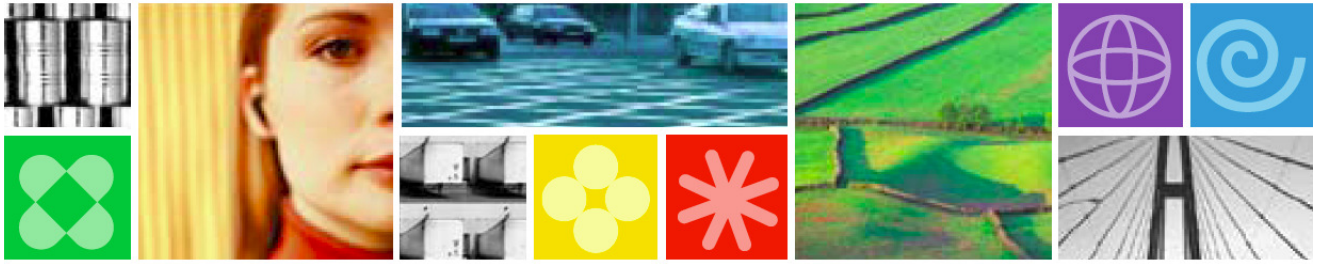
System z Server Direction - Maximize the potential of Mainframe Technology

Mark Anzani, VP, Chief Technology Officer, System z



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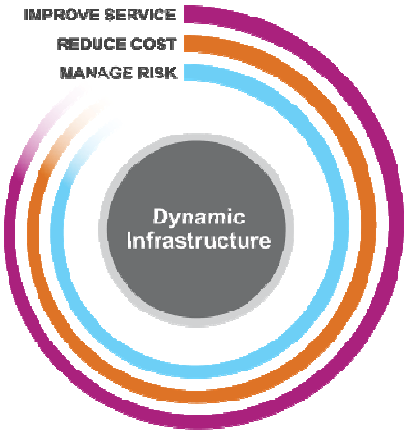
Agenda

- **System z today**
- **Workloads and Platform Characteristics**
- **What's ahead – next generation technologies**
- **System z in use**



System z: A long history, requiring constant innovation

IBM System z

Powerful enterprise computing platform

Improved price/ performance

100s of Capacity choices for the right size server

Business Resilience

Low cost of ownership

World-Class Virtualization

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

Rapid deployment of servers, networks, and solutions

Support for multiple operating systems

Dynamically optimize resources according to business priorities

Secure and Resilient

Mitigate the risk of security breaches

Dedicated cryptographic processors

Industry leadership capabilities and certification

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

Mainframe Investment and Growth

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 >3,100 applications
- Total applications now > 6,000 from > 1,600 ISVs
- Comprehensive middleware
- IBM Destination z, hub of the community

Today

Continuing the commitment

- New Solution Editions
- Lower HW pricing for Linux
- New Technology
  - zFuture roadmap
  - Smart Analytics Optimizer
- ISV Focus

Mainframe Innovation: Specialty Engines

Internal Coupling Facility (ICF) 1997

Integrated Facility for Linux (IFL) 2000

System z Application Assist Processor (zAAP) 2004

Eligible for zAAP:

- **Java™ execution environment**
- **z/OS XML***

IBM System z Integrated Information Processor (IBM zIIP) 2006

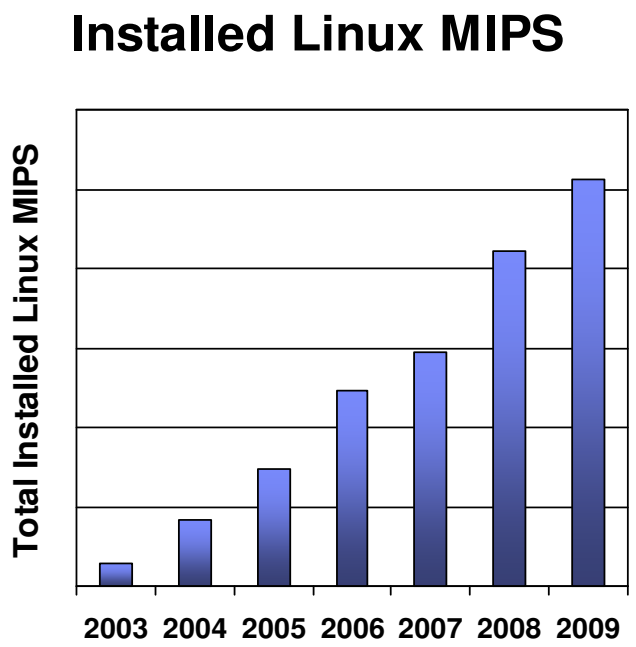
Eligible for zIIP:

