ENGINEERING NOTES

Using the Sedona Jennic option card

This document explains the software application of a Sedona Jennic option card (NPB-SED-001) installed in a JACE controller running AX-3.7 or later with Sedona TXS 1.2 modules, or running AX-3.6 or later with Sedona TXS 1.1 modules. Included are a few procedures to "get started" with the NiagaraAX integration of Jennic-based Sedona Framework devices. Further details are found in the *NiagaraAX Sedona Framework TXS Network Guide* and other documents. See "Related documentation" on page 4.

Note: *This document changed completely since the original release of the Sedona Jennic option card, to reflect the different NiagaraAX interface in Sedona Framework TXS 1.2 and TXS 1.1 (vs. Sedona Framework1.0). The "Jennic6LowpanBridgeService" is no longer used (or supported), such that a previous JACE's station database (.bog file) is not compatible with Sedona Framework-related NiagaraAX modules, as installed from the AX-3.6 and later Workbench "Sedona Installer".*

To help migrate an older AX-3.4 or AX-3.5 JACE station that used the Jennic6LowpanBridgeService (to integrate Jennic-based devices in a SedonaNetwork), a "Bog migration tool" is available in Workbench. Refer to the Sedona Framework engineering notes document NiagaraAX Station Migration Tool.

Note: *For hardware mounting and wiring information, please refer to the* NPB-SED-001 Option Card Installation Sheet *document, a copy of which ships with each option card.*

The following main sections are included in this document:

Overview

When a Sedona Jennic option card (NPB-SED-001) is installed in a JACE running AX-3.6 or later, it operates as the network "coordinator" node for one or more Jennic-based Sedona Framework devices. The following functions are available:

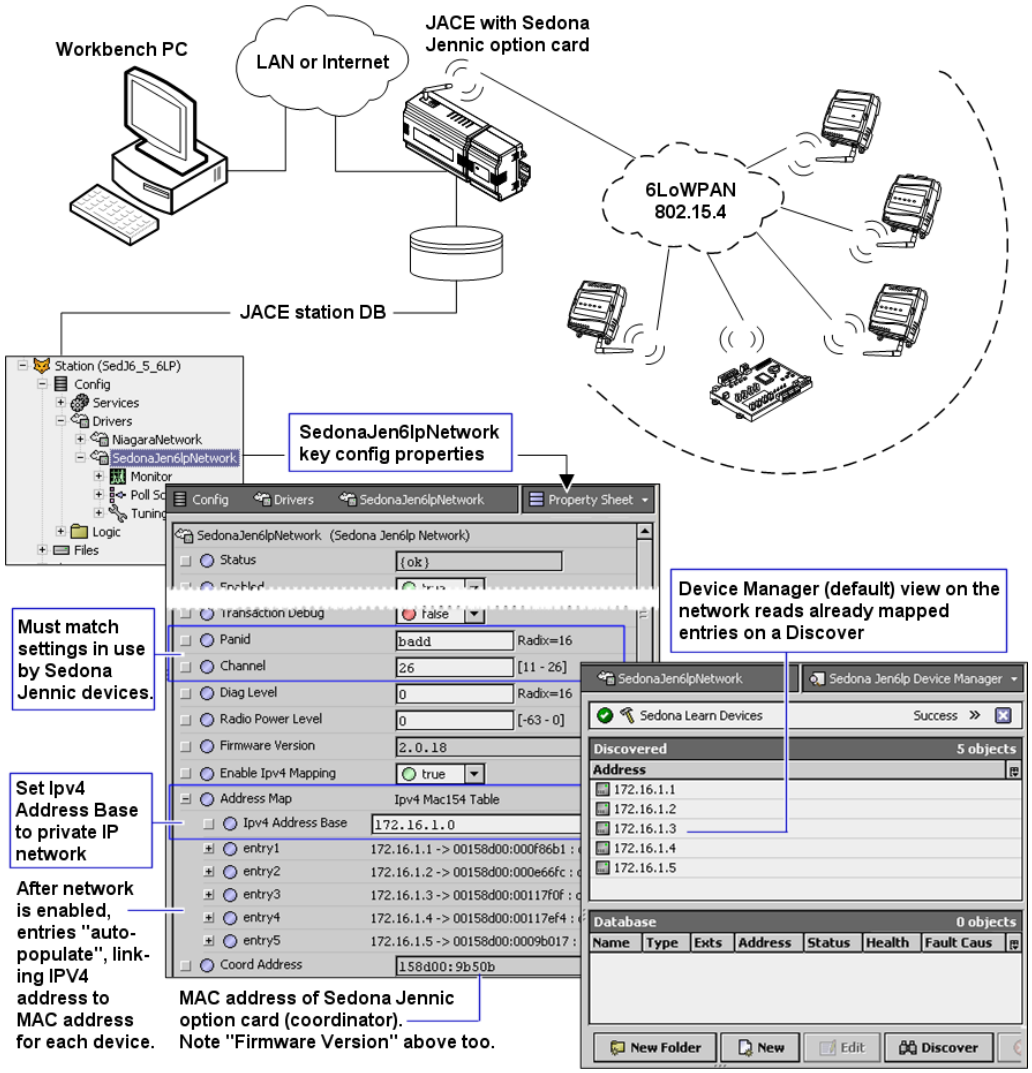
- Network integration of Jennic-based devices (and proxy points)
- Sox tunneling through station for native Sedona configuration

