Preparing the IT Organization for the Cloud
An Introduction

This paper is the first in a series on Preparing the IT Organization for the Cloud from the ECAR-CLOUD Working Group. For institutions that have decided to adopt cloud services, transitioning to the cloud presents both opportunities and challenges. This series provides guidance to help institutions effectively prepare to address these challenges. More information can be found at the ECAR working groups website.

Cloud computing has become a viable option for delivering transformational IT services in higher education. It has driven IT organizations to change the way they look at procuring, delivering, and assessing IT services. The agility and flexibility of cloud computing can shorten the delivery time for IT solutions and lower the overhead of developing, prototyping, and staging of IT environments. Our campuses are finding numerous benefits and opportunities when considering and deploying cloud solutions. Staff and students are embracing the accessibility and ease of use of services designed with the consumer in mind. Researchers are finding that they have an additional set of valuable tools for the computationally intensive research and analysis of large data sets. University administrators are discovering cost and resource savings in services such as file storage and e-mail. For these and other reasons, we are seeing a major cultural change in how IT decisions are being made on our campuses. The cloud enables business units to make IT decisions independently of the IT organization. Many higher education IT organizations are developing cloud strategies to help guide and assist their campuses with adopting and moving to cloud computing.

What is often overlooked, however, is that there is more to cloud computing than appears on the surface. Important topics like governance, migration, integration, organizational transformation, operationalizing risk management, and user management are all critical to the success of a cloud solution.

**What Do We Mean by Cloud Computing?**

For the purposes of this series of papers, we will use the definition of cloud computing developed by the National Institute of Standards and Technology (NIST):¹

Cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction. This cloud model is composed of five essential characteristics [on-demand self-service, broad network access, resource pooling, rapid elasticity, and measured service], three service models [SaaS, PaaS, and IaaS], and four deployment models [private cloud, community cloud, public cloud, and hybrid cloud].

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¹ Cloud computing definition developed by the National Institute of Standards and Technology (NIST).
This series will provide IT organizations with guidance for the adoption and delivery of cloud computing at their institutions. Although these papers are not intended to be prescriptive in nature, we hope that they will provide a set of valuable outputs that can be used to directly develop cloud operations and strategies at higher education institutions.

Why This Series?

This series of papers will provide a field guide for higher education institutions seeking to develop and implement cloud strategies. Cloud adoption issues will be explored in-depth, allowing CIOs, CFOs, and IT team leaders to proactively navigate decision making and change management.

Organizations leveraging the cloud will be required to navigate strategic planning, policy, contract management, risk management, and staffing and budgeting components, as well as potential pitfalls. Leaders will be charged with managing these components into operational realities and partnering with affiliated stakeholders to ensure that their interests are taken into account.

Higher education institutions should develop a strategy for decision making and risk tolerance, as well as a clear understanding of how the cloud may advance institutional goals. By engaging in a reflective process, organizations can evaluate whether cloud offerings can add value, identify leadership champions, and develop cloud-adoption taxonomies that best fit the mission.

IT organizations at educational institutions often lag, rather than lead, in providing innovative cloud services to meet user and business needs. One cause of this lag is the fact that IT organizations are typically held accountable by the institution for protecting sensitive data, which can cause delays as the IT organization explores ways to diligently protect data. Complicating matters is the fact that students, faculty, and staff frequently bring tools to work to store and share data using services such as Dropbox and iCloud, often without thought to the mix of personal and institutional data they store in the cloud.

Users are coming to campus having already established practices using cloud solutions that provide more capabilities and functionality when compared to services traditionally provided by IT organizations. In addition, business units can work with cloud providers to quickly create user-friendly cloud services that interface with or replace legacy enterprise systems, usually without involving their local IT unit. In spite of a growing acceptance and adoption of cloud services in higher education, campus compliance leadership (procurement, risk, legal, security, privacy, etc.) remains wary of entrusting institutional data to the cloud in a formal way, often due to perceived risks with cloud services and to limited analysis of the risks associated with on-premises solutions. IT organizations must adapt by recognizing the realities of both end-user (BYOD) and business-unit (distributed IT) use of cloud services to inform campus-wide strategy and approaches to IT.