- **DB2® remote access and BI/DW**
- **ISVs**
- **IPSec encryption**
- **z/OS XML**
- **Global Mirror**
- **ISV exploitation**
- **zAAP on zIIP**

Client Adoption Continues to Drive Linux Success

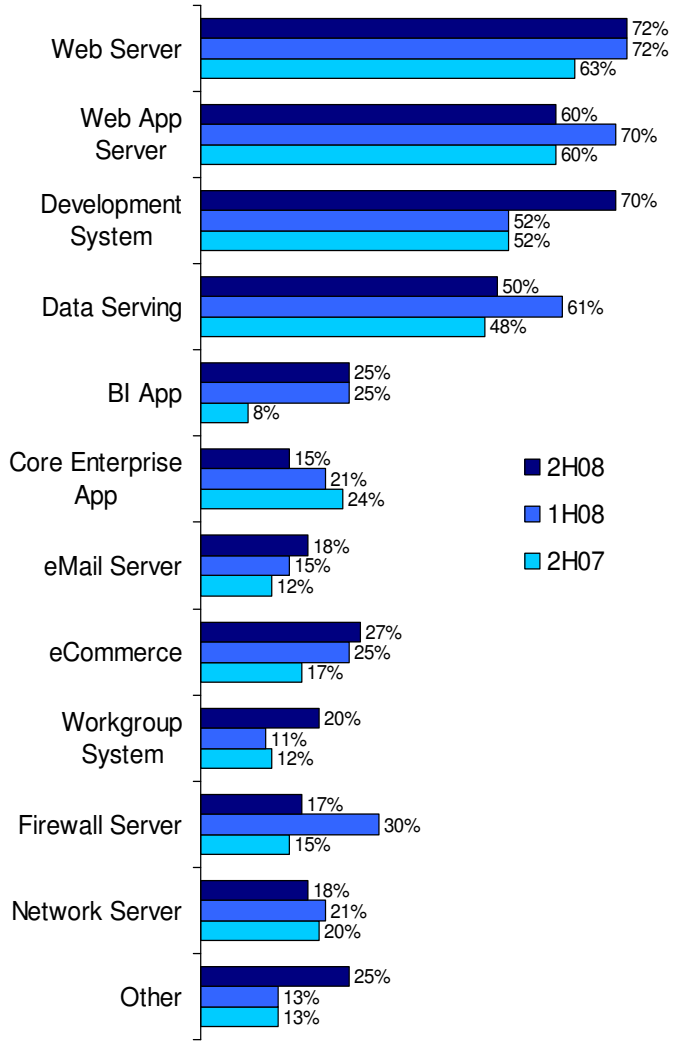
*Installed Linux MIPS at 43% CAGR**

- The momentum continues:
  - Shipped IFL engine volumes increased 35% from YE07 to YE09
  - Shipped IFL MIPS increased 65% from YE07 to YE09
- Linux is 16% of the System z customer install base (MIPS)
- 70% of the top 100 System z clients are running Linux on the mainframe
- More than 3,100 applications are available for Linux on System z



* Based on YE 2004 to YE 2009

What are Clients Consolidating to System z?



