The Modern Mainframe…
At the Heart of Your Business

Application Consolidation on System z

Implementing New Business Faster!

ODI is Wasting Money!

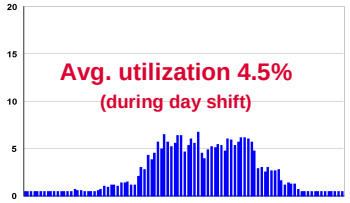
Your last report showed an average utilization of 5% - 10% for our distributed servers – isn't that wasteful?

Service Oriented Finance CEO

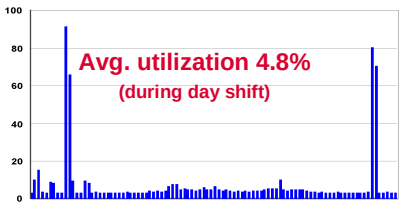
Service Oriented Finance CIO

UNIX and Windows Server Utilization – Typical Examples

App Server, Prod, PL6400R 4-way, Win2K



Exchange, Prod, PL 6400R 1-way, Win2K



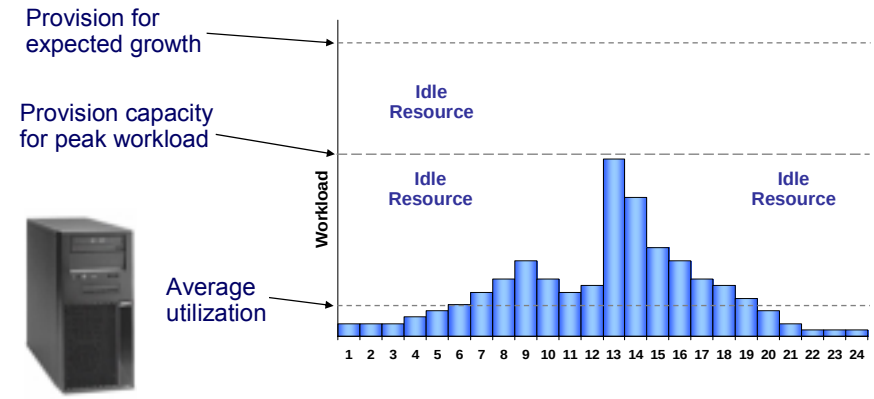
App Server, Sun E10000 24--way, Solaris

Windows Servers Aggregate Daytime Utilization < 5%
Unix Servers Aggregate Daytime Utilization 15-20%
Mainframes Aggregate Daytime Utilization 70-100%

Why Do Distributed Servers Have Low Utilization?

1. Often dedicated to a single application
2. Separate production, development, test, and site failover servers
3. Provision for peak workload and expected growth
4. Individual workloads have more variability in the peak
5. Organizational ownership limits usage
6. Hub-and-spoke style deployments
7. Workload growth not as fast as Moore's Law

Utilization of Distributed Servers



Server dedicated to one application

- Typical utilization of Windows Servers <5%
- Typical utilization of UNIX Servers 15 – 20%
- Typical utilization of System z Servers 70 – 100%

Sprawling Server Farms Are Also Costly To Manage

- A Financial Services Company
  - 68 Windows support staff at $100K/year, fully burdened
  - 16 servers per person
  - $6,000 per year per server for labor
- Another Financial Services Organization
  - 7 Windows support staff at $125K/year fully burdened rate
  - 19 servers per person
  - $6,500 per year per server for labor

Source: IBM Scorpion Customer Studies
NOTE: Figures for total administration cost

People Productivity to Manage NT Servers

Enterprise	# NT Servers	# People	Ratio (s/p)	Comment
AA	1123	68	16.5	excellent
BB	228	20	14.4	excellent
CC	671	51	13.1	excellent
DD	700	65	11.5	excellent
EE	154	18	8.5	good
FF	431	61	7.1	good
GG	1460	304	4.8	poor
HH	293	79	3.7	poor
II	132	54	2.0	poor

