Project Title: UCLA Anderson Data Center Migration to Central Campus Data Center

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Project Team:
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Timeframe
- 11/2011 – Planning and equipment inventory.
- 1/2012 – Dependency mapping, network configuration (firewalls, subnets etc...), server virtualization and hardware decommissioning.
- 4/2012 – Awareness Campaign, targeted communications to programs, departments and general population of faculty, students & staff of the migration outage window.
- 5/2012 - Dry Runs & special systems maintenance windows to prepare the environment.
- 6/2012 – Implement contingencies and special accommodations.
- 7/2012 – “Operation Lift-Off” – Critical Service Outage Window for physical move equipment.

Data Center Migration Window
| Phase 1: Core Infrastructure & Email components | Restore by Monday 7/30 at 7am | Sunday 7/29 at noon |
| Phase 2: Critical services with school wide impact | Restore by Tuesday 7/31 at noon | Monday 7/30 at 5:30pm |
| Phase 3: Remaining set of services | Restore by Friday 8/3 at 11pm | Monday 7/30 at 5:30pm |

Project Description:
The UCLA Anderson School of Management Computing and Information Services (ACIS) department was looking to address the problem of unreliable cooling in our local data center which housed the schools critical server, storage and network infrastructure. Upon completing a cost analysis of improving the cooling system and learning of an emerging central campus IT initiative to provide expanded data center services of “Tier 3” quality to campus departments, Anderson partnered with the central IT department, UCLA Information Technology Services (IT Services) to co-locate ACIS servers and storage components to the central campus data center. In doing so, being the first pilot department on campus to move.

Throughout the project, ensuring a smooth transition for Anderson clientele was a top priority. We took a leap of faith in proceeding and there were many questions initially: What did it mean to be the first department (external to IT Services) to move over? Will central campus really understand and respond appropriately to the unique needs and high demands that we escalate on behalf of our clientele? Would giving up control of certain tasks, which we have done internally for over 18 years, be better or worse? What we found, while working

1 “Tier” refers to the Tier designation for identifying different data center site infrastructure design topologies. The Uptime Institute’s tiered classification is an industry standard providing four Tiers, with Tier 1 being the simplest and Tier 4 being the most stringent. (Further info available at: http://uptimeinstitute.com/publications#Tier-Classification)
closely with the dedicated IT Services group was a vested interest in addressing our concerns and trust was established with both teams, as we collaborated to resolve and overcome project hurdles.

The project started as ACIS was struggling with an aging air handler unit that had a high replacement cost. We were also experiencing an increasing number of chiller outages, which would usually occur in the middle of the night! Requiring ACIS IT staff & facilities personnel to be onsite to restore services. To illustrate, over twenty eight (28) separate chiller, after-hour, incidents occurred in the 6 months prior to the data center move.

Migrating to the campus datacenter not only addressed the heat related problems by providing an environment with an existing, reliable and fully redundant cooling system, it also provided many more benefits described in the technology section below. Throughout the project we also documented lessons learned so that IT Services could use this experience in preparing its data center offerings to other campus departments, using Anderson as an example. In addition, relocating lined up with campus initiatives for consolidating data centers and technology efforts for larger campus efficiencies and cost savings to departments and the campus.

Planning: What exactly are we dealing with here?
The team focused on gathering information on the environment and systems to gain a holistic perspective and identify migration options.

Inventory & Dependency Mapping
- Updated equipment inventory.
- Collaborated with central IT Services group to identify complex interrelations and dependencies between services.
- This informed us that we required one major outage window to shut everything down, move and restore services versus a staggered “phased” approach.
- A single migration window also allowed us to migrate our network server subnet massively reducing complexity as there was no need to change individual IP addresses on all servers and apps. This greatly reduced risk and potential service outages due to the numerous changes avoided.
- Further facilitated in our ability to use existing firewall technologies we both shared.
- We created the server layout plan for systems being moved so we knew where to place items during the move.

Contingency Plans:
The team identified critical points of failure and developed contingency plans and risk mitigation strategies to address them, some examples include:

- **Public Website** – During the critical service outage migration window, we moved the public facing website to a new failover site. This provided uninterrupted public web presence throughout the migration. The creation of the failover site is another example of the collaboration with IT services to utilize existing failover infrastructure at UC Berkeley.
- **Class Capture**: We capture many of our classroom events utilizing in-class recorders that publish the video to our servers for remote viewing. This system was going to be down during a class event scheduled during
the migration window. Our instructional support team coordinated with the vendor to provide a temporary hosted solution so that this event could continue without interruption.

- **Backups:** Full and incremental data and system backups were completed prior to shut down.
- **“What if a server falls off the truck?!?”** An example of the “what-if” questions we asked ourselves in preparing for the likely and not so likely scenarios.
- **Onsite Spare Hardware:** We had critical spare hardware and a few servers pre-deployed and ready to go and be configured as needed to provide critical local services if hardware failure occurred.
- **Vendor Support:** We informed our vendors and verified all support contracts were in place. We met in advance with our storage solution vendor who provided specific boxes for transport and had a Storage Area Network (SAN) engineer onsite (at no-charge) during the move day to assist with reconnecting the storage environment.

