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WHITE PAPER

HP Utility Data Center: Enabling Enhanced Datacenter Agility

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EXECUTIVE SUMMARY

Enterprise datacenters are under increasing pressure to become flexible providers of IT services. In traditional industries, such as telecommunications, manufacturing, and financial services, legacy-distributed systems are being consolidated primarily to reduce management cost, gain business agility, and improve system utilization. In life sciences (e.g., pharmaceuticals, healthcare), the challenge is more likely to be a significant increase in data to be processed and stored. Other segments, such as government and retail, are increasingly interested in integration with citizens and customers, respectively.

The Hewlett-Packard Utility Data Center (HP UDC) is a highly integrated and consolidated environment that IT personnel can use to simplify the provisioning of IT services. In contrast to storage subsystem consolidation or server subsystem consolidation, the HP offering is datacenterwide. The HP Utility Data Center infrastructure is a complete environment for hosting enterprise applications and managing a systems area network. When an HP Utility Data Center is implemented, all processing, storage, and network resources can be allocated and reallocated via the Utility Controller portal. With drag-and-drop simplicity, resources can be rerouted without personnel being asked to move hardware and recable components. Simply put, installing an HP Utility Data Center means "wire once, virtualize, and reallocate many."

Traditional IT infrastructure has been a static, brittle, and costly proposition for most enterprises. To ensure that sufficient resources are available to support growth, IT planners have traditionally overbuilt and underutilized their datacenter infrastructure. Datacenter infrastructure has evolved into a complex collection of legacy systems that is hard to understand and manage in a uniform fashion. Skyrocketing management and services costs make datacenters expensive from a capital and operational perspective.

Moreover, datacenter requirements have changed. Business processes are becoming more integrated within the enterprise. IT investments are now evaluated by their impact on business value, that is, the profitability of the enterprise, gains in market share, and gains in customer satisfaction. Today's enterprise is far more dependent on the availability of IT services to conduct business. Business managers expect to buy IT services on an as-needed basis. These new requirements demand a flexible datacenter architecture.

IDC believes that the complexity of IT infrastructure will be successfully masked by encapsulating systems and subsystems in a virtual environment. Virtual environments are software-enabled collections of processors, storage systems, and networks that appear to each user as a single, unified system. Virtual environments streamline access to applications and to data. Virtual access software makes applications available to end users on any type of workstation and across any type of network media.

INTRODUCTION

In the 1980s, the IT architecture pendulum swung sharply in the direction of distributed computing solutions. Microprocessor-based workstations and servers could, for the first time, put computing resources on or near to the desktops of users. From a technology maturity perspective, there was another hidden enabler for distributed computing — the absence of ubiquitous, inexpensive, high-performance networking. From a business perspective, a distributed computing architecture enabled business managers to integrate IT costs and the benefits directly into their product and service offerings. Distributed computing enabled IT to escape from the back-office applications, such as general ledger and billing, and became woven into the fabric of the enterprise with front-office and customer-facing applications.

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In the new millennium, the IT architecture pendulum is swinging sharply back to centralized computing solutions. Most important, network technologies have improved and now allow users to access information quickly over great distances. The high cost of managing distributed systems is now well known, and initiatives to consolidate servers and storage are common across industries. Although IT is recentralizing, IT is not returning to the back office of the past. Requirements have changed.

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- Business processes are becoming more integrated within the enterprise. Changes in business condition can shift the priority and mix of workloads. As islands of information (i.e., silos) become interconnected, changes in business process ripple more rapidly through the enterprise. New consolidated IT systems must be designed to streamline the provisioning of datacenter resources as business managers adapt to shifting market conditions.

- IT investments are now evaluated by their impact on business value, that is, the profitability of the enterprise, gains in market share, and gains in customer satisfaction. IT planners now look beyond minimizing the IT budget to improving business metrics for the entire enterprise.

