CHAPTER 2

Planning

This chapter describes the preinstallation guidelines and several sample configurations for the FastHub 116C. Use these guidelines and examples to determine how FastHub 116C can best fit into your network.

Preinstallation Guidelines

You can install your FastHub 116C in the same locations as your other Ethernet hubs, bridges, and routers. This would normally be a wiring closet or computer room but it could also be an office.

The FastHub 116C can be mounted on a table, shelf, or rack. The key requirement is to locate FastHub 116C according to the cabling guidelines discussed in this chapter. Because the LEDs and the cable connectors are on the front panel, you should also ensure easy access to the front of the hub.

See the “Technical Specifications” appendix for a complete description of the hub’s dimensions and physical requirements.

Compatibility

Ports 1 through 15 are compatible with the 100Base-TX specification and can connect to any 100Base-TX device. Port 16 is compatible with the 100Base-FX specification.

Configuration Guidelines and Sample Networks

There are simple guidelines for cabling the FastHub 116C. This section consists of some common configurations and the guidelines that apply to them. In general, you can connect devices to the FastHub 116C according to the following rules:

- Each FastHub 116C in the network is equivalent to 90 meters of cable.
- The maximum distance between any two nodes on a repeated 100Base-T network is 400 meters. This includes the 90 meter distance associated with each repeater.
- The maximum length for any Category 5 UTP cable is 100 meters.

When implementing the FastHub 116C, these guidelines interrelate in the following ways:

- **In a one-repeater network**

  The maximum length of cable between any two nodes is 310 meters: 400 meters minus 90 meters for the repeater itself. Note that the 100-meter limitation for UTP cabling applies to any connections made to ports 1 through 15. Port 16, the fiber connector, can be any length as long as the sum of it and the longest cable on ports 1 through 15 does not exceed 310 meters.

  If, for example, the farthest device attached to a UTP port uses not more than 50 meters of cabling, the device using port 16 can have a maximum length of 260 meters of fiber-optic cable.

- **In a two-repeater network**

  Using a similar formula, the maximum length of cable between any two nodes separated by two repeaters is 220 meters: 400 - 90 - 90 = 220. In addition, note that the maximum length cable between any two nodes on the *same* repeater is still 310 meters. The 100-meter limitation on UTP connections to ports 1 through 15 still applies; port 16 can exceed the 100-meter limit as previously described.

Ports

Ports 1 through 15 require two pairs of Category 5 UTP cabling, wired for Ethernet, and RJ-45-type connectors. A straight-through cable is used to connect to an adapter in a server or workstation. When interconnecting two FastHub 116Cs or a FastHub 116C and a 100Base-T compatible hub, switch, or router, a crossover cable must be used. See Figure B-4 for more details.

Port 16 requires 62.5/125 or 50/125 micron multimode fiber-optic cabling with ST-type connectors. No special crossover cabling is required to interconnect devices using fiber.

Note that only one connection—either fiber or UTP— can exist between hubs. Attached servers or workstations must have a 100Base-TX or 100Base-FX compatible adapter installed. The FastHub 116C can be used to interconnect up to 15 100Base-TX devices and one 100Base-FX device.

Power Workgroups

FastHub 116C can be used to provide 100 Mbps performance for workstations and servers. This power workgroup can be enlarged by daisy chaining two FastHub 116Cs, and can also be connected to a 100Base-T switch or router as described in the following sections.

Daisy-Chaining FastHub 116Cs

By daisy-chaining two FastHub 116Cs together, as shown in Figure 2-1, you can build 100Base-T power workgroups of up to 30 nodes. The workgroup can consist of both workstations and servers, with 100Base-T adapters required in both cases.

