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THE DEATH OF ANALOGUE AND THE RISE OF AUDIO NETWORKING

An analysis of the trends and dynamics of the audio networking market

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Background

RH Consulting were commissioned to appraise the audio networking market. Whilst we were asked by Audinate to do this work they have no influence on our editorial line or on the opinions we hold. We asked them for specific data and we were only issued with the data we asked for. All data were given only as trend data in terms of percentage change. This was to avoid company sensitive detail being released.

This document discusses the audio networking technology, the business models and the rate of market adoption.

A little history

Audio networking is not new. It effectively started in 1997 with the introduction of CobraNet. Previously all professional audio connections were point to point. Early CobraNet systems were hub networks and simply replaced point to point connections with the QSC RAVE products. In 1999 came Peavey MediaMatrix hardware and switched networks in 1999.

EtherSound was launched in 2001. This had some popularity initially as it could be cabled without switches, much like normal audio cabling, and purported to have lower signal latency; all of which helped gain some traction in live events.

For several years CobraNet and EtherSound had the market to themselves until the introduction of Dante in 2006. This was initially in high-end products such as the Lake Controller and PLM amplifiers but has subsequently been adopted in wide variety of products and currently has product shipping from around sixty manufacturers.

Ravenna was introduced in 2010 but is currently largely used in the broadcast market.

In 2013 AVB was ratified after several years of talking but it has still not seen appreciable market penetration due to a lack of switch support and interoperability between manufacturers.

To put it in perspective audio networking is twice as old as Facebook and YouTube, five years older than Bluetooth and two years older than the smart phone, which we'll discuss later.

The technology

Audio networking technology promises many things; multiple channels over a single cable, simple accessibility for audio on and off a network, long distance transport using standard fibre-optic technology and ease of use. The various different implementations all use effectively similar technology to achieve this.

Audio is sampled and placed in standard Ethernet packets which are then placed on standard networks. This allows the audio industry to utilise all the hard work done by the IT industry without incurring much cost. It also allows audio networks to scale up as IT networks do.

The current major dividing line between the different technologies is at which layer of the OSI model they operate; i.e. do they work at layer 2 or layer 3?

The players

Below is a list of various standards available and highlighted some of there technical features. We've also specifically mentioned QSC-Q LAN even though it is proprietary because of points we make later about its compliance with AES-67.

Protocol	OSI Layer	Channel Count	Latency	Sampling	Licensing	Notes	AES67 Compliant
AVB	2	Effectively unlimited	Minimum 0.25ms	Up to 32 bits and 192kHz	Free and open	AVnu alliance promotes and certifies but not all AVB products compliant.	No
CobraNet	2	Typically 32in/out per interface. Maximum over 3000 ch on a network	Typically 5⅓ ms. Can also operate at lower values	Typically 20bit 48kHz. Can also operate at 16 or 24 bit and at 96kHz	Per node	Development appears to have ceased	No
EtherSound	2	128 ch (ES100)	1.5ms	Typically 24 bit 44.1 or 48kHz Can also operate at 96 or 192kHz	Per node?	Development appears to have ceased	No
Dante	3	Effectively unlimited	Typically 1ms but can vary	Up to 32 bits and 192kHz	Per node		Q1 2015
Q-LAN	3	Effectively unlimited	1ms	Current A-D/ D-A are 24bit 48 or 96kHz. Network audio is 32 bit	Proprietry	Q-Sys system also has CobraNet and Dante interface cards	Yes (tested at plug fest, official support unknown)
Ravenna	3	Effectively unlimited	Typically 1ms	Up to 384Khz	Open, some options free	Exclusively used in the broadcast world	Yes

