# Building a Better Infrastructure With IBM Middleware on System p

Consolidate Sprawling Web Tiers Onto Scalable WebSphere Servers

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Web Application Servers Need a Foundation

- The Java Virtual Machine (JVM) is the foundation for JEE application servers

Application

JEE Application Server

Java Virtual Machine (JVM)

**Hardware, Operating System, Database, Network, Storage…**
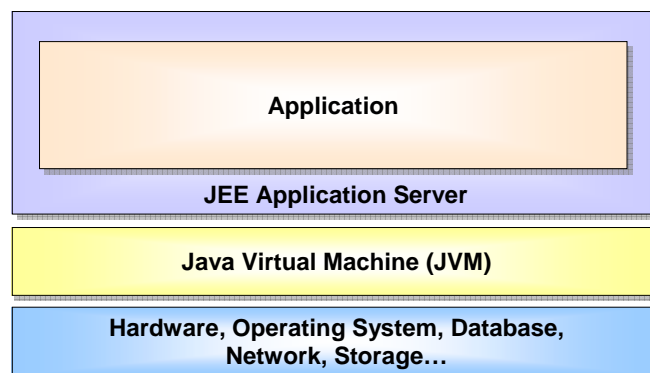
IBM SDK For Java Version 6 Provides Superior JVM Performance

- **Class instances can be shared across multiple JVMs**
  - ▶ Reduces memory requirements
  - ▶ Speeds startup

- **Garbage Collection (GC) process is enhanced**
  - ▶ Improved recognition of unused memory requires less frequent GC cycles
  - ▶ Parallel compaction threads increases efficiency of GC

- **Just in Time (JIT) compilation is highly effective**
  - ▶ Asynchronous threads for JIT compilation
  - ▶ Ordered queue for compilation makes sure most-used methods are compiled first
  - ▶ Five levels of optimization are offered for complete control
  - ▶ Methods can be re-compiled dynamically when runtime profile changes
  - ▶ Compiled methods can be cached across JVM instances, reducing JVM startup time

The Web Application Server is the Next Layer

- Provides a common environment and programming model for web applications

  - ▶ **Insulates** applications from hardware, operating system, network…
  - ▶ **Write once, run anywhere** (JEE™)
  - ▶ Provides a scalable **transaction** engine for your enterprise
  - ▶ Platform for developing and deploying **Web Services**

Application
JEE Application Server
Java Virtual Machine (JVM)
Hardware, Operating System, Database, Network, Storage…
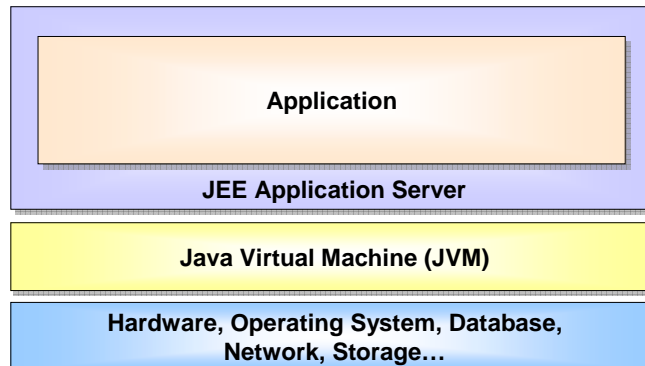
Why IBM WebSphere Software?

Nobody has the same breadth and depth

- Broad portfolio relied on by over 87,000 customers
- #1 market share
- Extensive ecosystem – more than 4,000 partners and 3,150 active ISV solutions
- Over 90% of the top Standard & Poor's 100 accounts rely on WebSphere Application Servers to run their business

Nobody invests more

- IBM investing over $1B a year to deliver SOA and Web services capabilities
- Over 6,700 IBM developers
- Over 10,750 IGS technical practitioners trained on WebSphere

Award winning SOA products

intelligent enterprise

IBM tops elite vendor list   *-Intelligent Enterprise Editors' Choice Awards (April 2005)*

IBM Overall Winner in Application Integration Middleware
-CRN Channel Champions Award (March 2005)

Computing WebSphere tops Network Computing App Server Reviews

WebSphere: "impressive management options, support for Web services and general ease of use…"   *– Network Computing (February 2005)*

