Tech Tip: Integrating Visionary Solutions Duet Encoders/Decoders

Integrating Visionary Solutions Encoders/Decoders with Symetrix DSP

Overview
This tech tip will explain how to integrate the Visionary Solutions Duet Encoders/Decoders into your Symetrix installation. The Visionary Solutions devices allow for moving 4K video over IP, bypassing the need for more traditional video matrix switching or video wall creation. The encoders and decoders come in two flavors: the Dante-enabled Duet devices (DuetE/D), and the non-Dante devices (E4100/D4100). Using Symetrix DSPs along with Visionary Solutions’ Dante-enabled devices allows for total control of both the Dante audio and the video routing from one central device. For the non-Dante-enabled devices, Symetrix DSPs are able to control video source selection at the decoder, along with whatever audio is riding along with the AV Stream.

Before we go into working with controlling these devices from Composer, it is of paramount importance to look into the networking requirements and connections. In fact, it is highly recommended that you not connect any encoders or decoders to a switch until the below switch settings have been enabled.

Networking Requirements

Switches Capabilities:

- Managed, with PoE (Visionary Solutions devices require full 15.4W PoE per port).
- Non-blocking.
- Minimum 1GbE bandwidth.
- Capable of IGMP (with IGMP Snooping).
- 8K or better Jumbo Packet capability.

Switch Settings:

- 2 VLANs – One for Video and Control traffic, the other for Dante traffic.
- Multicast must be allowed on all network ports through which video passes. DSP Ethernet ports will also need to be on this VLAN – multicast is not necessary on these ports.
- Flow Control must be removed on any network ports used for video streams.
- IGMP (Internet Group Membership Protocol): Video traffic from these devices is multicast, meaning it is broadcast across the network from a single device to all devices on the network - whether those devices want it or not. This can lead to wasted network bandwidth, as well as the potential for certain devices to be flooded. Enabling IGMP ensures that the multicast packets will only be received by those devices that are intentionally a part of that Group Membership.
  - IGMP Snooping and Querier must be enabled (set Querier Version to V2 if possible).
  - Enable IGMP Snooping Fast Leave: If your switch supports IGMP Snooping Fast Leave, turn it on. This lessens the amount of time it takes for a device to leave a multicast group, and join another – thus speeding up the video switching time.
- Enable Jumbo Frames.
- Disable Energy Efficient Ethernet (Green Ethernet).
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Cisco SG300 Example:
Two VLANs will need to be created – one for Video and Control traffic, and another for Dante traffic:

Tie the appropriate physical ports to each VLAN. In this case the first 5 physical ports will be assigned VLAN 2 (Video and Control), and the following 4 will be assigned to VLAN 3 (Dante traffic).
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For IGMP Snooping to function on the SG300, Bridge Multicast Filtering must be enabled:

Enable IGMP Snooping and Querier:

Edit the Video+Control VLAN and enable IGMP Snooping Status, Immediate Leave, and IGMP Querier Status. Set Querier Version to V2.

Enable Jumbo Frames:

Enable IGMP Snooping and Querier:
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Finally, disable Energy Efficient Ethernet (Green Ethernet):

VLAN 2: (Dante traffic):
- Multicast should be allowed to pass on all Dante network ports in order to allow multicast clock packets to pass unimpeded.
- IGMP is only needed if there is multicast Dante audio.
- Note that QoS is not needed on a Dante-only network
- Energy Efficient Ethernet (Green Ethernet) should be disabled.

Now that the switch has been configured properly, here is a basic connection diagram, showing 2 encoders and 1 decoder, along with a Radius NX 12x8 DSP. The Visionary Solutions devices’ PoE LAN ports connect to VLAN 1, and their Dante ports to VLAN 2. The Radius NX 12x8’s Ethernet port is connected to VLAN 1, and one of its Dante ports connects to VLAN 2.

A video source is connected to a Visionary Solutions Encoder with HDMI. The encoder converts this into an IP stream that is transmitted across the Video/Control VLAN to one or more Decoders. This stream is then converted back to HDMI at the decoder, and sent out to the connected display.
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A note on bandwidth:

If you take a look at this table provided by Visionary Solutions, note that a resolution of 1080p60 can take up 200 Mbps of bandwidth.

