



***The Modern Mainframe...
At the Heart of Your Business***

Application Consolidation on System z

Implementing New Business Faster!



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Service Oriented Finance is Wasting Money!

Your last report showed an average utilization of 5% - 20% for our distributed servers – isn't that wasteful?

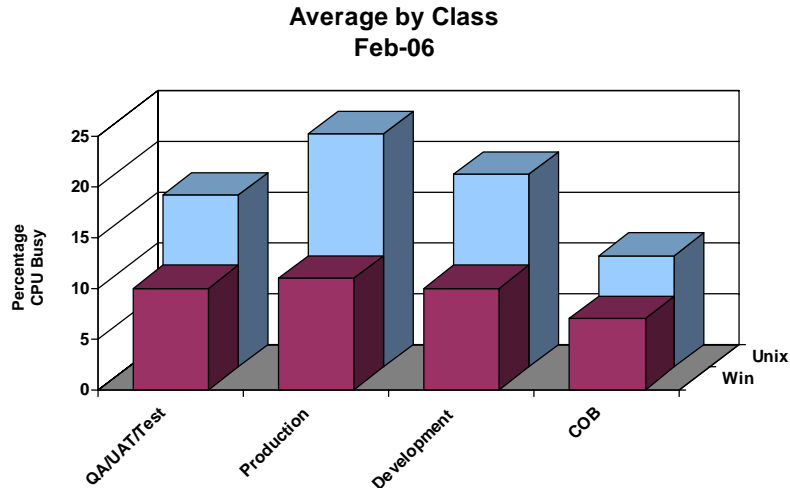


**Service Oriented Finance
CEO**



**Service Oriented Finance
CIO**

Case Study -Financial Services Customer Actual Server Utilization



Capacity Planning and Performance

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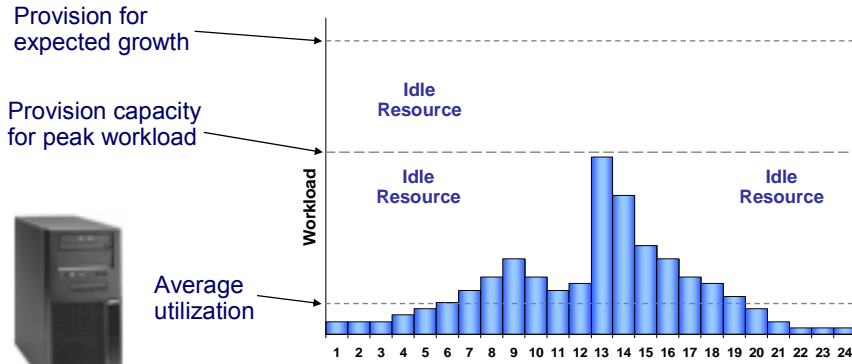
Why Do Distributed Servers Have Low Utilization?

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. Organizational ownership limits usage
5. Hub-and-spoke style deployments
6. Workload grows slower than Moore's Law

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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%

Internal IBM Consolidation Project – Distributed Cost Per Server Calculations

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

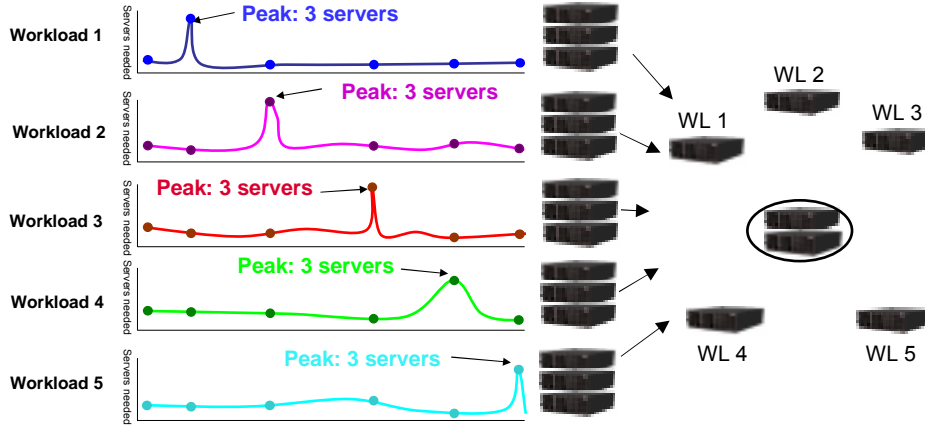
Power	\$731
Floor Space	\$987
Annual Server Maintenance	\$777
Annual connectivity Maintenance	\$213
Annual Disk Maintenance	\$203
Annual Software support	\$10,153
Annual Enterprise Network	\$1,024
Annual Sysadmin	\$20,359
Total Annual Costs	\$34,447