Also see "Sedona Jennic option card FAQs" on page 4, and also "Related documentation" on page 4.

Network integration of Jennic-based devices (and proxy points)

As the "coordinator" node, the Sedona Jennic-equipped JACE supports a *network* of wireless Jennic-based devices. Station integration requires a "SedonaJen6lpNetwork", where you set its properties PanId and Channel to match the equivalent properties in the installed devices (App:service:plat).

Figure 1 *SedonaJen6lpNetwork has properties related directly to Sedona Jennic option card*



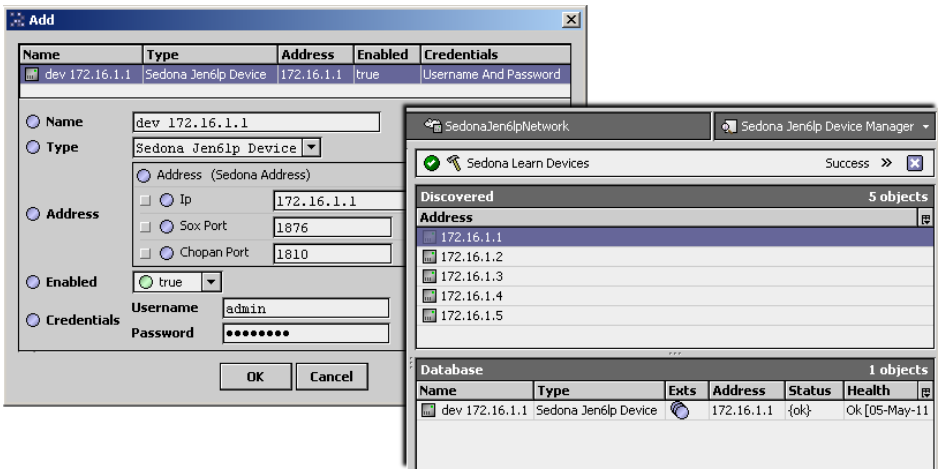
In the configuration of the SedonaJen6lpNetwork, you also specify an IPV4 address base to use for mapping the Jennic-based device into the station—this must be an unused "private IP subnet" using either a Class A, B, or C formatted IP address. *It cannot be the same IP subnet used by the* JACE.

If properly configured, when you enable the SedonaJen6lpNetwork, the JACE coordinator automatically broadcasts a message that results in responses back from the Jennic-based devices. Corresponding entries in the network's "Address Map" table auto-populate, where for each Jennic-based node a unique IPV4 address is associated for that device (listed by its unique 64-bit MAC address).

In the default "Sedona Jen6lp Device Manager" view of the network, a "Discover" simply shows the IPV4 addresses of the existing address map entries, as shown in Figure 1 above.

You add discovered devices to the SedonaJen6lpNetwork, using the **Add** dialog. Device type is always Sedona Jen6lp Device, with address entries typically left at default, as shown in Figure 2 below.

Figure 2 *Add dialog in Sedona Jen6lp Device Manager with defaults shown*



Often at first you leave device Names at the default "`dev IP address`", until you can associate each component with a specific physical device. Then you can rename with more meaningful text.

Device components each have a points extension in which you can discover Sedona Framework components, and select child properties and actions to model as NiagaraAX proxy points.

Sox tunneling through station for native Sedona configuration

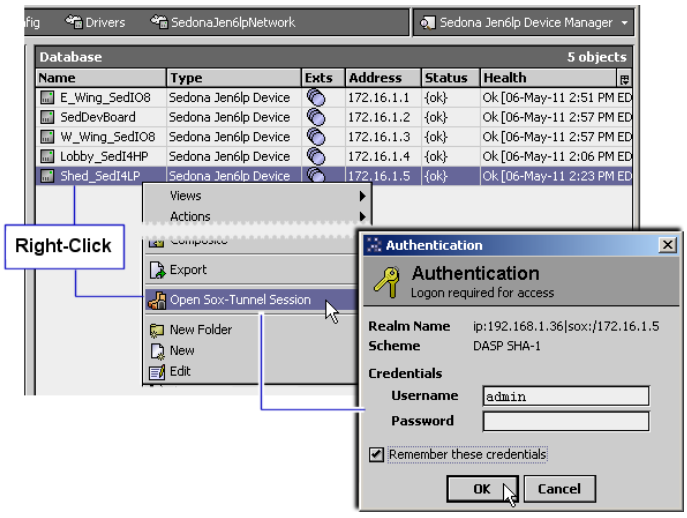
Note: *Starting in Sedona TXS-1.2 with AX-3.7 and later, the importance of Sox tunneling has diminished in favor of the* **`Sox Gateway`** *and* **`Sedona Tools`** *now available under each networked Sedona device. However, in some cases Sox tunneling may still be a desired method to open a networked device.*

