PIX/ASA 7.x: Enable FTP/TFTP Services Configuration Example

Contents

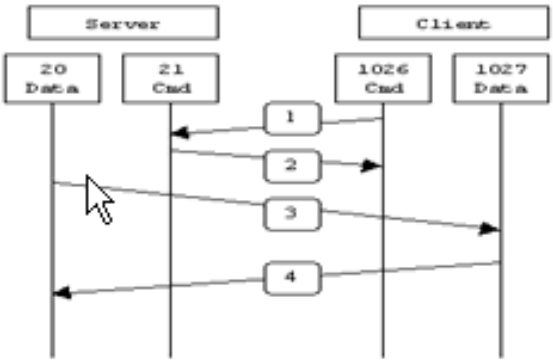
Introduction

This document explains the steps required for users outside of your network to access FTP and TFTP services in your DMZ network.

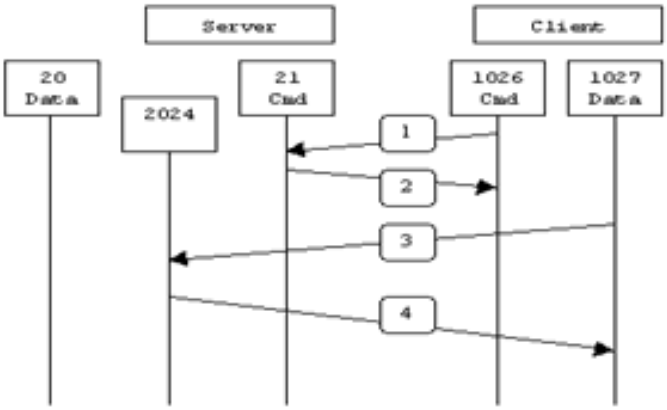
File Transfer Protocol (FTP)

There are two forms of FTP:

- Active mode
- Passive mode



Active FTP



Passive FTP

Active FTP :
command : client >1023 -> server 21
data : client >1023 <- server 20

Passive FTP :
command : client >1023 -> server 21
data : client >1023 -> server >1023

In Active FTP mode, the client connects from a random unprivileged port (N>1023) to the command port (21) of the FTP server. Then the client starts to listen to port N+1 and sends the FTP command port N+1 to the FTP server. The server then connects back to the specified data ports of the client from its local data port, which is port 20.

In Passive FTP mode, the client initiates both connections to the server, which solves the problem of a firewall that filters the incoming data port connection to the client from the server. When an FTP connection is opened, the client opens two random unprivileged ports locally (N>1023 and N+1). The first port contacts the server on port 21. But instead of then issuing a **port** command and allowing the server to connect back to its data port, the client issues the **PASV** command. The result of this is that the server then opens a random unprivileged port (P>1023) and sends the **port P** command back to the client. The client then initiates the connection from port N+1 to port P on the server to transfer data. Without the **inspection** command configuration on the Security Appliance, FTP from inside users headed outbound works only in Passive mode. Also, users outside headed inbound to your FTP server are denied access.

Refer to ASA 8.3 and Later: Enable FTP/TFTP Services Configuration Example for more information on identical configuration using ASDM with Cisco Adaptive Security Appliance (ASA) with version 8.3 and later.

Trivial File Transfer Protocol (TFTP)

TFTP, as described in RFC 1350, is a simple protocol to read and write files between a TFTP server and client. TFTP uses UDP port 69.

Prerequisites

Requirements

Ensure that you meet these requirements before you attempt this configuration:

- There is basic communication between required interfaces.
- You have a configured FTP server located inside your DMZ network.

