



- **Network topology** - How AoIP networks work, how the key components enable them, and a review of the most common configurations.
- **Network wiring** - Poor wire certification is the #1 reason new AoIP networks fail. If you think the same Cat 5 or 6 cable used in your phone system works the same way in an AoIP network...think again. Hear about the most common pitfalls and how to avoid them.
- **Dealing with latency issues** - Up and running AoIP networks can have audio delays which can interfere with automation systems. Learn how to avoid latency issues associated with AoIP networks.



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Understanding Multicast

- IGMP (Internet Group Management)
- IP Multicast
- IGMP Snooping



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Multicast Audio Explained



Source Device



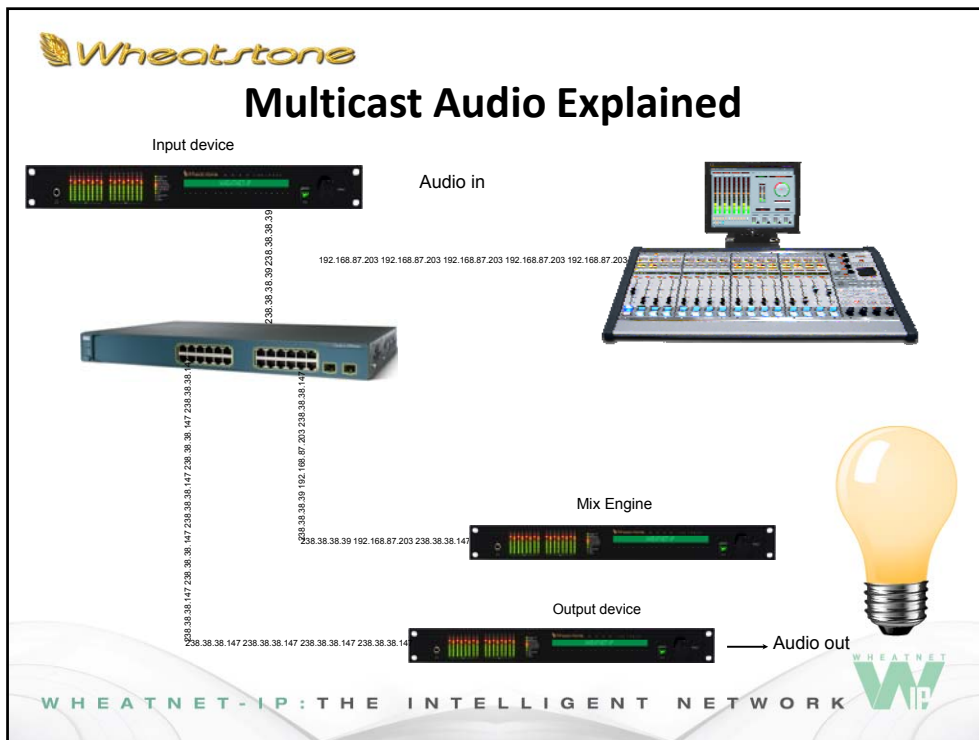
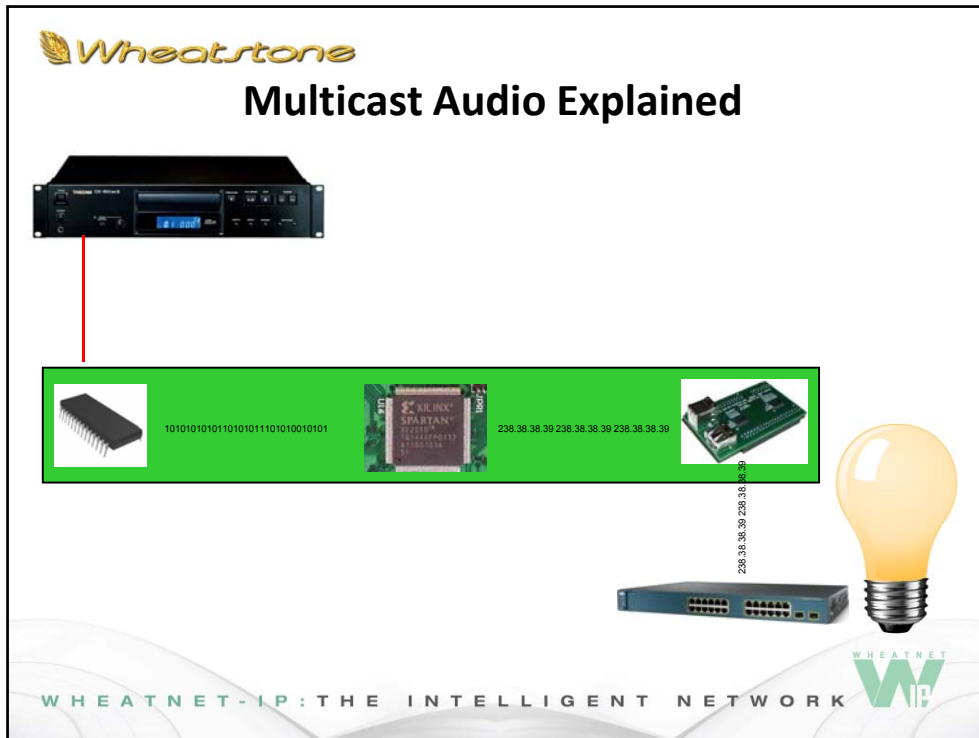
I/O Aggregator