This series will cover seven separate topics related to cloud computing, including this introductory paper:
Preparing the IT Organization for the Cloud: An Introduction

This first entry to the series will discuss cloud challenges and opportunities, common cloud deployment scenarios, and organizational cloud readiness.

Developing Cloud-Aware Governance

IT governance must evolve to include cloud services. As educational institutions increasingly adopt cloud services as part of formal IT portfolios and contend with the proliferation of bring-your-own-everything tools, traditional IT governance must adapt. To connect IT investments to business outcomes, IT governance must respond to a changing landscape in which the impetus for new services comes increasingly from stakeholders outside IT. By adopting cloud services, the institution may have less control over the service. For example, customization may be impossible or limited to minor user interface changes (e.g., branding). User communities can be quick to see certain advantages of cloud services but are often not aware that some aspects of control might be lost in the adoption of the cloud service. Cloud-aware IT governance must bring appropriate campus constituencies together to inform strategic decisions on IT services that embrace the realities of cloud use on campuses; that balance cloud risks with opportunities; and that support both top-down institutional goals and bottom-up user needs.

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Transforming the IT Organization

Given the enormous opportunities that cloud computing brings to higher education, coupled with the complexity of how these cloud services impact technical environments, this paper will attempt to address the impact and evolution of the changing roles of IT staff within current IT organizations.

Some of the important IT staffing questions and ideas this paper will attempt to address are:

- How can we create a shared vision and a collective understanding of the cloud for the IT department so that IT staff can become change agents for the institution?
- What organizational changes will be necessary?
- What new roles and skills will be required to successfully integrate cloud services into campus technical environments?
- How can we help IT staff acquire the necessary competencies to become proficient knowledge workers within the rapidly changing world of cloud computing?
- How do we create an organizational culture that embraces the emerging cloud ecosystem?

Building a Migration Plan

It is easy for an institution to aspire to move to the cloud. It is much more difficult to turn that aspiration into reality. This paper will discuss concrete approaches to migrating workloads from on-premises to the cloud and provide examples of the paths followed by institutions making the move, including challenges
and opportunities discovered along the way. Steps that need to be taken in migration include setting a reasonable goal, building support among key stakeholders, selecting appropriate pilot projects, staging service moves in an orderly fashion, considering data and system integration, and developing a financial model to support cloud migration. The paper will also look at what different approaches might be needed for IaaS, PaaS, and SaaS migrations, as well as the benefits of having articulated exit strategies.

**Operationalizing the Cloud**

The effective adoption of cloud services requires changes to an organization’s existing operational practices and procedures. The external nature of cloud services may require an organization to rethink its IT service management and disaster recovery practices, as well how a given cloud service integrates with its existing in-house technology infrastructure. The pay-as-you-go cost model common with cloud services may entail changes to financial management practices and total cost of ownership (TCO) calculations. Procurement processes may need to be adjusted to increase agility and effectively address the unique risks associated with cloud service, and new vendor management roles may need to be established and resourced to ensure ongoing compliance with contract terms. This paper will detail the changes required to operationalize the cloud in higher education institutions.

**Managing Risk**

It is imperative that organizations understand, assess, and evaluate the risks of cloud computing. Risks related to security, compliance, privacy, and disaster recovery should be compared and contrasted with those similar risks associated with on-premises systems, as well as with not staying up to date with current technological approaches. This paper will outline the potential risks when considering cloud computing and provide best practices—including contract addendums and service-provider security compliance reviews—to mitigate and manage those risks.

**Supporting Users**

Managing user expectations, training, and support for cloud-based solutions is a challenge that organizations must address. Cloud-based products are a new breed of IT service. Users of these services face frequent—and often unavoidable—updates, dramatic changes to user interfaces, new features introduced without announcement, and a bevy of additional issues. Our role as IT professionals includes not only making adjustments ourselves but also preparing our user base for the changes that come with cloud services. Building better documentation and offering training are a start toward mitigating the impact of new services, but preparing users for a cultural change is also necessary, given the new user experiences that come with cloud services.

