Interconnecting Catalyst 3920 Switches

The Catalyst 3920 is a switch, not a concentrator, so Catalyst 3920s can be connected to form large networks. This chapter describes the methods of connecting Catalyst 3920s: using TokenChannels or as a stack in a back-to-back configuration or using a Catalyst Matrix.

This chapter contains the following information about interconnecting Catalyst 3920 switches:

- Using TokenChannels on page 2-1
- Stacking Catalyst 3920s and Catalyst 3900s on page 2-2

Note   You can interconnect Catalyst 3920s with Catalyst 3900s, and in this chapter, Catalyst 39*xx* is used to represent both.

Using TokenChannels

The Catalyst 3920 allows you to configure *TokenChannels*. TokenChannels consist of two to eight parallel channels between two Catalyst 39*xx* switches. These parallel channels provide improved performance between switches.

A single TokenChannel can consist of a combination of HDX and FDX connections. For example, a TokenChannel consisting of three connections can have one HDX and two FDX connections. However, both ports in each interconnected pair must be either HDX or FDX. In addition, all ports in a single TokenChannel must belong to the same TrCRF on the Catalyst 3920.

Catalyst 3900 TokenChannel configurations are fault-tolerant. This feature enables channels to continue to function as long as there is at least one link active within the channel. This capability ensures that large portions of a network are not disrupted in the event a port or cable fails within the channel by transferring the traffic to one or more of the remaining ports in the channel.

Note   When the Catalyst 3920 is configured with TokenChannels, all broadcast frames use the lowest numbered active port of the TokenChannel.

Stacking Catalyst 3920s and Catalyst 3900s

A stack of Catalyst 39*xx* switches is not just a connection of several switches. A stack of Catalyst switches combine to form a "virtual" single switch.

A Catalyst stack is configured in one of the following two ways:

- As two Catalyst 39*xx* switches cabled together in a back-to-back configuration.

- As a stack of up to eight Catalyst 39*xx* switches connected together via a Catalyst Matrix.

Two Catalyst 39*xx* switches can be connected to form a stack by using only a stack port cable plugged into the stack port on the back of each Catalyst switch. This creates a direct connection between the two Catalyst 39*xx* switches, which is referred to as a *back-to-back* stack. As an alternative, you can use an 8-port Catalyst Matrix switch to create a stack of up to eight Catalyst 39*xx* switches. The ProStack port operates in FDX mode at speeds of 140 Mbps. It switches packets at wire speeds with low forwarding latency. A proprietary 4-byte header is used to allow the members of the stack to function as one operational system.

When you power-on a Catalyst 3920, it runs through a set of self-diagnostics. Immediately after the diagnostics are completed, the Catalyst 3920 runs through a *stack discovery mode*. This discovery mode detects whether the switch is cabled to another Catalyst 39*xx*. If it is determined during the discovery mode that the Catalyst 3920 is connected to other switches, the switches are automatically combined to form a stack. At the end of the discovery mode, if it is determined that the Catalyst 3920 is not connected to another switch, it will operate as a standalone switch.

Advantages of the stack include the following:

- Manage the entire stack as a single device

- Single SNMP image for entire stack

    — Easier to customize SNMP applications

- Distributed intelligence between the switches of the stack

    — Shared learning

    — Shared management information

- Hot swap of stack switches

    — When a switch is powered off or removed from the stack, the other switches reform as a stack

This release of the Catalyst 3920 includes a stack port (which is identified as revision B) that supports MTUs of up to 18190. The initial release of the Catalyst 3900 Stack Port module (which is identified as revision A) did not support MTUs greater than 4472. Revision B of the Catalyst 3900 Stack Port module supports MTUs of up to 18190.

Therefore, if you create a stack that contains a mixture of Catalyst 3920 and Catalyst 3900 switches, all the switches in the stack should include stack ports that are revision B or later. To verify the revision level of a stack port module on a Catalyst 3900, see the Module Information panel.

If you attempt to create a stack that contains switches that have both revision A and revision B stack ports, the stack will not completely form. If the controlling switch (the first switch in the stack to come up) contains a revision A module, only the switches with revision A modules will be able to join the stack. Likewise, if the controlling switch contains a revision B module (for example, a Catalyst 3920), only the switches with revision B modules will be able to join the stack.