\$34,447 !



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

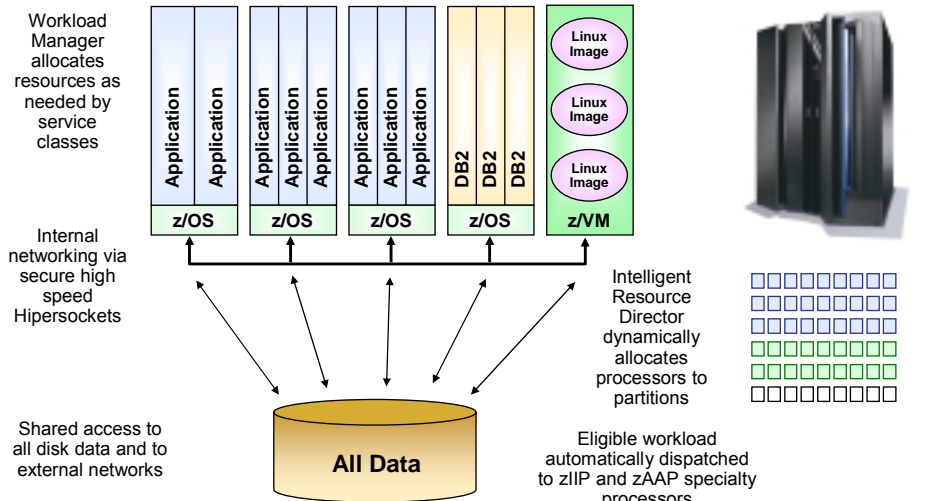
Theoretically Run the Same Workloads with Less Resources



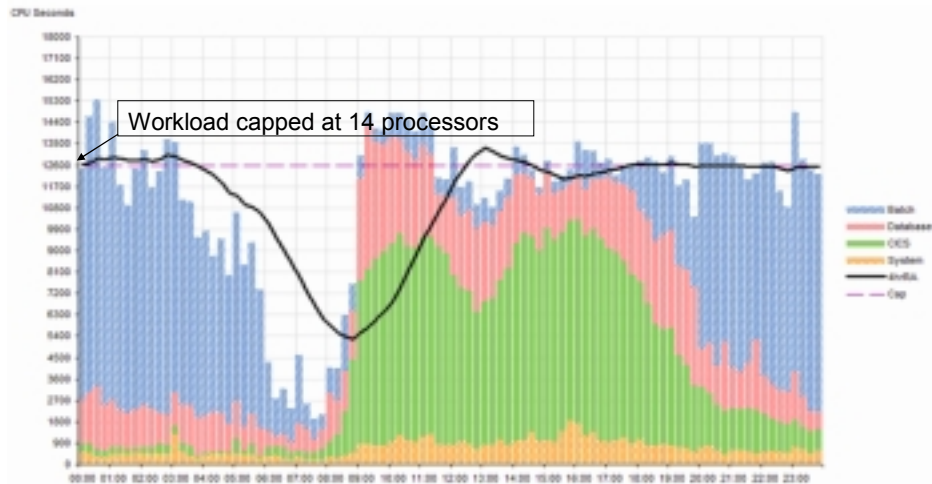
What's Required: Virtualization and Intelligent Workload Management to Accommodate Shifting Workloads – automatic on the mainframe!