For related details, see the Sedona Framework TXS 1.2 Networks Guide *sections "Sox Gateway" and "Sedona device 'tools' views", as well as the* Sedona Framework TXS Sedona Tools Guide.

Provided that the JACE's license has the `tunneling` feature, with its attribute "`sox="true"`", and it has the **`SoxTunnel`** component (from the **`nsedona`** module) copied into the station's Services container, you can use Workbench to "tunnel" through the JACE to open Sox connections to devices in its network. Once Sox-connected to a device, you can make Sedona Framework app configuration changes, or use any of the Sedona Tools (Application Manager, Backup/Restore Tool, Kit Manager).

Figure 3 below shows the right-click "Open Sox Tunnel Session" menu option on a Jen6lp device, and the resulting authentication popup dialog.

Figure 3 *Sox tunneling as right-click option on SedonaJen6lpDevice*



When sox tunneled to a Jen6lp device, you can use Sox Tools or work in its app, as shown in Figure 4.

Figure 4 *Sox tunnel session through JACE to wireless Jennic-based device*

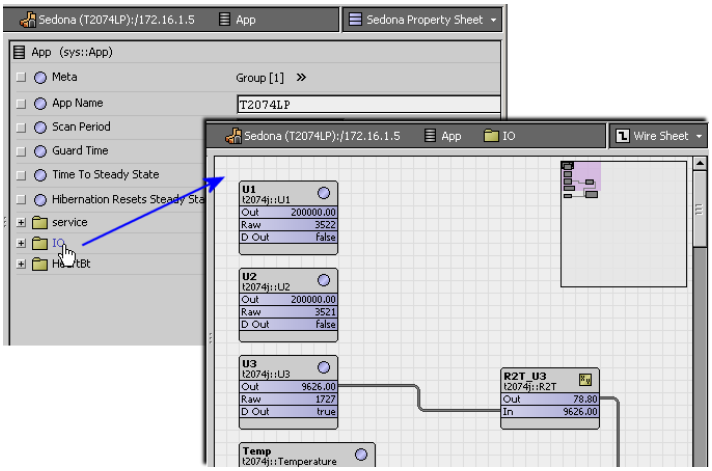


Figure 4 shows the wire sheet view of a folder in the Sedona Framework app, with components that have shapes and behavior that are similar to NiagaraAX components. As when working in the station database, when working in a Sedona Framework app you must explicitly save changes, to write to the device's Flash memory. Otherwise, RAM-resident changes are lost on the next device restart/reboot.

For Sox tunneling details, see the *Sedona Framework Sox Tunneling - Engineering Notes* document.

Sedona Jennic option card FAQs

The following are some frequently asked questions (FAQs) about the Sedona Jennic option card.

Q: What can I do with the RS-485 port on the Sedona Jennic option card?

A: Currently, nothing. It is "future use" for support of wired Sedona Framework 6LoWPAN devices using an MS/TP link layer. Note this RS-485 port is not available to the NiagaraAX station, although it does reserve a COM port address on the JACE platform.

Q: How many Jennic-based devices are supported under an option card?

A: The maximum number of devices supported is determined by the JACE's license, in the `device.limit` attribute of its `jen6lp` feature. If more than the specified number of Jen6lp device components are added to the station, they remain in fault until deleted, or until the license is upgraded for more devices.

However, note that the `jen6lp` feature (for the SedonaJen6lpNetwork) may also limit the total number of proxy points, in the `point.limit` attribute. This point limit applies across all child devices, and may make a device limit irrelevant. For example, consider if a JACE's license has a jen6lp (feature) device limit of 25 and a point limit of 125. If 25 devices were modeled in the station with 5 proxy points each, both limits would be reached with good results. However, if each device was modeled in the station with 8 proxy points, any proxy points added after the 125 point limit would remain in fault.

Q: Are two Sedona Jennic option cards supported in a JACE, say for two different Jen6lp networks?

