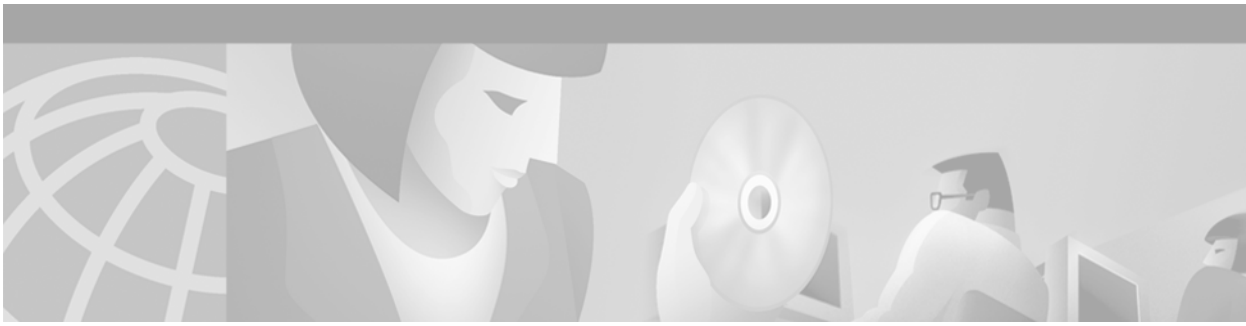


Configuring per-User Configuration

This chapter describes per-user configuration, a large-scale dial solution. It includes the following main sections:

- Per-User Configuration Overview
- How to Configure a AAA Server for Per-User Configuration
- Monitoring and Debugging Per-User Configuration Settings
- Configuration Examples for Per-User Configuration

This set of features is supported on all platforms that support Multilink PPP (MLP).

A virtual access interface created dynamically for any user dial-in session is deleted when the session ends. The resources used during the session are returned for other dial-in uses.

When a specific user dials in to a router, the use of a per-user configuration from an authentication, authorization, and accounting (AAA) server requires that AAA is configured on the router and that a configuration for that user exists on the AAA server.

To identify the hardware platform or software image information associated with a feature, use the Feature Navigator on Cisco.com to search for information about the feature or refer to the software release notes for a specific release. For more information, see the "Identifying Supported Platforms" section in the "Using Cisco IOS Software" chapter.

For a complete description of the commands mentioned in this chapter, refer to the *Cisco IOS Dial Technologies Command Reference*, Release 12.2 and the *Cisco IOS Security Command Reference*, Release 12.2. To locate documentation of other commands that appear in this chapter, use the command reference master index or search online.

Per-User Configuration Overview

Per-user configuration provides a flexible, scalable, easily maintained solution for customers with a large number of dial-in users. This solution can tie together the following dial-in features:

- Virtual template interfaces, generic interface configuration and router-specific configuration information stored in the form of a virtual template interface that can be applied (*cloned*) to a virtual access interface each time any user dials in. This configuration is described in the chapter "Configuring Virtual Template Interfaces" in this publication.
- AAA per-user security and interface configuration information stored on a separate AAA server and sent by the AAA server to the access server or router in response to authorization requests during the PPP authentication phase. The per-user configuration information can add to or override the generic configuration on a virtual interface.

- Virtual profiles, which can use either or both of the two sources of information listed in the previous bullets for virtual interface configuration. When a user dials in, virtual profiles can apply the generic interface configuration and then apply the per-user configuration to create a unique virtual access interface for that user. This configuration is described in the chapter “Configuring Virtual Profiles” in this publication.

The per-user configuration feature provides these benefits:

- Maintenance ease for service providers with a large number of access servers and a very large number of dial-in users. Service providers need not update all their routers and access servers when user-specific information changes; instead, they can update one AAA server.
- Scalability. By separating generic virtual interface configuration on the router from the configuration for each individual, Internet service providers and other enterprises with large numbers of dial-in users can provide a uniquely configured interface for each individual user. In addition, by separating the generic virtual interface configuration from the physical interfaces on the router, the number and types of physical interfaces on the router or access server are not intrinsic barriers to growth.

General Operational Processes

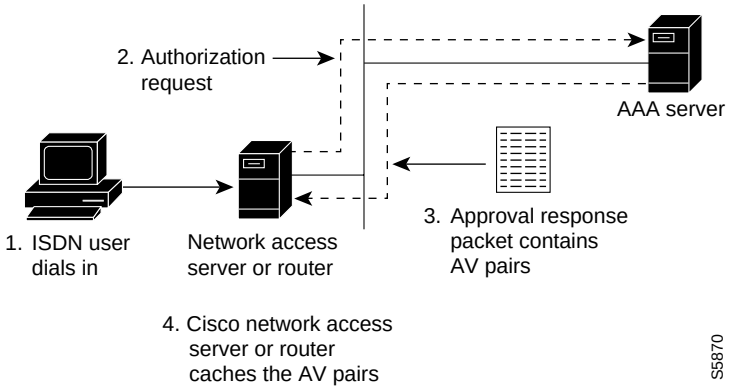
In general, the per-user configuration process on the Cisco router or network access server proceeds as follows:

1. The user dials in.
2. The authentication and authorization phases occur.
   a. If AAA is configured, the router sends an authorization request to the AAA server.
   b. If the AAA server has information (attribute-value or AV pairs, or other configuration parameters) that defines a configuration for the specific user, the server includes it in the information in the approval response packet.

      Figure 98 illustrates the request and response part of the process that happens when a user dials in, given that AAA is configured and that the AAA server has per-user configuration information for the dial-in user.
   c. The router looks for AV pairs in the AAA approval response.
   d. The router caches the configuration parameters.

Note TACACS servers treat authentication and authorization as two phases; RADIUS servers combine authentication and authorization into a single step. For more detailed information, refer to your server documentation.

Figure 98 Per-User Configuration Authentication and Authorization



3. A virtual access interface is created for this user.
   a. The router finds the virtual template that is set up for virtual profiles, if any, and applies the commands to the virtual access interface.
   b. The router looks for the AV pairs to apply to this virtual access interface to configure it for the dial-in user.
   c. The AV pairs are sent to the Cisco IOS command-line parser, which interprets them as configuration commands and applies them to configure this virtual access interface.

