## The Evolving Market:

The talk of AV & IT convergence has gone on for years now, mostly being pushed by one side or the other, but for the first time ever the trend is now being pushed by the needs of the market. Over the past five years, the distribution of music online has gone from an interesting experiment to the fastest growing content distribution channel. The transformation from the original analog recordings on vinyl, to the digital format on CD, and now to the bits and bytes over a wire has taken many decades. Each step along the way has been accompanied by the naysayer's and skeptics, but for each step we've won over all but the smallest fraction of hold outs. The reason of course is that each transition opened up new opportunities for portability, quality, and ease of use. However, until now, the custom audio distribution solutions within the premises have been relatively unaffected, and while many of the requirements such a quality, simplicity, and reliability continue on, new requirements have emerged that require dealers and integrators to rethink the solutions they offer their customers. New requirements for audio distribution systems are:

- Scale & Extensibility
- Environmental Impact
- Internet connectivity
- Processing intelligence for DRM and CODEC upgradeability
- Sound customization to the environment

## Scale & Extensibility

Today's buildings, whether they are homes or commercial properties, are getting bigger and bigger. They are also demanding high quality audio throughout the premises. While the 12 and 16 channel centralized audio distribution systems were an effective solution in the past, the lack of scalability for the future raises concerns. Additionally, today's sources are no longer fixed – audio subscriptions come and go, iPods, PCs and other Personal Media Players (PMP) move in and out of environments. The centralized view of audio sources has exploded into a web of sources that are transient. Where to plug each of these into? Where to configure them as they come and go? The predictable 12x12 matrix switch doesn't have a clean answer to these demands.

## Environmental Impact

There is a growing environmental awareness both within businesses and households. New large scale investments are being evaluated for their environmental impact and consumers want to know that their lifestyle choices are leaving the world a better place for their children and grandchildren. Many manufacturers have rushed to stick a green label on existing products without changing the product – this would seem at first glance to be a good thing. However, ask yourself this question, "If all manufacturers say their products are Green and our environment is suffering, how can the manufacturer's statements all be true?" The logical answer is they can't. Consumers and business

owners will look to their trusted advisors – their integrators – to separate fact from fiction.

In the custom audio market the big environmental offender is energy consumption and the use of copper.  For every pound of copper that we take out the ground and process, we release four pounds of carbon dioxide, a green house gas.  In a 100lbs amplifier and matrix switch unit there is on the order of 50lbs of copper. The copper in this system alone results in about 50 (multiply by 4, the number of pounds of carbon dioxide per pound of copper) = 200 pounds of carbon dioxide or about 0.1 tons!

## Internet Connectivity

There are many reasons for connectivity but the biggest drivers are access to audio content and monitoring and upgrades of systems.   Today's answer to the first requirement is to download content to a hard disc, convert it to analog and distribute it around the business or home.   This is fine in a world of fixed online services with a single download to disk business model. Unfortunately this is not the world we live in; we have content that is streamed from a subscription service, downloaded to iPods and mobile phones as well as audio codecs that media servers don't support out of the box. The real answer must be a true connectivity and distribution option for the digital audio files and streams of all kinds.   The second part of Internet connectivity is a more common use, remote access to systems allowing dealers to design services to ensure that the systems are delivering the optimal experience for the customer.   While many analog systems can tell if the matrix switch and amp are running, telling whether a speaker is working is a lot harder, and telling whether it's producing great sound is not even in the realm of possibility for analog systems.  From the simple to the advanced, the delivery of diagnostic services builds on the foundation provided by Internet connectivity.

## Processing Intelligence for DRM and upgradeability

One reality of online content is the unfortunate presence of DRM, of course it's unfortunate only in that there isn't one kind of DRM but the myriad of different open and proprietary schemes that make a consumers life a nightmare.   The ability to authenticate the user in their environment is something that any audio distribution system will have to do in the future.  In addition, since the particular flavor of DRM is unknown ahead of time, the audio distribution system must be capable of adapting itself to the DRM in use by the customers' favorite online music service.

### *Sound Customization to the Environment:*

Every customer wishes that the sound that came from their speakers could be tailored to their environment.  Whether the environment is a hospital that had specific paging groups that could be created on the fly or whether the environment was an exquisite

home theater with no expense spared.  Unfortunately, the reality of centralized audio distribution and this desire for having sound reproduced just for me don't mesh.  In commercial environments one set of solutions is used, in home theater another set of solutions is used, all to bring a unique and personal touch to the way audio is reproduced.  These different systems drive cost up and don't typically play well with the audio distribution system itself, leading to a hacked together system that 'sort of' works.

