Port Trunking

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Port Trunking
Overview

Overview

This chapter describes creating and modifying port trunk groups. This includes non-protocol trunks and LACP (802.3ad) trunks.

Port Status and Configuration Features

<table>
<thead>
<tr>
<th>Feature</th>
<th>Default</th>
<th>Menu</th>
<th>CLI</th>
<th>Web</th>
</tr>
</thead>
<tbody>
<tr>
<td>viewing port trunks</td>
<td>n/a</td>
<td>page 11-9</td>
<td>page 11-11</td>
<td>page 11-17</td>
</tr>
<tr>
<td>configuring a static trunk group</td>
<td>none</td>
<td>page 11-9</td>
<td>page 11-15</td>
<td>—</td>
</tr>
<tr>
<td>configuring a dynamic LACP trunk group</td>
<td>disabled</td>
<td>—</td>
<td>page 11-15</td>
<td>—</td>
</tr>
</tbody>
</table>

Port trunking allows you to assign up to eight physical links to one logical link (trunk) that functions as a single, higher-speed link providing dramatically increased bandwidth. This capability applies to connections between backbone devices as well as to connections in other network areas where traffic bottlenecks exist. A **trunk group** is a set of up to eight ports configured as members of the same port trunk. Note that the ports in a trunk group do not have to be consecutive. For example:

<table>
<thead>
<tr>
<th>Switch 1:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Ports c1 - c3, c5 - c7, and c9 - c10 configured as a port trunk group.</td>
<td>port c1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Switch 2:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Ports a1, a3 - a4, a6 - a8, a11, and a12 configured as a port trunk group</td>
<td>port 1</td>
</tr>
</tbody>
</table>

Figure 11-1. Conceptual Example of Port Trunking

With full-duplex operation in a eight-port trunk group, trunking enables the following bandwidth capabilities:
**Port Connections and Configuration:** All port trunk links must be point-to-point connections between a switch and another switch, router, server, or workstation configured for port trunking. No intervening, non-trunking devices are allowed. It is important to note that ports on both ends of a port trunk group must have the same mode (speed and duplex) and flow control settings.

**Note**

**Link Connections.** The switch does not support port trunking through an intermediate, non-trunking device such as a hub, or using more than one media type in a port trunk group. Similarly, for proper trunk operation, all links in the same trunk group must have the same speed, duplex, and flow control.

**Port Security Restriction.** Port security does not operate on a trunk group. If you configure port security on one or more ports that are later added to a trunk group, the switch resets the port security parameters for those ports to the factory-default configuration.

**Caution**

To avoid broadcast storms or loops in your network while configuring a trunk, first disable or disconnect all ports you want to add to or remove from the trunk. After you finish configuring the trunk, enable or re-connect the ports.
Port Trunking
Port Trunk Features and Operation

Port Trunk Features and Operation

The switches covered in this guide offer these options for port trunking:

- LACP: IEEE 802.3ad—page 11-18
- Trunk: Non-Protocol—page 11-25

Up to 36 trunk groups are supported on the switches covered in this guide. The actual maximum depends on the number of ports available on the switch and the number of links in each trunk. (Using the Link Aggregation Control Protocol—LACP—option, you can include standby trunked ports in addition to the maximum of eight actively trunking ports.)

**LACP Note**

LACP requires full-duplex (FDx) links of the same media type (10/100Base-T, 100FX, etc.) and the same speed, and enforces speed and duplex conformance across a trunk group. For most installations, ProCurve recommends that you leave the port Mode settings at Auto (the default). LACP also operates with Auto-10, Auto-100, and Auto-1000 (if negotiation selects FDx), and 10FDx, 100FDx, and 1000FDx settings. (The 10-gigabit ports available for some switch models allow only the Auto setting.)

**Fault Tolerance:** If a link in a port trunk fails, the switch redistributes traffic originally destined for that link to the remaining links in the trunk. The trunk remains operable as long as there is at least one link in operation. If a link is restored, that link is automatically included in the traffic distribution again. The LACP option also offers a standby link capability, which enables you to keep links in reserve for service if one or more of the original active links fails. Refer to “Trunk Group Operation Using LACP” on page 11-18.)

Trunk Configuration Methods

**Dynamic LACP Trunk:** The switch automatically negotiates trunked links between LACP-configured ports on separate devices, and offers one dynamic trunk option: LACP. To configure the switch to initiate a dynamic LACP trunk with another device, use the interface command in the CLI to set the default LACP option to Active on the ports you want to use for the trunk. For example, the following command sets ports C1-C4 to LACP active:
ProCurve(config) int c1-c4 lacp active

Note that the preceding example works if the ports are not already operating in a trunk. To change the LACP option on ports already operating as a trunk, you must first remove them from the trunk. For example, if ports C1 - C4 were LACP-active and operating in a trunk with another device, you would do the following to change them to LACP-passive:

ProCurve(config)# no int c1-c4 lacp

*Removes the ports from the trunk.*

ProCurve(config)# int c1-c4 lacp passive

*Configures LACP passive.*

**Static Trunk:** The switch uses the links you configure with the Port/Trunk Settings screen in the menu interface or the `trunk` command in the CLI to create a static port trunk. The switch offers two types of static trunks: LACP and Trunk.

