Extron AV Technologies Empower Advanced Healthcare Training at BCIT

Extron

The various bed station systems can be monitored and operated from a workstation within the associated control room.

Lab bed stations feature a myriad of medical and AV equipment and a human patient simulator with interactive AV capabilities.

CHALLENGES

British Columbia Institute of Technology (BCIT) in Vancouver, British Columbia, needed more space to meet the ever-increasing need for well-trained healthcare professionals throughout the province. BCIT's School of Health Sciences built the new Health Sciences Centre (HSC) on their Burnaby campus to meet this demand. To bolster theoretical studies with scenario-based experience, the new HSC was designed to provide collaborative learning spaces and cutting-edge medical equipment united with supporting AV technologies.

The new facility had to enhance the previous centre's technological capabilities for functionality, responsiveness, and available treatment options and opportunities. It would support the unique requirements for each of the school's 32 healthcare programs, including 17 traditional and specialty nursing programs and 15 programs covering MRI diagnostics, radiation therapy, occupational health & safety, and environmental health. Structural goals were enhancements to sight lines, noise dampening, and individual space acoustics.

AV system requirements included optimal video quality, instantaneous AV signal switching, video conversion between signal formats, pristine sound, along with needed lecture capture and streaming capabilities. Intuitive system control must be available from multiple locations, including installed touchpanels and wireless portable devices. Content had to be available for local presentation and remote display that could be sent across campus and beyond.

Each simulation lab includes as many as eight bed stations. A patient simulator is connected to the vital signs PC for that demonstration bed station prior to the lesson.

The patient simulator systems within rooms such as this High Fidelity Lab are tied to the AV system to allow two-way communication between the lab and the control room. In addition to the system operator, the instructor can observe and manipulate the treatment scenario from with the control room.

Lab systems would stitch together feeds generated by a wide variety of sources, such as computers, PTZ cameras, medical equipment, and human patient simulation manikins augmented with technology. Each AV system also had to facilitate remote, real-time observation and private as well as public communication between the lab and the control room. To meet these exacting requirements, consulting firm McSquared Design Group selected AV products and software from Extron.

DESIGN SOLUTION

Meticulous planning, construction, and rigorous AV system proof of concept testing, combined with expert equipment deployment by AVI-SPL Canada, resulted in an impressive learning facility. The four-story, 106,660-square foot (9,909-square meter) HSC is the top situation-based healthcare training facility in Canada. It encompasses active learning classrooms, conference and meeting rooms, computer labs, a divisible auditorium, and many program-specific teaching labs.

While Extron products are used throughout the facility, this case study focuses on the AV systems supporting the simulation labs that enable students to learn how to safely practice medicine within controlled environments.

The simulation labs range from hospital and medical laboratory settings to emergency response and triage environments. They provide treatment bays, technology-enhanced patient beds, crash carts with AV connectivity, nursing call systems, a medication dispensary system, and moulage kits for crisis response training. Each lab is associated with one of the control rooms and includes eight bed stations. Two beds are managed from each control room workstation, allowing multiple scenarios to run simultaneously.

"McSquared as the design consultants, AVI-SPL as the integrator, and Extron as a key equipment provider for this project worked closely together right up to system completion to provide the BCIT School of Health Sciences with one of the most advanced health professionals training sites in the world."

Marcel Schoenenberger
Principal Consultant
McSquared System Design Group Inc.

Proof of Concept testing included a comprehensive off-site mockup of the proposed labs, each with a technology-enhanced workstation bed or treatment station, and a control room that provided the full range of monitoring/operational controls and communication capabilities.

Training scenarios can be streamed to the collaborative learning spaces, stimulating discussion on diagnostic and treatment possibilities.

"Conducting application proof of concept testing has never been more important than it is today given the complexity of the AV systems and the challenges that come with it. The Extron team has played a vital part in conducting the POC testing and validating the design."

Marcel Schoenenberger
Principal Consultant
McSquared System Design Group Inc.

