The Latest News on IBM z/OS V2R2

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z/OS and the IBM z13
IBM z13 System Functions and Features

**Five hardware models**
- Up to 141 processors configurable as CPs, zIIPs, IFLs, ICFs or optional SAPs (no zAAPs)
  - 100-way on z/OS® V1.12 or V1.13
  - Up to 141-way on z/OS V2.1 (non-SMT mode)
  - Up to 128-way on z/OS V2.1 (SMT mode)
    - max active threads in SMT mode is 213
- Up to 10 TB of Redundant Array of Independent Memory (RAIM)
  - 1 TB per z/OS LPAR on z/OS V1.12 or V1.13
  - Up to 4 TB per z/OS LPAR z/OS V2.1 & V2.2
- Changed (node) cache structure
- 96 GB Fixed HSA
- Up to 85 LPARs (Up to 60 LPARs with z/OS V1.12 on any LPAR)
- Up to six logical channel subsystems (CSSs)
- 4 Subchannel Sets per CSS
- Single Instruction Multiple Data (SIMD) instruction set
- Two-way simultaneous multithreading (SMT) support for up to 128 cores (IFLs and zIIPs)
- New and enhanced instructions
  - XL C/C++ ARCH(11) and TUNE(11) exploitation: New z13 hardware instruction support, SIMD (Vector support) and Vector data, Decimal Floating Point packed conversion facility support, Performance improvements
  - New and enhanced instructions

**IBM zAware: z/OS and Linux® on IBM zSystems™**
- CPU Measurement Facility
- Flash Express (Storage Class Memory-SCM)
- CF exploitation of Flash Express
- SMC-Remote and SMC-Direct
- IBM z Systems Data Compression (zEDC) capability using zEDC Express
- OSA Express5S
- Shared RoCE Express Support
- Greater than 256 PFID support
- PCIe extended address translation
- Enhanced the PCIe function definition
- PCIe function measurement block changes
- FICON Express16S
- FICON® Dynamic Routing
- High Performance FICON for z Systems (including zHPF extended distance II)
- Fabric I/O Priority*
- CryptoExpress5S: Next Generation Coprocessor support, Support architecture for up to 85 Domains, Format Preserving Encryption (FPE)
- Integrated Coupling Adapter (ICA) Links
- Increased number of coupling CHPIDs, from 128 to 256 per CEC
- zBX Model 004 support

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z/OS System Limits with z13

• Up to 4 TB of real memory per LPAR
  – For z/OS V2.2
  – z/OS V2.1 also supported via APAR OA44436
  – (Note: HW limits to 1 TB per LPAR if old channel cards are carried forward)
z/OS System Limits with z13 Cont

- Up to 6 CSSs or Logical CSSs
- Up to 4 subchannel sets per LCSS
  - Maximum primary device limit unchanged, at 65,280
    - Limited by available subchannels in Subchannel Set 0
  - PPRC secondaries, PAV aliases, FlashCopy® targets can be defined in Subchannel Sets 0-3
  - Larger *practical* I/O configurations using advanced storage-related I/O functions can be supported with more subchannel sets
Shared Memory Communications – Direct (SMC-D)

- Requires z13, z/OS V2.2, Inter System Memory (ISM) defined
- SMC-D enables direct LPAR to LPAR communications
- Similar to SMC-R (over RoCE) extending the benefits of SMC-R to same CPC operating system instances without requiring physical resources (RoCE adapters, PCI bandwidth, NIC ports, I/O slots, network resources, 10GbE switches etc.).
- Its fast, i.e. up to 61% CPU saving for FTP file over hipersockets
Simultaneous multithreading (SMT)

• “Simultaneous multithreading (SMT) permits multiple independent threads of execution to better utilize the resources provided by modern processor architectures.”\(^1\)

• SMT is designed to make better use of processors

• With z13, SMT allows two active instruction streams or threads per core, each dynamically sharing the core's execution resources to get better overall throughput.

• On z/OS, SMT is available for zIIP processing:
  - Two concurrent threads are available per core and can be turned on or off
  - Capacity (throughput) usually increases
  - Performance may in some cases be superior using single threading.

• z/OS views two processors per core in SMT mode.
  - One or two processors can be online for zIIP cores, but…
  - One processor per CP core is always offline

• Up to 128-way (128 cores) on z/OS V2.1 in SMT mode. What is the max threads?
  - Max 43 CPs and 85 zIIPs (1:2 ratio limit) -> 128 cores.
  - Max active threads in SMT mode is: 43 + 85 + 85 = 213.

\(^1\) Wikipedia®
Single Instruction Multiple Data (SIMD) Support

z/OS V2.2 includes…

• HLASM support for new SIMD OpCodes
• MASS and ATLAS libraries included in z/OS
• Language Environment® enablement, dbx support
• z/OS XML System Services exploitation
• Various infrastructure enhancements to support new registers, etc.

…all these available for z/OS V2.1 with PTFs (find them all with FIXCATs!)

