

z/OS Software Support for **z14**

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SHARE in Providence RI

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z14 Functions & Features

Five hardware models and Five LinuxONE models
zArchitecture Mode ONLY
Up to 170 processors configurable as CPs, zIIPs, IFLs, ICFs or optional SAPs <ul style="list-style-type: none"> • Up to 170-way on z/OS V2.1 and later (non-SMT mode) • Up to 128-way on z/OS V2.1 and later (SMT mode)
Up to 32 TB of Redundant Array of Independent Memory (RAIM) – 1TB Memory Increment – 8TB/Drawer - Max <ul style="list-style-type: none"> • Up to 4 TB per z/OS LPAR with z/OS V2.1 and later
Changed Node/Cache structure
192 GB Fixed HSA
Channel Subsystem <ul style="list-style-type: none"> • Up to 85 LPARs • Up to six (6) Channel Sub Systems (CSSs) • 4 Subchannel Sets per CSS
HiperDispatch Enhancements
Two-way simultaneous multithreading (SMT) <ul style="list-style-type: none"> • Support for SAPs
New and enhanced instructions
z/OS XL C/C++ ARCH(12) and TUNE(12) exploitation: <ul style="list-style-type: none"> • New z14 hardware instruction support • Vector Programming Enhancements • Auto-SIMD enhancements to make use of new data types • Packed Decimal support using vector registers
IBM zAware: z/OS & Linux on z System monitoring (IOAz)



(z/OS support in blue)

Hardware Instrumentation Services (CPUMF)
Fast Memory Clear using SAPs
Much faster CPACF <ul style="list-style-type: none"> • Pervasive Encryption (Armored z) • Coupling Facility Encryption • Data Set and Network Encryption
IBM Virtual Flash Memory & CF Exploitation of VFM
Guarded Storage Facility (GSF)
Instruction Execution Protection (IEP)
CF Level 22: <ul style="list-style-type: none"> •List Notification Enhancements •CF Processor Scalability •CF Request Diagnostics •Encryption Support
Next Gen RoCE 10 GbE (RoCE-Express2)
Entropy-Encoding Compression Enhancements to CMPSC
FICON Express16S+
OSA Express6S
zHyperLink® Express
Crypto Express6S exploitation <ul style="list-style-type: none"> • Next Generation Coprocessor support • Support for Coprocessor in PCI-HSM Compliance Mode
Architected for up to 85 domains on Crypto Express6S
Integrated Coupling Adapter (ICA-SR) links CHPID CS5
Coupling Express LR (CE LR) CHPID CL5

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z/OS Support Summary

z/OS Release	z9 EC z9 BC WdfM OoS	z10 EC z10 BC WdfM	z196 z114 WdfM	zEC12 zBC12	z13 z13s	z14	End of Service	Extended Defect Support ¹
z/OS V1.13	X	X	X	X	X	X ¹	9/16	9/19*
z/OS V2.1	X	X	X	X	X	X	9/18*	9/21*
z/OS V2.2		X	X	X	X	X	9/20*	9/23*
z/OS V2.3 ²				X	X	X	9/22*	9/25*

Notes:

- 1 The IBM Software Support Services for z/OS V1.13, offered as of October 1, 2016, provides the ability for customers to purchase extended defect support service for z/OS V1.13
- 2 Planned to be Generally Available September 2017

* 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
OoS Server Out of Service

Legend

IBM Software Support Services required for z/OS support

Generally supported

Supported z/OS Releases

- z14 capabilities differ depending on z/OS Release
- Toleration Support
 - **z/OS 1.13 + PTFs** (Must have IBM Software Support Services offering purchased)
 - September 2016 was EoS
- Exploitation Support on z/OS Version 2
 - **z/OS V2.1 + PTFs**
 - Exploitation support of selected functions
 - **z/OS V2.2 + PTFs**
 - Exploitation support of more selected functions
 - **z/OS V2.3**
 - Even more exploitation

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Fix Categories

- z14 server support is provided via a combination of PTFs and web deliverables
- **1. Find what you need the easy way! Use FIXCATs and one PSP section!**
 - Easiest is to use these three FIXCATs for all required and most exploitation PTFs:
 - **IBM.Device.Server.***
 - **IBM.Function.***
 - **IBM.Coexistence.***
 - ...will pull in everything you need
 - They might pull in things you don't need, too, but that's generally OK
- **2. Exploitation** can require more PTFs and a web deliverable
 - For the DB2 Analytics Accelerator, use FIXCAT:
 - **IBM.DB2.AnalyticsAccelerator***
 - Exploitation of Crypto Express6S requires:
 - The ***Cryptographic Support for z/OS V2R1 - z/OS V2R3*** web deliverable
- **3. Check Section 5**, Optional Product Levels, in the **3906DEVICE subset 3906/ZOS PSP**
- **If you use FIXCATs you can skip the rest of it!**

z14 and Previous Servers Fix Categories and PSP Buckets

- As in the past, if you did not satisfy the requirements for prior generations of servers, you need to install all the maintenance and perform all the required migration actions for them. Here's a list of FIXCATs:

Server	Fix Category	PSP UPGRADE	PSP Subset
z14	IBM.Device.Server.z14-3906*	3906DEVICE	3906/ZOS
z13	IBM.Device.Server.z13-2964*	2964DEVICE	2964/ZOS
z13s	IBM.Device.Server.z13s-2965*	2965DEVICE	2965/ZOS
zEC12	IBM.Device.Server.zEC12-2827*	2827DEVICE	2827/ZOS
zBC12	IBM.Device.Server.zBC12-2828*	2828DEVICE	2828/ZOS
z196	IBM.Device.Server.z196-2817*	2817DEVICE	2817/ZOS
z114	IBM.Device.Server.z114-2818*	2818DEVICE	2818/ZOS
z10EC	IBM.Device.Server.z10EC-2097*	2097DEVICE	2097/ZOS
z10BC	IBM.Device.Server.z10BC-2098*	2098DEVICE	2098/ZOS

Other Fix Categories of Interest

Older FIXCAT categories (pre-z14)	Provides support for	New FIXCAT categories (as of z14) <u>Note the removal of the server level</u>
IBM.Device.Server.*.ParallelSysplexInfiBandCoupling <i>For: z13, z13s, zEC12, zBC2, z196, and z114</i>	Parallel Sysplex InfiBand Coupling	IBM.Function.ParallelSysplexInfiniBandCoupling
IBM.Device.Server.*.ServerTimeProtocol <i>For: z13, z13s, zEC12, zBC2, z196, and z114</i>	Server Time Protocol support	IBM.Function.ServerTimeProtocol
IBM.Device.Server.*.zHighPerformanceFicon <i>For: z13, z13s, zEC12, zBC2, z196, and z114</i>	High Performance FICON (zHPF)	IBM.Function.zHighPerformanceFICON
IBM.Device.Server.*.UnifiedResourceManager <i>For: z13, z13s, zEC12, zBC2, z196, and z114</i>	zEnterprise Unified Resource Manager (zManager)	IBM.Function.UnifiedResourceManager
N/A	zHyperLink	IBM.Function.HyperLink
N/A	Data Set Encryption	IBM.Function.DataSetEncryption

- PTFs that allow prior levels of ICSF to coexist with the Cryptographic Support for z/OS 2.1 – z/OS V2R3 (HCR77C1) web deliverable
 - **IBM.Coexistence.ICSF.z/OS_V2R1-V2R3-HCR77C1**

<http://www.ibm.com/systems/z/os/zos/features/smpe/fix-category.html>

FIXCAT cleanup*
in Aisle 31!
 * Thanks to Kurt Quackenbush



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General Migration Considerations

- z/OS does not require a z14
- A z14 only requires software identified as “base” or “toleration” or support
- A z14 does not require any “functional” or “exploitation” software support
 - However, we recommend installing all z14 service prior to upgrading your hardware
- z14 capabilities differ depending on z/OS release
 - Web deliverables are needed for some functions on some releases
- Recommendations:
 - Avoid migrating to new software releases and servers at the same time
 - Keep quantity of change smaller
 - Less-complex backout, if you need to back out
 - Keep members of the sysplex at the same software levels when possible to reduce functional disparity
 - Review restrictions and migration considerations when creating your upgrade plan

General Recommendations and considerations

- z14 servers extend IBM Z technology, using:
 - z/Architecture (introduced with z900/z800)
 - Multiple Logical Channel Subsystems (z990/z890)
 - OSA-Express2, FICON Express4, Crypto Express2 (z9 EC/z9 BC)
 - HiperDispatch, Large Pages, zHPF (z10 EC, z10 BC)
 - Native PCIe-based I/O – FICON Express8S and OSA Express4S (z196, z114), FICON Express16+ and Crypto Express6s (z14)
 - Flash Express (replaced in the z14 by Virtual Flash Memory, VFM), RoCE Express, and zEDC (zEC12/zBC12)
 - zHiperLink (introduced with z14)
- z9 EC, z9 BC, z10 EC, z10 BC, z196, z114, zEC12, zBC12, z13 and z13s server migration actions “inherited”
- Many functions are enabled/disabled based on the presence or absence of the required hardware and software.
 - Some functions may have exploitation or migration considerations

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Unsupported Hardware Features on z14 Servers

- Coupling:
 - HCA2-O and HCA2-O LR
 - ISC3
- Networking:
 - CHPID Type OSN (OSA Express for NCP) is not supported on OSA-Express5S GbE LX
 - OSA Express4S 1G SX/LS, 10G SX/LX
- Other:
 - Crypto Express3 and Crypto Express4S
 - FICON Express4 and Express8 (SX and LX)
 - Flash Express Adapter, replaced by Virtual Flash Memory (VFM)
 - IBM zAware Firmware Appliance, replaced by IBM Operations Analytics for z Systems™, V3.1
 - (5698-ABH)
 - STP Mixed CTN; all servers in the timing network must be configured in STP-only mode
 - IBM zEnterprise Application Assist Processor (zAAP)
 - IBM supports running zAAP-eligible workloads on IBM z Integrated Information Processors (zIIPs)
 - This was intended to help facilitate migration and testing of zAAP workloads on zIIPs.
 - With a z14, at least one CP must be installed at the same time as any zIIPs or prior to the installation of any zIIPs
 - The total number of zIIPs purchased cannot exceed twice the number of CPs purchased

