Classic Token Ring Bridged Network Migration

The Catalyst 3900 Token Ring switch and Catalyst 5000 Token Ring switch module can be used to collapse network backbones and floor rings in classic Token Ring environments with redundantly placed source-route bridges. The use of a Catalyst Token Ring switch in this scenario improves network performance by eliminating the need for multiple bridges and by allowing the direct attachment of high-utilization devices, such as servers, front-end processors, and routers.

This section provides an example of using Catalyst Token Ring switches to replace multiple bridges in a classic Token Ring network.

Initial Network Configuration

In your company, you have two backbone rings that service five floor rings. You have a server, router, and front-end processor attached to each of the backbone rings. Because the number of users is growing and there is an increased need to access the devices that are attached to the backbone rings, you need to improve the performance of your network. You have decided to replace one ring with a Catalyst 3900 and one with a Catalyst 5000 with a Token Ring switching module.

Figure 8-1 illustrates the initial network configuration.

Figure 8-1   Initial Network Configuration
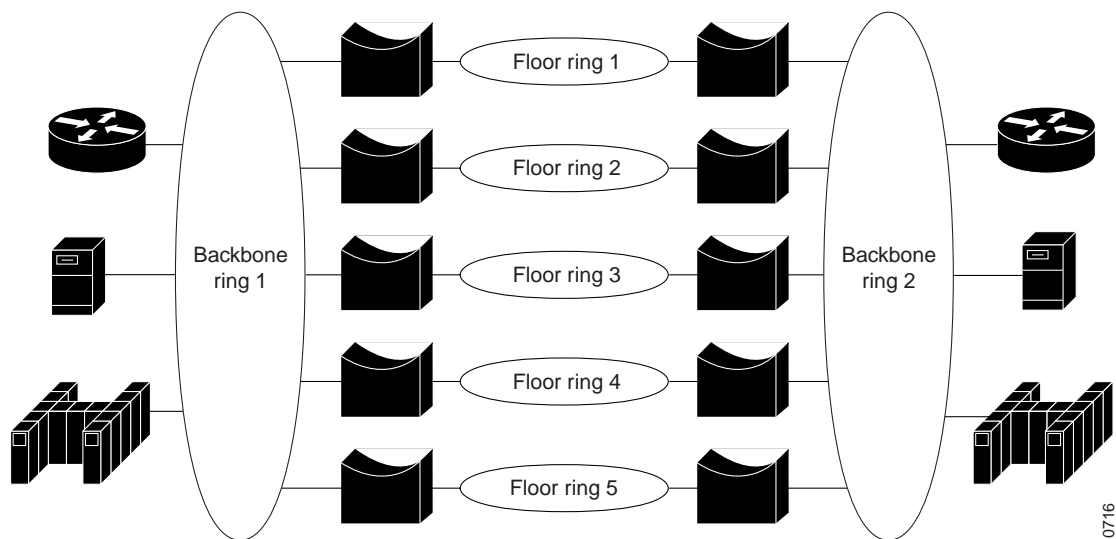
Configuration Steps

To configure your collapsed backbone network, on each switch you will need to configure a new bridge (or TrBRF) as you cannot add TrCRFs to the default TrBRF, a ring (or TrCRF) for each floor, as well as a TrCRF that will contain the high-utilization devices.

Note   For more information about Token Ring VLANs, see the "Token Ring VLANs and Related Protocols" chapter.

Configuring the Catalyst 3900

On the Catalyst 3900, you must configure a new bridge (TrBRF), six new rings (TrCRFs), and the Spanning-Tree Protocol.

Note   You must assign the ports to the TrCRFs before you can configure spanning-tree parameters for the TrCRFs.


Defining the Bridges

To define a bridge (TrBRF), complete the following steps:

Step 1   On the Catalyst 3900 Main Menu, select **Configuration**. The Configuration panel is displayed.

Step 2   On the Configuration panel, select **VLAN and VTP Configuration**. The VLAN and VTP Configuration panel is displayed.

