Redundancy Groups

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High Availability for Wireless Services

For many companies, wireless access has become as critical to their business as traditional wired access. Recognizing the importance of wireless access, ProCurve Networking has designed its wireless services with high availability in mind.

To protect the availability of your company's wireless services, purchase multiple Wireless Edge Services xl Modules and place them in a redundancy group. ProCurve Networking provides two types of modules, both of which can be members of a redundancy group:

- Wireless Edge Services xl Module (J9001A)
- Redundant Wireless Services xl Module (J9003A)

In this chapter, a Wireless Edge Services xl Module is called a primary module, and a Redundant Wireless Services xl Module is called a redundant module.

The section below describes the particular features of a Redundant Wireless Services xl Module. The next section, “Redundancy Group” on page 10-3, explains how both types of modules work together in a redundancy group.

Redundant Wireless Services xl Module

To provide failover capabilities for the ProCurve Wireless Edge Services xl Module (J9001A), you can purchase a Redundant Wireless Services xl Module (J9003A).

The Redundant Wireless Services xl Module provides the same functionality as the Wireless Edge Services xl Module, with one exception: the redundant module does not have any radio port (RP) licenses. On its own, the redundant module cannot adopt any RPs.

When combined with one or more Wireless Edge Services xl Modules in a redundancy group, however, the Redundant Wireless Services xl Module can adopt RPs under certain circumstances. Primarily, the redundant module is designed to adopt RPs if one of the primary Wireless Edge Services xl Modules becomes unavailable for any reason. However, you can also configure the Redundant Wireless Services xl to use a primary module’s licenses to adopt RPs at any time. (For more information about RP adoption in a redundancy group, see “Adopting RPs” on page 10-5.)
The redundant module has its own software image and configuration file. Before a redundant module can deliver wireless services for your network, you must configure it to provide those services—just as you would configure a primary module.

**Redundancy Group**

A redundancy group can contain up to twelve modules:

- at least one Wireless Edge Services xl Module
- up to 11 other Wireless Edge Services xl Modules or Redundant Wireless Services xl Modules, in any combination

For example, the group can include one Wireless Edge Services xl Modules (primary module) and two Redundant Wireless Services xl Module (redundant modules). Or it can include eight primary modules and four redundant modules. However, the typical configuration includes one primary module and one or more redundant modules. This is because adding modules to the group does not add licenses, as explained in “RP Licensing for Redundancy Groups” on page 10-6.

You can install up to two modules in a wireless services-enabled switch. For higher availability, you should install modules in separate switch chassis. Then if one wireless services-enabled switch becomes unavailable—due to a cable failure, for example—the other wireless services-enabled switch can still provide the wireless services that your company needs. (See Figure 10-1.)
Active or Standby Mode

When you configure a module to be part of a redundancy group, you must select a mode, which determines the module’s role in the group.

For each of the 12 members of a redundancy group, you can select:

- **Active mode**—In active mode, the module is responsible for adopting RPs and providing the wireless services that you have configured on the module.
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- **Standby mode**—In standby mode, the module is primarily responsible for providing failover capabilities if a module in active mode becomes unavailable. (A module in standby mode can adopt RPs in the circumstances described in “Adopting RPs” on page 10-5.)

Both Wireless Edge Services xl Modules and Redundant Wireless Services xl Modules support both modes. This difference between primary and redundant modules lies in the redundant module's lack of RP licenses, not in the modes in which the modules function. For example, in a group that includes one primary module and two redundant modules, you can configure the primary module in active mode and the redundant modules in standby mode. But you can also choose to configure all three modules in active mode. In fact, this is often a good idea because the active modules load balance RPs between them, adding capacity to the network.

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**Note**

Selecting active mode for more than one module in a redundancy group still provides high availability. If one module fails, another active module will adopt the failed module's radio ports.

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**Adopting RPs**

How a Wireless Edge Services xl Module or Redundant Wireless Services xl Module adopts RPs depends on the module's mode.

**Adopting RPs in Active Mode**

All active members of a redundancy group can adopt RPs. By default, the modules load balance the available RPs based on each module's load value. When an RP is detected, the active module with the lowest load value adopts that RP. If more than one module has the same load value, the module with the lowest media access control (MAC) address adopts the RP. The load value is based on the number of RPs adopted by the module, not on the amount of traffic the RPs support.

