



Technology Insight Paper

in association with



# The Audio Networking Jigsaw

What you need to know as  
an IT professional

Freeform Dynamics, 2019

## Introduction

### About this Document

The insights presented in this document are derived from independent research conducted by Freeform Dynamics. Inputs include in-depth discussions with IT vendors and service providers on the latest technology developments, along with intelligence gathered from mainstream enterprises during broader market studies.

*It's early days for enterprise audio networking but momentum is gathering.*

*Now is the time to embrace audio networking as a legitimate part of the corporate network infrastructure.*

For those of us in IT or the networking business, the term 'audio networking' most likely brings to mind IP telephony, plus Skype, Webex, Zoom and all the other voice-enabled software out there. This isn't surprising given the focus on unified comms and collaboration over the past few years – and the pain it often caused in the days before Gigabit Ethernet!

But audio networking actually emerged from the AV (audiovisual) world. The term was coined to describe how sound engineers are increasingly shifting to a more network-centric approach when connecting audio equipment together. Rather than using miles of traditional cabling, the idea is that sound equipment such as microphones, mixers, amplifiers, speakers, recording devices, and so on, is simply plugged into Ethernet, allowing connections to be defined and configured virtually in software.

So far, so familiar: like any other software-defined infrastructure, it means audio networking can be more flexible and scalable, simpler to manage and troubleshoot, and there's more potential for non-specialists to get involved in activities that previously required focused expertise. With regard to the latter, this could be as simple as replacing a dud device, but it could also be adjusting the microphone setup in a meeting room to make sure everyone is properly heard. These are tasks that would previously have required a call to the AV team (either in-house or provided on contract by an equipment provider or integrator).

At the time of writing, we are still in the early days of AV audio networking in a mainstream enterprise context. But momentum is gathering, with many facilities teams and business leaders making significant investments in modern, connected meeting rooms, huddle rooms, presentation areas and more. That makes this a good time to start learning about it – if you aren't already doing so.

### *Not on my network!*

From a corporate networking perspective, it's a worrying prospect. It means hosting new and unfamiliar end-points, along with streams of high-definition, multi-channel audio that's very sensitive to latency and data loss. Yes, it's a similar set of real-time requirements to IPT/VoIP, but without data compression to minimise traffic volumes. Now throw in security concerns as well, and the immediate reaction of some IT pros will be to throw up the barriers with a cry of "Not on my network!"

In this paper, we'll look at why this natural defensive stance is neither sustainable nor appropriate, and why it makes sense to embrace audio networking as a legitimate part of our corporate infrastructure – provided, of course, that it's done in the right way.

## Why have this conversation now?

There are three reasons why you need to address audio networking. Indeed, you may already have experienced one or more of them:

### *Reason 1: Business demand*

You almost certainly already know the hunger within the business for modern shared comms and collaboration facilities. Whether the motives are strategic digital transformation, workplace transformation, cutting the travel budget, or (more likely)

*Audio networking is fundamental to many initiatives.*

some combination of all three, organisations are already investing in this area. This may translate to initiatives such as equipping new buildings or converting traditional office space into meeting rooms. There might also be a focus on refurbishment of existing facilities. Either way, you end up with a requirement to handle high-quality audio (Figure 1).