Step 3   On the VLAN and VTP Configuration panel, select **VTP VLAN Configuration**. The VTP VLAN Configuration panel is displayed.

Step 4   On the VTP VLAN Configuration panel, select **Add**.

Step 5   At the prompt, enter a VLAN ID of **100**.

Step 6   At the prompt, select **TrBRF**. The VLAN Parameter Configuration for TrBRF panel is displayed.

Step 7   On the VLAN Parameter Configuration for TrBRF panel, specify:

- VLAN Name of **BRF100**.

- Bridge Number of **1**.

See Figure 8-2.

Figure 8-2   VLAN Parameter Configuration for TrBRF Panel
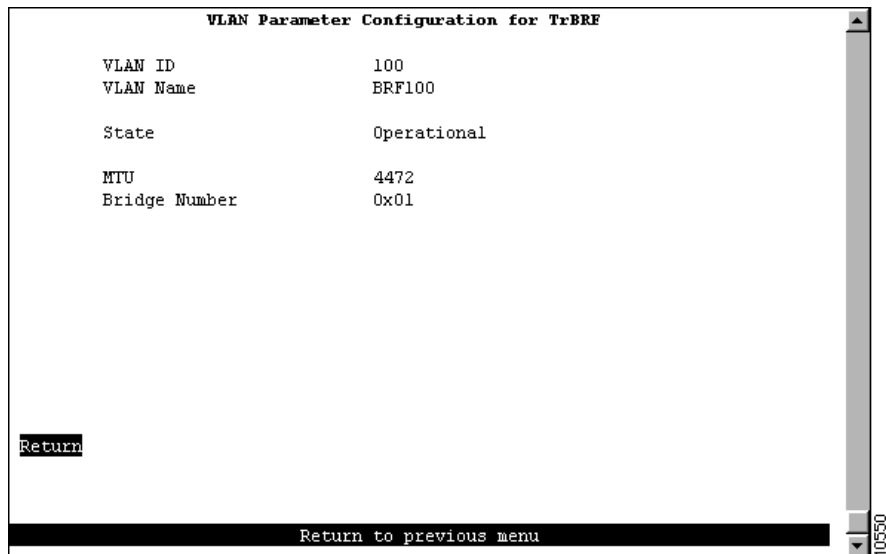
Step 8   Select **Return** to save your changes.

Defining the Rings

To define the rings (TrCRFs) for the first floor, complete the following steps:

Step 1   On the VTP VLAN Configuration panel, select **Add**.

Step 2   At the prompt, enter a VLAN ID of **101**.

Step 3   At the prompt, select **TrCRF**. The VLAN Parameter Configuration for TrCRF panel is displayed.

Step 4   On the VLAN Parameter Configuration for TrCRF panel, specify:

- VLAN Name of **Floor 1**.

- Parent VLAN of **BRF100**.

- Ring Number of **1**.

See Figure 8-3.

