



Release Notes for the Cisco Secure PIX Firewall Version 5.1(4)

October 2000

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Note

Version 5.1(4) fixes caveat CSCds38708 only. If your configuration includes the **fixup protocol smtp** *port_number* command and either a **conduit** or **access-list** command statement permitting access to SMTP, you should install version 5.1(4) immediately to counter a vulnerability in the Mail Guard feature.



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78-10391-04

System Requirements

Version 5.1 requires the following:

1. The PIX Firewall image no longer fits on a diskette. If you are using a PIX Firewall unit with a diskette drive, you need to download the Boothelper file, bh512.bin, from Cisco Connection Online (CCO) to let you download the PIX Firewall image with TFTP.
2. PIX Firewall *must* have at least 32 MB of RAM memory or the PIX Firewall unit will not boot. Use the **show version** command to verify how much RAM is in your PIX Firewall unit.
3. PIX Firewall requires at least 2 MB of Flash memory although support is provided for 2 MB, 8 MB, and 16 MB Flash memory. The maximum configuration size with 16 MB Flash memory is 1 MB; with all other Flash memory, it is 340 KB. A PIX Firewall unit equipped with 16 MB Flash memory cannot be downgraded to version 4.4(1), 4.4(2), 5.0(1), or 5.0(2).
4. If you use mode configuration with the PIX Firewall, any routers on the IPSec connection must run Cisco IOS Release 12.0(6)T or later.
5. If you are upgrading from version 4 or earlier and want to use the IPSec or VPN features or commands, you must have a new activation key. Before getting a new activation key, write down your old key in case you want to downgrade back to version 4. You can have a new activation key sent to you by completing the form at the following site:
<http://www.cisco.com/kobayashi/sw-center/internet/pix-56bit.shtml>
6. If you are using PFSS (PIX Firewall Syslog Server), we recommend that you install Windows NT Service Pack 6 to fix Y2K conflicts in Windows NT.
7. If you are upgrading from a previous PIX Firewall version, save your configuration and write down your activation key and serial number. Refer to “Installation Notes” for new installation requirements.

PIX Firewall Manager Interoperability

You can use PIX Firewall version 5.1 with the PIX Firewall Manager version 4.3(2)e. Refer to the *Release Notes for the PIX Firewall Manager Version 4.3(2)e* for more information. You can view this document online at the following site:

http://www.cisco.com/univercd/cc/td/doc/product/iaabu/pix/pix_v51/index.htm

The PIX Firewall Manager (PFM) lets you manage PIX Firewall units; however, it does not let you configure any PIX Firewall features added after version 4.3(2).

The “Frequently Asked Questions” section in the PFM release notes provides useful troubleshooting information.

Cisco Secure Policy Manager Interoperability

Cisco Secure Policy Manager (Cisco Secure PM), version 2.1, provides policy-based management support for PIX Firewall units running a version 4.2(*n*), 4.4(*n*), or 5.1(*n*) software image.

Refer to the documentation set for Cisco Secure PM at the following site:

<http://www.cisco.com/univercd/cc/td/doc/product/ismg/policy/index.htm>

New and Changed Information

Version 5.1 consists of bug fixes and new features. More details are provided in the *Configuration Guide for the Cisco Secure PIX Firewall Version 5.1*. You can view this document online at the following site:

http://www.cisco.com/univercd/cc/td/doc/product/iaabu/pix/pix_v51/config/index.htm

Version 5.1(4) Features

Version 5.1(4) fixes caveat CSCds38708 only. If your configuration includes the **fixup protocol smtp port_number** command and either a **conduit** or **access-list** command statement permitting access to SMTP, you should install version 5.1(4) immediately to counter a vulnerability in the Mail Guard feature.

Version 5.1(3) Features

Version 5.1(3) fixes caveats CSCds30699 and CSCdr91002 only.

Version 5.1(2) Features

The sections that follow describe each new version 5.1(2) feature.

RFC 2267 DoS Protection Support

You can enable Unicast RPF (Reverse Path Forwarding) protection with the new **ip verify reverse-path** command. With this feature, PIX Firewall provides ingress and egress spoof filtering. This command is described in the *Configuration Guide for the Cisco Secure PIX Firewall Version 5.1*.

PIX 506 Support

The PIX 506 is a simplified PIX Firewall unit that supports two Ethernet interfaces without user-customizable access to the inside unit. This unit provides PIX Firewall functionality with support for the full command set except for the **failover** and **session** commands. The PIX 506 contains 32 MB of RAM memory and an 8 MB Flash memory. The maximum configuration size is 340 KB.



Note

The PIX 506 supports 10BaseT only on both interfaces.



Note

The ACT light on the front of the PIX 506 indicates when the software image successfully loads. On the PIX 515, this light has an alternate meaning relating to use with failover.

Other Release Changes

Additional changes in this release can be found in the following sections of this document:

- clear configure Command
- show version Command

- ISAKMP Notes
- Syslog
- Resolved Caveats

The PIX Firewall documentation set has been enhanced to support the PIX 506. In addition, in the *Configuration Guide for the Cisco Secure PIX Firewall Version 5.1*, the information in Chapter 7, formally entitled, “PIX 515 Configuration,” was moved to Chapter 2, “Configuring PIX Firewall” and to the *Installation Guide for the Cisco Secure PIX Firewall Version 5.1*.

Version 5.1(1) Features

The sections that follow describe each new feature.

16 MB Flash Memory Card Support

PIX Firewall now supports an ISA-bus 16 MB Flash memory card for all PIX Firewall models except the PIX 515 and PIX 506, which already have a Flash memory unit built into the motherboard. Use the new 16 MB Flash memory card to replace your current 2 MB Flash memory card. (You must not use both the old Flash memory card and the new card together.)

Use of the 16 MB Flash memory card increases the maximum configuration size to 1 MB.

The 16 MB Flash memory card driver has been enhanced so that older PIX Firewall models can use the 16 MB card with software version 5.1(1) or later.

AAA Improvement

The **aaa** command now supports selection by service. See “aaa Command” for more information.

