



CISCO CRAFT WORKS INTERFACE QUICK START GUIDE



Cisco Craft Works Interface Quick Start Guide

Cisco IOS XR Software Release 3.5

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1 Introduction

This document introduces Craft Works Interface (CWI) that supports Cisco IOS XR Software Release .



Note This document refers to CWI managing devices. For Cisco IOS XR software, the devices can be any or all of the secure domain routers (SDRs) of which your Cisco IOS XR system is composed.

Related Documentation

See the following list for related documents that may be useful:

- *Cisco Craft Works Interface User Guide*
- *Cisco Craft Works Interface Online Help*

Intended Audience

This document is intended for experienced service provider administrators, Cisco telecommunication management engineers, and third-party field service technicians who have completed the required Cisco router training sessions.

2 About CWI

CWI is a powerful, session-based tool that allows you to manage, monitor, and configure a single device or a network of devices. CWI is designed to operate in as many situations as possible.

Using CWI you can:

- Connect to the devices in several ways through a serial port, a terminal server, or an IP-based method, such as Telnet, SSH, or CORBA.
- Run Windows, Macintosh, and Linux clients.
- Connect to devices with or without XML or command-line interface (CLI) capabilities.
- Display both the administrative (admin) plane and device plane for Cisco IOS XR devices.

CWI offers a selection of CLI- and graphic-based tools from which you can perform management tasks. In addition to monitoring tools, CWI provides these methods for configuring devices:

- Telnet, SSH, and Terminal Plus applications for direct access to the CLI of the device.
- CLI-based configuration editor tool for free-form editing and advanced navigation of the device configuration.
- Table-based applications that are used for bulk-configuration and client-side validation.

CWI provides the following capabilities beyond the limitations of most Element Management Systems (EMS):

- Any Cisco IOS XR user can download CWI.
- CWI has a small footprint and no server is required.
- CWI has the flexibility to connect to the router through a serial port, terminal server, or management interface that uses CLI or XML data.

See *Cisco Craft Works Interface User Guide* for details on the activities in the CWI Desktop.

3 Prerequisites

Prerequisites ensure that the CWI client and router are correctly set up to allow them to communicate. Meeting all prerequisites before starting any of the procedures in this guide ensures a successful communication between the CWI client and the router. For network information, see “Network Considerations” section on page 21.



Note If you are using a CORBA connection and require notifications, the router must be explicitly configured for each client that is to receive notifications. These notifications include real-time inventory updates (for example, online insertion and removal [OIR]), alarms, and change-of-configuration events. See the “Configuring the Router and CWI Client” section on page 4 for information on configuring the router to send notifications to a specified client.

These prerequisites sections are described:

- Router Prerequisites, page 3
- CWI Client Prerequisites, page 3
- CWI Client System Requirements, page 3

Router Prerequisites

The router prerequisites ensure that the router is correctly set up. Before logging in to a router, using CWI, you must meet the router prerequisites that are described in Table 1.

Table 1 Checklist for Router Prerequisites

Item	Task	Additional Information
Base image and manageability PIE	Ensure that the base image and manageability PIE are installed and running on the router to which you are connecting using CWI client. Optionally, install and activate the Cisco IOS XR Security Package (K9SEC) to enable SSH and SSL functionality.	See <i>Cisco IOS XR System Management Configuration Guide</i> for information on how to start the base image.
Minimum router configuration	Set the minimum router configuration before configuring the CWI client and required Management Services	—
TTY or CORBA connection method	Ensure that connectivity is established between the router Management Ethernet interface and CWI client.	See <i>Cisco IOS XR Getting Started Guide</i> for information on connecting an Ethernet interface from the CWI client to the router.
AAA ¹ username and password	Configure at least one username and password on the router. A valid AAA username and password for accessing the router must be configured.	See <i>Cisco IOS XR System Security Configuration Guide</i> for information on configuring usernames and passwords on the router.

1. AAA = authentication, authorization, and accounting.

CWI Client Prerequisites

Ensure that the CWI client is correctly set up to communicate with the router. We recommend that you test the client connection. No special configuration is required on the CWI client.

Contact your system administrator to obtain the following information required to configure the router for use with CWI:

- Router hostname
- CWI client IP address if the client DNS name is not registered in a DNS server accessible by the router

CWI Client System Requirements

These sections list the CWI client hardware and software requirements. The CWI client hardware requirements ensure that the CWI client has the proper verified system requirements for the chosen platform.

Hardware Requirements

Table 2 lists the CWI client hardware requirements.

Table 2 CWI Client Hardware Requirements

System Requirement	CPU and CPU Speed MHz	RAM	Drive Space	Monitor Display Settings
Windows-based PC	IBM PC-compatible 500 MHz PentiumIII minimum, 1.20 GHz Pentium IV recommended	256 MB minimum, 512 MB recommended	CWI=5MB, JRE=48MB.	1024 by 768 pixels
UNIX	Solaris 550 MHz minimum, 1.2 GHz recommended	256 MB minimum, 512 MB recommended	CWI=5MB, JRE=48MB	1024 by 768 pixels
Linux-based PC	IBM PC-compatible 500 MHz PentiumIII minimum, 1.20 GHz Pentium IV recommended	256 MB minimum, 512 MB recommended	CWI=5MB, JRE=48MB	1024 by 768 pixels
Macintosh	500 MHz minimum, 1.20 GHz recommended	256 MB minimum, 512 MB recommended	CWI=5MB, JRE=48MB	1024 by 768 pixels

Software Requirements

Table 3 lists the CWI client software requirements.

Table 3 CWI Client Software Requirements

System Requirement	Operating System	Additional Software
Windows-based PC	Windows 2000 or Windows XP	One of these browsers: <ul style="list-style-type: none"> • Microsoft Internet Explorer 5.0 or higher • Netscape Navigator 7.0 or higher JRE version 1.5
Linux-based PC	Red Hat Linux Release 7.1 or any Linux operating system on which JRE ¹ 1.5 runs	Netscape Navigator JRE version 1.5 See the Sun website for the latest minimum system requirements for the JRE on Linux.
Macintosh	MAC OS X 10	Safari version 1.2.3 JRE version 1.5

1. JRE = Java Runtime Environment

4 Configuring the Router and CWI Client

To install CWI and for CWI to manage a router, specific configuration pieces must be active on the router. If you want to use the serial port or terminal server connection method after installation, no further router configuration is required. For all other connection methods, ensure that the router is configured, as described in this section.

The “Troubleshooting Basic IP Connectivity” section on page 24 provides information on resolving connectivity problems. See *Cisco IOS XR System Management Configuration Guide* for information on the capabilities of, installation of Cisco IOS XR software packages on, and bootup of the router.

These sections describe how to set up client connections on the router:

- Enabling the HTTP Server, page 5
- Setting Up the Common Configuration for IP Connection Methods, page 5
- Connection Methods, page 6
- Setting Up the Minimum Crypto Requirements, page 6

Enabling the HTTP Server

To download and install CWI, you must enable the HTTP server on the device.



Note The HTTP server is used only to install CWI. After installation, the server can be deactivated.

To activate the HTTP server, install the manageability PIE, and add the configuration, use the **http server** command in global configuration mode, as shown in the following example:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# http server
```

In addition, you can enable SSL by using the **ssl** keyword from the **http server** command in global configuration mode, as shown in the following example:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# http server ssl
```

Setting Up the Common Configuration for IP Connection Methods

For CWI to manage the device through an IP connection method (for example, Secure Shell Version 1 [SSHv1], Secure Shell Version 2 [SSHv2], or CORBA) one or more of Telnet, SSHv1 or SSHv2 must be active on the router, regardless of which main connection method you are using. The default number of available virtual terminal lines (vty) is relatively small. We strongly recommend that the number be increased to allow several management sessions to run simultaneously.

