

z/OS



Language Environment Run-Time Migration Guide

z/OS



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Note

Before using this information and the product it supports, be sure to read the general information under "Notices" on page 63.

Fourth Edition, September 2002

This is a major revision of GA22-7565-02.

This edition applies to Language Environment[®] in Version 1 Release 4 of z/OS[™] (5694-A01), Version 1 Release 4 of z/OS.e[™] (5655-G52), and to subsequent releases and modifications until otherwise indicated in new editions.

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About this document

This document supports z/OS (5694–A01) and z/OS.e (5655–G52).

IBM z/OS Language Environment (also called Language Environment) provides common services and language-specific routines in a single run-time environment for C, C++, COBOL, Fortran (z/OS only; no support for z/OS UNIX System Services or CICS®), PL/I, and assembler applications. It offers consistent and predictable results for language applications, independent of the language in which they are written.

Language Environment is the prerequisite run-time environment for applications generated with the following IBM compiler products:

- z/OS C/C++
- OS/390® C/C++
- C/C++ Compiler for MVS/ESA™
- AD/Cycle® C/370™ Compiler
- VisualAge for Java, Enterprise Edition for OS/390
- Enterprise COBOL for z/OS and OS/390
- COBOL for OS/390 & VM
- COBOL for MVS & VM (formerly COBOL/370)
- Enterprise PL/I for z/OS and OS/390
- VisualAge PL/I for OS/390
- PL/I for MVS & VM (formerly PL/I MVS™ & VM)
- VS FORTRAN and FORTRAN IV (in compatibility mode)

Restrictions: The following restrictions apply to z/OS.e:

- The following compilers are not licensed for use on z/OS.e:
 - COBOL
 - PL/I
 - FORTRAN
- The following subsystems are not licensed for use on z/OS.e:
 - CICS
 - IMS™
- Execution of applications written in the following languages is not functionally supported on z/OS.e:
 - COBOL (except for precompiled COBOL DB2® stored procedures and other precompiled COBOL applications using the Language Environment preinitialization interface)
 - FORTRAN
- The following are not functional and/or not licensed for use on z/OS.e:
 - Language Environment Library Routine Retention (LRR)
 - Language Environment compatibility preinitialization for C and PL/I
 - Run-time library services (RTLS)
- Customers are not permitted to use lower levels of Language Environment on z/OS.e.

Language Environment supports, but is not required for, an interactive debug tool for debugging applications in your native z/OS environment. The IBM interactive Debug Tool is available with z/OS, or with the latest releases of the C/C++, COBOL, PL/I and VisualAge for Java compiler products.

Language Environment supports, but is not required for, VS Fortran Version 2 compiled code (z/OS only).

Language Environment consists of the common execution library (CEL) and the run-time libraries for C/C++, COBOL, Fortran, and PL/I.

For more information on VisualAge for Java, Enterprise Edition for OS/390, program number 5655-JAV, see the product documentation.

This book provides an overview of the steps z/OS customers must take to migrate applications for use with z/OS Language Environment. These customers may not necessarily be migrating to a new language compiler.

This book is written for application developers. Familiarity with the run-time libraries of the different languages, and an understanding of the basics of linking and running applications, are assumed.

The information in this book will not provide a comprehensive guide to the migration process; rather, it is designed to help you create a broad migration strategy. This book will help you identify which modules can be migrated first, and which will require relinking or recompiling. It also explains how to use Language Environment run-time options to achieve behavior that is compatible with your old modules. For more detailed information about migration topics such as upgrading source code and load module compatibility, see one of the following manuals:

- *z/OS C/C++ Compiler and Run-Time Migration Guide*
- *IBM C for VM/ESA Compiler and Run-Time Migration Guide*
- *Enterprise COBOL for z/OS and OS/390 Migration Guide* or *COBOL for OS/390 & VM Compiler and Run-Time Migration Guide*
- *VisualAge PL/I for OS/390 Compiler and Run-Time Migration Guide*
- *Enterprise PL/I for z/OS and OS/390 Migration Guide* or *PL/I for MVS & VM Compiler and Run-Time Migration Guide*
- *Fortran Run-Time Migration Guide*

Using your documentation

The publications provided with Language Environment are designed to help you:

- Manage the run-time environment for applications generated with a Language Environment-conforming compiler.
- Write applications that use the Language Environment callable services.
- Develop interlanguage communication applications.
- Customize Language Environment.
- Debug problems in applications that run with Language Environment.
- Migrate your high-level language applications to Language Environment.

Language programming information is provided in the supported high-level language programming manuals, which provide language definition, library function syntax and semantics, and programming guidance information.

Each publication helps you perform different tasks, some of which are listed in Table 1 on page ix. All books are available in printed and softcopy formats. For a complete list of publications that you may need, see “Bibliography” on page 67.

Table 1. How to Use z/OS Language Environment Publications

To ...	Use ...
Evaluate Language Environment	<i>z/OS Language Environment Concepts Guide</i>
Plan for Language Environment	<i>z/OS Language Environment Concepts Guide</i> <i>z/OS Language Environment Run-Time Migration Guide</i>
Install Language Environment	<i>z/OS Program Directory</i>
Customize Language Environment	<i>z/OS Language Environment Customization</i>
Understand Language Environment program models and concepts	<i>z/OS Language Environment Concepts Guide</i> <i>z/OS Language Environment Programming Guide</i>
Find syntax for Language Environment run-time options and callable services	<i>z/OS Language Environment Programming Reference</i>
Develop applications that run with Language Environment	<i>z/OS Language Environment Programming Guide</i> and your language programming guide
Debug applications that run with Language Environment, diagnose problems with Language Environment	<i>z/OS Language Environment Debugging Guide</i>
Get details on run-time messages	<i>z/OS Language Environment Run-Time Messages</i>
Develop interlanguage communication (ILC) applications	<i>z/OS Language Environment Writing Interlanguage Communication Applications</i> and your language programming guide
Migrate applications to Language Environment	<i>z/OS Language Environment Run-Time Migration Guide</i> and the migration guide for each Language Environment-enabled language

Where to find more information

Please see *z/OS Information Roadmap* for an overview of the documentation associated with z/OS, including the documentation available for z/OS Language Environment.

Accessing z/OS licensed documents on the Internet

z/OS licensed documentation is available on the Internet in PDF format at the IBM Resource Link™ Web site at:

<http://www.ibm.com/servers/resourceLink>

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You can use the PDF format on either **z/OS Licensed Product Library CD-ROM** or IBM Resource Link to print licensed documents.

Using LookAt to look up message explanations

LookAt is an online facility that allows you to look up explanations for most messages you encounter, as well as for some system abends and codes. Using LookAt to find information is faster than a conventional search because in most cases LookAt goes directly to the message explanation.

You can access LookAt from the Internet at:

<http://www.ibm.com/eserver/zseries/zos/bkserv/lookat/>

or from anywhere in z/OS where you can access a TSO/E command line (for example, TSO/E prompt, ISPF, z/OS UNIX System Services running OMVS). You can also download code from the *z/OS Collection* (SK3T-4269) and the LookAt Web site that will allow you to access LookAt from a handheld computer (Palm Pilot VIIx suggested).

To use LookAt as a TSO/E command, you must have LookAt installed on your host system. You can obtain the LookAt code for TSO/E from a disk on your *z/OS Collection* (SK3T-4269) or from the **News** section on the LookAt Web site.

Some messages have information in more than one document. For those messages, LookAt displays a list of documents in which the message appears.

Summary of changes

Summary of changes for GA22-7565-03 z/OS Version 1 Release 4

The book contains information previously presented in *z/OS Language Environment Run-Time Migration Guide*, GA22-7565-02, which supports z/OS Version 1 Release 3.

New information

- Information has been added to indicate that this book supports z/OS.e.

Changed information

- Clarifications have been made to information about migrating to Language Environment for OS/390 Version 2 Release 9 and Version 2 Release 10.
- Chapter 3, “Migrating from other run-time environments” on page 11 includes updates to the RTEREUS and WSCLEAR COBOL options.

This book contains terminology, maintenance, and editorial changes. Technical changes or additions to the text and illustrations are indicated by a vertical line to the left of the change.

Starting with z/OS V1R2, you may notice changes in the style and structure of some content in this book — for example, headings that use uppercase for the first letter of initial words only, and procedures that have a different look and format. The changes are ongoing improvements to the consistency and retrievability of information in our books.

Summary of changes for GA22-7565-02 z/OS Version 1 Release 3

The book contains information previously presented in *z/OS Language Environment Run-Time Migration Guide*, GA22-7565-01, which supports z/OS Version 1 Release 2.

Changed Information

- Information has changed for the STACK run-time option.

New Information

- “Migration considerations for Language Environment in OS/390 V2R9” on page 7 contains migration information.
- An appendix with z/OS product accessibility information has been added.

Summary of changes for GA22-7565-01 z/OS Version 1 Release 2

The book contains information previously presented in *z/OS Language Environment Run-Time Migration Guide*, GA22-7565-00, which supports z/OS Version 1 Release 1.

New Information

“Favor 31-bit application enhancement” on page 6 contains important changes that you must know about.

“Migration actions required for each release” on page 5 contains information on migrating from one release to another.

New run-time option FILETAG has been added.

Changed Information

The following are changed run-time options:

- ALL31
- HEAPCHK
- STACK
- STORAGE
- TERMTHDACT
- THREADSTACK

This book contains terminology, maintenance, and editorial changes, including changes to improve consistency and retrievability.

Summary of changes for GA22-7565-00 z/OS Version 1 Release 1

This book contains information also presented in *OS/390 Language Environment for OS/390 & VM Run-Time Migration Guide*.

Support for the following APARs is included:

- PQ39636 and PQ39927, a new sub-option of the TERMTHDACT.

Chapter 1. Planning to migrate to Language Environment

This chapter provides a checklist to help you plan the migration of your applications to the Language Environment run-time environment for the first time.

For more detailed information about migration considerations, see Chapter 3, “Migrating from other run-time environments” on page 11. If you are migrating from a previous release of Language Environment, you should review the information in Chapter 2, “Migrating from another Language Environment release” on page 5.

Checklist for migration

Each task in the following checklist is recommended; you should perform each task in the order shown.

1. Learn about Language Environment.

Ensure that you and other application programmers who will be involved in the migration effort are familiar with the features of Language Environment and the differences between your current run-time environment and the Language Environment run-time environment. You can get information about Language Environment from publications such as:

- *z/OS Language Environment Customization*
- *z/OS Language Environment Concepts Guide*

2. Take an inventory of the applications and vendor products you intend to run with Language Environment.

- C, C++, COBOL, Fortran, PL/I, or Assembler programs

For each program you intend to move to the Language Environment run-time environment, obtain the following information:

- Version and release of the compiler that generated the program
- Which COBOL programs were compiled with RES and which with NORES
- Run-time options used and how they were specified
- Which PL/I programs use the shared library and which ones do not
- Which programs call, or are called by, assembler programs
- Which applications contain interlanguage communication (ILC)
- Which programs are used with CICS, IMS, DB2, or other subsystems
- Control statements used
- Frequency and types of abends
- Test cases required and available
- Amount of storage used
- Frequency of execution of reusable or common modules
- Program execution time (processor (CPU) and elapsed)

- Vendor tools, packages, and products

- Ensure that all vendor tools, packages, and products run with Language Environment; any source code for the packages must also be compatible with your Language Environment-conforming compiler.
- Ensure that any vendor code generators generate code that is compatible with your Language Environment-conforming compiler.
- Ensure that vendor development tools and debuggers will not issue their own ESPIE or ESTAE, as Language Environment must get control first.

3. Prioritize programs.

Determine the effort required to migrate each program and the order in which you will migrate them. Each program will require some level of effort to migrate,

Planning to migrate

ranging from minimal testing to a code rewrite. Using the information from your inventory analysis, determine if each program:

- Requires minimum, moderate, or extensive testing
- Runs with Language Environment without change
- Requires relinking with Language Environment
- Must be recompiled with a Language Environment-conforming compiler, without change to the source code
- Requires changes to the source code
- Does not run with Language Environment

After you have determined the effort required to migrate each load module, list your programs in the order you want to move them to Language Environment. You should consider the importance of each program and how often it is used.

You should migrate applications that contain ILC after you have migrated any applications that contain only C, C++, COBOL, Fortran, or PL/I. (An application that contains assembler, but is otherwise created from one language, is not considered an ILC application in this book.) For information about compatibility considerations for ILC applications, see “Migrating ILC applications to Language Environment” on page 12.

4. Install Language Environment.

Perform the following tasks, which can be done concurrently:

- Change default run-time options as appropriate.

To ensure that the Language Environment run-time results are compatible with your current run-time results, you will need to change some of the default settings for the run-time options. For a list of recommended settings, see “Run-time option summary and recommendations” on page 22.

- Assess storage requirements.

Storage requirements may be larger for Language Environment than for your current run-time environment. During conversion, you might need DASD for the Language Environment run-time library and for the run-time library that you are currently using. For information about Language Environment DASD requirements, see *z/OS Program Directory*.

Virtual storage requirements for placing library routines above or below the 16M line may also increase, depending on which Language Environment storage options you specify. See “Run-time option summary and recommendations” on page 22 for recommended settings.

- Determine how to phase-in the Language Environment run-time environment using Run-Time Library Services (RTLS) support, a STEPLIB approach, or by adding Language Environment to the LNKLST.

On z/OS systems, Language Environment provides the RTLS support. With RTLS, you can use Language Environment run-time options to access the current level of the Language Environment run-time library or use different levels of the Language Environment run-time environment. You can specify one run-time environment for all of your applications or, if needed, you can specify a different run-time environment for each application.

Using the STEPLIB approach, you can gradually phase-in the Language Environment run-time environment. When you use STEPLIB statements to specify the Language Environment run-time environment, you can phase-in one region (CICS or IMS), batch (group of applications), or user (TSO) at a time. Although using STEPLIB means changing JCL, a gradual conversion can be easier than moving all of your applications at one time.

When you add Language Environment to the LNKLST, it is available to all of your applications. Ensure all applications are functioning correctly with Language Environment before adding Language Environment to your LNKLST. You might consider temporarily adding Language Environment to the LNKLST until you have confirmed the applications work as intended.

