zEnterprise.

A New Dimension in Computing

IBM Hardware news

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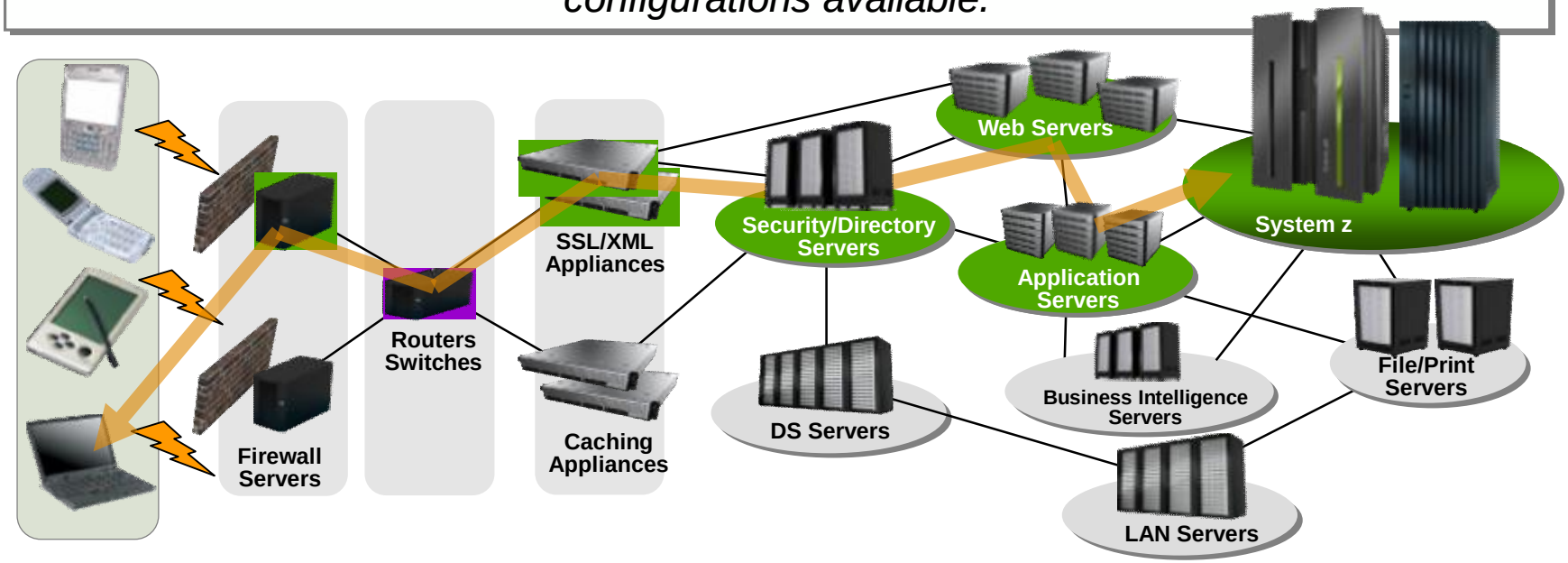
Information technology today: Limitations

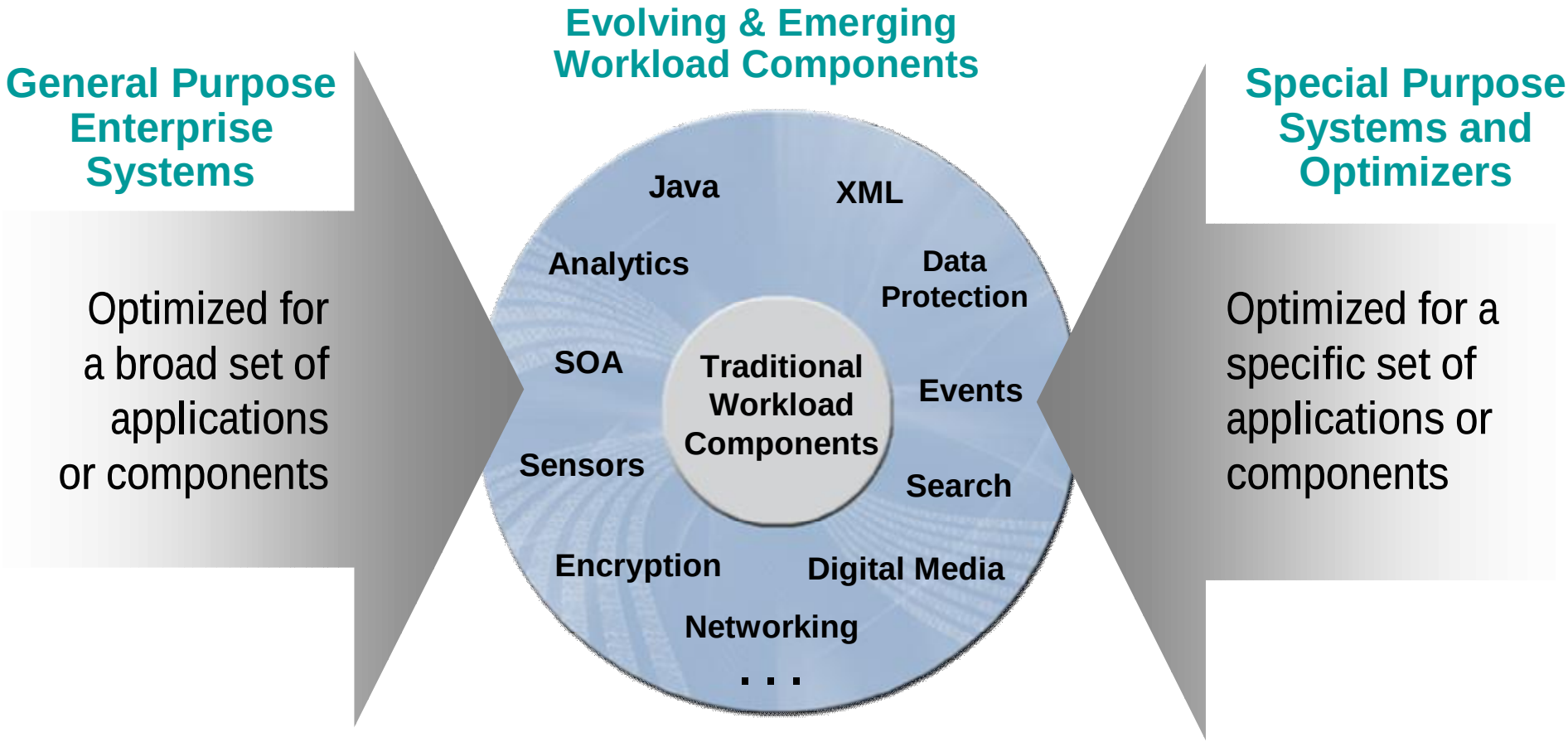
Information technology today is limited by the technology and architecture configurations available.



