z/OS

IBM

Planning for Installation

Version 1 Release 13

> **Note**
>
> Before using this information and the product it supports, be sure to read the general information under "Notices" on page 169.

This is a major revision to GA22-7504-26. as updated September 2012.

This edition applies to version 1 release 13 modification 0 of IBM z/OS (product number 5694-A01) and to all subsequent releases and modifications until otherwise indicated in new editions.

This edition replaces GA22-7504-26.

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About this document

This document helps you prepare to install z/OS® (5694-A01) by giving you information you need to write an installation plan. To *install* means to perform the tasks necessary to make the system operational, starting with a decision to either install for the first time or upgrade, and ending when the system is ready for production. An *installation plan* is a record of the actions you need to take to install z/OS.

Who should read this document

This document is intended for experienced z/OS personnel planning to install z/OS Version 1 Release 13 (V1R13). By "experienced" we mean that the reader's experience consists of installing and managing the z/OS operating system, subsystems, network products, non-IBM products, and other software that runs with z/OS.

How to use this document

Use this document as a reference as you create your installation plan. Although this document is not a step-by-step guide to planning an installation, its organization is generally chronological. For example, learning is presented first, driving system requirements are presented before target system requirements, and so forth.

If you would like a more detailed list of activities than what is presented in the body of this document, see Appendix A, "Installation checklist," on page 119.

Related information

The following documents can help you plan and perform a system upgrade:
- *z/OS Introduction and Release Guide*
- *z/OS Migration*
- *z/OS Summary of Message and Interface Changes*
- *ServerPac: Installing Your Order* (for ServerPac orders) and *z/OS Program Directory* (for CBPDO orders)

See *z/OS Information Roadmap* for a list of titles and order numbers of all the z/OS product documents, descriptions of the documents, information about the media in which they're available (CD, DVD, printed, or Internet), and how to get copies.

The documents previously named, as well as the rest of the z/OS product documents, are online at the z/OS Internet Library site. The documents are provided in BookManager® form served up by Library Server. You can browse or download them. If you download them, you can browse them on your workstation using any of the BookManager readers. The documents are also provided in Portable Document Format (PDF) form. You can download them and then print (or browse) them on almost any workstation platform using the Adobe Acrobat Reader, which is available free from the Web. Or, with the Infoprint Server feature of z/OS and the Infoprint Transforms to AFP V2 for z/OS (5655-N60) product, you can transform PDF files on z/OS to AFP format and print them on high-speed AFP printers.

Tip: The latest version of any document can be found at the Internet Library. CDs and DVDs are not updated as quickly or frequently as the Internet Library.

The z/OS Internet Library is at http://www.ibm.com/systems/z/os/zos/bkserv/.

At the z/OS Internet Library you will also find:
- An online document containing DOC (documentation) APARs and ++HOLD for documentation changes from PTF cover letters.
- LookAt. LookAt allows you to quickly look up explanations for z/OS messages, system abends, and some codes.

Two other sources of information are:
- IBM® Redbooks®, which are developed and published by the IBM International Technical Support Organization (ITSO). These documents, named for the color of their covers, are "how to" documents written by very experienced IBM professionals from all over the world. You can find IBM Redbooks at http://www.ibm.com/redbooks.
- "Flashes", which are articles written by IBM Systems Center personnel. Flashes alert customers and IBM personnel to significant new technical developments and guidance for the installation, use, and maintenance of IBM products. You can find flashes at http://www.ibm.com/support/techdocs.

How to send your comments to IBM

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1. Send an email to mhvrcfs@us.ibm.com
2. Visit the Contact z/OS web page at http://www.ibm.com/systems/z/os/zos/webqs.html
3. Mail the comments to the following address:
   IBM Corporation
   Attention: MHVRCFS Reader Comments
   Department H6MA, Building 707
   2455 South Road
   Poughkeepsie, NY 12601-5400
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4. Fax the comments to us as follows:
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- Your name and address
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   GA22-7504-27
- The topic and page number related to your comment
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If you have a technical problem

Do not use the feedback methods listed above. Instead, do one of the following:
- Contact your IBM service representative
- Call IBM technical support
- Visit the IBM support portal at http://www.ibm.com/systems/z/support/

Summary of changes

This topic summarizes the changes made to this document. This topic does not summarize the changes made to the product; for product changes, see "Summary of changes for the z/OS installation planner" on page 40.

Changes made in z/OS Version 1 Release 13 as updated September 2012

This document contains information previously presented in GA22-7504-27, which supports z/OS Version 1 Release 13 and GA22-7504-25, which supports z/OS Version 1 Release 13.

New information:

Information has been added for the Standard FTP (FTP) and Secure FTP (FTPS) processing. See Chapter 3, "Preparing the driving system," on page 53.

This document contains other technical, 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.

Changes made in z/OS Version 1 Release 13 as updated September 2012

This document contains information previously presented in GA22-7504-26, which supports z/OS Version 1 Release 13 and GA22-7504-25, which supports z/OS Version 1 Release 13.

New information:
- Information about the IBM zEnterprise EC12 (zEC12) is new.
- "Two-year release cycle" on page 18 is new.
- Information about the Product ServerPac option is new. See "Product ServerPac support" on page 23.
- Information about the system logger z/OS IBM zAware log stream client is new. See Appendix C, "Hardware requirements for running z/OS V1R13," on page 141.

Changed information:
- See "Changes in z/OS V1R13 updates for September 2012" on page 40.
- "List of base elements and optional features" on page 2 has been updated.
- "Service policy" on page 33 has been updated.
- "ServerPac and Product ServerPac service level" on page 33 has been updated
- Table 13 on page 130 has been updated.
- Appendix B, "Software requirements for running z/OS V1R13," on page 127 has been updated.
- Appendix C, "Hardware requirements for running z/OS V1R13," on page 141 has been updated.

This document 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.

Changes made in z/OS Version 1 Release 13 as updated September 2011

This document contains information previously presented in GA22-7504-24, which supports z/OS Version 1 Release 12.

New information:
- Information about the IBM zEnterprise®™ 114 (z114) server is new.
- "Changes in z/OS V1R13" on page 40.

Changed information:
- Chapter 1, "Learning about z/OS," on page 1 has been updated.
- Updates have been made to reflect these documentation changes: *ServerPac: Installing Your Order* and *CBPDO Memo to Users Extension* are no longer shipped in hardcopy format. These documents are now available in PDF format on a DVD that also includes the program directories. See "Changes in z/OS V1R13" on page 40.
- "HFS or zFS target volume" on page 105, "Decide whether to merge data sets" on page 111, and "Update SMP/E DDDEFs" on page 113 in Chapter 6, "Preparing for future installations," on page 93 have been updated to provide information that user-defined data sets can also be used for the DDDEF names and file system data sets.
- Updates have been made to reflect that program directories are no longer available as content within tape orders. This information is now available in PDF format on a separate DVD.
- The function levels (last time changed) of the elements and features changed in z/OS V1R13 have been updated. See "List of base elements and optional features" on page 2.
- Information about DVD delivery requirements has been updated in "Identifying driving system software requirements for installing z/OS using ServerPac or dump-by-data-set SystemPac" on page 54.
- Information about DVD delivery requirements has been updated in "Identifying driving system software requirements for installing z/OS using full volume dump SystemPac" on page 61.
- Information about DVD delivery requirements has been updated in "Identifying driving system software requirements for installing z/OS using CBPDO" on page 63.
- Table 12 on page 128 has been updated.
- Table 13 on page 130 has been updated.

Deleted information:
- See "Changes in z/OS V1R13" on page 40.

This document 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.

Changes made in z/OS Version 1 Release 12 as updated January 2011

This document contains information previously presented in , GA22-7504-23, which supports z/OS Version 1 Release 12.

New information:
- IEAVFTED REXX exec requirements have been added to Table 13 on page 130.
- Information has been added to reflect DVD as a new delivery medium available for the Customized Offerings Driver (5751-COD).

Changed information:
- Chapter 6, "Preparing for future installations," on page 93 has been updated.
- Table 13 on page 130 has been updated.

Deleted information:
- References to 34*xx* tapes have been removed when referring to the Customized Offerings Driver (5751-COD). The Customized Offerings Driver (5751-COD) is no longer available on 3480, 3480C, and 3490E tapes.

This document 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.

Changes made in z/OS Version 1 Release 12 as updated September 2010

This document contains information previously presented in GA22-7504-22, which supports z/OS V1R11.

New information:
- All information about the IBM zEnterprise™ 196 (z196) server is new.
- "Changes in z/OS V1R12" on page 42 is new.
- Information has been added to reflect DVD as a new delivery medium available with zOS V1R12.

Changed information:
- The function levels (last time changed) of the elements and features changed in z/OS V1R12 have been updated. See "List of base elements and optional features" on page 2.
- The "Readers' Comments - We'd Like to Hear from You" section at the back of this publication has been replaced with a new section, "How to send your comments to IBM." The hardcopy mail-in form has been replaced with a page that provides information appropriate for submitting readers comments to IBM.

Deleted information:
- msys for Setup is no longer part of z/OS. All references to msys for Setup have been removed.
- References to 34*xx* tapes have been removed when referring to delivery of z/OS. z/OS is no longer delivered on 3480, 3480C, and 3490E tapes.

This document 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.

Changes made in z/OS Version 1 Release 11 as updated January 2010

This document contains information previously presented in GA22-7504-21, which supports z/OS V1R11.

New information:
- Information has been added to "Decide whether to merge data sets" on page 111.
- Information has been added to Appendix B, "Software requirements for running z/OS V1R13," on page 127.

Changed information:
- Table 12 on page 128 and Table 13 on page 130 have been updated.
- In Appendix B, "Software requirements for running z/OS V1R13," on page 127, the reference number of the Technote associated with Tivoli® OMEGAMON® XE products has been corrected. The correct number is 13824936. The Technote is referred to in Table 12 on page 128.

This document 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.

Changes made in z/OS Version 1 Release 11 as updated September 2009

This document contains information previously presented in GA22-7504-20, which supports z/OS V1R10.

New information:
- "Changes in z/OS V1R11" on page 43 is new.
- A PTF, along with underlying LPAR firmware support, now enables the autoIPL function to be used in configurations where an SFM policy is active. For requirements, see the BCP requirements in Appendix C, "Hardware requirements for running z/OS V1R13," on page 141.

Changed information:
- The function levels (last time changed) of the elements and features changed in z/OS V1R11 have been updated. See Table 1 on page 3.

This document 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.

Changes made in z/OS Version 1 Release 10 as updated January 2009

This document contains information previously presented in GA22-7504-20, which supports z/OS V1R10.

New information:

- The following products and PTFs were added as software requirements in Table 12 on page 128:
  - CICS/TS V2R3 (5697-E93) and PTF UK40125 for APAR PK59274. (Note that this table entry has been removed from this document because service support for CICS/TS V2R3 was withdrawn, effective 30 September 2009.)
  - PTF UK40130 (APAR PK59275) for product CICS/TS V3R1 (5655-M15)
  - PTF UK40131 (APAR PK59277) for product CICS/TS V3R2 (5655-M15)

This document 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.

Changes made in z/OS Version 1 Release 10 as updated November 2008

This document contains information previously presented in GA22-7504-19, which supports z/OS V1R10.

New information:
- All information about the IBM System z10® Business Class (z10™ BC) server is new.
- The Web deliverable *Cryptographic Support for z/OS V1R8-R10 and z/OS.e V1R8* was added to Table 3 on page 19.
- In a study at IBM, the minimum amount of real storage required to IPL z/OS V1R10 was 128 MB. This information was added to "Processor storage" on page 75.
- The following products and PTFs were added as software requirements in Table 12 on page 128:
  - IMS™ V9 (5655-J38) and PTF UK41224 (for APAR PK63000)
  - IMS V10 (5635-A01), PTF UK38953 (for APAR PK65837), and PTF UK41225 (for APAR PK70721)
  - Rational® Developer for System z® V7 (5724-T07), R0 PTF UK39150 (for APAR PK69367), and R1 PTF UK38808 (for APAR PK69073)
  - Softek Transparent Data Migration Facility (TDMF®) V4.1 and TDMF Zap PR31413 or TDMF PTF TD41802
  - Tivoli NetView® for z/OS V5 (5697-ENV), R2 PTF UA42145 (for APAR OA25534), and R3 PTF UA42146 (for APAR OA25534)
  - PTF UA43003 (for APAR OA25545) for R2 of the product Tivoli System Automation for z/OS V3 (5698-SA3), as well as the PTF for APAR OA26275 if the INGPLEX IPL function of R1 or R2 is being used
  - Websphere Developer for System z V6.00.00 (5724-L44) and the PTF for APAR PK74099
- If you use DB2® utilities and set DFSORT installation defaults using parmlib members, you need a PTF so that the utilities can obtain the correct set of DFSORT installation defaults. The PTF for DB2 V8 (5625-DB2) is UK39757 and the PTF for DB2 V9 (5635-DB2) is UK39811. (The APAR for both versions of DB2 is PK59399.) With the PTFs, DB2 utilities can use the DFSORT options from PARMLIB and ICEAM2, as appropriate. This information was added to the DFSORT requirements in Appendix B, "Software requirements for running z/OS V1R13," on page 127.

- Use of the automatic IPL (autoIPL) function on a System z9® server requires the no-charge SCSI IPL hardware feature (#9904) and hardware driver 67 or later. (Both are required.) This hardware requirement was added to the BCP requirements in Appendix C, "Hardware requirements for running z/OS V1R13," on page 141.
- To use the DFSMSdfp extended address volume (EAV) function, you need an IBM System Storage® DS8000® with Licensed Machine Code (LMC) level 5.4.0xx.xx (bundle version 64.0.xx.xx) or later. This specific LMC level was added to Appendix C, "Hardware requirements for running z/OS V1R13," on page 141.

Changed information:

- If you use the Customized Offerings Driver V2 (5655-M12) to install z/OS V1R10 on a z10 BC server, the minimum driver level is higher than with other servers. If you install on a z10 BC server, the minimum driver level is V2.4.1. For the other supported servers, the minimum driver level continues to be V2.4.

This document 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.

Changes made in z/OS Version 1 Release 10 as updated September 2008

This document contains information previously presented in GA22-7504-18, which supports z/OS V1R9.

Changed information:

- The function levels (last time changed) of the elements and features changed in z/OS V1R10 have been updated. See Table 1 on page 3.

This document 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.

Chapter 1. Learning about z/OS

z/OS (program number 5694-A01) is an operating system designed to meet the on demand challenges of the e-business world. z/OS delivers the highest qualities of service for enterprise transactions and data, and extends these qualities to new applications using the latest software technologies. Some highlights of z/OS are:

- The 64-bit z/Architecture® implemented by z/OS eliminates bottlenecks associated with the lack of addressable memory. 64-bit real (central) storage support eliminates expanded storage, helps eliminate paging, and may allow you to consolidate your current systems into fewer logical partitions (LPARs) or to a single native image.
- The Intelligent Resource Director (IRD) expands the capabilities of the workload manager (WLM) by enabling resources to be dynamically managed across LPARs based on workload priorities.
- A Workload License Charges pricing model offers you flexibility in how your software product licenses are managed and charged.
- HiperSockets™ provides high-speed, low-latency TCP/IP data communication across LPARs within the same System z server. HiperSockets acts like a TCP/IP network within the server, eliminating the need to use I/O subsystem operations and the need to traverse an external network to communicate between LPARs in the same server.

For additional z/OS overview information, see:
- *z/OS Introduction and Release Guide*
- The z/OS Web site: http://www.ibm.com/eserver/zseries/zos/

Introduction to z/OS elements and features

z/OS consists of base elements and optional features:

- The *base elements* (or simply *elements*) deliver essential operating system functions. The base elements are listed in Table 1 on page 3. When you order z/OS, you receive all of the base elements.
- The *optional features* (or simply *features*) are orderable with z/OS and provide additional operating system functions. The optional features are listed in Table 1 on page 3.

  Optional features are unpriced or priced:

  – *Unpriced features* are shipped to you **only if** you order them. If you plan to use any unpriced features, you should order them when you order your base elements. You must not wait until the next release becomes available. Once a release's base elements are no longer orderable, neither are its unpriced features.

    To make ordering easier, the number of unpriced features has been reduced from time to time, mainly through consolidation. The number of unpriced features is currently two: Communications Server Security Level 3 and z/OS Security Level 3.

  – *Priced features* are **always** shipped to you. When IBM packages your order, we *enable* the priced features that you ordered. These features are ready to use after you install z/OS (and customize it as needed). We *disable* the priced features that you did not order. Although they are installed on your system, you cannot use them. Later on, if you decide to use them, you notify IBM and

you enable them dynamically (which is known as *dynamic enablement*). You dynamically enable by updating parmlib member IFAPRD*xx* and you notify IBM by contacting your IBM representative.

Elements and features may be exclusive or nonexclusive:

- An element or feature is called *exclusive* to z/OS if it exists only within z/OS (not also as a separately orderable product) and if future functional enhancements will occur only within z/OS.

- An element or feature is called *nonexclusive* if it exists both (1) within z/OS and (2) as a separate product.

List of base elements and optional features

Table 1 on page 3 lists the base elements and optional features in z/OS V1R13. The following table headings are used:

Name The name of the element or feature. (To help you distinguish elements from features, element names in this column are **highlighted**.)

Last time changed (and equivalent product if nonexclusive)
The most recent release in which the element or feature changed. ("Change" means that one or more of the element's or feature's FMIDs [function modification identifiers] was changed, or that the element or feature was added to the system. New function added in program temporary fixes [PTFs] is not considered change.) Also, for nonexclusive elements and features, the equivalent level of the separate product is listed in parentheses.

The last release in which an element or feature changed is considered its function level. Do not confuse the function level with the product level. All elements and features are at the V1R13 product level but they are at various function levels. For example, the product level of z/OS BookManager READ is z/OS V1R13 but its function level is OS/390® V1R1 because OS/390 V1R1 was the last release in which it changed.

Type and description
- "Type" means the following:
  - Whether it is a base element or optional feature
  - Whether the base element or optional feature is exclusive (existing only within z/OS) or nonexclusive (also available as a separate product)
  - If an optional feature, whether it is priced or unpriced
  - If an optional feature, whether it supports dynamic enablement (note that all the priced features support dynamic enablement)
- "Description" is a brief description of the element or feature, and miscellaneous facts about it.

Table 1. Base elements and optional features in z/OS V1R13

Name	Last time changed (and equivalent product if nonexclusive)	Type and description
Alternate Library for REXX	z/OS V1R9 (see description about equivalent programs)	Type: base element, nonexclusive. Alternate Library for REXX enables users to run compiled REXX programs. This base element is nonexclusive to z/OS because the following programs provide equivalent functions: • The Alternate Library portion of the priced product IBM Library for REXX on zSeries® V1R4 (5695-014). The Alternate Library consists of FMIDs HWJ9143 (ENU) and JWJ9144 (JPN). These are the same FMIDs that are in the z/OS base element. • The no-fee Web download Alternate Library for REXX on z/OS. This base element was new in z/OS V1R9. Including it as a base element in z/OS is intended to make it easier to use than the functionally equivalent programs listed above.
BCP	z/OS V1R13	Type: base element, exclusive. The Base Control Program (BCP) provides essential operating system services. The BCP includes the I/O configuration program (IOCP), the workload manager (WLM), system management facilities (SMF), the z/OS UNIX System Services (z/OS UNIX) kernel, the program management binder (FMID HPM7780), IBM Health Checker for z/OS, support for the Unicode Standard (FMID HUN7780), z/OS XML System Services (z/OS XML), Capacity Provisioning (FMID HPV7780), and System REXX for z/OS Base. The z/OS V1R13 RSM Enablement Offering web deliverable, planned for availability in the December 2012, provides additional exploitation when z/OS is running on a IBM zEnterprise EC12 (zEC12) server. These functions include: Flash Express® support, Pageable 1MB Large Page support, and 2 GB Large Page support (planned availability of 2 GB Large Page exploitation support is 1Q2013).
BDT	OS/390 V1R2	Type: base element, exclusive. Bulk Data Transfer (BDT) provides the base services that the optional BDT features (BDT File-to-File and BDT SNA NJE) need to transfer data from one computer system to another. You cannot activate any BDT functions until one or both of the optional BDT features is enabled.
BDT File-to-File	OS/390 V1R2	Type: optional feature, exclusive, priced, can be dynamically enabled. BDT File-to-File allows users at one z/OS system in a SNA network to copy data sets to or from another z/OS system in the network. This feature is related to the element BDT.
BDT SNA NJE	OS/390 V1R2	Type: optional feature, exclusive, priced, can be dynamically enabled. BDT SNA NJE allows JES3 users to transmit jobs, output, commands, and messages from one computer system to another within a SNA network. This feature is related to the element BDT and the feature JES3.

Table 1. Base elements and optional features in z/OS V1R13 (continued)

Name	Last time changed (and equivalent product if nonexclusive)	Type and description
BookManager BUILD	OS/390 V1R1 (BookManager BUILD/MVS V1R3, 5695-045)	Type: optional feature, nonexclusive, priced, can be dynamically enabled. BookManager BUILD creates softcopy documents that can be used by any of the BookManager products, such as BookManager READ or Library Server.
BookManager READ	OS/390 V1R1 (BookManager READ/MVS V1R3, 5695-046)	Type: base element, nonexclusive. BookManager READ is used to display, search, and manage online documents and bookshelves. A related optional feature is BookManager BUILD.
C/C++ without Debug Tool	z/OS V1R13	Type: optional feature, exclusive, priced, can be dynamically enabled. C/C++ without Debug Tool consists of: • XL C/C++ compiler • XL C/C++ application development utilities
CIM	z/OS V1R13	Type: base element, exclusive. Common Information Model (CIM) is a standard data model for describing and accessing systems management data in heterogeneous environments. It allows system administrators to write applications that measure system resources in a network with different operating systems and hardware. To enable z/OS for cross platform management, a subset of resources and metrics of a z/OS system are mapped into the CIM standard data model. CIM was new in z/OS V1R7. In z/OS V1R9, a new component was added that contains a Java™ programming interface for CIM client applications. In z/OS V1R10, all CIM components were consolidated under one single FMID, HPG7750. Transport layer security (TLS) encryption is performed for CIM by base element Communications Server. CIM does not implement any of its own encryption algorithms.
Communications Server	z/OS V1R13	Type: base element, exclusive, can be dynamically enabled. Communications Server supports secure TCP/IP, SNA, and UNIX networking throughout an enterprise. It gives you the ability to connect subsystems and applications to each other, and to connect network devices (such as terminals and printers) to the system. Communications Server consists of two components: IP Services and SNA Services. A related optional feature is Communications Server Security Level 3. For encryption, IP Services uses the SNMPv3 DES 56-bit and IP Sec DES 56-bit algorithms. IP Services also uses the System SSL component of Cryptographic Services for encryption services. SNA Services uses the limited DES algorithm for encryption.

Table 1. Base elements and optional features in z/OS V1R13 (continued)

Name	Last time changed (and equivalent product if nonexclusive)	Type and description
Communications Server Security Level 3	z/OS V1R13	Type: optional feature, exclusive, unpriced, cannot be dynamically enabled. This feature works in conjunction with the Communications Server base element to provide stronger encryption (greater than 64 bits) than that available without this feature. This feature uses the TDES and AES algorithms for encryption. The actual level of encryption that takes place with this feature installed can be configured to be less than the maximum level enabled by this feature. This feature is worldwide exportable subject to U.S. export regulations.
Cryptographic Services	z/OS V1R13	Type: base element, exclusive. Cryptography is the transformation of data to conceal its meaning. In z/OS, the base element Cryptographic Services provides the following base cryptographic functions: data secrecy, data integrity, personal identification, digital signatures, and the management of cryptographic keys. Keys as long as 56 bits are supported by this base element. (Keys longer than 56 bits are supported by the optional feature z/OS Security Level 3.) Cryptographic Services consists of the following components: • Integrated Cryptographic Service Facility (ICSF), which was last changed in z/OS V1R13. The Cryptographic Support for z/OS V1R12-V1R13 Web deliverable, provides additional function when z/OS is running on a zEC12 server. These functions include: Enterprise Security PKCS #11-Hardware Security Module (HSM), DUKPT for MAC and Data Encryption, Cipher Text Translate CCA Verb, PKDS/TKDS Constraint Relief, Random Number Cache, FIPS on Demand, and Wrapping Keys with Strong Keys.. • Open Cryptographic Services Facility (OCSF), which was last changed in z/OS V1R9. • PKI Services, which was last changed in z/OS V1R13. • System Secure Sockets Layer (SSL), which was last changed in z/OS V1R13. For encryption: • OCSF uses the RC2/RC4/RC5 40-56 bit and DES 56-bit algorithms. • PKI Services uses the RACF® component of optional feature Security Server, and the ICSF, OCSF, and System SSL components of base element Cryptographic Services. PKI Services uses the RSA, DSA, and DES 56-bit algorithms. • System SSL uses the RC2/RC4, DES through 56-bit, Diffie-Hellman, RSA, and DSA algorithms. • PKI Services and System SSL support keys generated with elliptic curve cryptography (ECC) algorithms. • PKI and SSL support ECC algorithms started from R12.

Table 1. Base elements and optional features in z/OS V1R13 (continued)

Name	Last time changed (and equivalent product if nonexclusive)	Type and description
DFSMSdfp	z/OS V1R13	Type: base element, exclusive. DFSMSdfp provides storage, data, program, and device management functions. Related optional features are DFSMSrmm, DFSMSdss, DFSMShsm, and DFSMStvs. In z/OS V1R9, the FMID for the English panels was eliminated and the panels were merged into the base FMID, which is HDZ1190.
DFSMSdss	z/OS V1R13	Type: optional feature, exclusive, priced, can be dynamically enabled. DFSMSdss copies and moves data for backup and recovery, and to reduce free-space fragmentation.
DFSMShsm (and DFSMSdss)	z/OS V1R13	Type: optional feature, exclusive, priced, can be dynamically enabled. DFSMShsm provides automated DASD storage management, including space management for low and inactive data, and availability management for accidental data loss caused by local and site disasters. DFSMShsm also lets you make effective use of tape media. DFSMShsm requires DFSMSdss. For this reason, DFSMShsm is not available by itself. If you want to use DFSMShsm, you must order the DFSMShsm/DFSMSdss combination. (DFSMSdss is also available by itself for those who do not want DFSMShsm.)
DFSMSrmm	z/OS V1R13	Type: optional feature, exclusive, priced, can be dynamically enabled. DFSMSrmm helps you manage your removable media as one enterprise-wide library across systems that can share DASD. DFSMSrmm also has a client/server function that enables a single enterprise-wide library without the need for shared DASD (c/s is via TCP/IP).
DFSMStvs	z/OS V1R13	Type: optional feature, exclusive, priced, can be dynamically enabled. DFSMS Transactional VSAM Services (DFSMStvs) enables batch jobs and CICS® online transactions to update shared VSAM data sets concurrently.
DFSORT	z/OS V1R12	Type: optional feature, exclusive, priced, can be dynamically enabled. DFSORT provides fast and easy sorting, merging, copying, reporting, and analysis of your business information, as well as versatile data handling at the record, field, and bit level. DFSORT also includes the high-performance ICEGENER facility, the versatile ICETOOL utility, Symbols, and multiple output capability with the powerful OUTFIL feature.

Table 1. Base elements and optional features in z/OS V1R13 (continued)

Name	Last time changed (and equivalent product if nonexclusive)	Type and description
Distributed File Service	z/OS V1R13	Type: base element, exclusive. Distributed File Service provides: • The zSeries File System (zFS). The zFS is a UNIX file system that can be used in addition to the hierarchical file system (HFS). zFS file systems contain files and directories that can be accessed with the z/OS hierarchical file system file APIs. zFS file systems can be mounted into the z/OS UNIX hierarchy along with other local (or remote) file system types (such as HFS, TFS, AUTOMNT, and NFS). The zFS does not replace the HFS; it is complementary to the HFS. As of z/OS V1R7, you can use any combination of HFS and zFS file systems. zFS can be used for the root file system. Because zFS has higher performance characteristics than HFS and is the strategic file system, HFS might no longer be supported in future releases and you will have to migrate the remaining HFS file systems to zFS. The zFS provides significant performance gains in most environments requiring files 8 KB in size or greater that are frequently accessed and updated. The access performance of smaller files is equivalent to that of the HFS. For all files, the zFS provides a reduced exposure to loss of updates. The zFS is a logging file system with a write pattern to disk that reduces the points of failure after a system outage. For additional information about the zFS, including how to migrate data from the HFS to the zFS, see *z/OS Distributed File Service zSeries File System Administration*. As of z/OS V1R11, zFS has the capability of running sysplex-aware for read/write mounted file systems. • Server message block (SMB) file/print serving support. The SMB support is based on the X/Open PC Interworking: SMB, Version 2. Included in the support is access to HFS, sequential, PDS, PDSE, and VSAM data sets from Windows XP Professional, Windows Terminal Server on Windows 2003, SUSE Linux with Samba, and Redhat Linux with Samba. Windows workstation users can also exploit z/OS printer capabilities using the SMB file/print server interface to the z/OS Infoprint Server feature. For the software necessary to use the DFS or SMB file/print serving support, as well as the other Distributed File Service functions, see Appendix B, "Software requirements for running z/OS V1R13," on page 127. The DFS and SMB support use the DES 56-bit algorithm for encryption.
EREP	OS/390 V1R1 (EREP MVS™ V3R5, 5658-260)	Type: base element, nonexclusive. The Environmental Record Editing and Printing Program (EREP) edits and prints reports for the records placed in the error recording data set (ERDS), helping IBM service representatives fix problems.
ESCON® Director Support	OS/390 V1R1	Type: base element, exclusive. ESCON Director Support enables the reporting of ESCON director device errors to z/OS.

Table 1. Base elements and optional features in z/OS V1R13 (continued)

Name	Last time changed (and equivalent product if nonexclusive)	Type and description
FFST™	OS/390 V1R2	Type: base element, exclusive. First Failure Support Technology™ (FFST) provides immediate notification and first failure data capture for software events.
GDDM®	OS/390 V1R2 (GDDM/MVS V3R2, 5695-167)	Type: base element, nonexclusive. GDDM provides presentation services and device-driving capability. It includes PCLK and REXX code. Related optional features are GDDM-Presentation Graphics Feature and GDDM-REXX. Other GDDM-associated products (IVU, GKS, IMD) are not in z/OS, but are separately orderable with z/OS.
GDDM-PGF	OS/390 V1R2 (GDDM/PGF V2R1.3, 5668-812)	Type: optional feature, nonexclusive, priced, can be dynamically enabled. GDDM-Presentation Graphics Feature (PGF) is a set of programs for creating presentation material in a variety of styles. This feature is related to the base element GDDM.
GDDM-REXX	OS/390 V1R2 (GDDM-REXX/MVS V3R2, 5664-336)	Type: optional feature, nonexclusive, priced, can be dynamically enabled. GDDM-REXX is a productivity tool that enables programmers to prototype GDDM applications and to create small routines and utility programs quickly and easily. This feature is related to the base element GDDM.
HCD	z/OS V1R13	Type: base element, exclusive. Hardware Configuration Definition (HCD) defines both the operating system configuration and the processor hardware configuration for a system. A related optional feature is HCM.
HCM	z/OS V1R13	Type: optional feature, exclusive, priced, can be dynamically enabled. Hardware Configuration Manager (HCM) is a workstation-based graphical user interface to the base element HCD.
HLASM	z/OS V1R10 (HLASM for z/OS and z/VM® and z/VSE® V1R6, 5696-234)	Type: base element, nonexclusive. High Level Assembler (HLASM) integrates almost all functions of past assemblers and provides extensions and improvements. A related optional feature is the HLASM Toolkit.
HLASM Toolkit	z/OS V1R10 (Toolkit feature of HLASM for z/OS and z/VM and z/VSE V1R6, 5696-234)	Type: optional feature, nonexclusive, priced, can be dynamically enabled. HLASM Toolkit provides tools to improve application development, debugging, and recovery. It is related to the base element HLASM.

Table 1. Base elements and optional features in z/OS V1R13 (continued)

Name	Last time changed (and equivalent product if nonexclusive)	Type and description
IBM HTTP Server	OS/390 V2R10 (but see description)	Type: base element, exclusive. IBM HTTP Server is the Web server for z/OS. It provides scalable, high performance Web serving for critical e-business applications. It supports Secure Sockets Layer (SSL) secure connections, dynamic caching using the Fast Response Cache Accelerator, multiple IP addresses, proxy authentication, and double-byte character set characters. IBM HTTP Server NA Secure is now a component of IBM HTTP Server. Before V1R6, it was an optional feature of z/OS. This packaging change was the only change to IBM HTTP Server in V1R6; there was no functional change.
IBM TDS	z/OS V1R13	Type: base element, exclusive. IBM Tivoli Directory Server for z/OS (IBM TDS) provides client access to an LDAP server. It consists of an LDAP server, an LDAP client, and LDAP client utilities. For encryption, IBM TDS uses the DES (56-bit) and MD5 encryption algorithms.
ICKDSF	z/OS V1R4 z990 Compatibility Support feature (ICKDSF for z/OS, z/OS.e, and OS/390 R17, 5655-257)	Type: base element, nonexclusive. The Device Support Facility (ICKDSF) enables you to perform functions needed for the installation and use of IBM DASD. ICKDSF was last changed in the z/OS V1R4 z990 Compatibility Support feature. This level was carried forward to the z/OS V1R4 z990 Exploitation Support feature and then to z/OS V1R5 and later, and is functionally equivalent to the R17 level of the ICKDSF product.
Infoprint Server	z/OS V1R13	Type: optional feature, exclusive, priced, can be dynamically enabled. Infoprint Server allows you to print files on z/OS printers from any workstation that has TCP/IP access. This feature consists of the following components: • IP PrintWay™ • NetSpool • Print Interface • Printer Inventory Manager • Transform Interface • z/OS Infoprint Central IBM recommends that you use the Infoprint Server feature's IP PrintWay component rather than the Communications Server base element's Network Print Facility (NPF) to reroute print data to an IP network. IP PrintWay provides improved function, capacity, performance, and usability over NPF.

Table 1. Base elements and optional features in z/OS V1R13 (continued)

Name	Last time changed (and equivalent product if nonexclusive)	Type and description
Integrated Security Services	z/OS V1R13	Type: base element, exclusive. Integrated Security Services provides base security functions for z/OS. Its components are: • Enterprise Identity Mapping (EIM), which was last changed in z/OS V1R10. This component allows you to map a user's identity on one system to the user's identity on another system. • Network Authentication Service, which was last changed in z/OS V1R13. Network Authentication Service uses the DES algorithm for encryption. • Open Cryptographic Enhanced Plug-ins (OCEP), which was last changed in z/OS V1R9. As of z/OS V1R13, Distributed Computing Environment (DCE) and Distributed Computing Environment Security Server (DCE Security Server) are removed from the system. IBM recommends the IBM WebSphere® Application Server, the IBM Network Authentication Service, and/or the IBM Directory Server as replacement strategies for each of the DCE technologies. See the DCE Replacement Strategies Redbook at http://www.ibm.com/redbooks.
ISPF	z/OS V1R13	Type: base element, exclusive. ISPF provides facilities for all aspects of host-based software development. ISPF has four major components: • Dialog Manager (DM). The Dialog Manager provides services to dialogs and end users. These services include display, variable services, input and output, user and application profiles, table management, system interface services, and dialog testing and debugging aids. • Program Development Facility (PDF). PDF provides services to assist dialog or application developers. These include edit and browse functions, a wide range of foreground and batch compilers, data set and catalog utilities, TSO command interfaces, and data set search and compare functions. • Software Configuration and Library Manager (SCLM). SCLM is a tool that controls, maintains, and tracks all of the software components of the application throughout the development cycle. • Client/Server component. The Client/Server component provides users who have a workstation running Windows or UNIX with a graphical user interface to ISPF application panels.
JES2	z/OS V1R13	Type: base element, exclusive. JES2 accepts the submission of work for the BCP. JES2 exercises independent control over its job processing functions, whereas JES3 exercises centralized control. A prior release of JES2 can be used with z/OS V1R13. See Table 9 on page 79.

Table 1. Base elements and optional features in z/OS V1R13 (continued)

Name	Last time changed (and equivalent product if nonexclusive)	Type and description
JES3	z/OS V1R13	Type: optional feature, exclusive, priced, can be dynamically enabled. JES3 accepts the submission of work for the BCP. JES3 exercises centralized control over its job processing functions, whereas JES2 exercises independent control. A prior release of JES3 can be used with z/OS V1R13. See Table 10 on page 79.
Language Environment®	z/OS V1R13	Type: base element, exclusive. Language Environment provides the run-time environment for programs generated with C, C++, COBOL, Fortran, and PL/I. Inclusion of Language Environment as a base element in z/OS does not replace the need for separate compilers. Language Environment uses the limited DES algorithm for encryption.
Library Server	z/OS V1R12	Type: base element, exclusive. Library Server converts BookManager and InfoCenter documents to HTML for display through a Web browser, and provides unified organization and searching of BookManager, PDF, and InfoCenter documents.
Metal C Runtime Library	z/OS V1R13	Type: base element, exclusive. The Metal C Runtime Library is a set of LPA-resident C functions that can be called from a C program created using the z/OS XL C compiler METAL option. This base element was new in z/OS V1R9.
MICR/OCR	OS/390 V1R1	Type: base element, exclusive. This element provides the device support code for various magnetic and optical devices.
NFS	z/OS V1R13	Type: base element, exclusive. Network File System (NFS) acts as a file server to workstations, personal computers, or other authorized systems in a TCP/IP network. It consists of a client and a server. It uses z/OS UNIX System Services (USS) sockets. NFS uses the Network Authentication Service component of Integrated Security Services for encryption. NFS is always enabled, even when the alternate base configuration is ordered. In z/OS V1R8, the NFS server and client FMIDs were merged into one FMID.

Table 1. Base elements and optional features in z/OS V1R13 (continued)

Name	Last time changed (and equivalent product if nonexclusive)	Type and description
OSA/SF	z/OS V1R4 z990 Compatibility Support feature	Type: base element, exclusive. Open Systems Adapter/Support Facility (OSA/SF) provides a user-friendly interface for monitoring and controlling the zSeries Open Systems Adapter feature, which provides network connectivity directly to local area networks (LANs) and wide area networks (WANs) that support IP and SNA protocols. OSA/SF supports Gigabit, Token Ring, Fast Ethernet, 1000Base-T Ethernet, 10 Gigabit Ethernet, and ATM features depending on the server on which z/OS runs. For details, see *zEnterprise System, System z10, System z9 and eServer zSeries OSA-Express Customer's Guide and Reference*, SA22-7935. OSA/SF was last changed in the z/OS V1R4 z990 Compatibility Support feature. This level was carried forward to the z/OS V1R4 z990 Exploitation Support feature and then to z/OS V1R5 and later. OSA/SF became exclusive with the introduction of the z/OS V1R4 z990 Compatibility Support feature.
RMF™	z/OS V1R13	Type: optional feature, exclusive, priced, can be dynamically enabled. Resource Measurement Facility™ (RMF) gathers data about z/OS resource usage and performance, and provides reports on any system in a sysplex.
Run-Time Library Extensions	z/OS V1R13	Type: base element, exclusive. Run-Time Library Extensions extends the run-time support provided by the Language Environment base element. It consists of : • Common Debug Architecture (CDA) libraries • Utilities • UNIX System Laboratories (USL) I/O Stream Library and USL Complex Mathematics Library
SDSF	z/OS V1R13	Type: optional feature, exclusive, priced, can be dynamically enabled. System Display and Search Facility (SDSF) provides you with information to monitor, manage, and control your z/OS system. If you use a prior release of JES2 or JES3 with z/OS V1R13, you must use the same prior release of SDSF with z/OS V1R13. See "Allowable JES-SDSF-BCP combinations" on page 79.
Security Server	z/OS V1R13	Type: optional feature, exclusive, priced, can be dynamically enabled. Security Server lets you control access to protected resources. Security Server contains one component, RACF. Security Server uses the limited DES, CDMF, RC 40-bit, RSA, and DSA algorithms for encryption.

Table 1. Base elements and optional features in z/OS V1R13 (continued)

Name	Last time changed (and equivalent product if nonexclusive)	Type and description
SMP/E	z/OS V1R13 (SMP/E for z/OS V3R6, 5655-G44)	Type: base element, nonexclusive. SMP/E is a tool for installing and maintaining software, and for managing the inventory of software that has been installed. The SMP/E product allows customers who are currently licensed for an earlier level of z/OS to order and install the latest level of SMP/E without having to upgrade their entire operating system. This allows products that run on z/OS to exploit the packaging and installation enhancements of SMP/E without requiring a later level of the operating system. This also allows customers to exploit new electronic delivery and installation technologies in SMP/E sooner. The SMP/E product is available at no additional charge to customers. The Planning and Migration Assistant (PMA), a component of SMP/E, can help you maintain, plan for, and order new releases of z/OS and other products. It provides reports that use IBM-supplied data, your SMP/E consolidated software inventory (CSI) data set, and a CustomPac inventory file. The PMA Web site is http://www.ibm.com/systems/z/os/zos/smpe/pma/.
TIOC	OS/390 V1R1	Type: base element, exclusive. TIOC allows console services and TSO/E to communicate with the terminal hardware.
TSO/E	z/OS V1R13	Type: base element, exclusive. Time Sharing Option/Extensions (TSO/E) provides an interactive terminal interface. As in prior releases of TSO/E, this element includes CLISTs and REXX, but does not include a REXX compiler.

Table 1. Base elements and optional features in z/OS V1R13 (continued)

Name	Last time changed (and equivalent product if nonexclusive)	Type and description
z/OS Security Level 3	z/OS V1R13	Type: optional feature, exclusive, unpriced, cannot be dynamically enabled. z/OS Security Level 3 provides strong encryption for z/OS. The components in this feature are: • IBM TDS Security Level 3, which was last changed in z/OS V1R13. This component works in conjunction with the IBM TDS base element to provide stronger encryption (greater than 64 bits) than that available without the z/OS Security Level 3 feature. This component uses the RC4, TDES, and Advanced Encryption Standard (AES) algorithms for encryption. • Network Authentication Service Level 3, which was last changed in z/OS V1R13. This component works in conjunction with the Network Authentication Service component of the Integrated Security Services base element to provide stronger encryption (greater than 64 bits) than that available without the z/OS Security Level 3 feature. This component uses the TDES and AES algorithms for encryption. • OCSF Security Level 3, which was last changed in z/OS V1R9. This component works in conjunction with the OCSF component of the Cryptographic Services base element to provide stronger encryption (greater than 64 bits) than that available without the z/OS Security Level 3 feature. This component uses the TDES, DES, and RC2/RC4/RC5 algorithms for encryption. • System Secure Sockets Layer (SSL) Security Level 3, which was last changed in z/OS V1R13. This component works in conjunction with the System SSL component of the Cryptographic Services base element to provide stronger encryption (greater than 64 bits) than that available without the z/OS Security Level 3 feature. This component uses the RC2/RC4, TDES, and AES algorithms for encryption. This feature is worldwide exportable subject to U.S. export regulations.
z/OS UNIX	z/OS V1R13	Type: base element, exclusive. z/OS UNIX System Services (z/OS UNIX) provides the standard command interface familiar to interactive UNIX users. This base element is made up of four components: • Application Services, which was last changed in z/OS V1R13. This component includes the Shell and Utilities, Debugger, and Parallel Environment. • Starting with z/OS V1R13, Connection Manager, which was last changed in OS/390 V2R7, is removed from the system. • Integrated Call Level Interface (ICLI), which was last changed in z/OS V1R6. • Starting with z/OS V1R13, Process Manager, which was last changed in OS/390 V2R7, is removed from the system.

Table 1. Base elements and optional features in z/OS V1R13 (continued)

Name	Last time changed (and equivalent product if nonexclusive)	Type and description
3270 PC File Transfer Program	OS/390 V1R2 (3270 PC File Transfer Program V1R1.1, 5665-311)	Type: base element, nonexclusive. 3270 PC File Transfer Program transfers files from the host to the workstation for offline data manipulation, updating, or correction or for the transfer and storage of local data in the host system.

Where are they now?

"Why can't I find that old base element in my new release?" you might ask. Or " I never heard of that feature; is it new?" Well, for reasons such as ordering simplification and technology improvements, elements and features come and go, components within them move around, and names change. See Table 2 for what has happened in z/OS V1R5 and later.