**Table 11-1. Trunk Types Used in Static and Dynamic Trunk Groups**

<table>
<thead>
<tr>
<th>Trunking Method</th>
<th>LACP</th>
<th>Trunk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dynamic</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Static</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>
### Table 11-2. Trunk Configuration Protocols

<table>
<thead>
<tr>
<th>Protocol</th>
<th>Trunking Options</th>
</tr>
</thead>
</table>
| LACP (802.3ad) | Provides dynamic and static LACP trunking options.  
- **Dynamic LACP** — Use the switch-negotiated dynamic LACP trunk when:  
  - The port on the other end of the trunk link is configured for Active or Passive LACP.  
  - You want fault-tolerance for high-availability applications. If you use an eight-link trunk you can also configure one or more additional links to operate as standby links that will activate only if another active link goes down.  
- **Static LACP** — Use the manually configured static LACP trunk when:  
  - The port on the other end of the trunk link is configured for a static LACP trunk  
  - You want to configure non-default spanning tree or IGMP parameters on an LACP trunk group.  
  - You want an LACP trunk group to operate in a VLAN other than the default VLAN and GVRP is disabled. *(Refer to “VLANs and Dynamic LACP” on page 11-23.)*  
  - You want to use a monitor port on the switch to monitor an LACP trunk.  
  For more information, refer to “Trunk Group Operation Using LACP” on page 11-18. |
| Trunk (non-protocol) | Provides manually configured, static-only trunking to:  
- Most ProCurve switches and routing switches not running the 802.3ad LACP protocol.  
- Windows NT and HP-UX workstations and servers  
Use the Trunk option when:  
  - The device to which you want to create a trunk link is using a non-802.3ad trunking protocol  
  - You are unsure which type of trunk to use, or the device to which you want to create a trunk link is using an unknown trunking protocol.  
  - You want to use a monitor port on the switch to monitor traffic on a trunk.  
  Refer to “Trunk Group Operation Using the “Trunk” Option” on page 11-25. |
Table 11-3. General Operating Rules for Port Trunks

**Media:** For proper trunk operation, all ports on both ends of a trunk group must have the same media type and mode (speed and duplex). (For the switches covered in this guide, ProCurve recommends leaving the port Mode setting at **Auto** or, in networks using Cat 3 cabling, **Auto-10**.)

**Port Configuration:** The default port configuration is **Auto**, which enables a port to sense speed and negotiate duplex with an Auto-Enabled port on another device. ProCurve recommends that you use the **Auto** setting for all ports you plan to use for trunking. Otherwise, you must manually ensure that the mode setting for each port in a trunk is compatible with the other ports in the trunk.

```
ProCurve(config)# show interface config
Port Settings
<table>
<thead>
<tr>
<th>Port Type</th>
<th>Enabled</th>
<th>Mode</th>
<th>Flow Ctrl</th>
<th>NDI</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1 10/100TX</td>
<td>Yes</td>
<td>Auto</td>
<td>Disable</td>
<td>Auto</td>
</tr>
<tr>
<td>C2 10/100TX</td>
<td>Yes</td>
<td>Auto</td>
<td>Disable</td>
<td>Auto</td>
</tr>
</tbody>
</table>
```

**Figure 11-2. Recommended Port Mode Setting for LACP**

All of the following operate on a per-port basis, regardless of trunk membership:
- Enable/Disable
- Flow control (Flow Ctrl)

LACP is a full-duplex protocol. Refer to “Trunk Group Operation Using LACP” on page 11-18.

**Trunk Configuration:** All ports in the same trunk group must be the same trunk type (LACP or Trunk). All LACP ports in the same trunk group must be either all static LACP or all dynamic LACP. A trunk appears as a single port labeled **Dyn1** (for an LACP dynamic trunk) or **Trk1** (for a static trunk of type: LACP, Trunk) on various menu and CLI screens. For a listing of which screens show which trunk types, refer to “How the Switch Lists Trunk Data” on page 11-26.

For spanning-tree or VLAN operation, configuration for all ports in a trunk is done at the trunk level. (You cannot separately configure individual ports within a trunk for spanning-tree or VLAN operation.)

**Traffic Distribution:** All of the switch trunk protocols use the SA/DA (Source Address/Destination Address) method of distributing traffic across the trunked links. Refer to “Outbound Traffic Distribution Across Trunked Links” on page 11-26.
Port Trunking
Trunk Configuration Methods

Spanning Tree: 802.1D (STP) and 802.1w (RSTP) Spanning Tree operate as a global setting on the switch (with one instance of Spanning Tree per switch). 802.1s (MSTP) Spanning Tree operates on a per-instance basis (with multiple instances allowed per switch). For each Spanning Tree instance, you can adjust Spanning Tree parameters on a per-port basis. A static trunk of any type appears in the Spanning Tree configuration display, and you can configure Spanning Tree parameters for a static trunk in the same way that you would configure Spanning Tree parameters on a non-trunked port. (Note that the switch lists the trunk by name—such as Trk1—and does not list the individual ports in the trunk.) For example, if ports C1 and C2 are configured as a static trunk named Trk1, they are listed in the Spanning Tree display as Trk1 and do not appear as individual ports in the Spanning Tree displays.

