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z/OS V2.1: Latest Functions and Migration Considerations

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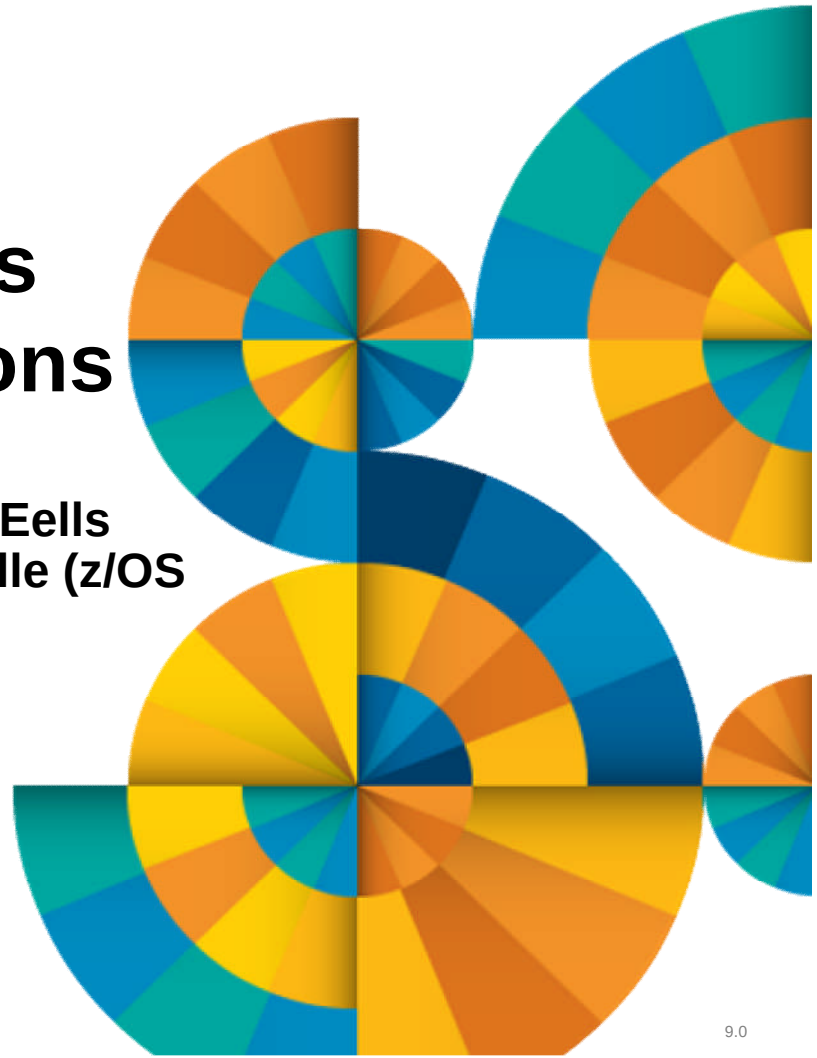

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Agenda

- zEC12 and zBC12 Support
  - CF Support of Flash Express
  - Thin Interrupts
  - zEnterprise Data Compression
- Other Recent/Planned z/OS V2.1 Enhancements
  - Usability, Scalability, Availability, Manageability, Application Enablement, Security, and Networking
- A “Pre” Preview of Planned z/OS V2.2 Enhancements
  - Usability, Scalability, Availability, Manageability, Application Enablement, Security, and Networking
- Key Migration Considerations
  - z/OS V2.1 Content
  - Selected Migration Actions

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z/OS Support Summary

Release	z900/ z800 WdfM	z990/ z890 WdfM	z9 EC z9 BC WdfM	z10 EC z10 BC WdfM	z196 z114	zEC12 zBC12	End of Service	Extended Defect Support[1]
z/OS V1.10	X	X	X	X	X	X	9/11[1]	9/13[1]
z/OS V1.11	X	X	X	X	X	X	9/12[1]	9/16[1,2]
z/OS V1.12	X	X	X	X	X	X	9/14[1]	9/17[3]
z/OS V1.13	X	X	X	X	X	X	9/16*	9/19[3]*
z/OS V2.1			X	X	X	X	9/18*	9/21[3]*
z/OS 2.2*				X	X	X	9/20*	9/23[3]*

Notes:

1 The IBM Lifecycle Extension for z/OS provides the ability for customers to purchase extended defect support for that release of z/OS for up to 24 months after the z/OS release's end of service date

2 IBM Software Support Services offers a service extension support for z/OS V1.11 for up to two years, beginning October 1, 2014 and available through September 30, 2016.

3 Beginning with z/OS V1.12, IBM Software Support Services replaces the IBM Lifecycle Extension for z/OS offering with a service extension for extended defect support.

* Planned. All statements regarding IBM's plans, directions, and intent are subject to change or withdrawal without notice.

WdfM Server has been withdrawn from Marketing

Legend

Out of support[2]
Defect support provided with IBM Software Support Services for z/OS
Generally supported

IBM zEnterprise EC12 (zEC12) System Functions and Features

- Five hardware models
- **Hexa-core 5.5 GHz processor chips**
- **Up to 101 processors configurable as CPs, zAAPs, zIIPs, IFLs, ICFs, or optional SAPs (up to 64-way on z/OS V1.10, 100-way on z/OS V1.11 and higher)**
- **Second generation out of order design**
- **Improvements to pre-fetch instructions**
- **Improved processor cache design**
- **Up to 3TB of Redundant Array of Independent Memory (RAIM) – same as z196**
- Twice the HSA versus z196 (32 GB vs 16 GB)
- **Decimal-Floating-Point Zoned-Conversion Facility**
- **Flash Express (Storage Class Memory-SCM)**
- **1 MB Pageable Large Pages**
- **Dynamic reconfiguration support for Flash Express**
- **2 GB Large Page Support**
- **Optional PLPA, COMMON page data sets**
- **Crypto Express4S cryptographic coprocessors and accelerators**
- **New support for IBM Enterprise PKCS #11 (EP11) coprocessor**
- **DUKPT for MAC and Data Encryption, Europay, Mastercard, and Visa (EMV) CCA enhancements**
- **New and enhanced instructions**
- **IBM zAware**
- **OSA-Express4S and OSA-Express5S (GbE LX and SX, 10 GbE LR and SR, and 1000BASE-T)**

(z/OS support in blue)

(GA2 support in red)

- **FICON Express8S**
- **24K subchannels for FICON channels**
- **IBM zEnterprise Data Compression (zEDC) capability using zEDC Express**
- **Shared Memory Communications-Remote Direct Memory Access (SMC-R) - 10GbE RoCE Express**
- **Parallel Sysplex InfiniBand (PSIFB) Coupling Links**
- **High Performance FICON for System z**
- **CPU Measurement Facility**
- **CFCC Level 18 and 19 enhancements**
- **Transactional Execution Facility**
- **Exploitation of new hardware instructions – XL C/C++ ARCH(10) and TUNE(10)**
- **CCA 4.4 and other enhancements: RKX Key Export Wrap, UDX Reduction/Simplification, additional EP11 algorithms, expanded EMV support, AP Configuration simplification, CTRACE Enhancements, KDS Key Utilization Stats**
- Optional Non Raised Floor
- Optional water cooling and DC Power
- Optional overhead Power and I/O cabling
- zBX Model 003 support of:
  - IBM WebSphere DataPower Integration Appliance XI50 for zEnterprise
  - Select IBM BladeCenter PS701 Express blades or IBM BladeCenter HX5 blades
- **zManager enhancements**

