JOURNEY INTO THE CLOUD

Cloud computing promises to revolutionize IT for higher education and drive unprecedented levels of efficiency and flexibility. And there's nothing nebulous about the potential business benefits.

Economic conditions have indelibly altered the bottom line at colleges and universities. In the current climate, IT infrastructure characteristics can make or break an organization, heightening requirements to minimize cost and risk while scaling up or down nimbly as demand rises and falls. For the CIOs and IT leaders of academic institutions, this translates into a continual need to maximize IT efficiency and flexibility because, after all, academic, administrative, and research programs can only act or react as fast as your IT systems do.

With the emergence of standards-based architectures, virtualization, and ubiquitous, high-speed connectivity, cloud computing is primed to offer exactly these benefits—and IT leaders are paying attention. Although achieving the full advantages promised by cloud services is a journey that may take a few years to complete, taking the first steps now can significantly advance both enterprise efficiency and competitive advantage.

UNDERSTANDING THE CLOUD

Cloud computing has been much discussed and often misunderstood. Dell defines a cloud in terms of three key characteristics:

- **Flexible costs:** Cloud computing incurs variable operational costs on a pay-per-use basis, without up-front infrastructure capital costs.
- **Elastic scalability:** Infrastructure capacity is highly elastic (either up or down), differentiating clouds from traditional hosting services providers.
- **Geographic and hardware independence:** The underlying hardware can be located virtually anywhere, with the applications and services abstracted from that hardware.

Cloud computing drives efficiency through virtualization and economies of scale. Just as virtualization can help maximize utilization of data center resources, control operational costs, and automate management in enterprise data centers, it also enables hyper-scale cloud services providers to achieve massive levels of scalability—helping to reduce labor costs and optimize their infrastructures in ways that enable them to offer pay-as-you-go services in a cost-effective way.

Ultimately, however, the cloud is not about technology—it is about making IT efficient and responsive across the entire campus. Fundamentally, cloud computing is disruptive to the traditional IT infrastructure model in that it enables various categories of IT to be delivered entirely as a service, without the traditional levels of hardware, software, and people investment.

DEFINING CLOUD SERVICES AND IMPLEMENTATION MODELS

Cloud services can be implemented as either a *private cloud* or a *public cloud*. A private cloud is an instance of the service dedicated to a specific enterprise, in which the data can remain on-site; this model avoids external dependencies on service levels and enables CIOs to maintain control over security, auditing, and data, but typically requires a large scale to be an economically viable option. A public cloud leverages a third-party instance in a multi-tenant environment, offering minimal up-front requirements along with costs and capacity that scale with usage—but with the perceived loss of some control.

Cloud services fall into three categories of usage:

- **Software as a service (SaaS):** SaaS provides complete applications using a pay-as-you-go model,

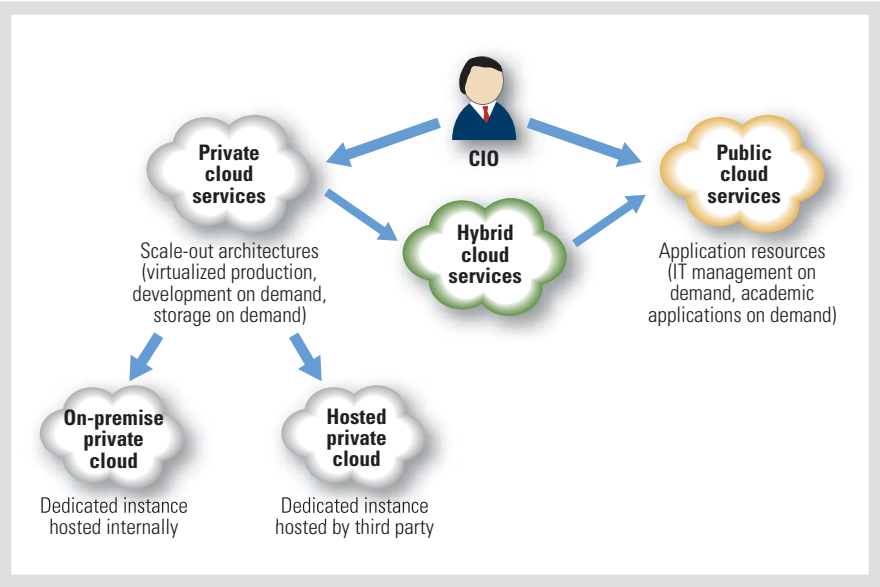

Figure 1. *Hybrid cloud services offer the advantages of both private and public clouds*

typically running on massively scalable, multi-tenant platforms in shared environments. Blackboard, for example, offers academic computing software using this model.