To set the maximum number of vtys, use the **vty-pool** command in global configuration mode, as shown in the following example:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# vty-pool default 0 max vty
```

For more information, see *Cisco IOS XR System Management Command Reference*.

Enabling the Telnet Server

To enable the Telnet server on a device for CWI, use the **telnet server** command in global configuration mode. The following example shows that you can set the default VPN routing and forwarding (VRF) instance name for the Telnet server, specify the IPv4 address prefix, and either specify the maximum number of Telnet servers or specify no limit to the maximum number of Telnet servers:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# telnet vrf default ipv4 server max-servers [no-limit | 1-200]
```

For more information, see *Cisco IOS XR IP Addresses and Services Command Reference*.

Enabling the SSH Server

Before you begin to enable the SSH server, ensure that you have generated the Rivest, Shamir, and Adelman (RSA) key pair for SSHv1 and Digital Signature Algorithm (DSA) key pair for SSHv2, as described in the “Setting Up the Minimum Crypto Requirements” section on page 6. To enable the SSHv1 server and SSHv2 server, use the **ssh server** command in EXEC mode, as shown in the following example:

```
RP/0/RP0/CPU0:router# ssh server
```

You can set both the rate limit and session limit options for the SSH server. For more information, see *Cisco IOS XR System Security Configuration Guide*.

Connection Methods

Some connection methods require additional configuration on the router, as described in Table 4. For the connection methods that require cryptographic (crypto) set up, see the “Setting Up the Minimum Crypto Requirements” section on page 6.

Table 4 Connection Methods and Requirements

Connection Method	Additional Router Configuration Command	Manageability PIE Requirement	Crypto Setup Requirement
Serial port	—	—	—
Terminal server (all types)	—	—	—
CLI over Telnet/SSHv1/SSHv2	—	—	Yes
XML over Telnet	<code>xml agent tty</code>	Yes	—
XML over SSHv1/SSHv2	<code>xml agent tty</code>	Yes	Yes
XML over CORBA	<code>xml agent corba</code>	Yes	—
XML over CORBA SSL	<code>xml agent corba ssl</code>	Yes	Yes

Setting Up the Minimum Crypto Requirements

This section describes the essential crypto requirements to enable the various secure communication options. If you want to run CWI in a nonsecure (for example, Telnet- or CORBA-based) environment, this configuration is not required. For more detailed information, see *Cisco IOS XR System Security Configuration Guide*.

Setting Up the Minimum Crypto Configuration for SSHv1 or SSHv2

To set up the minimum crypto configuration for SSHv1, use the `crypto key generate rsa` command in EXEC mode to generate an RSA key pair. You must accept all prompted defaults. For more detailed information, see *Cisco IOS XR System Security Configuration Guide*.

To set up the minimum crypto configuration for SSHv2, use the `crypto key generate dsa` command in EXEC mode to generate a DSA key pair. For more detailed information, see *Cisco IOS XR System Security Configuration Guide*.

Setting Up the Minimum Crypto Configuration for SSL

To set up the minimum crypto configuration for SSL (CORBA, HTTP, or both), perform the following steps:

Step 1 Generate an RSA key pair. Accept all prompted defaults. If the key pair label is not specified, “the_default” is used.

```
RP/0/RP0/CPU0:router# crypto key generate rsa
```

Step 2 Configure the certification authority (CA) trust point.

```
RP/0/RP0/CPU0:router(config)# crypto ca trustpoint ca-name
RP/0/RP0/CPU0:router(config-trustp)# enrollment url ca-URL
RP/0/RP0/CPU0:router(config-trustp)# rsakeypair keypair-label (If your RSA key pair was assigned a label)
RP/0/RP0/CPU0:router(config-trustp)# exit
RP/0/RP0/CPU0:router(config)# commit
```

The following example shows how to configure the CA trust point:

```
RP/0/RP0/CPU0:router(config)# crypto ca trustpoint myca
RP/0/RP0/CPU0:router(config-trustp)# enrollment url http://myca/mydomain.com
RP/0/RP0/CPU0:router(config-trustp)# rsakeypair keypair-label
RP/0/RP0/CPU0:router(config-trustp)# exit
RP/0/RP0/CPU0:router(config)# commit
```

Step 3 Exit configuration mode.

```
RP/0/RP0/CPU0:router(config)# commit
```

Step 4 Authenticate the CA by getting the certificate for the CA.

```
RP/0/RP0/CPU0:router# crypto ca authenticate ca-name
```

Step 5 Obtain a router certificate from the CA.

```
RP/0/RP0/CPU0:router# crypto ca enroll ca-name
```

5 Installing, Launching, and Uninstalling CWI

This section provides information about how to install, launch, and uninstall CWI. For a list of the login modes, see the “Login Modes and Requirements” section on page 22.

The following sections are presented:

- Installing CWI, page 7
- Launching CWI, page 8
- Closing CWI, page 16
- Uninstalling CWI, page 17

Installing CWI

Use this procedure to install CWI and log in to a router when SSL is either enabled or not enabled on the required Management Services. Ensure that you have already set up the minimum client connections on the router. See the “Configuring the Router and CWI Client” section on page 4 for more information.



Note All steps associated with accepting a certificate are not required after the first time you have started the CWI client and logged in to a router, if you choose the certificate option Always.

To install CWI, perform the following steps:

Step 1 Launch your HTTP- or HTTPS-enabled web browser. See the “CWI Client System Requirements” section on page 3 for information on web browsers.

If SSL is enabled, the router SSL certificate must be accepted. To choose the applicable option, follow the online instructions.



Note If you click **No** to deny the SSL certificate, the login process is canceled.

Step 2 Enter the DNS name or IP address of the router to be accessed in the Address field located near the top of the web browser window. Press **Enter**.

You must enter the DNS name or IP address in the Address field using the following format:

```
http://router-dns-name or http://ip-address
```

If SSL is enabled, use the following format:

```
https://router-dns-name or https://ip-address
```

Step 3 A router HTTP authentication dialog box appears. See *Cisco IOS XR System Security Configuration Guide* for information on the AAA username and password.

- a. Enter your AAA username and password in the username and Password fields.
- b. Click **OK**. The Cisco Systems router home page appears.

Step 4 Click the **Craft Works Interface** link in the web browser to start the CWI installation.



Note You must install JRE 1.5 to proceed with the CWI installation.

- Step 5** If this is the first time the CWI client has started CWI, the Java Plug-in must be installed and the CWI Cisco security certificate must be accepted.
- If the Java Plug-in installation is completed, a dialog box appears asking you to trust the security certificate distributed by Cisco Systems. This dialog box differs depending on the client platform.
 - The security certificate must be accepted to run CWI. To choose the applicable option, follow the online instructions. If applicable, the Craft Works Interface Launcher appears.
- Step 6** If this is the first time you have started CWI or you have installed a new version of CWI, the CWI components start downloading. Otherwise, a cached version of the CWI components is used, reducing CWI start time.
-

Launching CWI

This section describes how to select the devices for managing your CWI session before and after launch.

The CWI device tree is a graphical, user-customized hierarchy of devices you can manage. This user-friendly application provides a quick and simple method for selecting and managing devices as often as you like. The device tree lets you add, delete, and edit devices, as well as to define device groups to organize devices into logical sets. Your customizations are automatically saved for the next time you start CWI.

Because CWI can manage multiple devices in a session, you can select one or more devices or device groups from the device tree and have CWI automatically log in to all of them. The login credentials for all the devices must be the same; for example, they must have the same username and password. When you log in, the progress window displays the login activity for each device. When the login has been completed for all the devices, the main desktop appears. The CWI Inventory Tree is populated with the chosen devices, and from this tree you can launch various applications to manage them.

