SYMETRIX SOLUTIONS: TECH TIP

May 2014

Recommendations for Large Dante Networks

Setting up a large Dante network can be time consuming and confusing, especially when networking issues occur and troubleshooting the network becomes necessary. To streamline the process and help minimize networking issues, the following recommendations have been provided by Symetrix. It should be noted that there may not be a "one size fits all" approach to Dante network design, however the following information will help in creating an approach to solve issues if they arise.

Network Topology:

Certainly having all Dante connections to a single, managed, gigabit, network switch simplifies Dante networking by reducing network variables. However, it should come as no surprise that not all Dante networks will accommodate the routing needs with a single network switch. Installing Dante hardware to an existing corporate network is a prime example of just such a case.

Symetrix recommends running Dante on a flat network. A flat network is defined as a network in which all stations can reach others without going through any intermediary hardware devices, such as a bridge or router. A flat network is one network segment, also known as one subnet. In many environments, this isn't possible as large networks are typically broken into segments for security purposes as well as to improve traffic within departments and workgroups.

The advantage of using a flat network is that it helps to ensure broadcast clocking packets and audio reach all Dante devices reliably.

When setting up a Dante network, here are some additional considerations:

EEE Settings:

EEE (Energy Efficient Ethernet) is a set of enhancements to the twisted-pair and backplane Ethernet family of computer networking standards that allow for less power consumption during periods of low data activity.

Disable any EEE features on any network switch Dante will run on. Dante and EEE are not compatible.

QoS:

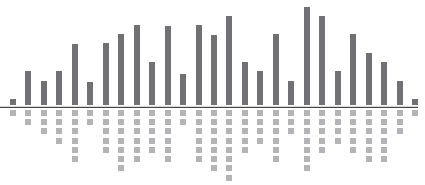
QoS stands for "Quality of Service" and in simplest of terms it is a feature that allows a network switch to prioritize data based upon its type and purpose. QoS standards were created to ensure reliability of audio on a data network in applications such as telephony, conferencing, and VOIP. Dante uses these same standards to prioritize audio, clocking info, etc.

Symetrix recommends QoS be enabled in all Dante networks. Will Dante work without QoS enabled? Many times the answer is yes, but if there are Dante related issues, the first thing that should be checked is whether QoS is enabled.

Dante uses standard Voice over IP (VoIP) Quality of Service (QoS) switch features to prioritize clock sync and audio traffic over other network traffic. QoS is available in both inexpensive and enterprise Ethernet switches. Any switch that supports Diffserv (DSCP) QoS with strict priority and 4 queues, and has Gigabit ports for inter-switch connections should be appropriate for use with Dante.

The QoS feature must have a trust mode option, which needs to be set to DSCP (diff serve) for Dante. Trust mode refers to the type of QoS tagging of the packets which allows the network to properly prioritize the different types of packets. DSCP (Diffserv) is the layer 3 QoS tagging which Dante uses. CoS is a layer 2 Trust mode that is not compatible with Dante.

Switches prioritize packets using what are called DSCP/Diffserv values. Although Dante packet priority values have been chosen to make it simple to configure QoS with many switches, some switches require special configuration to recognize and prioritize specific DSCP values.



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The table below shows how Dante uses various Diffserv Code Points (DSCP) packet priority values:

Priority	Usage	DSCP Label	Hex	Decimal	Binary
High	Time critical PTP events	CS7	0x38	56	111000
Medium	Audio, PTP	EF	0x2E	46	101110
Low	(reserved)	CS1	0x08	8	001000
None	Other traffic	BestEffort	0x00	0	000000

PTP (Precession Time Protocol) is a protocol used to synchronize clocks throughout a computer network.

VLAN Setup:

In larger networks or when Dante is to be integrated onto an existing network, it may be necessary to implement a separate VLAN for Dante audio. Symetrix does not recommend using a VLAN topology for Dante due to the additional complexities and potential pitfalls associated with VLANs, nonetheless here are some Symetrix recommendations for setting up VLANs.

First, ensure QoS is defined correctly on the VLAN as described in the previous section of this document.

Secondly, and most importantly, explicitly forbid all VLAN traffic between the different VLANs. Why?

