What's New in z/OS V2.5

z/OS V2.5 – GA Edition
September 2021 (z/OS V2.5 Announce)

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

IBM

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(CD) – Base V2.5 items that were **C**ontinuous **D**elivery on previous release(s)
(CD) – **C**ontinuous **D**elivery items post V2.5 General Availability
(SOD) – Statement of Direction

- Content solution pages

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z/OS V2.5 Release Overview - Release Themes

The next release of IBM z/OS, version 2 release 5, intends to drive innovative development to support new business applications in cloud and AI by enabling next generation systems operators and developers to have easy access and a simplified experience with IBM z/OS. All while relying on the most optimal usage of computing power and resources of IBM Z servers for scale, security and business continuity.

z/OS V2.5 Messaging			
Workload Enablement	**OS Mgmt. Simplification**	**Cyberthreat Secure Z**	**Intelligent Resiliency**
Hybrid Cloud / Application Modernization		**Security / Cyber Resiliency**	
Built for scale and simultaneous deployment to support agile business use cases for hybrid cloud and AI capabilities.	Easier installation, management, and use of z/OS by administrators and developers with no special skills required for increased agility.	Cyber security systems integrity, heightened application availability and automated detection and mitigation procedures to protect against the impacts of cyber attacks and help maintain exceptionally resilient environments	

z/OS V2.5 Release Overview - Release Highlights

Feature	Description
Workload Enablement	**Workload Enablement:** An **Application Developer,** can treat z/OS the same as any other operating system platform with respect to hybrid cloud deployment, achieving rapid application development and provisioning, demonstrating z/OS's ability to match or exceed any other operating system.
Intelligent Resiliency	**Resiliency**: An **Infrastructure Architect** will gain enhanced resiliency capabilities that provide heightened application availability, modernized tools and automated detection/mitigation procedures, enabling them to maintain exceptionally resilient environments in half the time and with reduced skill requirements.
Cyber Threat Secure Z	**Security:** A **Security Architect** can leverage cyber security system hardening and analytics to readily exceed regulatory compliance requirements and to provide a new level of cyber resiliency for the enterprise.
OS Management Simplification	**Systems Management**: An **early tenure z/OS System Programmer**, can independently, confidently, and successfully deploy, maintain, and manage z/OS (and stack) software functions using guided and customized instructions and workflows.

z/OS V2.5 Release Overview – Workload Enablement

An Application Developer can treat z/OS the same as any other operating system platform with respect to hybrid cloud deployment, achieving rapid application development and provisioning, demonstrating z/OS's ability to match or exceed any other operating system.

- COBOL/JAVA Interoperability
- UNIX Application Enablement and Standards
- Cross-Platform and Cloud Interoperability / Communication
- Cross-Platform and Cloud Interoperability / Filesystems
- Language Support
- Container Extensions (zCX) Adoption items
- Analytics Modernization
- Analytics integration and Adoption
- Exploit z and z/OS feature for Modern Analytics apps
- Running LE Applications and Programs in 64-bit Memory Space
- Native Containers (SOD)

z/OS V2.5 Release Overview – Intelligent Resiliency

An Infrastructure Architect will gain new and enhanced resiliency capabilities that provide greater application availability and scalability, faster recovery, and expedited triage and resolution of potential problems, enabling his team to easily and efficiently maintain exceptionally resilient environments.

Remote Pair FlashCopy Support for GM

z/OS Anomaly Mitigation

Parallel Sysplex Resiliency

z15 System Recovery Boost Use Cases

z/OS V2.5 Release Overview – CyberThreat Secure Z

A Security Architect can leverage cyber security system hardening and analytics to readily exceed regulatory compliance requirements and to provide a new level of cyber resiliency for the enterprise.

Security Standards, Crypto Support and Security Infrastructure

Definition and Protection of Sensitive Data in Dumps

Logical Corruption Protection & Recovery

Simplified Compliance via System Hardening

Digital Certificate Simplification

Network Encryption Enforcement

Pervasive Encryption Simplification

z/OS V2.5 Release Overview – OS Management Simplification

An early tenure z/OS System Programmer can independently, confidently, and successfully deploy, maintain, and manage z/OS (and stack) software functions using guided and customized instructions and workflows.

Core Software (z/OS) Management Services (SOD)

Platform Mgmt REST APIs, GUIs, and Simplification Apps

z/OS Cloud Provisioning and Management

z/OSMF Software Management: Software Installation Support

Parallel Sysplex and Coupling Management Application Enhancements

z/OS V2.5 Release Overview – z/OS support summary

Release	z9 EC z9 BC WdfM	z10 EC z10 BC WdfM	z196 z114 WdfM	zEC12 zBC12 WdfM	z13 z13s WdfM	z14 zR1	z15	End of Service	Extended Defect Support
z/OS V2.1	X	X	X	X	X	X		9/18	9/21[2]
z/OS V2.2		X	X	X	X	X	X	9/20	9/23[2]
z/OS V2.3				X	X	X	X	9/22[1]	9/25[2]
z/OS V2.4				X	X	X	X	9/24[1]	9/27[2]
z/OS V2.5[3]					X	X	X	9/26[1]	9/29[2]

Notes:

[1] - All statements regarding IBM's plans, directions, and intent are subject to change or withdrawal without notice.

[2] - Extended support dates are projected and are subject to change or withdrawal without notice.

[3] - z/OS 2.5 is the last release of z/OS that will include IBM JES3 & BDT

WdfM - Server has been withdrawn from Marketing

Legend

Defect support provided with IBM Software Support Services for z/OS
Generally supported

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Z Hardware Support

IBM z15 Model T01 functions & features

One hardware model, Five Features, 1-4 19" Frame System
z/Architecture Mode ONLY
•L1 Private 128K i & 28K d -L2 Private 2MB i & 2MB d •L3 Shared 256 MB / chip -L4 Shared 956 MB / drawer
Up to 190 processors configurable as CPs, zIIPs, IFLs, ICFs or optional SAPs • Up to 190-way on z/OS V2.1 and later (non-SMT mode)
Up to 40 TB of Redundant Array of Intendent Memory (RAIM) – 1 TB Memory Increment – 8 TB/Drawer - Max • Up to 16 TB per/z/OS LPAR with z/OS V2.5
256 GB Fixed HSA
Channel Subsystem scalability • Up to 85 LPARs • Up to six (6) Channel Sub Systems (CSSs) • 4 Subchannel Sets per CSS
HiperDispatch Enhancements
Two-way SMT for zIIPs, IFLs, and SAPs
30+ New instructions: Java, Vector enhancements for Analytics and sort acceleration
Hardware Instrumentation Services (CPUMF)
z/OS V2R4 XL C/C++ ARCH(13) and TUNE(13) exploitation: • New z15 hardware instructions • Aligned Vector Load/Store Hint instructions • Vector Enhancement Facility 2 • Miscellaneous-Instruction-Extension Facility 3

(z/OS support in blue)

IBM Virtual Flash Memory & CF Exploitation of VFM Up to 12 Features – Feature Size=0.5TB
IBM System Recovery Boost – Sysplex Recovery
IBM Integrated Accelerator for Z Sort
IBM Integrated Accelerator for z Enterprise Data Compression (on-Chip Compression)
Coupling Facility Level 24 •Coupling Facility Fair Latch Manager 2 •Message Path SYID Resiliency Enhancement •DYNDISP Default THIN •Coupling Facility Monopolization Avoidance
• Coupling CHPIDs increased to 384 from 256 per CEC • ICA SR increased to 96; ICP increased to 64
Integrated Coupling Adapter (ICA-SR) links NB + CF
Coupling Express (CX3) LR, NB + CE LR CF
Next Gen RoCE 25/10 GbE RoCE-Express2.1 (CX4)
FICON Express16SA
OSA Express7S (1,10,25 GbE) • Greater than 16 Adapters support
zHyperLink® Express1.1 (FC 0451) / CF • Maximum 16 Adapters
Crypto Express7S (FC 0899 - 1 HSM, FC 0898 - 2 HSM) • Max 60, Combination of (CEX7S. CEX6S,CEX5S) • Up to 16 (CEX6S and CEX5S) can be Carried Forward but rest must be CEX7 • Support for new CCA 7.1 functions • New ECC Edward Curves support

Z Hardware Support

IBM z15 Model T02 functions & features

One hardware model T02 19-inch frame
zArchitecture Mode ONLY
Up to 65 processors configurable as CPs, zIIPs, IFLs, ICFs or optional SAPs
•L1 Private 128K i & 28K d -L2 Private 2MB i & 2MB d •L3 Shared 256 MB / chip -L4 Shared 956 MB / drawer
Up to 16 TB of Redundant Array of Intendent Memory (RAIM) – 1 TB Memory Increment – 8 TB/Drawer - Max • Up to 16 TB per/z/OS LPAR with z/OS V2.5
160 GB Fixed HSA
Channel Subsystem • Up to 40 LPARs • Up to three (3) Logical Channel Sub Systems (LCSSs) • 3 Subchannel Sets per LCSS
HiperDispatch Enhancements
Two-way simultaneous multithreading (SMT) • Support for SAPs
30+ New instructions: Java, Vector enhancements for Analytics and sort acceleration
XL C/C++ ARCH(13) and TUNE(13) exploitation: • New z15 hardware instructions • Aligned Vector Load/Store Hint instructions • Vector Enhancement Facility 2 • Miscellaneous-Instruction-Extension Facility 3
Hardware Instrumentation Services (CPUMF)

(z/OS support in blue)

IBM Virtual Flash Memory & CF Exploitation of VFM Up to 4 Features – Feature Size=0.5TB
IBM System Recovery Boost
IBM Integrated Accelerator for Z Sort
IBM Integrated Accelerator for z Enterprise Data Compression (on-Chip Compression)
CF Level 24 •CF Fair Latch Manager 2 •Message Path SYID Resiliency Enhancement •DYNDISP Default THIN •CF Monopolization Avoidance
• Coupling CHPIDs increased to 384 from 256 per CEC • ICA SR increased to 48; CE-LR to 64; ICP increased to 64
Integrated Coupling Adapter (ICA-SR) links NB + CF
Coupling Express (CX3) LR, NB + CE LR CF
Next Gen RoCE 25/10 GbE RoCE-Express2.1 (CX4)
FICON Express16S+ (Fiber Channel Endpoint Security not supported)
OSA Express6S GbE, 10GbE, 1000Base-T OSA Express7S 25 GbE SR1.1
IBM zHyperLink® Express1.1 2 Port Adapter FC0451 / CF
Crypto Express7S (FC 0899 - 1 HSM, FC 0898 - 2 HSM) • Max 40 Combination of (CEX7S. CEX6S,CEX5S) • CEX6S and CEX5S can be Carried Forward (CF) • Support for CCA 7.1 • New ECC Edward Curves support

Z Hardware Support

IBM z15 highlights

- Up to 16 TB of memory per z/OS instance used by select middleware
- Improved compression performance (up to 17x throughput improvement*)
- Up to 20% More coupling links and up to 50% more CHPIDs for the T01 model and 2-3x more coupling links and up to 50% more CHPIDs for the T02 model (CD)
- CFCC improvements
  - Thin interrupt as the default for shared-engine CFs
  - Improved fairness in CF dispatching and better CF efficiency/scalability
  - Improved message path resiliency (CD)
  - CF monopolization avoidance exploitation for resiliency (CD)
- z/OS SLIP to monitor an address or range for a key change and take diagnostic action
- Sort accelerator – updates to DFSORT (CD)
  - New **SORTL** instruction, which is standard on the z15.
  - Designed to cut the CPU costs and improve the elapsed time for eligible sort workloads
  - DFSORT and DB2 for z/OS utilities Suite exploit the SORTL instruction

z15 DFSORT with the Integrated Accelerator for Z Sort vs z14 DFSORT

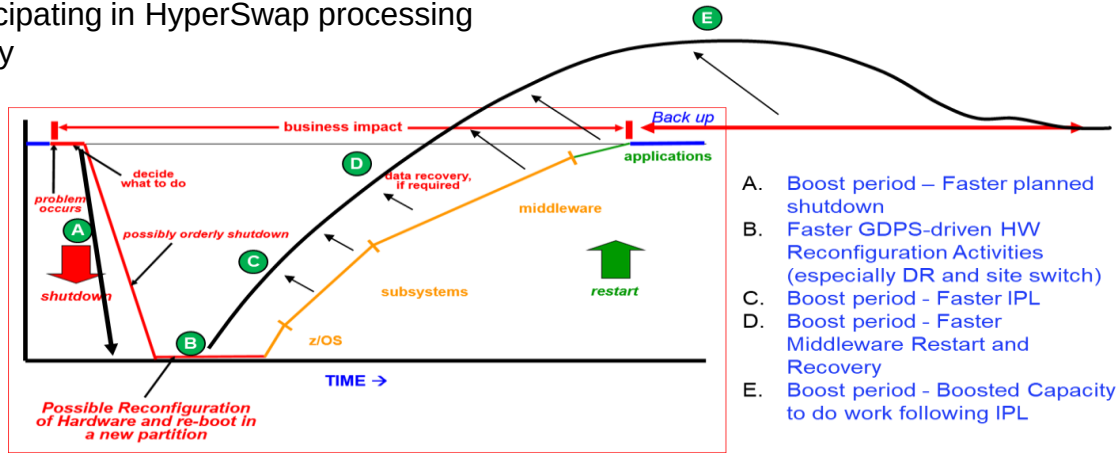
- *Exploiting Z Sort for DFSORT in-memory sort jobs can reduce elapsed time by up to 30% and CPU time by up to 40% for large format data sets with record lengths up to 500 bytes.**

*** All performance information was determined in a controlled environment. Actual results may vary.**
Performance information is provided "AS IS" and no warranties or guarantees are expressed or implied by IBM.

Z Hardware Support

System Recovery Boost support

- IPL and Shutdown boost
  - Speed boost – run the general purpose processors at full speed if they are running sub-capacity normally
  - zIIP boost – allow general purpose work to run on the available zIIPs for increased capacity
  - Up to 60 minutes of boost at IPL and up to 30 minutes of boost at shutdown
- Sysplex Recovery (CD) – support for recovery process boosts
  - Sysplex partitioning – boost surviving systems for recovery
  - CF structure recovery – boost systems participating in structure recovery
  - CF data sharing member recovery – boost all systems recovering
  - Hyper Swap – boost systems participating in HyperSwap processing
  - Up to 30 minutes per LPAR per Day



Z Hardware Support

ICSF is changing how Cryptographic HW support is delivered (CD)

- No more web deliverables. ICSF will ship new HW support via APARs with SMP/E FIXCAT tags.
- New ICSF FMIDs will be delivered with new z/OS releases only. Older FMIDs will remain in service as appropriate.
- HW exploitation on older z/OS releases will be via updates to HCR77D1 only.

