IP Phone 7940/7960 Fails to Boot Protocol Application Invalid

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Contents

Introduction

This document describes one reason that Cisco IP Phone models 7940 and 7960 fail to boot with the error message `Protocol Application Invalid`. This message displays in the liquid crystal display (LCD). This document provides a workaround in the Cisco CallManager environment.

Note: The problem that this document describes occurs in the IP Phone 7940/7960 with firmware versions 7.2(2) and earlier. For details, refer to these Cisco bug IDs:

- CSCed84163 (registered customers only)
- CSCsa85042 (registered customers only)

Prerequisites

Requirements

Cisco recommends that you have knowledge of these topics:

- Cisco CallManager
- Cisco Catalyst multilayer switching

Components Used

The information in this document is based on these software and hardware versions:

- Cisco CallManager version 4.x
- Cisco IP Phones 7940/7960 firmware versions 7.2(2) and earlier

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

Refer to Cisco Technical Tips Conventions for more information on document conventions.

Background Information

The voice VLAN feature enables access ports to carry IP voice traffic from an IP phone. The switch can connect to a 7940/7960 IP phone and carry IP voice traffic. Because the sound quality of an IP phone call can deteriorate if the data are unevenly sent, the switch supports QoS on the basis of IEEE 802.1P class of service (CoS). QoS uses classification and scheduling in order to send network traffic from the switch in a predictable manner. For more information on QoS, refer to Enterprise QoS Solution Reference Network Design Guide. The 7940/7960 IP phone is a configurable device, and you can configure it to forward traffic with an 802.1P priority. You can configure the switch to trust or override the traffic priority that an IP phone assigns. The 7940/7960 IP phone contains an integrated three−port 10/100 switch, as Figure 1 shows. The ports provide dedicated connections to devices, as this list details:

- Port 1 connects to the switch or another VoIP device.
- Port 2 is an internal 10/100 interface that carries the IP phone traffic.
- Port 3 (access port) connects to a PC or another device.

Figure 1   7940/7960 IP Phone That Is Connected to a Switch
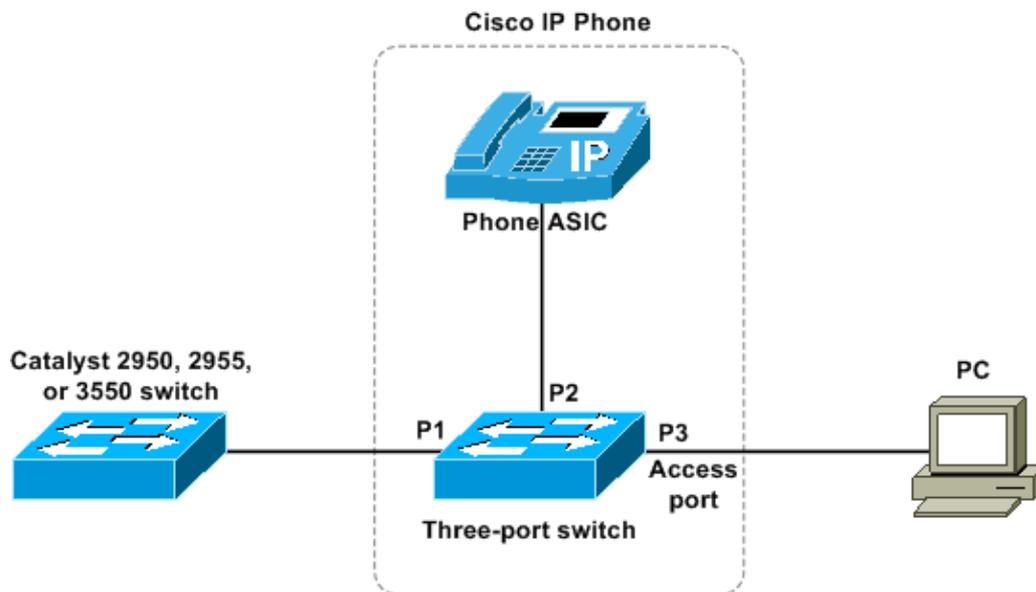
Problem

The 7960 IP phone fails to perform the boot process correctly. As the phone boots, this error message displays in the phone LCD:

```
Protocol Application Invalid
```

Solution

When you examine the sniffer trace between the DHCP server and the phone, you can identify that the phone accepts a DHCP offer from the data VLAN (the native VLAN) instead of the voice VLAN. The phone tries to communicate with the voice VLAN with the IP address that belongs to the data VLAN.

