



IBM Inside Sales

International Technical Support Organization Global Content Services

ITSO – z System Hardware Workshop

www.ibm.com/redbooks

Part 1 – IBM z13 Introduction



Trademarks

The following are trademarks of the International Business Machines Corporation in the United States, other countries, or both.

Not all common law marks used by IBM are listed on this page. Failure of a mark to appear does not mean that IBM does not use the mark nor does it mean that the product is not actively marketed or is not significant within its relevant market.

Those trademarks followed by ® are registered trademarks of IBM in the United States; all others are trademarks or common law marks of IBM in the United States.

For a complete list of IBM Trademarks, see www.ibm.com/legal/copytrade.shtml:

BladeCenter®, DB2®, e business(logo)®, DataPower®, ESCON, eServer, FICON, IBM®, IBM (logo)®, MVS, OS/390®, POWER6®, POWER6+, POWER7®, Power Architecture®, PowerVM®, S/390®, System p®, System p5, System x®, z Systems®, System z9®, System z10®, WebSphere®, X-Architecture®, zEnterprise®, z9®, z10®, z196®, z114®, zEnterprise System z196®, zEnterprise System z114®, zEnterprise System zEC12®, zEnterprise System zBC12®, z13®, z/Architecture®, z/OS®, z/VM®, z/VSE®, zSeries®

The following are trademarks or registered trademarks of other companies.

Adobe, the Adobe logo, PostScript, and the PostScript logo are either registered trademarks or trademarks of Adobe Systems Incorporated in the United States, and/or other countries.

Cell Broadband Engine is a trademark of Sony Computer Entertainment, Inc. in the United States, other countries, or both and is used under license therefrom.

Java and all Java-based trademarks are trademarks of Sun Microsystems, Inc. in the United States, other countries, or both.

Microsoft, Windows, Windows NT, and the Windows logo are registered trademarks of Microsoft Corporation in the United States, other countries, or both.

Intel, Intel logo, Intel Inside, Intel Inside logo, Intel Centrino, Intel Centrino logo, Celeron, Intel Xeon, Intel SpeedStep, Itanium, and Pentium are trademarks or registered trademarks of Intel Corporation or its subsidiaries in the United States and other countries.

UNIX is a registered trademark of The Open Group in the United States and other countries.

Linux is a registered trademark of Linus Torvalds in the United States, other countries, or both.

ITIL is a registered trademark, and a registered community trademark of the Office of Government Commerce, and is registered in the U.S. Patent and Trademark Office.

IT Infrastructure Library is a registered trademark of the Central Computer and Telecommunications Agency, which is now part of the Office of Government Commerce.

* All other products may be trademarks or registered trademarks of their respective companies.

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.

IBM hardware products are manufactured from new parts, or new and serviceable used parts. Regardless, our warranty terms apply.

All customer examples cited or described in this presentation are presented as illustrations of the manner in which some customers have used IBM products and the results they may have achieved. Actual environmental costs and performance characteristics will vary depending on individual customer configurations and conditions.

This publication was produced in the United States. IBM may not offer the products, services or features discussed in this document in other countries, and the information may be subject to change without notice. Consult your local IBM business contact for information on the product or services available in your area.

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

Information about non-IBM products is obtained from the manufacturers of those products or their published announcements. IBM has not tested those products and cannot confirm the performance, compatibility, or any other claims related to non-IBM products. Questions on the capabilities of non-IBM products should be addressed to the suppliers of those products.

Prices subject to change without notice. Contact your IBM representative or Business Partner for the most current pricing in your geography.

Important information about today's workshop

- The ITSO z hardware team created 7 IBM z13 presentations to be delivered today
 - Part 1 – IBM z13 – Positioning / introduction
 - Part 2 – z13 CPC Details, Capacity and Performance
 - Part 3 – z13 I/O Subsystem
 - Part 4 – Native PCIe Adapters – zEDC and RoCE (what's new with z13)
 - Part 5 – HMC, CoD and RAS and zAware
 - Part 6 – Installation Planning
 - Part 7 – Software Support

- The main references for the presentations today are:
 - IBM z13 Technical Guide – Redbook – SG24-8251
 - IBM z13 Technical Introduction – Redbook - SG24-8250

- **Part of the available material may not be presented..** 😞
 - Even if we don't cover the presentations entirely,
 - The material can be download from:
 - <http://www.redbooks.ibm.com/Redbooks.nsf/pages/addmats>

- **The material being presented may not fully match the copied version you have**

- **You can always get the latest version .. If you want it, just ask !** 😊

- **Please ask questions, make comments and share your own experiences at any time**

- **Thank You !**

Positioning the IBM z13



Reinventing enterprise IT for digital business

Designed for efficient and trusted **cloud** services to transform the economics of IT

Designed for integrating transactions and **analytics** for insight at the point of impact

Designed for data and transaction serving for the **mobile** generation



*The trusted enterprise platform for integrating
Data, Transactions and Insight!*

IBM z13

Intelligence and integration to cloud, analytics and mobile, to advantage the digital enterprise



Cloud

Private and public cloud deployments that deliver superior service, with highest efficiency at the lowest cost

- Intelligent consolidation – Increase your cloud workload capacity without increasing software licensing costs
- Greater flexibility when coupled with Softlayer in a on/off premise Hybrid Cloud
- Greater leverage of existing assets through Software as a Service



Analytics

Deliver actionable insights across all data, on one system at the speed of business

- Optimize your business decisions with next best action within the transaction to retain clients and prevent fraud
- Operational analytics on z13 outperforms the leading competitor, provide faster business decisions than your competition



Mobile

Rapidly and securely extend and scale core enterprise apps and data for mobile services

- Meet the demanding peaks of Mobile applications instantaneously without buying an army of servers
- Address competitive and business opportunities at the speed and the economics your business demands.

Using our core values as the foundation for **business leadership** and **operational excellence**



Next generation service delivery with a hybrid cloud model



Systems of Record

CRM
DB
ERP
HR



Systems of Engagement



Focus on Operational Costs

- Consolidation and modernization
- Operations Automation
- Risk and compliance Management
- Manual policy to analytics driven optimization

Affinity to private clouds

System z is the ideal hybrid cloud for integrated services that bridge systems of record and engagement

Focus on Speed and Agility

- Assemble solutions from verified components and services
- Fast deployment and redeployment
- Agile to DevOps model
- User first delivery model

Affinity to public clouds

IBM z13 unleashes new technology to drive innovation

Large Memory Pools	Dynamic multi-threading	Accelerated analytics processing	Data Compression Acceleration
<p>Access and analyze large datasets in real time instantly</p>	<p>Boost performance for Linux, Java, and zIIP workloads</p>	<p>Optimization of complex, numerically intensive analytics queries</p>	<p>Capture new opportunities due to lower cost of keeping data online</p>
<p>Up to 10TB of data to deliver up to 50% reduction in response time</p>	<p>24 to 1 consolidation ratio from x86 to z13 for up to 70% lower TCA</p>	<p>Significant throughput and response time improvement for analytics workloads</p>	<p>Reduce storage cost for sequential data by up to 75%</p>

The z13 for digital business

Performance and scale helping improve client experience

141 configurable cores

Larger cache for improved data serving

New SIMD vector facility for faster mathematical computation

Up to 10 TB memory to reduce latency (3X more than zEC12)

Simultaneous multithreading to expand IFL and zIIP capacity

Industry leading resilient and intelligent I/O

Standalone zBX



Focused on Enterprise Linux

Extending Linux to wider audience with Linux/KVM on mainframe (SOD)*

Continuous data availability for z/OS and Linux guests hosted by z/VM with new GDPS Appliance (SOD)*

Faster diagnosis with IBM zAware – now extended to Linux on z Systems

Better Economics, Flexibility and Efficiency

40% more total capacity

40% more logical partitions to host more cloud tenants (85 vs 60)

4x data access with zEDC

Trustful, reliable and secure for less risk

Improved recovery time using zHPF

Insure protection and integrity with next generation cryptography

New PCIe based short range coupling links

z13: The trusted enterprise platform for integrating data, transactions and insight

*All statements regarding IBM's plans, directions, and intent are subject to change or withdrawal without notice. Any reliance on these Statements of General Direction is at the relying party's sole risk and will not create liability or obligation for IBM.