Dante uses multicast PTP clocking packets at the rate of 4Hz (4 packets per second). Any Dante unit in the system can be master clock, providing clock synch to all other Dante devices. Each system will only have one master clock and the best, most reliable clock, will be chosen as the master, although a preferred master can be specified.

Cisco, HP Enterprise, and many other switches have a known tendency to "leak" multicast traffic between VLANs. Yes, many of these network switch models state they have a feature that eliminates this VLAN leakage…in theory, but in a practical sense and based upon our experience, this feature has been shown to not always work. Explicitly forbidding VLAN traffic from each other is truly the only way to solve this issue.

Symptoms of VLAN leakage would be when Dante Controller reports multiple Dante master clocks. This typically means PTP clock packets have leaked back and forth until there are more than 4 clock packets per second.

It should be noted that a virtual loop in the multicast traffic between VLANs will have the same symptoms as a physical loop in the system, so be sure to check the network for a physical wiring error in the network as well as ensure that VLANs are explicitly forbidden from communicating to one another.

IGMP Snooping:

IGMP Snooping allows a network switch to listen in on the IGMP (Internet Group Management Protocol) conversation between hosts and routers. By listening to these conversations the switch maintains a map of which links need which IP multicast streams. Multicast traffic may be removed from the links that do not need them and thus IGMP controls which ports receive specific multicast traffic.

Dante doesn't need special multicast features from switches and is designed to work efficiently with advanced multicast features like IGMP Snooping.

It should be noted that many Dante partners, including Yamaha, recommend turning on IGMP Snooping for all Dante networks.

That being said, Symetrix has seen some instances where IGMP Snooping did cause problems with Dante traffic. This may be a feature that is worth trying, but if problems with Dante are occurring, disable IGMP Snooping.

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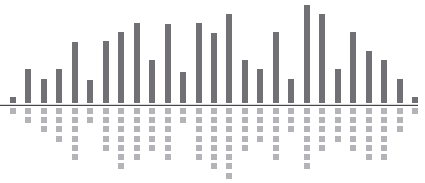
Example Switch Setup with VLANs:

Below is the switch configuration for a HP Enterprise switch utilizing the above Dante network recommendations. Use this as an example of optimized switch settings for Dante when using VLANs.

```
hostname “A-RM1001”
snmp-server contact “Ryan Curtright”
snmp-server location “A-RM1001”
max-vlans 20
time timezone -480
console inactivity-timer 30
qos dscp-map 001000 priority 3
qos dscp-map 101110 priority 5
qos dscp-map 111000 priority 7
sntp server 10.200.1.254
timesync sntp
sntp unicast
snmp-server community “public” Operator
snmp-server community “itSym” Unrestricted
snmp-server host 10.20.1.254 “public”
snmp-server host 10.20.1.252 “public”
snmp-server host 10.11.4.9 “public”
snmp-server host 169.254.118.153 “public”
vlan 1
   name “Management”
   forbid 3-9
   untagged 1
   ip address 10.25.1.82 255.0.0.0
   tagged 21-24
   no untagged 2-20
   exit
vlan 4001
   name “Dante Audio”
   forbid 1-2,10-20
   untagged 3-9
   ip address 192.168.153.82 255.255.255.0
   tagged 21-24
   ip igmp
   exit
vlan 4002
   name “DanteControl”
   forbid 3-9
   untagged 2,10-14
   ip address 192.168.154.82 255.255.255.0
   tagged 21-24
   ip igmp
   exit
vlan 4003
   name “COBRANET”
   forbid 3-9
   untagged 15-20
   no ip address
   tagged 21-24
   ip igmp
   exit
vlan 4004
   name “Audio 4”
   tagged 21-24
   exit
vlan 4005
   name “Audio 5”
   tagged 21-24
   exit
no fault-finder bad-driver
no fault-finder bad-transceiver
no fault-finder bad-cable
no fault-finder too-long-cable
no fault-finder over-bandwidth
no fault-finder broadcast-storm
no fault-finder loss-of-link
no fault-finder duplex-mismatch-HDx
no fault-finder duplex-mismatch-FDx
qos type-of-service diff-services
qos type-of-service diff-services 001000 dscp 001000
qos type-of-service diff-services 101110 dscp 101110
qos type-of-service diff-services 111000 dscp 111000
```



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