Tutorial – Using NISE with the SMIP IVI Driver

Note: This tutorial is intended for use with National Instruments Switch Executive (Rev. 2.0) and VTI's IVI SMIP driver (Rev. 2.0).

Note: To prepare your system for this tutorial, make sure you have completed the following steps:

1. You have obtained, and installed National Instrument's Switch Executive (NISE).
2. You have downloaded, and installed the IVI compliance package from National Instruments
3. You have obtained, and installed the SMIP IVI driver from www.vxitech.com

For the purposes of this tutorial, assume the following switching system to begin with

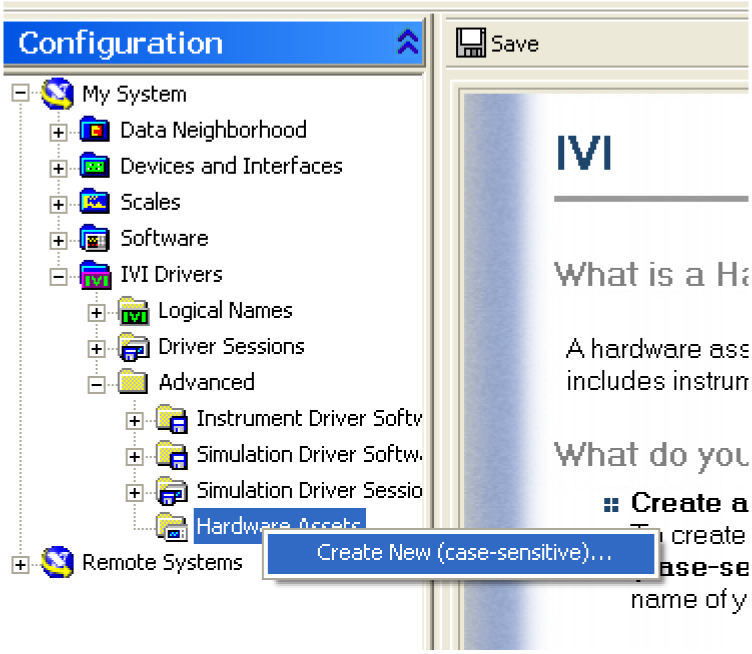
- One SM4004 in slot 0 of an SMP1200 (6 slot) unit located at resource: VXI0::2::INSTR. (Logical Address 2)
- One SM4004 in slot 0 of an SMP1100 (2 slot) unit located at resource: VXI0::8::INSTR. (Logical Address 4)

Defining IVI Attributes within Max

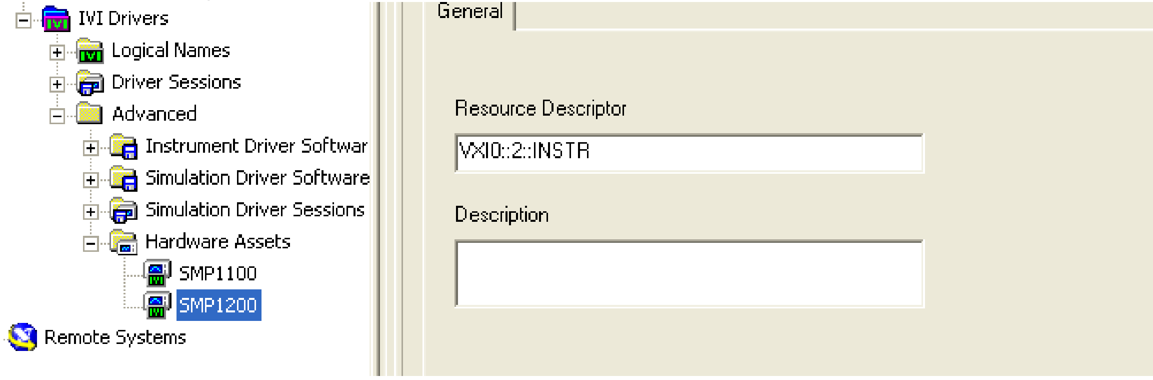
Defining Hardware Assets

First step towards preparing your system to run the IVI SMIP driver is defining hardware resources within Measurement and Automation Explorer (MAX).

1. Open up MAX. On the left hand side, expand the "IVI Drivers" tab, expand the "Advanced" tab, and right click on "Hardware Assets." Click "Create New."



2. Name your hardware asset, and fill in the "Resource Descriptor" string with the appropriate resource that you are setting up. Save, and repeat these steps for all logical addresses you plan on using in your switching system.

