

# Adding and Dropping Nodes in a BLSR Ring

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## Contents

### Introduction

#### Prerequisites

- Requirements
- Components Used
- Conventions

#### Background Information

##### Add Nodes to a BLSR Ring

- Step 1: Confirm BLSR Ring Provisioning
- Step 2: Check Circuit Integrity
- Step 3: Initiate a Protection Switch
- Step 4: Connect the New Node
- Step 5: Re-launch CTC
- Step 6: Accept the New Ring Map
- Step 7: Update Circuits
- Step 8: Clear Protection Switches

##### Remove Nodes from a BLSR Ring

- Step 1: Delete Circuits That Drop at the Node You Want to Remove
- Step 2: Identify, Delete and Re-create Pass Through Circuits That Change STS or VT
- Step 3: Initiate Protection Switches
- Step 4: Remove the Node and Re-connect Adjacent Nodes
- Step 5: Re-launch CTC
- Step 6: Accept the Ring Map
- Step 7: Release Protection Switches

#### Related Information

## Introduction

This document explains how to add and remove Networks Elements (NEs) in a Bidirectional Line Switched Ring (BLSR).

**Note:** You can add only one node to a BLSR at a time.

## Prerequisites

### Requirements

There are no specific requirements for this document.

### Components Used

This document is not restricted to specific software and hardware versions.

The information in this document was created from the devices in a specific lab environment. All of the devices used in this document started with a cleared (default) configuration. If your network is live, make sure that you understand the potential impact of any command.

## Conventions

For more information on document conventions, refer to the Cisco Technical Tips Conventions.

## Background Information



**Caution:** This procedure affects service. Perform this procedure during a maintenance window because the procedure involves protection switching. Disruptions of up to three minutes are possible for any Ethernet traffic due to Spanning Tree re-convergence. All other traffic endures up to a 50ms hit.

This procedure assumes that the new node is racked and powered with all cards installed, and that you have completed provisioning. Provisioning includes general issues, network, timing, SONET Data Communications Channel (SDCC), BLSR ring provisioning and putting optical ports in service. Before you begin the procedure, perform these steps:

1. Run test traffic through the node per NTP-A175 or NTP-A176 based on the BLSR type.
2. Identify and tag all involved fibers.
3. Resolve any critical or major alarms. You can identify these alarms from the **Alarms** tab in Network view.

## Add Nodes to a BLSR Ring

This section uses a lab setup with three nodes (Node1, Node2 and Node3). Here is an example that shows how to add a fourth node (Node4).



This procedure involves these steps:

- Step 1: Confirm BLSR ring provisioning.
- Step 2: Check circuit integrity.
- Step 3: Initiate a forced protection switch.
- Step 4: Connect the new node into the ring.
- Step 5: Re-launch Cisco Transport Controller (CTC).
- Step 6: Accept the new ring map.
- Step 7: Update circuits with the new node.
- Step 8: Release the forced protection switch.

## Step 1: Confirm BLSR Ring Provisioning

In a BLSR ring, you must fiber the NEs in an east–west configuration around the ring. Connect the east card of one node to the west card of the adjacent node, and vice versa. The optics trunk card furthest to the right in the shelf is normally the east card, and the card furthest to the left is normally the west card.

The screenshot shows the Cisco Transport Controller interface. The top part displays a network view with a map of the United States and four nodes (Node1, Node2, Node3, Node4) connected in a ring topology. Below the map is a table of alarms. The table has columns for Date, Node, Object, Type, Slot, Port, Sev, Cond, and Description. The bottom of the interface has buttons for 'Synchronize Alarms', 'Delete Cleared Alarms', and 'AutoDelete Cleared Alarms'.

Date	Node	Object	Type	Slot	Port	Sev	Cond	Description	
02/13/02 10:22:33	Node4	FAC-13-1	OC48_LINE_CARD	12	1	MJ	R	E-W-MISMATCH	Both ends of fiber provisioned as East, or both as West
02/13/02 10:22:26	Node4	FAC-6-1	OC48_LINE_CARD	6	1	MJ	R	E-W-MISMATCH	Both ends of fiber provisioned as East, or both as West
02/13/02 10:21:59	Node3	FAC-13-1	OC48_LINE_CARD	12	1	MJ	R	E-W-MISMATCH	Both ends of fiber provisioned as East, or both as West
02/13/02 10:22:16	Node1	FAC-6-1	OC48_LINE_CARD	6	1	MJ	R	E-W-MISMATCH	Both ends of fiber provisioned as East, or both as West
02/13/02 10:21:22	Node1	FAC-6-1	OC48_LINE_CARD	6	1	MN	R	APSCDFLTK	Default K Byte
02/13/02 10:21:04	Node3	FAC-12-1	OC48_LINE_CARD	12	1	MN	R	APSCDFLTK	Default K Byte

Ensure that the east–west provisioning is correct before you begin the procedure. Click on the **Alarms** tab in Network view to check whether any BLSR–related alarms are present. If you find any such alarms, clear the alarms before you proceed.

## Step 2: Check Circuit Integrity

Next, check the integrity of the circuits on the ring.

The screenshot shows the Cisco Transport Controller interface. The top part displays a network map with three nodes (Node1, Node2, Node3) connected in a ring topology. Below the map, there are tabs for Alarms, History, Circuits, Provisioning, and Maintenance. The Circuits tab is active, showing a table of circuits.

Circuit Name	Type	Size	Dir	State	Source	Destination	VLANs	Spans
Test0004	VT	1.5	2-way	ACTIVE	Node1/s16/S1/W4-1	Node3/s16/S1/W5-1		3
Test0003	VT	1.5	2-way	ACTIVE	Node1/s16/S1/W3-1	Node3/s16/S1/W4-1		3
Test0006	VT	1.5	2-way	ACTIVE	Node1/s16/S1/W6-1	Node3/s16/S1/W7-1		3
Test0002	VT	1.5	2-way	ACTIVE	Node1/s16/S1/W2-1	Node3/s16/S1/W3-1		3
Test0005	VT	1.5	2-way	ACTIVE	Node1/s16/S1/W5-1	Node3/s16/S1/W6-1		3
Test0001	VT	1.5	2-way	ACTIVE	Node1/s16/S1/W1-1	Node3/s16/S1/W1-1		3

In Network view, confirm that all circuits show up in an active state. If any circuits are in an incomplete state, refer to Best Practices When Configuring Circuits on the ONS 15454 and resolve the issue.

### Step 3: Initiate a Protection Switch

After you confirm the configuration of the ring, you must switch traffic away from the span where you insert the new node. First, go to the node that connects to the new node through the east port. Here, Node3 connects to the new node.

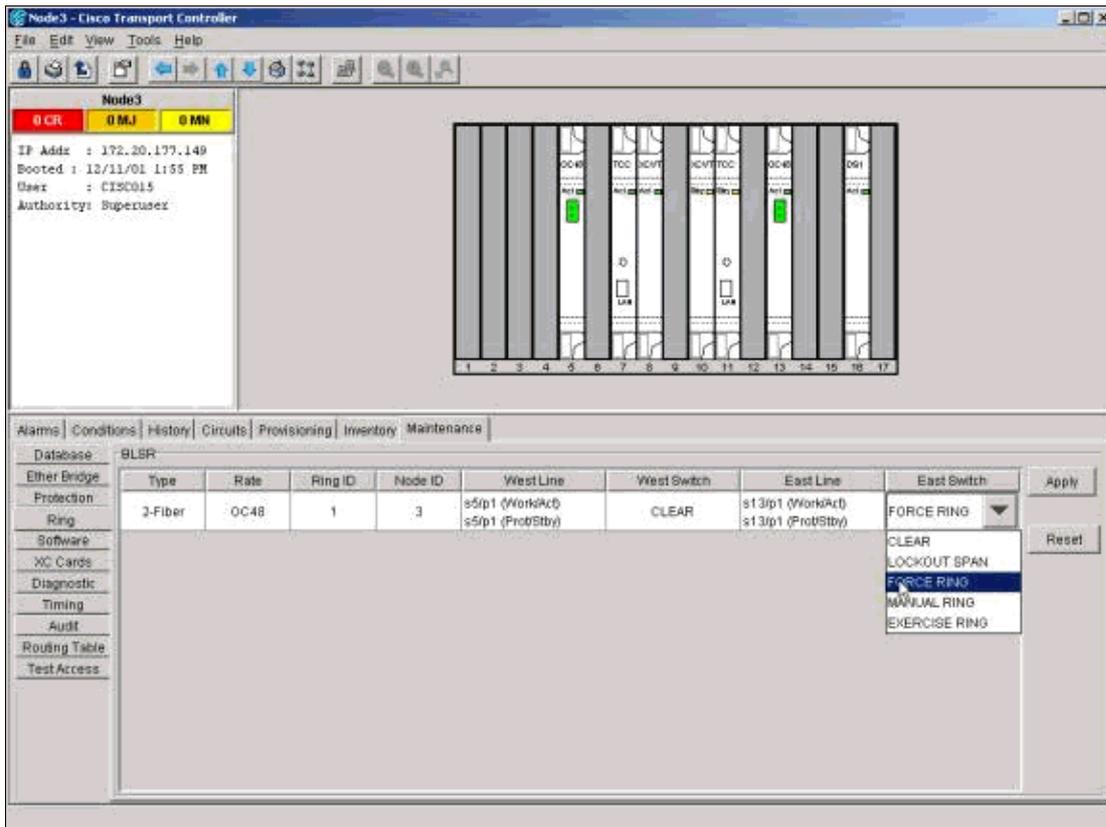


**Caution:** A forced protection switch can cause service disruption if the rest of the ring is not

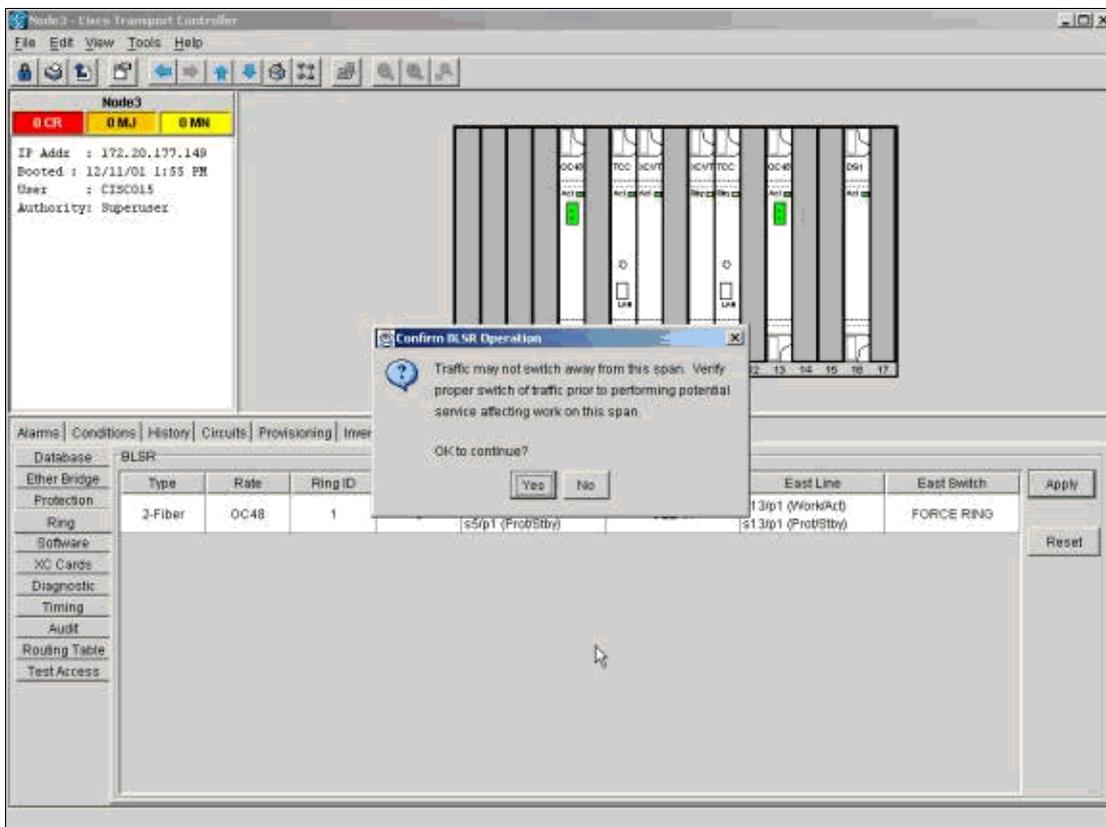
error-free. Check the Performance Monitoring (PM) statistics for the other optics cards in the ring. In order to check PM statistics:

1. Log into each shelf in the ring.
2. Click on a BLSR optics card.
3. Select the **Performance** tab.
4. Click **Refresh**.

