterprise Developer 3.0 provided enhancements in the following areas:

- Public class library - offers enhanced functionality for applications to interact with a running JES system:

    - Dynamic dataset allocation/deallocation
    - KSDS/ESDS/RRDS file handling support
    - ENQ/DEQ support

- Web User Interface (Technology Preview) - this is a Technology Preview of a web-based UI for the administration of an Enterprise Server for .NET system. The UI enables you to administer an Enterprise Server for .NET system from any device supporting a web browser and without the need to install Enterprise Server for .NET. The following features are available:

    - Starting and stopping of regions
    - The following views - Console, Statistics, Local trace tables, Monitor, Dynamic listener control and the HSF view for CICS.

- Region-specific external file handler (EXTFH) configuration - it is now possible to specify EXTFH configuration on a per-region basis using the MMC UI region start-up file editor. Previously, you had to specify EXTFH configuration on a per-machine basis and it was global to all regions. This could have lead to inconsistency in application behavior if one or more machines in a scale-out had different configurations defined.

- HSF performance improvements - various improvements have been made to HSF to reduce the amount of database processing required. This lowers the impact on application performance when HSF is enabled for a region.

- Accepting input from the system console - system console input can now be provided from the MMC UI console view, or using the seesys command-line utility. The input is provided to JES applications using ACCEPT FROM CONSOLE and to CICS applications using EXEC CICS WRITE OPERATOR REPLY.

- JES seven-digit job numbers - you can now configure JES regions to allow up to seven-digit job numbers to be used. This enhancement is also available in the native Enterprise Server product.

The following new features were initially provided as HotFix updates of Enterprise Server for .NET 2.3 Update 2 and are now available in this release:

- Dataset name filtering by the MMC UI Catalog view - it is now possible to filter catalog name entries through the use of wildcards in the MMC UI Catalog view. This helps reduce the time to display dataset names when a catalog contains a great number of entries.

- MMC UI file viewer enhancements:

    - Options for closing all open files, closing all but the currently selected file, and for loading all of the remaining lines of a file.
    - Viewing the contents of SYSOUT files being written by active job steps.

- Improved task recovery - Enterprise Server for .NET now automatically detects when a SEP pool process dies (for example, when you stop debugging, or the machine shuts down), or is no longer responsive, and recovers any running CICS transactions or JES jobs. This provides improved system integrity by ensuring that the responsiveness and work through a running system is maintained following a SEP pool failure.

Interface Mapping Toolkit

The Interface Mapping Toolkit (IMTK) contains the following enhancements in Enterprise Developer 3.0:

- Cross Origin Resource Sharing (CORS) support for REST Web services, enabling Web service access from a CORS-supported Web browser.

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.
- Endevor 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 snippets for each element of a test case.
- Support for running tests with Code Coverage enabled.
- The Micro Focus Unit Testing window, 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:

- Generating NUnit-style reports.
- 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 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 build-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.

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 Visual Studio IDE*
• *Building applications*
• *COBOL language enhancements*
• *Classic Data File Tools*
• *Compiler directives*
• *Database access - DSNREXX*
• *Debugging applications*
• *Dialog System GUI*
• *Enterprise Server with .NET*
• *File handling*
• *IMS support*

- *Library routines*
- *PL/I support*
- *Tutorials*

Integration with the Visual Studio IDE

Enterprise Developer 2.3 update 2 provided the following enhancements in the integration of Micro Focus COBOL with the Visual Studio IDE:

- A new menu command **SQL Option for DB2** on the **Tools** menu enables you to access all the SQL Option for DB2 utilities.
- It is now possible to specify options for compiling native resource files (.rc) by accessing the file's properties from within the IDE.
- Editor improvements:

    - Support for showing the margins and the ruler is now available for mainframe subsystem files: Assembler, BMS, JCL, and IMS.
    - Colorization of the code in the ToolTips for collapsed regions in the COBOL editor has been added.
    - The Time and Date Warp options are now available on the **Run-Time Configuration** tab when editing an application configuration file for native COBOL projects.
    - **Go To Next Method** and **Go To Previous Method** editor context menu commands are now available for native Object-Oriented and for managed COBOL code.

Building applications

It is now possible to use the 64-bit version of MSBuild to build COBOL projects.

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.

Debugging applications

- You can configure the debug tooltip for subscripted OCCURS items to either display the elements of arrays or to display the value of the current expression. To do this, right-click in the editor, click **COBOL Debug Tooltip Style** and either enable or disable **Show COBOL OCCURS or reference modification value**.

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

Dialog System GUI

Installing the version of the Compatibility AddPack for Visual COBOL provided with this release adds a new menu item, **Micro Focus Dialog System**, to the **Tools** menu of Visual Studio for starting the Dialog System GUI from within the IDE.

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

Enterprise Server for .NET

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

- Dynamic configuration of running regions using a new seesys command-line utility for re-cycling AppDomains such as when new versions of programs have been deployed. seesys enables you to replace any previously loaded programs without having to restart the region, or remove any unused SEPs.
- Performance improvements - it is now possible to configure JES regions to reuse AppDomains that were previously used to run a job's steps. The default behaviour is to unload the AppDomain at the end of each job. Reusing AppDomains improves a job's throughput by eliminating assembly reloads.
- JES security support equivalent to that of the native Enterprise Server (i.e. external security managers (ESMs)). Customers can now secure their JES regions using mechanisms similar to the native enterprise server.
- JES spool housekeeping - you can now use the MVSSPLHK utility to archive JES spool output file data.
- Share catalog/spool between JES regions - A JES catalog and spool file can now be shared between JES regions.
- Improvements to the system administration capabilities using the Microsoft Management Console (MMC):

  - A seemmcconfig command-line utility that enables you to configure regions.
  - A number of enhancements in the spool view such as additional filters and columns, sortable columns.
  - Shared catalog configuration and security configuration
  - JES program aliases

- Public class library enhancements - it is now possible to interact with the region to access the spool functions and the security options.
- FTP and sFTP support for JES jobs that enables you to perform FTP functions from job steps, with or without a secure layer.
- Support for IDCAMS DEFINE CLUSTER SHAREOPTIONS - provides improved mainframe emulation of sharing VSAM files between tasks or jobs.

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.

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:
  • The drop-down list of types and members in the Visual Studio editor now shows the PL/I types and members.

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

Tutorials

The product help includes the following new tutorial:

• *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 Visual Studio IDE*
• *Application Server JCA support for Enterprise Server*

- *CICS Web services (Technology Preview)*
- *Code Analysis*
- *Code Coverage*
- *Compiler directives*
- *Database Access - HCO for SQL Server*
- *Database Access - Mainframe Batch Database Tools (MBDT)*
- *Database Access - OpenESQL*
- *Data File Tools*
- *Debugging applications*
- *Dialog System Applications*
- *Editor writing assistance*
- *Enterprise COBOL 5.2*
- *Enterprise Server with .NET*
- *File Handling*
- *Library routines*
- *Managed COBOL Syntax*
- *Native COBOL Syntax*
- *PL/I support*
- *Rosetta Stone for COBOL, .NET and Java Developers*
- *Windows Azure*

Integration with the Visual Studio IDE

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

- The **Go To location** and **Go To Procedure Division** commands are now available from the **Edit** menu. In addition, the **Go To Procedure Division** has a shortcut key - **Ctrl+K, Ctrl+J**.
- Object Browser - now provides support for .NET COBOL code. You can view the members of objects in your project and the definition of classes and methods as specified by the XML documentation comments in your code. The window also provides support for the **Go To Definition** command.
- A new search option, **Current COBOL Program**, has been added to the **Find in Files** dialog box. This enables you to search in the COBOL program currently opened in the editor and in any copybooks referenced by that program.
- Solution Explorer - a new context menu command, **Add Folder to Copybook Paths**, is now available for the subfolders of your projects. This enables you to add the subfolders to the copybook path of the project. For Mainframe Subsystem Projects, similar commands, **Add Folder to Assembler Macro Paths** and **Add Folder to IMS Copy Paths**, are now available to help add subfolders that include Assembler macro paths or IMS copy file to the Dependency Paths of the project.

Editor improvements:

- Line numbers - a new option for configuring the increment for the COBOL and the standard line numbers when you use Renumber and Unnumber has been added. You can specify the increment from **Tools > Options > Text Editor > Micro Focus COBOL > Line Numbering**.
- Outlining - a new IDE option enables you to switch outlining in the COBOL editor on or off. See the **Enable Outlining** option available on the **Advanced** page in **Tools > Options > Text Editor > Micro Focus COBOL**.
- Program breakpoints - a new context menu command, **Add COBOL Program Breakpoint**, enables you to set program breakpoints directly from the editor.

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.

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 Microsoft's MSBuild utility which enables the integration of code analysis in CI frameworks.

Support is available for various MSBuild parameters. You can use MSBuild with the /p switch and with the following Micro Focus-specific command line options:

- `RunMicroFocusCodeAnalysisAfterBuild` - controls whether code analysis is performed with MSBuild or not regardless of what code analysis options are specified the project's properties.
  - `ActiveRulesets` - specifies which rule sets should be used when running code analysis from the command line.

Code coverage

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

- A new Code Coverage window showing the statistics of what percentage of the code has executed.
- Navigation from the Code Coverage window 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.
- 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.

Database Access - OpenESQL

This release provides the following new features:

- Demonstrations for using OpenESQL in .NET applications. To view these demos, see the *SQL* demonstrations in the Visual COBOL Samples browser.
- Support for the Oracle fully managed ODP.NET driver.

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

Debugging applications

- You can configure the debug tooltip for subscripted OCCURS items to either display the elements of arrays or to display the value of the current expression. To do this, right-click in the editor, click **COBOL Debug Tooltip Style** and either enable or disable **Show COBOL OCCURS or reference modification value**.

Dialog System Applications

The version of the Compatibility AddPack for Visual COBOL released with Enterprise Developer 2.3 Update 1 enables you to give your Dialog System applications a refreshed user interface. Features include:

- Support for a modern look and feel for Dialog System applications.

Dialog System now supports Microsoft's visual styles for controls and fonts to give your existing Dialog System applications a modern look that is native to the Windows version the applications are running on.

You use a new environment variable, MFVSSW, to switch the visual styles on. Alternatively, for applications that compile to an executable, to switch the new styles, you can add an application manifest file to the applications' project files.

See the section *Modernizing Dialog System Applications* in your product help for details on how to enable the visual styles, and for information about any possible changes in behavior or appearance of the common controls.

* A modern look and feel of the Dialog System painter.

There are new configuration options in the Dialog System painter for applying the visual styles and fonts to the painter.

* Visual Studio project templates for creating Dialog System applications with a modern look out-of-the box.

The Compatibility AddPack for Visual COBOL now installs the following new project templates:

* **Dialog System Application (Modern)** for creating Dialog System applications that use Microsoft's visual styles by default.
* **Dialog System Application (Classic)** for creating Dialog System applications that use the classic fonts and look.

* Additional samples:

All of the Dialog System samples previously available with Net Express are now included with the Compatibility AddPack for Visual COBOL. The samples have been converted to Visual Studio solutions.

Editor writing assistance

Enterprise Developer 2.3 Update 1 provides the following enhancements in the editor in Eclipse:

* 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.