Also, we have support for:

• z/OS XL C/C++ compiler, with new ARCH(11) and TUNE(11) parameters, in a web deliverable for z/OS V2.1 and included in z/OS V2.2
• Enterprise PL/I for z/OS, V4.5 (5655-W67)
• Enterprise COBOL for z/OS, V5.2 (5655-W32)

WebSphere® Application Server for z/OS Liberty Profile V8.5.5.5 (5655-W65) applications using the Liberty profile and running with Java® 8 are expected to benefit from SIMD exploitation.
A Whole Lot of Crypto

• z13 CPACF coprocessor speed approximately double that of the zEC12’s
  - Encryption and hashing both expected to be markedly faster
• New functions in Crypto Express5S with corresponding support, exploitation, and other improvements in ICSF Web Deliverable for z/OS V1.13 and z/OS V2.1 (not all require Express5S) designed to:
  - Help you meet emerging credit card processing standards using CCA-based services for key management, generation, transport, and derivation
  - Enhance support in the Remote Key Export callable service for key wrapping
  - Provide AES MAC enhancements to the Symmetric MAC Generate & Verify
  - Support some UDX callable services to CCA firmware:
    ➢ Recover PIN From Offset, Symmetric Key Export with Data, Authentication Parameter Generate
More Compression Support for zEDC

• **Extended Format BSAM and QSAM Compression**
  − Compressed Format data set support (available on z/OS V2.1 with PTF for APAR OA42195)
  − In addition to generic (DBBLIB) and tailored (supply a dictionary) compression
  − New data class level COMPACTION option in DATACLAS definition
  − New system level values on COMPRESS parameter in IGDSMSxx

• **DFSMSdss data compression**
  − For DUMP & COPY, and when DFSMSdss is used as the data mover by DFSMSHsm (available for z/OS V2.1 with PTF for APAR OA42243)
    ➢ Up to 80% decrease in DFSMSHsm CPU expected for L0-ML1 migration and up to 69% decrease for ML1 recall with zEDC compared to software-based compression & inflation*
    ➢ Up to 50% less ML1 space with zEDC compared to software-based compression*

• **Keep an eye out for others like:**
  − MQ V8 support via COMPMSG(ZLIBFAST)

* Based on projections and/or measurements completed in a controlled environment. Results may vary by customer based on individual workload, configuration and software levels.
• **FICON Dynamic Routing Health Check**
  - Exploits SAN dynamic routing policies in the fabric
    - Improves performance
    - Lowers costs
  - Requires:
    - A z13 GA2 processor
    - IBM System Storage DS8000 series devices with a minimum MCL
    - z/OS V1.13 and up
  - Health Check:
    - In z/OS V2.2
      - For z/OS V1.13 and z/OS V2.1 get PTF for APAR OA47297 (APAR closed on Sept 25, 2015)
    - Check fabric, channel subsystem, disk control units
    - Help assure dynamic routing requirements are met when dynamic routing has been enabled for one or more FICON switches
    - Helps you identify misconfiguration errors that can result in data integrity exposures
z/OS V2.2
A smarter operating system

Usability and Skills
z/OSMF as a base element of z/OS; TCP/IP configuration; z/OSMF plug-in setup workflow; Updates to WLM, RMF, Incident Log, Software Management, WebISPF applications; New z/OSMF External Applications API; DJC and Deadline Scheduling for JES2; System Symbol enhancements…

Application Development
Web Enablement Toolkit, EU ordering rules for Unicode, ISPF improvements, DFSORT™ Date Functions, Enhanced RESTful data set and file APIs, Parallel Batch Scheduling, Improved JES3 symbol and JCL support, …

Scalability & Performance
More threads for z/OS UNIX® System Services, AMODE64 File System Services for zFS & NFS, CA-Level Locking for RLS, zFS performance, Even More Jobs for JES2, …

Enhancing Security
Signed SMF records, RFC 4556 X.509 support in Kerberos, RRSF Dynamic Node Reassignment, Multiple certificate approvers, PKI RFC 6277 Support, System SSL RFC 2560 OCSP Support, z/OS UNIX security improvements, BCPii audit records, …

Availability
Dynamic JES2 Checkpoint Tuning & Expansion, Private Area Virtual Storage Tracking in PFA, Dynamic TDS (LDAP) Compatibility Upgrades, Multi-target PPRC, Incremental FlashCopy, XCF message processing, LOGREC deallocation, O/C/EOV Dynamic Exits, …

Systems Management
Smarter Subsystem Interface processing, DFSMShsm Storage Tiers Extensions, Extensions to Health-Based Workload Routing, RMF Reporting Enhancements, Generic Tracker Improvements, …

Networking
64-bit TCP/IP Stack, RoCE Improvements, DVIPA Limit, CICS Sockets, Enterprise Extender Scalability, NIST SP800-131a, TLS Session Reuse, Resolver Improvements, …
A quick way to find lots of z/OS V2.2 new functions!

- IBM Education Assistance (IEA for V2.2)

- Also available for z/OS V2.1 (IEA for V2.1)
## z/OS Support Summary

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1. Fee-based service extension available, or is planned to be available.
2. All statements regarding IBM future direction and intent are subject to change or withdrawal without notice, and represent goals and objectives only.
3. Fee-based service extension is required for certain functions.
Usability and Skills
Usability & Skills

• **z/OSMF now a base element of z/OS**
  - No need to order separately

• **z/OSMF setup now like other z/OS functions**
  - *much* easier:
    - 1. Optional Parmlib member (IZUPRMxx), 2. USERDIR file, 3. security definitions, 4. start server.
    - Plug-in configuration makes more use of workflows

• **More z/OSMF enhancements**
  - Support for one workflow to call another
    - Intended to support reusable workflow building blocks
Usability & Skills