- Today's enterprise is far more dependent on the availability of IT service to conduct business. System outages can be extraordinarily expensive, and as a result, IT planners specify IT systems that are resilient to component failures and deploy multiple datacenters at different geographical locations.

- Business managers no longer expect the IT department to purchase servers and storage to support new business initiatives. Rather, business managers expect to buy IT services on an as-needed basis. A service level agreement specifies the performance, capacity, and availability expected from IT.

Traditional IT infrastructure has been a static, brittle, and costly proposition for most enterprises. To ensure that sufficient resources are available to support growth, IT planners have traditionally overbuilt and underutilized the datacenter. Datacenter infrastructure has evolved into a complex collection of legacy systems that are hard to understand and manage in a uniform fashion. Skyrocketing management and services costs make datacenters expensive from a capital as well as from an operational perspective.

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VIRTUAL ENVIRONMENTS AND UTILITY COMPUTING

Virtual environments play a central role in IDC's thinking about IT's evolution to utility computing. Virtual environments are software-enabled collections of processors, storage systems, and networks that appear to each user as a single, unified system. Utility computing is the provisioning of IT processing, storage, and network services on demand. As IT systems are increasingly consolidated and encapsulated within virtual environments, end users will use and pay for IT services just as they use and

pay for metered telecommunication services provided by a third-party utility. In addition to providing each user with a single-system view, virtual environments will also enable the rapid reallocation of consolidated system resources.

IDC believes that *IT public utilities* (i.e., companies that sell IT on demand to the public) will play an important role in enterprise computing. Telecommunications companies use a utility model when supplying wide area networking services to enterprises, for example, and third-party backup-and-recovery providers are also utility providers of business continuity services. Exploiting economies of scale is a key concept for the public utility providers of Internet-enabled service providers (e.g., application service providers).

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IT private utilities (i.e., internal IT departments that sell IT on demand within the enterprise) will be the early adopters of utility computing, IDC believes. For midsize and larger enterprises, economies of scale and improved utilization can make a significant difference as multitudes of distributed systems are brought into the datacenter. Line-of-business managers will be pleased to pay variable costs for IT resources rather than a fixed expenditure. Risks associated with trusting that third parties will provide reliable, secure IT services are sidestepped by private utility initiatives.

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NEW REQUIREMENTS FOR ENTERPRISE DATACENTERS

Enterprise datacenters are under increasing pressure to become private utility providers of IT services. In traditional industries, such as telecommunications, manufacturing, and financial services, legacy-distributed systems are being consolidated primarily to reduce management cost and improve system utilization. In life sciences (e.g., pharmaceuticals, healthcare), the challenge is more likely to be a significant increase in data to be processed and stored. Other segments, such as government and retail, are increasingly interested in integration with citizens and customers, respectively.

PAIN POINTS

Common to all enterprise datacenters is a set of pain points, real points of tension as IT planners attempt to deploy consolidated IT infrastructure:

- **Business variability.** After several growth years when the primary challenge was to expand IT services as quickly as possible, many IT managers are now asked to shrink the cost of IT wherever possible in accordance with a slower economy. Successful enterprises will be those that remain agile during uncertain times — prepared to capture emerging opportunities quickly and to reallocate IT resources when market conditions dictate a hasty retreat.

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- **Capacity planning in the Internet age.** Most enterprises today provide gateways for information sharing within the corporation, among trading partners, and with customers. In addition to processing larger amounts of data, IT managers find that they have less control and only an indirect understanding of capacity requirements. Estimating internal capacity requirements is far easier than estimating requirements for populations of users who reside outside the enterprise.

- **High cost of managing infrastructure.** Datacenters are complex, and the new technologies that permeate server, storage, and network subsystems demand new skill sets for IT staff. While managing a farm of smaller servers with attached

storage was difficult, building and maintaining a storage area network (SAN) in conjunction with fewer, larger servers is not an easy task.

