

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

### Highlights

- Enables the creation, maintenance, and modernization of business-critical PL/I applications on z/OS® systems
- Improves middleware support for IMS™ and DB2®
- Enhances performance including the performance gain from additional exploitation of zEC12 hardware architecture
- Delivers modernization features including expanded support for UTF-16
- Provides productivity and usability improvements, many of them client-requested
- Integrates with IBM® Rational® Developer for System z® and IBM Rational Team Concert™ providing a modern development environment and a collaborative team environment

To make your business as agile and responsive as possible, you need to be able to connect your business components end to end with your suppliers, partners, employees, and customers, and you need to position your organization to quickly take advantage of opportunities by responding to challenges in real time. Unfortunately, many IT systems were not designed to address these objectives or to support web services and service-oriented architecture (SOA) that are essential for transforming an enterprise into a flexible business with an open, integrated operating environment. You could rewrite your applications in a different programming language in order to address these objectives, but rewriting your applications would be expensive and risky, and it could potentially create downtime that you just cannot afford. To remain competitive, you need a complete business strategy to help you modernize, integrate, and manage existing applications, data, and skill sets to ease your organization's transformation into a more flexible business.

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### Integrates, modernizes and manages assets with web services capabilities

With Enterprise PL/I for z/OS V4 you can leverage more than 30 years of IBM experience in application development to facilitate your new On Demand Business endeavors, helping integrate PL/I and web-based business processes in web services, XML, Java™, and PL/I applications. This compiler's interoperability lets you capitalize on existing IT investment while smoothly incorporating new, web-based applications as part of your organizations infrastructure.

Enterprise PL/I for z/OS is an integral part of the comprehensive application development environment delivered with IBM Rational Developer for IBM 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.

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

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

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### Facilitates web interoperability using XML parsing and generation

Enterprise PL/I for z/OS allows existing PL/I transactions to process inbound and outbound XML data directly within the applications. It provides a high-speed parser that enables PL/I programs to parse XML documents in Extended Binary Coded Decimal Interchange Code

(EBCDIC), American Standard Code for Information Interchange (ASCII) or Unicode Transformation Format (UTF)-16. Using the IBM PL/I Simple API for XML (SAX) parser, this XML can then be passed to other applications, even those running on other platforms—including IBM IMS and IBM CICS environments.

Enterprise PL/I for z/OS also supports the generation of XML using a built-in function, so you are able to dump the contents of a structure as XML into a buffer. You can use this XML code to enhance existing high-performance IMS and CICS transactions that have been written in PL/I. By enabling these transactions to send and receive XML documents, you are better positioned to support a business-to-business (B2B) environment.

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## Improves middleware support for IMS and DB2

- The new BASE64DECODE8, BASE64DECODE16, BASE64ENCODE8, and BASE64ENCODE16 built-in functions support the encoding and decoding of BASE64. These built-in functions are useful in XML processing, particularly by IMS.
- The new XMLCLEAN, WHITESPACEREPLACE, and WHITESPACECOLLAPSE built-in functions ease the processing of XML. These functions are important to the IMS XML convertors, and their presence in PL/I enables each of those convertors to be reduced by more than 64 KB in size.
- The new LOCATES attribute enables significant storage reduction when the compiler is creating and passing sparse arrays of strings.
- The structured query language (SQL) preprocessor has been enhanced to issue better diagnostic messages for incorrect programs and to create, under an option, an empty database request module (DBRM) for programs that contain no SQL statements.

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## Enhances performance including the performance gain from additional exploitation of zEC12 hardware architecture

- The compiler now generates its assembler listing faster and thereby reduces overall compiler time and CPU consumption.

- This release includes additional exploitation of the zEC12 processor so that code generated under the ARCH(10) option runs faster.
- The compiler increases its exploitation of the DFP-zoned instructions to improve the performance of some conversions between PICTURE and FIXED variables.
- This release also improves the code generated for some WCHAR assignment statements to improve its support for UTF-16.

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## Delivers modernization features including expanded support for UTF-16

- The compiler is expanded in its ability to support UTF-16 with the new WIDEPIC attribute. WIDEPIC variables serve the same purpose as the traditional PICTURE variables with the important difference that the data is held as UTF-16 rather than as simple character data.
- The release improves the multithreading support with the addition of the CANCEL THREAD statement. The CANCEL THREAD statement cancels the specified thread.

