The Modern Mainframe
At the Heart of Your Business

Application Consolidation on System z

Implementing New Business Faster!

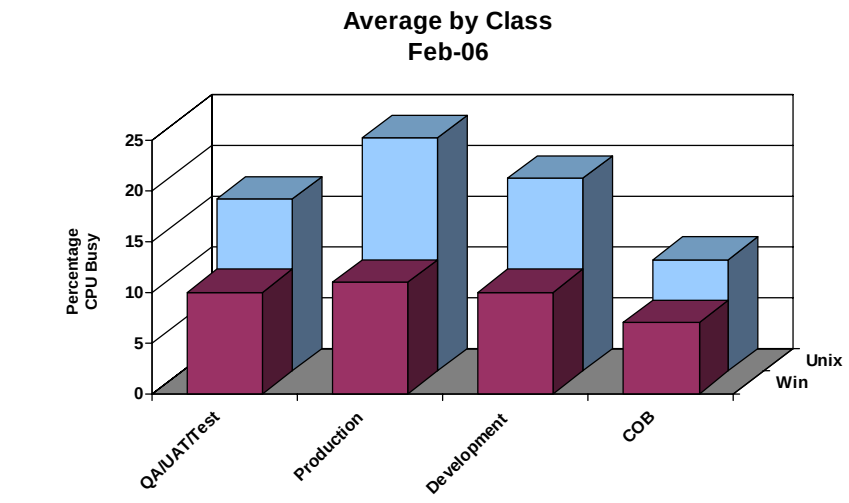
Service Oriented Finance is Wasting Money!

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

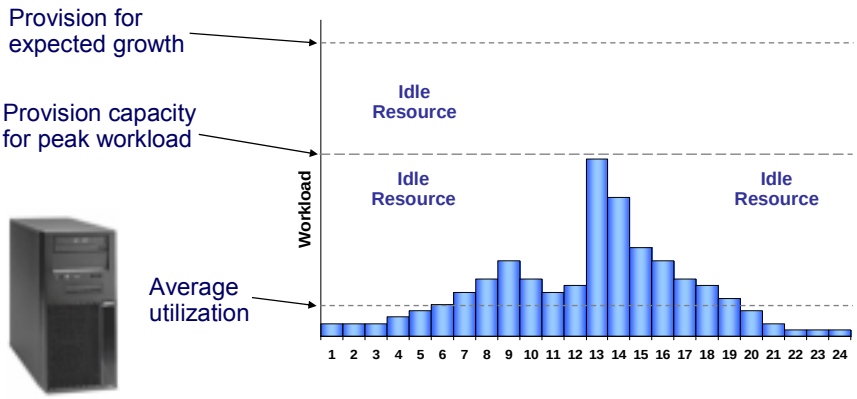


Capacity Planning and Performance

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

Utilization of Distributed Servers



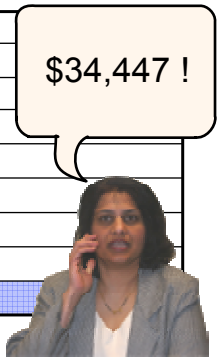
Server dedicated to one application

- 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

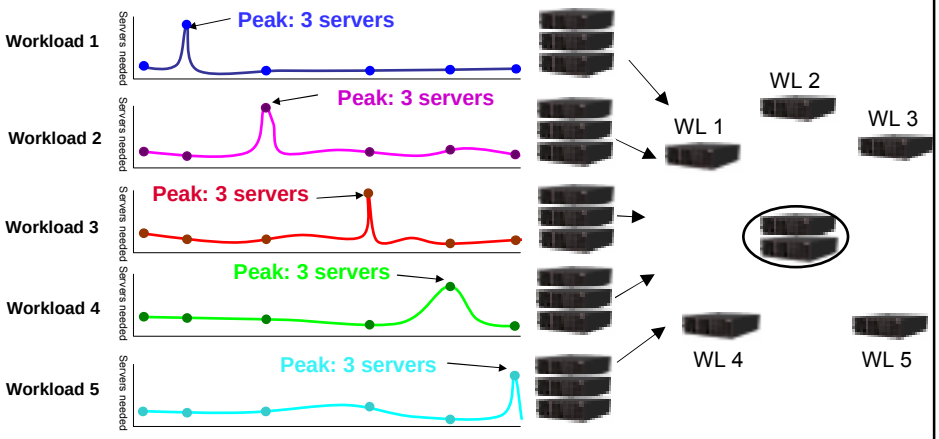
Annual Operations Cost Per Server
(Averaged over 3917 Distributed Servers)

