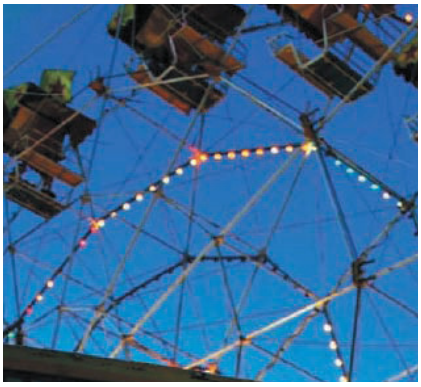
Case Study ›

PROJECT OVERVIEW

- Employs fiber as the backbone and Category 6 as the horizontal cable
- Cal-(IT)2 provides a technologically advanced real-world environment in which to conduct research incommunications and information technologies

The Ultimate Playground for IT Imagineers

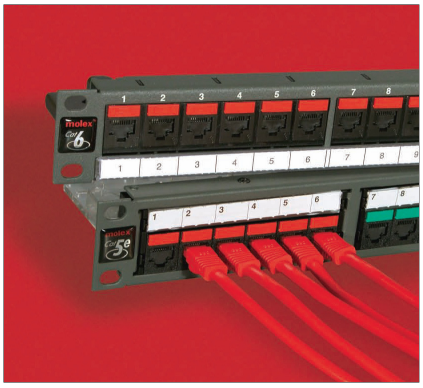


By Carol Everett Oliver, RCDD
Reprinted from Cabling Business Magazine, January 2005

When a wordsmith coined the term, “Imagineers,” it was tagged to graphic design engineers who were thinking “outside of the box” by applying new computer technologies to create artistic innovations. But, perhaps the term more aptly applies to the creative inventors of the next technologies to be utilized not only in the arts, but extends to the research in computer science for physical, biological and social sciences.

When a wordsmith coined the term, “Imagineers,” it was tagged to graphic design engineers who were thinking “outside of the box” by applying new computer technologies to create artistic innovations. But, perhaps the term more aptly applies to the creative inventors of the next technologies to be utilized not only in the arts, but extends to the research in computer science for physical, biological and social sciences.

For example, imagine taking your PDA into a mall and having it inform you which stores are having sales. Or more seriously, how about being able to create a diagnostic chip that could be implanted to monitor blood sugar levels on diabetics, or even be able to dispense small dosages of medicine into the body, as opposed to one large dosage. There are endless ways to discover new interactive causes and effects through information technology exploration, which will ultimately change the lives of future generations.



Extensive research in such technological advancements is being done at the University of California, Irvine. They have recently completed their Cal-(IT)2 (California Institute for Telecommunications and Information Technology) facility, built to provide faculty, students, visiting scholars and industrial partners with a technologically advanced real-world environment in which to conduct research in communications and information technologies. The institute’s research mandate is very broad and includes IT issues in the social sciences, education, and the arts as well as engineering and computer science. This advances IT “imagineering” to change the realms of both leisure and sciences.

Because this facility is dedicated to the research of information technology, it became top priority of the university’s IT department to be selective with their vendors to design and install a flexible communications infrastructure to handle all the bandwidth and speed needed for each aspiring project. “Because of the uncertainty of who would be in the building at any point in time and cabling requirements they would want, we needed to make sure that the pathways, cabling and active electronics would deliver flexibility for many types of networking applications,” notes Garrett Hildebrand, NACS network planner.

Network and Academic Computing Services (NACS), the IT support department, designed two data networks – one to be dedicated to the rapidly evolving

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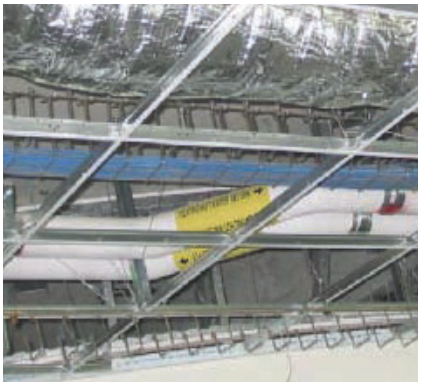
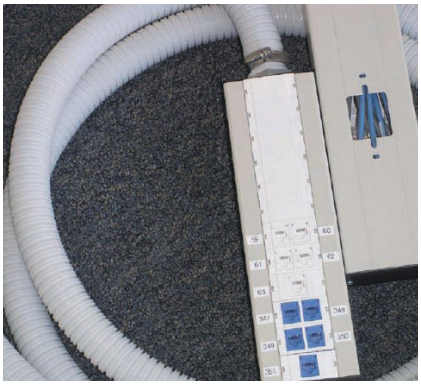


and variable projects and one tied to the campus network – using fiber as the backbone and Category 6 as the horizontal cable. Additionally, through a zone cabling concept and by running spare cable management wireways throughout the offices and some lab areas, they would become equipped to handle any cable type for horizontal connectivity that each unique project might require.

