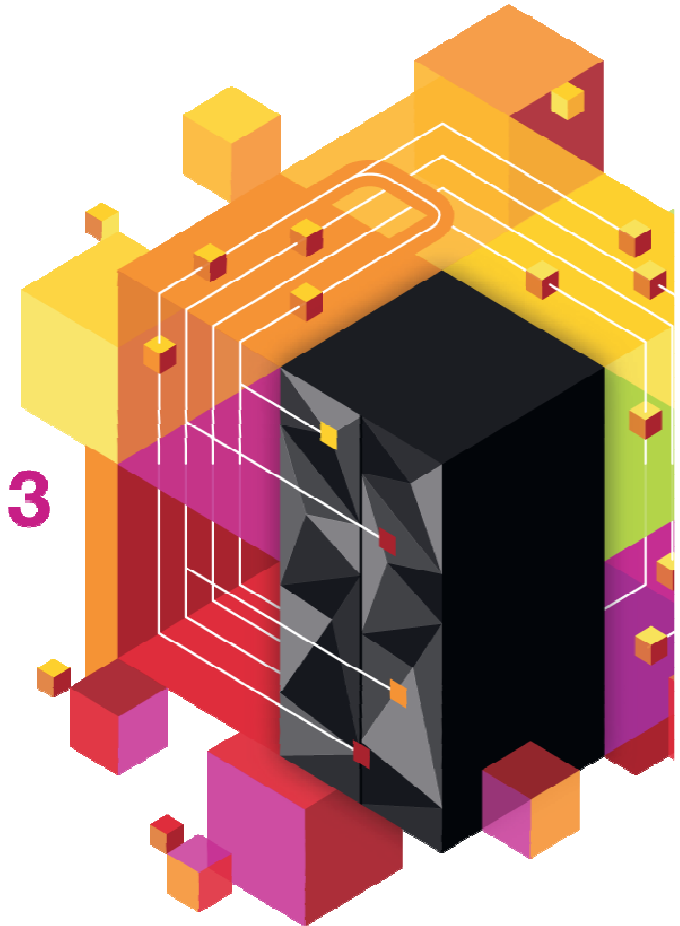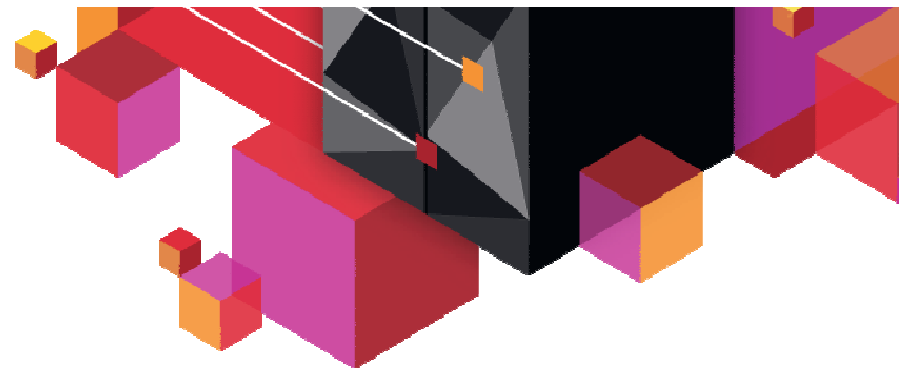# Université du Mainframe 2013

4-5 avril

IBM zEC12

Tout sur le zEC12

(Savez-vous tout de lui ?)
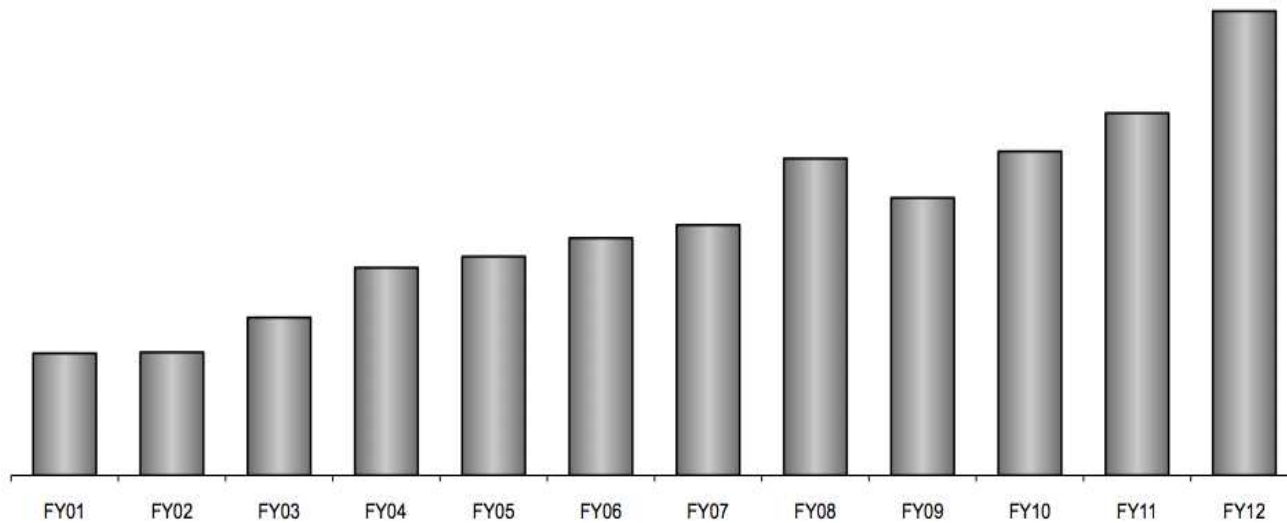
François Launay
Product Manager hardware System z / zEnterprise
flaunay@fr.ibm.com

Université du Mainframe 2013

4-5 avril

The growing IBM zEnterprise System ecosystem

System z Total Installed Capacity

4Q12: 66% yty
The highest shipped MIPS growth in history

56%	**180+**	**220+**	**3/4+**	**1,000+**	**7,400+**
year-to-year revenue growth in 4Q12, the strongest since before 2000	new accounts since 3Q10 IBM zEnterprise® launch, with 1/3+ in growth markets	hybrid computing units shipped since 3Q10	of Top 100 enterprises have installed IFLs	schools in 67 countries are part of the IBM Academic Initiative for System z	ISV apps run on IBM System z; 90 new ISVs added in 2012

[IFL = Linux-on-z Only Engine]

3

[as of 4Q12]

Delivering to Smarter Computing with zEnterprise

Vision:
- zEnterprise will continue to invest in improving the virtualization and management capabilities for hybrid computing environments

- zEnterprise will more tightly integrate with PureSystems over time

- zEnterprise and STG will continue to leverage the Tivoli portfolio to deliver enterprise wide management capabilities across all STG systems including PureSystems
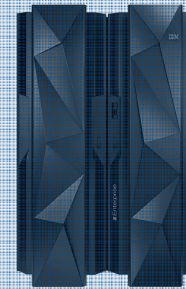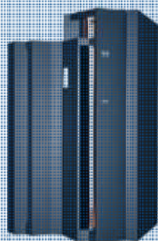
IBM zEnterprise EC12: Optimized from Silicium to Software

Linux

z/OS

z/TPF

WebSphere

Information Management

AIX

z/VM

Java

Tivoli

Lotus

Linux

z/VSE

Rational.

Cognos.

| Semiconductor Technology | Microprocessor Design | Systems Design | Virtualization & Operating Systems | Compilers & Java Virtual Machine | Optimized Middleware |
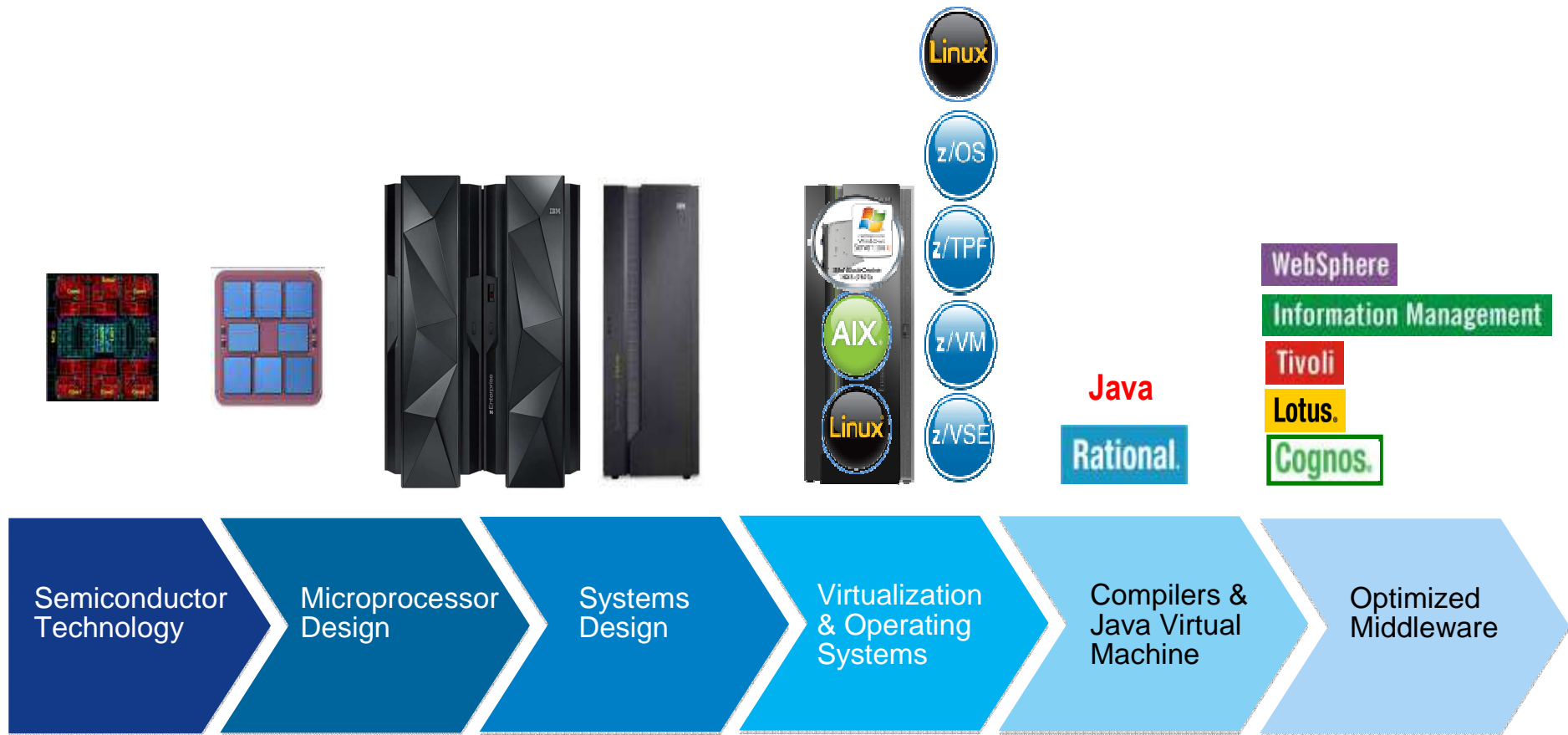
Introducing the newest members of the zEnterprise System family

IBM zEnterprise EC12 (zEC12)

IBM zEnterprise Unified Resource Manager and zEnterprise BladeCenter® Extension (zBX) Mod 003

IBM DB2 Analytics Accelerator V3
Plus more flexibility and function by connecting to IDAA

zEnterprise EC12

IBM System z Generations

N-5	N-4	N-3	N-2	N-1

z900
- Announced 10/2000
- 770 MHz
- Up to 16 assignable cores
- CP, IFL, ICF
- Up to 64 GB Memory

z990
- Announced 5/2003
- 1.2 GHz
- Up to 32 assignable cores
- CP, IFL, ICF, zAAP
- Up to 256 GB Memory

z9 Enterprise Class
- Announced 7/2005
- 1.7 GHz
- Up to 54 assignable cores
- CP, IFL, ICF, zAAP, zIIP
- Up to 512 GB Memory

z10 Enterprise Class
- Announced 2/2008
- 4.4 GHz
- Up to 64 assignable cores
- CP, IFL, ICF, zAAP, zIIP
- Up to 1.5 TB Memory

zEnterprise 196
- Announced 7/22/2010
- 5.2 GHz
- Up to 80 assignable cores
- CP, IFL, ICF, zAAP, zIIP
- Up to 3 TB Memory

z800
- Announced 2/2002
- 625 MHz
- Up to 4 assignable cores
- CP, IFL, ICF
- Up to 32 GB Memory

z890
- Announced 4/2004
- 1.0 GHz
- Up to 4 assignable cores
- CP, IFL, ICF, zAAP
- Up to 32 GB Memory

z9 Business Class
- Announced 4/2006
- 1.4 GHz
- Up to 7 assignable cores
- CP, IFL, ICF, zAAP, zIIP
- Up to 64 GB Memory

z10 Business Class
- Announced 10/2008
- 3.5 GHz
- Up to 10 cfg cores (5 CP)
- CP, IFL, ICF, zAAP, zIIP
- Up to 248 GB Memory

zEnterprise 114
- Announced 7/12/2011
- 3.8 GHz
- Up to 10 cfg cores (5 CP)
- CP, IFL, ICF, zAAP, zIIP
- Up to 256 GB Memory

IBM zEnterprise EC12 – new for September 2012

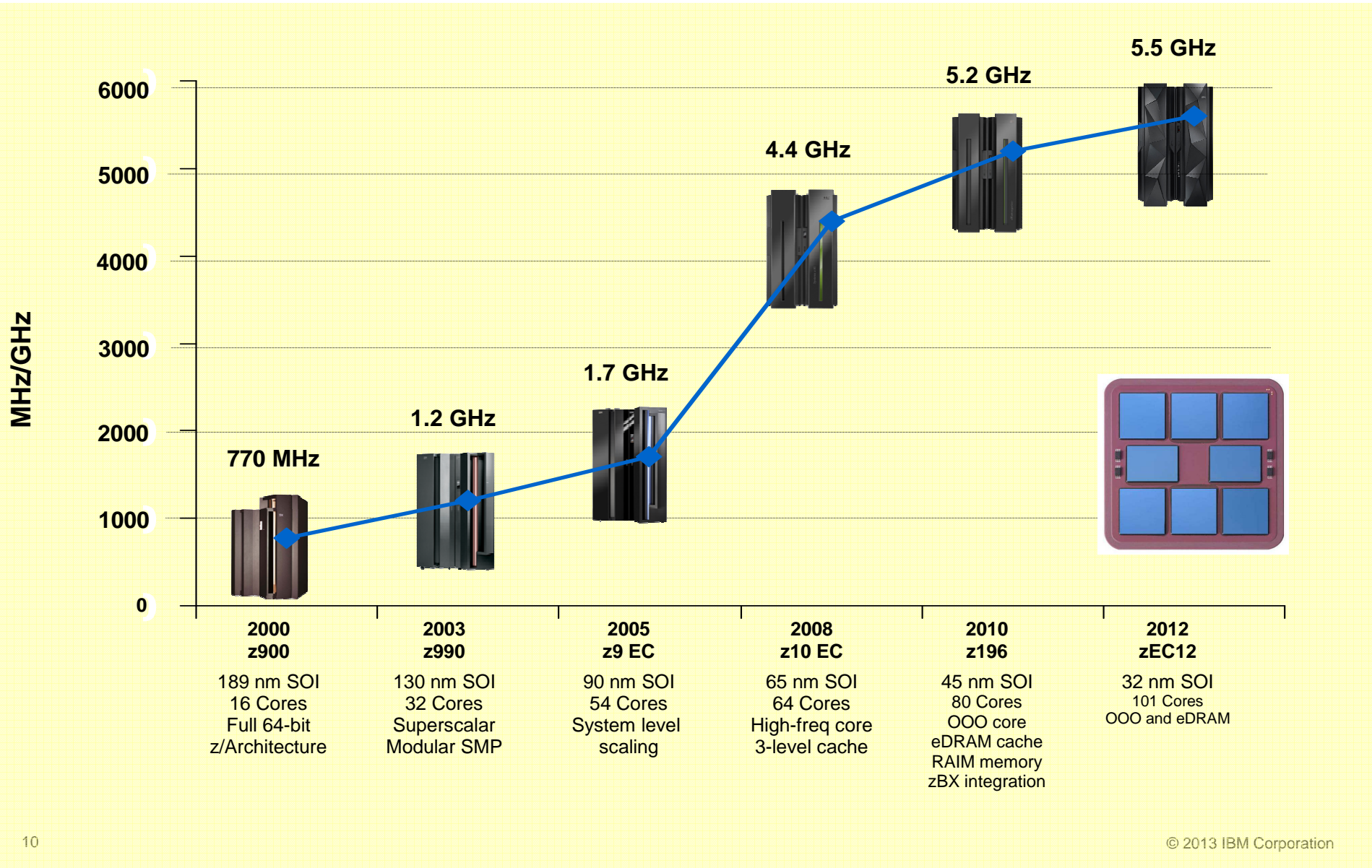## IBM zEnterprise EC12 (2827)

