

15. Troubleshooting CME

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C I S C O T R O U B L E S H O O T I N G

Dogs Gobble Cookies; Cats Irritate Owners

1. **Define the Problem**—Symptoms & probable causes. Compare current condition to baseline. Create a clear problem statement.
2. **Gather Facts**—Command outputs and user statements. Eliminate possible causes. When did the problem occur? What changed before it started? Problem intermittent or constant? Pattern to intermittence? Any error messages? Does anyone else have the problem?
3. **Consider Possibilities**—Short list of likely causes.
4. **Create an Action Plan**—Starting with the most likely cause, define a plan to correct the problem. Only change one thing at a time.
5. **Implement the Action Plan**—Don't improvise; follow the plan. Maybe revisit step 3 if new ideas or information arises. At each step, make sure you're not making things worse. Minimize side effects, especially security related ones like removing ACLs to see if they're the problem.
6. **Observe Results**—if problem persists, undo step 5 and return to step 4. If solved, documents the solution, root cause, and changes made to the system.

C M E R E G I S T R A T I O N I S S U E S

Narrow down between

- Network issues
- IP phone config issues
- CME config issues

IP Phone Boot Process (recap)—Watch the phone & see where it gets stuck & starts over. Note that a newly installed phone may reboot several times because of firmware and config updates.

- PoE—802.3af switch sends small DC voltage, detects an unpowered 802.3af device and powers the line.
- Switch delivers voice VLAN info using CDP
- Phone sends DHCP request on the voice VLAN. DHCP server responds, including option 150 (TFTP server)
- Phone downloads its config file and firmware via TFTP
- Phone contacts the call processing server (CME/CUCM) at the address in its config file

PoE—If the phone shows nothing on screen

- Check physical connections—cable & patch panel need all 8 pins for PoE
- Check the PoE Switch

`show power inline`

Make sure the switch hasn't exhausted its power capability

`show run interface fa0/0`

Make sure the port doesn't have "power inline never" (disables PoE)

- Check the Phone—expansion modules can exceed PoE capabilities. Try a different phone on the port; try the phone on a different port. Ensure that the kind of PoE (802.3af / 802.3at) is compatible between switch and phone.
- (Reset the phone to factory default)

Voice VLAN Assignment—a phone on the wrong VLAN may not contact necessary services (DHCP, TFTP, CME, etc.), causing the phone to continually reboot.

- Check the Switch

`show run interface fa0/0`

Check the voice VLAN assignment

`show interface fa0/0 switchport`

Check the interface operating mode

`show vlan brief`

Ensure that the VLAN exists

`show interface trunk`

Ensure that any necessary trunks pass the VLAN

Also check that CDP is enabled on the phone's port; that's how it learns its VLAN

- Check the Phone—On the network settings page (“Settings” button on the phone), check the voice VLAN & IP address. Connect to the phone's IP address with a web browser to inspect the phone's log files.

DHCP Server—depends on correct VLAN assignment to get correct IP address and pool settings. Note that a continually rebooting phone will spend much of the cycle without an IP even if DHCP works.

- DHCP Helper-Address—on the router or L3 switch under the router (sub-)interface connected to the VLAN. (If DHCP is centralized elsewhere)
- DHCP Server—check that there's a pool for the voice VLAN, that it has addresses remaining, that option 150 (TFTP server) is correct. Put a laptop in the voice VLAN and ensure that it gets an address.
- IP Phone—on the network settings page, check for an IP from the right subnet & all the DHCP options (mask, gateway, TFTP). Ping the phone from another subnet to check routing (assuming no ACL prevents)
- Static IP—try putting a static IP on the phone. If it successfully registers with CME, the problem is DHCP/VLAN. If not, the problem is routing, TFTP, or CME.

TFTP Server—supplies phone firmware & config file with base settings for the phone, plus the address of the CME server for registration. An external TFTP can be used, but most just use the router.

- Check Routing Configuration—if the TFTP server (external) is on a different VLAN from voice, put a PC in the voice VLAN and try transferring files
- Check the TFTP Server—Make sure the server is working and transferring files. Check that the firmware for your model of phone exists on the server. Check that the configuration file for your specific phone (has MAC as title) is on the server

```
show run | begin telephony-service
```

Check for "create cnf-files" under "telephony-service"

- Check the IP Phone—(network settings) ensure configured (statically or DHCP) for correct TFTP address

CME Server—Most common error is “Registration Rejected,” which means the phone went through the entire boot process before failing to register with the CME router. This almost always means that the phone isn't properly configured in CME—focus on the ephone settings.

- Check that an ephone entry exists in the CME router config for the phone
- Check the phone MAC address on that entry—don't trust the phone sticker; check the phone settings or dynamic MAC entries on the switchport
- If the MAC is correct, try enabling auto-registration.

```
telephony-service  
auto-reg-ephone
```

This should allow a phone to register, even without any extension (DN) assignment. When it does, check its MAC

```
show ephone
```

Shows the MAC

```
debug ephone detail
```

Shows registration step by step. Beware of many ephones registering at once.

D I A L - P L A N A N D Q O S

Outside test scope. After the phone registers and attempts to make calls—fast busy (misconfigured dial-plan) or static, distortion, dropped calls (QoS).

Dial Plan Issues—If calls fail as they are dialed, verify that the dial peers exist, have the correct destination pattern, and point to a port or IP address that is reachable from the CME router

```
show dial-peer voice summary
```

Similar to "show ip interface brief." Displays a tabular view of all dial peers on your voice gateway.

If the dial-peer is OK, but there's still a reorder tone (fast busy)

```
debug voip dialpeer
```

Shows digits as they are dialed. Good for talking a user through dialing a number (support)

QoS Issues—CCNP (CVOICE) has lots more. For good calls, Cisco recommends:

DELAY (END-END ONE-WAY)	JITTER	PACKET LOSS
≤ 150 ms	≤ 30 ms	≤ 1 %

Average Bandwidth Usages (packetization interval tells how much audio per packet and saves header overhead):

CODEC	PACKETIZATION INTERVAL	BANDWIDTH PER CALL
G.711	20 ms (default)	80 kbps
G.711	30 ms	74 kbps
G.729a	20 ms (default)	24 kbps
G.729a	30 ms	19 kbps

Monitor Actual Call Statistics—Hit the phone's question-mark button (help menu) or access its web server (ip address of the phone in a browser) during a call. Stats include codec, packet size, counts of received and transmitted packets, average & maximum jitter, lost packets.

The “service-policy” interface configuration command applies a policy map to an interface and engages QoS in a way that parallels the way that “ip access-group” applies an ACL.

```
show policy-map interface Serial0/1 output
```

Allows you to verify QoS statistics. Significant % of dropped packets indicate a problem, for example strict priority dropping voice traffic above its allocation.

All of the above phone troubleshooting also applies to phones in a CUCM environment.