Table 2. Summary of element, feature, and component name changes, additions, deletions, and moves in z/OS V1R5 and later

Name	Change	When changed
Alternate Library for REXX	This is a new base element.	V1R9
AnyNet®	This function has been removed from the system. It was a part of the SNA Services component of base element Communications Server. AnyNet has not been enhanced in many years and has been supplanted by Enterprise Extender, which has superior function and performance.	V1R8
APPC Application Suite	This function has been removed from the system. It was a part of the SNA Services component of base element Communications Server. For most of the functions provided by the APPC Application Suite, more-robust alternative applications exist in modern integrated SNA/IP networks.	V1R9
BookManager BookServer	The name of this base element changed to Library Server.	V1R5
C/C++ IBM Open Class® Library	This base element has been removed from the system.	V1R5
C/C++ with Debug Tool	This optional feature has been removed from the system. For debugging tools, see http://www.ibm.com/software/awdtools/debugtool/.	V1R5
Capacity Provisioning	This is a new component of base element BCP. Its FMID is HPV7740.	V1R9
CIM	Common Information Model (CIM) was a new base element in V1R7.	V1R7
Cryptographic Services	This base element now includes the component PKI Services, which used to be in optional feature Security Server. The complete list of Cryptographic Services components is now ICSF, OCSF, PKI Services, and System SSL.	V1R5

Table 2. Summary of element, feature, and component name changes, additions, deletions, and moves in z/OS V1R5 and later (continued)

Name	Change	When changed
Distributed Computing Environment (DCE) and Distributed Computing Environment Security Server (DCE Security Server).	This base element has been removed from the system. IBM recommends the IBM WebSphere Application Server, the IBM Network Authentication Service, and/or the IBM Directory Server as replacement strategies for each of the DCE technologies. See the DCE Replacement Strategies Redbook at http://www.ibm.com/redbooks.	V1R13
Distributed Computing Environment (DCE) Application Support	This base element has been removed from the system. It facilitated the interaction between DCE clients and CICS or IMS regions. With the continued evolution of technology and accompanying changes in the marketplace, there is no need for this support. If similar function is required, IBM recommends that you use IBM WebSphere.	V1R13
DFSORT English and Japanese panels	The panels have been removed from DFSORT. For many years these panels were not enhanced, and they no longer matched the new functions added to DFSORT.	V1R10
Encina Toolkit Executive	This base element has been removed from the system. It provided a set of tools for developing client components of distributed transactional applications. Over time, the marketplace has moved to other technologies. This element was an enabler for DCE Application Support. There will be no replacement.	V1R6
Enterprise Identity Mapping (EIM)	This is a new component in the new base element Integrated Security Services. (The other components in Integrated Security Services previously existed in optional feature Security Server.)	V1R5
IBM Firewall Technologies	This component has been removed from the system. It was a Security Server component before V1R5 and an Integrated Security Services component in V1R6 and V1R7.	V1R8
IBM Health Checker for z/OS	This function is a component of base element BCP. It was initially available by PTF and download for z/OS V1R4, was integrated in base element msys for Operations in z/OS V1R5, was moved to the BCP in z/OS V1R7 (keeping its own FMID), had "and Sysplex" removed from the end of its name in z/OS V1R7, and was merged into the BCP base FMID in z/OS V1R8 (losing its own FMID).	V1R5, V1R7, V1R8
IBM HTTP Server NA Secure	This former unpriced optional feature is now a component of base element IBM HTTP Server.	V1R6
IBM Tivoli Directory Server for z/OS (IBM TDS)	This is a new base element in V1R8.	V1R8
IBM Tivoli Directory Server for z/OS (IBM TDS) Security Level 3	This component of optional feature z/OS Security Level 3 is a replacement for the component LDAP Security Level 3, which was added in V1R6.	V1R8

Table 2. Summary of element, feature, and component name changes, additions, deletions, and moves in z/OS V1R5 and later (continued)

Name	Change	When changed
IBM License Manager (ILM)	This base element has been removed from the system.	V1R5
Integrated Security Services	This base element, new in z/OS V1R5, is comprised of the new (in z/OS V1R5) component Enterprise Identity Mapping (EIM) and four former components of optional feature Security Server: DCE Security Server, LDAP Server (subsequently rewritten and added to IBM TDS in V1R8, and removed from Integrated Security Services in V1R11), Network Authentication Service, and OCEP.	V1R5
CIM Client for Java	This component (FMID JPG290B) of base element CIM is new in z/OS V1R9. It contains a Java programming interface for CIM client applications. (This component was subsequently [in z/OS V1R10] moved to the single CIM FMID HPG7750.)	V1R9
LDAP Security Level 3	This component of optional feature z/OS Security Level 3 was added in V1R6. In V1R8 it was replaced by IBM TDS Security Level 3.	V1R6 and V1R8
LDAP Server	The original LDAP Server component was in base element Integrated Security Services. In z/OS V1R8, this component was rewritten and added by PTF as a component of new base element IBM TDS (and subsequently integrated in z/OS in V1R9). In z/OS V1R11, the original LDAP Server (in Integrated Security Services) was removed from z/OS.	V1R8 and V1R11
Library Server	This is the new name of base element BookManager BookServer.	V1R5
Metal C Runtime Library	This is a new base element.	V1R9
msys for Operations	This base element has been removed from the system. A related component of the BCP called msys Support (FMID JBB772H) was also removed from the system.	V1R8
msys for Setup	This base element has been removed from the system.	V1R12
Network Authentication Service Level 3	This former optional feature is now a component of new optional feature z/OS Security Level 3. In addition, its name has been trimmed; "Security Server" is removed from the beginning of the name.	V1R5
OCSF Security Level 3	This former optional feature is now a component of new optional feature z/OS Security Level 3.	V1R5
Run-Time Library Extensions	This base element was new in z/OS V1R5.	V1R5

Table 2. Summary of element, feature, and component name changes, additions, deletions, and moves in z/OS V1R5 and later (continued)

Name	Change	When changed
Security Server	This optional feature had seven components but now has only one, RACF. The PKI Services component moved to the Cryptographic Services base element. The other five components moved to new base element Integrated Security Services. They are DCE Security Server, IBM Firewall Technologies (removed from the system in V1R8), LDAP Server (subsequently rewritten and added to IBM TDS in V1R8, and removed from Integrated Security Services in V1R11), Network Authentication Service, and OCEP. As of z/OS V1R11, LDAP Server is no longer a component of Integrated Security Services. IBM TDS, a base element introduced in z/OS V1R8, contains a rewritten LDAP Server.	V1R11
Security Server Network Authentication Service Level 3	This former optional feature is now a component of new optional feature z/OS Security Level 3. Also, it has a new name: Network Authentication Service Level 3 ("Security Server" was removed from the name).	V1R5
System SSL Security Level 3	This former optional feature is now a component of new optional feature z/OS Security Level 3.	V1R5
Text Search	This base element has been removed from the z/OS product but is available as a Web download because the Text Search function is still required by the DB2 UDB Text Extender feature of DB2 V8 (5625-DB2). Therefore, before you use this DB2 feature on z/OS V1R10, download and install the *Text Search* Web deliverable from the DB2 UDB Text Extender Web site: http://www.ibm.com/software/data/db2/extenders/text/te390/. (This is a different Web site than the one used before z/OS V1R7. The previous one was the z/OS downloads Web site.)	V1R6
z/OS Security Level 3	This unpriced optional feature was new in z/OS V1R5. It was a repackaging (no new functions), comprised of the formerly separate optional features Security Server Network Authentication Service Level 3 (but now without "Security Server" in its name), OCSF Security Level 3, and System SSL Security Level 3. In V1R6, a new component, LDAP Security Level 3, was added. (In V1R8, LDAP Security Level 3 was replaced by IBM TDS Security Level 3.)	V1R5
z/OS UNIX	The Connection Manager and Process Manager components are removed from the system.	V1R13

Two-year release cycle

z/OS V1R13 is the last z/OS release that IBM intends to deliver on an annual basis. The annual release cycle started in September 2004 with the general availability of z/OS V1R6. Before V1R6, a new release was delivered every six months. After z/OS V1R13, IBM intends to deliver a z/OS release every two years.

The change from a 12-month to a 24-month release cycle was announced in April 2012 and was in response to customer feedback that the 12-month release cycle was too short and that it complicated customer migration plans. Two year releases, in addition to benefiting customers, allow IBM to perform more platform (integration) testing for z/OS and related IBM middleware. With two-year releases

IBM continues to align the coexistence, migration, and fallback policy with the service policy. (See "Which releases are supported for coexistence, fallback, and migration?" on page 30.)

New z/OS functions continue to be delivered between releases through the normal maintenance stream or as web deliverables. In addition, significant new functions may be delivered between releases as features of the product. For a summary of web deliverables and between-release features, see Table 3.

Table 3. z/OS and z/OS.e deliverables from September 2002 through September 2012. Full releases (as opposed to enhancements) are **highlighted**.

Deliverable	General availability	Delivery method
z/OS V1R4 and **z/OS.e V1R4**	27 September 2002	New release of products
z/OS V1R4 z990 Compatibility Support. This deliverable is replaced by z/OS V1R4 z990 Exploitation Support.	June 2003	Unpriced feature of z/OS V1R4
z990 Compatibility for Selected Releases (for z/OS V1R3, z/OS.e V1R3, z/OS V1R2, and OS/390 V2R10)	June 2003	Web
z990 Cryptographic CP Assist Support (for z/OS V1R3 and z/OS.e V1R3). This deliverable is replaced by z990 Cryptographic Support, which in turn is replaced by z990 and z890 Enhancements to Cryptographic Support.	June 2003	Web
z/OS.e V1R4 z990 Coexistence. This deliverable is replaced by z/OS.e V1R4 z990 Coexistence Update.	June 2003	Unpriced feature of z/OS.e V1R4
z/OS V1R4 DFSMStvs and *z/OS.e V1R4 DFSMStvs*	June 2003	Priced features of z/OS V1R4 and z/OS.e V1R4
z990 Cryptographic Support (for z/OS V1R4, z/OS.e V1R4, z/OS V1R3, z/OS.e V1R3, z/OS V1R2, and OS/390 V2R10). This deliverable replaces z990 Cryptographic CP Assist Support, and is replaced by z990 and z890 Enhancements to Cryptographic Support.	September 2003 for z/OS V1R4, z/OS.e V1R4, and z/OS V1R2; October 2003 for z/OS V1R3 and z/OS.e V1R3; November 2003 for OS/390 V2R10	Web
z/OS V1R4 z990 Exploitation Support. This deliverable replaces z/OS V1R4 z990 Compatibility Support.	October 2003	Unpriced feature of z/OS V1R4
z/OS.e V1R4 z990 Coexistence Update. This deliverable replaces z/OS.e V1R4 z990 Coexistence.	October 2003	Unpriced feature of z/OS.e V1R4

Table 3. z/OS and z/OS.e deliverables from September 2002 through September 2012 (continued). Full releases (as opposed to enhancements) are **highlighted**.

Deliverable	General availability	Delivery method
z/OS V1R4 Consoles Enhancements and *z/OS.e V1R4 Consoles Enhancements*	March 2004	Unpriced features of z/OS V1R4 and z/OS.e V1R4
z/OS V1R5 and **z/OS.e V1R5**	March 2004	New release of products
z990 and z890 Enhancements to Cryptographic Support (for z/OS V1R6, z/OS.e V1R6, z/OS V1R5, z/OS.e V1R5, z/OS V1R4, z/OS.e V1R4, z/OS V1R3, z/OS.e V1R3, z/OS V1R2, and OS/390 V2R10). This deliverable replaces both z990 Cryptographic CP Assist Support and z990 Cryptographic Support.	May 2004 except September 2004 for z/OS V1R6 and z/OS.e V1R6	Web
z/OS V1R6 and **z/OS.e V1R6** **Note: Annual releases begin.**	September 2004	New release of products
z/OS and z/OS.e Text Search. This deliverable supports z/OS V1R6 and z/OS.e V1R6, and later.	September 2004	Web
LDAP Enhancements for z/OS V1R4/R5 and z/OS.e V1R4/R5	November 2004	Web
ICSF 64-bit Virtual Support for z/OS V1R6 and z/OS.e V1R6	December 2004	Web
Cryptographic Support for z/OS V1R6/R7 and z/OS.e V1R6/R7 (contains ICSF FMID HCR7730)	September 2005	Web
IBM Health Checker for V1R4/R5/R6 of z/OS and z/OS.e	September 2005	Web
z/OS V1R7 and **z/OS.e V1R7**	September 2005	New release of products
Enhancements to Cryptographic Support for z/OS and z/OS.e V1R6/R7 (contains ICSF FMID HCR7731)	May 2006	Web
IBM zIIP Support for z/OS and z/OS.e V1R6/R7	June 2006	Web
z/OS V1R8 and **z/OS.e V1R8**	September 2006	New release of products (**Note:** final release of z/OS.e)
System REXX Support for z/OS V1R8 and z/OS.e V1R8	September 2007	Web
z/OS V1R9	September 2007	New release of product

*Table 3. z/OS and z/OS.e deliverables from September 2002 through September 2012 (continued). Full releases (as opposed to enhancements) are **highlighted**.*

Deliverable	General availability	Delivery method
Cryptographic Support for z/OS V1R7-R9 and z/OS.e V1R7-R8 (contains ICSF FMID HCR7750)	November 2007	Web
z/OS V1R10	September 2008	New release of product
Cryptographic Support for z/OS V1R8-R10 and z/OS.e V1R8 (contains ICSF FMID HCR7751)	November 2008	Web
z/OS V1R11	September 2009	New release of product
Cryptographic Support for z/OS V1R9-R11 (contains ICSF FMID HCR7770).	November 2009	Web
z/OS V1R12	September 2010	New release of product
Cryptographic Support for z/OS V1R10-R12 (contains ICSF FMID HCR7780).	September 2010	Web
z/OS V1R13	September 2011	New release of product
Cryptographic Support for z/OS V1R11-R13 (contains ICSF FMID HCR7790).	September 2011	Web
Cryptographic Support for z/OS V1R12-R13 (contains ICSF FMID HCR77A0)	September 2012	Web
z/OS V1R13 RSM Enablement Offering Web deliverable.	Planned availability December 14, 2012	Web

The statements regarding the release strategy represent current intentions of IBM. Any reliance on these statements is at the relying party's sole risk and will not create any liability or obligation for IBM. All statements regarding IBM plans, directions, and intent are subject to change or withdrawal without notice.

Methods of installing z/OS

Several IBM packages are available for installing z/OS. Some are entitled with the product (as part of your z/OS license, at no additional charge), while others are available for an additional fee. This section describes each package.

Rule: Because the base elements and optional features are integrated into a single package with compatible service levels, **you must install, with few exceptions, the entire z/OS product.** See "Choosing the z/OS base and optional features" on page 69 for details about this policy.

Tip: You might find that sharing system libraries or cloning an already-installed z/OS system is faster and easier than installing z/OS with an IBM installation package. For further information, see "Installing z/OS without using an installation package" on page 46.

ServerPac (entitled with z/OS)

ServerPac is an entitled software delivery package consisting of products and service for which IBM has performed the SMP/E installation steps and some of the post-SMP/E installation steps. To install the package on your system and complete the installation of the software it includes, you use the CustomPac Installation Dialog.

Two types of ServerPac installation are available to you, when ordering z/OS. One option is to order both z/OS and the products that run on it by way of ServerPac. Another option is to order a Product ServerPac that includes only the software products you want without the z/OS base. See "Product ServerPac support" on page 23.

The CustomPac Installation Dialog generates tailored installation jobs and saves detailed definitions of volume, catalog, and data set configurations, which can be tailored, saved, and merged to install subsequent ServerPacs. The CustomPac Installation Dialog is the same dialog that is used for all the CustomPac offerings, including SystemPac® (dump-by-data-set format), ProductPac®, and RefreshPac. For more information about CustomPac fee offerings, see http://www.ibm.com/services/custompac.

Consider the following ServerPac installation options that are available to you (You choose the type when you install, not when you order.)

- A *full system replacement* installs a complete z/OS system. It installs all the data sets you need to IPL, to log on to the target system, and to run a z/OS image in order to complete other installation and customization tasks. The installed data sets fall into two major categories:

  1. System software and related data sets (such as distribution and target libraries, SMP/E CSI data sets, and sample libraries)
  2. Operational data sets (such as page data sets, system control files, and a master catalog).

  Because IBM creates a working set of operational data sets for you, a full system replacement helps assure a successful first IPL.

  Depending on your environment, you might need to merge your existing operational data sets with the data sets created by ServerPac. You can do this before or after first IPL.

- A *software upgrade* installs only system software and related data sets (such as distribution and target libraries, SMP/E CSI data sets, and sample libraries). It does not create the set of new operational data sets required to IPL (such as page data sets, system control files, and a master catalog). With a software upgrade, all operational data sets are assumed to already exist and to be usable by the new level of software installed. When new operational data sets are required, you must allocate and initialize them before you IPL. For example, you might need to add parameters required by the new software level or change data sets so they will work with both the old and new levels.

  A software upgrade uses your existing catalog structure. This includes your existing master catalog (with direct or indirect cataloging references) and user catalogs. In addition, software upgrade allows you to create new user catalogs as part of the installation process.

A software upgrade is possible for z/OS but not for a Product ServerPac order or for subsystems (DB2, IMS, CICS, NCP, and WebSphere Application Server).

Of the entitled installation packages available for installing z/OS, most customers choose ServerPac rather than CBPDO.

- A *Product ServerPac* order allows you to install MVS and DB2 without the z/OS base product. See "Product ServerPac support."

Product ServerPac support

For products other than z/OS itself, starting October 15, 2012, IBM plans to add a new capability for ServerPac called a Product ServerPac. Shopz and ServerPac now allow you to order many of the z/OS and DB2 products or groups of products without requiring a particular product to be included unless it is required to build your order. For example, you can order z/OS Management Facility (5655-S28), or Enterprise PL/I V4 (5655-W67), or IBM Sterling Connect: Direct for z/OS (5655-X01), and IBM InfoSphere Guardium Data Encryption for IMS and DB2 Databases without having to order z/OS or DB2 itself.

This new capability is expected to be useful for customers who build product sets apart from z/OS and DB2 that are intended to include products to be installed, maintained, and migrated either at other times than z/OS or DB2, or are intended to be migrated to a subset of z/OS and DB2 environments within an enterprise.

As with all ServerPac orders, multiple products and PTFs can be included in the IBM-recommended service level will be integrated in the package. Using ServerPac rather than CBPDO to build these product sets avoids having to install each product individually and then install service using SMP/E.

As with the ServerPac orders for subsystems, Product ServerPac orders are not shipped with a separate master catalog and use the existing master catalog during installation.

Ordering through Product ServerPac

Using Shopz, you can order eligible products in a Product ServerPac in the same manner as for regular ServerPac. Shopz will have a new triangle icon to indicate which products in the ServerPac catalog are eligible for a Product ServerPac. Because this is a ServerPac, Shopz product requisite checking enforces requirements for installation, but similar to CBPDO, Shopz also displays requisites that can be bypassed if you already have them installed on your system.

A Product ServerPac has the same characteristics as a regular ServerPac. IBM installs the product or product set when manufacturing your order and delivers the target and distribution libraries with service integrated (applied and accepted) to the latest RSU level and with HIPER and PRP service applied, and the SMP/E environment with a single GLOBAL zone and the minimum number of TARGET and DLIB zones required. By default, for the z/OS SREL, IBM delivers WebSphere products in their own zone pair, IBM Installation Manager installed products in their own zone pair, and the rest of the products in a separate zone pair. The intent is for you to manage the products you ordered as a product set in the delivered SMP/E environment.

CBPDO (entitled with z/OS)

CBPDO (Custom-Built Product Delivery Option) is an entitled software delivery package consisting of uninstalled products and unintegrated service. There is no dialog program to help you install, as there is with ServerPac. You must use

SMP/E to install the individual z/OS elements and features, and their service, before you can IPL. Installation instructions are in the publication *z/OS Program Directory*.

When enhancements (such as the z/OS V1R4 z990 Exploitation Support feature) are provided as features of a release subsequent to the general availability of the release, the enhancements are available by themselves in CBPDO. There is no need to reorder and reinstall all of z/OS. In addition, the enhancements are available for Internet delivery in CBPDO when ordered using Shopz. This support provides a quick and easy way for you to order and receive these post-release features.

For products other than z/OS itself, CBPDO is useful to upgrade an existing product, or add a new product to an existing SMP/E environment. By contrast, the new Product ServerPac is useful when creating a new SMP/E environment.

SystemPac (additional charge with z/OS)

SystemPac is a software package, available for an additional fee. CustomPac offerings like SystemPac will no longer be available in geographies other than Europe, Middle East, Africa (EMEA). After July 6, 2012, it is only offered to EMEA IBM locations. SystemPac helps you at those locations install z/OS, subsystems (DB2, IMS, CICS, NCP, and WebSphere Application Server). SystemPac is tailored to your specifications; it is manufactured according to parameters and input/output definition file (IODF) definitions that you supply during order entry. The goal is to have the system tailored to your specifications and have products enabled according to your specified configuration. Parameters are collected by telephone. Using a printed questionnaire as a guide, you tell an IBM representative your responses. Upon completion, a printout showing all the parameters and definitions you specified is sent to you for reference.

SystemPac comes in two formats:
- The *full volume dump* format requires you to install using volume restore. The tapes you receive are in physical volume format (DFSMSdss dumped or Innovation Data Processing FDR dumped, depending on your choice during ordering).
- The *dump-by-data-set* format requires you to install using the CustomPac Installation Dialog. The tapes you receive are in IEBCOPY dump-by-data-set format (not a physical volume dump).

In both formats, selected products, elements, features, and functions (such as z/OS UNIX, Communications Server, IBM HTTP Server, and WLM goal mode) are enabled with IBM defaults to allow you to exploit e-commerce upon IPL once your enterprise connectivity is established.

SystemPac is designed for those who have limited skill or time to install or upgrade z/OS but who want to install or upgrade to exploit z/OS functions in e-commerce or other areas.

You can find information about SystemPac on the Web at http://www.ibm.com/services/custompac.

Other fee-based methods (additional charge with z/OS)

Other fee-based methods (besides SystemPac) for installing z/OS are:
- The *Entry Server Offering* (available in some countries) is a packaged solution that includes hardware, software, installation services, maintenance and financing to help customers get to current technology.

- Other fee-based offerings include z/OS Select in the United Kingdom, Rapid Migration Offering in Canada, Software Management in Germany, and Express Plus Offering in France. Most of these offerings are based on SystemPac. These offerings vary in scale; they can go as far as to include a total system cutover.
- Other fee-based services include customized solutions, hardware services, and software services.

The scope of this information is limited to the entitled methods (ServerPac and CBPDO) and the SystemPac fee-based method. For information about the other fee-based methods, contact an IBM representative or browse the IBM Integrated Technology Services Web page at http://www.ibm.com/services/.

Web deliverable method

Sometimes enhancements are provided as Web deliverables. For example, some of the z/OS V1R4 enhancements in support of the z990 server were made available this way.

z/OS Web deliverables are available from http://www.ibm.com/systems/z/os/zos/downloads/. They are packaged as two files that you download:
- A **readme** file, which contains a sample job to uncompress the second file, transform it into a format that SMP/E can process, and invoke SMP/E to RECEIVE the file. This file must be downloaded as text.
- A **pax.z** file, which contains an archive (compressed copy) of the FMIDs to be installed. This file needs to be downloaded to a workstation and then uploaded to a host as a binary file.

For Web downloads, you must perform the following tasks:
1. Allocate an HFS or zFS directory as R/W on the z/OS driving system where the package will be staged.
2. Download both parts of the package from the download zone: http://www.ibm.com/systems/z/os/zos/downloads/.
3. Run the sample job provided in the README.TXT file. The job will invoke the GIMUNZIP service routine to extract the original data from the packages.
4. Obtain and install service for the target system. Service is not included in Web deliverables. You can obtain service for Web deliverables through your regular preventive service deliverables that you use for z/OS.
5. Install (SMP/E APPLY) the downloaded FMIDs.

Languages in which z/OS is available

z/OS is provided in U.S. English. In addition, 16 other languages are supported. The main items that are provided in these other languages are messages, panels, and documentation. Not all elements and features are available in each of the 16 languages. Table 4 on page 26 shows the 16 languages and lists which elements and features are available in each.

When you order z/OS, you receive it in U.S. English and in the following additional languages:
- Thirteen additional languages for base element Library Server (listed in Table 4 on page 26)
- One additional language (Japanese) for the program management binder in base element BCP

If you want an additional language, you have to specify the language feature number in your order.

If you order the z/OS base in a non-English language, you get all priced features (which support dynamic enablement) in English and any priced features that are available in that non-English language. If you order a priced feature in a non-English language, you get it in that language and in English.

The enablement setting is based on whether an element or feature was ordered in **any** language.

Table 4. Languages supported (in addition to U.S. English) and the elements and features available in each language

Language	Base elements	Priced optional features
Brazilian Portuguese	• BookManager READ • GDDM • Library Server (see note 1)	• BookManager BUILD
Canadian French	• BookManager READ • GDDM	• BookManager BUILD
Danish	• BookManager READ • GDDM • Library Server (see note 1)	
French	• BookManager READ • GDDM • Library Server (see note 1)	• BookManager BUILD
German	• BookManager READ • GDDM • ISPF • Library Server (see note 1) • TSO/E	• BookManager BUILD
Italian	• BookManager READ • GDDM • Library Server (see note 1)	
Japanese	• Alternate Library for REXX • BCP (see notes 1 and 2) • DFSMSdfp • DFSMSrmm • Distributed File Service • GDDM • HCD • IBM HTTP Server • IBM TDS • Integrated Security Services • ICKDSF • ISPF • JES2 • Language Environment • Library Server (DBCS) (see note 1) • Run-Time Library Extensions • SMP/E • SSL component of Cryptographic Services • TSO/E • z/OS UNIX	• C/C++ without Debug Tool • Infoprint Server • RMF • SDSF • Security Server

Table 4. Languages supported (in addition to U.S. English) and the elements and features available in each language (continued)

Language	Base elements	Priced optional features
Korean	• GDDM • Library Server (DBCS) (see note 1)	
Netherlands Dutch	• BookManager READ • Library Server (see note 1)	
Norwegian	• GDDM • Library Server (see note 1)	
Simplified Chinese	• GDDM • Library Server (DBCS) (see note 1) • z/OS UNIX kernel in the BCP • TSO/E • z/OS UNIX	
Spanish	• BookManager READ • GDDM • Library Server (see note 1)	• BookManager BUILD
Swedish	• GDDM • Library Server (see note 1)	
Swiss German	• ISPF	
Traditional Chinese	• GDDM • Library Server (DBCS) (see note 1)	
Uppercase English	• ISPF	

Notes:

1. Translations for the following are provided with the z/OS base license and therefore do not have to be ordered separately: the program management binder in base element BCP, and base element Library Server.

2. If you order the Japanese Base or Japanese Alternate Base feature, you will receive the Unicode Japanese FMID without separately ordering it.

Coexistence and fallback

Coexistence and fallback play an important part in planning for migration to the latest release. This section explains what coexistence and fallback are, describes the IBM policy regarding the releases that are supported for coexistence and fallback (as well as migration), and states which specific releases are supported.

While coexistence and fallback might at first seem unrelated, they are very much related in that both deal with an earlier level of a system being able to tolerate changes made by a later level.

Understanding coexistence

Coexistence occurs when two or more systems at different software levels share resources. The resources could be shared at the same time by different systems in a multisystem configuration, or they could be shared over a period of time by the same system in a single-system configuration. Examples of coexistence are two different JES releases sharing a spool, two different service levels of DFSMSdfp

sharing catalogs, multiple levels of SMP/E processing SYSMODs packaged to exploit the latest enhancements, or an older level of the system using the updated system control files of a newer level (even if new function has been exploited in the newer level). In some documentation you might find the terms "compatibility" or "toleration" used instead of "coexistence".

The sharing of resources is inherent in multisystem configurations that involve Parallel Sysplex® implementations. But other types of configurations can have resource sharing too. Examples of configurations where resource sharing can occur are:

- A single processor that is time-sliced to run different levels of the system, such as during different times of the day
- A single processor running multiple images by means of logical partitions (LPARs)
- Multiple images running on several different processors
- Parallel Sysplex or non-Parallel Sysplex configurations

Note: The term coexistence does not refer to z/OS residing on a single system along with z/VSE, VSE/ESA, or z/VM in an LPAR or as a VM guest.

z/OS V1R13 systems can coexist with specific prior releases of z/OS systems. (The releases are listed in "Which releases are supported for coexistence, fallback, and migration?" on page 30.) This is important because it gives you flexibility to migrate systems in a multisystem configuration to z/OS V1R13 using rolling IPLs rather than requiring a systems-wide IPL. (See "Rolling z/OS across a multisystem configuration.") The way in which you make it possible for earlier-level systems to coexist with z/OS V1R13 is to install coexistence service (PTFs) on the earlier-level systems.

You should complete the migration of all earlier-level coexisting systems to z/OS V1R13 as soon as you can. Keep in mind that the objective of coexistence PTFs is to allow existing functions to continue to be used on the earlier-level systems when run in a mixed environment that contains later-level systems. Coexistence PTFs are not aimed at allowing new functions provided in later releases to work on earlier-level systems.

Rolling z/OS across a multisystem configuration

A *rolling IPL* is the IPL of one system at a time in a multisystem configuration. You might stage the IPLs over a few hours or a few weeks. The use of rolling IPLs allows you to migrate each z/OS system to a later release, one at a time, while allowing for continuous application availability.

For example, data sharing applications offer continuous availability in a Parallel Sysplex configuration by treating each z/OS system as a resource for processing the workload. The use of rolling IPLs allows z/OS systems running these applications to be IPLed one at a time, to migrate to a new release of z/OS, while the applications continue to be processed by the other z/OS systems that support the workload. By using LPAR technology, you can use rolling IPLs to upgrade your systems without losing either availability or capacity.

You can use rolling IPLs when both of the following are true:

- The release to which you are migrating is supported for coexistence, fallback, and migration with the releases running on the other systems. See "Which releases are supported for coexistence, fallback, and migration?" on page 30 for the releases that are supported.

- The appropriate coexistence PTFs have been installed on the other systems in the multisystem configuration.

Even when you are using applications that do not support data sharing, rolling IPLs often make it easier to schedule z/OS software upgrades. It can be very difficult to schedule a time when all applications running on all the systems in a multisystem configuration can be taken down to allow for a complex-wide or Parallel Sysplex-wide IPL.

The use of rolling IPLs not only enables continuous availability from an end-user application point of view, but it also eliminates the work associated with migrating all z/OS systems in a multisystem configuration at the same time.

Understanding fallback

Fallback (backout) is a return to the prior level of a system. Fallback can be appropriate if you migrate to z/OS V1R13 and, during testing, encounter severe problems that can be resolved by backing out the new release. By applying fallback PTFs to the "old" system before you migrate, the old system can tolerate changes that were made by the new system during testing.

Fallback is relevant in all types of configurations, that is, single-system or multisystem, with or without resource sharing.

As an example of fallback, consider a single system that shares data or data structures, such as user catalogs, as you shift the system image from production (on the "old" release) to test (on the new release) and back again (to the old release). The later-level test release might make changes that are incompatible with the earlier-level production release. Fallback PTFs on the earlier-level release can allow it to tolerate changes made by the later-level release.

As a general reminder, always plan to have a backout path when installing new software by identifying and installing any service required to support backout.

Fallback is at a system level, rather than an element or feature level, except for JES2, SDSF, and JES3. That is, except for JES2, SDSF, and JES3, you cannot back out an element or feature; you can only back out the entire product. JES2, SDSF, and JES3 fallback can be done separately as long as the level of JES2, SDSF, or JES3 is supported with the release of z/OS and any necessary fallback PTFs are installed.

Fallback and coexistence are alike in that the PTFs that ensure coexistence are the same ones that ensure fallback.

Note: Keep in mind that new functions can require that all systems be at z/OS V1R13 level before the new functions can be used. Therefore, be careful not to exploit new functions until you are fairly confident that you will not need to back out your z/OS V1R13 systems, as fallback maintenance is not available in these cases. You should consult the appropriate element or feature information to determine the requirements for using a particular new function.

If your fallback plans include making a clone, refer to Appendix D, "Making a copy of your system software (cloning)," on page 157.

Which releases are supported for coexistence, fallback, and migration?

z/OS V1R13 is coexistence, fallback, and migration supported with the following z/OS releases: V1R13, V1R12, and V1R11. This means that:

- Coexistence of a V1R13 system *with* a V1R13, V1R12, or V1R11 system is supported.
- Fallback *from* a V1R13 system *to* a V1R12 or V1R11 system is supported.
- Migration *to* a V1R13 system *from* a V1R12 or V1R11 system is supported.

Before z/OS V1R6, four consecutive releases were supported for coexistence, fallback, and migration. **Starting with z/OS V1R6, the coexistence, fallback, and migration policy was aligned with the service policy.** Because the service policy is a 3-year policy (described in "Service policy" on page 33), and because V1R6 was the start of the annual release cycle, **as a general rule, three releases are supported for coexistence, fallback, and migration over a period of three years.** You can think of this as an "*n*–2" rule, where *n* is the latest release. Thus, R13 minus 2 = R11, meaning that R11 is the earliest (oldest) release supported for coexistence, fallback, and migration with R13.

The current policy represents an increase of one year over the two-year period provided by the previous coexistence, fallback, and migration policy of four releases under a six-month release cycle. The intention of the current policy is to simplify and provide greater predictability to aid in release migrations.

Exceptions are:

- In some cases, more than three releases may be coexistence, fallback, and migration supported if IBM at its sole discretion chooses to provide service support for greater than three years for a release.
- Any z/OS release having three or fewer months of service remaining at general availability of a new release will not be coexistence, fallback, or migration supported with the new release.

The z/OS coexistence, fallback, and migration policy applies to the elements and features of z/OS, not to customer-developed applications, vendor-developed applications, or IBM products that run on z/OS.

IBM performs platform (integration) testing and will provide service as necessary to support the z/OS coexistence, fallback, and migration policy.

These statements represent the current intentions of IBM. IBM reserves the right to change or alter the coexistence, fallback, and migration policy in the future or to exclude certain releases beyond those stated. IBM development plans are subject to change or withdrawal without further notice. Any reliance on this statement of direction is at the relying party's sole risk and does not create any liability or obligation for IBM.

Table 5. Coexistence, fallback, and migration support for recent, current, and upcoming releases

z/OS release (see note 1)	Releases that are coexistence, fallback, and migration supported with the release in column one (see note 1)	Explanation (see note 2)
R6	R6, R5, R4, R3	General availability of R6 was September 2004. R2 was the oldest service-supported release at that time and therefore the oldest release that would be coexistence, fallback, and migration supported. However, its end-of-service date (October 2004) was within three months of R6 general availability (September 2004), so R3 became the oldest release supported for coexistence, fallback, and migration with R6.
R7	R7, R6, R5, R4	General availability of R7 was September 2005. R4 was the oldest release that was service supported at that time and therefore the oldest release supported for coexistence, fallback, and migration with R7.
R8	R8, R7, R6, R5	General availability of R8 was September 2006. R4 was the oldest release that was service supported at that time because its end-of-service date was extended by 18 months to 31 March 2007. However, R4 was not coexistence, fallback, and migration supported with R8. Therefore, R5 became the oldest release supported for coexistence, fallback, and migration with R8.
R9	R9, R8, R7	General availability of R9 was September 2007. R7 was the oldest release that was service supported at that time and therefore the oldest release supported for coexistence, fallback, and migration with R9.
R10	R10, R9, R8	General availability of R10 was September 2008. R8 was the oldest release that was service supported at that time and therefore the oldest release supported for coexistence, fallback, and migration with R10.
R11	R11, R10, R9	General availability of R11 was September 2009. R9 was the oldest release that was service supported at that time and therefore the oldest release supported for coexistence, fallback, and migration with R11.
R12	R12, R11, R10	General availability of R12 was September 2010. R10 was the oldest release that was service supported at that time and therefore the oldest release supported for coexistence, fallback, and migration with R12.
R13	R13, R12, R11	General availability of R13 was September 2011. R11 is planned to be the oldest release that is service supported at that time and therefore the oldest release supported for coexistence, fallback, and migration with R13.

Table 5. Coexistence, fallback, and migration support for recent, current, and upcoming releases (continued)

z/OS release (see note 1)	Releases that are coexistence, fallback, and migration supported with the release in column one (see note 1)	Explanation (see note 2)
V2R1	V2R1, V1R13, V1R12	Planned general availability is second quarter 2013.

Notes:

1. For readability, the version numbers have been omitted from the releases shown. Also, release numbering of future releases (later than R13) is for illustrative purposes and is not a guarantee of actual release numbers.

2. Future general availability (GA) dates are projections based on a two-year release cycle (described in "Two-year release cycle" on page 18). Future end of service (EOS) dates are projections based on the 3-year service policy (described in "Service policy" on page 33).

Platform (integration) testing by IBM

For each release of z/OS, a team of IBM testers and system programmers performs a System z platform test (formerly known as integration test). Test systems simulate customer production Parallel Sysplex environments running z/OS and many related software products such as DB2, IMS, CICS, WebSphere MQ (formerly known as MQSeries®), and WebSphere Application Server. The team migrates to each new release of z/OS, puts the system into production, and then verifies that all products applicable to each operating system work together. The team not only tests software but also verifies that the software runs in a hardware environment that has both generally available (GA) and pre-GA levels of System z hardware.

The zPET team maintains two parallel sysplex environments. They have a 4-way test and quality assurance sysplex, and a 9-way production sysplex. Like most customers, the latest z/OS gets migrated by LPAR first to the 4-way system and later to the 9-way environment. Migration and coexistence is tested between the pre-GA (n+1) z/OS and the latest z/OS GA code (n). After fully migrated to the pre-GA z/OS, a fallback test scenario is performed. If successful, the fallback LPAR is once again migrated to pre-GA z/OS and tests of new functions commence.

The team produces a report containing test results and advice for customers. The report is entitled *z/OS Parallel Sysplex Test Report* and is available from the z/OS Parallel Sysplex Test Web site: http://www.ibm.com/eserver/zseries/zos/integtst/. This Web site includes illustrations of the team's hardware, software, networking, and application enablement configurations.

The team follows a process that includes simulating the workload stress levels, transaction rates, and lock contention rates that customers might experience. They stress many of the same areas of the system that customers stress. In their report they include detailed descriptions of their hardware, software, networking, and application enablement configurations, as well as the key operational, performance, and availability characteristics of their Parallel Sysplex environment. They provide recommended recovery procedures and a variety of hints and tips distilled from their own experiences. They let you know about the mistakes they make so you can avoid those mistakes.

Service

This topic describes the IBM service policy for z/OS, the level of service that is provided with your order, what PSP information is, the preventive maintenance that you should perform after installing z/OS, and how preventive and corrective service are distributed.

Service policy

After z/OS V1R13 IBM's service policy is to provide maintenance (service) for each release of z/OS for five years following their general availability (GA) date. However, service on the last release of a version might be extended beyond the intended five-year period. Before withdrawing service for any version or release of z/OS, IBM intends to provide at least 12 months notice. For end-of-service (EOS) dates, including those for z/OS V1R12 and z/OS V1R13, see http://www.ibm.com/systems/z/os/zos/support/zos_eos_dates.html.

The service policy for z/OS also applies to any enhancements, such as the z/OS V1R4 enhancements that were provided to support the z990 server.

Program temporary fix (PTF) distributions, including Recommended Service Upgrades (RSUs), will continue to be available monthly while a release is current. Service testing for a release will be performed for five quarters after the general availability date for that release.

ServerPac and Product ServerPac service level

For ServerPac and Product ServerPac orders, service is integrated with product code according to the following timeline:
- ServerPac and Product ServerPac are refreshed every month to pick up the most current RSU.
- All products incorporate high impact or pervasive (HIPER) and PTF-in-error (PE) fixes that are available up to the day your order is built. Because these PTFs are still fairly new at the time your order is built, they are not SMP/E ACCEPTed. They have been APPLYed only, therefore allowing you to back them off of your system using the SMP/E RESTORE command, if necessary. Your order also includes (in its SMP/E global zone) the latest unintegrated service that was available at the time the order was created. In addition, the PTFs that were SMP/E APPLYed but not ACCEPTed are also in the SMP/E global zone.
- All z/OS elements and features will incorporate additional service that has been through platform (integration) testing (SOURCEID ZOSV1R*n*, where *n* is the release number).

The publication *ServerPac: Installing Your Order*, which comes with your order, specifies the integrated service level applicable to your order.

Note: Starting with z/OS V1R13, *ServerPac: Installing Your Order* is no longer shipped in hardcopy format. This book and the program directories for your order are available in PDF format on a DVD for physical orders. For electronic orders the information is available in PDF format through links on the download page

CBPDO service level

For CBPDO orders, service is not integrated. You must receive and apply the service during the installation process.

Service for all products, base elements, and optional features that you ordered is shipped with default CBPDO orders. Effective June 2006, service for other products licensed under the same customer number within the same system release identifier (SREL) is no longer included. To get service for other products, you can use SMP/E Internet Service Retrieval, Shopz, or a fee service offering.

The *CBPDO Memo to Users Extension* that comes with CBPDO orders describes the SOURCEIDs for service. For example, platform-tested (integration-tested) PTFs have a SOURCEID of ZOSV1R13 for z/OS V1R13. *z/OS Parallel Sysplex Test Report* describes the SMP/E SOURCEIDs to be used to install z/OS.

Note: Starting with z/OS V1R13, *CBPDO Memo to Users Extension* is no longer shipped in hardcopy format; the information is available in PDF format on a DVD for physical orders that also includes the program directories. For electronic orders the information is available through a link on the Shopz download page in PDF format.

SystemPac service level

For SystemPac orders (where available), service is integrated with product code according to the following timeline:

- SystemPac is refreshed every month to pick up the most current RSU.
- All products incorporate high impact or pervasive (HIPER) and PTF-in-error (PE) fixes that are available up to the day your order is built. Because these PTFs are still fairly new at the time your order is built, they are not SMP/E ACCEPTed. They have been APPLYed only, allowing you to back them off of your system using the SMP/E RESTORE command, if necessary. Your order also includes (in its SMP/E global zone) the latest unintegrated service that was available at the time the order was created. In addition, the PTFs that were SMP/E APPLYed but not ACCEPTed are also in the SMP/E global zone.
- All z/OS elements and features will incorporate additional service that has been through platform (integration) testing (SOURCEID ZOSV1R*n*, where *n* is the release number).
- The publication *SystemPac Installation Guide*, which comes with your order, specifies the integrated service level applicable to your order.

  Note: Starting with z/OS V1R13, *SystemPac Installation Guide* is no longer shipped in hardcopy format. This book and the program directories for your order are available in PDF format on a DVD for physical orders. For electronic orders the information is available in PDF format through links on the download page..

Your SystemPac order will also include unintegrated service that was available when your order was built (applicable to the products in your order).

z/OS Web deliverables service level

z/OS delivers some functions from the z/OS Download Web site (http://www.ibm.com/systems/z/os/zos/downloads/). z/OS Web deliverables can be identified by the references to supported z/OS releases in their titles or in their functional descriptions. These Web packages contain only the base function, that is, service is not included in the Web download. Service is included in your regular preventive service deliverable for z/OS automatically.

PSP information

z/OS and most products that run on it provide files containing information that becomes available after the product information is published. Kept on the IBM RETAIN® system and also available using IBMLink, these files are called preventive service planning (PSP) "buckets", or just "PSPs". These terms were chosen when PSP buckets contained only APAR- and PTF-related information, but over time customers asked for a more general repository of important installation-related information, and the role of the PSP bucket has grown.

PSP buckets are kept on the IBM RETAIN system and are available to customers at http://www14.software.ibm.com/webapp/set2/psp/srchBroker.

PSP buckets are identified by an *upgrade* identifier, and specific parts of them are called *subsets*. Each upgrade contains information about a product. Subsets contain information about specific parts of a product. For example, the z/OS PSP bucket has subsets for the BCP, JES2, ServerPac, and others.

For software upgrades for ServerPac and CBPDO installations, see *z/OS Parallel Sysplex Test Report*. For software upgrades for SystemPac installations, the upgrade is CUSTOMPAC and the subsets are SYSPAC/FVD (for full volume dump format) and SYSPAC/DBD (for dump-by-data-set format). For hardware upgrades, see "PSP hardware upgrade identifiers" on page 76.

At the beginning of each PSP bucket is a change index. For each subset, the change index identifies the date of the latest entries in each section. You can quickly determine whether there are new entries you need to read by checking the change index.

Each subset is broken into five sections, numbered 1 through 5:

Section 1
> Installation Information. This section contains any changes to installation procedures or information about additional requisite PTFs.

Section 2
> Documentation Changes. This section contains any major changes to product information.

Section 3
> General Information. This section contains important information that does not fit in another section.

Section 4
> Service Recommendations. The original purpose of the PSP bucket was to provide this information, which includes a list of HIPER APARs and their fixes, as well as other important service-related information.

Section 5
> Cross-Product Dependencies. This section contains information about the levels or service levels of other products you might need to run with the software you intend to install, or service that you might need to install to run other products.

Effective 31 December 2010, the Enhanced PSP Tool (EPSPT), host compare program, and the associated extract files are removed from the IBM Technical Support Web site (http://www14.software.ibm.com/webapp/set2/psp/srchBroker). The Enhanced PSP Tool's function is replaced by the addition of FIXCAT (fix category) information to Enhanced HOLDDATA and the REPORT

MISSINGFIX function introduced in z/OS V1R10 SMP/E, which offers distinct advantages over the Enhanced PSP Tool. This SMP/E function is also available for all supported releases of z/OS in SMP/E for z/OS V3.5 (5655-G44), which you can order separately.

Consolidated service testing by IBM

IBM launched the consolidated service test (CST) effort in November 2000 and redefined the Recommended Service Upgrade (RSU) for the OS/390 and z/OS platforms in November 2001. The objective was to provide a consolidated, tested, and recommended set of service for z/OS, z/OS.e, , and key subsystems on a quarterly basis with published results. This means that you can obtain and install service for z/OS and key subsystems from one recommended service package, so that you have a tested level of service for all these products.

Note: CST testing does not replace PTF testing performed by each product. CST testing is in addition to individual PTF testing.

The CST team tests in a customer-like production Parallel Sysplex environment in an IBM test lab. It runs batch and data-sharing applications that exploit and stress the latest functions with up to two levels of subsystems on three levels of z/OS systems. The CST team is continuously improving the test environment. For more information about the environment, see the quarterly *Consolidated Service Test Report* at the CST web site: http://www.ibm.com/eserver/zseries/zos/servicetst/.

During testing, the team observes how each product runs and how all the products interact in this environment. The team reports problems it finds to the IBM Support Center.

The testing cycle is quarterly. The team begins each quarter by installing all service from the prior quarter and defining test scenarios to exploit new product functions while existing workloads are being run. During the second month of the quarter the team starts running new test scenarios, identifies problems, and applies fixes. In the final month of the quarter the team performs recovery tests and runs workloads in a high stress environment. At the end of the quarter the team publishes results in the *Consolidated Service Test Report*.

At the end of each month, between quarterly recommendations, the CST team provides a delta recommendation for customers whose preventive strategy requires more frequent maintenance updates. The monthly recommendation supports the most recently published CST quarterly recommendation. It includes HIPER and PE fixes that have been installed at the beginning of the month and tested for the duration of the month.

As quarterly and monthly recommendations become available, the team updates the CST Web site.

Maintenance after installation

After you have installed z/OS, you should install preventive maintenance using Recommended Service Upgrades (RSUs). An RSU is an SMP/E SOURCEID (RSU*yymm*) used to identify the following:
• All PTFs that completed CST testing during the prior quarter.