IBM zEnterprise BC12 (zBC12) System Functions and Features

2 Models – H06, H13
Hexa-core 4.2 GHz processor chips
Up to 13 processors configurable as CPs, zAAPs, zIIPs, IFLs, ICFs, or optional SAPs
Second generation out of order design
Improvements to pre-fetch instructions
Improved processor cache design
Up to 496 GB RAIM
Twice the HSA versus z114 (16 GB vs 8 GB)
Up to 6 CPs at 26 capacity points
Decimal-Floating-Point Zoned-Conversion Facility
Flash Express (Storage Class Memory-SCM)
1 MB Pageable Large Pages
Dynamic reconfiguration support for Flash Express
2 GB Large Page Support
Optional PLPA, COMMON page data sets
Crypto Express4S cryptographic coprocessors and accelerators
New support for IBM Enterprise PKCS #11 (EP11) coprocessor
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(z/OS support in blue + red)

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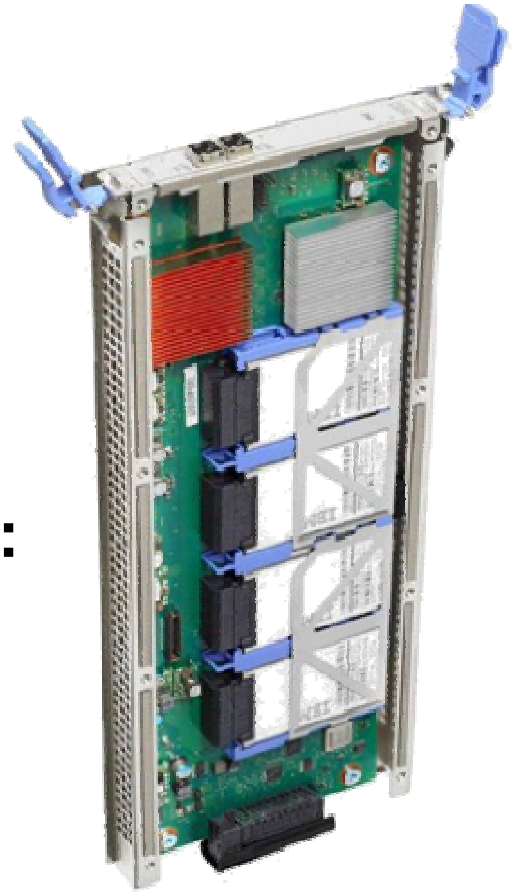
Non-raised floor option available
Overhead Cabling and DC Power Options
zBX Model 003 support of: •IBM WebSphere DataPower Integration Appliance XI50 for zEnterprise •Select IBM BladeCenter PS701 Express blades or IBM BladeCenter HX5 blades
zManager enhancements

Flash Express Support

- **Available for z/OS V1.13 with…**
  - A zEC12 or zBC12 server with Flash Express
  - z/OS V1R13 RSM Enablement Offering web deliverable
    - http://www.ibm.com/systems/z/os/zos/downloads/
  - Dynamic Reconfiguration and optional PLPA/COMMON page data sets in enabling PTFs
  - …all these functions are included in z/OS V2.1
- **z/OS designed to use Flash Express for:**
  - Pageable large pages
  - Paging, when performance would be improved vs. disk-based paging
  - SVC and Standalone Dump
  - Speculative page-ins to help buffer workload spikes (such as market open)



Flash Express Support …

- **CF support for Flash Express***
  - Requires z/OS V2.1 running on zEC12 or zBC12 servers with CFLEVEL 19
  - Support Flash Express for certain Coupling Facility list structures
  - Can allow keyed list structure data to be migrated to Flash Express memory
    - For example, when data consumers do not keep up with creators
    - Designed to migrate it back to real memory to be processed
  - With WebSphere MQSeries® for z/OS Version 7 (5655-R36):
    - Can buffer enterprise messaging workload spikes
    - Provide support for storing very large amounts of data in shared queue structures
    - Potentially allow several hours' worth of data to be stored without causing interruptions in processing
  - z/OS V2.1 RMF™ designed to provide measurement data and reporting capabilities for Flash Express on Coupling Facilities
  - **Available with the PTF for APAR OA40747**
  - CFSIZER also updated for Flash Express:
    - http://www.ibm.com/systems/support/z/cfsizer/

“Thin” Interrupts

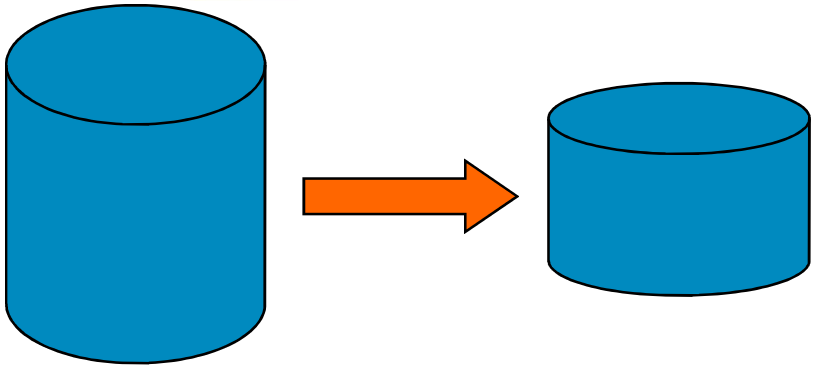
- **“Thin” interrupts for CFs**
  - CFCC polled for work to do, so all CF engines were 100% used
  - So, shared engine CFs had a very limited use case
    - A CF always used its entire PR/SM™ timeslice except in DYNDISP=YES mode
    - Not a great way to implement many/most production CFs
  - New CFCC design in CFLEVEL 19 on zEC12 and zBC12 servers along with XES/XCF changes designed to use a more interrupt-driven, hyrbrid approach
  - Should allow the use of shared engine coupling facilities in many production environments with acceptable performance
  - Intended to lower Parallel Sysplex entry costs by reducing the number of environments for which dedicated coupling facility (CF) engines are needed to achieve good performance
- **Also, new set of “thin” interrupts to be used by z/OS**
  - Designed to decrease response time on the average
  - Help reduce XCF and XES processing overhead and improve performance when processing asynchronous coupling facility operations and recognizing certain CF events
  - ➢ **Also available on z/OS V1.12 and V1.13 with the PTFs for APARs OA38734, OA38781, OA37186, & OA42682**