Basing adoption on the load value is not always the best way to manage RPs, however. Sometimes, you may want manual control over which RPs are adopted by which module. See “Setting up Adoption Preference IDs to Control RP Adoption” on page 10-24 to learn how to use adoption preference IDs to determine which RPs each module adopts.
Adopting RPs in Standby Mode

In standby mode, a redundancy group member adopts RPs only in certain circumstances:

- The standby member does not receive a heartbeat from an active member for the length of time specified in the hold period option.
  
  In a group with multiple active members, the standby member takes action should even one member fail.

- All active members fail to adopt an RP, although the group has enough RP licenses to adopt the RP.

Table 10-1 describes some of these situations.

**Table 10-1. Situations in Which a Standby Member Adopts RPs**

<table>
<thead>
<tr>
<th>Situation</th>
<th>Possible Causes</th>
</tr>
</thead>
</table>
| A standby member misses heartbeats from an active member. | • The active member has failed.  
  • The wireless services-enabled switch in which the active member is installed has failed.  
  • A failed network connection has isolated the wireless services-enabled switch from the network. |
| Active modules fail to adopt an RP. | • Active members’ internal downlink ports have not been tagged for the RP VLAN.  
  • Active members’ are explicitly prohibited from adopting the RP. |

If the active member becomes unavailable and a standby member adopts its RPs, the standby member continues to support these RPs even after the active member becomes available again, which maintains continuity of service. You can, however, manually revert the standby member to force it to return the RPs to the active member.

**RP Licensing for Redundancy Groups**

The sections above described the circumstances in which a member of a redundancy group can adopt an RP. A final condition for adopting an RP is that the group have sufficient licenses. (See “Radio Port Licenses” on page 2-123 of Chapter 2: Configuring the ProCurve Wireless Edge Services xl Module.)
The number of licenses for the redundancy group equals the number of licenses installed on the group member with the most licenses. For example, a group includes these members:

- one Wireless Edge Services xl Module with the default license (for 12 RPs) and one additive license (for 12 RPs)
- one Wireless Edge Services xl Module with the default license (for 12 RPs)
- one Redundant Wireless Services xl Module

The redundancy group has two licenses and can adopt 24 RPs.

All members of the redundancy group share the group’s licenses. Any active member can use the groups’ licenses to adopt an RP at any time. Any standby member can use the groups’ licenses to adopt an RP in the circumstances listed in “Adopting RPs in Standby Mode” on page 10-6.

Establishing a Redundancy Group

To ensure that each module recognizes that it is part of a redundancy group and knows the IP address of the other modules in the group, you must complete the steps to configure a redundancy group on each module. In addition, you must ensure that the modules can communicate with one another. For example, if the modules are installed in different wireless services-enabled switches, the switches must be connected either directly or indirectly (through one or more infrastructure switches).

When you configure and enable a redundancy group on a module, that module begins the process of establishing a group. To successfully complete this process, the module must receive communications from the other modules in the redundancy group.

The process for establishing a redundancy group is the same for both primary and redundant modules. If all modules all configured correctly as a redundancy group, each will go through the following stages in establishing a group:

- **Startup state**—The redundancy service starts on the module.
- **Discovery state**—The module begins to send heartbeat messages to advertise that it is available. It listens for the other modules to send heartbeat messages to verify that its peers are also available.

In addition, the module sends an update message, listing the current values for its redundancy group settings, such as heartbeat time, discovery time, hold time, redundancy ID, and redundancy protocol version. The other modules send an update message as well. The modules
compare their redundancy group settings to ensure that they are the same. If the modules are not using the same settings, they cannot establish a functioning redundancy group.

- **Online state**—If the modules can reach each other and they are using the same redundancy group settings, they change their status to online. In this state, a standby module can take over for an active module if the active module becomes unavailable. However, you must configure the standby modules to provide wireless services, as explained in “Creating Matching Configurations for the Redundancy Group” on page 10-9.

If redundancy is not enabled for a module, it is in the disabled state.

