

## Enable the integration of business-critical PL/I applications with modern web technology

### Highlights

Enterprise PL/I for z/OS® V4R5 delivers the following enhancements:

- Modernization of PL/I applications on z/OS including support for JSON parse, generate, and validate
- Performance improvements including the exploitation of the new IBM® z13 hardware architecture
- Improved middleware support for CICS® and DB2®
- Productivity and usability improvements
- Integration with IBM Rational® Developer for System z® and IBM Rational Team Concert™ providing a modern development environment and a collaborative team environment

### Modernization of PL/I applications on z/OS

With Enterprise PL/I for z/OS, V4, you can take advantage of more than 45 years of IBM experience in compiler development. This compiler can help facilitate your new on-demand business endeavors by helping to integrate PL/I and web-based business processes in web services, XML, Java™, and PL/I applications. This compiler's interoperability helps you capitalize on existing IT investment while more smoothly incorporating new, web-based applications as part of your organization's infrastructure.

Enterprise PL/I for z/OS is an integral part of the comprehensive application development environment delivered with IBM Rational Developer for System z software—providing a robust, integrated development environment (IDE) for PL/I and connecting web services; Java Platform, Enterprise Edition (Java EE) applications; and traditional business processes.

Enterprise PL/I for z/OS V4 underscores the continuing IBM commitment to the PL/I programming language on the z/OS platform.

In Enterprise PL/I V4R5, a series of new built-in functions and subroutines are added so you can parse and generate JSON text.

### Performance improvements

- The ARCH option now accepts 11 as its maximum value, and when ARCH(11) is specified, the compiler generates code that exploits the new hardware instructions on the supported IBM z Systems. This code especially improves the performance of some instances of the SEARCH and VERIFY built-in functions.
- Faster code is generated for MOD and REM of FIXED DEC with precision greater than 15 places.

### Improved middleware support

IBM Enterprise PL/I is a leading-edge, z/OS-based compiler that maximizes middleware by providing interoperability with IBM DB2, CICS, and IMS™ systems.

- The code that is generated for each EXEC CICS statement now executes faster because one Move Character (MVC) instruction is eliminated from the code that is generated for each statement.
- SQL enhancements
  - The validation of an EXEC SQL statement will not stop when the first invalid host variable is found, but will instead check all host variable references.
  - A PL/I variable with the VALUE attribute can now be used as a host variable if SQL allows a constant in that setting.
  - The new SQL preprocessor option (NO)CODEPAGE determines how the compiler CODEPAGE option is honored by the SQL preprocessor.
  - The new SQL preprocessor option (NO)WARNDECP allows you to reduce the noise produced by the SQL preprocessor.

- Structures can now be used as indicator variables for host structure variables.

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## Productivity and usability improvements

- The LIMITS option supports a new suboption that specifies the maximum length allowed when declaring a string variable, and allows support for strings greater than 32 KB characters. The maximum length of the string can now be up to 128 MB.
- The new BETWEEN built-in function makes it easier to write code that tests if a variable is in between 2 specified values. This built-in function also makes it easier for the compiler to generate better code for such tests.
- The new INLIST built-in function makes it easier to write code that tests if a variable has a value in a specified list of values. This built-in function also makes it easier for the compiler to generate better code for such tests.
- The new REINIT statement allows variables to be reset with their INITIAL values.
- Apostrophes are now accepted as insertion characters in picture strings in the same way that the comma, point, and slash have been.
- The new NULLENTY built-in function makes it easy to assign a null value to an entry variable and to test if an entry variable is null. Under the options INITAUTO, INITBASED, etc, entry variables will now be initialized as well.
- The new PLISTCK, PLISTCKE, and PLISTCKF built-in subroutines generate the corresponding store clock hardware instruction to help you time sections of code more easily. Also, with these new built-in subroutines you can get clock values more precise than those provided by the date-time built-in functions.

New compiler options make it easier to improve code quality and analyze runtime problems.

## Other Enterprise PL/I for z/OS features

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### Provides compatibility for PL/I programs and Java components

Because it supports the Institute of Electrical and Electronics Engineers (IEEE) decimal floating point standard, the Enterprise PL/I for z/OS compiler can receive, manipulate and send Java data without any translation.

Built-in functions provide support for UTF-8 and UTF-16. One example is the ULENGTH function, which returns the number of UTF-8 or UTF-16 characters in a CHAR or WIDECHAR string, respectively. A second important example is the USUBSTR function which returns the UTF-sensitive substring of a CHAR or WIDECHAR string.

To further improve Java interoperability, Enterprise PL/I for z/OS provides a thread-safe PL/I library and multithreading statements (ATTACH, WAIT, DETACH) as part of the PL/I language supported by the compiler.