- **Maintaining sufficient quality of service (QoS).** Several vectors combine to heighten concern with QoS. System outages can potentially be more widespread, service level agreements put IT financial resources at risk if downtime occurs, and businesses are more vulnerable to IT outages because IT has become a pervasive foundation for nearly all business processes.

- **Management of growing application and project portfolios.** It is increasingly important for IT managers to set priorities and overview datacenter operations systematically and holistically. Many IT departments struggle to escape a reactive stance to problem solving and to regain the ability to look ahead and take action proactively.

ADDRESSING THE PAIN POINTS

IDC believes that migrating to a consolidated infrastructure is the first step in addressing these pain points. Pooling resources is necessary because pooling makes reallocation possible. Overprovisioning in a distributed architecture can and does leave many resources stranded when business variability strikes. Capacity-planning challenges ease when pooled resources service the ebb and flow of demand.

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Improved management tools that wrap virtual environments around complex datacenter infrastructure will address system management pain. Initially, these management tools will leverage IT staff by providing a wider view over datacenter resources and needs. As experience accumulates, more datacenter operations, such as priority-based reallocation of server resources, will become automated.

OVERVIEW OF HP UTILITY DATA CENTER

Wire once, virtualize, and reallocate many! In sum, the HP Utility Data Center solution aims to support a consolidated IT environment that can be efficiently managed to provision IT services. In contrast to storage subsystem consolidation or server subsystem consolidation, the HP offering is datacenterwide. The HP Utility Data Center infrastructure is a complete environment for hosting enterprise applications and managing a system's area network.

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HP'S ADAPTIVE ENTERPRISE STRATEGY AND THE HP UTILITY DATA CENTER

The HP Utility Data Center solution is an instantiation of HP's Adaptive Enterprise strategy. HP believes that enterprises are under tremendous pressure to reduce cost, complexity, and risk, while increasing agility. HP's Adaptive Enterprise strategy links business and IT to provide a platform for managing change as a competitive advantage. HP's Adaptive Enterprise strategy is focused on measuring and assessing the dynamic link between business and IT; architecting and integrating heterogeneous environments; managing and controlling business processes, applications, and IT environments; and extending and linking business processes and applications horizontally.

An adaptive enterprise will share a common IT infrastructure that can quickly respond to changing business needs. In an adaptive enterprise, IT deployment is never an inhibitor to introducing new product, service, or customer care initiatives. The datacenter of an adaptive enterprise should be able to support growing markets that demand expanded services. That same datacenter should also be capable of beating

a hasty retreat from shrinking markets and returning resources to the pool for reallocation. Finally, the adaptive enterprise will undoubtedly have an IT infrastructure that is available, reliable, and secure.

HP's thinking about the needs of the adaptive enterprise extends beyond datacenter technology. The HP Utility Data Center, however, provides a clear example of the products, technologies, virtual environments, and management tools required for agility and adaptivity. With HP UDC and the Adaptive Enterprise vision, HP will demonstrate once more that it can help its customers think ahead to the next phase of IT architecture and then plot an effective course to reach it.

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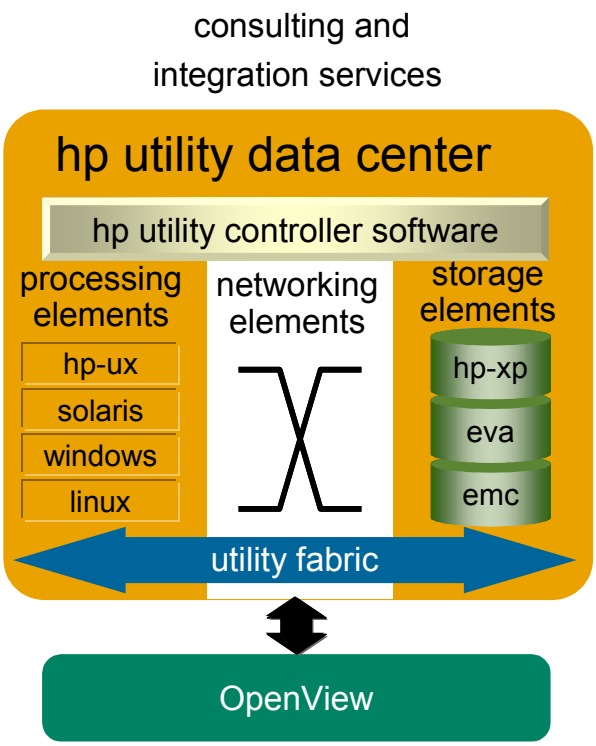
HP UTILITY DATA CENTER ARCHITECTURE