These hardware features cannot be ordered on or carried forward to z14 servers

New zArchitecture Machine Instructions

- OPTABLE option now supports ZS8
 - The assembler loads and uses the operation code table that contains the mnemonics for the machine instructions specific to zArchitecture and z14 instructions
- These mnemonics may collide with the names of Assembler macro instructions you have
 - If you code Assembly Language macros, you should compare the list of new instructions to the names of you Assembler macros
 - If a conflict is identified, then either:
 - Rename your affected macros
 - Specify a separate assembler OP CODE table – PARM=,ASMOPT, or ‘*PROCESS OPTABLE’ insource
 - *See HLASM Programmer’s Guide*
 - Use a coding technique that permits both use of a new instruction and a macro with the same name in an assembly such as HLASM’s mnemonic tag (:MAC :ASM)
 - *See HLASM Language Reference*
- For assistance in identifying assembler macros which conflict with z14 hardware instructions, see this document: <http://www.ibm.com/support/techdocs/atmastr.nsf/WebIndex/PRS5289>

IOCP (I/O Configuration Program) for z14

- IOCP provides support for:
 - z14 Base machine definition
 - New PCI function adapter for zHyperLink
 - New PCI function adapter for RoCE Express2 (CX4)
 - New IOCP Keyword **MIXTYPE** required for prior FICON cards
 - **Note:** [FICON Express16S+](#) does not allow a mixture of CHPID types on new cards
- All supported z/OS releases use the same IOCP FMID (HIO1104)
- PTFs are required to write an z14 IOCDS
- For an upgrade, it is possible to use a z13 IOCDS if no new functions are required for the z14:
 1. Write the IOCDS on the z13 before the upgrade
 2. Do the upgrade to z14 and POR with the IOCDS you wrote above
- ...however, it is recommended to write a z14 IOCDS to the z13 to be upgraded instead

HCD and HCM Support for z14

- For both HCD and HCM:
 - z14 base machine definition and activation support
 - zHyperLink[®] support with new PCIe function type HYL with PORT attributes
 - RoCE Express2
 - Support for new PCIe function type RoCE-2
 - **FICON Express16S+** support
 - Warning for mixed CHPID types on the same adapter
 - LinuxONE definition support
 - Hardware can be defined on any supported OS version and server. Dynamic activation of new server and new adapter types can only be done on a z14 server
 - Support for z/OS 2.1 and later with limited support for z/OS 1.13
 - z/VM V6R2, V6R3, and V6R4
 - Note: HCD service needs to be installed on all systems used for HCD definition and activation
- Additional requirements for HCM:
 - HCM service must be installed on all systems where HCD definition and activation is done
 - Workstation code must be refreshed

HCD Activation Support

- Dynamic activation is supported on z/OS V2.1 and later releases
- IBM recommends that you define and activate all the new hardware definitions on a z/OS V2.1 (or later) system with the appropriate HCD/HCM PTFs installed and only perform software activations (with hardware validation) on lower level systems
- Dynamic activation is **restricted** on z/OS V1.13:
 - **z/OS V1.13** allows no hardware activation if PCIe functions or the PNETID attribute for channel paths is defined
 - Limited software activation with hardware validation support

EREP for the z14 ... and Beyond!

- EREP (Environmental Record Editing and Printing) is the formatting utility for LOGREC data, and can create many different readable reports
 - EREP is a base z/OS element
 - EREP has no new software and hardware dependencies
 - Starting with the PTF for APAR IO24874, EREP supports any specification for the CPU parameter
 - Prior to IO24874, specifying the CPU parameter with an invalid CPU model will yield:

```
CPU=(XXX9999,2000)  
IFC131I Syntax Error at *
```

- With IO24874, EREP will accept any CPU type, but issue an existing message if no records are found:

```
IFC120I      0 Records That Passed Filtering
```

- If a record with a CPU model found in LOGREC matches what is specified, EREP will format it

z14 IPL Mode

- The z13 and z13s were the last processors to support IPL in ESA/390 Mode
- The z14 must be IPLed in zArchitecture Mode
 - The things that IPLed in ESA/390 mode and then switched to zArchitecture mode had to change!
- Thus, there are changes to IPL processing for:
 - z/OS, including:
 - z/OS IPL
 - Standalone Dump IPL
 - Standalone DFSMSdss IPL
 - ICKDSF IPL
 - z/VM, including:
 - CP IPL
 - Standalone Dump IPL
 - DDR IPL
 - Device Support Facility (DSF)

For z/OS, the FIXCATs will pull in everything needed; for z/VM, see the PSP bucket

ICKDSF Release 17

- ICKDSF Release 17 is the supported release of ICKDSF
 - Device Support Facilities is a nonexclusive element of z/OS
- The Stand-Alone version of ICKDSF IPLs in z/Architecture mode with APAR PI46151
 - Install the PTF (UI38554)
 - Don't forget to re-create the standalone version of ICKDSF!
- The IPLable CD version of ICKDSF also supports z/Architecture mode with APAR PI75033, but you must re-order it to get the new level
- Both can be IPLed on any supported processor and will switch to z/Architecture mode
- Publication:
 - [ICKDSF User's Guide and Reference GC350033-42](#)

DFSMSdss

- The DFSMSdss Stand-Alone Services has likewise been changed to IPL in z/Architecture mode
 - (Included in z/OS V2.3)
 - APAR [OA47091](#) for z/OS V2.1 and z/OS V2.2
 - APAR [OA52041](#) for z/OS V1.13
 - Install the PTF (or z/OS V2.3!)
 - Don't forget to re-create the standalone version of DFSMSdss!
- This version can be IPLed on any supported processor
- The Stand-Alone Services program can run in a z/OS LPAR or in a virtual machine under z/VM in an LPAR with a general purpose machine processor (CP)
- Publication:
 - [z/OS V2R2.0 DFSMSdss Storage Administration \(SC23-6868\)](#)

Use of the LOADxx MACHMIG Statement

- **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 are 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
 - **VEF** – The hardware-based vector registers (VR) in support of SIMD
 - **GSF** - Guarded Storage Facility (new with z14)
- A maximum of 3 MACHMIG statements are allowed
- Default: None
 - If MACHMIG statement is not specified, the system does not limit its use of the machine facilities

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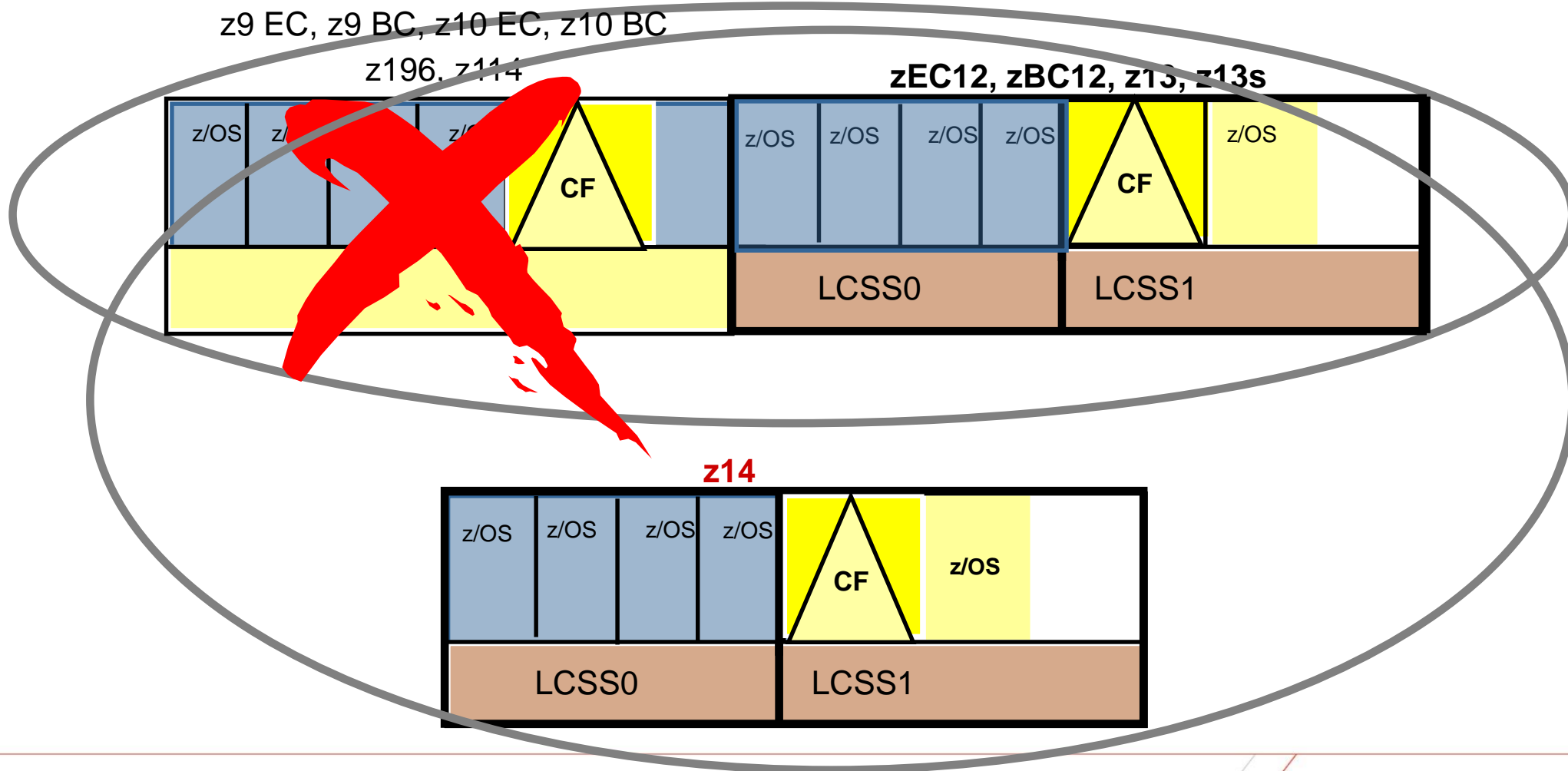
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Server Participation in a Parallel Sysplex

- z14 servers support active participation in the same Parallel Sysplex with these servers:
 - IBM z14
 - IBM z13™
 - IBM z13s
 - IBM zEnterprise® EC12 (zEC12)
 - IBM zEnterprise BC12 (zBC12)
- This means:
 - Configurations with z/OS on one of these servers can add a z14 server to their Sysplex for either a z/OS or a Coupling Facility image
 - Configurations with a Coupling Facility on one of these servers can add a z14 server to their Sysplex for either a z/OS or a Coupling Facility image

Server Participation in a Parallel Sysplex ...

