Upgrading* to z/OS V2.4 - Planning

GSE UK Conference 2019
Dock into the Dark Side

* **Upgrading** is the new term for migrating!

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Session **BG**

Statements regarding IBM future direction and intent are subject to change or withdrawal, and represent goals and objectives only.

Abstract:
This is the planning part of a two-part session for system programmers and their managers who are planning on upgrading to z/OS V2.4. In part one, the focus is on preparing your current system for upgrading to either release. The system requirements to run and how to prepare your system for the upgrade are discussed. Part two covers the only upgrade details for upgrading to z/OS V2.4 from either V2.2 or V2.3. It is strongly recommended that you attend both sessions for an upgrade picture for z/OS V2.4.

The general availability date for z/OS V2.4 happened September 30 2019.

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Upgrading to z/OS V2.4: Part 1 of 2   Agenda

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- **Content of z/OS V2R4**
  - Added, Changed, and Withdrawn Elements and Features
- **z/OS Ordering and Deliverables**
  - Products Related to z/OS
- **z/OS Policies**
  - z/OS End of Service dates
  - z/OS Coexistence-Upgrade-Fallback
- **Planning for z/OS V2R4:**
  - Ensuring System Requirements are Satisfied
    - Driving and Target System Requirements
  - Coexistence System Requirements
  - Some Upgrade Actions You Can Do NOW
  - Programmatic Verification of Upgrade Actions for z/OS V2R4 and higher
  - Using z/OSMF Workflow for z/OS Release Upgrade
  - Preparing for the z/OS Installation Strategy

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Scope

• **Focus on z/OS upgrade, not HW upgrade.**
• If upgrading to a new server level, see:
  - for zEC12 and zBC12: upgrade action in *z/OS Upgrade* "*Upgrade to an IBM zEnterprise EC12 or BC12 server*"
  - for z13 and z13s: z/OSMF Workflow (or upgrade action in *z/OS Upgrade*) for "*Upgrade to an IBM z13 or z13s server*"
  - for z14: *z/OS z14 Workflow* (or Upgrade action in z/OS V2.4 Upgrade Workflow) for "*Upgrade to an IBM z14 server*".
  - for z15: *z/OS z15 Workflow* (or Upgrade action in *z/OS V2.4 Upgrade Workflow*) for "*Upgrade to an IBM z15 server*".

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Related Publications:
- *z/OS V2.4 zipped PDFs **with index*** https://t.co/eKOUGUydO8?amp=1
- *z/OS V2.4 library for all books:* https://www-01.ibm.com/servers/resourcelink/svc00100.nsf/pages/zOSV2R4Library?OpenDocument
  - *z/OS Planning for Installation*
  - *z/OS Introduction and Release Guide*
  - *z/OS Release Upgrade Reference Summary (new name for Summary of Message and Interface Changes!)*
  - *z/OS MVS Initialization and Tuning Reference*
  - *z/OS UNIX System Services Planning*
- *System z Platform Test Report for z/OS and Linux Virtual Servers (available from http://www.ibm.com/servers/eserver/zseries/zos/integtst/)*
- S*erverPac: Installing Your Order (no order number; custom-built to your order)*
- *ServerPac: Using the Installation Dialog,*

URL	DESCRIPTION
http://www.ibm.com/systems/z/os/zos/	IBM z/OS home page
https://github.com/IBM/IBM-Z-zOS/tree/master/zOS-Workflow	z/OSMF Workflows
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http://www.ibm.com/servers/eserver/zseries/swprice/	IBM System z Software Pricing
http://www.ibm.com/systems/z/os/zos/support/zos_eos_dates.html	z/OS marketing and service announce.
http://www.ibm.com/systems/z/os/zos/features/unix/bpxa1ty1.html	Some ported programs for z/OS web page
https://www.ibm.com/systems/z/os/zos/installation/zosnfapars.html	z/OS Platform New Function APARs

IBM Education:
IBM courses are available for z/OS. For schedules and enrollment on the world wide web, IBM Global Campus
URL: http://www.ibm.com/services/learning/ .

z/OS V2.4 Performance Information
At z/OS V2.4 GA (September 2019), the SOFTCAP tool can be downloaded from the web site:
http://w3.ibm.com/support/americas/wsc/cpsproducts.html . This tool provides more specific capacity planning information for
the upgrade to z/OS V2.4.

z/OS V2R4 Elements (changing in z/OS V2R3 and V2R4) IBM

→ BCP
→ Common Information Model (CIM)
→ Communications Server
→ *Communications Server Security Level 3*
→ Cryptographic Services:
  → ICSF (FMID HCR77D0)
  → PKI Services
  → System SSL
→ DFSMSdfp
→ **DFSMSdss**
→ **DFSMShsm**
→ **DFSMSrmm**
→ **DFSMStvs**
→ **DFSORT**
→ HCD
→ **HCM**
→ IBM Knowledge Center for z/OS
→ IBM Tivoli Directory Server
→ IBM z/OS Liberty Embedded
→ IBM z/OS Management Facility

→ **Infoprint Server**
→ Integrated Security Services:
  → Network Authentication Service
→ ISPF
→ JES2
→ **JES3**
→ Language Environment
→ Network File System
→ **RMF**
→ **RUCSA** NEW!
→ Run-Time Library Extensions
→ **SDSF**
→ **Security Server - RACF**

→ SMP/E
→ TSO/E
→ **XL C/C++** NEW!
→ z/OS Container Extensions(zCX)
→ z/OS File System (zFS)
→ z/OS Font Collection
→ z/OS OpenSSH
→ *z/OS Security Level 3:*
  → *IBM Tivoli Directory Server Security Level 3*
  → *Network Authentication Service Level 3*
  → *SSL Level 3*
→ z/OS UNIX

KEY:
Black (not in bold) are base elements
Green (also in **bold**) are optional priced features
Brown (also in *italics*) are optional unpriced features with export controls
→ This element changed in z/OS V2R3,
→ This element changed in z/OS V2R4
All other elements not listed have not changed since z/OS V2.2.
New in V2R3: IBM z/OS Liberty Embedded.
New in V2R4: RUCSA, Container Extensions(zCX)

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*An important reminder about two orderable features… IBM

→ *Communications Server Security Level 3*
→ *z/OS Security Level 3:*
  → *IBM Tivoli Directory Server Security Level 3*
  → *Network Authentication Service Level 3*
  → *SSL Level 3*

KEY:
Brown (also in *italics*) are optional unpriced features with export controls.

Do not forget to order these export controlled features if you need them for z/OS V2.4!

• z/OS V2.3 Security Level 3 features orderable until z/OS V2.3 is orderable – January 2020.

If you need these two export controlled z/OS features after the release is no longer orderable, you will be have to do extra installation work.

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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. 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. 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, IBM recommends that you 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, usually neither are its unpriced features.
  - ☐ *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 them 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, or stand-alone, 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 stand-alone product.

Listed in the slide above are the changing elements within z/OS V2R4 since z/OS V2R2.

Optional priced feature in z/OS V2.4: RUCSA

IBM

Restricted Use Common Service Area(RUCSA):

- Priced feature as of z/OS V2.4
  - *Not* a priced feature prior to z/OS V2.4 (APAR OA56180 to V2.1).
  - Supports restricted user key CSA usage with SAF security protection
  - Provides a way to continue to use one aspect of user key common removal, after z/OS V2.4.

- IBM strongly recommends that you eliminate all use of user key common storage, so this priced feature is not necessary.

- Associated FMID is HBB77C0 (the BCP).

- IFAPRDxx statement:
  ```
  PRODUCT OWNER('IBM CORP') NAME('z/OS')
  ID(5650-ZOS) FEATURENAME(RUCSA) STATE(ENABLED)
  ```

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New base element in z/OS V2.4: zCX

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zOS Container Extensions (zCX):

- Run almost any Linux® on IBM Z Docker container in z/OS alongside existing z/OS applications and data without a separate provisioned Linux server.
  - Intended for workloads with an affinity to z/OS.

- FMID is HZDC7C0

- Found at /usr/lpp/zcx_zos/
  - Is a separate file system, OMVS.SAZDZFS

- zCX workloads are zIIP-eligible and will run on IBM z14 GA2 servers with a HW feature code.
- Configuration must be done via z/OSMF Workflow.

Learn more at: http://ibm.biz/zOSContainerExtensions

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New base element in z/OS V2.3: IBM z/OS Liberty Embedded

IBM z/OS Liberty Embedded:

- IBM z/OS Liberty Embedded provides a copy of the IBM Liberty server stack <u>for sharing between IBM z/OS elements</u>.
  - FMID is HWLPEM0.

- *Also, from the License Program Specifications (LPS): Licensee may use this Supporting Program for purposes independent of the Principal Program without obtaining additional entitlements. Such use is Nonsupported and limited to Non-Production purposes.*

- Found at /usr/lpp/liberty_zos/

  - Is a separate file system, OMVS.SBBLZFS

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Element and Functions Withdrawn from z/OS V2R3

Simple Mail Transport Protocol Network Job Entry (SMTPD NJE) Mail Gateway and Sendmail mail transports	Base Element support: See presentation notes for recent replacement suggestions.	**z/OS V2.3**
Trivial File Transfer Protocol Daemon (TFTPD) function (from Communications Server)	Base Element support	**z/OS V2.3**
TCP/IP legacy device drivers for FDDI and Token Ring (LCS with LINKs FDDI and IBMTR), Token Ring (MPCIPA with LINK IPAQTR), and ENet and FDDI (MPCOSA with LINKs OSAENET and OSAFDDI).	Base Element support – migrate to more recent device types such as OSA Express QDIO and Hipersockets. *Support for SNA device drivers is not affected.*	**z/OS V2.3**
Consoles shared mode (from the BCP)	Base Element support: migrate to distributed mode (in R10)	**z/OS V2.3**
System Logger DRXRC log stream duplex staging data set option (BCP)	Base Element support – remove the logstream DUPLEXMODE(DRXRC) specification. Other available mirroring options are IBM z/OS Global Mirror (zGM), also known as Extended Remote Copy (XRC), or Geographically Dispersed Parallel Sysplex (GDPS).	**z/OS V2.3**

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Withdrawn in z/OS V2R3 (last delivered in z/OS V2R2)

This section lists items that were withdrawn in z/OS V2R3. You should take this into account if you are upgrading from z/OS V2.2 or 2.3, to z/OS V2.4. The removal of these functions may have upgrade actions which you can perform now, in preparation for z/OS V2.4.

- z/OS V2.3 is the last release in which the consoles component supports shared mode. Migrate to distributed mode, which was introduced in z/OS V1.10. A "best practices" health check was added in z/OS V1.13 to help you identify systems on which shared mode is in use. Distributed mode is designed to improve operations in sysplex environments by helping reduce the time required to IPL and for systems to join a sysplex, improve availability, and allow more MCS, SMCS, and subsystem consoles to be configured.
- z/OS V2.3 is the last release to include the Trivial File Transfer Protocol Daemon (TFTPD) function in z/OS Communications Server.
- z/OS V2.3 is the last release to include the TCP/IP legacy device drivers for FDDI and Token Ring (LCS with LINKs FDDI and IBMTR), Token Ring (MPCIPA with LINK IPAQTR), and ENet and FDDI (MPCOSA with LINKs OSAENET and OSAFDDI). If you are using any of these devices, migrate to newer devices such as OSA Express QDIO and Hipersockets. Note that this withdrawal is only for TCP/IP device types, and not for any of the SNA device drivers.
- z/OS V2.3 is the last release to include the Simple Mail Transport Protocol Network Job Entry (SMTPD NJE) Mail Gateway and Sendmail mail transports. If you use the SMTPD NJE Gateway to send mail, use the existing CSSMTP SMTP NJE Mail Gateway instead. IBM had announced plans to provide a replacement program for the Sendmail client that would not require programming changes. Those plans have changed, and IBM plans to provide a compatible subset of functions for Sendmail in the replacement program and to announce those functions in the future. Programming changes or alternative solutions to currently provided Sendmail functions might be required. No replacement function is planned in z/OS Communications Server to support using SMTPD or Sendmail as a (SMTP) server for receiving mail for delivery to local TSO/E or z/OS UNIX System Services user mailboxes, or for forwarding mail to other destinations.
- z/OS V2.3 is the last release to provide support in the Common Information Model (CIM) component for the Java Managed Provider Interface (JMPI).

- z/OS V2.3 is the last release to support the DFSMSrmm CIM Provider.
- Starting in z/OS V2.3, z/OS system logger will no longer support the log stream DRXRC duplex mode option. z/OS V2.2 was announced as being the last release for system logger to support the DRXRC log stream duplex staging data set option. See the statement of direction in US Software Announcement 215-006, dated January 14, 2015. Also refer to the logger migration health check ZOSMIGV2R2_NEXT_IXG_REMOVE_DRXRC), provided in the PTFs for APAR OA49507, to aid in identifying whether any log stream is defined in the sysplex with the DUPLEXMODE(DRXRC) attribute.
- IBM previously announced in Software Announcement 215-267, dated July 28, 2015, that z/OS V2.2 would be the last release to include a number of System Data Mover (SDM) TSO/E commands. Based on client feedback, IBM now intends to continue to support these commands in the future, including the query and XSET commands. However, IBM plans no future enhancements for them. IBM recommends you use the equivalent REXX versions of these commands instead, which are intended to be updated as needed to support any new functions in the future. For more information about using the REXX commands, see *z/OS DFSMS Advanced Copy Services.*

Element and Functions Withdrawn from z/OS V2R4

BookManager READ and Library Server	Base Element support: Use IBM Knowledge Center for z/OS instead.	**z/OS V2.4**
National Language Translation, other than Japanese, for messages and panels	Base Element and Priced Feature support for: Chinese (Simplified and Traditional), Danish, Dutch (Netherlands), French (including Canadian French), German (including Swiss German), Italian, Korean, Norwegian, Portuguese (Brazilian), Spanish, and Swedish.	**z/OS V2.4**
User key common removal (see next slidle)	Base Element support – ensure your software will not require this capability. Partial continuation of support could use z/OS V2.4 RUSA priced feature.	**z/OS V2.4**
Server Message Block (SMB) (see next slide)	Base Element support (DFS/SMB): Use Network File System (NFS) instead.	**z/OS V2.4**

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BCP: Removal of support for user key common areas
Required if you are using any of the user key common areas described in this upgrade action.

