IBM System z10 Enterprise Class

Future of System z

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The Future Runs on System z

IBM Systems

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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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IBM Systems

Introducing the IBM System z10™ Enterprise Class (z10™ EC) … A marriage of evolution and revolution

Evolution

- Scalability and virtualization to reduce cost and complexity
- Improved efficiency to further reduce energy consumption
- Improved security and resiliency to reduce risk
- New heights in storage scalability and data protection

Revolution

- 4.4 GHz chip to deliver improved performance for CPU intensive workloads
- 'Just in time' deployment of capacity resources
- Vision to expand System z capabilities with Cell Broadband Engine™ technology

Continuing the modular design for flexibility
Facilitates upgradeability and availability

IBM System z10 Enterprise Class (z10 EC)
Machine Type: 2097

5 Models: E12, E26, E40, E56, E64

Processor Units (PUs):

- **One to four book modular design**
- **Sub-capacity available up to 12 CPs**
- **Enterprise Quad Core technology – 4.4 GHz**
- **Enhanced capacity 64-way model**
- **17 PUs per book (17 and 20 for Model E64)**
  - New core sparing technology
  - More SAPs per system
  - Configurable PUs allow you to design the system to meet your needs (e.g. CPs, specialty engines, SAPs)

Memory:

- **Up to 1.5 TB / 384 GB per book**
- **16 GB HSA separately managed and not included in customer purchased memory**
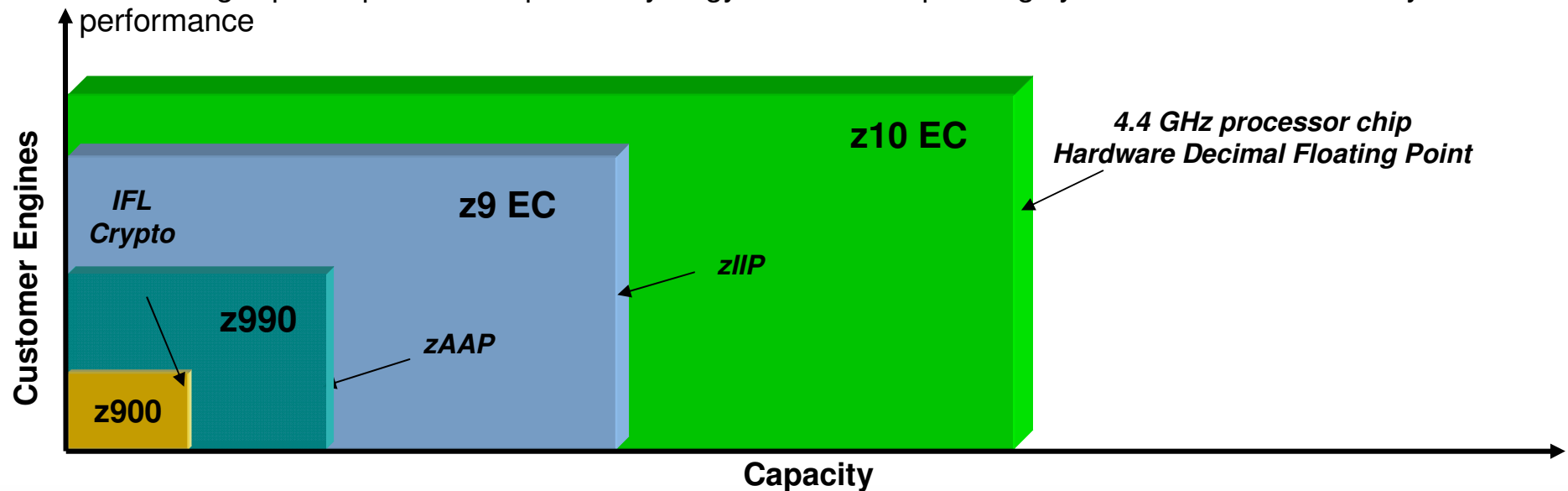- **Books connected in star topology via L2 cache**

I/O:

- **6 GBps InfiniBand host buses for I/O**
- **FICON™/FCP Enhancements**
- **New OSA-Express3 10 GbE [1]**
- **InfiniBand Coupling Links [1]**

[1] Planned availability 2Q08

Improved server performance and scalability with faster and more processors and improved dispatching synergy