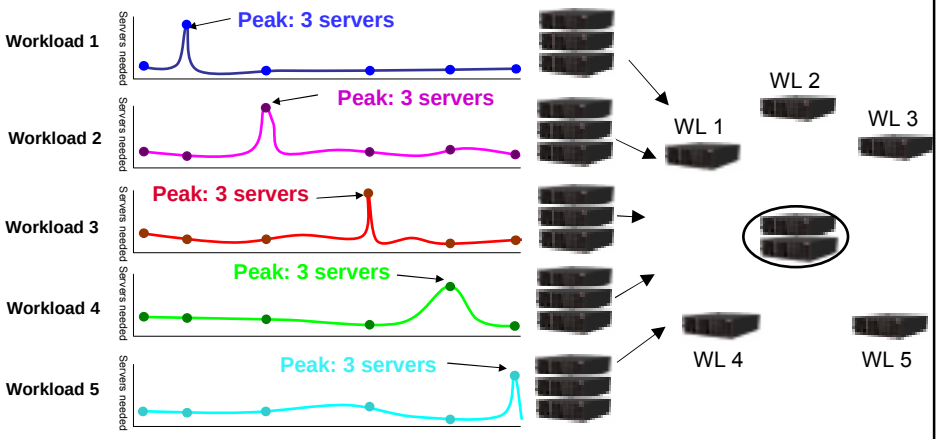
Source: IBM Scorpion Customer Studies
NOTE: Figures for total administration cost

People Productivity to Manage UNIX Servers

Enterprise	# UNIX Servers	# People	Ratio (s/p)	Comment
A	706	99	7.1	excellent
B	273	52	5.2	good
C	69	15	4.6	good
D	187	56	3.3	average
E	170	51	3.3	average
F	85	28	3.0	average
G	82	32	2.6	below average
H	349	134	2.6	below average
I	117	50	2.3	below average
J	52	52	1.0	poor

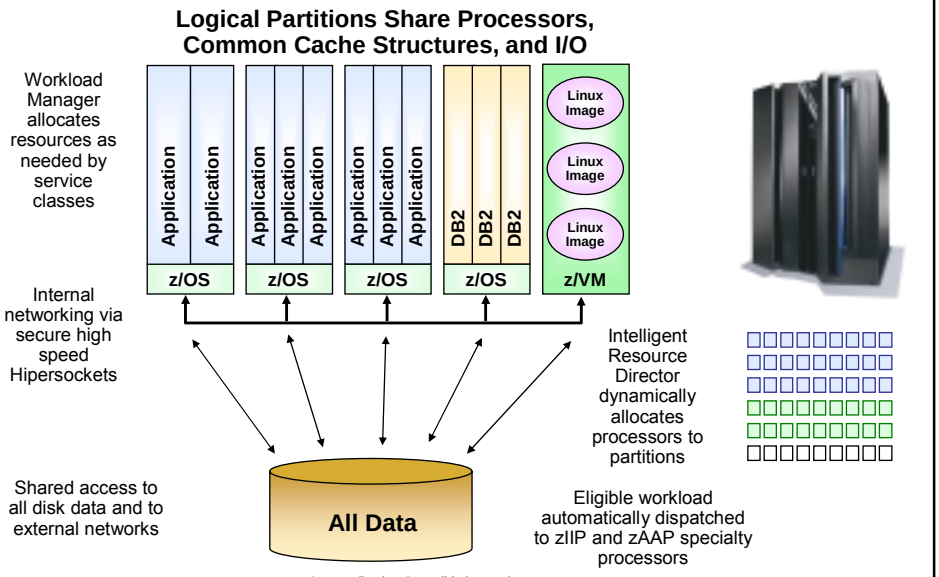
Source: IBM Scorpion Customer Studies
NOTE: Figures for total administration cost