Three Ways to Compress (and Decompress) on z/OS

- **Software compression**
  - CPU-intensive
  - Much slower
  - Data can be inflated on anything supporting the same algorithm
- **Compression coprocessor-based instructions**
  - Dictionary-based compression, generic or tailored
  - Can be inflated on a System z processor
  - All compression consumes apparent CP cycles
    - Compression done on the coprocessor, but accounted for as CP busy time because the CP is unavailable until the coprocessor is done
- **New zEDC Express adapter for zEC12 and zBC12 and zEnterprise Data Compression (zEDC) for z/OS V2.1**
  - Compression work is offloaded to the card
  - Minimal CP cycles consumed
  - zlib-based, industry-standard deflate compression
  - Data can be inflated anywhere zlib processing is available

zEnterprise Data Compression

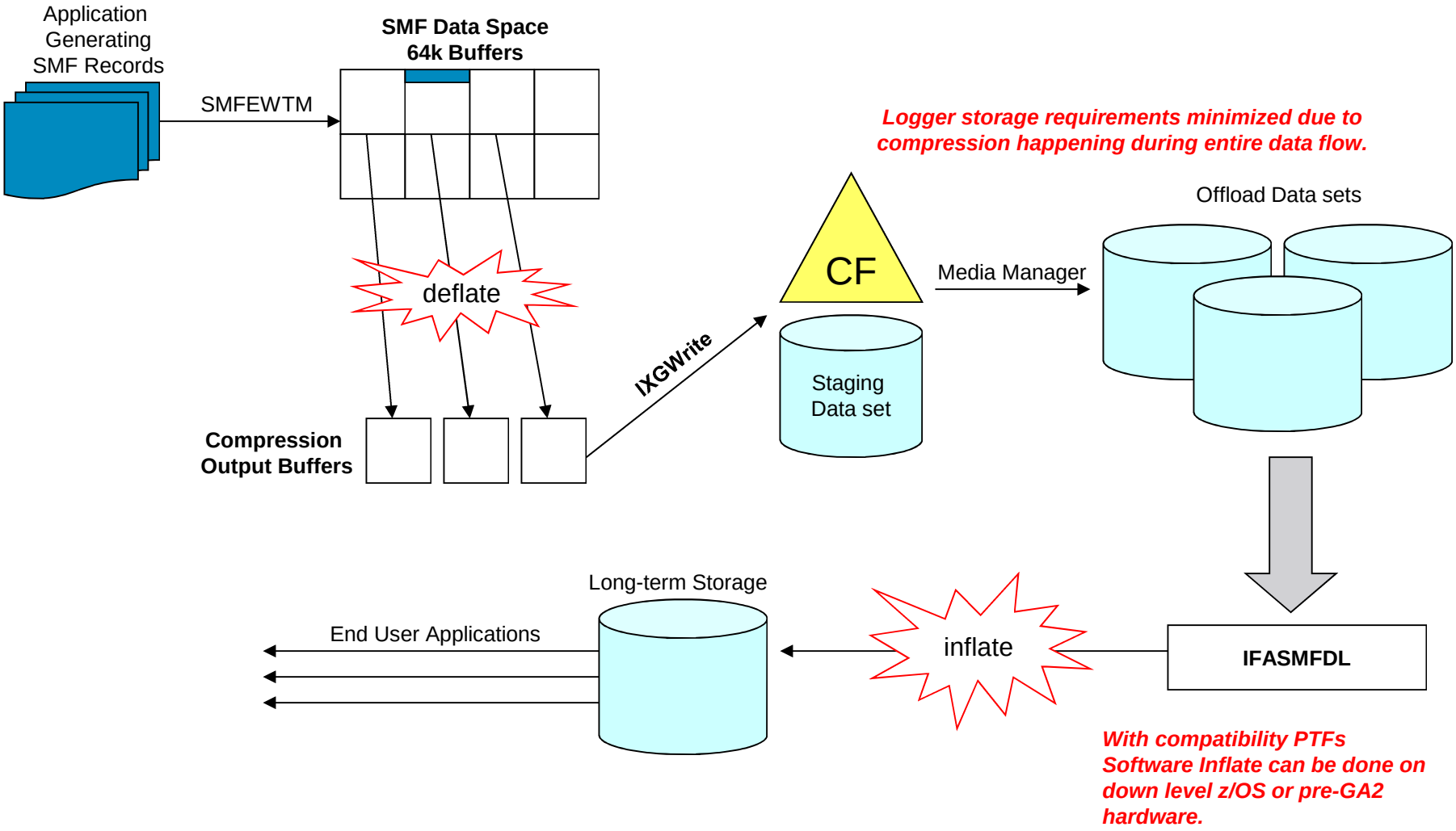
- Now available:
  - Card & z/OS feature
  - zBNA support
  - SMF and RMF support
  - Support for industry standard zlib compression
  - zlib library in z/OS V2.1
  - SMF data compression on z/OS V2.1
  - Software-based decompression support for SMF data on z/OS V1.12 and V1.13
  - Java support
  - IBM Encryption Facility support
  - Extended Format BSAM/QSAM support
  - DFSMSdss data compression
  - WebSphere MQSeries support
  - IBM Sterling Connect:Direct support



SMF Data Compression

- **For SMF data written to log streams**
  - We expect about a 4:1 compression ratio for SMF data
  - Designed to significantly increase SMF recording rates
  - Can specify that all SMF data or SMF data written to selected log streams be compressed
  - New SMFPRMxx COMPRESS keyword on LSNAME and DEFAULTLSNAME
  - New PERMFIX subparameter of COMPRESS to balance fix/unfix overhead with available real memory
- ***Corresponding IFASMFDL support***
  - Automatic inflation on z/OS V2.1 with feature and Hardware support
  - SOFTINFLATE parameter for software-based decompression
    - For z/OS V1.12 & z/OS V1.13, with the PTF for APAR OA41156
    - Included in z/OS V2.1
    - Intended to be used when zEDC is not available

SMF Data Flow Overview



Measurements

- **SMF and RMF support**
  - SMF14 and SMF15 records show compression ratios
  - SMF14CDS has the size of the compressed-format data set
  - SMF14UDS is the uncompressed size
  - New SMF14CMPTYPEzEDC field
  - SMF 74 subtype 9 records created by RMF include new PCIe, zEDC Express data
  - RMF Monitor I PCIE Activity Report:
    - I/O queue and execution time
    - Compressed and uncompressed data transfer rates
    - Number of compression and decompression requests

DFSMS (BSAM/QSAM) Exploitation of zEDC

- **Extended Format BSAM and QSAM Compression**
  - ***New compression support for non-VSAM extended format data sets (using zEDC compression) is now available with the PTF for APAR OA42195***
  - In addition to generic (DBBLIB) and tailored (supply a dictionary) compression
  - New COMPACTION option in DATACLAS definition
  - New values on COMPRESS parameter in IGDSMSxx
    - Data class continues to take precedence over system level. The default continues to be GENERIC.
  - Use SMF records to determine compression ratio
    - SMF Type 14/15 contains existing compressed/uncompressed bytes to calculate compression ratio.
    - SMF Type 14/15 defines new bits to identify zEDC compressed format data set, as well as indicate if zEDC Express is not available for compression/decompression during this OPEN.

Compression Ratios and Performance*

- **Compression rates will vary with the data, but…**
  - Internal testing shows us ~4X compression for SMF data
  - Internal testing shows up to 4X compression for BSAM/QSAM non-VSAM extended format data
    - That's as much as *2X better* than generic or tailored compression
  - Also, for BSAM/QSAM we see 80% or more CPU time reduction compared to tailored and generic compression
    - CPU cost for zEDC is ~0.1sec/GB in testing on a zEC12

* Based on projections and/or measurements completed in a controlled environment. Results may vary by customer based on individual workload, configuration and software levels.