<table>
<thead>
<tr>
<th>Resolution</th>
<th>Pixel Count</th>
<th>Frame Rate</th>
<th>Color Sampling</th>
<th>Bandwidth (Uncompressed)</th>
<th>SDVoE</th>
<th>JPEG2000</th>
<th>PacketAV</th>
<th>H.264 HEVC</th>
</tr>
</thead>
<tbody>
<tr>
<td>2160p60</td>
<td>3840x2160</td>
<td>60 fps</td>
<td>4:4:4</td>
<td>12 Gbps</td>
<td>8.5 Gbps</td>
<td>800 Mbps</td>
<td>N/A</td>
<td>24 Mbps</td>
</tr>
<tr>
<td>2160p60</td>
<td>3840x2160</td>
<td>60 fps</td>
<td>4:2:0</td>
<td>6 Gbps</td>
<td>6 Gbps</td>
<td>400 Mbps</td>
<td>225 Mbps</td>
<td>12 Mbps</td>
</tr>
<tr>
<td>2160p30</td>
<td>3840x2160</td>
<td>30 fps</td>
<td>4:4:4</td>
<td>3 Gbps</td>
<td>3 Gbps</td>
<td>200 Mbps</td>
<td>150 Mbps</td>
<td>6 Mbps</td>
</tr>
<tr>
<td>1080p60</td>
<td>1920x1080</td>
<td>60 fps</td>
<td>4:4:4</td>
<td>1.5 Gbps</td>
<td>1.5 Gbps</td>
<td>100 Mbps</td>
<td>75 Mbps</td>
<td>3 Mbps</td>
</tr>
<tr>
<td>1080p30</td>
<td>1920x1080</td>
<td>30 fps</td>
<td>4:4:4</td>
<td>1.5 Gbps</td>
<td>1.5 Gbps</td>
<td>100 Mbps</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

So if for some reason you have a Gigabit switch that can’t do IGMP properly (or otherwise know there may be an issue with multicast bandwidth management on the network), there could be an issue with having the Ethernet control port of a Symetrix DSP on the same VLAN as the video traffic. Why? On all Symetrix DSPs (aside from Radius NX), the control port is a 10/100 port. Without adequate multicast bandwidth management in the above scenario, the control port of the DSP would be flooded by multicast data, which will cause communication issues with the DSPs.

It is therefore recommended that in a situation where there is questionable bandwidth management capabilities, the Radius NX DSP should be used as the preferred solution. This is due to its built-in Gigabit control ports, which will handle much more traffic.

Visionary Solutions Web Admin:

Configuring Encoder/Decoder IP Addresses:

1. Access the web interface for the encoder and decoder units. (log in with admin/admin)

2. Select the Network tab.

3. Set the IP.MODE to Static

4. Set the IP.ADDRESS. (e.g. 192.168.1.45)

5. Set the IP.NETMASK. (e.g. 255.255.255.0)

6. Set the IP.GATEWAY. (e.g. 192.168.1.1)

7. Click save.

Configuring the Encoder/Decoder Stream Addresses:

Visionary Solutions recommends setting the first octet to 225. Although not required, it’s helpful to set the last 3 octets to match the IP address as set above in the Network tab (e.g. 225.168.1.45).

1. Access the web interface as above.

2. Select the Configuration tab.

3. Set STREAM.MODE to Multicast.

4. For the encoder:
   a. Set STREAM.ADDRESS to a multicast IP address, such as 225.168.1.45 (to match the control IP in the above example).  
   b. Click STREAM.ENABLE = True
   c. Save

5. For the decoder:
   a. The STREAM.HOST IP should be set to the IP of the encoder that the decoder should be receiving from.
   b. The STREAM.ADDRESS should also be set to the STREAM.ADDRESS of that same encoder (as set in step 4).

Note these fields in the decoder will update while the decoder is being controlled by Symetrix Composer software. If a different encoder is selected from Composer, the Configuration tab will be updated to reflect the different encoder’s IP info.
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Working with the DuetE Encoder and DuetD Decoder (Dante-enabled)

Composer Set Up:
A basic classroom design with audio being received into a Radius NX from two decoders, as well as two channels of audio being transmitted to the single decoder:

1. Locate DSP: In Composer, first drag in a Dante-based DSP (e.g. Radius NX 12x8). With your PC on the same subnet as the DSP, locate the hardware by clicking the lower-left corner of the block. Select the DSP from Available Units on Network list, and click “Select Hardware Unit”. The lower-left corner will show a green checkmark when the unit is properly located.