• **z/OS V2.2 Communications Server extends the z/OSMF Configuration Assistant plugin:**
  - Supports creating and storing new configuration profiles for TCP/IP stacks with integrated help to guide novice users
  - Can make it faster and easier to create and maintain TCP/IP configurations
  - Also: Statement of Direction for having the Configuration Assistant consume configuration data from an active stack to prime the tool!*

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Usability & Skills

• “Dependent Job Control” for JES2*
  - Overall goal to allow for increased parallelism
  - Conceptually similar to /*NET JECL for JES3, but different
  - Can allow you to specify that job groups run in particular ways
    - No job (except the first) runs before other jobs it depends on
    - Support for parallel execution (with available INITs) so that multiple jobs can start once prerequisite jobs have finished
    - Corresponding support in SDSF and WLM Batch Initiator Management
  - Convenient ad hoc scheduling of jobs that do not need formal production control
  - Corresponding operator command support for job groups

• “Deadline Scheduling” for JES2*
  - Similar to some of the JES3 /*MAIN DEADLINE= function
    - But: “STARTBY” and “HOLDUNTIL” vs. “DEADLINE”
  - As above, intended for ad hoc job scheduling
    - Jobs can tend to run at quiet, less-expensive times of day
    - Help you avoid manual submission

*Both delivered in 4Q15 with OA48782.
Usability & Skills

• JES2 Dynamic Checkpoint Tuning
  - To ensure “controlled access” to JES2 checkpoints defined in a multi-access spool (MAS) configuration, system hold and dormancy times must be tuned via the MASDEF statement
  - You can pick good values…
  - …but it’s hard to pick ones that are good all the time
  - z/OS V2.2 JES2 can tune them automatically

• JES2 Step-Level Completion Codes, R15 on exit
  - Enables applications to get the Return Code of every step
  - In addition to existing support for job-level completion codes
  - Summary-oriented information can help you interpret job output
  - New machine-readable JES2 spool EVENTLOG data set
  - Optional SMF30 support
  - SDSF support
Usability & Skills

- **SDSF Updates provides:**
  - Address space information panels:
    - Virtual memory (JM), device allocation (JD), delays (JY)
  - Output disposition column for JES3 only
  - New Job Group and Job Dependency panel for new JES job grouping
  - A new facility for building REXX™ execs and running them as SDSF commands
    - Capture a set of actions taken within SDSF as REXX exec statements
    - Run a REXX exec against selected jobs and devices
  - Saving context-sensitive groups, more recallable commands, and support for user-specified notes about specific commands
  - Offloading a portion of some SDSF processing to zIIPs, when available
  - Display support for user IDs associated with enclaves in new panel column
Usability & Skills

• **Planned SMP/E ZONEMERGE enhancements:**
  - Better ZONEMERGE command processing
  - Better processing of CIFREQ entries during ZONEMERGE
  - Planned for 1Q16 Delivery in IO23466*

• **System Symbol enhancements to support:**
  - Longer system symbols, up to 16 characters
  - Symbol values longer than the corresponding symbol names, up to 44 characters long
    ➢ Data set names, IP addresses, etc.
  - Larger symbol table

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Usability & Skills

• Support for More GDG Generations
  – New GDGE support for up to 999 from 255 data set group generations
    ➢ More than a year’s worth at last!
    ➢ Enablement via IGGCATxx: GDGEXTENDED(YES|NO)
    ➢ New IDCAMS DEFINE keywords: EXTENDED|NOEXTENDED
  – Also, IDCAMS allows you to specify that unexpired GDSs be deleted when they would prevent creating a new generation

• ISPF improvements
  – New ISPF Configuration Utility option can create a new keyword file from an active/or inactive ISPF configuration table/lmod, providing an easy way to recover a missing keyword source file
    ➢ Available now for z/OS V2.1 with the PTF for APAR OA42680
  – Support for browsing data sets and members with over 2 billion (2,000,000,000) records (old limit was 99,999,999 records)
  – New mount table functions in z/OS UNIX directory list (OPT 3.17)
Usability & Skills

- **Infoprint Server usability improvements**
  - Infoprint Server supports a new TSO/E command so authorized users can start and stop Infoprint® Server PrintWay **extended mode printers**
    - Supports interactive and batch environments, and to work with printers managed by an instance of Infoprint Server running in the same Parallel Sysplex
  - Infoprint Central allows you to select TSO/E address space-related output data sets (those associated with TSUnnnnnn job IDs) and display them in JES2 environments

- **bpxmtext now supports NFS messages**
  - Displays the description and action text for a reason code from a TSO, SHELL, or REXX environment
  - In addition to existing support for z/OS UNIX, Language Environment, Communications Server, zFS, and TFS
Usability & Skills

• **JES2 Support for (some) JES3 JECL**
  - z/OS V2.2 JES2 allows you to specify that:
    - Some JES3 JECL statements be converted to JES2 equivalents when equivalents exist…
    - …or ignore (default) i.e. treated as a comment
  - Makes it:
    - Possible for some JES3 JECL statements to be used with JES2
    - Easier to write JES-agnostic JCL that runs the same way on both
    - Easier to convert from JES3 to JES2

• **Generic Tracker Support for JES3 JECL**
  - z/OS V2.2 JES3 uses the z/OS Generic Tracker to help you identify use of a number of JES3 JECL statements
  - Helps you write JES-neutral JCL and help those who want to migrate from JES3 to JES2
Scalability and Performance
Scalability and Performance