- Business processes and the applications that support them are becoming more service oriented, modular in their construction, and integrated.
- The components of these services are implemented on a variety of architectures and hosted on heterogeneous IT infrastructures.
- Approaches to managing these infrastructures along the lines of platform architecture boundaries cannot optimize: alignment of IT with business objectives; responsiveness to change; resource utilization; business resiliency; or overall cost of ownership.
- **Customers need better approach: The ability to manage the IT infrastructure and Business Application as an integrated whole.**

Emerging Applications with Special-Purpose Capabilities

Future objectives include extended application integration and optimization



Integration will be critical

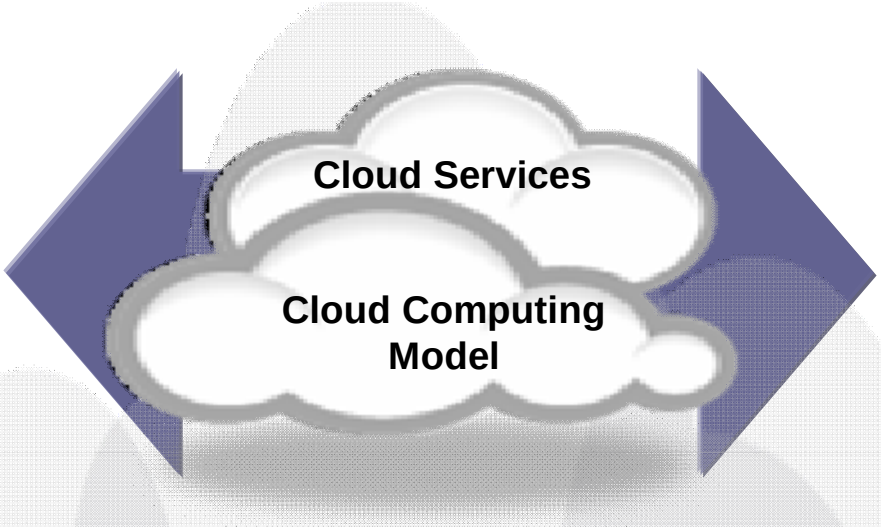
Both General and Special Purpose capabilities are needed

Cloud Computing

Flexible Service Delivery and Consumption

Public …

- Service provider owned and managed.
- Access by subscription.
- Delivers select set of standardized business process, application and/or infrastructure services on a flexible price per use basis.



Private …

- Client owned and managed.
- Access limited to client and its partner network.
- Drives efficiency, standardization and best practices while retaining greater customization and control

….Standardization, capital preservation, flexibility and time to deploy

…. Customization, efficiency, availability, resiliency, security and privacy

ORGANIZATION **CULTURE** **GOVERNANCE**

zEnterprise value pyramid

Goal

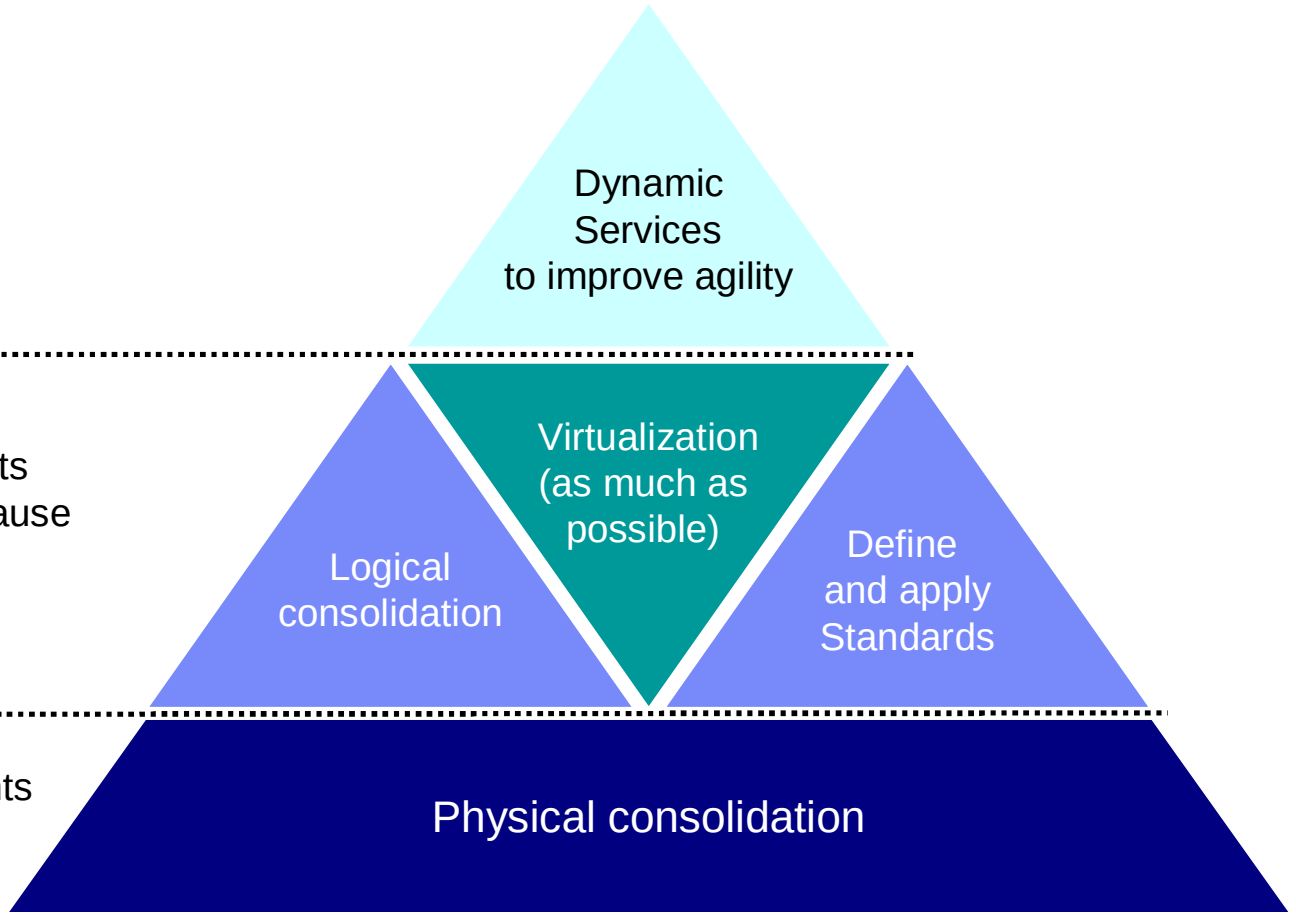
- Cost benefits
- Improved agility

Exploitation

- Many virtualization projects
- Large benefits (cost) because of defined standards and logical consolidation.

Basics

- Infrastrucure Improvements
- Centralized IT
- Cost benefits



Today's Environment

Today… Many System z shops run their core, data-sensitive business processes on System z but also maintain distributed servers to accommodate a variety of processing that interacts with mainframe resources.