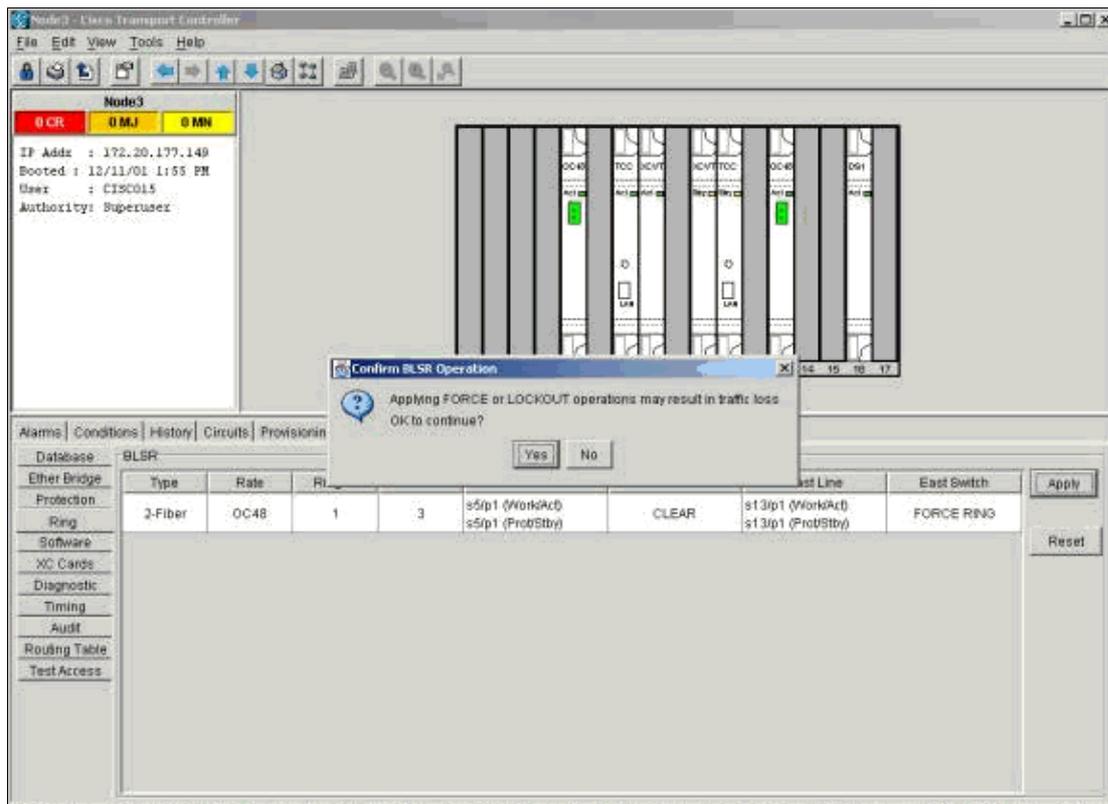
You can expect to see zeros in all fields if the span runs without errors. Traffic is unprotected during a forced protection switch.



From the Shelf view, click the **Maintenance/Ring** (Maintenance/BLSR in later software versions) tab. From the East Switch list, choose **Force Ring** > **Apply** to force traffic away from the east span.

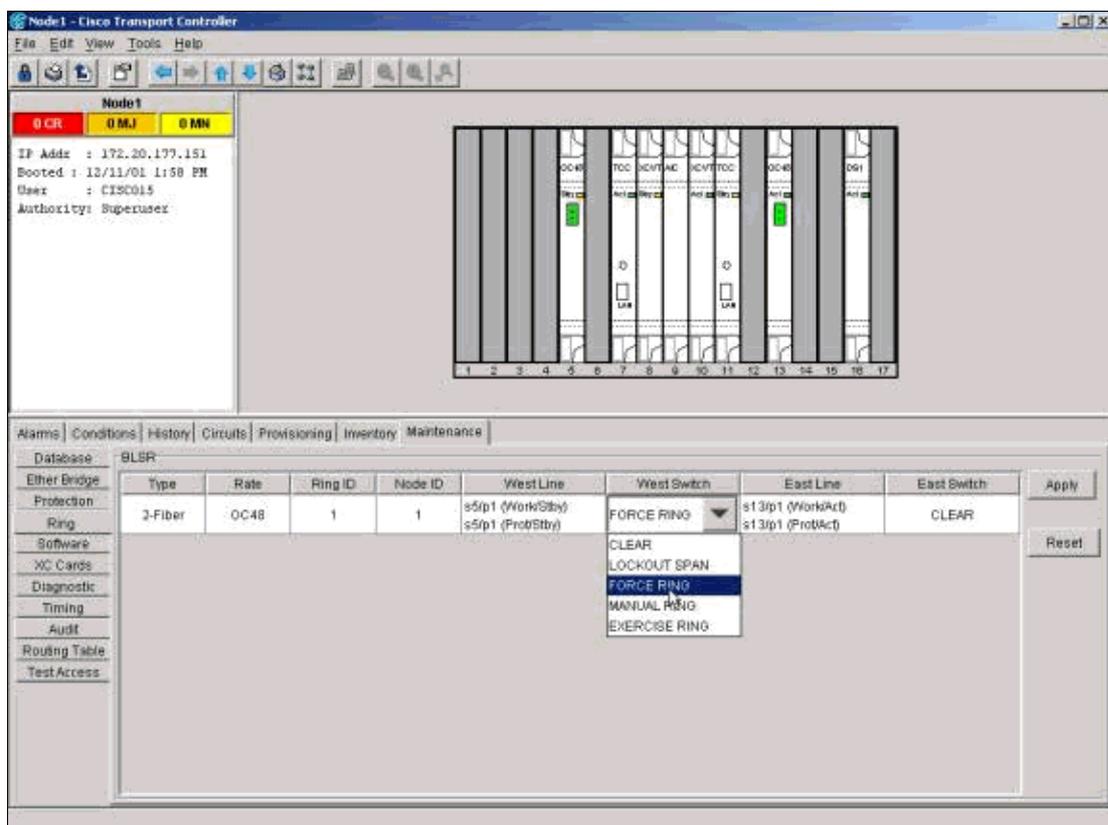


Click **Yes** in the confirmation dialog box.



Select **Yes** again.

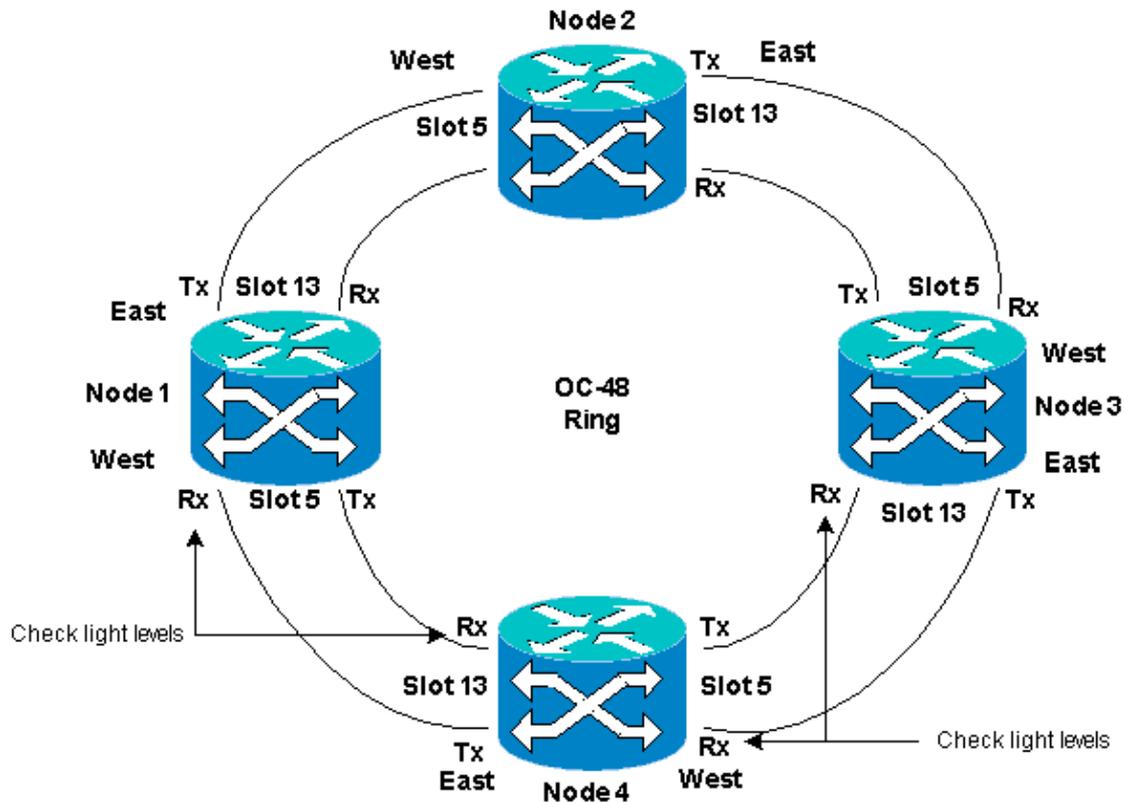
Now go to the Shelf view of the node that connects to the new node through the west port. Here, Node1 connects to the new node.



Click the **Maintenance/Ring** (**Maintenance/BLSR** in later software versions) tab. From the West Switch list choose **Force Ring > Apply**. Click **Yes** in the two confirmation dialog boxes. Thus, you force traffic away from the west span.

## Step 4: Connect the New Node

Now you can open this span and connect the new node (Node4).