2. Drag in Encoder and Decoder modules: Now that communication has been established with a DSP, it’s possible to locate Dante devices through it. From the Third-party Dante Devices section in the Toolkit, drag in the Visionary Solutions encoders and decoders as needed. Do note that the maximum number of third-party Dante devices locatable by a single DSP is 24.
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3. Locate Encoders and Decoders: As in step 1, locate each encoder and decoder by clicking the square in the lower left corner of each. This will open the Locate Hardware window, which shows the available units on the network. Highlight the relevant device, and click “Select Hardware Unit”:

A green check mark will appear as each unit is successfully located:

Click “OK” on the Sync Confirm screen:
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4. Right-click either encoder to open the Encoder Unit Properties Window:
   a. Now that the decoder is located, the Host Control Interface IP should be auto-populated. This can be verified by clicking “Verify Host IP”.

   b. The Dante Audio Reception section allows the encoder to receive up to four channels of Dante audio from any source on the Dante network. These received Dante channels can be selected to transmit over the A/V stream (see step 5c below). But first, click “Edit Source” to choose the Dante source.
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c. The Dante Audio Transmission section shows the four channels of Dante audio the encoder transmits onto the Dante network. These channels contain the audio from the video source that is plugged into the encoder.

5. Double-click either encoder to access the Encoder Settings window. This view provides:
   a. Various diagnostic and networking information.
   b. A video stream preview that updates approximately every second (which can be copied to a SymVue control screen for end-user previewing).
   c. The “Audio” selector, which determines which audio source the encoder packages up and sends over the AV Stream to the decoder. This selector can be right-clicked and set up to be remotely controlled by any control system.
   d. Note that the Video Wall Wizard can be accessed here as well (this function is covered later).
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6. To receive and process the Dante audio directly from the Encoders, double-click the DSP to enter the Design View of the DSP. Expand Network I/O Modules à Receive Modules in the Toolkit, and find the Dante Receive Buses that are tied to the Encoders. Drag those in, and place them in the site file.

b. Use the “Dante Audio Reception” section to program the decoder to receive up to four Dante audio channels, such as the two Dante transmit channels shown below. Once this is set, it is then possible to select between these Dante channels, or the audio stream coming from the encoder (see step 8a below).

7. Back on Site View, right-click the decoder to open the Decoder Unit Properties window:

a. Again, now that the decoder is located, the Host Control Interface IP should be auto-populated:
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c. “Dante Audio Transmission” shows the four Dante audio channels the decoder is transmitting onto the Dante network. These names can be edited.

d. The “Video Selector” area allows for up to 64 different encoders to be set up as video sources. Highlight a channel in the Video Selector table, and click “Edit Source”. You can then either manually enter the Host IP and Stream IP of an encoder, or click “Browse Dante Network” to pick an encoder. The IP info will then auto-populate. (Note this info can also be manually entered in the Video Source Selector area in Step 8 below).
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8. Double-click the decoder to open the Decoder Settings window. This view also provides various networking info and diagnostic information for the decoder, as well as:

   a. **A/V Settings:**
      
      i. The Host IP and Stream IP fields show the encoder from which the decoder is currently receiving video. This info can be manually filled in, but it is recommended to instead enter the info into the Video Selector area as mentioned in Step 7. The Host IP and Stream IP fields under A/V Settings will then update automatically based on the video source selected in the Video Source Selector.

      ii. The “Audio” selector is used to select which audio source is played out of the decoder’s HDMI output. Choose “stream” to select the audio coming across from the selected encoder. Choose “Dante” to select the Dante audio the decoder has been programmed to receive in the decoder’s Unit Properties (Step 7b).

   b. **Video Source Selector:**
      
      i. The Video Source Selector allows the user to choose which of the available encoder streams gets picked up by the decoder. It is also possible to copy the Video Source Selector buttons to a SymVue control screen, for end-user control of video source selection. A single control number may also be assigned to the horizontal source selector fader for ARC or third-party control.

      ii. The video stream preview window updates approximately every second, and can be copied to a SymVue control screen for end-user viewing.
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Creating a Video Wall:

The Video Wall Wizard can be used to lay out multiple decoders into an array of up to 4x4 decoders. There is a max of 64 possible video wall configurations, with up to 64 presets created for each.