- Announced 08/12 – Server w/ up to 101 PU cores
- 5 models – Up to 101-way
- Granular Offerings for up to 20 CPs
- PU (Engine) Characterization
  - CP, SAP, IFL, ICF, zAAP, zIIP
- On Demand Capabilities
  - CoD, CIU, CBU, On/Off CoD, CPE, FoD
- Memory – up to 3 TB for Server and up to 1 TB per LPAR
  - 32 GB Fixed HSA
- Channels
  - PCIe bus
  - Four LCSSs
  - 3 Subchannel Sets
  - FICON Express8 and 8S
  - zHPF
  - OSA 10 GbE, GbE, 1000BASE-T
  - InfiniBand Coupling Links
  - Flash Express
- Configurable Crypto Express4S
- Parallel Sysplex clustering
- HiperSockets – up to 32
- Up to 60 logical partitions
- Enhanced Availability
- IBM zAware
- Unified Resource Manager
- Operating Systems
  - z/OS, z/VM, z/VSE, z/TPF, Linux on System z

IBM zEnterprise Blade Extension (2458)

- First Announced 7/10
- Model 003 for zEC12 – 08/12
- zBX Racks with:
  - BladeCenter Chassis
  - N + 1 components
  - Blades
  - Top of Rack Switches
  - 8 Gb FC Switches
  - Power Units
  - Advance Management Modules

- Up to 112 Blades
  - POWER7 Blades
  - IBM System x Blades
  - IBM WebSphere DataPower Integration Appliance XI50 for zEnterprise (M/T 2462-4BX)
- Operating Systems
  - AIX 5.3 and higher
  - Linux for Select IBM x Blades
  - Microsoft Windows for x Blades
- Hypervisors
  - PowerVM Enterprise Edition
  - Integrated Hypervisor for System x

zEC12 Continues the CMOS Mainframe Heritage Begun in 1994

MHz/GHz

6000

5000

4000

3000

2000

1000

0

770 MHz

1.2 GHz

1.7 GHz

4.4 GHz

5.2 GHz

5.5 GHz

2000 z900	2003 z990	2005 z9 EC	2008 z10 EC	2010 z196	2012 zEC12
189 nm SOI 16 Cores Full 64-bit z/Architecture	130 nm SOI 32 Cores Superscalar Modular SMP	90 nm SOI 54 Cores System level scaling	65 nm SOI 64 Cores High-freq core 3-level cache	45 nm SOI 80 Cores OOO core eDRAM cache RAIM memory zBX integration	32 nm SOI 101 Cores OOO and eDRAM

zEnterprise EC12 in one chart

zEC12
2827 Models: H20, H43, H66, H89, HA1

Up to 25% Performance / z196 uniprocessor[1]

Up to 50% Total capacity / z196 M80[1]

Up to 101 Configurable cores
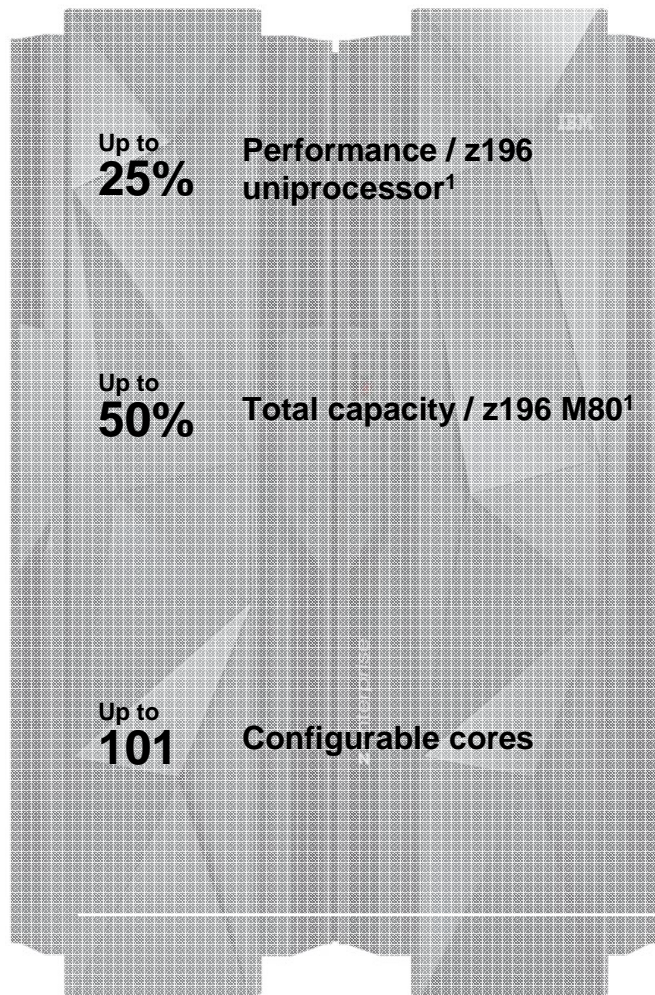
- Advanced Technology 5.5 GHz processor chip for performance boost for all workloads
  - Over *78,000 MIPS* for large scale consolidation
  - *Larger cache* for data serving

- Processor chip optimized for software performance
  - Advanced performance functions exploited by *Java, PL/I, compilers, DB2* and more

- Innovation to drive availability to superior levels
  - *IBM zAware*
  - *FLASH Express and pageable large pages*

- Security and reliability are in our DNA
  - High speed *cryptography integrated as part of the chip*
  - Enhanced support with new *Crypto Express4S*
  - PR/SM designed for *EAL5+ certification*

Official performance data can be obtained online at LSPR website at: https://www-304.ibm.com/servers/resourcelink/lib03060.nsf/pages/lsprindex?OpenDocument . © 2013 IBM Corporation

zEC12 New Build Radiator-based Air cooled – Under the covers (Model H89 and HA1) Front view
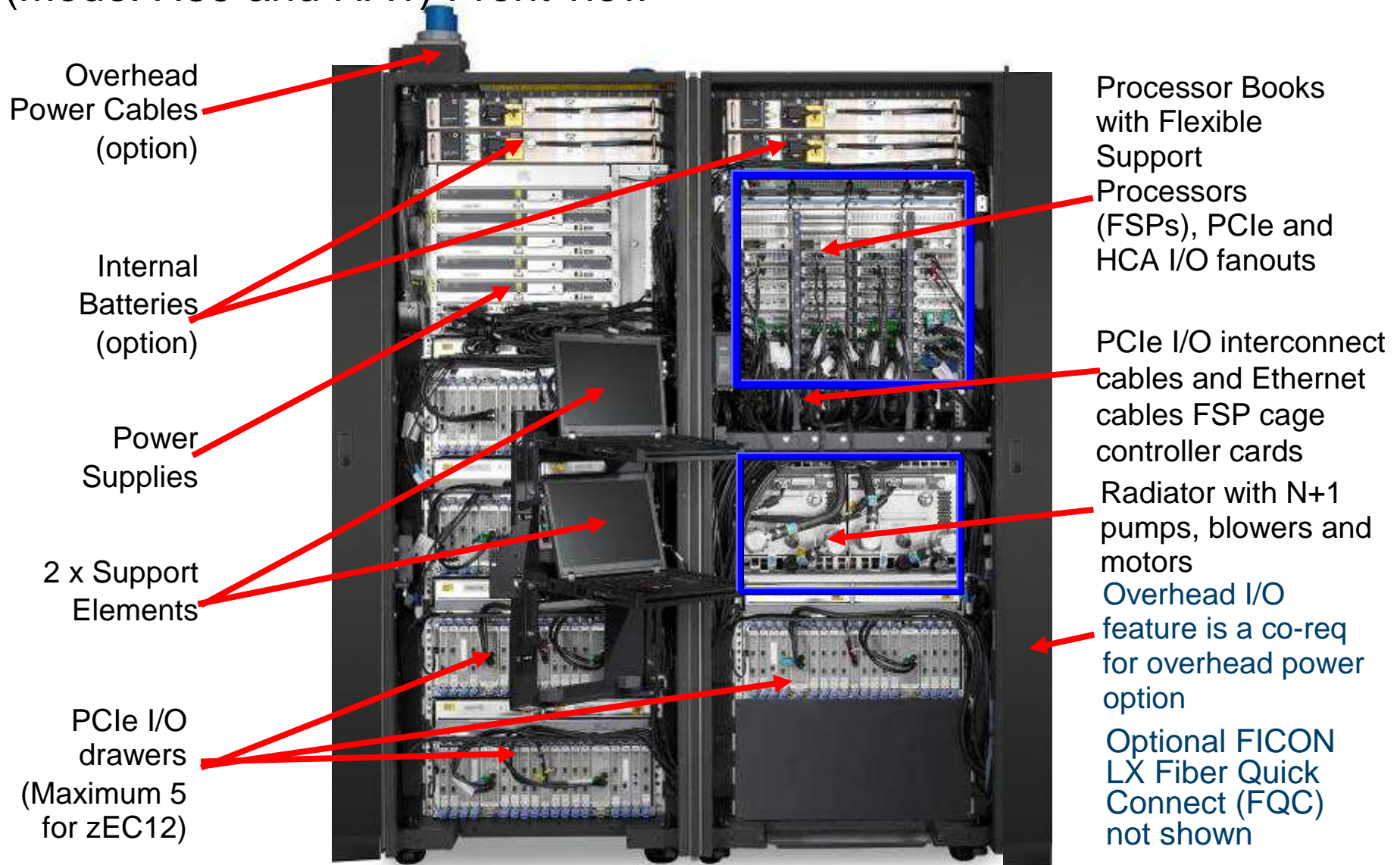
Overhead
Power Cables
(option)

Internal
Batteries
(option)

Power
Supplies

2 x Support
Elements

PCIe I/O
drawers
(Maximum 5
for zEC12)

Processor Books
with Flexible
Support
Processors
(FSPs), PCIe and
HCA I/O fanouts

PCIe I/O interconnect
cables and Ethernet
cables FSP cage
controller cards

Radiator with N+1
pumps, blowers and
motors

Overhead I/O
feature is a co-req
for overhead power
option

Optional FICON
LX Fiber Quick
Connect (FQC)
not shown

# Processor chip optimized for software performance

- **Microprocessor design supports a boost in performance for all workloads**
  - Second generation out of order design
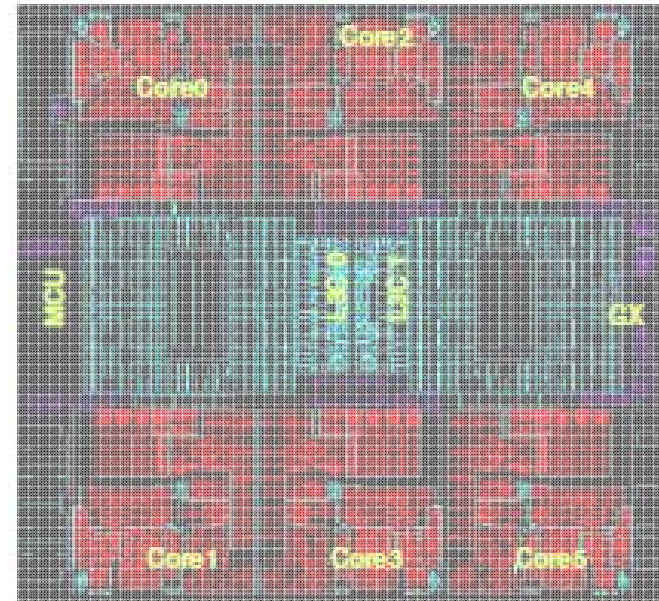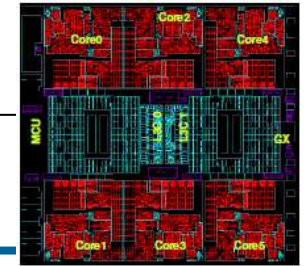
Processor chip optimized for software performance

- **Microprocessor design supports a boost in performance for all workloads**

- **Larger caches to optimize data serving environments**
  - Almost 2x on chip and 2x additional on book
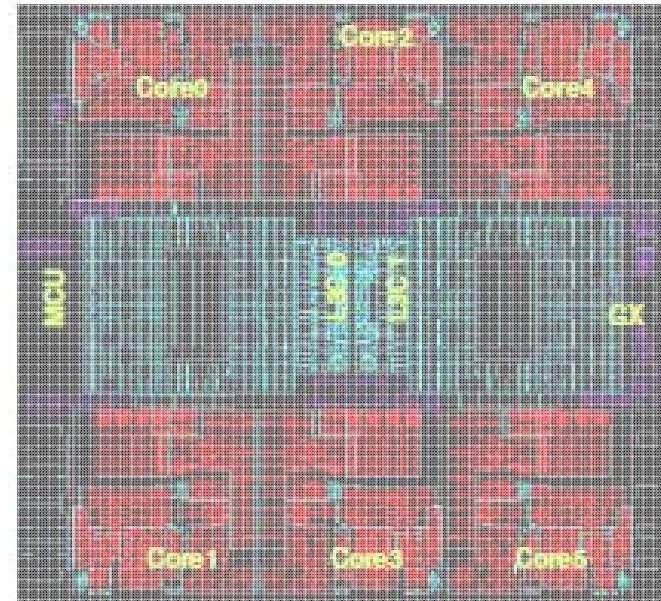
z196 MCM vs zEC12 MCM Comparison

z196 MCM

- MCM
  - 96mm x 96mm in size
  - 6 PU chips per MCM
    - Quad core chips with 3 or 4 active cores
    - PU Chip size 23.7 mm x 21.5 mm
    - 5.2 GHz
    - Superscalar, OoO execution
    - L1: 64 KB I / 128 KB D private/core
    - L2: 1.5 MB I+D private/core
    - L3: 24 MB/chip – shared

