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Preface

In this issue of ZTE's "Maintenance Experience", we continue to pass on various field reports and resolutions that are gathered by ZTE engineers and technicians around the world.

The content presented in this issue is as below:

- One Special Document
- Ten Maintenance Cases of ZTE's Data Products

Have you examined your service polices and procedures lately? Are you confident that your people are using all the tools at their disposal? Are they trained to analyze each issue in a logical manner that provides for less downtime and maximum customer service? A close look at the cases reveals how to isolate suspected faulty or mis-configured equipment, and how to solve a problem step by step, etc. As success in commissioning and service is usually a mix of both discovery and analysis, we consider using this type of approach as an example of successful troubleshooting investigations.

While corporate leaders maintain and grow plans for expansion, ZTE employees in all regions carry out with individual efforts towards internationalization of the company. Momentum continues to be built, in all levels, from office interns to veteran engineers, who work together to bring global focus into their daily work.

If you would like to subscribe to this magazine (electronic version) or review additional articles and relevant technical materials concerning ZTE products, please visit the technical support website of ZTE Corporation (http://ensupport.zte.com.cn).

If you have any ideas and suggestions or want to offer your contributions, you can contact us at any time via the following email: doc@zte.com.cn.

Thank you for making ZTE a part of your telecom experience!

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802.1x Protocol Configuration

⊙ Wang Huali / ZTE Corporation

Key word: 802.1x

1 802.1x Overview

IEEE 802.1x is called Port-based Network Access Control Protocol. Port-based access control provides authentication and authorization for users or devices to access to LAN by means of IEEE 802.X. 802.1x authentication is able to provide point-to-point user identification in multi-point access environment.

In LAN defined by IEEE 802.x, as long as a physical interface exists, the unauthorized network device can access to LAN, or unauthorized user can access to network through a device connected to LAN. For example, an office network can access to public network. In such a network, the network owner does not allow unauthorized users or devices to access network and use network service.

With the rapid development and large scale application of LAN, the requirements for safety authentication are under investigation. The heat topic in the industries is how to make use of the simple and cheap characteristics of LAN to provide authentication for user or devices. Therefore, IEEE 802.1X emerge as the times require.

2 802.1x Protocol Architecture

802.1x protocol architecture is shown in Figure 1.

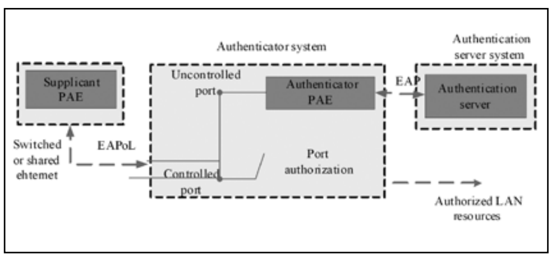


Figure 1. 802.1x Architecture

802.1 x architecture consists of the following main parts:

- Supplicant System
- Authenticator System
- Authentication Server System

Figure 1 shows the relation and communication among three main parts. Client software is installed on Supplicant system. User enters 802.1x authentication process by using client software. To support port-based access control, supplicant system has to support EAPoverLAN (EAPoL). Authenticator system is a network device supporting 802.1x.

3 Port State and Control Mode

The ports of authenticator system are divided into two logical port, controlled port and uncontrolled port.

Uncontrolled port is used to transmit authentication protocol packets no matter it is authenticated or unauthenticated.

Controlled port is used to transmit service packets. If user passes authentication, the controlled port enters authenticated state and it can transmit service packets. If user fails to pass authentication, the uncontrolled port enters unauthenticated state and it can not transmit service packets.

Controlled port is disabled in the state of unauthenticated. In this time, switching function of switch is disabled. That is to say, switch can not exchange data by searching destination MAC addresses. Therefore, service packets of users can not be transmitted.

After user passes the authentication, the controlled port is disabled and it enters authenticated state. In this time, switching function is enabled in switch. Switch is able to exchange data with the conventional method. User service packets can be transmitted well.

There are many methods to control port. The port can be a logical port, physical port, VLAN or VLAN+physical port and so on.

In physical port-based control mode, each physical port consists of two logical ports, controlled and uncontrolled port. Uncontrolled port transmits authentication protocol packets, and controlled port transmits service packets.

Another control mode is based on the VLAN ID of the user device. VLAN ID of user device is considered to be a port. Each user device has two logical ports, controlled and uncontrolled port.

4 802.1x Authentication Process

802.1x authentication process is shown in Figure 2.

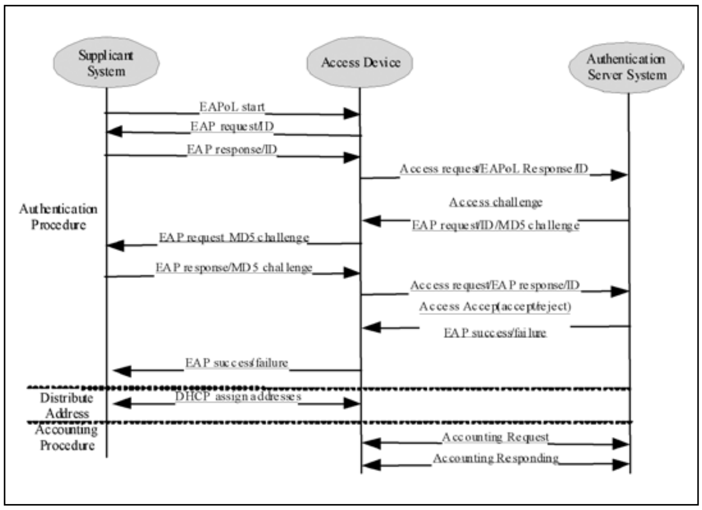


Figure 2. 802.1x Authentication Process

The authentication procedure is described as follows:

1. 802.1X supplicant system sends EAPOL-Start packet to access device for starting 802.1X authentication access.

2. Access device sends EAP-Request/ Identity response packet to supplicant system for requesting the legal identifier, such as, user name and password.

3. Supplicant system responds to

EAP-Response/Identity packet including username and password to access the device. The authentication packet is transferred through the uncontrolled port because the supplicant system has not passed the authentication.

4. Access device encrypts EAP-Response/Identity packet into Radius Access-Request packet and sends Radius Access-Request packet to authentication server system for authentication.

5. Authentication server system sends RADUIS Access-Challenge packet including EAP-Request/MD5-Challenge to supplicant system through access device.

6. Access device sends EAP-Request/MD5-Challenge to supplicant system for requesting authentication.

7. After EAP-Request/MD5-Challenge packet is received by supplicant system, Challenged-Password which is calculated from password and Challenge by MD5 arithmetic is responded to access device through EAP-Response/MD5-Challenge.

8. Access device sends Challenge, Challenged password and user name to Radius server for authentication.

9. RADIUS server implements MD5 arithmetic according to user information for judging whether user is legal or not, and then responds authentication result packet to access device. If the authentication is successful, then a packet with negotiation parameters and the related service attribution is sent back for authorization. If the authentication is failed, then the authentication procedure ends.

10. If the authentication is successful, the controlled port is enabled. User obtains the allocated IP address from DHCP Server through the standard DHCP protocol (it can be DHCP Relay).

11. The allocated address information is responded to authentication system. Authentication system records user information, such as MAC address, IP address and so on, and creates dynamic ACL list to control user authority.

12. Access device will send accounting request to authentication server system when it detects netflow.

13. Authentication server system replies access device for accounting. At this step, use connects the Internet.

14. To leave the network, the user will pass through software on supplicant system. When receiving the leaving request, the access device will notify authentication server system to stop accounting and delete user information. The controlled logical port will be disabled. Users need to authenticate if they want to connecting network.

15. Access device ensures the activity of link through periodic detection. If computer corruption occurs, access device will consider the user has left the computer automatically after launching detection many times. Access device will send the request to stop accounting to authentication server system.

