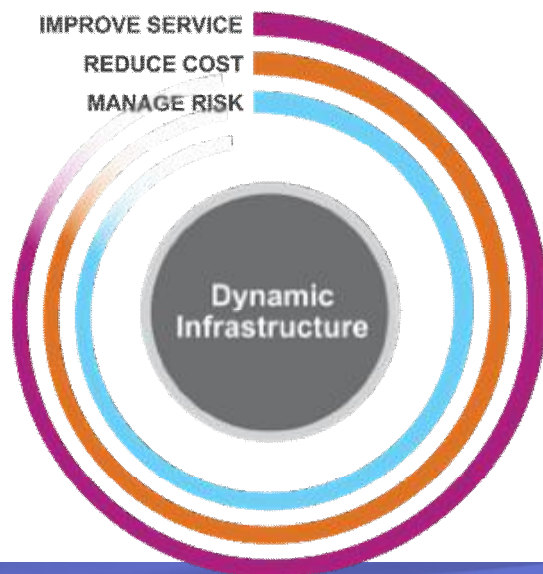# System z - Strategy and Directions "Leveraging technology for new workloads"

Mark Anzani, VP, Chief Technology Officer, System z

IBM

Discussion Topics

§ **State of the System z business**

§ **System z in a more dynamic world**

§ **What's ahead for System z**

The State of the System z Business and ecosystem

System z: The right technology…
45 years of innovation and change

IBM System z

The world's most powerful enterprise computing platform

Improved price/ performance

100s of Capacity choices for the right size server

Business Resilience

LOW COST OF OWNERSHIP

Leadership capabilities with IBM Systems software

World-Class Virtualization

Large scale consolidation for savings of up to 80% in total cost of ownership compared to distributed platforms

Deploy servers, networks, and solutions fast

Support for multiple operating systems

Dynamically optimize resources according to business priorities

Just in Time Capacity

Permanent capacity for non-disruptive growth

Temporary capacity for fluctuating workloads

Interim capacity for continued operation

Policy based automation capabilities

Offerings can be replenished dynamically

Secure and Resilient

Mitigate the risk of security breaches

Dedicated cryptographic processors

Industry leadership capabilities and certification

The Mainframe Charter:

Continuing the Commitment

2003:

Mainframe charter announced

- **Innovation**
- **Value**
- **Community**

Value Delivered:

MIPs growth of >20% CAGR fuelled by

- Generation to generation price / performance gains
- Unique value of specialty engines
- Ability to reduce energy costs by up to 80%

Innovation that matters:

System z10™

- Breakthrough performance
- Massive Scale and capacity
- Investment Protection
- Just-in-time Capacity
- Unprecedented resiliency and security

A Vibrant Community:

- Academic Initiative includes >600 colleges and more than 50,000 students
- Linux on System z matures with >2,900 applications
- Total applications now > 6,000 from > 1,600 ISVs
- Comprehensive middleware
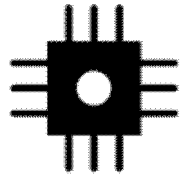- IBM Destination z, hub of the community

2009:

Continuing the commitment

- 7 New Solution Editions
- Lower HW pricing for Linux
- zFutures Roadmap
  - Smart Analytics Optimizer
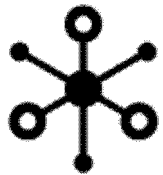- New ISVs

System z in a more dynamic world

Consider how our world is changing:

Our world is becoming more…

INSTRUMENTED

§ **30 billion** embedded RFID tags by 2010

§ **1/2 of all sensors** in transportation, facilities and production equipment are smart sensors

INTERCONNECTED

§ **1/3 of the world's population** on the Web by 2011

§ **4B mobile subscribers** globally at the end of 2008

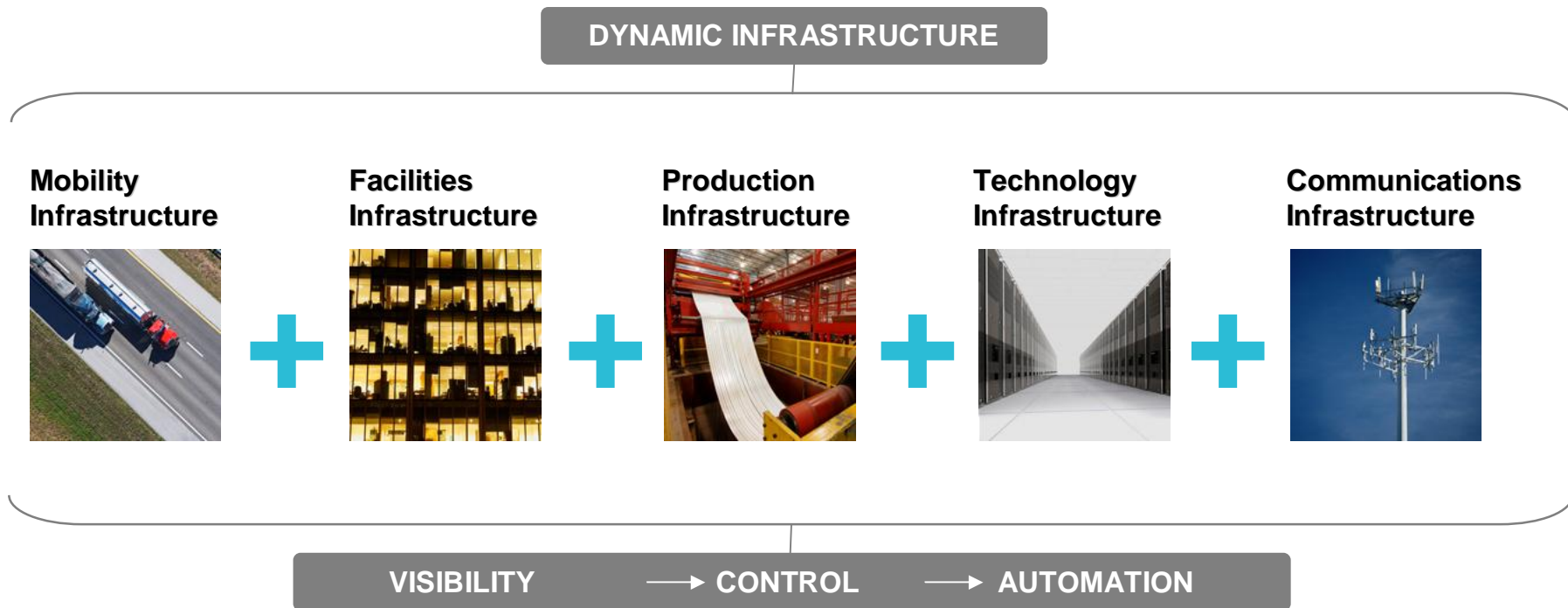§ **37K cyber attacks** in the US in 2007; 158% increase since 2006