The result of this process is a virtual access interface configured uniquely for the dial-in user.

When the user ends the call, the virtual access interface is deleted and its resources are returned for other dial-in uses.

Note The use of virtual profiles can modify the process that occurs between the user dial-in and the use of AAA configuration information. For more information, see the chapter "Configuring Virtual Profiles" in this publication.

Operational Processes with IP Address Pooling

During IP Control Protocol (IPCP) address negotiation, if an IP pool name is specified for a user, the network access server checks whether the named pool is defined locally. If it is, no special action is required and the pool is consulted for an IP address.

If the required pool is not present (either in the local configuration or as a result of a previous download operation), an authorization call to obtain it is made using the special username:

```
pools-nas-name
```

where *nas-name* is the configured name of the network access server. In response, the AAA server downloads the configuration of the required pool.

This pool username can be changed using Cisco IOS configuration, for example:

```
aaa configuration config-name nas1-pools-definition.cisco.us
```

This command has the effect of changing the username that is used to download the pool definitions from the default name "pools-*nas-name*" to "nas1-pools-definition.cisco.com."

On a TACACS+ server, the entries for an IP address pool and a user of the pool might be as follows:

```
user = nas1-pools {
     service = ppp protocol = ip {
        pool-def#1 = "aaa 10.0.0.1 10.0.0.3"
        pool-def#2 = "bbb 10.1.0.1 10.1.0.10"
        pool-def#3 = "ccc 10.2.0.1 10.2.0.20"
        pool-timeout=60
    }
}

user = georgia {
    login = cleartext lab
    service = ppp protocol = ip {
                  addr-pool=bbb
    }
}
```

On a RADIUS server, the entries for the same IP address pool and user would be as follows:

```
nas1-pools      Password = "cisco" User-Service-Type=Outbound-User
        cisco-avpair = "ip:pool-def#1=aaa 10.0.0.1 10.0.0.3",
        cisco-avpair = "ip:pool-def#2=bbb 10.1.0.1 10.1.0.10",
        cisco-avpair = "ip:pool-def#3=ccc 10.2.0.1 10.2.0.20",
        cisco-avpair = "ip:pool-timeout=60"

georgia Password = "lab"
        User-Service-Type = Framed-User,
        Framed-Protocol = PPP,
                cisco-avpair = "ip:addr-pool=bbb"
```

Note This entry specifies a User-Service-Type of Outbound-User. This attribute is supplied by the network access server to prevent ordinary logins from using the well-known username and password combination of nas1-pools/cisco.

Pools downloaded to a Cisco network access server are not retained in nonvolatile memory and automatically disappear whenever the access server or router restarts. Downloaded pools can also be made to time out automatically by adding a suitable AV pair. For more information, see the section "Supported Attrubutes for AV Pairs" and the pool-timeout attribute in Table 37. Downloaded pools are marked as *dynamic* in the output of the **show ip local pool** command.

Deleting Downloaded Pools

To delete downloaded pools, you can do either of the following:

- Manually delete the definition from the network access server. For example, if "bbb" is the name of a downloaded pool, you can enter the Cisco IOS **no ip local pool bbb** command.

  Deleting a pool definition does not interrupt service for current users. If a pool is deleted and then redefined to include a pool address that is currently allocated, the new pool understands and tracks the address as expected.

- Set an AV pair pool-timeout value; this is a more desirable solution.

  The pool-timeout AV pair starts a timer when the pool is downloaded. Once the timer expires, the pools are deleted. The next reference to the pools again causes an authorization call to be made, and the pool definition is downloaded again. This method allows definitions to be made and changed on the AAA server and propagated to network access servers.

Supported Attributes for AV Pairs

Table 37 provides a partial list of the Cisco-specific supported attributes for AV pairs that can be used for per-user virtual interface configuration. For complete lists of Cisco-specific, vendor-specific, and TACACS+ supported attributes, see the *Cisco IOS Security Configuration Guide* and *Cisco IOS Security Command Reference*.

Table 37 Partial List of Cisco-Specific Supported AV Pair Attributes

Attribute	Meaning
inacl#	An input access list definition. For IP, standard or extended access list syntax can be used, although you cannot mix them within a single list. For Internet Protocol Exchange (IPX), only extended syntax is recognized. The value of this attribute is the text that comprises the body of a named access list definition.
outacl#[1]	An output access list definition. For IP, standard or extended access list syntax can be used. For IPX, only extended syntax is recognized. The value of this attribute is the text that comprises the body of a named access list definition.
rte-fltr-in#	An input route filter. For IP, standard or extended access list syntax can be used, although you cannot mix them within a single list. For IPX, only extended syntax is recognized. The first line of this filter must specify a routing process. Subsequent lines comprise the body of a named access list.
rte-fltr-out#	An output route filter. For IP, standard or extended access list syntax can be used, although you cannot mix them within a single list. For IPX, only extended syntax is recognized. The first line of this filter must specify a routing process. Subsequent lines comprise the body of a named access list.
route#[2]	Static routes, for IP and IPX. The value is text of the form *destination-address mask* [*gateway*].
sap#	IPX static Service Advertising Protocol (SAP). The value is text from the body of an **ipx sap** configuration command.
sap-fltr-in#	IPX input SAP filter. Only extended access list syntax is recognized. The value is text from the body of an extended IPX **access-list** configuration command. (The Novell socket number for SAP filtering is 452.)
sap-fltr-out#	IPX output SAP filter. Only extended **access-list** command syntax is recognized. The value is text from the body of an extended IPX access-list configuration command.
pool-def#	An IP pool definition. The value is text from the body of an **ip local pool** configuration command.
pool-timeout	An IP pool definition. The body is an integer representing a timeout, in minutes.

1. The “outacl” attribute still exists and retains its old meaning.
2. The “route” attribute, without a trailing #, is still recognized for backward compatibility with the TACACS+ protocol specification, but if multiple static routes are required in TACACS+, full “route#” names will need to be employed.