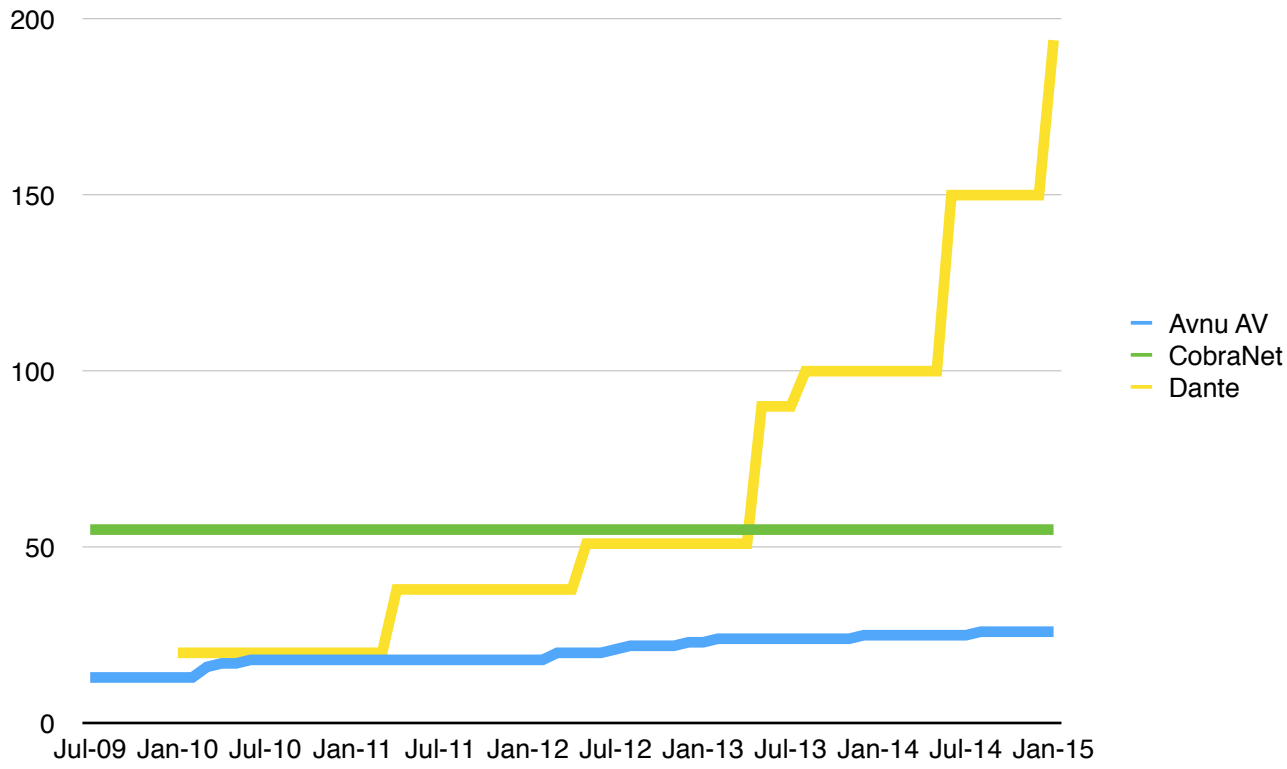
Whilst we have given a simple technical comparison, we know from experience that features don't necessarily drive the purchase decision. Marketers believe they compete on features and signal to their competition with them. Some customers go for features too, but many are wiser than that. They ask the question 'does this solve the problem I have?'

The data

It's impossible to get reliable and comprehensive data on the sales of networked audio products. No manufacturer releases this information nor do we know how profitable each product is. Worse still just because a product has a network port on it doesn't mean it will be actually used in a networked application, and if it was we don't know whether that project was successful, used networking appropriately, or whether another protocol would have given a better result.

We have tried to map out some trends in the progression of audio networking.

Initially we just looked at the number of licensees for each protocol. Currently just over a quarter of the licensees of Dante are shipping product and one third for Ravenna and AVB. CobraNet and EtherSound have many long-standing licensees but almost no new adopters or products.



Progression of selected protocol licensees

Sources - CobraNet website, Avnu press releases, Audinate

We have included only members of the AVnu alliance who work in the 'proAV' sector, not those involved with consumer, switch or silicon production, automotive or industrial.

Dante has the most manufacturers signed up by a considerable margin. They have achieved 400% increase in licensees in 24 months and have almost four times the number of licensees as the next largest protocol.

As of December 2014 there were just under 700 networked audio products available on the market.