Figure 1 broadly shows the elements that make up the HP Utility Data Center. Processing elements (i.e., servers from HP, SUN, and others) may run any of several operating systems, and the networking and storage elements may be obtained from HP or from other suppliers. HP utility controller software manages the interconnect technology that integrates processing, storage, and networking, and provides a console for datacenter managers to activate or reallocate resources to new enterprise workloads. HP's venerable OpenView provides enterprise-level management with traditional systems, security, and asset management capabilities. In addition, OpenView provides better integration of business processes with IT infrastructure. OpenView supports Web services and mobility management as well. HP's service organization is prepared to assist customers in deploying the HP Utility Data Center solution.

HP utility controller software manages the interconnect technology that integrates processing, storage, and networking, and provides a console for datacenter managers to activate or reallocate resources to new enterprise workloads.

FIGURE 1

HP UTILITY DATA CENTER



Source: Hewlett-Packard, 2003

As shown in Figure 2, HP Utility Data Center consists of complete hardware, software and services solutions. Components are contained in racks. The management rack contains the Utility Controller software and the portal. The backup rack contains automated storage backup equipped with linear tape open (LTO) drives. The operations center rack with preintegrated operations support includes HP OpenView Service Desk for troubleshooting and help desk capabilities. Tier 1 and Tier 2 network fabric racks connect storage arrays with a resource pool of servers, which scale from a single processor to eight-way multiprocessors that run HP-UX, Linux, Windows, or Solaris.

FIGURE 2

HP UTILITY DATA CENTER: HARDWARE CONFIGURATION

Source: Hewlett-Packard, 2003

HP UTILITY DATA CENTER SOFTWARE ARCHITECTURE

Software is the mortar between the hardware building blocks of the HP Utility Data Center.

Software is the mortar between the hardware building blocks of the HP Utility Data Center. As Figure 3 shows, the Utility Controller Software functionality is divided between *information services* and *management and control*.

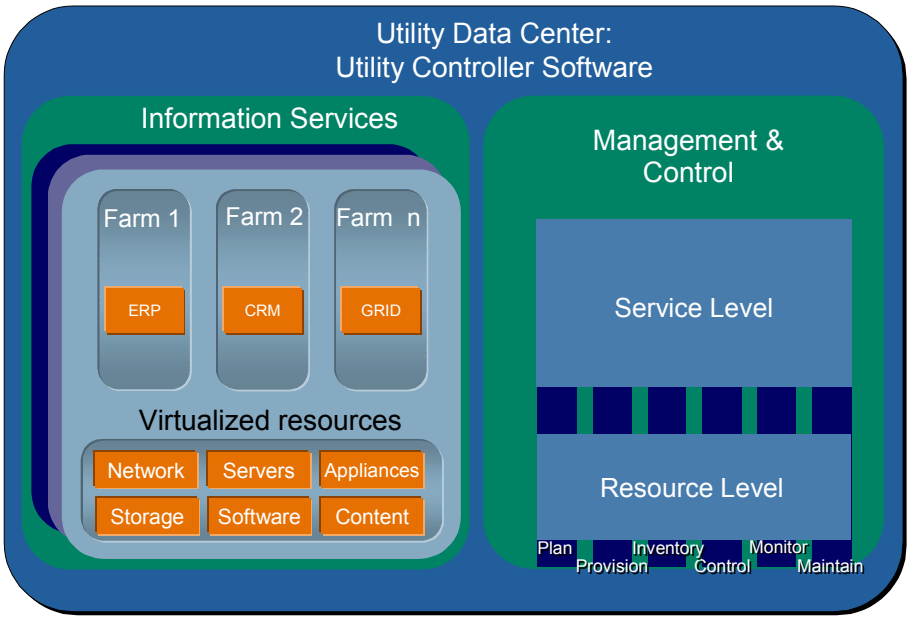
- The *information services* help the administrator configure an application or a service (a.k.a. a "farm") with drag-and-drop simplicity via a portal graphical user interface (GUI). The software also helps the administrator modify the configurations of the farms and save the configurations for future deployments (i.e., the software provides a library function). The Utility Controller software also maintains a detailed inventory of all storage, processing, and network resources along with their current allocations to specific workloads. Server farm and storage