IBM strongly recommends that you eliminate all use of user key common storage. Allowing programs to obtain user key (8-15) common storage creates a security risk because the storage can be modified or referenced, even if fetch protected, by any unauthorized program from any address space. Therefore, without the restricted use common service area (RUCSA) optional priced feature, the obtaining of user key (8-15) storage is not supported in z/OSV2R4.

RUCSA is more secure because it can be managed as a SAF resource. However, it does not prevent two or more different SAF-authorized applications from altering or referencing another application's RUCSA storage. RUCSA became available as a part of the BCP base element with APAR OA56180 on earlier z/OS releases, but it is only available as a priced feature in z/OS V2R4.

Related to this change:
*   Support to change the key of common ESQA storage to a user key (via CHANGKEY) is removed regardless of RUCSA exploitation. NUCLABEL DISABLE(IARXLUK2) is no longer a valid statement in the DIAGxx parmlib member. (Note: This statement only exists in z/OS V2R3.)
*   Support of user-key (8 - 15) SCOPE=COMMON data spaces is removed regardless of RUCSA exploitation.
*   YES is no longer a valid setting for the following statemets in the DIAGxx parmlib member:
    VSM ALLOWUSERKEYCSA   Controls the allocation of user key CSA.
    ALLOWUSERKEYCADS Controls the allocation of user key SCOPE=COMMON data spaces.
    If set to YES on a z/OS V2R4 system, these statements are treated as syntax errors with messages, such as the following:

```
SET DIAG=J2
IEE252I MEMBER DIAGJ2 FOUND IN D10JHM1.PARMLIB
ASA002I SYNTAX ERROR IN PARMLIB MEMBER=DIAGJ2
LINE 17: 393 NO EXPECTED BEFORE <NON-KEYWORD>. DETECTING MODULE IS IGVDITMS.
INPUT LINE: VSM ALLOWUSERKEYCSA(YES)
```

```
ASA004I PARSING OF PARMLIB MEMBER=DIAGJ2 395 CONTINUED AT ),
LINE 17. DETECTING MODULE IS IGVDITMS.
INPUT LINE: VSM ALLOWUSERKEYCSA(YES)
ASA002I SYNTAX ERROR IN PARMLIB MEMBER=DIAGJ2
LINE 18: 396 NO EXPECTED BEFORE <NON-KEYWORD>. DETECTING MODULE IS IGVDITMS.
INPUT LINE: ALLOWUSERKEYCADS(YES)
ASA004I PARSING OF PARMLIB MEMBER=DIAGJ2 397 CONTINUED AT ),
LINE 18. DETECTING MODULE IS IGVDITMS.
INPUT LINE: ALLOWUSERKEYCADS(YES) IEE536I DIAG VALUE J2 NOW IN EFFECT
```

Upgrade action:
1. On the production system that you are upgrading to z/OS V2R4, determine whether you are using user key common storage by checking the response to the following operator commands :
   o D IPLINFO,RUCSA . If RUCSA was specified with nonzero values, you are already using RUCSA and must do either of the following:
     ▪ Upgrade to the z/OS V2R4 priced optional feature. For instructions, see z/OS Planning for Installation. No other steps are required. However, you might want to see whether you can reduce or possibly eliminate user key common storage usage by following the additional steps below.
     ▪ Start with **Step 2** below to remove all usage of user key common storage from your current system and then remove the use of RUCSA before IPLing z/OS V2R4.
   o D DIAG . If VSM ALLOWUSERKEYCSA and ALLOWUSERKEYCADS are set to NO and you are not using RUCSA, no further action is required. You already prevent the use of user key common storage.
2. Query all software vendor products to determine whether any service is required to eliminate the use of user key common storage.
   o If you are running CICS Transaction Server for z/OS, ensure that you are running V5.2 or a later version.
   o If you are running Tivoli OMEGAMON XE for DB2 PE/PM, apply APAR PI97225 ("Removed User Key CADS Creation").
3. Check for usage of user key common areas, such as the following:
   o Using the STORAGE, GETMAIN or CPOOL service to obtain common ECSA/CSA storage (subpool 227, 228, 231, 241) that specifies a key of 8-15.
   o Using the DSPSERV service to allocate a SCOPE=COMMON data space in a key of 8-15.
   o Using the CHANGKEY service to change the storage key of common storage to a key of 8-15.
   To aid in finding all instances of user key common usage, apply the PTF for APAR OA53355 on your production system. Doing so allows you to take one or more of the following actions:
   o Enable the following example SLIP trap to produce GTF trace records to help in identifying software that uses user key common storage:
     SLIP SET,IF,A=TRACE,ID=UKEY,NUCEP=(IARXLUK4,0,1),TRDATA=(STD,REGS),END
     In the GTF trace record, register 1 contains the address of the program that used user key common storage.
   o Activate the ZOSMIGV2R3_NEXT_VSM_USERKEYCOMM health check. This health check issues an exception message when it detects usage of user key common storage.
   o Ensure that SMF Type 30 recording is active. The Storage and Paging section contains flags that indicate whether user key common storage is used. For information about the SMF30_UserKeyCsaUsage, SMF30_UserKeyCadsUsage and SMF30_UserKeyChangKeyUsage flags, see z/OS MVS System Management Facilities (SMF).
4. If the PTF for APAR OA53355 is not applied, you can take one or more of the following actions to help find instances of user key common usage:
   o Set the DIAGxx parmlib statement VSM ALLOWUSERKEYCSA to NO, which is the default. Then, IPL a test system with the updated setting. Any software on your test system that attempts to obtain user key CSA/ECSA storage by using the GETMAIN, STORAGE, or CPOOL service will fail. The service receives one of the following abends: B04-5C, B0A-5C, or B78-5C.
   o Specify ALLOWUSERKEYCADS(NO) in your DIAGxx parmlib. Then, IPL a test system with the updated setting. Any software on your test system that attempts to obtain a user key (8-15) SCOPE=COMMON data space fails with a 01D-xx0015xx abend.
   o On z/OS V2R3 systems and later, specify NUCLABEL ENABLE(IARXLUK2) in your DIAGxx parmlib member. Then, IPL a test system with the updated setting. Any software on your test system that attempts to use CHANGKEY to change subpool 247 or 248 common storage to a user key (8-15) will fail with a 08F-1C abend.
   o Enable the following example SLIP trap to produce GTF trace records to help in identifying software that obtains user key CSA/ECSA storage:
     SLIP SET,IF,A=TRACE,ID=UCSA,NUCEP=(IGVVSMG2,0,1),END
   o Enable the following example SLIP trap to produce GTF trace records to help in identifying software that allocates user key SCOPE=COMMON data spaces:

```
SLIP SET,IF,A=TRACE,ID=UCAD,NUCEP=(IAXDKUKY,0,1),END
```
  - Check for usage of the CHANGKEY service to change the storage key of common storage to a key of 8-15.
5. Change the affected software to use a system key rather than a user key. Or, change the affected software to use storage that is not common to all address spaces. Some alternatives for sharing storage (instead of having storage common to all address spaces) include the following options:
   - Use a SCOPE=ALL data space to share data space storage with specific units of work in specific address spaces.
   - Use IARVSERV SHARE to share below-the-bar storage with specific address spaces.
   - Use IARV64 GETSHARED to share above-the-bar storage with specific address spaces.
   - Use z/OS UNIX shared memory to share below-the-bar or above-the-bar storage with specific address spaces.
6. For those who cannot immediately eliminate all affected software programs or need more assistance in identifying the programs that reference user key CSA storage, the more secure restricted use common service area (RUCSA), an optional priced feature in z/OS V2R4 (and provided in the BCP base element by APAR OA56180 for earlier z/OS releases) can be used. However, IBM still recommends the elimination of all user key common storage. For more information about RUCSA and upgrading to it, see z/OS MVS Initialization and Tuning Guide.

Reference information

For more information, see the following references:
- For information about IBM Health Checker, see IBM Health Checker for z/OS User's Guide.
- For information about SMF records, see z/OS MVS System Management Facilities (SMF).
- For information about the z/OS V2R4 RUCSA optional priced feature, see:
  - z/OS Introduction and Release Guide
  - z/OS Planning for Installation

Removal of support for DFS/SMB in z/OS V2R4

- Server Message Block (SMB) has been removed as of z/OS V2R4.

- DFS was composed of SMB and zFS, and the base element is now changed to z/OS File System (zFS).

Upgrade Actions you MUST do NOW:

- Determine if your system uses DFS/SMB
  - Use health check IBMUSS,ZOSMIGV2R3_NEXT_USS_SMB_DETECTED
  - If DFS/SMB is being used, stop using DFS/SMB.
- Verify that NFS is configured and running.
  - NFS provides two z/OSMF workflows to aid the system administrator:
    1. Workflow for Installing and Configuring the z/OS NFS Server
    2. Workflow for Migration from z/OS DFS/SMB to z/OS NFS
- Use the equivalent functions in NFS.
  - For more information on NFS configuration see *z/OS Network File System Guide and Reference.*

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DFS/SMB: Use Network File System (NFS) instead of DFS/SMB
Required if you currently are using Server Message Block.
As of z/OS V2R4, the z/OS operating system no longer supports Distributed File System / Server Message Block (DFS/SMB). Originally, the z/OS Distributed File Service base element consisted of two components: SMB and z/OS File System (zFS). In z/OS V2R4, the name of the base element is changed to z/OS File System.

If you need to share files between z/OS and Microsoft Windows, IBM recommends that you use the Network File System (NFS) protocol instead of DFS/SMB. NFS also allows for the sharing of z/OS data with UNIX and Linux systems.

NFS is the strategic file sharing protocol for the z/OS platform. To help your installation upgrade to NFS, IBM plans to deliver new NFS function on existing levels of the operating system, including installation, security, availability, and operational enhancements. These planned enhancements are intended to help you more easily migrate to NFS before you upgrade to the next release of z/OS.

To determine whether your system uses DFS/SMB, use health check
IBMUSS,ZOSMIGV2R3_NEXT_USS_SMB_DETECTED. This check, which is added by APAR OA56251, is
available for z/OS V2R3 and z/OS V2R2 systems.

Upgrade action: Do the following:
1. Determine whether your system uses DFS/SMB. To do so, use health check
   IBMUSS,ZOSMIGV2R3_NEXT_USS_SMB_DETECTED.
2. If so, stop using DFS/SMB.
3. Verify that NFS is configured and running.
   NFS provides two z/OSMF workflows to aid the system administrator, as follows:
   - Workflow for Installing and Configuring the z/OS NFS Server
     Guides the system administrator through the process of setting up the z/OS NFS Server. This workflow
     provides information on the initial installation of the NFS server. You might find it to be helpful, if you have
     not set-up NFS before.
   - Workflow for Migration from z/OS DFS/SMB to z/OS NFS
     Describes the steps that the system administrator must perform to have z/OS NFS provide function that is
     similar to an existing z/OS DFS/SMB configuration.

For more information about these workflows, see APAR OA56186.
4. Use the equivalent functions in NFS.
Reference information
For more information about NFS, see z/OS Network File System Guide and Reference.
Instructions:

Element and Functions Withdrawn from z/OS V2R4

Server-Requester Programming Interface (SRPI) (TSO/E)	Base Element support: Introduced in 1980s for a programming interfaces between workstations and the mainframe. Use TCP/IP instead.	**z/OS V2.4**
Default change to enable dynamic configuration (Infoprint Server)	Priced feature support: dynamic configuration support is irreversible and mandatory. Benefits exist for using dynamic configuration support!	**z/OS V2.4**
z/OS Batch Runtime	Base Element: recommended to use WebSphere Application Server JSR 352 instead.	**z/OS V2.4**
Open Systems Adapter Support Facility(OSA/SF)	Base Element: use the HMC to configure the OSA adapters. No change to the OSA cards' strategic importance to z/OS is meant by this change	**z/OS V2.4**
Planning and Migration Assistant (PMA), a component of SMP/E	Base Element: Supplanted by newer functions provided by Shopz and by z/OSMF Software Management SMP/E became an exclusive base element in z/OS V2R4.	**z/OS V2.4**

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Withdrawn in z/OS V2R4 (last delivered in z/OS V2R3)

This section lists items that IBM has announced it has removed in z/OS V2R4. You are encouraged to consider these removals when making your plans for system upgrades. These statements represent IBM's current intentions. IBM development plans are subject to change or withdrawal without further notice.

- z/OS V2.3 is the last release of z/OS to support the Server-Requester Programming Interface (SRPI). SRPI was introduced in TSO/E in the 1980s to provide a programming interface that enhances the environment of IBM workstations communicating with IBM mainframes running z/OS. Customers with applications using SRPI should start using TCP/ IP for z/OS to provide similar function. Documentation for SRPI is available in *TSO/E Guide to the Server-Requester Programming Interface,* SA22-7785, and this publication as well as documentation for SRPI-related functions, such as the MVSSERV command, will be removed.
- Infoprint Server intends to enable dynamic configuration as the default behavior. This change in default behavior will be mandatory and not reversible. You can disregard this statement if you already enabled dynamic configuration. See the Infoprint Server Customization publication (SA38-0691) for details on how to enable and the advantages of enabling dynamic configuration. Some advantages of enabling dynamic configuration include:
  - o Authorized administrators can use the Infoprint Server ISPF panels or the Printer Inventory Definition Utility (PIDU) to view and change the dynamic attributes rather than editing the /etc./Printsrv/aopd.conf file.
  - o If you change an attribute in the system configuration definition, with a few exceptions, you do not need to stop and restart Infoprint Server for the change to take effect.
  - o You can configure Infoprint Server to start and stop individual daemons.

