The IBM Enterprise Linux Server – A Solution to Your IT Challenges

The Right Solution: IBM's Enterprise Linux Server

What's the right solution to address today's IT challenges?

Is this what your data center looks like?

Is this where you'd like to be?

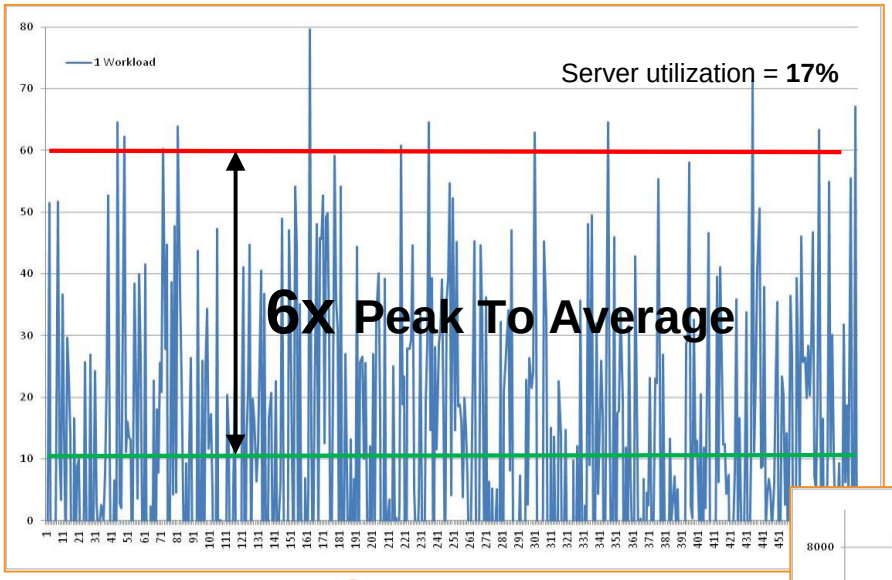
- Currently running *lots* of x86 or UNIX servers
- Have serious concerns about
  - Downtime
  - Data security
  - Data center floor space and energy usage
  - Growth and scalability
- Strategically committed to Linux and open source

- Improved efficiency
  - Fewer servers, less networking
  - Fewer software licenses
  - Growth within the box
  - Better utilization of compute resources
- Reduced risk, better security, higher availability
- Reduced costs, reduced staff, simplification

Introducing the IBM Enterprise Linux Server (ELS)

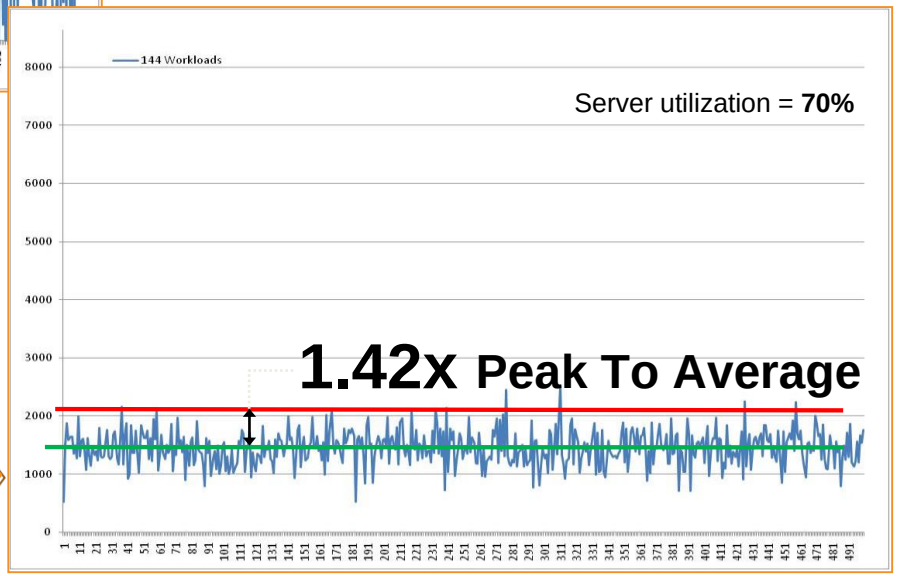
- An excellent platform for large scale consolidation
  - Highly virtualized, and designed to run at very high CPU utilization rates
- Fast, very high-capacity processors; extreme scalability and elasticity; ultimate levels of reliability, availability and security
- Simplified administration, efficient IT operations
- Low comparable total cost of ownership (TCO)
- Ideal Linux platform for today and the future

Statistical multiplexing models show how consolidating on a highly virtualized platform drives up CPU utilization



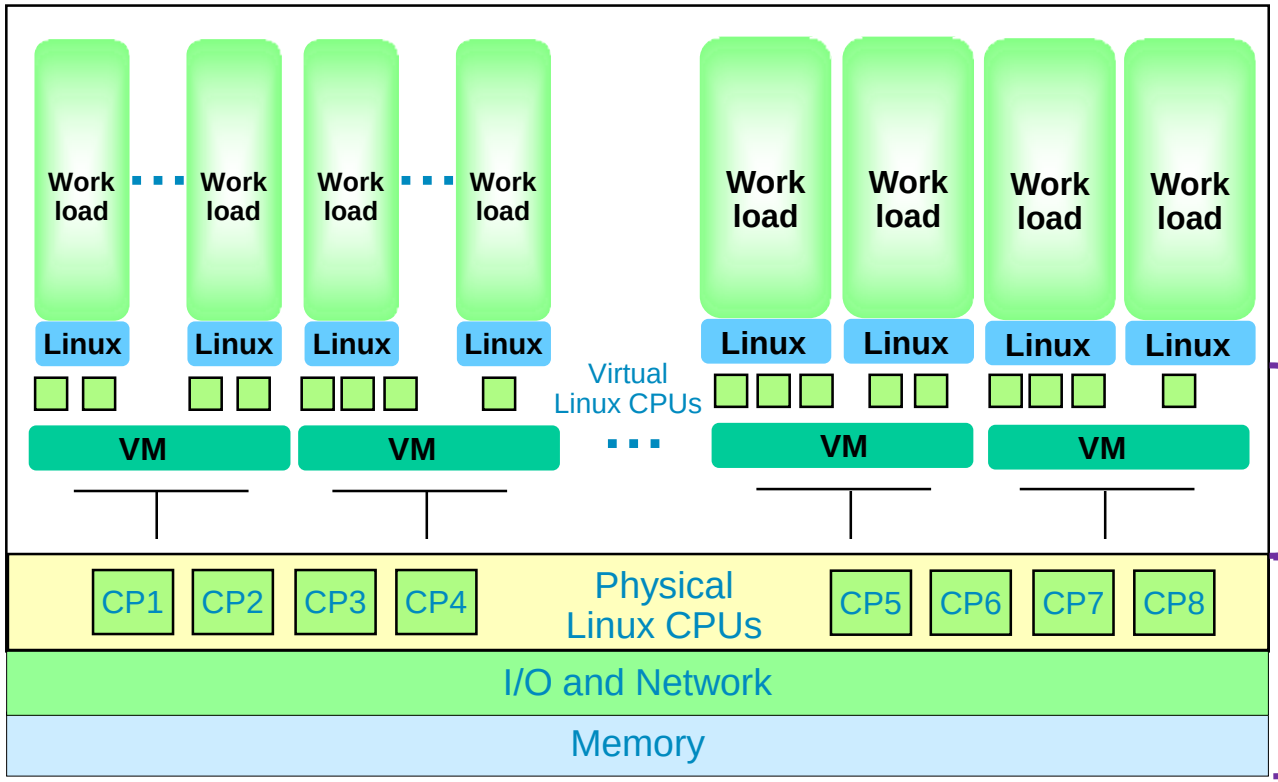
- Consolidating variable workloads on a virtualized server reduces the overall variance (statistical multiplexing)
- Consequently, larger servers with capacity to run more workloads can be driven to higher average utilization levels without violating service level agreements

1 variable workload:
Machine capacity (red) =
6x average demand (green)



144 variable workloads:
Machine capacity (red) =
1.42x average demand (green)

Enterprise Linux Server virtualization is built-in (not added-on) to give the best workload isolation



Guaranteed workload isolation

1,000s of Linux guests (Linux virtual servers) are supported

Virtualization hypervisor layer; up to 32 physical CPUs per VM

Shared-everything architecture

Hardware-enforced isolation: 10% of circuits support virtualization

Enterprise Linux Server has superior virtualization compared to distributed servers

Enterprise Linux Server is designed to run
1,000s of Linux virtual servers at nearly 100% utilization
nearly 100% of the time

Enterprise Linux Server

- **Most sophisticated** and functionally complete hypervisors, based on **shared everything** architecture
- Virtualization can **simulate devices** not physically present
- Highly **granular** resource sharing (<1%)
- **Deploy** Linux virtual servers (guests) **in seconds**
- Add physical resources without taking system down, scale out to **1,000s** of Linux guests
- Extensive built-in facilities for virtual server **life-cycle management**
- **Hardware-enforced isolation**

Distributed Platforms

Limited per-core virtual server scalability

Physical server sprawl is needed to scale

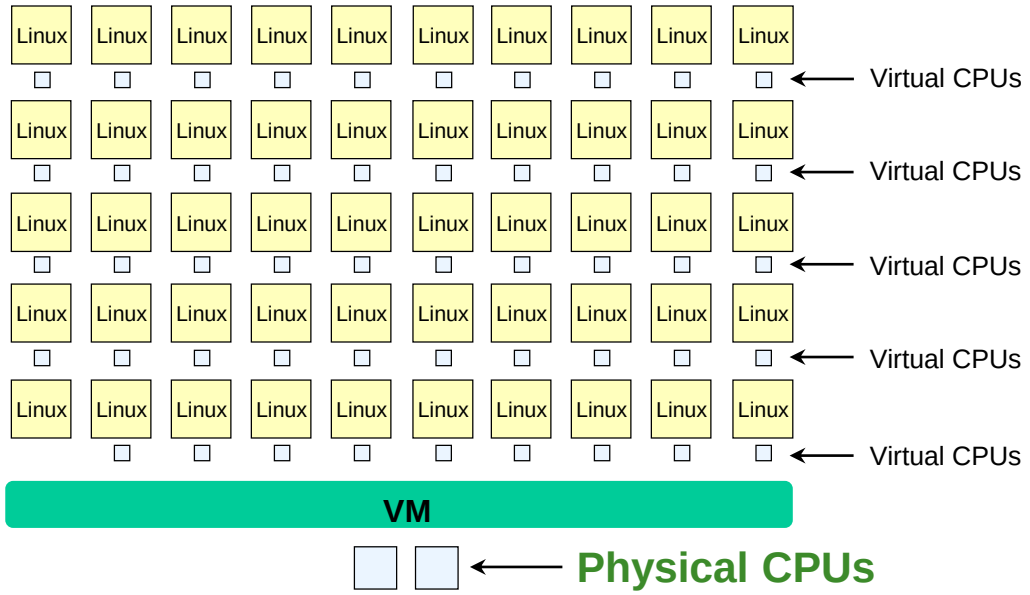
Operational complexity increases as virtual server images grow

VMware tools only support VMware hypervisor (ESX)