managers oversee these resources and provide a layer of abstraction that masks complexity (i.e., virtualizes) these resources.

- The m*anagement and control* functions provide service delivery, service assurance, and service usage capabilities to the system administrators that manage the resources in a datacenter. These capabilities include activating a service as defined by the IT department's customer, monitoring and managing the service's performance and service utilization levels, and charging the customer on a pay-per-usage basis.

FIGURE 3

HP UTILITY DATA CENTER: SOFTWARE ARCHITECTURE

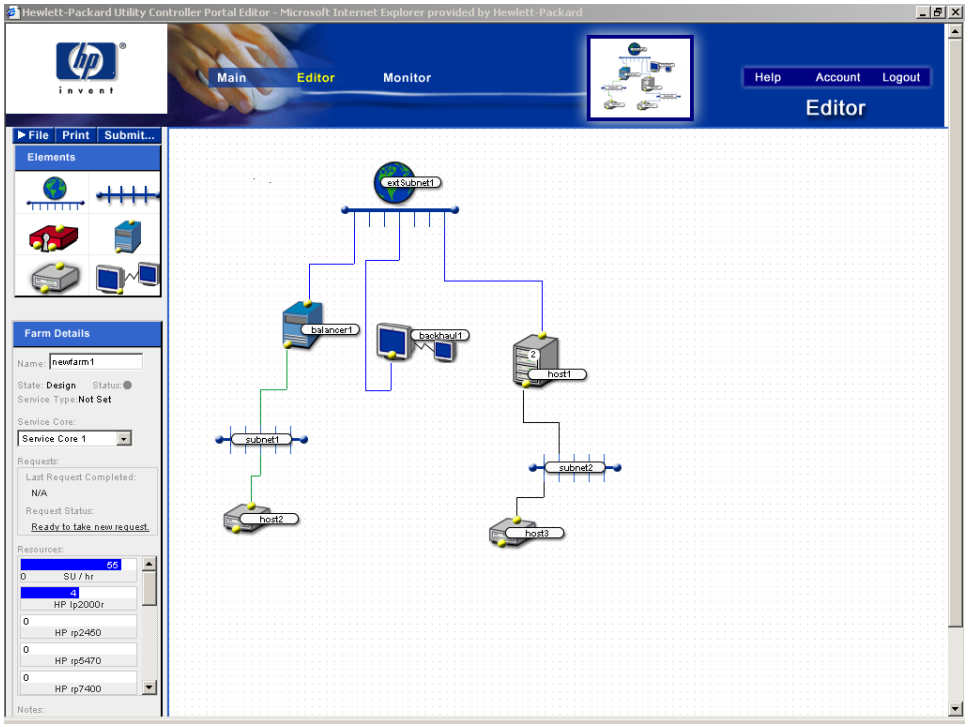


Source: Hewlett-Packard, 2003

The HP Utility Controller portal is accessed by a Web browser and, as shown in Figure 4, administrators can assemble a virtual server farm by dragging server, storage, and network elements and dropping them into a visual editing workspace. Resource allocations are monitored on the left side of the portal GUI as the virtual farm is adjusted to meet business needs. When the design is complete, the administrator submits the virtual server farm to the Utility Controller for provisioning.

