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The Information Technology Modernization Challenge: Maintain or Innovate

ORACLE

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Executive Overview

The key to successful information technology (IT) modernization is planning, establishing, and maintaining an initiative that spans the organization, with strong checks and balances to ensure business alignment. A comprehensive approach includes applications, systems, infrastructure, and services. Isolated attempts that do not consider current and future business goals, and overall effects on the organization, are likely to cause disaster. IT modernization is not a one-time operation; it is dynamic and ongoing. An IT modernization effort must use a solid foundation and strong framework to produce the desired goals and objectives. A focused, well-defined strategy makes up the IT modernization roadmap. Oracle Advanced Customer Services, a global business of more than 2,000 Oracle Support professionals, provides comprehensive capabilities for all aspects of IT modernization execution.

Introduction

Most have heard the directive “Do more with less,” but far less understand the difficulty of meeting this challenge with respect to IT. The “do more” part is easy to grasp. Organizations want to install new applications or infrastructure to improve productivity across the enterprise and address new business opportunities. The “with less” part is much more difficult, especially considering that up to 80 percent of most IT budgets go to maintaining what is already in place.

Economic pressures over the last 10 years have caused many companies to become very conservative in their IT investments, lowering their IT costs wherever possible and delaying investments and new projects. Still, most businesses have been able to do more with less because technological innovation—cloud computing, consolidation, extended lifespans—has reduced many IT asset and service costs. The combination of cost reduction through technological innovation and a generally conservative approach to IT spending has resulted in IT environments with little or no roadmap and poor guidelines for moving ahead. In some cases, these issues have led to business-critical services relying on hardware, software, and applications that have either reached end of life, or are now incurring outsize costs to maintain.

The average company spends from 60 to 85 percent of its IT budget maintaining legacy applications—ongoing maintenance and support consume the most.

Industry analysts are unanimous in their proclamations as to what must be done: IT modernization. Broadly speaking, *IT modernization* can be defined as moving from something old to something new in your IT environment. This could be application to application, system to system, or even as far reaching as moving into a new enterprise architecture that changes the entire IT infrastructure.

In addition to greater efficiencies and tighter alignment with business objectives, there are several other factors that highlight the need to modernize aging IT infrastructures:

- **Obsolescence.** Many legacy applications and systems have been deployed long enough that they are about to enter periods of nonsupport, if they have not already done so.

- **Skills.** The knowledge to maintain many legacy applications is no longer taught in the education system. It's estimated that 25 to 30 percent of the people who have these skills today are eligible to retire in three years.

- **Regulatory compliance.** Government regulations such as Sarbanes-Oxley and Basel II require that CEOs and CFOs verify their systems are doing precisely what they claim they do. Many companies use manual, inefficient processes to meet these requirements.

- **Datacenter infrastructure.** With acquisitions, contractions, and spin-offs, some datacenters are poorly used, whereas others are capacity constrained with issues such as power, cooling, and space. Datacenter issues hold back IT agility and increase capital expenditures (capex).

- **Speed and agility.** As business cycles get shorter, reaction times must improve to address new opportunities. If IT architecture was not designed or built for agility, then working harder is not going to make it better.

- **Tactical and strategic planning.** In the past few years, many IT organizations have operated without a comprehensive plan for short- and long-term activities. Within the context of enterprise goals, this includes optimizing new and existing assets, consolidating solution stacks, prioritizing investments according to ROI, and developing new IT skills and services.

Your company's demand for IT modernization can vary depending on how it uses IT with respect to growth. One reference point is Moore's law, which states that processing power doubles approximately every two years. Companies that grow faster than Moore's law are constrained by their IT. These businesses use IT to drive their growth. Because these fast-growth businesses use newer equipment and drive higher use rates, overall support costs are lower. Annual IT support costs for these businesses are as low as 50 percent of the annual IT budget, with the remainder invested in areas where IT can provide strategic growth.

Mature businesses that are not growing quickly often regard IT as an overhead cost. Their IT infrastructure grows reactively and tactically, and is not aligned with business goals. Because their IT infrastructure is underused, both capex and operating expenditures (opex) are affected. For example, these businesses spend as much as 80 percent of their IT budget on support and maintenance costs, leaving little for investments that can lower costs and improve productivity. Companies with underused IT assets are the primary focus for IT modernization services.

Modernizing an IT infrastructure offers increased productivity, lower costs, and higher reliability and security. However, there is more to it than upgrading an application stack or consolidating datacenters—IT modernization requires a holistic approach. Oracle offers a comprehensive methodology to IT modernization, with wide-ranging services that include proven, integrated capabilities in modernizing virtually every aspect of your IT solution infrastructure, along with the associated people and processes.

Oracle's open, complete, and integrated IT modernization services can be the foundation of an IT modernization program that reduces total cost of ownership (TCO), increases agility, eliminates reliance on legacy skill sets, and improves compliance. Oracle's thought leadership and investment in research and development have resulted in comprehensive innovation in every area affected by IT—from chips to bricks. Oracle has created forward-thinking solutions for IT from a unique combination of the following:

- Delivery methodology based on the Information Technology Infrastructure Library (ITIL) and Six Sigma
- Knowledgebase and learned experience from prior client projects
- Deep expertise in products, technology, integration, and industry-specific practices
- Best practices and business consulting and procedures in all areas of IT modernization
- Knowledge gained from its own internal datacenter improvements

This white paper describes approaches to and considerations of IT modernization, and the benefits of Oracle's methodology and services.

Overview of Information Technology Modernization

This section will help you learn the key principles and criteria of IT modernization, based on Oracle's more than 28 years of expertise, thought leadership, and innovation in this area.

A successful approach to IT modernization must include a holistic and agnostic view across the entire enterprise—beyond what some consider the traditional IT infrastructure of applications, middleware, systems, networks, and storage. Enterprise IT infrastructure includes operations, facilities, datacenter infrastructure, processes, people, and geographic location. All of these must be included as part of any IT modernization process. Before you can change or modernize any part of the IT infrastructure, you must understand how it will affect the enterprise. For example, before you consolidate or virtualize an application environment, you must clearly understand any wide-ranging effects:

- Is there enough power? Is there enough cooling? Or is an inefficiency being created because the new environment no longer requires the current cooling and power capabilities that are in place?
- How will consolidation affect the applications and interdependencies that exist in the legacy environment? Is there too much or too little storage capacity? Are there too many or too few network capabilities? Can the applications meet service-level requirements?
- Do current processes and legacy skill sets support the new environment? Do system administrators possess the knowledge to work in a virtualized environment?
- What potential risks are introduced into the enterprise if a well-defined strategy and roadmap aren't established?

The Challenge

IT infrastructure is limited in its ability to stay synchronized and aligned with business goals. Although IT delivers many process and productivity improvements, it can also be a major bottleneck that restricts your organization's ability to be flexible and agile in reducing costs and seizing new opportunities. Many organizations today have focused on lowering capex and opex, on maintaining versus innovating, but this can have adverse consequences. Legacy infrastructure can hinder the ability to deploy needed applications or services; expose or induce risk through inconsistencies and lack of standards; and strain resources, people, and processes.

Open lines of communication are important within any organization. Unfortunately, most infrastructure groups operate within conceptual stovepipes, where information and process go mostly up and down within the group. Side-to-side information flow—between groups—is less common. Because IT modernization affects many (or all) parts of an organization, any successful implementation must ensure that there is a widespread flow of two-way information.

Figure 1 captures the key concepts that make up an IT modernization framework. The figure also provides insight into the interdependencies across the organization, individual groups, and elements that can make up IT modernization.

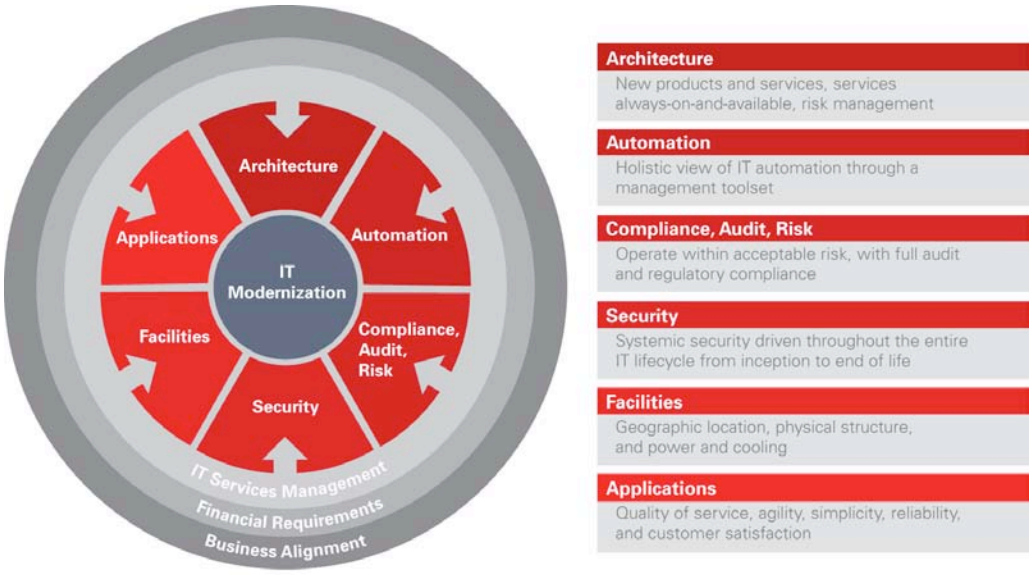


Figure 1. IT modernization's effect on the entire organization.

