

AN APPLICATION CENTRIC VIEW OF Server Consolidation and IT Optimization

Preface

During the late eighties and on into the nineties, there was a concerted move of business functions away from mainframe systems to smaller, more highly distributed mid-range organization/server environments. While the mainframe produced highly structured and standardized applications, the time required to develop and deploy applications was perceived as a liability in a highly volatile, competitive, and rapidly-changing marketplace. For cost and competitive reasons, organizations began to deploy most of their application workload on UNIX and other mid-range organization/server systems. For the most part, this change was made without strict adherence to standards because strict standardization was considered a constraint on delivering and deploying applications rapidly.

Therefore, the typical mid-tier development and deployment strategy allowed development teams and business units to select their own hardware, software, development tools and products. The tendency was to purchase hardware for each application that was developed. As the shift to UNIX and other mid-range

systems accelerated, so did the number of different hardware platforms, operating systems/versions, development tools, application packages, and databases, along with the need for an enlarged and diverse IT staff to develop, deploy and support these systems.

This continuous expansion of technology has caused IT to become fragmented and inflexible, with proliferating pockets of specialties and knowledge not shared among the rest of IT. Because they were purchased and dedicated to single business units or function, these systems also tended to be greatly underutilized. Compounding the problem further was the belief that IT understood the business problem better than the business professional, which often resulted in technology “solutions” that did not fully meet business needs and applications that were out of step with business processes. Today IT simply cannot keep pace with business and this must change.

This paper will explore how server consolidation and IT Optimization can significantly reduce cost and complexity in the data center.

What Is IT Optimization And Server Consolidation?

Server consolidation and IT optimization are often used interchangeably. Server consolidation focuses on lowering cost by reducing the number of boxes, which is relatively easy to quantify and justify on the basis of a “speeds-and-feeds” configuration and can be calculated purely “by the numbers” of CPU/disk/memory requirements.

IT optimization, on the other hand, typically includes server consolidation as an aspect but does so in a richer context, resulting in a more tempered and balanced solutions design that combines business process and goals, standards, systems and asset management, security and backup/disaster recovery, as well as server and applications consolidation.

Organizations can greatly reduce IT cost and simplify the IT environment through server consolidation or IT optimization. However, server consolidation and IT optimization is complex and often confused by vendors that insist they have the answer to all of your server consolidation needs. Most of them know what “the answer” is before they even take the time to understand your business requirements. You don’t have to convince an organization that it is cheaper, easier, or simpler to run an application with two servers rather than ten. That’s patently obvious. What you are wrestling with is probably much deeper than that.

First, the problem is not ten servers. It’s more likely 100, 500, 1000, 2000 or even more. How do you go from 2000 servers, encompassing perhaps ten different architectures, to “something less?” And how do you know what “something less” is? How do you even know what you’re shooting for?

Interestingly, organizations often say that the number of servers is not the crucial focus — it’s the 1000 applications running across those 2000 servers that are the crux of the matter. How do you know which of those 1000 applications should be consolidated and/or centralized based on the company’s core business process model? Which ones shouldn’t and why? How would you rank those applications, from high to low, in terms of business return in such a way that you know which ones to go after first?

That’s why you must be cognizant of the complex relational model that exists in every IT infrastructure — a relationship that is a unique reflection of the business process model around which an IT organization has designed and engineered their business.

This relationship is not hardware centric — it is application centric. Each application can be mapped to a unique server or set of servers. Further, each server can be mapped to a unique IT architecture. Each of the architectures will have a discrete set of support costs associated with it. Combining these elements into a data model that reflects the core logical relationships among one another allows us to profile an IT infrastructure in unique and insightful ways.

To optimize an organization’s IT we must go beyond applications, servers, architecture and cost and consider organizational strategy and maturity.

IT optimization is about going back to the basics. What are some of the basics?

1. Clear strategies, direction and standards
2. Strong application delivery and execution processes
3. Avoid pockets of intellectual capital that fragment the organization
4. Make data available and accessible
5. Align IT with business needs

IT optimization addresses crucial questions that organizations are dealing with — things like:

1. How do we optimize our IT operation and lower the total cost of ownership (TCO) of our IT infrastructure?
2. How can we deliver a higher level of IT services to our existing (and future) organizations/applications?
3. How can we provide a more stable and highly scalable IT foundation capable of deploying new/different solutions — such as B2B, ERP, supply chain management — quickly and efficiently?

