

GETTING STARTED GUIDE

NI Switch Executive

Contents

Verifying the System Requirements	1
Verifying the Kit Contents	1
Installing the Software	2
Installing the Hardware	2
Configuring an NI Switch Executive Virtual Device	2
Creating an NI Switch Executive Virtual Device	2
Configuring Channels and Hardwires	3
Configuring Routes and Route Groups	4
Nesting Route Groups	5
Adding Buses	6
Adding Mutual Exclusions	7
Validating an NI Switch Executive Virtual Device	8
Using NI TestStand with NI Switch Executive	9
Programming an NI Switch Executive Virtual Device	9
Deploying an NI Switch Executive Virtual Device (Optional)	10
Worldwide Support and Services	11

Verifying the System Requirements

To use NI Switch Executive, your system must meet certain requirements. For more information about minimum system requirements, recommended system specifications, and supported application development environments (ADEs), refer to the readme, which is available on the software media or online at ni.com/updates.

Verifying the Kit Contents

Verify that the kit contains the following items:

- NI Switch Executive software media, which includes the *NI Switch Executive Help* and the *NI Switch Executive Readme*
- NI Switch Executive Getting Started Guide* (this document)

Installing the Software

You must be an Administrator to install NI software on your computer.

1. Install an ADE, such as LabVIEW or LabWindows™/CVI™.
2. Insert the driver software media into your computer. The installer should open automatically. If the installation window does not appear, navigate to the drive, double-click it, and double-click `autorun.exe`.
3. Follow the instructions in the installation prompts.



Note Windows users may see access and security messages during installation. Accept the prompts to complete the installation.

4. When the installer completes, select **Restart** in the dialog box that prompts you to restart, shut down, or restart later.

Installing the Hardware

For NI switches, install and configure the devices using the *NI Switches Getting Started Guide*.

For third-party switches, install and configure them as specified in the manufacturer-supplied documentation. You must then manually create IVI configuration for these devices using the IVI Drivers section in Measurement & Automation Explorer (MAX). Refer to the *Using Third-Party Switches* topic of the *NI Switch Executive Help* for more information.

Configuring an NI Switch Executive Virtual Device

An NI Switch Executive virtual device represents a switching system. As such, a virtual device is composed of the switch modules, channels, hardwires, buses, exclusions, routes, and route group definitions and configurations that are a part of the switching system.

Use the NI Switch Executive configuration utility in MAX or the configuration API to configure a virtual device. To launch NI MAX with NI Switch Executive, navigate to **Start»All Programs»National Instruments»Switch Executive»NI MAX with NI Switch Executive**.


Creating an NI Switch Executive Virtual Device

Complete the following steps to create an NI Switch Executive virtual device:

1. Launch NI MAX with NI Switch Executive.
2. Expand **Devices and Interfaces**.
3. Right-click **NI Switch Executive Virtual Devices** and select **Create New**. The Create New dialog box opens.
4. Type a name for the virtual device in the **Virtual Device Name** textbox. The name you select is the name used to refer to the virtual device in the API.



Note For this and other textbox entries in NI Switch Executive, invalid characters include , . * & ! < > ; [] : ~ /, space, tab, and new line.

5. Select a switch device or multiple switch devices from the **Available Switches** listbox and click  to add each switch to the **Switches to Add** listbox.



Tip To select multiple items at one time from this and other listboxes, hold <Ctrl> while clicking the items you want.

6. Click **Next**. A dialog box displays the status of the virtual device creation.
7. Click **Finish** when the virtual device creation is complete. MAX automatically browses to the NI Switch Executive virtual device that you created.

Configuring Channels and Hardwires

Complete the following steps to create the channel aliases and hardwires of the virtual device:

1. Launch NI MAX with NI Switch Executive.
2. Expand **Devices and Interfaces»NI Switch Executive Virtual Devices**.
3. Select the NI Switch Executive virtual device to modify and navigate to the **Schematic Configuration** tab.
4. Verify that the required switch device is selected in the **Devices** listbox and its schematic appears in the **Schematic** window.
5. Click a channel in the **Schematic** window. The **Edit Alias & Hardware** dialog box opens.
6. Type an alias name for the channel in the **Alias Name** textbox.





