IBM System z10 Business Class

Hardware Innovation

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<table>
<thead>
<tr>
<th>Certified Used Equipment</th>
<th>Multiprise*</th>
<th>Tivoli*</th>
</tr>
</thead>
<tbody>
<tr>
<td>DB2*</td>
<td>Parallel Sysplex*</td>
<td>z9</td>
</tr>
<tr>
<td>DS8000</td>
<td>PR/SM</td>
<td>z10</td>
</tr>
<tr>
<td>ESCON*</td>
<td>Resource Link</td>
<td>z10 BC</td>
</tr>
<tr>
<td>FICON*</td>
<td>S/390*</td>
<td>z10 EC</td>
</tr>
<tr>
<td>GDPS*</td>
<td>Scalable Architecture for Financial Reporting</td>
<td>zArchitecture*</td>
</tr>
<tr>
<td>HiperSockets</td>
<td>Systems Director Active Energy Manager</td>
<td>z/OS*</td>
</tr>
<tr>
<td>HyperSwap</td>
<td>System Storage</td>
<td>z/VM*</td>
</tr>
<tr>
<td>IBM*</td>
<td>System z*</td>
<td>z/VSE</td>
</tr>
<tr>
<td>IBM eServer</td>
<td>System z9*</td>
<td>zSeries*</td>
</tr>
<tr>
<td>IBM logo*</td>
<td>System z10</td>
<td></td>
</tr>
</tbody>
</table>

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Notes:

Performance is in Internal Throughput Rate (ITR) ratio based on measurements and projections using standard IBM benchmarks in a controlled environment. The actual throughput that any user will experience will vary depending upon considerations such as the amount of multiprogramming in the user's job stream, the I/O configuration, the storage configuration, and the workload processed. Therefore, no assurance can be given that an individual user will achieve throughput improvements equivalent to the performance ratios stated here.

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The Mainframe Charter

The evolution of System z

Support programs designed to foster vitality in the IBM mainframe community, helping to promote a strong application portfolio and world-class support services.*

Provide leadership in innovation to enhance the use of the IBM mainframe to support increasingly integrated and flexible business processes for the on demand business.*

Enhance the value proposition and lower the cost of computing of mainframe solutions in a way that is compelling, clear, and consistent.*

* Excerpted from the Mainframe Charter – August 2003

Explore the integral components of the IBM community ecosystem
IBM System z family

IBM System z9 EC (2094)
- Announced 7/05 - Superscalar Server with up to 64 cores
- 5 models – Up to 54-way
- Granular Offerings for up to 8 CPs
- PU (Engine) Characterization
  - CP, SAP, IFL, ICF, zAAP, zIIP
- On Demand Capabilities
  - CUoD, CIU, CBU, On/Off CoD
- Memory – up to 512 GB
- Channels
  - Four LCSSs
  - Multiple Subchannel Sets
  - MIDAW facility
  - 63.75 subchannels
  - Up to 1024 ESCON channels
  - Up to 336 FICON channels
  - FICON Express2 and 4
  - OSA 10 GbE, GbE, 1000BASE-T
  - Coupling Links
- Configurable Crypto Express2
- Parallel Sysplex® clustering
- HiperSockets – up to 16
- Up to 60 logical partitions
- Enhanced Availability
- Operating Systems
  - z/OS, z/VM, z/VSE, TPF, z/TPF, Linux on System z

IBM System z9 BC (2096)
- Announced 4/06 - Superscalar Server with 8 cores
- 2 models – Up to 4-way
- High levels of Granularity available
  - 73 Capacity Indicators
- PU (Engine) Characterization
  - CP, SAP, IFL, ICF, zAAP, zIIP
- On Demand Capabilities
  - CUoD, CIU, CBU, On/Off CoD
- Memory – up to 64 GB
- Channels
  - Two LCSSs
  - Multiple Subchannel Sets
  - MIDAW facility
  - 63.75 subchannels
  - Up to 420 ESCON channels
  - Up to 112 FICON channels
  - FICON Express2 and 4 Gbps
  - OSA 10 GbE, GbE, 1000BASE-T
  - Coupling Links
- Configurable Crypto Express2
- Parallel Sysplex clustering
- HiperSockets – up to 16
- Up to 30 logical partitions
- Enhanced Availability
- Operating Systems
  - z/OS, z/OS.e, z/VM, z/VSE, TPF, z/TPF, Linux on System z

