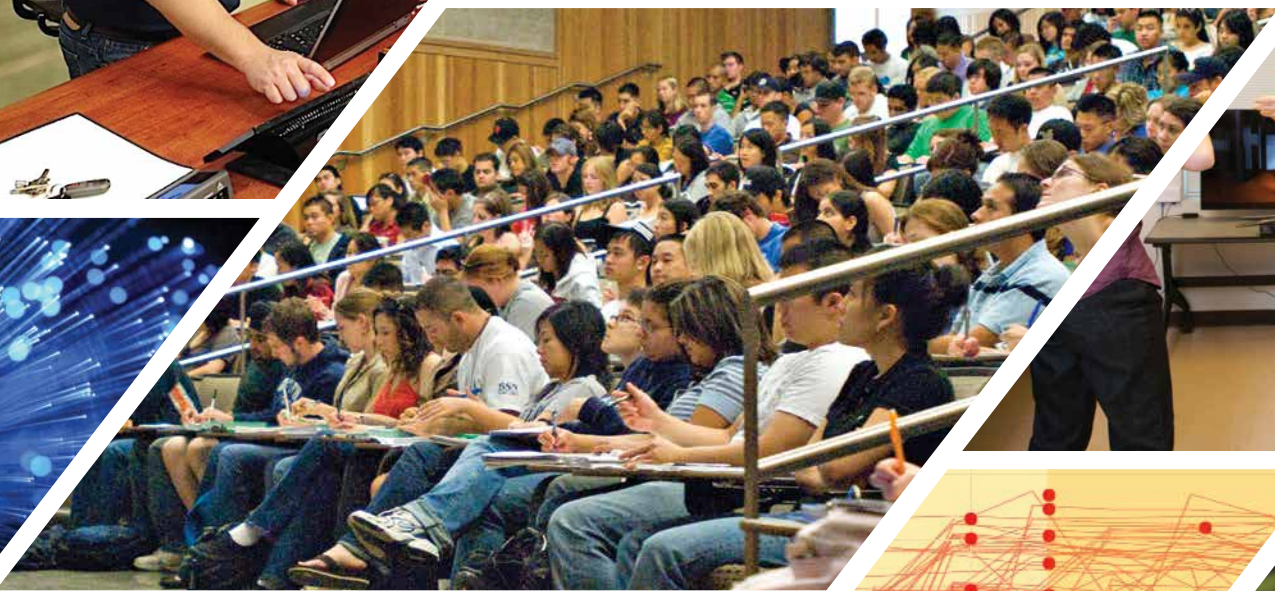


2017 Technology Highlights

A report from the CIO on how campus technology supports instruction, research, and service



UCDAVIS

A story of advances and achievement

As a campus, we're making progress in the ways information technology supports the UC Davis mission. This report offers a few stories that illustrate that progress, from efforts to help researchers secure their data, to an inventive program that uses immersive technology to expand the study of drama.

As chief information officer, I'm keenly interested in how we can best amplify and extend this progress.

A crucial element is our ability to collaborate across the campus, identify common priorities and themes, and then work together to meet those needs. Synergy will help us achieve our shared goals. Working independently, we individually will never have enough resources for IT to meet the collective challenges of supporting a growing student population, addressing emerging cybersecurity threats, or optimizing the use of administrative computing. But addressing shared needs together—dealing with repeatable, overlapping tasks in a common way—frees IT staff in departments to work on the specialized needs in their areas. This is a formula for progress.

The work in these pages does not necessarily involve Information and Educational Technology. We lead some of these projects. For others, we assist, and for some, we simply admire the innovation. As food for thought, this report also includes a sample of statistics about campus IT, a list of services that can assist faculty, students and staff (with a link to the IT Service Catalog for more information), and a snapshot of how students use technology in 2017.

I want to conclude with this striking photo of a new graduate during commencement for the College of Biological Sciences. This image reminds us why information technology matters—not for its own sake, but because IT supports the research, instruction, and everyday transactions that help individuals, and the campus collectively, achieve the transformative goals that moments like this one represent.

To all our colleagues across the campus: Thank you for helping us support UC Davis.