Tip To quickly rename channels with a sequential naming scheme (DIO_0, DIO_1, DIO_2, and so on), use the batch rename feature in the Channels/Exclusions tab. Refer to the *Batch Renaming* topic of the *NI Switch Executive Help* for more information about batch renaming.

7. Click the **Hardwires** tab.



Note NI Switch Executive creates `Hardware0` by default. If you are associating a channel with `Hardware0`, skip to step 9.

8. If necessary, click , **Add hardware**, at the top of the **Available Hardwires** listbox to create a new hardware.
9. Click **Associate *channelName* with *hardwareName***, where *channelName* and *hardwareName* are variables, depending on the channel and hardware you want to associate.
10. Click **OK**. The alias replaces the default channel name in the **Schematic** window. NI Switch Executive denotes the hardware association by appending a superscript *n* to the channel name in the **Schematic** window, where *n* is a numeric variable that represents the hardware.

11. Repeat steps 5 through 6 as needed to create an alias for each channel of the required switch device. Repeat steps 7 through 10 to associate a hardware with every configuration channel of the required switch device.
12. Click  on the taskbar to save the configuration.
13. Repeat steps 4 through 12 to configure additional switch devices.

Configuring Routes and Route Groups

Use route groups to ensure that multiple routes connected at the same time are not using the same resources. If the routes are associated in the same group, NI Switch Executive notifies you of any resource conflicts and attempts to automatically correct those conflicts.

Complete the following steps to create a route group and associated routes:

1. Launch NI MAX with NI Switch Executive.
2. Expand **Devices and Interfaces»NI Switch Executive Virtual Devices**.
3. Select the NI Switch Executive virtual device to modify and navigate to the **Schematic Configuration** tab.
4. Right-click **RouteGroup0** in the **Routes and Route Groups** listbox and select **Rename**.




Note When you create a new virtual device, NI Switch Executive creates a default route group, `RouteGroup0`, in the **Routes and Route Groups** listbox.

5. Type a name for the route group.
6. Verify that the required switch device is selected in the **Devices** listbox and its schematic appears in the **Schematic** window.
7. Complete one of the following steps depending on the topology of the switch device selected to create a route between channels:
 - **General purpose topology**—Click a crosspoint between two channels on the specific relay you want to use in the **Schematic** window.
 - **Matrix topology**—Click a crosspoint between two channels in the **Schematic** window.
 - **Multiplexer topology**—Click a channel connection point in the **Schematic** window.
 - **Third-party IVI-switch and independent topologies**—Select one channel from the **Channel 1** listbox and one channel from the **Channel 2** listbox and click **Create**.


The route displays in the **Schematic** window and is added to the route group.

8. Enable the **Show Routes** checkbox located under the **Routes and Route Groups** listbox.
9. Right-click the route you created in the **Routes and Route Groups** listbox and select **Rename**.
10. Type a name for the route.

11. Validate the route.
 - a. Click  **Validate** on the taskbar. The Validate dialog box opens.
 - b. (Optional) Select the **Use Simulation Mode** checkbox to simulate connections during validation.




Caution If you do not use simulation mode during the validation process, all routes and route groups are connected on the hardware. If you choose to validate a real system, verify that the hardware can handle switch connections *before* you validate.

- c. Select the checkbox items you want to validate: **IVI Configuration**, **Routes**, and/or **Route Groups**.
 - d. Click **Next**. A window displays the validation status of the items in your configuration and if the validation passes or fails.
 - e. Proceed to step f if the validation test passes. If the validation status includes any errors, correct the configuration and repeat steps a through d.
 - f. Click **Finish**. Now you can program and/or deploy the virtual device.
12. Click  **Save** on the taskbar to save the configuration.

