IBM z Systems

## IBM z13 Hardware Innovation

#### February 3, 2015

**Crystal Singleton** 

NA-Mid-Atlantic Client Technical Specialist-z Systems





•© 2015 IBM Corporation 2

### Trademarks

•The following are trademarks of the International Business Machines Corporation in the United States and/or other countries.

BladeCenetr* BlueMix CICS* COGNOS* DB2*	DFSMS DFSMSdfp DFSMSdss DFSMShsm DS8000*	Easy Tier* ECKD FlashSystem FICON* GDPS*	HiperSockets HyperSwap IBM* IBM (logo)* Infinband*	IMS MQSeries* NetView* OMEGAMON* RACF*	System Storage* Tivoli* WebSphere* z13 zEnterprise*	z/OS* z Systems z/VM* z/VSE*
---	--	--	--	--	---	---------------------------------------

•\* Registered trademarks of IBM Corporation

•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.
 •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.

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

Commerce. 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. Java and all Java based trademarks and logos are trademarks or registered trademarks of Oracle and/or its affiliates.

•Linear Tape-Open, LTO, the LTO Logo, Ultrium, and the Ultrium logo are trademarks of HP, IBM Corp. and Quantum in the U.S. and

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

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

•OpenStack is a trademark of OpenStack LLC. The OpenStack trademark policy is available on the <u>OpenStack website</u>.

•TEALEAF is a registered trademark of Tealeaf, an IBM Company.

•Windows Server and the Windows logo are trademarks of the Microsoft group of countries.

•Worklight is a trademark or registered trademark of Worklight, an IBM Company.

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

•\* Other product and service names might be trademarks of IBM or other 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.

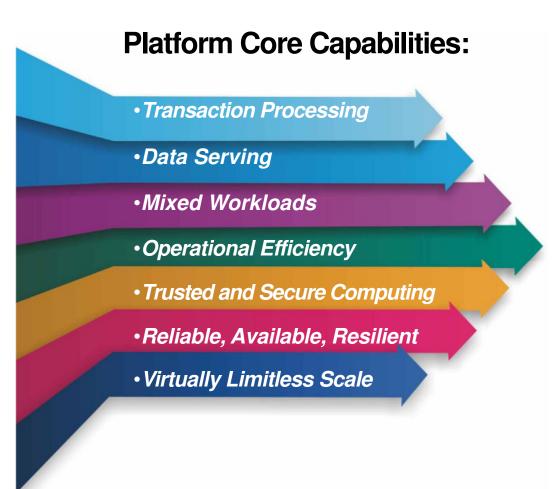
•Information about non-IBM products is obtained from the manufacturers of those products or their published announcements. IBM has not tested those products and cannot confirm the performance, compatibility, or any other claims related to non-IBM products. Questions on the capabilities of non-IBM products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

•This information provides only general descriptions of the types and portions of workloads that are eligible for execution on Specialty Engines (e.g., zIIPs, zAAPs, and IFLs) ("SEs"). IBM authorizes customers to use IBM SE only to execute the processing of Eligible Workloads of specific Programs expressly authorized by IBM as specified in the "Authorized Use Table for IBM Machines" provided at <a href="http://www.ibm.com/systems/support/machine\_warranties/machine\_code/aut.html">www.ibm.com/systems/support/machine\_warranties/machine\_code/aut.html</a> ("AUT"). No other workload processing is authorized for execution on an SE. IBM offers SE at a lower price than General Processors/Central Processors because customers are authorized to use SEs only to process certain types and/or amounts of workloads as specified by IBM in the AUT.

•© 2015 IBM Corporation 2



### IBM z13 platform positioning



- The world's premier transaction and data engine now enabled for the **mobile** generation
- The integrated transaction and analytics system for right-time insights at the point of impact
- The world's most efficient and trusted cloud system that transforms the economics of IT

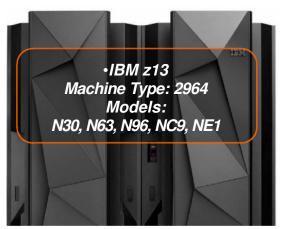


### Introducing the IBM z13 for digital business

## 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 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 \*

- •Continuous data availability for z/OS and Linux guests hosted by z/VM with new GDPS Appliance \*
- •Faster diagnosis with IBM zAware now extended to Linux on z