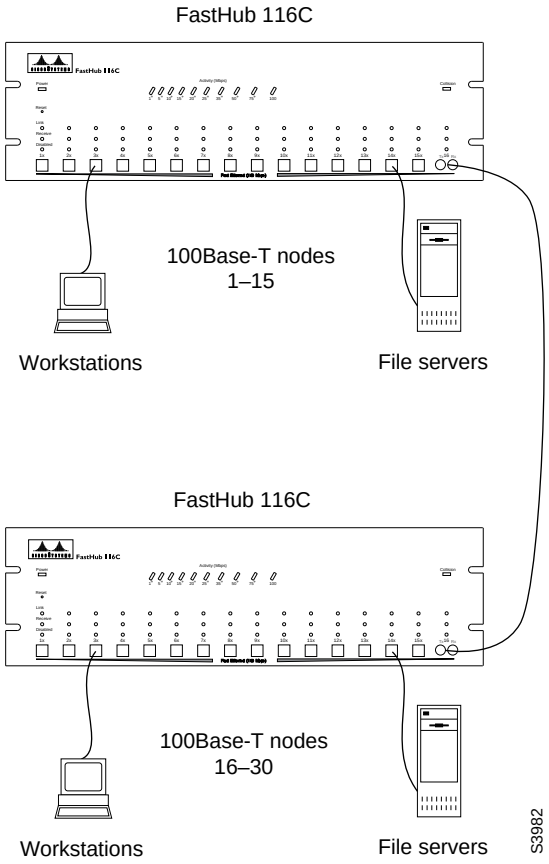
Only two FastHub 116Cs can be daisy-chained in this manner, and the total length of the cable from node to node through the two repeaters must not exceed 220 meters.

Cabling Considerations

The 220-meter rule applies to nodes connected to different FastHub 116Cs, or a FastHub 116C and a repeated port on a Catalyst 2800 desktop switch. If, for example, the length of cable between the two FastHub 116Cs is 30 meters, then each workstation or server can be connected to its FastHub 116C by a cable no more than 95 meters long: 30 + 95 + 95 = 220. Connections between two nodes on the same FastHub 116C can be 310 meters end to end.

If the length of cable between the two repeaters is 60 meters, then each workstation or server can be connected to its FastHub 116C by a cable no more than 80 meters long: 60 + 80 + 80 = 220 meters. Alternatively, in this same example, you could have a cable 60 meters long on one repeater and 100 meters long on the other repeater, since 60 + 60 + 100 = 220 meters.

Figure 2-1 Power Workgroups

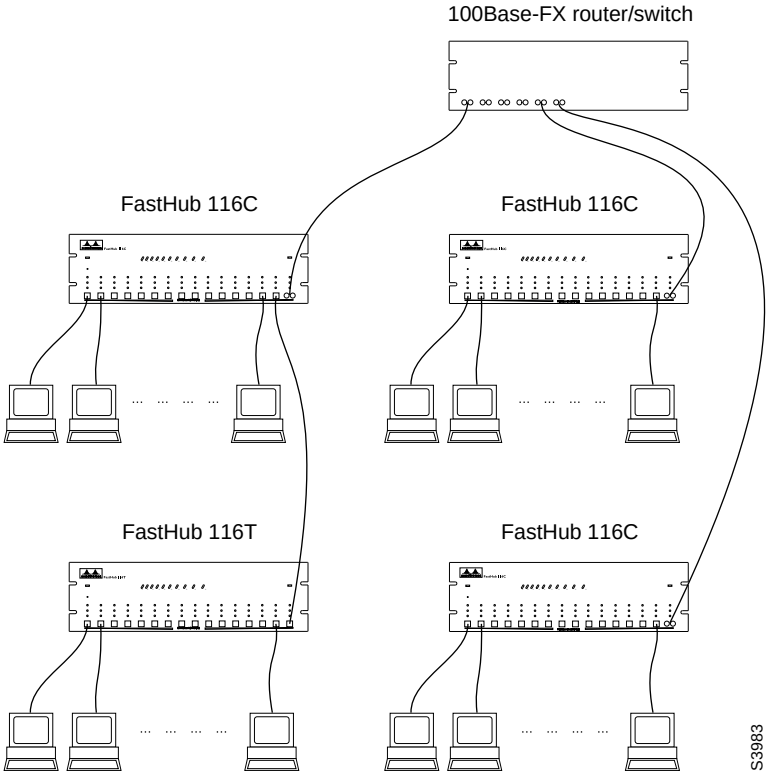


Connecting Power Workgroups to a Fast Ethernet Switch or Router

You can also connect FastHub 116C power workgroups to a 100Base-FX switch or router. Two daisy-chained FastHubs, one FastHub 116C and one FastHub 116T, can be attached to each 100Base-FX switch or router port to support workgroups of up to thirty 100Base-TX nodes on each switch or router port. All nodes on each port share 100 Mbps of bandwidth. The clients and servers connect to the FastHub 116C with the 100Base-TX

ports and require a 100Base-TX adapter. The FastHub 116C and the FastHub 116T are connected in this scenario via 100Base-TX ports. The 100Base-FX port on the FastHub 116C is used to connect to the 100Base-FX router or switch.