ICSF updates planned for z/OS V2.5

- Key data set updates to support larger keys, such as lattice-based keys asymmetric keys.
- Improved capability to demonstrate compliance with key rotation policies related to CEX master key changes
- New protections for elliptic-curve cryptography (ECC) keys – the “private key name” in the token can now be SAF checked.
- The ability to restrict the use of archived keys to “decrypt” operations only, allowing re-encrypt of old ciphertext but not creating new
- Additional HW exploitation for certain SSL/TLS ciphers
- Digital signature support for Edwards curves, Ed448 and Ed25519, and lattice based keys
- CPACF protected key support for a subset of ECC keys
- TR-31 key block support for HMAC keys.
- CVN-18 support for EMV (Europay MasterCard, and Visa) services
- Clear key capability added to Hash-based Message Authentication Code (HMAC) related callable services with CPACF exploitation.
- Additional ISO-4 format PIN bock integration, and the addition of AES DUKPT capability
- New Format Preserving Encryption (FPE) services exploiting FF1, FF2, and FF2.1 algorithms

Z Hardware Support

ICSF HCR77D1 WD#19 (CD)

- A new method for encrypting a DES secure key token is introduced. This is the first proprietary Triple DES (TDES) key token (also known as a key block) to be independently reviewed and confirmed to be compliant with Payment Card Industry (PCI) Security Standard Council (SSC) PIN Security key block requirements as updated September 30, 2020. The new key block is backward compatible with existing applications, can be stored in the Cryptographic Key Data Set (CKDS), and introduces a new wrapping method called WRAPENH3. The wrapping method controls the cryptographic algorithms used to encrypt the clear-key material within the boundary of the coprocessor, resulting in what is known as a "secure key" from an ICSF perspective.
- ICSF offers a utility that can be used to migrate all existing TDES secure keys in a CKDS to the new wrapping method, or it can be done on a key-by-key basis using updated callable services. In addition, a new SAF resource provides a way to override existing applications such that wherever a wrapping method is specified or defaulted, the wrapping method is automatically updated to WRAPENH3.

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z/OS V2.5 Release Overview

Usability and Skills
z/OSMF Desktop filter and type ahead, Workflow management and logging, simpler configuration, performance improvements, SCA for external apps, Diag Assist, Sysplex Mgmt and Policy Editor, Console UI enhancements, DFSMSrmm plug-in, zMSC…

Application Development
z/OS Container Extensions, Web Enablement toolkit, OAM with DB2, ISPF, ABO, Java, Node.js, Python, Go…

Enhancing Security
PassTicket Improv, Spool encrypt, Certificate simplification, FIPS, Data Privacy for Diagnostics, zACS…

Scalability & Performance
VTOC I/O, zHyperLink write Stats, WLM batch improv., IWQ for zCX, RMF, Greater than 4TB…

Data Serving & Storage
Logical Corruption Protection, Transparent Cloud Tiering (TCT), TCT full volume dump, Object Access Method (OAM), DFSMShsm UNIX file backup enhancements, DFSMShsm UNIX indiv file backup and to new directory …

Availability
ARM, Anomaly Mitigation, Catalog improvements, system recovery boost, CF monopolization avoidance…

Systems Management
z/OSMF install of products/fixes,, Multiple NFS servers on a system, JES2 expanded policy support, CP&M time limits, zWIC, SDSF new displays…

Networking
SMC-Dv2, TLS V1.3, zERT, Sysplex Network Health, stack services…

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Application Development

- Expand scope of existing application functions driven mainly by customer usage scenarios
  - Provide new APIs or services
  - Unique support for building and deployment of executables
  - Enhance debugging capability
  - Support for specific standards where required
- Provide timely internationalization support
  - Support Unicode character sets
  - Other support driven by world events
- Upgrade open source and other imbedded IBM technology to current levels and take advantage of z/OS QoS
  - zCX
  - OpenSSH, Xvfb
  - WAS Liberty
- Exploitation of IBM Z-specific technology (including HW) to further advantage application deployment on our platform

Application Development

z/OS Container Extensions – Run Linux workloads on z/OS!

- z/OS Container Extensions provides a virtual appliance for running Linux on Z workloads on z/OS
- The **same binary** container images that run on Linux on Z under zVM or zKVM will run in zCX
- The open mainframe project Ambitus provides an ecosystem for zCX
- For more information, see the zCX content solution (https://www.ibm.com/support/z-content-solutions/container-extensions/).

z/OS Container Extensions Performance Enhancements (CD)

- Improved performance and reduced locking
  - zIIP eligibility improved - 95%+ ziip offload in lab measurements*
  - Support for SIMD – single instruction multiple data
  - Support for 1MB and 2GB Large pages, containers per server raised up to 1000, and maximum guest memory raised to 1 TB
- The number of data and swap disks per appliance is increased to as many as 245.
  - This enables a single zCX server to address more customer data at one time
- The maximum size of zCX disks is increased to 1TB

Application Development

z/OS Container Extensions trial (CD)

- 90 day trial without HW feature code 104

  (90-day trial is free subject to normal hardware and software consumption when adding a workload to z/OS)
- Customer self service

z/OS Container Hosting Foundation Product (CD)

- A new monthly license charged software product to optionally replace the HW feature code 104
- Customers have a choice with z15 to purchase the HW Feature code or the new Product
- The SW product is for zCX only but requires only one instance per machine

z/OS Container Extensions IBM License Metric Tool (ILMT) (CD)

- For use with sub-capacity pricing of IBM Linux on z software
- Manual counting no longer required

z/OS Container Extensions IPv6 Support (CD)

- Support is added to zCX in support of IPv6

Application Development

z/OS Container Extensions resiliency (CD)

- Support to monitor and log zCX resource usage of the root disk, guest memory, swap disk, and data disks in the servers job log.
- A new operator command option to display the version and service information about any zCX server and all the relevant components used to provision and run it.
- The zCX instance root disk can be enlarged when using the software upgrade workflow of the zCX appliance.
- zCX resource shortage z/OS alerts. These proactive alerts are sent to the z/OS system log (SYSLOG) or operations log (OPERLOG) to improve monitoring and automated operations.

Proxy server for IBM z/OS Container Extensions (CD)

- zCX is enhanced to support proxy configuration, allowing the Docker daemon to use the proxy server in your enterprise to access external public and private Docker registries.
- The optional proxy configuration for z/OS Container Extensions can be configured using the provisioning and reconfiguration z/OSMF workflows.

IBM Z Container Image Registry

Early Access Program

A registry for open source container images*

- Building blocks for creating workloads
- IBM Z versions of popular images
- Foundational distros, languages, databases, web serving, CI/CD infrastructure

Hosted at the IBM Container Registry

- Images are built from scratch by IBM
- IBM controls the contents of the channel
- Images are scanned by IBM Vulnerability Manager
  - Reports available to review
- Image digest hashes published to enable secure pull
- Images deploy on IBM z/OS zCX and Linux on Z/LinuxONE

Accommodate common Z security requirements by working with a source you can trust to deliver container images built using best practices

Get started at https://ibm.biz/zregeap

* This program has important terms and conditions for use of the images of this registry. Please see the program agreement for a full details of these terms.

Application Development

z/OS Containers (SOD)

- In June of 2020 IBM® made the following statements of general direction:
  - *IBM intends to deliver a container runtime for IBM z/OS® in support of Open Containers Initiative (OCI) compliant images comprising traditional z/OS software.*
  - *IBM intends to deliver Kubernetes orchestration for these containers on z/OS.*

- z/OS intends to provide the basis for future support of an OCI container runtime and Kubernetes container orchestration for **IBM z/OS applications and workloads**. This will enable clients to adopt a container based cloud native strategy for application development and operation of mission critical z/OS applications

- As a future item in z/OS - z/OS Containers intends to provide an industry standard container experience for z/OS that is consistent and familiar to application developers.

Application Development

AI on z/OS – New materials to help jump start your AI adoption journey

- Journey to AI on IBM Z and LinuxONE content solution
  - Guidance on identifying use cases, available solutions, recent developments and more.

https://www.ibm.com/support/z-content-solutions/journey-to-ai-on-z/

- AI on IBM Z and LinuxONE community
  - Read recent blogs and announcements.
  - Engage with subject matter experts on the latest topics around AI on IBM Z
  - https://community.ibm.com/community/user/ibmz-and-linuxone/groups/topic-home?CommunityKey=038560b2-e962-4500-b0b5-e3745175a065

AI on z/OS – Leverage open-source AI frameworks on zCX

- Deploy AI frameworks co-located with z/OS applications for low latency response times.
- Popular machine learning and deep learning frameworks such as TensorFlow available as pre-built images in the IBM Z Container Image Repository.
- Utilize Anaconda to install and manage data science packages: https://www.ibm.com/blogs/systems/announcing-anaconda-for-linux-on-ibm-z-linuxone/

Application Development

AI on z/OS - Watson Machine Learning on z/OS 2.3 recent updates

- Build, deploy and operationalize machine learning models on z/OS.
- Improved performance for various type of machine learning models.
- Easily import, optimize and deploy Open Neural Network Exchange (ONNX) deep learning models on zCX.

AI on z/OS – Watson Machine Online Scoring Community Edition

- A lightweight no-charge trial of Watson Machine Learning for z/OS that enables you to score ONNX models for in-transaction inferencing.

Latest Compiler Offerings on z/OS

Enterprise COBOL v6.3

Automatic Binary Optimizer v2.1

Enterprise PL/I v5.3

z/OS v2.4 XL C/C++
(entitled also to IBM Open XL C/C++ V2.4.1)

IBM SDK for z/OS, Java Technology Edition

IBM SDK for Node.js – z/OS v14

IBM Open Enterprise SDK for Python on z/OS v3.9

IBM Open Enterprise SDK for Go 1.16

Application Development

z/OS V2.5 and Java

- The Java 8 level of Java will be supported at z/OS 2.5 GA.
- Anticipate z/OS 2.5 may support newer Java levels when they are available
- Java 11 Statement of Direction reiterated in recent blog posting:
    - IBM intends to deliver IBM SDK for z/OS, Java Technology Edition version 11 in phases. The initial phase of the SDK is planned to support the language specification compliant with Java Platform Standard Edition (Java SE) 11 application programming interfaces (APIs).

Application Development

COBOL-Java Interoperability (CD)

- Support to manage parallel 31-bit and 64-bit Language Environment addressing mode (AMODE) enclaves within the same address space.
- Enables transparent traversal between the two AMODE enclaves.
- This interoperability support enables clients to modernize their existing high-level language applications.
  - 31-bit COBOL applications can now be extended by calling 64-bit Java programs (or vice versa) directly, in the same application context and address space with the enhancements made to IBM Java 8 SDK.
- Other features of this support include coordinated condition handling, easier serviceability because both enclaves are automatically part of the same dump and having the same security context for the entire application.
- While the primary focus is for COBOL-Java interoperability, the LE support is designed to work for any combination of high-level languages interoperating between 31-bit and 64-bit addressing modes.

Application Development

New IBM Open XL C/C++ compiler adds support to help IBM z/OS UNIX users port applications from distributed platforms (CD)

- The IBM Open XL C/C++ V2.4.1 web deliverable for z/OS V2.4 delivers C11, C++11, and C++14 language standards support, and hardware exploitation capabilities, including exploitation of the latest IBM z15. It is the integration of IBM advanced XL optimization technologies with the LLVM open source Clang infrastructure that gives the IBM Open XL C/C++ V2.4.1 web deliverable more current language standards support, ease in migrating apps from distributed platforms, and z/Architecture exploitation capabilities.
  - The IBM Open XL C/C++ V2.4.1 compiler supports EBCDIC and ASCII execution character sets, and generates AMODE 64 code, making it ideal for z/OS UNIX users porting applications from distributed platforms.
  - The IBM Open XL C/C++ V2.4.1 web download is a no-charge add-on feature for clients that have enabled the IBM z/OS XL C/C++ compiler (an optionally priced feature) on z/OS V2.4.
    - It coexists with, and does not replace, the base IBM z/OS XL C/C++ V2.4 compiler. Both the IBM z/OS XL C/C++ V2.4 and IBM Open XL C/C++ V2.4.1 compilers are both designed to be used independently and are also serviced and supported independently.
  - The IBM Open XL C/C++ V2.4.1 web deliverable will be available on December 13, 2019, from the z/OS Downloads (http://www.ibm.com/systems/z/os/zos/downloads/) website.

Application Development

ISPF Enhancements

- Updates to ISPF in support of PDSE V2 member generations, providing improved messages for edit, browse, and view of members.
- Enhancement to SUBMIT command to add an optional parameter SUBSYS which allows submission of jobs to an alternate JES other than the Primary subsystem. This is useful for directing jobs to the JES2 emergency subsystem if required.
- Oview is now available for ISPF-view of z/OS Unix files

z/OS UNIX and POSIX memory-map 64-bit support (CD)

- Applications using the z/OS UNIX or POSIX memory-map service can now use 64-bit storage and map files of lengths greater than 2 GB.

Application Development

Web enablement toolkit (CD)

- “Patch” & “Options” added to Web Enablement Toolkit
- Server Name Indication (SNI) when System SSL usage is specified, and support for TLS 1.3
- Enhanced tracing to help with debugging using environment variables.
- Support for TLS 1.3 when using system SSL.

__smf_record() – C function

- Updated to handle standard or extended SMF record numbers

DFSORT enhancements

- Sort accelerator – see hardware

OAM support for Db2 stored procedures (CD)

- DFSMSdfp OAM is providing a new sample, CBROSRSP, available in SYS1.SAMPLIB, that can invoke the OAM OSREQ API in a Db2 stored procedure environment.
- Managing multiple Db2 connections within a single stored procedure, to access different databases (subsystems) without having to create multiple programs.

Application Development

Cryptographic hash utilities (CD)

- Cryptographic hash utilities are provided in z/OS UNIX, including **md5,rmd160**, **sha1**, **sha224**, **sha256**, **sha384** , and **sha512**. These utilities use the Integrated Cryptographic Service Facility (ICSF) One-Way Hash Generate callable service to generate a cryptographic hash for input files respectively. The utilities can check cryptographic hashes read from input files.

Unicode 12

- z/OS v2.5 provides API's to meet the Unicode 12 standard.