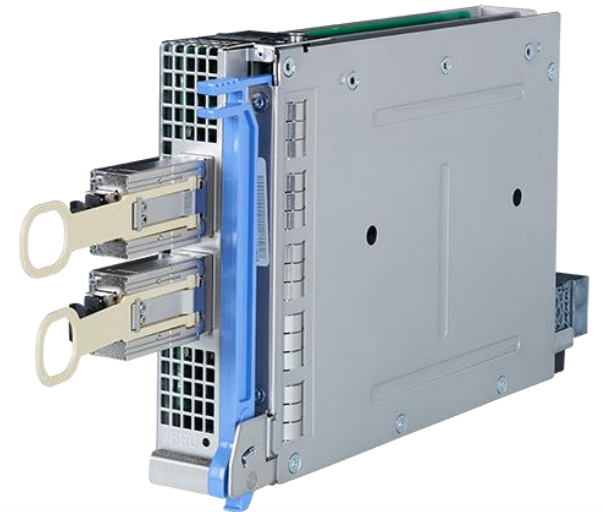
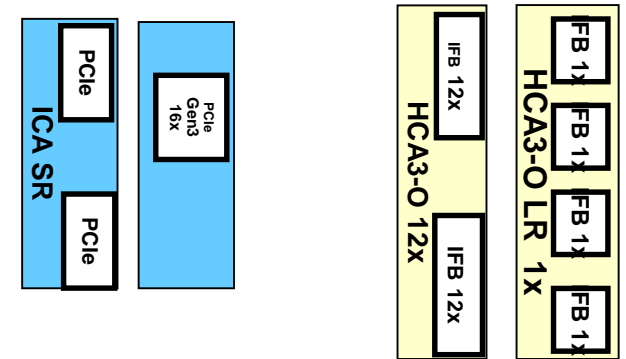
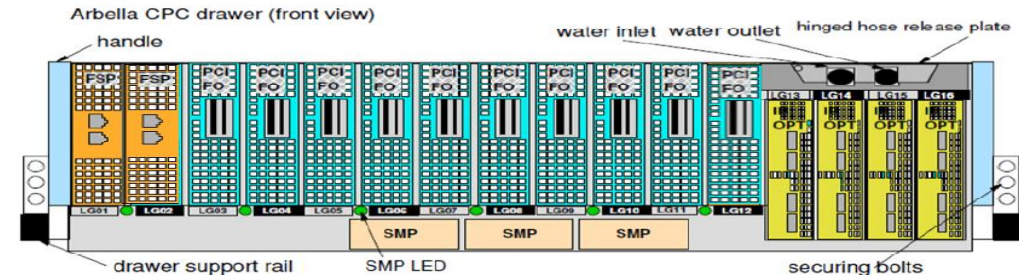


Parallel Sysplex Coupling Links - SR

- **IBM Integrated Coupling Adapter (ICA SR)**

- **Coupling Connectivity into the Future (Short Distance)**

- ICA SR is Recommended for Short Distance Coupling z13 to z13 and beyond
- New coupling CHPID type: CS5, Performance similar to Coupling over InfiniBand 12X IFB3 protocol
- PCIe Gen3, Fanout in the CPC drawer, 2-ports per fanout, 150m; z13 to z13 and later Connectivity
- Maximums: 32 links per z13; Up to 4 CHPIDs per port, 8 buffers (that is, 8 subchannels) per CHPID
- ICA requires new cabling for single MTP connector
 - Differs from 12X InfiniBand split Transmit/Receive connector; 150m: OM4; 100m OM3
- Available with z13 and later servers

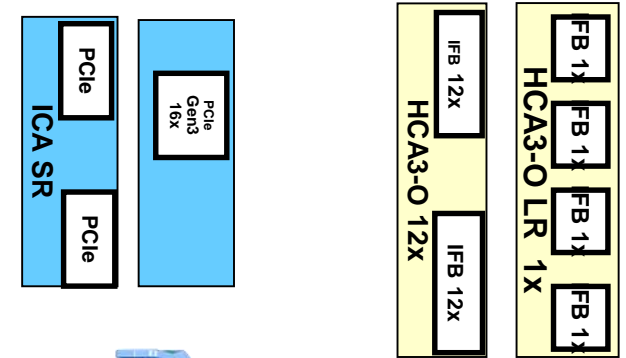
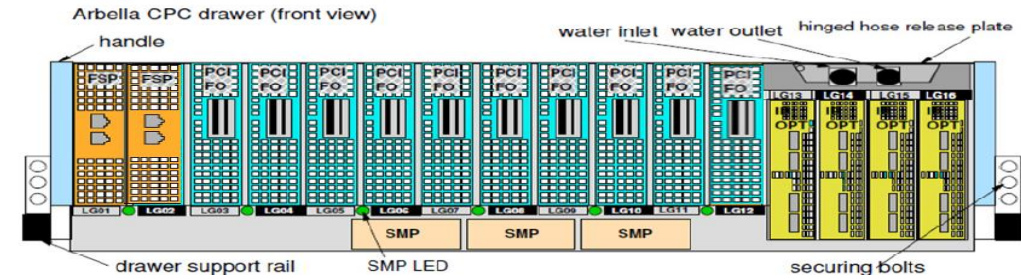


Parallel Sysplex Coupling Links - LR

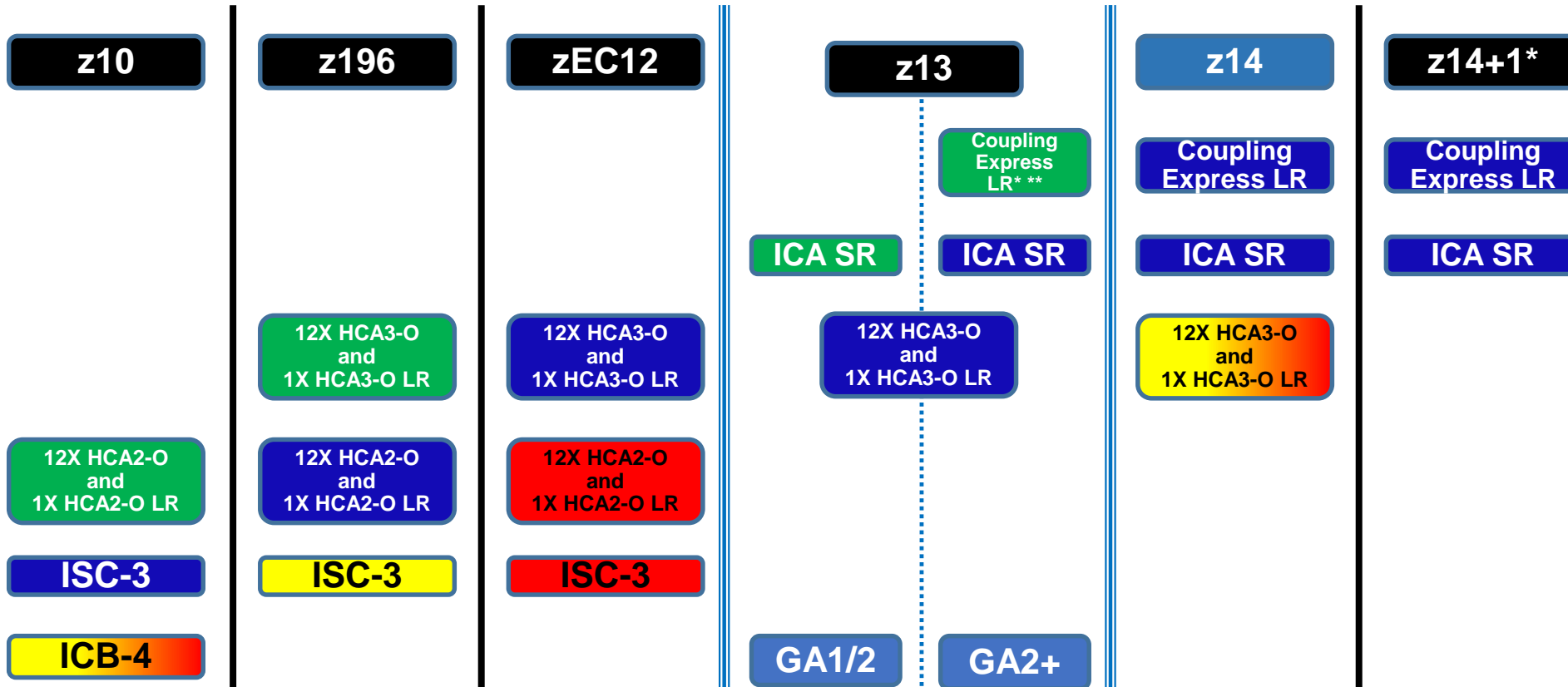
- **Coupling Express LR (CE LR)**

- **Coupling Connectivity into the Future (Long Distance)**

- *Coupling Express LR is recommended for Long Distance Coupling z13 to z13 and up*
- New coupling CHPID type: CL5. Performance expected to be similar to Coupling over InfiniBand 1x for most workloads, but with improved bandwidth
- PCIe I/O drawer required for CL5 adapter – *even for standalone CF usage*
- Adapter (2-port card): same adapter as 10GbE RoCE Express but with Coupling Optics and Firmware
- 10 Gbps, Up to 4 CHPIDs per port, 32 buffers (that is, 32 subchannels) per CHPID
- Distance: 10 KM Unrepeated; up to 100 KM with a qualified DWDM
- Point-to-Point just like InfiniBand 1X and ISC-3; cannot be utilized in a switched environment
- Cabling: Utilizes same 9μ, Single Mode fiber type as 1X IFB and ISC-3