Nesting Route Groups


Route groups are also useful for categorizing the connections required for a test. In applications in which you need to create the same connections for different tests, you can create a route group for these connections that can be used in other route groups.

Complete the following steps to nest route groups:

1. Launch NI MAX with NI Switch Executive.
2. Expand **Devices and Interfaces»NI Switch Executive Virtual Devices**.
3. Select the NI Switch Executive virtual device to modify and navigate to the **Schematic Configuration** tab.
4. Click  **Add route group**, at the top of the **Routes and Route Groups** listbox. NI Switch Executive creates a route group with a default name, `RouteGroupX`.
5. Right-click the route group that you created in the **Routes and Route Groups** listbox and select **Rename**.
6. Type a name for the route group.
7. Repeat steps 4 through 6 to create a second route group.
8. Drag the second route group and drop it on the first route group you created in the **Routes and Route Groups** listbox to add the second route group to the first route group.




Note The second route group still exists in the **Routes and Route Groups** listbox. Disassociating a nested route group from a parent route group only removes the route group from the parent route group and does *not* delete the route group from the **Routes and Route Groups** listbox.

9. Validate the route group.
 - a. Click  on the taskbar. The Validate dialog box opens.
 - b. (Optional) Select the **Use Simulation Mode** checkbox to simulate connections during validation.



Caution If you do not use simulation mode during the validation process, all routes and route groups are connected on the hardware. If you choose to validate a real system, verify that the hardware can handle switch connections *before* you validate.

- c. Select the checkbox items you want to validate: **IVI Configuration**, **Routes**, and/or **Route Groups**.
 - d. Click **Next**. A window displays the validation status of the items in your configuration and if the validation passes or fails.
 - e. Proceed to step f if the validation test passes. If the validation status includes any errors, correct the configuration and repeat steps a through d.
 - f. Click **Finish**. Now you can program and/or deploy the virtual device.
10. Click  on the taskbar to save the configuration.


Adding Buses

Adding a bus allows multiple hardwires to be created simultaneously. Buses are useful when working with large matrices that have been expanded to include multiple modules.

Complete the following steps to add a bus.



Note The following steps will only connect channels in software for routing and connection purposes. You are still required to make your own external connections.


1. Launch NI MAX with NI Switch Executive.
2. Expand **Devices and Interfaces»NI Switch Executive Virtual Devices**.
3. Select the NI Switch Executive virtual device to modify and navigate to the **Hardwires/Buses** tab.
4. Click , **Add bus**, at the top of the **Buses** listbox to add a bus.
5. Type a name for the bus in the **Name** textbox.
6. Select a switch to associate with the bus from the **IVI Switches** listbox.
7. Enable the **Connect to Bus** checkbox.
8. Select a channel from the **Base Channel** pull-down menu. The base channel is the first channel of the series of hardwires that are created.
9. Select the last channel in the series of created hardwires from the **End Channel** pull-down menu.



Note Some switch devices do not support creating multi-channel buses. If the switch device you selected from the **IVI Switches** listbox does not support multi-channel bus creation, you will only be able to select the same channel from the **End Channel** pull-down menu as the channel selected in the **Base Channel** pull-down menu.

10. Accept the predefined **Hardware Start Index** value or type a new number in the **Hardware Start Index** textbox.

This value is the first number appended to the end of the generated hardwire names. For example, if the start index is 2, `BusName2`, `BusName3`, `BusName4`, and so on are the default names created, where `BusName` is the name of the newly created bus.

11. Repeat steps 6 through 10 for additional switches associated with the bus.
12. Type any comments you have in the **Comment** textbox.
13. Click  on the taskbar to save the configuration.
14. Expand the newly created bus tree in the **Buses** listbox to view hardwire connections.
15. Verify that each bus connection is correct by selecting a hardwire and verifying that the **Associated Channels** are correct.



Note Buses are useful for simplifying sequential associations. If you have non-sequential channels, you can use individual hardwires to configure the NI Switch Executive virtual device. Refer to the *Adding Buses* topic of the *NI Switch Executive Help* for more information.