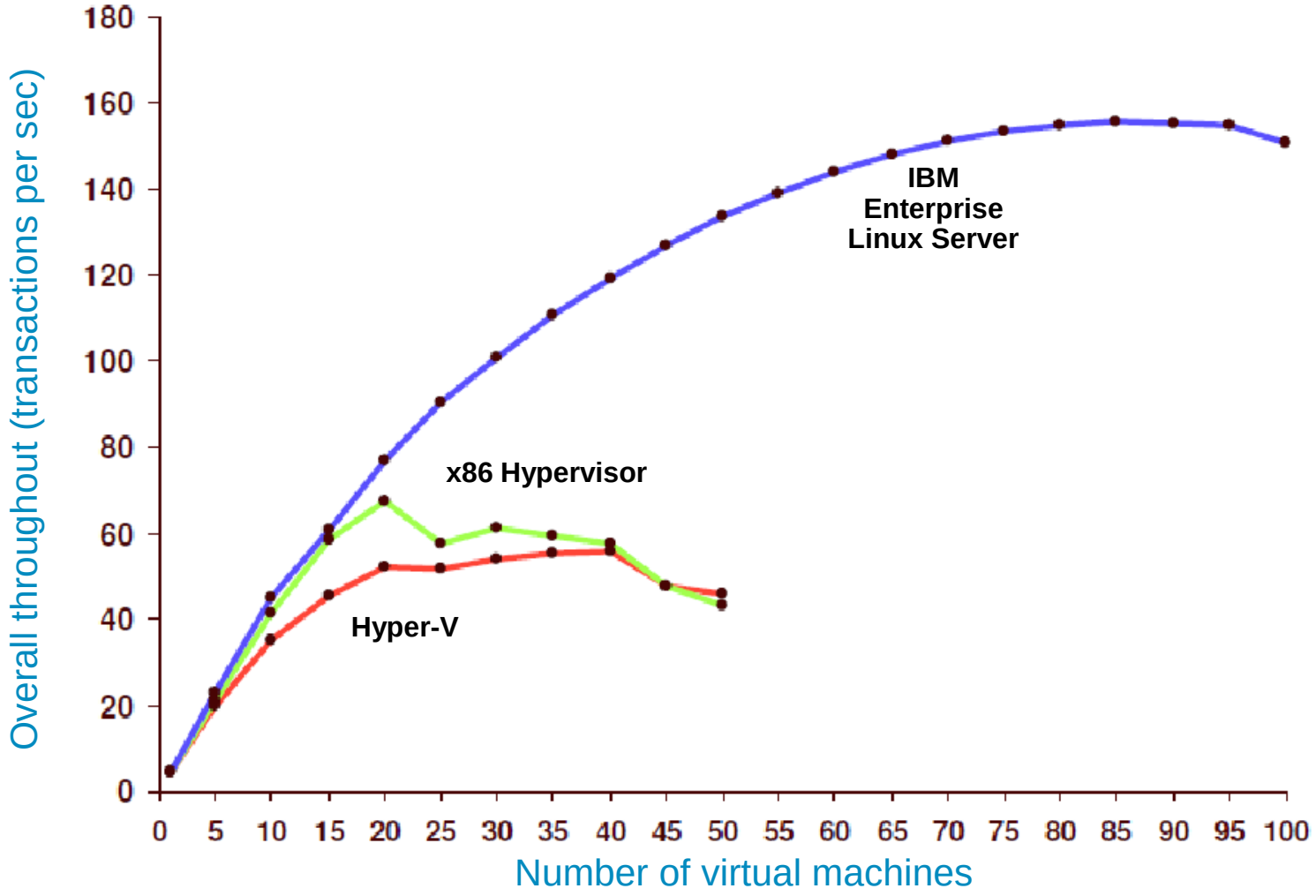
A key strength to ELS virtualization is the ability to over-commit resources

- Hosted environment consumes considerably more CPU and memory, in aggregate, than what is configured for the VM instance
  - Translate directly into cost savings for hardware *and* software

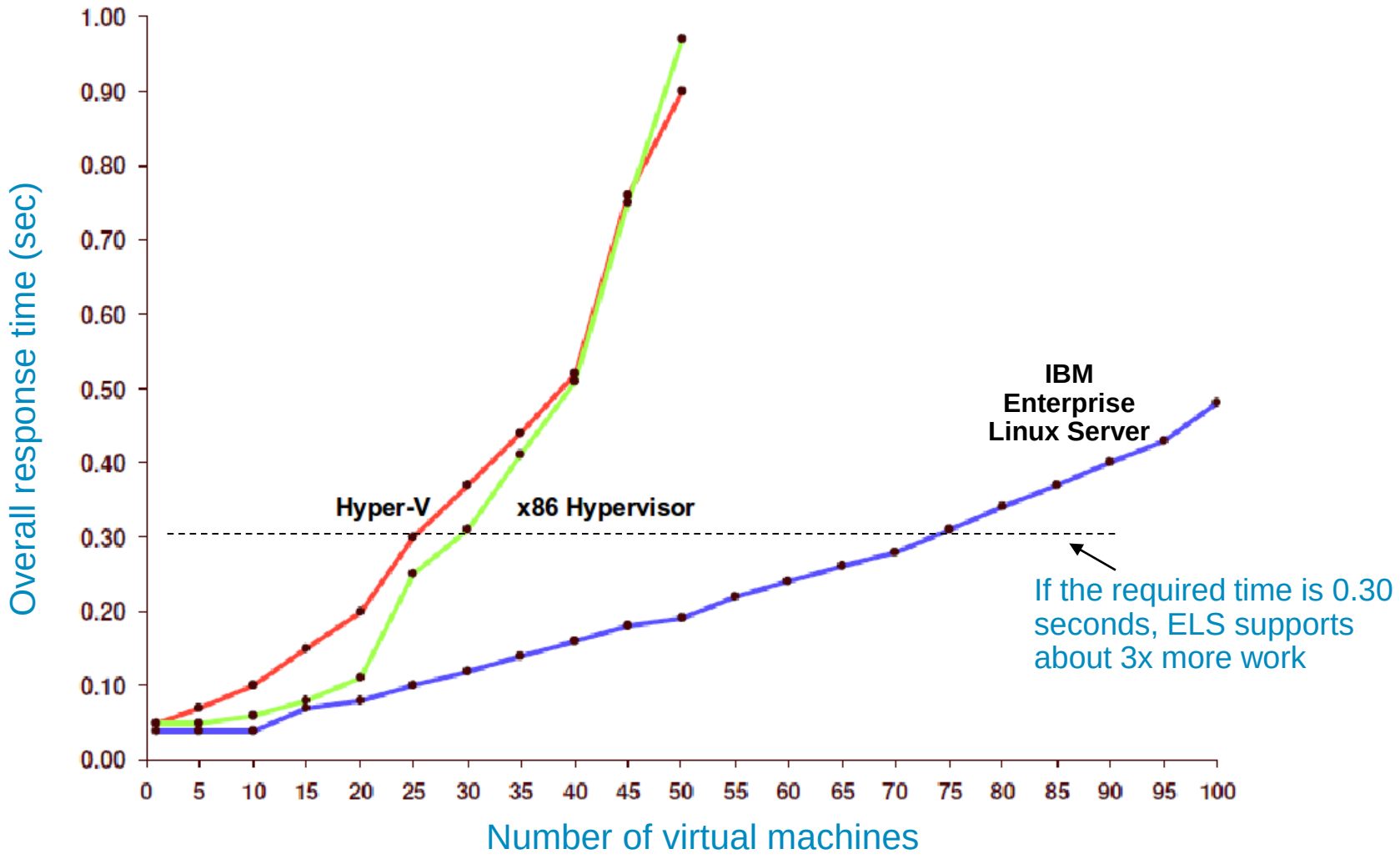
Example: Software is licensed for two **physical CPUs**, but runs on 50 virtual Linux CPUs



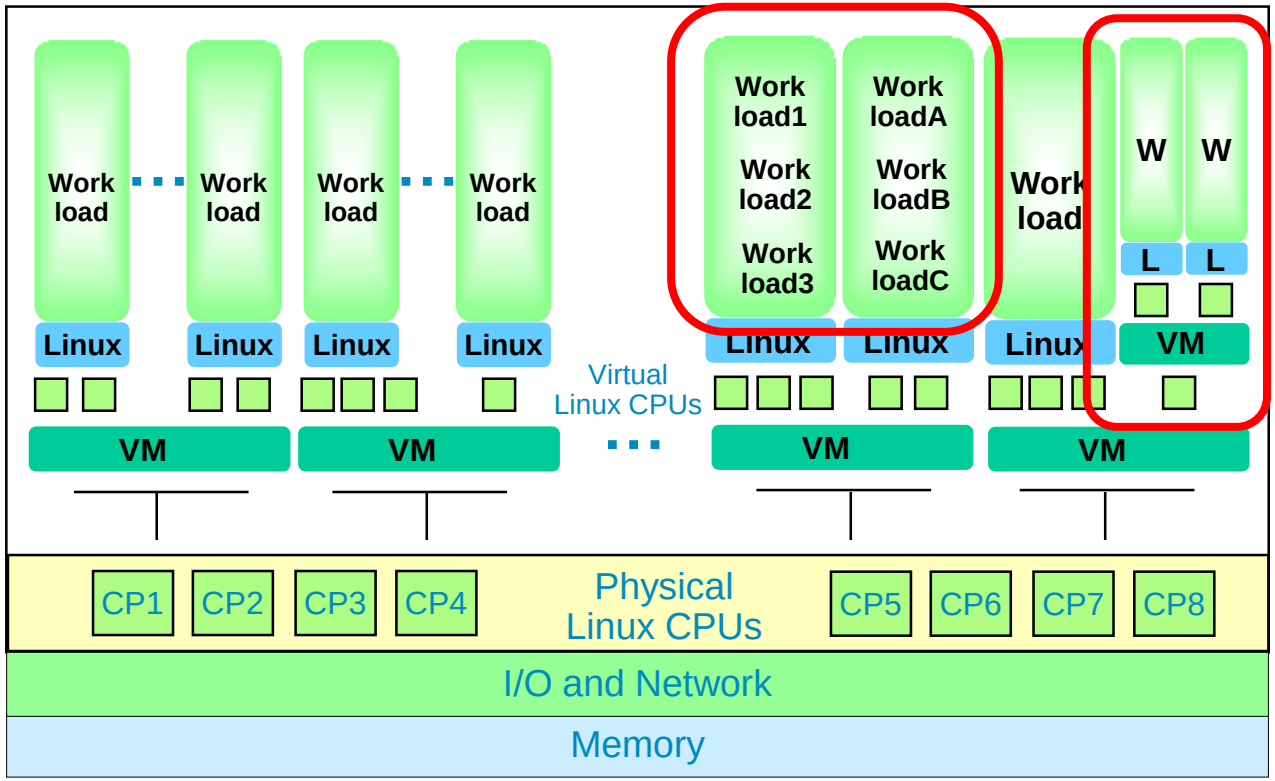
Throughput comparison for different virtualization platforms



Response time comparison for different virtualization platforms



IBM Enterprise Linux Server has many unique virtualization advantages



Hypervisor recursion!

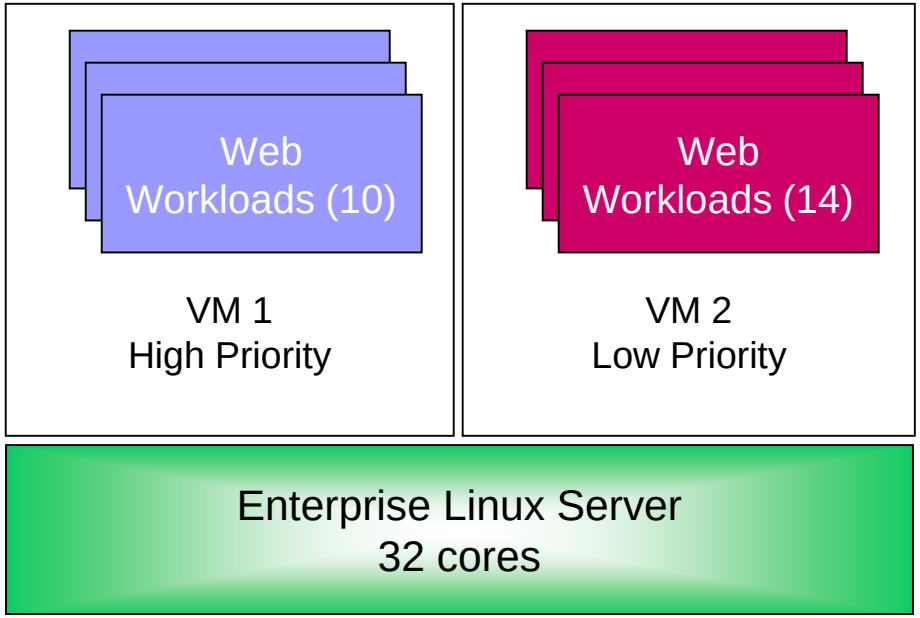
Multiple application instances per Linux guest

