

# CBC/Radio-Canada Moves into a New Era of Media

How the National Public Broadcaster Is Leading the Way with Its New All-IP Production Hub in Montreal



BROADCAST CENTRE IN THE NEW MAISON DE RADIO-CANADA

By Michael Raine

In April 2017, following approval from the Treasury Board of Canada, it became official — CBC/Radio-Canada’s Montreal operations would move to a brand new, 420,000-sq.-ft., state-of-the-art facility. The exciting part for the tech geeks out there, though this wouldn’t be revealed until later, was that this opened the door for a major technological leap forward. With construction completed in 2020 and the move of shows and operations currently nearing completion, CBC/Radio-Canada is now one of the first public broadcasters in the world to be powered almost entirely by Internet Protocol (IP) technology. This, of course, brings infinitely more flexibility to its production and distribution workflows across radio, television, and digital.

Interestingly, when construction began in the summer of 2017 on the new building — which sits at René-Lévesque Boulevard and Papineau Avenue, and just east of the old Maison de Radio-Canada — a key component of the broadcaster’s technical plans hadn’t yet become a reality. That is, the suite of standards for sending digital media over an IP network hadn’t been released. Nonetheless, the technical teams at CBC/Radio-Canada were heavily involved in its development and confident that these new

SMPTÉ standards were the networking solution they needed. Thankfully, the new standard, SMPTÉ ST 2110 and its four parts — -10, -20, -21, and -30 — were released on Nov. 27, 2017. It now forms the technical backbone of the new Maison de Radio-Canada and the company’s plans for modernizing workflows and media distribution across Canada.

“When the project started, we were at a point where I think the decision had to be made between the new and old technology. We’re audio, but we’re also TV, and the [old] technology was HD SDI, like all of our other stations. So, we could choose between going with the old technology, knowing that within a couple of years standards would change and we would probably have to update and change everything within a pretty short span of years, or we could look at the new standards coming in, which was ST 2110 — and AES67 was also already there — and just go IP-based,” explains Patrice Dumont, Montreal-based project engineer at CBC/Radio-Canada. “So, the decision was just made that we should go with something that is going to last longer, and which is most likely going to provide us with more flexibility, long-term scalability, and future-proofing. Before, if we would have had to change from a whole facility in HD SDI to some

other technology, then historically, we would have had to change all the equipment, all the cabling, and all the backbone infrastructure. Whereas, with an IP-based infrastructure, maybe you have to change the SFPs in your switches, but all the fibre that you run through the building is still going to be usable and you maybe just have to adapt your switches.”

Importantly, too, adds Philippe St-Pierre, the facility’s project lead for spectrum engineering, the company is working towards full redundancy between its two main production hubs in Toronto and Montreal and moving to an all-IP network will enable that.

“There are always many, many projects going on in all the [CBC/Radio-Canada] production centres to replace equipment, to bring parts of new technologies into the video and audio across the country, but it’s not every day that you have the opportunity to look at the whole picture and try to position yourself for the next decades to come. I think to build a completely new facility like we are doing in Montreal, it’s a good opportunity to make a major shift into the next decades for CBC/Radio-Canada,” adds St-Pierre. “Of course, the audio is driven a little bit by the video side, so when they make a decision to better position themselves in the video world, we follow suit,

and here we are today transitioning every kind of signal into the all-IP technology.”

With ST 2110 providing a framework for the transport of both video and audio signals, it’s exactly what a modern broadcaster needs. ST 2110-20 manages uncompressed video signals and is a video-only evolution of SMPTE 2022-6 SDI-over-RTP stream, while ST 2110-30 is for audio transport and was based on the more-established AES67.

“Building something like this, once a signal or stream is on the network, you can basically send it to anywhere in your building,” adds Dumont. “You’re not limited by where your cabling goes. Wherever you have switches, your signal can go. So, it adds a lot of flexibility.”

CBC/Radio-Canada, of course, is as much focused on radio as it is television or digital broadcasting. On that side of things, project engineer Dai Dam notes that audio-over-IP has been around for a decade “and why we are going over there,” he notes, “is the modularity. It is easy to add more devices or easy to add a new studio because everything is already in the same bucket. Like Patrice was saying, everything is there and you don’t need to have the old-fashioned DA or anything — it’s very modular. That’s where you see the most gain, is with the modularity and we can easily add and retrieve information. Also, the delegation; if you want to delegate, for example, one control room can control multiple studios, and we can do this easily with a click. With [Lawo’s] VSM and everything, that control is much easier over IP. That’s why we implemented the IP technology. As early adopters of this new technology, in the long run it will provide savings compared to traditional, and it provides easy modularity and flexibility for the future.”

