# Contents

1 Configuring ZAM

1.1 Introduction

1.1.1 Overview

The zero automatic manager (ZAM) function enables the device to automatically download the software version, upgrade the device version, and apply configuration files when the device has no configuration and the network administrator is not in contact with the field devices. ZAM simplifies the operation, maintenance, and deployment of massive devices, lowers the labor cost, reduces human errors, and improves the efficiency of network deployment.

1.1.2 Principles

Figure 1-1   ZAM Automatic Go-Online Solution

DHCP Server

Device

DNS Server

File Server
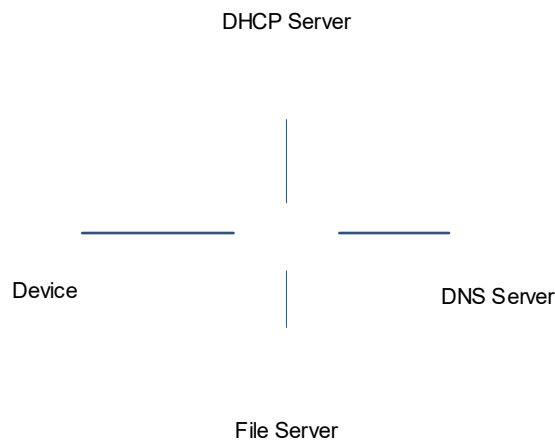
ZAM go-online and deployment include four stages as follows:

(1) Initialization

At this stage, a device that goes online without configurations connects to a network and completes initialization. The device automatically pre-deploys the ZAM environment. During the pre-deployment, the MGMT port or service port must be used as the ZAM interface. The device automatically performs configuration, without any need of extra configuration by the administrator.

(2) DHCP

Upon the pre-deployment above, the ZAM interface requests an IP address from the Dynamic Host Configuration Protocol (DHCP) server via the DHCP protocol. In a reply packet, the reply packet carries Option 66 (containing the IP address of the file server) and Option 67 (containing the name of the Python script to be downloaded). The requirements are as follows:

o   The ZAM interface supports DHCP.

○ Configure the ZAM interface with a DHCP-allocated IP address. DHCP requests support Option 66 and Option 67, and Option 66 and Option 67 have been configured in the address pool of the DHCP server.

○ The device analyzes and deploys the IP address of the ZAM interface, and analyzes the content of Option 66 and Option 67.

(3) TFTP

According to the Python script file name and TFTP server IP address obtained at the DHCP stage, the device downloads the configuration script.

Upon downloading above, the device executes the configuration script and downloads the corresponding configuration file or version from the TFTP server.

(4) Configuration loading

After the Python script is executed, the device restarts automatically to update the device version and load the configuration file.

1.2 Restrictions and Guidelines

● An automatic retry is available after a ZAM failure. In this case, check whether the network functions properly and whether the DHCP server is correctly configured based on the ZAM failure prompt.

● For a product version with ZAM disabled by default, please manually enable this function.

1.3 Configuring ZAM

1.3.1 Overview

This section describes how to configure ZAM to enable a device with no configurations to implement automatic deployment.

1.3.2 Restrictions and Guidelines

To use the ZAM function, deploy the Trivial File Transfer Protocol (TFTP) server and DHCP server.

1.3.3 Prerequisites

● Configure the address pool, Option 66, and Option 67 for the DHCP server. The configuration example is as follows:

```
ip dhcp pool poap
 option 67 ascii zam.py
 option 66 ascii 100.1.1.2
```

● Configure the TFTP server. Store the Python script file in the root directory of the TFTP server, and create the folders listed in Table 1-1 in the root directory to store the files required during the ZAM configuration.

Table 1-1　Description of Folders to Be Created on the TFTP Server

Folder Name	Content	Function
POAP_CFG	● xxxx.cfg ● xxxx.params	● xxxx.cfg: Indicates the configuration file of the device. The configuration file of each device is named after the sn value of the device and uses .cfg as the suffix.