#### •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

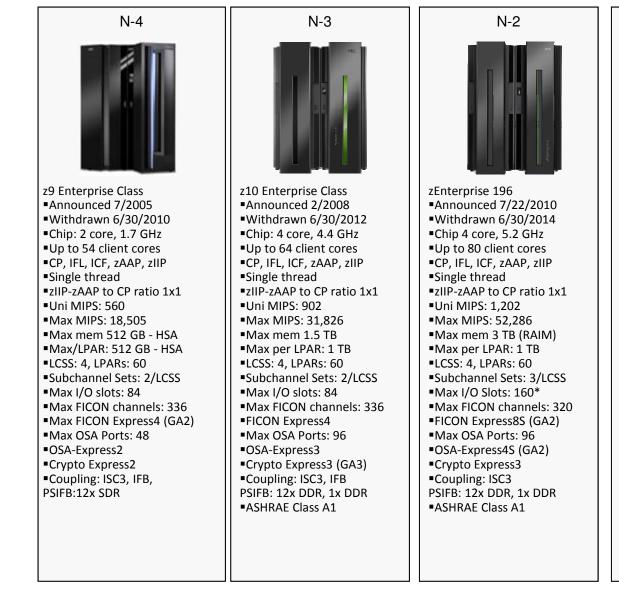
- •Insure protection and integrity with next generation cryptography
- •New PCIe based short range coupling links

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



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

## **IBM z Systems High End Generations**





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 Expres4S Coupling: PSIFB: 12x DDR, 1x DDR ASHRAE Class A1 Native PCIe: zEDC, Flash Express 10 GbE RoCE

Ν



IBM 713 Announced 102015 Chip: 8 core, 5.0 GHz •Up to 141 client cores ■CP, IFL, ICF, zIIP SMT: zIIP. IFL IIP 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

## z13 – Redesigned for the scale and speed of a mobile generation

•141 cores and 40%\* more capacity in a single system

•2X\* performance improvement with crypto coprocessors for more secure transactions

•10 TB\* memory plus 2X increase in cache size

•320 separate channels dedicated just to driving I/O throughput

•16 Gbps FICON links for faster throughput

Performance, scale, intelligent I/O, and security
enhancements to support transaction growth in
the mobile world

•z/OS <u>Connect</u> provides consolidated REST •APIs for all z/OS transactions

Seamlessly channel z/OS transactions to mobile
devices with MobileFirst Platform

IBM MobileFirst Platform for iOS specifically for
iOS mobile apps

•Enable end to end security from mobile device •to mainframe with z/OS, RACF<sup>®</sup> and MobileFirst •products



### z13 helping deliver insights at the point of impact

IBM DB2 Analytics
Accelerator further accelerates queries for faster insight
SIMD delivers accelerated analytics processing for mathematical optimization
EDC reduces data transfer time and storage cost by up to 75%
Gbps FICON links reduce latency for workloads such as DB2

•zllPs help to lower the cost of ownership helping to help connect, manage, extend, and protect data Mega-memory and new opportunities for inmemory computing

New machine architecture boosts complexmathematical model performance

•Use Hadoop to explore z Systems within the •secure zone of the mainframe

Evolving support for new and innovative use
cases, such as in-database transformation and
advanced predictive analytics



## z13 Redesigned for efficient and trusted cloud services

•Up to **8,000** virtual servers per system, more than **50** per core

•Open virtualization with new KVM support \*

•z13 brings faster processing and higher throughput of secure transactions (2X more throughput on crypto coprocessor)

•Business continuity and IT analytics with enterprise grade •Linux solution Open support extended with OpenStack<sup>®</sup>,
PostgreSQL, Node.JS, and KVM\*



Enterprise-grade Linux provides the foundation
for public, private, and hybrid cloud

Patterns for Linux on z Systems to quickly build
out complex cloud workload instances

Improved overall system performance leads to
a lower TCO compared to public cloud
deployments and deployments on x86
architectures

Enabling next generation cloud applications
with IBM Bluemix<sup>™</sup> on z Systems

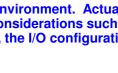
IBM.