In the early phases of the project, a CBC/Radio-Canada delegation led by Director of Media Transport Architecture Félix Poulin and Senior Director of Core Systems Engineering François Legrand travelled to other major broadcast facilities in the U.S., Europe, and Australia to assess their technological options and best approach.

“They were looking at many examples around the world and they learned a lot. What we are doing, we are pretty much the first multiplatform, large-scale production centre in the world trying to go all-IP,” explains St-Pierre. “Before, all of the other broadcasters were more attached to proprietary switching solutions or things like that. So, the way [CBC/Radio-Canada] wanted to do it is to work more in the IT world. So, the new facility is pretty much a data centre and we are not attached directly to any proprietary switching solution. That’s why we worked very hard with the industry to develop and push the ST 2110 standard.”

“The idea for us was to use ‘COTS’ – commercial-off-the-shelf equipment,” continues Dumont. “So, we use IT switches, because IT is a much bigger industry than broadcast, so they sell and use a lot of switches, which means their volume is bigger and the price per bit transmitted is much lower than any proprietary technology. All this leads to a



pace of technological innovation that simply cannot be matched by the broadcast industry. We wanted to leverage that and use what was developed by other businesses, and also to use open standards to ultimately not be attached to a specific vendor and have some standards that any of the vendors could work with and become interoperable.”

At that time, when CBC/Radio-Canada was taking ideas and lessons from other international broadcasters, the other facilities they were looking at were not IP-based from end to end. They were primarily partial-IP systems with a lot of legacy equipment included in the loop. “But we’re talking many years ago, so these days we’ve worked really hard with many, many vendors across the last few years to develop and push on every aspect of a broadcast centre; every type of equipment needed to have, in the end, an all-IP solution,” notes St-Pierre. “This was a huge task and the industry was not quite ready yet, but a lot of people got interested and jumped in. Obviously, we are not yet ‘all IP’ from end to end. We favoured the purchase of IP equipment, we worked with suppliers to develop IP products, and when this was not possible, we used gateways directly before or after legacy equipment in order to integrate them in the IP workflow. The broadcast industry should get up to speed in the next few years and IP solutions will continue to grow.”

As Dam noted earlier, Lawo’s VSM (Virtual Studio Manager) was chosen as the master IP control system. And in fact, he had been using VSM on the radio side in the old building for years. Given the scope of the new building’s operations, it was a crucial decision to get right. The broadcast facility hosts several production areas dedicated to radio, TV, and post-production activities, with dozens of studios, control rooms, editing and infographic workstations, and audio mixing suites. According to an announcement from Lawo released when the contract was finalized in 2018, the new master control and playout room hosts around 40 TV channels, 40 digital channels, and 160 radio

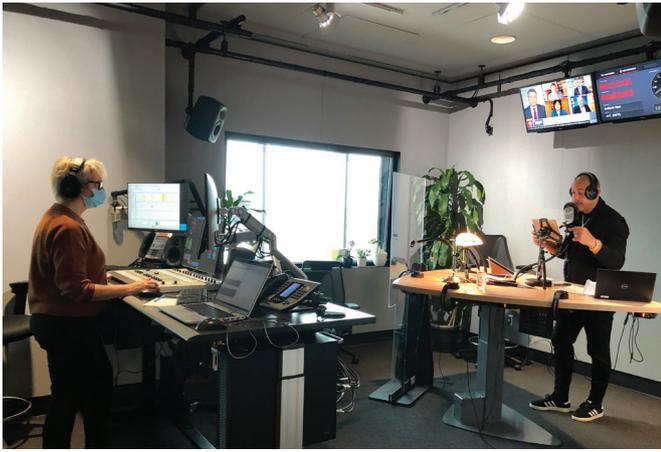
channels in both French and English. At the time of the 2018 announcement, François Legrand praised VSM Studio for its ability to “directly interface with true COTS networking equipment and deliver the advanced functionalities” while providing “feature-rich user interfaces that require no middleware, which simplifies the software stack and allows maintenance of the audio/video signal routing system over IP!”

