

z/OS



# Language Environment Run-Time Migration Guide



z/OS



# Language Environment Run-Time Migration Guide

**Note**

Before using this information and the product it supports, be sure to read the general information under "Appendix B. Notices" on page 57.

**Second Edition, October 2001**

This is a major revision of GA22-7565-00.

This edition applies to Version 1 Release 2 of z/OS (5694-A01) and to subsequent releases and modifications until otherwise indicated in new editions.

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## About This Book

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
- COBOL for OS/390 & VM
- COBOL for MVS & VM (formerly COBOL/370)
- VisualAge PL/I for OS/390
- PL/I for MVS & VM (formerly PL/I MVS & VM)
- VS FORTRAN and FORTRAN IV (in compatibility mode)

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*
- *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*
- *Fortran Run-Time Migration Guide*

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## 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. All books are available in printed and softcopy formats. For a complete list of publications that you may need, see “Bibliography” on page 61.

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

| <b>To ...</b>  | <b>Use ...</b>   |
|--|--|
| Evaluate Language Environment  | <i>z/OS Language Environment Concepts Guide</i>  |
| Plan for Language Environment  | <i>z/OS Language Environment Concepts Guide</i><br><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><br><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 and your language programming guide</i>   |
| 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 Applications and your language programming guide</i>                          |
| Migrate applications to Language Environment   | <i>z/OS Language Environment Run-Time Migration Guide and the migration guide for each Language Environment-enabled language</i> |

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## 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 licensed books on the Web

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

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

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3. Click on **Access Profile**.
4. Click on **Request Access to Licensed books**.
5. Supply your key code where requested and click on the **Submit** button.

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2. Click on **Library**.
3. Click on **zSeries**.
4. Click on **Software**.
5. Click on **z/OS**.
6. Access the licensed book by selecting the appropriate element.

## Using LookAt to look up message explanations

LookAt is an online facility that allows you to look up explanations for z/OS messages and system abends.

Using LookAt to find information is faster than a conventional search because in most cases LookAt goes directly to the message explanation.

LookAt can be accessed from the Internet at:

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

or from a TSO command line.

To use LookAt as a TSO command, LookAt must be installed on your host system. You can obtain the LookAt code for TSO from a disk on your *z/OS Collection*, SK3T-4269, or from the LookAt Web site. To obtain the code from the LookAt Web site, do the following:

1. Go to <http://www.ibm.com/servers/eserver/zseries/zos/bkserv/lookat/lookat.html>.
2. Scroll to and click on the **News and Help** button.
3. Scroll to and click on the **Download LookAt from the Web** link.
4. Click on the ftp directory for the appropriate operating system and release.
5. Find the README file and follow its detailed instructions.

To find a message explanation from a TSO command line, simply enter: **lookat** *message-id* as in the following example:

```
lookat iec192i
```

This results in direct access to the message explanation for message IEC192I.

**Note:** Some messages have information in more than one book. For example, IEC192I has routing and descriptor codes listed in *z/OS MVS Routing and Descriptor Codes*. For such messages, LookAt prompts you to choose which book to open.

---

# Summary of Changes

## **Summary of Changes for GA22-7565-01 z/OS Version 1 Release 2**

The book contains information previously presented in GA22-7565-00, which supports z/OS Version 1 Release 1.

### **New Information**

“Favor 31-Bit Application Enhancement” on page 5 contains important changes that you must know about.

“Migration Actions Required” on page 8 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. Technical changes or additions to the text and illustrations are indicated by a vertical line to the left of the change.

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 GA22-7565-00 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.



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# 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 9. 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 10.

#### 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 20.

- 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 20 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 LNKLST 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.

---

### Migration Considerations for z/OS Version 1 Release 2

#### 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 (CEECOPT) 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-line or relies on the STACK residing in storage below-the-line.
- Users of CEEPIPI subroutine environments. If the CEEPIPI 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 CEEPIPI table or invoked using the CEEPIPI call\_sub\_addr function.

The following are recommended actions to address the migration concerns:

- Link a CEEUOPT specifying ALL31(OFF) and STACK(,BELOW,,) with the main routines of each application that will 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 CEEPIPI subroutine environments that will 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)

## Migrating from Another Language Environment Release

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)

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.

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## Upward Compatibility and Language Environment Migration

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 Version 1 Release 3 (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 1.3 no longer works after you install the current release of Language Environment), you should report them to IBM.

Most load modules will run compatibly 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.