5. **Set up a regression testing procedure.**

To ensure that the Language Environment run-time results are compatible with your current run-time results, you will need to perform regression tests on all the programs you migrate. Run your applications in parallel with your current run-time environment and with the Language Environment run-time environment to confirm that the results are the same. You can temporarily add Language Environment to the LINKLST to accomplish this. When your applications are running with Language Environment in a test environment, you should take performance measurements, especially on any time-critical or response-critical applications.

6. **Move applications into production.**

When your testing shows the entire application (or group of applications, if running more than one application in an IMS region or under TSO) runs as expected, you can move the entire unit over to production use. However, if an unexpected error occurs, you may need to perform one of the following steps:

- On z/OS systems, run the previous version of your application as a substitute.
- Under DB2, CICS, and IMS, return to the last commit point and then continue processing from that point using the previous version of the program. For DB2, use an SQL ROLLBACK WORK statement.
- For batch applications, use the backup and restore facilities at your site to recover.

After you move your applications to production use with the Language Environment run-time environment, monitor your applications to ensure that they continue to work properly. You can then run with the confidence that you had in your previous run-time library.

Planning to link and run with Language Environment

Language Environment provides separate libraries for linking and running applications. The link libraries, of which SCEELKED is one, contain static (resident) routines that are linked with the application and used to resolve external references at link-edit time. The load library, of which SCEERUN is one, contains dynamic routines that are not part of the application and are dynamically loaded at run time. Language Environment callable services and other routines, such as those for initialization and termination, are located in SCEERUN. For a complete list of libraries and which phase of application development they are used in, see *z/OS Language Environment Customization*.

You will need to modify the job control statements in your input stream to point directly to SCEELKED and SCEERUN, or to point to the appropriate IBM-supplied cataloged procedures, if your job uses cataloged procedures. See *z/OS Language Environment Programming Guide* for more information about linking and running and using cataloged procedures.

On z/OS systems, you can install reentrant members of the SCEERUN data set in the link pack area (LPA) for faster retrieval. IBM provides a data set called

Planning to migrate

SCEELPA and highly recommends putting this data set in the LPA (or LPALSTxx). This data set contains modules that are reentrant, reside above the line, and are heavily used by z/OS itself.

Chapter 2. Migrating from another Language Environment release

This chapter provides information about migrating from one release of Language Environment to another. This chapter explains upward compatibility as well as downward compatibility. Please look at any migration considerations listed below for the release you are migrating to as well as any releases you are skipping over.

Language Environment provides general object and load module compatibility for applications that ran with a previous release of Language Environment. All Language Environment-enabled applications that have been linked with a minimum level of Language Environment for MVS and VM 1.3 will continue to run with later releases of Language Environment without the need to relink the application. If you experience any problems (for example, an application that worked with Language Environment for MVS and VM 1.3 no longer works after you install the current release of Language Environment), you should report them to IBM.

Most load modules are compatible with any level of Language Environment that is equivalent to, or higher than, the level used to link-edit them. Similarly, object modules can be link-edited with any level of Language Environment that is equivalent to, or higher than, the level required by the compiler that generated them.

Please see any exceptions below.

Migration actions required for each release

This section describes common activities and considerations that are typically required when you migrate from one release of Language Environment to another:

1. Update the CICS System Definition (CSD) file using the program definitions in the CEECCSD member found in the SCEESAMP data set. Language Environment may have changed (added or deleted) load modules in this release.
2. Update the Language Environment load modules that were placed in the link pack area (LPA). Sample members found in the SCEESAMP data set, that can be used to move load modules into LPA, should be reviewed with every release migration. See the table “Language Environment sample IEALPAnn or PROGxx Members in CEE.SCEESAMP” for the list of sample members and their changed content in *z/OS Language Environment Customization*.

Migration considerations for Language Environment in z/OS V1R4

No migration considerations.

Migration considerations for Language Environment in z/OS V1R3

No migration considerations.

Migration considerations for Language Environment in z/OS V1R2

Favor 31-bit application enhancement

z/OS V1R2 Language Environment includes an enhancement to favor 31-bit applications. The goals of this enhancement are to reduce initialization/termination path length and reduce below-the-line storage usage. Reducing the use of below-the-line storage will improve scalability for multiprocess and multithreaded applications.

This enhancement changes the default non-CICS installation-wide run-time options (CEEDOPT) for ALL31 and STACK options. The new installation-wide defaults are:

- ALL31=((ON),OVR)
- STACK=((128K,128K,ANY,KEEP,512K,128K),OVR)

Note: ALL31(ON) and STACK(,ANY,,) have been the CICS installation wide (CEEEOPT) defaults for several years.

These changes introduce migration concerns for non-CICS applications that invoke an AMODE 24 routine during application processing. The areas of concern are the following:

- Applications that begin with an AMODE 31 routine but give control at some point to an AMODE 24 routine, and the AMODE 24 relies on external Language Environment control blocks residing in storage below -the 16M line or relies on the STACK residing in storage below the line.

- Users of preinitialization (Prelnit) subroutine environments.

If the Prelnit subroutine environment is initialized with the new defaults of ALL31(ON) and STACK(,ANY,,), then problems occur if an AMODE 24 subroutine is later added to the Prelnit table or invoked using the call_sub_addr function.

Recommendations: The following actions address migration concerns.

- Link a CEEUOPT specifying ALL31(OFF) and STACK(,BELOW,,) with the main routines of each application that continue to give control to an AMODE 24 routine.
- Specify ALL31(OFF) and STACK(,BELOW,,) as part of the run-time options string when initializing Prelnit subroutine environments that call AMODE 24 subroutines.

If you know that the preceding actions will not be practical in your environment, and you expect that the migration impact will be high, then the best approach is to change the installation wide defaults (CEEDOPT) back to the values prior to z/OS V1R2:

- ALL31=((OFF),OVR)
- STACK=((128K,128K,BELOW,KEEP,512K,128K),OVR)

Changing these defaults will allow applications to run as they did in previous releases.

Other z/OS V1R2 Language Environment installation wide (CEEDOPT) run-time option default changes are as follows:

- STORAGE=(NONE,NONE,NONE,0K),OVR)
- THREADSTACK=((OFF,4K,4K,ANY,KEEP,128K,128K),OVR)

Migrating from another Language Environment release

These default changes create fewer migration concerns, but you need to be aware of the changes.

The fourth sub-option on STORAGE identifies the reserve stack size, which is now 0K. The reserve stack is used to process an out-of-storage condition, as when a stack or heap cannot be extended. The reserve stack was allocated from below-the-line storage in previous releases, and the old default of 8K was not sufficient to execute code that could recover from the condition. If your application requires a reserve stack, the recommendation is to link a CEEUOPT with an appropriate setting to the main routines.

The THREADSTACK option specifies the stack settings for additional threads in a multithreaded application. Any application using this option today has probably already specified ANY as the location, so this default change will have little expected impact.

SOMobjects

SOMobjects[®] ADE and SOMobjects RTL have been removed from Language Environment for z/OS V1R2.

COBOL COBPACKS

The COBOL COBPACKs can no longer be modified. All of the COBOL COBPACK modification jobs have been removed from SCEESAMP.

Migration considerations for Language Environment in z/OS V1R1

No migration considerations.

Migration considerations for Language Environment in OS/390 V2R10

Users migrating to OS/390 V2R10 or later (including z/OS) from a previous release of Language Environment must be aware of the new Version_ID interface for CEEGPID. In previous releases of Language Environment, the CEE_Version_ID of CEEGPID was a three digit number, VRM, with one digit each for Version, Release, and Modification level. As of OS/390 Version 2 Release 10, the CEE_Version_ID for CEEGPID is a six digit number, with two digits each for Version, Release, and Modification level.

Tip: Beginning with OS/390 V2R10, COBOL programs that process RECFM=VB data sets using RECORDING MODE U are affected by DFSMS large block interface (LBI) changes to QSAM access for COBOL programs. For detailed information, see *Enterprise COBOL for z/OS and OS/390 Migration Guide*.

Migration considerations for Language Environment in OS/390 V2R9

AMODE

Users migrating to OS/390 V2R9 or later (including z/OS) from a release earlier than OS/390 V2R9 could be impacted by a change made to the COBOL runtime that affects the AMODE when COBOL returns to an assembler program. For details about this change, see *Enterprise COBOL for z/OS and OS/390 Migration Guide* or *COBOL for OS/390 & VM Compiler and Run-Time Migration Guide*.

Migrating from another Language Environment release

COBOL programs compiled with DATA(31)

Users migrating to OS/390 V2R9 or later (including z/OS) from a release earlier than OS/390 V2R9 could be impacted by a change made to the Language Environment heap manager that affects COBOL programs compiled with DATA(31). Before Language Environment V2R9, COBOL programs compiled DATA(31) could get their WORKING-STORAGE from a HEAP segment that was allocated from BELOW storage. With Language Environment V2R9 and higher, COBOL programs compiled with DATA(31) will always get their WORKING-STORAGE from a HEAP segment that was allocated from ANYWHERE storage (which could be above or below). Here is a scenario where this change could impact an application:

- A previous HEAP request in the enclave had to specifically request BELOW HEAP storage (for example, a COBOL DATA(24) program).
- A subsequent DATA(31) COBOL program had to request HEAP storage that could be satisfied in the BELOW HEAP segment (WORKING-STORAGE could not be too big).
- A call is made to an AMODE(24) program.
- The AMODE 24 program would no longer be able to access the parameters after moving to Language Environment V2R9 or later.

For more information, see *Enterprise COBOL for z/OS and OS/390 Migration Guide*.

Migration considerations for Language Environment in OS/390 V2R8

APAR PQ38656 corrected a problem when the user specified NODUMP on the ABEND macro, a CEEDUMP was still produced. Since NODUMP is the default, users who didn't specify anything and expect a CEEDUMP, will need to specify DUMP if they want a CEEDUMP. This was corrected as of OS/390 V2R8.

Migration considerations for Language Environment in OS/390 V2R7

No migration considerations.

Migration considerations for Language Environment in OS/390 V2R6

No migration considerations.

Other release considerations

There are some pre-OS/390 Language Environment for MVS and VM 1.3 compatibility exceptions. For example, load modules that were generated with AD/Cycle COBOL/370 and linked with pre-OS/390 LE/370 Version 1 Release 1 must be relinked with a later release of Language Environment. See *Enterprise COBOL for z/OS and OS/390 Migration Guide* or *COBOL for OS/390 & VM Compiler and Run-Time Migration Guide* for details. There are some additional compatibility exceptions for C and C++ load modules. For more information, see *z/OS C/C++ Compiler and Run-Time Migration Guide*.

In addition, customers who are migrating from Language Environment for MVS and VM 1.3 or earlier must recompile any applications that reference the following symbolic feedback codes:

CEE36U	CEE36V	CEE370	CEE371
CEE372	CEE373	CEE374	CEE375

Downward compatibility and Language Environment migration

As of OS/390 Version 2 Release 10, Language Environment provides downward compatibility support. With required programming guidelines and restrictions described in *z/OS Language Environment Programming Guide*, observed, this support enables you to develop applications on higher levels of the operating system for use on platforms that are running lower release levels of the operating system.

For example, a company may use z/OS Version 1 Release 3 with Language Environment where applications are coded, link-edited, and tested, while using any supported lower release of OS/390 Language Environment on their production systems where the finished application modules are used.

Downward compatibility is not the rollback of new function to prior releases of the operating system. Applications developed that exploit the downward compatibility support can use only Language Environment function that is available on the lower release of the operating system where the application will be used.

The downward compatibility support includes toleration PTFs for lower releases of the operating system to assist in diagnosing applications that do not meet the programming requirements for this support. (Specific PTF numbers can be found in the PSP buckets.)

The downward compatibility support that Language Environment provides is independent of Language Environment's upward compatibility. That is, applications coded and link-edited with one release of Language Environment will continue to run on later releases of Language Environment without the need to recompile or link-edit the application again.

Chapter 3. Migrating from other run-time environments

This section describes, in general, the compatibility of Language Environment with previous run-time libraries. It also describes what you must do to migrate different object and load modules to Language Environment.

Note: This publication does not describe all migration considerations. For a detailed description of migration considerations, see the appropriate language migration guide listed in the following section.

Compatibility with previous run-time libraries

With certain exceptions, Language Environment provides object and load module compatibility for applications that are generated with the following pre-Language Environment IBM language products. Load modules that are created with these compilers and link-edited with their associated run-time libraries run compatibly with Language Environment without relinking. Also, object modules created with these compilers can be linked and run with Language Environment without recompiling.

- C/370 Versions 1 and 2
- OS/VS COBOL Release 2
- VS COBOL II Release 3 or later
- OS PL/I Version 1 Release 3 (object modules), Version 1 Release 5.1 and Version 2, all releases (load modules)
- VS FORTRAN Versions 1 and 2 (MVS only)
- FORTRAN IV H Extended (MVS only)
- FORTRAN IV G1 (MVS only)

Note: The run-time library support (RTLS) function does not support applications that are written in some of the preceding pre-Language Environment language products. For more information about using RTLS, see *z/OS Language Environment Customization* book.

The following sections contain some basic information to help you determine if your applications will run compatibly with Language Environment. For more detailed information about compatibility, see one of the following migration guides:

- *z/OS C/C++ Compiler and Run-Time Migration Guide*
- *IBM C for VM/ESA Compiler and Run-Time Migration Guide*
- *Enterprise COBOL for z/OS and OS/390 Migration Guide* or *COBOL for OS/390 & VM Compiler and Run-Time Migration Guide*
- *VisualAge PL/I for OS/390 Compiler and Run-Time Migration Guide*
- *PL/I for MVS & VM Compiler and Run-Time Migration Guide* or *Enterprise PL/I for z/OS and OS/390 Migration Guide*
- *Fortran Run-Time Migration Guide*

Migrating ILC applications to Language Environment

Table 2 lists some of the compatibility exceptions you should consider when migrating ILC applications to Language Environment.

