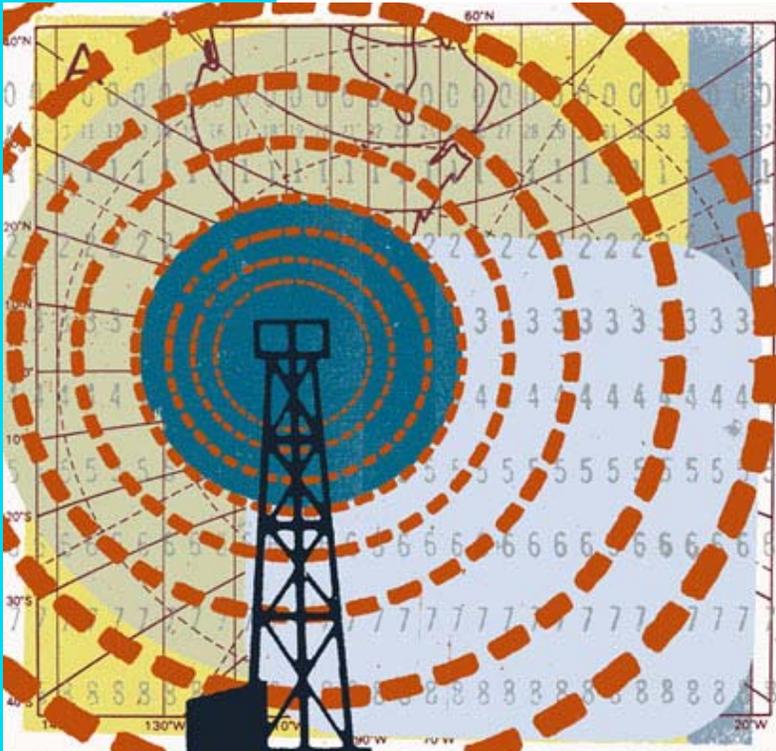


Getting Started with Automatic Provisioning



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SkyPilot Firmware 1.4

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About This Guide

This guide provides a quick-start introduction to the automatic provisioning of a SkyPilot™ network. It includes an overview of provisioning, a list of tasks required for setting up automatic provisioning, and tutorials for common provisioning scenarios.

This chapter explains the audience and purpose of this guide and how it's organized.

Chapter Highlights

- Audience and purpose
- How this guide is organized

Audience and Purpose

This guide is intended for administrators who are responsible for managing a SkyPilot network. It explains the role of automatic provisioning in network maintenance, and documents common automatic provisioning procedures such as creating node profiles and loading software images.

This guide assumes administrator-level knowledge of IP networks and basic knowledge of wireless networking. It also assumes that SkyPilot devices have already been successfully installed according to the procedures in their installation guides. (Complete SkyPilot documentation is available from SkyPilot customer support at www.skypilot.com/support/.)

How This Guide Is Organized

- Chapter 1, “Introduction,” introduces the concept of automatic provisioning, describes the components of the provisioning server, and lists the tasks you must perform to set up automatic provisioning on your SkyPilot network
- Chapter 2, “Common Scenarios,” provides tutorials that walk you through the two most common scenarios for automatic provisioning of a SkyPilot network.

Introduction

This chapter introduces the SkyPilot network provisioning modes and then, focusing on automatic provisioning, describes its hardware and software components and discusses planning for automatic provisioning.

Chapter Highlights

- SkyPilot network provisioning modes
- Overview of automatic provisioning
- Network components
- Planning for automatic provisioning

SkyPilot Provisioning Modes

Provisioning is the process by which SkyPilot network devices are configured for service and authorized for customer use. Administrators of a SkyPilot network can choose between two provisioning modes: manual and automatic.

With manual provisioning, each device is individually configured with the minimum settings it needs to make a wireless link. Manual provisioning is a good choice for test networks or the rollout of a small-scale installation that's not expected to expand. It does not require an EMS server for device configuration.

Better suited for large-scale service rollouts, automatic provisioning allows unattended configuration of SkyPilot devices from EMS server software running on a Linux-based server at your network operations center (NOC). Although

automatic provisioning requires more initial setup time than manual provisioning, it greatly simplifies the administration of a large, dynamic network.

When a SkyPilot device is set up for automatic provisioning, it is able to authenticate itself on the network and download the appropriate configuration file containing customer-specific settings, such as Quality of Service (QoS) rate limits.

NOTE Although device provisioning is independent of end-user provisioning, it can assist end-user provisioning by serving IP addresses via DHCP to user devices such as PCs and home routers.

The Provisioning Server

Automatic provisioning is performed by SkyPilot EMS server software running on a Linux-based server. SkyPilot EMS software includes these software components:

- **SkyProvision™**—A server-based application that automates device provisioning by enabling devices to get their configuration information from the SkyPilot EMS server. SkyProvision is also used for updating network node firmware and for setting device and system configuration options. Administrators can access SkyProvision through an EMS Java client or via a Web browser, such as Internet Explorer or Mozilla Firefox.
- **SkyControl™**—An SNMP management system for monitoring and managing SkyPilot devices in real time. The software provides a graphical view of your network topology with at-a-glance updates on topology, routing, and performance. Administrators can access SkyControl via the EMS Java client or a plug-in for Google Earth.
- **Third-party applications**—Provided as part of the SkyPilot EMS server installation. The server package includes open-source versions of FTP, HTTP, and DHCP servers plus an open-source database for storing device configuration information.

How Automatic Provisioning Works

To enable automatic provisioning, an administrator uses SkyProvision to create node profiles—sets of operating parameters—and assigns devices to the profiles.

Profiles are stored in a server database and retrieved by devices upon completion of startup (for SkyGateway™) or the formation of links (for SkyExtender™ and SkyConnector™).

Once a device receives its configuration information from the server, it is available to participate in the SkyPilot network.

Node profiles streamline network administration by allowing application of a single configuration to large numbers of nodes. Instead of having to update configurations on each individual node, you simply update the profile and let the provisioning server do the rest of the work, automatically sending a new profile to every device that's been assigned to that profile.

Figures 1 and 2 present a high-level view of the automatic provisioning process on a SkyPilot wireless mesh network.