Enterprise Server for .NET

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

- Support is provided for DSNRLI, the language interface load module for the DB2 Resource Recovery Services attachment facility (RRSAF). The interface to RRSAF is only through the DSNRLI entry point which provides explicit service connection requests for any XA resource, including WebSphere MQ.
- HSF support has been extended and is now available in JES regions.
- The EXEC CICS POST and WAIT API's are now implemented.
- Support for EZASOKET is now available in both CICS and JES regions.
- SQL API diagnostic events are now being recorded and displayed in the local trace tables.

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.
- PC_PRINTER_INFO_DOTNET (.NET COBOL only) - enables the access to the native Hdc for a printer.

Managed COBOL syntax

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

- 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.

Windows Azure

Enterprise Developer support on Microsoft Azure has been updated to version 2.8 of the Microsoft Azure SDK.

⚠ **Important:**

- Starting with this release, versions of the Microsoft Azure SDK earlier than version 2.8 are no longer supported.
- Support for the Microsoft Azure SDK is no longer provided in Enterprise Developer for Visual Studio 2012. If you have COBOL Azure projects created with earlier versions of Enterprise Developer for Visual Studio 2012, to maintain them, use Enterprise Developer for Visual Studio 2013 or 2015.

What was New in Enterprise Developer 2.3

Enterprise Developer 2.3 provided enhancements in the following areas:

- *General IDE enhancements*
- *Building applications in Visual Studio*
- *COBOL editor in Visual Studio*
- *Code analysis*
- *Code coverage*
- *Command Line Compilation and Linkage*
- *Compiler directives*
- *Converting additional directives to project's properties*
- *Data File Structure command line utility*
- *Data File Tools (Technology Preview)*
- *Database access*
- *File handling*
- *Library routines*
- *Managed COBOL syntax*
- *Micro Focus Unit Testing Framework*
- *Microsoft Azure*
- *Preprocessors*
- *Profiler*
- *REST service interfaces*
- *RM/COBOL Compatibility*
- *Single file support*
- *Tunables*
- *Updated run-time system*

General IDE enhancements

In Visual Studio:

- Menu items - the following Micro Focus utilities were previously available under the **Tools > Micro Focus** menu and have been moved as follows:

  - **ADO.NET Connection Editor** - now accessed from **View > Micro Focus SQL Tools**.

- **MFA Compare and Synchronization Monitor** - now available directly under the **Tools** menu.
- **MFA Server Access Configuration** - now available directly under the **Tools** menu.
- **OpenESQL Assistant** - now accessed from **View > Micro Focus SQL Tools**.
- **OpenESQL Configuration Utility** - now accessed from **View > Micro Focus SQL Tools**.
- **Web Service Client** - now accessed by creating a new project of type "Web Service Client Application from JSON/REST" - click **File > New > Project > COBOL > Native > Web Service Client Application from JSON/REST**.

- Managed COBOL project properties - a new setting, **Expose group linkage items to managed code**, is now available on the **COBOL** tab in the properties of managed COBOL projects. Checking this sets the ILSMARTLINKAGE directive that specifies that group linkage items in your code are to be exposed as properties of a class. A related button, **Options**, enables you to also specify whether to remove specific prefixes from the names of COBOL data items, whether to make the new classes serializable, expose Linkage Section items as nested classes of the program class or to limit the property generation to non-redefining elementary items.
- PL/I project properties - there is now a new page, **Assembler**, in the project properties of PL/I Mainframe Subsystem Projects that enables you to set properties for configuring PL/I Assembler applications.
- Resetting the file properties - a new button, **Use Project Defaults**, on the file property pages of COBOL files in native projects now enables you to reset the file properties of COBOL files in native COBOL projects.

Building applications

Enterprise Developer now supports Visual Studio's parallel builds for COBOL projects. Parallel building enables you to build multiple projects faster on multi-CPU machines. Following this change, in order for your multi-project solutions to build in parallel successfully, ensure that the project dependencies and build order are set correctly for your solution using **Project > Project Dependencies**. For more information about parallel building, see *Tips on Building COBOL* in your product help and your product Release Notes.

Note: Parallel builds are not supported with Mainframe Subsystem COBOL projects.

COBOL editor

The COBOL editor includes the following enhancements and new features:

- Improved Intellisense writing assistance for COBOL in both native and managed COBOL:
  - Context sensitive suggestions - IntelliSense only shows suggestions that are relevant for the position of the cursor in the code or for the type of project.
  - Enhanced completion 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, IntelliSense shows suggestions for the relevant clauses and identifiers that you can use to complete the statement.
  - Automatic completion for single items - IntelliSense automatically inserts single suggestions in the code.
  - Qualifying non-unique names - IntelliSense qualifies data items whose names are not unique.
  - Configuration preferences for IntelliSense - 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.
  - Snippets - code snippets are now included in the IntelliSense suggestions.
- $IF-$ELSE-$END statement colorization - parts of a $IF Compiler-control statement that are not executed are now colored in grey.
- $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 folded or expand in the editor.

- Copybook glyphs (▶) in the left-hand margin on a copy line - indicate that a copybook can be expanded inline.
- Creating copybooks from a selection of code - a new context menu command, **Extract to Copybook** in the editor enables you to move a selection of COBOL code into a new copybook file. The file is added to the project and the code in the original program is replaced with a COPY statement that refers to the new copybook.
- Expanded copybook view - provides indicators for read-only copybooks
- Outlining - outlining is now available on comment blocks, paragraphs and on $REGION and $IF statements.
- Task List comments - the COBOL editor now provides support for Visual Studio-style Task List comments in COBOL. Typing TODO, HACK or UNDONE in the code immediately after the declaration of the COBOL comment (*>, *>> or * in column 7) creates a task that appears in the **Task List** window.

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 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:

EOF-1A	Treats a 0x1a character in the source file as the end of file.
NLS-CURRENCY-LENGTH	Specifies the number of bytes to allocate for the currency symbol in a PIC field.
NULL-ESCAPE	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.

Converting additional directives to project's properties

The **Update Project Properties** utility allows you to convert additional directives in your project to project properties. This option is presented on opening a project. You can select to not show this dialog again by unchecking **Check Additional Directives for project properties** in **Tools > Options > Micro Focus > General**.

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 or a terminal.

To use the new editor directly from the Visual Studio IDE, clear the **Use classic data file tools** check box, available from **Tools** > **Options** > **Micro Focus** > **Data File Tools**. When cleared, the Data File Tools (Technology Preview) version is used, when possible. When this editor does not support the action you are attempting to complete, Classic Data File Tools is used instead. This check box is selected by default.

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** tab. • 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 • 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. See the *BINDDIR* DB2 compiler directive option topic for details. • 64-bit support for PL/I on appropriate platforms. See *Additional Software Requirements on Windows* for details.
HCO for SQL Server	Enterprise Developer version 2.3 provides: • Support for the DATA-CHANGE-TABLE-REFERENCE clause.

- The following HCOSS Add-Ins have been converted to VSPackage Extensions:
  - HCO for SQL Server Tools, now available under **View > Micro Focus SQL Tools**
  - Options for HCO for SQL Server Tools, now available under **Tools > Options > Micro Focus**
- 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	**ADO.NET Connection Editor**	In this release: • The ADO.NET Connection Editor has been redesigned using a series of Wizards that guide you through the processes of adding, copying, and removing connections. • Context Help is now provided for the main window, and each Wizard page and dialog box.
	Date/Time Processing	This release provides streamlined datetime processing for ODBC and JDBC and ADO.NET.
	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 • Npgsql ADO.NET 4.0 driver version 2.2.5

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

- Windows 32-bit
- Windows 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		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

Tools (MBDT)	• 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 CICS and 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.

Library routines

The following library routines are new in this release:

CBL_MANAGED_SESSION_GET_USERDATA	Retrieves user data saved in the current RunUnit.
CBL_MANAGED_SESSION_SET_USERDATA	Sets user data in the current RunUnit.

The following library routines contain new parameters in this release:

CBL_LOCATE_FILE	You can now specify a file name that is a null-terminating string, which has resulted in three new values available for the `user-mode` 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 prompt. A test fixture or suite is a COBOL program compiled to `.dll` 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.

Microsoft Azure support

Enterprise Developer support for Microsoft Azure has been updated to version 2.6 of the Microsoft Azure SDK.

Support has been added to the product for making any future versions of the Microsoft Azure SDK available before the next major release of Enterprise Developer. Micro Focus will deliver support for these only upon customers' requests.

Note:

2.3 HotFix 1 update: This HotFix provides support for version 2.7 of the Microsoft Azure SDK in Enterprise Developer for Visual Studio 2013 and 2015.

Preprocessors

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

A new page, **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.
2. Compile your application to apply the changes.
3. Run your application with Profiler to produce the relevant reports.

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.

To enable full IDE support for single files, Enterprise Developer provides a path for creating projects from them - right-click such files in the editor, and click **Create COBOL Project**.

Tunables

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:

- *Visual Studio*
- *Character Set Enhancements*
- *Code Analysis*
- *Database Access*
- *Enterprise COBOL 5.1 compatibility*
- *External Call Interface (ECI)*
- *Micro Focus COBOL enhancements*
- *External Security Facility (ESF)*
- *Enterprise Server for .NET*
- *Enterprise Server MQ-IMS Bridge*
- *IMS Connect*
- *PL/I General Enhancements*
- *RUMBA 9.2*
- *Transaction Classes (Technology Preview)*
- *Tunables*

Visual Studio

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

* Call Hierarchy - support for the Call Hierarchy window has been enhanced and it now shows types and members across the entire solution.
* Debugging enhancements - includes enhanced support for the Autos windows for native and managed COBOL, support for querying EBCDIC data in managed code, and support for the standard visualizers for data items and groups in native COBOL.
* Find All References - you can now configure the scope of the Find All References command. The default behavior is to search for references in the current COBOL project and now, you can enable Find All References to search for matches in all managed COBOL projects that are part of your solution.
* Net Express Project Import wizard - now includes a number of usability enhancements.
* Run-time configuration - you can now use the application configuration file, `Application.config`, in native COBOL projects to set all run-time tunables.

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 for Visual Studio can produce the following COBOL reports:

* Dead Code - finds unreferenced items or any piece of code that can't be reached during execution.
* Unreferenced Data - finds any data items that are not explicitly referenced in the Procedure Division of a program.
* Undeclared Procedures - finds any procedures that are referred to but not defined.
* Copybook Structure - displays the hierarchy of any copybooks defined in a program.
* Program Statistics - provides general information, such as number of source code lines, number of data items, and size of data items.
* Unexecuted Procedures - finds any procedures that are defined but not referred to.

Database Access

The following new features are available in database access support:

COBSQL In Visual Studio:

* Pro*COBOL support - you can now select and configure the Pro*COBOL COBSQL preprocessor for compiling COBSQL applications on the **SQL** tab in the project's properties.
* KEEPCOMP - the new KEEPCOMP directive resolves COMP/COMP-5 issues with Oracle applications on little-endian platforms.

HCO for DB2 LUW 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.

