Der Mainframe

gestern, heute und morgen!

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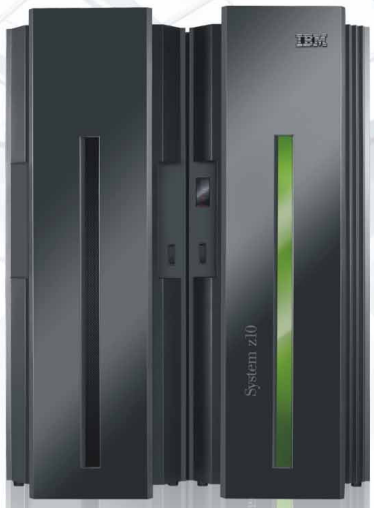


The Future Runs on System z

IBM Systems

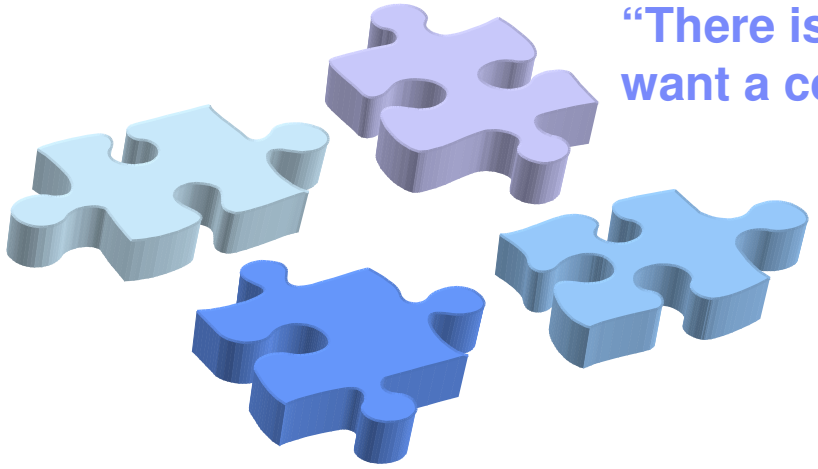
The Global Technology Outlook (GTO 2007)

"I think there is a world market for maybe five computers."

Thomas Watson, chairman of IBM, 1943

"Computers in the future may weigh no more than 1.5 tons. "

Popular Mechanics, 1949



"There is no reason anyone would want a computer in their home. "

Ken Olsen, founder of DEC, 1977

"640K ought to be enough for anybody. "