- Certain types of PTFs that completed CST testing during the prior month. The types are high impact or pervasive (HIPER) PTFs, PTF-in-error (PE) PTFs, and other recommended PTFs (recommended because of new function, serviceability, installability, security, or integrity).

Note: While all CST-tested PTFs become RSU PTFs, not all RSU PTFs are tested in CST. Only the following products or product families are included in CST testing: z/OS, IMS, DB2, CICS, and MQSeries.

RSUs are available monthly. They are assigned an RSU SOURCEID that reflects when the PTFs in them completed the test cycle and became recommended, not when the PTFs closed. (The PUT*yymm* SOURCEID continues to be used to identify when a PTF closes.) Both the monthly and quarterly RSUs use the same RSU*yymm* SOURCEID notation. You can identify quarterly RSUs by their month values, which are RSU*yy*03, RSU*yy*06, RSU*yy*09, and RSU*yy*12. For a better understanding of RSU content and availability, see Table 6.

Recommendation: Install an RSU every three months if possible, with the RSU level being the most current month. Also, regularly (weekly if possible) review current HIPER and PE PTFs, and roll these fixes into production at least monthly. If you are unable to install RSU maintenance every three months, then it is more important to review the HIPER and PE fixes on a regular basis.

Table 6. RSU content and RSU SOURCEID for each month of 2012

Month	RSU content	SOURCEID
January 2012	All PTFs that exit CST through the end of September 2011 and are not already in an RSU, plus HIPER and PE-correcting PTFs that exit CST in November 2011	RSU1112
February 2012	HIPER and PE-correcting PTFs that exit CST in December 2011	RSU1201
March 2012	HIPER and PE-correcting PTFs that exit CST in January 2012	RSU1202
April 2012	All PTFs that exit CST through the end of December 2011 and are not already in an RSU, plus HIPER and PE-correcting PTFs that exit CST in February 2012	RSU1203
May 2012	HIPER and PE-correcting PTFs that exit CST in March 2012	RSU1204
June 2012	HIPER and PE-correcting PTFs that exit CST in April 2012	RSU1205
July 2012	All PTFs that exit CST through the end of March 2012 and are not already in an RSU, plus HIPER and PE-correcting PTFs that exit CST in May 2012	RSU1206
August 2012	HIPER and PE-correcting PTFs that exit CST in June 2012	RSU1207
September 2012	HIPER and PE-correcting PTFs that exit CST in July 2012	RSU1208
October 2012	All PTFs that exit CST through the end of June 2012 and are not already in an RSU, plus HIPER and PE-correcting PTFs that exit CST in August 2012	RSU1209
November 2012	HIPER and PE-correcting PTFs that exit CST in September 2012	RSU1210
December 2012	HIPER and PE-correcting PTFs that exit CST in October 2012	RSU1211

One way to review HIPER and PE PTFs is to use Enhanced HOLDDATA. Enhanced HOLDDATA is HOLDDATA with additional information to identify the reason for the hold and a fixing PTF. Enhanced HOLDDATA provides a hold against function SYSMODs (FMIDs) for HIPER and PE PTFs. (Non-Enhanced HOLDDATA provides a hold only against PE PTFs.)

To display the Enhanced HOLDDATA, use the SMP/E REPORT ERRSYSMODS command. The SMP/E report, when used with Enhanced HOLDDATA, identifies missing critical service that applies to your specific system. This allows you to identify any missing HIPER and PE fixes for any target zone. Additionally, the report identifies whether a corrective PTF is available, whether the corrective PTF is already in RECEIVE status, and the reason indicator for a HIPER.

Enhanced HOLDDATA is available through ESO packages, with CBPDO orders, and from the Web. For more information, see the *ESO Memo to Users Extension*, the *CBPDO Memo to Users Extension*, or the Enhanced HOLDDATA Web site at http://service.boulder.ibm.com/390holddata.html.

To perform (or install) service on elements and features, you must minimally meet the driving system requirements for CBPDO Wave 1. For CBPDO Wave 1 driving system requirements, see "Driving system Wave 1 requirements" on page 66.

Service distribution

Both preventive and corrective service are delivered using processes such as Shopz, SMP/E Internet Service Retrieval, SystemPac follow-on service (SFS), and RefreshPac.

CBPDO service orders are no longer accepted, effective as follows:

- Effective March 2006, new CBPDO physical delivery subscriptions are no longer accepted. Effective September 2006, existing CBPDO physical delivery subscriptions were discontinued. You can use a job scheduling system and SMP/E Internet Service Retrieval to get service at any interval you find convenient, or use the Internet delivery subscription option available in Shopz.
- Effective June 2006, service-only CBPDO orders are no longer accepted. An improved option for ordering service by SREL, or for all licensed products under the same customer number, continues to be supported in Shopz. You can also get service based on what you have installed using SMP/E Internet Service Retrieval, Shopz, or selected fee offerings. Note that CBPDO product orders are not affected by this change.
- Effective July 2012. CustomPac offerings like RefreshPac and CBPDO will no longer be available in geographies other than EMEA. Orders will be fulfilled only for EMEA after July 6, 2012.

The zSeries Technical Support Web site contains information about problem submission, problem review, open and closed APARs, and documentation. The Web address is http://www.ibm.com/eserver/zseries/support/.

Shopz

Shopz is an Internet application you can use to order z/OS software products and service. Using Shopz, you can order corrective and preventive service over the Internet, with delivery over the Internet, DVD, or by tape. Service with Shopz reduces your research time and effort by using your uploaded SMP/E consolidated software inventory (CSI) to ensure that all applicable service, including

reach-ahead service, for the installed FMIDs in the target zones is selected. Shopz and Roles and Authorization Management (RAM) users can now be authorized to create service orders, submit them for fulfillment, view and download orders they create. Service order authorization can also be separated from product ordering authorization. The Shopz Web address is http://www.ibm.com/software/Shopzseries.

> Note: IBM's strategy is to provide entitled service ordering and service delivery capabilities for the z/OS platform products electronically using the Internet. Shopz is the primary ordering and delivery method for software service on these platforms. The S/390® Service Update Facility (SUF), the Internet-based software service tool for ordering and receiving z/OS, z/OS.e, z/VM, and VSE/ESA software service, was discontinued effective 15 January 2006.

SMP/E Internet Service Retrieval

Obtaining software service over the Internet was improved in z/OS V1R7 (and in the SMP/E V3R4 product) with the introduction of SMP/E Internet Service Retrieval. Without this function, ordering and obtaining service over the Internet through Shopz involves a number of steps including running an SMP/E job to create an inventory file, initiating a service order transaction on Shopz, uploading the inventory file, waiting for notification that the service package is available, accessing the package on Shopz, and running an SMP/E job to download and process the service package. SMP/E Internet Service Retrieval consolidates these steps into one. You use a new form of the RECEIVE command to run an SMP/E job to place a service order, wait for the IBM server to fulfill the order, download the service package (which contains PTFs and HOLDDATA), and process its contents, all in one step.

With SMP/E Internet Service Retrieval, you can request service on demand and even automate the service delivery process. For example, you could schedule an SMP/E job to run once a week, or even every night, to order and download the latest HOLDDATA and critical PTF service and have these service updates available exactly when you want.

SystemPac SFS

For SystemPac users, SystemPac follow-on service (SFS) comes free as an option as part of the SystemPac fee offering. You can order a maximum of three SFSs with maximum intervals of 90 days apart. SFSs contain PTFs fixing PEs and HIPERs. They are built according to the copy of the SMP/E consolidated software inventory (CSI) of your system. Thus, these critical services are tailored to fit your environment.

RefreshPac (fee offering)

RefreshPac is a software preventive service offering that is available for a fee. As of July 6, 2012, RefreshPac is only offered to IBM EMEA locations. With RefreshPac you can update one or all target and DLIB zone pairs residing in a target and DLIB consolidated software inventory (CSI). These zone pairs must belong to the same system release identifier (SREL). RefreshPac is customized by providing input from the customer in the form of a copy of the CSI information that the target and DLIB zone pairs to be serviced resided in. Upon delivery of the RefreshPac, you are entitled to selective follow-on service (SFS). SFSs contain PTFs that fix PE and HIPER fixes that are discovered after the package was shipped to you. By applying SFSs repeatedly, HIPER and PE fixes are flushed out of your system, thus providing a highly available system for your applications.

Education and training

See the z/OS Education Web site at http://www.ibm.com/systems/z/os/zos/
education.html. You will find a course catalog, training paths, a list of classes, and
several links, including a link to the IBM Education Assistant. The IBM Education
Assistant is a collection of multimedia educational modules designed to help you
gain a better understanding of IBM products and use them more effectively to
meet your business requirements. Among many topics, you can find a ServerPac
introduction module and a z/OS migration module.

Publications

See "Related information" on page vii.

Summary of changes for the z/OS installation planner

This topic describes the release-to-release differences that affect z/OS installation
planning.

Changes in z/OS V1R13 updates for September 2012

z/OS V1R13 as updated for September 2012. For functional changes in this release,
see Appendix B, "Software requirements for running z/OS V1R13," on page 127
and "Hardware Requirements for Communications Server" on page 152. This
updated release introduces the IBM zEnterprise EC12 (zEC12) server.

ServerPac and SystemPac changes A new Product ServerPac option is available
that allows you to order only MVS and DB2 without including a base product in
the order. See "Product ServerPac support" on page 23.

**FTPS for the Product Customized Offerings (CBPDO, ServerPac, Product
ServerPac, and SystemPac)**: The capability to download Internet orders using FTPS
for the Product Customized Offerings (CBPDO, ServerPac, and SystemPac), for
Shopz service orders, and for SMP/E RECEIVE ORDER will be provided. The
Shopz download pages provide the option to download directly to your z/OS host
system using FTPS. The CustomPac installation dialog allows you to specify your
own FTP.DATA configuration file or will create one to use for the RECEIVE job.
Secure delivery through FTP using Secure Sockets Layer (FTPS) is planned to be
made available October 15, 2012, as outlined by the z/OS statement of direction,
Software Announcement 212-086 (RFA56317), dated April 11, 2012.

Product documentation changes: None

Note: You need a workstation with a DVD drive to access the above information,
and you must also have Adobe Reader to open and read the PDF files.

Changes in z/OS V1R13

Changed base elements: The following base elements were changed in z/OS
V1R13:
- BCP
- CIM
- Communications Server
- Cryptographic Services
- DFSMSdfp
- Distributed File Service
- HCD

- IBM Tivoli Directory Server
- Integrated Security Services
- Network Authentication Service
- ISPF
- JES2
- Language Environment
- Metal C Runtime Library
- Network File System (NFS)
- Run-Time Library Extensions
- SMP/E (same level as SMP/E V3.6 program product)
- TSO/E
- z/OS UNIX System Services Application Services

Changed optional features: The following optional features were changed in z/OS V1R13:
- C/C++ without Debug Tool
- Communications Server Security Level 3
- DFSMSdss
- DFSMShsm
- DFSMStvs
- DFSMSrmm
- HCM
- Infoprint Server
- JES3
- RMF
- SDSF
- Security Server
- z/OS Security Level 3

Deleted base elements and FMIDs : The following base elements and their associated FMIDs wers deleted in z/OS V1R13:
- Distributed Computing Environment (DCE)
- DCE Base Services: HMB3190, JMB319J (Japanese)
- Integrated Security Services DCE: HRSS190, JRSS19J (Japanese)
- z/OS UNIX System Services Connection Manager: HCMG110, JCMG1J0 (Japanese)
- z/OS UNIX System Services Process Manager: HPMG110, JPMG1J0 (Japanese)

Changes to driving system requirements:
- The minimum driving system level for installing z/OS V1R13 is z/OS V1R11. (For installing z/OS V1R12, it was z/OS V1R10.)

New server
- z/OS V1R13 runs on the IBM zEnterprise 114 (z114) server.

ServerPac and SystemPac changes
- The Modify System Layout dialog allows you to define user data sets as HFS or zFS.
- IBM shipped data sets can be merged into user defined data sets using Merge function in Modify System Layout.
- Existing data sets can be defined as user data sets in Modify System Layout dialog. For more details, refer to Dynamic HELP Facility of **Define a USER Data Set** panel.

Product documentation changes:

- The product program directories will no longer be shipped in hardcopy format or in LIST1403 format. They will now be provided on a separate DVD for tape orders and on the first DVD for DVD orders and will be provided in PDF format.
- *SystemPac Installation Guide*, *ServerPac: Installing Your Order* and *CBPDO Memo to Users Extension* are no longer shipped in hardcopy format. These documents are now available in PDF format on a DVD that also includes the program directories.
- The *z/OS Program Directories* can be accessed through a link on the PL web page as PDFs

Note: You need a workstation with a DVD drive to access the above information, and you must also have Adobe Reader to open and read the PDF files.

Changes in z/OS V1R12

Changed base elements: The following base elements were changed in z/OS V1R12:
- BCP
- CIM
- Communications Server
- Cryptographic Services
- DFSMSdfp
- Distributed File Service
- HCD
- IBM TDS
- Integrated Security Services
- JES2
- Language Environment
- Library Server
- NFS
- Run-Time Library Extensions
- TSO/E
- z/OS UNIX

Changed optional features: The following optional features were changed in z/OS V1R12:
- C/C++ without Debug Tool
- Communications Server Security Level 3
- DFSMSdss
- DFSMShsm
- DFSMSrmm
- DFSMStvs
- DFSORT
- HCM
- Infoprint Server
- JES3
- RMF
- SDSF
- Security Server
- z/OS Security Level 3

Deleted base element: The following base element was deleted in z/OS V1R12:
- msys for Setup

Deleted FMIDs: The following FMIDs were deleted in z/OS V1R12:

- msys for Setup: HMSI707 (Framework)
- msys for Setup: HMSI737 (DFSMS Support)

Product distribution media changes
- z/OS is no longer delivered on 3480, 3480C, and 3490E tapes. DVD is a new delivery medium available with zOS V1R12. Like tape and the Internet, this method can be used to order z/OS and products that run on z/OS. Your order is placed and processed through Shopz as a DVD (4.7 GB single-sided, single-layered) media order. To upload your DVD order, you will need a DVD reader and a workstation that is network-attached to your z/OS host system.
- As of February 22, 2011, the Customized Offerings Driver V3(5751-COD) and PTF maintenance are no longer delivered on 3480, 3480C, and 3490E tapes. DVD is a new delivery medium available for this information.

Changes to driving system requirements:
- The minimum driving system level for installing z/OS V1R12 is z/OS V1R10. (For installing z/OS V1R11, it was z/OS V1R9.)

New server: z/OS V1R12 runs on the IBM zEnterprise 196 (z196) server.

Changes in z/OS V1R11

Changed base elements: The following base elements were changed in z/OS V1R11:
- BCP
- CIM
- Communications Server
- Cryptographic Services
- DFSMSdfp
- Distributed File Service
- HCD
- IBM TDS
- Integrated Security Services
- ISPF
- JES2
- Language Environment
- Metal C Runtime Library
- NFS
- Run-Time Library Extensions
- TSO/E
- z/OS UNIX

Changed optional features: The following optional features were changed in z/OS V1R11:
- C/C++ without Debug Tool
- Communications Server Security Level 3
- DFSMSdss
- DFSMShsm
- DFSMSrmm
- DFSMStvs
- HCM
- JES3
- RMF
- SDSF
- Security Server

- z/OS Security Level 3

Deleted FMIDs:
- FMID HRSL3AA, the LDAP Server in base element Integrated Security Services, has been removed from z/OS. LDAP Server is now in base element IBM TDS and its z/OS V1R11 FMID is HRSL3B0. This is a rewritten LDAP Server that has been in IBM TDS since z/OS V1R8. (The function was provided by PTF in z/OS V1R8 and integrated in z/OS V1R9.)

Changes to driving system requirements:
- The minimum driving system level for installing z/OS V1R11 is z/OS V1R9.
- If a Customized Offerings Driver is used to install z/OS V1R11, you must use the newer one, Customized Offerings Driver V3 (5751-COD). It replaces the Customized Offerings Driver V2 (5655-M12).
- Beginning with V3 of the Customized Offerings Driver (5751-COD), 3380 DASD is no longer supported.

ServerPac and SystemPac changes:
- For hierarchical files that are switchable between zFS and HFS, the CustomPac Installation Dialog now sets the default to zFS. This is another step in the implementation of zFS as the strategic z/OS file system. Note that all file systems are still delivered as HFSs.
- The default volume in the CustomPac Installation Dialog has been changed from 3390-3 to 3390-9. The greater capacity of a 3390-9 volume can better handle the increasing size of products, their PTFs, and file systems. Note that 3390-3 volumes continue to be supported.
- The Modify System Layout dialog now allows you to maintain your ServerPac or SystemPac configuration after your ServerPac or SystemPac has been installed so that you can use the configuration in future installations.
- Electronic orders are now delivered more efficiently. First, order archives are now segmented, which should eliminate the problem of archives being too large for your proxy server to handle. Second, you no longer have to rename files in the order and content directories.
- You can now order Tivoli OMEGAMON and other Tivoli monitoring products in their own ServerPac or SystemPac without having to include z/OS itself in the same order. When you order with Shopz, you will see the products bundled under a display group called "IBM Tivoli Monitoring Products". You must select IBM Tivoli Management Services on z/OS (5698-A79) as the "base product".

CBPDO changes:
- Electronic orders are now delivered more efficiently. First, order archives are now segmented, which should eliminate the problem of archives being too large for your proxy server to handle. Second, you no longer have to rename files in the order and content directories.

Chapter 2. Choosing the software installation and delivery methods

You were introduced to the various packages available for installing z/OS in "Methods of installing z/OS" on page 21. You learned that ServerPac and CBPDO are entitled (provided as part of your z/OS license). Other packages, such as SystemPac, are available for an additional fee. Now it is time to choose one of the installation packages. This topic helps you make your decision.

This topic also helps you choose how you want your order delivered: on tape or electronically (using the Internet).

Choosing an installation package for installing z/OS

If you are a **new customer** (never had z/OS), use one of the following installation packages to install z/OS V1R13:

- Of the entitled packages (ServerPac and CBPDO): Use ServerPac using the full system replacement installation path. You will also need the Customized Offerings Driver V3 (5751-COD) as a driving system. (The Customized Offerings Driver is also entitled.)
- Of the packages available for an additional fee: Use SystemPac in full volume dump format or one of the other fee offerings.

If you are migrating to z/OS V1R13 **from z/OS V1R10 or earlier**, you are migrating from a release that is no longer supported for migration. Contact your IBM representative to find out what alternatives are available.

If you are migrating to z/OS V1R13 **from z/OS V1R11 or V1R12**, use any of the installation packages to install z/OS V1R13:

- Of the entitled packages (ServerPac and CBPDO):
  - Use ServerPac if most of the elements and features already installed on your system are not equivalent to the z/OS V1R13 level. Of your two choices within ServerPac, software upgrade is preferable to full system replacement in the following cases:
    - You are creating a new system image that will share operational data sets (like the master catalog and parmlib) with existing systems.
    - Your new environment will be similar to your old one.
    - Your data set layouts will be the same or similar. (IBM recommendations are described in "Placing data sets on specific volumes" on page 97).
    - You prefer to migrate your operational data sets before (not after) IPLing the new system for the first time.
  - Use CBPDO only if most of the elements and features already installed on your system are equivalent to the z/OS V1R13 level, your enterprise has good to excellent product installation skills, and you are within six months of service currency. Otherwise, using ServerPac will probably take significantly less time and effort.

  Note: Most customers choose ServerPac rather than CBPDO.
- Of the packages available for an additional fee (SystemPac full volume dump, SystemPac dump-by-data-set, and the more-tailored services):

- Use SystemPac full volume dump if you can. The restore of the system is performed by way of volume restore. You get an IPLable system within a day. There is no need to use installation dialogs for restoring and customizing. All customizing is performed up front during local order entry, which an IBM technical representative will guide you through.

- Use SystemPac dump-by-data-set if you want to do a software upgrade instead of a full system replacement. The software upgrade installation path is preferable to a full system replacement for the same reasons as in a ServerPac installation, described above.

- Choose other fee offerings (for example, Select in the United Kingdom, Software Management in Germany, Express Plus Offering in France) if you want to have more than a system replacement done. Some of the additional activities you might want done for you are system automation; production cutover; database and related applications migration; backup and recovery; data management; disaster recovery; parmlib, proclib, and VTAMLST conversion; and on-site support.

Note: To find out the driving system software and hardware requirements necessary to install a ServerPac, CBPDO, or SystemPac order, see Chapter 3, "Preparing the driving system," on page 53.

Installing z/OS without using an installation package

You might find that sharing system libraries or cloning an already-installed z/OS system is faster and easier than installing z/OS with an IBM installation package such as ServerPac. You do not have to wait for the order to be processed and the package delivered, and you do not have to use the CustomPac Installation Dialog twice. Sharing the system libraries (logical SYSRES volume) may also save DASD and support costs because you only need to install service (or additional products) once.

However, before sharing or cloning z/OS, you must have a license for each z/OS operating system that you run. If you do not have the appropriate license or licenses, you must contact IBM. Any sharing or cloning of z/OS without the appropriate licenses is not an authorized use of such programs.

Choosing the delivery medium: tape, DVD, or Internet

You can have products delivered to you on tape, DVD, or electronically (using the Internet):

- Tape is the original delivery medium and can be used for all products, that is, z/OS and products that run on z/OS. You order the products using Shopz or any of the other ordering methods, and you install the products using any of the installation methods (ServerPac, CBPDO, or SystemPac).

  Note: As of z/OS V1R13 35xx software tapes in all Custom Built Offerings include a bar code on the side label.

- Starting with z/OS V1R13, the program directories, *SystemPac Installation Guide*, *ServerPac: Installing Your Order*, and *CBPDO Memo to Users Extension* will be delivered on a separate DVD media (in PDF format) along with the tape media.

- DVD is the newest medium and, like tape and the Internet, can be used for all products, that is, z/OS and products that run on z/OS . Choosing DVD delivery reduces the size of shipments to you and eliminates the need to introduce foreign tapes into your site. Your order is placed and processed through Shopz as a DVD (4.7 GB single-sided, single-layered) media order. To upload your

DVD order, you will need a DVD reader and a workstation that is network-attached to your z/OS host system.

- Internet delivery, like tape and DVD, can be used for all products, that is, z/OS and products that run on z/OS. You must place the order using Shopz. You can install the order using ServerPac, CBPDO, or SystemPac. Shopz generates a customized download page for each order; the page includes order content and instructions. Support to install Internet orders has been added to the CustomPac Installation Dialog and CBPDO installation process.

A typical z/OS-only ServerPac or SystemPac order is approximately 6 GB (compressed) in size. A typical SystemPac order with multiple SRELs is approximately 8 GB (compressed) in size. A typical subsystem ServerPac or SystemPac order is approximately 500 MB (compressed) in size.

If you choose Internet delivery, you can estimate how long a download will take for a specific order by using the download speed table at the Download Support Web site: http://www6.software.ibm.com/regsvs/nethelp/download.html.

Choosing the Internet download method: direct or intermediate

If you choose Internet delivery, you also have to choose whether to download your order directly to z/OS (recommended) or download it to an intermediate node (a workstation) and then forward it to your z/OS system. Table 7 and the security sections that follow help you understand the characteristics of each download method and which method is most appropriate for your environment.

Table 7. Considerations for download methods (direct versus intermediate)

Considerations	If downloading *directly* to z/OS	If downloading to a workstation as an *intermediate* node
Minimum recommended bandwidth (higher bandwidth reduces download times)	100 KBPS between your host and the IBM server.	100 KBPS between your intermediate workstation and the IBM server.
Direct access to the Internet and driving system	Your z/OS system must have access to the Internet and your firewall and security policies support connectivity to the Internet.	The workstation that will be used to download the package must have access to the Internet. The workstation must also have the ability to make Internet packages available to the z/OS host system. ServerPac and SystemPac orders: the workstation can be configured as an FTP server or the package can reside on a network drive that is accessible by the host.

Table 7. Considerations for download methods (direct versus intermediate) (continued)

Considerations	If downloading *directly* to z/OS	If downloading to a workstation as an *intermediate* node
Software requirements	For ServerPac and SystemPac dump-by-data-set, see item 12 on page 56. For CBPDO, see "Identifying driving system software requirements for installing z/OS using CBPDO" on page 63. For SystemPac full volume dump, see "Identifying driving system software requirements for installing z/OS using full volume dump SystemPac" on page 61.	For ServerPac and SystemPac dump-by-data-set, see items 12 on page 56 and 13 on page 57. For CBPDO, see "Identifying driving system software requirements for installing z/OS using CBPDO" on page 63. For SystemPac full volume dump, see "Identifying driving system software requirements for installing z/OS using full volume dump SystemPac" on page 61.
Hardware requirements	See "Identifying driving system hardware requirements" on page 67.	See "Identifying driving system hardware requirements" on page 67.
Restart capability if transfer is interrupted	For ServerPac and SystemPac dump-by-data set, you can resubmit the RECEIVE job, and the SMP/E GIMGTPKG service routine manages the resumption of the download from the file that was interrupted. For CBPDO, you can resubmit the RFNJOB or RFNJOBS job, and the RECEIVE FROMNETWORK service manages the resumption of the download from the file that was interrupted. For SystemPac full volume dump, you can resubmit the GETORDER job, and the SMP/E GIMGTPKG service routine manages the resumption of the download from the file that was interrupted.	The download is resumed with the file that was interrupted. Also supports ability to suspend and resume download.

Table 7. Considerations for download methods (direct versus intermediate) (continued)

Considerations	If downloading *directly* to z/OS	If downloading to a workstation as an *intermediate* node
Background capability	For ServerPac and SystemPac dump-by-data set, you can generate the RECEIVE job in the CustomPac Installation Dialog, which retrieves the package as a background request. For CBPDO, you can obtain the RFNJOB or RFNJOBS job from the Shopz download page for your order. When the job is run on your host system, it retrieves the CBPDO package as a background request. For SystemPac full-volume-dump, you can obtain the GETORDER job from the Shopz download page for your order. When the job is run on your host system, it retrieves the SystemPac package as a background request.	The download applet runs as a separate task but cannot be scheduled for specific initiation times.
Authentication to access order	IBM-supplied user ID and password for Shopz. Also, FTP access to download the order is controlled by user ID and password.	IBM-supplied user ID and password for Shopz.
Internet package integrity	SHA-1 hashing algorithm and verification.	RSA encryption to create a digital signature. A unique client and server public/private key pair is created.
Controlling who can download the package	Access to order information is controlled by the Shopz user ID and password. Also, you can use the RACF SERVAUTH class to control access to the IP stack and FTP client authentication.	Access to order information is controlled by the Shopz user ID and password.

Security of your Internet order

Internet delivery uses a combination of industry standard authentication and data integrity approaches to provide security for information about your order and to ensure the integrity of the contents of your order. Your Shopz user ID and password protects sensitive data associated with your order from access by others. This sensitive data includes the status of your order and information required to access your order on the IBM server.

Chapter 2. Choosing the software installation and delivery methods   **49**

Hashing algorithms are used for both download methods (directly to z/OS and to a workstation as an intermediate node). For downloads directly to z/OS, SMP/E ensures the data integrity of your package through its assignment of a hash value during packaging of your order and verification of that hash value upon download. SMP/E uses the ICSF One-Way Hash Generate callable service to perform the verification. If you download your order to a workstation as the intermediate node, the browser-based transfer also uses a hashing algorithm to verify data integrity.

Network security

Before downloading your order, you must understand your network security environment. For example,

- Does a z/OS image have access to the Internet?
- Are there security concerns for downloading to a workstation or transferring files to the host?

If you are planning to download directly to z/OS, you must be familiar with the security and networking information required to navigate your enterprise's firewall from z/OS:

- For ServerPac and SystemPac dump-by-data-set, this information is used by the CustomPac Installation Dialog.
- For CBPDO, this information must be supplied within the RFNJOBS job that is supplied on the Shopz download page.
- For SystemPac full-volume-dump, this information must be supplied within the GETORDER job that is supplied on the Shopz download page.

Server information defines the IBM server where your order resides. The server information specifies:

- The TCP/IP-connected host that is the FTP server.

  Note: As of October 2012, the IBM Servers that handle Custom Built Offerings like ServerPac, CBPDO, and others (CB) will be able to handle a secure or non secure FTP. In the fourth quarter of 2012, IBM plans to make secure delivery through FTP using Secure Sockets Layer (FTPS) an option for Internet delivery of ServerPac, CBPDO, SystemPac®, FunctionPac, ProductPac, and Internet delivery of PTFs ordered using ShopzSeries and the SMP/E RECEIVE ORDER command. In the third quarter of 2012, IBM plans to make a connectivity test available on Shopz to help you verify that your system is set up to support secure delivery. In the fourth quarter of 2013, IBM plans to require the use of FTPS for direct downloads to z/OS systems. Download Director, an alternative download method you can use to download packages to a workstation and transfer them to z/OS later, is not affected by this change and is planned to remain available.

- User ID and password information to access the IBM server.

  If you are downloading your order to a workstation and you plan to use SMP/E RECEIVE FROMNETWORK to transfer the order to z/OS, you must update the server information to reflect the workstation's FTP server information.

  Some firewall programs require an explicit IP address. The address depends on your domain. To determine the IP address, you can use the FTP ping command to the server identified on the customized download pages for ServerPac orders. For example, issue `ping inetsd01.boulder.ibm.com`. This returns the IP address.

- Package information: package attribute file, hash value, and the package ID (which is used as the package directory in the SMPNTS).

Client information describes:

- The IP address or host name of the firewall server
- IP port
- User ID and password
- Account information
- Firewall-specific commands

Both ServerPac and SystemPac (by way of the SMP/E GIMGTPKG service routine) use the One-Way Hash Generate callable service to verify the SHA-1 hash value associated with your package. Therefore, you must always have ICSF configured and active so that the One-Way Hash Generate callable service is available.

Chapter 3. Preparing the driving system

The *driving system* is the system image (hardware and software) that you use to install the target system. The *target system* is the system software libraries and other data sets that you are installing. You log on to the driving system and run jobs there to create or update the target system. Once the target system is built, it can be IPLed on the same hardware (same LPAR or same processor) or different hardware than that used for the driving system.

This topic identifies the software and hardware you will need for your driving system. See Chapter 4, "Preparing the target system," on page 69 for the software and hardware you will need for your target system.

Note: If your driving system will share resources with your target system after the target system has been IPLed, be sure to install applicable coexistence service (see "Coexistence and fallback" on page 27) on the driving system before you IPL the target system. If you do not install the coexistence service, you will probably experience problems due to incompatible data structures (such as incompatible data sets, VTOCs, catalog records, global resource serialization tokens, or APPC bind mappings).

What is the Customized Offerings Driver?

The Customized Offerings Driver (5751-COD) is an entitled driving system you can use if (1) you do not have an existing system to use as a driving system or (2) your existing system does not meet driving system requirements and you do not want to upgrade it to meet those requirements. As of October 2012 this driver is a subset of a z/OS V1R12 system.

The Customized Offerings Driver is in DFSMSdss dump/restore format and supports DASD volumes formatted as 3390-9 or larger. The Customized Offerings Driver requires a locally attached non-SNA terminal and a system console from the IBM® (or equivalent) family of supported terminal types: 317x, 327x, 319x, or 348x. Starting in February 2011, the Customized Offerings Driver can be delivered on DVD (three DVDs per order). The DVD restore process will take approximately two hours per DVD. Also, an IBM (or equivalent) supported tape drive can be used to restore the driver.

The Customized Offerings Driver is intended to run in single-system image and monoplex modes only. Its use in multisystem configurations is not supported. The Customized Offerings Driver is intended to be used only to install new levels of z/OS using ServerPac or CBPDO, and to install service on the new software until a copy (clone) of the new system can be made. The use of the Customized Offerings Driver for other purposes is not supported. For example, IBM does not support the use of the Customized Offerings Driver to run any production workload.

The Customized Offerings Driver includes a hierarchical file system and the necessary function to use Communications Server (IP Services), Security Server, and the system-managed storage (SMS) facility of DFSMSdfp, but these items are not customized. However, existing environments can be connected to, and used from, the Customized Offerings Driver system.

Depending on the level of your existing system, the Customized Offerings Driver might be at higher product and service levels. Therefore, as is true of the level of software you plan to install, fallback service might be necessary to let you IPL and use your existing level of software after the Customized Offerings Driver has been IPLed and used in any environment. **You must either (1) use the Customized Offerings Driver in a completely isolated environment or (2) install the needed fallback service on your existing system before the Customized Offerings Driver is IPLed.** A completely isolated environment shares no DASD with any other system and will not be used to IPL any lower level of software.

Installing the service on your existing system, as described in "Coexistence and fallback" on page 27, will also satisfy the requirements for falling back from the Customized Offerings Driver. This will allow you to IPL and use your current level of software after using either the Customized Offerings Driver or the new system. (IBM has installed the service on the Customized Offerings Driver to allow it to be IPLed and used (if necessary) after the new system has been IPLed and used.)

Identifying driving system software requirements for installing z/OS using ServerPac or dump-by-data-set SystemPac

Driving system requirements for installing z/OS by way of ServerPac or dump-by-data-set SystemPac are:

1. **An operating system.** Use either of the following:
   - z/OS V1R11 or later.
   - The Customized Offerings Driver V3 (5751-COD). This entitled driving system is provided for those (1) who do not have an existing system to use as a driving system or (2) whose existing system does not meet the requirements of a driving system and who choose to not upgrade their driving system. For more information, see "What is the Customized Offerings Driver?" on page 53.

2. **A TSO/E session.** A TSO/E session on the IPLed system must be established using a locally-attached or network-attached terminal.

3. **Proper authority.** Use the RACFDRV installation job as a sample of the security system definitions required so that you can perform the installation tasks.

4. **Proper security.** In order for you to install the z/OS UNIX files, the following is required:
   - The user ID you use must be a superuser (UID=0) or have read access to the BPX.SUPERUSER resource in the RACF FACILITY class.
   - The user ID you use must have read access to FACILITY class resources BPX.FILEATTR.APF, BPX.FILEATTR.PROGCTL, and BPX.FILEATTR.SHARELIB (or BPX.FILEATTR.* if you choose to use a generic name for these resources). The commands to define these FACILITY class resources are in SYS1.SAMPLIB member BPXISEC1.
   - Group IDs uucpg and TTY, and user ID uucp, must be defined in your security database. These IDs must contain OMVS segments with a GID value for each group and a UID value for the user ID. (For ease of use and manageability, define the names in uppercase.)
     Rules:
     – The group ID and user ID values assigned to these IDs cannot be used by any other IDs. They must be unique.

– You must duplicate the required user ID and group names in each security database, including the same user ID and group ID values in the OMVS segment. This makes it easier to transport the z/OS UNIX file systems (HFS or zFS) from test systems to production systems. For example, the group name TTY on System 1 must have the same group ID value on System 2 and System 3. If it is not possible to synchronize your databases you will need to continue running the FOMISCHO job against each system after z/OS UNIX is installed.

  If names such as uucp, uucpg, and TTY are not allowed on your system, or if they conflict with existing names, you can create and activate a user ID alias table.

  For information about defining these group and user IDs to RACF and about creating a user ID alias table (USERIDALIASTABLE), see *z/OS UNIX System Services Planning*. Another source of information is SYS1.SAMPLIB member BPXISEC1.

  Note: You can use the RACFDRV installation job as a sample of the security system definitions required to perform the installation tasks.

  • In order for you to install into the zFS, the user ID you use must have read access to the SUPERUSER.FILESYS.PFSCTL resource in the RACF UNIXPRIV class.

5. **OMVS address space active.** For ServerPac only (not SystemPac), an activated OMVS address space with z/OS UNIX kernel services operating in full function mode is required.

6. **SMS active.** The Storage Management Subsystem (SMS) must be active to allocate z/OS UNIX file systems (HFS or zFS) and PDSE data sets, whether they are SMS-managed or non-SMS-managed. Also, the use of z/OS UNIX file systems (HFS or zFS) is supported only when SMS is active in at least a null configuration, even when the file systems are not SMS-managed. Do either of the following:

  • To allocate non-SMS-managed z/OS UNIX file systems (HFS or zFS) and PDSE data sets, you must activate SMS on the driving system in at least a null configuration. You must also activate SMS on the target system.

  • To allocate SMS-managed z/OS UNIX file systems (HFS or zFS) and PDSE data sets, you must activate SMS on the driving system in at least a minimal configuration. Then you must define a storage group, create SMS-managed volumes, and write, translate, and activate a storage class ACS routine that allows the allocation of z/OS UNIX file systems (HFS or zFS) and PDSE data sets with the names in the ALLOCDS job. You must also activate SMS on the target system.

7. **Language Environment requirements.** The CustomPac Installation Dialog uses the Language Environment run-time library, SCEERUN. If SCEERUN is not in the link list on the driving system, you must edit the ServerPac installation jobs to add it to the JOBLIB or STEPLIB DD statements.

  Do not specify the following Language Environment run-time options as nonoverrideable (NONOVR) in the CEEDOPT CSECT or the CEEDOPT group of the CEEPRM*xx* parmlib member:

    ALL31
    ANYHEAP
    BELOWHEAP
    DEPTHCONDLMT
    ERRCOUNT
    HEAP
    HEAPCHK

```
HEAPPOOLS
INTERRUPT
LIBSTACK
PLITASKCOUNT
STACK
STORAGE
THREADHEAP
THREADSTACK
```

8. **CustomPac Installation Dialog.** If you are installing a ServerPac or dump-by-data-set SystemPac for the first time, you need to install the CustomPac Installation Dialog on your driving system. See *ServerPac: Using the Installation Dialog* or *SystemPac: CustomPac Dialog Reference* for instructions. For subsequent orders you do not need to reinstall the dialog. IBM ships dialog updates with each order.

   You should check the PSP bucket for possible updates to the CustomPac Installation Dialog. For ServerPac, the upgrade is ZOSV1R13 and the subset is SERVERPAC. For SystemPac dump-by-data-set orders, the upgrade is CUSTOMPAC and the subset is SYSPAC/DBD.

9. **Proper level for service.** In order for you to install service on the target system that you are building, your driving system must minimally meet the driving system requirements for CBPDO Wave 1 (see "Driving system Wave 1 requirements" on page 66) and must have the current (latest) levels of the program management binder, SMP/E, and HLASM.

   The service jobs generated by the CustomPac Installation Dialog use the target system's (and therefore current) level of the program management binder, SMP/E, and HLASM. If you choose to use your own jobs, model them after the jobs provided by ServerPac or dump-by-data-set SystemPac by adding STEPLIB DD statements to access MIGLIB (for the program management binder and SMP/E) and SASMMOD1 (for HLASM). Be sure that the SASMMOD1 and SYS1.MIGLIB data sets are APF authorized.

   Another way to install service is from a copy of your target system.

10. **SMP/E ++JAR support.** If your ServerPac order contains any product that uses the ++JAR support introduced in SMP/E V3R2 (which is the SMP/E in z/OS V1R5), your driving system requires IBM SDK for z/OS, Java 2 Technology Edition, V1 (5655-I56) at SDK 1.4 or later. z/OS itself does not use the ++JAR support.

11. **zFS configured properly.** If you will use a zFS for installation, then you must be sure that the zFS has been installed and configured, as described in *z/OS Distributed File Service zSeries File System Administration*.

12. Internet delivery requirements. If you intend to receive your ServerPac or SystemPac dump-by-data-set order by way of the Internet, you need the following:

    - SMP/E if you intend to receive your order using Standard FTP (FTP):
      - SMP/E V3R5 or higher.
      - SMP/E V3R5, which is in z/OS V1R10, V1R11, and V1R12.
      - SMP/E V3R6 which is in z/OS V1R13.

      If you intend to receive your order using Secure FTP (FTPS) for SMP/E V3R6, use the following PTFs:
      - UO00959
      - UO00960

To verify the Secure FTP web site, go to the Customized Offerings Connectivity Test web site: https://www14.software.ibm.com/webapp/iwm/web/preLogin.do?lang=en_US&source=cbct

- ICSF configured and active so that it can calculate SHA-1 hash values in order to verify the integrity of data being transmitted. If ICSF is not configured and active, SMP/E calculates the SHA-1 hash values using an SMP/E Java application class, provided that IBM SDK for z/OS, Java 2 Technology Edition, V1 (5655-I56) or later is installed. IBM recommends the ICSF method because it is likely to perform better than the SMP/E method. (To find out how to configure and activate ICSF, see *z/OS Cryptographic Services ICSF System Programmer's Guide*. For the required SMP/E setup, see *SMP/E User's Guide*.)

- A download file system. Your order is provided in a compressed format and is saved in a download file system. The size of this file system should be approximately twice the compressed size of your order to accommodate the order and workspace to process it.

- Firewall configuration. If your enterprise requires specific commands to allow the download of your order using FTP or FTPS through a local firewall, you must identify these commands for later use in the CustomPac Installation Dialog, which manages the download of your order.

- Proper dialog level. If you plan to use Standard FTP (FTP), look for the text "This dialog supports secure Internet delivery." at the bottom of panel CPPPPOLI in the CustomPac Installation Dialog. If you plan to use Secure FTP, look for the text "This dialog supports electronic delivery." at the bottom of panel CPPPPOLI in the CustomPac Installation Dialog. If your dialog does not contain either text, follow the migration scenarios and steps described in *ServerPac: Using the Installation Dialog*.

  Note: Note: Be sure that your FTP.DATA data set statements are set appropriately for your environment. For example, an FTPKEEPALIVE statement with a value of 0, the default, can cause an FTP control connection to time out in some environments. Also, the key ring file specified by the KEYRING statement in the FTP.DATA file might require certificates to be added in order to use Secure FTP. For details about specifying FTP.DATA statements, see z/OS Communications Server: IP Configuration Reference. If you intend to receive your order using FTPS, you need to ensure the "Root 2 - GeoTrust Global CA Certificate" is connected to your keyring and trusted on your system. Go to the Customized Offerings Connectivity Test web site at Customized Offerings Connectivity Test for instructions on how to set up and verify that your system can connect to the IBM download servers. For detailed information on how to set up FTPS, see the SMP/E for z/OS User's Guide.

13. **Additional Internet delivery requirements for intermediate download.** If you plan to download your ServerPac or SystemPac dump-by-data-set order to a workstation and from there to z/OS, you need the following in addition to the requirements listed in item 12 on page 56:

    - Download Director. This is a Java applet used to transfer IBM software to your workstation. For Download Director requirements, see http://www14.software.ibm.com/dldirector/faq.html.

    - The ServerPac or SystemPac dump-by-data-set order accessible to the host. To make the order (files) accessible to z/OS, you can do either of the following:

– Configure the workstation as an FTP server. After you download the order to your workstation, the dialogs used to install a ServerPac or SystemPac dump-by-data-set order can point to a network location (in this case, your workstation) to access the order. Consult the documentation for your workstation operating system to determine if this FTP capability is provided or if you have to install additional software. Commercial, shareware, and freeware applications are available to provide this support. However, IBM cannot directly recommend or endorse any specific application. This option requires the use of ICSF.

– Use network drives that are mounted to z/OS. The mounting can be accomplished using the NFS base element, server message block (SMB) support provided by the Distributed File Service base element, or the Distributed FileManager component of the DFSMSdfp base element. The package is received from the file system defined as your SMPNTS.

For information about NFS, see *z/OS Network File System Guide and Reference*. For information about using the Distributed FileManager, see *z/OS DFSMS DFM Guide and Reference*.

- CD write capability. If you specified that 100% electronic delivery is required, there might be CD images associated with your order. The images are delivered in ISO9660 format and are packaged in zip files (with an extension of .zip). These files require your workstation to have CD write capability and you might have to acquire software to support this capability.

14. **DVD delivery requirements.** If you intend to receive your ServerPac or SystemPac dump-by-data-set order by way of DVD, you need the following:

  a. SMP/E:

    - SMP/E V3R5 or higher.
    - SMP/E V3R5, which is in z/OS V1R10, V1R11, and V1R12.
    - SMP/E V3R6 which is in z/OS V1R13.

    If you intend to receive your order using Secure FTP (FTPS) for SMP/E V3R6, use the following PTFs:

    - UO00959
    - UO00960

  b. ICSF configured and active so that it can calculate SHA-1 hash values in order to verify the integrity of data being transmitted. If ICSF is not configured and active, SMP/E calculates the SHA-1 hash values using an SMP/E Java application class, provided that IBM SDK for z/OS, Java 2 Technology Edition, V1 (5655-I56) or later is installed. IBM recommends the ICSF method because it is likely to perform better than the SMP/E method. (To find out how to configure and activate ICSF, see *z/OS Cryptographic Services ICSF System Programmer's Guide*. For the required SMP/E setup, see *SMP/E User's Guide*.)

15. **Additional DVD delivery requirements.** If you plan to copy the contents of the DVD(s) to a workstation before making them available on a z/OS host system, then the following requirements apply:

  a. The ability to share or transfer data to the z/OS host system where the order will be installed.

  b. Disk space for storing DVD files. The amount of disk space required varies by order. You need to have sufficient space for the compressed package. The package will be uncompressed on your host.

c. If you plan to use the 'S' option in ServerPac/SystemPac using the workstation as the server, you must set up an FTP server on that workstation.

Preparing for installation

If you are going to install z/OS using ServerPac or dump-by-data-set SystemPac, take the following steps:

1. Separate customization data and non-z/OS products from your system software as described in "Separating data from software" on page 94. This will minimize your installation and migration workload not only for this installation but for future ones.

2. Plan your data set layout ahead of time. Before running any of the jobs generated by the CustomPac Installation Dialog, decide where (on which volumes) you want to place product libraries and other data sets. You may choose to implement the IBM recommended layout as described in "Recommended data set placement" on page 100, or you could lay out the same catalog and volume structure of your current system. After completing the installation, you can save the configuration (including layout) and use it in future installations.

   The easiest way to implement the IBM recommended layout is to assign your order's data sets to DASD volumes automatically, using the dialog's Create a Recommended System Layout function. This function helps you configure a target system that complies with the recommended system layout. The alternative is to assign data sets manually using either (1) the View and Change Data Sets by Selected Attributes function or (2) the Summary Display commands on the Modify System Layout Options panel.

