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# Hardware Innovation with the IBM zEnterprise EC12



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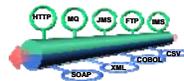
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# Evolution of hybrid computing with IBM System z

**IBM zEnterprise® 196 (z196)**  
First ever multiplatform computer – mainframe and distributed with single management



**DataPower® XI50z**  
within the IBM zEnterprise BladeCenter® Extension (zBX)



**Availability of Linux®** on IBM System x® on HX5 blades in the zBX



**Availability of Microsoft® Windows®** on System x blades in zBX and APIs



July 2010

Nov 2010

Mar 2011

Jul 2011

Sep 2011

Oct 2011

Dec 2011

Aug 2012

**Availability of zBX with IBM POWER7® blades and IBM Smart Analytics Optimizer**



**Announce zEnterprise 114**



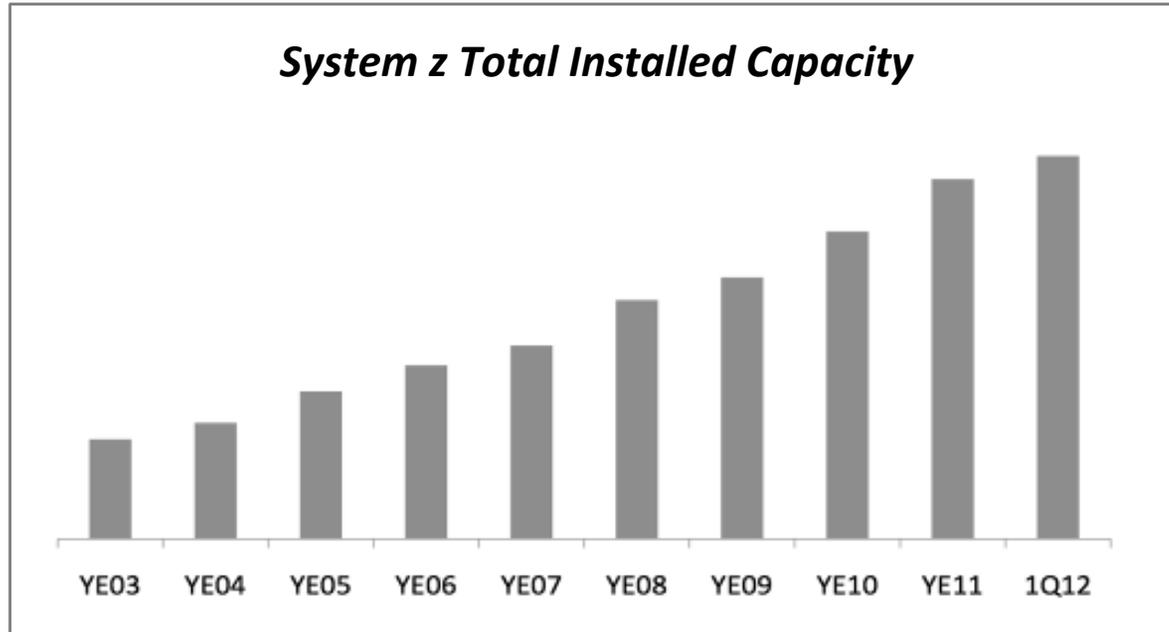
**IDAA – evolution of IBM Smart Analytics Optimizer – coming out of the zBX and into Netezza technology**



**IBM zEnterprise EC12 (zEC12) Next generation of hybrid computing**



# Clients continue to invest in the value of zEnterprise



**140+**

BladeCenter Extension units; **1,100+** blades shipped [ITD]

**120+**

new accounts since 3Q10 zEnterprise launch [as of 1Q12]

**35%+**

new growth market accounts; **12%** new accounts ww in FSS

**67%**

of Top 100 accounts have installed IFLs [as of 2Q12]

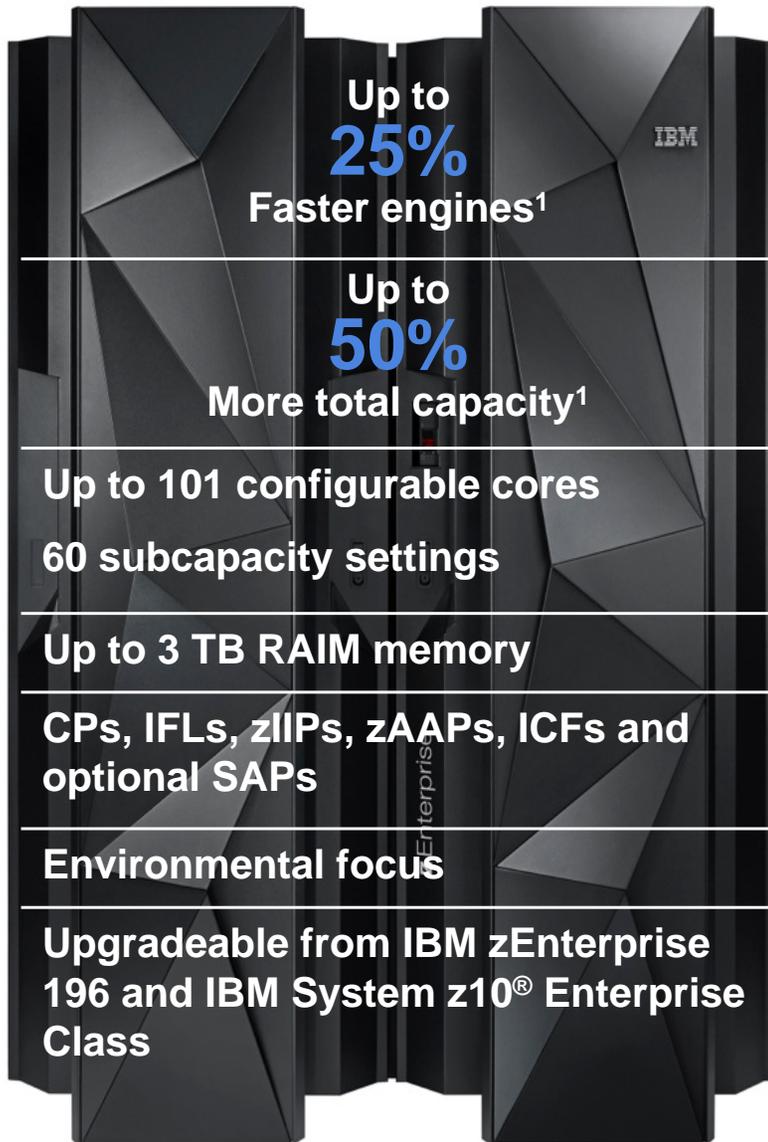
**36%**

System z clients have IFLs installed [as of 2Q12]

**21%**

of total installed MIPS run Linux [as of 2Q2012]