Bill Gates, 1981

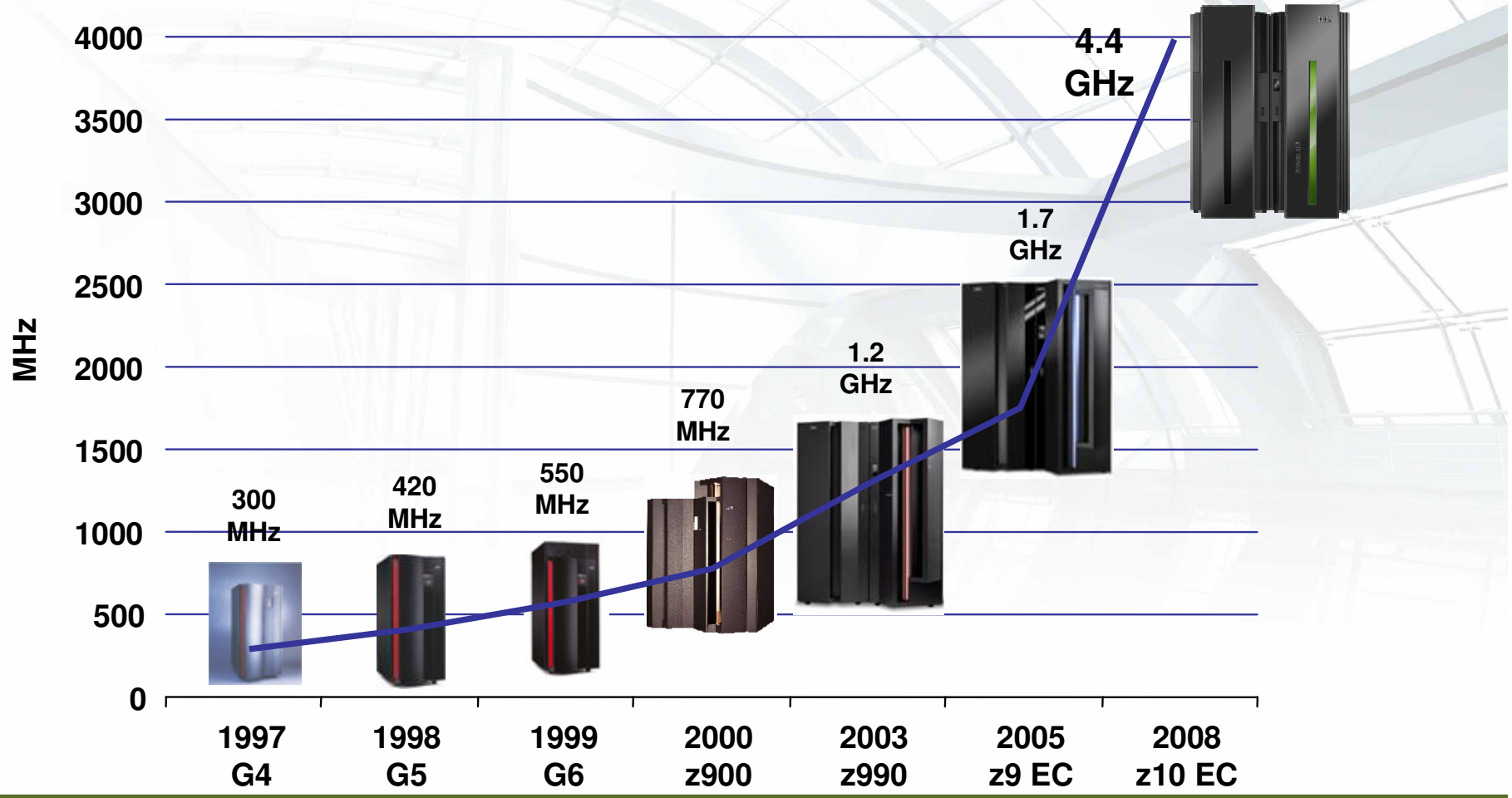
"Prediction is difficult, especially about the future"

Yogi Berra

Von 'System/360' (S/360) zu ESA/390 und z/-Architektur

- **1964 S/360**
  - **CISC, 24bit Adressierung, 'Real Storage', Uniprozessoren**
  - Amdahl, G.M., Blaauw, G.A., and Brooks, F.P.: ***Architecture of the IBM System/360***
- **1971 S/370**
  - **'Virtual Storage', Multiprozessor-Unterstützung, ...**
- **1981 S/370 XA** (E***x***tended ***A***rchitecture)
  - **31bit Adressierung (2GB), 'Expanded Storage' (>2GB), 'Channel Subsystem'**
  - **'Interpretive Execution': Basis für *L*ogische *Par*titionierung ('LPAR')**
- **1988 ESA/370**
  - **ESA = Enterprise Systems Architecture, Logische Partitionierung**
  - **Ausbau der Speicher-Zugriffsmethoden: Mehr als ein 'address space'**
- **1990 ESA/390**
  - **'ESCON' (*E*nterprise *S*ystems *Con*nection Architecture) Glasfasertechnologie ...**
  - **Datenkompression, Kryptographie, LPAR Erweiterungen**
- **1994 Parallel Sysplex, Übergang von Bipolar zu CMOS Technologie**
  - **'Coupling Facility', Cluster von bis zu 32 x 16-way MultiProzessoren**
  - **'FICON' (*Fi*ber Channel *Con*nectivity), Ausbau der Glasfasertechnologie**
- **2000 z/-Architektur (64-bit), z900, z800, z990(2003), z890(2004), z9 EC(2005), z9 BC(2006)**
- **2008 z10 EC, z10 BC**