Look at each segment of the inner circle in the figure from a business perspective:

- **Architecture.** Provides a standardized architecture that allows you to quickly deploy new products and services in a tried-and-tested manner. A modernized architecture is highly available and can host mission-critical applications.
- **Automation.** Provides a holistic view of IT automation processes, removing the need to have multiple specialists with unique product knowledge. This is achieved through management toolsets that cross different environments to meet business operational demands.
- **Compliance, Audit, Risk.** Ensures that your legal and legislative requirements are adequately managed, while minimizing or eliminating business risk.
- **Security.** Addresses your security objectives on a systematic basis, from inception to end of life.
- **Facilities.** Provides a comprehensive view of requirements for power, cooling, space, and so on—regardless of geographic location. This capability can be extended from the datacenter into the office environment.
- **Applications.** Analyzes IT modernization from many aspects, including quality, agility, and simplicity. Oracle looks at how it can help the CIO improve customer satisfaction. Ultimately, end-user and customer satisfaction is reliant on the service quality of the business applications.

The Starting Point

A best practice in launching any IT modernization program is to discover and document a thorough understanding of the existing IT infrastructure, including assets, capabilities, current status, limitations, any expected future business and operational requirements, and new technology capabilities. A good starting point is gathering data and defining requirements. This is accomplished via different forums,

such as discovery and requirement-gathering workshops, where you bring together representatives from across the organization, including personnel from executive management, infrastructure, applications, operations, compliance, networking, security, and facilities. Including all stakeholders at this phase is essential and will empower them to build a solid framework for a sustainable IT modernization based on a flexible and agile IT infrastructure**.**

Oracle's IT modernization services help your company transform your IT infrastructure. Oracle will recommend an IT strategy and portfolio of improvements that meet your business goals and metrics, and are based on its broad experience and leadership in IT innovation in software, infrastructure, and operations.

Methodology

A proven, repeatable, and reusable methodology is the backbone of all IT modernization programs. Oracle's approach provides the necessary consulting processes and tools to achieve results of the highest caliber, as measured by metrics that characterize the alignment of your IT infrastructure with your corporate goals. Oracle's Six Sigma-based methodology seamlessly integrates with project management tools and best practices to consistently deliver high-quality services.

As shown in Figure 2, Oracle's IT modernization approach uses a proven lifecycle methodology comprising the following steps (discussed in more detail in the next section):

- **Discover.** Discovery of requirements.
- **Synthesis.** Tactical and strategic solution options.
- **Design.** Detailed designs.
- **Execute and realize.** Success milestones and metrics.
- **Sustain.** An ongoing plan for sustainability.

Figure 2. Oracle IT modernization methodology overview.

Composition

The overall IT modernization process consists of

- Creating a baseline summary of where you are currently
- Aligning business and IT for key initiatives
- Prioritizing for the future

Baseline Summary of Your Current Infrastructure

As with most companies, your IT infrastructure was probably dictated by tactical requirements. An example of your implementation process would be as follows:

- A new application needed to be deployed.
- A server was past its service-level agreement (SLA) utilization metric, which was addressed by increasing memory CPU speed or I/O throughput.
- A disk array was approaching capacity and new disks needed to be installed.
- Servers were deployed on a 1:1 ratio with direct-attached disk arrays.

In all likelihood, your infrastructure grew incrementally out of control. As assets were deployed outside of any inventory or asset management tracking mechanism, the infrastructure grew even less clear.

A key starting point for IT modernization is to establish current state by determining what assets are deployed throughout your environment. This includes servers, storage, applications, networks, telecommunications, resources, and processes—extending out to people and skill sets. You must know where you are before you can create an IT modernization framework and roadmap.

Business and Information Technology Alignment Matrix on Key Initiatives

Over the years, IT architects and corporate strategists have become more segregated, resulting in misaligned goals. To optimize business productivity, IT should be in unison with the CXOs and line-of-business owners. If these disciplines remain out of sync, IT becomes a cost center versus an enabler or asset to the goals, strategy, and growth of a business. It is important for a business and IT to stay aligned with key matrices for key initiatives—the result can be a competitive advantage.

Prioritization Matrix of Future Phased Project Implementations

As with any business investment, you must justify the rationale for every aspect of your IT modernization program. TCO and ROI analysis will be required for executive and financial approvals, to guide the resources and investment, and to set the priority for which steps to take first. Key metrics must be established, then measured and monitored throughout the program's lifetime.

Business Benefits

As stated earlier, a properly designed and well-executed IT modernization program, synchronized across the enterprise, offers strong benefits. Such a plan can help ensure that you're making the right investments for the future, highlight where to expand capacity or make changes to meet future demands, and improve quality of service and flexibility, while reducing costs. An IT modernization program improves efficiency, agility, risk management, and new processes. Standardized, shared services and operations based on best practices will

- Address risk mitigation
- Lower expenses

- Meet compliance and security regulations

The result is an IT infrastructure that can help your organization stay ahead of market pressures and competition.

Technology Benefits

When any part of your IT infrastructure fails, your business lifeline is adversely affected. Many of the datacenters that support the world's largest companies use infrastructure that is as much as 30 years old. Practically speaking, in many cases this legacy infrastructure has reached the end of useful service life: it is on life support. This represents an immense risk to these businesses. It also means that their IT personnel and resources—who are responsible for maintaining the infrastructure—are in constant reaction mode. Opex, including expenses and personnel costs, is consumed in this type of environment.

Doing more with less is the common thread across all types of businesses and markets. A modernization program for infrastructure provides a means for achieving this goal. Replacing legacy infrastructure through modernization promotes dynamic provisioning, consolidation, virtualization, and standardization. Each one of these helps to

- Reduce opex
- Accelerate refresh and update cycles
- Increase efficiency across the infrastructure environment
- Decrease power consumption, cooling costs, and real estate requirements

A flexible and dynamic infrastructure can quickly address changes in demand on compute cycle requirements, within individual lines of business or across the enterprise. In addition, a modernized IT enables flexible options for disaster recovery and business continuance.

Organizational and Cultural Benefits

Working in an environment that keeps pace with changes in technology provides an environment that attracts and retains the best talent: the best people want to work in the best environment. A solid IT modernization program pulls together global business units, which promotes increased innovation and invention. Oracle has observed many times how one of the biggest advantages to the business is to provide decision-makers with real-time information on how the infrastructure is performing and aligning with business goals, which leads to improved decision-making. This allows the business to more-quickly adapt to market conditions and embrace new opportunities, and lead its competition through innovation and thought leadership.

How Oracle Can Help

Enabling strategic business transformation, IT modernization allows organizations to maximize the content of their existing application assets as they move toward better application and technology environments. Oracle has a portfolio of proven modernization solutions that can align your IT

infrastructure with business goals and requirements. Key services to any IT modernization program include consolidation and virtualization. Critical to success is to understand and address through defined actionable projects the impact that consolidation and virtualization have across the enterprise—cooling, real estate, power, architecture.

Oracle Advanced Customer Services, a global business unit within Oracle Support, offers consulting services for customers interested in consolidation activities in their datacenter, such as

- Simplifying administration
- Optimizing system use
- Improving staff efficiency

Consolidation, Virtualization, and Migration

Many organizations deploy only one application per server to avoid possible issues with system security, availability, performance, or software conflicts. This is a traditional way to design distributed computing environments, driven by inexpensive servers and straightforward deployment. The result is a sprawling, inflexible, and underused compute infrastructure. This approach has become increasingly expensive due to growing energy and maintenance costs, and the length of time needed to deploy applications onto separate servers. The problem is magnified when associated development, quality assurance, and test environments are implemented, each requiring its own system. Although many line-of-business managers are hesitant to reduce the number of servers through consolidation, seeing the success of this approach in core IT services, such as printing, networking, directory, and database, has helped to show that it is more cost effective and productive.

Consolidation is a fairly simple concept that can be complex to implement. The basic goal is to accomplish the same work using fewer machines, fewer operating environments, and fewer licenses, and to reduce the number of assets required to accomplish the same level of services. Successfully implemented, fewer components means less support and maintenance cost, and less complexity.

There are many types of systems, applications, infrastructure, and datacenters, and many strategies for achieving effective consolidation. The real challenge is not really enabling many systems to run with less infrastructure, but creating an IT business model and supporting processes for designing, acquiring, deploying, and managing workloads in the shared infrastructure environment that can improve business reaction times, increase flexibility, and reduce capital and operating expenditures.

Virtualization Simplified

Virtualization is not a new technology, although recently, it has become a popular buzzword and marketing point. *Virtualization* is a simple concept, which can be described as the process of abstracting and pooling resources. Virtualization enhances server consolidation strategies by enabling administrative and resource boundaries to be created within a system, while providing a framework where resources can be allocated as needed. The abstraction layer isolates the consumer of a resource from the underlying physical dependencies. Decoupling the physical resources results in a more-

modular architecture, and introduces more flexibility and options in both the supply and demand sides of IT resources.

In systems virtualization, the critical component is called a *hypervisor*: a hardware or software capability that presents multiple virtual machines or virtual operating environments on a single server system. To the operating system (OS) or application administrator, the virtual machine appears to be a physical server. Similar facilities exist for storage, networks, desktop computers, and application software, which separates the service or resource being provided from the physical machines, cables, and configurations that host the IT resources (see Figure 3).

