# Cloud 101: Developing a Cloud-Computing Strategy for Higher Education

White Paper

## Introduction

In 2010, the University of Texas at Austin migrated to a brand-new $32 million data center. Roughly twice the size of the university's previous data center – and the result of two years of intensive planning and design – the new facility features a consolidated network architecture and eco-friendly power and cooling systems. It is expected to reach full capacity in just three to five years.[1] At that point, the university will need to expand or migrate its data center yet again.

Not coincidentally, 2010 also marked the first year in which more data traveled across the Internet than during all the previous years combined.[2] With such an exponential increase in data traffic, university IT teams will need to spend an ever-increasing share of their time simply preparing to handle projected capacity requirements. Year over year, the challenge of long-term scalability will only become more acute. And with university IT budgets sometimes falling behind the pace of change, schools need to find smart, secure ways to meet growing demand while controlling costs.

In the search for a more scalable approach to IT infrastructure, a growing number of schools see cloud-based computing as a tremendous opportunity to achieve large-scale efficiencies without sacrificing performance. Yet in order to realize these benefits and get the maximum return on their investment, colleges and universities must take into account the various challenges and considerations unique to each particular environment. No cloud solution should be one-size-fits-all.

In the following pages, you will learn how you can take the first steps toward a custom-built cloud-computing solution by:

- Creating a comprehensive cloud strategy
- Designing a cloud-based architectural model
- Making the transition to the cloud

## Competing Demands in an Increasingly Complex Environment

College and university IT organizations are expected to keep up with a long list of competing demands, such as:

- Deploying applications and delivering web-based student services at a rapidly accelerating rate, often without a proportionate increase in budget for hardware, software, and personnel

1. Information Technology Services at the University of Texas at Austin, "UDC: Frequently Asked Questions."
2. James Temple, "Web 2.0 Summit: Data Explosion Creates Revolution," SFGate.com, October 19, 2011.

 

- Drastically reducing CapEx and OpEx costs while maintaining the highest levels of security and privacy
- Maintaining a traditional IT infrastructure increasingly unable to accommodate the growing number of personal devices – including tablets, smartphones, and laptops – that students bring into the campus environment
- Offering sufficient bandwidth to accommodate huge swings in network usage, from the high activity of autumn to the lull of summer
- Competing against other universities, many of which attempt to differentiate themselves in the market based on the services they offer to students

Security is an especially pressing issue for institutions of higher education. With many faculty members pursuing patent-pending research, and with student privacy safeguarded by strict regulations, colleges and universities must be careful to minimize exposure to legal risk and compliance risk. A secure and reliable networking infrastructure is therefore a flat-out requirement.

Fortunately, many higher education institutions have found a way to meet these competing demands – for greater agility, less risk, and lower cost – by migrating much of their IT infrastructure to the cloud.

## Increased Adoption, Proven Benefits

The trend in higher education is clearly toward cloud services adoption. According to a 2011 study by CDW, only 5 percent of U.S. college and university respondents were *not considering* a cloud migration. 29 percent had developed a written strategic plan for the adoption of cloud computing, with 28 percent in the midst of implementation.[3] In February 2011, the Higher Education Funding Council for England (HEFCE) developed a new program that would invest up to £10 million in cloud computing, shared IT infrastructure, and support to deliver virtual servers, storage, and data management applications for universities and colleges.[4]

This should come as no surprise when considering the many advantages that cloud computing can offer to institutions of higher education:

### The Cloud and Cloud Services Defined

#### What is the cloud?

A model for delivering on-demand services, infrastructure, and application software using the network.

#### What are the different types of cloud deployment models?

- **Public cloud:** Cloud infrastructure shared or accessible by all, with applications and services delivered through the Internet.
- **Private cloud:** Restricted cloud infrastructure operated by or on behalf of a specific organization, available exclusively to approved users affiliated with that organization; cloud services are delivered using a private network.
- **Community cloud:** Multitenant, private cloud infrastructure that supports a specific community, consisting of two or more organizations.
- **Hybrid cloud:** Combination of two or more of the preceding cloud types.