- **Infrastructure as a service (IaaS):** IaaS offers on-demand computing resources such as servers, databases, and storage capacity as well as infrastructure solutions such as archiving and disaster recovery. In this category, for example, Amazon's Simple Storage Service (S3) and Elastic Compute Cloud (EC2) offer storage and compute capacity, respectively.
- **Platform as a service (PaaS):** PaaS offers application development and production environments, enabling developers to write multi-tenant applications using on-demand processor and memory capacity. The Microsoft Azure™ Services Platform, for example, offers this type of service for .NET development.

The appropriate approach is specific to the nature of an individual school—including its current management of IT, its economic pressures, and its risk profile. Large universities, especially those that are highly decentralized, may be able to take advantage of their own economies of scale to address concerns about security, data latency, and storage capacity. As a result, they may opt to build services on an internal private cloud that offers greater control over service levels, security, and auditing than a public cloud can provide. On a smaller scale, public cloud services enable schools to pay as they go without a large up-front investment.

MAXIMIZING FLEXIBILITY AND TCO WITH A HYBRID APPROACH

In some instances, the choice between private and public cloud services may be clear-cut. But the trade-offs inherent to each of these models can also present a difficult decision, requiring IT leaders to balance multiple strategic, practical, and economic considerations. What if you could have the best of both worlds—a service that, for example, enabled your school to retain direct local control over critical data while still letting you take advantage of the economies of scale available through a public cloud for services that are not mission critical?

Hybrid cloud services offer exactly this type of flexibility. With this model, CIOs can choose not just private or public services, but also a single service that spans both realms to help maximize the advantages of each (see Figure 1). Enterprise e-mail systems offer a prime example of the benefits of hybrid cloud services. Because e-mail is critical to most organizations, e-mail continuity is a paramount concern. However, the traditional approach of implementing a second physical mirror of the primary e-mail system can significantly burden total cost of ownership (TCO), given the low utilization of that secondary system. In this scenario, hybrid cloud services promise an ideal solution. By linking an on-premise e-mail infrastructure with a public cloud service for continuity, schools can help reduce IT TCO while still meeting their security and regulatory requirements (see Figure 2). The same would be true of enterprise e-mail archiving requirements.

MAKING THE PASSAGE

The journey toward cloud computing will vary depending on the specific needs,

PLOTTING YOUR COURSE

Schools can start on the journey toward peak enterprise efficiency with an action plan based on the following steps:

- **Virtualize everything:** The baseline for cloud economies is virtualization—it is the core competency and starting point.
- **Leverage software as a service for IT management:** Using SaaS management tools can help reduce infrastructure total cost of ownership and build experience with cloud services.
- **Add incremental services:** Once the virtualized infrastructure is in place, layering in other incremental cloud services helps complete the transition.

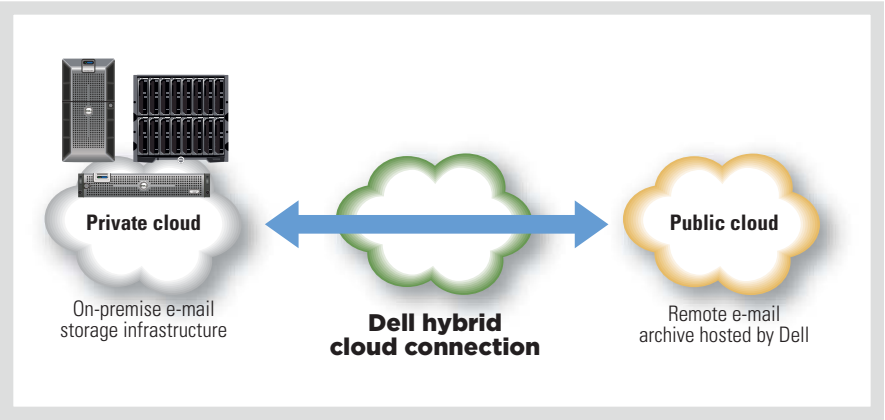

Figure 2. *Enterprise-class hybrid cloud services offer a flexible, scalable approach to e-mail storage*

competencies, and resources of your school. For colleges and universities struggling with data center efficiency and capacity issues, it may make sense to start at the infrastructure level and begin pursuing large virtualization efficiencies through standardization and consolidation. Those with increasing costs stemming from their storage and archiving systems may want to begin there—first by optimizing the resources in place, and then by investigating cloud storage for archiving and disaster recovery.

