COBRANET FAQ

(Almost) everything you always wanted to knoow about CobraNet…

OVERVIEW

Although CobraNet technology has been used in commercial AV venues for over 15 years, there are always a few new things to know as you consider deploying a CobraNet system. At Attero Tech, we've tried to distill some of the lessons we've learned over the years to put some practical information about CobraNet in this short white paper. We've included a number of commonly asked questions, a short overview of CobraNet and some insight into the signal routing capability of this powerful protocol, and a few words of warning about CobraNet network setup to keep you on the good side of your IT department.

FREQUENTLY ASKED QUESTIONS ABOUT COBRANET

How far can I run a CobraNet line?

As far as you can run an Ethernet data line. So, by spec, that's 100 meters for a copper UTP. Go with fiber, and you can jack the distance up to a couple kilometers. Not too shabby.

WHITE PAPER

Mind you, that's just how far you can take a *single run*. At the end of 100 meters, you can also throw on another switch, and viola: another 100 meters.

How's latency on CobraNet?

CobraNet systems (like all other Audio over Ethernet systems) have a non-zero delay, or latency, when they deliver an audio or video signal. This latency can be set to 1.33mS, 2.66mS, or 5.33mS, and the latency value is fixed and applies to the entire system. Any latency associated with analog to digital conversion or DSP signal processing, of course, adds to the basic transport latency. However, in almost all cases the total system delay is less than 10mS. For the vast majority of venues, from small to large, 10mS of transport latency plus processing delay is perfectly acceptable.

Can I send video over CobraNet, too?

Yes, it's doable, but not through the audio-specific equipment that is already on the market. CobraNet is, all said and done, just a transfer protocol. So, it could carry video just as easily as it could carry audio (of course, video would take more bandwidth).

As you can imagine, video over CobraNet would be a pretty useful trick. For example, a stadium would already have its audio coursing over a network, so if you could piggyback video onto that signal, you'd have a central command center that controls everything, and no secondary lines run for the picture. There are tons of other applications that'd be helpful for, such as residential A/V, but like we said, it'd take specialized equipment.

What does it mean that CobraNet is an OSI level-2 technology?

On-time delivery. Think "software version of a physical cable," it's a dedicated path defined between two or more points, and ensures that the data won't get caught up in traffic during its morning commute or be late because it stopped for donuts. For live audio, you need that kind of dedicated path, otherwise you'll notice a delay between the lips moving and the sound coming out.

What if the technology were a higher OSI level?

You get more options for playing along well with other technologies, and slicing and dicing your data. You start to walk away from low and fixed latency, and towards a delivery guarantee with higher latency. Higher OSI tech is more adaptable, so it can do cool things like self-configure and

overcome network congestion. What you lose is that guarantee that there won't be any delay or hiccups in the middle of the signal.

So what's the OSI thing mean to me?

It means that, at heart, CobraNet is a simple, focused, point-to-point or point-to-multipoint technology. While CobraNet implements SNMP (Simple Network Management Protocol) at the IP layer to allow CobraNet routing to be controlled, all media content data delivery takes place at layer 2 – guaranteeing on-time delivery every time.

I guess I can't stream it over the Internet, then either.

No way. The Internet has way too many hops, bottlenecks and detours for it to work with truly live audio.

Think of it this way: higher-functioning protocols are like a post office, but CobraNet is like an unbridled river. The post office wants to make sure that your precious letters get to the correct address, no matter how long it takes. CobraNet is more of an unbridled river. That data is movin' just as fast as it can, and if you miss it then there's more where that came from. There's no faster way to get the audio to you, but this ride is on rails and you'll need to formally reconfigure if you want to change its destination.

ShoutCast, QuickTime, VLC Server, Windows Media, etc. are even higher-level OSI, and require serious computing power to intelligently throw away bits, sync up the data, and make sure that the transmission was received. We've all had to wait for video to buffer before we could experience the finer points of YouTube. That delay and audio artifacts might be fine for piping Musak into an elevator, but you don't want a crowd at the Wynn getting ready to go all *Deliverance* on you because they can't hear their beloved Garth Brooks.