Coupling Link Roadmap – High End z Systems



Legend:




**All statements regarding IBM's future direction and intent are subject to change or withdrawal without notice, and represent goals and objectives only.*

*** Coupling Express LR is the new Long Distance Ethernet Coupling Link which resides in the PCIe I/O drawer. Like ICA SR, it requires z13 to z14 and later connectivity.*

Coupling Link Constraint Relief on z14

- z14 provides additional physical and logical coupling link connectivity compared to z13
 - Maximum number of physical ICA SR coupling links (ports) is increased from 40 per CEC to 80 per CEC
 - Increased from 20 ICA SR adapters to 40 adapters, each 2-port adapters

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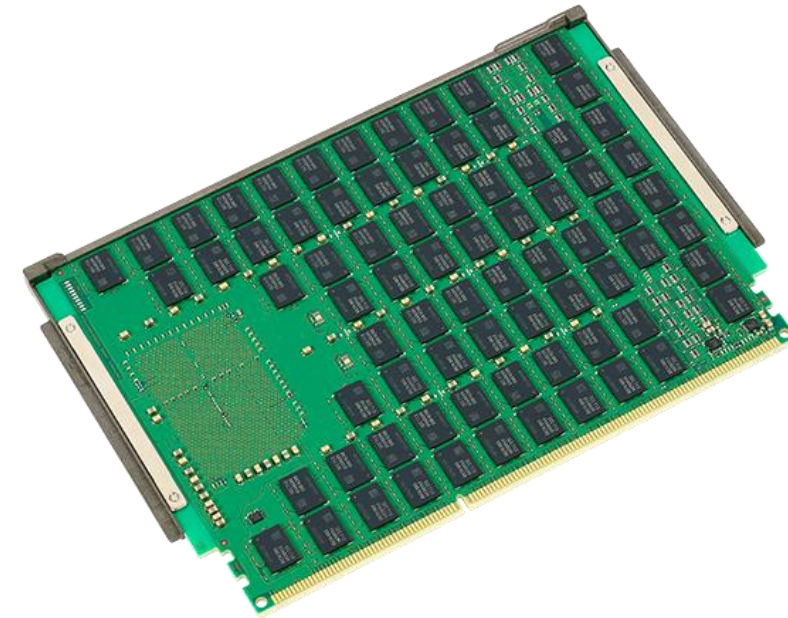
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Exploitation Considerations for Selected Functions

- IBM Virtual Flash Memory
- RDMA over Converged Ethernet (RoCE) RoCE Express2
- Two way Simultaneous Multi Threading (SMT-2) for SAPs
- Exploitation of new hardware instructions – XL C/C++ ARCH(12) and TUNE(12)
- CFCC Level 22
- Coupling Facility Scalability
- Coupling Facility Encryption
- Data Set Encryption
- Guarded Storage Facility
- Instruction Execution Protection
- z/OS Memory Management
- Huffman Encoding for CMPSC
- z14 HiperDispatch Enhancements
- Crypto Express6 and CPACF Cryptographic Support
- zHyperLink®

IBM Virtual Flash Memory (VFM)

- Replacement for IBM Flash Express on z14
 - VFM implements EADM Architecture using HSA-like memory instead of Flash card pairs
 - Saves at least two PCIe I/O Drawer Slots, Less power consumption and no API changes
- Reliability, Availability, Serviceability
 - VFM Concurrent Add
 - The memory associated with the VFM can be evacuated to another processor drawer along with the “regular” customer memory
- Increment Size
 - 1.5 TB (IBM Flash Express adapter has 1.4 TB)
 - Up to **four** 1.5 TB features
 - Add Customer memory + HSA (192GB) + VFM (n x 1.5 TB) to determine memory ordered via eConfig
 - IBM Virtual Flash Memory Feature Code is 0604



IBM Virtual Flash Memory ... Allocation

HMC1: Hardware Management Console Workplace (Version 2.14.0)

Hardware Management Console pedebug

Home Customize/D... - MLMDR31R

Customize Image Profiles: MLMDR31R : LP01 : Storage

MLMDR31R
LP01
General
Processor
Security
Storage
Options
Load
Crypto

Central Storage

Amount in: Gigabytes (GB)

Initial: 2.0

Reserved: 0.0

Storage origin:
 Determined by the system
 Determined by the user

Origin: 0.0

Virtual Flash Memory (GB)

Choose memory amounts in 16GB increments up to a maximum of 2048GB.

Initial: * 16

Maximum: * 32

Cancel Save Copy Profile Paste Profile Help

Consider defining 0-"something" so that you can dynamically add it later without having to reactivate the LPAR, even if you won't use it right away!

RDMA over Converged Ethernet - RoCE Express2

- RoCE Express2
 - Technology refresh with no changes to the base SMC-R or RoCE functionality
 - z/OS Communications Server (CS) provides a new software device driver ConnectX4 (CX4)
- Provides:
 - Increased Bandwidth: Dual port cards for 10 GbE
 - Maximum of eight (8) features per CEC
 - Also, maximum of both features cannot exceed eight features
 - Increased Sharing: 127 Virtual Functions (VFs) per PCHID port (63 per port), more than a 4X increase from z13
- RoCE Express2 and the new CS RoCE device driver are transparent to:
 - Upper layers of the CS (the SMC-R and TCP/IP stack) -and-
 - Application software (exploiting TCP sockets)



RoCE Express2 ...

- RoCE Express2 introduces a minor change in how the physical port is configured
 - In IBM z13 RoCE Express physical port configuration:
 - Portnumber (1 or 2, default=1) is configured in TCP/IP Profile. The FID (configured in HCD) has access to both ports is based on software usage model (OS Configuration)
 - z14 RoCE Express2 physical port configuration:
 - Configured in HCD (IOCDs) with the FID and must be specified (no default).
 - Each FID now has access to the single defined port *
 - The OS must learn the port number associated with a FID
 - On z14 two generations can co-exist and both (port definition) models must also exist
 - APAR [OA51867](#) rolled back to z/OS 2.1

* Will ignore (tolerate) if coded in TCP/IP profile

RMF Support for RoCE Express2

- Support of RoCE Express2 (CX4) on z14
 - Current RMF PCIE Activity reporting already provides statistics and performance measurements on RoCE CX3 adapters
 - RMF is enhanced to recognize the new CX4 card type and properly display CX4 cards in the PCIE Activity reports
 - z/OS V2.2 RMF and later will provide this support
 - PCIE data gathering can be turned on or off in Monitor III

Simultaneous Multi Threading (SMT)

- Support provided for zIIPs, IFLs, and now **SAPs**
- Increased capacity expected for most workloads
 - Achieved through increased parallelism
 - Twice as many execution paths as similarly configured server in non-SMT mode
- No application changes required to exploit MT
- Comprehensive measurement data for performance monitoring, capacity planning, accounting, and chargeback
- Optional enablement for each z/OS, z/VM, or Linux on z Systems instance
 - For zIIPs and IFLs
- **Optimized second generation SMT with growth in cache and TLB2**
- **Better thread and resource balancing**
- **Multiple outstanding translations**
- **Optimized hang avoidance mechanisms**

z/OS XL C/C++ ARCH(12) TUNE(12)

- Vector programming enhancements:
 - z14 "vector float" data type support
 - Enhanced existing built-in-functions (BIFs) to support "vector float" data type
 - Approximately 50 additional z14 vector BIFs added
 - Make use of new vector floating point support for IEEE Extended Format
 - Auto-SIMD enhancements to make use of the new data type and BIFs
- z14 Miscellaneous Instructions
 - New forms of Halfword Add/Subtract instructions; new forms of Multiply, and a new Branch instruction for z14
- z14 Vector Packed Decimal Facility
 - Packed decimal type support in the z/OS H/W is through a series of instructions that operate on storage. z14 introduces set of instructions that perform operations on decimal type using vector registers. This support takes advantage of these new z14 instructions for performance improvement
- This set of functions is designed to take advantage of the new z14 instructions, and intended to provide performance improvements for applications

XL C/C++ ...

- Requirements
 - Must use z/OS V2.3 compiler to exploit ARCH(12) and TUNE(12)
 - Code compiled can run on z/OS V2.1 and up on a z14 for these functions to be enabled
 - Note: The PTF for APAR [PI12281](#) must be installed on z/OS V2.1 and V2.2 to enable SIMD instructions on z13 and later
 - z/OS image running on z/VM 6.3 needs PTF for APAR [VM65733](#) or higher z/VM release
 - CICS/TS 5.3 with PTF for APAR [PI59322](#) or higher CICS/TS release
 - No toleration support is required
- Binaries produced by the compiler for a z14 can only be executed on z14 and above, as it will make use of the vector facility on z14 for new functions
 - Using older versions of the compiler on z14 and lower ARCH levels does not enable new functions
- Since these are new functions
 - No fallback dependencies and No migration actions are required
- To enable the use of new functions
 - Specify ARCH(12) and VECTOR for compilation

CF Level 22 Exploitation

- Coupling Facility processor scalability
- Coupling Facility SMSG Diagnostics
- XCF/XES List Notification Enhancements

- Structure and Coupling Facility Storage Sizing with CF Level 22
 - May increase storage requirements when moving from:
 - CF Level 21 (or below) to CF Level 22
 - CFSizer Tool recommended
 - <http://www.ibm.com/systems/z/cfsizer>

 - As in prior CF Levels, ensure that the CF LPAR has at least 512 MB storage for CFCC code

Coupling Facility Processor Scalability

- Coupling Facility work management and dispatcher changes to allow improved efficiency as additional processors are added to scale up the capacity of a CF image
 - Non-prioritized (FIFO-based) work queues
 - Formerly, ordered queues were maintained in command-sequence-number (CSN) order, requiring expensive sort/insertion logic
 - Avoids overhead of maintaining queues sorted in CSN order
 - Master/slave system-managed duplexing protocol
 - Avoids costly latching deadlocks that often occurred between primary/secondary structure
 - Master/slave protocol allows one structure to “take the lead” on all latching, avoiding deadlocks
 - Specialized processors that operate for CF images of 5 or more dedicated processors
 - This enhancement applies only to CF images using dedicated processors (**not shared**)
 - One specialized processor for inspecting suspended commands and making them ready to run on the non-specialized processors
 - One specialized processor for pulling in new commands that have arrived on coupling links
 - Avoids lots of inter-processor contention previously associated with these two processes
 - All remaining processors are “unspecialized” for general CF request processing
 - Exploitation of improved z14 instruction set