IBM WebSphere Application Server Family

WebSphere Application Server for zOS

WebSphere Application Server Extended Deployment

WebSphere Application Server Network Deployment

WebSphere Application Server

WebSphere Application Server Express

WebSphere Application Server Community Edition

Run on System p

Customer Needs

Capabilities

■ *Built on a common codebase*
■ *Built on open source technology*
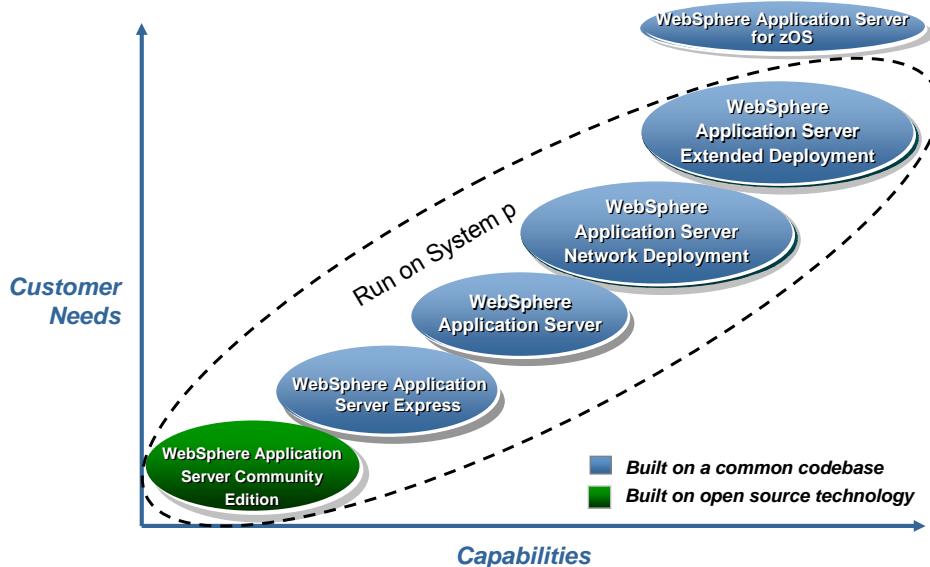
WebSphere Application Server 6.1 Exploits System p Hardware

- Supports 64-bit AIX and Linux on System p
  - ▶ Leverages large memory
    - − caching large amounts of data in memory
    - − avoiding slower access resources like databases or disks
    - − BLOB's (binary large objects) is a good case, in 32-bit, sometimes not able to cache the entire object in the Java heap

  - ▶ Java heaps can be configured much larger than the ~2-3GB limitations of the 32-bit platforms to enhance performance

  - ▶ Double precision 64-bit mathematical computations are better for
    - − computational intense applications
    - − statistical applications, simulation and modeling applications
    - − apps that use security and encryption

WebSphere Application Server Caching Improves Performance

- WebSphere Application Server supports caching of static content
  - ▶ HTML pages
  - ▶ Graphic files (e.g., JPG)
  - ▶ Java class libraries

- WebSphere Application Server also supports caching of dynamic content produced by
  - ▶ Java servlets
  - ▶ JavaServer Pages (JSP)
  - ▶ WebSphere command objects
  - ▶ Web services objects
  - ▶ Java objects

- What was the name given to IBM's patented dynamic caching technology?
  - ▶ "DynaCache"

WebSphere Dynamic Caching Increases Overall Throughput

Legend: ■ No Dynamic Caching   ■ Servlet & Command Caching   ■ Full Dynamic Caching
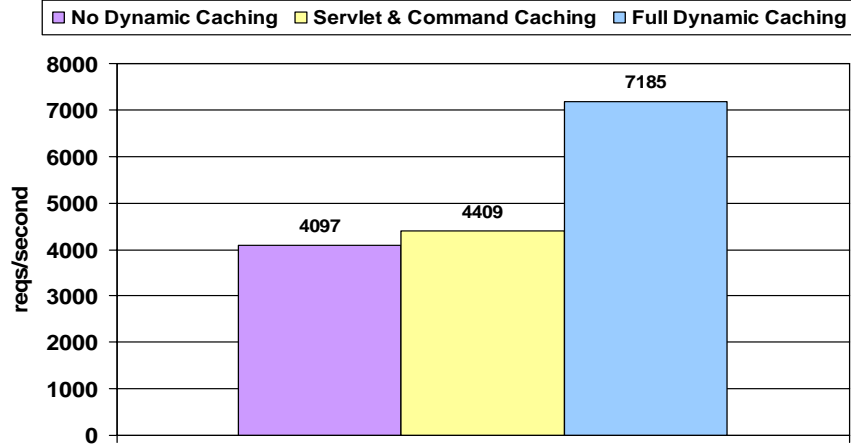
WebSphere Application Server V6.1