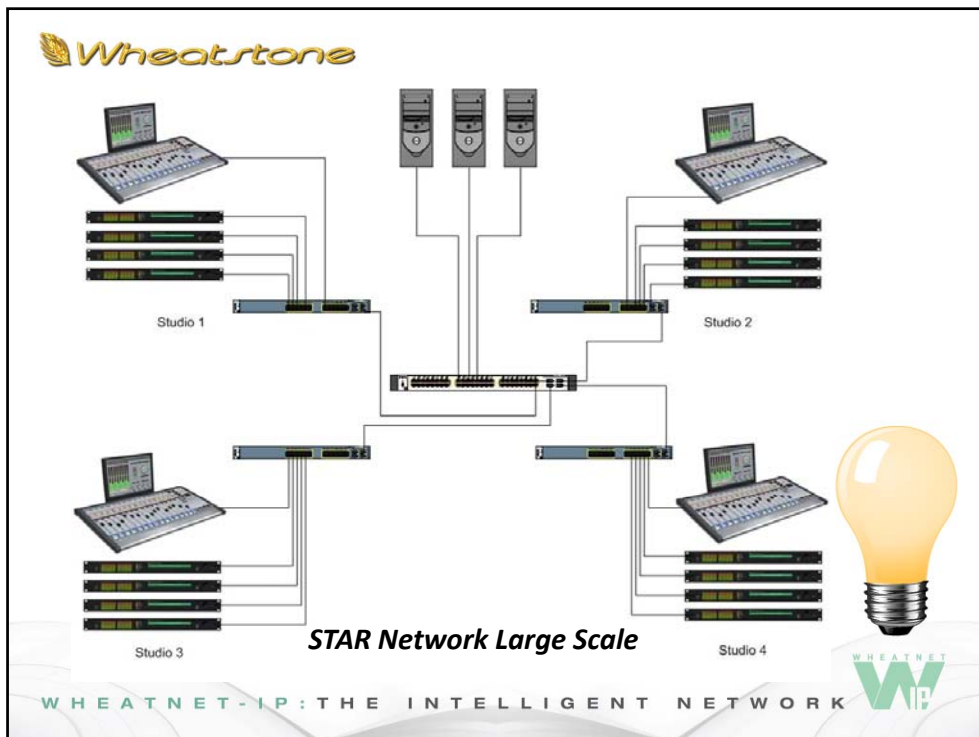
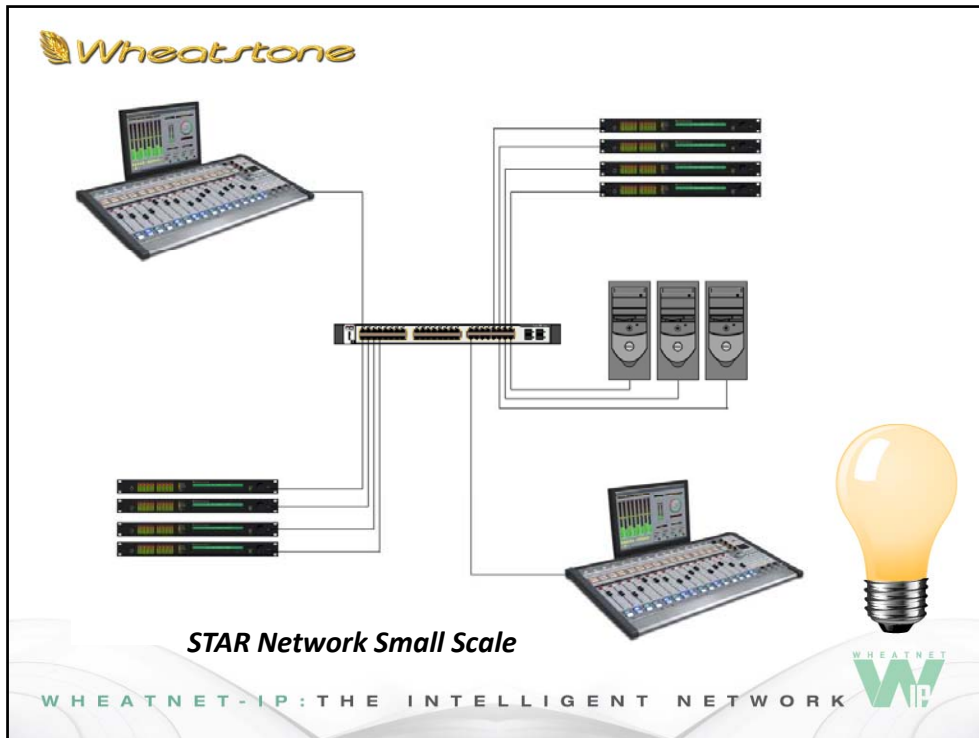