<table>
<thead>
<tr>
<th>Port</th>
<th>Type</th>
<th>Cost</th>
<th>Priority</th>
<th>State</th>
<th>Designated Bridge</th>
</tr>
</thead>
<tbody>
<tr>
<td>C3</td>
<td>100/1000T</td>
<td>5</td>
<td>128</td>
<td>Forwarding</td>
<td>0001e0-9b7a00</td>
</tr>
<tr>
<td>C4</td>
<td>100/1000T</td>
<td>5</td>
<td>128</td>
<td>Forwarding</td>
<td>0060b0-889e00</td>
</tr>
<tr>
<td>C5</td>
<td>100/1000T</td>
<td>5</td>
<td>128</td>
<td>Disabled</td>
<td></td>
</tr>
<tr>
<td>C6</td>
<td>100/1000T</td>
<td>5</td>
<td>128</td>
<td>Disabled</td>
<td></td>
</tr>
<tr>
<td>Trk1</td>
<td>1</td>
<td>64</td>
<td></td>
<td>Forwarding</td>
<td>001e00-000e00</td>
</tr>
</tbody>
</table>

Figure 11-3. Example of a Port Trunk in a Spanning Tree Listing

When Spanning Tree forwards on a trunk, all ports in the trunk will be forwarding. Conversely, when Spanning Tree blocks a trunk, all ports in the trunk are blocked.

Note: A dynamic LACP trunk operates only with the default Spanning Tree settings. Also, this type of trunk appears in the CLI show spanning-tree display, but not in the Spanning Tree Operation display of the Menu interface. If you remove a port from a static trunk, the port retains the same Spanning Tree settings that were configured for the trunk.

IP Multicast Protocol (IGMP): A static trunk of any type appears in the IGMP configuration display, and you can configure IGMP for a static trunk in the same way that you would configure IGMP on a non-trunked port. (Note that the switch lists the trunk by name—such as Trk1—and does not list the individual ports in the trunk.) Also, creating a new trunk automatically places the trunk in IGMP Auto status if IGMP is enabled for the default VLAN. A dynamic LACP trunk operates only with the default IGMP settings and does not appear in the IGMP configuration display or show ip igmp listing.

VLANs: Creating a new trunk automatically places the trunk in the DEFAULT_VLAN, regardless of whether the ports in the trunk were in another VLAN. Similarly, removing a port from a trunk group automatically places the port in the default VLAN. You can configure a static trunk in the same way that you configure a port for membership in any VLAN.

Note: For a dynamic LACP trunk to operate in a VLAN other than the default VLAN (DEFAULT_VLAN), GVRP must be enabled. Refer to “Trunk Group Operation Using LACP” on page 11-18.

Port Security: Trunk groups (and their individual ports) cannot be configured for port security, and the switch excludes trunked ports from the show port-security listing. If you configure non-default port security settings for a port, then subsequently try to place the port in a trunk, you will see the following message and the command will not be executed:

< port-list > Command cannot operate over a logical port.

Monitor Port:

Note: A trunk cannot be a monitor port. A monitor port can monitor a static trunk but cannot monitor a dynamic LACP trunk.
Menu: Viewing and Configuring a Static Trunk Group

Configure port trunking before you connect the trunked links to another switch, routing switch, or server. Otherwise, a broadcast storm could occur. (If you need to connect the ports before configuring them for trunking, you can temporarily disable the ports until the trunk is configured. Refer to “Using the CLI To Enable or Disable Ports and Configure Port Mode” on page 10-10.)

To View and/or Configure Static Port Trunking: This procedure uses the Port/Trunk Settings screen to configure a static port trunk group on the switch.

1. Follow the procedures in the Important note above.
2. From the Main Menu, Select:
   2. Switch Configuration …
      2. Port/Trunk Settings
3. Press [E] (for Edit) and then use the arrow keys to access the port trunk parameters.

4. In the Group column, move the cursor to the port you want to configure.
5. Use the Space bar to choose a trunk group assignment (Trk1, Trk2, and so on) for the selected port.
Port Trunking
Menu: Viewing and Configuring a Static Trunk Group

- For proper trunk operation, all ports in a trunk must have the same media type and mode (such as 10/100TX set to 100FDx, or 100FX set to 100FDx). The flow control settings must also be the same for all ports in a given trunk. To verify these settings, refer to “Viewing Port Status and Configuring Port Parameters” on page 10-2.

- You can configure the trunk group with up to eight ports per trunk. If multiple VLANs are configured, all ports within a trunk will be assigned to the same VLAN or set of VLANs. (With the 802.1Q VLAN capability built into the switch, more than one VLAN can be assigned to a trunk. Refer to the chapter titled “Static Virtual LANs (VLANs)” in the Advanced Traffic Management Guide for your switch.)

(To return a port to a non-trunk status, keep pressing the Space bar until a blank appears in the highlighted Group value for that port.)

---

<table>
<thead>
<tr>
<th>Port</th>
<th>Type</th>
<th>Enabled</th>
<th>Mode</th>
<th>Flow Ctrl</th>
<th>Group</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1</td>
<td>10/100TX</td>
<td>Yes</td>
<td>Auto</td>
<td>Disable</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C2</td>
<td>10/100TX</td>
<td>Yes</td>
<td>Auto</td>
<td>Disable</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C3</td>
<td>10/100TX</td>
<td>Yes</td>
<td>Auto</td>
<td>Disable</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C4</td>
<td>10/100TX</td>
<td>Yes</td>
<td>Auto</td>
<td>Disable</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C5</td>
<td>10/100TX</td>
<td>Yes</td>
<td>Auto</td>
<td>Disable</td>
<td></td>
<td>Trunk</td>
</tr>
<tr>
<td>C6</td>
<td>10/100TX</td>
<td>Yes</td>
<td>Auto</td>
<td>Disable</td>
<td>Trunk</td>
<td>Trunk</td>
</tr>
</tbody>
</table>

Select whether the port is part of a trunk or Mesh.
Use arrow keys to change field selection, <Space> to toggle field choices, and <Enter> to go to Actions.