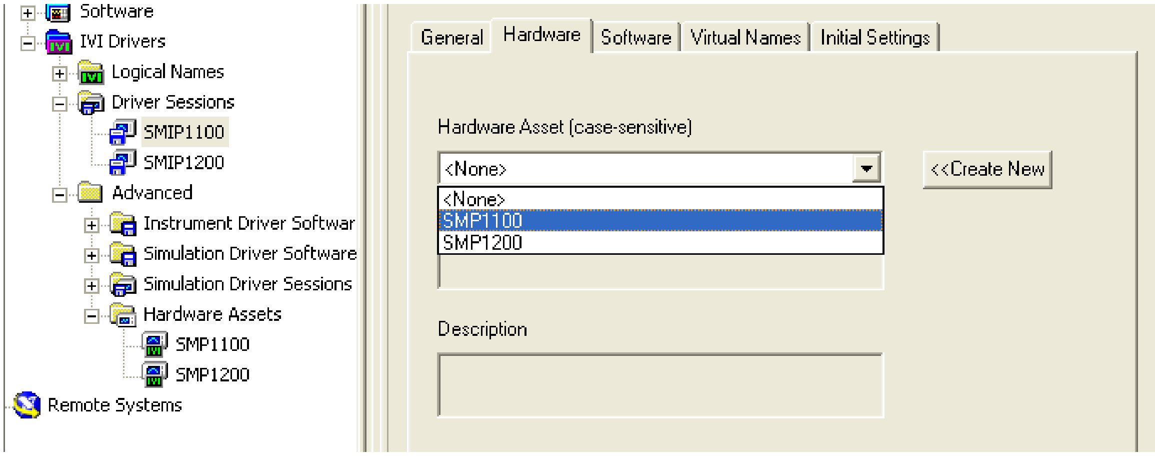


Resource Descriptor
VXI0::2::INSTR

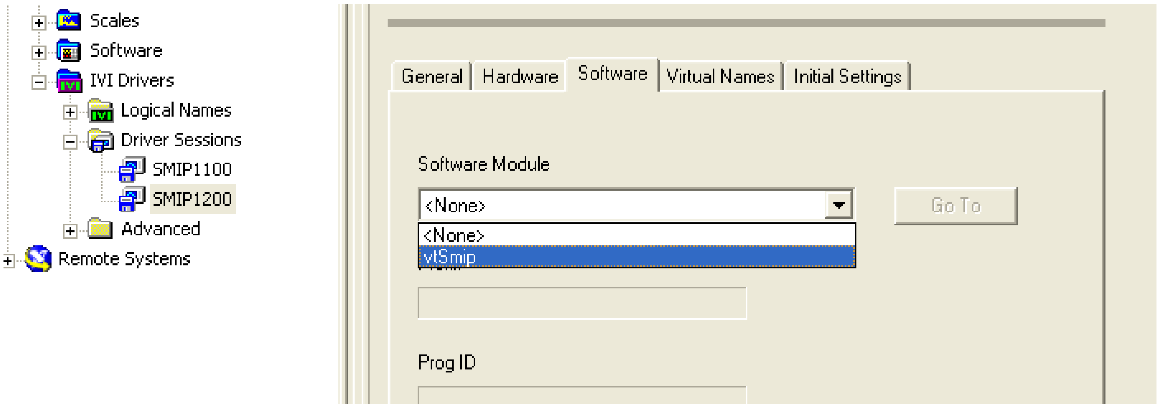
Description

Defining Driver Sessions

1. Right click on the "Driver Sessions" tab under the "IVI Drivers" tab. Select "Create New" and name the new driver session.
2. Go to the "Hardware" tab, and select from the "Hardware Asset" ring one of the hardware assets that you just defined, and would like to associate with this driver session.

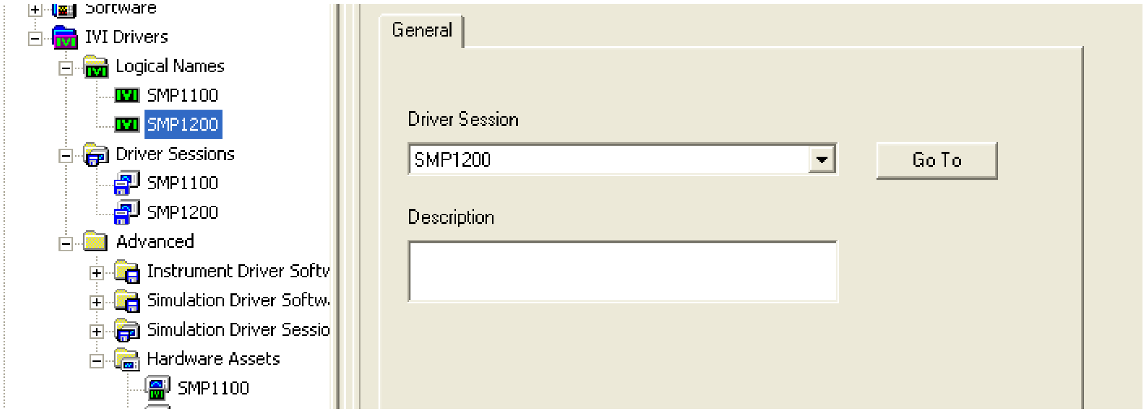


3. You must select a software module to associate with this driver session. The software module is something that is installed with the SMIP driver. To select the software module that corresponds to the SMIP driver, click on the "software" tab, and select the "vtSmip" from the list of software modules. Save your driver sessions.



Defining Logical Names

1. You must now define logical names, and link them to driver sessions. To do this, right click on the "Logical Names" tab under "IVI Drivers," select "Create New", and name your logical name. Once you've named it, click on that name, and on the right side choose the driver session that you would like to associate with that logical name. Save these settings.



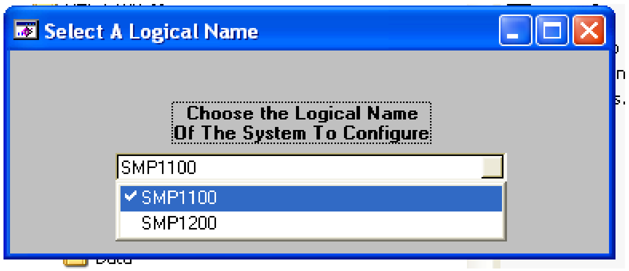
Driver Session: SMP1200

Description:

Running the Configuration Utility to Configure your Switching System

You must configure your switch system so that the driver knows which switch cards are present in each unique system. To do this go to the directory where the driver is installed: C:/Program Files/ IVI/Drivers/vtSmip, and double click on "vtConfigSwtch.exe."

1. <u>Configuring the SMP1200 in "auto" mode:</u> Auto mode requires that the hardware be present and that the resource manager has been ran. The first screen just contains instructions on how the utility works, click "continue"
2. Next you must select the logical name that is associated with the driver session that you would like to configure.



Select A Logical Name

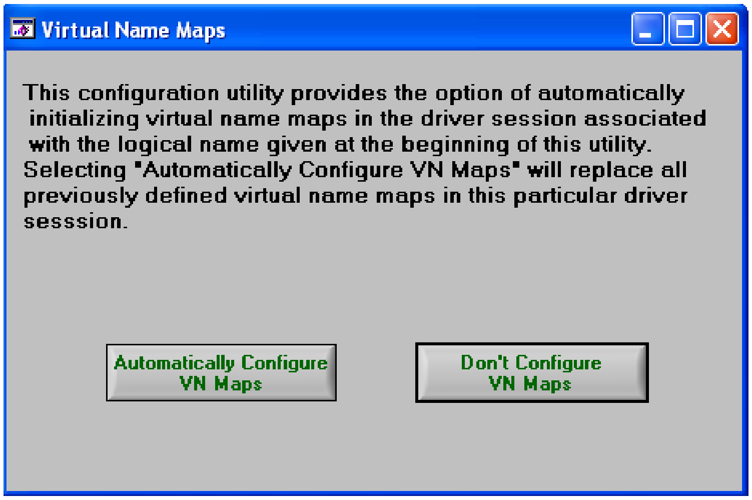
Choose the Logical Name Of The System To Configure

SMP1100

✓ SMP1100
SMP1200

3. The next screen that pops up gives the user the option to configure the switch cards manually, or automatically. For the SM1200, we are going to use auto mode. Click "Auto."

4. The next window gives the user the option to automatically configure virtual names within the IVI configuration store. What is a virtual name? Simply put, the virtual name adds convenience for the end user when using an IVI driver that utilizes repeated capabilities such as channels. IVI defines two attributes: physical names, and virtual names. Physical names are used by the driver itself (Ex: channel1, channel2, channel3….) whereas virtual names are optional labels that get mapped to physical names (Ex: DMM → channel1). Within the application program, either reference can be used. It is recommended that the "Don't configure VN Maps" option only be selected in cases where users have already defined virtual names in the IVI configuration store, or in MAX, and don't want these virtual names over written.