Remove the east fibers from the node that connects to the new node through the east port. Connect the east fibers to the west port of the new node. Remove the west fibers from the node that connects to the new node through its west port. Connect the west fibers to the east port of the new node. Here, you connect:

- Slot 13 Node3 to Slot 5 Node4
- Slot 13 Node4 to Slot 5 Node1

In each case, first connect only Tx fibers and check levels before you connect the Rx fibers. You can find Rx levels in the Card Reference section of the Cisco ONS 15454 Troubleshooting Guide, Release 5.0.

## Step 5: Re-launch CTC

Now close CTC, and launch CTC again to any node in the ring.

The screenshot displays the Cisco Transport Controller interface. At the top, there is a menu bar (File, Edit, View, Tools, Help) and a toolbar. Below this is the 'Network View' section, which includes a status bar showing '0 CR', '1 MJ', and '4 MN'. The main area shows a map of the United States with four nodes (Node1, Node2, Node3, Node4) connected by green lines, forming a ring topology. Node4 is highlighted with a green 'X' icon.

Below the map is the 'Alarms' section, which includes tabs for 'Alarms', 'History', 'Circuits', 'Provisioning', and 'Maintenance'. The 'Alarms' tab is active, showing a table of alarm events.

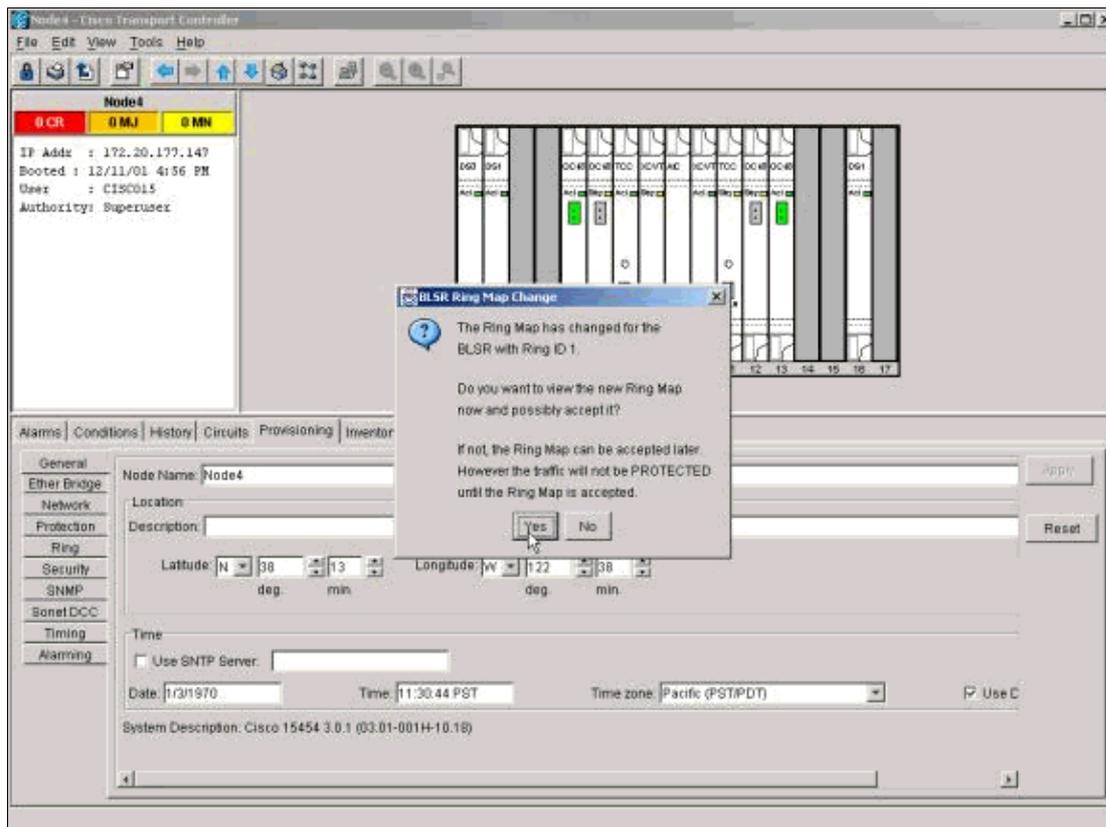
New	Date	Node	Object	Type	Slot	Port	Sev	ST	SA	Cond	Description
	01/03/70 16:07:40	Node1	STS-5-1	OC48_LINE_CARD	5	1	MN	R		UNEQ-P	Unequipped - Path
	01/03/70 16:07:33	Node1	FAC-5-1	OC48_LINE_CARD	5	1	MN	R		APSCDFLTk	Default K Byte
	01/03/70 16:12:30	Node3	STS-13-1	OC48_LINE_CARD	13	1	MN	R		UNEQ-P	Unequipped - Path
	01/03/70 16:12:23	Node3	FAC-13-1	OC48_LINE_CARD	13	1	MN	R		APSCDFLTk	Default K Byte
	01/01/70 19:00:30	Node2	SYNC-NE				MJ	R	<input checked="" type="checkbox"/>	FRNGSYNC	Free Running Synchronization n

At the bottom of the Alarms section, there are three buttons: 'Synchronize Alarms', 'Delete Cleared Alarms', and 'AutoDelete Cleared Alarms' (with an unchecked checkbox).

At this point, you can see the Path Unequipped (UNEQ-P) and **APSCDFLTk** alarms on the optics cards adjacent to the new node. The occurrence of these alarms is normal.

## Step 6: Accept the New Ring Map

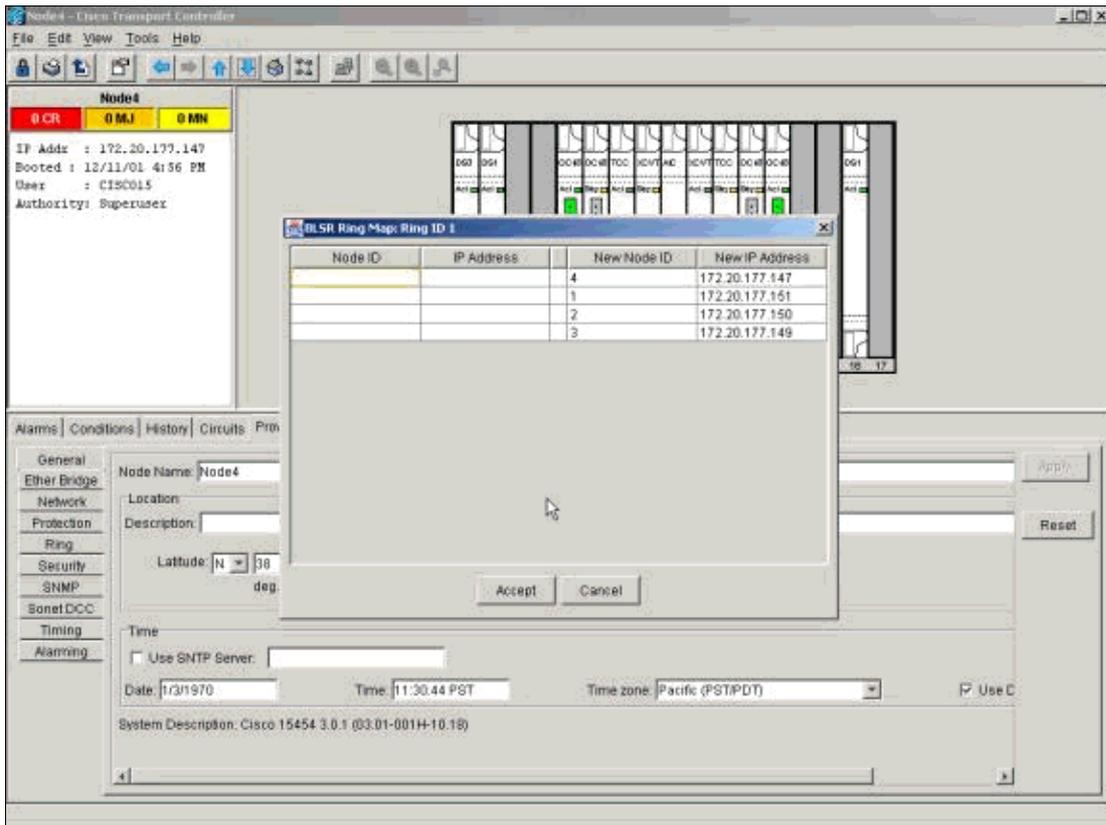
The next step is to accept the new ring map.



Wait for the BLSR Ring Map Change dialog box to appear. Click **Yes** to view the new ring map.

If the BLSR Ring Map Change dialog box does not appear:

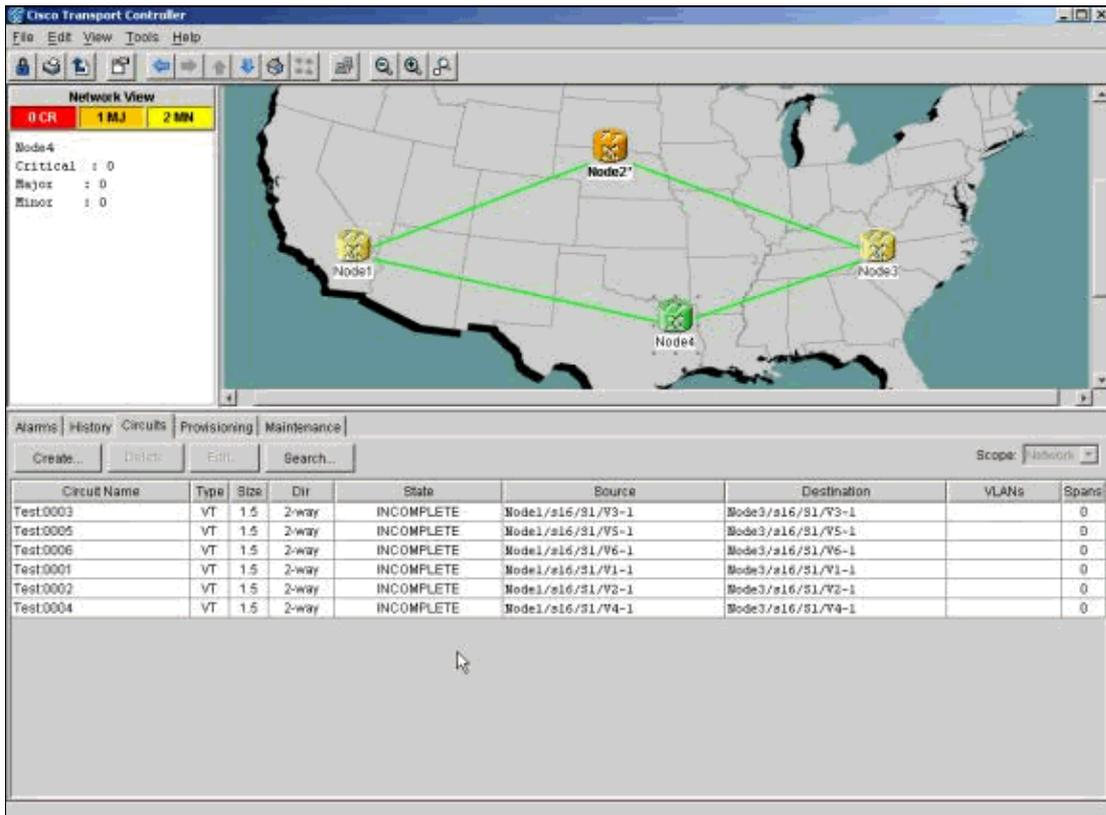
1. Go to the Shelf view of the new node.
2. Select the **Provisioning/Ring (Provisioning/BLSR in later software versions)** tab.
3. Click in the **Type** field to highlight the ring information.
4. Click **Ring Map**.