Table 38 provides examples for each attribute on an AAA TACACS+ server.

Table 38 TACACS+ Server AV Pair Examples for Each Attribute

Attribute	TACACS+ Server Examples

inacl#	**IP:**
	`inacl#3="permit ip any any precedence immediate"`
	`inacl#4="deny igrp 10.0.1.2 255.255.0.0 any"`
	IPX:
	`inacl#1="deny 3C01.0000.0000.0001"`
	`inacl#2="deny 4C01.0000.0000.0002"`

outacl#	`outacl#2="permit ip any any precedence immediate"` `outacl#3="deny igrp 10.0.9.10 255.255.0.0 any"`

rte-fltr-in#	**IP:**
	`rte-fltr-in#1="router igrp 60"`
	`rte-fltr-in#3="permit 10.0.3.4 255.255.0.0"`
	`rte-fltr-in#4="deny any"`
	IPX:
	`rte-fltr-in#1="deny 3C01.0000.0000.0001"`
	`rte-fltr-in#2="deny 4C01.0000.0000.0002"`

rte-fltr-out#	`rte-fltr-out#1="router igrp 60"`
	`rte-fltr-out#3="permit 10.0.5.6 255.255.0.0"`
	`rte-fltr-out#4="permit any"`

route#	**IP:**
	`route#1="10.0.0.0 255.0.0.0 1.2.3.4"`
	`route#2="10.1.0.0 255.0.0.0"`
	IPX:
	`route#1="4C000000 ff000000 10.12.3.4"`
	`route#2="5C000000 ff000000 10.12.3.5"`

sap#	`sap#1="4 CE1-LAB 1234.0000.0000.0001 451 4"` `sap#2="5 CE3-LAB 2345.0000.0000.0001 452 5"`
sap-fltr-in#	`sap-fltr-in#1="deny 6C01.0000.0000.0001"` `sap-fltr-in#2="permit -1"`
sap-fltr-out#	`sap-fltr-out#1="deny 6C01.0000.0000.0001"` `sap-fltr-out#2="permit -1"`

pool-def#	`pool-def#1 = "aaa 10.0.0.1 1.0.0.3"`
	`pool-def#2 = "bbb 10.1.0.1 2.0.0.10"`
	`pool-def#3 = "ccc 10.2.0.1 3.0.0.20"`

pool-timeout	`pool-timeout=60`

Table 39 provides examples for each attribute on an AAA RADIUS server.

Table 39 RADIUS Server AV Pair Examples for Each Attribute

Attribute	RADIUS Server Examples
lcp:interface-config[1]	`cisco-avpair = "lcp:interface-config=ip address 10.0.0.0 255.255.255.0",`
inacl#	`cisco-avpair = "ip:inacl#3=permit ip any any precedence immediate",` `cisco-avpair = "ip:inacl#4=deny igrp 10.0.1.2 255.255.0.0 any",`

Table 39 RADIUS Server AV Pair Examples for Each Attribute (continued)

Attribute	RADIUS Server Examples
outacl#	cisco-avpair = "ip:outacl#2=permit ip any any precedence immediate", cisco-avpair = "ip:outacl#3=deny igrp 10.0.9.10 255.255.0.0 any",
rte-fltr-in#	**IP:** cisco-avpair = "ip:rte-fltr-in#1=router igrp 60", cisco-avpair = "ip:rte-fltr-in#3=permit 10.0.3.4 255.255.0.0", cisco-avpair = "ip:rte-fltr-in#4=deny any", **IPX:** cisco-avpair = "ipx:rte-fltr-in=deny 3C01.0000.0000.0001",
rte-fltr-out#	cisco-avpair = "ip:rte-fltr-out#1=router igrp 60", cisco-avpair = "ip:rte-fltr-out#3=permit 10.0.5.6 255.255.0.0", cisco-avpair = "ip:rte-fltr-out#4=permit any",
route#	**IP:** cisco-avpair = "ip:route=3.10.0.0 255.0.0.0 1.2.3.4", cisco-avpair = "ip:route=4.10.0.0 255.0.0.0", **IPX:** cisco-avpair = "ipx:route=4C000000 ff000000 10.12.3.4", cisco-avpair = "ipx:route=5C000000 ff000000 10.12.3.5"
sap#	cisco-avpair = "ipx:sap=4 CE1-LAB 1234.0000.0000.0001 451 4", cisco-avpair = "ipx:sap=5 CE3-LAB 2345.0000.0000.0001 452 5",
sap-fltr-in#	cisco-avpair = "ipx:sap-fltr-in=deny 6C01.0000.0000.0001", cisco-avpair = "ipx:sap-fltr-in=permit -1"
sap-fltr-out#	cisco-avpair = "ipx:sap-fltr-out=deny 6C01.0000.0000.0001", cisco-avpair = "ipx:sap-fltr-out=permit -1"
pool-def#	cisco-avpair = "ip:pool-def#1=aaa 10.0.0.1 1.0.0.3", cisco-avpair = "ip:pool-def#2=bbb 10.1.0.1 2.0.0.10", cisco-avpair = "ip:pool-def#3=ccc 10.2.0.1 3.0.0.20",
pool-timeout	cisco-avpair = "ip:pool-timeout=60"

1. This attribute is specific to RADIUS servers. It can be used to add Cisco IOS interface configuration commands to specific user configuration information.

How to Configure a AAA Server for Per-User Configuration

The configuration requirements and the structure of per-user configuration information is set by the specifications of each type of AAA server. Refer to your server documentation for more detailed information. The following sections about TACACS and RADIUS servers are specific to per-user configuration:

- Configuring a Freeware TACACS Server for Per-User Configuration (As required)
- Configuring a CiscoSecure TACACS Server for Per-User Configuration (As required)
- Configuring a RADIUS Server for Per-User Configuration (As required)

See the section "Monitoring and Debugging Per-User Configuration Settings" later in this chapter for tips on troubleshooting per-user configuration settings. See the section "Configuration Examples for Per-User Configuration" at the end of this chapter for examples of configuring RADIUS and TACACS servers.