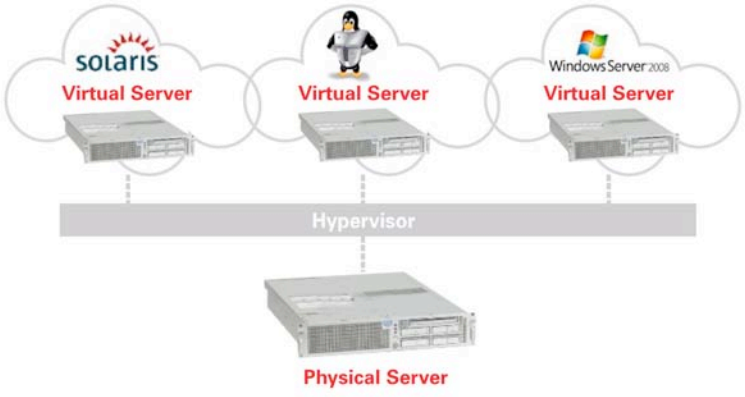


Figure 3. Hypervisors abstract the operating environment and application services from physical hardware, providing a more flexible and modular architecture.

Virtualization enables and accelerates consolidation. Consolidation efforts often require a complex migration of resources, applications, and services throughout the project, with possible integration into standard deployment and management processes. Once consolidation has optimized the resources providing the IT services, virtualization enables simplified management of the services and supporting infrastructure—as long as proper workflows and processes are implemented reflecting the new environment.

Implementing Virtualization into Information Technology

Adding virtualization into an existing environment can lower the number of physical systems and network connections, which should result in reduced capex for IT. In reality, it is adding software (hypervisors) with additional support costs, OS instances (for software-driven hypervisors), additional complexity of dependencies and support, and new training requirements and support tasks. While a virtualized datacenter is running with fewer machines, there might be more assets to manage, which could result in a significant increase in opex. If the workflows and processes in IT are not designed to take advantage of virtualization's capabilities and strengths, the result is often less favorable than you might have been led to believe.

Figure 4 represents the classic, one service or application per server scenario. Each system has a physical server with a given configuration, an independent OS, an application, and a data set for a specific purpose. This appears simple, but it can create anarchy when multiplied by hundreds or

thousands of servers. Physical systems might not be standardized, so platforms, peripherals, architecture, and firmware are rarely common among datacenter systems. OSs will have different patch levels, different versions, or even different vendors and core skill sets. The applications running on the system will often be procured and deployed based on what was current at the time of deployment, rather than using a standardized and tested version and release. This results in hundreds or thousands of unique configurations, adding risk and effort in maintenance and troubleshooting fairly simple problems.

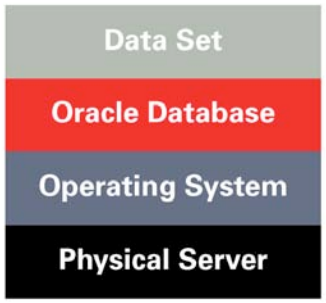


Figure 4. Classic (legacy) system architecture.

Once a fix for a problem is found, it doesn't necessarily propagate as appropriate to the other systems in the datacenter, resulting in repetition of effort that could easily be eliminated.

Figure 5 shows one strategy of consolidation that was popular in the late 1990s. In this architecture, individual applications are migrated into a single platform. This forces the application owners to share a physical server as well as a single operating environment. This hosting model allows IT to begin deploying more-standardized system environments and adds additional efforts in the testing phases of deployment. If one application requires a specific patch, then all applications hosted on the system must be tested with that patch for both compatibility and performance. With the proper discipline in deployment, release, and change management, this model presents excellent opportunities for reducing asset and support costs.

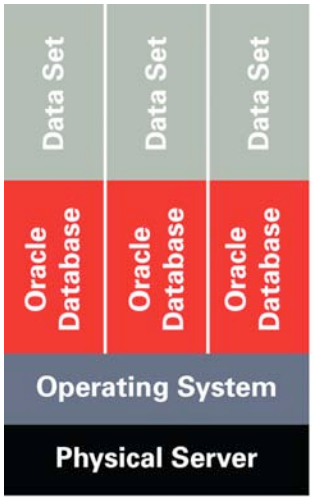


Figure 5. Consolidated services architecture.

Companies often run many copies of a single application in production environments. For example, the corporate customer relationship management (CRM), enterprise resource planning, human resources (HR), and service desk applications might run on an Oracle Database. In Figure 6, the three data sets have been merged into a single, shared instance of the Oracle Database application layer. The system now has one image to manage and one application to manage. The operating environment and application patching and versioning complexity have been removed, simplifying the support processes and the deployment, release, and change management required to support the system. The system can now be treated as a shared service in the environment. In this example, the supporting platform and operating environment are truly shared, enabling the individual application data sets to have full use of the supporting operating environment and the physical system's resources. This can easily result in conflict between the organizations relying on the systems to provide business critical services.

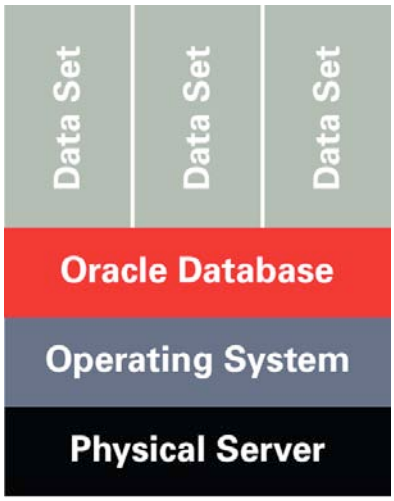


Figure 6. Shared services architecture.

One significant hurdle in moving from a consolidated services architecture (Figure 5) to a shared services architecture (Figure 6) can be the organization itself. Many companies acquire systems and software at a business application owner level; for example, HR acquires the systems and software required to run HR applications, and sales organizations acquire the systems and software required to run CRM applications. In the shared services model, a central organization acquires and maintains the database "service" to be used by all of the consuming organizations. This often requires a chargeback model, or a commitment by the corporation that IT will become a service provider within the company.

Figure 7 shows two common and fairly simple consolidation architectures, using hypervisors or OS containerization to host multiple applications on a single physical server. In these examples, the number of physical servers is reduced by a 3:1 ratio. If average peak shift utilization[1] (PSU) was under 30 percent for these systems, then there is a worst-case PSU of under 90 percent, and a resulting 67-percent reduction in physical servers, energy consumption, cooling load, server support costs, OS

[1] PSU is system utilization during the busiest processing window, averaged across a meaningful period such as an eight-hour workday.

support costs, and server floor space footprint. Also introduced is either a hypervisor or an additional operating environment to the architecture. The hypervisor can introduce new license, training, and support costs, and the hosting operating environment of containerization adds additional instances of the environments to be managed.

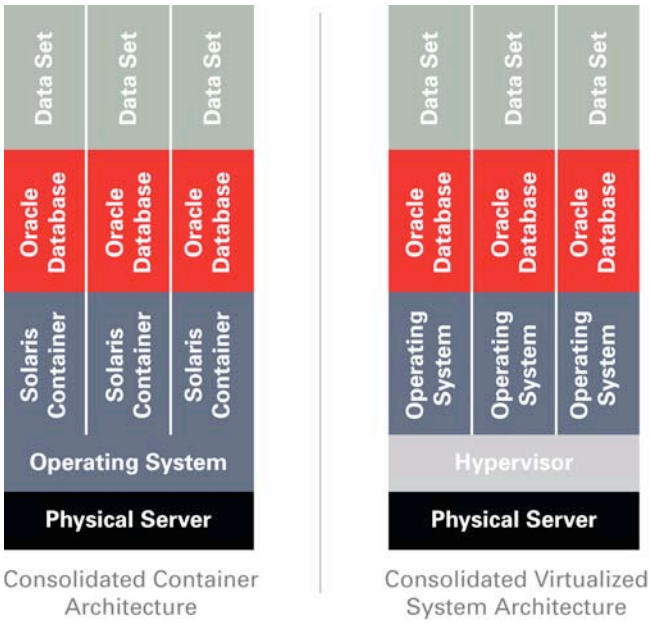


Figure 7. On the left, a consolidated container architecture; on the right, a consolidated virtualized system architecture.

These additional components bring additional complexity in debugging and resolving problems in the application's supporting "stack." Moving anarchy into a virtualized, hypervisor environment frequently increases complexity and chaos. Single failures in the underlying physical server, hypervisor, or operating environment can have a cascading effect—degrading performance or even causing outage in all services supported by that component of the system.

Implementing standardized system configurations and operating environment images, and stringent release and configuration management, combined with these consolidated architectures, can greatly increase overall IT efficiencies. The result can be increased service levels to the end users; less downtime; and a quicker, more-agile time to market or time for deployment for new services.

Figure 8 shows a consolidated environment where multiple data sets, application instances, and application types share a single physical platform. In this example, a resource management layer has been added to control the demands on the compute resources. The controls placed on the workloads can either guarantee a specified level of resource to a workload (at least two cores of processing power), specify a relative quantity of resource (at least half the machine), or limit the resources that a particular workload can consume (no more than two cores' worth of processing power). Similar resource controls can be implemented for storage, storage bandwidth, network bandwidth, and memory use to create a well-behaved operating environment with predictable service levels.

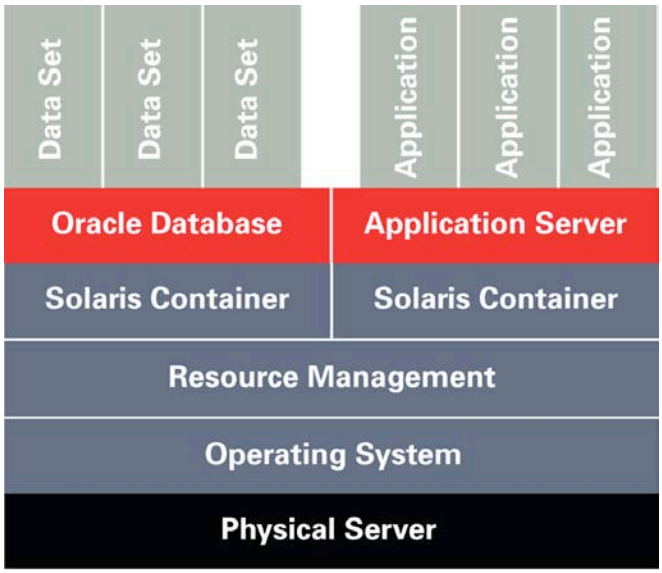


Figure 8. Consolidated zoned shared services architecture.