Figure 1. Automatic provisioning process, stages 1 and 2

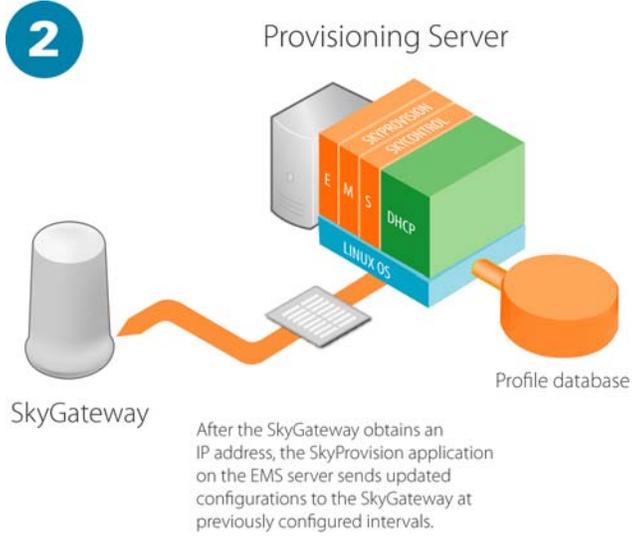
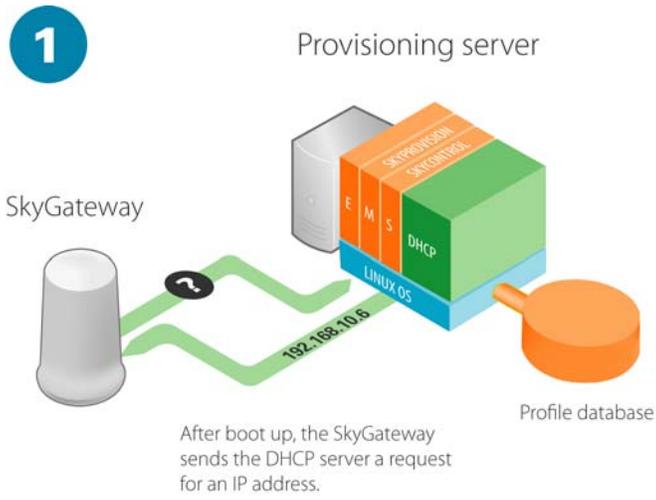
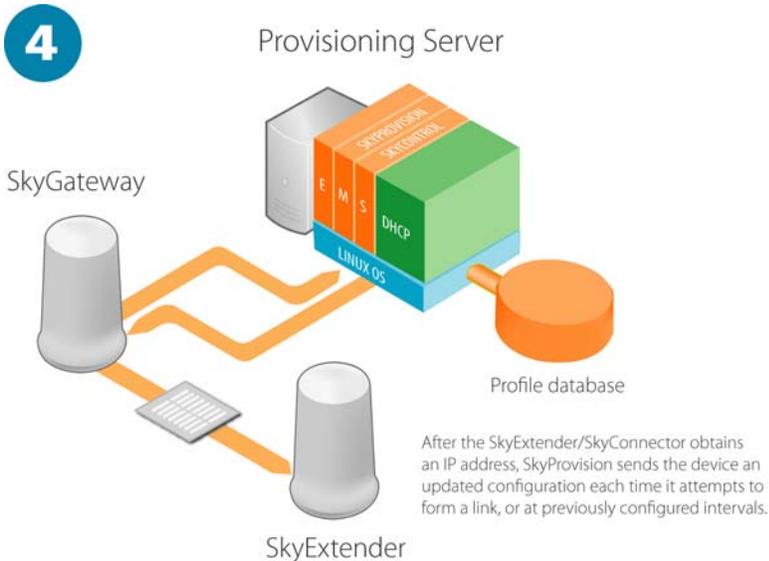
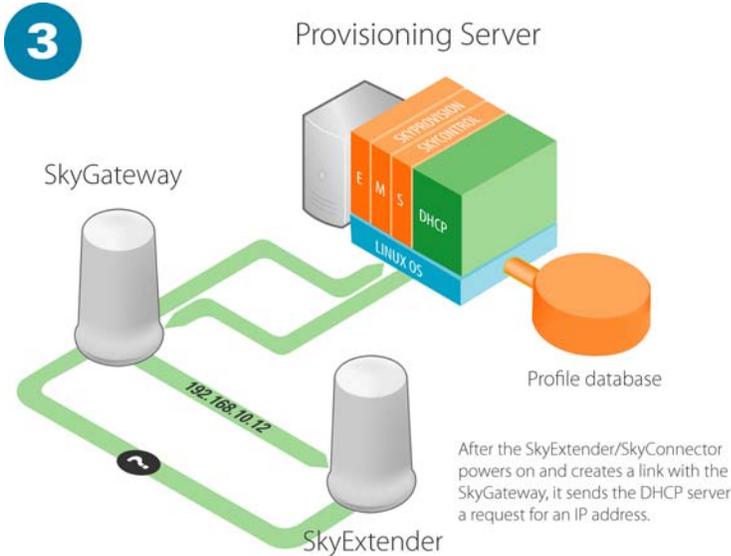


Figure 2. Automatic provisioning process, stages 3 and 4



Common Scenarios

This chapter provides tutorials in the form of two typical scenarios that easily map to your own network, greatly simplifying the process of automatic configuration

In preparation for the scenarios, the chapter provides instructions for setting up simple SkyPilot networks for automatic provisioning and an overview of setting up the provisioning server for distributing configurations and authenticating devices. It includes a list of tasks required for setting up the provisioning server and the SkyPilot network devices it will provision.

Chapter Highlights

- Preparing network devices
- Setting up the provisioning server
- Scenario tutorials guiding you through the process of automatic provisioning

About the Scenarios

The two scenarios that follow give you hands-on experience in setting up automatic provisioning for basic SkyPilot networks.

Scenario 1 walks you through the process of setting up automatic provisioning for a baseline SkyPilot network consisting of a SkyGateway and a SkyConnector.

Scenario 2 extends the original scenario with step-by-step instructions for setting up automatic provisioning for a SkyExtender DualBand that provides subscribers with Wi-Fi access via an access point housed in the device.

The scenarios are designed to give you the basic building blocks of automatic provisioning, which you can then apply to your own network.

Preparing for the Scenarios

Before you can perform the scenarios, you need to set up your network devices: the provisioning server and the SkyPilot network nodes that will receive the configurations.

Table 1 lists the tasks you must perform (in the order shown) before starting the scenarios. It provides pointers to SkyPilot documentation that gives more detailed instructions about each item. Current documentation is available from SkyPilot customer support at www.skypilot.com/support/.

Table 1. Requirements for Automatic Provisioning Scenarios

Task	See also
Install a Red Hat Linux operating system on the server you will use to provision SkyPilot network devices.	<i>SkyPilot OS Installation: Red Hat 9 or SkyPilot OS Installation: Red Hat Enterprise</i>
Install SkyPilot EMS software, including SkyProvision and SkyControl, on the server running Linux.	<i>SkyPilot EMS Installation</i>
Configure and enable the DHCP server to distribute IP addresses to SkyPilot devices.	www.skypilot.com/support/
Download the latest device firmware to the <code>/var/ftp/pub/images</code> directory on the provisioning server.	www.skypilot.com/support/
Set up and power on the SkyPilot devices you'll be using in the scenarios: SkyGateway, SkyConnector, and SkyExtender DualBand.	The appropriate physical installation guide

Scenario 1: Automatic Provisioning of a Basic SkyPilot Network

This first scenario walks you through the procedure of setting up automatic provisioning for the most basic SkyPilot wireless network: a SkyGateway and a SkyConnector (Outdoor).

It provides instructions for adding the devices to a DHCP configuration file and then tells you how to use SkyProvision to create a configuration profile to which network devices can be assigned

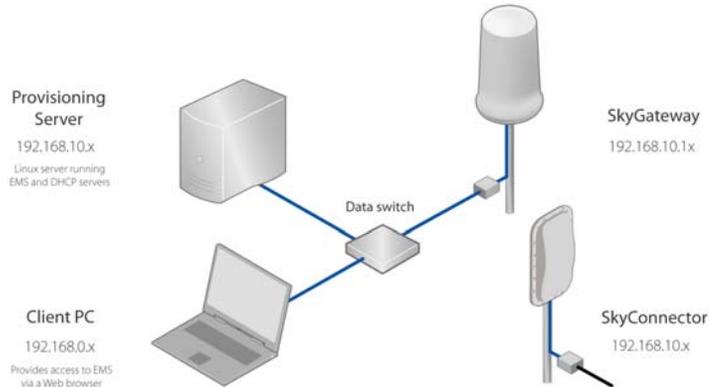
What You Need

To successfully complete the scenario, you need the following:

- A provisioning server on which Red Hat Linux and EMS server software are installed and running.
- A SkyPilot SkyGateway and SkyPilot SkyConnector, set up and powered on.
- MAC addresses for the SkyPilot equipment you'll be setting up for automatic provisioning.
- A DHCP configuration file. (You can download a sample file from SkyPilot customer support at www.skypilot.com/support/.)
- A Web browser running on a PC or notebook with network access to the provisioning server.

The figure below shows the device configuration you'll need in order to perform the scenario.

Figure 3. Device setup for Scenario 1



Part 1: Adding the Devices to the DHCP Configuration File

To permit automatic assignment of IP addresses to SkyPilot devices, you'll add the devices to your DHCP server configuration through edits to the DHCP configuration file.

