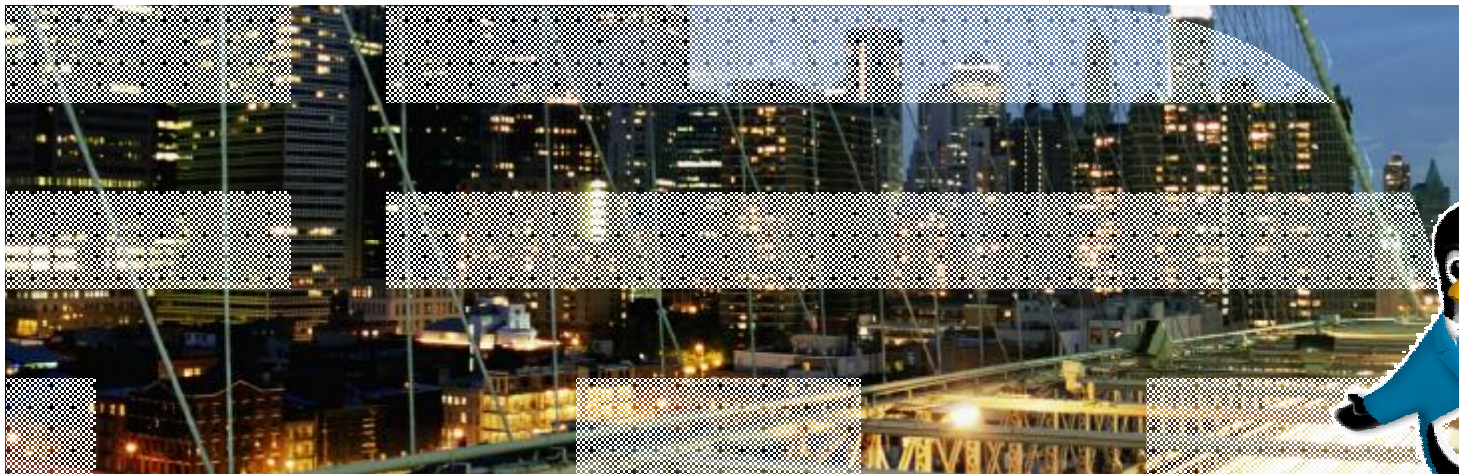


Linux on the IBM Enterprise Linux Server: Solutions for your data center



IDC: Mainframe Directions: Today's Workloads and Future Outlook: Special Study Sep 2009, IDC #219797, Volume:1

- § The mainframe as an enterprise-class server has a long life expectancy ahead, combining its dominance in performing traditional **high-value high-volume computing workloads** with newer capabilities that **support "modern" workloads** based on Linux, Java, and Web applications.
- § Enterprise Linux workloads need RAS features and security to boost overall reliability and availability. To the degree that distributed systems applications are moved to Linux on z, then the System z **RAS and security make System z a strong alternative for enterprise Linux application deployment.**
- § Overall, the **IBM mainframe continues to be an important force in enterprise computing.**

www.idc.com/getdoc.jsp?containerId=219797

IBM and Linux on System z can help.



Highly Virtualized



Highly Scalable



Highly Secure



Highly Available

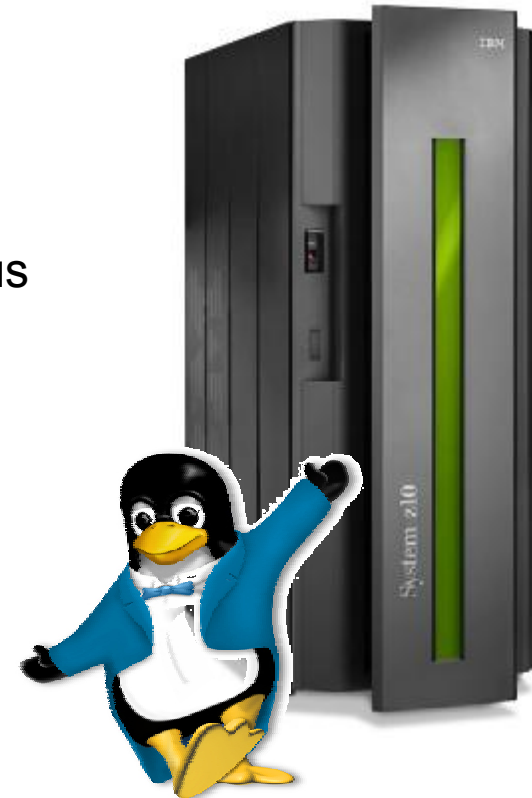


Highly Efficient

ibm.com/systems/z/linux

Agenda

- § ISV ecosystem
- § Extreme virtualization capabilities
- § RAS (Reliability, Availability, Serviceability) design focus
- § Server consolidation benchmark
- § IBM internal consolidation project
- § Value proposition



System z ISV Ecosystem

Dramatic growth responding to market demand



- * 142 ISVs added to the System z portfolio in YTD 2009
- * 900 New System z applications & tools YTD 2009
- * 1,700 + ISVs developing for our System z Ecosystem
- * 3,500 + applications available for z/OS
- * 3,000 + applications available for Linux on System z
- * 6,300 + applications available for System z



System z – RAS Design Focus

§ High Availability (HA)

- The attribute of a system designed to provide service during defined periods, at acceptable or agreed upon levels and masks UNPLANNED OUTAGES from end-users. It employs **Fault Tolerance; Automated Failure Detection, Recovery, Bypass Reconfiguration, Testing, Problem and Change Management**

§ Continuous Operations (CO)

- Attribute of a system designed to continuously operate and mask PLANNED OUTAGES from end-users. It employs **non-disruptive hardware and software changes, non-disruptive configuration, software coexistence**

§ Continuous Availability (CA)

- Attribute of a system designed to deliver non-disruptive service to the end user 7 days a week, 24 HOURS A DAY (there are no planned or unplanned outages). It includes the **ability to recover from a site disaster by switching computing to a second site**