- o You can benefit from new functions in Infoprint Server that require dynamic configuration. For example, you can use the MVS system logger function.
- z/OS V2R3 is the last release to support z/OS Batch Runtime. This component provides a framework for interoperability between PL/I, COBOL, and Java applications that run on z/OS. It is designed to provide a managed environment that enables shared access to a DB2 connection by PL/I, COBOL, and Java programs. It is recommended that you use IBM WebSphere® Application Server JSR 352 instead. Doing so might require you to modify and test your programs in a JSR 352 compliant batch container.
- IBM plans to discontinue delivery of z/OS platform products and service on magnetic tape on July 1, 2018. This fulfills the statement of direction in IBM United States Software Announcement 217-085, "Preview: IBM z/OS Version 2 Release 3 - Engine for digital transformation," dated February 21, 2017. IBM recommends downloading products and service over the Internet. However, if you have a requirement for physical media, products and service remain available on DVD.
- z/OS V2.3 is planned to be the last release of the operating system to provide national language translation in languages other than Japanese. As such, the handful of z/OS elements that provide message and panel translation to Chinese (Simplified and Traditional), Danish, Dutch (Netherlands), French (including Canadian French), German (including Swiss German), Italian, Korean, Norwegian, Portuguese (Brazilian), Spanish, and Swedish today, will no longer provide translations into these languages in the release after z/OS V2.3.
- z/OS V2.3 is planned as the last release to include the z/OS BookManager READ and Library Server base elements, the latter of which includes the BookRead API. Over time, IBM's platform for delivering product documentation to customers has evolved to IBM Knowledge Center technology, and production of documentation formats that are supported by BookManager Read and Library Server has greatly diminished. IBM recommends now using IBM Knowledge Center for z/OS (KC4z), which was introduced as a base element of z/OS in version 2.2, to maintain local repositories of product documentation and serve content.
- OSA Support Facility (OSA/SF) is an element of z/OS that has been used to configure devices on Open Systems Adapter (OSA) cards used for the SNA protocol and to support and manage all OSA features. OSA/SF in z/OS has both a graphical user interface as well as a REXX API. On EC12/BC12 systems, IBM introduced support to configure these devices on the latest generation OSA adapters (OSA Express5S) and to support and manage these adapters exclusively using the Hardware Management Console (HMC), with no capability to configure or manage devices on these adapters provided in the z/OS OSA/SF application. The OSA/SF on the HMC functionality can be used to configure and manage OSA-Express4S and newer generation adapters. No change to the OSA cards' strategic importance to z/OS is meant by this change. z/OS continues to support the networking operational use of OSA adapters.
- z/OS V2.3 is the last release to include the SMP/E Planning and Migration Assistant (PMA). The set of functions provided by PMA, which was introduced in 1998, has largely been supplanted by newer functions provided by Shopz and by z/OSMF Software Management or duplicate other functions available in SMP/E. For those functions, IBM recommends you use the replacements instead. However, no replacements are planned for the Intermediate Product Migration Changes report or for the PMA ISPF tables. With this removal and repackaging of SMP/E, it has become as exclusive base element to z/OS.

Functions Planned to be Withdrawn
in the releases after z/OS V2R4...

HFS	Base Element support: Use zFS instead. Use z/OS utilities to help with the conversion of the entire file system hierarchy.	In the release after z/OS V2.4
ISPF Workstation Agent (WSA), also known as ISPF Client/Server component	Base element support: Use more current transfer solution, such as Zowe Data Set Explorer or ftp.	In the release after z/OS V2.4
VTAM Common Management Information Protocol (CMIP)	Base element support: is an API that enables a management application program to gather various types of SNA topology data from a CMIP application called the *topology agent* that runs within VTAM. IBM recommends using the SNA network monitoring network management interface (NMI) to monitor SNA Enterprise Extender and High Performance Routing data.	In the release after z/OS V2.4
Direct invocation of System SSL APIs for TLS/SSL by TN3270 Telnet server, FTP server, and Digital Certificate Access Server (DCAS)	Base element support: in the future, the only TLS/SSL protection option for these servers will be AT-TLS. Convert these servers to use AT-TLS.	In the release after z/O V2.4
JES3	Priced feature – many JES2 functions already added, additional function to aid in migrations is planned. For questions, contact jes3q@us.ibm.com. **As of z/OS V2.4, the JES2 SMP/E zones will not be allowed to be removed from ServerPac.**	In the release after the release after z/OS V2.4 (2023)

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Functions Planned to be Withdrawn
in the releases after z/OS V2R4...

|		
WLM service coefficients specification (on Service Definition Details page)	Base element support: Use recommended values of CPU=1, SRV=1, MSO=0, and IOC=0 which will be the default in a later release. Adjust now.	In the release after z/OS V2.4
EIM, OCSF, and all of its plug-ins such as OCEP and PKITP.	Base element support: Use other applications such as ICSF and System SSL for comparable functionality.	In the release after z/OS V2.4
Network Configuration Assistant (NCA) z/OSMF plug-in for policy data import function, for importing existing Policy Agent configuration files.	Base element support: Import of policy configuration files for AT-TLS, IPSec, PBR, and IDS technologies. Import of TCP/IP profile into NCA is not affected.	In the release after z/O V2.4

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Planned for removal in the releases following z/OS V2R4

This section lists items that IBM has announced it intends to remove in the releases after z/OS V2R4 and beyond. You are encouraged to consider these removals when making your plans for system upgrades. These statements represent IBM's current intentions. IBM development plans are subject to change or withdrawal without further notice.

- The release after /OS V2.3 is planned to be the last release of the operating system to support the HFS (Hierarchical File System) data structure used by the z/OS UNIX environment. IBM has provided equivalent if not superior functionality with the z/OS File System (zFS). Customers should migrate from HFS to zFS using the utilities provided in the operating system to convert their entire file system hierarchy.
- z/OS V2.4 is planned to be the last release to support the ISPF Workstation Agent (WSA), also known as the ISPF Client/Server Component. WSA is an application that runs on your local workstation and maintains a connection between the workstation and the ISPF host. It is primarily used to transfer files between the workstation and the host. IBM recommends using more current file transfer solutions such as those provided by the Zowe Dataset Explorer, z/OS FTP, and similar file transfer mechanisms. These solutions have more capabilities, including the ability to provide secure communications.
- z/OS V2.4 is planned to be the last release to support the VTAM Common Management Information Protocol (CMIP). CMIP services is an API that enables a management application program to gather various types of SNA topology data from a CMIP application called the *topology agent* that runs within VTAM. IBM recommends using the SNA network monitoring network management interface (NMI) to monitor SNA Enterprise Extender and High Performance Routing data.
- IBM announced that JES2 is the strategic Job Entry Subsystem (JES) for the z/OS Operating System and that JES3 would continue to be supported and maintained. To date, IBM has made significant investment in JES2 by delivering unique functions such as email support in JCL, spool migration and merge, and dynamic checkpoint expansion and tuning to make management easier. In z/OS V2.4, IBM plans to deliver in JES2 Spool Encryption and a new user exit alternative based on defining policies that allow exit programs to be implemented in a parameterized rule-based approach. To help JES3 to JES2 migration efforts, JES2 has added functionality, including dependent job control, deadline scheduling, 8-character job classes, and interpreting JES3 JECL control statements. For z/OS V2.4, additional function to aid in migrations is planned, including Disk Reader capability and enhanced JES3 JECL support in JES2 (ROUTE XEQ). Today, as a result of our strategic investment and ongoing commitment to JES2, as well as continuing to enhance JES3 to JES2 migration aids, IBM is announcing that the release following z/OS V2.4 is planned to be the last release of z/OS that will include JES3 as a feature. If you are one of the clients who remains on JES3, IBM encourages you to start planning your migration. For questions, contact jes3q@us.ibm.com.
- z/OS V2.4 is planned to be the last release in which the z/OS TN3270E Telnet server, FTP server, and Digital Certificate Access Server (DCAS) will support direct invocation of System SSL APIs for TLS/SSL protection. In the future, the only TLS/SSL protection option for these servers will be Application Transparent Transport Layer Security (AT-TLS). The direct System SSL support in each of these components is functionally outdated and only supports TLS protocols up through TLSv1.1. IBM recommends converting your TN3270E Telnet, FTP server, and DCAS configurations to use AT-TLS, which supports the latest System SSL features, including the TLSv1.2 and TLSv1.3 protocols and related cipher suites. Note that while native TLS/SSL support for z/OS FTP client is not being withdrawn at this time, no future enhancements are planned for that support. IBM recommends using ATTLS to secure FTP client traffic.
- z/OS V2.4 is planned to be the last release of z/OS to allow specifying service coefficients in the Workload Manager (WLM) service definition on the Service Definition Details page. The IBM recommended values are CPU=1, SRB=1, MSO=0, and IOC=0, which will be the default values in a later release. IBM recommends that you adjust your service coefficients before upgrading to a later release.
- z/OS V2.4 is planned to be the last release to support EIM (Enterprise Identity Mapping) and OCSF (Open Cryptographic Services Facility), and all of its plug-ins, such as OCEP (Open Cryptographic Enhanced Plug-ins) and PKITP (PKI Services Trust Policy). These components have not been widely utilized nor enhanced for several releases of z/OS. IBM recommends using other applications such as ICSF (Integrated Cryptographic Services Facility) and System SSL for comparable functionality.
- z/OS V2.4 will be the last release that the Network Configuration Assistant (NCA) z/OS MF plug-in supports the policy data import function, which allows you to import existing Policy Agent configuration files into the Network Configuration Assistant. After z/OS V2.4, import of policy configuration files will no longer be

supported for AT-TLS, IPSec, PBR, and IDS technologies. Import of TCP/IP profiles into NCA is not affected.
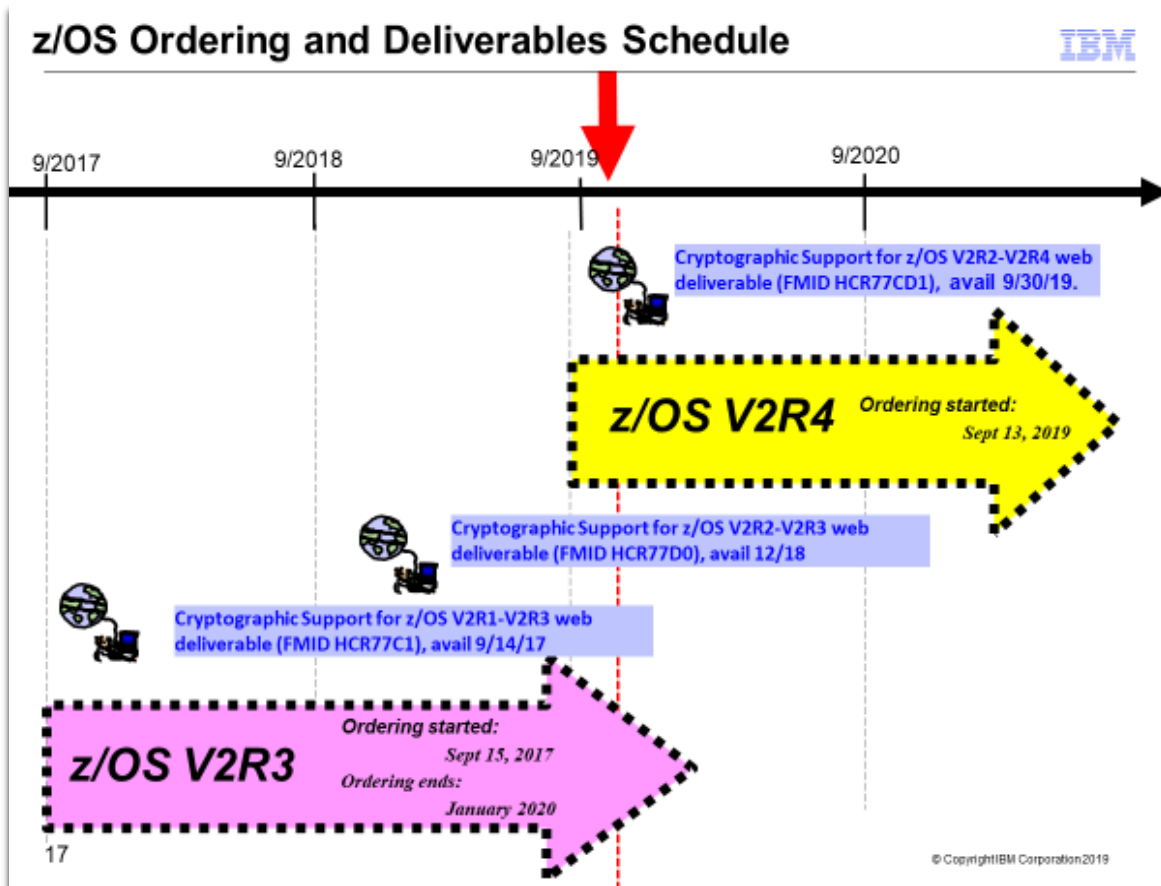
z/OS Ordering and Deliverable Key Dates

Key dates for recent z/OS releases and functions:

- **October 17, 2016:** Availability date for the Cryptographic Support for the z/OS V2R1-V2R2 web deliverable. (The FMID is HCR77C0.)
- **September 14, 2017:** Availability date for the Cryptographic Support for the z/OS V2R1-V2R3 web deliverable. (The FMID is HCR77C1.)
- **September 15, 2017:** Ordering starts for z/OS V2.3
- **September 29, 2017:** z/OS V2.3 general availability.
- **January 29, 2018:** All ordering of z/OS V2.2 is completed.
- **December 2018:** Availability date for the Cryptographic Support for the z/OS V2R2-V2R3 web deliverable. (The FMID is HCR77D0.)
- **September 13, 2019:** Ordering starts for z/OS V2.4
- **September 2018:** Availability date for the Cryptographic Support for the z/OS V2R2-V2R4 web deliverable. (The FMID is HCR77D1.)
- **September 27, 2017:** z/OS V2.4 general availability.
- **January 2020:** Ordering complete for z/OS V2.3.