Introducing the IBM z13



IBM z Systems Generations

N-6	N-5	N-4	N-3	N-2
 <p>z900</p> <ul style="list-style-type: none"> •Announced 10/2000 •770 MHz •Up to 16 assignable cores •CP, IFL, ICF •Up to 64 GB Memory 	 <p>z990</p> <ul style="list-style-type: none"> •Announced 5/2003 •1.2 GHz •Up to 32 assignable cores •CP, IFL, ICF, zAAP •Up to 256 GB Memory 	 <p>z9 Enterprise Class</p> <ul style="list-style-type: none"> •Announced 7/2005 •1.7 GHz •Up to 54 assignable cores •CP, IFL, ICF, zAAP, zIIP •Up to 512 GB Memory 	 <p>z10 Enterprise Class</p> <ul style="list-style-type: none"> •Announced 2/2008 •4.4 GHz •Up to 64 assignable cores •CP, IFL, ICF, zAAP, zIIP •Up to 1.5 TB Memory 	 <p>zEnterprise 196</p> <ul style="list-style-type: none"> •Announced 7/22/2010 •5.2 GHz •Up to 80 assignable cores •CP, IFL, ICF, zAAP, zIIP •Up to 3 TB Memory
 <p>z800</p> <ul style="list-style-type: none"> •Announced 2/2002 •625 MHz •Up to 4 assignable cores •CP, IFL, ICF •Up to 32 GB Memory 	 <p>z890</p> <ul style="list-style-type: none"> •Announced 4/2004 •1.0 GHz •Up to 4 assignable cores •CP, IFL, ICF, zAAP •Up to 32 GB Memory 	 <p>z9 Business Class</p> <ul style="list-style-type: none"> •Announced 4/2006 •1.4 GHz •Up to 7 assignable cores •CP, IFL, ICF, zAAP, zIIP •Up to 64 GB Memory 	 <p>z10 Business Class</p> <ul style="list-style-type: none"> •Announced 10/2008 •3.5 GHz •Up to 10 cfg cores (5 CP) •CP, IFL, ICF, zAAP, zIIP •Up to 248 GB Memory 	 <p>zEnterprise 114</p> <ul style="list-style-type: none"> •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 z Systems High End Generations

N-4



- z9 Enterprise Class**
- Announced 7/2005
 - Withdrawn 6/30/2010
 - Chip: 2 core, 1.7 GHz
 - Up to 54 client cores
 - CP, IFL, ICF, zAAP, zIIP
 - Single thread
 - zIIP-zAAP to CP ratio 1x1
 - Uni MIPS: 560
 - Max MIPS: 18,505
 - Max mem 512 GB - HSA
 - Max/LPAR: 512 GB - HSA
 - LCSS: 4, LPARs: 60
 - Subchannel Sets: 2/LCSS
 - Max I/O slots: 84
 - Max FICON channels: 336
 - Max FICON Express4 (GA2)
 - Max OSA Ports: 48
 - OSA-Express2
 - Crypto Express2
 - Coupling: ISC3, IFB, PSIFB: 12x SDR

N-3



- z10 Enterprise Class**
- Announced 2/2008
 - Withdrawn 6/30/2012
 - Chip: 4 core, 4.4 GHz
 - Up to 64 client cores
 - CP, IFL, ICF, zAAP, zIIP
 - Single thread
 - zIIP-zAAP to CP ratio 1x1
 - Uni MIPS: 902
 - Max MIPS: 31,826
 - Max mem 1.5 TB
 - Max per LPAR: 1 TB
 - LCSS: 4, LPARs: 60
 - Subchannel Sets: 2/LCSS
 - Max I/O slots: 84
 - Max FICON channels: 336
 - FICON Express4
 - Max OSA Ports: 96
 - OSA-Express3
 - Crypto Express3 (GA3)
 - Coupling: ISC3, IFB, PSIFB: 12x DDR, 1x DDR
 - ASHRAE Class A1

N-2



- zEnterprise 196**
- Announced 7/22/2010
 - Withdrawn 6/30/2014
 - Chip 4 core, 5.2 GHz
 - Up to 80 client cores
 - CP, IFL, ICF, zAAP, zIIP
 - Single thread
 - zIIP-zAAP to CP ratio 1x1
 - Uni MIPS: 1,202
 - Max MIPS: 52,286
 - Max mem 3 TB (RAIM)
 - Max per LPAR: 1 TB
 - LCSS: 4, LPARs: 60
 - Subchannel Sets: 3/LCSS
 - Max I/O Slots: 160*
 - Max FICON channels: 320
 - FICON Express8S (GA2)
 - Max OSA Ports: 96
 - OSA-Express4S (GA2)
 - Crypto Express3
 - Coupling: ISC3, PSIFB: 12x DDR, 1x DDR
 - ASHRAE Class A1

N-1






- zEnterprise EC12**
- Announced 8/28/2012
 - Chip: 6 core, 5.5 GHz
 - Up to 101 client cores
 - CP, IFL, ICF, zAAP, zIIP
 - Single thread
 - zIIP-zAAP to CP ratio 2x1
 - Uni MIPS: 1,514
 - Max MIPS: 78,426
 - Max mem 3 TB (RAIM)
 - Max per LPAR: 1 TB
 - LCSS: 4, LPARs: 60
 - Subchannel Sets: 3/LCSS
 - Max I/O Slots: 160*
 - Max FICON channels: 320
 - FICON Express8S
 - Max OSA Ports: 96
 - OSA-Express5S (GA2)
 - Crypto Express4S
 - Coupling: PSIFB: 12x DDR, 1x DDR
 - ASHRAE Class A1
 - Native PCIe: zEDC, Flash Express, 10 GbE RoCE

N






- IBM z13**
- Announced 1Q2015
 - Chip: 8 core, 5.0 GHz
 - Up to 141 client cores
 - CP, IFL, ICF, zIIP
 - SMT: zIIP, IFL
 - zIIP to CP ratio 2x1
 - Uni MIPS: 1,695
 - Max MIPS: 111,556
 - Max mem: 10 TB (RAIM)
 - Max per LPAR: 10 TB
 - LCSS: 6, LPARs: 85
 - Subchannel Sets: 4/LCSS
 - Max I/O Slots: 160*
 - Max FICON Channels: 320
 - FICON Express16S
 - Max OSA Ports: 96
 - OSA-Express5S
 - Crypto Express5S
 - Coupling: PSIFB: 12x DDR, 1x DDR
 - ASHRAE Class A2
 - PCIe: Gen3 16 GBps
 - Native PCIe: zEDC, Flash Express, 10GbE RoCE with SR-IOV



IBM zEnterprise family

IBM zEnterprise 196 (2817)	IBM zEnterprise Blade Extension (2458)	IBM zEnterprise 114 (2818)
 <ul style="list-style-type: none"> • Announced 7/10 – Server w/ up to 96 PU cores • 5 models – Up to 80-way • Granular Offerings for up to 15 CPs • PU (Engine) Characterization <ul style="list-style-type: none"> – CP, SAP, IFL, ICF, zAAP, zIIP • On Demand Capabilities <ul style="list-style-type: none"> – CoD, CIU, CBU, On/Off CoD, CPE • Memory – up to 3 TB for Server and up to 1 TB per LPAR <ul style="list-style-type: none"> – 16 GB Fixed HSA • Channels <ul style="list-style-type: none"> – PCIe bus – Four LCSSs – 3 Subchannel Sets – MIDAW facility – Up to 240 ESCON channels – Up to 288 FICON channels – FICON Express8 and 8S – zHPF – OSA 10 GbE, GbE, 1000BASE-T – InfiniBand Coupling Links • Configurable Crypto Express3 • Parallel Sysplex clustering • HiperSockets – up to 32 • Up to 60 logical partitions • Enhanced Availability • Unified Resource Manager • Operating Systems <ul style="list-style-type: none"> – z/OS, z/VM, z/VSE, z/TPF, Linux on System z 	 <ul style="list-style-type: none"> • Announced 7/10 • Model 002 for z196 or z114 • zBX Racks with: <ul style="list-style-type: none"> – BladeCenter Chassis – N + 1 components – Blades – Top of Rack Switches – 8 Gb FC Switches – Power Units – Advance Management Modules • Up to 112 Blades <ul style="list-style-type: none"> – POWER7 Blades – IBM System x Blades – IBM WebSphere DataPower Integration Appliance XI50 for zEnterprise (M/T 2462-4BX) • Operating Systems <ul style="list-style-type: none"> – AIX 5.3 and higher – Linux for Select IBM x Blades – Microsoft Windows for x Blades • Hypervisors <ul style="list-style-type: none"> – PowerVM Enterprise Edition – Integrated Hypervisor for System x 	 <ul style="list-style-type: none"> • Announced 07/11 • 2 models – M05 and M10 <ul style="list-style-type: none"> – Up to 5 CPs • High levels of Granularity available <ul style="list-style-type: none"> – 130 Capacity Indicators • PU (Engine) Characterization <ul style="list-style-type: none"> – CP, SAP, IFL, ICF, zAAP, zIIP • On Demand Capabilities <ul style="list-style-type: none"> – CoD, CIU, CBU, On/Off CoD, CPE • Memory – up to 256 GB for Server <ul style="list-style-type: none"> – 8 GB Fixed HSA • Channels <ul style="list-style-type: none"> – PCIe bus – Two LCSSs – 2 Subchannel Sets – MIDAW facility – Up to 240 ESCON channels – Up to 128 FICON channels – FICON Express8 and 8S – zHPF – OSA 10 GbE, GbE, 1000BASE-T – InfiniBand Coupling Links • Configurable Crypto Express3 • Parallel Sysplex clustering • HiperSockets – up to 32 • Up to 30 logical partitions • Unified Resource Manager • Operating Systems <ul style="list-style-type: none"> – z/OS, z/VM, z/VSE, TPF, z/TPF, Linux on System z