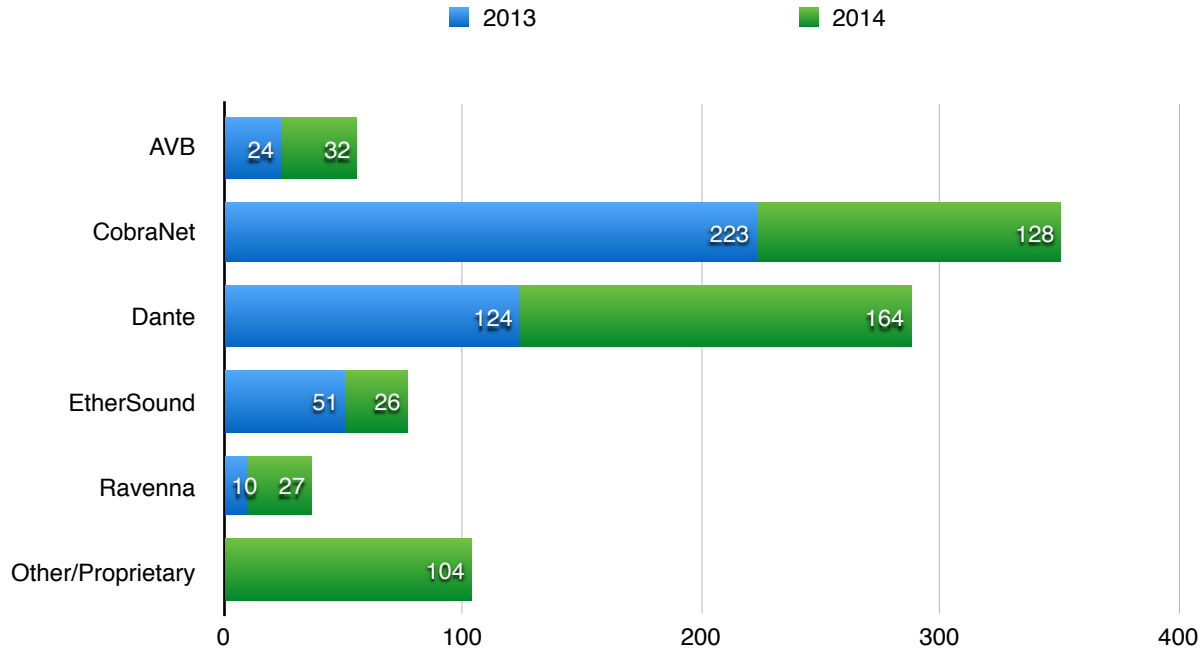


Chart of available products using different protocols - source RH Consulting

The above chart needs a little explanation so that people don't simply run off with headline data. Note that some of the increase in numbers, particularly for CobraNet and EtherSound, is because our research was more diligent in 2014. Most of the additional products we found using those protocols were more than one year old.

Dante has the largest growth and the most new products, so whilst CobraNet is still the market leader it has lost momentum.

Counting devices proved not to be as easy as we thought. When is a product a product? When is something a different product? We have a number of notes about this:

- We have investigated products that appear to be shipping. Its sometimes difficult to see if it is shipping or discontinued
- We have included every SKU of a product. If a company sells a 2 x 600W amplifier and a 2 x 1200W amplifier they are counted as two products because they would have a different use
- If the same product is available in a variety of card configurations such as a processor that is 16 in 16 out, 8 in 24 out, 24 in 8 out etc. then this is counted as one product as the overall channel count is the same
- Where a similar product is available in different models 8 in 8 out, 12 in 12 out, 16 in 16 out, or a mixer with different input channel counts then these are counted as separate products as they would have a different use
- If they are members of the AVnu alliance then we count their product as AVB. Non AVnu products are not included in our totals for AVB devices as they do not provide connectivity to anything other than themselves
- We have not included hacks, circuit boards or something that it not an actual product sold on its own or, at a user level, allows a product to become networked
- Software that enables a Mac or PC to support a particular network protocol is counted as one product

