

Moving Enterprise Systems to the Cloud

University of California, Santa Cruz

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Team Members:

The project included a large team of other technical and business resources at UC Santa Cruz including team members from Applications and Project Management, Core Technologies, and Information Security.

The following team members made major contributions:

Graham Freeman, Lead Security Incident Responder, graham.freeman@ucsc.edu

Todd Graham, Business Systems Team Lead, tgraham@ucsc.edu

Cliff Pearson, Unix Systems Engineer, cliffp@ucsc.edu

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Summary

Faced with an aging technology infrastructure, UC Santa Cruz made the bold move to rapidly move large enterprise systems to the cloud to achieve gains in elasticity, disaster recovery and business continuity, speed of implementation and modernization.

The Problem and Opportunity

In the fall of 2016, UC Santa Cruz was at a crossroads of either needing to complete an expensive infrastructure refresh of servers and storage or to move enterprise applications to the cloud to take advantage of modern technology. Information Technology Services at UC

Santa Cruz strives to provide the most efficient and effective approach to managing the critical business systems for the university.

The university had traditionally engaged in a four to five year infrastructure refresh cycle during which we replaced our entire enterprise application infrastructure. This activity has been costly in terms of dollars and staff effort, but the university had not previously had an alternative to running enterprise applications on large servers in the campus data center. This strategy required sizing infrastructure for the greatest potential load tied to scheduled events like the March 15th Admit Decisions window, despite the fact that most of time the infrastructure remained idle. In addition to the wasted cost and effort, this approach left UC Santa Cruz with no business continuity or disaster recovery solutions other than duplicating systems at off-site locations.

The decision was made to make the bold move of retooling staff members to take advantage of the infrastructure refresh opportunity to move enterprise systems to the cloud. Although there was some risk associated with doing something new, UC Santa Cruz has highly skilled technical resources that were eager to embrace new technology. Customers of Information Technology Services were interested in taking advantage of the new technology and worked with us to make the move to the cloud as seamless as possible.

UC Santa Cruz has begun taking advantage of the following benefits of moving to the cloud:

Technical Benefits - Immediate

- Increased agility
- Stronger security infrastructure
- Higher resilience that exceeds current capabilities for essential systems
- Broad set of infrastructure tools and services

Technical Benefits - Future (with ongoing optimization, maintenance, and monitoring)

- Improved availability
- Improved scalability
- Increase flexibility
- Improved security
- Simplified architectures
- Improved Sustainability

Functional Benefits:

- Tune resources during peak times
- Add/delete environments as needed
- Schedule non-production up-times (e.g. 7AM to 6PM) and allow automated startup/shutdown of environments
- Automate data refresh / cloning
- Minimize involvement with future hardware-driven infrastructure improvements
- Eventual cost savings from re-engineering to utilize cloud efficiencies

Project Goals

The project goal is to move enterprise application services to AWS by the end of 2018. This included 20 servers that hosted Oracle databases, Banner environments, and Peoplesoft environments in addition to other services that needed to be replaced in this refresh cycle.

The initial systems included the student information system and identity and access management. These systems were moved by December of 2017.

The next phase includes the financial information system, university advancement system, and the data warehouse to be moved by the end of 2018. On completion, other services will be considered for migration.

Project Objectives include creating a cloud standard for enterprise applications that meets or exceeds current standards. The standard includes:

- Security model
- Disaster Recovery/Backups
- Account Management
- Logging
- Monitoring
- Patching
- Build and Configuration Management
- Database selection
- Account Structure and Basic Billing Process
- Network architecture
- Additional infrastructure architecture as identified

Another project goal is to have minimal impact to customers during each application/database cutover with any outage approved by business stakeholders. The team will also meet or exceed current application performance and service standards once migrated to the cloud, improve overall security posture and reduce time to delivery, and enable disaster recovery capabilities for essential systems.

Impact and Project Success

While still completing moving some systems to the cloud for enterprise systems, the project of moving enterprise applications to the cloud has been incredibly successful.

There has been minimal interruption of service on existing or new infrastructure. UC Santa Cruz has greatly improved the security and disaster recovery posture and serves as an example to other institutions of a new way to operate.

Customers across the enterprise have begun to see the benefits of their applications being in the cloud and more customers are eager to begin the transition, including the campus web content management system.

Staff members are enjoying the chance to use this cutting edge technology and appreciate the continued investment in their skills by UC Santa Cruz.

Collaborations

Moving from a stable, on-premise data center to cutting edge cloud technology required hundreds of people from UC Santa Cruz to agree to take the risk together. While this project had a heavy technology component, the driver is to take advantage of modern technology to better support our business partners in supporting the mission of the university.

Several units from Information Technology Services participated in the project, including Applications and Project Management, Core Technologies, and Information Security. Budget and Resource Management played a critical role in determining appropriate financial resource for the project.

This collaboration has been successful because the business partners of Information Technology Services trust the unit to make choices that will enable them to run their business and to not take risks that don't have a substantial payoff.

Our technology partner, Amazon Web Services, has provided critical strategic and technology support to us throughout the project. Peer higher education institutions have also provided guidance and lessons learned.

UC Santa Cruz worked with other University of California units through this process, including the UC-wide AWS users group and the ITAC Cloud Architecture group. We also collaborated with other universities at the Cornell Cloud Forum.

During the project there were significant leadership changes, including the Chief Information Officer, the Director of Core Technologies, and the Director of Applications and Project Management. The dedicated technology staff working in concert with our business partners continued to move the project forward even during these transitions.

Timeframe

The project initially kicked off in September of 2016. The first two major system moves to the cloud were identity and access management and the student information system. These moves were completed by December of 2017.

Other systems including the financial information system, the advancement system, and the data warehouse will be completed by the end of 2018. Other systems will migrate after the completion of the initial project.

Technology

UC Santa Cruz selected Amazon Web Services (AWS) for the cloud hosting environment.

While AWS is not the only cloud Infrastructure as a Service (IaaS) provider, they are the leading provider¹ for many years running. The UC System spent considerable time evaluating multiple IaaS providers in 2014, and AWS was selected to become our common preferred vendor. All other UC's investigating and deploying cloud infrastructure are primarily utilizing AWS.

Other tools and technologies used in the transition include:

- Jenkins for scheduling
- Chef for system configuration
- Security Monkey for security
- Nexpose for system/application scanning
- BitBucket/Git for code management

¹ <https://aws.amazon.com/resources/gartner-2015-mq-learn-more/>