# zEnterprise EC12 is the core of next generation of System z



## **zEC12**

*Machine Type: 2827*

*Models: H20, H43, H66, H89, HA1*

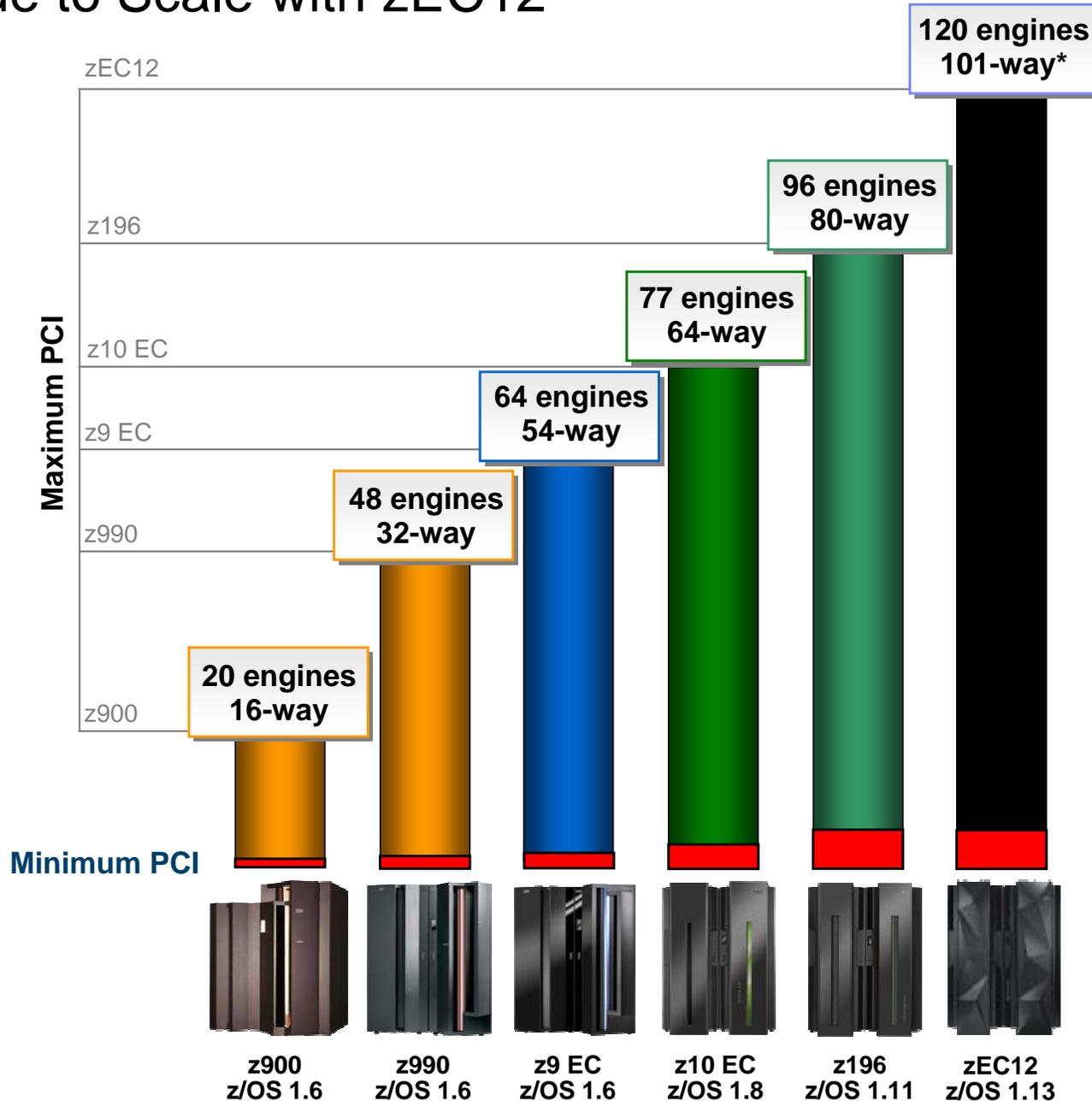
- **Advanced Technology 5.5 GHz processor chip for performance boost for all workloads**
  - Over **78,000 MIPS** for large scale consolidation
  - **Larger cache** for data serving
- **Processor chip optimized for software performance – exploited by Java, PL/I, compilers, DB2 and more**
- **Innovation to drive availability to superior levels**
  - **IBM zAware** offers snap-shot of the current state of your business
  - **FLASH Express and pageable large pages** to drive availability and performance for critical workloads
- **Security and reliability are in our DNA**
  - High speed **cryptography integrated as part of the chip**
  - Enhanced functions with new **Crypto Express4S**
  - PR/SM designed for **EAL5+ certification**

1. Based on preliminary internal measurements and projections against a z196. Official performance data will be available upon announce and can be obtained online at LSPR (Large Systems Performance Reference) website at <http://ibm.com/servers/resource/link/lib03060.nsf/pages/lspindex>. Actual performance results may vary by customer based on individual workload, configuration and software levels.

# System z Servers Continue to Scale with zEC12

## Each new range continues to deliver:

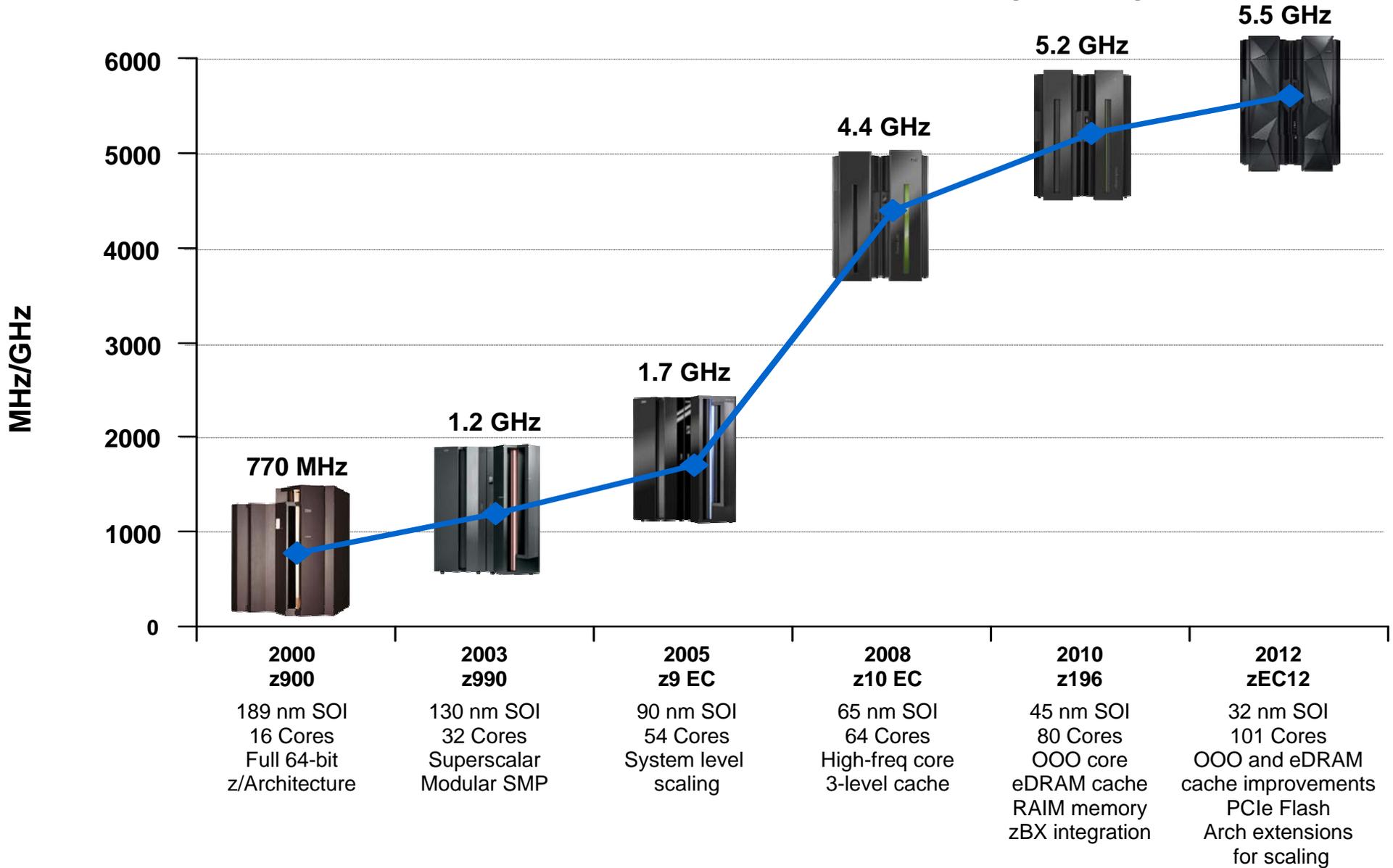
- New function
- Unprecedented capacity to meet consolidation needs
- Improved efficiency to further reduce energy consumption
- Continues to delivering flexible and simplified on demand capacity
- A mainframe that goes beyond the traditional paradigm