5 Configuring 802.1x

5.1 Configuration Idea and Steps

The following aspects need to be considered in 802.1x configuration,

- Enable authentication
- Create and delete authentication rule
- Create and delete local authentication user (if local authentication is required)
- Configure authentication rule
- Configure radius server
- Configure 802.1x parameters

Configuration steps are shown below.

1. Enable authentication, enter NAS configuration mode from global configuration mode.

2. Create or delete authentication rule. Authentication rule can be either VLAN+port based

or specified VLAN port-based.

3. Create or delete local authentication user. When the mode is local authentication, configure user information of local authentication, including user name, password, VLAN ID, MAC address and so on.

4. Configure authentication rule and parameters, including,

● The parameter control, it has two options, dot1x and dot1x-relay

● Access authorization mode (authorization): auto, force-unauthorized and force-authorized

● Access authentication mode (authentication): RADIUS, local

● Authentication protocol in RADIUS server (protocol): pap and chap

● User name is used with ISP name

● The default user name

● Authentication and accounting RADIUS server (Radius-Server)

● On-line detection of access user (keepalive): enable, disable

● On-line detection period (keepalive-period)

● Access accounting (accounting): enable, disable

● Multi-user access (multiple-hosts)

● The maximum number of users (max-hosts)

5. Configure RADIUS server, authentication and accounting parameters, RADIUS server, and retransmission times.

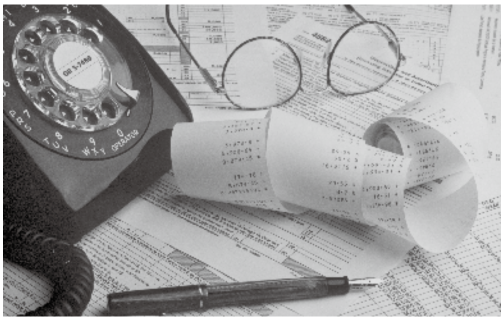
6. Configure 802.1x parameters.

● Re-authentication: enable, disable. 802.1x protocol has a re-authentication mechanism. The mechanism can be enabled or disabled. If it is enabled, user needs to restart its authentication.

● Re-authentication-period: Configure the time interval for performing re-authentication.

● Quiet-period: It is used to control a user not to restart its authentication in a certain time if the authentication is failed.

● The time interval for retransmitting client ID (tx-period).



● The period for waiting response from client (supplicant-timeout).

● The period for waiting response from authentication server (server-timeout).

● The retransmission times for waiting authentication server response (max-request).

For detail configuration commands, please refer to user manual.

5.2 802.1x Configuration Example One:dot1x-relay Local Authentication

As shown in Figure 3, PC1 and PC2 belong to VLAN 100. There are two G series switches, A and B. Switch A acts as dot1x server, and switch B acts as dot1x-relay. Dot1x server and dot1x-relay are interconnected through Trunk.

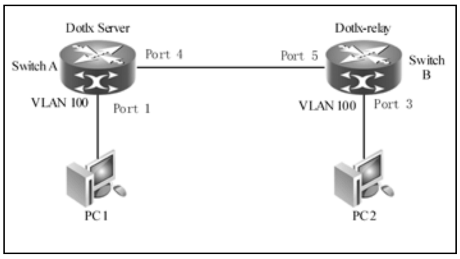


Figure 3. Dot1x-relay Local Authentication

Configuration requirements:

● The VLAN 100-based rule is configured as local authentication in dot1x server.

● Configure multiple-host.

● keepalive-period is 20 seconds.

● Local user name is test and password is test.

1. Configure dot1x server in switch A,

```
ZXR10_A(config)#nas
ZXR10_A(config-nas)#create aaa 10 vlan 100
/* This creates vlan 100-based authentication rule.*/
ZXR10_A(config-nas)#aaa 10 control dot1x enable
/*This configures the parameter control is dot1x.*/
ZXR10_A(config-nas)#aaa 10 authentication local
/* This configures access authorization mode is local.*/
ZXR10_A(config-nas)#aaa 10 multiple-hosts enable
/*This configures multiple-hosts.*/
ZXR10_A(config-nas)#aaa 10 keepalive enable period 20
/*This configures keepalive period is 20 seconds.*/
```

2. Configure local user in switch A,

```
ZXR10_A(config-nas)#create localuser 1 name test password test
/*This creates user name and password of local authentication user.*/
ZXR10_A(config-nas)#localuser 1 vlan 100
/*This configures local authentication user VLAN is VLAN 100.*/
```

3. Configure dot1x-relay in switch B,

```
ZXR10_B(config)#nas
ZXR10_B(config-nas)#create aaa 12 vlan 100
ZXR10_B(config-nas)#aaa 12 control dot1x-relay enable
/*This configures This configures the parameter control is dot1x-relay.*/
```

5.3 802.1x Configuration Example Two: Radius Authentication with Accounting Function

As shown in Figure 4, PC1 and PC2 belong to VLAN 100. Radius Server belongs to VLAN 200. The IP address of Radius server is 10.40.92.2, 24 bits sub-network mask, gateway address is 10.40.92.1.

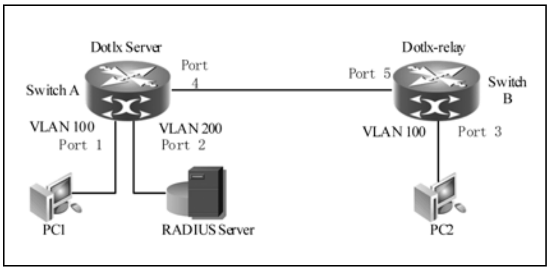


Figure 4. Radius Authentication with Accounting Function

1. Configure authentication rule in switch A.

```
ZXR10_A(config)#nas
ZXR10_A(config-nas)#create aaa 2 vlan 100
ZXR10_A(config-nas)#aaa 2 control dot1x enable
ZXR10_A(config-nas)#aaa 2 authentication radius
/* This configures the access authorization mode is RADIUS server authentication.*/
ZXR10_A(config-nas)#aaa 2 accounting enable
/*This enables accounting function.*/
ZXR10_A(config-nas)#aaa 2 multiple-hosts enable
```

```
ZXR10_A(config-nas)#aaa 2 keepalive enable
ZXR10_A(config-nas)#aaa 2 protocol chap
/*This configures to adopt CHAP as authentication protocol in RADIUS server*/
ZXR10_A(config-nas)#aaa 2 radius-server 1
ZXR10_A(config-nas)#aaa 2 fullaccount enable
/* This configures the user name to bring ISP name.*/
ZXR10_A(config-nas)#aaa 2 default-isp 163
/*This configures the default ISP name is 163.*/
```

2. Configure authentication server in switch A.

```
ZXR10_A(config)#radius server 1 authen master 10.40.92.2 1812 fang
/*This configures IP address of master authentication server is 10.40.92.2, the port number is 1812, authentication key is fang.*/
ZXR10_A(config)#radius server 1 account master 10.40.92.2 1813 fang
/* This configures IP address of master accounting server is 10.40.92.2, the port number is 1813, authentication key is fang.*/
ZXR10_A(config)#interface vlan 200
ZXR10_A(config)#ip add 10.40.92.1 255.255.255.0
```

3. Configure authentication rule in switch B.

```
ZXR10_A(config)#radius server 1 authen master 10.40.92.2 1812 fang
/*This configures IP address of master authentication server is 10.40.92.2, the port number is 1812, authentication key is fang.*/
ZXR10_A(config)#radius server 1 account master 10.40.92.2 1813 fang
/*This configures IP address of master accounting server is 10.40.92.2, the port number is 1813, authentication key is fang.*/
ZXR10_A(config)#interface vlan 200
ZXR10_A(config)#ip add 10.40.92.1 255.255.255.0
```

5.4 802.1x Configuration Example Three: Configuration of Active/Standby Radius Server in Low-end Switch

As shown in Figure 5, T160G connects to two RADIUS authentication servers. One is active, and the other is standby. The IP address of active RADIUS server is 172.16.1.166, and that of standby RADIUS server is 172.16.1.110. The gateway of L2 switch is configured in T160G. L2 switch can access to user directly, or connects to a L2 switch. The management IP address of 2826s is 172.16.254.12, 25 bits sub-network mask. No.24 port connects to 2852s, port 1~23 connect to users.