IBM System p5-550, (4) 64-bit 1.65GHz POWER5+ processors (SMT Enabled), 4GB RAM, AIX 5.3 ML3 (64 bit)

Throughput increases with dynamic caching in all scenarios

WebSphere Application Server on System p SMP Achieves Near-Linear Scalability

WAS Performance Scaling on AIX on System p
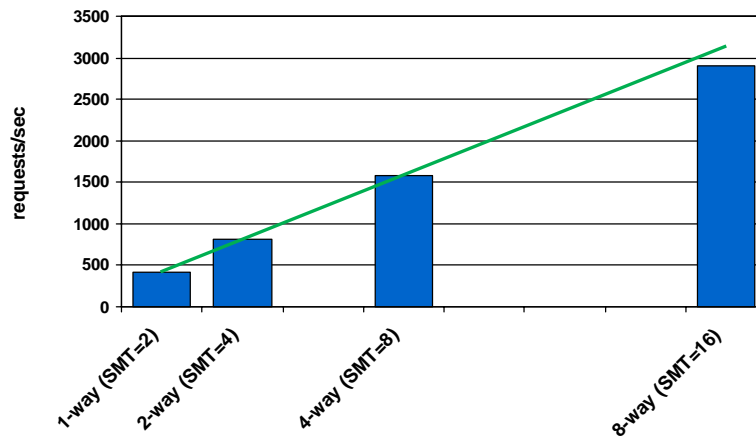
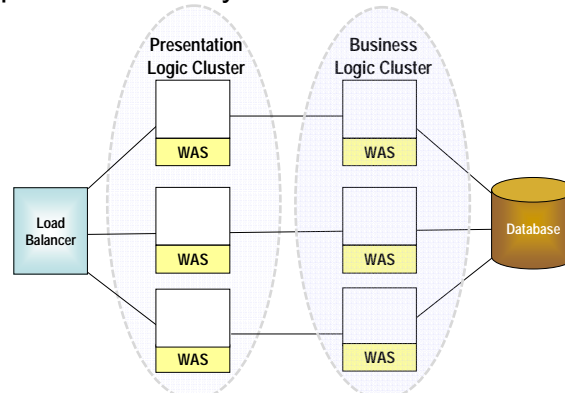IBM p5-570, 16 x 1.9 GHz, 32GB RAM, AIX 5.3 SP2, 64 bit

Web Application Servers Are Often Clustered

- Why?
  - To increase workload capacity
  - To improve availability
- How?
  - In multi-tier deployments
  - Cluster members connected through LAN