Viji Murali
Chief Information Officer
Vice Provost for Information
and Educational Technology
UC Davis



A new graduate, holding a phone to her ear, waves to the crowd at the College of Biological Sciences commencement. Photo by Karin Higgins/UC Davis



From left: Jonathan Martindill, Andrew Holguin, Steve Pigg, Kendra Olmos, Thomas Ryan, Nathan Hatch, Sumiko Hong, Gabriel Paras, and Professor Frank Loge.

TEAMING UP to secure research

YES, the utility told UC Davis Professor **Frank Loge**, you can use our data for your research. But first you must verify that you're meeting strict requirements for securing data.

What Prof. Loge did next has turned into a collaborative effort that should assist researchers throughout UC Davis who face similarly rigorous security requirements.

Prof. Loge, director of the Center for Water-Energy Efficiency and professor of Civil and Environmental Engineering in the College of Engineering (COE), conducts research in areas of water, contaminants, and treatment technology. He often works with public utility districts in California to get information about consumers and infrastructure.

Researchers commonly sign security agreements so they can use protected data, but the standards are increasingly strict, and the liability and consequences of a data breach are growing. The status quo isn't enough. Nor are unverifiable assurances to data owners that there won't be a problem.

Loge's group does much of its own IT work, but rather than try to meet the utility's standard on his own, he discussed ideas with **Steve Pigg**, executive director of Information Technology for COE. Pigg then brought the Information Security Office and other areas of Information and Educational Technology into the discussion.

Collectively, they are working on what could grow into a campus service that provides a secure shared infrastructure that protects sensitive research data, makes clear who is responsible for protecting it, and verifies compliance.

The service would help UC Davis researchers obtain and protect research data they need, minimize their exposure to data breaches, and support secure work with data in the cloud, via such vendors as Amazon Web Services or Microsoft Azure.

They'll align with the requirements of NIST 800-171 (National Institute of Standards and Technology) and Santa Fe Group Shared Assessments, widely accepted standards for securing information. NIST 800-171 sets out requirements that apply to "controlled unclassified information" shared by the federal government with contractors, universities, and similar institutions. Non-government parties also accept NIST 800-171, and it is becoming a benchmark for data security requirements of all kinds.

Phase one of the UC Davis project will produce a system that Prof. Loge can use to work with the utility's data. From there, Pigg says, "we need to build out the system's foundation with components, and this is where IET can contribute—with architecture, the implementation of foundational services, and so on." If a service emerges, IET is likely to manage it for the campus. The Office of Research is also involved.

Decisions remain about how to build the service and cover its costs, but the need is clear.

"We're creating a standard the campus can use to counter liability responsibilities," Prof. Loge says. "This is key for researchers to understand. They're liable if data is exposed, even if they might not think so."

"I'm just a case study," he says. "We're building this for the campus."

IET employees working on this project, page 12.

'Having one place that integrates all this is really liberating'

Robert Blake, distinguished professor of Spanish linguistics, believes strongly in UC Davis Canvas. He was one of the first faculty to start using it in 2016, and is glad to share his reasons, which start with the way the new campus learning management system (LMS) works with video. It is central to how he teaches Spanish.

"Learning a language requires the use of the four skills: reading, writing, speaking and listening," says Prof. Blake, who supervises online language courses, teaches several upper-division courses in Spanish linguistics, and directs the Davis Language Center. Assigning frequent, short videos "really allows you to do oral testing. In languages, that's crucial. We couldn't do this before."

Here's a typical example. He assigns a question to a student, who responds in Spanish on video.

Prof. Blake has set up Canvas so it automatically shares the student's response with a number of other students, who then watch the video and attach their own comments. Throughout, Prof. Blake can see all the work—the answer, the comments, and any discussion that follows.

This easy use of video "allows you to harness time outside of the classroom, so students can work more on their oral proficiency," he says. "From an instructor's perspective, I'm getting more of their time." With SmartSite, the LMS that Canvas is replacing, Prof. Blake says students had to use different systems to record, produce and upload videos, and sharing them was harder.

A top change for 2016-17

The transition from SmartSite to UC Davis Canvas is a top change in campus tech this year. UC Davis chose Canvas as its new LMS a year ago, following a fresh look at what faculty and the campus require from an LMS, a review of options, and tryouts of three alternatives.