Table 2. ILC Compatibility Exceptions

To Migrate:	You Need To:
Load modules that contain OS/VS COBOL, with calls to, or from, OS PL/I	Upgrade the COBOL source code and compile with Enterprise COBOL for z/OS and OS/390 or COBOL for OS/390 & VM.
Load modules that contain VS COBOL II Version 1 Release 3 or later, with calls to, or from, OS PL/I	Relink with Language Environment. However, if you link your VS COBOL II-OS PL/I ILC applications with the migration tool provided by OS PL/I Version 2 Release 3, you will not need to relink your applications. The PTF numbers for the migration aid are UN76954 and UN76955. For information about the migration tool, see <i>Enterprise PL/I for z/OS and OS/390 Migration Guide</i> or <i>PL/I for MVS & VM Compiler and Run-Time Migration Guide</i> .
C/370 Version 2 Release 2 (V2R2) load modules that contain calls to, or from, VS COBOL II, COBOL/370, or COBOL for MVS & VM programs	Apply the PTF associated with APAR PN74931, which allows you to relink C/370 V2R2 load modules with the C/370 V2R2 library and run with Language Environment or the C/370 V2R2 library.
Load modules that contain Fortran with calls to, or from, any other language	Relink the load modules with z/OS Language Environment, using the Language Environment libraries rather than pre-Language Environment Fortran libraries. Fortran and PL/I provide migration tools. For information about the Fortran library replacement tool, see <i>z/OS Language Environment Programming Guide</i> ; for information about the PL/I migration tool, see <i>Enterprise PL/I for z/OS and OS/390 Migration Guide</i> or <i>PL/I for MVS & VM Compiler and Run-Time Migration Guide</i> .

See *z/OS C/C++ Compiler and Run-Time Migration Guide*, or *IBM C for VM/ESA Compiler and Run-Time Migration Guide* for detailed instructions on how to relink C-COBOL ILC applications. (You do not need to relink PL/I-C ILC applications.)

See *Enterprise PL/I for z/OS and OS/390 Migration Guide*, *PL/I for MVS & VM Compiler and Run-Time Migration Guide* or *VisualAge PL/I for OS/390 Compiler and Run-Time Migration Guide* for instructions on how to relink PL/I-COBOL ILC applications, and for information about a migration aid that helps migrate OS PL/I-VS COBOL II ILC applications.

For more information about relinking C-Fortran ILC applications, see *z/OS Language Environment Programming Guide* or *z/OS C/C++ Compiler and Run-Time Migration Guide*.

Migrating C routines to Language Environment

Generally, you can directly migrate most C/370 Version 1 or Version 2 applications to any release of Language Environment. However, you must use the Language Environment libraries to relink an application if a load module contains one of the following items:

- ILC calls to, and from, Fortran or in some cases COBOL (see Table 2 on page 12)
- Debugging information (that is, they are compiled with the TEST option)
- System Programming C Facility (SPC) load modules that contain dynamic C/370 library functions

For detailed information about migrating your C applications, see *z/OS C/C++ Compiler and Run-Time Migration Guide*.

Migrating COBOL programs to Language Environment

Table 3 contains a subset of COBOL compatibility exceptions.

Table 3. COBOL Compatibility Exceptions

To Migrate:	You Need To:
OS/VS COBOL programs mixed with assembler under non-CICS	Run in a single run unit (SVC LINK is not allowed).
OS/VS COBOL programs that use ILC with PL/I	Upgrade the COBOL source code to Enterprise COBOL for z/OS and OS/390 or COBOL for OS/390 & VM.
OS/VS COBOL programs that use ILC with FORTRAN	Upgrade the COBOL source code to Enterprise COBOL for z/OS and OS/390 or COBOL for OS/390 & VM.
VS COBOL II programs that use ILC with C or PL/I	See Table 2 on page 12 for information about migration aids for each language.

Recommendation: You should not install more than one library for a language in the LNKLST or LPALST. You should not concatenate pre-Language Environment run-time libraries in the LNKLST.

See *Enterprise COBOL for z/OS and OS/390 Migration Guide* for detailed migration information about LNKLST concatenation and COBOL..

Migrating Fortran routines to Language Environment

Table 4 lists some compatibility exceptions to consider when migrating Fortran applications to Language Environment. For more information, see *Fortran Run-Time Migration Guide*.

Table 4. Fortran Compatibility Exceptions

To Migrate:	You Need To:
Object modules compiled with VS FORTRAN Version 1 Release 2.0 or earlier and are either programs or subprograms that receive character arguments or pass character arguments to subprograms	Recompile with VS FORTRAN Version 2 and run under Language Environment.

Migrating other run-time environments

Table 4. Fortran Compatibility Exceptions (continued)

To Migrate:	You Need To:
Object modules compiled with VS FORTRAN Version 2 Release 5 or 6 that contain parallel constructs, use the PARALLEL compile-time option, or invoke PEORIG, PEPOST, PEWAIT, PETERM, PLCOND, PLFREE, PLLOCK, PLORIG, or PLTERM	Continue to link-edit and run under VS FORTRAN Version 2. These object modules cannot run under Language Environment.
Object modules compiled with VS FORTRAN Version 2 Release 5 or 6 using the EC compiler option	Perform one of the following actions, as these object modules cannot run under Language Environment: <ul style="list-style-type: none"> • Continue to link-edit and run under VS FORTRAN Version 2 Release 5 or 6, or • Remove the EC option from your source, if possible, then recompile and run with Language Environment.
Object modules with calls to DVCHK or OVERFL services	Remove the calls, change the logic of the program and recompile with VS FORTRAN Version 2.
Object modules that have dependences on product internals	Remove the dependencies, change the logic of the program and recompile with VS FORTRAN Version 2.
Object modules that have misaligned vector operands	Ensure that all vector operands are properly aligned and recompile with VS FORTRAN Version 2.
Object modules that use static debug	Remove the debug packets and recompile with VS FORTRAN Version 2.
Load modules that contain Fortran with calls to, or from, any other language	See Table 2 on page 12 for instructions.

Migrating PL/I routines to Language Environment

Table 5 lists some compatibility exceptions for migrating PL/I routines to Language Environment. See *VisualAge PL/I for OS/390 Compiler and Run-Time Migration Guide*, *Enterprise PL/I for z/OS and OS/390 Migration Guide* or *PL/I for MVS & VM Compiler and Run-Time Migration Guide* for more information.

Table 5. PL/I Compatibility Exceptions

To Migrate:	You Need To:
Object modules created with OS PL/I Version 1 Release 1 through Version 1 Release 2.3 compilers	Recompile with VisualAge PL/I, PL/I for MVS & VM or with the OS PL/I Version 2 compiler.
Load modules created with OS PL/I Version 1 Releases 3 through 5.	Relink with Language Environment or with OS PL/I Version 2.
Load modules created with OS PL/I Version 1 Release 5.1.	Apply the IBM-supplied program fix (ZAP) before running the following types of OS PL/I V1 R5.1 load modules: <ul style="list-style-type: none"> • Main load modules for MVS non-shared library, non-CICS, nonmultitasking

Migrating other run-time environments

Table 5. PL/I Compatibility Exceptions (continued)

To Migrate:	You Need To:
Load modules that use the OS PL/I shared library	Relink or recompile load modules from OS PL/I Version 1 Releases 1 through 5 shared library; these load modules are not supported. Load modules from OS PL/I Version 1 Release 5.1 and the Version 2 shared library are supported; however, you must rebuild the shared library once under Language Environment.

Migrating assembler programs to Language Environment

To run assembler programs with Language Environment, you must ensure the assembler programs adhere to conventions for items such as register and storage usage, condition handling, and accessing input parameters. For example, assembler programs must set a valid 31 bit address in the save area back chain.

Language Environment provides several assembler macros, which your assembler programs should use to perform tasks such as entering and exiting assembler routines and mapping Language Environment data areas. For example, when you use the CEEENTRY and CEETERM macros, Language Environment automatically initializes and terminates, respectively, the execution environment for the application. In addition, when the Language Environment environment is established for the main assembler program, that environment is also established for any other routines that may be called later.

For more information about assembler considerations and Language Environment macros, see *z/OS Language Environment Programming Guide*. For more information about assembler considerations when assembler programs are used with COBOL, see *Enterprise COBOL for z/OS and OS/390 Migration Guide* or *COBOL for OS/390 & VM Compiler and Run-Time Migration Guide*.

Chapter 4. Choosing run-time options for compatible behavior

This section provides information on how Language Environment run-time options differ from run-time options that are specific to a high-level language (HLL). It also provides the Language Environment default settings and the recommended settings for C, COBOL, and PL/I applications running in CICS and non-CICS environments; note that Fortran does not run in the CICS environment.

Differences between run-time options

Language Environment provides a set of run-time options for applications. These options are processed at the enclave level and allow you to control many aspects of the Language Environment environment. The following tables show how Language Environment run-time options differ from the run-time options that are specific to C, COBOL, Fortran, and PL/I (if an HLL run-time option is not listed in a table, you can assume it operates under Language Environment in the same way it did before Language Environment):

High-Level Language	Language Environment Option Information
C	Table 6
COBOL	Table 7 on page 18
Fortran	Table 8 on page 20
PL/I	Table 9 on page 21

C and Language Environment run-time options comparison

Table 6. C and Language Environment Run-Time Options

C Option	Language Environment Equivalent	Notes
ISAINC	STACK	If you do not change the C/370 run-time option ISAINC, you will receive a warning message during execution.
ISASIZE	STACK	If you do not change the C/370 run-time option ISASIZE, you will receive a warning message during execution.
LANGUAGE	NATLANG	Mixed-case and uppercase US English and Japanese are supported. If you do not change the C/370 run-time option LANGUAGE, you will receive a warning message during execution.
REPORT NOREPORT	RPTSTG(ON OFF), RPTOPT(ON OFF)	RPTSTG(ON OFF) and RPTOPT(ON OFF) provide behavior compatible with REPORT NOREPORT, and affect all languages in an enclave. If you do not change the C/370 run-time option REPORT NOREPORT, you will receive a warning message during execution.
SPIE NOSPIE STAE NOSTAE	TRAP(ON,SPIE) TRAP(OFF)	If either SPIE or STAE is specified or defaulted in input, TRAP is set to TRAP(ON,SPIE). If both NOSPIE and NOSTAE are specified, TRAP is set to TRAP(OFF). TRAP(ON,SPIE) is the recommended setting.

Choosing compatible run-time options

COBOL and Language Environment run-time options comparison

Table 7. COBOL and Language Environment Run-Time Options

COBOL Option	Language Environment Equivalent	Notes
AIXBLD NOAIXBLD	AIXBLD NOAIXBLD	<p>Invokes the access methods services for VSAM indexed and relative data sets to complete the file and index definition procedures for COBOL routines.</p> <p>Under z/OS, Access Method Services (AMS) messages are directed to the ddname specified in the Language Environment run-time option MSGFILE. Under CMS, the messages are erased, which is the same behavior as VS COBOL II.</p> <p>AIXBLD NOAIXBLD is not applicable under CICS.</p>
DEBUG NODEBUG	DEBUG NODEBUG	DEBUG NODEBUG provides behavior compatible with VS COBOL II.
FLOW NOFLOW	FLOW NOFLOW	FLOW NOFLOW provides behavior compatible with VS COBOL II.
LANGUAGE	NATLANG	NATLANG replaces LANGUAGE, which is a VS COBOL II installation option. You can select a national language at run time or installation time by using the NATLANG option.
LIBKEEP NOLIBKEEP	Not applicable	<p>LIBKEEP NOLIBKEEP is not supported under Language Environment and is not applicable under CICS.</p> <p>To obtain similar function, use the Library Routine Retention (LRR) feature, which is described in <i>z/OS Language Environment Programming Guide</i>. To use LRR in an IMS/TM environment, see <i>z/OS Language Environment Customization</i>.</p>
MIXRES NOMIXRES	Not applicable	<p>MIXRES NOMIXRES is not supported under Language Environment and is not applicable under CICS.</p> <p>Mixed RES and NORES applications when linked with Language Environment will exhibit RES-like behavior; see <i>Enterprise COBOL for z/OS and OS/390 Migration Guide</i> or <i>COBOL for OS/390 & VM Compiler and Run-Time Migration Guide</i> for more information.</p>
QUEUE	Not applicable	QUEUE is not supported under Language Environment.

Choosing compatible run-time options

Table 7. COBOL and Language Environment Run-Time Options (continued)

COBOL Option	Language Environment Equivalent	Notes
RTEREUS NORTEREUS	RTEREUS NORTEREUS	<p>RTEREUS is not recommended as an installation default. Use RTEREUS only for specific applications and ensure that you understand the possible side effects, for example:</p> <ul style="list-style-type: none"> • Under Language Environment, RTEREUS(ON) is only supported in a single enclave environment. Applications that create multiple enclaves will terminate with error message IGZ0168S. Multiple enclaves can be created by applications that use SVC LINK or CMSCALL to invoke application programs. One example is when an SVC LINK is used to invoke an application program under ISPF that is using ISPF services (such as CALL 'ISPLINK' and ISPF SELECT). • If a Language Environment reusable environment is established (using RTEREUS), attempts to run a C or PL/I main program under Language Environment will fail. For example, when running on ISPF with RTEREUS(ON): <ul style="list-style-type: none"> – The first program invoked by ISPF is a COBOL program; a Language Environment reusable environment is established. – At another point, ISPF invokes a PL/I or C program; the initialization of the PL/I or C program will fail. • If many COBOL programs are run under the same z/OS task, "out of storage" abends may occur. This occurs because all storage acquired by Language Environment to run COBOL programs is kept until the z/OS task ends or the Language Environment environment terminates. • Language Environment does not produce storage and run-time options reports unless STOP RUN is issued to end the enclave.
SIMVRD NOSIMVRD	SIMVRD NOSIMVRD	SIMVRD NOSIMVRD provides behavior compatible with the VS COBOL II SIMVRD NOSIMVRD option.
SPOUT NOSPOUT	RPTOPTS(ON OFF), RPTSTG(ON OFF)	Storage reports are directed to the ddname specified in the Language Environment option MSGFILE. For more information, see <i>Enterprise COBOL for z/OS and OS/390 Migration Guide</i> or <i>COBOL for OS/390 & VM Compiler and Run-Time Migration Guide</i> .
SSRANGE NOSSRANGE	CHECK(ON OFF)	CHECK(ON OFF) provides behavior compatible with SSRANGE NOSSRANGE.
STAE NOSTAE	TRAP(ON,SPIE) TRAP(OFF)	If STAE NOSTAE is specified in input, then TRAP is set according to the option: TRAP(ON,SPIE) for STAE, and TRAP(OFF) for NOSTAE. TRAP(ON,SPIE) is the recommended setting.
UPSI	UPSI	UPSI provides behavior compatible with the VS COBOL II UPSI option.
WSCLEAR NOWSCLEAR	STORAGE(00,,)	For behavior similar to WSCLEAR NOWSCLEAR, use the Language Environment STORAGE(00,,) option. For more information, see <i>Enterprise COBOL for z/OS and OS/390 Migration Guide</i> or <i>COBOL for OS/390 & VM Compiler and Run-Time Migration Guide</i> .