FIGURE 4

HP UTILITY CONTROLLER PORTAL



Source: Hewlett-Packard, 2003

HP SERVICES

To assist customers in leveraging the HP UDC, HP offers a full array of IT services. These services begin with a series of consultative offerings designed to identify a gradual and guaranteed path to a complete HP Utility Data Center deployment. As part of the consultative process, HP service professionals will assess existing infrastructure and expected workloads and then chart a path to HP UDC. HP can supply HP UDC-certified components that can be put to immediate use and later be woven together into a full HP Utility Data Center. Software, network, storage, processing, and services are all included in this offering.

Further, once a customer actively engages in a HP Utility Data Center purchase, HP Services can also provide consulting services that justify the investment in terms of budget, return on investment (ROI), and total cost of ownership (TCO). HP Services will also design an architectural blueprint for the HP UDC implementation, including a high-level design and a detailed design plan. Once the HP Utility Data Center is ordered and integrated at the HP factory, HP Services is available to implement the HP UDC into the customer's datacenter environment and then support it. For those customers looking to outsource their HP UDC infrastructure, HP provides a series of managed service offerings that include a variety of on-demand solutions.

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HP UDC USE-CASE SCENARIO

The HP Utility Data Center enables IT departments to act as service providers by subdividing consolidated resources into multiple logical server farms. Using the Web-based Utility Controller (UC), system administrators can design and configure servers, subnets, storage, firewalls, and load balancers to meet the needs of an IT user. The system administrator submits the completed design to the UC, and the network, devices, servers, and storage are provisioned and appear as a logical server farm. The UC remains available to system administrators for reconfiguring the virtual server farm as needed.

Suppose, for example, that an enterprise plans to launch a new consumer product that requires customer care. System architects will work with line-of-business representatives to design a customer-care service and agree on a service level (i.e., availability, response time, capacity). When the requirements are set, then a service template is prepared that identifies all necessary resources to support the customer-care service. In addition to specifying the application software and database management system, the template will also identify processing, storage, and network resources necessary to deliver the service to its users. The HP Utility Data Center management tools will automatically allocate and configure these datacenter resources and install the application. After testing, the customer-care service will be launched and delivered.

If sales of the consumer product are greater than expected, then additional storage and processing resources will be allocated in support of the service automatically. Moreover, if the consumer product moves into international distribution requiring 24 x 7 customer care, then the HP Utility Data Center can allocate a different array of storage devices that allow for real-time data replication, migrate from a single server to a cluster of servers with failover to improve availability, and initialize new global network access. Alternately, if the product is withdrawn from the marketplace, then the customer-care service is terminated and its resources are reallocated to other enterprise needs.

Three key differences between this scenario and today's application deployment methodology are the following:

- All IT resources (i.e., processing, storage, network) are pooled and allocated rather than acquired for a particular application or project.
- Heterogeneous resources are available to meet initial service requirements and accommodate changes in service levels.
- Utilization of resources is improved due to the dynamic, virtualized hosting environment of the HP Utility Data Center.

HP UDC AND IT SYSTEM CONSOLIDATION

The HP UDC is designed to support datacenter consolidation requirements in the following ways:

The HP UDC is designed to provide agility and scalability…

- The HP UDC is designed to provide agility and scalability, which will be essential in providing service offerings. HP's focus on automated provisioning and the ability to reallocate resources underpins this value proposition.
- Accounting and management subsystems are an integral part of the HP UDC. Both private and public utility computing providers will need HP's precise accounting of resource usage to bill their customers accurately and easily.