There are many virtualization options and many ways in which they can be deployed, configured, controlled, and managed. Finding the right combination of products, processes, and capabilities to fit your business and operating model is critical to maximizing the return on IT investments and to realizing the potential value to your business of these new technologies and architectures. Figure 9 shows an example of a deployment and systems architecture that could be either very well thought out and very well implemented to drive business value and agile IT, or poorly implemented with conflicting IT processes and unaligned business processes—a very haphazard model that is nearly impossible to support.

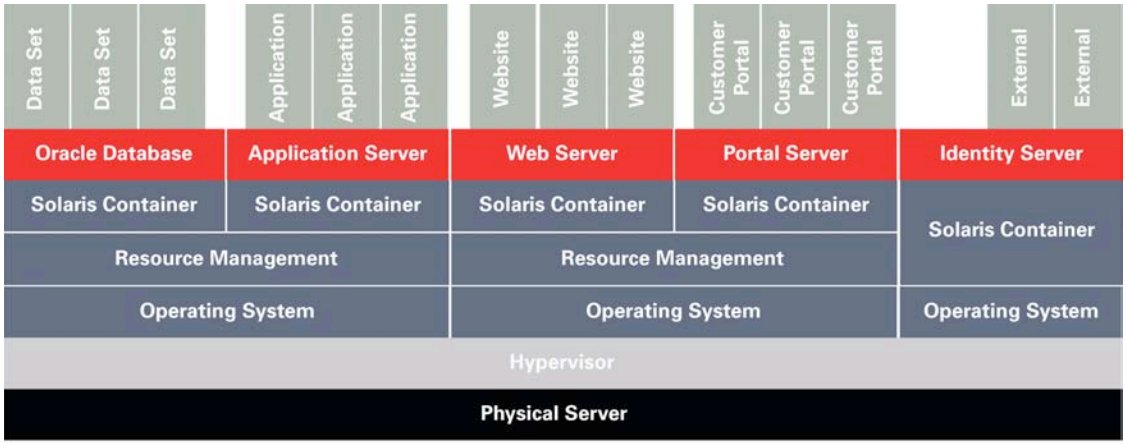


Figure 9. Consolidated zoned shared services architecture with hypervisor.

Simplifying Information Technology Management through Consolidation

The efficiencies provided by consolidation and virtualization strategies are countered by new costs and complexities throughout the infrastructure. The costs can be controlled through careful planning and balanced against the improved efficiencies to show potential ROI. A more-difficult metric to predict is value. The improved efficiencies can reduce time to deploy and time to market for new services, and improve business operations by adding flexibility throughout the organization.

By abstracting the dependencies of the operating environment, the application services now depend on, or are attached to, "objects." In the first example of a classic system architecture (Figure 4), the data set depends on the Oracle Database and likely depends on custom configuration within the application to achieve performance and functionality within the application. The data set and associated application are tested to a specific revision of the database software.

The database itself depends on the OS—launched, tested, and deployed with specific patch and OS versions, package feature sets, network and security settings, and possibly even local user account and user configuration settings. The OS is tied to the hardware, with drivers, disk drives, and network connections attached to specific switches and networks. This cascading set of hard dependencies forces IT to associate services to the physical and logical assets supporting the system.

With a virtualized IT architecture, the resources are *attached* rather than *dependent*. A data set is attached to the database and viewed as a consumer of an IT capability. The database is running in a container, or a virtual machine, which has no hard dependencies on the underlying machine itself. The hypervisor (in a virtual machine or using containerization) abstracts the physical hardware (CPU brands and models, memory, network adapters, firmware, storage adapters, and physically attached storage) and presents a simplified virtual environment. This means there is no longer a need to hand-build systems for applications, or to treat each application as a complete and custom stack.

The complexities of configuration and change management for the applications still exist, but are addressed as groups of requirements rather than as independent complex problems to repetitively solve. If we continue to think of the virtual machines as machines, then patching by hand, installing custom configurations of OSs and applications, and allowing administrative tasks to diverge from a base standard introduces more risk and support overhead.

As shown in Figure 10, in the simplest form, the entire IT infrastructure is reduced to network, storage, system, application, and access, or user resource objects.

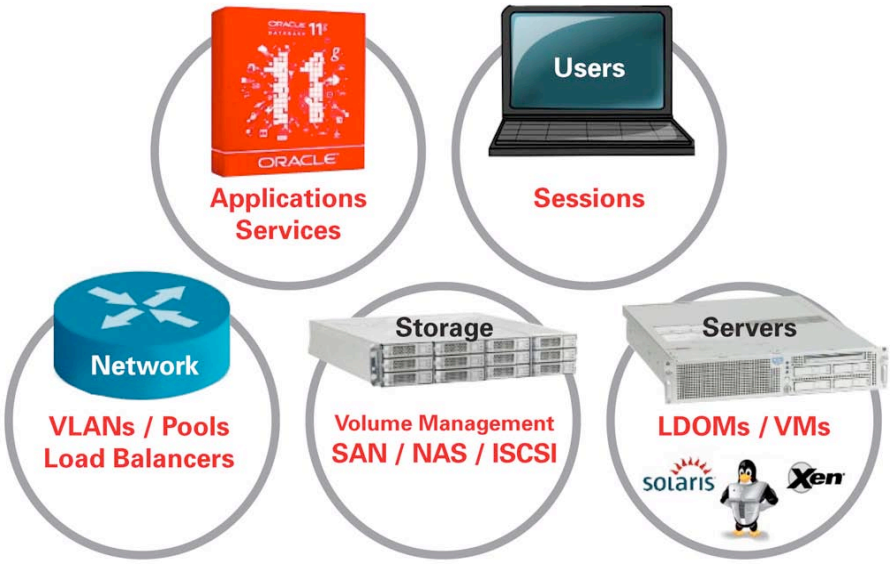


Figure 10. Abstracting different layers of the solution stack.

For example, the process for deploying a new application could be reduced to much-simpler tasks:

STANDARDIZED INFORMATION TECHNOLOGY OBJECTS—OLD VS. NEW METHODOLOGY

OLD METHOD	NEW METHOD
Acquire hardware	Create storage object
Acquire software	Attach storage object to server object
Allocate storage	Create container on server using storage
Install system and storage	Configure application
Install OS	
Install patches	
Install application	
Configure application	

For this to work, the underlying objects must be defined and standardized as much as possible. A storage object could be a standard size, using storage area network (SAN), internet SCSI (iSCSI), or network-attached storage (NAS) to attach to the server object. An application container object can be deployed from a "golden image," or cloned from a base image with packages and patches preinstalled. Servers can be deployed from golden images prepatched, or at least installed with a predefined set of packages and patches specified by a change and release control process. Using standard configurations

for the objects enables automation and reduced testing cycles, decreasing the deployment time for new applications and simplifying the support complexities often found in legacy IT environments.

Even the most difficult and business-critical IT challenges, such as disaster recovery and datacenter migration, are greatly simplified when viewing the IT infrastructure as objects with attachments and dependencies, rather than as hundreds or thousands of standalone computing stacks of tightly coupled components.

Consolidation Capabilities

Mainstream technologies in systems and software virtualization, and IT management focusing on service implementations, have evolved much more quickly in recent years, far outpacing the ability of business processes and flows to take advantage of them. Taking existing services and deploying them into a consolidated architecture using virtual machines, without looking at the business drivers and processes of acquisition, asset lifecycle management, and deployment, is likely to lead to bad results.

Use and Value of Assets

In many nonvirtualized environments, server use is significantly less than 30 percent during peak shift. Often, server use is monitored for a high water alarm, but not managed or analyzed for efficiency. Personnel managing a system or application often does not have any idea what their PSU is, or what their resource consumption patterns look like. Idle CPU cycles still consume energy, generate heat, and waste capital investment that could be better invested in something more productive than a datacenter space heater.

The two most common justifications for overconfiguration of servers are as follows:

- **Seasonal or cyclic workloads.** With seasonal workloads, the server system is configured to safely address worst-case busy processing cycles, but also configured based on a projection of what the workload demands will be. For example, annual workloads supporting calendar events such as holiday shopping, tax filing deadlines, or sporting events are often projected by historical traffic data, mixed with marketing projections, and hampered by new software features and capabilities that introduce new variability to the consumption of IT resources.
- **Lack of capacity management.** Lack of thorough capacity management is far more common than significant cyclic workload variability. Capacity management includes monitoring; alarming; historical trending; and modeling of demands, resource consumption, performance, and capacity. Monitoring a high-water mark of consumption or performance is a good start, but in most cases not comprehensive enough. Receiving an alert that consumption is high might not be indicative of a problem, and during busy processing windows, might actually be a sign of a well-configured machine, efficient batch processing, or common maintenance tasks such as backup, data import/export, or reconciliation. Without good knowledge of the nature of the workloads and processing demands, consumption alarms have no context.

Performance-based alarms are easier to put into context. The users of the system are seeing degraded performance. Something is wrong and is starting to impact the business. Unfortunately, this indicates a

problem, and the resulting corrective activities are going to require time, effort, and expense to execute. Among the questions to be answered:

- Is additional hardware needed?
- Can the workload be moved to a larger machine?
- Are there performance and scaling modifications that can be implemented in the software, application, system, or storage?