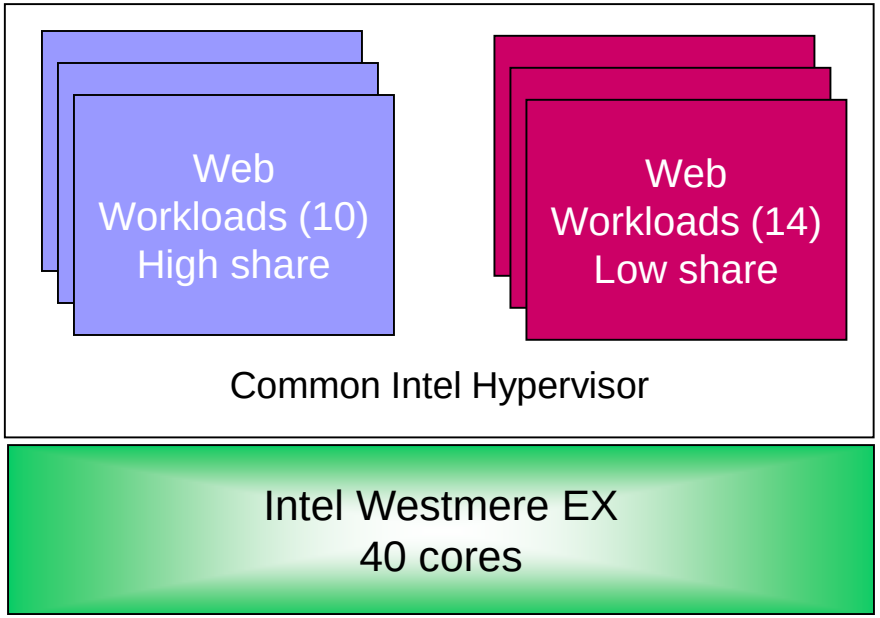
Easy partition and virtual server cloning enables high availability

Partition-to-Partition communication via very fast in-memory TCP/IP

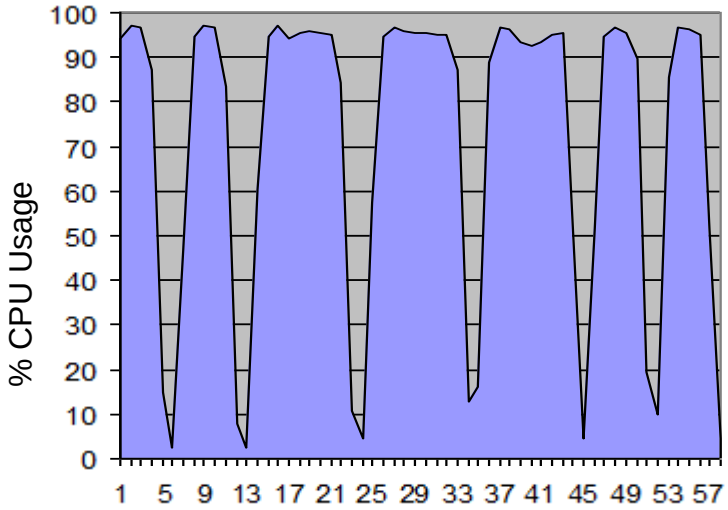
Tests demonstrate comparison of Enterprise Linux Server virtualization to a common x86 hypervisor

- High priority workloads had defined demand over time
  - Service Level Agreement (SLA) requires that response time not degrade over time
- Low Priority workloads had unlimited demand
  - Allowed to “soak up” any unused CPU resource



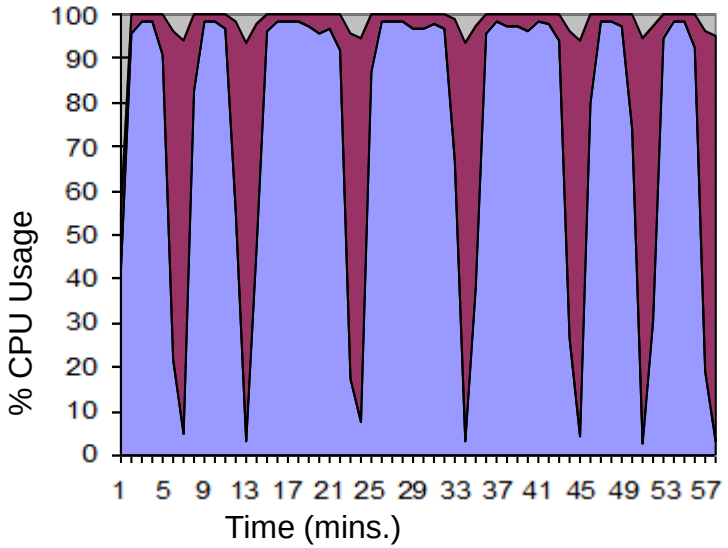


Enterprise Linux Server demonstrated perfect workload management and very high utilization



Demand curve for 10 high priority workloads running in VM 1

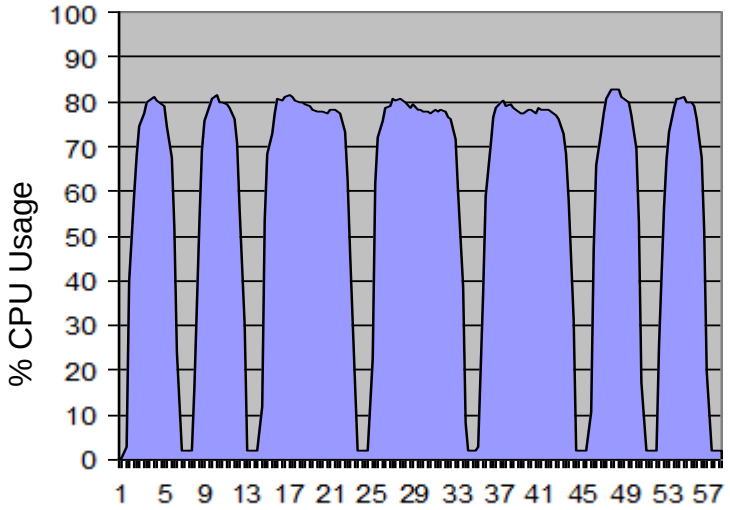
- **Workloads consume 72% of available CPU resources (28% unused)**
- **Total throughput: 9.13M**
- **Average response time: 140ms**



Demand curve when 14 low priority workloads are added in VM 2

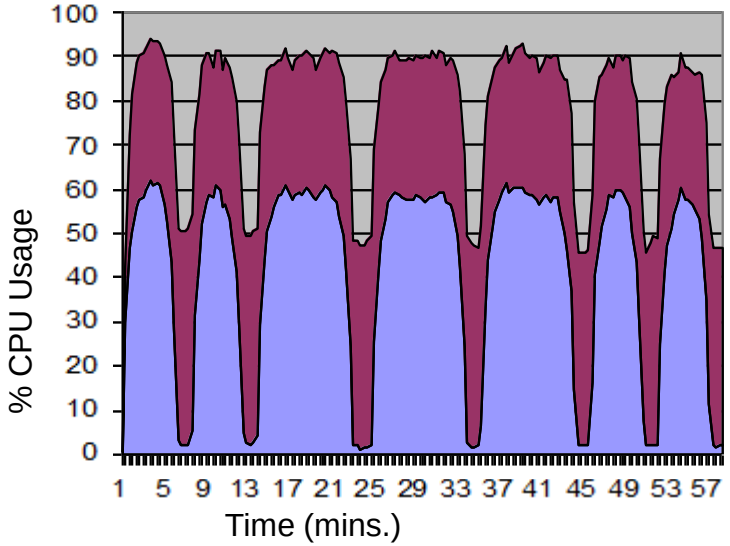
- **All but 2% of available CPU resources is used (high=74%, low=24%)**
- **High priority workload throughput is maintained (9.13M)**
- **No response time degradation (140ms)**

Common x86 hypervisor could not manage high priority workloads correctly, and ran at much lower utilization rate



Demand curve for 10 high priority workloads running on a common Intel hypervisor (high share)

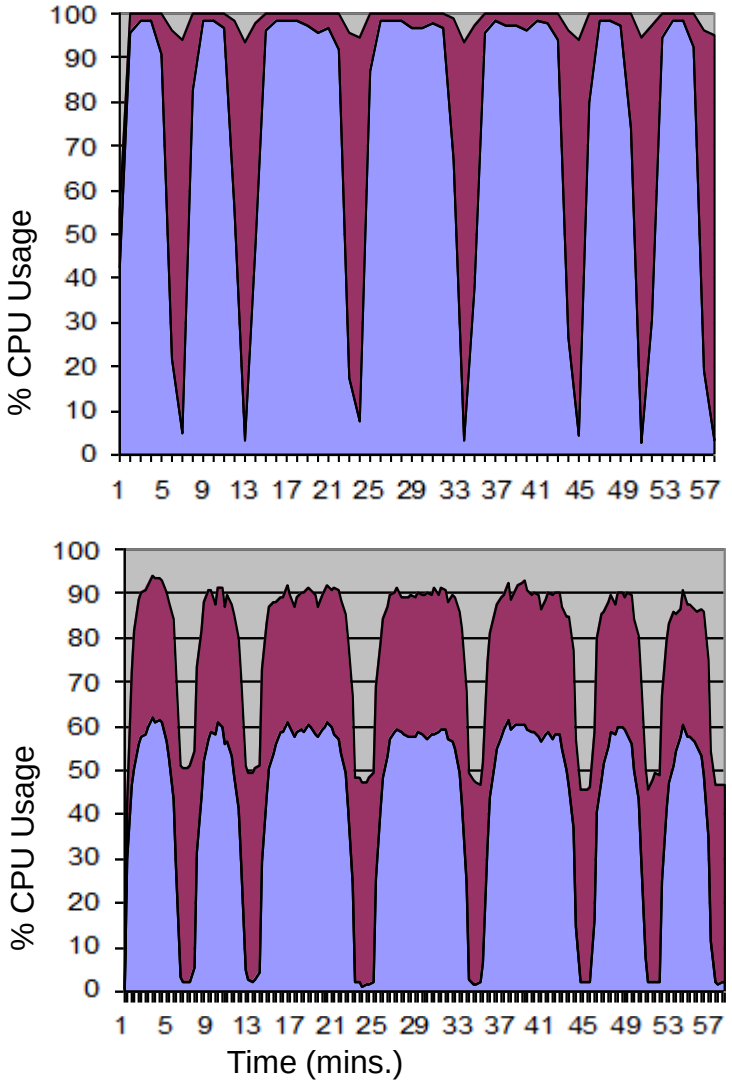
- **Workloads consume 58% of available CPU resources (42% unused)**
- **Total throughput: 6.47M**
- **Average response time: 153ms**



Demand curve when 14 low priority workloads are added (low share)

- **22% of available CPU resources is unused (high=42%, low=36%)**
- **High priority workload throughput drops 31% (4.48M)**
- **Response time degrades 45% (220ms)**

Enterprise Linux Server virtualization is much more efficient, and assures workload requirements are met



IBM Enterprise Linux Server

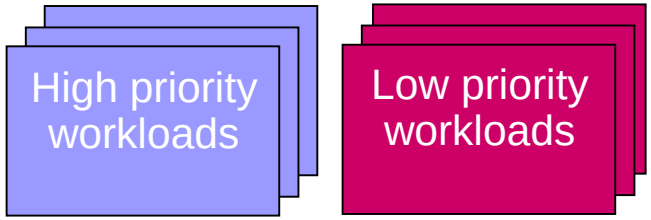
- Perfect workload management
- Consolidate workloads of different priorities on the same platform
- Full use of available processing resource (high utilization)

Common hypervisor on Intel

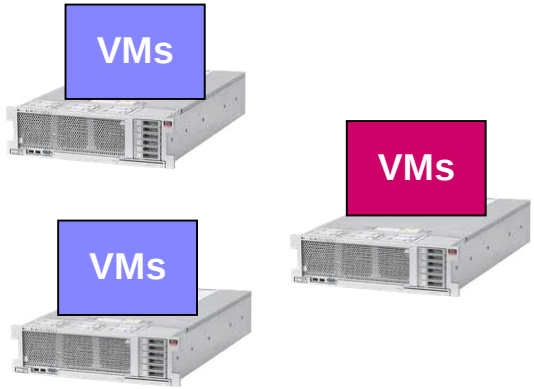
- Imperfect workload management
- *Forces workloads to be segregated on different servers*
- *More servers are required (low utilization)*

Result: Enterprise Linux Server easily manages mixed priority workloads at lower cost

Which platform provides the lowest TCA over 3 years?

