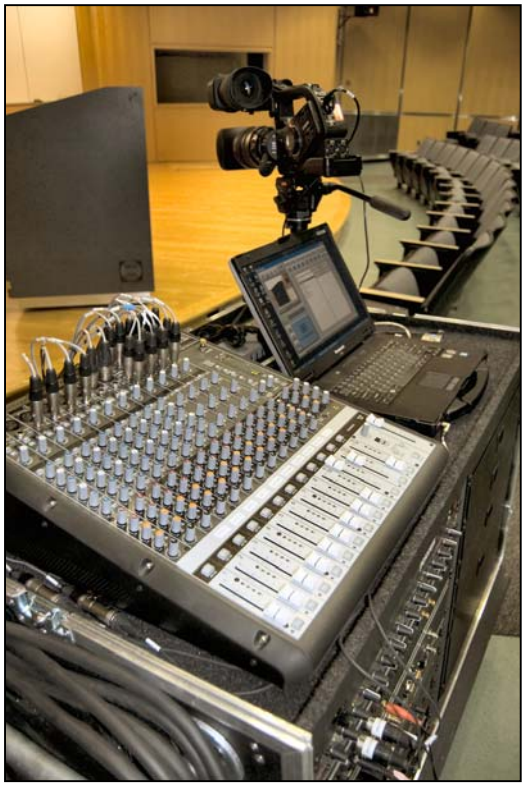
Need To Rapidly Deploy Quality Audio Support System For Both Live And Streaming Events Leads To Development Of The Streaming Media "Audio Ready" Technology Cart Or S.M.A.R.T. Cart

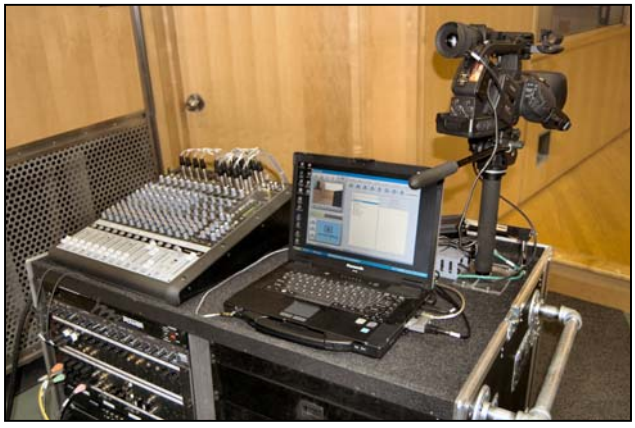
From: Office of Program Director, Operations and Technology, Rogers Communications Centre



May 1, 2009 – The need to rapidly deploy a quality audio system to collect live sound for Internet streaming and o pull double duty in multi-speaker presentation support for house sound has lead to the latest Rogers Communications Centre innovation. The Streaming Media "Audio Ready" Technology Cart or S.M.A.R.T. Cart was designed for rapid deployment by a single operator to deliver quality audio when video streaming. It also doubles up by providing quality mixed feeds for house sound.

"I was always frustrated by the audio quality of our live webcasts because there were so many things to be set up by a single person in a short period of time. It always seemed to be the audio that got compromised," comments Brad Fortner, Director of Operations and Technology for Ryerson Universities Rogers Communications Centre. "The complexity of a single person setting up three or four wireless microphones and mixer in short windows of time was robbing us of the ability to properly mic the presenters. In turn we were delivering poor quality audio to the live audience and consequently poor quality audio to our live streams. Everyone who streams knows that the most important aspect of a live stream is the quality of the audio." he added.