Each of these options will require time for analysis, testing, execution, changes to the production environment—and most likely, additional cost to the organization.

Alarms and alerts, in proper context of the business requirements and demands, are a good backstop or line of defense. Proper capacity management, including trending of supply (of computing resources) and demand (of users and workloads) can use historical data, test environment data, and business inputs to create predictions of consumption and requirements of performance, along with models of capacity.

Evaluating Virtualization as a Tool

Virtualization is a tool and a capability to be leveraged by IT and built into IT and business process flows. To demonstrate the need for this new way of thinking, answer a few simple questions about your organization:

- Who procures, owns, depreciates, and retires the servers, storage, and software licenses for a given business application?
    - If the business application owners procure and own their platforms and licenses, consolidation can be more difficult. If a business unit owns the assets, they could be hesitant to share their IT resources with other business units. This is a common issue in very segmented businesses and in government, where divisions run autonomously and IT services are often acquired through independent, project-based procurements.
- Are your systems running common architectures, OSs, and commercial applications? Are they using standardized configuration, version, and patch/update levels?
    - Standardization of platforms, operating environments, and application software can remove many layers of complexity and greatly increase overall service uptime by decreasing the time necessary to troubleshoot and resolve issues. Although this is true in the independent server model, it is especially important in the consolidated and virtualized environments. "Deploy an application container" is much simpler than "Deploy a virtual machine, on this platform, running this OS, with these patches, with this version of the application, and with these updates applied." Complex configurations are difficult to deploy, debug, and share.
- Does every business application have a unique development, test, and production environment?
    - Virtualization, along with capabilities such as cloning and migration, enables complete operating environments to be replicated, created, deleted, or suspended dynamically. A production system

can be cloned into a development environment to debug a software problem. A development release of software can be deployed into production through cloning, or by moving the virtual machine or container to a different physical server. Entire enterprises can share a smaller test environment that has virtual machines and containers detached, but ready to go when needed.

- What controls are in place to make sure that development and test environments accurately reflect the production environments?
  - By on-demand cloning or deploying of the resources that define a business service, the applications running that business service can be replicated, copied, and logically moved among development, test, and production. Recreating a system that "looks like" the production system for debugging and testing can be difficult in the independent server model, including duplication of the physical components of the server in many cases. Copying a virtual machine or a container can remove many of the dependencies on physical hardware, firmware levels, physical attachment of peripherals, storage, and networks, and ensure that the new environment target is identical to the production source.
- Who is responsible for managing the performance and capacity of your IT resources?
  - Too often, the answer to this question is either "no one," or "I don't know." Servers are often overconfigured for safety margins or capacity that never arrives, or configured for a peak seasonal demand. This is often because buying too much capacity outweighs the consequences to the business of not having enough resources to meet demands. Creating an alarm when capacity is running out is important, but properly managing performance and capacity can not only reduce the cost of idle assets and pool together those resources for overall growth, but also provide valuable business intelligence by showing trends and snapshots of what kind of processing is being done, how much is being done, and by whom.

Consolidation and virtualization need to be treated as an ongoing program rather than as a product or tactical project. The architecture and implementation of the shared services and the shared resources models have far-reaching implications to consumers of IT resources, application owners, and business financials. The opportunities for improved service levels, cost savings, increased efficiency of overall operations, and improved time to deploy new applications and services carry with them the risk of adversely affecting those same metrics.

Consolidation and virtualization are a means to an end, and tools to be used as part of an enterprise architecture, contributing to the business cost and value of IT. The real value is in the integration into the business itself as both a resource for growth opportunities and a driver for overall efficiency throughout the organization.

Modernized Power and Cooling in the Datacenter

With the growing need to reduce opex in the datacenter, there is an ever-increasing amount of focus on the potential to save power and cooling costs. Significant savings can be realized by implementing a modular approach in the datacenter infrastructure, which includes high-efficiency chiller plants with an

air-side or water-side economizer, close-coupled cooling such as in-row or overhead units, efficient transformers, and high-efficiency uninterruptible power supplies.

Many of Oracle's modernized datacenters use a pod-based design, which features small, self-contained groups of racks or benches that optimize power, cooling, and cabling efficiencies. As shown in Figure 11, pods use a set of complementary components that include the following:

- Racks that are organized in a hot-aisle/cold-aisle configuration with closely coupled overhead or in-row cooling. The in-row or overhead cooling neutralizes heat at the source.
- Variable speed fans are used in the in-row units to move hot air out of the hot aisle through water-cooled heat exchangers. These units sense the actual load and adjust the fan speeds automatically, significantly reducing power costs and maximizing efficiency. The units can be sized to neutralize the heat load of very high-density racks.
- Heat isolation that includes hot-aisle or cold-aisle containment.
- Room air conditioning is used to meet code requirements for habitable space, provide humidity control and air filtration, and in some cases low-density base cooling to pods.

Figure 11. A compute pod with Liebert's overhead cooling on the left and APC's in-row cooling on the right.

The pod design enables short cable length and in-pod switching equipment—saving copper, decreasing costs, and increasing flexibility. Patch panels are installed above or below each rack, depending on whether the datacenter is on a raised floor or slab.

Designing at a pod level, rather than a room level, simplifies the approach and enables the same architecture to be used in both small and large datacenters throughout your business. Small datacenters can deploy a single pod, whereas larger datacenters can replicate the pod design as many times as necessary. The pod design gives a standard increment by which lab and datacenter space can be scaled up and down as dictated by your business cycle—accommodating reorganizations, acquisitions, expansions, consolidations, and new product development efforts.

Another component of the modernized datacenters is the *busway*, which distributes power from above the rack or below the floor, depending on whether a raised floor is used. Different power requirements can be accommodated by plugging in different "cans" that supply the appropriate voltages, provide a circuit breaker, and feed power to the rack. The busway is hot-pluggable, and the pod's power configuration can be changed easily, in a matter of minutes, without risking damage to other equipment.

Automation Between Information Technology and Datacenter Facilities

As previously discussed, dynamic provisioning and automation of the IT infrastructure can help meet dynamic business challenges. Virtualization, consolidation, and technology refresh will continue to drive higher usage and rack densities. There are greater numbers of CPUs per rack, running at far higher usage rates than legacy systems, and often running in a considerably smaller datacenter floor space footprint.

This trend drives the need for more-efficient power and cooling solutions, as well as the need for closely coupled monitoring and management of the entire IT and datacenter facilities stack (a convergence between facilities and IT). Such a convergence can be accomplished through integration between the IT monitoring and management systems and the Building Management System (BMS). Although the BMS provides real-time monitoring of the overall facility power consumption, it can also provide real-time monitoring of the datacenter infrastructure power consumption, chilled water consumption, and other utilities that support the datacenter.

Once integration between the IT systems and the BMS is complete, additional cost-saving measures can be automated while adhering to predefined IT SLAs. For example, deploying a large number of new virtual servers can ramp up compute usage, or a live IT load can be shifted from one server farm to another (maybe even across DC facility locations). In these situations, the cooling capability will need to increase to address the resulting ramp-up in heat output as the compute resource hits peak use in the target location.

In this type of scenario, one action might be for the IT system to signal the BMS to proactively start another chiller to have sufficient cooling available to address the peak compute load. However, if the datacenter is part of a large office complex, an alternate action might be to signal the BMS to increase all comfort set points in the office spaces slightly (and within predefined limits) to shift cooling capacity to the datacenter—prior to shifting the IT load, or in other cases, prior to processing a large number of transactions or executing a high-performance computing application.

Similarly, if the facility is nearing a peak power demand during high outdoor ambient temperature, the IT system could be signaled to delay noncritical processing until after the peak period has passed. In most cases, if a facility exceeds its peak power demand (as recorded by the local power provider), the cost per kilowatt-hour will be increased by the power provider for the next year. Many BMSs offer demand limiting as a key energy management feature, which can save the facility a significant operating expense.

Customers are now often required to make decisions in seconds—rather than hours, days, or weeks—before that decision has an impact on the datacenter facility. Similarly, an issue with cooling infrastructure will impact IT in seconds when a dense compute resource needs to be shut down, and IT load will be shifted elsewhere if there are any temperature excursions in the facilities. This real-time decision-making can be enabled through the convergence of IT, facilities, and building automation systems.

Modernizing Legacy Software and Data

Legacy applications have become a significant business problem. They carry a high cost of ownership, are difficult to modify to meet ongoing business demands, require a legacy skill set that fewer and fewer people possess, and do not adequately meet today's compliance demands.

For these reasons, organizations are considering the move to new software technologies and architectures. But although it is possible to develop applications that fully use new technologies, the approach is expensive and risky. The strategy that a growing number of organizations are embracing is to modernize their existing applications and infrastructure software.

To get the maximum strategic business benefit from modernization, it is important to base the modernized system on an architecture that is built on open standards and deployed on open systems. IT modernization based on an open architecture offers the benefits of

- Increased agility
- Reduced reliance on legacy skill sets
- Reduced TOC
- Improved compliance

The Benefits of Application Modernization

Modernizing your application portfolio is essential to your strategic IT modernization program. Maintaining applications that respond to the business's needs and planning for the lifecycle of your applications can improve efficiency and achieve significant cost savings.

Just as with systems and storage, upgrading existing applications to the latest version is not always the best way to maximize productivity and ROI. Applications are often deployed or upgraded as a one-time event, in place until there is a demand to upgrade or replace it. Different applications might provide overlapping functionality, or simply be unused. Duplication and overlap can be the result of mergers and acquisitions or independent lines of business. Enhancing more of the same can become an ever-expanding nightmare. Instead, rationalizing and managing your business's application portfolio against current and future business requirements can maximize investment decisions, ROI, and productivity. Modernization of your application portfolio includes application rationalization and application portfolio management (APM), as well as a thorough understanding of your application's lifecycles.

