Positioning Your Enterprise
for Cloud, Analytics and Mobile Computing

Agenda

1. Positioning Your Enterprise for Cloud, Analytics and Mobile Computing
Break (15 minutes)
2. The Mainframe and Mobile Computing: A Perfect Match
Break (15 minutes)
3. Scoring Fast and Winning Big with Analytics on z Systems
Lunch (60 minutes)
4. Implementing Hybrid Clouds with z Systems
Break (15 minutes)
5. Easy and Agile Development and Administration for Cloud, Analytics and Mobile Computing
Break (15 minutes)
6. Building the Business Case for Cloud, Analytics and Mobile Computing on z Systems

01. Positioning Your Enterprise

Digital business is driving the world today – and forcing businesses to transform… or fail!

*Most C-level executives say the three key trends in **digital business…***
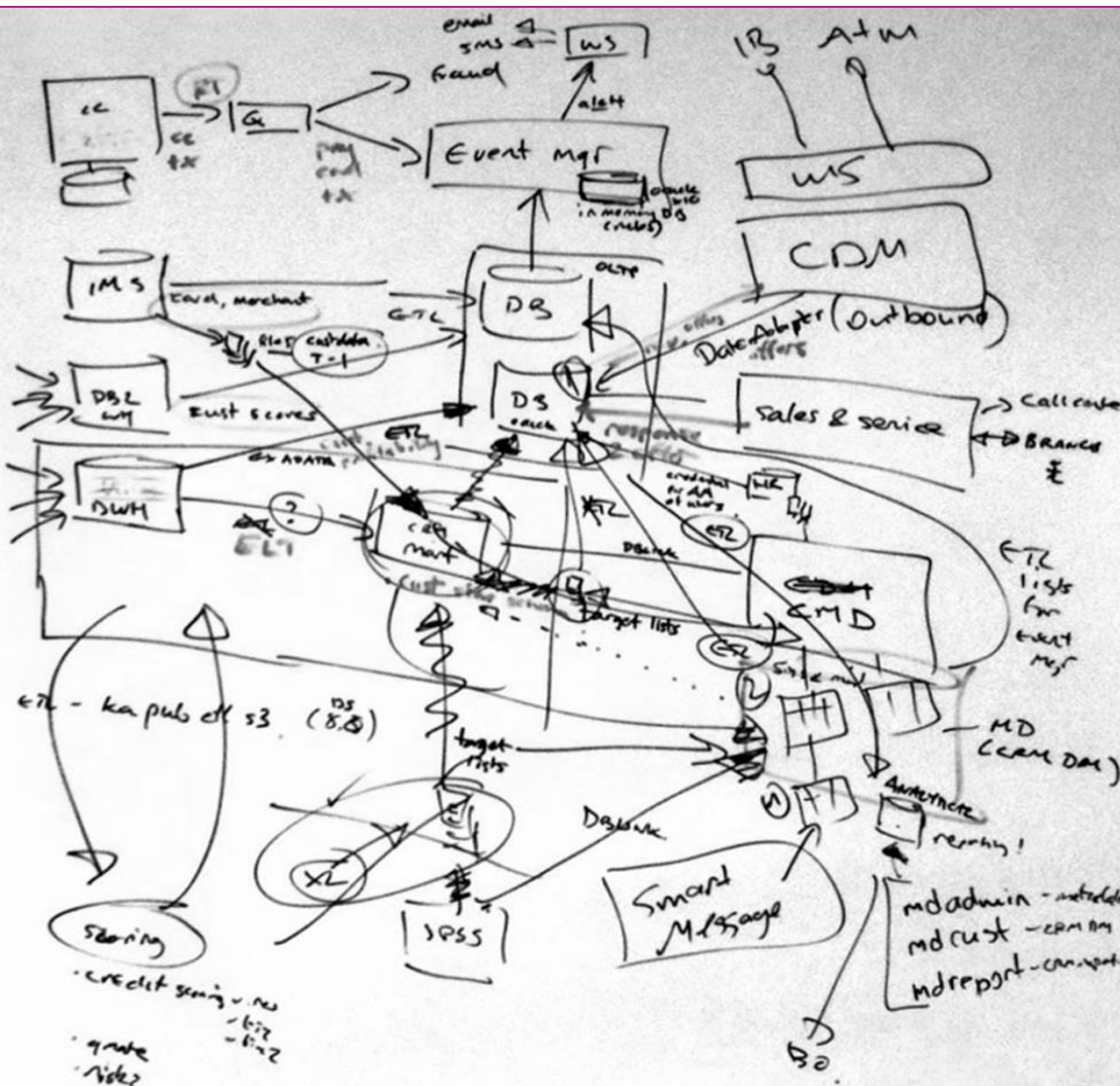
Big Data and Analytics

Mobile Computing

Cloud and new delivery platforms

are strategic priorities at their companies.

Source: McKinsey & Company, Minding your digital business: McKinsey Global Survey Results, 2012

01. Positioning Your Enterprise

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Many businesses struggle to position themselves for Cloud, Analytics and Mobile Computing

Volumes of data
Businesses perceive more data is good – but it impacts storage, processing, replication and exchange.

Architectural complexity
Accumulation of large amounts of under-utilized resources, creating management headaches

Latency
Response times are too slow, information is not readily or easily available

Unsustainable Costs
Most businesses struggle to maintain status quo

Constant security threats
Risk has never been higher, new threats to business and data occur every second

Security is increasingly important… and incredibly costly if ignored!

http://map.ipviking.com/

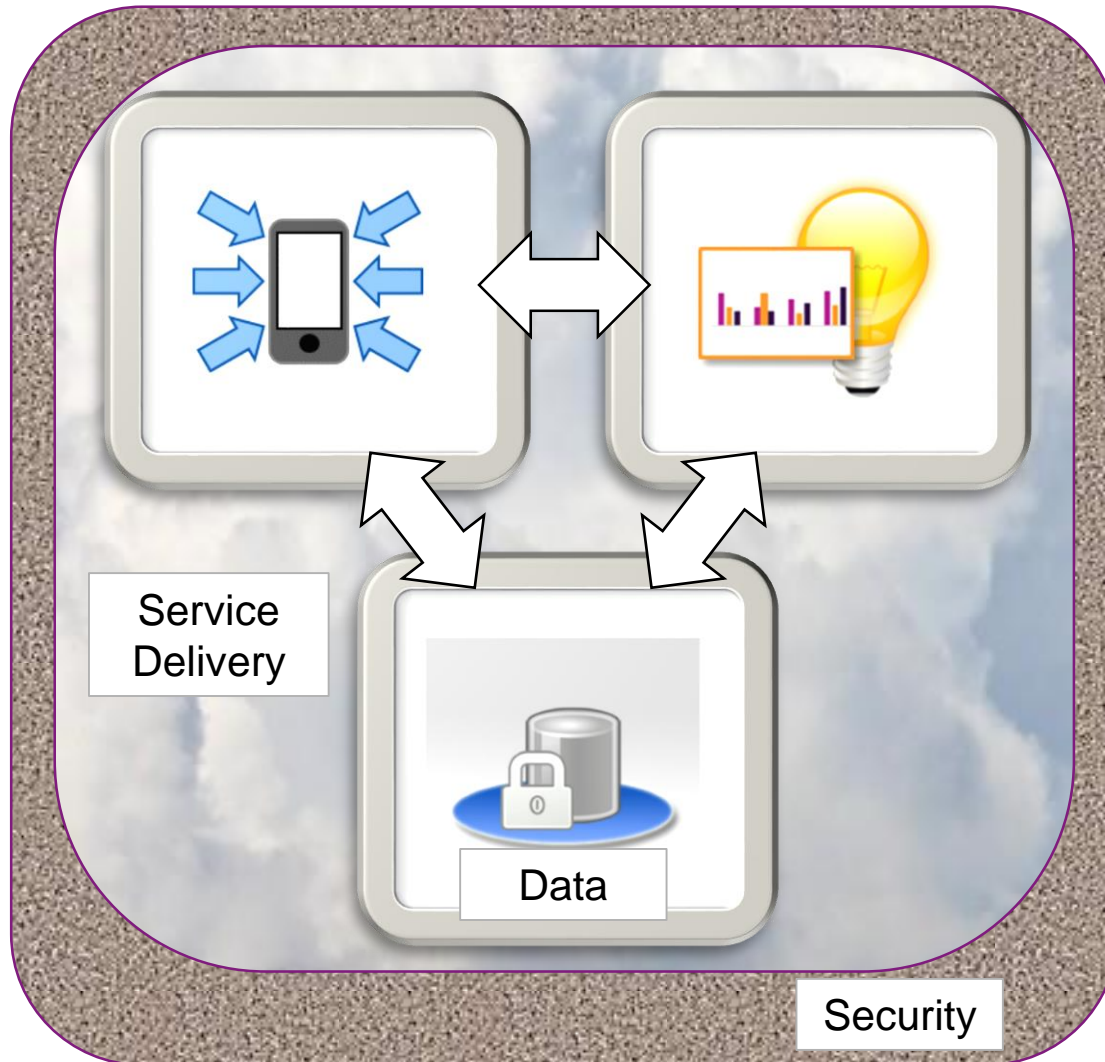$11 million –
Average cost
of a security breach
in the US

