

Extending Your Mainframe for More Business Value

Consolidate Workloads
to Reduce Costs

Distributed Server Sprawl

Our Data Centers are full of distributed servers and our costs are out of control!

Consolidating your workloads on the mainframe can solve this problem

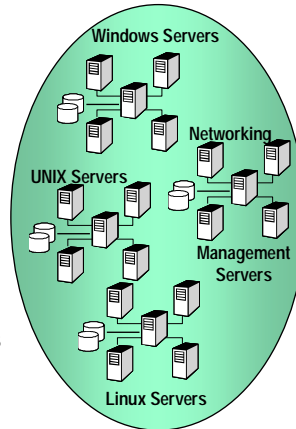


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Distributed Server Sprawl Uses...

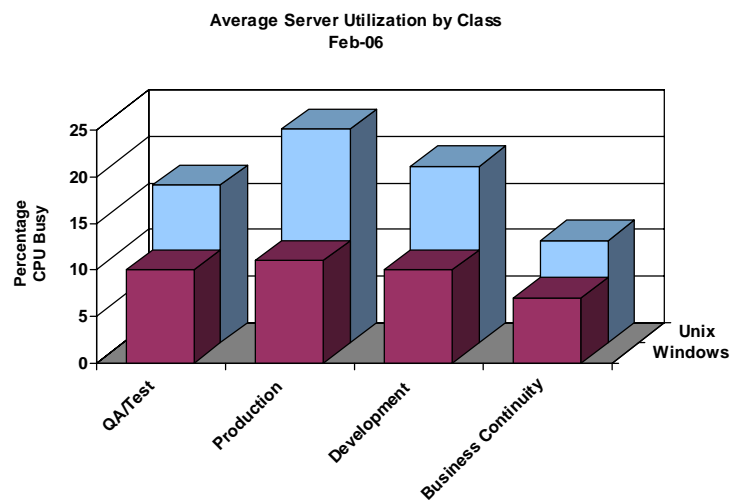
- Lots of hardware
 - ▶ Lots of floorspace
 - ▶ Lots of power
 - ▶ Lots of networking
- Lots of software licenses
- Lots of people to manage the systems
- **Consequences**
 - ▶ Low Utilization of Hardware Resources
 - ▶ Complexity
 - ▶ Increased time to respond to business requirements
 - ▶ Difficulty integrating information from various systems



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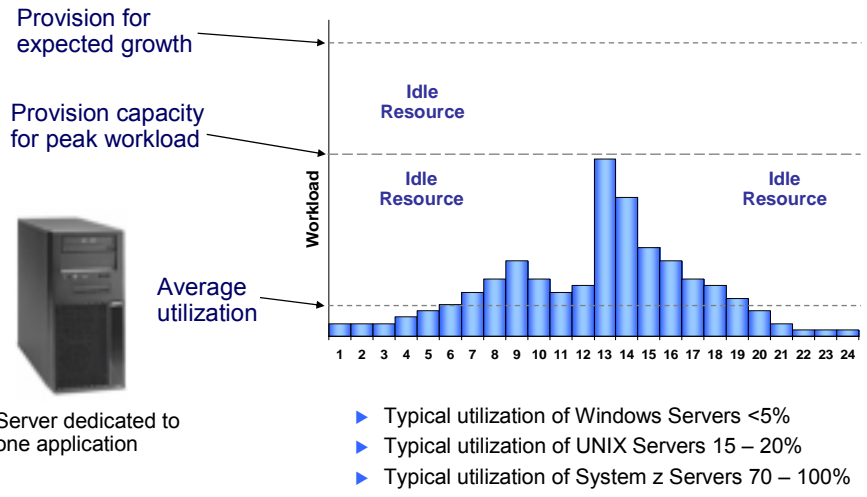
Server Utilization at a Large Financial Institution



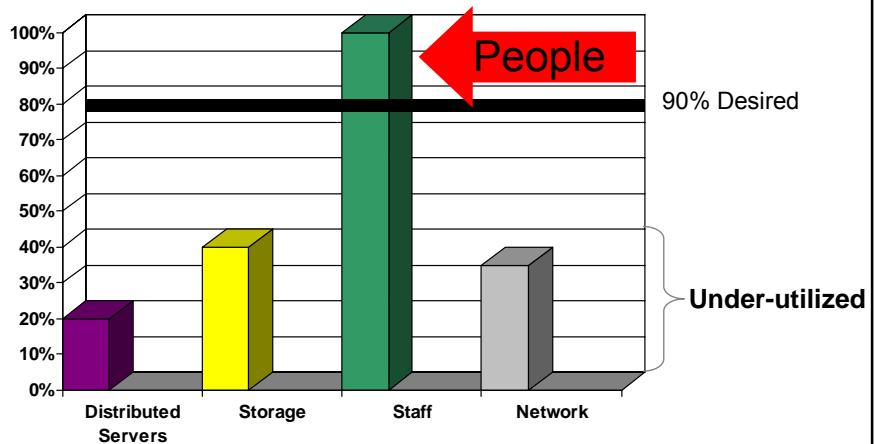
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Utilization of Distributed Servers



Distributed Result: Only One Resource is Highly Utilized!



