

**HUAWEI SoftCo
V100R003**

Troubleshooting Cases

Issue 01
Date 2011-07-30

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1 Troubleshooting of Typical SoftCo Faults

1.1 Voice Call Faults

1.1.1 Busy Tone Played After Phone Pick-up

Symptom

After basic SoftCo data is configured, a user picks up the phone and hears the busy tone. The following alarm information is displayed when the user uses a serial cable to log in to the SoftCo.

```
ASSERT(0) [cm_rmmsgproc.c]: 1210
ASSERT(0) [urm_adp.c]: 2233
[rm.c 4365] Alloc CDSP failed!
[rm.c 4390] Alloc GDSP failed!
```

Cause

The possible causes are as follows:

- No number is assigned for the user.
- The MRU fails to be added to the SoftCo.

Procedure

Step 1 Log in to the SoftCo and run the **show subscriber** command to verify that a number is assigned for the user in the corresponding POTS port.

Step 2 Run the **show board** command to check whether the MRU exists.

- If no MRU exists, run the **config add board slot <2-9> type mru** command to add one.
- If the MRU exists, check whether the MRU is in the **OK** state.
If the MRU is not in the **OK** state, check whether the MRU is inserted in the slot properly.
 - If no, insert the MRU properly.
 - If yes, change another MRU.

Step 3 Contact Huawei technical support if the fault persists.

----End

1.1.2 Failure for a User to Call Another User When the Users Are in the Normal State

Symptom

When two users are in the normal states, a user fails to call another user.

Cause

The possible causes are as follows:

- The called user has enabled some services that cause the call failure.
- CDRs cause the call failure.

If the user can be registered successfully and can dial *125 to query the number, but fails to initiate new calls, the possible cause is that the CDR generation function is enabled, but the BillServer does not start, which leads to full CDR pool and call restriction.

Procedure

Step 1 Run the **show subscriber dn XXX type all** command to check the following information about the XXX user (called user):

- Whether the user has enabled the call forwarding service.
- Whether the user has enabled the simultaneous ringing service or sequential ringing service. When the user does not answer the call, the phones registered in the simultaneous ringing service and sequential ringing service ring.
- Whether the user belongs to a PBX group. If the user belongs to a PBX group, run the **show pbxgroup** command to verify that the group enables a line selection mode.
- Whether the user belongs to a Centrex group and uses the preceding services in the Centrex group.

Step 2 Run the **show createbill** command to check whether CDR generation function is enabled, and check whether the BillServer starts. If this function is enabled or the BillServer does not start, disable the CDR generation function or start the BillServer to rectify the fault.

Step 3 Contact Huawei technical support if the fault persists.

----End

1.1.3 Error forbidden 403 Displayed When an IP Phone Connected to the SoftCo Is Used to Make a Call

Symptom

After an IP phone user initiates a call, an error message "forbidden 403" is displayed on the LED.

Cause

The possible causes are as follows:

- The IP phone has not been registered with the SoftCo due to network problems.
- The IP phone is configured incorrectly, resulting in the failure to register the IP phone with the SoftCo.
- The number configured for the IP phone duplicates with another IP phone. Therefore, the two IP phones scramble for the same number.

Procedure

Step 1 Check whether the IP phone has been registered with the SoftCo. If the phone displays the information indicating network disconnection, check the network cable.

Step 2 If the phone displays the information indicating that the network is in good condition but is unregistered, check the configuration of the IP phone, SIP server, and port number.

If the registration requires password authentication, verify that the password is correct.

Step 3 Log in to the SoftCo and run the **show sipue eid** command to view the IP phone configurations. This command output also contains the information about whether the IP phone has been registered.

The information contains the IP address that the phone is using. Verify that the IP address is the same as the actual IP address of the IP phone. If the IP addresses are different, the number configured on this IP phone may duplicate with that on another IP phone. In this case, configure another number for the IP phone.

Step 4 Contact Huawei technical support if the fault persists.

----End

1.1.4 Automatic Call Disconnection After 5 Minutes of a Call

Symptom

Every time a call duration reaches 5 minutes, it is disconnected automatically.

Cause

The possible cause is that the SoftCo enables the heartbeat but the IP phone does not support Update messages.

Procedure

Step 1 Run the **show sip parameter** command on the SoftCo to check whether the **UseSessionTimer** parameter is set to **yes**.

If yes, the SoftCo sends an Update message to the IP phone at the middle of the heartbeat interval. If the IP phone does not send any responses, the SoftCo sends Update messages to the SoftCo every four seconds. After 10 Update messages are sent, the SoftCo regards that the IP phone stops, and releases the call.

Step 2 Capture and analyze packets on the network port.

- If the IP phone does not receive any Update messages, the network is abnormal. Check the network cable.
- If the IP phone receives the Update messages but does not send any responses, the IP phone cannot parse the Update message. Run the **config modify sip parameter usesessiontimer no** command to disable the SoftCo heartbeat function.

Step 3 Contact Huawei technical support if the fault persists.

----End

1.1.5 Announcement Indicating Call Channel Quantity Limit Played When a SoftCo User Initiates an Outgoing Call

Symptom

SoftCo users can initiate intra-office calls successfully. When they initiate outgoing calls, they hear an announcement indicating that the number of call channels is limited, and the calls fail.

Cause

The possible causes are as follows:

- The **MaxTkcCount** parameter of the sub-PBX group that the user belongs to is set to an improper value.
- Trunk resources are used up.

Procedure

Step 1 Run the **show subscribe dn** command to view the ID of the sub-PBX group that the user belongs to.

Step 2 Run the **show subpbx** command to search for the group name based on the group ID.

Step 3 Run the **show subpbx name** command to view the value of **MaxTkcCount**. If **MaxTkcCount** is set to **0** or a number that is less than the actual number of trunks, run the **config modify subpbx no x maxtkcnum xx** command to change the value.

Step 4 Contact Huawei technical support if the fault persists, and provide log information as required.

----End

1.1.6 Slow Call Connection When a User Dials 0 to Transfer from the SoftCo VU Switchboard to the Attendant Service

Symptom

A user dials the access code of the VU switchboard and then dials an extension number. The call is properly connected. When the user dials **0** to transfer to the attendant service, the call connection takes a long time.

Cause

The possible cause is that the VU script configuration is incorrect.

Procedure

- Step 1** Obtain the VU script used on site. View the information "PlayCollect 512,512,251,true,4,'#','*',**0**,#,30,NumLen,calledNum" in the VU script for processing the transfer to the attendant service. Check whether the eighth parameter **0** (in bold) contains single quote marks. If the parameter contains single quote marks, delete them. That is, change the information to "PlayCollect 512,512,251,true,4,'#','*',**0**,#,30,NumLen,calledNum".



The correct configuration is that the parameter **0** contains no single quote mark.

- Step 2** Contact Huawei technical support if the fault persists.

----End

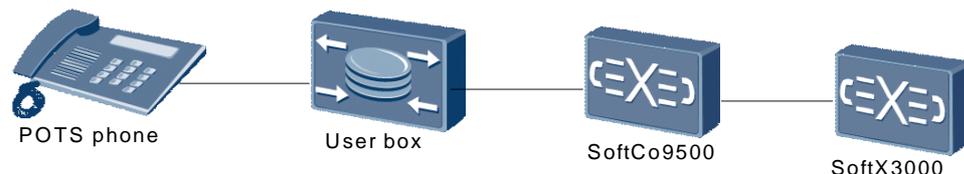
1.1.7 Failure to Make Outgoing and Intra-Office Calls

Symptom

After the SoftCo is configured, the outgoing and intra-office calls fail to be connected.

Figure 1-1 shows the network.

Figure 1-1 Connection between SoftCo9500 and SoftX3000



Cause

The possible causes are as follows:

- The outgoing or intra-office prefix is not configured.
- The MRU is not loaded or is faulty.
- The number is not registered with the SoftCo.
- The user box version is different from the version specified in the SoftCo release notes.

Procedure

- Step 1** Run the **show prefix** command to check whether the prefix exists. If the prefix exists, check the prefix attribute, in which **inter** indicates intra office, **local** indicates local office, **ddd** indicates national toll, and **idd** indicates international toll.
- Step 2** Run the **show board** command to check the MRU status.
- Step 3** If the user is a SIP user, verify that the number has been registered.
- Step 4** Run the **show subbox version slot x** command to check whether the user box version meets the requirement of the SoftCo version. In the command, *x* indicates the slot of the user box.
- Step 5** Contact Huawei technical support if the fault persists.

----End

1.1.8 Failure for a UA5000 User to Dial Some Numbers

Symptom

After the UA5000 is connected to the SoftCo5816 using H248, the UA5000 fails to call the numbers starting from 053 and 0189.

Cause

The possible causes are as follows:

- The prefix configuration is incorrect.
- An error occurs on the connection between the UA5000 and the SoftCo5816.

Procedure

- Step 1** Run the **show prefix** command to view the prefix configuration.
- Step 2** Check the SoftCo digitmap configuration.

The SoftCo delivers the default digitmaps to the UA5000.

```
[2-9]xxx.|1[35]xxxxxxxx|0xxxxxxxx.|1[01246-9]x|[FE]xxEx.F|[FE]xxF|ExxExx.Exx.F|Exx  
Exx.Exx.Exx.F|EExx|Exxx|ExxEx.Ex.Ex.F|xx.F
```

The default digitmaps do not contain the numbers starting from 053 or 0189.

There are two troubleshooting methods: add the corresponding digitmaps and configure digitmap X to implement speed dial. To configure digitmap X to implement speed dial, proceed as follows:

1. Run the **config delete digitmap protocol h248** command to delete the default digitmaps.
2. Run the **config add digitmap protocol h248 name ua5000 value [FE]xxEx.F|[FE]xxF|ExxExx.Exx.F|ExxExx.Exx.Exx.F|EExx|Exxx|x** command to configure digitmap X on the SoftCo.
3. Run the **mg-software parameter 13 0** command to set the digitmap match mode on the UA5000 to the minimum match.

Step 3 Contact Huawei technical support if the fault persists.

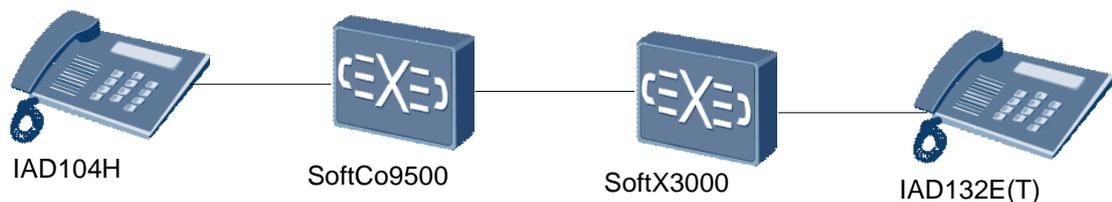
----End

1.1.9 Failure for an Outer-Office User to Call Intra-Office Users With an Outgoing Prefix in a Sub-PBX

Symptom

Figure 1-2 shows the network.

Figure 1-2 Connection between the Softco9500 and SoftX3000



After the SoftCo is configured, a user dials a number and hears an announcement indicating that the dialed number is incorrect.

Cause

The possible causes are as follows:

- The outgoing prefix is not configured.
- If the user belongs to a sub-PBX, and **if4pstnprefix** is not set to **yes**, the call from the Public Switched Telephone Network (PSTN) to the SoftCo cannot be connected.

Procedure

Step 1 Verify that the outgoing prefix has been configured.

Step 2 Check whether the user belongs to a sub-PBX. If the user belongs to a sub-PBX, verify that **if4pstnprefix** of the outgoing prefix in the sub-PBX is set to **yes**.

Step 3 Contact Huawei technical support if the fault persists.

----End

1.1.10 Ringing on the Called Phone Continued After a User Dials the Access Code of the VU Switchboard, Switches to the Attendant Service, Hears the RBT, and Hangs Up

Symptom

The SoftCo9500 connects to the IMS platform through the SIP trunk. An outer-office user dials the access code of a SoftCo VU switchboard, and dials **0** to switch to the attendant

service. If no one answers the call and the user hangs up, the phone of the attendant service still rings for dozens of times.

Cause

The possible cause is that the SoftCo configuration is incorrect.

Procedure

Step 1 Check the configuration.

- Run the **show ims connectpara** command to view the domain name of the IMS.

```
[%SoftCo9500(config)]$show ims connectpara
DomainName UsedIP ConfigIP Port OfficeselectCode Mode
-----
==== Command executed success ! ====
```

- Run the **show peercomponent** command to view the domain name of the peer device.

```
[%SoftCo9500(config)]$show peercomponent
Peer Component
DomainName UsedIPAddr ConfigIP PeerTKCNUM
-----
H323Office H323ServiceStatus HeartBeat Hea
SupportUpdate
==== Command executed success ! ====
```

- Run the **show protocol sip** command to view the domain name of SIP.

```
[%SoftCo9500(config)]$show protocol sip
SIP
office IPAddress DomainName LocalUdpPort LocalTcpPort Pe
-----
DefaultCLDNum1 DefaultCLDNum2 CallerPhoneContext CalleeP
SupportInfo CRBT supportCliPredeal ImsConnId workMode
==== Command executed success ! ====
```

Step 2 Verify that the preceding domain names are the actual IMS domain names.

- If the domain name in the **connectpara** parameter is incorrect, run the following command:
config modify ims connectpara domainname XXX
- If the domain name in the **peercomponent** parameter is incorrect, run the following command:

- config modify peercomponent domainname XXX
- If the domain name in the **protocol sip** parameter is incorrect, run the following command:
config protocol sip officeno N domainname XXX
In the preceding command, N indicates the office route code of SIP.

Step 3 Contact Huawei technical support if the fault persists.

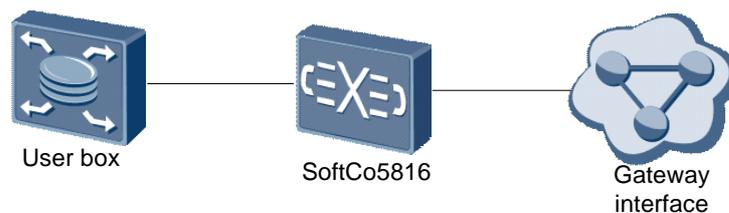
----End

1.1.11 Announcement Indicating the Incorrect Dialed Number Played If a User Dials a Digit After the Trunk Bearer of the Call Source Is Configured on the SoftCo

Symptom

Figure 1-3 shows the network.

Figure 1-3 SoftCo5816 outgoing call network



After dialing a digit, a user hears an announcement indicating that the dialed number is incorrect.

Cause

The possible cause is that the prefix configuration is incorrect.