With all these new requirements on audio distribution, manufacturers of electronics and speakers have been clamoring to find the perfect solution.  The result is a wealth of choice for the consumer and installer.  In this next section we'll compare the options available today and discuss why *StreamNet* Connected IP speakers address all the challenges and needs of the market.

## Solving the audio distribution challenge

Like the evolution from analog to digital to IP delivered content, the audio distribution architecture for consuming the content has evolved from analog, to digital, and now to complete IP-Based.  In looking at the next generation of requirements you will see that only the *StreamNet* Connected IP-Based architecture creates a platform for meeting the needs of the market.

## Analog Distribution systems with passive speakers

Analog systems have proven themselves over the years and work in today's low-cost environments where the audio system is being used for low level background music, but as we look to the future the analog system fails to meet all the new requirements for audio distribution in any meaningful way.

From a scalability and extensibility perspective the analog system is confined by the matrix switch, and while some matrix switches offer the ability to cascade, they generally reach their limits with 32 or 64 channels.  Additionally the cost to build out a system with an odd number of channels or zones is excessive; consider the 9<sup>th</sup> zone on an 8 zone system.

Environmental impact was covered earlier in some detail, but it's worth restating.  The copper in the matrix switch and amplifier combined with the copper wire to transmit the data has a large carbon dioxide footprint.  As mentioned earlier for a 6 zone system the carbon footprint is almost ¼ of a ton!  This doesn't even include the actual energy consumed during the 1<sup>st</sup> year of operation.

Internet connectivity is only now being added to analog systems; however the connectivity is only for meta data typically.  In the case where IP connectivity is added to downstream components like speakers, this is typically for control.  However, going

back to the market need – Internet connectivity is for 2 purposes – getting content and monitoring down to the end points (speakers).  Analog systems fail to meet these requirements; any content must be put on a separate unit on the premise or a tuner that receives content, forcing the user to create a system with a multitude of components just to get the content.

Processing intelligence doesn't exist in analog systems.  Any processing is done in source devices like tuners and media servers, and even most of those devices are fixed function devices.  Analog systems cannot adapt to new DRM schemes or codecs easily – for digital audio content they completely miss the mark.

Sound customization can be done with very expensive speakers, but generally these speakers are active speakers and don't connect to traditional analog systems. However, even this sound customization is typically done once, whether its room optimization or paging groupings the passive speaker connected to a large centralized multi-room amp misses the mark for sound customization requirements.

Overall, it's clear that analog systems are no longer where the custom audio market should be focused, the technology is proven but is struggling to keep up with the requirements of monitoring, Internet content distribution, environmental friendliness, and customization.  Seeing this reality, many manufacturers and integrators turned to digital distribution over proprietary networks.


## Digital Distribution systems with passive and active speakers

Digital distribution technologies like CobraNet®, EtherSound® and others are a great leap forward from analog distribution.  By distributing digitally you avoid the typical issues with noise and signal degradation that occurs in an analog system.  At the same time you simplify wiring down to CAT-5 or 6 cables.  That said, these digital distribution technologies fall short when we consider the future requirements for audio distribution and rendering.

Scale and extensibility is much improved on digital systems, however many are still limited to 256 or fewer audio channels, many of these have to be unicast or point to point distribution instead of point to multi-point or multicast.  Some of the technologies are limited to only 8 multicast streams, severely hampering them for certain applications.

From an environmental perspective digital distribution has moved much of the materials problem closer to the speaker which allows for smaller amplifiers and processors, however, unless an implementer chooses to use active speakers with digital amplifiers built in there is still significant environmental impact.

While many digital systems tout the Ethernet (IEEE 802.3x) standard and imply full Internet connectivity, the implementation reality is very different.  While the Ethernet standard is part of the implementation of Internet or IP connectivity it is only a portion of what is necessary and while a number of digital standards can co-exist on the same CAT-5 cable as Internet traffic the performance of the IP part of the network is severely degraded.  Furthermore a specialized device is necessary to consume both the IP traffic and the digital audio transmission and interpret them together, raising the cost of the digital audio systems.  For example, a CobraNet connected speaker would have a hard time consuming streaming content from the Internet and rendering it in 5 different zones while the content was streaming.

Processing intelligence for DRM and audio codecs is simply not built into the digital audio distribution technologies, most of this would have to be added separately and therefore cannot be relied upon as a platform on which to build new audio applications.

