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z/OS Software Support for the new IBM zEnterprise EC12 (zEC12) Servers

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Agenda

- **IBM zEnterprise EC12 (zEC12) Overview**
- **IBM zEnterprise EC12 (zEC12) Support by z/OS Releases**
  - Device 2827 PSP Buckets and Fix Categories
- **Migration Considerations**
  - General
  - Migration Considerations for Selected Functions
  - Multisystem/Sysplex Considerations
  - Exploitation Considerations for Selected Functions
- **Migration Paths**
  - General Recommendations and Considerations
  - Recommended Paths for Supported z/OS Releases
- **Summary**
- **Backup**
  - Cryptographic Support

Scope

- **The IBM zEnterprise EC12 (zEC12) system is comprised of:**
  - The IBM zEC12 Central Processor Complex (CPC),
  - The IBM Unified Resource Manager,
  - The IBM zEnterprise BladeCenter® Extension (zBX) Model 003
- **z/OS platform software requirements for:**
  - Hardware upgrade to a zEC12 server
    - With or without zBX
  - Install a new zEC12 server
    - With or without zBX
- **Outside scope**
  - z/VM® (native), Linux® on IBM System z®, and z/TPF considerations
  - Non-z/OS software required for zBX solutions

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z/OS Support Summary

Release	z900/ z800 WdfM	z990/ z890 WdfM	z9 EC z9 BC WdfM	z10 EC z10 BC WdfM	z196 CPC	z196 w/zBX	z114 CPC	z114 w/zBX	zEC12 CPC	zEC12 w/zBX	End of Service	Extended Defect Support[1]
z/OS V1.7[2]	X	X	X	X	X						9/08[1]	9/10[1]
z/OS V1.8[2]	X	X	X	X	X		X				9/09[1]	9/11[1]
z/OS V1.9[2]	X	X	X	X	X		X				9/10[1]	9/12[1]*
z/OS V1.10	X	X	X	X	X	X	X	X	X	X	9/11[1]	9/13[1]*
z/OS V1.11	X	X	X	X	X	X	X	X	X	X	9/12[1]	9/14[1]*
z/OS V1.12	X	X	X	X	X	X	X	X	X	X	9/14*	9/16[3]*
z/OS V1.13	X	X	X	X	X	X	X	X	X	X	9/16*	9/19[3]*
z/OS V2.1[4]*			X	X	X	X	X	X	X	X	9/18*	9/21[3]*

Legend

Out of Lifecycle Extension for z/OS support[2]
Defect support provided with Lifecycle Extension for z/OS
Generally supported

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

2 See IBM GTS services for additional fee-based extended service

3 Optional extended service is planned to be offered

4 z/OS V2.1 announced as a preview of availability

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

WdfM – Server has been withdrawn from Marketing

Supported Releases

- **zEC12 capabilities differ depending on z/OS release**
  - Toleration support provided on z/OS V1.10 and z/OS V1.11
  - The Lifecycle Extension for z/OS V1.10 or z/OS V1.11 is required to acquire toleration PTFs and for support
  - Exploitation support provided on z/OS V1.12 and higher
    - z/OS V1.12
      - *Exploitation of selected functions*
    - z/OS V1.13
      - *Exploitation of most functions*
    - z/OS V2.1*
      - *Full exploitation in base*

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

Supported z/OS Releases and ICSF Levels

- **z/OS V1.10 Crypto customers can run with:**
  - HCR7750 – Base z/OS V1.10[1]
  - HCR7751 – Cryptographic Support for z/OS V1.8 through z/OS V1.10 and z/OS.e V1.8[1]
  - **HCR7770 – Cryptographic Support for z/OS V1R9-V1R11**
  - **HCR7780 – Cryptographic Support for z/OS V1R10-V1R12**
- **z/OS V1.11 Crypto customers can run with:**
  - HCR7751 – Base z/OS V1.11[1]
  - **HCR7770 – Cryptographic Support for z/OS V1R9-V1R11**
  - **HCR7780 – Cryptographic Support for z/OS V1R10-V1R12**
  - **HCR7790 – Cryptographic Support for z/OS V1R11-V1R13**
- **z/OS V1.12 Crypto customers can run with:**
  - **HCR7770 – Base z/OS V1.12**
  - **HCR7780 – Cryptographic Support for z/OS V1R10-V1R12**
  - **HCR7790 – Cryptographic Support for z/OS V1R11-V1R13**
  - **HCR77A0 – Cryptographic Support for z/OS V1R12-V1R13**
- **z/OS V1.13 Crypto customers can run with:**
  - **HCR7780 – Base z/OS V1.13**
  - **HCR7790 – Cryptographic Support for z/OS V1R11-V1R13**
  - **HCR77A0 – Cryptographic Support for z/OS V1R12-V1R13**
- **z/OS V2.1* Crypto customers can run with:**
  - **HCR77A0 – Base z/OS V2.1**

1 - unless CyrptoExpress3 is Carried Forward

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IBM zEC12 System Functions and Features

Five hardware models
Hexa-core 5.5 GHz processor chips with 25% increased capacity per core than a z196[2]
Up to 101 processors configurable as CPs, zAAPs, zIIPs, IFLs, ICFs, or optional SAPs (up to 64-way on z/OS V1.10, 100-way on z/OS V1.11 and higher)
Second generation out of order design
Improvements to pre-fetch instructions
Improved processor cache design
Up to 3TB of Redundant Array of Independent Memory **(**RAIM) – same as z196
Twice the HSA versus z196 (32 GB vs 16 GB)
Decimal-Floating-Point Zoned-Conversion Facility
Flash Express (Storage Class Memory-SCM)
1 MB Pageable Large Pages
Dynamic reconfiguration support for Flash Express[1]
2 GB Large Page Support [1]
Optional PLPA, COMMON page data sets[1]
Crypto Express4S cryptographic coprocessors and accelerators
New support for IBM Enterprise PKCS #11 (EP11) coprocessor
DUKPT for MAC and Data Encryption, Europay, Mastercard, and Visa (EMV) CCA enhancements

(z/OS support in blue)

New and enhanced instructions
IBM zAware
OSA-Express4S (GbE LX and SX, 10 GbE LR and SR), 1000BASE-T
FICON Express8S
Parallel Sysplex InfiniBand (PSIFB) Coupling Links
High Performance FICON for System z
CPU Measurement Facility
CFCC Level 18 enhancements
Transactional Execution Facility
Runtime Instrumentation Facility
Exploitation of new hardware instructions – XL C/C++ ARCH(10) and TUNE(10)
Optional Non Raised Floor
Optional water cooling and DC Power
Optional overhead Power and I/O cabling
zBX Model 003 support of: •IBM WebSphere DataPower Integration Appliance XI50 for zEnterprise •Select IBM BladeCenter PS701 Express blades or IBM BladeCenter HX5 blades
Unified Resource Manager enhancements

1 - Planned target availability for z/OS exploitation is 1Q2013. All statements regarding IBM's plans, directions, and intent are subject to change or withdrawal without notice.
2 - Based on preliminary internal measurements projections against a z196. Official performance data is available online at the LSPR website.

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zEC12 PSP Bucket and Fix Categories

- **Software requirements differ depending on z/OS release and functions exploited**
  - **Support provided via a combination of web deliverables and PTFs**
  - **zEC12 Required PTFs**
    - **Documented in zEC12 PSP Bucket: Upgrade = 2827DEVICE, Subset = 2827/ZOS**
      - *Broken out by z/OS release, identifying required and exploitation*
    - **PTFs can be identified by SMP/E commands (REPORT MISSINGFIX, LIST, or APPLY) for the following Fix Categories:**
      - ***IBM.Device.Server.zEC12-2827***
      - ***IBM.Device.Server.zEC12-2827.Exploitation***
    - **If you are skipping generations of servers, you need to install all the maintenance and perform required migration actions for the servers that you are skipping:**

Server	UPGRADE	Subset	Fix Category
z114	2818DEVICE	2818/ZOS	IBM.Device.Server.z114-2818*
z196	2817DEVICE	2817/ZOS	IBM.Device.Server.z196-2817*
z10 BC	2098DEVICE	2098/ZOS	IBM.Device.Server.z10-BC-2098*
z10 EC	2097DEVICE	2097/ZOS	IBM.Device.Server.z10-EC-2097*
z9 BC	2096DEVICE	2096/ZOS	IBM.Device.Server.z9-BC-2096*
z9 EC	2094DEVICE	2094/ZOS	IBM.Device.Server.z9-EC-2094*
z890	2086DEVICE	2086/ZOS	IBM.Device.Server.z890--2086*
z990	2084DEVICE	2084/ZOS	IBM.Device.Server.z990-2084*

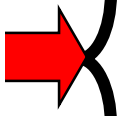
zEC12 PSP Bucket and Fix Categories

- Other PTFs related to zEC12 (common to other servers)
  - PTFs can be identified by SMP/E commands (REPORT MISSINGFIX, LIST, or APPLY) for the following Fix Categories:
    - IBM.Device.Server.zEC12-2827.ParallelSysplexInfiniBandCoupling
    - IBM.Device.Server.zEC12-2827.ServerTimeProtocol
    - IBM.Device.Server.zEC12-2827.zHighPerformanceFICON
    - IBM.Device.Server.zEC12-2827.UnifiedResourceManager
- zBX Required PTFs
  - Documented in zBX PSP Bucket: Upgrade = 2458DEVICE, Subset = 2458/ZOS
    - Broken out by z/OS release, identifying required and exploitation
  - Can be identified by SMP/E commands (REPORT MISSINGFIX, LIST, or APPLY)
    - Fix Categories
      - *IBM.Device.Server.zBX-2458*

Please note that currently there are NO PTFs listed in this PSP bucket

z/OS Toleration Support for zEC12

- z/OS V2.1*
- z/OS V1.13
- z/OS V1.12
- **z/OS V1.11 (Will no longer be generally supported after September 30, 2012. The IBM Lifecycle Extension for z/OS V1.11 (5657-A01) will be required for extended defect support for z/OS V1.11 for up to 24 months after the z/OS V1.11 end of service date)**
- **z/OS V1.10 (No longer generally supported. The IBM Lifecycle Extension for z/OS V1.10 (5656-A01) provides the ability for customers to purchase extended defect support for z/OS V1.10 for up to 24 months after the z/OS V1.10 end of service date)**



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

z/OS Toleration Support for zEC12

- **Provides same functionality as that on the IBM zEnterprise 196 (z196)**
  - HiperDispatch, OSA-Express4S, FICON Express8S, Parallel Sysplex InfiniBand (PSIFB) Coupling Links, CF Level 17, High Performance FICON for System z (zHPF), CPU Measurement Facility, …
- **Plus for z/OS V1.10 and z/OS V1.11**
  - OSA-Express4S (GbE LX and SX, 1000BASE-T, 10 GbE LR and SR)
  - Crypto Express4S toleration
  - GRS FICON CTC toleration
  - New z/Architecture® Instructions (and new OPCODE support)

z/OS Toleration Support for zEC12

Release	Base Support									Exploitation Support									
	Base zEC12 Support	OSA-Express4S (Gbe LX and SR, 1000BASE-T, 10 Gbe LR and SR)	FICON Express8S (CHPID FC)	IFB Coupling Links	Crypto Express4S Toleration[2]	High Performance FICON (zHPF)	CPU Measurement Facility (HIS)	GRS FICON CTC Toleration	New z/Architecture Instructions	CF Level 18	Crypto Express4S Exploitation[3]	XL C/C++ ARCH(10)/TUNE(10)	IBM zAware (z/OS Monitoring)	Java exploitation of the Transactional Execution Facility	Flash Express (Storage Class Memory - SCM)	Pageable Large Pages	Dynamic reconfiguration support for Flash Express[4]	2 GB Large Page[4]	Optional PLPA/ COMMON page data set support[4]
	zEC12 PSP Bucket – 2827DEVICE 2827/z/OS																		
z/OS V1.10[1]	P	P	P	P	W P	P	P	P	P	N	N	N	N	N	N	N	N	N	N
z/OS V1.11[1]	P	P	P	P	W P	P	P	P	P	N	N	N	N	N	N	N	N	N	N

[1] – The Lifecycle Extension for z/OS V1.10 (5656-A01) is required to acquire toleration PTFs and for support. The Lifecycle Extension for z/OS V1.11 (5657-A01) is required for support after September 30, 2012 and to acquire PTFs that become available after that date.