Procedure

- Step 1** Run the **show tgl** command to check whether the trunk bearer of the call source is enabled.
If the trunk bearer has been enabled, go to [Step 2](#). If the trunk bearer has not been enabled, go to [Step 3](#).
- Step 2** Verify that the minimum number length of the outgoing prefix is equal to or greater than 2.
- Step 3** Contact Huawei technical support if the fault persists.

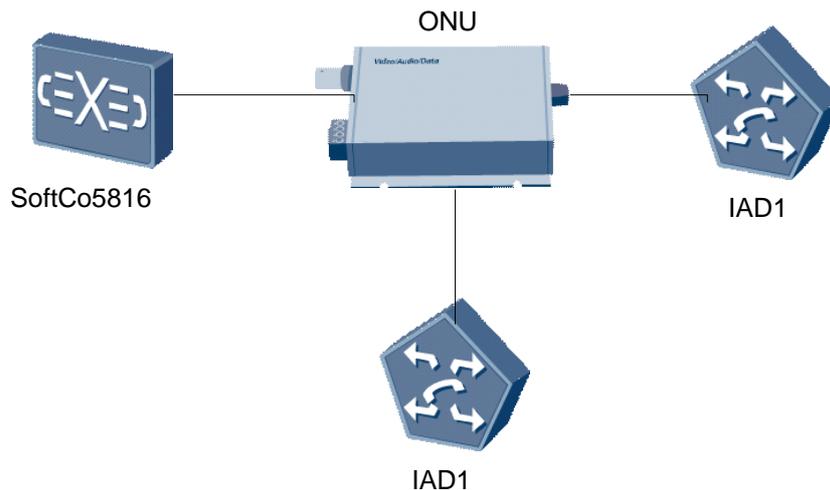
----End

1.1.12 No Voice Heard in a Call Between Two IADs Connected to the SoftCo Using the Same ONU

Symptom

Figure 1-4 shows the network.

Figure 1-4 Connections between IADs and SoftCo using the ONU



A call between users on two IADs that are connected to the SoftCo using the same ONU can be connected successfully, but neither of the users can hear the voice after the call is connected. The call from the users to outer-office numbers, long numbers, or intra-office short number on other devices can be connected.

Cause

The possible cause is that the RTP stream is filtered out by the network device.

Procedure

- Step 1** Ask the customer to modify the ONU configuration.
 - Step 2** Connect a small switch to the ONU and connect the switch to the IAD.
This operation is recommended when the number of users who use the ONU is small.
 - Step 3** Contact Huawei technical support if the fault persists.
- End

1.1.13 Failure to Call an Outer-Office Number at a Call Conference

Symptom

During the call conference configuration, the phone numbers for participating in a conference are configured on the BMU. Outer-office phones cannot ring. Only intra-office phones ring and are successfully connected to the conference.

Cause

The possible cause is that the sub-PBX configuration is incorrect.

Procedure

Step 1 Run the **show subpbx** command to check whether **OutConfDn** is set to the default value **000**.

If **OutConfDn** is set to **000**, run the **config modify subpbx no 0 OutConfDn xxx** command to change the value of **OutConfDn** to the number format that is valid for the peer office. In the preceding command, **xxx** is set to a number without the area code.

Step 2 Contact Huawei technical support if the fault persists.

----End

1.1.14 Busy Tone After UA5000 User Phone Pick-up When the UA5000 and SoftCo Are Connected Using H248

Symptom

The MGC delivers the message for monitoring all users' phone pick-up to the MG. Then the MG sends response 402.

Cause

The possible causes are as follows:

- The domain name of the first MGC on the UA5000 is not set to **SS**, which is the default SoftCo domain name.

Procedure

Step 1 Check whether the domain name of the first MGC on the UA5000 is set to **SS**.

This parameter is mandatory. If it is not set, some UA5000 versions will fail to be registered, and the error information "ER=402" is displayed.

```
MEGACO
  !/1 [10.212.120.10]:2944
    Version: 1
    MediatgatewayID: [10.212.120.10]:2944
  P=550166260{
    Transaction: Reply
    Transaction ID: 550166260
    ERROR Descriptor: ER=402{"Unauthorized"}}
  [Error code: Unauthorized]
```

Step 2 Contact Huawei technical support if the fault persists.

----End

1.1.15 Slow Call Connection or Call Release Due to Timeout When the UA5000 and the SoftCo Are Connected Using H248

Symptom

- A UA5000 user dials a number and waits for a long period of time before the call is connected.
- If a user dials a part of a number, waits for 5 seconds, and dials two digits, the user will hear the busy tone after 2 seconds. If the user dials the number without interruption, the call will be connected normally.

Cause

The possible cause is that the SoftCo digitmap configuration does not match the number.

Procedure

Step 1 Run the **show digitmap protocol mgcp** command to check whether the Media Gateway Control Protocol (MGCP) digitmap configuration is as follows:

```
"[2-9]xxx.|1[35]xxxxxxxx|0xxxxxxxx.|1[01246-9]x|[FE]xxEx.F|[FE]xxF|ExxExx.Exx.F|ExxExx.Exx.Exx.F|EExx|Exxx|xx.F"
```

If the preceding information is displayed, run the following commands to delete the digitmap and add a new digitmap:

```
config delete digitmap protocol h248

config add digitmap protocol h248 name xxxx value
[FE]xxEx.F|[FE]xxF|ExxExx.Exx.F|ExxExx.Exx.Exx.F|EExx|Exxx|x
```

Step 2 Contact Huawei technical support if the fault persists.

----End

1.2 Trunk Faults

1.2.1 Abnormal Call Connection Due to Poor AT0 Ground

Symptom

Noises occur in a call, the call is disconnected, or other unknown faults occur when the AT0 trunk of the SoftCo is used

Cause

The possible cause is that the AT0 ground is poor.

Procedure

- Step 1** Check the AT0 ground.
For details, see [2.2 AT0 Ground Check](#).
- Step 2** Test the ground impedance.
For details, see [2.3 AT0 Ground Impedance Test](#).
- Step 3** Contact Huawei technical support if the fault persists.
----End

1.2.2 Invalid Routing Failure Configuration for the SIP Trunk

Symptom

Between SoftCo9500s, the SIP trunk is the active trunk, and the TUP trunk is the standby trunk. When the SIP trunk is faulty, outgoing calls are routed to the TUP trunk. After the route configuration, however, calls cannot be connected to the other offices through the TUP trunk when the SIP trunk is faulty. Users cannot hear any announcements after dialing numbers, and the calls cannot be connected.

Cause

The possible causes are as follows:

- The physical link of the trunk is faulty.
- Trunk connection data is configured incorrectly, and the link is not connected.
- The SIP trunk configuration is incorrect.

Procedure

- Step 1** Run the **show tke** command to view the physical link of the trunk.
- Step 2** Verify that the SIP trunk and TUP trunk can be used separately to connect outgoing calls.
- Step 3** Run the **show peercomponent domainname XXX** command to check whether the **HeartBeat** parameter of the SIP trunk is set to **YES**.

In the command, *XXX* indicates the actual domain name of the SIP trunk. If **HeartBeat** is not set to **YES**, run the **config modify peercomponent domainname *xxx* heartbeat yes heartbeatperiod 5** command to enable the heartbeat.

Step 4 Contact Huawei technical support if the fault persists.

----End

1.2.3 Connection Failure Through the SS7 Trunks

Symptom

The SoftCo fails to connect to the upper-level office device through the SS7 trunks.

Cause

The possible causes are as follows:

- The board is faulty so that the physical channel is not connected.
- Settings on the SoftCo are inconsistent with those on the peer device.

Procedure

Step 1 Run the **Show board** command to view the indicator status of the DTU.

If the signal loss indicator **LOS** is on, the signals are lost; if the indicator is off, the signals are normal. If the remote alarm indicator **RFA** is on, the peer device is faulty; if the indicator is off, the peer device is working properly.

Step 2 Verify that the following information of the local office is consistent with that of the peer office:

- Local signaling point code
- Destination signaling point code
- Trunk direction
- Trunk line selection mode
- CIC of the start trunk circuit
- SLC of the MTP link
- Circuit number timeslot of the MTP link

Step 3 Contact Huawei technical support if the fault persists.

----End

1.2.4 Outgoing Call Failure Through the AT0 Trunk

Symptom

The SoftCo5816 outgoing calls through the AT0 trunk fail.

Cause

The possible cause is that the ATU fails to be loaded.

Procedure

- Step 1** Run the **show at0tkc card slot** command to check the ATU status.
- Step 2** Run the **reset card slot** command to reset the ATU.
- Step 3** Run the following commands to delete the ATU and load the ATU again:
- config isolate card slot *x*
 - config delete card slot *x*
 - config add card slot *x* type atu officeno *y*
- Step 4** Run the **start load mainnode** command to load the **mainnode.hex** file to the MPU chip.
- Step 5** Change another ATU if the fault persists.
- Step 6** Contact Huawei technical support if the fault persists.
- End

1.2.5 Ringing on the Called Phone in the SoftCo Continued

Symptom

A user uses a mobile phone to call a number in the SoftCo through the AT0 trunk. If the calling user hangs up before the called user answers the call, the phone of the called user continues ringing for about 1 minute.

Cause

The possible causes are as follows:

- The amplitude of the received busy tone signals is lower than the scope that the SoftCo can detect, that is, $-10\pm 3\text{Db}$.
- The AT0 trunk module is affected by the static electricity because the device is not grounded or the ground is poor.

Procedure

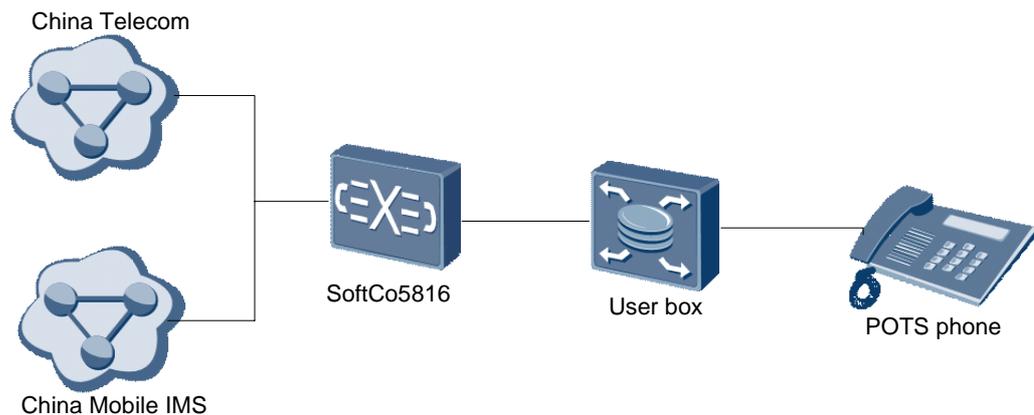
- Step 1** Verify that the ATU is grounded well.
- Step 2** Contact Huawei technical support if the fault persists.
- End

1.2.6 Abnormal AT0 Connection

Symptom

Figure 1-5 shows the network.

Figure 1-5 SoftCo5816 AT0 connection network



An outer-office user dials the access code of the VU switchboard, and hears the busy tone. There are three VUs on site, namely, two China Telecom AT0s, and one China Mobile IMS. The user hears the busy tone when dialing the access code of the two China Telecom VU switchboards, but successfully dials the China Mobile VU switchboard.

Cause

The possible causes are as follows:

- The VU script is incorrect.
- The device ground is abnormal.

Procedure

Step 1 Run the **show card slot 1** command to check the AT0 status.

The AT0 statuses of ports 0 and 1 on the ATU continuously switch between **BUSY** and **IDLE** when no call is made.

Step 2 Verify that the device has been grounded.

Step 3 Verify that the device ground meets the specifications. The reference ground impedance is 5 ohms.

Step 4 Verify that the VU script is correct.

Step 5 Contact Huawei technical support if the fault persists.

----End

1.3 Service Faults

1.3.1 Failure to Retrieve the Messages Left on the UMS

Symptom

After the SoftCo and the UMS are connected, a user uses a mobile phone to leave a message. After the message leaving is complete, the user presses # for confirmation and then presses 1 as prompted to hear the message. The user can successfully hear the message.

When the called user uses a fixed-line phone to retrieve the message, no message exists for this account.

Cause

The possible cause is that SmartCall 1000 does not enable the mail service.

Procedure

Step 1 Verify that the mail service in the service management of the SmartCall 1000 is enabled.

After a user leaves a message in the IVR, the system uses the internal mail system to store the message in the corresponding account. If the mail service is not enabled, the system fails to store the message, and the message cannot be identified or retrieved.

If the fax service is not enabled, the fax received in the IVR also cannot be retrieved.

Step 2 Contact Huawei technical support if the fault persists.

----End

1.3.2 Transfer Failure

Symptom

At an office, the VU script is used to compile command lines and VU command lines are executed to implement the VU switchboard function. A user in the POST user box on the SoftCo5816 dials the VU prefix, and hears the switchboard announcement. When the user presses a key as prompted, the call is disconnected.

Cause

The possible causes are as follows:

- The VU script is incorrect.
- The VU on the SoftCo host is configured incorrectly.

Procedure

Step 1 Check the VU script on site, and verify that the number of string-type variables is less than 30.

Step 2 Check the VU configuration on the SoftCo host.

Step 3 Contact Huawei technical support if the fault persists.

----End

1.3.3 Call Forwarding Failure After a SIP User Configures the CFB Service

Symptom

After a SIP IAD user configures the call forwarding busy (CFB) service, the call forwarding fails occasionally, and the user hears the announcement indicating that the called party is busy.

Cause

The possible cause is that the forwarded-to party's phone in the IAD has just been picked up when the call forwarding occurs.

The SoftCo implements the CFB service without interacting with the IAD.

When the user dials up, the IAD does not send the INVITE message to the SoftCo. Therefore, the SoftCo does not obtain the busy state of the user in the IAD. The SoftCo connects the call to the IAD and finds that the forwarded-to phone has been picked up. Then the SoftCo plays the busy tone to the calling user.

Procedure

Step 1 Check whether the forwarded-to party's phone is in an IAD.

Step 2 Contact Huawei technical support if the fault persists.

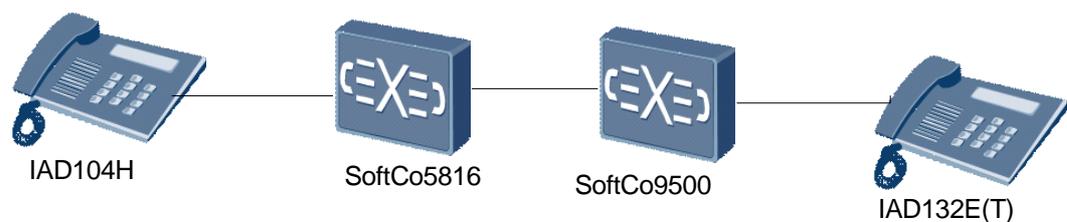
----End

1.3.4 Failure to Send and Receive Faxes When the SoftCo Is Connected to the IMS

Symptom

Figure 1-6 shows the network.