Understanding the Application Lifecycle

You must make the most of the applications your business already owns. The first step is to understand the application lifecycle, which represents the TCO from development, implementation, and adoption through to retirement. The value of your company's application portfolio changes over time. As you measure the value of your business applications, several factors need to be considered, such as

- Acquisition
- Implementation
- Training and maintenance costs
- Availability of necessary skills to support the deployment

There are many phases in an application's lifecycle, each with key aspects, as shown in Figure 12.

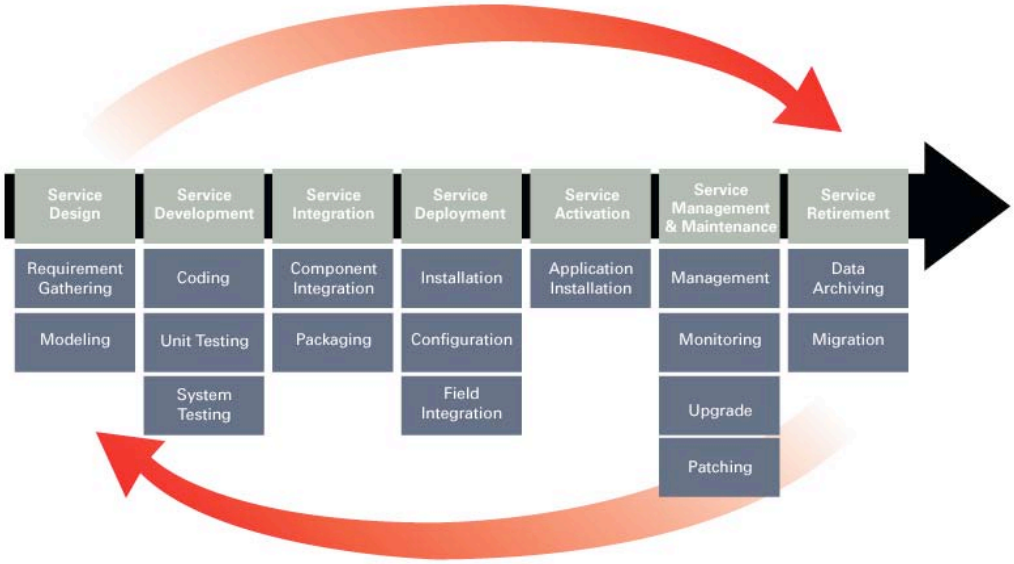


Figure 12. Core factors in the application lifecycle and service life.

Application Rationalization

Application rationalization is taking an inventory of existing applications and capabilities, and aligning them with business needs. A business-driven evaluation of your applications can deliver substantial savings by keeping your portfolio "clean" and current—you will always know the value of your investments. By selecting your applications based on business need and prioritizing related actions, such as choosing what you will and won't do, you can effectively manage the value of both existing and proposed applications. You can monitor changing priorities and application value in real time, continually reviewing and adjusting as necessary.

Application rationalization is best achieved by adopting an APM solution that provides a framework for

- Creating an inventory of applications
- Evaluating applications against business requirements
- Recommended actions, such as transitions and upgrades

Application Inventory

The process of rationalizing your applications begins with an inventory of all applications currently in use. Many businesses have performed such an inventory, but as a one-time event in a difficult-to-maintain spreadsheet. The exercise includes arduous, manual analysis performed on collected data, with a few follow-on actions. The process is inefficient at best: there is often no continuity in the process, data, or analysis, and follow-on activity tapers off over time. If there is a subsequent inventory exercise, the organization will potentially go through the same time-consuming process all over again.

Oracle's IT modernization services use automated tools, which can vastly improve the creation of an accurate application inventory by quickly identifying servers and software installed on your network. This process produces an initial inventory to help you actively manage your infrastructure within your portfolio management system of record. It also performs incremental synchronization to easily identify changes in the portfolio or on the network.

Another aspect of rationalization is to classify applications based on workload, exclusivity, and behavior. This involves understanding the location of the application, network requirements, load, and actual resource and storage needs. This can involve detailed investigation and, at times, running a scripted program to test the application for compatibility, for example, if the application is targeted for migration.

These automated tools support the Oracle IT modernization experts in determining basic information such as business process support, application owner, intended user population, and costs. Completing such an inventory usually highlights any overlapping or duplicate applications that are candidates for consolidation.

Application Evaluation

Evaluating your company's applications can be a simple or an elaborate process, depending on your organization's maturity. For some organizations, just reviewing mission objectives and capturing an estimate of application costs will be a substantial accomplishment, and enough to identify where to cut and where to invest. However, if a recommendation for an application isn't obvious, a more-detailed evaluation is required. As part of a detailed evaluation, you will want to consider the following:

- How does the application conform to technical and corporate standards?
- Where are the gaps and overlaps between application capabilities and business requirements?
- Does staff have the necessary skills?
- Are users satisfied with the application's performance and utility?
- Is management satisfied with the application's cost and benefits?
- Are there better alternatives?
- What are the maintenance costs?

Once the analysis is completed, you will be able to recommend actions for each application, such as replacement, retirement, upgrade, or maintenance.

Application Recommendations

After the application inventory and business requirements are laid out, preparing the recommendations is the next step. You'll realize that some recommendations are easier to implement than others—and some might even conflict. Some applications can be candidates for immediate or near-term retirement, whereas others might need to stay longer. Most organizations don't have the budget or resources to follow all the recommendations at once, even if executives wanted to take such measures.

A Framework for Application Modernization

There is more to transitioning applications than ripping out the old ones and replacing them with new ones. Depending on your business requirements and application assets, there are several options:

- **Rehost.** Move an application from its current platform environment to an Oracle solution stack by employing emulation or by porting.
- **Re-architect.** Develop a completely new application using the most current application and infrastructure architecture. For example, applications can be made accessible through a portal, which can improve productivity and security. Web enabling an application can enable it to work with new devices, such as smartphones.
- **Refront/replace.** Evaluate and select a replacement application or commercial off-the-shelf product.
- **Interoperate.** Develop the new technology to work with and interface between legacy systems. Simply saying, "Migrate to Java" can be an option, but could also be inappropriate. For example, enabling the application using the principles of a service-oriented architecture might be appropriate, or switching the application's data repository to a centralized Oracle Database.

Figure 13 graphically illustrates these concepts. At the bottom of the figure, the way business needs are met with the current IT environments are described. For example, how does the code achieve the level of security required to prevent hackers from taking control of application function calls?

The left column measures how much the IT environment will require to operate the application with quality. These used to be referred to as the "-ilities." For example, if business needs are met and IT operations perform well and cost effectively, then "Do nothing" could be a viable option. At the other extreme, application replacement and re-architecture will help a customer to respond to business needs reliably and effectively. The Oracle IT modernization experts can guide your IT group through this process to achieve your short- and long-term goals.

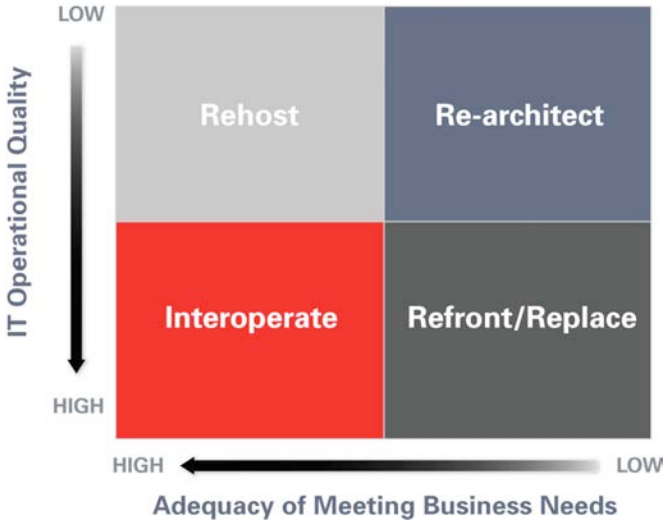


Figure 13. A framework for evaluating IT application modernization.

Governance: Application Portfolio Management

If you can't measure it, you can't manage it. Understanding your assets and how they map to business requirements is only the first step in managing them efficiently. Consistent, methodological, and ongoing APM is a key part of a successful IT modernization strategy.

APM is a process that prioritizes business priorities—which are constantly reacting to the market—with IT priorities. It's important to track the operational quality of your applications to help determine the most appropriate adjustments. These reviews and the resulting adjustment recommendations might assist in budget planning as well. As part of the ongoing governance process, good portfolio management solutions provide scorecards and financial models to help determine when a new application should be acquired and deployed. You can capture application proposals, score and rank them, and model the alternatives, thus preventing wasteful expenditures. Oracle IT modernization experts can put a system in place to dynamically track application effectiveness toward your company's goals.

The Role of Service Management in Modernization Programs

When approaching IT modernization, you must also consider the entire service lifecycle. Modernization cannot be regarded simply as a technology exercise—it must span all of the IT service assets, including people, processes, tools, and knowledge within the IT organization that use the IT resources to deliver IT services.

A Holistic Approach to Modernization in the Service Management Lifecycle

Figure 14 shows a simplified IT Infrastructure Library (ITIL) V3 Lifecycle diagram, which depicts the five core aspects of IT service management (ITSM). Each aspect of your IT lifecycle is impacted by

modernization, and any area left unaddressed could constrain your ability to achieve the results you seek: agility, efficiency, and effectiveness. In fact, many initiatives fail because they attempt to execute modernization as a series of isolated IT exercises that hope to drive down IT opex and reduce future capex, without considering the impact on both current and future business needs.