IBM System z10 EC (2097)
- Announce 2/08 - Server with up to 77 cores
- 5 models – Up to 64-way
- Granular Offerings for up to 12 CPs
- PU (Engine) Characterization
  - CP, SAP, IFL, ICF, zAAP, zIIP
- On Demand Capabilities
  - CoD, CIU, CBU, On/Off CoD, CPE
- Memory – up to 1.5 TB for Server and up to 1 TB per LPAR
- Channels
  - Four LCSSs
  - Multiple Subchannel Sets
  - MIDAW facility
  - 63.75 subchannels
  - Up to 1024 ESCON channels
  - Up to 336 FICON channels
  - FICON Express2 and 4
  - OSA 10 GbE, GbE, 1000Base-T
  - Coupling Links
- Configurable Crypto Express2
- Parallel Sysplex clustering
- HiperSockets – up to 16
- Up to 60 logical partitions
- Enhanced Availability
- Operating Systems
  - z/OS, z/VM, z/VSE, TPF, z/TPF, Linux on System z

IBM System z10 BC (2098)
- Announced 10/08 – Server with 12 cores
- Single model – Up to 5-way
- High levels of Granularity available
  - 130 Capacity Indicators
- PU (Engine) Characterization
  - CP, SAP, IFL, ICF, zAAP, zIIP
- On Demand Capabilities
  - CoD, CIU, CBU, On/Off CoD. CPE
- Memory – up to 120 GB
- Channels
  - Two LCSSs
  - Multiple Subchannel Sets
  - MIDAW facility
  - 63.75 subchannels
  - Up to 480 ESCON channels
  - Up to 128 FICON channels
  - FICON Express2 and 4 Gbps
  - OSA 10 GbE, GbE, 1000BASE-T
  - InfiniBand Coupling Links
- Configurable Crypto Express2
- Parallel Sysplex clustering
- HiperSockets – up to 16
- Up to 30 logical partitions
- Enhanced Availability
- Operating Systems
  - z/OS, z/OS.e, z/VM, z/VSE, TPF, z/TPF, Linux on System z
IBM z10 BC continues the CMOS Mainframe heritage

- **Multiprise® 2000** – 1st full-custom CMOS S/390®
- **Multiprise 3000** – Internal disk, IFL introduced on midrange
- **IBM eServer™ zSeries® 800** (z800) – Full 64-bit z/Architecture®
- **IBM eServer zSeries 890** (z890) – Superscalar CISC pipeline
- **z9 BC** – System level scaling
- **z10 BC** – Architectural extensions
- Higher frequency CPU
New levels of application performance
Designed for an expanded set of workloads

- The z10™ BC can deliver up to 50% more performance for general purpose workloads than an IBM System z9® Business Class (z9™ BC)*
- The uniprocessor can deliver up to 40% more performance than z9 BC uniprocessor**
- Up to 1.9x performance improvements for CPU intensive jobs or tasks
- Up to 10X improvement in decimal floating point instructions
- Up to 10 IFLs for large scale consolidation

All performance information was determined in a controlled environment.
* LSPR mixed workload average running z/OS® 1.9 - z10 BC z05 versus z9 BC z04
** LSPR mixed workload average running z/OS 1.9 - z10 BC z01 versus z9 BC z01
The modern mainframe for small and medium enterprises
The mainframe made over – Smart, Cool, Affordable

IBM System z10™ Business Class (z10 BC™)

Machine Type: 2098
1 Model: E10
Single Frame
Non-raised floor option

Processor Cores:

- Enterprise Quad Core technology – 3.5 GHz
- Enhanced capacity 5-way model with up to 5 zAAPs/zIIPs
- Up to a 10-way IFL or Coupling Facility
- Core sparing technology
- 2 SAPs standard per system
- Configurable PUs allow you to design the system to meet your needs (e.g. CPs, IFLs, ICFs, zAAPs, zIIPs, SAPs)

Memory:

- Lower 4 GB entry point
- 8 GB HSA separately managed and not included in customer purchased memory
- Customer maximum 248 GB
  - 120 GB - Oct. 08
  - 248 GB – June 09