1. Access the Video Wall Wizard from either a located encoder or decoder’s Settings window, or by going to the Tools menu in Composer and clicking “Wall Wizard (VSI Video)”.

2. Create a new video wall by clicking the Add button. Specify the name of the configuration, as well as the number of rows/columns according to the number of decoders you’d like to have as part of the video wall. Click OK.

3. The array of decoders will now appear in the center of the screen. Click on an Unassigned Decoder, and select the “Assign Decoder” button. This will open the Select Video Decoder window – click “Browse Dante Network” to select one of the decoders from the Dante network. Do the same for the remaining decoders.

4. To control which source is currently playing on the wall of decoders, it is necessary to create a preset for each encoder source. Click “Add…” to open the Add Video Wall Preset window. Select the Preset number, then click “Browse Dante Network” to open the Locate Hardware window.
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5. Locate the encoder on the Dante network, then click “Sync to Hardware”. The Host IP and Stream IP should now be automatically populated for you. Click “OK”, then repeat the process for additional encoder sources.

6. Presets can be triggered and previewed from within the Video Wall Wizard by clicking “Test”. To view a preview of the selected encoder source, be sure “Show Thumbnails” is checked. Also be aware that each decoder in the array will still show the full-picture from the encoder chosen as the source...in reality, Visionary Solutions will indeed break up the single encoder’s source evenly across the multiple decoders.

These presets are simply part of the 1000 presets available in Composer, meaning they can be triggered by ARCs, the T-5, and any other controller.
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Working with the E4100 Encoder and D4100 Decoder (Non-Dante)

Despite the E4100 and D4100 units not having Dante capability, Symetrix is still able to control certain aspects of these devices – namely source select for each decoder, as well as the creation of video walls. Both options are controllable via the Wall Wizard option in the Tools menu of Composer. But first – a small bit about switch settings.

Switch Requirements and Settings:
The same switch requirements and settings mentioned above apply. Do note that the second Dante-only VLAN is only necessary if there are other devices utilizing Dante audio. Otherwise, if the install doesn’t require Dante, a single VLAN that has the video and control on it will suffice.

Visionary Solutions Web Admin:
Follow the same steps as above for the Dante-enabled units. Make note of the Host IPs of all encoders and decoders that will be part of this set up. These will need to be manually entered in the next couple of steps.

Composer Setup - Creating Source Selection for Single Decoders:
1. To set up source select for a single D4100 Decoder, first drag any Composer-based DSP into the Site View. Then click the Tools menu and select “Wall Wizard (VSI Video)”.

2. Click the “Add” button create a new Video Wall. As this is a single decoder, be sure to make it a 1x1 video wall. Give the video wall a specific name (e.g. the location of the encoder). Hit OK.

3. With the new video wall selected on the left, click on “Assign Decoder…”. Manually enter the Host IP of this specific decoder from the Web Admin. Click OK.
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4. Now to set up source select! We will need to create a unique preset for each encoder that will be available to this decoder. First click the “Add…” button, and choose a unique preset (one that is un-used in the site file). Then manually enter the Host IP and Stream IP from the encoder’s Web Admin. Click OK. Repeat this step for additional encoders, making sure to choose a unique preset for each new encoder.

5. As with the Dante-enabled units, Presets can be triggered and previewed from within the Video Wall Wizard. Click the “Show Thumbnails” checkbox to preview, then highlight a preset and click the “Test” button to see that encoder route to the decoder.

Again, these presets are part of the 1000 presets available in Composer, and can be triggered by type of remote control.

6. Once all presets have been created and tested for one decoder, either add a new decoder by starting over at step 2, or click OK in the lower right to exit the Wall Wizard.
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Composer Setup - Creating Source Selection for a Video Wall:
Creating a Video Wall build with non-Dante decoders is, for the most part, the same as the processes we’ve seen above.

1. First open the Video Wall Wizard from the Tools menu. Click the “Add…” button in the lower left of the Video Wall Wizard. Create a name for the video wall, and select the desired size. Click OK.