PCI - Processor Capacity Index

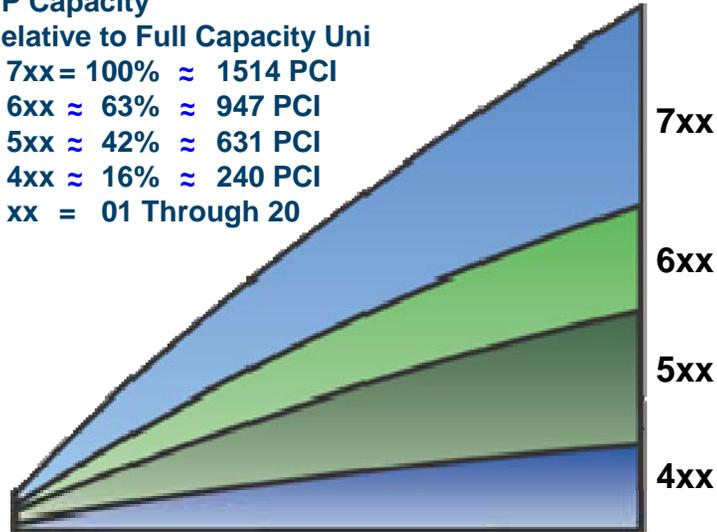
\*z/OS supports up to a 100-way only

# zEC12 Continues the CMOS Mainframe Heritage Begun in 1994



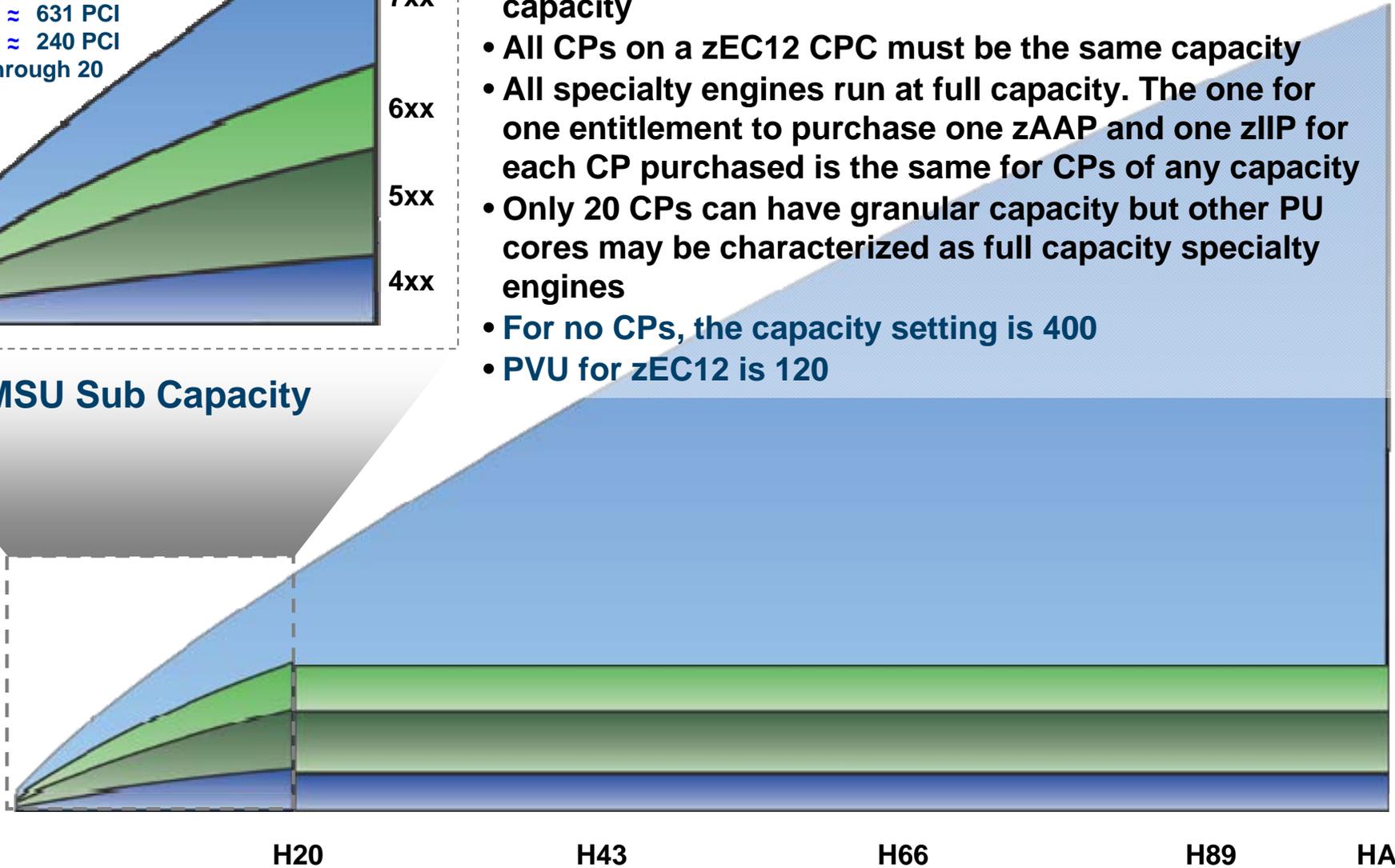
# zEC12 Full and Sub-Capacity CP Offerings

**CP Capacity**  
 Relative to Full Capacity Uni  
 7xx = 100% ≈ 1514 PCI  
 6xx ≈ 63% ≈ 947 PCI  
 5xx ≈ 42% ≈ 631 PCI  
 4xx ≈ 16% ≈ 240 PCI  
 xx = 01 Through 20

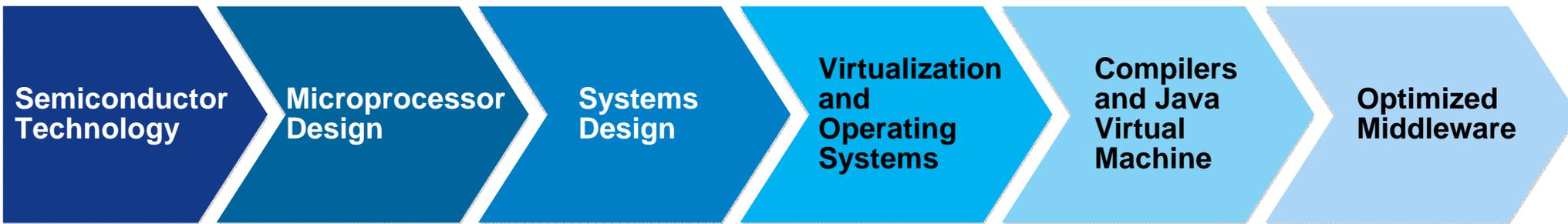


- Subcapacity CPs, up to 20, may be ordered on ANY zEC12 model.  
 If 21 or more CPs are ordered all must be full 7xx capacity
- All CPs on a zEC12 CPC must be the same capacity
- All specialty engines run at full capacity. The one for one entitlement to purchase one zAAP and one zIIP for each CP purchased is the same for CPs of any capacity
- Only 20 CPs can have granular capacity but other PU cores may be characterized as full capacity specialty engines
- For no CPs, the capacity setting is 400
- PVU for zEC12 is 120