Figure 1-6 Network for receiving and sending faxes



After the SoftCo is configured, a user dials a number and hears an announcement indicating that the dialed number is incorrect.

Cause

The possible causes are as follows:

- The signaling interaction is abnormal.
- The fax mode is incorrect.

Procedure

Step 1 Run the **show softarg** command to check whether software parameter 255 is set to **0**.

If software parameter 255 is not set to **0**, run the **config softargu type 255 value 0** command to change the value to **0**.

The software parameter description is "fax and modem sdp attr mode [0: FAX/MODEM, 1: X-FAX/X-MODEM]".

- **0**: When the media is updated and the SoftCo sends the REINVITE message, the fax parameter is **FAX/MODEM**.
- **1**: When the media is updated and the SoftCo sends the REINVITE message, the fax parameter is **X-FAX/X-MODEM**.

When the SoftCo is connected to the IMS, the **FAX/MODEM** parameter is used.

Step 2 Contact Huawei technical support if the fault persists.

----End

1.3.5 Service Interruption Due to the Full CDR Pool

Symptom

At an office, the onsite service traffic is low. During the deployment, the **config createbill switch on** command is executed to enable the CDR recording function, which is not disabled later. There is no CDR server onsite, and CDRs are stacked in the CDR pool. After the CDR pool is full, services are interrupted.

After the **config createbill switch off** command is executed to disable the CDR recording function and the SoftCo is restarted, the fault persists.

Cause

The possible cause is that the CDR pool is full and the CDR files are not deleted.

Procedure

Step 1 Run the **config createbill switch off** command to disable the CDR recording function.

Step 2 Run the **show billpool state** command to view the number of CDRs. Assume that the number of CDRs is *N*.

Step 3 Run the **debug debug_pid os_pid_bill_server cmd 45 p1 0 p2 N** command to delete the CDRs.

If the site is not provided with the Huawei or third-party CDR server to obtain CDRs, the CDR recording function must be disabled during the SoftCo deployment to avoid full CDR pool and service interruption.

Step 4 Contact Huawei technical support if the fault persists.

----End

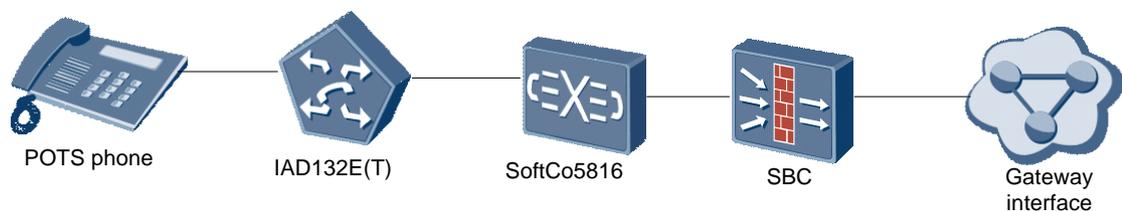
1.3.6 Failure to Cancel the CFU Service

Symptom

A user dials *57*TN# to register the call forwarding unconditional (CFU) service. The service takes effect. Then the user dials #57# but fails to cancel the service.

Figure 1-7 shows the network.

Figure 1-7 Network for canceling the CFU service



Cause

The possible cause is that the SoftCo configuration is incorrect.

Procedure

Step 1 Run the **show sip convert23tosharp switch** command to check whether the function of converting the number sign (#) is disabled.

Step 2 If the function is enabled, run the **config sip convert23tosharp flag off** command to disable it.

Step 3 Contact Huawei technical support if the fault persists.

----End

1.3.7 CDR Duplication in the Hotel System

Symptom

A hotel (office) uses the third-party charging software to perform charging based on the CDRs generated by the SoftCo. Some CDRs duplicate in the SoftCo, causing repeat charging. Figure 1-8 and Figure 1-9 show two duplicate CDRs.

Figure 1-8 CDR 1

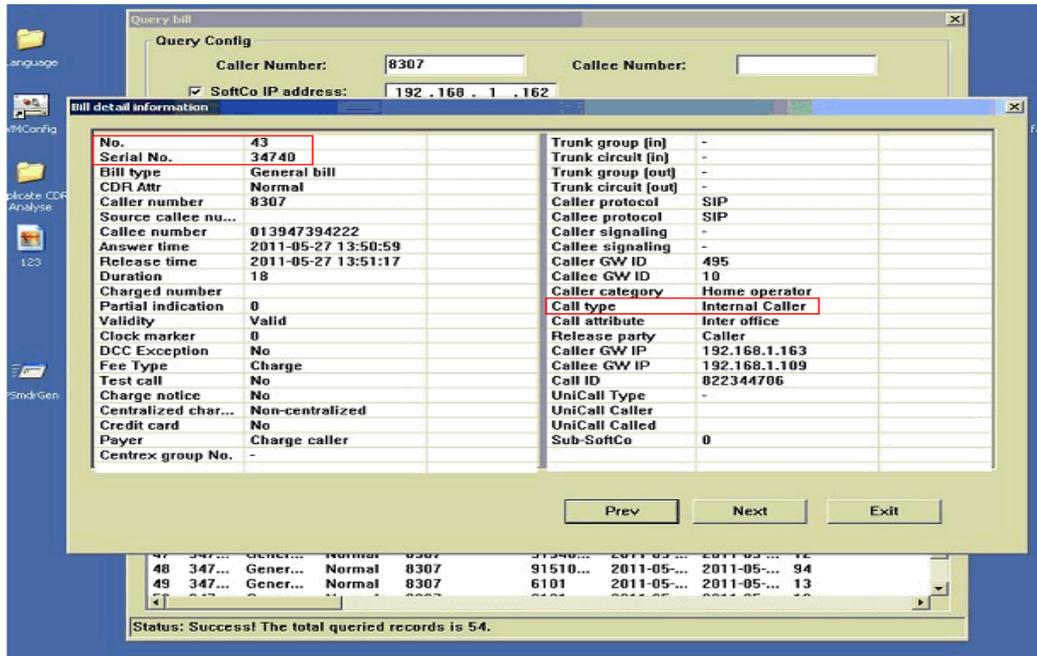
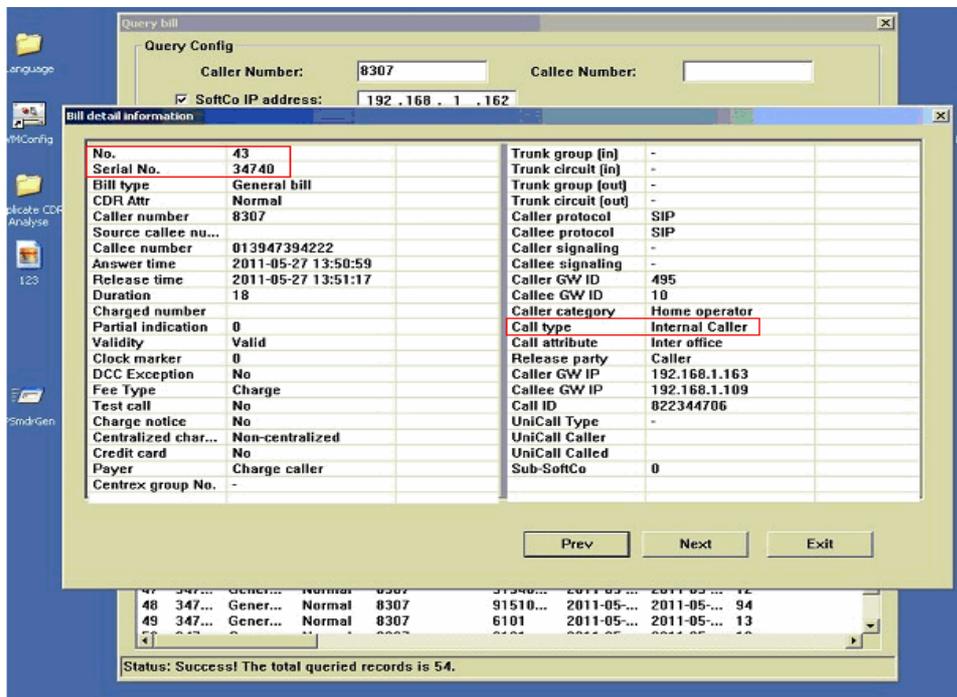


Figure 1-9 CDR 2



Cause

The possible cause is that the third-party charging software cannot determine some fields in the SoftCo CDRs.

Procedure

Step 1 Check whether the **call attribute** values of two duplicate CDRs are set to **inter office** (intra-office call). If the values of **call attribute** are **inter office**, the two CDRs respectively generate for the calling and called parties. The CDRs are the same but not duplicate.

Step 2 Contact Huawei technical support if the fault persists.

----End

1.3.8 Invalid Pickup Group Function After the SoftCo9500 Is Upgraded to V100R002C03SPC200

Symptom

After the SoftCo9500 is upgraded from V100R002C02B06c to V100R002C03SPC200, the pickup group function is invalid. A user dials *11# but fails to answer the calls to other users in the same pickup group.

Cause

The possible cause is that V100R002C02B06c does not have the **f4pstnprefix** attribute, but V100R002C03SPC200 has the **if4pstnprefix** attribute and the default value is **yes**.

Procedure

Step 1 Run the **conf mod pref dn *11# if4pstnprefix no** command to change the value of **if4pstnprefix** of the call pickup prefix to **no**.

Step 2 Use the same method to change the values of **if4pstnprefix** of other special access codes to **no**.

Step 3 Contact Huawei technical support if the fault persists.

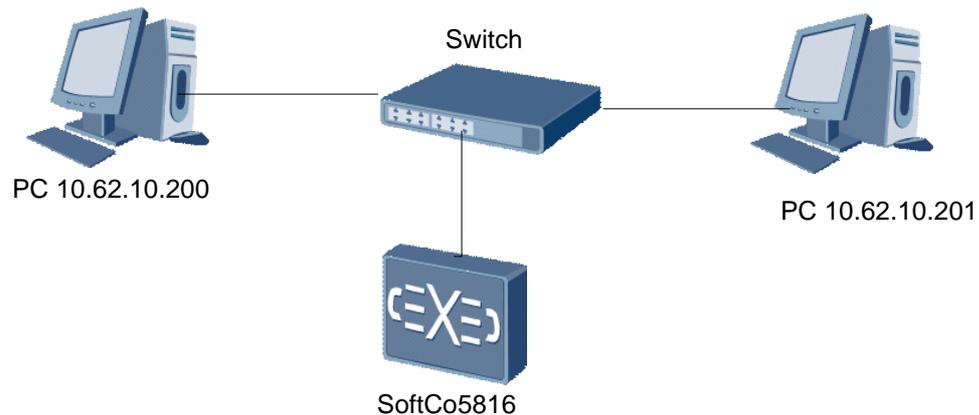
----End

1.3.9 One-Way Voice Blocking of the SoftCo Console System

Symptom

On two PCs connected to the SoftCo9500, the SoftCo Console Systems are installed. The SoftCo is in the V100R002C03 version. The IP addresses of the PCs are 10.62.10.200 and 10.62.10.201. [Figure 1-10](#) shows the network.

Figure 1-10 SoftCo Console system network



When a customer uses the Console system, the one-way voice blocking fault occurs. That is, PC2 can hear the voice from PC1 but PC1 cannot hear the voice from PC2 after a call is established.

Cause

The possible causes are as follows:

- The earphone does not work.
- The PC audio card is incorrectly configured.
- The SoftConsole or PC is muted.
- The sound of the microphone is too low.
- An error occurs on the network.

Procedure

- Step 1** Check the earphone.
- Step 2** Check the audio card.
- Step 3** Ensure that the SoftConsole or PC is not muted.
- Step 4** Check the microphone sound.
- Step 5** Check whether the current communication port is occupied.

Check method:

Use the Wireshark to capture the network packets of PC1 and PC2 when the fault occurs, and obtain the RTP packet port number used by PC1 (the party who cannot hear the voice) based on the SIP message. Determine whether the port receives RTP messages that are sent only by PC2. If the port also receives messages sent from another IP address, the port is occupied.

Stop the device with the unknown IP address.

- Step 6** Contact Huawei technical support if the fault persists.

----End

1.3.10 Automatic Call Release After the Called Party's Phone Rings

Symptom

User A in the SoftCo enables the One Number Link You (ONLY) service and binds user B. User C calls user A. After a short period (several seconds), user A's phone stops ringing and user C hears the announcement indicating that the called user is busy.

Cause

The possible cause is that user B has enabled the automatic answer function.

Procedure

Step 1 Check whether user B has enabled the automatic answer function or other supplementary service functions that causes the fault.

The fault also occurs when user A sets the user B for simultaneous ringing and user B has enabled the automatic answer function.

Step 2 Contact Huawei technical support if the fault persists.

----End

1.3.11 Failure to Convene a Conference on the BMU and Insufficient Resources Prompted During Phone Access

Symptom

The conference call function is enabled on the SoftCo9500. A user sets a conference call on the BMU and clicks the conference invitation button. A message indicating invitation failure is displayed. Then the user enters the moderator password on the phone to access the conference and hears an announcement indicating that the resources are insufficient and the conference access fails.

Cause

The possible cause is that the MRU of the SoftCo is configured incorrectly.

Procedure

Step 1 Run the **show board slot x** command to check the **conference** parameter of the MRU.

In the preceding command, *x* indicates the slot where the MRU is inserted. If the **conference** parameter is set to **no**, run the **config modify board slot 4 type mru conference yes** command to change the values of **conference** for the MRU in all slots to **yes**.

Step 2 Contact Huawei technical support if the fault persists.

----End

1.3.12 Failure to Hold the Instant Multimedia Conference on the eSpace

Symptom

When a user uses the eSpace to hold an instant multimedia conference, a message indicating server connection failure is displayed, and the error code is 6.

Cause

The possible causes are as follows:

- The time on the SoftCo is different from that on the eServer (BMU) server.
- The license is incorrect.

Procedure

- Step 1** Run the **show license** command to view whether there are any conference licenses. If there is no conference license, apply for a license.
- Step 2** Check whether the time on the SoftCo is the same as that on the eServer (BMU) server. If the time difference is greater than 2 minutes, change the time on the eServer (BMU) server to the same as that on the SoftCo, and restart the eServer (BMU) server.
- Step 3** Contact Huawei technical support if the fault persists.

----End

1.3.13 Occasional Outgoing Call Failure from the Switchboard Number When the SoftCo Is Connected to the IMS

Symptom

After the SoftCo5816 is connected to the IMS, some users in the user box of the SoftCo5816 fail to initiate outgoing calls and hear an announcement indicating that the call cannot be connected. At the office, four switchboards are configured and extensions in other three switchboards are normal. Only some phones in the switchboard 865966032778 fail to make outgoing calls, and the phones have long numbers.