- The z10 EC delivers on average 50% more performance in a n-way configuration than a IBM System z9™ Enterprise Class (z9 EC) n-way
  - The uniprocessor is expected to deliver 62% more performance than z9 EC uniprocessor *
- The z10 EC 64-way offers 70% more server capacity than the largest z9 EC**
- Introducing HiperDispatch for improved synergy with z/OS® operating system to deliver scalability and performance

Customer Engines (vertical axis)

Capacity (horizontal axis)

z10 EC

z9 EC

z990

z900

IFL Crypto

zAAP

zIIP

4.4 GHz processor chip
Hardware Decimal Floating Point

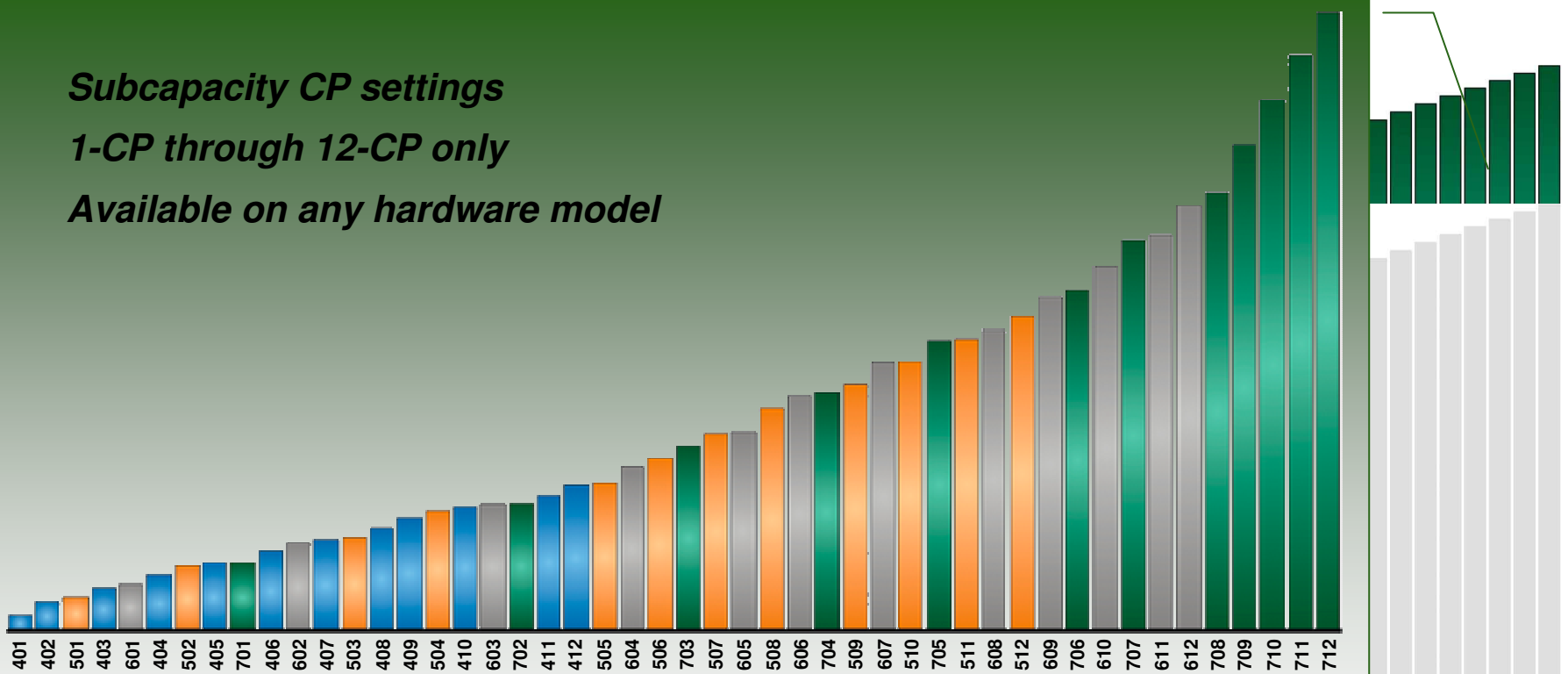## *Significant capacity for traditional growth and consolidation*