INTELLIGENT

§ **15 petabytes of new information** generated every day (8x more than the information in all U.S. libraries)

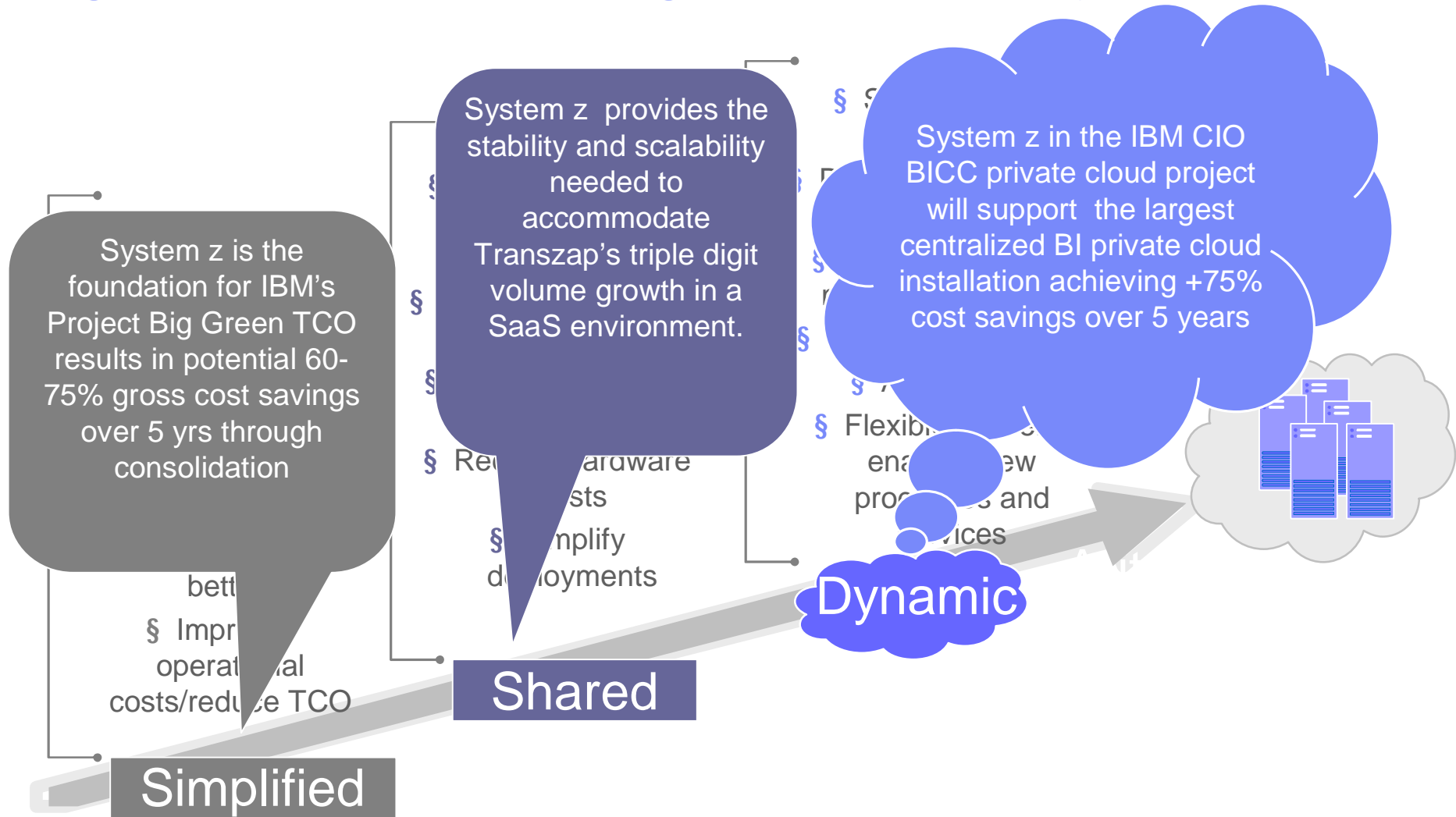§ **64B** credit card transactions/annum; **up 35%**

The IT transformation roadmap for the enterprise to get to cloud computing is paved for System z

System z is the foundation for IBM's Project Big Green TCO results in potential 60-75% gross cost savings over 5 yrs through consolidation

System z provides the stability and scalability needed to accommodate Transzap's triple digit volume growth in a SaaS environment.