I/O:

- New I/O drawer (RAS)
- 6 GBps InfiniBand® host buses for I/O
- High Performance FICON® for System z
- FICON/FCP Serviceability Enhancements
- OSA-Express3 GbE, 10 GbE, 1000BASE-T
- InfiniBand Coupling Links
- Continued lower capacity / priced I/O cards
The right size for existing and future applications

Smart, affordable and flexible

- Granularity designed for flexibility and growth
- Any to any capacity upgradeability within the Model
- All IBM System z10 Enterprise Class (z10 EC™) temporary capacity offerings are available on z10 BC
- CBU capability from smallest to largest capacities
- Increased number of specialty engines than z9 BC
- All specialty engines run at full capacity
- Linux only IFL and ICF only servers (A00)

Remember the IBM Processor Capacity Reference (zPCR) is a free tool available for download that can be used to size your System z processors.
http://www-03.ibm.com/support/techdocs/atsmastr.nsf/WebIndex/PRS1381
Just in time capacity gives you control

- Permanent and temporary offerings – with you in charge
  - Permanent offerings – Capacity Upgrade on Demand (CUoD), Customer Initiated Upgrade (CIU)
  - Temporary offerings – On/Off Capacity on Demand (On/Off CoD), Capacity Backup Upgrade (CBU) and the new Capacity for Planned Event (CPE)
- No customer interaction with IBM at time of activation
  - Broader customer ability to order temporary capacity
- Multiple offerings can be in use simultaneously
  - All offerings on Resource Link™
  - Each offering independently managed and priced
- Flexible offerings may be used to solve multiple situations
  - Configurations based on real time circumstances
  - Ability to dynamically move to any other entitled configuration
- Offerings can be reconfigured or replenished dynamically
  - Modification possible even if offering is currently active
  - Some permanent upgrades permitted while temporary offerings are active
- Policy based automation capabilities
  - Using Capacity Provisioning Manager with z/OS 1.9
  - Using scheduled operations via HMC
Evolution of System z Specialty Engines

Building on a strong track record of technology innovation with specialty engines – DB Compression, Encryption, Vector Facility

In z/VM® 5.4, IBM fulfilled plans to support the new System z10 capability to allow any combination of CP, zIIP, zAAP, IFL, and ICF processor-types to reside in the same z/VM LPAR
Harness the Unique Value of Specialty Engines

- Specialty engine Prices have remained constant yet deliver more capacity
  - Up to 40% more capacity from z9 BC!!
  - New lower Prices on z10 BC, now $47.5k USD\(^1,3\)
- Specialty engine MES upgrades to z10 BC typically move with NO charge
  (exception for all IFL server and short path upgrades)
- New lower memory costs for specialty engine enabled workloads, now $2250 per GB\(^1,2,3\)
- Distributed Server model over same time:
  - 3 Technology Refreshes (New Hardware)
  - 3 System migrations

Specialty Engines:
The investments that continues to deliver value generation to generation.

1 - Prices in USD, may vary by country, 2 - Limited to 16GB per engine, 3 – Does not include Internal Coupling Facilities (ICFs)
Making high performance a reality

Designed for the next evolution of Enterprise applications

- New Enterprise Quad Core z10 processor chip
  - 3.5 GHz – additional throughput means improved price/performance
  - Cache rich environment optimized for data serving
  - 50+ instructions added to improve compiled code efficiency
  - Support for 1 MB page frames

- Hardware accelerators on the chip
  - Hardware data compression
  - Cryptographic functions
  - Hardware Decimal Floating point

- CPU intensive workloads get performance improvements from new core pipeline design
Decimal arithmetic widely used in commercial and financial applications
- Computations often handled in software
- First delivered in millicode on the System z9 – brought improved precision and function
  - Avoids rounding and other problems with binary/decimal conversions
- Integrated on every z10 core to deliver a performance boost to execution of decimal arithmetic
- Growing industry support for hardware decimal floating point standardization
  - Java BigDecimal, C#, XML, C/C++, GCC, DB2® V9, Enterprise PL/1, Assembler
  - Open standard definition led by IBM

