

THE COMPUTERWORLD HONORS PROGRAM

CASE STUDY



LOCATION:
*Merced, California,
United States*

YEAR:
2006

STATUS:
Laureate

CATEGORY:
Education and Academia

NOMINATING COMPANY:
Extreme Networks

ORGANIZATION:

University of California Merced

PROJECT NAME:

An Identity-Based Service Architecture

Summary

UC Merced has taken an innovative approach to meeting the fundamental information needs of students, faculty, staff, visitors and graduates etc. by leveraging identity management, portal, and other technologies to create a highly user-centric environment. Starting with a legacy-free landscape, UC Merced has implemented vision, strategies, and architecture that support a consistent, integrated user experience. We have taken leading-edge technologies that have been on the periphery at many installations, and cast them as fundamental cornerstones of our technology infrastructure. We have also purposefully separated UC Merced-specific core functionality that support our business rules out from the general infrastructure and applications and services that users interact with, deploying standards-based solutions for the latter, to provide maximum flexibility now and in the future.

The result is a user-centric environment that allows faculty and students coming from diverse environments to use tools that they prefer, and to easily locate and access the entire range of UC Merced information and applications. It also provides a consistent experience as relationships to the University change.

Introductory Overview

UC Merced is the first research university built in the 21st century, welcoming its first class of nearly 1,000 students in 2005, and scheduled to increase its enrollment to 25,000 over the next 30 years. As such, we needed to build an infrastructure that was highly extensible and scaleable. Also, with all faculty coming to UC Merced from other institutions, we needed to provide an environment hospitable to users with a highly diverse set of expectations. Additionally, being extremely resource-constrained as many start-ups are, we needed to automate as many processes as possible to reduce staff requirements.

However, we also had the opportunity to adopt key technologies, particularly identity management and portals, in ways that other universities have not. Most institutions of higher education have a large inventory of web sites and departmental applications that grew over time but without the benefit of an overall strategy. They have added portals addressing specific groups of



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users, such as students or administrative staff, to simplify access for those groups. But navigating convoluted web sites and having multiple userids and passwords is the rule rather than the exception.

While identity management has been or is in the process of being implemented at many campuses, it has been a difficult endeavor in view of the diverse set of directories, application providers, and general autonomy of many schools within universities. The same may be said for electronic directories.

UC Merced was able to make a number of key decisions from the start. One was that an identity management system (and associated electronic directory) needed to be implemented day one and become a cornerstone for user-oriented functionality. In a university, people have roles that tend to evolve over time. For example, a high school student may start as an applicant, then become a student, and then become an alumnus. That student might also become a graduate student and research assistant. In that case, he or she would have 3 simultaneous roles: student, staff, and alumnus. In general, staff may take courses, and former students may become faculty or staff. So tracking and understanding roles is a fundamental necessity for providing services based on who a person is.

We decided to assign a unique id to people who became affiliated with the university (by virtue of being an applicant, being hired, etc.) and to maintain those ids for life. Applicants for admission are assigned an id so that they can track the status of their applications, and then, once admitted, use that same id for everything they need to access.

Another key strategy from the start was the assignment of clear and distinct roles for the campus's portal and web sites. Our view is that the web site is primarily a marketing site designed to attract students, faculty, and staff. That allows us to prioritize and optimize design elements for those audiences. The portal, on the other hand, is assigned the role as the place where everyone already affiliated with the university – students, faculty, staff, and, in the future, alumni) – go to locate information and access applications.

The portal is a universal portal, not one oriented towards a particular constituency. Informed by the identity management system, the portal determines which information and resources should be accessible to any given user at the moment of logon. An individual with multiple roles will see the composite set of facilities. Accessible resources change when roles change (e.g., from student to alumnus).

A default set of views is assigned to users. For example, beyond tabs with announcements, discussion groups, and other general services, students will see (by virtue of signing in to the portal) a tab with an email client, and another tab for the collaboration and learning environment, with all of the courses they are enrolled in pre-configured. However, like most portals, users can customize their views, changing the layout of tools and windows within each tab, adding or deleting content to each tab, and creating custom tabs. This allows each person to create an optimal working environment, and by making everything needed available within the portal (as opposed to the web site), we can greatly reduce the amount of time spent on navigation.