IBM Consolidation Experience: Annual Costs Per Distributed Server

Annual Operations Cost Per Server (Averaged over 3917 Distributed Servers)

Power	\$731
Floor Space	\$987
Annual Server Maintenance	\$777
Annual connectivity Maintenance	\$213
Annual Disk Maintenance	\$203
Annual Software support	\$10,153
Annual Enterprise Network	\$1,024
Annual Sysadmin	\$20,359
Total Annual Costs	\$34,447

\$34,447!

No wonder I don't
have any money
left over for new
projects



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The largest cost component was labor for administration 7.8 servers per headcount @ \$159,800/yr/headcount

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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

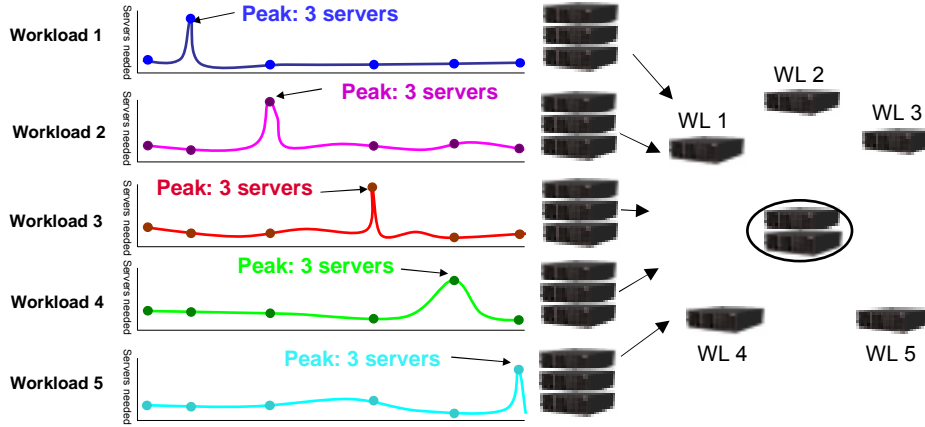


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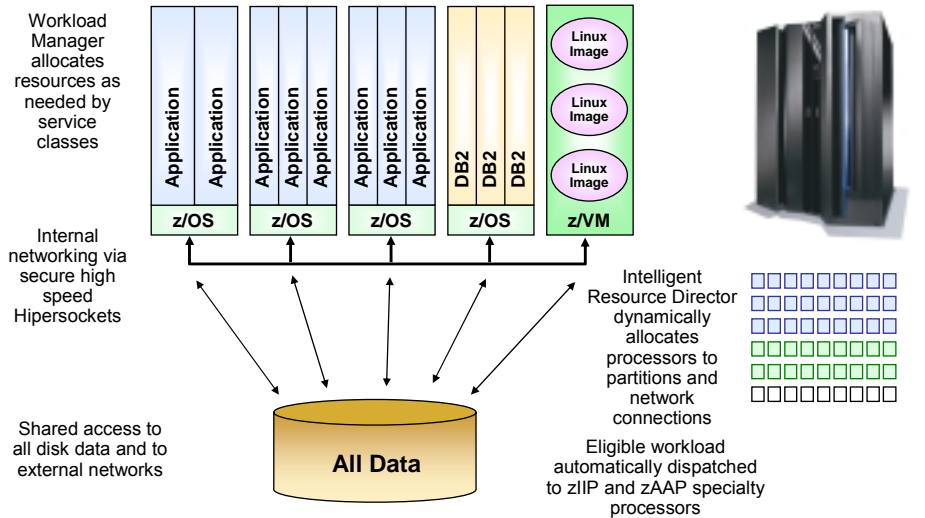
Theoretically Run the Same Workloads with Less Resources



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

Dramatic Virtualization – How it Looks in z/Architecture

Logical Partitions Share Processors, Common Cache Structures, and I/O



Multiple Workloads on a Single Server Requires Business Oriented Workload Management