When you are sure that the IP addresses match the node IDs, click **Accept** to clear the **APSCDFLTK** alarms.

## Step 7: Update Circuits

Next, you must update the circuits. Go into the Network view and wait until CTC discovers all circuits.



Any circuits that pass through the new node show up as Incomplete. Note the number of incomplete circuits.

The screenshot shows the Cisco Transport Controller interface. The network map displays four nodes: Node1, Node2, Node3, and Node4. Node4 is the newly added node. A context menu is open over Node4, with the option "Update Circuits With New Node" selected. Below the map, a table lists six circuits that are currently in an "INCOMPLETE" state.

Circuit Name	Type	Size	Dir	State	Source	Destination	VLANs	Spans
Test.0003	VT	1.5	2-way	INCOMPLETE	Node1/s16/S1/W3-1	Node3/s16/S1/W3-1		0
Test.0005	VT	1.5	2-way	INCOMPLETE	Node1/s16/S1/W5-1	Node3/s16/S1/W5-1		0
Test.0006	VT	1.5	2-way	INCOMPLETE	Node1/s16/S1/W6-1	Node3/s16/S1/W6-1		0
Test.0001	VT	1.5	2-way	INCOMPLETE	Node1/s16/S1/W1-1	Node3/s16/S1/W1-1		0
Test.0002	VT	1.5	2-way	INCOMPLETE	Node1/s16/S1/W2-1	Node3/s16/S1/W2-1		0
Test.0004	VT	1.5	2-way	INCOMPLETE	Node1/s16/S1/W4-1	Node3/s16/S1/W4-1		0

Right-click the **new node**, and select **Update Circuits With New Node** from the menu.

The screenshot shows the same Cisco Transport Controller interface after the update. A "Circuits Update" dialog box is displayed in the center, indicating that 6 network circuits were added to Node4. The network map now shows Node4 as a green node, and the table below shows that all six circuits are now in an "ACTIVE" state.

Circuit Name	Type	Size	Dir	State	Source	Destination	VLANs	Spans
Test.0003	VT	1.5	2-way	ACTIVE	Node1/s16/S1/W3-1	Node3/s16/S1/W3-1		2
Test.0005	VT	1.5	2-way	ACTIVE	Node1/s16/S1/W5-1	Node3/s16/S1/W5-1		2
Test.0006	VT	1.5	2-way	ACTIVE	Node1/s16/S1/W6-1	Node3/s16/S1/W6-1		2
Test.0001	VT	1.5	2-way	ACTIVE	Node1/s16/S1/W1-1	Node3/s16/S1/W1-1		2
Test.0002	VT	1.5	2-way	ACTIVE	Node1/s16/S1/W2-1	Node3/s16/S1/W2-1		2
Test.0004	VT	1.5	2-way	ACTIVE	Node1/s16/S1/W4-1	Node3/s16/S1/W4-1		2

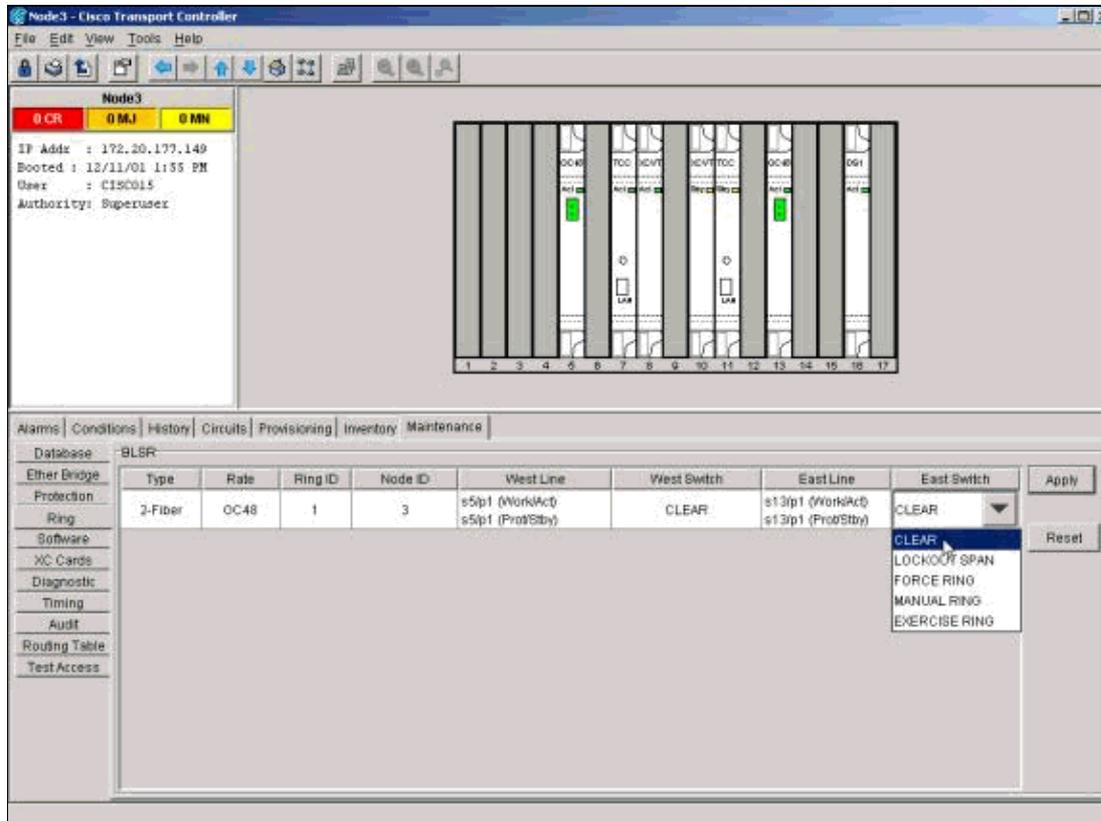
Ensure that the number of updated circuits matches the number of incomplete circuits that you noted previously. Confirm that all circuits are active. If either case is untrue, re-run **Update Circuits With New**

## Node.

**Note:** At this point, ensure that the UNEQ-P alarms are clear.

## Step 8: Clear Protection Switches

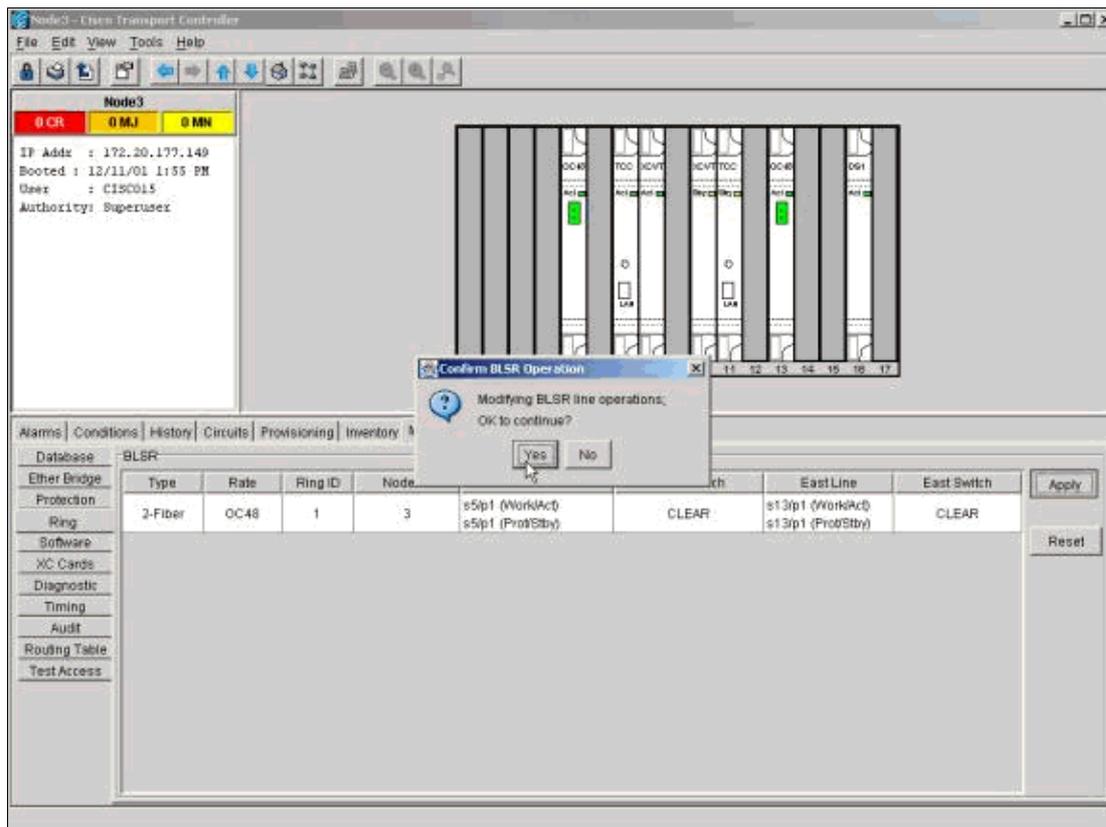
The last step in the procedure is to clear the protection switch you initiated in Step 3.



The screenshot shows the Cisco Transport Controller interface for Node3. The top left pane displays system information: IP Addr: 172.20.177.149, Booted: 12/11/01 1:55 PM, User: CISCO15, Authority: Superuser. The main area shows a rack diagram with 17 slots. The bottom pane is the Provisioning/Maintenance tab, displaying a table of protection switches. The table has columns for Type, Rate, Ring ID, Node ID, West Line, West Switch, East Line, and East Switch. The first row shows a 2-Fiber OC48 switch with Ring ID 1 and Node ID 3. The West Switch is CLEAR and the East Switch is also CLEAR. A dropdown menu is open for the East Switch, showing options: CLEAR, LOCKOUT SPAN, FORCE RING, MANUAL RING, and EXERCISE RING. The CLEAR option is selected.

Type	Rate	Ring ID	Node ID	West Line	West Switch	East Line	East Switch	Apply
2-Fiber	OC48	1	3	s5/p1 (WorkAct) s5/p1 (ProtStby)	CLEAR	s13/p1 (WorkAct) s13/p1 (ProtStby)	CLEAR	Apply

Log into the node through the east port to connect to the new node. In the **Provisioning/Maintenance** tab, choose **Clear** from the East Switch list, and click **Apply**.



Click **OK** in the confirmation dialog box. Repeat the action for the node through the west port to connect to the new node. Choose **Clear** from the West Switch list.

## Remove Nodes from a BLSR Ring

This procedure is service-affecting and should be performed during a maintenance window. Disruptions of up to three minutes are possible for any Ethernet traffic due to spanning tree re-convergence. All other traffic endures up to a 50ms hit for each protection switch initiated. Each circuit that changed Synchronous Transport Signal (STS) or Virtual Tributary (VT) while passing through the removed node incurs an outage for the length of time that it takes to delete and rebuild. This depends on the operator proficiency with CTC.

