

Dante Advanced Configuration

Networking Matters

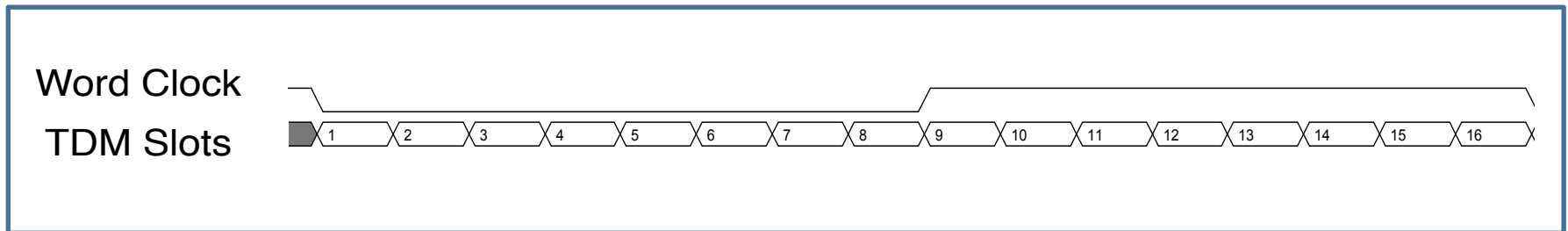
A large version of the Dante logo is centered on the page. It consists of the stylized 'D' icon, the word 'Dante' in a bold, uppercase, sans-serif font, and the trademark symbol (TM) to the upper right. Below the word 'Dante' is the tagline 'DIGITAL MEDIA NETWORKING PERFECTED' in a smaller, uppercase, sans-serif font. A red horizontal line is positioned below the 'D' icon.

Dante: Advanced

- Contents:
 - Clock
 - Latency
 - Bit Depth
 - Sample Rate
 - Flows
 - QoS
 - IGMP Snooping
 - VLANs, LAGs & STP
 - Switches & Cables

Dante: Clock

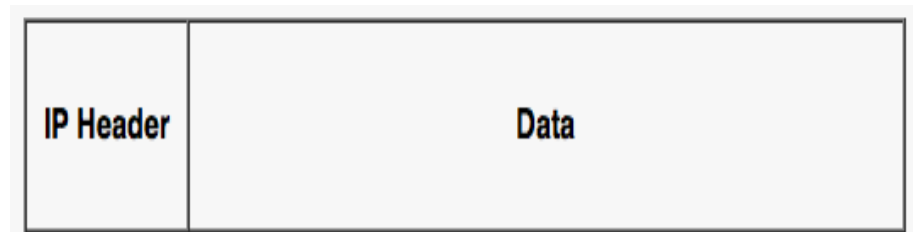
- Does not use TDM
- Time Division Multiplexing
 - Used by traditional digital audio transports
 - Such as AES/EBU, MADI, EtherSound
 - Each audio channel sends data during a set time interval
 - Clock signal is derived from the timing of the audio data



- But these are systems with a fixed-capacity...

Dante: Clock

- Dante Clock Is Packet Based



- Using PTP: Precision Time Protocol
 - IEEE1588
 - Sub-microsecond accuracy
 - PTP is used in extremely time critical applications
 - Factory Automation
 - Wall street trading

Dante: Clock - PTP

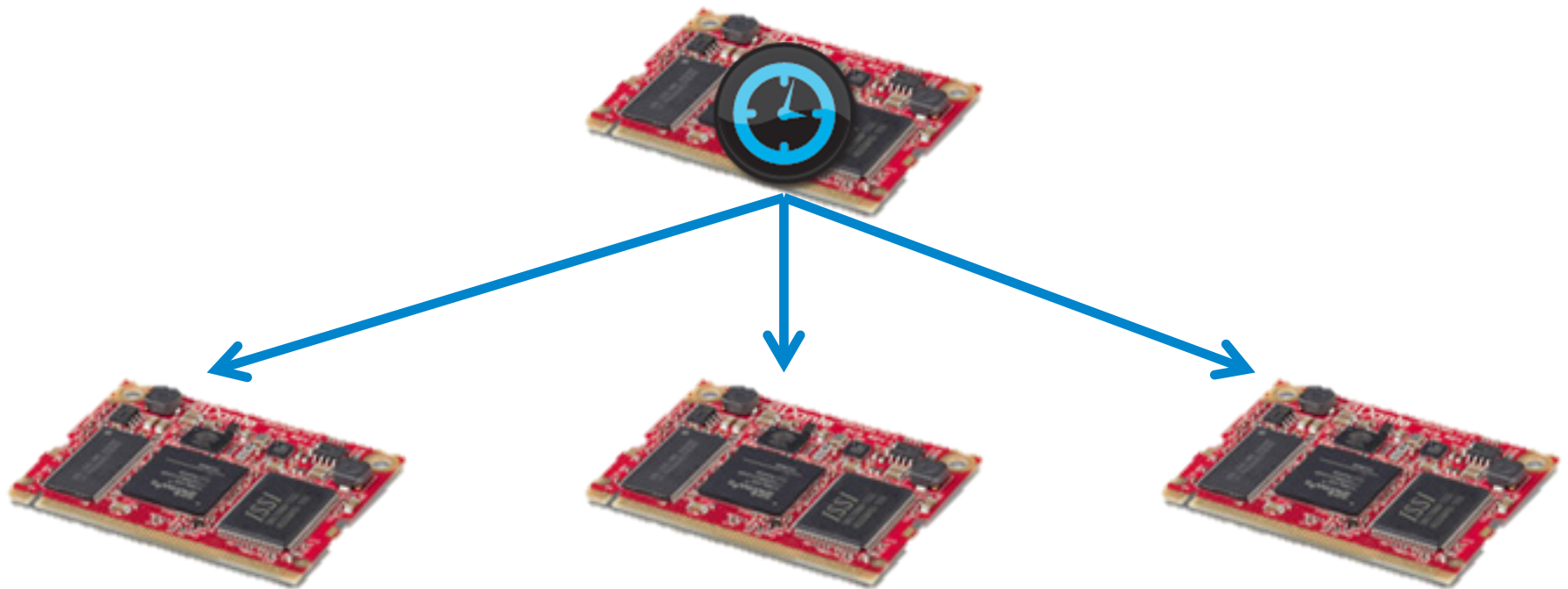
- It is a Master / Slave concept
 - With strictly one Master only
- The Master is automatically selected based on:

Device Name	Primary Interface Clock Status	Secondary Interface Clock Status	Clock Role	Slave To External Word Clock
Casc-macbook	Listening	Not Supported	Slave Only	Not Supported
Y001-Yamaha-CL5-060ba6	Master	Link down	<input checked="" type="checkbox"/> Preferred Master	<input checked="" type="checkbox"/> Yes
Y001-Yamaha-Rio3224-D-0606ca	Slave	Link down	<input type="checkbox"/> Preferred Master	Not Supported
Y002-Yamaha-CL3-06167a	Slave	Link down	<input checked="" type="checkbox"/> Preferred Master	<input type="checkbox"/> Yes
Y002-Yamaha-Rio3224-D-060da2	Slave	Link down	<input type="checkbox"/> Preferred Master	Not Supported
Y003-Yamaha-Rio1608-D-06218c	Slave	Link down	<input type="checkbox"/> Preferred Master	Not Supported
Y004-Yamaha-Ri8-D-068648	Slave	Link down	<input type="checkbox"/> Preferred Master	Not Supported
Y005-Yamaha-Ro8-D-0687a8	Slave	Link down	<input type="checkbox"/> Preferred Master	Not Supported

1. Is it labelled as “Preferred”?
2. Is it slaved to “External Clock”?
3. Does the Dante module have a high quality clock?
4. Is its MAC address lower than other devices?

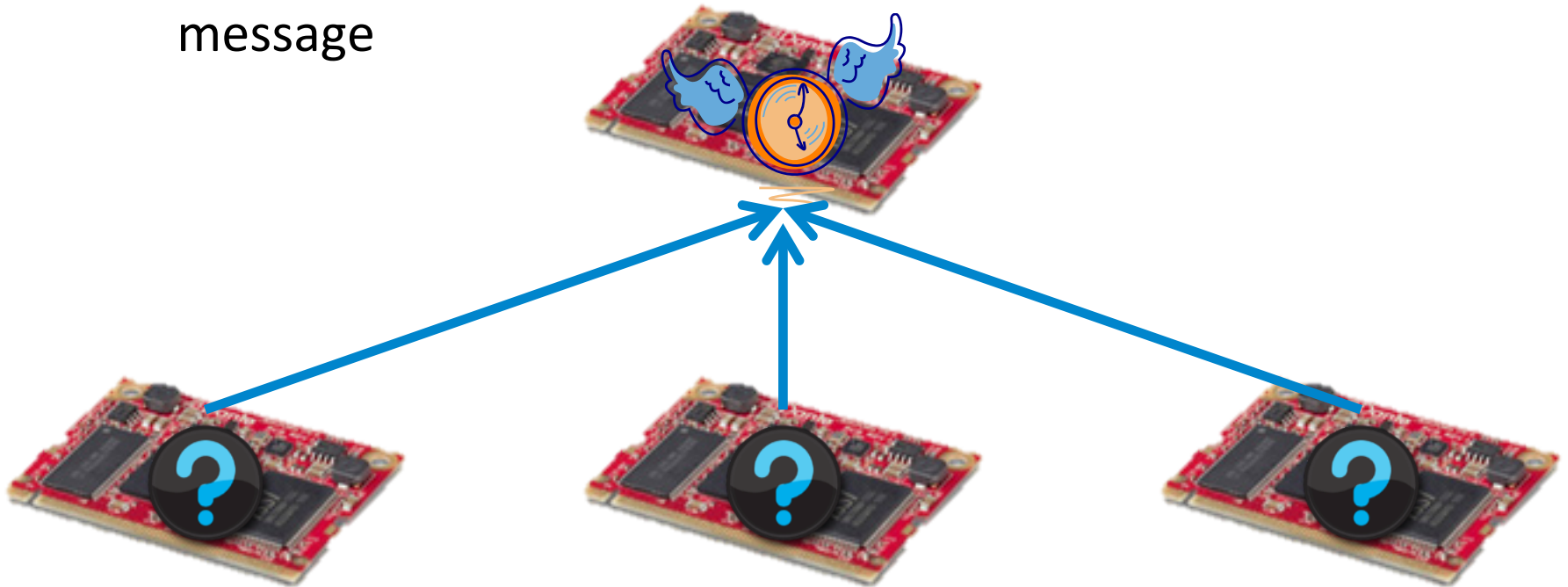
Dante: Clock - PTP

- After a Master device is selected, it will start to multicast transmit a discipline signal to each slave, to keep them in sync.



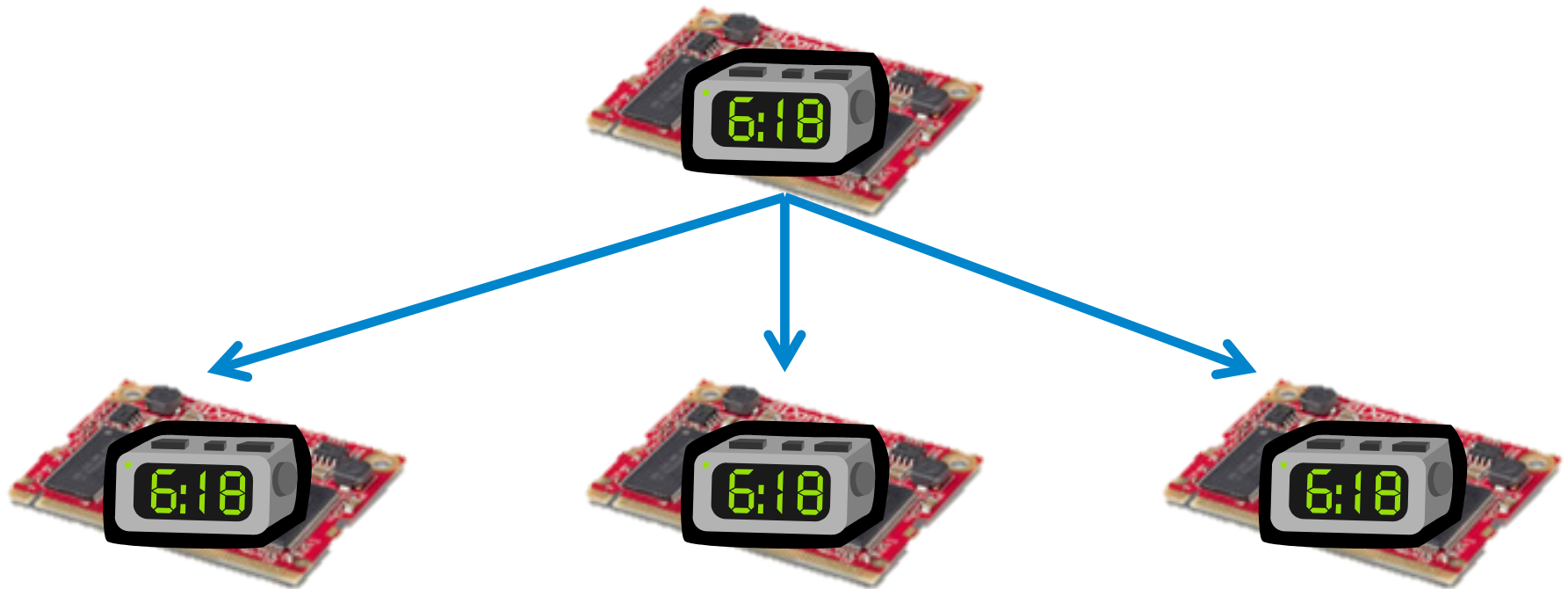
Dante: Clock - PTP

- Each slave will determine its time offset caused by transmission delay.
 - The slave sends a “Delay Request” to its Master
 - The Master replies with a time-stamped “Delay Response” message



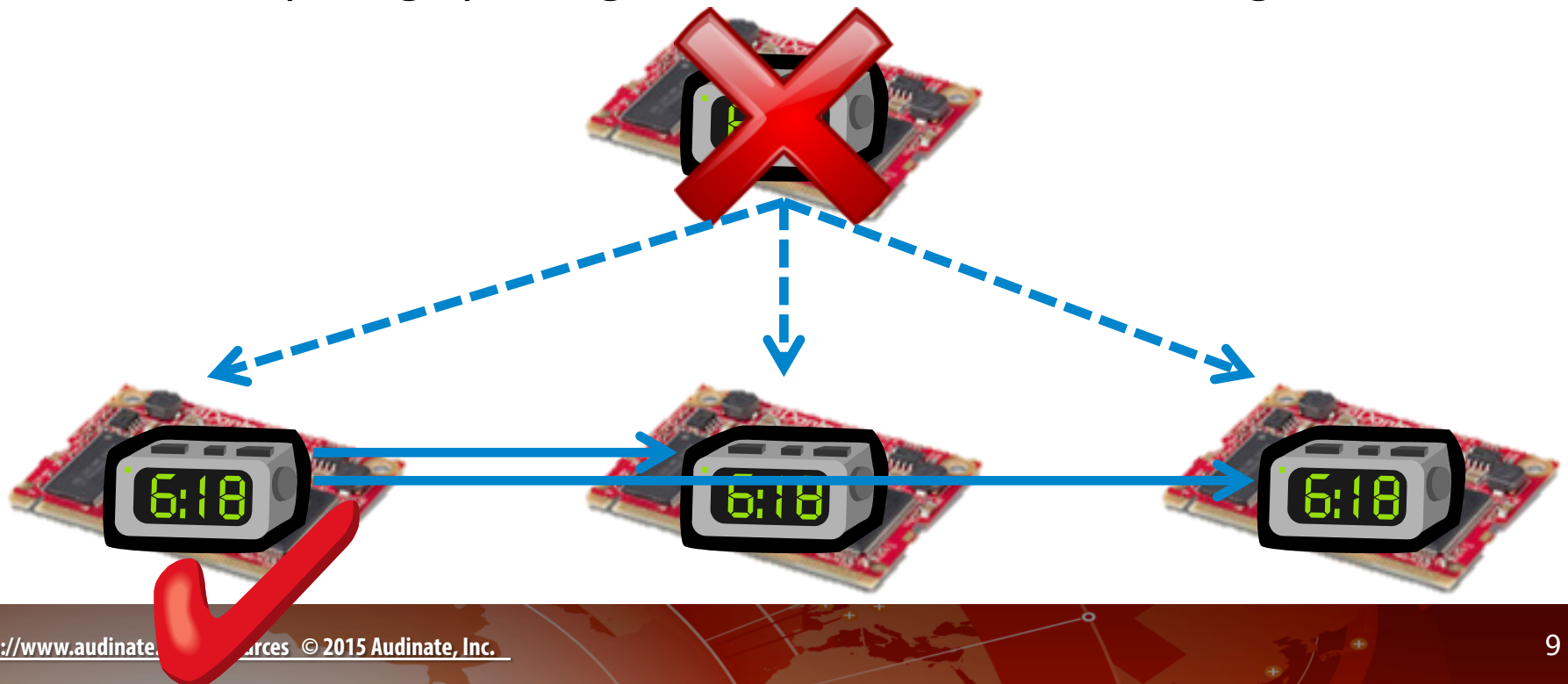
Dante: Clock - PTP

- The Slave will perfectly time-align itself to the Master
 - And all Slaves will be perfectly in sync
 - The sync is checked several times every second