After launching CWI, you can continue to add or delete devices by choosing **File > Login**. The following list of attributes are included:

- Device name or address
- Connection method
- Description (optional)

In addition, you can connect to a device without using the Device Tree by choosing the Login Information root node in the tree. CWI provides the user and device credentials on the right-hand side of the CWI - Login window.

The following sections are presented:

- Scripted Login Capability Overview, page 8
- Launching CWI Without Using the Device Tree, page 9
- Launching CWI from the Device Tree, page 10
- Encountering an Error While Logging in to Multiple Devices Simultaneously, page 14
- Specifying the User Login Script, page 15

Scripted Login Capability Overview

The Scripted Login capability allows CWI to access devices not directly accessible from the CWI workstation. The following steps are performed through a Scripted Login connection:

1. Connect by using Telnet, Secure Shell Version 1 (SSHv1), or Secure Shell Version 2 (SSHv2) to an intermediate device; for example, a UNIX server.
2. Execute a user-specified series of commands to open a character-based connection such as a Telnet or SSH connection to the remote device.

Then, CWI logs in to the remote device and communicates over the end-to-end connection by using XML or CLI, as specified by the user.

Launching CWI Without Using the Device Tree

To launch CWI with SSL either enabled or not enabled, perform the following steps:

Step 1 Double-click the CWI icon to launch the client desktop. The CWI - Login window appears (see Figure 1).

You have the option to add a device or device group and log in to multiple routers. See the “Launching CWI from the Device Tree” section on page 10 for more information.

Figure 1 CWI - Login Window

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Note Enter the same AAA username and password that you used in Step 4 to access the router that must be configured. See the “Installing CWI” section on page 7.

Step 2 Enter the same AAA username.

Step 3 Enter the same AAA password.

Step 4 (Optional) Enter the enable password for Cisco IOS.

Note When you connect to a Cisco IOS device, you must enter the enable password.

Step 5 Choose one of the following connection categories from the drop-down menu:

- IP
- Console/Aux
- Scripted

Note If you choose the IP-based or Console/Aux connection categories, the scripted login fields are not displayed.

Step 6 Choose one of the following connection types from the drop-down menu:

- XML over CORBA. Choose the node name. Note that XML over CORBA is the default.
- CLI over Telnet/SSH. Choose the server name. Specifying the port is optional. If you specify a port, CWI tries to connect using only that port. CWI does not automatically try to connect with other ports.
- Terminal Server. Choose the server name and port.
- Serial Port. Choose the Serial Port. You can also set the parameters for the serial port.

- Step 7** (Optional) If you chose the Scripted connection category to log in to the intermediate or Scripted server:
- Enter the Scripted username.
 - Enter the Scripted password.
 - Click the ellipsis button to display the Login Script Steps window (see Figure 7). Follow the procedure in the “Specifying the User Login Script” section on page 15.



Note In addition, you must enter the applicable information in the Device Description field to uniquely identify the connection. For example, if you are connecting to a device such as router_1 through the intermediate machine, enter router_1 in the Description field.

- Step 8** Enter the node name (DNS name or IP address) of the device that CWI is directly connecting to.
- Step 9** (Optional) Check the Manage admin plane check box to enable the admin plane for the applicable device group or device. If checked, the admin plane node appears above the corresponding device node in the Inventory Tree. For more information, see “Understanding the Admin Planes and Device Planes” section on page 18.
- Step 10** Click **Login**. Note that if you checked the Lite Mode check box, the XML option is disabled.
For SSL enabled: If you did not choose Always to automatically accept the SSL certificate from the “Installing CWI” section on page 7, you must accept the SSL certificate.
- Step 11** After the CWI initialization is completed, the CWI Desktop window appears. The chosen login mode is indicated in the Inventory Tree. See the “CWI Desktop Window” section on page 19 for information on the CWI Desktop window.



Note CWI is automatically locked when there is no activity in the CWI session for 15 minutes. To unlock CWI, you must provide the username and password used when logging in to the router. See *Cisco Craft Works Interface User Guide* for CWI unlocking procedures.

If any of the minimum requirements of the initialization steps fails, a CWI dialog box appears allowing you to abort, troubleshoot, or continue the initialization process.

- Step 12** If necessary, complete the following steps to troubleshoot the initialization process.
- To stop the initialization process, click **Abort**.
 - To troubleshoot the process, click **Troubleshoot**. The Troubleshooter application is started, and a Troubleshoot New Device Launch problems dialog box appears. The Troubleshooter application runs fault isolation tests on the client/server communication path between the CWI and router management agent. The Troubleshooter application provides a window that describes the reason for the failure, possible cause, and recommended repair action. An automatic repair option is provided in many instances. See *Cisco Craft Works Interface User Guide* for information about using the Troubleshooter feature.
 - To continue the initialization process, click **Continue**.
-

Launching CWI from the Device Tree

These sections describe how to launch CWI through configured devices or device groups:

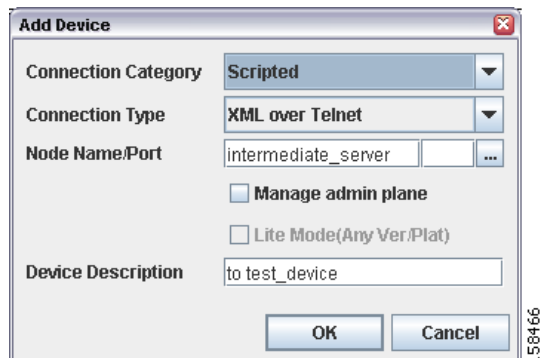
- Adding or Editing a Device, page 10
- Adding or Editing a Device Group, page 11
- Removing a Device or Device Group, page 12
- Logging In to Multiple Network Elements, page 12

Adding or Editing a Device

To add or edit a new device to the Device Tree, perform the following steps:

Step 1 From the CWI - Login window, right-click the Login information directory and choose **Add New Device**. The Add Device window appears (see Figure 2). Or you can right-click the device in the Login information directory and choose **Edit** to display the Edit Device window.

Figure 2 Add Device Window



Step 2 Choose one of the following connection categories from the drop-down menu:

- IP
- Console/Aux
- Scripted



Note If you choose the IP-based or Console/Aux connection categories, the scripted login fields are not displayed.

Step 3 Choose the applicable connection type from the drop-down list. For a list of the connections, see the “Launching CWI Without Using the Device Tree” section on page 9.

Step 4 Click the ellipsis button to display the Login Script Steps window (see Figure 7). For more information on how to specify the login script steps, see “Specifying the User Login Script” section on page 15.



Note This step is mandatory only if you selected the Scripted connection category.

Step 5 Enter the IP address or name of the node in the Node Name/Port field.

Step 6 (Optional) From the Device Tree, check the Manage admin plane check box to enable the admin plane for the applicable device group or device. If checked, the admin plane node appears above the corresponding device node in the Inventory Tree. For more information, see “Understanding the Admin Planes and Device Planes” section on page 18.

Step 7 (Optional) Check the Lite Mode check box to force a connection to the device in Lite Mode.

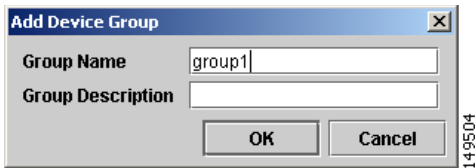
Step 8 Click OK to accept the device information for the Device Tree.

Adding or Editing a Device Group

To add or edit a new device group to the device tree, perform the following steps:

Step 1 From the CWI - Login window, right-click the Login Information directory and choose **Add New Device Group**. The Add Device Group window appears (see Figure 3). Or you can right-click the device group and choose **Edit** to display the Edit Device Group window.