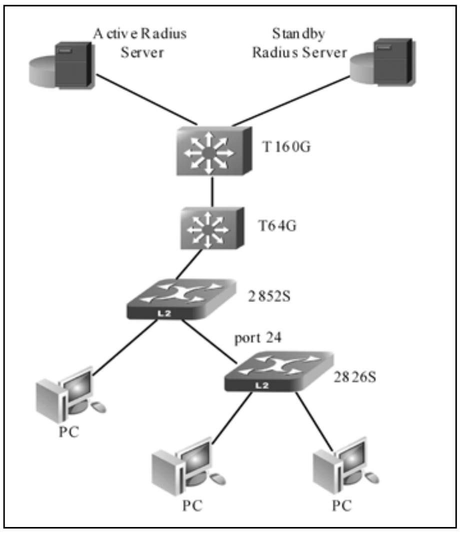


Figure 5. Configure Active/Standby Radius Server in Low-end Switch

1. Configure IP address in 2826s for network management.

```
zte(cfg)#config router
zte(cfg-router)#set ipport 0 ipaddress 172.16.254.12 255.255.255.128
zte(cfg-router)#set ipport 0 vlan 4093
zte(cfg-router)#set ipport 0 enable
zte(cfg-router)#iproute 0.0.0.0 0.0.0.0 172.16.254.1
```

2. To realize 802.1x function, security attribute has to be enabled in port.

```
zte(cfg)#set port 1-23 security enable
```

3. Configure Radius ISP.

```
zte(cfg)#conf nas
zte(cfg-nas)#radius isp daxue enable
/*This adds a ISP called daxue.*/
zte(cfg-nas)#radius isp daxue defaultisp enable
/*This specifies the domain as default domain.*/
zte(cfg-nas)#radius isp daxue sharedsecret ocean
/* This configures shared key of domain as ocean.*/
zte(cfg-nas)#radius isp daxue add accounting 172.16.1.166 1813
/*This adds accounting server whose IP address is 172.16.1.166 in domain, the port number is 1813.*/
zte(cfg-nas)#radius isp daxue add authentication 172.16.1.166 1812
/*This adds authentication server whose IP address is 172.16.1.166 in domain, the port number is 1812.*/
zte(cfg-nas)#radius isp daxue client 172.16.254.12
/*This configures IP address of Radius client as 172.16.254.12.*/
zte(cfg-nas)#radius isp daxue add accounting 172.16.1.110 1813
/*This configures standby accounting server.*/
zte(cfg-nas)#radius isp daxue add authentication 172.16.1.110 1812
/*This configures standby authentication server.*/
```

4. Configure aaa access control.

```
zte(cfg-nas)#aaa-control port 1-23 dot1x enable
/*This enables 802.1x authentication access in port 1~23.*/
zte(cfg-nas)#aaa-control port 1-23 protocol chap
zte(cfg-nas)#aaa-control port 1-23 keepalive client-ip enable
zte(cfg-nas)#aaa-control port 1-23 keepalive enable
zte(cfg-nas)#aaa-control port 1-23 keepalive period 180
zte(cfg-nas)#aaa-control port 1-23 accounting enable
zte(cfg-nas)#aaa-control port 1-23 multiple-hosts enable
zte(cfg-nas)#dot1x quiet-period 0
/* This configures the quiet period is 0. User can re-authenticate without limitation.*/
```

Private Protocol Configuration of ZTE 802.1x Client in 2826S

⊙ Wang Baoyuan / ZTE Corporation

Key words: 2826s, 802.1x, private protocol, authentication timeout

Malfunction Situation

As shown in Figure 1, 802.1x authentication function was enabled in 2826S. User PC accessed to authentication switch 2826S through UT switch and then it was authenticated by AAA server. ZTE 802.1x client was installed in user PC. The user failed to pass the authentication by dialing. The client prompted that the authentication is overtime.

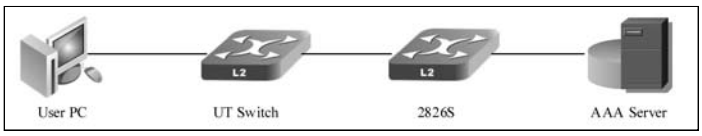


Figure 1. User PC Authentication Timeout

Malfunction Analysis

Engineer enabled DEBUG function of AAA and Radius in 2826S to view the information, as shown below.

```
zte(cfg)#host DEBUG
   Important notice!
------------------------------------
  The debug mode is used to collect some information which may be useful for
  analyzing problems.
  Unauthorized use of those commands is prohibed .
  Those commands are not under tested.
  It is recommended to restart the S300 after run debug commands.
------------------------------------
      Copyright 2002 ZTE.
zte(debug)#debug nas aaa en
zte(debug)#debug nas radius en
```

There was no information in the output result, which indicated that 2826S could not receive 802.1x authentication packets from user PC. Therefore, AAA server would not respond and user could not pass the authentication.

User PC used 802.1x client. 802.1x authentication packets were sent if the software ran properly. Therefore, engineer estimated that authentication packets were lost by UT switch. Engineer captured packets in egress and ingress of UT switch. The result showed that the packets sent by PC arrived in UT switch ingress but 802.1x authentication packets could not be captured in egress. UT switch did not support 802.1x packet transparently transmission so that it discarded 802.1x packets as abnormal packets.

Solution

The following command can be corporately used with ZTE 802.1x client to configure private protocol. The private protocol helps 802.1x packets to pass through the intermediate devices.

zte(cfg)# **dot1x add fid** <X> **mac** <XX.XX.XX.XX.XX.XX>

Engineer selected private protocol option in client configuration and configured MAC address. MAC address has to be consistent with that of authentication switch. After that, the switches coming from other manufactories will broadcast authentication like unknown unicast packet, and the authentication packets will be transmitted to authentication switch finally.

However, it is inconvenient for users. Therefore, engineer modified the command as follows,

zte(cfg)# **dot1x add fid** <VLAN-ID> **mac 01.d0.d0.ff.ff.ff**

Here, <VLAN-ID> indicates that FID which user VLAN belongs to. 01.d0.d0.ff.ff.ff is the default ZTE private MAC address, it does not conflict with other manufactories. The configuration of client can be simplified further. It is enough to select private protocol option. MAC address is not required to be input.

After private protocol was enabled by engineer, user PC passed the authentication and accessed to the Internet. ■

802.1x Authentication Disconnection Malfunction

⊙ Zhang JinTao / ZTE Corporation

Key words: 2626, ZXISAM, AAA, RADIUS, 802.1X, supplicant system, authenticator system, authentication sever

Malfunction Situation

As shown in Figure 1, ZXISAM authentication software was run on PC, 802.1x authentication function was enabled in ZXR10 2626. Client passed the authentication in RADIUS server and then obtained IP address by DHCP to access the Internet. DHCP server was run on T64G.