This problem can happen under these conditions:

- With an IP Phone 7940/7960 with firmware version 7.2(2) and earlier
- When a DHCP server sends a response packet in an untagged format
- With a DHCP server switch port that is configured with voice VLAN or with a trunk that contains that voice VLAN
- When option 150 is not set for the native VLAN on the DHCP server
- When Cisco Discovery Protocol (CDP) on the switch and the phone do not converge in a timely fashion

The workaround for this problem is to complete these steps:

1. Configure option 150 in the native VLAN scope on the DHCP server.

   Complete these steps:

   a. Choose **Start > Programs > Administrative Tools > DHCP**.
   b. Right–click the DHCP server and choose **Set Predefined Options** in the pop–up window.
   c. Click **Add**.

   The Option Type window displays, as Figure 2 shows:

   Figure 2   Option Type

   d. Enter **TFTP Server IP Address** in the Name field.

      See arrow A in Figure 2.
   e. Choose **IP Address** from the Data type menu.

      See arrow B in Figure 2.
   f. Enter **150** in the Code field.
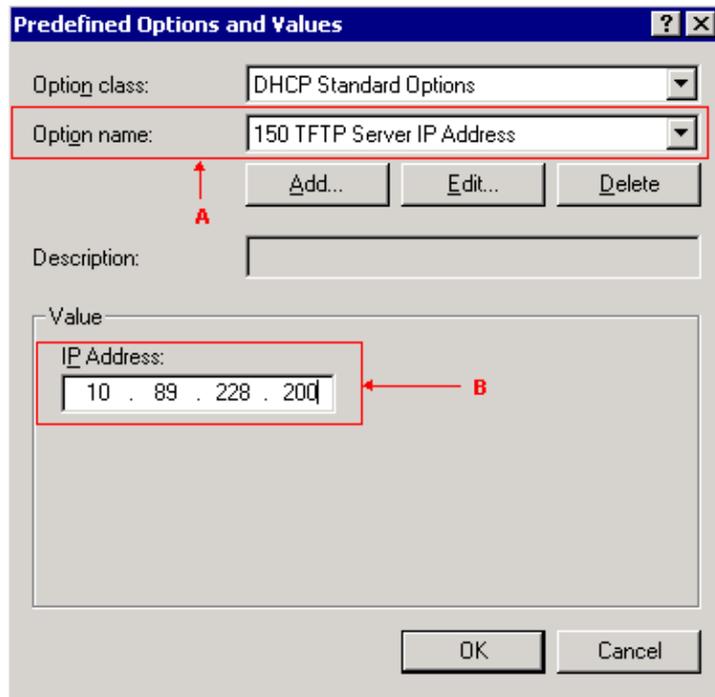
      See arrow C in Figure 2.
   g. Click **OK**.

      See arrow D in Figure 2.

   The Predefined Options and Values window displays, as Figure 3 shows:

   Figure 3   Predefined Options and Values

h. Choose **150 TFTP Server IP Address** from the Option name menu.

   See arrow A in Figure 3.
   i. Enter the IP address of the TFTP server in the IP Address field, which is in the Value area.

   See arrow B in Figure 3.
   j. Click **OK**.
2. Remove the voice VLAN command from the phone switch port and leave the switch port as an access
   port on the native VLAN.

   For example, if the phone is connected to a Catalyst 3550 multilayer switch, remove this line:

   ```
   switchport voice vlan 205
   ```

   Arrow A identifies this line in Figure 4.

   Figure 4   Catalyst 3550 Multilayer Switch VLAN Port Configuration

   If the phone is connected to a Cisco Catalyst Express 500 series switch, then change the smartport
   role of the port from **IP Phone** + **Desktop** to **Desktop**. Refer to Apply Smartport Roles to Ports for
   configuring a Catalyst Express 500 switch port with a particular smartport role.
3. Reboot the 7940/7960 IP phone.

   The phone upgrades its load with the use of an IP address on the native VLAN.
4. Add the voice vlan command back to the switch port.

   See arrow A in Figure 4.
5. Reboot the 7940/7960 IP phone.

The phone now comes up with an IP address on the voice VLAN.

Related Information

- **Voice Technology Support**
- **Voice and IP Communications Product Support**
- **Troubleshooting Cisco IP Telephony**
- **Technical Support & Documentation – Cisco Systems**