  - 2 SC chips per MCM
    - L4: 2 x 96 MB = 192 MB L4 per book
    - SC Chip size 24.5 mm x 20.5 mm

  - 1800 Watts

zEC12 MCM

- MCM
  - 96mm x 96mm in size
  - 6 PU chips per MCM
    - Hex-core chips with 4 to 6 active cores
    - PU Chip size 23.7mm x 25.2mm
    - 5.5 GHz
    - Superscalar, OoO enhanced
    - L1: 64 KB I / 96 KB D private/core
    - L2: 1 MB I / 1 MB D private/core
    - L3: 48 MB/chip - shared

  - 2 SC chips per MCM
    - L4: 2 x 192 MB = 384 MB L4 per book
    - SC Chip size 28.4mm x 23.9mm

  - 1800 Watts

Processor chip optimized for software performance

- **Microprocessor design supports a boost in performance for all workloads**

- **Larger caches to optimize data serving environments**
  - Almost 2x on chip and 2x additional on book

- **New hardware functions optimized for software performance**
  - *Transactional Execution Facility* for parallelism and scalability
  - *Runtime Instrumentation Facility*
  - *2 GB page frames*
  - Up to *30% improvement in IMS throughput* [1]
  - New IBM Enterprise PL/I compiler for Decimal format conversions

Processor chip optimized for software performance

- **Microprocessor design supports a boost in performance for all workloads**
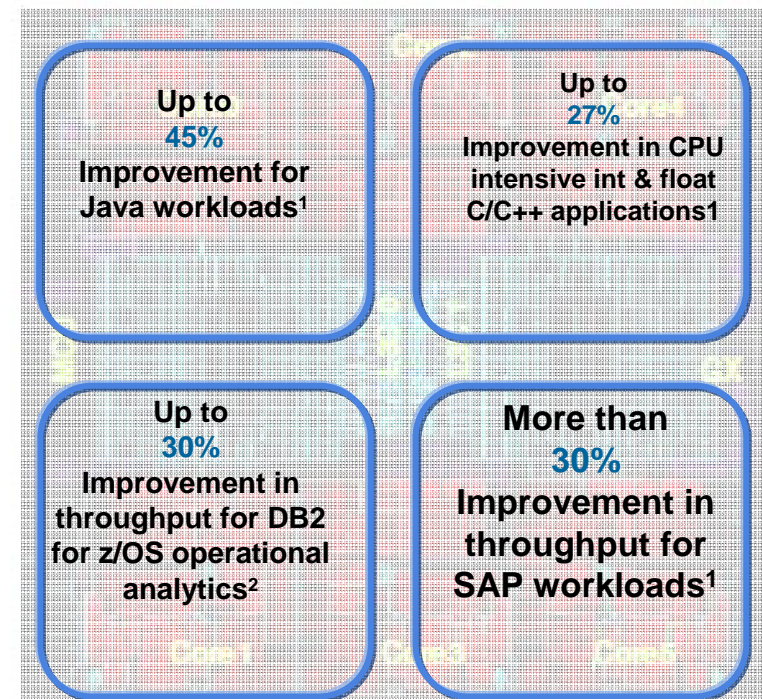

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  - *Runtime Instrumentation Facility*
  - *2 GB page frames*
  - Up to *30% improvement in IMS throughput* [1]
  - New IBM Enterprise PL/I compiler for Decimal format conversions

Up to **45%** Improvement for Java workloads[1]	Up to **27%** Improvement in CPU intensive int & float C/C++ applications[1]
Up to **30%** Improvement in throughput for DB2 for z/OS operational analytics[2]	More than **30%** Improvement in throughput for SAP workloads[1]

zEC12 Full and Sub-Capacity CP Offerings

CP Capacity
Relative to Full Capacity Uni

7xx =	100%		1514 PCI
6xx	63%	≈	947 PCI
5xx ≈	42%	≈	631 PCI
4xx ≈	16%	≈	240 PCI
≈		≈	

7xx

6xx

5xx

4xx
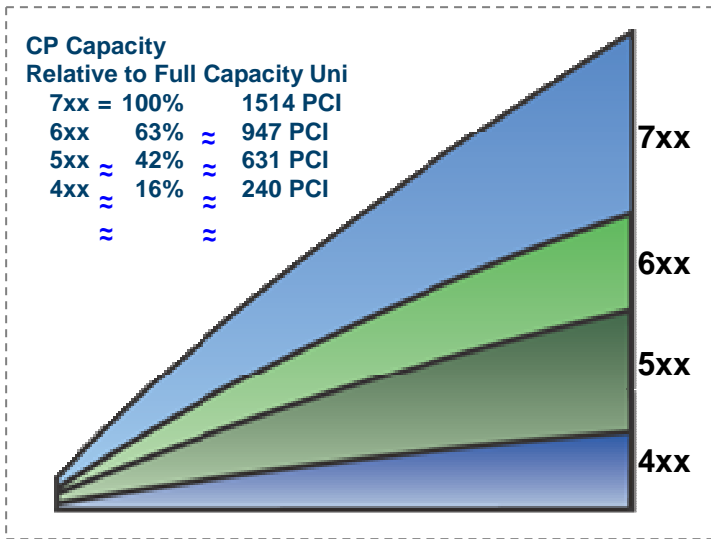
- z9 EC up to 54-way: 193 – 18,505 PCIs
- z10 EC up to 64-way: 214 – 31,826 PCIs
- z196 up to 80-way: 240 – 52,286 PCIs
- zEC12 up to 101-way: 240 – over 78,426 PCIs

MSU Sub Capacity

- PVU for zEC12 is 120

H20   H43   H66   H89   HA1
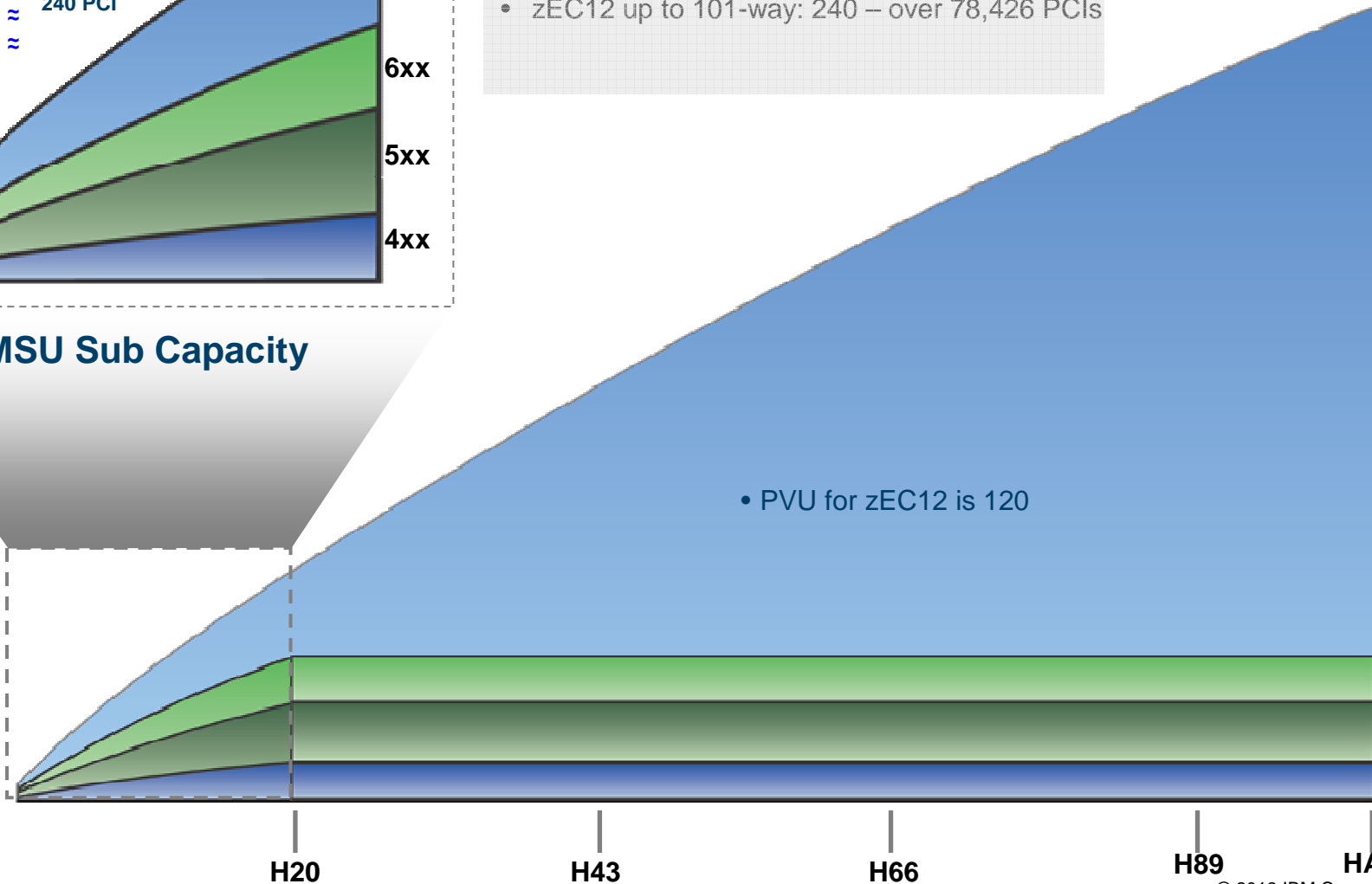
zEC12 Processor Unit allocation/usage

Model	Books/ PUs	CPs	IFLs uIFLs	zAAPs	zIIPs	ICFs	Std SAPs	Optional SAPs	Std. Spares	Rsvd. PUs
H20	1/27	0-20	0-20 0-19	0-10	0-10	0-20	4	0-4	2	1
H43	2/54	0-43	0-43 0-42	0-21	0-21	0-43	8	0-8	2	1
H66	3/81	0-66	0-66 0-65	0-33	0-33	0-66	12	0-12	2	1
H89	4/108	0-89	0-89 0-88	0-44	0-44	0-89	16	0-16	2	1
HA1	4/120	0-101	0-101 0-100	0-50	0-50	0-101	16	0-16	2	1

zEC12 Purchase Memory Offerings

Model	Standard Memory GB	Flexible Memory GB	Plan Ahead Memory GB
H20	32 - 704	NA	32-704
H43	32 - 1392	32 - 704	96 - 1392
H66	32 - 2272	32 - 1392	64 - 2272
H89	32 - 3040	32 - 2272	96 - 3040
HA1	32 - 3040	32 - 2272	96 - 3040

- Purchase Memory - Memory available for assignment to LPARs

- Hardware System Area – Standard 32 GB outside customer memory for system use

- Standard Memory - Provides minimum physical memory required to hold base purchase memory plus 32 GB HSA

- Flexible Memory - Provides additional physical memory needed to support activation base customer memory and HSA on a multiple book zEC12 with one book out of service.

- Plan Ahead Memory – Provides additional physical memory needed for a concurrent upgrade (LIC CC change only) to a preplanned target customer memory

zEC12 Upgrades

z196

zBX Model 002

z10 EC

zEC12

HA1 (101w)
H89
H66
H43
H20

Concurrent Upgrade

zEC12   **zBX Model 003**

- zEC12 to higher hardware
- Any z10 EC to any zEC12
- Any z196 to any zEC12

- When a z196 with a zBX Model 002 is upgraded to zEC12, the zBX is converted to a Model 003.
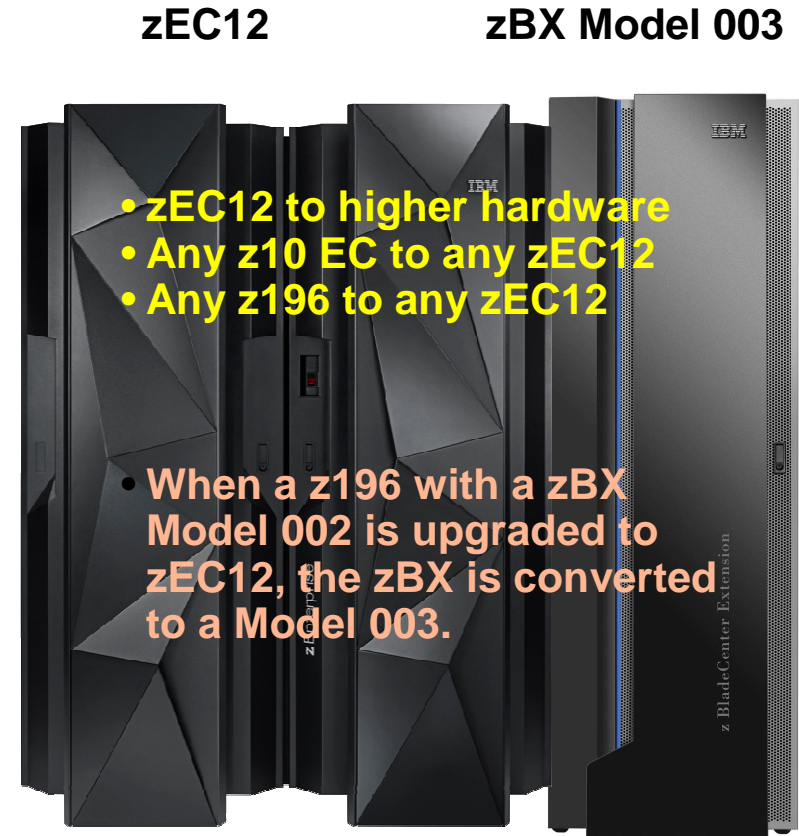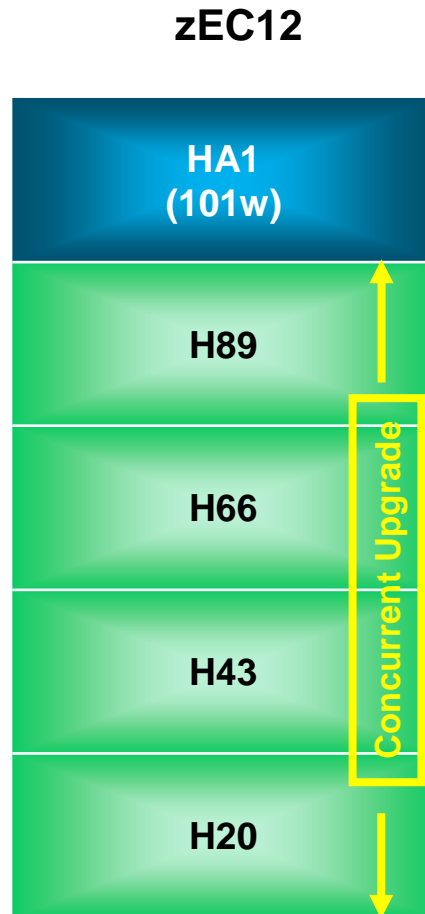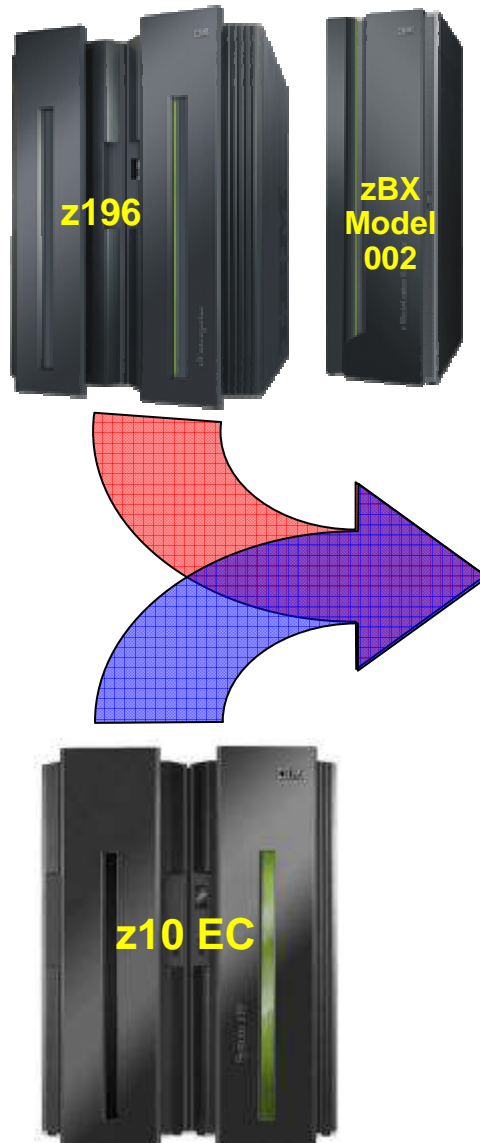
Extending System z Availability with Flash Express and IBM zAware