Embracing digital business involves focusing on a few key areas

Convenient, compatible, appealing interface with customers

Cost-effective deployment and service delivery models

Business data and core business processing

Service Delivery

Data

Security

Deeper understanding and predictions based on patterns of behavior

Trusted data, trusted interfaces, absolute security… *period*!

# Data and information are at the center of every business

- The trusted, centralized, single version of the truth

- Authoritative / governed / regulated

- Highly secure,
  with strict access control

- Always available

- Supports major, mission-critical business workloads including transaction processing and batch processing

System of Record

System of Record

Data

New interfaces are needed to extend the business to connect with the Mobile world

- Agile, social and engaging interface to legacy data and transactions on the System of Record

- Always on, and very fast response times

- Guaranteed data and transaction security and privacy

- Unfettered, and engaging support for all devices

Mobile

System
of Engagement

System of Record
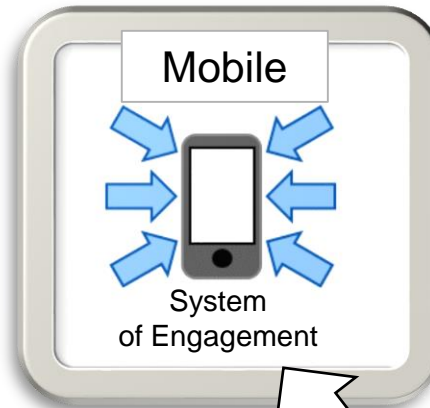
Data

**System
of Engagement**

Deep, predictive, and real-time Analytics adds a new dimension to the business data and information

- Handle all kinds of data, structured and unstructured, in *huge* amounts

- Ultra-fast response times to complex queries as well as simple queries

- Real-time forecasting and insight

- Guaranteed data security

System of Insight

System of Insight

Analytics

System of Record

Data
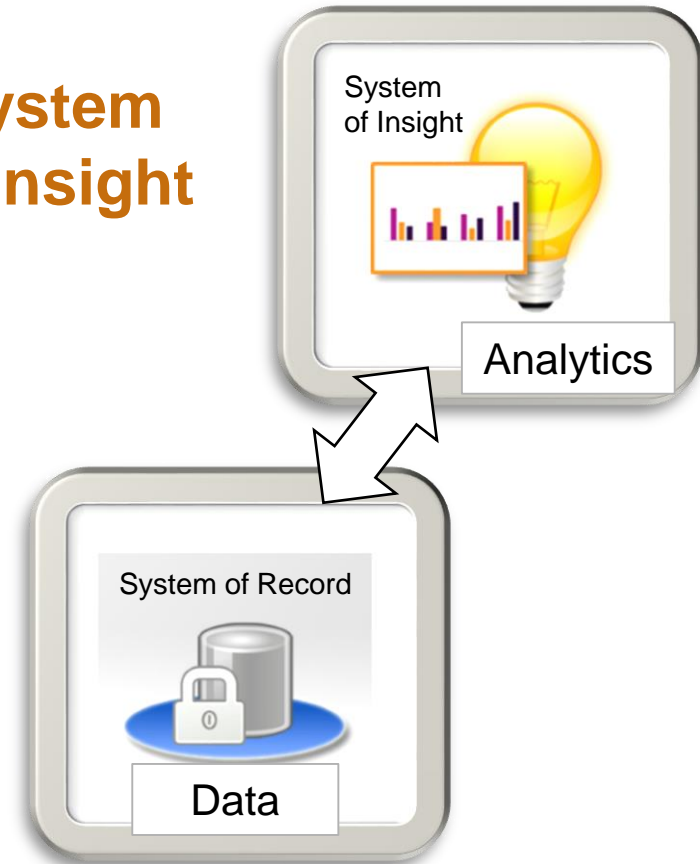
Adding a solid foundation for service delivery with Cloud computing leads to cost efficiency

- Superior virtualization and workload management supporting 1,000s of applications

- Rapid, easy-to-use, yet robust deployment and management tools; on-demand self-service