To add the devices to the DHCP server configuration:

- 1 Connect to the DHCP server using an SSH client, and log in as `root`.
- 2 Using a text editor such as `vi`, open the DHCP configuration file, `dhcpd.conf` (typically located in the `/etc` directory).
- 3 Using the existing entries as a model, add host entries for the devices you're installing and set up general IP addressing parameters.

Your entries must be enclosed in the main subnet declaration where the TFTP, HTTP, and NTP server addresses are defined; otherwise, it will not include (inherit) the required server addresses.

File entries will look similar to the following:

```
host cpe0135 {  
    hardware ethernet 00:0A:DB:00:01:35;  
    fixed-address 192.168.6.118;  
    option host-name "cpe0135";  
}
```

Tables 2 and 3 provide a guide to the statements and options you need to modify in the DHCP configuration file.

Table 2. Modifying Server and Subnet Entries in the DHCP Configuration File

Action	Edits in the DHCP configuration file (bold)
Server name— Change to the IP address of the Linux server.	<pre>ddns-update-style ad-hoc; default-lease-time 172800; max-lease-time 345600; server-name "192.168.5.4" omapi-port 7911; authoritative;</pre>
Network information—Add your own network IP address, subnet mask, broadcast address, FTP address, and EMS server IP address.	<pre>shared-network SkyPilot { subnet 192.168.5.0 netmask 255.255.255.0 { range 216.15.3.3 216.15.3.254 option subnet-mask 255.255.255.0; option broadcast-address 192.168.5.255; option routers 192.168.5.1; option tftp-server-name "192.168.5.4"; option www-server 192.168.5.4;</pre>
Dynamic range— Delete. No dynamic range is required.	<pre>subnet 216.15.3.0 netmask 255.255.255.0 { range 216.15.3.3 216.15.3.254 option subnet-mask 255.255.255.0; option broadcast-address 216.15.3.255; option routers 216.15.3.1; option domain-name-servers 66.81.32.11, 66.81.32.12;}</pre>
Subnet mask— Change to the subnet mask of your Linux server.	<pre>subnet 216.15.3.0 netmask 255.255.255.0 { option subnet-mask 255.255.255.0; option broadcast-address 216.15.3.255; option routers 216.15.3.1; option domain-name-servers 66.81.32.11, 66.81.32.12;}</pre>
Broadcast address— Change to the broadcast address of your server.	<pre>subnet 216.15.3.0 netmask 255.255.255.0 { option subnet-mask 255.255.255.0; option broadcast-address 191.168.10.255; option routers 216.15.3.1; option domain-name-servers 66.81.32.11, 66.81.32.12;}</pre>

<p>Router—Change to the address of the network’s default gateway.</p>	<pre> subnet 216.15.3.0 netmask 255.255.255.0 { option subnet-mask 255.255.255.0; option broadcast-address 191.168.10.255; option routers 192.168.10.254; option domain-name-servers 66.81.32.11, 66.81.32.12;} </pre>
<p>Domain name servers—Delete. SkyPilot devices do not use DNS.</p>	<pre> subnet 216.15.3.0 netmask 255.255.255.0 { option subnet-mask 255.255.255.0; option broadcast-address 191.168.10.255; option routers 192.168.10.254; option domain-name-servers 66.81.32.11, 66.81.32.12;} </pre>
<p>NTP server—Change to the address of your NTP server.</p>	<pre> subnet 216.15.3.0 netmask 255.255.255.0 {option subnet-mask 255.255.255.0; option broadcast-address 191.168.10.255; option routers 192.168.10.254; option ntp-servers 198.123.30.132; option tftp-server-name "192.123.30.132"; option www-server 192.168.5.4; option domain-name "skypilot.com"; </pre>
<p>FTP server—Change to the IP address of your Linux server.</p>	<pre> subnet 216.15.3.0 netmask 255.255.255.0 { option subnet-mask 255.255.255.0; option broadcast-address 191.168.10.255; option routers 192.168.10.254; option tftp-server-name "192.168.10.x"; option www-server 192.168.5.4; option domain-name "skypilot.com"; </pre>
<p>Web server—Change to the IP address of your Linux server.</p>	<pre> subnet 216.15.3.0 netmask 255.255.255.0 { option subnet-mask 255.255.255.0; option broadcast-address 191.168.10.255; option routers 192.168.10.254; option tftp-server-name "192.168.10.x"; option www-server 192.168.10.x; option domain-name "skypilot.com"; </pre>
<p>Domain name—Delete. This option is not required.</p>	<pre> subnet 216.15.3.0 netmask 255.255.255.0 { option subnet-mask 255.255.255.0; option broadcast-address 191.168.10.255; option routers 192.168.10.254; option tftp-server-name "192.168.10.x"; option www-server 192.168.10.x; option domain-name "skypilot.com"; </pre>

Table 3. Modifying SkyGateway Host Statements in the DHCP Configuration File

Action	Edits in the DHCP configuration file (bold)
Hardware Ethernet address— Change to the MAC address of the SkyGateway.	<pre>host Gateway { hardware ethernet 00:0A:DB:01:08:A0; fixed-address 192.164.4.50; option host-name "Gateway";</pre>
IP address—Change to the IP address of the SkyGateway.	<pre>host Gateway { hardware ethernet 00:0a:db:01:08:a0; fixed-address 192.168.5.20; option host-name "Gateway";</pre>
Host name—Optionally change to a descriptive name.	<pre>host Gateway { hardware ethernet 00:0a:db:01:08:a0; fixed-address 192.168.5.20; option host-name "SG-01";</pre>

- 4 Repeat the host statement edits for the SkyConnector.

Confirm that you've supplied the correct addresses, added a semicolon (;) at the end of each line, and used an equal number of braces—that is, { and } characters—for each section.

- 5 Save your changes and close the file.

- 6 Refresh the DHCP server by entering the following command:

```
skypilot_dhcp_refresh
```

The response should look similar to this:

```
Shutting down dhcpd: [ OK ]  
Starting dhcpd: [ OK ]
```

If the refresh fails, look at the error description and edit the file again. Go to line number in the error description and look for missing or incorrect characters. In most cases, a missing semicolon or brace is the cause of the error.

- 7 Verify that the DHCP server restarts successfully.

You should see OK in the command output (as shown in the preceding step), and you can monitor the startup messages (by using the `tail -f /var/log/messages` command) and watch for the `Start up of dhcpd successful` message.

Part 2: Creating Node Profiles in SkyProvision

In this part of the scenario, you'll set up a base configuration for automatic provisioning of devices. It will include domains, software maintenance records, node profiles, and node records.

Logging In to the EMS Web Client

To use the EMS Web client to provision SkyPilot devices, you must be able to access the EMS server via a Web browser. In addition to the IP address of the EMS server, you'll need a user name and password.

To log in to the EMS Web client:

- 1 Open a Web browser and enter the URL for the SkyPilot EMS server login page: the server's IP address or host name, preceded by `http://` (for example, `http://192.168.1.228`).

The Web client displays a login screen.

Figure 4. EMS Web client login screen



- 2 Enter the user name and password. Both the default user name and the default password are `admin`.
- 3 Click **Sign in**.

The Web client displays its Welcome screen.

On the left, you'll see a navigation pane displaying a hierarchical menu tree for navigating SkyProvision.

NOTE After 30 minutes of inactivity, the EMS Web client session expires. If the session expires, you'll have to log in again to continue using SkyProvision.

Creating a Domain

Your first task is to create a domain for SkyPilot network nodes. This domain must match the domain that's broadcast by the SkyGateway; otherwise, your nodes will be unable to connect to the network.

To create a new domain:

- 1 Expand the SkyProvision tree in the navigation pane and click **Domain**.
SkyProvision displays the Domain screen
- 2 Click **New** to display the New Domain screen.