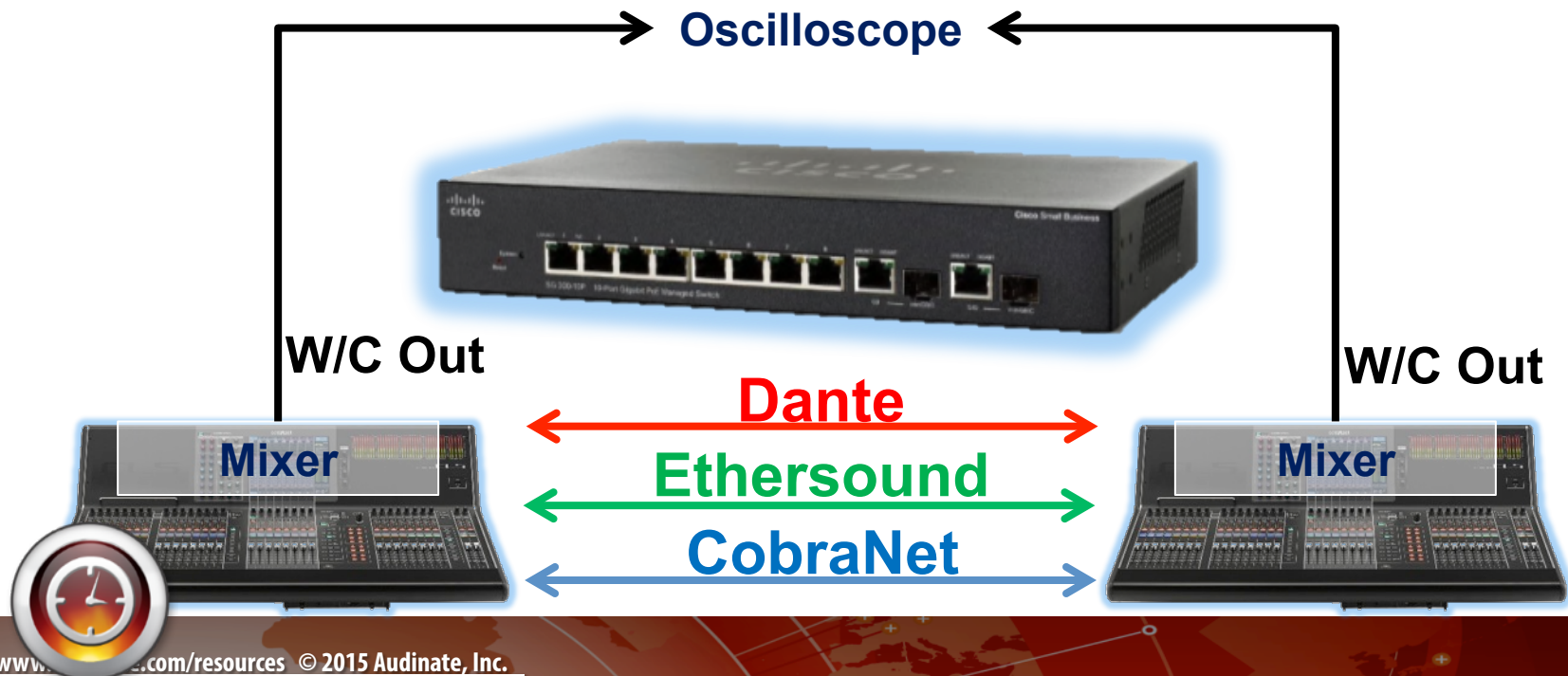
Dante: Clock - PTP

- If the Master clock gets disconnected...
 - All slaves will continue to run from their own clocks
 - A new Master is elected quickly and automatically
 - Everything syncs again, with no silence and no glitch!



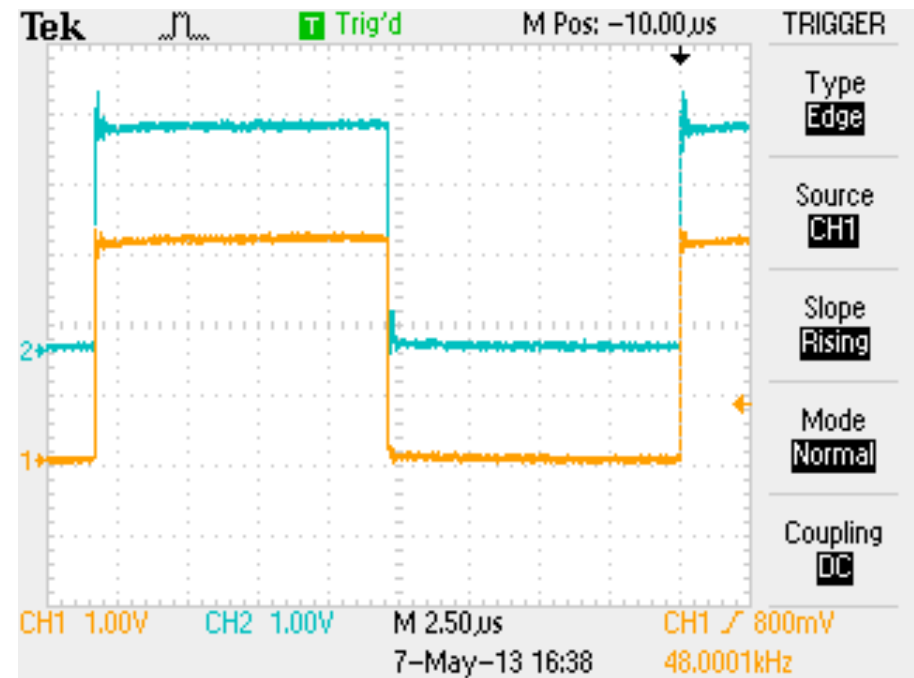
Dante: Clock - Network Clock Comparison

- How good are conventional networks at synchronising Clocks?
 - Add an extra switch: what happens to the sync?



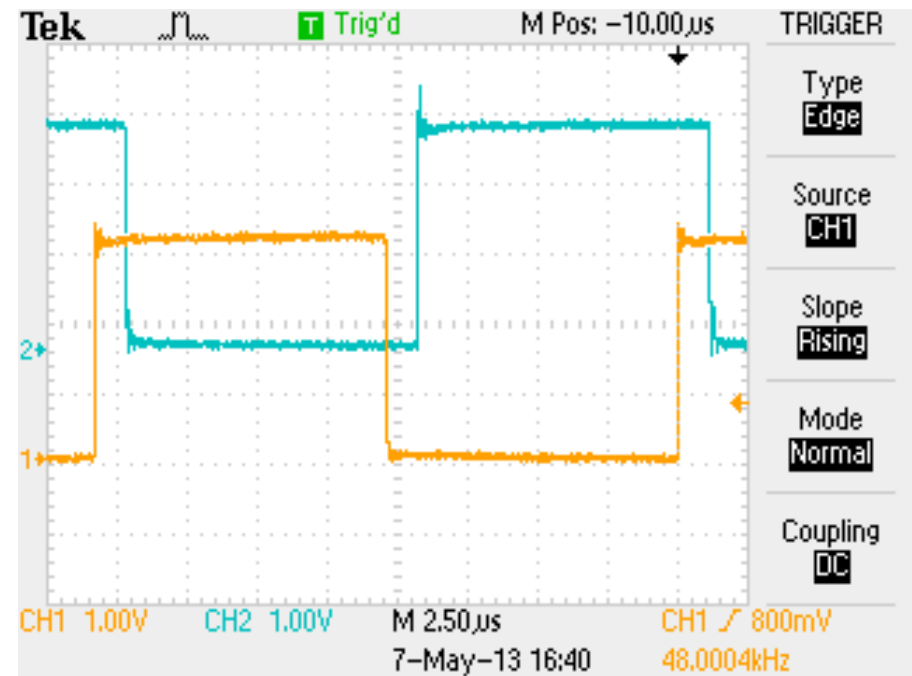
Dante: Clock - Delay in a Network

- The “Control” of the experiment: Both mixers clock to Ext. Gen.
- In sync and in phase



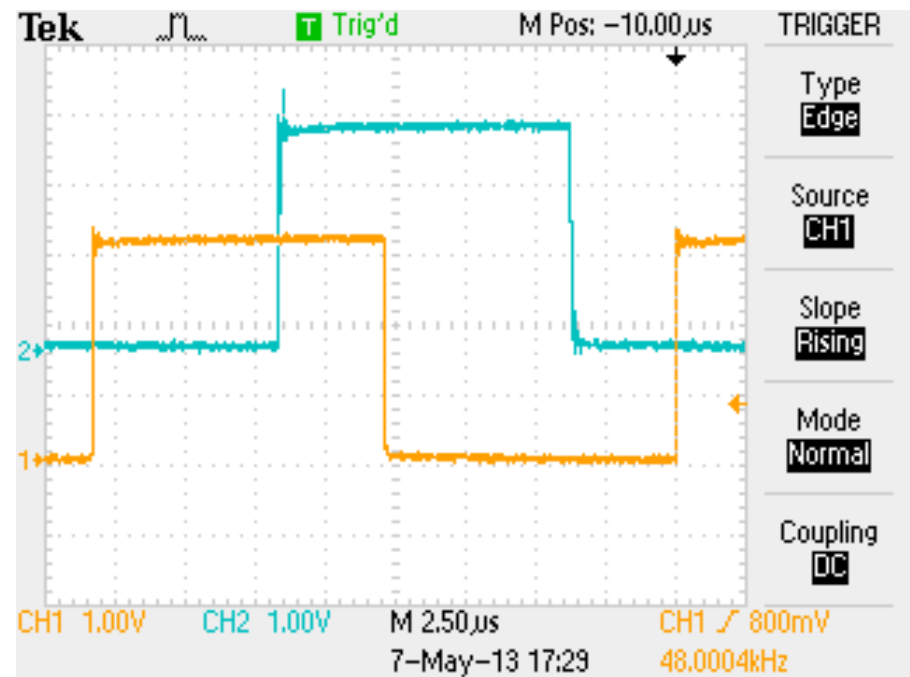
Dante: Clock - Delay in a Network

- The Master Mixer clocks internally, Slave Mixer clocks via AES/EBU.
- In sync, but not in-phase
- (Slave = blue)



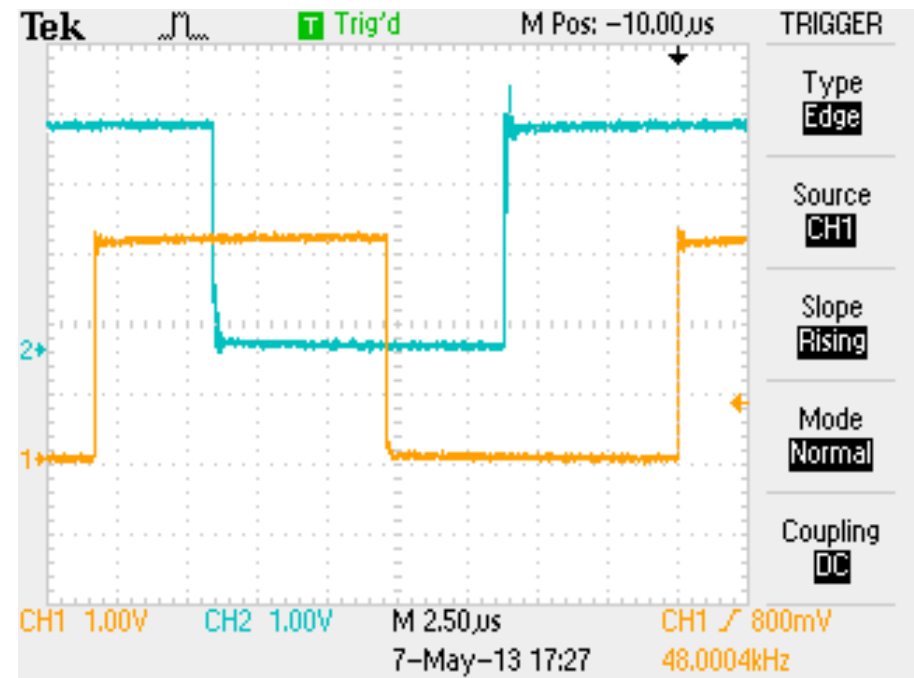
Dante: Clock - Delay in a Network

- Slave Mixer clocks via CobraNet.
- In sync but not in phase
- (Slave = blue)



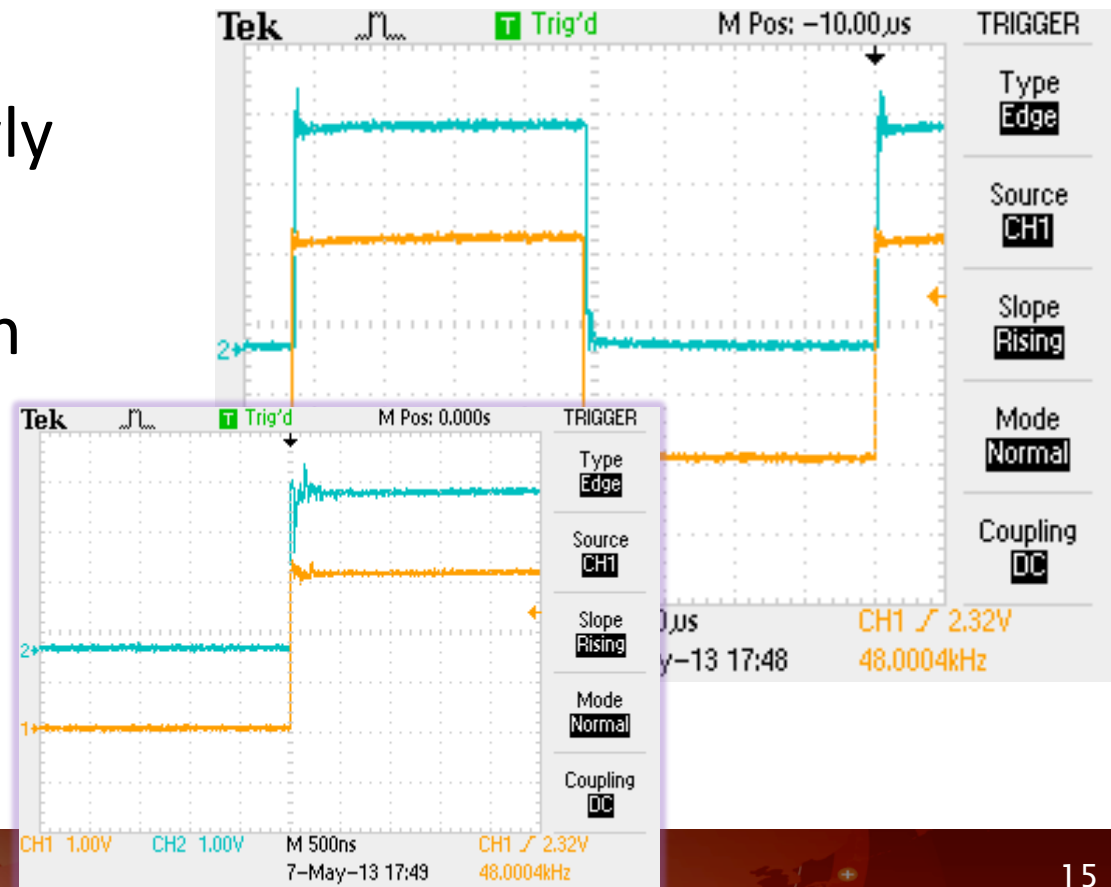
Dante: Clock - Delay in a Network

- Slave Mixer clocks via CobraNet.
 - Add another switch to the network
- Clock phase shifts due to extra signal delay
- (Slave = blue)