Delivering the benefits of System z to a new set of workloads

* All performance information was determined in a controlled environment.
z10 High Performance FICON for System z (zHPF)

- Simplification of storage area network (SAN) traffic with zHPF can improve performance
  - For small data transfers of OLTP and other workloads that exploit the zHPF protocol, the maximum number of I/Os per second is increased by up to 100%*

- Only available on System z10
  - Supported on FICON Express2 and FICON Express4

- Requires control unit exploitation and z/OS 1.8 and higher with PTF
  - IBM System Storage™ DS8000™ Release 4.1

* Some complex channel programs can not be converted to zHPF protocol
System z10 BC delivers continued price / performance and affordability for new workloads

<table>
<thead>
<tr>
<th>Generation to generation price / performance improvements:</th>
<th>z10 BC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduction in software charging units, MSUs,(^1) versus z9 BC ((^1) Millions of Service Units)</td>
<td>10%</td>
</tr>
<tr>
<td>Reduction in software charging units, MSUs, versus z890 or z800 / z900</td>
<td>19% or 27%</td>
</tr>
<tr>
<td>Maintenance price per MIPS reduction for equivalent capacity(^1)</td>
<td>5%</td>
</tr>
<tr>
<td>Maintenance price per MIPS reduction with capacity growth(^1)</td>
<td>Up to 10%</td>
</tr>
<tr>
<td>Performance improvement for Linux (IFLs), Java (zAAPs) and Integrated Information Processors (zIIPs)</td>
<td>Up to 40%</td>
</tr>
<tr>
<td>Typical charge for MES upgrades for IFLs, zAAPs, and zIIPs</td>
<td>0</td>
</tr>
</tbody>
</table>

**Technology-driven value**

<table>
<thead>
<tr>
<th>Number of capacity settings - 5 Full Uni + 125 Sub-Cap settings</th>
<th>130</th>
</tr>
</thead>
<tbody>
<tr>
<td>50% price reduction on Specialty engines for System z10 BC (^2,4)</td>
<td>$47.5 K</td>
</tr>
<tr>
<td>IBM Software charges for zAAP capacity and zIIP capacity</td>
<td>0</td>
</tr>
<tr>
<td>62% price reduction on System z10 Memory Prices for new workloads when purchased together with Specialty engines (^2,3,4)</td>
<td>$2,250 USD</td>
</tr>
</tbody>
</table>

**Plus**

- 100 percent of IBM mainframes are delivered virtualization ready
- System z New Application License Charge (zNALC) pricing metrics for New Workloads
- On/Off Capacity on Demand (On/Off CoD) enhancements to better manage volatile business requirements

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1 – Comparisons shown are z9 BC to z10 BC; 2 - Prices in USD, may vary by country; 3 – Limited to 16GB per engine; 4 – Does not include Internal Coupling Facilities (ICFs)
Connecting to the world — z can do IT all

- Improved performance and flexibility for connectivity
- Broad set of options to meet your needs

Within the server
- HiperSockets
  - Multi Write Facility
  - Layer 2 and layer 3 support

For Clustering
- InfiniBand Coupling Links
- ICB-4 (12 connections)
- ISC-3 (peer mode only)
- IC (define only)
- STP
  - NTP Server and NTP Client support to provide common time synchronization across heterogeneous platforms
  - Enhanced time accuracy (NTP server with Pulse per second)
- Support for n-2 and above servers

To the Network with OSA
- QDIO Data Connection Isolation
- OSA-Express3
  - 10 Gigabit Ethernet LR and SR
  - 1 Gigabit Ethernet SX and LX
  - 1000BASE-T Ethernet — including support for ICC and OSA for NCP
- OSA-Express2
  - 1000BASE-T Ethernet
  - Gigabit Ethernet LX and SX
  - 10 Gigabit Ethernet LR

To the Data
- FICON/FCP – zHPF
  - FICON Express4\(^1\)
  - FICON Express2
  - FICON Express
    (Required for FCV)
- ESCON\(^\circ\)

\(^1\)zHPF only applies to FICON Express4 and FICON Express2

* Note: Red items carry forward on a Machine MES only, not available for new system orders
z10 BC & z10 EC Parallel Sysplex coexistence and coupling connectivity