- Cost-effective, elastic and scalable

- Open architecture

Mobile

System of Engagement

System of Insight

Analytics

Cloud - Service Delivery

System of Record
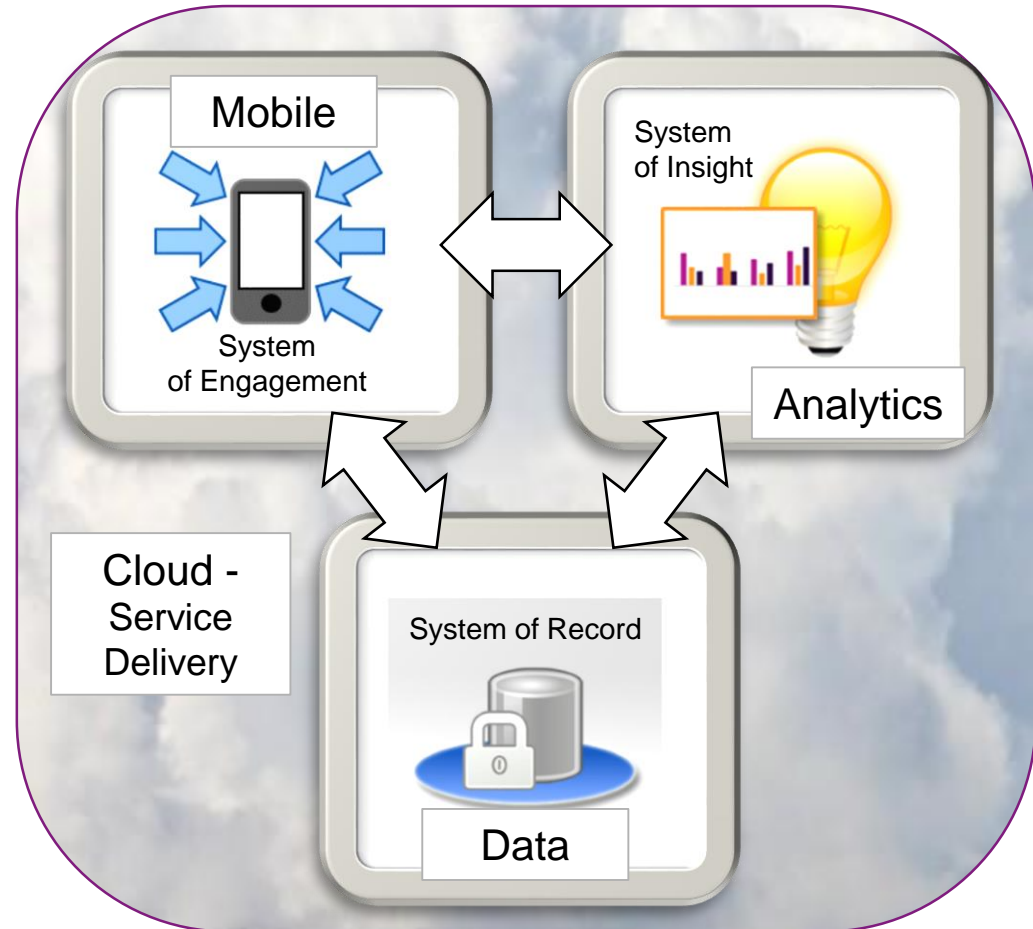
Data

Security – an imperative – must be pervasive across the entire picture

- Security of data and transactions

- Centralized

- Strict governance and audit control

- Deepest levels of cryptography

01. Positioning Your Enterprise
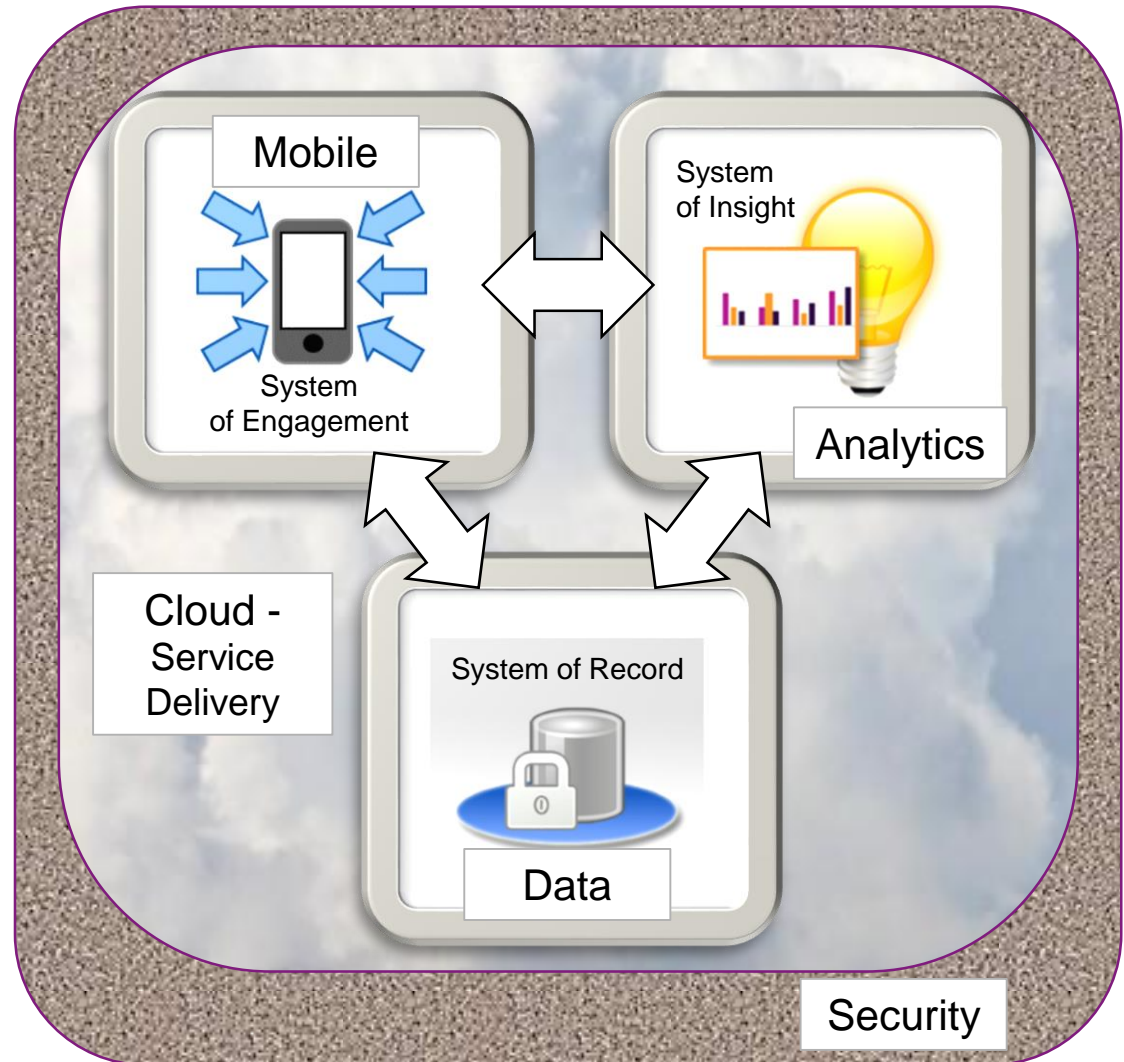
IBM z Systems are unquestionably the established Systems of Record for businesses today

IBM z Systems

- Exceptional performance and capacity

- Highest levels of security and availability

- Unmatched reputation for reliability

- Near linear scalability to millions of MIPS

80% of the world's corporate data resides or originates on mainframes

System of Record

Data

Today, the IBM mainframe is everywhere – It is the data and transaction hub for the global economy

Mainframes process 30 billion business transactions per day

Mainframes enable $6 trillion in card payments annually

Who uses mainframes?

25 of 25 top banks worldwide

10 of 10 top insurance companies

>90% of the largest US retailers

>90% of the world's largest airlines

**Mainframes run 68% of the world's production workload capacity, but at only 6.2% of total server spend**

z Systems are also the only platforms capable of supporting all facets of digital business

Remove the complexity…

The best
System of Engagement
for interface
with **Mobile** users

The strong foundation
of cost-effective
service delivery
for **Cloud** computing

Reduce the cost…
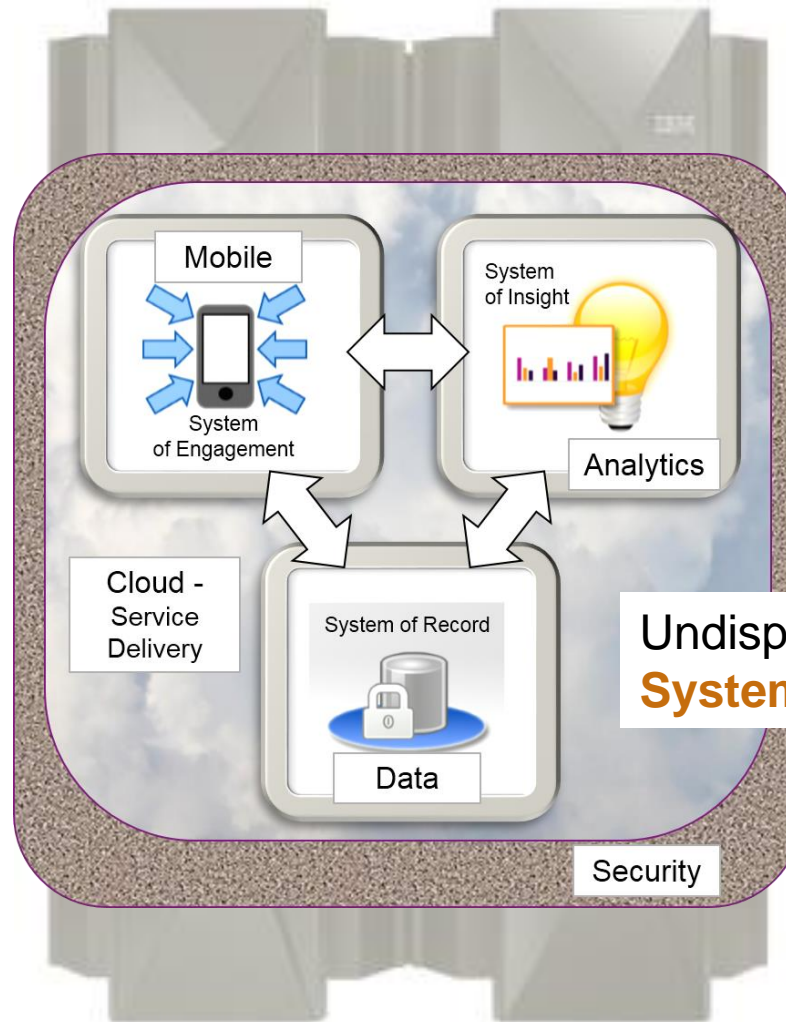
An unmatched
System of Insight
for **Analytics** and
business growth