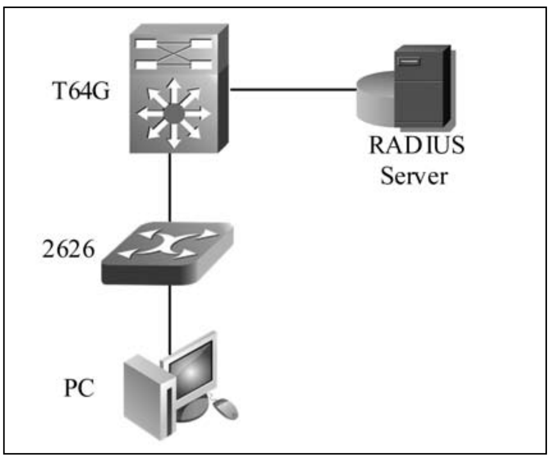


Figure 1. 802.1x Authentication Disconnection Malfunction

The gateway of Radius server was configured in T64G. Network management IP address was configured by 2626. The gateway of 2626 was configured in T64G.

User PC passed the authentication by ZXISAM and was connected to the Internet properly. However, ZXIASM authentication frequently failed after user restarted the PC.

Malfunction Analysis

802.1x protocol was used to perform user identification in this network. 802.1x authentication system consists of the following three parts:

- Supplicant system: It is the PC running ZXIASM software.
- Authenticator system: ZXR10 2626.
- Authentication server: Radius server.

802.1x is based on port. ZXR10 2626

only permitted authentication packets to be transmitted before user passed the authentication.

The steps for 802.1x authentication are shown below.

1. Supplicant system sends authentication request (EAPOL packets) to authenticator system.

2. Authenticator system forwards the authentication information (EAPOR packets) of supplicant system to authentication server.

3. Authentication server returns authentication result (EAPOR packet) to authenticator system.

4. Authenticator system forwards authentication result (EAPOL packets) received from authentication server to supplicant system.

Engineers inspected the devices and found that the packets were lost heavily if they pinged the gateway of 2626 by 2626 when the authentication was failed. Engineers used command **show arp** in T64G to view ARP entry. The result showed that ARP information of 2626 always could not be learnt.

The malfunction reason was clear now. The disconnection between authenticator system and authentication system caused the failure of the user authentication.

Solution

Engineers used the command arp add <A.B.C.D> <xx.xx.xx.xx.xx.xx> in T64G to statically bind ARP entry of 2626. Here, <A.B.C.D> is the IP address, and <XX.XX.XX.XX.XX.XX> is the MAC address. After that, engineers pinged the gateway of 2626 in 2626 again, and they found the connection was recovered and no packet was lost. Engineers pinged Radius server and still no packets were lost. In this time, user could pass the authentication and accessed to the Internet. ■

ZXR10 2826S Failed to Pass Radius Authentication

⊙ Wang TuJian / ZTE Corporation

Key words: 2826S, 802.1X, HUB, transparent transmission 802.1x

Malfunction Situation

As shown in Figure 1, ZXR10 2826S switches A and B composed the network. 802.1X was enabled in 2826S-A. 2826-B acted as HUB for accessing without any configuration. The users connected to 2826-B could not pass Radius authentication.

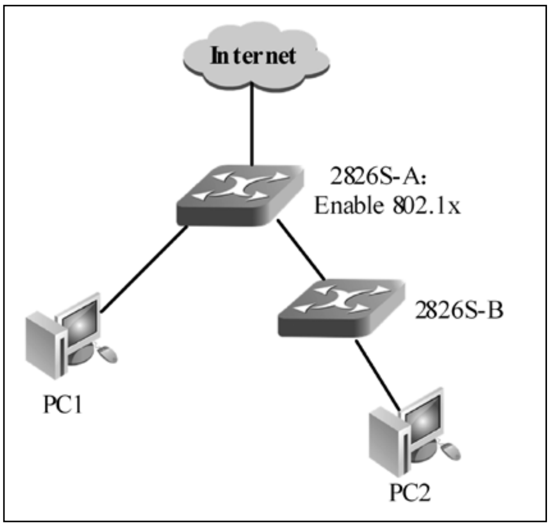


Figure 1. Network Structure

Malfunction Analysis

Engineers found that the user connected to 2826-S (such as PC1) was able to pass Radius authentication and accessed to the Internet.

Engineers planned to connect a HUB to 2826S-A for user accessing. However, engineers found that 2826S-B could not act as HUB without any configuration and PC2 could not pass the authentication.

Engineers replaced 2826S-B with a HUB to connect to 2826S-A. After that, engineers found that PC2 was able to pass Radius authentication.

Thus it could be seen that ZXR10 2826S could not process 802.1x packet like a HUB if without any configuration. By default, 802.1x transparent transmission function is disabled in ZXR10 2826S. That is to say, 802.1x protocol packets could not be transparently transmitted by 2826S. Therefore, the connected user failed to pass authentication.

Solution

Engineers enabled 802.1x transparent transmission function in 2826S-B, and then the connected user could pass Radius authentication.

The following command is used to enable 802.1x transparent transmission function.

```
zte(cfg)# set dot1x-relay enable
```

User Fails to Obtain IP Address by DHCP Relay

⊙ Wang Tao / ZTE Corporation

Key words: DHCP, relay, fails to obtain IP address

Malfunction Situation

As shown in Figure 1, DHCP server function was configured in Radius server, DHCP Relay was configured in T160G. However, user PC failed to automatically obtain IP address in T160G.

The network is composed of:

- VLAN 300 (gei4/7-8) in T160G is used to connect users. The gateway IP address of user is 10.1.12.1/24.
- VLAN 100 (gei4/3) interconnects with RADIUS. The interconnection IP address is 10.10.0.0-10/30.
- IP address of Radius server is 10.1.1.3. Routing is accessible between T160G and RADIUS.

Malfunction Analysis

To find and resolve the problem,

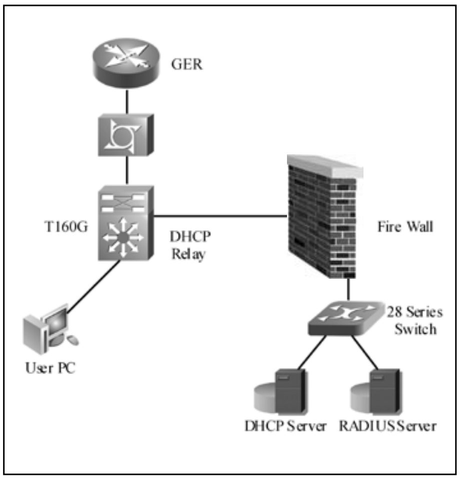


Figure 1. DHCP Relay

engineers performed the following tests,

1. Engineer inspected the routing between T160G and Radius server, and they pinged these devices. The devices could be pinged.
2. Engineer enabled debug function in T160G, and the information is as follows:

```
01:57:58 DHCPR:npc 12 rcv dhcp forward packet
01:57:58 DHCPR:can not get valid forward npc no
01:57:58 DHCPM:vlan300 receive DHCPDISCOVER[001E.C9E6.6FDC]!
01:57:58 DHCPR:send DHCPDiscover from 10.1.12.1 to 10.1.1.3
```

3. Engineers inspected Relay configuration of T160G.
4. Engineers inspected address pool configuration of DHCP Server. The result showed the configuration was proper.
5. Engineers inspected relay information of DHCP Server. They found the fault reason that DHCP relay address was the interconnection address between T160G and firewall. The correct relay address shall be gateway address of users.

Solution

Engineers modified DHCP relay address and tested again. PC could obtain IP address and connected to the Internet. The malfunction was recovered. ■

SSH Local Authentication Usage

⊙ Zhu Xuan / ZTE Corporation

Key words: SSH, RADIUS, Local authentication

Configuration Description

As shown in Figure 1, WinRadius is installed on PC to run Radius Server. Putty is installed to act as SSH Client.

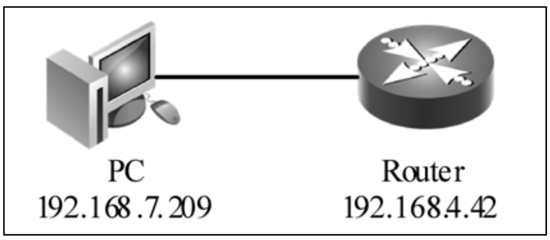


Figure 1. SSH Radius/Local Authentication Configuration

Enable SSH in router and configure SSH and Radius. Install Radius and SSH software in PC.