Unix Service Improvements

- df displays filesystem size in megabytes
- BPXCOPY supports file tagging using CCSID
- BPXBATCH has options to return the program or shell return codes

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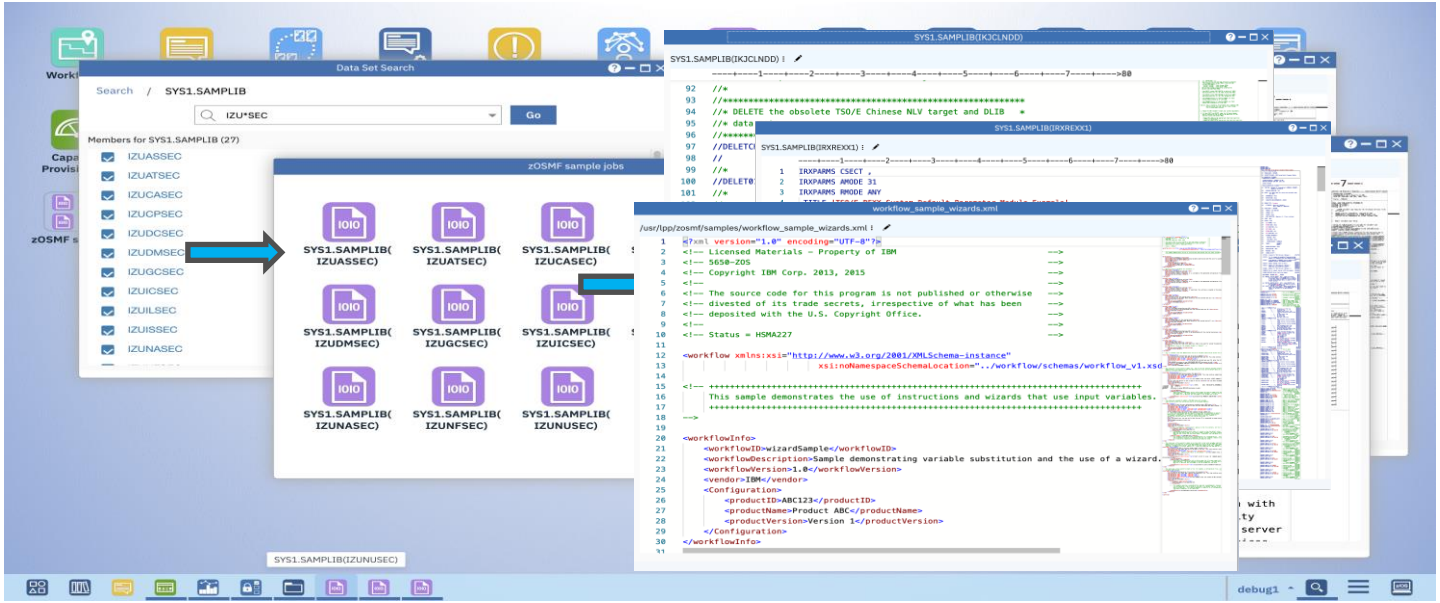
Usability & Skills

- Bring a browser based ecosystem to z/OS Management
  - Consistent with other platform User interfaces
  - Modern compared to ISPF 3270
  - Client platform agnostic – OS, devices etc.
  - Exploit graphics and other techniques where appropriate
- Develop Applications focused on z/OS unique needs
  - Task Oriented
  - Reduced effort
- Integrate and expand the z/OS ecosystem
  - Provide REST API's for public consumption
    - Securely and efficiently
- Reduce Reliance on Assembler Skills
  - Provide solutions that don't require assembler code where possible
  - Support higher level language extensions of z/OS

Usability & Skills

z/OSMF Desktop – Replaces Tab UI in z/OS 2.5 (CD)

- Customer grouping of items in folders, such as data sets or Jobs
- Search, Browse, Edit files and data sets
- Submit, query, browse jobs – Job Output Task
- Editor Syntax highlighting, user created links, improved performance



Usability & Skills

z/OSMF UI Type Ahead Search (CD)

- The z/OSMF desktop utilities are enhanced. The search function is enhanced to provide typeahead capability for searching data sets, UNIX System Services (USS) files, and USS directories.

z/OSMF Desktop Create Data Set (CD)

- Adds the function of “create data set” into the z/OSMF desktop. Clients can create a new physical sequential or partitioned data set based on an existing data set, a predefined template, or fully specified attributes.

z/OSMF Desktop File and Data Sets Hot-links (CD)

- The z/OSMF desktop editor is enhanced to highlight data set names and zFS file paths as hot-linkable URLs. A user can open the referenced data set or a zFS file from the z/OSMF desktop editor simply by clicking on the link.

z/OSMF Browser Support for V2.5

- For z/OS 2.5 z/OSMF now formally supports Chrome, Firefox, and Edge. Other browsers should work such as Safari.

Usability & Skills

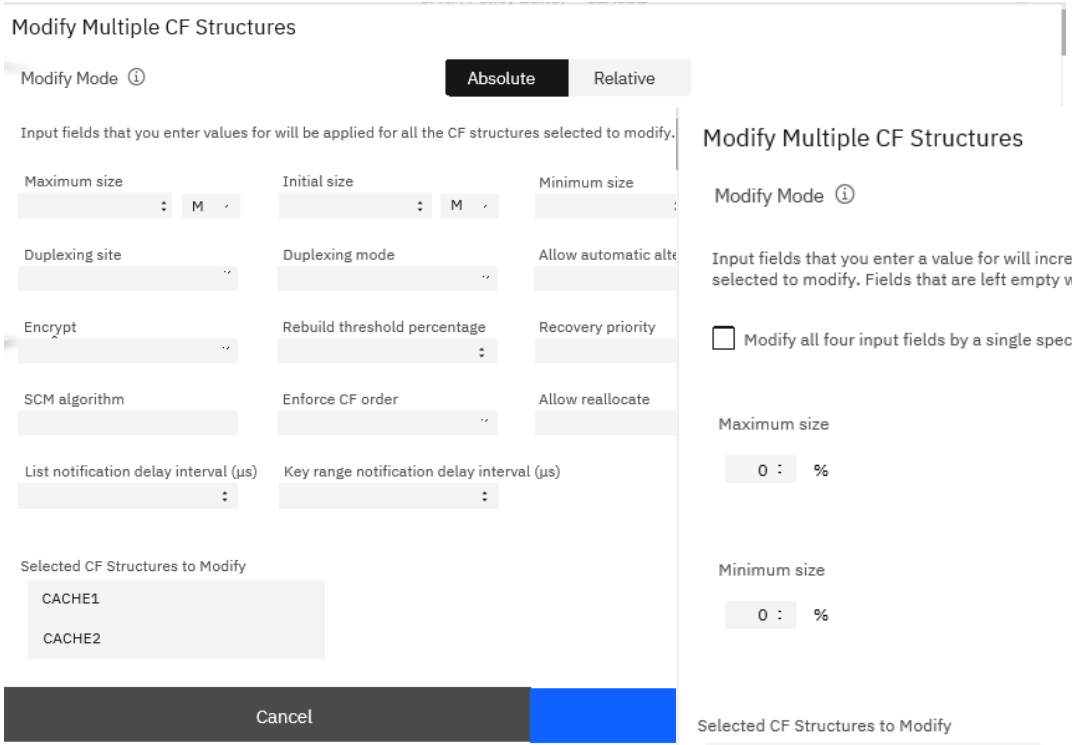
z/OSMF Sysplex Management

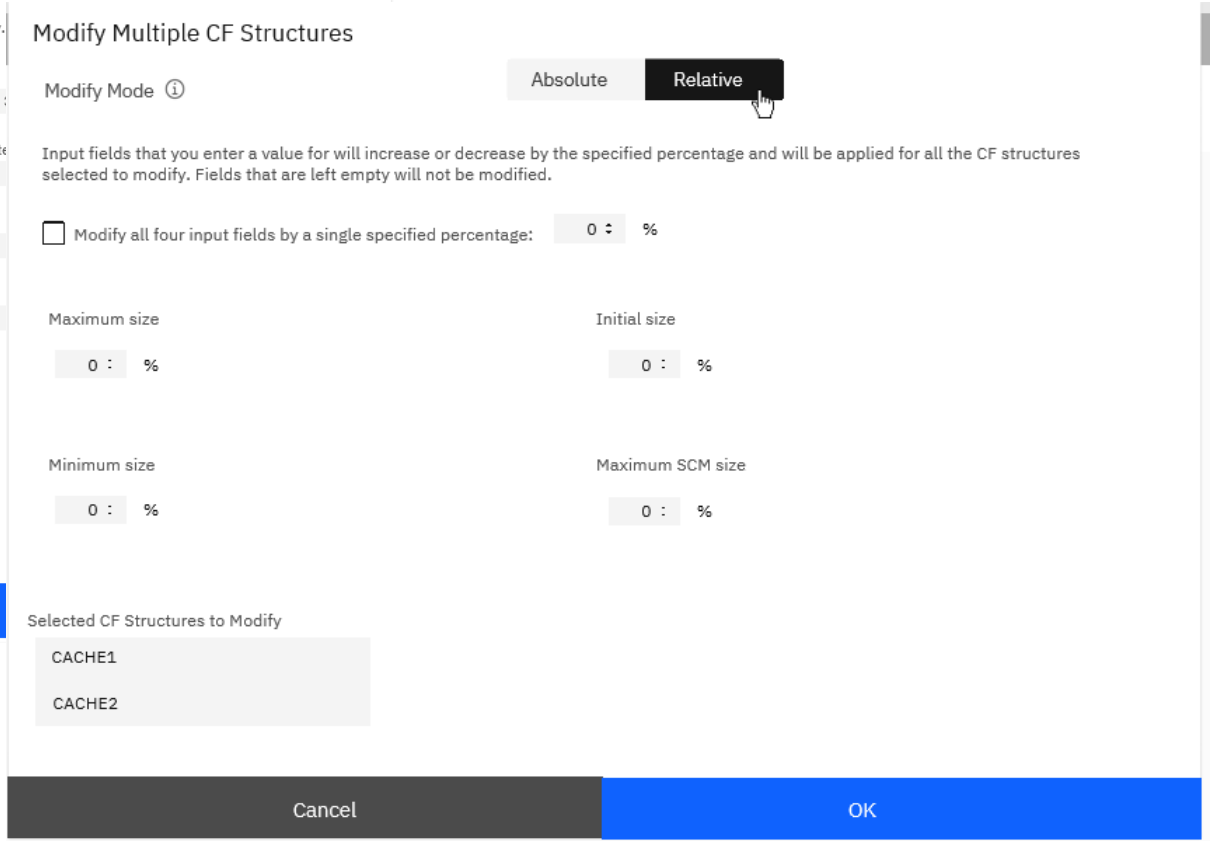
- View Sysplex configuration
  - Table and graphical views
    - Physical and logical views, by CPC, by sysplex, by Coupling Facility, by Structure
    - Coupling Facility, Links, Structures
  - Available in z/OS 2.2 and up

- Modify Sysplex configuration
  - Sysplex-wide commands and results display
  - Command Log retained across IPL
  - Allows review of who took what action when (and the detailed results of each action)
  - Optionally view generated commands before issuing them
  - Actions include Rebuild, Duplex, Reallocate, CF actions, CF connectivity management, Couple Dataset Mgmt. (CD)

- NEW - Sysplex CFRM Policy Editor
  - Edits information about Sysplex CFRM policy including structure sizes
  - Bulk editing of CF structures
  - Policy actions – create, delete, rename, activate
  - CF and CF structure definition, modify, delete, rename, etc
  - Full referential integrity, health checking and best practices, etc.
    - Prevent mistakes rather than recover from them!
  - Replacing the need for IXCMIAPU batch utility
    - Coexists and interoperates with IXCMIAPU batch utility

Usability and Skills

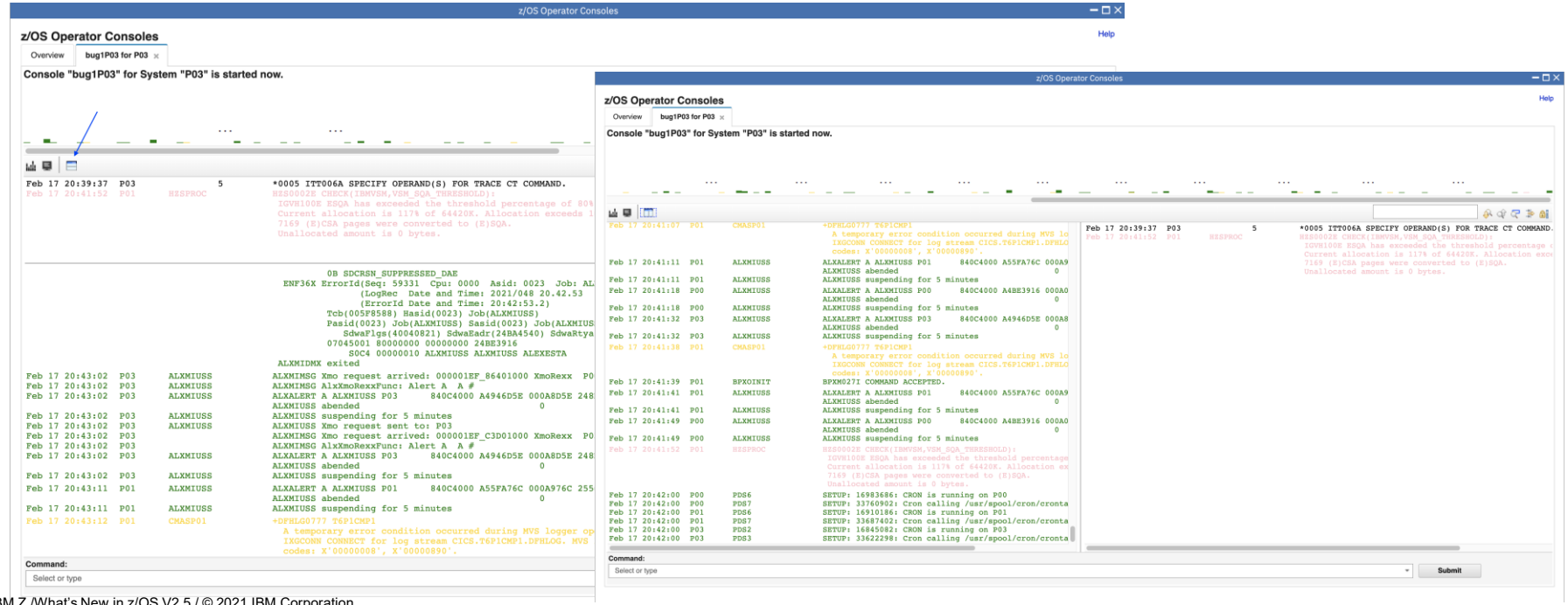




Usability & Skills

Console application

- Support for WTOR/HOLD messages (CD)
- Improved handling of large amounts of messages
- Simplified Configuration of console (CD)

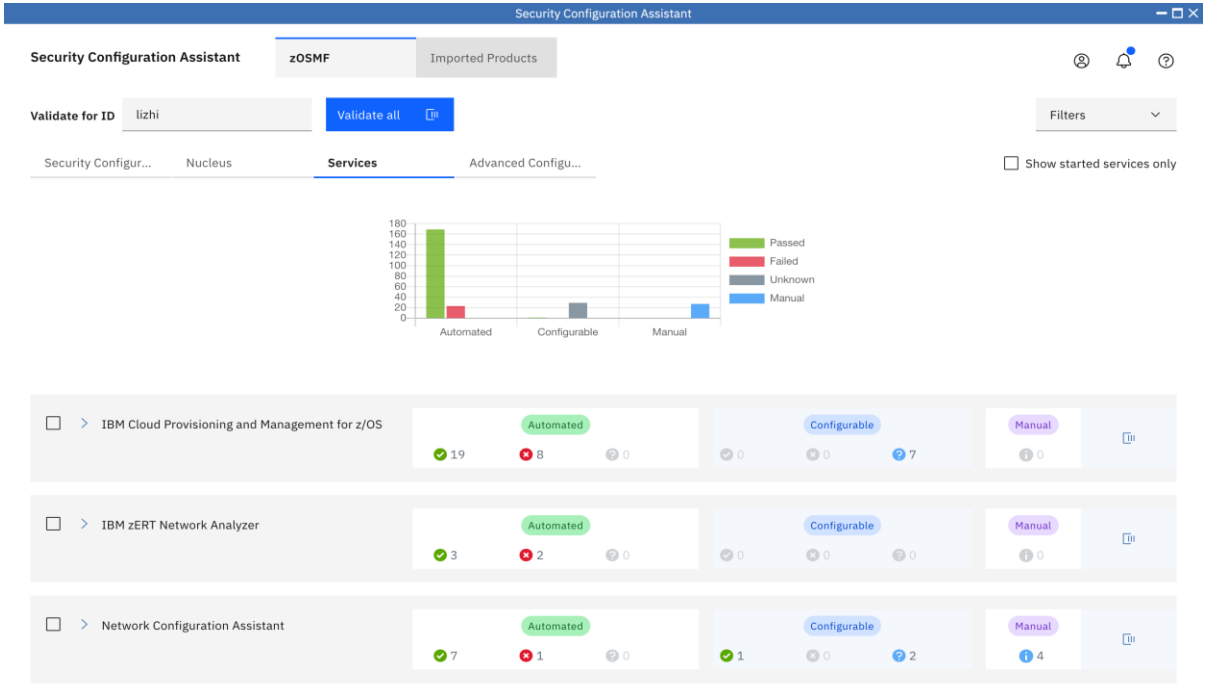


Usability & Skills

Security Configuration Assistant (SCA) (CD)

A new z/OSMF application to help system programmers in configuring z/OS security

- Support for variable substitution
- Support user grouping
- External Applications
  - DFDSS, DFHSM etc.