A: No—currently only one Sedona Jennic option card is supported; therefore its station may have only one SedonaJen6lpNetwork. However, if licensed for Ethernet-based Sedona Framework devices (feature: `sedonanet`), its station can use an additional SedonaNetwork to integrate these type of devices. Note this network has separate license limits for the maximum number of devices and proxy points.

Related documentation

The following documents provide more details related to Sedona Framework TXS and NiagaraAX:

- *NiagaraAX Sedona Framework TXS Networks Guide*
- *NiagaraAX Sedona Installer Guide*
- *Sedona Framework Sox Tunneling - Engineering Notes*
- *Sedona Framework Manifest Manager - Engineering Notes*
- *Sedona Framework TXS Sedona Tools Guide* (if Sedona TXS-1.2)
- *Sedona Framework Sox Tools Guide* (if Sedona TXS-1.1)
- *Sedona Framework Chopan Usage*
- *Jennic Network Visualization (Pan Sheet) - Engineering Notes*
- *NiagaraAX Station Migration Tool - Engineering Notes*
- *Jennic Serial Tools Guide*

Requirements

Requirements for using the Sedona Jennic option card include the following:

- A QNX-based JACE (JACE-2, -6, -7 or JACE-x02 XPR series) with an available option card slot.
- The JACE must be running AX-3.7 or later for Sedona Framework TXS 1.2, or AX-3.6 or later for Sedona Framework 1.1. It must have the `jen6lp`, `platJen6lp`, `nsedona`, and `sedonanet` modules installed using Sedona Framework TXS-enabled Niagara Workbench, using the Sedona Installer.
- The JACE's license must include the features: `jennic` and `jen6lp`. If Sox tunneling to installed Sedona devices, the JACE license must also have the `tunneling` feature, with attribute "`sox="true"`.

Adding and configuring the SedonaJen6lpNetwork

In summary, you add the **`SedonaJen6lpNetwork`** to the JACE's station. Then you configure it to specify the PAN ID (Panid) and radio channel number for the option card to use, which should match the setup of the Jennic-based wireless devices. You also specify the private IPv4 subnet (Address Base) you want for mapping Jennic-based devices from their native IPv6/6LoWPAN addresses to IPv4 addresses.

Note: *Before commissioning or installing/upgrading modules on the JACE, use the* **`Sedona Installer`** *tool in NiagaraAX Workbench to install the latest Sedona Framework TXS bundle, and restart Workbench. Refer to the* NiagaraAX Sedona Installer Guide*, which also explains how Sedona Framework features are licensed in NiagaraAX.*

Make sure the JACE has the `jen6lp` *and* `platJen6lp` *modules installed before proceeding—these modules are needed by the Sedona Jennic option card. If not installed, open a platform connection to the JACE and use the* **`Software Manager`** *to install both of these modules.*

Configuring the SedonaJen6lpNetwork

Step 1 Using Niagara Workbench enabled for Sedona Framework TXS 1.2 (AX-3.7 or later required) or TXS 1.1 (AX-3.6 or later), open the JACE station.

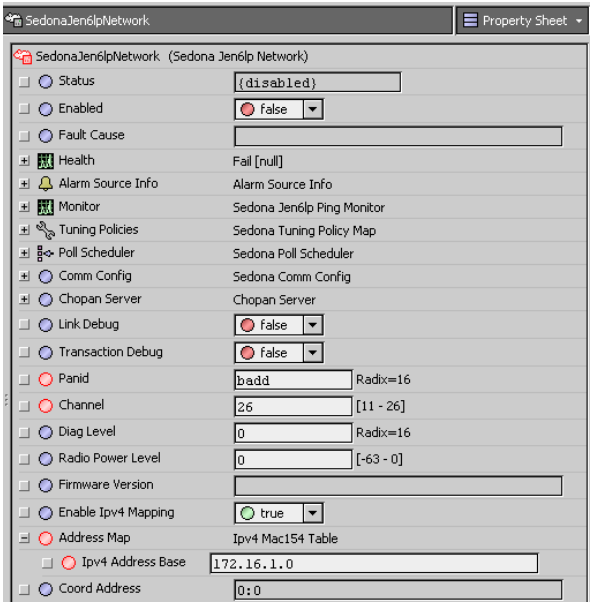
Step 2 Expand the station's **`Config`** space to see the contents of its **`Drivers`** container.
If a SedonaJen6lpNetwork is already there, go to Step 5.

Step 3 Open the **`jen6lp`** palette in your Workbench palette side bar (see "Using the palette side bar" in the *User Guide* for general details).

Step 4 From the **`jen6lp`** palette, *drag* (or copy and paste) the **`SedonaJen6lpNetwork`** into the station's **`Drivers`** container. In the popup **`Name`** dialog, simply use the default (or rename if desired).

Step 5 Open the property sheet for the **`SedonaJen6lpNetwork`**.