Around each bed are one to four PTZ cameras, a Shure® wireless microphone system, a ceiling-mounted speaker, and a wall-mounted Sharp® 50" display. The PTZ cameras mounted above each bed capture scenario activities for streaming/archive and facilitate observation and interactivity with the control room operator. Specific bed stations add a 24" monitor on an articulated boom arm, two HDMI inputs dropped down from the ceiling, a wallplate with at least one HDMI input, and a fixed lens camera built into the surgical light fixture. Some demonstration bays also feature specialized medical devices such as a doppler ultrasound or kidney dialysis machine.

Displayed content can include any combination of vital signs from the patient simulator or a computer, other computer- and equipment-generated health data, and the PTZ camera feeds.

Linked to the AV systems are the LMS, the Health Capture & Debriefing System – HCDS, and/or the Kaltura® lecture capture content management and hosting service. The installation can capture up to four video streams for simultaneous display in a quad-window layout at 1080p or a video channel displayed full screen in 4K. Each stream is also archived for later playback.

The facility includes over 50 portable human patient-simulator manikins. Each bed provides one of these manikins connected to the AV system along with specialized medical equipment. An Extron TouchLink® Pro 10" touchpanel is mounted on the headboard to control system operations. The manikins can present a wide array of ailments, and many can mimic one or more human reactions, such as bleeding, groaning, and crying. Each patient simulator has a built-in speaker, and most feature a microphone for diagnostic sessions between students in the lab

This teaching lab is also ideal for proctored exam purposes.
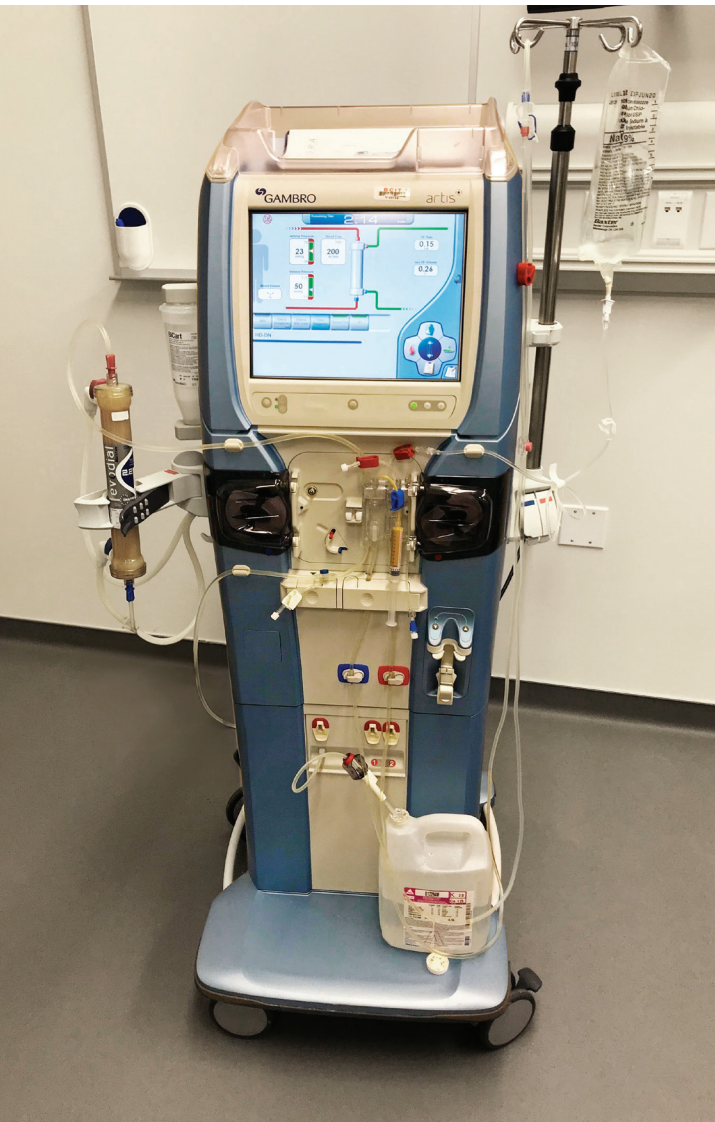
Multiple bed stations are designed to address specific processes, such as this one for dialysis treatment.

and a confederate in the control room. An integrated network router allows each unit to be on its own Wi-Fi network.