System z in the IBM CIO BICC private cloud project will support the largest centralized BI private cloud installation achieving +75% cost savings over 5 years

§ S

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§ 7

§ Flexib   e
   ena   ew
   proc   s and
           vices

§ Re   ardware
         sts

§   mplify
   de   oyments

bett

§ Impr
   operat   al
costs/reduce TCO

Dynamic

Shared

Simplified

Platform choice – Fit for purpose

Many factors influence a platform selection, making it difficult to present a simple selection matrix
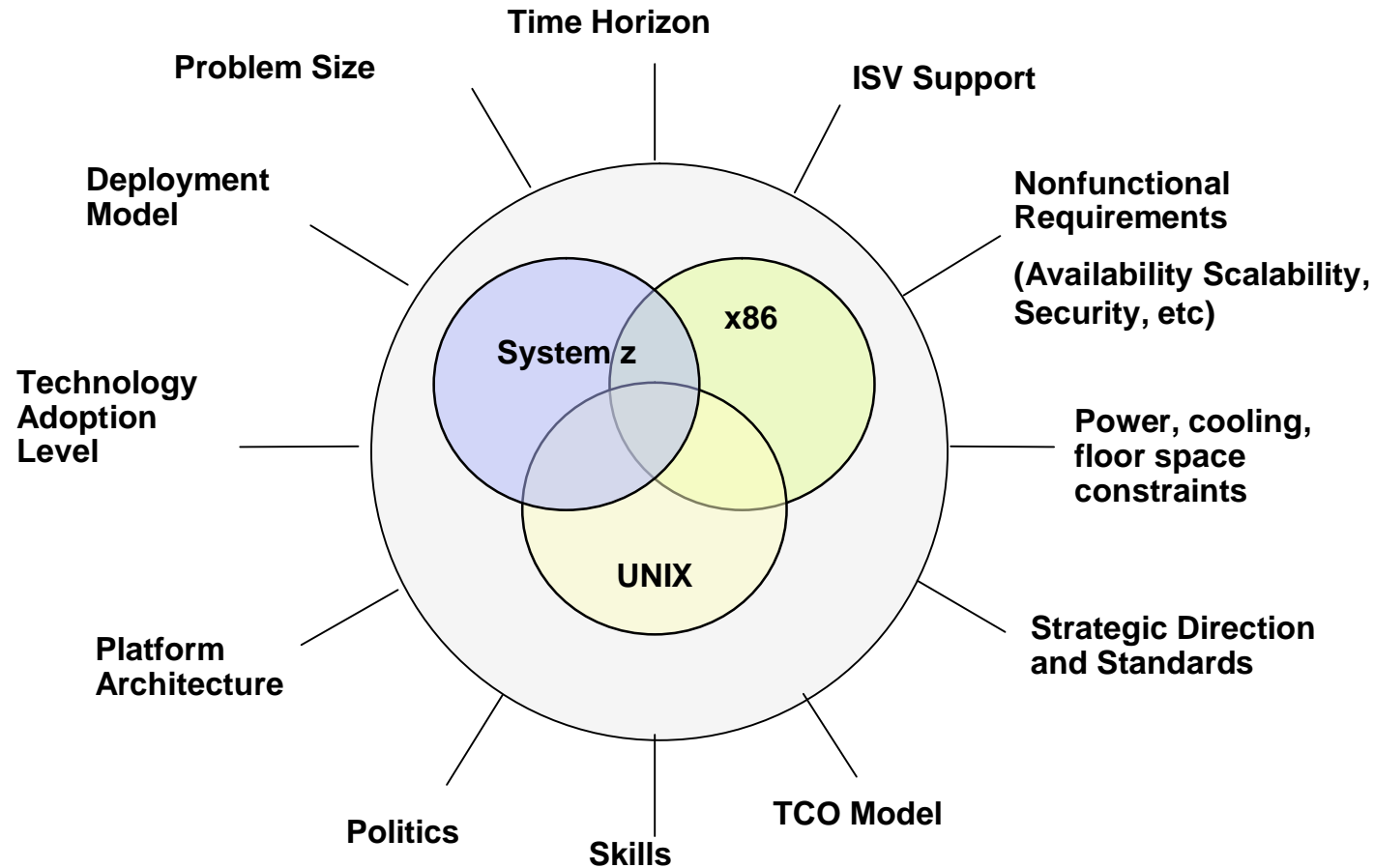
Some factors are specific to each business, others are common to all and can be generalized

Application Performance Characteristics – what fits on which platform?

Workload performance varies by application and can be best served by different platforms or the right mix of multiple platforms

10. **CPU Intensive** – e.g. numerically intensive, etc.

9. **Protocol Serving** – e.g. static HTTP, firewall, etc.

8. **Skewless OTLP** – e.g. simple and predictable transaction processing

7. **Java Heavy** – e.g. CPU intensive JAVA applications

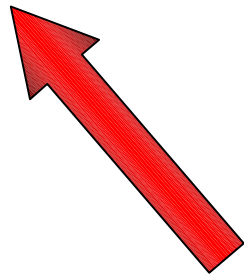6. **Java Light** – e.g. data intensive java applications

5. **Database** – e.g. Oracle DBMS or dynamic HTTP server

4. **Mixed High** – e.g. multiple, CPU-intense simple applications

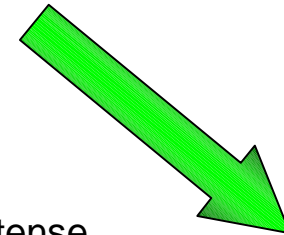3. **Mixed Low** – e.g. multiple, data-intense applications or skewed OLTP, MQ

2. **I/O Bound** – e.g. high I/O content applications

1. **Data Intensive** – large working set and/or high I/O content applications

Optimal for System z

Optimal for other platforms

So, what is the right platform for a dynamic infrastructure?
Golden Rule: A Dynamic infrastructure is heterogeneous

§ **A "one size fits all solution" will be sub-optimized**

§ **Optimized infrastructures**

– Multiple technologies

– Best "fit for purpose"