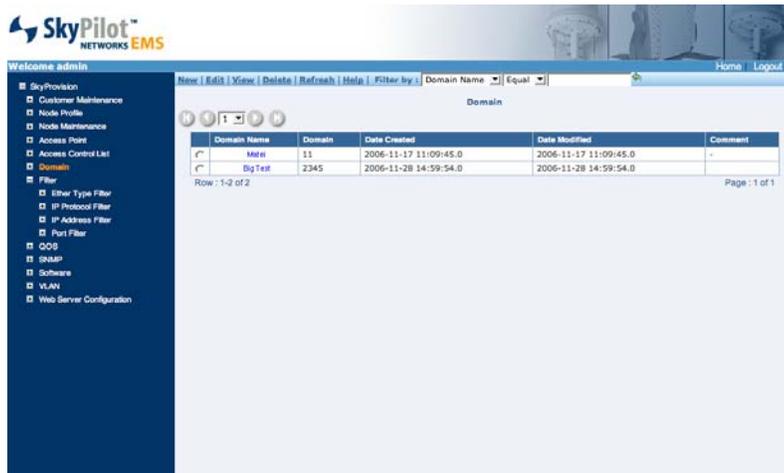
Figure 5. New Domain screen

The screenshot shows the SkyPilot Networks web interface. On the left is a navigation pane with a tree structure. The 'Domain' option is selected. The main content area is titled 'Domain - New' and contains a form with the following fields: 'Domain Name *', 'Domain #', and 'Comments'. A red asterisk is next to the 'Domain #' field. Below the form, a red note states 'Fields marked with an asterisk * are required.' At the bottom right of the form are 'Save' and 'Cancel' buttons. The top of the page shows the SkyPilot logo and 'Welcome admin'.

- 3 Enter domain information.
Provide a domain name and domain number (any whole number between 1 and 10000).

- 4 Click **Save**.
The Domain screen appears again and now lists the new domain, as shown in the example in Figure 6.

Figure 6. Domain screen



Retrieving Software Images

An important task in automatic provisioning is the maintenance of up-to-date software images for each SkyPilot device.

For automatically provisioned devices, you use SkyProvision's Software Maintenance screen to browse and select software images from the FTP repository, and then assign the image to a node profile. (You can schedule future software updates by using the Software Schedule screen in SkyProvision.)

- 1 Expand the Software tree under SkyProvision in the navigation pane and click **Software Maintenance**.

The Software Maintenance screen appears, listing the software images that are currently available for assignment to node profiles (as shown in the example in the figure below).

Figure 7. Software Maintenance screen

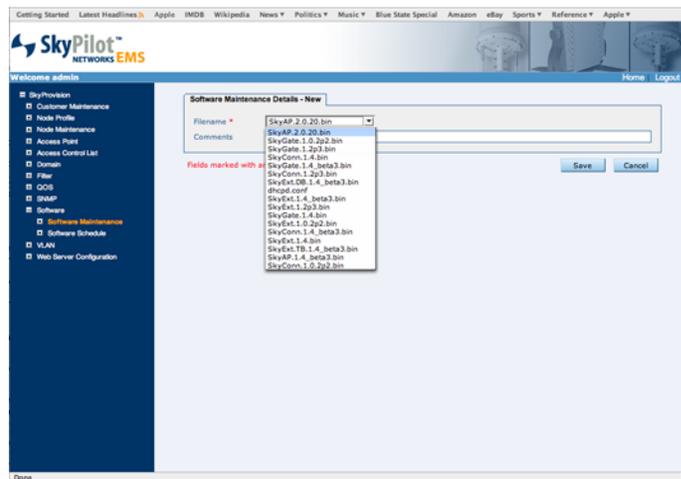


If no images are listed, you need to add them to the list by selecting images stored on the EMS server.

- 2 Click the **Filename** pull-down menu to view the list of available software images stored in `/var/ftp/pub/images`.

Figure 8 shows an example.

Figure 8. Software Maintenance Details screen



- 3 Choose the SkyGateway software image you want to apply to the SkyGateway and click **Save**.

The image you choose appears on the Software Maintenance screen, as shown in Figure 9, and is available for assignment to a node profile.

Figure 9. Software Maintenance screen



- 4 Repeat step 3 for each type of SkyPilot device, choosing the most recent software image available in the menu.

Creating Node Profiles

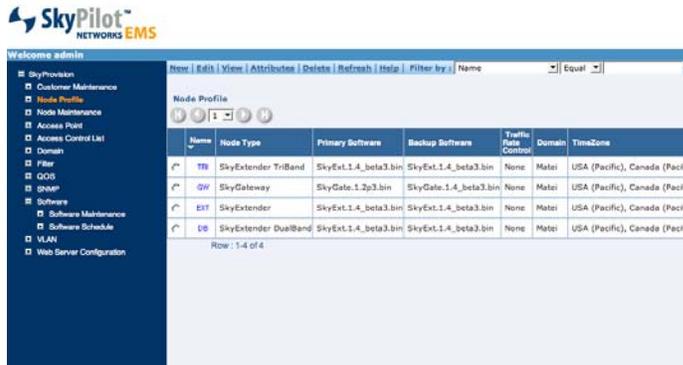
Node profiles are collections of settings that define the operating parameters of a SkyPilot network node. After creating a node profile, you can use SkyProvision to apply it to multiple nodes, greatly simplifying the initial configuration of devices and subsequent updates.

For example, you could create a node profile named Peninsula Connector that includes settings common to all SkyConnectors in a particular geographic area. When you need to configure a SkyConnector for a new subscriber in that same area, you simply assign the device to the Peninsula Connector profile and it will be provisioned automatically when it comes on line.

Later on, when you change a parameter (for example, QoS) you only have to make the change to the Peninsula Connector node profile; SkyProvision does the rest, updating the device configuration on every SkyConnector node that uses that profile.

- 1 Under SkyProvision in the navigation pane, click **Node Profile** to display a list of existing profiles.

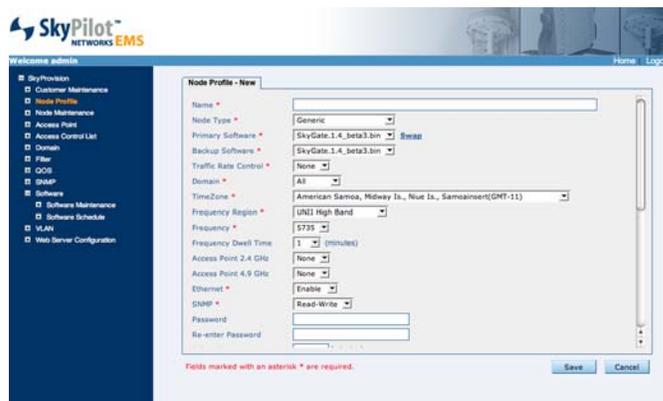
Figure 10. Node Profile screen



If no profiles appear in the list, you must prepare for automatic provisioning of a basic SkyPilot wireless mesh network by creating a node profile for your SkyGateway.

- 2 Click **New** to display the New Node Profile screen.

Figure 11. New Node Profile screen



The New Node Profile screen provides fields for specifying profile settings. On this screen (and other similar screens), asterisks identify mandatory information.

- 3 Using Table 4 as a guide, enter text and choose pull-down menu options to build a node profile for use with SkyGateway nodes.