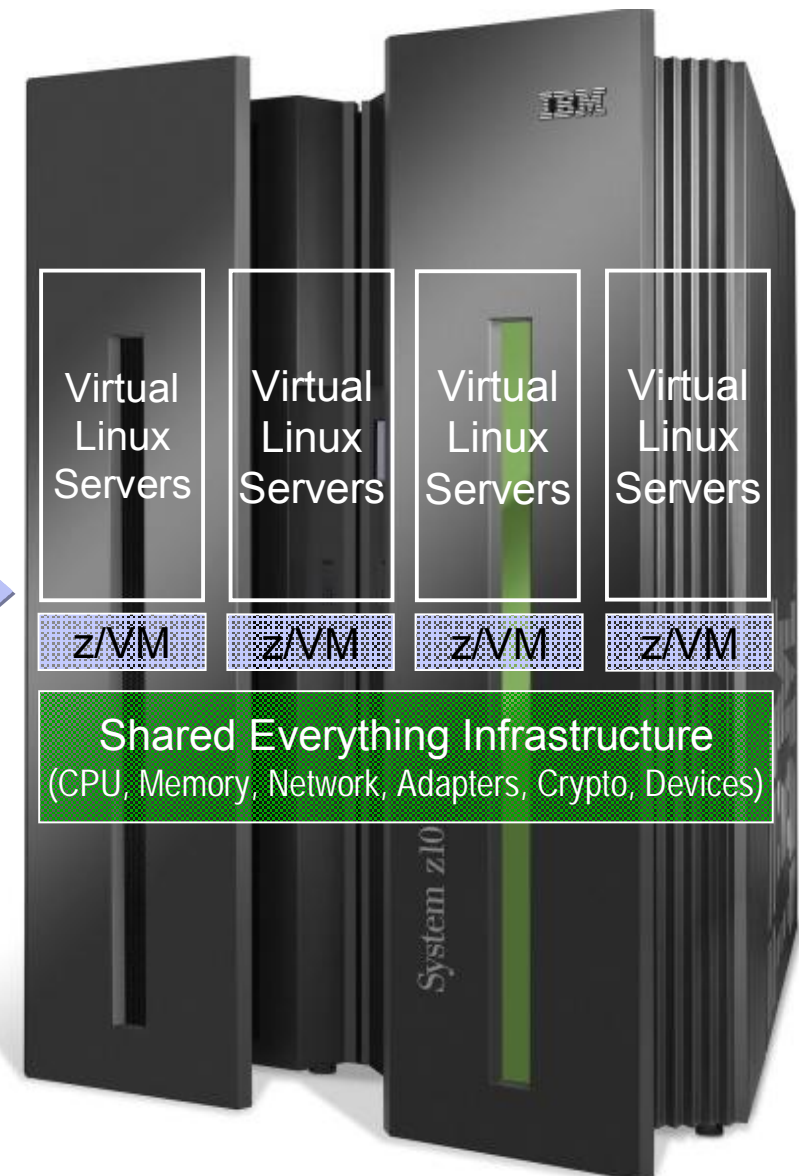
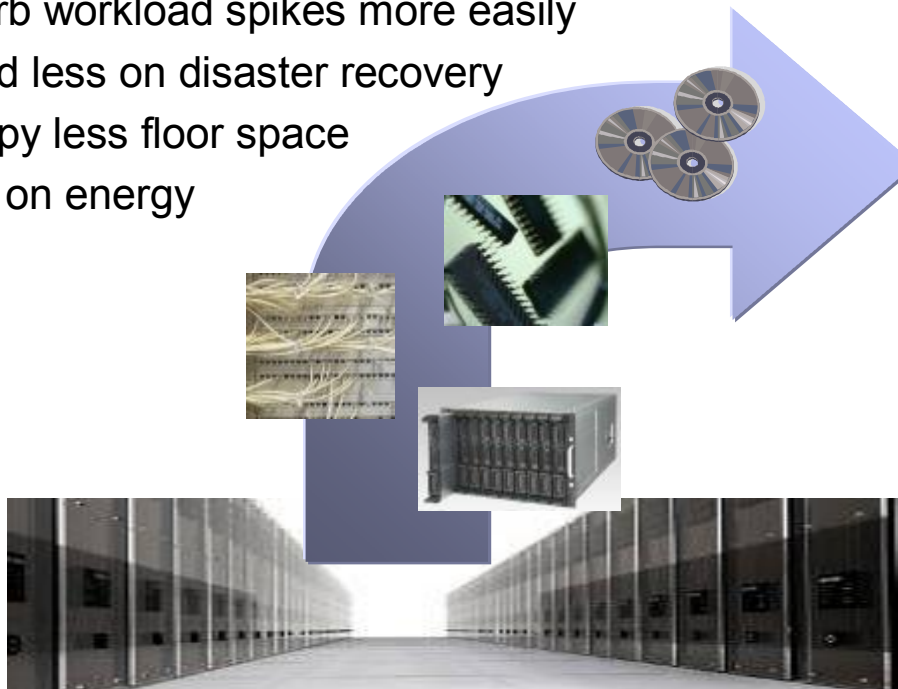


IBM System z Virtualization Support

Saving Money and Reducing Complexity

Helping You “Do More with Less” with Linux

- § Consolidate more x86 cores per CPU
- § Spend less on software license fees
- § Manage more virtual servers with fewer people
- § Deploy new servers and applications faster
- § Absorb workload spikes more easily
- § Spend less on disaster recovery
- § Occupy less floor space
- § Save on energy



Making high performance a reality

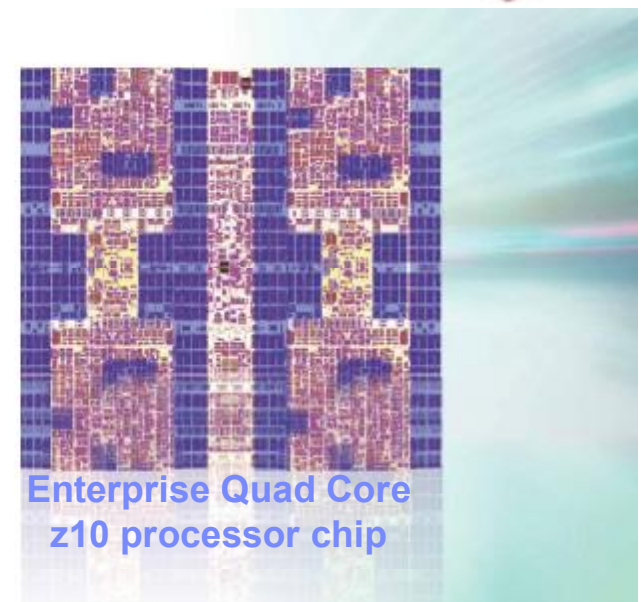
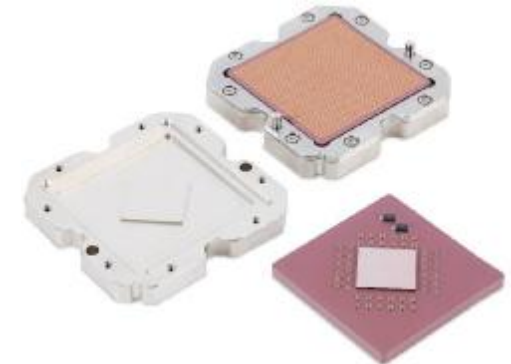
§ New Enterprise Quad Core z10 processor chip

- Up to 4.4 GHz
- Cache rich environment optimized for data serving
- 50+ instructions added to improve compiled code efficiency
- Support for 1 MB page frames