Undisputed, world-leading
System of Record

Top to bottom,
ultimate **Security**

Now we have the most advanced mainframe ever – Introducing IBM z13

✓ *The most advanced information, data and transaction engine…*
✓ *The heart of your cloud, analytics and mobile computing…*

z13

zEC12

z196

z10

z9

**Let's look at why z13
is the heart of digital business**

z13 gives you more capacity for integrating data, transactions and insight

Up to **141** configurable cores

Uni-processor = **1,695 MIPS**

36% more on-chip cache
25% more shared L4 cache

Up to **3x** more memory –
10 TB

More logical partitions
(85 vs 60)

Increase scale and
management for I/O

2x improvement
in crypto performance

4x improvement
in zEDC compression

Increase in granularity
(90 vs 60 capacity settings)

Simultaneous
Multi-threading

Built-in vector processing
facility (SIMD)

Increased virtualization
of 10GbE RoCE Express

IBM zAWARE support
extended to Linux on z

Linux / KVM support*
GDPS appliance*

* All statements regarding IBM's future direction and intent are subject to change or withdrawal without notice, and represent goals and objectives only.
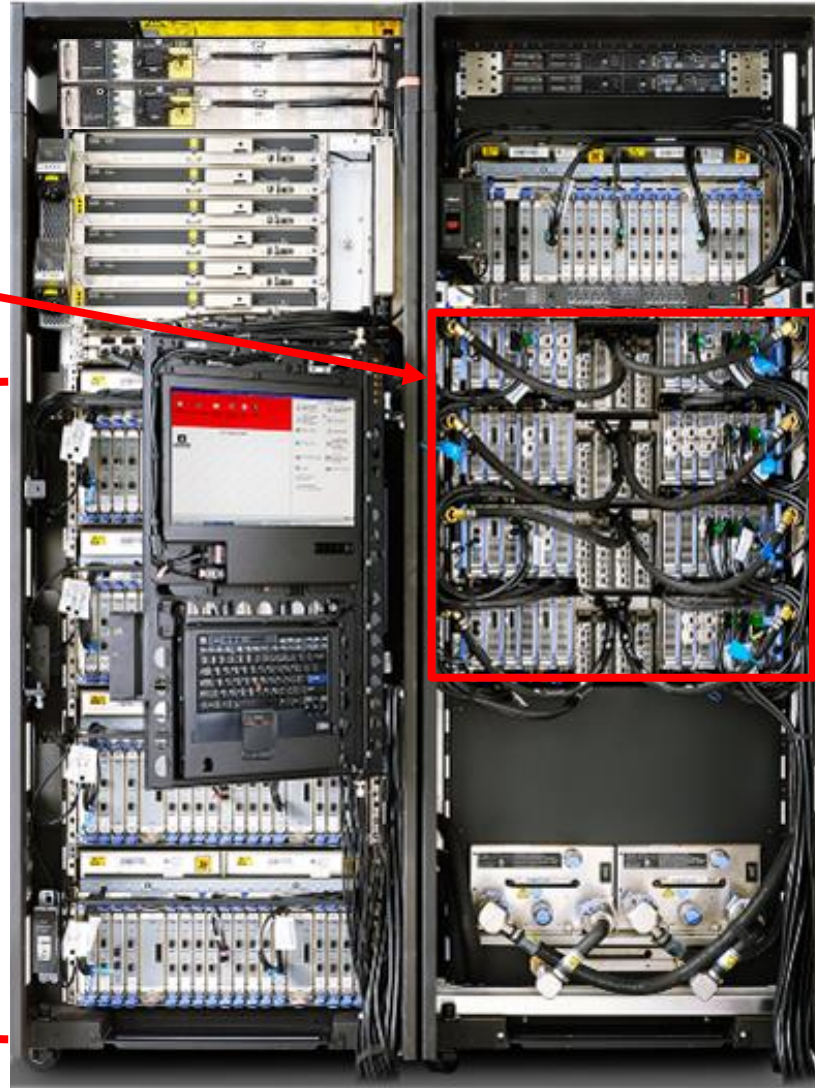
The new physical design of the z13 improves serviceability

New drawer-based design introduces cables between the drawers

PCIe Gen 3 I/O drawer (5)

PCIe Gen 3 I/O drawers (1-4)

Same 2-frame base system, with no significant increase in weight.

Now includes a lock on the rear door!

Serviceability options –

Non-raised floor, Water cooling, High-voltage DC power, Top exit power, I/O cabling

– designed to provide increased flexibility and to save space.