Presentation Logic Cluster

Business Logic Cluster

WAS

WAS

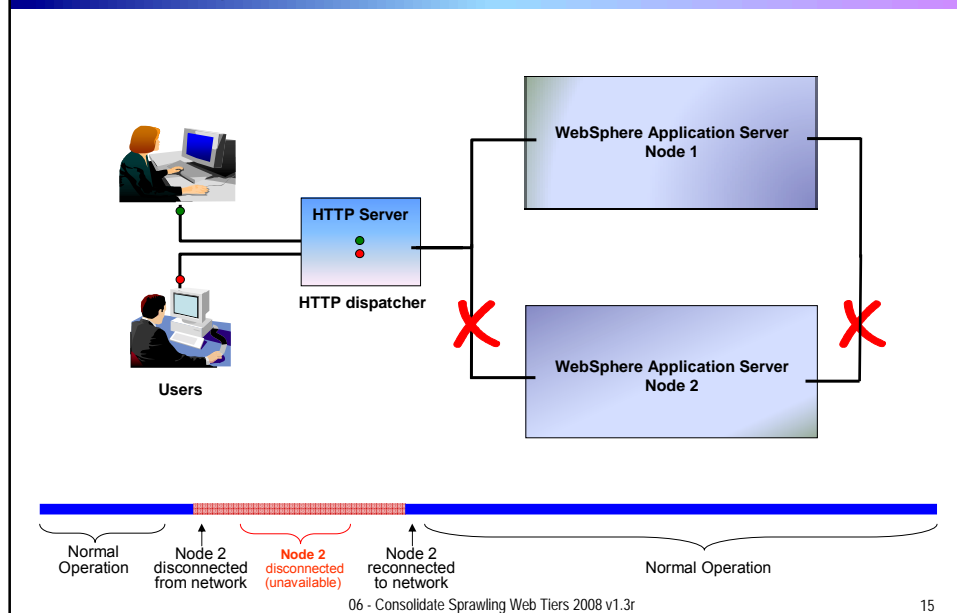Load Balancer

WAS

WAS

Database

WAS

WAS

WebSphere Network Deployment (ND) Provides Clustering Capability

- Built-in clustering capability eliminates single points of failure and also provides
  - Capacity to handle workloads greater than one server
  - Workload management to balance client requests across application servers
  - Server failover capability to automatically redirect requests to a redundant server

- Enables isolation of application servers. Each application server
  - Loads from local file system
  - Runs its own services (JNDI, security)
  - Logs distributed transactions

- Built-in High Availability Manager reduces the amount of time it takes to recover

WAS ND Cluster Test: Perfect Failover and Recovery Behavior

WebSphere Application Server
Node 1

HTTP Server

HTTP dispatcher

Users

WebSphere Application Server
Node 2

| Normal Operation | Node 2 disconnected from network | **Node 2** disconnected (unavailable) | Node 2 reconnected to network | Normal Operation |

WebSphere XD Can Provide Continuous Operation – Even During Maintenance

■ Application Edition Management
  ▶ WebSphere XD supports managing multiple editions of an application in a WebSphere cluster
    − Explicit control over application editions (creation/activation/deletion)

■ Interruption-free rollout of application updates
    − Explicit orchestration between routing agent and application servers during updates
  ▶ Ability to "roll back" to a previous application version

■ **Eliminate the need for planned web site outages!**

DEMO: WebSphere XD Application Update Rollout
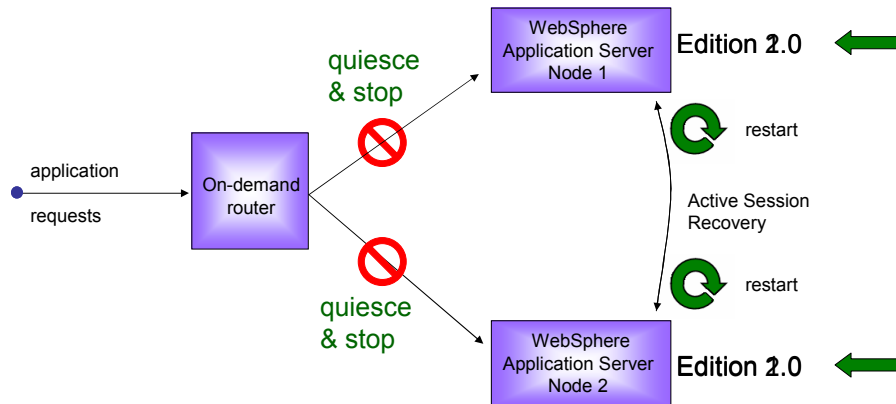
WebSphere XD Is Designed for Data Centers with More Complex Requirements

- Continuous operations
  - ▶ Application update rollouts

- Dynamic cluster management
  - ▶ Pooled servers may be dynamically allocated to clusters to meet defined service levels

- Long-running Java workloads
  - ▶ "Batch-like" jobs

- Object Grid
  - ▶ Grid caching of objects for high-performance environments

Wal★Mart Leverages WebSphere XD for Infrastructure Optimization and Availability

WAL★MART

- **Problem**
  - ▶ Under utilized, inefficient infrastructure (siloed)
  - ▶ Different administrative interfaces for the multitude of WebSphere applications
  - ▶ Peak demand for individual applications resulting in response time degradation
- **Solution**
  - ▶ Shared infrastructure based on WAS/ND and WAS/XD Operations Optimization
- **Key XD features / benefits**
  - ▶ Improved resource utilization / infrastructure optimization
    - − Reclaim 90 servers while providing capacity for 50 future applications without additional hardware purchase
  - ▶ Increased system availability and reliability
  - ▶ Decreased support and administration time
  - ▶ Simplified rollouts via WAS/XD's application versioning capabilities

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Intel-based Web Environments, A Common Source of Server Sprawl

We have too many web application servers.