We have supported our vision with the creation of an Identity Management Office (IMO), which is charged with assuring that the identity management system (which is fed from core systems such as the Payroll Personnel System and the Student Information System, and also allows the inclusion of affiliates that are not represented in any of the core business systems) has



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accurate and current data. The IMO is also the place that users contact to resolve access issues, errors in the electronic directory, problems related to name changes or typos, etc.

Like many campuses, we have also deployed a universal campus/id card, allowing access to buildings, meal plans, vending machines, clothes washers and driers, printers/copiers, etc. This is the physical counterpart to the single electronic id. In our case, we have elected to deploy cards with RFID technology. In the future, that will allow us to blur the lines between physical and electronic access by virtue of electronic security credentials and application information that can be stored on the card, but for now it works pretty much like a typical campus card (albeit with more waving than swiping!).

We have, however, deployed the campus card system “downstream” from the identity management system, so that the two are integrated. One example of the benefits of doing this is the way our library check-out process works. For privacy reasons, arbitrary identifiers are stored on the cards, as opposed to personal information (such as student id numbers). Our identity management system feeds our centralized electronic directory with the card identifiers. The library circulation system reads the card identifier, looks up the personal identification information in a secure part of the directory, and then uses that information to locate the appropriate records in the circulation system.

As an aside, the library also uses RFID tags in each book as the tracking mechanism. So the process of checking out books is basically putting one’s id card on top of a stack of books and waving them at a check-out station.

Over time, we expect to continually integrate new applications and functionality into this framework, so that the user-centric vision is maintained. Towards this goal, we have stressed the use of open standards where they exist, and have elected to use products, be they vendor-supplied or open source, that support those standards. This will allow us to replace components and integrate new ones with maximum flexibility and minimal disruption to the existing infrastructure and application base.

Benefits

Our strategy has clearly benefited end users in several ways. One is that only a single id and password need be remembered. This has the additional benefit of making it practical for users to choose strong passwords without having to write them down (keeping track of multiple ids and passwords in one’s head is extraordinarily difficult). Also, obtaining a new id is not necessary when one’s role changes.

The use of the single id is extended via the electronic directory and other standards-based middleware to control access to the campus wireless network (via 802.11x), VPN services, dial-in access, print services, file services, etc. Also, although we focus on a single standards-based electronic directory, the identity management system can provision other directories as necessary to provide unique functionality. For example, in addition to provisioning our primary LDAP directory, we also populate Active Directory.

Another is that a single location (the portal) is the starting point to access everything that a user needs. Automated tailoring and user customization simplifies day-to-day access. In conjunction with UC system-wide initiatives, we will also be integrating access to centralized payroll and benefit information as well as digital library resources into the portal, still accessed via the single



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userid and password.

As a tool for existing members of the university community, portal content deployment can focus more on functionality than on esthetics. Conversely, the University web site design can focus on clear objectives, with the highest priority on attracting students, the next priority on attracting faculty, etc. This virtually eliminates the fighting for web real estate that ensues on many campuses and enables the choice of graphic designs and other elements aligned with those clear priorities.

Over the long haul, UC Merced will benefit from having a highly automated and integrated infrastructure that will significantly reduce costs. The elimination of duplication of effort and manual processes, resulting in the need for fewer, more effective, staff is one piece of the equation, but not the only one. Reducing complexity for users will result in the need for less Help Desk and similar staff.

The use of open standards also reduces cost in the long run by avoiding vendor lock-in and maintaining a competitive playing field. The use of standards also benefits individuals who can use their favorite browsers and email clients.

We believe that our lack of legacy has enabled us to, from the outset, articulate and pursue a vision that can serve as an example for other institutions that may be overwhelmed by tactical issues, fighting one fire at a time, and haven't had the luxury of stepping back and uniting their campuses in an all-encompassing long-term strategy.