Figure 5 *Set desired Panid and channel for Sedona Jennic option card in JACE*



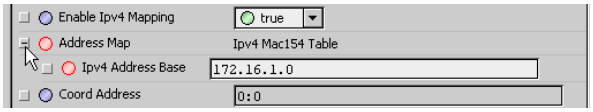
Step 6 Set the **`Panid`** and **`Channel`** used by the wireless network of Jennic-based devices. A few properties of this network are described as follows:

- **Enabled**
  Initially false (disabled). *After* configuring and saving other properties in remaining steps, you change it tor true and save, to initiate all changes.
- **Panid**
  Jennic PAN ID (Personal Area Network identifier), in hexadecimal, range 0x0000 to 0xFFFE for the network. The JACE station acts as the coordinator for this network. Panid should match the PANID in use by installed devices. For example, the default (factory) Panid for devices could be: `defa`
- **Channel**
  RF 2.4GHz channel number to use, from 11 to 26. This channel must be included in the "channel map" of installed devices.
- **Address Map**
  Container to specify the IPv4 address network "base" as well as hold entries for discovered nodes. See the next step.

(for reference information on all network properties, refer to the "SedonaJen6lpNetwork properties" section in the *NiagaraAX Sedona Framework Networks Guide*)

Step 7 Expand the **`Address Map`**.

Figure 6 *Expanded Address Map*



In the **`Ipv4 Address Base`** field, either accept the default address base network (`192.168.1.0`), or enter another private IPv4 subnet for the JACE to map discovered Jennic-based devices. This subnet must fall within the Class A, B, or C address range, as follows:

- 10.0.0.0 to 10.255.255.0 (Class A)
- 172.16.0.0 to 172.31.255.0 (Class B)
- 192.168.0.0 to 192.168.255.0 (Class C)

Note: *It is important that you assign a* different IP subnet *than the IP subnet used by the JACE. Otherwise, the JACE TCP/IP stack will be unable to route packets appropriately. Also, set the Ipv4 Address Base to an* unused subnet *for your domain. For example, if you already use a* `192.168.1.0` *subnet, you should not use the default Ipv4 Address Base. Enter a subnet not currently utilized, say* `10.10.8.0`*, or* `172.16.1.0`*.*

As new devices are discovered, they are assigned the next available IP address. The first address (`n.n.n.0`) is reserved for the coordinator.

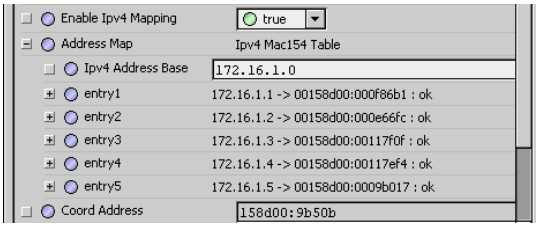
For example, with the base address at default (`192.168.1.0`), the coordinator is `192.168.1.0`, and the first device detected will be assigned `192.168.1.1`, the next device `192.168.1.2`, and so on. These devices automatically appear as dynamic entries under the service's Address Map.

Note: *These dynamic entries persist until you clear them. Note the "Clear Table" action on the Address Map clears all dynamic entries—potentially useful if you are changing your address base.*

Step 8 Save all changes made in the SedonaJen6lpNetwork property sheet.

Step 9 Make sure the **`Enable Ipv4 Mapping`** property is true, and set the network's **`Enable`** property to true, and Save again.

Figure 7 *Example Address Map entries after enabling network*



The status of the network should change from disabled to ok, and the Coord Address should change from `0:0` to an actual address (for example: `158d00:9b50b`).

Under the Address Map in the property sheet, entries should begin to populate under the Ipv4 Address Base, similar to shown in Figure 7. Within a minute or two, all address map entries should be complete.

Note: *In the future, after changing any of the following network properties, you must* disable then re-enable the SedonaJen6lpNetwork *(or else restart the station) for them to be effective:*

- Panid
- Channel
- Radio Power Level

Adding discovered SedonaJen6lpDevices

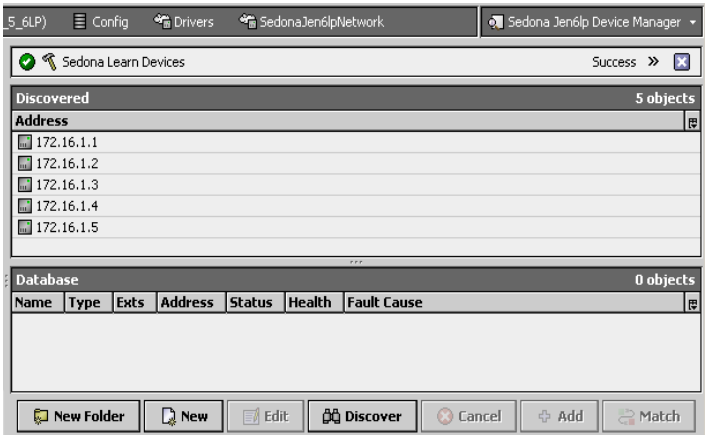
In summary, you use the **Discover** feature of the network's default **Sedona Jen6lp Device Manager** view to add devices already detected when you enabled the SedonaJen6lpNetwork.