Usability & Skills

DFSMSrmm plug-in for z/OSMF (CD)

- In addition to the ISPF dialogs and TSO user interfaces available today for DFSMSrmm (RMM), support for a modern graphical user interface via a z/OSMF
- The RMM plug-in for z/OSMF has been improved to view data sets defined to RMM and the related data set information and export this data to a CSV format file.

Usability & Skills

Workflows - What are they?

- A series of steps to accomplish a task and a tool to track each steps status
- Can involve one person or many people
- Workflow authors decide on style and technical approach of a workflow
- Can be: Manual instructions, Semi-automated instructions, Fully automated actions
- Consist of Jobs, Shell scripts, REXX execs, REST calls, file updates etc.
- Optionally retains a log of what has been done
- Useful for Installation, Service, Upgrade, or any configuration actions

z/OSMF One Stop Hub (https://ibm.github.io/zOSMF/)

Usability & Skills

IBM z/OS Management Services Catalog – Planned new plugin (SOD)

z/OS Management Services Catalog in z/OSMF plans to leverage the power of z/OSMF workflows to enable system programmers to run services that help complete z/OS management tasks faster and with fewer errors.

- Experienced z/OS system programmers are planned to be able to create a catalog of customized services, each written with unique institutional knowledge, protocols, and processes.
- These services can then be run by less experienced colleagues.
- IBM plans to provide an initial set of services to help z/OS system programmers of all skill levels get started, demonstrate accepted practices, and simplify information sharing.
  - Such as grow a ZFS.

Capabilities:

- Planned are a powerful graphical interface for creating new services, editing IBM-provided services, and updating existing services
- Step-by-step guidance for completing z/OS management tasks
- History of all services performed on a system is planned

You can learn more and watch for future developments on the release on the z/OS Management Services Catalog content solution (https://www.ibm.com/support/z-content-solutions/management-services).

Usability & Skills

z/OS Release Upgrade Enhancement

- z/OSMF *z/OS V2.5 Upgrade Workflow* ***will be a part of and serviced with z/OS*** (CD)
  - Use the z/OS V2.5 Upgrade Workflow directly from your z/OS system, since you do not need to retrieve from github.
    - /usr/lpp/bcp/upgrade/
  - z15 Upgrade Workflow will also be part of and serviced with z/OS in that same APAR.
  - Will be identified with FIXCAT IBM.Coexistence.z/OS.V2R5
  - IBM strongly recommends that you become familiar with z/OSMF Workflows to take advantage of these benefits!
    - Allows for discovering functions used, tailoring information specific to your systems, and verification of many upgrade actions.
- *z/OS Migration* publication will not be provided for V2.5
  - However, an exported format of the z/OS V2.5 Upgrade Workflow will be available on KnowledgeCenter for those that prefer to use it.

Usability & Skills

z/OSMF Software Management Installation of ServerPac

- Installation method uses a simplified web-based GUI replacing the ISPF CustomPac Dialog
  - Manages allocation and placement of data sets, cataloging, and deployment in z/OSMF Software Management
  - Customization and verification is done in z/OSMF Workflows
  - Data set merge and disconnect Master Catalog on driving system planned (SOD)
- IBM has been delivering ServerPac as a Portable Software Instance format (CD)
  - IMS, DB2, and CICS Transaction Server and associated products, all can be installed with z/OSMF today.
  - Striving for a “Consistent” packaging and installation method with other leading software vendors.
- z/OS 2.5 ServerPac
  - Is available in Portable Software Instance format, and only that format after January 2022.
  - Initially available in the existing ISPF CustomPac Dialog format, will be disabled in January 2022 *for all products (z/OS, IMS, Db2, CICS, MQ, and program products).* **Prepare now**.
- z/OS V2.4 will not be offered as a Portable Software Instance, and will remain installable with the ISPF CustomPac Dialog.

For more information, see the z/OSMF ServerPac content solution (https://www.ibm.com/support/z-content-solutions/serverpac-install-zosmf/)

- try a sample Portable Software Instance to be familiar with the install.

*z/OSMF is required on your driving system to install a ServerPac in Portable Software Instance format

Usability & Skills

z/OSMF Software update task (CD)

- GUI provides a simplified and guided process to install any SMP/E-packaged PTF, regardless of software vendor.
- Enables you to review and track SMP/E HOLD data in an orderly fashion. All installation output is saved so you can review it at any time.
- Supports three update use cases:
  1. **Corrective.** Install individual software updates to fix a problem.
  2. **Recommended**. Install all software updates that are recommended by software vendors. The IBM recommendations are those designated as IBM Recommended Service Upgrade (RSU) fixes.
  3. **Functional**. Install software updates to support new hardware, software, or functions identified with a SMP/E FIXCAT.

- Existing traditional methods to install SMP/E-packaged software updates (batch JCL jobs) are still possible, but z/OSMF Software Upgrade is expected to provide a simpler experience requiring lesser SMP/E skill.

For more information about z/OSMF Software Update, including helpful instructions on how to get started, see the Software Update with z/OSMF content solution (https://www.ibm.com/support/z-content-solutions/software-update-zosmf/).

Usability & Skills

z/OSMF Workflow updates (CD)

- z/OSMF Workflow task will now support parallel-step workflows. One or more automated steps of a parallel-step workflow can run at the same time
- Workflow support for array type variables, support creating workflow instances from workflow definitions located in remote systems .
- z/OSMF Workflows task is enhanced to support saving job output in a specified zFS directory.
- Deletion after a workflow is completed
- Workflow selection now supports typeahead searching
- Workflow steps can be keyword searched
- The workflow administrator can delete multiple workflow instances at a time.
- To perform a workflow on a remote sysplex, a single sign-on among z/OSMF instances is no longer strictly required. In the absence of a single sign-on, the request prompts for a user and password, if necessary.

Usability & Skills

z/OSMF Workflow Editor (CD)

- z/OSMF Workflow Editor is planned to be enhanced to use the VS code editor, already included in z/OSMF, when working with large amounts of text. This is planned to provide a large area to do editing as well as standard editor support such as find/replace string, line numbers, and the file overview.
- A test action is planned to be added to the workflow editor to make it easier to try out workflows as you create them
- A raw text option is planned to be added to the workflow Editor
- An expand option is planned to be added to input fields where more area would be helpful
- The editor plans to remember where files were found so that they can be saved back in the same location if needed

Usability & Skills

z/OSMF Change Password API (CD)

- z/OSMF adds a REST API to support changing a user's z/OS password or passphrase.

z/OSMF ISPF Application Global Settings (CD)

- The z/OSMF ISPF application, provides system-wide defaults for the ISPF application settings rather than requiring each user to configure those values.
- The setting values of the z/OSMF ISPF application also can be captured in a file and used by an administrator to set up other systems' global configurations.

z/OSMF Incident Log Diagnostic Viewing (CD)

- The z/OSMF Incident Log application adds support for viewing diagnostic data using the z/OSMF desktop editor application. This standardizes the user experience using a more native browser look and feel. Previously, viewing the diagnostic data was performed only using the z/OSMF ISPF application.

Usability & Skills

z/OSMF Improved configuration (CD)

- Start up performance improvements when there are no changes to PARMLIB

z/OSMF Granular Configuration (CD)

- z/OSMF is enhanced to provide a simple UI to enable or disable most z/OSMF services.
- Simplified settings deployment with a simple JSON file

z/OSMF Start Up Improvements (CD)

- z/OSMF startup time and resource consumption during startup is improved. In laboratory measurements of a small z15 LPAR, the startup time improved by 30% elapsed time and 48% CPU time. Results depend on a client's configuration.

z/OSMF Updated Liberty (CD)

- z/OSMF now uses the default path in embedded liberty

Usability & Skills

z/OSMF REST files and datasets Updates (CD)

- Allocate Like another dataset, handling carriage returns automatically

z/OSMF Files and Datasets Network Compression (CD)

- Support is added to compress content when retrieving large amounts of data. This can speed up the REST files and Datasets API when transferring over long or slow links.

z/OSMF Request Queueing (CD)

- z/OSMF REST Data Set and File service is enhanced to queue concurrent requests from the same user when the number of Time Sharing Option (TSO) address spaces are exhausted. This can improve the processing when a large number of requests are sent to z/OSMF.

z/OSMF CEA Increased TSO Sessions (CD)

- z/OS CEA is updated to increase the maximum TSO sessions allowed per user from 10 to 99.

Usability & Skills

IBM z/OSMF support for JSON Web Token (CD)

- z/OSMF supports JSON Web Token (JWT) by returning JWT token during authentication and accepting JWT token for authorization of z/OSMF services.

z/OSMF Remote REST APIs (CD)

- REST data set and file service is enhanced to support accessing data sets and files in remote systems.

z/OSMF REST JOBS Updates (CD)

- New spool Search options, improved spool codepage support, option to retrieve active jobs, return additional data (submit time, system etc)

z/OSMF Dynamic Parmlib IZUPRMxx Update (CD)

- New z/OS operator commands (SETIZU and SET IZU) are planned to be added for z/OSMF to dynamically change z/OSMF parmlib options without requiring an IPL or in some cases a full server restart.

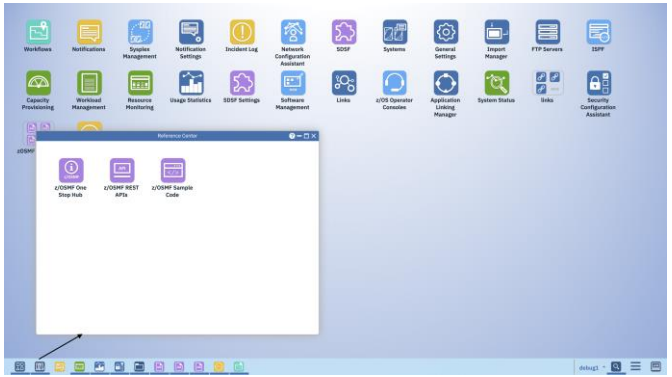
Usability & Skills

z/OSMF Incident Log Task Support for CASE numbers (CD)

- The z/OSMF Incident Log task is enhanced to support the CASE parameter in addition to the existing PMR number when sending diagnostic data to the IBM support site. The CASE parameter is a new format for problem management.

z/OSMF Open API 1.0 or Swagger Support (CD)

- OpenAPI 1.0 support for most z/OSMF REST Services
- Shipped with z/OSMF



Usability & Skills

Assembler Skills Reduction

- More C Header files for z/OS control blocks
- JES2 policy-based exit reduction
  - Intended to provide a non-assembler facility to *extend* JES2
    - Can be mixed with traditional JES2 exits
  - In addition to end-of-conversion new exits points of pre-conversion, and SYSOUTGroup are added
  - New predicates and actions
    - Look at and update attributes like jobclass, srvclass, destination, etc.
    - General SAF AuthorityCheck can be used with any attribute
  - Character conversion to numeric in policy
  - Policy files are Release neutral and are planned to not require change during release or service upgrades (no reassembly required)
  - Dynamically enabled – Changes can be applied and removed while JES2 is running
  - MAS Wide definitions for policy (CD)

Usability & Skills

Simplification via Removal of Obsolete Function

- Removal of native TLS/SSL from TN3270 Telnet server, FTP server, DCAS – replaced by AT-TLS policy
- Removal of Comm Server HFS support – use zFS
- Removal of Comm Server support for Data Power load balancing – no longer offered
- Removal of LFS support for HFS – use zFS
- Removal of ISPF support for HFS and the ISPF Workstation Agent
- Remove MAXSHAREPAGES as a limit – no longer consumes common storage

Table of Contents

Scalability & Performance

- Goal is release to release equivalence
  - Ensure smooth release to release migration
  - Performance focus on selected areas
- Exploit hardware features
  - Synergistic improvements with new hardware including:
    - Hardware instructions and memory topology
    - Accelerators
    - I/O technology exploitation
  - Expand the software that can exploit features
- Constraint relief
  - Identify and remediate constraints before client impact
  - Long term - continue AMODE 64 and RMODE 64 roadmap items
- System scalability and performance metrics
  - Metrics for resource consumption
  - Capacity planning tools

Scalability & Performance

Increase z/OS Memory limit above 4 TB

- Prior to z/OS 2.5 the limit for real storage consumption in z/OS was 4 TB
- New support allows z/OS 2.5 to address more than 4TB
- The new storage requires the use of new API's and is therefore limited to a subset of z/OS applications
- The limit is now 16TB of real storage in a single z/OS Operating system Image.
- Storage above 4TB is delivered in fixed storage with 2GB frame sizes.
- It can be used for z/OS Container Extensions, and is planned for other large memory consumers

Inbound Workload Queueing (IWQ) support for IBM z/OS Container Extensions (CD)

- z/OS Communication Server's OSA-Express Inbound Workload Queueing support is enhanced to add a new input queue for zCX network traffic.
- The OSA-Express IWQ separation of the zCX traffic from native z/OS traffic provides optimized Communications Server processing for zCX network traffic.
    - When IWQ is enabled, the z/OS TCP/IP inbound processing for the zCX traffic becomes zIIP eligible.
    - OSA-Express will direct zCX traffic for protocols TCP and UDP to the zCX input queue. The z/OS IWQ zCX solution will be made available on OSA-Express6S and beyond.

