Audio over IP

IP technology for broadcast audio routing systems

Solid State Logic

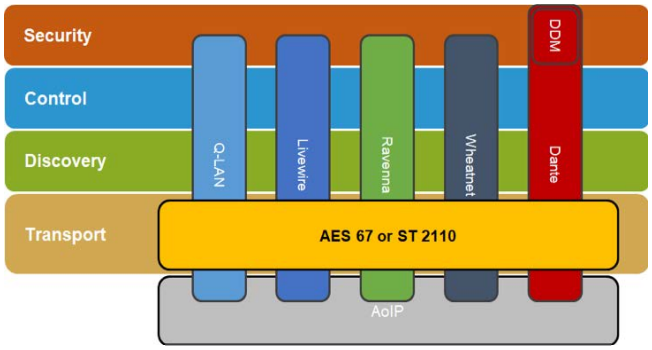
OXFORD • ENGLAND

As the AoIP debate continues to confuse and delight in equal measure, what is clear is different scenarios require specific solutions. So is there a solution that encompasses open standards and existing proven AoIP technologies to the benefit of all?

By definition, network infrastructure (switches, routers and cables) is protocol and technology agnostic, it carries data. This is one of the primary reasons to use IP technology in a broadcast facility, the same infrastructure can carry different formats of video and audio data. Key to developments are open standards, ensuring the widest potential future interoperability. Key to real-world installations are system requirements and technology choices driven by the application, or specific usage case. The market share of AoIP technology stacks is also an important factor to consider for interoperability. At this point on the standards adoption curve for audio, the use of licenced AoIP technology stacks provides the widest guaranteed interoperability and greatest functionality when considering audio specific routing requirements.

AoIP technology and transport standards

SSL's System T utilises Audinate's Dante technology stack, including the Dante API managing audio routing of SSL Network I/O and over 2000 third party AoIP products directly in the console GUI, including automatic discovery. The exact same hardware interfaces on Tempest Engines and Network I/O devices simultaneously support Dante and the transport standards - AES67 or ST 2110-30 - providing the widest possible interoperability.



Stacks of standards

Media over IP systems can be broken down into layers, the layers make up what is referred to as a stack. Within each layer, different standards perform different functions. At a network level, these standards are managed by the IEEE and IETF. Within the broadcast industry, SMPTE and AES standards, plus the more recent AMWA specifications, have been developed for media specific network requirements. It is commonplace for standards to use other standards (ST 2110 uses RTP), specifications to use standards (NMOS IS-04 uses mDNS and/or DNS-SD) and technology packages to use standards (Dante uses mDNS and DNS-SD).

The benefit of an IP network is that both the technology packages and broadcast standards plus specification approaches use the same underlying network standards. To the network infrastructure, all media and control traffic is simply data. Another benefit is that evolution of technology and standards can be accommodated because the underlying network standards are respected. The choice is not between using a specific technology package or standards, but where it's appropriate to use a specific technology or standard. Looking at the user requirements will inform this choice.

Other factors to consider include the total cost of infrastructure. For the audio-only section of a system, lower cost 1GbE switches (perhaps with a 10GbE uplink) may well be suitable. Using 10GbE or higher bandwidth ports that are required for the video stream for every audio device will be extremely wasteful and costly. SSL has installed System T projects where over 6000x6000 Dante audio signals have been deployed on Cisco's small business range of SG350 and SG500 series switches.

Security	TLS, JWT....	BCP-003-002 BCP-003-001
Control	HTTP, TCP....	NMOS IS-08 NMOS IS-07 NMOS IS-05
Discovery	mDNS, SAP, SIP, RTSP....	NMOS IS-04
Transport	UDP, RTP....	SMPTE 2110 AES67
	IEEE IETF	SMPTE AES AMWA

Security

The best thing about media over networking technology is that everything can be seen by everything and options are limitless, the worst thing is that everything is also available everywhere.

Audinate's Dante Domain Manager provides a security layer for the Dante technology stack. DDM acts as an authorisation server that allows routing clients access to devices to make changes. Dante Controller is a routing client that uses the Dante API, the System T control software is also a routing client that uses the Dante API. When thinking about any IT system, security, functionality and ease of use can be considered to have a triangular relationship. A change in any one of the three factors also changes the others; for example, adding a login pin on a mobile phone makes it slower to make a phone call. Any security considerations should always consider the intended usage of the system.

There are a number of ways of using DDM with Dante devices, thinking about IP systems in layers helps with planning how DDM may be used. Is the intention to restrict transport to stop someone "listening to audio"? Is it to restrict control and access to make changes? Should a user be able to discover and see how a system is currently being used, but not have access to make changes? It should be noted SSL have installed a significant number of Dante enabled System T facilities without DDM, depending on requirements security can be managed at a physical and/or network level. This type of security prevents access entirely unless you are the network admin or pre-authorised, DDM provides a more granular security approach with different user capabilities.

