Up in the air? Nothing nebulous about cloud computing benefits

By Holly Vatter, Barton George, and Janet Bartleson

Data center virtualization and consolidation often clear the path toward private, public, and hybrid cloud computing environments. Whether enterprises take a revolutionary or evolutionary approach, understanding IT infrastructure options is the first step.

Despite all the attention-grabbing headlines, cloud computing is still a confusing concept for many enterprise decision makers. Is it a transformative force that will revolutionize IT service delivery—or just more hype?

Much of the confusion over cloud computing stems from the inherent versatility of the cloud model. Clouds can be private, public, or a hybrid of the two. Whichever approach an IT organization takes, cloud computing is designed to heighten responsiveness with outstanding efficiency. In addition, cloud computing enables exceptional flexibility to provide the computing power and capacity business users need to dynamically support products and services.

Cloud models also give IT departments the opportunity to implement alternative deployment strategies that help optimize costs to align with business goals. For example, a hosted software service can be paid for by the transaction, with no capital investment required, or a disaster recovery site can be maintained by a service provider, thereby avoiding the need for a separate facility.

Still, cloud computing environments may not suit every organization or every project. Different types of clouds are appropriate for different usage scenarios. Understanding IT infrastructure options is the critical first step of any journey into the cloud.

Cloud delivery models

There are three different deployment models for cloud computing: private, public, and hybrid. Each has its own advantages, drawbacks, and potential use cases.

Private cloud computing

Private cloud computing platforms are designed for the exclusive use of a single organization. These platforms can be operated and hosted either by the enterprise IT department or by an external provider. Although they enable greater control over security and data availability than public and hybrid cloud models, private clouds may require IT organizations to make significant up-front capital investments. In addition, the physical infrastructure does not offer limitless scalability.

Driven by cost, many federal agencies are moving some functions to private clouds run by external providers. For example, Web sites for the Recovery Accountability and Transparency Board (recovery.gov), the U.S. Department of the Treasury (treasury.gov), and the Federal Communications Commission (fcc.gov) are hosted by cloud computing platforms, in part because the government data centers hosting these sites were underutilized. Moving to cloud computing platforms promises to be more cost-effective than maintaining data centers dedicated

▣ Clearing the clouds

Join Barton George as he talks about open, capable, and affordable ways to drive business value through cloud computing.

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Accelerating the transition

Virtualizing data center infrastructure is a key first step when taking an evolutionary approach toward implementing cloud computing in the enterprise. However, for IT departments without in-house expertise on the interdependencies among servers, storage, and networking—as well as how each component should be configured to support cloud-based applications—the complexity of virtualization projects may threaten to negate efficiency and cost-saving benefits.

Dell™ vStart infrastructure is designed to simplify and streamline the path to cloud computing by offering standardized building blocks that combine servers, storage, networking, racks, cabling, management software, and deployment services in a single package. Because it is delivered pre-racked, pre-cabled, pre-validated, and pre-configured, vStart seamlessly plugs into existing management consoles using extensions designed to leverage best practices.

vStart enables IT generalists to perform tasks that are critical to laying the foundation for cloud computing—including streamlining server management tools and tasks, using deep device-level detail for monitoring and alerts, deploying hypervisors to bare-metal servers, and remotely updating BIOS and firmware. In this manner, vStart helps organizations accelerate deployment of cloud infrastructure, reduce configuration errors, and focus resources on managing workloads rather than configuring hardware.

The Dell Virtual Integrated System (VIS) portfolio can further help IT departments address common data center challenges that may otherwise hamper virtualization and cloud computing initiatives. By helping reduce costs related to management, maintenance, and licensing, VIS enhances agility in responding to changing technologies and business needs. Open architecture gives IT departments the option to leverage both existing investments and future technologies without being locked in to a single vendor. VIS also facilitates real-time provisioning, which helps eliminate the need to overprovision or overpurchase resources when attempting to preempt unexpected growth.

to each agency's exclusive use. At the same time, maintaining these services on private clouds within the shared data center helps protect sensitive data.