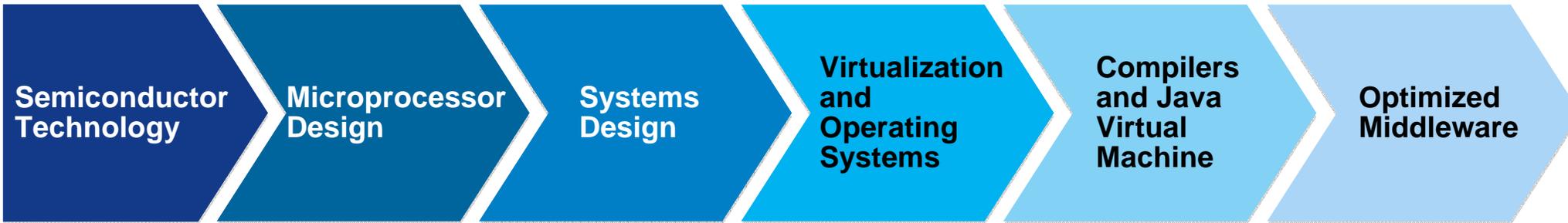
## MSU Sub Capacity



# IBM zEnterprise EC12: An optimized system



# IBM zEnterprise EC12: An optimized system



- eDRAM cache integrated on processor chip
- Efficient packaging
- Optimized high-K metal gate transistor design
- 2x transistor density for logic and on-chip memory

- World's fastest chip at 5.5 GHz
- More cache for superior data serving
- On-chip crypto and data compression
- Instruction co-optimized with compilers, Java, DB2
- Transactional Execution
- Runtime Instrumentation
- Decimal Format Conversions
- 2 GB page frames

- Optimized I/O pathways & subsystems with massive scale
- Best-of-breed reliability, availability & serviceability
- RAIM memory for high availability
- Integrated cryptographic coprocessor
- I/O cryptographic coprocessor
- Highest commercial security certification in industry (EAL5+ & FIPS 140-2 level 4)
- Multi-platform design of mainframe and distributed technologies
- Designed for highest utilization with heterogeneous workloads

- Intelligent policy management of mainframe & distributed technologies
- Granular, scalable virtualization of servers, memory and I/O with low overhead
- PR/SM and z/VM offer two-tier approach for superior virtualization supporting native Linux
- Dispatching on z/OS keeps software close to cache for optimized performance
- Highly available and resistant partition architecture suitable for private cloud

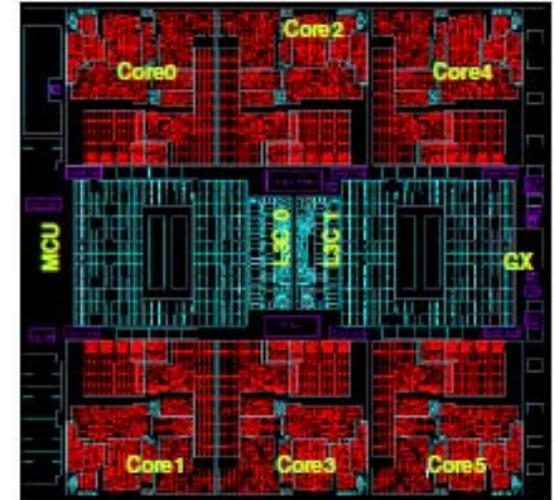
- Java, ASM, C/C++, PL/I Compilers optimized to exploit hardware architecture
- Java Runtime Environment exploits dynamic optimization (transactional execution)

- WebSphere, WebSphere MQ, DB2 exploit multi-system workload management, scale and availability
- Middleware optimized and tuned to scale up
- Tivoli optimized for operations management and security
- High volume, high performance, low cost transaction processing with CICS and IMS

\* Compared to z196

## zEC12 – Optimization and scale improvements starting at the core

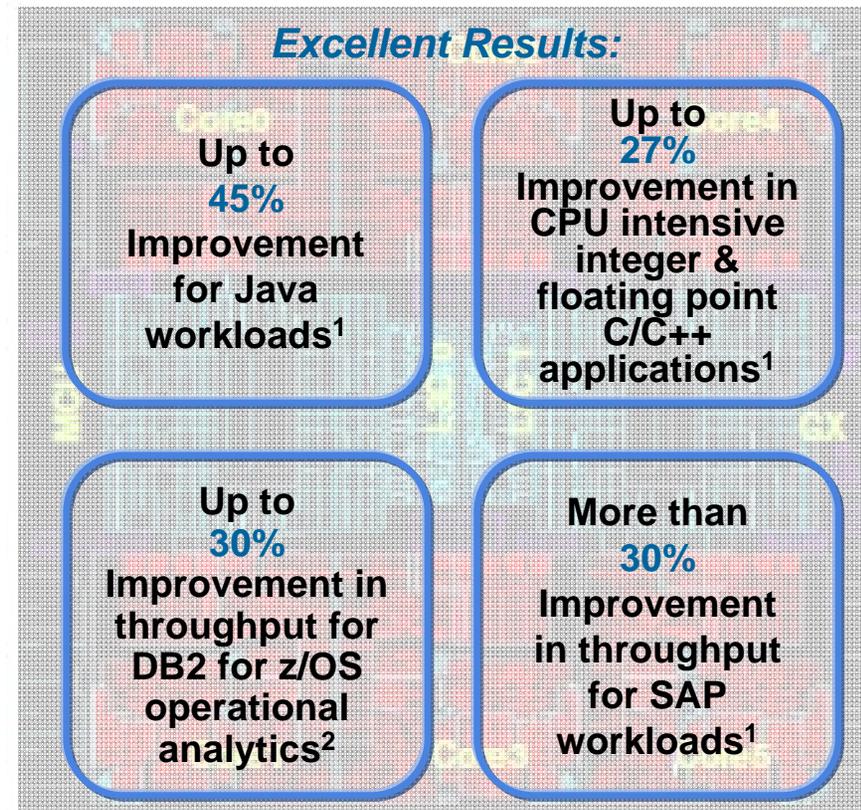
- **New 5.5 GHz 6-core processor chip continues our leadership in microprocessor design with a boost in performance for all workloads**
  - Second generation out of order execution design
- **Larger caches to optimize data serving environments**
- **New hardware functions optimized for software performance**
  - **Transactional Execution Facility** for parallelism and scalability
  - **Runtime Instrumentation Facility** is intended to help reduce Java overhead
  - **2 GB page frames** are intended to offer performance improvements for DB2 buffer pools and Java heaps
  - New IBM Enterprise PL/I compiler is planned to exploit and get a performance boost from **decimal format conversions facility**
- **Integrated cryptographic function available on each core characterized as a CP or IFL with enabling microcode**



# Processor chip optimized for software performance

## *Exploited by Java, PL/I, compilers, DB2, more*

- **Our leadership in microprocessor design supports a boost in performance for all workloads**
  - Second generation out of order design
  - Multi-level branch prediction supports complex 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** is intended to help reduce Java overhead
  - **2 GB page frames** are intended to offer performance improvements for DB2 buffer pools and Java heaps
  - Up to **30% improvement in IMS throughput** due to faster CPU and cache, compilers, and more<sup>1</sup>
  - New IBM Enterprise PL/I compiler is planned to exploit and get a performance boost from **decimal format conversions facility**



1. Based on preliminary internal measurements and projections

2. Aa measured by the IBM 9700 Solution Integration Center. The measured operational BI workload consists of 56 concurrent users executing a fixed set of 160,860 Cognos reports. Compared DB2 v10 workload running on IBM's z196 w/10 processors to an zEC12 w/10 processors