   As part of layout planning, decide whether you'll want to merge any data sets that have matching attributes in order to create a single panel library, single message library, and so forth. This is most easily done using the View and Change Data Sets by Selected Attributes option. See *ServerPac: Using the Installation Dialog* or *SystemPac: CustomPac Dialog Reference* for information about merging data sets in a ServerPac or dump-by-data-set SystemPac. Be aware that not all data sets that can be merged should be merged.

3. If possible, have empty volumes available onto which you will install your order. Empty volumes make it easier to start over if necessary. But if you choose to place data sets on volumes that are not empty, follow these steps:

   a. Back up the target volumes.

   b. Check the names of data sets on the volumes. A data set name on a given volume must not be the same as the name of a data set that you plan to install on that volume. You can use the View and Change option of Modify System Layout of the CustomPac Installation Dialog to get a list of the data sets in your order.

      All data sets are initially allocated with one or more temporary high-level qualifiers, called *system-specific aliases* (SSAs). Later during installation, the data sets are renamed to remove these temporary qualifiers. If you plan to install your order using volumes that already have data sets on them, you must ensure that the names of the data sets already on the volumes will not be duplicated by the names of the data sets you will create, both with and without their temporary qualifiers.

4. Make sure that any data sets you choose to SMS-manage will not have names, with or without an SSA, that duplicate the names of existing data sets on your driving system. This is because SMS-managed data sets cannot coexist with like-named data sets in the driving system's catalog structure. Data sets with

duplicate names will become inaccessible from your driving system during installation, and installation jobs will fail.

5. If you have decided to do a software upgrade instead of a full system replacement, follow these steps:

   a. Back up catalogs that will be updated by the installation process. You can use the Defining Alias-to-Catalog Relationships panel in the CustomPac Installation Dialog to determine which catalogs will be updated. Consider using a DASD backup utility such as DFSMSdss or the IDCAMS EXPORT TEMPORARY command. (But do not use the IDCAMS REPRO command. REPRO changes volume ownership for VSAM and SMS-managed data sets from the input catalog to the output catalog.) For information about DFSMSdss, see *z/OS DFSMSdss Storage Administration* and *z/OS DFSMSdfp Storage Administration*. For information about backing up catalogs using the EXPORT command, see *z/OS DFSMS Managing Catalogs* and *z/OS DFSMS Access Method Services for Catalogs*.

   b. Back up other operational data sets (like parmlib, proclib, and the primary RACF database) that will be updated during the installation.

   c. When using the CustomPac Installation Dialog's Modify System Layout function, make sure that the data set layout you specify matches your current system's catalog and volume structure (with the exception of new data sets that will be allocated as part of the installation and old data sets that you do not need to keep). The best way to do this is to use the saved configuration from your last order as the basis for the new configuration. The dialog does this by default, placing data sets on the same volumes with the same names. This makes it easy to keep the new system in sync with the old system's catalog and volume structure.

   If you cannot avoid changing the layout, you have to determine whether changes must be made to the existing system, and if so, how to make them. If the existing catalogs will never be used to IPL a system other than the new target, or the changes will not affect other systems that use the same catalog, you can change the existing configuration. However, if the existing catalogs will be used to IPL other systems and there is a possibility that users of those systems will be adversely impacted by the changes that the new catalog entries introduce, you must change your existing environment before performing the installation, change your planned configuration to make it compatible with your existing environment, or use new catalogs for the installation.

6. Set up parmlib and proclib concatenation as described in *z/OS MVS Initialization and Tuning Reference*. This step will save migration time now and in future installations.

7. If you use indirect cataloging at your site and have chosen to do a full system replacement, you will have some additional migration work to do after installing because the new catalogs created by the installation process use volume/unit referencing, not indirect cataloging. You can do one of the following:

   • Add the new entries to your existing catalogs and connect the new user catalogs to your existing catalogs.

   • Update the new catalogs to use indirect and extended indirect catalog entries.

Identifying driving system software requirements for installing z/OS using full volume dump SystemPac

For a SystemPac full volume dump order delivered on tape, there are three possible ways to restore your order:

- With stand-alone utilities.

  If you do not have a z/OS driving system, your SystemPac order contains the stand-alone versions of the following utility programs so that you can install your order:

  - ICKDSF, to be used to initialize DASD, create VTOCs, and perform other utility functions during system installation
  - DFSMSdss, to restore the volume from tape to DASD

  The utilities are provided based on selections you make during local order entry. See the *SystemPac Installation Guide* supplied with your order for details about running these utilities.

- With batch JCL.

  This is the most common way to install a full volume dump order. If you have a z/OS driving system, you can install your order through a batch job that initializes and restores the DASD volumes. However, you need to have the following software:

  - ICKDSF R17 or later. (The R17 level of the ICKDSF product is functionally equivalent to the ICKDSF base element in z/OS V1R4 [with the z/OS V1R4 z990 Compatibility Support feature installed] and later.)
  - DFSMSdss or Innovation Data Processing FDR V5.3.44 or later.

  The JCL to restore the DASD volumes is described in the *SystemPac Installation Guide* supplied with your order.

  A full volume dump order is a load-and-go implementation that allows you to IPL your system as it is restored. You can customize after you start your target system. Jobs are "file-tailored" and stored in a library, as described in the *SystemPac Installation Guide*.

- With the CustomPac Installation Dialog.

  If you previously installed a ServerPac or dump-by-data-set SystemPac order and you have the CustomPac Installation Dialog installed, you can use the dialog to receive your order from the first System and Distribution tape, and then use the dialog to install your order. If you use this method, after your DASD volumes are restored and the catalog volume is available, you need to connect the target system master catalog to your driving system. For details, see the *SystemPac Installation Guide* sent with your order.

If you intend to receive your SystemPac full volume dump order by way of the Internet, you need the following:

- SMP/E if you intend to receive your order using Standard FTP (FTP):
  - SMP/E V3R5 or higher.
  - SMP/E V3R5, which is in z/OS V1R10, V1R11, and V1R12.
  - SMP/E V3R6 which is in z/OS V1R13.

  If you intend to receive your order using Secure FTP (FTPS) for SMP/E V3R6, use the following PTFs:
  - UO00959
  - UO00960

- ICSF configured and active so that it can calculate SHA-1 hash values in order to verify the integrity of data being transmitted. If ICSF is not configured and active, SMP/E calculates the SHA-1 hash values using an SMP/E Java application class, provided that IBM SDK for z/OS, Java 2 Technology Edition, V1 (5655-I56) or later is installed. IBM recommends the ICSF method because it is likely to perform better than the SMP/E method. (To find out how to configure and activate ICSF, see *z/OS Cryptographic Services ICSF System Programmer's Guide*. For the required SMP/E setup, see *SMP/E User's Guide*.)
- A download file system. Your order is provided in a compressed format and is saved in a download file system. The size of this file system should be approximately twice the compressed size of your order to accommodate the order and workspace to process it. Job ALLOCFS, which is provided, will allocate a new HFS file system data set large enough to receive your Syste mPac order content, if you do not already have a data set with enough free space.
- Firewall configuration. If your enterprise requires specific commands to allow the download of your order using FTP or FTPS through a local firewall, you must identify these commands for later use in the GETORDER job provided on the download page, which manages the download of your order.

  Note: Note: Be sure that your FTP.DATA data set statements are set appropriately for your environment. For example, an FTPKEEPALIVE statement with a value of 0, the default, can cause an FTP control connection to time out in some environments. Also, the key ring file specified by the KEYRING statement in the FTP.DATA file might require certificates to be added in order to use Secure FTP. For details about specifying FTP.DATA statements, see z/OS Communications Server: IP Configuration Reference. If you intend to receive your order using FTPS, you need to ensure the "Root 2 - GeoTrust Global CA Certificate" is connected to your keyring and trusted on your system. Go to the Customized Offerings Connectivity Test web site at Customized Offerings Connectivity Test for instructions on how to set up and verify that your system can connect to the IBM download servers. For detailed information on how to set up FTPS, see the SMP/E for z/OS User's Guide.

If you intend to download your SystemPac full volume dump order to a workstation and from there to z/OS, you need the following in addition to the requirements above:
- Download Director. This is a Java applet used to transfer IBM software to your workstation. For Download Director requirements, see http://www14.software.ibm.com/dldirector/faq.html.
- The SystemPac full volume dump order accessible to the host. To make the order (files) accessible to z/OS, you can do any of the following:
  - Configure the workstation as an FTP server. After you download the order to your workstation, the GETORDER job can point to a network location (in this case, your workstation) to access the order. Consult the documentation for your workstation operating system to determine if this FTP capability is provided or if you have to install additional software. Commercial, shareware, and freeware applications are available to provide this support. However, IBM cannot directly recommend or endorse any specific application. This option requires the use of ICSF.
  - Use FTP commands to upload your package. Shopz help contains sample FTP commands that you can use to transfer your package to the host. You can copy/paste and update as required to provide a user ID and password, and

to replace `your_package_id` with the actual workstation location (directory) and `packid` with the host location (directory) for your environment. To make the transfer easier, you can create a text file that contains these FTP commands. This file then becomes input to the FTP program on your workstation. See the Shopz help at http://www.ibm.com/software/Shopzseries.

– Use network drives that are mounted to z/OS. The mounting can be accomplished using the NFS base element, server message block (SMB) support provided by the Distributed File Service base element, or the Distributed FileManager component of the DFSMSdfp base element. The package is received from the file system defined as your SMPNTS.

For information about NFS, see *z/OS Network File System Guide and Reference*. For information about using the Distributed FileManager, see *z/OS DFSMS DFM Guide and Reference*.

- CD write capability. If you specified that 100% electronic delivery is required, there might be CD images associated with your order. The images are delivered in ISO9660 format and are packaged in a compressed file. This file requires your workstation to have CD write capability and you might have to acquire software to support this capability.

- **DVD delivery requirements.** If you intend to receive your SystemPac full volume dump order on DVD, you need the following:

  1. ICSF configured and active so that it can calculate SHA-1 hash values in order to verify the integrity of data being transmitted. If ICSF is not configured and active, SMP/E calculates the SHA-1 hash values using an SMP/E Java application class, provided that IBM SDK for z/OS, Java 2 Technology Edition, V1 (5655-I56) or later is installed. IBM recommends the ICSF method because it is likely to perform better than the SMP/E method. (To find out how to configure and activate ICSF, see *z/OS Cryptographic Services ICSF System Programmer's Guide*. For the required SMP/E setup, see *SMP/E User's Guide*.)

- **Additional DVD delivery requirements.** If you plan to copy the contents of the DVD(s) to a workstation before making them available on a z/OS host system, then the following requirements apply:

  – The ability to share or transfer data to the z/OS host system where the order will be installed.

  – Disk space for storing DVD files. The amount of disk space required varies by order. You need to have sufficient space for the compressed package. The package will be uncompressed on your host.

  – If you plan to use GETORDER GIMGTPKG steps to receive order content using the workstation as the server, you must set up an FTP server on that workstation.

Identifying driving system software requirements for installing z/OS using CBPDO

When you use the CBPDO method of installing z/OS you install in three stages called *waves*. (Wave 1, in order to be more manageable, is divided into several tasks called *ripples*.) This section describes the driving system requirements for each wave.

If you intend to receive your CBPDO order by way of the Internet, you need the following:

- SMP/E if you intend to receive your order using Standard FTP (FTP):

- SMP/E V3R5 or higher.
- SMP/E V3R5, which is in z/OS V1R10, V1R11, and V1R12.
- SMP/E V3R6 which is in z/OS V1R13.

If you intend to receive your order using Secure FTP (FTPS) for SMP/E V3R6, use the following PTFs:
- UO00959
- UO00960

- ICSF configured and active so that it can calculate SHA-1 hash values in order to verify the integrity of data being transmitted. If ICSF is not configured and active, SMP/E calculates the SHA-1 hash values using an SMP/E Java application class, provided that IBM SDK for z/OS, Java 2 Technology Edition, V1 (5655-I56) or later is installed. IBM recommends the ICSF method because it is likely to perform better than the SMP/E method. (To find out how to configure and activate ICSF, see *z/OS Cryptographic Services ICSF System Programmer's Guide*. For the required SMP/E setup, see *SMP/E User's Guide*.)

- A download file system. Your order is provided in a compressed format and is saved in a download file system. The size of this file system should be approximately twice the compressed size of your order to accommodate the order and workspace to process it.

- Firewall configuration. If your enterprise requires specific commands to allow the download of your order using FTP or FTPS through a local firewall, you must identify these commands for later use in the RECEIVE FROMNETWORK job (RFNJOB or RFNJOBS) provided on the SHOPz download page, which manages the download of your order.

> **Note:** Note: Be sure that your FTP.DATA data set statements are set appropriately for your environment. For example, an FTPKEEPALIVE statement with a value of 0, the default, can cause an FTP control connection to time out in some environments. Also, the key ring file specified by the KEYRING statement in the FTP.DATA file might require certificates to be added in order to use Secure FTP. For details about specifying FTP.DATA statements, see z/OS Communications Server: IP Configuration Reference. If you intend to receive your order using FTPS, you need to ensure the "Root 2 - GeoTrust Global CA Certificate" is connected to your keyring and trusted on your system. Go to the Customized Offerings Connectivity Test web site at Customized Offerings Connectivity Test for instructions on how to set up and verify that your system can connect to the IBM download servers. For detailed information on how to set up FTPS, see the SMP/E for z/OS User's Guide.

If you intend to download your CBPDO order to a workstation and from there to z/OS, in addition to the requirements above you need the following:

- Download Director. This is a Java applet used to transfer IBM software to your workstation. For Download Director requirements, see http://www14.software.ibm.com/dldirector/faq.html.

- The CBPDO order accessible to the host. To make the CBPDO order (files) accessible to z/OS, you can do any of the following:
  - Configure the workstation as an FTP server. After you download the order to your workstation, the RECEIVE FROMNETWORK job (RFNJOB) can point to a network location (in this case, your workstation) to access the order. Consult the documentation for your workstation operating system to determine if this FTP capability is provided or if you have to install additional software.

Commercial, shareware, and freeware applications are available to provide this support. However, IBM cannot directly recommend or endorse any specific application. This option requires the use of ICSF.

– Use FTP commands to upload your package. Shopz help contains sample FTP commands that you can use to transfer your package to the host. You can copy/paste and update as required to provide a user ID and password, and to replace `your_package_id` with the actual workstation location (directory) and `packid` with the host location (directory) for your environment. To make the transfer easier, you can create a text file that contains these FTP commands. This file then becomes input to the FTP program on your workstation. See the Shopz help at http://www.ibm.com/software/Shopzseries.

– Use network drives that are mounted to z/OS. The mounting can be accomplished using the Network File System base element, server message block (SMB) support provided by the Distributed File Service base element, or the Distributed FileManager component of the DFSMSdfp base element. The package is received from the file system defined as your SMPNTS.

For information about Network File System, see *z/OS Network File System Guide and Reference*. For information about using the Distributed FileManager, see *z/OS DFSMS DFM Guide and Reference*.

- CD write capability. If you specified that 100% electronic delivery is required, there might be CD images associated with your order. The images are delivered in ISO9660 format and are packaged in zip files (with an extension of .zip). These files require your workstation to have CD write capability and you might have to acquire software to support this capability.

- **DVD delivery driving system requirements.** If you intend to receive your CBPDO order by way of DVD, you need the following:

  1. SMP/E:
     – SMP/E V3R5 or higher.
     – SMP/E V3R5, which is in z/OS V1R10, V1R11, and V1R12.
     – SMP/E V3R6 which is in z/OS V1R13.

  2. ICSF configured and active so it can calculate SHA-1 hash values in order to verify the integrity of data being transmitted. If ICSF is not configured and active, SMP/E calculates the SHA-1 hash values using an SMP/E Java application class, provided that IBM SDK for z/OS, Java 2 Technology Edition, V1 (5655-I56) or later is installed. IBM recommends the ICSF method because it is likely to perform better than the SMP/E method. (To find out how to configure and activate ICSF, see *z/OS Cryptographic Services ICSF System Programmer's Guide*. For the required SMP/E setup, see *SMP/E User's Guide*.)

- **Additional DVD delivery requirements**. If you plan to copy the contents of the DVD(s) to a workstation before making them available on a z/OS host system, then the following requirements apply:

  1. The ability to share or transfer data to the z/OS host system where the order will be installed.

  2. Disk space for storing DVD files. The amount of disk space required varies by order. You need to have sufficient space for the compressed package. The package will be uncompressed on your host.

- If you plan to use the CBPDO RECEIVE FROMNETWORK command using the workstation as the server, you must set up an FTP server on that workstation.

Driving system Wave 0 requirements

In Wave 0 you install the program management binder (part of the BCP), the HLASM base element, and the SMP/E base element. These items must be installed on (available from) the driving system for subsequent wave installations.

You can use either of the following as the driving system for installing Wave 0:
- z/OS V1R11 or later.
- The Customized Offerings Driver V3 (5751-COD). This entitled driving system is provided for those (1) who do not have an existing system to use as a driving system or (2) whose existing system does not meet the requirements of a driving system and who choose to not upgrade their driving system. For further information, see "What is the Customized Offerings Driver?" on page 53.

Wave 0 requires that the target system file system be mounted on the driving system because the code for the program management binder and SMP/E installs into that file system.

Driving system Wave 1 requirements

In Wave 1 you install the majority of the elements and features of z/OS.

Driving system requirements for installing Wave 1 are:
1. **An operating system.** Use either of the following:
   - z/OS V1R11 or later, except that the program management binder, HLASM, and SMP/E must be at the current (latest) levels.

     To satisfy the program management binder, HLASM, and SMP/E requirements, you can use a STEPLIB DD statement to access the z/OS V1R13 program management binder, HLASM, and SMP/E in the Wave 0 target system's SYS1.MIGLIB and ASM.SASMMOD1 data sets. Ensure that the target system's SYS1.MIGLIB and ASM.SASMMOD1 data sets are APF-authorized on the driving system. Also, ensure that HLASM PTF UK57150 (APAR PM14258) is installed.
   - The Customized Offerings Driver V3 (5751-COD).
2. **Proper security.** In order for you to install the UNIX files, the security definitions described in item 4 on page 54 are required.
3. **Program management binder entry in SMP/E UTILITY.** The SMP/E UTILITY must have an entry for the program management binder. You can specify any of these program names in the UTILITY entry: IEWBLINK, HEWL, IEWL, LINKEDIT, or HEWLH096. (The linkage editor, which uses the names HEWLKED, HEWLF064, IEWLF440, IEWLF880, and IEWLF128, cannot be used.)
4. **Language Environment requirements.** You must add SCEERUN (the run-time library provided by Language Environment) to your program search order because many elements and features require it. If you wish, add SCEERUN to your LNKLST concatenation. If you do not add SCEERUN to your LNKLST, you access SCEERUN by using STEPLIB DD statements in the individual element and feature procedures that require them. The BCP is one element that requires access to SCEERUN; its program management binder is the source of this requirement since OS/390 V2R10. This means that you must make SCEERUN available (by LNKLST concatenation or STEPLIB DD statement, for instance) to any JCL and procedures (such as SMP/E procedures) that invoke the program management binder. This ensures that processing, such as conversion of long names to short names, is successful.

5. **OMVS address space active.** Before you install the elements and features in Wave 1, you must activate the OMVS address space in full function mode on the driving system. To activate OMVS, complete the required customization (for example, SMS and RACF setup) as described in *z/OS UNIX System Services Planning*.

6. **Mounting of the target system's file system.** The target system's file system must be mounted.

Driving system Wave 2 requirements

In Wave 2 you install z/OS V1R13 JES2 or JES3, and z/OS V1R13 SDSF. Wave 2 is optional and can be combined with Wave 1.

The driving system requirements for Wave 2 are the same as for Wave 1. See "Driving system Wave 1 requirements" on page 66.

Identifying driving system software requirements for installing subsystems

The driving system software required to install subsystems (DB2, CICS, IMS, NCP, and WebSphere Application Server) using ServerPac is the same as the software in "Identifying driving system software requirements for installing z/OS using ServerPac or dump-by-data-set SystemPac" on page 54.

To use a z/OS release as the driving system for installing subsystems, you might need to apply PTFs to the prior release of the subsystem. For SMP/E PTFs, see Apply coexistence and fallback PTFs in *z/OS Migration*. For subsystem PTFs, see the subsystem program directories. Additionally, review the subsystem PSP buckets for any updates. For ServerPac, the upgrade is ZOSV1R13 and the subset is SERVERPAC. For SystemPac dump-by-data-set orders, the upgrade is CUSTOMPAC and the subset is SYSPAC/DBD.

Identifying driving system hardware requirements

In addition to the hardware needed to run a driving system and the DASD required to install the software, you need:

- A TSO/E terminal, preferably a color terminal if you are doing a ServerPac installation because the ServerPac Installation Dialog uses color to identify key information on panels.
- Sufficient real storage. For ServerPac and dump-by-data-set SystemPac installations, at least 94 MB of real storage is required for test systems on which there is one interactive TSO/E user and only the RESTFS job will run, or at least 42 MB of real storage for systems supporting other workloads (plus whatever real storage is needed to support the system's normal workload).
- For orders delivered on tape, a tape device capable of reading one of the following:
  - 3592 tape cartridges.
  - 3590 tape cartridges.
  - A DVD reader for a 4.7 GB (single-sided, single-layered) DVD.
- For orders delivered on DVD:
  - A DVD reader for a 4.7 GB (single-sided, single-layered) DVD.
  - A workstation that is network-attached to your z/OS host system.

- Enough workstation hard drive space to download the order if you use store-and-forward. (About 6 GB is required for a z/OS-only order. More products require more space.)
- For orders delivered electronically (using the Internet):
  - Sufficient SMPNTS DASD space for your ServerPac or CBPDO package. You will need approximately two times the size of your order. The customized download pages indicate your order size and the installation instructions on the download page provide formulas to help you calculate the amount of space required for your order. As a guideline, about 6 GB (compressed) is required for a z/OS-only order. More products require more space. A typical subsystem order is approximately 500 MB (compressed).

    To provide sufficient work space, add at least 950 cylinders to the space required to download the package and use a secondary space allocation amount for the file system

  - Enough workstation hard drive space to download the order if you use store-and-forward. (About 6 GB is required for a z/OS-only order. More products require more space.)

  - A firewall configuration that supports downloads of a long duration without closing the connection. The control connection can also benefit from keepalive packets. For more information, see *z/OS Communications Server: IP Configuration Reference*, SC31-8776.

  - For direct download, using the ICSF One-Way Hash Generate callable service to verify the SHA-1 hash value can have associated hardware requirements. Enabling this function varies, depending on your server; you might need to order and enable additional features. For example:

    - On a z990 server, the CP Assist for Cryptographic Functions are implemented on every processor. No additional features must be enabled to provide SHA-1 support.

    - On a z900 server, you must enable the Cryptographic Coprocessor Feature (Feature Code 800) to provide SHA-1 support.

    For list of features that must be ordered, see *z/OS Cryptographic Services ICSF System Programmer's Guide*.

    Optionally, the hash value can be calculated by SMP/E (instead of by ICSF). SMP/E V3R4 (included in z/OS V1R7, z/OS V1R8, and z/OS V1R9) and later supports the use of an SMP/E Java application class to perform the calculation. However, the calculation is done more quickly if ICSF is used rather than SMP/E. But ICSF must be active. If z/OS does not detect ICSF to be active, SMP/E is used to calculate the hash value.

Chapter 4. Preparing the target system

The *driving system* is the system image (hardware and software) that you use to install the target system. The *target system* is the system software libraries and other data sets that you are installing. You log on to the driving system and run jobs there to create or update the target system. Once the target system is built, it can be IPLed on the same hardware (same LPAR or same processor) or different hardware than that used for the driving system.

This topic helps you identify the software and hardware you will need for your target system. See Chapter 3, "Preparing the driving system," on page 53 for the software and hardware you will need for your driving system.

Choosing software products to install and identifying requisites

This task consists of:
- Choosing the z/OS base and optional features
- Identifying functional requisites for z/OS elements and features
- Choosing IBM products that you want to run with z/OS
- Choosing ISV products that you want to run with z/OS
- Planning for the system identifier for z/OS

Choosing the z/OS base and optional features

Rule: Because the z/OS base elements and optional features are integrated into a single package with compatible service levels, <u>you must install, with few exceptions, the entire z/OS product</u>.

The exceptions are:
- Elements and features that are already installed do not have to be reinstalled if both of the following are true: (1) you use the CBPDO installation method to migrate to the current z/OS release and (2) an element or feature has not changed (its FMID did not change), or an element or feature is nonexclusive and you've already installed its functionally-equivalent separate product version. To find out which elements and features have changed in the current release, see Table 1 on page 3.
- Unpriced features that you did not order do not have to be installed.
- JES2 does not have to be installed if you are a JES3 customer or if you would rather use the JES2 that you already have installed. But if you continue to use your "old" JES2, be aware that you should migrate to the new JES2 as soon as possible to benefit from its new functions and to enable other elements and features to benefit from the new level. See "Using your existing JES and SDSF with z/OS V1R13" on page 79 for details about using your older JES2.
- JES3 does not have to be installed if you are a JES2 customer or if you would rather use the JES3 that you already have installed. But if you continue to use your "old" JES3, be aware that you should migrate to the new JES3 as soon as possible to benefit from its new functions and to enable other elements and features to benefit from the new level. See "Using your existing JES and SDSF with z/OS V1R13" on page 79 for details about using your older JES3.

> **Failure to install the entire z/OS product, except for the exceptions described above, could result in an unserviceable system until you install the entire product.**

You can use the Planning and Migration Assistant (part of SMP/E) to help you determine what software is already on a system from which you are migrating.

Alternate base

Customers may have the ability to replace some of the z/OS base functions with a commercially available product that provides similar functions. Contact an IBM representative for qualification and pricing information. All z/OS integrated testing results and performance claims will be voided with such replacement.

The mechanism IBM uses for this accommodation is an alternate base configuration. One alternate base is defined and is supported by the price file and the configurator. This alternate base, which contains the base elements with IP Services (the component of base element Communications Server that provides TCP/IP networking) disabled, is available for customers who have a commercially available product that provides similar functions.

The alternate base, in addition to not supporting IP Services, does not support the optional feature Communications Server Security Level 3.

Identifying functional requisites for z/OS elements and features

The base elements in z/OS represent an IPLable target system and satisfy most of the dependencies of the base elements and optional features. But some elements and features require other features or IBM products that are not part of the z/OS base. Moreover, some elements and features have optional dependencies on other features or on IBM products that help you take full advantage of z/OS capabilities. For a list of required and optional dependencies, see Appendix B, "Software requirements for running z/OS V1R13," on page 127.

Choosing IBM products that you want to run with z/OS

For a list of products available for ordering with z/OS, you can do either of the following:

- Use the self-service Internet application Shopz: http://www.ibm.com/software/shopzseries.
- Access the software configurator used in your country, select the z/OS environment, and then select ServerPac, CBPDO, or SystemPac.

If you are migrating to z/OS V1R13 from a prior release:

- You can find out which products have new levels by using Shopz or by using the SMP/E base element's Planning and Migration Assistant. Both tools use data found on your system as well as the latest IBM software product catalog.
- You can expect that products that run on your prior z/OS release will also run on z/OS V1R13, at the same product release levels, unless information is provided to the contrary in IBM announcement letters or in Appendix B, "Software requirements for running z/OS V1R13," on page 127. To find out the levels of products that you currently have on your system, you can use the SMP/E Planning and Migration Assistant. Be sure that the products you are running will be service supported in the timeframe you are considering using

them. You can find service support dates in the software descriptions (sales manual) at the IBM Offering Information Web site: http://www.ibm.com/common/ssi/index.wss.

Choosing ISV products that you want to run with z/OS

For a list of independent software vendors (ISVs) that support z/OS, as well as announcements, testimonials, and other information, see http://www.ibm.com/systems/z/solutions/isv/.

For a directory of ISV products that support z/OS, see the Global Solutions Directory at http://www.ibm.com/software/solutions/isv.

Planning for the system identifier for z/OS

If you need to produce a sub-capacity report each month because you are using a sub-capacity pricing metric for z/OS, you will use the Sub-Capacity Reporting Tool (SCRT). The SCRT has the requirement that each system identifier assigned to an operating system instance is unique for an LPAR on the processor during the entire reporting period, that is, each system identifier is associated with a single LPAR name. In order to comply, ensure that you review the SCRT requirements when deciding on z/OS system identifiers. For more information on the SCRT and its requirements, see http://www.ibm.com/systems/z/resources/swprice/subcap/scrt/ and *Using the Sub-Capacity Reporting Tool*.

Ordering z/OS and related IBM products

Depending on the installation method you've chosen, order z/OS or related IBM products as follows:

- **ServerPac:**

  Use the self-service Internet application Shopz, use IBMLink, or contact an IBM representative. You can find Shopz at http://www.ibm.com/software/shopzseries.

  The system release identifiers (SRELs) are MVS, CICS, IMS, and NCP. If an order is for multiple SRELs, it must include the operating system (z/OS).

  IBM recommends that you order all products that you intend to install, migrate, and maintain on the same schedule as z/OS (the "z/OS product set") in the same ServerPac. (See "Product sets" on page 98 for a description of product sets.) If you need to order from multiple SRELs, place multiple orders (and you will receive multiple ServerPacs).

  As of October 2012 with Product ServerPac orders, orders for products in the MVS SREL no longer need to include the operating system. You can order WebSphere Application Server for z/OS, Tivoli, and any other Product ServerPac eligible product without having to order a base.

  Tivoli OMEGAMON and other Tivoli monitoring products can be also ordered in their own ServerPac or SystemPac without having to include z/OS itself in the same order. When you order with Shopz, you will see the products bundled under a display group called "IBM Tivoli Monitoring Products." You must select IBM Tivoli Management Services on z/OS (5698-A79) as the "base product."

  When ordering upgrades to software products for which you are currently licensed, you can generate an SMP/E report of installed software to be upgraded, and upload the report to Shopz. Shopz selects upgrades and performs technical requisite checking. Shopz then lets you submit the order and track it through delivery.

Typically, when a z/OS release becomes orderable in ServerPac, the previous release remains orderable for one more month. Refer to z/OS announcements for exact dates.

- **CBPDO:**

  Use the self-service Internet application Shopz, use IBMLink, or contact an IBM representative. You can find Shopz at http://www.ibm.com/software/shopzseries.

  An order can be for products in one or more of the four system release identifiers (SRELs): MVS, DB2, CICS, IMS, WebSphere Application Server, and NCP. The order will result in one set of CBPDO tapes for each SREL. Because z/OS is a large product, you can minimize the size of your order by placing separate orders for z/OS itself and for other products in the same SREL (MVS).

  When ordering upgrades to software products for which you are currently licensed, you can generate an SMP/E report of installed software to be upgraded, and upload the report to Shopz. Shopz selects upgrades and performs technical requisite checking. Shopz then lets you submit the order and track it through delivery.

  If the equivalent level of a nonexclusive optional priced feature is currently running on your system, and a CBPDO installation is planned for the next release with the intent of not replacing that equivalent level of the feature during the installation, then the z/OS level of that feature must be ordered, even if it will not be installed, to ensure that the appropriate product policy statements are shipped for that feature.

  Any country that has Shopz product delivery can have those products delivered electronically.

- **SystemPac:**

  Use the self-service Internet application Shopz, use IBMLink, or contact an IBM representative. You can find Shopz at http://www.ibm.com/software/shopzseries.

  Unlike a ServerPac order, a SystemPac order can be for multiple SRELs. IBM recommends that you order in the same SystemPac all products that you intend to install, migrate, and maintain on the same schedule as z/OS.

  An order for products in the MVS SREL must include the operating system, unless the order includes only WebSphere-related products. An order with only WebSphere-related products must include WebSphere Application Server for z/OS or WebSphere Business Integration Server Foundation for z/OS. See "Product ServerPac support" on page 23.

  When you place your SystemPac order, be sure to select the selective follow-on services (SFSs) as well. You can specify a maximum of three SFSs at intervals of 30, 60, or 90 days apart. SFSs contain PTFs fixing PE and HIPER PTFs that are discovered after your system is built. SFSs are tailored to the SMP/E CSI of your system. The goal of SFSs is to stabilize your system over time, thus improving its availability. SFSs are delivered on the same media type as your original order.

  Upon placing the order, an IBM representative will contact you to provide additional help to have your order enriched. Enrichment is an important part of SystemPac. Through a local order entry tool, your system's parameters (such as volume serials, DASD types, catalog names, SMP/E definitions, and SMS definitions) are collected. This enables the SystemPac to be built exactly the way you specified, eliminating the need for customizing upon system restore. This also enables IBM to enable subsystems and products according to your specifications (for example, z/OS UNIX in full function mode according to your SMS specifications).

You also need to send a copy of your IODF to the IBM manufacturing center. Your SystemPac will be built according to your IODF input. You can send the IODF electronically or using physical media.

Note: The Print Services Facility™ (PSF) product should be treated as part of the z/OS product set. (Product sets are discussed in "Product sets" on page 98.) If you want to use PSF and you plan to install with ServerPac or SystemPac, include PSF in your product order.

Most new products and releases become orderable in ServerPac and SystemPac within eight weeks after their general availability. However, the product lists might not contain the most current releases of all products that run on z/OS. If the release of the product you want is not currently available in ServerPac or SystemPac, and you cannot delay your order, IBM recommends that you:

1. Order ServerPac or SystemPac, omitting products not at the appropriate level.
2. Order CBPDO or ProductPac with those products you omit from ServerPac or SystemPac.
3. Install the ServerPac or SystemPac order, and then install the products from the CBPDO or ProductPac.

The Internet delivery process

You can choose to have a ServerPac, CBPDO, or SystemPac order delivered to you entirely by Internet or by a mix of Internet and traditional (physical) means:

- The following items are delivered only by Internet:
  - An e-mail notification that the order is ready
  - Order-specific Web pages accessible through Shopz
- The following physical items can be delivered by Internet or by physical means. If you choose Internet, the items are in an Internet format and are available from your customized download pages:
  - A hardcopy packing list, which describes both the electronic and physical components of your package. The list contains the same information that is in the softcopy packing list provided on your download page in Shopz.
  - CDs containing code or other materials.
  - Diskettes.
  - Entitled hardcopy publications.

You place and receive an order as follows:

1. Place your ServerPac or SystemPac order using Shopz, specifying a preferred media of Internet.

   For ServerPac or SystemPac, providing an inventory to Shopz can help you complete your checklist. The inventory is used to customize the checklist to reflect the products that you have installed. For CBPDO, providing an inventory to Shopz assists with product status, upgrade paths, and requisite checking. Use the GIMXSID service routine to create the inventory.

   You can also specify your delivery media preference to indicate that you require 100% Internet delivery. In this case, you might have additional materials with your order, such as various CD images, that must be downloaded. Installation instructions for these materials are provided on the Shopz download pages for your order.

2. Track the status of your order. This can be done using functions available in Shopz. You will also receive an e-mail when your order is ready.

You have 30 days to download your order. The date that the order will be removed is specified in the e-mail.

Access to the order-specific information requires that you use the same Shopz user ID that was used to place the order.

3. Download the various components of your order using the customized download pages available for your order. The content of the pages is specific to the content of your order, its associated components, and whether you indicated 100% Internet delivery.

Your customized download pages include:

- A packing list and installation documentation.
- Information related to downloading the order. For ServerPac and SystemPac dump-by-data-set, this includes information that you will need to use in the CustomPac Installation Dialog.
- Download links for the publications associated with your order.
- Optionally, download links and information for additional materials that might be included with your order if you requested 100% Internet delivery. These are typically materials that you would have received on CDs with your order; these CDs might have included publication collections or client code.

Identifying hardware requirements for the target system

This task consists of:
- Identifying server requirements.
- Identifying DASD space requirements.
- Identifying I/O device requirements.
- Identifying additional hardware needed by z/OS elements and features. See Appendix C, "Hardware requirements for running z/OS V1R13," on page 141.

Identifying server requirements

The only IBM servers on which z/OS V1R13 runs are the IBM System z servers, which are:

- IBM zEnterprise EC12 (zEC12)
- IBM zEnterprise 196 (z196)
- IBM zEnterprise 114 (z114)
- IBM System z10 Enterprise Class (z10 EC)
- IBM System z10 Business Class (z10 BC)
- IBM System z9 Enterprise Class (z9 EC)
- IBM System z9 Business Class (z9 BC)
- IBM eServer™ zSeries 990 (z990)
- IBM eServer zSeries 890 (z890)
- IBM eServer zSeries 900 (z900)
- IBM eServer zSeries 800 (z800)

Note: The IBM statement of direction for the next release of z/OS after z/OS V1R13 is to restrict the kinds of servers that you can run. For the next release of z/OS, the z990, z890, z900, and z800 servers are not supported.

The **maximum number of processors per LPAR** that z/OS V1R13 supports is 100 processors per LPAR on the zEC12 processor, 80 processors per LPAR on the z196, 64 processors per LPAR on the System z10 EC servers, and 54 processors per LPAR

on System z9 EC servers. Note that the total number of processors defined in a z/OS LPAR is the sum of general purpose processors (CPs), System z Application Assist Processors (zAAPs), System z Integrated Information Processors (zIIPs).

z/OS can only be IPLed in z/Architecture mode.

There are hardware and software requirements related to coupling facility levels (CFLEVELs). See http://www.ibm.com/systems/z/pso/cftable.html.

Processor storage

Expanded storage is not supported in z/Architecture. Only real storage (formerly called central storage) is supported, unlike the combination of central and expanded storage in the ESA/390 environment. Thus, you must configure your LPAR to use only real storage (and not expanded storage).

The **maximum amount of real storage supported by z/OS V1R13 on a single image,** without considering processor implementations, is 4 TB (where TB equals 1,099,511,627,776 bytes). However, because this limit is higher than the current hardware supports, the maximum amount of real storage supported is as follows (where GB equals 1,073,741,824 bytes):

- zEC12, 3.0 TB per server, 1 TB per LPAR
- z196: 3.0 TB per server, 1 TB per LPAR
- z114: 248 GB
- z10 EC: 1.5 TB per server, 1 TB per LPAR
- z10 BC: 248 GB
- z9 EC: 512 GB
- z9 BC: 64 GB
- z990: 256 GB
- z890: 32 GB
- z900: 64 GB
- z800: 32 GB

Note: : z/OS V1.13 with the z/OS V1R13 RSM Enablement Offering web deliverable provides support for Flash Express on a zEC12 server (planned availability of the z/OS exploitation is December 2012). The Flash Express feature allows each logical partition to be configured with its own storage class memory (SCM) address space. The Flash Express card, internal solid state disk (SSD), has a capacity of 1.6 TB of storage per pair. If you use Flash Express, you can have a minimum of 2 (1 pair) and a maximum of eight (4 pairs), the cards must be installed in pairs.

The **minimum amount of real storage required to IPL z/OS** depends on a number of factors, including the number of devices in the I/O configuration, the amount of storage configured, the number of address spaces created, the types of applications supported, and the products and subsystems supported in the IPLed system. In IPL studies at IBM, 128 MB of real storage was the minimum amount required to IPL z/OS V1R12 and z/OS V1R11. The systems in the studies were IPLed to the point of completing JES2 initialization. The systems had I/O configurations defined with the following devices:

- 22753 direct access devices (DASDs)
- 16 graphics devices
- 910 channel-to-channel (CTC) connections

- 56 tape drives

PSP hardware upgrade identifiers

For the latest hardware dependencies related to z/OS, including any APARs required for specific server models, obtain current PSP information (from PSP "buckets"). You can obtain PSP information at http://www14.software.ibm.com/webapp/set2/psp/srchBroker.

The PSP hardware upgrade identifiers are:
- **2827DEVICE** for the zEC12 server
- **2817DEVICE** for the z196 server
- **2818DEVICE** for the z114 server
- **2097DEVICE** for the z10 EC server
- **2098DEVICE** for the z10 BC server
- **2094DEVICE** for the z9 EC server
- **2096DEVICE** for the z9 BC server
- **2084DEVICE** for the z990 server
- **2086DEVICE** for the z890 server
- **2064DEVICE** for the z900 server
- **2066DEVICE** for the z800 server

Identifying DASD space requirements

The DASD required for z/OS includes:
- All elements
- All features that support dynamic enablement, regardless of your order
- All unpriced features that you ordered.

The storage requirements for z/OS can be found in the topic Total DASD Storage Requirements in *z/OS Parallel Sysplex Test Report*. Remember that products that run on z/OS will require additional storage.

Identifying I/O device requirements

z/OS supports FICON® (Fiber Connection), ESCON (Enterprise Systems Connection), and ESA/390 (Enterprise Systems Architecture/390) devices. The most commonly-used I/O devices supported by z/OS are listed in Table 8. If you have a question about support for a device not listed, contact your IBM representative.

Note: The table does not comprise a list of devices that are service supported. (Many of the devices have been withdrawn from service support.) Rather, the table comprises a list of devices that are supported by the software (z/OS). Normally, when devices are withdrawn from service, they continue to be supported by the software.

Use of the IBM TotalStorage Enterprise Storage Server® (2105) with z/OS requires the 2105 microcode to be at EC fix level F25584 or later. This EC level fixes a problem caused by software exploitation of the SII/RND CCW commands.

For a table summary of device information, see *z/OS MVS Device Validation Support*. The table shows the order that z/OS uses when it attempts to satisfy a request for a device.

Table 8. IBM I/O devices and subsystems supported by z/OS V1R13

DASD

1750 TotalStorage DS6000™	9340 DASD Subsystem
2105 TotalStorage Enterprise Storage Server (ESS)	9341 Storage Controller Module, 9343 Storage
2107 System Storage DS8000	Controller, 9345 DASD Module
3380 Direct Access Storage Device	9391 RAMAC Array DASD
3390 Direct Access Storage Device	9393 RAMAC Virtual Array Storage
3880 Storage Control	9396 RAMAC Scalable Array 3 Storage
3990 Storage Control	9397 RAMAC Electronic Array Storage
9332 Direct Access Storage Device	RAMAC Array Device

Tape

2440 Magnetic Tape Subsystem	3494 TotalStorage Enterprise Automated Tape Library
3420 Magnetic Tape Unit	3494 TotalStorage Enterprise Peer-To-Peer Virtual Tape
3422 Magnetic Tape Subsystem	Server
3423 Magnetic Tape Device	3494 TotalStorage Enterprise Virtual Tape Server
3424 Magnetic Tape Subsystem	3495 TotalStorage Enterprise Automated Tape Library
3430 Magnetic Tape Subsystem	3584 TotalStorage Enterprise Automated Tape Library
3490 Magnetic Tape Subsystem	3590 TotalStorage Enterprise Tape System
	3592 TotalStorage Enterprise Tape System

Printer

1403 Printer	3827 Page Printer
3203 Printer	3828 Advanced Function MICR Printer
3211 Printer	3835 Page Printer
3262 Line Printer	3900 Advanced Function Printer
3284 Printer	4000 InfoPrint 4000
3286 Printer	4028 Laser Printer
3800 Printing Subsystem	4100 InfoPrint 4100
3812 Page Printer	4245 Line Printer
3816 Page Printer	4248 Impact Line Printer
3820 Page Printer	6262 Impact Line Printer
3825 Page Printer	See also *Printer Summary*, S544-5749 at http://publibfp.dhe.ibm.com/epubs/pdf/ ic5s2mst.pdf.

Card reader and punch

2501 Card Reader	3505 Card Reader
2540 Card Read Punch	3525 Card Punch

Magnetic/optical

3890 Document Processor	MVS/ESA Direct Optical Attachment
3995 Optical Library Dataserver	S/370 and S/390 Optical Media Attach/2

Display

3178 Display Station	3205 Color Display Station
3179 Display Station	3206 Display Station
3180 Display Station	3251 Display Station
3191 Display Station	3270 Information Display System
3192 Color Display Station	3290 Information Panel
3194 Display Station	3472 InfoWindow Workstation

Communication

See "Hardware Requirements for Communications Server" on page 152.	

Identifying service needed for the target system

Before you IPL the target system for the first time, you should determine whether your target system software is at the appropriate service level, and apply fixes if it is not. This section explains the additional service that you might need to apply.

See "Service" on page 33 for background information on the service that is shipped with ServerPac, CBPDO, and SystemPac orders. See "Maintenance after installation" on page 36 for guidance on applying maintenance to your z/OS system after you have finished installing it.

If you are installing a z/OS ServerPac or Product ServerPac order...

If you install your ServerPac or Product ServerPac order shortly after it arrives, you should not need to install additional RSU service. It should already be included in your order.

But if more than a few weeks have passed since your order arrived:
- Consult *ServerPac: Installing Your Order*, in the topic about service included in your order, to find the service level of the system as shipped.
- Order a service package using the service delivery vehicle you prefer, such as Shopz, SMP/E Internet Service Retrieval, or RefreshPac. Use a starting service level one month later than the level identified in *ServerPac: Installing Your Order*.

If you are installing a z/OS CBPDO order...

If you ordered z/OS as a CBPDO package:
- Install all PTFs with a SOURCEID of ZOSV1R13. In addition, install all PTFs with a SOURCEID of HIPER or PRP provided they are not in a PTF-in-error (PE) chain.
- Consult *Memo to Users Extension* to find the service level of the system as shipped.
- If more than a few weeks have passed since your order arrived, there should be a service package available; order and apply it in accordance with the guidelines in "Maintenance after installation" on page 36. Use the service delivery vehicle that you prefer, such as Shopz or SMP/E Internet Service Retrieval.

If you are installing a z/OS SystemPac order...

IBM strongly recommends that you select, during order entry, the optional follow-on services (SFSs) that come with the SystemPac. SFSs contain critical service information: PTFs that resolve PEs and HIPERs that are discovered after your system is built. The SFSs you get are tailored to the image of the SMP/E CSI of the system that IBM shipped to you earlier. By installing repeating SFSs (at most 90 days apart, maximum of three), you stabilize the system you installed, thus enabling you to have a system with higher availability for your applications.

SFSs can be installed by way of the CustomPac Installation Dialog or batch JCL.

If you are installing a System z server...