The challenges reach beyond just “consolidating little servers onto bigger ones.” It involves looking at the entire end-to-end IT infrastructure and assessing whether it is truly aligned with the organization’s current (and future) business model. And since no two companies have implemented their businesses the same way, no two organizations will implement IT the same way, either. There simply is no such thing as a “one size fits all” IT solution.

Who Needs to Optimize?

Consider an organization that has accumulated disparate hardware, software, architectures, databases, and redundant functionality. The infrastructure is becoming increasingly difficult to manage. Staff, license and hardware/software maintenance, and support account for an increasingly large portion of the IT budget. It has become difficult to staff and maintain the resources needed to support existing systems.

In general any organization suffering from the following is a candidate for IT optimization:

- Higher than average IT costs
- A unnecessarily complex environment
- Low utilization of CPU resources
- Low utilization of storage resources
- Weak systems management capabilities
- Weak asset management capabilities
- Slow provisioning
- Inadequate service level agreements
- No utility model

IT optimization can deliver a computing model that will reduce cost and improve quality and value by simplifying your technical infrastructure.

Top 10 Reasons For Consolidation*

A few years back InfoWorld published a list of ten things that indicate whether an enterprise needs to consider consolidation. They are still valid today:

- 1. You start losing track of servers**
Easily done if you have dozens or hundreds dispersed over several locations. The flip side of this is knowing where a server is but not knowing what it does.
- 2. You can't scale**
The complexity and rigidity of highly dispersed architectures works against scalability. There comes a point where bolting on another server simply adds to your problems.
- 3. You don't have enough administrators**
Someone has to look after all those servers. The more you have the more likely you are to run short of skilled people to maintain them.

- 4. You are running more than seven operating systems**
The rule of thumb is that one person can know two operating systems reasonably well. Any more than that and you face a dilution of expertise. Once you get up to seven you are seriously stretched and vulnerable.
- 5. You have difficulty controlling software licenses**
Complex, dispersed environments = a tangle of software licenses. If you fail to comply, or forget to buy them in the first place, you could face prosecution.
- 6. You think it's cheaper to buy new servers than to do capacity planning**
A classic warning sign. It's nearly always cheaper to plan properly than to buy new kit as a knee-jerk reaction to increased demand. If you think otherwise, you probably need to consider consolidation.
- 7. You manage your infrastructure centrally, but your purchasing is decentralized**
In short, you don't control what's being purchased, but you are responsible for managing it when it arrives. What seems like a good deal to the procurement department can mean your having to hire another administrator.
- 8. Your utilization rates for more than half your servers are in single digits**
Most of your servers are idle for 90% of the time, but you are paying to administer and maintain them 100% of the time.
- 9. You are running out of physical space**
This one is pretty hard to miss. When there's no more room for new hardware then some kind of basic consolidation is difficult to resist.
- 10. Your server maintenance costs are rocketing**
You may not have full visibility of these until the CEO tells you to cut overheads. Then the true cost of maintaining all those servers can come as a shock.

*As identified by InfoWorld

What Technologies Have Made Optimization Practical?

New hardware technologies can simplify and improve the IT environment. Here are a few things to consider.

Technology Advancements

- Logical partitioning
- Virtualization
- Blades
- Business process/data abstraction: Web services
- Automated infrastructure management
- Self-healing infrastructure

What Size Box Should I Consolidate On?

You should consolidate on the largest server practical simply to reduce the number of physical servers. Most major vendors offer some facility for setting up partitions or domains to run multiple OS images on their large servers. However there are other things to consider. For example, you may decide that lines of business (LOB) cannot share the same physical hardware. So if the workload for a line of business only requires a six CPU box you wouldn't necessarily want to install a 32-way for that LOB, even though all other LOBs may need larger systems. You could need a combination of sizes, which may lead you to establishing a standard set of configurations. For example, you may standardize on 8-way and 16-way servers and then combine them to meet more rigorous needs. Also price may lead you to use an 8-way over a 32-way, because proportionally the 8-way is less expensive. However an 8-way would need to be significantly less to overcome the space, power and load balancing capabilities of a larger box.