Cause

The possible cause is that the multi-call permission is not granted for the switchboard.

Procedure

- Step 1** Check whether the multi-call permission is granted for the switchboard number that the carrier provides for the SoftCo on the carrier network. If the multi-call permission is not granted, contact the carrier to grant it.
- Step 2** Contact Huawei technical support if the fault persists.

----End

1.4 Other Faults

1.4.1 Failure to Change the IP Address of the SoftCo5816

Symptom

After the SoftCo5816 is installed, change to the IP address of the SoftCo5816 based on the onsite network plan is invalid.

Cause

The possible cause is that the new IP address is on the same network segment as the IP address of the commissioning network port of the SoftCo.

Procedure

- Step 1** Check whether the planned IP address is on the 192.168.0 network segment. If the IP address is on the network segment, perform the following operations to change the IP address of the commissioning network port and set the IP address of the SoftCo5816 again:

Use the serial cable to log in to the SoftCo. Restart the system, stop at boot2, and run the **C0** command to change the IP address of the commissioning network port to an IP address in another network segment. Then set the IP address of the SoftCo5816 again.

- Step 2** Contact Huawei technical support if the fault persists.

----End

1.4.2 Failure to Load the SoftCo License

Symptom

An error is reported during license load, indicating that the license load fails or the verification is not passed.

Cause

The possible causes are as follows:

- The device ESN is different from the ESN in the license, and the verification is not passed.
- The configured device data is not allowed by the license.
- The TFTP setting is incorrect, and the system cannot find the file to be loaded.
- The maximum number of temporary license load times is 10. If the license is a temporary license and has been loaded for 10 times, the subsequent load fails.
- The license file version does not match the host software version.

Procedure

- Step 1** Verify that the device ESN is the same as that in the license.

- Step 2** Verify that the configured device data, such as the number of users and number of trunks, is allowed by the license.
- Step 3** Check the TFTP setting information, such as check whether the TFTP server has started, the host IP address is correct, and the license file has been stored in the TFTP server path.
- Step 4** If the license is a temporary license, ask the customer whether the license has been loaded for 10 times. To check the number of license load times, run the **debug debug_pid os_pid_license cmd 2** command in the **super** mode and check the value of **Total CB**.
- Step 5** Verify that the version of the license that the customer has applied for matches the host software version. The license template varies slightly with the host software version. Pay attention to the difference.
- Step 6** Contact Huawei technical support if the fault persists.

----End

1.4.3 ONU Registration Failure When the ONU and the SoftCo Are Connected Using H248

Symptom

The SoftCo is connected to the Huawei ONU 928G-A. Then the Huawei ONU 928G-A uses H248 to register with the SoftCo but fails.

Cause

The possible cause is that the ONU device version is too old.

Procedure

- Step 1** Capture the logs or packets to view the registration information, and check whether the characters **root** in the registration information is uppercase.

```
Context=-{
ServiceChange=root{
ERROR Descriptor: Error=430{"Unknown TerminationID"}
[Error code: Unknown TerminationID]
----- (RAW text output) -----
MEGACO/1 <SS>:2944 Reply=614544119{Context=-{ServiceChange=root{Error=430{"Unknown TerminationID"}}}}
```

If the character is the uppercase **ROOT**, upgrade the ONU device. The SoftCo cannot identify the character **root** in lowercase.

- Step 2** Contact Huawei technical support if the fault persists.

----End

1.4.4 SoftCo Upgrade Failure

Symptom

Five SoftCos are connected to a switch. Two of them were used for test and the IP addresses of them were deleted. When the **config download file all** command is used during the upgrade, a message indicating the file load failure is displayed. When the upgrade is performed based on the upgrade guide, the file load failure is also reported.

Cause

The possible causes are as follows:

- The TFTP server does not start.
- An error occurs on the connection between the SoftCo and the TFTP file server. They may be on different network segments.
- Other network errors.

Procedure

- Step 1** Verify that the TFTP server has started, and the upgrade software path is correctly configured.
 - Step 2** Verify that the value of **hostip** on the SoftCo is the IP address of the TFTP server and that the TFTP server can be pinged from the SoftCo.
 - Step 3** Check whether the SoftCo IP addresses are the same.
 - Step 4** Contact Huawei technical support if the fault persists.
- End

2 Common Tools and Troubleshooting Methods

2.1 Common Tools

2.1.1 Wireshark Overview

Packet Capture Scenario

Network packets are captured to help locate voice quality faults, media faults, and signaling interaction faults.

Packet Capture Tools

WireShark and ethereal can be used to capture packets. WireShark is recommended.

Limitation

Packet capture tools can capture only the IP packets on the local host network adapter. The IP phone, or IAD, port mirroring must be configured on the switch for IP packet capture on the SoftCo.

Port Mirroring

Port mirroring configuration varies with switches. To configure port mirroring on Huawei Quidway s3000, proceed as follows:

Step 1 Use the serial cable to connect to the switch.

Step 2 Run the **system-view** command to enter the system mode.

Run the **monitor-port ethernet 0/24** command to set port 24 as the listening port to listen on other ports. The PC where packets are to be captured must connect to port 24.

Run the **mirroring-port ethernet 0/1 to ethernet 0/23 both** command to set ports 1 to 23 as mirroring ports.

Step 3 Run the **display mirror** command to view the port mirroring result.

Step 4 Run the **undo mirroring-port Ethernet 0/21 to Ethernet 0/23 both** command to disable the listening on ports 21 to 23.

----End



CAUTION

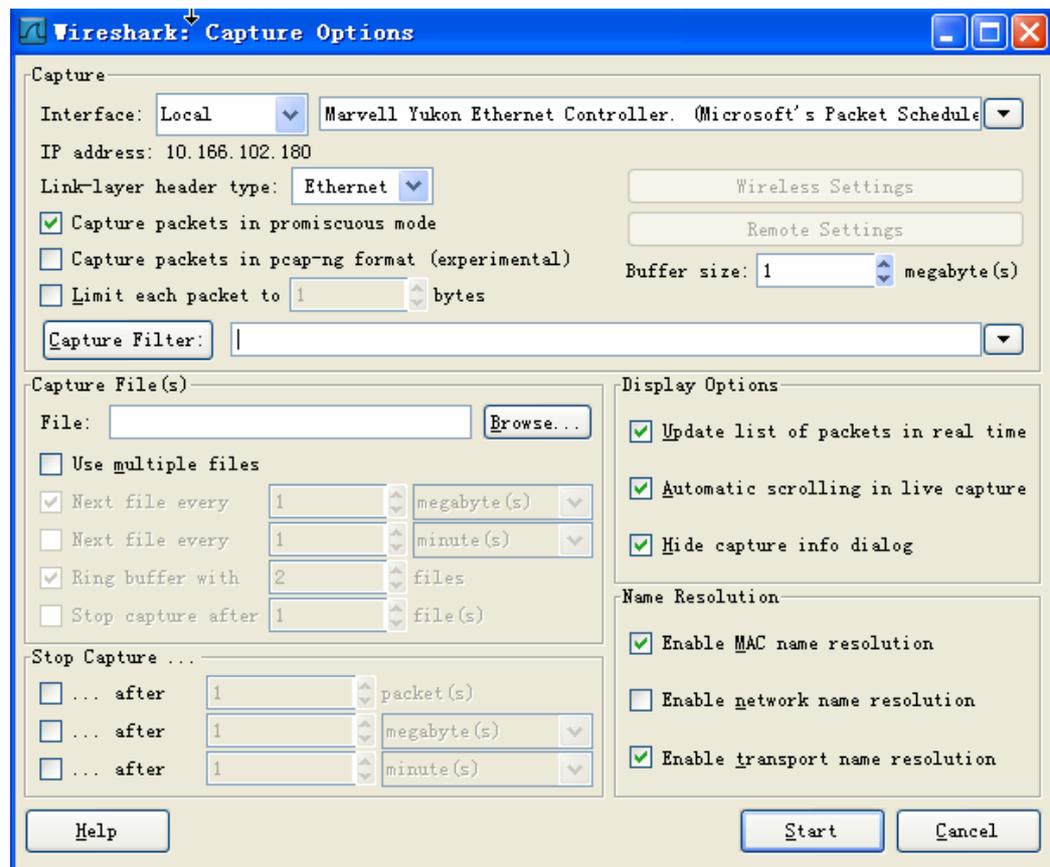
Only one listening port can be set on a switch and the port cannot listen on itself.

Packet Capture and Analysis by the Wireshark

Step 1 Start Wireshark and choose **Capture Options**.

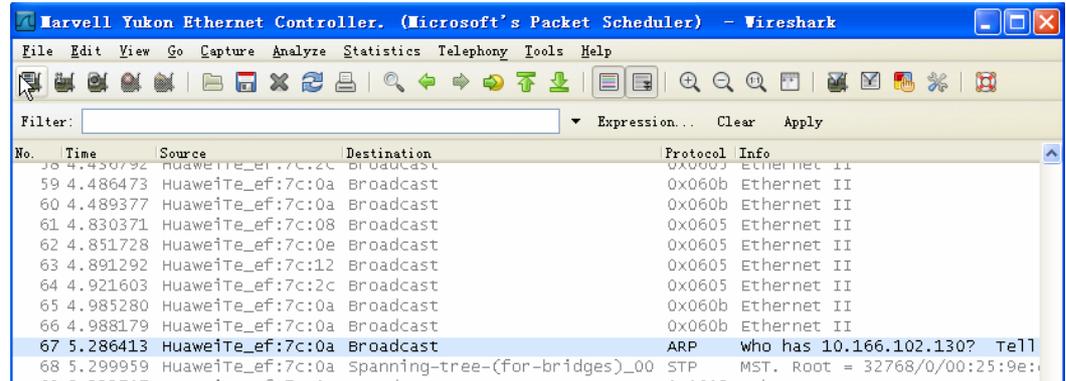
The page shown in [Figure 2-1](#) is displayed.

Figure 2-1 Setting packet capture options



Step 2 Set packet filtering criteria after packets are captured, as shown in [Figure 2-2](#).

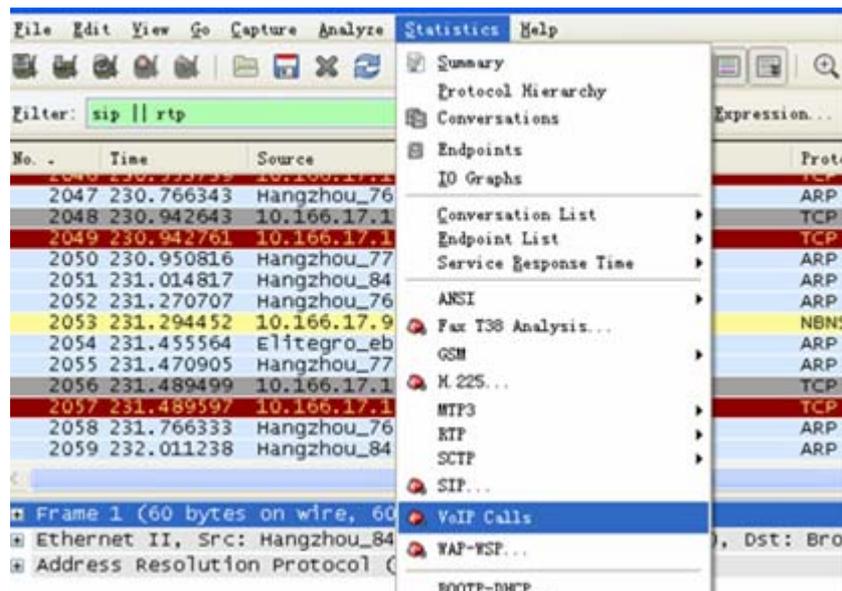
Figure 2-2 Setting packet filtering criteria



Step 3 Choose **File > Save as** to save the packets in a specified path.

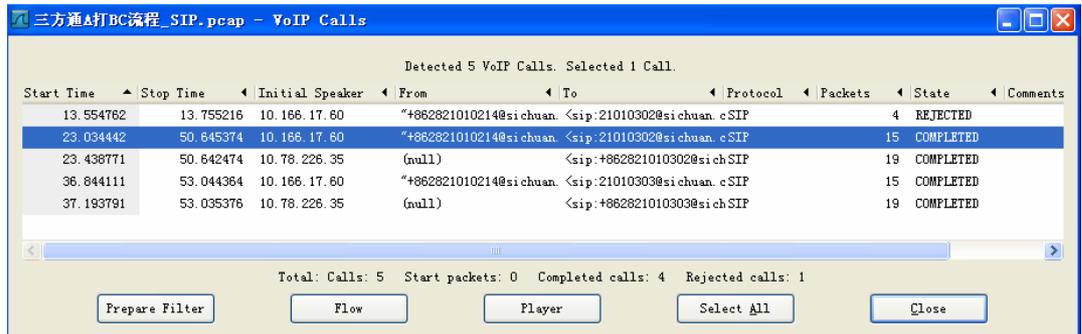
Step 4 Choose **Statistics > VoIP Calls** to simply analyze captured packets, as shown in Figure 2-3.

Figure 2-3 Analyzing packets



Step 5 Select a call record based on the calling and called numbers, as shown in Figure 2-4.

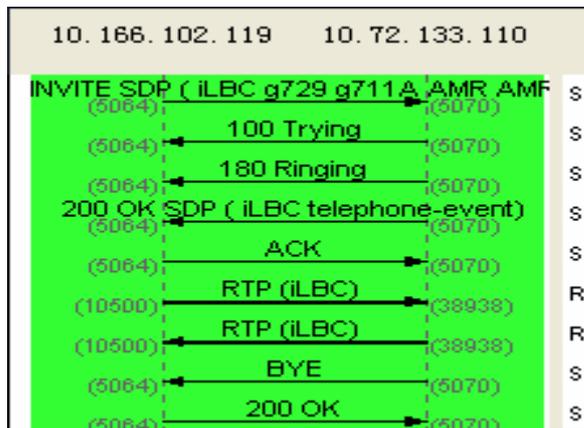
Figure 2-4 Selecting a call record



Step 6 Click Flow.