Figure 10-2 illustrates the process of establishing a redundancy group between two modules.
Creating Matching Configurations for the Redundancy Group

To establish a redundancy group, modules must support the same redundancy group settings. Typically, you also want all modules in the redundancy group to provide the same wireless services.

You can use one module’s configuration file as a starting point for configuring other modules. You can transfer the first module’s configuration file to a TFTP or an FTP server and then upload the configuration file to the other modules in the group. You can then edit module-specific settings (such as IP addresses for virtual LANs [VLANs] and redundancy group settings) and save the configuration to the each module’s startup-config. If you later change the configuration of one module, you must remember to make the same change to other modules.

Redundancy Group Configuration Mode Context

Alternatively, you can use the redundancy group configuration mode in the CLI to configure settings that are pushed to all members of the group.

The redundancy group configuration mode is a special configuration mode available from the enable mode context of the Wireless Edge Services xl Module CLI. You can only access the redundancy group configuration mode, however, in these circumstances:

- The module is a member of a redundancy group.
- All members of the group are in the Online state.

The redundancy group configuration mode is shared among all members, so that must the local module must be able to communicate with them.

To enter the redundancy group configuration mode context, enter this command from the module enable mode context:

```
ProCurve(wireless-services-C)# redundancy-group-cli-config enable
ProCurve(wireless-services-C)redundancy-cli*#
```

After accessing the redundancy group configuration mode context, you can enter almost any command that you can enter from the configuration mode contexts of an individual module. For example, you can configure a WLAN. However, when you enter commands, not only the local module, but all modules in the group, receive the commands. In this way, all members of the redundancy group enforce consistent settings.
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You cannot enter some commands from the redundancy group configuration mode context. For example, you cannot configure IP settings and redundancy group settings. These you must set on members on an individual basis.

If you paste a configuration file into the redundancy group configuration mode context, the invalid commands simply do not take effect. For example, you could configure one Wireless Edge Services xl Module with all the settings for your network. Then you could set up the redundancy group, access the redundancy group configuration mode context, move to the global configuration mode context, and paste the startup-config of the base module into the CLI. The other modules in the redundancy group would receive WLAN, radio, DHCP, and RADIUS settings (as well as others), but each module would keep its own IP address.

**Note**

At most four managers can access a group's redundancy group configuration mode context at once.

For more information on CLI commands, see Appendix A: *ProCurve Wireless Services xl Module Command Line Reference*.

Redundancy Group Behavior When a Member Fails

Members of a redundancy group listen for heartbeats from every other member. If, over the duration of the hold period, modules miss heartbeats from one member, standby members load balance the failed member's RPs among themselves. If you desire, you can configure adoption preference IDs to control which of several standby modules adopt particular RPs.

Active members take no action when another member of the group fails unless, for whatever reason, the standby members fail to adopt the orphaned RPs. For example, a failed network connection might isolate a standby member from the RPs, or manual adoption might be inadvertently enabled on the standby member. If a redundancy group consists of only active members, active members can also adopt a failed members' RPs, load balancing the RPs among themselves.

When the active member becomes functional again, the standby modules continue to support the RPs. You can manually force the standby modules to revert the RPs to the recovered member. You cannot, however, force an active member to return any RPs that it may have adopted. (See “Reverting RPs Adopted by a Standby Member to the Active Member” on page 10-33.)
Configuring a Redundancy Group

When you configure a redundancy group, you must define the following on each module that is a member of the group:

- the interface IP address for the module that you are configuring
- the member IP addresses (which are the IP addresses for the other modules in the redundancy group)

These two settings enable each module to send messages to and receive messages from other modules. The interface IP address that you enter on the one module should be the member IP address that you enter on each of the other modules. Table 10-2 provides an example.

Table 10-2. Configuring IP Addresses for a Redundancy Group

<table>
<thead>
<tr>
<th>Setting</th>
<th>Configuring a Redundancy Group on Primary Module A</th>
<th>Configuring a Redundancy Group on Redundant Module B</th>
<th>Configuring a Redundancy Group on Redundant Module C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interface IP</td>
<td>192.168.1.10 (IP address of the default management interface on the primary module)</td>
<td>192.168.1.59 (IP address of the default management interface on redundant module A)</td>
<td>192.168.1.69 (IP address of the default management interface on redundant module B)</td>
</tr>
<tr>
<td>IP addresses for members</td>
<td>192.168.1.59</td>
<td>192.168.1.10</td>
<td>192.168.1.69</td>
</tr>
<tr>
<td></td>
<td>192.168.1.69</td>
<td>192.168.1.69</td>
<td>192.168.1.59</td>
</tr>
</tbody>
</table>

For each module, you must also select either active mode or standby mode.