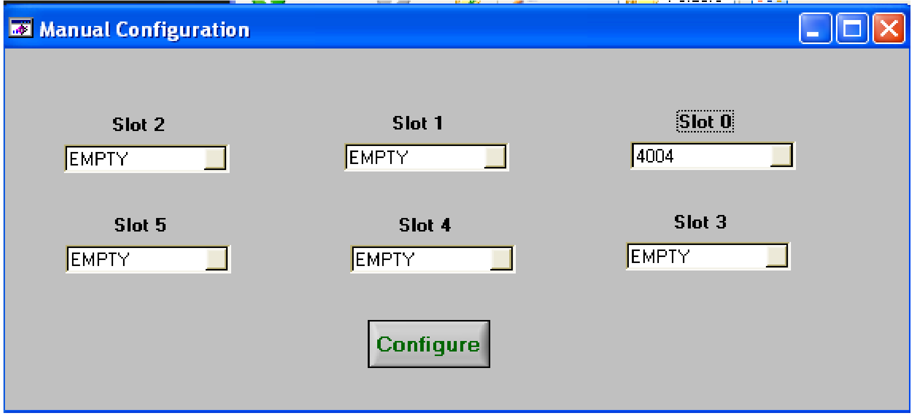


This configuration utility provides the option of automatically initializing virtual name maps in the driver session associated with the logical name given at the beginning of this utility. Selecting "Automatically Configure VN Maps" will replace all previously defined virtual name maps in this particular driver sesssion.

5. The next window simply double checks that the user would like to over write their virtual names. Click "Continue" and the switching system for that particular driver session is configured.

1. <u>Configuring the SMP1100 in "manual" mode:</u> Manual mode does not require the presence of hardware. The first screen contains instructions for running the utility. Click "continue."
2. Next you must select the logical name that is associated with the driver session that you would like to configure.
3. The next screen that pops up gives the user the option to configure the switch cards manually, or automatically. For the SM1100, we are going to use manual configuration. Click "Manual."
4. The next screen displays six different rings, each of which correspond to available slots in an SMIP system. As stated at the beginning of this

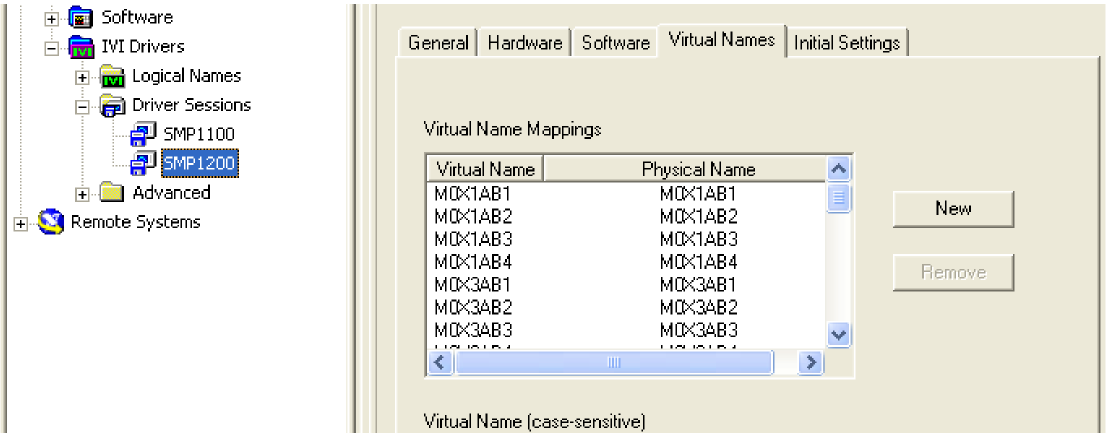
tutorial, in this system we have one SM4004 in slot 0. Click “Configure.”



Slot 2: EMPTY
Slot 1: EMPTY
Slot 0: 4004
Slot 5: EMPTY
Slot 4: EMPTY
Slot 3: EMPTY

5. Carry on with steps 4 & 5 from the auto mode instructions from above.

**You can examine your virtual/physical names by opening MAX, and going to your “Driver Sessions” tab under “IVI Drivers.” Within this folder, you want to look under the “Virtual Names” tab.



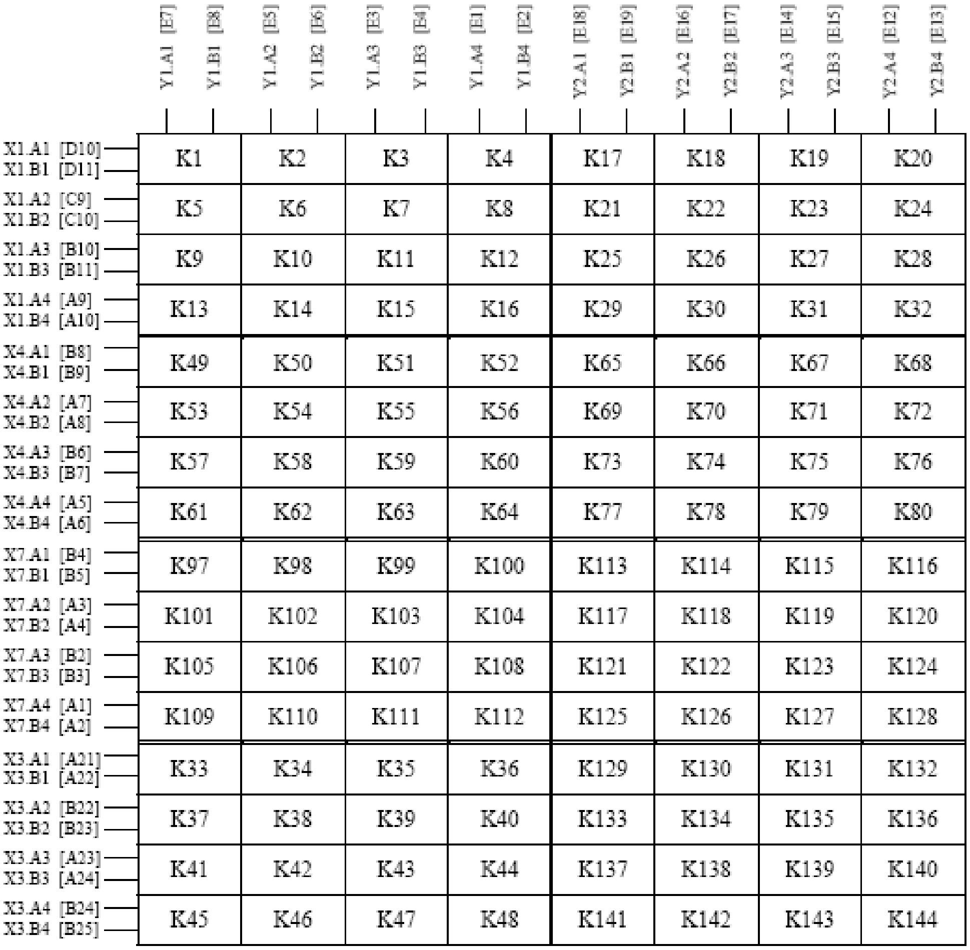
Virtual Name Mappings

Virtual Name	Physical Name
MUX1AB1	MUX1AB1
MUX1AB2	MUX1AB2
MUX1AB3	MUX1AB3
MUX1AB4	MUX1AB4
MUX3AB1	MUX3AB1
MUX3AB2	MUX3AB2
MUX3AB3	MUX3AB3