Folder Name	Content	Function
		● xxxx.params: Indicates the parameter file of the device. It contains the path to the downloaded configuration file, path to the file used for version upgrade, and the name of the version file. ● The device automatically downloads the files.
POAP_IMAGE	Version binary file	● The folder stores the version file of the device. ● The device automatically downloads the file.
POAP_LOG	Log file	● The folder stores the log files uploaded during the ZAM configuration of the device. The log files of each device are named after the sn value of the device. ● The device automatically uploads the files.
POAP_STARTUP	Device sn value files	● The folder stores the sn value file of the device where ZAM needs to be configured. ● The device automatically uploads the file.
POAP_STATUS	-	● The folder stores the ZAM result log files, which are named after the sn value. ● The device automatically uploads the files.

1.3.4 Procedure

(1) Enter the privileged EXEC mode.

enable

(2) Enter the global configuration mode.

configure terminal

(3) Enable ZAM.

zam

The ZAM function is enabled by default.

1.4 Monitoring

Run the **show** command to check the running status of a configured function to verify the configuration effect.

Run the **debug** command to output debugging information.

⚠ **Caution**

The output debugging information occupies system resources. Therefore, disable the debugging function immediately after use.

Table 1-1   **ZAM Monitoring**

Command	Purpose
show zam	Displays the current configurations and status of ZAM.
debug zam	Enables the ZAM framework event debugging.

## 1.5 Configuration Examples

1.5.1 Configuring ZAM

1.   Requirements

dut1-standalone and dut2-VSU belong to different subnets, dut2-VSU and the ZAM server belong to the same network segment, and dut1-standalone and the ZAM server belong to different segments. ZAM needs to be configured on dut1-standalone and ut2-VSU to implement automatic upgrade and configuration delivery. The requirements are as follows:

● Configure the Secure Shell (SSH) function to allow the network management system (NMS) to manage the devices remotely via SSH. Configure a ciphertext password, with the length of no less than eight characters including letters, digits, and special characters. dut1-standalone and dut2vsu must have different usernames and passwords.

2.   Topology

Figure 1-1   **ZAM Topology**
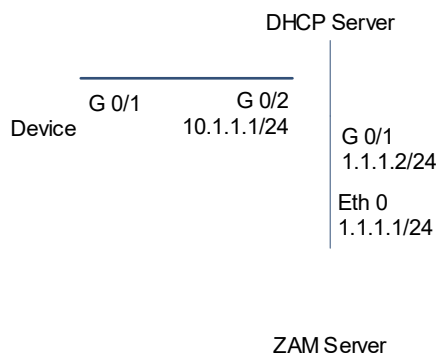
3. Notes

- Configure the DHCP server.

- Configure the ZAM server.

- Enable the ZAM function on the devices.

4. Procedure

(1) Configure the DHCP server.

Set the IP address of interface GigabitEthernet 0/1 of the DHCP server to 1.1.1.2/24.

```
Dhcp_Server> enable
Dhcp_Server# configure terminal
Dhcp_Server(config)#interface gigabitEthernet 0/1
Dhcp_Server(config-if-GigabitEthernet 0/1)# ip address 1.1.1.2 255.255.255.0
Dhcp_Server(config-if-GigabitEthernet 0/1)# exit
```

Set the IP address of interface GigabitEthernet 0/2 of the DHCP server to 10.1.1.1/24.

```
Dhcp_Server(config)#interface gigabitEthernet 0/2
Dhcp_Server(config-if-GigabitEthernet 0/2)# ip address 10.1.1.1 255.255.255.0
Dhcp_Server(config-if-GigabitEthernet 0/2)# exit
```

Enable the DHCP server function.

```
Dhcp_Server(config)# service dhcp
```

Configure the address pool of the DHCP server.

```
Dhcp_Server(config)# ip dhcp pool zam
Dhcp_Server(dhcp-config)# network 10.1.1.1 255.255.255.0
Dhcp_Server(dhcp-config)# default-router 10.1.1.1
```

Configure Option 66.

```
Dhcp_Server(dhcp-config)# option 66 ascii 1.1.1.1
```

Configure Option 67.

```
Dhcp_Server(dhcp-config)# option 67 ascii zam.py
```

(2) Configure the ZAM server. Store the intermediate file (Python script named **zam.py**), and the configuration files and version files to be delivered to the devices on the ZAM server. For details, see 1.3.3 Prerequisites.