2. Highlight one of the Unassigned decoders, and click “Assign Decoder…”. Manually type in the Host IP of the decoder from the unit’s Web Admin, then click OK.

Repeat for the rest of the Unassigned decoders.
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3. Now to set up the source select. As before, you will need to create a unique preset for each encoder that will be available to this video wall. First click the “Add...” button, and choose a unique preset (one that is un-used in the site file). Then manually enter the Host IP and Stream IP from the encoder’s Web Admin. Click OK.

   Repeat this step for additional encoders, making sure to choose a unique preset for each new encoder.

4. As with the Dante-enabled units, Presets can be triggered and previewed from within the Video Wall Wizard. Click the “Show Thumbnails” checkbox to preview, then highlight a preset and click the “Test” button to see that encoder route to the decoder.

   Again, these presets are part of the 1000 presets available in Composer, and can be triggered by type of remote control.
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**Additional Features for non-Dante Encoders/Decoders:**
As you now know, with the Dante versions, there are modules with built-in GUI elements to work with in Site View. This makes it very easy to simply copy over the Decoder's source select buttons, and the encoder/decoder video stream preview windows to a SymVue control screen. With the non-Dante versions it is still possible to get these controls over on SymVue control screens. But first, let’s build a convenient way to open the Web Admin of each Visionary Solutions device from within Composer.

**Adding Command Buttons to Access Web Admin:**
1. From the Toolkit, drag in a Command Button. This will open up the Command Button Properties window.
2. Enter a Label – this will be the name that shows up on the button, so be specific, e.g. Encoder 1.
3. Select the Web Page option.
4. Type in the Host IP of the encoder or decoder.
5. Hit OK.

The Command Button will now be in your site file. Simply double-click the button to launch the Web Admin in your default browser.

Repeat this process for each encoder or decoder you want to access the settings of. Note, this is best used only within Composer to assist with system integration – you probably won’t want to give the end-user access to these settings.

**Adding Video Stream Previews to SymVue:**
1. To add a video stream preview window to a SymVue control screen, first navigate to the “Device” page of the Web Admin. Click the “Monitor Button” to show the preview image. This image updates every second with a frame showing the video currently playing on the device.
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2. Right-click the preview image and select “Copy Image Location”.

3. Back in Composer, create (or open) a control screen. From the Toolkit, hold down the Control key on your keyboard while clicking on “Picture” and dragging it into your control screen. Holding the Control key creates a different sort of image than the typical – this type can be linked to a web URL. At this point, the new image you’ve dragged in should say “Offline”.

4. Double-click the image to open the Properties tab. In the URL field, paste in the Image Location you copied back in step 2. Hit Enter and the image should now update to show the preview. Also note that you can manually enter the Host IP address of the Visionary Solutions device appended with “/thumb.jpg” as well. (E.g. 192.168.1.121/thumb.jpg)

5. Repeat the process for more encoders and decoders as necessary.
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Adding Video Source Select controls to SymVue:
By following one of the two “Creating Source Selection…” processes above, you should have some presets created that will handle the source selection for either single decoders or video walls. In order to trigger these presets from a SymVue screen it’s a matter of using Preset Recall Buttons. In fact, we can take these preset recall buttons, make them invisible, and layer them on top of the encoder video stream preview – that way the end-user can simply press the video source they want to see, and it will trigger the preset to show that source on the decoder.

1. Make sure there are some presets created for source select as done in the above steps:

2. Open the Control Screen in Composer. From the Toolkit, expand the “Preset Recall Button” option, then drag the preset buttons into the control screen. Place each preset button on top of its corresponding video stream preview.
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3. Control-click both Preset Trigger Buttons so they’re both highlighted in red. Resize them to completely cover the video stream previews by holding the Shift key and using the arrow keys on your keyboard. Alternatively, highlight both, and manually enter the Width and Height in the Properties sheet.

4. Again highlighting both buttons, change “Use Name of Preset” to “False” in the Properties sheet. This will remove the text from the Preset Recall Buttons.

5. Finally, change the “Transparent” field in the Properties sheet to “True”. This will make the Preset Recall Buttons 100% transparent so the video stream preview can be seen below the button. However the button is still active on the top layer, therefore if the end-user touches the preview, the preset will be triggered and the video source will change.