Components Used

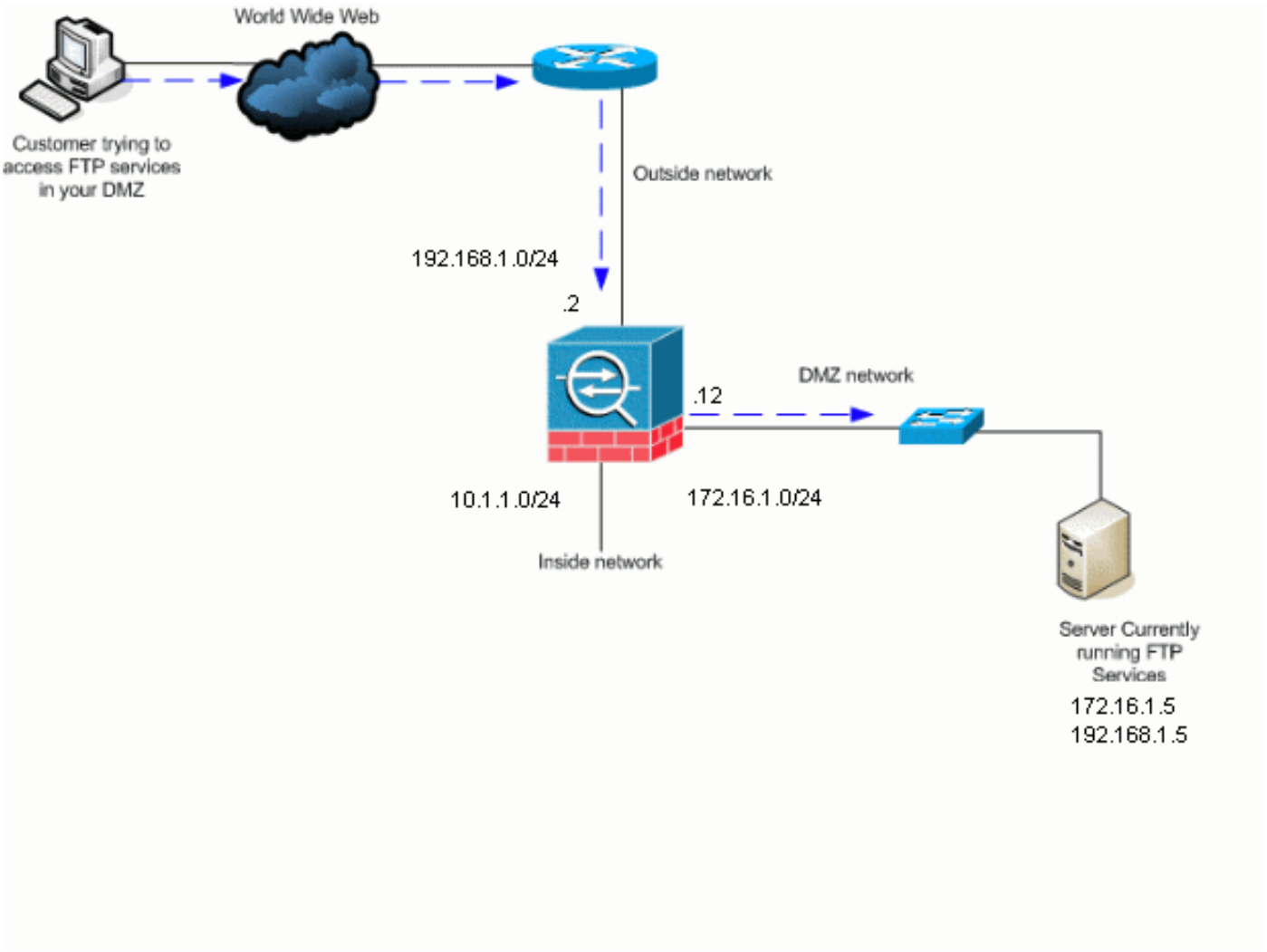
The information in this document is based on these software and hardware versions:

- ASA 5500 Series Adaptive Security Appliance that runs the 7.2(2) software image
- Windows 2003 Server that runs FTP services
- Windows 2003 Server that runs TFTP services
- Client PC located on the outside of the network

The information in this document was created from the devices in a specific lab environment. All of the devices used in this document started with a cleared (default) configuration. If your network is live, make sure that you understand the potential impact of any command.

Network Diagram

This document uses this network setup:



Note: The IP addressing schemes used in this configuration are not legally routable on the Internet. They are RFC 1918 addresses which have been used in a lab environment.