Choosing compatible run-time options

Fortran and Language Environment run-time options comparison

Table 8. Fortran and Language Environment Run-Time Options

Fortran Option	Language Environment Equivalent	Notes
ABSDUMP NOABSDUMP	TERMTHDACT	TERMTHDACT(DUMP) replaces ABSDUMP to produce a Language Environment dump at termination, but there is no automatic mapping. TERMTHDACT with suboptions TRACE, QUIET, MSG, UATRACE, UAONLY, or UAIMM replaces NOABSDUMP to avoid getting a Language Environment dump at termination.
AUTOTASK NOAUTOTASK	AUTOTASK NOAUTOTASK	AUTOTASK NOAUTOTASK provides behavior compatible with VS FORTRAN Version 2.
CNVIOERR NOCNVIOERR	Not applicable	There is no Language Environment equivalent for CNVIOERR NOCNVIOERR. Fortran semantics are as though CNVIOERR were in effect.
DEBUG NODEBUG	Not applicable	There is no debugger support for Fortran.
DEBUNIT	Not applicable	There is no Language Environment equivalent for DEBUNIT.
ECPACK NOECPACK	Not applicable	There is no Language Environment equivalent for ECPACK NOECPACK. You cannot run programs with Language Environment that use access registers or that were compiled with the EC or EMODE compiler options.
ERRUNIT	ERRUNIT	ERRUNIT provides behavior compatible with VS FORTRAN Version 2.
FAIL	ABTERMENC	ABTERMENC replaces FAIL, but there is no automatic mapping. ABTERMENC controls whether a condition of severity 2 or greater is terminated with a return code or an abend. ABTERMENC(RETCODE) is similar to FAIL(RC), and ABTERMENC(ABEND) is similar to FAIL(ABEND).
FILEHIST NOFILEHIST	FILEHIST NOFILEHIST	FILEHIST NOFILEHIST provides behavior compatible with VS FORTRAN Version 2.
INQPCOPN NOINQPCOPN	INQPCOPN NOINQPCOPN	INQPCOPN NOINQPCOPN provides behavior compatible with VS FORTRAN Version 2.
IOINIT NOIOINIT	Not applicable	There is no Language Environment equivalent for IOINIT NOIOINIT. The message file is opened either when the first record is written to it or when an OPEN statement refers to error message unit. If no allocation for the dname has been made for the message file, it is dynamically allocated to the terminal (under TSO) or to SYSOUT=* (under z/OS batch).

Choosing compatible run-time options

Table 8. Fortran and Language Environment Run-Time Options (continued)

Fortran Option	Language Environment Equivalent	Notes
OCSTATUS NOOCSTATUS	OCSTATUS NOOCSTATUS	OCSTATUS NOOCSTATUS provides behavior compatible with VS FORTRAN Version 2.
PARALLEL NOPARALLEL	Not applicable	There is no Language Environment equivalent for PARALLEL NOPARALLEL. Parallel programs cannot be run with Language Environment.
PC NOPC	PC NOPC	PC specifies that Fortran static common blocks with the same name but in different load modules do not refer to the same storage.
PRTUNIT	PRTUNIT	PRTUNIT provides behavior compatible with VS FORTRAN Version 2.
PTRACE NOPTRACE	Not applicable	There is no Language Environment equivalent for PTRACE NOPTRACE. Parallel programs cannot be run with Language Environment.
PUNUNIT	PUNUNIT	PUNUNIT provides behavior compatible with VS FORTRAN Version 2.
RDRUNIT	RDRUNIT	RDRUNIT provides behavior compatible with VS FORTRAN Version 2.
RECPAD NORECPAD	RECPAD(OFF NONE VAR ALL ON)	NORECPAD automatically maps to RECPAD(OFF). Fortran does not support RECPAD(VAR). RECPAD must be changed to RECPAD(ON).
SPIE NOSPIE STAE NOSTAE	TRAP(ON,SPIE) TRAP(OFF)	If either SPIE or STAE is specified or defaulted in input, TRAP is set to TRAP(ON,SPIE). If both NOSPIE and NOSTAE are specified, TRAP is set to TRAP(OFF). TRAP(ON,SPIE) is the recommended setting.
XUFLOW NOXUFLOW	XUFLOW(ON AUTO) XUFLOW(OFF)	There is no automatic mapping of XUFLOW to the Language Environment XUFLOW. NOXUFLOW maps to the Language Environment XUFLOW(OFF), which provides compatible behavior.

PL/I and Language Environment run-time options comparison

Table 9. PL/I and Language Environment Run-Time Options

PL/I Option	Language Environment Equivalent	Notes
COUNT NOCOUNT	Not applicable	There is no Language Environment equivalent for COUNT NOCOUNT. It is not processed but produces an informational message.
FLOW NOFLOW	Not applicable	There is no Language Environment equivalent for FLOW NOFLOW. Language Environment honors this option only as a COBOL option.

Choosing compatible run-time options

Table 9. PL/I and Language Environment Run-Time Options (continued)

PL/I Option	Language Environment Equivalent	Notes
ISAINC	STACK, THREADSTACK, or PLITASKCOUNT	ISAINC maps to three Language Environment options, STACK, NONIPTSTACK, and PLITASKCOUNT, which provide compatible behavior.
ISASIZE	STACK, THREADSTACK, or PLITASKCOUNT	ISASIZE maps to three Language Environment options, STACK, NONIPTSTACK, and PLITASKCOUNT, which provide compatible behavior.
LANGUAGE	NATLANG	Mixed-case and uppercase U.S. English and Japanese are supported.
REPORT NOREPORT	RPTSTG(ON OFF) RPTOPTS(ON OFF)	RPTSTG(ON OFF) and RPTOPTS(ON OFF) provide behavior compatible with REPORT NOREPORT.
SPIE NOSPIE STAE NOSTAE	TRAP(ON,SPIE) TRAP(OFF)	If either SPIE or STAE is specified or defaulted in input, TRAP is set to TRAP(ON,SPIE). If both NOSPIE and NOSTAE are specified, TRAP is set to TRAP(OFF). TRAP(ON,SPIE) is the recommended setting.
TASKHEAP	THREADHEAP	THREADHEAP provides behavior compatible with TASKHEAP.

Run-time option summary and recommendations

Table 10 summarizes the Language Environment run-time options, defaults, and recommended settings for applications running in CICS and non-CICS (for example, batch or IMS) environments. For more information about how to use these options, including the full syntax and additional usage notes, see *z/OS Language Environment Programming Reference*. *z/OS Language Environment Programming Guide* contains additional compatibility information about these options.

Some options apply to all high-level languages; others are only applicable to specific languages. These options are identified by table notes, which are described on page 24. The recommended setting for some run-time options can vary, depending upon the language used to create the application or if multiple (Multi) languages are used in the environment. When a recommendation varies, the applicable settings for the languages are listed in the table. Also, the table identifies the run-time options that are not applicable (N/A) in either the CICS or non-CICS environment; Language Environment ignores these options if they are specified.

Table 10. Language Environment Run-Time Options, Defaults, and Recommendations

Option	Non-CICS		CICS		Notes
	Default	Recommended	Default	Recommended	
ABPERC	NONE	NONE	N/A	N/A	1
ABTERMENC	ABEND	ABEND	ABEND	ABEND	1, 2
AIXBLD NOAIXBLD	NOAIXBLD	NOAIXBLD	N/A	N/A	3
ALL31	ON	ON	ON	ON	1, 4

Run-time option summary

Table 10. Language Environment Run-Time Options, Defaults, and Recommendations (continued)

Option	Non-CICS		CICS		Notes
	Default	Recommended	Default	Recommended	
ANYHEAP	16K,8K,ANY,FREE	16K,8K,ANY,FREE (C, COBOL, Multi, PL/I) 48K,8K,ANY,FREE (Fortran)	4K,4080,ANY,FREE	4K,4080,ANY,FREE	1, 5, 30
ARGPARSE	ARGPARSE	ARGPARSE	N/A	N/A	12, 7
AUTOTASK	NOAUTOTASK	NOAUTOTASK	N/A	N/A	8
BELOWHEAP	8K,4K,FREE	8K,4K,FREE	4K,4080,FREE	4K,4080,FREE	1, 30
CBLOPTS	ON	ON	N/A	N/A	3, 9
CBLPSHPOP	ON	N/A	ON	ON	3
CBLQDA	OFF	OFF	N/A	N/A	3
CHECK	ON	ON	ON	ON	3
COUNTRY	US	User-defined	US	User-defined	1, 10
DEBUG	DEBUG(OFF)	DEBUG(OFF)	DEBUG(OFF)	DEBUG(OFF)	3, 11
DEPTHCONDLMT	10	0	10	0	1
ENV	No default	User-defined	No default	User-defined	7, 12
ENVAR	"	"	"	"	1
ERRCOUNT	0	0	0	0	1
ERRUNIT	6	6	N/A	N/A	8
EXECOPS	EXECOPS	EXECOPS	N/A	N/A	7, 12
FILEHIST	FILEHIST	FILEHIST	N/A	N/A	8
FILETAG	NOAUTOCVT, NOAUTOTAG	NOAUTOCVT, NOAUTOTAG	N/A	N/A	12
FLOW	NOFLOW	FLOW	N/A	N/A	3, 7
HEAP	32K,32K,ANY, KEEP,8K,4K	32K,32K,ANY, KEEP,8K,4K (C, COBOL, Multi, PL/I) 4K,4K,ANY,KEEP, 8K,4K (Fortran)	4K,4080,ANY, KEEP,4K,4080	4K,4080,ANY, KEEP,4K,4080	1, 5, 30
HEAPCHK	OFF,1,0,0	OFF,1,0,0	OFF,1,0,0	OFF,1,0,0	1
HEAPOOLS	OFF,8,10,32,10, 128,10,256,10, 1024,10,2048,10	User-defined	OFF,8,10,32,10, 128,10,256,10, 1024,10,2048,10	User-defined	13, 14
INFOMSGFILTER	OFF	OFF	OFF	OFF	1
INQPCOPN	INQPCOPN	INQPCOPN	N/A	N/A	8
INTERRUPT	OFF	OFF	N/A	N/A	1
LIBRARY	SYSCEE	SYSCEE	N/A	N/A	1
LIBSTACK	4K,4K,FREE	4K,4K,FREE	32,4080,FREE	32,4080,FREE	1
MSGFILE	SYSOUT,FBA,121,0, NOENQ	<i>ddname</i>	N/A	N/A	1, 16
MSGQ	15	15	N/A	N/A	1
NATLANG	ENU	ENU	ENU	ENU	1
NONIPTSTACK	Replaced by THREADSTACK				24
OCSTATUS	OCSTATUS	OCSTATUS	N/A	N/A	8
PC	NOPC	NOPC	N/A	N/A	8
PLIST	HOST	HOST	N/A	N/A	7, 12

Run-time option summary

Table 10. Language Environment Run-Time Options, Defaults, and Recommendations (continued)

Option	Non-CICS		CICS		Notes
	Default	Recommended	Default	Recommended	
PLITASKCOUNT	20	20	N/A	N/A	18
POSIX	OFF	OFF	N/A	N/A	1
PROFILE	OFF,"	OFF,"	OFF,"	OFF,"	12, 19
PRTUNIT	6	6	N/A	N/A	8
PUNUNIT	7	7	N/A	N/A	8
RDRUNIT	5	5	N/A	N/A	8
RECPAD	RECPAD(OFF)	RECPAD(OFF)	N/A	N/A	8
REDIR	REDIR	REDIR	N/A	N/A	7, 12
RPTOPTS	OFF	OFF	OFF	OFF	1
RPTSTG	OFF	OFF	OFF	OFF	1
RTEREUS	RTEREUS(OFF)	RTEREUS(OFF)	N/A	N/A	3
RTLS	OFF	OFF	N/A	N/A	1
SIMVRD	SIMVRD(OFF)	SIMVRD(OFF)	N/A	N/A	3
STACK	128K,128K,ANY,KEEP, 512K,128K	128K,128K,ANY,KEEP, 512K,128K (C, Fortran, Multi, PL/I) 64K,64K,ANY,KEEP (COBOL)	4K,4080,ANY,KEEP, 4K,4080	4K,4080,ANY,KEEP, 4K,4080	1, 20, 23, 30
STORAGE	NONE,NONE, NONE,0K	NONE,NONE, NONE,0K	NONE,NONE, NONE,0K	NONE,NONE, NONE,0K	1, 22, 25
TERMTHDACT	TRACE,,96	TRACE,,96 (C, Fortran, Multi, PL/I) UATRACE,,96 (COBOL)	TRACE,CESE,96	TRACE,CICSDDS,96 (C, Fortran, Multi, PL/I) UATRACE,CIDSDDS, 96 (COBOL)	1, 15, 21
TEST	NOTEST (ALL,*, PROMPT, INSPREF)	NOTEST (ALL,*, PROMPT, INSPREF)	NOTEST (ALL,*, PROMPT, INSPREF)	NOTEST (ALL,*, PROMPT, INSPREF)	1
THREADHEAP	4K,4K,ANY,KEEP	4K,4K,ANY,KEEP	N/A	N/A	1
THREADSTACK	OFF,4K,4K,ANY,KEEP, 128K,128K	OFF,4K,4K,ANY,KEEP, 128K,128K	N/A	N/A	1, 17, 24
TRACE	OFF,4K,DUMP, LE=0	OFF,4K,DUMP, LE=0	OFF,4K,DUMP, LE=0	OFF,4K,DUMP, LE=0	1
TRAP	ON,SPIE	ON,SPIE	ON,SPIE	ON,SPIE	1
UPSI	00000000	00000000	00000000	00000000	3
USRHDLR	NOUSRHDLR	User-defined	NOUSRHDLR	User-defined	1, 10, 29
VCTRSAVE	OFF	OFF	N/A	N/A	1
VERSION	"	"	N/A	N/A	1
XPLINK	OFF	OFF	N/A	N/A	12, 26, 27, 28
XUFLOW	AUTO	AUTO	AUTO	AUTO	1

Table Notes:

1. This option is supported in all languages (C/C++, COBOL, Fortran, PL/I) and in environments where multiple (Multi) languages are used.
2. When running with IMS, this setting ensures that IMS transactions will be rolled back if errors occur in an application that is written in another Language Environment-enabled language; an abend causes IMS to rollback any

Run-time option summary

database updates. When running a batch job, this setting ensures that a job step will abend if errors occur in an application that is written in another language.