Figure 8-3   **VLAN Parameter Configuration for TrCRF Panel**


```
                    VLAN Parameter Configuration for TrCRF

          VLAN ID                    101
          VLAN Name                  Floor 1
          Parent VLAN                BRF 100
          State                      Operational

          Ring Number                0x01
          Bridging Mode              SRB
          Max ARE Bridge Hop Count   7
          Max STE Bridge Hop Count   7
          Backup CRF                 No




   Return



                        Return to previous menu
```
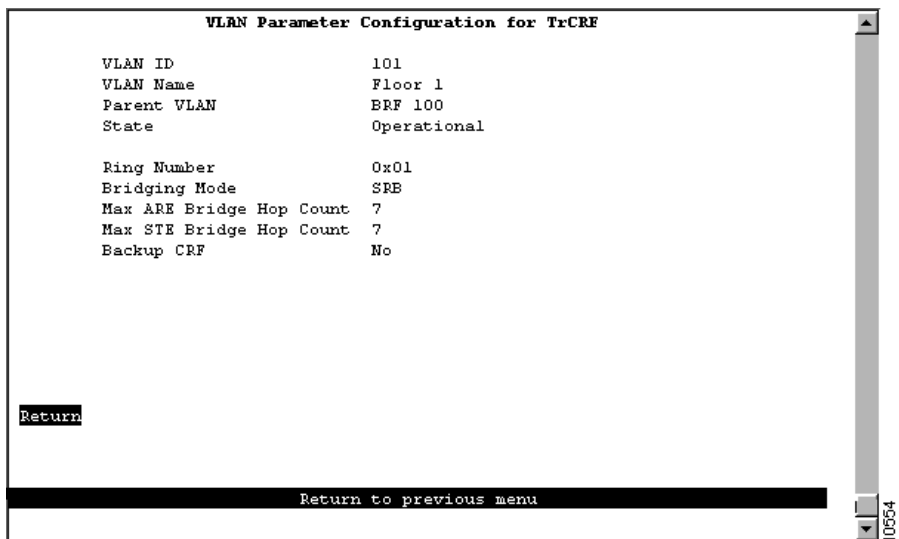
Step 5   Select **Return** to save your changes.

To define the TrCRFs for the remaining floors, repeat Step 1 through Step 5 and use the following values:

- VLAN IDs of **102**, **103**, **104**, and **105**.

- VLAN Names of **Floor 2**, **Floor 3**, **Floor 4**, and **Floor 5**.

- Parent VLAN of **BRF100**.

- Ring Numbers of **2**, **3**, **4**, and **5**.

To define the TrCRF for the high-utilization devices, repeat Step 1 through Step 5 and use the following values:

- VLAN ID of **106**.

- VLAN Name of **Server Ring 1**.

- Parent VLAN of **BRF100**.

- Ring Number of **6**.

Figure 8-4 shows the resulting VTP VLAN Configuration panel.

Figure 8-4   **VTP VLAN Configuration Panel**

```
                        VTP VLAN Configuration                              ▲

TrBRF/TrCRF                            ID    Brdg/Rng   Ports   Local State
BRF 100                               100     0x0F              preferred
     Floor 1                          101     0x01      no      preferred
     Floor 2                          102     0x02      no      preferred
     Floor 3                          103     0x03      no      preferred
     Floor 4                          104     0x04      no      preferred
     Floor 5                          105     0x05      no      preferred
     Server Ring 1                    106     0x06      no      preferred
trbrf-default                        1005     0x0F              preferred
     trcrf-default                   1003     auto      yes     preferred




Return    More    View...  Add...   Change...   Change_Local_State   Delete   Sort


                      Return to previous menu                               ▼
```

Assigning Ports to the Rings

Next, you must assign the ports to the appropriate TrCRFs. On the Catalyst 3900, complete the following steps:

Step 1   On the VLAN and VTP Configuration panel, select **Local VLAN Port Configuration**. The Local VLAN Port Configuration panel is displayed.

Step 2   On the Local VLAN Port Configuration panel, select **Change**.

Step 3   At the prompt enter port number **1**.

Step 4   Select **Floor 1** from the list of possible TrCRFs. To select the TrCRF, use your cursor movement keys to highlight the desired TrCRF, press the space bar to select it, and press Enter to implement your change. See Figure 8-5.

Figure 8-5   **Local VLAN Port Configuration Panel**


```
                    Local VLAN Port Configuration

Port  Mode   TrCRF                        TrBRF
  1  Static  Floor 1                      BRF 100
  2  Static  trcrf-default                trbrf-default
  3  Static  trcrf-default                trbrf-default
  4  Static  trcrf-default                trbrf-default
  5  Static  trcrf-default                trbrf-default
  6  Static  trcrf-default                trbrf-default
  7  Static  trcrf-default                trbrf-default
  8  Static  trcrf-default                trbrf-default
  9  Static  trcrf-default                trbrf-default
 10  Static  trcrf-default                trbrf-default
 11  Static  trcrf-default                trbrf-default
 12  Static  trcrf-default                trbrf-default
 13  Static  trcrf-default                trbrf-default
 14  Static  trcrf-default                trbrf-default
 15  Static  trcrf-default                trbrf-default

Return      More      Change


                    Return to previous menu
```