• **CA-Level Locking for VSAM RLS**
  - Today an entire data set’s index (cluster level) is locked for a number of operations
    - Notably CI splits, CI reclaim, spanned-record processing
  - z/OS V2.2 locks the index at the CA level
  - For all KSDS and RRDS (including AIXes and Catalogs)
  - CA split and reclaim still need the data set level lock
  - Expected to improve performance and make much larger data sets practical with high update activity. *Enabled by default.*

• **JES2 supports more jobs:**
  - Up to 1,000,000 jobs (from 400,000)
  - More JQEs, BERTs
Scalability and Performance

• **DFSORT support for zHPF**
  - z/OS V2.2 DFSORT will automatically use zHPF
    - For SORTIN, SORTOUT, and OUTFIL
  - Expected to provide significant performance benefits when zHPF is available

• **zFS Performance**
  - z/OS V2.2 zFS can provide significant performance improvements for each file or directory operation
    - caches moved “Above the Bar” allowing much larger data and object caches
    - can now run in the z/OS UNIX (OMVS) address space to reduce inter-component overhead
Scalability and Performance

- **DSMSHshm Fast Replication processing improvements**
  - New Distributed Common Dump Queue (CDQ) processing across host members in HSMPllex
    - Previously Dump cmds had to be processed on the same host that initiated the request which did not scale well for large pool sizes
    - Intended to speed processing time for large DB2® copy pools
  - Allow stacking multiple copy pools on a single tape
  - Allow you to specify multitasking for processing Fast Replication requests even when it would use more tapes
  - Optionally write messages issued during the operation to a data set.

These enhancements are expected to be particularly valuable in DB2 environments.
Scalability and Performance

• **z/OS Unix Stacks above the bar**
  - Optional at IPL, default is below the bar like before
  - More threads as many as 500,000 threads from 32,000
    - Actual practical limit for depends on services used and additional storage they require

• **LLA improvements**
  - A program objected with a deferred segment (such as those compiled with COBOL V5 (5655-W32) can be cached by LLA in VLF.
  - Can help to improve performance for such program objects in LLA-managed libraries
  - Available now for z/OS V1.13 and z/OS V2.1 with the PTF for APAR OA45127
Availability

• **Private Area Virtual Storage Tracking in PFA**
  - Tracks data based on new fields in VSM’s Local Data Area (LDA)

• **Dynamic JES2 Checkpoint Expansion**
  - Assuming enough space, allows you to increase Checkpoint size without a cold start

• **TDS Tivoli Directory Server (LDAP) Compatibility**
  - Upgrades with no down time
    - New “transition mode” for LDAP server
      - Allows higher compatibility level and new back ends to be specified
      - Support for directing LDAP requests to the transition mode server
    - Allows new specifications to be effective for the Parallel Sysplex once other LDAP servers in the Sysplex have been shut down
      - Subsequently restarted servers can use new specifications
    - Restart the original TM server to complete the process
Availability

• JES3 address space DSI Change so all datasets can be protected
  – Before z/OS V2.2, setting DSI was only for
    – Specific JES3 proc DD batch allocations
    – But not dynamically allocated ones
  – z/OS V2.2 supports specifying DSI for JES3 in SCHEDxx
    ➢ Default PPT still contains NO DSI (PPTNDSI) for JES3 for now
    ➢ Recommended to explicitly take advantage of the DSI protection so all datasets are protected
    ➢ This causes JES3 to use S99NORES (“don’t ENQ”) for its allocations

• Better Subsystem Interface (SSI) Initialization Processing:
  – Can now delete a subsystem if there is an error during initialization
  – SSCVT entry no longer built when initialization routines (INITRTNs) are not found
  – New subsystem delete command:
    ➢ SETSSI DELETE, SUBNAME=ssss, FORCE
    ➢ (There are some restrictions!)

• Dynamic Exit support for Open/Close/EOV
  – Support for the Tape Installation Exits: Volume Mount, File Start, File Validate, File End and Label Anomaly
Availability

• Multiple Incremental FlashCopy
  – z/OS V2.2 now supports up to 12 targets for incremental FlashCopy at a time
  – Allows a full physical incremental FlashCopy to be created quicker than a non-incremental FlashCopy.
  – Helps:
    ➢ Provide more flexibility and resilience
    ➢ Better protect application availability
    ➢ Provide improved data protection across physical volume failures
  – Available for z/OS V1.13 and z/OS V2.1 with PTFs for APARs OA45412 and PI22256
  – Requires IBM DS8870 Storage Subsystem with the 7.4 microcode feature

• Support for moving LOGREC
  – z/OS V2.2 allows LOGREC data sets to be deallocated
  – Updated SETLOGRC command allows you to deallocate an in-use LOGREC ds and allows you to specify a new pre-allocated data set name
  – Allows you to discontinue the use of a particular LOGREC data set when switching to either a log stream or a different LOGREC data set
Availability

• System Logger pre-allocates Log stream offload data set
  – Helps avoid situations offload delays from causing system problems and provide more time to react
  – Support for Logger policy, an API, an operator command, and new warning messages

• SLIP command enhancements
  – z/OS V2.2 SLIP processing allows you to specify operator command(s)
    ➢ Issued when the trap is matched
    ➢ Provides an easy way to issue commands during problem diagnosis
  – PER SLIPs to capture the BEAR
    ➢ Breaking Event Address Register, the last “branch-from” address
Systems Management
Systems Management