Scalability & Performance

WLM Batch Initiator Enhancements

- Historically Workload Manager has managed initiators based on the available capacity of general-purpose processors. New support is provided to start and stop batch initiators also taking into account available zIIP capacity.
- Separation of heavy zIIP using batch jobs by service class will allow WLM to start initiators for zIIP using jobs on systems in a sysplex that have available zIIP capacity

SMF.py Support (SOD)

- IBM intends to deliver a System Management Facility (SMF) data access toolkit leveraging Python and Jupyter Notebooks.
  - This new capability can help clients access SMF data in an easy and modern way.
  - This can enable data science solutions, IT analytics solutions, or artificial intelligence solutions

Scalability & Performance

zHPF VTOC I/O performance (CD)

- Prior to the new enhancement, CVAF uses a FICON channel program to read/write VTOC (volume table of contents) records which may cause high channel utilization when the entire VTOC is read with sequential access.
- Enhancements in DFSMS extend the use of zHPF to VTOC I/O done by CVAF and Fast VTOC/VVDS (FVV) services.
  - Enablement and disablement of the new function is managed by the DEVSUPxx PARMLIB member or by using the MODIFY DEVMAN command.
- Intended to provide improved performance when sequentially reading the VTOC.

zHyperLink write statistics (CD)

- Enhancements in DFSMS provide a command to allow users to display zHyperLink write statistics for a data set and optionally clear them.
- Additionally, new SMF fields are created in the SMF type 42 subtype 6 record to show information related to zHyperLink write failures.

Scalability & Performance

More Concurrently ”Open” Datasets

- More VSAM linear data sets (LDS) are planned to be able to be concurrently ”opened” in address spaces such as DB2
    - Each data set is represented by several internal z/OS data areas which reside in below the bar storage.
    - This support moves both VSAM and allocation data areas above the bar to reduce the storage usage in the below the bar storage area
- The support is optional
- DB2 APAR PH09189 is required to enable this support
- IBM also recommends DB2 APAR PH33238 get the most value out of this support

Scalability & Performance

JES2 Memory Improvements

- JES2 checkpoint structures move into above the bar private area from dataspaces
    - Eliminates the need to copy them and to manage the dataspaces
- JES2 Spool track group map is moved to above the bar private area to relieve some memory in the below the bar private area.

Faster Mount of zFS Filesystems (CD)

- Improved IPL time is planned to be provided when mounting zFS filesystems
    - In the event that the file system was copied while it was mounted the process of mounting the copy has to go through a quiesce period. That period has been reduced or eliminated.
- Requires support on both the copying and restoring systems in the Sysplex

Scalability & Performance

IBM Resource Measurement Facility – RMF Priced Feature (CD)

- A new control session option allows RMF to optimize Coupling Facility data collection
- Display information about System Recovery Boost
- CF monopolization avoidance is supported
- Reports about storage class memory (SCM) busy percentage on a z15. RMF adds input/output processor (IOP) utilization SCM busy percentage for all IOPs in the I/O Queuing Activity (IOQ) report
- Support for XCF transport class statistics
- Crypto support
  - The capability to analyze the performance of recently delivered hardware using callable services
  - Integrated Cryptographic Service Facility (ICSF) format-preserving encryption, Feistel-based encryption, and other digital signatures, is now available with the RMF Postprocessor Crypto hardware report.
- Health Checks
  - Verify the HTTPS (AT-TLS) configuration of the RMF Distributed Data Server (DDS).
  - Warn users when SESSION_PORT(8801) and DM_PORT(8802) are still being used. RMF client code no longer uses both ports and IBM recommends removing the options SESSION_PORT, MAXSESSIONS_INET, TIMEOUT, DM_PORT, and DM_ACCEPTHOST from the GPMSRV## PARMLIB member.

Table of Contents

Availability

- Provide industry-leading availability
  - For mission-critical application workload through synergy between resilient hardware, operating system, middleware, and storage technologies
- Exploit Parallel Sysplex and the coupling technology to mitigate impacts from planned or unplanned outages
  - Extend Data Sharing exploitation and efficiency
  - Provide workload balancing and routing optimizations and efficiencies
  - Enhance sysplex recovery mechanisms for improved performance and recovery time (e.g. CF structure duplexing)
  - Provide near-continuous access to data stored in Filesystems (e.g. zFS, NFS)
- Detect and Mitigate system resource problems
  - Monitor resource consumption and system/sysplex operations in real-time
  - Provide operational insight into anomalies and trends that require attention
  - To mitigate problems quickly, proactively, and autonomically
- Support dynamic modification of shared resources without incurring disruptions in which the resources are temporarily unavailable (“always on”)
- Support state-of-the-art disk replication technologies
  - Data availability (Hyperswap) – locally and at distance
  - Disaster recovery for 2-site, 3-site, and 4-site DR configurations
- Extend Geographically Dispersed Parallel Sysplex (GDPS) environments
  - Multi-site “stretched” Parallel Sysplex across metro distances and improved isolation/availability of the GDPS k-system
  - Continuous Availability (Active/Active Sites) solution through improved software replication technologies, and innovative solutions to improve the achievement of RPO and RTO objectives to near zero

Availability

Coupling Facility (CF) Monopolization Avoidance (CD)

- New function introduced by coupling facility control code level (CFLEVEL) 24 on z15 servers to prevent a runaway sysplex application from monopolizing a disproportionate share of CF resources.

Automatic Restart Manager (ARM) support for restarting a system task (CD)

- Enhancement to IXCARM REGISTER support, to enable system tasks (for example, ICSF) to register with ARM and be restarted.

BPXPRMxx improvements

- LIMMSG default is changed to issue warning messages when system limits are reached in z/OS Unix
- The BPXPRMxx syntax checker now checks parameters to ROOT and MOUNT statements

Availability

z/OS Anomaly mitigation client pain points

- WLM-based triggering based on changes in velocity metrics (and other anomalies)
- JES2 spool consumption tracking
- Above the bar private area tracking
- Specific RTD enhancements
  - Allow address spaces time to warm up before SERVERHEALTH event – avoid anomalies detected during component startup
  - Remove HIGHCPU event (CPU usage data) in favor of other instrumentation such as RTM Loop Detection
  - Add parameterization to allow RTD to analyze subsets of symptoms – messages only, for example – and to have RTD process address spaces without re-analyzing the system for all other events
- Invoke and consume the output of Predictive Failure Analysis (PFA) and Runtime Diagnostics (RTD), along with other diagnostic inputs, to create report-style output from analysis in these components, containing diagnostic summary *and recommended actions*
  - sorting/grouping by component
  - Graphical-style output for visualization of trend lines, growth over time, etc.
  - JSON description of report contents, consumable by z/OSMF, automation, or ISV/other products
- Improve client triage of anomaly observations and predictions with IBM System Automation mechanism to capture report details, including recommended actions

Availability

z/OS Catalog Enhancements

- Catalog address space is planned to be re-startable and to support dynamically changing the Master Catalog. (Previously this required a re-IPL)
- Catalog Modify command plans to support comments following the command parameters
- Catalog entries can be validated for the rename in progress indicators using IDCAMS DIAGNOSE function

Access Method Services - IDCAMS

- DELETE MASK has two new options TEST and EXCLUDE
  - TEST will return all the objects that would have been deleted if TEST wasn't specified
  - EXCLUDE will allow a subset of objects that match the MASK to be excluded from those being deleted
- DEFINE MODEL is enhanced to also model the KEYLABEL parameter to support encryption attributes
- REPRO is enhanced to move its I/O buffers above the line to reduce the instances of out of space (878) abends

Availability

OAM address space Db2 connection management enhancements

- Included with z/OS V2.5 are several customer requirement enhancements to ensure there is no delay in accessing customer data via OAM and Db2.
  - Db2 connection management characteristics for OAM object users are enhanced
    - to enable OAM to be more tolerant of Db2 connection issues and Db2 maintenance cycles
    - to improve OAM availability by providing the capability to dynamically switch between object and SMS-tape configurations without the need to reactivate the Source Control Data Set (SCDS) or re-IPL

Availability

System Recovery Boost – Sysplex Recovery enhancements (CD)

- Initial support for System Recovery Boost provided recovery acceleration via additional processor capacity and parallelism, but only during image-level events like image Shutdowns and re-IPLs
  - IPL and Shutdown boosts
    - Speed boost and/or zIIP boost
    - GDPS orchestration enhancements
    - Up to 60 minutes of boost at IPL and up to 30 minutes of boost at shutdown
    - Optional, priced SRB Upgrade temporary capacity for zIIP Boost
- New support extends this to provide recovery boosts for smaller-scope, occasional sysplex recovery activities, that introduce small-scale disruptions when they occur
  - Boosts automatically initiated when these events occur
  - And on the relevant set of systems in the sysplex where the recovery is taking place
  - Short-term boost periods, limited in total amount (30 minutes per LPAR per day)
- Sysplex recovery activities that are boosted include:
  - Sysplex Partitioning – planned or unplanned removal of a system from the sysplex
  - CF Structure Recovery – recovery from CF or CF structure problems that require structure-level rebuild or duplexing recovery
  - CF Datasharing Member Recovery – recovery from disconnect or failure of a CF locking datasharing member with locking resources held
  - HyperSwap – planned or unplanned HyperSwaps from primary to secondary disk sets
- No increase in IBM software licensing costs!

For more information see the Systems Recovery Boost Content solution (https://www.ibm.com/support/z-content-solutions/system-recovery-boost/).

Table of Contents

Systems Management

- Provides system programmer efficiency, confidence, and consistency
  - Consistent z/OS installation platform for IBM & Vendors
    - Packaging, delivery, installation, deployment, configuration, and validation
  - Simplified installation of SMP/E service
  - Improved security integration
    - Detection, validation and correction
  - Focus on common tasks
    - Deliver standard service catalog
    - Capturing site unique activities
    - Can be integrated with change management
    - Optionally self service provisioning (Cloud)
  - Enhanced z/OS release upgrade process
    - More discovery and more automated actions

- Basic facilities to ‘get the job done’
  - Entitled with the operating system

- Enhanced facilities available
  - Features or products (IBM or Vendor)

Systems Management

z/OS System Provisioning

Problem : z/OS system provisioning in a single system or sysplex environment is complex, cumbersome and time consuming. Frequently z/OS systems are defined using configuration approaches that no longer exploit current system capabilities

Solution : z/OS Cloud Provisioning and Management (CP&M) is enhanced to provide capability to provision an entire new z/OS system.

- Entry level system programmers can provision a new z/OS system in less than one hour using Cloud Provisioning and Management automation and a template provided by an experienced system programmer.
- A z/OS System is configured from scratch using an IBM provided best practices workflow. Experienced system programmers can customize a small set of environment specific properties and provide them as a template in the CP&M Catalog.
- One or more z/OS Systems can be provisioned on pre-defined LPARs identified by the system programmer in the CP&M LPAR Pool.
- Initial capability is provided to provision a z/OS with a “MONOPLEX” configuration.

Systems Management

z/OS Cloud Provisioning and Management

- Entitled part of z/OS that delivers a self service Cloud aligned Provisioning tool for Software including IBM Middleware
- Support for Red Hat OpenShift (CD)
  - Via the IBM z/OS Cloud Broker (Announcement (https://www-01.ibm.com/common/ssi/ShowDoc.wss?docURL=/common/ssi/rep_ca/3/897/ENUS219-233/index.html&request_locale=en))
- Provision a single item or a composite within a system or Sysplex, or even across Sysplexes (CD)
- Define a time limit for a provisioned instance also available
- z/OS Cloud provisioning security and security simplification
  - Support for policy using Users and/or Groups also available (CD)
  - Simplified security using a domain shared resource pool (CD)
- Metering and capping for memory and Disk in addition to CPU also available (CD)
  - Providers can monitor memory consumed by any instance or tenant
  - Providers can isolate Disk and apply Disk limits (caps) for a tenant
  - Providers can enforce memory maximums (caps) for a tenant
- The Workflow Editor task enhancements (CD)
  - The Workflow Editor includes a "toolbox" of IBM-supplied steps
  - The files for a workflow, also support sequential or partitioned data
  - The editor retains long pathnames, has a large editor area, and also edits property files
- Improved User Experience
- For more information, see the Cloud Provisioning and Management content solution (https://www.ibm.com/support/z-content-solutions/cloud-provisioning/).

For additional details about these enhancements, see the What's new in IBM Cloud Provisioning & Management for z/OS blog (https://community.ibm.com/community/user/ibmz-and-linuxone/blogs/hiren-shah1/2021/01/19/whats-new-in-ibm-cloud-prov-mgmt-10-12-20).

Systems Management

Support in NFS to help customers migrate from DFS/SMB (CD)

- A migration health check to help customers identify their usage of DFS/SMB (Distributed File System / Server Message Block)
- To aid in NFS Server configuration, a z/OSMF (documentation only) work flow with step-by-step instructions - especially useful for the first time user.
- z/OS NFS Client utilities, namely MVSLOGIN and MVSLOGOUT (that allow a non-z/OS client to manage SAF authentication to a z/OS host) and SHOWATTR (that displays the z/OS NFS server attributes) are delivered for the Windows 10 NFS Client.
- Kerberos support has been provided for NFS V3 - the level of protocol supported by Windows 10 to control access to NFS network shares
  - Also allows for integration with Active Directory for UID/GID specification
  - Can enable end-to-end encryption between z/OS and Windows environments
- Multiple NFS servers in a single LPAR
- “Windows” Prefix support improving windows client integration.
- **Note:** z/OS V2.3 was the last release to support the DFS/SMB file-sharing protocol

Systems Management

Better administration for zFS (CD)

- zfsadm chaggr now supports wildcard capability
- Protection from rm –r recursively removing files in the root or across file systems

JES2 enhancements

- Spool compression and encryption (CD)
  - Ability to compress spool to increase effective space
  - Ability to encrypt spool for increased security
- Replace JES2 exits with policies
  - See section usability and skills
- JES2 Dynamic Proclib Updates
  - Specify specific datasets for a jobclass
  - Recall in z/OS 2.4 addition of $p cnvt/$s cnvt to simplify proclib mgmt.