System z

Data Management Structure
Core Business Applications
Consolidation
Security
Low TCO

Distributed Systems

Cycles
Many ISV Applications
Large Skill Pools
Low TCA

- **The mainframe has hosted most of the world's business data and executed a majority of core business transactions**
- **The mainframe is best suited for applications that require the highest levels of:**
  - Reliability
  - Security
  - Performance
  - Availability
  - Service
  - Scalability
- **However, the mainframe is not optimized for all workloads**

- **There are particular industry application where distributed topology is the standard.**
- **Distributed environments are suited for applications where:**
  - High levels resource sharing is not required
  - The workload is
    - CPU intensive
    - Does not require high levels of data sharing
    - Highest levels of availability are not required
- **Other Distributed System Characteristics -**
  - Multiple management interfaces
  - Redundancy required for availability
  - On-site assembly
  - End-user service for problem resolution

IBM zEnterprise System
The integration of Superior technologies

zEnterprise 196

- The industry's fastest and most scalable enterprise server
- Ideally suited for large scale data and transaction serving and mission critical enterprise applications

zEnterprise Unified Resource Manager

- Unifies resources, extending System z qualities of service across the infrastructure
- Install, Monitor, Manage, Optimize, Diagnose & Service

zEnterprise BladeCenter Extension

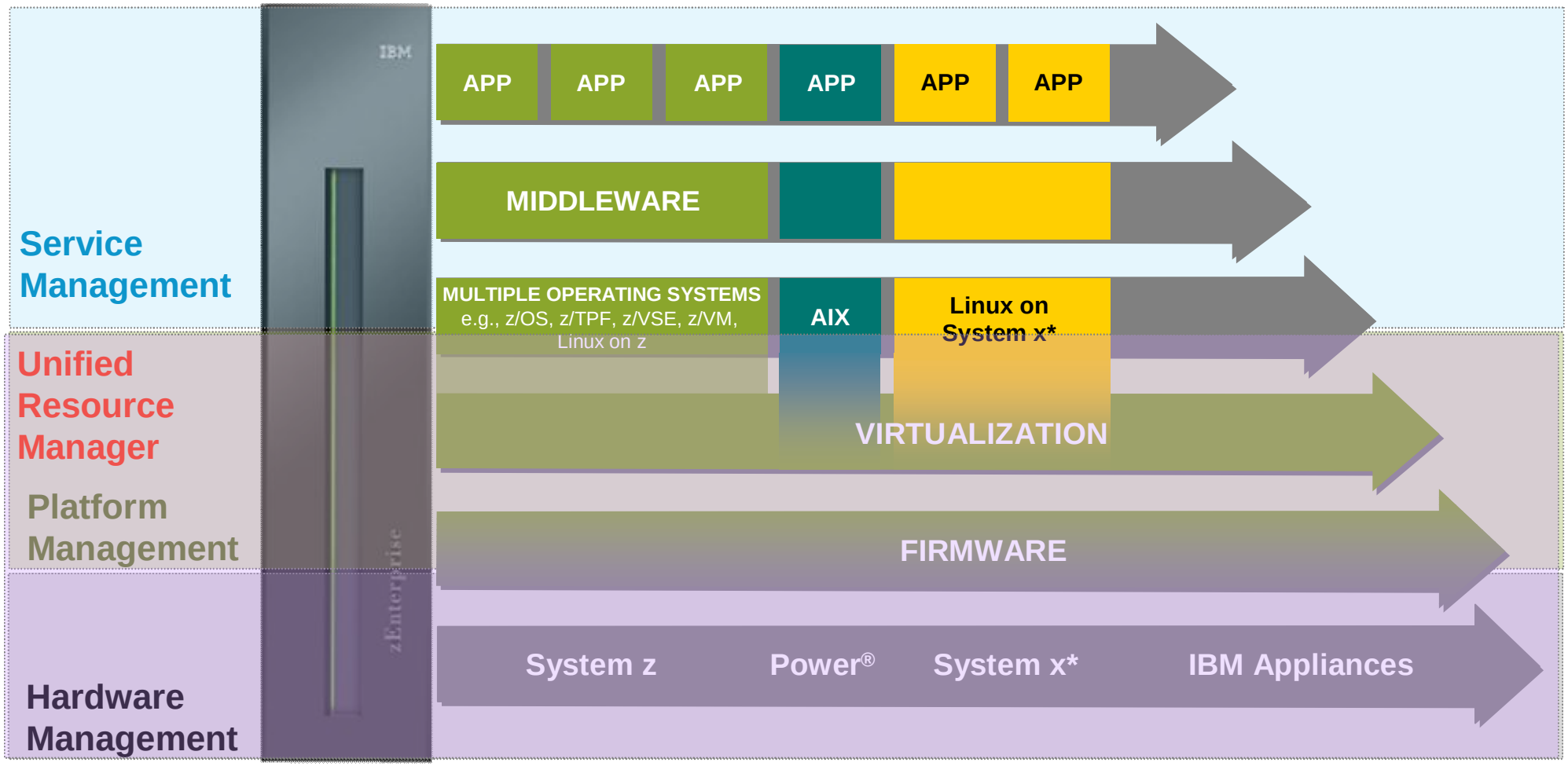
IBM Blades

- Runs app unchanged and supports what you know. Logical device integration between System z and distributed resources

Optimizers

- Workload specific accelerators to deliver a lower cost per transaction, appliance for example IBM Smart Analytics Optimizer

Built on this construct – zEnterprise – Innovation at every level



Focused, collaborative innovation

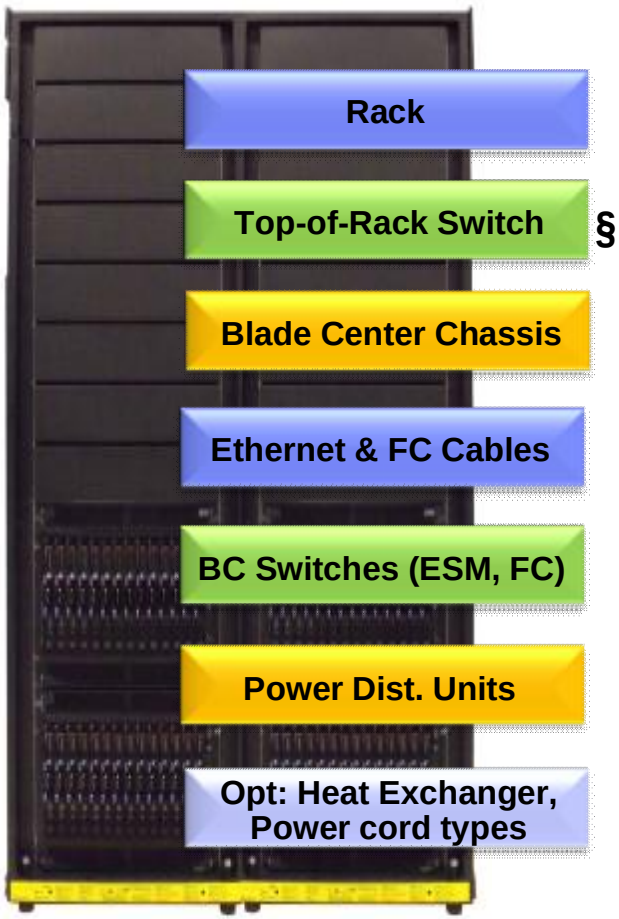
A "complete systems" approach

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

z196 and zBX Hardware Components

z196

zBX Infrastructure



§ New System z Machine Types:

- CPC = 2817
- zBX = 2458 Model 002
- Customer supplied IBM System x* and POWER7 Blades

§ Key points:

1. CPC Availability and Integrity
2. Independent Lifecycles
   - Asynchronously Upgradeable
   - Enhancements not tied to CPC HW
3. Data availability not tied to single CPC
   - Shareable between CPCs
4. Growth
5. System z service