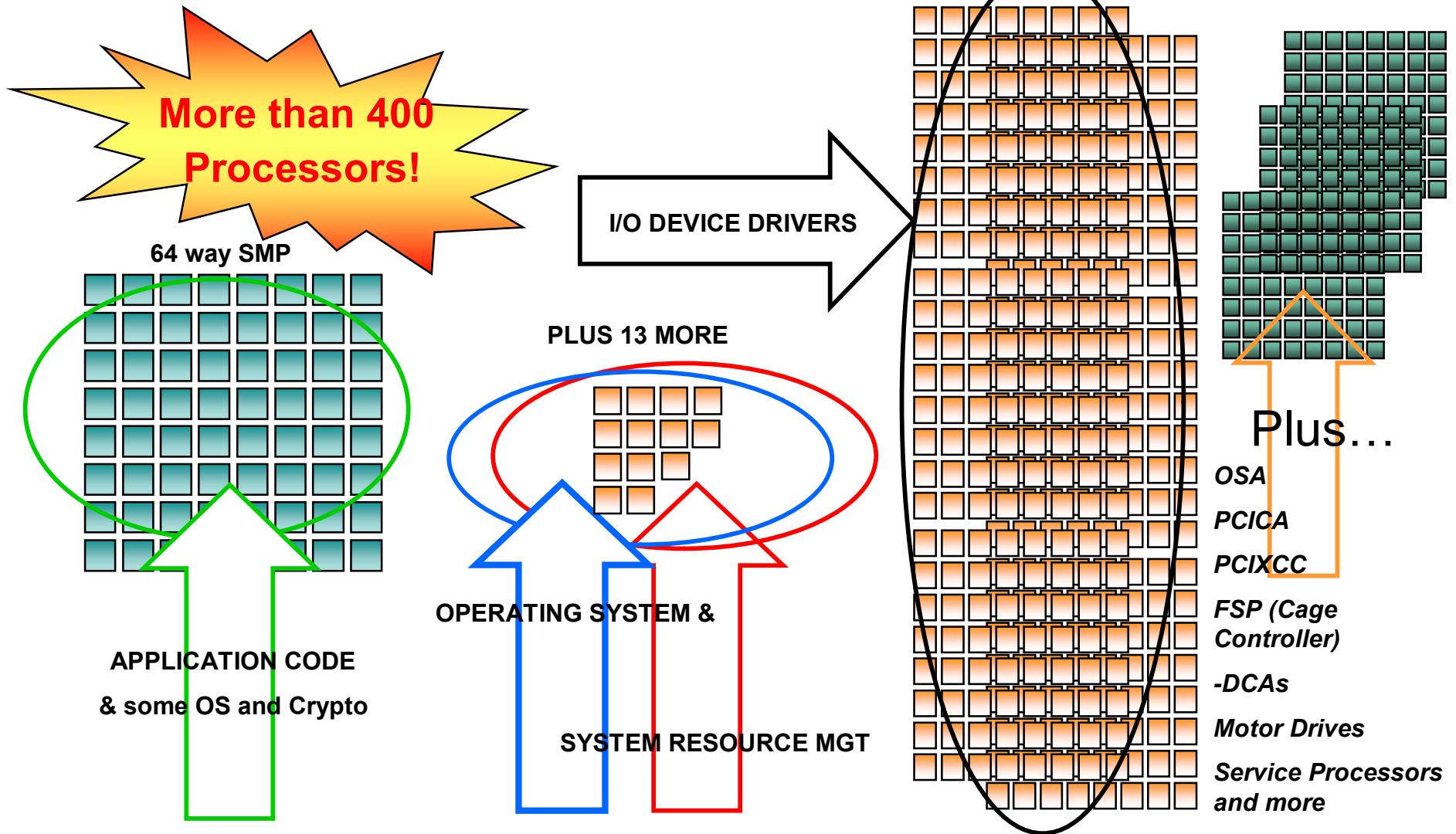
§ Hardware accelerators on the chip

- Hardware data compression
- Cryptographic functions
- Hardware Decimal Floating point

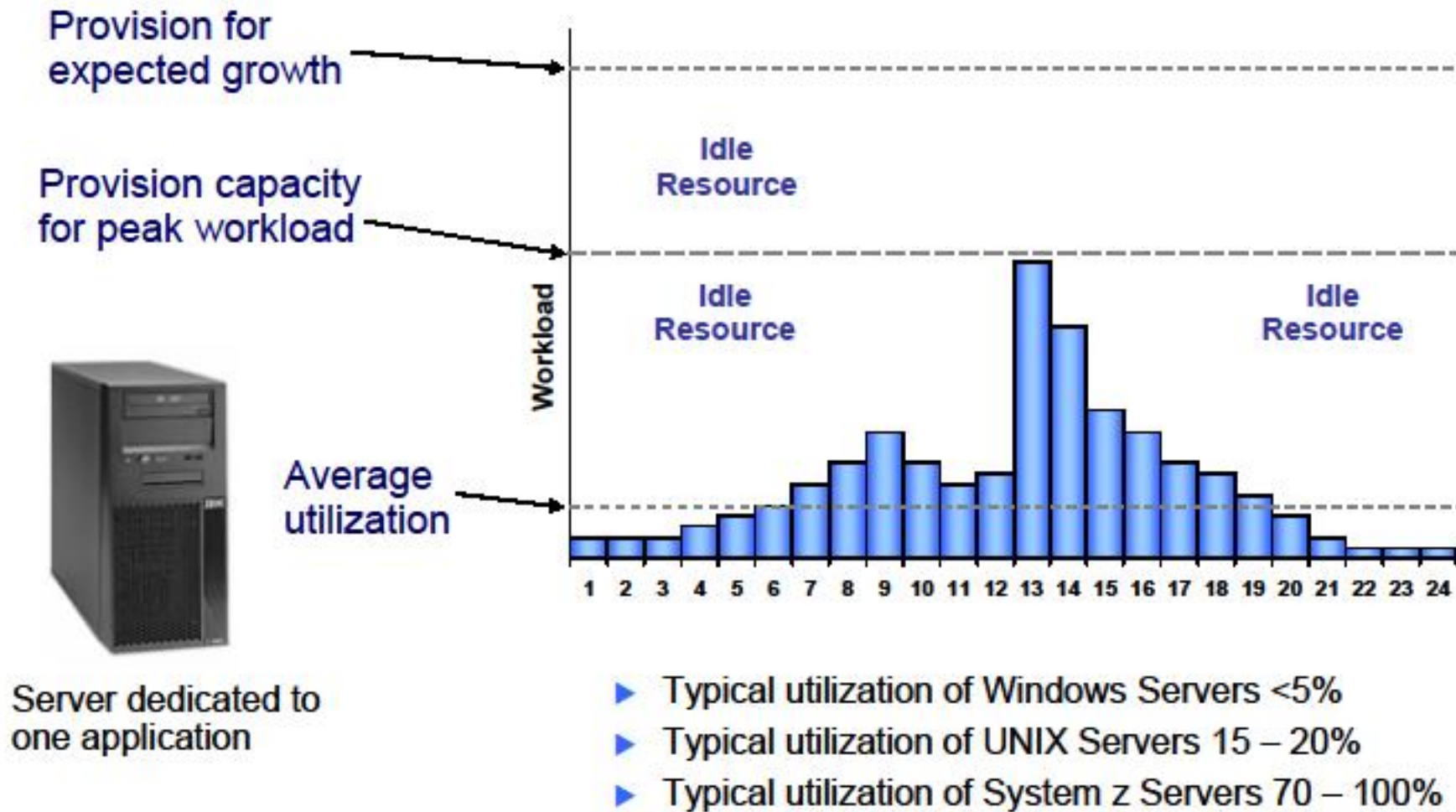
§ CPU intensive workloads get performance improvements from new core pipeline design



z10 implementation "How to build a scalable 64-way server"



Utilization of distributed servers



Why are clients consolidating to System z? Real customers. Real workloads.

Customer	Distributed Cores	IBM System z Cores	Ratio of Distributed to System z cores*
Nationwide	450	21 IFLs on z9	21 to 1
Large bank	111	4 IFLs on z10	27 to 1
Government Agency	292	5 IFLs on z10	58 to 1