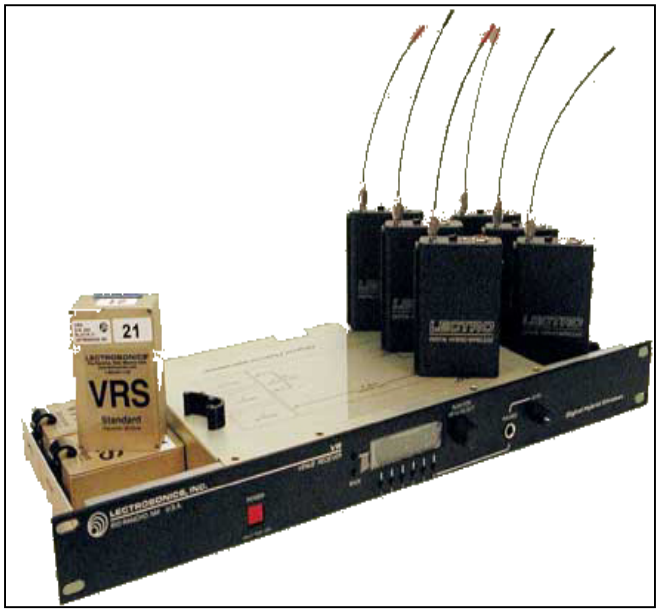
The solutions that were finally employed revolved around three new technologies that were not in use in the Centre.. They were Countryman Associates E6i Omnidirectional Earset microphones, Lectrosonics Venue Wireless Microphone solution and a Mackie Onyx 1620 Audio Board that's equipped with a FireWire I/O card. The "Cart" itself is mounted in a mobile Clydesdale case and it has been put together to offer a lot of audio and video I/O capability.



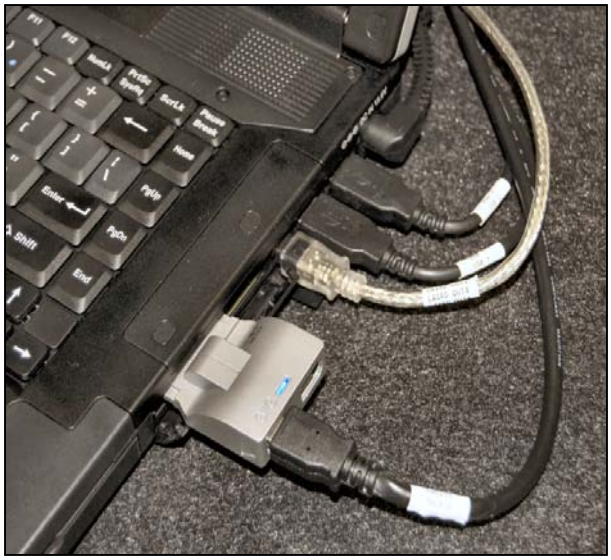
The key to first capturing quality audio is the microphone employed. After years of problems related to feedback when employing lavaliere microphones and later having presenters walk away from fixed microphones that severely affected the live stream, a Countryman Associates E6i Omnidirectional Earset microphone was employed.

“The Earset microphone solved a number of problems,” said Fortner. “It delivered high quality audio from our presenters and its wearable nature solved the feedback problems we had when using lavaliere microphones in different venues. We have since added two wireless Galaxy Audio Headset microphones to our existing cadre of wireless handheld and lavaliere microphones to complement the Countryman E6i. The combination is ideal for situations where we have multiple presenters such as panels.”

Prior to the S.M.A.R.T. Cart the most labour intensive part of most set-ups was individually building as many as four wireless microphones, their associated transmitters, receivers and antennas to an audio mixer to supply both streaming and house audio. The solution came by employing the Lectrosonics Venue Receiver. The Venue Receiver is a modular rack mountable solution that can employ up to six receivers that share one antenna system. In Ryerson’s application the Venue Receiver and its antenna was mounted in the S.M.A.R.T. Cart and an additional external fold out antenna is built onto the cart for situations where reception may not be ideal.



While the Venue system is a real timesaver in terms of set-up the most unique innovation associated with the S.M.A.R.T. Cart is in its use of a Mackie Onyx 1620 Audio Board that’s equipped with a FireWire I/O card. The Mackie1620 is a premium 16 channel analogue audio mixing board that can provide up to 24-Bit/96kHz FireWire I/O.