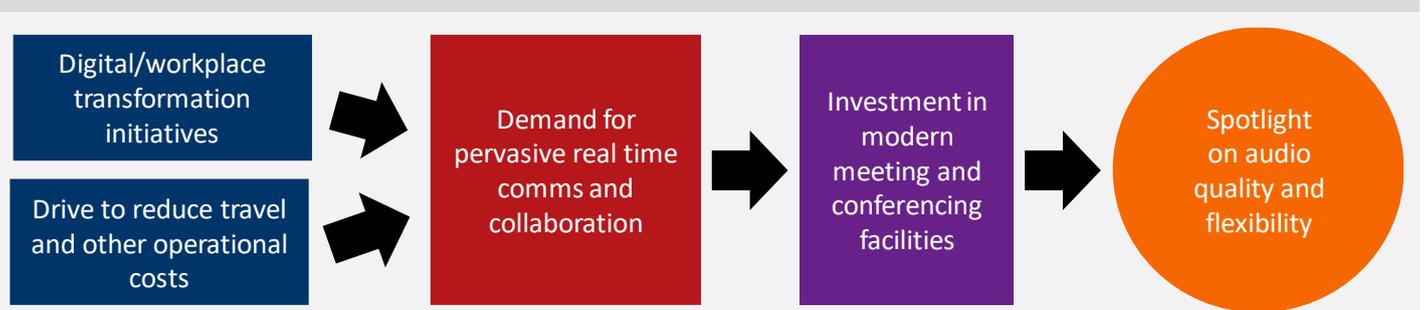


Figure 1 Mainstream trends and investments are highlighting the need for high quality audio experiences

**Reason 2: Technology and infrastructure readiness**

*Mature protocols and tools that operate at OSI Layer 3 are now available, and these sit at the centre of a thriving ecosystem of audio equipment manufacturers.*

Although it’s had a low profile in IT, audio networking is not a new idea – sound engineers have been using the approach for many years. In the early days, though, it was confined to discrete local networks based on specialist switches and OSI Layer 2 protocols. Just as well really, because in pre-Gbit networking days most corporate networks would have struggled to handle uncompressed audio.

But today things are different. Mature Layer 3 protocols and tools are available, and these sit at the centre of a thriving ecosystem of audio equipment manufacturers. Specialist switches are no longer needed, which opens the door to leveraging the corporate network in a way not previously possible. Meanwhile, from both a bandwidth and QoS management perspective, those networks are now generally much more capable of handling the kind of traffic generated by audio networking alongside other applications (Figure 2).



Figure 2 External and internal developments have aligned to make mainstream audio networking viable

*Significant modernisation and refresh initiatives generally only take place every few years.*

**Reason 3: Seizing the next network refresh opportunity**

Depending on the current state of your infrastructure, the last big reason to spend time thinking about audio networking now is the typical investment cycle. While demands on your corporate network grow continuously, core network infrastructure investments usually occur in waves, with significant modernisation and refresh initiatives only happening every few years.

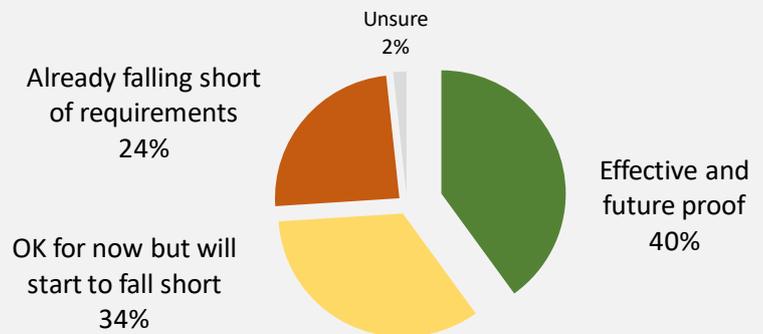
If you have been through an investment cycle recently, then you may be one of the 40% of respondents who regard your network infrastructure as effective and future proof (Figure 3). Otherwise, there's a good chance that it's been a while since that last big initiative, in which case it's only a matter of time before new challenges pop up – if they aren't doing so already.

**SURVEY QUESTION:**

Thinking of readiness for the next 3 years, how would you characterise the state of your existing corporate networking infrastructure?

**Source:**

Freeform Dynamics, from report entitled: "Infrastructure Readiness Temperature Check" available from [www.freeformdynamics.com](http://www.freeformdynamics.com)



**Figure 3** The current state of your infrastructure is usually related to where you are in your investment cycle

We need to keep things in proportion and acknowledge that audio is unlikely to be the primary driver for that next big wave of investment. But as you start to plan and budget for it, whether it's about catching up or getting ahead, take the opportunity to think through imminent and longer-term audio networking requirements and how you might accommodate them.