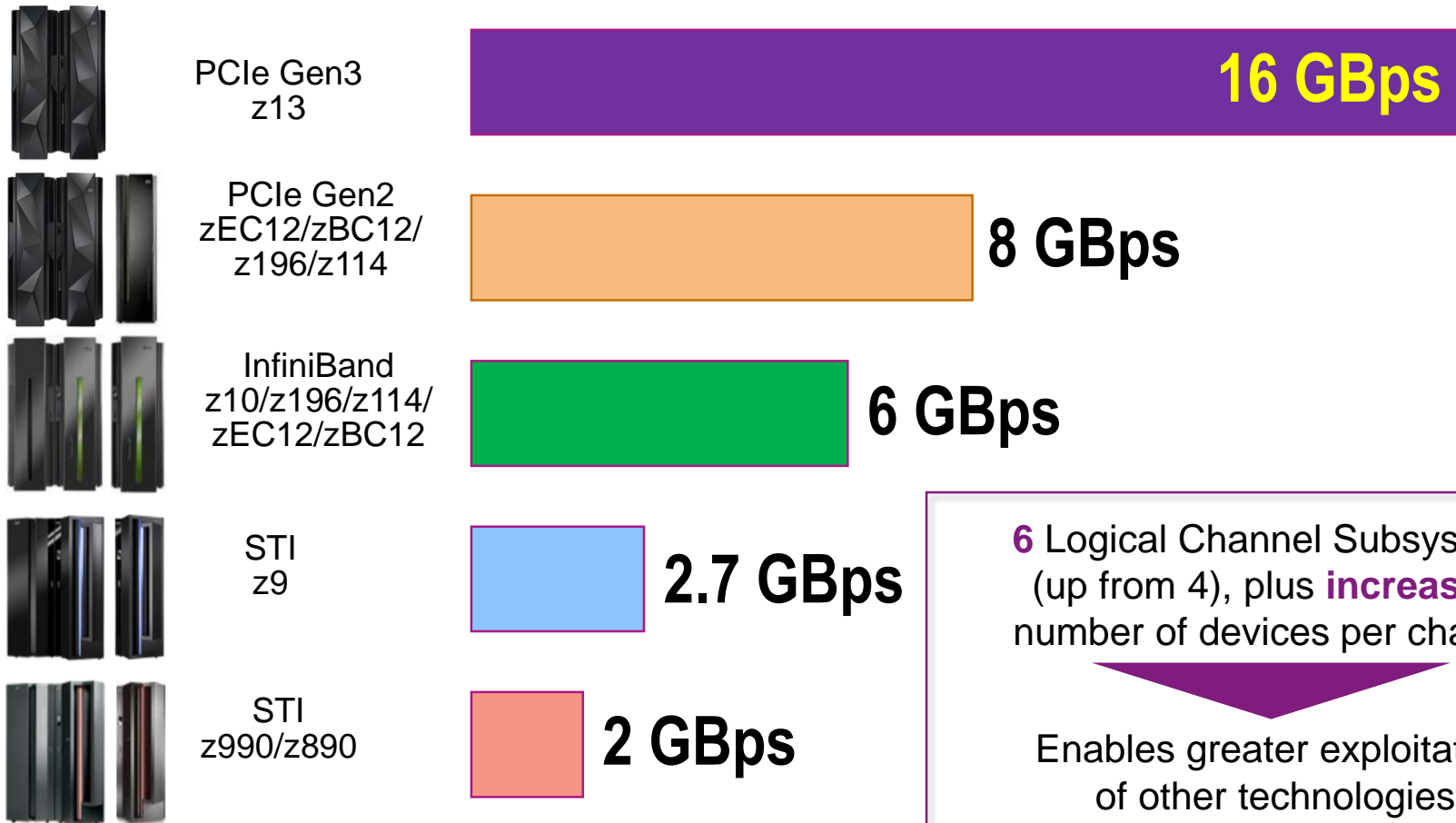Maintains 27.5 kW box max input power (same as z10 EC, z196, and zEC12).

The new chip design and features yield higher performance

- 22 nm SOI technology – almost 4B transistors!

- Up to 8 active cores per chip

- Redesigned cache interface; over 40% more on-chip cache

- 4 Drawers total – each with 6 chips packaged in Single Chip Modules
  - 10-12% more capacity per core than zEC12

- Fully configured server delivers more than 111,000 MIPS
  - Over 40% more z/OS processing capacity than zEC12
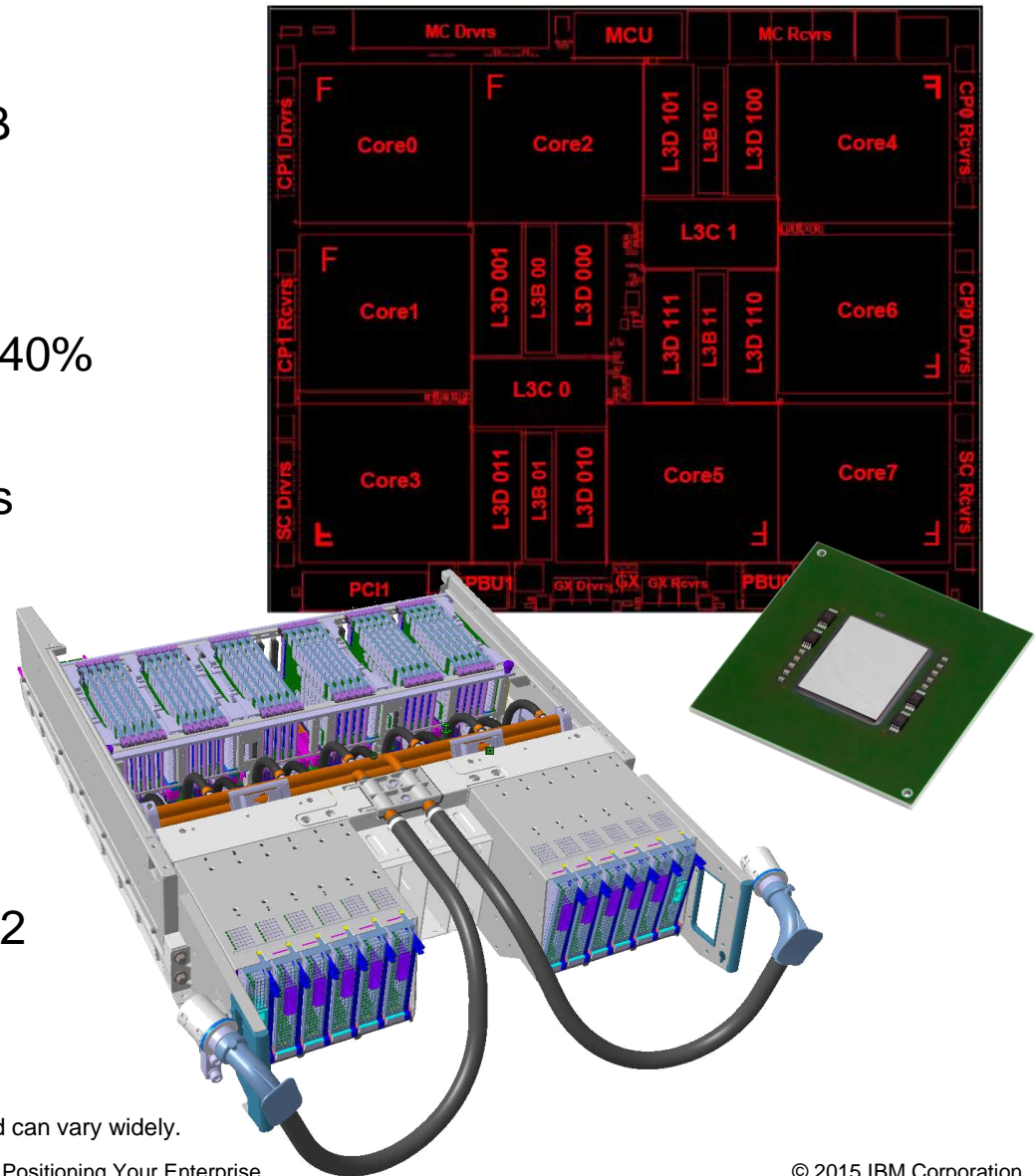
Note: The improvement ratios are workload and configuration dependent and can vary widely.

Faster I/O means faster response times for transactional and other workloads

|		
PCIe Gen3 z13		**16 GBps**
PCIe Gen2 zEC12/zBC12/ z196/z114		**8 GBps**
InfiniBand z10/z196/z114/ zEC12/zBC12		**6 GBps**
STI z9		**2.7 GBps**
STI z990/z890		**2 GBps**

6 Logical Channel Subsystems (up from 4), plus **increase** in number of devices per channel

Enables greater exploitation of other technologies
(e.g., Flash Express, zEDC Express, 10GbE RoCE Express, etc.)