Server Design	Systems Availability	Operations Availability	Business Application Availability
Sparing Enhanced Book Availability Hardware checks Redundant parts Parallel Sysplex	HyperSwap™ Concurrent Upgrade Virtual networking Data Sharing	CoD CBU GDPS®/HyperSwap Call home	Flash Express IBM zAware
Designed to Prevent Hard Failures	*Designed to Improve System SW Availability*	*Designed to improve Continuous Operations*	*Designed to Improve Business Availability*

Flash Express

Flash Express PCIe Adapter Card
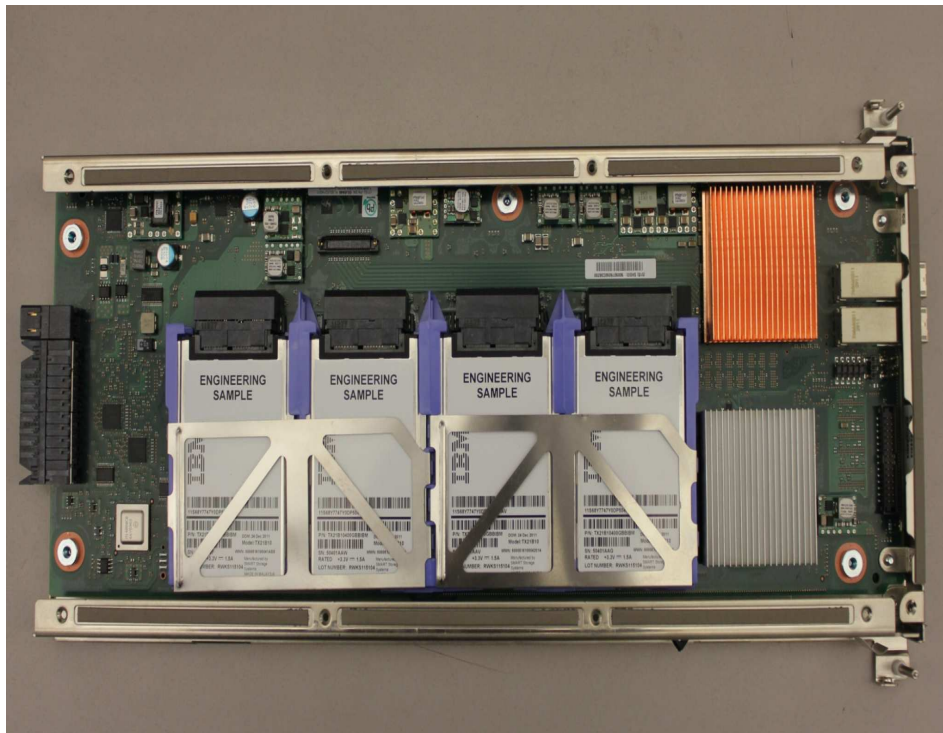
More Latency

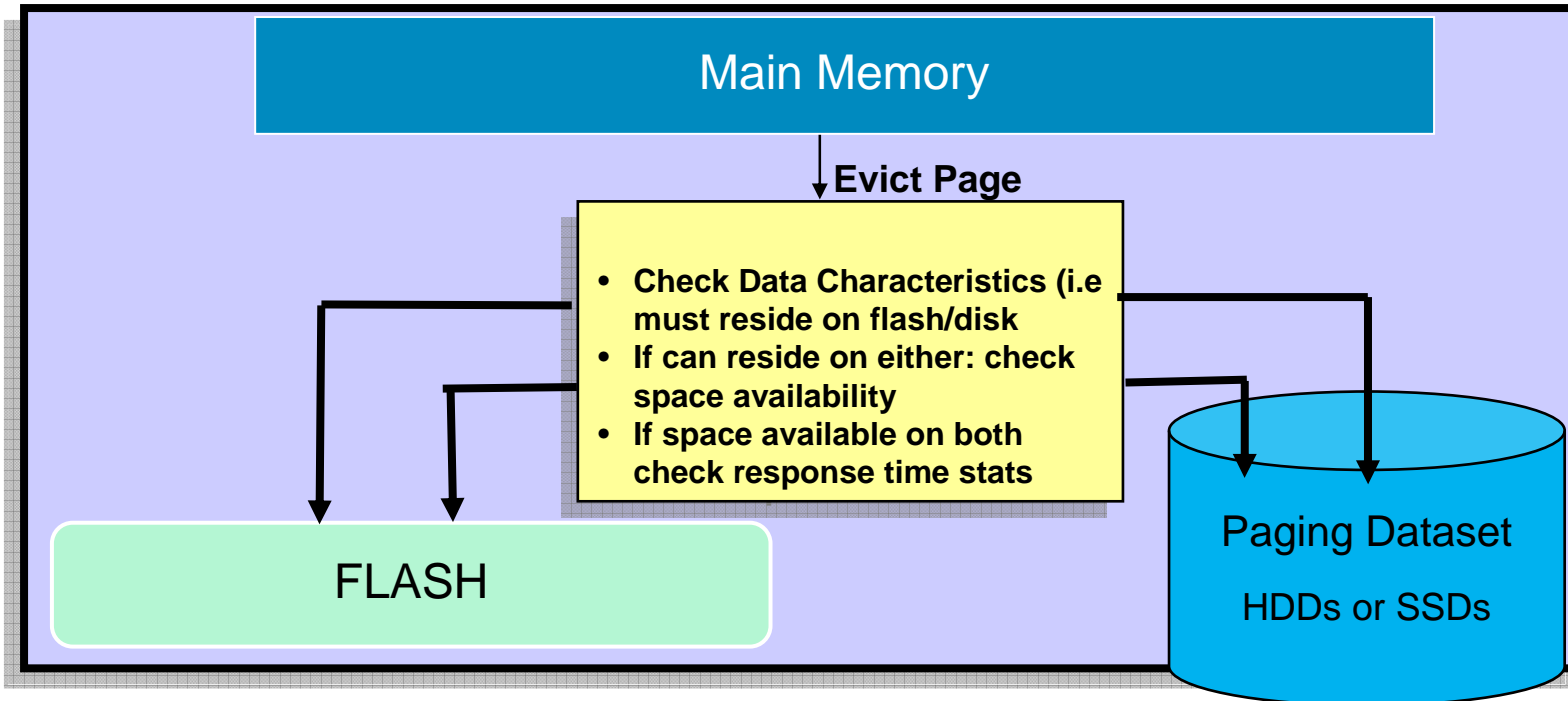| |
|---|
| Time to Read Data measured in System z Instructions |
| Real Memory: (256B line) ~100 Instructions |
| Flash Memory (4K page) ~100K Instructions |
| External Disk (4K page) ~5,000K Instructions |

Flash Express strengthens availability

- **Innovation to drive availability to exceptional levels**
  - Is an *industry unique* application of Flash to improve availability

- **Flash Express can improve availability and reduce latency**
  - Improves availability during transition periods and spikes
  - Helps accelerate start of day processing - batch to online
  - Enables faster snapshots of diagnostics (e.g. SVC dump, SAD dump)
  - With pageable large pages can improve performance of DB2 and Java
  - Ideal for applications with random read access and high read/write ratios.

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  - With pageable large pages can improve performance of DB2 and Java
  - Ideal for applications with random read access and high read/write ratios.

- Minimal configuration- no special skills needed
  - Usable immediately; no special training required
  - Easy to set up and dynamically configurable.

Flash vs Disk Placement Criteria

Main Memory

↓ **Evict Page**

- **Check Data Characteristics (i.e must reside on flash/disk**
- **If can reside on either: check space availability**
- **If space available on both check response time stats**

FLASH

Paging Dataset

HDDs or SSDs

Data Type	Data Page Placement
Pageable Link Pack Area (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)
HyperSwap Critical Address Space data	If flash space is available, all virtual pages belonging to a HyperSwap Critical Address Space will be placed on flash memory. If flash space is not available, these pages will be kept in memory and only paged to disk when the system is real storage constrained and no other alternatives exist
Pageable Large Pages	If contiguous flash space is available, pageable large pages will be preferentially written to flash.
All other data	If available space exists on both flash and disk then make a selection based on response time.

# Performance benefits from application of Flash Express

- ## Achieve outstanding availability
  - Designed to improve availability and improve paging performance
  - Achieve CPU performance benefits from use of pageable large pages

- ## Expected Benefits *based on estimates only* *
  - **DB2:** *Estimated* incremental (up to 3%) System CPU for PLP
  - **Java:** *Estimate* up to 3-5% System CPU benefit for PLP
  - **IMS:** expected exploitation for common queues

- ## Longer roadmap
  - Continued optimization of 1MB pageable large pages vs. 4K pages
  - Additional exploitation expected by Linux® and middleware
  - Available for ISV exploitation

Diagnostic Capture Time

28
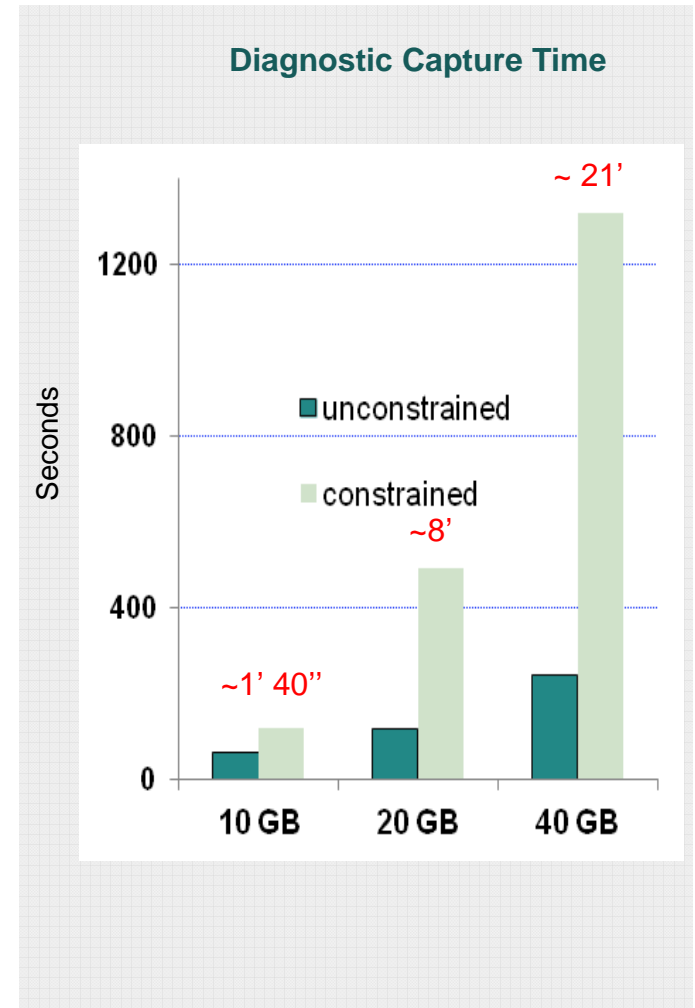
Flash Express and z/OS Java SDK 7: Performance up to 60% Improvement 64-bit Java Multi-threaded Benchmark on 16-Way

z/OS 1.13 Multi-Threaded 64 bit Java Workload
~60% Hardware (zEC12) and Software (SDK 7 SR3) Improvement
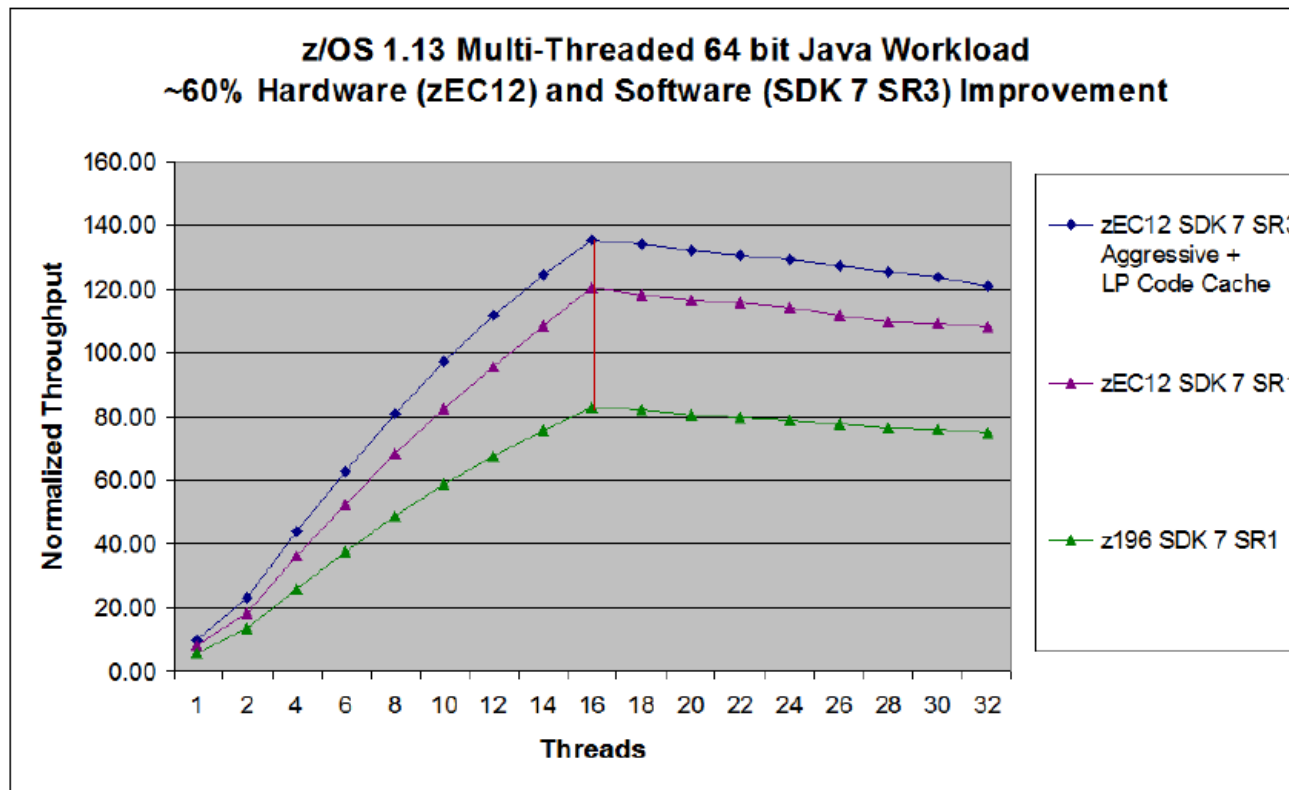
Aggregate 60% improvement from zEC12 and Java7 SR3