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## Provides productivity and usability improvements, many of them client-requested

- The compiler now supports the complete, standard-conforming PL/I DEFAULT statement. With the statement, users can control when defaults are applied by specifying that a default is applied only when a conditional attribute expression is true.
- The compiler now supports the new INDEXR built-in function. The built-in function has the same function as the INDEX built-in function, but the search is done from right to left.
- The compiler now flags declarations for variables that do not have the STATIC attribute but do have more than 100 INITIAL items. Both the compiler and the user code can benefit if such variables were declared as STATIC.
- The ALLOCATE built-in function has the AREA reference as a new optional argument. Users can allocate arbitrarily sized chunks of storage from AREAs as well as from heap storage.
- New compiler options are provided to give the users more control of their code quality; for

example, assignment of " to POINTER variables is prohibited or %INCLUDE statements are disallowed except during the preprocessor passes.

- The new preprocessor CALL statement supports the calling of a MACRO procedure

from MACRO procedures. This new statement increases the usefulness of procedures using the ANSWER statement and enhances the power and flexibility of the macro preprocessor.

## 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.

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### Ease into 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. Our Compiler and Runtime Migration Guide provides you with all the information that you might need to move your applications to a new run-time (run-time 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.

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### 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, also 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.

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### 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 System z and the zEnterprise® System	<p>Utilizes the latest z/Architecture® through EC12 facilities, the UNROLL compiler option and changes to inline code generation for improved application performance.</p> <p>zEnterprise EC12 hardware exploitation has been implemented in the Enterprise PL/I for z/OS compiler through the addition of the ARCHITECTURE(10) option. This option enables the use of new instructions such as Decimal-Floating-Point Zoned-Conversion Facility and tuning of the compiler generated code. These optimizations provide better performance for applications deployed to zEnterprise EC12 server without requiring changes to the application source code. An average performance improvement of 31% was observed for Common CPU-Intensive PL/I benchmarks that run on zEnterprise EC12 over the same benchmarks that run on zEnterprise z196<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(9) 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 through SQL preprocessor improvements to facilitate application integration and modernization.
Modernize applications	XML generation through the XMLCHAR built-in function, supports XML attributes and the omission of null values for improved web interoperability.
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 or changed messages and options improve your programming practices. New or changed 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 run-time (run-time 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 V4.4.

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>• IBM DB2 10 for z/OS (5605-DB2)</li> <li>• DB2 10 for z/OS Value Unit Edition (5697-P31)</li> <li>• DB2 V9 for z/OS (5635-DB2)</li> <li>• DB2 V9 for z/OS Value Unit Edition (5697-P12)</li> <li>• IBM IMS V13 (5635-A04)</li> <li>• IMS V12 (5635-A03)</li> <li>• IMS V11 (5635-A02)</li> <li>• IBM DFSORT element of z/OS (5694-A01)</li> <li>• IBM High Level Assembler/MVS and VM and VSE (5696-234)</li> <li>• IBM Debug Tool for z/OS, V12.1 (5655-W70)</li> <li>• Debug Tool for z/OS, V11.1 (5655-W45)</li> <li>• IBM Fault Analyzer for z/OS V12.1 (5655-W69)</li> <li>• Fault Analyzer for z/OS V11.1 (5655-W46)</li> <li>• IBM File Manager for z/OS V12.1 (5655-W68)</li> <li>• File Manager for z/OS V11.1 (5655-W47)</li> <li>• IBM Application Performance Analyzer for z/OS V12.1 (5655-W71)</li> <li>• Application Performance Analyzer for z/OS V11.1 (5697-Q03)</li> <li>• IBM 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 COBOL for z/OS and OS/390®, V3 (5655-G53)</li> <li>• Enterprise PL/I for z/OS, V4 (5655-W67)</li> <li>• Enterprise PL/I for z/OS, V3 (5655-H31)</li> <li>• PL/I for MVS &amp; VM V1.1 (5688-235)</li> <li>• OS PL/I V2.3 (5668-909, 5668-910, 5668-911)</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, V4.4 compiler runs on the following IBM servers:</p> <ul style="list-style-type: none"> <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, V4.4 compiler generates code that runs on the following IBM servers:</p> <ul style="list-style-type: none"> <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> <li>• zSeries z990</li> <li>• zSeries z890</li> </ul>

## Ordering information

Upgrade to the latest Enterprise PL/I compiler and get more out of your zEnterprise 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.

## **For more information**

To learn more about IBM Enterprise PL/I for z/OS V4.4, 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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