In terms of hardware in the studios, all the consoles are also from Lawo, largely because they obviously work well with the VSM media controller and also met the technical requirements. There is a third-generation Lawo mc<sup>2</sup>56 console in each of the three entertainment studios (used for FOH and monitor applications) and four news-focused control rooms, and a third-generation Lawo mc<sup>2</sup>96 console in each of the two main entertainment control rooms.

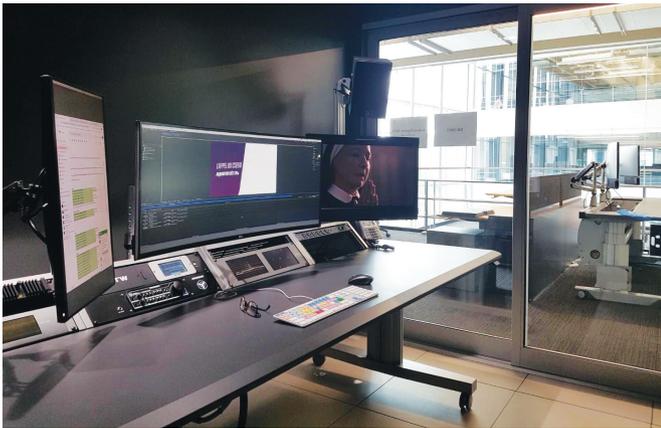
When the TV consoles were selected, Dumont says the requirements included pristine sound quality, huge amounts of processing power, great ergonomics, true native ST 2110-30 (which is similar but not exactly the same as AES67) support, including for ST 2022-7 redundancy, be controllable using free and open standards (Ember+ support was mandatory due to the requirement of being compatible with VSM but NMOS IS-04 and IS-05 were very high on the wishlist), and so on.

“There were just not that many choices of consoles a couple of years back that were able to do ST 2110-30 with ST2022-7 redundancy, plus be able to be controlled by the broadcast controller that we had,” he adds.

In terms of the intercom, Dumont explains that it is centralized and shared by the whole facility. “It is composed of two Riedel Artist 1024 notes – mainly one for news and one for entertainment TV – that are trunked with each other,” he says. “The system also has trunks to a recovered RTS ADAM frame currently still in our old building that allows us to reach other cities running RTS intercoms through RVON cards and Trunkmaster. It is also used in the



RADIO STUDIO



POST-PRODUCTION MIXING ROOM



BROADCAST CENTRE

transition for any communications requirements between the old and the new building. The ADAM frame and Trunkmaster will eventually move to the new building. We also have a mesh of more than 40 Riedel Bolero antennas throughout the new building to cover wireless communication across control rooms, studios, newsroom, atrium, elevators, and other technical areas."

And regarding the new production centre's wireless microphone system, there were two main objectives. "The first

was to follow the centralization design principle, which mandates the installation of the majority of the equipment in the central equipment room. The second one was to do zoning and have a pool of equipment accessible to all control rooms with coverage on every single studio. We had to send signals over fibre around the building to be able to achieve this distribution," explains St-Pierre. "Although we have put a lot of effort into designing the RF infrastructure – choosing the right equipment for our needs, amplifiers, filters, anten-

nas, etc. – the key to an effective RF system remains coordination and planning, which are very well taken care of by our team of technicians and engineers."

For this, there are two centralized pools of wireless receivers — one for entertainment and one for news production. The entertainment pool includes nine Shure Axient AD4Qs receivers (36 channels) while the news pool includes seven receivers (28 channels). Each pool also includes a Shure AXT600 frequency manager that manages automatic backup frequency switching in case of any interference and adds additional resiliency. As well, there is RF-over-fibre transmission between the central equipment room and telecom risers across the building. From there, there is antenna coaxial distribution using low-loss cable.

Additionally, there are eight Wisycom ADFA and LFA active directional and omni antennas within the three entertainment television studios and a half-dozen more in the news studios. "Each one of them is filtered directly at the antenna to minimize noise at the input of the system and protect the fibre-optic frontend," St-Pierre notes. He adds that there are a dozen of Shure's AD610 ShowLink wireless access points spread across the many studios for microphone control. "We also deployed 10 virtual machines, reachable from our network to deal with microphone control using Shure WWB6 Wireless Workbench."