However, there are some pre-Language Environment 1.3 compatibility exceptions. For example, load modules that were generated with AD/Cycle COBOL/370 and linked with LE/370 Release 1 must be relinked with a later release of Language Environment. See *COBOL for OS/390 & VM Compiler and Run-Time Migration*

## Migrating from Another Language Environment Release

*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 1.3 or earlier must recompile any applications that reference the following symbolic feedback codes:

|        |        |        |        |
|--------|--------|--------|--------|
| CEE36U | CEE36V | CEE370 | CEE371 |
| CEE372 | CEE373 | CEE374 | CEE375 |
| CEE58Q | CEE58R | CEE58S |        |

Users migrating to OS/390 V2R10 or later 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.

Users migrating to OS/390 V2R9 and later from a release prior to OS/390 V2R9 may 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 *COBOL for OS/390 & VM Compiler and Run-Time Migration Guide*.

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## 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 2 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.

### Migration Actions Required

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*.

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## 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.

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### 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 will 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*
- *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*
- *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 COBOL for OS/390 & VM or COBOL for MVS & 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.<br><br>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>PL/I for MVS &amp; 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.<br><br>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>PL/I for MVS &amp; 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 *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*, *z/OS C/C++ Compiler and Run-Time Migration Guide*, or *IBM C for VM/ESA 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 10)
- 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* or *IBM C for VM/ESA Compiler and Run-Time Migration Guide*.

## Migrating COBOL Programs to Language Environment

Table 3 contains a subset of COBOL compatibility exceptions. See *COBOL for OS/390 & VM Compiler and Run-Time Migration Guide* for more migration information.

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 COBOL for OS/390 & VM, COBOL for MVS & VM, or COBOL/370. |
| OS/VS COBOL programs that use ILC with FORTRAN           | Upgrade the COBOL source code to COBOL for OS/390 & VM, COBOL for MVS & VM, or COBOL/370. |
| VS COBOL II programs that use ILC with C or PL/I         | See Table 2 on page 10 for information about migration aids for each language.            |

## 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"> <li>• Continue to link-edit and run under VS FORTRAN Version 2 Release 5 or 6, or</li> <li>• Remove the EC option from your source, if possible, then recompile and run with Language Environment.</li> </ul> |
| 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 10 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* 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"> <li>• Main load modules for MVS non-shared library, non-CICS, nonmultitasking</li> </ul> |

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.<br><br>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. |

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### 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 *COBOL for OS/390 & VM Compiler and Run-Time Migration Guide*.



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## 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.

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### 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 16                      |
| Fortran             | Table 8 on page 18                      |
| PL/I                | Table 9 on page 19                      |