Virtual Name (case-sensitive)

Creating a Switch Executive Virtual Device:

First off, it is important to give good consideration of the needs of your system prior to creating your virtual device due to the fact that NISE's capability to edit a virtual device after initial creation is limited. For the rest of this tutorial, the following diagram displaying some of the valid connections on a SM4004 will be helpful.



	Y1.A1 [E7] Y1.B1 [E8]	Y1.A2 [E5] Y1.B2 [E6]	Y1.A3 [E3] Y1.B3 [E4]	Y1.A4 [E1] Y1.B4 [E2]	Y2.A1 [E18] Y2.B1 [E19]	Y2.A2 [E16] Y2.B2 [E17]	Y2.A3 [E14] Y2.B3 [E15]	Y2.A4 [E12] Y2.B4 [E13]
X1.A1 [D10] X1.B1 [D11]	K1	K2	K3	K4	K17	K18	K19	K20
X1.A2 [C9] X1.B2 [C10]	K5	K6	K7	K8	K21	K22	K23	K24
X1.A3 [B10] X1.B3 [B11]	K9	K10	K11	K12	K25	K26	K27	K28
X1.A4 [A9] X1.B4 [A10]	K13	K14	K15	K16	K29	K30	K31	K32
X4.A1 [B8] X4.B1 [B9]	K49	K50	K51	K52	K65	K66	K67	K68
X4.A2 [A7] X4.B2 [A8]	K53	K54	K55	K56	K69	K70	K71	K72
X4.A3 [B6] X4.B3 [B7]	K57	K58	K59	K60	K73	K74	K75	K76
X4.A4 [A5] X4.B4 [A6]	K61	K62	K63	K64	K77	K78	K79	K80
X7.A1 [B4] X7.B1 [B5]	K97	K98	K99	K100	K113	K114	K115	K116
X7.A2 [A3] X7.B2 [A4]	K101	K102	K103	K104	K117	K118	K119	K120
X7.A3 [B2] X7.B3 [B3]	K105	K106	K107	K108	K121	K122	K123	K124
X7.A4 [A1] X7.B4 [A2]	K109	K110	K111	K112	K125	K126	K127	K128
X3.A1 [A21] X3.B1 [A22]	K33	K34	K35	K36	K129	K130	K131	K132
X3.A2 [B22] X3.B2 [B23]	K37	K38	K39	K40	K133	K134	K135	K136
X3.A3 [A23] X3.B3 [A24]	K41	K42	K43	K44	K137	K138	K139	K140
X3.A4 [B24] X3.B4 [B25]	K45	K46	K47	K48	K141	K142	K143	K144

For the sake of this tutorial, we will want to make the following busses, and hardwires. What is meant by this is that we will want to make connections from the SMP1100/SM4004 to the SMP1200/SM4004 in the following way:

Hardwire:
SM1100/M0CHY1AB1 → SM1200/M0CHX3AB1

Utilizing Convenient Virtual Names (Same Channels)

Hardwire1100 → Hardwire1200

Bus:
SM1100/M0CHY1AB3 → SM1200/M0CHX1AB1 (0)
SM1100/M0CHY1AB4 → SM1200/M0CHX1AB2 (1)
SM1100/M0CHY2AB1 → SM1200/M0CHX1AB3 (2)
SM1100/M0CHY2AB2 → SM1200/M0CHX1AB4 (3)
SM1100/M0CHY2AB3 → SM1200/M0CHX4AB1 (4)
SM1100/M0CHY2AB4 → SM1200/M0CHX4AB2 (5)

Utilizing Convenient Virtual Names (Same Channels)

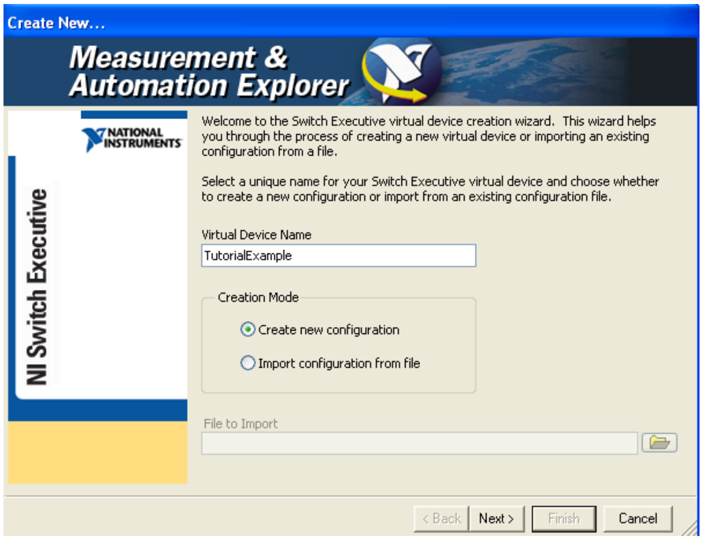
BusA0 → BusB0 (0)
BusA1 → BusB1 (1)
BusA2 → BusB2 (2)
BusA3 → BusB3 (3)
BusA4 → BusB4 (4)
BusA5 → BusB5 (5)

There will be a section later in this tutorial explaining how to configure hardwires and busses in NISE, but this information is included now to stress the point that these details should be considered prior to setting up your virtual device. This way you can assign convenient virtual names to your channels which will make creating busses and hardwires much simpler once the virtual device has been created.

You can edit these virtual names by clicking the “Virtual Names” tab under the “Driver Sessions” folder within MAX. At this point, click on the virtual name that you wish to edit, and enter your virtual name in the “Virtual Name (Case Sensitive)” field.

Now that we have considered our switching system carefully, and have modified virtual names within MAX, we can officially create our virtual device

1. In MAX, in the left column, expand the tab “Devices and Interfaces.” Right click on “NI Switch Executive Virtual Devices,” and select “create new.”
2. Name your Virtual Device and click “next.”



Create New...

Welcome to the Switch Executive virtual device creation wizard. This wizard helps you through the process of creating a new virtual device or importing an existing configuration from a file.