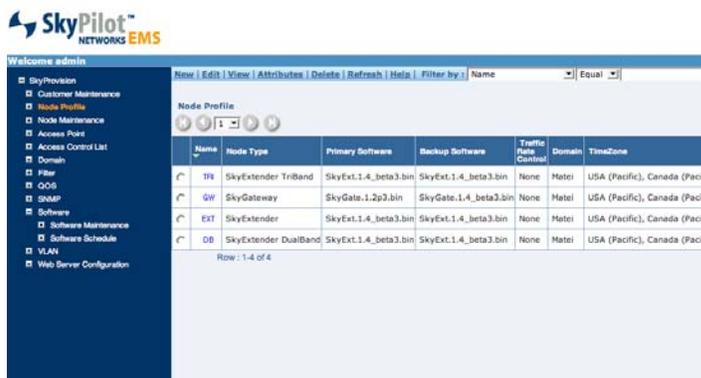
Table 4. Node Profile Entries for SkyGateway

Field	Action to take
Name	Enter a name that's descriptive of the device the profile supports (for example, <code>Peninsula SkyGateway</code>).
Node Type	Choose SkyGateway .
Primary Software	Choose the latest version of the device software (for example, SkyGate.1.3.bin).
Backup Software)	Set the same as the Primary Software field.
Traffic Rate Control	Leave as None .
Domain	Choose the domain you specified earlier under Creating a Domain (for example, 1324)
TimeZone	Choose your current time zone.
Frequency Region	Leave as the current default.
Frequency	Set to the center frequency you want to use with all devices that will connect to the SkyGateway.
Frequency Dwell Time	Leave as the default.
Access Point 2.4 GHz	Leave as None .
Access Point 4.9 GHz	Leave as None .
Ethernet	Leave as Enable .
SNMP	Leave as Enabled
Password (and Re-enter Password)	Leave blank to preserve the default setting (<code>public</code>).

4 Click **Save**.

The Node Profile screen appears again and now lists the new node profile, as shown in the example in Figure 12.

Figure 12. Node Profile screen



Your next step is to create another new node profile, for SkyConnectors.

- 5 Click **New** to display the New Node Profile screen.
- 6 Using Table 5 as a guide, enter text and choose menu options to build a node profile for use with SkyConnectors.

Table 5. Node Profile Entries for SkyConnector

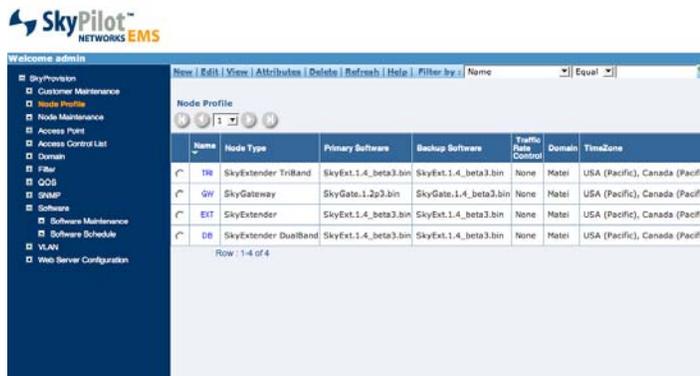
Field	Action to take
Name	Enter a name that's descriptive of the device the profile supports (for example, <i>Peninsula Connector</i>).
Node Type	Choose SkyConnector .
Primary Software	Choose the latest version of the device software (for example, SkyConn.1.3.bin).
Backup Software	Set the same as the Primary Software field.
Traffic Rate Control	Leave as None .
Domain	Choose the same domain you chose for the SkyGateway node profile (for example, 1324).
TimeZone	Choose your current time zone.
Frequency Region	Leave as the current default.
Frequency	Leave as the default or set to the frequency you chose for the SkyGateway node profile..
Frequency Dwell Time	Leave as the default.
Access Point 2.4 GHz	Leave as None .

- Access Point 4.9 GHz Leave as **None**.
- Ethernet Leave as **Enable**.
- SNMP Leave as **Enabled**.
- Password (and
Re-enter Password) Leave blank to preserve the default setting (`public`).

7 Click **Save**.

The Node Profile screen appears again and now lists the new node profile. Figure 13 shows an example.

Figure 13. Node Profile screen



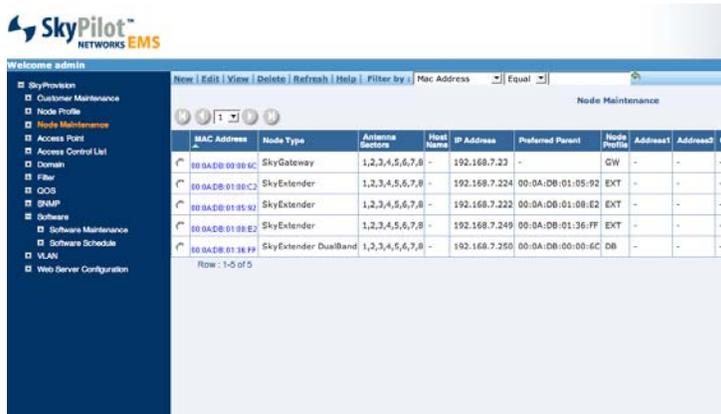
Adding Node Records

You now have node profiles in place for provisioning SkyGateway and SkyConnector devices, but the devices require node records before they can be assigned to profiles.

1 Under SkyProvision in the navigation pane, click **Node Maintenance**.

The Node Maintenance screen appears, displaying any existing node records (as shown in the example in Figure 14).

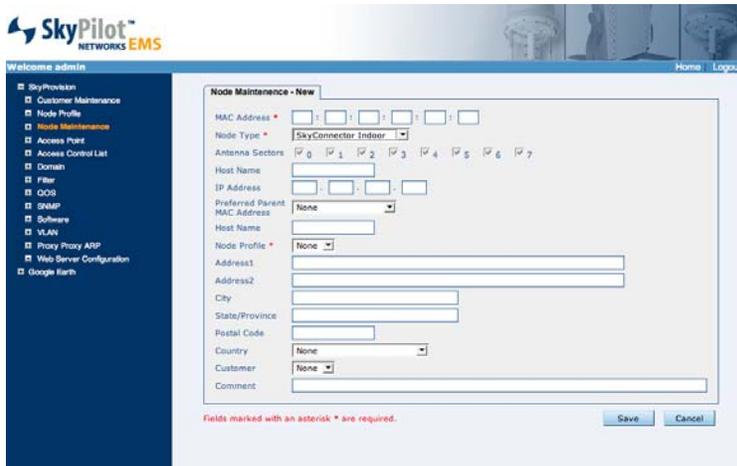
Figure 14. Node Maintenance screen



You'll now add a new node record for the SkyGateway and associate it with the node profile you created in the previous section.

- 2 Click **New** to display the node record creation screen (labeled "Node Maintenance – New").

Figure 15. Node record creation screen



- 3 Using Table 6 as a guide, enter text and choose menu options to build a node record for the SkyGateway. (Ignore the remaining optional fields.)

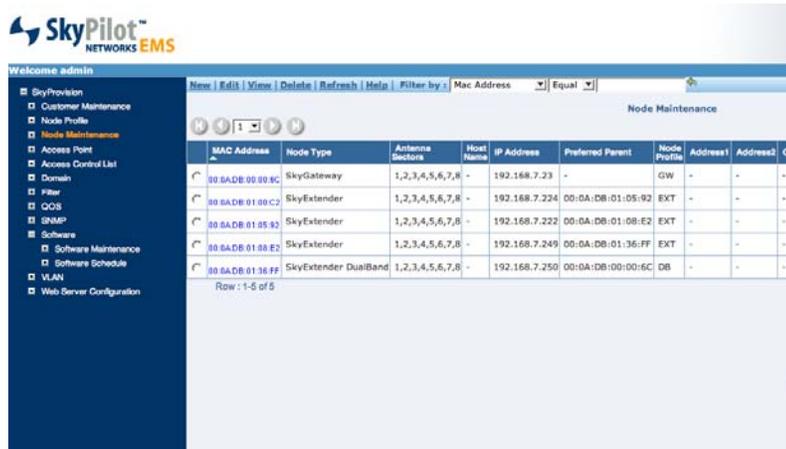
Table 6. Node Record Entries for SkyGateway

Field	Action to take
MAC Address	Enter the MAC address of the SkyGateway.
Node Type	Choose SkyGateway.
Host Name (under Antenna Sectors)	Enter a descriptive name that will identify the SkyGateway.
IP Address	Enter the same IP address you specified for the SkyGateway in the DHCP configuration file.
Node Profile	Choose the SkyGateway node profile you created in the previous section.

