

Networking Now

It's Time to Get On-Air With SSL Over IP

Solid State Logic
SOUND || VISION

Audio-over-IP solutions are now in regular use around the world and in a wide range of critical applications. The installed sound market has been relying on IP transport for many years already, and now many broadcasters are implementing facility-wide AoIP technologies.

More recently, with the conversation moving to the implementation of complete (Audio + Video) networked production infrastructures, video-over-IP has taken centre-stage in the on-coming standards discussions. This succession has rich precedence in our industry: Audio cassettes appeared before VHS, CD's preceded DVD's, and Spotify came before Netflix. However, in the case of IP, the networked video revolution faces significant additional challenges - higher data rates, more varied formats, and greater transition costs.

So, while standards discussions continue in that domain it is worth reminding ourselves that the solid foundation of Ethernet and TCP/IP infrastructure is independent of the standards it carries, and that the benefits of an IP-based future cannot be overstated. These are lessons that have already been learned in audio...

Infrastructure & Hardware

Where an IP infrastructure replaces a traditional analogue studio wiring scheme, the basic hardware advantages are plain. A single Cat5/6 or fibre cable can replace hundreds of analogue connections and a single RJ45 Ethernet connector can replace a large I/O panel, with connections available wherever a Network I/O device is plugged in. Redundancy provision would double the connections in a traditional patched system of, say, 100 connections, to 200 connections, whereas an IP system would only double the network connection count to two, no matter how many channels you need.

Thus, wiring is greatly simplified, the cost of wall panels is eliminated, and audio performance is improved (no capacitance issues from long cable runs).

Keeping track of cross-patched numerical IDs from a multitude of XLR sockets to a multitude of console inputs and outputs is the bane of many studio engineers. By routing in the IP domain, every input or output of every networked device can have a label that persists no matter where the device is plugged in. In a network with a discovery mechanism, such as Dante, devices automatically register their presence to every other device on the network and expose their ability to provide or receive signals.

Diverting resources from one location to another, or to multiple locations, is simply a matter of choosing the I/O on the network. Because I/O is attached to the network and not directly to a processing core, all I/O on the Network is available anywhere, to any another device. There is no more physical patching, no expensive cross-point routers in the way, and no studio, console, or system-specific I/O - all I/O can be deployed anywhere. All those costs disappear - reduced to IT industry standard switches from vendors like Cisco, and only the I/O that you need. And expansion is linear - simply add a new device to the port on a switch or add a new switch. Traditional cross-point router expansion requires square-law increments, which brings complexity and expense.

The discoverable network also provides inherent permanency. There is no single point of failure. If you remove an I/O device or turn off the mixing

console, the network continues to function, the routes between other devices continue unaffected, and new routes can be made. In this, we can also profit from IT standards, as the mirrored configurations for parallel networks are integral to high quality switches and provide additional redundancy.



There are now over 1000 Dante devices from over 350 manufacturers, all offering automatic network registration and discovery services.



1000's of audio connections can be made with just a single off-the-shelf network switch.



System T - SSL's fully networked AoIP-based broadcast audio production environment.

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Standards & Interoperability

A TV station's infrastructure must knit together a wide variety of systems and processes, and it is inconceivable that one protocol could service all of these. However, an IP network, or a set of interconnected networks, can. Ethernet and TCP/IP protocol are well defined, and the network is simply a transport mechanism for any data, so different media transports and control protocols can live alongside each other to deliver

Registration is necessary for discoverability. As we move forward after the SMPTE 2110 transport standard is ratified, it is likely that NMOS IS-04 will be the preferred registration and capability discovery mechanism. Again, this is not an issue when you remember that multiple media types and data from multiple applications can co-exist in a networked infrastructure. A great thing about SMPTE 2110 is that audio data is separately packetized and so using it in audio infrastructures will be seamless - unlike

Network Standards

Control/configuration: HTTP, TCP, ConMon, Ember+, AES70...

Discovery/ registration: mDNS, SAP, SIP, RTSP, NMOS IS-04...

Media transport layer: UDP, RTP, AES67, SMPTE2110...

IP infrastructure can carry data from multiple applications as well as media data.

the required functionality. They can interact as much as they need to, or not at all, and different applications can access the content as required.

