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Implementing Google Apps
University of Maryland, College Park

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Overview

In higher education, major information technology decisions are sometimes driven by and institution's desire to take advantage of breakthroughs in cloud computing including software, infrastructure, and services that support research, teaching and learning. At other times, decisions are driven by the need to sunset technologies that no longer serve the needs of the institution. Still other times they are driven by the cost in real dollars including maintenance and ongoing support and the availability of adequate technical expertise. Most often, decisions are driven by a combination of these factors.

In 2011 the University of Maryland College Park made a decision instigated by all of these factors in addition to a demand from the student body. This decision involved moving the students at the university, including alumni from the legacy premise based system, Mirapoint to Google Apps for Education a cloud solution, with a suite of applications which includes Gmail, Google Calendar, Goggle Docs, Google Sites and 60+ other applications. The move was first suggested by the University of Maryland's Office of Information Technology (OIT), which saw an opportunity to advance from an e-mail system to a collaboration platform and simultaneously more closely align the technology infrastructure with the University's strategic plan. The University had already moved the faculty and staff from Mirapoint to Exchange the year before.

Highlights

The University of Maryland College Park is the largest university in the state, with more than 37,000 students[i] and 14,000 employees. In 2010 the university was using an e-mail and calendaring system consisting of more than 50,000 accounts hosted on multiple MiraPoint proprietary servers. In the preceding decade, MiraPoint had lost considerable market share and upcoming releases did not show promise of offering a true collaboration platform. Additionally the university would realize a significant cost savings by moving to a new mail provider for the campus. Had the university chosen to upgrade their existing system rather than migrate to Google Apps they would have been tethered to a vendor that would most likely never recover significant market share. Declining market share often indicates that a vendor does not have the ability to incorporate innovation into future product releases. Significant risks are involved with using a product in the declining phases of a life cycle. Converse to Google Apps which has a robust community of third party developers, declining products find that the providers of third party applications begins to narrow.

Student Movement

In March 2011 the university, following the recommendation of the Student E-Mail Committee, announced that the student email accounts would be moved to Google Apps. To address the users with concerns of security risk, they were afforded the choice to move to the Exchange email system used by the employees of the

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university. After several months of discussion and gathering student input, the faculty and student committee determined Gmail, overwhelmingly favored among students, was the best option for the university's student email system. Committee members said the alternative — an account under the Microsoft Exchange program that faculty and staff use — would also be available to students who are concerned about their emails being subject to data mining. These concerns, which were discussed with students at a town hall forum earlier this month, did little to dissuade the student body from supporting a switch to Gmail.

Security and Privacy

Discussion of Google Apps in the media inevitably turns to concerns about security. Many universities nationwide have delayed their Google Apps rollouts because of concerns about privacy and security.
The University of Maryland had two major concerns:

1. If messaging communication and documents are stored at a data center that is not owned or maintained by the university, will they still own the data?
2. If messaging communication and documents are stored at a data center that is not owned or maintained by the university, will our data be used in ways that owners of the data do not approve?

With respect to data ownership, the agreement between the university of Maryland and Google is explicit about who owns the intellectual data stored on Google's servers. There were still concerns regarding the scanning and indexing of data which has the intended purpose of allowing the users to search their own Google Apps accounts. E-mail may also be scanned for the purposes of detecting viruses and filtering spam, as well as for the display of contextually relevant advertising which can be disabled at the domain level.

Cloud Computing Overview

Cloud computing is a sourcing and delivery model for enabling 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 promotes availability and is composed of five essential characteristics:

- On demand self service – a consumer can unilaterally provision computing capabilities, such as server time and network storage, as needed automatically without requiring human interaction with each service's provider.
- Broad network access – capabilities are available over the network and accessed through standard mechanisms that promote use by heterogeneous thin or thick client platforms (e.g. mobile phones, laptops, tablets and PDAs).
- Resource pooling – the provider's computing resources are pooled to serve multiple consumers using a multi-tenant model, with different physical and virtual resources dynamically assigned and reassigned according to consumer demand. There is a sense of location independence in that the

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customer generally has no control or knowledge over the exact location of the provided resources but may be able to specify location at a higher level of abstraction (e.g. country, state, or data center). Examples of resources include storage, processing, memory, network bandwidth, and virtual machines.

- Rapid elasticity – capabilities can be rapidly and elastically provisioned, in some cases automatically, to quickly scale and be rapidly released to quickly scale in. To the consumer, the capabilities available for provisioning often appear to be unlimited and can be purchased in any quantity at any time.
- Measured Service – cloud systems automatically control and optimize resource use by leveraging a metering capability at some level of abstraction appropriate to the type of service (for example, storage, processing, bandwidth, and active user accounts). Resource usage can be monitored, controlled and reported; providing transparency for both the provider and consumer of the utilized service.