IBM z10 EC Continues the CMOS Mainframe Heritage

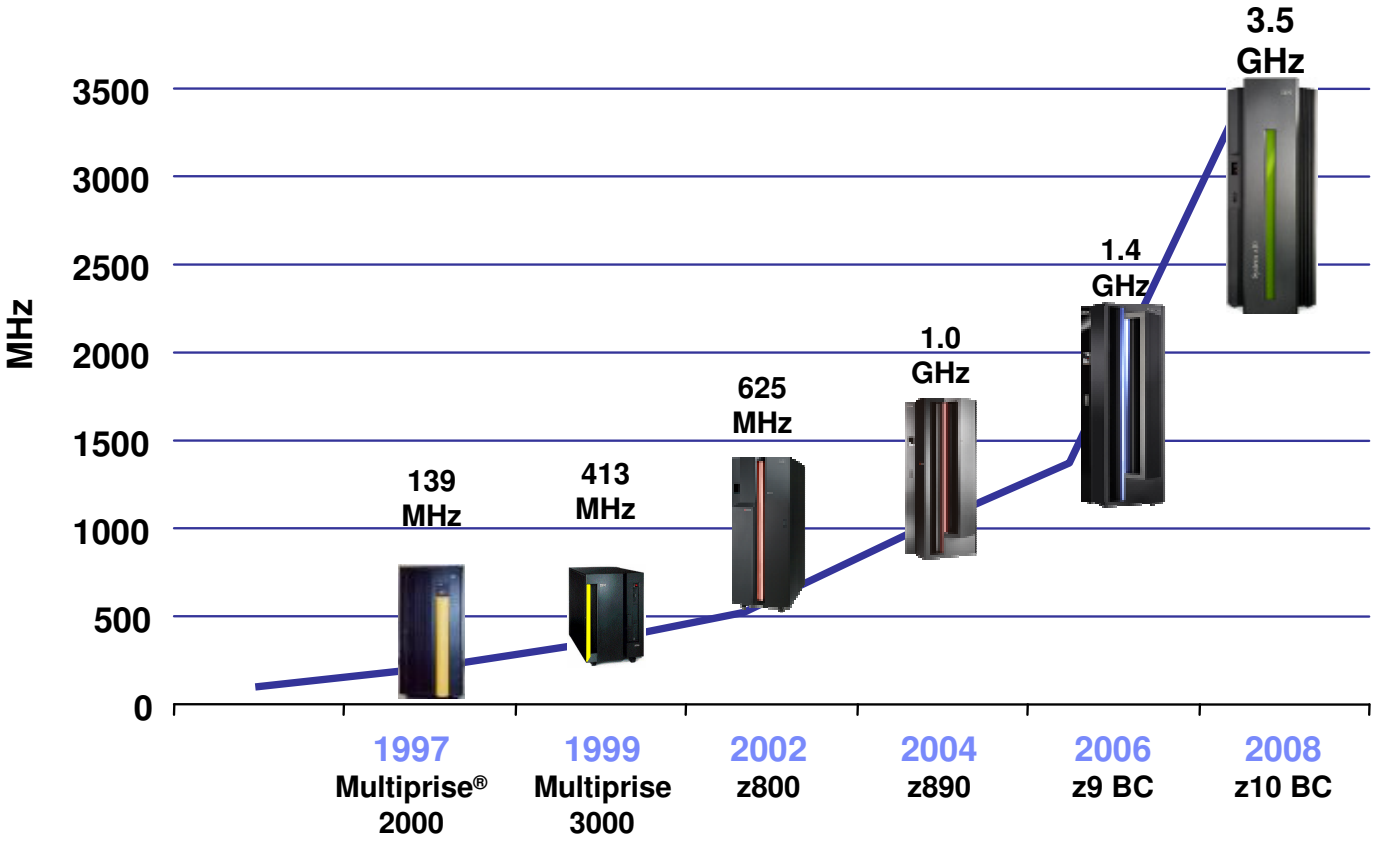


- G4 - 1st full-custom CMOS S/390®
- G5 - IEEE-standard BFP; branch target prediction
- G6 - Cu BEOL