**How Does Cloud Arrive at Your Institution?**

Deployment of cloud computing at institutions of higher education has been a balancing act between the demands of staff, faculty, and students for more services (e.g., new applications, collaboration tools, anytime/anywhere access to data, additional storage, etc.) and each institution’s risk appetite to let data and applications move outside the institutional data center and to relinquish a certain amount of control (e.g., security, compliance, access control, etc.). This balancing act is being influenced by two trends:
Information technology and related applications are being developed and made available in the marketplace at much faster rates than institutions’ capability to absorb the impact of new technology and assess its risks, adapt institutional business processes and culture to the change it brings, and adopt it in a cost-effective and secure manner.

Consumers—staff, faculty, and students—are increasingly willing and able to become early adopters of new technology for personal use and to bring that technology to the workplace, first as an extension of their personal experience and later as added tools to their workplace experience. Convenience, mobility, collaboration, and social interaction are powerful motivators. Consequently, it is more common for the cloud to “sneak” into institutions at first than for institutions to go to the cloud. A likely adoption sequence for cloud computing could take place in the following phases:

### Adoption by Individuals

Adoption by individuals starts with the personal use of cloud services for work purposes, often driven by convenience or by individuals seeking additional resources not provided by the institution. At this time, institutions start to come to terms with the fact that the cloud has arrived and is here to stay. Examples include the use of offline storage services such as Dropbox and Box or social media used for outreach and collaboration (e.g., FaceTime). Institutions’ deployments are mostly tactical and are reactions to the increasingly common practice of the independent adoption of cloud services. Further, institutions—knowing that constituents will be using cloud services, regardless of whether they come from central IT—are driven by the belief that users might as well be provided with alternatives sanctioned and endorsed by the institution. Policies are drafted around the use of specific services, and vendor assessments begin to incorporate evaluation criteria specific to hosted and cloud environments.

### Adoption by Business Units

Opportunistic cloud is an extension, of sorts, of “sneaker cloud” but driven mostly from within by departments and business units turning to the marketplace in search of functionality and capabilities to meet specific business needs, such as the increasing need for conferencing and collaboration, fundraising and development effectiveness metrics, online/distance learning, increased storage for researchers, etc. This adoption “strategy” is driven by purchaser choice. Services and applications evaluated by business units often come cloud-ready or as SaaS offerings, and cloud service vendors often market their services directly to business units, sometimes without involving IT in the conversation. Examples include institution-wide implementations of cloud-hosted e-mail and collaboration services, Google Apps for Education, Slate for admissions and financial aid, Salesforce.com applications for donor and development management, and Adobe Creative Cloud for online learning. At this stage, institutional differentiation, control, and integration with institutional applications remain important, though the move of institutional services to the cloud may be taking place without strategic direction from institutional leadership.
Adoption by the Institution

This phase starts when institutions begin to see cloud options as viable alternatives to on-premises services. A strategic plan and roadmap (i.e., which applications should go to the cloud and which should not) start to emerge, driven by IT management and supported by institutional leadership. At this point, institutions begin to increase the use of virtualization of IT infrastructure and services. In addition, institutions can account for the total cost of providing and supporting IT infrastructure, services, and applications—including the cost of space and utilities—and this provides the means to adequately compare services provided on-premises versus services provided in the cloud. As has often been the case with e-mail, institutions question whether the value provided by an on-premises solution justifies the infrastructure, licensing, personnel, and other costs required to locally administer a given system. The possibility of saving at least some of these costs by using a low-cost—or sometimes free—cloud-based alternative has often been a persuasive argument at institutions that were otherwise hesitant to move services to the cloud. Negotiated service-level agreements and migration plans allow institutions to consider PaaS and IaaS offerings and leverage the cost savings, higher availability, and scalability offered by cloud computing. Examples include institution-wide implementation of e-mail and collaboration tools such as Google Apps for Education or Microsoft Office 365; various storage, platform, and other services provided by Amazon Web Services (AWS); and, in some cases, ERP applications (e.g., Workday). The Open Cloud Consortium is a good example of how research institutions are increasingly combining resources with those of peer institutions or joining consortia to work on common projects, share data, or support distance learning and education.³