DFSMSdss Data Compression

- **New function was added to DFSMSdss to allow compression and decompression using zEDC Services during DUMP and RESTORE.**
  - In z/OS 1.12 and z/OS 1.13, toleration is provided to allow RESTORE from a dump that was compressed with zEDC services.
- **With DFSMShsm zEDC support, DFSMShsm provides users with a new zEDC compression option that will use zEDC services to compress data during backup, migration and full-volume dump.**
- **Available with the PTF for APAR OA42243**

IBM System z Batch Network Analyzer

- **Helping determine if you have files that are candidates for zEDC: the IBM System z Batch Network Analyzer**
  - A free, Microsoft Windows-based “as is” tool to analyze batch windows using SMF data
  - Available to Customers, Business Partners and IBMers
  - Replaces the old BWATOOL
  - PC based, graphical and text reports
    - Including Gantt charts and support for Alternate Processors

- **Available from NA Advanced Technical Support**
  - http://w3.ibm.com/support/techdocs/atsmastr.nsf/WebIndex/PRS5126
- **zBNA can help identify zEDC Compression Candidates**
  - Identify zEDC compression candidates across specified time spans, like batch windows
  - Help estimate utilization of a zEDC feature and help size number of features needed
  - Generate a list of data sets by job which already do hardware compression and may be candidates for zEDC
  - Generate lists of data sets by job which might be zEDC candidates but are not in extended format
- **Initial support was December 2013—updates made in January and February 2014**

What You'll Need to Use zEDC

- **New Hardware and z/OS features:**
  - zEDC Express adapter for zEC12 and zBC12
  - zEnterprise Data Compression (zEDC) for z/OS V2.1
  - For software inflation of compressed SMF data, the PTF for APAR OA41156 on z/OS V1.12 and z/OS V1.13
  - For Extended Format BSAM/QSAM support, PTF for APAR OA42195
  - For DFSMSdss (and DFSMShsm) support, PTF for OA42243
  - zlib on other platforms where you want to process compressed data
- **Other products:**
  - Java support in IBM 31-bit and 64-bit SDK for z/OS Java Technology Edition, Version 7 Release 1 (5655-W43 and 5655-W44) (IBM SDK 7 for z/OS Java)
  - IBM Encryption Facility for z/OS support with PTF UA72250

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z/OS V2.1…

Improving Usability and Skills

z/OSMF Enhancements; zDAC improvements; HMC complex-wide Activate; SMP/E ISPF split screen; TSO/E logon failure messages; Generic Tracker; GDGs in chronological order; ISPF improvements; Catalog alias improvements; Correct incorrect SHAREOPTIONS for ACDS/COMMDS; **Automatically start Health Checker; additional Health Checks; D PPT; IEBCOPY enhancements; Delete member masking;** Recover VSAM data set with a NEWNAME, **PDSE Member Generation** …

Integrating new Applications and Supporting Industry and Open Standards

Batch Modernization: Job Correlator, JES3 instream data in procedures, dynamic ENQ downgrade, JES2 symbol support in instream data, new long parameter support, Parallel recall for batch; 8-character Job classes; new SYSTEM and SYSAFF keywords; multivolume RLSE improvements; WebSphere Extended Deployment Compute Grid for z/OS, V8.0; Batch Run time environment – Java, PLI, COBOL interoperability; **inclusion of the z/OS Font Collection;** Infoprint Server improvements; Language environment support for check zones; TSO/E REXX enhancements; IXCNOTE interface for XCF; TMP support for SYSREXX; Unicode 6.0 support; support for Japanese Industry Standards; Generalized Alignment support in the Program Binder; **ASCII support in more z/OS UNIX System Services shell commands and utilities; Delayed Debug; Provide HKSCS-2008 Support and mapping to/from 4 byte Unicode conversions …**

Scalability & Performance

RLS for Catalogs; System Logger separation; EXCP support for zHPF; **CF structure rebuild performance; PDSE V2; GDG support for PDSEs; BCPii Enhancements; zFS V5;** JES2 additional spin data sets; 64-bit NFS Server; larger VSAM LDS's; VSAM RLS enhancements; DFSMShsm enhancements; **DFSMShsm Migration Throughput Improvement,** DFSORT improvements; WLM and RMF enhancements; z/OS UNIX enhancements, **improve XES MQ Shared Queues performance, LE 64-bit support for COBOL and PL/I*, Tape Device Support TS7700 R3.1, zEDC Exploitation, New HyperWrite Function with TPC-R/GDPS HyperSwap* …**

Self Managing Capabilities

DFSMShsm Stroage Tiers; OAM improvements; improved JES3 support for SMS-managed tape libraries; improved DFSMSrmm support for SMS-managed tape; **DCM support for cascaded switches;** CPM support for defined capacity ; RMF support for zBX activity; **STP maximum time variance;** System Logger threshold messages; SMF BUFSIZMAX for logstrams; z/OS UNIX Automount enhancements; VSAM DATACLAS additions; New ACS variable for EAS eligibility, …

Improving Availability

JES3 dynamic spool volume removal; Dynamic System Symbol updates; z/OS console support for HMC consoles; New operand on FORCE; DCCF support for WTOR Auto-Reply; RRS internal restart; **modify VLF enhancements**; **Add/remove MCS Consoles dynamically;** RPCBINDE/NFS re-registration; …

Extending the Network

Resolver startup fault tolerance; support for QDIOACCEL with IPSEC; **new FTP subcommands;** FTP client security exit points; **TCP Profile syntax check,** Intrusion Detection improvements, DVIPA affinity**, …**

Enhancing Security

Security Portal; Certificate enhancements, RRSF enhancements; certificate processing improvements; SAF job class controls; z/OS UNIX timeout; **ICSF enhancements, RACF Sensitive Resources Health Check** improvements; System SSL TLS 1.2 support; System SSL NSA Suite B compliance; remote access to System z Crypto via LDAP; **SMP/E HTTPS Support, ICSF DK AES PIN Support Phase 2, ICSF PKT UDX Support, USS Kernel provide environment variable for pthread_security(), ICSF UDX Exit Support, ICSF/RACF best preactice Health Checks, ICSF DK AES PIN Migrate, SSL PKCS#12 Certificate Store Support, RACF Enhanced Password Algorithms*, …**

PDSE Member Generations

- Implemented via APAR OA42358
- Exclusive to the V2 PDSE Format
- PDSE Datasets can now retain multiple generations of members
  - Applies to BOTH Data Members and Program Objects
  - Retains generations up to the dataset/system limit
  - Generations are uniquely numbered
    - They can be referenced either by their **Absolute** or **Relative** generation
    - Current member is always 0, both relative and absolute
    - Greatest number indicates the newest generation

PDSE Member Generations …

- Usage Considerations
  - Allow extra space for each generation
  - Each generation retains the entire member
  - MAXGENS_LIMIT in IGDSMSxx is the System limit
  - MAXGENS_LIMIT can be set dynamically
  - MAXGENS_LIMIT is set at 2 billion

PDSE Member Generations …

- Creating a Generation
  - 2 requirements
    - (LIBRARY,2)
    - MAXGENS > 0
  - New generations are automatically created on replace or delete of a member
  - Update in place will not create a new generation
  - Generation creation is atomic
- Backup Considerations
  - IEBCOPY and IDCAMS REPRO
    - Only copy the current generation of each member
    - All old generations are lost
  - DFSMSdss
    - Physical or Logical dump and restore retain all old generations
    - This includes HSM backup

PDSE Member Generations (ISPF) …

IBM

Panels

- ISPF now has generations support
- Enhanced member list option must be selected

```
                    Data Set List Settings Main
                                                          More:      +
   General Options
   Enter "/" to select option
   /  Display Edit/View/Browse entry panel (*)
   /  Automatically update reference lists
   /  List pattern for MO, CO, D, and RS actions
   /  Show status for MO, CO, D, and RS actions
   /  Confirm Member delete
   /  Confirm Data Set delete
   /  Do not show expanded command
   /  Enhanced member list for Edit, View, and Browse
   _  Display Total Tracks
   /  Execute Block Commands for excluded Data Sets
   _  Display Expiration Date

 (*) Requires enhanced member list option to be selected
```