Configuring a Freeware TACACS Server for Per-User Configuration

On a TACACS server, the entry in the user file takes a standard form. In the freeware version of TACACS+, the following lines appear in order:

- "User =" followed by the username, a space, and an open brace
- Authentication parameters
- Authorization parameters
- One or more AV pairs
- End brace on a line by itself

The general form of a freeware TACACS user entry is shown in the following example:

```
user = username {
     authentication parameters go here
     authorization parameters go here
}
```

The freeware TACACS user entry form is also shown by the following examples for specific users:

```
user= Router1
  Password= cleartext welcome
  Service= PPP protocol= ip {
        ip:route=10.0.0.0 255.0.0.0
        ip:route=10.1.0.0 255.0.0.0
        ip:route=10.2.0.0 255.0.0.0
        ip:inacl#5=deny 10.5.0.1
}

user= Router2
  Password= cleartext lab
  Service= PPP protocol= ip {
        ip:addr-pool=bbb
}
```

For more requirements and detailed information, refer to your AAA server documentation.

Configuring a CiscoSecure TACACS Server for Per-User Configuration

The format of an entry in the user file in the AAA database is generally name = value. Some values allow additional subparameters to be specified and, in these cases, the subparameters are enclosed in braces ({}). The following simple example depicts an AAA database showing the default user, one group, two users that belong to the group, and one user that does not:

```
# Sample AA Database 1
unknown_user = {
  password = system #Use the system's password file (/etc/passwd)
}
group = staff {
  # Password for staff who do not have their own.
  password = des "sefjkAlM7zybE"
  service = shell {
    # Allow any commands with any attributes.
    default cmd = permit
    default attribute = permit
  }
```

```
}
user = joe {  # joe uses the group password.

  member = "staff"
}
user = pete {  # pete has his own password.
  member = "staff"
  password = des "alkd9Ujiqp2y"
}
user = anita {
  # Use the "default" user password mechanism defined above.
  service = shell {
    cmd = telnet {  # Allow Telnet to any destination
    }
  }
}
```

For more information about the requirements and details of configuring the CiscoSecure server, see the *CiscoSecure UNIX Server User Guide*.

Configuring a RADIUS Server for Per-User Configuration

On a RADIUS server, the format of an entry in the users file includes the following lines in order:

- Username and password
- User service type
- Framed protocol
- One or more AV pairs

Note All these AV pairs are vendor specific. To use them, RADIUS servers must support the use of vendor-specific AV pairs. Patches for some servers are available from the Cisco Consulting Engineering (CE) customer-support organization.

The structure of an AV pair for Cisco platforms starts with *cisco-avpair* followed by a space, an equal sign, and another space. The rest of the line is within double quotation marks and, for all lines but the last, ends with a comma. Inside the double quotation marks is a phrase indicating the supported attribute, another equal sign, and a Cisco IOS command. The following examples show two different partial user configurations on a RADIUS server.

Router1

```
Password = "welcome"
User-Service-Type = Framed-User,
Framed-Protocol = PPP,
cisco-avpair = “ip:route=10.0.0.0 255.0.0.0”,
cisco-avpair = “ip:route=10.1.0.0 255.0.0.0”,
cisco-avpair = “ip:route=10.2.0.0 255.0.0.0”,
cisco-avpair = “ip:inacl#5=deny 10.5.0.1”
```

Router2

```
Password = "lab"
User-Service-Type = Framed-User,
Framed-Protocol = PPP,
cisco-avpair = "ip:addr-pool=bbb"
```

Monitoring and Debugging Per-User Configuration Settings

Per-user configuration information exists on AAA servers only and is configured there, as described in the "How to Configure a AAA Server for Per-User Configuration" section.

For more information about configuring an application that can tie AAA per-user configuration information to generic interface and router configuration, see the chapter "Configuring Virtual Profiles" in this publication. Virtual profiles are required for combining per-user configuration information and generic interface and router configuration information to create virtual access interfaces for individual ISDN B channels.

However, you can monitor and debug the per-user configuration settings on the router or access server that are set from an AAA server. Table 40 indicates some of the commands to use for each attribute.

Table 40 Monitoring and Debugging Per-User Configuration Commands

Attribute	show Commands	debug Commands
inacl# outacl#	**show ip access-list** **show ip interface** *interface* **show ipx access-list** **show ipx interface**	**debug aaa authorization** **debug aaa per-user**
rte-fltr-in# rte-fltr-out#	**show ip access-list** **show ip protocols**	**debug aaa authorization** **debug aaa per-user**
route#	**show ip route** **show ipx route**	**debug aaa authorization** **debug aaa per-user**
sap#	**show ipx servers**	**debug aaa authorization** **debug aaa per-user**
sap-fltr-in# sap-fltr-out#	**show ipx access-list** **show ipx interface**	**debug aaa authorization** **debug aaa per-user**
pool-def# pool-timeout	**show ip local pool** [*name*]	—

Configuration Examples for Per-User Configuration

The following sections provide two comprehensive examples:

- TACACS+ Freeware Examples
- RADIUS Examples

These examples show router or access server configuration and AV pair configuration on an AAA server.

TACACS+ Freeware Examples

This section provides the TACACS+ freeware versions of the following examples:

- IP Access Lists and Static Routes Using Virtual Profiles over ISDN BRI
- IPX Per-User SAP Filters Using IPXWAN and Virtual Profiles by a Synchronous Interface

IP Access Lists and Static Routes Using Virtual Profiles over ISDN BRI

The following example provides configurations for the TACACS+ freeware daemon, the network access server, and the peer router named Router1. On the TACACS+ AAA server, peer router Router1 has a configuration that includes static routes and IP access lists.