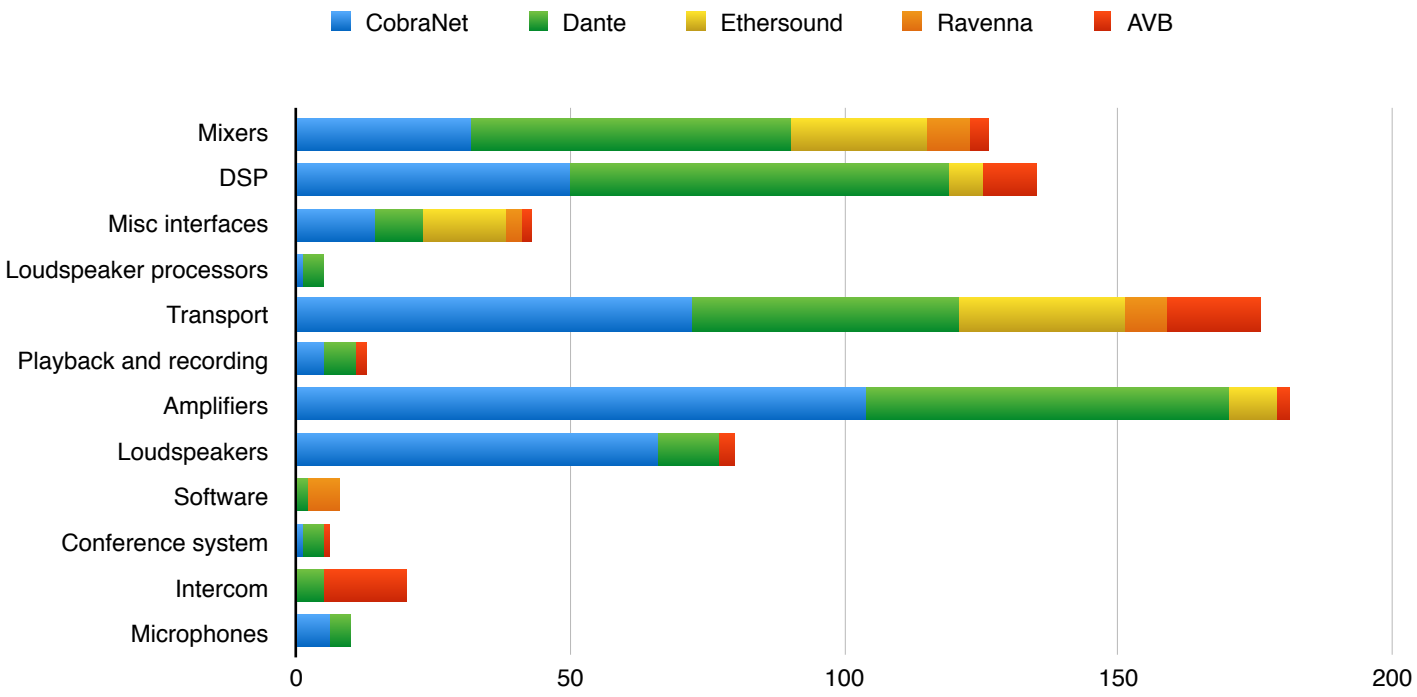


Chart of product availability by category of product - source RH Consulting

Its worth noting that 53 of the 66 CobraNet loudspeakers were from one manufacturer which seriously skews the result. Similarly 25 of the 104 CobraNet amplifiers are from one manufacturer too. This paints a misleading picture of CobraNet's success.

Dante is the only protocol that offers products in every product category.

Three product categories in particular are worth further comment.

Interfaces

We found about 100 of these but choose not to count them as products because they are just enablers to network a product. Indeed a number of manufacturers make two or more cards that fit into the same slot to give customer choice over what protocol they wish to use. The manufacturer isn't interested in networking, they want to sell audio products.

For example, Harman were a founding partner of the AVB initiative and were initially reluctant to adopt Dante. However, they have subsequently evolved their offer to their 'ABCD' networking pitch.

Audio transport

The second category of product that needs scrutiny is what we call 'transport'. These are devices that simply get audio (normally analogue) on and off the network. You could argue that they are a form of interface. These currently make up a sizeable number of networked products available on the market but they don't actually 'do' anything.

If, all audio products are networked, from the microphone to the loudspeaker then these products will become irrelevant.

Software solutions

AVB, Dante and Ravenna all offer the possibility of outputting their protocol directly from the Ethernet port of a modern computer. In our survey we counted each solution as one product. This gave us six products. However increased use of software solutions could cause an explosion in the use of networked audio and make product counting very difficult. Dante Virtual Sound (DVS) card is currently 28% of all Dante unit sales.

Any audio aware programme can use the networked outputs offered by DVS or Ravenna software. AVB is possible if it were enabled by the OS (apparently the capability for AVB is already in most modern computers).

We don't know how these software solutions are being deployed.

The business model

With the introduction of a new technology there is often a new business model that goes with it. In the beginning, a new innovation is at a loss as to what the business model will be and it needs to discover one.

You can also divide adoption of technology into number of phases along an adoption curve - invention phase,market creation phase, high growth/mass adoption phase - made up of early and late majority, late mover/straggler.

New ways of making money need to be invented along with the technical innovation itself. Audio networking is no different.

Analogue connectivity sells cables and connectors. The size of these connectors sets the form factor for devices because they have to be fitted onto the item of equipment, sometimes in very large numbers. There is also a service that is sold to terminate, temporarily run or permanently install these cables.

Audio networking mostly eliminates the specialised cable and connector manufacturers and allows more flexibility in product form factor. It also moves or eliminates the cable installation cost to use permanent installed cabling in a building instead of a temporary run or moves the money to do that work from a company in our market to an IT cabling company.

Audio networking still hasn't discovered the best business model. AVB and Ravenna are open but they still have a cost and require investment in terms of their promotion, testing and future development. CobraNet and Dante charge for selling technology that goes into a manufacturer's product. Dante can also charge for a software sound card and there are paid for Ravenna software solutions too.

All of these technologies need support provided either by manufacturers and/or the protocol inventor.

The two current most successful protocols; CobraNet and Dante, are paid for but this is not necessarily the reason why they are in the position they are today. CobraNet is there because it was the first.

However they both provided their customers, who are manufacturers, an easy to deploy solution in the form of a card or chip, with a clear pricing model. They provided their customers with an *integrated* solution.

The progression of Dante

It's worth looking at some of the key factors that have got Dante to where it is today.

Audinate offer a solution that is easy to integrate into products. They have a clear pricing structure and some good technical features.

Support

Audinate provide a support service to manufacturers. This raises an interesting point in that Audinate have a direct commercial interest in supporting manufacturers with the adoption of Dante and that end-user projects are successful.

Whilst manufacturers should normally provide product support, this provides a useful 'backstop', should the problem go beyond the manufacturer's capabilities, who after all are audio people, not necessarily networking experts. Additionally, they could arbitrate if there was a problem with a multi-manufacturer system.

What's more, this active participation in product and project adoption gives them feedback for product modification and improvement.

This support is part of the cost of Dante in comparison to using a standard. For example, the AES and AVnu do not provide a support service because they have no structure for doing so.

This perhaps best explains the difference between those who wish audio networking to be a technology based on a standard or a product that is supported and developed.

Updates and new developments

Audinate have updated their firmware an average of twice a year, for example their Brooklyn card has been updated six times in three years.

They have created new products as their technology has developed to meet evolving market requirements.