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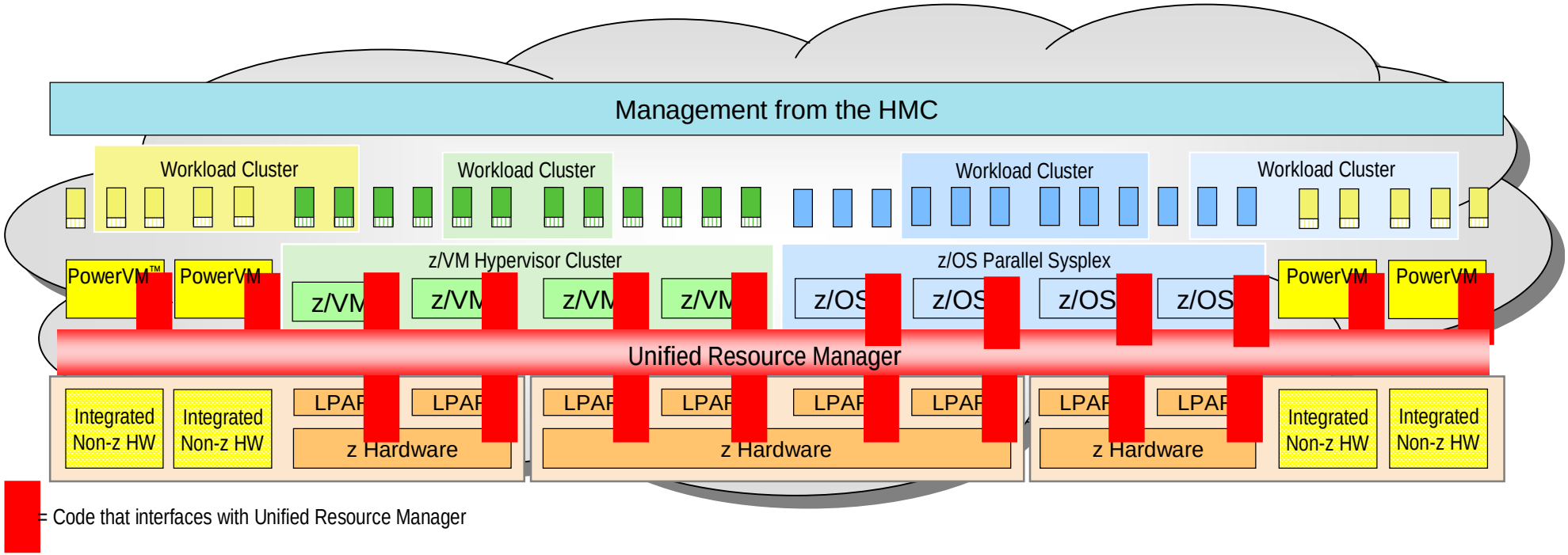
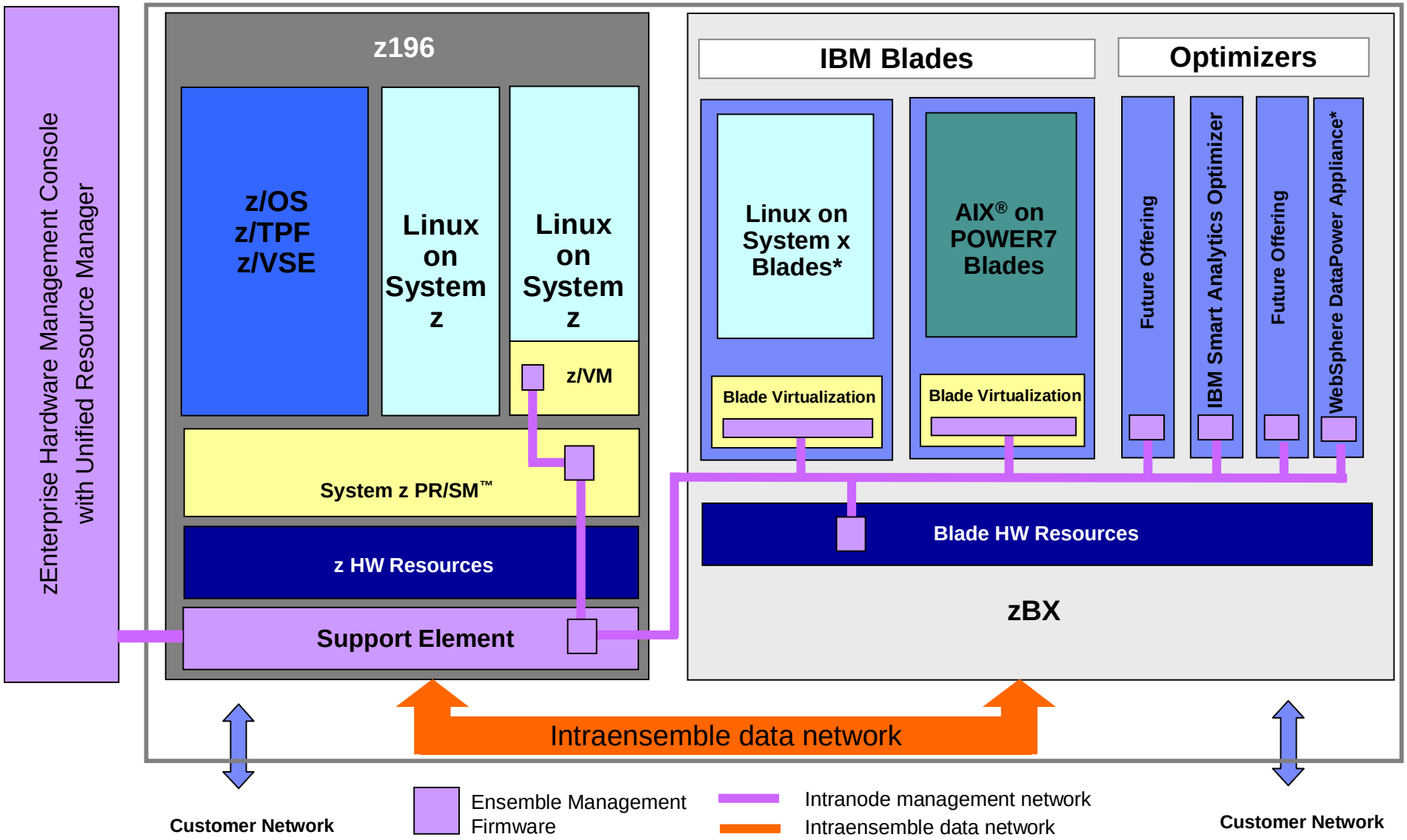
IBM Multi-Architecture Virtualization – "Fit for Purpose"
System z Multi-System, Federated Hypervisor Configuration