- Mainframe hardware provides:
 - ▶ Hypervisor assigns processor resources to logical partitions
 - ▶ Intelligent Resource Director supervises this assignment
 - ▶ Virtualized I/O Subsystem

- z/OS provides:
 - ▶ Workload Manager assigns resources within a z/OS image according to service level agreements
 - ▶ Also performs this function across a cluster of z/OS images

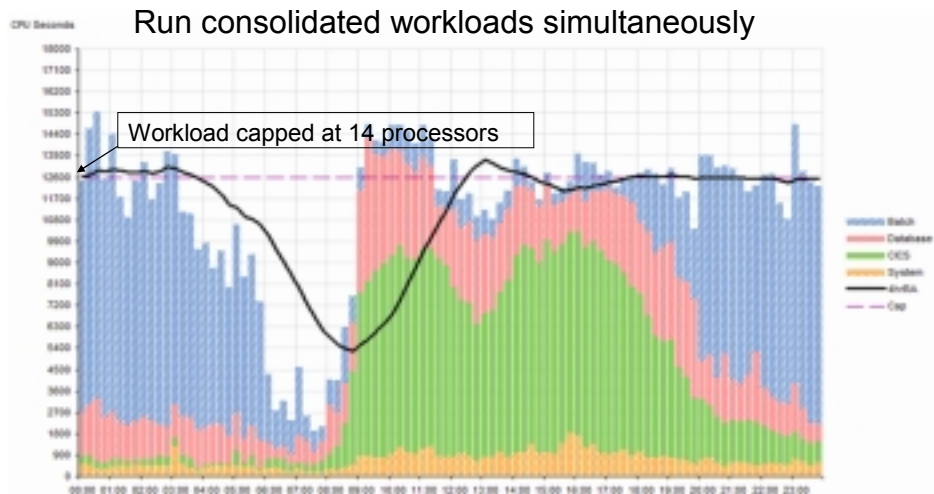
- z/VM provides:
 - ▶ Virtual Machine Resource Manager
 - ▶ Complete mainframe virtualization (including memory)

- All of these facilities provide
 - ▶ Business workload oriented goal or velocity definitions
 - ▶ Autonomic and continuous management to those definitions

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The Result – High Utilization on a Mainframe



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"

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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

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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	Linux on z/VM	IFL	Mono, Mainsoft
Open Solaris Applications	Open Solaris on z/VM	IFL	Sine Nomine

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Linux on z/VM

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

- ▶ Extend new access channels with WebSphere
- ▶ New data workloads with DB2
- ▶ Business insight with DB2 and Information Server
- ▶ Communications backbone with IBM Enterprise Service Bus

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



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Telemar Roll-up Consolidation Project

Largest provider of fixed-line telecommunications services in South America.

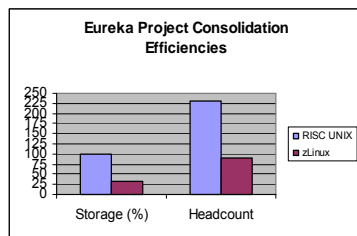


Consolidated 16 geographically dispersed UNIX servers on a centralized System z9 EC

16 to 1 consolidation

Benefits:

- Open-standards-based solution
- Maximized manageability, scalability, security and availability of its key business systems.
- Reduced need for server capacity by one-third
- Lowered operating and administration for maintaining email server applications.



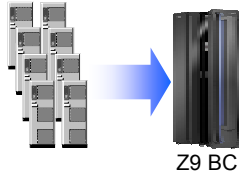
Source Robert Frances Group

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Nexxar - Financial Services

80 x86
Servers



1 IFL

z/VM supports Nexxar's strategy of acquiring firms by providing secure workload isolation for each "private label" relationship

- Operating costs reduced by 30% per year
- Capacity on demand can handle activity spikes
- System z9 cryptography provided assurance required by Nexxar's customers
- Started with one IFL, will add more as needed
- Staff support reduced by 75% due to z9 BC
- Used DB2 on z/OS as data server
- **80 to 1 consolidation**

A first-time mainframe customer

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Québec Government Runs Oracle at IFL Prices

- Consolidated 200 Oracle databases on to 135 Linux virtual machines on a z9-EC with 3 IFL's – **45 to 1 consolidation!**
 - ▶ Reduced TCO (SW, HW, labor) by 30%
 - Reduced cost of Oracle licenses by 90%
 - ▶ Used RACF for consistent security
 - ▶ Each administrator can manage 100 Linux images
 - ▶ Easy migration
 - One migration per day
 - Create new Linux server in 10 min (vs 1 week – 3 months)
 - Clone Oracle DB instance in 30-45 min (vs 10 – 14 hours)
 - ▶ Inherited benefits of z platform – workload management, availability, disaster recovery, I/O bandwidth
 - ▶ Expect to migrate at least 100 more Oracle databases per year