- IBM eServer zSeries 900 (z900) - Full 64-bit z/Architecture®
- IBM e Server zSeries 990 (z990) - Superscalar CISC pipeline
- z9 EC - System level scaling

- z10 EC - Architectural extensions

IBM z10 BC continues the CMOS Mainframe heritage

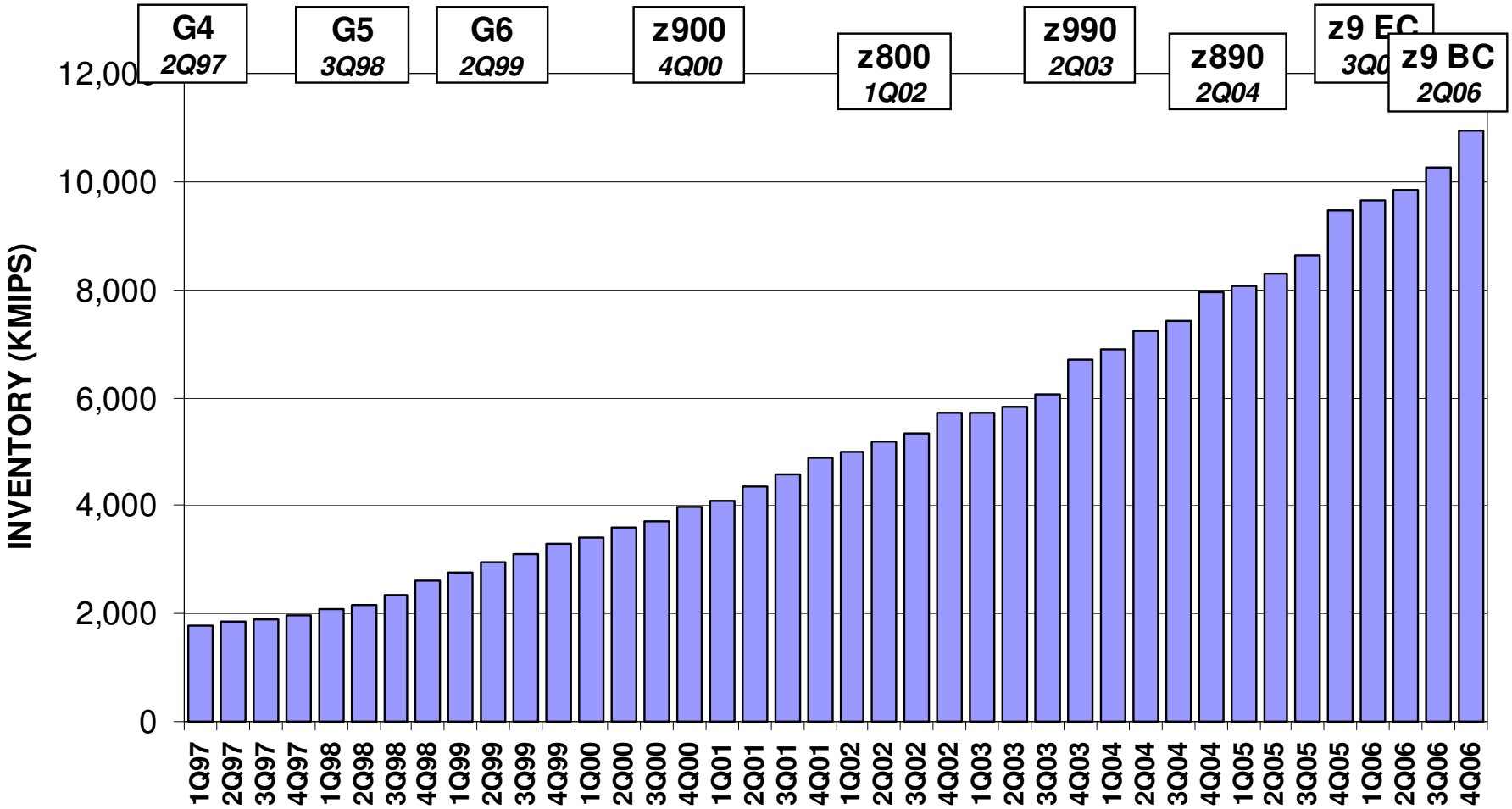


- Multiprise 2000 - 1st full-custom Mid-range CMOS S/390
- Multiprise 3000 – Internal disk, IFL introduced on midrange

- IBM eServer zSeries 800 (z800) - Full 64-bit z/Architecture®
- IBM eServer zSeries 890 (z890) - Superscalar CISC pipeline
- z9 BC - System level scaling