For example, in audio the AES has agreed AES67 as a standard. AES67 defines an IP transport protocol for audio and is a useful way to connect different AoIP technologies. AES67 does not include a single discovery mechanism (four different approaches are listed for consideration in the document), and it does not incorporate a control layer. However, a complete technology such as the Dante AoIP protocol can incorporate AES67 compatibility because of the Ethernet and TCP/IP foundation that underpins both.

the resource-hungry and expensive process of embedding and de-embedding to and from SDI.

Of course, while GBit ports can transmit and receive up to 512 audio channels at 48kHz, video typically requires at least 10Gbit ports with associated technical and cost constraints - one of the big challenges for uptake of Video over IP networks.

The SSL Audio Approach

The three main elements of transport, discoverability, and control are required to fully realise the benefits of an IP-based infrastructure, so at SSL we have chosen to use the Dante protocol - a technology based on the IEEE and IETF standards that combines audio transport, registration, and control in a complete technology solution. SSL Dante devices are ASE67 compatible and profit from an API that enables other applications to manage devices and routing, and - importantly - the protocol is widely adopted.

As such, it follows in the footsteps of many other successful proprietary technologies, such as Dolby-E, CD, HDMI, and so on. It's a protocol that works and is properly supported by a large community of experts. Over 350 manufacturers now use Dante, and the number devices available recently passed the 1000 mark (April 2017).

The TV industry is changing faster and faster. This is not a good time to be waiting for the development of standards, which although helpful to the Video-over-IP transition, do not have an immediate bearing on proven audio solutions that are available now. So, SSL is already deploying networked audio systems operating on standard IT infrastructure using complete, reliable technology, and will embrace future standards as they develop.

The Future is What You Want

IT infrastructure is agnostic to the standards deployed on it. The entire industry does not have to adopt a single standard when it adopts an infrastructure technology that can carry multiple standards. SSL understands this.

SSL is a member of the AES, the Media Network Alliance, and AIMS, and is closely engaged with all the standards discussions. We will embrace confirmed standards as they emerge in order to support our customers' workflows.

In the meantime, SSL is delivering a complete 'natively IP' based production environment, with direct AoIP routing control of its own devices and those from any of the many other manufacturers of Dante products, as well as use of the network to flexibly locate and configure control surface and processing components. Our System T consoles and infrastructure started shipping shortly after last year's NAB and are on-air in the US, the UK, France, Denmark, Japan and Brazil among others.

Even though new video-over-IP production protocols are just emerging, broadcasters can be confident that adopting Ethernet and TCP/IP infrastructure for audio transport and routing is not a blind leap, but an informed step into now, and into the future.



SSL is a member of the AES, the Media Network Alliance, and AIMS, and is closely engaged with all the standards discussions - ready to embrace standards as they emerge.

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Networking Now Case Study: Canal Factory, Canal+



SSL recently installed a complete IP-based production environment at Canal Factory, a recently developed production facility for daily live programming and live music events from French premium subscription channel Canal+ and free-to-air channel C8.

The facilities include two main audio control rooms, three production stages, and a music pre-mix studio. All audio I/O is connected to and routed around the facility's IP network using the Dante networked AoIP protocol via 'Commercial Off The Shelf' (COTS) Cisco network switches. This provides comprehensive, ultra-low latency distributed routing with full device discovery and more than 6000 x 6000 system channel capacity. The Dante Network has also been extended to the Canal+ Lumière studios via a fibre link, so that studio's existing MADI infrastructure is now incorporated into the new network.

The Canal Factory also hosts a 100% network-based video system that includes multiviewers,



processing, and edge routing technology, using SMPTE 2022-6 (7 to come).