In addition to defining these settings, you must configure other settings for the redundancy group, such as the length of the discovery period, the interval between heartbeats, and the redundancy group ID. These settings must be the same on all members of the group. If these settings do not match, the modules cannot establish a functioning redundancy group.

After you define the redundancy group settings, you must enable redundancy. You must perform this step last; if you try to enable the redundancy group before you add at least one member, an error message is displayed, telling you that you must first add a member. If you enable redundancy before configuring other redundancy settings, the fields for these settings are dimmed, and you cannot configure them (unless you disable redundancy once again).
Configuring Redundancy Group Settings

Redundancy group settings must match on all members of the group. (However, each member has its own IP address.) To configure the redundancy group settings a module, complete these steps:

1. Select **Network Setup > Redundancy Group** and click the **Configuration** tab.

   **Figure 10-3. Network Setup > Redundancy Group > Configuration Screen**

2. In the **Interface IP** field, enter the IP address of the module that you are configuring. The redundancy feature uses this IP address to send heartbeat and update messages to the other modules in the redundancy group. (When you configure the redundancy group on the other modules, you enter this IP address when you add a member.)
Note

If you have assigned an IP address to more than one VLAN on the module, you should use the IP address assigned to the default management interface (which, by default, is VLAN 1).

If you decide to enter the IP address for a different VLAN, however, you must ensure that the redundancy traffic (such as the heartbeat and update messages) can be transmitted to the other module in the group. If the other module is installed in another wireless services-enabled switch on the network, both wireless services-enabled switches and all the switches in between must be able to transmit traffic on that VLAN.

3. In the **Redundancy Group ID** field, enter a number for the group. Each redundancy group on your network must have a unique group ID, and you must use the same group ID for each member of the group. You can enter any number from 1 through 65535.

4. Choose the **Mode**:
   - Select **Active** to allow the module to adopt RPs in all circumstances (as long as the group has sufficient licenses).
   - Select **Standby** to allow the module to adopt RPs only when active members fail to do so.

   More than one member of the group can act in active mode, and more than one can act in standby. You can choose either mode for either model (the Wireless Edge Services xl Module or the Redundant Wireless Services xl Module). See “Active or Standby Mode” on page 10-4 and “Adopting RPs” on page 10-5 for more information on the effects of the mode.

5. In the **Discovery Period** field, accept the default setting of 30 seconds, or enter a number from 10 through 60 seconds. (The discovery period is the amount of time that the module spends locating the other modules and ensuring that they are using the same redundancy group configuration.)

6. In the **Heartbeat Period** field, accept the default setting of 5 seconds, or enter a number from 1 through 255 seconds. Each module in the redundancy group periodically sends a heartbeat to determine if the other modules are still “alive,” or available. This setting determines the number of seconds between each heartbeat.
7. In the Hold Period field, accept the default setting of 15 seconds, or enter a number from 1 through 255 seconds. This setting determines the number of seconds that the module waits when it does not receive a heartbeat from another module in the redundancy group. If no heartbeats are received for the number of seconds specified in the hold period, the module determines that the other module in the group is unavailable. If the active member is unavailable, a standby member takes over its responsibilities and begins to adopt RPs.

As a general rule, you should configure the hold period to be three times as long as the heartbeat period. In practice, this means that if a module does not receive three consecutive heartbeats, it decides that the other module is unreachable.

8. Check the Handle STP convergence box if you want the module to factor in Spanning Tree Protocol (STP) convergence time before trying to establish the redundancy group.

STP's relatively slow convergence can cause a problem when one member of a group is in a subnetwork that uses STP while another member is in a subnetwork that does not use STP or that uses rapid STP (RSTP). The second member does not hear any heartbeats from the first member, which is waiting for the spanning tree to be established before transmitting messages. The second member assumes that the first member is down and may attempt to adopt RPs when it should not.