*Knowing a few audio networking essentials, can help as you discuss requirements and options with the specialists.*

## A few audio networking specifics

The sound engineering aspects of audio networking aren't directly relevant to IT and enterprise networking. However, knowing some basics can clearly help as you discuss requirements with specialists and work through the IT implications. Let's therefore take a brief look at the nature of the beast.

As mentioned, once your audio devices are on the network, you set up and manage the environment in software. Typically, microphones, mixers, amplifiers, speakers, etc are hooked up simply by clicking on the intersection points of a device matrix presented within a management tool. The connections themselves can be multichannel and are fully configurable, so sound engineers can set detailed channel characteristics, and define the way in which channels are split, merged, and so on.

A number of protocol options underpin the resulting real-time audio environment. They each provide configurable, deterministic, low-latency control to minimise transmission delays and ensure the kind of precise synchronisation required to support distributed high-definition audio. The market leader here is Dante (from Audinate), which operates at Layer 3 and at the time of writing has both the broadest support among equipment manufacturers and the greatest industry momentum. Other credible options are available, though, and the ones you are most likely to come across are Q-SYS, RAVENNA and Livewire.

*A number of protocol options are available to underpin a real-time audio network.*

The various Layer 2 technologies are less relevant for newer projects in an enterprise context. But it is worth mentioning the AES67 standard which you can look up to learn more about interoperability – particularly useful if you are dealing with AV legacy technology such as older AV hardware etc.

*Audio networks transport sound data in uncompressed form and in real-time, so they are sensitive to packet loss.*

*Dealing with audio networking from an IT perspective is not rocket science.*

### Netting it out

Protocols and tools to one side, the main considerations when looking at audio networks through an IT lens are:

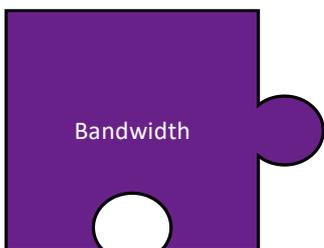
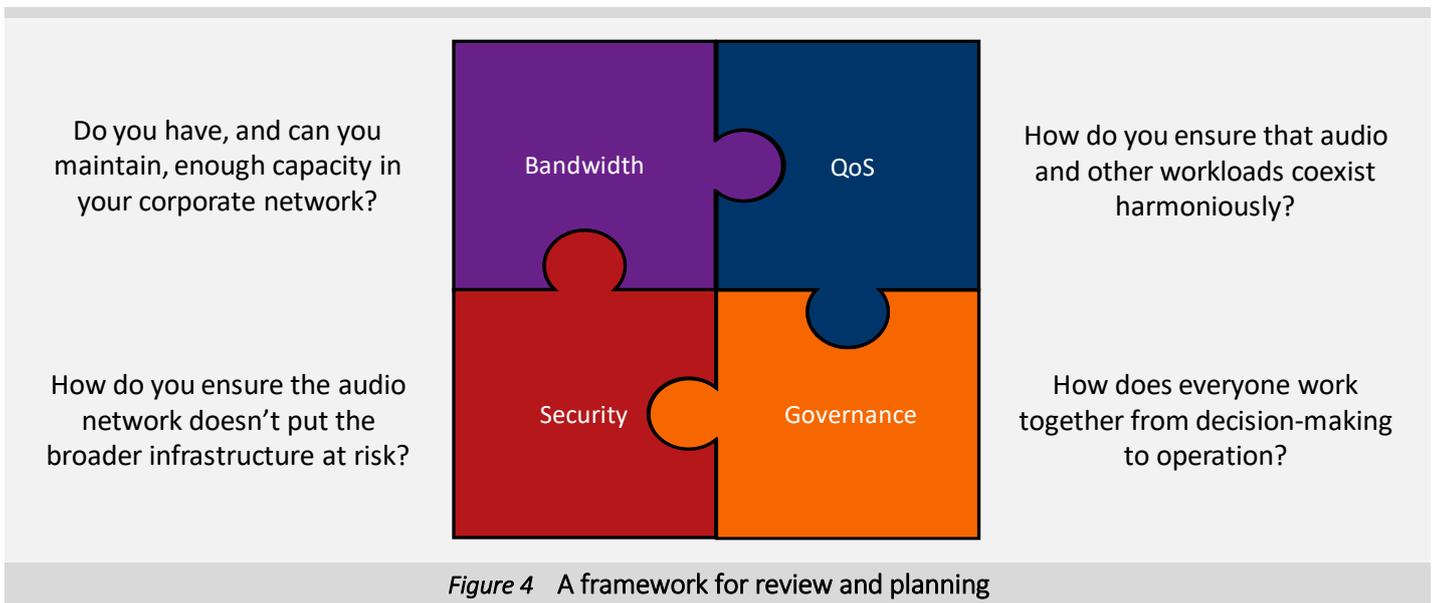
- Sound-related data is moved around in uncompressed form
- Connections are real-time, so are sensitive to packet loss
- It’s essentially an IoT model, so security is a particular concern
- Responsibility for implementation and management is shared