[2] –A Crypto Web Deliverable (HCR7770 or higher) AND a PTF is required for toleration unless CyrptoExpress3 is Carried Forward. Support differs depending on the Crypto Web Deliverable installed

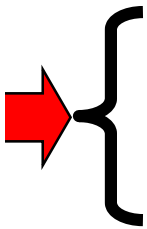
[3] – Crypto Exploitation differs based on the Crypto Web Deliverable installed

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

[5] - z/OS V2.1 announced as a preview of availability

B – FMID shipped in Base product P – PTF is required W – FMID shipped in a Web Deliverable

z/OS Exploitation Support for zEC12



- **z/OS V2.1***
- **z/OS V1.13**
- **z/OS V1.12**
- z/OS V1.11 (Will no longer be generally supported after September 30, 2012. The IBM Lifecycle Extension for z/OS V1.11 (5657-A01) will be required for extended defect support for z/OS V1.11 for up to 24 months after the z/OS V1.11 end of service date)
- z/OS V1.10 (No longer generally supported. The IBM Lifecycle Extension for z/OS V1.10 (5656-A01) provides the ability for customers to purchase extended defect support for z/OS V1.10 for up to 24 months after the z/OS V1.10 end of service date)

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z/OS Exploitation Support for zEC12

- **Provides same functionality as that on the IBM zEnterprise 196**
  - IBM zEnterprise Unified Resource Manager, Network and Performance Management, intranode management network (INMN) and intraensemble data network (IEDN), Static Power Save Mode, Three subchannel sets, IPL from alternate subchannel set, zDAC support, OSA-Express3 and OSA-Express4S Inbound Workload queuing (IWQ)
    - z/OS V1.13 (and higher) only
      - *OSA-Express4S checksum offload for IPv6, OSA-Express4S checksum offload for LPAR to LPAR traffic (both IPv4 and IPv6), Large Send for IPv6, Inbound Workload queuing (IWQ) for Enterprise Extender traffic, HiperSockets optimization for intraensemble data networks (IEDN)*
- **z/OS z/OS V1.10 and z/OS V1.11 functions plus:**
  - **XES/XCF Support of New Hardware (CF Level 18)**
  - **Crypto Express4S Exploitation**
    - Enterprise Security PKCS11- Hardware Security Module (HSM), DUKPT for MAC and Data Encryption, Cipher Text Translate CCA Verb, PKDS/TKDS Constraint Relief, FIPS Evaluation, Common Criteria, Random Number Cache, FIPS on Demand, Wrapping Keys with Strong Keys
  - **z/OS V1.13 (and higher) only**
    - **Java exploitation of the Transactional Execution Facility**
    - **Exploitation of New Hardware Features - C/C++ Arch(10) / Tune(10)**
    - **IBM zAware (z/OS Monitoring)**
    - **RSM Enhancements**
      - *Flash Express Support*
      - *Pageable 1MB Large Page Support*
      - *Dynamic reconfiguration support for Flash Express - target 1Q2013**
      - *2 GB Large Page Support – target 1Q2013**
      - *Optional PLPA and COMMON page data set support – target 1Q2013**
  - **z/OS V2.1* (and higher)**
    - Support the transactional Execution Facility in additional production environments
    - Usability and performance improvements for zDAC (also available on z196/z114)

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

z/OS Exploitation Support for zEC12

Release	zEC12 PSP Bucket – 2827DEVICE 2827/z/OS																	
	Base Support									Exploitation Support								
	Base zEC12 Support	OSA-Express4S (Gbe LX and SR, 1000BASE-T, 10 Gbe LR and SR)	FICON Express8S (CHPID FC)	IFB Coupling Links	Crypto Express4S Toleration[2]	High Performance FICON (zHPF)	CPU Measurement Facility (HIS)	GRS FICON CTC Toleration	New z/Architecture Instructions	CF Level 18	Crypto Express4S Exploitation[3]	XL C/C++ ARCH(10)/TUNE(10)	IBM zAware (z/OS Monitoring)	Java exploitation of the Transactional Execution Facility	Flash Express (Storage Class Memory - SCM)	Pageable Large Pages	Dynamic reconfiguration support for Flash Express[4]	2 GB Large Page[4]	Optional PLPA/ COMMON page data set support[4]
z/OS V1.12	P	B	B	B	W P	P	P	P	P	P	W	N	N	N	N	N	N	N	N
z/OS V1.13	P	B	B	B	W P	P	P	P	P	P	W	P	P	P	W P	W P	W P	W P	W P
z/OS V2.1[4,5]	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B

[1] – The Lifecycle Extension for z/OS V1.10 (5656-A01) is required to acquire toleration PTFs and for support. The Lifecycle Extension for z/OS V1.11 (5657-A01) is required for support after September 30, 2012 and to acquire PTFs that become available after that date.

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z/OS Support for zEC12

- **Base support for zEC12 is provided by PTFs**
- **Exploitation of many functions is provided by PTFs**
- **Exploitation of Crypto Express4S requires a web deliverable on z/OS V1.12 and higher**
- **Exploitation of RSM Enhancements, including Flash Express exploitation, requires the z/OS V1R13 RSM Enablement Offering web deliverable, installed on z/OS V1.13**
  - Available since December 14, 2012

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zEC12 General Migration Considerations

- **Software Changes**
  - z/OS releases do not require zEC12 servers
  - zEC12 servers ONLY require software identified as ‘base’ support
    - Minimal toleration support needed depending on z/OS release
    - zEC12 servers do NOT require any ‘functional’ software
- **Very few new migration issues identified (next chart)**
  - z990, z890, z9 EC, z9 BC, z10 EC, z10 BC, z196, and z114 server migration actions “inherited”
  - New multisystem considerations
  - “Inherited” sysplex considerations
  - Many functions are enabled/disabled based on the presence or absence of the required hardware and software.
    - Some functions have exploitation or migration considerations (subsequent charts)

zEC12 Specific Migration Considerations

- **New zEC12 z/Architecture Machine Instructions**
  - New mnemonics
  - Use of XL C/C++ ARCH(10) and TUNE(10) options
- **Sysplex and Multisystem Considerations**
  - Server participation restriction in a Parallel Sysplex
  - GRS Ring ESCON CTC not supported on zEC12 Servers
  - New CFCC Level
    - Evaluate structure sizes
    - Increased CFCC footprint
- **Update SCRT to latest version**
  - Always required if you want to use subcapacity pricing

New z/Architecture Machine Instructions

- **The new mnemonics may collide with (be identical to) the names of Assembler macro instructions you use**
  - If you write programs in Assembler Language, you should compare the list of new instructions to the names of Assembler macro instructions you use and/or provide
  - If a conflict is identified, take one of these actions:
    - Change the name of your macro instruction.
    - Specify a separate assembler OPCODE table
      - *via PARM= , ASMAOPT, or '*PROCESS OPTABLE….' in source*
- **Use a coding technique that permits both use of a new instruction and a macro with the same name in an assembly**
- **Use of XL C/C++ ARCH(10) and TUNE(10) options**
  - See later chart

z/OS XL C/C++ Exploitation of zEC12 Machine Instructions

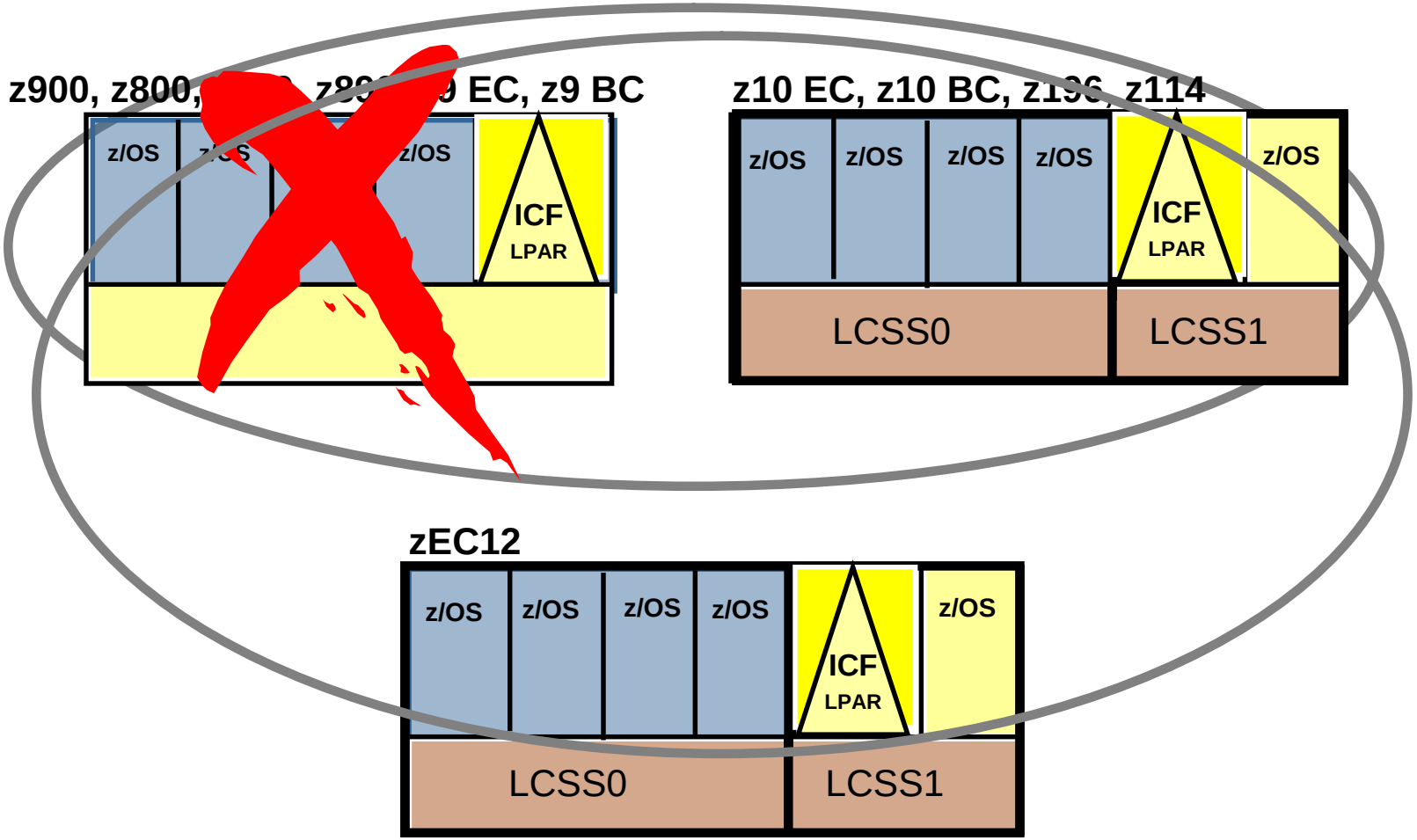
- **C/C++ ARCH(10) and TUNE(10) options:**
  - The ARCHITECTURE C/C++ compiler option selects the minimum level of machine architecture on which your program will run.
    - ARCH(10) exploits instructions available on a zEC12 server
    - The TUNE compiler option allows you to optimize your application for a specific machine architecture within the constraints imposed by the ARCHITECTURE option
      - *The TUNE level has to be at least the ARCH level*
      - *If the TUNE level is lower than the specified ARCH level, the compiler forces TUNE to match the ARCH level or uses the default TUNE level, whichever is greater.*
      - *For more information on the ARCHITECTURE and TUNE compiler options refer to the z/OS XL C/C++ User's Guide.*
- **Exploitation Restriction:**
  - Code compiled with the C/C++ ARCH(10) option can only run on zEC12 servers, otherwise an operation exception will result
  - This is a consideration for programs running on different level servers during development, test, production, and during fallback or DR

Server Participation in a Parallel Sysplex

- **zEC12 servers do not support active participation in the same Parallel Sysplex with:**
  - IBM System z9 Enterprise Class (z9 EC), IBM System z9 Business Class (z9 BC)
  - IBM eServer zSeries 990 (z990), IBM eServer zSeries 890 (z890),
  - IBM eServer zSeries 900 (z900), IBM eServer zSeries 800 (z800),
  - and older System/390 Parallel Enterprise Server systems

  This means:
  - Configurations with z/OS on one of these servers can't add a zEC12 server to their sysplex for either a z/OS image or a CF image
  - Configurations with a CF on one of these servers can't add a zEC12 server to their sysplex for either a z/OS image or a CF image
- **zEC12 servers do not support ICB-4 Coupling Links**
  - Customers should plan their coupling link technology
- **zEC12 servers do not support connection to an ETR**
  - A mixed CTN configuration IS supported
    - z10 servers using ETR or STP and zEC12 servers using STP
    - zEC12 will be the last high-end server to support connections to an STP Mixed CTN

zEC12 – Parallel Sysplex Coexistence Considerations

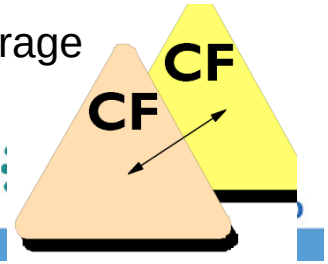


New zEC12 Multisystem Considerations

- **zEC12 does NOT support ESCON**
- **Previously, GRS could not directly manage FICON CTCs**
- **Two unrecommended GRS Ring configurations are affected**
  - GRS Ring complex that is larger than one sysplex
  - GRS Ring that doesn't utilize sysplex signaling
- **Migration Options:**
  - Convert to a Parallel Sysplex exploiting GRS Star
    - GRS star is recommended over GRS Ring
  - Convert to a Basic Sysplex exploiting XCF signaling for GRS Ring
    - Sysplex communications recommended over GRS-managed CTCs
  - Install zEC12 maintenance to provide toleration for FICON CTCs
    - This support does not enhance the robustness of GRS-managed CTCs
    - The toleration must be installed across GRS complex