If you are installing a System z server, check the appropriate PSP bucket before you install. The relevant upgrades are:
- **2827DEVICE** for the zEC12 server
- **2817DEVICE** for the z196 server

- **2818DEVICE** for the z114 server
- **2097DEVICE** for the z10 EC server
- **2098DEVICE** for the z10 BC server
- **2094DEVICE** for the z9 EC server
- **2096DEVICE** for the z9 BC server
- **2084DEVICE** for the z990 server
- **2086DEVICE** for the z890 server
- **2064DEVICE** for the z900 server
- **2066DEVICE** for the z800 server

Using your existing JES and SDSF with z/OS V1R13

You should migrate to the JES2 or JES3 that comes comprehensively tested with z/OS V1R13 at the same time you migrate to the rest of z/OS V1R13, or as soon as possible thereafter. In this way, you benefit directly from the new functions in the z/OS V1R13 level of JES2 or JES3 and enable other elements and features to benefit from this level. However, because such a migration is not always practical, certain prior levels of JES2 and JES3 are supported with z/OS V1R13 so that you can *stage* your migration to z/OS V1R13 (that is, migrate your JES2 or JES3 later).

The rest of this section describes the levels of JES2 and JES3 that are supported, followed by details required to use your current JES2 or JES3 with z/OS V1R13 until you can migrate to z/OS V1R13 JES2 or JES3.

Allowable JES-SDSF-BCP combinations

The JES2 and SDSF releases allowed with z/OS V1R13 BCP are shown in Table 9. Note that the SDSF release level must be the same as the JES2 release level.

Table 9. Allowable BCP-JES2-SDSF combinations

BCP release	JES2 release allowed	SDSF release allowed
R13	R11	R11
	R12	R12
	R13	R13
Note: For any release of z/OS later than z/OS V1R13, the coexistence of different JES2 release levels is not supported.		

The JES3 and SDSF releases allowed with z/OS V1R13 BCP are shown in Table 10. Note that as of z/OS V1R10, SDSF is supported with JES3. Before z/OS V1R10, SDSF was supported only with JES2.

Table 10. Allowable BCP-JES3-SDSF combinations

BCP release	JES3 release allowed	SDSF release allowed
R13	R11	R11
	R12	R12
	R13	R13

Compliance with the allowable JES-BCP combinations is enforced. Therefore, failure to use one of the allowable JES releases with the z/OS V1R13 BCP results in an abend and subsequent termination of the JES address space.

For an explanation of the coexistence policy as it pertains to JES2 and JES3, see "Which releases are supported for coexistence, fallback, and migration?" on page 30.

ServerPac and SystemPac delivery of JES2, JES3, and SDSF

Only the latest levels of JES2, SDSF, and JES3 are delivered in ServerPac and SystemPac. For ServerPac and SystemPac dump-by-data-set format, you choose the JES you want at installation. For SystemPac full volume dump format, you choose the JES during order manufacturing. Only the chosen JES is delivered with the order. Also, you choose whether the JES and/or SDSF zones will be separate from the z/OS zones or be merged with them. This choice of zone structures allows you to use the new level, or your existing level, of JES2, JES3, and SDSF.

Starting in z/OS V1R10, there are separate zones for JES2, JES3, and SDSF by default in ServerPac. You can choose to merge either JES2 or JES3, or both, into the BCP zone.

z/OS V1R13 SDSF comes assembled with the latest JES2 macros. If you do source maintenance on your JES, you might have to reassemble it using the macros that come with z/OS. See the topic about reassembling existing JES2/JES3 modules in *z/OS Program directory.* for information on the macro levels that are used by IBM to create and service JES2 and JES3.

Placing your existing JES2/SDSF or JES3/SDSF in a separate zone

To use your existing (earlier than z/OS V1R13) JES2 and SDSF with z/OS V1R13, or your existing (earlier than z/OS V1R12) JES3 and SDSF with z/OS V1R13, you must consider SMP/E zone structure and SMP/E SYSLIB concatenation, and their impact on:
• Integrity of other load modules in the z/OS environment
• Your maintenance procedures
• Your ability to upgrade from your existing JES2/SDSF or JES3/SDSF to the latest levels
• Your ability to upgrade to a new z/OS level while continuing to use your existing level of JES2/SDSF or JES3/SDSF

You should not install an earlier level of JES2/SDSF or JES3/SDSF in the same zones as z/OS. If you intend to use a previously-installed level of JES2/SDSF or JES3/SDSF, you should place it in separate SMP/E target and DLIB zones. In this way, you are well-positioned to:
• Ensure integrity of both the JES and non-JES load modules
• Eliminate manual post-install assemblies for maintenance (especially for SDSF users)
• Upgrade your existing JES2/SDSF or JES3/SDSF to z/OS V1R13 level
• Continue to run your existing JES2/SDSF or JES3/SDSF while upgrading z/OS to a later level

Use the following procedure to separate your existing JES2/SDSF or JES3/SDSF from its existing SMP/E environment. Use this procedure only if your existing JES is not already in a separate zone.

1. Follow the installation procedures in the program directory supplied with your level of JES2/SDSF or JES3/SDSF, using any corrections listed in the PSP upgrade and subset it identifies for the JES2/SDSF or JES3/SDSF components.

2. ACCEPT (or RESTORE) all unaccepted service and USERMODS for JES2/SDSF or JES3/SDSF.

3. Use the SMP/E BUILDMCS command to create an SMP/E installable image of your existing JES2/SDSF or JES3/SDSF.

   The BUILDMCS command builds an SMP/E installable image from information in the target and distribution zones and the code in the distribution libraries. Therefore all code must be ACCEPTed (or RESTOREd and then re-APPLYed).

4. Define new SMP/E zones for JES2/SDSF or JES3/SDSF.

5. Allocate separate target and distribution libraries for JES2/SDSF or JES3/SDSF.

   z/OS levels of JES2, SDSF, and JES3 provide sample allocation jobs which can be used to allocate that level of the libraries or as a model for non-z/OS levels of JES.

6. Define SMP/E DDDEFs for the new target and distribution libraries for JES2, SDSF, and JES3.

   z/OS levels of JES2, SDSF, and JES3 provide sample DDDEF jobs which can be used to define those levels of the libraries or as a model for non-z/OS levels of JES.

7. If you do source-code maintenance (++SRC/++SRCUPD) rather than object-code maintenance (++MOD) for JES2/SDSF or JES3/SDSF, define the SYSLIB macro concatenation for new zones.

   The macro concatenation to be used for assemblies in the new zone must be defined to SMP/E. You have three choices of which macro libraries to use:

   - Use the z/OS V1R13 macro libraries and your existing JES2/SDSF or JES3/SDSF macro libraries.
   - Continue to use the BCP, DFSMSdfp, and Communications Server–SNA Services macro libraries that your existing JES2/SDSF or JES3/SDSF is using.
   - Use the macro levels that are used by IBM to create and service JES2, SDSF, and JES3. See the *z/OS Parallel Sysplex Test Report* for additional considerations for this option.

   You should use the same level of macros for all production systems in your complex using the existing JES level. That is, the JES2 used on all systems in a JES2 MAS environment should be assembled with the same operating system macros (the lowest level BCP, DFSMS/MVS, and VTAM® macros should be used). You must never assemble JES2 with macro levels lower than those it was originally assembled with by IBM (higher is acceptable). If you follow this recommendation you can use the same load libraries on all systems. You can use different libraries for assemblies (and different target libraries) during migration or testing. Once all systems have migrated to z/OS V1R13, you should consider reassembling using the z/OS V1R13 macros. If you reassemble one module, you must reassemble the entire element. (Sample SMP/E USERMODS are provided.) For more information on assembling JES2 or JES3, see the post-installation steps in the *z/OS Parallel Sysplex Test Report*.

   If you do object-code maintenance (++MOD) rather than source-code maintenance (++SRC/++SRCUPD) for JES, the only assembling you need to be concerned with is assembling your exit routines. You need to make sure that:

   - You use the same SPLEVEL to assemble your exit routines that IBM used to assemble JES.

- The release level used to assemble your exit routines is not below the release level used to assemble JES. (For example, you cannot use z/OS V1R11 BCP macros to assemble z/OS V1R13 JES2 exit routines.)

8. RECEIVE, APPLY and ACCEPT the SMP/E installable image built by the BUILDMCS command into the new separate zones.

9. If you chose to do the RESTORE in Step 1, reAPPLY any service that was RESTOREd.

10. Make the necessary updates to use the copy of JES2/SDSF or JES3/SDSF in the new libraries:

- Update the catalog or catalogs with the names of the existing JES new data sets
- Update PROG*xx* (or LNKLST*xx* and IEAAPF*xx*) members of parmlib
- Update the JES2 or JES3 cataloged procedure, if STEPLIBs are used
- Add the JES parmlib to the system's parmlib concatenation, or copy the IPCS parmlib members from the JES parmlib to the system parmlib.
- If you are using JES3, add the modules in the SIATLPA library to LPA or dynamic LPA by updating an LPALST*xx* or PROG*xx* member of parmlib. (If you choose to use dynamic LPA for JES3 modules, the SET PROG command used to add them must complete before JES3 initialization begins.)

Applying service required to use your existing JES2/SDSF or JES3/SDSF

If you plan to use your existing (earlier than z/OS V1R13) JES2 and SDSF with z/OS V1R13, or your existing (earlier than z/OS V1R13) JES3 and SDSF with z/OS V1R13, apply the same PTFs that are required for coexistence service. See *z/OS Migration*. Apply the PTFs before you IPL z/OS.

Chapter 5. Preparing for customization and test

You complete your installation by customizing and testing the new system. Most of the information for performing these tasks is in the various element and feature publications. However, a few items are in this topic: customizing for CEA, using dynamic enablement, and scheduling test activities.

Customizing for CEA

Common event adapter (CEA) is a component of the BCP that provides the ability to deliver z/OS events to C-language clients, such as the z/OS CIM server. A CEA address space is started automatically during initialization of every z/OS system.

Notes:

1. A sample job is available with z/OS V1R13 that contains sample RACF commands to set up security for CEA. The sample job can be found in SYS1.SAMPLIB(CEASEC).

2. If z/OSMF is to be installed on the system, CEA will need the TRUSTED(YES) attribute set on the RDEFINE STARTED CEA.** definition. This will ensure that CEA has appropriate authority to launch and manage ISPF sessions.

CEA has two modes of operation:

- *Full function mode*. In this mode, both internal z/OS components and clients such as CIM providers can use CEA indication functions.
- *Minimum mode*. In this mode, only internal z/OS components can use CEA indication functions.

If you want CEA to start in full function mode, perform the following customization (or else CEA will start in minimum mode):

- Define user ID CEA to the security product:

```
ADDUSER CEA DFLTGRP(SYS1) OMVS(UID(any)  FILEPROCMAX(1024))
RDEFINE STARTED CEA.** STDATA(USER(CEA) GROUP(SYS1) TRACE(YES))
SETROPTS RACLIST(STARTED) REFRESH
```

- Give user ID CEA read access to the profile protecting SYS1.PARMLIB:

```
PERMIT 'SYS1.PARMLIB' GENERIC ACCESS(READ) ID(CEA)
SETROPTS GENERIC(DATASET) REFRESH
```

> **Note:** It is possible to have CEA start in full function mode without this setup being performed. This is because of the way that RACF can be configured to handle tasks that do not have user IDs of their own. Because CEA is a started task, its RACF user ID does not have to be "CEA". If the STARTED class or started procedures table (ICHRIN03) contains a user ID other than "CEA", CEA will have that user ID assigned to it. For example, a generic entry might specify that a user ID such as STCUSER should be assigned to any started task that is not defined with its own entry. If the user ID "CEA" was not set up and assigned to the started task, the generic entry would be used and an IEF695I message would indicate that START CEA was assigned to the generic user ID.
>
> If the default user ID that is assigned does not have an OMVS segment, a default OMVS segment is sought through the FACILITY class profile BPX.DEFAULT.USER. RACF uses the default OMVS segment if the CEA

task is running with a RACF-defined user ID and the BPX.DEFAULT.USER FACILITY class profile is set up. However, if the BPX.DEFAULT.USER FACILITY class profile is missing or not set up correctly, no OMVS segment will be associated with the default user ID and CEA will start in minimum mode.

If z/OSMF is to be installed on the system, CEA will need the TRUSTED(YES) attribute set on the RDEFINE STARTED CEA.** definition. This will ensure that CEA has appropriate authority to launch and manage ISPF sessions.

- User ID CEA needs write and execute access to the z/OS UNIX directory, /SYSTEM/var, where it creates a UNIX domain socket address file (CEAServer). That directory is shipped from IBM with permission 1777. If the permission for that directory (or path to that directory) was changed, perform the appropriate definitions to give user ID CEA write and execute access to that directory.

Note: If user ID CEA was previously defined to RACF with the SPECIAL attribute and UID(0), and it is now being redefined without the SPECIAL attribute and without UID(0), you must delete the file CEAServer from the z/OS UNIX directory, /SYSTEM/var, before restarting CEA.

If CEA is running in minimum mode, you can change to full function mode by making the security definitions above, stopping CEA (P CEA), and restarting it (S CEA).

Other customization that you might have to perform for CEA is the following:

- If your system will run with multilevel security, allow CEA to perform multilevel security file accesses. Use these commands:

```
ALTUSER CEA SECLABEL(SYSMULTI)
PERMIT SYSMULTI CLASS(SECLABEL) ACCESS(ALTER) ID(CEA)
PERMIT SYSHIGH  CLASS(SECLABEL) ACCESS(ALTER) ID(CEA)
PERMIT SYSLOW   CLASS(SECLABEL) ACCESS(ALTER) ID(CEA)
ADDSD  'CEA.*' SECLABEL(SYSNONE)

SETROPTS GENERIC(STARTED) REFRESH
SETROPTS RACLIST(STARTED) REFRESH
SETR CLASSACT(SECLABEL)
SETR RACLIST(SECLABEL) REFRESH
```

- If your MAXCAD setting in parmlib member IEASYS*xx* is inadequate to accommodate the data space created by CEA, raise the setting.

Using dynamic enablement

As explained in Chapter 1, "Learning about z/OS," on page 1, the priced features support dynamic enablement. This means that the priced features that you order are shipped enabled and are ready to use after you install and customize them. The priced features that you do not order are shipped disabled; even though you install them, you cannot use them. Later on, if you decide to use them, you enable them dynamically.

While priced features are the main focus of dynamic enablement, several related items can also be dynamically enabled should you decide to use them with z/OS:

- The individual product versions of z/OS nonexclusive features.
- The product Document Composition Facility (DCF) (5748-XX9).
- IP Services, one of the components of base element Communications Server, which is shipped enabled when you order the standard z/OS base but disabled

when you order the alternate base configuration. Note that "TCP/IP" is the name used for dynamic enablement of this component.

Note: Infoprint Server Transform products V1 (5697-F51) was removed from the list above when service support ended. The follow-on Infoprint transform products have not been added to the list because they are not dynamically enabled.

In brief, the steps required to dynamically enable are:

1. Notify IBM that you are starting to use the feature, product, or TCP/IP on a specific processor (as identified by a specific processor serial number).
2. Update parmlib. IBM supplies a SYS1.PARMLIB member, IFAPRD00, that is tailored to your order. IFAPRD00 contains entries that enable the priced features, products, or TCP/IP that you ordered for a specific processor. To make the parmlib update, copy the contents of IFAPRD00 to an IFAPRD*xx* member that will be active on the processor for which your z/OS order was placed, and modify IFAPRD*xx* appropriately.
3. Establish the active parmlib member through the PROD parameter in IEASYS*xx* or the SET PROD operator command.

The rest of this section helps you decide whether you need to use dynamic enablement, describes in detail the three steps to do it, and explains how to disable should you want to. Topics are:
- "Deciding whether to dynamically enable"
- "Dynamic enablement Step 1: Notify IBM" on page 86
- "Dynamic enablement Step 2: Update parmlib" on page 87
- "Dynamic enablement Step 3: Establish the active parmlib member" on page 89
- "Disabling what was enabled" on page 90.

Deciding whether to dynamically enable

By describing the situations that require dynamic enablement, this section helps you decide whether you need to dynamically enable.

A priced feature was not in your original order for a specific processor (as identified by a specific processor serial number) but you now want to use it on that processor. If this is the case, then follow the steps starting with "Dynamic enablement Step 1: Notify IBM" on page 86. The priced features are:
- BDT File-to-File
- BDT SNA NJE
- BookManager BUILD
- C/C++ without Debug Tool
- DFSMSdss
- DFSMShsm (and DFSMSdss)
- DFSMSrmm
- DFSMStvs
- DFSORT
- GDDM-PGF
- GDDM-REXX
- HCM
- HLASM Toolkit
- Infoprint Server
- JES3
- RMF
- SDSF
- Security Server

You are licensed for a product that is also a nonexclusive priced feature and the license is on a processor other than the one to which your z/OS order applies. To allow your installation flexibility as you migrate to z/OS, you can run the separate product versions of the z/OS nonexclusive priced features (or, in one case, a component of a nonexclusive priced feature). Running the separate product version of such a z/OS feature means you do not have to order and install the z/OS feature.

The products that are also z/OS nonexclusive priced features are:
- BookManager BUILD/MVS. The corresponding z/OS feature is BookManager BUILD.
- GDDM-PGF. The corresponding z/OS feature is GDDM-PGF.
- HLASM Toolkit feature of HLASM. The corresponding z/OS feature is HLASM Toolkit.

If your order included separate product versions of these features, the separate versions are enabled in the IBM-supplied IFAPRD00 member. If you are licensed for such products on a processor other than the one to which your z/OS order applies, you must specifically enable them because the IBM-supplied IFAPRD00 does not. Follow the steps starting with "Dynamic enablement Step 1: Notify IBM."

You are licensed for DCF on a processor other than the one to which your z/OS order applies, or not licensed at all. The product DCF (5748-XX9) can be dynamically enabled. To use DCF, you must do one of the following:
- If you are already licensed for DCF on a specific processor, you must explicitly enable it in the IFAPRD*xx* member that is active on that processor in order to continue to use it with z/OS. Follow the steps starting with "Dynamic enablement Step 1: Notify IBM."
- If you are not licensed for DCF on a specific processor and would like to use it, you must purchase a license for that processor, receive and install DCF, and then follow the steps starting with "Dynamic enablement Step 1: Notify IBM" to enable it in the IFAPRD*xx* member that is active on that processor. (It is a violation of your license agreement with IBM to enable DCF on a processor if you are not licensed for it on that processor.)

You are licensed for the alternate base but now want to use the standard base. IP Services, the component of element Communications Server that supports TCP/IP networking, supports dynamic enablement because of the z/OS alternate base configuration. (Refer to "Alternate base" on page 70.) IP Services is shipped enabled if you order the standard z/OS base but disabled if you order the alternate base. Thus, if you are licensed for the alternate base but now want to be licensed to use the standard base, you must enable IP Services (using the name TCP/IP). Follow the steps starting with "Dynamic enablement Step 1: Notify IBM."

Dynamic enablement Step 1: Notify IBM

Ask your asset manager to contact your IBM representative to alert IBM that you are starting to use the feature, individual product, or TCP/IP on a specific processor (as identified by a specific processor serial number). Because the z/OS license is processor-based, you need to contact IBM only once when multiple z/OS systems execute in LPAR mode on that processor.

Use of (and enablement of) the feature, individual product, or TCP/IP is subject to the z/OS license terms and conditions and must be done with the knowledge of your asset manager according to the terms and conditions for z/OS. For additional

license terms and conditions, see the Usage Restriction section of *z/OS Version 1 Release 13 Licensed Program Specifications* in the z/OS library: &zosliburl;.

Dynamic enablement Step 2: Update parmlib

The IBM-supplied SYS1.PARMLIB member that defines the product enablement policy for a system is IFAPRD00. IFAPRD00 contains a PRODUCT statement for each item (feature, product, or TCP/IP) that can be dynamically enabled, set to an enablement state determined by your order. Copy IFAPRD00 to an IFAPRD*xx* of your choosing and edit IFAPRD*xx*, if necessary, so that it contains the correct form of PRODUCT statements to enable each feature, product, or TCP/IP that should be enabled, as described in the topics starting with "z/OS priced features and TCP/IP."

If you use the order that IBM ships to you to clone systems for use on other processors, you must ensure that the IFAPRD*xx* member used on each processor enables only the z/OS priced features and products that are licensed to that processor. A single shared copy of IFAPRD*xx* might or might not be suitable for use by all of the processors.

Note the following:
*   DFSMSdss, DFSMSrmm, DFSMShsm, and DFSMStvs do not use the IGDDFPKG parmlib member for enablement.
*   GDDM-REXX does not use the ERXTENAB JCL member of the GDDM SADMSAM data set.

z/OS priced features and TCP/IP

For each priced feature that you want to enable, or to enable TCP/IP, ensure that there is a PRODUCT statement (or, for TCP/IP, multiple PRODUCT statements) having one of the following forms:

```
PRODUCT   OWNER('IBM CORP')
          NAME('z/OS')
          ID(5694-A01)
          FEATURENAME(name)
          STATE(ENABLED)
```

NAME specifies the operating system.

The variable *name* on the FEATURENAME parameter identifies the feature, or TCP/IP, that you want to enable. Refer to Table 11 for possible values.

ID specifies the program number for z/OS.

The VERSION RELEASE MOD parameter should be omitted or specified with asterisks, as follows:

```
VERSION(*) RELEASE(*) MOD(*)
```

Table 11. FEATURENAME values for z/OS priced features, and TCP/IP

Name	FEATURENAME value
BDT File-to-File	BDTFTF
BDT SNA-NJE	BDTNJE
BookManager BUILD	BOOKMGR BUILD (see note 1)
C/C++ without Debug Tool	C/C++ (see note 2)

Table 11. FEATURENAME values for z/OS priced features, and TCP/IP (continued)

Name	FEATURENAME value
DFSMSdss	DFSMSDSS
DFSMShsm	DFSMSHSM
DFSMSrmm	DFSMSRMM
DFSMStvs	DFSMSTVS
DFSORT	DFSORT
GDDM-PGF	GDDM-PGF
GDDM-REXX	GDDM-REXX
HCM	HCM
HLASM Toolkit Interactive Debug Facility HLASM Toolkit Disassembler HLASM Toolkit Enhanced Super-C HLASM Toolkit Cross-Reference Facility	TOOLKIT DEBUGGER TOOLKIT DISASSEM TOOLKIT SUPERC TOOLKIT XREF (see note 1)
Infoprint Server	INFOPRINT SERVER (see note 1)
JES3	JES3
RMF	RMF
SDSF	SDSF
Security Server	SECURITY SERVER (see note 1)
TCP/IP (includes the components TCP/IP Base, TCP/IP CICS, and TCP/IP IMS)	TCP/IP BASE TCP/IP CICS TCP/IP IMS (see notes 1, 3, and 4)

Notes®::
1. To specify a FEATURENAME value that contains a blank, either replace the blank with an underscore (as in SECURITY_SERVER) or enclose the name in single quotation marks (as in 'SECURITY SERVER').
2. To specify a FEATURENAME value that contains a +, enclose the name in single quotation marks (as in 'C/C++').
3. You must specify multiple PRODUCT statements.
4. If your installation ordered the standard z/OS base, TCP/IP is shipped enabled. Otherwise, it is shipped disabled.

BookManager BUILD/MVS product

To enable the BookManager BUILD/MVS product to run with z/OS, the following entry must be in the IFAPRD*xx* parmlib member:

```
PRODUCT OWNER ('IBM CORP')
        NAME('BOOKMGR BUILD')
        ID(5695-045)
        VERSION(*) RELEASE(*) MOD(*)
        FEATURENAME('BOOKMGR BUILD')
        STATE(ENABLED)
```

A sample BookManager BUILD/MVS entry appears in the EOYIFAPR member of the SEOYSAMP library.

GDDM-PGF product

To enable the GDDM-PGF product to run with z/OS, the following entry must be in the IFAPRD*xx* parmlib member:

```
PRODUCT OWNER('IBM CORP')
        NAME(GDDM-PGF)
        ID(5668-812)
        VERSION(*) RELEASE(*) MOD(*)
        FEATURENAME(GDDM-PGF)
        STATE(ENABLED)
```

HLASM Toolkit feature

To enable the High Level Assembler (HLASM) Toolkit feature of the HLASM
product to run with z/OS, the following entries must be in the IFAPRD*xx* parmlib
member:

```
PRODUCT OWNER('IBM CORP')
        NAME('HI LVL ASSEMBLER')
        FEATURENAME('TOOLKIT DEBUGGER')
        VERSION(*) RELEASE(*) MOD(*)
        ID(5696-234)
        STATE(ENABLED)

PRODUCT OWNER('IBM CORP')
        NAME('HI LVL ASSEMBLER')
        FEATURENAME('TOOLKIT DISASSEM')
        VERSION(*) RELEASE(*) MOD(*)
        ID(5696-234)
        STATE(ENABLED)

PRODUCT OWNER('IBM CORP')
        NAME('HI LVL ASSEMBLER')
        FEATURENAME('TOOLKIT SUPERC')
        VERSION(*) RELEASE(*) MOD(*)
        ID(5696-234)
        STATE(ENABLED)

PRODUCT OWNER('IBM CORP')
        NAME('HI LVL ASSEMBLER')
        FEATURENAME('TOOLKIT XREF')
        VERSION(*) RELEASE(*) MOD(*)
        ID(5696-234)
        STATE(ENABLED)
```

DCF product

To enable the Document Composition Facility (DCF) product to run with z/OS, the
following entry must be in the IFAPRD*xx* parmlib member:

```
PRODUCT OWNER('IBM CORP')
        NAME(DCF)
        ID(5748-XX9)
        VERSION(*) RELEASE(*) MOD(*)
        FEATURENAME(DCF)
        STATE(ENABLED)
```

Dynamic enablement Step 3: Establish the active parmlib member

To dynamically activate the updated enablement policy without an IPL, place the
updated PRODUCT statements in the appropriate IFAPRD*xx* member of the active
SYS1.PARMLIB data set. You can then issue the SET PROD operator command to
specify the IFAPRD*xx* member that defines the enablement policy. See *z/OS MVS
System Commands* for more information.

The enablement policy change takes place immediately but does not affect any
instances of features, products, or TCP/IP that are already executing. Also,
activating a new enablement policy does not start any of the enabled features,
products, or TCP/IP. They will only run when explicitly started by some other
action, such as a START command.

Be sure to change the PROD system parameter in IEASYS*xx* to point to the appropriate IFAPRD*xx* member; no IFAPRD*xx* member is activated by default. This change ensures that the next IPL activates the correct policy. For more information about using IFAPRD*xx*, see *z/OS MVS Initialization and Tuning Reference*.

Disabling what was enabled

If, after you use an enabled feature, product, or TCP/IP, you want to discontinue its use, you must disable it — again using the IFAPRD*xx* member to define the policy change and the SET PROD command to activate the changed policy.

Because disabling the feature, product, or TCP/IP in the enablement policy does not stop it from running, you might have to explicitly stop it. For example, you might have to:

- Issue a command provided by the feature, product, or TCP/IP.
- Issue the MVS MODIFY or MVS STOP command, as appropriate.

Or, you might decide that the least disruptive way to stop a long-running feature, product, or TCP/IP is to IPL the system without it.

After you disable a feature, product, or TCP/IP, ask your asset manager to contact your IBM representative to alert IBM that you are discontinuing its use on a specific processor. See the Usage Restriction section of *z/OS Version 1 Release 13 Licensed Program Specifications* for additional license terms and conditions.

Scheduling test activities

IPL the new release in a production environment after you have tested the new release with a simulated production workload that includes all applications and all non-IBM products, and that ensures that service level agreements can be met.

IPL in a shared resource environment after you have installed any coexistence PTFs.

If your production workload will require greater than 2 GB of real storage, be sure to use greater than 2 GB on your test image. In fact, the more storage you use above the 2 GB line on your test image, the greater the chance that pages will be backed up there, and the greater the odds of exposing problems during test rather than during production.

Perform function and stress test. Testing by IBM does not replace the need for this testing in your own environment. Testing might include:
- Initializing the system
- Initializing JES2 or JES3
- Logging on to TSO/E
- Running the IVPs
- Submitting a job
- Checking the job's output
- Starting customization of z/OS
- If CICS or IMS is installed, initializing a region and signing on to a terminal
- Bringing your ISV products into the test environment
- Running critical production jobs
- Supporting a representative interactive workload
- Communicating with all networks
- Testing critical functions in applications
- Checking some of the paths not often taken

- Checking for completeness of accounting records
- Testing all non-IBM product functions
- Bringing your applications into the test environment
- Ensuring that performance goals stated in service level agreements can be met.

Do not complicate your testing by exploiting the new function that z/OS provides. Save that task until after you are successfully running in production.

You should have a fallback (backout) plan in case problems occur during testing and you have to fall back to your previous level.

Chapter 6. Preparing for future installations

When you build a z/OS system, you must balance the needs of your installation to build a system that meets its needs well. While this will sometimes mean compromise, it more often means finding ways to build a flexible system that is easy to install, easy to migrate, easy to extend, and easy to change. z/OS provides tremendous flexibility in installation and customization. When applied using a well-planned structure, this flexibility can minimize the time it takes to install and migrate new systems or new software levels throughout an installation.

Adopting a well-planned structure for your installation provides the foundation for controlling workload during future installations and migrations. Depending on how your system is structured today, doing this can be very easy, requiring little investment, or quite difficult, requiring many system programming hours. However, the long-term benefits of a well-planned structure are quite clear.

This topic helps you prepare for future installations. Many of the techniques discussed in this topic, if you are not using them today, could take considerable time to implement. It can be difficult or even impossible to attempt to do all these things during a single build and migration cycle, for any number of reasons.

A phased approach will often prove most feasible and can begin to control the installation and migration workload in the least time. This provides you benefits, starting with the next installation and migration cycle, while controlling the work involved in implementation. As you implement each technique, more time to implement the remainder should be available during future system builds and migrations.

Note: Some of the SystemPac-related techniques discussed in this topic are applicable only to SystemPac dump-by-data-set format. SystemPac full volume dump format employs a very different philosophy, requiring far fewer actions on your part.

System and installation requirements

Creating an installation plan helps you make sure the software you install is able to meet your installation's requirements for software function. However, software function alone will not meet all the needs of your business, and there are other things you should consider when planning to build a system, such as:
- Achieving efficient virtual storage mapping
- Achieving best application performance
- Building a minimum number of system software configurations
- Reducing installation and migration time
- Reducing the opportunities for error during migration
- Making it easy to manage the system after it is in production
- Minimizing migration actions for the people who use the system.

How you choose to meet all of these requirements can have a significant effect on how much work is required to perform the tasks associated with each stage. Keep these requirements in mind while reading this topic.

Separating data from software

When you separate your data from your system software, you eliminate many tasks that would otherwise need to be performed each time you upgrade or replace your system software. An effective way to separate data from software is to use different DASD volumes for each.

You will minimize your installation and migration workload if you try to satisfy these objectives:
- All system software volumes for the same product set at the same product and service levels should be identical.
- All differentiation between systems should happen during or after IPL.
- Only system software (and SMP/E data pertaining to it) should reside on system software volumes.

If you have not previously used a system replacement method to install software, you will find that it makes the installation considerably easier. Most of the work involves separating the following kinds of data from z/OS software:
- Customization data, including most system control files
- Non-IBM software
- IBM products that run on z/OS
- User exits
- User data.

Your goal is to make it easier to replace the volumes that contain z/OS software, which are supplied by ServerPac or SystemPac (dump-by-data-set format). This allows you to more easily keep the other software and data you will need to use with z/OS across migrations.

What to do with the non-ServerPac or non-SystemPac code

1. Ask if the code is still required. If not, do not carry it forward; if so, go to the next step.
2. Determine the usefulness and effectiveness of this code:
   - Does it need to be updated for the new function in z/OS? If it does, you might need to upgrade a product or change the code.
3. If this code can be separated from the code delivered with ServerPac or SystemPac, place it in another product set. The product set should be placed on another volume so that future ServerPac or SystemPac installations will not overlay it. This requires moving it into separate libraries and SMP/E zones.
4. If the code cannot be separated from the code delivered with ServerPac or SystemPac, then it must be reinstalled in the same zones and libraries delivered with ServerPac or SystemPac. One way to do this is with the SMP/E BUILDMCS command.
5. Enable the useful and effective code to work with z/OS. This might mean using concatenation, reinstalling the code, or possibly reassembling it.

As you face the task of where to place the various types of code in your installation and enabling the code to work with z/OS, keep in mind the following advice:

- Use SMP/E to install all modules you use with the operating system; place comments in each module that identify its function.
- Where possible, use IBM-supplied exit points to control the system rather than changing the source or object code.
- Where possible, use the dynamic exits service. This service allows you to refresh exits without losing availability. For information about the dynamic exits service, see *z/OS MVS Installation Exits*.
- Where possible, place your exit code in libraries placed on different volumes from IBM code. This allows compatible exits to stay in place when you start to use a new level of the operating system, and reduces migration time.

The following list includes the different kinds of code found in an installation, and describes actions that ensure that the code you want to use with z/OS survives the installation process and is enabled to run with z/OS. The list includes the ways you insert customer-written code into an operating system environment or change the operating system code:

- **IBM products that run on z/OS**: This category includes the following:
  - Products that are no longer marketed. Such products are not available through ServerPac. To avoid having to reinstall these products every time you reinstall a z/OS ServerPac order, place these products, if possible, in separate product sets with separate libraries or SMP/E zones.

    Note: SMP/E provides the BUILDMCS command to copy a product from one zone to another. Use BUILDMCS to either (1) move the product to new (target and DLIB) zones, if the product is not available in ServerPac and if it can be installed in a separate zone, or (2) create an installable copy of the product with its service already integrated so that it can be reinstalled in the new zones shipped with ServerPac, which can be faster than reinstalling the product and its service from scratch. This use of BUILDMCS applies to vendor products and to IBM products that are still in service but have been withdrawn from marketing. For the information you need to use the BUILDMCS command and restrictions on its use, see *SMP/E Commands*.

    Products that are no longer marketed but are still service supported are available for selection in the SystemPac shopping list. Where appropriate, when you order a SystemPac, have these products separated into their own SMP/E zone or volume using the local order entry tool.

  - Available MVS SREL products, such as PSF or NetView. You can order these products in the same ServerPac or SystemPac as z/OS.
  - Non-MVS SREL products, such as the subsystems (DB2, CICS, IMS, NCP, and WebSphere Application Server). Check to make sure that these products do not need to be upgraded to run with z/OS by doing the following:
    - Do cross-zone requisite checking. For ServerPac, run the SMPREP job or the REPORT CROSSZONE command. For CBPDO, you should have done cross-zone requisite checking during APPLY processing, as described in *z/OS Program directory*. If you did not, run a REPORT CROSSZONE command. For information about the REPORT CROSSZONE command, see *SMP/E Commands*. For information about the SMPREP job, see *ServerPac: Installing Your Order*.
    - Check the cross-product dependencies section of the applicable PSP buckets.

    If you need to upgrade a non-MVS SREL product, order it in a separate ServerPac or use SystemPac. SystemPac provides the option of integrated subsystems. The package you order can include z/OS and no more than one of the subsystems (DB2, CICS, IMS, NCP, or WebSphere Application Server).

The deliverable is shipped to you integrated and requires just one installation, by way of either the CustomPac Installation Dialog or a full volume restore.

Should you choose to order subsystems with z/OS in one single SystemPac order, separate your subsystems from the z/OS SREL products to gain maximum flexibility in the future. The local order entry tool enables you to do so.

- **User modifications**: This category includes:
  - User exits
  - Updates to source code
  - Zaps
  - Changes to ISPF elements, such as panels, CLISTs, and EXECs.

Isolate this code from the IBM code when possible by:
  - Placing it in a separate library that can be concatenated ahead of the IBM libraries
  - Using the dynamic exits service and placing the code in separate libraries.

One simple way to tell whether user modifications must be reworked for the new level of software is to try to reapply them and see how many of them SMP/E will install. Those that SMP/E will not install will need to be changed for the new level of software. This method works if you have followed IBM's advice about using SMP/E to install the code.

If your user modifications have been installed using SMP/E, you can get the list of user modifications you now have installed by running a LIST SYSMODS USERMODS command against each of your existing target zones. You will need to evaluate each user modification to determine whether it is still needed and whether it needs to be reworked to be reinstalled.

To save time, you can run SMP/E REPORT SYSMODS commands, specifying each existing target zone on the INZONE keyword and each corresponding new target zone on the COMPAREDTO keyword. (The ServerPac SMPREP job includes a REPORT SYSMODS.) SMP/E will create SYSMODS Comparison Reports that identify user modifications that are installed in the old zones and are applicable to FMIDs in the new zone. It will also create a job in the SMPPUNCH data set to reinstall them (and any applicable PTF and APAR SYSMODS) in the new ServerPac or SystemPac system's target zone.

Some of your user modifications might be listed by the LIST commands but not included in the SYSMODS Comparison Reports. These user modifications apply to FMIDs that are not installed on your new system. Some FMIDs might have been replaced by others, in which case you will have to rework applicable user modifications before reinstalling them. The others might have no replacements and their user modifications are almost certainly no longer needed.

For FMIDs that have changed, evaluate the usermods and rework them, if necessary.

Keep the source for all user modifications in a single data set, and document each modification. Such documentation often includes:
  - The name of the part (for example the module) affected by the usermod
  - The business justification for the usermod
  - When the usermod can be eliminated
  - The purpose of the usermod
  - Instructions for reworking or reinstalling the usermod
  - The product and current FMID to which the usermod is applied.

You might need to rework and reinstall source updates and zaps.

Some actions not only make a ServerPac or SystemPac (dump-by-data-set format) installation easier, but can also organize code and data so that other tasks are easier. Here are some recommended actions:

- **SYSRES**: Some SYSRES volumes are not large enough to hold all the z/OS target libraries. If you have such a volume you can move some of the data sets off SYSRES. For help in determining which ones to move, see "Recommended data set placement" on page 100.

- **Parmlib and proclib**:
  - Do not make changes to the parmlib and proclib data sets that you use for production until you have seen what IBM sends in the copies that IBM ships with z/OS. Compare the IBM copy to your production copy or use the IBM library in your production concatenation and decide which of IBM's parmlib and proclib specifications apply to your environment and manually make the changes. Copy any new parmlib and proclib members into your production copy. Then, tailor your production copy, as needs require.
  - In a multisystem environment, try to have SYSRES, master catalog, and system-type libraries (such as IODF, SYS1.DAE, and RACF data) common to as many systems as is practical. Use symbolic substitution to reduce the number of parmlib and proclib members that are unique to specific systems.

    Using symbols in parmlib members makes it easier to share a parmlib member across multiple systems. z/OS provides a tool that helps you to verify that your system symbolics work successfully in your own configuration before you put the parmlib member into production. This tool, called the parmlib symbolic preprocessor, runs as an ISPF dialog to interactively display the results of symbol substitution before you IPL the system and use the symbols. You can find the tool in members SPPINST and SPPPACK in SYS1.SAMPLIB. Information about setting up and using the tool appears in the prolog of the SPPINST member.

  Use parmlib concatenation to separate your tailored parmlib members from the IBM-supplied parmlib members. See information about parmlib concatenation in the description of the LOAD*xx* parmlib member in *z/OS MVS Initialization and Tuning Reference*.

Placing data sets on specific volumes

With the ability to define very large volume sizes on certain hardware, it is possible that all your target and DLIB libraries could fit on a single volume. If possible, use a large enough volume for your target libraries so that you will not need multiple SYSRES logical extension volumes. However, some SYSRES volume types, such as the 3390-3, are not big enough to hold all the target libraries for a z/OS system, with the result that you have to move some data sets to SYSRES logical extension volumes (overflow volumes). This section describes considerations for placing data sets on specific volumes. These considerations try to minimize your migration actions, taking into account:

- Your ability to use a system (or subsystem) replacement
- Data set and system availability
- System performance
- System cloning and servicing techniques
- Sysplex/multisystem operations
- Your ability to exploit new technologies
- Sharing of data sets
- Backup and recovery
- Disaster recovery.

Using the guidelines in this section, you will have to determine which data set placements work best in your environment, probably making trade-offs in order to achieve your business goals.

Product sets

Introducing product sets

A *product set* is a set of products that you should install, maintain, and migrate as a group. Everyone has at least one product set that includes z/OS. The judicious grouping of your other system software products into product sets can help you avoid reinstalling software you have already installed, give you greater flexibility during migrations, control the amount of DASD used for system software, and make it easier to have different groups maintain different sets of products.

Well-chosen product sets let you treat most system software in a logical, modular way. When different images have different sets of requirements, you can use product sets as modular building blocks to make the entire needed set of software available on each image. Specific recommendations for placement of each product set's data sets are discussed in "Recommended data set placement" on page 100.

Characteristics of a product set

A product set is a group of products that is logically separate from any other group of products. Each product set is an entity that can be installed, maintained, and migrated by itself. Each product set has its own data sets, typically on separate DASD volumes, and its own SMP/E target and DLIB zones. Which products you should place in each product set depends on how you plan to install, maintain, and use software from different vendors.

When planning the number and content of product sets to be used in your installation, consider:

- Software installation requirements.

  Some products must be installed in data sets and SMP/E zones shared with other products in order to work. Such products cannot be considered as candidates for placement in different product sets. However, the remaining products are potential candidates.

- Migration cycles.

  Do you install and migrate all your software products at the same time (for example, once a year)? Or do you install and migrate groups of products separately? Software often installed or migrated separately includes subsystems, software from vendors, and application software.

  Any software installed or migrated on a cycle different from other software is itself a candidate product set.

- Organizational requirements.

  Does a single person or group of people do all software installations and migrations? Or do different people maintain different products? Note that some installations that once had separate organizations install and maintain different product sets now have one group install all of them and others make the software operational (including customization). This lets them include more products in each product set and reduce the number of product sets.

  Examples of software often maintained by different groups include application development software (such as compilers and debuggers), database products (such as IMS Database Manager and DB2), transaction processing products (such as CICS and IMS Transaction Manager), and networking products (such as ACF/NCP and NCP/SSP).

Software products maintained by different groups are sometimes candidates for inclusion in separate product sets.

- Sharing boundaries.

  Software can often be shared among multiple system images. There are many considerations for sharing system software, and more information about this can be found in *Parallel Sysplex - Managing Software for Availability*, SG24-5451. The boundaries on which you choose to share different products can vary, depending on which products are being used.

  When some products are shared among some sets of images and other products are shared among different sets of images, they are candidates for inclusion in different product sets.

  Note: You should generally not separate products to control access to them on different images for licensing reasons, unless the terms and conditions of your licensing agreements require you to do so. Most often, access to particular programs is better controlled using your security product.

- Product availability.

  Some of the products you use might no longer be available from a particular software vendor. They might originally have been placed in product sets with other products. Depending on how the product is installed, it might become a candidate for inclusion in a product set separate from the vendor's other products. Moving these products to separate product sets can sometimes let you avoid reinstalling them each time you rebuild the product sets in which they were originally placed.

Which product sets are appropriate?

One or more product sets, as described below, will be appropriate for your installation. Any of these product sets can be merged with any other, as required by your business needs. (The result of merging two product sets is considered to be a single product set.) Any product set described below can also be split into two or more product sets, if this is what is needed to meet your installation's requirements. Product sets can be built at the same time or different times, and migrated together or separately to different images as your business requires.

Each installation's requirements usually lead to a unique number of product sets and to unique content in each set. Remember that your objective in choosing the number and composition of product sets is to control workload while providing the amount of flexibility you need to manage your software easily. If you have either too many or too few product sets, you will do more work during some phase of installation or migration, and your system software will be harder to manage.

Product set for z/OS and closely-related products: The z/OS product set consists of all z/OS elements and features and other products that either must be installed with z/OS, or that you choose to install with z/OS. Some products must be installed with z/OS because they share load modules with z/OS load modules. Others can be installed separately but are difficult to maintain separately because of frequent service dependencies or local installation policies. Products in these two categories should always be part of the z/OS product set.

Note: Remember to add products to the z/OS product set that install into data sets that cannot be concatenated, such as SYS1.NUCLEUS. For example, the PSF product should be treated as part of the z/OS product set because it installs into SYS1.NUCLEUS.

Other products within the MVS SREL need not be installed with z/OS and are not difficult to maintain separately. However, unless your installation has a reason to place them in a separate product set, you should consider including them in the z/OS product set.

Subsystem product sets: Subsystem software includes database software, transaction processing software, and some network software. This software is often installed using different installation methods, is usually migrated on different cycles, is usually shared on different boundaries, and is often maintained by different groups. These products are usually good candidates for different product sets.

Licensed product sets: If your migration cycles, organizational requirements, and sharing of boundaries make it appropriate, you should consider creating a separate product set for some products. Generally, such products should be reasonably stable and easy to install, maintain, and migrate separately. Examples of such products include compilers, automation products, and products that can no longer be ordered.

Vendor product sets: You should consider creating one or more product sets for each vendor's products.

Recommended data set placement

Data set placement recommendations are **not** mandatory. The use of any or all of this layout is strictly optional. The recommended layout provides a good foundation for many recent functional and system management enhancements (such as sharing a master catalog, indirect volume serial support, z/OS UNIX, and Parallel Sysplex). It can be used to suggest how you might place data sets or as a set of objectives to which you can evolve.

To help you decide whether to follow the recommendations, ask yourself the following questions. Positive answers indicate that at least some of the recommended actions would be beneficial to you.

- Will you require additional SYSRES logical extension volumes? Some SYSRES volume types, such as the 3390-3, are not big enough to hold all the z/OS target libraries. Therefore, you might have to move some data sets to SYSRES logical extension volumes.

  Note: Several data sets shipped with z/OS are PDSEs. These data sets are CBC.SCCNCMP, CBC.SCLBDLL2, CEE.SCEEBIND, CEE.SCEERUN2, SYS1.SHASLNKE, SYS1.SIEALNKE, SYS1.SIEAMIGE, and TCPIP.SEZALOAD. One or more are most likely in your link list or will be added to your link list as part of installation. If one or more are in your link list and on your SYSRES volume, you should not share the SYSRES volume beyond the scope of a sysplex because PDSE sharing between sysplexes is not supported. If a PDSE is shared between sysplexes, data could become corrupted.