These factors give rise to a jigsaw of key inter-related questions and imperatives.

## The Audio Networking Jigsaw

First, a spoiler alert – dealing with audio networking from an IT perspective is not rocket science. If you are experienced at designing, securing and running networks in the broader IT context, then you could probably infer all or most of what we are about to cover based on what we have told you already. Our objective in walking through the jigsaw of dependencies is to provide a convenient framework for making sure you have everything properly covered.

With that, let’s quickly review some of the important high-level considerations and associated questions (Figure 4).



### Assessing and managing bandwidth requirements

The prospect of supporting uncompressed, multi-channel audio on the corporate infrastructure may be daunting, and it’s true that large-scale implementations can lead to significant additional traffic on your network, both LAN and WAN. But you need to keep a sense of proportion. The chances are that when considered alongside all other applications and workloads running in your environment, the traffic

*Audio requirements should simply get factored into your overall capacity planning.*

generated by the audio network will represent a small single-figure percentage of the overall load.

It's clearly impossible to generalise so you need to factor audio requirements into your capacity planning. In practical terms, while you can do your own calculations from first principles based on a set of theoretical assumptions, for initial implementations it makes more sense to work with the audio engineers on the project.

Once you have an audio network in place, ongoing capacity management becomes much easier. Your standard network monitoring tools will provide you with visibility of traffic volumes and patterns, and give you a good feel for how demand is growing. If you then have to plan for stepwise expansion, e.g. bringing new meeting rooms online, you'll be able to model additional requirements based on actual data.

### *Ensuring harmonious coexistence with other applications*

When it comes to quality of service management, audio engineers will stress that "the packets must get through, and get through fast." The logic is that in a real-time environment, not only is latency a big deal, but when data is lost in transmission it is effectively lost forever. And you'll know from experience with IP telephony that drop-outs, delays and other quality issues during calls can wreck the user experience. This isn't great for the business, nor for the stress levels and reputation of IT, especially if network constraints, either LAN or WAN, are seen as undermining the value of all that expensive AV kit.

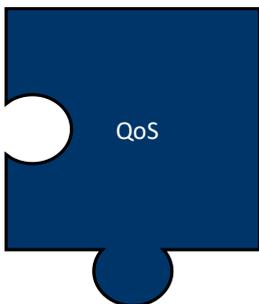
Important though this perspective is, there are undoubtedly other sensitive workloads relying on your network – high speed, high volume transaction systems, real-time flows from other IoT systems, and depending on your industry, even safety-critical applications. Audio networking therefore needs to be prioritised and managed from a QoS perspective alongside other competing workloads.