Canvas has caught on quickly. In winter term 2017, almost all UC Davis students were using Canvas for at least one class, and 75 percent of instructors were using it

to teach their courses. SmartSite, in use since 2006, will be retired for teaching after spring 2017.

Canvas offers much more than the easy integration of videos in assignments, of course.

Prof. Blake likes using its modules feature to organize and present his classroom materials for each day of instruction. He likes the way Canvas "clearly keeps track of everything, such as due dates and cutoff dates. It facilitates things you could do before, but digitally, which makes them harder [for students] to avoid."

He likes its compatibility with various content formats, "such as PowerPoint, PDF, slides, Keynotes, and illustrations. And you can write your own pages with rich text, which is like writing web pages on the fly, which is what rich text is supposed to do."

And then over the course of a quarter, the evaluations of all the work he assigns flow down to the Canvas grading tool (SpeedGrader)—comments from peer reviews, comments he enters, homework results, test scores, more. The tool provides a customizable scoring rubric. He likes the high level of organization.

Prof. Blake says lower division language courses for first- and second-year students, nearly 1,000 students total, are using Canvas. "We've already embraced it," he says. It's getting "very high positive rating comments."

And he will aggressively explore other ways to use Canvas. "To teach languages, we have to use all the senses we can," Prof. Blake says. "To have one place that integrates all this is really liberating."

"SmartSite was just sitting there. It provided resources, and a crude communication system," he says. "Canvas is better. It's all in one."

Find more at
movetocanvas.ucdavis.edu

IET employees working on this project, page 12.



Robert Blake

A GLANCE at a few key stats from campus tech

4,000

Number of wireless access points on campus

10,066 hours

Average daily # of time available on computers in IET-managed computer labs

2 petabytes

Total amount of data storage capacity in campus Data Center

If 1 byte = 1 grain of sand, then 1 petabyte = a cube of sand 40 stories tall

175,000

Malicious contacts blocked (by central campus intrusion prevention system) from campus network daily

30,446 hours

Amount of time people spent watching videos of classroom lectures, recorded by Academic Technology Services video, fall 2016

33,000

Average weekday peak number of concurrent wireless device connections to campus network — up 18 percent from year before

1,700

Number of courses using UC Davis Canvas, start of winter term

322,529

Visits in 2016 to IT Knowledge Base

25%

Students who have at least one class in a computer classroom

250,000

Number of sessions (rough estimate) involving public ucdavis.edu websites per day

15,500

Number of campus phones (VoIP and analog, desk and cell)

7 gigabits

per second. Data flowing over main campus connection to Internet (weekday afternoons)

53,916

Service contacts in 2016 to IT Express (phone calls, chats, emails)

144,000

Number of active campus computing accounts



Play the game! ciohighlights.ucdavis.edu/game

New programs + teamwork = better cybersecurity

As hacks go, the one that redirected Google search traffic from a popular UC Davis website to pharma-spam pages in Canada last year was short-lived and relatively minor.

Still, it could have been serious, and the way it was resolved illustrates the teamwork the campus is pursuing in information security. The cooperation is expressed both in new programs, and simply by encouraging different parts of the campus to work more collaboratively to protect data—UC Davis', and their own.

This particular hack surfaced one afternoon when UC Davis information security consultant **Jevan Gray** ran a Google search using the term “viagra site:ucdavis.edu.” Universities are constant targets of malicious cyber-attacks, including ones where hackers redirect searches from responsible locations to junk sites. He wondered if that was happening here.

“My search queried for the term ‘Viagra,’ but only for websites in the ucdavis.edu domain,” Gray says. “What I saw in the results were several hits for content promoting Viagra, and other legal drugs for sale, that were obviously not related to valid university business.”

He alerted the administrator, who fixed the problem. And then—this next step is important—the administrator talked about the incident at the next meeting of the UC Davis IT Security Committee, so the campus could learn from it. Other campus tech employees have been similarly open, overriding the more common instinct of saying

nothing about such hacks for fear of being criticized.