Finally sound customization is not an inherent element in digital audio, for the most part room optimization is still a manual process as is the configuration of things like paging zones.  While the Ethernet addressability of some digital systems makes configuration possible it doesn't make it easy – configuration still requires individuals with specialized knowledge and industry trained professionals who understand networking are still required to learn one off protocols and tools for each digital distribution technology.

### *StreamNet* Connected IP Speakers – A solution from the ground up

*StreamNet* was conceived with the notion that the Internet and a myriad of audio sources would make up the distribution system of the future.  In fact, the *StreamNet* context is that sources may or may not exist within the same premises as the speakers. Instead, sources can come and go from a premise, they can be only online, or they can live in the premise scattered around a physical location.

The underlying technology of *StreamNet* is a fully network connected device, in fact, *StreamNet* devices look like any other network connected device on a network, you can look for their IP address, you can browse to them, you can even interrogate them like a network device to determine their status.  On top of this strong base that is provided by the IP network *StreamNet* adds a number of important benefits.

*StreamNet* distributes uncompressed or compressed audio, synchronized across multiple zones without any centralized control point or matrix switch.  Additionally, *StreamNet* devices are self-configuring on the network and they assign their own IP addresses, advertise their capabilities to other devices on the network and discover the capabilities of any other device on the network. The control in the *StreamNet* system is completely decentralized. The removal of any one device, source, speaker, touch

screen does not impact the system – the other devices simply work around the missing device.

*StreamNet* enables speaker manufacturers to transform what is today an audio rendering device into an audio distribution system without adding any specialized new components to their product portfolio. The only additional component necessary is a managed network switch, available from many networking manufacturers.  This truly creates a new category for the speaker manufacturer, linking them tightly into the application value chain instead of being the passive box at the end of a lot of very expensive electronics and wiring.

In terms of the requirements for audio distribution, *StreamNet* was designed from the ground up to address these.

*StreamNet* Connected speaker solutions have been deployed to hundred of synchronous zones of audio. In fact, the limit on the number of *StreamNet* Connected devices on a network has not been reached yet.  Additionally, *StreamNet* Connected IP speakers scale linearly, you only buy what you need to use.

For the environment *StreamNet* Connected speakers are significantly better – a separate *StreamNet* module, including the metal enclosure weighs only 0.5 lbs, at most there is 0.1 lbs of copper in the system and hence the resulting carbon dioxide is about 0.4 lbs for each zone or 2.4 lbs for 6 zones (12 channels) of audio. For powering the distributed system, the *StreamNet* Connected IP speakers use a centralized power supply that contains 4.5 lbs of copper. The total system including the *StreamNet* modules therefore contains approximately 5.1 lbs of copper and contributes about 20.4 lbs of carbon dioxide gas to the environment.  You'll recall that the similar analog system contributed some 200 lbs of carbon dioxide or about 10x more than the *StreamNet* connected system.

Since *StreamNet* Connected technology is built on top of the IP network foundation it is by default very easily connected to the Internet.  In fact all that is needed is an Internet connection from your broadband provider.  *StreamNet* connected systems could be programmed to pull content directly from online sources,  monitor themselves and trigger alerts when they experience problems, and communicate with any IP connected device.

Within each *StreamNet* Connected IP speaker is an advanced DSP capable of encoding and decoding content and authenticating with different DRM schemes.  The DSP is a general purpose device and can therefore be programmed and upgraded to support new codecs and DRM schemes as they come out.  *StreamNet* Connected licensees can choose which codecs and DRM schemes they wish to support for their products.  In addition the processing capability can be used for integration to control

systems such as Crestron®, AMX®, *NetStreams,* and others. This allows *StreamNet* Connected IP speakers to be a powerful part of an overall custom installation, focused on the distribution of audio.

Finally, *StreamNet* Connected speakers allow a range of customization not possible with any other system. The IP addressability of the speaker allows for fine grain paging, down to the speaker. Additionally, the DSP can be used in conjunction with built in speaker microphones to create a dynamic self-optimizing system where each speaker knows where the other is and adjusts it's filter arrangements and EQ to create the optimal sound experience for the environment. No more manual setup, *StreamNet* gives you the platform to enable dynamic self-adjusting optimization schemes.

## StreamNet Connected Partners

*StreamNet* Connected partners range from electronics manufacturers to speaker companies. All *StreamNet* products are interoperable and work simply by plugging them into the same network. To find out more about developing *StreamNet* Connected products, contact bizdev@netstreams.com.