In each scenario, however, the best practices that have historically applied in other areas continue to apply here: first rationalize, then optimize, then revolutionize. In the context of cloud services, after choosing a starting point—be it an academic, administrative or research application, data management, or the infrastructure itself—your first step should be to rationalize that area and establish a baseline (see Figure 3). Only then can you decide how to move forward and how quickly you can proceed. For more information, see the "Plotting your course" and "Assessing the alternatives" sidebars in this article.

As IT organizations move toward cloud computing, they typically evolve through three phases (see Figure 4). In most cases, virtualization provides the first step toward cloud computing, offering flexible resource pools that can help reduce costs, increase IT agility, and enable the creation of private cloud infrastructure. In this first phase, the organization implements a virtualized infrastructure to support low-risk test and development functions, allowing the IT team to build knowledge and confidence in the technology and learn how to thrive in a hyper-efficient, hyper-responsive environment. The team then leverages core virtualization hypervisors and management tools to consolidate production servers and help reduce capital expenses. In the second phase, organizations accelerate and expand use of virtualization to more workloads—including mission-critical production applications—to help reduce operating expenses. A more sophisticated virtualized infrastructure provides operational management of large virtualized server, storage, and network farms.

In the final phase, the school intercon-

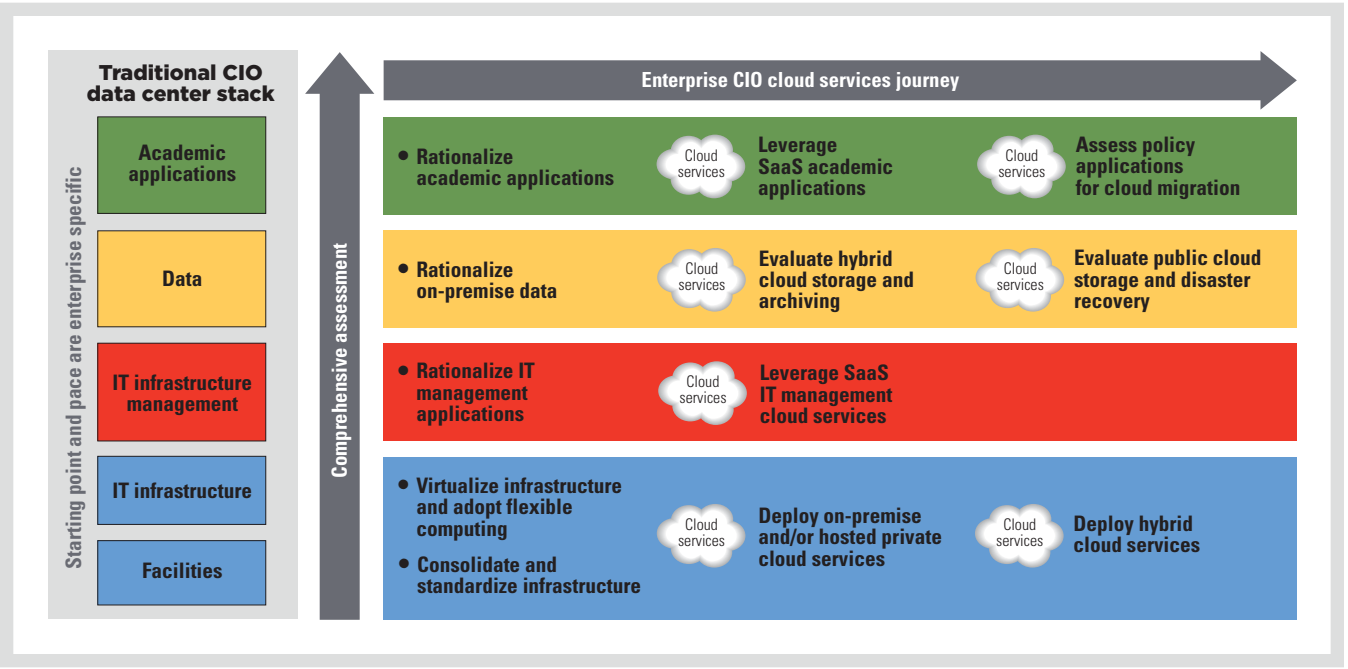

Figure 3. *Standardization and rationalization provide a starting point for the cloud services journey*

