

# The SuperLab at University of Technology Sydney

Sydney, Australia

CASE STUDY | EDUCATION

## → Challenge

Create a system that provides intuitive, simple control of a multi-modal video and audio delivery scenario.

## → Solution

A fully integrated Crestron system that manages a DM switching and transport layer alongside control and routing of IP Video, Audio and Lighting.



## UTS realises leading-edge science education facility with Crestron

The moment he was briefed, project manager Rob Hardy knew he was taking on one of the toughest challenges in AV design. A ‘SuperLab’ was planned as the centrepiece of the new Science & Graduate School of Health Building at the University of Technology Sydney (UTS). Ranked as the No. 1 young University in Australia, UTS is one of the largest universities in the country with a total enrolment of over 40,000 students and 3000 staff.

But just what is a SuperLab? The idea of a SuperLab had been around for only a decade, but it was already established as a new category of teaching room. The first SuperLab was built at the London Metropolitan University and it quickly gained a reputation as a key tool for improving passing grades and enhancing retention rates amongst first-year Science students.

A SuperLab must allow many classes to run in the space at once, and be able to instantly reconfigure to allow an instructor to address any sized class — from as little as a dozen to as many as 200 students.

It sounds easy if you say it quickly, but facilitating two-way communication between a demonstrator and a class undertaking practical chemistry or biology experiments is already taxing. Adding the requirement for different groups to work side by side without interrupting each other takes the audiovisual task to an entirely new plane. Match that with the need to



Leveraging the flexible Crestron control capabilities yet again, the UTS solution was brilliant



The design of the SuperLab aims to facilitate the ‘buzz’ of a multidisciplinary environment while ensuring students feel part of an intimate class group.

configure up to 12 different sized classes on the fly and you bring the audiovisual design to the very edge of the possible.

Fortunately, they already had an ace up their sleeve — a long-term relationship with Crestron.

## Scoping the Challenge

The UTS vision was for a state-of-the-art SuperLab 52 metres (170 feet) long, with space for 220 students. The 26 workbenches seating eight students were to be fitted with touchscreen PCs and microphones, to allow up to 12 classes to work concurrently. Every second bench would feature a demonstration station for teachers, while multiple break-out areas accommodate group work and informal meetings.

From the experience in London, it was clear that this SuperLab would require bringing together complex video matrix switching, two-way multi-frequency wireless communication and IP video links direct to each student computer. So the critical element was the creation of a flexible yet intuitive control system that could invisibly manage these disparate elements.

From the earliest stage, UTS designers knew they wanted to use a Crestron control solution. “We’re a Crestron house,” noted Rob Hardy, Senior Project Manager at UTS Audio Visual Services. “We’ve always had really good relations with Crestron and they’ve been fantastic”. UTS is a heavy user of Crestron control and switching solutions and employs Crestron Fusion RV (Room View) to manage all the myriad AV systems throughout the dozens of buildings in its downtown campus.

While control aspects were on track, Rob knew that the next problem would be routing and transporting the many vision sources involved with the multiple simultaneous classes. So early in the design phase Rob briefed Bignesh (Vicky) Dayal, the University’s long-term Crestron contact, about the project and sought input on the technical challenges involved in video distribution.

“One of the first things that came to mind,” Vicky recalled, “is that Crestron Digital Media (DM) is a proven architecture, it is in hundreds of rooms already in UTS. It’s something they depend on so we looked at their specifications and started to work on a design using DM.



“Within Crestron we have a Tech Sales design team, who do ‘proof of concept’ designs and then build a prototype to show how it will work,” he explained.

## Demonstrating a Solution

The proof-of-concept idea would prove crucial. UTS set up a dedicated space to build a student bench and two teaching stations with Crestron coming on board to provide prototype systems for testing.

The brief called for 12 demonstrator stations, each with a PC, a document camera, a wireless input for a tablet PC and wired inputs for laptops, microscopes and other experimental equipment. Video sources could be switched to selected wall mounted monitors between each pair of benches and were also to be delivered direct to a PC at each student position. Demonstrators would each have a wireless headset to allow them to have two-way conversations with students in their class group.

It quickly emerged that the Crestron DMPS-300-C all in one presentation switcher would be the ideal core for each of the twelve teaching stations. The system would provide local control, as well as video source switching and audio de-embedding and mixing. Output signals would then be routed to the central equipment rack via Digital Media across a single Cat6a cable. At the rack a Crestron DM-MD32x32 Digital



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Media Switcher provided outputs to the monitors as well handling the combining tasks feeding signals back to the benches. One problem solved, three to go!

To provide feeds to the student PCs, the UTS team turned to IP transmission and hit upon a novel method for routing the signals. Each station was equipped with a streaming encoder fed by a separate HDMI output from the DMPS-300-C. Each demonstrator’s stream had a unique URL and each student PC decodes and displays the stream using a software player. Then came the clever bit. When the demonstrator selected a student to be in a group, the Crestron control system used software scripting to force their computer to open the software player and tune in to the correct demonstrator stream from the twelve available. Two problems down, thanks to flexible Crestron control over IP!