The IFB system for the three main news studios is a pooled system with a distributed set of antennas. "We use a passive set of filtering, combining two 50-watt RF power amps," continues St-Pierre. "Oversizing the RF power amps was a crucial step while designing this system since it is not necessarily easy to deal with digital RF carriers in transmission like we did, especially when it comes to a distributed system. This allows us to cover the entire news production floor with IFB signals, and thus, the talent can walk from studio to studio without any interruption."

For the three entertainment television studios, St-Pierre says the IEMs/IFBs are managed locally for each of the studios without any distributed antenna system or control. They are fed by Lawo Power Cores with 24 channels of Shure PSM1000 to serve all three studios.

In the post-production department, in the four 5.1 audio mixing rooms, it's a fairly straight-forward Pro Tools-based setup with Avid S6 M40 control surfaces. Aside from being an industry standard, the choice to go with Avid was also about continuity between the old and new buildings and other CBC/Radio-Canada facilities.

"Everybody's used to it, we have the backend infrastructure for it, and it's not only for Montreal, but it's across Canada. So, it's the ease of training and maintenance and spare parts and everything," notes Dumont. "Staying with [Pro Tools] was actually one of the few parts of the project where we were able to stick with something that we knew. That was a good thing, probably, because starting from scratch for everything and people having to familiarize themselves with IP networks and troubleshooting things differently, it's not that easy. So, it's probably a good thing to have some base of things that you can keep and know."

On the radio side, one of the most unique and challenging aspects of this project was how quickly the 13 studios and 15 booths had to be designed and built. There was just one year to get it done. On top of that, resources and manpower were stretched thin, with only two engineers, one operations tech, one maintenance tech, and three wiremen available to get the job done on schedule.

Typically, Dam explains, they would tackle each radio studio as a separate project with its own unique specifications. Doing that, though, would normally take five to six weeks per studio to get it ready, plus an additional week of testing, training, and so on.

"So, we sat around a table and brainstormed, 'How can we shorten the installation and also do it better?'" recalls Dam. "We proposed categorizing them into four types of studios; like Studio Type A for the big shows, Studio Type B for news, and so on, and we also did this for the booths."

In each radio studio type, everything would be identical, right down to the number and placement of cables. This way, once the first studio of a specific type is done, it can be replicated quickly. "It speeds up the installation *a lot*, and also the delivery and the workflow. Everything in the process, like

the planning, the installation, everything, is much faster," Dam attests. "But for that, we need to speak with the [show] producers and everyone and see what their workflow is and make sure, 'If we do this type of installation, can we fulfill exactly what they need?'

They said yes, and we knew at the end there would be some particulars and adding some new stuff, but that was minimal. So, we standardized this type of installation. It's like making bread or sausages; once you have the recipe, you just make it like a pro-

duction. It was a big success."

In the end, designing and building the new Maison de Radio-Canada was a mammoth undertaking, and a magnificent feat of design, planning, engineering, and technical know-how. Frankly,

it's one that an article such as this can only skim the surface of. Ultimately, though, it's proven successful and achieved its goal of pushing Canada's public broadcaster into the future of media. For that, Canadians can be proud.

## A TECHNOLOGICAL OVERVIEW OF THE NEW MAISON DE RADIO-CANADA

1000 Papineau Ave, Montréal, QC, H2K 0C2

### TV CONSOLES & CONTROL ROOMS

Overview courtesy of Philippe St-Pierre

#### Three Entertainment Studios (one large, one medium & one multifunctional/atrium) include:

- 2x Lawo mc<sup>2</sup>56 mkIII console (48 faders)
- 1x Lawo mc<sup>2</sup>56 mkIII console (32 faders)
- 1x Lawo mc<sup>2</sup>56 mkIII console (16 faders)
- 4x Waves SoundGrid server (one for each console)
- 10x Lawo A\_stage64 stage box for remote studio inputs
- 16x Lawo A\_line AoIP node to feed monitor racks, etc.
- 10x Lawo A\_digital8 to feed main PA

#### Two main control rooms

Each of the identical audio/video control rooms is able to control any studio by automated delegation processes managed within the Lawo VSM broadcast controller. Both are equipped with:

- 1x Lawo mc<sup>2</sup>96mkIII console (48 faders)
- 1x Junger D\*AP4 audio processor
- 1x RTW Loudness meter
- Neumann KH 310/KH 870 5.1 monitoring
- JBL 708P stereo monitoring
- Avantone stereo monitoring
- 1x Trinnov MC Pro controller
- 2x Sound Devices 970
- 2x Cedar DNS8 Live
- 1x Merging Ovation Playback system
- 1x Universal Audio UAD-2 Live rack
- 1x Dolby DP570
- 1x Eventide H9000R
- 1x Lexicon 960L
- 1x Tascam DA-3000
- 1x Denon DN-300Z