HCO for SQL Server (HCOSS)

Enterprise Developer 2.2 Update 2 provides the following new HCOSS features:

- DATE/TIME formatting - the OpenESQL Configuration Utility now supports DATE/TIME formatting for HCOSS batch utilities.
- Multi-row INSERT - supports a multi-row INSERT statement.
- Sample applications - Enterprise Developer for Visual Studio includes the following new mainframe HCOSS sample applications:

  - Array Insert - demonstrates how array inserts work with SQL Server using mainframe DB2 syntax.
  - Multiple Result Sets - demonstrates how to create a SQL Server SQL CLR stored procedure with multiple result sets and how to access them from a client program using mainframe DB2 syntax.

- Sample application - Enterprise Developer for Eclipse includes the following new mainframe HCOSS sample application: the **Array Insert** sample demonstrates how array inserts work with SQL Server using mainframe DB2 syntax.

OpenESQL

This version provides the following new OpenESQL features:

- Support for SQL Server 2014.
- New SQL Compiler directive options:

  - 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:

  - 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:

  - 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 for .NET

Enhancements are available in the following areas:

- Azure deployment - the Azure deployment now deploys to the latest worker role guest OS version, Windows Server 2012 R2, which has the latest .NET frameworks (versions 4.0, 4.5 and 4.5.1) installed.
- CICS/JCL Subsystem Started Task Manager - Subsystem Started Task Manager (SSTM) provides JES functionality within a CICS region and enables the region to submit batch work to a JES region. The JES functionality is equivalent to that of a task started under z/OS and must support CICS spooling.

  CICS spooling enables spooling files to the JES region or submitting JCL jobs. CICS spooling does this using its internal reader or using the SPOOLOPEN, SPOOLWRITE and SPOOLCLOSE APIs.
- Diagnostics - the diagnostic collection process now provides more detailed diagnostic information.
- JCL initiator node affinity - node affinity enables a particular initiator to be associated with a particular machine and execute certain types of work only on that machine. An example of this is running a particular job on a machine with specific third-party software installed, for which only one license exists.
- MQ Series support - the WebSphere MQ .NET managed code client only provides a class library interface and not the traditional MQI (MQ programming interface). The MQI interface is now implemented within Enterprise Server for .NET which enables you to run applications that utilize the MQI without any code changes.
- System administration - this release includes two new views, Sessions view and Request view, that enable system administrators to see which sessions are attached to a region, which tasks are active and which ones are queued.

Enterprise Server for .NET provides a better integration with Visual Studio as follows:

- Associating projects with regions - support for associating your managed CICS or JCL projects with a region is available from within Visual Studio. This is to provide the ports required for JVCL submission and for TN3270 integration.
- Submit JCL from within Visual Studio - for a project that is associated with a JCL-enabled region, you can now submit JCL files that are part of the project directly from within Visual Studio.
- Embedded TN3270 Rumba mainframe display - you can now use the **TN3270 Rumba mainframe display** embedded in Enterprise Developer to run managed CICS applications from within Visual Studio.
- Viewing the console log in Visual Studio - you can now display the console log of a region associated with your project in the **Output** window in Visual Studio.

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.

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:

- *Visual Studio IDE*
- *Micro Focus Heartbleed Update*
- *ACUCOBOL-GT Compatibility*
- *Btrieve Support*
- *COBOL Source Information*

- *Compare and Synchronization Monitor*
- *Compiler Directives*
- *Database Access*
- *Enterprise Server Integration in the IDE*
- *Enterprise Server MQ-IMS Bridge (Technology Preview)*
- *Environment Variables*
- *Fileshare Recovery*
- *Line Numbering for COBOL Programs*
- *Local Catalog*
- *Mainframe Emulation*
- *Managed COBOL Syntax*
- *PL/I*
- *Preprocessors*
- *Rumba Integration with Visual Studio*
- *Run-time Launch Configuration Files*

Visual Studio IDE

Enterprise Developer 2.2 Update 1 provided the following enhancements to COBOL support in the IDE:

Find All References	The Find All References functionality now works for managed OO COBOL code.
Navigation	You can now use **Alt+Shift**+Up Arrow (or Down Arrow) to navigate the variables in the editor.
	You can use the drop-down types and members to navigate to the different sections (Linkage section, File section etc.) in your source files.
Project Details Window	The **Project Details Window** now includes columns showing the COBOL dialect of the files and the SQL properties set on them.
Run-Time Configuration	- You can now use the application configuration file (`application.config`) in native COBOL projects to specify some additional settings such as the search order for called programs, command line handling, or file handling. You can do this from the new **Run-Time Configuration** tab. - When an executable is built using the IDE, the application configuration file is automatically copied to the output folder and is renamed as *`<executable-base-name>`*`.exe.mfgcf`.
Samples	Visual COBOL 2.2 Update 1 includes the following new samples: - Airport Demo (managed) - shows how to create a COBOL WCF REST service and then use a client application to consume it. - Airport Demo (native) - a basic lookup program that reads the information about airports from a .dat file and outputs the distance between two airports. The Sandcastle sample has been updated and now uses Sandcastle Help File Builder v1.9.8.0.

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.

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

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.
	• ADO.NET connection editor now provides context help.
	• 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.

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 Output window.

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.

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).

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 –bitsltr 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 Visual Studio, click **Tools > Options > Micro Focus > Directives > PL/I**.

- A new page in the project and file properties enables you to set SQL directives on PL/I source files.

Preprocessors

IDE support is now available for selecting and using third-party preprocessors installed on your machine and integrated with Enterprise Developer for building native COBOL Mainframe Subsystem applications.

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.

Rumba Integration with Visual Studio

Visual Studio now offers context menu commands for launching the Rumba mainframe display (Desktop or embedded) from Solution Explorer or from Server Explorer. The embedded Rumba display now provides keyboard mapping and color settings.

You can use the display of choice both in debugging and when running applications.

Run-time Launch Configuration Files

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.

What was New in Enterprise Developer 2.2

Enterprise Developer 2.2 provided enhancements in the following areas:

- *Enhancements for Enterprise Developer 2.2 for Visual Studio 2012*
- *ACUCOBOL-GT Compatibility*
- *RM/COBOL Compatibility*
- *Application Configuration*
- *COBOL Source Information (CSI)*
- *Compiler Directives*
- *Consolidated Tracing Facility*
- *Converting Net Express Projects*
- *Enhanced Accept and Display Statements*
- *Debugging*
- *Grouping Files in Virtual Folders in Solution Explorer*
- *File Handling*
- *Interface Mapping Toolkit*
- *Managed COBOL*
- *Searching in Copybooks*
- *COBOL Editor Enhancements*
- *Upgrading from Net Express to Visual COBOL*
- *WCF REST Service Application projects*

- *Microsoft Windows Azure*
- *XML Extensions*

Enhancements for Enterprise Developer 2.2 for Visual Studio 2012

The following enhancements are applicable to Enterprise Developer for Visual Studio 2012:

- Copybook Dependencies - Solution Explorer shows a tree view of the dependencies of the COBOL programs and copybooks on copybooks in a project to help you navigate easily around the source code.
- Expanded Copybook View: Technical Preview - The COBOL editor supports showing the contents of copybooks inline at the place where they are referenced in a program or a copybook. Features include:
    - Support for copybooks referenced using any of the following statements - COPY, -INC, ++INCLUDE, EXEC SQL INCLUDE.
    - Support for editing copybooks in the expanded copybook view (except for copybooks shown with replaced values or such for which the user does not have write access).
    - For copybooks referenced using a COPY... REPLACING statement, you can show either the original contents of the copybook file or show its contents with replaced values. The expanded copybook view with replaced values is read-only which is indicated by a yellow background color.

        Note: You can configure the background color of the read-only view from **Tools > Options > Environment > Fonts and Colors**, and changing the background color for the **COBOL Read-Only Background** item.
    - **Go To Definition**, **Find All References**, navigation using the drop-down types and members, and navigating to an error from the **Error List** window all find results or locate information in the expanded copybook view.
    - Support for Intellisense and code snippets when editing copybooks in the expanded copybook view.
    - Support for the Visual Studio outlining feature (collapsing and expanding regions of code) within the expanded copybook view and for regions that include expanded copybooks.

        Note: The following limitations apply to the expanded copybook view:
        - The expanded copybook view displays bookmarks in copybooks and commands for bookmarks such as enable or disable are supported. However, using Next/Previous and the Bookmark window will open the standalone copybook file rather than inline view.
        - It is not possible to edit copybooks referenced through a COPY... REPLACING statement in expanded copybook view when the view shows the replaced values. In this case, the expanded copybook view is read-only.
        - The read-only status of expanded copybooks is not preserved when you close the project. Next time you open the project, the copybook is shown in the Expanded Copybook view but not as read-only.
        - If you used the OF or IN phrases with a COPY statement, it is not possible to show the corresponding copybook in the Expanded Copybook view or open it using the **Open "*CopybookName*" in New Window** command if the copybook is stored in a library file (where you have used the COPYLBR Compiler directive).
        - Navigating to items in the expanded copybook view is not supported from the **Class View** or using the **Navigate To** command.
        - References to file locations in the output windows such as pointing to the build output, or in the results received by **Find in Files**, do not point to items in the expanded copybook view.
        - Selecting the currently selected statement in the call stack in an expanded copybook may show the actual copybook. You can use the **Show Next Statement** command of the debugger to return the actual expanded copybook position.
        - The Breakpoints window always shows the line number of a breakpoint within the file containing it, not the line number within expanded copybook view.
        - The **Call Stack**, **Threads** and **IntelliTrace** windows all display line numbers corresponding to the file containing the statement, not the line number within expanded copybook view.

- If you move the caret to an invalid position in the expanded copybook view, the **Set Next Statement** command will display an 'Unable to set the next statement to this location' error message and the copybook will be opened as a separate document.
- When stepping through .NET COBOL code, if the next statement to step onto is within the same class or program, and on the same line number, but in a different source file, the debugger steps over that statement. For example, if you try to step from line 10 of `Program1.cbl` to line 10 of `Copybook1.cpy`, the debugger steps over the statement in the copybook.

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 CSI query control and CSI returns the results of the query in the Micro Focus Code Analysis window.

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.
ILEXPONENTIATION	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):

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

pseudo-variable	Description
$(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

Converting Net Express Projects

Conversion of Net Express projects has been enhanced. You now use the Visual Studio conversion wizard to import and convert Net Express projects (.app files) to Visual Studio solutions.

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 *Micro Focus Customer Support Documentation Web site*.
Procedural Multi-Output Project type	A new .NET managed project template, Procedural Multi-Output Project, is now available. The project compiles procedural programs to individual managed assemblies or executables as opposed to the standard managed project templates that produce a single assembly. This project type is useful when you are moving existing procedural applications that consist of multiple programs to Enterprise Developer and to managed code. When calling a subprogram, the COBOL run-time system can locate the assembly using the name of the called program which will match the assembly file name. In this case, the assembly does not have to be preloaded. See *Types of COBOL Project Templates* for more details and for a list of the limitations of this project type.

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.

Searching in Copybooks

The search in copybook files has been enhanced. Visual Studio's **Find in Files** now enables you to perform a search in all copybooks - the ones that are part of the project, and in the ones that are found in the paths defined on the **Dependency Paths** tab in the project's properties. To do so, set the search scope in the **Find and Replace** dialog to **COBOL Project Copybook Paths**.