The Importance of Technology

As our challenge was to simplify the use of information technology for individuals to perform their work (be that learning or administrative tasks), technology was a fundamental component of our implementation. As previously indicated, using standards-based technologies was essential, both to provide end-user choices and to enable us to replace components as needed. Also, technologies such as identity management are pre-requisite to providing user-centric solutions, such as portals. Technology that provides automation, such as identity management and provisioning, reduces errors and service times from the user perspective, while reducing personnel costs. Finally, electronic directory technology enables the use of a single id and the sharing of other resources among a diverse set of applications

Originality

This project is exceptional in a number of ways. One is that UC Merced built an entire information technology infrastructure and set of applications starting from scratch in a very short period of time with limited resources while meeting all of our service availability milestones. Second, we focused on providing services from the user perspective as opposed to what was perhaps easier to deploy, providing a comprehensive and integrated view for our users. Finally, we carefully planned out the architectural framework for a broad set of services beforehand, taking account of user needs so that user departments would not need to duplicate or supplement services, leaving us with a central managed set of solutions that are extensible to meet the needs of the entire campus as the university grows and evolves.

The originality of this implementation lies in the purpose and the way the pieces were put



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together, as well as tenacity in keeping with a vision, as opposed to constructing any fundamentally different pieces. A variety of vendor-supplied products have been deployed from companies such as Cisco (wireless), Extreme Networks (network), Oracle (calendar), and Sun Microsystems (directory, e-mail, and identity management), implementing standards such as IMAP4, LDAP, 802.11x, etc. A number of open/community-source products were also deployed including major applications such as uPortal (portal) and Sakai (collaborative learning environment) as well as more infrastructure-oriented services including web servers, RADIUS authentication, content management, etc. A guiding principal in selecting many of the key components was to ensure maximum control over strategic components, such as our portal and identity management, and to treat other components as commodities. Although we have not deployed any unique technologies, we believe that our approach represents best practice in multiple dimensions.

Success

In our case, success cannot be measured by a before and after comparison, as we didn't have a "before". As a start-up with limited resources attempting to build the entire panoply of services essential to a research university, we pushed the concept of "just-in-time" to new dimensions. However, we met all of our key goals. Incoming faculty (who preceded the students) were able to access email using their customary clients. Student applicants were issued userids when needed, and their email accounts were created on schedule and accessible via the portal. They were able to use their userids for course registration, and before the first day of classes, they were able to access the course sites provided by the course management facility within the portal.

Various wires and mirrors were employed to make the user experience appear seamless, especially when some of the infrastructure pieces weren't quite there yet. Even today, we are still building out pieces of our vision and have a ways to go in some areas and among some constituencies.

Student use of the portal is universal, as that is where students go to read their e-mail, access course sites, read announcements, etc. Staff use is lower, as they tend to use native clients to access e-mail and calendars, and we have less compelling content currently in the portal. However, now that academic needs have been largely addressed, we are putting a renewed emphasis on administrative content (this is almost all new content, not integration of pre-existing content, that we haven't yet had the resources to construct given our overriding focus on opening the campus for students).

In general, a measure of our success is that everything works from the user perspective. Incoming students, faculty, and staff get up and running quickly and find the information technology environment completely natural. As one would expect in a university, we have ongoing requests to improve and add features, and will continue to do so.

Difficulty

This has been an immensely challenging deployment because of limited funding, staff, and a very tight and inflexible time line. The campus had to be able to process student applications on a given date, admit students on a given date, and start classes on a given date. Plans for services such as e-mail and networks needed to start moving before technical staff with the associated



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skills were in place.

In addition, the usual governance processes were also lacking. We started building information technology infrastructure before any faculty were on board. When the first dozen faculty did arrive, although they were concerned about information technology, the lion's share of their time was focused on building the curriculum and individual courses, getting their research going, and creating the academic rules and framework within which the University operates. So we had to make a number of assumptions and move forward with a minimal amount of advise and consent -- otherwise we never would have been able to complete the implementation in time.

Our ability to meet the challenges came from a combination of elements. As CIO, I was able to meld previous experience with the UC Merced objectives and circumstances to produce a vision and strategy that served as a roadmap. I had strong support from the campus leadership, but still in the context of very limited resources. Several of our commercial partners went to unusual lengths to help us acquire products at an affordable cost and to get our implementations configured and going. But most of all, a small, but incredibly talented and dedicated staff, picked up the vision and never stopped running towards it.

For the record, our campus opening would not have been possible without the assistance of two of our sister campuses, UC Davis and UC Los Angeles, but their support was primarily on the administrative system side, as opposed to the deployment described in this case study.

In the context of significant resource contention, there was originally some sentiment that the identity management system was a "luxury" that could be deferred to the future. We successfully made the argument that there was a choice between building identity management or creating a large set of independent interfaces, but that the cost would be incurred in any case.