Theoretically Run the Same Workloads with Less Resources

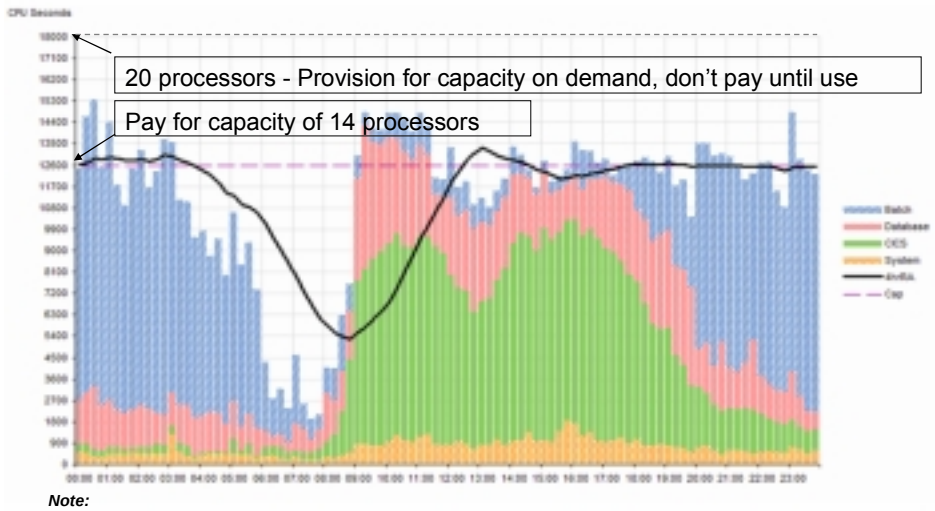


What's Required: Virtualization and Intelligent Workload Management to Accommodate Shifting Workloads – automatic on the mainframe!

Extreme Virtualization – How it Looks in z/Architecture



System z Virtualization, Workload Management, and Storage Bandwidth Achieve High Levels of Utilization



Note:

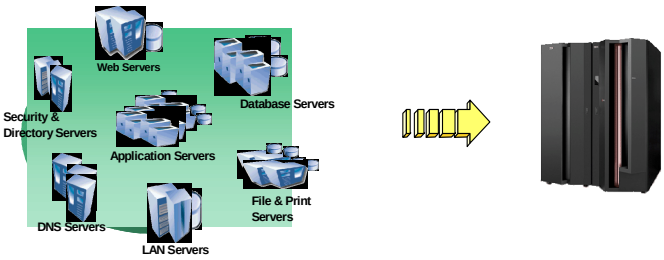
- *Each bar represents the amount of CPU seconds used in 15 minutes (= 900 seconds) with 2 10-way machines*
- *The way Workload Management controls the workload 4-hour rolling average to the Cap "high-water mark"*

Economics of Consolidation

- Consolidating workload means running multiple workloads on the mainframe at the same time
- Consolidation achieves greater utilization of assets which minimizes cost per unit of work
- Same principal was applied by Henry Ford at the dawn of the industry era
  - It still applies today
- Workload consolidation on a mainframe squeezes out cost to achieve maximum efficiency
  - And return on investment

Benefits of Server Consolidation – Less Hardware Required

- By consolidating on the IBM mainframe we can reduce
  - Floor space required in the data center
  - Power (and cooling) required
  - Networking equipment and cabling
  - Number of component failures requiring attention



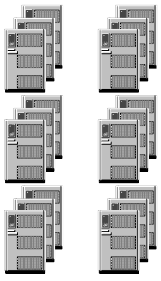
Benefits of Server Consolidation – Higher Availability and Systematic Disaster Recovery

- A single mainframe provides very high availability
  - Comprehensive design for reliability and serviceaility
  - Logical partitions isolate workloads
- Mainframe clusters can provide continuous operation capability
  - Failover allows the sysplex cluster to keep running
  - Online operations maintenance
- Systematic Disaster Recovery can be provided via GDPS
  - Disk mirroring and automated site failover
  - Negligable hardware and software licensing for cold-standby

Benefits of Server Consolidation – Systematic Security

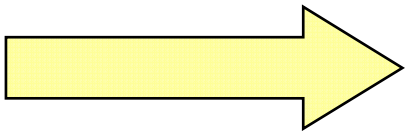
- RACF can be used to secure all the workloads
  - Including Linux on z/VM
- Central security administration
- Central security auditing
- Can be extended via Tivoli to even larger aggregations

Two Kinds of Workload Consolidation



Roll-up

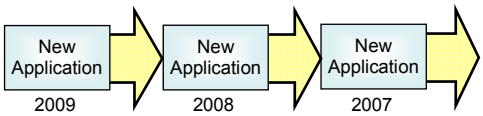
Migrate to achieve lower costs



Strategic Hosting

Incremental growth on System z

Programmers



"Specialty Engines" Make Consolidation Even More Attractive

- Special assist processors for System z
  - For Java workloads (zAAP)
  - For selected DB2 workloads (zIIP)
  - For Linux workloads (IFL)
- Attractive pricing
  - Hardware is $125K per processor one time charge
    - $125K for a 580 MIP processor
    - ~ 9% of the normal price
  - No charge for IBM software running on zAAP/zIIP
  - IBM software running on IFL pays 100 PVU's (same as Intel dual core)
  - Free upgrade to next generation!