When Possible, Reuse What You Have

Consolidation does not necessarily mean that you must go out and purchase all new hardware. The business may have some large servers with 18 to 36 months left on the lease. These servers are good candidates to consolidate on. The same applies to storage.

Struggling With The Choice

If you are considering new hardware, here are questions to ask the hardware vendors:

1. What is your technology roadmap? Discuss OS, chipset, architecture, platforms, uptime, performance, scalability, pervasive technology, and investment protection.
2. Do you support logical-partitioning capability on UNIX and Intel? How does your system partitioning technology allocate the resources?
3. Open architecture/Linux direction
4. Philosophy and direction for autonomic computing (self-healing, self-diagnosing, self-configuring systems along with uptime and reliability figures planned and unplanned outages.
5. Capacity on demand/utility model capability

Types Of IT Optimization

Physical Consolidation

Physical consolidation is the consolidation of applications from a large number of servers to a fewer number of servers.

Homogeneous Consolidation (Like To Like)

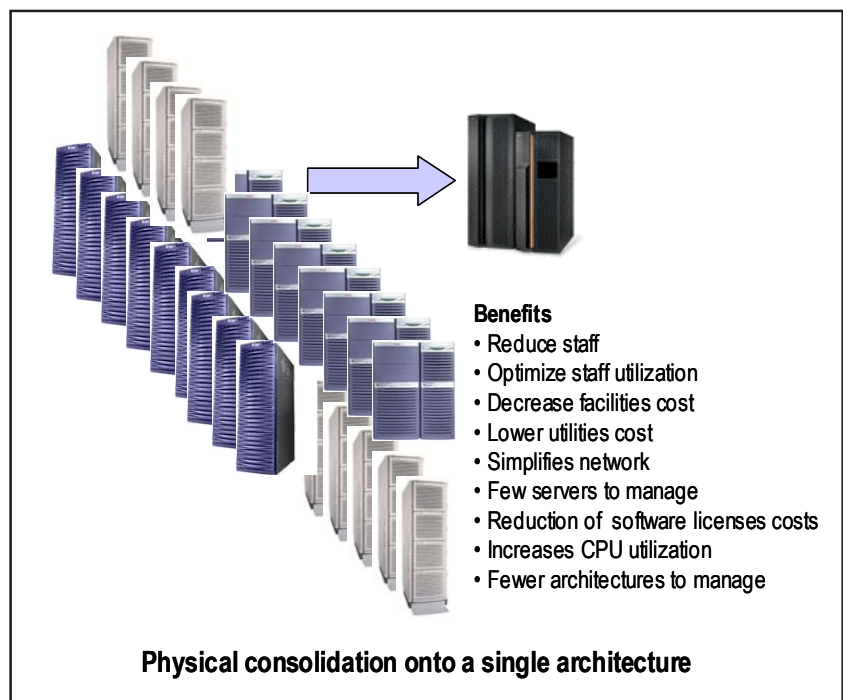
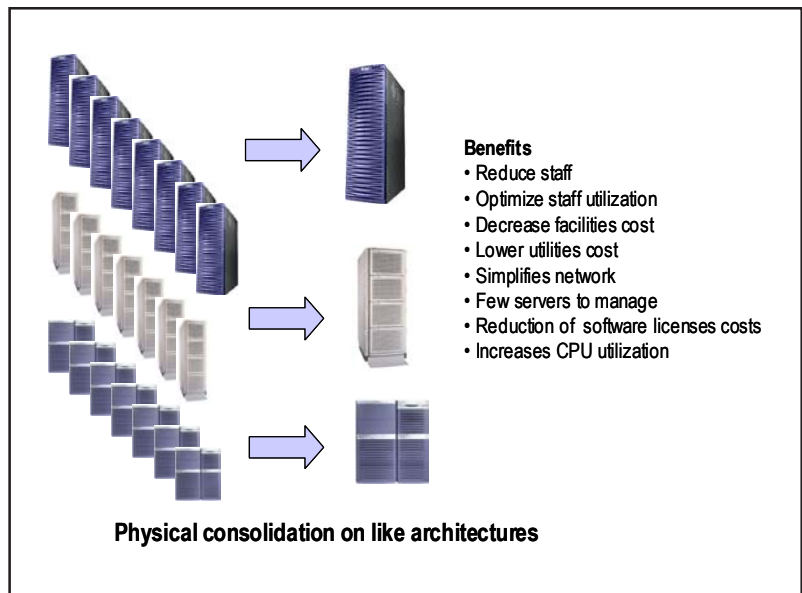
Homogeneous consolidation is the process of consolidating workload from many servers to fewer servers of the same type of platform. For example, moving the workload off 30 Sun Solaris servers to a few Sun Solaris servers, and at the enterprise level, doing the same within all the platforms. Taking this approach