Mature Cloud

This phase is reached when cloud applications become predominant. The fully cloud-mature institution engages SaaS, PaaS, and IaaS at all levels, and the institutional IT organization has been transformed into an enabler/coach/support role for the institution. The institution has successfully socialized a strategy that incorporates the value that the institution wants to obtain from cloud computing, a list of preapproved public cloud “partners,” and a documented approval and vetting process. With proper data-stewardship and security policies in place for cloud computing, the institution can obtain cloud-based “best of breed” solutions to specific challenges that would otherwise be nearly impossible to address. In this phase, solutions are no longer evaluated on the long-term time horizon of traditional IT; instead, business and academic needs can be addressed with solutions that have a life span of three to five years, at which point they can be easily exchanged for newer offerings. From alumni portals to admissions management, management of international students, hybrid classrooms, distance education, and big-data research, the array of specific cloud-based solutions is developing at a breathtaking pace.

This progression is not the same for all institutions. Due to differences of size, type, and mission, institutions will see these phases in different ways. This paper will touch on topics that are relevant for institutions no matter what stage they are in.

Are You Ready for Cloud?

Different institutions will take differing approaches to their cloud strategies. Some institutions are aggressively pursuing a “cloud first” strategy and moving existing services to the cloud as quickly as they can.⁴ Others are being more opportunistic about choosing cloud services that suit specific needs while
continuing to build and operate other services on-premises. It’s probably safe to say that few, if any, institutions will ignore the cloud entirely or decide not to use any cloud services.

Within an institution, different approaches may be taken for different cloud layers—for example, using lots of SaaS services while not engaging heavily in cloud infrastructure or choosing to build as much as possible on PaaS over IaaS. Those approaches are likely to evolve as institutions gain experience with the cloud and as the services continue to mature.

Institutions should be discussing their stance on cloud services, being deliberate about articulating the current state and intentional about periodically evaluating their strategies. The documents in this ECAR series are designed to help IT organizations understand the kinds of questions they and their institutions should be asking to understand the landscape and decide on an approach to cloud services. The series can help frame the questions that organizations should be preparing to answer to articulate a cloud strategy.

IT organizations cannot afford to wait to undertake the deployment of cloud services. If we do not actively engage our institutions in the implementation of cloud solutions, we incur potential institutional risks as individual units adopt the cloud in ways that may not be optimal and might also not be compliant with regulations and institutional policies. Institutions can take advantage of IT’s experience and perspective on integration, security, and architecture, but only if IT is seen as a partner in enabling the rapid adoption and use of cloud services. The trick is for IT to be that enabling partner at the same time as the institution reaches for maturity in cloud management and usage.

The IT organization is not the only part of the institution that needs to adapt to new ways of thinking in the cloud era. The cloud requires adjustment from procurement officers, legal counsel, risk management, and other business units. IT can help drive understanding of cloud models and work with colleagues across the institution to help make those adjustments.

Don’t expect to understand all the issues during the first cloud implementations. But do expect to learn from those implementations and to understand more during the next implementation. In this ECAR series, institutions that have been implementing cloud services will share their experiences and lessons learned. This is only the start of a new era in technology—be prepared to share your experiences with your colleagues as we make this journey together.

What’s Next?

Cloud-based IT services are becoming a norm for higher education, providing researchers, faculty, students, and administrators alike with the tools they need to do their work. But cloud adoption faces many challenges, including transitioning the traditional IT department and IT workforce to be able to select, adopt, and support cloud services. This series will serve as a guide for organizations looking to transition from a primarily on-premises workshop to one that includes a robust cloud presence. The papers in the series will provide a sample roadmap and together answer the question, “How do we prepare the organization to successfully make this move?” We hope that you will find the series useful.
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Notes


3. The ECAR Campus Cyberinfrastructure (ECAR-CCI) Working Group is currently developing a guide on research computing in the cloud, discussing what works well and what limitations exist from a technological point of view.

4. See the “cloud first” strategy described in Asbed Bedrossian et al., Cloud Strategy for Higher Education: Building a Common Solution, research bulletin (Louisville, CO: ECAR, November 5, 2014).