3. This option is supported for COBOL only.
4. For C/C++ and PL/I, specify ALL31(OFF) for AMODE 24 programs. For COBOL, specify ALL31(OFF) if the applications contain one of the following:
 - A VS COBOL II NORES program (non-CICS program)
 - An OS/VS COBOL program (non-CICS program)
 - An AMODE 24 program

If you use ALL31(OFF), you must also specify STACK(,BELOW,,); AMODE 24 programs usually require stack storage below the 16M line.

5. If your installation uses Fortran in a multi-language environment, use the recommended setting for Fortran.
6. This option is supported for C only; it is not supported in C++.
7. You cannot set this option in CEECOPT, CEEDOPT or CEEROPT during Language Environment installation.
8. This option is supported for Fortran only.
9. This option can only be specified in CEEUOPT and CEEDOPT during Language Environment initialization.
10. There is no standard recommended value for this option; specify an appropriate value according to the needs of your installation.
11. Specify this option only when developing and debugging applications.
12. This option is supported for C/C++ only.
13. This option is supported for C/C++ and VisualAge PL/I only.
14. For tuning and performance information about the HEAPPOOLS run-time option, see *z/OS Language Environment Programming Guide*.
15. If your installation uses COBOL in a multi-language environment, use the recommended option setting for COBOL.
16. Specify any name for the message output file. For Fortran applications, specify MSGFILE(FT06F001) to produce the same ddname as in VS Fortran.
17. For single-tasking PL/I applications, use the recommended Language Environment default. However, for multitasking PL/I applications, the following setting is recommended: THREADSTACK(4K,4K,BELOW,KEEP,,).
18. This option is supported for PL/I for MVS only.
19. If the TEST run-time option is in effect when you specify a value on the PROFILE run-time option, Language Environment will ignore the PROFILE value.
20. For C/C++ applications running with ALL31(OFF) or OS PL/I applications that have not been relinked, you must specify STACK(,BELOW,,) to ensure that stack storage is addressable by the application.
21. For CICS:

UATRACE option will produce a Language Environment-formatted dump (CEEDUMP) which includes traceback information, and it will produce a CICS transaction dump. This recommendation applies to those customers that wish to maintain compatibility with the VS COBOL II default option of STAE in a CICS environment.

If a traceback CEEDUMP is not needed by the application environment (either because the COBOL II option of NOSTAE used to be implemented or if that dump is unused in any of the other member language application

Run-time option summary

environments) use TERMTHDACT(MSG) to eliminate the performance overhead of writing formatted CEEDUMPs to the CESE CICS transient data queue.

For Non-CICS:

Specify UADUMP to obtain a system dump and a Language Environment-formatted dump which includes traceback information and a dump of control blocks and various levels of storage. This is only recommended if the TRACE dump is insufficient for debugging the application.

For more information, see *z/OS Language Environment Customization and Enterprise COBOL for z/OS and OS/390 Migration Guide* or *COBOL for OS/390 & VM Compiler and Run-Time Migration Guide*.

22. To get behavior that is similar to the VS COBOL II run-time option WSCLEAR, use STORAGE(00,NONE,NONE,0K) for non-CICS and CICS applications.

Recommendation: You should **not** use STORAGE(NONE,NONE,00,0K). Although it initializes variables for C and PL/I applications, serious performance degradation can occur. C and PL/I programs should be changed to initialize their own variables.

23. Values 512K, and 128K represent dsinit_size and dsincr_size, the amounts of storage that can be used for downward growing stack frames (plus stack header, approximately 20 bytes). The actual size of the storage getmained will be 4K larger to accommodate the guard page. The downward growing stack is only initialized in an XPLINK supported environment and when an XPLINK application is active in the enclave, otherwise the dsint_size and dsincr_size are ignored.
24. NONIPTSTACK | NONONIPTSTACK has been replaced by THREADSTACK. For applications using NONIPTSTACK, Language Environment will convert NONIPTSTACK to THREADSTACK. If you are using NONIPTSTACK we recommend changing to THREADSTACK.
25. The behavior of the dsa_alloc_value sub-option of the STORAGE runtime option will be different for an XPLINK stack. The dsa will only be initialized for routines that perform an explicit check for stack overflow. For C/C++, the compiler option XPLINK(NO GUARD) can be used to force the compiler to generate prologs with explicit checks for stack overflow.
26. The ALL31 runtime option will be forced to ON when the XPLINK(ON) run-time option is specified, or at least one XPLINK routine is present in the enclave. No message will be issued to indicate this action.
27. If the XPLINK run-time option is not specified and the initial program contains at least one XPLINK-compiled part, then the XPLINK run-time option will be forced to ON. No message will be issued to indicate this action.
28. When the XPLINK(ON) run-time option is specified or at least one XPLINK routine is present in the enclave, the STACK run-time option will forced to STACK(,ANY,,). No message will be issued to indicate this action.
29. IBM supplies a sample user-written condition handler found in SCEESAMP called CEEWUCHA. Under CICS, this handler will give you similar abend codes that were around in certain pre-Language Environment environments. The CEEWUCHA load module needs to be build using CEEWWCHA provided in SCEESAMP. Please be aware that this handler has support for both COBOL and PL/I and is shipped with the PL/I specific behavior commented out. If you want this PL/I behavior, modify the source before using CEEWWCHA.
30. Acquiring a storage increment often involves a new storage obtain.
Recommendations: The increment size (4080 is recommended) should be 16 bytes less than the exact size of one or more pages to account for the 16-byte

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| check zone that CICS applies to all storage obtain requests. This keeps
| Language Environment from obtaining an extra page of storage beyond the
| requested amount. This is important in CICS environments where storage
| below the line is especially constrained. The initial size in a CICS environment
| is part of a larger storage obtain that includes other storage required for
| Language Environment during initialization. Therefore, you can specify the
| initial size as exactly one or more pages, for example, 4K, 8K, and so forth,
| without concern for acquiring an extra page.

Run-time option summary

Chapter 5. Other HLL migration considerations

This section includes migration concerns that are language-specific, such as: differences in how Language Environment and an HLL handle return codes, run-time messages, entry files, and user exits. For more information about these considerations, see the following books:

- *z/OS C/C++ Compiler and Run-Time Migration Guide*
- *Enterprise COBOL for z/OS and OS/390 Migration Guide* or *COBOL for OS/390 & VM Compiler and Run-Time Migration Guide*
- *VisualAge PL/I for OS/390 Compiler and Run-Time Migration Guide*
- *Enterprise PL/I for z/OS and OS/390 Migration Guide* or *PL/I for MVS & VM Compiler and Run-Time Migration Guide*
- *z/OS Language Environment Programming Guide*

C considerations

The following sections list some sample migration problems. For a complete list of migration considerations, see one of the C migration guides listed in the preceding section.

Standard streams

Under z/OS Language Environment there is no longer an automatic association of ddnames SYSTERM, SYSERR, SYSPRINT with stderr. Command line redirection of the type 1>&2 is necessary in batch to cause stderr and stdout to share a device.

In C/370 Version 1 and Version 2, you could override the destination of error messages by redirecting stderr. Language Environment determines the destination of all messages from the new MSGFILE run-time option. For more information about the MSGFILE option, see *z/OS Language Environment Programming Guide*.

Passing command line parameters

In C/370 Version 1 or Version 2, if an error was detected with the parameters being passed to the main program, the program terminated with a return code of 8 and a message indicating the reason the program terminated. For example, if there was an error in the redirection parameters, the message would indicate that the program had terminated because of a redirection error. Under Language Environment, the same message is displayed, but the program also terminates with a 4093 abend, reason code 52 (X'34'). For more information about reason codes, see *z/OS Language Environment Debugging Guide*.

User exits

If CEEBXITA and IBMBXITA are present in a relinked C/370 Version 1 or Version 2 module, CEEBXITA will take precedence over IBMBXITA.

Time functions

If you are migrating from IBM C/370 (Version 1 or Version 2) or AD/Cycle C/370 (Version 1 Release 1 or Version 1 Release 2), you should be aware of the following change in time functions.

- The `ctime()`, `localtime()`, and `mktime()` functions will return Coordinated Universal Time (UTC) time unless customized locale information is available.

Other considerations

When you customize the locale, time functions preserve the time and date and correctly adjust for daylight time on a given date. See *z/OS C/C++ Programming Guide* for more information about environment variables and customizing locale information.

- In POSIX and non-POSIX applications, you can use the TZ environment variable to supply the necessary time zone information for your location. Previously, for non-POSIX applications, you could supply customized locale information only by setting time zone and daylight information in the LC_TOD locale category.

Load modules that invoke a Debugging Tool

C/370 library application load modules that use `ctest()` to invoke the Debug Tool must be relinked to run with Language Environment. The old library object, `@@CTEST`, must be replaced, as described in *z/OS C/C++ Compiler and Run-Time Migration Guide* and *IBM C for VM/ESA Compiler and Run-Time Migration Guide*. After you replace the old objects, the new modules will run with Language Environment.

Prefix of `perror()` and `strerror()` messages in C

With Language Environment, all `perror()` and `strerror()` messages in C contain a prefix. With C/370 Version 1 and Version 2 there was no prefix on these messages. The prefix is `EDCxxxxa`, where `xxxx` is a number (always `5xxx`) and the `a` is I, W, or E. See *z/OS Language Environment Run-Time Messages* for a list of messages.

AMODE errors from ILCs

In ILC applications of C/370 Version 1 or Version 2 and VS COBOL II, if C/370 was running at AMODE 31 and COBOL was running at AMODE 24, an error was produced (2052) and the application failed. Under Language Environment, the call will fail but the message will be `EDC5052`, protection exception.

PL/I considerations

The following sections describe some of the items you should consider when migrating PL/I applications to Language Environment.

Dumps

The output produced by `PLIDUMP` is different when running under Language Environment. For detailed information, see *VisualAge PL/I for OS/390 Compiler and Run-Time Migration Guide*, *Enterprise PL/I for z/OS and OS/390 Migration Guide* or *PL/I for MVS & VM Compiler and Run-Time Migration Guide*.

Condition handling

In general, PL/I condition handling functions in the same way when running under Language Environment. However, the issuing of diagnostic messages may vary. For example, the diagnostic message for an ERROR condition is issued only if there is no ERROR ON-unit established, or if the ERROR ON-unit does not recover from the condition by using a GOTO out of block. However, for other PL/I conditions whose implicit action includes printing a message and raising the ERROR condition, the message is issued before control is given to an established ERROR ON-unit.

User exits

The OS PL/I Version 2 assembler user exits IBMBXITA and IBMFXITA are supported by PL/I for MVS & VM for compatibility. However, the Language Environment user exit CEEBINT should be used instead. Only CEEBINT is supported by VisualAge PL/I for OS/390.

Also, the OS PL/I Version 2 high-level language user exit IBMBINT is not recommended; it is supported only for compatibility. Use the Language Environment high-level language user exit, CEEBINT, instead. Only CEEBXITA is supported by VisualAge PL/I for OS/390. See *VisualAge PL/I for OS/390 Compiler and Run-Time Migration Guide*, *Enterprise PL/I for z/OS and OS/390 Migration Guide* or *PL/I for MVS & VM Compiler and Run-Time Migration Guide* for detailed information. See *z/OS Language Environment Programming Guide* for more information about the Language Environment user exits.

SYSPRINT

In PL/I, run-time messages are directed, by default, to the Language Environment MSGFILE rather than to SYSPRINT. Run-time user output is still directed to SYSPRINT. If you want run-time messages to go to SYSPRINT, specify the MSGFILE(SYSPRINT) run-time option. In this case, SYSPRINT can contain both user output and run-time output. For more information about the MSGFILE run-time option, see *z/OS Language Environment Programming Reference*.

Format and content of messages

The format and content of run-time messages is different for PL/I applications that run with Language Environment. Differences include the following items:

- The message number in the message prefix is now four digits instead of three digits.
- The message severity in the message prefix can now be C, E, I, S, or W.
- The message text of some mixed-case English and Japanese messages has been enhanced.

You must modify your applications if they analyze the run-time output. See *z/OS Language Environment Programming Reference* for more information about using and handling messages.

VisualAge PL/I for OS/390 object compatibility

Certain restrictions apply to load modules containing a mixture of VisualAge PL/I for OS/390 objects, and objects produced by earlier compilers (for example OS PL/I and PL/I for MVS & VM). For best results, do not mix compiler levels in a load module. See *VisualAge PL/I for OS/390 Compiler and Run-Time Migration Guide* for more information.

General considerations

This section describes other items you should consider when migrating a pre-Language Environment HLL application to an application that conforms to Language Environment.

Return and reason codes

Some return and reason codes will differ when running under Language Environment. JCL and EXECs that are affected by them must be changed

Other considerations

accordingly. See *z/OS Language Environment Debugging Guide* book for more information about return and reason codes.

Storage reports

The output of the run-time storage report is different when running with Language Environment. For detailed information about the RPTSTG run-time option, see *z/OS Language Environment Programming Reference*.

Appendix A. Language Environment-enabled vendor tools and application packages

Language Environment for z/OS is IBM's common run-time environment for enterprise applications written in COBOL, C/C++, PL/I, and FORTRAN. Language Environment provides interlanguage communication for modules written in different languages as well as a consistent run-time environment for essential services, such as initialization, termination, message handling, National Language, and storage management. In addition, Language Environment provides common exception-handling services resulting in improved reliability and better failure diagnosis.

Customers with IBM compilers and tools also have third party vendor tools and application packages installed. IBM recognizes the following in upgrading the languages:

- **C/C++** — Many IBM products (for example BookManager, TCP/IP, and others) and third party vendor tools and application packages are built using C.
- **COBOL** — Some of the third party vendor tools and application packages do not run with Language Environment. Customers will upgrade their COBOL when their existing tools and application packages run in the new Language Environment.
- **FORTRAN** — Fortran is now available in Language Environment, which allows Interlanguage Communication (ILC) calls into Fortran modules from C, COBOL, and PL/I.
- **PL/I** — Many IBM products (for example OV/MVS, NetView, and others) and third party vendor tools and application packages are built using PL/I.