NAV Pro AV Over IP Connects It All

The NAV system ties the active learning/teaching spaces, labs, and simulator facilities together, with the flexibility to route any source to any display. NAV encoders are connected to PTZ and dome cameras at the patient stations and to computer and wallplate HDMI connections at both the patient and teaching stations. More than 230 NAV encoders transmit high-quality, ultra-low latency video and AES67 audio across the IP network. Over 170 NAV scaling decoders receive the signals from the encoders, delivering pixel-perfect image quality to large displays and desktop monitors at the facility's various stations.

ShareLink Pro and LinkLicense for Active Learning

Stations are equipped with Extron ShareLink® Pro wireless presentation gateways. They provide secure connectivity, bringing content sourced from school tablets and other authorized portable devices into each lab's AV system. This also enables HDMI wallplate access to NAV encoders.

The collaboration gateway includes a LinkLicense® for Active Learning upgrade. This Extron technology facilitates the use of multiple displays, allowing easy comparison and discussion among student groups or between the instructor and students. It also enables each bed station to be operated from its associated tablet, which is running the Extron Control app. The AVoIP and control systems reside and operate on the converged, enterprise network with multicasting.

The AV components are rack-mounted within the various control rooms.

Certain rooms support distance learning and collaboration via Zoom™. The videoconferencing software is installed on a dedicated host computer connected to the AV system via an Extron MediaPort 200 USB bridge.

For assured sound quality and recorded clarity, each lab features an Extron XMP Series audio expansion matrix processor. Its 24 channels of AEC facilitate clear communication between bed stations and remote locations. The processor provides Dante® connectivity for 48 sources and 48 destinations. The support staff uses Dante Domain Manager to handle user authentication and role-based security, with Extron AXI Series Dante audio interfaces providing the audio inputs and outputs where needed. This solution also enables seamless expansion of the Dante systems over the BCIT network.

Control from Here, There, and Everywhere

In most cases, a control room operator manages the conjoined systems and provides remote verbal responses to the scenario participants. For the instructor/confederate learning model, the instructor is able to control the patient simulator, the bed's associated medical equipment, the computers and other sources, and the AV system from the bedside using the headboard-mounted touchpanel or a tablet running the Extron Control app.

When the instructor chooses to run the scenario from the control room, an operator at the workstation manages the equipment. The instructor uses a tabletop microphone or a wireless lapel microphone or headset to communicate with the

"The BCIT Health Sciences Centre comes with an expansion of resources that are critical in ensuring the current and future generation of healthcare professionals are well supported to care for the people in our province. I am honing my skills using cutting-edge technology to become part of an industry that makes a long-term difference."

Carla Lucero
Bachelor of Science in Nursing student at BCIT

confederate in the lab who wears an earbud. General two-way communication between the control room and the lab is possible using a push-to-talk microphone at each operator workstation and the ceiling microphone and speaker associated with each bed station. Regardless of the method, all exchanges are captured and made available for streaming and archive.

Each lab's control system is built on an Extron IP Link® Pro control processor with LinkLicense, and the largest labs have more than one. The control processors were programmed using Global Scripter, Extron's Python-based development environment. The user interface was created with GUI Designer to ensure the layout was intuitive and easily replicated across the many touch devices.

RESULTS

Due to delays in construction, AVI-SPL's installation window was significantly reduced. To meet the completion date, they used the dedicated area at their Vancouver office to configure and test the hundreds of pieces of equipment ahead of installation. For many of the rooms and labs, individual devices needed to be assigned to a specific room for initial configuration and integration. AVI-SPL developed a detailed system to document and identify each device, streamlining on-site installation. Also, remote commissioning by Extron engineers helped ensure everything was ready on time.