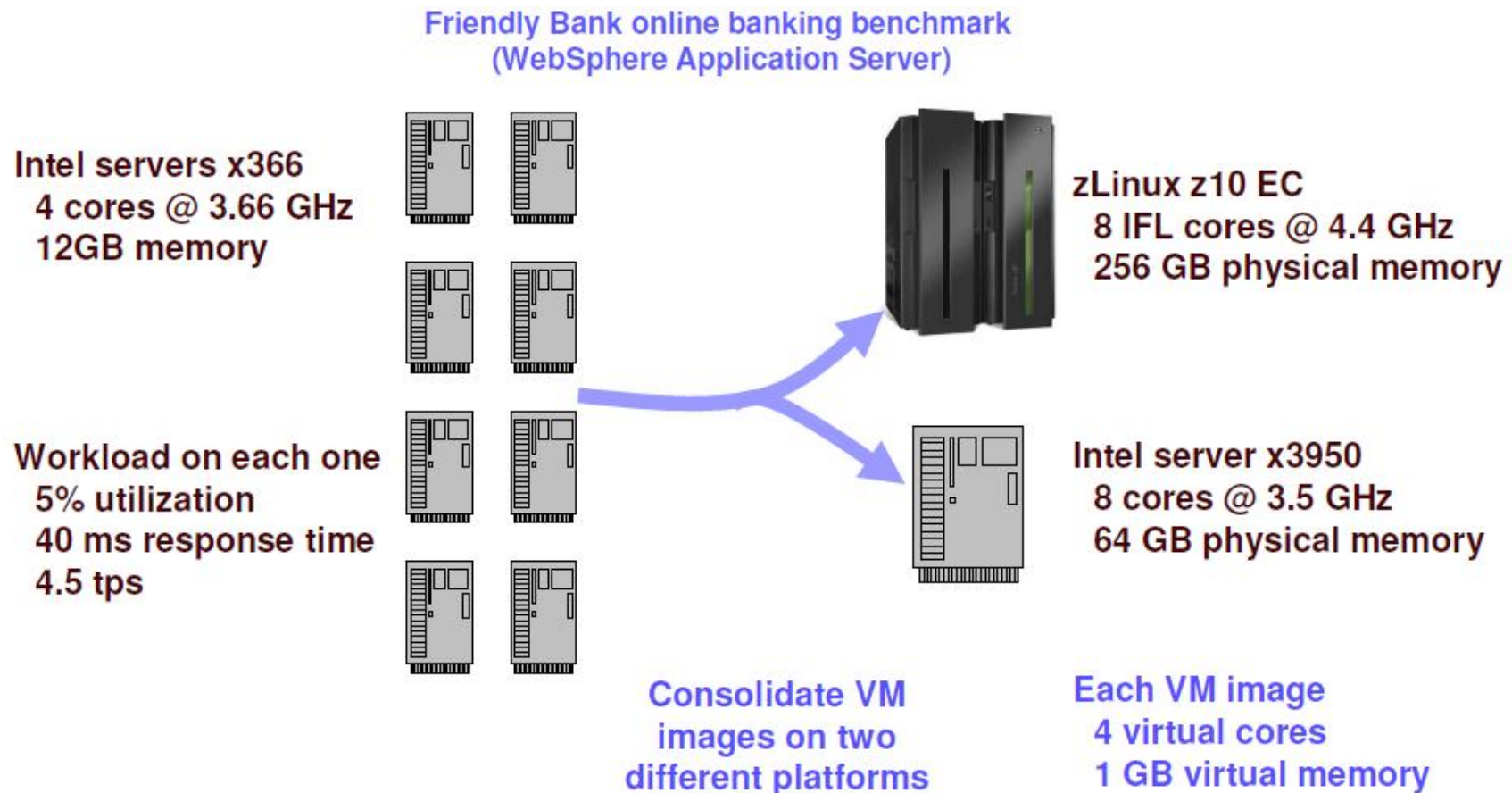
- § Unique value of System z Virtualization
- § Extremely efficient
- § Superior availability and security

* Client results will vary based on each specific customer environment including types of workloads, utilization levels, target consolidation hardware, and other implementation requirements.