Figure 3 Add Device Group Window



- Step 2** Enter the name of the group in the Group Name field.
- Step 3** (Optional) Enter a description of the group in the Group Description field.
- Step 4** Click OK to accept the device group information for the device tree.

Removing a Device or Device Group

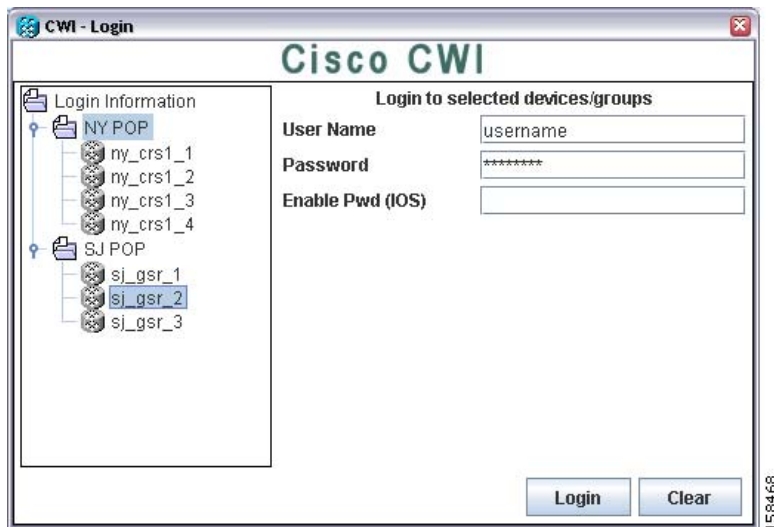
To remove a device or device group from the Login Information directory, right-click the device or device group and choose Delete. Click Yes to confirm.

Logging In to Multiple Network Elements

To log in to multiple network elements, perform the following steps:

- Step 1** From the CWI - Login window, choose the devices or device groups that you want to log in to. The CWI - Login for Selected Devices/Groups window is displayed (see Figure 4).

Figure 4 CWI - Login for Selected Devices and Groups Window



- Step 2** Enter the same AAA username across all routers.
- Step 3** Enter the same AAA password across all routers.
- Step 4** (Optional) Enter the enable password for Cisco IOS.



Note When you connect to a Cisco IOS device, you must enter the enable password.

- Step 5** Choose one of the following connection categories from the drop-down menu:
- IP

- Console/Aux
- Scripted



Note If you choose the IP-based or Console/Aux connection categories, the scripted login fields are not displayed.

Step 6 Choose one of the following connection types from the drop-down menu:

- XML over CORBA. Choose the node name. Note that XML over CORBA is the default.
- CLI over Telnet/SSH. Choose the server name. Specifying the port is optional. If you specify a port, CWI tries to connect using only that port. CWI does not automatically try to connect with other ports.
- Terminal Server. Choose the server name and port.
- Serial Port. Choose the Serial Port. You can also set the parameters for the serial port.

Step 7 (Optional) If you chose the Scripted connection category to log in to the intermediate or Scripted server:

- a. Enter the Scripted username.
- b. Enter the Scripted password.
- c. Click the ellipsis button to display the Login Script Steps window (see Figure 7). Follow the procedure in the “Specifying the User Login Script” section on page 15.



Note In addition, you must enter the applicable information in the Device Description field to uniquely identify the connection. For example, if you are connecting to a device such as router_1 through the intermediate machine, enter router_1 in the Description field.

Step 8 Enter the node name (DNS name or IP address) of the device that CWI is directly connecting to.

Step 9 (Optional) From the device tree, check the Manage admin plane check box to enable the admin plane for the applicable device group or device. If checked, the admin plane node appears above the corresponding device node in the Inventory Tree. For more information, see “Understanding the Admin Planes and Device Planes” section on page 18.

Step 10 (Optional) Check the Lite Mode check box to force a connection to the device in Lite Mode.

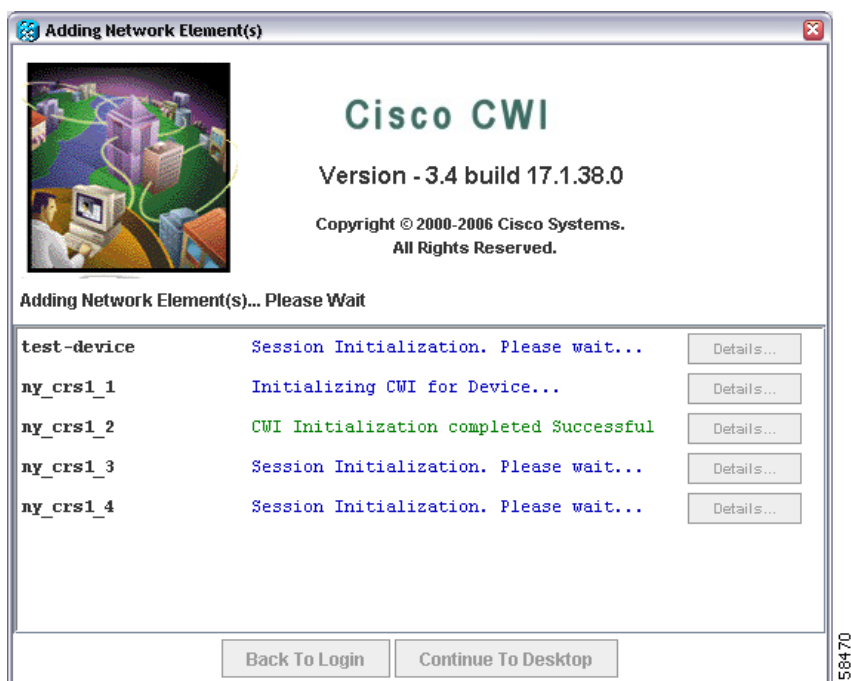
Step 11 Click **Login**. You can log in to all devices simultaneously or to one device. All devices appear in the Inventory Tree in the same order as they are displayed in the Login Information directory.



Note If you are logged in to one device, the Inventory Tree is collapsed when the CWI Desktop appears. To expand the Inventory Tree, click the right-arrow to display the objects in the Inventory Tree.

The progress window (see Figure 5) displays the login activity for each device. When the login has been completed for all the devices, the main desktop appears.

Figure 5 Progress Window



If one or more devices failed, see the “Encountering an Error While Logging in to Multiple Devices Simultaneously” section on page 14.

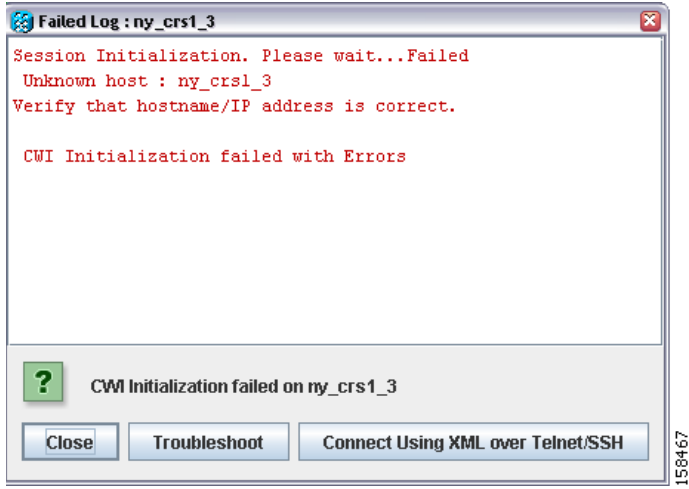
Encountering an Error While Logging in to Multiple Devices Simultaneously

If an error is encountered while logging in to multiple devices simultaneously from the Progress window (see Figure 5), you can:

- Click the **Continue to Desktop** button if at least one device passed.
- Click the **Back to Login** button to go back to the CWI - Login window.
- Click the **Details** button that is located next to the failed device to display the entire log and display fallback and troubleshooting options, if any.