Boothelper

The PIX Firewall image no longer fits on a diskette. If you are using a PIX Firewall unit with a diskette drive, you need to download the Boothelper file, bh512.bin, from Cisco Connection Online (CCO) to let you download the PIX Firewall image with TFTP. Boothelper only works with version 5.1 or later images and cannot pass the image over a Gigabit Ethernet interface. See “Installation Notes” for more information. You can view Boothelper information online in the *Configuration Guide for the Cisco Secure PIX Firewall Version 5.1* at the following site:

http://www.cisco.com/univercd/cc/td/doc/product/iaabu/pix/pix_v51/config/config.htm

Firewall MIB Support

The Cisco Firewall MIB and Cisco Memory Pool MIB are now available. These MIBs provide the following PIX Firewall information via SNMP:

- Buffer usage from the **show block** command
- Connection count from the **show conn** command
- Failover status
- Memory usage from the **show memory** command

For more information, refer to “Using the Firewall and Memory Pool MIBs” in Chapter 3, “Advanced Configurations” in the *Configuration Guide for the Cisco Secure PIX Firewall Version 5.1*. You can view this chapter online at the following site:

http://www.cisco.com/univercd/cc/td/doc/product/iaabu/pix/pix_v51/config/advanced.htm

FragGuard and Virtual Re-Assembly

The following virtual re-assembly features are new in version 5.1:

- Version 5.1 enhances IP fragment protection and performs full-reassembly of all ICMP error messages and virtual-reassembly of the remaining IP fragments that are routed through the PIX Firewall. The previous restriction with the FragGuard feature that the initial fragment must arrive first has been lifted.



Note Virtual reassembly is currently enabled by default and no mechanism is provided to disable it.

- A new teardrop syslog message has been added to notify of any fragment overlapping and small fragment offset anomalies.

Syslog message, %PIX-2-106020: Deny IP teardrop fragment (size = *num*, offset = *num*) from *IP_addr* to *IP_addr* was added in this release to log teardrop.c attacks. This message occurs when the PIX Firewall discards an IP packet with a teardrop signature with either a small offset or fragment overlapping. You should treat this event as a hostile attempt to circumvent the PIX Firewall or the Cisco Secure Intrusion Detection System.

- IP packets fragmented into more than 12 elements cannot pass through the PIX Firewall.

FTP and URL Logging

You can now log URLs and FTP commands for both inbound and outbound connections. This feature is enabled automatically when you specify syslog level 7 (**debugging**) with the **logging** command.

Gigabit Ethernet

PIX Firewall now supports 1000 Mbps (Gigabit) Ethernet. The gigabit interface cards use the **gb-ethernet** device name and only have one hardware speed and the following options:

- **1000sxfull**—forces full duplex operation
- **1000basesx**—forces half duplex operation
- **1000auto**—auto negotiates full or half duplex

An example **interface** command for a gigabit interface follows:

```
interface gb-ethernet0 1000auto
```

Gigabit interface cards do not provide information for the extended **show interface** command counters introduced in version 5.0(3).

Gigabit Ethernet uses the same MTU as 10/100 Ethernet.

Installation Enhancement

See “Installation Notes” for how to use the Boothelper diskette, and how to download and use a TFTP server, or you can view this information online in the *Configuration Guide for the Cisco Secure PIX Firewall Version 5.1* at the following site:

http://www.cisco.com/univercd/cc/td/doc/product/iaabu/pix/pix_v51/config/config.htm

IPSec Enhancements

The following IPSec improvements are new to this release:

- IPSec tunnel termination—you can now differentiate UDP IPSec traffic from TCP traffic using the port parameter to the **access-list** command. The use of port ranges can dramatically increase the number of IPSec tunnels. For instance, if a port range of 5000-65535 is specified for a highly dynamic protocol, a possible 60,535 tunnels can be created.
- Multiple interface termination—IPSec now lets you terminate an IPSec tunnel on any and all active interfaces.
- Client termination—you can now enable the PIX Firewall to terminate an IPSec tunnel destined for itself.

The IPSec command interface has the following changes:

1. Any traffic selectable by the **access-list** command and negotiated by IKE can be used. ICMP type and code cannot be used because there is no mechanism to negotiate these selectors by IKE.
2. Multiple **crypto map** command statements can be bound to multiple interfaces. However, only one **crypto map** command statement can be bound to a single interface.
3. **sysopt ipsec pl-compatible** command—the previous need for static routes for non-IPSec traffic is removed.
4. New **debug crypto ipsec** command.

You can view command information online in the *Configuration Guide for the Cisco Secure PIX Firewall Version 5.1* at the following site:

http://www.cisco.com/univercd/cc/td/doc/product/iaabu/pix/pix_v51/config/commands.htm

Java and ActiveX Filtering Improvements

The ActiveX and Java applet filtering implementation has been improved. Formerly, filtering Java applets was handled by the **outbound** command. The new implementation has been placed in the **filter** command and lets users receive a web page but with the Java applets disabled. The previous behavior dropped the connection when an applet was encountered.



Note

The previous **outbound java** command is being phased out. Cisco recommends that you convert all Java filtering configurations to the **filter java** command.

The ActiveX filtering mechanism, which also is handled by the **filter** command has been improved to more reliably detect objects and screen out their use.

PPTP Support

Point-to-Point Tunneling Protocol (PPTP) is a layer 2 tunneling protocol which lets a remote client use a public IP network to communicate securely with servers at a private corporate network. PPTP can tunnel the IP protocol. RFC 2637 describes the PPTP protocol.

RAS V2 Support

RAS (registration, admission, and status) handles multimedia applications such as video conferencing and Voice over IP that require video and audio encoding. PIX Firewall now supports RAS version 2.

RIP V2 Support

PIX Firewall now supports RIP version 2. This implementation supports Cisco IOS software standards, which conform to RFC 1058, RFC 1388, and RFC 2082 of RIPv2 with text and keyed MD5 authentication.

Routing Extensions

A number of extensions were added to the **route** command in this release. Refer to “route Command” for more information.

RTSP Support

PIX Firewall now provides the **rtsp** option to the **fixup** command. This feature lets PIX Firewall pass RTSP (Real Time Streaming Protocol) packets. RTSP is used by RealAudio, RealNetworks, Apple QuickTime 4, RealPlayer, and Cisco IP/TV connections. See “fixup rtsp Command” for more information.

Separate SNMP and Syslog Message Levels

The **logging** command now lets you specify separate message levels for syslog and SNMP. See “logging Command” for more information.

System Software Downloads

See “copy tftp flash Command” for more information on copying a new software image via TFTP. This feature permits remote management where a binary image can be uploaded without accessing monitor mode.