# Extending System z Availability with Flash Express and IBM zAware

Highly resilient and available systems

Server Design	Systems Availability	Operations Availability	Business Application Availability
<p>Sparing</p> <p>Enhanced book availability</p> <p>Hardware checks</p> <p>Redundant parts</p> <p>Parallel Sysplex®</p> <p><i>Designed to prevent hard failures</i></p>	<p>HyperSwap™</p> <p>Concurrent upgrade</p> <p>Virtual networking</p> <p>Data sharing</p> <p><i>Designed to improve system software availability</i></p>	<p>Capacity on Demand</p> <p>Capacity Back Up</p> <p>GDPS®/HyperSwap</p> <p>Call home</p> <p><i>Designed to improve continuous operations</i></p>	<p>Flash Express</p> <p>IBM zAware</p> <p><i>Designed to improve business availability</i></p>

## IBM zAware delivers smarter message monitoring capabilities



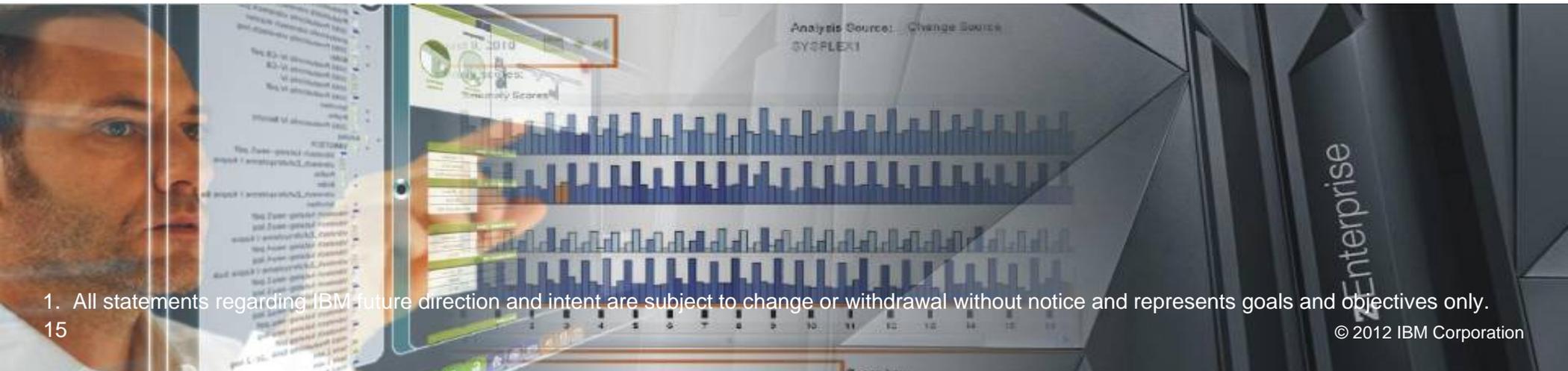
- **The complexity and rate of change of today's IT infrastructures stress the limits of IT to resolve problems quickly and accurately – while preserving SLAs**
- **IT is challenged to diagnose system anomalies and restore service quickly**
  - Systems often experience problems which are difficult or unusual to detect
  - Existing tools do little to quickly identify messages preceding system problems
  - Some incidents begin with symptoms that remain undetected for long periods of time
  - Manual log analysis is skills-intensive, and prone to errors
- **IBM zAware with Expert System Diagnostics Gets it Right, Fast**
  - IBM zAware helps improve problem determination in near real time – helps rapidly and accurately identify problems and speed time to recovery
  - Analyzes massive amounts of data to identify problematic messages, providing information to enable faster corrective action
  - Analytics on log data provides a near real time view of current system state
  - Cutting edge pattern recognition examines system behavior to help you pinpoint deviations
  - Machine learning, modeling and historical data work to describe your unique environment



# 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
<ul style="list-style-type: none"> <li>• Supports IBM and non-IBM middleware and applications</li> <li>• Monitors OPERLOG in a sysplex or monoplex</li> <li>• Assigns a message anomaly score to help identify potential issues</li> </ul>	<ul style="list-style-type: none"> <li>• Detects anomalies other solutions might miss</li> <li>• Can find the rare or infrequent message</li> <li>• Can detect an unusual number of normal messages</li> <li>• Can detect messages issued out of context</li> </ul>	<ul style="list-style-type: none"> <li>• Samples every 2 minutes</li> <li>• 10 minute interval</li> <li>• Uses 90 day rolling baseline; a utility provided to populate baseline; flexibility provided</li> </ul>	<ul style="list-style-type: none"> <li>• Near real time analysis</li> <li>• Intuitive reporting – both high level and drill down</li> <li>• Color coded browser display</li> <li>• XML output can feed ISVs or processes               <ul style="list-style-type: none"> <li>– Tivoli intends to provide alert and event notifications<sup>1</sup></li> </ul> </li> </ul>



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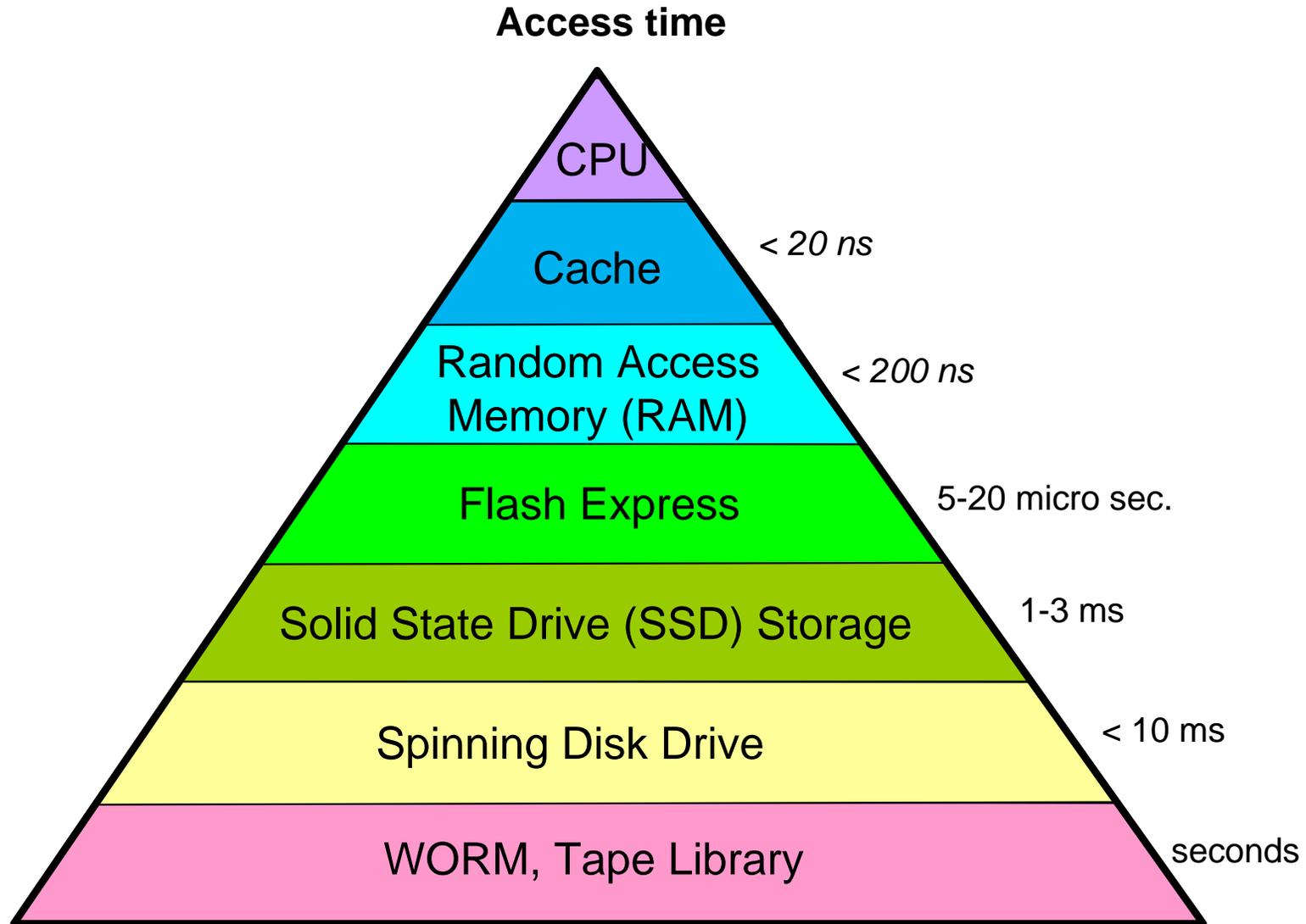
# IBM Flash Express – Smarter Availability for Smarter Systems