Adding Mutual Exclusions

A mutual exclusion is a list of channels that should never connect to one another to prevent damage to sensitive equipment. A source channel is a type of mutual exclusion.



Note Refer to the *Adding Set Exclusions* topic of the *NI Switch Executive Help* for information about another type of available exclusion. For information about problems that might occur when using exclusions with single-pole double-throw (SPDT) relays, refer to the *Exclusions and SPDT Relays* topic of the *NI Switch Executive Help*.


Complete the following steps to add a mutual exclusion:

1. Launch NI MAX with NI Switch Executive.
2. Expand **Devices and Interfaces»NI Switch Executive Virtual Devices**.
3. Select the NI Switch Executive virtual device to modify and navigate to the **Channels/Exclusions** tab.
4. Click , **Add mutual exclusion**, at the top of the **Exclusions** listbox to add a mutual exclusion.
5. Type a name for the exclusion in the **Name** textbox.

6. Select the channels to exclude from the **Available Channels** listbox and click  to add each channel to the **Mutually Excluded Channels** listbox.
7. Type any comments you have in the **Comment** textbox.




Note If needed, select the **Disabled** checkbox to disable the exclusion.

8. Click  on the taskbar to save the configuration.

Validating an NI Switch Executive Virtual Device

Always validate a virtual device before using and/or deploying it. Validating a virtual device ensures that IVI configurations, routes, and route groups are valid and route group members do not use conflicting resources.

Complete the following steps to validate an NI Switch Executive virtual device:


1. Launch NI MAX with NI Switch Executive.
2. Expand **Devices and Interfaces»NI Switch Executive Virtual Devices**.
3. Select the virtual device you want to validate.
4. Click  on the taskbar. The Validate dialog box opens.
5. (Optional) Select the **Use Simulation Mode** checkbox to simulate connections during validation.



Note Simulation mode simulates the configuration of your virtual device, performs a valid system check, and reduces the wear and tear on switch relays. Simulation mode does not physically communicate with your switches.



Caution If you do not use simulation mode during the validation process, all routes and route groups are connected on the hardware. If you choose to validate a real system, verify that the hardware can handle switch connections *before* you validate.

6. Select the checkbox items you want to validate: **IVI Configuration, Routes, and/or Route Groups**.
7. Click **Next**. A window displays the validation status of the items in your configuration and if the validation passes or fails.
8. Proceed to step 9 if the validation test passes. If the validation status includes any errors, correct the configuration and repeat steps 4 through 7.
9. Click **Finish**. Now you can program and/or deploy the virtual device.
10. Click  on the taskbar to save the configuration.

Using NI TestStand with NI Switch Executive

Using NI Switch Executive in NI TestStand, you can configure switching actions for TestStand steps.

Complete the following steps to implement individual switch operations for your TestStand steps:

1. Launch NI TestStand.
2. Select **File»Open File** and choose a sequence (.seq) file in which switching will be used.
3. Drag and drop a **Step Type** from the **Insertion Palette** to the Sequence File tree under **Main**.
4. Select the step type and click the **Properties** tab on the **Step Properties** dialog box.
5. Select **Switching** from the **Properties** tab.
6. Select the **Enable Switching** checkbox.
7. Select the settings you want to use in the **Switching** panel. Refer to the *Using NI Switch Executive in NI TestStand* topic of the *NI Switch Executive Help* for descriptions of these settings.

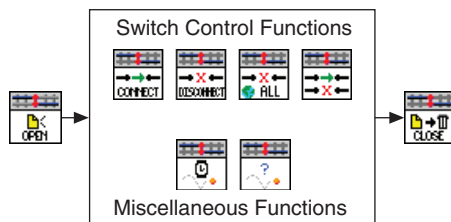
Programming an NI Switch Executive Virtual Device

After you configure and validate a virtual device, you can program the virtual device using a supported ADE. Programming time is minimal because an NI Switch Executive virtual device is recognized as a single instrument.