- Requirements
  - Max number of zAAP =< number of general purpose processors
  - Max number of zIIP =< number of general purpose processors
  - No limit on the number of IFL's

Example Workloads That Can be Consolidated on a Mainframe

What	Where	Specialty Processor	How
Growth of Existing Mainframe Workload	z/OS	--	Capacity on demand
New CICS or IMS Applications	z/OS	--	Develop
Data Warehouse	z/OS	zIIP	Deploy
SAP Database Server	z/OS	zIIP	Deploy
WebSphere Application Server	z/OS	zAAP	Deploy
WebSphere Portal Server	z/OS	zAAP	Deploy
WebSphere Process Server	z/OS	zAAP	Deploy
Domino	z/OS	--	Deploy

More Example Workloads That Can be Consolidated on a Mainframe

What	Where	Specialty Processor	How
Linux Applications	Linux on z/VM	IFL	Recompile
Linux Middleware - IBM Brands (DB2, WebSphere, Lotus, Rational, Tivoli) - Oracle Database - etc.	Linux on z/VM	IFL	Rehost
Linux Packaged Applications - SAP - Oracle - etc.	Linux on z/VM	IFL	Rehost
.NET Applications	WebSphere Linux on z/VM	IFL	Mainsoft

Linux on z/VM

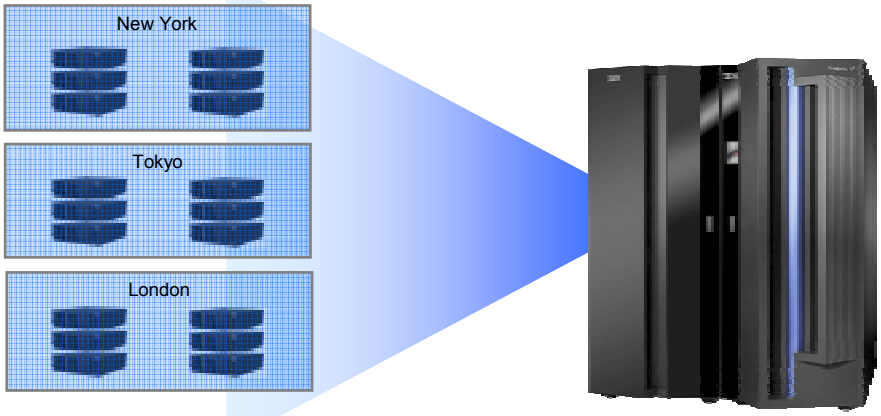
We've seen some examples of incremental strategic hosting on z/OS

- WebSphere Process Server
- Data Warehouse
- SAP Data Server

Now let's look at some examples of roll-up consolidation on Linux on z/VM

IBM

Roll-up Branch-style Linux Workloads onto System z to Save Money



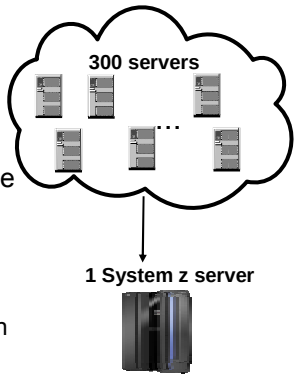
5-10% utilization
Local staffing and infrastructure required in each location

95% utilization of fewer processors

All of the qualities of services of the System z platform

Hannaford Supermarket Chain Goes Real Time with Linux on System z

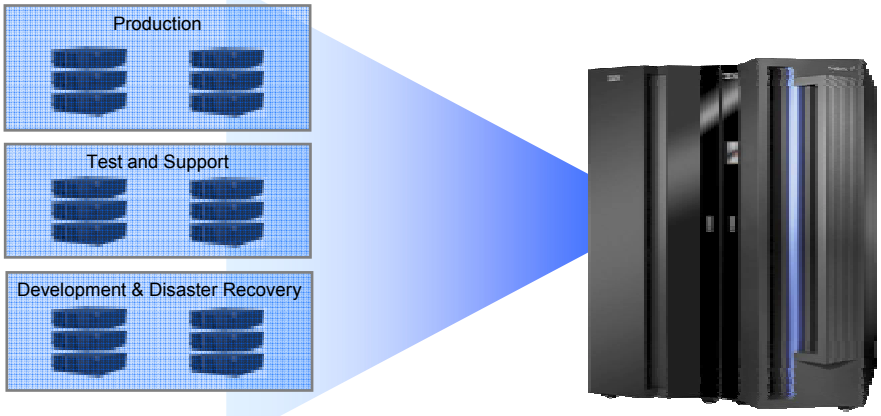
- Northeastern United States supermarket chain
- Reduced costs while improving customer and partner satisfaction using Linux on z/VM
- Consolidated 300 store servers on to 8 mainframe IFL processors
  - Orders now direct from the aisles, just-in-time inventory management
  - Introduced new web portal for business partners
  - Significant labor savings across the IT organisation