STI: Self-Timed Interconnect

More memory (up to 10 TB) and more LPARs (up to 85) yields more sustainable business growth

Research on state-of-the-art usage practices at very large-scale virtualized production data centers shows:
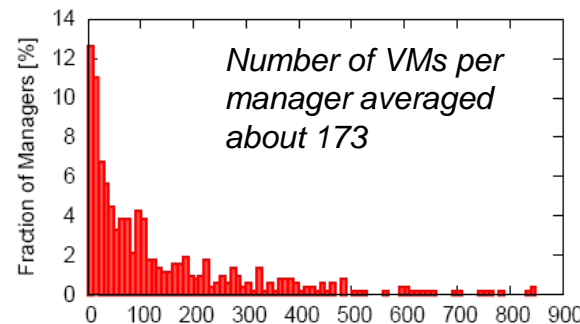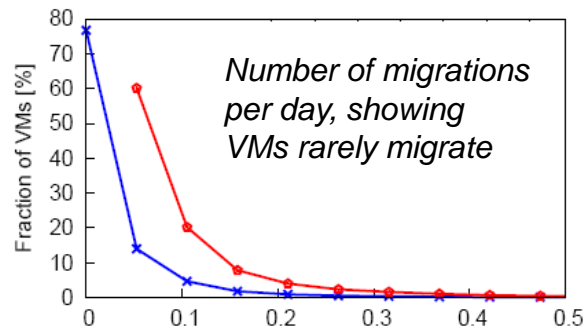
1 **Memory is more important than CPU**

Result

Strong tendency to over-commit core

Memory was rarely over-committed
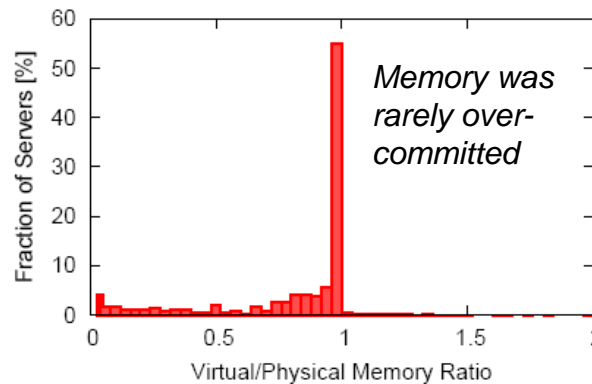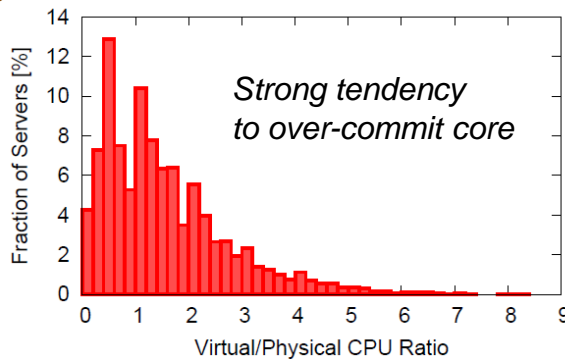
z Systems – with very large memory (and more memory/core) – are more efficient platforms, and enable memory over-commit

2 **Growth is typically done in manageable "chunks"**

Result

Number of migrations per day, showing VMs rarely migrate

Number of VMs per manager averaged about 173

Large centralized servers capable of running many workloads – like z Systems – are easier to manage

Source: IBM Zurich Research Lab, "State-of-the-Practice in Data Center Virtualization:
Toward a Better Understanding of VM Usage", by R. Birke, A. Podzimek, L. Chen and E Smirni

z13 introduces Simultaneous Multi-threading (SMT) for specialty engine (IFL and zIIP) workloads

- z13 now supports two instruction **threads** per core
  - Threads share all core resources, each thread has its own unique state information
  - z13 insures that one thread can't lock out the other

- Implemented for IFL and zIIP workloads only
  - Independently implemented for each LPAR – operating system must be explicitly enabled
  - Support up to 32 multi-threaded core (64 threads)

- Architecturally transparent for middleware and applications
  - Some customer applications may require modifications to work well

**38%** performance improvement of zIIPs in z13 over zEC12

32% performance improvement of IFLs in z13 over zEC12
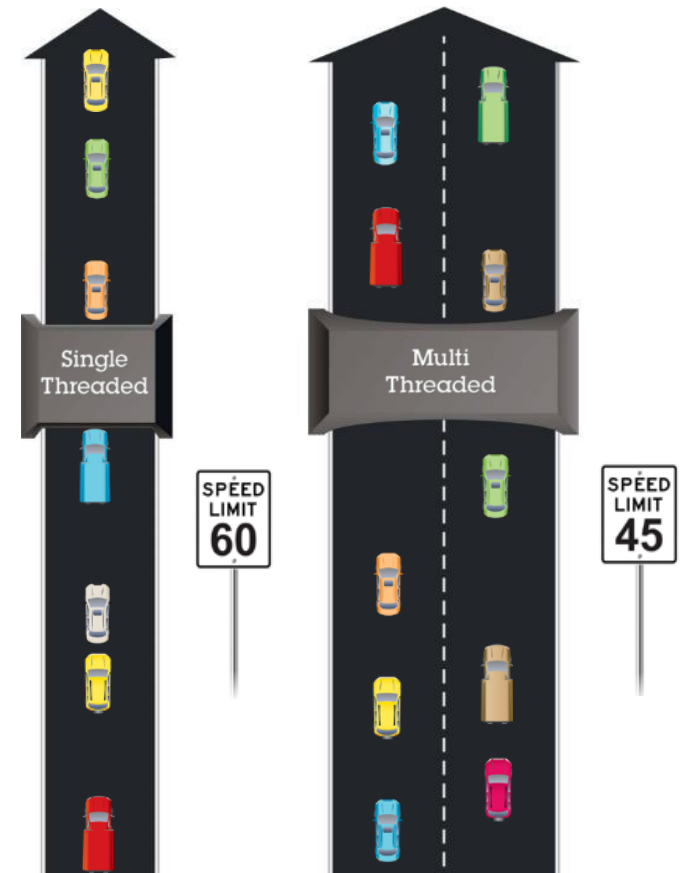
Each thread runs slower, but overall throughput per core increases from ~1.2-1.6x

Note: The improvement ratios from one thread to two threads are workload and configuration dependent and can vary widely.

