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Prepared by ISSG Technology Communications

Compaq Computer Corporation

Contents

IT Consolidation with Compaq ProLiant Servers and StorageWorks

Abstract: This white paper addresses the many benefits of IT consolidation on industry-standard Compaq ProLiant servers and Compaq StorageWorks offerings. IT consolidation is an industry trend that optimizes physical resources, consolidating applications onto fewer, more powerful servers and storage components and centralizing the management of many business critical applications.

For more information about IT consolidation, visit the Compaq Solutions website at http://www.compaq.com/solutions/consolidation/.

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Notice

IT Consolidation with Compaq ProLiant Servers and StorageWorks White Paper prepared by ISSG Technology Communications

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The IT Balancing Act

Many IT professionals find themselves carefully balancing many problems simultaneously, forced to respond to the disparate needs of the many departments they support, IT specialists often struggle to meet the requests of their organization. A common method of reacting to changing demands involves adding equipment. This procedure often solves immediate problems, but later reveals unforeseen consequences. This balancing act tends to trickle down to a common industry problem – high total cost of ownership.

Trends towards Standards

Industry wide trends reveal that most major corporations are migrating from custom-designed, proprietary platforms to more economical, standardized systems running fewer operating systems. Beyond the obvious cost savings are powerful benefits, such as highly expandable systems and easy to use shrink-wrapped applications. These trends stem from IT organizations' growing need to reduce the total cost of ownership of servers, storage, and labor while maximizing processing power.

IT Consolidation Defined

The act of balancing many problems simultaneously forces IT organizations to be reactive, ultimately spiraling costs out of control. IT consolidation stems from the acceptance of industry - standard systems and the need to reduce the total cost of ownership.

IT consolidation involves optimizing hardware resources to increase staff productivity and reduce labor requirements, reducing total costs. Placing systems at core locations enables IT organizations to effectively respond to emerging business challenges, simplifies data management, reduces space requirements and helps control the overall cost of ownership. As the world's largest computer supplier of industry - standard computing hardware platforms, Compaq is able to provide the most reliable and cost-effective IT consolidation solutions.

Compaq ProLiant servers lead the industry in reliability, are designed for optimal space utilization, and include system management tools that empower IT staffers to manage more servers in less time. The primary benefits of consolidation involve reducing costs and increasing reliable access to data and computing resources.

IT consolidation can help reduce the following costs:

- Personnel - reduced number of servers and centralized server management leverages precious IT resources, improves response times, decreases server downtime and increases productivity.
- Data control and security - server consolidation provides more consistent and reliable access to data.
- Hardware - equipment standardization leads to economies of scale as initial purchase and maintenance of smaller numbers of servers reduces overall hardware costs.
- Software licensing fees - reducing the number of servers required to support clients means less application licensing fees.

The Four Types of Consolidation

When it comes to IT consolidation, there are several different terms to describe the same basic types. For the purposes of this paper, we will use the ITCentrix (http://www.itcentrix.com/) terminology. The four common topologies of consolidation that are widely used in the industry are distributed IT consolidation, collocated or physical consolidation, application workload consolidation, and IT Center of the Future.

Type 1 – Distributed Consolidation

Gartner and IDC call this type a logical topology.

In this type, servers and storage remain in the same location, but the number of consoles is reduced providing a standardized way of managing the infrastructure, connecting them to the network and the user community and consolidating the management of applications and databases. This solution relies on cluster technology, system management applications, and ERP applications to link the servers together. Figure 1 illustrates this consolidation type.

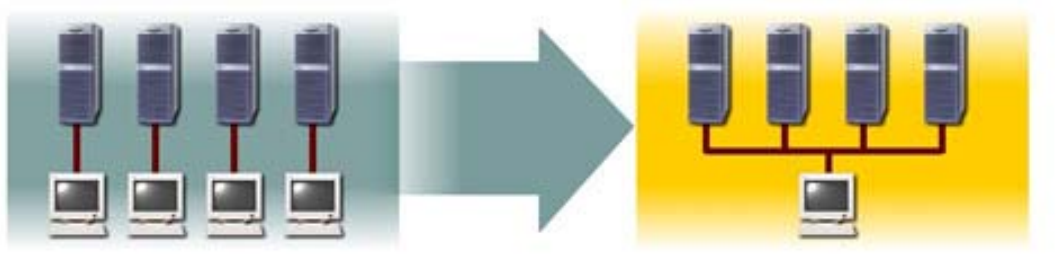

Figure 1: Illustrates the topology of distributed consolidation

Type 2 – Collocated or Physical Consolidation

This type of IT consolidation involves moving widely distributed systems into more centralized locations, and consolidating systems and data centers from multiple sites. Physical consolidation involves both systems and storage consolidation.

Figure 2: Illustrates the topology of physical consolidation

Type 3 – Application Workload Consolidation

Gartner sometimes refers to this type as rational consolidation.