System z CFCC Level 18

- **Improved Serviceability**
  - Non-disruptively capture and collect extended diagnostic structure data for CF structures that have encountered an error
  - Verification of local cache controls for a CF cache structure connector
    - Rolled back to CFCC Level 17 on a z196 or z114
- **Performance Enhancements**
  - Elapsed time improvements when dynamically altering the size of a cache structure
  - DB2 conditional write to a group buffer pool (also rolled back to CFCC Level 17)
  - CF cache structures to avoid flooding the CF cache with changed data and avoid excessive delays and backlogs for cast-out processing
- **Reporting and Monitoring Improvements**
  - Additional information provided for Coupling over Infinband (CIB) CHPID types.
  - RMF exploits changed XES interface and obtains new channel path characteristics. The new channel path characteristics is:
    - Stored in a new channel path data section of SMF record 74 subtype 4
    - Added to the Subchannel Activity and CF To CF Activity sections of the RMF Postprocessor Coupling Facility Activity report
    - Provided on the Subchannels Details panel of the RMF Monitor III Coupling Facility Systems report.
- **Structure and CF Storage Sizing with CFCC level 18**
  - May increase storage requirements when moving from:
    - CF Level 17 (or below) to CF Level 18
    - CF Sizer Tool recommended
      - http://www.ibm.com/systems/z/cfsizer/
  - Similar to CF Level 17, ensure that the CF LPAR has at least 512MB of storage



zEC12 Specific Migration Considerations

- **"Inherited" Sysplex Considerations**
  - Evaluate Coupling Links requirements
    - ICB-4 Coupling Links not supported
  - Evaluate Sysplex Timer environment
    - ETR not supported
      - *A mixed CTN configuration IS supported:*
        - *z10 servers using ETR or STP and zEC12 servers using STP*
      - *zEC12 will be the last high-end server to support connections to an STP Mixed CTN*

zEC12 Parallel Sysplex Coupling Connectivity

z10 EC and z10 BC

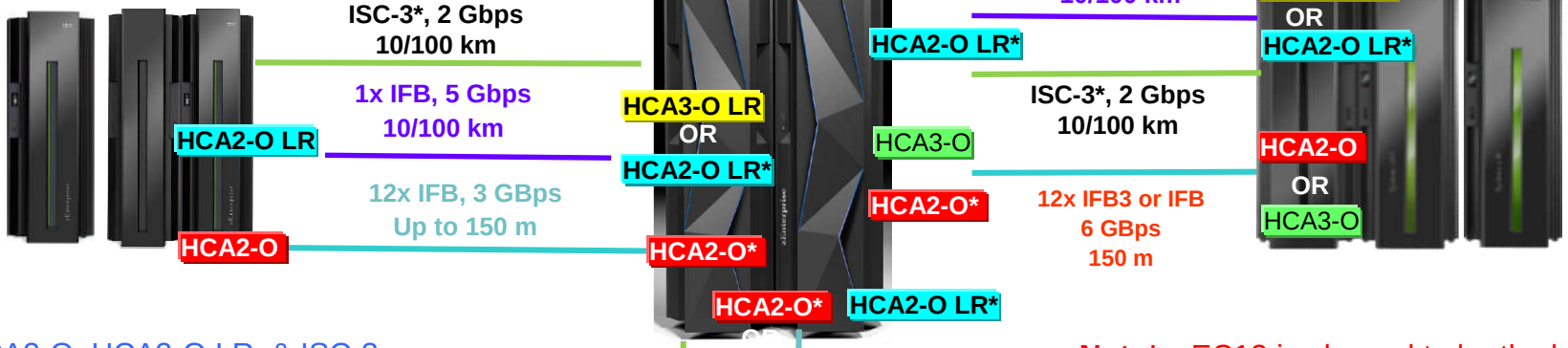
12x IFB, 1x IFB & ISC-3

zEC12

12x IFB, 1x IFB & ISC-3

z196 and z114

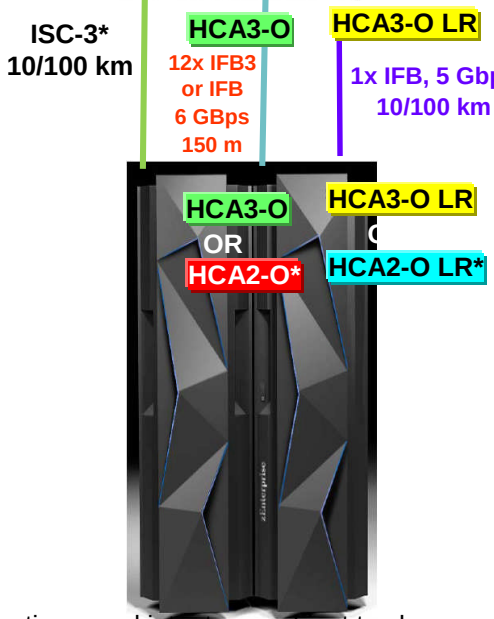
12x IFB, 12x IFB3, 1x IFB, & ISC-3



*HCA2-O, HCA2-O LR, & ISC-3 carry forward only on zEC12

z800, z900
z890, z990
z9 EC and z9 BC

Not supported!



Note*: zEC12 is planned to be the last high-end server to offer support of the InterSystem Channel-3 (ISC-3) for Parallel Sysplex environments at extended distances. ISC-3 will not be supported on future high-end System z servers as carry forward on an upgrade.

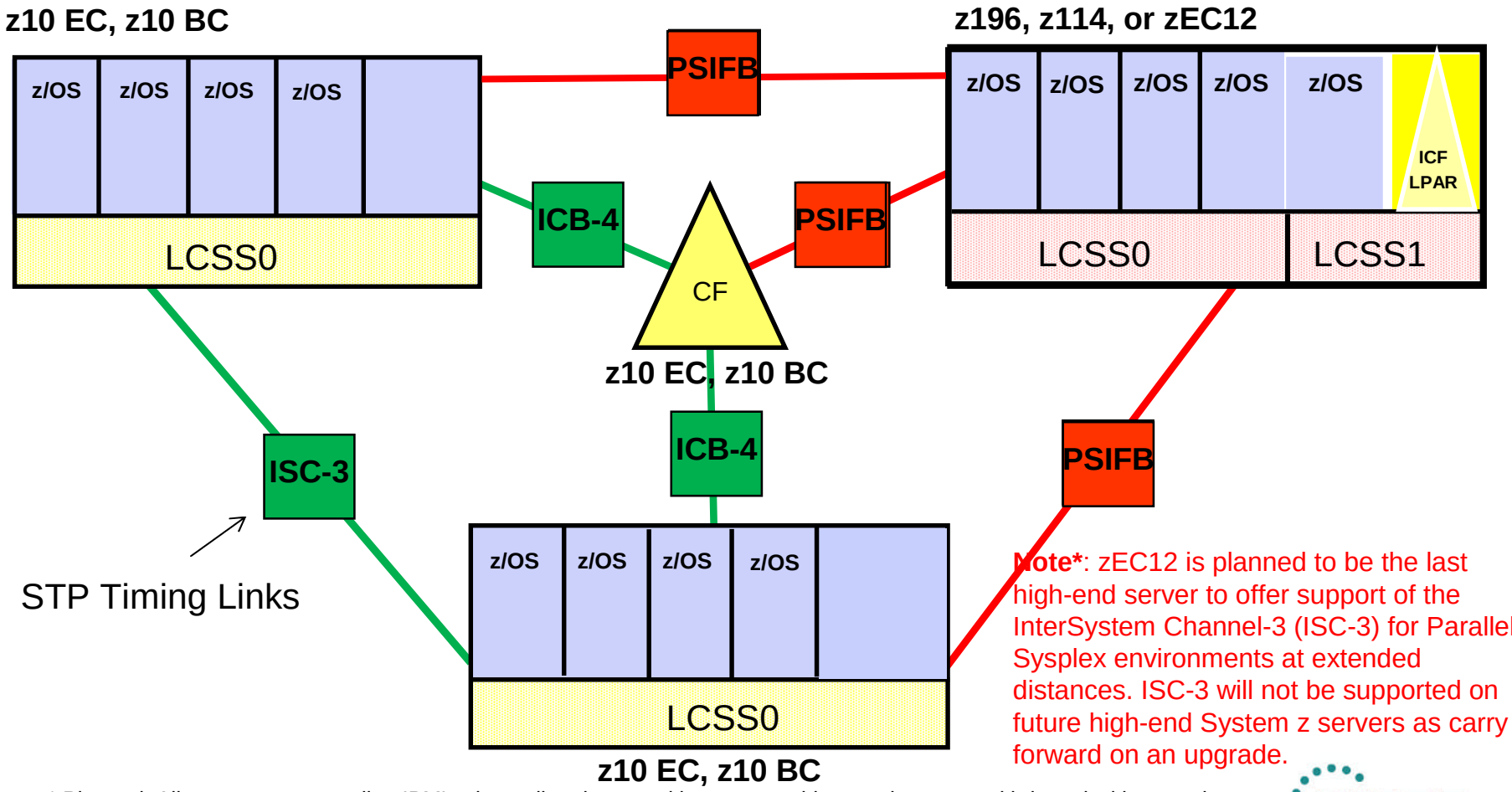
Note: The InfiniBand link data rates do not represent the performance of the link. The actual performance is dependent upon many factors including latency through the adapters, cable lengths, and the type of workload.

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

Parallel Sysplex (No ICB-4 Link Support)

The "intermediate" CFs can provide a 'bridge' to connect to z196, z114, or zEC12 servers

- No IBC-4 Links to z196, z114, or zEC12
- Can intermix existing ICB4 and PSIFB link technology if using z10 Coupling Facilities



Note*: zEC12 is planned to be the last high-end server to offer support of the InterSystem Channel-3 (ISC-3) for Parallel Sysplex environments at extended distances. ISC-3 will not be supported on future high-end System z servers as carry forward on an upgrade.

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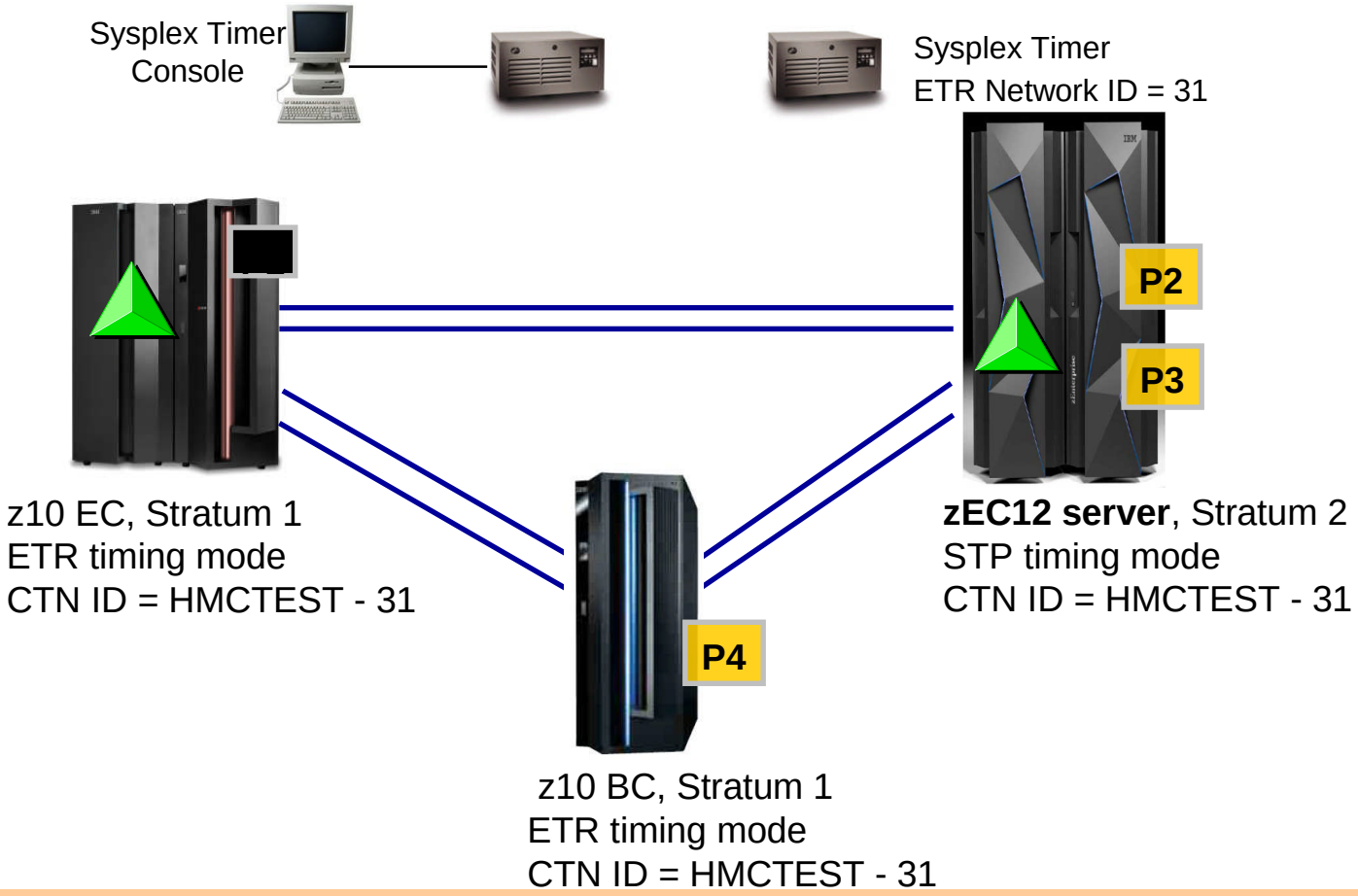
STP Configurations

- **Two types of Coordinated Timing Network (CTN) configurations possible:**
  - Mixed CTN
    - Allows servers/CFs that can only be synchronized to a Sysplex Timer (ETR network) to coexist with servers/CFs that can be synchronized with CST in the “same” timing network
    - Sysplex Timer provides timekeeping information
    - CTN ID format
      - *STP network ID concatenated with ETR network ID*
    - zEC12 is planned to be the last high-end System z server to support connections to an STP Mixed CTN*
  - STP-only CTN
    - All servers/CFs synchronized with CST
    - Sysplex Timer is NOT required
    - CTN ID format
      - *STP network ID only*

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

Mixed CTN Example with System zEC12 server

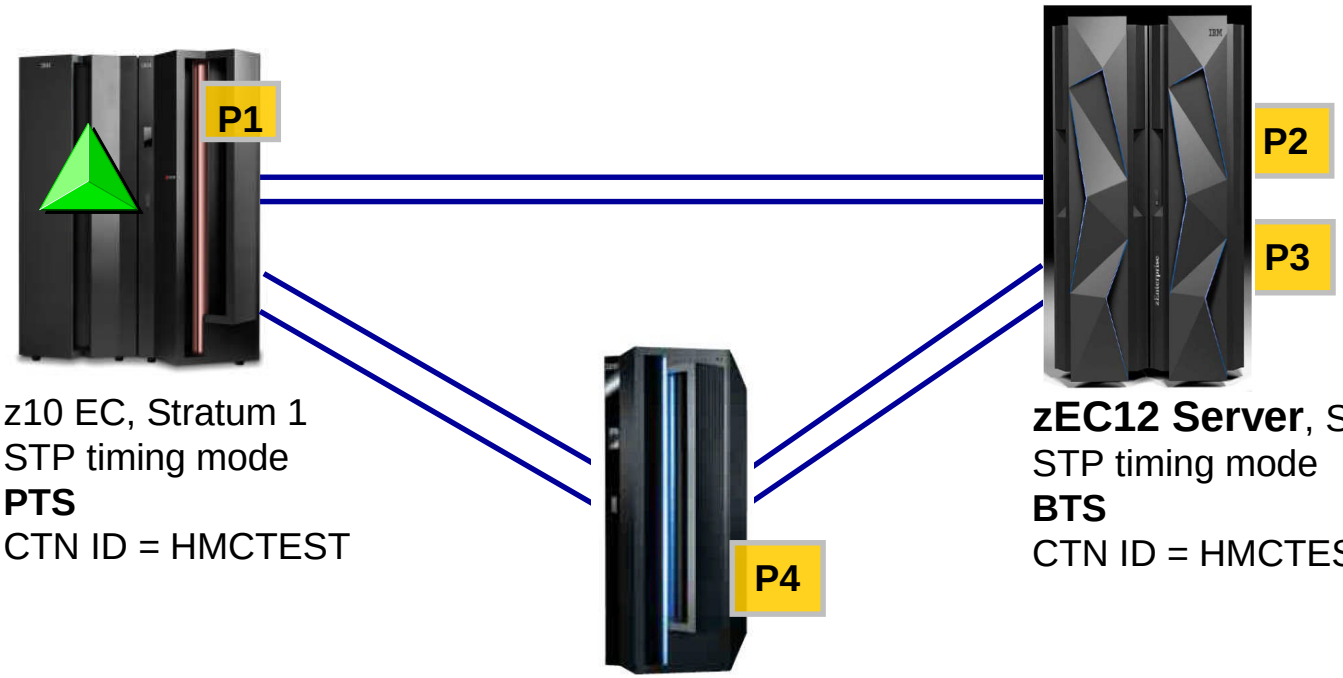


Strong recommendation: Configure at least two Stratum 1 servers before configuring a zEC12 server as S2 – to avoid a single point of failure

zEC12 is planned to be the last high-end System z server to support connections to an STP Mixed CTN*