- **z9 EC**
  - ISC-3, ICB-4
  - Dedicated CF when PSIFB
  - ISC-3, ICB-4

- **z9 BC**
  - ISC-3, ICB-4

- **PSIFB**
  - z10 BC & z10 EC Parallel Sysplex coexistence and coupling connectivity
  - 12x IB-SDR
  - 12x IB-DDR
  - 10/100 KM
  - 150 meters
  - PSIFB – z9 to z9 NOT supported

- **PSIFB – z9 to z9 NOT supported**

- **z800, z900 Not supported!**

- **z990**
  - ISC-3, ICB-4

- **z890**
  - ISC-3, ICB-4

- **z10**
  - PSIFB, ISC-3, and ICB-4 (CFCC 16)
Tracking energy consumption within the infrastructure
System z10 – Smart, cool, manageable

- Resource Link provides tools to estimate server energy requirements before you purchase a new system or an upgrade
- Has energy efficiency monitoring tool
  - Introduced on IBM System z9 platform in April 2007
  - Power and thermal information displayed via the System Activity Display (SAD)
- IBM provides an integrated solution to help simplify IT operations – IBM Systems Director 6.1
  - Includes IBM Systems Director Active Energy Manager™ (AEM) for Linux on System z V3.1 offering a single view of actual energy usage across multiple heterogeneous IBM platforms within the infrastructure – meeting your “green” initiatives and cost objectives
  - Reduces complexity with integrated platform and enterprise service management
  - Deploys and manages virtual servers to control data center space
  - Integrates with IBM service management offerings from IBM Tivoli®
Consolidation with Linux gets a “green light”

System z servers may help customers become more energy efficient:

- Deploy energy efficient technologies – reduce energy consumption and save floor space

Economics of IFLs and z/VM help to drive down the cost of IT

- IFLs attractively priced, have no impact on z/OS license fees, and z/VM and Linux software priced at real engine capacity
- New 50% price reduction on IFLs for System z10 BC, now $47,500*
- Plus 62% price reduction on System z10 memory prices for new workloads when purchased with Specialty Engines*, now $2250 per GB **
- And typically MES upgrades when moving to new technology are priced at no charge

* Prices are stated in US currency and may vary by country. Specialty engines do not include Internal Coupling Facilities (ICFs)
** Limited to 16 GB per engine

Over 2450 LINUX applications are supported on System z, 15% growth in 2008

Integrated Facility for Linux – IFL
Protecting your investment in IBM technology

- Designed to protect your investment by offering upgrades from any z9 BC or z890 to the z10 BC
  - Typically no charge MES upgrades on IFLs and zAAPs

- Full upgradeability within the System z10 family
  - Full upgrades within the z10 BC
  - Upgrade to z10 EC Model E12 (requires a planned outage)

- Temporary or permanent growth when you need it
  - New provisioning architecture
Operating systems

**z/OS**
- Intelligent workload dispatching for performance
- Simplified verification and installation of service
- Enable enterprise-wide password synchronization
- High availability disk solution with simplified management
- Extreme storage volume scaling
- More zIIP exploitation
- Up to 64-way support
- Capacity provisioning

**z/TPF**
- Support for 64+ processors
- Workload charge pricing
- Exploit encryption technology

**z/VSE™**
- Interoperability with Linux on System z
- Exploit encryption technology
- MWLC pricing with sub-capacity option

**Linux on System z**
- Enhanced performance for applications with large memory requirements
- Reduced latency and better network performance for bandwidth hungry applications
- Improved performance with Intelligent Dispatching
- HiperSockets Layer 2 support for easier IP configuration and problem diagnosis
- Enhanced encryption technology support

**z/VM**
- z/VM Evaluation Edition
- Exploitation of new z/VM-mode partitions providing additional flexibility for hosting workloads
- Dynamically add processors and memory to z/VM LPARs and virtual servers
- Extended systems management functions using the HMC
- More secure network connectivity
- Reduced latency and better networking performance for bandwidth hungry applications
### System z10 BC Operating System Support