This topology means consolidating applications and databases on fewer, more powerful servers and larger storage solutions. It allows the customer to streamline resources, standardize systems and applications, reduce total cost of ownership, and increase potentially performance. Refer to Figure 3 for a visual representation of this consolidation type.

Figure 3: Illustrates the topology of application workload consolidation

Type 4 – IT Center of the Future

IDC calls this type a transparent consolidation.

This topology provides customer access capacity on demand, employs flexible technology implementations, such as Galaxy or storage or server utility, operate in a highly automated environment, and executes in real-time. Basically, this type exemplifies to full migration from a distributed infrastructure to a dynamic allocation of resources. Figure 4 represents the transparent server consolidation type.

Figure 4: Illustrates the topology of IT Center of the Future type consolidation

Distributed Consolidation

Corporations relying on business critical applications often benefit from application management capabilities, a core feature of logical consolidation.

Organizations likely to benefit from distributed consolidation rely on business critical applications such as ERP, business intelligence, e-commerce, Internet, Intranet, mail and collaboration products.

Because these applications are often difficult to control, they benefit from management applications that ease their administration and reduce downtime.

With distributed consolidation, application management tools improve availability, significantly reduce downtime and decrease IT labor costs. Logical consolidation centralizes IT support staff and gives them the ability to manage centrally located or distributed applications.

Additionally, this type of consolidation automates tasks and applies application management across many systems at once to resolve common problems such as disk space utilization and software updates.

Benefits of Distributed Consolidation

The many benefits of distributed consolidation include:

- Extended uptime – by proactively monitoring system resources and solving application problems before they fail.
- Increased administrator productivity – by automating and centralizing tasks, making it easier to maintain or improve network, systems and application performance.
- Reduced total cost of ownership – by minimizing the number of man-hours required to perform installations, upgrades and application management.
- Improved application availability – by reducing planned and unplanned downtime, assuring users access to network and computing resources.

Tradeoffs of Distributed Consolidation

Management software costs, installation labor and time are all factors that can inhibit a management application installation.

Research has revealed tradeoffs of distributed consolidation can be offset if a proper solution is implemented. The primary challenges of installing software are the labor required to install the solution and the time needed to fully implement a solution. An installation can take months to fully implement and IT staffers must be trained to fully use the functionality of management tools.

International Data Corporation (IDC) performed a study identifying specific manageability features on Compaq systems, administration software tools and general practices that reduce the cost of using PCs and servers. The study provides unambiguous verification that businesses can achieve an extremely favorable return on investment over a wide range of metrics by installing manageable desktop and server products along with complimentary administration tools. The value of improved application availability and enhanced set-up and automation of the process created total annual savings averaging $410,000 per 100 users over a 5-year period leading to a return on investment in just 77 days.

Benefits of Using Compaq for Logical or Distributed Consolidation

The Compaq partnerships with major independent software vendors such as Altiris, BMC, CA, Tivolli and others, coupled with powerful Compaq system management capabilities help you plan, deploy, and operate application management tools. Additional benefits include:

- Compaq ActiveAnswers empowers administrators with unparalleled access to information that can aid in the management of major applications. To subscribe to this service, visit the Compaq website: http://www.compaq.com/activeanswers/.

- Compaq Insight Manager 7 manages an unlimited number of servers from a single console. It provides device management capabilities that consolidate and integrate management data from Compaq and third-party devices using SNMP, DMI, and HTTP. With Compaq Insight Manager 7, you can monitor and manage groups of servers, clients, clusters, and networking products anywhere, anytime from a standard Web browser.
- Compaq SmartStart for Servers decreases the time required installing and upgrading servers. This automated tool surveys systems and configurations, enabling easy manageability of upgrades.
- Compaq SmartStart Scripting Toolkit delivers an unattended automated installation for high-volume server deployments. The SmartStart Scripting Toolkit was designed to support the Compaq ProLiant DL and ML series servers. The toolkit includes a modular set of utilities and important documentation that describes how to apply these new tools to build an automated server deployment process.
- Compaq Remote Insight Lights-Out Edition provides seamless, hardware-based, OS-independent graphical remote access to Compaq ProLiant servers using a standard browser. It requires no additional software on server or client browser.
- ProLiant Essentials Integrated Lights-Out Advanced Pack delivers sophisticated virtual administration features for full control of servers in dynamic data centers and remote locations.

  For customers who want full front-of-the-server remote control of their resources located in data centers and remote sites, Compaq offers the Integrated Lights Out (iLO) Advanced Pack (263825-B21) that can be activated via a purchased license key. The ProLiant Essentials iLO Advanced Pack offers the license key to switch on the advanced feature set of Compaq's Integrated Lights-Out solution. Using the iLO Advanced features, an administrator can install, configure, monitor, update, and troubleshoot remote ProLiant servers from anywhere, anytime, all via a standard Web browser.
- ProLiant Essentials Rapid Deployment Pack is a server deployment product that facilitates the installation, configuration, and deployment of high-volumes of servers via a GUI-based console using either scripting or imaging technology; server configuration time is reduced, making it possible to scale server deployments to high volumes in rapid fashion.