Again, you can leverage all your existing QoS mechanisms to achieve this in terms of resource allocations and limits, conflict resolution policies and so on, along with the same troubleshooting tools and techniques when problems arise. And the 'business as usual' approach also applies when it comes to disaster recovery, e.g. in the case of a major switch failure leading to drastically reduced capacity, do you shut down or throttle the AV systems to maintain the performance of other applications, or vice versa?

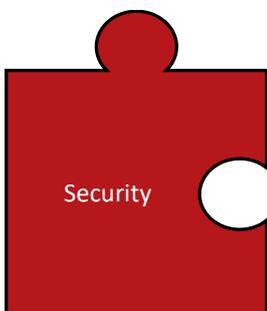
### *Making sure the audio network doesn't become a security liability*

The first and arguably most obvious piece of advice is to put the audio network onto its own subnet, or preferably its own VLAN. This will minimise the chances of a vulnerability putting the broader corporate network at risk, as well as allowing you to constrain the scope of potential damage should an actual breach occur (particularly in the case of VLANs). In line with the notion that our jigsaw pieces are inter-dependent, you will probably have created at least one network segment for audio networking traffic anyway to facilitate QoS policy definition and management. Indeed, this approach can be valuable to help manage QoS, security and bandwidth challenges.

Whether you use one or multiple subnets or VLANs will depend on the scale and complexity of your audio environment, though in general it's better to keep things as simple as possible. The more complicated a scheme you come up with, the more difficult it will be to troubleshoot and maintain. The good news is that the AV team will



*Audio needs to be prioritised and managed alongside other competing workloads.*

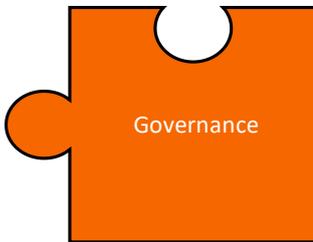


*Whether it's network segmentation or end point management, the simpler and more centralised you keep security measures, the less chance there is of things falling through the cracks.*

have access to higher-level segmentation mechanisms within the audio networking software layer. They can group devices into logical pools for management and configuration according to room, floor, building or whatever scheme makes most sense to them. As an IT pro, you can leave them to get on with that.

When it comes to end-point security, the key is to ensure that enterprise-class devices are used from trusted suppliers that respect the need for appropriate authentication, and provide the necessary hooks for remote monitoring and management (including patching). As with any other type of endpoint, initial configuration and acceptance onto the network needs to be controlled, and again the simpler and more centralised the approach you use, the easier it is all round, and the more confidence you can have that measures are properly implemented.

The way you allocate security-related responsibilities between the IT team, in-house AV personnel, contractors and other suppliers is clearly important to ensure that nothing falls through the cracks. This brings us onto our last piece of the puzzle.



### *Getting everyone to work together effectively*

Audio networking is one of those solutions that crosses traditional boundaries. Clarity on decision-making, roles and responsibilities, i.e. governance, is therefore critical.

The first big question to be addressed is whether or not the audio network should live within the overall corporate networking environment. Even if modern Layer 3 based protocols are used, it is still theoretically possible to set up a totally separate physical network. However, this would mean a duplication of capital expenditure, additional administration overhead, and, more importantly from a strategic business perspective, a lack of scalability and flexibility. Bringing new conferencing locations online, for example, would require a physical network buildout.

In order to make this fundamental decision objectively, you will need to get the various parties together to talk it through. Business stakeholders will likely favour the converged approach, but it's up to the IT team to provide assurances that this can be taken efficiently, effectively and safely. The AV and facilities teams, meanwhile, will be concerned about maintaining adequate control over the sound engineering side of the equation. The last thing they will want is to be beholden to IT to get anything done.