Web deliverables

Sometimes enhancements are provided as Web deliverables*, and not integrated in your ServerPac or CBPDO deliverable*. For example, some of the ICSF enhancements are available this way. z/OS Web deliverables are available from http://www.ibm.com/eserver/zseries/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 perform the SMP/E installation work yourself.

Cryptographic Support for z/OS V2.1-V2.3 Web deliverable (ICSF FMID HCR77C1). This web deliverable supports z/OS V2.1, V2.2, and V2.3. This Web deliverable contains support for Crypto Express6S coprocessors available on z14 processors. These updates are intended to help clients meet standards and provide better cryptographic security. ICSF enhancements for the Crypto Express6S updates are intended to include support for a PCI HSM ("Payment Card Industry Hardware Security Module") configured CCA coprocessor. This Web deliverable also contains other enhancements.

Cryptographic Support for z/OS V2R2-V2R3 Web deliverable (ICSF FMID HCR77D0) was available December 2018. This web deliverable supports z/OS V2.2 and V2.3. This download provides ICSF enhancements for Crypto Express5S (CCA Release 5.4 and later) and Crypto Express6S (CCA Release 6.1 and later). Additional enhancements to ICSF available in this download provide support for:
- CCA redirection for Regional Crypto Enablement. Certain CCA callable services will have the ability to direct the request to a regional crypto device. This enhancement introduces the concept of "RCS Redirection" through a new XFACILIT resource, and adds the concept of an "RCS Token" to existing symmetric key token types.
- ChaCha20 and Poly1305 algorithms. These new algorithms will be available via the PKCS#11 interfaces and clear key only.
- Dynamic Service Update. Applying service to a running ICSF instance without causing an interruption to their applications. When ICSF service is available on a system, ICSF will have a new operator command that will allow running requests to finish, pause incoming requests, prepare to restart with the service libraries, and then stop ICSF. Through system automation (preferred), ICSF will be restarted and the paused requests will be resumed without a visible interruption.
- Early ICSF. ICSF will now be able to start much earlier in the IPL process, such that ICSF should be available for work as early as full function start. ICSF is also adding new ways to provide installation options via a more standard PARMLIB interface.
- KGUP and SAF profile prefixing. KGUP can be made to honor CSFKEYS resource profiles, configured to require higher permission when performing destructive operations on an existing key (such as UPDATE or DELETE), permit a user or group to a CSFKEYS resource but only for specific callable services, and have ICSF prepend a system name to a CSFKEYS resource prior to the SAF check.
- A new ISPF browser added for the PKDS.
- A new DISPLAY ICSF, MKVPs operator command.
- …and much more.

Cryptographic Support for z/OS V2R2-V2R4 Web deliverable (ICSF FMID HCR77D1) was available September 2019. This web deliverable supports z/OS V2.2, V2.3, and V2.4. ICSF provides the following new features:
- Support for the new Crypto Express7S adapter, configured as a CCA coprocessor, an EP11 coprocessor, or an accelerator.
- The ability to use CP Assist for Cryptographic Functions (CPACF) for certain clear key ECC operations. ICSF can now call CPACF instructions to perform ECC key generation, key derivation, and digital signature generation and verification using a subset of the NIST curves. The CPACF on IBM z15 also supports the ed448 and ec25519 curves.
- A new SMF record whenever a master key is changed. Certain compliance regulations mandate the periodic rotation of encryption keys, including the master keys loaded into coprocessors. As part of the master key change process, an SMF record will now be written every time the new master key is promoted to the current master key as part of the change master key ceremony.
- A health check that verifies a system's ability to use the NIST recommended PSS signature algorithms. It is not obvious that the ECC master key is required when generating and using RSA keys enabled for PSS signatures, so a health check will help clients understand the need for this additional master key so they can begin to exploit the recommended algorithms.
- New quantum safe algorithms for sign and verify operations. With this release of ICSF, it is now possible to use quantum safe encryption algorithms for digital signature operations, which also includes the ability to generate and store new keys. These algorithms will be clear key only and available via the PKCS #11 interfaces.
- Support for CCA Release 5.5 and CCA Release 6.3 including:

- o New services in support of ANSI TR-34 Remote Key Loading.
- o PCI HSM Compliance for AES and RSA keys.
- o Additional AES based financial services.
- o Note: These functions were made available on ICSF FMD HCR77D0 with PTFs for APAR OA57089.

Crypto Support in z/OS Releases

Your ICSF upgrade actions depend on where you are coming from, and where you are going…

Release — Level Integrated and Available

Release	Level Integrated and Available
z/OS V2R4	ICSF FMID HCR77D0 is incorporated. • Cryptographic Support for z/OS V2R2-V2R4 Web deliverable (FMID HCR77D1) available 9/2019.
z/OS V2R3	ICSF FMID HCR77C0 is incorporated. • Cryptographic Support for z/OS V2R2-V2R4 Web deliverable (FMID HCR77D1) available 9/2019. • Cryptographic Support for z/OS V2R1-V2R3 Web deliverable (FMID HCR77D0) available 12/2018. • Cryptographic Support for z/OS V2R1-V2R3 Web deliverable (FMID HCR77C1) available 9/2017.
z/OS V2R2	ICSF FMID HCR77B0 is incorporated. • Cryptographic Support for z/OS V2R2-V2R4 Web deliverable (FMID HCR77D1) available 9/2019. • Cryptographic Support for z/OS V2R1-V2R3 Web deliverable (FMID HCR77D0) available 12/2018. • Cryptographic Support for z/OS V2R1-V2R3 Web deliverable (FMID HCR77C1) available 9/2017. • Cryptographic Support for z/OS V2R1-V2R2 Web deliverable (FMID HCR77C0) available 10/2016. • Cryptographic Support for z/OS V1R13-V2R2 Web deliverable (FMID HCR77B1) available 11/2015.

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z/OS ICSF Release Levels

The support for cryptography (z/OS base element ICSF) has been delivered via Web deliverables and release incorporations over the years.

z/OS Releases and Crypto Web Deliverables		
Deliverable	**General availability**	**Delivery method**
z/OS V2R1, FMID HCR77A0 Incorporated	September 30, 2013	New release of products
Cryptographic Support for z/OS V1R13-V2R1 (FMID HCR77A1)	September 20, 2013	Web deliverable
Enhanced Cryptographic Support for z/OS V1.13–V2.1 (FMID HCR77B0)	February 2015	Web deliverable
Cryptographic Support for z/OS V1R13-V2R2 (FMID HCR77B1)	November 2015	Web deliverable
Cryptographic Support for z/OS V2R1-V2R2 (FMID HCR77C0)	October 2016	Web deliverable
Cryptographic Support for z/OS V2R1-V2R3 (FMID HCR77C1)	September 2017	Web deliverable
z/OS V2R2, FMID HCR77B0 Incorporated	September 30, 2015	New release of products
Cryptographic Support for z/OS V1R13-V2R2 (FMID HCR77B1)	November 2015	Web deliverable
Cryptographic Support for z/OS V2R1-V2R2 (FMID HCR77C0)	October 2016	Web deliverable

Cryptographic Support for z/OS V2R1-V2R3 (FMID HCR77C1)	September 2017	Web deliverable
Cryptographic Support for z/OS V2R2-V2R3 (FMID HCR77D0)	December 2018	Web deliverable
Cryptographic Support for z/OS V2R2-V2R4 (FMID HCR77D1)	September 2019	Web deliverable
z/OS V2R3, FMID HCR77C0 Incorporated	September 29, 2017	New release of products
Cryptographic Support for z/OS V2R1-V2R3 (FMID HCR77C1)	September 2017	Web deliverable
Cryptographic Support for z/OS V2R2-V2R3 (FMID HCR77D0)	December 2018	Web deliverable
Cryptographic Support for z/OS V2R2-V2R4 (FMID HCR77D1)	September 2019	Web deliverable
z/OS V2R4, FMID HCR77D0 Incorporated	Planned for September 2019	New release of products
Cryptographic Support for z/OS V2R2-V2R4 (FMID HCR77D1)	September 2019	Web deliverable

Refer to this technote: http://www.ibm.com/support/techdocs/atsmastr.nsf/WebIndex/TD103782 for a complete history of ICSF deliverables, and functions contained in those deliverables.

Some orderable no-charge products (with z/OS V2.4, 5650-ZOS)

- *XML Toolkit for z/OS V1 R10 (5655-J51, 5655-I30)*

- *IBM 31-bit SDK for z/OS V8 (5655-DGG, 5655-I48)*

- *IBM 64-bit SDK for z/OS V8 (5655-DGH , 5655-I48)***
- ** *prereq for z/OS V2.4 z/OSMF*

- *SDK for Node.js V8– zOS (5655-DKN, 5655-SDS)*

No longer orderable. End of Service Sept 30, 2019:
IBM 64-bit SDK for z/OS V7.0 (5655-W44 , 5655-I48)
IBM 31-bit SDK for z/OS V7.0 (5655-W43, 5655-I48)
End of Service planned for April 30, 2022:
IBM 64-bit SDK for z/OS V7.1 (5655-W44 , 5655-I48)
IBM 31-bit SDK for z/OS V7.1 (5655-W43, 5655-I48)

By the way, ordering via "Standalone Product" path (not CBPDO or ServerPac) is no longer an option. Use Product ServerPac instead of CBPDO!

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XML Toolkit for z/OS Version 1 Release 10 (5655-J51, 5655-I30)
The XML Parser, C++ Edition has been updated with the following support:
- Ability to optionally utilize z/OS XML System Services (z/OS XML) as an underlying parsing technology when performing DOM (Document Object Model) and SAX2 (Simple API for XML) based parsing operations. Support is provided for both non-validating parsing as well as validating parsing utilizing schema based on the W3C Schema recommendation. This enhancement is provided by way of a set of new z/OS-specific parser C++ classes that are similiar in name to and closely mimic the existing DOM and SAX2 interfaces. Utilizing z/OS XML provides redirection to zAAP specialty processors of the portion of the XML parsing operation performed by z/OS XML and may result in significant improved raw performance as well.
- A new feature that supports importing multiple schemas with the same namespace.
- Improved source offset support, enhancing the ability to obtain information that correlates parsed output with the associated data in the input document being parsed. This new support is included in the new z/OS-specific

IBM 31-bit SDK for z/OS V8 (5655-DFH, 5655-I48) available March 6, 2015
The 31-bit SDK for z/OS Version8 has been enhanced to:
- Deliver a comprehensive Java SDK at the SE level 8 for the IBM(R) z/OS platform
- Include the enhancements to z/OS Java unique security and JZOS functionality
- Exploit new capabilities available with z/OS V2.1 and V2.2, as announced in Software Announcement 215-006, dated January 14, 2015,and IBM z SystemsTM z13TM, as announced in Hardware Announcement 115-001, dated January 14, 2015.
- Provide improved performance using the Data Access Accelerator API for processing native data records and types directly from Java code
- Provide enhanced monitoring and diagnostics
- Contain the JZOS and z/OS unique security enhancements of previous z/OS Java SDK products.

IBM 64-bit SDK for z/OS V8 (5655-DGG, 5655-I48) available March 3, 2015

The 64-bit SDK for z/OS Version 8 has been enhanced to (similar to the 31-bit SDK V8):
- Deliver a comprehensive Java SDK at the SE 8 level for the IBM(R) z/OS platform
- Include the enhancements to z/OS Java unique security and JZOS functionality
- Exploit new capabilities available with z/OS V21. and V2.2, as announced in Software Announcement 215-006, dated January 14, 2015,and IBM z Systems z13, as announced in Hardware Announcement 115-001, dated January 14, 2015.
- Provide improved performance using the Data Access Accelerator API for processing native data records and types directly from Java code
- Provide enhanced monitoring and diagnostics
- Contain the JZOS and z/OS unique security enhancements of previous z/OS Java SDK products.

IBM SDK for Node.js - z/OS V8.0.0 (5655-DKN, 5655-SDS) available June 14, 2019

Node.js is one of the fastest growing language runtimes in the market with a large open source community. Available and supported on z/OS, IBM SDK for Node.js - z/OS provides extra security and performance by leveraging the capabilities of IBM Z.

SDK for Node.js - z/OS, V8.0 is the follow-on product to SDK for Node.js - z/OS, V6.0. SDK for Node.js - z/OS, V8.0 is upgraded to the open source Node.js V8.0 level and includes performance improvements and additional features.

SDK for Node.js - z/OS can take advantage of the colocation of your data and existing applications on IBM Z to significantly increase throughput and reduce response time. You can control which data will be exposed externally, while keeping all confidential data secure inside the Z platform.

The IBM Z stack is designed with large I/O capacity to support high volumes of transactions. Node.js applications on z/OS exploit the underlying asynchronous I/O support in z/OS and Z hardware, to scale to thousands of connections with minimal overhead. New in SDK for Node.js - z/OS, V8, application developers can leverage the C++ compiler with EBCDIC and ASCII execution character sets shipped with Node.js V8 to build optimized native npm add-ons.

End of Service Dates for Older IBM XML and Java SDK levels:

- **XML V1R9** was out of service on September 30, 2013.

- **IBM 64-bit SDK for z/OS, Java 2 Technology Edition, V1 Release 4 (5655-I56):** was out of service as of September 30, 2008.

- **IBM 31-bit SDK for z/OS, Java 2 Technology Edition, V1 Release 4 (5655-M30):** was out of service as of September 30, 2011. z/OS R11 was the last release for which IBM SDK V1R4 support was available.

- **IBM 64-bit SDK for z/OS, Java 2 Technology Edition, V5 Release 0 (5655-N99):** was out of service as of September 30, 2013.

- **IBM 31-bit SDK for z/OS, Java 2 Technology Edition, V5 Release 0 (5655-N98):** was out of service as of September 30, 2013.