Note If the stack contains Catalyst 3900s that contain ATM or ISL modules, you will be able to configure the ports on these modules and obtain statistics about these modules from the Catalyst 3920 console. For information about configuring the ATM or ISL modules of a Catalyst 3900 and the types of statistical information you can obtain, see the *Catalyst 3900 Token Ring Switch User Guide*.

Forming a Back-to-Back Catalyst Stack

A proprietary shielded cable, 1 meter in length, with 50-pin connectors, is used to connect the Catalyst 39*xx* switches together. After power-on diagnostics, the stack discovery mode runs. If, during this stack discovery mode, a Catalyst 39*xx* switch detects that it is connected to another Catalyst 39*xx* switch in a back-to-back configuration, the two switches will begin to form a stack.

As soon as the stack discovery mode is completed, two things happen:

- Each Catalyst 39*xx* switch is assigned a box number.

   — The two Catalyst 39*xx* switches in a back-to-back stack become box 1 and box 2. The box number is determined by the MAC address of each Catalyst 39*xx* switch. The Catalyst 39*xx* switch with the lower MAC address becomes box 1, and the Catalyst 39*xx* switch with the higher MAC address becomes box 2.

- The Catalyst 39*xx* switches must combine configuration information so that both of the boxes, as a stack, will use certain common parameters. This common information is called the *interbox parameters*. The "Interbox Parameters" section on page 2-5 of this chapter lists the shared parameters. In a stack of switches, one of the switches must become the provider of the interbox parameters.

   — If the Catalyst 39*xx* switches have the *same* configuration information (whether they are new or have been preconfigured to be the same) when they begin to form a stack, the Catalyst 39*xx* switch that becomes box 1 also becomes the provider of the interbox parameters.

   — If the configuration information differs between the two Catalyst 39*xx* switches, the first switch up provides its configuration information to the other switch. If both switches come up simultaneously, an error message is displayed that instructs the user to briefly press the SYSREQ button on the switch that contains the desired configuration.

After a stack has formed and sets up the interbox parameters, the stack operates the same way whether it is in a back-to-back configuration or is in a multi-unit configuration using the Catalyst Matrix interface.

Creating a Multi-Unit Catalyst Stack with a Catalyst Matrix Interface

Using a Catalyst Matrix, you can create a multi-unit stack of up to eight Catalyst 39*xx* switches. The following sections describe how this multi-unit stack is formed.

Catalyst Matrix Description

The Catalyst Matrix is an eight-port switch matrix interface that connects up to eight Catalyst 39*xx* switches. The Catalyst 39*xx* detects if it is connected to a Catalyst Matrix and also detects if there are other Catalyst 39*xx* switches connected to that Catalyst Matrix. The connected Catalyst 39*xx* switches and the Catalyst Matrix combine logically to form a stack.

Any combination of up to eight Catalyst 39*xx* switches can be connected to or disconnected from the Catalyst Matrix while it, or any of the switches, are powered on or powered off. A proprietary shielded cable, 1 meter in length, with 50-pin connectors, is used to connect the Catalyst stack equipment together. The cable has *cross-over* wiring so either end can connect to the Catalyst Matrix, or to the Catalyst 39*xx* switches. The cable is plugged directly into a stack port I/O connector on the back of the Catalyst Matrix. The other end is plugged into a Catalyst stack port module interface card that is installed in the rear expansion slot in the Catalyst 39*xx*.

Forming a Multi-Unit Catalyst Stack

When Catalyst 39*xx* switches first power up, they run through a set of self-diagnostics. Immediately after the diagnostics are completed, the Catalyst 39*xx* switches run through a stack discovery mode. During this stack discovery mode, if two or more Catalyst 39*xx* switches are connected to a Catalyst Matrix, the switches will detect the connection and combine logically to create a stack configuration.

As soon as the stack discovery mode is completed, each Catalyst 39*xx* is assigned a box number. With a Catalyst Matrix configuration, the box number for a Catalyst 39*xx* is determined by the port number the Catalyst 39*xx* is connected to on the Catalyst Matrix. For example, the Catalyst 39*xx* plugged into port 3 on the Catalyst Matrix becomes box 3. The box number remains constant as long as that switch is plugged in to that port. If a Catalyst 39*xx* is moved to another port, the box number for that Catalyst 39*xx* will change to the number of the port it is moved to.

Note   The switch with the lowest box number becomes the controlling switch.

For a stack to operate as a single entity, the interbox parameters must be the same in all of the switches in a stack. The "Interbox Parameters" section on page 2-5 of this chapter lists the shared parameters. There are two possible ways of providing configuration information to the Catalyst 39*xx* switches in a stack. These methods are as follows:

- Preconfigure all the Catalyst 39*xx* switches with the same parameters.