COBOL Editor Enhancements

Navigating in the editor is now more similar to the editor navigation in Net Express. You can configure things like word wrap and indentation, the movement of the cursor using the **Home** and **End** keys, the style of the ruler and the colors of the text and the margins:

Smart editing mode	The default mode in the editor is now Smart edit mode. It controls the word wrapping and the indentation in the different COBOL areas. You can configure the Smart edit mode from the **Tools > Options > Text Editor > Micro Focus COBOL > Margins** page. To toggle the mode, click in the COBOL toolbar.
Home and End keys navigation	You can configure how the **Home** and **End** keys move the cursor in the editor on the **Tools > Options > Text Editor > Micro Focus COBOL > Margins** page. To toggle the mode, click in the COBOL toolbar.
Configuring the ruler	You can specify whether to display the horizontal ruler in the editor and also choose its style, a default style or a mainframe style for which the ruler indicates COBOL area A/B, from **Tools > Options > Text Editor > Micro Focus COBOL > Margins** and check **Show ruler**.

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 Customer Care 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 Visual Studio 2017*, provides guidance on how to move existing applications either developed or debugged in the Net Express IDE into the Visual Studio IDE.

WCF REST Service Application projects

Enterprise Developer now provides a project template for creating COBOL WCF REST Application services. The requirements are - Visual Studio Professional, Premium, or Ultimate (Visual Studio Shell does not support WCF applications), and versions of the .NET Framework 4.0 and later. For more information about WCF and REST, check Microsoft's MSDN.

Microsoft Windows Azure

Enterprise Developer for Visual Studio now enables you to create, build, debug, run, and package COBOL applications for use with Windows Azure. It provides:

• Project template for a COBOL cloud service. This creates a solution containing a project for the cloud service and projects for the web and worker roles you specify.
• Demonstration projects, showing a web and worker role in COBOL, with the business logic remaining in unchanged COBOL programs.
• Help. This includes a tutorial that shows how to create a simple cloud service for COBOL and how to deploy and run the service as an off-premises Microsoft Azure instance.

This functionality was previously available as an AddPack but is now integrated into Enterprise Developer.

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*
- *Copybooks Enhancements*
- *Enterprise Server*
- *HCO for SQL Server*
- *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

Copybooks Enhancements

For variables in a copybook that are modified by COPY… REPLACING statements in your code, the Autos window displays all values defined in the source code. When there are multiple COBOL programs in your project that perform a COPY… REPLACING in a copybook, the Autos window only uses the replacing values found in the first COBOL program. In addition, a new command, **Open *copybook* with replaced values**, is now available from the editor for the copybooks that the COPY... REPLACING statements modify.

Enterprise Server

The following new features and enhancements are available:

Clustering	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.

Historical Statistics Facility	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.
Recovery of in-doubt XA transactions	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.
SSL Support for the CICS Web Interface	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.

OpenESQL Assistant

Support for generation of PL/I SQL queries and copybooks.

PL/I Support

- 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 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

For variables in a copybook that are modified by COPY… REPLACING statements in your code, the Autos window displays all values defined in the source code. When there are multiple COBOL programs in your

project that perform a COPY… REPLACING in a copybook, the Autos window only uses the replacing values found in the first COBOL program. In addition, a new command, **Open *copybook* with replaced values**, is now available from the editor for the copybooks that the COPY... REPLACING statements modify.

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*
* *Associating file extensions with the COBOL language*
* *Compiler Directives*
* *.int, .gnt and .lbr File Types Support*
* *IMS Support*
* *Managed code enhancements*
* *OpenESQL*

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.

Associating file extensions with the COBOL language

This release includes enhancements to the way you associate file extensions and extensionless files with the COBOL language.

If you are importing existing COBOL applications into Visual Studio, it is recommended that you create associations with COBOL within the IDE for any extensions that are not traditionally used in COBOL.

Compiler Directives

The following new Compiler directives are now available:

DISPLAY	Defines the default behavior of standard DISPLAY statements.
COMP1	Specifies the behavior of a COMP-1 data item.
COMP2	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 on the Application page in your project's properties.
* A new native COBOL project template, Micro Focus INT/GNT.
* 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.

Managed code enhancements

Delegates and Events	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, `01 o 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.
	TIMEDELIM	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.	

What was New in Enterprise Developer 2.0

Enterprise Developer 2.0 provided enhancements in the following areas:

- *Building Projects to Multiple Output Files*
- *Compiler Directives*
- *Debugging Enhancements*
- *Library Routines*
- *Managed COBOL Language Features*
- *Data Access*
- *Run-Time Tunables*
- *Samples*
- *Vision Data File Searching*
- *XML Support*

Building Projects to Multiple Output Files

You can now build your native Link Library projects to multiple output files. To configure this, you need to go in the project properties and set **Output To** to **Multiple Libraries**.

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.
- ILUSING - when set on a single file using the SET statement, `$set ilusing`, the directive only affects that file.

Debugging Enhancements

Enterprise Developer 2.0 provides the following enhancements to debugging:

|	
Core dump files	On Windows, the core dump files created by this product are Microsoft minidump files. If you have a mixed-language application, you can use the minidump file to debug the other languages involved.
Debugging native COBOL Link Library projects	You can now debug native COBOL link library projects that get built to a single .dll file.
Program Breakpoints	**Note:** Program breakpoints are supported in native COBOL only, and are not supported with nested programs. Use the **Program Breakpoints (Native COBOL)** window to add program breakpoints to your applications. When a program breakpoint is set the application breaks whenever the program or one of its entry points is called. In the **Program Breakpoints (Native COBOL)** window, click **New** and type the name of the source file, without the extension. For multi-program source files, to set a break for a sub-program, use its program-id. To display the **Program Breakpoints (Native COBOL)** window, click **Debug** > **Windows** > **Program Breakpoints (Native COBOL)**.
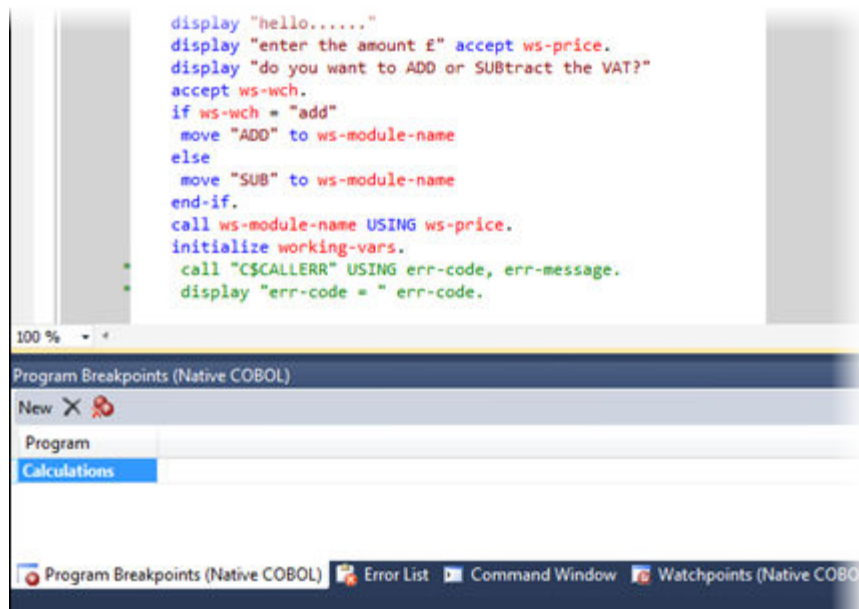
Step out of OSVS perform statements	You can now step out of a perform statement when PERFORM-TYPE(OSVS) or DIALECT(OSVS) is set.
Support for debug attaching to programs	Enterprise Developer now supports debugging of native CGI applications by waiting for attachment on a directory.

launched by services	
Wait for debuggable attachment option for native COBOL	**Wait for debuggable attachment** on the Debug page in the properties of native properties has been enhanced. You can now specify one the following options for it - Wait for any program, Wait for directory, and Wait for ID.

Library Routines

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:

Local Variables	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.
Collections	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.
Properties	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.
Indexers	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.
Zero-based Indexing	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.

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
* The OpenESQL ADO.NET managed run-time has been redesigned so it now works faster. It also supports multiple result sets with stored procedures.

Run-Time Tunables

Enterprise Developer 2.0 provides the following new tunables:

- printer_raw_redirection - use this to redirect WRITE statements through the Windows print spooler as RAW data types.
- 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:

- CGI demonstrations:
  - Complex CGI application - demonstrates how to use native COBOL to create CGI programs which accept data from a form on a Web page and then redisplay that data in another Web page
  - Simple CGI application - demonstrates how to use native COBOL to create CGI programs which accept data from a form on a Web page and then redisplay that data in another Web page
- The following samples have been added to the COBOL for .NET section:
  - Collections - demonstrates the new LIST and DICTIONARY collection types
  - 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 in the **COBOL for .NET** section of Samples Browser 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
```

XML Support

The IBM-style XML GENERATE syntax is now supported in .NET managed COBOL.

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

Documentation for the Dialog System AddPack

Documentation for the Dialog System AddPack is now available and is integrated with the Enterprise Developer documentation.

This documentation describes the AddPack, which enables you to 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.

The documentation describes some modernization techniques such as:

- 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`.

Native OO COBOL Class Library Reference

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 `nxrclr.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 `nxrclr.chm` in File Explorer.

Net Express Project Import Wizard

Enterprise Developer for Visual Studio includes a Net Express Project Import Wizard that converts NetExpress projects into Visual Studio solutions. The wizard analyzes the Net Express project file and its configuration settings, creates one or more Visual Studio native projects based on this information, imports the existing source code into them and sets the appropriate directives. When the process is complete, it can optionally display a detailed conversion report.

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$CALLEDBY
  - C$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.

ADO.NET Runtime Improvements

The OpenESQL ADO.NET runtime has been re-engineered, offering several advantages over previous versions, providing:

- Better performance - the new runtime is much faster and can as much as double your performance, depending on the specifics of your application.
- Support for multiple run unit processing.
- Support for both client applications and SQL CLR stored procedures.
- For stored procedure applications:

    - Support for input/output parameters defined as COBOL data types, in addition to the previously supported .NET data types
    - Support that enables stored procedures to return more than one result set.
    - Static SQL Support for the DIALECT=MAINFRAME Compiler directive.
- For client-based applications:

    - Support for dynamic SQL that uses an SQLDA structure to pass parameter and result host variables, specifically including the following embedded SQL statements:

        - PREPARE - For example, the following statement passes a prepared statement into the SQLDA from a host variable:

            ```
            EXEC SQL
                 PREPARE stmt1 INTO :sqlda FROM :stmt-buf
            END-EXEC
            ```
        - EXECUTE - For example, the following statement executes a prepared statement using a previously constructed SQLDA structure:

            ```
            EXEC SQL
                 EXECUTE stmt1 USING DESCRIPTOR :sqlda-structure
            END-EXEC
            ```
        - OPEN - For example, the following statement opens a cursor using a previously constructed SQLDA structure:

            ```
            EXEC SQL
                 OPEN c1 USING DESCRIPTOR :sqlda-structure
            END-EXEC
            ```

For complete information on using these statements, see the *PREPARE*, *EXECUTE*, and *OPEN* topics.

- Additional support for result set processing that allows you to receive more than one result set back from a stored procedure.
- Support for applications built to target .NET Framework versions 2.0, 3.0 and 3.5, in addition to .NET Framework version 4.0.

⚠️ **Important:** To take advantage of these improvements you must recompile your applications with the DBMAN=ADO Compiler directive. However, if you want to continue using the functionality available in previous releases, we now provide the DBMAN=OADO directive to use in place of the DBMAN=ADO directive. DBMAN=OADO provides the same functionality as was available with previous versions of the DBMAN=ADO Compiler directive, and has 100% backward compatibility with applications designed and developed with Visual COBOL R3.

Debugging Enhancements

The ability to load core dump files in Visual Studio has been added. This feature works with native COBOL only.

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 Visual Studio 2017. However, it was previously available in the Enterprise Developer - Enterprise Server for .NET product. The following are HCOSS features that are new since its previous release in Enterprise Developer - Enterprise Server for .NET:

- 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.

Language Improvements

The following improvements have been made to managed COBOL:

Extension methods and extending operators	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.
The SYNC modifier for methods	The SYNC modifier locks the values of the arguments sent to the method, so that they do not change while the method is processing.
Nested classes	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.

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 Customer Care 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 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*
- *Containers*
- *Enterprise Server*
- *Machine Administration*
- *Mainframe Access*
- *File Handling*
- *JCL Support*
- *Micro Focus Batch Scheduler Integration*
- *Micro Focus Communications Server*
- *Micro Focus Directory Server*
- *PL/I Support*
- *REXX Support*
- *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)

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_xxxxxxxxxxxx.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_xxxxxxxxxxxx.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 SYSZJOBD and/or SYSZJOBN 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

* 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_DSNQSHR* 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 lexigraphical 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 `IKJTCB.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 `mfds /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:

```
mfds /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 mfds /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

Back to the list

- 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

Back to the list

- 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 supressed to match those expected by the application.

    (193003)

SQL Option for DB2

Back to the list

- 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).

- *Assembler Support*
- *Common Communications Interface*
- *Communications Server*
- *Compiler*
- *Data Tools*
- *Enterprise Server*
- *File Handling*
- *Header-to-COPY Utility*
- *Interface Mapping Toolkit*
- *JCL Support*
- *Mainframe Access*
- *Micro Focus Batch Scheduler Integration*
- *PL/I Support*

- *REXX Support*
- *Run-time System*
- *SQL: Mainframe Batch Database Tools*
- *SQL: OpenESQL*

Assembler Support

Back to the list

- 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)

Common Communications Interface

Back to the list

- 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

Back to the list

- 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

- 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)

Enterprise Server

- 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 `cassub` 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)
- 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 ccorrected.

  (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

Back to the list

- 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

Back to the list

- 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

Back to the list

- 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

Back to the list

- 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 to 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 systsprt 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)

Mainframe Access

Back to the list

- Users will now be able to specify a volume when cataloguing a data set.

  (41007)

Micro Focus Batch Scheduler Integration

Back to the list

- 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

Back to the list

- 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)

REXX Support

Back to the list

- 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

Back to the list

- When defining the file name for CBL_CREATE_STACKDUMP, %f now expands to basename of the program correctly when used cross-process.

(60049)
- 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

Back to the list

- An equivalent of the mainframe DB2 utility DNSTIAUL, SQLTUL, is now available in the MBDT utility suite.

2148818 (10857)

SQL: OpenESQL

Back to the list

- 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*
- *Assembler Support*
- *Call prototyping in library routines*
- *Common Communications Interface*
- *Communications Server*
- *Compiler*
- *Database Access - OpenESQL*
- *Data Tools*
- *Documentation*
- *Early warning of compatibility issues with current operating systems*
- *Enterprise Server*
- *Enterprise Server Common Web Administration*
- *Enterprise Server for .NET*
- *Enterprise Server Security*
- *File Handling*
- *Handling of Anonymous Root Field in JSON*
- *IDE*
- *JCL Support*
- *Micro Focus Batch Scheduler Integration*
- *Micro Focus Directory Server*
- *National data items in .NET COBOL code*
- *PL/I Support*
- *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

Back to the list

- 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)

Assembler Support

Back to the list

- 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.

  3224507 (1119933)
- 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.

  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

Back to the list

The copybooks `cbltypes.cpy` and `cblproto.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

Back to the list

- 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

Back to the list

- "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".
- External data and files declared in an instance context (such that is not within STATIC/END STATIC and without the STATIC qualifier) can no longer be accessed from a static method. The STATIC qualifier is now allowed in combination with EXTERNAL.

  3216822 (1119228)

Data Tools

Back to the list

- 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

Back to the list

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

Back to the list

- The information about the -flag and warn compiler options has been updated.

  3190928 (1120000)

Early warning of compatibility issues with current operating systems

Back to the list

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-rts64-Error-96-encountered-in-child-process/ta-p/1771191* for more details.

Enterprise Server

Back to the list

- 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

Back to the list

- 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 for .NET

Back to the list

- Previously, it was difficult to programmatically detect an error condition in the PowerShell commands for Enterprise Server for .NET. The commands will now throw exceptions in the event of an error.

  3187426 (1116657)

Enterprise Server Security

Back to the list

- 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

Back to the list

- 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

Back to the list

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

Back to the list

- 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

Back to the list

- In fixed format COBOL code, lines in custom code snippets will now be automatically wrapped if they reach the end of area A/B.

  3201628 (1117874)
- Server Explorer in Eclipse and in Visual Studio now requires you to specify user names and passwords if security is enabled to connect to the nodes. The default credentials are no longer automatically applied.

JCL Support

- The wrong Symbol value was used when a symbol was assigned a different value following a procedure.

  3223719 (1119901)
- When replacing symbols in in-stream data, space-separated elements will be taken into account, and if possible, the original position will be maintained.

  3222942 (1119802)
- 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, mfcatxml 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

Back to the list

- 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 .NET COBOL code

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.NET 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

Back to the list

• 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)

Run-Time System

Back to the list

• 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

Back to the list

• 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*
• *Data Tools*
• *Documentation*
• *Enterprise Server*

- *Enterprise Server Auditing*
- *Enterprise Server for .NET*
- *File Handling*
- *HCO for SQL Server*
- *IMS Support*
- *Interface Mapping Toolkit*
- *JCL Support*
- *Mainframe Access*
- *Micro Focus Batch Scheduler Integration*
- *Micro Focus Directory Server*
- *MFCRYPTLIB*
- *PL/I Support*
- *Request Packet Interface API*

Common Communications Interface

Back to the list

- 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.

Data Tools

Back to the list

- 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

Back to the list

- 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)

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.

Enterprise Server for .NET

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- The system has been improved so that in a scale-out work is more likely to be distributed evenly among SEP pools. There is now a configurable time limit for SEPs to continuously retrieve work, after which they will distribute the next task to a different SEP. This time limit is controlled by the ContinuousTaskProcessingTimeLimit key in `seesep.exe.config`, or in the WAS SEP `Web.config`

file. In order to take advantage of this change, there must be a load balancer between the monitor and the dispatcher, to ensure work is distributed evenly between dispatchers.

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 EXTFH.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

Back to the list

* 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

Back to the list

* 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

Back to the list

- 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.

Mainframe Access

Back to the list

- 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 Endevor "Source Date" and "Source Time" information to determine if a file has changed since the last synchronization.

  3177475 (1115904)

Micro Focus Batch Scheduler Integration

Back to the list

- 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

Back to the list

- 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

Back to the list

- Passing an incorrect keyfile passphrase no longer results in receiving an RTS115 error in MFDS.

  3181743 (1116186)

PL/I Support

Back to the list

- 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)

Request Packet Interface API

Back to the list

- 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*
- *CICS Support*
- *Code Coverage*
- *Codeset Support*
- *Common Communications Interface*

- *Communications Server*
- *Compiler*
- *Data Tools*
- *Documentation*
- *Enterprise Server*
- *Enterprise Server Auditing*
- *Executables require relinking*
- *File Handling*
- *HCO for Microsoft SQL Server*
- *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, `mfccl.jar` is no longer located in the `bin` subdirectory, but can be found in the `javaee-ccl\common` directory.

CICS Support

Back to the list

- 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

Back to the list

- 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

Back to the list

- 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

Back to the list

- 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)
- 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

Back to the list

- 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

Back to the list

- Records with an invalid value for a conditional field will no longer result in a match for that conditional layout.

  2853226 (1103406)

Documentation

Back to the list

- 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

Back to the list

- 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=MQL*,CN=MFESMAC,CN=Enterprise Server Resources,CN=Micro
Focus,CN=Program Data,DC=X
changetype: add
cn: MQL*
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` file, which is located in the `bin` sub-directory of your product directory.

Enterprise Server Auditing

- 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

- 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 `cbllink` 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

Back to the list

- 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)

- For .NET applications, set XFHLOG=DEFAULT to create the XFHLOG file in the current directory; otherwise it is created in C:\ProgramData\Micro Focus\[ED/VS]\[Release]. From release 4.0 onwards, this variable also has an effect for native applications.

  3115116 (1110323)
- Setting the configuration option ASCIISOSI=ON will adds 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 OUTFIL statement of a SORT operation now supports the NULLOFL parameter.

  3110364 (1109822)
- The MFJSORT OUTFIL emulation now supports the VLTRIM parameter.

  3107105 (1109820)

HCO for Microsoft SQL Server

Back to the list

- 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.

JCL Support

Back to the list

- 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

Back to the list

- 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)

Back to the list

• The total number of active sessions or clients in MFDS is now limited to 2000.

Micro Focus Directory Server

Back to the list

• The mfds -g options D, O, and S have been added to the product Help.

2848627 (1102864)

• 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

Back to the list

• 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

Back to the list

• 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:

• *CICS Support*
• *Compatibility AddPack*
• *Compiler*
• *Documentation*
• *Enterprise Server*
• *Enterprise Server for .NET*
• *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*

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)

Enterprise Server for .NET

- A problem that caused an RTS 173 error while executing a batch job step that performed a COBOL sort (as opposed to EXEC PGM=SORT)when the program terminated using STOP RUN instead of GOBACK has been fixed.

  3105738 (1109359)

IDE

- Disabling CICS support from the properties of a file in your project within the IDE now correctly sets the NOCICSECM Compiler directive on that file.

File Handling

- 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 = *nnnn* (where *nnnn* 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 both ADO.NET (DBMAN=ADO) and ODBC (DBMAN=ODBC). For ADO.NET, this reduces cursor memory consumption thereby providing optimal performance. This also ensures that, for ODBC, 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:

- *Compiler*
- *Enterprise Server*
- *MF Directory Server*
- *Monitoring and Management*
- *JCL Support*
- *PL/I Support*
- *Run-Time System*

Compiler

- The ILPINVOKE directive is now allowed only in an initial $SET. This is in line with similar directives like ILREF and ILTARGET. Previously, the ILPINVOKE directive was allowed in other positions in the source code, but could later result in 'Insufficient memory' errors.

  2860347 (1104422)

- 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.

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)

MF Directory Server

- The "-n" option for the mfds 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 (CASMG0001I).

  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:

- *Communications Server*
- *Data Tools*
- *Dialog System*
- *Editor Writing Assistance*
- *Enterprise Server*
- *IBM Language Environment for OS/390 & VM Support*
- *JCL Support*
- *Run-Time System*
- *SQL: OpenESQL*
- *SQL Option for DB2*

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.