TACACS+ Freeware Daemon Configuration File

```
key = tac123
user = Router1 {
global = cleartext welcome
service = ppp protocol = ip {
route#1=”10.0.0.0 255.0.0.0"
route#2=”10.1.0.0 255.0.0.0"
route#3=”10.2.0.0 255.0.0.0"
inacl#1=”deny 10.5.0.1"
}
}
```

Current Network Access Server Configuration

```
version 11.3
service timestamps debug datetime localtime
service udp-small-servers
service tcp-small-servers
!
hostname Router2
!
aaa new-model
aaa authentication ppp default tacacs+
aaa authorization network tacacs+
enable secret 5 $1$koOn$/1QAylov6JFAElxRCrL.o/
enable password lab
!
username Router1 password 7 15050E0007252621
ip host Router2 172.21.114.132
ip domain-name cisco.com
ip name-server 172.19.2.132
ip name-server 192.168.30.32
isdn switch-type basic-5ess
interface Ethernet 0
 ip address 172.21.114.132 255.255.255.224
 no ip mroute-cache
 media-type 10BaseT
!

interface Virtual-Template1
 ip unnumbered Ethernet0
 no cdp enable
!
!
interface BRI0
 ip unnumbered Ethernet0
 no ip mroute-cache
 encapsulation ppp
 no ip route-cache
 dialer idle-timeout 300
 dialer map ip 10.5.0.1 name Router1 broadcast 61482
 dialer-group 1
 no fair-queue
 ppp authentication chap
!
!
```

```
ip default-gateway 172.21.114.129
no ip classless
ip route 0.0.0.0 0.0.0.0 172.21.114.129
!
virtual-profile virtual-template 1
dialer-list 1 protocol ip permit
tacacs-server host 172.21.114.130
tacacs-server key tac123
```

Current Peer Configuration for Router1

```
version 11.3
no service pad
!
hostname Router1
!
enable secret 5 $1$m1WK$RsjborN1Z.XZuFqsrtSnp/
enable password lab
!
username Router2 password 7 051C03032243430C
ip host Router1 172.21.114.134
ip domain-name cisco.com
ip name-server 172.19.2.132
ip name-server 192.168.30.32
isdn switch-type basic-5ess
!
interface Ethernet0
 ip address 172.21.114.134 255.255.255.224
 no ip route-cache
 shutdown
!
interface BRI0
 ip address 10.5.0.1 255.0.0.0
 encapsulation ppp
 dialer map ip 172.21.114.132 name Router2 broadcast 61483
 dialer-group 1
 no fair-queue
!
ip default-gateway 172.21.114.129
no ip classless
ip route 172.21.0.0 255.255.0.0 BRI0
dialer-list 1 protocol ip permit
!
line con 0
 exec-timeout 0 0
line vty 0 4
 password lab
 login
end
```

IPX Per-User SAP Filters Using IPXWAN and Virtual Profiles by a Synchronous Interface

The following example provides configurations for the TACACS+ daemon and the peer router named Router1. On the TACACS+ AAA server, user ny has a configuration that includes inbound and outbound SAP filters.

TACACS+ Freeware Daemon Configuration File for User

```
key = tac123
user = Router1 {
 global = cleartext welcome
 service = ppp protocol = ipx {
        sap=”101 CYBER-01 40.0000.0000.0001 400 10"
        sap=”202 CYBER-02 40.0000.0000.0001 401 10"
        sap=”303 CYBER-03 40.0000.0000.0001 402 10"
        sap-fltr-out#1=”deny 40 101"
        sap-fltr-out#2=”deny 40 202"
        sap-fltr-out#3=”permit -1"
        sap-fltr-in#1=”permit 30 444"
        sap-fltr-in#2=”deny -1"
```

Current Remote Peer (Router1) Configuration

```
version 11.3
!
hostname Router1
!
enable password lab
!
username Router2 password 7 140017070F0B272E
ip host Router1 172.21.114.131
ip name-server 172.19.2.132
ip name-server 192.168.30.32
ipx routing 0000.0c47.090d
ipx internal-network 30
!
interface Ethernet0
 ip address 172.21.114.131 255.255.255.224
!
interface Serial1
 no ip address
 encapsulation ppp
 ipx ipxwan 0 unnumbered peer-Router1
 clockrate 4000000
!
ipx sap 444 ZEON-4 30.0000.0000.0001 444 10
ipx sap 555 ZEON-5 30.0000.0000.0001 555 10
ipx sap 666 ZEON-6 30.0000.0000.0001 666 10
!
Current Network Access Server (Router2) Configuration
version 11.3
service timestamps debug uptime
!
hostname Router2
!
aaa new-model
aaa authentication ppp default tacacs+
aaa authorization network tacacs+
enable password lab
!
username Router1 password 7 044C0E0A0C2E414B
ip host LA 172.21.114.133
ip name-server 192.168.30.32
```

```
ip name-server 172.19.2.132
ipx routing 0000.0c47.12d3
ipx internal-network 40
!
interface Ethernet0
 ip address 172.21.114.133 255.255.255.224
!
interface Virtual-Template1
 no ip address
 ipx ipxwan 0 unnumbered nas-Router2
 no cdp enable
!
interface Serial1
 ip unnumbered Ethernet0
 encapsulation ppp
 ipx ipxwan 0 unnumbered nas-Router2
 ppp authentication chap
!
ipx sap 333 DEEP9 40.0000.0000.0001 999 10
!
virtual-profile virtual-template 1
tacacs-server host 172.21.114.130
tacacs-server key tac123
```

RADIUS Examples

This section provides the RADIUS versions of the following examples:

- IP Access Lists and Static Routes Using Virtual Profiles over ISDN BRI
- IPX Per-User SAP Filters Using IPXWAN and Virtual Profiles by a Synchronous Interface

IP Access Lists and Static Routes Using Virtual Profiles over ISDN BRI

The following example shows a remote peer (Router1) configured to dial in to a BRI on a Cisco network access server (Router2), which requests user configuration information from an AAA server (radiusd):

RADIUS User File (Router1)

```
Password = "welcome"
User-Service-Type = Framed-User,
Framed-Protocol = PPP,
cisco-avpair = "ip:route=10.1.0.0 255.0.0.0",
cisco-avpair = "ip:route=10.2.0.0 255.0.0.0",
cisco-avpair = "ip:route=10.3.0.0 255.0.0.0",
cisco-avpair = "ip:inacl#5=deny 10.0.0.1"
```