This appendix includes information about other companies' products. Such information was obtained from the respective manufacturers of such products or their published announcements. The user should validate any information depicted here by contacting the appropriate manufacturer for the most current information on the product(s) in their particular situation.

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Below is the legend for the Enabled column in the tables contained in this appendix.

Entry	Meaning
Yes	The product works with Language Environment. Note: Check comments for release level or needed service.
No	The product requires a run-time library, but does not work with Language Environment.
N/A	The product does not use a run-time library for the languages supported by Language Environment.

Enabled vendor tools

Entry	Meaning
?	The product requires a run-time library, but it is unknown if it will work with Language Environment.

IBM Corporation

NAME:	IBM Corp.
ADDRESS:	Old Orchard Rd. Armonk, NY 10504
PHONE:	(800) IBM-4-YOU
DIRECT SALES:	(800) 426-2968 (IBM Direct) or Local IBM Branch Office
TECH SUPPORT:	(800) 237-5511
WEB SITE:	http://www.ibm.com

z/OS

For individual elements or features of z/OS that require Language Environment, please refer to *z/OS Program Directory*.

Products

Product	Enabled	Comments
ACF Network Control Program (ACF/NCP)	N/A	Runs in a communications controller, not on the host
ACF/VTAM for MVS	Yes	VTAM V4R3 is Language Environment-enabled for the following functions: <ul style="list-style-type: none">• Network Management Agent• ASUITE - a suite of APPC applications shipped with VTAM<ul style="list-style-type: none">– ANAME - a 6.2 based name server– ACPY - a 6.2 file copy routine– AFTP - a 6.2 based FTP application– APING - an APPC PING application• AnyNet feature<ul style="list-style-type: none">– SNA over IP– Sockets over SNA
ACF/VTAM for VM	No	No plans for support
AD/Cycle C/370 compiler Version 1.2	Yes	
ADSTAR Distributed Storage Manager (ADSM) (MVS/ESA)	Yes	
AFP ToolBox for MVS (5655-A25)	Yes	Requires Language Environment
AIX Distributed Computing Environment/ESA (DCE/ESA) (AIX/ESA)	Yes	Enabled since V1R1
ANo/MVS (5756-265)	No	Replaced by 5695-178

Enabled vendor tools

Product	Enabled	Comments
ANo/MVS (5695-178)	Yes	
ANYNET (MVS/ESA)	Yes	Feature of VTAM V4R3
Automated Operations Control/MVS (AOC/MVS)	No	No plans for support; replaced by System Automation for MVS
Application System (AS) (MVS/ESA, VM)	Yes	AS IC/E is Language Environment-enabled for V3 with APAR PN68743 that contains 4 PTF's: IC/E (MVS) V3.1 UN74167, IC/E (VM) V3.1 UN74168, IC/E (MVS) V3.2 UN74169 and IC/E (VM) V3.2 UN74170. AS IC/E is Language Environment-enabled for V4 with APAR PN68833 that contains 2 PTF's: IC/E (MVS) V4.1 UN74171 and IC/E (VM) V4.1 UN74172.
Application Support Facility (ASF) for MVS (MVS/ESA)	Yes	ASF V3R1 is Language Environment-enabled; IMS support requires PN74705
Basic Telecommunication Access Method (BTAM) (5665-279)	N/A	Does not require a run-time library
BookManager/MVS (MVS/ESA)	Yes	BookManager/MVS 1.3 is Language Environment-enabled
BookManager/VM	Yes	BookManager/VM 1.3 is Language Environment-enabled with APAR GC05334
Bulk Data Transfer (BDT) (5696-PKK)	N/A	Does not require a run-time library
CACHE RMF Reporter (DQD-5798)	?	This PO is written in PL/I. The function provided by this PO is now integrated with the RMF postprocessor reports. It is no longer being developed or supported and has not been tested with Language Environment.
C/C++ for MVS/ESA V3R2	Yes	
OS/390 C/C++	Yes	
CICS/MTCS	Yes	No known Language Environment dependencies
CICS/MVS 3270 Format Utility	No	Discontinued service 12/31/96
CICS/VSAM Recovery	Yes	Enabled since V2R2
CLIO/S	Yes	
COBOL CICS Conversion AID (CCCA)	Yes	Enabled since R2 for MVS
COBOL Structuring Facility	Yes	Enabled since V3R1
Cross System Product (CSP) (5688-218, 5688-206)	Yes	CSP V4R1 will work with Language Environment. Be sure CSP APARS PN64541, PN60042 and Language Environment APAR PN60776 are on your system. CSP V3R3 and earlier releases do not require a run-time library.

Enabled vendor tools

Product	Enabled	Comments
Customer Information Control System/ESA (CICS/ESA) (MVS/ESA)	Yes	Enabled since V3R3
Data Interchange	N/A	Does not require a run-time library
DB2 (5665-DB2)	N/A	Does not require a run-time library
Data Base Edit Facility (DBEDIT) (MVS/ESA)	Yes	PN60210 contains Language Environment enablement instructions
Data Facility Sort (DFSORT) (MVS/ESA)	Yes	Enabled since R12
Device Support Facility (DSF) (5655-257)	N/A	Does not require a run-time library
DFSMSdfp	Yes	Only if you plan on using CDRA in DFSMS 1.3 and upward
DFSMSdss	N/A	Does not require a run-time library
DFSMSshsm	N/A	Does not require a run-time library
DFSMSrmm	N/A	Does not require a run-time library
DI/MVS	Yes	
DISOSS (5665-290)	N/A	Does not require a run-time library
DISOSS Library Services Extended (DLS-E) (5787-ECH)	Yes	APAR HC06749 for DLS-E required to run with Language Environment
DITTO (5798-ARD)	N/A	Does not require a run-time library
Document Composition Facility (DCF/MVS)	Yes	DCF/MVS is Language Environment-enabled with STACK option for ODF support. The remainder of DCF has no run-time dependency.
Document Composition Facility (DCF/VM)	Yes	DCF/VM is Language Environment-enabled with APAR PN61308 for ODF support. The remainder of DCF has no run-time dependency.
DisplayWrite/370 (DW/370)	N/A	Does not require a run-time library
DPAM	No	No plans for support
DROP/R Capture MVS	Yes	
Emulator Program (EP)	N/A	Runs in a communications controller, not on a host
Environment Error Recording Program (5658-260)	N/A	Does not require a run-time library
ESCON Manager (ESCM) (5688-008)	No	Replaced by System Automation for MVS
Graph Data Display Manager (GDDM) (5665-356)	N/A	Does not require a run-time library
GDDM IMD (5665-356)	N/A	Does not require a run-time library
GDDM Program Graphic Feature (GDDM-PGF)	N/A	Does not require a run-time library
Hardware Configuration Definition (HCD)	Yes	
Host Communication Facility (HCF) (5668-985)	N/A	Does not require a run-time library

Enabled vendor tools

Product	Enabled	Comments
ICF Catalog Recovery (5798-DXQ)	N/A	Does not require a run-time library
IMS Application Development Facility (IMSADF)	Yes	IMSADF V2R2 is Language Environment-enabled with APAR PN84976
IBM Print Services Facility (PSF/MVS) (MVS/ESA)	Yes	Enabled since V2
Image Object Distribution Manager (IODM)	No	Plans being developed to support Language Environment
Image/Plus Folder Application Facility (IPFAF)	No	Plans being developed
IMS/ESA	Yes	
IMS System Utilities	Yes	
InfoMan		Only 2 parts of InfoMan require Language Environment, the Graphics Module and the NetView Bridge Adapter. The Graphics Module V5R1 and above work with Language Environment. The NetView Bridge Adapter requires NetView and does not work with Language Environment.
Inforem III	Yes	
Information Management System/ESA (IMS/ESA) Database Manager and IMS/ESA Transaction Manager	Yes	Enabled since V1R3
Interactive System Product Facility (ISPF) (5655-042)	N/A	Does not require a run-time library
Item Access Facility MVS/ESA (IAFC) (MVS/ESA)	No	Migration guide available; send a request to Language Environment Feedback via the Web
Job Entry Subsystem (JES) (5695-047)	N/A	Does not require a run-time library
Jes328X Printing Subsystem	N/A	Does not require a run-time library
KnowledgeTool (MVS/ESA)	No	Product has no plans of relinking with Language Environment. Therefore it is not Language Environment-enabled.
MQSeries (MVS/ESA)	Yes	
NetView (MVS/ESA)	Yes	NetView V3R2 or TME10 NetView
NetView/GMFHS (MVS/ESA)	Yes	
NetView/RODM (MVS/ESA)	Yes	
NetView Access (5665-365)	N/A	Does not require a run-time library
NetView Distribution Manager (NDM)	N/A	Does not require a run-time library
NetView File Transfer Program (NetView FTP)	N/A	Does not require a run-time library
NetView Performance Manager (NPM) (5655-043)	N/A	Does not require a run-time library
NPSI (5688-035)	N/A	Runs on a communications controller, not on a host

Enabled vendor tools

Product	Enabled	Comments
NTUNEMON (NCP Monitor Tool)	N/A	Does not require a run-time library
NTUNENCP (NCP Tuning Tool)	N/A	Does not require a run-time library
OfficeVision/MVS (MVS/ESA)	Yes	Enabled since V1R3
OfficeVision/VM	Yes	
OpenEdition Services	Yes	
Overlay Generation Language/370 (OGL) (5688-191)	N/A	Does not require a run-time library
Page Printing Formatting Aid/370 (PPFA/370) (5688-190)	N/A	Does not require a run-time library
PC/TSO File Transfer Product (PC/TSO FTP)	N/A	Does not require a run-time library
Print Facility (VMPRF)	Yes	VMPRF is Language Environment-enabled with APAR VM59419
PagePrinterMigrationProgram (PPMP) (MVS/ESA) (5695-040)	Yes	Need to apply PTF UW43230
Resource Measurement Facility (RMF) (MVS/ESA)	N/A	Does not require a run-time library
ScreenView (5695-047)	N/A	Does not require a run-time library. This product is out of service for VM, VSE and MVS.
SearchManager/370 for MVS (5695-070)	Yes	Enabled since R3. R3 requires APARs PN73137 and PN76260.
SGML Translator (5684-025)	No	SGML Translator is not planning to support Language Environment
System Automation for MVS	No	No plans to support Language Environment
z/OS Transmission Control Protocol/Internet Protocol (TCP/IP)	Yes	Enabled since V3R1
Transmission Control Protocol/Internet Protocol (TCP/IP) for VM	No	
TSCF (MVS/ESA)	No	Replaced by System Automation for MVS
VisualAge Generator (MVS/ESA)	Yes	Formerly known as VisualGen
VisualInfo (MVS/ESA)	Yes	VisualInfo V2 works with Language Environment R5 and APAR PN81700

Action Software International

NAME: Action Software International (a division of Mazda Computer Corporation)

ADDRESS: 20 Valleywood Drive, Suite 107 Markham, ON L3R 6G1 Canada

PHONE: (905) 470-7113

FAX: (905) 470-6507

Enabled vendor tools

TECH SUPPORT: (905) 470-7113 (E-mail: change@actionsoftware.com)

Product	Enabled	Comments
Change Action	N/A	No known Language Environment dependencies

ADPAC Corp.

NAME: ADPAC Corp.
ADDRESS: 425 Market St., Suite 400 San, Francisco, CA 94105
PHONE: (415) 777-5400
FAX: (415) 284-1126
WEB SITE: <http://www.adpac.com>

Product	Enabled	Comments
Programming Maintenance/Standard Solution (PM/SS) (MVS/ESA)	Yes	
System Vision Impact Analysis	Yes	
System Vision JCL VIEW	Yes	
System Vision Program Inventory	Yes	
System Vision Upgrade Unit	Yes	

Advantis

NAME: Advantis
ADDRESS: 3405 West Dr. Martin Luther King Jr. Blvd., P.O. Box 30021, Tampa, FL 33630
PHONE: (800) 727-2222
WEB SITE: <http://www.advantis.com>

Product	Enabled	Comments
Expedite Base MVS	N/A	Does not require a run-time library
Expedite CICS for MVS	Yes	

Advisor Technology Services

NAME: Advisor Technology Services (Formerly Broadway and Seymour, Inc.) (Formerly Trust Systems, Inc.)
ADDRESS: 128 South Tryon St., Charlotte, NC 28202
PHONE: (800) 836-6575

Enabled vendor tools

TECH SUPPORT: (800) 743-2505
WEB SITE: None. In process of developing one (2/6/97 status).

Product	Enabled	Comments
AMtrust (MVS/ESA)	Yes	

Alltel Corp.

NAME: Alltel Corp.
ADDRESS: One Allied Drive, Little Rock, AR 72202
PHONE: (501) 661-8000
FAX: (501) 661-8487
WEB SITE: <http://www.alltel.com>

Product	Enabled	Comments
Systematics Financial & Health Care Packages	No	Have worked with customers on work around
TDS Healthcare Packages (Eclipsis Corp.)	?	Language Environment status not known

American Software, Inc.

NAME: American Software, Inc.
ADDRESS: 470 E. Paces Ferry Rd., Atlanta, GA 30305
PHONE: (404) 261-4381
FAX: (404) 264-5394
WEB SITE: <http://www.amssoftware.com>

Product	Enabled	Comments
AMSOFT (MVS/ESA)	Yes	
Distribution Requirements Planning (MVS/ESA)	Yes	
MRP-8 Manufacturing Resource Planning (MVS/ESA)	Yes	

ANSYS, Inc.

NAME: ANSYS, Inc.
ADDRESS: 275 Technology Drive, Canonsburg, PA 15317
PHONE: (412) 746-3304
FAX: (412) 514-9494
WEB SITE: <http://www.ansys.com>

Enabled vendor tools

Product	Enabled	Comments
ANSYS	N/A	Language Environment not required, ships FORTRAN runtime

Applications Software, Inc.