Related Products

This configuration can also be used with PIX Security Appliance 7.x.

Conventions

Refer to the Cisco Technical Tips Conventions for more information on document conventions.

Background Information

The Security Appliance supports application inspection through the Adaptive Security Algorithm function. Through the stateful application inspection used by the Adaptive Security Algorithm, the Security Appliance tracks each connection that traverses the firewall and ensures that they are valid. The firewall, through stateful inspection, also monitors the state of the connection to compile information to place in a state table. With the use of the state table in addition to administrator-defined rules, filtering decisions are based on context that is established by packets previously passed through the firewall. The implementation of application inspections consists of these actions:

- Identify the traffic.
- Apply inspections to the traffic.
- Activate inspections on an interface.

Advanced Protocol Handling

FTP

Some applications require special handling by the Cisco Security Appliance application inspections function. These types of applications typically embed IP addressing information in the user data packet or open secondary channels on dynamically assigned ports. The application inspection function works with Network Address Translation (NAT) to help identify the location of embedded addressing information.

In addition to the identification of embedded addressing information, the application inspection function monitors sessions to determine the port numbers for secondary channels. Many protocols open secondary TCP or UDP ports to improve performance. The initial session on a well-known port is used to negotiate dynamically assigned port numbers. The application inspection function monitors these sessions, identifies the dynamic port assignments and permits data exchange on these ports for the duration of the specific sessions. Multimedia and FTP applications exhibit this kind of behavior.

The FTP protocol requires some special handling due to its use of two ports per FTP session. The FTP protocol uses two ports when activated for transferring data: a control channel and a data channel that uses port 21 and 20, respectively. The user, who initiates the FTP session over the control channel, makes all data requests through that channel. The FTP server then initiates a request to open a port from server port 20 to the user's computer. FTP always uses port 20 for data channel communications. If FTP inspection has not been enabled on the Security Appliance,

this request is discarded and the FTP sessions do not transmit any requested data. If FTP inspection is enabled on the Security Appliance, the Security Appliance monitors the control channel and tries to recognize a request to open the data channel. The FTP protocol embeds the data-channel port specifications in the control channel traffic, requiring the Security Appliance to inspect the control channel for data-port changes. If the Security Appliance recognizes a request, it temporarily creates an opening for the data-channel traffic that lasts for the life of the session. In this way, the FTP inspection function monitors the control channel, identifies a data-port assignment, and allows data to be exchanged on the data port for the length of the session.

The Security Appliance inspects port 21 connections for FTP traffic by default through the global-inspection class-map. The Security Appliance also recognizes the difference between an active and a passive FTP session. If the FTP sessions support passive FTP data transfer, the Security Appliance, through the **inspect ftp** command, recognizes the data port request from the user and opens a new data port greater than 1023.

The FTP application inspection inspects FTP sessions and performs four task:

- Prepares a dynamic secondary data connection
- Tracks the FTP command-response sequence
- Generates an audit trail
- Translates the embedded IP address using NAT

FTP application inspection prepares secondary channels for FTP data transfer. The channels are allocated in response to a file upload, a file download, or a directory listing event, and they must be pre-negotiated. The port is negotiated through the **PORT** or **PASV** (227) commands.

TFTP

TFTP inspection is enabled by default.

The security appliance inspects TFTP traffic and dynamically creates connections and translations, if necessary, to permit file transfer between a TFTP client and server. Specifically, the inspection engine inspects TFTP read requests (RRQ), write requests (WRQ), and error notifications (ERROR).

A dynamic secondary channel and a PAT translation, if necessary, are allocated on a reception of a valid RRQ or WRQ. This secondary channel is subsequently used by TFTP for file transfer or error notification.

Only the TFTP server can initiate traffic over the secondary channel, and at most one incomplete secondary channel can exist between the TFTP client and server. An error notification from the server closes the secondary channel.

TFTP inspection must be enabled if static PAT is used to redirect TFTP traffic.