#### Why opt for cloud services?

The value of cloud services is to help manage – and make immediately available and useful – information rather than infrastructure. Since universities are, after all, centers for the dissemination of information, this emphasis enables university IT departments to focus on their unique priorities within the educational environment.

- **Fiscal advantages.** The 2011 CDW survey reports that for U.S.-based institutions of higher education, the average savings from migrating applications to the cloud is 21 percent. This makes perfect sense when you consider that underutilized infrastructure – especially during off-peak times of the school year – represents a considerable waste of hardware, power, management, and cooling resources. By using a virtualization model and shared infrastructure, cloud implementations promise greatly reduced expenses in these areas. This increases long-run capital efficiency, while allowing university IT departments to bypass complex provisioning processes, minimize "shelfware," avoid

3. "From Tactic to Strategy: The CDW 2011 Cloud Computing Tracking Poll," July 2011.
4. http://www.hefce.ac.uk/news/hefce/2011/cloud.htm.

 

**Cloud Case Study: Enhanced Scalability and Simplified Management at a Reduced Cost**

Berlin's University of Technology (TU) virtualized much of its IT infrastructure using the Cisco Unified Computing System™ (Cisco UCS™). As a result, TU realizes high scalability through maximum utilization of resources while simplifying management and gaining a clear edge over international competitors. Cost savings have been particularly impressive. For example, TU now requires only eight cables per blade chassis, achieving a 90 percent reduction in cabling-related costs.

equipment-obsolescence traps, and comply with green computing expectations and initiatives.

- **Increased efficiency and availability.** The cloud model provides the ability to rapidly acquire, provision, and deploy new IT platforms, services, applications, and test environments. With cloud capabilities, months-long IT hardware procurement processes can be eliminated, reducing time spent on such tasks to a matter of hours or even minutes. The cloud model also helps ensure that university networks are available and secure, regardless of the circumstances. The result is a more agile and efficient organization that can swiftly respond to changing conditions and requirements.
- **Simplification and standardization.** The cloud consolidates and simplifies data centers and facilities while standardizing practices and improving compliance with regard to security, as well as enhancing access to that most critical of commodities: information. In addition, IT spending and practices – which are not often understood or easily defined – can be unified and clarified under the cloud-computing model. Cloud implementations enable universities to build a solution once and then use that solution many times. This lowers costs, increases reliability, and reduces time to implementation.
- **Innovation.** In higher education, the primary purpose of technology should be to enable and inspire innovation in the classroom and lab. That means giving educators, administrators, and students both the applications and the freedom they need to do their work. With the agility of the cloud model, IT organizations can try out new applications with minimal commitment, pay for as much as they use, and adjust as necessary. The cloud can also offer new ways for institutions of higher education to explore up-to-the-minute research opportunities by sharing cloud-computing resources with other universities.

## Considerations Unique to Higher Education

Many higher education IT organizations design migrations to cloud computing with only their in-house resources and expertise to guide them. In most cases, this means that colleges and universities are making the transition without the benefit of the best practices required for the wide variety of technologies involved. In fact, a 2011 study shows that only 15 percent of university campuses report having a strategic plan for cloud computing.[5]

This lack of overall strategy is especially surprising when you consider the importance of security within the campus IT environment. Security becomes even more of a challenge as universities begin to use video and wireless to extend their domestic and global reach so that they can attract new students to their schools. Nearly one-third of IT professionals in higher education identified potential security breaches as the single biggest barrier to cloud adoption.[6] With so many concerns around security, privacy, and compliance in the higher education realm, why trust a cloud implementation to a nonspecialized in-house team?


5. "Colleges Unite to Drive Down Cost of 'Cloud Computing,'" *The Chronicle of Higher Education,* October 16, 2011.
6. Campus Technology, "Higher Ed Optimistic About Cloud Use," June 2011.