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

STP-only CTN Example with System zEC12 Server



z10 EC, Stratum 1
STP timing mode
PTS
CTN ID = HMCTEST

zEC12 Server, Stratum 2
STP timing mode
BTS
CTN ID = HMCTEST

z114, Stratum 2
STP timing mode
Arbiter
CTN ID = HMCTEST

OSA-Express CHPID Types to Control Operation

CHPID type	Purpose / Traffic	Operating Systems
OSC 1000BASE-T[1] zEC12, z196, z114, z10, z9 z990, z890	OSA-Integrated Console Controller (OSA-ICC) Supports TN3270E, non-SNA DFT to IPL CPCs & LPs	z/OS, z/VM z/VSE
OSD All OSA features zEC12, z196, z114, z10, z9, zSeries	Supports Queue Direct Input/Output (QDIO) architecture TCP/IP traffic when Layer 3 (uses IP address) Protocol-independent when Layer 2 (uses MAC address)	z/OS, z/VM z/VSE, z/TPF Linux on System z
OSE 1000BASE-T[1] zEC12, z196, z114, z10, z9, zSeries	Non-QDIO; for SNA/APPN/HPR traffic and TCP/IP "passthru" traffic	z/OS, z/VM z/VSE
OSM 1000BASE-T[1] zEC12, z196, z114	OSA-Express for Unified Resource Manager Connectivity to intranode management network (INMN) from zEC12, z196, or z114 to Unified Resource Manager functions	z/OS, z/VM Linux on System z
OSN[2] GbE, 1000BASE-T zEC12, z196, z114, z10, z9	OSA-Express for NCP Appears to OS as a device supporting CDLC protocol Enables Network Control Program (NCP) channel-related functions Provides LP-to-LP connectivity OS to IBM Communication Controller for Linux (CCL)	z/OS, z/VM z/VSE, z/TPF Linux on System z
OSX 10 GbE zEC12, z196, z114	OSA-Express for zBX Connectivity and access control to intraensemble data network (IEDN) from zEC12, z196, or z114 to zBX	z/OS, z/VM, z/VSE 5.1, Linux on System z

[1] – 1000BASE-T is not available using OSA-Express4S on z196 and z114

[2] - CHPID type OSN (OSA-Express for NCP) is not available for OSA-Express4S GbE SX and LX

Note: zEC12 is planned to be the last high-end System z server to offer support for the Open System Adapter-Express3 (OSA-Express3)*

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

Agenda

- **IBM zEnterprise EC12 (zEC12) Overview**
- **IBM zEnterprise EC12 (zEC12) Support by z/OS Releases**
  - Device 2827 PSP Buckets and Fix Categories
- **Migration Considerations**
  - General
  - Migration Considerations for Selected Functions
  - Multisystem/Sysplex Considerations
  - **Exploitation Considerations for Selected Functions**
- **Migration Paths**
  - General Recommendations and Considerations
  - Recommended Paths for Supported z/OS Releases
- **Summary**
- **Backup**
  - Cryptographic Support

New MACHMIG Statement in LOADxx for Server Migrations

- **MACHMIG**
  - Identifies one or more facilities that you do not want z/OS to use at this time because migration to another processor, z/OS release, or both is underway.
  - Code the MACHMIG statement as follows:
    - Column Contents
      - *1-7 MACHMIG*
      - *10-72 A list of facilities not to use. When more than one facility is listed, separate each from the previous by one or more blanks or commas. The following facilities may be specified in upper, lower, or mixed case:*
        - *EDAT2 - the hardware-based enhanced-DAT facility 2*
        - *TX - the hardware-based transactional-execution facility*
  - A maximum of 3 MACHMIG statements are allowed
  - Default: None.
    - If you do not specify a MACHMIG statement, the system does not limit its use of machine facilities.

New MACHMIG Statement in LOADxx for Server Migrations

- **Example**
  - The following example shows a MACHMIG statement that tells the system not to use the transactional execution facility and the enhanced DAT facility 2.

```
*---+----1----+----2----+----3----+----4----+----5…
MACHMIG TX,EDAT2
```

- **New operands on DISPLAY IPLINFO**
  - DISPLAY IPLINFO,LOADXX,MACHMIG command
    - Displays all the relevant MACHMIG statements from the LOADxx PARMLIB member, or indicates that there were none.

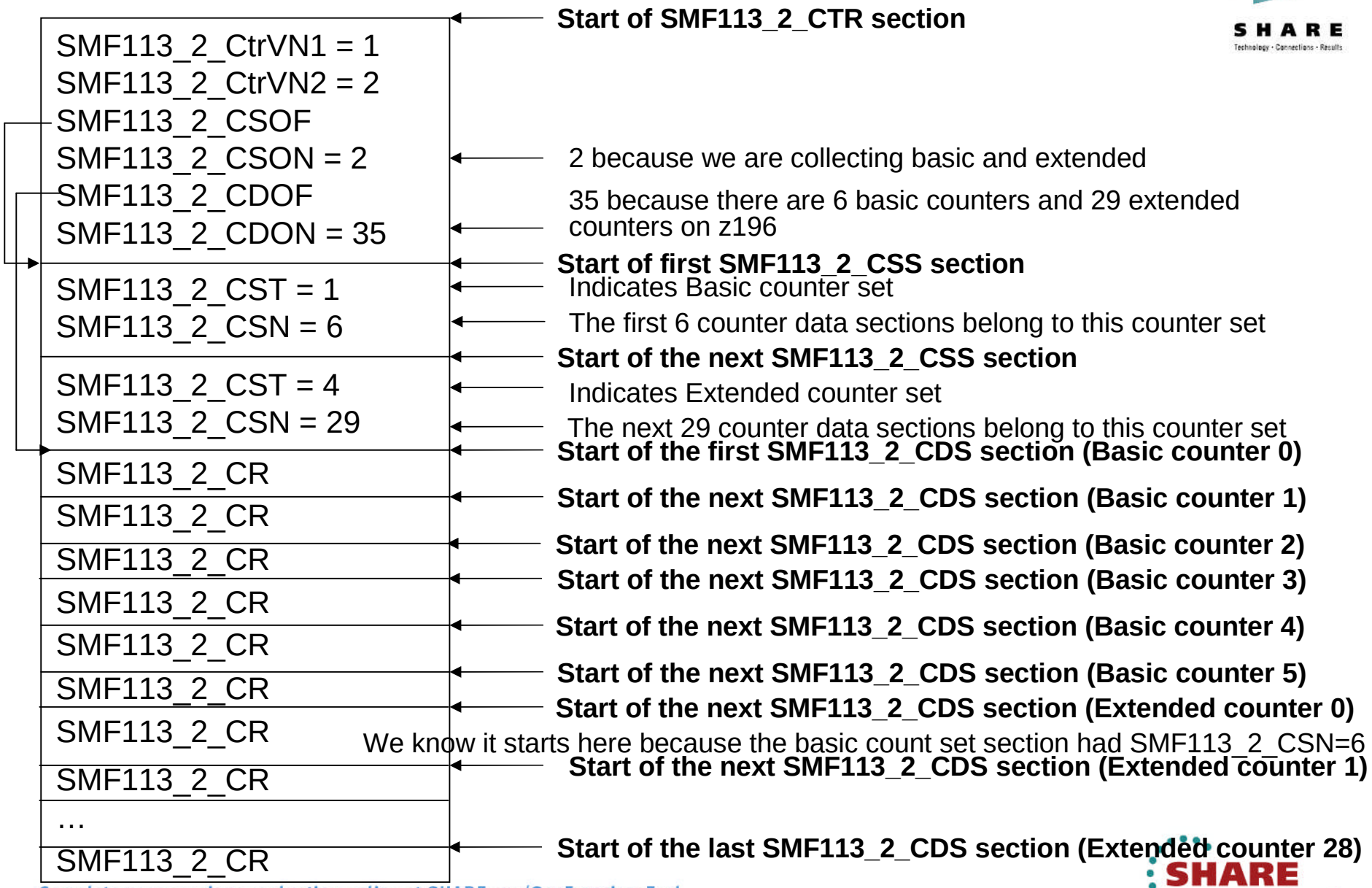
Hardware Instrumentation

- **The number of counters for zEC12 is increased to 80**
  - More Extended counters means more internal storage is required
    - By applying the PTF for HIS base zEC12 support, you increase the amount of common storage used by 128 bytes
- **The structure of the SMF 113 Record does not change**
  - The values, interpretations, and frequency of certain sections will change – therefore current tools using the data need to be updated for zEC12
- **Formulas and use of these fields are documented in Techdocs**
  - Available now for z10 and z196 (same information is applicable for z114)
    Title: CPU MF - 2012 Updates and WSC Experiences (updated June 2012)
    http://www-03.ibm.com/support/techdocs/atsmastr.nsf/WebIndex/TC000066
  - Available for zEC12 at announce
- **Recommendations**
  - Enable now on z196, z10, and z114
    - Minimum overhead to collect this data
  - Leave it enabled all the time
    - Critical for current servers

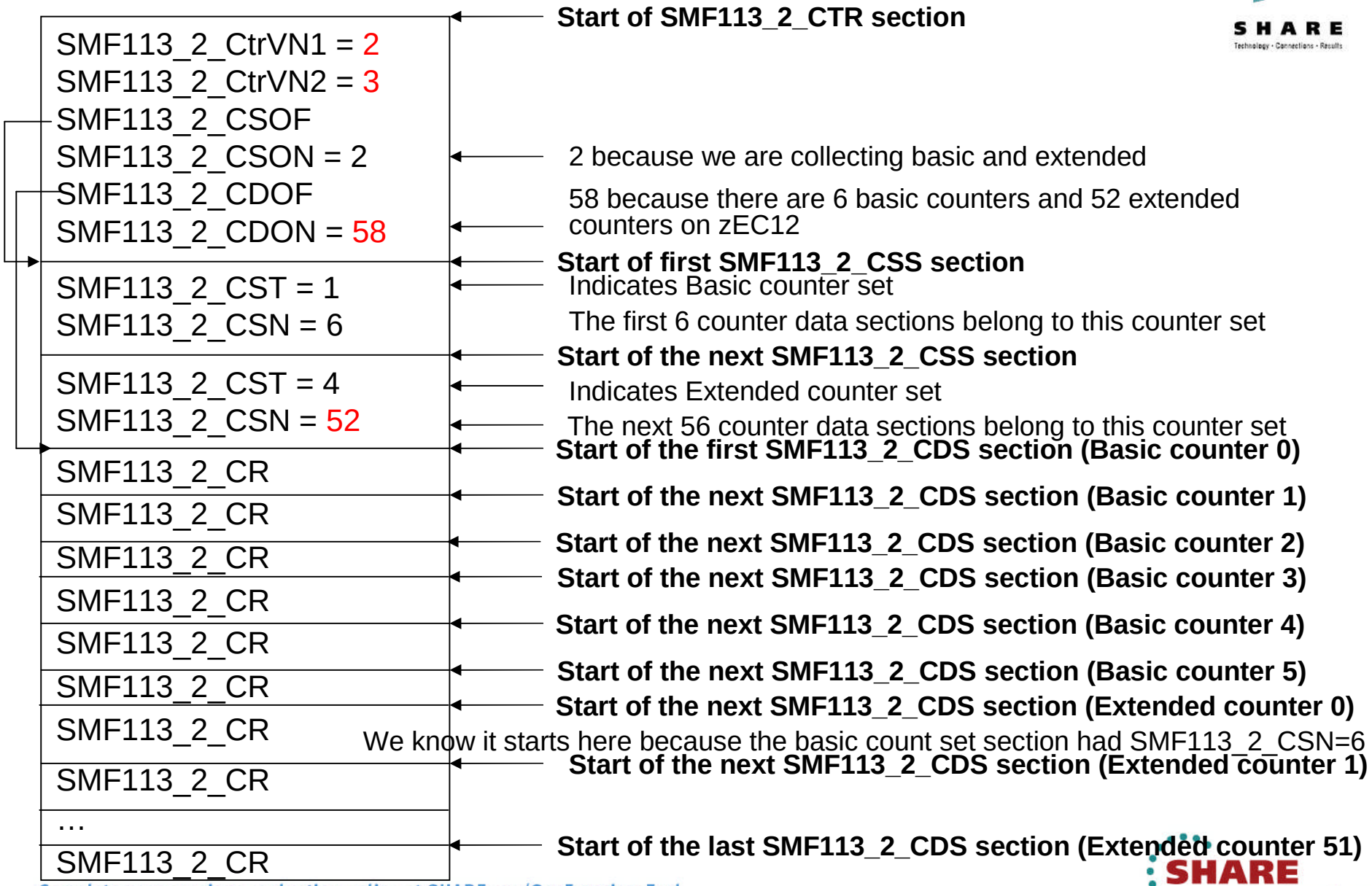
Hardware Instrumentation Details

- **The structure of the SMF 113 Record does not change.**
  - However the values, interpretations, and frequency of certain sections do change. The noteworthy fields are:
    - SMF113_2_CtrVN1 identifies how to interpret the Basic and Problem counter sets. As described in SA23-2260 this will be set to **1** (z10/z196/z114) or **2** (zEC12)
    - SMF113_2_CtrVN2 identifies how to interpret the Crypto and Extended counter sets. As described in SA23-2260 this will be set to 1 (z10), **2** (z196 or z114) or **3** (zEC12)
    - The number of counter set sections (SMF113_2_CSS) depends on what you specified for the collection run (which counter sets and the values in SMF113_2_CtrVN1 and SMF113_2_CtrVN2.
      - *How these sections are interpreted relies on knowledge of what you're running on (i.e. the SMF113_2_CtrVN1 and SMF113_2_CtrVN2 fields).*