Coupling Facility Processor Scalability

Migration Considerations

- These changes automatically apply to all CF images on z14
- In a mixed environment, with CFs in different machine generations, there will necessarily be a mix of CF dispatching modes
 - z14 CFs will be using non-prioritized FIFO ordering
 - Older CFs will be using CSN-ordered work queues
- The different dispatching modes matter only when there is a system-managed duplexing relationship present between the two kinds of CFs
 - z/OS automatically manages the use (or not) of the master/slave duplexing protocol on a per-structure basis when a CF structure is duplexed across CFs with different dispatching modes, to optimize for the best results
- The Master/Slave protocol will be automatically enabled when one or both duplexed List structures are allocated in CFs that are at CFCC Level 22 or above and appropriate z/OS exploitation support on z/OS 2.1 and later is installed

Coupling Facility Request Diagnostics

- Provides support in z/OS for enhancements to Coupling Serviceability
- Diagnostic information related to coupling links will be surfaced to z/OS by CF μ code to allow this additional information to be captured in logs and traces
- This diagnostic information will be valuable in diagnosing hardware errors related to CF links
 - CF μ code is enhanced to return information on SMSG command
 - z/OS code is added to either trace or log or both when the additional diagnostic information is provided
- This support is provided in z/OS 2.3 and z/OS 2.2 + PTF on z14
- This function will be enabled by default if both hardware and software support is available

Coupling Facility List Notification Enhancements

- CF list structures support 3 notification mechanisms to inform exploiters about the status of shared objects in the CF
 - List notification (used by many exploiters including XCF Signalling)
 - Key-range notification (used predominantly by MQ shared queues)
 - Sublist notification (used predominantly by IMS shared queues)
- CF exploiters have requested the following 3 enhancements to these existing notification mechanisms
 - Immediate/delayed round-robin notification for list and key-range notifications (requested by MQ)
 - Avoids “overkill” of shotgunning notifications of new work being placed onto a queue to all users of the queue.
 - Instead, one selected user (round robin) will receive an immediate notification, and then the other users will receive a delayed notification if and only if the first user does not process the work
 - Tailorable delay interval on a per-structure basis under administrative control via CFRM policy. Transparent to exploiters
 - Aggressive list and key-range notifications (requested by MQ)
 - Allows additional notifications to be sent to users as additional work elements are placed onto the list or key-range, providing follow-up initiative to get those processed in a timely manner. Exploiter-controlled via API.
 - List full/not-full notifications (requested by XCF Signalling)
 - Allows notifications to be sent when a list that was previously full becomes not-full, providing timely initiative to redrive messages that could not be written to the “full” CF list. Exploiter-controlled via API.

Coupling Facility List Notification Enhancements ...

Migration Considerations

- Immediate and delayed round-robin notifications
 - Requires explicit administrative activation of this function via CFRM policy
 - If requested for a downlevel CF, it's ignored (shotgun notifications still take place)
- Aggressive notifications and list full/not-full notifications
 - Exploiter software is sensitive to CFLEVEL and requests these functions only when present for their CF structure
 - Exploiter polling logic must be retained in order to continue to handle cases where the structure is allocated in a downlevel CF
- Support provided for z/OS 2.2 with PTF and later with functional prerequisite of CFCC Level 22
- Benefits
 - Customers expected to see less data sharing overhead associated with the “shared queue” type of users who currently generate “shotgun” notifications to many users simultaneously. Many exploiters (including MQ)
 - Customers expected to see less data sharing overhead and better responsiveness from the CF list structure exploiters who take advantage of aggressive notifications and/or full/not-full notifications
 - MQ
 - XCF Signalling

```
STRUCTURE NAME(strname)
  SIZE(size[u])
  [INITSIZE(initsize[u])]
  [MINSIZE(minsize[u])]
  [SCMMAXSIZE(scmmaxsize[u])]
  [SCMALGORITHM(algorithm)]
  [ALLOWAUTOALT(NO | YES)]
  PREFLIST(cfname1,cfname2,...,cfname8)
  [EXCLLIST(strname1,strname2,...,strname8)]
  [REBUILDPERCENT(value)]
  [DUPLEX(DISABLED | ALLOWED[,dupopts] |
ENABLED[,dupopts])]
  [SUBNOTIFYDELAY(delaytime)]           Default: 5000 µsecs
  [LISTNOTIFYDELAY(listnotifydelay)]    Default: 0 (no delay)
  [KEYRNOTIFYDELAY(keyrnotifydelay)]    Default: 0 (no delay)
  [ENFORCEORDER(NO | YES)]
  [ALLOWREALLOCATE(YES | NO)]
```

Coupling Facility and Data Set Encryption

- The z14's much faster CPACF dramatically reduces the overhead for two new functions:
 - **Coupling Facility structure encryption**
 - New in z/OS V2R3: CF Structure Encryption
 - Wednesday 10:00
 - **Access method-based data set encryption**
 - Protect Your Data at Rest with z/OS Data Set Encryption
 - Wednesday 11:15
 - Pervasive Encryption: Three Essential Views on Encrypting Access Methods
 - Wednesday 4:30 PM



z/OS Data Set and CF Encryption

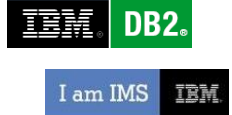
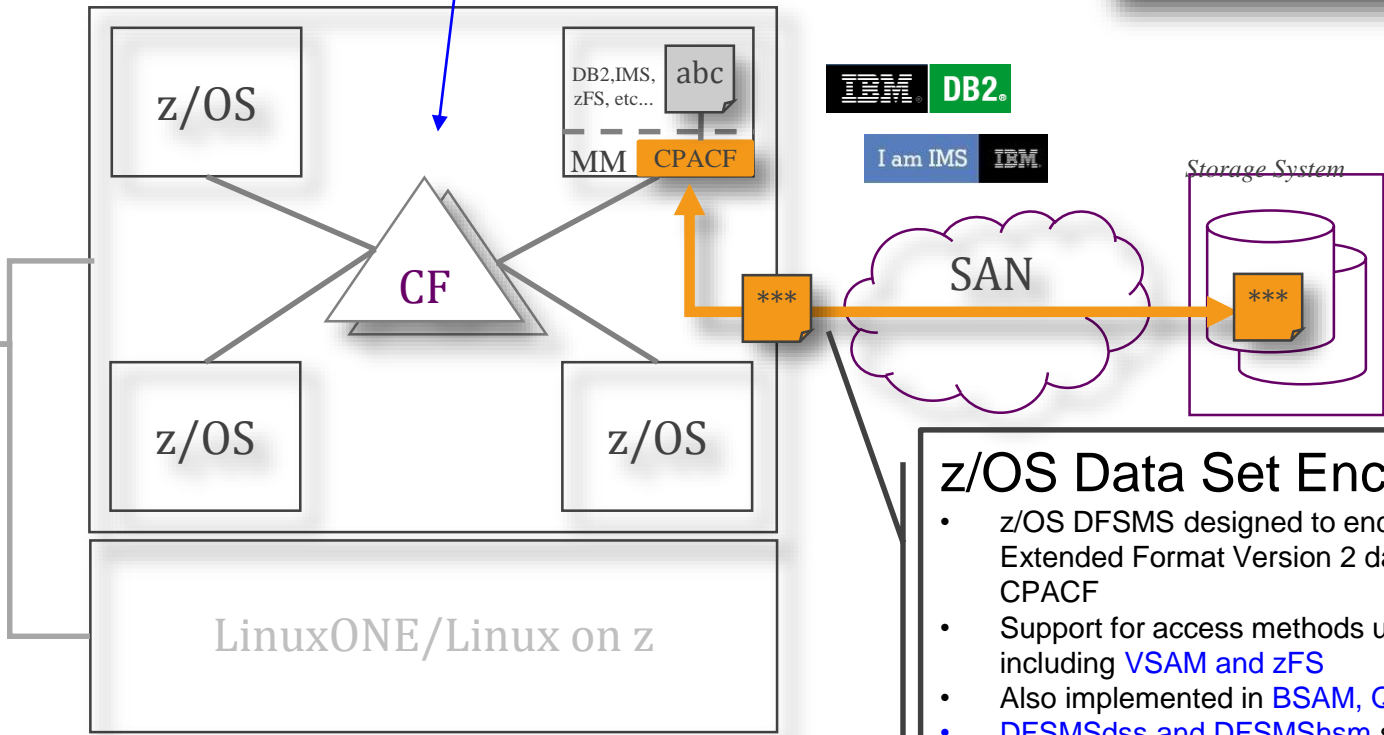
Protection of data at-rest and in-flight

CF Encryption:
 Designed to encrypt and decrypt:

- Cache data
- List structure data

Disk
 At-rest data is protected by layers of encryption controlled by Identity and key management

Legend:
 - encrypted data
 - unencrypted data



Robust Data Protection Value:
 Reduced CPU cost of encryption and simple policy controls allow clients to enable extensive encryption for data in mission critical databases including DB2, IMS, and VSAM

z/OS Data Set Encryption:

- z/OS DFSMS designed to encrypt and decrypt Extended Format Version 2 data on disk using the CPACF
- Support for access methods using Media Manager including [VSAM](#) and [zFS](#)
- Also implemented in [BSAM](#), [QSAM](#)
- [DFSMSdss](#) and [DFSMSshm](#) support for moving encrypted data (migrate, recall, backup, recover)
- Additional SAF-based controls for key access