IBM zEnterprise EC12 and zBC12 – September 2013

<p>IBM zEnterprise EC12 (2827)</p>	<p>IBM zEnterprise Blade Extension (2458)</p>	<p>IBM zBC12 (2828)</p>
 <ul style="list-style-type: none"> • 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 <ul style="list-style-type: none"> – CP, SAP, IFL, ICF, zAAP, zIIP, IFP • On Demand Capabilities <ul style="list-style-type: none"> – CoD, CIU, CBU, On/Off CoD, CPE, FoD • Memory – up to 3 TB for Server and up to 1 TB per LPAR <ul style="list-style-type: none"> – 32 GB Fixed HSA • Channels <ul style="list-style-type: none"> – PCIe bus – Four LCSSs – 3 Subchannel Sets – FICON Express8 and 8S – zHPF – OSA 10 GbE, GbE, 1000BASE-T – InfiniBand Coupling Links – Flash Express – Compression Acceleration (zEDC) – RDMA over CEE (RoCE) • Configurable Crypto Express4S • Parallel Sysplex clustering • HiperSockets – up to 32 • Up to 60 logical partitions • Enhanced Availability • IBM zAware • Unified Resource Manager • Operating Systems <ul style="list-style-type: none"> – z/OS, z/VM, z/VSE, z/TPF, Linux on System z 	 <ul style="list-style-type: none"> • First Announced 7/10 • Model 003 for zEC12 – 08/12 • zBX Racks with: <ul style="list-style-type: none"> – BladeCenter Chassis – N + 1 components – Blades – Top of Rack Switches – 8 Gb FC Switches – Power Units – Advance Management Modules • Up to 112 Blades <ul style="list-style-type: none"> – POWER7 Blades – IBM System x Blades – IBM WebSphere DataPower Integration Appliance XI50 for zEnterprise (M/T 2462-4BX) • Operating Systems <ul style="list-style-type: none"> – AIX 5.3 and higher – Linux for Select IBM x Blades – Microsoft Windows for x Blades • Hypervisors <ul style="list-style-type: none"> – PowerVM Enterprise Edition – Integrated Hypervisor for System x 	 <ul style="list-style-type: none"> • Announced 07/13 • 2 models – H06 and H13 <ul style="list-style-type: none"> – Up to 6 CPs • High levels of Granularity available <ul style="list-style-type: none"> – 156 Capacity Indicators • PU (Engine) Characterization <ul style="list-style-type: none"> – CP, SAP, IFL, ICF, zAAP, zIIP, IFP • On Demand Capabilities <ul style="list-style-type: none"> – CoD, CIU, CBU, On/Off CoD, CPE • Memory – up to 512 GB for Server <ul style="list-style-type: none"> – 16 GB Fixed HSA • Channels <ul style="list-style-type: none"> – PCIe bus – Two LCSSs – 2 Subchannel Sets – FICON Express8 and 8S – zHPF – OSA 10 GbE, GbE, 1000BASE-T – InfiniBand Coupling Links – Flash Express – Compression Acceleration (zEDC) – RDMA over CEE (RoCE) • Configurable Crypto Express 4S • Parallel Sysplex clustering • HiperSockets – up to 32 • Up to 30 logical partitions • IBM zAware • Unified Resource Manager • Operating Systems <ul style="list-style-type: none"> – z/OS, z/VM, z/VSE, z/TPF, Linux on System z

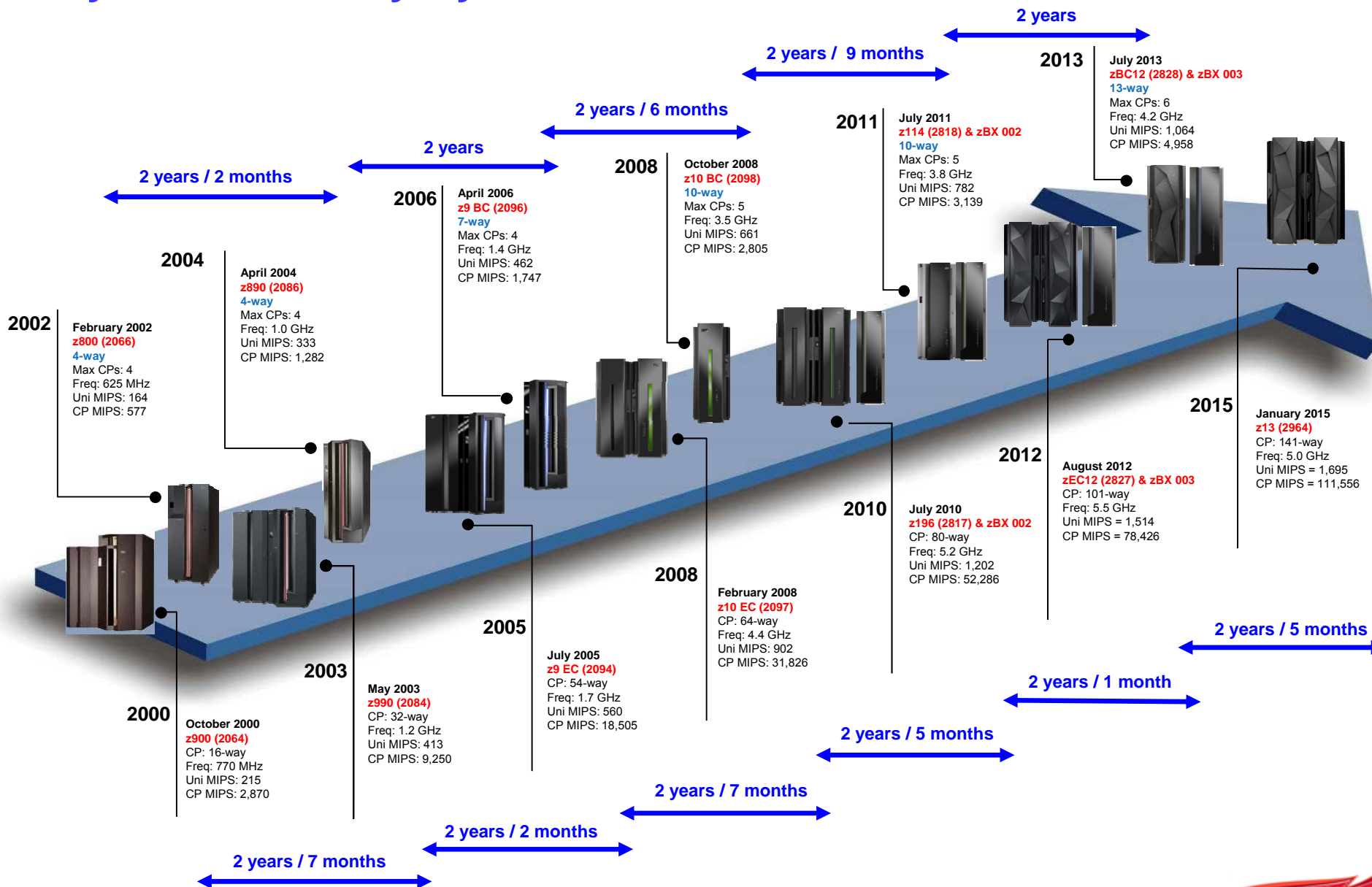
zEC12 and z13

IBM zEnterprise EC12 (2827)	IBM z13 (2964)
 <ul style="list-style-type: none"> • Announced – 08/12 • 5 models – Up to 101-way • Sub-Capacity Offerings for up to 20 CPs • PU (Engine) Characterization <ul style="list-style-type: none"> – CP, SAP, IFL, ICF, zAAP, zIIP, IFP • On Demand Capabilities <ul style="list-style-type: none"> – CoD, CIU, CBU, On/Off CoD, CPE, FoD • Memory – up to 3 TB for Server and up to 1 TB per LPAR <ul style="list-style-type: none"> – 32 GB Fixed HSA • Channels <ul style="list-style-type: none"> – PCIe bus – Four LCSSs – 3 Subchannel Sets – FICON Express8 and 8S – zHPF – OSA 10 GbE, GbE, 1000BASE-T – InfiniBand Coupling Links – Flash Express – Compression Acceleration (zEDC) – RDMA over CEE (RoCE) • Configurable Crypto Express4S • Parallel Sysplex clustering • HiperSockets – up to 32 • Up to 60 logical partitions • Enhanced Availability • IBM zAware • Unified Resource Manager • Operating Systems <ul style="list-style-type: none"> – z/OS, z/VM, z/VSE, z/TPF, Linux on System z 	 <ul style="list-style-type: none"> ▪ Announced – 01/15 ▪ 5 models – NE1, NC9, N96, N63, N30 <ul style="list-style-type: none"> – Up to 141 customer configurable engines ▪ Sub-capacity Offerings for up to 30 CPs ▪ PU (Engine) Characterization <ul style="list-style-type: none"> – CP, IFL, ICF, zIIP, SAP, IFP (No zAAPs) ▪ SIMD instructions, SMT for IFL and zIIP ▪ On Demand Capabilities <ul style="list-style-type: none"> – CoD: CIU, CBU, On/Off CoD, CPE ▪ Memory – up to 10 TB <ul style="list-style-type: none"> – Up to 10 TB per LPAR (if no FICON Express8) – 96 GB Fixed HSA ▪ Channels <ul style="list-style-type: none"> – PCIe Gen3 16 GBps channel buses – Six CSSs, up to 85 LPARs – 4 Subchannel Sets per CSS – FICON Express16S or 8S (8 Carry forward) – zHPF – OSA Express5S (4S carry forward) – HiperSockets – up to 32 – Flash Express + (Refresh) – zEnterprise Data Compression – RDMA over CE (RoCE) with SR-IOV Support ▪ Crypto Express5S ▪ Parallel Sysplex clustering, PCIe Coupling, and InfiniBand Coupling ▪ IBM zAware: z/OS and Linux on z System ▪ Operating Systems <ul style="list-style-type: none"> – z/OS, z/VM, z/VSE, z/TPF, Linux on z System