Configure Basic FTP Application Inspection

By default, the configuration includes a policy that matches all default application inspection traffic and applies inspection to the traffic on all interfaces (a global policy). Default application inspection traffic includes traffic to the default ports for each protocol. You can only apply one global policy, so if you want to alter the global policy, for example, to apply inspection to non-standard ports, or to add inspections that are not enabled by default, you need to either edit the default policy or

disable it and apply a new one. For a list of all default ports, refer to the Default Inspection Policy.

1. Issue the **policy-map global_policy** command.`ASAwAIP-CLI(config)#`**`policy-map global_policy`**
2. Issue the **class inspection_default** command.`ASAwAIP-CLI(config-pmap)#`**`class inspection_default`**
3. Issue the **inspect FTP** command.`ASAwAIP-CLI(config-pmap-c)#`**`inspect FTP`** There is an option to use the **inspect FTP strict** command. This command increases the security of protected networks by preventing a web browser from sending embedded commands in FTP requests.After you enable the *strict* option on an interface, FTP inspection enforces this behavior:An FTP command must be acknowledged before the Security Appliance allows a new command.The Security Appliance drops a connection that sends embedded commands.The **227** and **PORT** commands are checked to ensure they do not appear in an error string.  **Warning:** The use of the *strict* option might cause the failure of FTP clients that are not strictly compliant with FTP RFCs. Refer to Using the strict Option for more information on the use of the *strict* option.

Example Configuration

Device Name 1

```
ASA-AIP-CLI(config)#show running-config ASA Version
7.2(2) ! hostname ASA-AIP-CLI domain-name corp.com
enable password WwXYvtKrnjXqGbu1 encrypted names !
interface Ethernet0/0 nameif Outside security-level 0 ip
address 192.168.1.2 255.255.255.0 ! interface
Ethernet0/1 nameif Inside security-level 100 ip address
10.1.1.1 255.255.255.0 ! interface Ethernet0/2 nameif
DMZ security-level 50 ip address 172.16.1.12
255.255.255.0 ! interface Ethernet0/3 no nameif no
security-level no ip address ! interface Management0/0
no nameif no security-level no ip address ! !--- Output
is suppressed. !--- Permit inbound FTP control traffic.
access-list 100 extended permit tcp any host 192.168.1.5
eq ftp !--- Permit inbound FTP data traffic. access-list
100 extended permit tcp any host 192.168.1.5 eq ftp-data
! !--- Command to redirect the FTP traffic received on
IP 192.168.1.5 !--- to IP 172.16.1.5. static
(DMZ,outside) 192.168.1.5 172.16.1.5 netmask
255.255.255.255 access-group 100 in interface outside
class-map inspection_default match default-inspection-
traffic ! ! policy-map type inspect dns preset_dns_map
parameters message-length maximum 512 policy-map
global_policy class inspection_default inspect dns
preset_dns_map inspect ftp inspect h323 h225 inspect
h323 ras inspect netbios inspect rsh inspect rtsp
inspect skinny inspect esmtp inspect sqlnet inspect
sunrpc inspect tftp inspect sip inspect xdmcp ! !---
This command tells the device to !--- use the
"global_policy" policy-map on all interfaces. service-
policy global_policy global prompt hostname context
Cryptochecksum:4b2f54134e685d11b274ee159e5ed009 : end
ASA-AIP-CLI(config)#
```

Configure FTP protocol inspection on non standard TCP

port

You can configure the FTP Protocol Inspection for non standard TCP ports with these configuration lines (replace XXXX with the new port number):

```
access-list ftp-list extended permit tcp any any eq XXXX
!
class-map ftp-class
  match access-list ftp-list
!
policy-map global_policy
  class ftp-class
   inspect ftp
```

Configure Basic TFTP Application Inspection

By default, the configuration includes a policy that matches all default application inspection traffic and applies inspection to the traffic on all interfaces (a global policy). Default application inspection traffic includes traffic to the default ports for each protocol. You can only apply one global policy. So if you want to alter the global policy, for example, to apply inspection to non-standard ports, or to add inspections that are not enabled by default, you need to either edit the default policy or disable it and apply a new one. For a list of all default ports, refer to the Default Inspection Policy.