The following steps and Figure 1 represent a typical NI Switch Executive programming flow:

1. Open a session.
2. Control the virtual device.
3. Handle errors.
4. Close the session.

Figure 1. NI Switch Executive Programming Flow



Refer to the *Programming Flow* topic of the *NI Switch Executive Help* for more information about programming an NI Switch Executive virtual device.

Deploying an NI Switch Executive Virtual Device (Optional)

If you configure an NI Switch Executive virtual device to use on one or more computers, you can deploy the virtual device to target systems.



Note A development system must be running a licensed development version of NI Switch Executive. Target, or deployment, systems can run either a licensed deployment or a licensed development copy of NI Switch Executive.

Complete the following steps to deploy an NI Switch Executive virtual device from a development system to a target system:

1. Export the configuration files from the development system with the same NI Switch Executive version as the target system. NI Switch Executive supports the following export and import formats:
 - **NI Configuration Export (.nce) File**—Recommended for export and import of complete configurations that do not need editing outside of NI Switch Executive. Allows saving of system configuration information for all devices and interfaces, including NI Switch Executive virtual devices.
 - **NI Switch Executive Export (.xml) File**—Recommended for export and import of individual virtual device configurations that do not need editing outside of NI Switch Executive.
 - **Microsoft Excel Workbook (.xlsx and .xls)**—Recommended for export and import of individual virtual device configurations in a format suitable for editing. Components of the switching system (virtual devices, channels, routes, and so on) are contained in separate workbook sheets.
 - **Tab-delimited (.txt) File**—Recommended for export and import of individual virtual device configurations in a format suitable for editing. When opened in a spreadsheet editing program, tab-delimited files contain the components of the switching system (virtual devices, channels, routes, and so on) in a single workbook sheet.
2. Import the configuration files to the target system.
3. Validate the deployment of the NI Switch Executive virtual device.

Refer to the *Deploying a Virtual Device* topic of the *NI Switch Executive Help* for more information.

Worldwide Support and Services

The National Instruments website is your complete resource for technical support. At ni.com/support you have access to everything from troubleshooting and application development self-help resources to email and phone assistance from NI Application Engineers.

Visit ni.com/services for NI Factory Installation Services, repairs, extended warranty, and other services.

Visit ni.com/register to register your National Instruments product. Product registration facilitates technical support and ensures that you receive important information updates from NI.

National Instruments corporate headquarters is located at 11500 North Mopac Expressway, Austin, Texas, 78759-3504. National Instruments also has offices located around the world. For telephone support in the United States, create your service request at ni.com/support or dial 1 866 ASK MYNI (275 6964). For telephone support outside the United States, visit the Worldwide Offices section of ni.com/niglobal to access the branch office websites, which provide up-to-date contact information, support phone numbers, email addresses, and current events.

Refer to the *NI Trademarks and Logo Guidelines* at ni.com/trademarks for more information on National Instruments trademarks. Other product and company names mentioned herein are trademarks or trade names of their respective companies. For patents covering National Instruments products/technology, refer to the appropriate location: **Help»Patents** in your software, the `patents.txt` file on your media, or the *National Instruments Patents Notice* at ni.com/patents. You can find information about end-user license agreements (EULAs) and third-party legal notices in the readme file for your NI product. Refer to the *Export Compliance Information* at ni.com/legal/export-compliance for the National Instruments global trade compliance policy and how to obtain relevant HTS codes, ECCNs, and other import/export data. NI MAKES NO EXPRESS OR IMPLIED WARRANTIES AS TO THE ACCURACY OF THE INFORMATION CONTAINED HEREIN AND SHALL NOT BE LIABLE FOR ANY ERRORS. U.S. Government Customers: The data contained in this manual was developed at private expense and is subject to the applicable limited rights and restricted data rights as set forth in FAR 52.227-14, DFAR 252.227-7014, and DFAR 252.227-7015.

© 2001–2015 National Instruments. All rights reserved.