will significantly reduce server and logical count. In many cases source code recompiling will not be necessary. However, expect to recompile approximately 30% of your applications for product and compiler upgrade requirements. For example, objects, PL/SQL and embedded SQL will need to be recompiled when upgrading from Oracle 7.x.x to Oracle 8 or 9. Oracle 7.x.x will not be available for new hardware technologies.

Heterogeneous Consolidation (Single Or Fewer Architectures)

Heterogeneous consolidation is the process of consolidating workload from many servers on disparate platforms to fewer servers on a single platform type.

For example, moving the workload off 30 Sun Solaris, 30 HP UNIX and 30 HP Tru64 servers to a few IBM AIX servers. The *transitional* costs are greater for heterogeneous consolidation compared to homogenous consolidation, but taking this approach will significantly reduce server and logical count. The payoff is that operating this environment is cheaper in the long run. Heterogeneous consolidation will also reduce the number of disparate operating environments and overall IT complexity.



Additional benefits to consolidating to a single architecture:

- Greater simplification
- Greater reduced facility needs
- Greater reduced need for staff (system administrators)
- Greater reduced cost of licenses
- Reduction in skill set requirements

Storage Consolidation

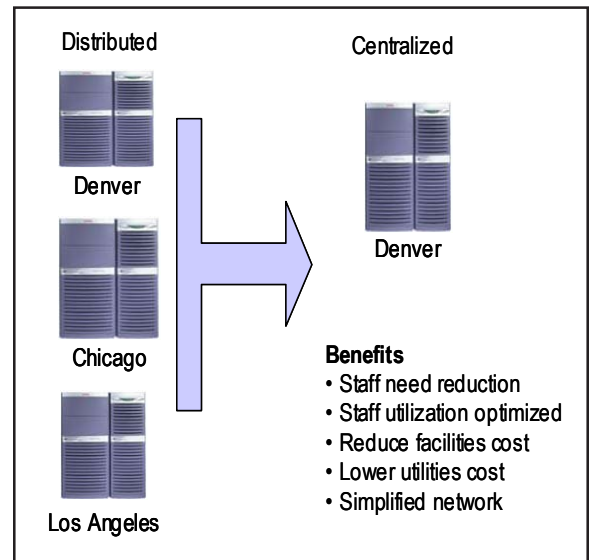
Storage is very tightly coupled to servers and should be considered in any server consolidation. Typically storage is significantly underutilized. Storage administration costs are increasing significantly and can be reduced through storage consolidation.

Benefits

- Single file system
- Common point of management
- Heterogeneous file sharing
- Local file systems performance
- Increase storage administrative productivity
- Improve capacity utilization