When you select the Handle STP convergence box, the module waits 50 seconds, which is the standard time period allowed for STP convergence, before attempting to establish the redundancy group.

9. Click the Apply button to apply changes to the running-config.

Adding Members to the Redundancy Group

You must manually specify the IP address of every other module in the redundancy group. Follow these steps to define each member:

1. Select Network Setup > Redundancy Group and select the Member tab.
2. Click the **Add** button. The **Add Members** screen is displayed.

![Network Setup > Redundancy Group > Member Screen](image)

**Figure 10-4. Network Setup > Redundancy Group > Member Screen**

![Network Setup > Redundancy Group > Add Members Screen](image)

**Figure 10-5. Add Members Screen**
3. Enter the IP address of one of the other modules in the redundancy group. This address should match the address that you configure for the Interface IP in the other module’s redundancy group settings.

4. Click the OK button. The module is now listed on the Network Setup > Redundancy Group > Member screen.

5. Repeat this step for each additional module in the redundancy group.

Enabling Redundancy

After you enable redundancy, the Wireless Edge Services xl Module begins communicating with other modules and establishing the redundancy group. Completely configure the redundancy group before enabling redundancy. After you enable redundancy, you can no longer alter settings or add new members.

Follow these steps:

1. Click the Configuration tab to return to the Network Setup > Redundancy Group > Configuration screen.

2. Check the Enable Redundancy box. The redundancy group configuration options are now dimmed. You also cannot change the member configuration (on the Member tab) while redundancy is enabled.
3. Click the **Apply** button to save the configuration to the running-config.

4. Click the **Save** link at the top of the Web browser interface to save the changes to the startup-config.

5. Access the Web browser interfaces for each of the other modules in the redundancy group and configure those modules in the same way.
Viewing Information about the Redundancy Group

To view information about the redundancy group, select **Network Setup > Redundancy Group** and select the **State** tab.

![Network Setup > Redundancy Group > State Screen](image)

<table>
<thead>
<tr>
<th>Configuration</th>
<th>State</th>
<th>Member</th>
</tr>
</thead>
<tbody>
<tr>
<td>Redundancy state</td>
<td>Online</td>
<td>Module Authorization Level</td>
</tr>
<tr>
<td>Group Authorization Level</td>
<td>36</td>
<td>Group Connectivity Status</td>
</tr>
<tr>
<td>Radio Ports adopted by Group</td>
<td>2</td>
<td>Radio Ports adopted by this module</td>
</tr>
<tr>
<td>Adoption capacity in group</td>
<td>144</td>
<td>Adoption capacity on this module</td>
</tr>
<tr>
<td>Unapproved Radio Ports in group</td>
<td>0</td>
<td>Unapproved Radio Ports on this module</td>
</tr>
<tr>
<td>Radios in group</td>
<td>3</td>
<td>Radios on this module</td>
</tr>
<tr>
<td>Self-healing Radios in group</td>
<td>0</td>
<td>Self-healing Radios on this module</td>
</tr>
<tr>
<td>Wireless Stations in group</td>
<td>3</td>
<td>Wireless Stations on this module</td>
</tr>
</tbody>
</table>

After the primary module and the redundant modules establish a redundancy group, each module tracks the following information about the group:

- **Redundancy state**—This field lists the current state of the module. Both primary and redundant modules go through the same redundancy states:
  - Disabled
  - Startup
  - Discovery
  - Online

If this module is running redundancy, its state is Online.
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- **Module Authorization Level**—This field displays the number of RPs this module's licenses allow it to adopt when it functions on its own. The authorization level for a redundant module, however, is taken from the level of the primary module with the most licenses.

- **Protocol Version**—When the modules attempt to establish a redundancy group, each module includes its protocol version in the update messages sent during the discovery stage. If the modules are not all using the same protocol version, they cannot establish a group. You should ensure that the modules are running the same major release version of the software image. (In the software image, WS.XX.YY, XX indicates the major release version.)