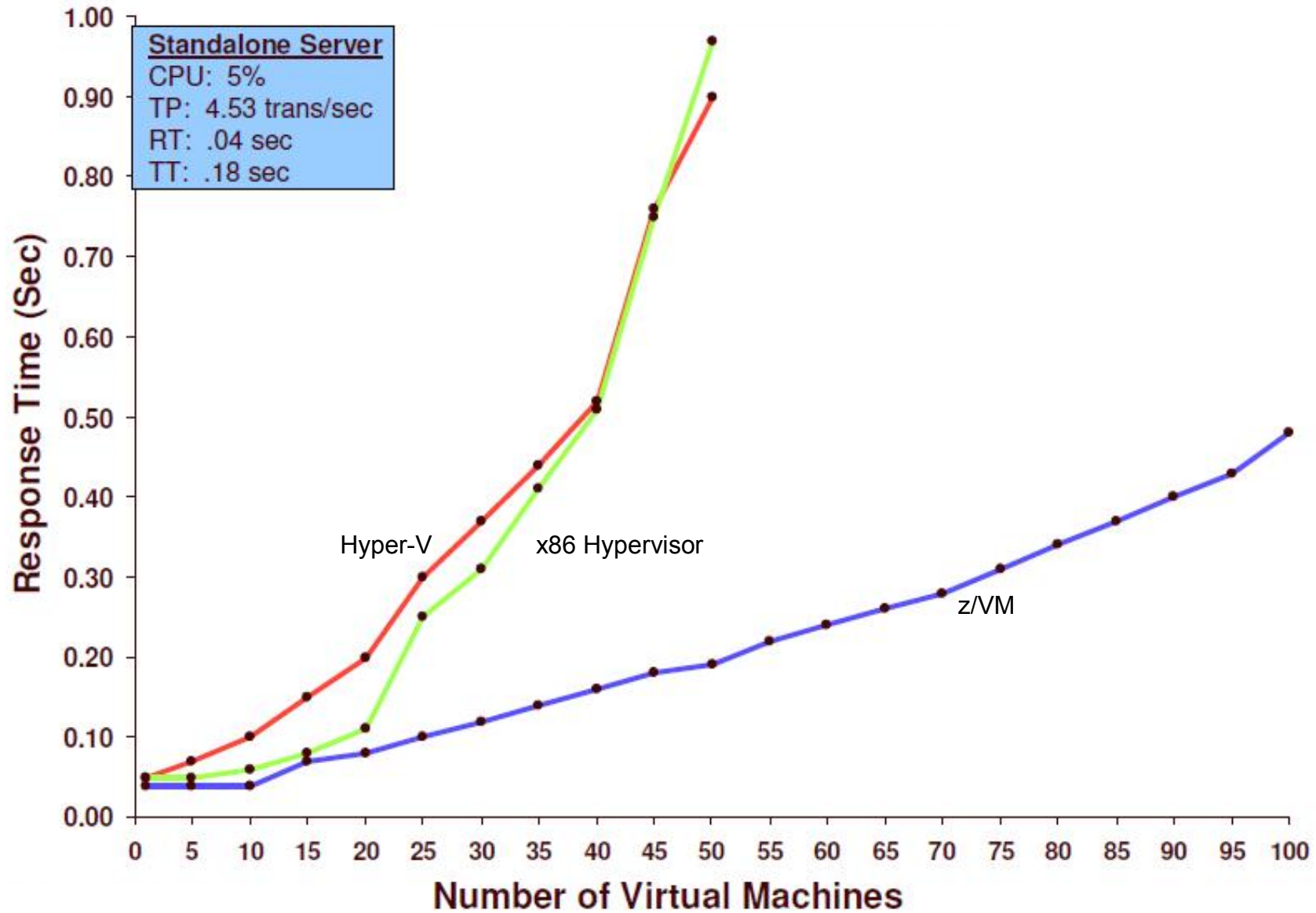
Source: zCPO

How Many Workloads Can Be Consolidated? A Benchmark Comparison

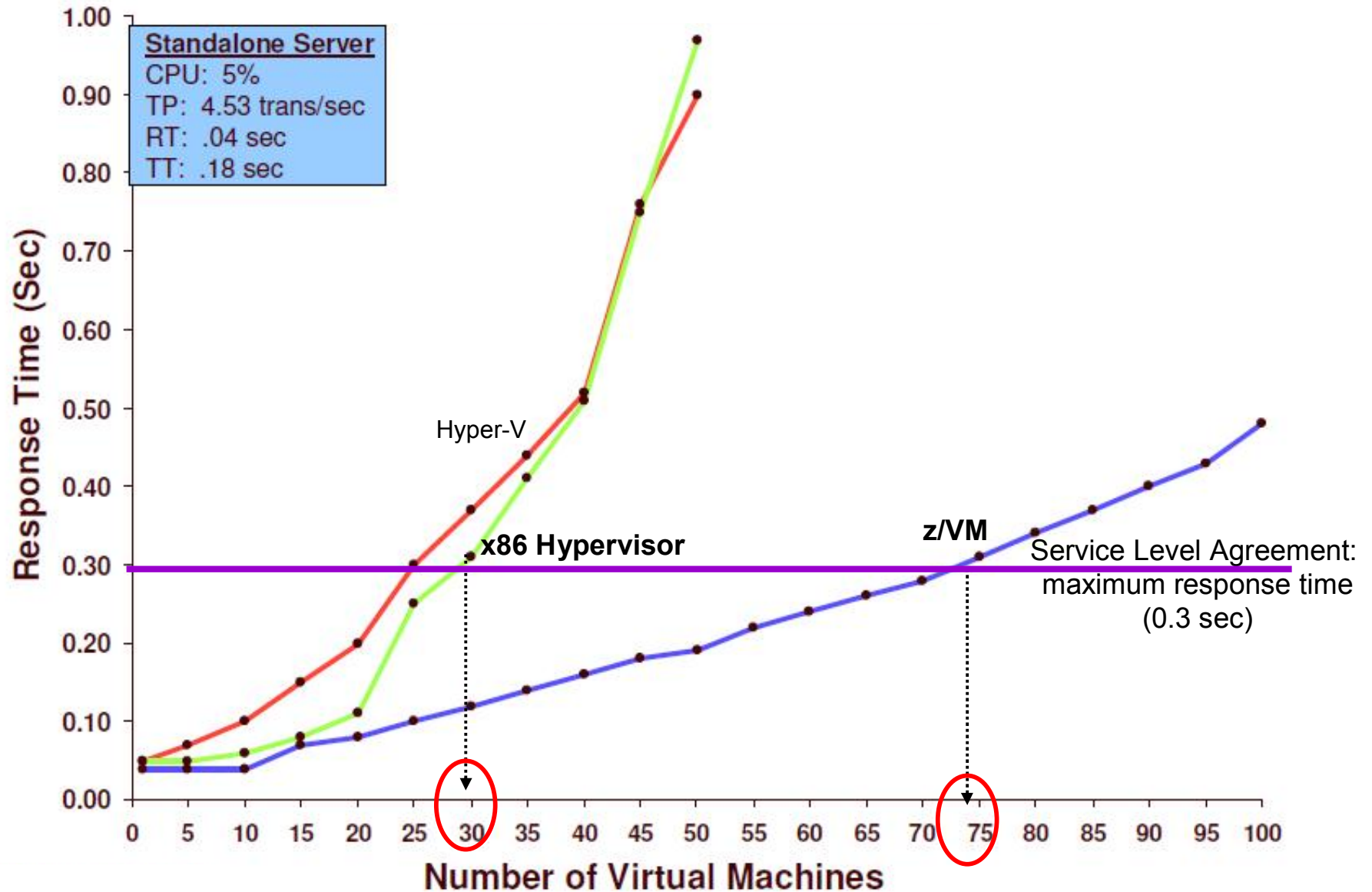
We ran a benchmark to compare how many images can be consolidated in practice



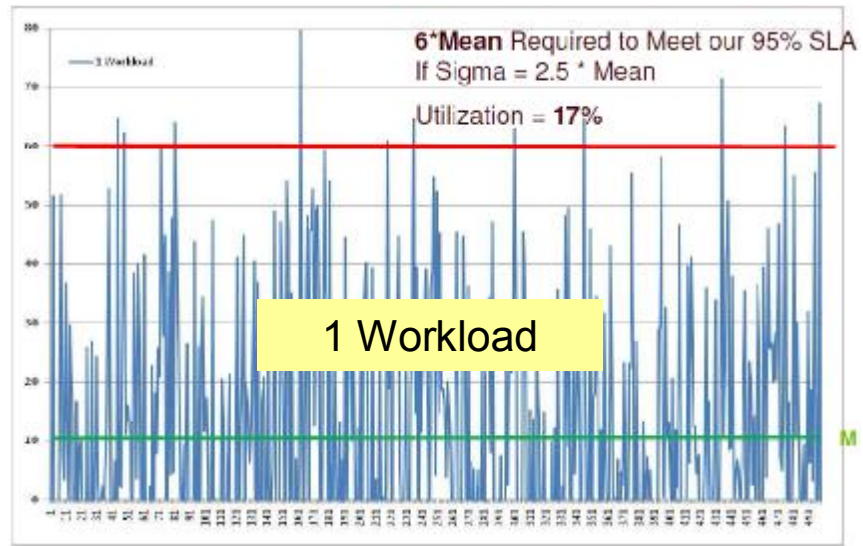
Response time comparison



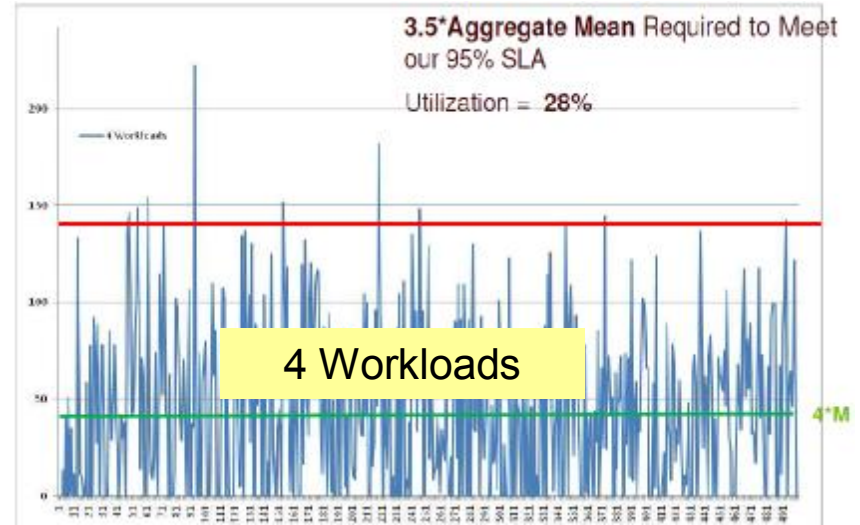
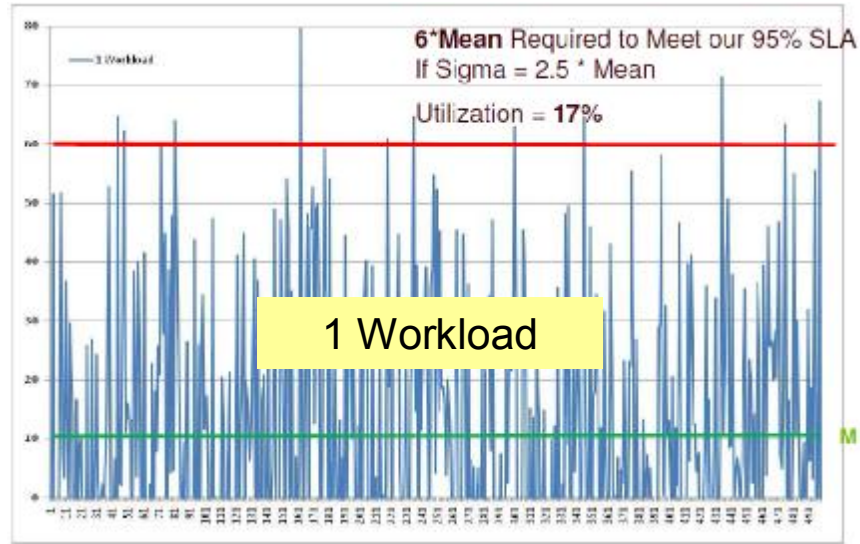
Response time comparison