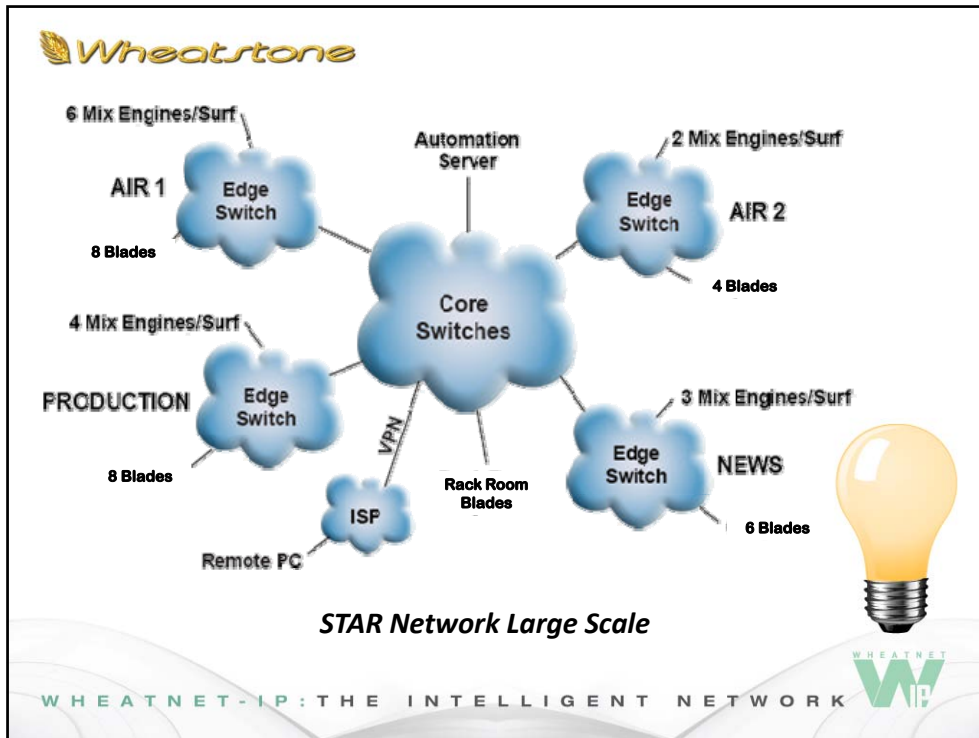
Network Switch



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Wheatstone

Wire Selection ...