Cloud computing is the result of several technology advances including:

- reliable, high-speed networks, such as the NBN;
- very large, global-class infrastructures deployed by vendors like Google and Amazon;
- virtualization capabilities;
- commodity server hardware;
- open source software (e.g. Linux, Apache, and Hadoop), which has slashed the cost of software for data centers; and
- adoption of open Web 2.0 standards, which has made development of applications in the Cloud much easier and faster.

There are four basic cloud delivery models which relate to who provides the cloud services. Organizations may employ one model or a combination of different models in delivery of applications and business services.

Type	Description
Private or internal cloud	Cloud services are provided solely for an organization and are managed by the organization or a third party. These services may exist off site.
Community cloud	Cloud services are shared by several organizations and support a specific community that has shared concerns (e.g. mission, security requirements, policy, and compliance considerations). These services may be managed by the organizations or a third party and may exist off site.
Public cloud	Cloud services are available to the public and owned by an organization selling cloud services, for example, Amazon.

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Hybrid cloud	An integrated cloud services arrangement that includes a cloud model and something else (another cloud model, agency back end systems, etc.), e.g. data stored in private cloud or agency database is manipulated by a program running in the public cloud.

Advanced Virtualization

Advanced virtualization is a technology rather than a cloud delivery model. It can be defined as a virtual ICT infrastructure that has automated management.
The cloud characteristics that are not intrinsic in virtualization are:

- Capability to undertake usage based billing and invoicing;
- On-demand self-service
- Broad network access; and
- Rapid elasticity (to some extent).

Advanced virtualization has been included to provide a complete set of information for organizations.

Potential Benefits of Cloud Computing for the University of Maryland

Transitioning to cloud services may offer the following benefits for organizations – the level of benefit will depend on the cloud model adopted.

Benefit	**Detail**
Scalability	Unconstrained capacity allows for more agile enterprises that are scalable, flexible and responsive to change. For example: • Faster responsiveness can benefit organization service delivery, and meet the needs of citizens, businesses, employees, suppliers and corporate relations. For example, ability to provision and utilise a service in a single day; • Option of scalability is provided without the serious financial commitments required for infrastructure purchase and maintenance; and • Provisioning and implementation are undertaken on demand, allowing for traffic spikes and reducing the time to implement new services.

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Benefit	Detail
	Organizations, however, need to be aware that when transitioning from legacy systems, data migration and change management can slow down the "on demand" adoption of cloud computing.
Efficiency	Reallocation of IT operational activities offers opportunity for organizations to focus on: • Research and development including new and innovative applications allowing for business and product growth (improved service delivery); • Creating new solutions that were not technically and/or economically feasible without the use of cloud services; • Enabling prototyping and market validation of new approaches much faster and less expensively; • Providing the ability to de-couple applications from existing infrastructure; and • Rationalising legacy systems.

Cost Containment	Changes to an organizations cost model can be modified by the following:
	• Services and storage become available on demand without the serious financial commitments required for infrastructure purchase and maintenance. Additionally, they are priced as a pay-as-you-go service;
	• Transfer of costs
	• no need to invest in high-cost IT equipment; for example, able to test software solutions without capital investment;
	  ○ Reduction of operating costs
	  ▪ reduced energy consumption;
	  ▪ less expense in managing IT systems;
	  ▪ less cost and complexity in doing both routine computing tasks and computationally-intensive problems;
	  ▪ reduced associated with time delays;
	  ▪ potential to reduce support and maintenance costs

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Benefit	Detail
	through transitioning legacy systems to new systems; ▪ potential to reduce the demand for data center resources; and ▪ potential to reduce the carbon footprint. *Note: organizations will need to compare current costs against potential cloud expenses and consider models for lowering total cost of ownership (TCO) to understand whether cloud services will offer any potential savings.*
Flexibility	• Organizations can save time at set-up, as cloud computing becomes functional faster than other systems; • To transition to the cloud, organizations are not required to install additional hardware or software; • Implementation can be undertaken remotely; and • Potential to access latest technology through software applications being automatically updated by cloud providers.
Availability	• Cloud software architectures are designed from the bottom up for maximum network performance – potentially delivering improved application level availability than conventional IT solutions; and • Greater flexibility and availability of 'shared' information enables collaboration from anywhere in the world – all that is required is an internet connection.
Resiliency	• The potential for failure in a highly resilient computing environment is reduced. The failure of one node of a system in a cloud environment will have no impact on overall information availability and reducing the risk of perceivable downtime.