Figure 6 displays the Failed Log window. Click the Close button to go back to the Progress window.

Figure 6 Failed Log Window



Specifying the User Login Script

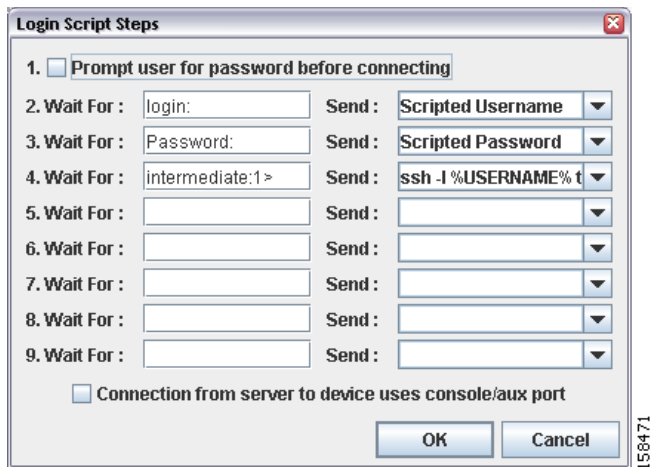
You can access devices not directly accessible from the CWI workstation through the Scripted Login capability. Table 5 lists the fields in the Login Script Steps window (see Figure 7).

Table 5 Fields for Login Script Steps Window

Field	Description
Wait For	Represents the output from the intermediate device that CWI should wait for before sending the data specified in the corresponding Send.
Send	Information that is sent to the device following the preceding Wait For. You can enter a string to be sent to connect to the router; for example, telnet term-server 2001. Or you can choose the Scripted Username or Scripted Password options from the drop-down list. If you choose either Scripted Username option or Scripted Password option, CWI uses the same scripted username and scripted password that you specified from the CWI - Login window (see Figure 1). In addition, you can enter the following special characters in the Send field: <ul style="list-style-type: none"> • \n is a new line. • \r is a carriage return. • \t is a tab. • %USERNAME%¹

1. CWI substitutes with what was entered in the username field when you logged in.

Figure 7 Login Script Steps Window



The exact input depends on the intermediate server you are using. If you are connecting to the intermediate machine using SSHv1 or SSHv2, you do not need to specify steps for sending the username and password to the intermediate machine, because this is done when establishing a connection.

Table 6 lists the steps that you can enter for a Telnet connection to the intermediate server with a Telnet connection from the server to the device.

Table 6 Telnet Example

Wait For	Send
login	Scripted Username
Password	Scripted Password
<router prompt>	telnet <router IP address>

Table 7 lists the steps that you can enter for a SSH connection.

Table 7 SSH Example

Wait For	Send
login	Scripted Username
Password	Scripted Password
<router prompt>	ssh -l %USERNAME% <router IP address>

Depending on where you launched the Login Script Steps window, click **OK** to go back to the CWI - Login window or the Add Device window.

Closing CWI

To close CWI, perform the following steps:

Step 1 Choose **File> Exit**. Or click the Close button on the CWI Desktop title bar.

A Craft Works Interface dialog box appears.

Step 2 Click **Yes** to exit the application.

The CWI Desktop window closes.

Uninstalling CWI

To uninstall a specific version of CWI, perform the following steps:

Step 1 Navigate to the following CWI uninstall directory:

<CWI installation directory>/uninstall

Step 2 Execute the uninstall script of the desired version, as shown in the following example:

CWI_<version>_uninstall.cmd

For Windows, you have the option to double-click the CWI_<version>_uninstall.cmd filename to uninstall CWI. Follow the online instructions.

6 Getting Started with CWI

These sections describe how to begin using CWI:

- Installing and Accessing Online Help, page 17
- Understanding the Admin Planes and Device Planes, page 18
- Configuring a Router with CWI, page 18
- CWI Desktop Features, page 18
- CWI Desktop Window, page 19
- Reference Information, page 21

When starting CWI, you can log in to one or more devices or device groups. For more information, see the Logging In to Multiple Network Elements, page 12.

Installing and Accessing Online Help

The first time you log in to the CWI Desktop, the online help should be installed. The online help provides a descriptive overview of the windows, menu items, toolbar buttons, status icons, and other interface features of CWI that can be launched from the CWI Desktop Help menu. For information on the CWI Desktop Help menu, see *Cisco Craft Works Interface User Guide*.

To install the CWI online help, perform the following steps:

Step 1 In the CWI Desktop, choose **Help > Help Desktop**.

A Help dialog box appears.

Step 2 Click **Yes** to install help.

An Online Help Installer dialog box appears and downloads the help files. When the download is complete, a CWI Help installation complete message appears in the dialog box.

Step 3 Click **Close**.

The Online Help Installer dialog box closes.

Step 4 To open the online help, choose **Help > Help Desktop**.

Understanding the Admin Planes and Device Planes

CWI can manage both the admin planes and device planes on a single desktop for Cisco IOS XR devices. A node is available for each plane in the Inventory Tree of the CWI desktop. Each plane provides you with different domains (see Table 8).

Table 8 Supported Domains

Node	Application	Inventory
Device	All ¹	Nonshared. For example, line cards, PLIMs ² , SPAs ³ , and so forth.
Admin	Inventory Viewer	Nonshared and shared. For example, power supplies, fans, fabric, and so forth.
	Rack Environment Monitor	
	Card Environment Monitor	
	Sensor Environment Monitor	
	Telnet	
	SSHv1	
	SSHv2	
	Configuration Editor	

1. You cannot access the Rack Environment Monitor application from the device node.
2. PLIM = physical layer interface module
3. SPA = shared port adapter

Configuring a Router with CWI

Table 9 lists the applications to configure a router using CWI.

Table 9 Applications Used to Configure a Router with CWI

Application	Function
Telnet/SSH/Terminal Plus	Configures and manages the router using CLI commands.
Configuration Editor (single and multi-device)	Views and edits the running configuration in CLI format. The configuration editor provides common text editing functionality, such as copying, pasting, redoing, and undoing, and provides syntax checking. In addition, you can use traditional CLI features and functions, such as command completion and CLI help. As well as configuring individual devices, the Configuration Editor can be used with multiple devices simultaneously to edit, syntax check and deploy pieces of configuration that are valid across all the devices. When working with devices that have two-stage configuration, there is full support for rollback-on-error so that the state of the devices remains consistent.

CWI Desktop Features

Here are some of the things you can do from the CWI Desktop:

- View, filter, sort, search, correlate, purge, and monitor real-time alarms.
- View, filter, export, and search real-time inventory and interface object attribute information.
- Monitor network elements to display various attributes of the state of one or more devices, such as environmental and performance data.
- Troubleshoot management connectivity problems.
- View and modify one or more configurations using the Configuration Editor, or the Multi-Device Configuration Editor.
- Use Telnet or Secure Shell (SSH) for command-line interaction with the router.
- Display a dynamic graphical representations of routers.

- Print, export, and search data.
- Sort and move columns.
- Filter records.
- Set individual UI preferences.