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



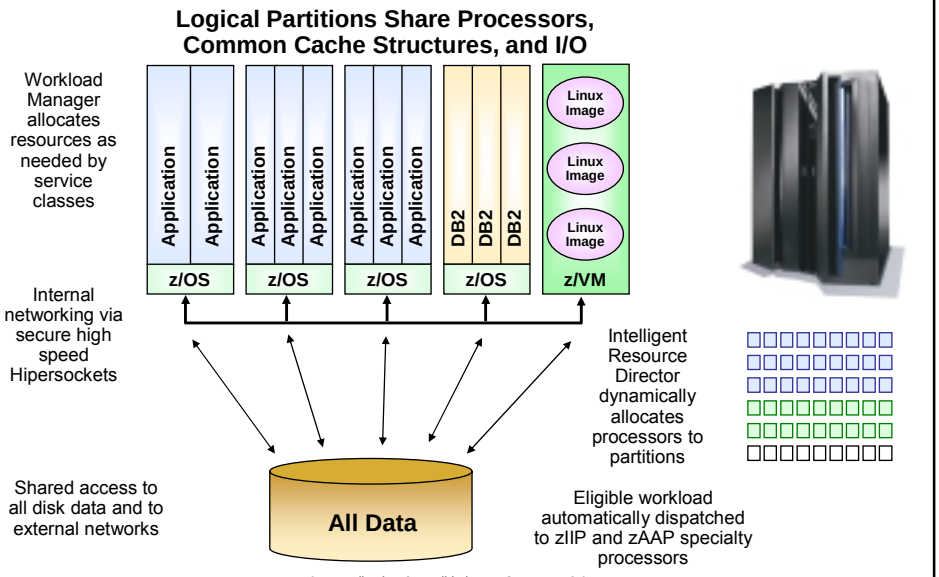
The largest cost component was labor for administration
7.8 servers per headcount @ $159,800/yr/headcount

Theoretically Run the Same Workloads with Less Resources

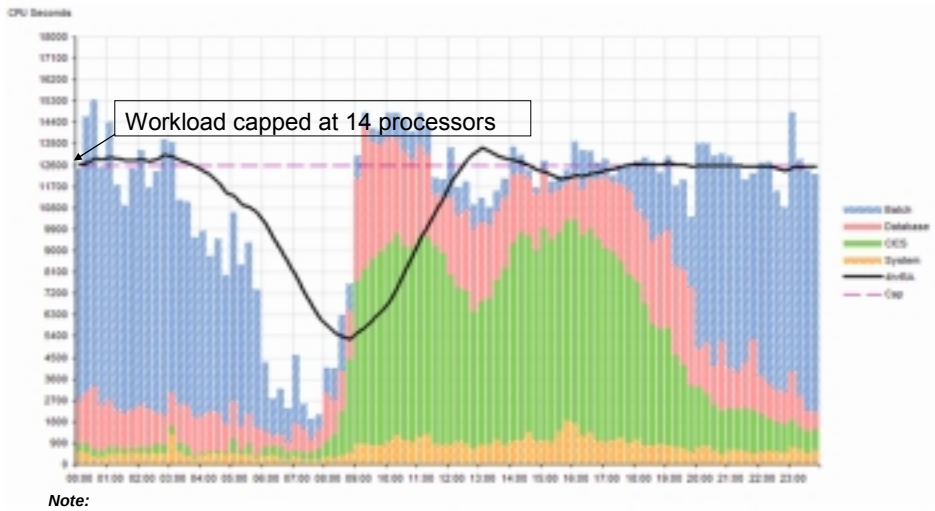


What's Required: Virtualization and Intelligent Workload Management to Accommodate Shifting Workloads – automatic on the mainframe!

Extreme Virtualization – How it Looks in z/Architecture



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



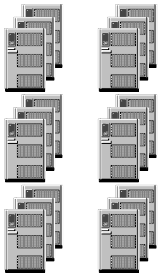
Note:

- *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

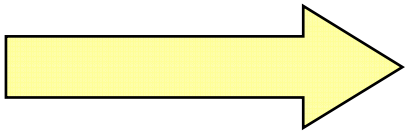
- Consolidating workload means running multiple workloads on the mainframe at the same time
- Consolidation achieves greater utilization of assets which minimizes cost per unit of work
- Same principal was applied by Henry Ford at the dawn of the industry era
  - It still applies today
- Workload consolidation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

Two Kinds of Workload Consolidation



Roll-up

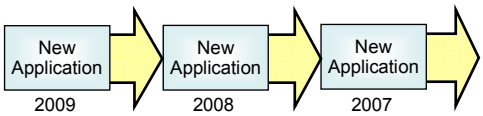
Migrate to achieve lower costs



Incremental Growth

Mainframe Extensions

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
  - 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 growth on z/OS
- WebSphere Process Server
- Data Warehouse
- SAP Data Server

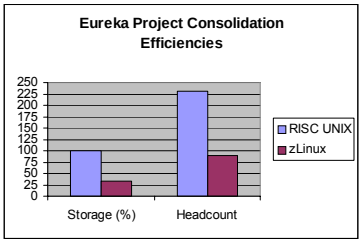
Now let's look at some examples of roll-up consolidation on Linux on z/VM

IBM

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



Source Robert Frances Group

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.