The Information Security Office (ISO) is working on several programs, some new, to improve cybersecurity. Like the resolution of the pharma-spam hack, they require stronger cross-campus collaboration. Here are five of the key initiatives:

- A partnership program. Chief Information Security Officer **Cheryl Washington** will talk individually with department leaders, to understand their security risks, needs, and common issues. The goal is to build relationships and connections on issues of information security, and to find the best ways to work together.
- Risk assessments. These reviews, already required by UC policy, are likely to gain more importance when the next edition of the UC security policy takes effect. They help departments understand and set priorities for addressing the risks they face, based partly on the department's answers on the (usually annual) campus Cyber Security Survey. The ISO wants to identify areas with the most risk, and offer help to lower that risk.
- Help meeting payment-card industry (PCI) standards. To the industry, UC Davis resembles one big

merchant that processes payments for anything from tuition to lunch. Tough PCI standards cover areas ranging from building and maintaining a security network, and protecting cardholder data, to controlling access and managing vulnerabilities. The ISO is helping campus units meet the standards.

- Vendor contract review. If any unit buys a service or product that uses sensitive UC Davis information, then the ISO reviews the contract to make sure the data is secured.
- Security Operations Center. The ISO has created a group of information security analysts who look for, analyze, respond to, and help prevent incidents. Gray is one of its members.

There are other programs besides these (community outreach, policy development, and training, to name three), all based on the principle that information security is not just a concern for technologists. “Collectively, we’re not protecting machines. We’re protecting research, reputations, health records, and other private data. That’s why teamwork is vital,” Washington says.

“There’s a big misunderstanding that cybersecurity is about IT,” she says. “The asset we’re protecting is information. Everyone is involved in this.”

Information Security Office employees, page 12.



TECHNOLOGY,

often invisible, accompanies students throughout the day

Meet Lin. She’s a composite of different students, and if we follow her through a typical weekday we can learn a thing or two about how students use technology at UC Davis.

She employs a mix of tech, some created here, some adapted here, and some that she simply likes. Some services she’ll know she’s using, and others she’ll barely detect. In that sense, a campus service like login authentication resembles the ignition switch on your car. You only notice if it fails.

As Lin leaves her apartment this morning, she takes her smartphone, laptop, and earbuds so she can listen to Spotify while riding to campus on Unitrans. Unitrans’ site (there’s also an app) shows the bus is on time. When it pulls up she climbs aboard, finds a seat, and checks her DavisMail account via the Gmail app. She texts a few friends, hears back from a couple. The day is starting well.

She exits at the MU station and connects to eduroam as she walks to the Coffee House. She checks Facebook while waiting to buy coffee, then sits at one of the CoHo’s tables. She unfolds her laptop and gives her homework a last read before using the course site in UC Davis Canvas to send it to her instructor.

She checks other course sites for posts, then shuts her laptop and heads to her first class. It has about a hundred students, most looking at laptops, tablets or phones on their fold-out desks. The students focused on the class type notes during the lecture, or use a stylus to write on their tablets. A few take notes on a PowerPoint printout of the day’s lecture, which the instructor had loaded in advance on the course site.

After class she needs to print a letter (some places still want hard copies!), so she sends the file wirelessly to a printer in the computer room in 2101 Student Community Center. She’ll pick up the letter in an hour or so, then use the room’s Adobe Premiere software (2101 SCC is also a media lab) to do more edits on a video due next week.

Tech after lunch

But first she’s meeting a friend at the Silo for lunch, and uses Venmo on her phone to pay her part of the tab. They talk about Tercero, where they were roommates. For fun they check Aggie Dish to see what the commons is serving today.

Her friend has to leave, so Lin catches up on other things on her list. Another friend’s text says he put their team project in a Box.com folder. Most students she knows would just have emailed it. She uses DropBox—is Box like that? She Googles for instructions. She can always open a chat session with IT Express if she can’t figure it out; they’ve helped her solve access problems before.

On other days she might go to UC Davis sites and apps to schedule classes, pay tuition, make appointments, learn about creating a good resume, check syllabi, find her grades, or ask questions. Today she heads to 2101 SCC to get the letter and work on her video, and then she’ll go to her next class. This one’s old school. The professor wants all devices turned off.

After class she checks DavisMail and Instagram on her ride home.