Xauth Support

The Xauth (Extended Authentication) feature lets you deploy IPSec to remote users to gain the privacy and packet-level authentication available with IPSec. This feature provides authentication by prompting for user credentials and verifies them with the information stored in Cisco Secure Database in the VPN environment (AAA with VPN).

Extended Authentication is negotiated between IKE phase 1 and IKE phase 2 at the same time as mode configuration. Authentication is performed using your existing TACACS+ or RADIUS authentication system.

The extended authentication feature is enabled with the **crypto map** command.

**Note**

The Xauth feature requires version 1.1 of the Cisco Secure VPN Client.

XDMCP Support

PIX Firewall now provides support for XDMCP (X Display Manager Control Protocol) to handle an XWindows TCP back connection. XDMCP handling is enabled by default. XDMCP uses UDP port 177. XWindows uses TCP ports 6000 through 6063.

New Commands

The sections that follow describe the new commands in this release.

copy tftp flash Command

The **copy tftp flash** command lets you change software images without requiring access to the TFTP monitor mode. An image you download is made available to the PIX Firewall on the next reload (reboot).

The **copy tftp flash** command requires that routing be configured. In certain cases such as with IPsec configuration, a ping from the PIX Firewall to the TFTP server may be successful even without complete routing information. However, the success of the ping command does not guarantee that the **copy tftp flash** command will be successful. This command is described on the **copy tftp flash** command page in Chapter 6, “Command Reference” in the *Configuration Guide for the Cisco Secure PIX Firewall Version 5.1*.

ip verify Command

You can enable RFC 2267 Denial of Service (DoS) protection with the new **ip verify reverse-path** command. This command is described on the **ip verify** command page in Chapter 6, “Command Reference” in the *Configuration Guide for the Cisco Secure PIX Firewall Version 5.1*.

vpdn Command

The **vpdn** command implements the PPTP feature. This command is described on the **vpdn** command page in Chapter 6, “Command Reference” in the *Configuration Guide for the Cisco Secure PIX Firewall Version 5.1*.

Changes to Existing Commands

More details are provided in the *Configuration Guide for the Cisco Secure PIX Firewall Version 5.1*. You can view this document online at the following site:

http://www.cisco.com/univercd/cc/td/doc/product/iaabu/pix/pix_v51/config/index.htm

aaa Command

- For HTTP authentication, a username can be up to 30 characters long and a password up to 15 characters long.
- The **aaa include** and **exclude** options let you select which services are permitted or denied from authentication, authorization, and accounting.



Note The **include** and **exclude** options are not backward compatible with previous PIX Firewall versions. If you downgrade to an earlier version, the **aaa** command statements will be removed from your configuration.

aaa-server Command

The maximum number of AAA servers PIX Firewall lets you specify is 14, not 16 that is described in the **aaa-server** command page in Chapter 6, “Command Reference” in the *Configuration Guide for the Cisco Secure PIX Firewall Version 5.1*.

access-list Command

- The **show access-list** command now lists a hit count that indicates the number of times an element has been matched during an **access-list** command search.
- The **access-list** command now works correctly with the **name** command so that names can be used in **access-list** commands. [CSCdr46152]

auth-prompt Command

The maximum length of the prompt string is 235 characters.

conduit Command

The **show conduit** command now lists a hit count that indicates the number of times an element has been matched during a **conduit** command search.

clear configure Command

The **clear configure** command no longer sets interfaces into the shutdown state. Previously, the **interface** command for the inside interface would appear as follows after using the **clear configure** command:

```
interface inside auto shutdown
```

clear interface Command

The **clear interface** command clears all interface statistics except the number of input bytes. This command no longer shuts down all system interfaces. The **clear interface** command works with all interface types except gigabit Ethernet.

crypto map client authentication Command

The **crypto map client authentication** command enables the extended authentication (Xauth) feature.

debug Command

The **debug crypto ipsec** command provides new debug messages. You can display debugging messages with the **logging** command.

established Command

The **established** command has been enhanced to include a new source port. By designating 0 as the destination port, you can use the **show established** command to display the port as it is allocated. See “XDMCP Support” for more information.

This change is backward compatible with previous PIX Firewall software versions and will not cause problems with an existing configuration.

fixup rtsp Command

The **fixup rtsp** command lets PIX Firewall pass RTSP (Real Time Streaming Protocol) packets. RTSP is used by RealAudio, RealNetworks, Apple QuickTime 4, RealPlayer, and Cisco IP/TV connections. PIX Firewall does not support multicast RTSP.

The default port for this command is TCP 554. This command does not fix RTSP UDP connections. PIX Firewall PAT is not supported with the **fixup rtsp** command. PIX Firewall does not yet have the ability to recognize HTTP cloaking where RTSP messages are hidden in the HTTP messages.

interface Command

The **interface** command now supports the **gb-ethernet** option for Gigabit Ethernet.

logging Command

The **logging** command now lets you specify different message levels for syslog and SNMP. You can set the message levels for SNMP with the **logging history snmp_message_level** command. The **logging trap syslog_message_level** command now only sets the syslog message level.

The **logging queue** command lets you specify the number of messages in the syslog message queue. The **show logging queue** command lists the size of the queue, the greatest number of messages in the queue, and the number of messages discarded because queue space was not available to contain them. The size of the queue is limited by available block memory.

nat Command

The **nat** command has been extended to let you disable NAT and specify an access list that determines which services users on a higher security level interface can access on a lower security level interface. This command lets you mix and match NAT, stateful inspection with the **fixup** command, and the **aaa** command without forcing everything through NAT. The new **nat 0 access-list** command also lets you enable policy NAT based on destination.

no failover Command

When a failover cable connects two PIX Firewall units, the **no failover** command now disables failover until you enter the **failover** command to explicitly enable failover. Previously, when the failover cable connected two PIX Firewall units and you entered the **no failover** command, failover would automatically re-enable after 15 seconds.