Dante: Clock - Delay in a Network

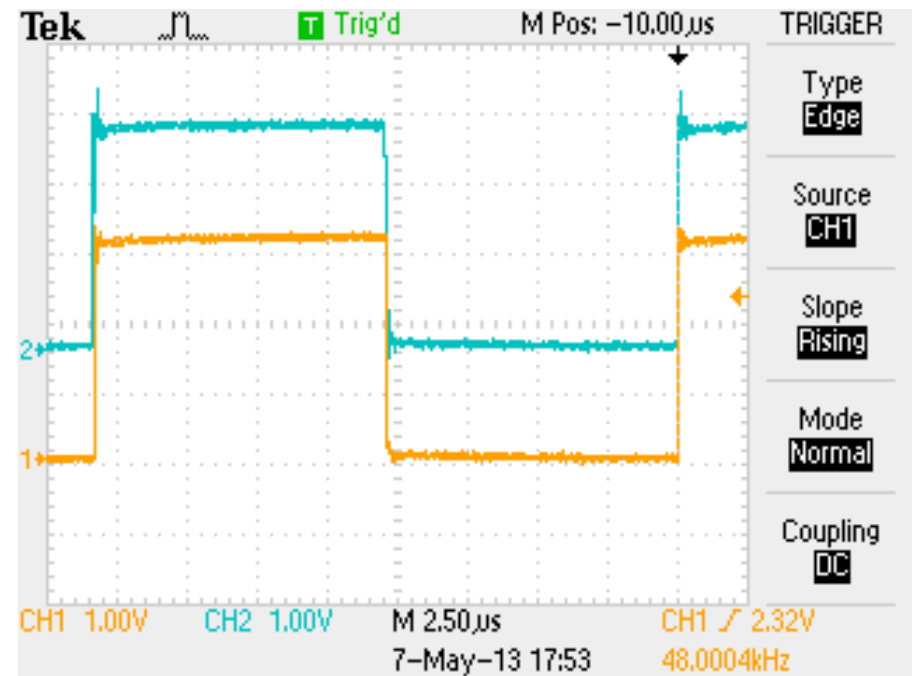
- Slave Mixer clocks via Dante.
- See the clocks slowly converge
- Time-aligned within about $0.1\mu\text{s}$
- (Slave = blue)



Dante: Clock - Delay in a Network

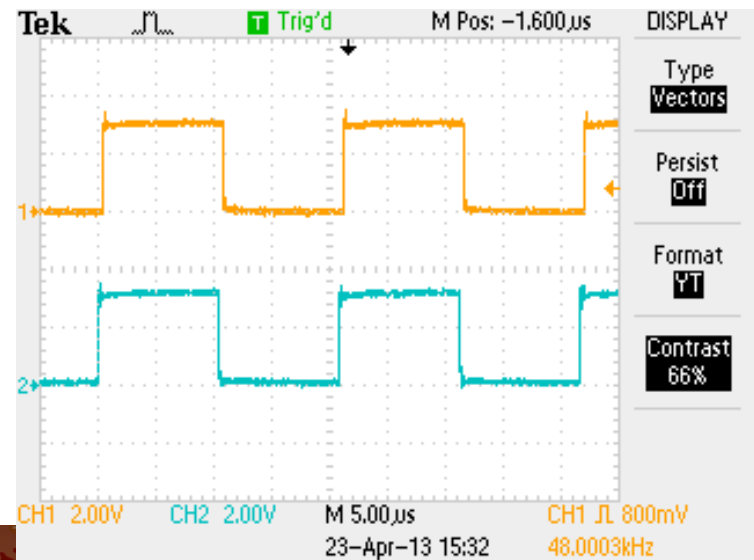
- Slave Mixer clocks via Dante.
 - Add another switch to the network

- If clock drifted away, it will drift back into phase again within a few seconds.
- Because Dante clock is time-stamped.



Dante: Clock - PTP

- The sync tolerance of Dante devices is guaranteed to be $\pm 1\mu\text{s}$ (microsecond)
 - In practice we find it to be more like $\pm 0.2\mu\text{s}$
 - One clock cycle at 48kHz is $20.8\mu\text{s}$
 - So we have a realistic sync within $1/100^{\text{th}}$ of a sample!
 - All outputs from the network will be w/c aligned!

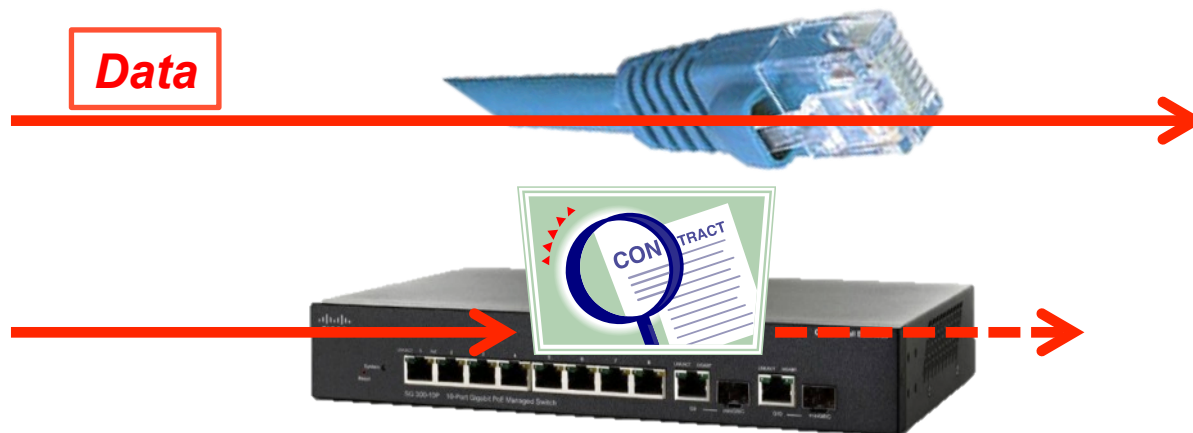


Dante: Advanced

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Dante: Latency

- Data takes more time to travel through a switch than through a wire
 - The switch analyses, copies, filters, splits, forwards the data...
- So more switches in a network means more latency



Dante: Latency

- Some Dante devices have switches built in to allow for simple “daisy-chain” connections
- Most Dante devices have a fixed number of latency options, to keep it simple.
- Latency general rule; 100 microseconds per switch

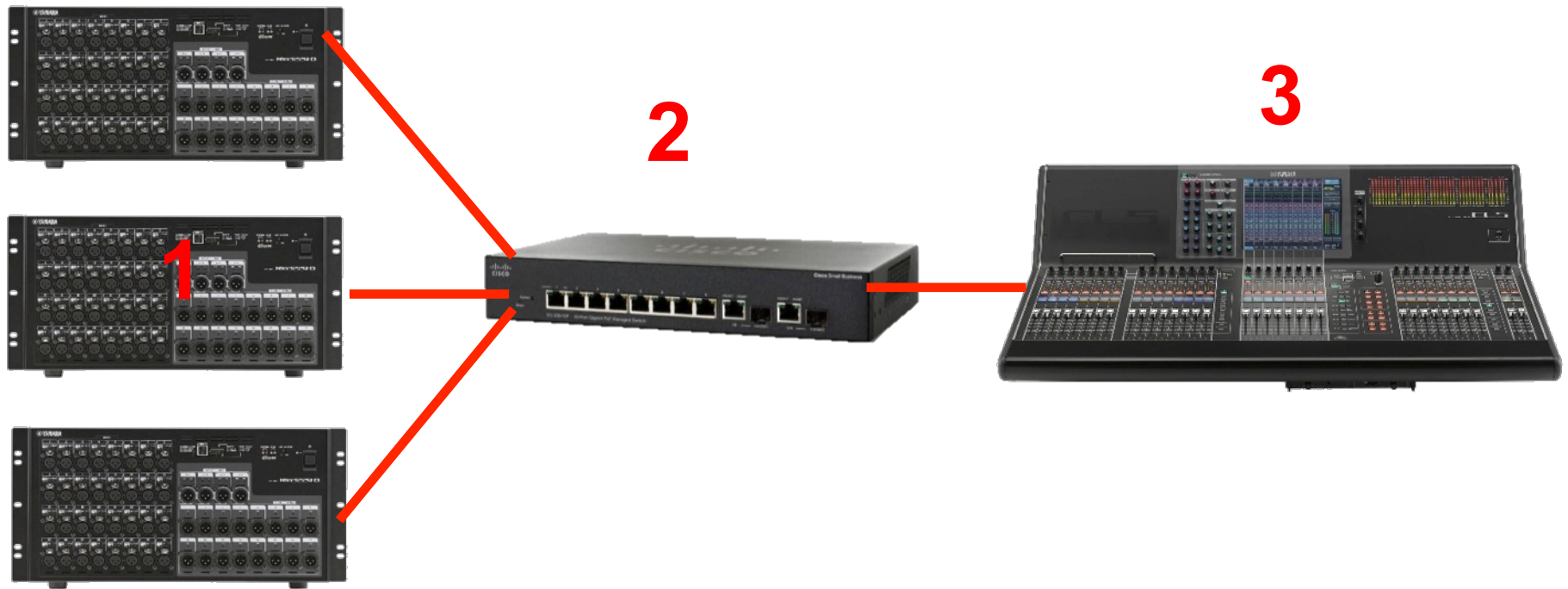
Device Latency

Current latency: 0.5 msec

Latency	Maximum Network Size
<input type="radio"/> 0.15 msec	Gigabit network with one switch
<input type="radio"/> 0.25 msec	Gigabit network with three switches
<input checked="" type="radio"/> 0.5 msec	Gigabit network with five switches
<input type="radio"/> 1.0 msec	Gigabit network with ten switches or gigabit network with 100Mbps leaf nodes
<input type="radio"/> 2.0 msec	Gigabit network with 100Mbps leaf nodes
<input type="radio"/> 5.0 msec	Safe value

Dante: Latency

- Star, 4 Dante devices
- Audio travels through 3 switches
- Use 0.25ms setting (or higher)



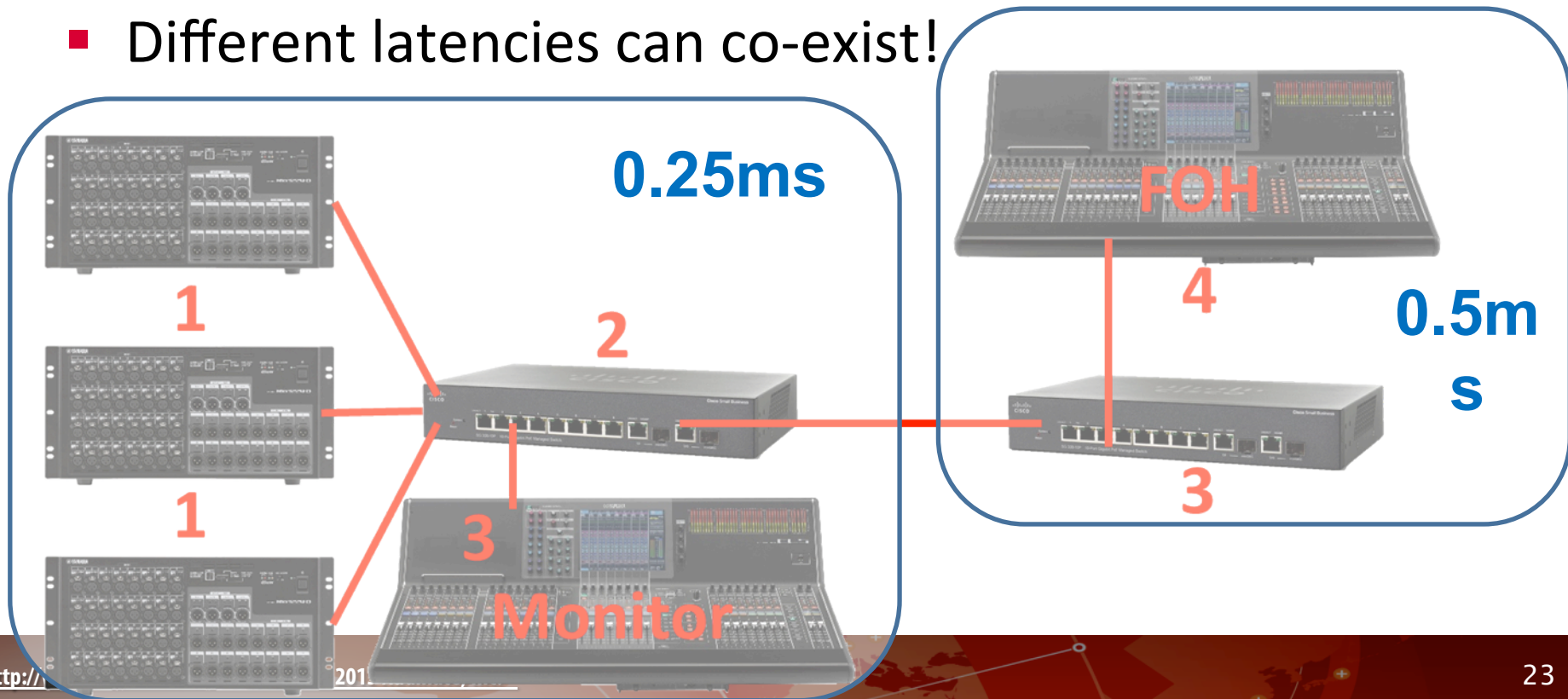
Dante: Latency

- Star, 5 Dante devices + 2 switches
- Audio travels through 4 switches
- Use 0.5ms setting (or higher)



Dante: Latency

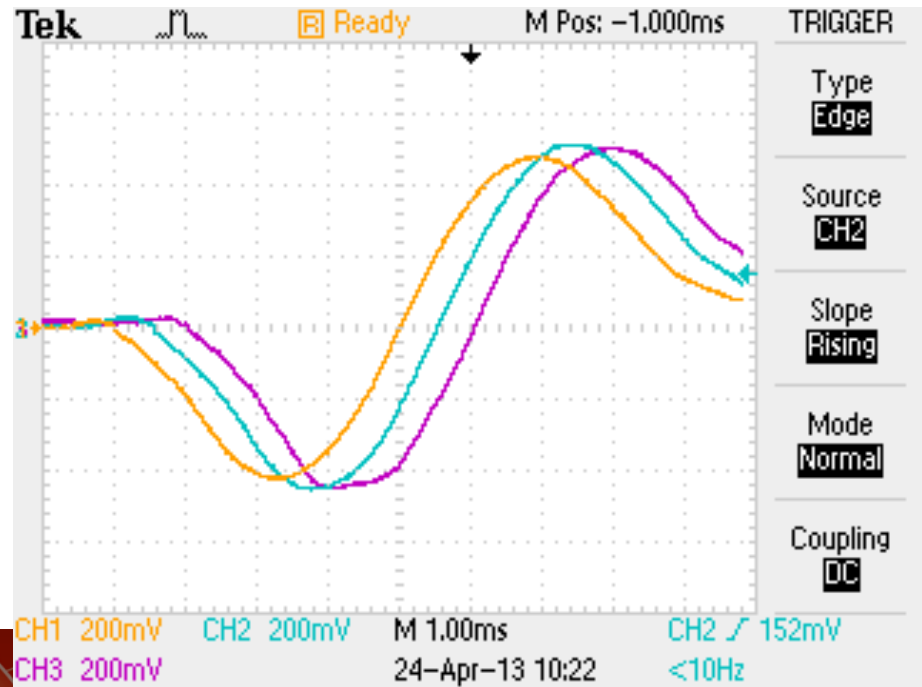
- Or, to keep in-ear monitoring latency low, set Monitor console and Rios on stage at 0.25ms
- Set FOH console at 0.5ms
- Different latencies can co-exist!



Dante: Latency

- Latency comparison:
 - Yellow = mic->omni in->omni out (no Dante)
 - Blue = mic->Rio->CL@Mons->Rio (0.25ms latency)
 - Pink = mic->Rio->CL@FOH->Rio (0.5ms latency)

- Yellow = 2.0ms
- Blue = 2.5ms
- Pink = 3.0ms



Dante: Latency - Guidelines

- If the transmitting device and the receiving device have different latency settings, the higher setting will be used.
- Multicast transmission will ALWAYS have a latency of 1ms, regardless of the setting.
 - Switches often take more time to analyse and forward multicast data, so Dante needs to compensate.
- 1ms setting can cover a network 10 switches wide.
- 5.0ms setting is just for troubleshooting and should never be necessary.