Now that we have successfully added a node (Node4) to a BLSR ring, let's go through the process of removing it again. For the purpose of demonstration, we have added some circuits to the lab setup we used above. These circuits drop at the node we are removing.



In order to remove nodes from a BLSR ring, you need to perform these steps:

- Step 1: Delete any circuits that dropped at the node you want to remove.
- Step 2: Identify, Delete and Re–create Pass Through Circuits That Change STS or VT.
- Step 3: Initiate Protection Switches.
- Step 4: Remove the Node and Re–connect Adjacent Nodes.
- Step 5: Re–launch CTC.
- Step 6: Accept the Ring Map.
- Step 7: Release Protection Switches.

## Step 1: Delete Circuits That Drop at the Node You Want to Remove

You need to first identify and delete any circuits that drop at Node4.



**Caution:** This procedure affects service. Be sure that you move all traffic that drops at this node before you delete any circuits.

The screenshot shows the Cisco Transport Controller (CTC) interface for Node4. The top left pane displays node details: IP Addr: 172.20.177.148, Booted: 2/13/02 9:30 AM, User: C18C015, Authority: Superuser. The main area shows a shelf view of Node4 with 17 slots. Below the shelf view, the 'Circuits' tab is selected, and the 'Scope' is set to 'Node'. A table lists the circuits passing through or dropping at Node4.

Circuit Name	Type	Size	Dir	State	Source	Destination	VLANs	Spans
Test0009	VT	1.5	2-way	ACTIVE	Node2/s14/s1/V3-1	Node4/s2/s1/V3-1	2	
Test0002	VT	1.5	2-way	ACTIVE	Node1/s3/s1/V3-1	Node3/s3/s1/V3-1	2	
Test0004	VT	1.5	2-way	ACTIVE	Node1/s3/s1/V5-1	Node3/s3/s1/V5-1	2	
Test0005	VT	1.5	2-way	ACTIVE	Node1/s3/s1/V2-1	Node3/s3/s1/V2-1	2	
Test0006	VT	1.5	2-way	ACTIVE	Node2/s14/s1/V2-1	Node4/s2/s1/V2-1	2	
Test0001	VT	1.5	2-way	ACTIVE	Node1/s3/s1/V1-1	Node3/s3/s1/V1-1	2	
Test0003	VT	1.5	2-way	ACTIVE	Node1/s3/s1/V4-1	Node3/s3/s1/V4-1	2	
Test0007	VT	1.5	2-way	ACTIVE	Node2/s14/s1/V1-1	Node4/s2/s1/V1-1	2	
Test0006	VT	1.5	2-way	ACTIVE	Node1/s3/s1/V6-1	Node3/s3/s1/V6-1	2	

From the Shelf view of the node you want to remove, click the **Circuits** tab. Select **Node** from the Scope drop–down list to see only the circuits that pass through or drop at this node. Check the source and destination column to identify any circuits that contain the node you want to remove (Node4). In order to sort the Source or Destination columns, click on the column heading.

The screenshot shows the Cisco Transport Controller (CTC) interface for Node4. The top left pane displays node details: IP Addr: 172.20.177.148, Booted: 2/13/02 9:30 AM, User: CISCO15, Authority: Superuser. The main area shows a network diagram with nodes and links. Below the diagram is a table of circuits.

Circuit Name	Type	Size	Dir	State	Source	Destination	VLANs	Spans
Test0001	VT	1.5	2-way	ACTIVE	Node1/s3/S1/V1-1	Node3/s3/S1/V1-1		2
Test0005	VT	1.5	2-way	ACTIVE	Node1/s3/S1/V2-1	Node3/s3/S1/V2-1		2
Test0002	VT	1.5	2-way	ACTIVE	Node1/s3/S1/V3-1	Node3/s3/S1/V3-1		2
Test0003	VT	1.5	2-way	ACTIVE	Node1/s3/S1/V4-1	Node3/s3/S1/V4-1		2
Test0004	VT	1.5	2-way	ACTIVE	Node1/s3/S1/V5-1	Node3/s3/S1/V5-1		2
Test0006	VT	1.5	2-way	ACTIVE	Node1/s3/S1/V6-1	Node3/s3/S1/V6-1		2
Test0007	VT	1.5	2-way	ACTIVE	Node2/s14/S1/V1-1	Node4/s2/S1/V1-1		2
Test0008	VT	1.5	2-way	ACTIVE	Node2/s14/S1/V2-1	Node4/s2/S1/V2-1		2
Test0009	VT	1.5	2-way	ACTIVE	Node2/s14/S1/V3-1	Node4/s2/S1/V3-1		2

Complete these steps:

1. Click on each circuit to highlight it.
2. Click **Delete**.
3. Click **Yes** in the confirmation dialog box.
4. Click **OK** in the informational dialog box.

**Note:** In order to highlight multiple circuits for deletion, hold down the CTRL or SHIFT key while you click on each circuit.

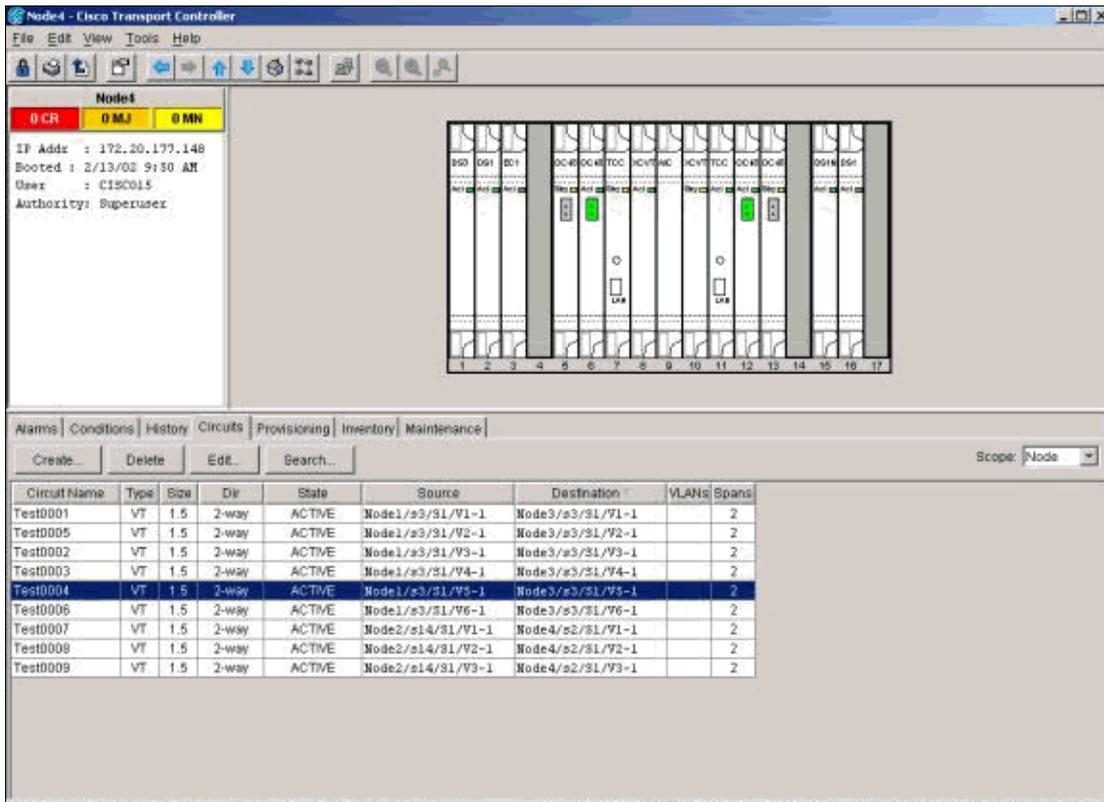
## Step 2: Identify, Delete and Re-create Pass Through Circuits That Change STS or VT

**Note:** This step is necessary only if you used CTC Release 2.x to create the circuits that pass through the node. If you provisioned this BLSR ring with Release 3.0 or later, proceed to Step 3.

You need to identify, delete and re-create any circuits that change STS or VT when the circuits pass through the node you want to remove.

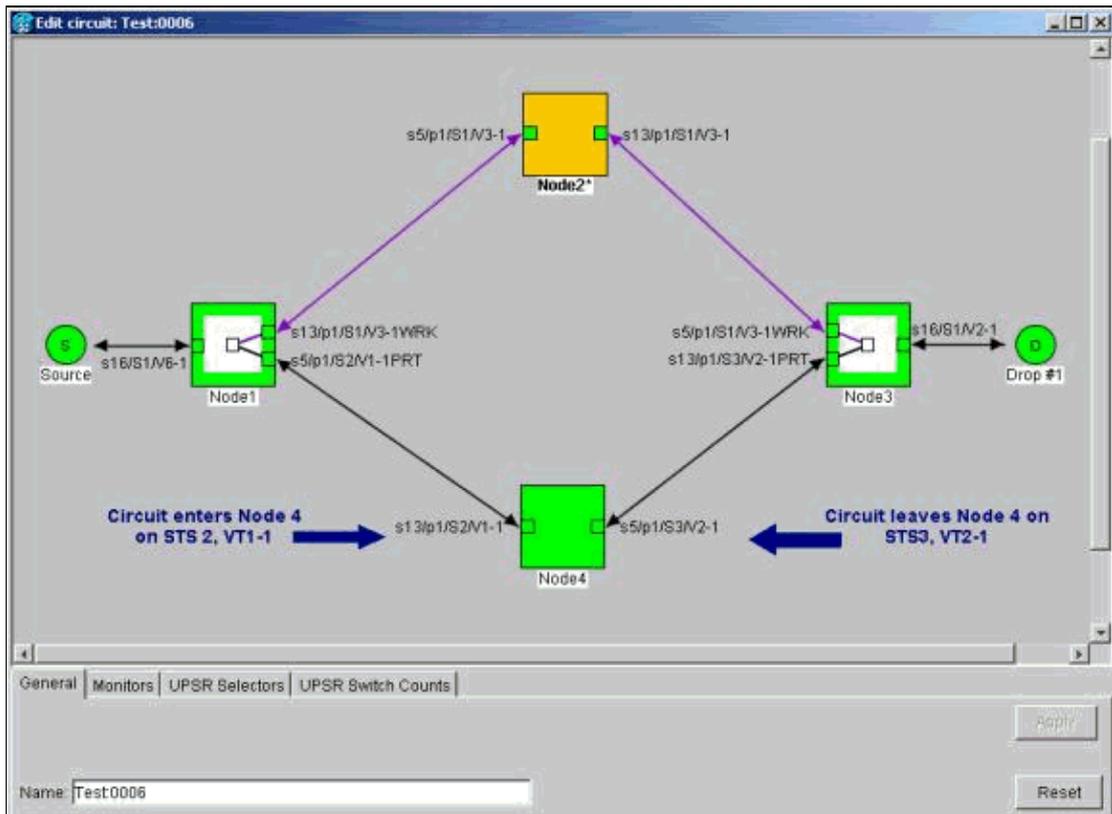


**Caution:** This procedure affects service. An outage occurs for the length of time you take to delete and re-create each circuit.



1. From the Shelf view of the node you want to remove, click the **Circuits** tab.
2. Select **Node** from the Scope drop-down list.