⚠ **Note:** Local authentication mode is only handed over when Radius authentication is invalid.

Configuring Radius Server

1. Open the **WinRadius.exe**. Select the **Add an Account** menu to add an account with the username being **zte** and password being **123**. Click **OK**. Figure 2 shows the details.

Result: System setting menu appears.

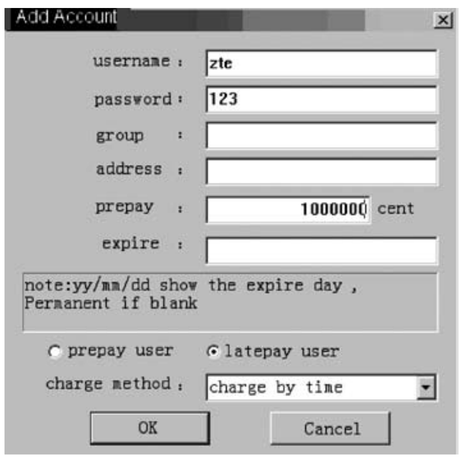


Figure 2. Radius Server Account Configuration

2. Select the **System Setting** menu. Set the **NAS password** to **zxr10** and **auth port** to **1812**, and then click **OK**, as shown in Figure 3.

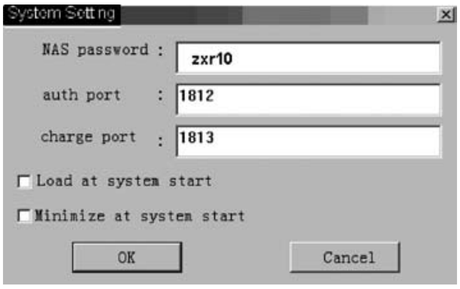


Figure 3. Radius Server System Configuration

3. Ping the PC in router. The PC can be pinged.

Configuring Radius and SSH in Router

1. Configure Radius in router, as follows:

```
ZXR10(config)#radius authentication-group 1
ZXR10(config-authgrp-1)#server 1 192.168.7.209 key zte
ZXR10(config-authgrp-1)#exit
ZXR10(config)#radius auto-change on
/*After Radius authentication is overtime, the authentication mode is handed over local authentication. */
```

Here, the key is zte. The key has to be consistent with NAS key.

Radius configuration is finished in router. Use **show run** command to view the configuration.

2. Configure SSH in router, as follows:

```
ZXR10(config)#ssh server enable
ZXR10(config)#ssh server version 2
ZXR10(config)#ssh server authentication mode radius
ZXR10(config)#ssh server authentication ispgroup 1
```

Logining Router from PC

1. Enable **Putty.exe** at the SSH client. Enter the IP address of the remote router **192.168.4.42** in **hostname**. The interface is shown in Figure 4.

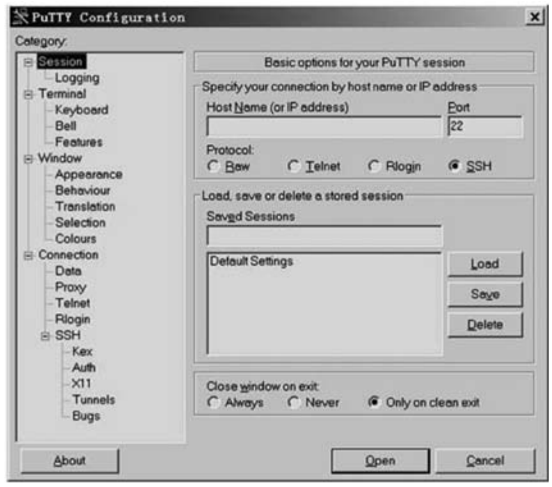


Figure 4. SSH Client Login Configuration 1

16. Select **version 2** from the protocol options and select the SSH version, as shown in Figure 5.

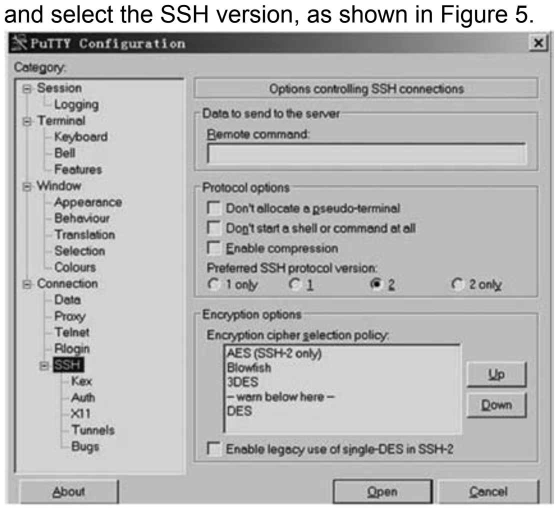


Figure 5. SSH Client Login Configuration 2

17. Click **open**. The login interface appears, as shown in Figure 6. Directly enter the user name and password of Radius Server in the interface. The login is successful.

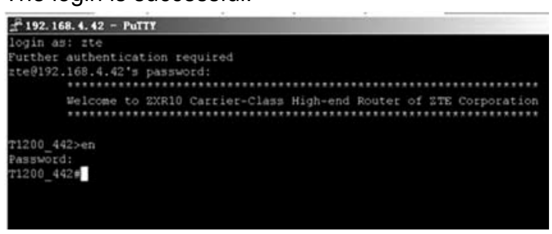


Figure 6. SSH Login Interface 1

18. Enter the local user name and password for login. The login is unsuccessful.

5. Shut down Radius server. Re-enter local user name and password for login. The login is successful. ■

MPLS VPN Inter-access Malfunction

⊙ Qu ZhiHui / ZTE Corporation

Key words: T600, MPLS VPN, mask, ping

Malfunction Description

As shown in Figure 1, MPLS VPN was enabled in DCN network, Cisco 12410 acted as P device, ZXR10 T1200 acted as router reflector and ZXR10 T600 acted as PE device and router reflector client.

After the configuration was finished, user found the following problems:

- PC1 and PC2 could not ping each other successfully.
- T600-2 could not ping PC1, but T600-1 could ping PC2.

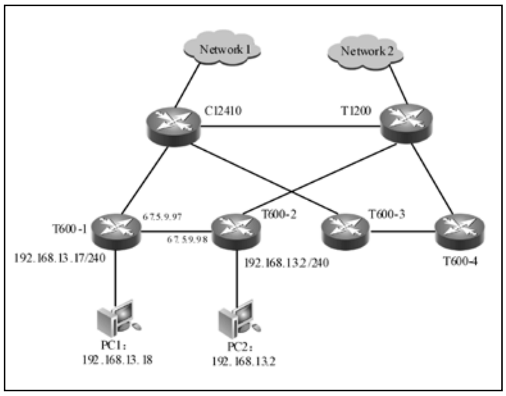


Figure 1. DCN Network Topology

```
T600-2#ping vrf jl-dcnbss 192.168.13.2
sending 5,100-byte ICMP echoes to 192.168.13.2,timeout is 2 seconds.
!!!!!
Success rate is 100 percent(5/5),round-trip min/avg/max= 1/2/4.
T600-1#ping vrf jl-dcnbss 192.168.13.18
sending 5,100-byte ICMP echoes to 192.168.13.18,timeout is 2 seconds.
.....
Success rate is 0 percent(0/5).
```

- T600-3 could ping PC1 and PC2.

```
T600-2#ping vrf jl-dcnbss 192.168.13.17 source 192.168.13.1
sending 5,100-byte ICMP echoes to 192.168.13.17,timeout is 2 seconds.
!!!!!
Success rate is 100 percent(5/5),round-trip min/avg/max= 1/1/2.
```