 

If institutions of higher education choose to take an in-house approach, they risk facing common cloud-computing challenges, including:

- Limited virtualization around the endpoint computing resources
- Failure to exploit innovative, cost-saving initiatives, such as business continuity or disaster recovery based in the cloud
- Security inadequately focused at the application or server layer only
- Lack of customer isolation using secure, scalable, multitenant services

Some cloud-computing requirements are the same across all industries. But colleges and universities face particularly challenging circumstances in the following areas:

- **Robust security is critical.** Security and data privacy implications are the foremost concern for many higher education IT organizations. In the last few years, security has taken on an added dimension of complexity, due in part to the proliferation of so-called BYOD (bring your own device) programs at many universities. Many IT teams find themselves simply overwhelmed by the sheer range of devices requiring at least some level of on-campus protection.
- **The right balance between public and private.** Universities must first determine the right balance between the public and private cloud, taking all relevant legal and security issues into consideration, and then pursue a change-management strategy so that students can understand why the university favors some applications over others.
- **Any strategy should firmly position education as the university's number-one priority.** In the higher education space, the goal of cloud computing isn't necessarily to reduce headcount in IT. Rather, the goal is to give IT the opportunity to support the university's primary function of educating students.

Every cloud implementation should be as unique as the campus it serves. When undertaking any major technology initiative, it is necessary to carefully define objectives and requirements, aligning them with the business needs as well as the technology architecture and strategy. It is also imperative to understand the risks and develop plans for mitigating them. This approach is critical in order to maximize success and return on investment.

## Cloud Security Checklist

Here is a checklist of security issues and capabilities to consider when it comes to optimizing the security of your cloud implementation:

- ✔ Data safety
- ✔ Data confidentiality
- ✔ Data privacy
- ✔ XML signature
- ✔ Browser security
- ✔ Cloud integrity and binding
- ✔ Network security
- ✔ Flooding and denial-of-service attacks
- ✔ Regulatory compliance
- ✔ Data center location
- ✔ Dedicated security team to ease transition

## Designing a Custom Cloud-Computing Strategy with Help from Seasoned Experts

Since an exclusively internal approach to building a cloud-based system would use already stretched in-house resources, one solution for ensuring a successful transition to the cloud is to turn to a professional services group for assistance in developing a strategy that best suits your college or university's needs.

This team of experts will work with university IT teams to create a wish list for making the transition to the cloud easier. Items on the wish list may include:

- Choice of vendors, partners, and cloud-computing solutions
- Alignment with business strategy and goals
- A comprehensive, architectural approach
- A full service and solution offering with robust security
- Measurable benefits such as time-to-market

 

**Cloud Case Study: Expanded Capabilities with Virtualized Infrastructure**

At the Chinese University of Hong Kong (CUHK), the IT team required faster and more flexible provisioning of resources. By virtualizing operations with Cisco® Data Center Business Advantage Architecture, CUHK achieved more efficient allocation of computing resources and significant expansion of data center capability within a constrained physical space.

With a clearly defined wish list, organizations must then approach the cloud transition in the following four phases:

### 1. Strategic Preparation

In this initial phase, IT decision makers will determine the appropriate cloud computing strategy, asking questions about architecture and security, as well as about objectives. Colleges and universities should work with experts who have extensive experience in multiple technology areas, such as virtualization, service orchestration, automated provisioning, and the security that underpins network architectures.

The costs, benefits, and operational changes required to successfully migrate to a cloud-computing model should also be evaluated, including both the current and desired services management approach. A thorough analysis helps align business results with subsequent cloud architectural development, tools, process integration, and implementation.

Strategic preparation should also target security. University IT experts should evaluate their cloud services and architecture security risks, focusing on protecting access and providing on-demand security options within a services catalog for their users. In addition, your strategy should take into account your cloud-computing evolution and post-deployment activities in every stage: strategy, planning and design, implementation, and optimization.