### Easier migration

Enterprise PL/I for z/OS gives you a migration path from OS PL/I V2 and PL/I for MVS™ and VM compilers. The Enterprise PL/I for z/OS Compiler and Runtime Migration Guide provides you with all the information that you might need to move your applications to a new runtime environment (runtime migration) and to compile your source programs with the new compiler (compiler migration). Migrating to the new compiler allows your existing applications to take advantage of new functions.

### Workstation-based development

Rational Developer for System z provides an interactive, workstation-based environment to help you create, maintain, and reuse applications. Rational Developer for System z includes support

for traditional development using PL/I, but also has the ability to generate web services interfaces from PL/I constructs to ease creation of web services from existing PL/I applications.

Rational Developer for System z provides a workstation interface to Debug Tool, and is also integrated with IBM File Manager and Fault Analyzer. File Manager integration enables you to access Keyed Sequence Data Set (KSDS) files from the Rational Developer for System z workbench, and gives you the ability to browse and update data sets. By integrating with Fault Analyzer, Rational Developer for System z enables you to browse Fault Analyzer ABEND reports on CICS, IMS, batch, Java, WebSphere®, and other run times. Rational Developer for System z supports Enterprise PL/I and helps improve the productivity of PL/I developers. Within the workbench you can show the context-sensitive editor, as well as a compiler listing that indicates errors from a compilation. A simple click on a diagnostic message takes you to the line of source code in error.

IBM Rational Team Concert for System z, an Eclipse-based offering, allows you to boost programming productivity with a collaborative team environment that makes it easy to manage your distributed software projects and teams.

### PL/I across platforms

Enterprise PL/I for z/OS is part of a family of compatible compilers, application development tools, and maintenance tools. Along with Enterprise PL/I for z/OS, IBM offers PL/I compilers for multiple platforms as well as IBM File Manager, IBM Fault Analyzer, and Debug Tool. As mentioned previously, the recommended workstation-based development environment is Rational Developer for System z.

## Summary of features and benefits

The following table summarizes the features and benefits for Enterprise PL/I for z/OS V4.

Table 1. Summary of new features and benefits

Feature	Benefit
Designed for z Systems	<p>Utilizes the latest z/Architecture® through z13 facilities, the UNROLL compiler option and changes to inline code generation for improved application performance.</p> <p>z13 hardware exploitation has been implemented in the Enterprise PL/I for z/OS compiler through the addition of the ARCHITECTURE(11) option. The optimizations provide better performance for applications deployed to z13 server without requiring changes to the application source code. An average performance improvement of 17% was observed for Common CPU-Intensive PL/I benchmarks that run on z13 over the same benchmarks that run on zEnterprise® EC12.<sup>1</sup>.</p> <p><b>Notes:</b></p> <ol style="list-style-type: none"> <li>1. Performance improvements are based on internal IBM lab measurements using the ARCH(11) and OPT(3) compiler options. Performance results for specific applications will vary; some factors affecting performance are the source code and the compiler options specified.</li> </ol>
Maximizes middleware	Delivers enhanced middleware support to facilitate application integration and modernization.
Modernize applications	Provides XML parsing through the PLISAX built-in functions, XML generation through the XMLCHAR built-in function, and JSON parsing and generation through a series of additional built-in functions.
Improves application debugging	The compiler supports typed structures in the IBM Debug Tool so that you can debug code containing not only untyped structures but also code using HANDLE variables and typed structures.
Leverages productivity with new options and messages	New and changed messages and options improve your programming practices. The enhanced RULES option gives you more control over your code.
Provides compatibility for PL/I and Java components	<ul style="list-style-type: none"> <li>• Supports the Institute of Electrical and Electronics Engineers (IEEE) decimal floating point standard, so the compiler can receive, manipulate and send Java data without any translation</li> <li>• Supports UTF-8 and UTF-16 through built-in functions.</li> <li>• Provides a thread-safe PL/I library and multithreading statements (ATTACH, WAIT, DETACH) as part of the PL/I language for improved Java interoperability</li> </ul>

Table 1. Summary of new features and benefits (continued)

Feature	Benefit
Ease of migration	Gives you a migration path from OS PL/I V2 and PL/I for MVS and VM compilers to easily move your applications to a new runtime environment (runtime migration) and to compile your source programs with the new compiler (compiler migration). Migrating to the new compiler allows your existing applications to take advantage of new functions.
Integrates with a modern development environment	Rational Developer for System z (a separate product) boosts developer productivity by making it easy to edit, compile, and debug PL/I applications from your workstation.
Integrates with a collaborative team environment	Rational Team Concert (a separate product) unifies development teams by making it easy to manage your distributed software projects and teams.

## System requirements

The following table presents the system requirements for Enterprise PL/I for z/OS V4.5.