- **DFSMShsm Storage Tiers Extensions supports:**
  - Command-initiated transitions for tier demotion within L0 for storage admins:
    - MIGRATE VOLUME|STORAGEGROUP support for new MIGRATIONONLY and TRANSITIONONLY keywords
    - MIGRATE DATASETNAME support for new TRANSITION keyword
  - A corresponding user-level HMIGRATE command, ARCHMIG service
  - MIGRATE STORAGEGROUP
  - *Lateral* transitions with MIGRATE STORAGEGROUP MOVE

- **Start/Stop Support for Infoprint Server Daemons:**
  - Lets you use started tasks in place of daemons
  - Much better integration with typical recovery tools (MPF, SA, ARM, SFM, NetView®, etc.) expected

- **Generic Tracker Improvements**
  - GTZTRACK creates new SMF 117 records
  - Can allow you to split GTZTRACK records into a dedicated log stream and run IFASMFDL later to retrieve **all** tracked program events after some period of time (e.g., to find migration actions)
  - REXX interface
Systems Management

• **DFSMS™ improvements:**
  - Support for a new USER_ACSVAR variable for which up to three values can be set in IGDSMSxx members for use with ACS routines
    - SETSMS command support for dynamic changes
  - DISPLAY SMS,SG command displays the space usage statistics for a specified pool storage group
  - Support for specifying your own storage group space warning thresholds
    - *Set lower thresholds for warning messages!*
  - New secondary space reduction specification on DATACLAS to allow data sets to extend by less than specified secondary space when it avoids allocating space on additional volumes
    - Provides support for non-striped SMS-managed VSAM data sets and non-VSAM data sets
    - **For DB2 Objects, use reduced % 0 - > see APAR PI56611!**
  - Support for modifying SMS Space parameters in the DADSM preprocessing exit (IGGPRE00)
Systems Management

• Parmlib Specification of Storage Limits in SMFLIMxx
  – Covers the common cases for limits on 24-bit, 31-bit, and 64-bit storage
  – Helps reduce the need for IEFUSI exits
  – Many filters like Job: name, class, account,….
  – Also, JCL support to allow you to specify individual limits for 24-bit, 31-bit, and 64-bit storage with REGIONX

• More IPL Information by Default…
  – z/OS V2.2 provides a new IPL-time message, IOS128I, that includes the IPL device number, subchannel set, and volume serial number
Enhancing Security
Enhancing Security

- **SMF record signing provides:**
  - Tamper detection for SMF’s repository of audit data written to log streams
  - Uses CPACF symmetric algorithm for hashing to support needed data rates and CEXnC card for signatures
  - **Groups** of records to be signed, with chained signatures
  - A new SMF2 trailer record with the signature for each group
  - IFASMFDP (SMF Dataset Dump Pgm) support for verifying the signatures
    - Data does not have to verified when read
    - To verify signatures:
      1. Unload using IFASMFDL
      2. Process the SMF data with IFASMFDP
  - SMF2 record format documented to allow signature verification
Enhancing Security

• **z/OS V2.2 PKI Services support for:**
  - Optionally requiring multiple admin approvers to create new certificates, to help prevent the creation of unauthorized certificates
  - Signing OCSP responses with the client-specified algorithm per RFC 6277 to improve interoperability of PKI Services and OCSP clients
  - SHA-224 and SHA-256 with DSA for signing certificates, CRLs, OCSP responses, and verifying certificate requests
  - **New SMF records for APF List Updates**
    - From T PROG, SETPROG, & CSVAPF
    - SMF Type 90 Subtype 37 records
Enhancing Security

- **PKINIT (RFC 4556) support in Network Authentication Services**
  - To provide X.509 certificate-based authentication for Kerberos

- **Separate SAF OPERCMDS profiles for display/change aspects of F CATALOG**
  - To support a new profile
    - `MVS.MODIFY.STC.CATALOG.CATALOG.SECURE`
  - To restrict access to the two different flavors of MODIFY CATALOG:
    - READ access to allow display commands
    - UPDATE to allow actual changes to Catalog behavior
Enhancing Security

• New z/OS V2.2 SAF and RACF® functions for z/OS UNIX
  – For two new functions:
    Ð Allow users with access to a new SUPERUSER.FILESYS.DIRSRCH profile in the UNIXPRIV class to list files in a directory, without being authorized to read or alter the files
    Ð Allow you to protect file system data sets with new FSEXEC class profiles to prevent programs stored in them from being executed when users do not have at least UPDATE permission
Enhancing Security

• **RRSF (RACF DB Remote Sharing Facility) Improvements**
  - Can ignore inbound updates for specified systems
    - For example, specify on production systems that updates made to test systems be ignored
    - Can help prevent inadvertent escalations of privilege
  - Supports operator command-based dynamic movement of the MAIN RRSF system
    - To make this process much simpler
  
  – **BCPii SMF Audit Records**
  - New SMF Type 106 records for HWISET and HWICMD events
  - To allow you to audit updates to attribute values for CPC processor weights, image profiles, and activation profiles; and, for operations affecting a CPC or image such as image activations
Enhancing Security

- **RACF password encryption algorithm change (we did a prior Statement of Direction):**
  - To allow you to transition from 56-bit single DES to AES
  - Available on z/OS V1.13 and z/OS V2.1 with PTFs for APARs OA43998 (SAF) & OA43999 (RACF)

- **Other password-related enhancements for z/OS V2.2 RACF:**
  - No default passwords for new users
  - No need for an ICHDEX01 exit to use password encryption!
  - Password phrases supported with the RACLINK DEFINE command
Enhancing Security

• **More RACF Sensitive Resource Health Check enhancements for:**
  − ICSF
  − RRSF work data sets
  − More z/OS UNIX System Services resources

Separate new checks for: RACF password encryption technique, and Password controls.