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WHEATNET WIP

The slide features the Wheatstone logo at the top left and a glowing lightbulb icon at the bottom right. The central text reads 'Wire Selection ...'. At the bottom, the text 'WHEATNET-IP: THE INTELLIGENT NETWORK' is displayed next to the 'WHEATNET WIP' logo.

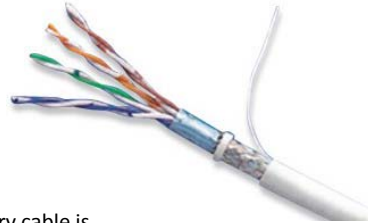
Wheatstone Audio / Network Wire Selection

Gigabit Ethernet requires the use of CAT5e or CAT6 (Class E) cabling and supporting infrastructure to help guarantee the performance of your Gigabit Audio Network system.

FACT ...

The sheer number of vendors and options for category cable is staggering. A recent internet search for "CAT 6 cable" yielded nearly 11 million results!

Before looking for a vendor, let's review some of the key factors involved in choosing the right cable for Gigabit Ethernet applications:

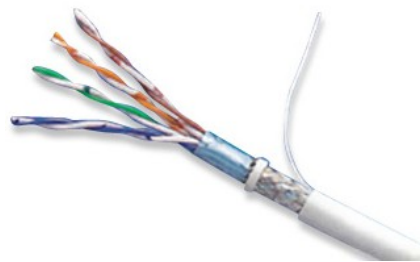


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Wheatstone Audio / Network Wire Selection

- PRICE
- Quality / Name Brand
- Performance
- Availability
- Application
- PRICE!



The network cabling chosen will determine the overall performance of the audio network. Choosing cable based solely on price is likely not the best choice.

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Wheatstone Audio / Network Wire Selection

It makes a lot of sense to choose a unique color of cable and patch cords for various different networks in your facility. This way you can trouble shoot and also let others know what networks to be very careful with

Example:

Red - Audio Network

White - Phone

Blue – Business LAN

Yellow - Automation

Grey – Access Control



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Wheatstone Choosing Termination Products

Choose a single component manufacturer for patch panels, wall plate inserts, etc. and stick with them exclusively for all parts of the system. This is especially true with CAT6 products.

Choosing RJ-45 connectors ... easy right?



There are different connectors for CAT5e, CAT6 in both Stranded and Solid. Make sure you get the proper connectors based on your cable selection other wise you may run into intermittent network issues



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Audio / Network Wiring

**The #1 discovery on a support call is
faulty network or audio wiring
connection and/or installation**



Let's look at some examples of what we have found...

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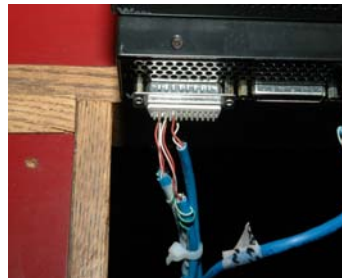


Wiring Examples



Kinked Cable causes intermittent
Network connections

"Sloppy" & unfinished wiring
causes intermittent audio and
grounding issues



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Wiring Examples



Stress on network cables can cause intermittent network connections & audio dropouts

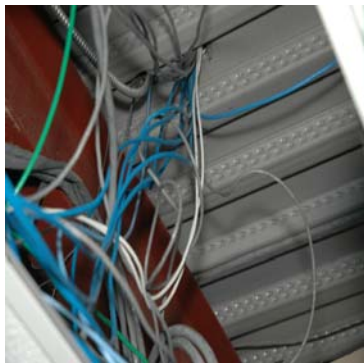
New install ... no explanation needed



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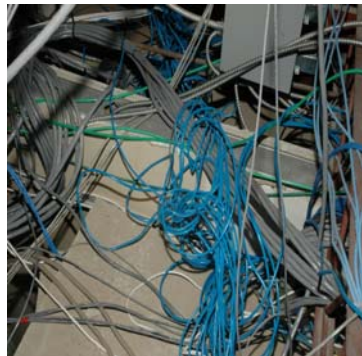


Wiring Examples



Pulling wire through sharp holes can cause an intermittent network & audio dropouts.