- Do you plan to use indirect volume serial support? If so, the recommended layout fits nicely with this support. See "Using indirect catalog entries" on page 114 for more information.

- Do you plan to use ServerPac or SystemPac (dump-by-data-set format) for future installations? ServerPac replaces at least your target and distribution libraries, so using the layout recommended in this section makes it easier to lay down the ServerPac or SystemPac (dump-by-data-set format) libraries.

- Do you plan to share master catalogs? The recommended layout provides a good foundation if you do.
- Do you plan to move your volumes across systems? If so, the recommended placement of user catalogs creates more-portable volumes and reduces migration workload. Also, the master catalog alias resolution support in DFSMSdfp allows system symbols to be used for the user catalog name. See *z/OS DFSMS Managing Catalogs* for details.

Based on these factors, you should determine which data sets to place on each volume based on data set type, not based on element, feature, or product. There are five types of data sets in the recommended data set layout. Each type is placed on a separate (logical) volume. The types of data sets and their volumes are:

- **SMP/E global-shared data sets**, on a volume shared by all systems in the complex that need access to SMP/E global information. See "SMP/E global data sets" on page 102 for details.
- **Target libraries (TLIBs) for product sets**, on the following volumes:
  - TLIB volume 1 (TVOL1)
  - TLIB volume 2 (TVOL2) through TLIB volume n (TVOLn)
  - HFS or zFS target volume
  - Licensed product set volume (for those licensed programs not installed with the z/OS product set)
  - Vendor product set target volume
  - Subsystem product set target volume

  See "Target libraries (TLIBs)" on page 102 for details.

- **Distribution libraries (DLIBs) for product sets**, on the following volumes:
  - DLIB volumes for target volumes (which include TVOL1, TVOL2-n, HFS, and zFS)
  - DLIB volume for the licensed product sets
  - DLIB volume for the vendor product sets
  - DLIB volumes for the subsystem product sets

  See "Distribution libraries (DLIBs)" on page 106 for details.

- **Image-related data sets**, on the following volumes:
  - Page data sets volume 1
  - Page data sets volume 2 through n
  - HFS or zFS customization volume

  See "Image-related data sets" on page 107 for details.

- **Cluster-related data sets**, on the following volumes:
  - Master catalog volume (you can also choose to make this an image-related volume)
  - JES checkpoint volume
  - JES spool volume
  - Sysplex volume 1
  - Sysplex volume 2
  - Softcopy volumes

  See "Cluster-related data sets" on page 109 for details.

Many volumes on your system will contain data sets that are not supplied by ServerPac or SystemPac (dump-by-data-set format). Keeping such volumes separate from those that ServerPac or SystemPac (dump-by-data-set format) will replace, or that you will replace when migrating the new system to other system images, makes it easier to prevent overlaying data sets that you want to keep. Volumes that contain non-ServerPac or non-SystemPac data sets might include, but are not limited to, the volumes identified below in the data set descriptions, as

well as volumes for assorted data sets (dumps that were dynamically taken, logger log streams, and so forth). Note that you can install your ServerPac or SystemPac (dump-by-data-set) order on volumes with existing data sets. See "Preparing for installation" on page 59 for the steps to follow when your target volumes contain data that you want to preserve.

The rest of this topic contains details about the five types of data sets and volumes outlined above. As you read, keep the following in mind:

- Volumes can be combined in order to conserve DASD. Combine volumes based on like characteristics. For example, consolidating two SMS-managed volumes with the same SMS constructs (Storage Class, Management Class and in the same Storage Group) is more appropriate than consolidating a non-SMS-managed volume and an SMS-managed volume.
- Although ServerPac and SystemPac (dump-by-data-set format) considerations are mentioned specifically, this recommended system layout is equally applicable to CBPDO users and will save time when the new system is migrated to other images.

SMP/E global data sets

These data sets contain SMP/E global system information. For the sake of organization, and ease of backup and recovery, it is a good idea to keep them together on a volume shared by all systems that use SMP/E in your complex. If you maintain multiple global zones for subsystems or vendors, the global zone described here should contain ZONEINDEX references to all other zones. This will assist you in cross-zone conditional requisite checking without requiring any changes to your installation's maintenance procedures.

The recommended types of data sets for this volume are:
- SMP/E global CSI
- SMPPTS (this data set alone might fill a volume)
- SMP/E global logs (SMPLOG/A)

Target libraries (TLIBs)

These data sets are SMP/E target libraries for products sets mentioned in "Which product sets are appropriate?" on page 99.

If you want to take advantage of indirect volume serial support, do not SMS-manage the target data sets that reside on volumes TVOL1 through TVOLn.

TVOL1 through TVOLn may be shared with other systems (for IPCS or WLM migrations, for example). If TVOL1 does not contain enough space to hold all the data sets listed for your system, then the criterion for a split (between TVOL1A and TVOL1B, for instance) would be that the IPCS and change migration libraries should be kept together on the first volume (TVOL1A).

If you support more than one language and are short of space on TVOL1, you might choose to put your primary language on TVOL1A and your secondary languages on TVOL1B. An additional criterion for a TVOL1A and TVOL1B split is to keep together those data sets that are less critical to the system and that do not affect existing catalog structures (for instance, data sets that are new to z/OS and are not critical to system usage).

When you install using ServerPac or dump-by-data set SystemPac, you should take advantage of the Recommended System Layout enhancement. This function takes into consideration the volume space available and the data set sizes in your order, and places the data sets accordingly. If you are a CBPDO customer, you might

have to calculate available space for the data set types on target volumes to ensure that it is sufficient. Depending on the volume type, you might have to add another target volume.

TVOL1 through TVOLn contain the z/OS product set target libraries, except for HFS and zFS files.

TLIB volume 1 (TVOL1): TVOL1 is the first target library volume and the system residence (IPL) volume. It contains many of the z/OS target libraries. Be sure to leave enough free space to allow for future growth. TVOL1 allows you to IPL if one or more TVOL2 through TVOLn volumes are temporarily not available.

TVOL1 contains some or all of the non-z/OS-UNIX target libraries for the z/OS product set. (See "Product set for z/OS and closely-related products" on page 99 for more information on the z/OS product sets.) This does not include the licensed product set, which you install separate from z/OS (on licensed program volumes), or the subsystem product set (on the subsystem target volumes).

The recommended types of TVOL1 data sets are given below. The type of a data set is known within the Recommended System Layout function in ServerPac and dump-by-data set SystemPac. The data set type can also be found within the product's program directory.

- **Load libraries.**
- **Change migration libraries.** These libraries are used, or might be used, during migration from one level of software to another.
- **Help libraries.**
- **Panel libraries.**
- **Message libraries.**
- **Skeleton libraries.**
- **Table libraries.**
- **Fixed-block CLIST and EXEC libraries (if possible).** If you do not use fixed-block CLIST and EXEC data sets, then TVOL1 should contain your variable-block CLISTs and EXECs and TVOL2 would contain your fixed-block CLISTs and EXECs. (In other words, put the kind of CLISTs and EXECs you use on TVOL1.)
- **Data libraries.** Some data libraries should go on TVOL2.
- **SMP/E managed PARMLIB.** This data set is the one pointed to by the PARMLIB DDDEF, which will be used to store parmlib members supplied by products you install. If you copy the SMP/E-managed PARMLIB data set into your own system control data set, then the SMP/E-managed parmlib should be placed on TVOL2-n. The placement of this PARMLIB data set makes it easier to use concatenated PARMLIB support to reduce migration workload.
- **SMP/E managed PROCLIB.** This data set is the one pointed to by the PROCLIB DDDEF, which will be used to store JCL procedures supplied by products you install. If you copy the SMP/E-managed PROCLIB data set into your own procedure library, then the SMP/E-managed PROCLIB data set should be placed on TVOL2-n. The placement of this PROCLIB data set makes it easier to use concatenated PROCLIB support to reduce migration workload.

Reasons to put these data sets on TVOL1 are:
- These data sets are critical to basic system function and are required for recovery. Should some TVOLn volumes be lost or become inaccessible, the system is less likely to fail if the most critical data sets are all on a single

volume. Also, in the event that all TVOLn volumes are lost or become inaccessible, the ability to IPL, log on, and use basic system functions after recovering TVOL1 can speed the recovery of other volumes and greatly simplify the process of restoring full function. (For example, restoring additional volumes from backup tapes can be done in parallel, using cataloged tape data set names.)

- Although it is technically possible to SMS-manage these data sets, it is still recommended to not have these volumes under SMS management. SMS volumes and data sets and volumes might not be accessible during recovery situations (for example, ISPF edit). By extension, any data set required for IPL is not recommended for SMS management.

- These data sets will be overlaid by a system replacement. By keeping them together, you can more easily separate what will and will not be overlaid.

- The SMP/E DDDEFed PARMLIB and PROCLIB are on TVOL1 so that TVOL1 can be IPLed in a minimum setup (without TVOL2 through TVOLn) and still have the SMP/E-installed defaults available. The members stored by SMP/E in the PARMLIB pointed to by the PARMLIB DDDEF, and those stored in the PROCLIB pointed to by the PROCLIB DDDEF, are not sufficient to IPL by themselves; a minimum set of system control parameters and JCL procedures are required to IPL and use the system. You can either concatenate your own PARMLIB and PROCLIB data sets to these data sets (which is preferred) or add your own members to these data sets.

TLIB volume 2 (TVOL2) through TLIB volume n (TVOLn): TVOL2 through TVOLn are volumes used for data sets that do not fit on TVOL1. They are for the z/OS product set; see "Product set for z/OS and closely-related products" on page 99 for more information about the z/OS product set. Products you want to install separately should be placed instead on licensed program volumes or subsystem volumes.

The recommended types of TVOL2 through TVOLn data sets are given below. The type of a data set is known within the Recommended System Layout function in ServerPac and dump-by-data set SystemPac. The data set type can also be found within the product's program directory.

- **Fixed-block CLIST and EXEC libraries** (only if variable-block CLIST and EXEC libraries were used on TVOL1).
- **Sample and JCL libraries.**
- **Source libraries.**
- **Macro libraries.**
- **Workstation libraries** (which are combined in the data libraries).
- **Softcopy libraries into which SMP/E installs.**
- **Font and printing libraries.**
- **Text libraries.**
- **Flat files that SMP/E cannot manage** (interface repositories and so forth, excluding documents).
- **MMS-compiled and MMS-source data sets**. MMS-source data sets are those data sets that are used as input into the MMS compiler.
- **SMP/E target CSI.**
- **SMP/E target data sets**: SMPLTS, SMPMTS, SMPSTS, SMPSCDS.
- **User catalog for the SMP/E target CSI and MMS-compiled data sets.**

If you find that just one volume (TVOL2) is not enough, and you require other volumes (TVOL3 for instance), you could place groups of data sets (rather than individual data sets) on one volume or the other. Some examples of groupings are:

- Operational data sets, such as flat files, font and printing libraries, MMS-compiled libraries, and user catalogs.
- VSAM data sets, such as the target CSI, MMS-compiled clusters, and user catalog.
- SMP/E work data sets, such as SMPLTS, SMPSCDS, SMPMTS, and SMPSTS.

Remember that these data sets are replaced by a subsequent ServerPac or SystemPac (dump-by-data-set format) installation and associated customization.

HFS or zFS target volume: This is a user-maintained volume and may be SMS-managed. This volume is not overlaid when unloading the ServerPac or SystemPac (dump-by-data-set format) HFS or zFS data sets. However, the data in the z/OS UNIX file system will be overwritten by the installation of service or the installation of z/OS with CBPDO. Therefore, you must ensure that you have a copy of your z/OS UNIX file system before you install into it. See *z/OS UNIX System Services Planning* for more information about installing service into the z/OS UNIX file system.

The recommended types of data sets (file systems) for the HFS or zFS target volume are:
- HFS or zFS data sets for z/OS elements or features that install into a z/OS UNIX file system
- HFS or zFS data sets for products that run on z/OS, except data sets containing customization data (which would be on the HFS or zFS customization volume)
- User-defined HFS or zFS data sets (the CustomPac Installation Dialog allows user-defined data sets to be defined as HFS or zFS)
- User catalog for HFS or zFS data sets on this volume if the volume is SMS-managed

You can combine the HFS or zFS target volume and your TVOL2-n volumes if you wish. You might want to combine them if the products they share are migrated on the same boundary and there is enough space on the TVOL2-n volumes for the HFS or zFS data sets.

Licensed product target volume: The libraries on this volume consist of the licensed product set that you might not have in a system-replacement order and you want to keep separate. The data sets on this volume are not overlaid by a system replacement and the content is decided on by the user. There can be any number of this type of volume on a system.

The recommended types of data sets for this volume are:
- Licensed program target libraries
- SMP/E target CSI
- SMP/E target data sets: SMPLTS, SMPMTS, SMPSTS, SMPSCDS
- User catalog. The SMP/E target CSI should be defined using this catalog. Except for any data sets you choose to catalog in the master catalog, all the licensed program target libraries should also be cataloged in this user catalog, and ALIAS entries should be defined in the master catalog to relate their high-level qualifiers to this user catalog.

Reasons to put these data sets on this volume are:

- To keep data sets that cannot be system-replaced (no longer marketed by IBM, older product levels, and so forth) on volumes other than TVOL1-TVOLn, so they are not overlaid by a system replacement.
- To keep together licensed programs that have dependencies on each other.
- To facilitate data set sharing between systems and maintain data sets in one place.

Vendor product target volume: The libraries on this volume consist of the vendor product set that you might not have in a system-replacement order and you want to keep separate. There can be any number of this type of volume on a system.

The recommended types of data sets for this volume are:
- Vendor target libraries (that can be separated)
- SMP/E target CSI
- SMP/E target data sets: SMPLTS, SMPMTS, SMPSTS, SMPSCDS
- User catalog for the SMP/E target CSI. Unless a data set must be in the master catalog, all the vendor product target libraries should be cataloged in the user catalog.

The reason to put these data sets on this volume is to keep the data sets off volumes that are overlaid by a system replacement.

You will need to contact your vendors to determine whether their products need to be updated for each z/OS release and whether the updates can be made ahead of time. To access the vendor's information through the Web, see http://www.ibm.com/systems/z/solutions/isv/.

Subsystem target volume: The libraries on this volume consist of the subsystem product sets (CICS, DB2, IMS, NCP, or WebSphere Application Server). There can be any number of this type of volume on a system.

The recommended types of data sets for this volume are:
- Subsystem target libraries.
- Alternate subsystem SMP/E global CSI, if applicable.
- SMP/E target CSI
- SMP/E target data sets: SMPLTS, SMPMTS, SMPSTS, SMPSCDS
- User catalog for the SMP/E global and target CSIs. Unless a data set must be in the master catalog, all the subsystem target libraries should be cataloged in the user catalog.

Reasons to put these data sets on this volume are:
- To keep these data sets off volumes that are overlaid by a system replacement.
- To keep the subsystem together on the same volume.
- To facilitate data set sharing between systems and maintain data sets in one place.

A subsystem product set might need to be serviced before it can be used with a new z/OS system. However, service updates usually can be made before the z/OS migration.

Distribution libraries (DLIBs)
You should place data sets on the DLIB volumes wherever they fit. There need not be a correlation between TVOL1 and the DLIB volume for TVOL1, or between TVOL2 and the DLIB volume for TVOL2, and so forth. It is possible, but not necessary, to SMS-manage the data sets.

Keep in mind how other systems will use the distribution libraries when you are deciding where to place them. There might be cases where you do not want or need a set of distribution libraries available on certain packs. These cases include:
- Distributing software to sites that do not use SMP/E or need the distribution libraries
- Having multiple target zones connected to a DLIB zone.

When allocating the distribution libraries you might have to use more than one DLIB volume. See Total DASD Storage Requirements in *z/OS Program directory* for an estimate of how much space the distribution libraries in z/OS will use.

If space allows, any of the following DLIB volumes can be combined with their corresponding target volumes: DLIB volume for licensed products, DLIB volume for vendor products, and DLIB volume for subsystems.

If you choose to catalog your distribution library data sets, you should catalog them in the user catalog used for the DLIB zone CSI. This makes it easier to move the DLIB volumes into other environments, to switch between different levels of DLIB volumes, and to have more than one level available at a time. It also reduces the amount of update activity required for the master catalog.

DLIB volumes for TVOL1, TVOL2 through TVOLn, HFS, and zFS: These distribution libraries are the ones that are replaced by ServerPac or SystemPac (dump-by-data-set format) for your z/OS product set:
- DLIBs for TVOL1, TVOL2 through TVOLn, and TVOLH

The DLIB CSI should be placed on one of the DLIB volumes, along with a user catalog for the DLIB CSI.

DLIB volume for licensed products: These are the distribution libraries that correspond to the target libraries for TVOLP (the licensed product set):
- DLIBs for TVOLP
- SMP/E DLIB CSI
- User catalog for the SMP/E DLIB CSI

DLIB volume for vendor products: These are the distribution libraries that correspond to the target libraries for TVOLV (the vendor product set):
- DLIBs for TVOLV
- SMP/E DLIB CSI
- User catalog for the SMP/E DLIB CSI

DLIB volumes for subsystems: These distribution libraries are the ones that will be replaced by ServerPac or SystemPac (dump-by-data-set format) for a subsystem product set:
- DLIBs for TVOLS
- SMP/E DLIB CSI
- User catalog for the SMP/E DLIB CSI

Image-related data sets

These data sets contain unshareable system image information. Although the recommendation is that they be put on separate volumes, as described below, if DASD is scarce you can combine them at the expense of performance or availability, or both.

Image-related data sets should use system symbolics in their names for easier maintainability. For more information on system symbolics, see *z/OS MVS Initialization and Tuning Reference*.

Page data set volume 1: The recommended types of data sets for this volume are:
- PLPA (1-cylinder allocation)
- Common

Unless your system is central-storage constrained, and has significant PLPA paging activity, there is little or no performance impact to combining the PLPA and COMMON page data sets. The PLPA data set should be allocated first, as a 1-cylinder data set. The COMMON data set should be allocated second, immediately following the PLPA data set on the volume. The COMMON data set's size should be large to contain both PLPA and COMMON pages.

This causes the vast majority of PLPA pages to be written to the COMMON page data set during IPL. This allows the operating system to use chained CCWs within a single data set and improves performance when both data sets are on the same volume.

Note: A warning message (ILR005E) is issued during IPL when PLPA pages overflow into the COMMON page data set during CLPA processing. This message is intended to alert you to the possibility that PLPA pages might have to be retrieved from data sets on different volumes (which would negatively affect performance if there was significant PLPA paging). When PLPA and COMMON page data sets are on the same volume, this message can be ignored.

Page data set volumes 2-n: The recommended types of data sets for these volumes are:
- Local
- SMF
- RMF reporting
- STGINDEX data sets (if used)
- Image-related LOGREC data set (if used)

Considerations when setting up a page data set volume are:
- Where possible, each local page data set should be placed on a dedicated volume connected to a control unit that is not used for other paging volumes, and on channel paths that are not used for other paging volumes. Although paging rates to DASD might be low, given sufficient central and expanded storage, increasing workloads might eventually cause significant paging. If this happens, locating local page data sets as suggested provides the best performance. Additionally, a large number of page data sets yields better performance than a small number if there is significant paging to DASD.

  IBM does not recommend placing other data sets on the volumes used for page data sets. However, if you must place other data on local page data set volumes, choose data with the lowest frequency of reference possible to minimize contention with paging.
- As one might expect, the I/O activity to SMF data sets is proportional to the amount of SMF data you record from your specified SMF parmlib member.
- I/O to STGINDEX data sets is only done when a job stream does batch checkpoints to save status (to allow the job stream to be restarted) or obtains restart status; therefore, this data set has relatively low I/O. If your installation always IPLs using CVIO or CLPA (which implies CVIO), there is no reason to

have a STGINDEX data set. In this case, specify VIODSN=IGNORE in IEASYS*xx*. For more information, see *z/OS MVS Initialization and Tuning Reference*.

- For information on choosing the LOGREC recording medium, see "Recording Logrec Error Records" in *z/OS MVS Diagnosis: Tools and Service Aids*. I/O activity is typically low for the image-related LOGREC data set.
- Dynamic dumps are recommended, so SVC dump data sets are not listed above.

HFS or zFS customization volume: This is an installation-maintained volume. The data sets on this volume will not be overlaid by system replacement. This volume is separate from the HFS or zFS target volume because it may contain unshareable HFS or zFS files that will generally need to be mounted MODE(RDWR).

The recommended types of data sets for this volume are:

- HFS or zFS data sets that must be in write mode (for instance, /etc, /u, /var) and contain customized information.
- A user catalog to own the HFS or zFS data sets (optional). This makes the volume portable using dump and restore, catalog services (IMPORT CONNECT), and SMS definition changes.

Reasons to put these data sets on this volume are:

- To keep customer HFS or zFS customization file systems separate so that they can be mounted under the file system provided in a system replace.
- To improve system performance. The number of HFS or zFS data sets that must be in write mode should be minimized to just what is required.
- To keep installation-maintained HFS or zFS data sets (which may be SMS-managed) together on the same volume for easier management.

Cluster-related data sets

These are shareable data sets used in a multisystem environment. Cluster-related data sets should use system symbolics in their names for easier maintainability. For more information on system symbolics, see *z/OS MVS Initialization and Tuning Reference*.

While all cluster-related data sets can be combined on the same volume, it is usually preferable to separate certain data sets from others for performance or availability reasons. For example, the following data sets should usually not be placed on the same volume:

- Primary and secondary RACF databases
- JES spool and checkpoint data sets
- Primary and backup SMS data sets
- Primary and secondary couple data sets

Note: You should also consider placing the primary RACF database in the coupling facility.

Master catalog volume: The recommended types of data sets for this cluster-related volume are:

- Master catalog
- BRODCAST
- Customer parmlib concatenation (not the SMP/E DDDEFed PARMLIB)
- Customer proclib concatenation (not the SMP/E DDDEFed PROCLIB)
- UADS (if used)

- VTAMLST
- SMS ACDS, CDS, model DSCB, HSM, RMM, and so forth
- APPC VSAM data sets (side information, TP profile)
- System control files (TCP/IP configurations and so forth)
- Primary RACF database
- IODF
- SYS0.IPLPARM
- UCATs
- SYS1.DDIR sysplex dump directory data set
- DAE data set

Considerations when setting up the master catalog volume are:
- BRODCAST (when individual user BRODCAST data sets are in use), LOGREC, parmlib, proclib, UADS, IODF, and DAE are low-activity data sets.
- Customer parmlib and customer proclib should be concatenated with other parmlibs and proclibs. For information on using system symbolics in concatenated parmlibs, see *z/OS MVS Initialization and Tuning Reference*.

JES2 checkpoint volume: For maximum performance and reduced contention, place the primary JES2 checkpoint data set on its own dedicated volume. The JES2 checkpoint primary data set may be on a coupling facility.

JES2 spool volume: Except in the case of a single-system MAS complex, you should dedicate JES2 spool volumes to spool data sets, with no other data sets on the volumes. A system can have many spool volumes.

The JES2 checkpoint duplex data set may be on a coupling facility.

Sysplex-related volume 1: This is a user-maintained volume and does not contain data sets overlaid by a system replacement.

The recommended types of data sets for this volume are:
- Sysplex primary
- CFRM alternate
- ARM primary
- WLM primary
- LOGR primary
- SFM primary
- Sysplex root

Considerations when setting up sysplex-related volume 1 are:
- Couple data sets should not be placed on volumes that have high I/O activity, are subject to RESERVEs, have page data sets, contain SYS1.DUMPnn data sets, or are eligible for allocation of data sets dynamically allocated for SVC dumps.
- The CFRM primary and SYSPLEX primary should be on different volumes attached to different control units. All other primary couple data sets can reside on the same volume, and all other alternate couple data sets can reside on a different volume.

You can find more guidelines for placement of couple data sets in *z/OS MVS Setting Up a Sysplex*.

Sysplex-related volume 2: This is a user-maintained volume and does not contain data sets overlaid by a system replacement.

The recommended types of data sets for this volume are:
- Sysplex alternate
- CFRM primary
- ARM alternate
- WLM alternate
- LOGR alternate
- SFM alternate
- Sysplex root backup
- Secondary RACF database

Couple data sets should not be placed on volumes that have high I/O activity, are subject to RESERVEs, have page data sets, contain SYS1.DUMPnn data sets, or are eligible for allocation of data sets dynamically allocated for SVC dumps.

You can find more guidelines for placement of couple data sets in *z/OS MVS Setting Up a Sysplex*.

Softcopy volume: This volume holds softcopy documents and related data sets.

There can be any number of this type of volume on a system. This is a user-maintained volume and does not contain data sets overlaid by a system replacement.

The recommended types of data sets for this volume are:
- Documents (books)
- Bookshelves
- Bookindexes

The data sets on the softcopy volume are recommended to be SMS-managed. This allows the hierarchical storage manager (HSM) to migrate any unused or infrequently-used data sets or documents.

Implementing the recommended data set placements

As you plan how you will implement the recommended data set placements, be sure to include the following activities:
- Decide whether to merge data sets.
- Determine which data sets to move and where to move them.
- Choose a volume serial naming convention if you plan to use indirect volume serial support.
- Decide whether to use your existing master catalog.
- Move data sets to appropriate volumes.
- Update SMP/E DDDEFs.
- Update catalog entries to point to appropriate volumes.
- Update IEASYM*xx* in your parmlib, using volume naming conventions.
- If using ServerPac or SystemPac (dump-by-data-set format), save your configuration for the next release.
- Update any environmentals that are applicable.

Decide whether to merge data sets

During a ServerPac or SystemPac (dump-by-data-set format) installation you can merge data sets while you modify the shipped order's configuration. This makes it possible to consolidate data sets that are used in the same ways. For example, you might merge ISPF panel libraries to create a smaller number of panel libraries. The merged data set configuration remains available for your use during subsequent installations.The CustomPac Installation Dialog allows IBM candidate data sets to be merged into the user-defined target data set.

The CustomPac Installation Dialog shows the data sets that are eligible for merging with a data set that you select. Not all data sets can be merged, however. The LPA and link list attributes must be compatible. In addition, the Dialog allows you to merge data sets only when they share all of the following attributes with the target data set:
- Same record format (RECFM)
- Same logical record size (LRECL)
- Same data set type (DLIB or target library)
- A data set organization of PO (DSORG=PO).

The candidate list is merely a reflection of the merge rules; you should not simply merge all eligible data sets. Instead, base your merge decisions on logical groupings and similarity of content (for example, all panel libraries).

If a CBPDO installation is chosen, you can follow the same merge rules used in the CustomPac Installation Dialog when installing a ServerPac or SystemPac. You must not merge any data sets that contain like-named members or aliases. For example, SFOMOBJ and SCLBCPP are the two libraries that cannot be merged together.

Determine which data sets to move and where to move them

You can move data sets manually or you can use the CustomPac Installation Dialog's Create a Recommended System Layout function to assign them automatically.

Understand the effects of this move on your environment. Do you have any applications that refer to the data sets specifying a UNIT and VOLUME? If references to the moved data sets use the catalog, and the catalog has been updated, then moving the data sets should have minimal impact. However, if the catalog is shared with other systems, then the impact would be greater.

You should also review your backup and recovery procedures for the data sets you plan to move.

Choose a volume serial naming convention if you plan to use indirect volume serial support

If you follow a naming convention for your SYSRES logical extension volumes, you can use a single SYMDEF statement in your IEASYM*xx* parmlib member. For more information about indirect cataloging, see "Using indirect catalog entries" on page 114.

Decide whether to use your existing master catalog

Is your current master catalog shared between several images? If so, will all images in your system use the same layout?

In order to share the master catalog, all images should use the same layout. If all systems will not use the same layout, then the master catalog should not be shared. In this situation, a separate master catalog for the system that has been converted to the layout must be used because the same data set cannot be cataloged on two different volumes.

Keep in mind that a catalog that contains extended indirect catalog entries cannot be used by a system where the support is not available. If you plan on sharing your master catalog with an earlier system that does not provide this function, you must decide if you will:
- Upgrade the earlier system to the minimum required for extended indirect cataloging

- Not use extended indirect cataloging until each image has the minimum required
- Use a separate master catalog on the later system, and discontinue sharing master catalogs.

Move data sets to appropriate volumes

If you are implementing the recommended data set placements during your ServerPac or SystemPac (dump-by-data-set format) installation, once you have configured your system data sets you do not have to move any data sets on the global, target, distribution, image, and some cluster volumes. The data sets will already be restored from the ServerPac or SystemPac (dump-by-data-set format) in the configuration you have chosen.

If you are implementing the recommended data set placements outside of a ServerPac or SystemPac (dump-by-data-set format) installation, move the data sets you researched onto the appropriate volumes. You might need some spare DASD space into order to move the data sets to a temporary location in order to do a swap. How much space you will need depends on how many data sets you are moving.

Update SMP/E DDDEFs

If you are implementing the recommended data set placements during your ServerPac or SystemPac (dump-by-data-set format) installation, once you have configured your system data sets you do not update your SMP/E DDDEFs to reflect the configuration. The DDDEFs will correctly identify the data sets for the configuration you have chosen.

If you are implementing the recommended data set placements outside of a ServerPac or SystemPac (dump-by-data-set format) installation, update your DDDEFs to identify the appropriate volumes. You can use the SMP/E ZONEEDIT command. If your data sets are cataloged, you will not have to update the UNIT and VOLUME. You should verify that the data sets you moved are correct in their DDDEFs.The CustomPac Installation Dialog allows DDDEF to be defined for user-defined data sets. The installation job will define the DDDEF for user-defined data sets as mentioned in the configuration.

Update catalog entries to point to appropriate volumes

If you are implementing the recommended data set placements during your ServerPac or SystemPac (dump-by-data-set format) installation, once you have configured your system data sets, the catalog your ServerPac or SystemPac provides will correctly reflect your configuration.

If you are implementing the recommended data set placements outside of a ServerPac or SystemPac (dump-by-data-set format) installation, update your catalog to identify the appropriate volumes.

Import user catalogs created to manage HFS, zFS, and VSAM (including CSI) data sets, and define the necessary aliases.

If you are using extended indirect cataloging, your catalog should reflect the SYSRES logical extension volumes by using your system symbols. It is recommended that &SYSR2 be used as the first SYSRES logical extension symbol when using extended indirect cataloging.

Update IEASYMxx in your parmlib

Update your parmlib member to reflect the system symbols that you used in your catalog for extended indirect cataloging. Your IEASYM*xx* member must match your catalog entries in order for your data sets to be found.

If using ServerPac or SystemPac (dump-by-data-set format), save your configuration for the next release

Because ServerPac or SystemPac (dump-by-data-set format) can save your configuration and reuse it for your next ServerPac or SystemPac, it is recommended that you use this function. Once your configuration is defined, you will not have to reconfigure the same data sets again.

Update any environmentals that are applicable

If you have any customization, applications, or parameters in your environment that have to be updated to reflect your new layout, these need to be updated.

Choosing a naming convention for data sets

Choosing the right naming conventions for system software data sets can save you considerable time during installation and migration.

Some data sets are associated with only one system in a multisystem environment. Choose names for these data sets that reflect the name of the specific system. Names of system operational data sets, such as page and swap data sets, should include the system name. You can accomplish this using the IBM-supplied system symbol &SYSNAME.

Remember that once you go into production with a set of naming conventions, you cannot easily change them.

Using symbolic substitution

Using symbolic substitution involves carefully establishing naming conventions for such things as:
- Parmlib and proclib members
- Data sets
- System images
- HCD definitions
- Network definitions
- Subsystems.

Using indirect catalog entries

Indirect cataloging, also known as *indirect volume serial support*, allows the system to dynamically resolve volume and device type information for non-VSAM, non-SMS-managed data sets that reside on the system residence (IPL) volume when accessed through the catalog. This allows you to change the volume serial number or device type of the system residence volume without also having to recatalog the non-VSAM data sets on that volume.

Extended indirect volume serial support allows catalog entries to be resolved using system symbols defined in an IEASYM*xx* member of parmlib, so that indirect references can be made to one or more logical extensions to the system residence volume. Like indirect catalog support, this support lets you change the volume serial numbers or device types of system software target volumes without having to recatalog their non-VSAM data sets. Therefore, you can have multiple levels of

z/OS data sets residing on multiple sets of volumes with different names and device types, and use them with the same master catalog.

Furthermore, extended indirect volume serial support includes a system-defined static symbol, &SYSR1. The value of &SYSR1 is automatically set to the volume serial of the IPL volume. If you name your system residence volumes and their extensions according to a pattern, you can use substrings of the &SYSR1 symbol to assign substitution text to symbols for the other volumes.

Using indirect catalog entries, together with the extended support, allows you to share master catalogs among multiple images that use different volumes with different names for the system residence volumes and their extensions. You can also do this using a single SYMDEF for all images in a shared parmlib data set. Thus, once set up, no future updates should be needed to continue using this support.

For details about IEASYM*xx* parmlib members and how to define system symbols to use with indirect volume serial support, see *z/OS MVS Initialization and Tuning Reference*. For details about how to use indirect volume serial support itself, see *z/OS DFSMS Access Method Services for Catalogs*.

Using parmlib concatenation (logical parmlib)

You can concatenate up to 16 data sets to SYS1.PARMLIB, in effect creating a "logical parmlib". You define the concatenation in the LOAD*xx* member of SYS1.PARMLIB or SYSn.IPLPARM. Programs can use the IEFPRMLB macro to obtain the parmlib concatenation data set list, allocate and open the parmlib data sets, read a specified parmlib member, and close and unallocate the parmlib data sets. In addition, the operator, if desired, can use a SETLOAD command to switch from one logical parmlib to another without an IPL.

The overriding benefit of using parmlib concatenation is that it gives you greater flexibility in managing parmlib. Specifically, it lets you:
- Separate IBM-supplied members from locally-customized ones
- Separate members based on job responsibility and security requirements
- Separate members for change-management purposes.

If you install using ServerPac or SystemPac, the IBM-supplied defaults cause the following concatenated parmlib data sets to be searched in the order shown when you IPL the target system:
1. SYS1.PARMLIB (either the SYS1.PARMLIB supplied by IBM and edited by you or your original SYS1.PARMLIB updated appropriately)
2. CPAC.PARMLIB (supplied by IBM and customized for your ServerPac or SystemPac order)
3. SYS1.IBM.PARMLIB (supplied by IBM).

For further information about specifying parmlib concatenation, see *z/OS MVS Initialization and Tuning Reference*.

DASD space utilization and performance

The space required by system software data sets, except for PDSE data sets, is affected by the block sizes you choose for those data sets. Generally, data sets with larger block sizes use less space to store the same data than those with smaller block sizes. Data sets that store more data in less space usually offer better DASD performance than those that use more space to store the same data.

There are some exceptions to the general rule that larger block sizes result in better space utilization. For example, fixed block (FB) record format data sets should not be allocated with block sizes larger than half the track length of the DASD they are allocated on. Doing so will cause considerable DASD space to be wasted, because current DASD track lengths are less than twice the maximum block size of 32,760 bytes. However, some data sets are best allocated using specific block sizes. When this is true of system software data sets, IBM recommends specific block sizes for them.

Note: Block sizes listed in the data set space tables in program directories are not generally recommended unless they are explicitly identified as recommended. You should treat the recommendations in this topic as though they apply to all the system software data sets you allocate unless the product specifically says to do otherwise.

Generally, system-determined block sizes (SDB) makes the best choice for block size for fixed block (FB), variable block (VB), and variable-block spanned (VBS) record format data sets. You should use SDB for all system software data sets with these record formats except those for which IBM specifically recommends other block sizes. One way to do this is specifying BLKSIZE=0 in the DCB parameter of a DD statement when allocating new data sets using JCL. For details about how to specify system-determined block sizes, see *z/OS MVS JCL Reference*.

Note that system determination of block sizes affects the block size and number of blocks used. It does not affect the amount of space allocated in a data set. The amount of space is defined by IBM (in sample jobs and program directories).

Undefined record format data sets

Data sets with undefined (U) record formats do not follow the same rules as those with other record formats. In particular, most load libraries in partitioned data sets (not PDSEs) will require less space (often as much as 20% less) and offer better performance at increasing block sizes right up to the block size limit of 32,760 bytes. This is because the program management binder, linkage editor, and IEBCOPY COPYMOD command use the data set block size only to set the maximum block length they will use. They will write a block whenever the space available on a track is greater than the minimum block size (over which you have no control) and less than or equal to the maximum block size.

Allocate all load libraries using a block size of 32,760 bytes unless you plan to move your system software data sets from the device types on which they were originally allocated to device types with shorter track lengths, or plan to move them between device types having different track lengths without using IEBCOPY COPYMOD. A block size of 32,760 bytes will optimize space utilization and performance for all system software load libraries.

Using recommended block sizes for z/OS data sets

For most efficient use of DASD, you should allocate z/OS data sets using the following block sizes:

- Use the system-determined block size for most non-RECFM U data sets (for example, code BLKSIZE=0 in JCL).
- For RECFM U data sets, use BLKSIZE=32760. (Note that 32760 is optimum because all supported DASD types have track lengths greater than 32,760 bytes.)
- If you use a UADS data set for TSO/E, you should generally use the same block size you currently use to allocate a new one. *Do not allocate the UADS data set with a system-determined block size. This will result in very poor DASD space utilization.* Instead, model your new UADS from your existing UADS or start with a small block size and increase the block size if a significant number of user ID entries are split into multiple members. For details about allocating a UADS data set and optimizing its block size, see *z/OS TSO/E Customization*.
- The AFP font libraries should not be allocated with system-determined block sizes. The correct block size for the font libraries is 12288. The font data sets will take up more space if system-determined block sizes are used and will result in very poor DASD space utilization.

For details about the conditions under which the system can determine the optimum block size for a data set, look for information about system-determined block sizes in *z/OS DFSMS Using Data Sets*.

Appendix A. Installation checklist

This topic lists the tasks for installing z/OS. You can use this checklist of tasks as an aid when creating your installation plan.

To *install* in the broad sense means to perform the tasks necessary to make a system operational. The starting point is the decision to install, either for the first time or a subsequent time (the latter being an *upgrade*). The ending point is a system in production.

An upgrade involves *migration*, during which you install your new system with the objective of making it functionally compatible with the previous system, followed by *exploitation*, which involves taking advantage of the enhancements in the new release.

This checklist can be used by either the first-time installer (whose enterprise never had z/OS before) or the installer who is upgrading to a new release.

Step 1. Plan the details

1. **If installing for the first time (not upgrading), understand installation basics.**

   Reference information: Chapter 1, "Learning about z/OS," on page 1.

2. **If upgrading, understand changes in the new release that affect installing.**

   Reference information: "Summary of changes for the z/OS installation planner" on page 40.

3. **Choose the software installation method.** Choices are:
   - ServerPac (entitled)
   - CBPDO (entitled)
   - SystemPac (additional charge)
   - Others at additional charge
   - None if sharing or cloning

   Reference information:
   - ServerPac, CBPDO, and SystemPac: "Choosing an installation package for installing z/OS" on page 45
   - Other fee-based methods: http://www.ibm.com/services/
   - Sharing or cloning: "Installing z/OS without using an installation package" on page 46

4. **Choose the software delivery method.** Choices are:
   - Tape
   - DVD
   - Internet

   Reference information: "Choosing the delivery medium: tape, DVD, or Internet" on page 46.

5. **Identify driving system hardware and software requirements.**

   Reference information: Chapter 3, "Preparing the driving system," on page 53.

6. **Choose the target system hardware to install or upgrade.**

Reference information: "Identifying hardware requirements for the target system" on page 74 and Appendix C, "Hardware requirements for running z/OS V1R13," on page 141.

7. **Choose the target system software to install.**

   Possible types of software are z/OS optional features, IBM middleware, IBM applications, and ISV products.

   Reference information: "Choosing software products to install and identifying requisites" on page 69 and Appendix B, "Software requirements for running z/OS V1R13," on page 127.

8. **Choose the target system JES level.**

   You may install the level of JES2 or JES3 that is shipped with z/OS V1R13, or you may remain at your current level of JES (as long as it is z/OS V1R11 or later) and upgrade at a later date.

   Reference information: "Using your existing JES and SDSF with z/OS V1R13" on page 79.

9. **If upgrading, identify migration actions for z/OS.**

   Migration actions, or tasks, fall into three categories based on when they should be performed:

   - Before installing (performed on the old system)
   - Before first IPL (performed on the new system before the first IPL)
   - After first IPL (performed on the new system after the first IPL)

   Two migration actions in the "before installing" category are worthy of note here:

   - Identifying coexistence and fallback service.

     Coexistence service (installed on old systems that share resources) allows the new system to coexist (share resources) with old systems. (Examples of shared resources are JES spools, RACF databases, user catalogs, and ISPF profiles.)

     Fallback service (installed on the system from which you are migrating) allows you to back out of the installation, if necessary.

   - Reviewing hardware and software PSP buckets for changes to planning information.

   Reference information:

   - All of *z/OS Migration*. Note that within the publication, the three possible timings are labeled "before installing z/OS V1R13", "before the first IPL of z/OS V1R13", and "after the first IPL of z/OS V1R13".
   - Apply coexistence and fallback PTFs in *z/OS Migration*
   - Review PSP buckets in *z/OS Migration*

10. **If upgrading, identify migration actions for IBM middleware, IBM applications, and ISV products.**

    Reference information: IBM product publications and ISV publications.

11. **If installing for the first time, identify customization needed on the new system.**

    This customization will allow you to exploit (make productive use of) the z/OS functions necessary to accomplish your enterprise's goals.

    Reference information:

- z/OS publications that have customization information, such as *z/OS MVS Initialization and Tuning Reference* and *z/OS Infoprint Server Customization*. z/OS publications are at the z/OS Internet Library (http://www.ibm.com/systems/z/os/zos/bkserv/).
- Product-specific publications that have customization information, such as *CICS Customization Guide*.
- Chapter 5, "Preparing for customization and test," on page 83.

12. **If upgrading, identify postmigration customization needed on the new system.**

   Examples of postmigration customization tasks are adding devices, upgrading the network, and taking advantage of (exploiting) release enhancements.

   Reference information:

   - z/OS publications that have customization information, such as *z/OS MVS Initialization and Tuning Reference* and *z/OS Infoprint Server Customization*. z/OS publications are at the z/OS Internet Library (http://www.ibm.com/systems/z/os/zos/bkserv/).
   - Product-specific publications that have customization information, such as *CICS Customization Guide*.
   - Chapter 5, "Preparing for customization and test," on page 83.

13. **Identify test activities.** Be sure they are consistent with local test policies.

   Reference information: "Scheduling test activities" on page 90.

14. **Establish a fallback strategy.**

   Reference information: "Coexistence and fallback" on page 27.

15. **Prepare for future installations.**

   Specific tasks are separating data from software, placing data sets on specific volumes, choosing a naming convention for data sets, using indirect catalog entries, using parmlib concatenation, and making optimum use of DASD space.

   Reference information: Chapter 6, "Preparing for future installations," on page 93.

Step 2. Order hardware and software

1. **Order driving system hardware and software** that you chose in Step 1.
2. **Order target system hardware and software** that you chose in Step 1. For software, place your order with ShopzSeries, the self-service Internet application, if possible. Go to http://www.ibm.com/software/shopzseries.

   Reference information: "Ordering z/OS and related IBM products" on page 71 and http://www.ibm.com/servers/eserver/zseries/zos/buy.html.
3. **If upgrading, order coexistence and fallback PTFs** that you identified in Step 1.
4. **Receive software shipments and verify contents.**

Step 3. If upgrading, prepare the current environment (old target system) for the new release

1. **Perform as many z/OS migration actions as possible on the existing (old) system.** These are the preinstallation migration actions that you identified in Step 1, which have a timing of "before installing z/OS V1R13" in *z/OS Migration*. These migration actions include installing the coexistence and fallback PTFs that you identified in Step 1 and ordered in Step 2.

   Reference information: z/OS publications (http://www.ibm.com/eserver/ zseries/zos/bkserv/)

2. **Perform as many migration actions as possible for IBM middleware, IBM applications, and ISV products that run on the existing (old) system.** These migration actions were identified in Step 1.

   Reference information: IBM product publications and ISV publications.

3. **Build, test, and put the old target system back into production.** Follow local procedures.

Step 4. Build the driving system

The *driving system* is the system image (hardware and software) that you use to install the target system. The system from which you are migrating can be used as the driving system, or you may use a different system provided that it meets the minimal hardware and software requirements for a driving system.

1. **Install or update driving system hardware** that you identified in Step 1 and ordered in Step 2.

   Reference information: related product documentation.

2. **Install or update driving system software** that you identified in Step 1 and ordered in Step 2.

Step 5. Build and verify the target system

The *target system* is the system software libraries and other data sets that you are installing. You log on to the driving system and run jobs there to create or update the target system. Once the target system is built, it can be IPLed on the same hardware (same LPAR or same processor) or different hardware than that used for the driving system.

ServerPac or SystemPac dump-by-data-set installation:

1. **Install or upgrade target system hardware** that you chose in Step 1 and ordered in Step 2.

   Reference information: related product documentation.

2. **Review PSP buckets** for the latest installation information.

   Reference information: "PSP information" on page 35.

3. **Prepare target system volumes for installation.**

   Reference information: "Preparing for installation" on page 59.

4. **Receive the ServerPac or SystemPac order to DASD.**

   Reference information: *ServerPac: Using the Installation Dialog* or *SystemPac: CustomPac Dialog Reference*.

5. **Select the type of installation you prefer:** full system replacement or software upgrade. Each requires a different amount of work and a different order of tasks.

Reference information: *ServerPac: Using the Installation Dialog* or *SystemPac: CustomPac Dialog Reference*.

6. **Create and tailor the work configuration.**

   Reference information: *ServerPac: Using the Installation Dialog* or *SystemPac: CustomPac Dialog Reference*.

7. **Run installation jobs.** The jobs install distribution and target libraries for your target system.

   Reference information: *ServerPac: Installing Your Order* or *SystemPac Installation Guide*.

8. **Review system HOLDs and latest Enhanced HOLDDATA** in the CPAC.DOCLIB data set in the ServerPac or SystemPac order and at http://service.boulder.ibm.com/390holddata.html.