In her room she plugs in her laptop and looks up library materials, using a virtual private network to access Melvyl, UC’s online library catalog. Then she heads to a friend’s for dinner and to stream a movie (legally!) on their smart TV. In her room again a few hours later, she signs in to the IET Virtual Lab. She has to finish a math assignment, and can use their specialized software from home. She submits the work at midnight. Then she cracks open her reading for another hour or two. The texts are a mix of print and PDFs.

And then she puts down her phone. Another day done.



Nancy Nguyen, all-day tech user

Direct Connect, stronger wireless: Preparing the network for a varied future

Picture the campus network as a spectrum. At one end you have esoterica like Amazon Web Services (AWS) Direct Connect. At the other end you have the internet of things, extending even to novelties like “smart clothes.” In between you have growing volumes of everyday traffic—research data, homework, emails, transactions of any kind.

The campus is building its network to handle all of it. Accommodating the strong growth of wireless use is the major part of the work, and affects just about everyone. Other changes will be more directly valuable for researchers.

A promising connection for researchers

One of the newest features available to UC Davis and UC Davis Health customers is AWS Direct Connect, which provides a 10-gigabit private network connection to Amazon. “We’re in the final steps of putting that in,” says **Mark Redican**, director of Communications Resources and the Data Center for Information and Educational Technology.

C. Titus Brown, associate professor of Population Health and Reproduction in the School of Veterinary Medicine, already uses AWS extensively “for small-to-medium data analysis projects where our other dedicated compute resources aren’t sufficient.” Direct Connect will “make it faster and cheaper to transfer data to and from our local AWS region.

“Direct Connect removes some of the major hurdles [to using AWS],” he says. “This is especially true for the burgeoning area of data-intensive biology, in which we have to

move lots of large data sets around.”

Chip Mrizek

AWS Direct Connect has administrative uses too. **Chip Mrizek**, IT director for the Graduate School of Management, will use it with the Event Management System (for reserving classrooms and meeting rooms) that GSM runs for the campus. AWS Direct Connect

moves data without using the public internet, either to locations in the cloud hosted by Amazon or to other AWS Direct Connect locations. “It lets private spaces more readily talk to other locations, but still stay private,” Mrizek says. This is good for security.



Illustration by Mark Deamer

“My watch can’t access the parking app. What’s the workaround?”

Students? Mostly wireless. Staff? Headed there

Most of the network-related work at UC Davis focuses on the wireless side. “It probably occupies our time the most, because of the need and pervasive appetite,” Redican says. “And it affects everyone.”

Two-thirds of campus network traffic is now wireless. Although faculty and staff use both wired and wireless connections, students mostly use the latter, and staff are trending that way. To support the demand, the campus network now has approximately 4,000 wireless access points, up from 2,500 a few years ago.

The new access points are also more powerful than their predecessors, especially in locations with intense demand, including classrooms, lobbies, and popular public spaces like the Coffee House.

Students each bring an average of two to three wi-fi devices to campus, and the number of connections per person will grow as more “things” join the network, from monitors, lights, and vehicles, to clothes with sensors that measure the wearer’s vital signs.

Not every added thing requires a direct network connection. Many personal devices, such as FitBits, use smartphones as intermediaries between the device and the network.

Still, the volume of data flowing across the campus network is huge. The stream hits 7 gigabits per second via the main campus connection starting about noon on the average weekday, and stays there for several hours before tapering.

“If you include our Internet2 and Comcast connections, the total rises to 8.5 to 9 gigs per second,” Redican says. (The Comcast connection provides Xfinity On Campus television programming in residential housing.)

And no one thinks it’s done growing. A year ago, the peak number of concurrent wireless device connections to the campus network, on the average weekday, was 28,000. It’s 33,000 now.

Play the Knave expands the study of drama

For today’s demonstration, Associate Professor of English **Gina Bloom** and student **Tobi Foley** have set up *Play the Knave* in a room on the second floor of Voorhies. Tables and chairs are pushed to the wall.

They face a large screen and stand still as the game’s lens captures them as avatars, first as stick figures, then as fleshed-out characters in a scene they chose from William Shakespeare’s *Coriolanus*. Next, Foley and Prof. Bloom act out a fight described in the text. As they read lines from the screen, their avatars mirror their combat—and we get to see one of the ways that *Play the Knave*, an immersive game, enriches the study of drama.