Malfunction Analysis

To resolve the problem, engineers performed the following steps,

1. Engineers checked whether the problems existed.

2. Engineers pinged PC1 by T600-1, and they pinged PC2 by T600-2 to make sure that the directly-connected network segment can be pinged.

```
T600-2#ping vrf jl-dcnbss 192.168.13.2
sending 5,100-byte ICMP echoes to 192.168.13.2,timeout is 2 seconds.
!!!!!
T600-1#ping vrf jl-dcnbss 192.168.13.18
sending 5,100-byte ICMP echoes to 192.168.13.18,timeout is 2 seconds.
!!!!!
Success rate is 100 percent(5/5),round-trip min/avg/max= 1/1/1.
```

3. Engineers pinged gateway address of PC1 by T600-1, and they pinged gateway address of PC2 by T600-2 to confirm whether the routing is failed.

```
T600-2#ping vrf jl-dcnbss 192.168.13.17 source 192.168.13.1
sending 5,100-byte ICMP echoes to 192.168.13.17,timeout is 2 seconds.
!!!!!
Success rate is 100 percent(5/5),round-trip min/avg/max= 1/1/2.
```

4. Engineers pinged PC2 address by T600-1, and they pinged PC1 address by T600-2 to make sure that PC gateway and mask are correct.

```
T600-1#ping vrf jl-dcnbss 192.168.13.2
sending 5,100-byte ICMP echoes to 192.168.13.2,timeout is 2 seconds.
!!!!!
Success rate is 100 percent(5/5),round-trip min/avg/max= 1/2/4.

T600-2#ping vrf jl-dcnbss 192.168.13.18
sending 5,100-byte ICMP echoes to 192.168.13.18,timeout is 2 seconds.
.....
Success rate is 0 percent(0/5).
```

5. Engineers found that PC 2 gateway and mask configuration were correct, but the malfunction occurred due to PC1 gateway, mask configuration or other factors.

6. Engineers performed the following test in T600-3 to confirm whether the configuration of PC1 was correct. The test result showed that the configuration was correct.

```
T600-3#ping vrf jl-dcnbss 192.168.13.18
sending 5,100-byte ICMP echoes to 192.168.13.18,timeout is 2 seconds.
!!!!!
Success rate is 100 percent(5/5),round-trip min/avg/max= 12/12/13.
```

7. Engineers doubted that 192.168.13.18 was conflicted in the network. However, the tracing result showed that the address was not conflicted.

```
T600-1#trace vrf jl-dcnbss 192.168.13.18
 tracing the route to 192.168.13.18
1  *.110  MPLS : Label 6282/5988 Exp 0 20 ms 17 ms 17 ms
2  *.113  MPLS : Label 1648/5988 Exp 0 16 ms 16 ms 16 ms
3  *.102  MPLS : Label 24/5988 Exp 0 18 ms 18 ms 18 ms
4  67.5.9.97 17 ms 16 ms 16 ms
5  192.168.13.18 14 ms 14 ms 14 ms
[finished]
```

8. Engineers used gateway address of PC2 as source IP address to ping PC1 in T600-2, and PC1 could not be pinged.

```
T600-2#ping vrf jl-dcnbss 192.168.13.18 source 192.168.13.1
sending 5,100-byte ICMP echoes to 192.168.13.18,timeout is 2 seconds.
.....
Success rate is 0 percent(0/5).
```

Solution

The mask configuration of PC1 was incorrect so that PC1 recognized that it and PC2 belonged to the same network segment. Therefore, after PC1 received packets from PC2, it would send ARP request to ask PC2 MAC address but not send ping respond packet to T600-1. Additionally, engineer could not ping PC1 in T600-2 because the ping packet sent by T600-2's MAC source address was 192.168.13.1. ■

ZXUAS WLAN+WEB Authentication Failure

⊙ Wang Yufeng / ZTE Corporation

Key words: DHCP, Portal, firewall, BRAS

Malfunction Description

As shown in Figure 1, PC accessed to AP by wireless. The following two functions were realized at the same time.

● PC was able to connect to UAS 10600 by PPPoE dialing and then obtained IP address for accessing the Internet.

● PC was able to obtain IP address by DHCP; UAS 10600 could act as DHCP server to assign IP addresses to user.

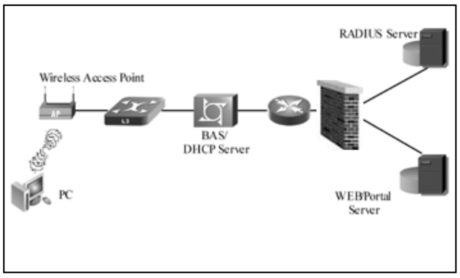


Figure 1. WLAN+DHCP+WEB Authentication Topology

When user entered any website in IE browser, such as www.zte.com.cn, an authentication interface appeared. However, when user entered user name and password for web authentication, a prompt of "authentication failure, for some reasons, code 13000001, information: server is busy, please try it later" or "error information: 11001000, SDX error" appeared.

Malfunction Analysis

1. Engineers captured the packets in BRAS according to the two prompts. The result showed that Portal did not send Challenge packets to BRAS.

The malfunction phenomenon showed that the tunnel between BRAS and Portal had not been established. Therefore, the authentication process would not be performed in fact. Such a phenomenon also showed that packet interaction was not performed between BRAS and Portal. Without packet interaction, the BRAS and Portal packets would not match.

2. Engineers discussed with the staffs from Portal manufactory and confirmed that Portal server had sent challenge packets to BRAS. However, engineers captured packets in Portal server, and the result showed that there was no BRAS reply packets. The reason was that BRAS did not receive Challenge packets from Portal server. Therefore, engineers considered that the Challenge packets sent from Portal were blocked by a device in network. Here, only firewall had such ability to block packets.

3. Engineers discussed with the staff who was responsible for firewall, and the staff confirmed that firewall permits the communication of BRAS and Portal server.

4. Engineers took PPPoE dialing, to

● confirm whether the data configuration was correct.

● confirm whether the account information was correct.

● confirm whether the packets sent from BRAS could pass firewall.

5. Engineer used debug radius user command in BRAS. However, the No.691 error always appeared when engineers dialed up. Engineers discussed with the staff from operator to confirm the account information. The result showed that the password of test account was changed into 12345678. Engineers used the new password for dialing, and the dialing was successful. BRAS packets could pass firewall finally.

6. Engineers opened IP for WEB authentication. However, the same error information still appeared. BRAS configuration was correct, and the related configuration was as shown below.

```
special-acl 1
  permit 218.77.177.33
/*WEB server address.*/
  permit 202.100.192.68
/* DNS server address*/
interface vbui111
  special-acl 1
  web authentication subscriber web force
/*web force indicates that authentication and force-web are enabled.*/
  web  server 218.77.177.33 port 1814 key gsta
/* This specifies the address of force-web, that is address of web/portal server*/
  url  http://218.77.177.33
```

7. Engineers contacted the staff from Portal manufactory again. The staff found that challenge packets had been sent to BRAS by Portal server, but there were no BRAS reply packets. BRAS nas-ip-address and user IP addresses had been added into Portal server. At this time, engineers could not find any user information or Challenge packets even if they captured packets or used **debug radius user** command in BRAS.

8. Engineers contacted the staff from operator to check the policy information performed by firewall for Portal server. Finally, operator staff found that he configured an incorrect Portal server address.

Solution

Engineers reconfigured firewall, and then they opened IE to perform WEB authentication. The authentication was successful. Engineers captured packets from Portal server, and the interaction packets of Portal and BRAS server could be viewed. In Radius server, the packets about passing authentication could be viewed. In BRAS server, the code=1, code=2, code=4 and code=5 packets could be viewed too.

Engineers captured packets in BRAS uplink interface. The captured packets showed three relative UDP packets, as shown in Figure 2.