  The ProLiant Essentials Rapid Deployment Pack integrates two powerful products: Altiris eXpress Deployment Server and the SmartStart Scripting Toolkit. This deployment solution is a fast, easy, point-and-click solution for deploying servers using imaging or scripting and maintaining server software images, all from a management console. The management console's graphical user interface provides an intuitive drag-and-drop of events, such as scripts and images, to deploy the operating systems and applications. Deploying a server is as easy as dragging and dropping predefined images or scripts onto one to hundreds of target servers.

  Especially designed for the new ProLiant BL servers, the ProLiant Essentials Rapid Deployment Pack has advanced features that can detect and display server blades based on their physical rack, enclosure, and bay location. You can set the deployment console to automatically install pre-defined configurations on newly installed server blades.

To find out more about the Intelligent Manageability tools, visit the Compaq Intelligent Manageability website: http://www.compaq.com/manage/.

Physical Consolidation

Physical consolidation involves reducing the number of servers and centralization of resources to reduce operational costs, which includes adding, moving or upgrading existing server resources. There are 2 types of physical consolidation:

1. Systems consolidation
2. Storage consolidation

The benefits and tradeoffs of each are unique and are described in detail in the following sections.

Systems Consolidation

Corporations with physically dispersed computing resources may benefit from consolidating and updating systems into fewer locations to ease physical systems management and reduce overall expenses.

Organizations that may benefit from systems consolidation often have applications and systems in separate departments, rooms and even buildings across the globe. As systems become more distributed, managing, repairing, and upgrading them becomes more difficult and costly. Corporations need to carefully weigh the business benefits of distribution in light of the cost benefits of consolidation.

With systems consolidation, corporations rework and upgrade their network so that resources are located in a smaller number of locations.

Consolidating systems enables enterprise management of physical resources from fewer locations, quick identification and resolution of problems and it can significantly reduce overall expenses. In addition, the installation of newer hardware and software can increase performance, capacity and fault-tolerance of the entire infrastructure.

Benefits of Systems Consolidation

Consolidating and upgrading systems and resources into fewer locations provides significant benefits, including:

- Reduced number of servers and storage devices making efficient use of floor space enabling multiple servers and storage devices to be stacked in a single rack.
- Reduced costs as a function of fewer systems performing greater tasks.
- Increased physical security enabling all hardware to be locked and monitored in fewer locations.
- Improved data security as the numbers of platforms decrease, accessing data can be monitored more effectively.
- Increased administrator productivity allowing engineers to spend more time on server-related issues and less time on non-server administrative functions, such as traveling to remote sites to trouble shoot, and upgrade systems.
- Enhanced reaction time due to physical proximity, allowing for proactive monitoring of systems to help administrators to quickly solve problems and reduce downtime.
- Simplified upgrade procedures are the result of fewer locations, reducing staffing requirements.

- Improved capacity planning provides for applications to be run from fewer servers in centralized locations.
- Increased network performance due to closer physical proximity of servers enabling high-speed connections among servers and the network.

Tradeoffs of Systems Consolidation

There are some situations where systems consolidation might not be cost effective. For example, if an organization's servers are supporting extremely remote locations (such as U.S. based servers supporting locations in Asia-Pacific regions of the world), network infrastructure costs may outweigh the benefits of consolidation. In addition, organizations that are distributed by design, such as retail chains, may benefit by distributing computing resources while centralizing the management of those resources.

There are general tradeoffs for nearly all organizations implementing server consolidation. Significant up-front expenditures may be required to redesign the corporate network architecture. In addition, centralizing physical equipment opens a corporation to greater risks in disaster situations. When downtime does occur, it may affect a larger number of users. Clustering and other fault resilient features can help increase the high availability of data. Finally, the administration staff should be prepared for increased need for telephone support from remote users.

Benefits of Using Compaq for Systems Consolidation

Organizations distributed by design, such as retail chains, may not realize significant cost saving with systems consolidation. As the largest manufacturer of Intel based industry standard servers, Compaq has the broadest array of services and support for your systems consolidation efforts.

An important reason to consider Compaq for your consolidation needs and upgrade efforts is the completeness with which Compaq can satisfy your needs. Compaq manufactures the industry's most density-optimized, expandable, and complete line of Intel based servers in the industry. Compaq also has comprehensive professional services capabilities via Compaq Global Services to provide configuration consulting and implementation of your solution. For additional information, visit http://www.compaq.com/solutions/consolidation/consol_services.html. Compaq can collaborate with you during each step of planning, design and implementation to ensure the success of your consolidation effort.