DEMO: SMT gives significant boost to Linux workloads at no additional cost
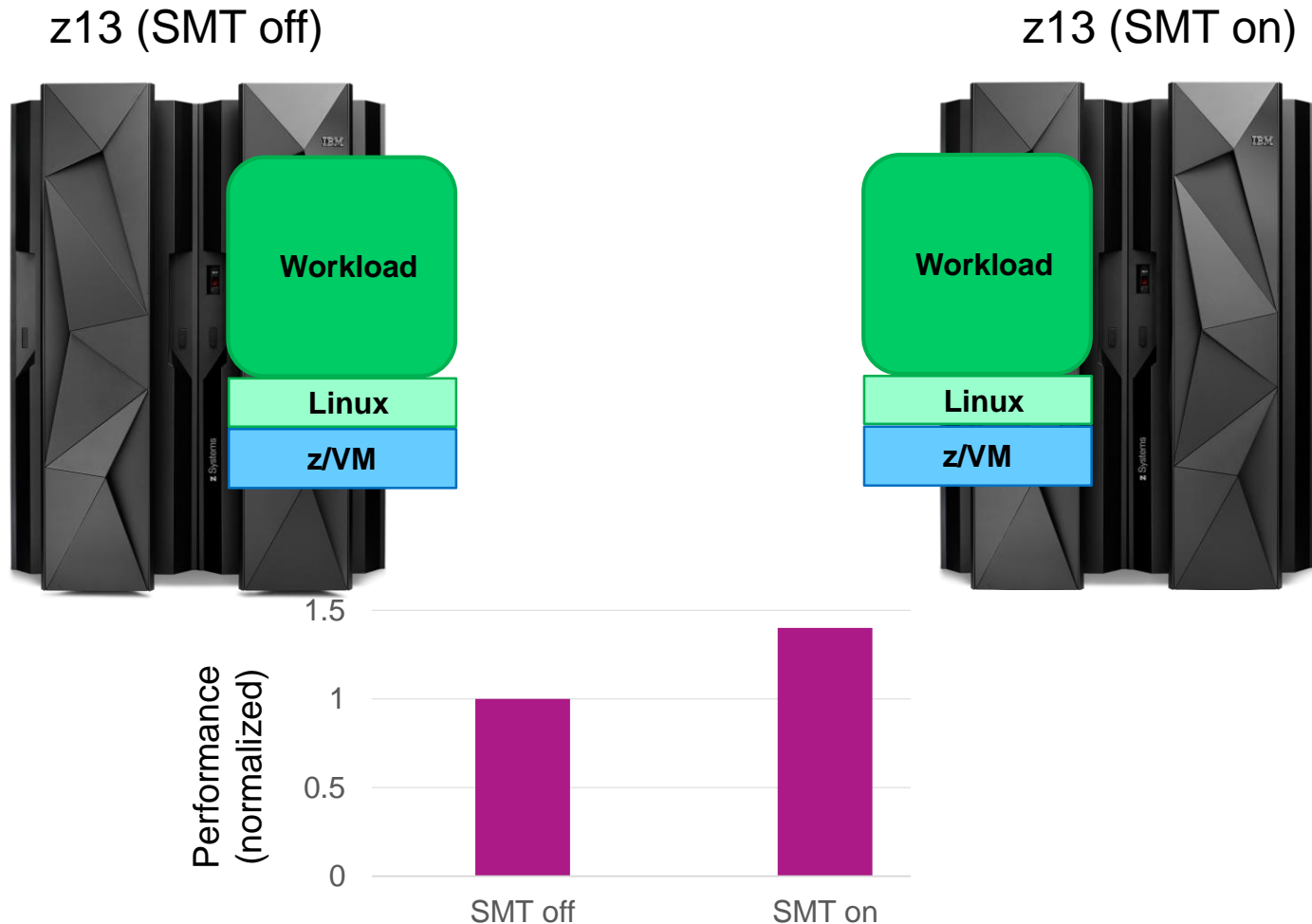
z13 (SMT off)   z13 (SMT on)

Workload   **Workload**

Linux   **Linux**

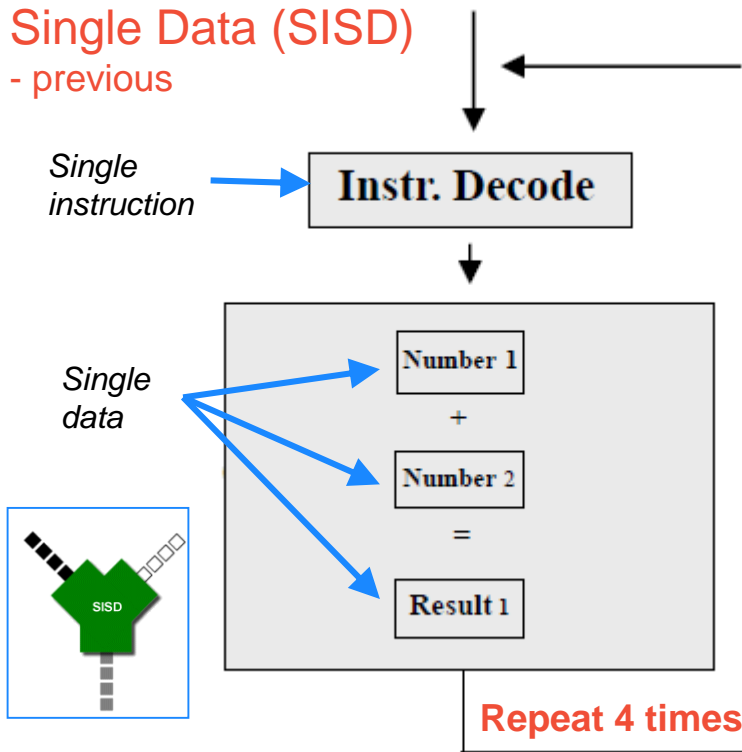**z/VM**   **z/VM**

Note: The improvement ratios from one thread to two threads are workload and configuration dependent and can vary widely.

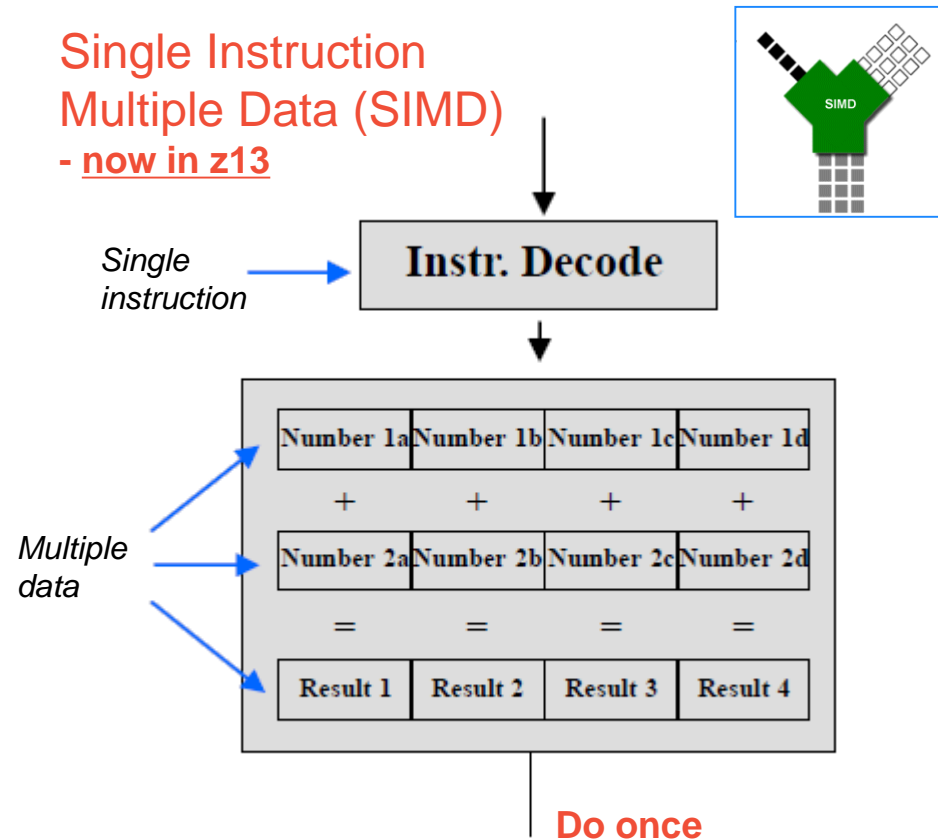# Vector processing, or parallel computing, with SIMD speeds up compute-intensive analytical workloads

With the amount of data increasing exponentially, math and data-intensive analytics computing can lead to high MIPS usage

SIMD on z13 provides yet another chip architecture enhancement - for analytics and compute-intensive competitiveness on z Systems

Single Instruction
Single Data (SISD)
- previous

Single Instruction
Multiple Data (SIMD)
- **now in z13**

Single instruction

Instr. Decode

Single data

| Number 1 |
| + |
| Number 2 |
| = |
| Result 1 |

Repeat 4 times

Single instruction

Instr. Decode

Multiple data

Number 1a	Number 1b	Number 1c	Number 1d
+	+	+	+
Number 2a	Number 2b	Number 2c	Number 2d
=	=	=	=
Result 1	Result 2	Result 3	Result 4