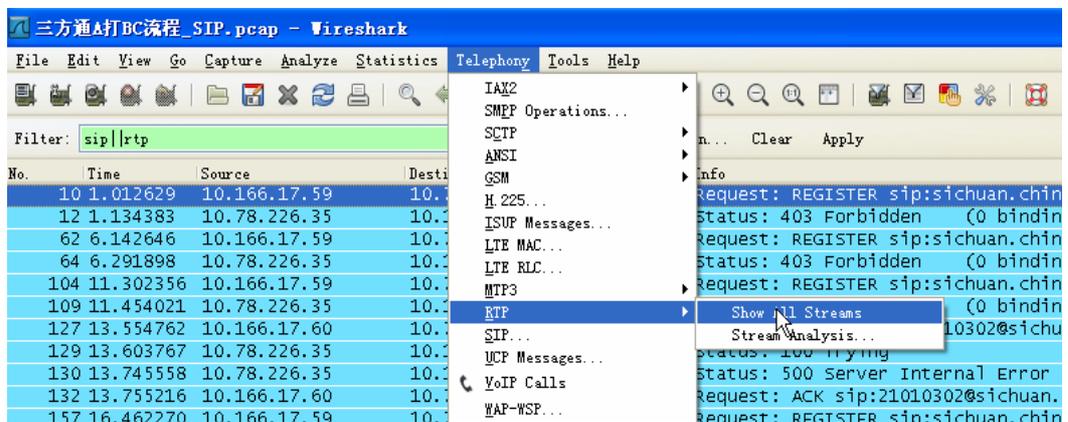
The signaling flowchart is generated, as shown in Figure 2-5.

Figure 2-5 SIP signaling flowchart



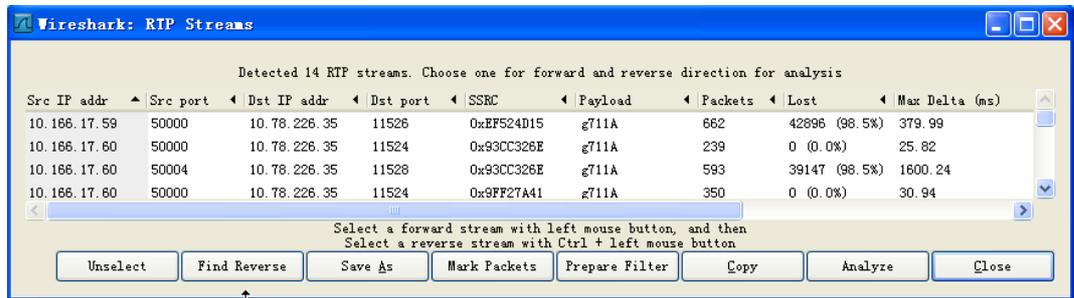
Step 7 Choose Telephony > RTP > Show All Streams to analyze the RTP streams, as shown in Figure 2-6.

Figure 2-6 Analyzing RTP streams



The page shown in [Figure 2-7](#) is displayed.

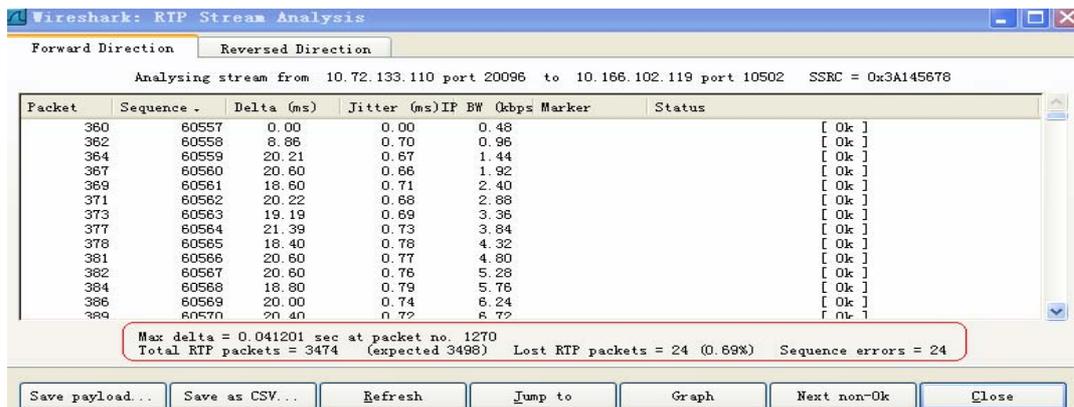
Figure 2-7 RTP Streams page



Select a record and click **Analyze**.

The page shown in [Figure 2-8](#) is displayed.

Figure 2-8 Analysis result



The RTP streams are simply analyzed and the analysis result contains the packet loss, jitter, and disorder information.

----End

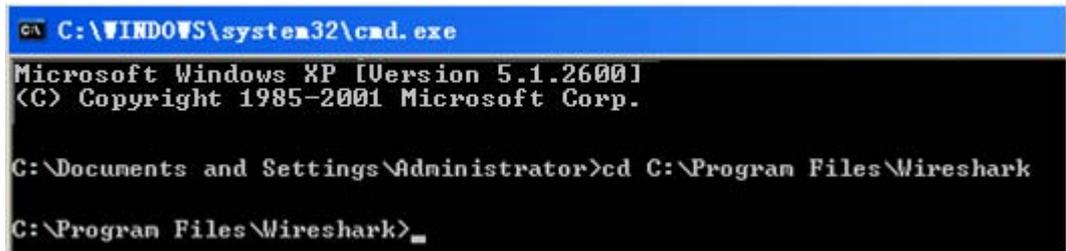
2.1.2 Cyclic Packet Capture by the Wireshark

To locate faults that occur occasionally, use Wireshark to capture packets cyclically and filter the captured packets to obtain the required packets.

The procedure is as follows:

Step 1 Go to the Wireshark installation directory, as shown in [Figure 2-9](#).

Figure 2-9 Going to the Wireshark installation directory

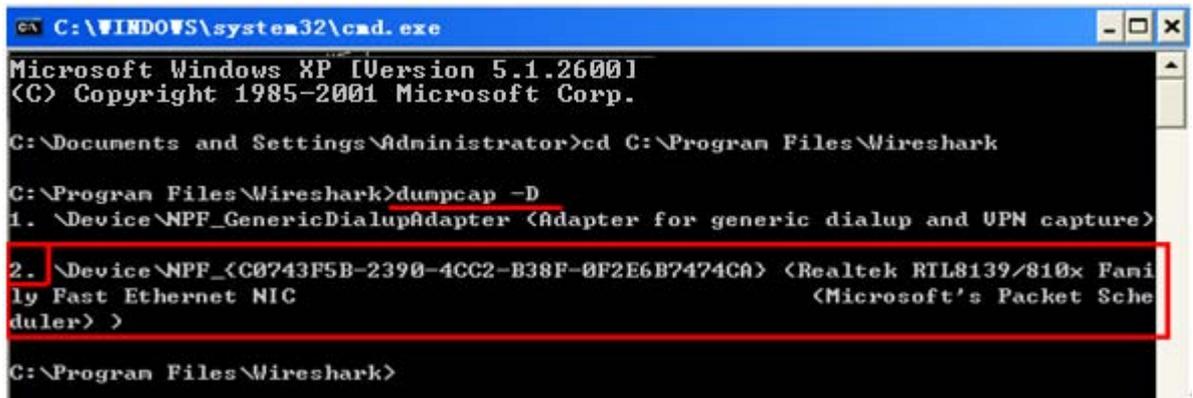


```
C:\WINDOWS\system32\cmd.exe
Microsoft Windows XP [Version 5.1.2600]
(C) Copyright 1985-2001 Microsoft Corp.

C:\Documents and Settings\Administrator>cd C:\Program Files\Wireshark
C:\Program Files\Wireshark>
```

Step 2 View the current PC network interface index and description to confirm the network interface card (NIC) used to capture packets, as shown in [Figure 2-10](#).

Figure 2-10 NIC information



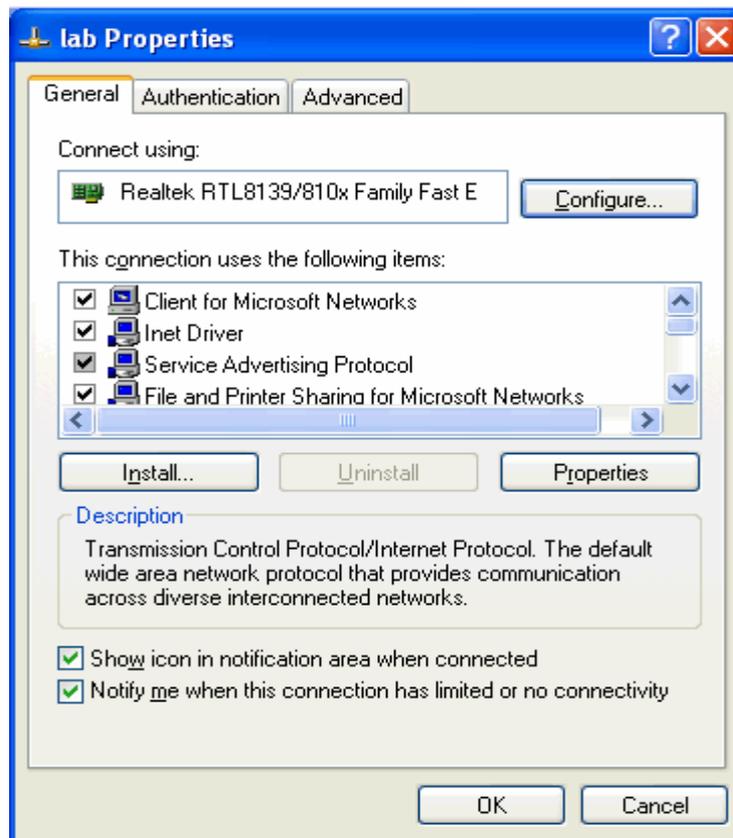
```
C:\WINDOWS\system32\cmd.exe
Microsoft Windows XP [Version 5.1.2600]
(C) Copyright 1985-2001 Microsoft Corp.

C:\Documents and Settings\Administrator>cd C:\Program Files\Wireshark
C:\Program Files\Wireshark>dumpcap -D
1. \Device\NPF_GenericDialupAdapter <Adapter for generic dialup and VPN capture>
2. \Device\NPF_{C0743F5B-2390-4CC2-B38F-0F2E6B7474CA} <Realtek RTL8139/810x Family Fast Ethernet NIC (Microsoft's Packet Scheduler) >

C:\Program Files\Wireshark>
```

Step 3 Compare the NIC information with that found on the Windows operating system, as shown in [Figure 2-11](#).

Figure 2-11 NIC information on the operating system



Step 4 Record the NIC interface where packets are to be captured.

Step 5 Run the following command to start cyclic packet capture:

```
dumpcap -i 2 -w D:\zhuabao\aa.pcap -b filesize:100000 -b files:100
```

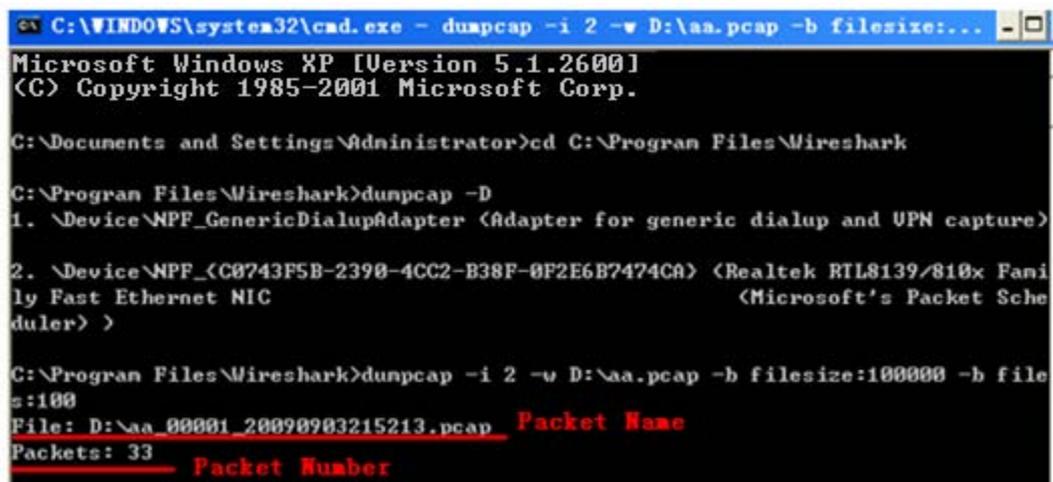
**CAUTION**

In the preceding command:

- **-i**: NIC interface ID
- **-w**: captured packet file name
- **-b**: cyclic packet capture
- **filesize**: size of each packet file, in KB
- **files**: maximum number of packet files that can be saved

The preceding command indicates that the maximum size of a packet file is 100 MB (a new file is created after the original file size reaches 100 MB) and the total number of packet files is 100 (the existing packet files are replaced when the number reaches 100). Therefore, the maximum space occupied by the packet files is about 10 GB.

Figure 2-12 Setting packet capture parameters



```

C:\WINDOWS\system32\cmd.exe - dumcap -i 2 -w D:\aa.pcap -b filesize:...
Microsoft Windows XP [Version 5.1.2600]
(C) Copyright 1985-2001 Microsoft Corp.

C:\Documents and Settings\Administrator>cd C:\Program Files\Wireshark

C:\Program Files\Wireshark>dumcap -D
1. \Device\NPF_GenericDialupAdapter <Adapter for generic dialup and UPN capture>
2. \Device\NPF_{C0743F5B-2390-4CC2-B38F-0F2E6B7474CA} <Realtek RTL8139/810x Family Fast Ethernet NIC (Microsoft's Packet Scheduler)>

C:\Program Files\Wireshark>dumcap -i 2 -w D:\aa.pcap -b filesize:100000 -b files:100
File: D:\aa_00001_20090903215213.pcap Packet Name
Packets: 33
Packet Number
    
```

---End

2.1.3 Packet Filtering by the Capfil

After Wireshark captures a large number of packets, use the Capfil tool to filter the packets. The procedure is as follows:

Step 1 Save the captured packet files in the directory where **capfil.exe** is stored. Open the Command-Line Interface (CLI) and go to the directory.

Step 2 Filter the captured packets:

- Run the following command to specify the IP address, start time, end time, filtering range, and result file name (**out.cap**) and filter packets:
 capfil -r *.pcap -w out.cap -stime "2009-08-28 10:00:00" -etime "2009-08-28 20:00:00" -ip "192.168.0.20"
- Run the following command to specify **udpport** (5060 by default) and filter packets:
 capfil -r *.pcap -w out2.cap -udpport 5060
- Run the following command to specify multiple IP addresses and filter packets:
 capfil -r *.pcap -w out3.cap -ip "192.168.0.20" -ip "192.168.0.19" -ip "192.168.0.18"

---End

2.1.4 Black Box

Introduction

A black box is a .dat file that is named by the SoftCo IP address and file generation time and saved in the flash. The file records call stack information before a system restart and is used to locate system restart and breakdown faults.

Obtainment

To obtain a black box, proceed as follows:

- Step 1** Run the TFTP server (the 3CDaemon tool is recommended) and specify a TFTP path.
- Step 2** Run the following command to change the SoftCo IP address to that of the TFTP server:
 conf system hostip IP address of the TFTP server
- Step 3** Run the following command to upload the black box file:
 config upload file lastwords slot <0-9>
- End

Commands

Table 2-1 lists the black box commands and their functions.