ASSESSING THE ALTERNATIVES

IT organizations can make the move toward cloud computing from virtually any starting point—from standardizing hardware through x86 migrations, to implementing virtualization technology for the first time, to deploying SaaS-based IT management. The variety of cloud computing models enables CIOs to adopt the most suitable approach for their particular organization:

- **Cloud computing infrastructure solutions:** Stores services and data in shared, dynamically scalable resource pools using virtualization and/or scale-out application environments
- **Cloud software-as-a-service IT management (public cloud):** Delivers IT management services over the public Internet; can scale without user intervention and is typically billed by usage
- **Cloud infrastructure as a service (hybrid cloud):** Combines internal IT systems with public cloud services, enabling use of excess capacity without up-front investment
- **Cloud infrastructure as a service (private cloud):** Enables IT to be delivered as a service behind the school's firewall for internal use

To help CIOs accelerate cloud computing initiatives, Dell has developed a streamlined optimization approach to migration and cloud service life cycle management. Designed to put together workflows, tasks, and processes specific to the needs and environments of individual colleges and universities, customized Dell™ cloud computing services offer the tools and resources to rapidly implement virtualization and provide a foundation for cloud computing and services with minimal risk. Dell also provides a software portal for operational control of migration through automation and deep visibility into every level of workload migration, which can be customized to meet specific requirements and can scale to manage large environments.

nects its data centers to create a single resource pool and private cloud. At this point, the IT team could also push some applications to compatible public clouds when appropriate for specific use cases, which can help balance peak or unpredictable demand. The resulting hybrid infrastructure provides true on-demand computing in an environment designed for maximum flexibility.

ENABLING THE EFFICIENT ENTERPRISE

Why are education and technology strategists so excited about the cloud? Beyond the breakthrough scalability of this approach, cloud services help create significant cost and operating model advantages—helping academic institutions reduce capital and operational expenses, enabling rapid scale-up and scale-down capacity to enhance IT agility while minimizing up-front risk, and enabling resources to shift from simply keeping the data center running to pursuing more strategic goals. Whatever path you choose, the potential advantages are simply too great to ignore. By starting on your journey now, you can not only realize the benefits of standardization and virtualization, but also begin to move toward the ultimate goal of a truly responsive IT infrastructure—the sky's the limit.

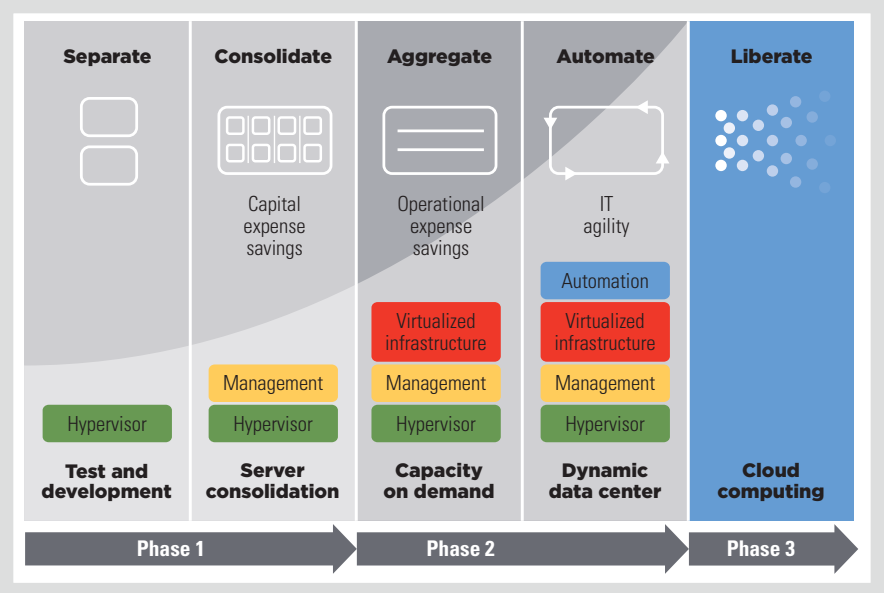

Figure 4. *Virtualization clears the way to cloud computing in three key phases*

QUICK LINK

Dell Cloud Computing Solutions