**Figure 11-5. Example of the Configuration for a Two-Port Trunk Group**

6. Move the cursor to the Type column for the selected port and use the Space bar to select the trunk type:
   - LACP
   - Trunk (the default type if you do not specify a type)

All ports in the same trunk group on the same switch must have the same Type (LACP or Trunk).

7. When you are finished assigning ports to the trunk group, press [Enter], then [S] (for Save) and return to the Main Menu. (It is not necessary to reboot the switch.)

During the Save process, traffic on the ports configured for trunking will be delayed for several seconds. If the Spanning Tree Protocol is enabled, the delay may be up to 30 seconds.
8. Connect the trunked ports on the switch to the corresponding ports on the opposite device. If you previously disabled any of the trunked ports on the switch, enable them now. (Refer to “Viewing Port Status and Configuring Port Parameters” on page 10-2.)

Check the Event Log (“Using the Event Log To Identify Problem Sources” on page C-22) to verify that the trunked ports are operating properly.

---

### CLI: Viewing and Configuring Port Trunk Groups

#### Trunk Status and Configuration Commands

<table>
<thead>
<tr>
<th>Command</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>show trunks</td>
<td>11-13</td>
</tr>
<tr>
<td>show lacp</td>
<td></td>
</tr>
<tr>
<td>trunk</td>
<td>11-15</td>
</tr>
<tr>
<td>interface &lt; port-list &gt; lacp</td>
<td>11-15</td>
</tr>
</tbody>
</table>

**Using the CLI To View Port Trunks**

You can list the trunk type and group for all ports on the switch or for selected ports. You can also list LACP-only status information for LACP-configured ports.

**Listing Static Trunk Type and Group for All Ports or for Selected Ports.**

**Syntax:** `show trunks [ < port-list > ]`

*Omitting the < port-list > parameter results in a static trunk data listing for all LAN ports in the switch. For example, in a switch where ports A4 and A5 belong to Trunk 1 and ports A7 and A8 belong to Trunk 2, you have the options shown in figures 11-6 and 11-7 for displaying port data for ports belonging to static trunks.*
Using a port list specifies, for switch ports in a static trunk group, only the ports you want to view. In this case, the command specifies ports A5 through A7. However, because port A6 is not in a static trunk group, it does not appear in the resulting listing:

```
ProCurve> show trunks e a5-a7
Load Balancing
  Port | Name        | Type     | Group | Type
    +----+------------+----------+------+------
    A5 | Print-Server-Trunk | 10/100TX | Trk1 | Trunk
    A7 | not assigned    | 10/100TX | Trk2 | Trunk
```

Port A6 does not appear in this listing because it is not assigned to a static trunk.

**Figure 11-6. Example Listing Specific Ports Belonging to Static Trunks**

The `show trunks < port-list>` command in the above example includes a port list, and thus shows trunk group information only for specific ports that have membership in a static trunk. In figure 11-7, the command does not include a port list, so the switch lists all ports having static trunk membership.

```
ProCurve> show trunks
Load Balancing
  Port | Name        | Type     | Group | Type
    +----+------------+----------+------+------
    A4 | Print-Server-Trunk | 10/100TX | Trk1 | Trunk
    A5 | Print-Server-Trunk | 10/100TX | Trk1 | Trunk
    A7 | not assigned    | 10/100TX | Trk2 | Trunk
    A8 | not assigned    | 10/100TX | Trk2 | Trunk
```

**Figure 11-7. Example of a Show Trunk Listing Without Specifying Ports**
Listing Static LACP and Dynamic LACP Trunk Data.

**Syntax:** show lacp

Lists data for only the LACP-configured ports.

In the following example, ports A1 and A2 have been previously configured for a static LACP trunk. (For more on “Active”, see table 11-11-5 on page 11-21.)

<table>
<thead>
<tr>
<th>PORT</th>
<th>LACP</th>
<th>TRUNK</th>
<th>PORT</th>
<th>LACP</th>
<th>LACP</th>
</tr>
</thead>
<tbody>
<tr>
<td>NUMB</td>
<td>ENABLED</td>
<td>GROUP</td>
<td>STATUS</td>
<td>PARTNER</td>
<td>STATUS</td>
</tr>
<tr>
<td>A1</td>
<td>Active</td>
<td>Trk1</td>
<td>Up</td>
<td>Yes</td>
<td>Success</td>
</tr>
<tr>
<td>A2</td>
<td>Active</td>
<td>Trk1</td>
<td>Up</td>
<td>Yes</td>
<td>Success</td>
</tr>
<tr>
<td>A3</td>
<td>Active</td>
<td>A3</td>
<td>Down</td>
<td>No</td>
<td>Success</td>
</tr>
<tr>
<td>A4</td>
<td>Passive</td>
<td>A5</td>
<td>Down</td>
<td>No</td>
<td>Success</td>
</tr>
<tr>
<td>A5</td>
<td>Passive</td>
<td>A6</td>
<td>Down</td>
<td>No</td>
<td>Success</td>
</tr>
</tbody>
</table>

**Figure 11-8. Example of a Show LACP Listing**

(For a description of each of the above-listed data types, refer to table 11-5, “LACP Port Status Data” on page 11-21.)