- **IBM 64-bit SDK for z/OS V6 Release 0 (5655-R32):** was out of service as of September 30, 2018.

- **IBM 31-bit SDK for z/OS V6 Release 0 (5655-R31):** was out of service as of September 30, 2018.

- **IBM 64-bit SDK for z/OS V7 Release 0 (5655-W44):** has announced to be end of service as of September 30, 2019.

- **IBM 31-bit SDK for z/OS V7 Release 0 (5655-W43):** has announced to be end of service as of September 30, 2019.

- **IBM 64-bit SDK for z/OS V7 Release 1 (5655-W44):** has announced to be end of service as of April 30, 2022.

- **IBM 31-bit SDK for z/OS V7 Release 1 (5655-W43):** has announced to be end of service as of April 30, 2022.

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z/OS Service Policy

• **Priced service extensions available for older releases:**
  • V2R1: Contact your IBM rep.
• **With the V2 release cycle, IBM plans to provide 5 years of z/OS support, with 3 years of optional extended service (5+3).**

	GA Date	End of Service Date
z/OS V2R1	30 Sept 2013	Announced to be Sept 2018 (5 years!) **Contact your IBM rep.**
z/OS V2R2	30 Sept 2015	Announced to be Sept 2020 (5 years!)
z/OS V2R3	29 Sept 2017	Planned to be Sept 2022 (5 years!)
z/OS V2R4	Planned for Sept 2019	Planned to be Sept 2024 (5 years!)

One year!

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Service Policy

With the two-year z/OS release frequency, the z/OS support policy is five years of z/OS support, with three years of optional extended service (5+3).

Prior to withdrawing service for any version or release of z/OS or z/OSMF, IBM intends to provide at least 12 months notice. The service policy for z/OS also applies to any enhancements (including but not limited to web deliverables), such as the RSM Enablement Offering for z/OS R13 which was provided for z/OS R13.

See the table below for expiration dates for service support.

Version and release	General availability (GA)	End of service (EOS)
OS/390 V2R8	24 September 1999	Occurred 30 September 2002
OS/390 V2R9	31 March 2000	Occurred 31 March 2003
OS/390 V2R10	29 September 2000	Occurred 30 September 2004
z/OS V1R1	30 March 2001	Occurred 31 March 2004
z/OS V1R2	26 October 2001	Occurred 31 October 2004
z/OS V1R3	29 March 2002	Occurred 31 March 2005
z/OS V1R4	27 September 2002	Occurred on 31 March 2007
z/OS V1R5	26 March 2004	Occurred on 31 March 2007
z/OS V1R6	24 September 2004	Occurred on 30 September 2007
z/OS V1R7	30 September 2005	Occurred on 30 September 2008 * ***The "z/OS V1.7 Lifecycle Extended Service" offering expired on 30 September 2010.** If you require support for defects for z/OS V1R7 beyond September 2010, contact an IBM representative for a special bid.
z/OS V1R8	29 September 2006	Occurred 30 September 2009 * ***The "z/OS V1.8 Lifecycle Extended Service" offering expired on 30 September 2011.** If you require support

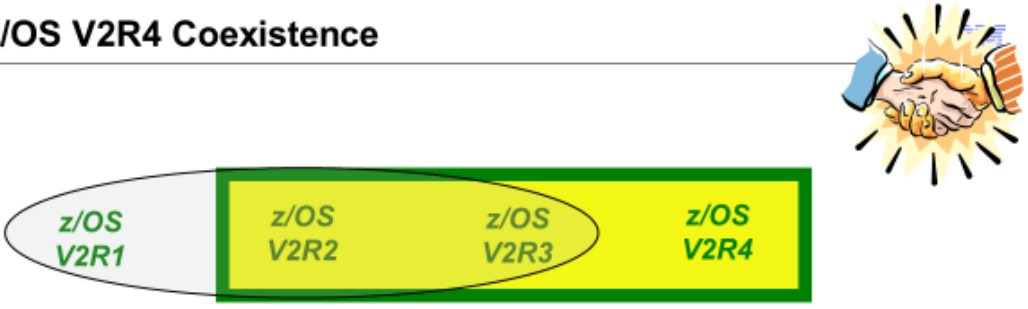|		
		for defects for z/OS V1R8 beyond September 2011, contact an IBM representative for a special bid.
z/OS V1R9	**28 September 2007**	**Occurred 30 September 2010 *** ***The "z/OS V1.9 Lifecycle Extended Service" offering expired on 30 September 2012.** If you require support for defects for z/OS V1R9 beyond September 2012, contact an IBM representative for a special bid.
z/OS V1R10	**26 September 2008**	**Occurred 30 September 2011 *** ***The "z/OS V1.10 Lifecycle Extended Service" offering expired on 30 September 2013.** If you require support for defects for z/OS V1R10 beyond September 2013, contact an IBM representative for a special bid.
z/OS V1R11	**25 September 2009**	**Occurred 30 September 2012 *** ***See "z/OS V1.11 Lifecycle Extended Service" below for a fee-based accommodation, through 30 September 2014.** ***See "IBM Software Support Services for z/OS V1.11" below for a fee-based accommodation, through 30 September 2016.**
z/OS V1R12	**24 September 2010**	**Occurred 30 September 2014** ***See "IBM Software Support Services for z/OS V1.12" below for a fee-based accommodation, through 30 September 2017**
z/OS V1R13	**30 September 2011**	**Occurred 30 September 2016**
z/OS V2R1	**30 September 2013**	**Occurred 28 September 2018**
z/OS V2R2	**30 September 2015**	**Announced for September 2020**
z/OS V2R3	**29 September 2017**	**Planned for September 2022**
z/OS V2R4	**Planned for September 2019**	**Planned for September 2024**

IBM Software Support Services for z/OS V1.13 – starting October 1, 2016
If you wish to purchase extended service on z/OS V1R13, contact your IBM representative.

IBM Software Support Services for z/OS V2.1 – starting September 29, 2018
If you wish to purchase extended service on z/OS V2R1, contact your IBM representative.

z/OS V2R4 Coexistence

z/OS
V2R1

z/OS
V2R2

z/OS
V2R3

z/OS
V2R4

- **With two year release frequency, <u>three consecutive releases for coexistence remains</u>.**

- **z/OS V2R1, z/OS V2R2, and z/OS V2R3 are supported for coexistence, upgrade, and fallback.**

- **z/OS V2R2, z/OS V2R3, and z/OS V2R4 are supported for coexistence, upgrade, and fallback.**
  - If you are running z/OS V2R1 and would like coexistence support, plan for a upgrade to z/OS V2R3.

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z/OS 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).

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 VSE/ESA, VM/ESA, or z/VM in an LPAR or as a VM guest.

z/OS systems can coexist with specific prior releases. This is important because it gives you flexibility to migrate systems in a multisystem configuration using rolling IPLs rather than requiring a systems-wide IPL. The way in which you make it possible for earlier-level systems to coexist with z/OS is to install coexistence service (PTFs) on the earlier-level systems.

You should complete the upgrade of all earlier-level coexisting systems 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're migrating falls is supported for coexistence, fallback, and upgrade with the releases running on the other systems.

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

Even when you're 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 V2R2 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.

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 V2R4 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 V2R4 systems, as fallback maintenance is not available in these cases. You should consult the appropriate element or feature documentation to determine the requirements for using a particular new function.

Which releases are supported for coexistence, fallback, and upgrade?
- IBM plans to continue to support an n-2 (three consecutive release) coexistence, fallback, and upgrade policy.
- Do note that with the two-year release cycle that z/OS support is intended for five years with three optional extended service years (5+3). You should plan on completing your upgrade plans during the period of time while your older z/OS release is still in service.
- **Starting with z/OS R6, IBM has aligned the coexistence, fallback, and upgrade policy with the service policy.** IBM intends to continue with the practice of providing coexistence, fallback, and policy support for those releases which are still in support. **As a general rule, this means that three z/OS and**

 Thus, **z/OS V2R3 is coexistence, fallback, and upgrade supported with the following two z/OS releases: V2R1 and V2R2.** This means that:

- Coexistence of a V2R3 system with a V2R1 or V2R2 system is supported.

- Fallback *from* V2R3 *to* V2R1 or V2R2 is supported.

- Upgrade *to* V2R3 *from* V2R1 or V2R2 is supported

z/OS V2R4 is coexistence, fallback, and upgrade supported with the following two z/OS releases: V2R2 and V2R3. This means that:

- Coexistence of a V2R4 system with a V2R2 or V2R3 system is supported.

- Fallback *from* V2R4 *to* V2R2 or V2R3 is supported.

- Upgrade *to* V2R4 *from* V2R2 or V2R3 is supported

The z/OS coexistence, fallback, and upgrade 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 integration testing and will provide service as necessary to support the z/OS coexistence, fallback, and upgrade policy.

See the table below for a summary of current and planned coexistence, fallback, and upgrade support. These statements represent IBM's current intentions. IBM reserves the right to change or alter the coexistence, fallback, and upgrade 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.
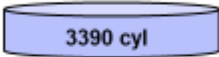
Releases that are coexistence, fallback, and upgrade supported as of z/OS R10

z/OS release	Releases that are coexistence, fallback, and upgrade supported with the release in column	Explanation
R10	R10, R9, R8	General availability of R10 was September 26, 2008. R8 is the oldest release that is service supported at that time and therefore the oldest release that is coexistence, fallback, and upgrade supported with R10.
R11	R11, R10, R9	General availability of R11 was September 25, 2009. R9 is the oldest release that is service supported at that time and therefore the oldest release that is coexistence, fallback, and upgrade supported with R11.
R12	R12, R11, R10	General availability of R12 was September 24, 2010. R10 is the oldest release that is service supported at that time and therefore the oldest release that is coexistence, fallback, and upgrade supported with R12.
R13	R13, R12, R11	General availability for R13 was September 30, 2011. R11 is the oldest release that is service supported at that time and therefore the oldest release that is coexistence, fallback, and upgrade supported with R13.
V2R1	V2R1, R13, R12	General availability for V2R1 was September 30, 2013. R12 is the oldest release that is service supported at that time and therefore the oldest release that is coexistence, fallback, and upgrade supported with V2R1.
V2R2	V2R2, V2R1, R13	General availability for V2R2 was September 30, 2015. R13 is the oldest release that is service supported at that time and therefore the oldest release that is coexistence, fallback, and upgrade supported with V2R2.
V2R3	V2R3, V2R2, V2R1	General availability for V2R3 was September 29, 2017. V2R1 is the oldest release that is service supported at that time and therefore the oldest release that is coexistence, fallback, and upgrade supported with V2R3.
V2R4	V2R4, V2R3, V2R2	General availability for V2R4 is planned for September 2019. V2R2 is the oldest release that is service supported at that time and therefore the oldest release that is coexistence, fallback, and upgrade supported with V2R4.

Positioning for z/OS V2.4

- **Read Documentation and PSP buckets**
  - *z/OS V2.4 Upgrade Workflow* and *z/OS V2.4 Planning for Installation*
  - Software PSP buckets: ZOSV2R4: ZOSGEN, SERVERPAC, ...
- Approximate **DASD Storage Requirements for z/OS V2.4 (8/2019)**:

3390 cyl	z/OS V2R2	z/OS V2R3	z/OS V2R4
Target libraries (PDS and PDSE)	11,169	11,572	10,944
DLIB	16,746	16,949	19,255
Root file system	5,200 (HFS) 5,219 (zFS)	5,120 (HFS) 5,132 (zFS)	4,980 (HFS) 4,990 (zFS)
Font file system	2,048 (HFS or zFS)	2,342 (HFS or zFS)	2,800 (HFS or zFS)
Liberty file system	n/a	2,400 (HFS or zFS)	2,400 (HFS or zFS)
zCX (z/OS Container Extensions) file system	n/a	n/a	5,250 (HFS or zFS)

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Positioning for z/OS V2.4

- **Ensuring System Requirements Are Satisfied**
  - *Driving System Requirements*
    - Requirements to install z/OS V2.4.
    - Old news: Any coexisting system level suffices.
    - *Ready for the future??* z/OSMF will be a driving system requirement for the new z/OS installation strategy when ServerPac is installed with z/OSMF!

  - *Target System Requirements*
    - Product requirements for running on z/OS V2.4
    - Hardware and Software

  - *Coexistence System Requirements*
    - Allows z/OS V2.4 to coexist with other z/OS systems

- **Upgrade Actions You Can Do <u>NOW</u>**

- **Using Programmatic Assistance – Health Checks and Workflow**

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z/OS Documentation: Where to Start
To gain an overview of z/OS and plan for the installation, review:
- *z/OS V2R4 Upgrade* Workflow
- *z/OS V2R4 Planning for Installation*
- *zSeries Platform Test Report for z/OS and Linux Virtual Servers* (formerly, the *z/OS Parallel Sysplex Test Report*)
- *z/OS V2 R4 Introduction and Release Guide* - great for finding new functions in a release to exploit!

To install z/OS, review Preventive Service Planning (PSP) Buckets for:
- ServerPac (if using ServerPac to install)
- z/OS and individual elements (including ZOSGEN, which helps you with general z/OS level information)
- Hardware, if you will using specific HW functions or upgrading your server

In addition, to install z/OS using ServerPac, review:
- *ServerPac: Using the Installation Dialog (SC28-1244)*
- The custom-built installation guide, *ServerPac: Installing Your Order*

To install z/OS using CBPDO, review the *z/OS Program Directory.*

PSP Buckets
z/OS, and most products that run on it, provide files containing information that became available after the product documents were printed. Kept on IBM's RETAIN system and also available using IBMLink, these files are called preventive service planning (PSP) "buckets", or just "PSPs". 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, refer to *z/OS Program Directory*. 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).

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. Use the PSP Web site (http://www14.software.ibm.com/webapp/set2/psearch/search?domain=psp) for the contents of the buckets.