Centralization

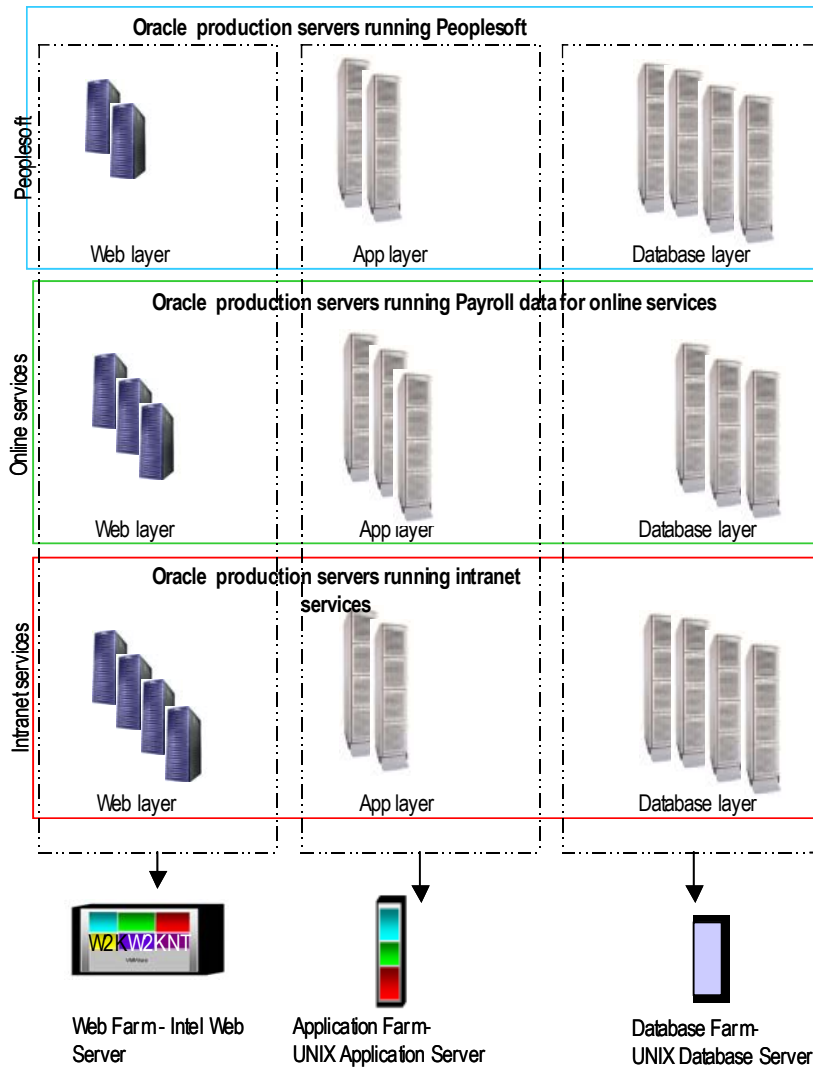
Centralization takes the concepts of server and storage consolidation across many data centers. For example reducing from 30 data centers to two. Actually most large organizations have fewer than ten large data centers. However an organization may have utility and infrastructure servers in support of business operations at any site where an employee needs to print and connect to the network. Keep in mind that it may not be possible to centralize utility and infrastructure servers when you are centralizing IT but other LOBs remain at the site. For example, a site may continue to need file, print and domain controllers even though all the production and development servers for applications have been centralized.



An Application Centric View Of Server Consolidation And IT Optimization

Logical Consolidation

Logical consolidation takes advantage of the logical partitioning capabilities available from most hardware vendors. Logical partitioning provides maximizing the use of platforms resources.



This is an example of consolidating three applications into Farms.

Peoplesoft -The Web (Presentation) layer for Peoplesoft runs on 2 Windows 2000 servers and has been consolidated into a single partition on an Intel Web Server. The application layer runs on 2 UNIX machines and has been consolidated into a Domain on a UNIX Application Server. The Oracle Database layer runs on 4 UNIX machines and has been consolidated into a UNIX Database Server.

Online Services -The Web (Presentation) layer for Online Services runs on 3 Windows 2000 servers and has been consolidated into a single partition on an Intel Web Server. The application layer runs on 3 UNIX machines and has been consolidated into a Domain on a UNIX Application Server. The Oracle Database layer runs on 3 UNIX machines and has been consolidated into a UNIX Database Server.

Intranet Services -The Web (Presentation) layer for Intranet Services runs on 4 Windows NT servers and has been consolidated into a single partition on an Intel Web Server. The application layer runs on 2 UNIX machines and has been consolidated into a Domain on a UNIX Application Server. The Oracle Database layer runs on 4 UNIX machines and has been consolidated into a UNIX Database Server.