Table 2-1 Black box commands and functions

Command	Function
debug print task switch info	Displays task switch information after the watch dog is cleared.
debug show last exception information boardno < boardno> NOTE The value of boardno for SoftCo5816 is 0 and that for SoftCo9500 is 1 .	Displays information about the last error on the MCU.
debug print stack content taskflag root place backup	Displays information about the last stack used by the root task.
debug print stack content taskflag cli place backup	Displays information about the last stack used by the cli task.
debug print stack content taskflag exc place backup	Displays information about the stack used by the exception task.
debug print stack content taskflag reboot place backup	Displays information about the stack used by the reboot task.
debug print stack content taskflag int place backup	Displays information about the stack used by the task where services are interrupted.
debug print cli history info place backup	Displays cli and omu task records in the last system running.
show system reboot info	Displays system restart records.

2.1.5 Log Collection by the UCMaint

Introduction

Logs are generally used to locate internal SoftCo faults. The UCMaint tool is used to collect logs in the new SoftCo versions. In versions earlier than V1002002C02LENT10, the CLI is used to collect logs. Before collecting logs, determine the target module based on the fault symptom. Therefore, you must understand the basic SoftCo modules. [Table 2-2](#) describes the basic SoftCo modules.

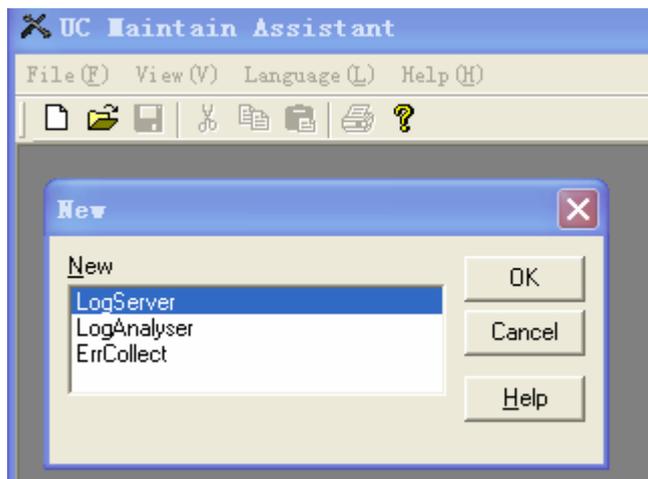
Table 2-2 SoftCo modules

Module	Function
CCM	The CCM is a core call processing module. It provides number analysis, user location, trunk selection, service control, and charging control. The CCM logs are required generally.
USAM	The USAM manages intra-office users. The USAM logs are required for user-related faults.
AT0, PRI, SIPTK, CNO1, ISUP, and TUP	The modules correspond to the AT0, PRI, SIPTK, CNO1, ISUP, and TUP trunks. Logs of these modules are required for related trunk faults.
SIP	SIP logs are required for SIP user and trunk faults. Before displaying SIP logs, run the following command: <code>debug debug_pid os_pid_sip cmd 40 p1 1</code>
CM	The CM manages call connections, such as the following: <ul style="list-style-type: none"> • Establishes and terminates bidirectional, upstream, or downstream network connection. • Releases resources. • Establishes and terminates third-party break-in • Establishes and terminates conference call connections
RM	The RM manages DSP resources. RM logs are required for voice play and digit collection faults.
NM	NM logs are required for SIP registration faults.
NCM	The NCM establishes and terminates narrowband connections.

Procedure

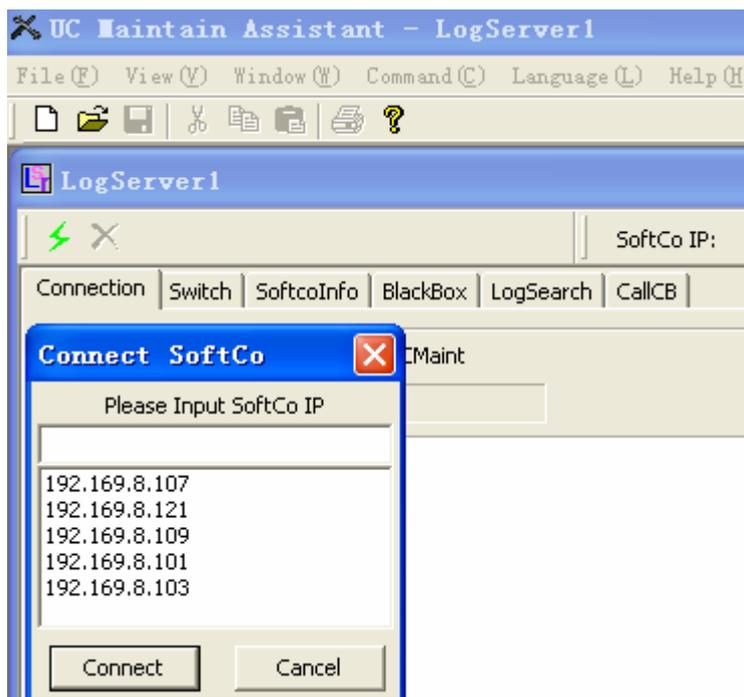
- Step 1** Run the UCMaint, choose **File > New**, select **LogServer** in the displayed window, and click **OK**, as shown in [Figure 2-13](#).

Figure 2-13 Creating a connection to the SoftCo



Step 2 Click **Connect**, enter the SoftCo IP address, and click **Connect**, as shown in [Figure 2-14](#).

Figure 2-14 Connecting to the SoftCo



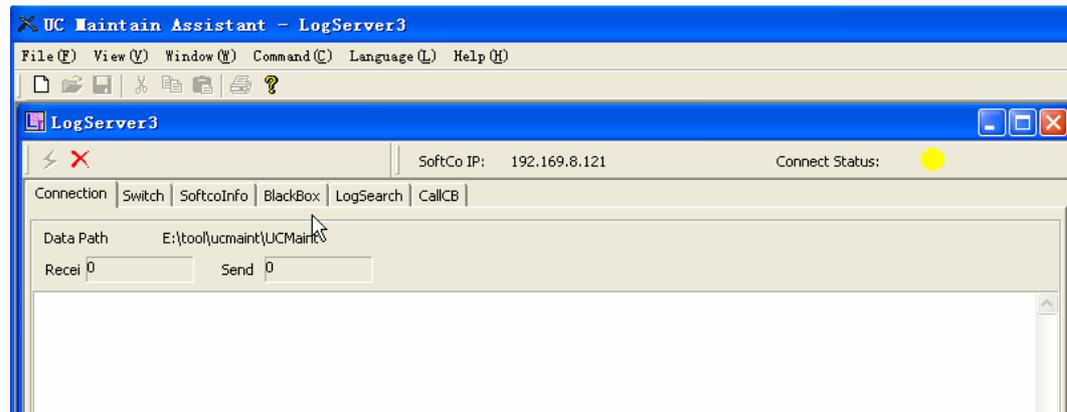
After the LogServer connects to the SoftCo, the LogServer status is .

 **CAUTION**

Multiple LogServers can be created on the UCMaint and connected to multiple (20 at most) SoftCos. Each SoftCo, however, can connect to only one LogServer.

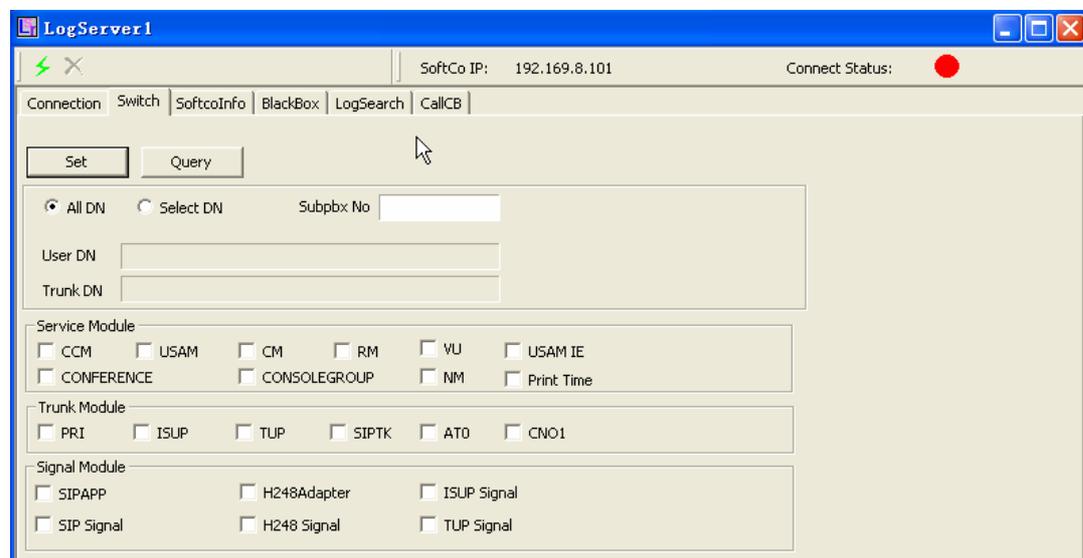
The connecting page is displayed, as shown in [Figure 2-15](#).

Figure 2-15 Connecting to the SoftCo



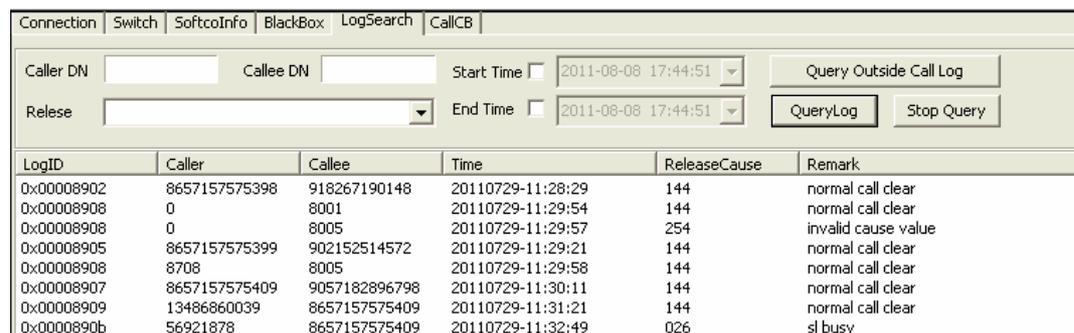
Step 3 Click the **Switch** tab and select target modules, as shown in [Figure 2-16](#).

Figure 2-16 Selecting target modules



Step 4 Click the **LogSearch** tab and collect logs, as shown in [Figure 2-17](#). Logs about a call can be collected only after the call is complete.

Figure 2-17 Querying logs



After log collection, a folder named by the SoftCo IP address is generated in the UCMaint path. The collected log files are saved in the folder. You are advised to pack the folder and send it to the R&D personnel for analysis if necessary.

----End

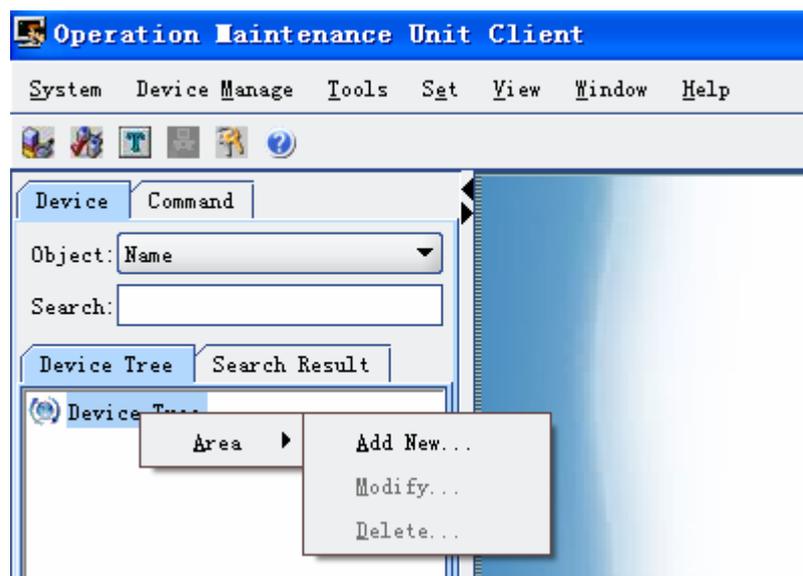
2.1.6 Signaling Tracing by the OMU

Signaling is often traced to locate SoftCo connection faults. Only logs about signaling interaction are collected during signaling tracing. The OMU can collect SIP, H248, PRI, SS7, and R2 signaling. You must obtain an OMU license before using it.

Procedure

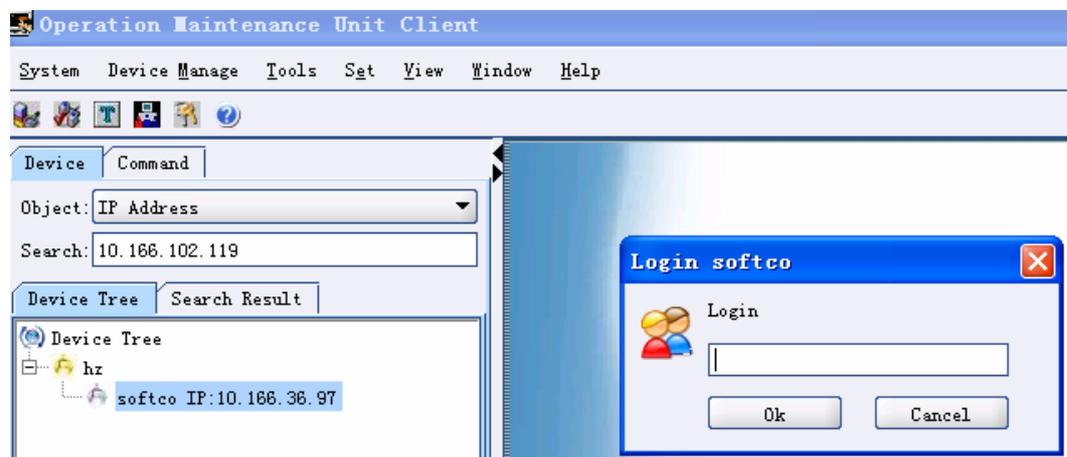
- Step 1** Run the OMU. The initial password is **huawei**.
- Step 2** Add an area named **hz**, as shown in [Figure 2-18](#).

Figure 2-18 Adding an area



Step 3 Add a SoftCo server with the SoftCo IP address, as shown in [Figure 2-19](#).