Extreme Virtualization – How it Looks in z/Architecture

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



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"

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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

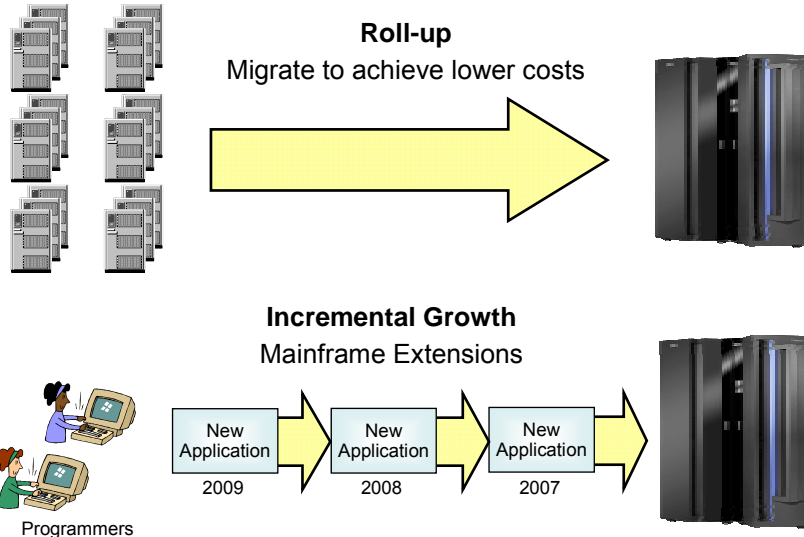


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Two Kinds of Workload Consolidation



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“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



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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	WebSphere Linux on z/VM	IFL	Mainsoft

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Linux on z/VM

We've seen some examples of incremental growth 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



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Telemar Roll-up Consolidation Project

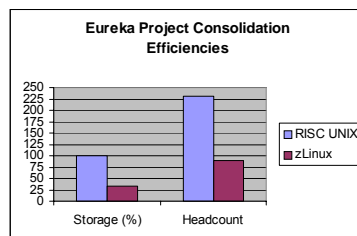
Largest provider of fixed-line telecommunications services in South America.



Consolidated 16 geographically dispersed servers on a centralized System z9 EC server running SuSE Linux

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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Case Study: 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
 - ▶ 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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DEMO: Fast Linux Provisioning

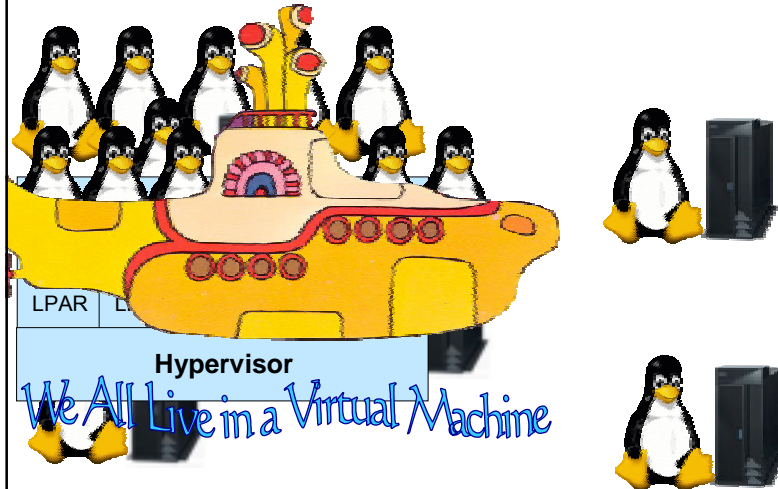
- Let's show mainframe Linux provisioning – live!
 - ▶ Laptop based demo system
 - Using a single Intel processor, 3GB memory
 - ▶ Emulated mainframe is running z/VM to virtualize
 - ▶ We will create and start 10 virtual mainframes
 - 3 will run Linux plus the Apache webserver

- 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

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Get On Board!