The upgrade for the z/OS V2.4 PSP bucket is ZOSV2R4. Recognizing that there are many PSP buckets to review, z/OS uses descriptive element names, instead of FMIDs for the subsets. This reduces the number of PSP buckets that must be reviewed, since most elements are composed of multiple FMIDs. There are subsets in the ZOSV2R4 upgrade for general topics (ZOSGEN), and for the ServerPac deliverable (SERVERPAC) that should be reviewed also. DFSMS is consolidated into one subset. All PSP upgrades and subset IDs are listed in the *z/OS Program Directory*. However, the non-exclusive elements' stand-alone product upgrade and subsets are used.

Hardware PSP upgrade identifiers
Hardware PSP bucket upgrade IDs are in the form xxxxDEVICE and contain the latest software dependencies for the hardware, and recommended PTFs and APARs required for specific processor models. The PSP hardware upgrade identifiers are:
- 3907DEVICE for the z14 ZR1 server.
  - The FIXCAT names are IBM.Device.Server.z14ZR1-3907.RequiredService, IBM.Device.Server. z14ZR1-3907.Exploitation, and IBM.Device.Server. z14ZR1-3907.RecommendedService.
- 3906DEVICE for the z14 server.
  - The FIXCAT names are IBM.Device.Server.z14-3906.RequiredService, IBM.Device.Server. z14-3906.Exploitation, and IBM.Device.Server. z14-3906.RecommendedService.
- 2965DEVICE for the z13s server.
  - The FIXCAT names are IBM.Device.Server.z13S-2965.RequiredService, IBM.Device.Server.z13s-2965.Exploitation, and IBM.Device.Server.z13s-2966.RecommendedService.
- 2964DEVICE for the z13 server.
  - The FIXCAT names are IBM.Device.Server.z13-2964.RequiredService, IBM.Device.Server.z13-2964.Exploitation, and IBM.Device.Server.z13-2964.RecommendedService.
- 2828DEVICE for the zBC12 server.

- o   The FIXCAT name is IBM.Device.Server.zBC12-2828.
- 2827DEVICE for the zEC12 server.
  - o   The FIXCAT name is IBM.Device.Server.zEC12-2827.

Specific functions for each server also have corresponding FIXCATs.

Verifying the PTFs in the PSP buckets are installed
- To simplify finding the appropriate PSP bucket and identifying which PTFs listed in the PSP bucket need to be installed on your system, use the SMP/E REPORT MISSINGFIX command in conjunction with the FIXCAT type of HOLDDATA. For complete information about the REPORT MISSINGFIX command, see *SMP/E Commands*. For a description of what FIXCATs are available, go to http://www.ibm.com/systems/z/os/zos/smpe/ and click on **"**Guide to fix category values and descriptions**".**

DASD Storage Requirements
Keep in mind the DASD required for your z/OS system includes all z/OS elements (per the z/OS Policy). That is, it includes ALL elements, ALL features that support dynamic enablement, regardless of your order, and ALL unpriced features that you ordered. This storage is in addition to the storage required by other products you might have installed. All sizes include 15% freespace to accommodate the installation of maintenance.

The estimated total storage required for z/OS V2.4 data sets is provided below. If you add other products to your z/OS V2.4 ServerPac, you will need additional space for those other products.

For z/OS V2R4 (as of September 2017):

- The total storage required for all the target data sets is approximately 10,944 cylinders on a 3390 device. **This total size exceeds the space on a 3390-9.**

- The total storage required for all the distribution data sets is approximately 19,255 cylinders on a 3390 device.

- The total executable root file system storage is approximately at 4,990 cylinders on a 3390 device when it is an HFS and 4,980 when it is a zFS. Use IBM Health Checker for z/OS check ZOSMIGREC_ROOT_FS_SIZE to determine whether a volume has enough space for the z/OS version root file system, available back to z/OS R9 in APARs OA28684 and OA28631.

- z/OS V2.1 introduced the z/OS Font Collection base element. This element installs into a separate file system (the "font file system"). You may choose to merge the font file system and root file system if you desire. ServerPac will provide you this file system. The total font file system storage is estimated at 5,500 cylinders on a 3390 device when it is an HFS or a zFS.

- z/OS V2.3 introduces the IBM z/OS Liberty Embedded base element. This element installs into a separate file system (the "Liberty file system"). IBM recommends that you keep the Liberty file system separate from other file systems in case of space fluctuations. ServerPac will provide you this file system. The total Liberty file system storage is estimated at 2,400 cylinders on a 3390 device when it is an HFS or a zFS.

- z/OS V2.4 introduces the IBM Container Extensions (zCx) base element. This element installs into a separate file system (the "zCX file system"). IBM recommends that you keep the zCX file system separate from other file systems in case of space fluctuations. ServerPac will provide you this file system. The total xCX file system storage is estimated at 5,250 cylinders on a 3390 device when it is an HFS or a zFS.

- For configuration and execution, additional file system space is needed:
  - You will need 50 cylinders for the /etc file system (either HFS or zFS).
  - For the CIM element, the space required for the /var VARWBEM file system is 94 cylinders primary, 10 cylinders secondary (either HFS or zFS).
  - For Predictive Failure analysis, a separate file system, either HFS or zFS, is created and mounted at mountpoint the /var/pfa. The total space required for zFS or HFS is 300 cylinders primary; 50 cylinders secondary.

- For z/OSMF additional file system space is needed for the repositories. Refer to your ServerPac installation or sample jobs provided.

z/OS Driving System Requirements

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.

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* on the driving system before you IPL the target system. If you don't install the coexistence service, you will probably experience problems due to incompatible data structures (such as incompatible data sets, VTOCs, catalog records, GRS tokens, or APPC bind mappings).

Customized Offerings Driver (5751-COD)

The Customized Offerings Driver V3.1 (5751-COD) is an entitled driving system you can use if:
- you don't have an existing system to use as a driving system, or
- your existing system does not meet driving system requirements and you don't want to upgrade it to meet those requirements.

This driver is currently a subset of a z/OS V2R2 system (with the level of SMP/E at V3R6).

The Customized Offerings Driver requires three DASD volumes configured as 3390-9, or larger; a non-Systems Network Architecture (SNA) terminal used for a z/OS MVS™ system console; and a locally attached SNA terminal for a Time Sharing Option Extended (TSO/E) session. Also, if you select tape media, a tape drive that can read 3590 or 3592 tape is required. The Customized Offerings Driver can also be ordered on DVDs, which removes the requirement for a tape drive.

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.

As of z/OS V2R2, the Customized Offerings Driver Installation Guide is no longer shipped in hardcopy format. Instead, this publication is shipped in PDF format on a separate DVD.

The Customized Offerings Driver includes a zFS 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.

Identifying Driving System Software Requirements for ServerPac for z/OS V2R4

Driving system requirements for installing z/OS V2R3 by way of ServerPac or dump-by-data-set SystemPac are:

- *An operating system:* Use either of the following:
  - A supported z/OS release (V2R2 or later), or
  - The Customized Offerings Driver V3 (5751-COD).

- *A terminal:* A locally-attached or network-attached terminal that can be used to establish a TSO/E session on the IPLed system is required.

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

- Proper security:
  - 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 FACILITY class.
  - 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.)
  - ☐ 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 HFS data sets 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*. Other sources of information are 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.)

- *Language Environment run-time options:*   As of z/OS R7, ServerPac requires that the following Language environment run-time options are **not** specified as nonoverrideable (NONOVR) in the CEEDOPT CSECT: ALL31, ANYHEAP, BELOWHEAP, DEPTHCONDLIMIT, ERRCOUNT, HEAP, HEAPCHK, HEAPPOOLS, INTERRUPT, LIBSTACK, PLITASKCOUNT, STACK, STORAGE, THREADHEAP, and THREADSTACK .

- *Language Environment:* 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.

- *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.

- *SMS active:* The Storage Management Subsystem (SMS) must be active to allocate HFS and PDSE data sets, whether they are SMS-managed or non-SMS-managed. Also, the use of HFS data sets is supported only when SMS is active in at least a null configuration, even when the data sets are not SMS-managed. Do either of the following:
  - ☐ To allocate non-SMS-managed HFS 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 HFS 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 PDSE and HFS data sets with the names in the ALLOCDS job. You must also activate SMS on the target system.
  - • Note that ServerPac supports extended format and extended addressability for zFS data sets. For any zFS data sets that exceed the 4 GB size limit, you must define an SMS Data Class with extended format and extended addressability. Doing so will require that you specify an SMS Data Class name (defined with extended format and extended addressability) in the CustomPac Installation dialog. For information about providing the Data Class information, see *ServerPac: Using the Installation Dialog*.

- *SMP/E ++JARUPD Support:* If your ServerPac order contains any product that uses the ++JARUPD support introduced in SMP/E V3R2, then your driving system will require IBM SDK for z/OS, Java 2 Technology Edition.

- *zFS configuration requirements (optional):* If you will specify that you will use a zFS for ServerPac 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*.

If you intend to receive your order using Secure FTP (FTPS):
- SMP/E V3R6 or higher

- ICSF configured and active or IBM 31-bit SDK for z/OS, Java Technology Edition V6.0 (5655-R31), or IBM 64-bit SDK for z/OS, Java Technology Edition V6.0 (5655-R32), or higher installed, which enables SMP/E to calculate SHA-1 hash values to verify the integrity of data being transmitted. If ICSF is not configured and active, SMP/E will use its Java application class instead for calculating the SHA-1 hash values. 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*).
- 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 through a local firewall, you must identify these commands for later use in the CustomPac Installation Dialog, which manages the download of your order.
- Ensure that the Root 2 - GeoTrust Global CA Certificate is connected to your security manager keyring and trusted on your system, and that the user ID that executes SMP/E is authorized to use the keyring.
- Ensure that your FTP.DATA data set statements used in the RECEIVE job 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 security manager keyring file specified by the KEYRING statement in the FTP.DATA file might require certificates to be added. For details about specifying FTP.DATA statements, see *z/OS Network File System Guide and Reference*.

If you intend to download your order using HTTP Secure (HTTPS):
- SMP/E V3R6 with PTFs UO01693 (Base), UO01695 (Japanese), and UO01741 (Base) or higher
  - SMP/E uses the services of IBM 31-bit SDK for z/OS Java Technology Edition V6.0 (5655-R31), or IBM 64-bit SDK for z/OS Java Technology Edition V6.0 (5655-R32) or higher.
- 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.
- Proper level of CustomPac Installation Dialog to support HTTPS downloads. The CustomPac Installation Dialog must be at a level of 26.20.00 or higher. For further details see "Updating Your Dialogs" and "required migration step" in *ServerPac: Using the Installation Dialog*.
- HTTP or SOCKS Proxy Server configuration. If your enterprise requires specific commands to allow the download of your order through an HTTP or SOCKS Proxy Server, you must identify these commands for later use in the CustomPac Installation Dialog, which manages the download of your order.
- Ensure that the Root 2 - GeoTrust Global CA Certificate is connected to your security manager keyring or stored in your default Java keystore file and trusted on your system, and that the user ID that executes SMP/E is authorized to use the keyring or default Java keystore file.
- For instructions on how to set up and verify that your system can connect to the IBM download servers, see the Connectivity Test for SW Download Readiness web site.
- For more information about how to set up FTPS or HTTPS, see *SMP/E for z/OS User's Guide*.

If you intend to receive your order by way of DVD, you need the following:
- Order available on z/OS host system. To make the order available on your z/OS host system, upload the order to the z/OS host from the DVD(s). Refer to readme.pdf on the first DVD to find the various methods for making your order available on your z/OS host system.
- Space requirements on z/OS. Ensure you have the required space on your z/OS host system. To get the actual size of the order, refer to dialog.txt on the first DVD.
- Space requirements on a workstation. If you chose to copy your order from the DVD(s) to a workstation before uploading the contents to your z/OS host system, ensure you have the required space available on your workstation.

- *Proper level for service:* In order for you to install service on the target system that you're building, your driving system must minimally meet the driving system requirements for CBPDO Wave 1 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 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 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.

Target System HW Requirements for z/OS V2R4

- **Hardware Requirements**

  - Processor Requirements for z/OS V2.4:

    - IBM System z server: **z15, z14, z14 ZR1, z13, z13s, zEC12, and zBC12**.

  - Minimum Memory Requirements as of z/OS V2R3 on z14:

    - As of z/OS V2.3 on z14 "native": **8 GB** of memory
      - < 8GB : WTOR in which your reply indicates you know that running less than the minimum might impact availability.
    - As of z/OS V2.3 on z14 "guest" or with zPDT: **2 GB** of memory
      - < 2GB : WTOR in which your reply indicates you know that running less than the minimum might impact availability.
    - Health Check on V2.1+ to warn you that the minimum hasn't been met today.
    - WTOR is IAR057D LESS THAN *8* GB OF REAL STORAGE IMPACTS SYSTEM AVAILABILITY – ADD STORAGE OR REPLY C TO CONTINUE.

  - z/VM level: If you will be running IBM z/OS V2.4 on IBM z/VM, the z/VM release must be z/VM 6.4, or later.

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Target System Hardware Requirements
The minimal hardware requirements for z/OS, as well as additional hardware needed by specific z/OS elements and features, are documented in *z/OS Planning for Installation*.

Identifying Processor Requirements
z/OS V2.4 supports these System z server models:
- IBM z15
- IBM z14 and z14 ZR1
- IBM z13 and z13s
- IBM zEnterprise zBC12 and zEC12

The following IBM System z servers, and earlier servers, are not supported with **z/OS V2.3** and later releases:
- IBM zEnterprise 196 (z196) and IBM zEnterprise 114 (z114)
- IBM System z10 EC and System z10 BC

Important: If you IPL z/OS on a server that it does not support, you might receive wait state 07B-1E (decimal 30). The number of IEA434I messages is limited to 32 during IPL/NIP to avoid exhausting initial ESQA. An IEA444I message will be reported one time during IPL/NIP to indicate that additional IEA434I messages have been suppressed: IEA444I NUMBER OF IEA434I MESSAGES EXCEEDS NIP MAXIMUM .