CWI Desktop Window

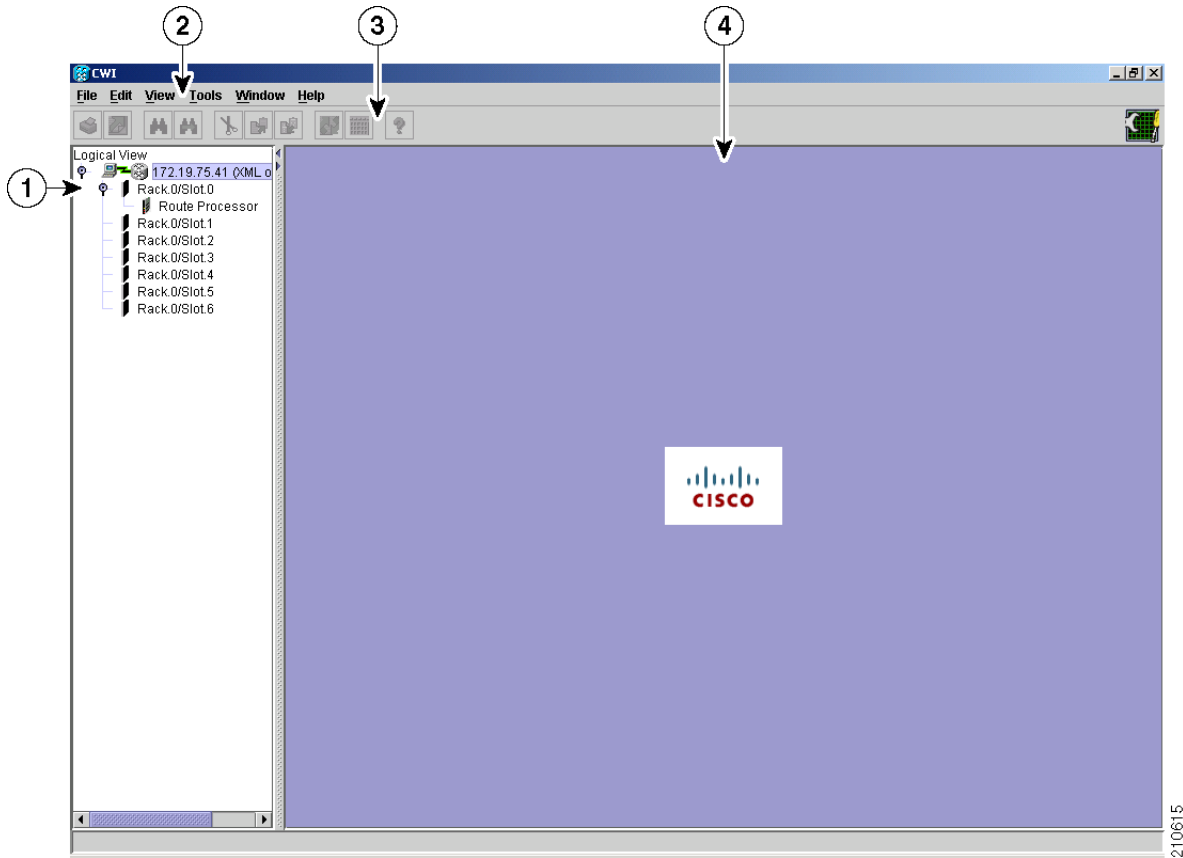
The CWI Desktop is the main access point for all CWI applications and tools, allowing you to configure, monitor, and manage routers (see Figure 8).

The CWI Desktop is designed with common elements that provide an easy-to-use and consistent user interface. The elements of the CWI Desktop window are described in Table 10.

Table 10 CWI Desktop Window Elements

Element	Description
Menu bar	Provides a list of options available on the basis of the selected object and active application. The options include administration tasks, editing tasks, viewing tasks, starting applications, and arranging windows.
Toolbar	Contains icons, referred to as tools, that provide direct access to context-sensitive functions. Clicking a tool selects a task.
Inventory Tree	Displays all components of each router that CWI can access and is the primary interface to these components. The Inventory Tree dynamically shows current alarms and events, connectivity status, and physical and logical tree views. The Inventory Tree provides context-sensitive launching of applications by selecting an object, a group of objects, or an entire router in the Inventory Tree and then choosing an available application
CWI application pane	Contains the active CWI applications that are used to manage the router. Multiple applications can be opened concurrently in the CWI application pane.

Figure 8 CWI Desktop



1	Inventory tree	3	CWI Desktop toolbar
2	CWI Desktop menu bar	4	CWI application pane

The CWI Desktop lets you to communicate with the router using the applications that are described in Table 11.

Table 11 Applications for the CWI Desktop

Application	Description
Alarm Dashboard	Provides a summary of the alarm status information for all routers on the CWI Desktop. A color code is used to indicate active alarm counts by severity. A resettable running count of new alarm arrivals is provided.
Alarm Viewer	Provides an interface between CWI and the alarm management functions of the router controller, allowing you to dynamically view alarm records with powerful filtering capabilities. Alarm Viewer also provides a launch point to view correlated alarms.
Inventory Viewer	Displays the attribute values of selected objects.
Interface Viewer	Provides a view of interface attributes for selected cards.
Telnet/SSH/Terminal Plus	Provides the capability to issue CLI commands and view session information within CWI. Telnet/SSH/Terminal Plus includes additional CWI features for creating command lists and running commands from the command list, saving and loading command lists from a file, and running in batch mode. Additionally, console text can be displayed in a separate window. The SSH application connects to the router with a secure connection.
Troubleshooter	Provides fault isolation and repair of connectivity problems between CWI and router.

Table 11 Applications for the CWI Desktop (continued)

Application	Description
Configuration Editor	Displays the target configuration in CLI format. The Configuration Editor provides general text editor functions, such as copy, paste, redo, and undo, and provides syntax checking and CLI functions, such as command completion and CLI help.
Fabric Status Viewer	Displays the port ID and port status columns in text format in a Fabric Status Viewer table.
Rack Environment Monitor	Displays the attributes at the rack level.
Card Environment Monitor	Displays the attributes at the card level.
Sensor Environment Monitor	Displays the attributes at the sensor level.
Health Monitor	Displays the attributes for each card.
Performance System Monitor	Displays the system-wide performance statistics.
Performance Process Monitor	Displays the attributes for each process.
Performance Interface Monitor	Displays the attributes at the interface level.

7 Reference Information

These sections include supplementary reference information:

- Network Considerations, page 21
- Login Modes and Requirements, page 22
- CWI Supported Connection Methods and Applications, page 23
- Testing the CWI Client, page 24

Network Considerations

Before you start setting up the minimum router and CWI client configurations, consider several key aspects of your network (see Table 12). Note that the specific setup is dependent on the session used from the “About CWI” section.

Table 12 Network Information

Type	Function
Network Security	The default configuration is not secure.
SSL Encryption Configuration	The secure configuration uses Secure Socket Layer (SSL) encryption. If you use the SSL protocol on your network, use the SSL configuration.
IP Security	IP security (IPSec) does not require any special configuration for CWI on the router or client.
Firewall	If you have a firewall in your network, you can use the basic or SSL encryption configuration. See Table 13 for a list of firewall ports.

Table 12 Network Information (continued)

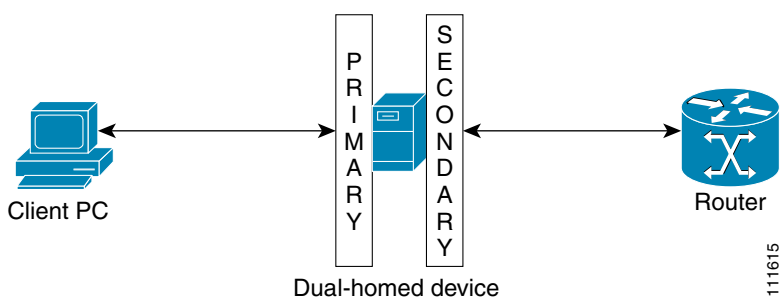
Type	Function
VPN	When setting the minimum router configuration, you must use the client Virtual Private Network (VPN) IP address and Domain Name Server (DNS) name instead of the client IP address and DNS name when configuring the IP hostname for the CWI client. This mapping is required for the client to receive notifications from the router. If you have a VPN, you can use the basic or SSL encryption configuration.
Dual-Homed	Dual-homed devices are used to bridge two networks. You can run an instance of CWI on the dual-homed device so that you can access the secondary network. You need terminal services or X-client software to run the CWI graphical application from the client PC. A dual-homed device contains a client-side interface (IP address) and router-side interface (IP address). If you have a dual-homed device in your network, you can use the standard or SSL encryption configuration. See Figure 9 for an example.