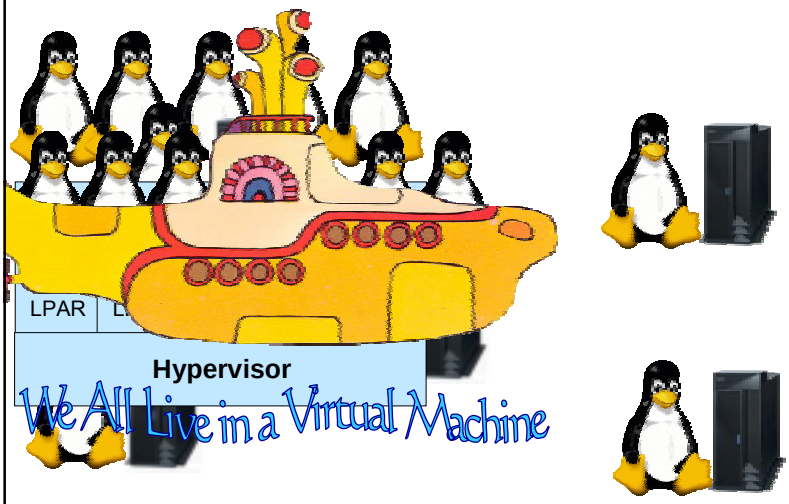
Case Study: Québec Government Runs Oracle at IFL Prices

- 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

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 machines
    - 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

Get On Board!



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

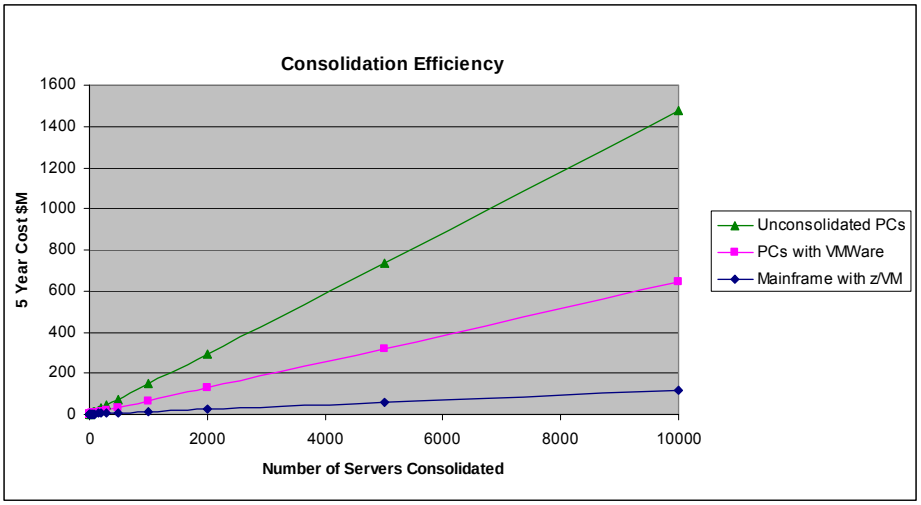
IBM "Eats Its Own Cooking" With a New, Massive Server Consolidation Project

- 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

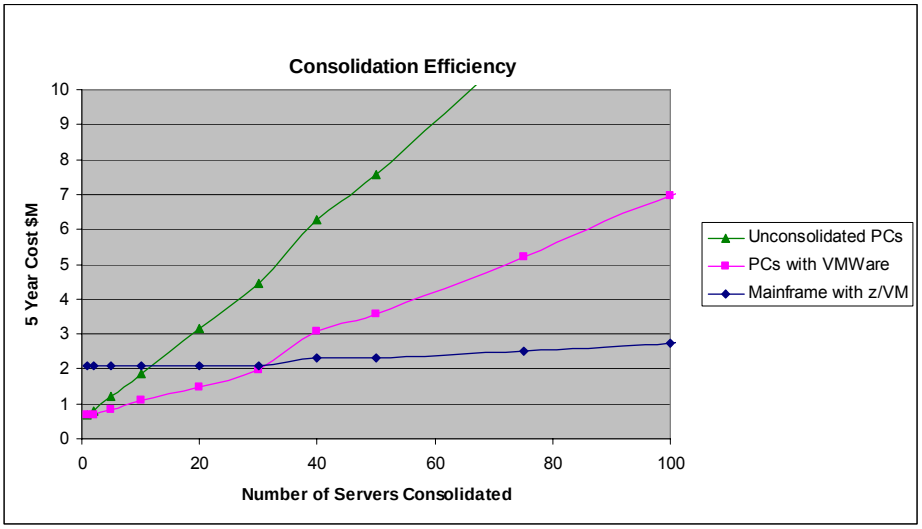
VMWare ESX3 with Intel Has Limitations

- 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

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

Service Oriented Finance CIO