Google's Public Cloud Based Service

Google offers some of the best known cloud computing services available with their Google Apps Suite, including Gmail, Google Docs, Google Calendar, and Picasa. They also offer some lesser known cloud services, such as Google Sites, Google

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Gadgets, Google Video, and most notable, the Google Apps Engine. Google Apps Engine is a free setup that allows the users to write and run their web applications on Google infrastructure. The Apps Engine debuted Java and Ajax support in April 2010. A key advantage is scalability of the applications. Google App Engine provides centralized administration, reliability, support and enterprise features.

Google Apps Deployment at the University of Maryland

The Office of Information Technology (OIT) at the University of Maryland with program and development support from Valiant Solutions, deployed the Google Apps Suite to provide delivery continuity and an extended communication platform for the students at the University. The deployment and subsequent services where named TERPmail. The features and functions included:

- 25 gigabytes of mailbox space.
- The capability to forward e-mail from your other e-mail accounts to TERPmail.
- Extensible APIs to create automatic provisioning for users and to allow you to set\reset your own password if you forget it.
- Access to Google Apps calendar where you can keep and share your schedule.
- Access to 60+ Google Apps:
    - Google Sites – to create your own Web pages.
    - Google Docs – to create, store and share documents for academic purposes.
    - Google Chat – to send messages back and forth between your classmates, friends, and other Gmail users.
    - Google Analytics – to set and track metrics for Google sites and Docs.

The University had three technical objectives that were driven by unique business case scenarios. These scenarios required Valiant Solutions to develop a toolset to provide the service level that the students would require to migrate from Mirapoint to Google Apps and to extend the additional functional components of Google Apps for Education.

The three technical objectives included:

- Create a Migration tool to move students from Mirapoint to Gmail
- Online Address Book to look up users in Exchange and non-Gmail email systems
- Create an Archiving tool to backup Mirapoint email data to a local data store

Migration and Archiving

The migration and archiving of data from the legacy premise based system Mirapoint to Google Apps was a key component to a successful transition and adoption by the students at the University. The students were given the

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choice to migrate their data themselves or to be a part of the overall automated migration. The migration process involved a complex analysis and data extraction process. The high level process included creating a migration tool that read the existing LDAP attributes from an IBM Tivoli Directory to perform the following activities:

- Migrate Data from Mirapoint to Google. (Only messages/email data)
    - Student selects Yes - Migrate data to Google from http://goingterpmail.umd.edu/user_actions.html - Step 1.
    - Lock the Mirapoint email account before the migration of data.
    - Migrate data to Gmail using the Google email migration API
    - Update Tivoli Directory Server LDAP attribute when migration completed.
    - Send an email to user to notify that data migration has completed.
    - Tool runs on a Virtual Linux server from within the University environment
    - Multi-threaded Bulk process that can be scheduled
    - Scalable solution so the solution can scale up or out based on customers' requirements
    - Send log file to administrator to monitor success of scheduled job
    - Audience is 37,000 students and Alumni
- Archive Mail Data from Mirapoint
    - Archive all Mail Data from Mirapoint in case required in the future
    - Extract email data from Mirapoint to a folder and compress to a zip file.
    - Multi-threaded Bulk process that can be scheduled
    - Update Tivoli Directory Server LDAP attribute when migration completed.
    - Scalable solution so the solution can scale up or out based on customers' requirements
    - Send log file to administrator to monitor success of scheduled job
    - Size - For 37,000 accounts on the Mirapoint servers

GAL Directory Synchronization

The University of Maryland provides two different email solutions for their vast number of students, alumni, affiliates, faculty and staff. A premise based Exchange email solution for faculty, affiliates and staff. A cloud based Google Apps collaborative email solution for students, and alumni. The challenge was how to provide students and alumni access to faculty and staff email information since they are in different systems. This required that a custom directory tool be created to provide access within TERPMail to all the addresses available in the LDAP directory service. Valiant Solutions created a Google Gmail "Address Book" sidebar gadget that reads the LDAP attributes from an IBM Tivoli Directory Server to perform the following activities within the University's Google Mail domain:

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- Allows searching for users who have selected opt in for the University Directory.
- Reads the IBM Tivoli Directory from outside the University.
- Only University personnel can read the LDAP Directory
- Returns email address information, used as an address book for Non-Google users.
- Provides an easy to use interface to copy and paste a fully formed SMTP email address into a Gmail message or any email enabled Google Apps products
- Can be cloud or premise based depending on customer requirements

Conclusion

The transition to Google Apps for the students of the University of Maryland has been an overwhelming success. On October 17, 2011, the legacy email system Mirapoint was decommissioned and turned down. The University has already begun to see increased productivity with Google Apps through their powerful messaging and collaboration tools. The University also expects significant ROI and cost savings benefits through reductions in software licensing, hardware cost and administrative labor cost. The University also plans to offer lifetime access to Google Apps for Alumni so they stay connected to the University after graduation.

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[i] UMD News desk - http://www.newsdesk.umd.edu/facts/quickfacts.cfm