HIS - z196 run with CTR=(B,E) might produce this record



HIS - zEC12 run with CTR=(B,E) might produce this record



IBM System z Advanced Workload Analysis Reporter (IBM zAware)

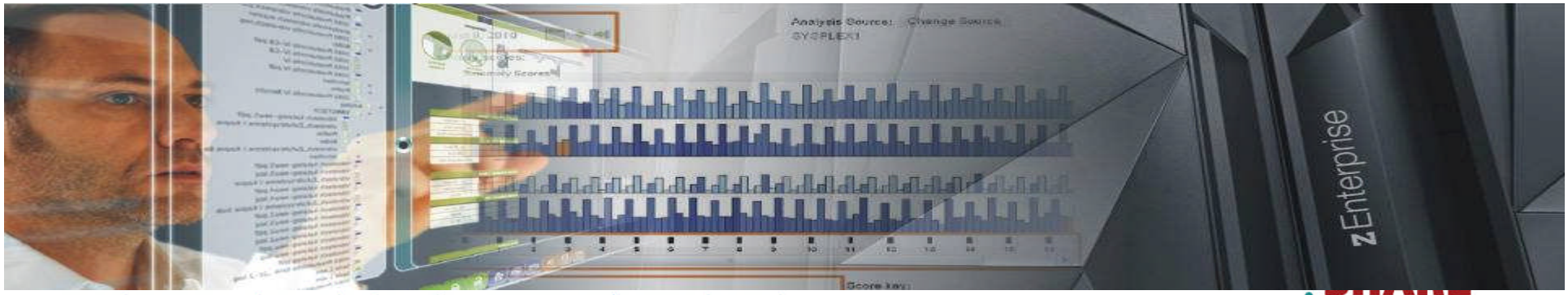
- z/OS provides the capability of having specific log stream data sent "out-of-band" to the IBM zAware (z/OS Monitoring) server.
- The initial data being sent to the IBM zAware (z/OS Monitoring) server for analysis is the log data within the OPERLOG logstream.
- This allows the IBM zAware (z/OS Monitoring) server to provide analytical monitoring and machine learning of z/OS health for purposes of availability management.
- It detects things typical monitoring systems miss due to:
  - Message suppression (message too common)
    - Useful for long-term health issues
  - Uniqueness (message not common enough
    - Useful for real-time event diagnostics
- Color coded easy to use GUI via web browsers
- Output can be queued up to existing monitoring systems.

Ability to drill down for details on anomalies

IBM zAware …

From a z/OS perspective,

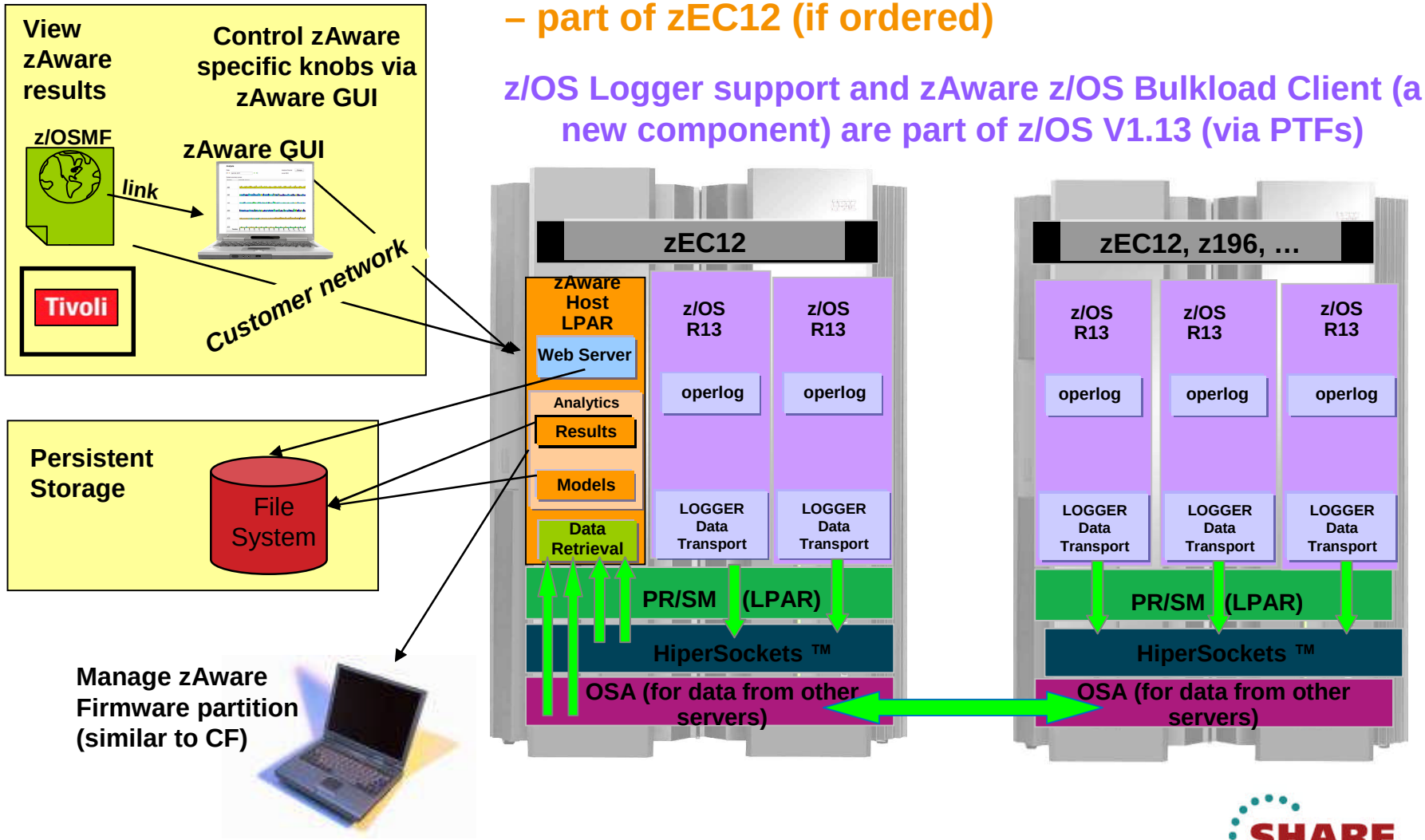
- **IBM zAware server**
  - **Firmware instance (in a separate PR/SM LPAR)**
  - **Receives data from each z/OS image**
    - Can monitor operating system images on same CPC or from other CPCs which are running z/OS V1.R13 (with PTFs installed)
- **z/OS is an IBM zAware monitored client**
  - **z/OS sends data to IBM zAware server for analysis/monitoring**
  - **z/OS IBM zAware monitored client**
    - **z/OS does this via log streams**
      - *z/OS IBM zAware log stream client*
    - **z/OS system logger uses term**
      - *z/OS ZAI logstream client*



IBM zAware …

zAware Partition and contents are Firmware – part of zEC12 (if ordered)

z/OS Logger support and zAware z/OS Bulkload Client (a new component) are part of z/OS V1.13 (via PTFs)



IBM zAware Operating Requirements

- **zEC12 server for IBM zAware host system (1 of 3)**
  - **Processor**
    - In general, an average customer configuration requires only a partial processor.
    - Large customer configurations might require up to two processors.
    - The use of IFLs is preferable, especially for dedicated use, because IFLs are less costly than central processors
  - **Memory**
    - Your installation must assign a minimum of 6 gigabytes (GB) of memory to activate the IBM zAware partition and support up to six monitored clients.
    - If your installation plans to connect more than six monitored clients, you need to assign an additional 256 megabytes (MB) of memory for each monitored client. Use the following formula for determining the amount of memory to assign to the partition.
      - *6GB + (.25GB * (number of clients))*

IBM zAware Operating Requirements

- **zEC12 Server for IBM zAware host system (2 of 3)**
  - **Network**
    - OSA OSD CHPIDs to gather instrumentation data and to provide outbound alerts
      - *Need dedicated IP address for partition*
      - *The IBM zAware server supports the following types of network options*
        - *A customer-provided data network that provides Ethernet connectivity through an OSA channel.*
        - *A HiperSockets subnet within the zEC12 CPC.*
        - *The intraensemble data network (IEDN) on the zEC12 CPC.*

IBM zAware Operating Requirements

- **zEC12 Server for IBM zAware host system (3 of 3)**
  - **External DASD Storage**
    - IBM zAware uses Extended Count Key Data (ECKD) direct-access storage devices (DASD) for persistent storage of analytical data for each monitored client.
      - *Because of the way IBM zAware uses storage, your installation can select a combination of small volumes or volumes of different sizes to satisfy storage requirements.*
      - *These volumes cannot be SMS-managed volumes.*
    - Storage requirements vary depending on the number of monitored systems that you plan to connect to IBM zAware.
      - *Start with 500 GB of storage for IBM zAware to use.*
      - *If you increase the number of monitored clients, you need to configure 4-5 GB of storage for each monitored system.*
      - *If you increase the retention times of instrumentation data, training models, or analysis results, you also might need to increase the amount of persistent storage that IBM zAware can use.*

Note: Because of the way that the IBM zAware server uses storage, you need to configure these devices such that no other partitions can use them.

- This requirement applies to LPARs on the host system and on any other System z servers that have access to the storage devices.
- When you assign persistent storage through the IBM zAware GUI, the IBM zAware server formats the storage devices before using them.
- If other LPARs are using these storage devices, data will be lost or overwritten.
- To avoid this potential loss of data, you must use the explicit device candidate list to allow only the IBM zAware partition to access the device.

IBM zAware Operating Requirements

- **IBM zAware Monitored Client System**
  - Monitored clients can run in partitions on the zEC12 or in partitions on the following System z servers:
    - IBM zEnterprise 196 (z196) or IBM zEnterprise 114 (z114)
    - System z10 Enterprise Class (z10 EC) or Business Class (z10 BC)
    - Prior System z server generations, as long as the z/OS systems running on them can meet the operating system and configuration requirements for IBM zAware monitored clients.
  - IBM zAware supports z/OS systems that run in z/OS partitions or as z/VM guests.
  - z/OS monitored clients must meet the following requirements:
    - The system must be configured as a single-system sysplex (monoplex), a system in a multisystem sysplex, or a member of a Parallel Sysplex.
    - The system must be running z/OS Version 1 Release 13 (V1R13) with the appropriate service installed.
    - The system must be using the operations log (OPERLOG) as the hardcopy medium.
    - The system name and sysplex name must uniquely identify the system to be monitored.

IBM zAware Customization Considerations …

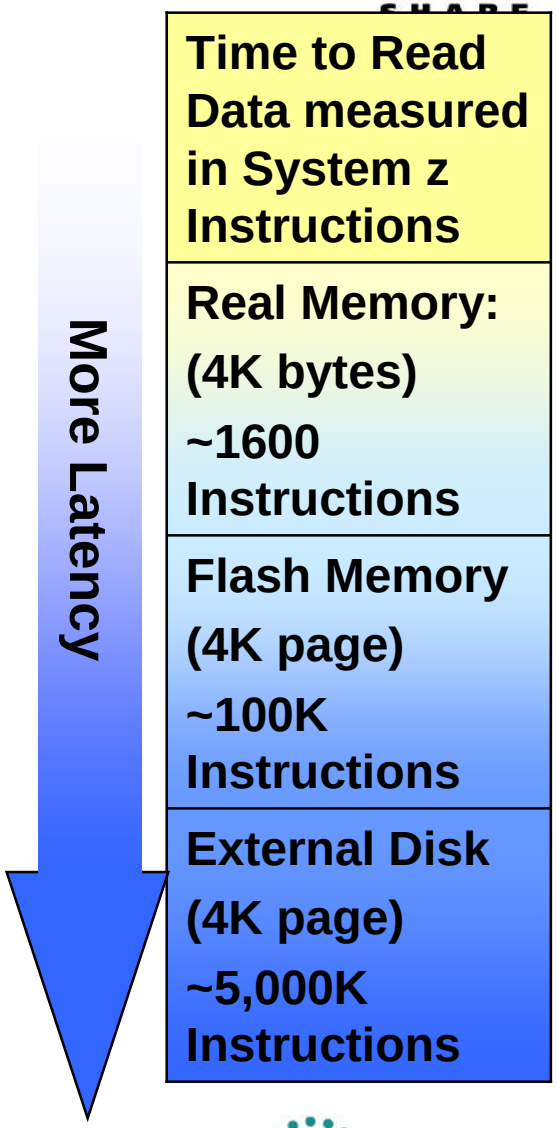
- **Requirements:**
  - SYS1.PARMLIB Updates:
    - IXGCNFxx ZAI SERVER(host) PORT(nnnnn)
      - *PORT number can not currently be changed*
  - Log stream
    - ZAI(YES) ZAIDATA('OPERLOG')
  - Network
    - Configure network scheme to include above host/port info
  - Ensure z/OS OMVS & Resolver, z/OS Communications Server and TCP/IP are available (started)
  - 90 days historical SYSLOG or formatted OPERLOG data to prime zAware
    - "Bulk loader" pushes historical data to IBM zAware server so that a model can be created using archived "syslogs" during installation of IBM zAware
- **New manual, IBM System z Advanced Workload Analysis Reporter (IBM zAware) Guide (SC27-2623)**