Product	Year
Dante Legacy Module	2008
Dante Virtual Soundcard	2009
Dante Brooklyn	2010
Dante Brooklyn II	2011
Dante PCI-e card	2011
Dante HC	2014
Dante Ultimo 2x2	2014
Dante Ultimo 4x4	2014
Dante Via	2015 (likely)

Table of Audinate product introductions - source Audinate

Timing

Technology gets adopted only when the timing is right. We are still at the very early stage of adoption so people may not yet want to invest significant capital. If you invest too early then you waste money on experiments that are going to fail because you don't know how the industry will converge and how long it will take. You only really get an idea when you get to around 10% adoption and we are currently much lower than that.

The timing is wrong for AVnu because the lack of wide availability of AVB compliant switches holds back adoption. They could wait a few years until the switches are widely deployed before pushing the technology. This would save a great deal of wasted resource on an investment that cannot currently deliver a return.

When there is an increase in the adoption of AVB compliant switches, that would be the time to pour capital into AVB, when the invested money can actually create a profit.

The other choice is for AVnu is to remove the need for compliant switches. This might be a big leap for AVnu whose raison d'être is to have standards-based technology.

Lack of alternatives

We've often mentioned that its surprising that we are even having the discussion about different protocols. We raised the example that had MIDI had continuous development since the 1980s then it might have gone through many iterations, started carrying audio and eventually may have become our complete IP-based audio and control solution.

Things might have gone another way too. A few years ago Cirrus Logic decided not to develop CobraNet any further. It was too small a part of their business. Had they chosen to, they may have delivered CobraNet 2 and more. It would have been hard for Dante or any other protocol to progress against such a large, well resourced, established player.

It's possible that Dante may not have failed in this scenario. They may not have even started. We will never know.

There are currently a lack of decent alternatives to choose from:

- CobraNet is no longer developed (and rightly or wrongly it accrued the image of being difficult to use)
- EtherSound never offered true IP connectivity and also doesn't appear to be developed anymore
- AVB lacks wide availability of switches, has slow certification and mass adoption by manufacturers is not there
- Ravenna is a relatively new entrant and is focussed on the broadcast market

Audinate has put the most resource into audio networking in the past decade but they have also progressed because of a lack of commitment from others.

Sales

Dante would not be the most actively developed protocol without Audinate being focussed on sales.

	Hardware sold (% YoY growth)	Channels sold (% YoY growth)
2012-2013	34%	10%
2013-2014	125%	93%

Table of Audinate growth - source Audinate

Part of their sales growth is attributed to an expanded product line in which they are now offer more channel count options to 'right size' their solution more appropriately. Someone who makes a two channel input device isn't going to want to pay for an eight channel card, so previously many of those categories of products weren't made with Dante.

Messaging

Salesmanship is a factor behind their success but it doesn't tell the whole story.

Despite the fact that they sell their product to manufacturers, they have used consistent messaging about how easy it is for users.

AVnu have over promised and under-delivered. Their messaging has been from an engineering standpoint stating that standards are always good. They suggest an inevitability about AVB and much is made of the technology and standards involved without ever really describing how it satisfies a user need.

They have been working on certification with extensive testing of products. However their messaging about the programme is very technical and engineering lead. It leads to articles such as this.

The problem with this sort of coverage is that it also fails to mention user benefits. The need to make such a fuss over such extensive testing could even imply a risk with their technology. Whereas Audinate and Ravenna say their stuff 'just works'.

Audinate has had a small marketing team because they've had very few people to actually sell to. They've made 194 sales to manufacturers in six years, because that is the number of licensees they have. What's more, half those sales have been in the past 18 months.

Who should Audinate be?

In the past, some have raised issues with Audinate because they are a private company backed with venture capital. However those who voice concerns about Audinate do not offer alternatives over what sort of organisation should develop effective audio networking technology.

AVnu demonstrates that a strict de jure standards approach isn't necessarily the answer. If we ignore the slow adoption due to lack of switches, we still see a desperately slow certification process and poor messaging. Organisations such as AVnu, by their very nature, tend to be less agile than private companies.

Had Dante been an invention of a professional audio company then its adoption may have been treated with suspicion by its competitors. Our industry has a long history of 'not invented here'. There are almost no examples of a manufacturer standard being adopted by our industry whereas the IT industry has many cases of this.

CobraNet demonstrates that even if the technology is developed by a rich, neutral third party, they can just lose interest because it is not their core business. The IT industry doesn't (need to) care about the professional audio industry.

Ravenna separates itself somewhat from its professional audio owner and has based its protocol closely on AES67, but they choose to focus on the broadcast market.

Of course the AES could have developed all this and they now indeed have with AES67 but rather elegantly that standard doesn't try to stand in the way of people trying to do their own thing. They just ask you to follow some rules to allow basic compatibility. This is a good use of a standard because it doesn't restrict individual innovations.

At the invention phase of new technologies the most successful are private companies who create, learn and adapt - often quite rapidly. This happened in industries as diverse as aviation, oil exploration and IT. Early electricity generation had no standard output until the technology was more established. Even now different countries use 50/60Hz, and variations between 110 and 240 volts. We subsequently invented technology to deal with these discrepancies rather than try to have one world wide electricity standard.