Figure 2-2 Connecting to a Fast Ethernet Switch or Router



Cabling Considerations

Include the connections to the switch or router when configuring to the one- or two-repeater guidelines. For example, a single FastHub 116C attached to the router or switch can have 310 meters from the router or switch port to the most distant attached workstation. A daisy-chained pair of FastHub 116Cs can have 220 meters of cable from the router or switch port to the most distant attached workstation. When calculating cable distances for daisy-chained FastHub 116Cs, four distances need to be considered: router or switch to FastHub 116C; FastHub 116C to FastHub 116C; most distant workstation on one FastHub 116C; and the most distant workstation on the other FastHub 116C.

High-Density Catalyst 2800 Aggregation

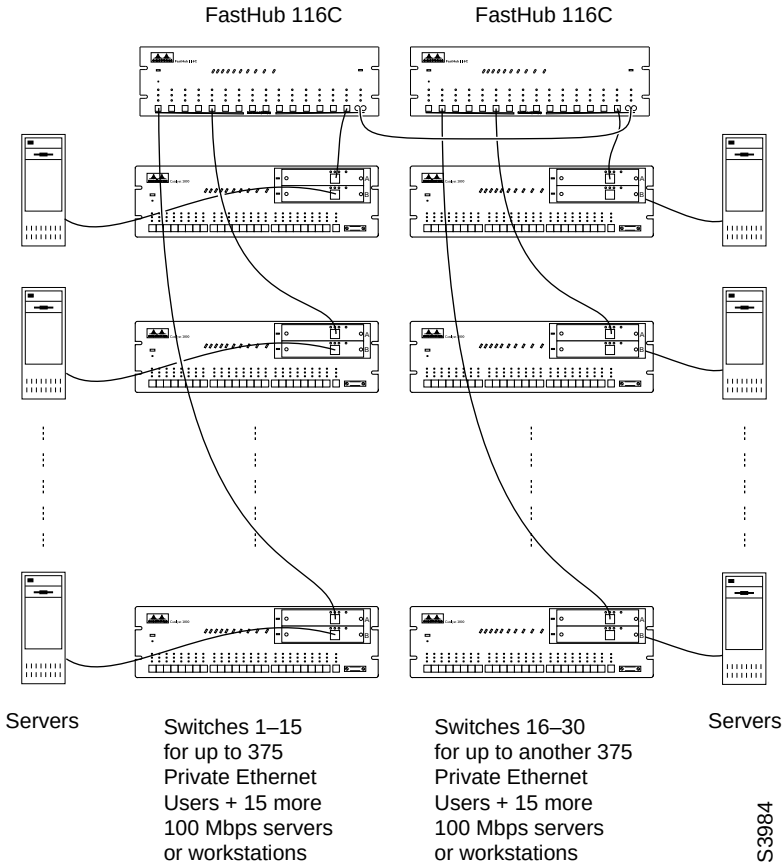
FastHub 116C can also be used as a high-speed backbone for interconnecting Cisco Catalyst 2800 desktop switches. The number of Catalyst 2800s aggregated can be increased from 16 to 30 by daisy chaining two FastHub 116Cs. The FastHub 116Cs can then be connected to a 100Base-T router or switch, as described in the following sections.

Daisy-Chaining FastHub 116Cs

You can connect two FastHub 116Cs to aggregate up to 30 Cisco Catalyst 2800 desktop switches as shown in Figure 2-3. All inter-switch traffic would use the 100Base-T local backbone provided by the FastHub 116Cs. This configuration supports up to 750 private Ethernet nodes and 30 switched Fast Ethernet servers.

Only two FastHub 116Cs can be connected in this way and, because each hub accounts for 90 meters of cabling distance, the maximum distance between any two Catalyst 2800s connected through the repeaters is 220 meters. Connections from a server or workstation to a Catalyst 2800 port—whether 10 Mbps or switched Fast Ethernet—are not included in this calculation and can be up to 100 meters long using UTP cabling. For fiber-optic cabling, the distance from the server or workstation connected to a Catalyst 2800 switched Fast Ethernet port can be up to 400 meters. Using full-duplex mode, you can extend this distance up to 2 kilometers.