• **Read-Only AUDITOR support to provide:**
  − A new ROAUDIT attribute is a “look but don’t touch” setting
  − Precludes changes to RACF audit events;
  − Otherwise, the same as AUDITOR

• **Console auto-logoff support:**
  − To allow you to specify a timeout for consoles
  − Similar to timeouts for TSO/E and z/OS UNIX users
  − Automatically logging users from unattended consoles is may help you improve security
  − Also, support for SAF-based control over whether the same user can log on to more than one console at a time
Enhancing Security

- **More TCP/IP Startup Filtering**
  - z/OS Communications Server supports a set of default IP filters
    - Specified in the TCP/IP Profile
    - Helps you protect the stack during initialization
    - Before Policy Agent installs an IPSec policy
  - z/OS V2.2 Communications Server allows you to specify additional default filter parameters
    - Source and destination address ranges
    - Source and destination port ranges

Allows greater flexibility in configuring the default filter rules
Application Development
Application Development

• **Client Web Enablement Toolkit**
  
  – To enable applications written in C/C++, COBOL, PL/I, and HLASM to participate easily as a REST client
  
  – Support for:
    - A z/OS JSON parser, able to build or modify JSON text
    - An HTTP/HTTPS protocol enabler
  
  – JSON parser available for z/OS V2.1 with the PTF for APAR OA46575
  
  – HTTP enabler available for z/OS V2.1 at z/OS V2.2 with the PTF for OA46622
Application Development

• **DFSORT date conversion functions**
  
  — WEEKNUM converts input dates to numbers representing corresponding weeks of the year
  
  — AGE calculates the time between a given date and the current date
  
  — Both provide additional flexibility in creating reports and to help improve the usability of reports generated with these new functions

• **Infoprint Server Customized Text**
  
  — z/OS V2.2 Infoprint Server provides new function in IP PrintWay™ extended mode for adding personalized text to emailed notes that include print output
  
  — For example, add a greeting (such as "Dear Ms. Doe,") at the beginning of a note with an attachment
Networking
Networking

**RoCE Improvements to support**

- z/OS V2.2 Communications Server support for the new RoCE virtualization capability on z13 processors and for sharing across up to 31 z/OS images
  
  Also allow you to use both ports in the RoCE adapter

- Support for selecting between TCP/IP and RoCE transport layer protocols automatically based on traffic characteristics and to support MTU sizes up to 4K for RoCE adapters

- Also available on z/OS V2.1 with the PTF for APARs OA44576 and PI12223; corresponding RMF support with the PTF for OA44524

- z/OS V2.2 Communications Server tool shows the percentage of RoCE-eligible TCP traffic
  
  Available for z/OS V1.13 with the PTF for PI27252 and z/OS V2.1 with the PTF for APAR PI29165
Networking

- **64-bit TCP/IP Stack**
  - TCP/IP stack supports AMODE 64

- **Enterprise Extender (EE) scalability**
  - Intended to improve performance for configurations with very large number of EE endpoints

- **DVIPA Limit**
  - Single-stack limit now supports 4K application instance DVIPAs (was previously 1K)

- **Automatic Segment Sizes for VIPAROUTEs**
  - Rerouted DVIPA package encapsulation creates a new packet possibly > the MTU creating 2 or more packets
  - Can automatically set the appropriate maximum segment size for each IPv4 route, to simplify VIPAROUTE configuration and help improve performance
IBM z Systems
The innovation continues
IBM in the AUT.

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z/OS and the IBM z13

For you reference only
The following charts will not be presented as not enough time!
Simultaneous multithreading (SMT) Support

z/OS V2.2 Adds…

- Parmlib (IEAOPTxx) support for SMT enablement
- Operator commands for dynamically switching in and out of SMT mode
- SMF30 fields with normalized CPU time values in SMT mode
- SMF70 records with new SMT-related fields
- Hardware Instrumentation Services (HIS) updates to provide measurement data in SMT mode
- RMF metrics for capacity planning and performance analysis

…all these available for z/OS V2.1 with PTFs
RDMA over Converged Ethernet (RoCE)

- **RoCE Support for Shared Memory Comm-R**
  - Requires z/OS V2.2 or z/OS V2.1 running on z13, IBM zEnterprise® EC12, or IBM zEnterprise BC12 servers with the RoCE Express feature
  - SMC-R open sockets over RDMA for TCP applications
  - Shares memory between peer z/OS images on different CECs
  - Read/write access to the same memory buffers without application changes
  - Helps increase transaction rates with low latency and reduced CPU cost
  - RMF support with new SMF74-9 records and PCIE Activity Report
  - Java support in IBM 31-bit and 64-bit SDK for z/OS Java Technology Edition, Version 7 (Java7R1, 5655-W43 and 5655-W44) or later
RoCE Virtualization

• Allows:
  – Sharing RoCE (RDMA over Converged Ethernet) cards across up to 31 z/OS images in a processor
  – Use of both 10GbE ports on the same adapter
Even More Crypto