**Dry Runs**

- The team completed 3 dry runs to test and validate full shutdown and startup procedures. This was essential to identify the timing required for shutting down and bringing up over 185 systems in the proper order.
- Dry runs also helped facilitate our communications process as seven different network and systems administrators needed to be sync to power off/on dependent and interrelated services in the right order. For each dry run we used a chat client (Lync) to communicate current status and progress with the team.
- The dry runs validated the testing protocols we put in place to verify all services were production ready once systems were powered on.
- We discovered a few devices had not been turned off in 4 years due to continuous nature of use!

**Communications**

The Anderson School of Management has a very active administrative and academic schedule with events starting at 8am running until 10pm Monday through Saturday. With a complete outage of the majority of systems required, we began communicating with department heads and our events office to identify a date that would have the least impact on our students, faculty and staff. We made announcements at school-wide staff meetings and met with individual business units and program offices to communicate the relevant impact and address concerns. We also created webpages to communicate what was happening and how it would affect our end users.

“The Big Giant Clean Up”: Being that major systems would be unavailable during the migration window, our CIO along with the Deans office coordinated the “Big Giant Clean Up”.

This effort encouraged the school to utilize the migration outage time period to clean up physical office space. Provided were large bins for recyclables, trash and shredding and give away prizes! Encouraging everybody to de-clutter within the office to discover underutilized space and to shift attention away from the critical service outage window. Signs were posted throughout the complex and prizes were given for things like “most improved area”, “oldest item found” and “weirdest item disposed of” etc... This non-“technical” effort changed the tone of the inconvenience to our users due to the technical need to shut down major systems to move them and utilized the “down” time for something productive (space de-clutter) that was inclusive and fun.

**Technology**

**Existing Anderson Infrastructure**

- Moved a total of 98 physical devices accounting for 186 total servers (physical and virtual).
- Freed up 56U of rack space that did not have to move over by virtualizing 25 servers retiring and decommissioning old hardware.
Campus Tier 3 Data Center Features

- **Cooling:** Eight chilled water units providing over 200 tons of precision cooled air with humidity control. Back up chiller onsite. Anderson previously had only one chilled water unit (Anderson is using a portion at the central Data Center).
- **Power:** UCLA Cogen power with Uninterruptable Power Supplies (UPS) along with a diesel generator.
- **Fire Systems:** Clean agent with above & below floor detection and discharge pre-action sprinkler system.
- **Racks:** CPI Mega cabinet’s standard 19” racks with 45U per enclosure. Dual PDU’s with redundant power feeds from UPS supplied power and COGEN supplied power. Anderson moved from 9 racks to 3.
- **Raised Floor:** 18” raised floor providing optimal air flow to cabinets and equipment. Hot and cold aisles optimized for cooling.
- **Seismic Bracing:** Equipment placed on ISO-base seismic stands.
- **Security:** Controlled access via bio-metric palm scanner sign-in log and CCTV cameras placed at all entry and exit doors.
- **Monitoring:** 24/7/365 monitoring by Network Operations Center staff for immediate response and assistance.

Success Factors

✅ Servers and storage components are moved with no physical damage.

✅ Systems are brought back online with the proper configuration with no data loss or corruption.
All core network, server, storage components, middleware and end-user applications are fully tested and validated by the service owners to be production ready according to established test plans.

Do not exceed allotted service outage window.

Students, Faculty, and Staff are able to access systems and return back to normal day to day activities within the allocated time period.

Customer Satisfaction Responses

“I see that all is working well on email. Hats off to you and your teams who worked tirelessly in planning for this transition, and in executing over the last weekend. You all were very transparent in sharing information well in advance, keeping everyone informed, and then executing flawlessly. On behalf of all of Anderson, a huge thank you.” -- Dean, Anderson School

“Good job. I’ve done this sort of thing before and know how tricky it can be.”

“You and your Team are AWESOME!! And we thought we’d be able to ‘play’ this week while our computers were down, lol. Thanks so much, to all of you.”

“Way to go!!! Thanks for the short duration of the outage and the effort spent on this boon to us all. Great job!!!”

“Congrats to the DCM team! What an amazing effort - I'm totally impressed (tho not surprised)!”

“Wow — that was fast. Good work”

Moving Forward

In the last 10 months since the move, we have not had any heat related incidents! The transition has been very smooth and has brought peace allowing us to focus on more strategic projects. The relationship established during this project also opened doors to further collaborations with IT Services. We are currently working with IT Services to use the central IT service management system (helpdesk) along with other departments. Pilots are also planned to make use of centralized storage and backup and restore systems as well.

As the overall reliance on IT systems continue to grow, the complexity in planning and management grows alongside with it. This project is a great reminder that a single department is not alone in this endeavor and can make great strides in moving things forward by working with other units on campus and across the UC.