Source: IBM Market Intelligence

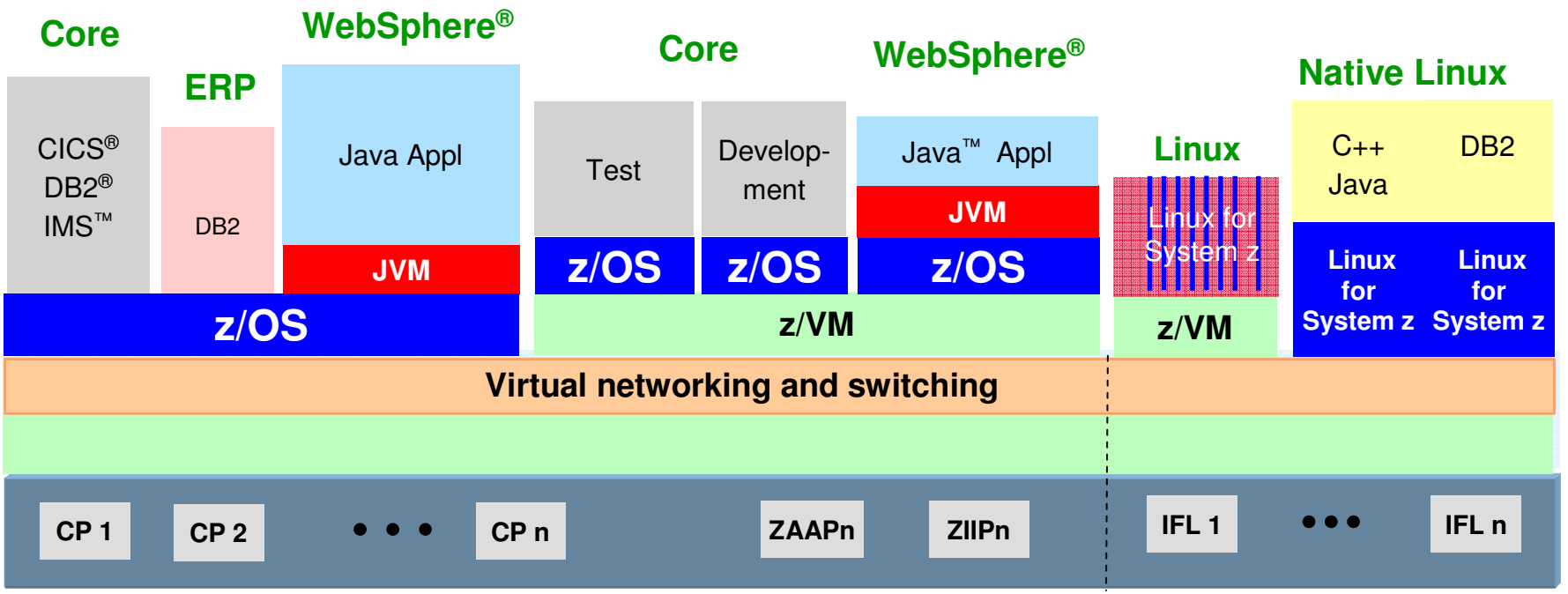
Surveys indicate IBM System z® customers use Linux for:

- Web Serving
- Web Application Serving
- Data Services
- Systems Development

"Best Fit" Workloads for Linux on System z:

- **Business connectors**: WebSphere® MQSeries®, DB2® Connect, CICS® Transaction Gateway, IMS™ Connect for Java®
- **Business critical applications**
- **Development** of WebSphere and Java™ applications
- **WebSphere Application Server** (WAS)
- **Email & collaboration**: Domino™, Web 2.0
- **Network Infrastructure**: FTP, NFS, DNS, etc. and Comm Server and Communications Controller for Linux, Communigate Pro (VoIP)
- **Data services**: Cognos®, Oracle, Informix®, Information Builders WebFOCUS
- **Applications requiring top end disaster recovery model**
- **Virtualization and Security Services**

System z – Integrated workloads



- **Massive, robust consolidation platform**
- **virtualization is built in**
- **100's to 1000's of virtual servers on z/VM**
- **Intelligent and autonomic management of diverse workloads and system resources**

System z Today – areas of use and workload expansion

1. Information Management on System z

- Data Management on System z (data base)
- Data Warehousing
- Business Analytics and Optimization
- IBM Smart Analytics Optimizer
- Competitive migrations / New Accounts

2. Business Applications

- SAP Solutions
- ACI, Core Banking Applications
- Chordiant and other ISV' applications
- Competitive migrations/New Accounts

3. IT Optimization and Consolidation

- TCO/TCA
- Competitive Consolidations from UNIX®/x86
- Oracle Consolidations
- Cloud Computing
- Domino®
- Enterprise Linux Server/New Accounts