* LSPR mixed workload average running z/OS 1.8 - z10 EC 701 versus z9 EC 701
** This is a comparison of the z10 EC 64-way and the z9 EC S54 and is based on LSPR mixed workload average running z/OS 1.8
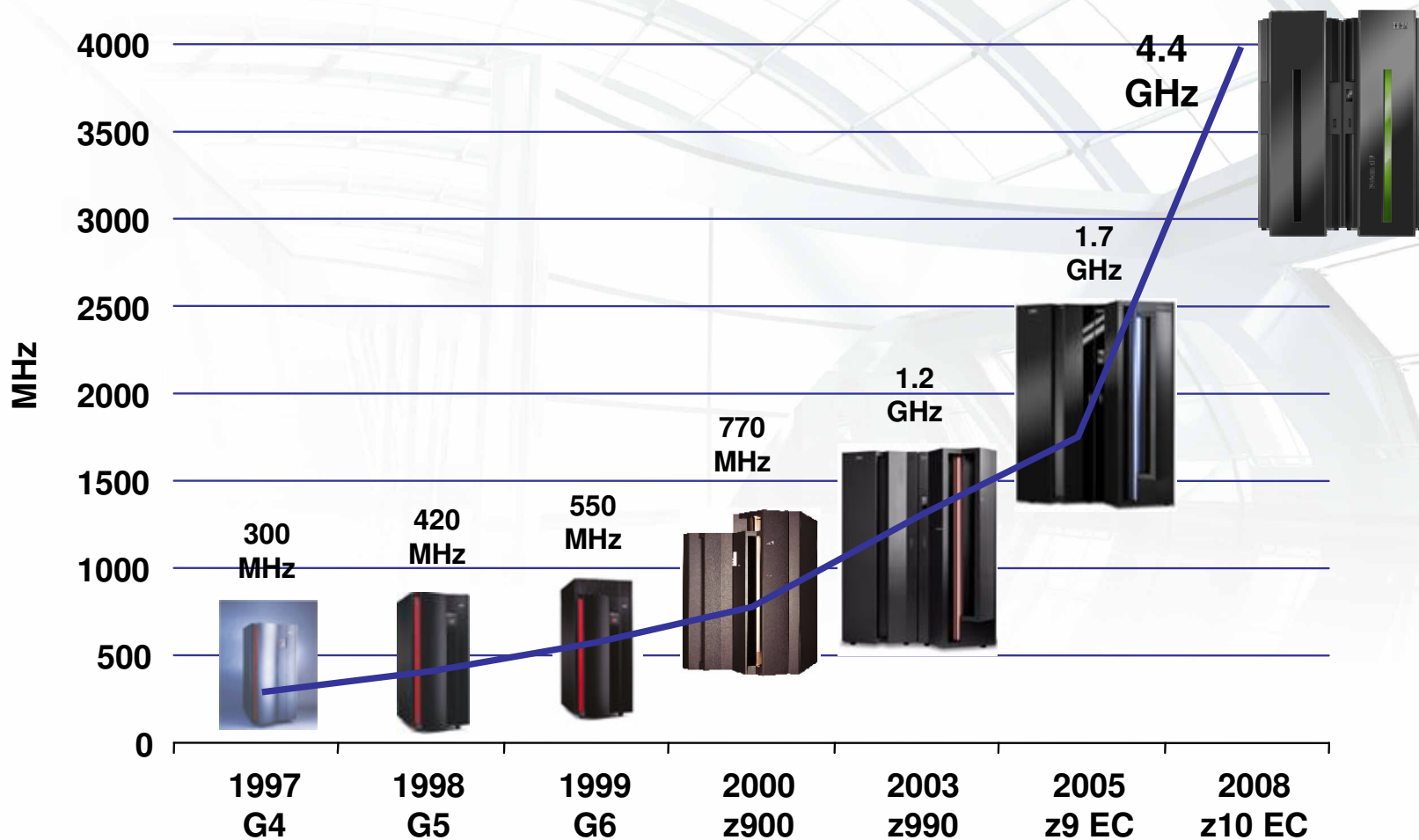
100 capacity settings to meet your needs

Subcapacity CP settings

1-CP through 12-CP only

Available on any hardware model

Chart bars labeled (left to right): 401, 402, 501, 403, 601, 404, 502, 405, 701, 406, 602, 407, 503, 408, 409, 504, 410, 603, 702, 411, 412, 505, 604, 506, 703, 507, 605, 508, 606, 704, 509, 607, 510, 705, 511, 608, 512, 609, 706, 610, 707, 611, 612, 708, 709, 710, 711, 712