IBM zAware Fallback Considerations …

- **If you are running fully enabled, have logstreams with ZAI(YES), then run on system that is not enabled:**
  - Connection attempts to logstream with ZAI(YES) will succeed, but no IBM zAware (z/OS Monitoring) client activity will occur for the log stream.
  - Inventory attempts to define logstreams using a LIKE(like-logstream) with ZAI(YES) will result in the new definition failure rc8, rsn8E3 (IxgRsnCodeLogstreamNotSupported).
    - For this situation, installation will need to either:
      - *Use a different like-logstream reference or specify all the appropriate parameters on the specific define logstream request; or*
      - *to avoid the above issue, before the fallback, first run IXCMIAPU DATA TYPE(LOGR) UPDATE LOGSTREAM NAME(logstream) ZAI(NO) on enabled release system to get the log stream "cleaned up" before defining another logstream that points to like-logstream with the ZAI(YES).*

Introducing System z Flash Express

- **Flash Express is intended to improve System z availability**
  - Slash latency delays from paging
  - Make your start of day processing fast
  - Eliminate frustrating delays from SVC dump processing
- **zEC12 will offer optional System z Flash Express memory cards**
  - Supported in PCIe I/O drawer with other PCIe I/O cards
  - Pairs of cards for availability
  - No HCD/IOCP definition required
- **Assign flash memory to partitions like main memory**
  - Assignment is by minimum/maximum memory amount, not by feature
  - Each partition's flash memory is isolated like main memory
  - Dynamically increase the partition maximum amount of flash
  - Dynamically configure flash memory into and out of the partition
- **Options to solve many different problems**
  - Flash Memory is much faster than spinning disk
  - Flash Memory is much slower than main memory
  - Flash Memory takes less power than either
- **The system z Software Stack has a staged plan to exploit flash memory**
  - z/OS 1.13 plus PTFs,
  - z/OS V1.13 Language Environment
  - Java SDK7 and by extension
    - WAS Liberty Profile V8.5
    - DB2 V10
    - IMS V12
    - A future release of CICS Transaction Server
  - IMS V12 Common Queue Server



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

RSM Enhancements

- **RSM Enhancements delivered in the z/OS V1R13 RSM Enablement Offering Web Deliverable (FMID JBB778H) for z/OS V1.13**
  - Flash Express Support - Exploits Storage Class Memory (SCM) technology for z/OS paging and SVC dump
  - Pageable 1MB Large Page Support
    - Is expected to yield substantial improvements in SVC dump data capture time, and removes the requirement for PLPA and Common page data sets when used for cold start (CLPA) IPLs.
    - It can also be used to remove the requirement for non-VIO local page data sets when the configuration includes enough SCM to meet peak demands.
      - *However, local page data sets remain required for VIO, and when needed to support peak paging demands that require more capacity than provided by the amount of configured SCM.*
  - Dynamic reconfiguration support for Storage Class Memory (SCM) - target 1Q2013*
  - 2 GB Large Page Support – target 1Q2013*
  - Optional PLPA and COMMON page data set support – target 1Q2013*

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

RSM Enhancement Considerations

- **Installation of the z/OS V1R13 RSM Enablement Offering Web Deliverable (JBB778H) will:**
  - Increase the size of the Nucleus by approximately 380K above the 16MB line
    - You may need to analyze your private storage usage
  - Increase of 24K (6 pages) in ESQA per CPU per LPAR
    - This increase in ESQA per CPU includes general purpose CPs, zIIPs, and zAAPs.

Flash Express Exploitation Considerations

- **New IEASYSxx parameter - PAGESCM**
  - Enables the use of Storage Class Memory (SCM) for paging, specifies the minimum amount of storage class memory to be reserved for paging
  - Value may be specified in units of M, G, or T
  - If Flash Express is installed but is not to be used for paging, then PAGESCM=NONE should be specified
  - Defaults to **ALL**
- **Command changes**
  - D M=SCM command changes
  - D ASM command changes
- **Specification of PLPA and COMMON paging data set is now optional (target 1Q2013*)**
  - PLPA/COMMON (*NONE*)

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

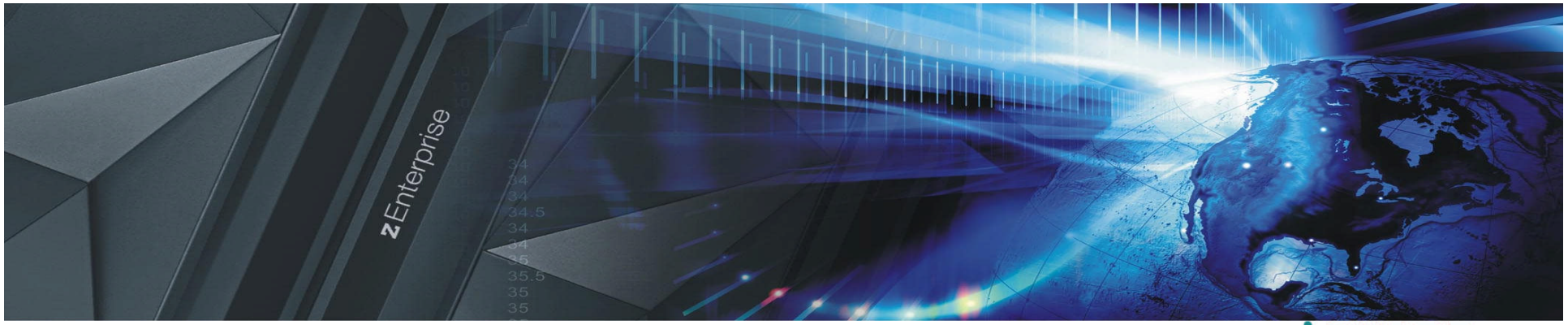
Flash Express Exploitation Considerations

```
d asm
IEE200I 17.17.46 DISPLAY ASM 944
TYPE      FULL STAT    DEV   DATASET NAME
PLPA      100% FULL    02E6  SYS1.PLPA.PAGCOM
COMMON     61%   OK    02E6  SYS1.COMMON.PAGCOM
LOCAL       0%   OK    098E  SYS1.LOCAL.PAGEP2
LOCAL       0%   OK    0987  SYS1.LOCAL.PAGEP3
LOCAL       0%   OK    098F  SYS1.LOCAL.PAGEP4
SCM        11%   OK     N/A   N/A
```

```
d asm,scm
IEE207I 17.35.02 DISPLAY ASM 947
STATUS       FULL      SIZE              USED          IN-ERROR
IN-USE        11%   393,216            46,954                 0
```

Flash Express Exploitation - RMF Considerations

- **RMF Page Data Set Activity (Monitor I and Monitor II):**
  - New entry for SCM space in report and SMF records
- **RMF Paging Activity (Monitor I):**
  - SCM Paging Block data added to report and SMF records
- **RMF Monitor III STORM Storage Memory Objects Data Table is enhanced to display SCM information**



2 GB Large Pages (target 1Q2013*)

- **Increase TLB coverage without proportionally enlarging the TLB size by using 2 GB large pages:**
  - A 2 GB page is a memory page that is
    - (2048 times) larger than a Large page and
    - (524,288 times) larger than an ordinary base page
  - 2 GB Large Pages allow for a single TLB entry to fulfill many more address translations than either a large page or ordinary base page
  - 2 GB Large Pages will provide exploiters with much better TLB coverage, and therefore provide
    - Better performance by decreasing the number of TLB misses that an application incurs
    - Less time spent converting virtual addresses into physical addresses
    - Less real storage used to maintain DAT structures

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

2 GB Large Pages Exploitation Considerations

- **Enhanced IEASYSxx parameter - LFAREA**
  - Enhanced to support the use of 2 GB large pages
  - The LFAREA parameter can be specified as:
    - LFAREA = ([1M=req] [,2 GB=req] [,prompt | noprompt])
  - Note: The old form of the LFAREA keyword is still supported:
    - LFAREA = (xx% | mmmmmmM | gggggG | tttttT)

- **Usage Enhancements**
  - IARV64 GETSTOR enhanced to support the request for 2 GB large pages

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Flash vs Disk Placement Criteria

Data Type	Data Page Placement
PLPA	At IPL/NIP time PLPA pages will be placed both on Flash and disk.
VIO	VIO data will always be placed on disk (First to VIO accepting datasets with any spillover flowing to nonvio datasets)
Pageable Large Pages	If contiguous Flash space is available, pageable large page will be written to Flash. If Flash is not available in the system configuration pageable large pages will be backed with 4k page frames.
All other data	If available space exists on both Flash and disk then make a selection based on response time.

z/OS FLASH Use Cases

- **Paging**
  - **z/OS paging subsystem will work with mix of internal Flash and External Disk**
    - Self tuning based on measured performance
    - Improved paging performance, simplified configuration
  - **Begin Paging 1 MB Large Pages only on Flash**
    - Exploit Flash's random IO read rate to get CPU performance by enabling additional use of Large Pages.
      - *Currently large pages are not pagable.*
  - **Begin Speculative Page-In of 4K Pages, 1MB Pages only on Flash**
    - Exploit Flash's random IO read rate to get improved resilience over disruptions.
      - *Market Open, Workload Failover*

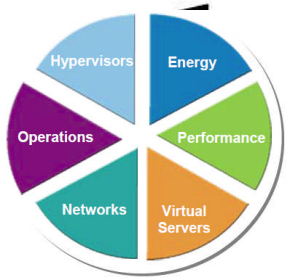
Customization / Activation for Crypto Exploitation

- **Crypto Toleration**
  - **Toleration PTFs are required on z/OS V1.10 - z/OS V1.13**
    - Even if a web deliverable is installed
- **Crypto Exploitation (software installation)**
  - **New ICSF web deliverable required for support**
    - Cryptographic Support for z/OS V1R12-V1R13 Web deliverable (HCR77A0)
      - **NOT** *integrated in ServerPac (even for new z/OS V1.13 orders)*
      - *Only required to exploit new zEC12 function*
      - *All systems in a sysplex that share a PKDS/TKDS must be at HCR77A0 to exploit the new PKDS/TKDS Coordinated Administration support*
      - *ICSF pubs will be updated with HCR77A0 function*
        - *Available online on the download site in PDF format and on ResourceLink*
  - z/OS PTFs needed for some z10 GA3 and z196 (or z114) functions, not any zEC12 functions
  - New ICSF toleration PTFs needed to:
    - Permit the use of a PKDS with RSA private key tokens encrypted under the ECC master key
    - Support for installation options data sets which use the keyword BEGIN(fmid).
    - New SMP/E Fix Category will be created for ICSF coexistence
      - *IBM.Coexistence.ICSF.z/OS_V1R12-V1R13-HCR77A0*
  - New IBM Enterprise PKCS #11 (EP11) coprocessor exploitation
    - Requires a TKE Workstation with TKE 7.2 LIC

zEC12 Crypto Express4S – UDX

- **UDX (User Defined eXtension)**
  - Extends the functionality of IBM's CCA (Common Cryptographic Architecture) application program
    - Customized cryptographic verb controls per customer
  - UDX interfaces using hardware control blocks and ICSF control blocks
    - Therefore if hardware platform changes, or ISCF level changes, or both, then
      - *UDX must updated for the new control blocks*
        - *If a customer has UDX, they would already know this*

zEC12 Ensemble Configuration



- An Ensemble is a collection of one or more zEnterprise or zEC12 system nodes
- zEC12 can participate in an ensemble:
  - **A single zEC12 with no zBX attached**
  - **Two to eight zEC12, z196 or z114 CPCs where at least one of the CPCs has a zBX attached**
    - **If the zBX is attached to a zEC12, it will be a Model 003**
- Ensembles are defined using the HMC
- Depending on the System z applications, each ensemble might require:
  - **Intranode management network (INMN)**
  - **Intraensemble data network (IEDN)**
  - **Customer managed data network**

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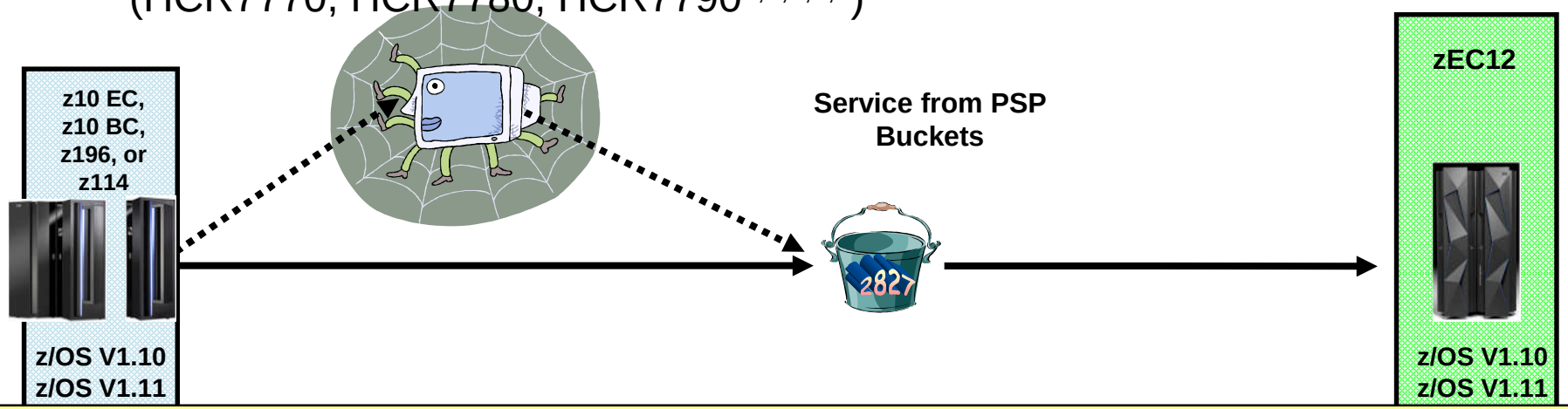
General Recommendations and Considerations