**Dynamic LACP Standby Links.** Dynamic LACP trunking enables you to configure standby links for a trunk by including more than eight ports in a dynamic LACP trunk configuration. When eight ports (trunk links) are up, the remaining link(s) will be held in standby status. If a trunked link that is “Up” fails, it will be replaced by a standby link, which maintains your intended bandwidth for the trunk. (Refer to also the “Standby” entry under “Port Status” in “Table 11-5. LACP Port Status Data” on page 11-21.) In the next example, ports A1 through A9 have been configured for the same LACP trunk. Notice that one of the links shows Standby status, while the remaining eight links are “Up”.

---
Port Trunking
CLI: Viewing and Configuring Port Trunk Groups

Using the CLI To Configure a Static or Dynamic Trunk Group

Important
Configure port trunking before you connect the trunked links between switches. Otherwise, a broadcast storm could occur. (If you need to connect the ports before configuring them for trunking, you can temporarily disable the ports until the trunk is configured. Refer to “Using the CLI To Enable or Disable Ports and Configure Port Mode” on page 10-10.)

The table on page 11-5 describes the maximum number of trunk groups you can configure on the switch. An individual trunk can have up to eight links, with additional standby links if you’re using LACP. You can configure trunk group types as follows:

<table>
<thead>
<tr>
<th>Trunk Type</th>
<th>Trunk Group Membership</th>
</tr>
</thead>
<tbody>
<tr>
<td>LACP</td>
<td>Yes</td>
</tr>
<tr>
<td>Trunk</td>
<td>Yes</td>
</tr>
</tbody>
</table>

The following examples show how to create different types of trunk groups.
Port Trunking
CLI: Viewing and Configuring Port Trunk Groups

Configuring a Static Trunk or Static LACP Trunk Group.

**Syntax:**  trunk < port-list > < trk1 ... trk36 > < trunk | lacp >

*Configures the specified static trunk type.*

This example uses ports C4 - C6 to create a non-protocol static trunk group with the group name of Trk2.

ProCurve(config)# trunk c4-c6 trk2 trunk

Removing Ports from a Static Trunk Group. This command removes one or more ports from an existing TrkX trunk group.

**Caution**
Removing a port from a trunk can create a loop and cause a broadcast storm. When you remove a port from a trunk where spanning tree is not in use, ProCurve recommends that you first disable the port or disconnect the link on that port.

**Syntax:**  no trunk < port-list >

*Removes the specified ports from an existing trunk group.*

For example, to remove ports C4 and C5 from an existing trunk group.

ProCurve(config)# no trunk c4-c5

Enabling a Dynamic LACP Trunk Group. In the default port configuration, all ports on the switch are set to disabled. To enable the switch to automatically form a trunk group that is dynamic on both ends of the link, the ports on one end of a set of links must be LACP Active. The ports on the other end can be either LACP Active or LACP Passive. The active command enables the switch to automatically establish a (dynamic) LACP trunk group when the device on the other end of the link is configured for LACP Passive.
Port Trunking
CLI: Viewing and Configuring Port Trunk Groups

Figure 11-10. Example of Criteria for Automatically Forming a Dynamic LACP Trunk

Syntax: interface < port-list > lacp active

Configures < port-list > as LACP active. If the ports at the other end of the links on < port-list > are configured as LACP passive, then this command enables a dynamic LACP trunk group on < port-list >.

This example uses ports C4 and C5 to enable a dynamic LACP trunk group.

ProCurve(config)# interface c4-c5 lacp active

Removing Ports from an Dynamic LACP Trunk Group. To remove a port from dynamic LACP trunk operation, you must turn off LACP on the port. (On a port in an operating, dynamic LACP trunk, you cannot change between LACP Active and LACP passive without first removing LACP operation from the port.)
**Caution**

Unless spanning tree is running on your network, removing a port from a trunk can result in a loop. To help prevent a broadcast storm when you remove a port from a trunk where spanning tree is not in use, ProCurve recommends that you first disable the port or disconnect the link on that port.

**Syntax:**

```
no interface <port-list> lacp
```

*Removes <port-list> from any dynamic LACP trunk and returns the ports in <port-list> to passive LACP.*

In this example, port C6 belongs to an operating, dynamic LACP trunk. To remove port C6 from the dynamic trunk and return it to passive LACP, you would do the following:

```
ProCurve(config)# no interface c6 lacp
ProCurve(config)# interface c6 lacp passive
```

Note that in the above example, if the port on the other end of the link is configured for active LACP or static LACP, the trunked link will be re-established almost immediately.

---

**Web: Viewing Existing Port Trunk Groups**

While the web browser interface does not enable you to configure a port trunk group, it does provide a view of an existing trunk group.

To view any port trunk groups:

Click on the **Status** tab.

Click on [Port Status].
Trunk Group Operation Using LACP

The switch can automatically configure a dynamic LACP trunk group or you can manually configure a static LACP trunk group.

**Note**

LACP requires full-duplex (FDx) links of the same media type (10/100Base-T, 100FX, etc.) and the same speed, and enforces speed and duplex conformance across a trunk group. For most installations, ProCurve recommends that you leave the port Mode settings at **Auto** (the default). LACP also operates with **Auto-10**, **Auto-100**, and **Auto-1000** (if negotiation selects FDx), and **10FDx**, **100FDx**, and **1000FDx** settings.