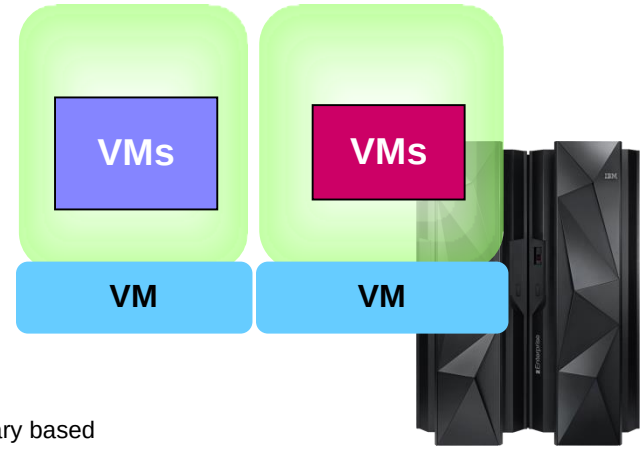


High priority online banking workloads driving a total of **9.1M** transactions per hour and low priority discretionary workloads driving **2.8M** transactions per hour



Virtualized on 3 Intel 40 core servers

$15.9M (3 yr. TCA)



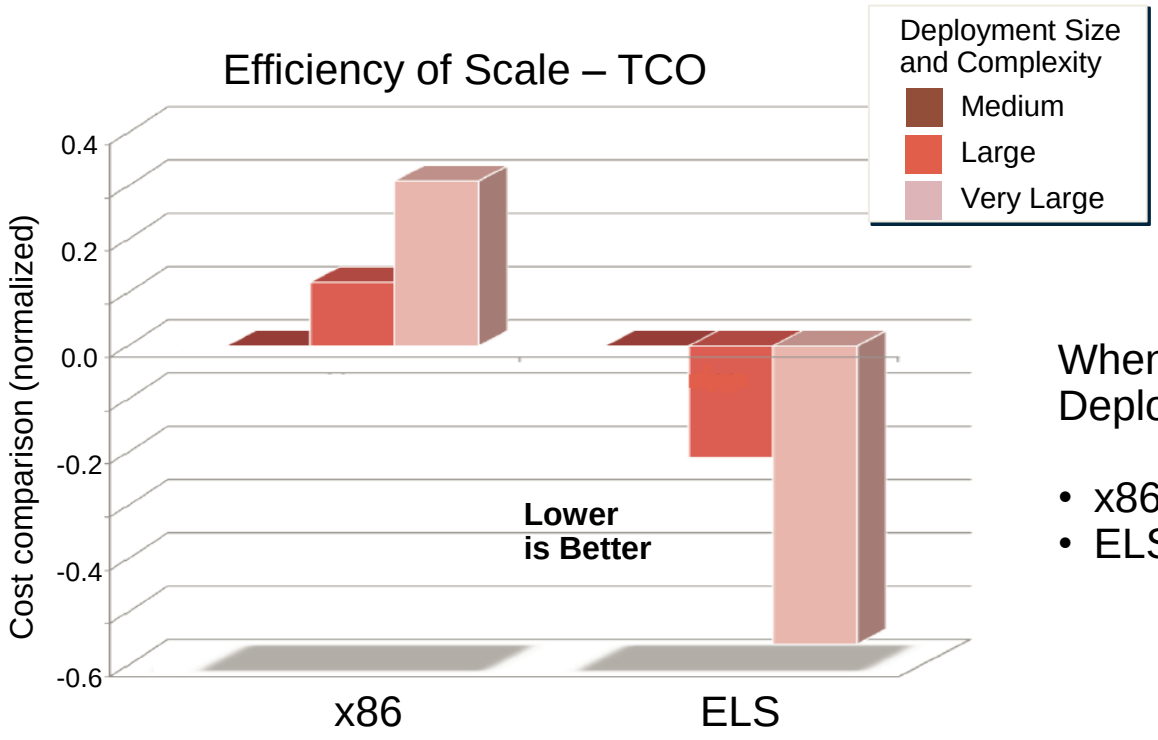
Enterprise Linux Server with 32 processors

$6.5M (3 yr. TCA)

59% *lower cost!*

Consolidation ratios derived from IBM internal studies. Results may vary based on customer workload profiles/characteristics. Prices will vary by country.

When compared to other virtualization platforms, Enterprise Linux Server demonstrates real economies of scale



When going from Medium to Large Deployments:

- x86 - **1.35x increase** in cost per VM
- ELS - **68% reduction** in cost per VM

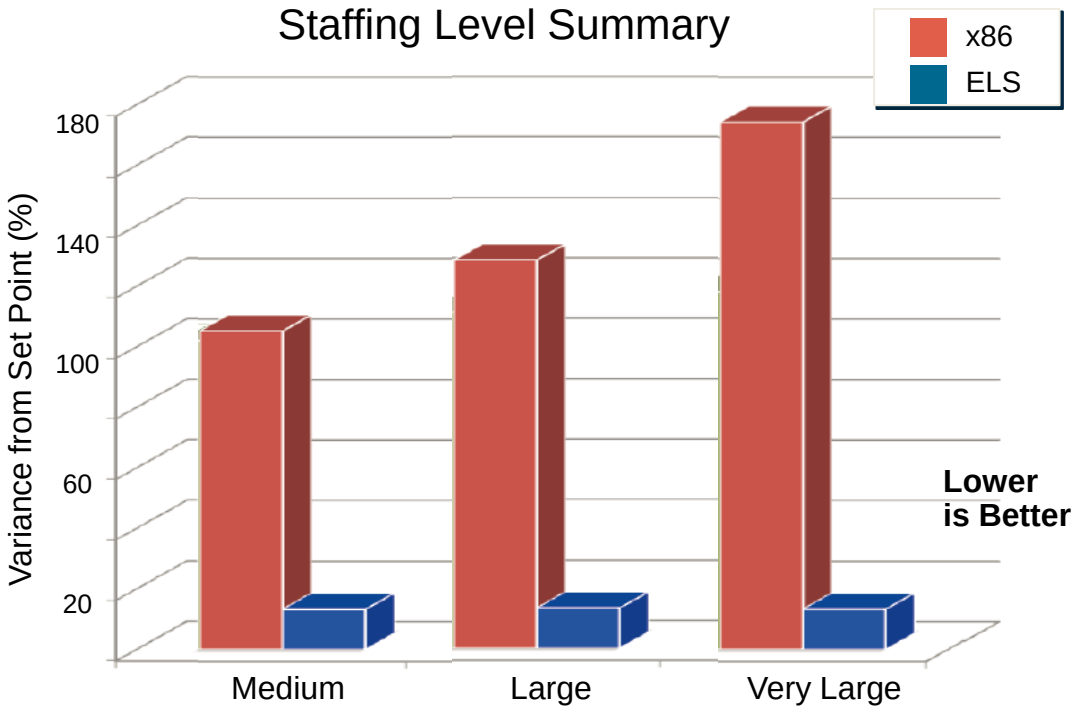
Better efficiency leads to savings of millions of dollars in deployment and operational costs

Source: Solitaire Interglobal Ltd., 2013

Better economies of scale leads directly to reduced administration staffing levels

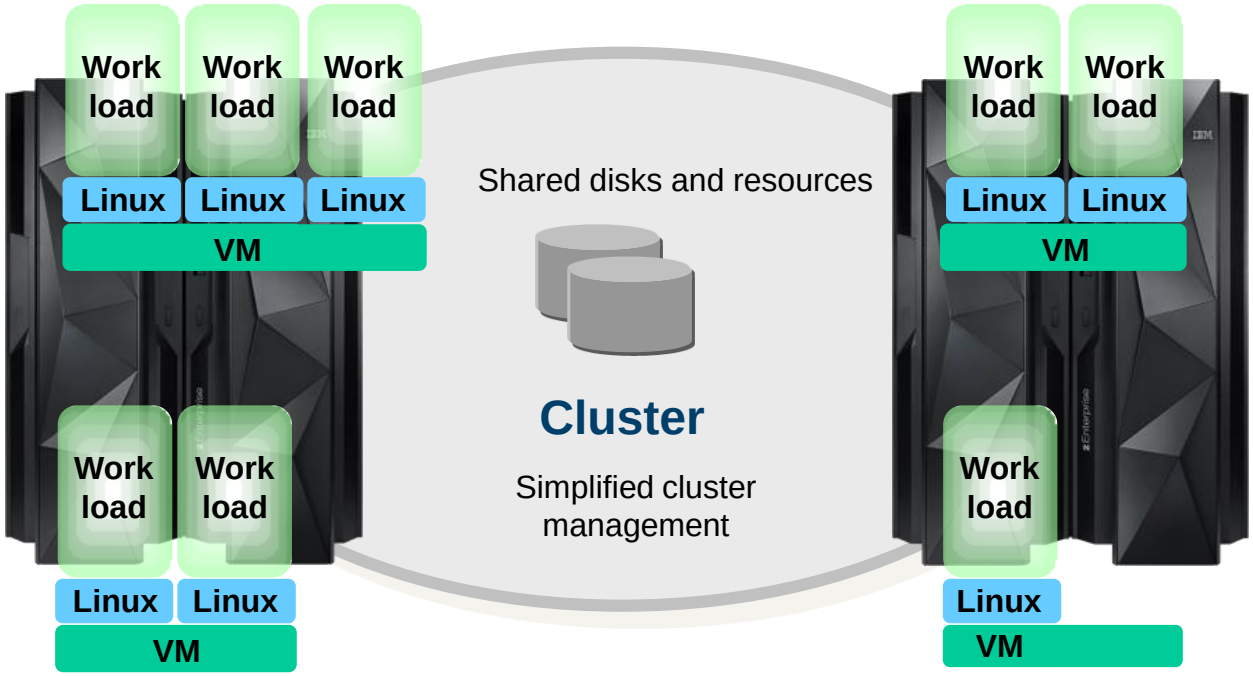
Staffing levels required to maintain a “gold standard”:

- Normalized to VMWare in Medium environment
- Staffing levels for ELS was as much as **13x smaller**



Source: Solitaire Interglobal Ltd., 2013

IBM Enterprise Linux Server has multi-system clustering and virtual server mobility



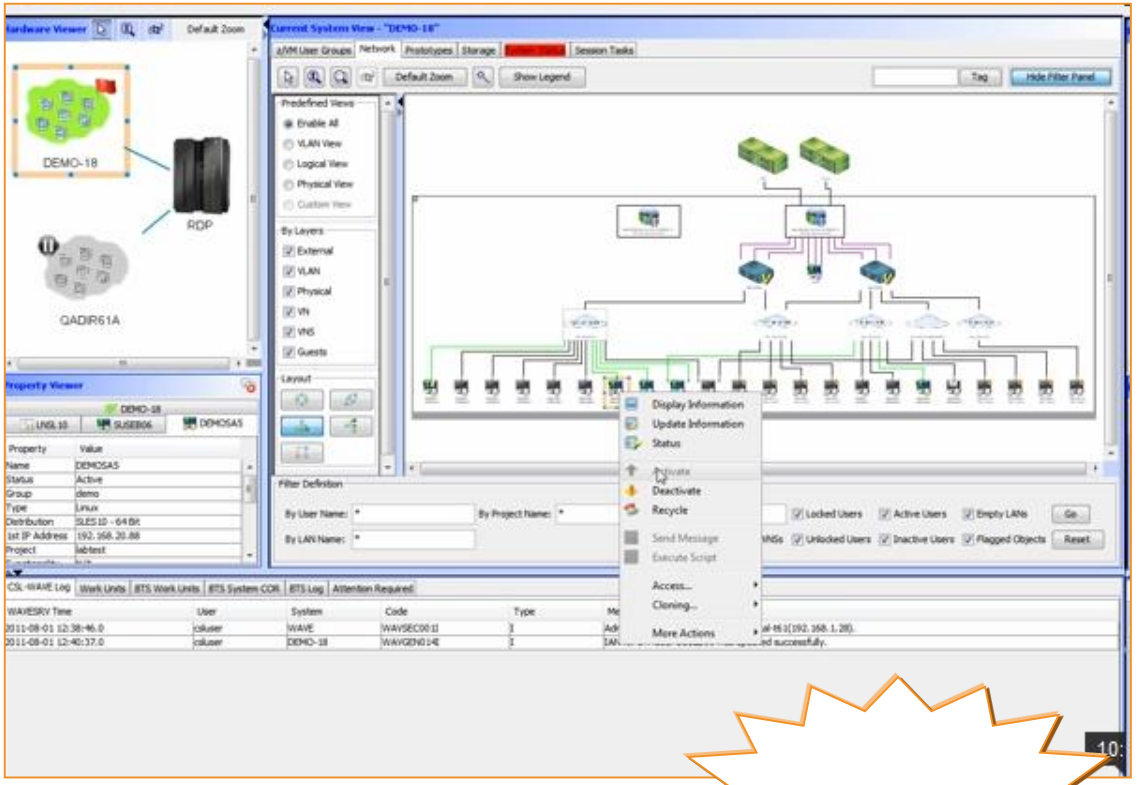
Clustering – Up to 4 VM instances can be clustered as a single system image; cluster members can be on the same or different physical servers