75 5.995287	218.77.177.33	218.77.144.14	UDP	Source port: 32892 Destination port: 2000
76 4.000182	218.77.144.14	218.77.177.33	UDP	Source port: 2000 Destination port: 32892
77 4.012607	218.77.177.33	218.77.144.14	UDP	Source port: 32892 Destination port: 2000
78 4.122121	218.77.144.14	218.77.177.36	RADIUS	Access Request(1) (id=68, l=186)
79 4.150452	121.58.53.137	218.77.177.33	HTTP	GET /?ZXUAS=ZXUAS&ZXUAS=121.58.53.137 HTTP/:

Figure 2. Interaction Packets of BRAS and Portal Server

These three UDP packets were: Challenge packets sent from Portal server to BRAS, the reply packets sent from BRAS to Portal server and authentication request packet sent from Portal server to BRAS. These three UDP packets indicated that the correct tunnel had been established between Portal server and BRAS. Engineer could inspect whether the format of Portal packets matched BRAS requirement. The other packets were authentication request packets sent from BRAS to Radius server.

Summary

Engineers have to master the related technologies and know how to resolve problem at each step, and the communication between engineers and operator staff is very important. ■

UAS10600 and PORTAL Interconnection Failure

⊙ Liu Peng / ZTE Corporation

Key words: Portal Server, WLAN, HTTPS, NAS-port-type

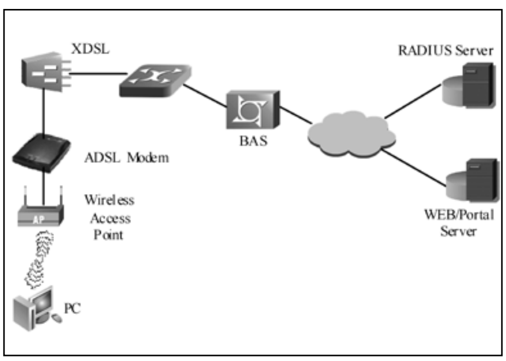


Figure 1. Network Topology

Malfunction Description

According to the conventional authentication process, user obtained IP addresses automatically by DHCP. When users opened any webpage, the authentication web appeared by force. Users had to enter the user name and password. After the authentication was passed, user could access to Internet.

The network topology of this case is shown in Figure 1.

The following malfunctions appeared in practical:

Malfunction phenomenon 1: When users accessed to L2 switch to obtain IP address, the force-web did not appear after users entered any website in the browser.

Malfunction phenomenon 2: When users entered their user name and password in authentication webpage, No.15 alarm “communication with Portal Server is failed” appeared.

In interconnection test, engineers connected user to L2 switch without DSLAM and AP. During this time, the configuration of BRAS is shown below.

```
ip dhcp enable
ip dhcp server dns *.44.150 *.24.68

bras
 web server listening-port 2000
 node-ip *.61.71
 special-acl 1
  permit *.0.130
  permit *.44.150
  permit *.24.68

interface vbui5
  ip address *.244.1 255.255.254.0
  ip dhcp mode server
  ip dhcp server gateway *.244.1
  special-acl 1
  ip proxy-arp none
  dhcp idle period 300 traffic 0
  dns primary *.44.150
  dns secondary *.24.68
  dhcp trust-option82
  dhcp option60
  web authentication subscriber web force
  web server 192.168.0.130 port 1814
  url http://192.168.0.130
  http-param uas uas uas
  http-param user userip
  $
  ip pool 16 wlan-1 *.244.2 *.245.254 dhcp-slot 1

interface gei_1/2.12 bras
  dot1Q 4001
  access-type Ethernet
  encapsulation dot1q multi
  bind multi vbui vbui5 authentication pap maximum 8000
  ppp idle interval 300 traffic-limit 0
  ppp keepalive timer 60 count 10
  sal 2

    sal 2
    default domain wlan.hb.*.com
    permit domain wlan.hb.*.com
 deny any

domain 5
  accounting-group 1
  accounting-type radius
  authentication-group 1
  authentication-type radius
  max-subscriber 32000
  ppp web-force timer 5 count 0
  alias wlan.hb.*.com
  subscriber-template
   ip address vrf
```

Analysis and Solution for Malfunction 1

Malfunction 1 is usually caused by incorrect configuration of special acl. However, engineers found that special acl was configured correctly already. Here, the IP addresses of Portal server and DNS were permitted, and engineers could ping the IP addresses of Portal server and DNS server in PC.

Engineers checked the parameters of monitoring port, Portal server and port with Portal server staff again. The result showed that the configurations were correct.

After discussing with Portal Server staffs, engineers found that HTTPS were used by Portal Server Web-force. HTTPS is Hypertext Transfer Protocol over Secure Socket Layer, which indicates SSL layer is added into HTTP. SSL is a technology of data encryption, which is widely used in identifier authentication and encrypted data transmission between Web browser and server.

If a website is based on HTTPS, it can not be accessed by entering "http://x.x.x.x". The differences between HTTP and HTTPS caused malfunction 1.

Engineers modified the force-web to url https://192.168.0.130 in Web server. After that, the authentication webpage would appear after user entered any website or IP address in IE browser.

Analysis and Solution for Malfunction 2

According to the error information appeared in malfunction 2, engineers doubted that the communication between BRAS and Portal server was failed. Therefore, engineers used **debug portal** command in BRAS. The output for user launching authentication is shown below.

```
3:10: 5  1/12/2009 Portal: Rx packet: SubIP *.244.3 VpnID 0
3:10: 5  1/12/2009 Portal: Tx packet: SubIP *.244.3 VpnID 0
3:10: 5  1/12/2009 Portal: EnableWebForce: SubIP *.244.3 VpnID 0 enable 0
3:10: 8  1/12/2009 Portal: Rx packet: SubIP *.244.3 VpnID 0
3:10: 8  1/12/2009 Portal: Tx packet: SubIP *.244.3 VpnID 0
3:10: 8  1/12/2009 Portal: EnableWebForce: SubIP *.244.3 VpnID 0 enable 0
3:10:15  1/12/2009 Portal: EnableWebForce: SubIP *.244.3 VpnID 0 enable 0
3:10:18  1/12/2009 Portal: EnableWebForce: SubIP *.244.3 VpnID 0 enable 0
3:10:21  1/12/2009 Portal: Rx packet: Req_Auth, vrf 0, UserIp *.244.3, ErrCode 0, Auth Pap
3:10:21  1/12/2009 Portal: IpSvr Auth Req: vrf 0, UserIp *.244.3, name 9900096_sy@wlan.
hb.*.com
3:10:21  1/12/2009 Portal: IpSvr Auth Complete: vrf 0, UserIp *.244.3
3:10:21  1/12/2009 Portal: Tx packet: Ack_Auth, vrf 0, UserIp *.244.3, ErrCode Reject
3:10:23  1/12/2009 Portal: Rx packet: SubIP *.244.3 VpnID 0
3:10:23  1/12/2009 Portal: Tx packet: SubIP *.244.3 VpnID 0
3:10:23  1/12/2009 Portal:
EnableWebForce: SubIP *.244.3 VpnID 0 enable 0
……
```

The output showed that the correct user name and password were extracted by BRAS. However, the Ack_Auth packet showed that the ErrCode packet was Reject. At this time, engineers could not view the authentication information sent from user when they used **debug radius** command. Therefore, the user authentication information could not be compared with PPPoE dialing user authentication information.

Engineers doubted that the account had problem because the account was sent to Radius server for authentication as **9900096_sy@wlan.hb.*.com**, but the test account was a normal

PPPoE dialing account. When PPPoE dialing was performed, the user name used in Radius server was **9900096_sy@hb.cn**. It was necessary to confirm with Radius server about the account information and authority and whether permits WLAN domain name to access.

These two domain names were valid, but an attribute was incorrect, it should be 19 not 16. Whose attribute is 16 in user account information?