Dante: Latency

- What happens if you set the latency too low?
 - Don't worry, if you follow the above guidelines, you will be safe: there is plenty of "safety margin".
 - In lab conditions, 10 switch hops can work with 0.25ms latency (very well tuned network)!
- Using QoS helps to achieve low latency
 - (More info later)
 - **If latency really is set too low, there will be silence...**

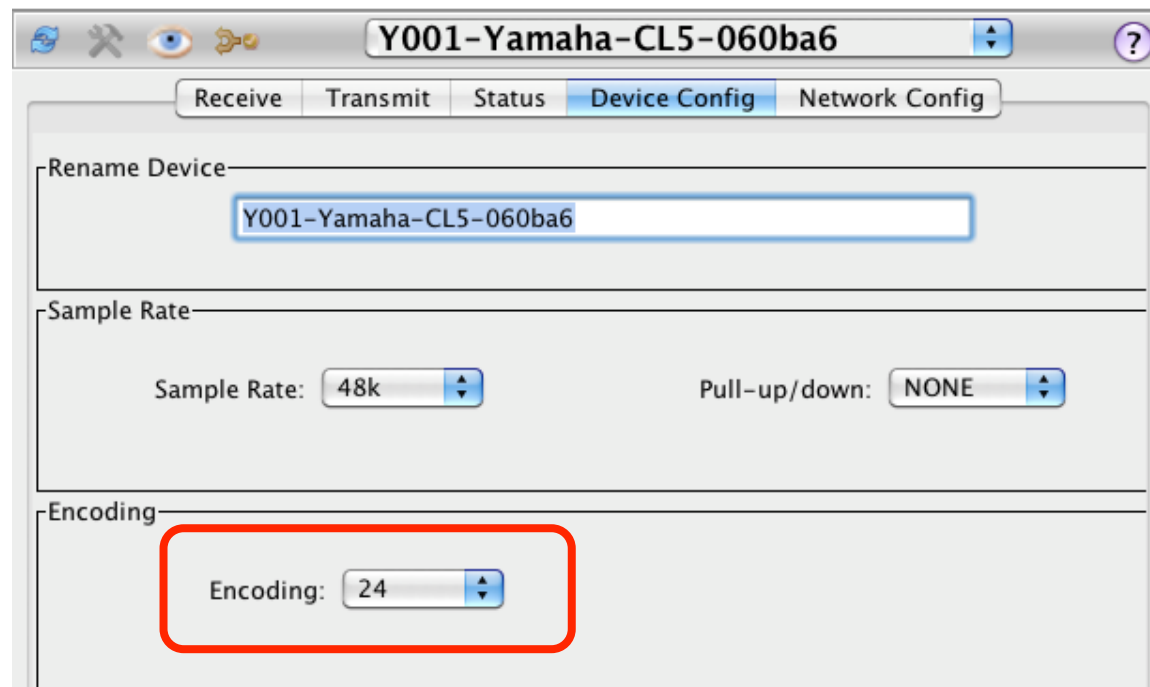


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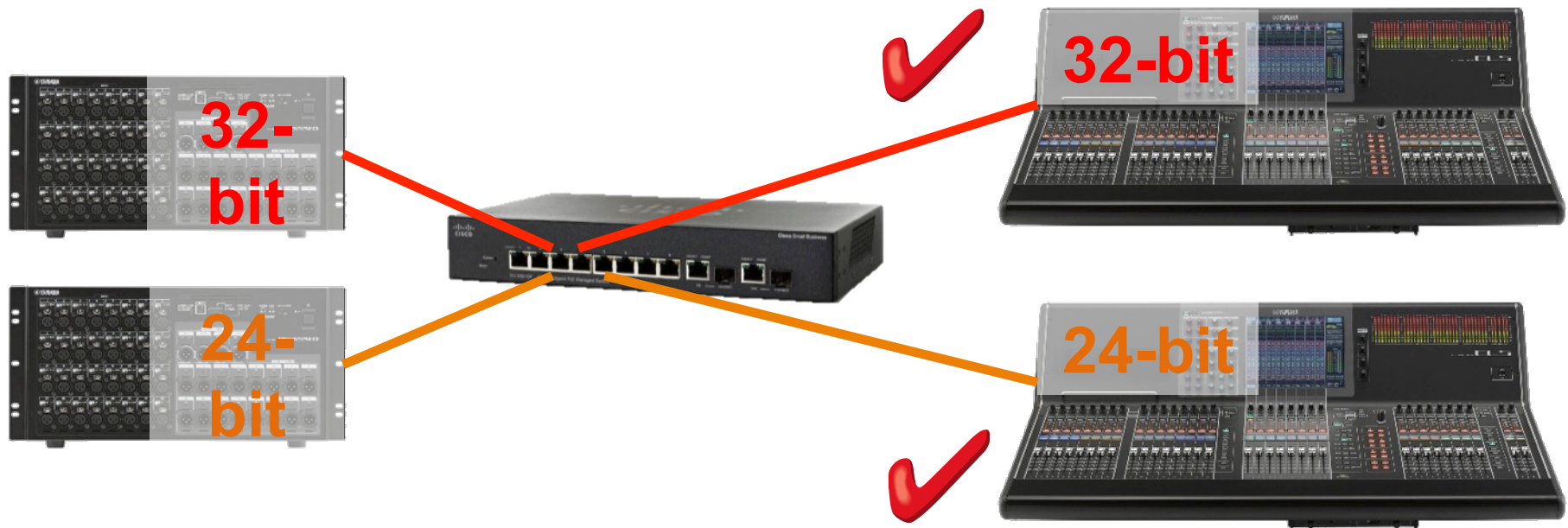
Dante: Bit Depth

- Dante devices can work at 16-bit, 24-bit or 32-bit.
- Others can only work at 24-bit.



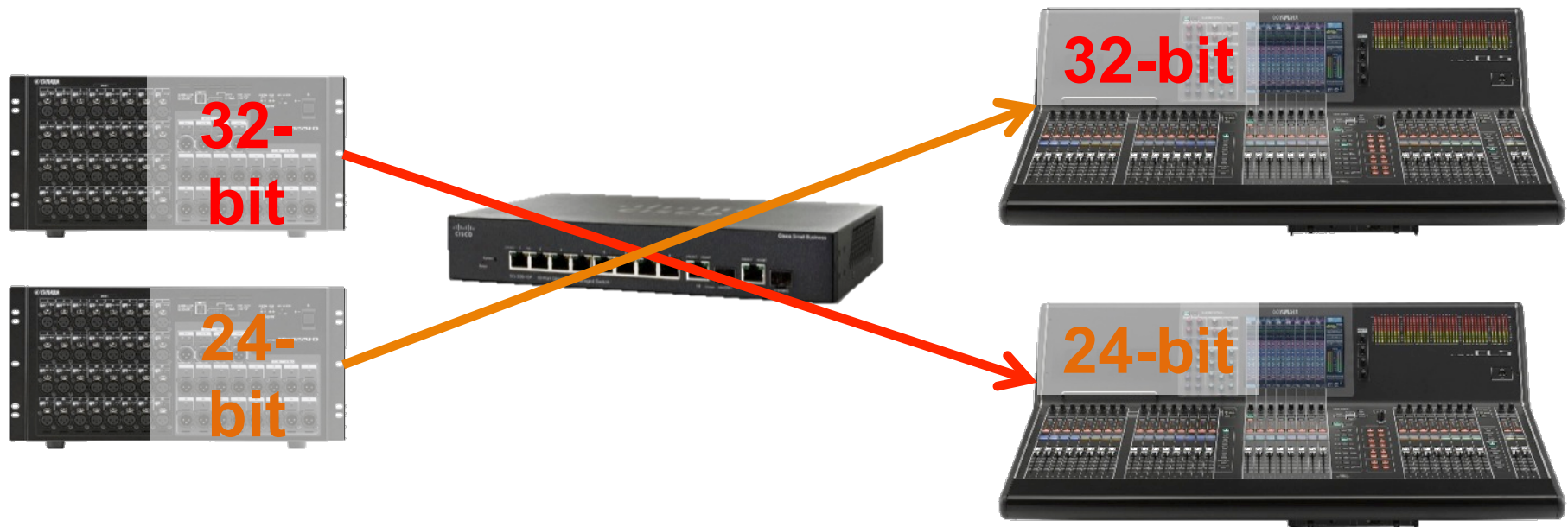
Dante: Bit Depth

- These different bit depths can co-exist on the network.



Dante: Bit Depth

- If a 24-bit device transmits to a 32-bit device, 8 “zero bits” are added to each word.
- If a 32-bit device transmits to a 24-bit device, the last 8 bits are simply removed.

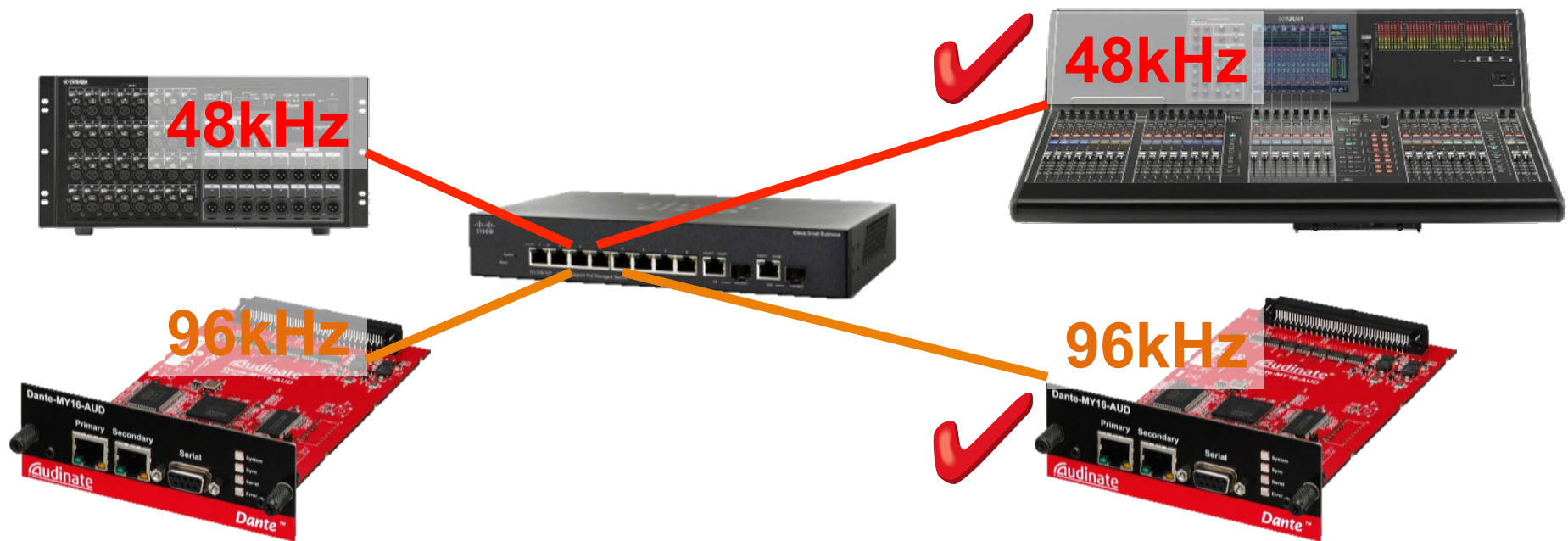


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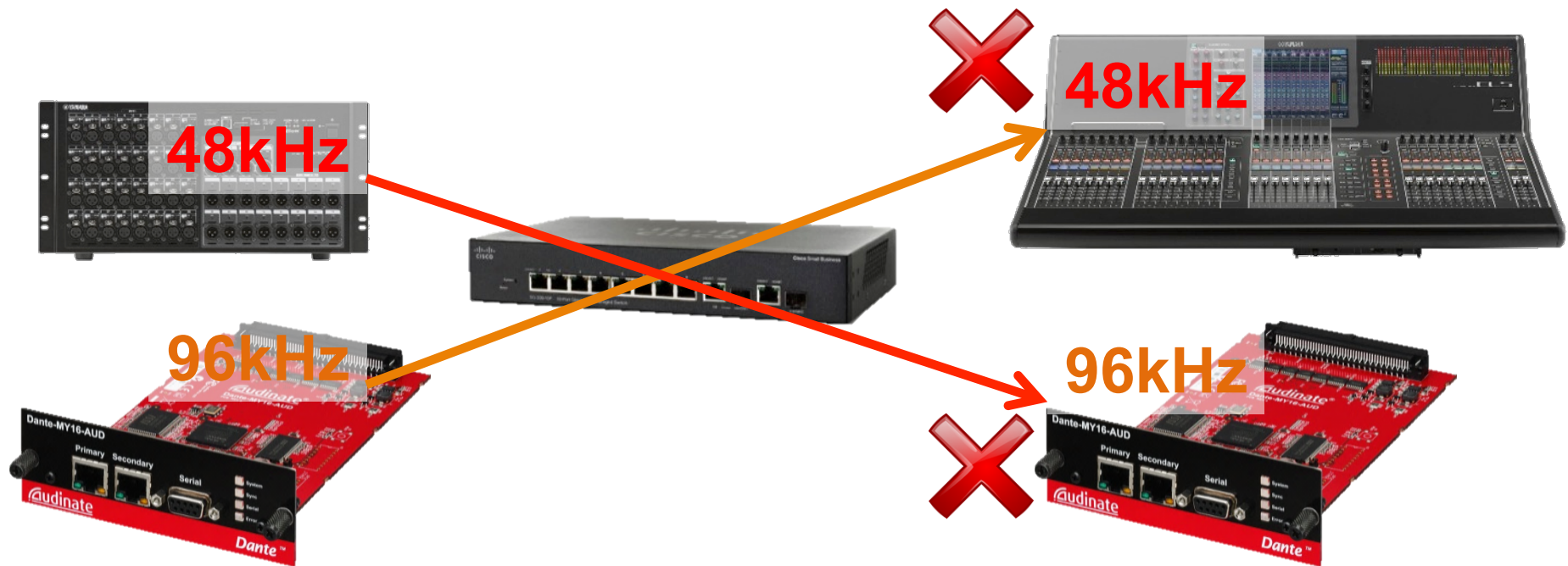
Dante: Sample Rate

- Different sample rates can co-exist on the same Dante network.
- Even 44.1kHz and 48kHz can share the network.



Dante: Sample Rate

- But devices working at different sample rates cannot share audio!
 - Dante Controller doesn't let you make the patch if the sample rates do not match.



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Dante: Flows

- For efficiency, Dante organises audio channels into groups, or “flows” whenever possible.
- Up to 4 channels are grouped in each “Flow” when they are transmitted and received by the same devices (unicast traffic).
 - It means they share the same Ethernet data packets.
 - This is efficient for bandwidth.

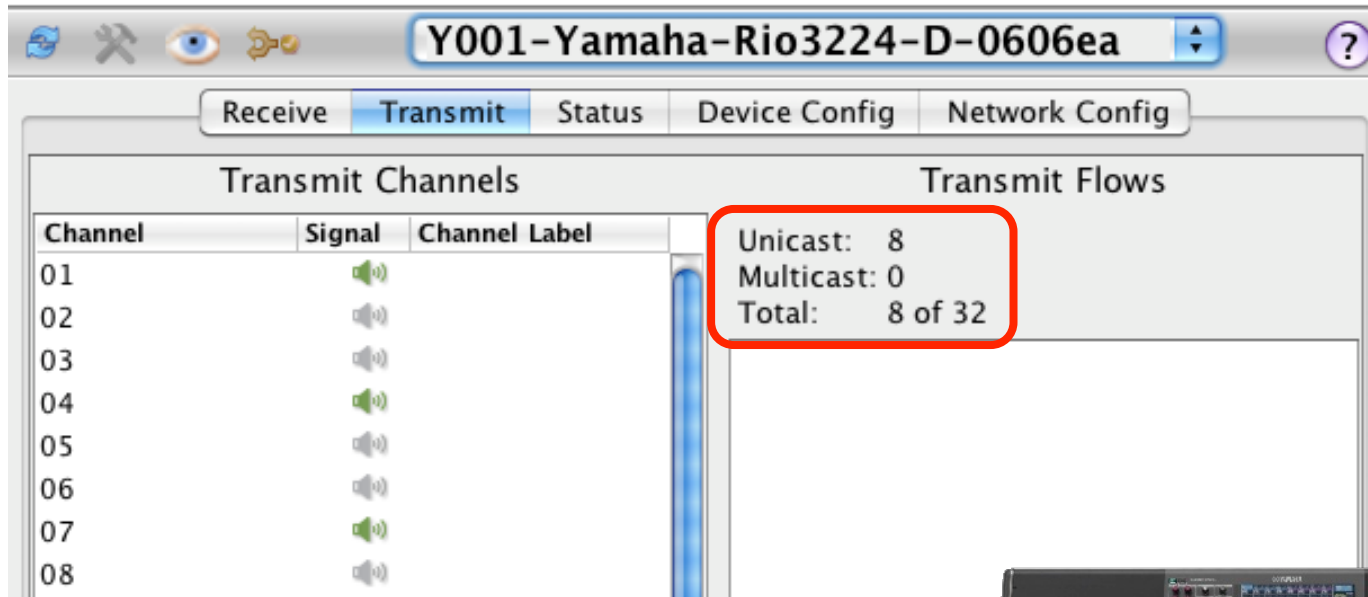


32 Channels
= 8 Flows



Dante: Flows

- Dante Controller shows the number of Flows
 - Device View->Transmit



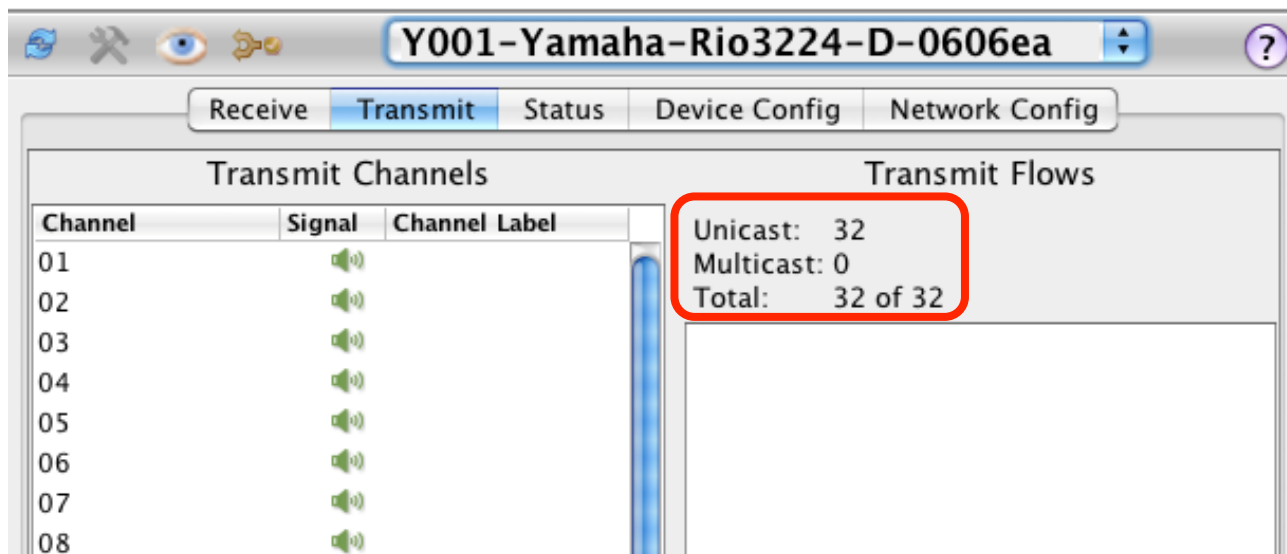
32 Channels

= 8 Flows



Dante: Flows

- With 32 Flows, you can:
 - Transmit up to 4 channels to 32 different devices
 - Transmit up to 8 channels to 16 different devices
 - Transmit up to 16 channels to 8 different devices
 - Transmit up to 32 channels to 4 different devices