Live Guest Mobility – Move Linux virtual servers non-disruptively to another VM instance on the same or another physical server in the single system image

Manage the complete virtualized network using a simple, intuitive, rich graphical user interface

IBM-WAVE virtualization management software for Enterprise Linux Server systems

- Intuitive graphical workspace with powerful drag-and-drop capability
- Automatically detects all resources in the environment
  - Spans partitions, servers, sites, geographies
  - Supports SSI clustering and Live Guest Mobility
- Simplifies and automates management
  - Monitor, provision, manage user accounts
- ***Significantly reduces administration requirements and costs***



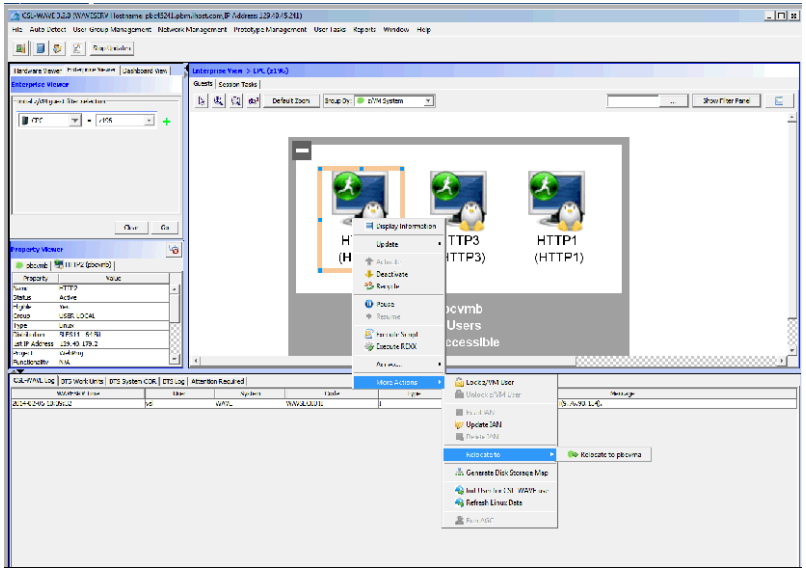
DEMO!

IBM-WAVE greatly simplifies management of the Enterprise Linux Server

Operation management example: Live Guest Migration

With IBM Wave:

- Graphical user interface
- Execute via menu selection



Using manual control program commands:

Task	Task Steps
Log into both VM instances	Login PBCVMA Login PBCVMB
Find out which instance has the running guest	q HTTP2 in PBCVMA q HTTP2 in PBCVMB
Verify the guest can be moved	vmrelo test HTTP2 to PBCVMB
Move the guest	vmrelo move HTTP2 to PBCVMB
Log out of both instances	Logoff PBCVMA Logoff PBCVMB

Enterprise Linux Server distributions supported

- Enterprise Linux Server supports both **Red Hat** and **SUSE** distributions
- Plentiful availability of skills administrators and developers
- Large selection of applications middleware and tooling from IBM, ISVs and Open Source

IBM has been collaborating on innovative Linux solutions for years

- IBM has been an active Linux community member since 1999
- IBM has over 600 full-time developers working with Linux and open source

Top 10 Linux Kernel Contributors (2013)

Company	Changes	Total
None	12,550	13.6%
Red Hat	9,483	10.2%
Intel	8,108	8.8%
Texas Instruments	3,814	4.1%
Linaro	3,791	4.1%
SUSE	3,212	3.5%
Unknown	3,032	3.3%
IBM	2,858	3.1%
Samsung	2,415	2.6%
Google	2,255	2.4%
Vision Engraving Systems	2,107	2.3%
Consultants	1,529	1.7%
Wolfson Microelectronics	1,516	1.6%
Oracle	1,248	1.3%
Broadcom	1,205	1.3%

Source: The Linux Foundation - http://www.linuxfoundation.org/

Virtually all IBM middleware runs on the Enterprise Linux Server

IBM Competitive Project Office

AIM / WebSphere (51)

CICS Transaction Gateway Desktop Edition
CICS Transaction Gateway for Multiplatforms
Communications Server for Linux
HTTP Server for WAS HE Novell SLES
IBM Business Monitor
IBM Business Process Manager Advanced
IBM Business Process Manager Standard
IBM Integration Bus
IBM Mobile Foundation
IBM Runtime Environment, Java Technology
IBM Worklight
TPF Toolkit
WebSphere Adapter for Email
WebSphere Adapter for ECM
WebSphere Adapter for File Transfer Protocol
WebSphere Adapter for Flat Files
WebSphere Adapter for IBM i
WebSphere Adapter for JDBC
WebSphere Adapter for Lotus Domino
WebSphere Adapter for Oracle E-Business
WebSphere Adapter for PeopleSoft
WebSphere Adapter for SAP Software
WebSphere Adapter for Siebel Business
WebSphere Adapters
WebSphere Application Server
WebSphere Application Server - Express
WebSphere Application Server FP Web 2.0
WebSphere Application Server for Developers
WebSphere Application Server Hypervisor
WAS HE for Novell SLES on System z (2)
WAS HE for Red Hat Enterprise Linux Server
WAS HE Intelligent Management Pack
WAS HE V7.0 on RHEL for System z (2)
WebSphere Application Server Liberty Core
WebSphere Application Server ND
WebSphere Enterprise Service Bus
WebSphere Extended Deployment
WebSphere Extended Deployment CG
WebSphere eXtreme Scale
WebSphere Lombardi Edition
WebSphere Message Broker
WebSphere MB Connectivity for Healthcare
WebSphere MQ, FTE, Low Latency (3)
WebSphere Service Registry and Repository
WebSphere SSR Advanced Lifecycle Edition
WebSphere SSR Client
WebSphere Virtual Enterprise

IM (52)

Cúram Social Program Management
Database Enterprise Developer Edition
DB2 Advanced Enterprise Server Edition
DB2 Advanced Workgroup Server Edition
DB2 Connect Application Server Advanced
DB2 Connect Application Server Edition
DB2 Connect Enterprise Edition
DB2 Connect Unlimited Advanced z, I (3)
DB2 Enterprise Server Edition
DB2 for Linux, UNIX and Windows for SAP
DB2 Merge Backup for Linux UNIX, Win
DB2 Recovery Expert for Linux, UNIX, Win
IBM Data Studio
IBM InfoSphere Business Info. Exchange
IBM InfoSphere Foundation Tools
IBM InfoSphere Identity Insight
IBM InfoSphere QualityStage Module US Cert
IBM Metadata Workbench
IBM solidDB
Information Server Bus. Glossary Anywhere
Informix Client Software Development Kit
Informix Connect Runtime
Informix Dynamic Server Enterprise Edition
InfoSphere Business Glossary
InfoSphere Change Data Capture
InfoSphere Change Data Delivery
InfoSphere Data Replication
InfoSphere Federation Server
InfoSphere Guardium
InfoSphere Information Analyzer
InfoSphere Information Server, SAP (2)
InfoSphere Master Data Management
InfoSphere Master Data Management Server
InfoSphere Optim Configuration Manager
InfoSphere Optim Performance Manager (2)
InfoSphere Optim pureQuery Runtime z/OS
InfoSphere Optim Query Capture and Replay
InfoSphere Warehouse Advanced Depart.
InfoSphere Warehouse Advanced Enterprise
InfoSphere Warehouse Departmental Edition
InfoSphere Warehouse Developer Edition
InfoSphere Warehouse Enterprise Base
InfoSphere Warehouse Enterprise Edition
InfoSphere Warehouse Optim Data Retention
Optim High Performance Unload for DB2
Optim Performance Manager (2)
Optim Query Tuner for DB2

SCI / Tivoli (57)

IBM License Metric Tool
IBM SmartCloud Control Desk
IBM SmartCloud Cost Management
IBM TRIRIGA Application Builder
IBM TRIRIGA Application Platform
IBM TRIRIGA Connector Business Apps (2)
IBM TRIRIGA Connector for Offline Forms
Maximo Adapter for Microsoft Project
Maximo Adapter for Primavera
Maximo Archiving Adapter for Optim Data Gr.
Maximo Asset Configuration Manager
Maximo Asset Mgmt, Essentials, Schedule (3)
Maximo Calibration
Maximo Change and Corrective Action Mgr
Maximo Enterprise Adapter, SAP (2)
Maximo Everyplace
Maximo for Government
Maximo for Life Sciences
Maximo for Nuclear Power
Maximo for Oil and Gas
Maximo for Service Providers
Maximo for Transportation
Maximo for Utilities
Maximo Health, Safety and Environment Mgr
Maximo Linear Asset Manager
Maximo Mobile Asset Manager
Maximo Mobile Inventory Manager
Maximo Mobile Suite
Maximo Mobile Work Manager
Maximo Spatial Asset Management
Tivoli Application Dependency Discovery Mgr
Tivoli Asset Discovery for Distributed
Tivoli Business Service Manager
Tivoli Monitoring, Energy Mgmt, VE (3)
Tivoli Netcool/Impact
Tivoli Netcool/OMNIbus
Tivoli NetView for z/OS
Tivoli Network Manager IP Edition
Tivoli Provisioning Manager
Tivoli Service Automation Manager
Tivoli Storage Productivity Center Editions (3)
Tivoli System Automation Application Mgr
Tivoli System Automation for Multiplatforms
Tivoli Usage and Accounting Manager, Ent (2)
Tivoli Workload Scheduler, z/OS, Agent (3)
TotalStorage SAN Volume Controller

Industry Solutions (28)

Case Foundation
Case Manager
Content Analytics
Content Foundation
Content Integrator Enterprise Edition
Content Manager Enterprise Edition
Content Manager OnDemand Multiplatforms
Cúram Social Program Management
Enterprise Records
FileNet Business Process Manager
FileNet Content Manager
IBM WebSphere Multichannel Bank Toolkit
Sterling B2B Integrator
Sterling Connect:Direct
Sterling Connect:Express
Sterling Control Center
WebSphere Commerce Enterprise
WebSphere Multichannel Bank Toolkit
WebSphere Transformation Extender
WebSphere Transformation Extender SEPA
WebSphere Transformation Extender SAP
WebSphere Transformation Extender SWIFT
WebSphere Transformation Extender EDI
WebSphere Transformation Ext. Financial
WebSphere Transformation Ext. Healthcare
WebSphere Transformation Ext. NACHA

Rational (19)

Rational Asset Manager Enterprise Edition
Rational Asset Manager Standard Edition
Rational Automation Framework
Rational Build Forge
Rational Build Forge Enterprise Edition
Rational Build Forge Enterprise Plus Edition
Rational Build Forge Standard Edition
Rational ClearCase
Rational ClearCase MultiSite
Rational Collaborative Lifecycle Management
Rational Developer for System z
Rational Developer for zEnterprise
Rational DOORS
Rational Host Access Transformation Service
Rational Programming Patterns
Rational Programming Patterns for System z
Rational Quality Manager
Rational Requirements Composer
Rational Team Concert

ICS / Portal (15)

IBM Connections
IBM Connections Mail
IBM Customer Experience Suite Rich Media
IBM Domino
IBM Forms Experience Builder
IBM Forms Server
IBM Mobile Portal Accelerator
IBM Web Content Manager, Rich Media (2)
IBM Web Experience Factory
Lotus Domino
WebSphere Dashboard Framework
WebSphere Portal Enable, Extend, Server (3)

BA (15)

Cognos Business Insight
Cognos Business Intelligence & Analysis
Cognos Insight
Cognos Mobile
Cognos Real-time Monitoring
IBM SPSS License Authorization Wizard
IBM SPSS Modeler Limited
SPSS Collaboration and Deployment Services
SPSS Decision Management
SPSS Modeler & Server (2)
SPSS Statistics & Server (2)

Security (7)

IBM Security Access Manager for Web
IBM Security Identity Manager
Tivoli Access Manager for e-business
Tivoli Directory Integrator
Tivoli Federated Identity Manager
Tivoli Federated Identity Mgr Bus. Gateway
Tivoli Key Lifecycle Manager