4. Enterprise Modernization

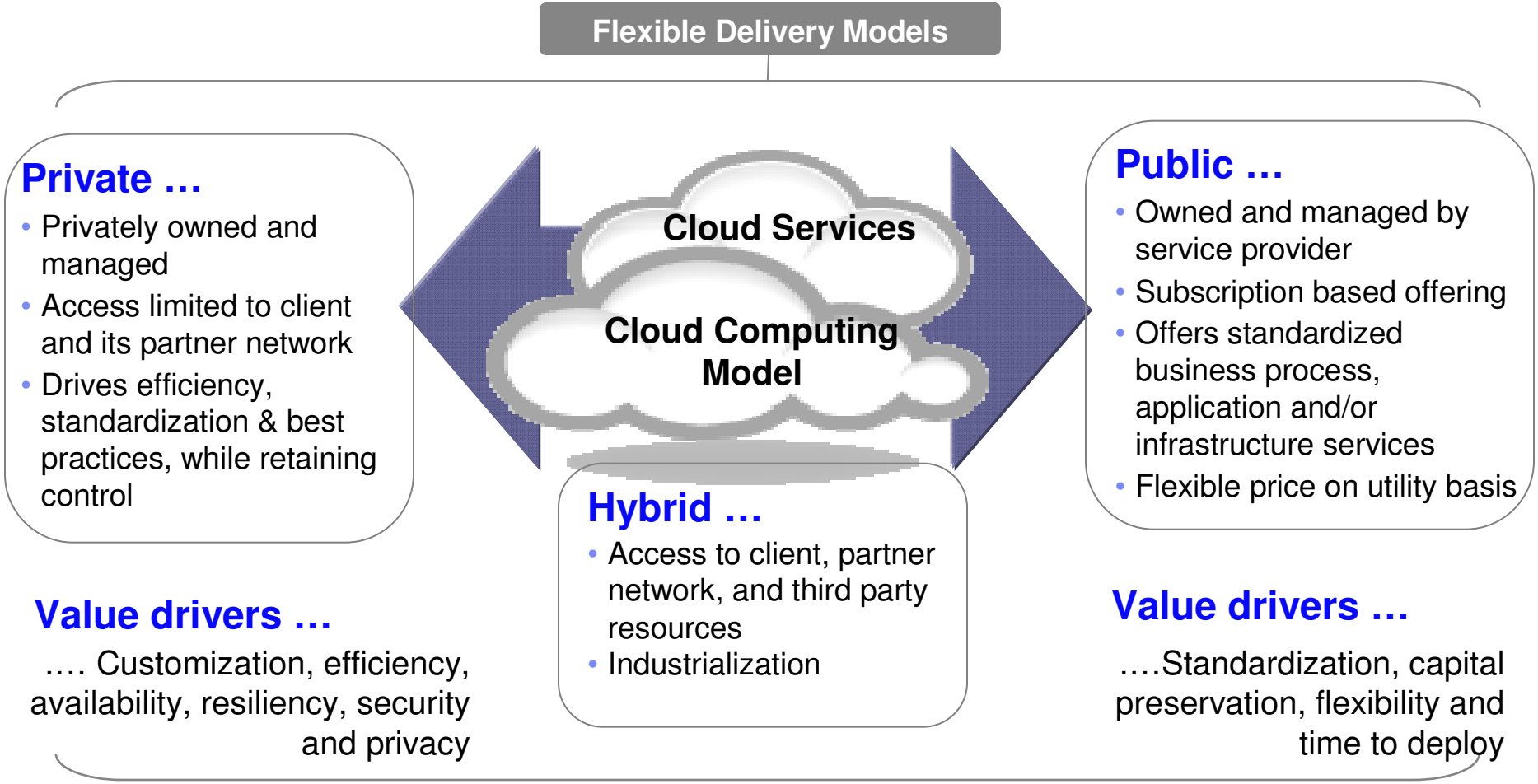
- WebSphere® on System z
- Rational® on System z
- Portal on System z
- Modernizing competitive software stacks (ie. SW, AG, CA, etc.) with IBM solutions

Foundational Competencies

- Virtualization
- Resiliency
- Systems Management
- Security
- zGovernance (Platform Management)