NAME: Applications Software, Inc.
ADDRESS: 5455 Garden Grove Blvd., Suite 500, Westminster, CA 92683
PHONE: (714) 891-2616
FAX: (714) 895-5690
TECH SUPPORT: (860) 675-8158
WEB SITE: None

Product	Enabled	Comments
ASI-ST (MVS/ESA)	N/A	Written totally in assembler; does not require a run-time library

Candle

NAME: Candle
ADDRESS: 2425 Olympic Blvd., Santa Monica, CA 90404
PHONE: (800) 843-3970 or (310) 829-5800
FAX: (310) 582-4287
TECH SUPPORT: (800) 328-1811
WEB SITE: <http://www.candle.com>

Product	Enabled	Comments
CL/GATEWAY	Yes	No Language Environment dependencies; no known problems
CL/SUPERSESSION	Yes	No Language Environment dependencies; no known problems
Omegamon for CICS/v300 (MVS/ESA)	Yes	Language Environment-enabled for compatibility
Omegamon II/v300 (MVS/ESA)	Yes	

Chicago-Soft, Ltd.

NAME: Chicago-Soft, Ltd.
ADDRESS: Maple St., Hanover, NH 03755
PHONE: (603) 643-4002
Direct Sales: (603) 643-4002
FAX: (773) 282-9036

Enabled vendor tools

TECH SUPPORT: (773) 282-4777
WEB SITE: <http://www.chicago-soft.com>

Product	Enabled	Comments
MVS/QuickRef	N/A	Does not require a run-time library

CHI/COR Information Management, Inc

NAME: CHI/COR Information Management, Inc
ADDRESS: 300 South Wacker Drive, Chicago, IL 60606
PHONE: (312) 322-0150
WEB SITE: <http://www.chicor.com>

Product	Enabled	Comments
Deduction Management System (MVS/ESA)	N/A	Written in RPG; doesn't use Language Environment

CINCOM Systems, Inc

NAME: CINCOM Systems, Inc.
ADDRESS: 2300 Montana Avenue, Cincinnati, OH 45211-3899
PHONE: (513) 612-2300
FAX: (513) 481-8332
WEB SITE: <http://www.cincom.com>

Product	Enabled	Comments
MAN Series M/TEXT (MVS/ESA)	N/A	Does not require a run-time library
MANTIS (MVS/ESA)	No	Language Environment enablement under discussion (status as of 1/27/97)

Computer Associates International, Inc.

NAME: Computer Associates International, Inc.
ADDRESS: One Computer Associates Plaza, Islandia, NY 11788-7000
PHONE: (800) CALL-CAI or (516) 342-5224
FAX: (516) 342-5734
WEB SITE: <http://www.cai.com>

Product	Enabled	Comments
CA-APCDDS	N/A	No Language Environment dependencies; no known problems
CA-APC/DOC	N/A	No Language Environment dependencies; no known problems

Enabled vendor tools

Product	Enabled	Comments
CA-DADS/PLUS	N/A	No Language Environment dependencies; no known problems
CA-Datcom/CICS Services	Yes	Works in Language Environment environment; no known problems
CA-Datcom/Extended SQL Option	Yes	Works in Language Environment environment; no known problems
CA-Datcom/DB	Yes	Works in Language Environment environment; no Language Environment dependencies
CA-Datcom/DB Datadictionary	Yes	Works in Language Environment environment; no known problems
CA-Datcom/DLI Transparency	Yes	Works in Language Environment environment; no known problems
CA-Datcom/IMS/DC Services	N/A	Does not require a run-time library
CA-Datcom/Total Transparency	Yes	Works in Language Environment environment; no known problems
CA-Datcom/VSAM Transparency	N/A	Does not require a run-time library
CA-Data Query	Yes	Works in Language Environment environment; no known problems
CA-DISPATCH	N/A	No Language Environment dependencies; no known problems
CA-DOCVIEW	N/A	No Language Environment dependencies; no known problems
CA-EASYTREVE	Y	EasyTreve 6.0 works with Language Environment compatibility mode
CA-EXAMINE	N/A	No Language Environment dependencies; no known problems
CA-EZT+	Yes	Language Environment dependencies occur when subroutines or exits are used which are written in a language using Language Environment as their run-time environment. This situation may be triggered by using CALL-statements or by using file I/O exits from within an EZT+ program. To bypass, 1) call IGZERRE before invoking your subprogram or exit, or 2) use the RTEREUS run-time option.
CA-EZT/DB2	N/A	No Language Environment dependencies; no known problems
CA-EZT/IMS	N/A	No Language Environment dependencies; no known problems
CA-EZTEST/CICS/3.4 (MVS/ESA)	Yes	
CA-FILESAVE/RCS	N/A	No Language Environment dependencies; no known problems
CA-IDMS (MVS/ESA)	Yes	Release 12.0 is Language Environment-enabled

Enabled vendor tools

Product	Enabled	Comments
CA-INSIGHT/DB2	N/A	No Language Environment dependencies; no known problems
CA-InterTest 5.3 (MVS/ESA)	Yes	Language Environment-enabled for LE/370 V1 R1 and above
CA-JCL/CHECK	N/A	No Language Environment dependencies; no known problems
CA-LIBRARIAN (MVS/ESA)	Yes	
CA-LSERV	N/A	No Language Environment dependencies; no known problems
CA-Masterpiece (MVS/ESA)	Yes	
CA-Netman (MVS/ESA)	Yes	LE/370 1.2 enabled with CA APAR A94256AK0. LE/370 1.3 enabled with fixes T5VR195 and T5VR196 from CA.
CA-OPERA	N/A	No Language Environment dependencies; no known problems
CA-OPTIMIZER (MVS/ESA)	Yes	OS/VS COBOL programs compiled with CA OPTIMIZER using DETECT or ANALYZE optimizer options and run under Language Environment will receive an abend 0C4 in CA OPTIMIZER module CPXEM. Contact CA customer support for CA fix T5U2468. This fix is for CA-Optimizer 6.0 only. Per CA, user cannot compile with DETECT or ANALYZE options and run under Language Environment.
CA-PANVALET (MVS/ESA)	Yes	
CA-PMO	Yes	There is a performance problem — fix available from CA.
CA-ROSCOE (MVS/ESA)	Yes	
CA-SYMDUMP	Yes	CA-SYMDUMP 5.3 works with Language Environment
CA-TELON (MVS/ESA)	Yes	Will work with Language Environment if CA-TELON is at GEN9706 or later (Problem with PL/I - fix available from CA)
CA-TLMS	N/A	No Language Environment dependencies; no known problems
CA-VERIFY	N/A	No Language Environment dependencies; no known problems
CA-1	N/A	No Language Environment dependencies; no known problems
CA-7	N/A	No Language Environment dependencies; no known problems
CA-11	N/A	No Language Environment dependencies; no known problems
CA-90	Yes	
Endevor/Cross System Product (Endevor/CSP) (MVS/ESA)	Yes	
Endevor/DB (MVS/ESA)	Yes	

Enabled vendor tools

Product	Enabled	Comments
Endevor/DB2 (MVS/ESA)	Yes	
Endevor/MVS (MVS/ESA)	Yes	
Endevor Parallel Development Manager (MVS/ESA)	Yes	
RAMIS (MVS/ESA)	Yes	

Computer Corporation of America

NAME: Computer Corporation of America
ADDRESS: 500 Old Connecticut Path, Framingham, MA 01701
PHONE: (508) 270-6666
FAX: (508) 270-6688
TECH SUPPORT: (800) 755-4222
WEB SITE: <http://www.cca-int.com>

Product	Enabled	Comments
Model 204	Yes	3.2.0 is Language Environment-enabled

Compuware Corp.

NAME: Compuware Corp.
ADDRESS: 31440 Northwestern Highway, Farmington Hills, MI 48334
PHONE: (800) 521-9353 or (248) 737-7300
FAX: (248) 737-7339
TECH SUPPORT: (800) 538-7822
WEB SITE: <http://www.compuware.com>

Product	Enabled	Comments
Abend-AID/MVS (MVS/ESA)	Yes	Release 7.0 and above Language Environment-enabled. Release 8.2 will support COBOL for MVS & VM Rel2.
CICS Abend-AID/FX (MVS/ESA)	Yes	CICS Abend-AID/FX began supporting Language Environment in 1993, and continues to support all current versions of Language Environment. Please consult Compuware's Web site for specific information.
File-AID/MVS (MVS/ESA)	Yes	V6.5 is Language Environment-enabled
Pathvu/Interactive (MVS/ESA)	Yes	V6.2 is Language Environment-enabled
STROBE (MVS/ESA)	Yes	

Enabled vendor tools

Product	Enabled	Comments
Xpediter/CICS	Yes	XPEDITER/CICS 6.6 works with Language Environment in compatibility mode XPEDITER/CICS 6.8 will provide full support in Language Environment, per XPEDITER support personnel.
Xpediter/IMS	Yes	V1 R6.1 is Language Environment-enabled
Xpediter/TSO	Yes	V1 R6.1 is Language Environment-enabled

Comshare, Inc.

NAME: Comshare, Inc.
ADDRESS: P. O. Box 1588, 555 Briarwood Circle, Ann Arbor, MI 48108
PHONE: (800) 922-7979 or (313) 994-4800
FAX: (313) 769-6943
TECH SUPPORT: (313) 994-5212
WEB SITE: <http://www.comshare.com>

Product	Enabled	Comments
Interactive Financial Planning System/Plus (IFPS/Plus) (MVS/ESA)	Yes	IFPS/Plus 5.01 is Language Environment-enabled

Data Kinetics, Ltd.

NAME: Data Kinetics, Ltd.
ADDRESS: 2460 Lancaster Road, Ottawa, Ontario Canada K1B 4S5
PHONE: (800) 267-0730 or (613) 523-5500
FAX: (613) 523-5533
TECH SUPPORT: (613) 523-5588
WEB SITE: <http://www.dkl.com>

Product	Enabled	Comments
tableBASE (MVS/ESA)	Yes	Language Environment-enabled

Deluxe Corp.

NAME: Deluxe Corp.
ADDRESS: 1050 County Road F West, St. Paul, MN 55126-2910
PHONE: (800) 328-9500
TECH SUPPORT: (800) 328-8434
WEB SITE: <http://www.deluxe.com>

Enabled vendor tools

Product	Enabled	Comments
Oneware	Yes	

Document Sciences Corporation

NAME: Document Sciences Corporation
ADDRESS: 6339 Paseo Del Lago, Carlsbad, CA 92009
PHONE: (760) 602-1400
FAX: (760) 602-1450
TECH SUPPORT: (760) 602-1500
WEB SITE: <http://www.docscience.com>

Product	Enabled	Comments
CompuSet	Yes	
DLS	Yes	

Early, Cloud Solution Unit of IBM

NAME: Early, Cloud Solution Unit of IBM (Formerly Early, Cloud and Company)
ADDRESS: Aquidneck Industrial Park, Newport, RI 02840
PHONE: (800) 829-2050 or (401) 849-0500
WEB SITE: <http://www.earlycloud.com>

Product	Enabled	Comments
CallFlow	Yes	
Message Driven processor (MDp)	Yes	

EWO Software, Inc.

NAME: EWO Software, Inc.
ADDRESS: 358 Walter Avenue, Newbury Park, CA 91320
PHONE: (805) 498-8782
WEB SITE: <http://www.ewosoft.com>

Product	Enabled	Comments
Prescient Downloader	Yes	
Prescient Replicator	Yes	
Prescient Documentor	Yes	
Prescient Loadsycn	Yes	

Geac Host Technologies

NAME: **Geac Host Technologies** (Formerly Dun & Bradstreet Software)

ADDRESS: 66 Perimeter Center E., Atlanta, GA 30346

PHONE: (404) 239-2000 or (404) 239-INFO

TECH SUPPORT: (800) 808-3327 for E Series or (800) 808-1327 for M Series

WEB SITE: <http://www.geac.com>

Product	Enabled	Comments
Expert Series Applications (E Series)	Yes	
Millennium Series Applications (M Series)	Yes	

HBO & Co.

NAME: **HBO & Co.**

ADDRESS: 301 Perimeter Center N., Atlanta, GA 30346

PHONE: (770) 393-6000

TECH SUPPORT: (800) 962-HBOC

WEB SITE: <http://www.hboc.com>

Product	Enabled	Comments
Health Quest 2000 (MVS/ESA)	Yes	
Plus 2000 (MVS/ESA)	Yes	

Hogan Systems, Inc.

NAME: **Hogan Systems, Inc.**

ADDRESS: 5525 LBJ Freeway, Dallas, TX 75240

PHONE: (972) 386-0020

FAX: (972) 386-0315

Product	Enabled	Comments
Consumer and Merchant Servicing (MVS/ESA)	Yes	

HNC Software

NAME: **HNC Software**

ADDRESS: 5930 Cornerstone Court, West San Diego, CA 92121

Enabled vendor tools

PHONE: (619) 546-8877
WEB SITE: <http://www.hnc.com>

Product	Enabled	Comments
Falcon	Yes	Falcon has 2 load libraries, one for on-line and one for batch. Both work with Language Environment 1.5. Batch requires Language Environment maintenance level 9609.
Profitmax	?	Status unknown. None of their customers have run it with Language Environment.

Infodata Systems, Inc.

NAME: Infodata Systems, Inc.
ADDRESS: 12150 Monument Dr., Fairfax, VA 22033
PHONE: (703) 934-5205
FAX: (703) 934-7154
TECH SUPPORT: (703) 934-8149
WEB SITE: <http://www.infodata.com>

Product	Enabled	Comments
Inquire/Text (MVS/ESA)	Yes	Working on a fix as of 1/22/97
Shelf Space (MVS/ESA)	Yes	
Webb Inquire (MVS/ESA)	Yes	

Information Builders, Inc.

NAME: Information Builders, Inc.
ADDRESS: 1250 Broadway, New York, NY 10001
PHONE: (800) 969-INFO
FAX: (212) 967-6406
TECH SUPPORT: (800) 736-6130
WEB SITE: <http://www.informationbuilders.com>

Product	Enabled	Comments
Focus MVS	Yes	Minimum level 7.01. Recommended level 7.05.
Focus VM	Yes	Minimum level 7.01. Recommended level 7.05.

Information Retrieval Companies, Inc. (IRC Inc.)

NAME: Information Retrieval Companies, Inc.
ADDRESS: 3500A Regency Parkway. Cary, NC 27511
PHONE: (800) IRC-7768

Enabled vendor tools

FAX: (919) 460-7438
TECH SUPPORT: (919) 460-7446 x-135
WEB SITE: <http://www.ircsoft.com>

Product	Enabled	Comments
Automated Systems Information Management (MVS/ESA)	Yes	

Information Systems Of America, Inc.