– Appropriate cost and service

§ **Technology requirements**

– Highly virtualized

– Integrated management

– End to End control of applications

§ **Cloud computing is a model for a Dynamic Infrastructure**

§ **The next generation System z is an intersection point of:**

– The leading enterprise computing platform

– Cloud services

– Capabilities for a dynamic infrastructure

Dynamic Infrastructure

zFuture

Cloud
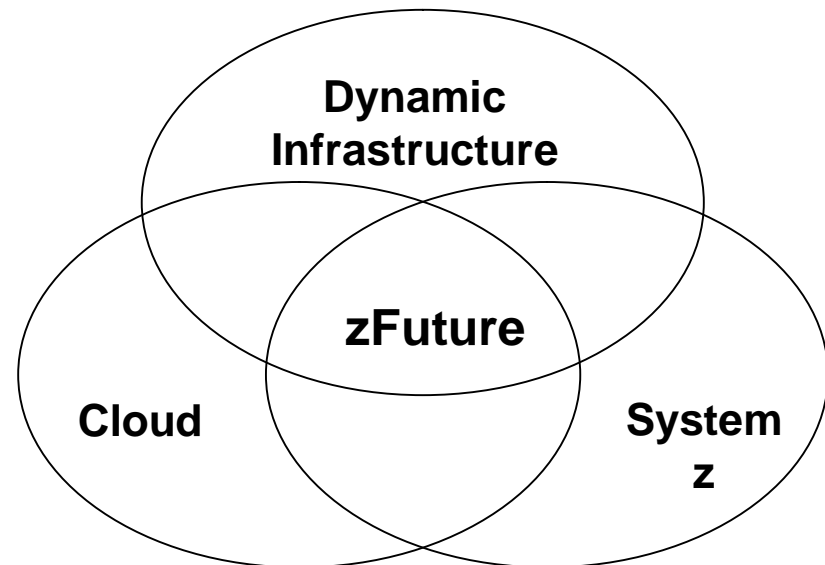
System z

# The road ahead for Dynamic Infrastructure with System z

Our goal is to extend mainframe qualities to <u>heterogeneous</u> platforms within a Dynamic Infrastructure to Support Critical Applications

§ End-to-End Systems Management

§ Policy based Automation Across the Applications Stack

§ Mainframe Security

§ Application Resiliency

§ Consolidated Disaster Recovery

§ Improved Economies of Scale and Efficiency

Trends and Directions

The IT model is shifting … real-time event-driven workloads, richer content, and modular technologies alter the composition of *systems and how systems are deployed and managed*
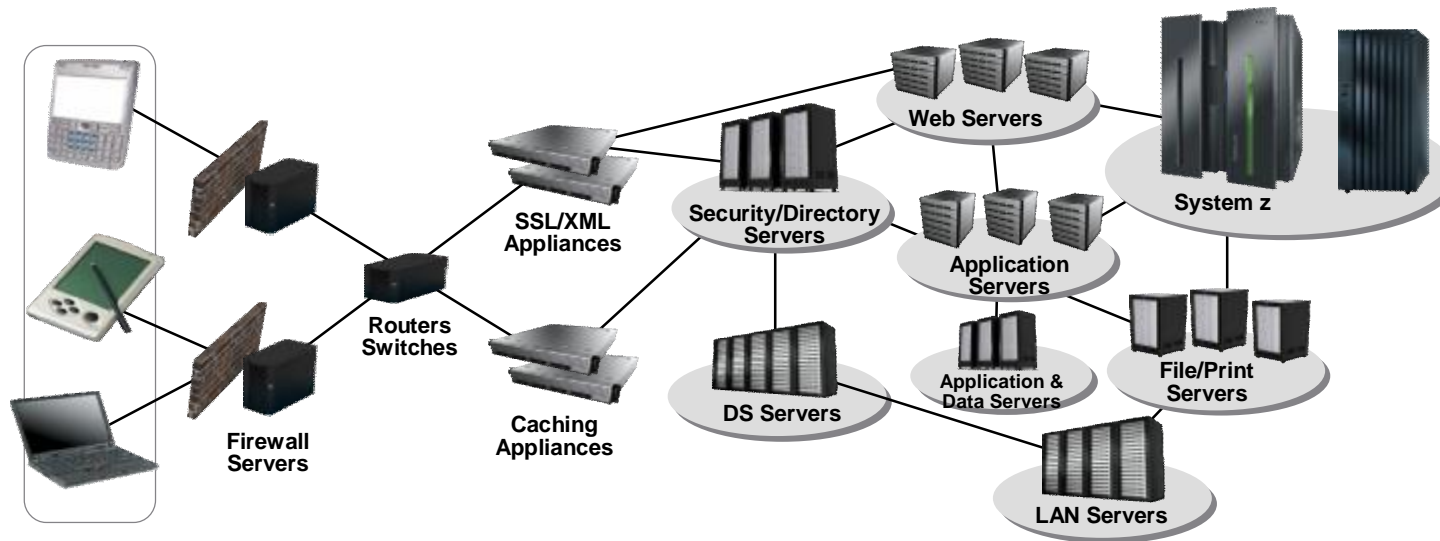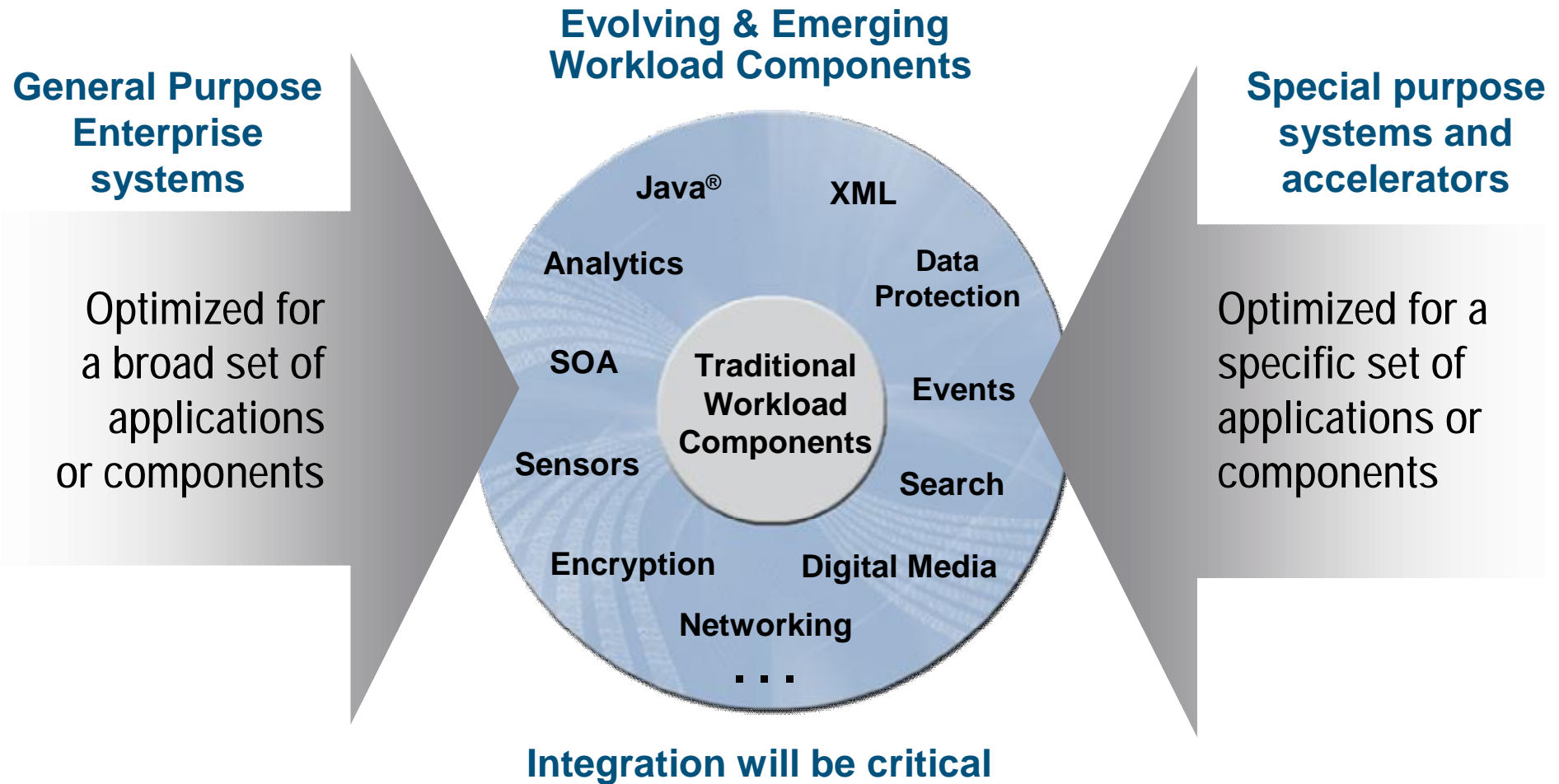