- **System z futures: hosting a federation of platform management functions, including:**
  - Resource monitoring
  - Workload management
  - Availability management
  - Image management
  - Energy management
- **Integrates with hardware management and virtualization functions**
- **Controls hypervisors and management agents on blades**
- **Open integration to enterprise-level management software**



zEnterprise System – 196 + zBX + Unified Resource Manager



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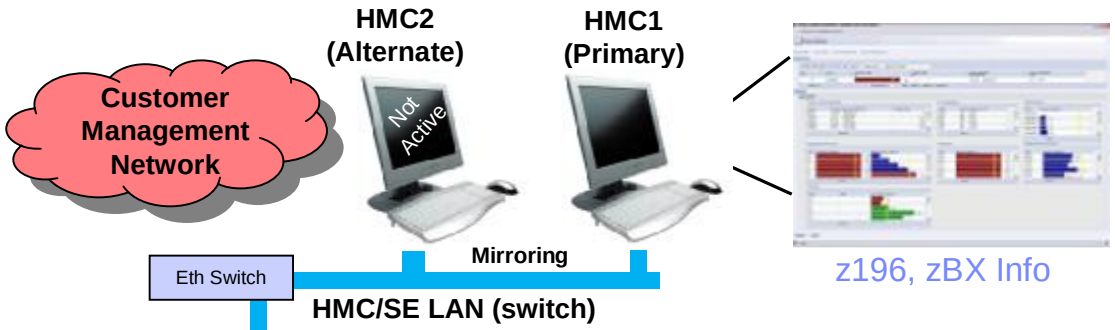
z196 zBX Model 002 – Communications



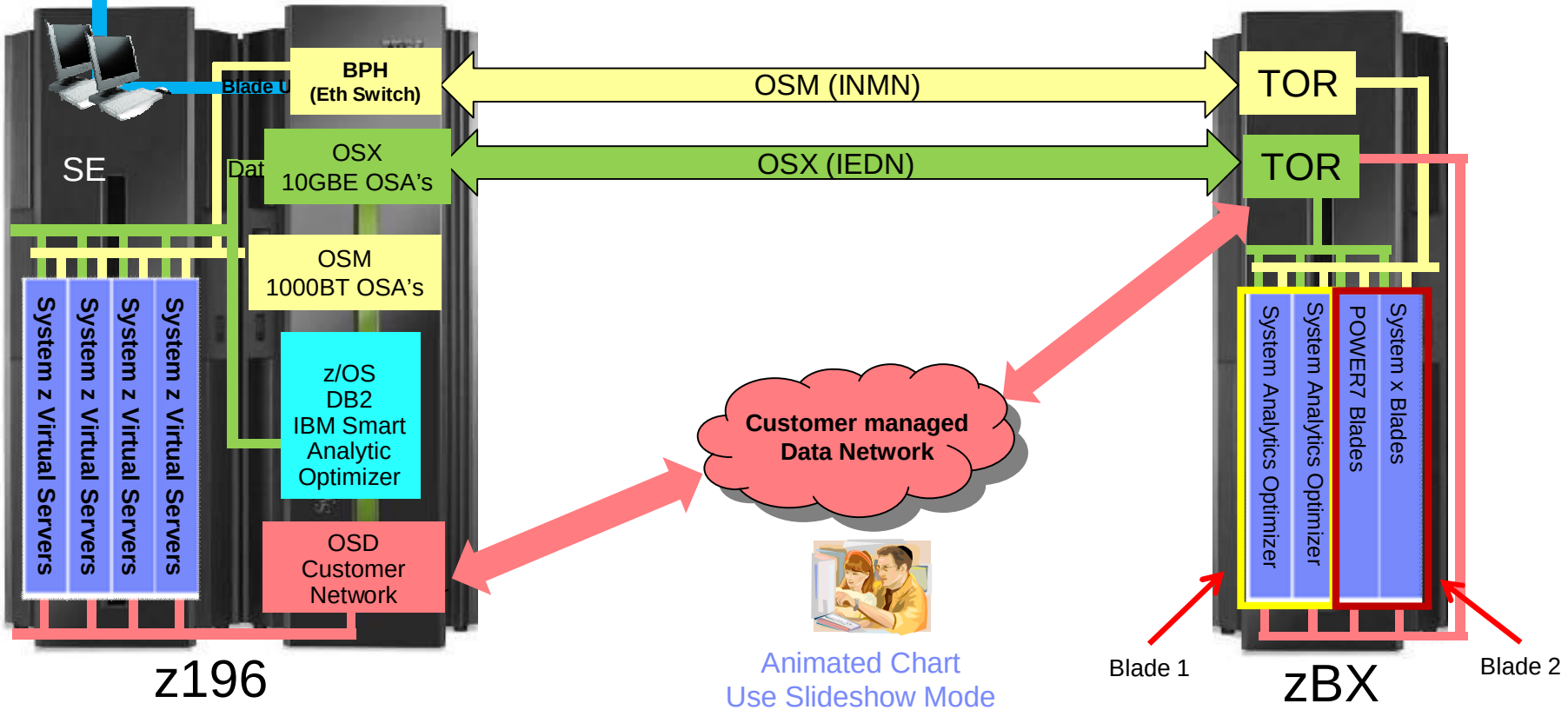
z196, zBX Info

IBM Service Updates

Virtual Server to Virtual Server Communications

IBM Smart Analytic Optimizer DB Updates

Power Monitoring / Management



Animated Chart
Use Slideshow Mode
(hit enter after each anime)

Z11 (buildt in 1956, Konrad Zuse), so lets have a look at z196 ....

Technical data:

Calculation
Floating point, 27 Bit Word length

Technology
1665 Relais,
654 Relais storage

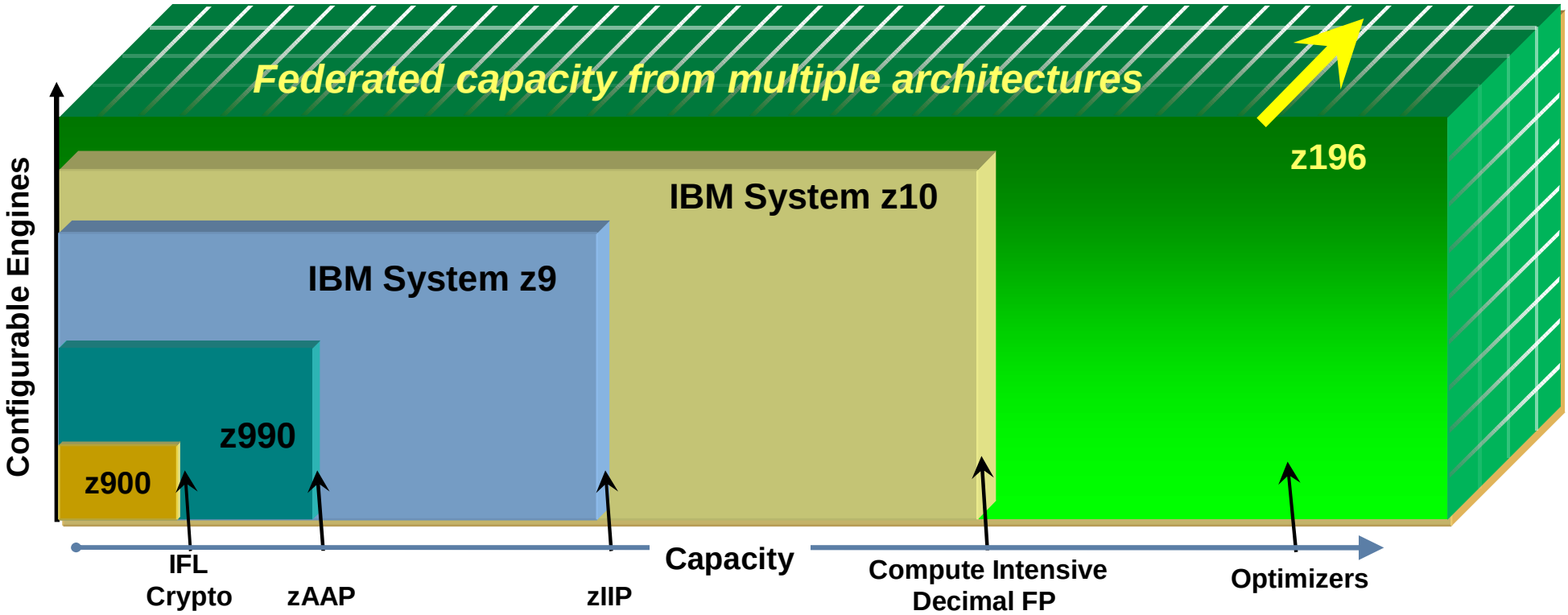
Frequency:
10-20 Hertz (mechanical)
Power: 2000 W
Weightt: 800Kg
Number of switches: 28