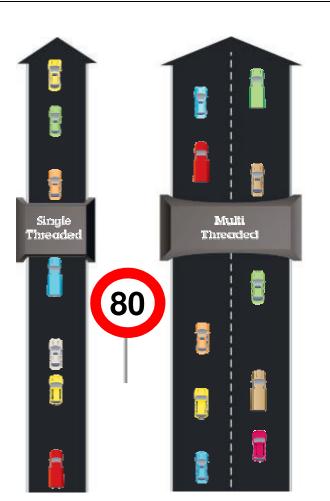
\* All statements regarding IBM's future direction and intent are subject to change or withdrawal without notice, and represent goals and objectives only.

#### Simultaneous Multithreading (SMT)

- Simultaneous multithreading allows instructions from one or two threads to execute on a zIIP or IFL processor core.
- SMT helps to address memory latency, resulting in an overall capacity\* (throughput) improvement per core
- Capacity improvement is variable depending on workload. For AVERAGE workloads the estimated capacity<sup>\*</sup> of a z13:
  - zIIP is 38% greater than a zEC12 zIIP
  - IFL is 32% greater than a zEC12 IFL
  - zIIP is 72% greater than a z196 zIIP
  - IFL is 65% greater than a z196 IFL
- SMT exploitation: z/VM V6.3 + PTFs for IFLs and z/OS V2.1 + PTFs in an LPAR for zIIPs
- SMT can be turned on or off on an LPAR by LPAR basis by operating system parameters. z/OS can also do this dynamically with operator commands.
- Notes:
  - 1. SMT is designed to deliver better overall capacity (throughput) for many workloads. Thread performance (instruction execution rate for an individual thread) may be faster running in single thread mode.
  - 2. Because SMT is not available for CPs, LSPR ratings do not include it

\*Capacity and performance ratios are based on measurements and projections using standard IBM benchmarks in a controlled environment. Actual throughput that any i 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.





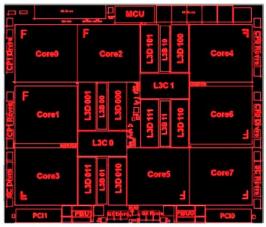
Which approach is designed for the highest volume\*\* of traffic? Which road is faster?

\*\* Two lanes at 50 carry 25% more volume if traffic density per lane is equal

© 2015 IBM Corporation

## Designed for transaction processing and data serving

- Substantial economies of scale with *simultaneous multi-threading delivering more throughput* for Linux and zIIP-eligible workloads
  - Cognos<sup>®</sup> on Linux under z/VM<sup>®</sup> could see up to 60% increase in throughput with SMT on a z13 IFL<sup>1</sup>
- Larger *caches to optimize* data serving environments
  - *Single Instruction Multiple Data (SIMD)* improves performance of complex mathematical models
  - Up to 2X *improved cryptographic performance* with enhanced Central Processor Assist for Cryptographic Functions (CPACF)
  - *Compress more data* helping to save disk space and cut data transfer time with improved *on chip hardware compression*



- *Better and faster memory management and execution time* with new hardware instructions and functional facilities to optimize compilers
- New 8-core Processor Design in 22nm Silicon Technology with wider instruction pipeline



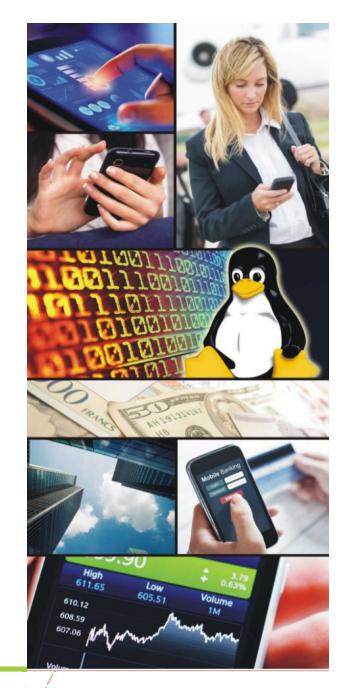
Results are based on internal lab measurements on a 4 core configuration on a single Linux guest running under z/VM and accessing DB2 on z/OS. Results may vary significantly depending on the workload and other factors.

