QUARRA PROVIDES AoIP BACKBONE FOR UNIVERSITY OF FREIBURG

With the transition to IP, the media production industry has introduced standards such as SMPTE ST 2110:2017 and AES67 to ensure high-performance and interoperability over IP networks. The primary use of PTP (precision time protocol) in these standards is to provide a stable timebase that can be used to synchronize video, audio, and other signals so that they can be processed easily and delivered to local and remote audiences.

Freiburg University's ECHO FM radio utilizes Artel's Quarra PTP Ethernet switches creating real-time audio links for AoIP streams between their remote studios and the main site where they are able to run audio streams without interruption, while other data is running in the background.

Background

Albert-Ludwigs-Universität Freiburg, more commonly known as the University of Freiburg, is among the leading universities in Germany, respected for its teaching of law, medicine, economics, history, German studies and biology, amongst other subjects. A major part of life on campus is the radio station Echo FM, run by students for students. This was refitted and upgraded with the Quarra switches providing the backbone of a distribution network linking several locations across campus using RAVENNA audio over IP (AoIP) and AES67 interoperability technologies.

System Overview

Echo FM broadcasts 24 hours a day with a mixture of music and news gathered by its on-campus reporting team. The on-air operation is based in two studios housed at the university library, which feature 12-fader Lawo crystal mixing

desks, a Zenon Media automated playout system, and a Broadcast Bionics PhoneBOX solution with social media management.

The studios are linked to a central control room (located 2km away in the university's data center) and a machine room housing the main matrix, servers, processors, and other hardware. The output of the station is broadcast from a FM transmitter on the roof of the university hospital. All sites are connected over a fiber optic network used exclusively for audio transport.

This infrastructure, and the studio equipment, was installed by SLG Broadcast, a systems integration and distribution company. SLG Broadcast selected a separate, dedicated AoIP circuit as the sole audio carrier rather than sharing the university's IT network because Echo FM's technical infrastructure demanded fast responses and good bandwidth with high security.

Delivering AES67

Fiber optic is used as a solid connection to carry a combined audio and data stream that is real-time, linear, and uncompressed. Critical to the operation of the network are three Quarra 1G PTP (precision time protocol) Ethernet switches, which are approved for both RAVENNA and AES67. These are situated at the machine room, the transmitter site, and the studio center. The machine room and the individual studios additionally have non-Artel switches, connected to the main network using standard data services.

"The Quarra switches are used to manage the links for each IP connection," explains Simon Groll, SLG's Technical Director. "This means that the audio is able to run without interruption, with everything else - including data and station email - running in the background. Because of the requirements for data we knew we needed PTP version 2 capability. This also plays a part in creating the real-time audio links for AoIP streams (e. g. SIP-Connections by MPEG), which link some remote studios in other faculties, as well as the main sites with the consoles and the automation system."

In addition, there is a connection to the student television channel, Alma, which makes audio feeds available for use on Echo FM through a Ravenna converter Direct-Out [AES67]. "This allows the radio people to pick up audio from TV and mix it on their consoles," Groll says. "The Quarra switches provide the backbone for the networking of all this. They allow the RAVENNA and data streams to run in real-time and be divided where necessary. There's also communications links between

QUARRA PTP SWITCHES IN A CAMPUS NETWORK
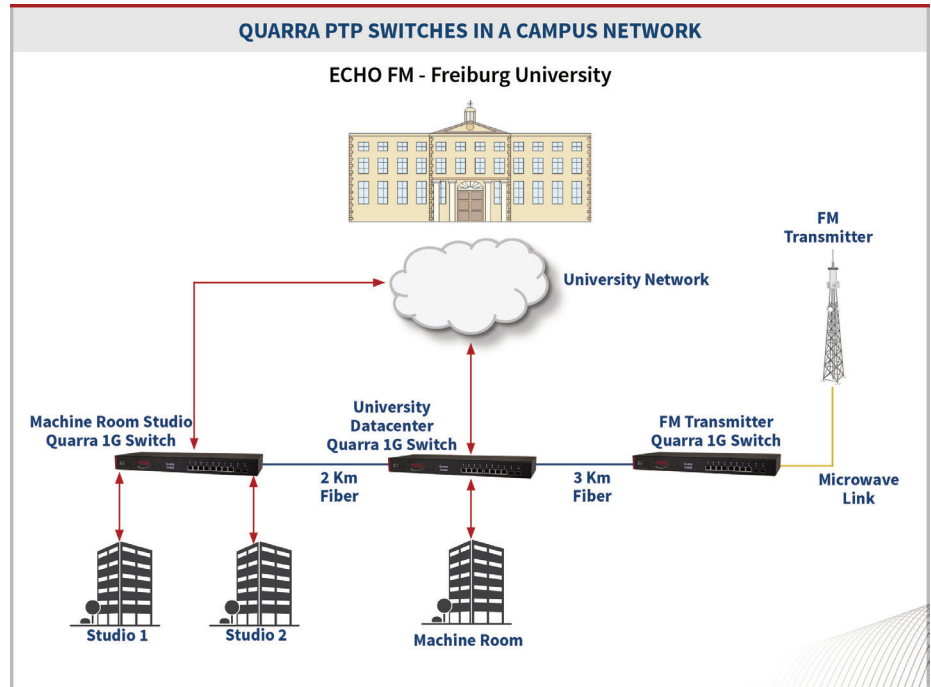**ECHO FM - Freiburg University**

the machine room and the Broadcast Bionics PhoneBOX in the studios."