Adding discovered Jennic-based devices

Do this after adding and configuring the SedonaJen6lpNetwork (see "Adding and configuring the SedonaJen6lpNetwork" on page 5).

Step 1 Double-click the SedonaJen6lpNetwork for its default Device Manager view, and click the **Discover** button. A "Sedona Learn Devices" job quickly runs, and shows discovered devices in the top pane.

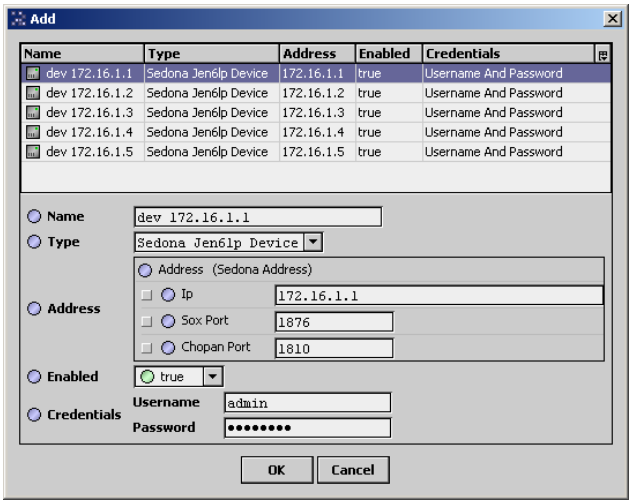
Figure 8 *Example discovered Jennic-based Sedona devices*



(Or, optional) Use the **New Folder** feature to make one or more device folders, each with its own device manager view—a common NiagaraAX driver feature that allows you to "group" devices. You can then perform a **Discover** from the device manager view of each device folder.

Step 2 Click to select one or more discovered devices, then click the **Add** button. Figure 7 shows the **Add** dialog.

Figure 9 *Example Add dialog when adding multiple devices, all with default entries*



Often properties can be left at defaults, including (initially) Name. After adding devices to the database you can rename devices with more meaningful text. See "Renaming SedonaJen6lpDevices".

Step 3 Click **OK** to add devices to the database.

Figure 10 *Example added Jennic-based devices with default names*

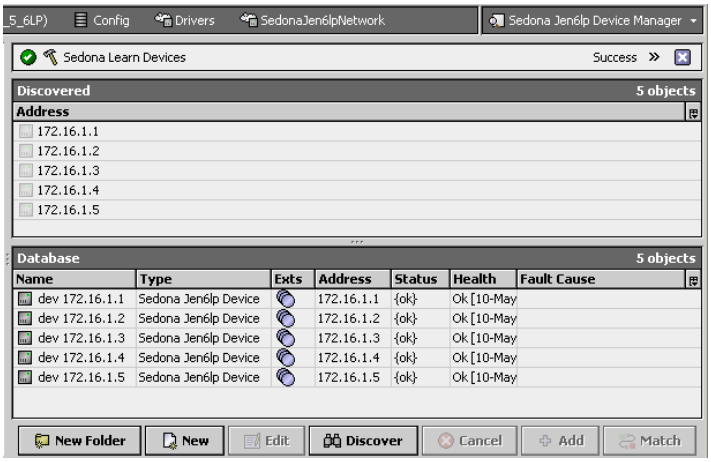


Figure 10 shows all discovered devices added to the station database using default names. Typically now you rename all the SedonaJen6lpDevice components.

Renaming SedonaJen6lpDevices

Do this after adding discovered devices (see "Adding discovered SedonaJen6lpDevices" on page 7). Rename each device component according to its purpose and location. Note that Jennic-based devices are initially mapped into the network's specified IPv4 Address Base (subnet) in an undefined order—e.g. you cannot "pre-specify" in the Sedona Framework app of a device for it to be "device 1" or "device 2" on a network.