- **The z10 EC will now offer 36 CP subcapacity settings**
- **All CPs must be the same capacity within one z10 EC**
  - On machines with 13 or more CPs, all CPs must run at full speed
- **The entry point is approximately 24% of the capacity of the full speed CP**
- **All specialty engines run at full speed. The 1-for-1 entitlement is to purchase one zAAP and one zIIP for each CP purchased.**

IBM z10 EC Continues the CMOS Mainframe Heritage

Chart — MHz processor speed over time:

- 1997 G4: 300 MHz
- 1998 G5: 420 MHz
- 1999 G6: 550 MHz
- 2000 z900: 770 MHz
- 2003 z990: 1.2 GHz
- 2005 z9 EC: 1.7 GHz
- 2008 z10 EC: 4.4 GHz

- G4 - 1st full-custom CMOS S/390®
- G5 - IEEE-standard BFP; branch target prediction
- G6 - Cu BEOL

- IBM eServer zSeries 900 (z900) - Full 64-bit z/Architecture®
- IBM e Server zSeries 990 (z990) - Superscalar CISC pipeline
- z9 EC - System level scaling

- z10 EC - Architectural extensions

Making high performance a reality

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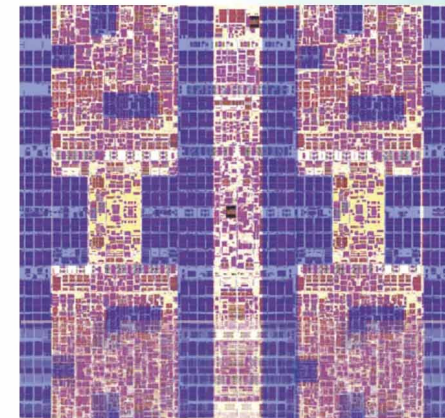
**Enterprise Quad Core
z10 EC processor chip**

Consolidation with Linux gets a "green light"

System z servers may help customers become more energy efficient:

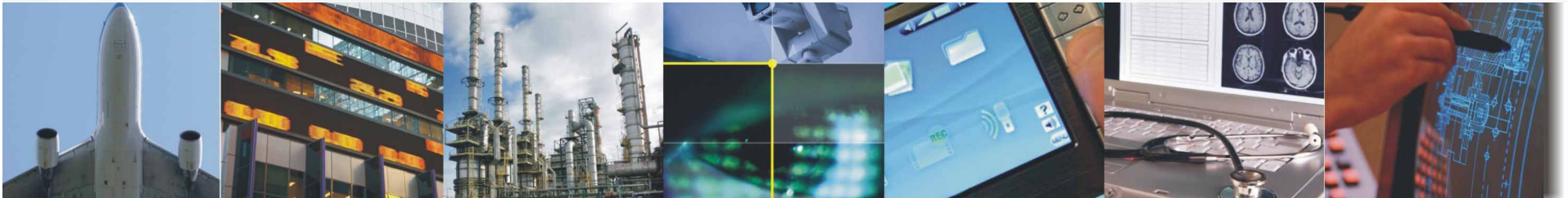- Deploy energy efficient technologies – reduce energy consumption and save floor space
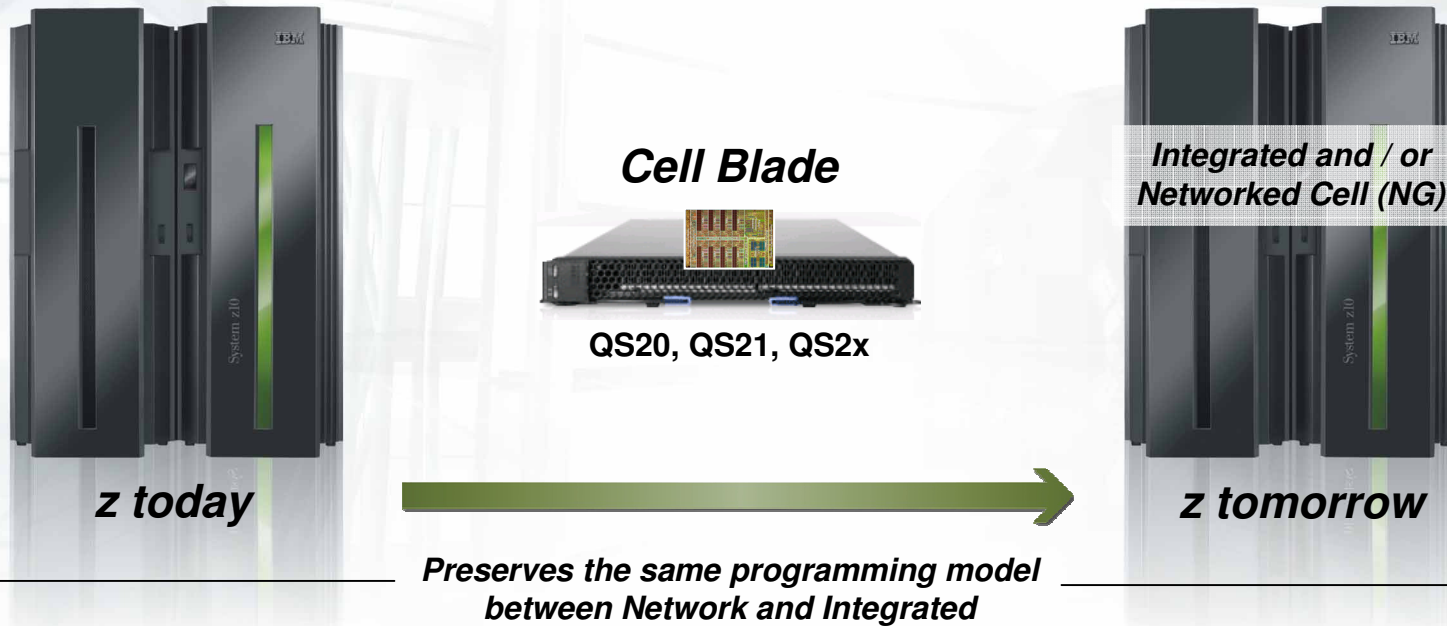
Economics of IFLs and z/VM® help to drive down the cost of IT