Assuming you decide to move ahead in a converged manner – the sensible decision in most situations – you'll need to agree who will take care of what. Much of this will be relatively clear-cut, but some activities will require the IT and AV teams to work together. For example, it will be the job of AV to evaluate and select audio equipment from a functional and form-factor perspective, but this should be in accordance with security and interoperability criteria developed in collaboration with IT. Conversely, while IT will look after capacity planning and QoS management, they will need input from AV to ensure requirements are properly understood.

The good news is that modern audio networking solutions allow this separation of concerns to be handled naturally and cleanly. Furthermore, suppliers can help with training and best practice guidance. So, provided there is a will to work together, establishing an effective approach to governance shouldn't be too hard.

*The IT and AV teams must learn to work together effectively.*

*Provided there is a will to work together, establishing an effective approach to governance shouldn't be that hard.*

## Final Thoughts

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*It's more likely a case of 'when' rather than 'if' audio networking will enter your world.*

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Audio networking is transforming the lives of sound engineers and AV teams by freeing them from the constraints and headaches associated with traditional cabling. The network-based, software-defined approach has huge benefits in terms of flexibility, quality and cost, and the advantages of hosting the audio network on the corporate infrastructure are real and significant.

If you haven't already received a knock on the door of the IT department asking for help and advice, it's probably only a matter of time. Put simply, if you are an IT or networking pro involved in looking after the corporate infrastructure, it's a case of 'when' rather than 'if' audio networking will enter your world.

The key, then, is to make sure that you welcome networked audio devices and the traffic associated with them – but on your terms. With no disrespect intended to AV and audio professionals, they generally don't know what they don't know when it comes to IT. Unless you proactively build relationships and work collaboratively with AV, the risk is that they could make decisions that will come back to bite you, them, and the business as a whole.

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*When working with your AV colleagues, encourage them to put the focus on connectivity, software infrastructure, and future-proofing.*

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A notable danger is if equipment manufacturers seduce the AV team into selecting devices that would either complicate interoperability or mandate the use of networking options that don't make sense from a future-proofing perspective. While devices are an important element of any solution, they are also the most volatile component – there will always be a newer model of microphone that outperforms the previous one. Just as in any other area of technology, such as mobile and end-user computing, allowing endpoint preferences and decisions to dictate strategy is letting the tail wag the proverbial dog.

So, when working with your AV colleagues, encourage them to focus on connectivity and software infrastructure, and to think beyond immediate requirements onto how demands might evolve and change over time. In today's digital business, it's not always possible to predict the future. So in fast-moving areas such as comms and collaboration, it's important to engineer systems that are flexible, open and designed in the spirit of simplicity and change-friendliness. And like Cloud and SaaS adoption by the business, you want to be proactive rather than be handed a fait accompli.

And when it comes to implementation, as with all emerging and fast developing technology areas, it's worth choosing suppliers wisely and leveraging their knowledge and experience to the full. As we have said, audio networking is not a new discipline, so the solutions now entering the corporate mainstream are generally well proven and backed by strong ecosystems. Whether you work with an integrator or an equipment manufacturer, work collaboratively so you get off to a good start.

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*The bottom line: there is nothing inherently difficult or risky about audio networks, provided you move forward in a planned, organised and disciplined manner.*

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Finally, if you take away nothing else from this paper, just remember that there is nothing inherently difficult or risky about audio networks or the prospect of incorporating them into your enterprise networking environment. It's just another set of IP traffic that needs to be managed with its specific operational requirements in mind. The trick is to work through the pieces of the audio jigsaw, develop collaborative relationships with your AV colleagues, and move forward in a planned, organised and disciplined manner.

## About Freeform Dynamics

Freeform Dynamics is an IT industry analyst firm. Through our research and insights, we aim to help busy IT and business professionals get up to speed on the latest technology developments, and make better informed investment decisions.

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