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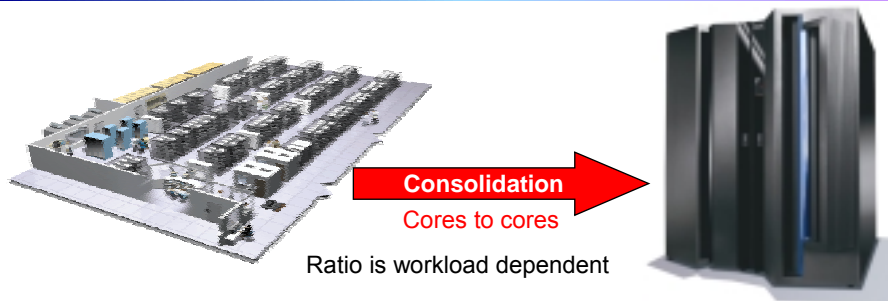
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Benefits of Consolidation on the Mainframe

- Less hardware
- Fewer software licenses
- Less costly to manage
- Consumes less power and floor space
- Responsiveness to the business via faster provisioning
- Inherit the benefits of the mainframe platform
 - ▶ High reliability
 - ▶ I/O bandwidth
 - ▶ Consistent security
 - ▶ Systematic disaster recovery
- Lower annual costs!



How Many IFLs Will Be Required?



Some recent examples:

Major Brokerage House	112 to 1
A Major US Bank	37 to 1
Hannaford	150 to 1
Nationwide	23 to 1
Nexxar	80 to 1
Quebec Government	45 to 1
Major Brokerage House	90 to 1

Case Study: Consolidate to Mainframe vs. Keeping Distributed Servers (HW and SW Cost Only)

Existing Mainframe



Existing processors:
4 general purpose
2000 MIPS of existing
mixed workload

*Add 1 LPAR for Oracle
Server Consolidation*



Add four processors:
4 IFLs

*Or maintain existing 200
server farm for Oracle
data servers*



50 → 1

*3 year
cost of acquisition
\$4.80 M*

*Annual operating
cost \$0.31 M*

Breakeven 2 yrs

*3 year
cost of acquisition
\$6.89 M*

*Annual operating
cost \$2.27 M*

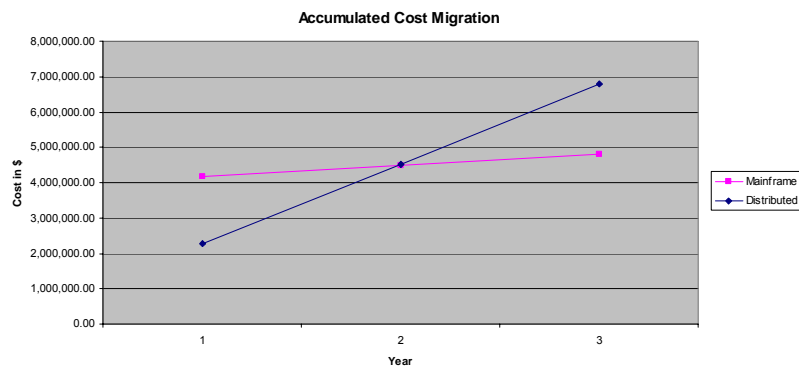
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Case Study: Consolidate to Mainframe vs. Keeping Distributed Servers (HW and SW Cost Only)

■ Rehosting Risks

- ▶ Minimal migration from Linux to z/Linux
- ▶ Leverage existing distributed expertise for new hardware platform



200 Oracle DBs to 4 IFLs on Existing Mainframe

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IBM Internal Project to Consolidate Over 3000 Servers

- IBM expects substantial savings by consolidating 3,917 distributed servers to about 30 mainframes
 - ▶ 86% savings in system admin cost
 - ▶ 85% savings in floor space
 - ▶ 81% savings in power
 - ▶ 57% savings in network
 - ▶ 41% savings in software support
 - ▶ 19% savings in disk storage maintenance

- \$81M savings per year

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Mainframe Labor Costs Per MIPS Declining

- A major bank went from 128 MIPS/person to 597 MIPS/person in 8 years with no extra people
- Gartner showed the MIPS/person doubling in 3 years at another site
- An outsourcer stated they doubled MIPS with only 20% increase in headcount
- IBM Survey five years ago, average MIPS per person
 - ▶ **50** for z/OS
- Typical MIPS per person today
 - ▶ **150 to 700** for z/OS (1,300 to 2,000 for zLinux)