Select a unique name for your Switch Executive virtual device and choose whether to create a new configuration or import from an existing configuration file.

Virtual Device Name: TutorialExample

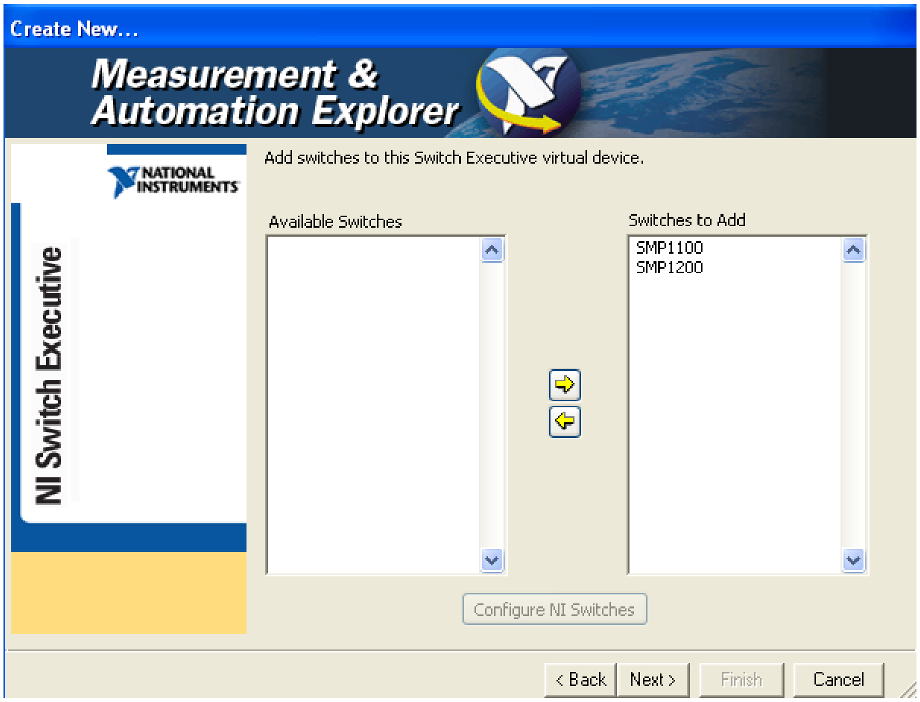
Creation Mode

● Create new configuration

○ Import configuration from file

File to Import:

3. Next you will see a page with two boxes. The box on the left contains all the logical names that are present in the system. You want to move those logical names to the right box of the switches you wish to include in your virtual device. Click “Next.”



Create New...

Add switches to this Switch Executive virtual device.

Available Switches:

Switches to Add:
SMP1100
SMP1200

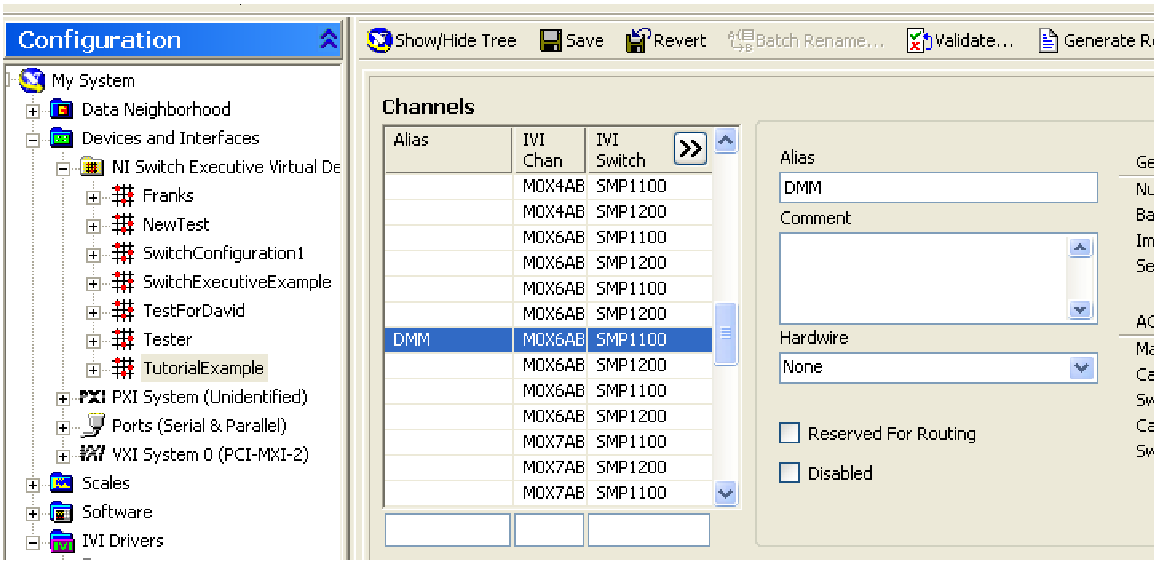
4. It will tell you whether or not the virtual device was built successfully. Click “finish,” and you have successfully created a virtual device.

Editing Channel Characteristics within NISE

Adding an Alias Name to a Channel

Alias names are similar to virtual names in the sense that they allow the user to define more convenient names for channels which can then be used later in an application program. In addition, the user can assign convenient names to other things as well including routes, route groups, hardwires, and busses.

1. Within your NISE virtual device, click on the “channels/Exclusions” tab. Direct your attention to the upper half of the display. Select the channel you want to add an alias name to, and type that name in the field titled “Alias”



Channels

Alias	IVI Chan	IVI Switch
	M0X4AB	SMP1100
	M0X4AB	SMP1200
	M0X6AB	SMP1100
	M0X6AB	SMP1200
	M0X6AB	SMP1100
	M0X6AB	SMP1200
DMM	M0X6AB	SMP1100
	M0X6AB	SMP1200
	M0X6AB	SMP1100
	M0X6AB	SMP1200
	M0X7AB	SMP1100
	M0X7AB	SMP1200
	M0X7AB	SMP1100

Alias: DMM

Comment:

Hardwire: None

□ Reserved For Routing

□ Disabled

Channels & Reserved for Routing.

On the “Channels/Exclusions” page, you can mark a channel as “reserved for routing.” Basically, this is the same as marking a channel as a configuration channel. Configuration channels, as defined by the IVI specifications, are intermediate relays between two endpoints needed to make a connection. For example, if we wanted to make the following connection:

SM1100/M0CHX1AB1 → SM1100/M0CHY1AB1 → SM1200/M0CHX3AB1

And we marked SM1100/M0CHY1AB1 as “Reserved for Routing,” then when defining the route, we would only have to provide the two endpoints.