LACP trunk status commands include:

<table>
<thead>
<tr>
<th>Trunk Display Method</th>
<th>Static LACP Trunk</th>
<th>Dynamic LACP Trunk</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLI <strong>show lacp</strong> command</td>
<td>Included in listing.</td>
<td>Included in listing.</td>
</tr>
<tr>
<td>CLI <strong>show trunk</strong> command</td>
<td>Included in listing.</td>
<td>Not included.</td>
</tr>
<tr>
<td>Port/Trunk Settings screen in menu interface</td>
<td>Included in listing.</td>
<td>Not included</td>
</tr>
</tbody>
</table>

Thus, to display a listing of dynamic LACP trunk ports, you must use the **show lacp** command.

In most cases, trunks configured for LACP on the switches covered in this guide operate as described in table 11-4 on the next page.
Table 11-4. LACP Trunk Types

<table>
<thead>
<tr>
<th>LACP Port Trunk Configuration</th>
<th>Operation</th>
</tr>
</thead>
</table>
| Dynamic LACP                 | This option automatically establishes an 802.3ad-compliant trunk group, with **LACP** for the port Type parameter and **DynX** for the port Group name, where **X** is an automatically assigned value from 1 to 36, depending on how many dynamic and static trunks are currently on the switch. (The switch allows a maximum of 36 trunk groups in any combination of static and dynamic trunks.) **Note:** Dynamic LACP trunks operate only in the default VLAN (unless GVRP is enabled and **Forbid** is used to prevent the trunked ports from joining the default VLAN). Thus, if an LACP dynamic port forms using ports that are not in the default VLAN, the trunk will automatically move to the default VLAN unless GVRP operation is configured to prevent this from occurring. In some cases, this can create a traffic loop in your network. For more on this topic, refer to “VLANs and Dynamic LACP” on page 11-23. Under the following conditions, the switch automatically establishes a dynamic LACP port trunk group and assigns a port Group name:  
  • The ports on both ends of each link have compatible mode settings (speed and duplex).  
  • The port on one end of each link must be configured for LACP Active and the port on the other end of the same link must be configured for either LACP Passive or LACP Active. For example:  

```
Switch 1
  Port X:  
  LACP Enable: Active
  Port Y:   
  LACP Enable: Active

Switch 2
  Port A: 
  LACP Enable: Active
  Port B:  
  LACP Enable: Passive
```

Either of the above link configurations allow a dynamic LACP trunk link. **Backup Links:** A maximum of eight operating links are allowed in the trunk, but, with dynamic LACP, you can configure one or more additional (backup) links that the switch automatically activates if a primary link fails. To configure a link as a standby for an existing eight-port dynamic LACP trunk, ensure that the ports in the standby link are configured as either active-to-active or active-to-passive between switches.  
**Displaying Dynamic LACP Trunk Data:** To list the configuration and status for a dynamic LACP trunk, use the CLI **show lacp** command.  
**Note:** The dynamic trunk is automatically created by the switch, and is not listed in the static trunk listings available in the menu interface or in the CLI **show trunk** listing.
Port Trunking
Trunk Group Operation Using LACP

<table>
<thead>
<tr>
<th>LACP Port Trunk Configuration</th>
<th>Operation</th>
</tr>
</thead>
</table>
| Static LACP                  | Provides a manually configured, static LACP trunk to accommodate these conditions:  
  - The port on the other end of the trunk link is configured for a static LACP trunk.  
  - You want to configure non-default spanning tree or IGMP parameters on an LACP trunk group.  
  - You want an LACP trunk group to operate in a VLAN other than the default VLAN and GVRP is disabled. (Refer to “VLANs and Dynamic LACP” on page 11-23.)  
  - You want to use a monitor port on the switch to monitor an LACP trunk.  
  The trunk operates if the trunk group on the opposite device is running one of the following trunking protocols:  
  - Active LACP  
  - Passive LACP  
  - Trunk  
  This option uses LACP for the port Type parameter and Trk.X for the port Group parameter, where X is an automatically assigned value in a range corresponding to the maximum number of trunks the switch allows. (The table on page 11-5 lists the maximum number of trunk groups allowed on the switches covered in this guide.)  
  Displaying Static LACP Trunk Data: To list the configuration and status for a static LACP trunk, use the CLI show lacp command. To list a static LACP trunk with its assigned ports, use the CLI show trunk command or display the menu interface Port/Trunk Settings screen.  
  Static LACP does not allow standby ports. |

Default Port Operation

In the default configuration, LACP is disabled for all ports. If LACP is not configured as Active on at least one end of a link, then the port does not try to detect a trunk configuration and operates as a standard, untrunked port. Table 11-5 lists the elements of per-port LACP operation. To display this data for a switch, execute the following command in the CLI:

ProCurve> show lacp
Port Trunking
Trunk Group Operation Using LACP

Table 11-5. LACP Port Status Data

<table>
<thead>
<tr>
<th>Status Name</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Port Numb</td>
<td>Shows the physical port number for each port configured for LACP operation (C1, C2, C3…). Unlisted port numbers indicate that the missing ports are assigned to a static Trunk group are not configured for any trunking.</td>
</tr>
<tr>
<td>LACP Enabled</td>
<td><strong>Active:</strong> The port automatically sends LACP protocol packets.&lt;br&gt;<strong>Passive:</strong> The port does not automatically send LACP protocol packets, and responds only if it receives LACP protocol packets from the opposite device. A link having either two active LACP ports or one active port and one passive port can perform dynamic LACP trunking. A link having two passive LACP ports will not perform LACP trunking because both ports are waiting for an LACP protocol packet from the opposite device.&lt;br&gt;Note: In the default switch configuration, LACP is disabled for all ports.</td>
</tr>
<tr>
<td>Trunk Group</td>
<td><strong>TrkX:</strong> This port has been manually configured into a static LACP trunk.&lt;br&gt;<strong>Trunk Group Same as Port Number:</strong> The port is configured for LACP, but is not a member of a port trunk.</td>
</tr>
<tr>
<td>Port Status</td>
<td><strong>Up:</strong> The port has an active LACP link and is not blocked or in Standby mode.&lt;br&gt;<strong>Down:</strong> The port is enabled, but an LACP link is not established. This can indicate, for example, a port that is not connected to the network or a speed mismatch between a pair of linked ports.&lt;br&gt;<strong>Disabled:</strong> The port cannot carry traffic.&lt;br&gt;<strong>Blocked:</strong> LACP, spanning tree has blocked the port. (The port is not in LACP Standby mode.) This may be due to a (brief) trunk negotiation or a configuration error such as differing port speeds on the same link or trying to connect the switch to more trunks than it can support. (See the table on page 11-5.)&lt;br&gt;Note: Some older devices are limited to four ports in a trunk. When eight LACP-enabled ports are connected to one of these older devices, four ports connect, but the other four ports are blocked.&lt;br&gt;<strong>Standby:</strong> The port is configured for dynamic LACP trunking to another device, but the maximum number of ports for the Dynamic trunk to that device has already been reached on either the switch or the other device. This port will remain in reserve, or “standby” unless LACP detects that another, active link in the trunk has become disabled, blocked, or down. In this case, LACP automatically assigns a Standby port, if available, to replace the failed port.</td>
</tr>
<tr>
<td>LACP Partner</td>
<td><strong>Yes:</strong> LACP is enabled on both ends of the link.&lt;br&gt;<strong>No:</strong> LACP is enabled on the switch, but either LACP is not enabled or the link has not been detected on the opposite device.</td>
</tr>
<tr>
<td>LACP Status</td>
<td><strong>Success:</strong> LACP is enabled on the port, detects and synchronizes with a device on the other end of the link, and can move traffic across the link.&lt;br&gt;<strong>Failure:</strong> LACP is enabled on a port and detects a device on the other end of the link, but is not able to synchronize with this device, and therefore not able to send LACP packets across the link. This can be caused, for example, by an intervening device on the link (such as a hub), a bad hardware connection, or if the LACP operation on the opposite device does not comply with the IEEE 802.3ad standard.</td>
</tr>
</tbody>
</table>
LACP Notes and Restrictions

**802.1X (Port-Based Access Control) Configured on a Port.** To maintain security, LACP is not allowed on ports configured for 802.1X authenticator operation. If you configure port security on a port on which LACP (active or passive) is configured, the switch removes the LACP configuration, displays a notice that LACP is disabled on the port(s), and enables 802.1X on that port.

```
ProCurve(config)# aaa port-access authenticator b1
LACP has been disabled on 802.1x port(s).
ProCurve(config)#
```

The switch will not allow you to configure LACP on a port on which port access (802.1X) is enabled. For example:

```
ProCurve(config)# int b1 lacp passive
Error configuring port < port-number >: LACP and 802.1x cannot be run together.
ProCurve(config)#
```

To restore LACP to the port, you must first remove the port’s 802.1X configuration and then re-enable LACP active or passive on the port.

**Port Security Configured on a Port.** To maintain security, LACP is not allowed on ports configured for port security. If you configure port security on a port on which LACP (active or passive) is configured, the switch removes the LACP configuration, displays a notice that LACP is disabled on the port(s), and enables port security on that port. For example:

```
ProCurve(config)# port-security a17 learn-mode static address-limit 2
LACP has been disabled on secured port(s).
ProCurve(config)#
```

The switch will not allow you to configure LACP on a port on which port security is enabled. For example:

```
ProCurve(config)# int a17 lacp passive
Error configuring port A17: LACP and port security cannot be run together.
ProCurve(config)#
```

To restore LACP to the port, you must remove port security and re-enable LACP active or passive.
Changing Trunking Methods. To convert a trunk from static to dynamic, you must first eliminate the static trunk.

Static LACP Trunks. Where a port is configured for LACP (Active or Passive), but does not belong to an existing trunk group, you can add that port to a static trunk. Doing so disables dynamic LACP on that port, which means you must manually configure both ends of the trunk.

Dynamic LACP Trunks. You can configure a port for LACP-active or LACP-passive, but on a dynamic LACP trunk you cannot configure the other options that you can on static trunks. If you want to manually configure a trunk, use the `trunk` command. (Refer to “Using the CLI To Configure a Static or Dynamic Trunk Group” on page 11-14.)

VLANs and Dynamic LACP. A dynamic LACP trunk operates only in the default VLAN (unless you have enabled GVRP on the switch and use `Forbid` to prevent the ports from joining the default VLAN).

- If you want to use LACP for a trunk on a non-default VLAN and GVRP is disabled, configure the trunk as a static trunk.

Blocked Ports with Older Devices. Some older devices are limited to four ports in a trunk. When eight LACP-enabled ports are connected to one of these older devices, four ports connect, but the other four ports are blocked. The LACP status of the blocked ports is shown as “Failure”.