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Case Study: Consolidate Mainframe vs. Keeping Distributed Servers (All Operating Costs Considered)

New Mainframe



4 IFLs

Add 1 LPAR for Oracle Server Consolidation



Four processors:
4 IFLs

Or maintain existing 200 server farm for Oracle data servers



*3 year
cost of acquisition
\$6.67M*

*Annual operating
cost \$0.94M*

*Breakeven in first
year*

*3 year
cost of acquisition
\$20.17M*

*Annual operating
cost
\$6.72 M*

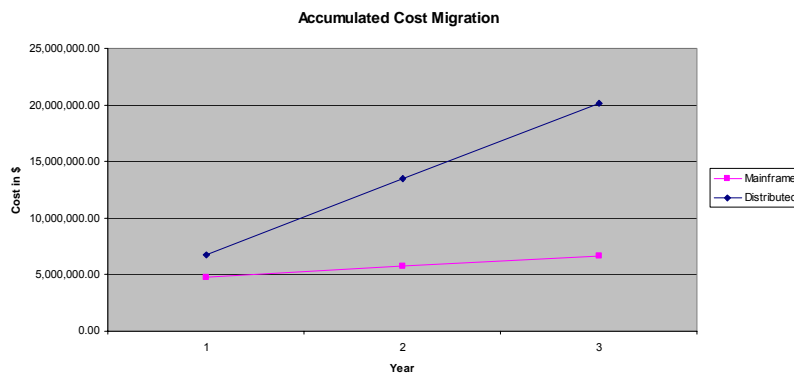
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Case Study: Consolidate Mainframe vs. Keeping Distributed Servers (All Operating Costs Considered)

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200 Oracle DBs to 4 IFLs on Existing Mainframe

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DEMO: Fast Linux Provisioning

- Another benefit of virtualization is speed of provisioning
 - ▶ No additional resources required, no purchase necessary!
- Coupled with standardization, reduces complexity
- Need a new machine? Let's see how fast we can get one...

What About Using VMWare on Intel?

- VMWare lacks the consolidation efficiency of z/VM
- Less efficient use of memory and storage
- Less efficient use of processors

	z/VM	VMWare
Maximum memory per virtual Linux server	More than 256GB	16GB
Maximum CPU's per virtual Linux server	Up to 64	Up to 4
Maximum "Active virtual memory" supported	Up to 8TB	16,384MB
Maximum real CPU's	Up to 32	Up to 32
Maximum virtual CPU's per core	Not Applicable	Up to 8
Maximum real memory	Up to 256GB	Up to 64GB
Maximum virtual servers per machine	>10,000s	128

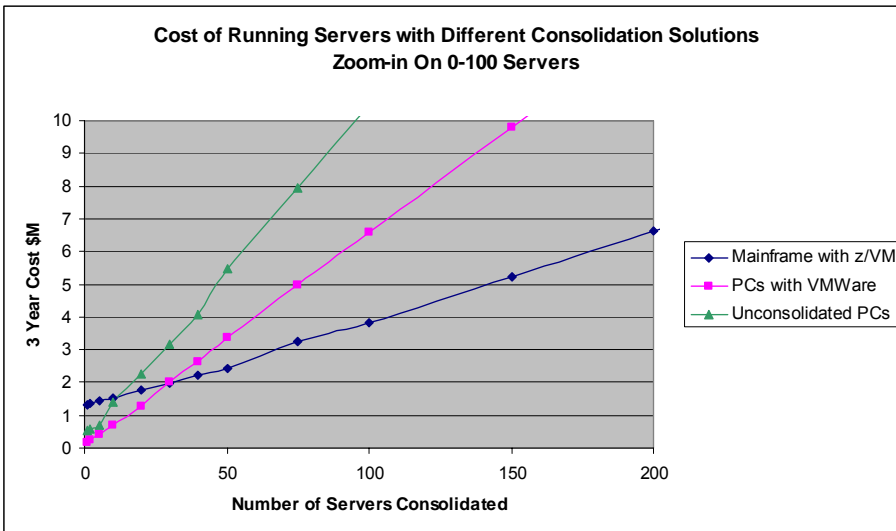
Result: Consolidation on z/VM Saves the Most Money



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



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Do YOU Need To Consolidate?

- I/T department whose budget is consumed by operating cost?
- Contemplating new data centers due to power or floor space constraints?
- Need a systematic site failover plan for **all** applications and data?
- Quality of service issues?
- Lots of UNIX or Linux servers?
- Lots of small database servers scattered around (including Oracle)?



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

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



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