Identifying Minimum Storage Requirements as of z/OS V2.3

As of IBM z/OS V2.3 with IBM z14 (or z14 ZR1) will require a minimum of 8 GB of memory. When running as a z/VM guest or on a IBM System z Personal Development Tool, a minimum of 2 GB will be required. If the minimum is not met, a warning WTOR will be issued at IPL. Continuing with less than the minimum memory could impact availability. A migration health check has been introduced back to z/OS V2.1 with PTFs to warn you when an LPAR on a z14 or ZR1 system has been configured with less than 8 GB.

Identifying Coupling Facility Requirements

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

When you change coupling facility control code (CFCC) levels, your coupling facility structure sizes might change. If, as part of your upgrade to a z14 server, you change CFCC levels, you might have larger structure sizes than you did previously. If your CFCC levels are identical, structure sizes are not expected to change when you migrate from a previous server to a newer generation server.

In addition, similar to CF Level 17 and later, ensure that the CF LPAR has at least 512MB of storage.

CFCC Level 22, introduced on the z14, supports the Coupling Facility use of Large Memory to improve availability for larger CF cache structures and data sharing performance with larger DB2 Group Buffer Pools (GBP) with no DB2 supporting code required. This support removes inhibitors to using large CF cache structures, enabling use of Large Memory to appropriately scale to larger DB2 Local Buffer Pools (LBP) and Group Buffer Pools (GBP) in data sharing environments. If you are moving your coupling facilities and the coupling facility structures will be on higher CFCC levels than they were previously, run the Coupling Facility Structure Sizer (CFSIZER) tool to find out if you have to increase coupling facility structure sizes. Prepare to make the necessary changes to the CFCC level as indicated by the tool.
You can download the CFSIZER tool at Coupling Facility sizer (http://www.ibm.com/systems/support/z/cfsizer/).

Note: After you make a coupling facility available on the new hardware, you can run the Sizer utility, an authorized z/OS program, to evaluate structure size changes. The Sizer utility is distinct from CFSizer, and should be run after the new hardware (CFLEVEL) is installed, but before any CF LPAR on the new hardware is populated with structures. You can download the Sizer utility at http://www.ibm.com/systems/support/z/cfsizer/altsize.html.

- IBM z15 servers initially ship with CFCC level 24.
- IBM z14 ZR1 servers initially ship with CFCC level 23.
- IBM z14 servers initially ship with CFCC level 22.
- IBM z13s servers initially ship with CFCC level 21.
- IBM z13 servers initially ship with CFCC level 20.
- IBM zEnterprise zEC12 servers initially shipped with CFCC level 18. After Sept 2013, the zEC12 and zBC12 ship at CFCC level 19.

Identifying z/VM Requirements

If you will be running IBM z/OS V2.4 on IBM z/VM, the z/VM release must be z/VM 6.4, or later.

Software Requirements for z/OS V2R4
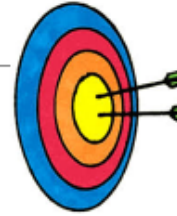
- **Software Requirements:**

  - **Coexistence Software** (on other z/OS systems)

  - **Target Software** (correct levels of IBM non-z/OS and non-IBM products on the z/OS system)
    - *Generally,* you may use the product levels on z/OS V2R4 from your prior system, as long as those product levels are still service-supported.
      - Note that CICS V5.2 is the minimum service-supported level.

    - Note, however, that if you are using any of the functions in *z/OS V2R4 Planning for Installation*, Appendix B, **verify that those functional requirements are satisfied.**

    - z/OS V2R4 has an *overall* dependency on IBM 64-bit SDK for z/OS V8 and IBM 31-bit SDK for z/OS V8.
      - For the specific Java dependencies for each element, see *z/OS V2R4 Planning for Installation*, Appendix B.

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Choosing ISV products that you want to run with z/OS V2.4

At the time of the presentation, the web page for ISVs supporting z/OS V2.4 was not available.

For a list of independent software vendors (ISVs) that support z/OS V2.3, a link is provided from this website http://www.ibm.com/systems/z/os/zos/features/software/isv230.html.

For a list of independent software vendors (ISVs) that support z/OS V2.2, a link is provided from this website http://www.ibm.com/systems/z/os/zos/features/software/isv220.html.

For a directory of IBM and IBM Business partners that provide z/OS applications, tools, and services, see the Global Solutions Directory: *http://www.ibm.com/software/solutions/isv*

Selected z/OS V2.4 SW Functional Requirements

Function	Minimum functional dependency
z/OSMF	IBM 64-bit SDK for z/OS, Java Technology Edition, V8 (5655-DGH)
BCP Predictive Failure Analysis (PFA)	IBM 31-bit SDK for z/OS, Java 2 Technology Edition, V8 (5655-DGG)
BCP Capacity Provisioning	IBM 31-Bit SDK for z/OS, Java 2 Technology Edition V8 (5655-DGG)
Knowledge Center for z/OS	IBM 64-bit SDK for z/OS, Java Technology Edition, V8 (5655-DGH)
IBM Application Performance Analyzer for z/OS	14.1 level at a minimum. Earlier levels of this product are not supported for use with z/OS V2.4
IBM Security zSecure™ products: • zSecure Admin (5655-N16) • zSecure Visual (5655-N20) • zSecure Audit (5655-N17). A subset of the zSecure Audit functions is contained in Adapters for QRadar® SIEM (5655-AD8). • zSecure Alert (5655-N21) • zSecure Command Verifier (5655-N19) • zSecure CICS Toolkit (5655-N18), which is installed on CICS.	2.4.0 level at a minimum. Earlier levels of this product are not supported for use with z/OS V2.4.

→ Use FIXCAT `IBM.TargetSystem-RequiredService.z/OS.V2R4`
→ Website http://www-306.ibm.com/software/support/lifecycle/ can be helpful.
→ Better! Use z/OSMF's Software Management report to help identify installed products that are approaching or are at EOS.

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Choosing IBM Products That You Want to Run with z/OS
You must determine the minimum product release levels and release levels for functional requirements. IBM middleware and application products require a specific level (version, release, or PTF) so that the products will run on z/OS V2R4. You cannot use the FIXCAT support to determine these _release_ levels. Instead, you can refer to _z/OS V2.4 Planning for Installation,_ Appendix B, for the 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 V2R2 or z/OS V2R3, you may generally use the product levels on z/OS V2R4 that you used on your prior z/OS release, as long as the product levels are still service-supported.
Note, however, that if you are using any of the functions in _z/OS V2.4 Planning for Installation,_ Appendix B, and those functions have dependencies on IBM middleware or application products, you must use the product levels shown (or later).

Many of these products can be ordered as part of your z/OS ServerPac order. Note that there may be differences between what is minimally service supported, what is minimally supported with z/OS V2R4, and what is currently orderable.

If you're upgrading to z/OS V2R4, you can find out which products have new levels by using Shopz and loading your current inventory to see what higher levels of products are orderable.

Tip! Finding End of Service Dates for IBM Products

A handy website for finding end of service dates for IBM products is *http://www.ibm.com/software/support/lifecycle/* .

An especially useful way of identifying if any of the products you are approaching or have met end of service is to use the z/OSMF Software Management application, and look at the End of Service report!

Target System PTF Verification for z/OS V2R4

1. RECEIVE the latest HOLDDATA. (If you pull HOLDDATA from the ftp website, make sure you use FULL!)

   - HOLDDATA is produced to associate a particular PTF with a minimum or functional level for z/OS V2R4.

```
++HOLD(HKDB520) FIXCAT FMID(HKDB530) REASON(AI97225)
RESOLVER(UI57539) CATEGORY(IBM.TargetSystem-
RequiredService.z/OS.V2R4) DATE(19088).
```

2. Run the REPORT MISSINGFIX command to see what is needed, but not yet installed.

```
SET BDY(GLOBAL).      /* Your Omegamon XE for Db2 V5.4 global */

REPORT MISSINGFIX ZONES(OMEGATGT)

FIXCAT(IBM.TargetSystem-RequiredService.z/OS.V2R4).
```

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Programmatic Help with Target System PTF Verification for z/OS V2.4

The IBM PTFs needed to support z/OS V2.4 are identified with a FIXCAT called **IBM.TargetSystem-RequiredService.z/OS.V2R4,** in Enhanced HOLDDATA. You must use the SMP/E REPORT MISSINGFIX command to help identify those PTFs on your current system which would be needed for your upgrade to z/OS V2R4. It is a good idea to periodically re-run the REPORT MISSINGFIX command to determine if any new PTFs have been identified that you are missing.

Coexistence System PTF Verification for z/OS V2R4 (IBM)

1. **RECEIVE the latest HOLDDATA. (If you pull HOLDDATA from the ftp website, make sure you use FULL!)**
   - **HOLDDATA is produced to associate a particular PTF as <u>coexistence</u> between z/OS V2R2 or V2R3, with z/OS V2R4.**

```
++HOLD(HDZ2230) FIXCAT FMID(HDZ2230) REASON(BA56627)
RESOLVER(UA98679) CATEGORY(IBM.Coexistence.z/OS.V2R4)
DATE(19058).
```

2. **Run the REPORT MISSINGFIX command to see what is needed, but not yet installed.**

```
SET BDY(GLOBAL).      /* Your z/OS V2R3 global */

REPORT MISSINGFIX ZONES(ZOS23T)

FIXCAT(IBM.Coexistence.z/OS.V2R4,

       IBM.Function.HealthChecker).
```
For the upgrade health checks ☺!

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Using FIXCAT for coexistence PTFs for z/OS V2R4

For coexistence verification for z/OS V2R4, the fix category of interest is **IBM.Coexistence.z/OS.V2R4**. You can use the FIXCAT of ++HOLD statement to identify APARs, their fix categories, and the PTF that resolves the APAR. Another fix category that is helpful when doing the coexistence verification is **IBM.Function.HealthChecker**, for verifying that you've got the latest migration IBM Health Checks for z/OS installed on your coexisting system.

When FIXCAT HOLDDATA statements are received into a global zone, SMP/E assigns the fix category values as sourceids to the PTFs that resolve the APARs. These sourceids then simplify selecting and installing required fixes. During APPLY and ACCEPT command processing you can specify the assigned sourceids on the SOURCEID and EXSRCID operands to select the SYSMODs associated with a particular fix category.

In addition, for the APPLY and ACCEPT commands you can specify which Fix Categories are of interest using the new FIXCAT operand. This tells SMP/E to process only FIXCAT HOLDDATA for the categories you specify, and all others are ignored.

Finally, SMP/E uses the FIXCAT HOLDDATA to identify what required fixes are missing. The REPORT MISSINGFIX command analyzes the FIXCAT HOLDDATA and determine which fixes (APARs) identified by the HOLDDATA are not yet installed. Only the fixes associated with the fix categories of interest to you, specified by you, are analyzed and identified. For example, you can identify only the missing fixes associated with a particular hardware device or coexistence for a specific new software release.

Note that you can use wildcards in the FIXCAT name in the REPORT MISSINGFIX command. For example, if you wanted to verify coexistence for z/OS V2R3 as well as z/OS V2R4 on your z/OS V2R2 system, your command could be:
REPORT MISSINGFIX ZONES(ZOSR21T) FIXCAT(IBM.Coexistence.z/OS.V2R*,
                IBM.Function.HealthChecker).
Do notice though, that z/OS V2.3 coexistence fixes have also been "backmarked" for z/OS V2.4 coexistence, so it is not necessary to specify interim z/OS releases for coexistence verification in the REPORT MISSINGFIX command.

Some Upgrade Tasks You Can Do NOW

1. **Transition off of removed functions and elements:**
   - <u>In V2.3:</u> Consoles shared mode, TCP/IP legacy devices, …
   - <u>In V2.4:</u> User key common storage. SMB, …
   - <u>Beyond V2.4:</u> HFS, JES3..
2. **Prepare for z/OSMF V2.4 starting at IPL in V2.3 – more in Part 2.**
3. **Prepare Driving and Target Systems:**
   - Driving systems – a supported z/OS system is required
   - Target systems -
     - HW: zEC12 or higher. z/OS V2.3 memory req on z14: 8GB "native".
     - SW: Java V8, other products
     - DASD storage for z/OS V2R4 – new zCX file system in V2.4
     - IBM product level research: FIXCAT **IBM.TargetSystem-RequiredService.z/OS.V2R4**
     - ISV research for z/OS V2R4
   - Coexisting systems - FIXCAT **IBM.Coexistence.z/OS.V2R4**
4. **Use IBM Health Checker for z/OS** FIXCAT **IBM.Function.HealthChecker**
   - Activate the Upgrade Health Checks (they are shipped INACTIVE).
5. **You need z/OSMF to use the z/OS V2.4 Upgrade Workflow.. No Book!**
6. **Perform z/OS V2R4 upgrade actions you can do NOW.**

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Prepare for your upgrade to z/OS V2.4!
In this presentation you've seen many things can you can do right now, on your current z/OS release to help make your z/OS V2R4 upgrade smooth. Listed above are a recap of the things that were shown in this presentation, but make sure you review the upgrade actions (and look at the z/OS Upgrade Workflow) so that you know a more complete upgrade picture.