Selected software vendors are also using private clouds to accelerate service deployment while maintaining strict control of their data. Delivering services rapidly can create a significant competitive advantage. And because private clouds are designed to make computing resources available to these services on demand without IT administrator intervention, they also streamline IT efforts while keeping sensitive data within the confines of their own dedicated hardware.

Public cloud computing

Public cloud computing platforms are based on shared infrastructure that is not dedicated to a single organization or user. They require no up-front capital investment or associated risk, and they enable agile, highly efficient use of computing resources—as well as virtually unlimited scalability. However, the shared nature of the resources raises security and regulatory concerns, and organizations must trust their cloud providers implicitly because they work through the provider to resolve any problems.

A public cloud–based IT infrastructure can be installed almost overnight without capital investments. As a result, this approach can be extremely valuable to business startups and organizational initiatives that need to be launched with minimal ramp-up time. And the public cloud approach allows enterprises to focus on core competencies without the risk or distraction of building their own data centers.

The travel industry was an early pioneer in the use of public clouds. The Semi-Automated Business Research Environment (SABRE) airline booking system, used by travel agents since the early 1960s, was arguably the first widely used cloud-based application. Now, the vast majority of air travel and hotel reservations are booked directly by consumers through an array of sites.

Hybrid cloud computing

Hybrid cloud computing platforms allow for data and application portability between private and public platforms. In this model, an application requiring additional processing capacity and unable to find it on the private cloud platform could access the public cloud platform for resources. For example, this approach—known as *cloudbursting*—relies on external public cloud platforms to handle capacity spikes.

In general, the hybrid cloud model provides the advantages of both private and public cloud platforms. However, all three approaches to cloud computing create IT challenges for workload management across multiple cloud-based infrastructures.
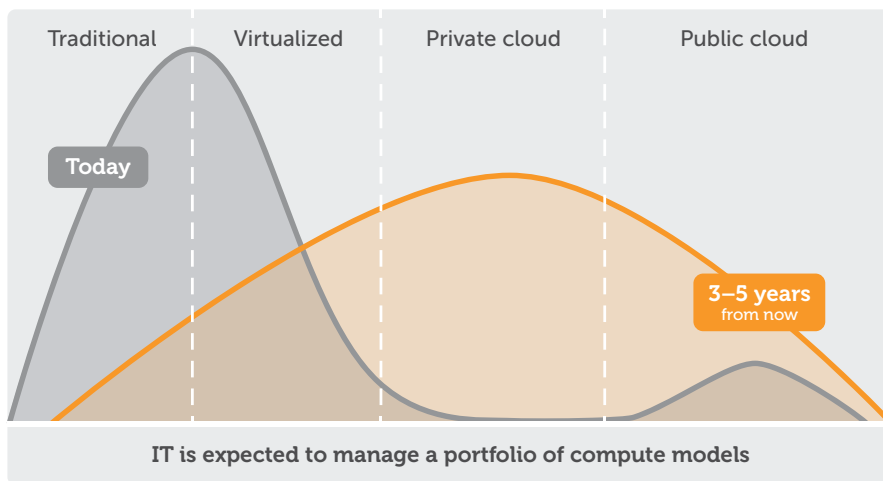
Figure 1. Moving from traditional one-server-per-one-application IT infrastructures toward resource-efficient private and public clouds

A hybrid cloud approach is gaining popularity among institutions of higher education. Universities typically face a sudden burst of activity at the start of each term that demands enormous server capacity. But in the months between enrollments, that capacity may not be needed. The ability to use a public cloud means the university can meet its seasonal needs without investing in IT hardware and infrastructure that it does not need to use year-round.

Cloud computing, traditional IT—or something in between?