Figure 14. The ITIL V3 Lifecycle with the five core aspects of ITSM.

IT modernization can deliver considerable changes in agility and capacity in your IT infrastructure. However, changing the technical capabilities of your IT assets can only be accomplished if the service capabilities of your organization are modernized as part of the initiative. Without this, it is unlikely that capabilities such as the ITSM processes will be able to accommodate the ongoing scale and nature of change that the new IT infrastructure will facilitate.

A holistic approach to IT modernization will analyze and address all of the assets that form IT's capability to deliver services. Simply modernizing hardware and software technology resources is unlikely to deliver the full potential in terms of ROI. An orchestrated program is required, starting with a clear understanding of the interrelationships and interdependencies between the IT resources and capabilities. Figure 15 shows this concept in more detail.

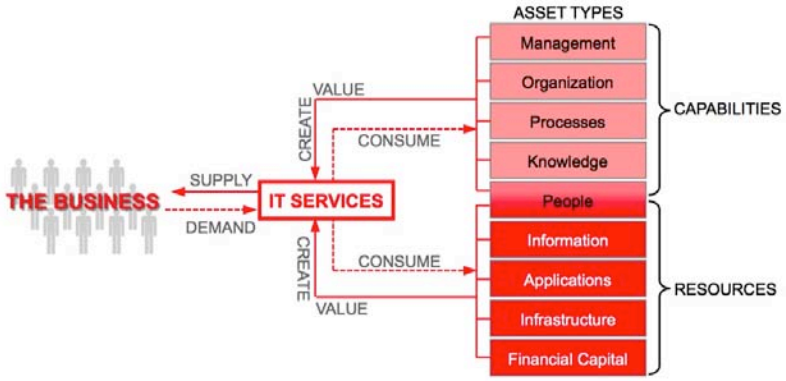
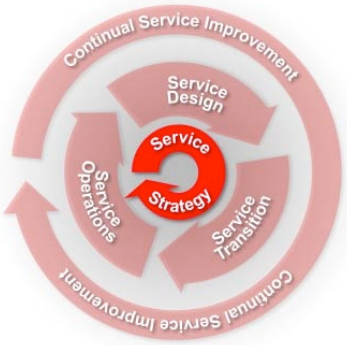


Figure 15. IT services comprising both resources and capabilities—both necessary for any IT modernization initiative.

Service Strategy



When modernizing other parts of your organization's IT, the starting point and hub of all ITSM investment and activity is the evolution and maintenance of a clear IT service strategy that reflects the overall strategies and policies. Adherence to this IT service strategy, therefore, ensures that all IT service solutions are driven by identified business needs that deliver real value to the customers of these IT services, and that these services are in full support of overall your company's strategy.

A well-evolved IT service strategy is an essential prerequisite to any IT modernization program, and should address the following:

- Who are your IT organization's current and future customers and stakeholders?
- What are your current IT service portfolio and service assets?
- What is your organization's approach and culture regarding IT financial management and risk management?
- What are your organization's IT sourcing strategies for both product and IT services?

All of these are of critical concern. This is particularly the case where IT modernization is likely to lead to multitenanted shared service environments that break through the traditional approach of IT infrastructure silos dedicated to specific business requirements, IT services, or departments or lines of business.

Shared infrastructure in the form of highly virtualized platforms, or cloud-type architectures, are desirable business tools only if there has been clear architectural thought given to how these shared infrastructures will be funded, allocated, and metered, and what performance metrics and associated dashboards are relevant to the service strategy. The same consideration needs to be given to how the modernized IT services will be architected to accommodate competing and sometimes contradictory individual business demands, including internal users and external customers, upon these shared services.

Forming and communicating a clear service strategy from the outset is therefore critical. The service strategy must be easily understood and well accepted to the organization as a whole and to the individual business units that IT supports. This strategy must be periodically revisited throughout the program to ensure its continued relevance, and it must be constantly communicated—not just to those directly within the program, but to all of the modernization program's stakeholders.

Service Design

The key purpose of the service design phase of the ITIL V3 Lifecycle, is to ensure there is a consistent approach to the design of all new and significantly changed IT services. Any approach must adequately consider and address the impact and demands of the new IT service upon existing IT services, and the existing underlying IT management systems, tools, architectures, and processes.

Therefore, when embarking on an IT modernization program, you should evaluate the capability and maturity of the existing approaches to IT service design. This should include the currently established approach to service-level management, service catalog management, availability management, IT service continuity management, and IT security management. Each of these capabilities might need to evolve to accommodate the new principles that IT modernization could bring. At the same time, your IT organization's capabilities in each of these areas will be used as the IT modernization program moves from the data gathering and concepts phase into solution design.

Service Transition

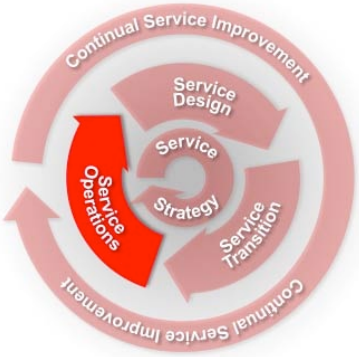
The service transition phase is the phase in the ITSM lifecycle that handles the managed transition of new and changed services into production service. It includes approaches to IT service validation and testing, change management, configuration and asset management, knowledge management, and release and deployment management.

You can see that an organization's existing capabilities in this area could be significantly impacted by any IT modernization program that wants to deliver highly agile, dynamic, and virtualized shared service platforms. Existing IT testing processes, platforms, and tooling might require significant revision and reinvestment to be able to adequately accommodate the added complexity and challenges of highly virtualized environments. Of course, there are the potential benefits that IT modernization can bring to this lifecycle phase, such as the ability to provision development and test environments far more rapidly and cost effectively. In any event, it is highly likely that IT modernization will have a significant impact upon an organization's existing capabilities, and therefore an extremely high reliance upon your organization's service transition capability and maturity for the modernization program to successfully execute and deliver.

IT modernization can deliver extremely agile IT environments that allow the business users of the IT services to be far more dynamic. However, if your IT organization's change management or configuration management processes do not have the capacity or robustness to handle vastly increased rates of change in the IT environment, the capability for agility that the modernization program delivers will never be realized; therefore, your program's business purpose will fail to be achieved.

It is important to achieve an appropriate balance between enhanced agility and effective control. Without such a balance, a modernization program could deliver the technical capability for extreme flexibility, but miss the need to also deliver the appropriate control mechanisms and standardization to prevent the potential chaos associated with virtual server sprawl. Effective modernization must include a clear approach to transitioning your organization's existing IT governance and control mechanisms to an ITSM model. This can help ensure that the potential agility, standardization, and risk reduction benefits that modernization brings actually meet your ROI goals.

Service Operations



The service operations phase is the phase in which production IT services are delivered to your business at the agreed service levels. IT modernization inevitably brings with it new technologies and increased complexity, the result of more technology layers and more interrelationships. Higher compute densities also extend and more-closely couple the relationships between the different entities of IT infrastructure and datacenter facilities. This highlights the need for a unified and holistic approach to service management across your IT and datacenter facilities.

Service operations have always been subjected to the somewhat competing demands of stability and responsiveness. Often, an extreme focus by IT on operational stability can frustrate its business customer's demands for faster changes. However, IT organizations that are forced to push through high volumes of change could suffer from lower service stability and availability. The business case for IT modernization generally tends to include benefits termed *high agility* and *faster time to market*. These are only achievable if the previously discussed phases of service design and service transition have standardized approaches to designing services that have the capability to safely co-exist in, and benefit from, highly agile infrastructures. The approaches to testing must adequately represent these dynamic, multitenanted shared service infrastructures. Services design packages for new and revised services also need to include all of the service operations requirements, ensuring that your new IT service can actually be packaged, released, monitored, administered, maintained, supported, metered, and managed in the modernized environment.

Modernization brings the opportunity to ensure that your IT performance metrics—and the tooling and governance mechanisms by which these metrics are captured—are relevant to your service strategy, and therefore relevant to your organization's overall goals and objectives. This, in turn, enables a data-driven approach to understanding the relationships between service operations performance and your actual business needs. Ultimately, service operations performance must be measured in terms of the value it delivers to each business unit, not simply the achievement of technology uptime. The relevant performance measurements also ensure that investments can be focused on those areas where your business can benefit most, rather than an across-the-board crusade to drive service-level performance higher—potentially without significant benefit to the organization as a whole.

Continual Service Improvement

As discussed earlier in this section, IT modernization should not be regarded as a one-off exercise. *Continual Service Improvement* (CSI) is the overarching structured process by which IT continues to ensure that its efficiency and effectiveness improve across all phases of the ITSM lifecycle, and that your IT service portfolio is continually aligned with current and future business needs.

Ad hoc or uncoordinated IT improvement projects can be counterproductive and lead to ineffective use of highly valuable, experienced IT resources. CSI strives to create a structured framework in which investment in IT improvement is led by business need and in support of your organization's overall business and IT service strategies.

In IT organizations with high ITSM capability and maturity, IT modernization is essentially an element of ongoing CSI. For organizations that have yet to reach high levels of ITSM maturity, IT modernization is a vehicle by which ITSM capability and maturity can be improved for your business.

Oracle Operational Capability

The Oracle IT modernization experts can assess your operational capability, based on its global experience, industry-wide best practices, and an operational maturity model. An overview is shown in Figure 16. Oracle can analyze gaps between current and desired operational results, and recommend specific activities to bridge those gaps.

Figure 16. Operational capabilities.