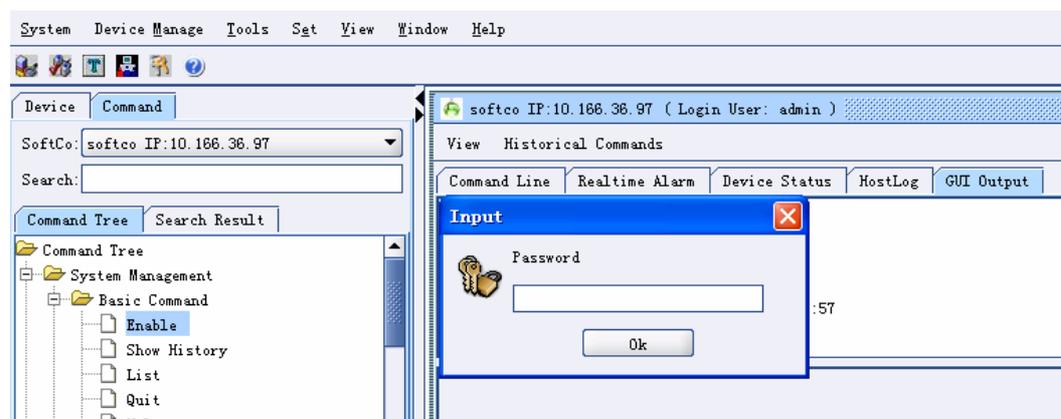
Figure 2-19 Adding a SoftCo server



Enter the login name and press **Enter**. Enter the login password and **en**.

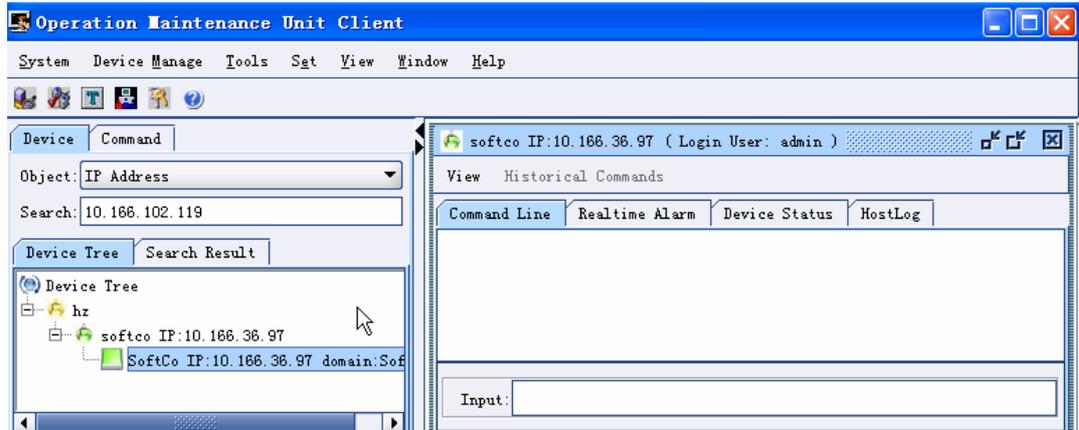
Enter the configuration mode password, as shown in [Figure 2-20](#). The initial password is **huawei**. The OMU can trace signaling only in configuration mode.

Figure 2-20 Entering the configuration mode password



The page shown in [Figure 2-21](#) is displayed after successful login.

Figure 2-21 Successful login



Step 4 Trace SIP signaling, as shown in Figure 2-22 and Figure 2-23. The method for tracing H248 signaling is the same.

Figure 2-22 Starting SIP signaling tracing

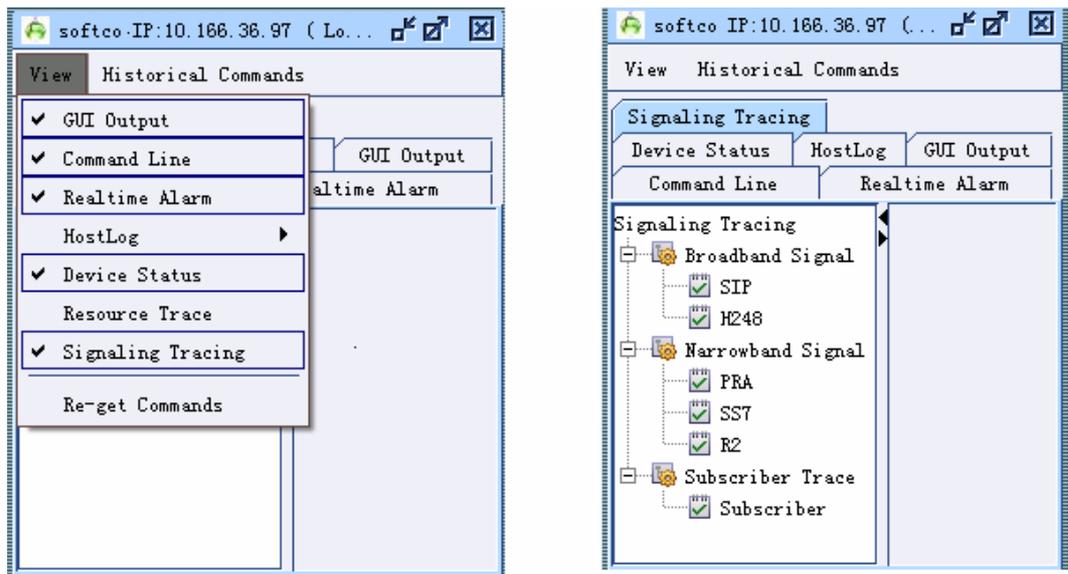
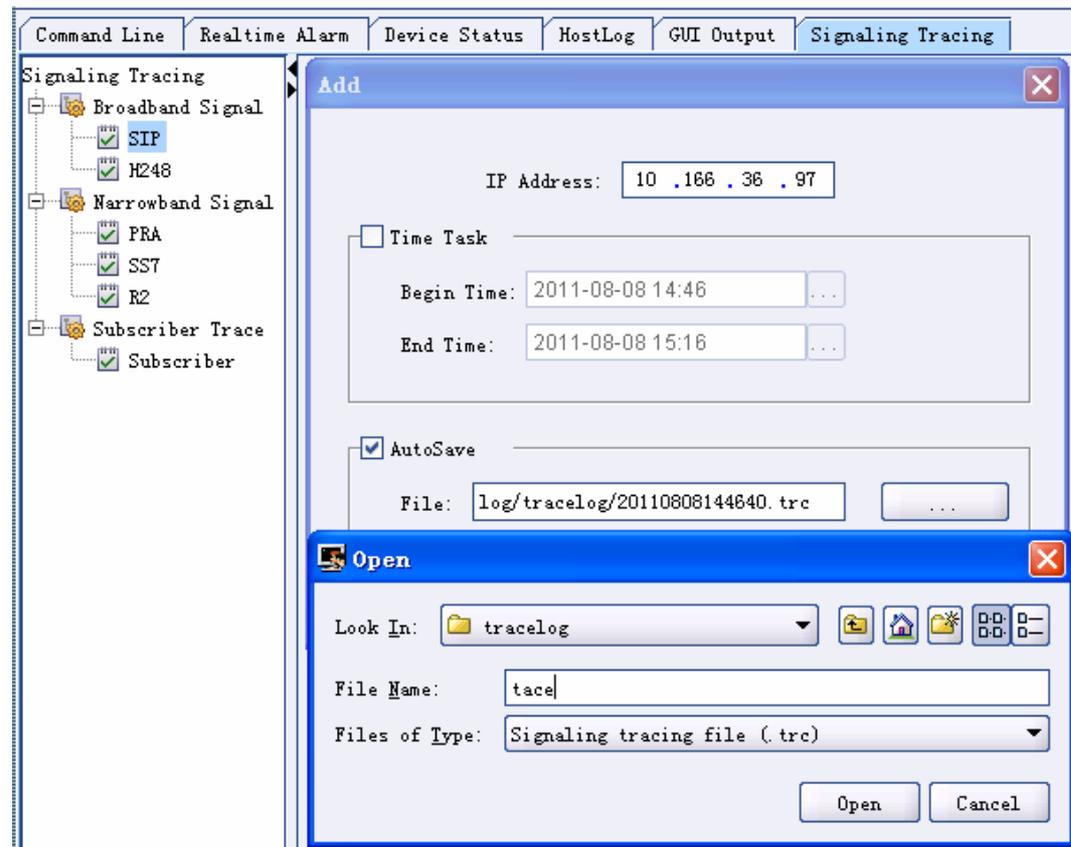
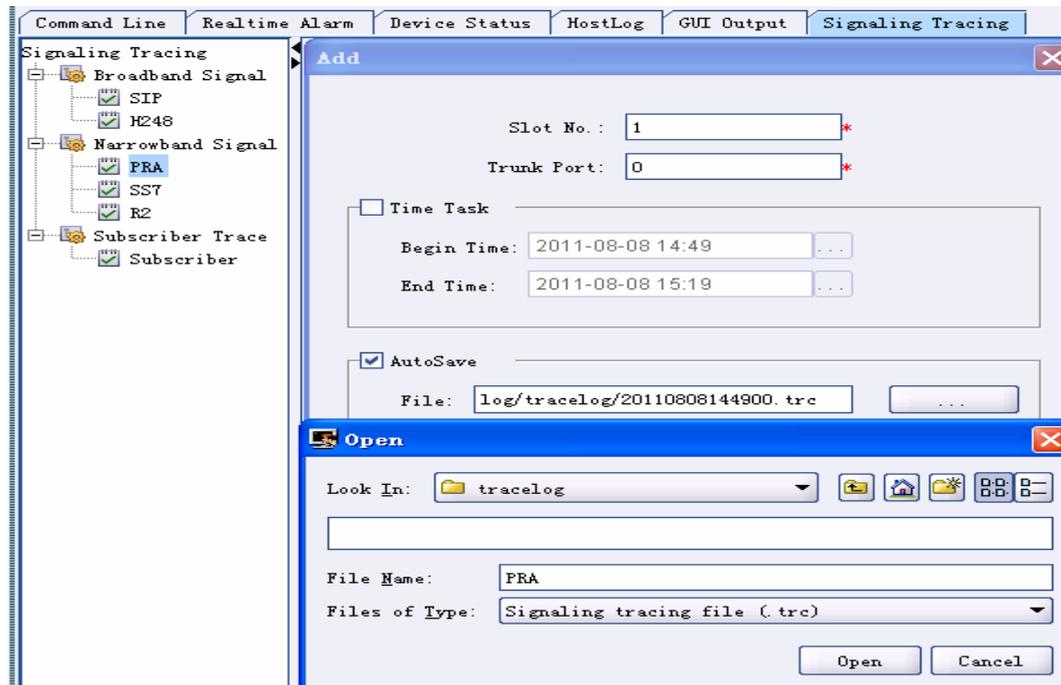


Figure 2-23 Setting signaling tracing parameters



Step 5 Trace PRA signaling, as shown in [Figure 2-24](#). The methods for tracing ISUP, TUP, and R2 signaling are the same.

Figure 2-24 Tracing PRA signaling



----End

2.2 AT0 Ground Check

2.2.1 AT0 Ground Specifications

Common Device Ground Specifications

Table 2-3 Common device ground specifications

No.	Specifications
1	The design for ground must follow the principle of equal voltage and equal electric potential. That is, the working ground and protection ground (including the shielded ground and the lightning-proof ground of the cable distribution frame) are jointly grounded in the same group of ground electrodes.
2	The cable tray, rack or shell, metal ventilation pipe, and metal door or window in the equipment room must be grounded for protection.
3	The metal device parts that are neutral in normal conditions must be grounded for protection.
4	The ground cable must be connected properly to the protection ground bar of the equipment room.
5	Only the specified device can be used as components for the electrical connection of the ground cable.

SoftCo Ground Specifications

Table 2-4 SoftCo ground specifications

No.	Specifications
1	All communication devices and auxiliary devices (such as mobile base station, transmission devices, switches, power supply devices) in the equipment room must be grounded for protection. Connect all protection ground (PGND) cables for various devices jointly to a general ground bar, and then to the same PGND bar together with the PGND of devices in the room.
2	The PGND of the equipment is shorted to the copper protection ground bar provided by the customer. The short-circuiting cable used should be an alternating yellow and green plastic insulating one with copper core, with cross-sectional area greater than 35 mm ² .
3	There are ground terminals and ground flags at the lower part of the front door, rear door and side panel of the cabinet, connected to the ground terminals of the cabinet framework through connection cables with cross-sectional area no less than 1.6 mm ² .
4	Keep all metal components of a cabinet in good conductivity. No insulating coating can be sprayed on the connection between the metal components.
5	Connect the cabinets in the same row closely by fastening captive screws and gaskets on the top of the cabinets. Do not spray coating into a rectangle area of 30 x 50 mm around the connection hole for captive bolt. Measures to prevent rust and corrosion must be taken for this area. Zinc electroplating with iridescent yellow chromate conversion coating should be applied to the gasket and nut to ensure sufficient electric contact.
6	During combination cabinets of the same type, short-circuiting cables are used to connect the ground busbars (if any) of the cabinets. The cross-sectional area of the short-circuiting cable is 6 mm ² and the length is less than 300 mm. Connect the two ends of the short-circuiting cable respectively to the ground busbar terminals on the neighboring cabinets and fix them firmly.

Communication Cable Ground Specifications

Table 2-5 Communication cable ground specifications

No.	Specifications
1	The AC power supply system of the equipment room uses the TN-S power supply mode.
2	The inlet for the AC power cable at the equipment room should be equipped with a lightning protection device with a nominal discharging current not less than 20 kA.
3	The protection ground for power supply and that for devices share the same group of ground electrodes. If the power supply and devices are in the same equipment room, try to use the same protection ground bar for them.

No.	Specifications
4	Add lightning protection circuit for the AC power interface.
5	The positive pole of the -48 V DC power supply (or negative pole of the 24 V DC power supply) must be grounded at the output of the DC power supply.
6	The working ground and protection ground of the DC power supply must use the same group of ground electrodes with the protection ground of the switches. If the power supply and devices are in the same equipment room, try to use the same protection ground bar for them.
7	Add surge protection for the DC power interface.

Signal Cable Ground Specifications

Table 2-6 Signal cable ground specifications

No.	Specifications
1	If there are digital trunks that connect a transmission device directly or indirectly to a wireless communication station, install an E1 lightning protection device for the relative interface of the transmission device.
2	Equip the cables laid outdoors with the metal jacket whose two ends are well grounded, or connect the cables to the protection ground bar of the equipment room. For cables inside an equipment room, install the lightning protection device at the device interfaces. The PGND cable for the lightning protection device should be as short as possible.
3	Both ends of the external conductor of the coaxial cable and those of the shield layer of the shielded cable must have good electric contact with the metal shell of the device they connect to.
4	In the incoming and outgoing signal cables to and from the office, the idle line pair inside the cable must be grounded for protection.
5	The Tone & Data Access (TDA) cable will inevitably pass the Main Distribution Frame (MDF) with security unit when going out the office. Its shield layer must be connected to the protection ground of the MDF. The MDF must use the same group of ground electrodes with the cabinet.
6	The signal cables within the area of the communication office and mobile station should not be arranged aerially.