The screenshot shows the Dante configuration software interface for a device named 'Y001-Yamaha-Rio3224-D-0606ea'. The 'Transmit' tab is selected, showing a table of Transmit Channels and a summary of Transmit Flows.

Channel	Signal	Channel Label
01		
02		
03		
04		
05		
06		
07		
08		

Transmit Flows Summary:

- Unicast: 32
- Multicast: 0
- Total: 32 of 32

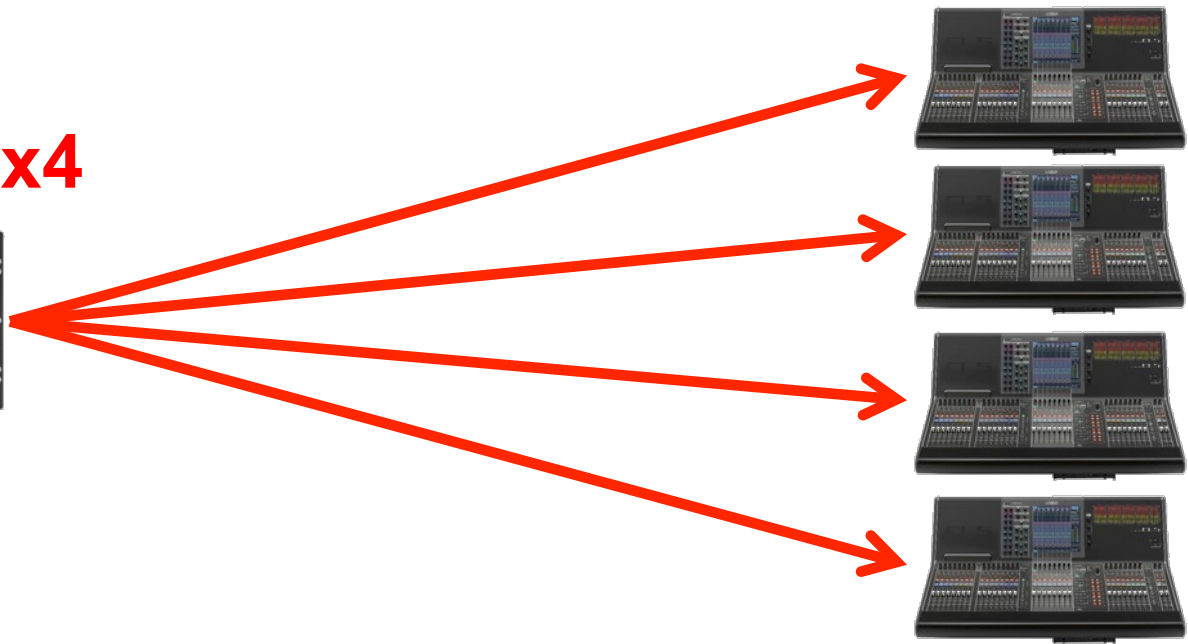
Dante: Flows

- So a Brooklyn II device can do a “digital split” to 4 consoles / multi-track recorders

32 Channels x4



= 32 Flows

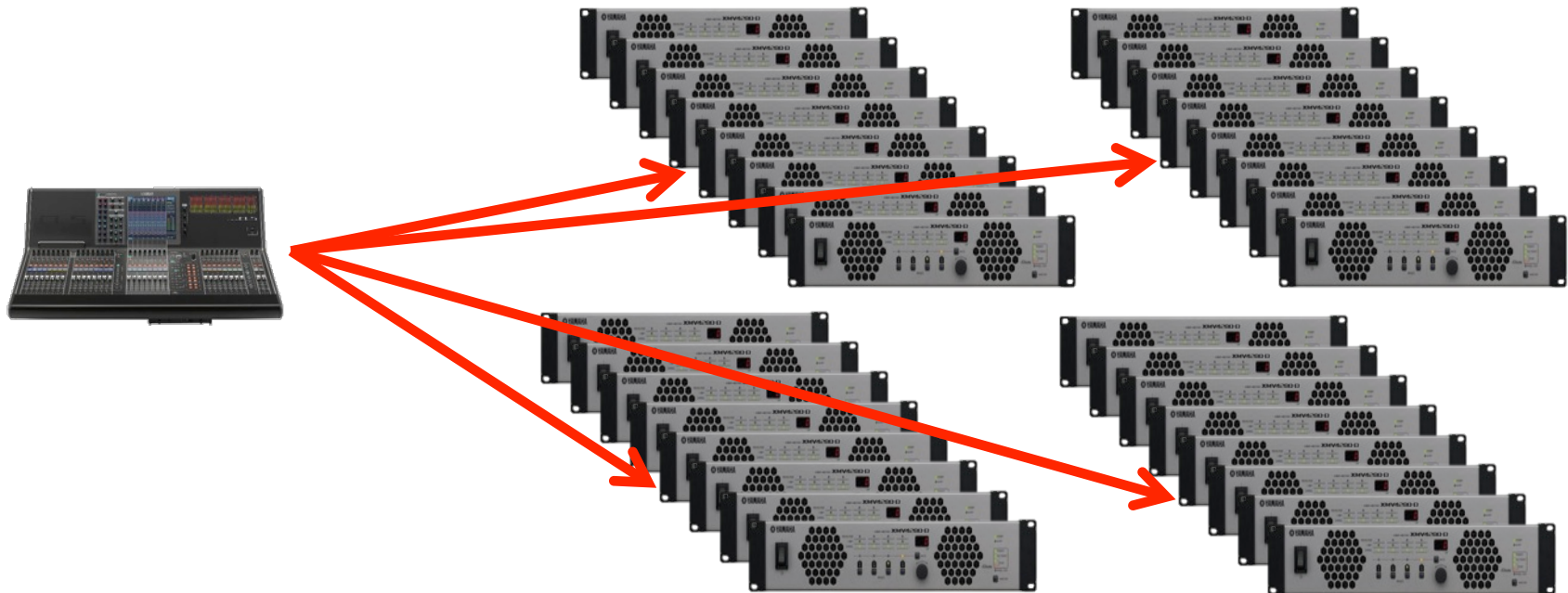


Dante: Flows (Unicast / Multicast)

- Need to “digital split” to more devices?
- Use “Multicast”!
- By default, all Dante Flows are “Unicast”
 - This preserves network switch bandwidth.
 - Unicast only goes to the designated devices
 - Multicast transmits to all Dante devices in the network!

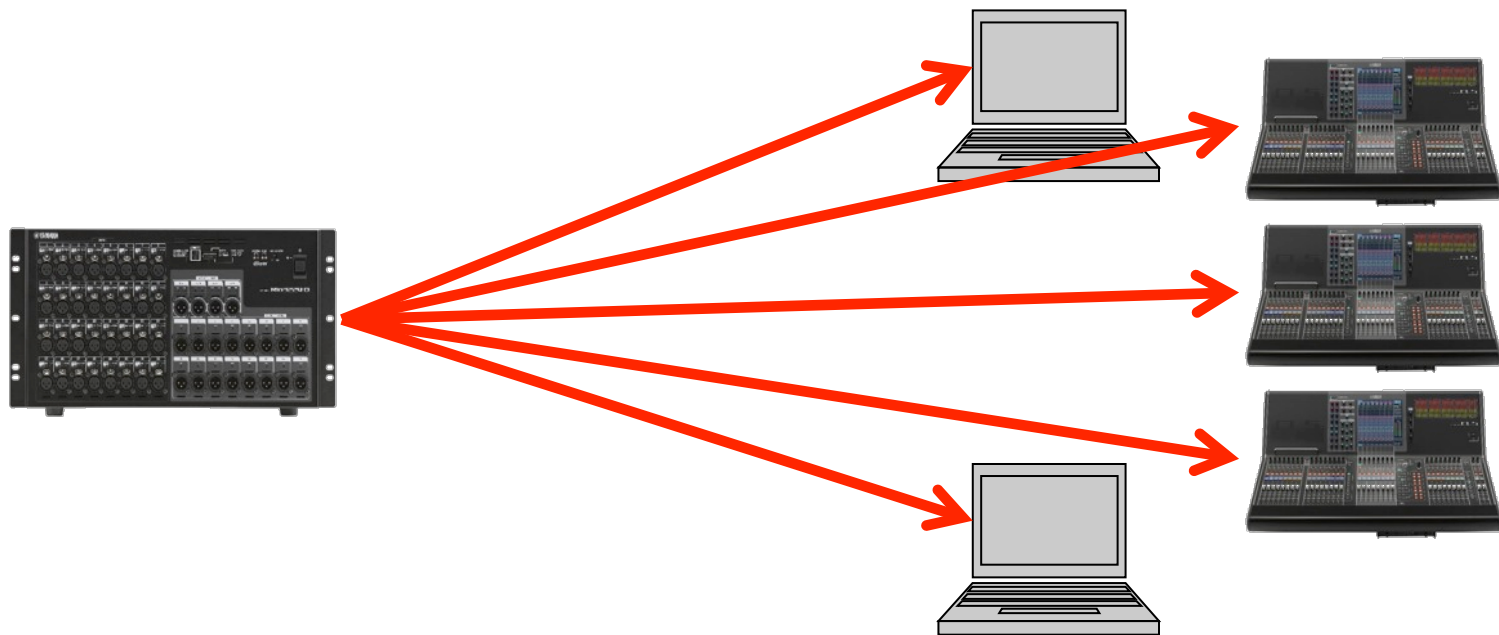
Dante: Flows - Multicast

- When do you need to use “Multicast”?
- When transmitting 2 channels to many amps



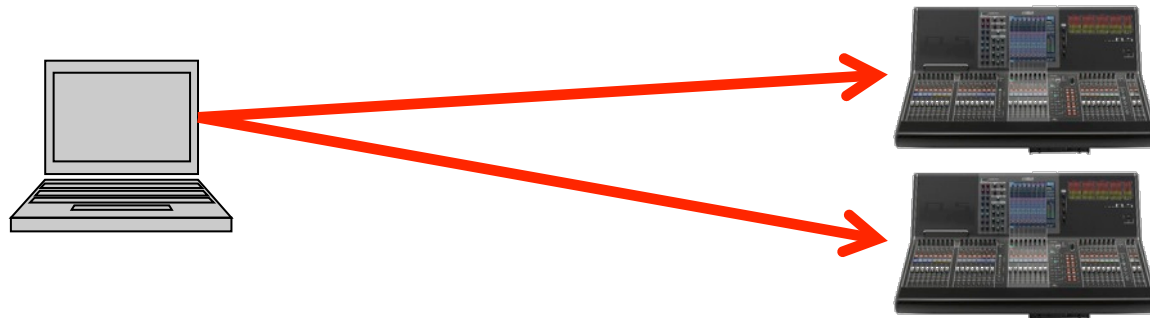
Dante: Flows - Multicast

- Use “Multicast”;
 - When transmitting 32 channels from Rio3224-D to 5 devices (3 consoles + 2 PCs for example)



Dante: Flows - Multicast

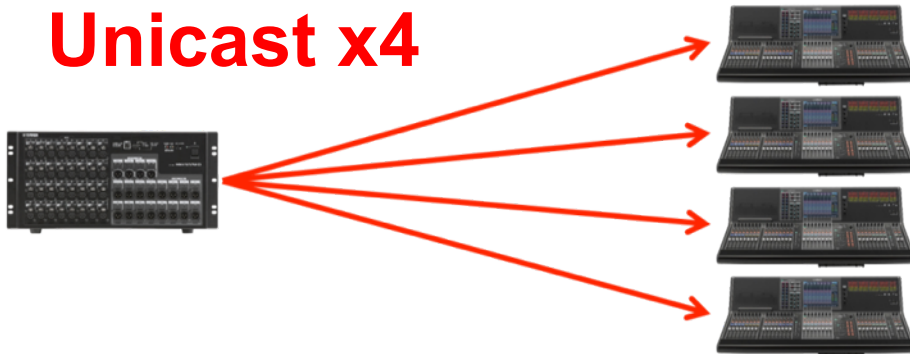
- Use “Multicast”
 - When playing from Dante Virtual Soundcard to 2 or more consoles.
 - DVS only has 16 Flows (16x4 = 64 Channels)
 - So to transmit 64 channels to 2 consoles, Multicast is *required*.



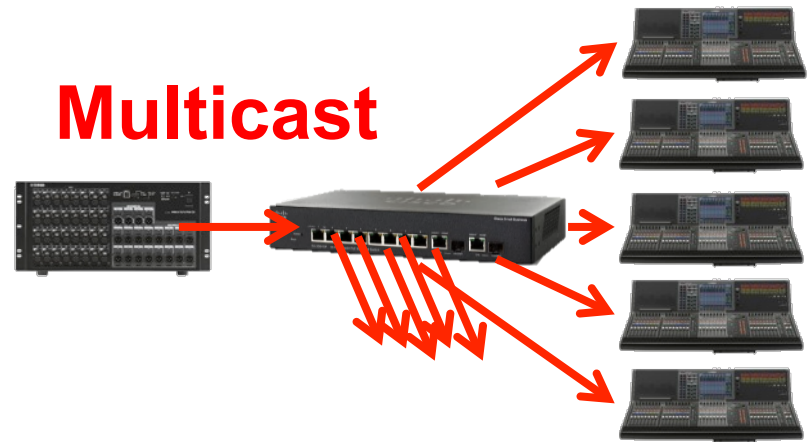
Dante: Flows - Multicast Vs. Unicast

- Multi- Unicast is more work for the **transmitting device**: it sends several copies of the same data.
- Multicast is more work for the **switches**: it copies & sends the data to all Dante devices in the network!