Can I send it across a WiFi network?

It's a bad idea. First, you just don't have the consistency you need with a wireless signal. But even if WiFi weren't prone to signal interference, QoS issues, and drop-outs, you'd still have the problem that its higher latency and a half-duplex technology.

Can I at least share the CobraNet with an existing data network?

Yes, but be careful! The key thing is to make sure that you're not losing data on the way to the receiving device. If you can swing that on an existing network, then have at it.

The most common way we see a shared setup is by setting up a VLAN that walls off the regular traffic, and then gives QoS priority to make sure that CobraNet is always the preferred signal.

As a rule, we recommend against mixing CobraNet and LAN data. The always-on demand of live A/V has a way of clogging up your pipes, and your users start getting mad when their connection slows to a crawl. Or worse, something goes awry, and now you're hearing audible blips because of dropped packets. If you have a dedicated system, that won't be a problem.

If CobraNet is soooo great, then why hasn't it been added to every mixer, speaker, rack, mic line, signal processor and amplifier from here to Tuscaloosa?

Well Sally, we may not have CobraNet-enabled toasters just yet, but it is the most widely used digital audio networking standard in the industry today. You can find CobraNet everywhere from the Dallas Cowboy's new stadium (where it has yet to interfere with *any* punt returns), to Orlando, Wichita, the Olympics in both Sydney and Bejing or wherever Eric Clapton happens to be playing tonight.

For just about any equipment you can think of, there's probably some flavor of CobraNet-ready gear already out there. Or, you might be able to go the route of just using cost-effective entry points to get "lit". That said, we do want to get more folks into the party. That's why we make products that convert CobraNet audio at-the-wall.

I walked right into that sales pitch, didn't I.

Yes. Yes you did.

APPENDIX A

INTRODUCTION TO COBRANET

NOTE

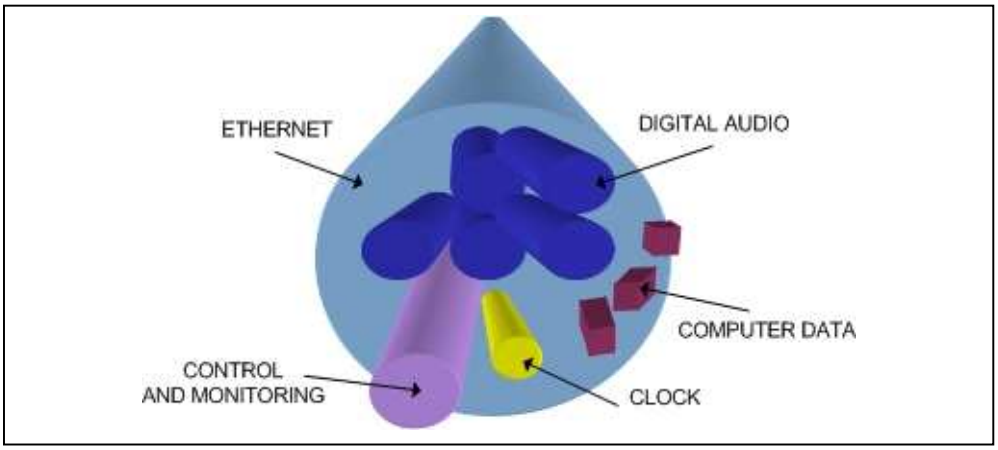
Appendix A explains some of the terminology and concepts that underlie CobraNet technology.

CobraNet is an audio networking technology for delivery and distribution of real-time, high quality, uncompressed digital audio using a standard Ethernet network. It is implemented using a combination of hardware, firmware, and the CobraNet protocol.

Unlike other audio networking or distribution technologies, CobraNet is a true network and exists on standard Ethernet networks using standard Ethernet hardware. Since it is a true network, audio routing is highly flexible between network nodes and can be used in a variety of audio distribution applications.