IBM z13– January 2015

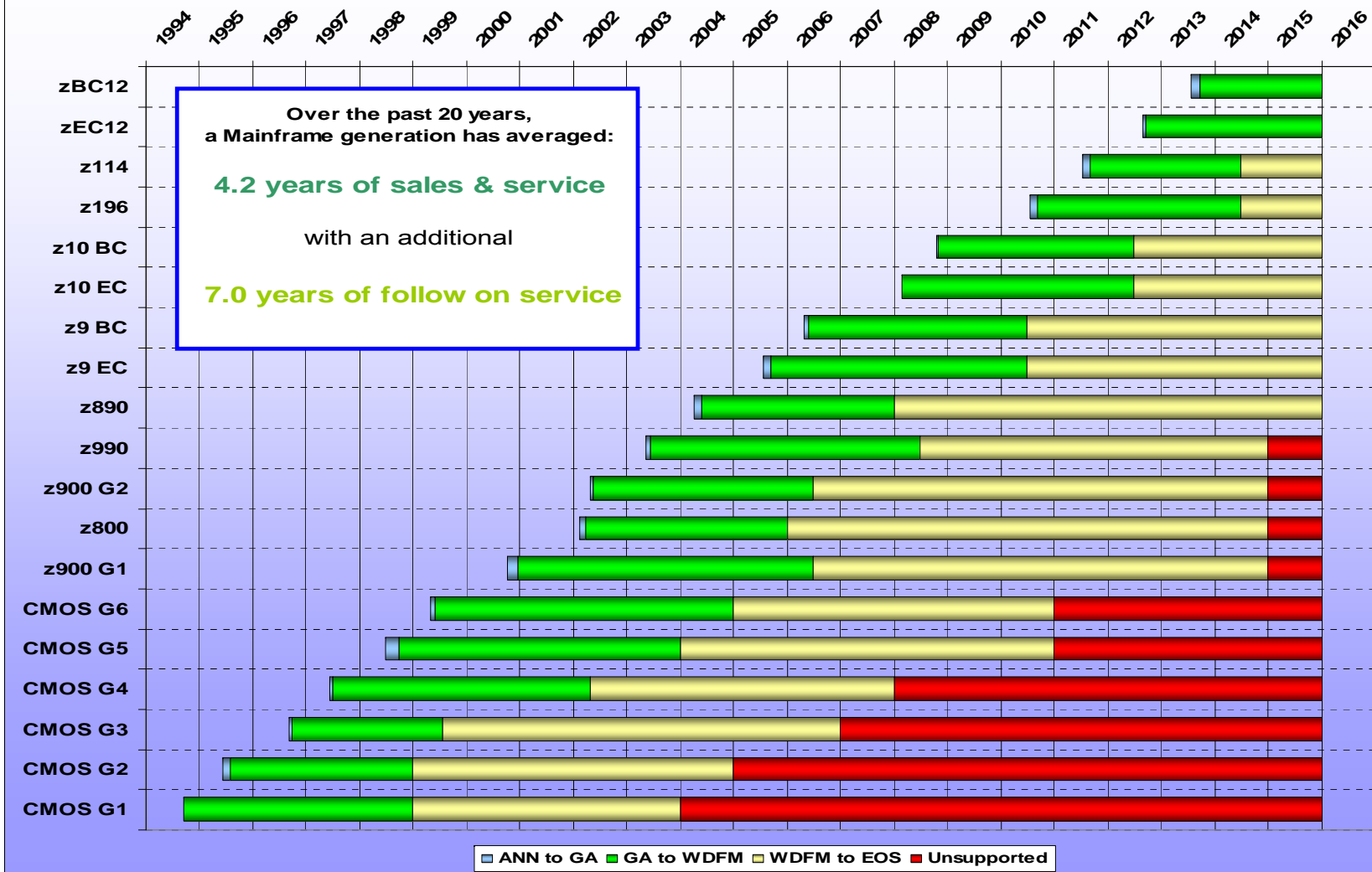
IBM z13 (2964)	IBM zEnterprise Blade Extension (2458) – zBX model 004
	
<ul style="list-style-type: none"> ▪ Announced – 01/15 ▪ 5 models – NE1, NC9, N96, N63, N30 <ul style="list-style-type: none"> – Up to 141 customer configurable engines ▪ Sub-capacity Offerings for up to 30 CPs ▪ PU (Engine) Characterization <ul style="list-style-type: none"> – CP, IFL, ICF, zIIP, SAP, IFP (No zAAPs) ▪ SIMD instructions, SMT for IFL and zIIP ▪ On Demand Capabilities <ul style="list-style-type: none"> – CoD: CIU, CBU, On/Off CoD, CPE ▪ Memory – up to 10 TB <ul style="list-style-type: none"> – Up to 10 TB per LPAR (if no FICON Express8) – 96 GB Fixed HSA ▪ Channels <ul style="list-style-type: none"> – PCIe Gen3 16 GBps channel buses – Six CSSs, up to 85 LPARs – 4 Subchannel Sets per CSS – FICON Express16S or 8S (8 Carry forward) – OSA Express5S (4S carry forward) – HiperSockets – up to 32 – Flash Express + (Refresh) – zEnterprise Data Compression – RDMA over CE (RoCE) with SR-IOV Support ▪ Crypto Express5S ▪ Parallel Sysplex clustering, PCIe Coupling, and InfiniBand Coupling ▪ IBM zAware: z/OS and Linux on z System ▪ Operating Systems <ul style="list-style-type: none"> – z/OS, z/VM, z/VSE, z/TPF, Linux on z System 	<ul style="list-style-type: none"> ▪ Announce – 01/15 ▪ Upgrade ONLY stand alone Ensemble node converted from an installed zBX Model 2 or 3 ▪ Doesn't require a 'owning' CPC ▪ Management – Unified Resource Manager ▪ zBX Racks (up to 4) with: <ul style="list-style-type: none"> – Dual 1U Support Elements, Dual INMN and IEDN TOR switches in the 1st rack – HMC LAN attached (no CPC BPH attachment) – 2 or 4 PDUs per rack ▪ Up to 8 BladeCenter H Chassis <ul style="list-style-type: none"> – Space for 14 blades each – 10 GbE and 8 Gbps FC connectivity – Advanced Management Modules – Redundant connectivity, power, and cooling ▪ Up to 112 single wide IBM blades <ul style="list-style-type: none"> – IBM BladeCenter PS701 Express – IBM BladeCenter HX5 7873 – IBM WebSphere DataPower Integration Appliance XI50 for zEnterprise (M/T 2462-4BX) – IBM WebSphere DataPower® Integration Appliance XI52 Virtual Edition on System x ▪ Operating Systems <ul style="list-style-type: none"> – AIX 5.3 and higher – Linux on System x – Microsoft Windows on System x ▪ Hypervisors <ul style="list-style-type: none"> – KVM Hypervisor on System x – PowerVM Enterprise Edition

z Systems Delivery Cycle





IBM Mainframe Life Cycle History



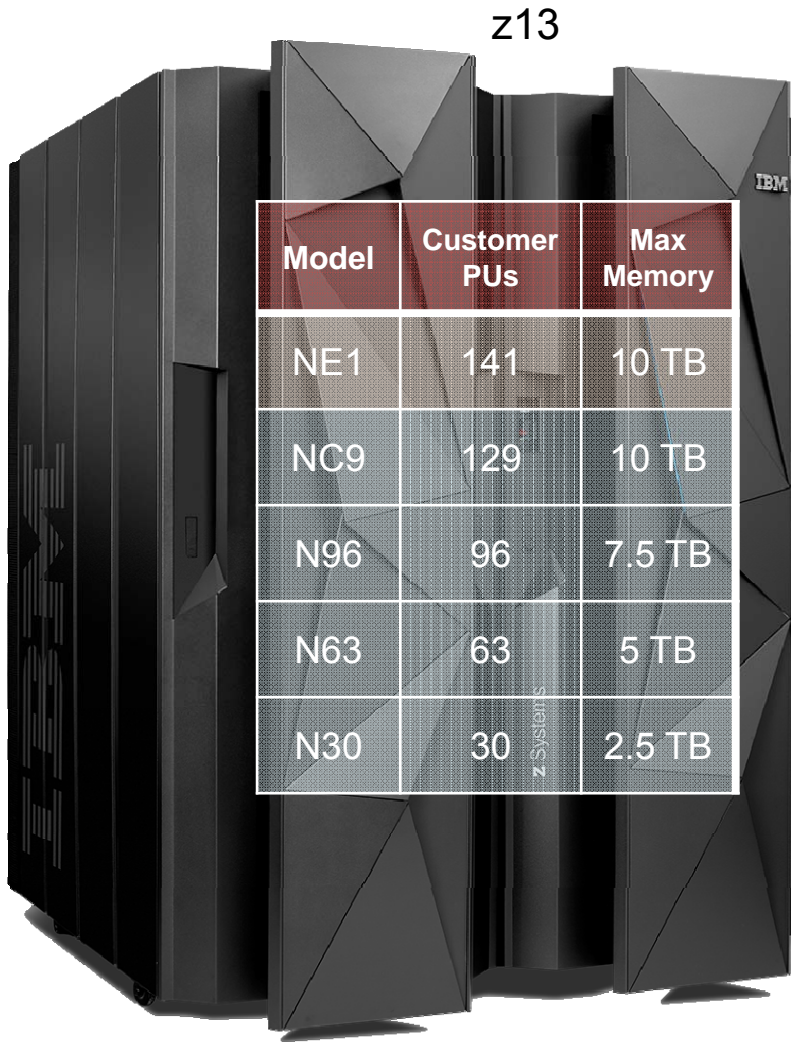
IBM has historically provided service support for at least five years following a product's withdrawal from marketing. While IBM does not guarantee that any product will have a particular period of support following withdrawal from marketing, IBM does not presently plan to deviate from its historical service and support practice with the z System product line. However, please be aware that IBM's plans may change at its sole discretion without notice. IBM determines a product's end-of-service (EOS) date by considering a large number of factors, including but not limited to the number of machines installed in the geography, spare parts availability, and the availability of skilled personnel. IBM will announce a product's EOS date at least 90 days before the actual EOS date and, in most cases, longer. In some geographies, when EOS is announced, service support may still be available through a special bid.