- **Group Authorization Level**—This field displays the maximum number of RPs that the group as a whole can adopt. This number matches the number for the module with the highest module authorization level. The group authorization level is *not* the sum of member's individual authorization level. In other words, a redundancy group that includes two primary modules, one with licenses to adopt 36 RPs and one with licenses to adopt 12, has a group authorization level of 36.

- **Group Connectivity Status**—This field displays one of the following:
  - All members connected—This is the normal state for a functioning redundancy group.
  - Not all members present—The modules in the group are not all communicating. A module may be unavailable, or the communication links between the modules may be disrupted.
  - n/a—Redundancy is not enabled.

- **Radio Ports adopted by Group**—This field displays the total number of RPs adopted by the redundancy group. This number should equal the total number of RPs in your network (or that are part of the group). If the number indicates that RP has not been adopted, investigate the problem.

- **Radio Ports adopted by this module**—This field displays the number of RPs that this module has adopted. If you are viewing the **Network Setup > Redundancy Group > Configuration** screen for a module that is running in standby mode, this field will typically display 0. If the standby module has adopted an RP, determine which active module has failed.

- **Adoption capacity in group**—The group's adoption capacity is the total number of RPs that the group is capable of adopting. This number is a sum of the adoption capacity of every online member of the group. Remember that the group authorization level sets the maximum for RPs that the group can *actually* adopt: a group might be capable of adopting many more RPs than its licenses allow.

- **Adoption capacity on this module**—The number of RPs that this module is capable of adopting (the default is 48).
Other fields in the **Network Setup > Redundancy Group > State** screen allow you to monitor activity both on this particular module and throughout the group. For example, you can compare the **Unapproved Radio Ports on this module** value to the **Unapproved Radio Ports in the group** value to see whether this module’s RPs seem to detect more rogue APs—a sign of a possible security issue in a particular location of your network.

You can also check these fields:

- **Radios in group** or **Radios on this module**—the number of radios adopted by the group or by the individual module.
  
  Because some RPs include two radios, these numbers may be greater than those for the corresponding **Radio Ports adopted by** fields.

- **Self-healing Radios in group** or **Self-healing Radios on this module**—the number of radios adopted by the group or by the individual module that are enabled for self-healing.
  
  This field counts any radio that is enabled for self healing; the radio does need to be currently taking self healing action.

- **Wireless Stations in group** and **Wireless Stations on this module**—the number of wireless stations associated to all RPs adopted by the entire group or by this individual module.
History

At the bottom of the Network Setup > Redundancy Group > Configuration screen, you can also view the history of redundancy events that have occurred on this module.

![Network Setup > Redundancy Group](image)

**Figure 10-8. Redundancy Group History**

The module records an event each time its redundancy state changes. For example, when you enable redundancy on the module, its state changes to startup, and the module records this event in the history. (The most recent events are listed first.) Each event listed includes:

- **State**—disabled, startup, discovery, or online
- **Time**—the day of the week, the date, the time, and the year
- **Trigger**—the event that initiated the change in the module's state
- **Description**—a brief description of the event that initiated the change
Viewing Information about the Other Members of the Redundancy Group

In addition to viewing information about the redundancy group, you can view information about the other members of the group. Select **Network Setup > Redundancy Group** and click the **Member** tab.

You can select a member and review the following information about the selected member:

- **IP Address**
- **State**—what the module knows about this member
  - Configured—The member is configured on the current module but no additional information is known about the member.
  - Seen—The module has exchanged heartbeats with this member.
  - Invalid—The redundancy group settings on the member (including heartbeat time, discovery time, hold time, redundancy ID, and redundancy protocol version) do not match the configuration on this module.
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- Not Seen—The module can no longer exchange heartbeats with the member.
- Established—The module and this member have successfully established a redundancy group.

- **Last Seen**—the day of the week, the date, the time, and the year that the module last received a heartbeat from this member
- **Adoption Count**—the number of RPs adopted by the member
- **Authorization Level**—the maximum number of RP licenses on this member
- **Mode**—standby or active

If you want to view additional information about the selected member in the redundancy group, click the **Details** button. The **Details** screen is displayed.