- IFLs attractively priced, have no impact on z/OS license fees, and z/VM and Linux software priced at real engine capacity

- 'No charge' MES upgrades available when upgrading to new technology

Over 1900 Linux on System z applications from at least 400 vendors

Integrated Facility for Linux – IFL

System z and Cell Broadband Engine – The Vision
A *'Marriage' of Two Technologies that Perfectly Complement Each Other*

Cell Blade

QS20, QS21, QS2x

Integrated and / or Networked Cell (NG)

z today

z tomorrow

Preserves the same programming model between Network and Integrated

Aerospace and Defense

Financial Services Sector

Chemicals and Petroleum

Digital Video Surveillance

Digital Media

Information Based Medicine

Electronic Design Automation

Focused performance boost
Hardware Decimal Floating Point

Up to 10X improvement in decimal floating point instructions

- **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

- **On z10 EC integrated on every core giving 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
  – Endorsed by key software vendors including Microsoft® and SAP
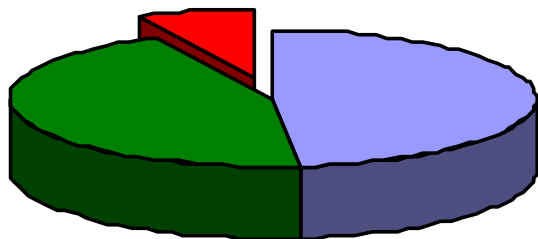 – Open standard definition led by IBM
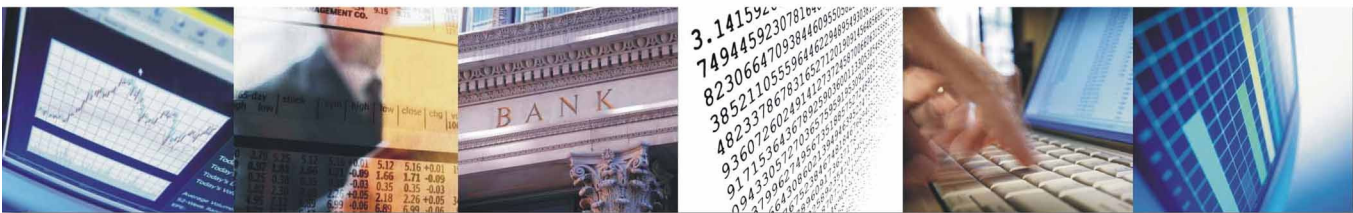
Bringing high performance computing benefits to commercial workloads