4 Click **Save**.

The Node Maintenance screen appears again and lists the new node record for the SkyGateway, as shown in the example in Figure 16.

Figure 16. Node Maintenance screen



Now you can make a node record for the SkyConnector and associate it with the SkyConnector node profile you created in the previous section.

- Click **New** to display the node record creation screen.
- Using Table 7 as a guide, enter text and choose menu options to build a node record for the SkyConnector. (Ignore the remaining optional fields.)

Table 7. Node Record Entries for SkyConnector

Field	Action to take
MAC Address	Enter the MAC address of the SkyConnector.
Node Type	Choose SkyConnector Outdoor.
Host Name (under Antenna Sectors)	Enter a descriptive name that that will identify the SkyConnector.
IP Address	Enter the same IP address you specified for the SkyConnector in the DHCP configuration file..
Node Profile	Choose the SkyConnector node profile you created in the previous section.

7 Click **Save**.

The Node Maintenance screen appears again and now lists the new node record.

All basic components are now in place for automatic provisioning of a SkyPilot mesh network that provides network access to subscribers.

What's Next

If you want to observe activity on the mesh network you created in this scenario, you can use the companion application to SkyProvision, SkyControl. For information on using SkyControl, see *SkyPilot Network Administration*.

To learn how to extend your base network to include a SkyExtender DualBand providing subscribers with a Wi-Fi access point, continue with Scenario 2.

Scenario 2: Automatic Provisioning for a SkyPilot Network with Wi-Fi Access

This scenario extends Scenario 1 to include automatic provisioning of a SkyExtender DualBand node providing Wi-Fi access to mesh network subscribers. It gives you instructions for editing your DHCP configuration file to include the SkyExtender DualBand, and then walks you through the process of creating profiles for the SkyExtender DualBand.

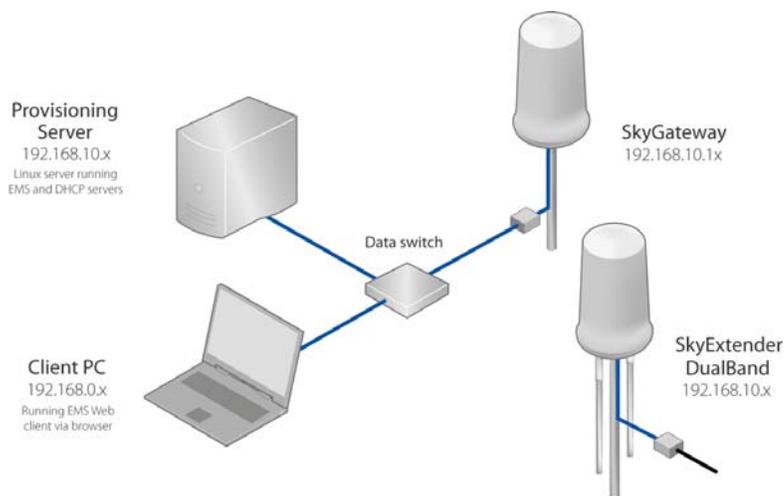
What You Need

In addition to the requirements for Scenario 1, you need the following:

- A SkyExtender DualBand
- MAC addresses of the SkyExtender DualBand and the access point inside it

Figure 18 shows the device configuration you'll need in order to perform the scenario.

Figure 17. Device configuration for Scenario 2



Automatic Provisioning and SkyExtender DualBand

A SkyExtender DualBand incorporates two distinct devices: a SkyExtender that operates as a node on the wireless mesh network and a Wi-Fi access point. To set up automatic configuration of a SkyExtender DualBand, you need to create two unique profiles: one for the SkyExtender and one for the access point.

Part 1: Adding the Devices to the DHCP Configuration File

To permit automatic assignment of IP addresses to the SkyExtender DualBand and the access point, you'll add the devices to the DHCP configuration file you edited in Scenario 1.

- 1 Connect to the DHCP server using an SSH client, and log in as `root`.
- 2 Using a text editor such as `vi`, open the DHCP configuration file again.
- 3 Add host entries for the SkyPilot DualBand and access point.

You already set up general IP addressing parameters in Scenario 1, so you won't need to repeat those steps here.

As in Scenario 1, your entries must be enclosed in the main subnet declaration where the TFTP, HTTP, and NTP server addresses are defined.

Table 8 provides a guide to the SkyExtender DualBand host statements you need to modify in the DHCP configuration file.

Table 8. Modifying SkyExtender DualBand Host Statements

Action	Edits in the DHCP configuration file (bold)
Hardware Ethernet address—Change to the MAC address of the SkyExtender DualBand.	<pre>host ExtDB { hardware ethernet 00:0A:DB:01:23:45; fixed-address 192.168.4.11; option host-name "skypilot_mgw";</pre>
IP address—Change to the IP address of the SkyExtender DualBand.	<pre>host ExtDB { hardware ethernet 00:0A:DB:01:23:45; fixed-address 192.168.10.x; option host-name "skypilot_mgw";</pre>
Host name—Optionally change to a descriptive name.	<pre>host ExtDB { hardware ethernet 00:0A:DB:01:23:45; fixed-address 192.168.10.x; option host-name "SDB-01";</pre>

- 4 Repeat the host statement edits for the access point.

Confirm that you've supplied the correct addresses for both devices, added a semicolon at the end of each line, and used an equal number of braces for each section.

- 5 Save your changes and close the file.
- 6 Refresh the DHCP server by entering the following command:

```
skypilot_dhcp_refresh
```

The response should look similar to this:

```
Shutting down dhcpcd: [ OK ]
```

```
Starting dhcpd: [ OK ]
```

If the refresh fails, look at the error description and edit the file again. Go to line number in the error description and look for missing or incorrect characters.

- 7 Verify that the DHCP server restarts successfully.

You should see `OK` in the command output (as shown in the preceding step), and you can monitor the startup messages (by using the `tail -f /var/log/messages` command) and watch for the `Start up of dhcpd successful` message.

Part 2: Creating Profiles in SkyProvision

In this part of Scenario 2, you'll extend the base configuration you set up in Scenario 1, to include a node and a node profile for the new device, as well some related profiles.

Logging In to the EMS Web Client

If you're no longer logged in to the EMS Web client, log back in.

- 1 Open a Web browser and enter the URL for the SkyPilot EMS server login page: the server's IP address or host name, preceded by `http://`.
- 2 When the login screen appears, enter your user name and password, and click **Sign in**.

For this scenario, you'll use the domain and software images you specified in Scenario 1, so you won't repeat those steps here.

Adding Profiles for the Access Point

The Wi-Fi access point profile will include references to a security profile and any VLANs and SSIDs that you want to use on the wireless network. Before you can create a node profile for the access point, you must first create profiles for the components that the node profile will reference.

Creating a Security Profile

- 1 Expand the Access Point tree under SkyProvision in the navigation pane and click **Access Point Security Profile**.

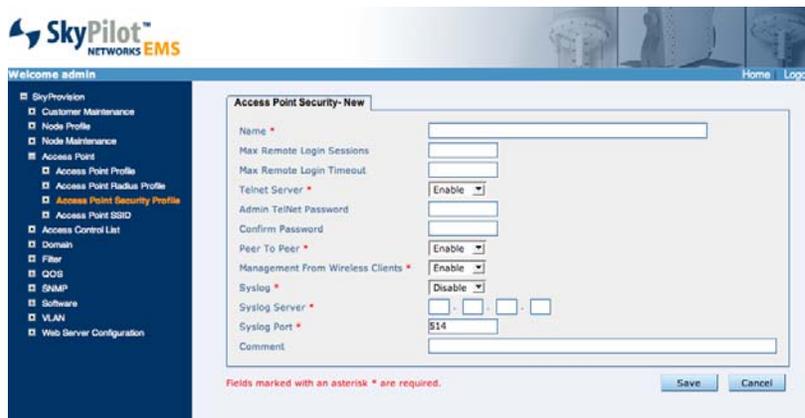
The Access Point Security Profile screen appears. If it does not list any profiles, you must create one as described in the rest of this procedure; otherwise, skip to the next section, “Creating an Access Point WLAN SSID Profile.”