Current Network Access Server Configuration

```
version 11.3
service timestamps debug datetime localtime
service udp-small-servers
service tcp-small-servers
!
hostname Router2
!
aaa new-model
aaa authentication ppp default radius
aaa authorization network radius
enable secret 5 $1$koOn$/1QAylov6JFAElxRCrL.o/
enable password lab
```

```
!
username Router1 password 7 15050E0007252621
ip host Router2 172.21.114.132
ip domain-name cisco.com
ip name-server 172.19.2.132
ip name-server 192.168.30.32
isdn switch-type basic-5ess
interface Ethernet0
 ip address 172.21.114.132 255.255.255.224
 no ip mroute-cache
 media-type 10BaseT
!
interface Virtual-Template1
 ip unnumbered Ethernet0
 no cdp enable
!
interface BRI0
 ip unnumbered Ethernet0
 no ip mroute-cache
 encapsulation ppp
 no ip route-cache
 dialer idle-timeout 300
 dialer map ip 10.5.0.1 name Router1 broadcast 61482
 dialer-group 1
 no fair-queue
 ppp authentication chap
!
ip default-gateway 172.21.114.129
no ip classless
ip route 0.0.0.0 0.0.0.0 172.21.114.129
!
virtual-profile vtemplate 1
dialer-list 1 protocol ip permit
radius-server host 172.21.114.130
radius-server key rad123
```

Current Peer Configuration for Router1

```
version 11.3
no service pad
!
hostname Router1
!
enable secret 5 $1$m1WK$RsjborN1Z.XZuFqsrtSnp/
enable password lab
!
username Router2 password 7 051C03032243430C
ip host Router1 172.21.114.134
ip domain-name cisco.com
ip name-server 172.19.2.132
ip name-server 192.168.30.32
isdn switch-type basic-5ess
!
interface Ethernet0
 ip address 172.21.114.134 255.255.255.224
 no ip route-cache
 shutdown
!
interface BRI0
 ip address 10.5.0.1 255.0.0.0
 encapsulation ppp
 dialer map ip 172.21.114.132 name Router2 broadcast 61483
 dialer-group 1
 no fair-queue
```

```
!
ip default-gateway 172.21.114.129
no ip classless
ip route 172.21.0.0 255.255.0.0 BRI0
dialer-list 1 protocol ip permit
!
line con 0
 exec-timeout 0 0
line vty 0 4
 password lab
 login
!
end
```

Output of ping Command from Router1

```
Router1# ping 172.21.114.132

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.21.114.132, timeout is 2 seconds:
U.U.U
Success rate is 0 percent (0/5)

(fails due to access list deny)
```

RADIUS Debug Output

```
radrecv: Request from host ac157284 code=1, id=46, length=67
    Client-Id = 172.21.114.132
    Client-Port-Id = 1112670208
    User-Name = "Router1"
    CHAP-Password = "\037\317\213\326*\236)#+\266\243\255x\331\370v\334"
    User-Service-Type = Framed-User
    Framed-Protocol = PPP
Sending Ack of id 46 to ac157284 (172.21.114.132)
    User-Service-Type = Framed-User
    Framed-Protocol = PPP
    [Vendor 9] cisco-avpair = "ip:route=10.0.0.0 255.0.0.0"
    [Vendor 9] cisco-avpair = "ip:route=10.1.0.0 255.0.0.0"
    [Vendor 9] cisco-avpair = "ip:route=10.2.0.0 255.0.0.0"
    [Vendor 9] cisco-avpair = "ip:inacl#5=deny 10.0.0.1"
```