Systems Management

Tailored Fit Pricing Ease of Use Features

- A new IEASYSxx parameter (SOLUT=) to identify an LPARs solution ID which helps with reporting on Tailored Fit Pricing
- The solution ID is passed through to SCRT in the SMF records captured about an LPAR
- This should reduce the manual updates needed in SCRT when reporting on Tailored Fit Solutions
- SCRT 28.2.0 includes this support

Systems Management

BCPii (CD)

- Version 2
  - REST style APIs to access Hardware Management Console (HMC) functions
  - Communication is through an internal service, no additional network configuration
  - New HMC capabilities as they are developed are designed to pass-through with no companion BCPii service updates required
  - Can access attributes previously unavailable to BCPii
    - CPC storage
    - Storage allocated
    - Environmentals like temperature and humidity
    - Etc.
  - This function requires z15 firmware 2.15.0 with appropriate MCL’s

Systems Management

Advanced Data Gatherer – new Feature

- The z/OS Advanced Data Gatherer (ADG) is a new priced feature in z/OS 2.5
- All customers of RMF are entitled to this priced feature
- The data gatherer base element will generally be running all the time to capture utilization information
  - This usage is entitled with base z/OS
- In “advanced” mode it will also capture detailed performance information required by performance monitors like RMF.
  - Advanced mode is a priced feature

Systems Management

SDSF – System Display and Search Facility Priced Feature (CD)

- Eight new Primary Displays
  - Address space diagnostics, Couple Datasets, System IPL Parameters, SVC and PC routines
- Four new Secondary Displays
  - Job Common Storage, Job storage Subpools, Job Private Storage, Memory Structure Map
- Fifteen new viewable fields
  - Used filesystem space, used storage group space, used storage volume space
- New general function to allow permitted users to view the contents of any memory
- New Help facility replacing ISPF help menus and adding more context sensitive information
- Point and Shoot fields for memory browsing
- Wide screen support for operator commands and log positioning for WTOR and Action messages
- A new browser based UI (in z/OSMF) which is more responsive and covers more function
- SDSF now adheres only to SAF based security making it more secure

Systems Management

Infoprint Central Priced Feature

- Comprehensive tool for managing print and printers
- Improved UI for large and small screens
- Improved performance to enable faster response while loading and sorting on columns
- Support for the XML toolkit 1.11
- Formal support for Google Chrome
- Support has been added to work with new JES blank truncation options (CD)

Systems Management

zWIC – Workload Interaction Correlator Priced Feature (CD)

- A priced feature of z/OS that implements a facility to report on high frequency events and can be used to improve diagnosis on z/OS
- Addresses the problem of capturing data on a production system running under load by providing an efficient way to capture and report on various diagnostic items
- IBM priced product IBM z/OS Workload Interaction Navigator can be used to visualize the data

- **New Feature Announce** (http://www-01.ibm.com/common/ssi/ShowDoc.wss?docURL=/common/ssi/rep_sm/n/897/ENUS5698-WKN/index.html&lang=en&request_locale=en))

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Networking

- Exploit platform features and enable efficient network access
  - Support latest OSA and RoCE hardware adapters, HiperSockets, and provide for efficient network communications, including external network and intra-CPC communications
- Provide support for network security standards and enable network security monitoring and compliance
  - Support pervasive encryption by protecting data-in-flight with evolving security standards such as TLSv1.3
  - Assist in determining security compliance posture through the use of z/OS Encryption Readiness Technology (zERT) and the zERT Network Analyzer (zNA)
- Simplify network configuration through the IBM Network Configuration Assistant (NCA)
  - Simplify networking configuration, including the configuration of TCP/IP stacks as well as policy-based networking functions
- Application development and workload enablement
  - Enable efficient network access to Linux applications deployed in z/OS Container Extensions (zCX)
- Enhance availability and resilience
  - Enhance application availability in parallel sysplex environments through improved sysplex autonomics

Networking

z/OS Encryption Readiness Technology (zERT) – Policy Enforcement

- z/OS v2.5 adds support for Detecting and responding to weak or questionable connections
- Policy based enforcement during TCP/IP connection establishment
- Extending the Communications Server Policy Agent with new rules and actions
  - Detect weak application encryption and take action
  - Notification through messages and take action with your automation
  - Auditing via SMF records
  - Immediate Termination of connections is available through policy

Networking

z/OS Encryption Readiness Technology (zERT) - Reporting

- zERT aggregation recording interval
  - The recording interval for zERT can be customized up to one call in 24 hours. This reduces the records produced and improves the performance of the zERT Analyzer (CD)
- zERT Network Analyzer, a z/OSMF plug-in, that provides an easy to use web UI for analyzing zERT data reported in SMF 119 subtype 12 records
  - Significantly improves Time-To-Value of gaining insights into zERT data and driving a Pervasive Encryption strategy for all z/OS network communications
  - Enhances flexibility in the zERT Network Analyzer Db2 for z/OS database schema definitions and reduces the access privileges required by the zERT Network Analyzer's database user ID through the use of Db2 partitioned tables. (CD)

Networking

Shared Memory Communications Version 2 (SMCv2) multiple IP subnet support

- SMC – Shared Memory Communication is a more efficient protocol for sending data to and from z/OS.
- An improved protocol SMCv2 allows for multiple IP subnet support.
  - This is now available for both Direct and Remote access types for SMC.
  - SMC-Dv2 is a local protocol for communicating between peers on the same physical machine. SMC-Rv2 is used over IBM RoCE Express2 adapters on z15.
- In z/OS v2.5 SMC-R and SMC-D are no longer limited to communications for hosts attached to a common IP subnet.
  - SMCv2 defines SMC over multiple IP subnets. The SMCv2 multiple IP subnet support extends SMC capability to additional application workloads that were previously ineligible for SMC.
  - z/OS V2.5 delivers SMCv2 multiple IP subnet capability for SMC-R (SMC-Rv2). SMC-Rv2 is enabled with new IBM Z capability provided by the RoCE Express2 adapters for z15.
  - z/OS V2.5 also delivers SMCv2 multiple IP subnet capability for SMC-D (SMC-Dv2). SMC-Dv2 is enabled with new IBM Z capability provided by the IBM Z Internal Shared Memory (ISM) function. The new ISMv2 capability is available on the z15. (CD)

Networking

Notification of Availability of TCP/IP extended services

- Currently, TCP/IP issues a message when the stack completes initialization.
- z/OS 2.5 adds notification of extended services that don't initialize until after TCP/IP is initialized
- Support is added to issue a message and a new ENF event for extended services initialization complete.
- Applications and automation can now listen for: Sysplex Dynamic DVIPA initialization, IP security infrastructure initialization, and Network Policy initialization.

Enhancements for CSSMTP (CD)

- Enhancements are intended to facilitate migration from SMTPD to CSSMTP

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Data Serving & Storage

- Provide flexible, secure, and resilient data storage and serving solutions for on premises IT or hybrid cloud applications
- Leverage the deep integration of innovative technology of IBM enterprise storage, designed to address mainframe data storage requirements and match the mission-critical capabilities of IBM Z servers
  - Utilize cyber resiliency solutions to protect business-critical applications and data from logical data corruption or deletion, either accidental or malicious, and to rapidly recover and restore data
  - Utilize hybrid cloud as an additional storage tier for z/OS structured and unstructured data
- Manage the exponential growth of structured and unstructured data thru simplification, modernization, and constraint relief enhancements to better store, access, manage, sort and audit data while continuing to scale and perform
  - Simplified DFSMSrmm management
  - Centralized data management across the z/OS platform

Data Serving and Storage

Logical corruption protection and recovery

- Cyber threats to enterprise data are increasing from a range of different sources including
  - External Malware Infection, External Hacking, and Insider Threats
- Depending on the platform, some risks may be more likely than others
  - For core systems running on Z or Power, many organizations believe the threat from a privileged insider is the greatest risk
- Similarly, inadvertent loss or corruption of data is still also possible from other causes such as Application error or Operational error
- IBM GDPS solutions designed to address these concerns are referred to as Logical Corruption Protection and are being designed to provide
  - Capabilities to regularly create secure, Point-in-Time copies of data to use for Logical Corruption Protection scenarios – at the core of this is the DS8000 Safeguarded Copy
  - Increased security capabilities to prevent privileged users from compromising production data and systems as well as protected copies of this data
  - Functionality to enable various use cases for the Logical Corruption Protection copies (ie data validation, forensic analysis, surgical & catastrophic recovery, and offline backup)

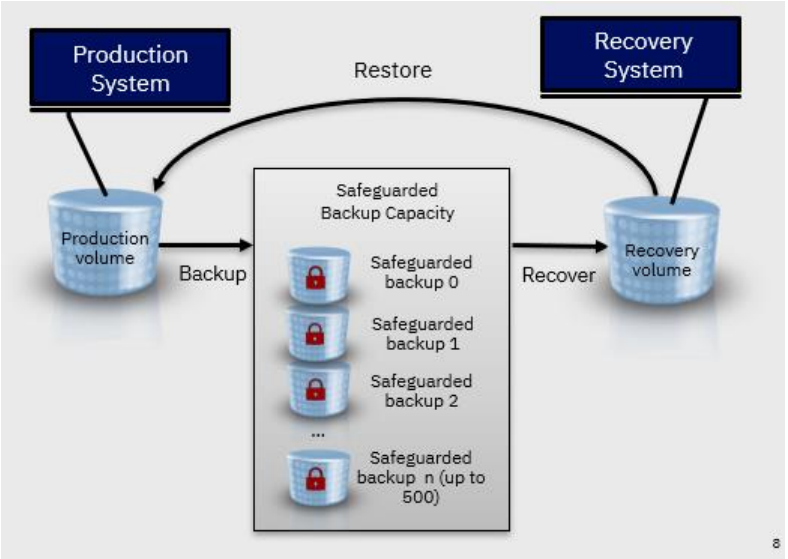
Data Serving & Storage

Logical corruption protection and recovery (CD)

DS8880 Safeguarded Copy:

- Safeguarded Copy provides up to 500 backup copies to restore data in case of logical corruption or destruction of primary data
  - The Safeguarded Capacity does not consume any of the regular DS8K volume addresses
  - Management and data consistency is provided by CSM or GDPS and copies can be maintained at production and/or recovery sites
  - Data can be restored to an additional recovery copy and can be used or copied to the source device depending on scenario
- A new TSO query, SGCQUERY**,** allows users to query the state of Safeguarded Copy relationships for a volume and the available recovery points (consistency groups)
  - Enables a storage administrator to access Safeguarded Copy information from TSO when other interfaces are not usable or not available and thereby continue to leverage persistent SGC recovery copies, potentially improving data availability.

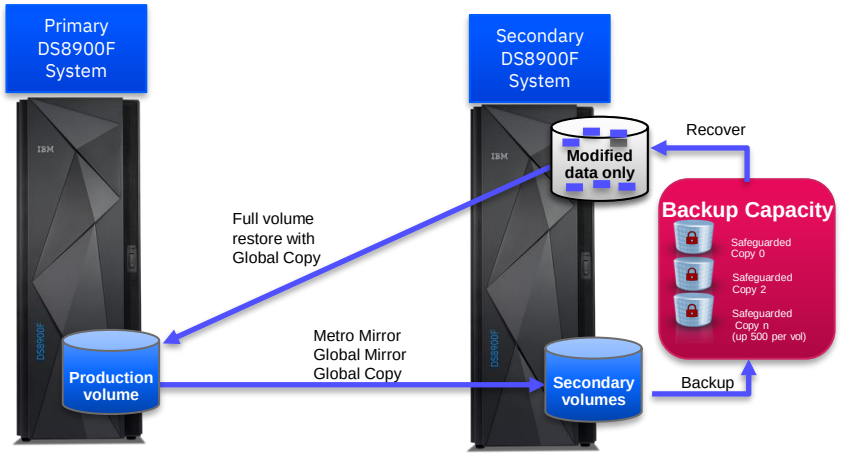
IBM DS8880 Safeguarded Copy prevents sensitive point in time copies of data from being modified or deleted due to user errors, malicious destruction or ransomware attacks



Data Serving & Storage

Safeguarded Copy restore to production with incremental global copy

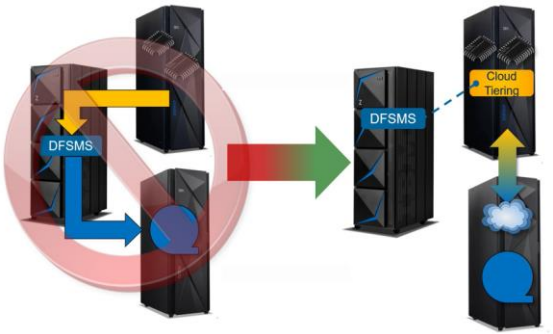
- Previously, production environments recovering from a Safeguarded Copy on a mirrored secondary were required to perform a ***full*** global copy of data from the recovery volume to restore data back to the primary
- With the latest enhancements, only the data that has been modified since the last recovery point is sent instead of the full volume
  - This ***"incremental copy"*** approach helps to greatly reduce the recovery time from hours to minutes per volume, while achieving significant savings in bandwidth
  - Restore to production is supported for Metro Mirror, Global Mirror, Global Copy and multi-site Metro Global Mirror environments



Data Serving & Storage

Enhanced Transparent Cloud Tiering (CD)

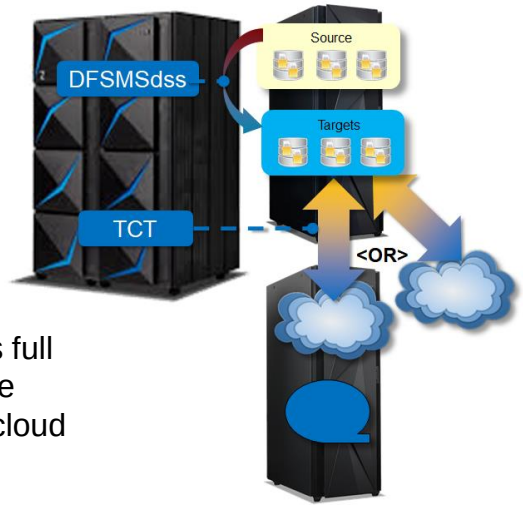
- The new TS7700 DS8000 Object Store capability enables DFSMShsm DS8000 transparent cloud tiering migration requests to target a TS7700 through existing GRID interfaces.
- Within the TS7700, the DS8000 object data is logically partitioned out of the existing resident cache and managed separately from traditional FICON logical volume data that coexists within the same physical TS7700 cluster.
- DFSMShsm manages the TS7700 DS8000 object store data identically to classic cloud object storage data.
  - Off-loads data movement responsibility to the DS8900 avoiding the need for additional HW infrastructure.
  - Dramatically reduces CPU resources to be efficiently used in other business-oriented applications.
  - Saves z/OS MIPS utilization by eliminating constraints tied to original tape methodologies (ie 16K Block sizes, recycle).
- Enables automated, policy-driven DFSMShsm migration and recall processing to move data through the entire traditional storage hierarchy with none of the data passing through your Z server.



Data Serving & Storage

Transparent Cloud Tiering Full Volume Dump Support (CD)

- Full volume copies of data can be backed up to the cloud with DFSMSdss where they can later be used to repair or recover a production environment that has been corrupted by system failures, human error, or compromised by either a cyberattack or internal attack.
- DFSMSdss leverages transparent cloud tiering to target either cloud object storage or a TS7700 configured as an object store.
  - To minimize the time a volume is locked, an initial full volume FlashCopy can be performed which can then be dumped to the object store.
  - Because the I/O for the FlashCopy is also completed within the DS8000, this could provide a point-in-time full volume dump to TS7700, with **none** of the data passing through the z/OS host.
  - DS8900 transparent cloud tiering can reduce CPU by up to 98% for z/OS DFSMSdss full volume dump and restore operations of Mod54 or larger volumes by performing all the data movement directly between the DS8900 and a TS7700 DS8000 object store or cloud object storage[1].
- Utility commands, list and delete, added to assist in managing full volume dumps.



[1]**DISCLAIMER:** The results are based on internal IBM measurements running z/OS V2R4 with PTFs for APAR OA60146. Full volume dumps and restores of MOD54 volumes on a DS8900 were performed on a z15 configured with Crypto Express7S cards. Results will vary based on workload, configuration, software level and the quantity and size of disk volumes.