Compaq ProLiant servers are rack optimized for the data center since ProLiant workgroup servers start at a mere 1.75 inches (1U) tall. The ProLiant 4-way processor enterprise servers start at 4U and the ProLiant 8-way processor enterprise servers start at 7U in height enabling up to 6 servers in an industry standard 42U rack.

Compaq has addressed server consolidation trends by developing a complete portfolio of modular, blade servers: the new ProLiant BL Line. The ProLiant BL Line is specifically designed to address the needs of space-constrained enterprises and service providers for increased server density, rapid deployment and provisioning, and remote manageability. Install 20 server blades in a 3U enclose and install up to 280 ProLiant BL10e server blades in a standard 42U rack.

Storage Consolidation

Corporations with dedicated storage pools for each server in their network may benefit from storage consolidation using highly available and manageable features.

Organizations that benefit from storage consolidation, a form of physical consolidation, often have a dedicated and rapidly growing storage capacity for each server in their network.

Whether servers are centralized or distributed, dedicated disk and tape volumes deter data sharing, complicate information security, make backups more difficult to administer, and greatly increase the cost and complexity of growing a storage farm. As the importance and volume of data grows, continuous access becomes critical and data management becomes more complex.

Storage consolidation provides pools of highly available, flexible, and centrally managed storage distributed to provide the performance and availability demanded by applications. In addition, storage consolidation enables organizations to better manage growth, control security, and information access, and it provides rapid response to changing business demands. Figure 5 shows how multiple servers have access to a shared storage repository.

Figure 5: Storage consolidation allows multiple servers to access a shared storage repository

Benefits of Storage Consolidation

Storage consolidation provides numerous benefits to organizations, including:

- Highly scaleable storage enables administrators to manage growth and quickly respond to changing business needs.
- Highly available and fault resilient storage provides continuous and reliable access to data.
- Improved centralized data management and protection via consolidated storage.
- Increased storage utilization from allocating storage via a centrally managed pool of storage.
- Reduced administrative costs and time required for troubleshooting problems.
- Platform independence thus enabling sharing of data and simplified backup procedures.

Tradeoffs of Storage Consolidation

Storage consolidations numerous benefits include a few notable tradeoffs. It is important to consider disaster recovery scenarios when centralizing data into a single location. Storage consolidation may require a significant initial cash outlay to obtain large RAID units as opposed to simply adding hard drives to a system. Existing investments in RAID and tape backup may become obsolete as larger arrays and automated tape backup libraries replace them. Compaq Network and Systems Integration Services team will help you plan your consolidation efforts, assuring a smooth and cost efficient implementation.

Benefits of Using Compaq for Storage Consolidation

Compaq is the world's largest storage supplier and is also the only storage vendor that ensures high availability and reliability, high capacity and high performance storage, with solutions for applications ranging from the desktop to the data center.

Other benefits include:

- Compaq Enterprise Network Storage Architecture (ENSA) provides a highly flexible environment for data storage capacity and management. This advanced technology creates "virtual disks" from a large pool of consolidated storage. The storage pool is physically distributed as business needs require. A storage pool can consist of a number of small, relatively inexpensive "array controllers" that are deployed as needed. Storage growth is granular down to a disk drive. In addition, ENSA preserves much of today's storage hardware investment. Only ENSA offers the range of configuration, performance tuning, monitoring and data protection capabilities needed to unify an enterprise storage environment. ENSA is designed to grow as business needs require, while maximizing the protection of your existing storage investments.
- ENSA-2 encompasses 6 advanced technologies that enhance the ENSA storage utility to help you solve your most pressing storage challenges. ENSA-2 provides a visionary roadmap for enabling you to succeed and win in the increasingly competitive world economy with a superior networked storage infrastructure. The 6 technologies include:
  - Life cycle data management
  - Universal network storage
  - Storage network scaling
  - DtS (**D**AS **t**o **S**AN or **D**irect Attach Storage **t**o **S**torage Area Network) architecture
  - VersaStor virtualization technology
  - Storage utility automation architecture
- The Compaq StorageWorks Command Console, a Windows NT based monitoring and configuration tool can manage up to 1.2 petabytes of data distributed across an enterprise from a single workstation. Its easy to use features include failure notification, reliability monitoring and multiple levels of security.
- The Compaq StorageWorks Modular SAN Array 1000 delivers a complete SAN solution that is simple and affordable. Compaq is committed to driving SAN standards to make storage solutions easier. The MSA1000 can be integrated into a variety of SAN solutions including multiple data paths and clustering, integrated "LAN-free" SAN backup, snapshot capabilities, and SAN management. As many Compaq customers look to consolidation as a method of management cost savings and a way to reduce complexity, a quick and simple migration from

direct attached storage to SAN attached storage is desired. DtS architecture is an exclusive Compaq feature that provides a quick and easy way to migrate stored data protected by any Smart Array controllers to an MSA1000 storage system.