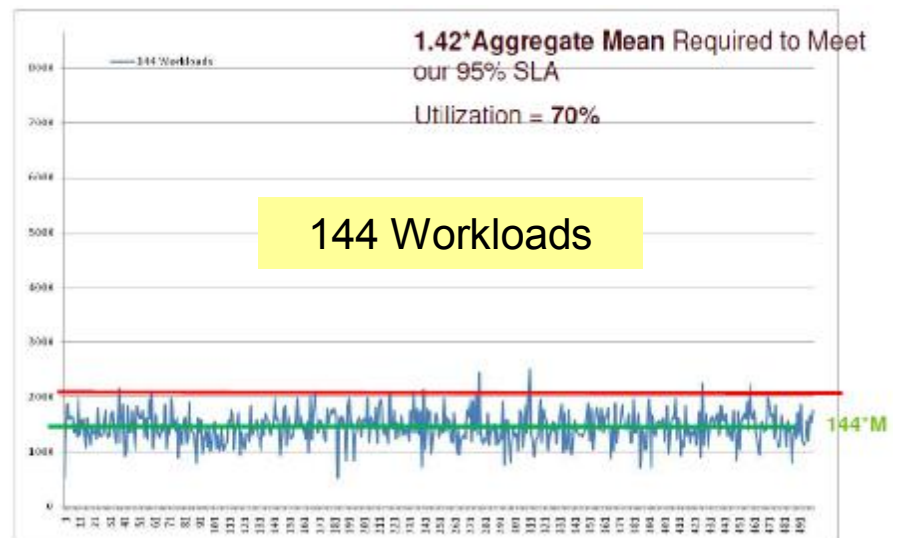
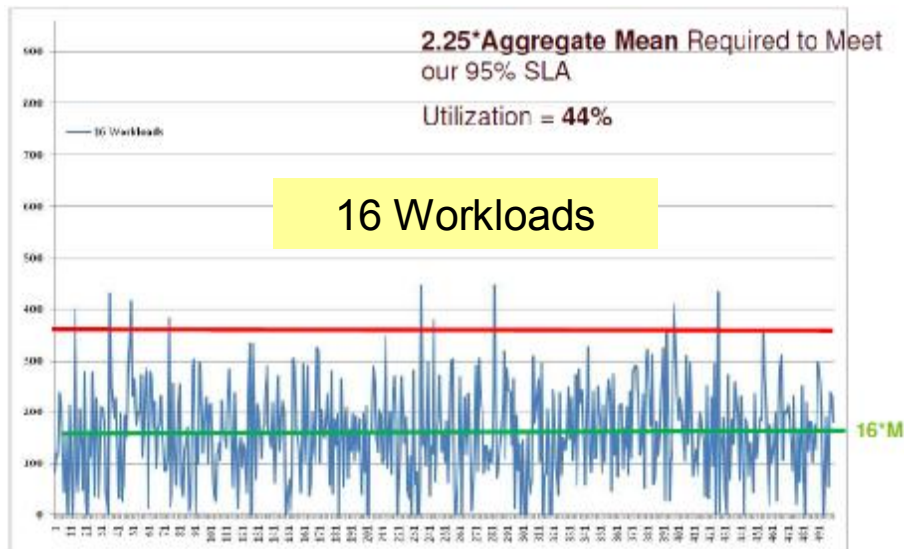
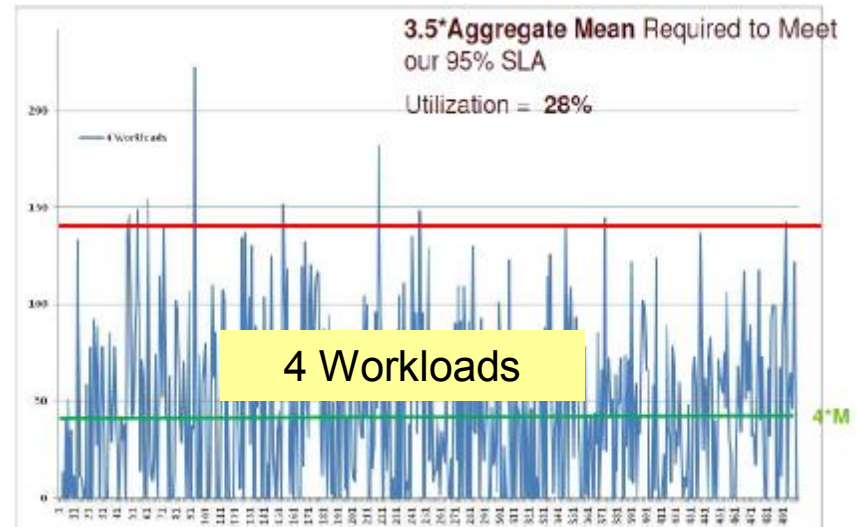
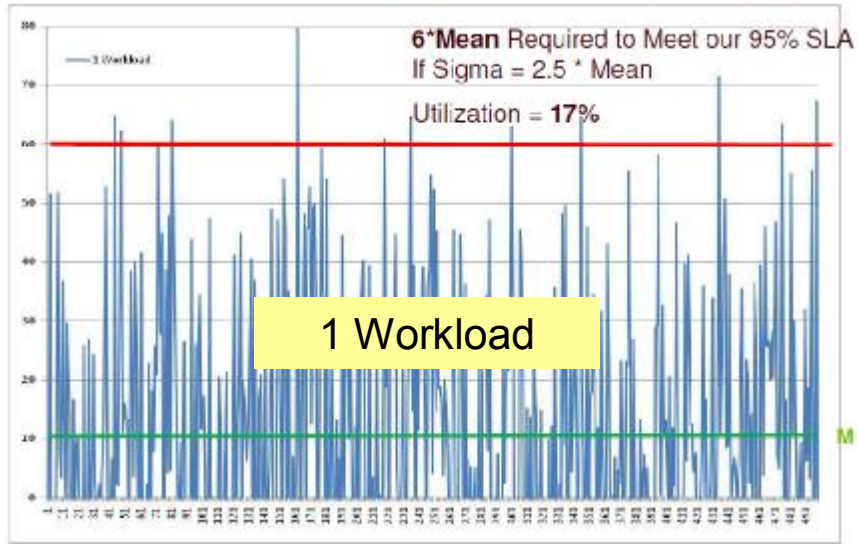
When we consolidate...



When we consolidate...