(3) Enable the ZAM function on the devices.

Delete the configuration files from the devices.

```
Device# delete config.text
Do you want to delete [flash:/config.text]? [Y/N]:y
Delete success.
```

Run the **reload** command to restart the devices to enable the ZAM function.

```
Device# reload
Reload system?(Y/N)y
Device#[1042947.400971] %SYS-0-REBOOT: Rebooting by job: dp_mom_thread/3877
[1042947.408318]
```

```
U-Boot 1.4.12--g1b6cd5f (Dec 17 2019 - 21:58:43 +0800)


I2C:   ready
DRAM:  1 GiB
NAND:  512 MiB
......
......
*Apr  7 19:22:16: %DHCP_CLIENT-6-ADDRESS_ASSIGN: Interface GigabitEthernet 0/1
assigned DHCP address10.1.1.10, mask 255.255.255.0.
*Apr  7 19:22:15: %ZAM-6-EVENT: Get tftp server ip 1.1.1.1.
*Apr  7 19:22:15: %ZAM-6-EVENT: Get boot file name zam.py.
*Apr  7 19:22:21: %ZAM-6-EVENT: Download script zam.py succ.
*Apr  7 19:22:21: %ZAM-6-INFO: Begin to exec script zam.py.
......
exec cmd cd /data
mv G1M91T8000415.CFG config.text success
......
upload zam_cli.elf "exec" "copy flash:G1M91T8000415.LOG
oob_tftp://1.1.1.1/POAP_LOG/G1M91T8000415.LOG" succ
upload zam_cli.elf "exec" "copy flash:G1M91T8000415.ok
oob_tftp://1.1.1.1/POAP_STATUS/G1M91T8000415.ok" succ
*Apr  7 19:22:28: %ZAM-6-INFO: Scipt exec succ,device reset now.
Press RETURN to get started
```

5.   Verification

Run the **show dhcp lease** command to display the obtained IP address.

```
Device# show dhcp lease
Temp IP addr: 0.0.0.0  for peer on Interface: Mgmt 0
Temp  sub net mask: 0.0.0.0
   DHCP Lease server: 0.0.0.0, state: 3 Init-proc
   Retry count: 7   Client-ID: 01800588aba05e4D676D7430
Temp IP addr: 10.1.1.2  for peer on Interface: VLAN 1
Temp  sub net mask: 255.255.255.0
   DHCP Lease server: 10.1.1.1, state: 9 Inform-proc
   DHCP transaction id: 75cf492b
   Lease: 86400 secs,  Renewal: 43200 secs,  Rebind: 75600 secs
   Next timer fires after: 43054 secs
   Retry count: 0   Client-ID: 01800588aba05d564C414E31
```

Run the **show zam** command to check the execution status of the ZAM function.

```
Device# show zam
ZAM state            :enable
ZAM status           :Now is waiting for dhcp wait
Server ip            :172.26.1.33
Usb path             :NULL
Interface name       :VLAN 1
```

```
Interface type          :SVI
Succ Interface name     :VLAN 1
Script URL              :NULL
```

6.   Configuration Files

● DHCP server configuration file

```
hostname Dhcp_Server
!
ip dhcp pool zam
 option 66 ascii 1.1.1.2
 option 67 ascii zam.py
 network 10.1.1.0 255.255.255.0
 default-router 10.1.1.1
!
end
```

7.   Common Errors

● The network connection between the device and the ZAM server is abnormal.

● The configuration file on the device is not deleted.