CALL IT CAL-(IT)2

The Cal-(IT)2 facility, which is 120,000 square feet, four floors, and divided into two wings (North and South), includes an auditorium, labs and two floors of modular office space for research. Some of the unique building features include:

- A clean room for nanoscale research and fabrication, such as exploring circuitry design and wafer processing; combined with a materials characterization lab to determine the structural and chemical properties of new materials for use in electronic devices
- A network lab to design and evaluate real and simulated communication systems; and another dedicated for research on wireless communications, such as antenna design and applications of wireless micro-electromechanical systems (MEMs)
- An optical devices laboratory, a studio and a multi-media lab for new media arts, which • includes virtual reality experiments, robotics, and even game networks
- A wet lab for biomedical engineering applications of IT, such as implantable microchips
- and A lab for studying applications of IT as it relates to civil structures, such as sensors that measure motion (i.e. earthquakes)



Networking Know-How

Trying to fathom installing enough networking computing capabilities in an unconventional facility could have been an IT design nightmare. “Flexibility was the key word,” states Stuart Ross, assistant director, research development for Cal-(IT)2. “Since our space is project-based, we had to organize by function to allot enough dedicated space to the evolving projects, without knowing what they would be. These are not stationary offices or people, therefore, we needed to be prepared to provide the right cabling services, connectivity and equipment when it was needed and where it was needed, on an on-going basis,” he adds. “Another important consideration was designing a separate network and infrastructure for these projects so that they do not compromise the existing campus network,” he notes.

Planning the cabling infrastructure for this facility became the endeavor of the on-campus NACS. NACS includes both computer service personnel and an academic staff to help design the IT component of their research projects. “Because we are dealing with applications that will change from research proj-ect to research project, we had to come up with a totally flexible cabling and pathway solution,” states Todd Strand, UCI’s NACS infrastructure engineer.

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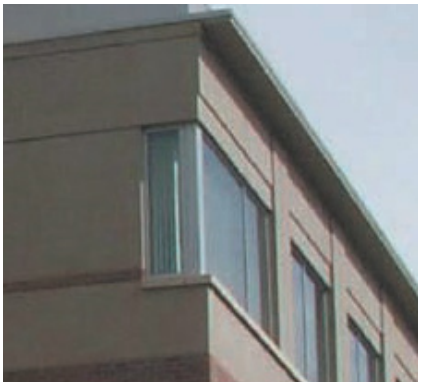
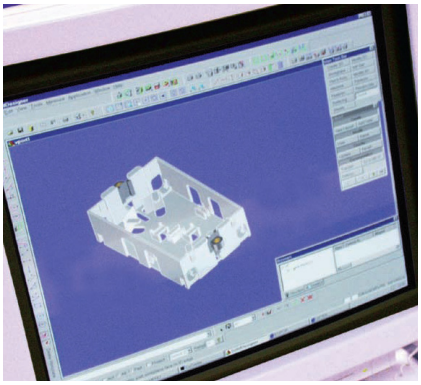


Two levels of data networks were established – called UCI Net and UserNet. UCI Net is the standard ISP service, for which NACS provides the cable and electronics used for Intranet and Internet, including E-mail. “UserNet is only within this facility and is an additional infrastructure dedicated to the experiments and projects within the facility, without having to disrupt the campus-wide security protocols of the campus data network, UCI Net,” notes Ross. The electronics were designed to provide a 10 Gigabit Ethernet backbone between floors and auto-sensing 10/100/1000 Mb/s to every UCI Net outlet in the building.

UserNet allows the user to connect to patch panels and to active equipment either in the telecommunications closets, server rooms or directly at the user’s desk, through MUTOA’s (Multi-User Telecommunications Outlet Assembly). UserNet also allows people to bring in any media into the building and connect it to their own active equipment. “This allows researchers to construct their own network. Therefore, if two ‘mad scientists‘ want to try something unique, they can put their own electronics on either end of the cable. They also have the capability from their office to control a device in a lab area through connectivity in the patch panels,” further explains Ross.