If you reboot the PIX Firewall without entering the **write memory** command and the failover cable is connected, failover mode automatically enables.

rip Command

Only enabled **rip** command statements appear in the configuration in version 5.1.

route Command

The following are the extensions to the **route** command:

- The routing table has been improved to let you specify the IP address of a PIX Firewall interface in the **route** command. If the **route** command statement uses the IP address from one of the PIX Firewall unit's interfaces as the gateway IP address, PIX Firewall will ARP for the destination IP address in the packet instead of ARPing for the gateway IP address.
- PIX Firewall also does not accept duplicate routes with different metrics for the same gateway.
- In version 5.1, the CONNECT route entry is supported. (This identifier appears when you use the **show route** command.) The CONNECT identifier is assigned to an interface's local network and the interface IP address, which is in the IP local subnet. PIX Firewall will use ARP for the destination address. The CONNECT identifier cannot be removed, but changes when you change the IP address on the interface.
- You can now enter duplicate **route** command statements with different gateways and metrics.
- You can now enter static **route** command statements with virtual subnets; for example:

```
route outside 10.2.2.8 255.255.255.248 192.168.1.3
route outside 10.2.2.8 255.255.255.255 192.168.1.1
```

This example lets all packets destined to 10.2.2.8/29 be routed to 192.168.1.3 except for packets destined to 10.2.2.8/32, which are routed to 192.168.1.1.

show failover Command

The items in the top row of the “Standby Logical Update Statistics” section of the **show failover** command are as follows:

- Stateful Obj—PIX Firewall stateful object
- xmit—Number of transmitted packets
- xerr—Number of transmission errors
- rcv—Number of received packets
- rerr—Number of packets received errors

The items in the first column provide an object static count for each statistic:

- General—Sum of all stateful objects
- sys cmd—Logical update system commands; for example, LOGIN and Stay Alive

- up time—Up time, which the Active unit passes to the Standby unit
- xlate—Translation information
- tcp conn—TCP connection information
- udp conn—Dynamic UDP connection information
- ARP tbl—Dynamic ARP table information
- RIF tbl—Dynamic router table information

show interface Command

The **show interface** command has been enhanced to include eight new status counters. In version 5.1(2) and later, the “unicast rpf drops” counter was added to list the number of packets dropped through use of the new **ip verify reverse-route** command.

show version Command

The **show version** command now lists the size of Flash memory; for example, the following line appears in the output to indicate 16 MB Flash memory:

```
Flash i28F640J5 @ 0x300, 16MB
```

show xlate Command

An example of the **show xlate** command output is as follows:

```
Global 10.130.0.101 Local 10.130.0.101 static
Global 10.130.0.100 Local 10.130.0.100 static
```

The **xlate** command page in Chapter 6, “Command Reference,” in the *Configuration Guide for the Cisco Secure PIX Firewall Version 5.1* incorrectly lists connection information in the command output. You can view connection information with the **show local-host** command.

sysopt connection permit-pptp Command

Allows PPTP traffic to bypass checking of **conduit** or **access-list** command statements. See “vpdn Command” for more information on PPTP commands and an example of the new **sysopt** command option.

sysopt ipsec pl-compatible Command

Using the **sysopt ipsec pl-compatible** command no longer requires static **route** statements for every host that needs to start non-IPSec connections through the PIX Firewall. The routing is now handled automatically.

url-filter Command

The **url-filter** command now can process a URL up to 1024 characters long.

Installation Notes

1. Refer to either the *Installation Guide for the Cisco Secure PIX Firewall Version 5.1* or Chapter 2, “Configuring PIX Firewall” in the *Configuration Guide for the Cisco Secure PIX Firewall Version 5.1* for information on the new Boothelper diskette installation feature and the new configuration version message. Boothelper only works with version 5.1 images. In addition, only specify Boothelper commands in lowercase. You can view this information online at the following site:
http://www.cisco.com/univercd/cc/td/doc/product/iaabu/pix/pix_v51/config/config.htm
2. Do not attempt to load version 5.1 on a PIX Firewall unit containing less than 32 MB of memory. While the PIX Firewall may appear to permit this configuration, upon reboot, the PIX Firewall unit will continuously fail. You can stop this by immediately inserting a previous version diskette into the PIX Firewall unit and then pressing the reboot switch. This note only applies to PIX Firewall units with a diskette drive, not to the PIX 515.
3. After installing additional memory in a PIX 520, do not remove the memory strips after you install them and have powered on the unit, or the PIX Firewall unit will become inoperable. [CSCdr14559]
4. A PIX Firewall unit containing a 16 MB Flash memory card cannot be downgraded to version 4.4(1), 4.4(2), 5.0(1), or 5.0(2). [CSCdp38206]
5. Version 5.1 on a PIX 515 cannot be downgraded to pre-version 4.4(1) images. [CSCdp21017]
6. The new **include** and **exclude** options to the **aaa** command are not backward compatible with previous PIX Firewall versions. If you downgrade to an earlier version, the **aaa** command statements will be removed from your configuration.

Limitations and Restrictions

The following limitations and restrictions apply to version 5.1:

1. If you are using a Gigabit Ethernet interface, refer to “Gigabit Interface Restrictions” for important restrictions on the use of this interface.
2. Loading a PIX Firewall image prior to version 5.1 with Boothelper reboots the PIX Firewall.
3. Only use version 5.1 of the PIX Firewall with version 1.1 or later of the Cisco Secure VPN Client.

Important Notes

More details are provided in the *Configuration Guide for the Cisco Secure PIX Firewall Version 5.1*.

Assertions

Previously, assertions in the code caused an error message to display at the PIX Firewall. In version 5.1, assertions now force the PIX Firewall to fail and display a trace output.

auth-prompt Command

Web browsers such as Internet Explorer or Netscape Navigator only display the first 23 characters of the string you indicate in the **auth-prompt** command. This limitation is imposed by the browser and is not a PIX Firewall fault. [CSCdp85254]

Console Access

Under heavy traffic on the 4-port Ethernet board, use of the console becomes much slower. Cisco recommends configuring such units during lighter traffic intervals. [CSCdp14222]

Default Configuration

The following commands have been added to the default configuration. The default configuration contains the commands that are enabled when you first install PIX Firewall:

```
aaa-server TACACS+ protocol tacacs+
aaa-server RADIUS protocol radius
floodguard enable
isakmp identity hostname
```

See “Default Configuration” in Chapter 1, “Introduction” in the *Configuration Guide for the Cisco Secure PIX Firewall Version 5.1* for the other commands provided in the default configuration. You can view this chapter online at the following site:

http://www.cisco.com/univercd/cc/td/doc/product/iaabu/pix/pix_v51/config/intro.htm

DNS Root Name Server Access

A DNS server on a higher level security interface needing to get updates from a root name server on the outside interface cannot use PAT (Port Address Translation). Instead, a **static** command statement must be added to map the DNS server to a global address on the outside interface. [CSCdp48115]

Failover

The following notes apply to the failover feature:

- All enabled interfaces must be connected between the Active and Standby units. If an interface is not in use, use the **shutdown** option to the **interface** command to disable the interface. [CSCdr41456]
- The Stateful Failover Logical Update Statistics output that displays when you use the **show failover** command only applies to Stateful Failover, not to the basic failover functionality. The statistics table only displays if a failover link has been configured.
- Failover no longer stops traffic when the 1550-byte pool exhausts. If this pool exhausts and cannot be reallocated on the Standby unit, the Standby unit will now reboot without affecting the Active unit. [CSCdp85718]
- The **failover timeout** command is only used with a non-supported PIX Firewall Engineering feature. To avoid confusion, the **failover timeout** command is not documented, but does appear in the default configuration. You can ignore this command.