IBM Health Checker for z/OS Checks for Upgrade

1. ZOSMIGREC_ROOT_FS_SIZE
2. XCF_SYSPLEX_CDS_CAPACITY
3. RSM_MEMLIMIT
4. ZOSMIGV2R3_RSM_Minimum_Real
5. ZOSMIGV2R3_NEXT_VSM_USERKEY_M (as of OA53355)
6. IOS_FABRIC_MONITOR
7. SUP_HiperDispatchCPUConfig
8. CNZ_CONSOLE_OPERATING_MODE
9. ZOSMIGV2R3_RSM_Include1MAFC
10. RSM_REAL
11. VSM_ALLOWUSERKEYCSA
12. ZOSMIGV2R2_Next_IXG_Remove_DRXRC
13. ZOSMIGV2R2_NEXT_CS_TFTP
14. CSVTAM_VIT_OPT_STDOPTS
15. VSAM_CA_RECLAIM
16. ZOSMIGV2R2_CS_LEGACYDEVICE
17. ZOSMIGV2R2_Next_CS_SMTPDDAEMON
18. ZOSMIGV2R2_Next_CS_SMTPDMTA
19. ZOSMIGV2R2_Next_CS_SENDMAILDAEMN
20. ZOSMIGV2R2_Next_CS_SENDMAILCLIEN
21. ZOSMIGV2R2_Next_CS_SENDMAILMTA
22. ZOSMIGV2R2_Next_CS_SENDMAILMSA
23. JES2_UPGRADE_CKPT_LEVEL_JES2
24. SDSF_ISFPARMS_IN_USE
25. USS_HFS_DETECTED
26. ZOSMIGV2R4_NEXT_CS_OSIMGMT
27. ZOSMIGV2R4PREV_CS_IWQSC_*tcpipstackname*
28. CSAPP_FTPD_ANONYMOUS_JES
29. CSVTAM_CSM_STG_LIMIT
30. ZOSMIGV2R3_NEXT_USS_SMB_DETECTED
31. ZOSMIGV2R3_NEXT_INFOPRINT_DYNCFG
32. ZOSMIGV2R3_NEXT_INFOPRINT_IPCSSL
33. INFOPRINT_CENTRAL_SECURE_MODE
34. ISPF_WSA
35. ICSF_PKCS_PSS_SUPPORT

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Using IBM Health Checker for z/OS for upgrade purposes
Starting in z/OS V1R10, the Health Checker infrastructure is exploited for upgrade purposes. Health Checks that are helpful for determining upgrade action applicability are provided. These checks ("Migration Health Checks") should be used prior to your upgrade to the new z/OS release to assist with your upgrade planning, and re-run after your upgrade to verify that the upgrade action was successfully performed. As with any Health Check, no updates are performed to the system. Migration Health Checks only report on the applicability of a specific upgrade action on a system; and only report on the currently active system.

Details on how to run the Migration Health Checks are provided in beginning of the *z/OS Upgrade Workflow*.

System REXX health check considerations
All exploiters of the System REXX support in z/OS require that the System REXX customization be performed. Using the IBM Health Checker for z/OS health checks is one example of possible System REXX exploitation. In particular, any compiled REXX execs must have the proper runtime support available from the Alternate Library for REXX (available in z/OS since V1R9) or from the IBM Library for REXX on zSeries (5695-014). Several IBM Health Checker for z/OS migration health checks have been written in compiled System REXX. These health checks rely upon the System REXX customization and runtime activities being completed. If System REXX (and the security environment that System REXX requires) have not been properly customized, then System REXX health checks will not execute successfully.
   o   For System REXX customization activities, refer to "System REXX" in *z/OS MVS Programming: Authorized Assembler Services Guide*.
   o   For compiled REXX exec runtime availability, see "Alternate Library for REXX Customization Considerations" in *z/OS Program Directory*, or refer to product documentation accompanying IBM Library for REXX on zSeries.

Migration Health Checks and Best Practice Health Checks
Migration Health Checks are not different from other Health Checks, but they do have some characteristics which allow them to be uniquely identified.

For z/OS, the convention is **ZOSMIGVvvRrr**_component_program_name The names of migration checks begin with the characters **ZOSMIG**. Following this prefix is a value to help you plan the timing of the upgrade action, as follows:

- **ZOSMIGVvRr_Next :** Upgrade action is recommended, but will become a required upgrade action in the release after V*v*R*r* .
- **ZOSMIGVvRr_Next2 :** Upgrade action is recommended, but will become a required upgrade action two releases after V*v*R*r*.
- **ZOSMIGVvRr :** Upgrade action is required in the release indicated by V*v*R*r*.
- **ZOSMIGVvRrPREV**: Upgrade action is required in the release indicated by VvRr and in prior releases, with the appropriate service.
- **ZOSMIGREC :** Upgrade action is recommended for the foreseeable future. The upgrade action might never be required.
- **ZOSMIGREQ :** Upgrade action that is recommended now, but will be required in a future release.

For the ICSF element, the convention is **ICSFMIGnnnn**_component_program_name).

Migration checks have a status of **INACTIVE** by default. Because you may not want to know about upgrade actions during non-upgrade periods, Migration Health Checks will not automatically be active.

There are Best Practice Health Checks that can help with upgrade actions, and yet they do not have the Migration Health Check naming convention. That is because the component owners felt that the practice is recommended for reasons above and beyond upgrade purposes. All Health Checks (whether they are Migration Health Checks or Best Practice Health Checks) will be cross-referenced in the *z/OS Upgrade Workflow* when they can assist with a specific upgrade action. *Be aware, your upgrade assistance is not just limited to the checks that follow the Migration Health Check naming convention!*

For description of the health checks above, which release they run on, and their severity refer to the *Health Checker User's Guide.*

z/OS V2.4 Upgrade Workflows

IBM

- Acquire the *z/OS V2.4 Upgrade Workflow* from IBM-Z-zOS on GitHub.
- Follow the associated README on github!
- Common problems:
  - Downloading the HTML web page, instead of the XML file.
    - Use "View Raw", then "Save As…".
  - Not downloading/uploading as binary. (Must use binary.)
  - Not downloading all three necessary files.
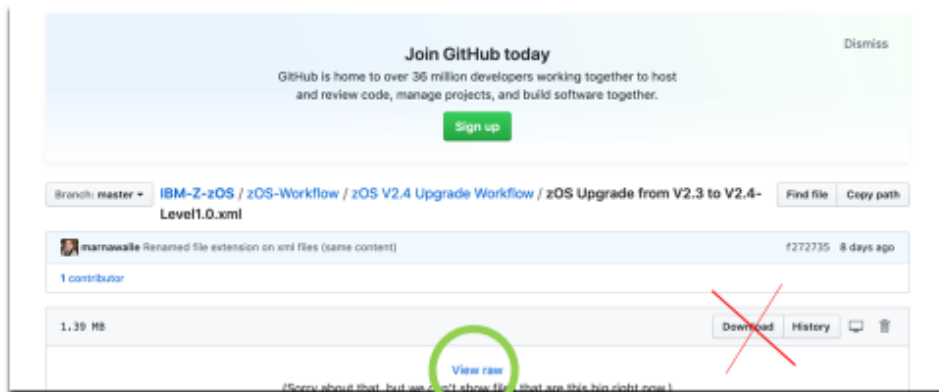
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z/OS Workflows…more important than ever!

IBM

- *z/OS V2.3 Migration* book is the last release to have technical migration actions in that traditional book format!

- z/OS V2.4 **upgrade** materials will be in two formats:
  1. *z/OS V2.4 Upgrade Workflow*, one for each path.
  2. Exported z/OS V2.4 Upgrade Workflow available on KC in a single file format (for printing, searching, browsing). One for each path.
- It behooves you to use z/OSMF Workflows now, as there are several benefits to using a Workflow over the traditional book (or exported format):
  - Discovery of used priced features, and some functions that skips steps right away, that you don't need.
  - Invocation of health checks to determine upgrade applicability.
  - A health check exception will mark the workflow step as failed, until re-run as successful, to ensure you ok.
  - Ability to optionally provide feedback on your upgrade experience.

- Minimally requires: z/OSMF V2.1 with PTF UI43847 (Jan 2017)

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Very Important Links:
z/OS V2.4 Upgrade workflow: https://github.com/IBM/IBM-Z-zOS/tree/master/zOS-Workflow/zOS%20V2.4%20Upgrade%20Workflow

Exported V2.3 to V2.4 Workflow:
https://www.ibm.com/support/knowledgecenter/en/SSLTBW_2.4.0/com.ibm.zos.v2r4.e0zm100/Export_zOS_V2R3_to_V2R4_Upgrade_Workflow.html

Exported V2.2 to V2.4 Workflow:
https://www.ibm.com/support/knowledgecenter/en/SSLTBW_2.4.0/com.ibm.zos.v2r4.e0zm100/Export_zOS_V2R2_to_V2R4_Upgrade_Workflow.html

Continuing the advancement in z/OS upgrade assistance!

We have converted the z/OS Migration book into two z/OS Management Facility (z/OSMF) z/OS Upgrade Workflows. (One for the V2R2 to V2.4 path, one for the V2.3 to V2.4. path.) Using the z/OSMF workflow, you can go through a z/OS V2.4 upgrade as an interactive, step-by-step process. Depending on your z/OS V2.4 upgrade path, you select the files you will need. If you do not download all necessary files, your workflow cannot be created.

In z/OS V2.4 (continuing what was introduced in V2.2) the z/OS Upgrade Workflow has the capability to invoke IBM Health Checker for z/OS health checks directly from the step, and also provides the optional capability to give feedback on your upgrade experience.

The z/OS V2.4 Upgrade Workflow is the ability to discover used z/OS priced features(continuing what was introduced in V2.3), and some other features, on your system. This is very helpful, because if you are not using a certain feature, then why have to manually skip those steps yourself? The z/OSMF Workflow can

identify many features that you might not be using, and automatically skip them in the Workflow for you, giving you less steps to perform.

This tool is not supported by the IBM Service organization but rather by the tool owner on a best-can-do basis. Please report any problems, suggestions, or comments to zosmig@us.ibm.com.
If you would like to see a short demo on using the z/OS V2.1 migration workflow, visit IBM® z/OSMF V2.1 Migration Workflow Demo on YouTube.

Upgrade Workflow Tips
1. Use discovery to help eliminate unnecessary upgrade actions!
    a. To be consistent with the former book, the workflows include some upgrade actions shown as "None" for components that do not have any upgrade action. "None." still counts as a workflow sub-task to complete, even though there is no upgrade action to perform. To complete the sub-task, mark the upgrade action sub-tasks with an "Override-complete" to have them designated as complete. Choose to "skip none" during the first discovery step.
    b. To allow you to skip prior hardware levels you have already upgraded through, choose to "skip prior hardware level" during the first discovery step.
2. The URL links to the documentation in the workflow cannot go to an anchor in the web page. The URLs will just bring you to the web page, not content that may be further down in the page. You may have to scroll down on the web page to find the information that you need.
3. Some upgrade actions have associated health checks. For those steps, the health check will be invoked to determine if the upgrade action is applicable to your system. Read the instructions carefully on the Perform tab before running the health check, as important information is provided for each check.
4. For each upgrade action and for the entire upgrade, you can optionally provide your feedback to IBM. Just follow the instructions you see in z/OSMF. You do not need to provide feedback to complete each step of the workflow.

z/OS Upgrade Workflow
Starting in z/OS V2.4, IBM no longer provide the z/OS Migration publication, GA32-0889, in its current format. Since z/OS V2.2, the preferred method for learning about upgrade actions has been the z/OS Upgrade Workflow. Discovering, performing, and verifying many upgrade actions through the z/OS MF Workflow function instead of a more traditional book format allows for a tailored and specific upgrade path associated with a particular system. Starting with the z/OS V2.4 release and later, IBM provides upgrade tasks in a z/OS MF Workflow, as well as a single exported file. By providing the z/OS V2.4 upgrade materials in both formats, users still can enjoy the advantages of a z/OSMF Workflow as well as being able to search, browse, and print in a more traditional format.

With the removal of the traditional z/OS publication, GA32-0889, it is strongly recommended that you plan for your next upgrade by having z/OS MF ready to use in at least one location in your enterprise. Notice that the exported format of the z/OS upgrade materials that can be easily read or printed for those without any z/OS MF capabilities will not be tailored for any environment.

z/OSMF ServerPac
IBM's first delivery of a ServerPac in z/OSMF Software Management portable software instance format is planned for CICS Transaction Server and associated CICS products. Initially, IBM intends to allow you to choose to order ServerPac for CICS and associated products in either the new z/OS MF portable software instance format or the existing CustomPac Dialog-based format. The z/OS MF portable software instance format is designed to be installed using z/OS MF Software Management. The requirements for using the CustomPac Dialog-based format remain unchanged, and this is the first of many offerings that are planned to be delivered in the PSI format. For both formats, IBM plans to continue to offer delivery via internet download or on DVD. This initial offering of an IBM ServerPac in a z/OS MF portable software instance represents the next step in IBM's collaboration with other leading z/OS platform software vendors to deliver a consistent package format intended to be used with z/OSMF software management as a common installer.

Upgrade to z/OS V2R4: Part 1 of 2 Summary

- **Changing content of z/OS V2R4**
  - New z/OS V2.4 content: RUCSA, zOS Container Extensions(zCX)
  - New z/OS V2.3 content: IBM z/OS Liberty Embedded
  - Prepare now for future removed content: HFS, **user key common**, JES3…
- **Get onto z/OSMF right now (V2R2 or V2R3). z/OSMF is auto-starting in V2.3.**
- **Timeline of z/OS ordering and deliverables:** associated products to consider
- **z/OS Policies**
  - Three consecutive releases (V2.2 → V2.4) for coex, upgrade, fallback.
- **Ensuring System Requirements are Satisfied**
  - Driving, Target SW, Target HW, and Coexisting System Requirements
    - z/OS V2.4 requires zEC12 or later
    - As of z/OS V2.3 on z14 requires 8 GB "native", or 2 GB zPDT or zVM of memory
    - Target system requirements: general Java SDK V8 functional requirement.
    - Use FIXCATs `IBM.TargetSystem-RequiredService.z/OS.V2R4`, `IBM.Coexistence.z/OS.V2R4`, `IBM.Function.HealthChecker`, …
- **Use IBM Health Checker for Upgrade Actions:** Install and activate checks
- **Use z/OSMF Workflow for z/OS V2.4 Upgrade:** Goodbye, book!
- **Interested in getting ServerPac installable with z/OSMF? CICS is planned to be offered first.** z/OSMF SM will be a driving system requirement for ServerPac's packaged as portable software instances.
- *Next will be the specific upgrade actions for z/OS V2.4…*

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