**Application Rationalization
And Legacy Transformation**

Current Technology State					Future State
Oracle	Sybase	DB2	Informix	Ingres	Oracle
WebLogic	.NET	WebSphere			WebSphere
Openview	CA	BMC	Tivoli		Tivoli
Iplanet	Apache				Apache

Application rationalization is the process of reviewing applications and applying architectural patterns. Architecture rationalization represents a logical next step to drive IT excellence by simplifying the environment, consolidating skills, and allowing iterative improvement to the architecture management process. The vision of application rationalization is to create a set of patterns that satisfy a majority of business requirements to be met by the IT community within any organization. These patterns will serve as the architectural standards for all software development and commercial software package implementation.

Through application rationalization organizations can reduce the number of redundant applications, overlapping third-party software packages, and development environments, all of which will significantly reduce cost and complexity.

Consider the cost and complexity of managing an application environment with so many possible combination of technologies and then consider what simplicity application rationalization can provide.

What organizations benefit from application rationalization?

- Organizations that have grown through mergers and acquisitions
- Organizations with large amounts of third-party software
- Organizations with legacy systems

Workstation Technology Refresh

IT optimization focuses on the data center, however there are significant savings possibilities for large workstation environments. If the organization has more than 500 UNIX workstations, compare the operational cost to running the workstations on an Intel or AMD platform. Of course you must keep in mind the short-term non-recurring cost of transitioning your software from UNIX to an operating system that runs on Intel or AMD. If you have several thousand UNIX workstations, the transition costs may be a rounding error in your TCO difference.

What To Shoot For

1. Logical consolidations of about 4:1. If you have 1000 servers today, you should be able to reduce the current image (OS) counts by 75%.
2. Stack applications by function and products. For example, create farms. Farms for SQLserver, Oracle, applications, web, mail, file, print, etc.
3. Physical consolidation of 15:1. This ratio will increase as faster hardware replaces older hardware.

What Amount Of Saving Should I Expect?

Savings typically fall in the range of 5% to 60%. To understand how to drive savings we need to consider what the typical data center looks like.

Typical Data Center

Most organizations deploy three primary types of functional servers. These include utility, infrastructure and application. Each defined below in more detail:

Utility Servers

Utility servers include:

- Email
- File and print
- Other utility/network servers
- Domain name servers (DNS)
- NIS
- DHCP
- Domain controllers
- Firewall
- WINS
- Authentication

Infrastructure Servers

An infrastructure server supports distributed computing services, the primary function of which is any of the following:

- Systems management capabilities — asset management, problem management, capacity management, performance management, availability management (ESM framework: including ESM application servers, concentrators, altering servers, business logic servers and databases)
- Network management
- SLA reporting and data warehouse
- Storage controllers
- Batch scheduling controllers
- Security ID servers
- Anti-virus
- SMS
- Help desk

Application Servers

An application server is a non-infrastructure server that supports an application.

- SAP
- Peoplesoft
- Homegrown application
- Database
- Web

Data Center Observations

- Utility and infrastructure servers make up approximately 20% of the Intel environment and 15% the UNIX environment.
- Average utilization per server is about 17% for Intel and 20% for UNIX.
- Peak utilization per server is 25% for Intel and 30% for UNIX.

Factors That Impact Savings

There are many factors that impact the savings your organization should expect. These factors include:

- The mix of server types. Utility and infrastructure server consolidations yield a lower proportion of savings than application servers.
- Current utilization levels. The lower the current utilization the higher the savings potential.
- Homogenous or heterogeneous consolidation. Consolidating to a single platform will bring additional savings.
- Maximizing logical consolidations. Staking like applications in a single partitionable image can provide additional savings.
- Current software licensing agreements. Your organization should renegotiate software license after a consolidation.
- Server consolidation will reduce staff needs. The organization must be willing to reduce cost through staff attrition or reassignment.