Failure Message

The former PIX Firewall failure message was changed from “Watchdog timer failure - ARF!” to “Watchdog timer failure - Internal system timeout failure -- please provide the output that follows to customer support.”

FTP

- PIX Firewall now restricts FTP commands so that only FTP servers can submit a 227 reply and only FTP clients can submit a PORT command. Furthermore, the only PORT command permitted can only be one port number lower than the FTP control channel. This change removes the wildcard port for connections created from the PORT command. PIX Firewall now also enforces that the first SYN packet from the dynamic back channel must be from the expected side. [CSCdp86352]
- To access a PAT with passive FTP, use the **fixup protocol ftp strict ftp** command statement with an **access-list** command statement to permit outbound FTP traffic, as shown in the following example:

```
fixup protocol ftp strict ftp
access-list acl_in permit tcp any any eq ftp
access-group acl_in in interface inside
nat (inside) 1 0 0
global (outside) 1 209.165.201.5 netmask 255.255.255.224
```

Gigabit Interface Restrictions

The following open caveats apply to use of the Gigabit Ethernet interface:

- The Boothelper TFTP image cannot be sent to the PIX Firewall over a gigabit interface. Ensure that the PIX Firewall unit has at least one 10/100 Ethernet interface to convey the image to the PIX Firewall. [CSCdp92050]
- The **clear interface** command clears all interface statistics except the number of input bytes. This command no longer shuts down all system interfaces. The **clear interface** command works with all interface types except gigabit Ethernet. [CSCdp88443]

IPSec Notes

The following sections provide useful information about IPSec.

Certification Authority (CA) Usage

- When using the VeriSign CA, always use the **crloptional** parameter to the **ca configure** command. The following is a sample **ca configure** command:

```
ca configure myca ca 5 15 crloptional
```

In this example, **myca** is the name of the CA and the CA will be contacted rather than the RA. It also indicates the PIX Firewall will wait 5 minutes before sending another certificate request, if it does not receive a response, and will resend a total of 15 times before dropping its request. If the CRL is not accessible, **crloptional** tells the PIX Firewall to accept other peer's certificates.

Without the **crloptional** option, an error occurs when the PIX Firewall validates the certificate during main mode, which causes the peer PIX Firewall to fail. This problem occurs because the PIX Firewall is not able to poll the CRL from the VeriSign CA.

- The lifetime of a certificate and the Certificate Revocation List (CRL) is checked in GMT time. If you are using IPsec with certificates, set the PIX Firewall clock to GMT time to ensure that CRL checking works correctly.
- PIX Firewall only supports the following CA servers:
 - Entrust—PIX Firewall supports the VPN Connector version 4.1 (build 4.1.0.337). Use the **debug crypto ca** command to ensure that the certificate is created correctly. Important error messages only display when the **debug** command is enabled. If you enter the fingerprint value incorrectly, the only warning message that the value is not correct appears in the **debug crypto ca** command output. PIX Firewall supports Entrust/PKI version 4.0b.
 - VeriSign—through the VeriSign Private Certificate Services (PCS) and the OnSite service that lets you establish a CA system for issuing digital certificates. When using VeriSign CA Server, always use the **crloptional** option with the **ca configure** command.

Cisco Secure VPN Client

Only use version 5.1 of the PIX Firewall with version 1.1 or later of the Cisco Secure VPN Client.

When two policies are configured on the Cisco Secure VPN Client for different PIX Firewall interfaces, after the PIX Firewall unit initiates a rekey, the Client loses the ability to differentiate between the interfaces. This condition causes the message, “Cannot match Policy Entry for received IDs” to display and can cause a loss of connections. Once dropped, the tunnels cannot be re-established. [CSCdp88761]

crypto map Command

The **crypto map** *map_name* **interface** *if_name* command causes any currently running SAs (security associations) to be deleted.

ISAKMP Notes

- Version 5.1(2) and later: When configuring ISAKMP for certificate-based authentication, it is important to match the ISAKMP identity type with the certificate type. The **ca enroll** command used to acquire certificates will, by default, get a certificate with the identity based on hostname. Therefore, Cisco recommends you set each participating peer's identity to hostname. Otherwise, the ISAKMP security association established during IKE phase 1 may fail. [CSCdp93890]
- If an ISAKMP SA expires, the IPsec tunnel for the expired ISAKMP SA continues for the remaining time. If a PIX Firewall peer reboots before the ISAKMP SA expires, the keepalive fails to note that the other peer is not there and packets are silently dropped until the SA expires. [CSCdp86785]
- All **isakmp** command policies now appear in the configuration. Previously, default values were not listed. You can view this information with the **show isakmp policy** command.
- When the Cisco Secure VPN Client is using aggressive mode, the ISAKMP identity of the PIX Firewall should be configured to use the **address** parameter:

```
isakmp identity address
```

Using the **isakmp identity hostname** command on the PIX Firewall with aggressive mode configured on the Cisco Secure VPN Client causes the tunnel setup to fail because of the mismatch in identity.

Mode Configuration

PIX Firewall does not proxy ARP for addresses in the mode config pool. To enable connectivity of a remote client to the internal network, addresses in the mode config pool cannot overlap with any of the directly connected networks to the PIX Firewall. In addition, static **route** command statements need to be configured on the internal networks to direct traffic destined for the mode config pool to the PIX Firewall.

SA Lifetimes

If you enter the **show crypto ipsec sa** command and the screen display is stopped with the More prompt, and if the SA lifetime expires while the screen display is stopped, subsequent display information may refer to a stale SA and the SA lifetime values that display will be invalid. [CSCdm59768]

NAT

The PIX Firewall has an implicit default route to the outside interface for configuring NAT.