## Unravelling the Audio

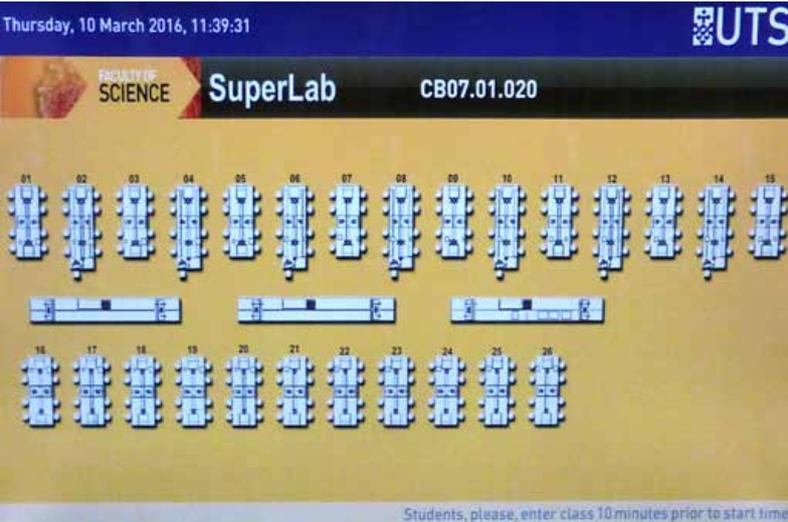
Now, as Rob Hardy recalled, things got tougher. “The surprising thing was the audio,” Rob said. “We anticipated that the switching to make the space adaptable for different size classes was always going to be a problem. But it became apparent very quickly that to find a two-way audio solution for 220 students in up to 12 groups was going to either be really, really costly — or very hard. We tried various different manufacturers, and different industries as well, just to find out if there was anything out there that would help us with the two way communication. We even looked at smartphones — but that wasn’t very practical.”

Finding enough spectrum space was difficult so UTS finally settled on a hybrid solution. Each of the 12 demonstrators was equipped with a Sennheiser radio microphone and headset monitoring system on a different channel. Back at the central rack, the receivers and transmitters were connected to an audio matrix. From the matrix, any desired demonstrator’s microphone could be sent back via cable to any selected student bench. At the bench, a Williams Sound transmitter operating in the 2.4GHz band provided signals to eight pre-tuned receivers and headsets for the students. But what about if a student wanted to talk back?

## Go Time with the Traffic Light

A wireless microphone per student was out of the question — there weren’t enough clear channels, and anyway how could you control and direct all the traffic from 220 student transmitters? Leveraging the flexible Crestron control capabilities yet again, the UTS solution was brilliant — traffic lights!

A bollard was built into the bench between each pair or students. At the top, was a signal light tied back to the Crestron control system. When the instructor started a session, this light would illuminate in blue to signal the students to put on their headsets and listen in. If someone needed to ask a question, they pressed a button on the bollard which turned their bollard ‘traffic light’ orange to warn the instructor that someone wanted to speak. This also brought up an indicator on their instructor’s Crestron control panel. When a teacher was ready to take the question, they touched the indicator on their screen, which activated a microphone mounted on that student’s bollard. This allowed teachers to easily see when there was a question and avoided the cacophony that might ensue if a number of students tried to talk back at once. There’s also a ‘panic button’ on each bollard that turns the light red if someone needs immediate assistance.



## X-Panel Marks the Spot

By this stage, there was an awful lot for the control system to do. It needed to switch video; direct IP streams; route two-way audio; control and respond to traffic lights — all from up to 12 locations at once. Fortunately Crestron, and the UTS programmers, were up to the job and had been developing the control strategy alongside the hardware design on the proof-of-concept system.

Knowing that a clear graphical interface would be crucial, the designers chose to use the Crestron X-Panel which placed a virtual touch panel directly on instructors' PC screen. This gave plenty of screen space (up to 24 inches) for the interface when needed and freed up precious bench real estate by using one screen instead of two. The key element would be devising an intuitive way for each instructor to select the correct benches to include in their own group.

Rob Hardy explained succinctly how the final design works. "There's an icon on the desktop when they start. The icon opens a full-screen plan of the super lab so they can see where all the benches are. They just select, by physically touching, each bench that they want to be a part of their group, then they press Begin Session to start the session. On the next screen that comes up they can drag and drop any source to either



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the wall monitors or the student PC screens. Once that is happening they can minimise the X-Panel window or take it down in size and they've got access to the rest of the computer and the network if they wish."

The end result is so elegant that it looks almost simple, but there's a lot of work and more than a little Crestron magic that went into the design, testing, installation, interfacing, programming and commissioning to achieve that simplicity.

## Meet the Team

### UTS Audio Visual Services

Senior Project Manager: Rob Hardy

AV Designer & DSP programmer: Raife Merchant

AV Applications & Systems Integration: David Connolly

Commissioning Technician: Josh Thomas

Guidance & management Support: Reg Collins

Audio Visual Consultant: Alder Consulting