NAME: Information Systems Of America, Inc. (Subsidiary of SunGard Insurance Systems, Inc.)
ADDRESS: 500 Northridge Rd., Atlanta, GA 30350
PHONE: (800) 659-4472 or (770) 587-6800
FAX: (770) 587-6808
WEB SITE: <http://www.sungard.com>

Product	Enabled	Comments
PRISM Investment Management & Accounting (MVS/ESA)	Yes	

Integral, Inc.

NAME: Integral, Inc.
ADDRESS: 2185 N. California Blvd., Walnut Creek, CA 94546
PHONE: (510) 939-3900
FAX: (510) 946-4891
WEB SITE: <http://www.integralsys.com>

Product	Enabled	Comments
Integral Human Resource System (MVS/ESA)	Yes	

Intersolv

NAME: Intersolv
ADDRESS: 9420 Key West Ave., Rockville, MD 20850
PHONE: (800) 582-1600
WEB SITE: <http://www.intersolv.com>

Product	Enabled	Comments
APS (MVS/ESA)	Yes	As of Version 4.0

ISOGON, Inc.

NAME: ISOGON, Inc.
ADDRESS: 330 Seventh Ave., New York, NY 10001
PHONE: (212) 376-3200
FAX: (212) 376-3280
TECH SUPPORT: (212) 376-3260
WEB SITE: <http://www.isogon.com>

Product	Enabled	Comments
Spiffy	N/A	No known Language Environment dependencies
Soft Audit/One	Yes	
Soft Audit/2000	Yes	
TICTOC	Yes	
License Power	Yes	

Lotus Development Corporation (An IBM Company)

NAME: Lotus Development Corporation
ADDRESS: 55 Cambridge Parkway, Cambridge, MA 02142
PHONE: (617) 577-8500
TECH SUPPORT: (610) 640-0700
WEB SITE: <http://www.lotus.com>

Product	Enabled	Comments
Softswitch Central (MVS/VM)	Yes	Enabled for VM 4.4.3 and above, and MVS 4.4.P2A and above

Macro 4 Inc.

NAME: Macro 4 Inc.
ADDRESS: 35 Waterview Boulevard, P.O. Box 292, Parsippany, NJ 07054-0292
PHONE: (973) 402-8000
FAX: (973) 402-7280
TECH SUPPORT: (973) 402-7360
WEB SITE: <http://www.macro4.com/dumpmaster>

Product	Enabled	Comments
Dumpmaster	Yes	Version Required 4.5.

Enabled vendor tools

MARBLE Computer, Inc.

NAME: MARBLE Computer, Inc.
ADDRESS: 160-4 Dover Road, Chichester, NH 03234
PHONE: (603) 798-4100
FAX: (603) 798-5100

Product	Enabled	Comments
Data Correlation and Documentation System (MVS/ESA)	Yes	

Merrill Consultants

NAME: Merrill Consultants
ADDRESS: 10717 Cromwell Drive, Dallas, TX 75229
PHONE: (214) 351-1966
FAX: (214) 350-3694
WEB SITE: <http://www.mxg.com>

Product	Enabled	Comments
MXG	N/A	No known Language Environment dependencies

Micro Focus, Inc.

NAME: Micro Focus, Inc.
ADDRESS: 2465 E. Bayshore Road, Suite 400, Palo Alto, CA 94303
PHONE: (800) 468-9080 or (415) 856-4161
FAX: (415) 856-6134
TECH SUPPORT: (415) 496-7230 or (610) 992-3550
WEB SITE: <http://www.microfocus.com>

Product	Enabled	Comments
Micro Focus COBOL Workbench	Yes	MF COBOL emulates COBOL/370 and support exists for source statements that utilize Language Environment services thru calls, but no Language Environment routines are provided.

Mobius Management Systems, Inc.

NAME: Mobius Management Systems, Inc.
ADDRESS: One Ramada Plaza, New Rochelle, NY 10801
PHONE: (914) 637-7200

WEB SITE: <http://www.mobius-inc.com>

Product	Enabled	Comments
INFOPAC-RDS	Yes	

National Technology Transfer Center

NAME: **National Technology Transfer Center** (Subsidiary of NASA Technology Transfer Div.)

ADDRESS: 316 Washington Ave., Wheeling, WV 26003

PHONE: (304) 243-2150

FAX: (304) 243-2539

WEB SITE: <http://www.nttc.edu/software>

Product	Enabled	Comments
NASTRAN (MVS/ESA)	No	No current plans for Language Environment support. Written in Fortran.

Panarama Software

NAME: **Panarama Software**

ADDRESS: 5550 Topanga Canyon Blvd. Third Floor, Woodland Hills, CA 91367

PHONE: (800) 829-7798 or (818) 710-7300

FAX: (818) 883-2338

WEB SITE: <http://www.pansoft.com>

Product	Enabled	Comments
Sunrise	N/A	Language Environment not required; ships SAS runtime.

Pegasystems, Inc.

NAME: **Pegasystems, Inc.**

ADDRESS: 101 Main Street, Cambridge, MA 02142

PHONE: (617) 374-9600

FAX: (617) 374-9620

WEB SITE: <http://www.pegasystems.com>

Product	Enabled	Comments
Pegasystems Banking Applications (MVS/ESA)	Yes	

Peregrine Systems, Inc.

NAME: **Peregrine Systems, Inc.**

Enabled vendor tools

ADDRESS: 12670 High Bluff Drive, San Diego, CA 92130
PHONE: (800) 638-5231 or (619) 481-5000
FAX: (619) 481-1751
WEB SITE: <http://www.peregrine.com>

Product	Enabled	Comments
SC3270	N/A	No known Language Environment dependencies

Pitney Bowes

NAME: Pitney Bowes
ADDRESS: 37 Executive Drive, Danbury, CT 06810-4148
PHONE: (800) 283-1527
WEB SITE: <http://www.pbss.com>

Product	Enabled	Comments
DocSense Mailer's Choice	Version FILE 11: Yes Version FILE 15: No	Product is a Document Distribution product. Product is written in COBOL and Assembler language

Platinum Technology

NAME: Platinum Technology
ADDRESS: 1815 South Meyers Road, Oakbrook Terrace, IL 60181
PHONE: (800) 442-6861
FAX: (800) 442-4230
TECH SUPPORT: (800) 833-PLAT
WEB SITE: <http://www.platinum.com>

Product	Enabled	Comments
DB-EXCEL	Yes	
AION/DS	Yes	
APS HPO	Yes	
TransCentury	Yes	Does not run under VM

Prince Software, Inc.

NAME: Prince Software, Inc.
ADDRESS: 1000C Lake Street, Ramsey, NJ 07446
PHONE: (800) 934-2022
FAX: (201) 934-0220

Enabled vendor tools**WEB SITE:** <http://www.princesoftware.com>

Product	Enabled	Comments
MHTRAN-1	Yes	
MHTRAN-2	Yes	
Portal 2000	Yes	
Translate/RW	Yes	

Proginet

NAME: Proginet
ADDRESS: 200 Garden City Plaza, Garden City, NY 11530
PHONE: (516) 248-2000
WEB SITE: <http://www.proginet.com>

Product	Enabled	Comments
RPC/EXEC	Yes	
Trans Access Programs and Tools	Yes	

Rocket Software, Inc.

NAME: Rocket Software, Inc.
ADDRESS: 161 Worcester Road, Framingham, MA 01701
PHONE: (508) 875-4321
FAX: (508) 875-1335
WEB SITE: <http://www.rocketsoftware.com>

Product	Enabled	Comments
HPO	Yes	

SAS Institute

NAME: SAS Institute
ADDRESS: 100 SAS Campus Drive, Cary, NC 27513
PHONE: (919) 677-8000
FAX: (919) 677-8123
TECH SUPPORT: (919) 677-8008
WEB SITE: <http://www.sas.com>

Product	Enabled	Comments
MVS-SAS	N/A	

Enabled vendor tools

Product	Enabled	Comments
SAS C	No	Cannot be statically linked; but can dynamically load and call a Language Environment/370 application as long as Language Environment/370 requirements for external calls are met. Doesn't support Language Environment headers or calls to Language Environment/370-unique functions.

Seer Technologies, Inc.

NAME: Seer Technologies, Inc.
ADDRESS: 8000 Regency Parkway, Cary, NC 27511
PHONE: (919) 380-5000
FAX: (919) 469-1910
WEB SITE: <http://www.seer.com>

Product	Enabled	Comments
High Productivity System (HPS)	Yes	Generated code is Language Environment-enabled

Serena Software International

NAME: Serena Software International
ADDRESS: 500 Airport Blvd. Second Floor, Burlingame, CA 94010
PHONE: (800) 457-3736 or (415) 696-1800
FAX: (415) 696-1776
TECH SUPPORT: (415) 696-6280
WEB SITE: <http://www.serena.com>

Product	Enabled	Comments
Comparex	N/A	No known Language Environment dependencies
PdsTools	N/A	No known Language Environment dependencies

Software AG Worldwide Headquarters

NAME: Software AG
ADDRESS: Uhlandstrasse 12 D64297 Darmstadt, Germany
PHONE: 49-6151-920
WEB SITE: <http://www.softwareag.com>

Enabled vendor tools

Product	Enabled	Comments
Com-plete (MVS/ESA)	Yes	
NATURAL (MVS/ESA)	Yes	Enabled as of V2.3.1

Software Engineers of America (SEA)

NAME: Software Engineers of America (SEA)
ADDRESS: 1230 Hempstead Turnpike, Franklin Square, NY 11010
PHONE: (516) 328-7000
FAX: (516) 354-4015
WEB SITE: <http://www.seasoft.com>

Product	Enabled	Comments
PDSFAST	N/A	No known Language Environment dependencies
FASTVSAM	N/A	No known Language Environment dependencies
FASTGENR	N/A	No known Language Environment dependencies
FDSO	N/A	No known Language Environment dependencies
CODEC	N/A	No known Language Environment dependencies
TRMS	N/A	No known Language Environment dependencies
TAPE2000	N/A	No known Language Environment dependencies
ODDS/MVS	N/A	No known Language Environment dependencies
CSAR	N/A	No known Language Environment dependencies
TRAMS	N/A	No known Language Environment dependencies
JCLPLUS!	N/A	No known Language Environment dependencies
XREFPLUS!	N/A	No known Language Environment dependencies

Sterling Software

NAME: Sterling Software
ADDRESS: 300 Crescent Court, Suite 1200, Dallas, TX 75201
PHONE: (214) 981-1000
FAX: (214) 739-0535
WEB SITE: <http://www.sterling.com>

Enabled vendor tools

Product	Enabled	Comments
Directions Image Return	No	A C/S version will replace the current host version
NDM	N/A	Replaced by CONNECT DIRECT
VISION Builder 12.0	Yes	
VISION Inform 2.0	Yes	
VISION Results 3.5	Yes	
VISION Transact 7.0	Yes	
Analysis Design Workstation	Yes	

Stonehouse & Co.

NAME: Stonehouse & Co.
ADDRESS: 4100 Spring Valley Road, Suite 400, Dallas, TX 75244
PHONE: (972) 960-1566
FAX: (972) 770-6909
TECH SUPPORT: (972) 770-6900
WEB SITE: <http://www.ncc.com/stonehouse>

Product	Enabled	Comments
MONIES	Yes	

Syncsort, Inc.

NAME: Syncsort, Inc.
ADDRESS: 50 Tice Blvd., Woodcliff Lake, NJ 07675
PHONE: (201) 930-8200
FAX: (201) 930-8285
TECH SUPPORT: (201) 930-8260
WEB SITE: <http://www.syncsort.com>

Product	Enabled	Comments
Online-SyncSort	Yes	
SyncSort/MVS	Yes	

Texas Instruments, Inc.

NAME: Texas Instruments, Inc.
ADDRESS: 6550 Chase Oaks Blvd., M/S 8474, Plano, TX 75023
PHONE: (214) 575-4553
FAX: (214) 575-4716

WEB SITE: <http://www.ti.com>

Product	Enabled	Comments
Information Engineering Facility (IEF)	Yes	

Viasoft, Inc.

NAME: **Viasoft, Inc.**
ADDRESS: 3033 North 44th Street, Phoenix, AZ 85018
PHONE: (800) 525-7775
WEB SITE: <http://www.viasoft.com>

Product	Enabled	Comments
VIA Center	Yes	
VIA/SmartTest	Yes	

Walker Interactive Systems

NAME: **Walker Interactive Systems**
ADDRESS: 303 Second Street Marathon Plaza Three N, San Francisco, CA 94107
PHONE: (415) 495-8811
FAX: (415) 543-6338
WEB SITE: <http://www.walker.com>

Product	Enabled	Comments
Tamaris	Yes	

Enabled vendor tools

Appendix B. Accessibility

Accessibility features help a user who has a physical disability, such as restricted mobility or limited vision, to use software products successfully. The major accessibility features in z/OS enable users to:

- Use assistive technologies such as screen-readers and screen magnifier software
- Operate specific or equivalent features using only the keyboard
- Customize display attributes such as color, contrast, and font size

Using assistive technologies

Assistive technology products, such as screen-readers, function with the user interfaces found in z/OS. Consult the assistive technology documentation for specific information when using it to access z/OS interfaces.

Keyboard navigation of the user interface

Users can access z/OS user interfaces using TSO/E or ISPF. Refer to *z/OS TSO/E Primer*, *z/OS TSO/E User's Guide*, and *z/OS ISPF User's Guide Volume I* for information about accessing TSO/E and ISPF interfaces. These guides describe how to use TSO/E and ISPF, including the use of keyboard shortcuts or function keys (PF keys). Each guide includes the default settings for the PF keys and explains how to modify their functions.

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- COBOL/370
- DATABASE2
- DB2
- DFSMS/MVS
- DFSMSdfp
- DFSMSdss
- DFSMSHsm
- DFSMSrmm
- DFSORT
- DisplayWrite
- ESCON
- GDDM
- IBM
- IBMLink
- IMS
- IMS/ESA
- Language Environment
- MQSeries
- MVS
- MVS/ESA
- OfficeVision/MVS
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- *z/OS Language Environment Customization*, SA22-7564
- *z/OS Language Environment Debugging Guide*, GA22-7560
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DB2

Database 2 Application Programming and SQL Guide, SC26-4377

DFSMS/MVS

- z/OS DFSMS Program Management*, SC27-1130
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