Proper wire management & install can help avoid network issues



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Wiring Examples



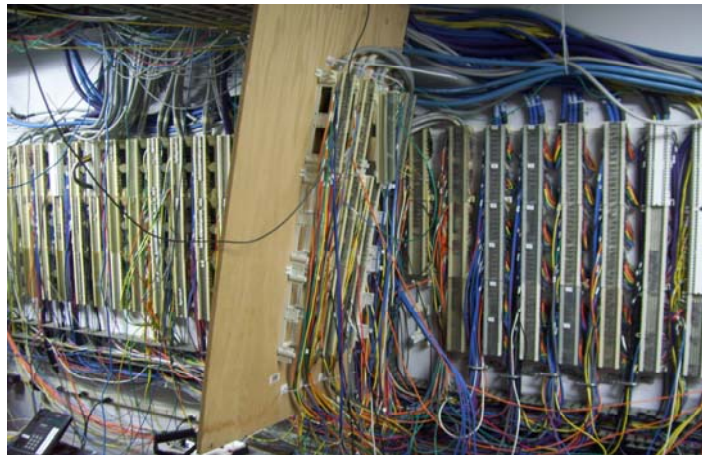
For real?



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Wiring Examples



Really ... brand new install and they cannot figure out why they had issues!



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Wiring Examples



Professionally installed and certified wire will save you time and money.



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Wiring Examples



Cables are laced and properly labeled



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Wiring Examples



Audio I/O at the Blade are laced and properly labeled



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Wiring Examples

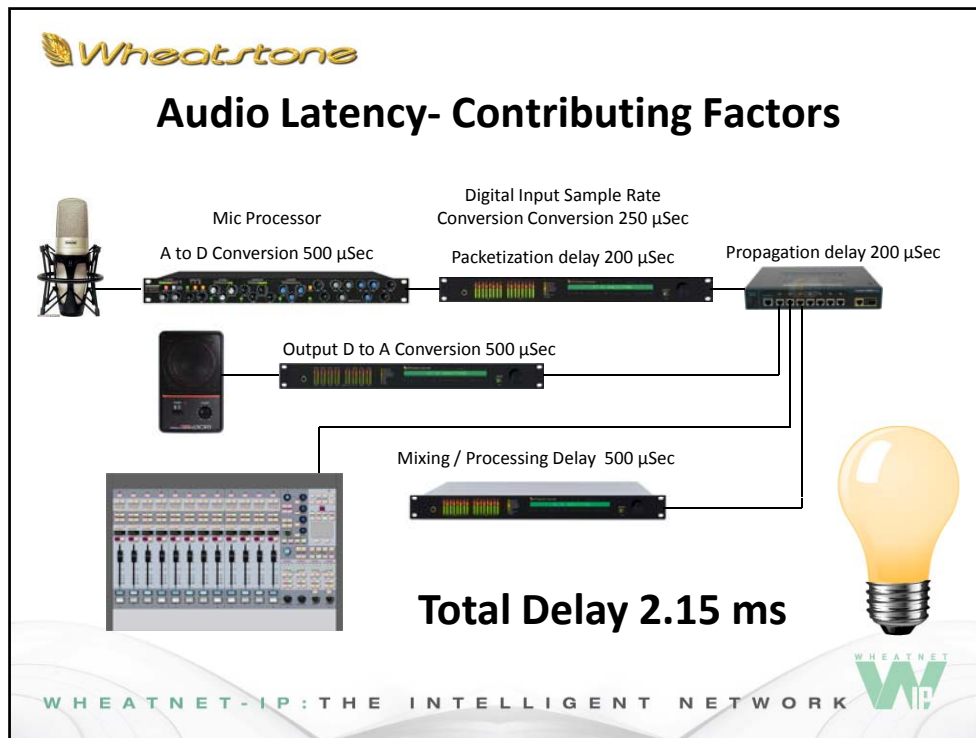



Once again not a single issue with this site.




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 **Audio Latency- Contributing Factors**

- Latency “budget” for real time monitoring is 5 to 6 milliseconds.
- Audible comb filtering occurs at 10 ms.
- Perceivable “slapback echo” occurs at 20 ms.
- Due to cumulative latency through devices each step must be optimized to stay within the “budget”.
- Talent monitoring through headphones will hear their own voice plus the headphone audio. this audio must not be delayed by more than 6 milliseconds.
- Gigabit networks offer 10 times the throughput of 100mbps, keeping packetization and propagation delays to a minimum.



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Questions?

Thank you,

Wheatstone Corporation



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