Cloud Computing

- There are multiple delivery models for cloud workloads



System z has characteristics that are fundamental for cloud computing workloads

Efficient – leading platform for energy efficiency

Virtual – a “share all” approach to system resources for efficiency

Secure - a multi-tenant design point with EAL 5 certification

Available - 24x7x365 operations with MTBF measured in decades

MTBF = Mean Time Between Failure

Scale - ability to meet massive demands from users and data

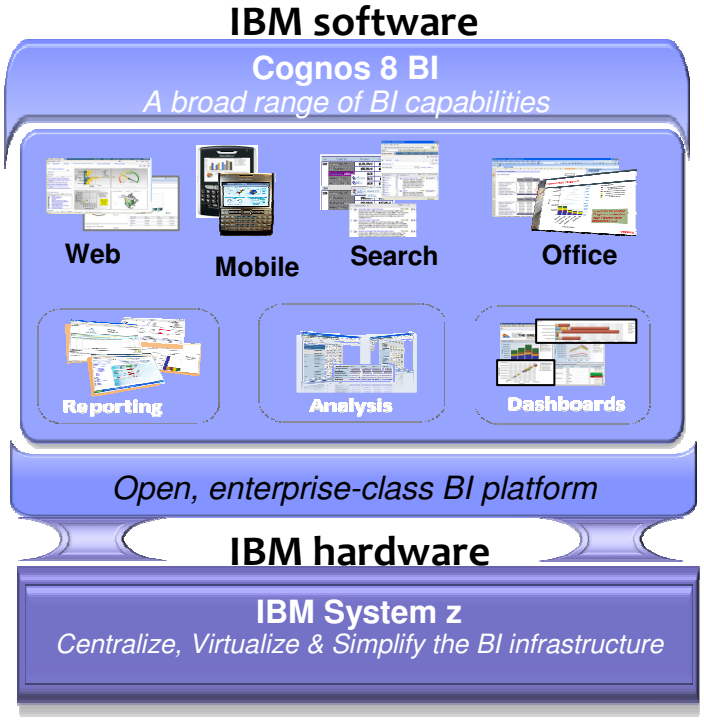
Learn more: http://www.ibm.com/systems/z/news/announcement/20090915_annc.html

The Smart Analytics Cloud

Creates … *That delivers …*

Smart Analytics Cloud	A private cloud within the enterprise	A solution for delivering business intelligence to the entire organization

The solution components …



IBM Services

- Phase 1: Create awareness of, a strategy for and a governance foundation for BI across the organization
- Phase 2: Preparation for the Smart Analytics Cloud

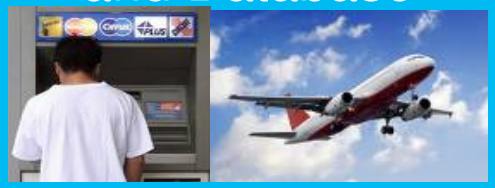
- Phase 3: Install the base cloud, integrate into the corporate enterprise and test the cloud use cases
- Phase 4: Educate the enterprise for on-going success with the Smart Analytics Cloud