Alternatively, if you wanted to make the same connection with out marking any channels as “Reserved for Routing,” then we could make two separate connections:

SM1100/M0CHX1AB1 → SM1100/M0CHY1AB1
SM1100/M0CHY1AB1 → SM1200/M0CHX3AB1

Note: You should only mark a channel as “Reserved for Routing” if, within you switching system, there is no situation where that channel would be used as an endpoint for a route.

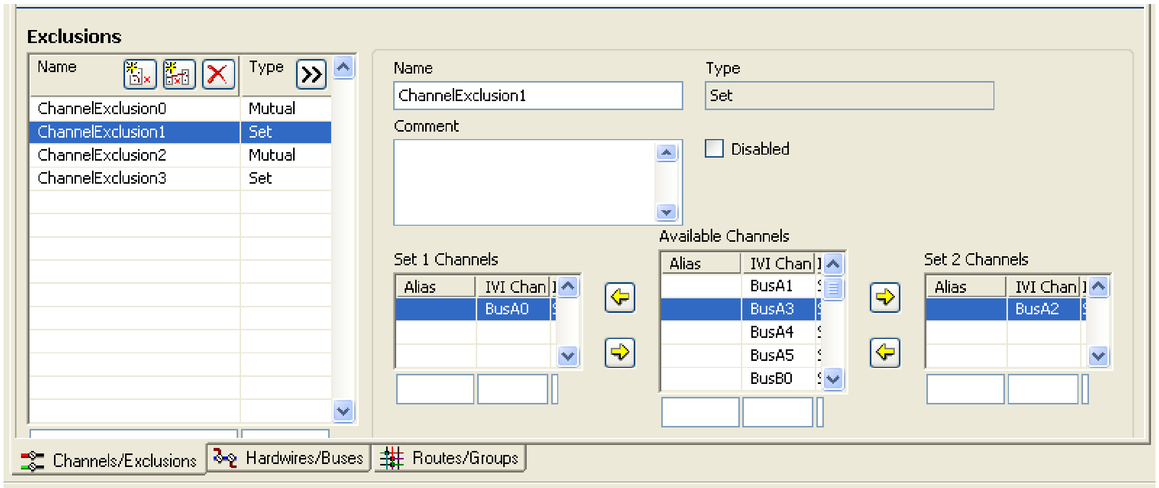
Creating Exclusions in NISE

An exclusion within NISE virtual devices are basically connection rules for specified channels. NISE currently provides for two types of exclusions: Mutual, and set.

Defining a Set Exclusion

A set exclusion defines two different channel sets, SetA and SetB. The exclusion is that no channel from SetA can connect to any channel within SetB.

1. Click on the “Channels/Exclusions” tab within your NISE virtual device.
2. Direct your attention to the bottom half of the display, and under the bold print that reads “Exclusions” click the “Add New Set Exclusion” button
3. Using the arrow buttons, and the provided list of available channels, add channels to the “Set 1 Channels,” and the “Set 2 Channels” fields.
4. When you have included all channels in the exclusion, click the save button Save and you have successfully created an exclusion.



Exclusions

Name	Type
ChannelExclusion0	Mutual
ChannelExclusion1	Set
ChannelExclusion2	Mutual
ChannelExclusion3	Set

Name: ChannelExclusion1

Type: Set

Comment:

□ Disabled

Set 1 Channels

Alias	IVI Chan
	BusA0

Available Channels

Alias	IVI Chan
	BusA1
	BusA3
	BusA4
	BusA5
	BusB0

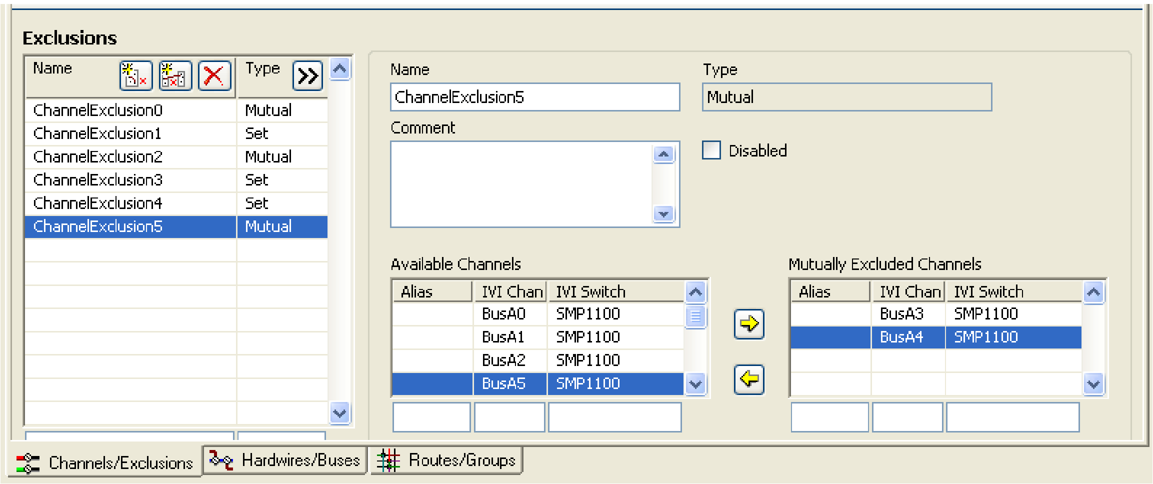
Set 2 Channels

Alias	IVI Chan
	BusA2

Defining a Mutual Exclusion

A mutual exclusion defines one set of channels. The exclusion is that no channels in this set may connect to any other channels in the set.

1. Click on the “Channels/Exclusions” tab within your NISE virtual device.
2. Direct your attention to the bottom half of the display, and under the bold print that reads “Exclusions” click the “Add New Mutual Exclusion” button
3. Move from the “Available Channels” field to the “Mutually Excluded Channels” field all the channels that you wish to be part of the exclusion.
4. When you have included all channels in the exclusion, click the save button Save and you have successfully created an exclusion.