- **Flash Express is an innovative solution designed to help you compete effectively in today's market**
  - Automatically improve availability for key workloads at critical processing times
  - Drive availability and performance for workloads that cannot tolerate paging spikes or inconsistent performance
  - Slash latency for critical application processing such as diagnostics collection
- **Extends IBM's expertise in memory management introducing a new tier of memory using Flash Express**
- **Provides a secured, resilient and immediately usable solution**
- **Planned Flash Express and pageable large page exploiters:**
  - z/OS V1.13 **Language Environment**
  - **Java SDK7** and by extension
    - **WAS Liberty Profile v8.5**
    - **DB2**
    - **IMS 12**
    - And a future release of **CICS Transaction Server**
  - **IMS 12 Common Queue Server**



# Relative Access Times for different technologies



# IBM System z Security as the Enterprise Standard

- **Intrinsic platform security and privacy for transactions and sensitive data helps enable System z to be the secure enterprise application server and data vault**
  - Hardware cryptography built into each general purpose CP and IFL, and via the new Crypto Express4S coprocessors
  - Secure your critical information assets (or data) throughout their life cycle
- **Security capabilities that span the needs of multiple industries**
  - Strong focus on security and crypto functions required by the Banking/Finance industries
  - Support for the payment card industry with solutions that leverage the zEC12 for compliance and security (i.e. EMV for American Express)
  - New IBM Enterprise PKCS #11 Coprocessor firmware and support from z/OS helps meets the requirements of the European Union and public sector clients
- **zEC12 supports the System z exclusive protected key processor based cryptography**
  - Blends the speed of processor based crypto with the security of the Crypto Express coprocessor
- **PR/SM™ designed for EAL 5+ certification**



## zEC12 – Supports efficiencies in the data center

- **New non-raised floor option offers flexible possibilities for the data center**
- **Continuing to support options for better control of energy usage and improved efficiency in your data center**
  - zEC12 has a new radiator-based air cooled system design for more efficient cooling and improved concurrent maintenance
  - Water cooled options on zEC12 allow for up to 9% additional data center energy savings<sup>1</sup>
  - Savings with optional HV DC power when implemented in a new data center could be on the order of 7-12% of server input power<sup>2</sup>
- **More capacity but little change to the footprint in the data center**
  - Identical floor cutouts for zEC12 as the z196 and z10 EC<sup>3</sup> with no significant increase in weight
  - Depth of system with covers will increase by 64 mm / 2.52 inches
- **Over 12 years experience in designing and building earthquake resistant servers**

1. Based on internal measurements with average power usage effectiveness (PUE) of 2 with well configured zEC12 configuration.

2. Based on internal measurements and projections.

3. With the exception of water cooling and overhead cabling

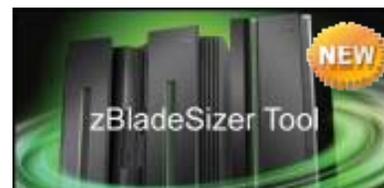
# Parallel Sysplex and Coupling Facility improvements

## *CFCC Level 18*

- **Scalability enhancements**
  - Up to 64 1x IFB3 links
  - 16 logical engines per CF LPAR
- **RMF™ channel path details**
  - Differentiate various IFB link types
  - Detect if CIB link running "degraded"
- **Serviceability enhancements**
  - Additional structure control info in CF dumps
  - Enhanced triggers for CF non-disruptive dumping
  - Enhanced CFCC tracing support
- **Performance enhancements**
  - DB2 GBP cache bypass
  - Dynamic structure size alter improvement
  - Cache structure management

# zBX – A Uniquely Configured Extension of the zEnterprise

- **zBX Model 003 supported by zEC12**
  - Investment protection – Model 002 upgrades to Model 003
- **No need to make changes to applications and application certifications are inherited from blades**
- **Managed by Unified Resource Manager**
  - Management of resources as defined by your business goals and objectives
  - Integrated network for better security, control and faster time to value
  - Programmable interfaces (APIs) to connect with system management tools for total management capabilities - IBM Tivoli Monitoring (ITM) has been enhanced to use the APIs



**zBX**  
*Machine Type: 2458*  
*Model: 003*

Up to <b>112</b>	PS701 blades (112 max)
	HX5 (7873) blades (56 max)
	DataPower XI50z (28 max)
1-4 Racks based on number of installed blades	
One zBX per zEC12	
Optional Acoustic Doors	
Optional Rear Door Heat Exchanger	
Upgradeable from zBX Model 002	

# Continuing to build a multi-platform roadmap for the future

## *Strengthening the story*

- **New Systems Director capability delivered through Unified Resource Manager APIs<sup>1</sup>**
  - Ability to discover, inventory, and visualize zBX resources under the Systems Director umbrella
  - Image management provided for blades within a zBX to support provisioning of new virtual servers
  - Energy Management of the zBX to lower energy consumption and costs
  - Power capping on System x and Power blades and power savings for Power blades
- **In the future, System z will continue to expand in the hybrid computing area<sup>1</sup>**
- **IBM intends to deliver workload-aware optimization for System x blades through function in Unified Resource Manager<sup>1</sup>**
- **IBM intends to deliver automated multi-site recovery for zBX hardware components based upon GDPS technologies<sup>1</sup>**

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# Flexible Connectivity on zEC12

*Improving bandwidth, granularity and options for connections*

## For Clustering

- **HCA-3 InfiniBand® Coupling Links**

- 12x InfiniBand
  - 1x InfiniBand (4 ports)
- improved scalability*

**NEW**

- **ISC-3 (peer mode only) <sup>1</sup>**

- **STP**

**NEW**

- *Improved broadband security*

## Heterogeneous environments

- **zBX**

- Intraensemble data network (IEDN)
- Intranode management network (INMN)

**NEW**

- *Increased 10 Gb Ethernet connectivity within zBX*

- **To PureSystems**

- 10 Gb Ethernet

## HMC

**NEW**

- *New IBM zAware partition managed from HMC*

- **Location to run Unified Resource Manager – including monitoring CPU, energy, workload performance**

- **Host of the ensemble – controlling all functions of the ensemble**

- **Primary with Alternate needed for DR**



## Within zEC12

- **PCIe I/O Infrastructure**
- **I/O Drawer and I/O Cage**

**NEW**

- *Flash Express*

## To the Data

- **FICON® Express8S (PCIe-based)**

- SX and 10KM LX

- **FICON Express8<sup>1</sup>**

- SX and 10KM LX

- **FICON Express4<sup>1</sup>**

- SX and 10 km LX

**NEW**

- *Enhanced channel subsystem*

## To the Network

- **OSA-Express4S PCIe based)**

- 10 Gb Ethernet LR and SR
- 1 Gb Ethernet SX and LX

**NEW**

- *1000BASE-T Ethernet*

- **OSA-Express3<sup>1</sup>**

- 10 Gb Ethernet
- 1 Gb Ethernet
- 1000BASE-T Ethernet

1. Carry forward only

# IBM System Storage DS8800

## Unique performance, availability and scalability makes DS8800 the ideal storage platform for zEnterprise

- **Self-optimizing performance and cost for hybrid computing**
  - Easy Tier can improve performance by up to 3x by moving only 3% of data to SSDs
  - Integrated QoS management aligns server and storage resources with application priorities
  - 8x faster query performance for operational analytics with special DS8000® List Prefetch Optimizer for High Performance FICON
- **Designed for near-continuous operations with over six-nines availability**
  - Fully-redundant design for near-continuous data access
  - Tight integration between DS8000 remote mirroring and GDPS HyperSwap is designed for over six-nines (99.9999%) availability
- **Optimized for zEnterprise efficiency and scalability**
  - Support for System z Discovery and Auto-Configuration simplifies configuration
  - Extended Address Volumes of up to 1 TB volumes simplifies management of large volumes
  - New support for System z load balancing algorithms can optimize throughput and response times between server and DS8000