PDSE Member Generations (ISPF) …

Allocation

- Allocates like any other PDSE
- MAXGENS must be >0
- Be sure you're using version 2!

```
 Directory blocks  . . 0_____          (Zero for sequential data set) *
 Record format . . . . FB____
 Record length . . . . 80____
 Block size  . . . . . 27200_
 Data set name type    LIBRARY         (LIBRARY, HFS, PDS, LARGE, BASIC, *
 Data set version  . : 2                EXTREQ, EXTPREF or blank)
 Num of generations  : 50____
 Extended Attributes   ___             (NO, OPT or blank)
 Expiration date . . . _________       (YY/MM/DD, YYYY/MM/DD
Enter "/" to select option              YY.DDD, YYYY.DDD in Julian form
```

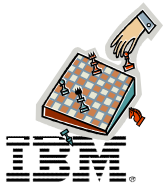
PDSE Member Generations (ISPF) …

- **Restrictions**
  - ENQUEUEing on one generation applies to all generations of that member
  - This is not a PDSE serialization restriction
  - The native API's allow for editing of multiple generations of the same member
  - ISPF Options 1 and 2 do **not** support a GEN parameter
  - ISPF 3.1 and 3.4 do support a GEN parameter
- **Editing**
  - Editing the current member (GEN 0) results in a new generation being created
  - Editing prior generations does NOT result in a new member
  - Supports referencing generations by either absolute or relative generation number
  - Deleting a member in ISPF deletes all generations
  - This is an ISPF implementation feature
  - TSO DELETE pdse(member) deletes only the primary

Delayed Debug

- Enhancements in LE, the Debug Tool and the XL C/C++ compiler allow the start up of a debug session to be delayed until a specific AMODE 31 C/C++ function is entered.
  - Available with PTF UI19022

Secure z/OS Software Delivery Statement



- July 11, 2014: IBM announces an addition of HTTPS (HTTP using Secure Sockets Layer) for secure software and service delivery on ~~October 19, 2014~~ (now November 16, 2014).
- **The electronic delivery options include:**
  1. Standard FTP (IBM plans to withdraw this option)
  2. FTP using Secure Sockets Layer (FTPS)
  3. HTTP using Secure Sockets Layer (HTTPS)
  4. Download Director with encryption (no change is needed)
- Electronic delivery of ServerPac, CBPDO, and Internet delivery of PTFs ordered using Shopz and the SMP/E RECEIVE ORDER command are affected.
- **Decide now** which secure option you would like to use: FTPS, HTTPS, or Download Director.
  - SMP/E PTF for APARs IO20858 and IO22326 are needed for HTTPS
  - IBM recommends you use the Connectivity Test website in advance:

    https://www14.software.ibm.com/webapp/iwm/web/preLogin.do?lang=en_US&sour ce=cbct

Software Delivery

Preventive Service

- **As of 19 October 2014:**
  - In Shopz, the z/OS "all licensed products" service package type and z/OS Internet delivery service subscriptions was be removed
  - ServiceLink z/OS ESO packages will be supported only when used to order service for selected FMIDs
  - z/OS preventive service orders will be based on installed products, not on licensed products
- **IBM recommends use of the SMP/E RECEIVE ORDER command**
  - Simplest way to get z/OS service
  - Can automate service acquisition using local batch scheduling tools
  - Alternatively, you can use Shopz or the ServiceLink z/OS ESO option
- **No changes to corrective service ordering**
- **For more information:**
  - http://www.ibm.com/software/shopzseries
  - http://www.ibm.com/ibmlink

Enhancing Security

- **Enhanced RACF password encryption algorithm:**
  - An enhanced RACF password encryption algorithm has been provided.
  - This support is designed to provide improved cryptographic strength in RACF password algorithm processing.
  - It is intended to help protect RACF password data in the event that a copy of a RACF database becomes inadvertently accessible.
- **Strengthening RACF's password & password phrase encryption algorithm (already had a Statement of Direction):**
  - Raises the computational complexity in evaluating passwords & password phrases
  - Optional new password algorithm to incorporate the use of AES
  - Allows users to migrate from 56-bit single DES to AES
  - Available via PTFs for APARs OA43998 (SAF) and OA43999 (RACF)
    - Rolled back to z/OS V1.12

Enhancing Security

- **Two new health checks are created with RACF APAR OA45608:**
  - **RACF_PASSWORD_CONTROLS**, which raises an exception if RACF has been configured to:
    - Not allow mixed-case passwords
    - Allow more than three (3) failed consecutive logon attempts
    - Allows a password or password phrase to be valid for more than 90 days
  - **RACF_ENCRYPTION_ALGORITHM,** which raises an exception if “weak” encryption is allowed for logon passwords.

Scalability and Performance*

- **New HyperWrite Function with TPC-R/GDPS HyperSwap® planned**
  - Substantially better DB2 log write performance expected
    - Acceleration of DB2 Log Writes when Metro Mirror is in use
    - Local response reduced up to 61% in prototype testing (final numbers TBD)
      - * Based on projections and/or measurements completed in a controlled environment. Results may vary by customer based on individual workload, configuration and software levels.
    - Less-than-local response benefit percentage varies with distance
    - Planned to require:
      - HyperWrite function in z/OS 2.1, with the PTF for APAR OA45662
      - DB2 10 or DB2 11
      - IBM DS8870 Storage Subsystem with an MCL
    - Planned for year end 2014*

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Agenda

- zEC12 and zBC12 Support
  - CF Support of Flash Express
  - Thin Interrupts
  - zEnterprise Data Compression
- Other Recent/Planned z/OS V2.1 Enhancements
  - Usability, Scalability, Availability, Manageability, Application Enablement, Security, and Networking
- **A "Pre" Preview of Planned z/OS V2.2 Enhancements**
  - **Usability, Scalability, Availability, Manageability, Application Enablement, Security, and Networking**
- Key Migration Considerations
  - z/OS V2.1 Content
  - Selected Migration Actions

A Look at z/OS Futures*

- This material is preliminary
- Work is in progress but not all designs/code are complete
- Some of what follows will change!
  - Some things might never appear, or appear (possibly *much*) later
  - Some things will be implemented differently as we go through Development
  - Some things will have different names and externals
  - And of course, some things will probably be added

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z/OS V2.2 & Futures*

IBM

Usability and Skills

z/OSMF inclusion in z/OS; z/OSMF setup workflow; z/OSMF single sign-on; z/OSMF Workflow enhancements; z/OSMF Incident Log enhancements; System Symbol enhancements; DJC and Deadline Scheduling for JES2; …

Application Development and Support for Industry and Open Standards

EU Ordering Rules for Unicode and HKSCS conversions support; Persistent File Handles for NFS access to z/OS UNIX files; Support for 64-bit shared large (1 MB) Pages; New and improved symbol support in JES3; Improved batch support in JES3 …

Scalability & Performance

CA Level Locking for RLS; Multisystem DFSMShsm Fast Replication Tape processing; AMODE64 File System Services; More Jobs for JES2; 64-bit NFS Client Support; Support for more temporary DD names …