Data Serving & Storage

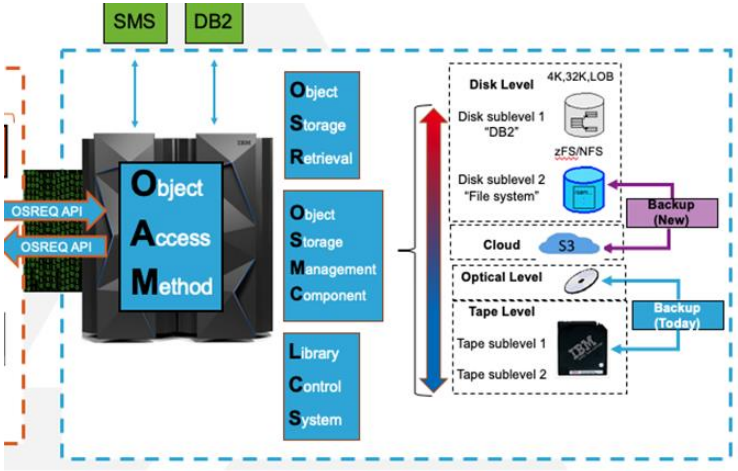
Transparent Cloud Tiering Multi-Cloud Support (CD)

- Expands the flexibility of Transparent Cloud Tiering (TCT) by allowing a DS8900F connect to up to eight different cloud targets.
  - These cloud targets can be a combination of off-prem or on-prem S3 cloud object stores and/or a TS7700 as an object store.
  - By defining multiple SMS cloud network connection constructs, DFSMShsm management class policies can be defined to split TCT backup and archive workloads to these different cloud targets by service level agreements, test/dev vs. production, by security levels of the data and more.

Data Serving & Storage

OAM Cloud Tier Support

- DFSMS OAM has included a new cloud tier to its existing storage hierarchy. OAM objects can be managed and stored as objects to public, private, or hybrid cloud infrastructures supporting the S3 API.
  - Through SMS policies, OAM objects can be stored directly to the cloud or can transition to the cloud, based on access requirements. Also provided is the capability to recall an object stored in the cloud to the disk level of the storage hierarchy.
  - This support satisfies a previously announced statement of direction.
- New with z/OS V2.5 is the ability for OAM-managed backup copies to be additionally supported in the cloud, a zFS, or NFS.
  - OAM is planned to continue to support up to two backup copies of an OAM object.



Data Serving & Storage

UNIX file backup / restore enhancements (CD)

- Clients want to use the same tools and applications to backup and restore individual z/OS UNIX files residing in z/OS File System (zFS) data sets as other z/OS data sets.
- The initial support to backup and restore individual z/OS UNIX files residing in zFS (z/OS File System) data sets is integrated into existing DFSMShsm backup / recover and DFSMSdss dump / restore capability, allowing for centralized data management across the z/OS platform and shipped on z/OS .
  - The support shipped on z/OS V2.3 and is intended to subsume the capabilities provided by the existing IBM Tivoli Storage Manager (TSM) z/OS UNIX System Services Backup-Archive Client.
  - DFSMS will **not** provide support for z/OS UNIX files found in Hierarchical File System (HFS) data sets.

DFSMShsm UNIX file-level backup and recovery with EXCLUDE criteria (CD)

- Unix files can be filtered with a new exclude option that includes directories, specific file names as well as file name patterns.

Data Serving & Storage

DFSMShsm file mode hosts (CD)

- A new FILEMODE for DFSMShsm enables an additional HSMplex to exclusively process UNIX files.
  - Any DFSMShsm requests for UNIX files are automatically directed to the DFSMShsm hosts configured with FILEMODE.
  - This support enables clients with very large existing DFSMShsm environments to add DFSMShsm UNIX data set backup processing without impacting their classic volume and data set environment.

DFSMShsm recover UNIX files to a new directory (CD)

- DFSMShsm adds the capability to recover UNIX files to a directory other than the original directory from the time of the backup.

Data Serving & Storage

Data Set File System (SOD)

- A new file system type that will allow customers to access data in data sets from the z/OS UNIX space.
- Enables z/OS UNIX applications, tools, and utilities to use data in data sets in a secure and consistent manner.
- Supports Sequential, PDS, PDSE data sets.
- Supports RECFM = F, FB, FBS, V, VB, U
- Compressed or encrypted data sets are also supported
- Existing cataloged data sets (DASD) can be read and written.
- “Data Set File System” can also create new data sets or delete a data set or PDS / PDSE member.
- Data set serialization is consistent with serialization done by ISPF edit.
- Access to a data set is governed by user permission to the data set - UNIX permissions are **not** used.
- User needs to know the type of data that is in the data set in order to use it under z/OS UNIX.
- A new class of applications can be developed using this technology.
- Use case scenarios:
  - Use **grep** to search for things in data sets.
  - Use **vi** to edit data sets
  - Write data sets into **tar** archives
  - Make data sets part of a **pax** file
  - **sftp** data sets
  - etc…

Data Serving & Storage

Tape Allocation Enhancements (CD)

- The existing keyword, SMSHONOR, currently available with the **UNIT** parameter on the DD statement is enabled through the SMS tape storage group construct.
- The new support is intended to broaden the original SMSHONOR support and make it easier, through SMS policies, to reserve a set of devices for critical applications by limiting the devices used by their less critical applications.

PDSE Member Compression (CD)

- PDSE's now can have members optionally compressed using the on board compression engine. This support complements the member level encryption that was previously available .
  - PDSE V2, non program object, member larger than 64K - transparent
- The new support is intended to reduce the amount of disk space required to store PDS members. Members that are compressed before they are encrypted should see improved encryption and decryption time as the amount of data to be managed goes down.

Data Serving & Storage

DFSMSdfp IEBCOPY Enhancements (CD)

- IEBCOPY can be used to preserve member generations when copying a PDSE V2.
  - Previously, DFSMSdss DUMP and RESTORE had to be used.
  - This now provides another popular method for retaining member generations and to avoid possible inadvertent loss of member generation data.
  - Exploit with new keyword on IEBCOPY to copy the member generations, on either COPYGRP or COPYGROUP:
    - `OUTDD=ddname,INDD={ddname|((ddname,R))}[,LIST={YES|NO}],GENS={ALL|NONE}`
    - **`GENS=`** is ignored when:
      - Input data set or Output data set are not PDSEs, with warning IEB1181I
      - Input data set is not V2 PDSE
      - If input data set is a PDSE V2 with generations and the output is a PDSE with no generations
      - If output data set has smaller generation count than the input data set, the oldest generations will be dropped.

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Security

- Pervasive Encryption
  - Additional support for more data (in flight and at rest)
  - Simplified ability to achieve security compliance
- System hardening
  - Detection of elevating privilege
  - Multi-Factor Authentication advancements
  - Provide password alternatives for APIs
  - Identification of common configuration concerns
- Standards
  - Continue strong encryption support for the platform
    - Evolve ahead of industry standards

Security

Pervasive encryption

- z/OS V2.5 plans to continue to drive pervasive encryption efforts within an enterprise:
  - z/OS policy-based encryption options that can help clients protect their critical business data have been enhanced to support additional z/OS data set types, including:
    - Basic and large format SMS data sets (CD)
    - JES2 spool encryption (CD)
    - Support for the EXCP API for encryption of data sets accessed vis EXCP (CD)
  - These enhancements allow users the ability to encrypt data, in most cases, without application changes and simplify the task of compliance.
  - For more information, see the pervasive encryption content solution (https://www.ibm.com/support/z-content-solutions/pervasive-encryption/).

Security

RACF Enhanced PassTicket Support (CD)

- z/OS V2.5 adds additional RACF PassTicket support. This includes:
  - Stronger cryptographic algorithm
  - Configurable expiration time
  - Optionally Expanded character set
  - Improved diagnostics
  - Recording to SMF
  - Co-existence and Migration

RACF Support for Restricted Profile Management

- z/OS V2.5 Includes a new installation option to limit a user who has ALTER access to a discrete profile from changing the profile
- This is intended to separate profile management from the access rights that a profile represents which should improve compliance.
- The security administrator can be further in control of the security of the system and allow the user to retain control over everything else about the data

Security

RACF New Health Checks

- New Health checks are provided to:
  - Verify all datasets are protected by RACF by verifying that SETROPTS PROTECTALL(FAILURES) option
  - Ensure all residual information is erased when data sets are deleted by verifying that SETROPTS ERASE(ALL) is enabled
  - Verify that all Passticket keys are encrypted and stored in ICSF
  - Verify that the RACF Address space is active
  - Verify that either RACF Sysplex communication or datasharing mode is active

Security

Certificate Fingerprint Support

- New support to display the certificate fingerprint using RACF RACDCERT command
- Add certificate fingerprints to SMF records
- Add search and display options for certificate fingerprints in PKI Services

- This is intended to improve security policy management and implementation when using certificates

IPsec Certificate Reporting

- ipsec –k display command, NMI and SMF 119 subtype 73 and 74 records are updated to include IPsec X.509 certificate information
  - This includes certificate serial number, certificate expiration, subject and issuer distinguished names

Security

System SSL, AT-TLS, and IPsec diagnostic Improvements

- New System SSL support to provide applications with peer certificate failure diagnostics
- AT-TLS support to log peer certificate failure diagnostic data to syslogd when handshakes fail
- IPSEC support to log peer certificate failure diagnostic data to syslogd for IKE failed negotiations
- The intent is to improve failure diagnosis by ensuring the certificate information is available in many common error scenarios

FIPS Compliance

- IBM Plans to support FIPS compliance support for interoperability by completing the FIPS enablement to the UNIX file-based Kerberos database.

Security

Data Privacy for Diagnostics (CD)

- Supports redacting sensitive user data in dumps
- Mark sensitive memory areas and remove from a dump before sending to IBM or a vendor
- Supported for SYSMDUMP and TDUMP
- New options on z/OS API's to tag known sensitive memory areas
- New optional post-processing step will remove previously tagged sensitive pages, and new z/OS Diagnostics Analyzer will detect and redact additional sensitive data in untagged pages
- All intended to be done without impacting the dump capture time.
- Required and available maintenance for Data Privacy for Diagnostics:
    - Fix Category IBM.Function.DataPrivacyForDiagnostics

Security

IBM SMF New Signature Algorithms(CD)

- z/OS extends the digital signature support for SMF records written to log streams to optionally include a second digital signature. When enabled, the second signature provides an alternative to current algorithms
- SMF signature verification function is extended to include this second signature to help you determine if SMF records have been altered or removed. This function is intended to protect SMF data into the future.
- The support requires Cryptographic Support for z/OS V2.2 - V2.4 (HCR77D1) and IBM z15.

Improved auditability (CD)

- Support is added to the password syscall to include the caller's Port of Entry IP address when calling the System Authorization Facility (SAF)
- The security product can include this IP address in SMF Type 80 records.
    - Improving logging and auditing

Security

z/OS Authorized Code Scanner Priced Feature

- The IBM z/OS Authorized Code Scanner is an optional priced feature of z/OS that provides automated system integrity testing in a dev/test environment as part of DevSecOps modernization. It scans for Program Calls (PCs) and Supervisor Calls (SVCs) available to all address spaces on a z/OS image and generates a series of tests that dynamically scan them for integrity.
- The output of this scan provides in-depth diagnostics whenever a potential vulnerability is found to facilitate remediation in order to further strengthen the security posture of the client's configuration of z/OS.

- **New Feature Announce** (https://www.ibm.com/common/ssi/ShowDoc.wss?docURL=/common/ssi/rep_ca/5/897/ENUS220-225/index.html&request_locale=en)

z/OS V2.5 – Hybrid Cloud

z/OS has the capabilities that any operating system would require to be a server in a hybrid cloud model.

- A Robust networking component with the ability to manage networks efficiently and securely
- A highly secure environment which supports multi-factor authentication, granular security access checks and tamper proof auditing
- Industry leading cryptographic technology
- Access to Cloud Object stores
- Ability to rapidly and repeatedly provision software
- Ability to run Linux workloads on z/OS
- A highly available environment which allows you to build high availability sites where an application has access to multiple system instances, running on multiple physical machines, sharing a consistent set of application data, with replicated physical data that can be recovered at long physical distances.

For more information, see the Hybrid cloud content solution (https://www.ibm.com/support/z-content-solutions/journey-to-hybrid-cloud-z/).

Requirements

z/OS requirements

- z/OS accepts requirements through Request for Enhancements (RFE)
  - Any customer can open a requirement on any part of the operating system on the RFE site (https://www.ibm.com/developerworks/rfe/)

- You can also search and vote on RFE's at that location
  - You need an IBM ID
  - Go to the search tab
  - Brand: Servers and System Software, z Software, z/OS

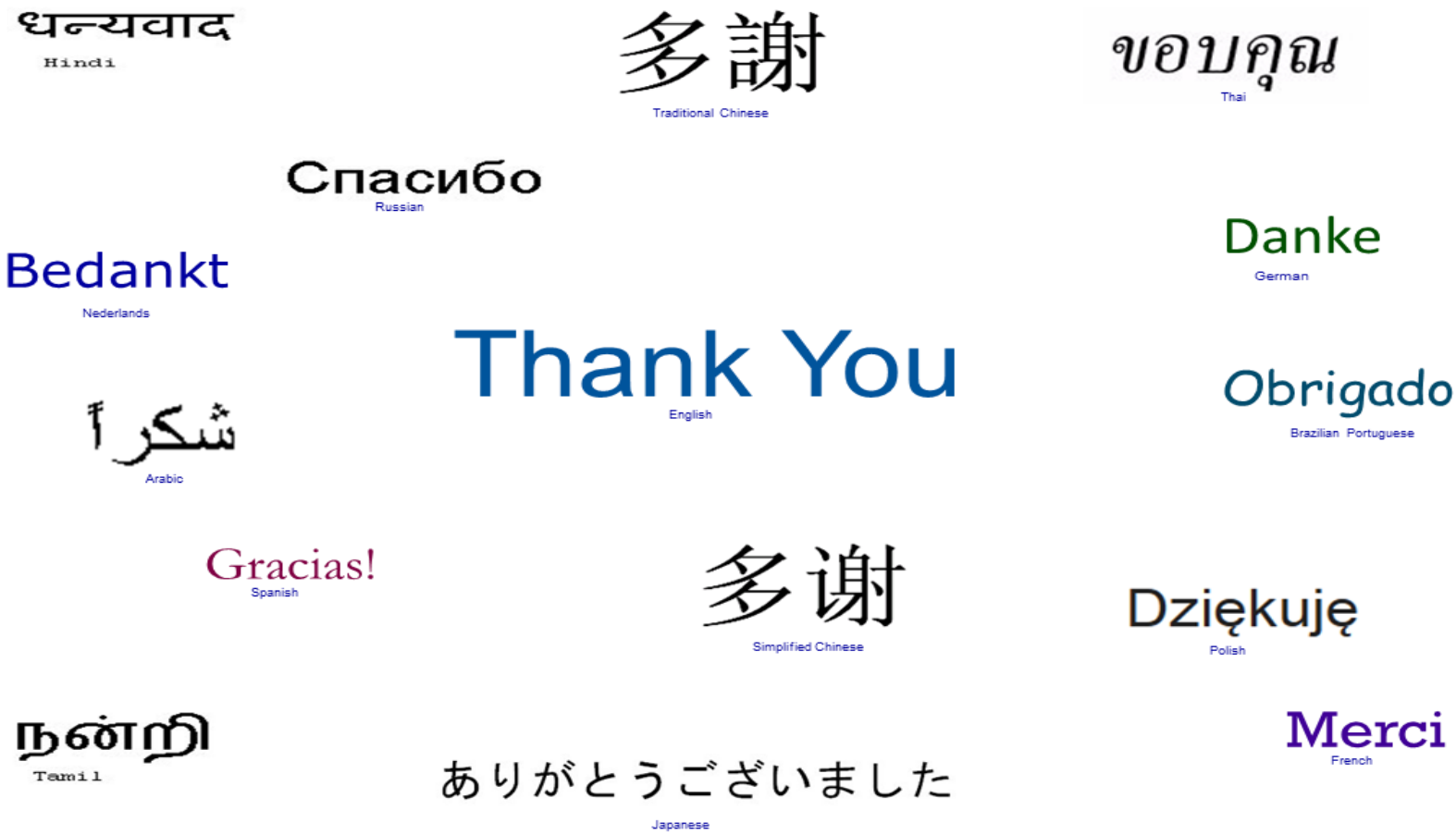
- z/OS also accepts requirements through user groups like SHARE

- Requirements specifically addressed in z/OS V2.5 can be found on the z/OS User Group Requirements page (https://www-01.ibm.com/servers/resourcelink/svc00100.nsf/pages/zosv2r5-user-req?OpenDocument)

For Additional Education

z/OS IBM Education Assistant

- For z/OS V2.5 educational materials, please see the z/OS github entry (https://github.com/IBM/IBM-Z-zOS/tree/main/zOS-Education/zOS-V2.5-Education)
- - Details for over 70 topics referred to in this presentation (as well as a PDF of the latest version of this presentation)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Continuous delivery

- z/OS embraces continuous delivery through new function APARs
- Get weekly emails when APARs close with MyNotification: start at
  - https://www.ibm.com/support/entry/portal/support
- Look on the web, updated monthly:
  - https://www-03.ibm.com/systems/z/os/zos/installation/zosnfapars.html

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IBM’s Statements of Direction

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IBM’s Statements of Direction

July 2021 - z/OSMF Software Management support for creating a new master catalog when installing z/OS portable software instances is already available. Follow-on support is planned to enable disconnecting the new master catalogs from the driving system, and other associated removals. These activities are not immediately required for installation of a z/OSMF portable software instance, but are planned to ensure that the removal of the connection of the new master catalog can be done easily with z/OSMF Software Management.