Keeping your system available is key to our design
Continuing our RAS focus helps avoid outages

Sources of Outages - Pre z9 -Hrs/Year/Syst-

- ■ Scheduled (CIE+Disruptive Patches + ECs)
- ■ Planned - (MES + Driver Upgrades)
- ■ Unscheduled (UIRA)

Impact of Outage

	Prior Servers	z9 EC	z10 EC
Unscheduled Outages	✔	✔	✔
Scheduled Outages	✔	✔	✔
Planned Outages	✔	✔	✔
Preplanning requirements			✔

Increased Focus over time

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 include On/Off Capacity on Demand (On/Off CoD) , Capacity Backup Upgrade (CBU) and a new one – 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

Tracking energy consumption within the infrastructure

- **ResourceLink™ provides tools to estimates server energy requirements <u>before</u> you purchase a new system or an upgrade**

- **Offers a 15% improvement in performance per kWh over z9 EC**

- **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)

- **New IBM Systems Director Active Energy Manager (AEM) for Linux on System z V3.1**
  - Offers a single view of actual energy usage across multiple heterogeneous IBM platforms within the infrastructure
  - AEM V3.1 energy management data can be exploited by Tivoli® enterprise solutions such as IBM Tivoli Monitoring, IBM Tivoli Usage and Accounting Manager, and IBM Tivoli OMEGAMON® XE on z/OS
  - AEM V3.1 is a key component of IBM's Cool Blue™ portfolio within Project Big Green

Protecting with IBM's world-class Business Resiliency solutions

- **Preplanning capabilities to avoid future planned outages, e.g. dynamic LPAR allocation without a system outage**

- **100 available capacity settings – 30% more than z9 EC**

- **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**
  - Advanced Encryption Standard (AES) 192 and 256 and Stronger hash algorithm with Secure Hash Algorithm (SHA-512)

- **Tamper-resistant Crypto Express2 feature**
  - Supports high levels of security for demanding applications
  - Fully programmable and configurable
  - High scale performance for SSL transactions

- **Trusted Key Entry (TKE) 5.2 with optional Smart Card reader**

- **System z – the only platform that is EAL5 certified1**

IBM Systems

Helping to get you connected to your world

- **Improved performance and flexibility for connectivity**
- **Broad set of options to meet your needs**
- **Excellent investment protection when you upgrade to the z10 EC**

Within the server

- HiperSockets™
  - Multi Write Facility **new!**
  - Layer2 support **new!**
- Integrated console controller
- Integrated communications controller support

To the Data

- FICON/FCP
  - FICON® Express4
  - FICON Express2
  - FICON Express (Required for FCV)
- ESCON®

* Note: Red items carry forward on a Machine MES only, not available for new system orders