Since drop circuits for this node were identified and deleted in the previous step, this will show pass through circuits on this node.



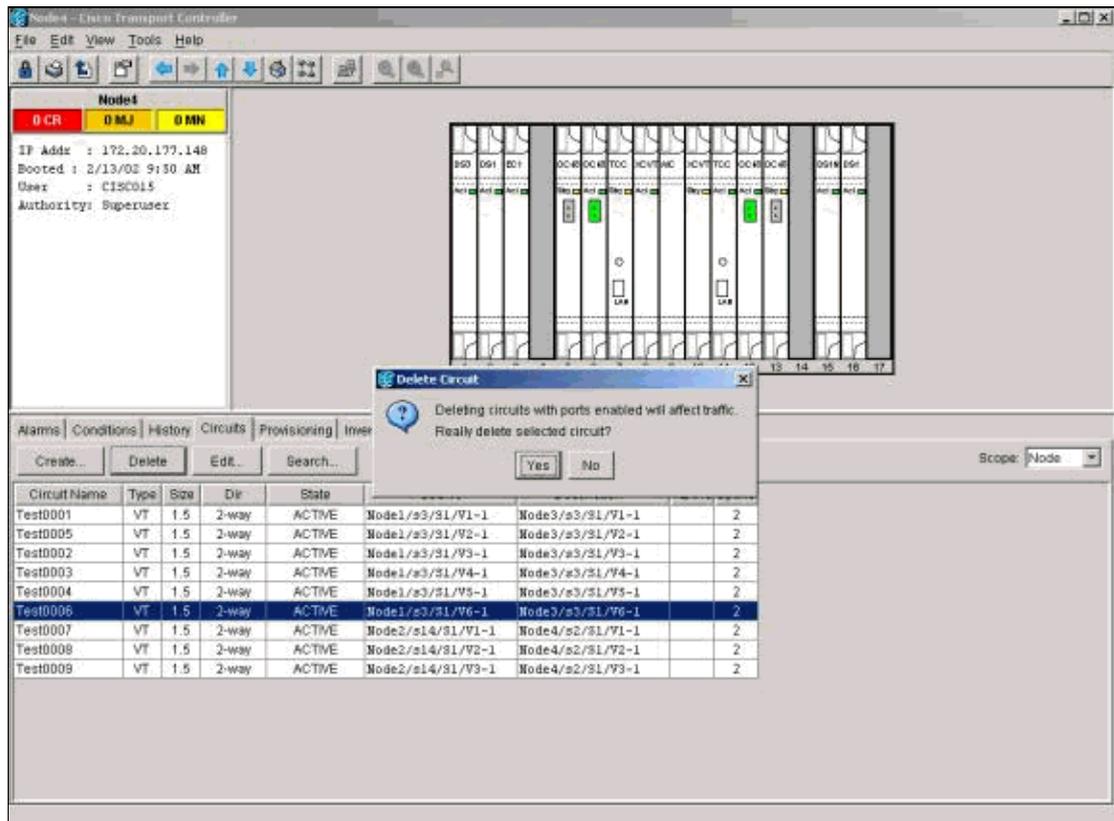
3. One by one, highlight each circuit, and click **Edit**.

4. Check the **Show Detailed Map** check box.

You can view the STS and VT on which the circuit enters and leaves the node. If these do not match, document the circuit for deletion and re-creation.

In this case our circuit actually changes STS and VT through Node4. As you can see, it enters using STS2, VT1-1, and exits using STS3, VT2-1.

5. Repeat Step 4 for all circuits that show up in the node view. You are now ready to delete and re-create the circuits.
6. One by one, highlight the circuits you identified previously, and click **Delete**.



7. Click Yes to confirm the **deletion**.
8. After circuit deletion is complete, click **OK** in the informational dialog box.
9. Then click **Create**, and rebuild the circuit with the original parameters.

### Step 3: Initiate Protection Switches

You now need to manually force traffic away from all spans that connect to Node4. Begin with the node that connects through the east port to Node4. Here, begin with Node3.

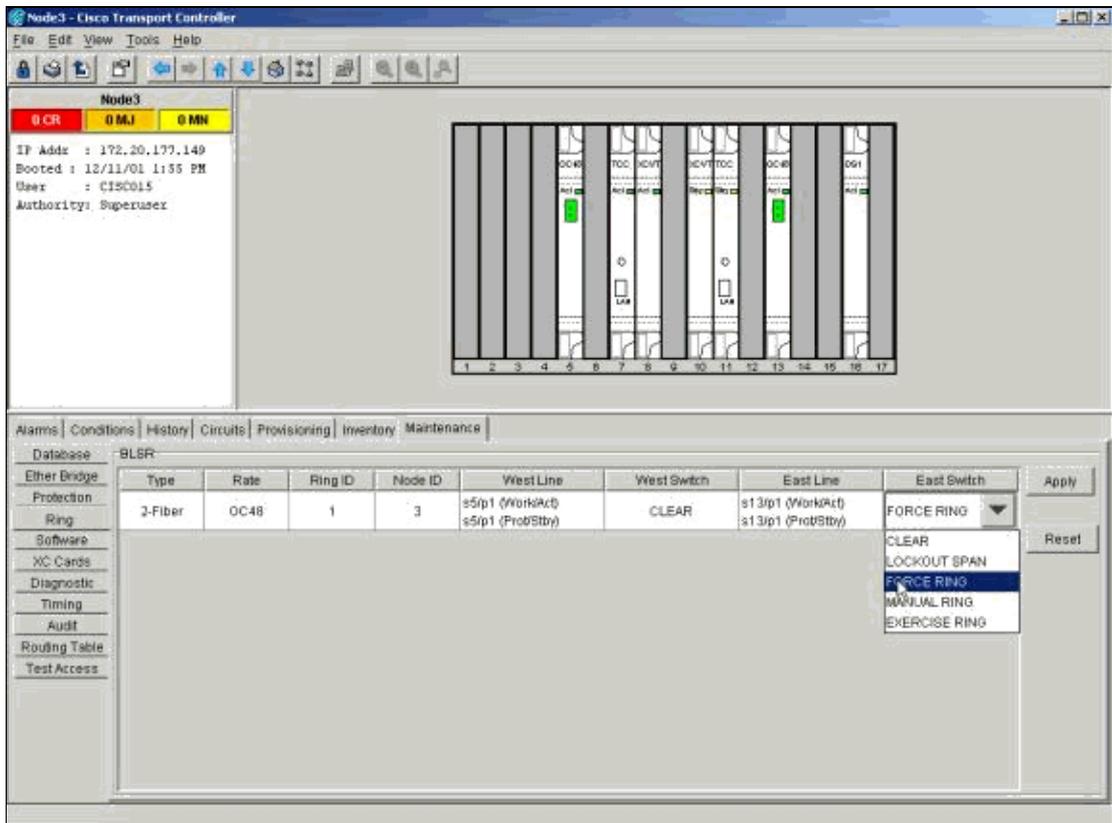


**Caution:** A forced protection switch can cause service disruption if the rest of the ring does not run error-free. Check the PM statistics for the rest of the optics cards in the ring. Complete these steps:

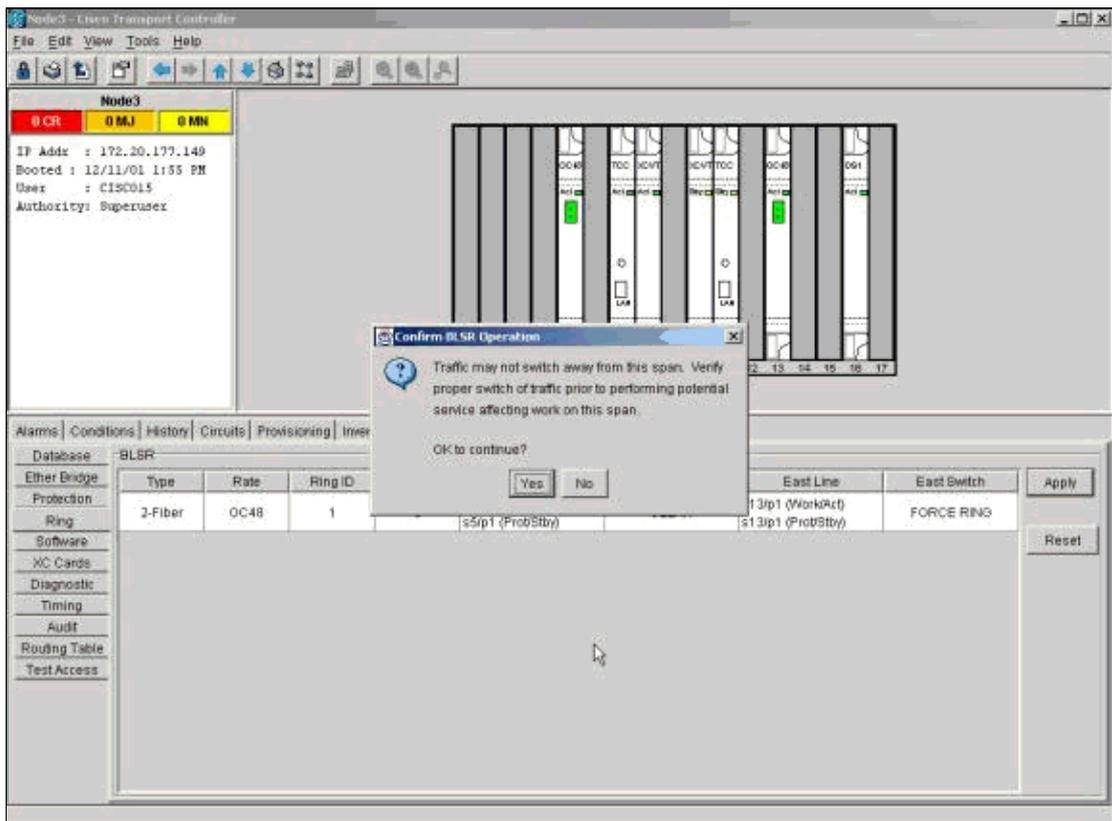
1. Log into each shelf in the ring.
2. Click on a BLSR optics card.
3. Select the **Performance** tab.
4. Click **Refresh**.

You can expect to see zeros in all fields if the span is error-free.