- z10 BC - Architectural extensions
- Higher frequency CPU

Mainframe Growth



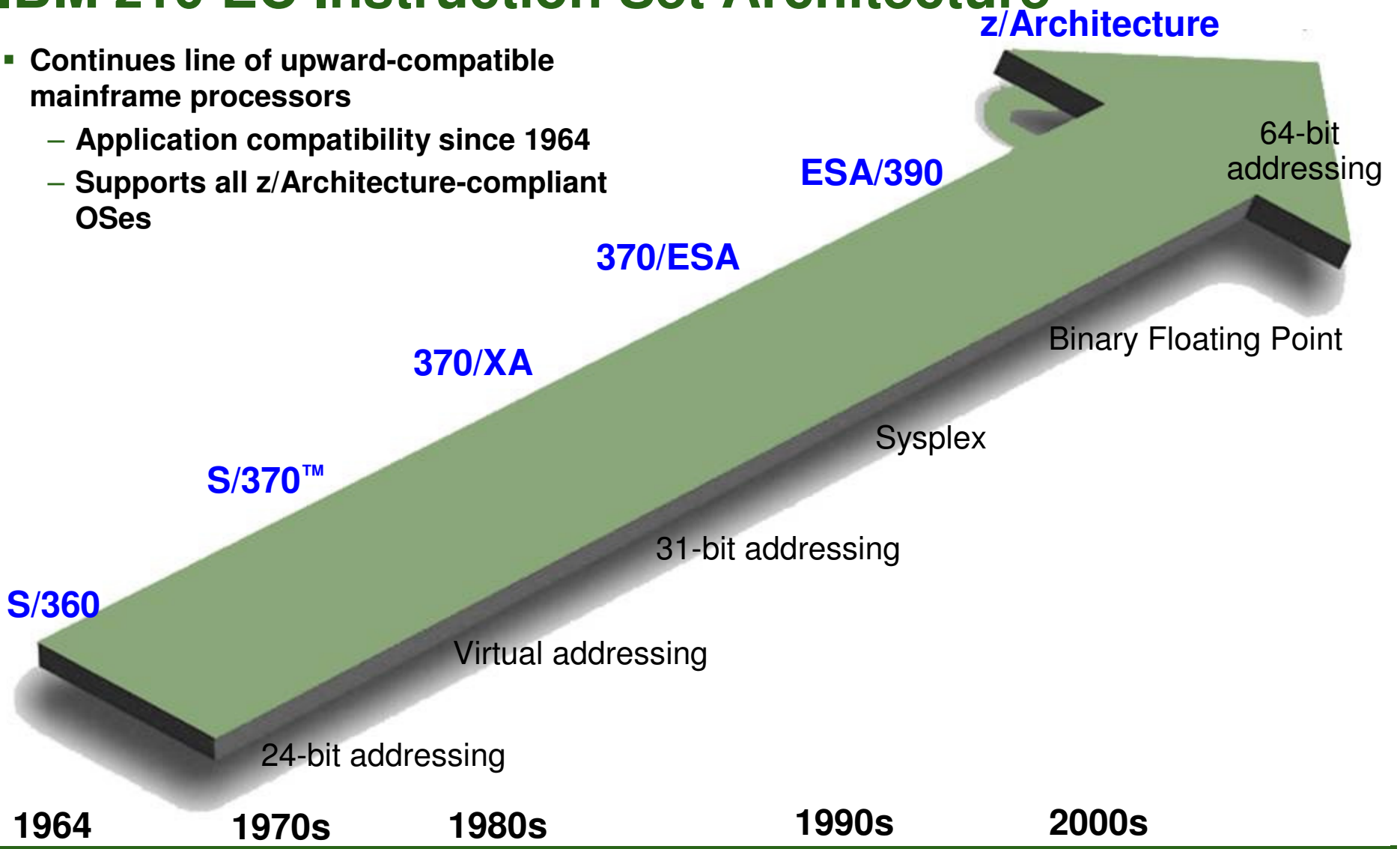
Source: IBM STG Finance

Do GHz matter?

- GHz does matter
  - It is the "rising tide that lifts all boats"
  - It is especially important for CPU-intensive applications
- GHz is not the only dimension that matters
  - System z focus is on balanced system design across many factors
    - Frequency, pipeline efficiency, energy efficiency, cache / memory design, I/O design
- System performance is not linear with frequency
  - Need to use LSPR + System z capacity planning tools for real client / workload sizing
- System z has been on consistent path while others have oscillated between extremes
  - Growing frequency steadily, with occasional jumps/step functions (G4 in 1997, z10 in 2008)
- z10 leverages technology to get the most out of high-frequency design
  - Low-latency pipeline
  - Dense packaging (MCM) allows MRU cooling which yields more power-efficient operation
  - Virtualization technology (etc.) allows consistent performance at high utilization, which makes CPU power-efficiency a much smaller part of the system/data-center power consumption picture