Network Access Server (Router2) show and debug Command Output

```
Router2# show debug

General OS:
  AAA Authorization debugging is on
PPP:
  PPP authentication debugging is on
  Multilink activity debugging is on
ISDN:
  ISDN events debugging is on
Dial on demand:
  Dial on demand events debugging is on
VTEMPLATE:
  Virtual Template debugging is on

pr  4 08:30:09: ISDN BR0: received HOST_INCOMING_CALL
        Bearer Capability i = 0x080010
*Apr  4 08:30:09:       -------------------
        Channel ID i = 0x0101
*Apr  4 08:30:09:         IE out of order or end of 'private' IEs --
        Bearer Capability i = 0x8890
```

```
*Apr  4 08:30:09:         Channel ID i = 0x89
*Apr  4 08:30:09:         Called Party Number i = 0xC1, '61483'
*Apr  4 08:30:09: ISDN BR0: Event: Received a call from <unknown> on B1 at 64 Kb/s
*Apr  4 08:30:09: ISDN BR0: Event: Accepting the call
%LINK-3-UPDOWN: Interface BRI0:1, changed state to up
*Apr  4 08:30:09: ISDN BR0: received HOST_CONNECT
        Channel ID i = 0x0101
*Apr  4 08:30:09:       -------------------
        Channel ID i = 0x89
*Apr  4 08:30:09: ISDN BR0: Event: Connected to <unknown> on B1 at 64 Kb/s
*Apr  4 08:30:09: PPP BRI0:1: Send CHAP challenge id=30 to remote
*Apr  4 08:30:10: PPP BRI0:1: CHAP response received from Router1
*Apr  4 08:30:10: PPP BRI0:1: CHAP response id=30 received from Router1
*Apr  4 08:30:10: AAA/AUTHOR/LCP: authorize LCP
*Apr  4 08:30:10: AAA/AUTHOR/LCP: BRI0:1: (0): user='Router1'
*Apr  4 08:30:10: AAA/AUTHOR/LCP: BRI0:1: (0): send AV service=ppp
*Apr  4 08:30:10: AAA/AUTHOR/LCP: BRI0:1: (0): send AV protocol=lcp
*Apr  4 08:30:10: AAA/AUTHOR/LCP: BRI0:1: (2084553184): Method=RADIUS
*Apr  4 08:30:10: AAA/AUTHOR (2084553184): Post authorization status = PASS_ADD
*Apr  4 08:30:10: PPP BRI0:1: Send CHAP success id=30 to remote
*Apr  4 08:30:10: PPP BRI0:1: remote passed CHAP authentication.
*Apr  4 08:30:10: VTEMPLATE Reuse vaccess1, New Recycle queue size:0

*Apr  4 08:30:10: VTEMPLATE set default vaccess1 with no ip address

*Apr  4 08:30:10: Virtual-Access1 VTEMPLATE hardware address 0000.0c46.154a
*Apr  4 08:30:10: VTEMPLATE vaccess1 has a new cloneblk vtemplate, now it has vtemplate
*Apr  4 08:30:10: VTEMPLATE undo default settings vaccess1

*Apr  4 08:30:10: VTEMPLATE ************* CLONE VACCESS1 ******************Apr  4
08:30:10: VTEMPLATE Clone from vtemplate1 to vaccess1
interface Virtual-Access1
no ip address
encap ppp
ip unnumbered ethernet 0
end

%LINK-3-UPDOWN: Interface Virtual-Access1, changed state to up
*Apr  4 08:30:10: AAA/AUTHOR/LCP: authorize LCP
*Apr  4 08:30:10: AAA/AUTHOR/LCP: Virtual-Access1: (0): user='Router1'
*Apr  4 08:30:10: AAA/AUTHOR/LCP: Virtual-Access1: (0): send AV service=ppp
*Apr  4 08:30:10: AAA/AUTHOR/LCP: Virtual-Access1: (0): send AV protocol=lcp
*Apr  4 08:30:10: AAA/AUTHOR/LCP: Virtual-Access1: (1338953760): Method=RADIUS
*Apr  4 08:30:10: AAA/AUTHOR (1338953760): Post authorization status = PASS_ADD
*Apr  4 08:30:10: AAA/AUTHOR/FSM: Virtual-Access1: (0): can we start IPCP?
*Apr  4 08:30:10: AAA/AUTHOR/FSM: Virtual-Access1: (0): user='Router1'
*Apr  4 08:30:10: AAA/AUTHOR/FSM: Virtual-Access1: (0): send AV service=ppp
*Apr  4 08:30:10: AAA/AUTHOR/FSM: Virtual-Access1: (0): send AV protocol=ip
*Apr  4 08:30:10: AAA/AUTHOR/FSM: Virtual-Access1: (1716082074): Method=RADIUS
*Apr  4 08:30:10: AAA/AUTHOR (1716082074): Post authorization status = PASS_ADD
*Apr  4 08:30:10: AAA/AUTHOR/FSM: Virtual-Access1: we can start IPCP (0x8021)
*Apr  4 08:30:10: MLP Bad link Virtual-Access1
*Apr  4 08:30:10: AAA/AUTHOR/FSM: Virtual-Access1: (0): can we start UNKNOWN?
*Apr  4 08:30:10: AAA/AUTHOR/FSM: Virtual-Access1: (0): user='Router1'
*Apr  4 08:30:10: AAA/AUTHOR/FSM: Virtual-Access1: (0): send AV service=ppp
*Apr  4 08:30:10: AAA/AUTHOR/FSM: Virtual-Access1: (0): send AV protocol=unknown
*Apr  4 08:30:10: AAA/AUTHOR/FSM: Virtual-Access1: (2526612868): Method=RADIUS
*Apr  4 08:30:10: AAA/AUTHOR (2526612868): Post authorization status = PASS_ADD
*Apr  4 08:30:10: AAA/AUTHOR/FSM: Virtual-Access1: we can start UNKNOWN (0x8207)
*Apr  4 08:30:10: MLP Bad link Virtual-Access1
*Apr  4 08:30:10: BRI0:1: Vaccess started from dialer_remote_name
*Apr  4 08:30:10: AAA/AUTHOR/FSM: BRI0:1: (0): can we start IPCP?
*Apr  4 08:30:10: AAA/AUTHOR/FSM: BRI0:1: (0): user='Router1'
*Apr  4 08:30:10: AAA/AUTHOR/FSM: BRI0:1: (0): send AV service=ppp
```

```
*Apr  4 08:30:10: AAA/AUTHOR/FSM: BRI0:1: (0): send AV protocol=ip
*Apr  4 08:30:10: AAA/AUTHOR/FSM: BRI0:1: (3920403585): Method=RADIUS
*Apr  4 08:30:10: AAA/AUTHOR (3920403585): Post authorization status = PASS_ADD
*Apr  4 08:30:10: AAA/AUTHOR/FSM: BRI0:1: we can start IPCP (0x8021)
*Apr  4 08:30:10: AAA/AUTHOR/FSM: BRI0:1: (0): can we start UNKNOWN?
*Apr  4 08:30:10: AAA/AUTHOR/FSM: BRI0:1: (0): user='Router1'