Source: IBM Clearinghouse

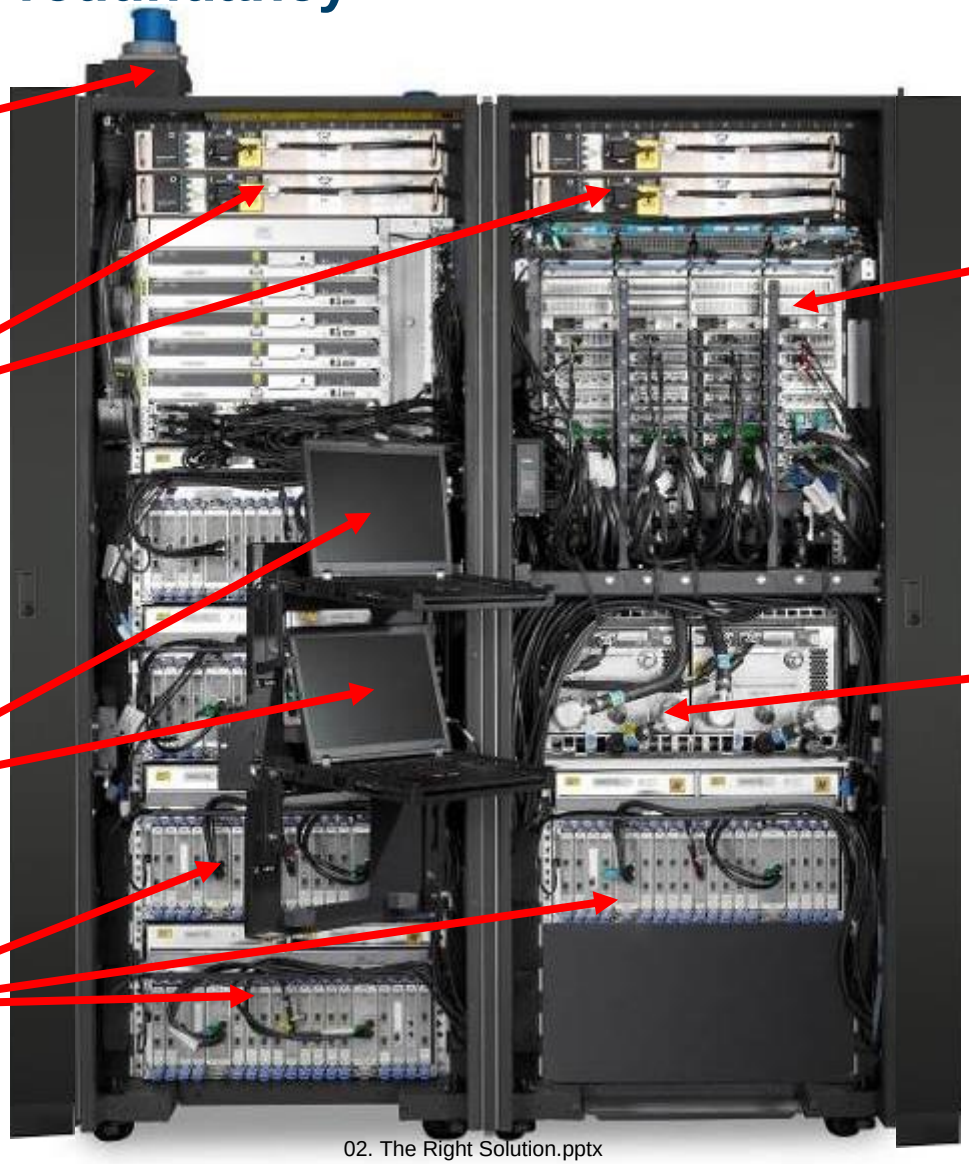
Last Updated: 9/11/13

The ISV ecosystem for the Enterprise Linux server is strong and continues to grow

Over 3,000 total Linux applications available from hundreds of ISVs

Source: IBM

The IBM Enterprise Linux Server is designed for high availability and redundancy



Optional overhead power cabling eliminates need for raised flooring

Optional internal batteries provides power backup

Two system configuration terminals

I/O drawers (PCIe)

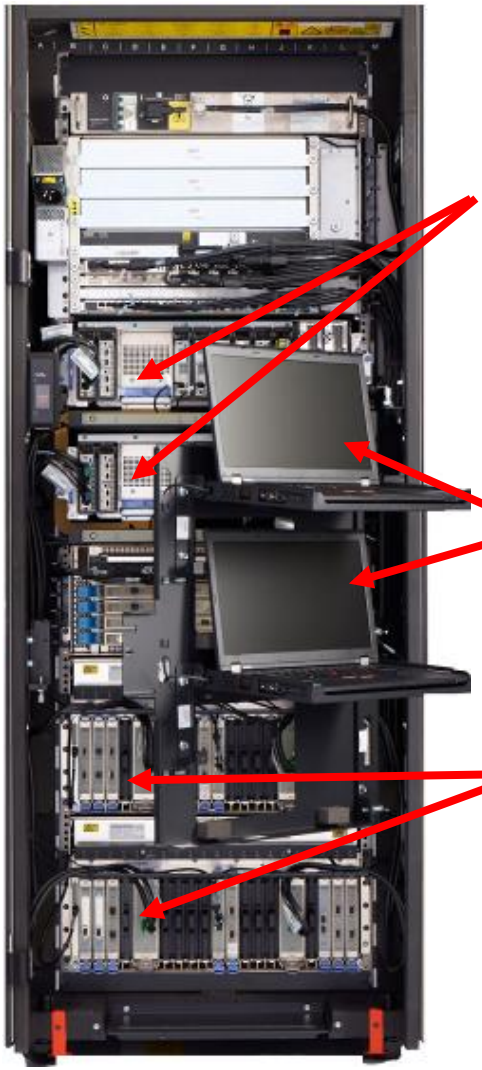
Processor unit drawers (4)

N+1 pumps, blowers and motors

Enterprise Class model

Mid-sized businesses may prefer the business class model

1 of the 10 "coolest" servers of 2013 (*CRN*)



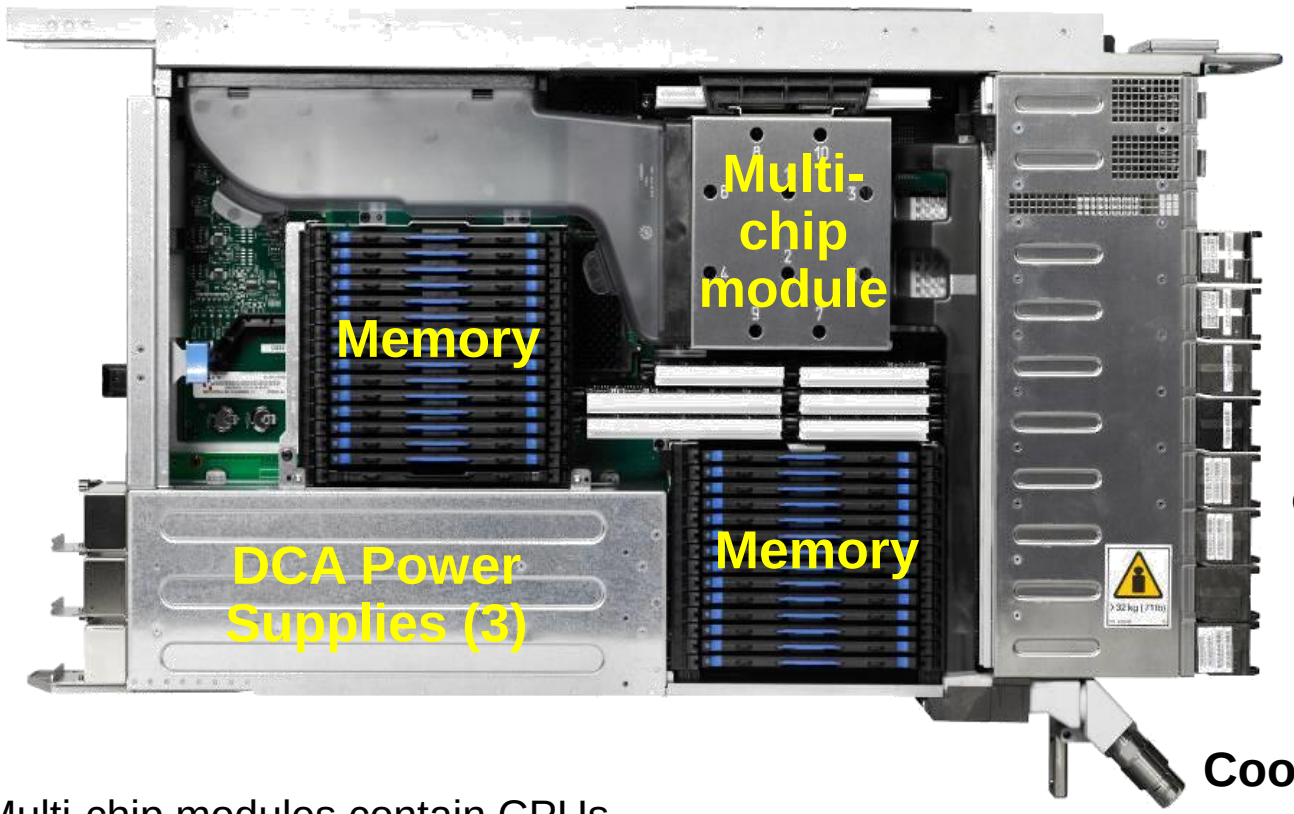
Processor unit drawers (2)

Two system configuration terminals

PCIe I/O drawers

Business Class model

Blade-like processing unit drawers support a balanced, pluggable technology



Enterprise Class model

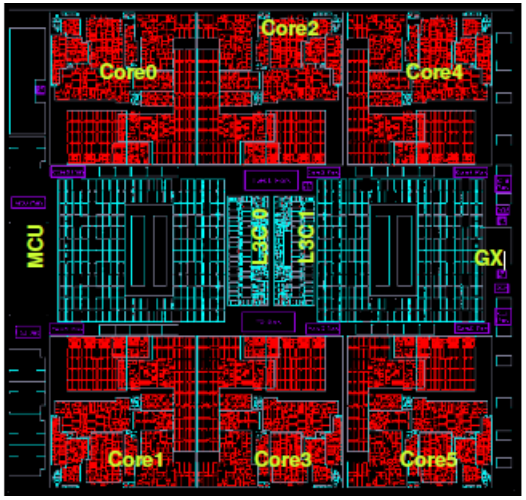
I/O inter-connects

Cooling connector

- Multi-chip modules contain CPUs, co-processors, memory controllers and cache
- Drawers support concurrent maintenance

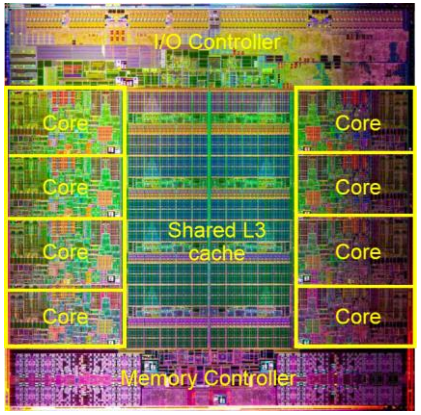
Enterprise Linux Server yields exceptional processing power from highly advanced processing unit chips

- Enterprise Class model
  - 5.5 GHz clock speed
    - *Fastest commercially available!*
  - 6 to 101 Linux processors total
    - Across 6 chips
  - 32 GB RAIM memory per core
- Business Class model
  - 4.4 GHz clock speed
  - 2 to 13 Linux processors
    - Across 3 chips
  - 28 GB RAIM memory per core
- Superscalar design, with advanced pipelining and out-of-order processing
- Each processor has dedicated cryptographic and compression coprocessors