### More memory makes a difference

- Enable totally new types of applications
  - Perform faster table scans with in memory data for faster response time; reduce CPU by avoiding IO, make possible new types of analysis
  - Accommodate growing workloads without changes to applications to gain benefits
    - Run sorts using large memory to improve elapsed times
    - Keep the entire Cognos Dynamic Cubes end-toend application online for faster decision making
  - Support modern memory heavy computing languages and architectures
    - Larger Java® heaps without an increase in paging
    - Improves IBM MQSeries<sup>®</sup> V8 ability to manage increasing messaging volumes generated by today's mobile and cloud applications
  - Reduce need to fine tune memory and leverage the tuning capabilities in DB2<sup>®</sup>, IMS<sup>TM</sup> and CICS<sup>®</sup>



•DB2 Buffer Pool simulator tool available as a DB2 (V11) deliverable. Provides an accurate benefit estimation of increasing buffer pool size for DB2.





## Trusted, secure and available





- Securely transfer more data across the internet with performance enhanced CPACF and next generation Crypto Express5S
- Extend *enhanced public key support for constrained digital environments* using hardware accelerated Elliptic Curve Cryptography (ECC) helping applications like Chrome, Firefox, and Apple's iMessage



• Avoid reformatting of databases with new exploitation of VISA *format preserving encryption* (VFPE) for credit card numbers



•*Continuous Availability and Disaster Recovery functions for Linux* on IBM z Systems<sup>TM</sup>and z/VM customers with new GDPS virtual appliance\*



- •IBM zAware extended to Linux on z to increase availability by *detecting unusual application or system behaviors* for faster problem resolution
- IBM intends to support the use of cryptography algorithms and equipment from selected providers in conjunction with z Systems in specific countries



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

## Resilient and intelligent I/O

- New FICON Express16S links reduce latency for workloads such as DB2
  - *Reduce up to 43% of DB2 write operations with IBM zHyperWrite*technology for DS8000<sup>®</sup> and z/OS for Metro Mirror environment



• First system to use a standards based approach for enabling Forward Error Correction for a complete end to end solution



• Clients with multi-site configurations can expect I/O service time improvement when writing data remotely which can *benefit GDPS or TPC-R HyperSwap*®



- Extend z/OS workload management policies
   into SAN fabric to manage the network congestion
- New Easy Tier<sup>®</sup> API removes requirement from
  - application/administrator to manage
    hardware resources *performance for mission*



critical environments

• Optimized for enterprise-scale data from multiple platforms and devices



## Flexible connectivity

Enhanced interoperability across platforms, improved configuration flexibility, reduced cost of data center infrastructure

ൢ	•Clustering •for availability	<ul> <li>Coupling Links</li> <li>New PCIe short range link</li> <li>InfiniBand<sup>®</sup> Coupling Links – 1x and 12x</li> <li>STP enhanced user interface</li> </ul>
Ö	•Controlled •and simplified management	<ul> <li>IBM zAware V2.0 analytics to improve problem resolution – <i>New</i> Linux for z support</li> <li>Rack mounted Hardware Management Console (HMC)</li> <li>Central management of heterogeneous resources with zManager</li> <li>Connectivity of IBM z BladeCenter<sup>®</sup> Extension (zBX )for Hybrid Computing:</li> <li>Intraensemble data network</li> </ul>
	•Efficient data access	<ul> <li>New zHPF – Extended Distance II</li> <li>zEDC Express</li> <li>Flash Express</li> <li>New FICON Express16S</li> <li>FICON Express8S</li> <li>Carry forward only - FICON Express8</li> </ul>
	•Linking up to Speed Up	<ul> <li>10GbE RoCE Express</li> <li>OSA-Express5S</li> <li>HiperSocket<sup>™</sup> - "network in a box"</li> <li>Carry forward only - OSA-Express4S</li> </ul>
IBM.	•	Improved I/O Backbone to drive transaction throughput 50-80% more bandwidth per 14

## Continuing to deliver technologies that can transform your business

• Applications and Economics Specialty engines expand the use of the mainframe and can help to lower the cost of ownership

•*Communicating* Optimize communications using **10 GbE RoCE Express** to reduce latency and CPU resource consumption for FTP file transfers, CICS workloads and WAS