Let me show you how **WebSphere Application Server running on System p** can simplify your IT infrastructure.
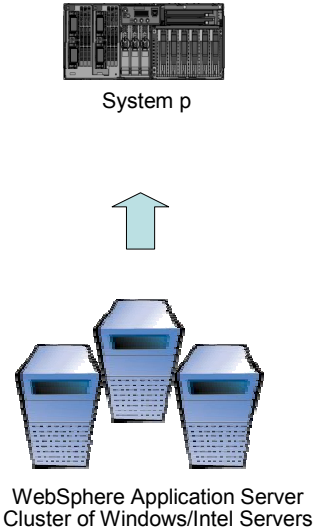
Service Oriented Finance CIO

IBM

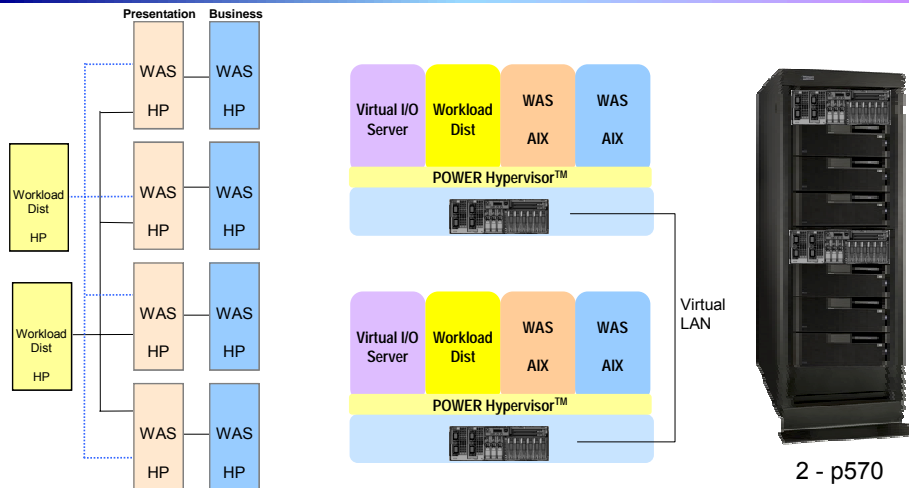# Scale Up From WebSphere Intel Clusters to System p

- Performance advantage on System p enables scale up
  - ▶ Replace Intel Servers with fewer System p servers
  - ▶ Simpler environment means less administration and a reduced footprint

- Can maintain hardware failover capabilities with server virtualization

- Virtual LAN enables communication between partitions at memory speed for additional performance advantages
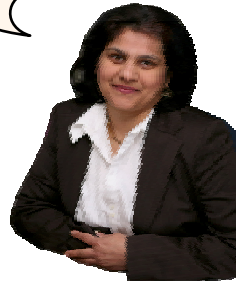
System p

WebSphere Application Server
Cluster of Windows/Intel Servers

Scale Up and Consolidate to Simplify WebSphere Clusters

Presentation **Business**

| WAS | WAS |
| HP | HP |

| Workload Dist | | | | |
| HP | | | | |

| WAS | WAS |
| HP | HP |

| Workload Dist | | | | |
| HP | | | | |

| WAS | WAS |
| HP | HP |

| WAS | WAS |
| HP | HP |

| Virtual I/O Server | Workload Dist | WAS AIX | WAS AIX |

POWER Hypervisor™

| Virtual I/O Server | Workload Dist | WAS AIX | WAS AIX |

POWER Hypervisor™

Virtual LAN

2 - p570

- Scale up leveraging performance advantages and server virtualization features
- Consolidate multiple types of workloads to a single System p
- Preserve advantages of clustering web application servers

How Can I Migrate to a WebSphere Environment on System p?

I want to move to WebSphere and System p to simplify my infrastructure!

JEE applications can be easily migrated from other JEE servers.