Enterprise Linux Server Processing Unit chip

Intel x86 chip

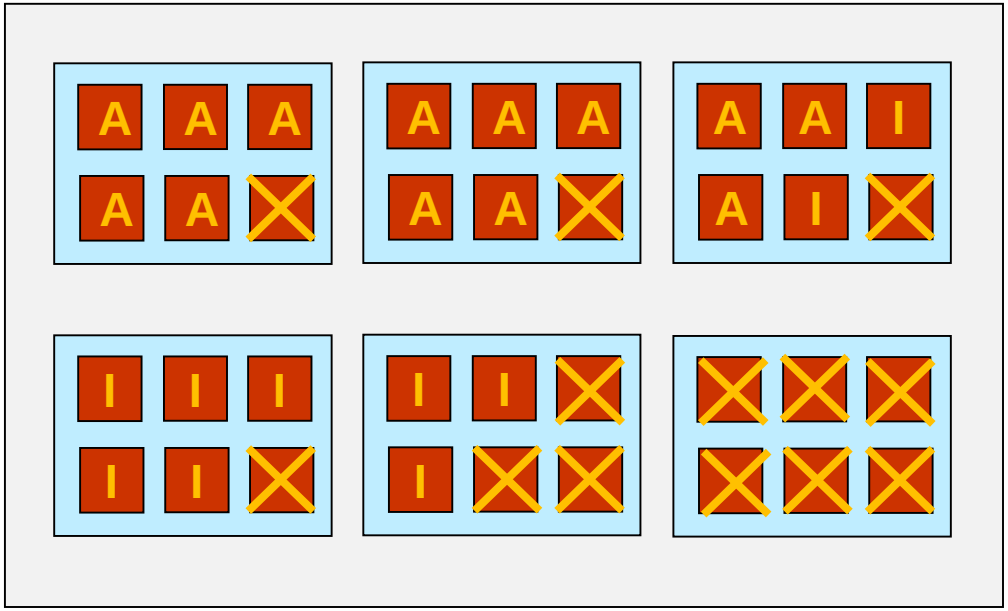


- Typical servers have 3.0-3.3 GHz and 8-24 cores
- Max: 3.8 GHz or 64 cores

Pay only for the number of processors needed – use Capacity on Demand for additional processing power when needed

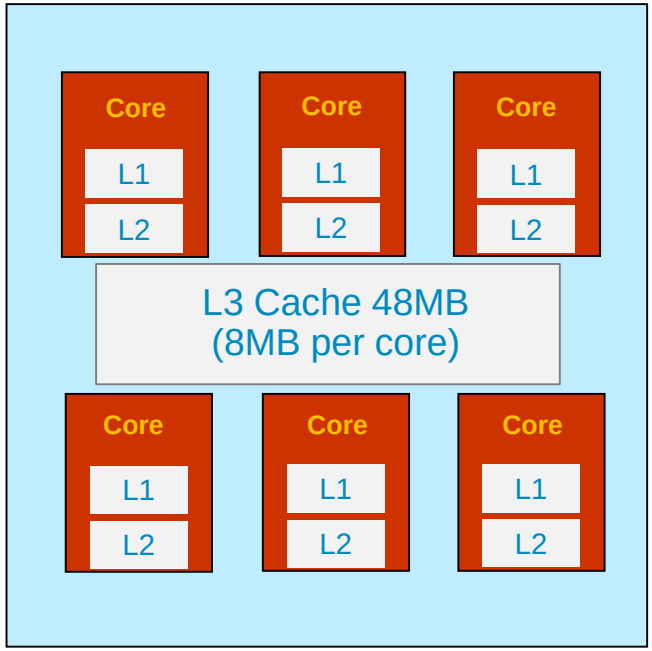
- Servers are shipped fully populated
  - Customers purchase (activate) only the number of processors desired
- Customers can also purchase "inactive" processors at reduced price (Capacity on Demand)
  - Activate only as needed
  - Use for temporary or permanent capacity
  - Self-managed on/off
- New capacity is immediately available for work without service disruption

Enterprise Linux Server with 36 processors



Enterprise Linux Server includes optimized cache structure, designed to support large data sets

Enterprise Linux Server
Processing Unit chip with 6 Linux cores



Total
L1 Cache
per chip =
960KB

Total
L2 Cache
per chip =
12MB

Enterprise Linux
Server Storage
Control chip

L4 Cache 1,536MB
(shared across all
processors)

Intel Sandy Bridge x86 chip with 8 cores

Total
L1 Cache
per chip =
512KB

Total
L2 Cache
per chip =
2MB

No L4 Cache

Enterprise Linux server can be configured to support either DASD or SCSI storage

IBM DS8xxx

DASD

SCSI

IBM Enterprise Linux Server

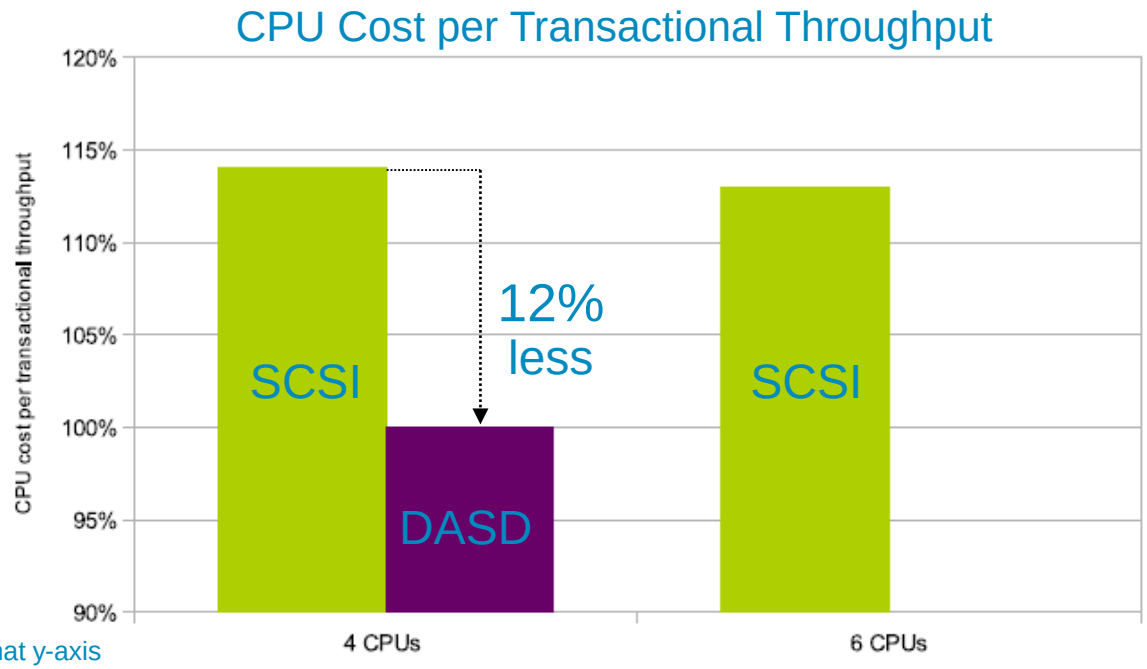
IBM SAN Volume Controller (SVC)

IBM Storwize V7000

IBM XIV

Tests demonstrate how ELS with DASD storage can be the right option for certain workloads

- Tests confirm:
  DASD option required less CPU than FCP to drive the same amount of workload

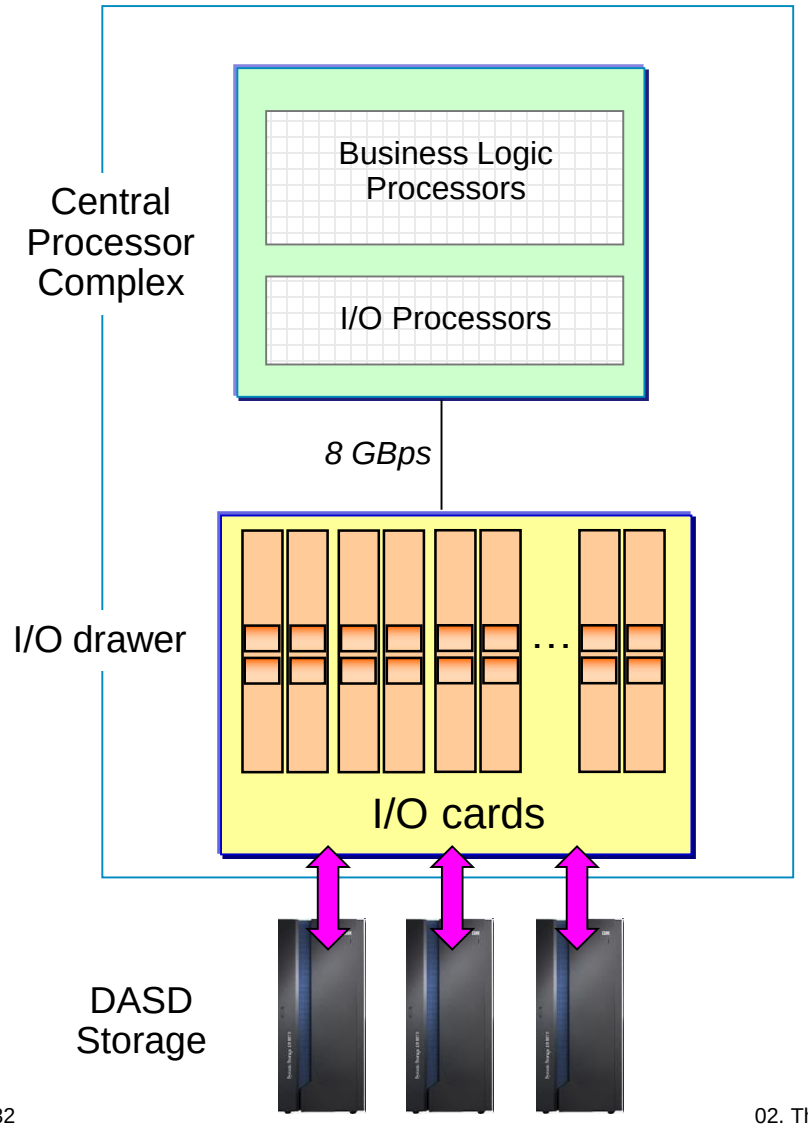


Note that y-axis starts at 90%

- SCSI yields higher performance, but requires additional CPU to drive the workload
- DASD makes sense when workloads have high I/O, and CPU costs must be kept low

Source: http://pic.dhe.ibm.com/infocenter/lnxinfo/v3r0m0/topic/liaag/l0orac00.pdf

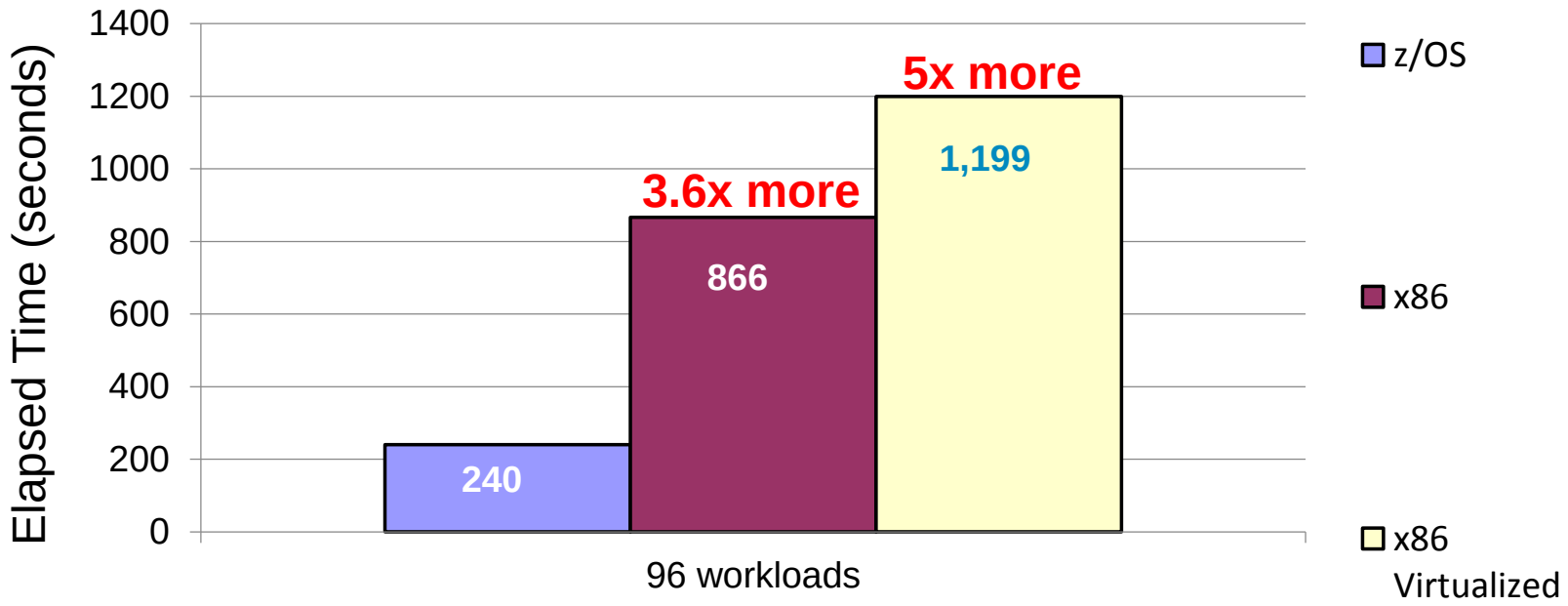
With DASD storage, special processors are dedicated to driving I/O



- I/O processing logic is offloaded to special processors
  - Isolates main Linux processor for business logic processing
- I/O processors managed Logical I/O Channel Subsystem
  - Determines optimal physical I/O path to be used
  - Delivers optimized I/O efficiency

- Dedicated I/O subsystem is excellent for high I/O workloads
- Intel servers have no dedicated I/O subsystem

In comparison tests of I/O load capacity, Intel times were significantly slower



Performance comparison test of an I/O intensive workload with identical enterprise class storage. Enterprise Linux Server EC model with **8** core. Westmere EX server with **40** core @2.4GHz. Each system connected via 4 x 8Gb links to DS8800. Enterprise Linux Server running against 8 SSD DASD CKD volumes. Intel server running against 8 SSD LUNs FB volumes. Note: Storage limitations came into effect at workload counts greater than 96.