An Application Centric View Of Server Consolidation And IT Optimization

Savings and Benefits by Consolidation Type

This table illustrates the savings and benefits based on type of consolidations

Categories	Category 1 Consolidation	Category 2A Consolidation	Category 2B Consolidation	Category 3A Migrate and Consolidate	Category 3B Migrate and Consolidate	Category 4 Application Rationalization	Category 5 Legacy Transformation	
Type of Server	Infrastructure Or Utility	Application	Application	Application	Application	Application	Application	
Approximate Percent of servers in this category	Less than 20%	70%					10%	
Example	DNS DHCP Domain Mail	Web, application or Database	Web, application or Database	Web, application or Database	Web, application or Database	Web, application or Database	Legacy application e.g. OpenVMS to UNIX Mainframe to UNIX	
Type of Consolidation	Homogeneous or Heterogeneous	Homogeneous	Homogeneous	Heterogeneous	Heterogeneous	Homogeneous or Heterogeneous	Heterogeneous	
Upgrades Required	No	No	Yes e.g. Oracle 7 to 8	No	Yes e.g. Oracle 7 to 8	Maybe	Yes	
Middleware Replacement	No	No	No	No	No	Yes e.g. Oracle to DB2 WebLogic to WebSphere	Yes	
Benefits	Fewer servers Reduce staff count	Fewer servers Reduced licenses cost Reduce staff count	Fewer servers Reduced licenses cost Reduce staff count Less complexity (fewer versions to support)	Fewer servers Fewer platform types Reduced licenses cost Reduce staff count Reduce staff skill set requirements	Fewer servers Fewer platform types Reduced licenses cost Reduce staff count Reduce staff skill set requirements Less complexity (fewer versions to support)	Fewer servers Fewer platform types Reduced licenses cost Reduce staff count Reduce staff skill set requirements Less complexity (fewer versions to support) Fewer software products/costs	Fewer servers Fewer platform types Reduced licenses cost Reduce staff count Reduce staff skill set requirements Less complexity (fewer versions to support) Fewer software products/costs Reduce dependency on legacy systems	
Savings	8%	SIGNIFICANTLY INCREASE =====>						

What Are The Key Success Factors?

Sponsorship From A Senior Executive Within The Organization

Strong sponsorship is required for the success of any large initiative. An oversight or steering committee is suggested.

Buy-In From IT And The Lines Of Business

A consolidation requires collaboration between the lines of business and IT. After all, one the most significant results of a consolidation is the realignment of the two.

Incentives For Those Involved

Like any major project a large organization undertakes, the chances of success increase if the participants are rewarded.

Data Collection

Starting with good data builds a solid foundation for beginning an IT optimization project.

A Solid Methodology

Don't reinvent the wheel. Use a proven methodology for migration and consolidation.

A Partner With The Intellectual Capital

Work with a partner that can provide the differentiated skills coupled with experience, methodology and tools necessary for the project success.

Mitigating Transformation Risk — Call in the Experts

Strong tools — coupled with proven methodologies — are the only way to achieve the comprehensive coverage of requirements within a short period of time for IT optimization initiatives. Each stage of the process must be designed to build upon the previous stage and move seamlessly into the next. Analysis that supports the plan must be comprehensive and knowledgeable from both technical and business perspectives. This is at the heart of the SCON/IT optimization practice at Sector7.

Risk Mitigation Elements

- Partner with an organization that has tools for:
 - Consolidation
 - Application Assessment
 - Migration and Porting
 - Functional Testing
 - Performance Testing
- Pilots, Proof of Concepts
- QA and Acceptance Criteria
- Project Management
- Technology Adoption
 - Implemented only when mature and stable
 - New technology adopted in selected groups if so desired
- Experienced skilled resources
- Fewer architectural differences throughout the enterprise

Planning For Consolidation And Virtualization

Start with a holistic approach. Make a list of the issues facing you today.

The list might include:

1. I can't control my costs
2. I have too many underutilized servers
3. I have too many platform types
4. I have too many data centers
5. I have too many software products
6. My environment is too complex
7. I can't meet my users needs in a reasonable amount of time
8. I have no idea how many servers are actually on my network

Then ask yourself if you can benefit from IT optimization. If you listed any of the items above, you probably can benefit. The next steps might include:

- Thoroughly research whether the organization will benefit from optimization
- Put a steering committee in place
- Appoint an executive sponsor
- Locate a partner that can provide methodology, tools and subject matter expertise

Corporate Background

Since 1985, Sector7 has provided solutions for organizations that need to leverage their IT investments. Sector7 understands the challenge of consolidating, migrating, technology refresh and application rationalization. Sector7 has performed IT optimization projects for many organizations around the world. Our broad range of experience allows us to be effective in all aspects of an IT optimization project — from the business case to the most detailed technical problem.