- **zEC12 servers are based on existing System z technology**
  - z/Architecture (z900/z800)
  - Multiple Logical Channel Subsystems (z990/z890)
  - OSA-Express2, FICON Express4, Crypto Express2 (z9 EC/z9 BC)
  - HiperDispatch, Large Page, zHPF (z10 EC, z10 BC)
  - Ensembles, native PCIe-based I/O – FICON Express8S and OSA Express4S (z196, z114)
- **zEC12 capabilities differ depending on z/OS release**
  - Web deliverables are needed for some functions on some releases
- **Don't migrate software releases and hardware at the same time**
- **Migrate off of ESCON CTCs for GRS Ring communication**
- **Keep members of the sysplex at the same software level other than during brief migration periods**
- **Review any restrictions and migration considerations prior to creating upgrade plan**

Typical z/OS V1.10 - z/OS V1.11 Migration Path

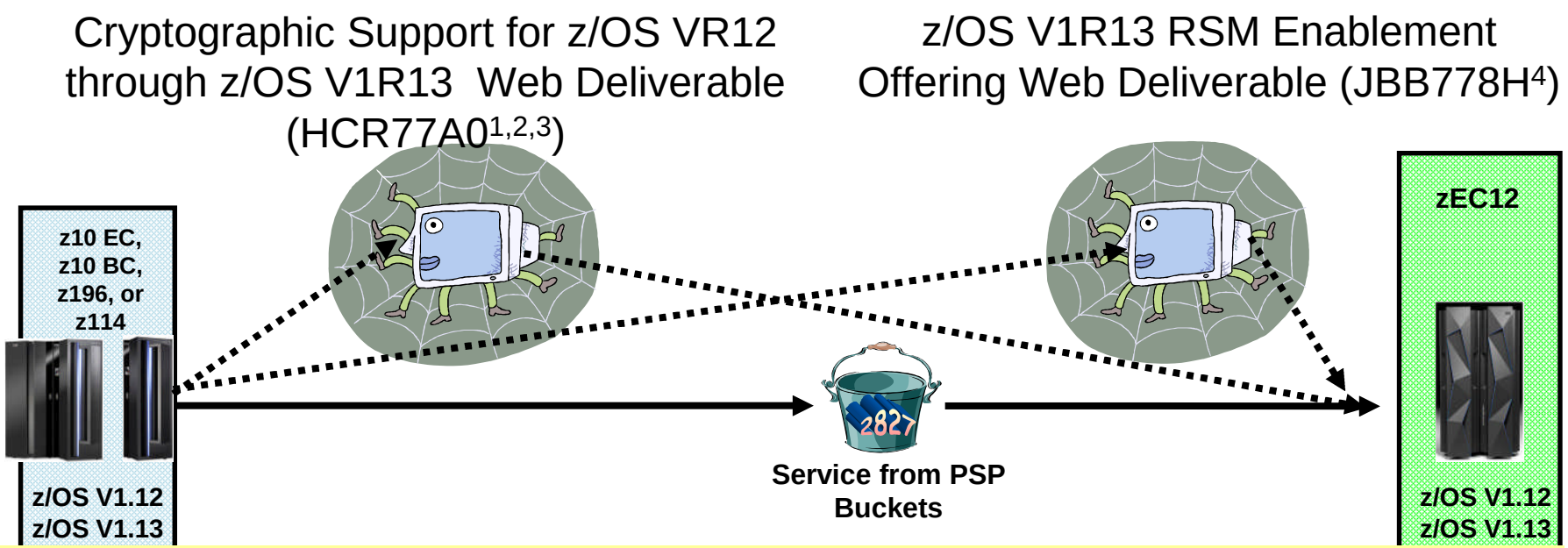
Cryptographic Support for z/OS VR10 through z/OS V1R12 Web Deliverable (HCR7770, HCR7780, HCR7790[1,2,3,4,5])



Notes:

1. A Web Deliverable and toleration PTF is needed for lower ICSF levels (HCR7770 or higher), **unless CyrptoExpress3 is Carried Forward**
2. For z/OS V1.10, if you require Support for 13- thru 19-digit Personal Account Numbers, ICSF Query Algorithms, or Key Token Policy support then you must install the Cryptographic Support for z/OS V1.8 through z/OS V1.10 and z/OS.e V1.8 Web deliverable (or higher)
3. For z/OS V1.10 or z/OS V1.11, if you require protected key CP Assist for Cryptographic Function, new Crypto Express3 or Crypto Express3 -1P, then you must install the Cryptographic Support for z/OS V1R9-V1R11 Web deliverable (or higher)
4. For z/OS V1.10 or z/OS V1.11, if you require X9.8 Pin, 64 Bit, HMAC, CKDS Constraint Relief, PCI Audit, ECC HW Support, CBC Key Wrap, and PKA RSA OAEP with SHA-256 algorithm, then you must install the Cryptographic Support for z/OS V1R10-V1R12 Web deliverable (or higher)
5. For z/OS V1.11 or higher, if you require Expanded key support for AES algorithm, enhanced ANSI TR-31 Secure Key Exchange, PIN block decimalization table protection, PKA RSA OAEP with SHA-256 algorithm, or additional Elliptic Curve Cryptography (ECC) functions then you must install the Cryptographic Support for z/OS V1R11-V1R13 Web deliverable

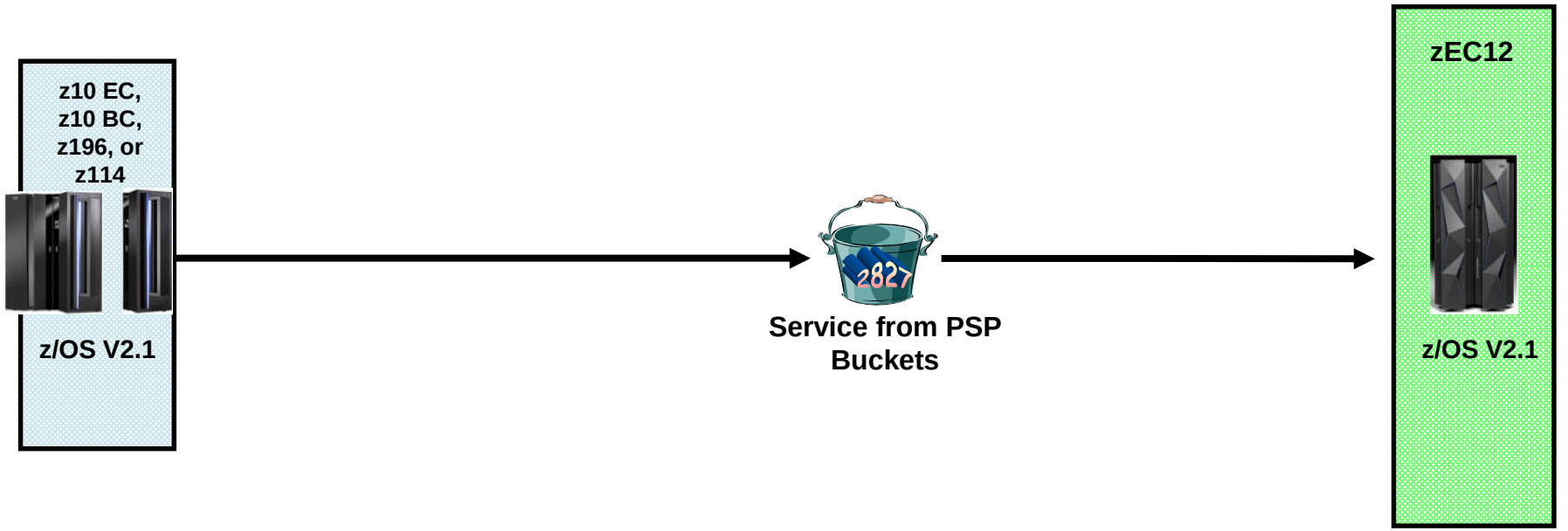
Typical z/OS V1.12 - z/OS V1.13 Migration Path



Notes:

1. For z/OS V1.12, if you require X9.8 Pin, 64 Bit, HMAC, CKDS Constraint Relief, PCI Audit, ECC HW Support, CBC Key Wrap, and PKA RSA OAEP with SHA-256 algorithm, then you must install the Cryptographic Support for z/OS V1R10-V1R12 Web deliverable (or higher)
2. If you require Expanded key support for AES algorithm, enhanced ANSI TR-31 Secure Key Exchange, PIN block decimalization table protection, PKA RSA OAEP with SHA-256 algorithm, or additional Elliptic Curve Cryptography (ECC) functions then you must install the Cryptographic Support for z/OS V1R11-V1R13 Web deliverable
3. If you require Enterprise Security PKCS11- Hardware Security Module (HSM), DUKPT for MAC and Data Encryption, Cipher Text Translate CCA Verb, PKDS/TKDS Constraint Relief, Random Number Cache, FIPS on Demand, Wrapping Keys with Strong Keys then you must install the Cryptographic Support for z/OS V1R12-V1R13 Web deliverable
4. If you require Flash Express support (including Pageable Large Pages) or 2 GB Large Page support, then you must install the RSM Enhancements for z/OS V1.13 Web deliverable.

Typical z/OS V2.1* Migration Path



No Web deliverables planned to be needed

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

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Supported IBM zEC12 System Migration Scenarios

1. **Existing System z server to new zEC12 server**
   - Toleration versus exploitation differs by release
   - ICSF web deliverable needed for function exploitation required
   - RSM web deliverable needed for Flash Express, and other RSM enhancements
   - Migrate off ESCON CTCs for GRS Ring communications
2. **Existing z10 sysplex replaced by zEC12 (or zEC12 added to existing sysplex)**
   - Coupling Link technology (no ICB-4 to z196 or z114)
   - Only STP or Mixed CTN supported (no ETR connections to a z196 or z114)
3. **If you want an ensemble**
   - Configure an Ensemble from the HMC
4. **Exploit a zEC12 with a zBX - 003**
   - Configure OSM OSA CHPIDs for intranode management network (INMN)
   - Configure OSX OSA CHPIDs for intraensemble data network (IEDN)
   - User responsible for AIX OS and application provisioning

Summary: z/OS Software Support for IBM zEC12 Servers

- **Provides same functionality as that on the IBM zEnterprise 196 (z196)**
  - HiperDispatch, FICON Express8S, Parallel Sysplex InfiniBand (PSIFB) Coupling Links, High Performance FICON for System z (zHPF), CPU Measurement Facility, …
- **Plus for z/OS V1.10 and z/OS V1.11**
  - OSA-Express4S (GbE LX and SX, **1000BASE-T**, 10 GbE LR and SR)
  - Crypto Express4S toleration
  - GRS FICON CTC toleration
  - New z/Architecture Instructions (and new OPCODE support)
- **z/OS z/OS V1.12:**
  - **XES/XCF Support of New Hardware (CF Level 18)**
  - **Crypto Express4S Exploitation**
    - Enterprise Security PKCS11- Hardware Security Module (HSM), DUKPT for MAC and Data Encryption, Cipher Text Translate CCA Verb, PKDS/TKDS Constraint Relief, FIPS Evaluation, Common Criteria, Random Number Cache, FIPS on Demand, Wrapping Keys with Strong Keys
- **z/OS V1.13 (and higher):**
  - **Java exploitation of the Transactional Execution Facility**
  - **Exploitation of New Hardware Features - C/C++ Arch(10) / Tune(10)**
  - **IBM zAware (z/OS Monitoring)**
  - **RSM Enhancements**
    - Flash Express Support
    - Pageable 1MB Large Page Support
    - Dynamic reconfiguration support for Flash Express - target 1Q2013*
    - 2 GB Large Page Support – target 1Q2013*
    - Optional PLPA and COMMON page data set support – target 1Q2013*
- **z/OS V2.1* (and higher)**
  - **Support the transactional Execution Facility in additional production environments**
  - **Usability and performance improvements for zDAC (also available on z196/z114)**

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

Summary: z/OS Software Support for IBM zEC12 Servers

Release	zEC12 PSP Bucket – 2827DEVICE 2827/z/OS																		
	Base Support									Exploitation Support									
	Base zEC12 Support	OSA-Express4S (Gbe LX and SR, 1000BASE-T, 10 Gbe LR and SR)	FICON Express8S (CHPID FC)	IFB Coupling Links	Crypto Express4S Toleration[2]	High Performance FICON (zHPF)	CPU Measurement Facility (HIS)	GRS FICON CTC Toleration	New z/Architecture Instructions	CF Level 18	Crypto Express4S Exploitation[3]	XL C/C++ ARCH(10)/TUNE(10)	IBM zAware (z/OS Monitoring)	Java exploitation of the Transactional Execution Facility	Flash Express (Storage Class Memory - SCM)	Pageable Large Pages	Dynamic reconfiguration support for Flash Express[4]	2 GB Large Page[4]	Optional PLPA/ COMMON page data set support[4]
z/OS V1.10[1]	P	P	P	P	W P	P	P	P	P	N	N	N	N	N	N	N	N	N	N
z/OS V1.11[1]	P	P	P	P	W P	P	P	P	P	N	N	N	N	N	N	N	N	N	N
z/OS V1.12	P	B	B	B	W P	P	P	P	P	P	W	N	N	N	N	N	N	N	N
z/OS V1.13	P	B	B	B	W P	P	P	P	P	P	W	P	P	P	W P	W P	W P	W P	W P
z/OS V2.1[4,5]	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B

[1] – The Lifecycle Extension for z/OS V1.10 (5656-A01) is required to acquire toleration PTFs and for support. The Lifecycle Extension for z/OS V1.11 (5657-A01) is required for support after September 30, 2012 and to acquire PTFs that become available after that date.