§ Application software and middleware is becoming more platform agnostic

§ Real-time, event-driven processing is driving the opportunity for specialized acceleration & offload engines

§ Multi-core/thread designs are becoming key drivers for system performance

§ *Platform Virtualization Capabilities* are improving the efficiency of single purpose workload images

§ *Platform management software for Virtualization* is emerging aimed at reducing cost and complexity and providing transparent quality of service to software hosted in the virtual image of today's compute-intensive applications

# Emerging applications . . . with hybrid transactions

Future objectives include complete application integration in an optimal fashion

Evolving & Emerging Workload Components

General Purpose Enterprise systems

Special purpose systems and accelerators

Optimized for a broad set of applications or components

Java®   XML

Analytics   Data Protection

SOA   **Traditional Workload Components**   Events

Sensors

Search

Encryption   Digital Media

Networking

. . .

Optimized for a specific set of applications or components

Integration will be critical

Both General and Special Purpose capabilities needed because of increasing transaction variability

Next: Coping with physical limits

§ **The industry is hitting fundamental physical limits:**

- – Size
- – Speed of electromagnetic propagation
- – Heat transfer rates

§ **Large CPU speed increases are a thing of the past, across the industry**

§ **Capacity increases will increasingly come from higher n-way, more multithreading, and NUMA optimization**

§ **Demand for lower latency will drive co-location of hybrid transaction processing elements**

Single CPU Speed

n-Way Capacity
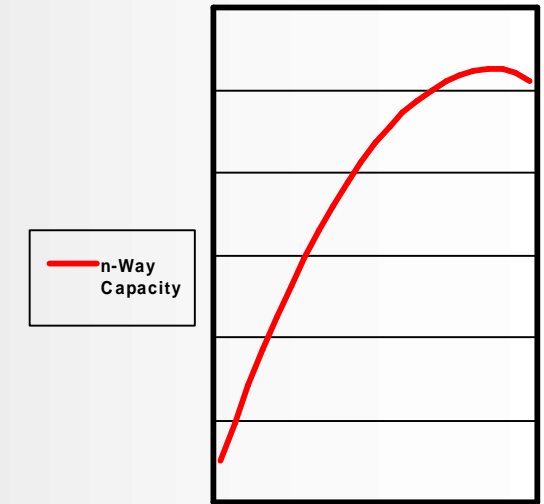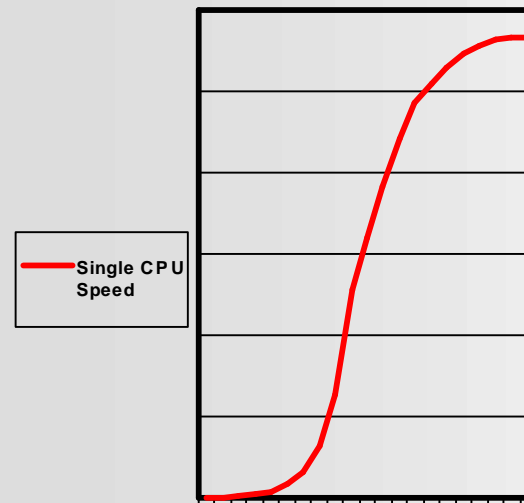
"In terms of size [of transistor] you can see that we're approaching the size of atoms which is a fundamental barrier, …."