Improving Availability

JES3 DSI change; better SSI initialization processing; Dynamic Exit support for O/C/EOV; Private Area Virtual Storage tracking in PFA; Dynamic TDS (LDAP) compatibility upgrades; …

Self Managing Capabilities

JES2 Step-level completion codes; Generic Tracker Improvements; Health-Based Workload Routing; Guaranteed Space; DFSMShsm Storage Tiers Extensions; Start/Stop Support for Infoprint Server Daemons; Dynamic JES2 Checkpoint Tuning & Expansion; …

Enhancing Security

SMF record signing; PKINIT (RFC 4556) support; RRSF Improvements; Separate OPERCMDS profiles for display/change aspects of F CATALOG; System SSL RFC 2560 OCSP Support; SAF interface to RACDCERT and the R_datalib service; More RACF Sensitive Resource Health Checks; Read-Only AUDITOR support; Console auto-logoff support …

Extending the Network

64-bit TCP/IP Stack; Enterprise Extender (EE) scalability; RoCE Improvements; Increasd DVIPA Limit; TCP/IP Configuration Assistant extensions; NIST SP800-131a support; TLS Session Reuse; CICS Sockets; Resolver Improvements …

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Usability & Skills: z/OSMF Improvements*

- **z/OSMF planned to be a base element of z/OS**
  - No need to order separately
- **z/OSMF single sign-on support designed to allow you to:**
  - Sign on to one z/OSMF
  - Perform administration for any system in any local or remote Parallel Sysplex that has a system running z/OSMF, connectivity, and shared DASD
- **z/OSMF workflow infrastructure**
  - Designed to allow a workflow to call another workflow
- **z/OSMF setup**
  - Enhanced workflow for z/OSMF setup planned
- **Incident Log improvements planned:**
  - Add search capability for similar APARs from an incident
  - Add a button for creating a PMR and attaching the relevant data
  - View and manage problems for multiple sysplexes from an aggregated view

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Usability & Skills: z/OS Improvements*

- **System Symbol enhancements, designed to support:**
  - Longer system symbols
  - Symbol values longer than the corresponding symbol names
- **Dependent Job Control for JES2**
  - Similar conceptually to //*NET for JES3 but implemented quite differently
  - Designed to allow you to specify that sets of jobs run in particular ways
    - No job (except the first) runs until other jobs it depends on have run
    - Support for parallel execution (with available INITs) so that multiple jobs can start once a dependent job has finished
  - Intended for ad hoc sets of jobs that do not need formal production control
- **Deadline Scheduling for JES2**
  - Similar to some of the JES3 //*MAIN DEADLINE= function but planned to be implemented a bit more intuitively (“STARTBY” vs. “DEADLINE”)
    - Submit jobs at a low priority…
    - …have the priority increase when the specified time is reached
  - As above, intended for ad hoc job scheduling
    - Jobs can tend to run at quiet, less-expensive times of day

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Scalability and Performance*

- **CA-Level Locking for RLS**
  - Today an entire data set's index is locked for a number of operations
    - Such as CI splits, CI reclaims, spanned-record processing
  - z/OS V2.2 planned to be designed to lock the index at the CA level
  - For all KSDS and RRDS (including AIXes and Catalogs)
  - CA split and reclaim still need the data set level lock
  - Expected to improve performance and make much larger data sets practical with high update activity
- **Support for more jobs with JES2 planned:**
  - Up to 1,000,000 jobs
  - More JQEs, BERTs
- **Multisystem DFSMShsm Fast Replication Tape processing**
  - New support planned to allow FRBACKUP processing to be distributed across a Parallel Sysplex

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Scalability and Performance*

- **AMODE64 File System Services**
  - z/OS UNIX file system services planned to be callable in AMODE64
  - Eliminate need for 64-bit programs to reset mode to AMODE31 for file system operations
  - Removing the need to set mode should help improve performance
- **64-bit NFS Client Support planned**
  - In support of the item above
  - Note: 64-bit NFS Server was in z/OS V2.1
- **Support for more temporary DD names**
  - Old supported limit was 64K-1 (real implemented limit was ~78K)
  - New limit planned to be 99999 (SYS00001-SYS99999)

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Improving Availability*

- **JES3 DSI Change**
  - *Not* Dynamic System Interchange; that "other" DSI": Data Set Integrity
  - In "recent" releases before z/OS V2.2, PPTNDSI must be set in IEFSDPPT (and not overridden by specifying DSI in SCHEDxx)
    - Default PPT entry for IATINTK remains:
      - C9C1 E3C9 D5E3 D240 ED10 (byte 8 bit 5 is PPTNDSI)
  - This causes JES3 to use S99NORES ("don't ENQ") for its allocations
  - z/OS V2.2 planned to support specifying DSI for JES3 in SCHEDxx
  - Default PPT still planned to contain PPTNDSI for JES3 for now
- **Better Subsystem Interface (SSI) Initialization Processing planned:**
  - SSCVT entry no longer intended to be built when initialization routines (INITRTNs) are not found
  - Support for a new command to delete a subsystem planned:
    - SETSSI DELETE,SUBNAME=ssss,FORCE
    - (There will be some restrictions!)
- **Dynamic Exit support for O/C/EOV**
  - Support for the Tape Installation Exits planned: Volume Mount, File Start, File Validate, File End and Label Anomaly

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Extending Availability*

- **Private Area Virtual Storage Tracking in PFA**
  - New function designed to track data based on new fields in VSM's LDA
- **Support for dynamic TDS (LDAP) Compatibility Upgrades planned**
  - New "transition mode" designed for LDAP server
  - TM intended to allow higher compatibility level and new back ends to be specified
  - Support for directing LDAP requests to the TM server
  - Designed to allow new specifications to be effective for the Parallel Sysplex once other LDAP servers in the 'plex have been shut down
  - Subsequently restarted servers will be designed to use the new specifications
  - Restart the original TM server to complete the process
- **Dynamic JES2 Checkpoint Expansion**
  - Assuming enough space, designed to allow you to increase Checkpoint size without a cold start

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Self-Managing Capabilities*

- **JES2 Step-Level Completion Codes**
  - In addition to existing support for job-level information
  - Summary-oriented information can make it much faster to interpret job output
  - New machine-readable JES2 EVENTLOG data set
  - Optional SMF30 support
- **Generic Tracker Improvements**
  - GTZTRACK planned to create SMF records
  - New SMF record type
  - Expected to allow you to split GTZTRACK records into a dedicated log stream and run IFASMFDL later to retrieve all tracked program events after some period of time (e.g., to find migration actions)
  - REXX interface also planned
- **Guaranteed Space* ("Some Conditions Apply")**
  - Based on a new DATACLAS parameter, this will be designed to allow "guaranteed" space to be reduced by up to a specified percentage
  - So the space specified becomes a "strong suggestion"
  - Default is that Guaranteed Space remains "guaranteed" (assuming it succeeds)

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Self-Managing Capabilities*

- **DFSMShsm Storage Tiers Extensions planned, designed to support:**
  - Command-initiated transitions for tier demotion within L0 for storage admins:
    - MIGRATE VOLUME|STORAGEGROUP support for new MIGRATIONONLY and TRANSITIONONLY keywords
    - MIGRATE DATASETNAME support for new TRANSITION keyword
  - A corresponding user-level HMIGRATE command, ARCHMIG service
  - MIGRATE STORAGEGROUP
  - *Lateral* transitions with MIGRATE STORAGEGROUP MOVE
- **Start/Stop Support for Infoprint Server Daemons planned:**
  - Will be designed to change the daemons to started tasks
  - Much better integration with typical recovery tools (MPF, SA, ARM, SFM, NetView, etc.) expected
- **Health-Based Workload Routing**
  - WLM infrastructure to improve “anti-storm drain” will be designed to support: Health value tracking
  - A query API, including ASID-level support, for retrieving health weight values
  - Health weight adjustment based on “finger-pointing” (i.e., “that’s not working right” in addition to “I’m not working right”)
  - Function-specific health weight values