Unicast x4

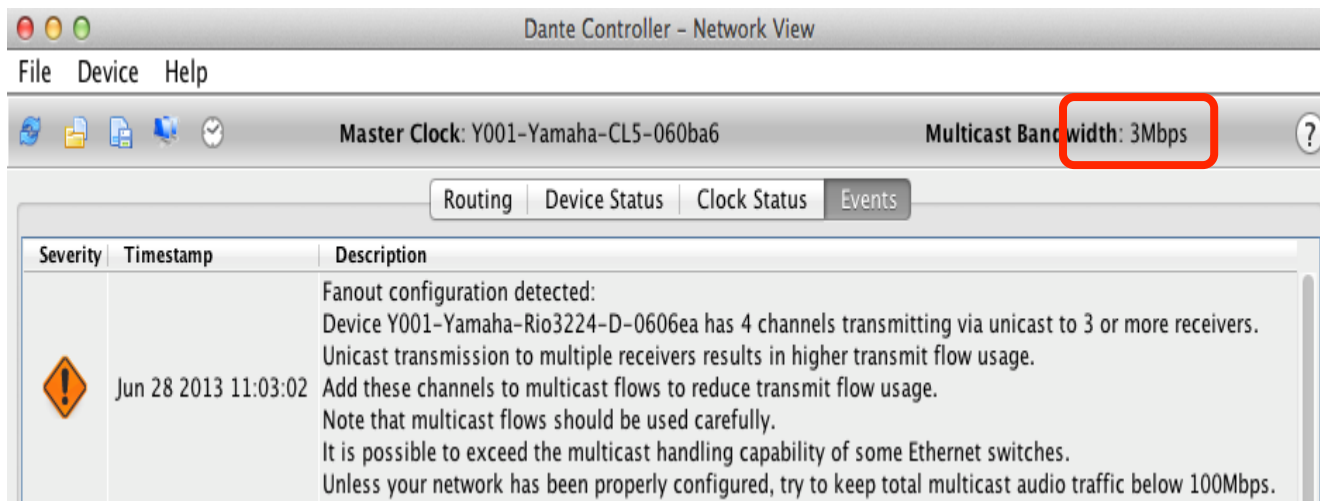


Multicast




Dante Controller & Multicast

- Dante Controller gives *tips* for when Multicast could be necessary.
 - Look in the “Events” page after routing one Transmitter to 3 or more Receivers:

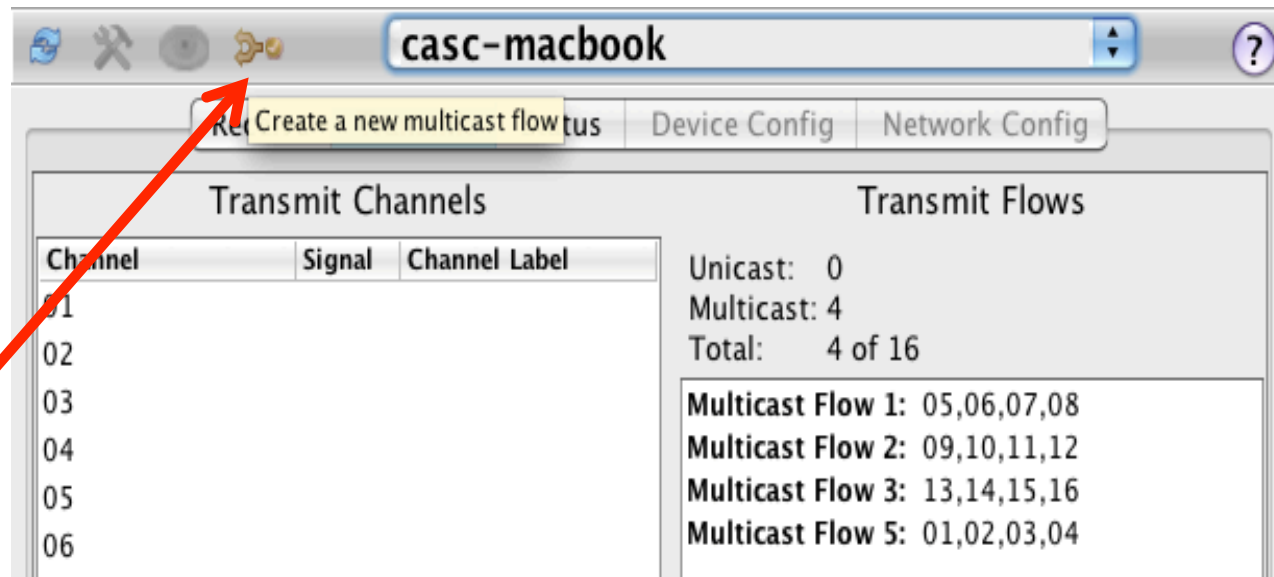


The screenshot shows the Dante Controller Network View interface. The title bar reads "Dante Controller - Network View". The menu bar includes "File", "Device", and "Help". The status bar shows "Master Clock: Y001-Yamaha-CL5-060ba6" and "Multicast Bandwidth: 3Mbps", with the latter highlighted by a red box. The "Events" tab is selected, displaying a table with the following content:

Severity	Timestamp	Description
	Jun 28 2013 11:03:02	<p>Fanout configuration detected: Device Y001-Yamaha-Rio3224-D-0606ea has 4 channels transmitting via unicast to 3 or more receivers. Unicast transmission to multiple receivers results in higher transmit flow usage. Add these channels to multicast flows to reduce transmit flow usage. Note that multicast flows should be used carefully. It is possible to exceed the multicast handling capability of some Ethernet switches. Unless your network has been properly configured, try to keep total multicast audio traffic below 100Mbps.</p>

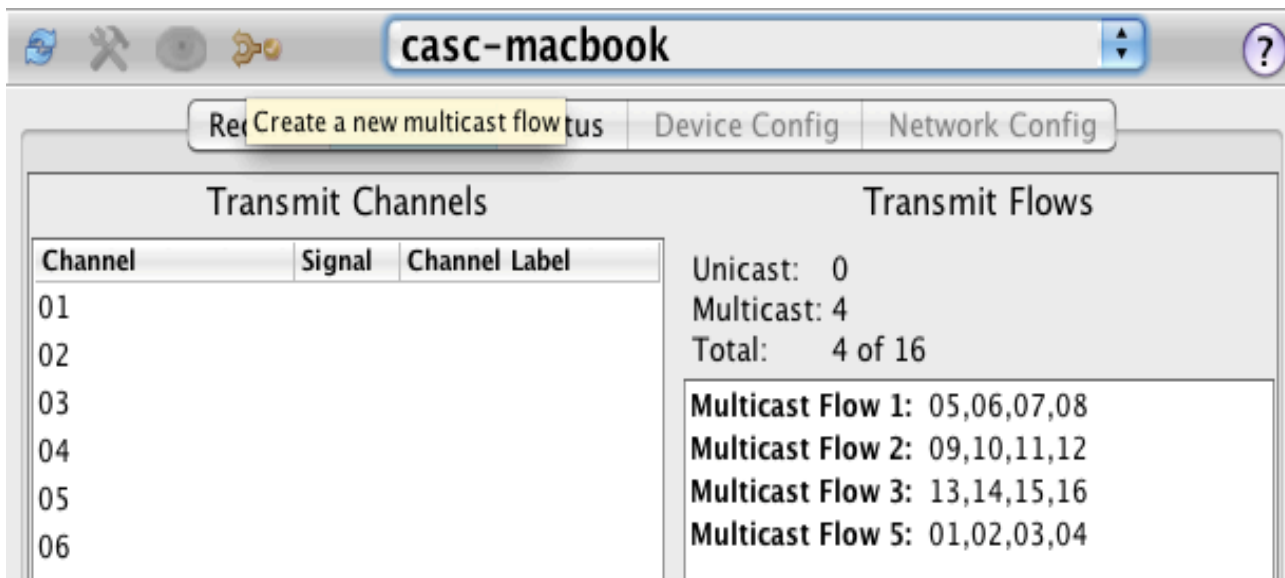
Dante Controller & Multicast

- Dante Controller is needed to create “Multicast” Flows
 - Multicast Flows can hold up to 8 channels each.
 - Click on the Golden “Split” icon in Device View->Transmit tab.



Dante Controller & Multicast

- Don't create Multicast Flows that are not needed.
 - Preserve the network bandwidth.
 - Remember Multicast is transmitted to ALL networked devices...
 - Unless IGMP Snooping, or multicast filtering is turned on

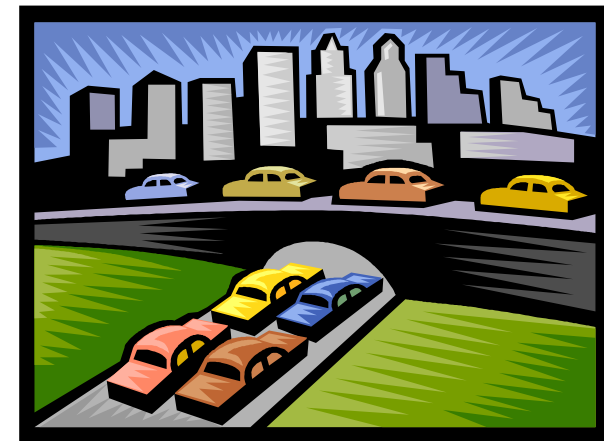


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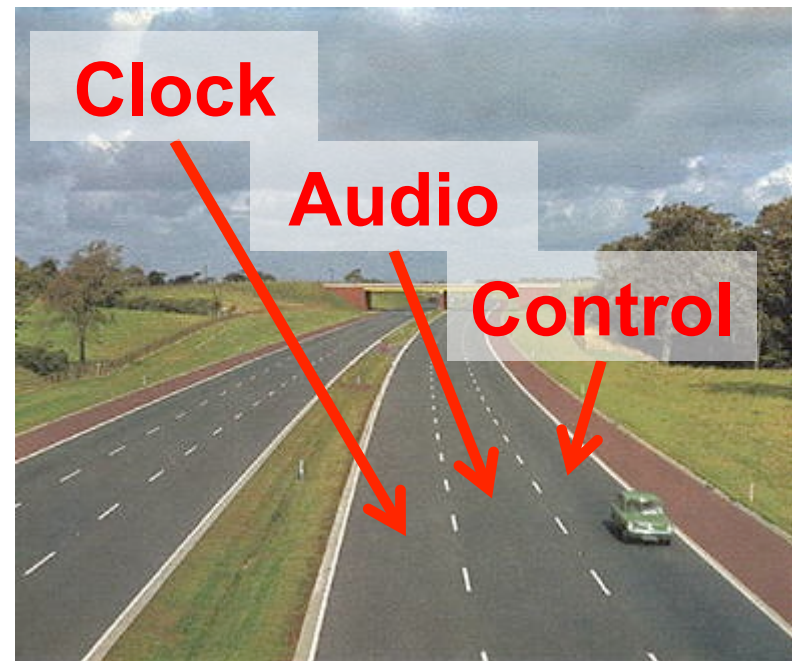
Dante: QoS

- QoS = Quality of Service
 - It is traffic management
 - Fast lanes, cycle lanes, bus lanes, emergency vehicle lanes...
 - Different types of traffic have different priorities.
 - There are several different methods for optimizing traffic flow
- Dante uses DiffServ
 - Differentiated Services Code Point
 - Also known as DSCP



Dante: QoS

- DSCP has 64 different types of data to prioritize
 - Dante uses just 4 of them
 - #56 is given to the PTP data (word clock timing)
 - Needs Highest priority
 - #46 is given to audio data
 - Needs High priority
 - #8 is given to other Dante data, such as control & monitoring
 - Needs Medium priority
 - All other values have low priority.



Dante: QoS - when to use

- QoS is only needed when networks get congested
 - For example, with a lot of multicast traffic
 - Or when mixing Dante with a lot of other data
 - Or when 100MB equipment is used
- It is not needed on small system for example.
- As your network grows, it is best to be prepared in advance:
 - The consequences could be audio dropouts!

This is how a typical switch setup looks for QoS:



Small Business
CISCO SG300-20 20-Port Gigabit Managed Switch

Getting Started
 ▶ Status and Statistics
 ▶ Administration
 ▶ Port Management
 ▶ Smartport
 ▶ VLAN Management
 ▶ Spanning Tree
 ▶ MAC Address Tables
 ▶ Multicast
 ▶ IP Configuration
 ▶ Security
 ▶ Access Control
 ▼ **Quality of Service**
 ▼ General
 QoS Properties
 Queue
 CoS/802.1p to Queue
DSCP to Queue
 Bandwidth
 Egress Shaping Per Queue
 VLAN Ingress Rate Limit
 TCP Congestion Avoidance
 ▶ QoS Basic Mode
 ▶ QoS Advanced Mode

DSCP to Queue

Control **Audio** **Clock**

Ingress DSCP	Output Queue	Ingress DSCP	Output Queue	Ingress DSCP	Output Queue	Ingress DSCP	Output Queue
0 (BE)	1	16 (CS2)	1	32 (CS4)	1	48 (CS6)	1
1	1	17	1	33	1	49	1
2	1	18 (AF21)	1	34 (AF41)	1	50	1
3	1	19	1	35	1	51	1
4	1	20 (AF22)	1	36 (AF42)	1	52	1
5	1	21	1	37	1	53	1
6	1	22 (AF23)	1	38 (AF43)	1	54	1
7	1	23	1	39	1	55	1
8 (CS1)	2	24 (CS3)	1	40 (CS5)	1	56 (CS7)	4
9	1	25	1	41	1	57	1
10 (AF11)	1	26 (AF31)	1	42	1	58	1
11	1	27	1	43	1	59	1
12 (AF12)	1	28 (AF32)	1	44	1	60	1
13	1	29	1	45	1	61	1
14 (AF13)	1	30 (AF33)	1	46 (EF)	3	62	1
15	1	31	1	47	1	63	1

Apply Cancel Restore Defaults

This is how a bad switch setup looks for QoS:

Control **Audio** **Clock**

DSCP to Queue Table							
Ingress DSCP	Output Queue	Ingress DSCP	Output Queue	Ingress DSCP	Output Queue	Ingress DSCP	Output Queue
0 (BE)	1	1 (CS2)	2	32 (CS4)	3	48 (CS6)	3
1	1	17	2	33	3	49	3
2	1	18 (AF21)	2	34 (AF41)	3	50	3
3	1	19	2	35	3	51	3
4	1	20 (AF22)	2	36 (AF42)	3	52	3
5	1	21	2	37	3	53	3
6	1	22 (AF23)	2	38 (AF43)	3	54	3
7	1	23	2	39	3	55	3
8 (CS1)	2	24 (CS3)	3	40 (CS5)	4	56 (CS7)	4
9	1	25	3	41	4	57	3
10 (AF11)	1	26 (AF31)	3	42	4	58	3
11	1	27	3	43	4	59	3
12 (AF12)	1	28 (AF32)	3	44	4	60	3
13	1	29	3	45	4	61	3
14 (AF13)	1	30 (AF33)	3	46 (EF)	3	62	3
15	1	31	3	47	4	63	3

Dante: Advanced

- Contents:
 - Clock
 - Latency
 - Bit Depth
 - Sample Rate
 - Flows
 - QoS
 - IGMP Snooping
 - VLANs, LAGs & STP
 - Switches & Cables

Dante: IGMP Snooping

- What is IGMP Snooping?
 - Internet Group Membership Protocol
 - It is multicast data management
 - It can restrict the propagation of multicast traffic.
- When is IGMP Snooping needed?
 - When lots of Dante Multicast flows are used
 - When Dante is mixed with other types of Multicast traffic.



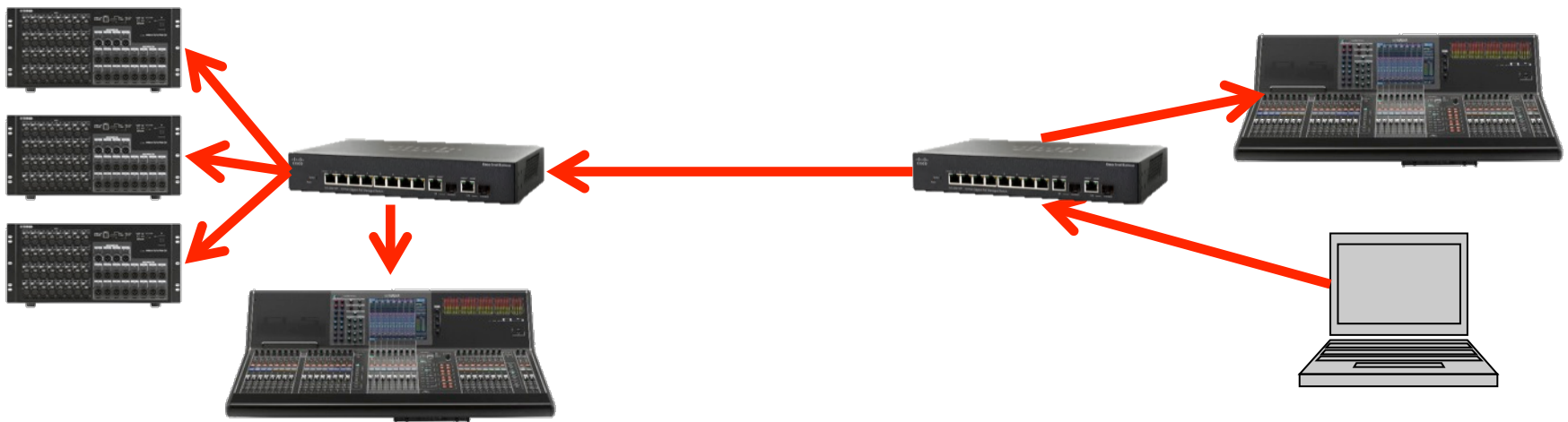
Dante: IGMP Snooping

- How does it work?
 - Each flow of multicast data is assigned an IP address
 - The switch will take a note of all the multicast IP addresses
 - If a device needs to receive the multicast data, it will ask the switch to forward it.
 - The switch will only forward the multicast data to the devices that request it.
- So it can greatly reduce the amount of multicast traffic in a network!