In the blogosphere - where is the networking debate?

Whilst real market share between protocols is unknown, we do at least have a reasonable idea as to the relative success of sales and projects and which protocol they use. The networking debate in the press and on the internet is still quite simplistic and uneven given the current success of Dante.

The problem is that so few people use audio networking and understand the technology. When there is an article or conference on the subject, a fair bit of time has to be given just to explain the basics and the different players involved. This prevents the debate progressing much further than discussing features and a possible turf war.

There are still probably more CobraNet installations out there due to its age but it is highly likely that the majority of new projects use Dante. It also seems that there are few AVB installations, especially truly interoperable ones, using the products of more than one manufacturer as AVnu would likely have publicised these, if they were able to. However, all these statements are anecdotal.

There is little press coverage of CobraNet sales and this may be because it is not new and exciting or that a lot of these sales are to supplement or modify an existing project so there is no new story.

AVB on the other hand gets a lot of coverage despite very few sales and this is due to the deference given to the number of major companies behind it. In such a small industry their opinion in the press carries a lot of weight.

It is also the case that a de jure standard will receive more positive coverage than the invention of a private company because it is perceived as fair, open and free. Such an attitude benefits both AVB and AES67 even though the latter has probably not had any actual use in the field.

Who decides what protocol we use anyway?

A common way to introduce a new technology is to look at the number of manufacturers on the market and approach the top tier. If you can convince a significant number of the heads of product management to adopt your technology, then you have a virtual monopoly.

This method of influencing the control points in an industry is well known - it's exactly what IBM and later Microsoft did and can sustain a business for a long time, though not forever.

This is how Dante has become the de facto standard. Whilst they have only made 194 manufacturer sales, with far fewer currently shipping, it has been used on thousands of projects.

Over time, networking has become less about specifying a protocol and more about specifying products that work together.

Changes to type of customer

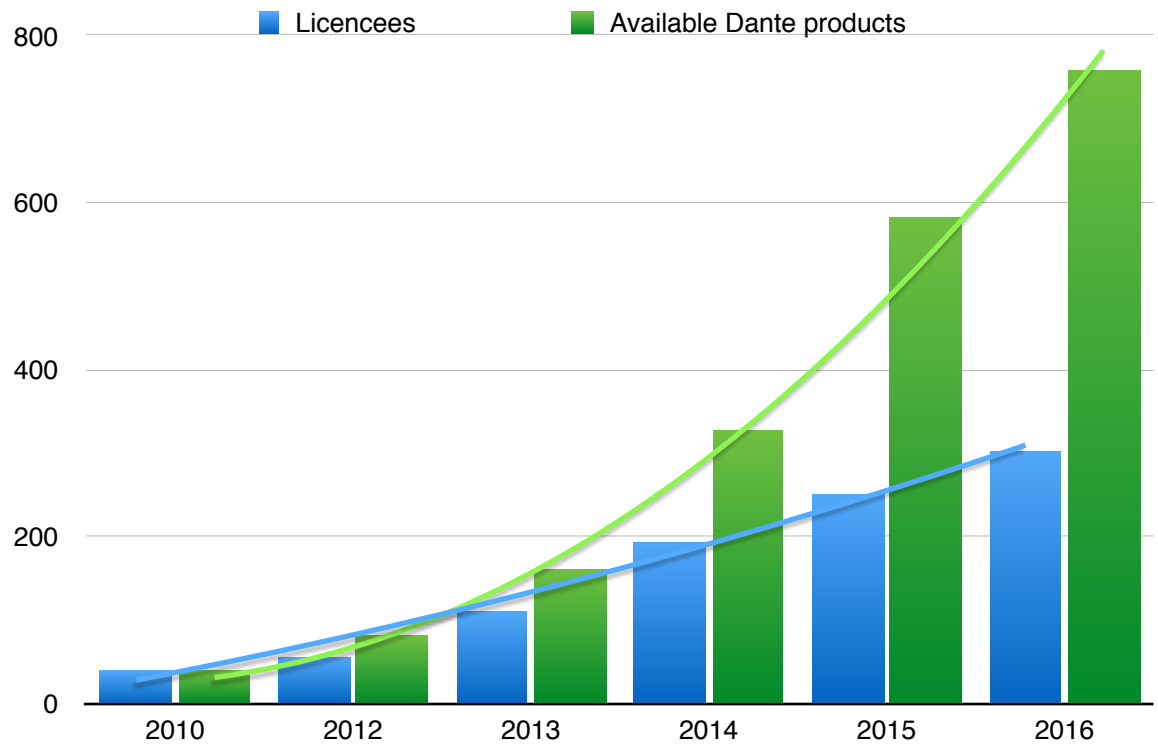
By analysing the licensees we can see that adopters of Dante networking are changing from people who used to be CobraNet users to companies who are first-time networkers. Audio networking is getting more companies to create products they've never made before.

How many future products?