In addition to the high degree of routing flexibility that CobraNet provides, the technology also incorporates the ability to monitor and control CobraNet devices remotely. This is a key feature that is highly important in fixed installation applications where the audio distribution equipment may not be readily accessible. All CobraNet devices on the network can be controlled and monitored from a central location by sending control commands and monitoring device specific parameters.

CobraNet provides this capability by implementing Simple Network Management Protocol (SNMP). SNMP is a standard protocol typically used for monitoring network devices such as Ethernet switches. In the case of CobraNet, it allows users to communicate with any CobraNet device using standard SNMP tools or a customized user interface designed specifically for CobraNet, such as Attero Tech's Control Center application.



The figure above represents the types of data that coexist on a CobraNet network.

Before a CobraNet system can be configured, it is important to first understand how CobraNet distributes audio between devices.

Audio is sent in "bundles" on a CobraNet system. Each bundle is capable of holding up to 8 logical audio channels. Every CobraNet device has a number of bundle transmitters and bundle receivers. These transmitters and receivers are the mechanism used to send and receive bundles between devices.

For a transmitted bundle, audio may be sourced either directly from the local audio inputs of the device or from internal audio via the on-board DSP, but not both simultaneously. The

internal audio from the onboard DSP could have originally been sourced from the local device inputs, sent from another CobraNet device or even generated by the DSP itself. Combinations of audio may exist within a bundle in any order. Additionally, a single audio source in a device may be used multiple times in a single transmitter bundle or across multiple transmitter bundles.

For a received bundle, the received network audio may be routed directly to the device's local outputs, the internal DSP[1] or simply ignored.

Once the contents of a bundle have been decided, the next step is to pass the bundle to another CobraNet device. To do this, every CobraNet device has up to 4 bundle transmitters. Each bundle transmitter has a transmit mode that must first be selected. This affects how many devices may receive that particular bundle at a time.

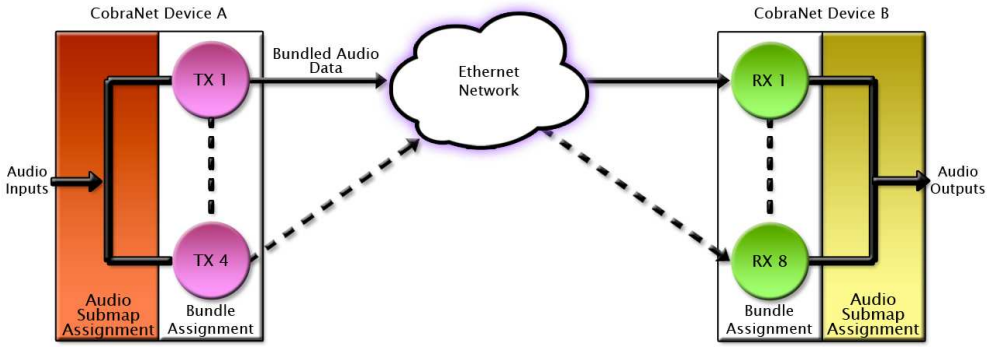
The modes are as follows:

- **Unicast** – Used for one-to-one connections. In this mode, only one receiver at a time can receive this bundle. Once a link is established from this transmitted bundle to a receiver, any future requests for that bundle from other potential receivers will fail.
- **Multicast** – Used for one-to-many connections. This mode broadcasts its contents over the entire network. There is no restriction on the number of receivers. However, the downside is that CobraNet packets are distributed to all nodes on the network, whether they need them or not thus creating possible network bandwidth issues.
- **Multi-unicasts** – Another one-to-many mode. Whilst this is the most efficient method for getting a bundle to multiple receivers in terms of network bandwidth, it requires more processing power on the CobraNet device so in this mode there is a maximum limit of four receiver connections (this can be reduced if required). If more connections are required than the limit, the node can be configured to automatically switches to multicast.

Once the mode is selected, to enable a device to transmit the bundle, simply allocate the particular transmitter bundle a non-zero number. Since this number identifies all the network packets sent out by that transmitter, each transmit bundle number must be unique on a network.[2]

NOTE

When a bundle must be transmitted to multiple receivers, multi-unicast transmissions should be used where possible.