Do once

Enhanced cryptographic features add to z Systems existing reputation for ultimate security
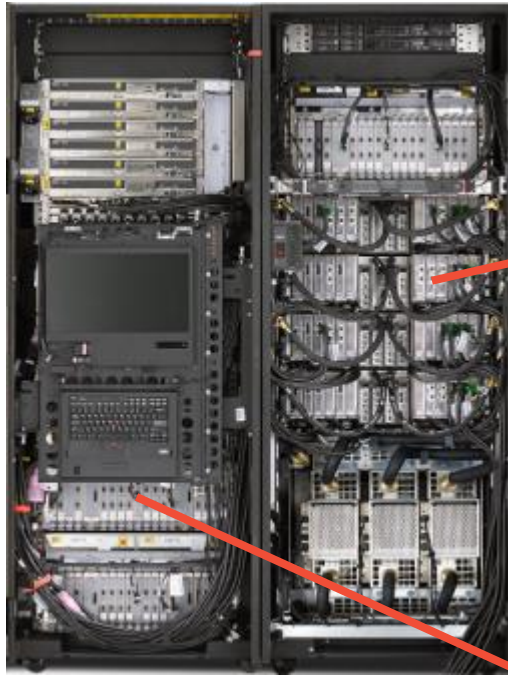
Each core has its own CPACF co-processor
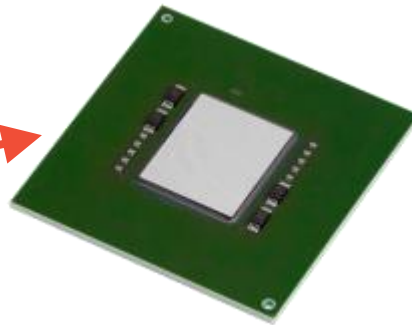
- The Central Processor Assist for Cryptographic Function (CPACF) has been optimized to provide up to **2x faster** encryption functions

- Hashing functions in CPACF are up to **3.5x faster**

50% reduction in cost of ubiquitous encryption

- Crypto Express5S PCIe feature has up to **2x better** performance than 4S

- New crypto algorithms (i.e. Elliptic Curve, SHA3, Visa FPE) hardcoded in feature

- Meets FIPS, ANSI, PKI, and DK standards

Trusted Key Entry workstation required for management of Crypto Express5S (provides secure key entry)

z Systems continues to provide advanced cryptographics capability to act as the *hub* of security for the data center

IBM's Advanced Cryptographic Services (ACS) extends Enterprise Key Management Foundation (EKMF) on z Systems to *remote* distributed applications and platforms
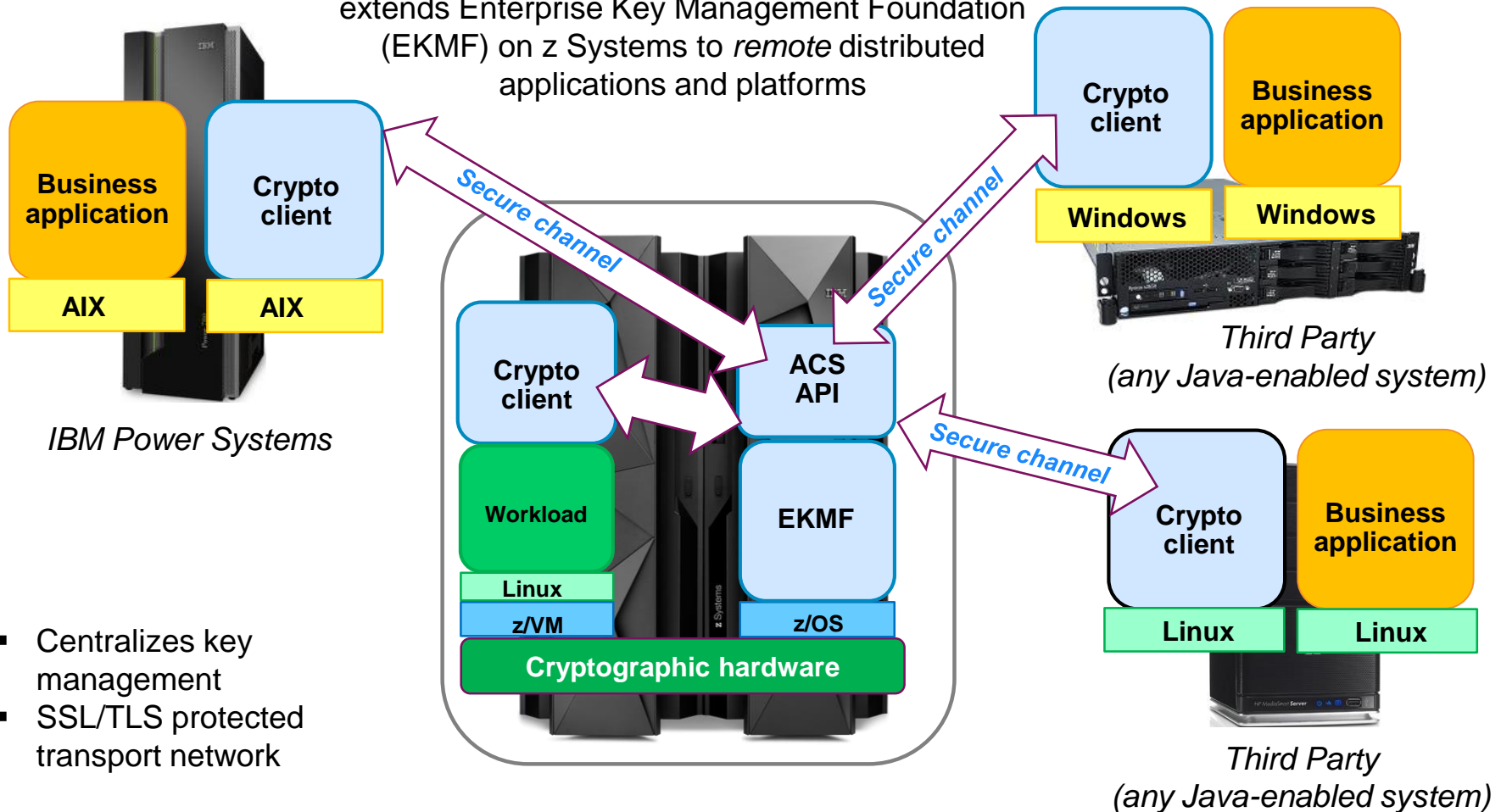
IBM Power Systems

Third Party (any Java-enabled system)

Third Party (any Java-enabled system)

- Centralizes key management
- SSL/TLS protected transport network

z13 supports enhanced Enterprise Grade Linux, further opening the platform and enhancing qualities of service

" *Enterprise-grade … is about delivering a strategy that enables a consistent architectural model with the support and service necessary for [the] … complex environment that organizations find themselves in.* - Ben Kepes, contributor to Forbes "

www.forbes.com/sites/benkepes/2013/12/18/what-does-enterprise-grade-really-mean

IBM zAware for Linux
z Systems Advanced Workload Analysis Reporter

- IT analytics solution for rapid identification of system issues

Elastic Storage for Linux on z
Based on GPFS technology

- IBM's shared disk, parallel cluster file system providing concurrent high-speed reliable data access

GDPS Appliance for Linux on z*
Geographically Dispersed Parallel Sysplex

- IBM's proven solution for Continuous Availability & Disaster Recovery

KVM and Docker Support*
Open architecture options for z/VM and Linux

- Additional hypervisor and platform choices for running new and existing Linux workloads

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z Systems are the hub of the data center and the heart of digital business…

Transaction Processing

Data Serving

Mixed Workloads

Operational Efficiency

Trusted and Secure Computing

Reliable, Available, Resilient

Virtually Limitless Scale

- *The world's premier data and transaction engine 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*

01. Positioning Your Enterprise