IBM z Systems naming for IBM z13 (z13)

Brand Name:	IBM
Product Class:	IBM mainframe
Family Name:	IBM z Systems™
Family Short Name:	z Systems
Product Line Name:	IBM z Systems™
Product Line Short Name:	z Systems
Product Name:	IBM z13™
Short Name:	z13
Models:	N30, N63, N96, NC9, NE1
Machine Type:	2964
Workload Optimizing Attachments:	IBM z BladeCenter® Extension (zBX) Model 004 IBM DB2® Analytics Accelerator for z/OS® Version 4
Management Firmware:	IBM z Unified Resource Manager
Management Firmware Short Name:	Unified Resource Manager or zManager

z13 Overview



▪ **Machine Type**

- 2964

▪ **5 Models**

- N30, N63, N96, NC9 and NE1

▪ **Processor Units (PUs)**

- 39 (42 for NE1) PU cores per CPC drawer
- Up to 24 SAPs per system, standard
- 2 spares designated per system
- Dependant on the H/W model - up to 30, 63, 96, 108, 141 PU cores available for characterization
 - Central Processors (CPs), Internal Coupling Facility (ICFs), Integrated Facility for Linux (IFLs), z System Integrated Information Processor (zIIP), optional - additional System Assist Processors (SAPs) and Integrated Firmware Processor (IFP)
 - 85 LPARs, increased from 60
- Sub-capacity available for up to 30 CPs
 - 3 sub-capacity points

▪ **Memory**

- RAIM Memory design
- System Minimum of 64 GB
- Up to 2.5 TB GB per drawer
- Up to 10 TB for System and up to 10 TB per LPAR (OS dependant)
 - LPAR support of the full memory enabled
 - 96 GB Fixed HSA, standard
 - 32/64/96/128/256/256 GB increments
- Flash Express

▪ **I/O**

- 6 GBps I/O Interconnects – carry forward only
- Up to 40 PCIe Gen3 Fanouts and Integrated Coupling Adaptors per System @ 16 GBps each
- 6 Logical Channel Subsystems (LCSSs)
 - 4 Sub-channel sets per LCSS

▪ **Server Time Protocol (STP)**

z13 Functions and Features (GA Driver Level 22)

System, Processor, Memory
Five hardware models
Eight core 22nm PU SCM
Up to 141 processors configurable as CPs, zIIPs, IFLs, ICFs, or optional SAPs
Increased Uni processor capacity
Up to 30 sub capacity CPs at capacity settings 4, 5, or 6
CPC Drawers and backplane Oscillator
SMT (for IFLs and zIIPs only) and SIMD
Enhanced processor/cache design with bigger cache sizes
Up to 10 TB of Redundant Array of Independent Memory (RAIM)
CPC Drawer/Memory Affinity
LPARs increased from 60 to 85

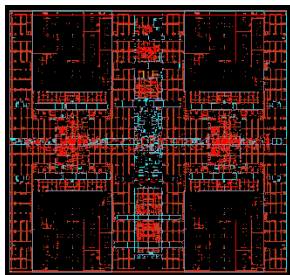


I/O Subsystem, Parallel Sysplex, STP, Security
New PCIe Gen3 I/O fanouts with 16 GBps Buses
LCSS increased from 4 to 6
4 th Subchannel Set per LCSS
Maximum number of I/O Devices (subchannels) per channel increased from 24K to 32K for all z13 FICON features
FICON Enhancements
SR-IOV support for RoCE
New Integrated Coupling Adapter (ICA SR) for coupling links
Support for up to 256 coupling CHPIDs per CPC
CFCC Level 20
Crypto Express5S and Cryptographic enhancements with support for 85 Domains
STP Enhancements

RAS, Other Infrastructure Enhancements	
IBM zAware for Linux on z Systems (June 23, 2015)	System Control Hub (SCH). Replaces BPH
New N+2 'radiator' design for Air Cooled System	Rack Mounted Support Elements in the CPC
Key Locks for doors	Rack mounted HMCs for customer supplied rack
Support for ASHRAE Class A2 datacenter	TKE 8.0 LICC

z Systems - Processor Roadmap

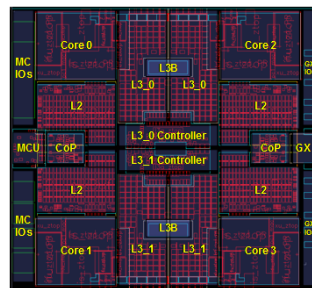
z10
2/2008



Workload Consolidation and Integration Engine for CPU Intensive Workloads

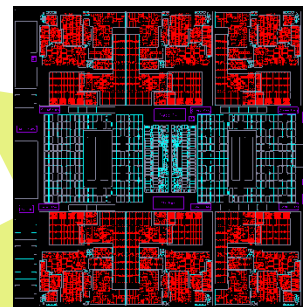
- Decimal FP
- Infiniband
- 64-CP Image
- Large Pages
- Shared Memory

z196
9/2010



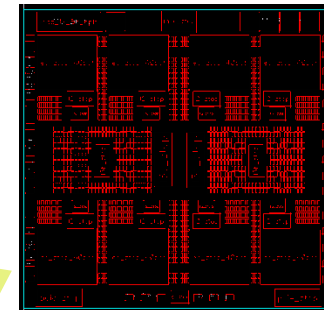
- Top Tier Single Thread Performance, System Capacity
- Accelerator Integration
- Out of Order Execution
- Water Cooling
- PCIe I/O Fabric
- RAIM
- Enhanced Energy Management

zEC12
8/2012



- Leadership Single Thread, Enhanced Throughput
- Improved out-of-order
- Transactional Memory
- Dynamic Optimization
- 2 GB page support
- Step Function in System Capacity

z13
1/2015

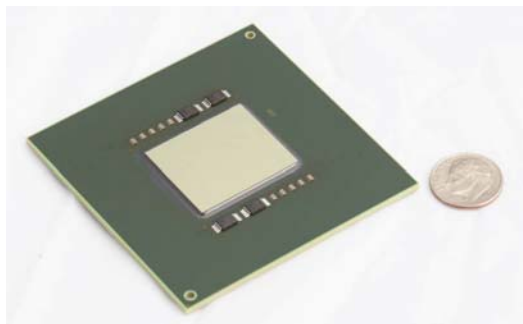


- Leadership System Capacity and Performance
- Modularity & Scalability
- Dynamic SMT
- Supports two instruction threads
- SIMD
- PCIe attached accelerators
- Business Analytics Optimized