Engineers searched Radius attribute table, and they found the attribute of NAS-PORT-TYPE was 16 if the access mode was XDSL. However, when access mode was WIRELESS_IEEE802_11, the attribute was 19. The configuration of access type in BRAS sub-interface influenced this attribute. In malfunction 2, PC was connected to switch without AP, therefore, the access type of BRAS sub-interface should be Ethernet.

Engineers modified the attribute to **access-type WIRELESS_IEEE802_11.** After that, user entered user name and password, and then they could access to the Internet. Engineers connected AP to BRAS by ADSL, and the PC was connected to AP by wireless, the authentication could also be passed.

Summary

1. The force-web can not appear for WLAN users because of the incorrect special acl configuration. However, the malfunction 2 was caused by HTTPS. Therefore, engineers need to communicate with Portal server staff in detail when configuring parameters, including IP address and port of Portal server, monitoring port and so on. Engineers need to check which kind of protocols is used for authentication webpage, HTTPS or HTTP.

2. The future developing trend is that an account can be used for different application. When user uses dialing up for accessing the Internet, the account indicates a normal PPPoE user. When user connects to AP by wireless, the account indicates a WLAN user. Radius devices have to perform different accounting modes according to the access modes rather than domain names.

Obviously, distinguishing accounting modes by different domain names tends to cause the accounting confusion because an accounting user name can bring many domain names and the domain names are legal. Therefore, user is possible to use WLAN domain name for dialing up, and the incorrect accounting standard will be used.

Distinguishing accounting modes by combining NAS-PORT-TYPE with user account is more reasonable and exactable. Therefore, engineers need to configure different access type for WLAN user in BRAS.

3. When connecting to Portal server or Radius server, debug function can be used in BRAS device for diagnosis, but sometimes it can not take effect. At this time, it is difficult to capture packets in BRAS uplink interface. Therefore, engineers can ask for help from server side. The malfunction can be located fast by capturing packets in server side.

4. When user entered user name and password in force-web webpage for authentication, and if the account was abnormal, the alarm information was different with that of PPPoE dialing user.

For example, when user authentication is failed because of incorrect NAS-PORT-TYPE attribute, Asiainfor Portal server will prompt No.15 alarm information “the communication with Portal server is failed”. If the user name or password is incorrect, No.10 alarm information “access data failure” will appear. Such alarm information is not clear and visible. Therefore, engineers need to obtain more information from Portal server. ■

VRRP Packet Loss

⊙ Duan Yifei / ZTE Corporation

Key words: VRRP, OSPF, convergence time, preemption, packet loss

Malfunction Description

As shown in Figure 1, there were some L3 devices in OSPF area. VRRP was enabled in two GER to provide virtual gateway for Radius server. GER-1 acted as master gateway device, and GER-2 acted as slave gateway device.

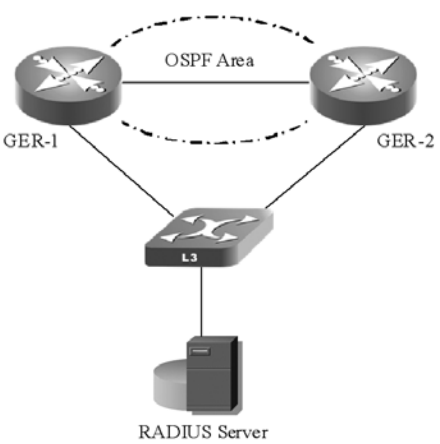


Figure 1. VRRP Packet Loss

After GER-1 restarted, the packets sent from Radius server to the devices in other network segments would be lost in a short time.

Malfunction Analysis

Engineers viewed the configuration of GER-1,

```
GER-1#show run int gei_1/1
Building configuration...
interface gei_1/1
  ip address 124.158.127.2 255.255.255.0
  description as vrrp router for Radius server
  vrrp 2 ip 124.158.127.1
  vrrp 2 priority 200
  vrrp 2 track 1 decrement 150
track 1 interface gei_1/2 line-protocol

GER-1#show vrrp 2
Gei1/1 - Group 2
  State is Master
  Connection interface is vlan102
  Virtual IP address is 124.158.127.1
  Virtual MAC address is 0000.5e00.0102
  Advertisement interval is 1.000 sec
  Preemption is enabled
    min delay is 0.000 sec
  Priority is 200 (config 200)
  Authentication is disabled
  Track object 1 decrement 150
  Master Router is 124.158.127.2 (local), priority is 200
  Master Advertisement interval is 1.000 sec
  Master Down interval is 3.218 sec
```

The configuration of GER-2 is omitted.

From the above information, engineers found that system adopted VRRP preempt by default even if VRRP preempt was not configured in the interface.

OSPF convergence needs time to finish. The convergence speed depends on the network size. However, VRRP preempt only needs shorter time than OSPF convergence if system runs properly and the port is UP.

Engineers suspected that the master gateway of GER-1 had switched to GER-1 already after GER-1 restarted, but the convergence of OSPF route has not been finished yet in GER-1. That caused the packet loss.

Solution

Engineers used the following command to make VRRP master preemption delay 100 seconds in GER-1 interface,

```
GER-1(config)# interface gei_1/1
GER-1(config-if)# vrrp 2 preempt delay 100
```

And then, engineers restarted GER-1 and tested. The malfunction is resolved and no packet was lost.

Another solution is to cancel VRRP preempt. After GER-1 restarted, the master gateway switched to GER-2. If GER-2 is failed, the master gateway will be switched back to GER-1. Engineers did not know the original network design idea, so they respected and followed the original design to make GER-1 as master gateway.

Summary

The malfunction occurred because the convergence speed of dynamic routing protocol is slower than VRRP preemption. Therefore, we need to pay attention to detailed problems in the future. ■

T64E Version Upgrading Malfunction

⊙ Chen WeiDong / ZTE Corporation

Key words: T64E, version upgrading, FTP, ping, overtime

Malfunction Description

To upgrade ZXR10 T64E router, the original version files needed to be deleted, and the device needed to be power off. That is to say, network startup is used here for upgrading.

Engineers configured the PC as FTP server, and they tested that FTP worked properly. Engineer started T64E, and entered “C” to enter boot mode. They modified network management port address, IP address of FTP server, FTP user name and password. Engineers press “@” to start network startup. However, the result showed “ftp file………time out”. No version files could be extracted. The network startup was unsuccessful.

Engineer adopted the same configuration to upgrade ZXR10 3928. The upgrading was successful.

Malfunction Analysis

Engineers took the following steps to analyse the problem,

1. At first, engineers inspected whether FTP server worked properly. They tested FTP server in PC and the result showed that FTP server work properly.

2. Engineers inspected whether the network ran properly. However, 3928 switch could be upgraded successfully. The engineers interconnected two laptops and then tested whether the two laptops could ping each other and could run FTP application. The result showed that two laptops could not ping each other and could not ran FTP application, either. Therefore, engineer confirmed that the malfunction was caused by network.

3. To know more about the interaction process of T64E upgrading, engineers captured the packets during the network startup. By capturing the packets, engineers found that T64E would send a ping packet to FTP server when T64E network startup starts. If the network was normal, FTP server responds a packet to T64E, and then T64E launched FTP connection.

4. However, the network connection was very simple for device upgrading that only T64E directly connected to laptop. After discussing, engineers found that the malfunction was caused by firewall.

Solution

Engineers shut down the firewall. Two directly-connected laptops could ping each other and run FTP application. The upgrading was successful.

Summary

FTP mechanisms of our devices are different. ZXR10 3928 does not have the process of ping, and it extracts version file from FTP directly. However, ZXR10 T64E has a process of ping to create connection. We need to prepare different upgrading methods for the different devices.

How to locate the malfunction? At first, engineers did not know how to resolve the malfunction but they used capturing tool. The malfunction was easy to be located. We need to be good at applying our tool and accumulating experience. ■

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