Data that is currently stored on Compaq's 1-inch Universal disk drives using any Compaq Smart Array controller as well as data on an RA4100 can easily be migrated to the MSA1000 in 4 easy steps:

- Set up a new SAN array.
- Move existing drives.
- Create server/volume ownership.
- Turn on servers.

Existing data and configuration will remain intact. In addition, the RAID set and data will be preserved allowing migration to be completed in minutes, not days.

Application Workload Consolidation

Corporations experiencing dramatic expansion and growth often benefit from consolidating workload tasks into fewer, more powerful systems and applications.

Organizations well suited for workload consolidation have experienced dramatic growth that resulted in complex solutions for workload related tasks. Situations such as corporate mergers and global expansions create redundant, incompatible workgroup practices, including financial applications, office productivity tools, Intranet applications, e-mail and customer management applications.

Application workload consolidation combines different workgroup applications onto standardized enterprise applications, running on fewer and larger servers, optimizing labor usage, and reducing overall costs.

Benefits of Application Workload Consolidation

The many benefits of this type of consolidation include:

- Reorganization of complementary resources into a singular workflow environment (for example, order entry and general ledger).
- Decreased downtime in a centralized single application environment because problem-resolution staff is locally accessible.
- Reduced application licensing fees as a single application replaces the workload of many applications.
- Increased resource utilization in large-scale global environment.
- Reduced total cost per user as a function of decreased software and overhead expenses.

Tradeoffs of Application Workload Consolidation

When consolidating workloads, equipment must be highly fault resilient and plans must be made to reduce planned and unplanned downtime.

Consolidating workload activities presents notable tradeoffs that require advance planning. A major challenge when centralizing workloads is the requirement for increased fault tolerance. A failure or even planned downtime in a consolidated environment can affect a great number of individuals and have an adverse effect on the productivity of an entire organization.

Equipment must be highly reliable and fault resilient to minimize failures. Workload consolidation may place a larger burden on the staff supporting remote sites, therefore organizations considering workload consolidation need a plan to deal with backup and scheduled downtime. Additionally, as a function of current operating systems, the industry-standard platform has limited capabilities when operating multiple applications on a single server.

Compaq AlphaServer and Himalaya platforms are also well suited for intensive workload consolidation efforts. The net benefit of any workload consolidation effort is a streamlined IT infrastructure that can better leverage the IT staff while assuring greater reliability for the users and lower capital costs for the corporation.

Benefits of Using Compaq for Application Workload Consolidation

A principal reason to use Compaq for all of your workload consolidation is the Compaq industry leadership in fault resilient solutions. With applications that can predict component failure and redundant components such as storage controllers, power, fans and hard drives, Compaq provides the fault resilience and management capabilities demanded for workload consolidation.

Compaq hardware and software provides the industry's most powerful and standardized solutions for your workload consolidation efforts. Highly scaleable and rack mountable, Compaq ProLiant servers can handle up to 1 terabyte of storage each, can contain multiple processors, extensive memory and an array of networking equipment. Compaq server platforms offer optimum availability, scalability, performance, and cost benefits to enable the industry's most comprehensive enterprise-level solutions. Investing in a Compaq solution is a secure way to assure that you can grow problem free for years to come.

One management product helping customers to deploy servers and to manage them in a consolidated environment is the ProLiant Essentials Workload Management Pack. This software package provides easier management of complex environments, improving overall server utilization and enabling Windows 2000 customers for the first time to confidently deploy multiple applications on a single multiprocessor ProLiant server. For deployment in "production" environments, the Workload Management Pack, featuring Compaq Resource Partitioning Manager, increases server utilization by giving administrators control over the size and physical location of system resources available to individual applications, services, and other processes.

For server consolidation, Resource Partitioning Manager enables administrators, who are focused on overall platform management and those who are responsible for application performance, to automatically balance resources to applications in response to each application's workload. In some instances, Resource Partitioning Manager can enable better performance due to finer control of resources to applications.

Compaq offers highly available, fault resilient solutions that deal directly with concerns about increased data and applications vulnerability that may result from IT consolidation. These solutions are designed to maximize performance and storage capacity, while ensuring 24x7 operations of business critical applications.

The ProLiant DL380 Packaged Cluster is a simple and affordable high availability solution powered by ProLiant servers and Smart Array technology. The Packaged Cluster is targeted for departmental, remote, and distributed environments that will benefit from low infrastructure costs. This product is ideal for businesses requiring high availability for messaging, database, and file and print applications with volume deployments.

Smart Array technology ensures easy configuration and management through the use of the Array Configuration Utility (ACU) and the Compaq Insight Management Suite. Compaq Smart Array Cluster Storage is an enclosure for 2-node clustering or direct attached storage at SCSI economics, providing high data availability with redundant controllers. Because Smart Array Cluster Storage is based on the familiar SCSI protocol, there are no additional infrastructure requirements such as hubs, switches, and cables, which allows for a low initial investment for a high availability system. As your storage requirements evolve and you want to implement a Fibre Channel solution, the Smart Array Cluster Storage is easily convertible to a SAN.