# Robust tape storage to protect your information

*Helping our clients retain data securely and in compliance with regulatory requirements*

## Comprehensive tape storage product line for System z attachment



**TS1140 Tape Drive**

- Offers high performance (250 MBps) and high native capacity (4 TB) for storage consolidation
- Provides information security with support for encryption and key management
- Supports Write Once Read Many (WORM) cartridges to help satisfy compliance requirements



**TS3500 Tape Library**

- Scalable, automated data retention with up to 2.7 EB capacity with 3:1 compression
- Offers enhanced data availability and reliability with optional dual library accessory
- Provides data security and regulatory compliance via support for tape drive encryption and WORM cartridges



**TS7700 Virtualization Engine**

- Virtualization solution implements a fully integrated tiered storage hierarchy of disk and tape
- Reduces batch processing time, total cost of ownership and management overhead
- Disk-only models with up to 1.3 PB native tape volume cache
- Grid configurations for information availability and business continuity

## Tape is often cost effective versus disk

- Lower price per MB
- Lowest power and cooling storage option available today

# Synergy with zEC12 operating systems

## z/OS

- Java exploitation of **Transactional Execution** for **increased parallelism and scalability**
- Enhanced security support for **digital signatures**
- Faster problem determination with **IBM zAware for improved availability**
- Improve availability and performance with **Flash Express**
- **2GB page** support
- Simpler Specialty Engine (**zIIP**) exploitation
- z/OS v1.13 exploitation of new hardware
- Plus **over 4,100** applications enabled on z/OS

## z/VM

- z/VM **Compatibility support**
- Guest exploitation **support for new encryption technology**
- Improved I/O performance using **High Performance FICON (zHPF)** for guest exploitation

- **AND** with blades on the zBX there are even more options with applications on **AIX, Linux on System x or Microsoft Windows**



## Linux on System z

- **Improved consolidation ratio** through new capacity performance
- Improved I/O performance using **High Performance FICON (zHPF)**
- **Application and Linux optimization** enabled by full exploitation of zArchitecture extensions
- Optimized system setup via **Linux health checker**
- **FCP end-to-end data integrity checking** for applications and storage subsystems
- Plus **over 3,000** applications on System z

## z/TPF

- Support for **86 CPUs**
- **Hardware exploitation** for performance improvements

## z/VSE

- **64-bit addressing** with z/VSE V5.1
- Strong **interoperability with Linux** on System z
- New CICS functionality (**CICS Explorer**)

## Operating System Support for zEC12

- **The following are the minimum operating systems planned to run on zEC12:**
  - z/OS V1.12, V1.13; z/OS V1.11, V1.10 with z/OS Lifecycle Extension
  - SUSE Enterprise Server (SLES) 10 and 11; Red Hat Enterprise Linux (RHEL) 5 and 6
  - z/VM V5.4, 6.1, 6.2, with PTFs; z/VM V6.1, 6.2 for zBX support
  - z/VSE V4.3, V5.1, with PTFs; z/VSE V5.1 with PTFs for Crypto Express4S toleration
  - z/TPF V1.1
- **Using the general purpose application server blades we have:**
  - Red Hat Enterprise Linux (RHEL) 5.5 and up, and 6.0 and up
  - SUSE Linux Enterprise Server (SLES) 10 SP4 and 11 SP1 and up
  - Microsoft Windows Server 2008 R2 and Microsoft Windows Server 2008 SP2 (Datacenter Edition recommended)
  - AIX 5.3 Technology Level 12 or higher, AIX 6.1 Technology Level 5 or higher, AIX 7.1



# z/OS Support Changes

- **Shift z/OS to a 2 year release cycle**

- **Version 2.1 targeted to deliver in 2H2013**

- Release delivery cycle is planned to be every 2 years, in the second half of that year.
- Will continue to deliver key hardware support & updates in-between releases
- Maintain N-2 release migration (accommodate a 2 or 4 year migration cycle)
- 5 Year Support with optional fee based service extension to accommodate migration
- z/OSMF will be on the same release and service cycle
- Minimum supported HW levels ( z9 server or later, and 3990-3 controller or later)
- R12 Support extended to 4 years, R13 Support extended to 5 years; bridges v2 migrations

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	
R 1.10		3 Year Support			Life Cycle Ext.		Extended Service									
R 1.11		3 Year Support			Life Cycle Ext.		Extended Service									
R1.12			3 Year Support			+1 Support	LCE	Extended Service								
R1.13				3 Year Support			+ 2 Support		Extended Service							
v 2.1							5 Year Support			Extended Service						
v next2								5 Year Support			Extended Service					
v next3											5 Year Support			Exten		

**Announced via Statement Of Direction on April 11, 2012**

# Redbooks



- **IBM zEnterprise EC12 Technical Introduction, SG24-8050**

- This book provides concepts, positioning, and a business value view of zEnterprise System capabilities, hardware functions/features, and associated software support. It is intended for IT Managers, consultants, IT Architects and Specialists, and anyone who wants to understand the basic elements of the zEnterprise EC12.

- **IBM System z Connectivity Handbook, SG24-5444**

- This book highlights the hardware and software components, typical uses, coexistence, and relative merits of the System z I/O features. It is intended for data center planners, IT Specialists, system engineers, technical sales staff, and network planners who are involved in planning connectivity solutions for System z servers.