Note: In-memory system and application data buffers not encrypted

Coupling Facility Encryption

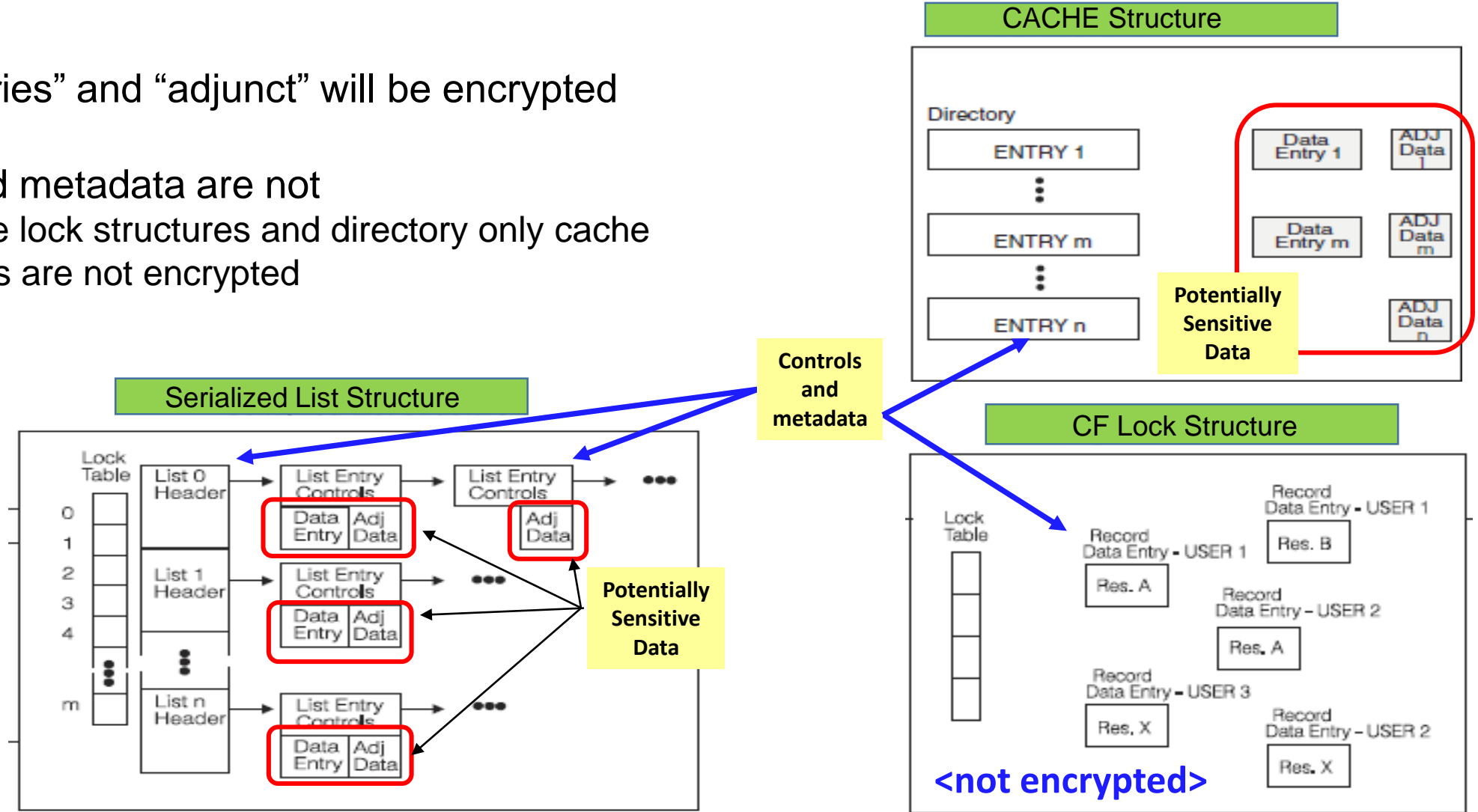
- Today, customer data flowing through the Coupling Facility (CF) link infrastructure is not encrypted
- With z/OS 2.3:
 - Via the CFRM policy, you can specify CF structures to be encrypted
 - Host-based encryption will be used to encrypt data written to specified structures
 - Requires the Central Processor Assist for Cryptographic Functions (CPACF) feature
 - Uses 256-bit Advanced Encryption Standard (AES) encryption with Cipher Block Chaining (CBC)
- Encryption is intended to provide better protection against potential breaches to help prevent the exposure of sensitive data
- **NOTE:** The Coupling Facility and CF Links do NOT perform any encryption/decryption

Coupling Facility Encryption

- This support can only be enabled when all systems are z/OS 2.3 or higher
 - Toleration support is planned for z/OS 2.2 and z/OS 2.1
 - A downlevel system cannot connect to or decrypt a structure encrypted by a higher level system. The toleration basically covers “locking out” down level systems who cannot use encrypted structures and tolerating CFRM policies that enable encryption.
- It is recommended to use CFE on z14; however, encryption may be enabled **without** z14 CF
 - z/OS Systems must have the cryptographic hardware configured and activated to perform cryptographic functions and hold Advanced Encryption Standard (AES) master keys within a secure boundary.
 - Requirements:
 - Crypto Express4 Coprocessor (CEX4C) or Crypto Express5 Coprocessor (CEX5C) with Feature 3863
 - CPACF DES/TDES Enablement must be installed to use features CEX4C or CEX5C
 - The following Access Control Points (ACP) must be enabled in the domain role for the cryptographic coprocessor.
 - The required ACP are enabled by default: Key Generate – OP (Enabled by default), Key Test (Always enabled, can not be disabled), High-performance secure AES keys (Enabled by default)
 - ICSF is required to be started on the z/OS system. The XCF address space must have authorization through RACF or an equivalent security product to access ICSF services protected by the CSFSERV resource class

Encryption applies to data in objects likely to contain sensitive information

- Data in “entries” and “adjunct” will be encrypted
- Controls and metadata are not
 - Therefore lock structures and directory only cache structures are not encrypted



Coupling Facility Encryption ...

- All systems in the sysplex must be at z/OS 2.3 before activating a CFRM Policy that has **ENCRYPT(YES)** which will enable encryption for each CF structure
 - Encryption may be enabled with a lower level CF, however certain functions will be restricted
 - IXCMIAPU must run on a system where ICSF is started
 - XCF REALLOCATE is recommended way to activate the Structure Encryption specifications in the Policy
 - However, any structure rebuild process may be used to put CFRM policy changes into effect, on structure specific basis
 - XCF Display commands are enhanced to show the encryption state for structures
 - XCF has new support for implementing key changes, master-key changes while structure remains encrypted

```
STRUCTURE NAME(structure_name)  
    SIZE(size)  
    [INITSIZE(initsize)]  
    [ALLOWAUTOALT(NO | YES)]  
    PREFLIST(cfname1,cfname2,...,cfname8)  
    [REBUILDPERCENT(value)]  
  
    [ALLOWREALLOCATE(YES | NO)]  
    [ENCRYPT(NO | YES)]
```

Coupling Facility Encryption ...

- Fallback Considerations:
 - Encrypted structures cannot be accessed by down level systems (z/OS V2R2 and below)
 - Connectors on down level systems (z/OS V2R2 and below) will fail to connect to structures that have already been encrypted
 - Active connections on down level systems (z/OS V2R2 and below) will prevent a structure from enabling encryption
- Fallback to z/OS 2.2 or z/OS 2.1 requires toleration APAR once encryption has been enabled for any Coupling Facility structure in the CFRM policy
- Encryption should be disabled for all structures before falling back - Requires CFRM Policy change
- zBNA Tooling will be provided to estimate the cost of encryption for workloads before and after it has been enabled

z/OS Data Set Encryption

- DFSMS is designed to enhance data security with support for data set encryption at the access method level, providing another method to support encryption of data at rest
- The function is designed to give users the ability to encrypt many of their data sets without changing their application programs
 - This can further protect data by requiring SAF-based access to the key labels used by the access method to encrypt and decrypt the data sets, in addition to SAF-based access to the data sets themselves
- Media Manager interfaces are enhanced to support encryption and to allow access methods and programs using Media Manager to exploit encryption
- You can identify which data sets are to be encrypted via JCL, SMS Data Class, RACF data set profile, TSO/E ALLOCATE command, IDCAMS DEFINE command, and Dynamic Allocation text unit
 - Support is provided for:
 - Non-VSAM extended format sequential data sets (Version 2 only) accessed through BSAM and QSAM
 - Extended format VSAM data sets (KSDS, ESDS, RRDS, VRRDS, LDS)
 - zFS 2.3 support available for new file system data sets
 - zFS support for existing file system data sets planned for January 2018

z/OS Data Set Encryption – Hardware Dependencies

- This function requires CP Assist for Cryptographic Functions (CPACF), feature code 3863
- For protected keys, minimum processor hardware is z196 or higher processor with CEX3 or later
 - z196/z114 require CEX3 (FC 0864)
 - zEC12/zBC12 require CEX3 (feature 0864) or CEX4 (FC 0865)
 - z13/z13s - CEX5 (FC 0890)
- One of the major enhancements of the z14 processor is an improvement in encryption performance.
 - The degree of improvement is based on the encryption mode used.
- To obtain the best performance improvements possible with z14, the encryption mode of XTS will be used by access method encryption
- Migration actions
 - **Make sure you disable encryption of any production data until all sharing systems (including replication target systems, fallback systems, backup systems, and DR systems) support encryption!**

Guarded Storage Facility (GSF) on z14

- Allows an area of storage to be identified for which an Exit routine gets control if it is referenced
- Intended to allow Java exploitation to improve garbage collection
 - A pause-less-often (Pause-Less) approach, **not** a *no-pause approach*
- GSF is managed by new instructions that define Guarded Storage Controls and system code to maintain that control information across un-dispatch and re-dispatch
- Function is provided on z/OS 2.2 and later on z14
 - APAR [OA51643](#) must be installed
 - At z14 GA this facility will not be available if running as z/VM guest
 - Guest exploitation support for GSF is planned for z/VM 6.4 by YE 2017
- MACHMIG statement in LOADxx of SYS1.PARMLIB provides ability to disable the function

Instruction Execution Protection (IEP)