z196 performance and scalability

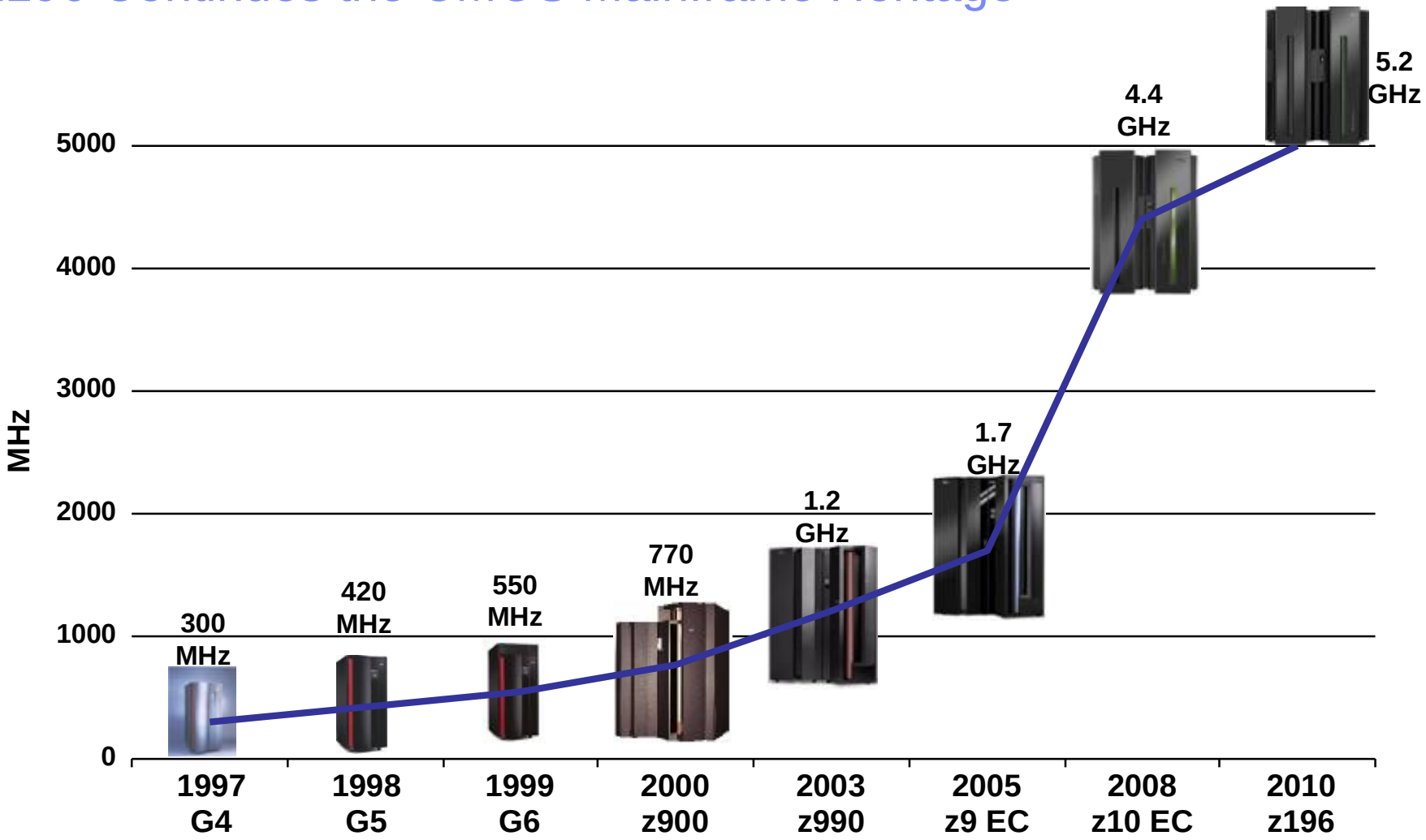
Think Inside the box! Think System z Qualities of Service!

- **zEnterprise ensembles – Multiple nodes**
  - Node – z196 with or without zBX
- **zEnterprise Unified Resource Manager**
- **Multiple architectures**
  - z/Architecture®
  - Power Architecture® - POWER7
  - X-Architecture®

- **z196**
  - Largest z196 model
    1.6x compared to z10 EC E64
  - Equivalent n-ways
    1.4x compared to z10 EC
  - With compiler optimization additional 30% additional for some CPU intensive work



z196 Continues the CMOS Mainframe Heritage



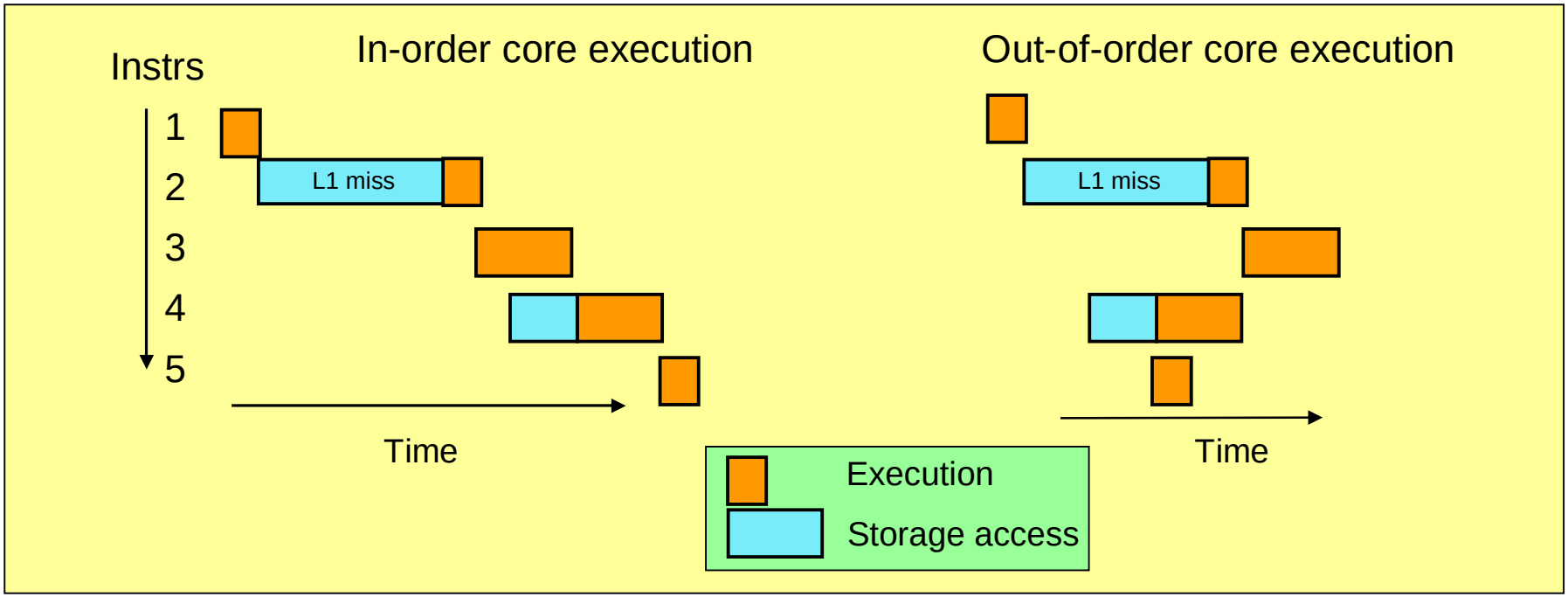
§ **G4** – 1st full-custom CMOS S/390® § **G5** – IEEE-standard BFP; branch target prediction § **G6** – Copper Technology (Cu BEOL)	§ **z900** – Full 64-bit z/Architecture § **z990** – Superscalar CISC pipeline § **z9 EC** – System level scaling	§ **z10 EC** – Architectural extensions § **z196** – Additional Architectural extensions and new cache structure