Dialog System

- Versions of the Micro Focus Compatibility AddPack released with version 2.3 of Enterprise Developer or Visual COBOL 2.3 or with earlier versions supported the use of the "MFOLECL_NO_THREAD_INIT" environment variable. Using this variable, you could disable the default OLE Class Library COM threading initialization. This helped avoid issues that could manifest as hangs and crashes, especially on Microsoft's Windows 8.x or 10 and with applications that are a hybrid between Dialog System, OLE class library and .NET elements - see *http://community.microfocus.com/microfocus/cobol/ visual_cobol/w/knowledge_base/20715.exception-occurs-when-native-dialog-system-program-calls-managed-winform.aspx*.

  In the version of the Micro Focus Compatibility AddPack released with Enterprise Developer 2.3.1 or Visual COBOL 2.3.1, this environment variable is now enabled by default and no longer needs to be set exclusively. To restore the previous behavior, use a new environment variable, MFOLECL_THREAD_INIT, and set it to Yes.

  2848875 (1102920)

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.
- Pressing TAB in the Visual Studio editor now always inserts the highlighted item in the IntelliSense list of suggestions.

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)

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 and Enterprise Server for .NET, 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\hcoss\InstallDigitsFunction.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:

- *Assembler Support*
- *Building*
- *Converting Additional Directives to Projects' Properties*
- *CAS Security*
- *CAS XA Switch modules*
- *Compiler*
- *Data Tools*
- *Discontinued Support for cwgui*
- *File Handling - External File Handler*
- *IDE*
- *J2EE Connector*
- *JCL Support*
- *Mainframe Access*
- *MF Server Administrator (GUI)*

- *PL/I Support*
- *SQL - HCO for SQL Server*
- *Updated Run-Time System*

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)

Building

- Enterprise Developer now supports Visual Studio parallel builds for COBOL projects. Parallel builds enable you to build multiple projects faster on multi-CPU machines.

  If, after upgrading to this version of Enterprise Developer, you start receiving unexpected build errors when compiling an existing multi-project solution, this may be a result of enabling support for parallel project builds. These are a couple of examples of issues that might be causing these errors:

  - Using file references to project outputs in the same solution. You need to use project-to-project references instead.

    Use **Project > Project Dependencies** to manage the project dependencies and build order within your solution.
  - A customized build process such as one that is using pre- or post- build events.

  If resolving any of these issues does not help resolve the build errors, consider disabling the parallel build support - click **Tools > Options > Projects and Solutions > Build and Run** and **set maximum number of parallel project builds** to `1`.

  Note: Parallel builds are not supported with Personal Edition licensing

Converting Additional Directives to projects' properties

Starting with this release, an **Update Project Properties** dialog box might start to appear when you are opening existing COBOL solutions. The dialog box recommends converting some of the directives specified in **Additional directives** to project's properties. This is to address an issue where you might try to set file properties that differ from the project directives and the directives specified in **Additional directives** that have a property equivalent take precedence over the file properties. As a result of this you might receive unexpected build issues when building your applications.

This dialog box helps eliminate the issue by converting the directives specified in **Additional directives** to project properties.

If you do not want the IDE to perform this check, click **Tools > Options > Micro Focus > General** and uncheck **Check Additional Directives for project properties**.

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)

IDE

- The default warning level for new COBOL projects in Enterprise Developer for Visual Studio is now "Include recoverable errors (Level E)". This also includes "Severe errors only (Level S)" and unrecoverable (Level U) errors. Micro Focus recommends you set the warning level on the COBOL page in a project's properties to "Include warnings (Level W)" where appropriate to help avoid potential coding problems.

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 Endevor you must be using Endevor R14 or later. CA stabilized the Endevor 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 complier 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:

- *.NET CICS (General)*
- *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*

.NET CICS (General)

- The data file location list in the region startup file now supports both on-disk and database folders – for example, c:/project/bin/debug and sql://(dbinst)/VSAM/?folder=FOLDER1;type=folder.

  When searching for a file, CICS will check in all of the provided locations in the order specified. Files that are accessed using fileshare or the catalog are not affected by these changes and continue to work like they did before. You can configure how CICS locates the underlying data files using a new set of properties. When using the CICS Resource File Editor to explore the ResourceDefinitions.config file, FCTs now include a File Location Overrides section with the following properties:

  - Filename – specify a filename or a filename with an extension (for example, ACCTFIL.DAT) that CICS will search for instead of using the FCT name.
  - File Extension –specify a file extension. The FCT name must be used as the file name.
  - Folder – specify where CICS should search for files.
  - If this is set to the absolute path to a folder on your machine or to a database folder, CICS only searches for files in that folder and does not use the data file locations.
  - If this is set to a relative path (such as "/subfolder1/subfolder2/"), CICS applies that relative path to each of the data file locations in which it searches for the file.

    Note: Previously, the Folder property was called Path and had to be set to the full absolute path to the data file. These three properties are compatible with the native Enterprise Server and can be enabled in any combination.

  Previously, in order for CICS to locate a file in the database, you had to set the Format property to RDBMS and the Path property of an FCT to the name of the datastore. This is no longer required.

  Instead, you need to add the datastore folder that contains the file either to the data file locations or to the Folder property in the File Location Overrides section in the FCT properties. You can still use the RDBMS format value as a hint to configure CICS to create the file (for example, using CFCR) in the database and not on disk.

  If you install this release, you must modify any FCTs that were using the old Path property. For example:

  If you previously had:

  FCT (Name=fct1 Path="c:\folder\file1.dat")

  This must be converted to: FCT (Name=fct1 FileName="file1.dat")

  And the data file location, c:\folder\, must be added to the region startup file.

  2780059 (1094576)

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.

  2697571 (1094370)

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:
	D
	Dynamic (default) use indirect PCB address list when PSB language is PL/I and main program is PL/I.
	Y
	Always use indirect PCB address list if PSB language is PL/I.
	N
	Never use indirect PCB address list.
IBM Platform	ES_IMS_IBMPLATFORM=M|D
	Where:
	M
	MVS (default)
	D
	DOSVS Required by some DOS/VS customers.
Secondary Index Sparse exit language	ES_IMS_SPARSE_EXIT_LANG=C|A
	Where:
	C
	COBOL

Field	Environment Variable
A	
	Assembler
Not set (default)	
	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:

- *.NET Compiler*
- *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*

.NET Compiler

- In member reference in managed COBOL syntax, you may now only use parentheses when referencing methods. You can no longer specify parentheses when referencing fields or properties, as this will produce a syntax error. For example:

```
set intLength to testString::Length()
```

must change to:

```
set intLength to testString::Length
```

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 Developer2.2 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:

- *.NET Compiler*
- *ASM Compiler: HLL Macro Assembler*
- *CCI Session Layer Code*
- *Compiler*
- *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*
- *Samples Browser*
- *Visual Studio IDE*

.NET Compiler

- The use of ILSMARTLINKAGE in sub-programs is now working correctly. In previous versions, if it was specified in a sub-program, a dynamic call of that program from another program could cause execution failure.

  2608825 (1087435)

- In managed code, the statement DISPLAY UPON SYSERR now behaves as expected. Previously, it was behaving the same as DISPLAY UPON CONSOLE.

  2589053 (1085576)

- When the PROPERTY keyword is used on a numeric edited field, the SET method now works correctly when the program specifies DECIMAL POINT IS COMMA.

  2588508 (1085560)

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.

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.

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 nas 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 S0C4 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.

Samples Browser

- If you have installed the version of this product for both Visual Studio 2010 and Visual Studio 2012, the Samples Browser now provides links for you to open the samples in either one of them.

Visual Studio IDE

- Performance when loading and building COBOL projects that consist of a large number of files has been improved.

2657121 (1090316)

- When building a project outside of the IDE, adding a new file to a project no longer results in a full rebuild of the project.

2617003 (1089623)

- You can now change the display format of values on individual rows in the Watch window using modifiers after the names of variables and expressions. To do this, click a row, press F2, and type a modifier after the name of the variable or the expression as follows - type VariableName,h or VariableName,x to always display the variable or the expression in hexadecimal format; type VariableName,d to always display numeric variables in decimal format and strings - as text.

2614182 (1087959)

- When you perform a search in the IDE for copybooks that your programs depend upon, the COPYEXT directive you set from the Additional directives field on the COBOL tab in your project's properties is now used in preference to the list of copybook extensions specified in Tools > Options > Text Editor > Micro Focus COBOL > Advanced, and in Copybook extensions. This change does not affect the project build and background parsing that already use COPYEXT.

  2612053 (1087773)
- Attempting to restart an enterprise server failed if the process took longer than fifteen seconds.

  2607051 (1087259)
- When you debug native code and query a data item which contains null bytes, the value displayed in the Watch window is no longer truncated at the first null byte.

  2604749 (1087235)
- A new setting, "Define DEBUG constant", is now available on the COBOL page in the project properties of managed projects for the Debug configuration. You can select it to add "constant"DEBUG(1)"" to the build directives.

  2600567 (1086629)
- The Output window now displays a notification when the compilation of the IMS files has been successful.

  2600137 (1086667)
- A problem with the value of "Link with objs" setting being duplicated after you reload the COBOL Link properties page has been resolved.

  2595408 (1086091)
- IntelliSense now displays data names longer than 32 characters correctly.

  2594901 (1086053)
- Previously, when you upgraded COBOL projects with signed assemblies from Visual Studio 2003 format to Visual Studio 2010 format, the signed assembly property was lost.

  2585458 (1085258)
- There is an improvement in the performance of the cursor in the text editor when working with larger files and projects.

  2585450 (1085255)
- Using linked files in projects has been improved as follows:

  - Folders that only contain linked files no longer disappear from the project when you reload it.
  - The location of linked files is preserved in the project structure when you reload the project.
  - Moving a linked file within a project no longer moves the actual file on the disk but only moves the link inside the project structure.
  - It is no longer possible to copy a linked file into the same project where, previously, this created a copy of the actual file on the disk.

  2574102 (1084208)
- When you convert Net Express projects that compile to .int or .gnt files to Enterprise Developer for Visual Studio, the application environment variables are now imported successfully.

  2569777 (1083953)
- It is now possible to convert Net Express projects that do not contain any COBOL source files to Visual Studio projects.

  2568638 (1083900)
- You can now set environment variables used by the native COBOL Run-Time system during initialization from the project properties - click Environment on the Application tab.

  2539447 (1081251)
- Pressing Enter to create a new line now preserves the indent in the COBOL editor in Smart edit mode.

2496411 (1077769)

- The "Edit IMS Database" command was disabled for DBD files in your project if the ACB file was not in the project directory. You can now optionally define a location for the ACB files different than the project directory by setting the ES_ACBLIB environment variable.

2496391 (1077864)

- Pressing End inside the writing area of the COBOL editor now positions the cursor on the first non-blank character, if columns 12-72 contain any text. If the line is blank, the cursor is positioned on column 73.

2496351 (1077767)

- The COBOL editor now supports a "Smart edit mode" (see Tools > Options > Text Editor > Micro Focus COBOL > Margins) which is enabled by default. In Smart edit mode, when you press ENTER in the code (A/B) area the comments move to the next line and stay in the right-hand area.