If one of the other ports becomes disabled, a blocked port will replace it (Port Status becomes “Up”). When the other port becomes active again, the replacement port goes back to blocked (Port Status is “Blocked”). It can take a few seconds for the switch to discover the current status of the ports.
Port Trunking
Trunk Group Operation Using LACP

If there are ports that you do not want on the default VLAN, ensure that they cannot become dynamic LACP trunk members. Otherwise a traffic loop can unexpectedly occur. For example:

![Figure 11-11. Blocked Ports with LACP](image)

Easy control methods include either disabling LACP on the selected ports or configuring them to operate in static LACP trunks.

![Figure 11-12. A Dynamic LACP Trunk Forming in a VLAN Can Cause a Traffic Loop](image)
Spanning Tree and IGMP. If Spanning Tree and/or IGMP is enabled in the switch, a dynamic LACP trunk operates only with the default settings for these features and does not appear in the port listings for these features.

Half-Duplex and/or Different Port Speeds Not Allowed in LACP Trunks. The ports on both sides of an LACP trunk must be configured for the same speed and for full-duplex (FDx). The 802.3ad LACP standard specifies a full-duplex (FDx) requirement for LACP trunking. (10-gigabit ports operate only at FDx.)

A port configured as LACP passive and not assigned to a port trunk can be configured to half-duplex (HDx). However, in any of the following cases, a port cannot be reconfigured to an HDx setting:
- If the port is a 10-gigabit port.
- If a port is set to LACP Active, you cannot configure it to HDx.
- If a port is already a member of a static or dynamic LACP trunk, you cannot configure it to HDx.
- If a port is already set to HDx, the switch does not allow you to configure it for a static or dynamic LACP trunk.

Dynamic/Static LACP Interoperation: A port configured for dynamic LACP can properly interoperate with a port configured for static (TrkX) LACP, but any ports configured as standby LACP links will be ignored.

---

Trunk Group Operation Using the “Trunk” Option

This method creates a trunk group that operates independently of specific trunking protocols and does not use a protocol exchange with the device on the other end of the trunk. With this choice, the switch simply uses the SA/DA method of distributing outbound traffic across the trunked ports without regard for how that traffic is handled by the device at the other end of the trunked links. Similarly, the switch handles incoming traffic from the trunked links as if it were from a trunked source.

When a trunk group is configured with the trunk option, the switch automatically sets the trunk to a priority of “4” for spanning-tree operation (even if spanning-tree is currently disabled. This appears in the running-config file as spanning-tree Trkn priority 4. Executing write memory after configuring the trunk places the same entry in the startup-config file.
Port Trunking
How the Switch Lists Trunk Data

Use the Trunk option to establish a trunk group between a switch covered in this guide and another device, where the other device’s trunking operation fails to operate properly with LACP trunking configured on the switches.

How the Switch Lists Trunk Data

Static Trunk Group: Appears in the menu interface and the output from the CLI `show trunk` and `show interfaces` commands.

Dynamic LACP Trunk Group: Appears in the output from the CLI `show lacp` command.

<table>
<thead>
<tr>
<th>Interface Option</th>
<th>Dynamic LACP Trunk Group</th>
<th>Static LACP Trunk Group</th>
<th>Static Non-Protocol</th>
</tr>
</thead>
<tbody>
<tr>
<td>Menu Interface</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>CLI show trunk</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>CLI show interfaces</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>CLI show lacp</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>CLI show spanning-tree</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>CLI show igmp</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>CLI show config</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Outbound Traffic Distribution Across Trunked Links

The two trunk group options (LACP and Trunk) use source-destination address pairs (SA/DA) for distributing outbound traffic over trunked links.

SA/DA (source address/destination address) causes the switch to distribute outbound traffic to the links within the trunk group on the basis of source/destination address pairs. That is, the switch sends traffic from the same source address to the same destination address through the same trunked link, and sends traffic from the same source address to a different destination address through a different link, depending on the rotation of path assign-
Port Trunking
Outbound Traffic Distribution Across Trunked Links

ments among the links in the trunk. Likewise, the switch distributes traffic for
the same destination address but from different source addresses through
different links. Because the amount of traffic coming from or going to various
nodes in a network can vary widely, it is possible for one link in a trunk group
to be fully utilized while others in the same trunk have unused bandwidth
capacity even though the address assignments are evenly distributed across
the links in a trunk. In actual networking environments, this is rarely a
problem. However, if it becomes a problem, you can use the ProCurve
Manager Plus network management software to quickly and easily identify the
sources of heavy traffic (top talkers) and make adjustments to improve
performance.

Broadcasts, multicasts, and floods from different source addresses are dis-
tributed evenly across the links. As links are added or deleted, the switch
redistributes traffic across the trunk group. For example, in figure 11-13
showing a three-port trunk, traffic could be assigned as shown in table 11-6.

Figure 11-13. Example of Port-Trunked Network

Table 11-6. Example of Link Assignments in a Trunk Group (SA/DA Distribution)

<table>
<thead>
<tr>
<th>Source:</th>
<th>Destination:</th>
<th>Link:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Node A</td>
<td>Node W</td>
<td>1</td>
</tr>
<tr>
<td>Node B</td>
<td>Node X</td>
<td>2</td>
</tr>
<tr>
<td>Node C</td>
<td>Node Y</td>
<td>3</td>
</tr>
<tr>
<td>Node D</td>
<td>Node Z</td>
<td>1</td>
</tr>
<tr>
<td>Node A</td>
<td>Node Y</td>
<td>2</td>
</tr>
<tr>
<td>Node B</td>
<td>Node W</td>
<td>3</td>
</tr>
</tbody>
</table>
Port Trunking
Outbound Traffic Distribution Across Trunked Links