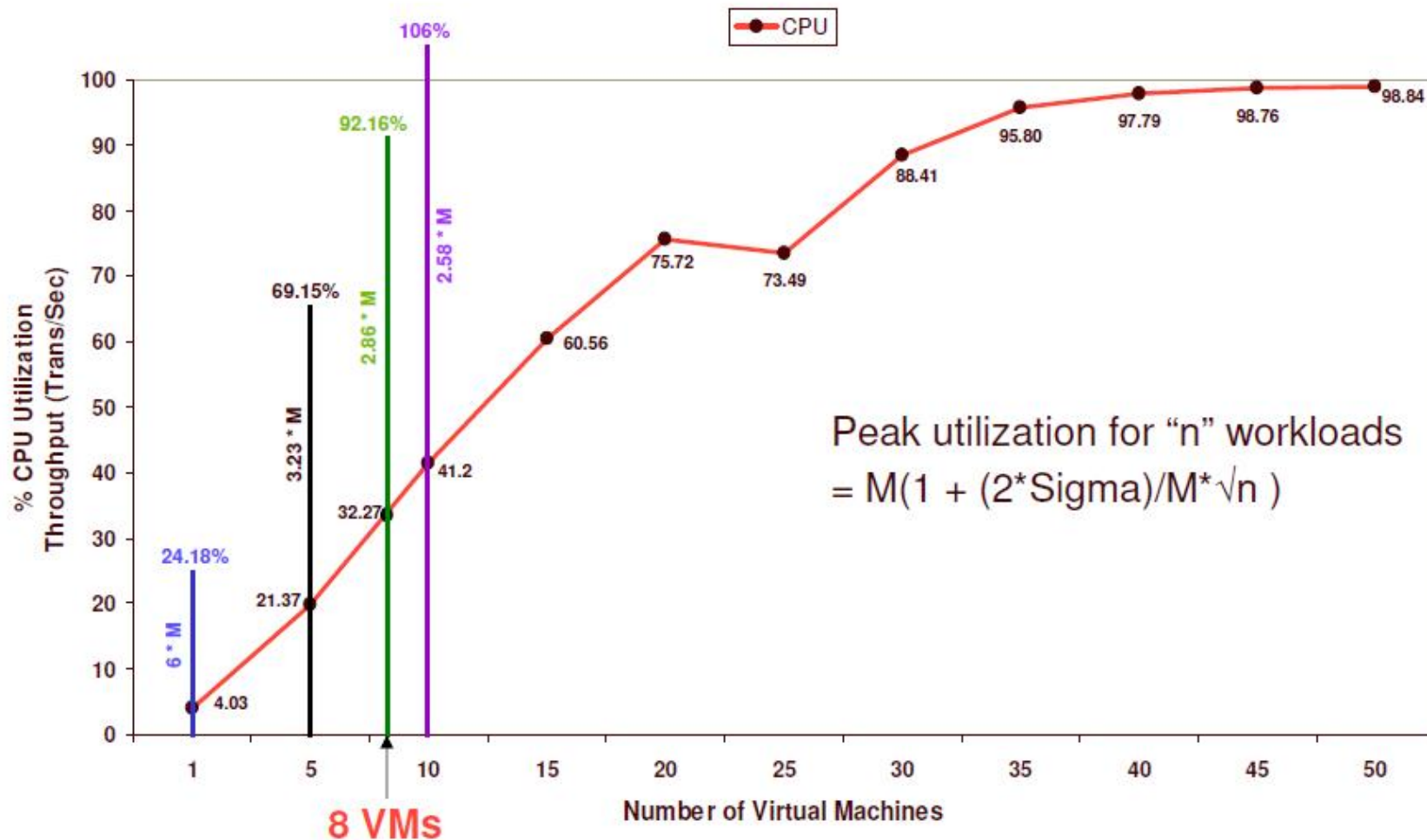


When we consolidate...