Cable Ground Specifications

Table 2-7 Cable ground specifications

No.	Specifications
1	The ground leading cannot be arranged parallel to the signal cable, and crossover is not allowed.
2	The ground cable cannot be led in aerially, but buried in the earth globally or arranged indoor.
3	Do not extend the PGND cable, or add any switch or fuse.
4	The PGND cable used should be an alternating yellow and green plastic insulating one with copper core.
5	Do not connect the neutral line of the AC power cable with the protection ground of any telecom device in the equipment room.
6	The length of the PGND cable should not exceed 45 m and should be as short as possible. If it is longer than 45 m, you can ask the user to replace the ground bar nearby.

Basic Ground Requirements

Table 2-8 Basic ground requirements

Requirements	Effect
<p>1. Ground mode: Joint ground. Connect the working ground, PGND, and lightning protection ground to the same group of ground electrodes.</p> <p>2. Ground impedance: < 10 ohms</p> <p>3. Ground cable: The cross-sectional areas of PGND cables are determined by the maximum current. The cables must be efficient conductor cables, for example, copper cable. Bare connector cables cannot be used.</p>	<p>Standard and efficient ground is a major measure to keep communication devices stable. It protects people and devices from static electricity, lightning, and electromagnetic interference.</p>

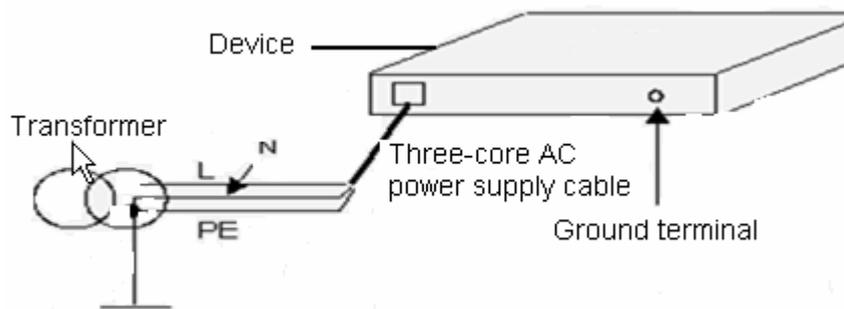
Detailed Ground Requirements

When the ground bar is already installed in the equipment room, check whether the ground bar is reliably grounded. If the ground bar is reliable, connect one end of the yellow-and-green PGND cable to the wiring terminal on the ground bar, and tighten the fixation nut firmly. The cross-sectional area of the PGND cable must not be smaller than 4 mm^2 , and the PGND cable should be as short as possible. Do not wind the cable.

If a device is installed on a 19-inch cabinet, connect the yellow-green PGND cable of the device to the ground terminal on the 19-inch cabinet and connect the ground terminal to the ground bar of the equipment room.

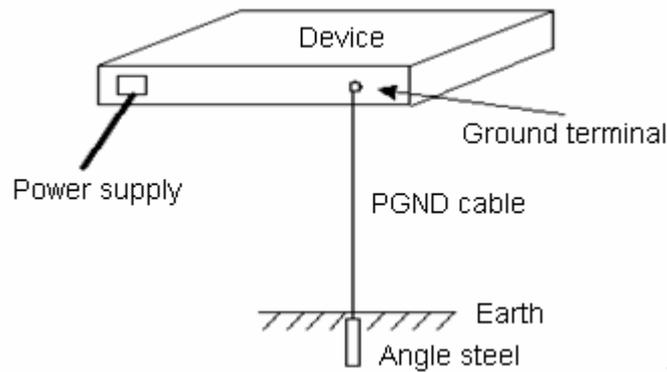
If a device uses 220 V AC power supply, the PE line of the AC power supply can be used as the ground cable, as shown in [Figure 2-25](#). Ensure that the PE line of the AC power supply is properly grounded inside the power distribution room or beside the AC voltage transformer. In addition, ensure that the PE terminal of the device is reliably connected to the PE line of the AC power supply. Use the three-core cable with PGND cable as the power cable for the device.

Figure 2-25 AC power supply ground



When no ground bar is installed in the equipment room, and the ground electrode can be buried in the ground electrode nearby, use an angle steel or steel pipe not shorter than 0.5 m. Bury the angle steel or steel pipe directly in the earth. The cross-sectional area of the angle steel should not be smaller than $L \times W \times H = 50 \times 50 \times 5 \text{ (mm}^2\text{)}$, and the steel pipe should not be thinner than 3.5 mm. The material used should be steel plated with zinc. Weld the yellow-green PGND cable of the device with the angle steel. Paint the surface of the welding point with anti-rustic paint. The cross-sectional area of the PGND cable must not be smaller than 4 mm^2 , and the PGND cable should be as short as possible. Do not wind the cable. See [Figure 2-26](#).

Figure 2-26 Ground without any ground bars



Ground Impedance Requirements

The ground impedance of an equipment room is determined by the equipment room environment. The ground impedance of a central equipment room must comply with standard YDJ26-89 (less than 1 ohm); that of a common equipment room must be less than 5 ohms; that of angle steel buried in the earth must be less than 10 ohms. In the area with high soil impedance ratio, spray some salt water or impedance-reducing agents to the earth.

2.2.2 Check Procedure

The procedure is as follows:

- Step 1** Verify that the device ground cables are connected to the ground bar of the equipment room.
- Step 2** Verify that devices are installed in cabinets and the ground terminals of cabinets are properly connected to the ground bar of the equipment room.
- Step 3** Verify that the ground bar of the equipment room is properly connected to the ground busbar (without paint) of the building.
- Step 4** If the power supply cable is used as the ground cable, verify that the power supply cable is a three-core cable without extended two-core cables.
- Step 5** Use multimeter to test the voltage difference between the chassis shell ground and the earth. If the voltage difference is greater than 10 V, the ground is poor.
- Step 6** Use multimeter to test the impedance between the chassis shell ground and the earth. If the impedance is greater than 10 ohms, the ground is poor.
- Step 7** If you cannot test the voltage of the earth, use the multimeter to test the voltage difference between the chassis shell ground and the live line, naught line, and earth line in the three-core ground cable. If the voltage difference is greater than 10 V, the ground is poor.

----End

2.3 AT0 Ground Impedance Test

2.3.1 Ground Impedance Test Principles and Precautions

Background

A ground is a conducting connection between an electrical circuit or device and the earth (generally a ground electrode in the earth) to discharge the system of current. The ground system includes the ground electrode and ground cables.

Ground Types

- PGND
When an electrical device is leaking because of some faults, personnel and devices could be exposed to the risk of electric shock. The PGND is provided to connect the electrical device house to the ground to prevent electric shock.
- Lightning protection ground
Lightning protection ground deals with the protection of buildings and other structures due to direct damage from lightning.
- Working ground
Working ground is to connect an electrical circuit to the ground as required by the normal work or fault location.

In a ground system, a ground electrode is buried in the earth and is connected to a ground conductor by a connector. The ground conductor connects to the ground bar or device houses. If multiple devices connect to the same ground electrode by conductors, a ground bar is required and the ground bar should be installed near to the ground electrode. The conductors from different devices must be connected to the ground bar separately.

Test Principles

The ground impedance is mainly affected by the following variables:

- Depth of the ground electrode
- Diameter and length of the ground electrode
- Number of ground electrodes
- Around geographical environment (plain, slop, or ditch)
- Soil humidity

The 3-pole Fall of Potential method is used to test the ground impedance. The method is as follows:

Position two ground stakes in the soil in a straight line on one side of the ground electrode (X), equidistant from one another. The stake (Y) is 20 m away from the ground electrode and stake (Z) is 40 m away from the ground electrode. The potential difference between X and Y and the current between X and Z are measured by a tester. Using Ohm's Law ($V=IR$), the tester automatically calculates the impedance.

Precautions

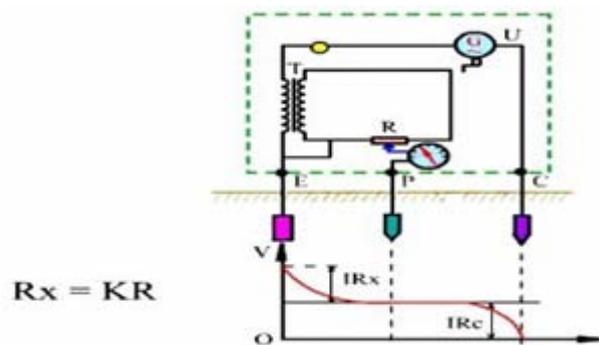
- The ground impedance changes with the season, weather, and soil humidity. Generally, the ground impedance tested in autumn is more precise.

- Before testing the PGND impedance, disconnect the ground cable from the device.
- If a ground electrode is severely rusty or corroded, polish the electrode and then test the impedance.
- Before testing the working ground (single-point ground), verify that the ground cable is connected to the device properly. If they are not connected, you cannot perform test; if the connection is abnormal, the test result is not accurate.
- Select a suitable test point because the test results on different points may vary greatly. If there is no available test point, you can remove the original ground conductor if necessary and connect a jumper cable that is easy to test.
- Prevent noise interference. If the current in the ground connector circuit is large, the test result will be inaccurate or even the impedance cannot be tested and **Noise** may be displayed on the tester.

Normally, the PGND and working ground impedance of devices is smaller than 4 ohms and the lightning protection ground impedance of high buildings is smaller than 10 ohms. If the ground impedance does not meet the requirements, report the fact and monitor the rectification, such as, rebury the ground electrode or verify the ground conductor connections.

Figure 2-27 shows the ground impedance tester.

Figure 2-27 Ground impedance tester



2.3.2 Ground Impedance Test Method

Impedance Requirements

- AC working ground: not greater than 4 ohms
- Security working ground: not greater than 4 ohms
- DC working ground: determined by the actual devices
- Lightning protection ground: not greater than 10 ohms
- Joint shielded system ground: not greater than 1 ohms

Resistance Tester Introduction

ZC-8 resistance tester is used to test the ground resistance of power supply systems, telecommunication devices, and lightning rods. IT can also test the resistance of low-resistance conductors and soil resistivity. The tester consists of a handle electric generator, current mutual-inductors, sliding resistor, and galvanometer. All these components are packed in plastic. In addition, probes and conductors are provided with the tester.

Preparation for Resistance Test

Prepare the following tools:

- ZC-8 resistance tester
- Two test probes
- Three conductors with the length of 5 m, 20 m, and 40 m.

Before impedance test, connect a 5 m conductor to point E, a 20 m conductor to point P, and a 40 m conductor to point C, and connect the other ends of the conductors to ground electrode E', potential probe P', and current probe C' respectively. Points E', P', and C' must be on a straight line and the distance between each other is 20 m.

Figure 2-28 shows the connection diagram for testing impedance greater than or equal to 1 ohm.

Figure 2-28 Connection diagram for testing impedance greater than or equal to 1 ohm

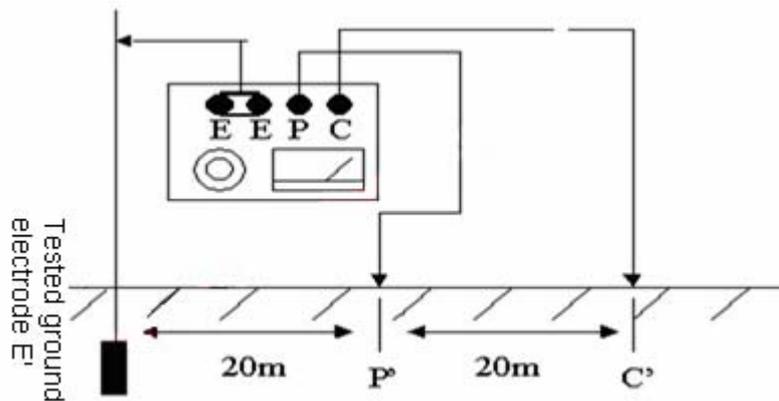
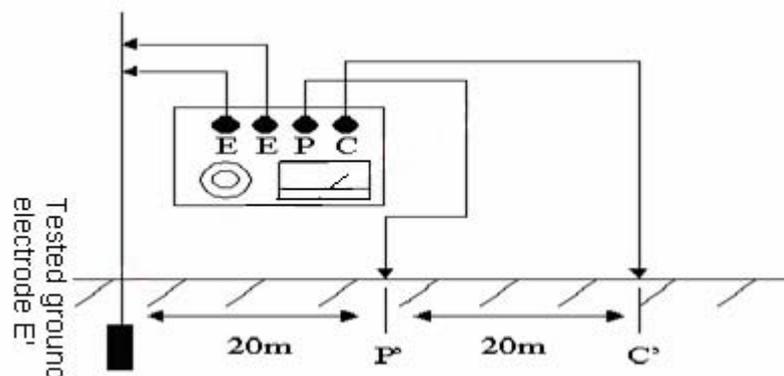


Figure 2-29 shows the connection diagram for testing impedance smaller than 1 ohm (both conductors on points E are connected to the ground electrode).

Figure 2-29 Connection diagram for testing impedance smaller than 1 ohm



Test Procedure

- Step 1** Ensure that the connections between the tester, ground electrode, and probes are correct.
- Step 2** Place the tester horizontally and ensure that the pointer is on the central line.
- Step 3** Set the ratio scale to the maximum, rotate the electric generator handle slowly, and move the tester until the pointer is on the central line.
- Step 4** When the pointer becomes stable on the central line, rotate the electric generator quickly (more than 150 rounds per minute), and move the tester until the pointer is on the central line again.
- Step 5** If the reading is smaller than 1, change the ratio scale to a smaller one and perform the test again.
- Step 6** If the pointer shakes, change the handle rotating speed until the pointer becomes stable.

----End

Precautions

- Place and take the tester carefully and avoid severe shake.
- The ground conductor must be disconnected from devices.
- The ground electrode to be tested cannot be surrounded by scattered current or polarized soil.
- Do not test the ground impedance when the soil humidity is too high (for example, after rain) or the temperature, pressure, and climate changes greatly.
- The probe must be far away from the big metal entities, such as pipes, cables, and railways. The current probe must be 10 m away from the metal entities and the potential probe must be 50 m away. If a metal entity does not connect to the ground system, the distance can be shortened by 1/2 to 1/3.
- The conductor must be well insulated.
- Select a proper position for the current probe and ensure that the potential of the ground electrode is 0 after the current probe is inserted to the soil.
- Test the impedance when the soil impedance ratio is high, such as in earlier winter.
- No electrolyte is allowed around the test area.
- If the tester is highly sensitive, plug the potential probe shallower; if the tester is not sensitive, moisten the probe.