Assessing your operational capability is an ideal component of an IT modernization program because it

- Establishes a clear benchmark at the starting point of the program
- Tells you what IT service management capabilities the program can leverage

- Identifies the areas of ITSM that you need to focus on evolving and enhancing to achieve your modernization goals

A periodic capability assessment during the IT modernization program enables tangible measurement of progress in the achievement of modernization goals (see Figure 17).

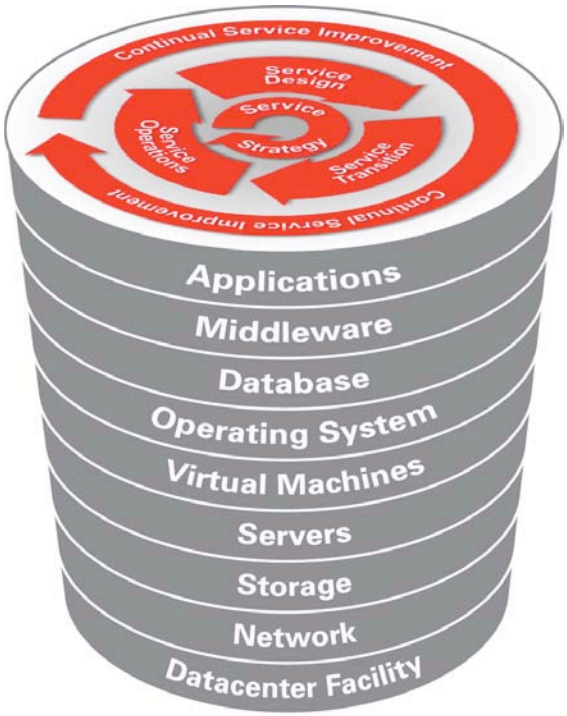


Figure 17. Evaluating operational capabilities across your entire IT infrastructure.

The main objective of evaluating operational capability is to provide an objective, quantitative assessment of the people, processes, and tools in your organization, and their ability to deliver IT-based services reliably, cost-effectively, and flexibly. Our experts can deliver a portrait of the current state of IT department operational capabilities, identify gaps, and issues, and recommend a roadmap for improvement. Our comprehensive, continual improvement methodology for IT management provides a practical framework and actionable roadmap for enhancing IT management infrastructure.

Our services integrate Oracle's experience and expertise in datacenter technologies and management as backed by industry-standard ITIL, Six Sigma, and People Capability Maturity Model. This mix of unique Oracle intellectual capital, industry standards, and community experience brings analytical depth and objectivity to your business.

Conclusion

IT organizations are under increasing pressure to reduce costs and increase their ability to react to ongoing business demands. Legacy IT infrastructure—applications, systems, datacenters, and

services—continue to be a problem for organizations because they are expensive, difficult to maintain, inflexible, and do not meet the needs of today's businesses.

IT modernization is the continuous evolution of an organization's existing infrastructure and services, with the goal of aligning IT with shifting business strategies, decreasing capital and operating expenditures, and preparing your IT for the future. IT modernization implies the acquisition and deployment of modern technologies—along with their associated skill sets and capabilities—to replace legacy environments, without having to start from scratch.

Oracle's open, complete, and integrated IT modernization service expertise can be the foundation of an IT modernization effort that helps reduce total cost of ownership, increase agility, eliminate reliance on legacy skill sets, and improve compliance.

Start Optimizing Now—Engage Oracle Advanced Customer Services Today

Oracle Advanced Customer Services offers a variety of expert services that are tailored to your specific business and technical needs. We can help you:

- **Develop a datacenter modernization strategy** with IT modernization and discovery service capabilities from Oracle Advanced Customer Services.
- **Optimize existing server environments** with Oracle's consolidation/virtualization service expertise.
- **Identify near-term optimization opportunities** with Oracle's tailored services from our datacenter experts.
- **Integrate new server and storage products efficiently** with Oracle System Application Readiness Service.
- **Drive higher database availability** with performance assessments for Oracle Database 11*g*.
- **Increase the efficiency of your IT team** with Oracle Operations Management.
- **Migrate data and applications to a new environment** with Oracle's expert data migration service capabilities.

To get additional information or schedule a meeting with an IT modernization specialist, email us at: acsdirect_us@oracle.com

About Oracle Advanced Customer Services

IT modernization services are offered by Oracle Advanced Customer Services, which provide you with solutions and experts to meet unique and complex technology goals. A global business of more than 5,000 experts, we provide customized, proactive solutions for all Oracle technologies—Database, Middleware, Applications, Servers, and Storage. Working closely with you at all phases of your Oracle solution lifecycle, our experts help maximize the performance and value of all your Oracle investments to ensure your business success. Oracle Advanced Customer Services provides you with a choice of flexible and personalized services—choose the level of service your business demands.

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Tony Cataliotti manages Oracle's Datacenter Consulting Practice in the Americas. Areas of expertise are IT modernization, datacenter strategy and design, and datacenter management. Tony has worked at Oracle for 11 years, with management roles in IT professional services and systems engineering. He is a frequent speaker on green/eco IT and datacenter topics at industry events.

Prior to Oracle, Tony was employed by the managed services company, Systems and Computer Technologies (SCT), and assigned as the director of technical operations at the University of Medicine and Dentistry of New Jersey. He has also held roles in software quality assurance and marketing for a software company in the health care field and was a principal of a startup company specializing in user interface testing and technology prototype design. Tony received a B.S. from Purdue University, an MBA from the Mays Business School, Texas A&M University, and Executive Education in Corporate Strategy at Sloan Business School, M.I.T.

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Lorna Gorny is a solution architect in Oracle's Advanced Customer Services Organization in the datacenter modernization practice. In this role, her focus is on IT modernization in the datacenter, applications modernization, consolidation, and virtualization. She addresses design, technology, and process improvements to help Oracle's customers leverage the value of their current IT portfolio, and focus their modernization efforts where they will provide the greatest return on their investment. Lorna frequently participates at events focused on datacenter efficiency and IT modernization as both a speaker and panelist.

Prior to joining Oracle, Lorna was a certified technical specialist in the IBM Software Group. While there, she designed solutions for customers that maximized the value of their investment in their IT portfolio.

Over the course of her career, Lorna has authored, co-authored, and acted as the technical lead on technical publications and papers for several companies including IBM, Microsoft, and Gartner Group. Lorna has worked with customers and partners in technical sales roles, including technologist, architect, sales consultant, and director of consulting.

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Prior to joining Oracle, Tom worked in the healthcare, aerospace and defense, manufacturing, financial services, and telecom industries in the roles of sales engineering (interface across R&D, product development, engineering, marketing, training, and customer facing), consulting, enterprise architect, technology specialist, sales and field engineering management. Tom holds degrees from the University of Connecticut and Porter and Chester Institute in Electronics Engineering and a BFA.

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James Reed is currently a senior solution architect in Oracle's Advanced Customer Services Organization. He is an APCC Certified Integrated Datacenter Design Consultant, and leverages innovative thinking and previous experience in energy management, IT infrastructure, and process improvement methodology to assist clients in increasing efficiency and reducing operational costs and environmental impact through datacenter modernization. James joined Sun's Global Sales Organization in Dallas 10 years ago as technical program manager and Six Sigma Black Belt. He managed complex sales engagements and led client-facing business-to-business process improvement initiatives. James has served in other roles, including program manager for Advanced R&D Engineering Team, and managed projects such as Grid Computing, and the design and build out of an RFID Technology Center.

Before joining Oracle, James was senior program manager of global data network operations for a leading telecommunications company, and served as liaison between product development, engineering, and managed services. Prior to the telecom industry, James was senior application engineer in the building automation industry for 14 years, where he helped clients achieve greater energy efficiency, operational performance, and cost savings throughout their facilities (including datacenters, military installations, high-rise office complexes, airports, hospitals, universities, airports, and energy providers). He specialized in HVAC systems and control, airflow distribution, power trending and analysis, lighting systems, security and surveillance, and energy management solutions.

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Bill Walker is a technical lead for global datacenter modernization within Oracle Advanced Customer Services focusing on IT modernization, capacity management, cloud computing, and virtualization. Bill has been with Oracle for 13 years, having served in various roles in service development, service delivery, and sales. Most recently, he was chief technologist for emerging markets, and has served as chief architect for the ITCOPs and practice development organizations.

Prior to Oracle, he was a partner and CTO in a successful DEC/IBM/SGI reseller, a principal IT engineer for a U.S. government research and development center, and worked in the cellular engineering, financial services, and defense research fields. He is a co-author of the BluePrint document *Capacity Planning for Internet Services* with Adrian Cockcroft, has written numerous white papers, and presented to conferences around the world on mainframe integration, performance, and capacity management, and IT efficiency.

John Windebank, Principal Solution Architect Oracle Advanced Customer Services

John Windebank is a principal solution architect for global datacenter modernization within Oracle Advanced Customer Services, and focuses on enabling Oracle's customers to maximize their IT operational efficiency, effectiveness, and agility through the adoption of effective IT service management strategies across IT and datacenter facilities environments. John is a specialist in IT service management (ITIL) strategy, with far-ranging practical experience in IT outsourcing, IT project and program management, and service contract negotiation.

Outside of Oracle, John is highly active within the IT service management community, recently holding roles of International Director of itSMF UK and itSMF UK Chair of Publications ESC. He is also an author, contributor, and reviewer of various ITIL related publications and active member of the "Sustainable IT Service Management" Special Interest Group.

John joined Sun in 2006 as service director for the UK and Ireland telcom and media sector for Sun Microsystems, and then as principal solution architect for Sun's global accounts hosted in UK and Ireland. During this time he worked to architect, contract, and implement large-scale services solutions across EMEA. Prior to these positions, John ran an independent IT service and program management consultancy, specializing in guiding organizations in the pragmatic adoption of IT service management good practice and program recovery.

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