Cabling Building Blocks

“Although everyone’s wish was to put singlemode capacity to every work-station outlet, we knew that this was not necessary. Gigabit to the desktop is the most that we would need, including applications such as Voice over IP, and this is certainly achieved through today’s high-end copper cabling,” Strand notes. “Additionally, we needed to look at ‘what-if’ scenarios and come up with a method to make sure that we could easily incorporate fiber optic cable to certain areas. This meant being creative with our pathways and the products we selected,” he adds. Therefore two levels of cabling were provided – one stationary and one flexible, on an as-needed basis.



For the stationary cable for both networks, Strand selected a totally mod-ular cabling system from Draka-Molex Cabling Systems (the technical partnership of Draka Comteq, www.drakacomteq.us and Molex Premise Networks, www.molexpn.com), which included a singlemode and multimode fiber optic backbone, plug-and-play fiber cassette termination and Category 6 cable for the horizontal. Additional horizontal zone cabling terminated to MUTOAs allowed additional services to office and modular furniture. The intricate pathway system for the cabling was a Snake Tray system, provided by Cable Management Solutions, Inc.(www.snaketray.com).

The main cross connect is located on the first floor. The IDF’s are stacked the first floor. The IDF’s are stacked and connected with Draka Comteq’s 12-fiber singlemode and 12-fiber multimode cables. There are also two server rooms on the third and fourth floors for additional electronics and passive equipment needed by project individuals.

The fiber optic cable is pre-terminated with pre-cut 12-fiber ribbon cable into

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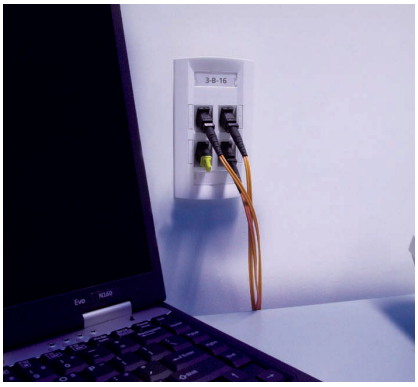
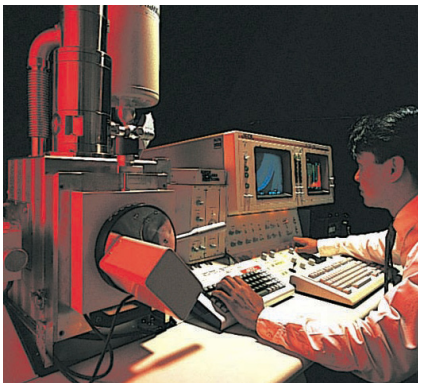


Molex's self-contained ModLink cassettes. "These cassettes eliminate splicing and time-consuming field termination," states Wayne Brushett, principal of Data Cabling Solutions (Mission Viejo, CA), the manufacturer's representative for Draka Comteq, Molex Premise Networks and Cable Management Solutions (Snake Tray). "The 12-fiber cassettes convert the MTP interface into an individual standard ST, SC, FC, LC or MT-RJ coupler allowing users to easily plug and play. The ModLink acts like a connector and allows any type of fiber optic connectivity," he explains. "The true savings was in the installation time and labor costs as the entire riser system was installed, terminated and tested on one day," adds Brushett.



"ModLinks will play an important role in the research areas, as we now have the flexibility to pull fiber to any location. It can easily connect to active electronics in the server rooms and allow fiber connectivity to other workstation locations. Therefore, we would only need to pull fiber where it is needed, when it is needed," further notes Strand. They specified Draka Comteq's SuperCAT1000 Category 6 as their horizontal cabling standard. "Although Voice over IP, as well as QoS (Quality of Service) and PoE (Power over Ethernet) was not specified in the original plans, we were able to reconfigure each location to handle these applications with this cable and through our additional pathways," notes Hildebrand.

A high capacity of Draka Comteq's SuperCAT 1000 plenum-jacketed cables was placed in Snake Tray's double pocket 201 Series from the closets to the workstations for UCI Net's horizontal cabling. "Rigid cable trays or baskets would have required multiple tiers, which would have resulted in excess material and labor costs," notes Strand. "The double Snake Tray has the capacity for holding a high volume of cables, as well as the flexibility to weave through tight spaces due to HVAC and supplemental systems located above our ceiling," he notes. Snake Tray only requires a single threaded rod to support this vast amount of cable, and does not need additional support apparatus. Mounting rings, called "Snake Eyes" are built into the tray and offer the installer a simple way to attach the tray to the rod. Two hex nuts and a flat washer are all that is needed. "Basket tray would have required, at a minimum, two threaded rods and some type of attachment hardware," notes Scott Jacobitti, national sales manager for Cable Management Solutions, Inc. "Each Snake Tray bend scenario took less than a minute to create, whereas each directional change for rigid baskets would have taken approximately 10-12 minutes. That is a 95 percent savings in labor cost," he adds.