### 2. Planning and Design

When undertaking a transition to cloud computing, strategic planning and design can help reduce the time to successful deployment and operation of complex cloud models. This phase requires expert coordination among the members of your team, your partners, and other vendors, as well as a detailed architecture design, data-center-specific expertise, and security designed from end to end.

The resulting designs and plans – including, for example, an end-to-end architecture blueprint, a migration roadmap, a common control framework, a security technology framework, physical safety and security, and your future cloud services evolution – should link back to your strategy and lay the foundation for subsequent implementation and integration.

### 3. Implementation

In order to reduce risk during a transition to cloud computing, college and university IT organizations need to have someone with experience in providing a virtualized architecture, as well as integrated tools, a facilities plan, orchestration integration, workload migration, and staging and validation activities prior to full-scale implementation. This phase also involves implementing the security technology architecture, the security portal design, automated audit, and physical safety and security designs.

Proven methodologies, best practices, and deep knowledge of the core systems within the cloud environment can facilitate a smooth migration from your existing environment to a cloud utility computing architecture, while helping ensure adherence to plans and enabling on-time delivery of a fully implemented cloud-computing model. During this implementation stage, knowledge transfer should be an ongoing process, providing operational confidence for in-house experts.

### 4. Optimization

Optimization of the cloud model, which can accelerate adoption, is the point where you can maximize the true benefits of cloud computing: lower operating and capital expenses, increased business agility and responsiveness, and scalability.

This is done through activities such as:

- Architectural reviews
- Security audits
- Cost-reduction exercises
- Process improvements
- Tool customization
- Post-deployment or Day 2 support

 

## Applying Best Practices for a Seamless Transition

Experts you trust can help you navigate these phases, helping you to decide on the appropriate cloud-computing strategy. These experts can also guide you through architecture and security planning, design, implementation, and optimization techniques.

The Cisco® Services approach draws on expansive data center and virtualization expertise, proven best practice methodologies, and Cisco's unique intellectual property to support cloud-enabling technologies. As a leader in networking products and solutions, Cisco can help your IT team develop the secure, high-performance network designs required for cloud services delivery.

Cisco Cloud Enablement Services help:

- Accelerate the development of a financially justified cloud strategy with a measurable ROI
- Help ensure that infrastructure-as-a-service (IaaS) infrastructure, management, people, and processes maximize the success of the transition to cloud computing
- Accelerate the development and implementation of an IaaS architecture, integrated tool design, and chargeback and security mechanisms validated by Cisco
- Create a phased migration plan to help ensure the successful adoption of the new cloud operational model
- Accelerate time-to-value of a data center architecture for cloud services creation and delivery

Cisco provides a complete set of service offerings to help your college or university through each step of its cloud transition. Figure 1 illustrates the specific areas of focus that Cisco Cloud Enablement Services offer.