#### Four News Studios (and several small "satellite" sets):

There are four news-focused audio/video control rooms that, like their entertainment-focused counterparts, can all take control of any studio via automated delegation processes managed within the VSM broadcast controller. The four rooms are identical and are automated with Ross Overdrive. The audio/video control rooms are physically in the same room but the audio section can be closed with a window partition. Each are equipped with:

- 1x Lawo mc<sup>2</sup>56mkIII console (32 faders)
- 1x Waves SoundGrid
- 1x RTW loudness meter
- 1x Junger D\*AP4 audio processor
- 1x Neumann KH310 / KH120 stereo monitoring
- 1x Cedar DNS8 Live multi-channel dialogue noise suppressor
- Lawo VisTool virtual interfaces

#### AUDIO POST-PRODUCTION

Overview courtesy of Patrice Dumont

All mixing rooms run Avid Pro Tools. All equipment is installed locally with a small acoustic rack, with the exception of the Media Composer instances that are remote (in the datacenter) to be shared by all mixing rooms.

#### Four large 5.1 mixing rooms feature:

- Avid S6 M40 Control Surface (16 faders)
- Apple Mac Pro
- Neumann KH 310 monitors & KH 810 sub (except one room that is physically smaller that has a KH 750 sub)
- Avantone stereo monitoring
- Avid MTRX as the I/O interface and speaker management (through an Avid MTRX SPQ speaker processing card)
- Lawo A\_madi4 to interface with the IP infrastructure
- RTW TouchMonitor TM7
- Sound & Construction IsoBox Studio 16RU sound isolation rack

#### One large, hybrid 5.1 mixing room/radio studio features:

- Avid S6 M40 Control Surface (32 faders)
- Apple Mac Pro
- Neumann KH 310 monitors & KH 810 sub
- Avantone stereo monitoring
- Lawo A\_madi4 to interface with the IP infrastructure
- 2x Avid MTRX as I/O interfaces (one each for studio & control room) and speaker management (through Avid MTRX SPQ speaker processing card)
- RTW TouchMonitor TM7
- Small Dante island for interconnection of Dante-only devices
- Sound & Construction IsoBox Studio 16RU sound isolation rack

#### Two medium 5.1 mixing rooms feature:

- Avid S1 slimline control surface
- Apple Mac Mini
- Neumann KH 120 monitors & KH 750 sub

- Avantone stereo monitoring
- Avid MTRX as I/O interface and speaker management (through an Avid MTRX SPQ speaker processing card)
- Lawo A\_madi6 to interface with the IP infrastructure
- RTW TouchMonitor TM7
- Sound & Construction IsoBox Studio 16RU sound isolation rack

#### Two small mixing rooms (mostly for podcasting) that are in stereo but wired for 5.1 feature:

- Apple iMac
- Neumann KH 120 monitors
- Universal Audio Apollo x6 Thunderbolt 3 audio interface
- Lawo A\_digital8 to interface with the building's IP infrastructure

#### RADIO STUDIOS

Overview courtesy of Dai Dam

In the new radio studios, audio patch cords and jack are no longer required, and only the production equipment is present on the table. There are also no more equipment racks in the control room, and remote access is much easier with VSM and Lawo technology. The 15 booths are using the Lawo VisTool virtual radio console with Merging Anubis audio interfaces and the Ross Iggy compact ST 2110-30 audio bridge platform. In total, there are two studios and three booths for news, plus three studios and booths for Ici Musique, and two studios and booths for Ici Première. All the other studio and booth facilities are used for English radio, First Nations radio, web, and audio publicity.

#### RADIO STUDIOS

- 13x Lawo PowerCores
- 8x Lawo Ruby radio consoles
- R3lay (ST 2110 virtual audio sound cards)
- Dalet audio software with Vistool virtual console
- 2x Telos VX Enterprise broadcast VoIP video phone system
- 6x Comrex Access MultiRack with five instances each
- 10x Comrex Access (total of 10 instances)
- 3x visual radio production systems (ST 2110).
- Dalet audio VMs servers, running in Windows 10
- Neumann BCM 705 dynamic studio microphone