To the Network

- OSA-Express3 [1]
  - 10 Gigabit Ethernet **new!**
- OSA-Express2
  - 1000BASE-T Ethernet
  - Gigabit Ethernet LX and SX
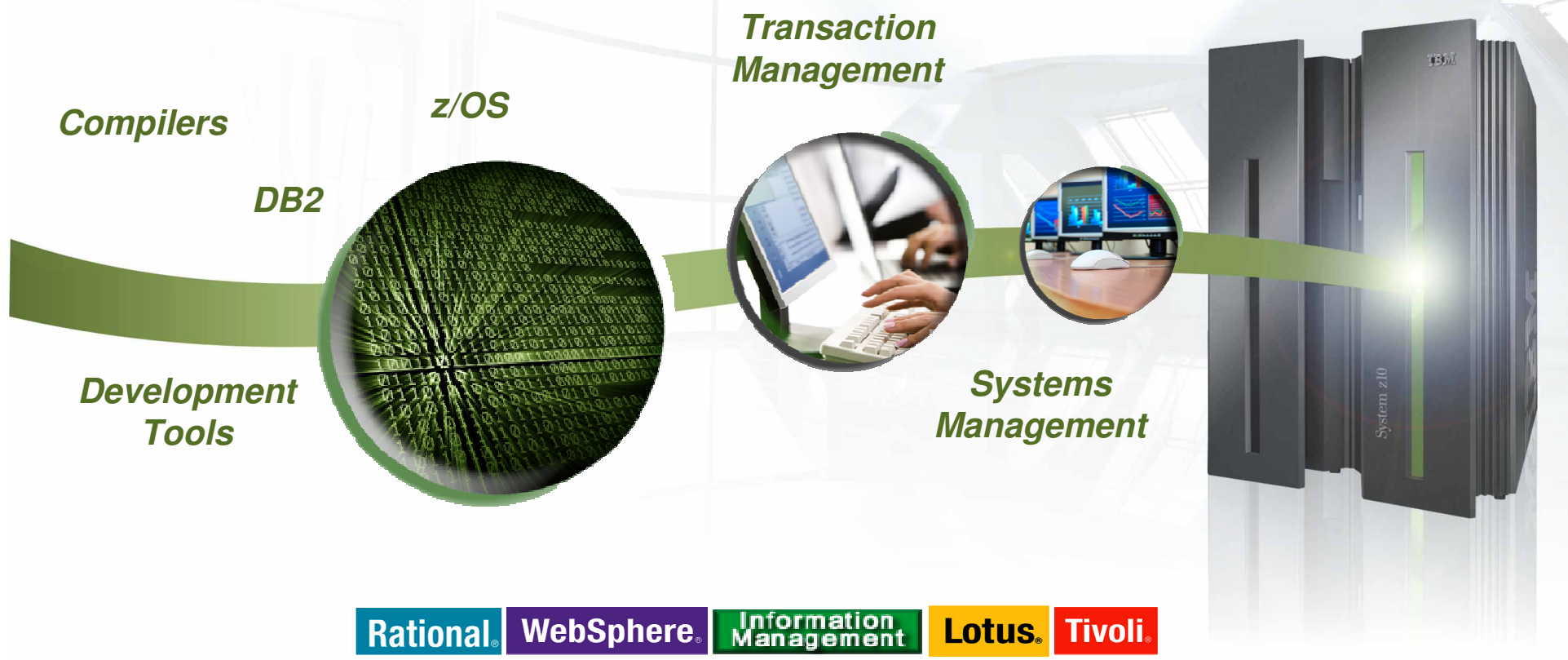 - 10 Gigabit Ethernet LR

For Clustering

- InfiniBand Coupling Links [1] **new!**
- ICB-4
- ISC-3 (peer mode only)
- IC (define only)
- STP - NTP Client Support
- Support for n-2 and above servers

[1] Planned availability 2Q08

Comprehensive Software Leveraging the Strengths of the z10 EC

Transaction Management

Compilers

z/OS

DB2

Development Tools

Systems Management

Rational WebSphere Information Management Lotus Tivoli

Operating systems

z/OS

- Providing intelligent dispatching on z10 EC for performance
- Up to 64-way support
- Simplified capacity provisioning on z10 EC
- New high availability disk solution with simplified management
- Enabling extreme storage volume scaling
- Facilitating new zIIP exploitation

Linux on System z

- Large Page Support improves performance
- Linux CPU Node Affinity is designed to avoid cache pollution
- Software support for extended CP Assist instructions AES & SHA

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

z/VM

- Consolidation of many virtual images in a single LPAR
- Enhanced management functions for virtual images
- Larger workloads with more scaleability

System z10 EC Operating System Support

Operating System	ESA/390 (31-bit)	z/Architecture (64-bit)
z/OS Version 1 Releases 7[1], 8 and 9	No	Yes
Linux on System z[2], RHEL 4, 5 & SLES 9, 10	No	Yes
z/VM Version 5 Release 2[3] and 3[3]	No	Yes
z/VSE™ Version 3 Release 1[2][4]	Yes	No
z/VSE Version 4 Release 1[2][5]	No	Yes
z/TPF Version 1 Release 1	No	Yes
TPF Version 4 Release 1 (ESA mode only)	Yes	No

1. **z/OS R1.7 + zIIP Web Deliverable required for z10 EC to enable HiperDispatch**
2. **Compatibility Support for listed releases. Compatibility support allows OS to IPL and operate on z10 EC**
3. **Requires Compatibility Support which allows z/VM to IPL and operate on the z10 EC providing System z9 functionality for the base OS and Guests.**
4. 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.
5. z/VSE V4 is designed to exploit 64-bit real memory addressing, but will not support 64-bit virtual memory addressing