Figure 18. Access Point Security Profile screen



- 2 Click **New** to display the New Access Point Security Profile screen.

Figure 19. New Access Point Security Profile screen



- 3 Using Table 9 as a guide, enter text and choose menu options to build an access point security profile for use with SkyGateways. (Ignore the remaining optional fields.)

Table 9. Access Point Security Profile Entries

Field	Action to take
Name	Enter a descriptive name for the profile (for example, <code>ap_security0</code>)
Telnet Server	Leave as Enable .
Peer To Peer	Leave as Enable .
Management From Wireless Clients	Leave as Enable .
Syslog	Leave as Enable .
Syslog Server	Enter the address of the syslog.
Syslog Port	Enter the syslog port address.

4 Click **Save**.

The Access Point Security Profile screen appears and lists the new profile, as shown in the example in Figure 20.

Figure 20. Access Point Security Profile screen



Creating an Access Point WLAN SSID Profile

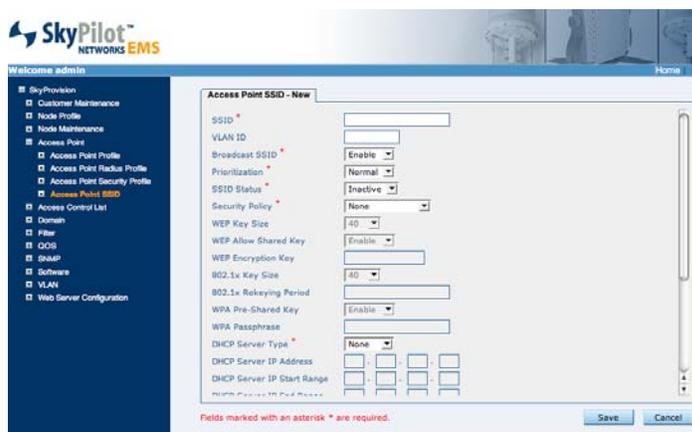
Your next step is to create the WLAN SSID profile that specifies the SSID that the access point will broadcast to Wi-Fi clients.

- 1** In the Access Point tree under SkyProvision in the navigation pane, click **Access Point WLAN SSID**.

The Access Point SSID Profile screen appears. If it does not list any profiles, you must create one as described in the rest of this procedure; otherwise, skip to the next section, “Creating an Access Point Profile.”

- 2 Click **New** to display the New Access Point WLAN SSID screen.

Figure 21. New Access Point WLAN SSID screen



- 3 Using Table 10 as a guide, enter text and choose menu options to create a WLAN SSID profile for use with access points. (Ignore the remaining optional fields.)

Table 10. Access Point WLAN SSID Profile Entries

Field	Action to take
SSID	Enter a descriptive name for the wireless network (for example, <i>gondola</i>).
VLAN ID	Enter an ID number for the VLAN (for example, 3).
Broadcast SSID	Leave as Enable .
Prioritization	Leave as Normal
SSID Status	Change to Active .
Security Policy	Leave as None .
DHCP Server Type	Leave as None .

- 4 Click **Save**.

The Access Point SSID Profile screen appears again and now lists the new profile, as shown in the example in Figure 22.

Figure 22. Access Point SSID Profile screen



Creating an Access Point Profile

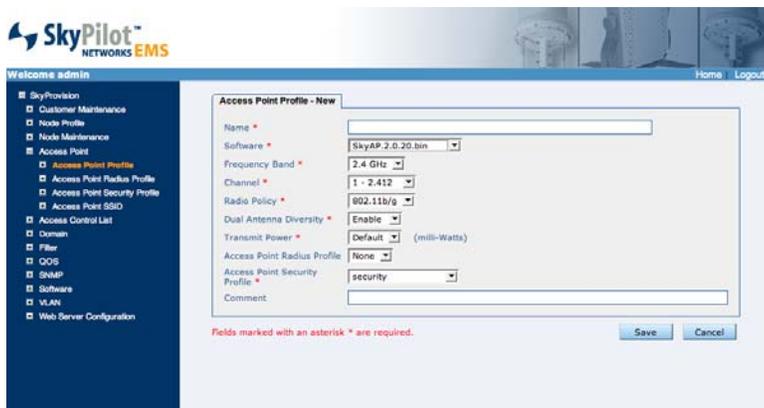
With profiles in place for security and the WLAN SSID, you can now create the access point profile that the provisioning server will use to provision access points on your SkyPilot network.

- 1 In the Access Point tree under SkyProvision in the navigation pane, click **Access Point Profile**.

The Access Point Profile screen appears. If it does not list any profiles, you must create one as described in the rest of this procedure; otherwise, skip to the next section, “Assigning Multiple SSID Profiles to an Access Point Profile.”

- 2 Click **New** to display the New Access Point Profile screen.

Figure 23. New Access Point Profile screen



- Using Table 11 as a guide, enter the information necessary to build an access point profile. (Ignore the optional fields.)

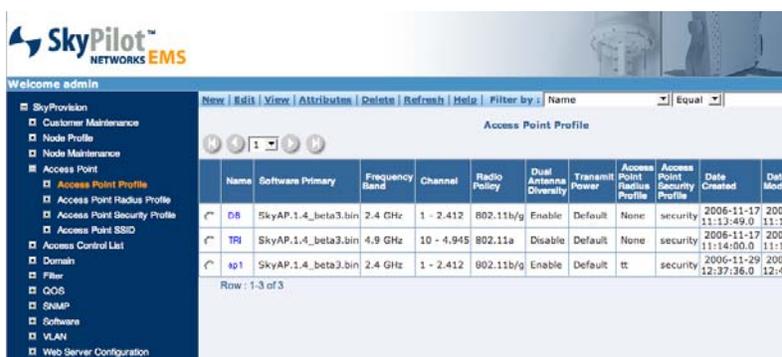
Table 11. Access Point Profile Entries

Field	Action to take
Name	Enter a descriptive name for the access point (for example, <code>ap_6</code>).
Software	Choose an access point software image (for example, <code>SkyAP.1.8.bin</code>).
Frequency Band	Leave as 2.4 GHz .
Channel	Leave as 1 – 2.412 .
Radio Policy	Leave as 802.11b/g .
Dual Antenna Diversity	Leave as Enable .
Transmit Power	Leave as Default .
Access Point Security Profile	Choose the applicable security profile (for example, <code>ap_security0</code>).

- Click **Save**.

The Access Point Profile screen appears again and now lists the new profile, as shown in the example in Figure 24.

Figure 24. Access Point Profile screen

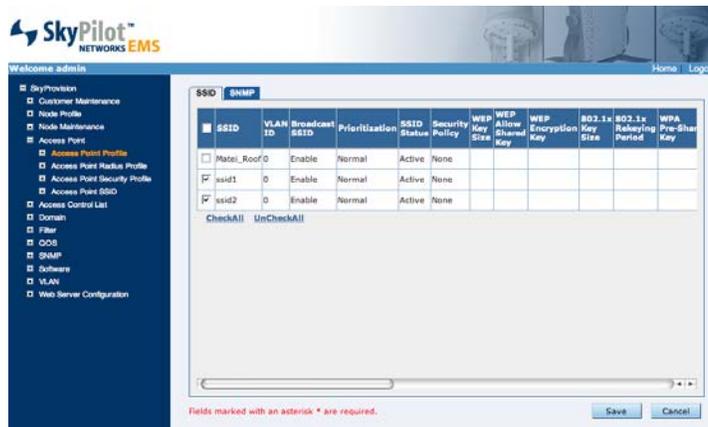


Assigning Multiple SSID Profiles to an Access Point Profile

SkyProvision allows you to assign multiple SSID profiles to a single access point profile. This capability allows you to implement different types of Wi-Fi networks on the same access point.