You must open the ports listed in Table 13 when configuring the firewall. See the firewall documentation for information on opening the ports.

Table 13 Firewall Ports

Component	Port	Direction
HTTP and HTTPS	80/443	Inbound
CORBA and CORBA SSL	10001/10002	Inbound
CORBA Notifications	49901 to 49950	Outbound
Telnet and SSH	23/22	Inbound and Outbound

For an example of a dual-homed device configuration, the client side is the primary interface, and the router side is the secondary interface (see Figure 9). When setting the minimum router configuration, you must use the dual-homed device router side (secondary) IP address and DNS name when configuring the IP hostname for the CWI client. This mapping is required for the client to view the notifications from the router received by the dual-homed instance of CWI.

Figure 9 Dual-Homed Device Configuration

Login Modes and Requirements

A primary goal of CWI is to communicate with a device in any state by dynamically supporting three operational modes (see Table 14). CWI can manage multiple devices with different modes simultaneously.

The three different login modes are based on the following requirements:

- Connection methods
- MGBL-PIE files (installed or not installed). MGBL refers to Manageability. PIE refers to Package Installation Envelope.

- HTTP server status (running or not running)
- XML agent status (running or not running)

Table 14 lists the applications and features to the corresponding login mode type.

Table 14 Login Modes Used for Applications and Features

Mode	Description
Full Mode (MGBL-PIE and XML Agent)	<p>The entire set of CWI applications is provided. The following list of features is included:</p> <ul style="list-style-type: none"> • Reduced Mode of applications and features • Notification-driven features • Troubleshooter application • Rack Environment Monitor • Card Environment Monitor • Sensor Environment Monitor • Health Monitor • Performance System Monitor • Performance Process Monitor • Performance Interface Monitor
Reduced Mode	<p>Reduced Mode functions as a default that operates independently of the presence of the manageability PIE or state of XML agent. The following CWI applications are included:</p> <ul style="list-style-type: none"> • Lite Mode of applications and features • Inventory Tree • Inventory Viewer application • Interface Viewer application • Alarm Viewer application • Health Monitor
CWI Lite Mode	<p>CWI communicates with the device using CLI and not XML¹. CWI Lite Mode operates under any circumstances and always works. This mode has no dependence on chassis type, software version, presence of the manageability PIE, or state of the XML agent. The following features are included:</p> <ul style="list-style-type: none"> • CWI Desktop • Telnet, Terminal Plus, and SSH • Configuration Editor application

1. XML = Extensible Markup Language

CWI Supported Connection Methods and Applications

Table 15 provides detailed information on the supported CWI connection methods and available applications.



Note If you are connecting to the router through either the Terminal Server or Serial Port connection methods from CWI, you must ensure that the logging console is not configured on the router.

Table 15 Connection Methods and Applications

CWI Application	Console Port (Serial Cable or Through a Terminal Server)	Telnet (No XML)	Telnet/SSH, or CORBA Connection (XML)
Launch and Login	Yes. Enter the serial port or terminal server and port name.	Yes. Enter the DNS name or IP address.	Yes. Enter the DNS name or IP address.
Main Desktop	Yes, but no notifications or associated alarms are displayed.	Yes, but no notifications or associated alarms are displayed.	Yes
Alarm Viewer	Yes, but no alerts are displayed.	Yes, but no alerts are displayed.	Yes
Alarm Dashboard	—	—	Yes
Inventory Viewer	Yes	Yes	Yes
Interface Viewer	Yes	Yes	Yes
Telnet Plus/SSH Plus	—	Yes	Yes
Terminal Plus	Yes but excludes access by other applications. ¹	—	—
Troubleshooter	—	—	Yes
Configuration Editor	Yes	Yes	Yes

1. When connecting through the serial port or terminal server, the Terminal Plus application requires exclusive access to the connection; no other applications can be launched or refreshed while it is open.

Testing the CWI Client

Verify that you can connect to the router by logging in to the router. See the “Installing CWI” section on page 7 for procedures. If you are unable to log in to the router, see the “Troubleshooting Basic IP Connectivity” section on page 24.

Troubleshooting Basic IP Connectivity

This section provides information on troubleshooting basic IP connectivity problems when attempting to log in to a router using CWI.

If you are unable to connect to the router HTTP server using the browser, follow these steps in sequence, exiting the test steps when a failure is encountered.

Step 1 Ping the IP address of the router management Ethernet interface from the client PC or workstation.

If this step fails, the problem might be an incorrect IP address, incorrect management Ethernet interface configuration, or a network connectivity problem.

Step 2 (Optional) Ping the DNS name of the router.

If this step fails, the problem is an incorrect hostname-to-IP address mapping. See the “Configuring the Router and CWI Client” section on page 4.

Step 3 Check that the HTTP server is running on the router using the following command:

```
RP/0/RP0/CPU0:router# show process emweb
```

If this step fails, start the HTTP server. See the “Setting Up the Common Configuration for IP Connection Methods” section on page 5.

If you are unable to log in to the router from the CWI login screen, run the Troubleshooter application at the prompt. See *Cisco Craft Works Interface User Guide* for information about using the Troubleshooter application.

8 Obtaining Documentation

Cisco documentation and additional literature are available on Cisco.com. This section explains the product documentation resources that Cisco offers.

Cisco.com

You can access the most current Cisco documentation at this URL:

<http://www.cisco.com/techsupport>

You can access the Cisco website at this URL:

<http://www.cisco.com>

You can access international Cisco websites at this URL:

http://www.cisco.com/public/countries_languages.shtml

Product Documentation DVD

The Product Documentation DVD is a library of technical product documentation on a portable medium. The DVD enables you to access installation, configuration, and command guides for Cisco hardware and software products. With the DVD, you have access to the HTML documentation and some of the PDF files found on the Cisco website at this URL:

<http://www.cisco.com/univercd/home/home.htm>

The Product Documentation DVD is created and released regularly. DVDs are available singly or by subscription. Registered Cisco.com users can order a Product Documentation DVD (product number DOC-DOCDVD= or DOC-DOCDVD=SUB) from Cisco Marketplace at the Product Documentation Store at this URL:

<http://www.cisco.com/go/marketplace/docstore>

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You must be a registered Cisco.com user to access Cisco Marketplace. Registered users may order Cisco documentation at the Product Documentation Store at this URL:

<http://www.cisco.com/go/marketplace/docstore>

If you do not have a user ID or password, you can register at this URL:

<http://tools.cisco.com/RPF/register/register.do>

9 Documentation Feedback

You can provide feedback about Cisco technical documentation on the Cisco Support site area by entering your comments in the feedback form available in every online document.