Gordon Moore, April 2005*

I/O Rate
Bandwidth

* Techworld, Operating Systems and Servers News, 13 April 2005
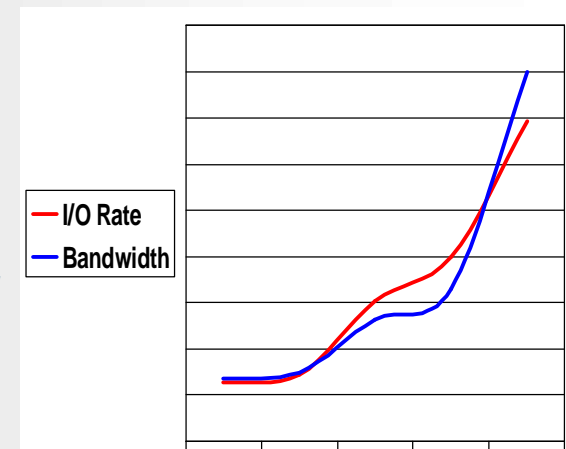
So what does this mean for future performance?

§ *Application and workload requirements are not decreasing*

   § Machine generated code
   § Speed of delivery of new app function
   § Low cost code factories

§ *More broad design techniques required to maintain physically consolidated and economic advantages*

   § Base silicon contribution
   § Innovative design techniques within hardware and lic
   § Operating system path length assists
   § Increased compiler investments
   § Middleware focus on performance improvements
   § Appliance / Accelerator / Specialty engine assists

§ *IBM goes from sand up to the application…………*
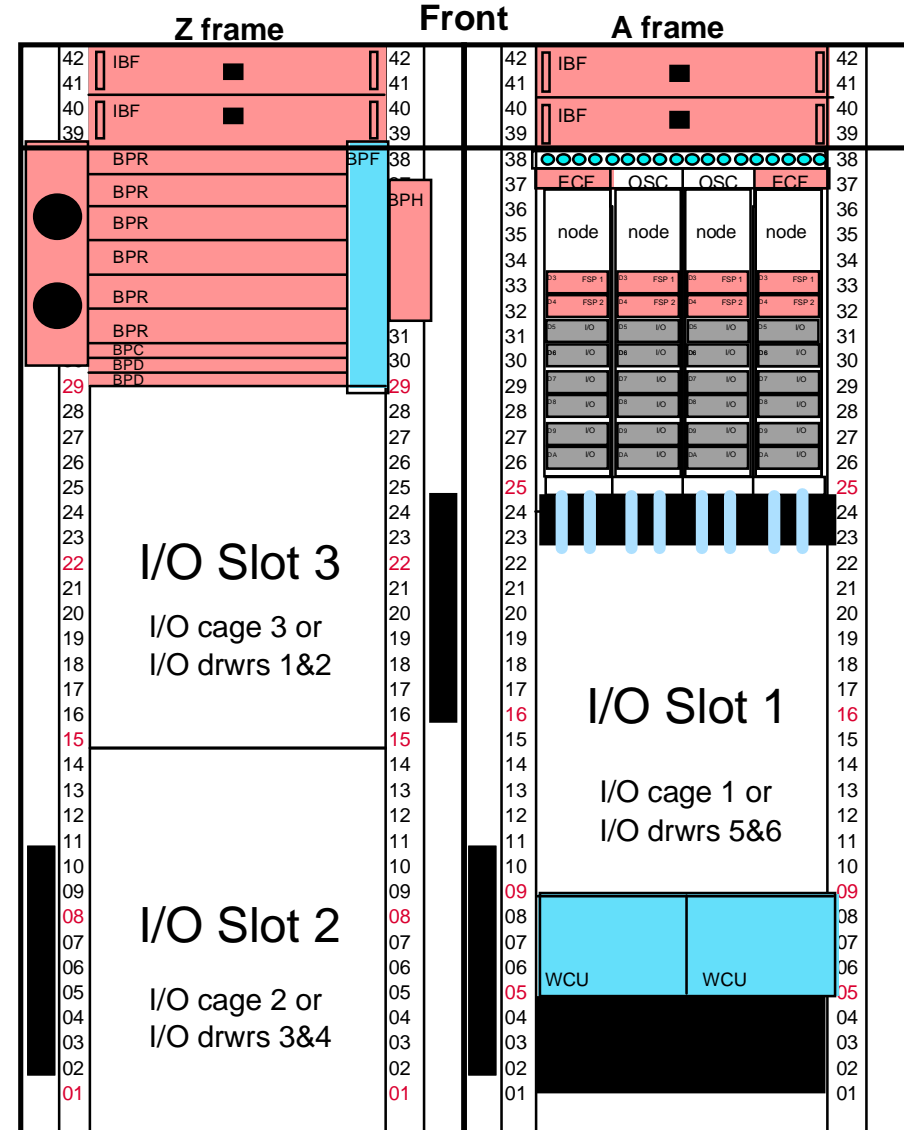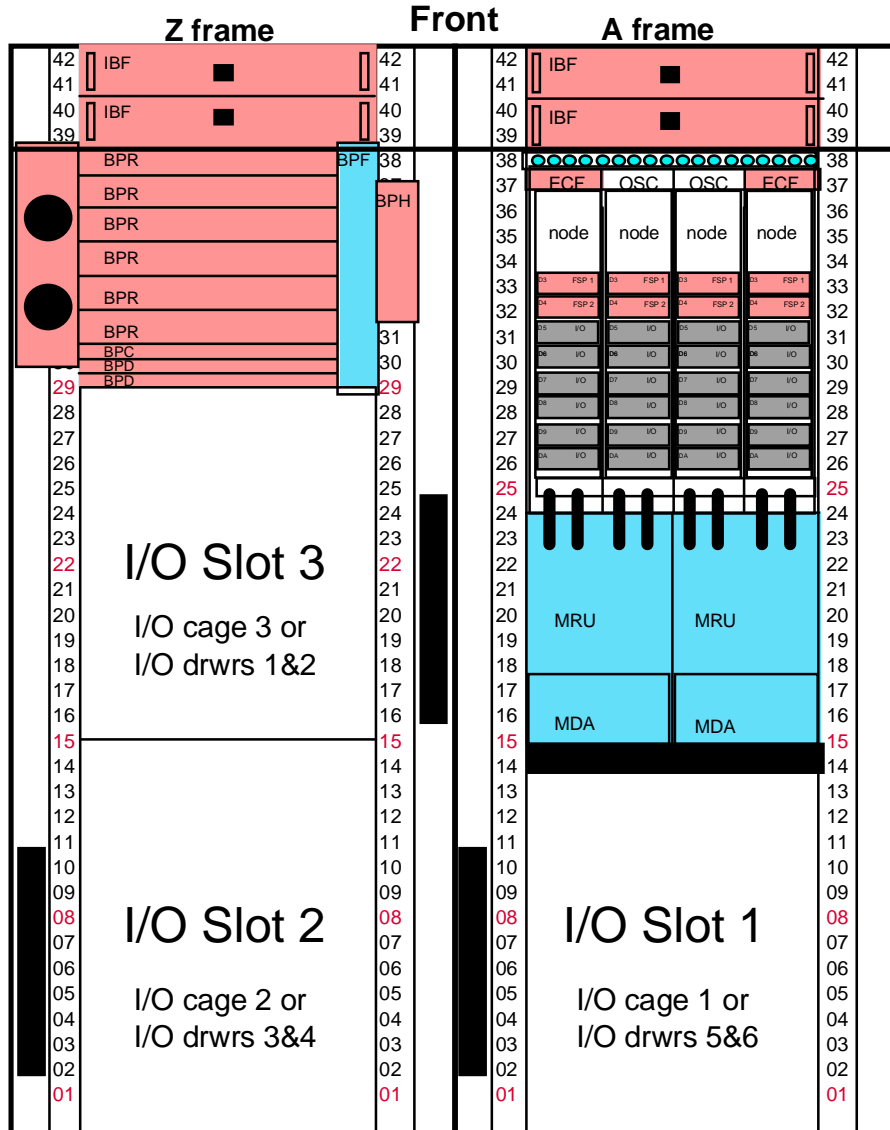
Capabilities for zFuture platform