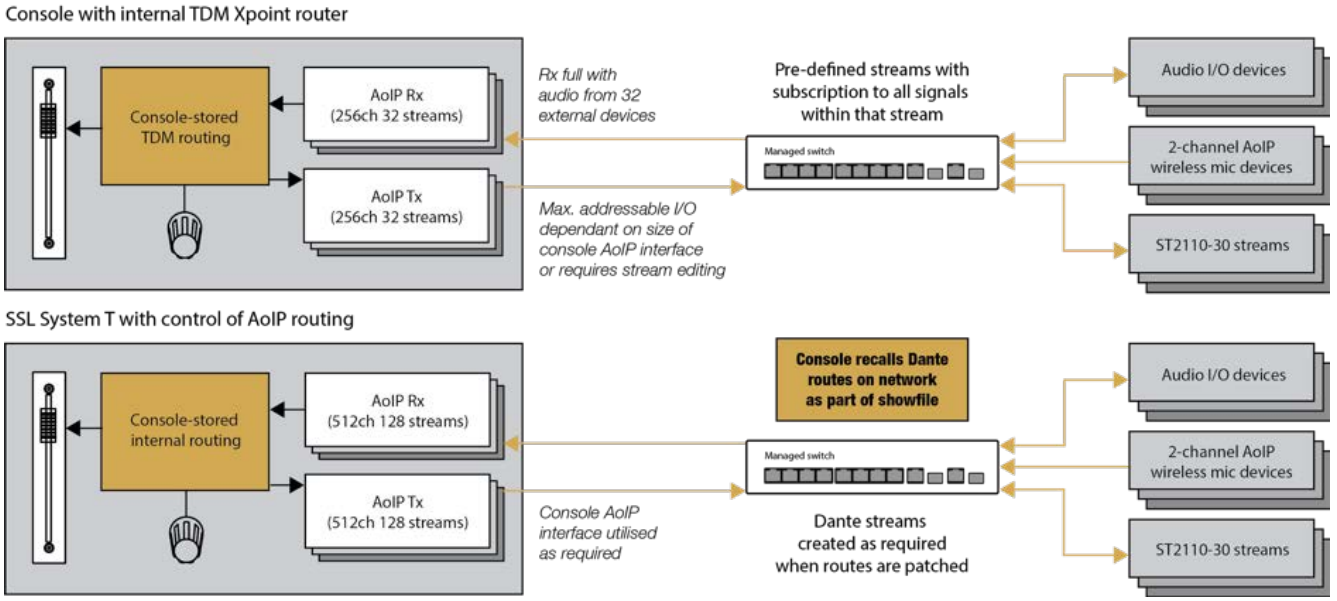
DDM provides the toolkit to centrally manage PTP settings and stream announcements for ST 2110 on Dante devices. The manual configuration aspects of ST 2110 require a significant level of understanding when adjusting settings, particularly PTP parameters and manual configuration of multicast addresses, where duplication would cause system issues. Using DDM provides a secure way to make changes. There is the added advantage that when configuring a large system a single interface can change all of the PTP settings on many devices at the same time.

System engineering

When thinking about usage requirements, consider who is performing audio routing within a broadcast facility. Obviously there are variations between different facilities, but typically this can be split into audio routing performed by the console operator and audio routing driven by engineering staff, typically using a routing control system. Console routing - including connecting microphones, or stagebox I/O to processing channels - across a network of audio consoles would be stored within the consoles' recallable settings ("showfile" in SSL System T language). To allow our clients the most flexible and future proof installations, SSL's approach is to deploy the console router on the network and use the same technology stack to provide and receive AES67 and ST 2110-30 streams. The console's routing software is a routing controller of the AoIP Dante network.

The Dante API includes many key features to allow mono routing that would traditionally have been a function of TDM routing inside a processing engine. The Dante API provides automatic stream creation when routes are made, and includes unicast possibilities, both are advantageous when dealing with the relatively bandwidth light but high channel count requirements of audio relative to video.

Ensuring both the console-centric audio routing and wider infrastructure hand-off is all performed on switches, using both an AoIP technology stack and transport standards removes the reliance on a proprietary TDM console router. It also negates the need for hardware shuffler and combiner nodes, that are essentially TDM routers. As the network infrastructure is agnostic, when open standards mature and are adopted, these can be utilised in the software platform that is the console GUI for console driven audio routing alongside the existing Dante routing.



The AoIP advantage

IP routing systems have significant advantages; a key advantage is the flexibility of the underlying infrastructure. Networks deal with data, data of any format, protocol, or standard as long as it respects the IEEE and IETF standards.

As with any system design, user requirements and intended applications are the primary concern. SSL's System T broadcast audio production environment supports Dante, ST 2110 and AES67 transport standards.

The advantages of Dante provide mono audio network routing capabilities directly from the console GUI, with auto discovery and connection management of thousands of available devices. SSL AoIP devices enable transmitting and subscribing to ST 2110 or AES67 streams on the same Dante interface, opening up interoperability to many more devices including IP video systems.

With System T you can have the best of both worlds as the audio routing is performed directly on COTS network hardware, not proprietary TDM audio routing hardware.

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