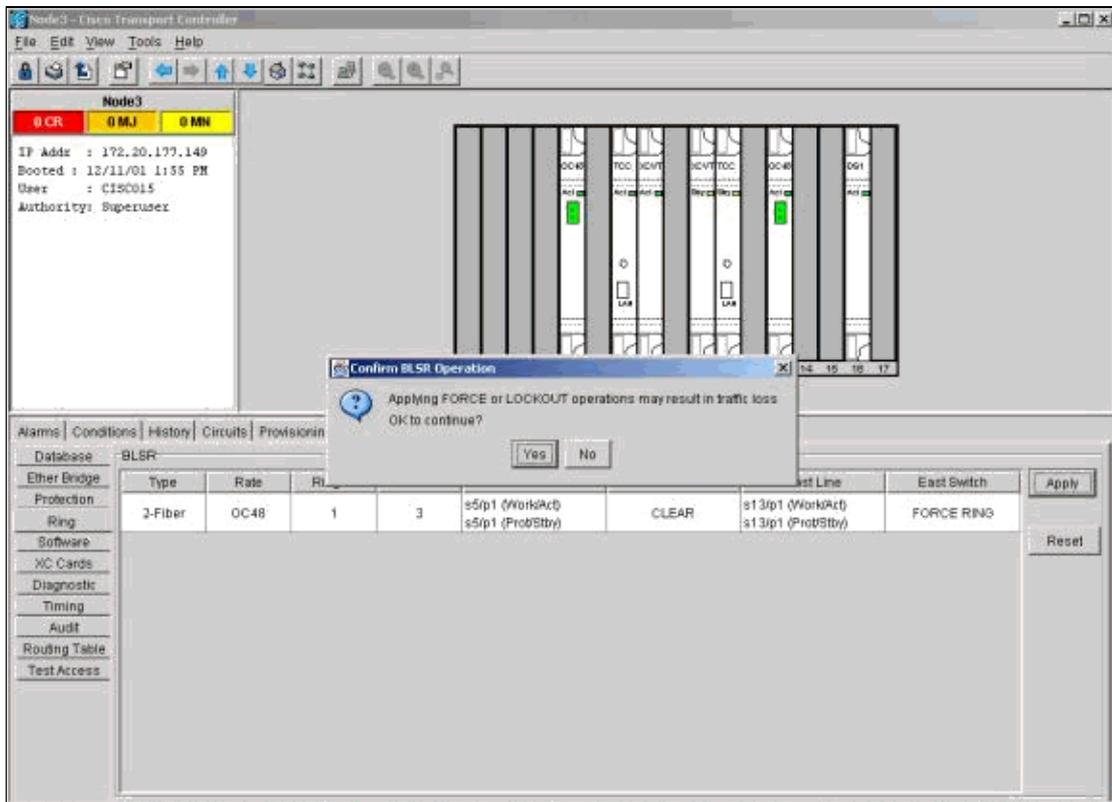
Traffic is unprotected during a forced protection switch



From the Shelf view of Node 3, click the **Maintenance/Ring (Maintenance/BLSR in later software versions)** tab. From the East Switch list choose **Force Ring**, and click **Apply** to force traffic away from the east span.

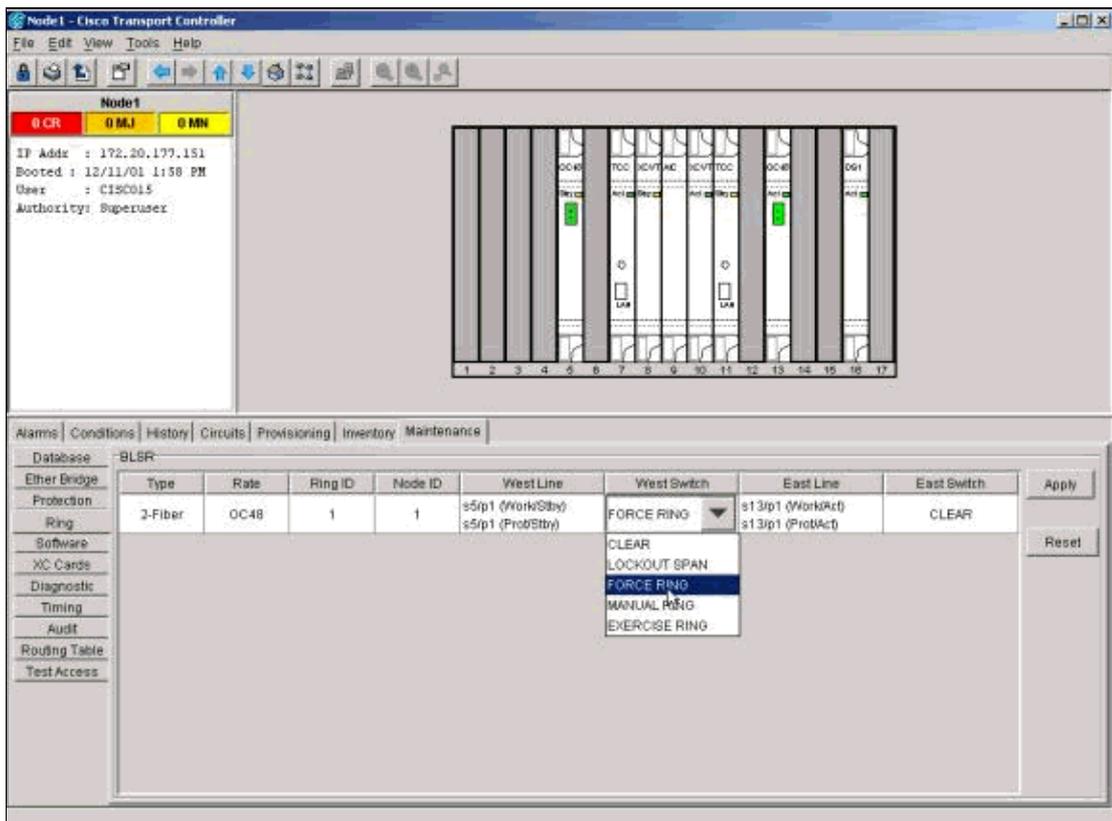


Select **Yes** in the confirmation dialog box.



Select **Yes** again.

Now go to the Shelf view of the node that connects to the new node through the west port. Here, go to Node1.

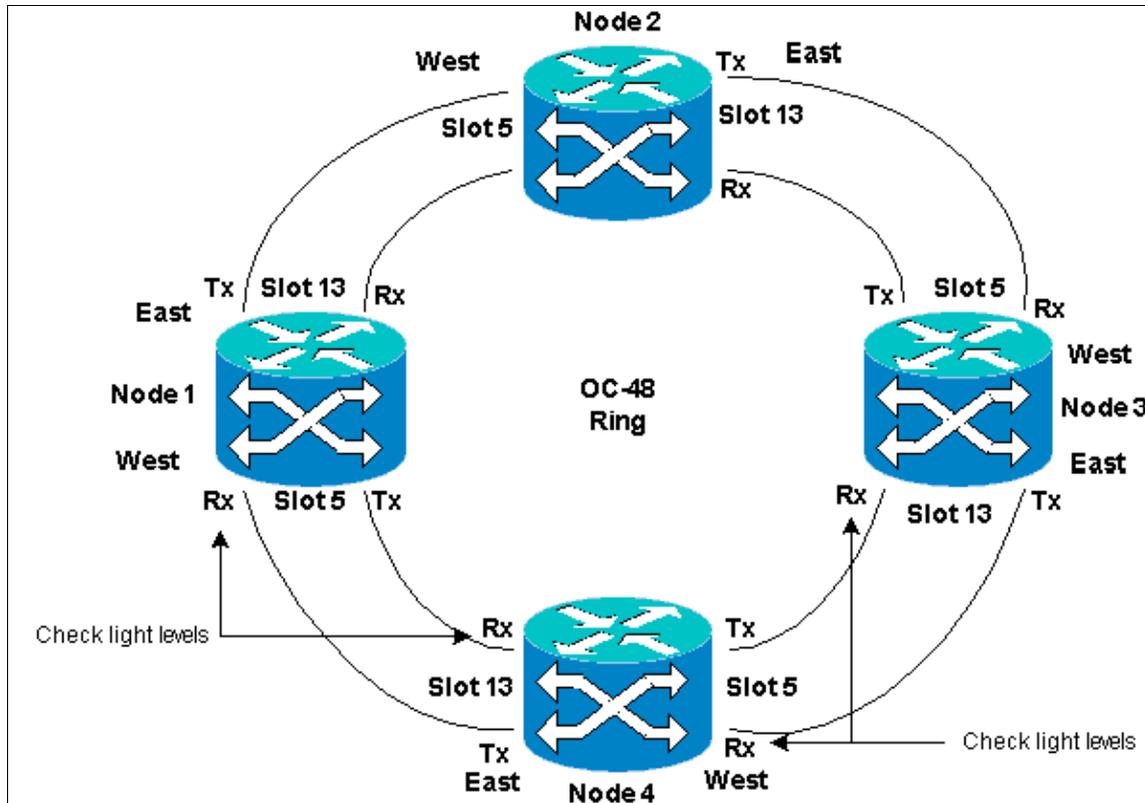


Go to the **Maintenance/Ring (Maintenance/BLSR in later software versions)** tab. From the West Switch list choose **Force Ring** and click **Apply** to force traffic away from the west span. Click **Yes** in the two confirmation dialog boxes.

## Step 4: Remove the Node and Re-connect Adjacent Nodes

**Note:** If the node you want to remove is BITS timed, be sure to make appropriate adjustments to any line timed sites that use the node as a reference.

You can now safely remove fibers from Node4. Reconnect fibers to adjacent nodes. Here, connect Slot 5, Node1 to slot 13, Node3.



When you reconnect fibers to adjacent Nodes, first connect only Tx fibers, and check levels before you connect the Rx fibers. You can find Rx levels in the Card Reference section of the Cisco ONS 15454 Troubleshooting Guide, Release 5.0.

After you reconnect all fibers, open the **Alarms** tab of the newly connected nodes. Verify whether the span cards are free of alarms. Resolve any alarms before you proceed.

## Step 5: Re-launch CTC

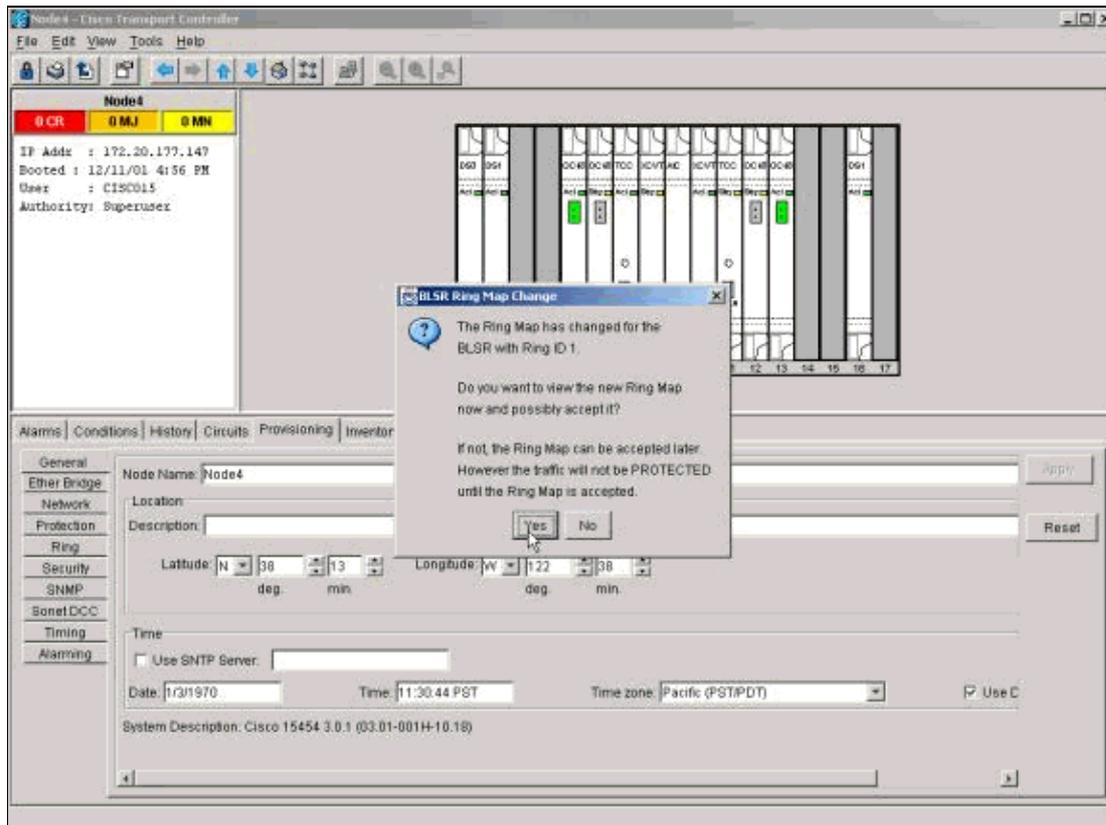
Next, you must close and re-launch CTC. Be sure not to launch CTC with the IP address of the node you just removed.