2496350 (1077768)

- You now receive a suitable error message when you try to use "Start Without Debugging" with Mainframe Subsystem Application projects.

2495298 (1078343)

- You can now use Solution folders to group projects in your solution.

2259310 (1065760)

- If, when you start debugging, the debug target does not exist you now receive an error message that correctly states the missing filename.
- Any leading or trailing spaces you added to the name specified in the "Output name" field on the Application tab in the properties of a native project are now ignored.
- Class view no longer contains outdated information from previous background syntax checking after classes have been renamed.
- Class view no longer contains outdated information from previous background syntax checking when the files defining types have been removed.
- A problem with navigating to member definitions from the Class View has been resolved.
- A problem with navigating to member definitions from the Class View has been resolved.
- An issue where canceling some of the dialogs in Tools > Options resulted in the changes being saved anyway, or the pages not reverting when next loaded, has been resolved.
- You can now start and stop servers from the Server Explorer when using the local machine's IP address or DNS name.
- It is now possible to debug a project that has its "Compile for debugging" setting enabled in the project properties for the Release configuration.
- Selecting a project in Class View now triggers background syntax checking, if it has not been performed for that project yet.
- If you have .NET Framework v. 4.5 installed, creating a COBOL Web application with Visual Studio 2010 Shell was failing with a Signal 114 error and was causing the IDE to crash. This issue has been resolved for the IDE. To work around the issue when you compile COBOL Web Applications from the command line, you need to manually set the environment variable VisualStudioVersion to 10.0 before compiling.
- Using the tab character in comments no longer causes issues with the colorization of the code.
- The Visual Studio IDE no longer crashes if you try to close it while directives scan is in progress.
- Adding files to a project when directives scan is disabled was taking a long time to complete.
- Friend assemblies (as identified by the InternalsVisibleToAttribute) are now correctly handled during syntax checking, and types are correctly found within friend assemblies when they are present.
- An issue with adding new platforms or configurations to a project or solution when the project contains pre- or post-build events has been resolved.
- A problem with navigating to member definitions from the Class View, when the definitions occurred within copybooks used within partial classes, has been resolved.
- A problem where trying to navigate to the source of an item from the Class View positioned you on the wrong line, has been resolved.

- An issue where the Implements smart tag was present for interfaces that were fully implemented (when some of the methods from that interface were implemented explicitly; and in addition to another interface which was not fully implemented) has been fixed.
- An issue where method signatures were rendered incorrectly if the member had a 78 level item in its local storage has been resolved.

Significant Changes in Enterprise Developer 2.1 Update 1

Enterprise Developer version 2.1 update 1 includes significant changes in the following areas:

- *Documentation*
- *JCL Support*
- *PL/I 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.

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) MFALLOC_PCFILE=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, IEBGENER and IEBCOMPR utilities to treat missing input files as though they were present but empty files.

PL/I Support

- When running the macro preprocessor as part of an Open PL/I compile, if there are missing %INCLUDE files, we now flag them as SEVERE errors which are visible in the Visual Studio Output Tab even with the minimal level of MSBuild information enabled. We terminate after the macro phase, allowing the customer to correct the situation before continuing.

Significant Changes in Enterprise Developer 2.1

Enterprise Developer version 2.1 includes significant changes in the following areas:

- *CICS Support*
- *Compiler*
- *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)

Compiler

- The use of extended ACCEPT or DISPLAY statements in Windows applications (ilsubsystem"2") now produces error COBCH1634: Extended ACCEPT/DISPLAY not allowed with a Windows GUI executable (ILSUBSYSTEM"2"). Remove the syntax or change the output type of your application to 'Console Application'.

  2575702 (1084365)

IDE

- A problem with the item templates in the Add New Items dialog box not available for PL/I projects has been resolved.

  2581187 (1084876)
- There is now a build summary report for projects that compile to multiple output files.

  2578006 (1084506)
- Previously, Visual Studio used to always rebuild the entire project after you changed the project properties or added files when there were build error. This has been changed so that during subsequent builds Visual Studio only rebuilds the files that are out-of-date.

  2576400 (1084393)
- A new setting has been added to the COBOL tab in the project properties, "Generate listing option", which produces an .lst file in a Listing subfolder in the project directory. The "Generate directives file" setting now generates the directive file in the project output directory.

  2494484 (1077662)
- Command line arguments are now passed to the program when started via the 'Start without Debugging' option in the Visual Studio IDE.
- Previously, if you started debugging using CBL_DEUGBREAK and there was a COBOL source file open in the editor, when you stopped debugging its dictionary file (.idy) was not being released. This resulted in any subsequent builds and rebuilds failing. This problem has been resolved.
- The native COBOL projects in Visual Studio have been enhanced so that you can now build them to multiple executables - each COBOL program in the project producing a separate executable.
- You no longer receive an error message when adding an event handler to an object in a COBOL WPF project if the .xaml code behind file includes a class that does not have methods in it.
- The IDE no longer ignores certain Run-Time System errors from the Compiler which previously caused the build to fail without an explanation.
- Compile extensionless COBOL files with the IDE no longer fails.
- Using the UI to add COBOL switches or environment variables to a COBOL Web Application (right-click the configuration file in Solution Explorer and select Edit) no longer causes a configuration error when you run the application.

  2558133 (1082871)

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*
- *OpenESQL*
- *Run-Time System*

Compiler

- An attempt to serialize a class containing COBOL data such as PIC X or group items could lead to a serialization exception.

  2555177 (1082730)

- Dependent assemblies (ones that are required by other assemblies) that fail to load now issue a COBCH1581 warning "Could not load dependent assembly AssemblyName". Previously, they generated a COBCH0942 error. If an assembly generates both COBCH0942 and COBCH1581 errors, the error report lists only the COBCH0942 error.

  2507380 (1078845)

- 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

- Using File > New > Solution From Net Express Project to convert a Net Express project to a Enterprise Developer solution on a machine with a language locale other than English or Japanese produced an empty solution.

  2548551 (1082073)

- The COBOL tab in the project properties of a new WPF Application sometimes was not showing any settings.

  2535705 (1080950)
- In some menus and dialogs in the IDE copybooks were referred to as copy files. They are now consistently referred to as copybooks.
- The project properties have been enhanced. The SQL directives are no longer shown in Build Settings on the COBOL page where they sometimes appeared as out-of-date. The SQL directives now appear only on the SQL page.
- Adding a watch on an item of the form buffer(1:size) caused the IDE to hang when "size" was not initialized.
- ActiveX components in the Windows Forms of a managed project could cause the programs to crash at run-time. Previously, to work around this problem, you had to check the ActiveX references in the project and set their CopyLocal reference property to True. This is now done automatically when the references are added.

  2536071 (1080978)
- Adding an existing Windows Form to another project as a linked file did not function correctly. When you reopened the project, the designer and the resx files were missing from all Windows Forms in the project.

  2524313 (1079984)

OpenESQL

- OpenESQL did not always return a consistent error message or it returned an incorrect error message when a data conversion exception occurred within the ADO.NET run-time system.

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 8.0

- Data File Editor - The method used to filter data files has been deprecated and replaced with new functionality.

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.

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
  - ILOBJECTIFY
  - 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:

Windows Azure versions

- Starting with Enterprise Developer 2.3 Update 1, versions of the Microsoft Azure SDK earlier than version 2.8 are no longer supported.
- Support for the Microsoft Azure SDK is no longer provided in Enterprise Developer for Visual Studio 2012. If you have COBOL Azure projects created with earlier versions of Enterprise Developer for Visual Studio 2012, to maintain them, use Enterprise Developer for Visual Studio 2013 or 2015.

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 pseudovariables 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 8.0:

Compatibility with older releases

- 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.

Installation

- It is not possible to upgrade from a 7.0 version of the Visual Studio-based product, if you are targeting a different version of Visual Studio. For example, it is not possible to upgrade from Enterprise Developer 7.0 for Visual Studio 2017 to Enterprise Developer 8.0 for Visual Studio 2019.

- The Server Core form of Windows Server 2019 is not supported.

Embedded Rumba display

The embedded Rumba Mainframe Display is only available in Visual Studio 2017 and 2019, and is not available in Visual Studio 2022. In Visual Studio 2022 you need to use the standalone Rumba+ Desktop application.

Visual Studio

- Problems with Microsoft's Visual Studio 2022, release 17.2, might cause the following issues with Visual COBOL or Enterprise Developer for Visual Studio 2022. The issues do not exist in release 17.1. See the points below for the workarounds to these issues:

    - An issue with Microsoft's Visual Studio installer might result in the IntelliSense and editor colorization not working. To repair your installation, execute the following command from a Visual Studio command prompt:

        ```
        devenv /updateconfiguration
        ```

    - Mixed-language multi-project builds might fail as a result of the project dependencies not working correctly. This means that some projects might build in parallel when they should build in a specific

order. As a result, the build might fail due to a dependency not always being available. To work around this issue, click **Tools > Options > Preview Features**, and check **Load projects faster (some features may be delayed)**.

- The expanded copybook visualizations are missing. This includes breakpoint, current statement when debugging, and others. These features might not always function correctly in non-expanded source (in the main programs) if that program contains expanded copybooks. To work around this issue, you can disable inline copybook expansions.

- Visual Studio 2022 requires that the `global.json` file of .NET 6 projects is placed at the directory level of the solution file in order for the project to successfully open and build. In previous versions of Visual Studio, the file could be located in subfolders of the solution such as in the project folder.

  This can affect existing .NET Core 3.1 COBOL projects that you upgrade from a prior release if the `global.json` file is not at the directory level of the solution file. It also affects .NET 6 COBOL projects that you add to an existing solution.

  In these cases, you might receive the following error message if building from the MSBuild command line, or in the IDE Output window if the project fails to load:

  ```
  "The SDK 'MicroFocus.Sdk' specified could not be found"
  ```

  To work around this issue, you need to move the `global.json` file to the directory level of the solution file.

  New .NET 6 COBOL solutions and projects created with VS2022 create the `global.json` file in the required location.

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" />
                <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 Visual Studio:

   a. Click **File > New**.
   b. Under COBOL, click **Native > Mainframe Subsystem Application**.
   c. Click **OK**.

   To emulate workgrouping behavior in Visual Studio, you can create different projects in your solution that will represent each individual level in the workgroup. For each project, you need to specify the copybook paths that are for the respective workgroup level.

5. Configure the projects in Enterprise Developer.

   In Visual Studio, first turn off the automatic directive determination as you will be setting the directives manually:

a. Click **Tools > Options > Micro Focus > Directives > COBOL**.
b. Disable **Determine directives of files** and click **OK**.

Configure the project properties:

a. Click **Project >** *YourProject* **Properties** and click the individual tabs to specify folder for the generated files and any other COBOL, IMS, JCL and CICS properties.

   You need to set exactly the same project properties as the ones set for the MFE project 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 Visual Studio:

   a. Right-click your project in Solution Explorer, and click **Add > Existing Item**.
   b. Browse to the directory which stores the sources of your Mainframe Express application.
   c. Select the files to add, and click **Add As Link**.

   This links the files to the project from within the original location and does not create copies of the files in the Enterprise Developer project directory.