Crypto, continued…

- New functions to provide...
  - Support for Enterprise PKCS #11 applications, intended to allow them to change a key's compliance mode using the Set Attribute Value function
  - Support for ECC keys generated using Brainpool curves in FIPS mode
  - Designs to help you improve the performance of applications that call the One Way Hash and Random Number Generate services, cryptographic processor configuration, provide a new, easier-to-use callable service to retrieve status information about the cryptographic environment
  - VISA® Format Preserving Encryption (VFPE) algorithms in CCA-based callable services*
  - Enhanced Random Number generation exploiting the CPACF Deterministic Random Number Generate (DRNG) instruction intended to be compliant with NIST standard SP 800-131A
  - Support allowing you to disable the RNG Cache
  - Support for sharing cryptographic coprocessors across up to 85 domains
  - (And, a number of other enhancements)

*VISA Format Preserving Encryption (VFPE) technology forms part of Visa, Inc.'s Data Secure Platform (DSP). The use of this function requires a service agreement with Visa, Inc. You must maintain a valid service agreement with Visa when you use DSP/FPE.
Still More Crypto

- **Crypto Enhancements**
  - Included in z/OS V2.2 ICSF and available for zEC12, zBC12, and z13 processors for z/OS V2.1 and z/OS V1.13 from: [http://www.ibm.com/systems/z/os/zos/downloads/](http://www.ibm.com/systems/z/os/zos/downloads/)
  - Intended to help banking and finance sector clients meet standards and provide better cryptographic security with designs intended to provide:
    - Support for emerging standards for American Express, JCB, MasterCard, and Visa payment systems (EMVCo) in CCA-based callable services for key management, generation, transport, and derivation.
    - Requires minimum MCLs for Crypto Express3 and Crypto Express4S coprocessors.
  - Enhanced support in the Remote Key Export callable service to allow you to specify the desired key-wrapping method generation and transport
    - Requires minimum MCLs for Crypto Express3 and Crypto Express4S coprocessors.
  - Support for AES MAC enhancements to callable services, allowing for key lengths greater than 128 bits for XCBC-MAC processing and frequently-used UDXs to help you reduce costs
  - This support, which requires minimum MCLs for CEX3 and later features, is designed to provide these new services:
    - Recover PIN From Offset
    - Symmetric Key Export with Data
    - Authentication Parameter Generate
Usability and Skills

For you reference only

The following charts will not be presented as not enough time!
Usability & Skills

• SDSF Updates:

  − A new set of display functions provides productivity enhancements for system programmers with PI43902 in 4Q2015:
    - Commands/panel to display data sets from any system within a Parallel Sysplex® that are APF authorized; are in the system's LPA list, link list, parmlib concatenation; or are page data sets
    - New command/panel to search listed data sets for members matching a pattern
    - Displays for important information about systems in the same Parallel Sysplex, such as IPL, performance-related, address space and CPU summary, and storage information.
Usability & Skills

• **z/OSMF Incident Log improvements for:**
  - Viewing and managing problems for multiple sysplexes from an aggregated view
  - SFTP support for sending diagnostic data to vendors

• **z/OSMF Capacity Provisioning plug-in**
  - Support for capacity provisioning based on overall CPC-wide utilization

• **Related Support:**
  - z/OS V2.2 CEA support for CEAPRMxx controls on how many TSO/E address spaces are available for the z/OSMF ISPF task and allowed per user
Systems Management

For you reference only

The following charts will not be presented as not enough time!
Systems Management

• **GRS monitoring improvements:**
  
  - SMF Type 87 records and GRS Monitor function were introduced in z/OS V1.13 and z/OS V2.1 (with the PTF for APAR OA42221)
  - z/OS V2.2 GRS supports a new subtype for SMF Type 87-2 records to help you identify users of GRS enqueue/dequeue and RESERVE
  - z/OS V2.2 also provides filtering options in a new GRSMONxx parmlib member to allow you to limit tracing to particular address spaces or resources

• **Capacity Provisioning Enhancements**
  
  - z/OS V2.2 Capacity Provisioning Manager and its z/OSMF plug-in supports provisioning based on overall CPC-wide utilization
  - Also supports relinquishing capacity when CPC utilization falls
Systems Management

- **ISPF Edit Pack Disablement**
  - z/OS V2.2 ISPF option to allow you to completely disable the use of ISPF Edit Pack
  - To allow you to help control CPU utilization and help assure that new data sets processed by ISPF can be easily processed by other programs

- **SMF Recording Extensions**
  - z/OS V2.2 DFSMSdfp™ adds job ID (such as Jnnnnnnnn, to SMF14 and SMF15 (non-VSAM data set activity) records
  - z/OS V2.2 IBM Tivoli Directory Server (ITDS, LDAP) allows you to specify that a number of additional events be recorded in the LDAP activity log and in SMF83 records

- **New STP Messages**
  - A number of events can cause problems with STP
  - Messages to identify these events were issued to the HMC…
  - …but console messages allow alerts and automation…
  - So z/OS V2.2 provides a number of new STP messages
• **New IEFOPZxx parmlib member**, to support:
  
  – Specifying pairs of partitioned (PDS and PDSE) data sets
  – Specifying that one of each pair is to be searched ahead of its counterpart data set when programs are fetched
  – Allowing you to “insert” program libraries ahead of others in the link list, in STEPLIB and JOBLIB concatenations, and for LLA-managed libraries without JCL changes
  – A new DISPLAY IEFOPZ to display information about existing pair definitions
  – A new SET IEFOPZ command to allow you to add, remove, or change pair definitions dynamically

Useful for:

– Converting application program libraries from PDS to PDSE, as is necessary for converting to COBOL V5 (5655-W32), without requiring JCL changes
– The IBM COBOL Binary Optimizer (presently in Beta)