Many enterprises are facing the decision over which cloud model to use—or whether cloud computing makes sense at all to meet their specific business and organizational requirements. Some legacy applications, for example, may not be able to take advantage of cloud computing scalability because of the way they are architected. Other applications, especially mission-critical applications that would pose significant risk to the business if they fail to work properly on the cloud platform, may not warrant the time and expense of implementing a dedicated infrastructure for a private cloud environment.

In these cases, organizations may find their requirements continue to be well served by traditional IT platforms. Still others may explore ways to take advantage of advanced compute models that capitalize on cost efficiencies from data center virtualization and consolidation as they consider the move toward cloud computing platforms (see Figure 1).

A practical path to cloud computing

By working closely with IT leaders throughout the process of envisioning, testing, and deploying a cloud computing strategy, Dell can engage in a strategic partnership designed to help enterprises gain a competitive advantage in the following three-step process:[1]

1. **Investigate:** In this phase, IT leaders educate themselves and key executives about cloud computing and explore the ways it can be used to heighten business outcomes.
2. **Experiment:** IT staff test the use of the cloud computing platform in limited ways to deepen their understanding of how it may improve business processes.
3. **Adopt:** Finally, IT leaders widen the use of cloud computing capabilities to meet a specific business need, create new opportunities, or enhance efficiency. Alternatively, organizations can build the entire IT infrastructure in the cloud.

Regardless of the approach an IT department decides upon, the path includes standardized building blocks, integrated management tools, and automated service delivery. (To learn about how Dell PowerEdge™ C Series servers advance cloud computing infrastructures, see the sidebar, "Build your own cloud.")

Revolutionary versus evolutionary approaches

As cloud computing technologies mature and IT infrastructure management becomes increasingly automated, the line separating virtualized data centers from private clouds begins to blur. IT leaders can take two different approaches to setting up cloud infrastructures: revolutionary and evolutionary.

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[1] For more information about making the transition to cloud computing, see "Reaching for the clouds: A three-step journey," by Egan Christensen, in *Dell Power Solutions*, 2011 Issue 3, content.dell.com/us/en/enterprise/d/business~solutions~power~en/documents~ps3q11-20110406-vatter.pdf.aspx.
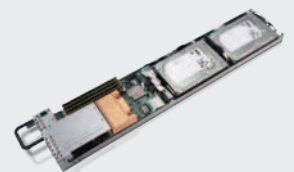
PowerEdge C6145	PowerEdge C6105	PowerEdge C6100	PowerEdge C5220

| **Key features and capabilities** | Designed for demanding tasks that require lightning-fast results, this rack server features two four-socket AMD Opteron™ 6100 processor–based server nodes for up to 96 cores, 1 TB of memory, and 40 Gbps I/O per card—packing exceptional speed and efficiency in a 2U form factor. | A building block with excellent work-per-watt performance for cost-effective data centers, this rack server is designed to utilize low-power AMD Opteron 4100 processors, 92-percent-efficient hot-plug power supplies, and a shared infrastructure—enabling IT departments to maximize performance while minimizing TCO and power, weight, and space requirements. | Well suited for scale-out environments that require high-density, flexible, and efficient computing, this rack server supports four server nodes, each with dual four- and six-core Intel® Xeon® processor 5500 series or Intel Xeon processor 5600 series, in a 2U chassis—providing outstanding compute performance in an ultra-dense package. | Geared for data centers that want to maximize the use of floor space, up to 12 single-socket microservers can be packed into a 3U PowerEdge C5000 chassis. Each is powered by two- or four-core Intel Xeon processor E3-1200 family—enabling two-socket performance on each cost-effective one-socket server. |

Build your own cloud

Cloud computing has inspired a fresh wave of business and technology innovation, in sometimes surprising ways. Dell PowerEdge™ C Series servers and chassis are efficient building blocks for high-performance, scale-out infrastructures to suit a world of opportunities.