Table 2. System requirements

Operating system	Software	Hardware
z/OS	<p>Required licensed programs</p> <ul style="list-style-type: none"> <li>• z/OS V1.13 (5694-A01), or later</li> <li>• z/OS V2.1 (5650-ZOS), or later</li> </ul> <p>Optional licensed programs Depending on the functions used, one or more of the following programs may be required:</p> <ul style="list-style-type: none"> <li>• CICS Transaction Server for z/OS, V5 (5655-Y04)</li> <li>• CICS Transaction Server for z/OS, V4 (5655-S97)</li> <li>• CICS Transaction Server for z/OS, V3 (5655-M15)</li> <li>• DB2 11 for z/OS (5615-DB2)</li> <li>• DB2 10 for z/OS (5605-DB2)</li> <li>• DB2 11 for z/OS Value Unit Edition (5697-P43)</li> <li>• DB2 10 for z/OS Value Unit Edition (5697-P31)</li> <li>• IMS V13 (5635-A04)</li> <li>• IMS V12 (5635-A03)</li> <li>• IMS Transaction Manager Value Unit Edition V13 (5655-TM2)</li> <li>• IMS Transaction Manager Value Unit Edition V12 (5655-TM1)</li> <li>• IMS Database Value Unit Edition V13 (5655-DSM)</li> <li>• IMS Database Value Unit Edition V12 (5655-DSQ)</li> <li>• DFSORT element of z/OS (5694-A01, 5650-ZOS)</li> <li>• High Level Assembler/MVS and VM and VSE (5696-234)</li> <li>• Debug Tool for z/OS, V13.1 (5655-Q10)</li> <li>• Debug Tool for z/OS, V12.1 (5655-W70)</li> <li>• Debug Tool for z/OS, V11.1 (5655-W45)</li> <li>• Fault Analyzer for z/OS V13.1 (5655-Q11)</li> <li>• Fault Analyzer for z/OS V12.1 (5655-W69)</li> <li>• Fault Analyzer for z/OS V11.1 (5655-W46)</li> <li>• File Manager for z/OS V13.1 (5655-Q12)</li> <li>• File Manager for z/OS V12.1 (5655-W68)</li> <li>• File Manager for z/OS V11.1 (5655-W47)</li> <li>• Application Performance Analyzer for z/OS, V13.1 (5655-Q09)</li> <li>• Application Performance Analyzer for z/OS, V12.1 (5655-W71)</li> <li>• Application Performance Analyzer for z/OS, V11.1 (5697-Q03)</li> <li>• Rational Developer for System z, V9 (5724-T07)</li> <li>• Rational Developer for System z, V8 (5724-T07)</li> <li>• Enterprise COBOL for z/OS, V5 (5655-W32)</li> <li>• Enterprise COBOL for z/OS, V4 (5655-S71)</li> <li>• Enterprise PL/I for z/OS, V4 (5655-W67)</li> <li>• Enterprise PL/I for z/OS, V3 (5655-H31)</li> <li>• For XL C/C++ with Enterprise PL/I -- You must use the XL C/C++ feature of z/OS, V1.13 (5694-A01) or the XL C/C++ feature of z/OS, V2.1 (5650-ZOS), or later</li> <li>• IBM VS FORTRAN V2 (5668-806, 5688-087)</li> </ul>	<p>The Enterprise PL/I for z/OS, V4.5 compiler runs on the following IBM servers:</p> <ul style="list-style-type: none"> <li>• z13</li> <li>• zEnterprise EC12 (zEC12) or zEnterprise BC12 (zBC12)</li> <li>• zEnterprise 196 or zEnterprise 114</li> <li>• z10™ Enterprise Class or z10 Business Class</li> <li>• System z9® Enterprise Class or z9 Business Class</li> </ul> <p>The Enterprise PL/I for z/OS, V4.5 compiler generates code that runs on the following IBM servers:</p> <ul style="list-style-type: none"> <li>• z13</li> <li>• zEnterprise EC12 (zEC12) or zEnterprise BC12 (zBC12)</li> <li>• zEnterprise 196 or zEnterprise 114</li> <li>• z10 Enterprise Class or z10 Business Class</li> <li>• System z9 Enterprise Class or z9 Business Class</li> </ul>

## Ordering information

Upgrade to the latest Enterprise PL/I compiler and get more out of your the z Systems investment and stay ahead of competitors on the technology curve. 5655-W67 is the ordering Product ID (PID) for Enterprise PL/I for z/OS Version 4.

Enterprise PL/I for z/OS is available through the Shopz website:

[www.ibm.com/software/shopzseries](http://www.ibm.com/software/shopzseries)

## For more information

To learn more about IBM Enterprise PL/I for z/OS V4.5, contact your IBM representative or IBM Business Partner, or visit: [www.ibm.com/software/products/us/en/plizos](http://www.ibm.com/software/products/us/en/plizos).

To learn more about IBM Rational Developer for System z software, visit: [ibm.com/software/rational/products/developer/systemz/](http://ibm.com/software/rational/products/developer/systemz/)

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Produced in the United States of America  
January 2015

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