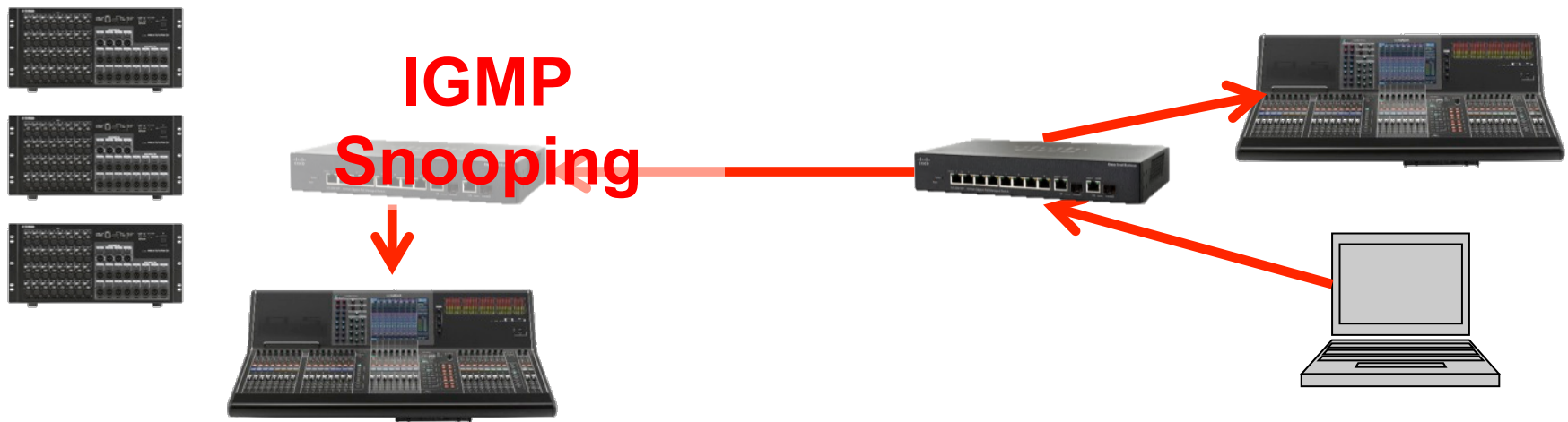
Dante: IGMP Snooping

- An example, when doing a Virtual Sound check:
 - To playback from Dante Virtual Soundcard to 2 consoles, Multicast is needed.
 - Normally, this traffic will spread all over the Dante network.
 - The stageboxes don't need it, but they will still receive it!



Dante: IGMP Snooping


- An example, when doing a Virtual Soundcheck:
 - With IGMP Snooping enabled, the switches will check the Multicast data.
 - So it only reaches the Mixers.
 - The Dante audio data will only transmit to the devices that are set to receive in the Dante patch/routing grid.



Dante: IGMP Snooping


- The effect on bandwidth
 - With Snooping disabled, stagebox receives 181Mbps
 - With Snooping enabled, stagebox receives 68Mbps
 - This is just the 24 outputs from the Console.

Primary Interface

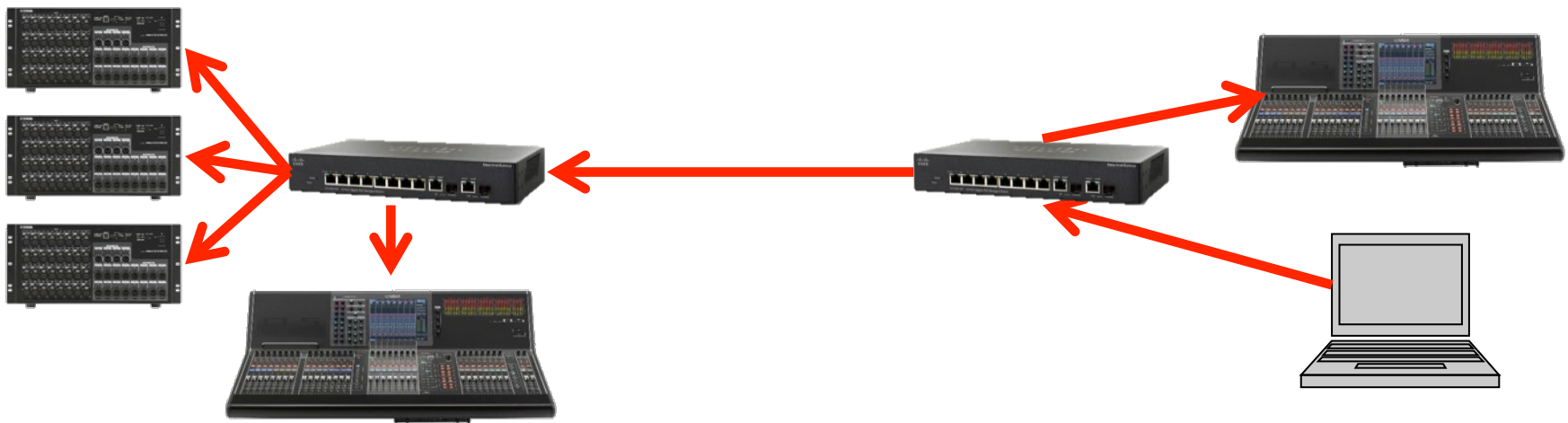


IP Address: 169.254.169.203
 MAC Address: 00:1D:C1:06:06:EA
 Tx Utilisation: 44 Kbps Errors: 0
 Rx Utilisation: 181 Mbps Errors: 0

Primary Interface



IP Address: 169.254.169.203
 MAC Address: 00:1D:C1:06:06:EA
 Tx Utilisation: 38 Kbps Errors: 0
 Rx Utilisation: 68 Mbps Errors: 0



Dante: IGMP Snooping

- This is vital when:
 - Using Multicast Dante in 100M networks
 - Bandwidth can quickly be filled
 - Using critical control devices on the same network as Multicast Dante traffic
 - Where control and audio use the same network port on the device
 - Using Wi-Fi on the same network as Dante
 - Otherwise Dante multicast data will flood the wi-fi bandwidth.



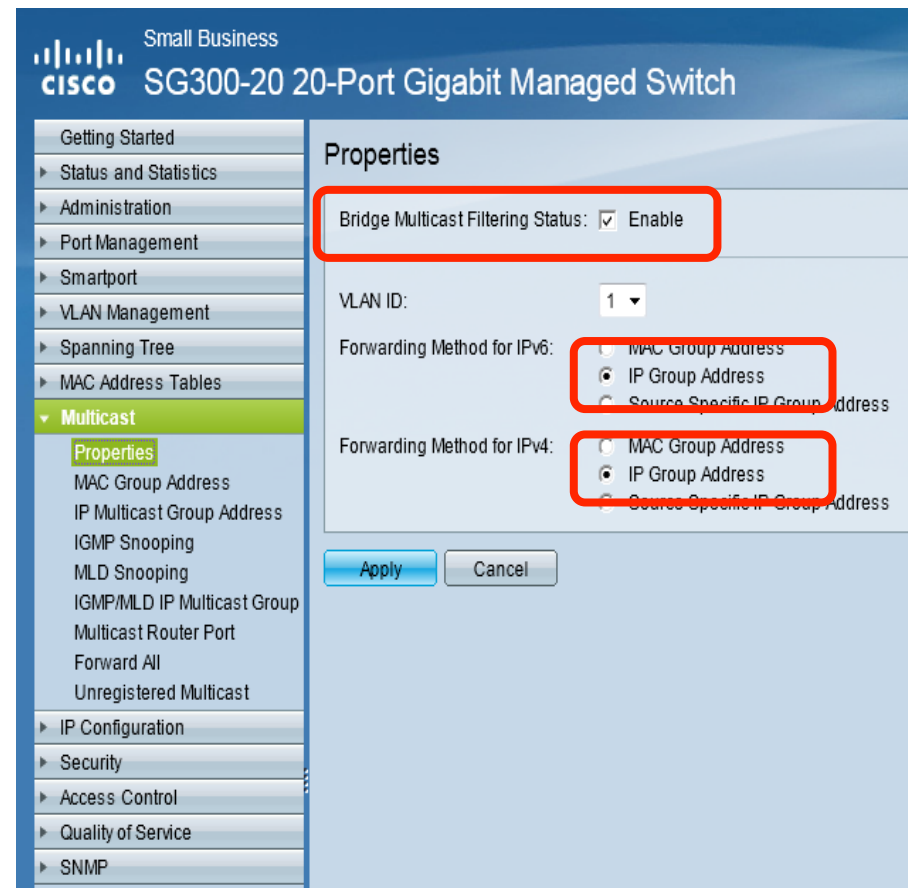
Dante: IGMP Snooping

- How to set it up
 - Using Cisco SG300-20
 - This switch has IGMP Snooping
 - V3 is the latest version, which is ideal for use with Dante
 - This feature is rare to find on such low cost switches!



Dante: IGMP Snooping

- How to set it up
 - Open the Multicast menu
 - Enable Multicast Filtering
 - For each VLAN, select “IP Group Address” as the Forwarding Method.



Dante: IGMP Snooping

- How to set it up
 - Open the IGMP Snooping menu
 - Enable Snooping
 - Edit each VLAN setting...

Small Business
 Cisco SG300-20 20-Port Gigabit Managed Switch

Language: English

IGMP Snooping

IGMP Snooping Status: Enable

Apply Cancel

IGMP Snooping Table

Entry No.	VLAN ID	IGMP Snooping Operational Status	Router IGMP Version	MRouter Ports Auto Learn	Query Robustness	Query Interval (sec.)	Query Max Response Interval (sec.)	Last Member Query Counter	Last Member Query Interval (mSec.)	Immediate Leave	IGMP Querier Status	IGMP Querier Version	Querier IP Address
1	1	Enabled	v3	Enabled	2	30	10	2	1000	Disabled	Enabled	v3	
2	2	Enabled	v3	Enabled	2	30	10	2	1000	Disabled	Enabled	v3	
3	3	Enabled	v3	Enabled	2	30	10	2	1000	Disabled	Enabled	v3	

Copy Settings... Edit...

Dante: IGMP Snooping

- How to set it up
 - Enable Snooping Status & Querier Status
 - Set Query Interval to minimum value: 30
 - Check IGMPV3

The screenshot shows the Dante configuration interface for IGMP Snooping. Several settings are highlighted with red boxes:

- IGMP Snooping Status:** Enable
- Query Interval:** 30 sec. (Range: 30 - 18000, Default: 125)
- IGMP Querier Status:** Enable
- IGMP Querier Version:** IGMPV3

Other visible settings include:

- MRouter Ports Auto Learn: Enable
- Query Robustness: 2 (Range: 1 - 7, Default: 2)
- Query Max Response Interval: 10 sec. (Range: 5 - 20, Default: 10)
- Last Member Query Counter: Use Default
- Last Member Query Interval: 1000 mS (Range: 100 - 25500, Default: 1000)
- Immediate leave: Enable
- Administrative Querier Source IP Address: Auto, User Defined (192.168.0.212)

Operational status on the right side of the interface:

- Operational IGMP Snooping Status: Enabled
- Operational Query Robustness: 2
- Operational Query Interval: 30 (sec.)
- Operational Query Max Response Interval: 10 (sec.)
- Operational Last Member Query Counter: 2
- Operational Last Member Query Interval: 1000 (mS)
- Operational Querier Source IP Address: 192.168.0.212

Buttons at the bottom: Apply, Close

Dante: IGMP Snooping

- Be aware that some other types of switch do not have the correct “Query” functions to work alone in a Dante network.
- The SG300 has all necessary functions.
- Here is a switch that has found and filtered several multicast flows.



Small Business
CISCO SG300-20 20-Port Gigabit Managed Switch

Getting Started
 ▶ Status and Statistics
 ▶ Administration
 ▶ Port Management
 ▶ Smartport
 ▶ VLAN Management
 ▶ Spanning Tree
 ▶ MAC Address Tables
▼ Multicast
 Properties
 MAC Group Address
IP Multicast Group Address
 IGMP Snooping
 MLD Snooping
 IGMP/MLD IP Multicast Group
 Multicast Router Port
 Forward All
 Unregistered Multicast
 ▶ IP Configuration
 ▶ Security
 ▶ Access Control
 ▶ Quality of Service
 ▶ SNMP

IP Multicast Group Address
 The Bridge Multicast Filtering is currently enabled.
 For IP Multicast Configuration to be effective, the [Bridge Multicast Filtering](#) must be enabled.

IP Multicast Group Address Table

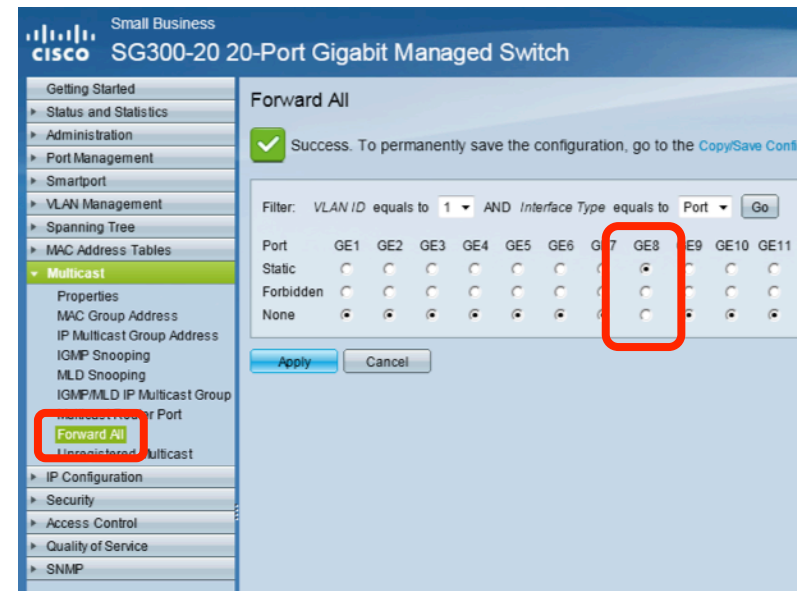
Filter: VLAN ID equals to (Range: 1 - 4094)
 IP Version equals to
 IP Multicast Group Address equals to
 Source IP Address equals to

<input type="checkbox"/>	VLAN ID	IP Multicast Group Address	Source IP Address
<input type="checkbox"/>	1	224.0.1.129	*
<input type="checkbox"/>	1	239.254.64.1	*
<input type="checkbox"/>	1	239.255.27.101	*
<input type="checkbox"/>	1	239.255.88.176	*
<input type="checkbox"/>	1	239.255.123.86	*
<input type="checkbox"/>	1	239.255.143.75	*
<input type="checkbox"/>	1	239.255.145.246	*
<input type="checkbox"/>	1	239.255.149.138	*
<input type="checkbox"/>	1	239.255.150.86	*
<input type="checkbox"/>	1	239.255.252.70	*
<input type="checkbox"/>	1	239.255.255.250	*

Add... Delete Details...

DVS with IGMP Snooping

- There is one potential problem when using DVS & IGMP Snooping
 - Some computers don't handle it so well
 - This will result in silence from DVS!
- In that case, use the “Forward All” setting for ports used with DVS.
 - Use this with care, and only when it is essential
 - It allows all Multicast data through the port!



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Dante: VLANs

- VLAN:
 - Virtual Local Area Network
- Sometimes, VLANs can be used to separate a network into segments
- Each segment would carry data for different purposes.
 - Such as audio / lighting / control / internet access, etc.

Dante: VLANs

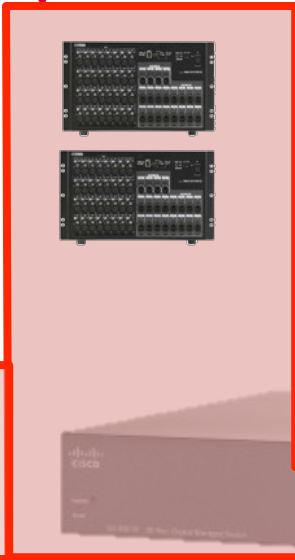
- Sometimes, VLANs can be used to separate an audio system into segments
- Each segment would have a different person managing it.
- This might be needed in large touring systems.