<table>
<thead>
<tr>
<th>Operating System</th>
<th>ESA/390 (31-bit)</th>
<th>z/Architecture (64-bit)</th>
</tr>
</thead>
<tbody>
<tr>
<td>z/OS Version 1 Releases 8, 9 and 10</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>z/OS Version 1 Releases 7(1)(2)</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Linux on System z(2), Red Hat RHEL 4, &amp; Novell SUSE SLES 9</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Linux on System z(2), Red Hat RHEL 5, &amp; Novell SUSE SLES 10</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>z/VM Version 5 Release 2(3) and 3(3) and 4</td>
<td>No*</td>
<td>Yes</td>
</tr>
<tr>
<td>z/VSE Version 3 Release 1(2)(4)</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>z/VSE Version 4 Release 1(2)(5) and 2(5)</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>z/TPF Version 1 Release 1</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>TPF Version 4 Release 1 (ESA mode only)</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

1. z/OS R1.7 + zIIP Web Deliverable required for System z10 to enable HiperDispatch on System z10 (does not require a zIIP). z/OS V1.7 support was withdrawn September 30, 2008. The Lifecycle Extension for z/OS V1.7 (5637-A01) makes fee-based corrective service for z/OS V1.7 available through September 2009. With this Lifecycle Extension, z/OS V1.7 supports the z10 BC server. Certain functions and features of the z10 BC server require later releases of z/OS. For a complete list of software support, see the PSP buckets and the Software Requirements section of the System z10 BC announcement letter, dated October 21, 2008.

- Compatibility Support for listed releases. Compatibility support allows OS to IPL and operate on a z10 BC.
- Requires Compatibility Support which allows z/VM to IPL and operate on the System z10 providing System z9 functionality for the base OS and Guests. *z/VM supports 31-bit and 64-bit guests
- z/VSE V3 31-bit mode only. It does not implement z/Architecture, and specifically does not implement 64-bit mode capabilities. z/VSE is designed to exploit select features of IBM System z10, System z9, and zSeries hardware.
- z/VSE V4 is designed to exploit 64-bit real memory addressing, but will not support 64-bit virtual memory addressing.

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Note: Refer to the z/OS, z/VM, z/VSE subsets of the 2098DEVICE Preventive Planning (PSP) bucket prior to installing a z10 BC.
Protecting with IBM’s world-class Business Resiliency solutions

- New I/O drawer with concurrent add/replace for drawers 2-4
- Preplanning capabilities to avoid future planned outages, e.g. dynamic LPAR allocation without a system outage and plan ahead memory
- Integrated enterprise level resiliency for heterogeneous data center disaster recovery management
- Policy driven flexibility to add capacity and backup processors
- Basic HyperSwap improves storage availability *
- Integrated cryptographic accelerator
- Tamper-resistant Crypto Express2 feature with enhanced secure key AES support and capability for increased Personal Account Numbers
- Audit logging on new Trusted Key Entry (TKE) 5.3 with optional Smart Card reader
- System z – the only platform that is EAL5 certified

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IBM System z10 Business Class

Innovative technology begins today

IBM System z10 Business Class enables clients to consolidate and virtualize their server environment, helping them to...

improve access time to data and to the network

reduce costs and simplify their IT infrastructure

run a wide variety of new workloads on a resilient and highly secure system
System z10 and IBM System Storage
Better Together

- **IBM Virtualization Engine™ TS7700 and TS3500 Tape Library**
  - NEW TS7720 provides high capacity disk cache for rapid recall
  - NEW TS7740 cache models more than double existing capacity
  - Grid configurations offer availability and disaster recovery

- **IBM System Storage™ DS8000: The best gets better**
  - NEW zHPF support brings performance and availability enhancements
  - Higher capacity Fibre channel drives & supported volume size up 400%
  - New z/OS Metro/Global Mirror Incremental Resync enables seamless high availability with GDPS® HyperSwap™
  - New IBM Basic HyperSwap volume failover as part of z/OS
  - Certified Secure Data Overwrite Services virtually erases all DS8000 data to protect sensitive information on retired systems

- **IBM System Storage™ SAN Volume Controller V4.3 for Linux, z/VM (V5.3/5.4) and z/VSE (V4.2)**
  - New space-efficient Virtual Disks and FlashCopy® support improves utilization and reduces storage growth
  - New Virtual Disk Mirroring helps improve availability for critical applications
Thank you