It draws you deeper into the play.

First, it offers options. You choose the play, scene, stage, and avatar. Do you prefer contemporary clothes to Elizabethan? Done. Or if you find it more engaging to be a robot, you can be a robot. If the language is unfamiliar, you can abridge it. That’s useful for middle-schoolers new to Shakespeare, Prof. Bloom adds.

Second, adapting scenes for the game requires students to really understand the scripts and language they work with, says Foley, an undergraduate majoring in German and philosophy. She’s earning credit by adapting scenes from *Coriolanus* and *Taming of the Shrew*.

Play the Knave reduces stage fright. Prof. Bloom likes to assign performances to her students. That’s difficult in large classes, but the game offers an alternative that still delivers some of the performance experience. Students are also less self-conscious, and freer to focus on the play, because they face a machine, not a crowd.

Finally, the game gets students thinking about bodies—how bodies move, look, and interact. The body is important to drama, Prof. Bloom says, because it’s how meaning is conveyed, but “it’s hard to think about what a body is. This [game] becomes a clear way to communicate what a body is. Tech is a nice way into this subject.”



Gina Bloom

Using the campus ModLab

Prof. Bloom directs the *Play the Knave* project. She started it in fall 2013, using the resources of the campus ModLab, an experimental laboratory for media research and digital humanities. She teamed with **Colin Milburn** (project co-director), **Evan Buswell** and **Nicholas Toothman** (lead architects), **Michael Neff** (animation research and development), and several graduate students.

She showed it at the Stratford Festival in Toronto in summer 2015 with one scene, and has kept building since then. She has used it in freshman studies seminars, graduate-level teaching, and in courses on pre-1800 literature and history, Shakespeare, and Renaissance literature.

She hasn’t yet released it publicly, although other colleges and universities are interested. She has done 10 installations so far. The latest is Gallaudet University.

Prof. Bloom is not a technologist, but the work has expanded her understanding of how technology can assist her work. “*Play the Knave* moved me into the digital humanities and arts,” she says, “and I have students thinking about pursuing this field, who hadn’t before.”

Find more at playtheknave.org



L-R: Tobi Foley and Gina Bloom



Information & Educational Technology

(a partial list of services)

- Academic and research programming
- Application services
- Audio-visual engineering
- Cable television
- Classroom technology
- Client services
- Computing accounts
- Computer rooms and management
- Data Center operations
- Database support
- DavisMail
- eduroam (wireless access)
- eLearning Studio
- Enterprise services
- Faculty support
- IAM infrastructure
- Information Security
- Infrastructure systems management
- IT Express Service Desk
- IT Professional Services
- Media lab
- Media production
- Network services and engineering
- Network operations
- Project management
- Quality assurance & business analysis
- Radio services
- Systems administration
- Service Management
- Software Licensing
- Telephone services
- UC Davis Canvas (learning management system)
- uConnect
- Virtual lab (software)
- Web development

Read more about these services, and others, in the IT Service Catalog at itcatalog.ucdavis.edu



IET employees working on research security project (page 4): Cheryl Washington, Quico Gonzalez, Joshua Van Horn, Sophon Im, Dewight Kramer, Kevin Murakoshi, Chris Callahan, John Harris, David Cassada, Joyce Johnstone, Sarah Robertson, and Joncarlo Ruggieri

IET employees working on transition to UC Davis Canvas (page 5): Todd Van Zandt, Andy Jones, Charlie Turner, Steve Faith, Fernando Socorro, Tabia Lee, Constance Fuller, Simon Dvorak, Margaret Merrill, David Levin, Bill Buchanan, Brian Donnelly, Mark Thonen, Bob Cutler, Dave Woods, Gary Sharpe, JP Gorrone, Thomas Amsler, Jason Fearing, Mark Miller, Shawn DeArmond, Joseph "Joey" Van Buskirk, Alexandra Dozsa, Jennifer Gong, Vandita Anand, Benjamin "Ben" Ochakovsky, Anupya Nalamalapu, Alexandria Rockey, Kayce Mastrup, and Steve Dana

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