- IEP is a hardware function provide by z14 (based on DAT table entry bit)
- z/OS provides new function to request that non-executable memory be allocated
 - Exploitation support in RSM for a new EXECUTABLE=NO option on IARV64 and STORAGE
 - Any attempt to execute an instruction within such an area will result in a program check
 - Could be an indication of an attempt to violate system integrity
- RTM will write LOGREC record of any program-check that results from IEP
- Support planned for z/OS 2.2
 - PTFs for APARs [OA51030](#), [OA51647](#), [OA51612](#) must be installed
 - PTF for toleration APAR required for lower z/OS releases, [OA52015](#)
 - Function will not be available when running as a z/VM guest

z/OS Memory Management on z14

- RSM Frame management algorithmic improvements for dynamic workloads
 - Many internal RSM changes
 - Minimum 8 GB LPAR storage will be required to IPL z/OS V2.3 and later releases on a z14
 - If you IPL z/OS V2.3 on z14 with <8 GB, you get this message:

IAR057D LESS THAN 8 GB OF REAL STORAGE IMPACTS SYSTEM AVAILABILITY – ADD STORAGE OR REPLY C TO CONTINUE

- If you continue, you understand that less amount of memory could impact system availability
 - This WTOR will **not** be issued on pre-z/OS V2.3 systems on z14
 - A health check will remind you of this recommendation on z/OS V2.1 and V2.2
 - z/OS 2.3 and later releases running as z/VM guest and zPDT on z14 will require 2 GB storage
- RSM Serialization algorithmic improvements for dynamic workloads
 - Optimizations for z14 performance
 - Support can be disabled using DIAGxx parameters FREEMAINEDFRAMES and FF31HIGH
 - Support provided for z/OS V2.1 and later releases

CMPSC Compression Enhancement

- Hardware support of Huffman encoding to improve compression
- Software-based expansion of Huffman-encoded text can be used when hardware support is not available on earlier processors
- Support is provided by z/OS 2.1 and later with [OA49967](#) on z14

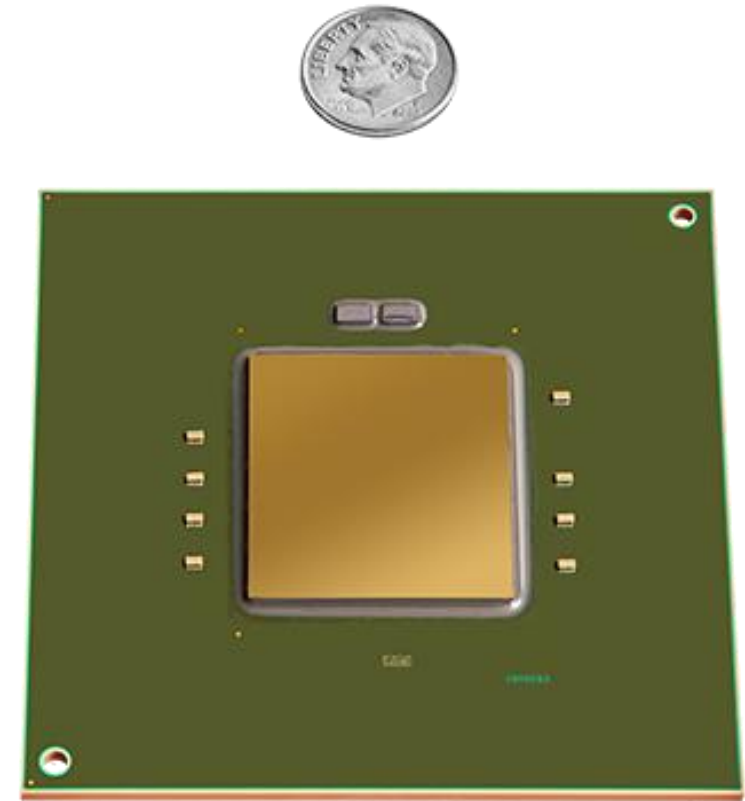
z14 HiperDispatch – Performance Enhancements

- z/OS HiperDispatch enhancements on z14
 - Dispatching work back to same core when data likely in core cache
 - “Smarter” HiperDispatch address space breakup algorithm tries to balances TCBs for an address space across a set of affinity nodes and keep them close to each other from a processor topology perspective
 - Optimization for deep verses shallow Work Unit Queue (WUQ)
- Support is rolled back to z/OS 2.1 when running on z14 with the PTF for APAR [OA50144](#)
- Enablement via IEAOPTxx HiperDispatch=YES
 - On z196 and later processors, the system defaults to HIPERDISPATCH=YES when not specified in IEAOPTxx (z/OS V1.13 and later)
 - HIPERDISPATCH=YES is set by the system, overriding the specification in IEAOPTxx, when:
 - An LPAR has >64 Logical CPUs, which requires HiperDispatch
 - LOADxx specifies PROCVIEW CORE (z/OS V2.1 and later)

New Cryptographic Support

ICSF Web Deliverable HCR77C1 - Cryptographic Support for z/OS V2R1 – z/OS V2R3

- z14 CPACF support
 - SHA-3 Adding to One-Way Hash service
 - True Random Number Generator (TRNG)
 - Improve performance for GCM for SYE/SYD
 - Exploitation is with ICSF (HCR77C1), which will run on z/OS 2.1 and later



z14 Processor Chip

New Cryptographic Support

ICSF Web Deliverable HCR77C1 - Cryptographic Support for z/OS V2R1 – z/OS V2R3

- Support for usage and administration of Crypto Express6S feature
 - New Crypto card available on z14
 - Functional equivalence to Crypto Express5, with additional enhancements
 - May be configured as:
 - Accelerator (CEX6A)
 - CCA coprocessor (CEX6C)
 - EP-11 coprocessor (CEX6P)
- **PCI-HSM (Payment Card Industry – Hardware Security Module)**
 - **Support for coprocessor in PCI-HSM Compliance Mode**
 - Enablement will require TKE 9.0



Note: Toleration APAR for CEX6 and PCI-HSM also needed for CEX5 toleration
– OA45547 for HCR77A0 and HCR77A1

Crypto Express6S and Trusted Key Entry (TKE)

- On z14, TKE 9.0 is required to manage the new Crypto Express6S features
- TKE 9.0 Licensed Internal Code requires Crypto Express6S feature
- The configuration migration tasks feature of the TKE was enhanced to also support the Crypto Express6S coprocessor
 - TKE 9.0 can be used to collect data from previous generations of Cryptographic modules and apply the data to Crypto Express6S coprocessors
 - TKE 9.0 can manage Crypto Express 5S features



RMF Support for Crypto Express6

- RMF enhances the Monitor I Crypto Activity data gatherer to recognize and exploit performance data for the new Crypto Express6 (CEX6) card, which is supported with z14 GA1
- RMF supports Crypto Express6 which is configured as
 - Cryptographic Accelerator
 - Cryptographic Coprocessor
 - Cryptographic PKCS11 Coprocessor
- RMF provides CEX6 crypto activity data in:
 - SMF type 70 subtype 2 records
 - RMF Postprocessor Crypto Activity Report
- Support will be rolled back to z/OS 2.1
- If CEX6 is not available or firmware doesn't provide type 10 CMB, RMF will not produce CEX6 Activity Report
- Turn on/off Monitor I data gathering
 - CRYPTO/NOCRYPTO

Additional RMF Support for z14

- Support of highest physical core address 'EF'x on z14 with OA51913
 - ▶ Diagnose 204 can return performance data for physical cores that have a core address between 0 and 239, and RMF CPU data gatherers and reporter are updated
- Multi-Threading support for SAPs
 - ▶ The maximum number of logical SAPs on z14 can become 88
 - ▶ Can now report on 88 SAPs in the RMF Post processor I/O Queuing Activity text report
- Virtual Flash Memory support
 - ▶ With z14, the SCM resource consists of chunks of RAIM instead of flash adapters
 - ▶ IOS API IOSSCM provides RMF with an SCM measurement block that is reflecting the complete VFM activity on a particular LPAR and on the CPC
 - ▶ Indicates whether **VFM** or old **Flash Express** adapters are used
 - ▶ SMF 74 subtype 10 indicates whether the underlying technology is using VFM instead of Flash Express adapters
 - ▶ Description of some fields in the RMF SCM Activity reports are changed

z14 Hardware Instrumentation Services (HIS)

- CPUMF's Sample and Counter changes on z14
 - Support for z14 Counter First Version Number (CSVN=3)
 - Problem Counter Set updates to define only first two counters and reserve remaining Counters
 - Support z14 new Diagnostic Sample Data format codes and lengths
 - Support z14 Sampling Data Block (SDB) Trailer basic and diagnostic sample data entry size for easier traversal of sampling data
 - When running on z14 z/OS support is provided back to z/OS 2.1
 - Migration Actions:
 - HISSERV Profilers may require changes to ignore new diagnostic samples
 - HISSERV Profilers, SMF 113, or USS Counter File consumers may require changes to tolerate 2 counters (cycle and instruction) in the Problem Counter Set
 - The Load-Program-Parameter and the CPU-Measurement Facilities will describe this function:
 - <http://www.ibm.com/support/docview.wss?uid=isg26fcd1cc32246f4c8852574ce0044734a&aid=1>