•Availability Use Flash Express and see up to 10x faster response time and 37% increase in throughput compared to disk for morning transition

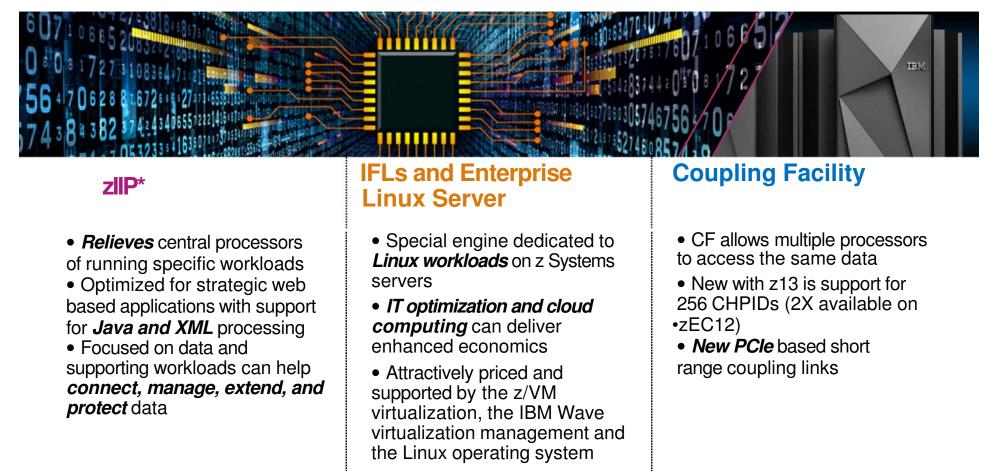


•*Resiliency* Use IT analytics to reduce service disruptions with IBM zAware V2.0 for z/OS and Linux on z Systems

• Secure, active data Shorten encryption time with zEDC Express hardware compression and IBM Encryption Facility for z/OS



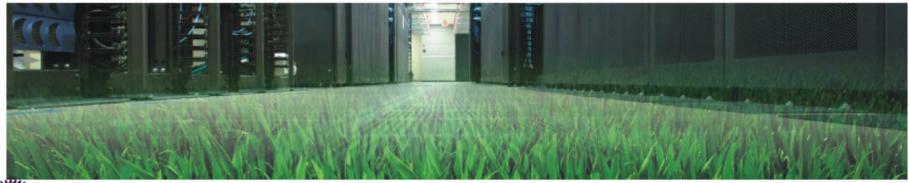
#### Specialty engines expand the use of the mainframe While lowering the cost of ownership



•zllP and IFLs get throughput increase with simultaneous multithreading



### z13 Data center planning and service updates



• Improved scaling, reliability and simplicity with *new modular CPC drawer* 



• **Enhanced integrated sparing** designed to reduce the complexity and number of repair actions



• Save space in the data center with optional 1U *rack-mounted* Hardware Management Console (HMC)



- A new renewable, custom-engineered cushion used for shipping --- completely compostable with less waste
- Gain flexible possibilities for the data center with *non-raised-floor option,* overhead power and cabling
- *Managing energy* usage in the data center using air cooling with radiator-based system, optional water cooling or optional HV DC power



### Protecting your investment in z Systems technology

- Designed to protect your investment Offering upgrades from zEC12 and z196 to the z13
  - Upgrades from zBX Model 002 and zBX Model 003 to zBX Model 004
- Full upgradeability within the z13 family Upgrade to Model NE1 will require a planned outage
- On demand offerings offer temporary or permanent growth when you need it





## Operating Systems focused on exploiting hardware innovation

•z/OS Version 2.1	<ul> <li>Improved price performance for zIIP workloads with SMT</li> <li>Support new analytics workloads with SIMD</li> <li>New crypto capabilities for faster encryption</li> <li>Large memory to improve performance and enable new applications</li> </ul>
•z/VM Version 6.3	<ul> <li>Improved price performance with simultaneous multithreading technology support for twice as many processors</li> <li>Improved systems management and economics</li> <li>Embracing Open Standards and Open Source Interoperability</li> <li>Supports more virtual servers than any other platform in a single footprint</li> </ul>
•z/VSE Version 5.1	<ul> <li>Reduced risk of access from unauthorized users</li> <li>Reduced memory constraints</li> <li>Wide portfolio using Linux on z</li> <li>Continued system usability enhancements with CICS Explorer</li> <li>More efficient communications</li> </ul>
•Linux on z Systems	<ul> <li>Multithreading allows for per core software savings</li> <li>Ability to host and manage more workloads efficiently and cost-effectively</li> <li>Automatic identification of unusual messages</li> <li>Integrated continuous availability &amp; disaster recovery solution</li> </ul>