[1] Not available on all devices – CS496xxx devices only

[2] Bundle numbers range from 1 through 65535. A value of 0 represents an inactive bundle. Numbers 1-255 are reserved for multicast mode transmissions only.

Now that the transmitter is set up, it is time to set up the receivers. In order to receive bundles, each CobraNet device has up to eight bundle receivers. To enable a device to receive a bundle, simply allocate one of that device's bundle receivers the same bundle number as a transmitted bundle. By doing so, a virtual link is created and audio should now be passed from one device to the other. It should be noted that no knowledge of a device's network topology or connection is thus required in order to configure audio connections. The only restriction to this is that a device cannot be set up to receive a bundle it is also transmitting.

The above case creates a simple, one-to-one, unidirectional link. If more devices are required to receive that bundle, allocate the same transmitted bundle number to a bundle receiver on the other CobraNet devices.

It is also important to note that CobraNet supports simultaneous bidirectional audio distribution in each device. Not only could audio be sent from Device A to Device B but at the same time, should it be needed, audio could also be sent from Device B to Device A. The exact bundle and routing configuration will be determined by the needs of each individual installation. An installation may have multiple units transmitting multiple bundles. The only restriction is the bandwidth available on the network to transfer the audio.

CobraNet does more than just transfer audio/video data. It can be used to pass serial information as well. A feature called serial bridging has been incorporated that allows the passage of serial data between nodes. Each node can pass serial data to a specific node or multicast the data to multiple nodes. A node can also receive data from either a single source or multiple sources. Baud rates, data bits, stop bits, parity, and so on are all configurable. There is also support for multi-drop serial buses as well.

Finally, CobraNet has the capability to alter all of the above options in real time making the whole system completely dynamic. By use of control software, all of the bundle assignment parameters can be configured with no need to change cables, switch out connectors, or pull new wiring. Most importantly, this control capability can be implemented from a single location!

APPENDIX B

COBRANET & PC NETWORKS

Whilst CobraNet is compatible and can co-exist with standard Ethernet traffic from PCs using the same infrastructure, it isn't all plain sailing. On lightly used systems, it is likely there will not be any noticeable problems. However, as audio/video system usage increases and/or PC network traffic increases, network bandwidth quickly disappears. Eventually, there becomes a point where PC operations over the network, such as web access, will begin to slow as CobraNet data is given priority. Fortunately, such problems can be overcome.

Physically separating the networks into two separate pieces, one for CobraNet traffic, the other for normal network traffic, is the ideal solution. This is often the way practical systems are implemented, since the A/V installer has little control over the typical home LAN. Having a separate A/V cabling infrastructure is the best way to prevent nuisance callbacks, and guarantee that changes on the home LAN do not affect the A/V system.

A slightly different approach uses network devices that can separate the traffic internally by implementing virtual networks. These virtual networks ensure that the PC traffic and CobraNet traffic cannot interfere with each other and are kept completely separate even though they are travelling through the same network device. The down side is that Ethernet switches with this capability are more expensive than standard switches.

Separating the audio system from the PC network gives best performance, but what if one or more of our A/V sources is PC or internet based such as internet radio, and needs access to the PC network? Homes aren't likely to want or have a dedicated PC or a dedicated internet connection just for the audio system. In such cases, a bridging device will be needed that prevents CobraNet data getting onto the home LAN while permitting the A/V device full home LAN access. Such a device could be a standalone device or the functionality could be built into an endpoint at very little cost.

ABOUT ATTERO TECH

Attero Tech is a leading provider of CobraNet® audio interfaces. These products make it easy and cost effective to integrate a wide variety of audio components such as consumer electronics, microphones, paging speakers, computers, and recording devices into a networked audio system. Attero Tech solutions help AV systems integrators reduce cost, improve audio quality, future proof systems, and meet their most unique design requirements.

Attero Tech is headquartered in Fort Wayne, Indiana. For more information on Attero Tech's full line of products, please visit www.atterotech.com.