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 Visual Studio:

   • Click **Build > Build Solution**. Check the **Output** window for the progress and the result of the build.

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:

   You can use Visual Studio to create customized templates with the desired set of options and the required source programs, and share these within your organization. Then, each user would be able to import the templates from a shared network location into their Visual Studio environments. See the Visual Studio help for more information on how to create, configure and distribute custom project templates.

   Enterprise Server templates:

   Create your own templates using the following command at an Enterprise Developer command prompt:
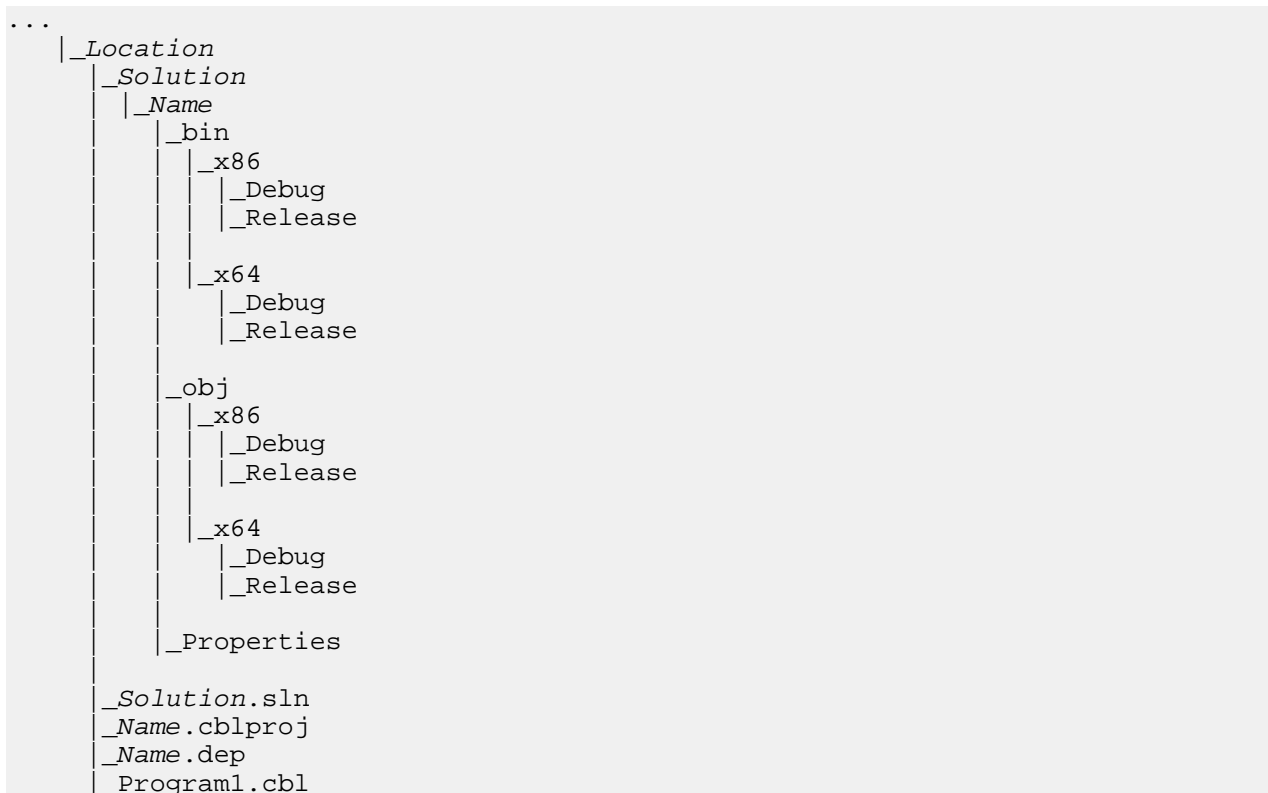
```
mfds -x [repository type] [repository address] [server name] <options>
<user id> <password>
```

Distribute the server .xml files across your development teams. The file should be saved in the `VSInstallDir\IDE\Extensions\nnnnnnnn.nnn\Etc\ServerTemplates` subfolder in the local Enterprise Developer installation folders.

Using Enterprise Developer for Visual Studio

Understanding the structure of Enterprise Developer solutions

On creating a new project, the following files are created in the file system with the following structure:

```
...
  |_Location
    |_Solution
    | |_Name
    | | |_bin
    | | | |_x86
    | | | | |_Debug
    | | | | |_Release
    | | | |
    | | | |_x64
    | | |     |_Debug
    | | |     |_Release
    | | |
    | | |_obj
    | | | |_x86
    | | | | |_Debug
    | | | | |_Release
    | | | |
    | | | |_x64
    | | |     |_Debug
    | | |     |_Release
    | | |
    | | |_Properties
    | |
    | |_Solution.sln
    | |_Name.cblproj
    | |_Name.dep
    | |_Program1.cbl
```

If you select the Create Directory for Solution option when creating a solution, the structure is slightly different.

In the *Solution* folder:

- **Solution.sln** - a description of the solution and what it contains.
- **Name.cblproj** - the project file that is opened in Visual Studio, which holds the description of the project and all its related configuration and directives information.
- COBOL source files - when you create a project, a skeleton COBOL source file `Program1.cbl` is added for most of the project templates.

In the `Name` folder:

- `..\bin` - this is the default location of build artefacts. With this folder are the subfolders `x86\Debug` that contains the executables or libraries, and `.idy` file for each of the project's COBOL source files. The `.idy` files contain information required for debugging your application. When you use the Release build configuration, build output goes to a subfolder `x86\Release` and no `.idy` files are created.

  Debug and Release are standard build configurations that you launch from the Visual Studio task bar. They use a different set of compiler directives as well as outputting different files. You can create your own build configurations by clicking **Build > Configuration Manager** and choosing **New** from the **Active solution configurations** drop-down list.

The `x86` folder exists because the default output platform is 32-bit. If you change this to be 64-bit, you will instead find your ouptut in an `x64` folder.

- `..\obj` - this also has `x86\Debug` subfolders, and contains an `.obj` file for each source file, used in intermediate build stages. The `obj` folder also holds supporting information such as logs and file lists.

> 🖉 **Note:** The project file `.cblproj` is an msbuild file, much like a makefile but consisting of XML that you can extend and modify to customise your builds. You can use this directly from command line, as it uses the same build environment as the IDE, and behavior is identical. This means you can have a single source of configuration information that makes your build process easier to maintain.
>
> If you open a command prompt and change to the *Location* folder, you can execute the `msbuild` command, without needing to specify the `.cblproj` file.

Finding your way around the IDE's features

- **Solutions and projects**

    A solution is a container holding one or more projects that work together to create an application. The solution has the extension `.sln`. A COBOL project has the extension `.cblproj` and a C# project has the extension `.csproj`.

    Solution Explorer shows the solution that is open and the projects therein.

    You can use the project's properties pages to display a list of the files in your solution with file details like output file type and location, COBOL dialect, and the number of errors generated by the file. To display the properties, click **Project** > *Name* **Properties**.

- **COBOL editor**

    The COBOL editor provides help such as column cut and paste, and background syntax checking, which underlines errors with red wavy lines (also known as "squigglies"), which you can then hover over to display details of the syntax error.

    When you are editing, you can insert code snippets and navigate forward and backward quickly, and the **Find All References** option enables you to search for references of any COBOL data items, section and paragraph names in the solution.

    You can customize the editor to display line numbers, adjust colorization, tabs, and margins, from the **Text Editor** > **Micro Focus COBOL** > **Advanced** page in **Tools** > **Options**.

    When developing code, the editor provides IntelliSense that helps you write syntactically correct code and, in .NET COBOL code, helps when you need to type more complicated constructs, such as the code to override the members that a class inherits from a base class or the code for implementing an interface.

    The Light Bulbs feature for implementing an interface helps complete incomplete interface declarations. A Light Bulbs appears at the beginning of the declaration: click it and choose the missing member(s) of the inheriting interface.

    When you encounter a COPY statement, or data item that is defined in a copybook, if you put your cursor on that code and press F12 the appropriate copybook opens in the editor at the relevant line. You can also do this by right-clicking the line and selecting **Show copybook name**.

- **Setting Compiler directives**

    Many Compiler directives are set automatically by certain configuration options in the IDE, but you can explicitly add directives to your project. Right-click on the project in Solution Explorer and choose **Properties**. In the COBOL tab, you can see directives that are set by the IDE in the **Build Settings** text box. Enter others in the **Additional Directives** text box as a space-separated list.

    If you use a separate text file to manage your directives, you can reference this instead by entering the USE"*directives file*" directive. You should enter a relative path.

- **Build Tools, the Output Pane and the Error List**

Build configurations define how to build a project or solution. There are default configurations of Debug and Release for each project type, and you can create your own specific configurations.

The Output window shows the results of your build together with errors. You can double-click an error and navigate directly to the appropriate line in the source code. You can do the same from the Error List.

- **Debugging**

    When you debug the application, you can step through the code, hover over a data item to see its value, and watch data item values in a variety of ways. You can specify breakpoints on a range of conditions, such as when an expression is true or changes, or when a line is hit a specified number of times.

    In native code, you can set COBOL watchpoints on data items and watch for changes in the area of memory associated with the watchpoints. When the memory changes or a condition associated with the watchpoint has been met, the debugger breaks on the line that follows the line on which the data change occurred.

    Also in native code, you can use the Memory window to watch the contents of the memory that is associated with data items or expressions.

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 typing `COBOL` in the search field of the **Create a new project** dialog boxexpanding **Installed > COBOL**.

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 .NET COBOL

> **Note:** Enterprise Developer for Visual Studio 2017 supports .NET COBOL. To develop applications for JVM COBOL, install our Enterprise Developer for Eclipse product.

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) .NET COBOL. The core COBOL syntax is supported in .NET 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 .NET COBOL applications.

.NET COBOL

.NET COBOL is COBOL with extensions to support the .NET Framework. It offers OO syntax support and syntax to allow access to the available class libraries.

When you compile .NET COBOL, the compiler generates code: `.il` for the .NET framework.

.NET COBOL and Native COBOL

You can compile your COBOL program to .NET COBOL code using the ilgen compiler directive. From within the IDE this happens automatically if you are using a .NET COBOL project.

The compiler has now created an intermediate language (`.il`).

COBOL and all other .NET languages (for example C# and VB) compile to this format, which makes mixed language applications easy to write.

You can also create native code applications. In Visual Studio, there are native COBOL project templates.

The compiler generates `.exe`/`.dll`s 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 intermediate language (`.il` files) can be deployed to a Windows platform running Microsoft's Common Language Runtime (CLR) for execution.

All programs written for the .NET Framework are executed by the Microsoft's Common Language Runtime (CLR) which makes mixed language application programming seamless.

The CLR's just-in-time (JIT) compiler compiles the `.il` into code native to the operating system. The CLR provides additional services including memory management, exception handling, garbage collection and thread management.

Developing Native and .NET COBOL Applications

You use the IDE to develop, compile and debug both native and .NET COBOL applications. You can write new COBOL code or you can recompile existing COBOL applications to native or .NET COBOL code, potentially without any code changes.

You can deploy and further debug the application under the run-time system provided by Enterprise Server.

.NET COBOL applications are deployed to Windows platforms running Microsoft's CLR.