- zEC12 offers a ~45% improvement over z196 running the Java Multi-Threaded Benchmark

- Java7SR3 offers an additional ~13% improvement (-Xaggressive + Flash Express pageable 1Meg large page)

Flash Express with zEC12 and DB2

- **Faster CPU – 1.25X compared to z196**
- **50% More System Capacity**
- **New Features DB2 plans to exploit**
  - FLASH Express and 1MB Pageable Large Pages
    - Larger DB2 Buffer Pools
  - 2GB frame support
    - Larger frames expected to provide additional CPU savings, especially for very large memory
  - DB2 code backed by large frames for CPU reductions
- Transactional Execution opportunities for performance gains
- Initial support planned for DB2 10 with APARS

ITR (Transactions committed/second)
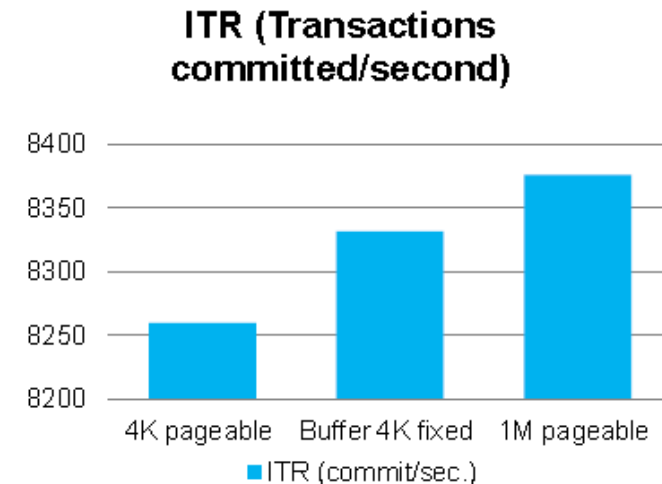
DB2 transaction throughput improvement stems from reduced CPU needed for buffer pool management

❖ **Up to 28% improvement in DB2™ throughput due to faster CPU and leveraging Flash Express with Pageable Large Pages (PLP)***
❖ **Workloads leveraging Flash Express with PLP can see up to a 8%** price performance improvement over the z196.**
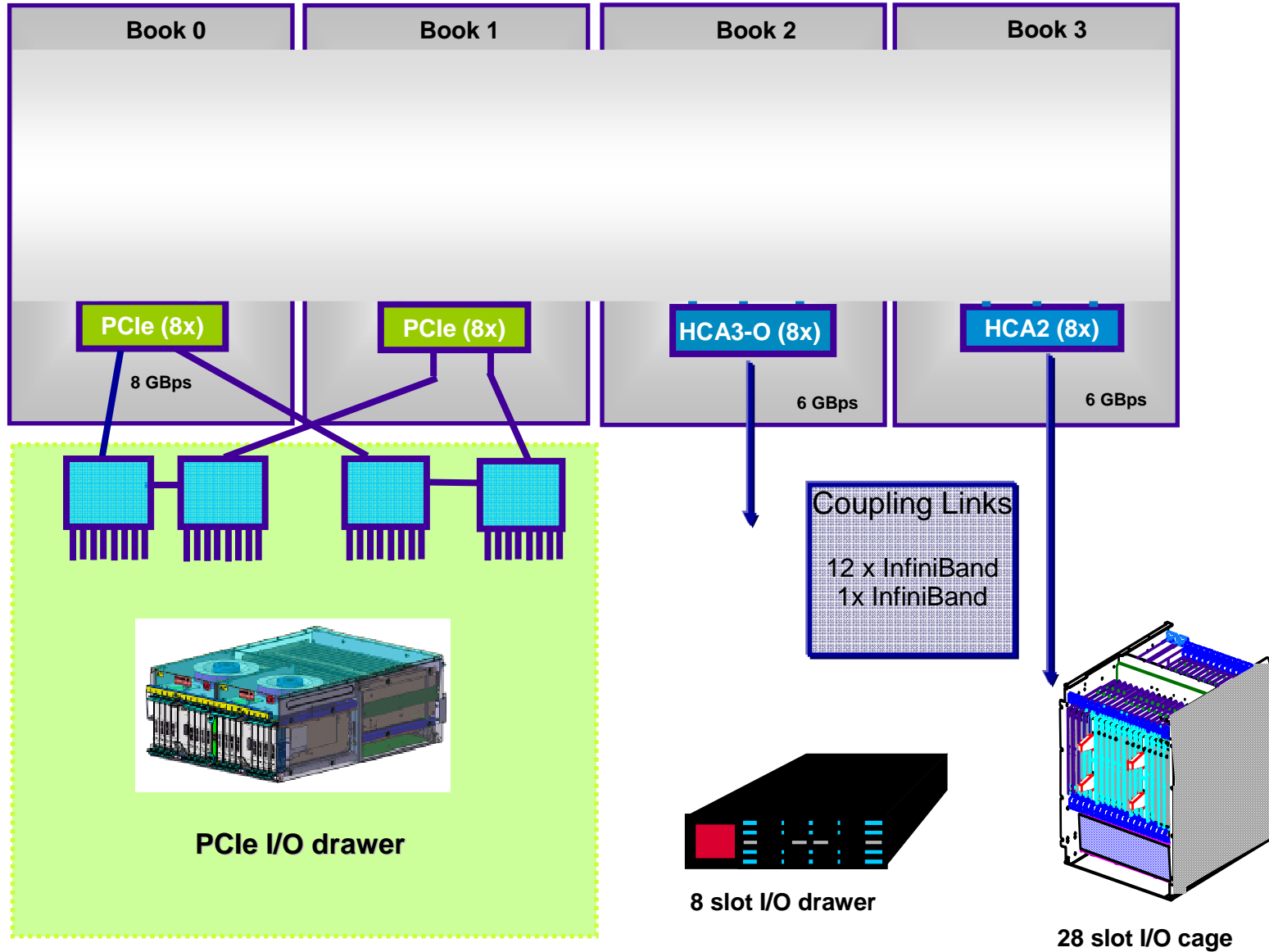** PLP for DB2 helps DB2 to achieve "additional" up to 3% additional performance on top of zEC12 CPU expected throughput improvements of 25%.*
** based on average 5% discount for zEC12 workloads under the AWLC pricing plus up to 3% more performance per MSU with Flash Express.

zEC12 Internal I/O Infrastructure

zEC12 I/O infrastructure

Book 0	Book 1	Book 2	Book 3

PCIe (8x)

PCIe (8x)

HCA3-O (8x)

HCA2 (8x)

8 GBps

6 GBps

6 GBps

Coupling Links

12 x InfiniBand
1x InfiniBand

PCIe I/O drawer

8 slot I/O drawer

28 slot I/O cage

zEC12 I/O Drawers and Cages

eConfig determines I/O drawer/cage mix and frame placement !

PCIe I/O drawer

FC 4009
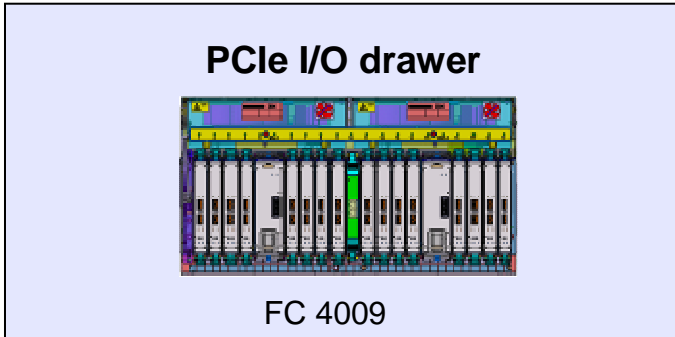
- 4 I/O domains
  - 32 I/O slots (PCIe I/O cards only)
  - At least two PCIe fanouts (4 ports per drawer)
  - 7 EIA Units

I/O drawer

FC 4008
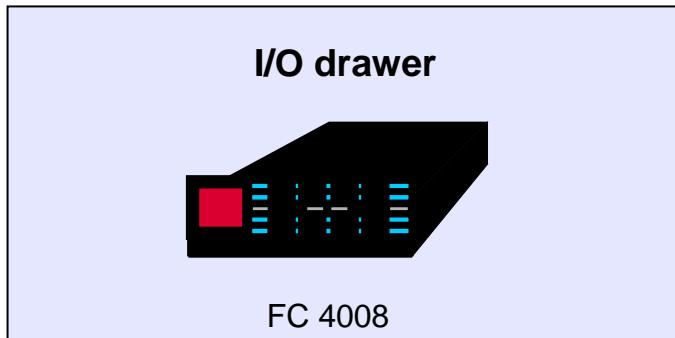
- 2 I/O domains
  - 8 I/O slots (legacy I/O cards only)
  - At least 2 HCA2-C fanouts (2 ports per drawer)
  - Up to two drawers on a pair of fanouts
  - 5 EIA Units

I/O cage

FC 4007
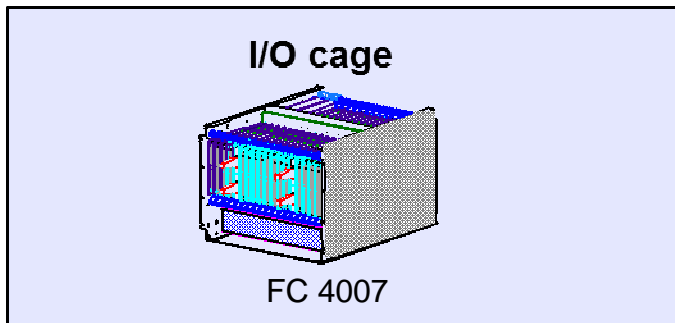
- 7 I/O domains
  - 28 I/O slots (legacy I/O cards only)
  - Up to 4 fanouts (z9 and later Systems) for all 7 domains
  - 14 EIA Units

zEC12 GA1 Features Supported – I/O Cage, I/O Drawer, PCIe I/O Drawer

Supported features

- Features – PCIe I/O drawer
  - Crypto Express4S
  - Flash Express
  - FICON Express8S
    - SX and LX
  - OSA-Express4S
    - 10 GbE LR and SR
    - GbE SX, LX
    - 1000BASE-T

PCIe I/O drawer
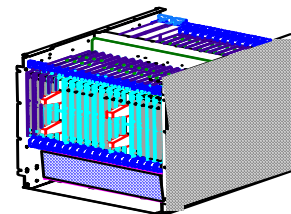
32 I/O slots
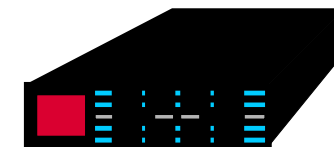
- Features – I/O cage and I/O drawer

  (Carry Forward ONLY on System MES – Maximum of 44 features. No ADDs)

  - **Not Supported: ESCON, older FICON, FICON Express4 LX 4 km, OSA-Express2, PSC**
  - Crypto Express3
  - FICON Express8
  - FICON Express4 10 km LX and SX
  - ISC-3
  - OSA-Express3
    - 10 GbE, GbE, 1000BASE-T

28 slot I/O cage   **8 slot I/O drawer**

zEC12 Storage Connectivity Options

Description	F/C	Ports	Available	Comments
FICON Express8S 10KM LX	0409	2	New and carry forward	Carry forward from z196/z114
FICON Express8S SX	0410	2	New and carry forward	Carry forward from z196/z114
FICON Express8 10KM LX	3325	4	Carry Forward only	Carry forward from z196/z114/z10
FICON Express8 SX	3326	4	Carry Forward only	Carry forward from z196/z114/z10
FICON Express4 10KM LX	3321	4	Carry Forward only	Carry forward from z196/z114/z10
FICON Express4 SX	3322	4	Carry Forward only	Carry forward from z196/z114/z10

Maximum FICON features varies with mix of Cages/Drawers types and Model of the System

All use LC Duplex connectors

Open Systems Adapter in the PCIe I/O drawer (FC4009)

Description	Feature Code	Ports	Available	CHPID
OSA-Express4S GbE LX	0404	2[1]	New Build	OSD
OSA-Express4S GbE SX	0405	2[1]	New Build	OSD
OSA-Express4S 10 GbE LR	0406	1	New Build	OSD, OSX
OSA-Express4S 10 GbE SR	0407	1	New Build	OSD, OSX
OSA-Express4S 1000BASE-T	0408	2[1]	New Build	OSC, OSD, OSE, OSM, OSN

Open Systems Adapter in the I/O cage (FC4007) or I/O drawer (FC4008)

Description	Feature Code	Ports	Available	CHPID
OSA-Express3 GbE LX	3362	4[1]	Carry Forward	OSD, OSN
OSA-Express3 GbE SX	3363	4[1]	Carry Forward	OSD, OSN
OSA-Express3 1000BASE-T	3367	4[1]	Carry Forward	OSD, OSE, OSC, OSN, OSM
OSA-Express3 10 GbE LR	3370	2	Carry Forward	OSD, OSX
OSA-Express3 10 GbE SR	3371	2	Carry Forward	OSD, OSX

[1] **Two ports per CHPID**

zEC12 Non-PSIFB Coupling Links

Description	F/C	Ports	Available	Comments
ISC-D	0217	N/A	Carry Forward	Mother Card
ISC-D	0218	1 to 2	Carry Forward	ISC-D (Daughter Card)
ISC-3 Link	0219	1 to 4	Carry Forward	Port(s) Enabled
ISC-D RPQ	8P2197		Carry Forward	ISC-3 20KM
ICB-3	0993		Not Available	
ICB-4	3393		Not Available	