Step 5   Repeat Step 2 through Step 4 to assign the ports to the appropriate TrCRFs as follows:

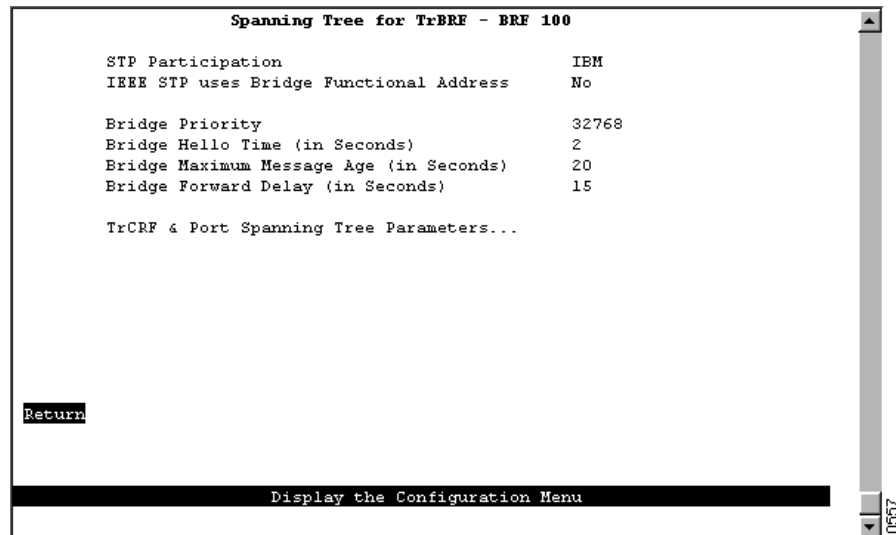| Ports	TrCRF
2	Floor 1
3, 4	Floor 2
5, 6	Floor 3
7, 8	Floor 4
9, 10	Floor 5
11, 12, 13	Server Ring 1

Step 6   Select **Return** to save your changes.

Configuring the Spanning-Tree Protocol

If you install an external bridge to create a backup path between rings 1 and 4, you introduce possible loops into your network. You can use the Spanning-Tree Protocols to prevent these loops. By default, no Spanning-Tree Protocol is run at the bridge (TrBRF) or the ring (TrCRF) level, therefore, you must configure the Spanning-Tree Protocol.

To configure the Spanning-Tree Protocol for the TrBRF, complete the following steps:

Step 1   On the Catalyst 3900 Main Menu, select **Configuration**. The Configuration panel is displayed.

Step 2   On the Configuration panel, select **Spanning Tree** and select **BRF100**. The Spanning Tree for TrBRF panel is displayed.