Learn more: http://www.ibm.com/systems/z/solutions/cloud/smart.html

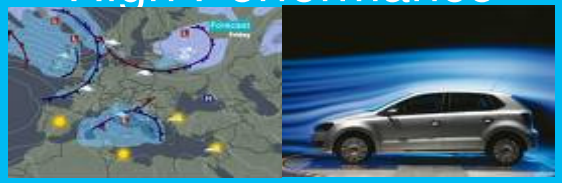
Workloads and Platform Characteristics

Workload Types - One size DOES NOT fit all

Transaction Processing and Database



Analytics and High Performance



Business Applications

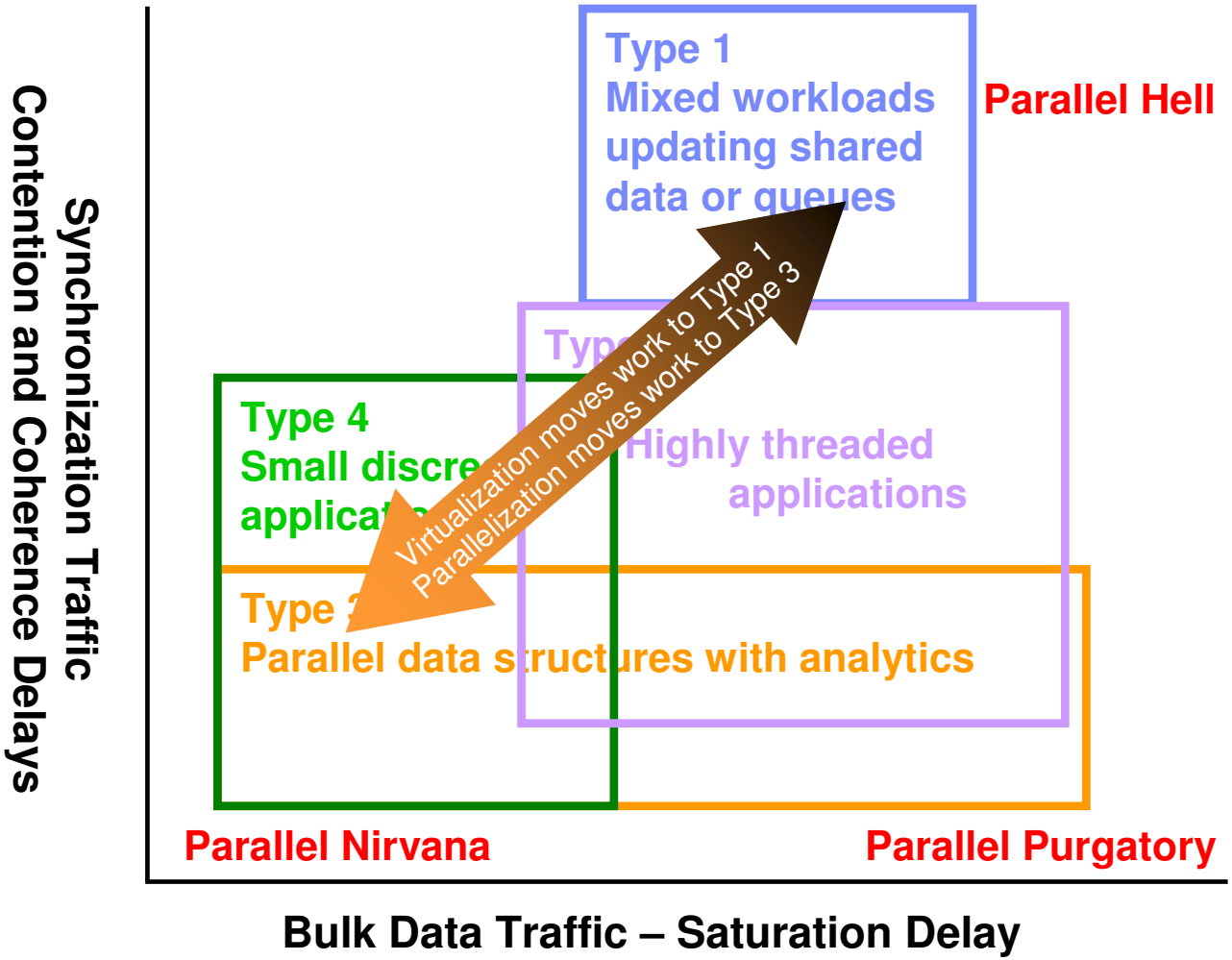
Web, Collaboration and Infrastructure

- **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**

Pfister's Paradigm is Useful for bridging from work to machines

From Greg Pfister: In Search of Clusters, The ongoing battle in lowly parallel computing, p461



Workload Optimization Requires Multiple Platforms

Mainframe
UNIX

Transaction Processing & Database

- Application Database
- Data Warehousing
- Online Transaction Processing
- Batch

Analytics & High Performance Computing

- Data Mining Applications
- Numerical
- Enterprise Search

UNIX

Mainframe
UNIX

Business Applications

- Enterprise Resource Planning
- Customer Relationship Management
- Application Development