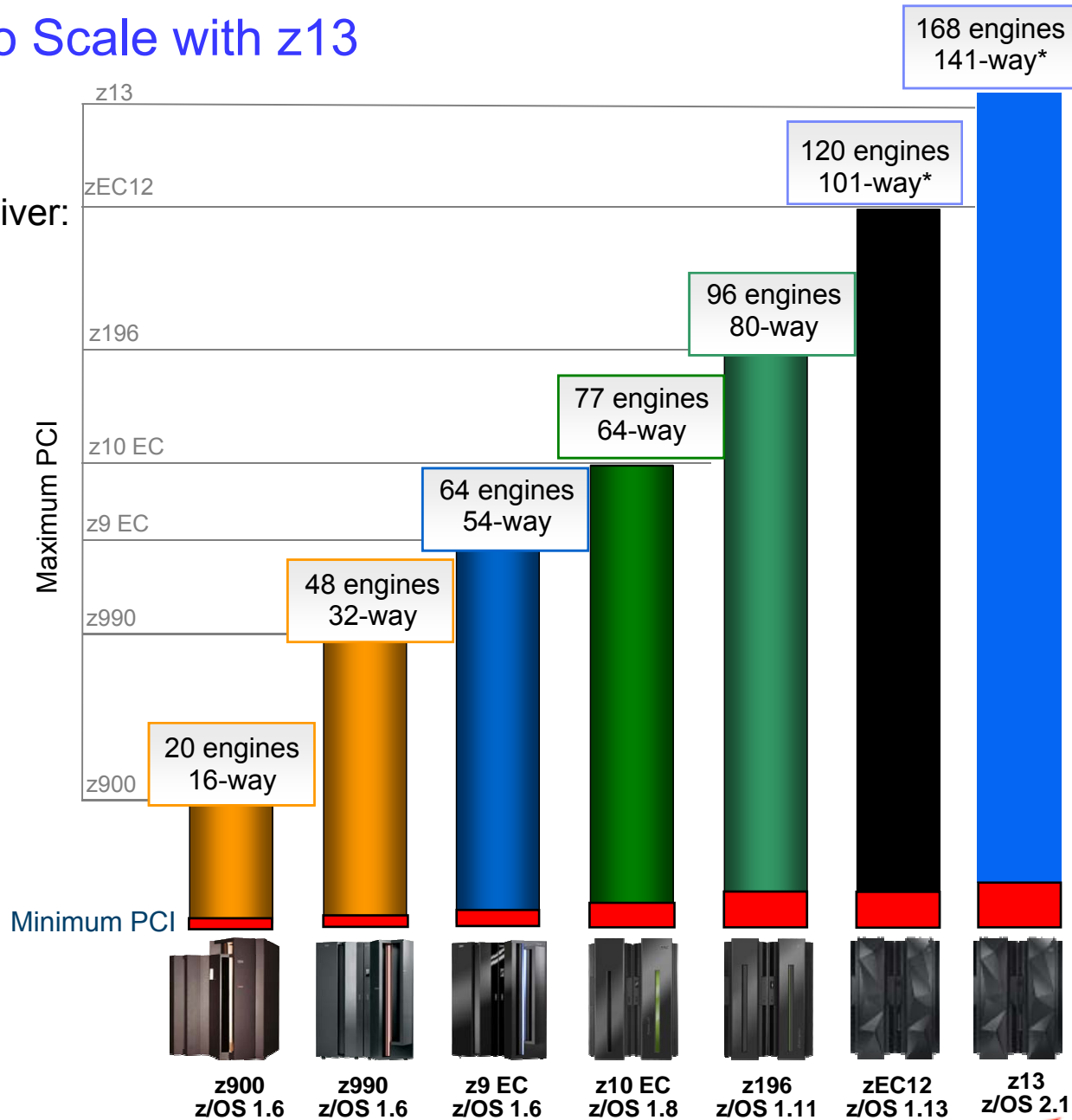
z Systems Continue to Scale with z13

Each new range continues to deliver:

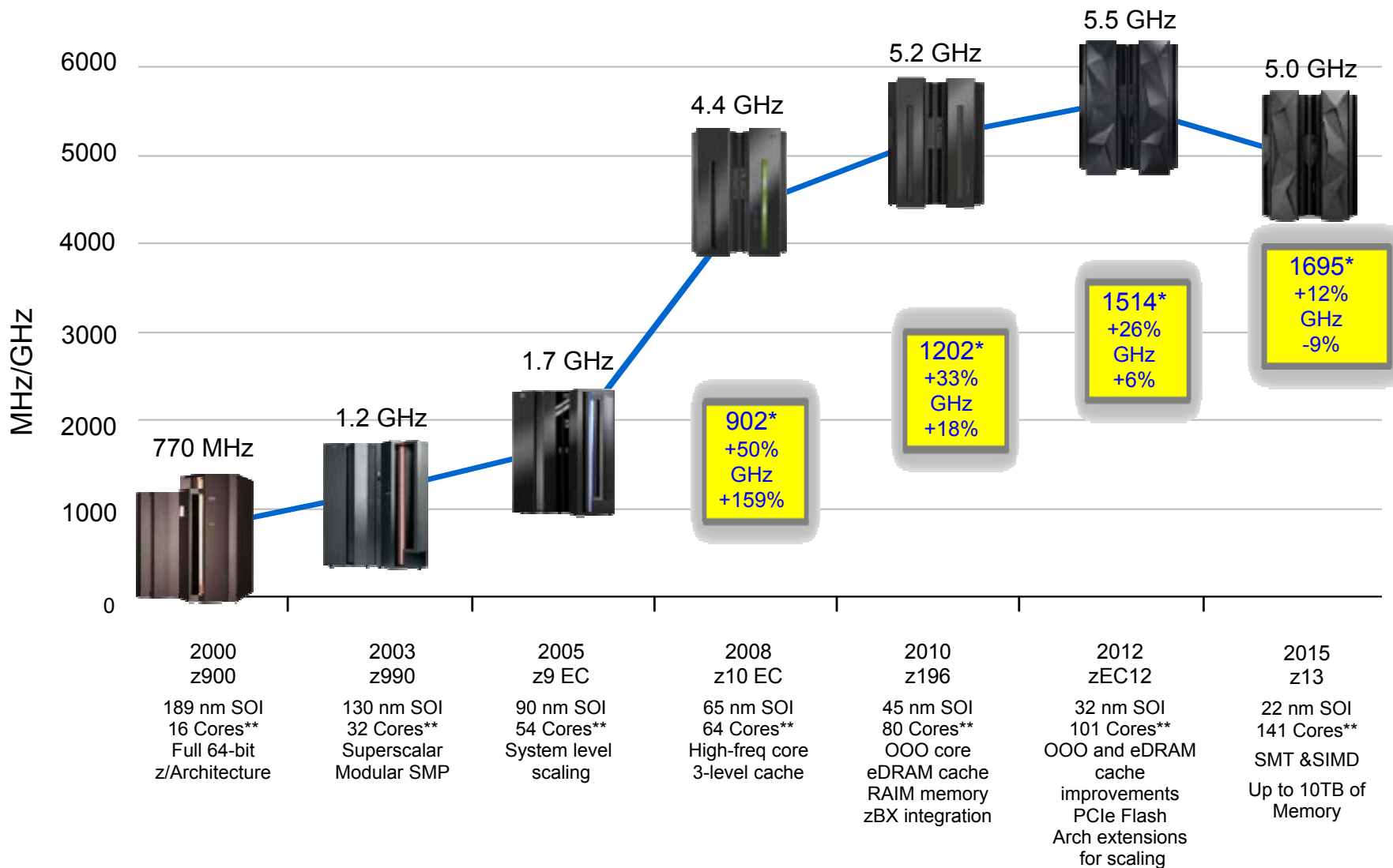
- New function
- Unprecedented capacity to meet consolidation needs
- Improved efficiency to further reduce energy consumption
- Continues to delivering flexible and simplified on demand capacity
- A mainframe that goes beyond the traditional paradigm



PCI - Processor Capacity Index
*z/OS supports up to a 100-way only



z13 Continues the CMOS Mainframe Heritage Begun in 1994



* MIPS Tables are NOT adequate for making comparisons of z Systems processors. Additional capacity planning required

** Number of PU cores for customer use

CPU Clock speed versus Computer Performance - Facts

- **Why the overall CPU frequency approach is changing ?**
 - Consistent frequency growth in the past decade
 - ✓ from hundreds of megahertz to gigahertz
 - CPU frequency has slowed or reduced in the past couple of years
- **Designing chips for better performance**
 - Limits are imposed by physics, technology or economics
 - Controls the rate of improvements in different dimensions
 - Different processor architectures have different issues with overclocking
- **Physical limitations**
 - Speed of signal transfer from one end to the other on a chip
 - Power and heat dissipation
 - Cooling
 - How many memory elements (caches) can be within a given latency from the CPU
- **Physical limitations force the designers to make trade-offs**
 - “Shrinking” a processor chip
 - ✓ pro: Faster due to the shorter distances
 - ✓ con: Reduced area for dissipation
 - Power dissipation increases as the chip speeds up
 - Raising the processor voltages would make transistors to switch quicker
 - ✓ pro: Frequency could then be increased
 - ✓ con: current also increases creating more heat
 - Sounds easy.. but... it causes serious problems with heat
- **Emerging technologies allow frequency variation according to processing needs**

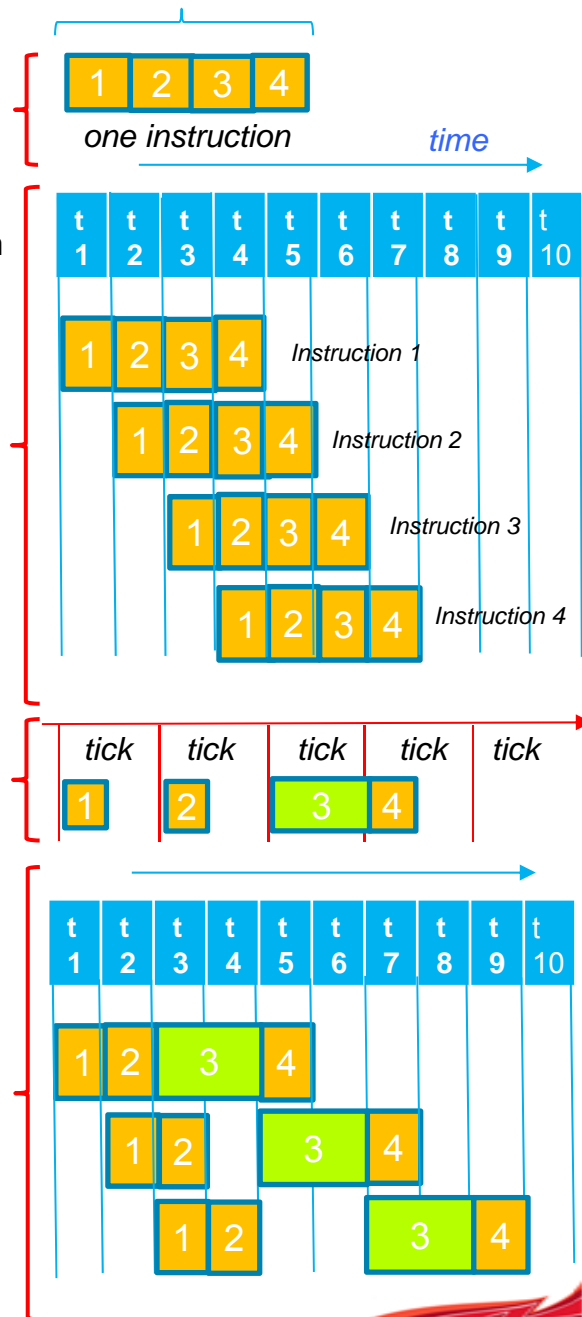


CPU Clock speed versus Computer Performance – Facts (part 2) *from the old z10 days...*