§ **Scalability of SMP Capacity**

§ **Price/performance improvement**

§ **Energy efficiency**

§ **Simplification, modernization, and autonomics**

§ **Resilience**

§ **Security**

§ **Virtualization**

§ **Maintain and extend system z unique value in hardware systems design**

§ **Innovative building blocks for new workload opportunities**

IBM Systems

zNext

Air Cooled · Front · Water Cooled · Front

Z frame — A frame — Z frame — A frame

I/O Slot 3 — I/O cage 3 or I/O drwrs 1&2
I/O Slot 2 — I/O cage 2 or I/O drwrs 3&4
I/O Slot 1 — I/O cage 1 or I/O drwrs 5&6

System z I/O Interface Evolution

	z9	z10	Future
Extended Link (CEC to IO Cage)	**eSTI** **(IBM)** →	**InfiniBand** **DDR** **(Ind. Std.)** →	**PCI Express** **(Ind. Std.)**
IO Cage **Backplane**	**mSTI** **(IBM)** →	**mSTI** **(IBM)** →	**PCI Express** **(Ind. Std.)**
Coupling Link	**ISC** **(IBM)** →	**InfiniBand** **DDR** **(Ind. Std.)** →	**InfiniBand** **DDR** **(Ind. Std.)**

Fabric Convergence (FCoCEE) à Value Proposition vs. Barriers

Servers   Multiple Fabrics   One Fabric
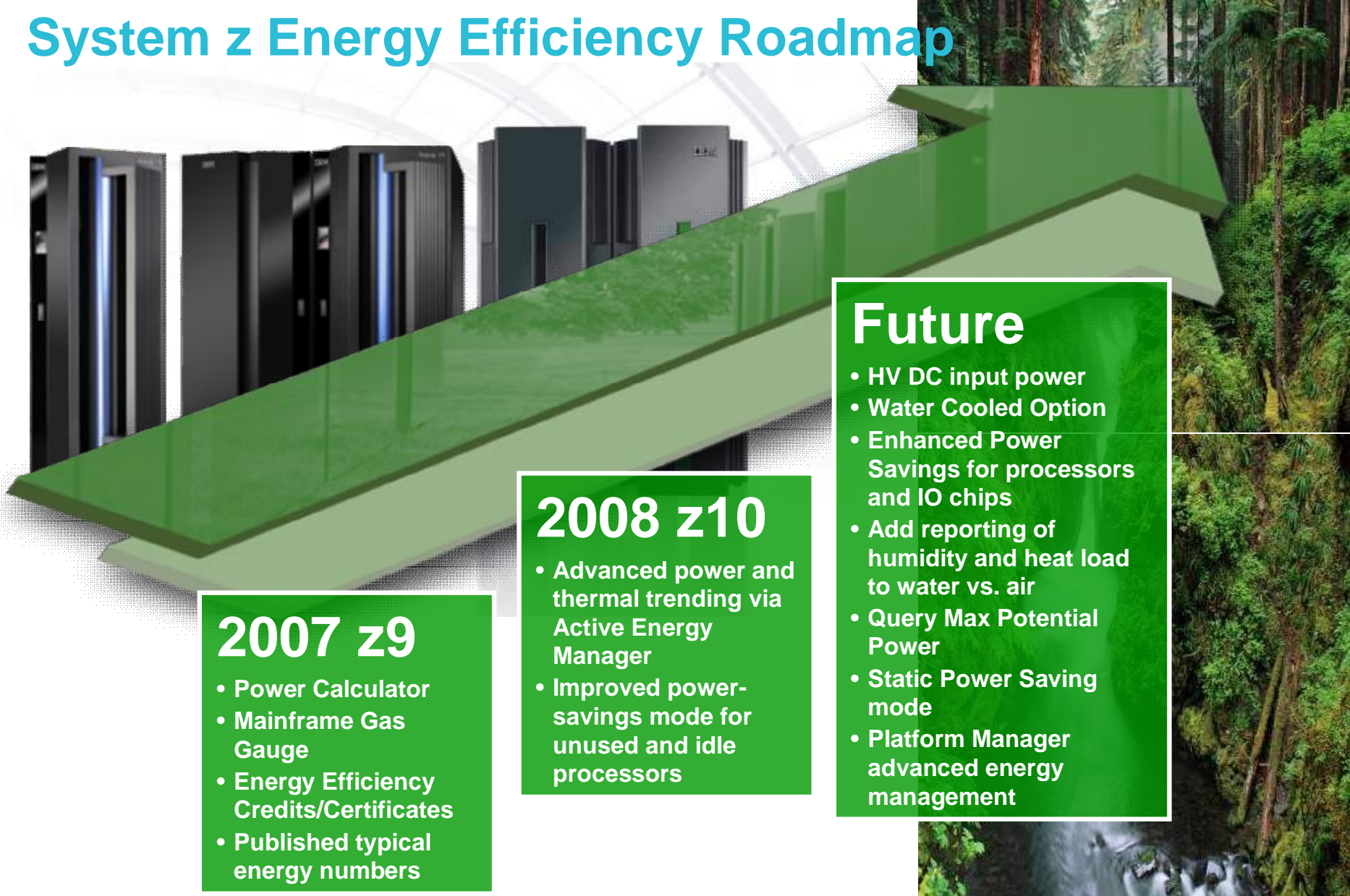
"One Wire"
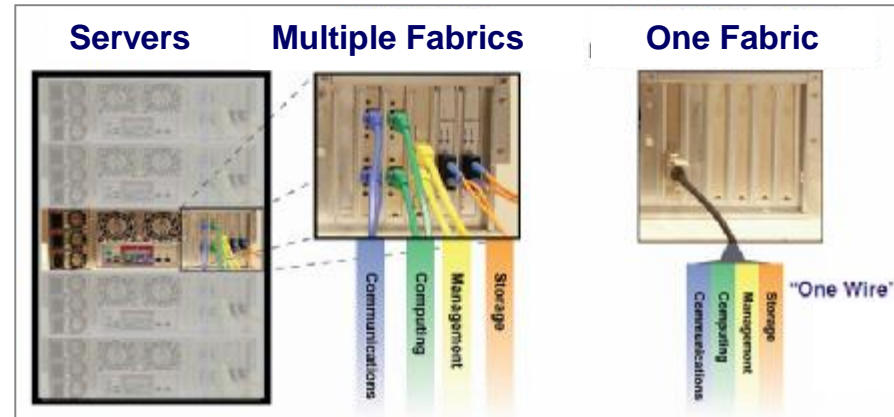
Value Proposition

- § Lower Cost, Lower Power
  - § Less adapters,
    cables and switches
- § Improved RAS
  - § Reduced failure points, time,
    misconnections, bumping, …
- § Simpler Management
  - § Single physical fabric to manage

Barriers

- § Customer organizational
  - § Server, Network, Storage silos
- § Operational management
  - § Quality of service control
  - § Security and access control
- § Maturity
  - § Standards, technology, management