July 2021 - When installing a new z/OS release, clients have indicated that certain data sets need to be merged during the installation process to simplify their data set and UNIX file system management. This data set merge capability exists within the CustomPac Installation Dialog, but does not currently exist within z/OSMF Software Management. This capability is planned to replace the CustomPac Installation Dialog for installing z/OS software. Therefore, a data set merge capability is planned to be added to z/OSMF Software Management to help clients continue to manage their z/OS systems.

July 2021 - IBM plans to provide a new file system type that will render traditional z/OS data sets accessible by the z/OS UNIX name space. This will enable z/OS UNIX applications, tools, and utilities transparent to gain access to data in these data sets in a secure and consistent manner.

IBM’s Statements of Direction

July 2021 - As stated in in a previous Hardware Announcement, many IBM Z clients continue to rely on Systems Network Architecture (SNA) applications for mission-critical workloads, and IBM has no plans to discontinue support of the SNA protocol, including the SNA APIs. However, IBM Z support for the SNA protocol being transported natively out of the server using OSA Express 1000BASE-T adapters configured as channel type “OSE” will be eliminated in a future hardware system family. With the support for OSE planned to be discontinued, support for the related VTAM and TCP/IP device drivers is also planned to be discontinued. IBM intends z/OS V2.5 to be the last z/OS release to provide support for LSA (SNA) and LCS (TCP/IP) devices. z/OS systems that have workloads that rely on the SNA protocol and utilize OSE networking channels as the transport should be updated to make use of some form of SNA over IP technology, where possible, such as Enterprise Extender.

July 2021 - z/OS V2.5 is planned to be the last z/OS release to provide support for the TCP/IP profile statements DEVICE, LINK, and HOME for OSA connectivity. All z/OS users who currently use DEVICE, LINK, or HOME for OSA connectivity should migrate to the INTERFACE statement for defining OSA Express connectivity in their TCP/IP profile.

July 2021 - IBM intends to deliver a System Management Facility (SMF) data access toolkit leveraging Python and Jupyter Notebooks. This new capability can help clients access SMF data in an easy and modern way. This can enable data science solutions, IT analytics solutions, or artificial intelligence solutions, helping to bring clients valuable insights into their IT operations without needing unique z/OS skills to access and process the data. IBM further intends to deliver Jupyter Notebook tutorials that will guide users on how to access, process, and visualize the SMF raw data.

June 2021 - z/OS V2.4 (ICSF FMID HCR77D0) and the web-deliverable Cryptographic Support for z/OS V2.2, z/OS V2.3, and z/OS V2.4 (ICSF FMID HCR77D1) are planned to be the last releases for which ICSF will support a network-attached RCS.

IBM’s Statements of Direction

March 2021 - For decades, IBM has offered two asynchronous replication strategies, IBM z/OS Global Mirror, also known as extended remote copy, or XRC, and DS8000 Global Mirror. IBM plans to support and maintain z/OS Global Mirror on z/OS with its current function only, and z/OS V2.5 will be the last release to provide such support. This withdrawal aligns with what was previously announced in Hardware Announcement 920-001, dated January 07, 2020 which indicated the DS8900F family would be the last platform to support z/OS Global Mirror. New functions to support asynchronous replication technology are intended to be developed only for DS8000 Global Mirror, and it is intended that no new z/OS Global Mirror functions will be provided with DS8900F and z/OS.

March 2021 - IBM intends to enhance pervasive encryption through RACF support for the use of an encrypted VSAM data set as its data base in specific configurations.

March 2021 - With the rapidly growing need to derive AI insights from data in critical business workloads, IBM is planning to optimize z/OS by introducing highly performing AI functionality targeted for clients' critical business workloads. These enhancements are planned to be delivered iteratively and are intended to enable IBM Z as a highly competitive AI inferencing platform. Areas of focus would include:

- Native z/OS solutions providing AI capabilities that would be tightly integrated with z/OS workloads
- Utilizing z/OS Container Extensions that broadly expand the AI libraries and tools ecosystem, including, but not limited to, technologies such as TensorFlow and ONNX
- Optimizations that would be focused on ensuring AI libraries and runtimes can utilize the latest IBM Z hardware capabilities
- Guidance and content that would be focused on accelerating the path to adoption of AI technology

These capabilities are planned to further strengthen z/OS position as the premier platform for enterprise computing.

IBM’s Statements of Direction

March 2021 - To ensure that clients can install Shopz-orderable software in the future, it is recommended that clients take steps to prepare their driving system for z/OSMF-based installations. For an overview of ServerPac with z/OSMF Software Management and the steps to follow, see the ServerPac Installation using z/OSMF content solution (https://www.ibm.com/support/z-content-solutions/serverpac-install-zosmf/) website. Here, clients can find a sample portable software instance that can be used to verify that their z/OS driving system is operational for installing a CICS, IMS, Db2, or z/OS ServerPac.

Care is advised when clients plan to install z/OS V2.5, because the delivery choices are expected to change in Shopz in January 2022. At the general availability of z/OS V2.5, except for z/OS V2.4, and prior to January 2022, IBM intends to make all IBM z/OS software on Shopz orderable as a ServerPac, and installable as a portable software instance or by using the CustomPac dialog. It is not intended that z/OS V2.4 ServerPac will be offered as a portable software instance. Prior to January 2022, all other software (CICS, IMS, Db2, z/OS V2.5, and licensed programs) are planned to be offered as ServerPac orders deliverable through z/OSMF or the CustomPac dialog.

In January 2022, the CustomPac dialog delivery option is planned to be removed for all software, including CICS, IMS, Db2, z/OS V2.5, and all licensed programs. Thereafter, it is planned that all software that is orderable as a ServerPac must be installed with z/OSMF Software Management.

Although it is planned that z/OSMF will become a driving system requirement, it would be a requirement only for the system in a client’s enterprise from which software installation activities are performed. However, clients might find that using z/OSMF throughout their enterprise offers tremendous benefits. If clients cannot meet the z/OSMF driving system requirements for ServerPac, the Customized Offerings Driver (5751-COD) is available on Shopz. It provides a z/OS system with z/OSMF, which will be activated at z/OS V2.5 availability.

March 2021 - As previously announced, for clients that use JES3, z/OS V2.5 is the last release for which IBM plans to include the JES3 feature. Clients should be making plans to migrate to JES2 or an alternative.

IBM’s Statements of Direction

December, 2020 – IBM intends to discontinue monthly service refreshes to the Software Information Base file in the first quarter of 2022. Any existing Software Information Base file can continue to be used as input to PMA, however, usage of z/OSMF Software Management reports is encouraged to be used instead to view current data.

December, 2020 – Aligned with the announcement of the end of life for IBM JES3 in Software Announcement 219-0-13, the next release after z/OS 2.4 will be the last release that BDT is included in z/OS. This applies to both priced features, BDT SNA NJE and BDT File-to-File (F2F). BDT SNA NJE offers JES3 clients the ability to send information over SNA networks to other end points. Note that BDT SNA NJE does not apply to JES2 clients as this function has always been included as part of JES2. The BDT F2F feature offers both JES3 and JES2 clients the capability of managed file copying from one system to another system.

Functional replacements for BDT File-to-File include IBM Sterling Connect:Direct for z/OS (5655-X11) and IBM MQ Advanced for z/OS (5655-AV9). This includes MQ File Transfer edition and MQ Advanced Message Security. BDT and it's features are planned to be supported until the discontinuance of support for the next z/OS release.

September 2020 - Today, SMC for both SMC-R and SMC-D is limited to communications for hosts attached to a common IP subnet. SMCv2 defines SMC over multiple IP subnets. The SMCv2 multiple IP subnet support extends SMC capability to additional application workloads that were previously ineligible for SMC. z/OS V2.4 delivers SMCv2 multiple IP subnet capability for SMC-D (SMC-Dv2). See details in the description section. IBM plans to make SMCv2 multiple IP subnet capability available for SMC-R exploiting "routable RoCE" (RoCEv2) in a future z/OS deliverable. IBM is working with Linux distribution partners to provide SMCv2 support for Linux on IBM Z and IBM LinuxONE.

IBM’s Statements of Direction

June 2020 – IBM intends to provide clients with capabilities that will help accelerate their transformation to greater portability and agility in a hybrid cloud environment by delivering containers and Kubernetes orchestration support for existing and new IBM z/OS applications and workloads.

This move towards greater portability and agility will be supported by taking advantage of architecture-independent standards and technology for container-based development and deployment on z/OS. As this container-based technology is deployed on core systems of record, it will ensure the isolation of environments and other users from the effects of other containers.

By providing a container runtime for z/OS, and the orchestration of those containers, users can:

- Increase speed from development to deployment of z/OS-based applications
- Increase predictability and repeatability across the application lifecycle for z/OS applications
- Enhance practices across z/OS development, testing, and operations through a wide ecosystem of open-source application container-based tools

These proposed capabilities for z/OS will reinforce and further strengthen the IBM focus on hybrid cloud to unlock business value and drive growth for clients. This can be achieved by providing technology that incorporates the client's core mission-critical applications and workloads across their z/OS middleware into a container-based cloud-native strategy.

IBM’s Statements of Direction

June 2020 – The release after z/OS V2.4 is intended to be the last release to support the ability to share RACF databases between z/VM and z/OS systems. While databases may remain compatible, sharing between operating systems is discouraged due to the distinct security and administration requirements of different platforms. A future z/OS release will be updated to detect whether a database is flagged as a z/VM database and reject its use if so marked. Sharing of databases between z/OS systems is not affected by this statement.

June 2020 – z/OS DFSMSdss and DFSMShsm plan to provide full volume dump support for transparent cloud tiering. This capability will enable all I/O for full volume dumps to be performed by a DS8000 directly to a TS7700 enabled as an object store, or directly to cloud object storage. To minimize the time that a volume is locked while performing this offload, an initial full volume FlashCopy can be performed which can then be dumped to the object store. Because all of the I/O for the FlashCopy is also completed within the DS8000, this will provide a point-in-time full volume dump to TS7700, with none of the data passing through the z/OS host. DFSMShsm also plans to integrate this capability into the FRBACKUP / FRRECOV functions, utilized by Db2 BACKUP / RESTORE SYSTEM.

May 2019 – IBM intends to leverage Kubernetes clustering in the future for the orchestration and management of z/OS Container Extensions with compatible cloud platforms.

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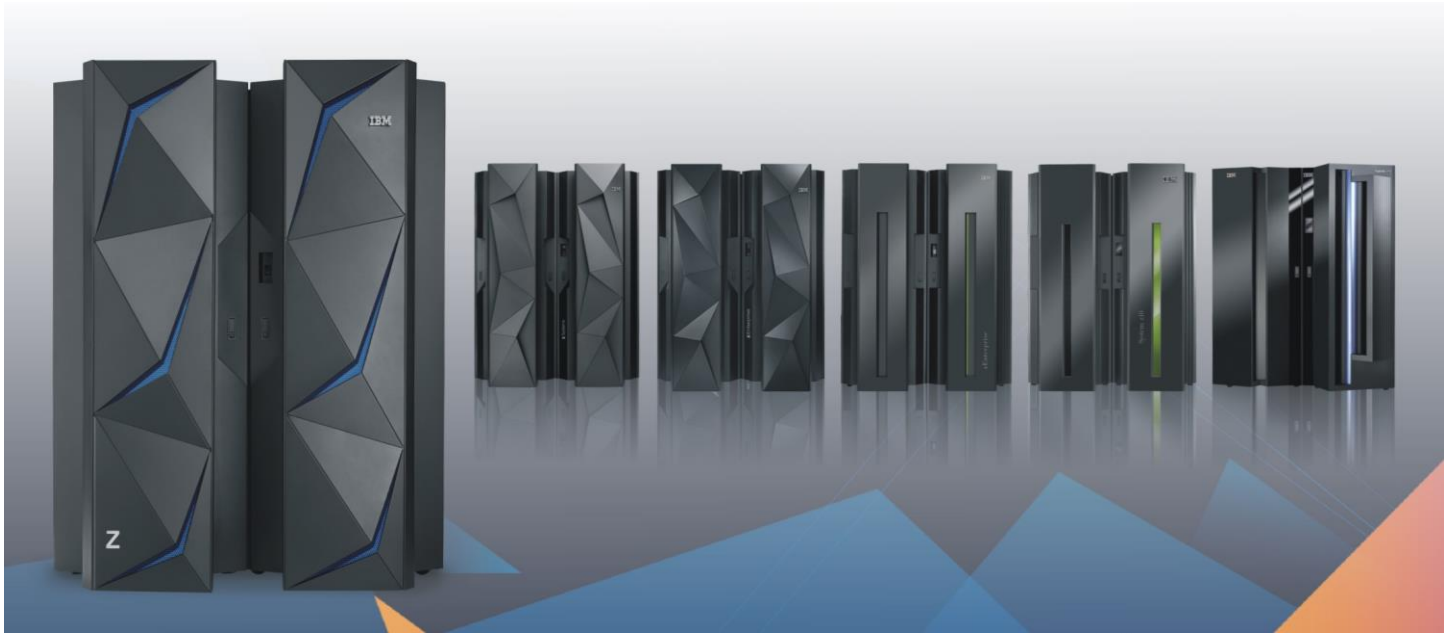
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