We've been tracking adoption of networked products with data over four years. From that we have tried predict how many future Dante products we may expect to see in the next couple of years. There are a number of factors to this:

- Number of manufacturer licensees - source Audinate
- Speed to market after signing up - about 12 to 15 months - source Audinate
- Number of SKUs - publicly available data

The shortest time to market for a Dante licensee was 4 months and the longest 3 years. Larger companies tend to be slower to market but in contrast will produce more product SKUs. We've been able to ascertain the average number of SKUs per manufacturer which has increased over time. Longer term adopters are equipping more products with Dante, though this is partly offset by new adopters who each start with fewer.



Graph of predicted Dante product availability - source RH Consulting for products, Audinate for licensees

There is a correlation between licensees and available products, delayed because of the time they take to develop and growing due of the increasing number of SKUs per manufacturer. This is like calculating population growth: we already know how many children there are in the world and how many children they will likely produce, we can predict the next two generations of population. Similarly, if we have 194 Dante licensees now, we can predict how many products will be available in the 12 to 15 month gestation period. We have done this for 2015 and also extrapolated one further year.

We project an increase of more than 75% in the number of Dante products for 2015 and 130% increase over two years.

Licensee growth won't continue at this rate as they will eventually approach saturation point in terms of available audio manufacturers but the number of SKUs per manufacturer can increase for much longer.

We can't do this work for the other protocols because the data set is too small for AVB and Ravenna and CobraNet is no longer developed.

Towards wider adoption of audio networks

Integrated or modular solutions

Many industries follow a similar pattern over time. Initially the players will operate in an integrated fashion and offer the whole solution. A classic example of this is the IT industry where initially companies like IBM offered every single part of what their customers required. This pattern tends to change over time as industries break into pieces and become modular by offering specialisation, they ask the question 'where does our work end and another's start?'

Again the IT industry, which the audio industry feeds off parasitically, is a perfect example of this where many companies offer specialised items. They realise that to be successful it is also important for other companies to do well too. Even companies such as Apple, who appear to offer a walled garden are tremendously dependent on the products of other companies from switch manufacturers to connect their products together to the same RAM and processor manufacturers that everybody else uses.

Audinate currently offer an integrated solution, Dante is not compatible with anything else. However they are members of the AVnu Alliance and have also promised AES67 compatibility in 2015. This has given them options for moving into a modular business model as the technology of audio networking expands and evolves.

Standards

When an industry becomes modular is the time when standards emerge as they are inevitably required to ensure that different manufacturers products interface with each other and this is as true today as it was when Henry Maudslay standardised screw sizes in 1800. Standards are simply agreements for connections between modules, they are not the solution in themselves.

Standards become popular for a variety of different reasons; investment, deal-making, salesmanship or control over the decision process. Standards work best at a certain time and if you are early in the adoption phase then a standard is likely to fail because the market conditions will most likely prefer an integrated solution at that time.

Engineers tend to look at things through technical lenses and see standards as a positive thing. De facto standards tend to come from companies and de jure from consortiums and committees. In the IT world de facto standards have generally been much more successful.

Just as standardised bolts don't make a better car (just perhaps easier to build and maintain), a standardised audio networking protocol doesn't actually make a sound system any better. A good integrated solution can do just as well, if not better than one based on standards.

Equipment and protocol manufacturers need to concentrate on building considered solutions for customers. These solutions may or may not use standards. In most cases there will be a degree of both. There is a balance between use of standards for compatibility, ease, speed and cost against bespoke solutions to differentiate your offer.

AVnu has tried to sell itself by being the de jure standard - backed by the IEEE and part of a very established set of global connectivity standards. In the meantime Dante has become the de facto standard simply by offering a solution that a larger number of customers can use right now. Ravenna's focus on one market makes it difficult to see what their strategy is - its built on AES67 but under private control for them to do with what they like.

Even if Cisco introduced AVB compliant switches today, they will not be committing a sales force themselves to promote this technology because it will never move the needle for them. Additionally AVB can't succeed at this moment because AVnu are pushing a modular, standards-based approach to the use of this new technology at the wrong time in the adoption curve. Basing things on standards is extremely difficult when you are doing something new, when the technology has no established business model and when you are facing market forces offering solutions in an integrated way that are initially better and easier to adopt than a modular approach.

The real competition

When an industry is very new it's necessary to offer an integrated solution so that the customer knows what they are getting and you can control the whole experience. When new technologies emerge, competing versions often happen at the same time. However the biggest battle is not between those different iterations but with non-consumption.

We are of the opinion that in the next few years, almost every audio product will be networked. This will eliminate the need for devices in the 'audio transport' category. Some people have scoffed when we have suggested that analogue will (mostly) die but there are examples of this in other industries and our own.

Twenty-five years ago it would have been absurd to suggest that even our children would not just have their own mobile phones but would own smart phones. When did the impossible become the inevitable?