![Figure 10-10.Member Details Screen](image)

In addition to the fields listed on the preceding screen, the **Details** screen lists:

- **Image Version**—the software image used by this member.
- **First Seen**—the day of the week, the date, the time, and the year that the module first received a heartbeat from this member
- **HB Sent**—the number of heartbeats that the module has sent to this member
- **HB Received**—the number of heartbeats that the module has received from this member
- **Updates Sent**—the number of updates that the module has sent to this member
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- **Updates Received**—the number of updates that the module has received from this member
- **Radio Portals**—the number of radios adopted by this member (some RPs have two radios)
- **Associated Stations**—the number of stations associated to RPs adopted by this member
- **Rogue AP**—the number of unapproved APs detected by RPs adopted by this member
- **Self Healing Radios**—the number of radios adopted by this member that are configured for self healing

When you have finished reviewing this information, click the Close button.

### Setting up Adoption Preference IDs to Control RP Adoption

Your redundancy group might include more than one active module. In this case, you can use adoption preference IDs to control which Wireless Edge Services xl Module (or Redundant Wireless Services xl Module) adopts particular RPs.

You set an adoption preference ID for both the module and the RPs. If you want a module to adopt an RP, the module’s adoption preference ID should match the RP’s adoption preference ID (which can be set in the radio adoption default configuration or the configuration for a particular RP).

Before configuring adoption preference IDs, consider your goals. Which RPs do you want a particular module to support and why? Sometimes you might want to group RPs in the same general location on the same module in order to simplify roaming. On the other hand, having different modules adopt RPs in the same general location can help build redundancy into your network. In this case, though, remember to set up roaming correctly as described in Chapter 9: Fast Layer 2 Roaming and Layer 3 Mobility.

Once you have planned your deployment, begin to configure adoption preference IDs. The following procedure for setting preference IDs gives you the greatest control over RP adoption: you set adoption preference IDs for each RP on each module before you install the RPs.

**Note**

These instructions also apply to Wireless Edge Services xl Modules that are not in a redundancy group but are in the same network.
1. Assign a different adoption preference ID to each active module in the redundancy group. Record the IDs in a table such as Table 10-3 on page 10-27.

2. Assign RPs to the modules that should adopt them. Record the Ethernet MAC addresses for the RPs in a table such as Table 10-3 on page 10-27.

3. On every module in the redundancy group, configure the redundancy settings and enable redundancy. Verify that all members are connected.

4. On every active module in the redundancy group, set the adoption preference ID that you assigned that module in step 1. (See "Configure an Adoption Preference for the Module" on page 10-28.)

5. Have one module adopt all the RPs.
   
   For example, you could wait to set the country code on the other modules until after the specified module has adopted all RPs. Or you could shut-down the other modules until after the RPs have become adopted.

   You can also push all RPs toward a single module by setting that module’s ID as the ID in the radio adoption default configurations on all modules. Every time that a new RP is added to the network, that RP is adopted by the same module so you know where to look for it.

6. Access the Network Setup > Radio screen on the module that has adopted the RPs. Set the correct adoption preference ID for each RP, as explained in "Configure an Adoption Preference for Targeted Radios" on page 10-28.

   For each RP, match the ID for the module that should adopt that RP. You can set the ID for multiple radios at the same time: press the Ctrl key, select the radios, and click the Edit button.

   For example, your Wireless LAN System includes these components:
   - one Wireless Edge Services xl Module with adoption preference ID 10, acting in active mode
   - one Redundant Wireless Services xl Module with adoption preference ID 20, acting in active mode
   - ten RP 230s that should be adopted by the primary module
   - five RP 220 that should be adopted by the redundant module

   You have the primary module adopt the 15 RPs. You select the 20 RP 230 radios (two for each RP) and assign them adoption preference ID 10. Then you select the 10 RP 220 radios at assign them adoption preference ID 20.

7. Copy the targeted radio configurations to every active module in the network.
You can use the redundancy group configuration mode context to speed this process. For example, you could view the running-config of the module that adopted the RPs and copy the radio configurations. Then paste these commands in the global configuration mode context of the redundancy group configuration mode.

8. After you have created a configuration for every RP in your network on every active module, reset the RPs. The correct module should now adopt each RP.