IBM

#### **Operating System Support for z13**

- Currency is key to operating system support and exploitation of future servers
- The following releases of operating systems will be supported on z13 (Please refer to PSP buckets for any required maintenance):

Operating System	Supported levels
z/OS	<ul> <li>z/OS V2.1 with PTFs (Exploitation)</li> <li>z/OS V1.13 with PTFs (Limited Exploitation)</li> <li>z/OS V1.12* with PTFs (End of service support 9/30/2014)</li> </ul>
Linux on z Systems	<ul> <li>SUSE SLES 11 (Later releases: GA support TBD by SUSE.)</li> <li>Red Hat RHEL 6 and 7 (Later releases: GA support TBD by Red Hat.)</li> </ul>
z/VM	<ul> <li>z/VM V6.3 with PTFs – Exploitation support</li> <li>z/VM V6.2 with PTFs – Compatibility plus Crypto Express5S support</li> </ul>
z/VSE	<ul> <li>z/VSE V5.2 with PTFs – Compatibility plus Crypto Express5S (up to 85 LPARs)</li> <li>z/VSE V5.1 with PTFs – Compatibility</li> </ul>
z/TPF	<ul> <li>z/TPF V1.1 – Compatibility</li> </ul>

#### Note:

- \* z/OS V1.12 will run on z13 provided the customer has IBM Software Support Services to get the PTFs
- Beginning with z/OS V1.12, IBM Software Support Services replaces the IBM Lifecycle Extension for z/OS offering for extended support coverage for z/OS. The TSS Service Extension for z/OS is a fee-based Defect support (a fix, bypass, or restriction to a problem) for users who have not completed their migration to a newer z/OS release.
- Service extension support for z/OS V1.12 is provided for up to three years, beginning October 1, 2014 and available through September 30, 2017.
- Going forward, when support for a z/OS release is withdrawn, IBM Software Support Services intends to provide service extension support for the given z/OS release for up to three years. The intention is to provide an accommodation where additional time is needed to migrate to a newer z/OS release within the service support period. This does not alter the z/OS coexistence, migration, fallback, or service policy.



Extending Business Continuity to Linux on z Systems GDPS Virtual Appliance for Linux on z clients (SOD)\*

- Fully integrated Continuous Availability and Disaster Recovery solution for Linux on z Systems
- GDPS helps customers avoid outages both planned, and unplanned due to single component failures or whole site failures
- Self contained and pre-configured virtual machine image Contains an operating environment (little or no z/OS skills •required), GDPS/PPRC, Tivoli<sup>®</sup> NetView<sup>®</sup> and Systems Automation\*\*, an appliance management layer, and APIs / UIs for customization, administration, and operation tailored to the appliance function
- Improves both consumability and time-to-value for customers

## •GDPS/PPRC is capable of providing:

IBM

- Near continuous disk availability
- Highly automated D/R solution
- Recovery Time Objective less than an hour
- Recovery Point Objective of zero
- Protection against localized area disasters



 \* All statements regarding IBM's future direction and intent are subject to change or withdrawal without notice, and represent goals and objectives only.
 \*\* The z/OS and Tivoli products are available only for GDPS Virtual Appliance use only

3

## IBM zAware V2.0 delivers smarter message monitoring IT analytics to reduce service disruptions



Leading-edge pattern recognition can intercept application and system problems before they cause future disruptions
Real-time, self-learning solution accurately represents your environment – automatically

#### • Typical Client Use Cases:



- Diagnose complex problems quickly and restore service faster
  - Extended to Linux on z Systems for enhanced management
- Accelerate problem determination across IT functions
  - Real-time, self-learning solution accurately represents your environment **automatically**