Digital mixers took over the high end of the market and then the technology and price trickled down, to where they are now available at almost every price point. The maxim seemed to be that as soon as the digital version of the same product came within 20% of the similar analogue version, then the latter died. It wasn't just a question of people choosing a digital console, despite their advantages, it isn't even possible to buy an analogue equivalent if you wanted to. There are now almost no 'quality' analogue desks on the market.

If you look back at the network service providers, initially IBM and DEC had their own networking solutions, later AOL and Prodigy were building services for consumers. These were all competing standards. IBM's token ring was praised because of its high quality of service. Then in the early 1990s TCP/IP came to prominence, even though it had been around for a long time, it then spread very rapidly because it turned out you could layer multiple protocols on top of it. For example AOL made a business on top of it as did IBM. It turned out that TCP/IP had become 'good enough' to displace the bespoke solutions.

AES67 is an imperfect solution but it allows scale and interoperability so it might be considered 'good enough' by the industry. Just remember that it doesn't displace the other protocols. Manufacturers still need to adopt a network protocol in their products. To do this they require software tools, hardware and networking expertise either in-house or bought-in. Manufacturers and users might choose a protocol that has the additional benefit of AES67 compliance.

The network effect

AES67 is the likely enabler that will allow the 'network effect' to take place. Metcalfe's law states that the value of a network is a function of the square of the number of nodes. So this might help us move to the tipping point into the mass adoption stage away from the market creation phase that we are probably in at the moment. When industries get to that stage is usually the time that investment pours in.

It could be argued that Dante itself is benefitting from its own network effect but this will be far greater from compatibility with AES67 because it offers a way to grow the whole market.

Increasing sales will allow them to invest further (and offer volume price reductions to customers). They may choose to invest in fighting the market share battle or in improved technology to compel users to turn to them. With AVnu the money simply won't be there to invest. There's a parallel with iOS and Android. Whilst Android has over 70% of the smart phone market, Apple makes over 80% of the profit.

In the event of AES67 assisting in mass adoption of audio networking, each of the protocol manufacturers would have to sell their particular protocol over another, but at least they are selling into a significantly expanded market.

Another factor to help the network effect is the increase in the number of products available for each part of the signal chain. Originally only signal processors and transport devices were networked but now the largest category of networked product is amplifiers. The ability to offer a complete networked solution is a major driving factor for adoption.

Displacing analogue

In order for analogue connectivity to be replaced, the audio networking world still has a number of challenges to overcome. Networking has to be easier to set up and this seems to be the greatest inhibitor to rapid growth. It also needs to be smaller so it can fit into microphones and other small devices and we would guess the next generation of hardware will accommodate that.

We don't know what percentage of audio projects are networked but it's still very small. So the biggest problem really for those involved with audio networking is the rate of market adoption. Taking work away from the old way of doing things is the primary concern until adoption of the new technology reaches at least 10% of the market. Its been 18 years now and we don't know what the incubation period is.

Adoption curves tend to be different for consumer and professional products. Political discussions are more likely to stand in the way of progress in the professional world where, as we discussed earlier, sometimes very few people can influence whether a technology or standard becomes de-facto.

The success of this technology has so far been decided by as few as 100 key industry people deciding to adopt it in their products. At present there are very few decision makers involved. In future it will become increasingly difficult for them to justify sticking to what they think is best. Buyers who are not the end-user buy things for different reasons.

In the next few years, users of the technology will increase and understand more about it themselves. They will have increasing sway over how such products are used and what networking technology goes into them. With audio there has often been a blur between the amateur and the professional. So whilst audio networking currently sits very firmly in the professional domain it could be that an explosion in the number of consumer users of this technology could dictate the rate of adoption and who will eventually be successful.

We don't know why Harman chose to adopt Dante but this *could* be an indication of a shift in power from the few manufacturers who've dictated where we are so far, to end customers asking for and getting what they want.

Whether that shift has happened to the industry as a whole is not yet clear but as adoption increases the market will decide.

Summary

Today Audinate is the clear market leader in audio networking.

Whilst adoption is still very low in terms of the whole audio market, there are now tens of thousands of networked installations out there. The technology moved from invention stage to be big enough to create ecosystems.

It appears Audinate have reached the point where their business is sustainable. Frankly, if it wasn't sustainable now with the current number of products and licensees then the whole business model of audio networking wouldn't stack up.

They are investing in their technology. They turn a profit for themselves and their customers' Dante equipped products are profitable too. Compare that with AVB where almost everyone involved is not yet making a profit from the technology but it is still demanding investment.

Whilst all the protocols discussed will benefit from the expansion in the adoption of this technology away from analogue, Dante currently gains the most. Their competitors are either slow to market, focusing on a particular niche or diminishing.

Finally they have taken the long term view that standards such as AVB and AES67 need to be considered and they might need to work alongside those initiatives, should they succeed, to continue to give Dante relevance.

Anything can happen in the future but a combination of good technology, ongoing investment, luck and forward thinking mean that Audinate is currently well placed to lead the next phase of audio networking as the technology becomes more mainstream.