**Note**

If your redundancy group includes multiple standby members, you might want to control which standby members adopt particular RPs if an active member fails. Assign every standby member an adoption preference ID. Then set the IDs just as you would for a group of active members. On every standby module, make sure that every RP has been assigned one of the IDs used by standby modules.

As always, if the preferred standby member cannot adopt the RP, another standby member will. However, the failover time might be slightly greater while the other members of the group wait for the preferred member to adopt the RP.

The following sections explain how to set the adoption preference ID so that you can complete the procedure described above. You can set the ID for:

- a module
- an individual RP
- all newly adopted RPs
### Table 10-3. Assigning Adoption Preference IDs

<table>
<thead>
<tr>
<th>Module (Hostname or IP Address)</th>
<th>Adoption Preference ID</th>
<th>Assigned RPs (MAC Address)</th>
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</table>
Configure an Adoption Preference for the Module

To set an adoption preference for the module itself, complete these steps:

1. Select **Network Setup > Radio** and click the **Configuration** tab.
2. Click the **Global Settings** button. The **Global** screen is displayed. (See Figure 10-11.)

![Figure 10-11.Global Settings Screen](image)

3. In the **Module Adoption Preference ID** field, enter a number, and then click the **OK** button.

4. Click the **Save** link at the top of the Web browser interface to save the changes to the startup-config.

Configure an Adoption Preference for Targeted Radios

To configure an adoption preference ID for a single radio, follow these steps:

1. Select **Network Setup > Radio > Configuration**.
2. Select the radio or radios to which you want to assign the adoption preference ID.

Hold down Ctrl while selecting the radios to select multiple radios and assign them the same ID.

3. Click the Edit button. The radios’ Edit screen is displayed.

If you have selected multiple radios, the screen has limited configurable options. (See Figure 10-13.) However, you can change the adoption preference ID.

4. In the Adoption Preference ID field, enter the ID that you have assigned to the Wireless Edge Services xl Module that should adopt the radio or radios.
Configuring a Redundancy Group

Configure an Adoption Preference for Newly Adopted Radios

To configure an adoption preference ID for all adopted RPs, edit the radio adoption default configuration. Complete these steps:

1. Select Network Setup > Radio Adoption Defaults and click the Configuration tab.

5. Click the OK button.

6. Click the Save link to copy the radio configurations to the startup-config.
2. Select a radio type and click the **Edit** button. The **Configuration** screen is displayed. (See Figure 10-15.)
3. Under **Advanced Properties**, in the **Adoption Preference ID** field, enter a preference ID, and then click the **OK** button.

4. Click the **Save** link at the top of the Web browser interface to save the changes to the startup-config.

To force another module to adopt a particular RP, change its radio preference ID to match the ID on that second module, as explained in “Configuring Advanced Properties for a Particular Radio” on page 3-32 in *Chapter 3: Radio Port Configuration*. 

![Figure 10-15.802.11bg Configuration Screen](image-url)
Reverting RPs Adopted by a Standby Member to the Active Member

When an active member of a redundancy group fails, a standby member of the group adopts the RPs. For continuity of service, the standby member continues to support the RPs even when the active member comes back online. However, eventually you may want to return the RPs to the original module.

You can manually revert a standby module, which means that you force it to unadopt all of its RPs. Only revert a module when you can afford a disruption to network service for the minute or two during which RPs become adopted by the active module.

You are allowed to revert a module when all of these conditions are met:
- The module is a standby member of the group.
- The module has adopted a failed member’s RPs.
- The module has detected that the failed member has returned online.

If the module has adopted RPs from more than one failed member, all must be recovered.

Note

Your redundancy group configuration might define multiple modules as active members. In some circumstances, another active member can adopt a failed member’s RPs. (See “Redundancy Group Behavior When a Member Fails” on page 10-10.) However, you cannot revert an active member.

Follow these steps to have a standby member relinquish its RPs:
1. Select Network Setup > Redundancy Group > Configuration.
2. Click the Revert Now button.

The button is active only if the three conditions described above are met.
Redundancy Groups
Configuring a Redundancy Group

The module immediately unadopts all RPs when you click the button. The RPs are adopted by any active member that can accept them, not necessarily the recovered module. However, either load balancing or adoption preference IDs, will probably guide most of the RPs toward the recovered module.