IBM z10 EC Instruction Set Architecture

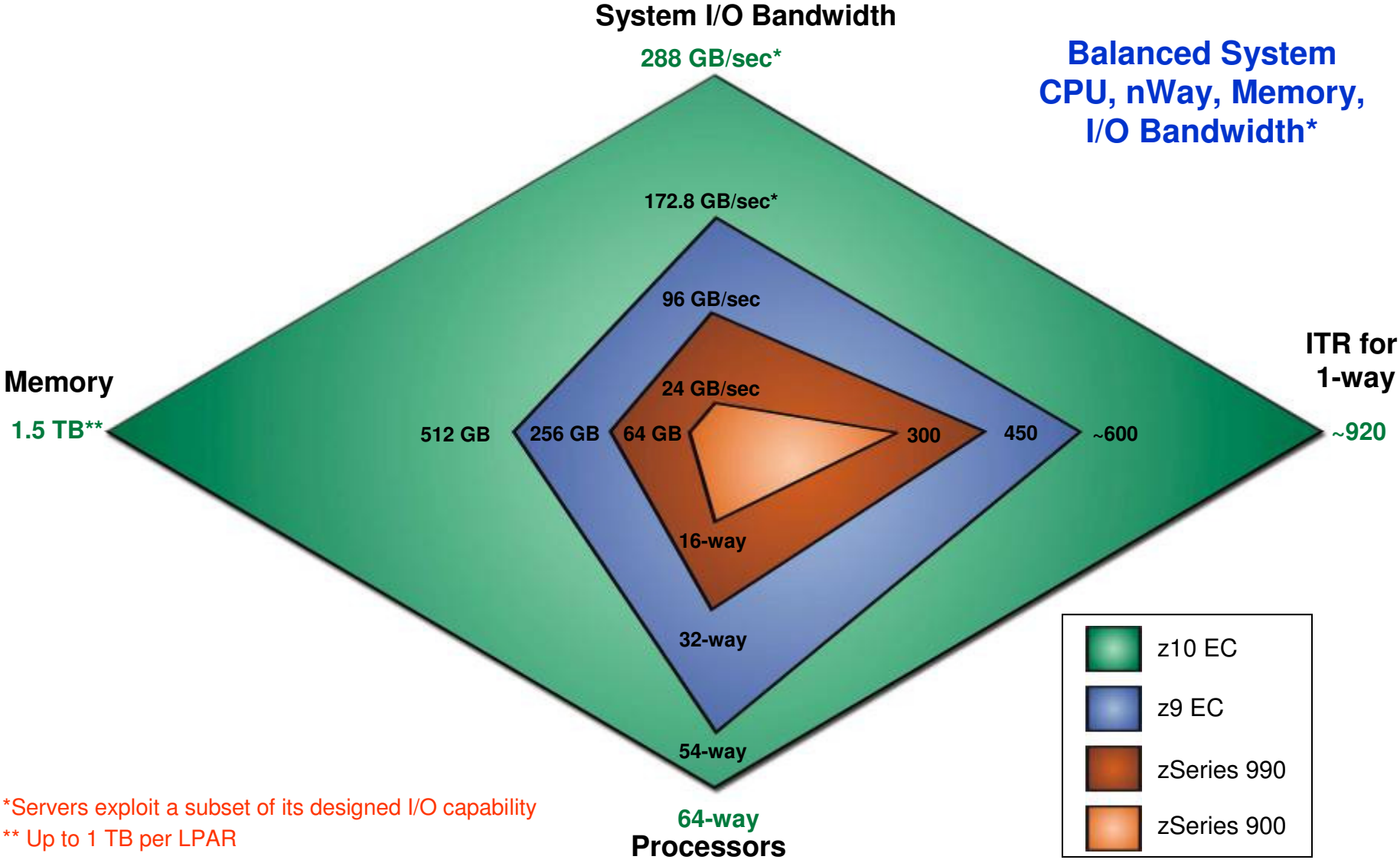
- **Continues line of upward-compatible mainframe processors**
  - **Application compatibility since 1964**
  - **Supports all z/Architecture-compliant OSes**



z10 EC Architecture

- Continues line of upward-compatible mainframe processors
- Rich CISC Instruction Set Architecture (ISA)
  - 894 instructions (668 implemented entirely in hardware)
  - 24, 31, and 64-bit addressing modes
  - Multiple address spaces robust inter-process security
  - Multiple arithmetic formats
  - Industry-leading virtualization support
    - High-performance logical partitioning via PR/SM
    - Fine-grained virtualization via z/VM scales to 1000's of images
  - Precise, model-independent definition of hardware/software interface
- Architectural extensions for IBM z10 EC
  - 50+ instructions added to improve compiled code efficiency
  - Enablement for software/hardware cache optimization
  - Support for 1MB page frames
  - Full hardware support for Hardware Decimal Floating-point Unit (HDFU)