  - § Resiliency and robustness

System z Energy Efficiency Roadmap

Future
- HV DC input power
- Water Cooled Option
- Enhanced Power Savings for processors and IO chips
- Add reporting of humidity and heat load to water vs. air
- Query Max Potential Power
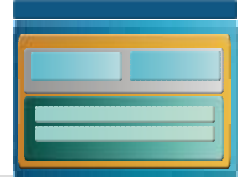- Static Power Saving mode
- Platform Manager advanced energy management

2008 z10
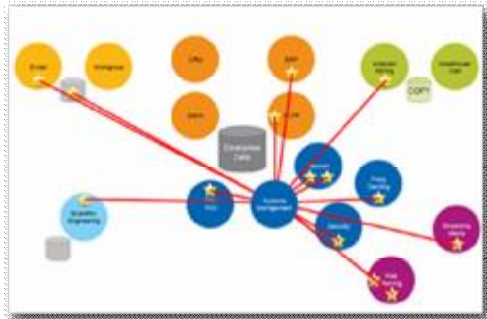- Advanced power and thermal trending via Active Energy Manager
- Improved power-savings mode for unused and idle processors

2007 z9
- Power Calculator
- Mainframe Gas Gauge
- Energy Efficiency Credits/Certificates
- Published typical energy numbers

System z ensemble

System z Future

### System z Mainframe

Integrated Systems Management firmware

Accelerators

§ Extend and accelerate System z workloads

§ Lower cost per transaction while improving application response time for CPU intensive applications

Application Serving Blades

§ Logical device integration between System z resources and application serving commodity devices

§ Providing competitive price-performance and improved QoS for applications with a close affinity to mainframe data
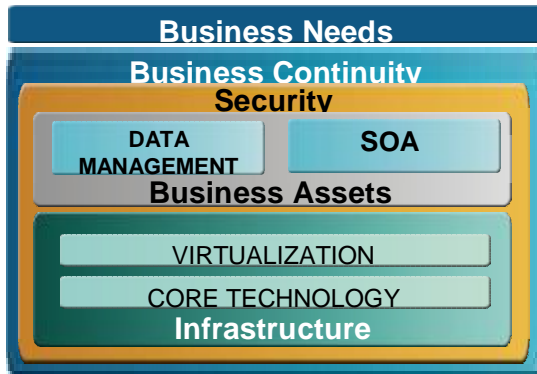
§ Integrate, monitor, and manage multi-OS resources as a single, logical virtualized system

§ Single WLM, Security, and System Management interface across all resources

Business Needs

Business Continuity

Security

DATA MANAGEMENT	SOA

Business Assets

VIRTUALIZATION

CORE TECHNOLOGY

Infrastructure

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