The zEC12 is the last server to support ISC-3 features.
ISC-3 requires an I/O Drawer or I/O Cage
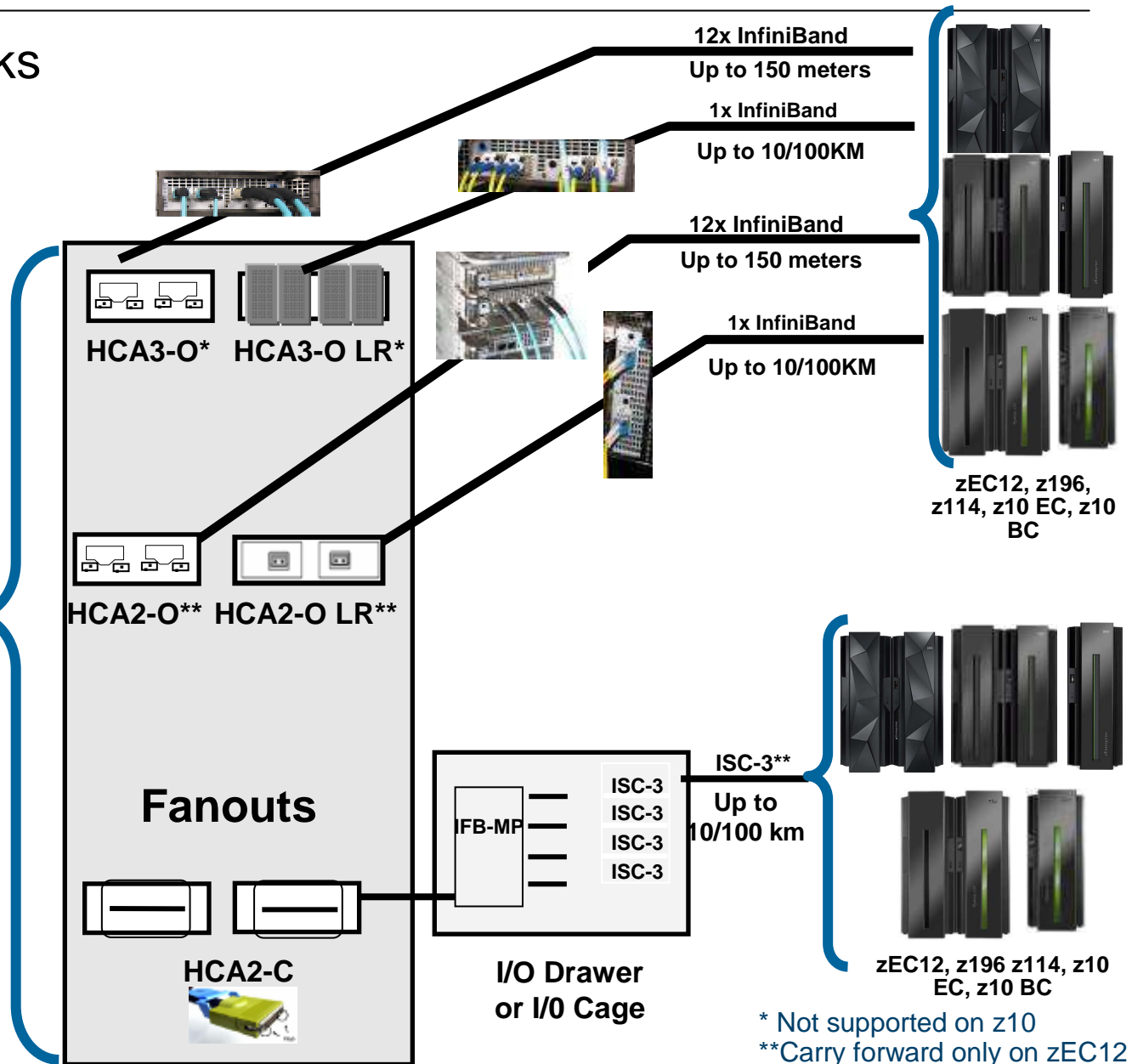
zEC12 InfiniBand Coupling Fanouts

Description	F/C	Ports	Comments
HCA3-O LR 1x InfiniBand DDR	0170	4	PSIFB coupling (10 km unrepeated, 100 km with DWDM) Double port density. 32 subchannels per CHPID
HCA3-O 12x InfiniBand DDR	0171	2	PSIFB coupling (150 m) Improved IFB3 protocol (HCA3-O to HCA3-O)
HCA2-O 12x IB-DDR Carry Forward only	0163	2	Coupling (150 meters)
HCA2-O LR 1x IB-DDR Carry Forward only	0168	2	Coupling (10 km unrepeated, 100 km with DWDM)
Note: Coupling fanouts compete for slots with the HCA2-C and PCIe fanouts for I/O drawers and cages.			

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.

zEC12 Coupling Links

- Fanout, not I/O slot, used for InfiniBand
- ICB-4 – No longer supported
- ETR – No longer supported
- All coupling links support STP
- Sysplex Coexistence – zEC12, z196, z114, z10 EC and BC only

zEC12

HCA3-O*   **HCA3-O LR***

HCA2-O**   **HCA2-O LR****

Fanouts

HCA2-C

IFB-MP

ISC-3
ISC-3
ISC-3
ISC-3

I/O Drawer or I/0 Cage

12x InfiniBand
Up to 150 meters

1x InfiniBand
Up to 10/100KM

12x InfiniBand
Up to 150 meters

1x InfiniBand
Up to 10/100KM

zEC12, z196, z114, z10 EC, z10 BC

ISC-3**
Up to 10/100 km
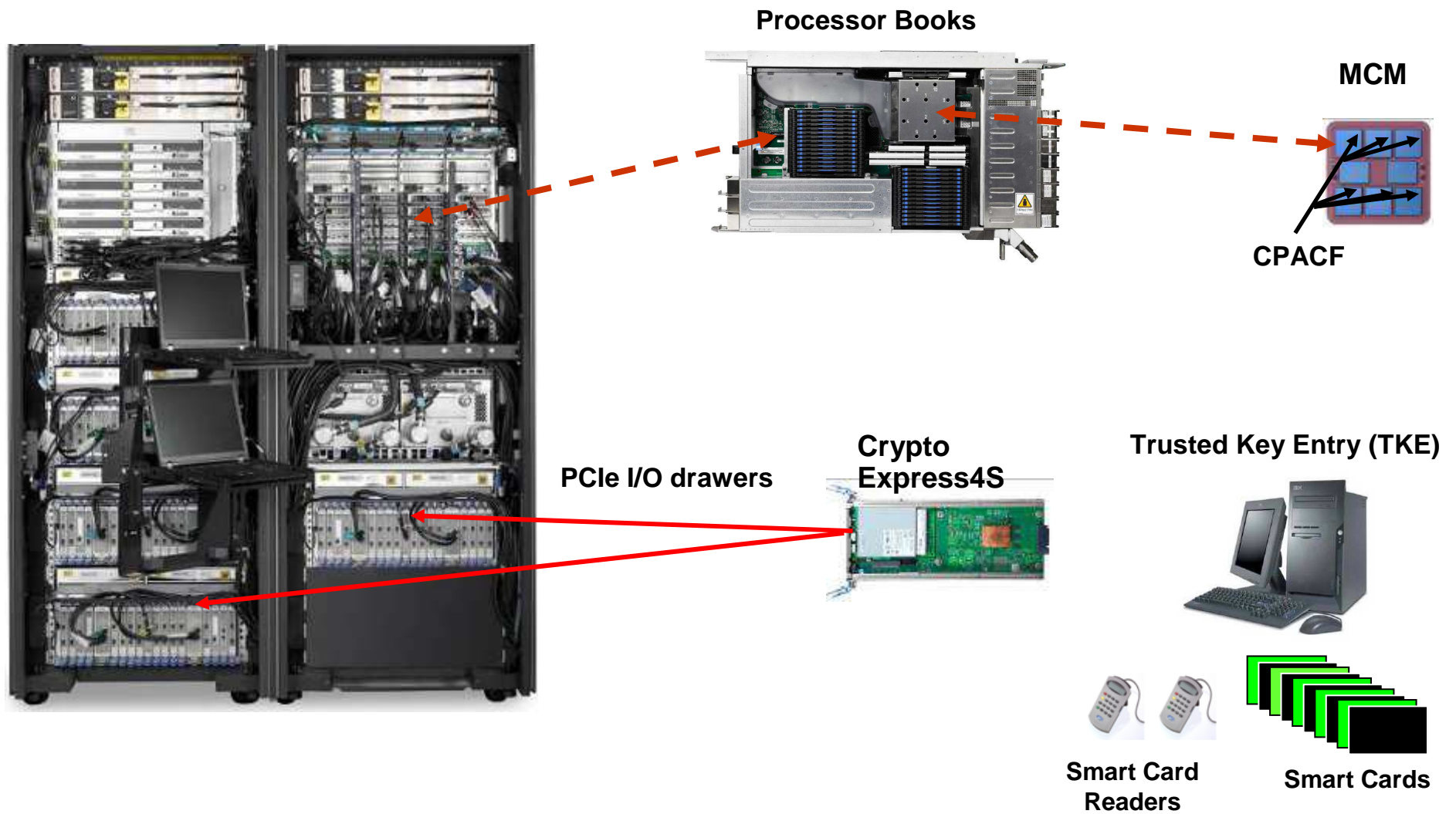
zEC12, z196 z114, z10 EC, z10 BC

* Not supported on z10
**Carry forward only on zEC12

IBM System z Security as the Enterprise Standard

- High speed cryptography integrated on the new Crypto Express4S chip

- Digital signature: new Enterprise PKCS #11 to meet regulatory requirements

- Integration of mainframe security events with IBM zSecure Suite and QRadar

- Designed to maintain EAL5+ common criteria certification – the highest in the industry

Overview – HW Crypto support in System zEC12

Processor Books

MCM

CPACF

PCIe I/O drawers

Crypto Express4S

Trusted Key Entry (TKE)

Smart Card Readers

Smart Cards

System z Availability

Flash Express

IBM zAware System
Diagnostics and Trend Analysis

Core System z Foundational capabilities

GDPS Resiliency

Predictive Failure Analysis

Run Time Diagnostics
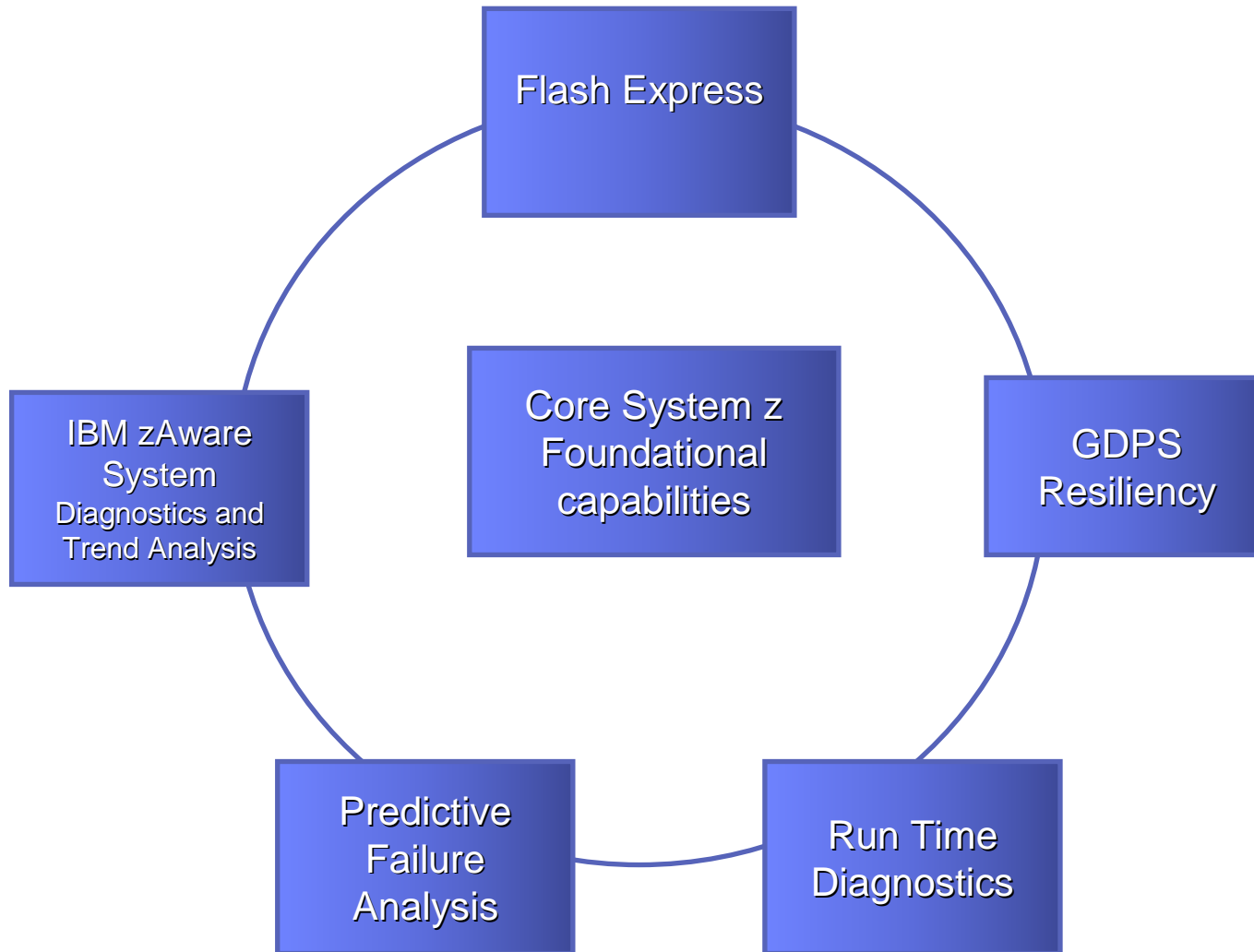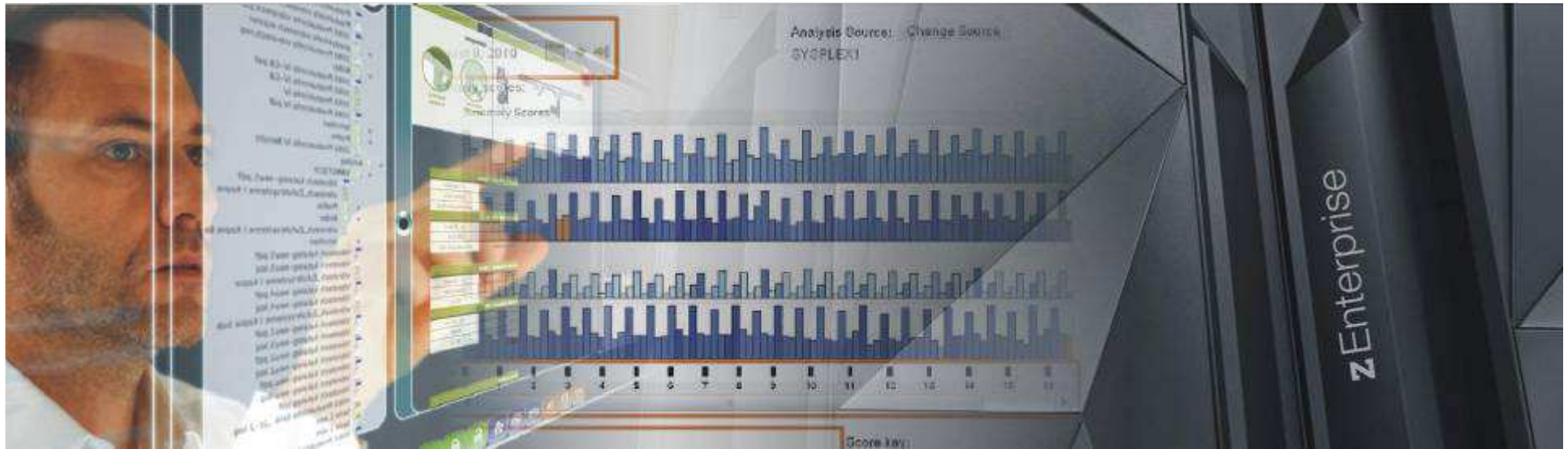
IBM zAware

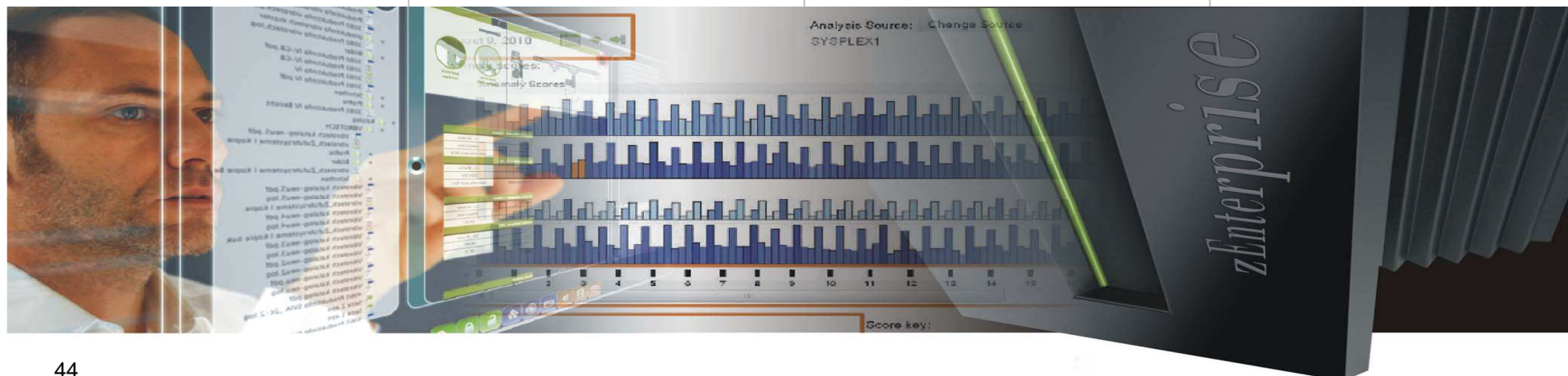# IBM zAware - Identifies unusual system behavior

IBM zAware contains sophisticated analytics, applies IBM insight, and machine learning to understand your unique system.