### 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),<br>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<br>STAE   NOSTAE | TRAP(ON,SPIE)<br>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>COBOL for OS/390 &amp; 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"> <li>• 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).</li> <li>• 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"> <li>– The first program invoked by ISPF is a COBOL program; a Language Environment reusable environment is established.</li> <li>– At another point, ISPF invokes a PL/I or C program; the initialization of the PL/I or C program will fail.</li> </ul> </li> <li>• If many COBOL programs are run under the same z/OS task, “out of region” 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.</li> <li>• Language Environment does not produce storage and run-time options reports unless STOP RUN is issued to end the enclave.</li> </ul> |
| SIMVRD   NOSIMVRD   | SIMVRD   NOSIMVRD                      | SIMVRD   NOSIMVRD provides behavior compatible with the VS COBOL II SIMVRD   NOSIMVRD option.   |
| SPOUT   NOSPOUT     | RPTOPTS(ON   OFF),<br>RPTSTG(ON   OFF) | Storage reports are directed to the ddname specified in the Language Environment option MSGFILE. For more information, see <i>COBOL for OS/390 &amp; 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)<br>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>COBOL for OS/390 &amp; 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.<br><br>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<br>STAE   NOSTAE | TRAP(ON,SPIE)<br>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)<br>XUFLOW(OFF)    | There is no automatic mapping of XUFLOW to the Language Environment XUFLOW.<br><br>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)<br>RPTOPTS(ON   OFF) | RPTSTG(ON   OFF) and RPTOPTS(ON   OFF) provide behavior compatible with REPORT   NOREPORT.  |
| SPIE   NOSPIE<br>STAE   NOSTAE | TRAP(ON,SPIE)<br>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 22. 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)<br><br>48K,8K,ANY,FREE (Fortran)                        | 4K,4080,ANY,FREE                                     | 4K,4080,ANY,FREE             | 1, 5   |
| 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      |
| 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,<br>NOAUTOTAG                              | NOAUTOCVT,<br>NOAUTOTAG   | N/A  | N/A                          | 12     |
| FLOW          | NOFLOW   | FLOW  | N/A  | N/A                          | 3, 7   |
| HEAP          | 32K,32K,ANY,<br>KEEP,8K,4K                           | 32K,32K,ANY,<br>KEEP,8K,4K (C,<br>COBOL, Multi, PL/I)<br><br>4K,4K,ANY,KEEP,<br>8K,4K (Fortran) | 4K,4080,ANY,<br>KEEP,4K,4080                         | 4K,4080,ANY,<br>KEEP,4K,4080 | 1, 5   |
| HEAPCHK       | OFF,1,0,0  | OFF,1,0,0   | OFF,1,0,0  | OFF,1,0,0                    | 1      |
| HEAPOOLS      | OFF,8,10,32,10,<br>128,10,256,10,<br>1024,10,2048,10 | User-defined  | OFF,8,10,32,10,<br>128,10,256,10,<br>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,<br>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<br>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,<br>KEEP, 512K,128K  | 128K,128K,ANY,KEEP,<br>512K,128K (C,<br>Fortran, Multi, PL/I)<br><br>64K,64K,ANY,KEEP<br>(COBOL) | 4K,4080,ANY,KEEP,<br>512K,128K     | 4K,4080,ANY,KEEP,<br>512K,128K   | 1, 20, 23         |
| STORAGE      | NONE,NONE,<br>NONE,0K              | NONE,NONE,<br>NONE,0K  | NONE,NONE,<br>NONE,0K              | NONE,NONE,<br>NONE,0K  | 1, 22, 25         |
| TERMTHDACT   | TRACE,,96                          | TRACE,,96 (C,<br>Fortran, Multi, PL/I)<br><br>UATRACE,,96<br>(COBOL)                             | TRACE,CESE,96                      | TRACE,CICSDDS,96<br>(C, Fortran, Multi,<br>PL/I)<br><br>UATRACE,CIDSDDS,<br>96 (COBOL) | 1, 15, 21         |
| TEST         | NOTEST (ALL,*,<br>PROMPT, INSPREF) | NOTEST (ALL,*,<br>PROMPT, INSPREF)   | NOTEST (ALL,*,<br>PROMPT, INSPREF) | NOTEST (ALL,*,<br>PROMPT, INSPREF)   | 1                 |
| THREADHEAP   | 4K,4K,ANY,KEEP                     | 4K,4K,ANY,KEEP   | N/A                                | N/A  | 1                 |
| THREADSTACK  | OFF,4K,4K,ANY,KEEP,<br>128K,128K   | OFF,4K,4K,ANY,KEEP,<br>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,<br>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 COBOL for OS/390 & VM Compiler and Run-Time Migration Guide*.

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

---

## 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*
- *IBM C for VM/ESA Compiler and Run-Time Migration Guide*
- *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*
- *z/OS Language Environment Programming Guide*

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### 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. When you customize the locale, time functions preserve the time and date and

## Other Considerations

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* 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*, 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.

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## 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 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*.



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## 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 work with OS/VS COBOL and some work with VS COBOL II, but many of them cannot 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

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

## z/OS

For individual elements or features of z/OS that require Language Environment, please refer to the 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"> <li>• Network Management Agent</li> <li>• ASUITE - a suite of APPC applications shipped with VTAM <ul style="list-style-type: none"> <li>– ANAME - a 6.2 based name server</li> <li>– ACPY - a 6.2 file copy routine</li> <li>– AFTP - a 6.2 based FTP application</li> <li>– APING - an APPC PING application</li> </ul> </li> <li>• AnyNet feature <ul style="list-style-type: none"> <li>– SNA over IP</li> <li>– Sockets over SNA</li> </ul> </li> </ul> |
| 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.<br><br>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.<br><br>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. |
| Infoform 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   |
| Transmission Control Protocol/Internet Protocol (TCP/IP) for MVS | 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                        |

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## 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 |

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## 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<br>Maintenance/Standard<br>Solution (PM/SS) (MVS/ESA) | Yes     |          |
| System Vision Impact<br>Analysis                                  | Yes     |          |
| System Vision JCL VIEW  | Yes     |          |
| System Vision Program<br>Inventory                                | Yes     |          |
| System Vision Upgrade Unit  | Yes     |          |

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## 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     |                                     |