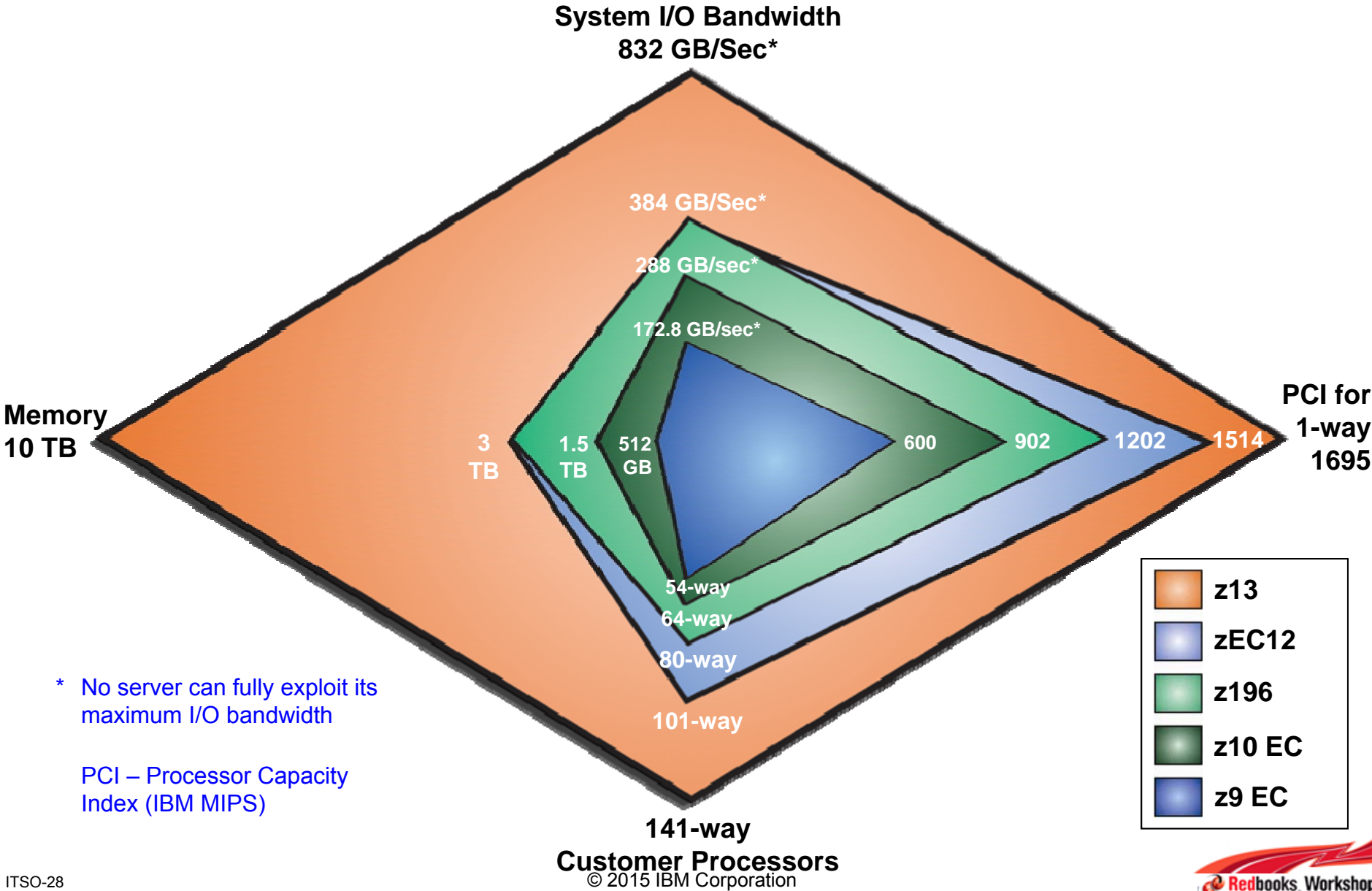
- **GHz is not the only dimension that matters**
 - z Systems focus is on balanced system design across many factors:
 - Frequency, pipeline, efficiency, energy efficiency, cache/memory design and I/O design
 - Greater logic density, power density, wire-ability. All permits more cores per chip, larger cache, additional execution units/circuits, addition of SMT and SIMD on each core.
- **System performance is not linear with frequency**
 - Need to use LSPR and z Systems capacity planning tools for real client / workload sizing
- **z Systems leverages technologies to get the most out of chips design**
 - Low latency pipelines
 - Dense packaging with proper cooling which yields more power-efficient operation
 - Consistent performance at high utilization
- **The IBM z13 Server**
 - z13 is a significant change from zEC12
 - Processor speed measured in instructions per second (for a given workload) has increased as compared to the zEC12.
 - Wider pipeline (up to six per cycle)
 - Enhanced branch prediction
 - Optimized resolution of dependencies between instructions

Theoretical study - machine frequency variation

- **Functionally, every execution of a processor instruction is divided in several steps**
 - The steps follow each other sequentially and each is executed on a separate computing device
 - When the execution of a specific step is completed, the computing device can then be used to execute a different instruction
 - As seen on the diagram at the right, the first computing device executes the first step of the first instruction during the **t1** time
 - By the beginning of the **t2** period, the first step has been completed and the second step can begin on the second device
 - The first device is now free and ready to begin the first step of the next instruction and so on
 - During the **t4** period, different steps of four different instructions can be executed
- **Different steps of the same instruction can vary in execution time**
 - One *tick* is equivalent to one processor cycle
 - There is no immediate advantage just by reducing the *tick* size
 - Suppose the *tick* is 500ps (2GHz)
 - Reducing the *tick* to 250ps and keeping all the rest the same, the step 3 would still take 2 *ticks*
- **Some observations**
 - Initially, the instructions execution will be much faster
 - But beginning from the fourth *tick*, the third step and all of the following steps will be delayed
 - This happens because the 3rd computing device will be free every two *ticks*, not every *tick*
 - While it is busy with the 3rd step of one instruction, the same step of another instruction (which uses the same device) cannot be executed
- **Possible conclusions**
 - One way to raise frequency is to shorten the longer steps
 - There are many ways to influence the step length using available technologies
 - Out of Order / Multi-Threading / duplicating execution devices
 - Reduced latency with larger caches, improved memory access, etc.



IBM z13 - Advanced system design optimized for digital business

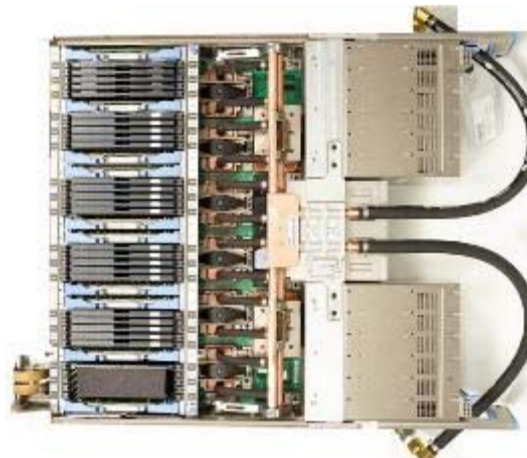
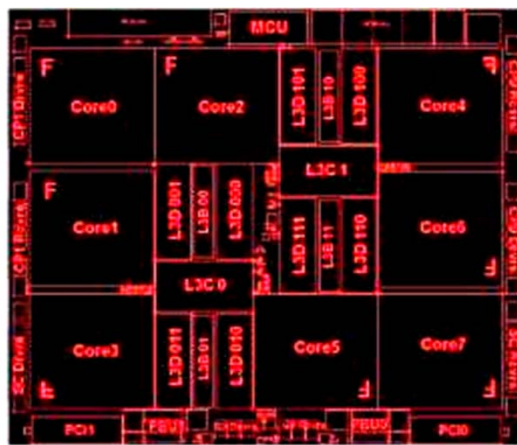


z13 System Design Changes

- 22nm Processor with SIMD, SMT
- Integrated I/O with PCIe Direct Attach
- Single Chip Modules
- Drawer-Based CPC Design
- Cable-Based SMP Fabric
- Oscillator Backplane
- Flexible Service Processor (FSP2)
- Integrated Sparing
- On-chip power/thermal monitor / control



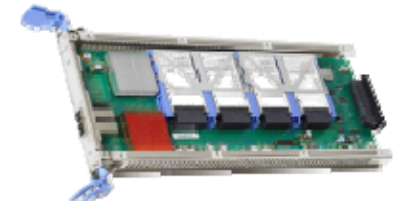
- New Memory Controller
- Crypto Express5S
- FICON Express16S
- 1U Support Element
- Standalone zBX Node Hybrid Computing
- 2.7M lines of firmware changed
- Radiator Design improvements
- Expanded operating environment
(*ASHRAE rating changed from 1 to 2)