Dante: VLANs

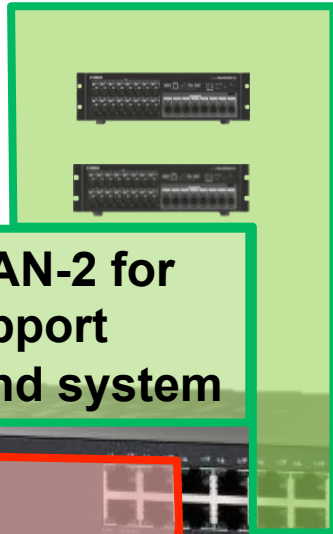
- For example:
 - 1 VLAN for the support band's stage boxes & consoles
 - 1 VLAN for the main band's stage boxes & consoles
 - 1 VLAN for the speaker processing & amp distribution.
- Use a device like DME, or Auvitran's Audio Toolbox to bridge between the VLANs.

Example

VLAN-1 for Main Band system



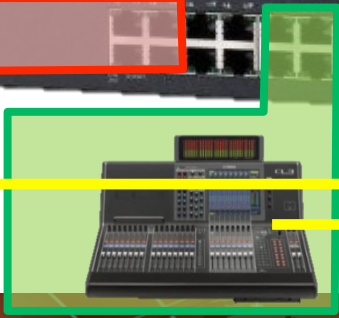
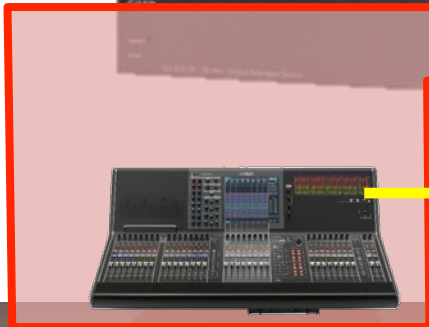
VLAN-2 for Support Band system



VLAN-3 for Processors & Amps



ALL VLANs share the long "Multicore" cable.



AES/EBU link with SRC on

Dante: LAGs

- LAG = Link Aggregation Group
 - Sometimes called “Trunk”
 - When 2 or more cables are used to carry the data between 2 switches.
 - This can increase available bandwidth to 2GB
 - Or it can be used as a form of cable redundancy.



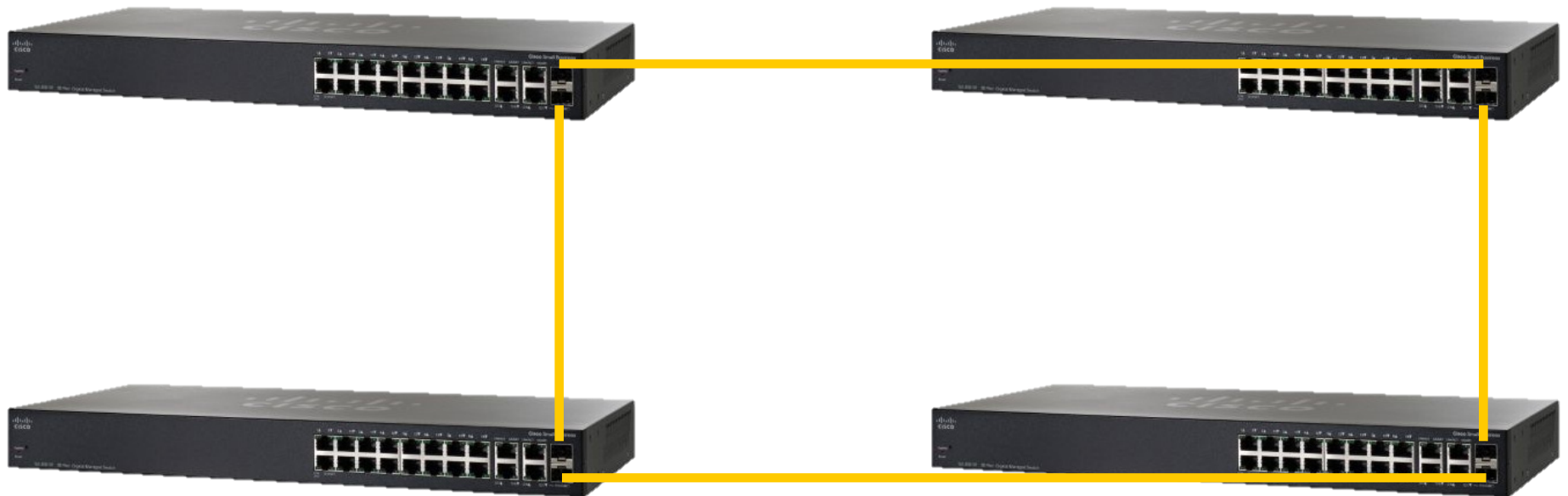
Dante: LAGs

- When one cable breaks, there can be a short silence
 - Less than 0.5sec
- But it is a low cost and simple way to get “Multicore” cable redundancy



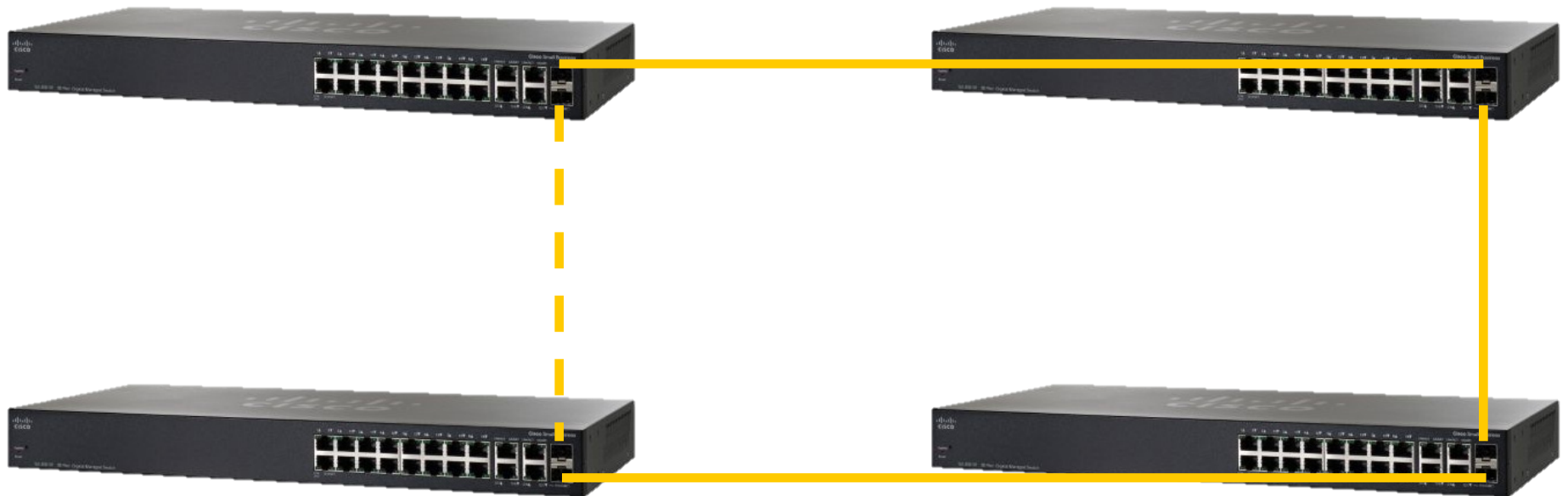
Dante: STP

- STP = Spanning Tree Protocol
 - It is a form of network redundancy
 - It allows loops to be formed in networks



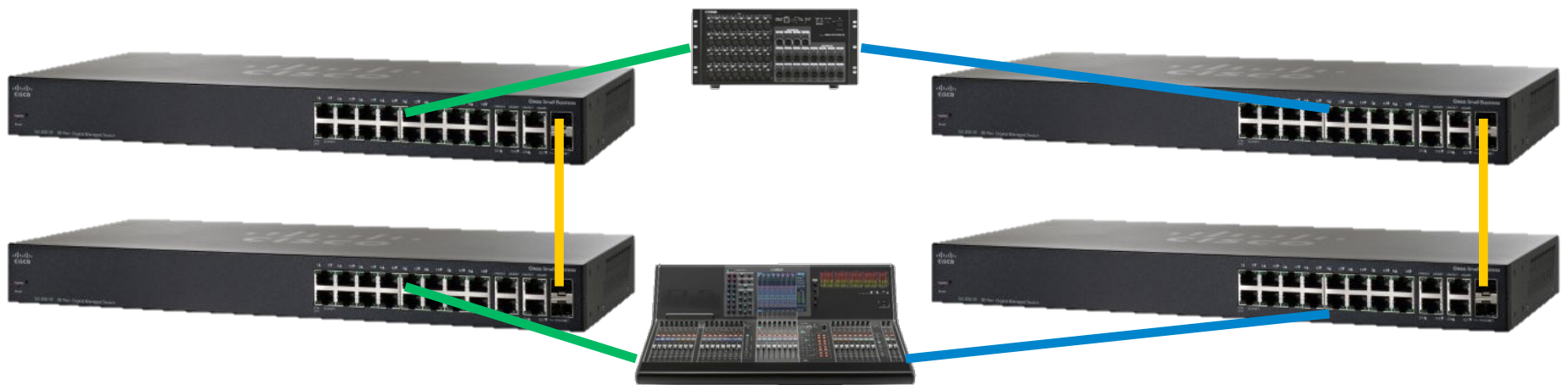
Dante & STP

- When one cable breaks, there can be silence up to 2 seconds.
- When the cable is repaired again, there can be longer silences of up to 20 seconds!



Dante: STP

- STP and Dante are compatible, but STP is not as quick as Dante's own Primary/Secondary dual network redundancy.
 - Glitch-free Redundancy!
- So, only use STP when it is necessary to protect other data sharing the network.



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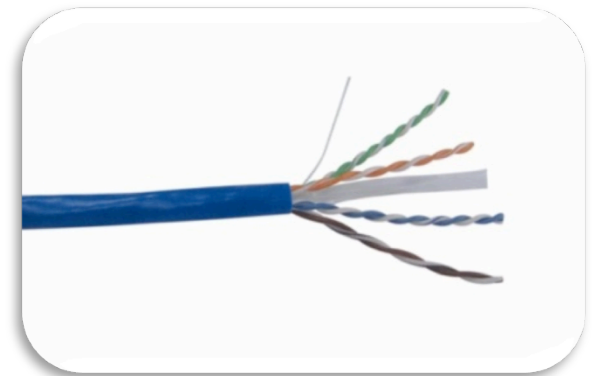
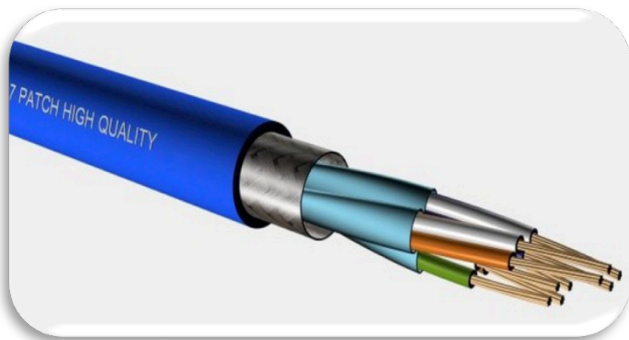
Dante: Cables

- Dante is 1Gb, while CobraNet, EtherSound, and many other formats are 100Mb
- Use shielded cable when RF interference is possible
 - Also better protection against EMI interference
 - Un-shielded will work in most cases
 - Un-shielded is easier to install & terminate!



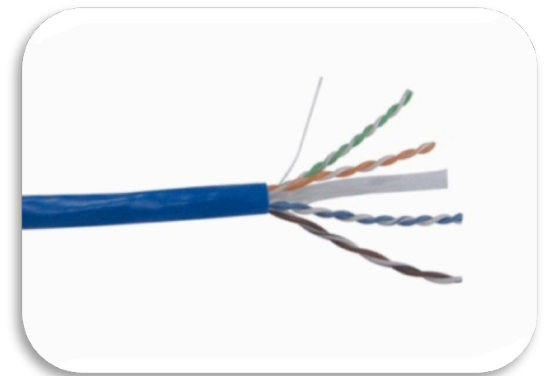
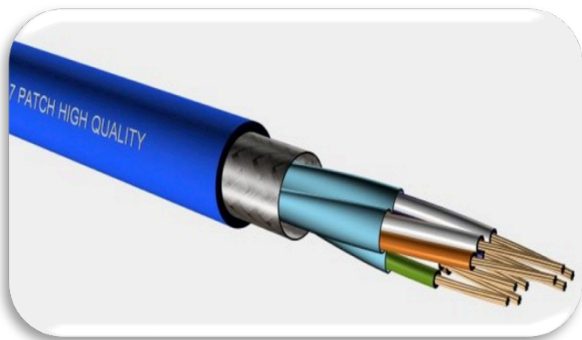
Dante: Cables - CAT5/6/7

- What's the difference between CAT5, 6 & 7?
 - CAT5 is the original standard, for 10Mb & 100Mb networks
 - CAT5e is an enhanced standard, suitable for 1Gb
 - CAT6 has more twists per metre, and a separator between each pair, designed for 1Gb networks
 - CAT7 has an individual shield for each pair, designed for 10Gb networks



Dante: Cables - CAT5/6/7

- Which one to use?
 - Don't use the old standard of CAT5
 - (rare to find new)
 - Use CAT5e or CAT6, solid core, shielded
 - CAT7 can be used for all devices, but is less easy to work with: termination takes more time, it is stiffer, and more expensive



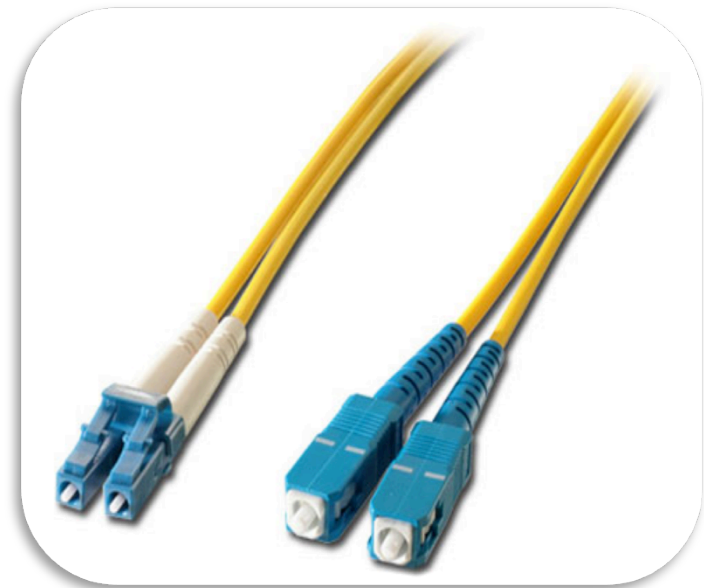
Dante: Cables - max length

- Never use a copper cable longer than 100m
 - Use cable with solid copper cores whenever possible
 - Stranded copper cores are more flexible, but not so good at long distance transmission
 - Keep 60m maximum with stranded cable
 - A lot of rugged “stage-cable” is stranded, so take care.



Dante: Cables - Fibre-Optic

- There are 2 main types:
 - Multi-Mode, up to about 500m
 - Single-Mode, good for several Km!
- Either can be used, with the correct interface
 - Multi-mode is lower cost
 - Single-mode can go longer distance and have more joins (like for patch panels)



Dante: Cable - Fibre-Optic Converters

- A converter is needed to change from CAT5e or CAT6 to fibre
 - Use a switch that has fibre modules included
 - They can be easier to trouble-shoot than stand-alone converters
 - Use the same type of fibre module at each end
 - Use a patch panel to hold rugged fibre connections.



Dante: Ethernet Switches

- There are so many types
- What are the necessary features?
 - 1GB (or more) for every port
 - Switching capacity equal to 2 x number of ports (eg, 20Gbps for a 10 port switch)
 - This can be tough to determine accurately
 - If it has EEE (Energy Efficient Ethernet), then it should be disabled
 - If the switch has this feature and is un-managed, then it can't be disabled: avoid it!



Dante: Ethernet Switches

- “Nice to have” features:
 - Internal power supply
 - Silent (or no) cooling fan
 - Rack-mount kit
 - Fibre option modules
 - Easy to use web interface for programming
 - Error reporting & trouble-shooting tools.



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Questions?

The Audinate logo features a stylized white 'A' icon composed of three curved segments, followed by the word 'audinate' in a lowercase, sans-serif font. A thin red horizontal line is positioned directly beneath the 'A' icon and the first few letters of the word.

audinate

The Dante logo consists of a large, stylized white 'D' icon made of three curved segments, followed by the word 'Dante' in a large, bold, sans-serif font. A small 'TM' trademark symbol is located to the upper right of the word. A red horizontal line is placed below the 'D' icon.

DanteTM

The Future of Media Networking... Today

The text 'Thank You' is centered on the slide in a white, sans-serif font. The background features a stylized world map with white latitude and longitude lines and small white plus signs marking specific locations. The map is set against a dark red background with a glowing sun or light source on the left side.

Thank You