- 1 Click the radio button next to the name of access point profile you just created and then click **Attributes** to display the Access Point Profile Attributes screen.

Figure 25. Access Point Profile Attributes screen



- 2 On the SSID tab, click check boxes next to the names of two SSIDs.
- 3 Click **Save** to return to the Access Point Profile screen.

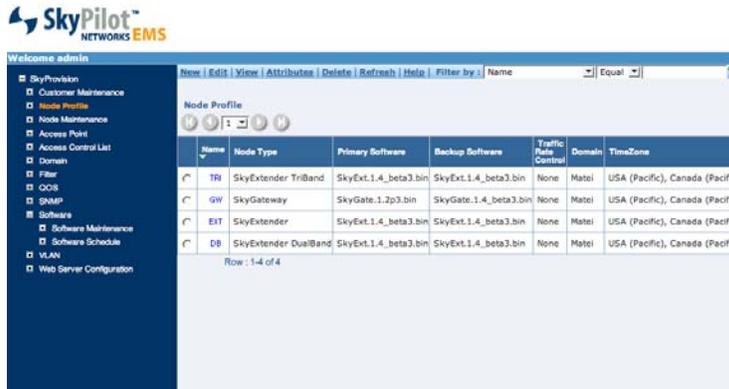
Creating a SkyExtender DualBand Node Profile

With your access point profiles set up, you can now create a node profile for the SkyExtender DualBand that you can apply to devices.

- 1 Under SkyProvision in the navigation pane, click **Node Profile**.

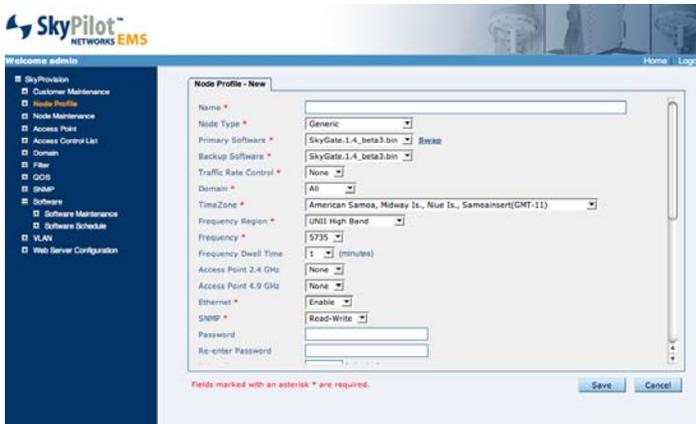
The Node Profile screen shows the profiles you created in Scenario 1.

Figure 26. Node Profile screen



- 2 Click **New** to display the New Node Profile screen.

Figure 27. New Node Profile screen



- 3 Using Table 12 as a guide, enter text and choose menu options to build a node profile for use with a SkyExtender DualBand.

Table 12. Node Profile Entries for SkyExtender DualBand

Field	Action to take
Name	Enter a name that's descriptive of the device the profile supports (for example, Peninsula DualBand).
Node Type	Choose SkyExtender DualBand.
Primary Software	Choose the latest version of the device software (for example, SkyDB.1.3.bin).

Backup Software	Set the same as the Primary Software field.
Traffic Rate Control	Leave as None .
Domain	Choose the domain you specified earlier under Creating a Domain (for example, 1324).
TimeZone	Choose your current time zone.
Frequency Region	Leave as the current default.
Frequency	Leave as the default.
Frequency Dwell Time	Leave as the default.
Access Point 2.4 GHz	Leave as None .
Access Point 4.9 GHz	Leave as None .
Ethernet	Leave as Enable .
SNMP	Leave as Enabled
Password (and Re-enter Password)	Leave blank to preserve the default setting (<code>public</code>).

4 Click **Save**.

The Node Profile screen appears again and now lists the new node profile, as shown in the example in Figure 28.

Figure 28. Node Profile screen



Adding a Node Record

The SkyExtender DualBand requires a node record before you can assign the device to any node profiles.

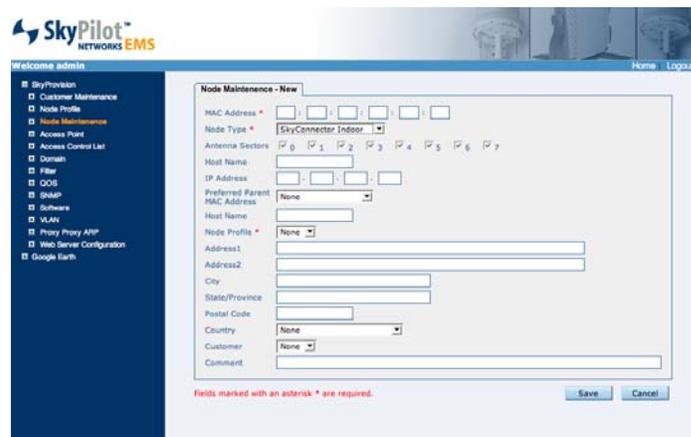
- 1 Under SkyProvision in the navigation pane, click **Node Maintenance**.

The Node Maintenance screen appears, displaying any existing node records.

You'll now add a node record for the SkyExtender DualBand and associate it with the node profile you created in the previous section.

- 2 Click **New** to display the node record creation screen.

Figure 28. New Node Record screen



- 3 Using Table 13 as a guide, enter text and choose menu options to build a node record for the SkyExtender DualBand. (Ignore the remaining optional fields.)

Table 13. Node Record Entries for SkyExtender DualBand

Field	Action to take
MAC Address	Enter the MAC address of the SkyExtender DualBand.
Node Type	Choose SkyExtender DualBand .
Host Name (under Antenna Sectors)	Enter a descriptive name that that will identify the SkyExtender DualBand.
IP Address	Enter the same IP address you specified for the SkyExtender DualBand in the DHCP configuration file..
Node Profile	Choose the SkyExtender DualBand node profile you created in the previous section.

- 4 Click **Save**.

The Node Maintenance screen appears again and now lists the new node record for the SkyExtender DualBand, as shown in the example in Figure 26.

Figure 26. Node Maintenance screen

MAC Address	Node Type	Antenna Sectors	Host Name	IP Address	Preferred Parent	Node Profile	Address	Address	City
00:9A:DB:00:30:6C	SkyGateway	1,2,3,4,5,6,7,8	-	192.168.7.23	-	GW	-	-	-
00:9A:DB:01:00:C2	SkyExtender	1,2,3,4,5,6,7,8	-	192.168.7.224	00:0A:DB:01:05:92	EXT	-	-	-
00:9A:DB:01:05:92	SkyExtender	1,2,3,4,5,6,7,8	-	192.168.7.222	00:0A:DB:01:08:E2	EXT	-	-	-
00:9A:DB:01:00:E2	SkyExtender	1,2,3,4,5,6,7,8	-	192.168.7.249	00:0A:DB:01:36:FF	EXT	-	-	-
00:9A:DB:01:36:FF	SkyExtender DualBand	1,2,3,4,5,6,7,8	-	192.168.7.250	00:0A:DB:00:00:6C	DB	-	-	-

All your basic components are now in place for automatic provisioning of a SkyPilot mesh network that provides network access to Wi-Fi clients.

What's Next

If you want to observe activity on the mesh network you created in this scenario, you can use SkyControl. For information on using SkyControl, see *SkyPilot Network Administration*.