Monitoring	Detection	Frequency	Reporting
▪ Supports IBM & non IBM middleware and applications ▪ Monitors OPERLOG in a Sysplex or Monoplex ▪ Assigns a message anomaly score to help identify potential issues	▪ Detects anomalies other solutions might miss ▪ Analyzes suppressed or rare messages ▪ Can detect a trend in messages to identify a possible problem	▪ Samples every 2 minutes ▪ 10 minute interval ▪ Uses 90 day rolling baseline; a utility provided to populate baseline	▪ Near real time analysis ▪ Intuitive reporting ▪ Both high level and drill down ▪ Color coder browser display, time slice graphics ▪ XML output can feed ISVs or processes

Specific applications of IBM zAware

- **Identify a possible z/OS incident**

  ► *Which image is having a potential problem?*

  ► *When did this unusual behavior start?*

  ► *Were similar messages issued in the past?*

- **Identify behavior after a change has been made**

  ► *Are unusual messages being issued after a change ?*

- **Diagnose intermittent problems**

  ► *Are new unusual messages being issued in advance of the problem?*

Trends   Abnormalities   Unusual situations
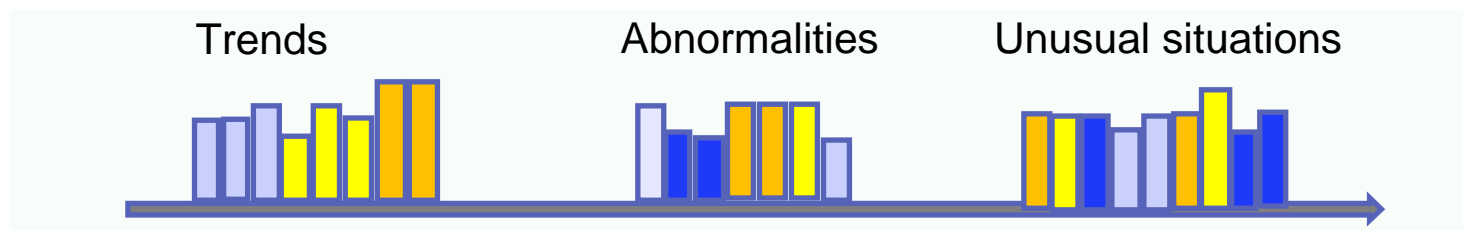
Reduces time and effort to identify & diagnose problematic messages

Resiliency offering on System z

	Make sure system is likely to work	Find cause of event after event was reported	Report "first" occurrence of event (before externally visible)
Rules Based Performance	Capacity planning – RMF®[1]	OMEGAMON® XE	OMEGAMON XE
Rules Based Non Performance	Health checker for z/OS	RTD	NetView® / TSA
Analytical / Statistically Based Performance	ITM 6.2.1	Netcool® Tivoli Performance Analyzer	ITM 6.2.1
Analytical / Statistically Based Non Performance	IBM zAware[2]	IBM zAware	PFA – control charts IBM zAware – pattern analysis

[1] RMF collects the data for customer analysis / customer rules

[2] Changes

z/OS Support

Release	z10 EC WdfM	z10 BC WdfM	z196	z114	zEC12	End of Service	Coexists with z/OS
z/OS V1.10	X	X	X	X	X	9/11[1]	V1.12
z/OS V1.11	X	X	X	X	X	9/12[1]	V1.13
z/OS V1.12	X	X	X	X	X	9/14*	V2.1*
z/OS V1.13	X	X	X	X	X	9/16*	V2.2*

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

IBM DB2 Analytics Accelerator Product Components

zEnterprise

Netezza Technology

CLIENT

Data Studio
Foundation
DB2 Analytics
Accelerator
Admin Plug-in

OSA-Express3 10 GbE

Network
Primary

10Gb

Backup

IBM DB2
Analytics
Acelerator

Users/ Applications

Data Warehouse application
DB2 for z/OS enabled for IBM
DB2 Analytics Accelerator
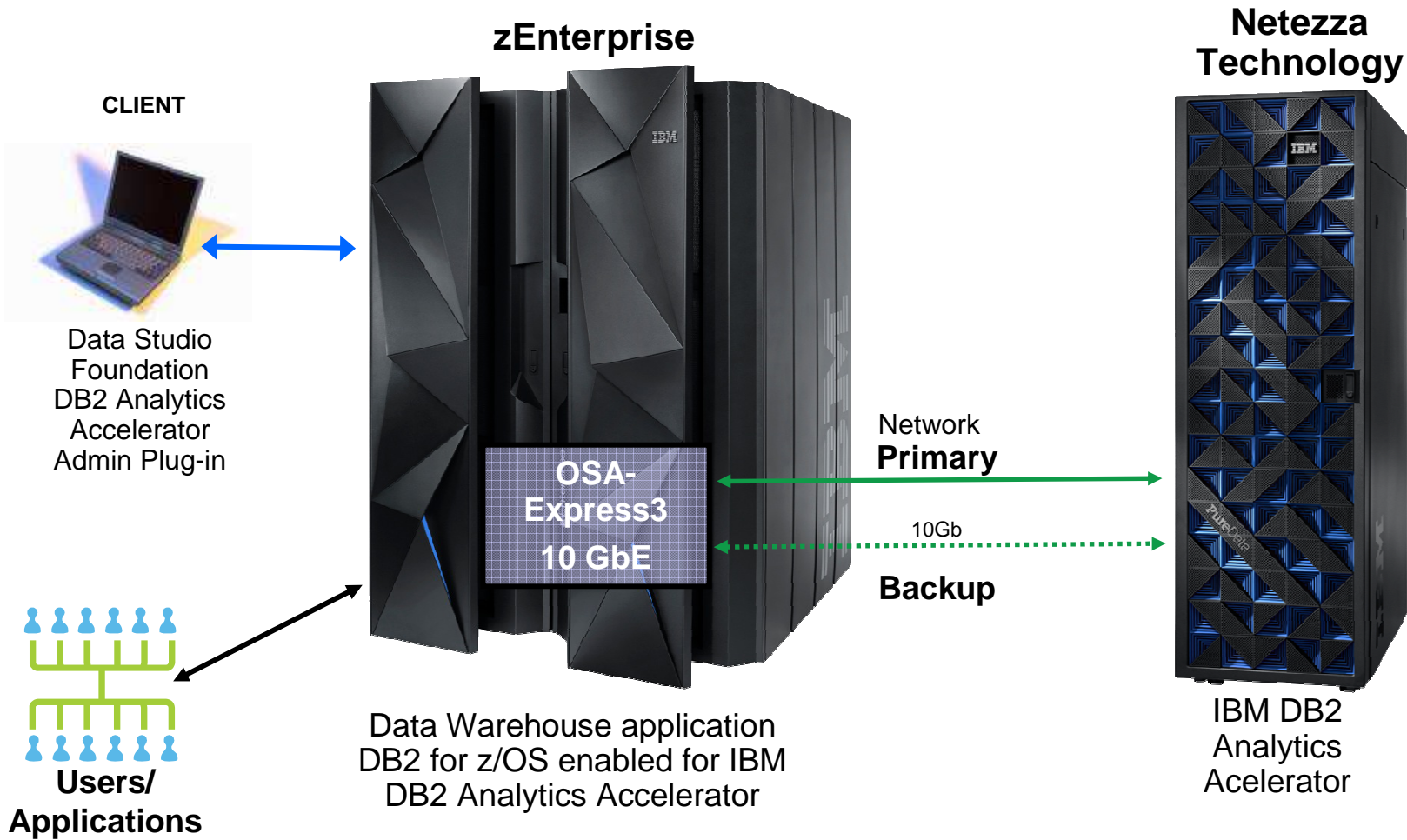
Note: There are several connection options using switches to increase redundancy

PureData for Analytics N2001 Hardware Overview

12 Disk Enclosures
- *288 600 GB SAS2 Drives*
  - *240 User Data, 14 S-Blade*
  - *34 Spare*
- *RAID 1 Mirroring*

2 Hosts (Active-Passive)
- *2 6-Core Intel 3.46 GHz CPUs*
- *7x300 GB SAS Drives*
- *Red Hat Linux 6 64-bit*

7 PureData for Analytics S-Blades™
- *2 Intel 8 Core 2+ GHz CPUs*
- *2 8-Engine Xilinx Virtex-6 FPGAs*
- *128 GB RAM + 8 GB slice buffer*
- *Linux 64-bit Kernel*

Scales from ½ Rack to 4 Racks

- *User Data Capacity:*   *192 TB**
- *Data Scan Speed:*   *478 TB/hr**
- *Load Speed (per system):*   *5+ TB/hr*

- *Power Requirements:*   *7.5 kW*
- *Cooling Requirements:*   *27,000 BTU/hr*

* 4X compression assumed

DB2 Analytics Accelerator

Large analytic systems at dramatically faster speeds

PureData for Analytics N2001

- **3x Faster than N1001**

- **Increased Throughput**

- **50% more storage /rack**

- **Improved Resiliency**

Over 3 times the performance, 50% more storage capacity, in the same footprint, for a about a 40% increase in price

DB2 Analytics Accelerator V3.1

- **High Performance Storage Saver**

- **Incremental Update**

- **zEnterprise EC12 Support**

- **Query Prioritization**

- **UNLOAD Lite**

41 customers with 56 systems are experincing the speed of analytics on z

50

zEC12
Power and
Cooling

zEC12 - Introducing Radiator for Air Cooled System

- Closed loop water cooling N+1 pump system replaces modular refrigeration units (MRUs) used for air cooling in z196 and z10 EC
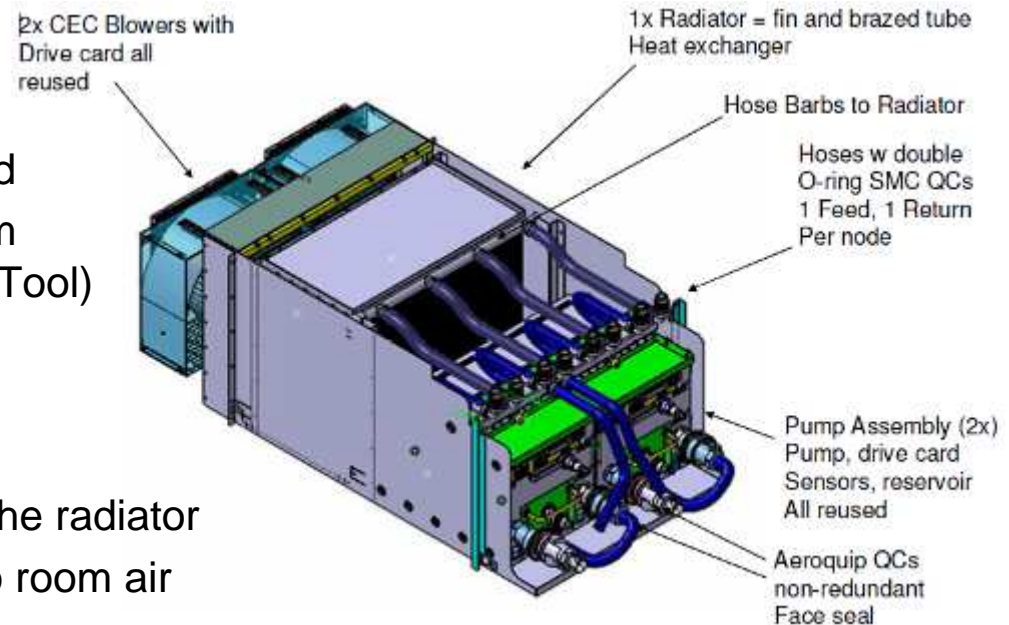
  – No connection to chilled water required

  – Water added to the closed loop system during installation (New Fill and Drain Tool)

2x CEC Blowers with Drive card all reused

1x Radiator = fin and brazed tube Heat exchanger

Hose Barbs to Radiator

Hoses w double O-ring SMC QCs 1 Feed, 1 Return Per node

Pump Assembly (2x) Pump, drive card Sensors, reservoir All reused

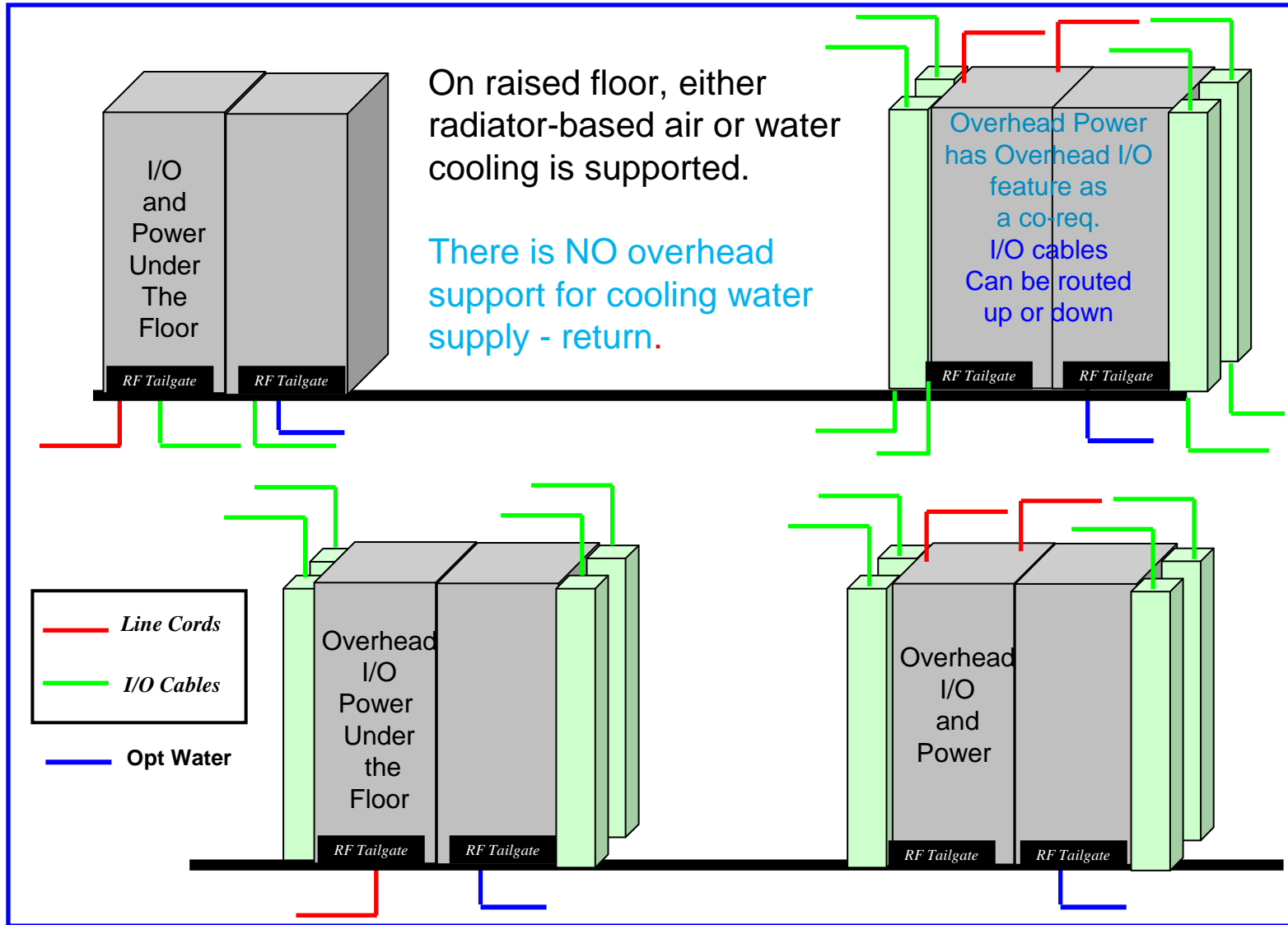Aeroquip QCs non-redundant Face seal

- Normal operation design:

  – Heat removed by water circulating to the radiator

  – Fans exhaust heat from the radiator to room air

- Backup operation design

  – N+1 pump/blower failure: Cooling maintained by closed loop water system without "cycle steering" slow down. Concurrent repair.