   Reference information: "Maintenance after installation" on page 36.

9. **Run element-specific post-installation jobs on the driving system.**

   Reference information: *ServerPac: Installing Your Order* or *SystemPac Installation Guide*.

10. **If upgrading, perform pre-first-IPL migration tasks for z/OS.** These migration actions were identified in Step 1 and have a timing of "before the first IPL of z/OS V1R13" in *z/OS Migration*.

    Reference information: z/OS publications (http://www.ibm.com/eserver/zseries/zos/bkserv/)

11. **If upgrading, perform pre-first-IPL migration tasks for IBM middleware, IBM applications, and ISV products.** These migration actions were identified in Step 1.

    Reference information: IBM product publications and ISV publications.

12. **IPL the target system and log on.**

    Reference information: *ServerPac: Installing Your Order* or *SystemPac Installation Guide*.

13. **Run element-specific post-installation jobs on the target system.**

    Reference information: *ServerPac: Installing Your Order* or *SystemPac Installation Guide*.

14. **Run installation verification programs (IVPs).**

    Reference information: *ServerPac: Installing Your Order* or *SystemPac Installation Guide*.

15. **Download client code to workstations,** if applicable.

    Reference information: element-specific documentation.

16. **Apply service to target system software,** if necessary.

    Reference information: "If you are installing a z/OS ServerPac or Product ServerPac order..." on page 78 or "If you are installing a z/OS SystemPac order..." on page 78.

17. **Save the customized configuration.**

    Reference information: *ServerPac: Using the Installation Dialog* or *SystemPac: CustomPac Dialog Reference*.

18. **Back up the system.**

    Reference information: Appendix D, "Making a copy of your system software (cloning)," on page 157.

CBPDO installation:

1. **Install or upgrade target system hardware.**

   Reference information: related product documentation.

2. **Review PSP buckets** for the latest installation information.

   Reference information: "PSP information" on page 35.

3. **Clone the system.**

   Reference information: Appendix D, "Making a copy of your system software (cloning)," on page 157.

4. **Update SMP/E zone entries.**

   Reference information: *z/OS Program Directory*.

5. **Create "FMIDSETs" that you will install in stages called "waves".**

   Reference information: *z/OS Program Directory*.

6. **Install Wave 0.**

   Reference information: *z/OS Program Directory*.

7. **Install Wave 1 and, if upgrading, perform pre-first-IPL migration tasks for z/OS, IBM middleware, IBM applications, and ISV products.** (The pre-first-IPL migration tasks for z/OS were identified in Step 1 and have a timing of "before the first IPL of z/OS V1R13" in *z/OS Migration*.)

   Reference information: *z/OS Program Directory*, z/OS publications (http://www.ibm.com/eserver/zseries/zos/bkserv/), IBM product publications, and ISV publications.

8. **Install Wave 2 and, if upgrading, perform pre-first-IPL migration tasks for z/OS, IBM middleware, IBM applications, and ISV products.** (The pre-first-IPL migration tasks for z/OS were identified in Step 1 and have a timing of "before the first IPL of z/OS V1R13" in *z/OS Migration*.)

   Reference information: *z/OS Program Directory*, z/OS publications (http://www.ibm.com/eserver/zseries/zos/bkserv/), IBM product publications, and ISV publications.

9. **Download client code to workstations,** if applicable.

   Reference information: element-specific documentation.

10. **Apply service to target system software,** if necessary.

    Reference information: "If you are installing a z/OS CBPDO order..." on page 78.

11. **Back up the system.**

    Reference information: Appendix D, "Making a copy of your system software (cloning)," on page 157.

SystemPac full volume dump installation:
1. **Install or upgrade target system hardware.**

   Reference information: related product documentation.

2. **Review PSP buckets** for the latest installation information.

   Reference information: "PSP information" on page 35.

3. **Prepare target system volumes for restore.**

4. **Initialize volumes.**

   Reference information: *SystemPac Installation Guide*.

5. **Unload the tapes to the initialized volumes.**

   Reference information: *SystemPac Installation Guide*.

6. **If upgrading, perform pre-first-IPL migration tasks for z/OS.** These migration actions were identified in Step 1 and have a timing of "before the first IPL of z/OS V1R13" in *z/OS Migration*.

   Reference information: z/OS publications (http://www.ibm.com/eserver/zseries/zos/bkserv/)

7. **If upgrading, perform pre-first-IPL migration tasks for IBM middleware, IBM applications, and ISV products.** These migration actions were identified in Step 1.

   Reference information: IBM product publications and ISV publications.

8. **IPL the target system and log on.**

   Reference information: *SystemPac Installation Guide*.

9. **Run post-installation jobs after IPL.**

   Reference information: *SystemPac Installation Guide*.

10. **Verify installation.**

    Reference information: *SystemPac Installation Guide*.

Step 6. Customize and test the target system

1. **If upgrading, perform the post-first-IPL migration tasks for z/OS.** These migration actions were identified in Step 1 and have a timing of "after the first IPL of z/OS V1R13" in *z/OS Migration*.

   Reference information: z/OS publications (http://www.ibm.com/eserver/zseries/zos/bkserv/)

2. **If upgrading, perform the post-first-IPL migration tasks for IBM middleware, IBM applications, and ISV products.** These migration actions were identified in Step 1.

   Reference information: IBM product publications and ISV publications.

3. **If installing for the first time, perform the customization tasks that you identified in Step 1.**

   Reference information: z/OS publications (http://www.ibm.com/eserver/zseries/zos/bkserv/), IBM product publications, and ISV publications.

4. **IPL the customized system.** Follow local procedures.

5. **Test the customized system.** Use the test cases that you identified in Step 1.

Step 7. Put the tested system into production (cut over to production)

1. **Deploy the tested system.** Follow local procedures.

2. **Clone the tested system across a multisystem configuration.**

   Reference information: Appendix D, "Making a copy of your system software (cloning)," on page 157.

Step 8. If upgrading, perform postmigration customization

(If installing for the first time, customization is done in Step 6.)

1. **Perform the customization tasks that you identified in Step 1.**

   Reference information: z/OS publications (http://www.ibm.com/eserver/zseries/zos/bkserv/), IBM product publications, and ISV publications.

Appendix B. Software requirements for running z/OS V1R13

You need to plan for the appropriate software that you will run on your target system with z/OS V1R13. This topic lists software requirements as follows:

- Table 12 on page 128 lists the IBM middleware and application products that require a specific level (version, release, or PTF) so that the products will run on z/OS V1R13.
- Table 13 on page 130 lists functions of z/OS that require specific z/OS optional features, IBM middleware products, or IBM application products.

If you are upgrading from z/OS V1R11 or z/OS V1R12, you may use the product levels on z/OS V1R13 that you used on your prior z/OS release, as long as the product levels are still service-supported, with the following exceptions:

1. If you are using any of the **products** in Table 12 on page 128, you must use the product levels shown.
2. If you are using any of the **functions** in Table 13 on page 130, and those functions have dependencies on IBM middleware or application products, you must use the product levels shown (or later).

SMP/E V3R6 or SMP/E V3R5 product support for FIXCAT HOLDDATA can be used for target system PTFs verification programmatically. The PTFs that are documented in Table 12 on page 128 and Table 13 on page 130 are required for support on z/OS V1R13. These PTFs are identified with a FIXCAT called IBM.TargetSystem-RequiredService.z/OS.V1R13, in Enhanced HOLDDATA. A HOLDDATA type FIXCAT (fix category) is used to associate an APAR to a particular category of fix for target system PTFs identified as levels.

To help identify those PTFs on your current system that would be needed for your upgrade to z/OS V1R13, you can use the SMP/E REPORT MISSINGFIX command. Here is a sample command used to run against the CICS CSI:

```
SET BDY(GLOBAL).
REPORT MISSINGFIX ZONES(CICS31T)
   FIXCAT(IBM.TargetSystem-RequiredService.z/OS.V1R13).
```

To determine what PTFs are needed and not yet installed, you must run the REPORT MISSINGFIX command against all the global zones you use to support your middleware and application products.

Notes:

1. This topic does not describe program requirements related to systems in a sysplex using the coupling facility. For that information, see the Parallel Sysplex Web site: http://www.ibm.com/systems/z/pso/.
2. Requirements listed in this topic reflect the minimum levels.
3. Some IBM products and z/OS elements and features have comparable non-IBM equivalents. This topic reflects only IBM software.
4. z/OS does not support service for client operating systems whose service is withdrawn by the operating system manufacturer.

Table 12. IBM middleware and application products that require a specific level (version, release, or PTF) to run on z/OS V1R13

If you use this IBM product...	You need this product level (in most cases achieved with PTFs)
APL2® V2R2 (5688-228) and APL2 Application Environment V2R2 (5688-229)	PTF UK21647 (APAR PK35370), PTF UK21694 (APAR PK37883), PTF UN69983 (APAR PN62132), PTF UN80106 (APAR PN73293), PTF UN96394 (APAR PN89484), PTF UQ05988 (APAR PQ03382), PTF UQ32641 (APAR PQ17281), PTF UQ39101 (APAR PQ34130), PTF UQ44309 (APAR PQ39155), PTF UQ51028 (APAR PQ40992), and PTF UK65259 (APAR PM33271).
CICS Transaction Server (CICS/TS) V3R2 (5655-M15)	PTF UK26871 (APAR PK48185), PTF UK26970 (APAR PK48186), PTF UK27462 (APAR PK49681), PTF UK40131 (APAR PK59277), PTF UK35003 (PK59577) .
CICS Transaction Server (CICS/TS) V3R1 (5655-M15)	PTF UK29210 (APAR PK49134), PTF UK29407 (APAR PK49136), and PTF UK40130 (APAR PK59275)
IMS V10 (5635-A01)	PTF UK38953 (APAR PK65837), PTF UK41225 (APAR PK70721), PTF UK41224 (APAR PK63000), and PTF UK47628 (APAR PK80298)
Softek Transparent Data Migration Facility (TDMF®) V5.1	Zap WR45203
Softek Transparent Data Migration Facility (TDMF®) V5.2	PTF UA56164 (APAR OA32196) and PTF for APAR OA35928.
Tivoli AF/Integrated Resource Manager on z/OS V5.0 (5608-AFI)	Requires PTF UA59103 (APAR OA35607, PTF UA52245 (APAR OA31775), and PTF UA53173 (APAR OA32300).
Tivoli Decision Support for z/OS V1R8.0 ancd V1R8.1 (5698-B06)	For V1R8.0, requires PTF UK66862(APAR PM32729), PTF UK67298 (APAR PM29198), PTF UK72548(APAR PM47009), and PTF UK76924(APAR PM50083). For V1R8.1, requires PTF UK66863(APAR PM32729), PTF UK67299 (APAR PM29198), PTF UK72549(APAR PM47009), and PTF UK76925 (APAR PM50083).
Tivoli Decision Support for z/OS V1R7.0 and V1R7.1 (5698-A07)	For R7.0, requires PTF UK72546(APAR PM47009). For R7.1, requires PTF UK72547(APAR PM47009). .
Tivoli NetView for z/OS V5 (5697-ENV)	R2 requires PTF UA42145 (APAR OA25534) and PTF UA46832 (APAR OA27667). R3 requires PTF UA42146 (APAR OA25534) and PTF UA46833 (APAR OA27667).
Tivoli NetView Performance Monitor (NPM) V2 (5655-043)	Requires PTF for APAR OA36034.
Tivoli OMEGAMON XE products	• All versions that were supported on zOS V1R12 will continue to be supported on zOS R1R13. To pick up z/OS V1R13 support, PTFs for the following APARs are required: – Tivoli OMEGAMON XE for Mainframe Networks 4.2.0: APAR OA35655 – Tivoli OMEGAMON XE for Mainframe Netwworks 4.1.0: APAR OA35658 – Tivoli OMEGAMON II for Mainframe Networks 5.6.0: APAR OA35660 – End to end 6.2.0: APAR OA35652 – End to end 5.5.0: APAR OA35654

Table 12. IBM middleware and application products that require a specific level (version, release, or PTF) to run on z/OS V1R13 (continued)

If you use this IBM product...	You need this product level (in most cases achieved with PTFs)
Tivoli System Automation for z/OS V3 (5698-SA3)	• R2 requires PTF UA43003 (APAR OA25545), PTF UA44993 (APAR OA27030), PTF UA47085 (APAR OA28217) and, if the System Automation INGPLEX IPL function is to be used, PTF UA43533 (APAR OA26275).
IBM Security zSecure™ Suite: Admin (5655-T01), Audit (5655-T02), CICS Toolkit (5655-T05), Command Verifier (5655-T07), Visual (5655-T09), Alert (5655-T11), and Tivoli Compliance Insight Manager Enabler for z/OS (5655-T15)	If you use the IBM Security zSecure Suite products, the V1R13 levels are required. That is, levels of IBM Security zSecure Suite products earlier than V1R13 will not fully work and are not supported with z/OS V1R13.

Table 13. Functions of z/OS V1R13 that require specific z/OS optional features or IBM products

z/OS element or feature	Required z/OS optional features or IBM products (by function)
Alternate Library for REXX	None

BCP	For requirements related to software support of the zEC12, z196, z114, System z10, System z9, z990, and z890 servers, see *z/OS Migration*.
	
	DB2 Data Server Driver for JDBC and SQLJ that supports Java Batch Container requirements
	• PTF UK69734 and UK69742 (FMID JDB9912)
	
	Dynamic APF requirements:
	• The z/OS Security Server feature is required if you want to use the RACF data security monitor program (DSMON) to produce reports for APF-authorized programs.
	
	FICON requirements:
	• To simplify configuration definition tasks when migrating to FICON, use the z/OS HCM feature.
	• To report on the measurement data generated for FICON CHPIDs, use the z/OS RMF feature.
	• To exploit the architecture enhancements, use the following:
	  – z/OS JES3 feature
	  – PSF for z/OS V4 (5655-M32)
	  – Tivoli System Automation for z/OS V3 (5698-SA3) or later
	  – IMS V9 (5655-J38) or later
	
	IEAVFTED REXX exec requirements:
	• The IBM supplied IEAVFTED REXX exec is used to produce a Timed Event Data Report in either a TSO or IPCS environment. The IEAVFTED REXX exec is a compiled REXX program which requires the full REXX compiler run-time libraries (at least [5695-014] REXX LIBR BASE V1.4 (FMID HWJ9140) installed before attempting to use IEAVFTED. Note that IEAVFTED will not work with the z/OS base element, REXX Alternate Runtime Library z/OS Base (FMID HWJ9143).
	
	Java requirements:
	• The SMF product registration Java support requires that the following Java level or later be installed: IBM SDK for z/OS, Java 2 Technology Edition, V1 (5655-I56) at SDK 1.5 or later.
	
	Job support for started tasks requirements:
	• The z/OS Security Server feature is required if you plan to use dynamic security control for started tasks (using the STARTED class to assign RACF identities to started procedures and jobs dynamically with the RDEFINE and RALTER commands).
	
	Messages displayed in non-English languages:
	• The z/OS Security Server feature is required if you use this function because RACF is used to obtain language information for users.
	
	Operations log (OPERLOG) requirements:
	• The z/OS Security Server feature is required if you want to protect the operlog log stream.
	• The z/OS SDSF feature is required if you want to use the log browser facility for the operlog log stream.

Table 13. Functions of z/OS V1R13 that require specific z/OS optional features or IBM products (continued)

z/OS element or feature	Required z/OS optional features or IBM products (by function)
BCP (continued)	Predictive Failure Analysis (PFA) requirements: • The PFA component requires that the following Java level be installed: IBM 31-bit SDK for z/OS, Java 2 Technology Edition, V5 or V6 (5655-N98). PFA will not run unless you modify it to point to the correct version of Java. RSM enhancements including Flash Express support (that also includes dynamic reconfiguration support and optional PLPA/COMMON page data set support), pageable 1 MB Large Page support, and 2 GB Large Page support, requires a separate web deliverable (the z/OS V1R13 RSM Enablement Offering web deliverable). Run-time library services (RTLS) requirement in z/OS: • The z/OS Security Server feature is required if you want to check a user's access to libraries that are defined to RTLS and protected by security profiles. System-managed duplexing rebuild requires any APARs included in the CFDUPLEXING PSP bucket. This function can be exploited by the following products and components: • System logger, the JES2 checkpoint, WLM for multisystem enclaves and IRD, VTAM GR and multinode persistent sessions (MNPS), and BatchPipes® for OS/390 V2 (5655-D45) enable system-managed duplexing rebuild through APAR PQ49953. • IRLM V2R1 enables system-managed duplexing rebuild for the IRLM lock structure for IMS data sharing and DB2 through APAR PQ48823. Additionally, PQ48996 is required for the DB2 data sharing environment. • DB2 supports system-managed duplexing rebuild for its system communication area. DB2 has supported user-managed duplexing rebuild for its group buffer pools since DB2 V5 and OS/390 V1R3 with supporting APARs. • MQSeries enables system-managed duplexing rebuild for shared queues in WebSphere MQ for z/OS V5 (5655-F10). • CICS shared temporary storage queues, coupling facility data tables, and named counters are protected by system-managed duplexing rebuild in CICS Transaction Server (TS) for z/OS V3 (5655-M15). • IMS supports system-managed duplexing rebuild function for IMS shared message queue structures and IMS fast path expedited message handler (EMH) structures. IMS also supports z/OS's system-managed duplexing rebuild function for IMS fast path virtual storage option (VSO) structures. This support also enables the system-managed rebuild and automatic altering of the VSO structure size. TSO consoles used as extended MCS consoles: • The z/OS Security Server feature is required if you want to use this function because RACF is used to obtain console security attributes. Virtual Storage Manager: • IMS APAR PK91843 is required in support of VSM APAR OA27291 when VSM USEZOSV1R9RULES(NO) is specified. System Automation V3R2 requires APAR OA31274 for System REXX APAR OA26802. System z Application Assist Processors (zAAPs) are specialized processing units that provide an economical Java execution environment. Use of a zAAP requires one of the following or later products: • IBM SDK for z/OS, Java 2 Technology Edition, V1 (5655-I56) at SDK 1.5 or later • IBM 31-bit SDK for z/OS, Java 2 Technology Edition, V5 (5655-N98) • IBM 64-bit SDK for z/OS, Java 2 Technology Edition, V5 (5655-N99) z/OS UNIX kernel requirements: • The z/OS Security Server feature is required if any address space wants to make a call to a z/OS UNIX kernel service.

Table 13. Functions of z/OS V1R13 that require specific z/OS optional features or IBM products (continued)

z/OS element or feature	Required z/OS optional features or IBM products (by function)
BDT	One or both of the BDT features (BDT File-to-File or BDT SNA NJE).
BDT File-to-File	None
BDT SNA NJE	Any supported JES3 level.
BookManager BUILD	Required: Document Composition Facility (DCF) R4. Optional: To build documents using source files marked up with BookMaster® tags, you need IBM Publishing Systems BookMaster (5688-015) R4 with PTFs UQ04721 and UQ47802, and BookManager BUILD PTF UQ54716.
BookManager READ	To use the print function to print BookManager documents on AFP printers, you need to set your BookManager READ print options to "GML Starter Set" and have the following products installed: • AFP Font Collection V2R1 (5648-B33) • DCF V1R4 (5748-XX9) • PSF for z/OS V4 (5655-M32)
C/C++ without Debug Tool	None
CIM	APAR OA38790 (R13 PTF UA65115)

Table 13. Functions of z/OS V1R13 that require specific z/OS optional features or IBM products (continued)

z/OS element or feature	Required z/OS optional features or IBM products (by function)

Communications Server	IP Services has the following software requirements:
	• For NCPROUTE server: SNALINK LU0 and ACF/NCP V7 (5648-063) or later
	• For X.25 interface support: X.25 NPSI V3R4 (5688-035) or later for 3745 or 3720, or X.25 NPSI V2R1 (5668-719) for 3725, and the corresponding level of NCP that supports NPSI
	• For SNMP NetView client support, either of the following:
	
	  – Tivoli NetView for OS/390 V1 (5697-B82). R4 requires the PTFs for APARs OA13616 and OA15907.
	
	  – Tivoli NetView for z/OS V5 (5697-ENV). R1 requires the PTFs for APARs OA12826 and OA15090.
	• For file access protection for FTP: z/OS Security Server feature
	• For FTP DB2 query: DB2 V8 (5625-DB2) or later
	• For user-written programs in Pascal that interface to a TCP, UDP, or IP boundary: IBM VS Pascal Compiler and Library (5668-767)
	• For IMS sockets on z/OS: IMS V9 (5655-J38) or later
	• For Network Print Facility support: ACF/NCP V7 (5648-063) or later
	• For user-written programs in C that interface to an X Window System client, Remote Procedure Call, TCP or UDP protocol boundary, DPI, IP, or z/OS UNIX feature (Rcommands, RPC, or X Window System): z/OS C/C++ without Debug Tool feature
	• For TCP/IP functions written in C (C sample programs, Network Database System client and server, Network Computing System, Remote Procedure Call, non-z/OS UNIX X Window System) or z/OS UNIX features (ONC/RPC, X Window System): z/OS C/C++ without Debug Tool feature
	
	SNA Services has the following software requirements:
	• For High Performance Routing (HPR) Border Node and HPR network management, either of the following:
	
	  – Tivoli NetView for OS/390 V1 (5697-B82). R4 requires the PTFs for APARs OA13616 and OA15907.
	
	  – Tivoli NetView for z/OS V5 (5697-ENV). R1 requires the PTFs for APARs OA12826 and OA15090.
	• For HPR, automatic network routing in composite network node: NCP V7R3 (5648-063).
	• To use Spare SDLC lines: NCP V7 (5648-063) and NTuneMON V2 (5648-141).
	• If running z/OS as a guest under z/VM, the PTF for VM APAR VM64789 is required.
	• To use the Performance Monitor Interface: Tivoli NetView Performance Monitor V2R7 (5655-043) with the PTF for APAR OA36034.

Communications Server Security Level 3	None.
Cryptographic Services	Use of Remote Key Loading support on a z9 EC requires the May 2006 or later level of the licensed internal code (LIC).

Table 13. Functions of z/OS V1R13 that require specific z/OS optional features or IBM products (continued)

z/OS element or feature	Required z/OS optional features or IBM products (by function)
DFSMSdfp	If you use DB2 V8 (5625-DB2) or DB2 V9 (5635-DB2), you must install the following DB2 PTFs before moving BSDS or active logs into cylinder-managed space on extended address volumes and before using administrative enablement procedures on extended address volumes: • For DB2 V8, PTFs UK36130 (APAR PK58291), UK35901 (APAR PK58292), and UK34129 (APAR PK61105) • For DB2 V9, PTFs UK36131 (APAR PK58291), UK35902 (APAR PK58292), and UK34130 (APAR PK61105) Distributed FileManager (DFM/MVS) DataAgent and the DFM target server: To check the authorization of remote systems to connect to z/OS and to access specific data sets, the z/OS Security Server feature (RACF component) is required. VSAM record level sharing (RLS): To use this function, you need the z/OS Security Server feature (RACF component); CICS TS for z/OS V3 (5655-M15) or later; and appropriate levels of COBOL, PL/I, FORTRAN, and Language Environment run-time libraries for batch applications that will use VSAM RLS data access.
DFSMSdss	IMS backup-while-open support: To use this function, the Database Manager feature of IMS V9 (5655-J38) or later is required.
DFSMShsm	Control data set (CDS) record level sharing (RLS) serialization: To use this function, global resource serialization or an equivalent function is required. DFSMShsm secondary host promotion: To use this function, a cross-system coupling facility (XCF) must be configured and running in multisystem mode.
DFSMSrmm	None
DFSMStvs	To apply forward recovery logs to a restored copy of a data set, you need CICS VSAM Recovery for z/OS V4 (5655-P30). To back up data sets while they are open, you need the z/OS features DFSMShsm and DFSMSdss.
DFSORT	DFSORT's Performance Booster for The SAS System requires enabling support from SAS Institute Inc. If you use DB2 utilities and set DFSORT installation defaults using parmlib members, you need a PTF so that the utilities can obtain the correct set of DFSORT installation defaults. The PTF for DB2 V8 (5625-DB2) is UK39757 and the PTF for DB2 V9 (5635-DB2) is UK39811. (The APAR for both versions of DB2 is PK59399.) With the PTFs, DB2 utilities can use DFSORT options from ICEPRMxx members that have been activated for DFSORT's ICEAM2 environment.
Distributed File Service	The IP Services component of the z/OS Communications Server base element must be operational. SMB print serving support requires the z/OS Infoprint Server feature to be operational. SMB password encryption requires the OCSF component of the z/OS Cryptographic Services base element to be operational to use hardware encryption capabilities. Supported SMB clients include Windows XP Professional, Windows 2003, Windows Terminal Server on Windows 2003, SUSE Linux with Samba, and Redhat Linux with Samba.
EREP	None
ESCON Director Support	None
FFST	None
GDDM	None

Table 13. Functions of z/OS V1R13 that require specific z/OS optional features or IBM products (continued)

z/OS element or feature	Required z/OS optional features or IBM products (by function)
GDDM-PGF	None
GDDM-REXX	None
HCD	To migrate from the active switch configuration or to activate a switch configuration, Tivoli System Automation for z/OS (5698-SA3) is required. To perform the verification/priming function of the active I/O configuration, Tivoli System Automation for z/OS (5698-SA3) is required. To map z196, z114, z10 EC, z10 BC, z9 EC, z9 BC, z990, and z890 logical CHPIDs to physical channels (PCHIDs) and create input to HCD/IOCP, use of the CHPID Mapping Tool is recommended. The tool is a workstation-based Java application available from the IBM Resource Link® Web site: http://www.ibm.com/servers/resourcelink. It updates the IBM zEnterprise EC12 (zEC12), z196, z114, z10 EC, z9 EC, z9 BC, z990, or z890 IOCP input file with the PCHID values and can generate reports to help with cabling.
HCM	Operating system (workstation): • Windows 7 • Windows Vista • Windows XP • Windows 2000 Host communication: • TCP/IP: TCP/IP networking protocol must be installed (delivered with Windows 7, Windows Vista, and Windows XP). • HCM installation: A method to download the code from the host to the workstation is required (for example, FTP or PCOMM).
HLASM	None
HLASM Toolkit	None
IBM HTTP Server	A Web browser must be installed on a networked workstation. Communications Server IP connectivity must be established.
IBM TDS	If IBM TDS will use DB2 to store data for a general LDAP directory server, DB2 V9 (5625-DB2) or later is required. If running DB2-based backends in 64-bit mode with DB2 version 9, then PTF UK50918 must be installed. DB2 is *not* required in the following situations: • If IBM TDS is used only to provide LDAP access to user, group, connect, and resource profiles stored in RACF. • If IBM TDS is used only to provide LDAP access to configuration data stored in an IODF by way of HCD • If IBM TDS uses a file system to store data for a general LDAP directory server If IBM TDS uses a file-based backend (LDBM, file-based GDBM, or CDBM), a z/OS UNIX file system is required for storing this data. IBM TDS for z/OS requires a z/OS UNIX System file system for storing the schema backend. To write application programs using the Kerberos or GSS-API programming interface, you need the z/OS C/C++ without Debug Tool feature. If you are using the ldapdiff Java-based utility introduced in z/OS V1R11, IBM 31-bit SDK for z/OS, Java 2 Technology Edition, V5 (5655-N98) is required.

Table 13. Functions of z/OS V1R13 that require specific z/OS optional features or IBM products (continued)

z/OS element or feature	Required z/OS optional features or IBM products (by function)
ICKDSF	Any z900, z800, or earlier (G5, G6, or Multiprise 3000) system that shares DASD with a z196, z114, z10 EC, z10 BC, z9 EC, z9 BC, z990, or z890 system must have ICKDSF at R17 level. (The R17 level of the ICKDSF product is functionally equivalent to the ICKDSF base element in z/OS V1R4 [with the z/OS V1R4 z990 Compatibility Support feature installed] and later.)

Table 13. Functions of z/OS V1R13 that require specific z/OS optional features or IBM products (continued)

z/OS element or feature	Required z/OS optional features or IBM products (by function)

Infoprint Server	The z/OS Security Server feature is required.
	
	To print output from Infoprint Server using AFP printers, PSF for z/OS V4 (5655-M32) is required.
	
	If you want to use the IPP server function of Infoprint Server, you need:
	• IBM 31-bit SDK for z/OS, Java 2 Technology Edition, V6 (5655-R31)
	
	The IPP Server can use only the 31-bit SDK. However, you can install the 64-bit SDK on your z/OS system.
	
	To use the print management functions provided by Infoprint Central, you need:
	• An operating IBM HTTP Server base element of z/OS
	• XML Toolkit for z/OS V1R10 (5655-J51).
	• One of the following:
	  – IBM 31-bit SDK for z/OS, Java 2 Technology Edition, V5 (5655-N98).
	  – IBM 64-bit SDK for z/OS, Java 2 Technology Edition, V5 (5655-N99).
	  – IBM 31-bit SDK for z/OS, Java Technology Edition, V6 (5655-R31).
	  – IBM 64-bit SDK for z/OS, Java Technology Edition, V6 (5655-R32).
	
	Accessing Infoprint Central requires one of the following web browsers on the user's workstation:
	• Microsoft Internet Explorer 6.0 or later
	• Netscape Navigator 7.0 or later
	• IBM Home Page Reader 4.0 or later
	
	Infoprint Server can use the following transform products to convert data streams from one format to another:
	• Infoprint Transforms to AFP V2 for z/OS (5655-N60)
	• Infoprint Transform for AFP to HP PCL V2 for z/OS (5655-P19)
	• Infoprint Transform for AFP to Adobe PDF V2 for z/OS (5655-P20)
	• Infoprint Transform for AFP to Adobe PostScript V2 for z/OS (5655-P21)
	• InfoPrint XT Extender for z/OS (5655-J65)
	• InfoPrint Transform Manager for Linux
	
	Version 1 Release 1 of the following transform products are now available and can also be used to convert data streams from one format to another on z/OS V1R13:
	• IBM Print Transform from AFP to PCL for Infoprint Server for z/OS (5655-TF2)
	• IBM Print Transform from AFP to PDF for Infoprint Server for z/OS (5655-TF1)
	• IBM Print Transform from AFP to PostScript for Infoprint Server for z/OS (5655-TF3)
	
	The transforms can convert (1) PCL, PostScript, PDF, SAP R/3, and Xerox print data to AFP format for printing by PSF for z/OS V4 (5655-M32) on AFP printers, and (2) AFP, line data, and XML data streams to PCL, PostScript, or PDF format for printing, e-mailing, or presenting on the web.
	
	To print on printers controlled by z/OS Communications Server SNA Services, Infoprint Coaxial Printer Support V2 for z/OS (5655-N62) is required.
	
	The workstation operating system required to use the Infoprint Port Monitor is Windows Vista (Business Edition or Enterprise Edition), Windows Server 2003, Windows Server 2008, Windows XP, or Windows 7.

Integrated Security Services	None.

Table 13. Functions of z/OS V1R13 that require specific z/OS optional features or IBM products (continued)

z/OS element or feature	Required z/OS optional features or IBM products (by function)
ISPF	To use ISPF's Software Configuration and Library Manager (SCLM), the z/OS Security Server feature is recommended, but not required, to ensure data integrity. For TCP/IP communication, ISPF Client/Server requires the IP Services component of Communications Server on the host and one of the following operating systems on the workstation, using the TCP/IP included in the workstation operating system: • Windows 2000 or Windows NT • IBM AIX® V5.2 with X11R5 Motif V1R2 • HP/UX 11.0 or later with X11R5 Motif V1R2 • Solaris 7 with X11R5 Motif V1R2 Use of VSAM support (Edit/View/Browse) requires the File Manager for z/OS product.
JES2	To monitor and control jobs, output, devices, and system resources from TSO/E, you need the z/OS SDSF feature. To use Advanced Function Presentation, you need PSF for z/OS V4 (5655-M32). Use of JES2 internal readers by CICS Transaction Server (CICS/TS) V3R1 (5655-M15) requires PTF UK25148 (for APAR PK42184). Use of Tivoli Workload Scheduler for z/OS (5698-A17) requires the JES2 PTF for APAR PK85334.
JES3	To monitor JES3 activity, z/OS RMF is required. To use Advanced Function Presentation, you need PSF for z/OS V4 (5655-M32).
Language Environment	None.
Library Server	The IBM HTTP Server base element must be operational. Use of extended shelf support requires XML Toolkit for z/OS V1R10 (5655-J51). Indexing or reindexing of any type of shelf requires XML Toolkit for z/OS V1R10 (5655-J51). Use of InfoCenter support requires XML Toolkit for z/OS V1R10 (5655-J51) or IBM 31-bit SDK for z/OS, Java 2 Technology Edition, V6 (5655-R31) at a minimum of Service Release 8 (SR8). Use of InfoCenter support requires XML Toolkit for z/OS V1R10(5655-J51), plus IBM 31-bit SDK for z/OS, Java 2 Technology Edition, V5 (5655-N98) or IBM 31-bit SDK for z/OS, Java 2 Technology Edition, V6 (5655-R31) at a minimum of Service Release 8 (SR8). Use of the Java applet-based administrative interface introduced in z/OS V1R10 requires IBM 31-bit SDK for z/OS, Java Technology Edition, V5 (5655-N98) or IBM 31-bit SDK for z/OS, Java Technology Edition, V6 (5655-R31) at a minimum of Service Release 8 (SR8). Note that in order to use the Java applet-based administrative interface, the client workstation must be running a level of Java that equals or exceeds the level of Java running on the z/OS server. Use of the original 2HTML-based administrative interface does not require Java to be running on the client workstation, nor does it require Java to be running on the z/OS server except when documentation stored as InfoCenters is being administered.
Metal C Runtime Library	None
MICR/OCR	None

Table 13. Functions of z/OS V1R13 that require specific z/OS optional features or IBM products (continued)

z/OS element or feature	Required z/OS optional features or IBM products (by function)
NFS	NFS Client and NFS Server both require: • z/OS Communications Server - IP Services • z/OS Security Server feature
OSA/SF	To meet the SAF of the host operating system on which OSA/SF is running, the z/OS Security Server feature is required. To handle alerts that OSA reports when the SNA mode is active on an OSA and issue OSA/SF for MVS commands from NetView, Tivoli NetView for OS/390 (5697-B82) at R4 or later is required. The z/OS RMF feature is required to obtain resource utilization data about OSA channels. To access OSA/SF at a workstation, use a workstation that supports Java 1.6 run-time libraries. Interoperability testing with Windows 2000, Windows XP, Windows 7, and Linux has been done. The OSA/SF GUI for Windows is shipped in a single JAR file.
RMF	The RMF Spreadsheet Reporter requires: • Operating system: Windows XP, Windows Vista, or Windows 7. • Spreadsheet program: To use the spreadsheet macros shipped with the Spreadsheet Reporter, you can use one of the following Microsoft Excel products: Office XP with Excel 2002, Excel 2003, or Excel 2007. Using RMF Performance Monitoring (RMF PM) requires: • Operating system: Windows XP, Windows Vista, or Windows 7. • Microsoft Internet Explorer 7.0 or later, or Mozilla Firefox 3.0 or later. The RMF Client/Server requires: • Host software: a z/OS Communications Server network connection from the workstation to the host. • Workstation software: any operating system that supports the z/OS ISPF Client/Server.
Run-Time Library Extensions	None
SDSF	To use the SAF security feature of SDSF, the z/OS Security Server feature is required. The z/OS RMF feature is required to: • Use the RMF support provided by the DA panel • View sysplex-wide data on the DA panel • View both the MVS and LPAR view of CPU use on the DA panel • Use the Y action character to issue an MVS STOP command on the DA panel • View zAAP and zIIP information on the DA panel For sysplex-wide data in a JES2 environment, WebSphere MQ for z/OS V5 (5655-F10) or later is required on these panels: • INIT, for z/OS V1R11 JES2 systems. • CK, ENC, PS and RM, for z/OS V1R12 JES2 or z/OS V1R11 JES2 systems.
Security Server	To run the RACF remove ID utility (IRRRID00) or the RACF report writer, the z/OS DFSORT feature is required. If you use DB2 to manage multilevel data, you must use DB2 V8 (5625-DB2) or later.

Table 13. Functions of z/OS V1R13 that require specific z/OS optional features or IBM products (continued)

z/OS element or feature	Required z/OS optional features or IBM products (by function)
SMP/E	The SMP/E Internet Service Retrieval function (the RECEIVE ORDER command) requires IBM SDK for z/OS, Java 2 Technology Edition V1 (5655-I56) at SDK 1.5 or later. The RECEIVE FROMNETWORK command and the GIMZIP and GIMGTPKG service routines require either the ICSF component of base element Cryptographic Services to be operational, or the product IBM SDK for z/OS, Java 2 Technology Edition V1 (5655-I56) at SDK 1.5 or later.
TIOC	None
TSO/E	For language support service or for TSO/E to save the user's console command profile, the z/OS Security Server feature is required.
z/OS Security Level 3	To write application programs using the DCE programming interface, you need the z/OS C/C++ without Debug Tool feature.
z/OS UNIX	To write application programs using the C or C++ language application programming interface, you need the z/OS C/C++ without Debug Tool feature.
3270 PC File Transfer Program	Compatible 3270 terminal emulation software, such as IBM Personal Communications/3270 and IBM Communications Manager/2, is required.

Appendix C. Hardware requirements for running z/OS V1R13

Hardware requirements for a target system are discussed in "Identifying hardware requirements for the target system" on page 74. Beyond these basic requirements, certain elements and features have additional hardware requirements. This topic describes the additional requirements.

Note: For general information about requirements for a Parallel Sysplex configuration, see the Parallel Sysplex Web site: http://www.ibm.com/systems/z/pso/.

Table 14. Hardware requirements for z/OS V1R13 elements and features

z/OS element or feature	Additional hardware required beyond the basic hardware requirements for z/OS V1R13
Alternate Library for REXX	None

Table 14. Hardware requirements for z/OS V1R13 elements and features (continued)

z/OS element or feature	Additional hardware required beyond the basic hardware requirements for z/OS V1R13
BCP	Automatic tape switching requirements for 3480, 3490, or 3590 tape drives: A single I/O device should have a single device number (defined through HCD) across the entire sysplex, and that number should not be reused for any other device. For ease of management, you should use the same device number on all systems to represent an automatically switchable device. If an automatically switchable device is a 3480 without the 'Read Configuration Data Capable' function, you must use the same device number on all systems. Note that, if you have not already applied C05566E, device numbers **must** be the same. Automatic IPL (autoIPL) requirement: Use of the autoIPL function on a System z9 server requires the no-charge SCSI IPL hardware feature (#9904) and hardware driver 67 or later. (Both are required.) Note the following: • The hardware feature is integrated on the zEnterprise servers and System z10 servers (that is, no features are required on the zEC12, z196 and z114 servers, or a System z10 server). • AutoIPL is not supported on servers prior to the System z9 server. • z/OS must be IPLed in order to detect the support. Enablement of autoIPL in multisystem-capable sysplexes with SFM active: The use of autoIPL in multisystem-capable sysplex configurations where a sysplex failure management (SFM) policy is active was previously disabled by PTF UA43911 (APARs OA26371 and OA26574) because the IPL actions performed by autoIPL could prevent or delay the successful completion of system isolation (fencing) and system removal actions performed by SFM. This restriction has now been removed. The PTF for APARs OA26993 and OA26995, along with underlying LPAR firmware support (identified below), now enables autoIPL to be used in configurations where an SFM policy is active. With this support, requested autoIPL actions will be performed in accordance with the DIAG*xx* parmlib member, even when an SFM policy is active in the sysplex. Use of autoIPL on a system in a multisystem-capable sysplex configuration where an SFM policy is active requires the following licensed internal code (LIC) levels to be installed: • For System z10 systems at driver 73: MCL009 in EC stream (LPAR) F85901 (bundle 45b) • For System z10 systems at driver 76: MCL003 in EC stream (LPAR) N10965 (bundle 8) • For System z9 systems at driver 67: MCL006 in EC stream (LPAR) G40954 (bundle 38) Flash Express, which supports storage-class memory (SCM) on Flash Express cards as optional auxiliary storage, is available only on the zEC12 server and requires FC #0402. Global resource serialization: If any systems are in a global resource serialization ring complex but not in the sysplex, global resource serialization requires basic mode CTCs to communicate with those systems.

z/OS element or feature	Additional hardware required beyond the basic hardware requirements for z/OS V1R13

BCP (continued)	XCF (cross-system coupling facility) requirements in a sysplex configuration with one central processor complex (CPC):
	
	• Sysplex timing capability is not required. However, to provide timing for all members of the sysplex, one of the following must be true:
	  – The sysplex is a single-system sysplex on one processor.
	  – The sysplex runs in multiple logical partitions on a single CPC.
	  – The sysplex runs as a set of VM guests on the same VM image.
	• Unless your system is running in XCF-local mode, a sysplex couple data set is required.
	• If you have more than one system image in the sysplex, XCF signaling connectivity is required between each system in the sysplex.
	
	In a sysplex configuration with two or more central processor complexes (CPCs), XCF requires all of the following:
	
	• Sysplex timing capability that extends to all of the processors that contain any of the z/OS or coupling facility images in the sysplex. The sysplex timing capability can be provided by either or both of the following:
	  – The Server Time Protocol (STP) feature of a zEC12, z196, z114, z10 EC, z10 BC, z9 EC, z9 BC, z990, or z890 servers
	  – A Sysplex Timer® (9037)
	• Shared DASD for the sysplex couple data set. Certain functions require multiple couple data sets. For more information, see *z/OS MVS Setting Up a Sysplex*.
	• XCF signaling connectivity between each system in the sysplex and every other system in the sysplex.
	  This signaling connectivity may be established using several different hardware means. The signaling mechanisms that are supported are:
	  – FICON or ESCON channels that are used as extended mode CTCs
	  – Coupling facility channels connected to a coupling facility with the use of XCF signaling structures
	
	System z Application Assist Processors (zAAPs) are specialized processing units that provide an economical Java execution environment. Use of a zAAP requires one of the following:
	
	• A zEC12, z196, z114, z10 EC, z10 BC, z9 EC, z9 BC, z990 (at Driver 55K or later), or z890 server
	• A Hardware Management Console (HMC) for defining and configuring the zAAP
	
	The zEC12 z196, z114, System z10, or System z9 Integrated Information Processor (zIIP) is a specialty engine for running database workloads. Use of a zIIP requires a IBM zEnterprise EC12 (zEC12), z196, z114, z10 EC, z10 BC, or a z9 EC with the 26 May 2006 or later update for SE Driver 63j and HMC Driver 64x, or a z9 BC.
	
	In order for z/OS to be a z/OS System z Advanced Workload Analysis Reporter (IBM zAware) monitored client, the system logger z/OS IBM zAware log stream client requires the following:
	
	• IBM zAware must be installed in a PR/SM™ logical partition (LPAR) on an IBM zEnterprise EC12 (zEC12) central processor complex (CPC).
	• IBM zAware must be accessible through Communication Server.
	
	Enablement of z/OS IBM zAware log stream client requires the PTF for APAR OA38747, along with the underlying LPAR firmware support (identified above). With this support, requested system logger actions are performed in accordance with the IXGCNFxx parmlib member and log stream attribute specifications. For more information see *z/OS MVS Setting Up a Sysplex*.

Table 14. Hardware requirements for z/OS V1R13 elements and features (continued)

z/OS element or feature	Additional hardware required beyond the basic hardware requirements for z/OS V1R13
BDT	None
BDT File-to-File	None
BDT SNA NJE	None
BookManager BUILD	None
BookManager READ	None
C/C++ without Debug Tool	None
CIM	For CIM support of the SMI-S Host Discovered Resources and Storage HBA profiles, a IBM zEnterprise EC12 (zEC12), z196, z114, or System z10 GA2 server is required.
Communications Server	See "Hardware Requirements for Communications Server" on page 152.
Communications Server Security Level 3	If hardware cryptography is available, it is used by Communications Server Security Level 3. The use of hardware cryptography by Communications Server Security Level 3 requires the Cryptographic Coprocessor hardware feature on the server.
Cryptographic Services	For ICSF to provide cryptographic services on zEC12, z196, z114, z10 EC, z10 BC, z9 EC, and z9 BC servers, the Crypto Express2 feature is required. For acceleration of cryptographic requests on IBM zEnterprise EC12 (zEC12), z196, z114, z10 EC, z10 BC, z9 EC, and z9 BC servers, the Crypto Express2 feature must be configured as an accelerator. For secure key processing on IBM zEnterprise EC12 (zEC12) z196, z114, z10 EC, z10 BC, z9 EC, and z9 BC servers, the Crypto Express2 feature must be configured as a coprocessor. The Crypto Express2 Coprocessor is the default configuration. To enable clear key DES and TDES instructions on zEC12, z196, z114, z10 EC, z10 BC, z9 EC, z9 BC, z990, and z890 servers, the CP Assist for Cryptographic Functions (CPACF) feature is required. To enable clear key AES-128 instructions on zEC12, z196, z114, z10 EC, z10 BC, z9 EC, and z9 BC servers, the CP Assist for Cryptographic Functions (CPACF) feature is required. To enable clear key AES-192 and AES-256, along with SHA-224, SHA-384 and SHA-512 instructions on a zEC12, z196, z114, z10 EC or z10 BC server, the CP Assist for Cryptographic Functions (CPACF) feature is required. For ICSF to provide cryptographic services on z900 and z800 servers, the Cryptographic Coprocessor Feature (CCF) is required. The PCI Cryptographic Coprocessor (PCICC) feature can be used to supplement the CCF with added functions and performance. It is available on these same servers. For acceleration of cryptographic requests on z990, z890, z900, and z800 servers, the PCI Cryptographic Accelerator (PCICA) feature is required. (On z990 and z890 servers, the PCICA feature requires the CPACF feature. On z900 and z800 servers, the PCICA feature requires at least one CCF.) For secure key processing on z990 and z890 servers, the PCIX Cryptographic Coprocessor (PCIXCC) feature is required. (The PCIXCC feature is only available if you have the CP Assist for Cryptographic Functions feature.)

z/OS element or feature	Additional hardware required beyond the basic hardware requirements for z/OS V1R13
DFSMSdfp	Catalog sharing enhancements (ECS) for Parallel Sysplex environments: To use this function, a coupling facility is required.