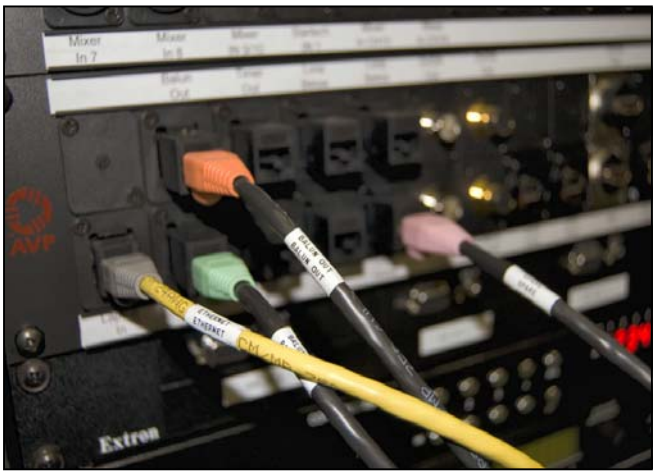
"The use of IEEE-1394 (Firewire) has always been an important component in terms of video streaming," Fortner went on to say. "To video stream we use an Xstreamulator system in a laptop that takes the video from a Firewire equipped Canon XL-H1 camera that mounts to a camera head. The camera head itself is affixed to the S.M.A.R.T. Cart. To stream the Mackie Onyx is added to the Firewire loop and instantly the high quality audio that we are mixing for the house is added to the Firewire signal that is then streamed to the internet." he said.

"The combination of technologies allows for a quality experience both in-house and online, while a single operator can quickly set-up a location, monitor the house sound during the presentation and stream the event supplying quality video, audio and PowerPoint slide switching to the online audience. It's about as economical a scenario one can put together for these kinds of situations and that is where the investment in the S.M.A.R.T. Cart pays for itself"

During the construction of the S.M.A.R.T. Cart, Rogers Communications Centre staff designers Bruno Boccia, Jim Loney, Barry Weatherhead and Jeremy Littler also designed the cart to handle both "current" and "next generation" video signals for the various technologies employed in the various presentation situations that they find themselves in. This includes recording presentations directly to DVD and using video switching components in the Cart to switch feeds to the venue projector.

Technologically the SMART Cart utilizes a Laird Telemedia FirePower IEEE-1394 distribution amplifier to simultaneously distribute video camera sources to the Xstreamulator laptop, two additional hot-swappable encoder laptops and a rack mounted DVD recorder. This functionality enables the Cart to operate as cross-platform multi-format streaming media system. The S.M.A.R.T Cart has been wired for HDMI playback from an rack mounted DVD recorder, and pre-wired for HDMI/SDI capturing in anticipation of the introduction of ExpressCard HDMI/SDI capture cards.

In addition to HDMI output, the DVD recorder is configured for recording/playback via Composite and S-Video connectors located on the Cart's video patch panel. USB headers located on the video patch panel enable content to be easily moved on and off the Xstreamulator laptop. Network connections on the patch panel are provided for the Xstreamulator laptop, a presentation timer system and, if required, additional presentation/encoder laptops.



To switch video sources and feed the venue projector, the streaming capture subsystem is augmented by a StarTech VGA matrix switcher. This device supports VGA acquisition from multiple presentation sources and flexible signal distribution to in-room projection/portable presentation systems. Inclusion of the VGA matrix switcher enables the S.M.A.R.T Cart to be reconfigured, at the touch of a button, to support a range of presentation scenarios. The switcher is normally programmed to distribute VGA signals (e.g., PowerPoint presentations) from multiple presenter laptops to the Xstreamulator laptop. The Xstreamulator laptop then employs an Epiphan VGA to USB "Frame Grabber" to convert the VGA signal to a bitmap or digital video file.

All of the available audio inputs/outputs on the Mackie Onyx 1620 board are wired to a rack-mount patch panel situated on the front of the S.M.A.R.T. Cart. This patch panel provides for rapid XLR, RCA and stereo mini-plug interfacing. The patch panel configuration neatly addresses a recurrent problem of insufficient or inaccessible audio feeds. For example, multiple outputs are now available for portable audio recorders, press kits and PA systems. Audio inputs can accept portable audio players, wireless microphone receivers and a wide range of media playback devices. The system is also configured so that the Mackie mixer's PA output level can be adjusted independently of the output level going to the Xstreamulator laptop. A DBX compressor/limiter is available as a mixer insert to further assist with maintaining consistent audio levels.

"We simply could not have built such a useful solution without the input we obtained from our experienced staff. We took input and teamed with all of the staff involved in every aspect of streaming production. That included those who work in the field, those who write and customize the software and those who have hardware experience in building and maintaining quality audio systems. And the result is a credit to them all." Fortner concluded.

More information on the Rogers Communications Centre, the shared FCAD facilities it operates and the specifics of the labs that it operates can be found at **www.rcc.ryerson.ca/technology/index.htm**