In scale-out IT environments for cloud computing platforms, every inch of data center space and every watt counts. That calls for a different mindset—and distinctly different requirements from general-purpose servers in traditional data centers. At the same time, cloud computing enables attractive economies of scale. For example, because high availability in cloud environments is typically achieved in the software layer, organizations may eliminate many system features and components that are often found in traditional data center servers.

Dell PowerEdge C Series servers are purpose-built for scale-out cloud computing environments. Features that are superfluous in a cloud scenario—including extensive systems management consoles, many redundant hardware components, and broad enterprise storage options—are absent from PowerEdge C Series servers. Instead, PowerEdge C Series systems are designed to make intelligent and efficient use of streamlined system resources, allowing IT departments to deploy cost-effective models equipped with only the capabilities needed for a specific cloud environment.

Maximum hardware density is a critical consideration when building a cloud infrastructure. As a result, cloud computing environments demand high-performance systems with a dense, energy-efficient design. Engineered to help decrease total cost of ownership (TCO), several PowerEdge C Series servers incorporate a shared infrastructure that leverages chassis, power, and cooling across compute resources to heighten density, energy efficiency, and serviceability.

In addition, PowerEdge C Series servers leverage Dell's global supply chain as well as extensive field experience gained by the Dell Data Center Solutions (DCS) team. The result is a comprehensive range of purpose-built cloud server models suitable for targeted hyperscale environments (see below).

PowerEdge C5125
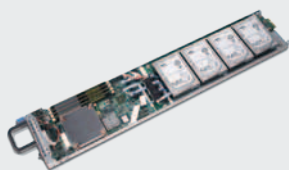
Rightsized for lightweight applications, 12 of these microservers can be configured in a 3U PowerEdge C5000 chassis. Each incorporates up to four cores of low-power AMD Phenom™ II or Athlon™ II processors, and each is designed to run on less than 457 watts per chassis—helping increase server density, power efficiency, and serviceability.

PowerEdge C2100

Geared for scale-out data centers where memory and storage density are critical, this rack server features dual four- and six-core Intel Xeon processor 5500 series or Intel Xeon processor 5600 series, up to 192 GB memory, and up to 26 TB storage in a 2U form factor—helping IT departments manage high volumes of data.

PowerEdge C1100

Well suited for applications that cache massive quantities of data in memory, this rack server offers dual Intel Xeon processor 5500 series or Intel Xeon processor 5600 series and up to 192 GB memory—delivering exceptional performance with a large memory footprint in a 1U form factor.

Building blocks for cloud computing

Get an up-close view of Dell's cloud computing systems as solutions architect Rafael Zamora overviews Dell PowerEdge C6100, PowerEdge C2100, and PowerEdge C1100 servers.

bit.ly/nUP3vA

5 best practices
for taking an evolutionary approach into the cloud

IT organizations that adopt an evolutionary approach for developing a cloud computing environment can benefit from the following best practices when incrementally building out their existing infrastructures:

1. **Assess the organization's starting point.** The journey to the cloud involves three phases: information gathering, experimentation, and adoption. Learn as much as possible about how cloud computing can benefit the organization during the first phase.

2. **Find the right path.** Building a private cloud means something different for each organization. IT leaders may develop a private, public, or hybrid cloud—or use a mix of these models—depending on their industry, size, and type of organization.

3. **Ensure a strategic cloud computing plan is in place that spans the desktop to the data center.** Consider the impact on all areas of the business, establish clear goals, and define plans and timelines for an overall strategy.

4. **Experiment first with noncritical workloads.** Migrate test and development projects to a public cloud. Then track results to help convince executives to buy into a cloud computing strategy and free up compute capacity in the data center. Or move areas of storage to a public cloud for quick results.

5. **Find a trusted partner who can help cut through the hype.** An overall cloud strategy and plan for implementation demands a thorough understanding of the entire data center ecosystem. Dell offers an approach to cloud computing that is designed to meet organization-specific requirements.