PIX 515 Rear Panel

The LED on the rear panel of a PIX 515 labeled FDX actually shows whether a link is up or down. The LED labeled LINK actually displays network activity. In addition, the four-port Ethernet card contains two LEDs at each interface connector. The left LED indicates 100 Mbps network connectivity and whether the link is up or down and the right LED indicates network activity.

PFSS

PFSS (PIX Firewall Syslog Server) now renames log files using the last modification date as the file type. For example, if PFSS needs to create a monday.log file and the filename already exists, PFSS checks the last modification date for the original file and finds, for example, that it was last modified on January 24, 2000. PFSS then renames the original file monday.012400 and moves it to the backup directory, which is named "backup." Then PFSS creates monday.log for the current log data.

PFSS attempts to create the backup directory whenever PFSS is restarted. If the directory exists, PFSS adds a message in the pfss.log file as follows:

```
mmm dd yyyy hh:mm:ss ThreadInit: Could not create backup directory
```

where *mmm dd yyyy hh:mm:ss* is a timestamp. This message can be ignored if the backup directory exists. If the directory does not exist and you see this message, then you should determine why the directory cannot be created.

PIX Setup Wizard

PIX Setup Wizard disables the **pager** command while configuring the PIX Firewall. After the wizard completes, use the **clear pager** command to return it to the default value. [CSCdr01768]

SNMP

- Syslog messages generated by the SNMP feature now specify the interface name instead of an interface number.
- The `cfwBufferStatTable` object does not list 4096-byte blocks. Refer to “Using the Firewall and Memory Pool MIBs” in Chapter 3, “Advanced Configurations,” in the *Configuration Guide for the Cisco Secure PIX Firewall Version 5.1* for detailed information on how to view the values in this object.

SQL*Net

PIX Firewall uses port 1521 for SQL*Net. This is the default port used by Oracle for SQL*Net; however, this value does not agree with IANA port assignments. [CSCdp33907]

Syslog

The following syslog changes occurred in version 5.1:

- Version 5.1(2) and later: If a bad TCP header length is detected, syslog message `%PIX-6-302002` reports an incorrect number of bytes transferred. The `%PIX-5-500003` syslog message has been added to indicate when a bad TCP header length occurs. The format for the new message is as follows:

```
%PIX-5-500003: Bad TCP hdr length (hdrhlen=bytes, pktlen=bytes) from src_addr/sport to
dest_addr/dport, flags: tcp_flags, on interface int_name
```

Refer to the *System Log Messages for the Cisco Secure PIX Firewall Version 5.1*, which you can view online at the following site:

http://www.cisco.com/univercd/cc/td/doc/product/iaabu/pix/pix_v51/syslog/index.htm

- Version 5.1(2) and later: `%PIX-4-500004` was added to indicate an invalid transport field for a protocol. The format for the new message is as follows:

```
%PIX-4-500004: Invalid transport field for protocol=ip_proto, from
src_addr/src_port to dest_addr/dest_port
```

- The following messages are new in version 5.1: `%PIX-2-106020`, `%PIX-1-107001`, `%PIX-1-107002`, `%PIX-6-110001`, `%PIX-3-110002`, `%PIX-3-208005`, `%PIX-3-213001`, `%PIX-3-213002`, `%PIX-3-213003`, `%PIX-3-213004`, `%PIX-6-312001`, `%PIX-4-403101`, `%PIX-4-403102`, `%PIX-4-403103`, `%PIX-4-403104`, `%PIX-4-403106`, `%PIX-4-403107`, `%PIX-4-403108`, `%PIX-4-403109`, `%PIX-4-403110`, `%PIX-5-500001`, `%PIX-5-500002`, `%PIX-6-603101`, `%PIX-6-603102`, `%PIX-6-603103`, `%PIX-6-603104`, `%PIX-6-603105`, `%PIX-2-709007`.

- The following messages were appended with the string “on interface *int_name*” (the interface name to which the message applies): %PIX-2-106003, %PIX-2-106006, %PIX-6-106015, %PIX-2-106016, %PIX-6-109002, %PIX-6-109005, %PIX-6-109006, %PIX-6-109007, %PIX-6-109008, %PIX-6-109009, %PIX-3-109010, %PIX-2-201003.
- %PIX-1-103002 was incorrectly listed in the version 5.0 documentation as a failover failure message when it actually indicated that the other unit was okay.
- %PIX-2-109011 formerly appeared at severity level 5.
- %PIX-6-302002 now ends with “*duration time bytes num (chars).*”
- %PIX-5-304001 formerly appeared at severity level 6.
- %PIX-3-304006 changed so that “trying *IP_addr*” was deleted from the message.
- %PIX-2-304007 formerly appeared at severity level 3.
- %PIX-6-307001 formerly appeared at both severity levels 6 and 3.
- %PIX-7-702301 formerly appeared at severity level 3.
- %PIX-3-702302 formerly appeared at severity level 7.
- The following messages were deleted: %PIX-2-106008, %PIX-2-106009, %PIX-2-106017, %PIX-2-110003, %PIX-3-202002, %PIX-3-202003, %PIX-3-202004, %PIX-3-209001, %PIX-3-209002, and %PIX-3-304006.

**Note**

Some syslog messages contain linefeeds. Because the Solaris version of syslog, known as syslogd, only stores the first line sent, logging information on these messages is incomplete. One such message, appears truncated on a Solaris system as follows:
[CSCdp87564]

```
%PIX-6-602301: sa created,
```

URL Logging

Inbound and outbound URLs are now logged by setting the **logging** command to the **debugging** option. However, URL filtering only affects outbound connections.

URL Size

The maximum length of a URL string passing through the PIX Firewall can now be up to 1024 characters in length.

Caveats

Open Caveats

Table 1 lists open caveats.