- HP expects that the HP Utility Data Center's support for pooling and sharing infrastructure resources will reduce the overall capital investment in IT. Consolidation reduces stranded resources and allows for greater utilization. In addition, datacenters using the HP UDC will have greater density and lower power consumption, thus leading to additional operational savings.

- The HP UDC also supports business continuity planning with both high-availability components and the capability to replicate data and shift application workloads when component failures occur.

- The HP UDC provides a virtual environment that simplifies the work of system managers and that automates many system management functions. HP asserts that resource virtualization will increase the system administrator to server ratio significantly. While today the ratio is typically 10 to 30 servers per administrator, in the future HP believes that each administrator will oversee 100 servers or more with HP Utility Data Center.

- The HP UDC has robust security measures in place to limit, detect, and react to security threats to the HP UDC management subsystems. Its architecture is based on "defense-in-depth" principles, using firewalls to protect the perimeter, and bastion host and host-based intrusion detection to protect critical systems. Network intrusion detection systems and consolidated alerts through OpenView both work to detect attacks on the infrastructure. Further, an automated security patch currency checking prevents vulnerabilities from being exploited.

OPPORTUNITIES AND CHALLENGES

IDC believes that the HP Utility Data Center provides HP the opportunity to help corporate IT departments move to the next phase in computing — utility computing. HP is a mature, long-term player in the system supplier market and IDC believes that the paradigm shift to utility computing is a long-term (10-year) transition that is now underway. The HP UDC offering is timely because IT organizations are charting a path and purchasing datacenter products that support the transition to their utility model.

OPPORTUNITIES

HP is a robust company with an abundance of products that fit into legacy architectures. HP's services offerings are particularly well suited to the needs of IT departments that will need evolutionary road maps leading from their existing systems to full-blown utility computing. Encouraging customers to accumulate next-generation products incrementally is a sound idea.

Early adopter success with HP UDC will be a key success factor in convincing IT planners that it is time to begin moving to a utility computing infrastructure. HP has a reputation for listening to its customers and providing early access to new technology to its most demanding users. As a result, HP has the opportunity to post reports from the field that demonstrate the capabilities of HP UDC.

The HP UDC offering reaches out to a broad market and provides HP with the opportunity to leverage its considerable experience in cross-industry IT requirements. As a major IT supplier to diverse industry segments, HP is in an excellent position to accumulate and share experience with its customers as those customers move to a utility model.

CHALLENGES

IDC believes that HP's patience will be challenged as IT departments slowly weigh their options for keeping or upgrading IT infrastructure. Generally speaking, IDC has observed that the adoption curves rise slowly for infrastructure improvements. Traditionally slow adoption combined with difficult economic times will slow all IT investments.

In addition to evaluating the HP UDC offering, IT consumers will also want to evaluate new competitors offering utility frameworks that are primarily software. The value propositions are similar with competitors offering virtualization and automation to expedite system management. Evaluating alternatives to the HP UDC will be difficult for customers and will further lengthen the sales cycle for HP.

The magnitude of cost reductions that virtualization and automation technologies can enable is yet to be widely demonstrated. The challenge is to mask complexity and automate tasks while creating a system that remains agile. IT buyers will look to multiple proof points to gain trust that a complex infrastructure can, in fact, be made flexible and easier to manage at the same time.

CONCLUSION

IDC believes that the HP Utility Data Center offering is in line with leading industry trends. HP UDC is a keystone for HP's Adaptive Enterprise strategy, and HP has designed an offering that directly addresses the pain points felt in many enterprise datacenters and xSP suppliers (i.e., IDC's private and public IT utilities, respectively). The HP UDC offering reflects the fact that HP has been working toward the goal of utility computing for nearly 20 years and considers utility computing the next phase of IT architecture: virtualized provisioning of IT server, storage, network and software services in a flexible and automated manner. HP is a mature player that is in the market, long term, and the paradigm shift to utility computing is, after all, a long-term transition already underway.