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Self-Managing Capabilities*

- **JES2 Dynamic Checkpoint Tuning**
  - JES2 checkpoints defined in a multi-access spool (MAS) configuration must be tuned for hold and dormancy times on the MASDEF statement
  - You can pick good values…
  - …but it's hard to pick ones that are good all the time
  - z/OS V2.2 JES2 will be designed to tune them automatically

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Enhancing Security*

- **SMF record signing planned**
  - Idea is to make SMF a fully-trusted repository of audit data by making it much more tamper-evident
  - Designed to be available for SMF data written to System Logger
  - Planned to use both CPACF symmetric algorithm for hashing to support needed data rates and CEXnC card for signatures
  - Groups of records planned to be signed
  - Each group intended to have a new SMF2 trailer record with the signature
  - IFASMFDP support planned for verifying the signatures
    - To verify signatures:
      1. Unload using IFASMFDL
      2. Process the SMF data with IFASMFDP
  - We plan to document the SMF2 record format, so anyone can do signature verification

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Enhancing Security*

- **PKINIT (RFC 4556) support planned**
  - Certificate-based authentication for Kerberos
- **RRSF Improvements**
  - Operator command-based dynamic movement of the primary RRSF node planned
  - Intended to allow system automation tooling to move the primary node to another system (and presumably move it back later!)
- **Separate OPERCMDS profiles for display/change aspects of F CATALOG**
  - Designed to support a new MVS.MODIFY.STC.CATALOG.CATALOG.SECURE profile
  - Will be intended to restrict access to the two different flavors of F CATALOG
    - READ access intended to allow display commands
    - UDPATE intended to allows changes to Catalog behavior

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Enhancing Security*

- **System SSL RFC 2560 OCSP Support**
  - Will be designed to:
    - Add OCSP support to System SSL
    - Expand SSL Support for FTP Data/Control (RFC 4217)
- **SAF interface to RACDCERT and the R_datalib service planned**
  - Will be designed for key ring and certificate management enablement

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Enhancing Security*

- **More RACF Sensitive Resource Health Checks planned, for**:
  - ICSF
  - RACF password encryption technique
  - Password controls
  - RRSF work data sets
  - More z/OS UNIX System Services resources

- **Read-Only AUDITOR support will be designed to provide:**
  - A new RAUDITOR attribute intended to be a “look but don’t touch” setting
  - Designed to preclude changes to RACF audit events; otherwise, the same as AUDITOR
- **Console auto-logoff support planned:**
  - Designed to allow you to specify a timeout for consoles
  - Intended to be similar to timeouts for TSO/E and z/OS UNIX users
  - Automatically logging off unattended consoles is intended to help you improve security

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

Application Development and Support for Industry and Open Standards*

- **EU Ordering Rules for Unicode and HKSCS conversions support planned:**
  - Common collation sequence across the EU
    - (e.g., how do you sort “a,” “ã,” “à,” “á,” “æ,” “ä,” and “ą”?)
  - Also, 4-byte HKSCS-2008 conversions
- **Persistent File Handles for NFS access to z/OS UNIX files**
  - New support will be designed to persist z/OS UNIX file handles accessed via NFS across a server restart
  - Also planned to support symlinks for z/OS UNIX files
- **Support for 64-bit shared large (1 MB) Pages**
  - Designed to allow you to specify that the system should try to back shared memory objects above the bar using 1M pages
- **New and improved symbol support in JES3**
  - Instream substitution, longer symbols, and ENF78 support planned
- **Improved batch support in JES3**
  - //OUTPUT JCL statement improvements
  - DDNAME, MERGE, and PROCLIB JCL support

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Extending the Network*

- **64-bit TCP/IP Stack**
  - TCP/IP stack will be designed to support AMODE 64
- **Enterprise Extender (EE) scalability**
  - Intended to improve performance for configurations with very large number of EE endpoints
- **RoCE Improvements planned to support**
  - SMC-R autonomics
  - 4K MTU
- **DVIPA Limit**
  - Single-stack limit will be designed to be increased from 1K to 4K for application instance DVIPAs
- **TCP/IP Configuration**
  - Configuration Assistant will be designed to support configuration beyond policy-based network management

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

Extending the Network*

- **NIST SP800-131a support will be designed for:**
  - TLSv1.1, TLSv1.2, SHA-2 hashes, and encryption key strengths of more than 111 bits
  - Support for Digital Certificate Access Server (DCAS), SNMP, Sendmail, and centralized policy agent
- **TLS Session Reuse planned to provide:**
  - Reduced overhead
  - One less opportunity to intercept a connection
- **CICS Sockets**
  - Support for CICS transaction tracking planned
- **Resolver Improvements planned to support:**
  - Resolver will be designed to enable nondisruptive tracing for long-running address spaces

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Agenda

- zEC12 and zBC12 Support
  - CF Support of Flash Express
  - Thin Interrupts
  - zEnterprise Data Compression
- Other Recent/Planned z/OS V2.1 Enhancements
  - Usability, Scalability, Availability, Manageability, Application Enablement, Security, and Networking
- A “Pre” Preview of Planned z/OS V2.2 Enhancements
  - Usability, Scalability, Availability, Manageability, Application Enablement, Security, and Networking
- **Key Migration Considerations**
  - **z/OS V2.1 Content (size/fonts; removals)**
  - **Selected Migration Actions**

z/OS Ordering and Delivery Schedule

IBM

Deliverable	2010	2011	2012	2013	2014	2015	2016	2017
z/OS V1.12[1,2]								
z/OS V1.13[3]								
Cryptographic Support for z/OS V1R11-R13 *(FMID HCR7790)*								
Cryptographic Support for z/OS V1R12 -R13 *(FMID HCR77A0)*								
z/OS V1R13 RSM Enablement Offering *(FMID JBB778H)*								
z/OS V2.1[4]								
Cryptographic Support for z/OS V1R13-V2R1 *(FMID HCR77A1)*								
z/OS V2.2*								

	Service Supported
	Announced additional service support period
	Extended defect support provided by IBM Software Services

We are here

1. **z/OS V1.12 is currently out of service. However IBM Software Support Services offers a service extension for extended defect support.**
2. **z/OS V1.12 customers can migrate with coexistence and fallback support to z/OS V1.13 or z/OS V2.1**
3. **z/OS V1.13 customers can migrate with coexistence and fallback support to z/OS V2.1 or z/OS V2.2***
4. **z/OS V2.1 customers can migrate with coexistence and fallback support to z/OS V2.2* or z/OS V2.3***

*** Planned. All statements regarding IBM's plans, directions, and intent are subject to change or withdrawal without notice.**

Positioning for z/OS V2.1

- **Read Documentation and PSP buckets**
  - ***z/OS V2.1 Migration*** and ***z/OS V2.1 Planning for Installation***
  - Software PSP buckets: ZOSV2R1: ZOSGEN, SERVERPAC, ...
- **Prepare the Driving and Target systems**
  - z/OS V2.1 requires z9 or higher, and appropriate storage control units.
  - Use FIXCATs *IBM.TargetSystem-RequiredService.z/OS.V2R1, IBM.Coexistence.z/OS.V2R1, IBM.Function.HealthChecker*, and others.
  - Approximate **DASD Storage Requirements for z/OS:**

sizes in 3390 cylinders	z/OS V1.12	z/OS V1.13	z/OS V2.1
Target libraries (PDS and PDSE)	5,891	5,868	**11,051**
DLIB	8,599	8,941	**17,960**
Root file system	3,100	3,293 (HFS) 3,309 (zFS)	**3,300 (HFS)** **3,319 (zFS)**
Font file system	N/A	N/A	**2,048 (HFS or zFS)**

The 3390-9 capacity is 10,017 cylinders.