zHyperLink® The Technology

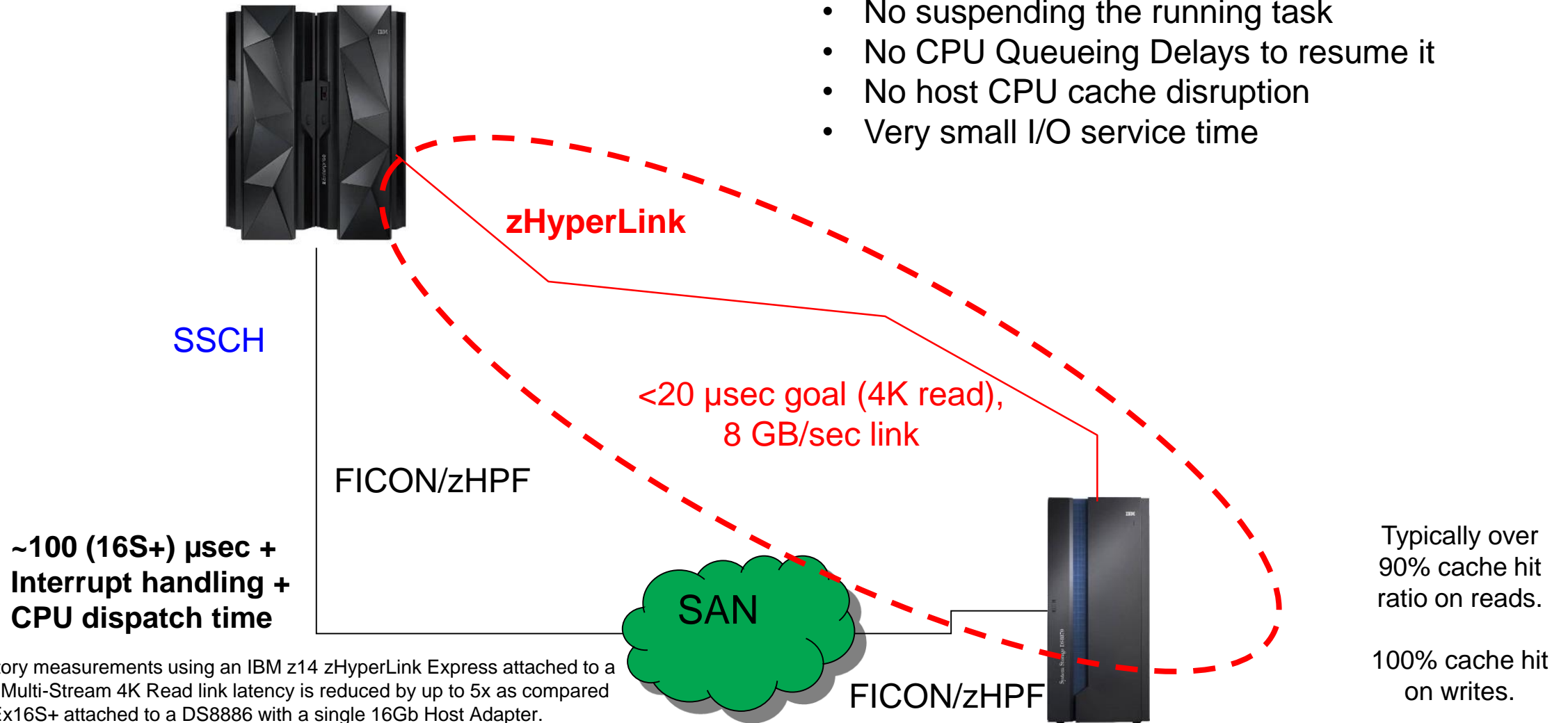
- zHyperLink is designed to provide a direct, low-latency, synchronous connection between a z14 and a DS8800
 - Supported for ECKD
 - Supported for native LPAR (no z/VM guest support)
 - FICON or zHPF paths required in addition to zHyperLink path for Backup/Recovery and IPL
 - PCIe adapters provide two zHyperLink ports each
 - Maximum of 16 Adapters are supported on a z14
 - Can avoid scheduling and interrupt operating system overhead associated with asynchronous operations
 - New command option to allow the OS to initiate a Synchronous I/O command
 - Processor waits for I/O to complete, and then returns to the program
 - Support Element panels are provided for the maintenance of these links
 - A blog by Harry Yudenfriend (IBM Fellow) and Peter Sutton (IBM Distinguished Engineer) :
 - <https://www.ibm.com/blogs/systems/ibm-ds8880-zhyperlinks-gives-low-latency-access-to-storage/>



zHyperLink®

zHyperLink™ designed to be fast enough that the CPU can *just wait for the data*:

- No suspending the running task
- No CPU Queueing Delays to resume it
- No host CPU cache disruption
- Very small I/O service time



In laboratory measurements using an IBM z14 zHyperLink Express attached to a DS8886, Multi-Stream 4K Read link latency is reduced by up to 5x as compared to z14 FEx16S+ attached to a DS8886 with a single 16Gb Host Adapter.

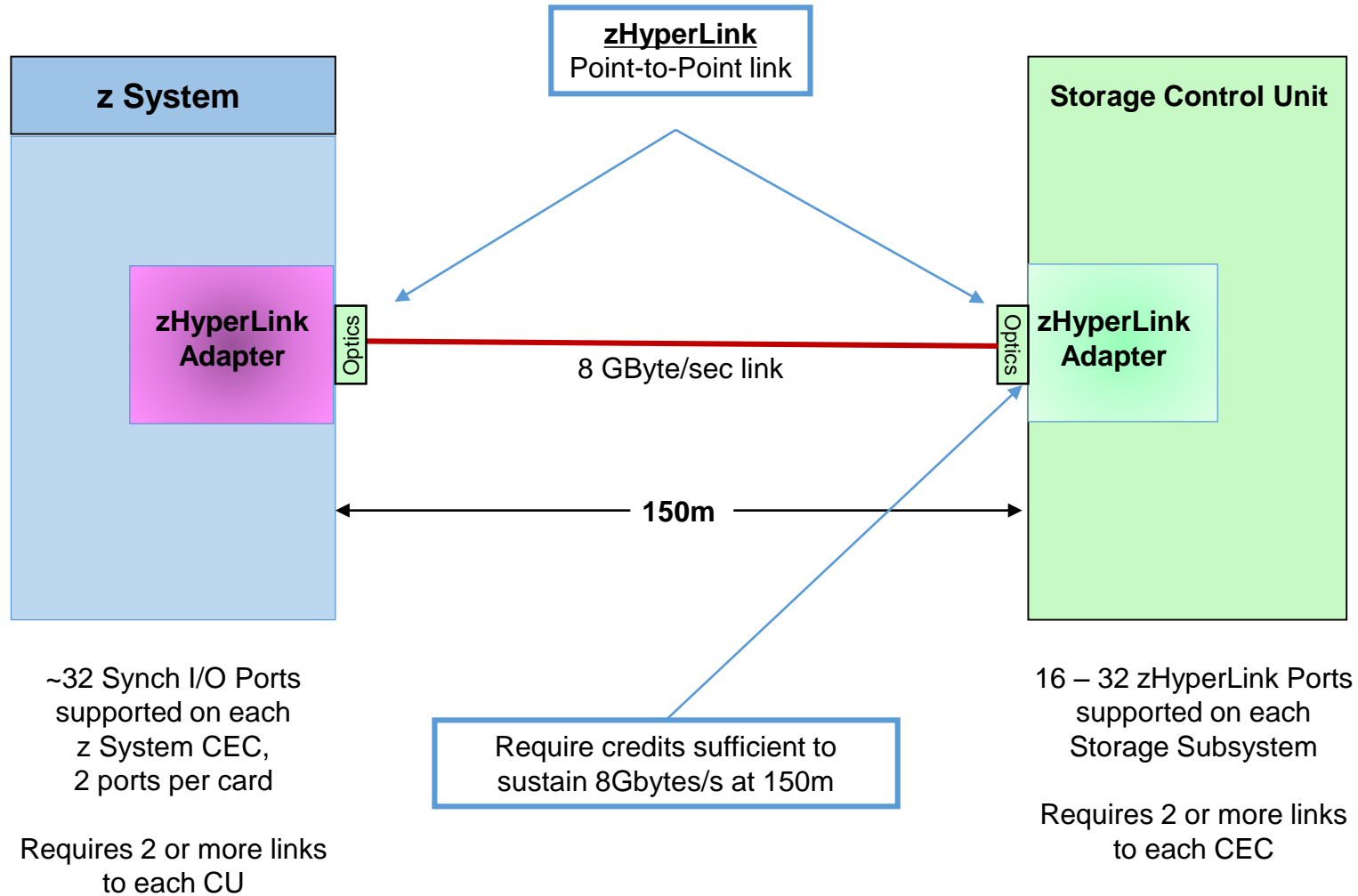


This performance data was measured in a controlled environment running an I/O driver program under z/OS. The actual link latency that any user will experience may vary. Link latency only accounts for a portion of I/O latency as experienced by an application. It reflects part of the benefit that zHyperLink Express provides for z/OS, middleware, and client applications.

zHyperLink® – Requirements and Customization

- Function planned for:
 - z14 with one or more IBM zHyperLink Express adapters – FC 0431
 - DS888x with I/O Bay Planar board and Firmware level 8.3
 - z/OS V2.3, z/OS V2.2, and z/OS V2.1
 - with PTFs
- Customization
 - Define zHyperLink PCIe function in the I/O Configuration
 - Activate IODF
 - Update IECIOSxx and/or issue SETIOS z/OS Command
- The zBNA Tool from IBM Washington Systems Center is being updated
 - Will be designed to estimate the potential value of the zHyperLink function
- Note: The zHyperLink function is not supported when z/OS is running as a z/VM guest

Physical Connectivity



Summary – z/OS Support for z14

Release	IBM.Device.Server.nnn-3906.RequiredService						IBM.Device.Server.z14-3906.Exploitation											Max Memory/LPAR
	Base Support	CPU Measurement Facility (HIS)	Crypto Express6S Toleration	FICON Express 16S+	z14 Assembler Support	OSA-Express6S	Guarded Storage Facility (GSF)	Instruction Execution Protection (IEP)	IBM Virtual Flash Memory	Crypto Express6S	ROCE Express2	z14 XL C/C++	CF Level 22	Coupling Express LR	HiperDispatch Enhancements	Data Set Encryption	zHyperLink	TB
z/OS V1.13 ^S	P		W,P ^{AO}	P	P	P			W									
z/OS V2.1	P	P	P	P	P	P			Y	W	P		P	P	P	C	P	4
z/OS 2.2	P	P	P	P	P	P	P	P	Y	W	P		P	P	P	P	P	4
z/OS 2.3	Y	Y	P	Y	Y	Y	Y	Y	Y	W	Y	Y	Y	P	Y	Y	Y	4

Notes:

- S IBM Software Support Services required for extended z/OS V1.13 support.
- P PTF is required, use SMP/E FIXCAT for identification
- Y Support is in the base

- C Coexistence support is required, if exploited
- Dependent upon the specific function. There could be partial support on lower levels. Full support in z/OS V2.3
- AO Requires the ICSF web deliverable for FMID HCR77A0 minimally, with PTF.
- W A web deliverable is required, available at <http://www-03.ibm.com/systems/z/os/zos/downloads/>



thank you!

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