Note: Refer to the z/OS, z/VM, z/VSE subsets of the 2097DEVICE Preventive Planning (PSP) bucket prior to installing a z10 EC

Increasing capacity, reducing outages and enhancing capabilities

- **Five hardware models**
- **Faster Uni Processor** [1]
- **Up to 64 customer PUs**
- **36 CP Subcapacity Settings**
- **Star Book Interconnect**
- **Up to 1.5 TB memory**
- **Fixed 16 GB HSA as standard**
- **Large Page Support (1 MB)**
- **HiperDispatch**
- **Enhanced CPACF SHA 512, AES 192 and 256-bit keys**
- **Hardware Decimal Floating Point**
- **Just in Time Deployment for capacity offerings – permanent and temporary**

[1] Compared to z9 EC
[2] Planned availability 2Q08

- **6.0 GBps InfiniBand HCA to I/O interconnect**
- **SCSI IPL included in Base LIC**
- **OSA-Express3 10 GbE** [2]
- **HiperSockets Multi Write Facility enhancements**
- **HiperSockets Layer 2 Support**
- **InfiniBand Coupling Links** [2]
- **STP using InfiniBand** [2]
- **Capacity Provisioning Support**
- **Scheduled Outage Reduction**
- **Improved RAS**
- **FICON LX Fiber Quick Connect**
- **Power Monitoring support**

System z10

SOD: PSIFB for z9 EC & z9 BC for non-dedicated CF Models*

IBM Systems

IBM System z10 Enterprise Class
Innovative Enterprise Systems Solutions, Now and in the Future

IBM System z10™ Enterprise Class
enables clients to **consolidate
and virtualize** their server environment…

to **reduce costs and simplify** their IT
infrastructure…

with high performance, **energy efficient
green technologies**,…

providing the most **resilient and secure**
system to support business innovation and
growth.

The Future Runs on System z

Evolution of zSeries and System z9 2000 ... 2008 ...

12/00 **10/01** **02/02** **04..08/02** **10..12/02**

2003: z990 Modular System-Structure (1 - 4 Books)

06/03 **10/03** **04/04** **10/04**
01/05

2005: IBM System z9 (Availability), 2008: IBM System z10

09/05 **05/06** **02/08**

IBM Systems

IBM System z family

IBM System z9 EC (2094)

- Announced 7/05 - Superscalar Server with up to 64 PUs
- 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**
  - **Enhanced FICON Express2 and 4**
  - **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 z9**

IBM System z9 BC (2096)

- Announced 4/06 - Superscalar Server with 8 PUs
- 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**
  - **Enhanced FICON Express2 4 Gbps**
  - **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 z9**

IBM System z10 EC (2097)

- Announce 2/08 - Server with up to 77 PUs
- 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
  - **CUoD, CIU, CBU, On/Off CoD, CPE**
- Memory – up to 1.5 TB
- Channels
  - **Four LCSSs**
  - **Multiple Subchannel Sets**
  - **MIDAW facility**
  - **63.75 subchannels**
  - **Up to 1024 ESCON channels**
  - **Up to 336 FICON channels**
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IBM Systems

z10 EC Overview

- **Machine Type**
  - 2097
- **5 Models**
  - E12, E26, E40, E56 and E64
- **Processor Units (PUs)**
  - 17 (17 and 20 for Model E64) PUs per book
  - Up to 11 SAPs per system, standard
  - 2 spares designated per system
  - Dependant on the H/W model - up to 12, 26, 40, 56 or 64 PUs available for characterization
    - Central Processors (CPs), Integrated Facility for Linux (IFLs), Internal Coupling Facility (ICFs), System z10 Application Assist Processors (zAAPs), System z10 Integrated Information Processor (zIIP), optional - additional System Assist Processors (SAPs)
- **Memory**
  - System Minimum of 16 GB
  - Up to 384 GB per book
  - Up to 1.5 TB GB for System
    - Fixed HSA, standard
    - 16/32/48/64 GB increments
- **I/O**
  - Up to 48 I/O Interconnects per System @ 6 GBps each
  - Up to 4 Logical Channel Subsystems (LCSSs)
- **ETR Feature, standard**

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