- Allow one of the switches to provide the configuration information to the other switches in the stack.

  The first switch that comes up provides the initial configuration to the rest of the switches. If the switches come up simultaneously and their configurations differ, a warning message is displayed that instructs the user to briefly press the SYSREQ button on the switch that contains the desired configuration. Pressing the SYSREQ button will cause the selected switch to send out its configuration information to the other switches in the stack.

Note   If you press the SYSREQ button for more than a few seconds, the System Request menu is displayed. If this happens, exit the System Request menu and then briefly press the SYSREQ button.

If the Catalyst 39*xx* switches are already powered on and *then* connected, the same procedure as described above occurs, except that because the switches are already powered up and functioning, they will continue to perform their previous internal switching functions. While the normal internal switching functions are still operating, a split stack is formed. Once the split stack is formed, the console displays the same warning message, instructing the user to press the SYSREQ button of the switch that contains the desired configuration.

If Catalyst 39*xx*s have formed a stack and any additional Catalyst 39*xx*s are added to the stack, the new switches will join the existing stack by altering their interbox parameters to match those of the existing stack.

After a stack has formed and sets up the interbox parameters, the stack operates the same way whether it is in a back-to-back configuration or is in a multi-unit configuration using the Catalyst Matrix interface.

Interbox Parameters

When a stack is formed, certain configuration information within all of the different Catalyst 39*xx* switches must combine to form a common configuration (interbox parameters). The stack operates as a single entity when all of the Catalyst 39*xx* switches in that stack use the same interbox parameters.

The following is a list of these shared interbox parameters. The parameters in this list are accessed through the console configuration menus. The console menus are described in "Configuring the Catalyst 3920" chapter.

- IP Configuration
    — IP address
    — Default gateway
    — Subnet mask
    — IP state
- Spanning-Tree Protocol
    — Participation
    — Switch priority
    — Port priority
    — Port cost
    — Maximum message age
    — Hello time
    — Forward delay
- VLAN information
- Limited Multicast Filters
- System password
- Console time-out
- Telnet configuration
    — Number of Telnet sessions allowed
    — Whether new Telnet sessions are allowed
- TFTP download
    — TFTP VLAN
    — TFTP server address
    — TFTP download filename

- Switch and stack information
  — Stack time-out
  — System name
  — System contact
  — System location
- SNMP configuration
  — Authentication traps
  — Trap table
  — Community name table

For a stack to operate as a single entity, the interbox parameters must be the same in all of the switches in a stack. Before Catalyst 39*xx* switches first start to form a stack, there are two possible configuration setups between the Catalyst 39*xx* switches. The first type of configuration setup is that each one of the different Catalyst 39*xx* switches is preconfigured with the same parameters. When all of the switches are preconfigured with the same information, the procedure for stack forming is described in the previous sections (back-to-back or multi-unit stack).

If the parameters are different in any of Catalyst 39*xx* switches trying to form a stack, the following occurs:

- If the Catalyst 39*xx* switches are connected together and *then* powered up, a message is displayed on the console screen as the stack tries to form. At this point, because there is different configuration information in at least two of the boxes, a temporary split stack (two logical stacks) is formed. The switches stay in a split-stack configuration until the warning message is cleared.

  The message is as follows:

  Warning: The units trying to form a stack have different configurations. Please select a unit as the stack's configuration provider by briefly pushing the SysReq (System Request) button on that unit. (This feature gives you the option of selecting which switch you want to use as a base for the stack parameters.)

  Once the SysReq button is pushed on a specific switch, that switch becomes the stack provider and the other switches will replace their stack-related configuration parameters with the parameters of the provider.

- If the Catalyst 39*xx* switches are already powered on and *then* connected together, the same procedure as described in the previous bullet occurs, except that since the switches were already powered up and were functioning, they will continue to perform their previous internal switching functions. While the normal internal switching functions are still operating, a split stack is formed. Once the split stack is formed, the console displays the same warning message requiring a System Request. Pushing the SYSREQ button provides the stack with that switch's interbox parameters and allows stack forming to continue.

- If Catalyst 39*xx* switches have formed and are functioning as a stack and any additional Catalyst 39*xx* switches are added to it, the new boxes will join the existing stack by configuring their interbox parameters to that of the existing stack.