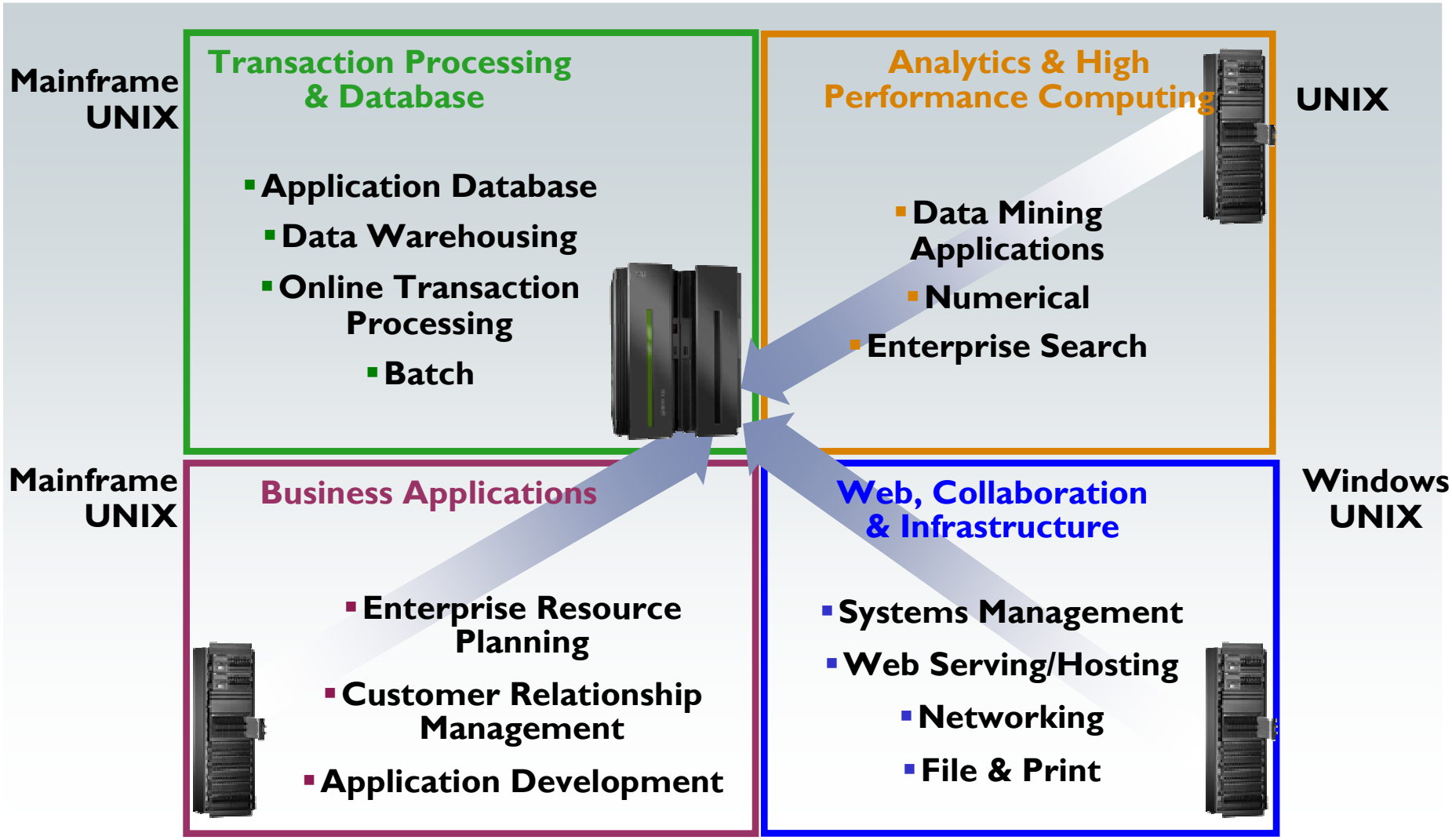
Web, Collaboration & Infrastructure

- Systems Management
- Web Serving/Hosting
- Networking
- File & Print

Windows
UNIX

Manage end-to-end application elements as an integrated system

With Mainframe Quality of Service



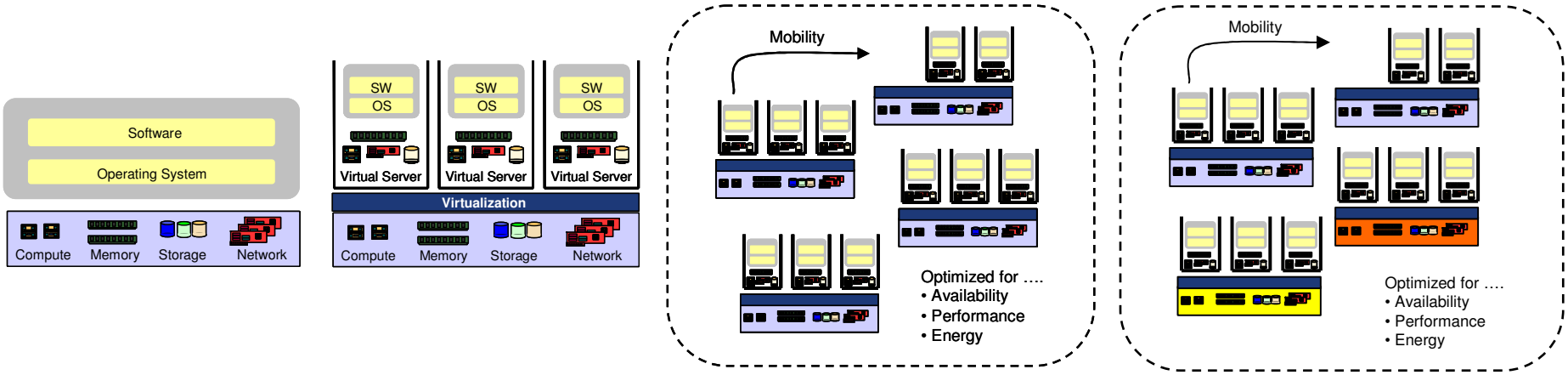
The road ahead for Dynamic Infrastructure with System z

Our goal is to extend mainframe qualities to other 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**

The Evolution of the “Platform”

Advanced Management of Virtualized IT Infrastructure



Server | **Virtualized Server** | **Virtualized Cluster** | **Virtualized Heterogeneous Cluster**

Future Directions

Future System z directions

- **Drive System z strengths**
  - Scalability, balanced system, I/O throughput and flexibility
  - Energy efficiency and dynamic energy management
  - Operational simplification
  - Resilience expansion with active-active
  - Integrated workloads, with security and high virtualization

- **Integrated Platform Management**
  - To provide dynamic deployment and management of virtual server images and virtualized appliances in support of a services oriented IT environment
  - To integrate, monitor, and manage the platform resources as a single, logical virtualized system
  - To manage the platform resources in accordance with specified business service level objectives
  - To provide built-in capability for upward integration with Data Center Management Tools

- **Workload Acceleration**