"The Extron team was great to work with and communicated very well, and with AVI-SPL on the ground working with them, this remote approach was highly successful," says Corey Furnell, Senior Account Manager at AVI-SPL Canada. "Given the timing of this project over the pandemic, the ability for Extron to be able to support the project without having to cross the border into Canada was very valuable."

BCIT's new HSC is the largest center for simulation-based healthcare training in Canada and is acknowledged as one of the most advanced in the world. Since the first day of class, it has been supporting innovative, progressive clinical education through active learning and sophisticated simulations. The integrated Extron NAV system and other products and technologies are helping to ensure that the students receive the instruction and experience they require to best serve the medical needs of British Columbia's citizenry.

"We would like to recognize the contributions and assistance of the ITS department at BCIT during the project. IT Services Project Manager Doug Woodley, Senior Systems Analyst Stefan Cioata, and the rest of the ITS project team who worked closely with McSquared and AVI-SPL were instrumental in the success of this project and with the integration into the existing enterprise network. The HSC and its simulators and AV equipment have made healthcare education better at BCIT, meaning improved patient care throughout the province."

Rob Kruger
RN MEd CNCC(C),
Equipment & Technology Coordinator
School of Health Sciences at BCIT

FEATURED EXTRON PRODUCTS

Model	Description
NAV E 101	1G Pro AV over IP HDMI Encoder
NAV SD 101	1G Pro AV over IP HDMI Scaling Decoder
NAVigator	Pro AV over IP System Manager
LinkLicense	NAVigator 240 Endpoints Upgrade
USB Extender Plus T	Twisted Pair Transmitter for USB Peripherals
USB Extender Plus R	Twisted Pair Receiver for USB Peripherals
USB Plus Matrix Controller	Management Interface to Create USB Switching Systems
ShareLink Pro 500	Wired and Wireless Presentation Gateway
SMP 111	Single Channel H.264 Streaming Media Processor/Recorder
SMP 352 - 400 GB SSD	Dual Recording H.264 Streaming Media Processor – 400 GB SSD
Streaming LinkLicense	SMP Enhanced Kaltura Features Upgrade LinkLicense.
MediaPort 200	HDMI and Audio to USB Scaling Bridge
MPA 601-70V	70 V Mono Amplifier - 60 Watts
XMP 240 C AT	Expansion Matrix Processor with 24 AEC and Dante
AXI 44 AT	4 In, 4 Out Dante Audio Interface with DDM and AES67
XPA U 358-70V	Eight Channel Audio Amplifier, 35 W at 70 V
XPA U 1004-70V	Four Channel Audio Amplifier, 100 W at 70 V
XPA U 1002-70V	Two Channel Amplifier, 100 W at 70 V
IPCP Pro 250 xi	IPCP Pro xi Control Processor with LinkLicense UI Upgrade
TLP Pro 1025T	10" Tabletop TouchLink Pro Touchpanel – Black
TLP Pro 725T	7" Tabletop TouchLink Pro Touchpanel – Black
TLP Pro 1025M	10" Wall Mount TouchLink Pro Touchpanel - Black
TLP Pro 725M	7" Wall Mount TouchLink Pro Touchpanel - Black
NBP 106 D	Network Button Panel with 6 Buttons – Black Decorator-Style Wallplate
NBP 108 D	Network Button Panel with 8 Buttons – Black Decorator-Style Wallplate
NBP 110 D	Network Button Panel with 10 Buttons – Black Decorator-Style Wallplate
Global Scripter	Integrated Python Development Environment, Extron Control Systems Programming
GUI Designer	Design Software for User Interfaces
Extron Control	Control App for TouchLink, eBUS, Network Button Panels, and MediaLink
GlobalViewer Enterprise	Server-Based AV Resource Management Software

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