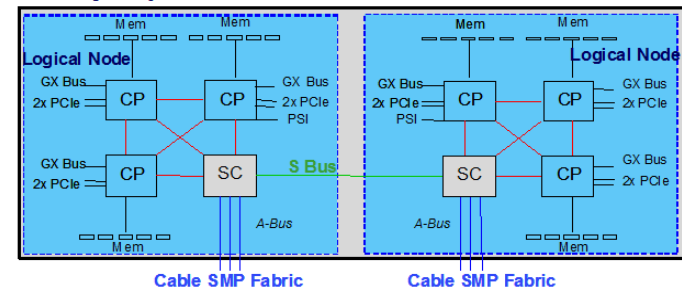
(*ASHRAE-American Society of Heating, Refrigerating, and Air-Conditioning Engineers

Accelerate Key Workloads with Special-Purpose Hardware

- On-processor
 - Crypto (CPACF), Compression, SIMD, SMT*
 - Tight, synchronous integration with instruction stream
- PCIe Gen3
 - Accessible and sharable by all processors
 - Faster time to market for new functions
 - Compression (zEDC), Crypto, Flash Express
- Network Acceleration
 - RDMA over Converged Ethernet SMC-R (RoCE)
- Integrated External Accelerators
 - Integrated by Software
 - IBM DB2 Analytics Accelerator for DB2 Query Acceleration
- Specialty Engines and Firmware Partitions
 - Leverage Flat SMP Design, enable price flexibility
 - zIIP for DB2 and Java, IFL for Linux on z System
 - IBM zAware



Fully Populated Drawer



* For zIIPs and IFLs

IBM z13 (z13) GA Key Dates – 2015 – Driver Level 22

- IBM z13 (z13) Announcement – January 14, 2015
(GA, March 9, 2015)
 - eConfig - First Day Orders for GA Systems
 - ResourceLink™ support available
 - Capacity Planning Tools (zPCR, zTPM, zCP3000, zBNA, zSoftCap, zTPM, zSCON) - updated
 - SAPR Guide and SA Confirmation Checklist available
 - New, SAPR Guide for z13, SA15-002
 - New, SAPR Guide for zBX Model 004, SA15-004

- z13 ITSO Technical Hardware Workshop – 1Q, 2015
Download presentations from: <http://www.redbooks.ibm.com/Redbooks.nsf/pages/addmats>

CFSizer Tool – Estimated availability date – February 14, 2015

IBM z13 (z13) Key Dates – 2015

- January 14, 2015. ITSO Redbooks – Draft Versions
 - New – IBM z13 Technical Introduction, SG24-8250
 - New – IBM z13 Technical Guide, SG24-8251
 - New – IBM z13 Configuration Setup, SG24-8260
 - Updated – IBM z Systems Connectivity Handbook, SG24-5444
 - Updated – IBM z Systems Functional Matrix

- January 14, 2015. The following ITSO published POVs:
 - Securing your Mobile Mainframe, REDP-5176
<http://www.redbooks.ibm.com/abstracts/redp5176.html?Open>
 - z Systems Simultaneous Multithreading Revolution, REDP-5144
<http://www.redbooks.ibm.com/abstracts/redp5144.html?Open>
 - SIMD Business Analytics Acceleration on z Systems, REDP-5145
<http://www.redbooks.ibm.com/abstracts/redp5145.html?Open>
 - Enhancing Value to Existing and Future Workloads with IBM z13, REDP-5135
<http://www.redbooks.ibm.com/abstracts/redp5135.html?Open>
 - z/OS Infrastructure Optimization using Large Memory, REDP-5146
<http://www.redbooks.ibm.com/abstracts/redp5146.html?Open>

- February to April, 2015 – Worldwide ITSO z13 Workshops
 - <http://www.redbooks.ibm.com/projects.nsf/WorkshopIndex/>

IBM z13 (z13) Key Dates – 2015 – Driver Level 22 (1 of 2)

- March 9, 2015
 - Features and functions for the z13
 - z13 Models N30, N63, N96, NC9, and NE1
 - z196 air-cooled EC upgrades to z13 air-cooled
 - z196 air-cooled EC upgrades to z13 water-cooled
 - z196 water-cooled EC upgrades to z13 water-cooled
 - z196 with zBX Model 002 upgrades to z13 and zBX Model 004 standalone
 - zEC12 air-cooled EC upgrades to z13 air-cooled
 - zEC12 air-cooled EC upgrades to z13 water-cooled
 - zEC12 water-cooled EC upgrades to z13 water-cooled
 - zEC12 with zBX Model 003 upgrades to z13 and zBX Model 004 standalone
 - zBX Model 002 upgrades to zBX Model 004 (#0512) standalone
 - zBX Model 003 upgrades to zBX Model 004 (#0512) standalone
 - Field installed features and conversions on z13 that are delivered solely through a modification to the machine's Licensed Internal Code (LIC)
 - Limited options to increase or decrease IBM BladeCenter HX5 blade server or IBM BladeCenter PS701 blade server entitlements on zBX upgrades to Model 004 standalone

- March 13, 2015
 - z/VM V6.3 exploitation support for Simultaneous multithreading (SMT)

- April 14, 2015
 - TKE 8.0 LIC (#0877) on zEC12 and ZBC12
 - TKE Workstation (#0847) on zEC12 and zBC12
 - TKE Smart Card Reader (#0891) on zEC12 and zBC12
 - TKE additional smart cards (#0892) on zEC12 and zBC12
 - 4767 TKE Crypto Adapter (#0894) on zEC12 and zBC12
 - Fill and Drain Kit (#3380) for zEC12
 - Fill and Drain adapter kit (#3379) for zEC12
 - Universal Lift Tool/Ladder (#3105) for zEC12 and zBC12
 - Universal Lift Tool upgrade kit (#3103) for zEC12 and zBC12

IBM z13 (z13) Key Dates – 2015 – Driver Level 22 (2 of 2)

- **May 30, 2015**
 - Limited MES features for zBX Model 004 standalone

- **June 26, 2015**
 - MES features for z13 Models N30, N63, N96, NC9, and NE1
 - z/VM V6.3 support for Multi-VSwitch Link Aggregation
 - Support for 256 Coupling CHPIDs
 - HMC STP Panel Enhancements: Initialize Time, Set Date and Time, Time Zone, View-Only Mode
 - Fibre Channel Protocol (FCP) channel configuration discovery and debug
 - Improved High Performance FICON for z Systems (zHPF) I/O Execution at Distance
 - IBM zAware support for Linux on z Systems

- **September 25, 2015**
 - FICON Dynamic Routing
 - Forward Error Correction (FEC) for FICON Express16S
 - Storage Area Network (SAN) Fabric I/O Priority



■ **Questions ?**

– **Ewerson Palacio**

bird@br.ibm.com

– **Frank Packheiser**

F.Packheiser@de.ibm.com

– **Parwez Hamid**

pnh@us.ibm.com

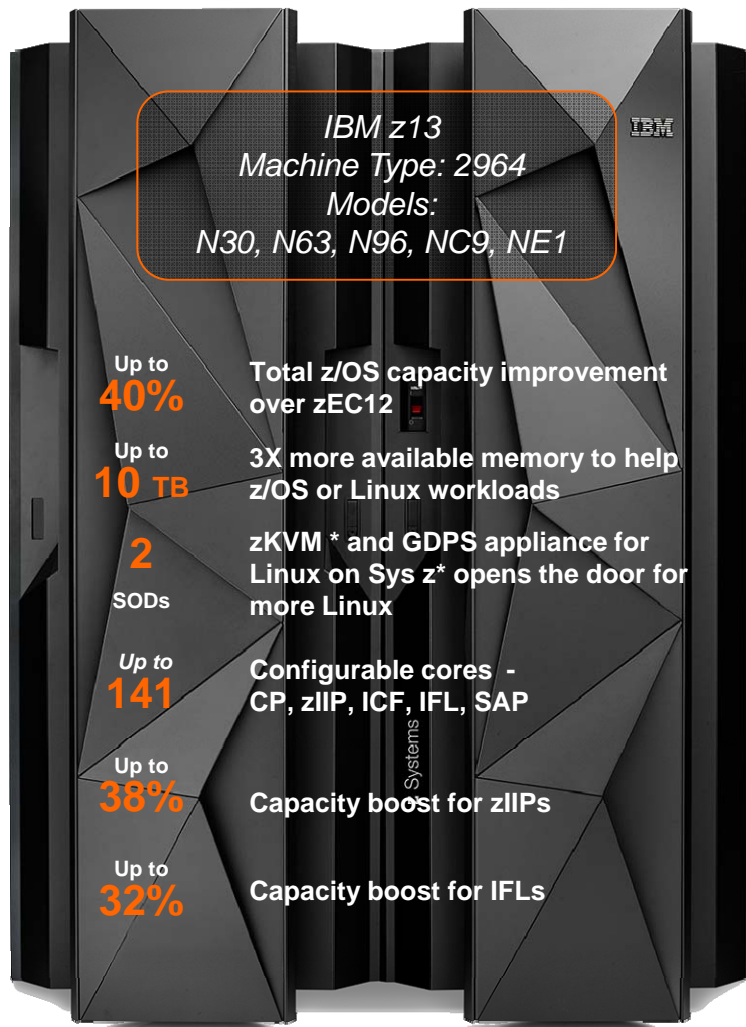
IBM z13

Reinventing enterprise IT
for digital business



Additional Slides
(available as additional material – Back up)

The mainframe optimized for the digital era



- Performance, scale, intelligent I/O and security enhancements to support transaction growth in the mobile world
- More memory, new cache design, improved I/O bandwidth and compression help to serve up more data for analytics
- Enterprise grade Linux, open standards, enhanced sharing and focus on business continuity to support cloud

Upgradeable from z196 and zEC12

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