As well as PTP and RAVENNA capability, Groll says the benefits brought by the Quarra units include being able to handle different kinds of streaming, plus QS management and ease of configuration. "Quarra switches support APT coding for transmission and can run AoIP for remote branches with voice over IP [VoIP] telephony. They also have the ability to efficiently manage bandwidth."

Quarra: The right choice

SLG Broadcast has used Artel's Quarra switches on other projects and Groll says the brand was the right choice for Echo FM.

"There are other switches available on the market, but none of them have PTP capability," he explains. "Other brands also take some time to configure. Artel's

Quarra switches are slightly less expensive and are easier and faster to commission and configure, which greatly helped us deliver this project on time."

Groll concludes that the University of Freiburg project was the first time SLG Broadcast has carried out an installation of such complexity using RAVENNA. The networks went in during June 2015, with the work taking a total of three weeks (Installation, Commissioning, and Training). "Combining broadcast services for audio, video, and data is critical and it's quite impressive that a small student radio station is using a set-up like this to run every thing on the same network. And we needed the Quarra switches to do that and they are working really well."

PTP Applications in Media

PTP is required by a variety of standards used throughout the media production industry, including SMPTE ST 2110:2017 "Professional Media over Managed IP Networks" and AES67 "High-performance streaming audio-over-IP interoperability." The primary use of PTP in these standards is to provide a stable timebase that can be used to synchronize video, audio, and other signals so that they can be processed easily and delivered to local and remote audiences.

Consider the needs of an audio production within a live concert venue. Many times, several sets of speakers need to be coordinated, so that their sound outputs reach all members of the audience without annoying echoes or, worse, canceling each other out due to phase mismatch. Achieving the best sound for the largest portion of the audience requires adding delay to some of the speaker outputs so that their sounds are in phase with those emitted by other speakers in the venue. Speaker arrays can also be adjusted to maximize their "sound field" output in specific directions by adjusting the timing of the audio signals fed into each speaker element. PTP provides a stable timebase that allows accurate synchronization of all the speakers.

Remote video production can also benefit from PTP, which enables every camera, microphone, and signal processing device to be tied to a common clock. When these signals are transported across a long-haul link back to the television production facility, the timing relationships between the signals are used to allow accurate switching between video signals and proper video/audio signal alignment. Because PTP clocks are used to generate the timestamps within each video and audio data packet, these embedded timing relationships can be used wherever the IP media signals are delivered.

There are other applications beyond the media space that will benefit from IP routers and Ethernet switches that support PTP. For example, financial services firms and markets need accurate timestamps for securities trading and record keeping. Factory automation systems often need to have machines working in lockstep for a variety of tasks. Electric power utilities need to accurately control the phases of high voltage sources and signals across their networks to avoid damaging current surges. Many other applications, including automobile systems, will benefit from accurate, reliable PTP-enabled networks.

Related Products

Artel Quarra PTP Ethernet Switches

Quarra 10G PTP Ethernet Switch

Quarra 1G PTP Ethernet Switch

The Quarra family supports the SMPTE ST 2110-10 standard for System Timing and Definition and ST 2059-2 permitting interoperable use of IP-based media equipment with conventional genlocked SDI equipment. Artel's Quarra switches are designed for audio/video broadcast, defense and security, finance, utilities, telecom, and enterprise IT applications in which accurate timing and control are required.

About SLG Broadcast

As a major system supplier, SLG Broadcast AG offers products and solutions for radio and TV. Its customers include not only private and public broadcasters, but also system integrators in Switzerland, Austria and Germany. SLG Broadcast supplies ready-to-use solutions as well as additional tools and sells a portfolio of selected products. The company's offering also includes consulting in the areas of workflow, sound design and system design. For further details visit: www.slgbroadcast.com.

About Artel

Artel Video Systems is a world-class provider of innovative, real-time, multimedia delivery solutions serving global markets. Today the majority of the live events in the US traverse Artel products to support their mission critical work-flows. Artel's expertise in IP- and fiber-based technologies spans more than 30 years and has established Artel as a trusted partner in the development of reliable, standards-based, IP infrastructures. Artel's integrated solutions include fiber and IP based multimedia delivery, precision timing, OTT, and data networking. An employee-owned business since 2014. More information is available at www.artel.com.

World Headquarters

5B Lyberty Way
Westford, MA 01886
USA
Tel: (978) 263-5775
Fax: (978) 263-9755
Artel.com | info@artel.com

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