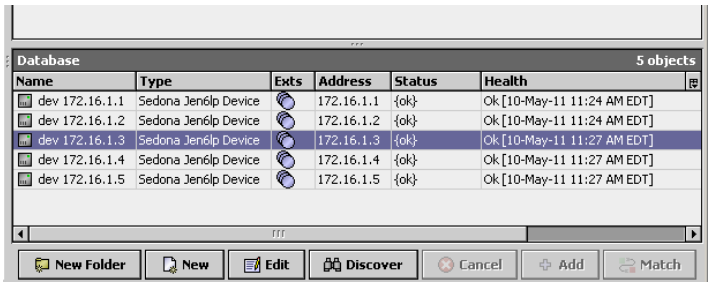
To force an order, you *could* power on only *one* Jennic-based device at a time, add it in the station, and then rename the device component as known appropriate. Apart from that, there are a couple of possible ways to make the association between an added Jen6lp device component and a specific Jennic-based device:

- Service pin method
- Match address map entries to recorded MAC addresses

Service pin method

If the device's Sedona Framework app supports it, a "service pin" can be invoked from the physical device. For example, this may be possible from a pushbutton on the device. If supported, the device row entry for it in the device manager's database table becomes highlighted (Figure 11).

Figure 11 *Device component can be "highlighted" if the device's app implements "service pin" routine*



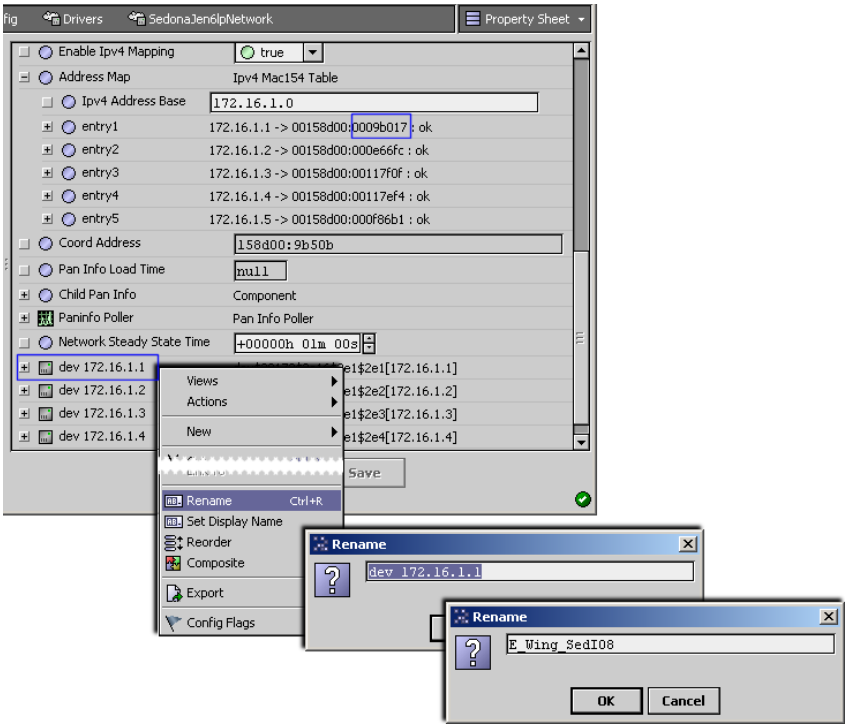
This can be useful to make a positive identification from that device.

Match address map entries to recorded MAC addresses

As you physically install the Jennic-based devices, make careful note of each one's unique MAC address (this appears on a label on each device), recording the last four bytes (8 characters) of its 64-bit address. For example, if installing a device with MAC address `00158d00:00117f0f`, record it as `0017f0f` in a list.

Compare your recorded list of devices against the SedonaJen6lpNetwork's "Address Map" entries (in the network's property sheet, expand the Address Map and note the mapped IPV4 addresses to device MAC addresses). See Figure 12.

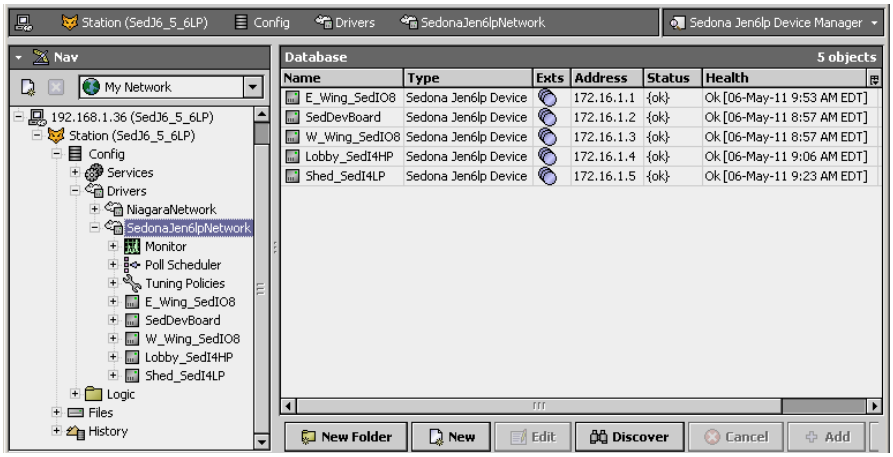
Figure 12 *MAC address of Address Map entries used against recorded list, to help device renaming*



As shown in Figure 12, in the network's property sheet, below the Address Map area, you can right-click on each child device component, and rename it according to your notes. This method always works, however it requires you to note and record MAC address endings of installed devices.