Step 3   On the Spanning Tree for TrBRF panel, set the STP Participation to **IBM**. See Figure 8-6.
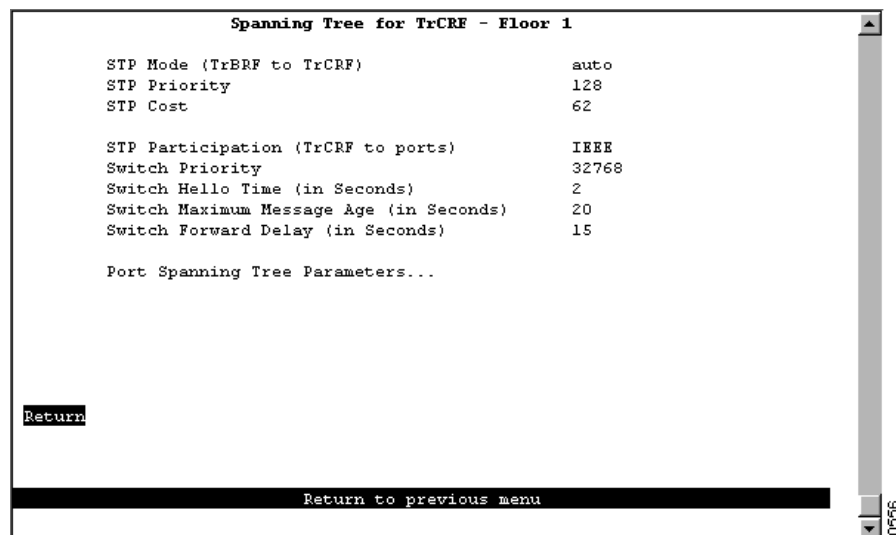
Figure 8-6   Spanning Tree for TrBRF Panel

```
                  Spanning Tree for TrBRF - BRF 100

        STP Participation                        IBM
        IEEE STP uses Bridge Functional Address  No

        Bridge Priority                          32768
        Bridge Hello Time (in Seconds)           2
        Bridge Maximum Message Age (in Seconds)  20
        Bridge Forward Delay (in Seconds)        15

        TrCRF & Port Spanning Tree Parameters...




Return


                    Display the Configuration Menu
```

To configure the Spanning-Tree Protocol for the TrCRF, do the following:

Step 1   While still on the Spanning Tree for TrBRF panel, select **TrCRF & Port Spanning Tree Parameters** and select **Floor 1**. The Spanning Tree for TrCRF panel is displayed.

Step 2   On the Spanning Tree for TrCRF panel, set the STP Participation to **IEEE**. See Figure 8-7.

Figure 8-7   Spanning Tree for TrCRF Panel

```
                  Spanning Tree for TrCRF - Floor 1

        STP Mode (TrBRF to TrCRF)                auto
        STP Priority                             128
        STP Cost                                 62

        STP Participation (TrCRF to ports)       IEEE
        Switch Priority                          32768
        Switch Hello Time (in Seconds)           2
        Switch Maximum Message Age (in Seconds)  20
        Switch Forward Delay (in Seconds)        15

        Port Spanning Tree Parameters...




Return


                        Return to previous menu
```

Step 3   Select **Return**.

Step 4   Repeat Steps 1-3 for **Floor 2**, **Floor 3**, **Floor 4**, **Floor 5**, and **Server Ring 1**.

Step 5   Select **Return** again.

Configuring the Catalyst 5000

On the Catalyst 5000, you must configure a new bridge (TrBRF), six new rings (TrCRFs), and the Spanning-Tree Protocol. You have inserted the Token Ring module into slot 2 of the Catalyst 5000.

Defining the Bridge

To define the bridge (TrBRF), complete the following steps:

Step 1   At the Catalyst 5000 command prompt, enter **enable**.

Step 2   At the enable prompt, enter **set vlan 200 name brf200 type trbrf bridge 2**.

Step 3   To verify the configuration of the new VLAN, enter **show vlan**.

The output, as shown in Figure 8-8, indicates that brf200 has been added but that it does not have any TrCRFs assigned to it yet.

Figure 8-8   **Output for Show VLAN Command**

```
VLAN Name                             Status    Mod/Ports, Vlans
---- -------------------------------- --------- ---------------------------
1    default                          active    1/1-2
200  brf200                           active
1002 fddi-default                     active
1003 trcrf-default                    active    2/1-16
1004 fddinet-default                  active
1005 trbrf-default                    active    1003
```

Defining the Rings

To define the ring (TrCRF) for the first floor, complete the following steps:

Step 1   At the enable prompt, enter:

set vlan 201 name Floor_1 type trcrf ring 1 parent 200 mode srb

Step 2   To verify the configuration of the new VLAN, enter **show vlan**.

The output, as shown in Figure 8-9, indicates that FLoor_1 has been added but that it does not have any ports assigned to it yet. It also shows that brf200 is the parent of the VLAN with the ID of 201.