Exclusions

Name	Type
ChannelExclusion0	Mutual
ChannelExclusion1	Set
ChannelExclusion2	Mutual
ChannelExclusion3	Set
ChannelExclusion4	Set
ChannelExclusion5	Mutual

Name: ChannelExclusion5

Type: Mutual

Comment:

☐ Disabled

Available Channels

Alias	IVI Chan	IVI Switch
	BusA0	SMP1100
	BusA1	SMP1100
	BusA2	SMP1100
	BusA5	SMP1100

Mutually Excluded Channels

Alias	IVI Chan	IVI Switch
	BusA3	SMP1100
	BusA4	SMP1100

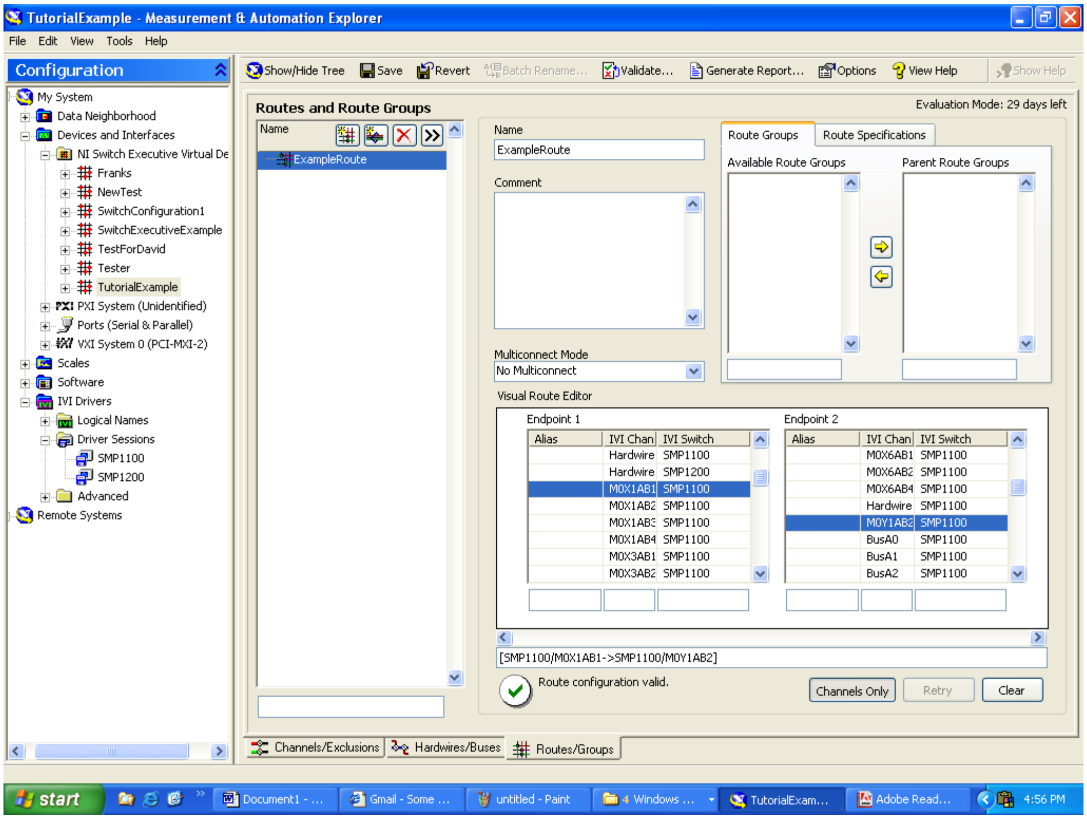
Defining Routes and Route Groups within NISE

Defining routes within NISE allows the user to have control over a connection, long or short, with one word, or route name. Furthermore, grouping a set of routes allows a user to have control over a set of routes with one word, or route group name. Programmatically, these relays can be controlled with one word.

Defining a route in NISE

1. Within your NISE virtual device, select the “Routes/Groups” tab.
2. Under the bold words that read “Routes and Route Groups,” select the button on the far left. This should un-dim the box labeled “visual route editor,” and temporarily name your new route “Route0.”
3. Name your Route Conveniently.

4. Choose two endpoints for your route, and ensure that NISE accepts your selection as a valid connection. An indication of whether or not your selection is valid is at the bottom left of the display which will show a green check mark (good connection), a red X (Invalid connection), or a yellow exclamation (incomplete entry).
5. After you have picked two valid endpoints click the save button Save at the top of the screen.



TutorialExample - Measurement & Automation Explorer

Routes and Route Groups

Evaluation Mode: 29 days left

Name: ExampleRoute

Multiconnect Mode: No Multiconnect

Visual Route Editor

Endpoint 1

Alias	IVI Chan	IVI Switch
	Hardwire	SMP1100
	Hardwire	SMP1200
	M0X1AB1	SMP1100
	M0X1AB2	SMP1100
	M0X1AB3	SMP1100
	M0X1AB4	SMP1100
	M0X3AB1	SMP1100
	M0X3AB2	SMP1100

Endpoint 2

Alias	IVI Chan	IVI Switch
	M0X6AB1	SMP1100
	M0X6AB2	SMP1100
	M0X6AB4	SMP1100
	Hardwire	SMP1100
	M0Y1AB2	SMP1100
	BusA0	SMP1100
	BusA1	SMP1100
	BusA2	SMP1100

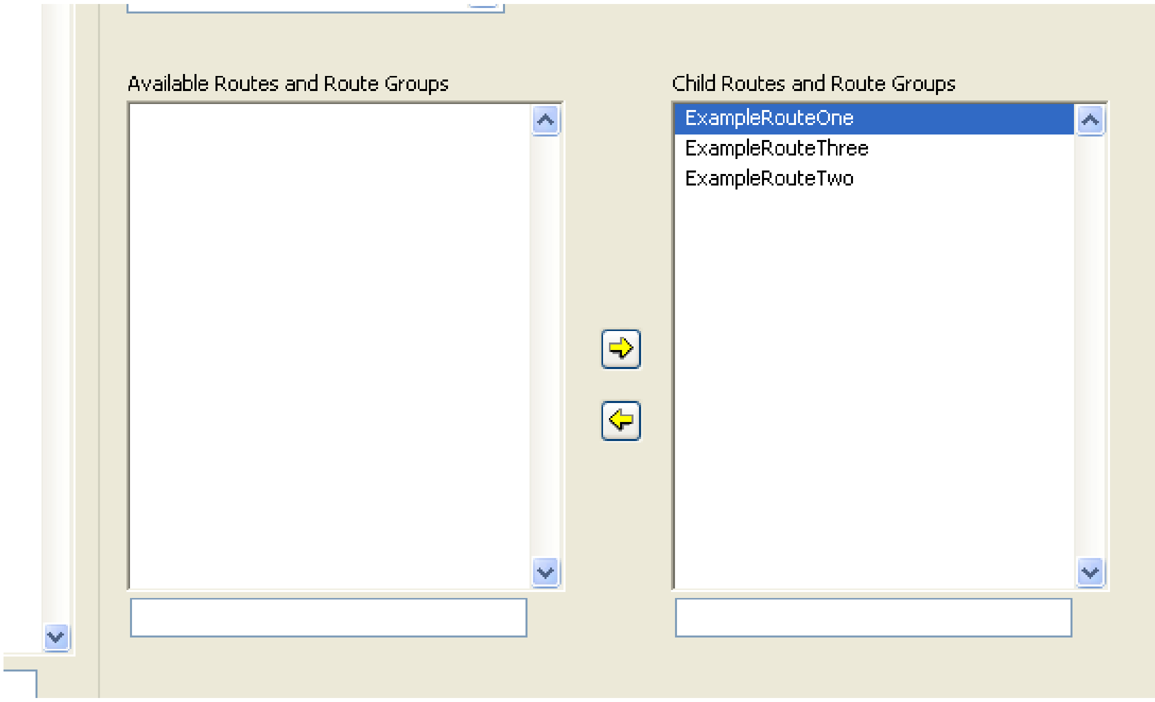
[SMP1100/M0X1AB1->SMP1100/M0Y1AB2]

✓ Route configuration valid.