"The flexibility of the Snake Tray cable management system for the hori-zontal cabling allowed the trays to be bent and shaped, by hand, into complex shapes along both lateral and vertical planes around impediments found in the plenum area such as HVAC ductwork," notes Brushett. "Together, with the cost savings in the labor, as well as allowing room for future growth, makes this a classic example of why the Snake Tray was selected as the cable management system," he adds.

The location of workstation outlets depended on whether the area is a lab or office

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space. For example, there are multiple data jacks in the ceiling and along the walls in the media arts lab to provide connectivity to devices, such as cameras or projectors, when and where needed. Connectivity to the lab areas on the lower floors allows direct networking access to the research offices located on the third and fourth floors.

Six-port Molex USO II single-gang outlets were installed in the labs and offices. As a standard they were each terminated with four SuperCAT1000 cables, which were color-coded white or gray for UCI Net and blue for UserNet, to four color-corresponding Molex DataGate jacks. Two blank ports were supplied for future applications. “The DataGate jacks were selected because they are springloaded, which means they are closed when not in use. They maintain clean and secure connections, providing protection from dust and contaminates, which is very important in this facility where there will be a lot of connects and disconnects of devices,” explains Brushett. In areas where durability was a factor, stainless steel outlets were installed.

All white UCI Net jacks provide 10/100/1000 mb/s powered connections. The blue jacks, which are terminated in the wiring closet for each floor for the UserNet, can be extended via the riser to any other floor and to any location in the building or to any networking device on an “on-demand” basis.

Perpetual Pathways

“We did not overcable, but we ‘over pathwayed’ this facility, since the design premise was flexibility,” states Ross. “We wanted to make sure that we had enough conduits and cable tray in place when we needed to add cable.”

There are four conduits between the floors for the riser, with only two initially populated, allowing for growth and also for additional cable when needed for the UserNet system. Additional horizontal conduit and Snake Trays were installed in some lab areas to permit bypassing of future cables without disrupting these sensitive areas. “Making sure we put in enough conduit and adhering to fire stopping codes when going through walls was important to do before rather than later,” adds Strand.

For additional Category 6 connectivity for the research offices on the third and fourth floors there are innerducts that stem off of the horizontal pathways and are connected to MUTOAs for zone cabling. To allow for additional cable for unique applications that may be required by individual projects, there is an exposed secondary pathway of Snake Tray below the ceiling grid.

“I’ve seen research facilities where temporary cables are taped onto the floor or hung over modular furniture walls,” notes Strand.“The single-pocket Snake Tray solution was selected because it could follow the line of the ceiling grid and allow turns around columns and also be attached to hard-walls,” states Jacobitti, “This provided the additional pathway for UserNet’s temporary cables from active

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equipment in the server rooms out to the workstations, while providing a safe working environment. When each project is complete, the cable is removed and the pathway is there for the next one," he further explains.

The additional cable management was uniquely suspended by two guy wires from the ceiling cement slab, forming a "V" to a bolt on the exposed drop ceiling grid, which subsequently provided additional support to the ceiling grid, while not damaging the ceiling tiles.

Zone cabling enhances homerun wiring by allowing active components to move out to hardwall and modular offices. Sensibly placed 24-port Molex MUTOAs will preserve the long-term integrity of permanent wiring from closets to termination, while giving flexible points of demarcation. Five UCI Net and five UserNet Category 6 terminations were provided to each MUTOA, but the available blank ports could be used for any media, including fiber optic, by connecting to the fiber cassettes in the closet and running fiber optic cable through the exposed cable pathways.

Making Mountains Out Of An Anthill

"The UCI acronym has been dubbed to also mean 'Under Construction Indefinitely' by students, faculty and alumni for many years because of the ongoing construction of new buildings, as well as, reconstruction on campus," notes Strand. With more than 23,000 students, 1,300 faculty members and 8,100 staff, UCI is the fourth largest campus of the University of California system. The main campus, which was originally main campus, which was originally built on ant-infested fields, hence the students selected an anteater for their mascot, now encompasses 1,476 acres on the main campus and an additional 42 acres for the Medical Center.

There are plans to construct many new facilities for research and development pertaining to the many areas of science, as well as retrofitting an entire dedicated backbone campus ring that will consist of singlemode fiber from Draka Comteq's long-haul fiber division (formerly Alcatel). "As long as technology evolves, so will the campus of UCI," maintains Strand. "The possibilities to our imagineering seem to be infinite."

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