  - To extend and accelerate System z workloads with Purpose-fit Hardware

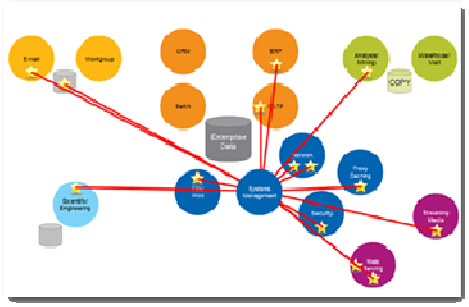
- **Application Serving**
  - To extend the System z environment with additional specialty engines to host new applications at competitive price-performance
  - To consolidate and manage a multiple-tier infrastructure with reduced complexity and lower cost
  - And to enable application integration with System z transaction processing, messaging, and data serving capabilities

System z Integrated Systems

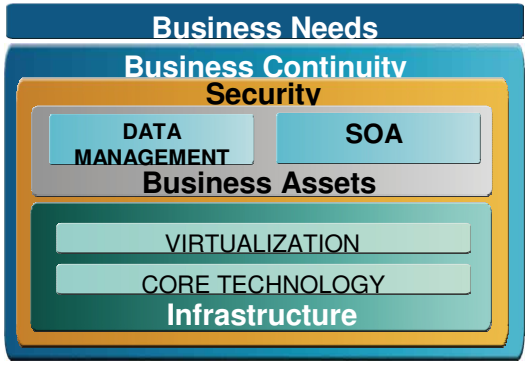
System z Future

System z Mainframe

Integrated Systems Management firmware



- Integrate, monitor, and manage multi-OS resources as a single, logical virtualized system
- Single WLM, Security, and System Management interface across all resources



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

zFuture: Integrated solutions that span heterogeneous platforms

zFuture: The world's premier workload-optimized platform for enterprise applications

- **Reduces the complexity typically associated with heterogeneous multi-tier environments.**
- **Extends System z qualities of service to heterogeneous platforms**
- **Lowers cost of deploying new and existing workloads**
- **Delivers IT service aligned to business processes**

Deploy end-to-end solutions across heterogeneous platforms
Optimize technologies on a best fit basis
The service you need with reduced risk at the right price

Service Levels to Match Your Business Needs

Increased flexibility for your multi-tier, multi-architecture strategy