1. Issue the **policy-map global_policy** command.`ASAwAIP-CLI(config)#policy-map global_policy`
2. Issue the **class inspection_default** command.`ASAwAIP-CLI(config-pmap)#class inspection_default`
3. Issue the **inspect TFTP** command.`ASAwAIP-CLI(config-pmap-c)#inspect TFTP`

Example Configuration

Device Name 1

```
ASA-AIP-CLI(config)#show running-config ASA Version
7.2(2) ! hostname ASA-AIP-CLI domain-name corp.com
enable password WwXYvtKrnjXqGbu1 encrypted names !
interface Ethernet0/0 nameif Outside security-level 0 ip
address 192.168.1.2 255.255.255.0 ! interface
Ethernet0/1 nameif Inside security-level 100 ip address
10.1.1.1 255.255.255.0 ! interface Ethernet0/2 nameif
DMZ security-level 50 ip address 172.16.1.12
255.255.255.0 ! interface Ethernet0/3 no nameif no
security-level no ip address ! interface Management0/0
no nameif no security-level no ip address ! !--- Output
is suppressed. !--- Permit inbound TFTP traffic. access-
list 100 extended permit udp any host 192.168.1.5 eq
tftp ! !--- Command to redirect the TFTP traffic
received on IP 192.168.1.5 !--- to IP 172.16.1.5. static
(DMZ,outside) 192.168.1.5 172.16.1.5 netmask
255.255.255.255 access-group 100 in interface outside
class-map inspection_default match default-inspection-
traffic ! ! policy-map type inspect dns preset_dns_map
parameters message-length maximum 512 policy-map
global_policy class inspection_default inspect dns
preset_dns_map inspect ftp inspect h323 h225 inspect
h323 ras inspect netbios inspect rsh inspect rtsp
inspect skinny inspect esmtp inspect sqlnet inspect
sunrpc inspect tftp inspect sip inspect xdmcp ! !---
```

```
This command tells the device to !--- use the
"global_policy" policy-map on all interfaces. service-
policy global_policy global prompt hostname context
Cryptochecksum:4b2f54134e685d11b274ee159e5ed009 : end
ASA-AIP-CLI(config)#
```

Verify

In order to ensure the configuration has successfully taken, use the **show service-policy** command and limit the output to the FTP inspection only, using the **show service-policy inspect ftp** command.

```
ASAwAIP-CLI# show service-policy inspect ftp

Global policy:
  Service-policy: global_policy
    Class-map: inspection_default
      Inspect: ftp, packet 0, drop 0, reset-drop 0
ASAwAIP-CLI#
```

Troubleshoot

Problem: Syntax in Configuration Does Not Work and class-map inspection Error is Received

The syntax presented in the configuration section does not work and you receive an error such as this:

```
ERROR: % class-map inspection_default not configured
```

Solution

This configuration relies on the default inspections being in the configuration. If they are not in the configuration, recreate them with these commands:

1. **class-map inspection_defaultmatch default-inspection-traffic**
2. **policy-map type inspect dns preset_dns_map parametersmessage-length maximum 512**
3. **policy-map global_policyclass inspection_defaultinspect dns preset_dns_mapinspect ftp inspect h323 h225inspect h323 rasinspect rshinspect rtspinspect esmtpinspect sqlnetinspect skinnyinspect sunrpcinspect xdmcpinspect sipinspect netbiosinspect tftp**
4. **service-policy global_policy global**

 **Warning:** If the default inspections were previously removed to resolve another issue, that issue might return when the default inspections are re-enabled. You or your administrator should know if the default inspections were removed previously as a troubleshooting step.

Unable to Run FTPS (FTP Over SSL) across ASA

FTP with TLS/SSL (SFTP / FTPS) is not supported through the Security Appliance. FTP connection is encrypted, so there is no way that the firewall is able to decrypt the packet. Refer to PIX/ASA: Security Appliance FAQ for more information.

Related Information

- **ASA 5500 Series Adaptive Security Appliances**
- **Cisco Security Appliance Command Reference**
- **PIX 500 Series Security Appliance**
- **Cisco Security Advisories and Notices**
- **Technical Support & Documentation - Cisco Systems**