Figure 8-9   **Output of Show VLAN Command**

```
VLAN Name                             Status    Mod/Ports, Vlans
---- -------------------------------- --------- ---------------------------
1    default                          active    1/1-2
200  brf200                           active    201
201  Floor_1                          active
1002 fddi-default                     active
1003 trcrf-default                    active    3/1-16
1004 fddinet-default                  active
1005 trbrf-default                    active    1003
```

```
VLAN Type  SAID       MTU   Parent RingNo BrdgNo Stp  BrdgMode Trans1 Trans2
---- ----- ---------- ----- ------ ------ ------ ---- -------- ------ ------
1    enet  100001     1500  -      -      -      -    -        0      0
200  trbrf 100200     4472  -      -      0x2    ibm  -        0      0
201  trcrf 100201     4472  100    0x01   -      -    srb      0      0
1002 fddi  101002     1500  -      0x0    -      -    -        0      0
1003 trcrf 101003     4472  1005   0xccc  -      -    srb      0      0
1004 fdnet 101004     1500  -      -      0x0    ieee -        0      0
1005 trbrf 101005     4472  -      -      0xf    ibm  -        0      0
```

To define the TrCRFs for the remaining floors, enter the **set vlan** commands as follows:

```
set vlan 202 name Floor_2 type trcrf ring 2 parent 200 mode srb
set vlan 203 name Floor_3 type trcrf ring 3 parent 200 mode srb
set vlan 204 name Floor_4 type trcrf ring 4 parent 200 mode srb
set vlan 205 name Floor_5 type trcrf ring 5 parent 200 mode srb
```

To define the TrCRF for the server ring, enter the **set vlan** commands as follows:

```
set vlan 207 name Server_Ring_2 type trcrf ring 7 parent 200 mode srb
```

The output, as shown in Figure 8-10, indicates that the TrCRFs have been added but that there are no ports assigned to them yet. It also shows that brf200 is the parent of the new TrCRFs.

Figure 8-10   Output of Show VLAN Command

```
VLAN Name                             Status    Mod/Ports, Vlans
---- -------------------------------- --------- ----------------------------
1    default                          active    1/1-2
200  brf200                           active    201, 202, 203, 204, 205, 207
201  Floor_1                          active
202  Floor_2                          active
203  Floor_3                          active
204  Floor_4                          active
205  Floor_5                          active
207  Server_Ring_2                    active
1002 fddi-default                     active
1003 trcrf-default                    active    2/1-16
1004 fddinet-default                  active
1005 trbrf-default                    active    1003


VLAN Type  SAID       MTU   Parent RingNo BrdgNo Stp  BrdgMode Trans1 Trans2
---- ----- ---------- ----- ------ ------ ------ ---- -------- ------ ------
1    enet  100001     1500  -      -      -      -    -        0      0
200  trbrf 100200     4472  -      -      0x2    ibm  -        0      0
201  trcrf 100201     4472  200    0x01   -      -    srb      0      0
202  trcrf 100202     4472  200    0x02   -      -    srb      0      0
203  trcrf 100203     4472  200    0x03   -      -    srb      0      0
204  trcrf 100204     4472  200    0x04   -      -    srb      0      0
205  trcrf 100205     4472  200    0x05   -      -    srb      0      0
207  trcrf 100207     4472  200    0x07   -      -    srb      0      0
1002 fddi  101002     1500  -      0x0    -      -    -        0      0
1003 trcrf 101003     4472  1005   0xccc  -      -    srb      0      0
1004 fdnet 101004     1500  -      -      0x0    ieee -        0      0
1005 trbrf 101005     4472  -      -      0xf    ibm  -        0      0
```

Assigning Ports to the Rings

To assign the ports to the rings (TrCRFs), enter the set vlan command at the enable prompt as follows:

```
set vlan 201 23/1-2
set vlan 202 2/3-4
set vlan 203 2/5-6
set vlan 204 2/7-8
set vlan 205 2/9-10
set vlan 207 2/11-13
```

The output, shown in Figure 8-11, shows that two ports on the module are assigned to each of the five TrCRFs that represent each floor and that three ports are assigned to Server_Ring_2.