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## 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     | Advisor Technology Services will support AMtrust in a Language Environment environment if the customer compiles using the CMPR2 option with COBOL/370. |

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## 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     |

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## 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.amsoftware.com>

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

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## 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 |

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### 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 |

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### 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     |   |

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### 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 |

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## 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 |

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## 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) |

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## 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     |          |

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### 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 |

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### 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  |

## Enabled Vendor Tools

| Product       | Enabled | Comments   |
|---------------|---------|--|
| Xpediter/CICS | Yes     | XPEDITER/CICS 6.6 works with Language Environment in compatibly mode<br>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  |

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## 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 |

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## 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 |

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## 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     |          |

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### 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     |          |

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### 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     |          |

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### 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.   |

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### 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     |                                |

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### 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. |

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### 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     |          |

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## 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     |          |

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## 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     |          |

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## 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. |

## 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 |

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## 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<br>11: Yes<br><br>Version FILE<br>15: No | Product is a Document Distribution product.<br>Product is written in COBOL and Assembler language |

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## 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

**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     |          |

## Programart Corporation

**NAME:** Programart Corporation  
**ADDRESS:** 124 Mount Auburn Street, University Place, Cambridge, MA 02138  
**PHONE:** (617) 661-3020  
**FAX:** (617) 498-4010  
**WEB SITE:** <http://www.programart.com>

| Product          | Enabled | Comments |
|------------------|---------|----------|
| STROBE (MVS/ESA) | 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     |  |
| 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 |

## Enabled Vendor Tools

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

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### Software AG Worldwide Headquarters

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

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

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### 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 |

## Enabled Vendor Tools

| Product   | Enabled | Comments                                   |
|-----------|---------|--|
| JCLPLUS!  | N/A     | No known Language Environment dependencies |
| XREFPLUS! | N/A     | No known Language Environment dependencies |

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## 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>

| 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     |   |

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## 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

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## Appendix B. Notices

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This book documents intended Programming Interfaces that allow the customer to write programs to obtain the services of Language Environment in z/OS.

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- CICS
- CICS/ESA
- CICS/MVS
- COBOL/370
- DATABASE2
- DB2
- DFSMS/MVS
- DFSMSdfp
- DFSMSdss
- DFSMSHsm
- DFSMSrmm
- DFSORT
- DisplayWrite
- ESCON
- GDDM
- IBM
- IBMLink
- IMS
- IMS/ESA
- Language Environment
- MQSeries
- MS
- MVS
- MVS/ESA
- OfficeVision/MVS
- OfficeVision/VM
- Open Class
- OpenEdition
- OS/390
- Print Services Facility
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- VM/ESA
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## Bibliography

This section lists the books in the Language Environment library and other publications that may be helpful when using Language Environment.

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### Language Products Publications

#### ***z/OS Language Environment***

*z/OS Language Environment Concepts Guide*, SA22-7567  
*z/OS Language Environment Programming Guide*, SA22-7561  
*z/OS Language Environment Programming Reference*, SA22-7562  
*z/OS Language Environment Customization*, SA22-7564  
*z/OS Language Environment Debugging Guide*, GA22-7560  
*z/OS Language Environment Run-Time Migration Guide*, GA22-7565  
*z/OS Language Environment Writing Interlanguage Applications*, SA22-7563  
*z/OS Language Environment Run-Time Messages*, SA22-7566  
*z/OS Language Environment Vendor Interfaces*, SA22-7568

#### ***z/OS C/C++***

*C/C++ Language Reference*, SC09-4815  
*z/OS C/C++ Compiler and Run-Time Migration Guide*, GC09-4913  
*z/OS C/C++ Programming Guide*, SC09-4765  
*z/OS C/C++ User's Guide*, SC09-4767  
*z/OS C/C++ Run-Time Library Reference*, SA22-7821  
*z/OS C/C++ Messages*, GC09-4819  
*IBM Open Class Library User's Guide*, SC09-4811  
*IBM Open Class Library Reference*, SC09-4812

#### ***COBOL for OS/390 & VM***

*COBOL for OS/390 & VM Licensed Program Specifications*, GC26-9044  
*COBOL for OS/390 & VM Customization under OS/390*, GC26-9045  
*COBOL for OS/390 & VM Language Reference*, SC26-9046  
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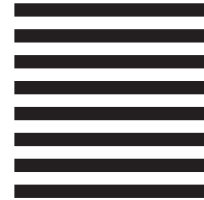
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