**Caution:** The purpose of this step is to eliminate the removed node from the view in CTC. If you skip this step, and delete pass-through circuits from the removed node, the pass-through circuits can be deleted from the nodes still in the ring.

## Step 6: Accept the Ring Map

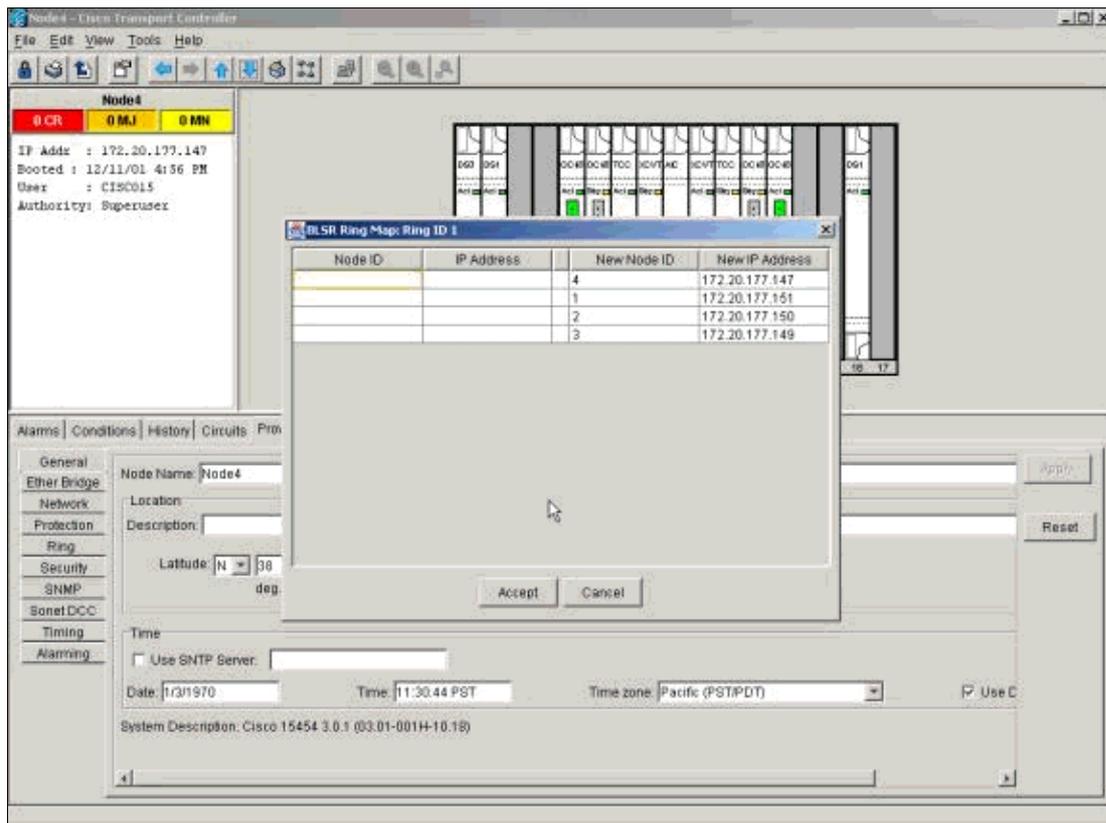
Now accept the new Ring Map.



Wait for the BLSR Ring Map Change dialog box to appear. Click **Yes** to view the new Ring Map.

If the BLSR Ring Map Change dialog box does not appear:

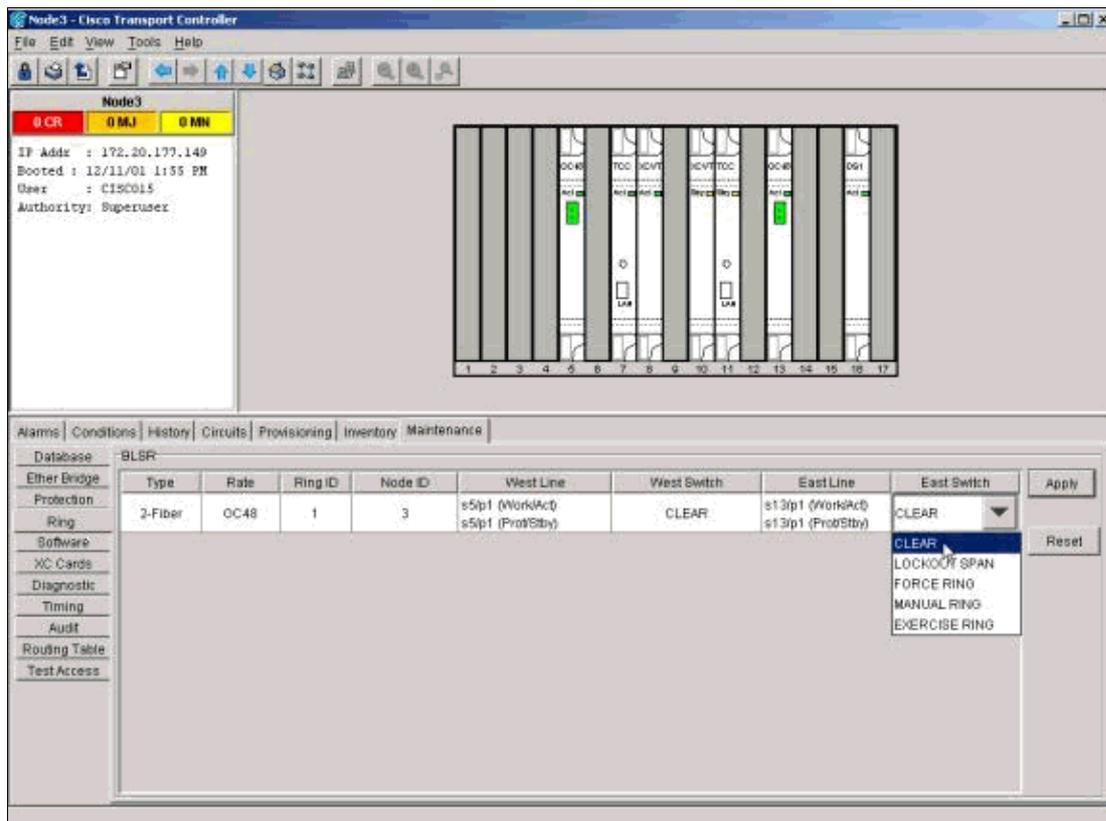
1. Go to the Shelf view of either node adjacent to the removed node.
2. Select the **Provisioning/Ring (Provisioning/BLSR in later software versions)** tab.
3. Click in the **Type** field to highlight the ring information.
4. Click **Ring Map**.



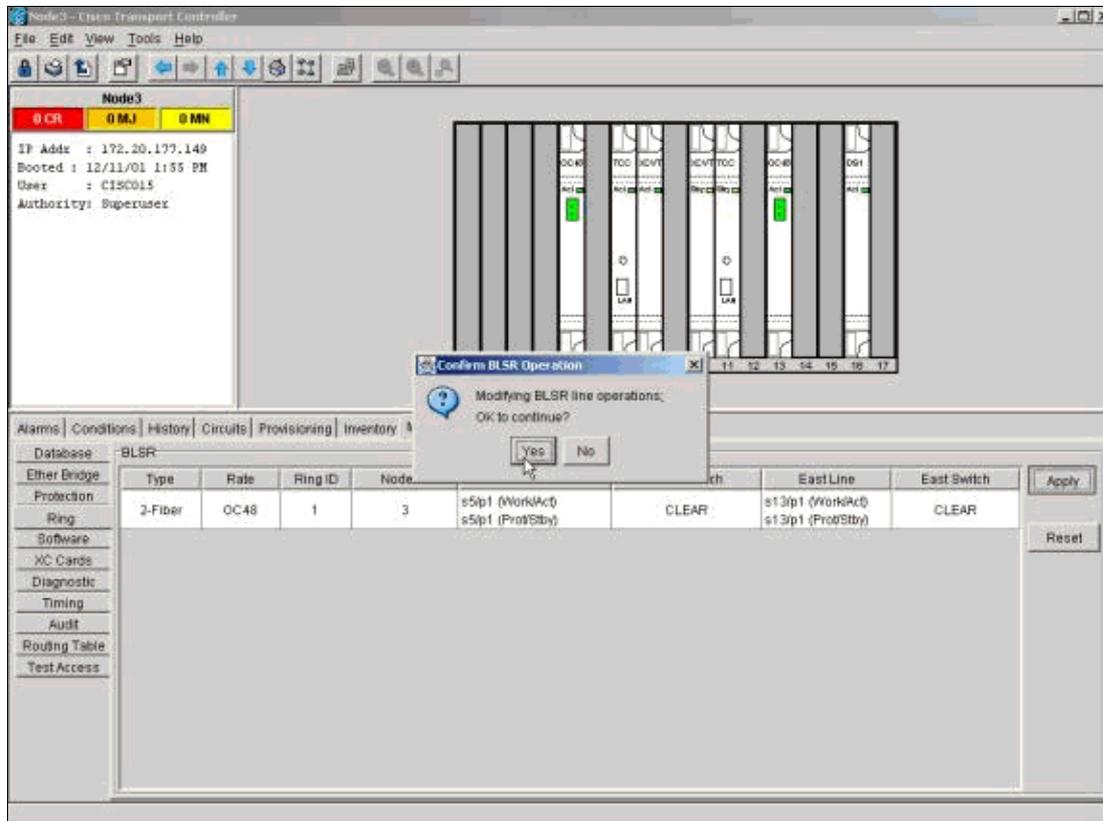
When you are sure that the IP addresses match the node IDs, click **Accept**.

## Step 7: Release Protection Switches

The last step in the procedure is to release the protection switch you initiated in Step 3.



Log into the node with the protection switch on the east port. In the **Maintenance/Ring (Maintenance/BLSR)** tab, select **Clear** from the East Switch List, and click **Apply**.



Click **OK** in the confirmation dialog box. Repeat this step for the node with a protection switch on the west port. Select **Clear** from the West Switch list.

## Related Information

- [Best Practices When Configuring Circuits on the ONS 15454](#)
- [Cisco ONS 15454 Troubleshooting Guide, Release 5.0](#)
- [Technical Support & Documentation – Cisco Systems](#)

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