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1 Configuring the TFTP Server

1.1 Introduction

1.1.1 Overview

Trivial File Transfer Protocol (TFTP) is a standard application layer protocol formulated by the IETF Network Working Group. TFTP uses User Datagram Protocol (UDP) as its transport protocol, and the well known UDP port for TFTP traffic is 69.

TFTP provides the uncomplicated and inexpensive file transfer service. Many commonly used FTP features are unavailable in TFTP. TFTP can only upload or download files, but not list directories, perform authentication, or provide a security mechanism. TFTP employs a timeout and retransmission strategy to ensure data transmission. TFTP is described in RFC1350.

A TFTP client can conveniently download files (such as upgrade packages) on the device from the TFTP server, or upload files directly to the file system of the TFTP server.

1.1.2 Principles

1. TFTP Packet

After the TFTP client initiates a file read or write request, and the TFTP server approves the request, TFTP transmits the data in 512-byte packets. A packet with less than 512 bytes indicates that the transmission is completed.

Each packet contains a data block, and the next packet can be sent only after an acknowledgment (ACK) packet is received from the peer. If the ACK packet is not received within the specified time, the last packet sent is retransmitted.

The header of a TFTP packet contains an Opcode field, which indicates the packet type. Opcodes 1 to 5 represent five types of packets:

- 1: Read Request (RRQ)
- 2: Write Request (WRQ)
- 3: Data (DATA)
- 4: Acknowledgment (ACK)
- 5: Error (ERROR)

Figure 1-1 TFTP Packet

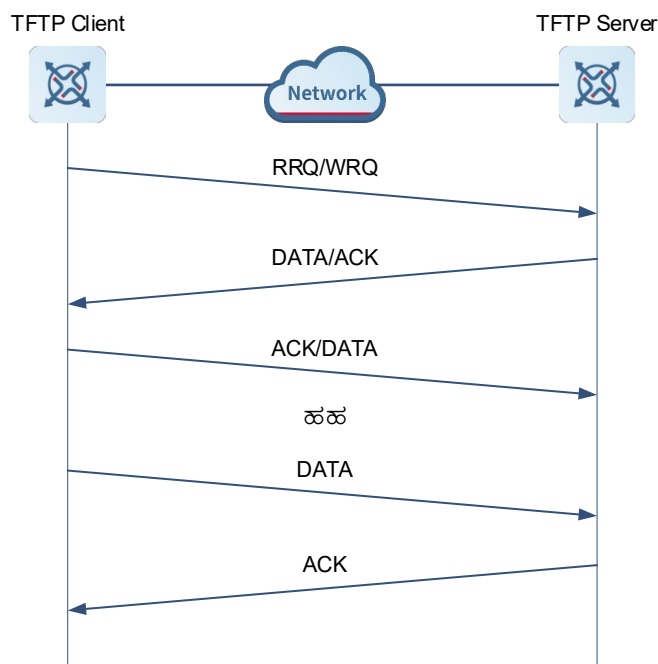
Read and Write Request Packet	Opcode (1 or 2)	File name	0	Mode	0
	2 Bytes	n Bytes	1	n Bytes	1
Data Packet	Opcode (3)	Block#	Data		
	2 Bytes	2 Bytes	0~512 Bytes		
Acknowledgment Packet	Opcode (4)	Block#			
	2 Bytes	2 Bytes			
Error Packet	Opcode (5)	Block#	Error Message	0	
	2 Bytes	2 Bytes	2 Bytes	1	

The Error Message in an error packet contains 2 bytes in ASCII code. TFTP provides the following error codes:

- 0: Not defined;
- 1: File not found;
- 2: Access violation;
- 3: Disk full;
- 4: Illegal TFTP operation;
- 5: Unknown port;
- 6: File already exists;
- 7: No such user.

2. TFTP Working Modes

Figure 1-1 TFTP Working Modes



- (1) The TFTP client initiates a read request (RRQ) or write request (WRQ) to the TFTP server.
- (2) If the TFTP server receives an RRQ, it checks whether the read conditions are met (whether the file exists and whether the TFTP client has the access permission). If yes, the TFTP server sends a data packet (DATA) to the TFTP client. If the TFTP server receives a WRQ, it checks whether the write conditions are met (whether there is enough space and whether the FTP client has the write permission). If yes, the TFTP server sends an ACK packet to the TFTP client.
- (3) If the TFTP client receives a DATA packet when preparing to download a file, it replies with an ACK packet. If the TFTP client receives an ACK packet when preparing to upload a file, it continues to send the DATA packet.
- (4) The process of sending the ACK packet repeats until the last DATA packet with less than 512 bytes is received and indicates the end of the transmission.
- (5) If an error is encountered in the transmission process, an ERROR packet is sent to the peer.

3. TFTP File Transmission Modes

TFTP supports the following transmission modes:

- Binary mode for transmitting program files
- ASCII mode for transmitting text files

1.1.3 Protocols and Standards

- RFC1350: The TFTP Protocol (revision 2)
- RFC2347: TFTP Option Extension
- RFC2348: TFTP Blocksize Option
- RFC2349: TFTP Timeout Interval and Transfer Size Options

1.2 Configuring Basic Functions of the TFTP Server

1.2.1 Overview

This section describes how to configure the TFTP server to provide the upload and download service for the TFTP client.

1.2.2 Procedure

- (1) Enter the privileged EXEC mode.

enable

- (2) Enter the global configuration mode.

configure terminal

- (3) Configure the top-level directory of the TFTP server.

ftp-server topdir *directory*

By default, the TFTP client can read and write files in the Flash directory.

- (4) Enable the TFTP server function.

ftp-server enable

The TFTP server is disabled by default. After the TFTP server is enabled, files can be transmitted only through the MGMT port.

1.3 Monitoring

Run the **show** commands 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 Monitoring

Command	Purpose
show tftp-server	Displays the TFTP server configurations.
show tftp-server updating-list	Displays the file download progress on the client.
debug tftp-server	Debugs the server.

1.4 Configuration Examples

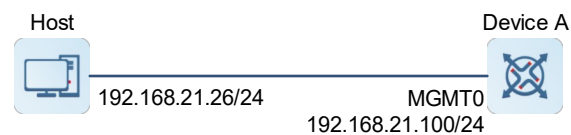
1.4.1 Configuring the TFTP Server

1. Requirements

Configure a TFTP server in a LAN so that users can upload and download files.

2. Topology

Figure 1-1 Configuring the TFTP Server



3. Notes

Configure device A as follows:

- (1) Enable the TFTP server.
- (2) Configure the top-level directory.

4. Procedure

- (1) Configure device A.

Configure the IP address of the MGMT interface.

```
DeviceA> enable
DeviceA# configure terminal
DeviceA(config)# interface mgmt 0
DeviceA(config-if-MGMT 0)# ip address 192.168.21.100 255.255.255.0
DeviceA(config-if-MGMT 0)# exit
```

Configure the top-level directory of the TFTP server.

```
DeviceA(config)# tftp-server topdir /tmp
```

Enable the FTP server function.

```
DeviceA(config)# tftp-server enable
```

(2) Configure the host.

Set the IP address of the host to 192.168.21.26/24.

5. Verification

Run the **show tftp-server** command to view the FTP server configurations.

```
DeviceA# show tftp-server
      tftp-server information
=====
enable : Y
topdir  : /tmp
```

6. Configuration Files

TFTP server configuration file

```
hostname DeviceA
!
interface MGMT 0
ip address 192.168.21.100 255.255.255.0
!
tftp-server enable
tftp-server topdir /tmp
!
```

7. Common Errors

- No top-level directory is configured.