z196 Overview

- **Machine Type**
  - 2817
- **5 Models**
  - M15, M32, M49, M66 and M80
- **Processor Units (PUs)**
  - 20 (24 for M80) PU cores per book
  - Up to 14 SAPs per system, standard
  - 2 spares designated per system
  - Dependant on the H/W model - up to 15,32,49,66 or 80 PU cores available for characterization
    - Central Processors (CPs), Integrated Facility for Linux (IFLs), Internal Coupling Facility (ICFs), System z Application Assist Processors (zAAPs), System z Integrated Information Processor (zIIP), optional - additional System Assist Processors (SAPs)
  - Sub-capacity available for up to 15 CPs
    - 3 sub-capacity points
- **Memory**
  - System Minimum of 32 GB
  - Up to 768 GB per book
  - Up to 3 TB for System and up to 1 TB per LPAR
    - Fixed HSA, standard
    - 32/64/96/112/128/256 GB increments
- **I/O**
  - Up to 48 I/O Interconnects per System @ 6 GBps each
  - Up to 4 Logical Channel Subsystems (LCSSs)
- **STP - optional** (No ETR)

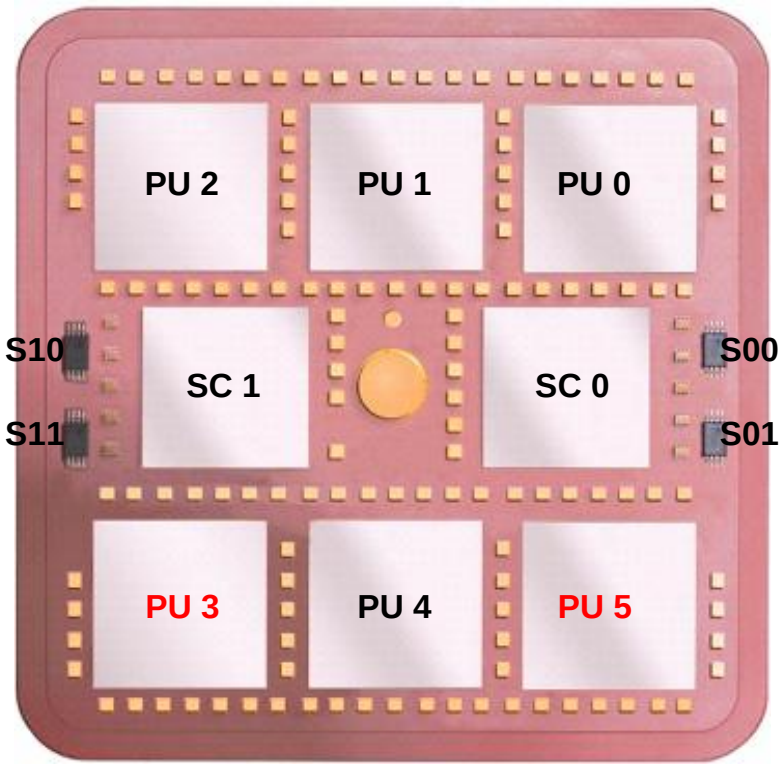
z196 Out of Order (OOO) Value

- **OOO yields significant performance benefit for compute intensive apps through**
  - Re-ordering instruction execution
    - Later (younger) instructions can execute ahead of an older stalled instruction
  - Re-ordering storage accesses and parallel storage accesses
- **OOO maintains good performance growth for traditional apps**



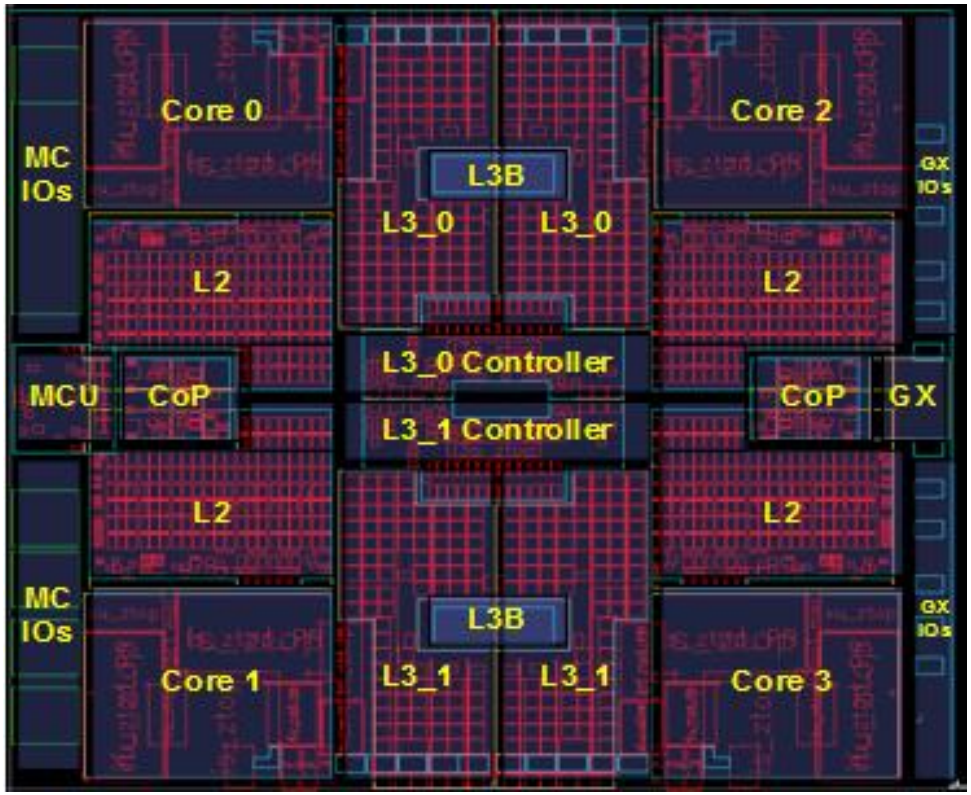
z196 Multi-Chip Module (MCM) Packaging

§ **96mm x 96mm MCM**
- 103 Glass Ceramic layers
- 8 chip sites
- 7356 LGA connections
- 20 and 24 way MCMs
- Maximum power used by MCM is 1800W