IBM System z: System Design Comparison



*Servers exploit a subset of its designed I/O capability

** Up to 1 TB per LPAR

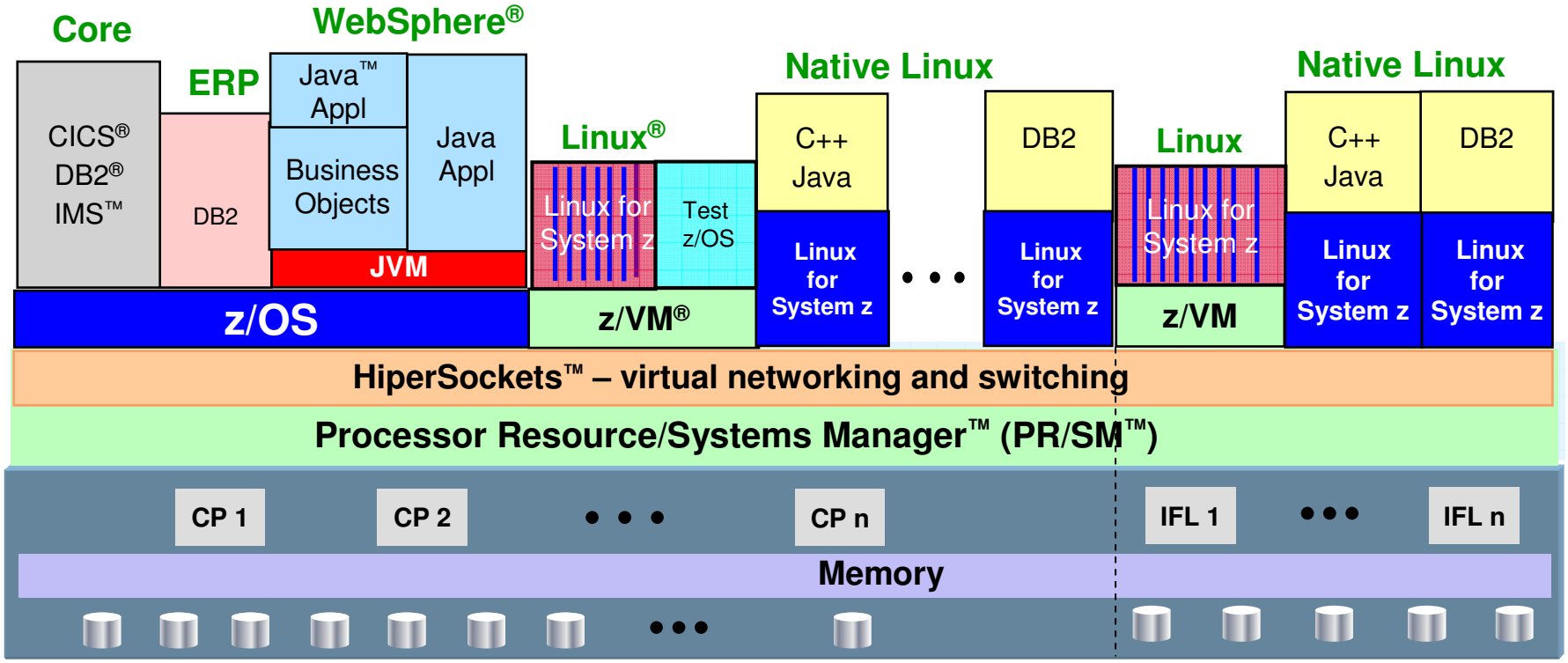
Protecting your investment in IBM technology

- **Designed to protect your investment by offering upgrades from z9 EC and z990 to the z10 EC**
- **Full upgradeability within the System z10 family**
  - Upgrade to Model E64 will require a planned outage
- **Temporary or permanent growth when you need it**
  - New provisioning architecture

“Top 10” values of System z

1. RAS, RAS, RAS
2. Throughput
3. Scalability
4. Automated Management
5. Built-in Security
6. Hub for SOA
7. Hub for Data
8. Virtualization & Flexibility
9. Open Standards
10. Pre-integration

System z – The Ultimate Virtualization Resource



- Massive, robust consolidation platform; virtualization is built in, not added on
- Up to 60 logical partitions on PR/SM; 100's to 1000's of virtual servers on z/VM
- Virtual networking for memory-speed communication, as well as virtual layer 2 and layer 3 networks supported by z/VM
- Most sophisticated and complete hypervisor function available
- Intelligent and autonomic management of diverse workloads and system resources based on business policies and workload performance objectives


IBM
Gibt es bis hierher noch Fragen?
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