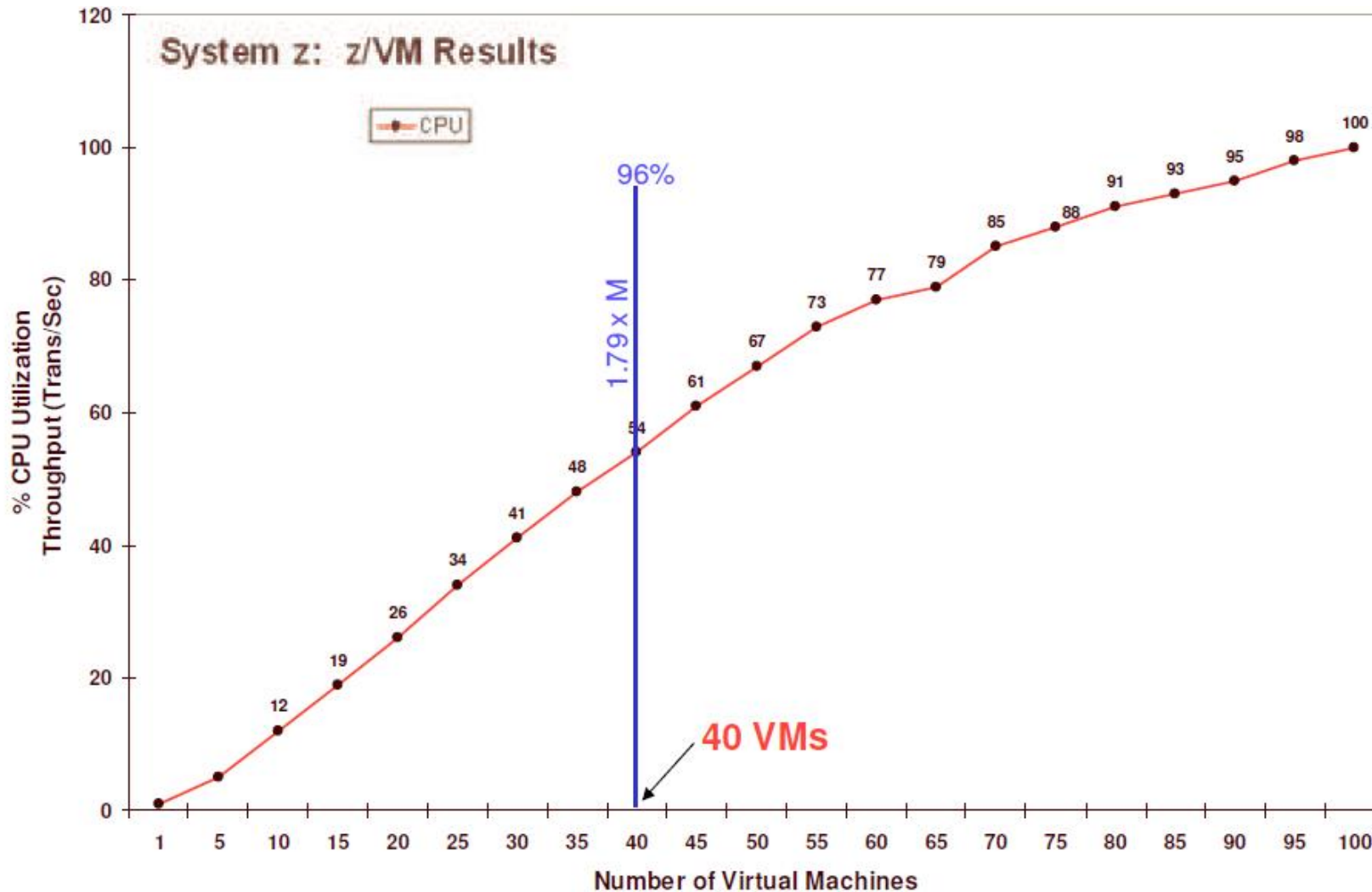


Apply utilization SLA to derive consolidation ratio for x86 Hypervisor

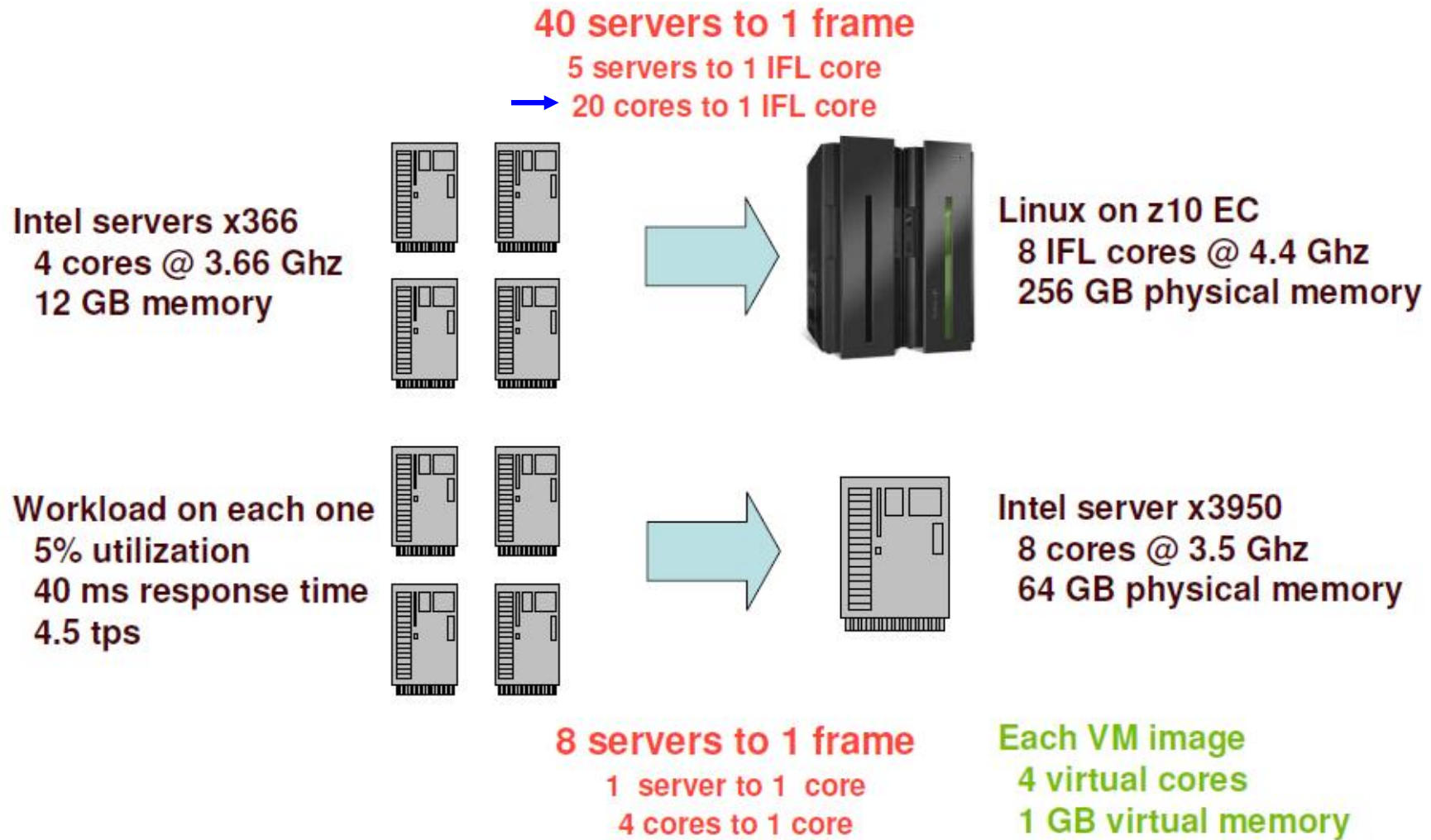
x86 Hypervisor results



Apply utilization SLA to derive consolidation ratio for z/VM



Consolidation ratios needed to satisfy Service Level Agreement



IBM consolidation highlights

§ IBM Consolidation Effort

- 3900 servers to 15 - z10 mainframes
- 80% savings in annual energy usage
- 85% savings in total floor space
- Improved availability and DR

§ Initial investment into methodology

- "Consolidation factory"
- IBM Services know-how



IBM'S PROJECT BIG GREEN SPURS GLOBAL SHIFT TO LINUX ON MAINFRAME



Plan to shrink 3,900 computer servers to about 30 mainframes targets 80 percent energy reduction over five years

Optimized environment to increase business flexibility

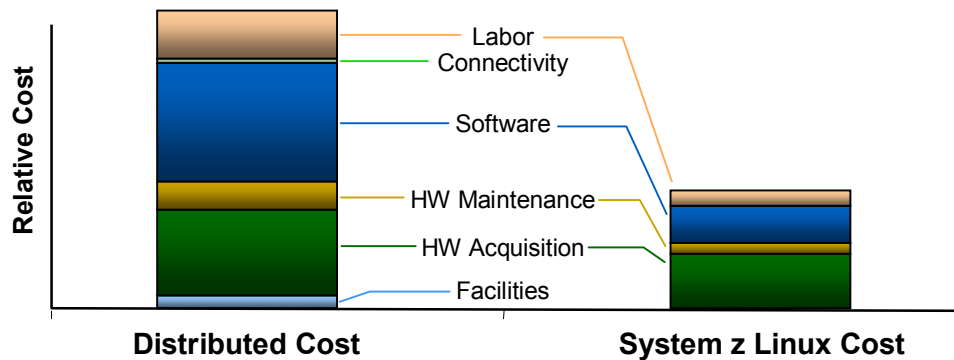
ARMONK, NY, August 1, 2007 – In one of the most significant transformations of its worldwide data centers in a generation, IBM (NYSE: IBM) today announced that it will consolidate about 3,900 computer servers onto about 30 System z mainframes running the Linux operating system. The company anticipates that the new server environment will consume approximately 80 percent less energy than the current set up and expects significant savings over five years in energy, software and system support costs.

At the same time, the transformation will make IBM's IT infrastructure more flexible to evolving business needs. The initiative is part of Project Big Green, a broad commitment that IBM announced in May to sharply reduce data center energy consumption for IBM and its clients.

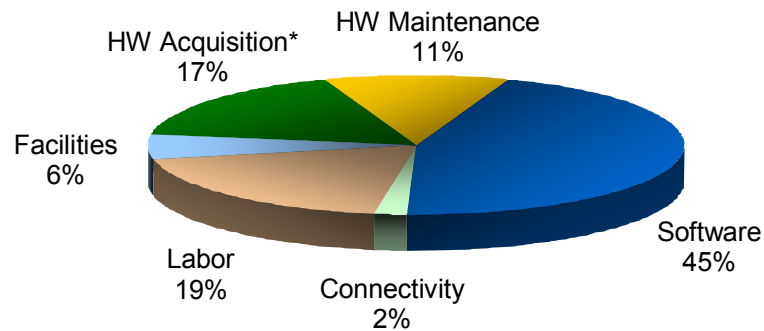
Client view of TCO comparison

Similar distributed workload vs. System z Linux results in potential 60-75% Gross Costs Savings

Operating Cost: Distributed vs. Mainframe



Potential Savings: Categories as a % of Gross Savings



* HW Acquisition compares server/disk refresh of distributed environment to the cost of acquiring new mainframes/storage

Dramatic Simplification

Unit	Distributed	System z Linux	% Reduction
Software Licenses	26,700	1,800	93%
Ports	31,300	960	97%
Cables	19,500	700	96%
Physical Network Connections	15,700	7,000	55%

Results will vary based on several factors including # of servers and work load types

Value Proposition – System z Solution Edition for Enterprise Linux and the Enterprise Linux Server

Leverage the ability of Linux on System z to run many distributed workloads and consolidate UNIX and x86 processor cores to unleash significant IT cost savings opportunities

- § **People Costs** – increase the productivity of the IT staff
- § **Software Costs** – reduce software license fees by consolidating a large number of virtual machines per System z core
- § **Energy Costs** – dramatic reduction in power usage
- § **Facilities Costs** – reduce floor space with dense server consolidation on System z
- § **Networking Costs** – consolidate networks inside the box too





Questions ?

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DB2 Connect	HyperSwap	System z10	zSeries*
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Enterprise Storage Server*	MQSeries*	Tivoli	z10
ESCON*	OMEGAMON*	TotalStorage*	z10 BC
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