- **IBM zEnterprise EC12 Technical Guide, SG24-8049**

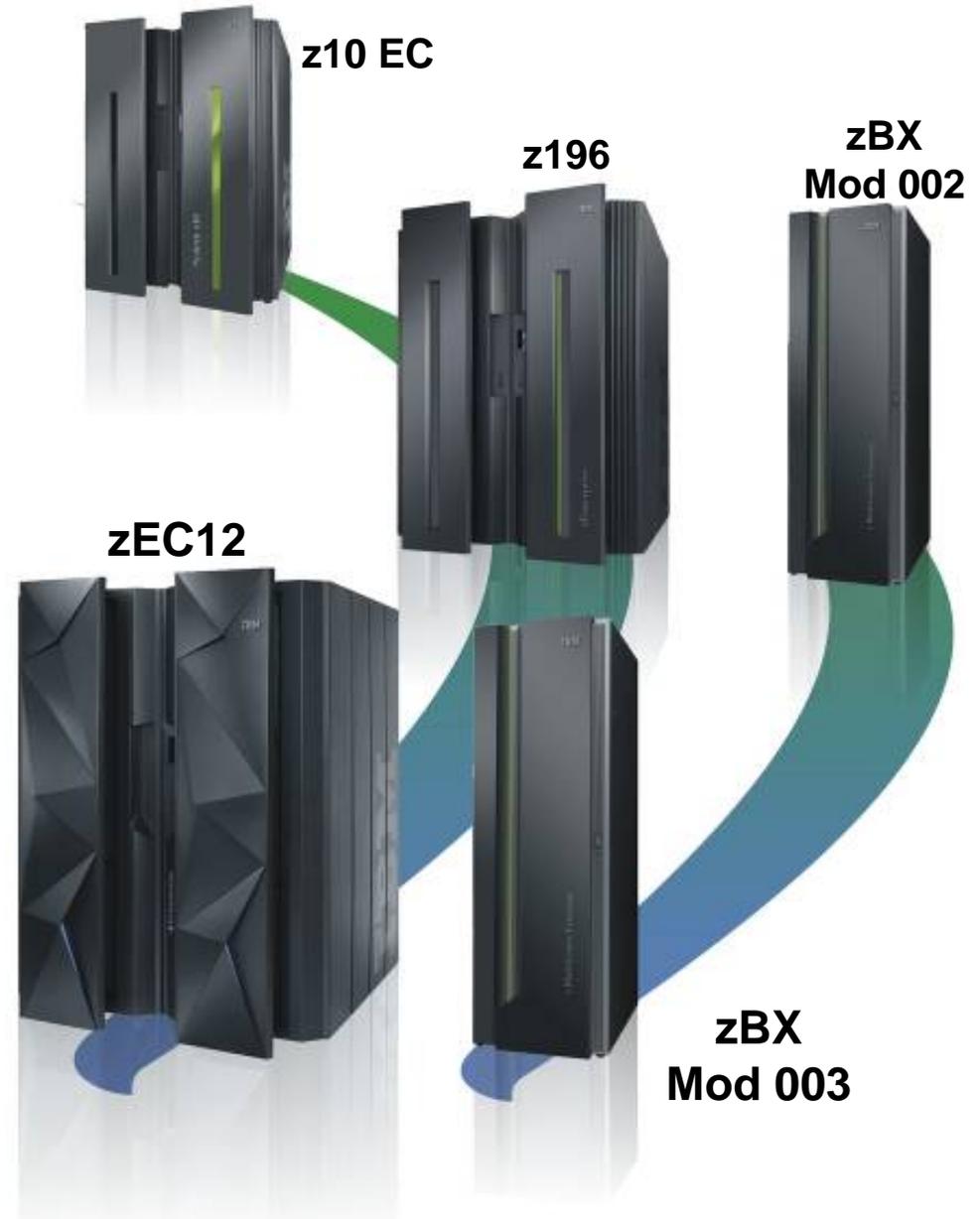
- This book provides specific information about the zEnterprise EC12 (zEC12) and its functions, features, and associated software support. Greater detail is offered in areas relevant to technical planning. It is intended for systems engineers, system programmers (IT Specialists), planners, and anyone wanting to understand the zEC12 functions and plan for their usage.

- **IBM zEnterprise EC12 Configuration Setup, SG24-8034**

- This book helps you install, configure, and maintain the IBM zEnterprise EC12 server. The zEC12 offers new functions that require a comprehensive understanding of the available configuration options. This book presents configuration setup scenarios, and discusses implementation examples in detail.

## Protecting your investment in IBM technology

- **Designed to protect your investment**
  - Offering upgrades from z10 EC™ and z196 to the zEC12
  - Upgrades from zBX Mod 002 to zBX Mod 003
- **Full upgradeability within the zEC12 family**
  - Upgrade to Model HA1 will require a planned outage
- **On demand offerings offer temporary or permanent growth when you need it**

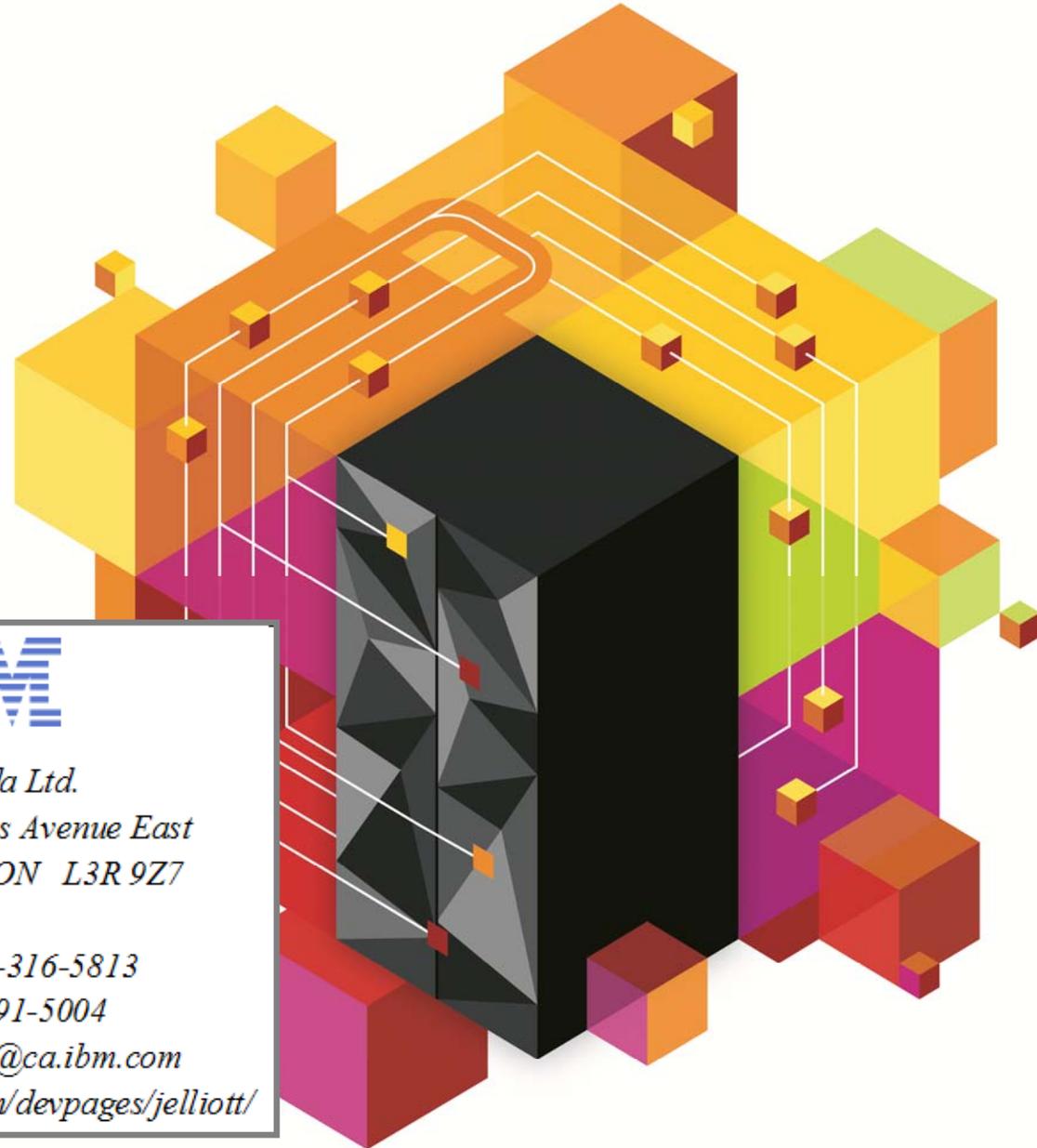


## IBM zEnterprise EC12 in an information-centric world

- **Operational analytics to enable business opportunities**
  - Most sophisticated data warehousing and analytics solutions with the fastest query performance in the market
  - Leverage your data to build competitive advantage
- **Trusted resilience for unmatched security and reliability**
  - Most secure system with 99.999% reliability
  - Unified platform for rapid development of secure applications end-to-end
- **Efficiency at scale**
  - Most efficient and fastest system for mission-critical workloads
  - Increased efficiency will free up IT resources to focus on new services to drive growth
  - Hybrid architecture enables rapid cloud deployment



# Thanks!



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