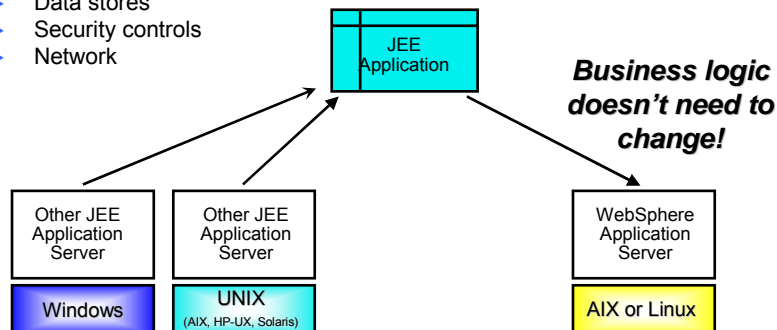**Service Oriented Finance CIO**

IBM

Migrate JEE Web Applications to WebSphere on System p

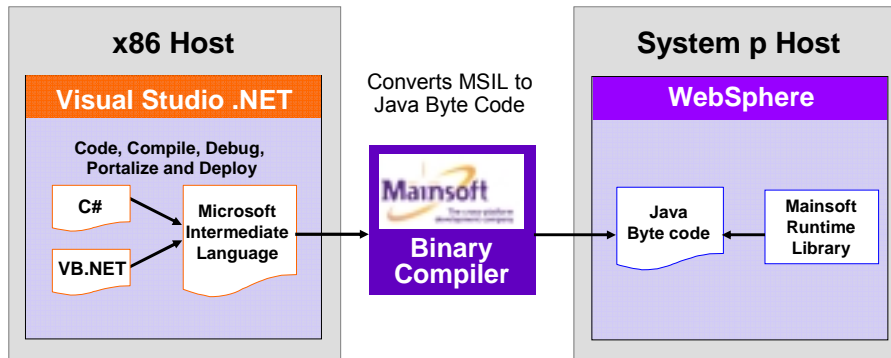**Application portability – one of the key benefits of JEE architecture**

Steps required:

1. Copy Enterprise Archive (EAR) file from other server
2. Install EAR into WebSphere Application Server
3. Specify environment-specific configuration
   ▶ Data stores
   ▶ Security controls
   ▶ Network

JEE Application

Business logic doesn't need to change!

Other JEE Application Server	Other JEE Application Server		WebSphere Application Server
Windows	UNIX (AIX, HP-UX, Solaris)		AIX or Linux

Execute .NET Code on System p

Visual MainWin® for Java EE

x86 Host

Visual Studio .NET

Code, Compile, Debug, Portalize and Deploy

C#

VB.NET

Microsoft Intermediate Language

Converts MSIL to Java Byte Code

Mainsoft
The cross platform development company

Binary Compiler

System p Host

WebSphere

Java Byte code

Mainsoft Runtime Library

WebSphere Application Server Consolidation Business Case

- Current environment
  - ▶ JEE application on WebSphere Application Server on Red Hat Linux
  - ▶ 30 HP Integrity rx2600 servers
    - – 2 workload distributors
    - – 14 presentation tier nodes
    - – 14 business logic tier nodes
  - ▶ HP servers are used at 27% capacity

Annual Cost Per Unconsolidated Server*

Power and Cooling	$731
Floor Space	$987
Annual Server Maintenance	$829
Annual Connectivity Maintenance	$213
Annual Disk Maintenance	$203
Annual Software support	$3,263
Annual Enterprise Network	$1,024
Annual Sys Admin	$20,359
Total Annual Costs	$27,609

For 30 unconsolidated servers, annual costs are $828,280

* Source: IBM internal consolidation project

Consolidation Cost Summary and Comparison

System p One Time Charge

Server Acquisition	$ 725,582
Connectivity Acquisition	$ 38,322
Disk Acquisition	$ 98,719
Software Licenses	$ 80,699
Migration Cost	$ 336,993
Total OTC (Cost of migration)	$ 1,280, 314

Price Sources—System p 570 and maintenance, Red Hat Linux and maintenance: IBM Technical Sales; WebSphere Application Server: IBM.com Passport Advantage Express Software Catalog; HP Integrity and maintenance: HP TPC-C benchmark report.