Sector7 brings extensive experience in the analysis and implementation of large enterprise IT optimization projects. We have developed strong tools — coupled with proven methodologies — to achieve the comprehensive coverage of requirements within a short period of time for IT optimization initiatives. Each stage of our process is designed to build upon the previous stage and move seamlessly into the next. Our analysis is comprehensive and supports plan construction. Our analysts are knowledgeable from both technical and business perspectives. The Sector7 methodology for IT optimization is not a theoretical approach. It has been tested, improved, enhanced and adapted for more than six years.

Sector7's IT optimization methodology recognizes the complex relational model that exists in every IT infrastructure: A relationship that is a unique reflection of the business process model around which an IT organization has designed and engineered their business.

At the core of this relationship is the individual application or solution. Each application can be mapped to a unique server (or set of servers). Further, each server can be mapped to a unique IT architecture. Each of the architectures will have a discrete set of support costs associated with it. Combining these four elements into a data model that reflects the core logical relationships among one another allows us to profile an IT infrastructure in some unique and insightful ways.

Having built that relational data model, a series of intelligent filters is then applied to that data. Solution specialists have built these filters based on experiences working with other IT organizations globally. The filters, along with the specialist's skills and experience, allow a framework to be built that identifies the changes that best address the particular business and infrastructure requirements.

In today's economic climate, the old paradigm simply cannot continue and must change. It is time to optimize.

Intellectual Capital

Below is some the intellectual capital that Sector7 leverages to reduce your risk and project cost:

Consolidation Phase

1. **Enhanced ALIGN**
6-step methodology for ensuring consolidation success
2. **Asset Inventory Control and Consolidation Tool**
Stores large amounts of server and application data for asset inventory and includes built in queries that produce powerful reports used to develop consolidation strategies
3. **Qualification Questionnaires**
4. **“TCO-Lite” Tool**
Used to qualify a candidate for consolidation
5. **Data Collection Worksheets**
Worksheets needed for a successful project
6. **Business Analysis Questionnaires**
Used to determine business needs for a consolidation
7. **SCON Estimator**
Estimates the time and requirements of performing a consolidation study
8. **Solution Tool**
Uses the *Asset Inventory Control and Consolidation Tool* to help us create possible solutions

Assessment Phase

1. **Powerful Application Inventory Tool**
Understands most application languages and provides sizing for validation of file counts and lines of code. The tool incorporates years of migration knowledge base built-in to evaluate complexity, find and flag portability issues. The output provides the initial data for migration estimating and planning.
2. **Historical Database**
Previous projects and metrics to improve project estimates and provide project measurements.
3. **Porting Questionnaires**
Capture essential metrics and complexity issues.
4. **Report Templates From All Previous Projects**
5. **Plan Templates From All Previous Projects**
6. **Sector7 Portfolio Strategy Matrix Profiler**
Classifies application by complexity

Migration Phase

- 1. Sector7 5-Step Migration Process**
Incorporates 17 years of experience performing application migrations, which has produced an extensive knowledge base of detailed metrics around the conversion of languages, databases and third-party products.
- 2. Suite of Tools for Migrating Application Code**
We have tools for most common application development languages including Perl, Shell, HTML, Java, C, C++, Fortran, Assembler, Cobol, Basic, PL/SQL, Pascal and many more.
- 3. Porting Guides**
Documentation of years of porting experience
- 4. Tools For Migrating Infrastructure And Binary Code**
These tools will move files, email and binary code including user accounts.
- 5. Powerful Code Synchronization Tool**
Compares and merges code from the original source base that has been migrated with any new software release and needs to be synchronized. The inability to handle code changes and lack of migration experience causes the majority of migration projects to fail.
- 6. Migration Factory**
Leveraging a high concentration of specialized skills, tools, methodology and intellectual capital — high productivity and cost reduction benefits

Testing Phase

- 1. Sector7 Test Methodology**
Tailored to the test needs of migrating applications
- 2. Sector7 Test Analyzer**
Determines code dependencies for creating a maximized test plan
- 3. Test Plan Templates**
Based on all previous projects
- 4. Sample Test Scripts**
Provide guidance for test script development
- 5. Test Guides**
Documenting our years of test experience
- 6. Migration Factory**
Leverages depth in testing skills, methodology and intellectual capital — results in higher efficiency, lower cost.

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