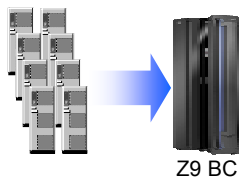


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Case Study: Nexxar - Financial Services

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

A first-time mainframe customer

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IBM “Eats Its Own Cooking” With a New, Massive Server Consolidation Project

- IBM expects substantial savings by consolidating 3,917 distributed servers to 28 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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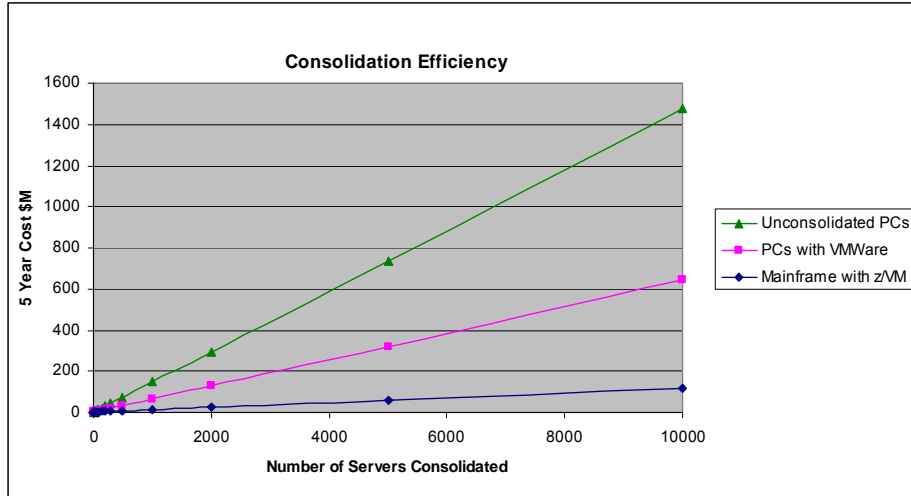
VMWare ESX3 with Intel Has Limitations

- 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

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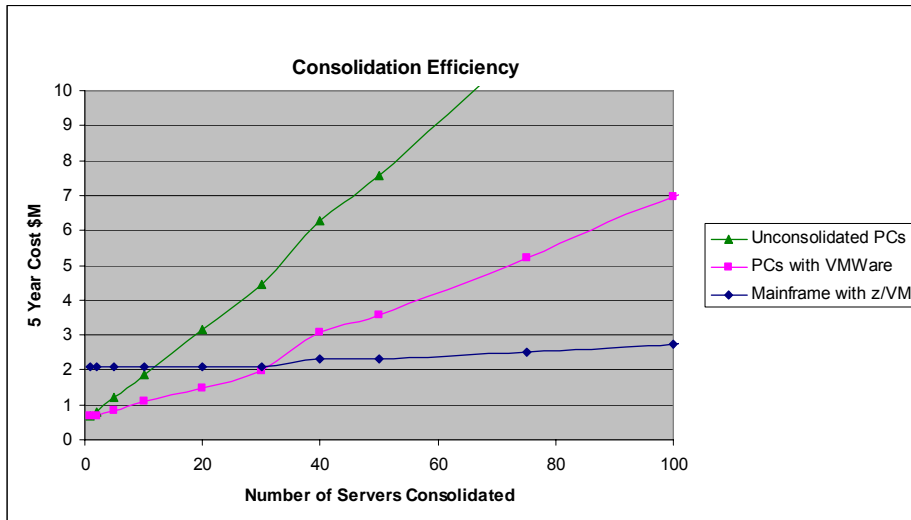
Cost of Different Linux Consolidation Solutions



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



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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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