Figure 13 below shows five Jen6lp devices added and renamed in the station.

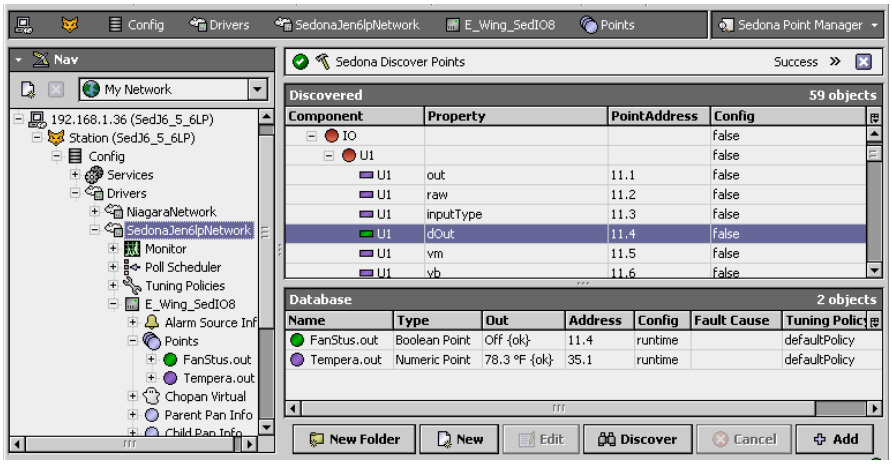
Figure 13 *Five example Jen6lp devices added and renamed in station*



Continue working with devices and points

Once a SedonaJen6lpDevice is added to the database, you can access its Points Manager (double-click its **Exts** icon). Figure 14 shows the Sedona Points Manager, with two proxy points added to the station.

Figure 14 *Added proxy points following a Discover in the Points Manager*



For more details, refer to "About Sedona proxy points" in the *NiagaraAX Sedona Framework Networks Guide*. In addition, there are special properties and views that apply to the SedonaJen6lpNetwork.

If hibernating devices exist, usage should be made of the "CHoPAN" protocol (Compressed HTTP Over PAN, or more simply "Chopan"), modeled within the SedonaJen6lpNetwork using a client/server architecture. For more details, refer to the section "About Jennic-based devices" in the *NiagaraAX Sedona Framework Networks Guide*, as well as the document *Sedona Framework Chopan Usage*.

Note: *At the time of this document, Sedona Framework support for hibernating devices (typically battery powered devices) is not widely available. However, the SedonaJen6lpNetwork driver in the NiagaraAX station is "ready" for such device support if this changes.*

About option card firmware

The Sedona Jennic option card requires firmware compatible with the release of NiagaraAX modules for Sedona Framework TXS—starting in AX-3.6, this firmware image is included in the `platJen6lp` module. In a station with a SedonaJen6lpNetwork, the option card's installed firmware level is available as a read-only property of the network, for example: Firmware Version `2.0.21`.

Option card firmware is automatically installed the *first time* a station starts up with a new `platJen6lp` module. Typically this *adds about 30 seconds* to the station startup process.

Caution *Do not remove power to the JACE during this initial station startup process, for example following an upgrade of software that includes the* `platJen6lp` *module. Otherwise, it could be possible for the option card to lose important data and become inoperable.*

Document change log

Updates (changes/additions) to this engineering notes *Using the Sedona Jennic option card* document are listed below.

- Updated: January 23, 2013
  Minor changes to mention Sedona TXS 1.2 (requiring AX-3.7 or later), noting the reduced importance of Sox tunneling (networked devices have a "Sox Gateway" and "Sedona Tools"). Note that screen captures were not updated to reflect a station running AX-3.7 with Sedona TXS 1.2 modules; however, all concepts and procedures in this document still apply. For TXS-1.2 related details on a SedonaJen6lpNetwork, see the *NiagaraAX Sedona Framework TXS 1.2 Networks Guide*.
- Updated: November 9, 2011
  Completely revised entire document to reflect the current NiagaraAX "SedonaJen6lpNetwork" station interface to the Sedona Jennic option card. NiagaraAX-3.6 or later is required, with Niagara Workbench enabled for Sedona TXS 1.1 using the Sedona Installer tool.
- Published: March 5, 2010
  Initial document describing the now-deprecated "Jennic6LowpanBridgeService" as the NiagaraAX station interface to the Sedona Jennic option card.