Table 1 Open Caveats

DDTS Number	Description	Found in Version
CSCdr41456	All enabled interfaces must be connected between the Active and Standby units. If an interface is not in use, use the shutdown option to the interface command to disable the interface.	5.1(2)
CSCdr14559	After installing additional memory in a PIX 520, do not remove the memory strips after you install them and have powered on the unit, or the PIX Firewall unit will become inoperable.	5.1(2)
CSCdr01768	PIX Setup Wizard disables the pager command while configuring the PIX Firewall. After the wizard completes, use the clear pager command to return it to the default value.	5.1(2)
CSCdp93890	When configuring ISAKMP for certificate-based authentication, it is important to match the ISAKMP identity type with the certificate type. See “ISAKMP Notes” for more information.	5.1(1)
CSCdp92050	The Boothelper TFTP image cannot be sent to the PIX Firewall over a gigabit interface. Ensure that the PIX Firewall unit has at least one 10/100 Ethernet interface to convey the image to the PIX Firewall.	5.1(1)
CSCdp88761	When two policies are configured on the Cisco Secure VPN Client for different PIX Firewall interfaces, after the PIX Firewall unit initiates a rekey, the Client loses the ability to differentiate between the interfaces. This condition causes the message, “Cannot match Policy Entry for received IDs” to display and can cause a loss of connections. Once dropped, the tunnels cannot be re-established.	5.1(1)
CSCdp87564	Some syslog messages contain linefeeds. Because the Solaris version of syslog, known as syslogd, only stores the first line sent, logging information on these messages is incomplete. One such message, appears truncated on a Solaris system as follows: %PIX-6-602301: sa created,	5.1(1)
CSCdp86785	If an ISAKMP SA expires, the IPSec tunnel for the expired ISAKMP SA continues for the remaining time. If a PIX Firewall peer reboots before the ISAKMP SA expires, the keepalive fails to note that the other peer is not there and packets are silently dropped until the SA expires.	5.1(1)
CSCdp88443	The clear interface command clears all interface statistics except the number of input bytes. This command no longer shuts down all system interfaces. The clear interface command works with all interface types except gigabit Ethernet.	5.1(1)
CSCdp85254	Web browsers such as Internet Explorer or Netscape Navigator only display the first 23 characters of the string you indicate in the auth-prompt command. This limitation is imposed by the browser and is not a PIX Firewall fault.	5.1(1)
CSCdp67251	The fixup protocol sqlnet command only works with Oracle, not with NetWare SQLNET.	5.1(1)
CSCdp64331	A gigabit interface must not be shut down for more than 5 minutes. After that, the PIX Firewall unit must be rebooted to regain access to the interface.	5.1(1)
CSCdp48115	A DNS server behind the PIX Firewall cannot use PAT; however, adding a static command statement can be used as a workaround.	5.1(1)
CSCdp42625	When using the VeriSign CA, always use the crloptional parameter to the ca configure command.	5.1(1)

Table 1 Open Caveats

DDTS Number	Description	Found in Version
CSCdp38206	A PIX Firewall unit containing a 16 MB Flash memory card cannot be downgraded to version 4.4(1), 4.4(2), 5.0(1), or 5.0(2).	5.1(1)
CSCdp14222	Under heavy traffic on the 4-port Ethernet board, use of the console becomes much slower. Cisco recommends configuring such units during lighter traffic intervals.	5.1(2)
CSCdm59768	If you enter the show crypto ipsec sa command and the screen display is stopped with the More prompt, and if the SA lifetime expires while the screen display is stopped, subsequent display information may refer to a stale SA and the SA lifetime values that display will be invalid.	5.1(1)

Resolved Caveats

Table 2 lists resolved caveats.

Table 2 Resolved Caveats

DDTS Number	Description	Fixed in Version
CSCds38708	The fixup protocol smtp command no longer permits commands it would normally screen out from being appended to the SMTP DATA command.	5.1(4)
CSCds30699	PIX Firewall continues to filter SMTP commands if the DATA command fails. Previously, the Mail Guard feature would stop filtering if the DATA command failed. The Mail Guard feature is enabled with the fixup protocol smtp port_number command, which is enabled in the PIX Firewall unit's default configuration.	5.1(3)
CSCdr91002	Multiple SMTP commands contained in a single packet are no longer permitted and are now dropped.	5.1(3)
CSCdr46152	The access-list command now works correctly with the name command so that names store correctly in the configuration.	5.1(2)
CSCdr03568	Traceroute through the PIX Firewall now works correctly with PAT. Previously, PIX Firewall would only let information return about the first hop from the PIX Firewall.	5.1(2)
CSCdr02190	PIX Setup Wizard no longer displays PAT IP addresses twice.	5.1(2)
CSCdr01766	PIX Setup Wizard now handles the nat 0 access-list command correctly.	5.1(2)
CSCdp95629	The Standby failover unit no longer sends Websense requests to the Websense server. This problem was noted in versions 4.4, 5.0, and 5.1. An identical fix will be provided in the next 4.4 release.	5.1(2)
CSCdp88122	An SQL*Net version 1 or truncated packet no longer crashes PIX Firewall.	5.1(1)
CSCdp86352	PIX Firewall now prevents FTP clients from initiating FTP server commands.	5.1(1)

Table 2 Resolved Caveats (continued)

DDTS Number	Description	Fixed in Version
CSCdp85781	PIX Firewall no longer fails if aaa-server protocol commands are entered with common letters in the protocol names, and if an aaa authentication command is entered using one of the protocol names. Previously, after the aaa command was entered, PIX Firewall would display the following assertion error before crashing: assertion "groupid >= 0" failed: file "uauth_server.c", line 439 This caveat exists in versions 4.4, 5.0, and 5.1. An identical fix will be provided in the next 4.4 release.	5.1(2)
CSCdp85718	Failover no longer stops traffic when the 1550-byte pool exhausts. If this pool exhausts and cannot be reallocated on the Standby unit, it will now reboot without affecting the Active unit.	5.1(1)
CSCdp78256	A 1550-byte memory block leak no longer occurs if an incoming SNMP request is invalid.	5.1(1)
CSCdp76529	Syslog and the show uauth command no longer displays wrong username information when used simultaneously.	5.1(2)
CSCdp74795	The source IP address in SNMP traps is no longer reversed; for example, 10.1.1.1 no longer displays as 1.1.1.10.	5.1(1)
CSCdp74486	If a bad TCP header length is detected, syslog message PIX-6-302002 reports an incorrect number of bytes transferred. The PIX-5-500003 syslog message has been added to indicate when a bad TCP header length occurs.	5.1(2)
CSCdp68315	XCB PIX AAA: HTTP Authentication no longer fails for usernames longer than 24 characters. The new limit on usernames is 30 characters and the limit on a password is 15 characters.	5.1(2)
CSCdp65228	Syslog message %PIX-2-108002 now lists the IP address in the correct order. Previously an IP address such as 10.1.1.1 was listed in the message as 1.1.1.10.	5.1(1)
CSCdp64321	The 1000auto option to the interface command now gets written to the configuration. When the PIX Firewall reboots, the gigabit interface is then automatically shut down.	5.1(2)
CSCdp60485	If a new peer successfully negotiates an IPsec tunnel to protect the same set of identities as an old tunnel, PIX Firewall switches to the new peer and maintains the old tunnel for 30 seconds to let traffic subside.	5.1(1)
CSCdp59021	PIX Firewall no longer continuously reboots after downgrading to the version 4.4(3) image.	5.1(1)
CSCdp58991	AAA accounting is no longer unidirectional. Now secondary connections are assigned the same direction as the control connection. This lets uauth associate and dynamically allocate the connections from the same control connection with the same identity. Accounting will then trigger for the matched identity.	5.1(1)
CSCdp57339	The MTU of an interface no longer is set to 0. Previously, entering the write erase command followed by rebooting, and then not explicitly setting the MTU, caused IPsec to initialize the tunnel with an MTU of 0.	5.1(1)
CSCdp58692	The name command now accepts dashes in the name you specify. An example is as follows: name 10.1.1.2 tftp-server-inside copy tftp://tftp-server-inside/pix512.bin flash	5.1(2)