Two industry standard solutions are the ProLiant Cluster HA/F100 and HA/F200 for MSA1000. These solutions target customers who need a flexible and scalable entry-level fibre channel cluster powered by ProLiant servers and StorageWorks Modular SAN Arrays. Another solution, the ProLiant Cluster HA/F500 for Enterprise Virtual Array, targets customers who need a maximum availability with no single point of failure to create and deploy SAN clustered solutions.

Additional benefits are Compaq ActiveAnswers and Compaq Financial Services.

- Compaq ActiveAnswers empowers administrators with unparalleled access to information that can aid in the planning, deployment, operation, and trouble shooting of popular applications ranging from Oracle databases to SAP. For more information, visit http://www.compaq.com/activeanswers/.
- Compaq Financial Services can finance up to100 percent of the Compaq solution, including hardware, software, and services. Compaq Capital financial asset management services can help reduce the total cost of ownership with trade-in programs, tech refresh options and equipment disposal services ensuring implementation meets your ever-changing business needs.

IT Center of the Future

This type of infrastructure, also called transparent consolidation, is a relatively new topology and is considered the consolidation of the future. This type involves pulling together a number of IT centers across a campus or network, and implementing storage-area networks to create a single set of resources. Transparent consolidation allows the customer to access capacity on demand, employs flexible technology implementations, such as Galaxy or storage or server utility, operates in a highly automated environment, and executes in real-time.

A few benefits of IT Center of the Future consolidation include:

- Server works like a utility and all system elements become virtual or transparent to the user.
- Little or no operator intervention required regardless of system(s) location.

- IT managers can manage the systems remotely, and do not need to monitor them as frequently or as carefully as in the past. There are multiple user-friendly ways to manage the system.

Consolidation Services

Special efforts are required to ensure your consolidation plans deliver the highest levels of availability, reliability and manageability. Compaq offers a broad range of consolidation services designed to get you started and keep you in business. Compaq consolidation services offer system integration, architectural methodology and consulting expertise to help you achieve high availability in a cost-effective way. For extreme availability requirements, Compaq will partner with your organization to guarantee up to 99.999 percent uptime.

The Compaq global team of service experts includes:

- More than 1,600 MCSEs and MCSDs
- 3,000 multivendor UNIX specialists
- 4,000 Microsoft-certified professionals
- 14,000 Microsoft-trained professionals

Compaq Global Services offers a full range of service offerings based on extensive consolidation experience executing projects around the world (see list below). Compaq services will minimize your risk with minimal disruption to your staff.

- **Consolidation Value Workshop** – Typically a 2-day workshop, this service is designed to provide customers with an evaluation of the financial business benefits of IT Consolidation. This service will help you scope out projects and budget for projects that will provide an attractive return on investment.
- **IT Consolidation Assessment Service** – Analyzes the IT environment for operational cost efficiencies, increased availability, and improved functionality.
- **Consolidation Plan and Design Service** – Compaq examines your business needs, creates requirements documentation, and provides plans for execution. This service enables a business to:
  - Maximize the benefits of a server consolidation implementation
  - Prepares the customer's business and computing environment
  - Designs an architecture document on how to implement a consolidation solution into this computing environment
  - Outlines how to minimize the impact on business functions and personnel while implementing a consolidation solution
- **Consolidation Implementation Service** – Compaq aids you in your implementation, including migration, upgrades, physical consolidation, backup and recovery operational policies and procedures as well as test and validation plans.
- **Migration Services** – Compaq has developed a methodology and a set of consulting services that greatly enhances the efficiency and reduces the risk of migration efforts. These consulting services are designed to examine the critical issues and effort required in migrating systems and applications to the Compaq architecture. Compaq consultants use a series of predefined steps to plan and implement the migration.

- **99.999 Percent Uptime Guarantee** – For business-critical environments requiring a 99.999 percent guarantee, Compaq offers a unique partnership service in conjunction with your IT organization. With an uptime guarantee, Compaq will share the responsibility and the cost of downtime. By partnering with Compaq, you will achieve proactive services and the responsiveness needed to keep your business up and running.

Compaq IT Consolidation Success Stories

Table 1 includes examples of companies that have benefited from Compaq consolidation solutions and services.