Data compression: For optimal performance, this support uses the data compression feature that is available on some system processors. If the hardware is not available, it uses the software compression facility to compress data.

Defining and accessing extended format sequential data sets: Extended format data sets must reside on DASD attached through cached storage controls and an ESCON or FICON channel adapter.

Extended address volumes (EAVs): To use this function, an IBM System Storage DS8000 with Licensed Machine Code (LMC) level 5.4.0xx.xx (bundle version 64.0.xx.xx) or later is required.

Extended remote copy (XRC): When migrating data with XRC, the primary storage device must be attached to an XRC-capable storage subsystem, such as an Enterprise Storage Server with applicable feature licenses enabled.

Peer-to-peer remote copy (PPRC): When migrating data with PPRC, the primary and secondary storage devices must be attached to a PPRC-capable storage subsystem, such as an Enterprise Storage Server with applicable feature licenses enabled.

OAM File System support: To use a file system sublevel configured with an NFS file system mounted in the z/OS UNIX hierarchy, an NFS server compatible with the z/OS NFS client is required.

OAM Parallel Sysplex support: To use this OAM object support capability, coupling facility hardware or a supported simulated environment is required.

OAM virtual tape server support: To use this support in an automated tape library environment, an IBM automated tape library or an IBM Virtual Tape Server is required. To use this support in a manual tape library environment, stand-alone tape drives are required.

PDSE cross-system sharing support: If sharing PDSEs in a Parallel Sysplex environment, coupling facility hardware is required.

Storage management subsystem 32-name support: When defining more than 16 systems in an SMS complex, you must allocate the ACDS and the COMMDS on DASD volumes that are capable of attaching to more than 16 systems.

Storage management subsystem system groups: Some SMS complex configurations might require DASD with enhanced connectivity. Because all systems in an SMS complex share the same configuration data sets, the ACDS and the COMMDS must reside on DASD devices that are accessible to the system activating the configuration.

VSAM record level sharing (RLS): A coupling facility (at least one) must be connected to all systems capable of VSAM RLS. For multiple coupling facilities, select one facility with global connectivity to contain the master lock structure. The coupling facility must be at control level 2. It must be large enough to contain either a lock or a cache structure, or both, and have enough surplus space to allow the structures to be modified. The cache structures must be defined to SMS to enable it for VSAM RLS.

WORM Tape Support: Requires the IBM 3592 Enterprise Tape System and WORM tape media. |

Table 14. Hardware requirements for z/OS V1R13 elements and features (continued)

z/OS element or feature	Additional hardware required beyond the basic hardware requirements for z/OS V1R13
DFSMSdss	Concurrent copy: To use this function, data must reside on DASD volumes attached through a concurrent copy-capable storage subsystem. Defining and accessing extended format sequential data sets through BSAM and QSAM: Extended format data sets must reside on DASD attached through cached storage controls and an ESCON or FICON channel adapter. FlashCopy®: To use this function you need DASD attached to a FlashCopy capable storage subsystem such as DS8000. Storage management subsystem 32-name support: When defining more than 16 systems in an SMS complex, you must allocate the ACDS and the COMMDS on volumes that are capable of attaching to more than 16 systems.
DFSMShsm	Control data set (CDS) record level sharing (RLS) serialization: To use this function, a coupling facility is required. Defining and accessing extended format sequential data sets through BSAM and QSAM: Extended format data sets must reside on DASD attached through cached storage controls and an ESCON or FICON channel adapter. FlashCopy: To use this function you need DASD attached to a FlashCopy capable storage subsystem such as DS8000. Storage management subsystem 32 name support: When defining more than 16 systems in an SMS complex, you must allocate the ACDS and the COMMDS on volumes that are capable of attaching to more than 16 systems. Common Recall Queue (CRQ): To use this function, a coupling facility is required
DFSMSrmm	None
DFSMStvs	A coupling facility is required.
DFSORT	None
Distributed File Service	None
EREP	None
ESCON Director Support	None
FFST	None
GDDM	GDDM supports devices that use the 3270 Extended Data Stream, the architected extensions to SNA character string (SCS), or IPDS. GDDM supports any other terminal or terminal-attached printer and provides graphics and image functions if it is upwardly compatible with the supported device. Certain non-IBM ASCII displays are supported through the 3174 Controller or on an upgraded older model 3174 Controller. GDDM host graphics are supported for viewing, printing, and plotting on OS/2 through CM/2 1.11 solely, IBM Personal Communications/3270 for OS/2 V4, or GDDM/MVS V3 download for GDDM-OS/2 Link in addition to CM/2. For Microsoft Windows, use either IBM Personal Communications/3270 V3 or V4, the latter providing a native graphics emulator. GDDM host graphics are supported on DOS for viewing and printing/plotting to GDDM-PCLK supported devices through IBM Personal Communications/3270 V2 or later, and download of GDDM-PCLK from GDDM/MVS V3 GDDM host graphics are supported for viewing on AIX terminals through the X3270 emulator or the TCP/IP GDDMXD facility.

Table 14. Hardware requirements for z/OS V1R13 elements and features (continued)

z/OS element or feature	Additional hardware required beyond the basic hardware requirements for z/OS V1R13
GDDM-PGF	None
GDDM-REXX	None
HCD	None
HCM	Hardware that can be used to establish a TCP/IP connection from the workstation to the z/OS host is required. Workstation requirements: • Disk space: about 200 MB • Color display with 1024 x 768 resolution • Network adapter Processing very large configurations may require additional disk space and may benefit from additional memory.
HLASM	To display or enter double-byte data, any of the following are required: • DBCS 3270 emulation on RS/6000® or PS/55 • DBCS nonprogrammable terminal To print double-byte data, any of the following are required: • Advanced Function Printing (AFP) printers • 3270 remote printing on RS/6000 or PS/55
HLASM Toolkit	None
IBM HTTP Server	A networked workstation with a web browser is required. If hardware encryption is desired, cryptographic hardware is required.
IBM TDS	None.
ICKDSF	None.
Infoprint Server	Printer and connectivity requirements depend on the function to be performed: • To print output using IP PrintWay, a printer connected by way of the z/OS Communications Server base element (either IP Services or SNA Services) is required. An IP connection requires a printer that supports the LPR protocol, the IPP protocol, or TCP/IP direct sockets. A SNA connection requires a printer that supports the SCS or DSC/DSE data streams. • To print AFP data streams, an IPDS (Intelligent Printer Data Stream) printer supported by PSF is required, with the appropriate hardware attachment (channel, SNA, or TCP/IP) for the printer. • Line data can be printed on any printer supported by JES2 or JES3. • To receive LPR print requests from a remote host, a TCP/IP connection is required from the remote host to the z/OS host. A workstation capable of running Windows Server 2003, Windows Server 2008, Windows Vista (Business Edition or Enterprise Edition), Windows XP, or Windows 7 is required to use the Infoprint Port Monitor. The Infoprint Port Monitor also requires a TCP/IP connection from the workstation to the z/OS host.
Integrated Security Services	None.

Table 14. Hardware requirements for z/OS V1R13 elements and features (continued)

z/OS element or feature	Additional hardware required beyond the basic hardware requirements for z/OS V1R13
ISPF	The ISPF base implementation requires a full-screen display terminal that supports 3270 data stream and provides a minimum interactive screen of 24 lines by 80 characters and a maximum interactive screen of 62 lines by 160 characters. On the host, the ISPF Client/Server (ISPF C/S) implementation requires the following: • A TCP/IP or APPC network connection from the workstation to the z/OS host On the programmable workstation, the ISPF C/S implementation requires one of the following: • Any personal computer capable of running Windows 2000. • Any RS/6000 machine capable of running AIX Version 5.2 with a display device or X-station capable of running Motif 1.2. • Any HP machine capable of running HP-UX Version 11 with a display device or X-station capable of running Motif 1.2. • Any SPARC machine capable of running Solaris Version 7 with a display device or X-station capable of running Motif 1.2 or OpenLook.
JES2	A JES2 MAS with multiple z/OS images using multiple central processors requires a Sysplex Timer to synchronize time across the processors.
JES3	A JES3 complex with multiple z/OS images using multiple central processors requires a Sysplex Timer to synchronize time across the processors.
Language Environment	None
Library Server	None
Metal C Runtime Library	None
MICR/OCR	None
NFS	None

Table 14. Hardware requirements for z/OS V1R13 elements and features (continued)

z/OS element or feature	Additional hardware required beyond the basic hardware requirements for z/OS V1R13
OSA/SF	Foremost, OSA/SF requires an OSA. For information about the requirements for an OSA, see *z900: OSA-2 Planning Guide* and *zEnterprise System, System z10, System z9 and eServer zSeries OSA-Express Customer's Guide and Reference*. Consider the following for levels of OSA/SF. OSA-1 is not supported on any zEnterprise or System z server. OSA-2 is not supported on IBM zEnterprise EC12 (zEC12), z196, z114, z10 EC, z10 BC, z9 EC, z9 BC, z990, and z890 servers. The only OSA-2 features supported on z900 and z800 servers are the token ring and FDDI features. OSA-Express features are not supported on IBM zEnterprise EC12 (zEC12), z196 , z114 ,z10 EC, and z10 BC servers. OSA-Express features: • The Gigabit Ethernet, Fast Ethernet, and 1000Base-T Ethernet features are supported on z9 EC, z9 BC, z990, and z890 servers. However, the Fast Ethernet feature does not run in HPDT MPC mode on z990, z890, z900, and z800 servers. • The Token-Ring feature is only supported on z990, z890, z900, and z800 servers. • ATM running Ethernet LAN emulation is only supported on z900 and z800 servers. **OSA-Express2 features** • The 1000Base-T Ethernet feature is only supported on IBM zEnterprise EC12 (zEC12), z196, z114, z10 EC, z10 BC, z9 EC, z9 BC, z990, and z890 servers. • The Gigabit Ethernet SX, Gigabit Ethernet LX, and 10 Gigabit Ethernet LR features are only supported on IBM zEnterprise EC12 (zEC12), z196, z114, z10 EC, z10 BC, z9 EC, z9 BC, z990, and z890 servers. • None of the OSA-Express2 features are supported on z900 and z800 servers. **OSA-Express3 features** • The Gigabit Ethernet SX, Gigiabit Ethernet LX, and 10 Gigabit Ethernet LR features are only supported on IBM zEnterprise EC12 (zEC12), z196, z114, z10 EC and z10 BC servers. • The 1000Base-T Ethernet feature is only supported on the z196, z114, and z10 EC servers. • None of the OSA-Express3 features are supported on the z9 EC, z9 BC, z990, z890, z900, and z800 servers. **OSA-Express4S features** • The Gigabit Ethernet SX, Gigabit Ethernet LX, and 10 Gigabit Ethernet LR features are only supported on IBM zEnterprise EC12 (zEC12), z196, z114, z10 EC and z10 BC servers. • The 1000Base-T Ethernet feature is only supported on the zEC12 servers. None of the OSA-Express4S features are supported on the z10 EC, z10 BC, z9 EC, z9 BC, z990, z890, z900, and z800 servers. • The 1000Base-T Ethernet feature is only supported on the zEC12 servers. • None of the OSA-Express4 features are supported on the z9 EC, z9 BC, z990, z890, z900, and z800 servers.

Table 14. Hardware requirements for z/OS V1R13 elements and features (continued)

z/OS element or feature	Additional hardware required beyond the basic hardware requirements for z/OS V1R13
OSA/SF (con't)	Any OSA can be run in the TCP/IP Passthru and SNA modes except OSA-Express Gigabit Ethernet, OSA-Express2 Gigabit, OSA-Express2 10 Gigabit Ethernet, OSA-Express3 Gigabit, and OSA-Express3 10 Gigabit Ethernet. Only a FDDI OSA-2 can be run in HPDT MPC mode on a z900 or z800 server. Only the OSA-Express features support IP traffic using QDIO architecture working with the IP Services component of z/OS Communications Server. Only an Asynchronous Transfer Mode (ATM) OSA-2 or an ATM OSA-Express feature can be run in ATM Native mode. Only ATM OSA-2 can be run in ATM IP Forwarding mode. For IBM zEnterprise EC12 (zEC12), z196, z114, z10 EC, z10 BC, z9 EC, z9 BC, z990, and z890 servers, an OSA-Express2 1000Base-T Ethernet feature is available as a replacement for the Fast Ethernet feature. For IBM zEnterprise EC12 (zEC12), z196, z114, z10 EC and z10 BC servers, an OSA-Express3 1000Base-T Ethernet feature is available as a replacement for the Fast Ethernet feature. If the Windows (GUI) interface to OSA/SF is to be used, OSA/SF requires: • A workstation with a Pentium 200 MHz (or equivalent) processor, 128 MB RAM, and an SVGA display with a resolution of 1024x768x16 colors is recommended. You might be satisfied with OSA/SF GUI performance on the minimum processor required by your Windows operating system, but the GUI might not display correctly at a lesser resolution. • TCP/IP connectivity to the host system where OSA/SF is running.
RMF	For all RMF workstation functions: • A workstation with a Pentium II or later processor • A graphics adapter and monitor with a configured resolution of at least 1024x768 pixels • At least 96 MB RAM and 150 MB free disk space
Run-Time Library Extensions	None
SDSF	None
Security Server	If you run in data sharing mode in a Parallel Sysplex configuration, a coupling facility must be configured for use by RACF.
SMP/E	Installing software products and service directly from a network source (such as the Internet) requires the Cryptographic Coprocessor Feature (CCF) on the z900 and z800 servers.
TIOC	None

z/OS element or feature	Additional hardware required beyond the basic hardware requirements for z/OS V1R13

TSO/E	These requirements apply to interactive use of TSO/E, not to batch use. Any terminal supported by base element Communications Server is required. The full-screen LOGON, TRANSMIT and RECEIVE commands, the Session Manager, and the Information Center Facility, which need a minimum screen size of 24 by 80, require one of the following terminals:
	
	• IBM 3270 Information Display System Terminals
	  – 3275 Models 2 and 12
	  – 3276 Models 2, 3, 4, 12, 13, and 14
	  – 3277 Model 2
	  – 3278 Models 2, 3, 4, and 5 (monochrome)
	  – 3279 Models 2A, 2B, 2X, 3A, 3B, 3X, S2A, S2B, and S3G (base color mode)
	• IBM 3472 Family
	• IBM 3178 Display Terminal Models C1, C2, C3, and C4
	• IBM 3179 Display Terminal Model 1 and Model G (alphanumeric mode)
	• IBM 3180 Display Terminal Models 100 and 110
	• IBM 3191 Display Terminal Models A30, A40, B30, B40, D, E, and L
	• IBM 3192 Color Display Terminal Models A, B, C, D, F, G, L, and W
	• IBM 3194 Display Terminal
	• IBM 3290 Information Panel
	• IBM PS/2 family (configured for 3270 support)
	• IBM Personal Computer (configured for 3278/79 support)
	• IBM PS/55 family (configured for 3270 support)
	• IBM 5550 family (configured for 3270 support)
	• Any other terminal that functions in compatibility mode with the terminals listed above.
	
	The VM/PC servers (spool, disk, and file) available with the MVSSERV command processor require the IBM Personal Computer Models XT/370 or AT/370 with an IBM 3278/79 Device Emulation Adapter.

z/OS Security Level 3	None

Table 14. Hardware requirements for z/OS V1R13 elements and features (continued)

z/OS element or feature	Additional hardware required beyond the basic hardware requirements for z/OS V1R13

z/OS UNIX	The extended user interface support allows existing hardware (such as terminals and workstations) and existing telecommunications software (such as VTAM and TCP/IP) that run on z/OS to be used.
	
	For 3270 support, most 3270 type terminals or 3270 emulators in a z/OS network from which a user can interactively log on to TSO/E are supported by z/OS UNIX services and include:
	• Real and emulated 3270s in a VTAM SNA network which satisfy the following.
	  – The minimum screen size is 24x80.
	  – The terminal must be known to TSO/E and VTAM as a full-screen device. z/OS UNIX services use full-screen mode.
	  – The terminal must support uppercase and lowercase characters.
	  – A minimum of 12 PF keys are required.
	• UNIX workstations and other workstations in a TCP/IP network that supports the TELNET 3270 (TN3270) client function.
	• The OMVS command supports customized PF keys to scroll backward/forward, display HELP, hide input typed into the command line, refresh the screen, retrieve previous commands, and enter TSO/E commands.
	
	For ASCII control sequence support from 3270 displays, the OMVS command, with the pseudoterminal functions, maps and transforms a 3270 TSO/E terminal interface and user externals to the POSIX 1003.1 defined terminal interface expected by POSIX compliant user processes, including the POSIX 1003.2 Shell. This mapping consists of:
	• Use of 3270 key sequences to emulate ASCII terminal control is supported.
	  A set of system-defined 3270 default key sequences that map to ASCII escape control values is supplied. The user can tailor the system defaults.
	• Execution in canonical (line-oriented) mode only.
	• Conversion tables that map the 3270 data stream to a pseudoterminal device driver for both control and data are provided. Users can customize these tables.
	
	For ASCII terminal interface, UNIX workstations and other workstations in a TCP/IP network that support the telnet or rlogin virtual terminal protocols can directly login to the z/OS shell through Communications Server. The supported ASCII terminal interface conforms to X/OPEN Issue 4, Version 2.

3270 PC File Transfer Program	An IBM or compatible PC with appropriate communications device, such as a LAN adapter or modem, is required.

Hardware Requirements for Communications Server

Hardware requirements for Communications Server are in two sections:
• "IP Hardware Requirements"
• "SNA Hardware Requirements" on page 156.

IP Hardware Requirements

Communications Server provides direct LAN communication and provides for point-to-point communication over S/390 channels (ESCON and/or Block Multiplex) to several IBM and equivalent other vendor devices.

• Direct LAN communication is provided by:
  – IBM Open Systems Adapter - Express
  – IBM Open Systems Adapter
  – IBM 3172 Interconnect Controller
  – IBM 8232 LAN Channel Station

- Point-to-point communication over System z channels is supported with the following devices:
  - IBM RS/6000
  - IBM Channel-to-Channel Adapter
  - IBM 374X Communications Controller
  - IBM 2216 Multiaccess Connector
  - IBM Netfinity® Server
  - Cisco 7200 and 7500-series Channel Attached Routers
  - NSC Hyperchannel A220

A zEC12, z196, or z114 server is required to use the following functions:
- Support for z/OS Communications Server for intra ensemble networks
- OSA-Express4S QDIO IPv6 checksum and segmentation offload

A zEC12,, z196, z114, or System z10 server is required to use the following functions:
- OSA-Express optimized latency mode
- OSA-Express inbound workload queueing
- Support for z/OS Communications Server for intra ensemble networks

A zEC12,, z196, z114, System z10, or System z9 server is required to use the following functions:
- OSA-Express network traffic analyzer
- OSA-Express virtual MAC
- QDIO diagnostic synchronization
- QDIO support for OSA interface isolation

A zEC12, z196, z114, System z10, System z9, z990, or z890 server is required to use the following functions:
- ICSF encryption/decryption instructions, called crypto assist, which provide synchronous clear key support for DES, TDES, and SHA-1 algorithms for IPSEC.
- The checksum offload of IPv4 packets enhancement. An OSA-Express with a supporting level of microcode is also required.
- IPv4 Broadcast support for HiperSockets.
- Segmentation Offload (Large Send). An OSA-Express with a supporting level of microcode is also required.

Network Attachments
To attach TCP/IP to the network you need one of the following network processors and associated components or their equivalents:

2216 Multiaccess Connector Model 400®
- To attach to the 2216 using MPC+ or LCS, an ESCON or parallel channel adapter is required. For details, refer to *2216 ESCON Adapter Setup*.

IBM 3172 Interconnect Controller with the Interconnect Controller Program (ICP)
- IBM 3172 Interconnect Controller Model 001, 002, or 003
- IBM Interconnect Controller Program (5601-433 or 5621-425)
- One of the following types of adapters:
  - 3172 Interconnect Controller Token-Ring Adapter (#2215)
  - 3172 Interconnect Controller Ethernet Adapter (#2220)
  - 3172 Interconnect Controller Ethernet Adapter (#2225)

- – Auto LANStreamer MC 32 Adapter (#2235)
- – EtherStreamer MC 32 Adapter (#2245)
- – 3172 Interconnect Controller FDDI A Station Adapter (#2250)
- – 3172 Interconnect Controller Network Baseband Adapter/A (#2270)
- – 3172 Interconnect Controller Network Adapter II/A (#2271)
- – 3172 Interconnect Controller Network Adapter II/A Frequency 2 (#2272)
- – 3172 Interconnect Controller Network Adapter II/A Frequency 3(#2273)
- – 3172 Interconnect Controller FDDI Adapter (#2300)
- – TURBOWAYS 100 ATM Adapter for the 3172 Model 3 (#2310) (LAN emulation for Token-Ring and Ethernet)
- One of the following channel adapters:
  - – PCA adapter (#2501)
  - – ESCON adapter (#2800)
- Standard System/370 I/O Channel Interface Cable

Note: The Pentium P90 Processor is supported.

IBM 8232 LAN Channel Station for LANs
- IBM 8232 LAN Channel Station Model 001 or 002
- One or more adapters for Token Ring, PC Network, or Ethernet
- Standard System/370 I/O Interface cable

IBM RISC System/6000 Channel Attachment
- To attach to the RISC System/6000 using CLAW, the following items are required:
  - – IBM RISC System/6000 with the Block Multiplexer Channel Adapter (#2755)
  - – AIX V3R2.3 (5756-030), or later, with feature (#5056)
  - – Standard ESCON Adapter
- To attach to the RISC System/6000 using MPCPTP, the following items are required:
  - – AIX 4.3 (or later)
  - – PCI ESCON Control Unit Connectivity Version 2.1

IBM Open Systems Adapter (OSA) Feature
- OSA-2 Feature supporting FDDI, Ethernet, Fast Ethernet, Token Ring, and ATM connections
- OSA-Express supporting Gigabit Ethernet, Fast Ethernet, 1000Base-T Ethernet (for z990, z890, z900, and z800), and Token Ring connections
- OSA-Express2 supporting Gigabit Ethernet, 10 Gigabit Ethernet, and 1000Base-T Ethernet connections on IBM zEnterprise EC12 (zEC12), z196, z114, z10 EC, z10 BC, z9 EC, z9 BC, z990, and z890 servers
- OSA-Express3 supporting Gigabit Ethernet and 10 Gigabit Ethernet, and 1000Base-T connections on IBM zEnterprise EC12 (zEC12), z196, z114, z10 EC and z10 BC servers

OSA Direct SNMP subagent support requires a server with the OSA-Express feature running in QDIO mode (OSD) or non-QDIO mode (OSE). It is available on all servers supported by z/OS. For information about the level of each server that is required for this support, see *zEnterprise System, System z10, System z9 and eServer zSeries OSA-Express Customer's Guide and Reference*.

For additional information about OSA, refer to the following publications:

- OSA-2: *z900: OSA-2 Planning Guide*
- OSA-Express: *zEnterprise System, System z10, System z9 and eServer zSeries OSA-Express Customer's Guide and Reference*

IBM 37xx family of communication controllers for X.25, Systems Network Architecture, and IP over Channel Data Link Control
- IBM 3745 Communication Controller for:
  - X.25
  - Ethernet
  - Token Ring
  - Frame Relay
- A microcode engineering change (EC) is required for the IP Dynamics (with Ethernet) capabilities:
  - C38006 for models 130, 150, 160, 170, and 17A
  - C37967 for models 210, 310, 410, and 610
  - C39888 for models 21A, 31A 41A, and 61A
- IBM 3746 or 3746–900 Communication Controller for:
  - X.25
  - ATM
  - Token Ring
  - Frame Relay
- A microcode engineering change (EC) is required for the IP-over-Channel (CDLC) for the 3746

  The 3746-900 requires microcode EC number D22510 at microcode change level ECA 142 for communication across an ESCON channel. The microcode level is shipped automatically with new 3746-900s. For installed machines running an earlier level of microcode, microcode ECA 142 can be ordered by the service representative.
- Standard System/370 I/O Channel Interface Cable

HYPERchannel A220 Processor Adapter 42990007
- HYPERchannel Series A devices
- HYPERchannel Series DX devices, provided they function as Series A devices (For additional information, refer to the appropriate Network Systems Corporation documentation.)
- Standard System/370 I/O Interface cable

The ATTENTION+BUSY and unit check conditions are normally handled in the background and can affect performance without any visible evidence. The recommendations on Hyperchannel A222 and A223 Mode Switch Settings follow:
- The Disable Attentions setting on the Hyperchannel box eliminates the ATTENTION+BUSY status in response to read commands. This setting reduces overhead.
- The Enable Command Retry setting reduces the number of unit checks needed because of a trunk connection. This setting improves performance because it eliminates the need to perform sense operations and retry commands.

Miscellaneous IP hardware requirements
IPv6 support requires any of the following:

- Any OSA-Express, OSA-Express2, or OSA-Express3 feature defined for QDIO mode (OSD)
- Multipath channel Point-to-Point (MPCPTP) Data Link Control (DLC), which may carry IPv6 traffic over ESCON/FICON, XCF links, and IUTSAMEH

IP over native ATM requires:
- OSA-2 adapter
- ATM external private or public equipment, for example, IBM 8260 NWays Multiprotocol Intelligent Switching Hub

Use of HiperSockets IPv6 support requires at a minimum a zEnterprise, System z10, or a System z9 server.

Use of HiperSockets multiple write facility requires a zEnterprise server or a System z10 server.

SNA Hardware Requirements

For communication with remote resources, one or more of the following products, or their equivalent, is required:
- Channel-to-channel adapter
- FICON channel-to-channel adapter
- IBM 2216 NWays Multiaccess Connector
- IBM 3088 Multisystem Channel Communication Unit
- IBM 3172 Nways Interconnect Controller
- IBM 3174 Establishment Controller
- IBM 3720, 3725, or 3745 Communication Controller
- IBM 3746 Nways Multiprotocol Controller
- IBM Cross-System Coupling Facility (XCF)
- IBM Enterprise System Connection (ESCON) channel
- IBM Open Systems Adapter-Express
- IBM Open Systems Adapter

APPN over native ATM requires:
- OSA-2 adapter
- ATM external private or public equipment, for example, IBM 8260 NWays Multiprotocol Intelligent Switching Hub

Multinode Persistent Sessions support requires a coupling facility with a minimum of CFLEVEL=1.

VTAM Generic Resource support requires a coupling facility with a minimum of CFLEVEL=0.

VTAM cryptographic enhancements, when used with the extended recovery facility (XRF) and Transaction Security System (TSS) family of products (4755), require 4755 Model 23 and later.

SNA triple DES (TDES) session level encryption requires a Cryptographic Coprocessor on the server.

Appendix D. Making a copy of your system software (cloning)

At some point after you have finished installing z/OS you will probably need to make a copy of it ("clone" it). Some reasons are:

- For backup. A backup copy is a copy of the z/OS product set (z/OS and other products you have installed on the same set of volumes using the same SMP/E zones) that:
  - Resides on different volumes with different volume labels
  - Includes copies of the associated SMP/E zones with different names that point to the data sets on the new volumes
  - Includes copies of the associated catalogs with different names
  - Can be IPLed in place of the original copy when the necessary setup has been done after making the copy.
- To move the software to another system.
- To create another SMP/E-serviceable copy for installing service or other products.

This topic describes how to make a copy of the system software in the z/OS product set on different DASD volumes with different volume serials. To make a copy, you must perform a number of tasks. The number and nature of the tasks depend on how your system has been configured. In addition, many of the tasks can be done using different techniques, and differing local standards and practices add more variations to the process. Some of the factors that can affect the way you copy your system are:

- Catalog-sharing boundaries (such as whether shared master catalogs are in use)
- Use of direct, indirect, or extended indirect catalog referencing
- Local versus central maintenance
- System software volume-sharing boundaries and their relationship to catalog and sysplex boundaries
- Naming conventions
- Whether new data sets affect the existing environment
- Testing and migration procedures
- Whether the copy will be used in an existing environment or a new one.

The information in this topic is based on the system layout described in "Recommended data set placement" on page 100. However, you should find this information useful even if your system is configured differently. The techniques shown here are designed to minimize the amount of work required to migrate software into existing environments that use the recommended system layout. They will make a complete copy of the software that can be serviced using SMP/E.

The following jobs in SYS1.SAMPLIB are referred to in this topic:

- IEACLNIN, which initializes volumes
- IEACLNSM, which converts an HFS or zFS volume to SMS management
- IEACLNCS, which defines catalogs and creates CSI data sets
- IEACLNCV, which copies volumes
- IEACLNMT, which creates a mount point directory and mounts the HFS or zFS at it

- IEACLNCZ, which copies zones

If you are migrating your software to another system and you can use the same volume, catalog, and data set names, you need only one of the procedures in this topic. Use the full-volume physical dumps and restores to make the copy, and then follow the steps in "Migrating to another system" on page 164.

Rule: Before cloning z/OS, you must have a license for each z/OS operating system that you run. See "Installing z/OS without using an installation package" on page 46.

Choosing names

The first step in preparing to make a copy of your system is choosing new names. You must choose new names for:
- The new DASD volumes that will be the target of the copy:
  - The IPL volume (TVOL1)
  - The second and any other target library volumes (TVOL2-n)
  - The HFS or zFS volume
  - The DLIB volumes, if you are also copying the distribution libraries

  Choose names that allow you to define system symbols for each target volume based on the name of the IPL volume. For example, the name for TVOL1 might be OS260 and the name for TVOL2 might be OS260X, using the scheme OS*rrr* for TVOL1 and OS*rrr*X for TVOL2, where *rrr* is a level identifier and the system symbols are &SYSR2.='&SYSR1(1:5).X'.
- User catalogs to manage the VSAM files, HFS files, zFS files, and DLIB data sets. These catalogs are:
  - One for the second target library volume (TVOL2), to own the target zone CSI data set and any MMS-compiled VSAM files
  - One for the HFS or zFS volume, to own the HFS or zFS data sets
  - One for the first DLIB volume, to catalog the distribution libraries.

  Choose names using a convention that avoids having two catalogs with the same name in the same catalog environment at the same time. IBM recommends that you choose a naming convention based on the volume serial of a TVOLn volume. You should pick one or more installation-wide high-level qualifiers and reserve them for catalog naming. This prevents catalog names from conflicting with any existing alias entry names. One example of such a convention is USERCAT.volser. In this example, the high-level qualifier USERCAT is reserved for naming catalogs.
- The SMP/E CSI data sets and SMP/E zones:
  - Target zone CSI data set
  - DLIB zone CSI data set
  - Target zone
  - DLIB zone

  You should choose the CSI data set names using different high-level qualifiers because they will be cataloged in different catalogs. You must pick currently-unused high-level qualifiers to be able to define them as aliases in the newly defined user catalog. IBM recommends that you choose a high-level qualifier for CSI data set names based on the volume serial of a TVOLn volume. For example, you might use OS26TZ.CSI as the name of a target zone CSI data set.
- MMS data sets.

  If you use MMS data sets, you should choose their names using different high-level qualifiers because they will be cataloged in different catalogs. You

must pick currently-unused high-level qualifiers to be able to define them as aliases and access the MMS data sets. The high-level qualifier you choose can be defined as a system symbol to avoid other parmlib changes.

IBM recommends that you choose a high-level qualifier for MMS data sets that is derived from the volume serial of a TVOLn volume. If you do, you will be able to define a single symbol for all MMS data sets in the z/OS product set that will not need to be updated in the future. For example, if:

– the MMS data sets are placed on TVOL2

– and the name of TVOL2 is derived from the name of TVOL1 (by defining a system symbol for TVOL2 based on a substring of the system-supplied symbol for the IPL volume label)

– and you choose a high-level qualifier based on the name of TVOL2 for the MMS data sets

then you can define a system symbol based on the name of TVOL2 in an IEASYM*xx* member of parmlib. This symbol would be resolved to the high-level qualifier you used, and could be used as part of the data set name in an MMSLST*xx* member of parmlib to allocate the MMS data sets associated with the IPL volume.

- HFS or zFS data sets.

  HFS and zFS data sets can be optionally SMS-managed. They must be cataloged and their names must be unique within the file system structure in order to be mounted. In the IBM cloning samples, the HFS and zFS data sets are SMS-managed.

- Distribution libraries.

  You can choose to use volume serials on the DLIB zone DDDEFs, or to name the data sets differently and locate them through the user catalog on the first DLIB volume. If you choose to locate them by name using the catalog, you must rename them using a new high-level qualifier.

Initializing the new volumes

To initialize the new volumes, use ICKDSF. See the **IEACLNIN** job in SYS1.SAMPLIB.

The size and location of the VTOCs specified will be changed on some of the new volumes by full-volume copy operations when sizes and locations of the VTOCs on the volumes they are copied from are different. The VTOC size and location remains as specified for new volumes that are not copied using full-volume physical copy.

Setting up SMS

Because SMS must be active and the HFS or zFS data sets must be cataloged in order to mount the HFS or zFS, some SMS setup is needed to prepare for copying the HFS or zFS volumes. The **IEACLNSM** job in SYS1.SAMPLIB does a DFSMSdss CONVERTV to convert the volume to an SMS-managed volume. The first step creates a VTOC index, which is required for all SMS-managed volumes. The second step converts the volume to an SMS-managed volume. Access to the STGADMIN.ADR.CONVERTV FACILITY class profile or to a higher-level profile (such as STGADMIN.*) is required to run CONVERTV.

Defining new catalogs and CSI data sets

The next step in making the copy is allocating new user catalogs to manage the VSAM files, HFS or zFS files, and distribution libraries. The **IEACLNCS** job in SYS1.SAMPLIB defines three user catalogs:

- A user catalog on TVOL2 to own the SMP/E target zone CSI data set and MMS data sets
- A user catalog on the HFS or zFS volume to own the HFS or zFS
- A user catalog on the first DLIB volume to manage the DLIB zone CSI data set and distribution libraries.

The user catalogs are defined using IDCAMS commands. These catalogs will not contain a large number of entries, so it is not necessary to allocate very much space for them.

Alias entries are defined to relate the new high-level qualifiers you chose for the VSAM files, HFS or zFS files, and distribution libraries to the new catalogs. This will establish the new catalogs as the owning catalogs for the VSAM and HFS or zFS files, making the volumes with their catalogs and data sets portable to other systems.

Next, new CSI data sets are defined, using the source data sets as models for allocating the new ones.

Because SMP/E CSI data sets must be initialized with the GIMZPOOL record before SMP/E can process them, both must be primed using the REPRO command:

Copying the software data sets

The previous steps created the environment needed to copy the data on the z/OS volumes. All the data except that in the SMP/E CSIs is copied using DFSMSdss. The job in SYS1.SAMPLIB for copying volumes is **IEACLNCV**.

The PARALLEL parameter is used to let DFSMSdss multitask the copy and dump operations so they can be done more quickly. The SERIAL parameter is used to make sure that the HFS or zFS volume dump completes before the HFS or zFS volume restore.

Access to the STGADMIN.ADR.STGADMIN.COPY FACILITY class profile, or to a higher-level profile (such as STGADMIN.*), is required to use the ADMINISTRATOR keyword. If you do not use the ADMINISTRATOR keyword, UPDATE or higher access to all the data sets on the volume is required.

The data on each volume is copied differently, depending on the volume being copied and its content:

- Because TVOL1 has no VSAM or SMS-managed data sets, it can be copied using full-volume physical copy.

  Note: Physical copy preserves the IPL text on TVOL1, so no steps are needed to replace it. If you are copying the system software between volumes on different device types, you will need to use copy-by-data-set rather than full-volume copy. Copy-by-data-set does not preserve the IPL text, so you have to replace the IPL text whenever you copy TVOL1 to a different device type.

- TVOL2 contains a user catalog and VSAM data sets (the target zone CSI data set and any MMS-compiled data sets). It is copied by data set, excluding the user catalog, VTOC Index, SMP/E target zone CSI data set, and VSAM Volume Data Set (VVDS). The VSAM data sets are renamed using the new high-level qualifiers you chose.

  The SMP/E CSI data sets are copied later using SMP/E commands.

  Note: The RECATALOG parameter catalogs all the data sets during the copy of TVOL2 in the user catalog on TVOL2. However, only the SMP/E CSI, SMP/E non-VSAM, and MMS-compiled data sets will actually be accessed using this catalog, because extended indirect cataloging is used to find them in the normal catalog search order.

- The HFS or zFS data sets are logically copied in the IEACLNCV sample job, and given a new name. Starting with z/OS V1R12, zFS data sets can be indirectly cataloged and do not necessarily require a new name. To use this support, you must do a physical copy of the zFS data set (not a logical copy). Here is an example of doing a physical copy of a zFS data set, which you intend to have cataloged indirectly:

```
//STEPS01 EXEC PGM=ADRDSSU
//SYSPRINT DD SYSOUT=*
//SYSIN DD *
COPY DATASET(INC(ZFS.ROOT)) -
PHYSINDYNAM ( (OLDZFS) ) -
OUTDYNAM ( (NEWZFS) ) -
ALLDATA(*)
/*
```

  Doing a physical copy of the zFS data set will result in a new data set with the same name as the source data set, but currently uncataloged. In order to subsequently catalog the zFS data set into the target system's catalog, you can use sample JCL like the following where *&zfsvl* is a system symbolic that has been defined in IEASYM*xx* parmlib member with the actual volume serial:

```
//CATZFS EXEC PGM=IDCAMS
//SYSPRINT DD SYSOUT=*
//SYSIN DD *
DEFINE CLUSTER -
(NAME(ZFS.ROOT) -
LINEAR -
VOLUMES(&zfsvl) -
RECATALOG)
/*
```

  For more information on indirectly cataloged zFS data sets, see *z/OS DFSMS Managing Catalogs*. Keep in mind that all HFS or zFS data sets associated with a particular system should be cloned. This includes the root as well as the /etc and /var file systems. When your cloned system is IPLed, you will also need unique /dev and /tmp file systems.

- The first DLIB volume is copied by data set, similar to the way TVOL2 is copied, because it contains the DLIB zone CSI data set and user catalog. Its data sets are renamed during the copy using the new high-level qualifier you chose. If you prefer not to rename the data sets, remove the RENAMEU parameter.

- The second DLIB volume is copied by data set. Its data sets are renamed during the copy using the new high-level qualifier you chose. If you prefer not to rename the data sets, remove the RENAMEU parameter.

Note: The RECATALOG parameter catalogs all the data sets during the copies of the DLIB volumes in the user catalog on DLIB1. However, only the SMP/E CSI and SMP/E non-VSAM data sets will actually be accessed using this catalog.

If you are making a clone for the purpose of creating an SMP/E-serviceable copy, make the HFS or zFS files accessible by mounting the file systems at the mount point you chose. To do this, you must first create the directory by issuing the MKDIR command. For example, you could issue `mkdir /service` to create a directory named **service**. Then, you could issue MOUNT commands from a TSO user ID to mount the file systems. The user ID must have superuser authority (either UID(0) or READ access to an applicable RACF UNIXPRIV class profile) to issue the MOUNT command. For more information about the MKDIR and MOUNT commands, see *z/OS UNIX System Services Command Reference*. For a sample job, see IEACLNMT in SYS1.SAMPLIB.

Copying the SMP/E zones

The SMP/E zones are copied using ZONECOPY rather than IDCAMS REPRO so that both the zones and the CSI data sets can be renamed. This makes it possible to use both the old and new target and DLIB zones with a single global zone. The **IEACLNCZ** job in SYS1.SAMPLIB shows how to do a ZONECOPY.

Before the zones are copied, the global zone's ZONEINDEX entry must be updated with the new CSI data set and zone names.

Next, the zones are copied using ZONECOPY commands. Because the SMP/E boundary is already set to do the ZONECOPY, the ZONEEDIT commands to change the DDDEFs to reflect new volume serials (and data set names, for the DLIB zone) can be issued at the same time.

If you have copied an existing cataloged data set that does not have the VOLUME defined to the new target system using the same name, you must use an ADD DDDEF for the new target data set. If this is not done, the new code will be installed into the existing cataloged data set and not the new target data set.

REP TARGETZONE(newtgt) RELATED(newdlb) is an optional command, to be added only if the DLIBs and DLIB zone will be copied at the same time as the target libraries and zone.

As a rule, you should not install service or products on the same copy of the system software that the system is using. This includes those parts of the system software that reside in an HFS or zFS. The way to update a copy of an HFS or zFS is to mount it on another mount point. The system will continue to use its own level of the HFS or zFS, and the copy will be accessible using the other mount point.

Before making any updates to the copy with SMP/E, you should change the HFS or zFS path DDDEFs to point to another directory, usually called a service directory, and mount the copy's HFS or zFS on that directory's mount point. This assures that SMP/E will update the correct HFS or zFS when products and service are installed.

To change the DDDEFs, use the SMP/E ZONEEDIT command. For example, the following commands will add `/service` to the beginning of all HFS or zFS paths:

```
              SET BDY(NEWTGT) .

                ZONEEDIT DDDEF .

                  CHANGE PATH(*,'/service'*) .

                ENDZONEEDIT .
```

Note that the HFS or zFS remains usable for backup no matter where the DDDEFs point. If you IPL using a BPXPRM*xx* member that mounts the copy's HFSs or zFSs at their normal mount points (not the service mount points), the system will function normally. The DDDEFs only affect where SMP/E searches for or stores parts that reside in an HFS or zFS.

For more information about servicing elements in the HFS or zFS, see the topic about installing service into the hierarchical file system in *z/OS UNIX System Services Planning*.

Making the copy usable

Once you have completed the preceding steps, you have a backup copy of the z/OS product set. If you have used the recommended system layout (described in "Recommended data set placement" on page 100), used indirect and extended indirect cataloging (described in "Using indirect catalog entries" on page 114), used a consistent TVOLn naming convention that lets you use system symbols to derive the names of TVOL2-n, and avoided the use of explicit volume serials in the link, LPA, and APF lists, there should be very few other actions you need to take to use the copy as a backup suitable for IPL. Because the SMP/E zones were copied with the software, you can also query the level of any SMP/E-maintained part of this copy of the system at any time.

The one thing you will have to do is create another BPXPRM*xx* member of parmlib to point to the new HFS or zFS data sets.

If you have not followed the recommendations mentioned above, you will have additional work to do. For example:
- If you did not use indirect cataloging, you need to create a copy of the master catalog to IPL with the new backup volumes. For information about creating a copy of your master catalog, see *z/OS DFSMS Managing Catalogs*.
- If you coded volume serials for z/OS product set volumes in the link, LPA, or APF lists, you need to create new parmlib members.
- If your clone is for a new image, you need to copy image-related data sets. See "Image-related data sets" on page 107 for information.
- If your clone is for a sysplex, you need to copy sysplex-related data sets. See "Cluster-related data sets" on page 109 for information.

Testing

Never assume that the backup copy will work until it has been tested. Schedule a test time on the system to be backed up to make sure that the copying process was successful and that backup procedures work. If this is not possible, a slightly more risky alternative is using a test system with copies of the production system's operational data sets.

Migrating to another system

If you want to move the copy to another system that also uses the recommended
system layout, there are only a few things left to do:

- If you chose to SMS-manage your HFS or zFS data sets, define the HFS or zFS
  volume to SMS on the other system if the volume is not in the same SMS-plex.
  You can define the HFS or zFS volume using ISMF, the same way it was defined
  in "Setting up SMS" on page 159.

- Import the user catalogs and define the data set aliases if the target system for
  migration is not sharing its master catalog with the system from which you
  made the copy.

- Create a new BPXPRM*xx* member on the other system. It should specify the ZFS
  or HFS file system type, as appropriate.

  Copy the active BPXPRM*xx* member to a new member. Update the ROOT
  FILESYSTEM and MOUNT FILESYSTEM statements as needed.

- Install any system-specific usermods. Also, install any system-specific exits that
  cannot be installed separately from the system software.

- Specify the master catalog name in LOAD*xx* rather than in SYSCAT*xx* members
  of the NUCLEUS data set. This is IBM's recommendation. However, if you
  choose to specify it using SYSCAT*xx*, you must add or update this member to
  reflect the name of the intended image's master catalog.

To import the user catalogs and define the aliases, use IDCAMS:

```
IMPORT -
  CONNECT -
    OBJECTS((usercat.newfs VOLUMES(newfs) DEVT(3390)))

IMPORT -
  CONNECT -
    OBJECTS((usercat.newtv2 VOLUMES(newtv2) DEVT(3390)))

IMPORT -
  CONNECT -
    OBJECTS((usercat.newdl1 VOLUMES(newdl1) DEVT(3390)))

DEFINE -
  ALIAS -
    (NAME(fsnew) -
    RELATE (usercat.newfs))

DEFINE -
  ALIAS -
    (NAME(newtarg) -
    RELATE (usercat.newtv2))

DEFINE -
  ALIAS -
    (NAME(newmms) -
    RELATE (usercat.newtv2))
```

```
DEFINE -
  ALIAS -
    (NAME(newdlib) -
    RELATE (usercat.newdl1))
```

Appendix E. Accessibility

Publications for this product are offered in Adobe Portable Document Format (PDF) and should be compliant with accessibility standards. If you experience difficulties when using PDF files, you may view the information through the z/OS Internet Library web site or the z/OS Information Center. If you continue to experience problems, send an email to mhvrcfs@us.ibm.com or write to:

    IBM Corporation
    Attention: MHVRCFS Reader Comments
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    2455 South Road
    Poughkeepsie, NY 12601-5400
    USA

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

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

Using assistive technologies

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

Keyboard navigation of the user interface

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

z/OS information

z/OS information is accessible using screen readers with the Library Server versions of z/OS books in the Internet library at:

`http://www.ibm.com/systems/z/os/zos/bkserv/`

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Notices

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The minimum supported hardware for z/OS releases identified in z/OS announcements can subsequently change when service for particular servers or devices is withdrawn. Likewise, the levels of other software products supported on a particular release of z/OS are subject to the service support lifecycle of those products. Therefore, z/OS and its product publications (for example, panels, samples, messages, and product documentation) can include references to hardware and software that is no longer supported.

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