  – Water cooling system failure: Cooling maintained by backup fans as in the z196 air cooled option with MRUs. "Cycle steering" slow down if needed to maintain operation. Concurrent repair

zEC12 Installation - Raised Floor options

I/O and Power Under The Floor

RF Tailgate   *RF Tailgate*

On raised floor, either radiator-based air or water cooling is supported.

There is NO overhead support for cooling water supply - return.

Overhead Power has Overhead I/O feature as a co-req. I/O cables Can be routed up or down

RF Tailgate   *RF Tailgate*

Line Cords

I/O Cables

Opt Water

Overhead I/O Power Under the Floor

RF Tailgate   *RF Tailgate*

Overhead I/O and Power
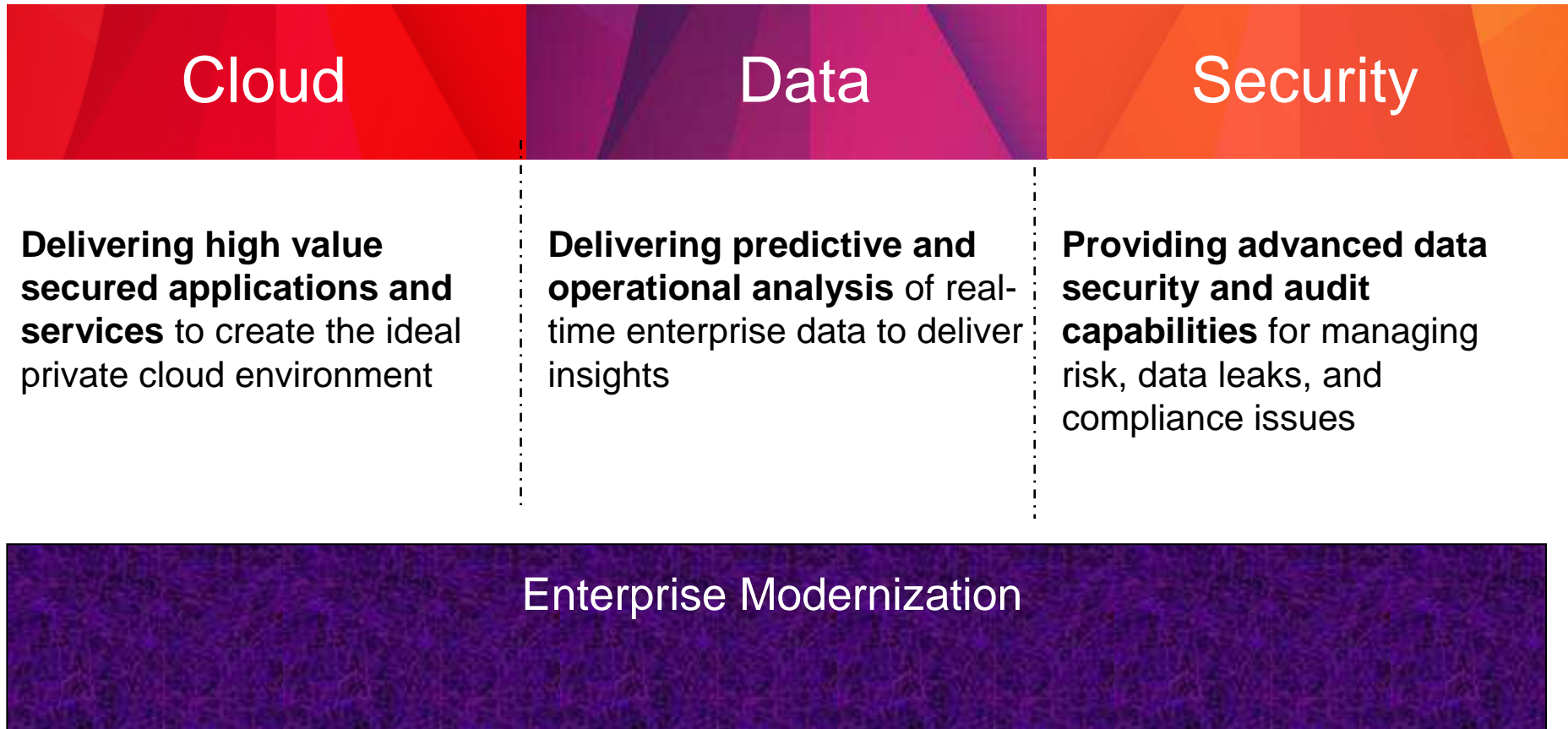
RF Tailgate   *RF Tailgate*

Top Exit Power option: When selected for a raised floor the Top Exit I/O feature is a coreq.   Also the diagram for this configuration should depict the I/O routing up thru the I/O chimneys and also routing thru the bottom of the frame using the raised floor tailgates.

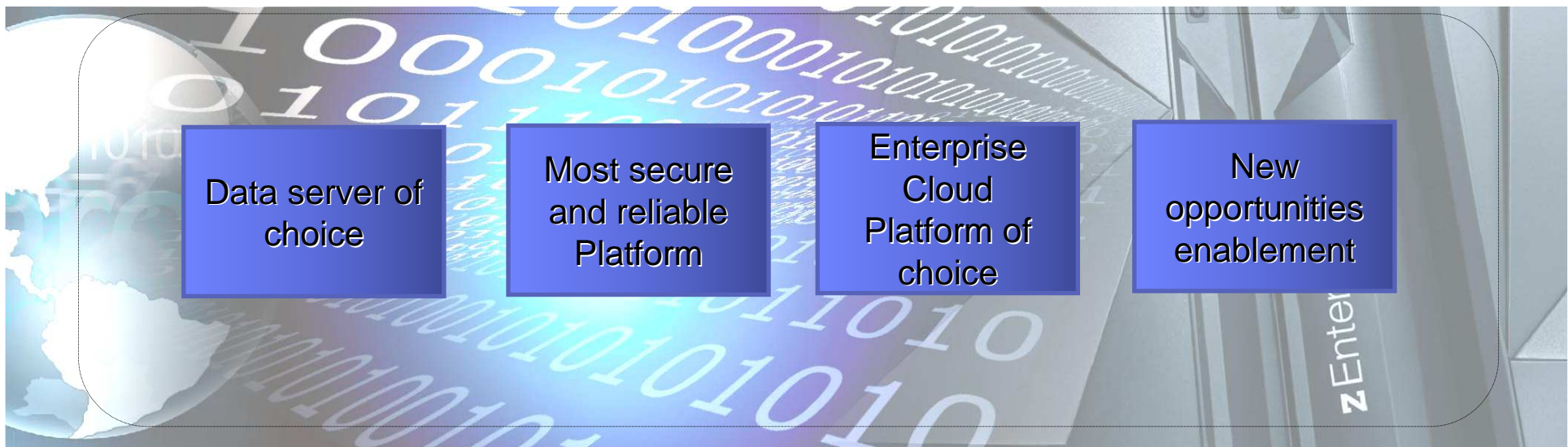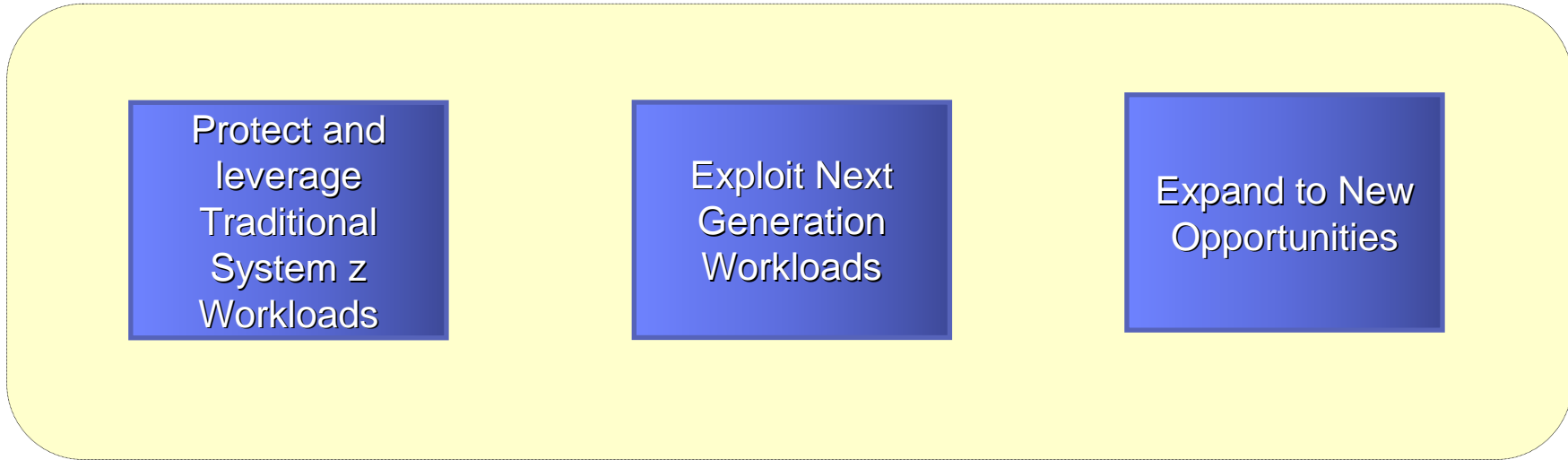# zEC12 Installation – Non-Raised Floor option

New

Line Cords

I/O Cables

OH I/O
OH
Power
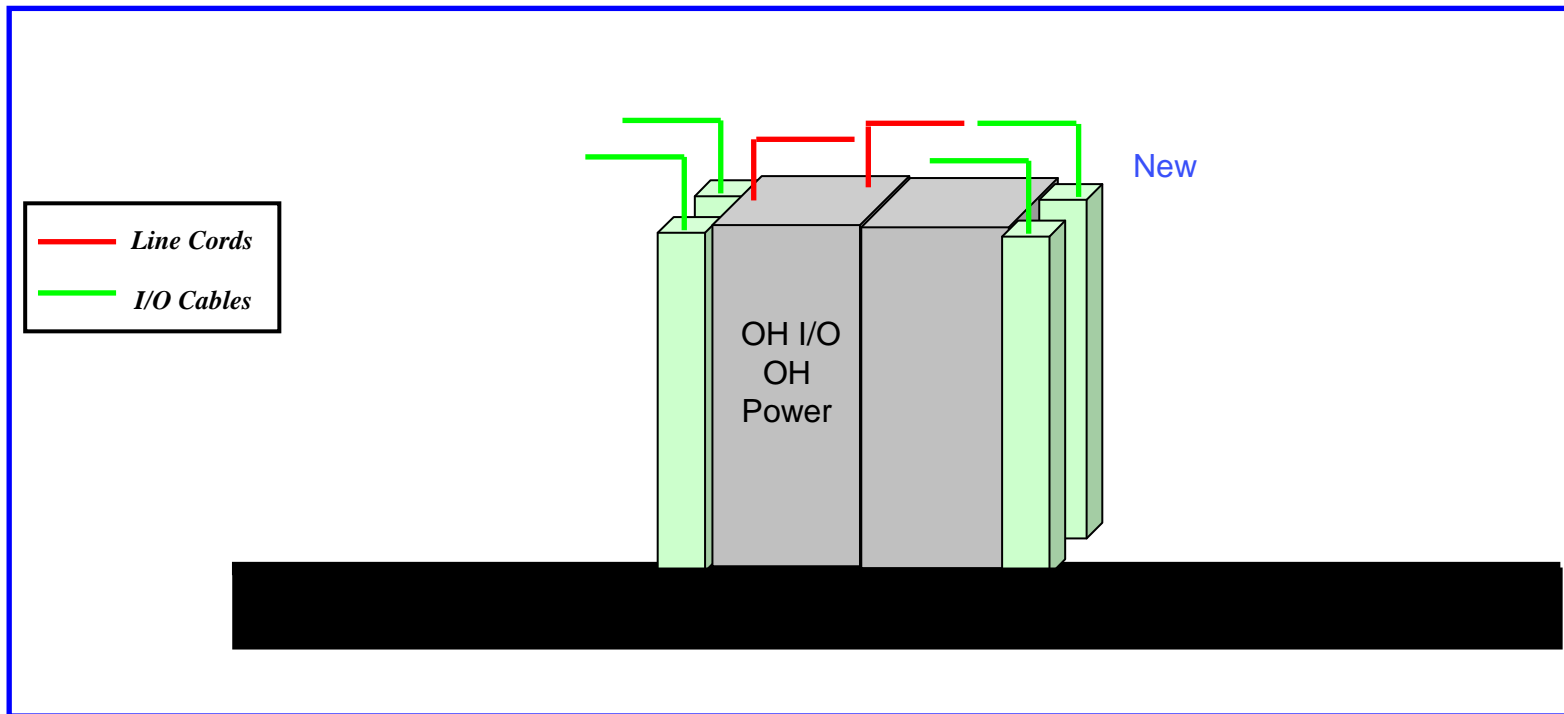
Water cooling is NOT supported. NO cables may exit at floor level.

IBM zEnterprise EC12 Business Initiatives

Cloud	Data	Security
Delivering high value secured applications and services to create the ideal private cloud environment	**Delivering predictive and operational analysis** of real-time enterprise data to deliver insights	**Providing advanced data security and audit capabilities** for managing risk, data leaks, and compliance issues

Enterprise Modernization

System z Strategy … and Future

Protect and leverage Traditional System z Workloads

Exploit Next Generation Workloads

Expand to New Opportunities

Data server of choice

Most secure and reliable Platform

Enterprise Cloud Platform of choice

New opportunities enablement

Cloud   Data   Security

Merci de votre attention