Table 1. Companies benefiting from Compaq consolidation

Company	Benefits
Caisse D'espargne (CNCE), a large French-owned, recently-merged bank	Used Compaq's ProLiant 8500 4-node Datacenter stretch cluster to achieve high availability, lowered cost and solid file and print capabilities.
CLP Power Hong Kong Limited	Replaced all 8 of the 5- year old Intergraph production servers with just 2 ProLiant DL760 servers. Assigned as database and graphics servers, they operate in a SAN reserved especially for the AM/FM system. Since the production run, users reported zero problems with availability or reliability. Full Story
FreeMarkets	Cut planned maintenance and administration costs by 20 percent, resulting in an annual savings of $66,000 per server. Full Story
Intuit	Runs SQL server solely on Compaq equipment, with more than a 100 SQL server environments. After recently completing a comprehensive evaluation, Intuit's long-term goal is to use SQL Server 2000 on Windows 2000 on Compaq ProLiant DL760 servers, consolidating multiple databases on a single cluster. Full Story
Microsoft	Quadrupled the number of users per server, improved storage utilization by a factor of 5 and reduced the restore time from eight hours to one for its millions of messages sent daily.
MSNBC.COM	Consolidated servers from 48 to 16 ProLiant 8500 Datacenter servers to increase reliability and ensure user base growth availability.
Reed Elsevier	Migrated all of its Compaq servers and desktops to Microsoft Windows 2000 and Microsoft Exchange 2000. Compaq Global Services designed and tested this migration and provided workshops to the individual business units to help them understand the project's process and benefits, resulting in lower cost of ownership, more efficient communications and business practices, and standardized platform across the enterprise. Full Story
Unilever	Is reducing the number of IT centers from 300 to 5.
Walt Disney Internet Group	Eliminated 5,000 square feet of space by merging 3 data centers and 8 outsourced co-location facilities into two company-owned facilities. Compaq provided global pricing and product availability for the Compaq ProLiant servers and Compaq Global Services to support Disney websites. Compaq ProLiant servers support a scalable database and back-end platform, powering publishing, advertising, registration, content delivery and cash management systems. Full Story
Verizon	Increased productivity by 70 percent and cut software expenses nearly 40 percent.

If you would like to read more about Compaq Server Consolidation Solutions, visit our website at http://www.compaq.com/solutions/consolidation/.

Summary

Forced to respond to the disparate needs of the many departments they support, IT staffs often struggle to meet the needs of their organization. Industry trends have revealed a demand for centrally managed highly available systems that reduce administration costs and enhance the ability to respond to new business challenges. IT consolidation meets these needs head-on by consolidating operations to reduce total costs.

There are four types of consolidation efforts that address unique concerns within a typical IT department: distributed, physical, workload, and IT Center of the Future. Distributed consolidation is the centralization of application management tools to increase uptime and IT staffs' productivity.

Physical consolidation consists of 2 types of material consolidation, systems and storage. Systems consolidation is the centralization and updating of server resources to fewer locations to reduce operational costs and consolidate to fewer servers that are more powerful. Storage consolidation is the standardization on a disk and tape storage platform to reduce operational overhead and increase data availability.

Workload consolidation is the consolidation of applications onto larger more powerful servers curtailing hardware and software expenses as well as operational overhead.

IT Center of the Future (also known as transparent) consolidation involves pulling together a number of IT centers across a campus or network, and implementing storage-area networks to create a single set of resources.

Together, these four categories of consolidation can significantly reduce costs and increase a corporations overall productivity levels. Compaq Computer Corporation is positioned to meet all of your IT consolidation requirements. As the market leader of Intel based industry standard servers and storage, Compaq offers an unparalleled array of services and equipment to aid in your consolidation efforts. If you need absolute reliability, Compaq has computing platforms and solutions that can meet your needs.

Regain control of your IT enterprise by contacting your authorized Compaq value-added reseller today or by visiting Compaq on the worldwide Web at http://www.compaq.com.

Appendix A - Compaq Web Resources

In addition to hardware and software products, Compaq also provides information enabling you to stay current on the latest developments and assisting you in making deployment decisions. Table 2 lists additional Compaq resources on the World Wide Web.