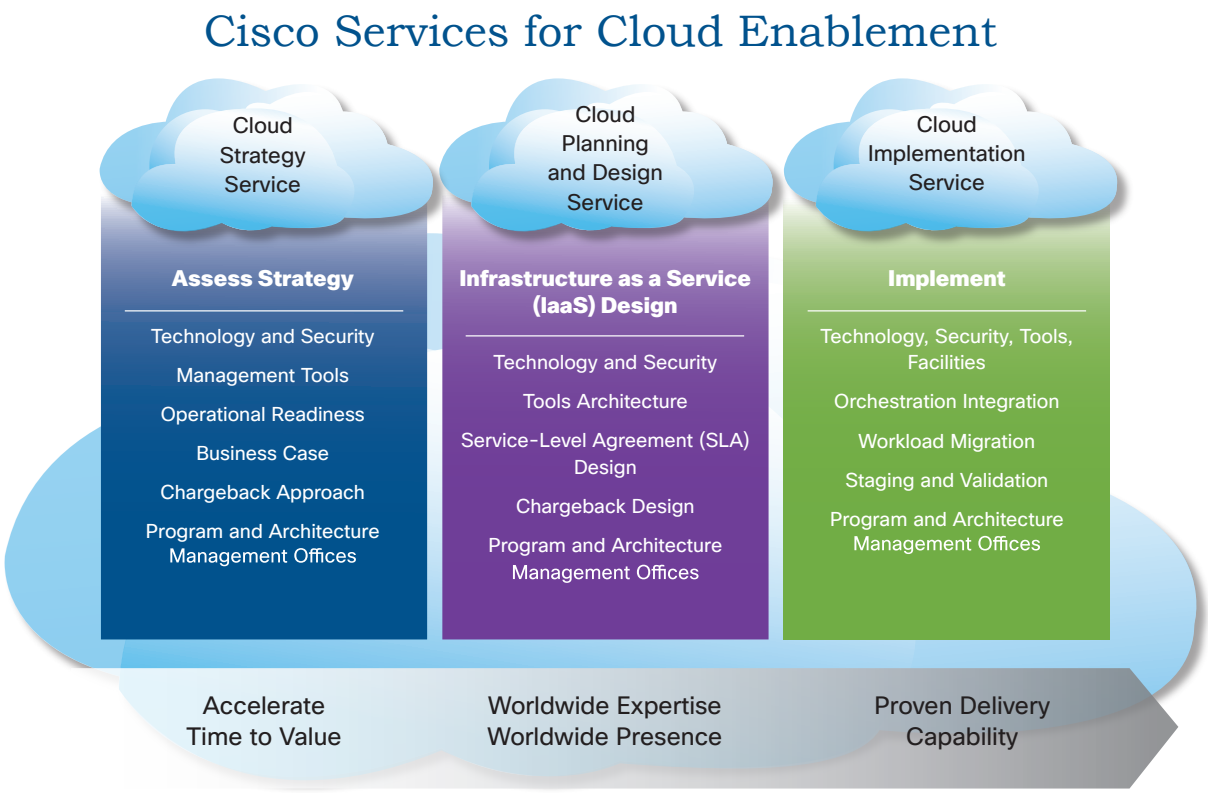


Figure 1 Cisco Services for Cloud Enablement

 

No matter what type of cloud model you want to deploy – hybrid, community, private, or public – Cisco, and our pervasive ecosystem of industry-leading partners, can support it. The network is the fabric that links clouds and all their components seamlessly and securely. With our reputation for integrity, our focus on security, and our extensive suite of offerings, Cisco can help your institution meet critical imperatives and make the transition to cloud computing with confidence.

## Conclusion

Innovative institutions of higher education seek to understand why and how to deploy cloud platforms efficiently and securely. Ultimately, their choices – regarding opportunities, approaches, and partners – have the promise to transform the role of IT in universities everywhere.

In the next five years, institutions of higher education expect to cut 20 percent of their IT budget by moving applications to the cloud.[7] That represents a major shift in approach across the industry – and a major opportunity to increase organizational efficiency, improve agility, and stimulate innovation. However, to support a smooth transition and optimal outcomes, college and university IT organizations must first develop a comprehensive cloud-computing strategy that addresses the challenges unique to each institution.

To learn how your university can accelerate its cloud initiative with a comprehensive strategy informed by proven best practices, schedule a discovery session with Cisco Cloud Enablement Services today.

## For More Information

Cisco Cloud Enablement Services:
www.cisco.com/go/cloudenablement

Cisco Cloud Computing for Higher Education:
www.cisco.com/web/strategy/docs/education/092111Cloud.pdf

7. "From Tactic to Strategy: The CDW 2011 Cloud Computing Tracking Poll," July 2011.

**Americas Headquarters**
Cisco Systems, Inc.
San Jose, CA

**Asia Pacific Headquarters**
Cisco Systems (USA) Pte. Ltd.
Singapore

**Europe Headquarters**
Cisco Systems International BV Amsterdam,
The Netherlands

Cisco has more than 200 offices worldwide. Addresses, phone numbers, and fax numbers are listed on the Cisco Website at **www.cisco.com/go/offices**.