Defining Route Groups in NISE

A route group is a term used to describe a group of connections that can be controlled all at once. Specifically, you can take pre-defined routes, and group them with a label so that you can control all these connections at once with just one label. You can define a route group by following these steps:

1. Within your NISE virtual device, select the “Routes/Groups” tab.
2. Under the bold words that read “Routes and Route Groups,” select the button.
3. In the field labeled “Available Routes & Route Groups,” all the defined routes, and route groups are displayed. Move from the box on the left, to the box on the right, all the connections that you want to associate with this route group.



Available Routes and Route Groups

Child Routes and Route Groups

ExampleRouteOne
ExampleRouteThree
ExampleRouteTwo

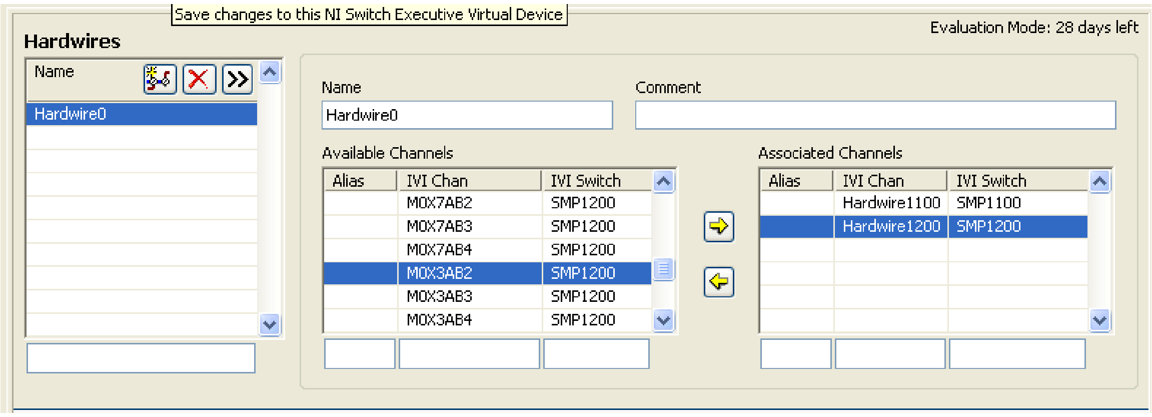
4. Click the Save button when you are finished, and you have successfully defined a route group.

Defining Hardwires and Busses within NISE

When you want to make a connection from one of the pins on one of your switch cards to a pin on another card, this is known as a hardwire. When you have several pins on one card grouped, and being connected to a group of pins on another card, this is known as a bus. To put it short, a bus is an organized group of hardwires.

Defining Hardwires

1. Click on the “Hardwires/Busses” tab in your NISE virtual device
2. Within the top section labeled in bold “Hardwires,” click the “add new hardwire” button.
3. Either accept the predefined name for the hardwire, or create your own.
4. Move from the “Available Channels” field to the “Associated Channels” field those endpoints that you wish to include in your hardwire



Save changes to this NI Switch Executive Virtual Device

Evaluation Mode: 28 days left

Hardwires

Name
Hardwire0

Name: Hardwire0

Comment:

Available Channels

Alias	IVI Chan	IVI Switch
	M0X7AB2	SMP1200
	M0X7AB3	SMP1200
	M0X7AB4	SMP1200
	M0X3AB2	SMP1200
	M0X3AB3	SMP1200
	M0X3AB4	SMP1200

Associated Channels

Alias	IVI Chan	IVI Switch
	Hardwire1100	SMP1100
	Hardwire1200	SMP1200

5. Click the Save button and you have successfully created a hardwire

Defining Busses

1. Click on the “Hardwires/Busses” tab in your NISE virtual device.
2. Click on the “Add New Bus” button. Accept the predefined bus name or create a new one.
3. Select on of the switches that you want to associate with your bus from the “IVI Switches” field.
4. Check the “Connect to Bus” box.
5. In the “Base Channel” drop down, select the base channel for your bus. For the bus that was defined above in “Creating a Switch Executive Virtual Device,” this would be “BusA0” for the SM1100, or “BusB0” for the SM1200.
6. From the “End Channel” dropdown, select the last channel in the bus. For the bus that was defined above in “Creating a Switch Executive Virtual Device,” this would be “BusA5” for the SM1100, or “BusB5” for the SM1200.
7. Now select the other switch that you want to associate with the bus, and repeat steps 4-6 for this switch.
8. Click the Save button, and you have successfully created a bus.

**NOTE: Note that NISE expects channels that are going to be busses to have a naming convention such that the channel names have common bases (Ex: BusA), and a postfix indicating its position in the bus (Ex: 0-5). This is why it was stressed earlier in this tutorial to give good consideration of your switching system prior to assigning virtual names, and creating a virtual device.

Notes Regarding Changing and Editing Your Switching System

NISE is limited in editing virtual devices after the initial creation. However, there are some edits that are possible.

Adding an Additional Switch to Your Virtual Device

You can add a switch to your virtual device by simply right clicking your virtual device within MAX and selecting “Add IVI Switch.”

Removing an IVI Switch from Your Virtual Device

From MAX, expand your virtual device so that the IVI switches in the virtual device are visible. Right click on the IVI switch that you wish to remove, and select “Remove IVI Switch.”

Dealing with a change in physical names

For some reason or another, the physical names that the driver (software module) uses within a switching system might change. For example, one might move a particular switch card from slot 0 to slot 1 within their system. This would result in the change of the physical names for the channels on this card.

SM1100/M0CHY1AB3   would change to
SM1100/M1CHY1AB3

Assuming that this card was part of a NISE virtual device, at this point the virtual names that were loaded into this virtual device when created are now mapped to incorrect physical names. To remedy this problem:

1. Expand the “Driver Sessions” tab in your MAX menu.
2. Select the driver session that contains the module that under went the change.
3. Remap the same old virtual names to the new physical names. For example:

Virtual Names		*Physical Names*
DMM		SM1100/M0CHY1AB3
	would now be	
DMM		SM1100/M1CHY1AB3

4. Save Changes.
5. Enter your NISE virtual device, and redefine all routes, hardwires, and busses that contained the changed channels.