Revolutionary approach

In a revolutionary approach, IT departments have the luxury of beginning with a greenfield opportunity and as a result do not need to accommodate traditional enterprise applications. Instead, they are able to build highly efficient cloud-native applications from the beginning. For example, nontraditional Web 2.0 applications that are designed to be cloud native—including software-as-a-service (SaaS) and platform-as-a-service (PaaS) offerings—can be architected from the ground up for enhanced scalability and use across a multitude of servers. As a result, they are able to run more efficiently and deliver a more responsive end-user experience than applications designed to run in traditional data centers.

Using the revolutionary model to build cloud computing platforms typically incurs higher up-front design and deployment costs than using the evolutionary model to develop cloud computing platforms from existing infrastructures. However, the revolutionary approach can deliver a highly flexible computing platform with the capacity to help immediately reduce administrative burden, reduce storage and networking costs, and enhance power efficiency. Additionally, when applications and cloud infrastructure are designed together, they can both be optimized to help simplify integration with other cloud components that may be introduced in the future.

Evolutionary approach

In an evolutionary approach, organizations start with existing traditional enterprise applications and build on the infrastructure they already have. They then migrate incrementally toward cloud computing. Virtualization is a critical first step because it facilitates resource pooling and increased utilization. Organizations then may achieve additional benefits as advanced tools are layered in to help simplify management of the infrastructure and speed the deployment of IT services on demand. (For information on how to apply a building-block approach to virtualization for cloud environments, see the sidebar, "Accelerating the transition.")

However, taking an evolutionary versus a revolutionary approach is not an either-or question. Organizations can use both approaches in different situations, depending on the applications they use and the benefits they want to achieve. Today, the

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evolutionary approach is the predominant approach—but as additional cloud-native applications are developed, the balance is expected to tip in favor of the revolutionary approach. (For more information on how to go about building a cloud infrastructure, see the sidebar, "5 best practices for taking an evolutionary approach into the cloud.")

First steps toward a cloud infrastructure

Dell Services helps organizations determine where to start with a cloud computing strategy—which applications to take into the cloud first, when to take a revolutionary or an evolutionary approach, and which technologies to use to build the infrastructure.

A Dell Services cloud engagement includes three fundamental steps. Dell Services begins by examining the business, its IT infrastructure, and IT goals. It then assesses how an organization may benefit from implementation of cloud technologies. And then Dell Services helps the organization develop and deploy a detailed, best-practices–based plan for cloud computing.

For companies taking a revolutionary approach, Dell Services helps assess requirements, design and implement the

cloud infrastructure, and perform ongoing data center management. Organizations taking an evolutionary approach can work with Dell Services to help reduce costs through standardization, consolidation, and automation; help optimize performance, power efficiency, and data center density; and help reduce IT infrastructure maintenance costs.[2]

Many paths into the cloud

As IT departments increasingly take on a service provider role across enterprises, they are shifting from cost centers to business units with heightened accountability to internal customers. When IT leaders reach an inflection point and begin thinking about delivering workloads rather than managing hardware, the time is appropriate to consider making the move to a cloud computing platform. Whether the organization travels a revolutionary or an evolutionary path—or a combination of both—Dell can offer guidance, best practices, and deployment assistance every step of the way. And in many cases, the potential rewards are great—enabling organizations to reduce IT infrastructure maintenance costs, in some cases to less than 50 percent of IT spending. PS

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Learn more

Cloud computing:
dell.com/cloud

Virtualization:
dell.com/virtualization

Revolutionary approach to cloud building:
intel.ly/pUinz5

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[2] To learn more about Dell cloud computing technologies in action, see "Expanding business opportunities through the cloud," in *Dell Power Solutions*, 2011 Issue 3, content.dell.com/us/en/enterprise/d/business~solutions~power~en/documents~ps3q11 -20110408-roundup.pdf.aspx.