10 Cisco Product Security Overview

Cisco provides a free online Security Vulnerability Policy portal at this URL:

http://www.cisco.com/en/US/products/products_security_vulnerability_policy.html

From this site, you will find information about how to do the following:

- Report security vulnerabilities in Cisco products
- Obtain assistance with security incidents that involve Cisco products
- Register to receive security information from Cisco

A current list of security advisories, security notices, and security responses for Cisco products is available at this URL:

<http://www.cisco.com/go/psirt>

To see security advisories, security notices, and security responses as they are updated in real time, you can subscribe to the Product Security Incident Response Team Really Simple Syndication (PSIRT RSS) feed. Information about how to subscribe to the PSIRT RSS feed is found at this URL:

http://www.cisco.com/en/US/products/products_psirt_rss_feed.html

Reporting Security Problems in Cisco Products

Cisco is committed to delivering secure products. We test our products internally before we release them, and we strive to correct all vulnerabilities quickly. If you think that you have identified a vulnerability in a Cisco product, contact PSIRT:

- For emergencies only—security-alert@cisco.com

An emergency is either a condition in which a system is under active attack or a condition for which a severe and urgent security vulnerability should be reported. All other conditions are considered nonemergencies.

- For nonemergencies—psirt@cisco.com

In an emergency, you can also reach PSIRT by telephone:

- 1 877 228-7302
- 1 408 525-6532



Tip

We encourage you to use Pretty Good Privacy (PGP) or a compatible product (for example, GnuPG) to encrypt any sensitive information that you send to Cisco. PSIRT can work with information that has been encrypted with PGP versions 2.x through 9.x.

Never use a revoked encryption key or an expired encryption key. The correct public key to use in your correspondence with PSIRT is the one linked in the Contact Summary section of the Security Vulnerability Policy page at this URL:

http://www.cisco.com/en/US/products/products_security_vulnerability_policy.html

The link on this page has the current PGP key ID in use.

If you do not have or use PGP, contact PSIRT to find other means of encrypting the data before sending any sensitive material.

11 Product Alerts and Field Notices

Modifications to or updates about Cisco products are announced in Cisco Product Alerts and Cisco Field Notices. You can receive these announcements by using the Product Alert Tool on Cisco.com. This tool enables you to create a profile and choose those products for which you want to receive information.

To access the Product Alert Tool, you must be a registered Cisco.com user. Registered users can access the tool at this URL:

<http://tools.cisco.com/Support/PAT/do/ViewMyProfiles.do?local=en>

To register as a Cisco.com user, go to this URL:

<http://tools.cisco.com/RPF/register/register.do>

12 Obtaining Technical Assistance

Cisco Technical Support provides 24-hour-a-day award-winning technical assistance. The Cisco Support website on Cisco.com features extensive online support resources. In addition, if you have a valid Cisco service contract, Cisco Technical Assistance Center (TAC) engineers provide telephone support. If you do not have a valid Cisco service contract, contact your reseller.

Cisco Support Website

The Cisco Support website provides online documents and tools for troubleshooting and resolving technical issues with Cisco products and technologies. The website is available 24 hours a day at this URL:

<http://www.cisco.com/en/US/support/index.html>

Access to all tools on the Cisco Support website requires a Cisco.com user ID and password. If you have a valid service contract but do not have a user ID or password, you can register at this URL:

<http://tools.cisco.com/RPF/register/register.do>



Note Before you submit a request for service online or by phone, use the **Cisco Product Identification Tool** to locate your product serial number. You can access this tool from the Cisco Support website by clicking the **Get Tools & Resources** link, clicking the **All Tools (A-Z)** tab, and then choosing **Cisco Product Identification Tool** from the alphabetical list. This tool offers three search options: by product ID or model name; by tree view; or, for certain products, by copying and pasting **show** command output. Search results show an illustration of your product with the serial number label location highlighted. Locate the serial number label on your product and record the information before placing a service call.



Tip **Displaying and Searching on Cisco.com**

If you suspect that the browser is not refreshing a web page, force the browser to update the web page by holding down the Ctrl key while pressing F5.

To find technical information, narrow your search to look in technical documentation, not the entire Cisco.com website. After using the Search box on the Cisco.com home page, click the **Advanced Search** link next to the Search box on the resulting page and then click the **Technical Support & Documentation** radio button.

To provide feedback about the Cisco.com website or a particular technical document, click **Contacts & Feedback** at the top of any Cisco.com web page.

Submitting a Service Request

Using the online TAC Service Request Tool is the fastest way to open S3 and S4 service requests. (S3 and S4 service requests are those in which your network is minimally impaired or for which you require product information.) After you describe your situation, the TAC Service Request Tool provides recommended solutions. If your issue is not resolved using the recommended resources, your service request is assigned to a Cisco engineer. The TAC Service Request Tool is located at this URL:

<http://www.cisco.com/techsupport/servicerequest>

For S1 or S2 service requests, or if you do not have Internet access, contact the Cisco TAC by telephone. (S1 or S2 service requests are those in which your production network is down or severely degraded.) Cisco engineers are assigned immediately to S1 and S2 service requests to help keep your business operations running smoothly.

To open a service request by telephone, use one of the following numbers:

Asia-Pacific: +61 2 8446 7411

Australia: 1 800 805 227

EMEA: +32 2 704 55 55

USA: 1 800 553 2447

For a complete list of Cisco TAC contacts, go to this URL:

<http://www.cisco.com/techsupport/contacts>

Definitions of Service Request Severity

To ensure that all service requests are reported in a standard format, Cisco has established severity definitions.

Severity 1 (S1)—An existing network is “down” or there is a critical impact to your business operations. You and Cisco will commit all necessary resources around the clock to resolve the situation.

Severity 2 (S2)—Operation of an existing network is severely degraded, or significant aspects of your business operations are negatively affected by inadequate performance of Cisco products. You and Cisco will commit full-time resources during normal business hours to resolve the situation.

Severity 3 (S3)—Operational performance of the network is impaired while most business operations remain functional. You and Cisco will commit resources during normal business hours to restore service to satisfactory levels.

Severity 4 (S4)—You require information or assistance with Cisco product capabilities, installation, or configuration. There is little or no effect on your business operations.

13 Obtaining Additional Publications and Information

Information about Cisco products, technologies, and network solutions is available from various online and printed sources.

- The Cisco Online Subscription Center is the website where you can sign up for a variety of Cisco e-mail newsletters and other communications. Create a profile and then select the subscriptions that you would like to receive. To visit the Cisco Online Subscription Center, go to this URL:
<http://www.cisco.com/offer/subscribe>
- The *Cisco Product Quick Reference Guide* is a handy, compact reference tool that includes brief product overviews, key features, sample part numbers, and abbreviated technical specifications for many Cisco products that are sold through channel partners. It is updated twice a year and includes the latest Cisco channel product offerings. To order and find out more about the *Cisco Product Quick Reference Guide*, go to this URL:
<http://www.cisco.com/go/guide>
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<http://www.cisco.com/go/marketplace/>
- Cisco Press publishes a wide range of general networking, training, and certification titles. Both new and experienced users will benefit from these publications. For current Cisco Press titles and other information, go to Cisco Press at this URL:
<http://www.ciscopress.com>
- *Internet Protocol Journal* is a quarterly journal published by Cisco for engineering professionals involved in designing, developing, and operating public and private internets and intranets. You can access the *Internet Protocol Journal* at this URL:
<http://www.cisco.com/ipj>
- Networking products offered by Cisco, as well as customer support services, can be obtained at this URL:
<http://www.cisco.com/en/US/products/index.html>
- Networking Professionals Connection is an interactive website where networking professionals share questions, suggestions, and information about networking products and technologies with Cisco experts and other networking professionals. Join a discussion at this URL:
<http://www.cisco.com/discuss/networking>
- “What’s New in Cisco Documentation” is an online publication that provides information about the latest documentation releases for Cisco products. Updated monthly, this online publication is organized by product category to direct you quickly to the documentation for your products. You can view the latest release of “What’s New in Cisco Documentation” at this URL:
<http://www.cisco.com/univercd/cc/td/doc/abtunicd/136957.htm>
- World-class networking training is available from Cisco. You can view current offerings at this URL:
<http://www.cisco.com/en/US/learning/index.html>



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