[2] –A Crypto Web Deliverable (HCR7770 or higher) AND a PTF is required for toleration unless CyrptoExpress3 is Carried Forward. Support differs depending on the Crypto Web Deliverable installed

[3] – Crypto Exploitation differs based on the Crypto Web Deliverable installed

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

[5] - z/OS V2.1 announced as a preview of availability

B – FMID shipped in Base product P – PTF is required W – FMID shipped in a Web Deliverable

Summary: z/OS Support for zEC12

- **Base support for zEC12 is provided by PTFs for releases z/OS V1.10 – z/OS V1.13**
- **Exploitation of many functions is provided by PTFs for z/OS V1.13 (and some for z/OS V1.12)**
- **Exploitation of Crypto Express4S requires a web deliverable on z/OS V1.12 and higher**
- **Exploitation of RSM Enhancements, including Flash Express exploitation, requires the z/OS V1R13 RSM Enablement Offering web deliverable on z/OS V1.13**
- **All support is planned to be included in the base of z/OS V2.1***

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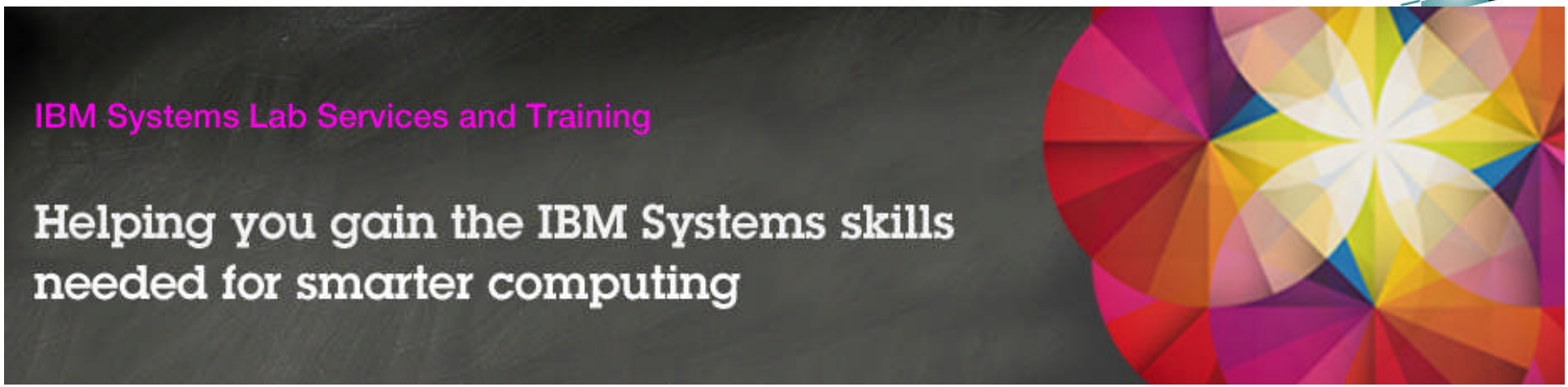
Additional Information

- z/OS Home Page
  http://www.ibm.com/servers/eserver/zseries/z/OS/
- zFavorites for System z
  http://www.ibm.com/servers/eserver/zseries/z/OS/zfavorites/
- z/OS Internet Library
  http://www.ibm.com/servers/eserver/zseries/z/OS/bkserv/
- IBM System z
  http://www.ibm.com/systems/z/
- IBM Resource Link
  https://app-06.www.ibm.com/servers/resourcelink/hom03010.nsf
- IBM Redbooks – How-To Books (also Redpieces)
  http://www.redbooks.ibm.com/
- Preventive Service Planning buckets
  http://www14.software.ibm.com/webapp/set2/psp/srchBroker
- Enhanced HOLDDATA
  http://service.boulder.ibm.com/390holddata.html

System z Social Media Channels

- **Top Facebook pages related to System z:**
  - IBM System z
  - IBM Academic Initiative System z
  - IBM Master the Mainframe Contest
  - IBM Destination z
  - Millennial Mainframer
  - IBM Smarter Computing
- **Top LinkedIn groups related to System z:**
  - System z Advocates
  - SAP on System z
  - IBM Mainframe- Unofficial Group
  - IBM System z Events
  - Mainframe Experts Network
  - System z Linux
  - Enterprise Systems
  - Mainframe Security Gurus
- **Twitter profiles related to System z:**
  - IBM System z
  - IBM System z Events
  - IBM DB2 on System z
  - Millennial Mainframer
  - Destination z
  - IBM Smarter Computing
- **YouTube accounts related to System z:**
  - IBM System z
  - Destination z
  - IBM Smarter Computing

- **Top System z blogs to check out:**
  - Mainframe Insights
  - Smarter Computing
  - Millennial Mainframer
  - Mainframe & Hybrid Computing
  - The Mainframe Blog
  - Mainframe Watch Belgium
  - Mainframe Update
  - Enterprise Systems Media Blog
  - Dancing Dinosaur
  - DB2 for z/OS
  - IBM Destination z
  - DB2utor



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z/OS Crypto Toleration Support (1 of 2)

z/OS Release	Crypto Web Download	FMID	Comments
z/OS V1.10[1]	N/A – In z/OS base product	HCR7750	Prior release plus: 4096-bit RSA keys, ISO-3 PIN Support, CPACF support for SHA-394 and SHA-512, Reduced support of retained private key in ICSF
	[11/2008] Cryptographic Support for z/OS V1.8 through z/OS V1.10 and z/OS.e V1.8 web deliverable	HCR7751	Support for 13- thru 19-digit Personal Account Numbers, ICSF Query Algorithms, Key Token Policy support, and Secure Key AES
	[11/2009] Cryptographic Support for z/OS V1R9-V1R11 Web deliverable	HCR7770	Protected Key CP Assist for Cryptographic Function and new Crypto Express3 and Crypto Express3 -1P
	[9/2010] Cryptographic Support for z/OS V1R10-V1R12 Web deliverable	HCR7780	X9.8 Pin, 64 Bit, z196/z114 CPACF, HMAC*, CKDS Constraint Relief, AP Interrupt, PCI Audit, ECC HW Support, CBC Key Wrap, and PKA RSA OAEP with SHA-256 algorithm
z/OS V1.11[1]	N/A – In z/OS base product	HCR7751	Prior release plus: Support for 13- thru 19-digit Personal Account Numbers, ICSF Query Algorithms, Key Token Policy support, and Secure Key AES
	[11/2009] Cryptographic Support for z/OS V1R9-V1R11 Web deliverable	HCR7770	Protected Key CP Assist for Cryptographic Function and new Crypto Express3 and Crypto Express3 -1P
	[9/2010] Cryptographic Support for z/OS V1R10-V1R12 Web deliverable	HCR7780	X9.8 Pin, 64 Bit, z196/z114 CPACF, HMAC*, CKDS Constraint Relief, AP Interrupt, PCI Audit, ECC HW Support, CBC Key Wrap, and PKA RSA OAEP with SHA-256 algorithm
	[9/2011] Cryptographic Support for z/OS V1R11-V1R13 Web deliverable	HCR7790	Expanded key support for AES algorithm, enhanced ANSI TR-31 Secure Key Exchange, PIN block decimalization table protection, PKA RSA OAEP with SHA-256 algorithm, and additional Elliptic Curve Cryptography (ECC) functions.

[1] The IBM Lifecycle Extension for z/OS is required for support after general support is withdrawn

z/OS Crypto Exploitation Support (1 of 2)

z/OS Release	Crypto Web Download	FMID	Comments
z/OS V1.12	N/A – In z/OS base product	HCR7770	Prior release plus: Protected Key CP Assist for Cryptographic Function and new Crypto Express3 and Crypto Express3 -1P
	[9/2010] Cryptographic Support for z/OS V1R10-V1R12 Web deliverable	HCR7780	X9.8 Pin, 64 Bit, z196/z114 CPACF, HMAC*, CKDS Constraint Relief, AP Interrupt, PCI Audit, ECC HW Support, CBC Key Wrap, and PKA RSA OAEP with SHA-256 algorithm
	[9/2011] Cryptographic Support for z/OS V1R11-V1R13 Web deliverable	HCR7790	Expanded key support for AES algorithm, enhanced ANSI TR-31 Secure Key Exchange, PIN block decimalization table protection, PKA RSA OAEP with SHA-256 algorithm, and additional Elliptic Curve Cryptography (ECC) functions.
	[10/2012] Cryptographic Support for z/OS V1R12-V1R13 Web deliverable	HCR77A0	Enterprise Security PKCS11- Hardware Security Module (HSM), DUKPT for MAC and Data Encryption, Cipher Text Translate CCA Verb, PKDS/TKDS Constraint Relief, Random Number Cache, FIPS on Demand, Wrapping Keys with Strong Keys

z/OS Crypto Exploitation Support (2 of 2)

z/OS Release	Crypto Web Download	FMID	Comments
z/OS V1.13	N/A – In z/OS base product	HCR7780	Prior release plus: X9.8 Pin, 64 Bit, z196/z114 CPACF, HMAC, CKDS Constraint Relief, AP Interrupt, PCI Audit, ECC HW Support, CBC Key Wrap, and PKA RSA OAEP with SHA-256 algorithm
	[9/2011] Cryptographic Support for z/OS V1R11-V1R13 Web deliverable	HCR7790	Expanded key support for AES algorithm, enhanced ANSI TR-31 Secure Key Exchange, PIN block decimalization table protection, PKA RSA OAEP with SHA-256 algorithm, additional and Elliptic Curve Cryptography (ECC) functions.
	[10/2012] Cryptographic Support for z/OS V1R12-V1R13 Web deliverable	HCR77A0	Enterprise Security PKCS11- Hardware Security Module (HSM), DUKPT for MAC and Data Encryption, Cipher Text Translate CCA Verb, PKDS/TKDS Constraint Relief, Random Number Cache, FIPS on Demand, Wrapping Keys with Strong Keys
z/OS V2.1*	N/A – In z/OS base product	HCR77A0	Prior release plus: Enterprise Security PKCS11- Hardware Security Module (HSM), DUKPT for MAC and Data Encryption, Cipher Text Translate CCA Verb, PKDS/TKDS Constraint Relief, Random Number Cache, FIPS on Demand, Wrapping Keys with Strong Keys

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

Deliverable Name	FMID	Applicable z/OS Releases	Avail	EoS
z/OS or z/OS.e V1.3 or V1.4	HCR7706	z/OS V1.3 and z/OS V1.4	3/2002	9/2004
z990 Cryptographic CP Assist Support for z/OS V1.3[1]	HCR7708	z/OS V1.3	6/2003	10/2003
z/OS V1.4 z990 Compatibility Support or z/OS.e z990 Coexistence	HCR7708	z/OS V1.4	6/2003	10/2003
z/OS V1.4 z990 Exploitation Support or z/OS.e Coexistence Update feature	HCR7708	z/OS V1.4	10/2003	12/2006
z990 Cryptographic Support [2]	HCR770A	OS/390 V2.10, z/OS 1.2, z/OS 1.3, z/OS V1.4, any z/OS V1.4 features, and z/OS V1.5	9/2003	5/2004
z/OS or z/OS.e V1.5	HCR7708	z/OS V1.5	3/2004	9/2004
z/OS or z/OS.e V1.6	HCR770A	z/OS V1.6	9/2004	10/2005
z990 and z890 Enhancements to Cryptographic Support [3]	HCR770B	OS/390 V2.10, z/OS V1.2, z/OS V1.3, z/OS V1.4 and z/OS V1.5	5/2004	TBD
ICSF 64-bit Virtual Support for Z/OS V1.6 and z/OS.e V1.6 [4]	HCR7720	z/OS V1.6	12/2004	9/2005
z/OS or z/OS.e V1.7	HCR7720	z/OS V1.7	9/2005	10/2006
Cryptographic Support for z/OS V1R6/R7 and z/OS.e V1R6/R7[5]	HCR7730	z/OS V1.6 and z/OS V1.7	9/2005	5/2006
Enhancements to Cryptographic Support for z/OS and z/OS.e V1R6/R7[6]	HCR7731	z/OS V1.6 and z/OS V1.7	5/2006	11/2007
z/OS or z/OS.e V1.8	HCR7731	z/OS V1.8	9/2006	10/2007
z/OS V1.9	HCR7740	z/OS V1.9	9/2007	10/2008
Cryptographic Support for z/OS V1R7-V1R9 and z/OS.e V1R7-V1R8 web deliverable[7]	HCR7750	z/OS V1.7, z/OS V1.8 and z/OS V1.9	9/2007	10/2011
z/OS V1.10	HCR7750	z/OS V1.10	9/2008	10/2009
Cryptographic Support for z/OS V1.8 through z/OS V1.10 and z/OS.e V1.8 web deliverable[8]	HCR7751	z/OS V1.7*, z/OS V1.8, z/OS V1.9, z/OS V1.10	11/2008	11/2009
z/OS V1.11	HCR7751	z/OS V1.11	9/2009	10/2010
Cryptographic Support for z/OS V1R9-V1R11 Web deliverable[9]	HCR7770	z/OS V1.9, z/OS V1.10, z/OS V1.11	11/2009	9/2010
z/OS V1.12	HCR7770	z/OS V1.12	9/2010	10/2011
Cryptographic Support for z/OS V1R10-V1R12 Web deliverable[10]	HCR7780	z/OS V1.10, z/OS V1.11, z/OS V1.12	9/2010	TBD
z/OS V1.13	HCR7780	z/OS V1.13	9/2011	2H/2013*
Cryptographic Support for z/OS V1R11-V1R13 Web deliverable[11]	HCR7790	z/OS V1.11, z/OS V1.12, z/OS V1.13	9/2011	TBD
Cryptographic Support for z/OS V1R12-V1R13 Web deliverable[12]	HCR77A0	z/OS V1.12, z/OS V1.13	9/2012	TBD
z/OS V2.1	HCR77A0	z/OS V2.1	2H2013*	2H2015*

zEnd

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z/OS Software Support for the new IBM zEnterprise EC12 (zEC12) Servers

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Thursday, February 5, 2013: 4:30 PM-5:30 PM
Grand Ballroom B, Ballroom Level
Session 13079

SHARE in San Francisco 2013