New base element in z/OS V2.1: z/OS Font Collection

z/OS Font Collection Overview:

- By having fonts in the z/OS base, fonts are always available on z/OS systems!
- No need to separately order what is included below!
  1. **AFP Font Collection for S/390** (5648-B33)
     - Includes Japanese, Korean, Traditional Chinese, and Simplified Chinese
  2. **IBM Infoprint Fonts for z/OS** (5648-E76)
     - Includes Japanese, Korean, Traditional Chinese, and Simplified Chinese
  3. **PSF Compatibility Font feature** (5655-M32)
     - NOT the executable code or entire product, just the PSF feature for the compatibility fonts
  4. **Selected object fonts (*not source!)***
     - Pi and Special (5771-ABC), Math and Science (5771-ADT).
     - (Some publications documented other fonts, incorrectly.)
  5. **World type fonts** that were not previously available in the z/OS environment.
     - Were part of the InfoPrint Font Collection V3.1 available on other platforms. Subset of TrueType fonts are in Infoprint Transforms to AFP for z/OS V2.3 (5655-N60).
     - Can be found the z/OS UNIX file system

New base element in z/OS V2.1: z/OS Font Collection

- **z/OS Font Collection** installation information
  - Uses these syslibs and path:
    - SYS1.FONT300 (previously existing, new to z/OS)
    - SYS1.FONTLIB (previously existing, new to z/OS)
    - SYS1.FONTLIBB (previously existing, new to z/OS)
    - SYS1.SFNTILIB (previously existing, new to z/OS)
    - SYS1.SFONDLIB (previously existing, new to z/OS)
      - These data sets use approx. 2000 cylinders
    - /usr/lpp/fonts/worldtype/IBM/ **new!**
  - Some fonts will use a new separately provided file system:
    - Mounted at /usr/lpp/fonts
    - Approx. allocation size of new font file system:
      - zFS: 2048 3390 cylinders
      - HFS: 2028 3390 cylinders

Element and Functions Withdrawn from z/OS V2.1

- **BPX.DEFAULT.USER**
  - Use BPX.UNIQUE.USER instead (as of R11) or assign unique UIDs and GIDs. Use RACF OA42554 to help with home directory set up!
- **Language Environment runtime options via USERMOD**
  - Use CEEPRMxx instead (with z/OS R12 NONOVR support, if necessary)
- **Windows-based tools: Capacity Provisioning Control Center and Configuration Assistant for Communications Server**
  - Use the z/OSMF-based Capacity Provisioning application to allow you to control your Capacity Provisioning function.
  - For configuration assistance for Communications Server, use the z/OSMF-based Configuration Assistant.
- **BookManager books withdrawn**
  - Instead, use Information Centers or PDFs
    - Use now for V2R1: http://*publib.boulder.ibm.com/infocenter/zos/v2r1/index.jsp*
- **Physical DVDs withdrawn**
  - Instead, use electronic delivery of documentation over the Internet

Element and Functions Withdrawn from z/OS V2.1

- **zFS multi-file system aggregates (from Distributed File Service)**
  - Copy zFS multi-file system aggregates to zFS compatibility mode aggregates
- **zFS cloning support (such as `zfsadm clone` and `zfsadm clonesys` commands). Do not mount file systems containing a cloned file system (.bak).**
  - Find (with **`modify zfs,query`** command) and copy any cloned files to compatibility mode aggregrates.
- **BIND 9.2.0 function (from the Communications Server** for use as a caching-only name server)
  - Use Resolver cache function (in z/OS R11). For use as a primary or secondary authoritative name server, consider using BIND on Linux for System z.
- **Capacity Provisioning using System z API with SE and HMC**
  - Use Tracking Facility with OA35284. Look for "CPO-W:SNMP *usage domain name*".
- **ICLI (Integrated Call Level Interface, from z/OS UNIX)**
  - Investigate changing from ICLI to standard IBM DB2 Connect for data base connectivity. Use Tracking Facility with PTF UA67900. Look for "ICLI Server for SAP…"

ServerPac Migration Action

- Applicable to any ServerPac order created as of October 1, 2013. Applicable to any z/OS V2.1 ServerPac order.
- You must have the CustomPac dialog level at least 26.00.00.
  - The upper right corner of the primary panel will tell you the level.

- Refer to *ServerPac: Using the Installation Dialog* for instructions. For electronic orders:
  1. Copy the EUPDATES job from the FTP server as instructed within Shopz, to your system.
  2. Customize the job to indicate what the hlq name of your master CustomPac dialog data sets are.
  3. Run the EUPDATES job.
- *You cannot perform this migration action until you receive your ServerPac order.*

IFAPRDxx Migration Action

- **Verify your IFAPRDxx Product ID is correct for z/OS V2 (Required)**
  - z/OS V2.1 has a new program number (5659-ZOS)
  - You can have both V1 and V2 features enabled, if sharing PARMLIB members
  - Failure to update IFAPRDxx may result in various initialization failures such as:

    IFA104I REGISTRATION HAS BEEN DENIED FOR PRODUCT
    WITH OWNER=IBM CORP NAME=z/OS
    FEATURE=TCP/IP BASE
    VERSION=.. ID=5650-ZOS
  - Use customized IFAPRDxx shipped with your z/OS V2 order, such as:

    PRODUCT OWNER('IBM CORP')
    NAME('z/OS')
    ID(5650-ZOS)
    VERSION(*) RELEASE(*) MOD(*)
    FEATURENAME('SECURITY SERVER')
    STATE(ENABLED)

z/OS V2.1 Migration Considerations

- **All migration actions are documented in the z/OS V2.1 Migration book.**
  - Always use the latest level of the book available on the web
    - New migration actions have been identified since z/OS V2.1 became available
- **Some key migration actions for z/OS V2.1**
  - z/OS V2.1 requires z9 or higher, and appropriate storage control units.
  - Use FIXCATs *IBM.TargetSystem-RequiredService.z/OS.V2R1, IBM.Coexistence.z/OS.V2R1, IBM.Function.HealthChecker*, and others.
  - Ensure that the increased disk space is accommodated for:
    - Target libraries (5K cyls),
    - z/OS UNIX filesystem (fonts) (2K cyls), and
    - DLIBs (9K cyls)
  - Prepare now for removed content:
    - BookManager books,
    - BPX.DEFAULT.USER,
    - zFS multi-fs aggrs,
    - IBM HTTP Server (Domino) (will be Required in the release after z/OS V2.1),
    - Migrate to z11 mode (will be Required in the release after z/OS V2.1)
    - ...
  - Ensure ServerPac dialogs are at the appropriate level
  - Update IFAPRXxx for new z/OS Program Number