§ **CMOS 12s chip Technology**
- PU, SC, S chips, 45 nm
- 6 PU chips/MCM – Each up to 4 cores
  - One memory control (MC) per PU chip
  - 23.498 mm x 21.797 mm
  - 1.4 billion transistors/PU chip
  - L1 cache/PU core
    - 64 KB I-cache
    - 128 KB D-cache
  - L2 cache/PU core
    - 1.5 MB
  - L3 cache shared by 4 PUs per chip
    24 MB
  - 5.2 GHz
- 2 Storage Control (SC) chip
  - 24.427 mm x 19.604 mm
  - 1.5 billion transistors/SC chip
  - L4 Cache 96 MB per SC chip (192 MB/Book)
  - L4 access to/from other MCMs
- 4 SEEPROM (S) chips
  - 2 x active and 2 x redundant
  - Product data for MCM, chips and other engineering information
- Clock Functions – distributed across PU and SC chips
  - Master Time-of-Day (TOD) function is on the SC

z196 Quad Core PU Chip Detail

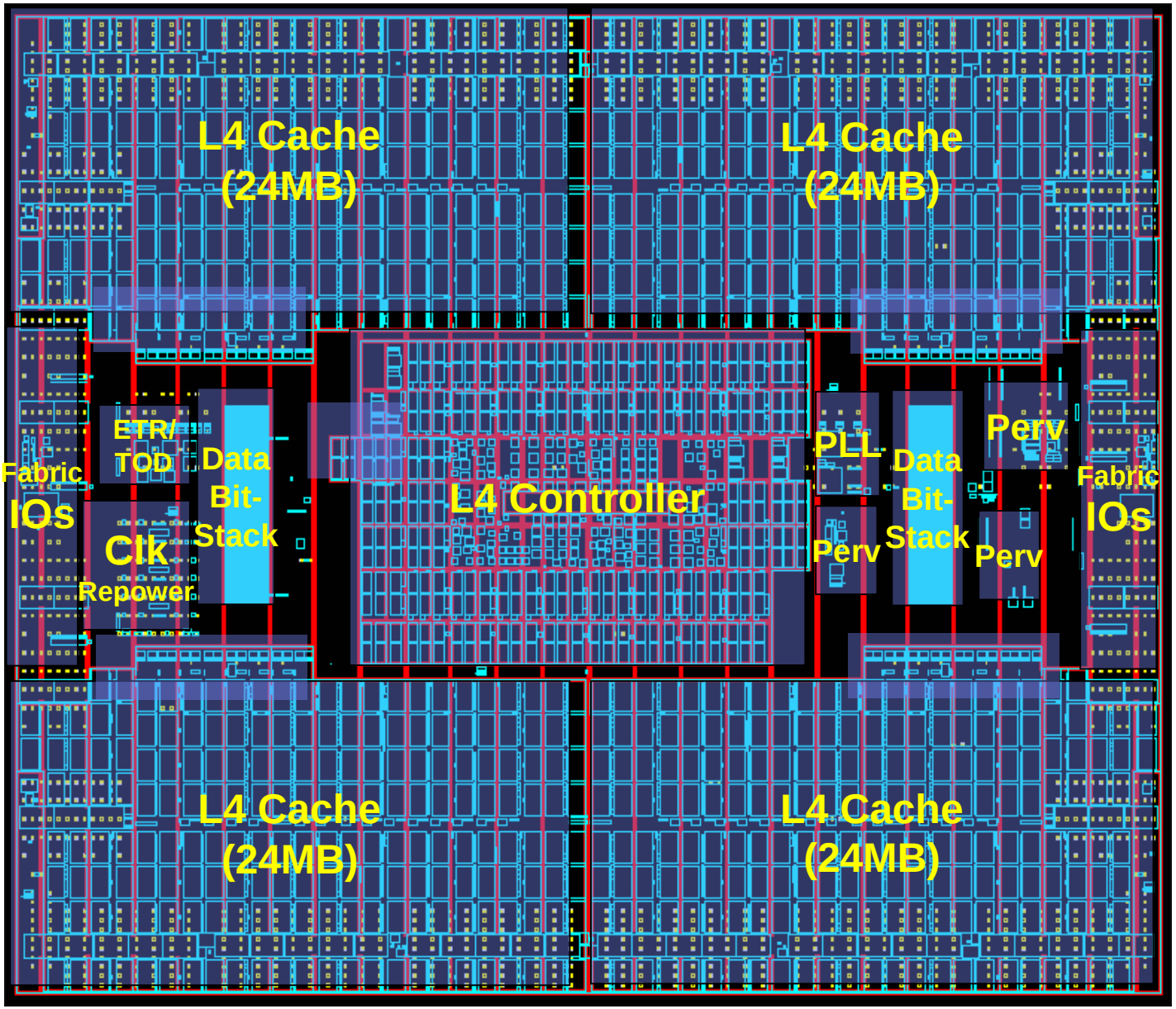


- **12S0 45nm SOI Technology**
  - 13 layers of metal
  - 3.5 km wire
- **1.4 Billion Transistors**
- **Chip Area – 512.3mm²**
  - 23.5mm x 21.8mm
  - 8093 Power C4's
  - 1134 signal C4's

- **Up to Four active cores per chip**
  - 5.2 GHz
  - L1 cache/ core
    - 64 KB I-cache
    - 128 KB D-cache
  - 1.5 MB private L2 cache/ core
- **Two Co-processors (COP)**
  - **Crypto & compression accelerators**
  - Includes 16KB cache
  - Shared by two cores
- **24MB eDRAM L3 Cache**
  - Shared by all four cores
- **Interface to SC chip / L4 cache**
  - 41.6 GB/sec to each of 2 SCs
- **I/O Bus Controller (GX)**
  - Interface to Host Channel Adapter (HCA)
- **Memory Controller (MC)**
  - Interface to controller on memory DIMMs
  - Supports RAIM design

z196 SC Chip Detail

- **12S0 45nm SOI Technology**
  - 13 layers of metal
- **Chip Area – 478.8mm^2**
  - 24.4mm x 19.6mm
  - 7100 Power C4's
  - 1819 signal C4's
- **1.5 Billion Transistors**
  - 1 Billion cells for eDRAM
- **eDRAM Shared L4 Cache**
  - 96 MB per SC chip
  - 192 MB per Book
- **6 CP chip interfaces**
- **3 Fabric interfaces**
- **2 clock domains**
- **5 unique chip voltage supplies**



Conclusion or what is IBM zEnterprise system all about?

Re-write the rulebook and set new standards for business-centric IT with IBM System z, to be the world's premier workload-optimized platform for enterprise applications.

Our Vision:

Deliver the best of all worlds - Mainframe, UNIX®, x86 and single function processors - integrated in a single system for ultimate flexibility and simplicity to optimize service, risk, and cost across multiple heterogeneous workloads.

Thank you for your audience !

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