Source: IBM CPO

Workloads with higher I/O bandwidth requirements benefit from Enterprise Linux Server architecture

Which platform provides the lowest TCA over 3 years?

Oracle DB workload

Customer Database Workloads each supporting 4K TPS

Oracle Enterprise Edition
Oracle Real Application Cluster

T5-8 server
(128 cores)

3 x 4-node Oracle RAC DB

$8.9M (3 yr. TCA)

ELS with 16 IFLs

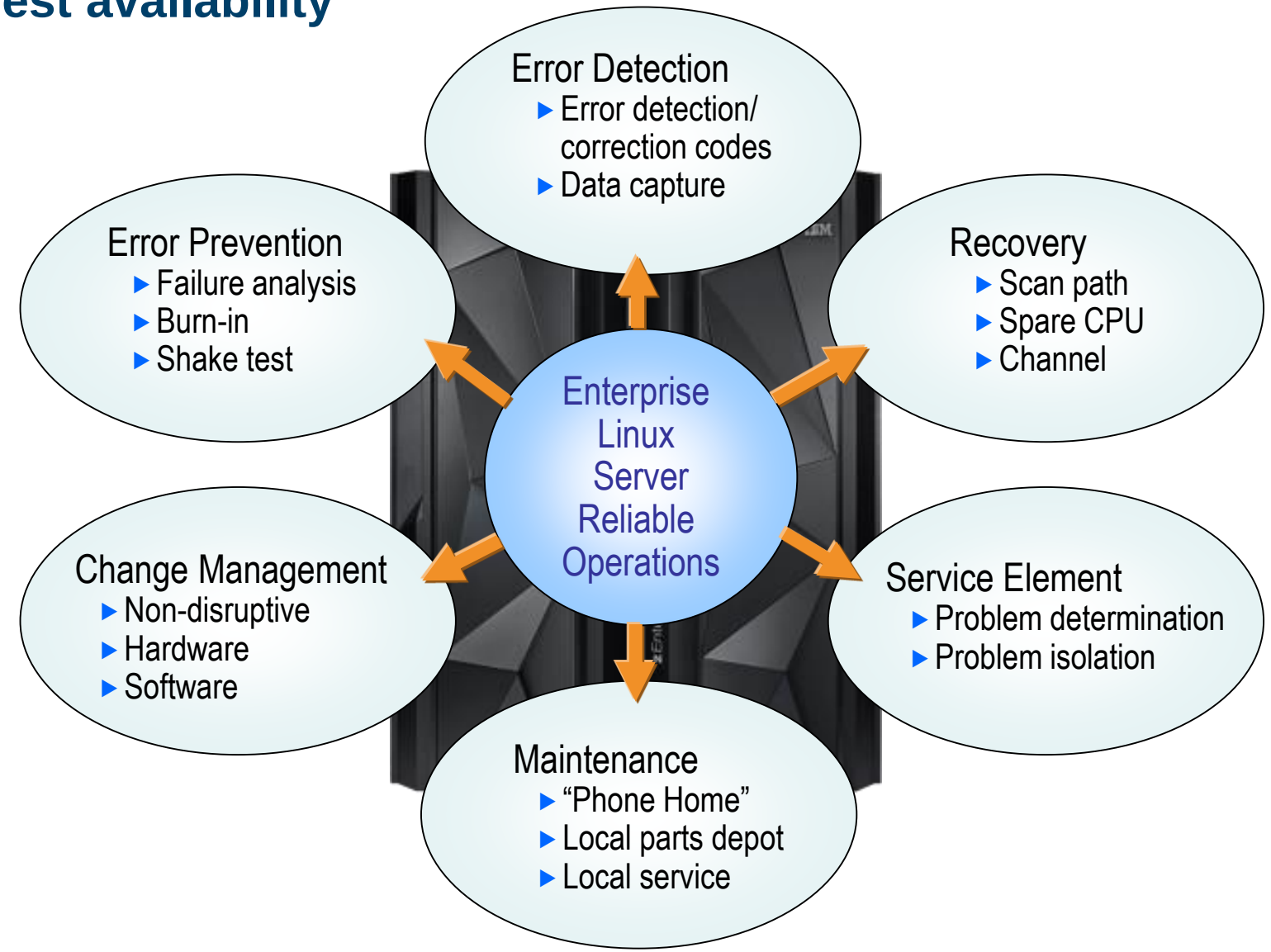
3 x 4-node Oracle RAC DB

$3.6M (3 yr. TCA)

***60%** less cost!*

TCA includes hardware, software, maintenance, support and subscription. Workload Equivalence derived from a proof-of-concept study conducted at a large Cooperative Bank and projecting to T5-8 servers using published TPC-C Results normalizing them to Relative Performance Units as available from Ideas International

Trusted reliability – comprehensive protection to ensure highest availability



IBM Enterprise Linux Server supports concurrent operations during maintenance

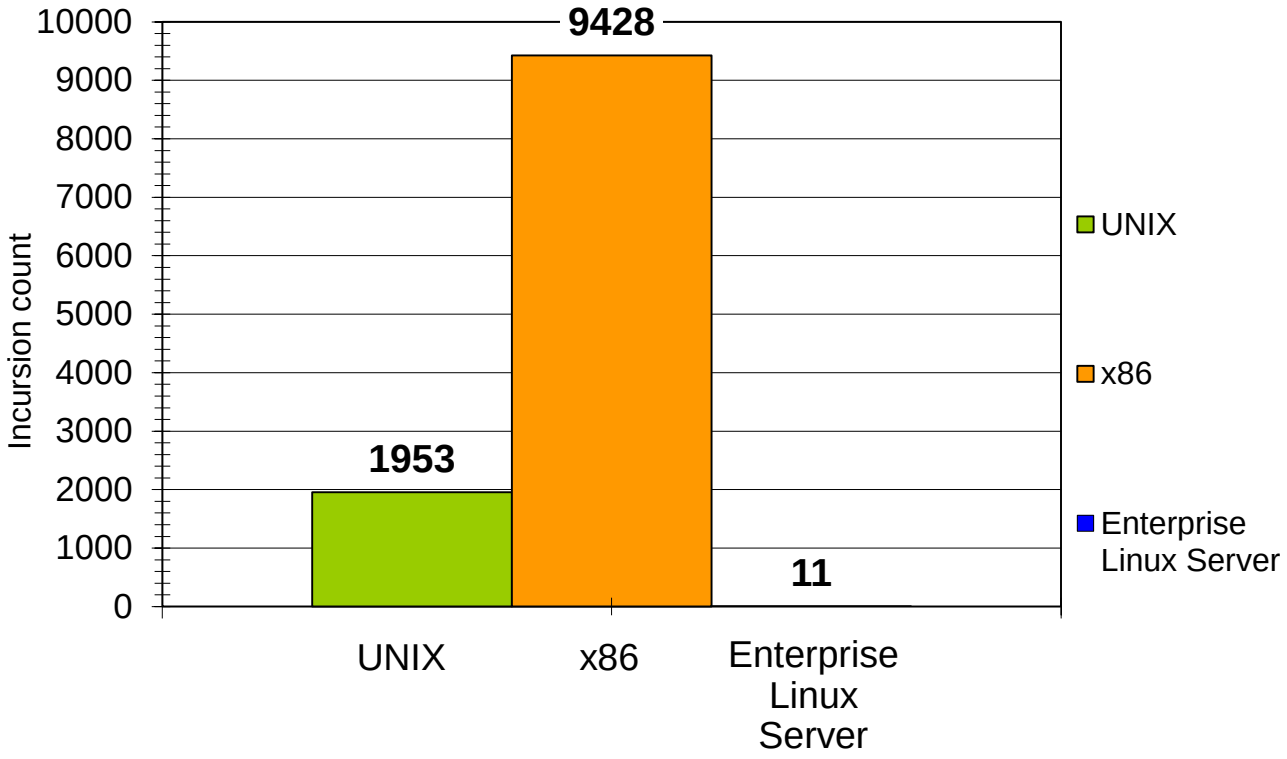
Capability	ELS	x86
ECC on Memory Control Circuitry	**Transparent While Running**	Can recognize/repair soft errors while running; limited ability with hard errors
Oscillator Failure	**Transparent While Running**	**Must bring server down to replace**
Core Sparing	**Transparent While Running**	**Must bring server down to replace**
Microcode Driver Updates	**While Running**	Some OS-level drivers can update while running, not firmware drivers; reboot often required
Book Additions, Replacement	**While Running**	**Must bring server down**
Memory Replacement	**While Running**	**Must bring server down**
Memory Bus Adaptor Replacement	**While Running**	**Must bring server down**
I/O Upgrades	**While Running**	**Must bring server down to replace (limited ability to replace I/O in some servers)**
Concurrent Driver Maintenance	**While Running**	**Limited – some drivers replaceable while running**
Redundant Service Element	**2 per System**	"Support processors" can act as poor man's SE, but no redundancy

Single book systems may not support concurrent memory upgrades

Ultimate security is a key feature of the Enterprise Linux Server

- Tight authentication and access control surround VM resources
- Virtualization architecture rated at one of the highest Common Criteria EAL ratings (5+)
  - By comparison, VMWare ESXi 5.0 rated at 4+

- Independent study shows security incursion rates are lowest on Enterprise Linux Server compared to x86 and Unix servers



Source: Solitaire Interglobal Ltd, 2013

Independent studies show how ELS security is superior to other platforms, and augmentation costs less

Security Natively Covered by Platform

Security Level Description	IBM Enterprise Linux Server	x86	Competitive UNIX
Normal corporate	100.00%	18.16%	30.26%
Credit card processing involved	99.00%	11.04%	18.28%
Banking	94.00%	5.26%	10.22%
Healthcare	100.00%	3.24%	8.51%
Research	92.50%	2.86%	4.16%
Defense	85.54%	0.26%	1.86%

- On System z, most security requirements are standard
- Major security deficiencies exist on distributed platforms

- Distributed platforms require considerable additional expense to achieve required security levels

Incremental Cost to Achieve Required Security

Security Level Description	IBM Enterprise Linux Server	x86	Competitive UNIX
Normal corporate	0.00%	32.54%	12.37%
Credit card processing involved	2.32%	46.27%	29.53%
Banking	2.07%	51.31%	26.58%
Healthcare	0.00%	67.26%	35.89%
Research	4.28%	91.26%	64.28%
Defense	11.36%	125.41%	102.26%

Source: Solitaire Interglobal Ltd., 2013

Summary – Advantages of Enterprise Linux Server over distributed server farms

- Exceptional virtualization – complete workload isolation and perfect workload management
- World's fast CPU clock rates, with no overcommit of resources – nearly 100% utilization nearly all the time
- Designed for superior reliability, highest availability, and ultimate security
- Low total cost of ownership – reduced costs for software licenses, networking, real estate, power and administration