– Available with the PTF for APAR OA47689
Systems Management

• RMF Enhancements

  – z/OS V2.2 RMF supports new Monitor III reports:
    ➢ A Job USAGE report to display information about address space resource consumption, including I/O-related, CPU-related, memory-related, and GRS-related information
      • The Monitor III Job USAGE report also added to the report list for the RMF Distributed Data Server
      • Similar information returned by the RMF DDS in XML format when requested
    ➢ A new Storage Class Memory (SCM) Activity report, with corresponding DDS support and new SMF74-10 records
    ➢ Three new reports showing zFS-related Parallel Sysplex wide data, overview, file system, and kernel information
    ➢ RMF Monitor III support for a new PCIE Activity report for zEDC and RoCE features available on zEC12 and later servers
      • Also, support for an RMF DDS XML format
Systems Management

• More Easy Tier® Integration
  - z/OS V2.2 supports a new interface provided by IBM System Storage Easy Tier
  - To allow software to help steer data placement within Easy Tier volumes
  - Helps guide appropriate tier placement
  - Requires z/OS V1.13 or z/OS V2.1 with the PTF for APAR OA45236 and IBM DS8870 Storage Subsystem with the 7.4 microcode feature
  - Used by DB2 10 and DB2 11 for reorgs, with the PTF for APAR PI35321
Application Development

For you reference only

The following charts will not be presented as not enough time!
Application Development

• **Support for 64-bit shared large (1 MB) Pages**
  - Allows you to specify that the system should try to back shared memory objects above the bar using 1M pages

• **New and improved symbol support in JES3:**
  - Instream substitution, longer symbols, and ENF78 support

• **Improved batch support in JES3, with:**
  - Support for //OUTPUT JCL statement improvements
  - DDNAME, MERGE, and PROCLIB JCL support

• **z/OS V2.2 CIM includes Version 2.2 of the SBLIM CIM client for Java**
  - Designed to be a JSR48-compliant implementation
Application Development

- **New REST APIs for Software Management**
  - To allow you to create, retrieve information about, change, and delete software instances

- **Enhanced RESTful data set and file APIs in z/OSMF to allow you to:**
  - Get a list of data sets matching a pattern
  - Get a list of files in a z/OS UNIX directory
  - Retrieve information about a data set or file (e.g., attributes, member lists)
  - Create, delete, rename, copy, or move a data set or file
  - Browse or edit a data set or file (up to 8 MB in size)
Application Development

• Jobs REST API updates to support
  – Retrieving the new step-level completion codes in JES2 environments
  – Running under a secondary subsystem
  – Holding and releasing jobs

• New Workflow functions
  – REST API to allow exploiters to initiate, monitor, and terminate workflows
  – Support for workflow defaults & automatic workflow steps
  – Support for one workflow to call another

• New ISPF functions
  – An application to specify whether ISPF or the application should process L/R scroll commands.
  – Support for zSTART as the default command stack variable
  – More mixed-case character support
  – Support for ISPDTLC to pass its RC in variable ZISPFRC.
Application Development

- **OpenSSH 6.4p1 now part of z/OS:**
  - Same level included in IBM Ported Tools V1.3.0 (5655-M23)
  - Support for FIPS 140-2 and Kerberos in 4Q2015 with the PTF for APAR OA48013
  - Note: IBM plans to provide future enhancements to OpenSSH in z/OS (Statement of direction in the z/OS V2.2 preview announcement) *

- **EU Ordering Rules for Unicode collation service, and HKSCS conversions**
  - Support for common collation sequence across the EU
    - EOR / EN 13710 standard and German tailoring defined by the European Committee for Standardization (CEN)
    - (e.g., how do you sort “a,” “ã,” “à,” “á,” “æ,” “ä,” and “ą”?)
  - Also, support for 4-byte HKSCS-2008 conversions
Networking

For you reference only
The following charts will not be presented as not enough time!
Networking

• **TLS Session Reuse provide:**
  – Reduced overhead
  – One less opportunity to intercept a connection

• **CICS Sockets**
  – Communications Server enhanced the CICS® Sockets Listener interface
  – Provides CICS additional information about local and remote session partners
  – Can used by CICS Explorer® or Session Monitor to provide transaction tracking capabilities
  – Requires IBM CICS Transaction Server for z/OS, V4.2 (5655-S97) or CICS Transaction Server for z/OS, V5.1 (5655-Y04)

• **Resolver Improvements for:**
  – Round-robin reordering of cached IP address lists for each host name
  – **Nondisruptive** tracing for long-running address spaces
    - New CTRACE option to capture same data as the Trace Resolver; dynamic start & stop; IPCS formatting support
Networking

• **NIST SP800-131a support for:**
  
  – TLSv1.1, TLSv1.2, SHA-2 hashes, and encryption key strengths of more than 111 bits in sendmail
  
  – SNMP Agent, SNMP command, and SNMP manager API support for the 128-bit AES
  
  – Updated Digital Certificate Access Server (DCAS) support, for TLSv1.1 and TLSv1.2, including 2-byte ciphers
  
  – Support for centralized policy agent client/server communication using TLSv1.1 and TLSv1.2, including support for 2-byte ciphers
  
  – These capabilities also available on z/OS V2.1 with the PTFs for APARs PM96891, PM96896, PM96898, and PM96901 (PTFs UI13120, UI13138, UI13139, and UI13140)