Figure 8-11   Output of Show VLAN Command

```
VLAN Name                             Status    Mod/Ports, Vlans
---- -------------------------------- --------- ---------------------------
1    default                          active    1/1-2
200  brf200                           active    201, 202, 203, 204, 205, 207
201  Floor_1                          active    2/1-2
202  Floor_2                          active    2/3-4
203  Floor_3                          active    2/5-6
204  Floor_4                          active    2/7-8
205  Floor_5                          active    2/9-10
207  Server_Ring_2                    active    2/11-13
1002 fddi-default                     active
1003 trcrf-default                    active    2/14-16
1004 fddinet-default                  active
1005 trbrf-default                    active    1003
```

Configuring the Spanning-Tree Protocol

By default, the TrBRF runs the IBM Spanning-Tree Protocol. The Spanning-Tree Protocol run on the TrCRFs is determined by the specified bridging mode. TrCRFs with a bridge mode of SRB will run the IEEE Spanning-Tree Protocol and TrCRFs with a bridge mode of SRT will run the Cisco Spanning-Tree Protocol.

Cabling the Network

Using the appropriate cabling, attach ports 1 and 2 of the Catalyst 3900 to the existing ring on floor 1. Repeat this for each of the floors. Then attach port 11 to the router, port 12 to the server, and port 13 to the front-end processor. Do the same for the ports on the Catalyst 5000.

Resulting Network Configuration

You now have a faster, more efficient network that includes less hardware to maintain. (See Figure 8-12.)

Figure 8-12   Resulting Network
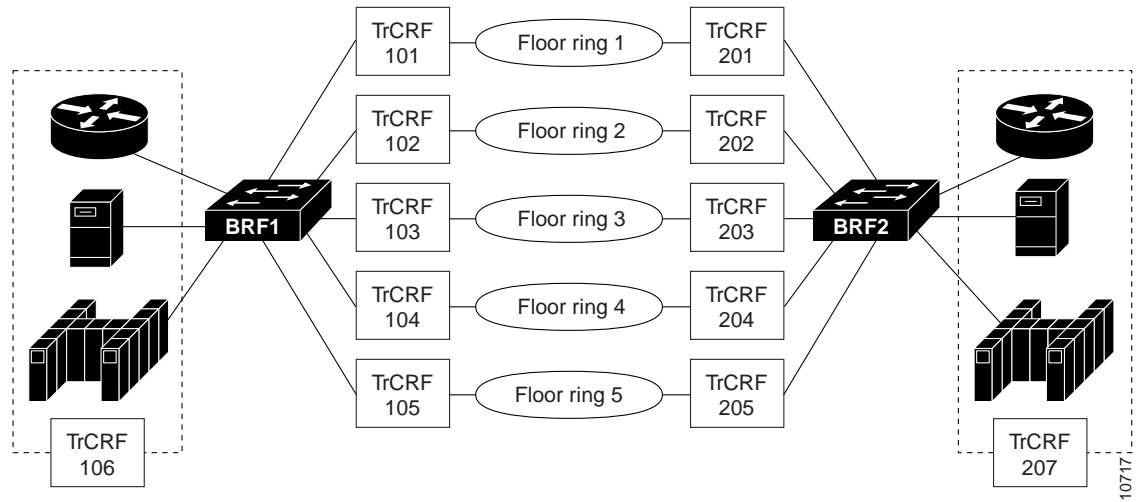
Tips

To further improve performance, if you have 16 Mbps connections and the network interface card (NIC) supports full-duplex, you can configure the ports connected to the servers to operate in FDX mode. To configure FDX:

Step 1   Select **Port Configuration** on the Configuration panel.

Step 2   Specify the port to which the high-utilization device is attached. In this scenario, that would be ports 11, 12, and 13.

Step 3   On the Port Configuration panel, move to the Operation Mode and select a mode of **FDX port**.

Step 4   Select **Return**.