Table 2 Resolved Caveats (continued)

DDTS Number	Description	Fixed in Version
CSCdp56795	<p>Syslog message %PIX-2-1006002 only displays the protocol as a number instead of as a name. This is also fixed in all future PIX Firewall versions. The text for this message is now one of the following:</p> <ul style="list-style-type: none"> • 1 Connection denied by outbound list <i>list_ID</i> src <i>laddr/lport</i> dest <i>faddr/fport</i> • 6 Connection denied by outbound list <i>list_ID</i> src <i>laddr/lport</i> dest <i>faddr/fport</i> • 17 Connection denied by outbound list <i>list_ID</i> src <i>laddr/lport</i> dest <i>faddr/fport</i> <p>where 1 means ICMP, 6 means TCP, and 17 means UDP. Previously, PIX Firewall listed the protocol by name in some messages and by number in others. The messages now consistently use the protocol number.</p>	5.1(1)
CSCdp56150	The Private Link PL/2 card is now recognized correctly. The use of this card improves IPsec processing speed.	5.1(1)
CSCdp55033	When a packet is received with a bad checksum, PIX Firewall now discards the packet without closing the TCP connection. Previously, if after a connection was closed, a subsequent packet arrived, PIX Firewall caused a reset that stopped traffic on the connection.	5.1(1)
CSCdp53852	The fixup smtp command now correctly translates multi-line banners.	5.1(1)
CSCdp52877	The debug icmp trace command no longer also enables the debug fixup_smtp command.	5.1(1)
CSCdp52185	Version 5.1 provides the access-list command port selector for IPsec.	5.1(1)
CSCdp51830	Access lists now handle ICMP echo-request and echo-reply correctly.	5.1(1)
CSCdp49186	Limited broadcasts sent to 255.255.255.255 now work correctly with the PIX Firewall. While the broadcast is not forwarded through the PIX Firewall, this feature lets RIP updates work correctly.	5.1(1)
CSCdp45416	PFSS (PIX Firewall Syslog Server) now renames log files using the last modification date as the file type. For example, if PFSS needs to create a monday.log file and the filename already exists, PFSS checks the last modification date for the original file and finds, for example, that it was last modified on January 24, 2000. PFSS then renames the original file monday.012400 and moves it to the backup directory. Then PFSS creates monday.log for the current log data.	5.1(1)
CSCdp44875	PIX Firewall no longer gets into an unrecoverable crash when reloaded after using the clear flashfs command without loading a new image.	5.1(1)
CSCdp41051	The terminal no monitor command now works correctly.	5.1(1)
CSCdp38828	The PIX Firewall failure message was changed from “Watchdog timer failure - ARF!” to “Watchdog timeout!”.	5.1(1)
CSCdp33907	PIX Firewall uses port 1521 for SQL*Net even though this value does not agree with the IANA port assignments.	5.1(1)
CSCdp23931	Adds syslog message %PIX-2-106020: Deny IP teardrop fragment (size = <i>num</i> , offset = <i>num</i>) from <i>IP_addr</i> to <i>IP_addr</i> . This message occurs when the PIX Firewall discards an IP packet with a teardrop signature with either a small offset or fragment overlapping. You should treat this event as a hostile attempt to circumvent the firewall or an intrusion detection system.	5.1(1)
CSCdp05727	Allows an interface to be the gateway for the route command. The PIX Firewall now uses ARP to determine the real destination address if the next hop address is the outgoing interface address.	5.1(1)

Table 2 Resolved Caveats (continued)

DDTS Number	Description	Fixed in Version
CSCdp00115	All isakmp command policies now appear in the configuration. See “ISAKMP Notes” for more information.	5.1(1)
CSCdm79900	Request for separate levels of debug for syslog and SNMP logging. See “Separate SNMP and Syslog Message Levels” for more information.	5.1(1)
CSCdm74155	PIX Firewall now supports the copy tftp flash command. See “copy tftp flash Command” for more information.	5.1(1)
CSCdm62488	DNS packets are no longer altered by the alias command in both directions. Use the version 5.0 sysopt noaliasdns outboundinbound command to disable DNS Address record fixups from interaction with the alias command. Using a separate command for inbound and another for outbound disables DNS A record fixups.	5.1(1)
CSCdm23996	PIX Firewall now has RIP version 2 support to ensure that incorrect routes are not learned from unauthorized neighbors.	5.1(1)
CSCdk77815	As of PIX Firewall version 5.0, the show conduit and show access-list commands list a hit count after each ACL (Access Control List) element that indicates the number of times an element has been matched during the access-list or conduit command statement search.	5.1(1)
CSCdk76181	The PIX Firewall now has a nat (interface) 0 access-list acl_name that provides no nat capability for both inbound and outbound connections. See “nat Command” for more information.	5.1(1)
CSCdk22364	The aaa command statement now accepts a protocol and port specification for what used to be the except option. The except option has been replaced by the include and exclude options. See “aaa Command” for more information.	5.1(1)
CSCdk06669	Support for new Cisco Firewall MIB.	5.1(1)
CSCdj95449	Support for enhancements to the established command.	5.1(1)

Related Documentation

Use this document in conjunction with the PIX Firewall documentation at the following site:

<http://www.cisco.com/univercd/cc/td/doc/product/iaabu/pix/index.htm>

Cisco provides PIX Firewall technical tips at the following site:

<http://www.cisco.com/warp/public/110/index.shtml#pix>

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