Figure 2-3 High-Density Catalyst 2800 Aggregation



Note The actual distances between the Catalyst 2800s and the FastHub 116C—and between the Catalyst 2800s—can vary, as long as the total distance does not exceed the 220-meter rule.

For example, the configuration shown in Figure 2-3 could be cabled as follows:

- 100 meters from the lowest-left server to the Catalyst 2800 when using UTP
- 35 meters from the most distant Catalyst 2800 to the left FastHub 116C
- 150 meters between the FastHub 116Cs
- 35 meters from the right FastHub 116C to the most distant Catalyst 2800
- 100 meters from the Catalyst 2800 to the lowest-right server when using UTP cabling

Connecting to a 100Base-FX Router or Switch

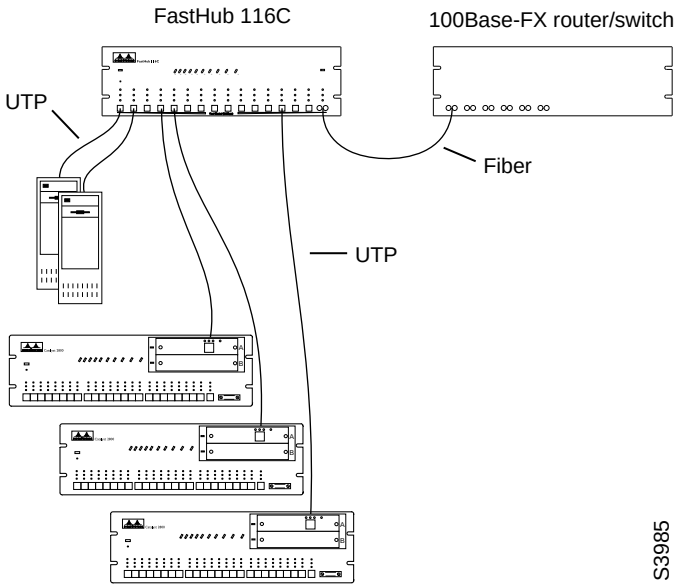
You can also connect the aggregated Catalyst 2800s to a 100Base-FX switch or router. The 100Base-FX port on the FastHub 116C connects to the switch or router; the Catalyst 2800s attach to the FastHub 116Cs via the 100Base-TX ports. Daisy-chained FastHub 116Cs also connect via 100Base-TX ports.

All inter-switch traffic uses the local backbone provided by the FastHub 116Cs. This configuration supports up to 375 private Ethernet users and 15 switched Fast Ethernet servers per router or switch port using a single FastHub 116C. If additional users or servers are required, a second FastHub 116C can be daisy-chained to a 100Base-TX port and additional Catalyst 2800s connected.

Cabling Considerations

Although a one-repeater configuration supports 310 meters of cabling distance between devices attached to a FastHub 116C, the 100 meter UTP limitation still applies. In the example shown in Figure 2-4, if the 100Base-FX router or switch is 150 meters from the FastHub 116C, the farthest a device could be connected is 100 meters, even though the FastHub 116C’s 310-meter limit has not been reached.

Figure 2-4 Catalyst 2800 Aggregation with 100Base-FX Switch or Router



If you daisy-chained a second FastHub 116C 10 meters from the first, the second FastHub 116C would account for another 90 meters of available cabling distance. To calculate how far the farthest device could be on the second FastHub 116C, calculate the longest link and subtract it from 400: 150m (hub to router) + 90m (hub) + 10 m (hub to hub) + 90 m (hub). This adds up to 340 meters and means that the maximum cable distance on the second hub is 60 meters.

Server Farms

Another configuration made possible by FastHub 116C's mixed-media design is connecting a 100Base-TX server farm to workgroups via a fiber Fast Ethernet backbone, either directly or via a FastHub 116C FX, as shown in Figure 2-5. In this example, if we use one fiber port per FastHub 116C to connect to each other, 15 100Base-TX ports remain on one repeater to connect to high-performance servers, and 15 100Base-FX ports remain on the other repeater to connect to 15 Catalyst 2800s with 100BaseFX/1 modules. This

configuration can support 375 private Ethernet users and 15 switched Fast Ethernet servers. Only two FastHub 116Cs can be connected in this manner and the 220-meter rule applies, as described in the “High-Density Catalyst 2800 Aggregation” section.

Figure 2-5 Server Farms