 Difficult or unusual z/OS problems can be found in
 2 clicks

not hours

•Same **GUI** used for monitoring z/OS or Linux on z Systems

 Tivoli® NetView for z/OS and Tivoli OMEGAMON® XE \*

can be used for automation and situation handling



 \* IBM zAware provides APIs to allow consumption by IBM and ISV products

22

### zEnterprise Data Compression (zEDC) Helps you keep more active data

- •Capture new
- opportunities with
- lower cost of keeping?
- •data online⊃
- Efficiently **compress active data** using a dedicated compression accelerator
- **Industry standard compression** for cross platform data distribution

#### •Typical Client Use Cases:

- **Disk savings** with improved utilization of storage tiers with DFSMSdss<sup>TM</sup> use of compression
- Compression for sequential files with less CPU costs
- **Shorten encryption time** with hardware compression and IBM Encryption Facility for z/OS
- Fast, secured data transfer across the enterprise with IBM Sterling Connect:Direct for z/OS Standard Edition V5.2
- Transparent acceleration of Java compressed applications



- \* Measurements for comparisons were completed as part of a formal performance evaluation on a dedicated, isolated test system.
- \*\* These results are based on projections and measurements completed in a controlled environment. Results may vary by customer based on individual workload, configuration and software levels
- \*\*\* Exploited through standard Java APIs java util.zip in the latest releases of Java 7.0.0, and Java V7R1 \*\*\*\* Achieve up to up 80% reduction in elapsed time for z/OS to z/OS file transfers with minimal CPU increase.

Results vary by data set type and characteristics of the data

#### • DFSMShsm™\*

• Use up to 58% less disk space and up to 80% less CPU compared to using DFSMShsm with the COMPACT keyword

#### •BSAM/QSAM\*\*

•Compress data up to 4X, with up to 80% reduced CPU \*

#### •Java 7\*\*\*

• Up to **90%** reduction in CPU time with up to **74%** reduction in elapsed time vs. using zlib software

#### Connect:Direct for z/OS 5.2\*\*\*\*

• Up to 80% reduction in elapsed time for • z/OS to z/OS file transfers

### Flash Express cuts away at availability lapses Smarter availability for critical processing times



• Integrated in storage hierarchy to provide higher levels of availability and performance

• Slashes latency for critical application processing such as diagnostics collection

#### • Typical Client Use Cases:

- Improve availability and performance during workload transition and spikes
- Faster, less disruptive diagnostics with faster first failure data capture time
- Less paging with use of pageable large pages for Java or DB2
- **Cost effective, resilient solution** for overflow of MQ shared queues in Coupling Facility

•SVC dump elapsed time ~25% less than with DASD

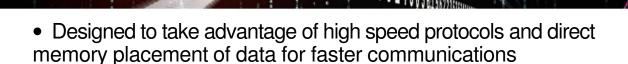
• 10x faster response time and 37% increase in throughput compared to disk for morning transition

•28% improvement in DB2 throughput leveraging Flash Express with Pageable Large Pages (PLP)

> •19% reduction in total dump time for 36 GB standalone dump



Optimize server to server networking transparently Exploitation of RDMA over Converged Ethernet (RoCE)



• Can be used for cross server and internal communications

#### • Typical Client Use Cases:

- Helps to reduce both latency and CPU resource consumption over traditional TCP/IP for communications across z/OS systems
- **Any** z/OS TCP sockets based workload can **seamlessly** use SMC-R without requiring any application changes
- With z/VM 6.3 guest exploitation, you can understand the value for your z/OS workloads before going into production

•New tool called SMC-AT is available to assist in gaining additional insight into the applicability of SMC-R for your environment

IBM.

\* Based on internal IBM benchmarks in a controlled environment using z/OS V2R1 Communications Server FTP client and FTP server, transferring a 1.2GB binary file using SMC-R (10GbE RoCE Express feature) vs. standard TCP/IP (10GbE OSA Express4 feature). The actual CPU savings any user will experience may vary.

\*\*\* Based on internal IBM benchmarks using a modeled CICS workload driving a CICS transaction that performs 5 DPL (Distributed Program Link) calls to a CICS region on a remote z/OS system via CICS IP interconnectivity (IPIC), using 32k input/output containers. Response times and CPU savings measured on z/OS system initiating the DPL calls. The actual response times and CPU savings any user will experience will vary.