"The only way we'd consider consolidating critical data from hundreds of servers onto one system was by choosing an IBM mainframe for its legendary reliability and availability,"

Bill Homa, senior vice president and CIO of Hannaford

Roll-up Server Farm Linux Workloads onto System z to Save Money



5-10% utilization

Separate servers for each task – all require infrastructure, staff

95% utilization of fewer processors

All of the qualities of services of the System z platform

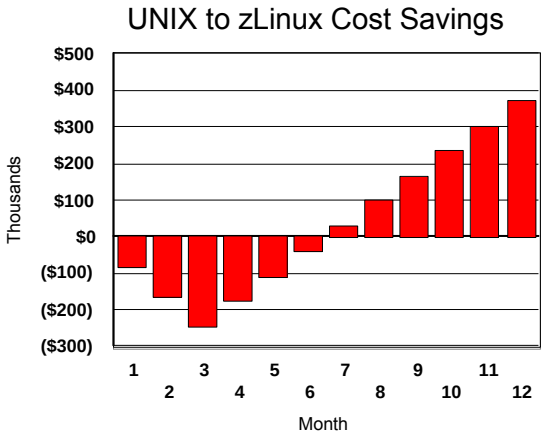
Nationwide® On Your Side™ Saves $16+ Million with Linux on System z

- ***Problems:***
  - High TCO including data center power and floor space scarcity
    - New facility would cost $10M+
  - Long server provisioning process
- ***Solution:***
  - 350 servers virtualized with 15 z990 IFLs, supported by 3 staff
    - 12 mission critical applications with 100,000+ users/day
  - 50% reduction in Web hosting monthly costs
  - 80% reduction in floor space & power conservation
  - 50% reduction in hardware & OS support efforts
    - Significant savings on middleware costs
  - Fast implementation (4 months)
  - Significantly faster provisioning speed (months → days)
  - Simple, robust mainframe high availability & disaster recovery

Vastly improved TCO, Speed & Simplification

Linux Consolidation Proof Point

IBM Global Services Consolidated 62 Linux Servers onto one IFL

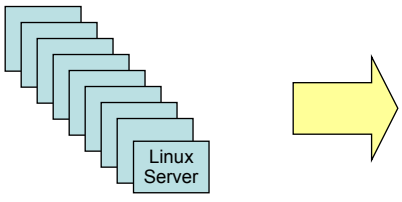


(Cost Savings are driven primarily by $89K monthly labor savings)

Cost Differential

✓***Broke-even after 6 months***
✓***>$2.5M saved in 3 years***

How Can Service Oriented Finance Consolidate Their Servers?



60 Linux servers with low utilization

60 @ $4,000 = $240,000

Plus 60 middleware licenses

Plus $3,900 x 60 = $234,000/yr labor

One IFL processor with high utilization

1 @ $125,000 = $125,000

Plus one middleware license

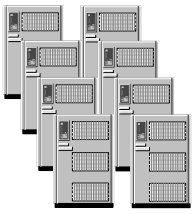
Plus $60,000 x 1 = $60,000/yr labor

Platform administration is 60% of total administration cost – analysis using data from Nationwide