81% reduction in power consumption

97% reduction in floor space costs

System p Annual Cost

	Year 1	Year 2, 3
Power and Cooling	$ 4,214	$ 4,214
Space	$ 1,125	$ 1,125
Annual Server Maint	$ 33,564	$ 33,564
Annual Connectivity Maint	$ 1,533	$ 1,533
Annual Disk Storage Maint	$ 3,949	$ 3,949
Annual SW Support	$ 1,499	$ 17,339
Annual Ent. Network	$ 13,824	$ 13,824
Annual Sys Admin	$ 82,889	$ 82,899
Total Annual Costs	$ 142,596	$ 158,436

Unconsolidated Annual Cost

Power and Cooling	$ 21,930
Space	$ 29,610
Annual Server Maint	$ 24,880
Annual Connectivity Maint	$ 6,390
Annual Disk Storage Maint	$ 6,090
Annual SW Support	$ 97,890
Annual Ent. Network	$ 30,720
Annual Sys Admin	$ 610,770
Total Annual Costs	$ 828,280

Operational cost savings = $ 669,844 per year, break even in 23 months

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WebSphere Application Server Cash Flow Analysis

Savings Cash Flow When Consolidating 30 HP Servers to System p

Savings Cash Flow

Ongoing operational savings $669,844 per year

Operational savings offset cost of migration after 23 months
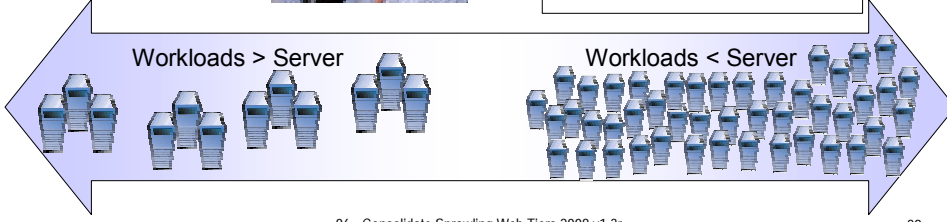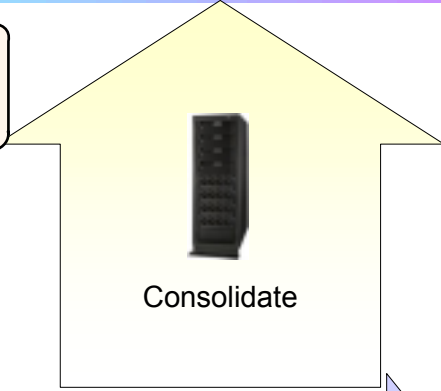
Time into Project (in months)

Service Oriented Finance Consolidated Their Web Servers onto System p

You saved a lot of money by consolidating our servers

And simplified my environment!

Consolidate

Workloads > Server

Workloads < Server
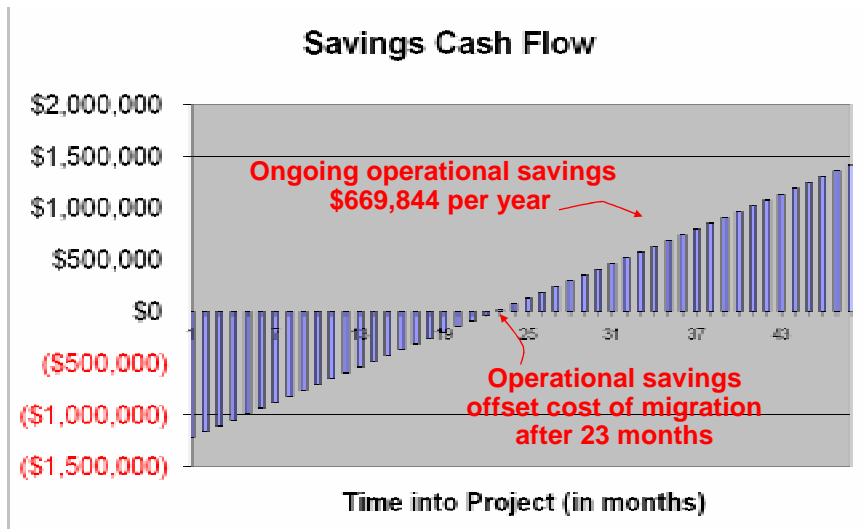
06 - Consolidate Sprawling Web Tiers 2008 v1.3r

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References, Additional Information

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

- WebSphere 64-bit performance whitepaper: ftp://ftp.software.ibm.com/software/webserver/appserv/was/64bitPerf.pdf