Table 2. Web resources

Resource Description	Web Address
IT Consolidation Resources	
The **Compaq Consolidation Solutions website** provides a vast amount of resources for server consolidation.	http://www.compaq.com/solutions/consolidation/
The **ITCentrix Server Consolidation Value Model** is used to help customers understand the business value of applications and how that value can be increased through server consolidation. The model is based on a proprietary and tested methodology that combines cost, technology and business modeling to more accurately predict how changes in IT will impact business results.	http://www.compaq.com/solutions/consolidation/whitepapers/Consolidation_Business_Value/Consolidation_Quantifying%20Benefits.pdf
The **Enterprise Server Consolidation - Compaq ProLiant DL760 Servers Running Microsoft Windows 2000** white paper discusses the DL760 as a consolidation platform for customers committed to an industry-standard solution that provides high levels of performance, availability and flexibility.	http://www.compaq.com/solutions/consolidation/whitepapers/ProLiant/DH%20Brown%20ProLiant.pdf
The white paper **The Compaq Infrastructure Consolidation to Microsoft Windows 2000 and Microsoft Exchange 2000** discusses key aspects of the massive migration and infrastructure consolidation effort Compaq undertook to move from Microsoft Windows NT 4.0 to Microsoft Windows 2000 and Microsoft Exchange 2000, at the same time consolidating formidable resources onto fewer servers.	http://www3.compaq.com/support/reference_library/viewdocument.asp?countrycode=1000&prodid=806|Microsoft%20Windows%202000&source=TC011102WP.xml&dt=21
The **Compaq Resource Partitioning Manager: A Server Consolidation and Optimization Solution for Microsoft Windows 2000** Technology Brief includes information about the Compaq Workload Management Pack, featuring Resource Partitioning Manager (RPM), increases the stability and availability of applications under Windows 2000, thereby allowing customers to confidently deploy multiple applications on a single server.	http://www3.compaq.com/support/reference_library/viewdocument.asp?countrycode=1000&prodid=806|Microsoft+Windows+2000&source=TC020102TB.xml&dt=21
Product Resources	
ActiveAnswers gives you the benefit of our experience to help manage your system and reduce the time, risks, and complexity associated with deploying solutions.	http://www.compaq.com/activeanswers
ActiveUpdate offers proactive notification and delivery of the latest software updates. Do not waste time searching the web. Subscribe to Compaq ActiveUpdate for automatic delivery of software updates for your Compaq servers, desktops, workstations, and portables.	http://www.compaq.com/activeupdate
Insight Manager 7 leverages the power of the Internet to provide web-based systems management for Compaq servers, and any HTTP, SNMP MIB2, or DMI v2.0 compliant device.	http://www.compaq.com/products/servers/management/cim7-description.html

continued

Table 2. Web resources *(continued)*

Resource Description	Web Address
Product Resources (continued)	
ProLiant Cluster HA/F100 and HA/F200 for MSA1000 make the delivery of data and services to clients continuous, therefore, minimizing downtime and process slowdowns.	http://www.compaq.com/solutions/enterprise/highavailability/microsoft/haf100-200/index-msa1000.html
ProLiant Cluster HA/F500 for Enterprise Virtual Array is a scalable and reliable enterprise cluster powered by ProLiant servers and StorageWorks Enterprise Virtual Arrays that ensures always-on operations of your mission critical applications.	http://www.compaq.com/solutions/enterprise/highavailability/microsoft/haf500/index-va.html
ProLiant DL380 Cluster consists of two Compaq ProLiant server nodes and a shared storage cabinet, pre-packaged in a cost effective, space efficient fixture giving you the most affordable clustering solution for Microsoft NT Enterprise Edition, Windows 2000 Advanced Server, Novell Netware and Linux.	http://www.compaq.com/solutions/enterprise/highavailability/dl380/index.html
ProLiant Essentials Integrated Lights-Out Advanced Pack delivers sophisticated virtual administration features for full control of servers in dynamic data centers and remote locations.	http://www.compaq.com/manage/iloadv-description.html
ProLiant Essentials Rapid Deployment Pack is an integrated Compaq and Altiris solution that automates the process of deploying and provisioning server software, enabling companies to quickly and easily adapt to changing business demands.	http://www.compaq.com/products/servers/management/rapiddeploy.html
ProLiant Essentials Workload Management Pack provides easier management of complex environments, improving overall server utilization and enabling Windows 2000 customers for the first time to confidently deploy multiple applications on a single multiprocessor ProLiant server.	http://www.compaq.com/rpm
Remote Insight Lights-Out Edition allows browser access to Compaq servers through a seamless, hardware-based, OS-independent graphical remote console.	http://www.compaq.com/manage/remote-lightsout.html
Server Software Download Center website provides the capability to download device drivers, utilities, services, and BIOS required for Compaq ProLiant servers.	http://www.compaq.com/support/files/server/us/index.html
Smart Array Cluster Storage is an enclosure for 2-node clustering at SCSI economics, providing high data availability with redundant controllers.	http://www.compaq.com/sharedstorage
SmartStart for Servers provides everything you need to get your servers up and running with full Compaq support for Microsoft Windows 2000.	http://www.compaq.com/smartstart
SmartStart Scripting Toolkit radically simplifies high-volume server deployment for businesses that are faced with the need to deploy hundreds to thousands of servers quickly and reliably.	http://www.compaq.com/manage/toolkit.html
Support Paq for Microsoft Windows 2000 is an advanced software delivery tool that replaces the familiar SSD utility vehicles used for support of Windows NT 3.51 and Windows NT 4.0. The Compaq Support Paq for Microsoft Windows 2000 includes an installer that analyzes system requirements and installs all drivers.	http://www.compaq.com/support/files/server/us/index.html

continued

Table 2. Web resources *(continued)*

Resource Description	Web Address
Customer Advisories inform you of any known problems and workarounds because of a Service Pack release.	http://www3.compaq.com/support/home/selectproduct.asp
Press releases and Communiqués announce the availability of new products and versions.	http://www.compaq.com/newsroom/pr
White Papers (complete listing) inform you of ways to optimize your environment and obtain the maximum benefit from software enhancements.	http://www3.compaq.com/support/home/selectproduct.asp