Potential Savings from Linux Consolidation on System z

$1.1M saving over 3 years

60 Linux Servers



+1 IFL

	Distributed Linux/Intel @ low utilization				Mainframe IFL @ high utilization			
	Unit cost	Quantity	Sub Total	3 year total	Unit cost	Quantity	Sub Total	3 year total
Hardware & OS - every 3 years	$4,000	60	$240,000	$240,000	$125,000	1	$125,000	$125,000
Additional Memory			Included		$8,000	10	$80,000	$80,000
HW Maintenance			Included		$19,944	1	$19,944	$39,888
VM virtualization			N/A		$22,500	1	$22,500	$22,500
VM S&S (25%)			N/A		$5,625	1	$5,625	$16,875
Annual Linux support	$1,000	60	$60,000	$180,000	$14,000	1	$14,000	$42,000
OTC Software license – WAS*	$4,000	60	$240,000	$240,000	$4,000	1	$4,000	$4,000
WAS S&S for 2 years	$800	60	$48,000	$96,000	$800	1	$800	$1,600
Annual labor for platform	$3,900	60	$234,000	$702,000	$60,000	1	$60,000	$180,000
Annual power & cooling	$920	60	$55,188	$165,564	$920	1	$920	$2,759
Grand Total				**$1,623,564**				**$514,622**

** IBM WebSphere Application Server for Linux*

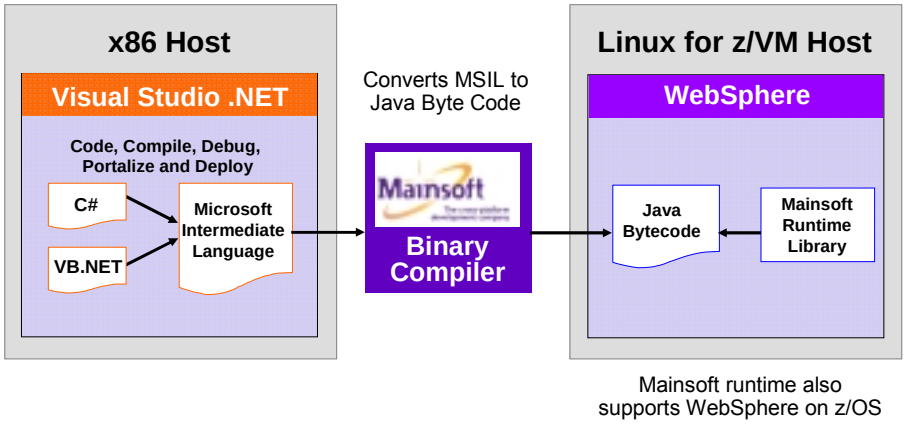
Québec Government Runs Oracle at IFL Prices

- Consolidated 190 Oracle Databases (9i and 10g) onto a z9-EC with IFL's
  - Reduced cost of hardware and software by 30%
  - Better database loading performance due to higher I/O bandwidth
  - Each administrator could manage 100 Linux instances
  - Easy migration
    - One migration per day
    - Create new Linux server in 30 min (vs 1 week – 3 months)
    - Clone Oracle DB instance in 30-45 min (vs 10 – 14 hours)
    - Unload/load
  - Inherit benefits of z platform – workload management, availability, disaster recovery
  - Expect to migrate at least 100 Oracle databases per year

DEMO: Fast Linux Provisioning

- Let's show mainframe Linux provisioning – live!
  - Laptop based demo system
    - Using a single Intel processor, 3GB memory
  - Emulated mainframe is running z/VM to virtualize
  - We will create and start 10 virtual mainframes
    - 3 will run Linux plus the Apache webserver
- Using an emulated mainframe on an Intel laptop, we can demonstrate better virtualization on Intel than VMWare can!!
  - VMWare limited to 8 virtual servers per real processor
  - z/VM demo showed 10 on top of our emulated mainframe

NEW!
Execute .NET Code on the Mainframe at IFL Prices
Visual MainWin for J2EE



Contact: Ron Johnsen – VP WW Sales, ronj@mainsoft.com USA 408 200 4023

Other Vendors Virtualization Capabilities are Limited

- HP still working on a real Hypervisor
  - HP vPars only allow one virtual server per real processor
  - HP's software virtualization has lower limits than VMWare
- Sun Containers are actually operating system partitions
  - Limited to 32 virtual servers per machine
  - Solaris kernel fault brings all containers down
- Microsoft still working on a real Hypervisor
  - Microsoft Virtual Server will be replaced
- Result – no one can beat System z for squeezing out cost