• Up to **50%** CPU savings for FTP file transfers across z/OS systems versus standard TCP/IP \*

TRM

Up to 48% reduction in response time and
10% CPU savings for a sample CICS<sup>®</sup> workload exploiting IPIC using SMC-R versus TCP/IP \*\*

•Up to **40%** reduction in overall transaction response time for WAS workload accessing z/OS DB2<sup>®</sup> \*\*\*

•Up to **3X** increase in WebSphere<sup>®</sup> MQ messages delivered across z/OS systems \*\*\*\*

<sup>\*</sup> Based on projections and measurements completed in a controlled environment. Results may vary by customer based on individual workload, configuration and software levels. \*\*\*\* Based on internal IBM benchmarks using a modeled WebSphere MQ for z/OS workload driving non-persistent messages across z/OS systems in a request/response pattern. The benchmarks included various data sizes and number of channel pairs The actual throughput and CPU savings users will experience may vary based on the user workload and configuration.

## Performance delivered through multiple dimensions

- **40%** more total capacity
- **2X** performance boost for cryptographic coprocessors
- 50-80% more bandwidth per I/O domain
- 2X increase in channel speed
- 3X increase in memory
- 2X increase in cache

•Hardware/ software integration leads to richer optimization

- Lower cloud cost
- Faster fraud detection
- More scale for mobile transactions
- Faster data sharing between systems
- Less exposure to regulatory penalties
- Faster decision making with data-in-memory

•© 2015 IBM Corporation 6

## The superscalar design allows the z13 to deliver a record level of capacity over the prior IBM z Systems

zEC12	<ul> <li>More than 111,000 millions of instructions per second (MIPS) compared to 78,426 MIPS on the largest zEC12</li> <li>z13 delivers up to 40% more total z/OS processing capacity than the zEC12.</li> <li>The z13 delivers up to 10% more capacity for z/OS per core compared to the zEC12.</li> <li>zIIPs have an average capacity improvement of 38% performance improvement compared to zEC12</li> <li>IFLs have an average capacity improvement of 32% performance improvement compared to zEC12</li> <li>The Central Processor Assist for Cryptographic Function (CPACF) has been optimized to deliver 100% performance improvement [or twice the performance improvement] more performance improvement over CPACF on the zEC12. Hashing functions in CPACF will deliver up to 250% more performance improvement over zEC12.</li> <li>Technology Update Pricing delivers on average 5% savings on MLC costs</li> </ul>
z196	<ul> <li>More than 111,000 millions of instructions per second (MIPS) compared to 52,286 MIPS on the largest z196</li> <li>z13 delivers up to 110% more total z/OS processing capacity than the z196.</li> <li>The z13 delivers up to 38% more capacity for z/OS per core compared to the z196.</li> <li>zIIPs have an average capacity improvement of 72% performance improvement compared to z196</li> <li>IFLs have an average capacity improvement of 65% performance improvement compared to z196</li> <li>The Central Processor Assist for Cryptographic Function (CPACF) has been optimized to deliver 100% performance improvement [or twice the performance improvement] over CPACF on the z196. Hashing functions in CPACF will deliver up to 250% performance improvement over z196.</li> <li>Technology Update Pricing delivering on average 10% savings on MLC costs</li> </ul>
I/O	<ul> <li>Using FICON Express16S on a z13, large data transfer I/O operations with zHPF (reads + writes) can achieve 2600 MB/sec a 63% increase in throughput over FICON Express8S on a zEC12.<sup>1</sup></li> <li>Using FICON Express16S on a z13, large data transfer I/O operations with FCP (reads + writes) can achieve 2560 MB/sec a 60% increase in throughput over FICON Express8S on a zEC12.<sup>1</sup></li> <li>Clients using multi-site business continuity solutions can experience improved I/O service times when writing data remotely allowing them to achieve service level agreements after a disaster or storage control unit failure causes a TPC-R or GDPS HyperSwap event to occur.</li> </ul>

<sup>1</sup> This performance data was measured in a controlled environment running an I/O driver program under z/OS. The actual throughput or performance 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.

# THANK YOU

TRM