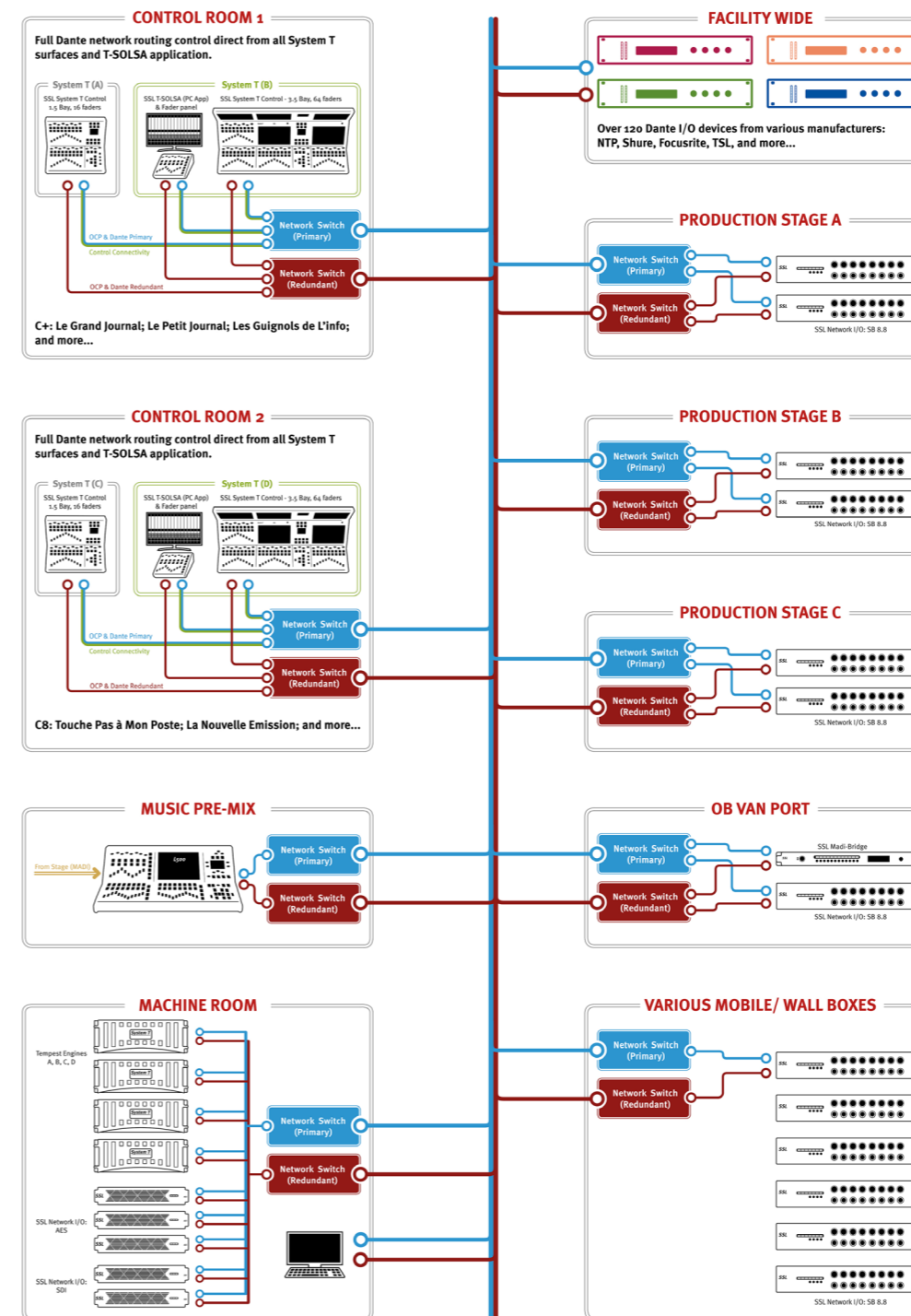
The two audio control rooms at Canal Factory each feature a 64-fader System T control surface, an additional 16-fader pre-mix surface, and PC-based T-SOLSA control software with a 16-fader panel, all connected to SSL Tempest Audio Engines. Dante system-wide routing can be controlled directly from the console, or via the control system routing panels in each room.

Those Tempest Engines (four in total) are in the Machine room. SSL's OCP network which handles communication between Tempest Engines and control interfaces is carried via the same standard Cisco switching hardware as the Dante network. The Machine Room also has network interfaces for analogue and SDI, MADI and AES digital signals, plus servers for Dante control services and other controllers.

The entire facility connects 120 Dante I/O devices from SSL and several different manufacturers, all on the same network.

Charles Lesoil, Head of Engineering at Canal+, commented: "The project has been a great success... This facility is proof that a large-scale AoIP network infrastructure can serve a sophisticated round-the-clock broadcast operation."

System T Installation: Canal+, Boulogne.



More Information

More details on System T - SSL's networked audio broadcast production environment - is available on the SSL website [here](#).

More detail on the SSL Network I/O range of Dante based audio interfaces is available on the SSL web site [here](#).

The SSL Systems Team bring decades of broadcast systems design to the challenges of leveraging AoIP technology for broadcast. They can offer expert guidance on the design of broadcast infrastructure using AoIP technology. [Click here for help and advice.](#)