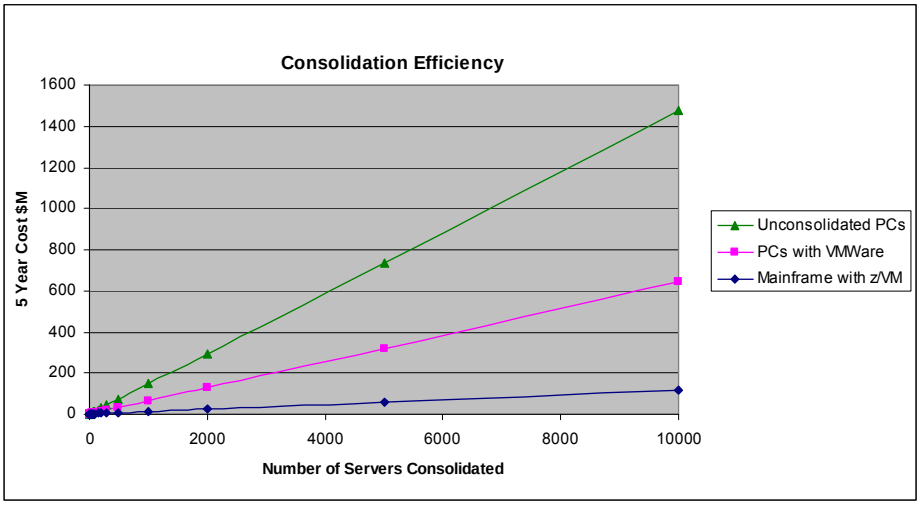
VMWare ESX3 with Intel Lacks Flexibility

- Maximum of 8 virtual servers per real processor
  - Although a normal production ratio is 2-3 servers
- Maximum of 16 GB memory for each virtual server
- Maximum of 32 real processors, 64 GB real memory
- Maximum of 128 virtual servers per machine
- Less efficient use of memory
  - Recommend keeping more real memory than total working set + VMWare overhead allowance
  - Dedicated disk space per-virtual server required for swap
- Can only create up to a 4-way SMP virtual server
  - And doing that requires additional charged software

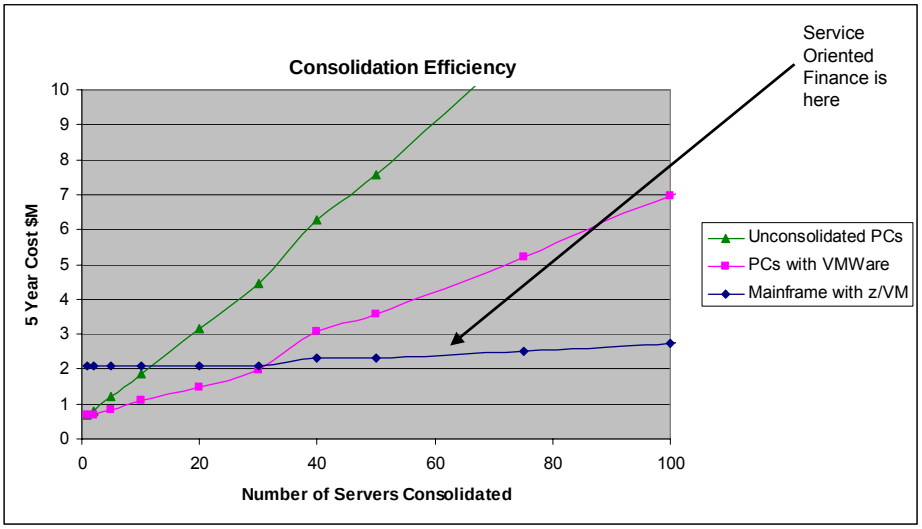
Linux Consolidation Assumptions

	zVM	VMWare
Consolidation Ratio	30:1	3:1
Servers per Administrator	100	30
Power Consumption per Rack	6.3kW	12.6kW
Linux Annual Maintenance	$18K/year	$2.5K/year
VMWare Enterprise	--	$3K, $0.9K/year
Oracle Server License	$40K, $8.8K/year	
Power Cost	$0.09 per kWh	
Headcount	$100K/year	
Floor Space	$11K/rack/yr	
Mainframe Linux Processor	$125K, $17.5K/year	--
Mainframe	$100K	--
Intel Servers	--	$4K - $54K
zVM Administrators	2 per mainframe	--

Cost of Different Linux Consolidation Solutions



Cost of Different Linux Consolidation Solutions (0-100 Servers)



Service Oriented Finance Did a Roll-up Consolidation of Linux Servers

I saved a lot of money by consolidating our Linux servers to System z!

Service Oriented Finance CIO