*Apr  4 08:30:10: AAA/AUTHOR/FSM: BRI0:1: (0): send AV service=ppp
*Apr  4 08:30:10: AAA/AUTHOR/FSM: BRI0:1: (0): send AV protocol=unknown
*Apr  4 08:30:10: AAA/AUTHOR/FSM: BRI0:1: (3439943223): Method=RADIUS
*Apr  4 08:30:10: AAA/AUTHOR (3439943223): Post authorization status = PASS_ADD
*Apr  4 08:30:10: AAA/AUTHOR/FSM: BRI0:1: we can start UNKNOWN (0x8207)
%LINEPROTO-5-UPDOWN: Line protocol on Interface BRI0:1, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface Virtual-Access1, changed state to up
*Apr  4 08:30:13: AAA/AUTHOR/IPCP: Virtual-Access1: start: her address 10.0.0.1, we want
0.0.0.0
*Apr  4 08:30:13: AAA/AUTHOR/IPCP: Virtual-Access1: (0): user='Router1'
*Apr  4 08:30:13: AAA/AUTHOR/IPCP: Virtual-Access1: (0): send AV servi*Apr  4 08:30:13:
AAA/AUTHOR/IPCP: Virtual-Access1: (0): send AV service=ppp
*Apr  4 08:30:13: AAA/AUTHOR/IPCP: Virtual-Access1: (0): send AV protocol=ip
*Apr  4 08:30:13: AAA/AUTHOR/IPCP: Virtual-Access1: (0): send AV addr*10.0.0.1
*Apr  4 08:30:13: AAA/AUTHOR/IPCP: Virtual-Access1: (3215797579): Method=RADIUS
*Apr  4 08:30:13: AAA/AUTHOR (3215797579): Post authorization status = PASS_ADD
*Apr  4 08:30:13: AAA/AUTHOR/IPCP: Virtual-Access1: Processing AV service=ppp
*Apr  4 08:30:13: AAA/AUTHOR/IPCP: Virtual-Access1: Processing AV protocol=ip
*Apr  4 08:30:13: AAA/AUTHOR/IPCP: Virtual-Access1: Processing AV addr*10.0.0.1
*Apr  4 08:30:13: AAA/AUTHOR/IPCP: Virtual-Access1: Processing AV route=10.1.0.0 255.0.0.0
*Apr  4 08:30:13: AAA/AUTHOR/IPCP: Virtual-Access1: Processing AV route=10.2.0.0 255.0.0.0
*Apr  4 08:30:13: AAA/AUTHOR/IPCP: Virtual-Access1: Processing AV route=10.3.0.0 255.0.0.0
*Apr  4 08:30:13: AAA/AUTHOR/IPCP: Virtual-Access1: Processing AV inacl#5=deny 10.0.0.1
*Apr  4 08:30:13: AAA/AUTHOR/IPCP: Virtual-Access1: authorization succeeded
*Apr  4 08:30:13: AAA/AUTHOR/IPCP: Virtual-Access1: done: her address 10.0.0.1, we want
10.0.0.1
*Apr  4 08:30:13: AAA/AUTHOR/IPCP: Virtual-Access1: authorization succeeded
*Apr  4 08:30:13: AAA/AUTHOR: Virtual-Access1: parse_cmd 'ip route 10.0.0.0 255.0.0.0
10.0.0.1' ok (0)
*Apr  4 08:30:13: AAA/AUTHOR: Virtual-Access1: enqueue peruser IP txt=no ip route 10.0.0.0
255.0.0.0 10.0.0.1
*Apr  4 08:30:13: AAA/AUTHOR: Virtual-Access1: parse_cmd 'ip route 11.0.0.0 255.0.0.0
10.0.0.1' ok (0)
*Apr  4 08:30:13: AAA/AUTHOR: Virtual-Access1: enqueue peruser IP txt=no ip route 11.0.0.0
255.0.0.0 10.0.0.1
*Apr  4 08:30:13: AAA/AUTHOR: Virtual-Access1: parse_cmd 'ip route 12.0.0.0 255.0.0.0
10.0.0.1' ok (0)
*Apr  4 08:30:13: AAA/AUTHOR: Virtual-Access1: enqueue peruser IP txt=no ip route 12.0.0.0
255.0.0.0 10.0.0.1
*Apr  4 08:30:13: AAA/AUTHOR: parse 'ip access-list standard Virtual-Access1#1' ok (0)
*Apr  4 08:30:13: AAA/AUTHOR: parse 'deny 10.0.0.1' ok (0)
*Apr  4 08:30:13: AAA/AUTHOR: Virtual-Access1: enqueue peruser IP txt=no ip access-list
standard Virtual-Access1#1
*Apr  4 08:30:13: VTEMPLATE vaccess1 has a new cloneblk AAA, now it has vtemplate/AAA
*Apr  4 08:30:13: VTEMPLATE ************* CLONE VACCESS1 *****************

*Apr  4 08:30:13: VTEMPLATE Clone from AAA to vaccess1
interface Virtual-Access1
ip access-group Virtual-Access1#1 in

*Apr  4 08:30:13: AAA/AUTHOR: Virtual-Access1: vaccess parse 'interface Virtual-Access1
ip access-group Virtual-Access1#1 in
' ok (0)
*Apr  4 08:30:13: AAA/AUTHOR/FSM: Check for unauthorized mandatory AV's
*Apr  4 08:30:13: AAA/AUTHOR/FSM: Processing AV service=ppp
*Apr  4 08:30:13: AAA/AUTHOR/FSM: Processing AV protocol=unknown
*Apr  4 08:30:13: AAA/AUTHOR/FSM: succeeded
%ISDN-6-CONNECT: Interface BRI0:1 is now connected to Router1
```

```
Router2# show ip access-list

Standard IP access list Virtual-Access1#1 (per-user)
    deny   10.0.0.1

Router2# show ip route

Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, * - candidate default
       U - per-user static route, o - ODR

Gateway of last resort is 172.21.114.129 to network 0.0.0.0

U    10.0.0.0/8 [1/0] via 10.3.0.1
U    10.1.0.0/8 [1/0] via 10.3.0.1
U    10.2.0.0/8 [1/0] via 10.3.0.1
     10.3.0.0/8 is subnetted, 1 subnets
C       10.3.0.1 is directly connected, Virtual-Access1
     172.21.0.0/16 is subnetted, 1 subnets
C       172.21.114.128 is directly connected, Ethernet0
S*   0.0.0.0/0 [1/0] via 172.21.114.129


Router2# show interfaces virtual-access 1

Virtual-Access1 is up, line protocol is up
  Hardware is Virtual Access interface
  Interface is unnumbered.  Using address of Ethernet0 (172.21.114.132)
  MTU 1500 bytes, BW 64 Kbit, DLY 100000 usec, rely 255/255, load 1/255
  Encapsulation PPP, loopback not set, keepalive set (10 sec)
  DTR is pulsed for 5 seconds on reset
  LCP Open, multilink Closed
  Open: IPCP, CDP
  Last input 5d04h, output never, output hang never
  Last clearing of "show interface" counters 00:06:42
  Queueing strategy: fifo
  Output queue 0/40, 0 drops; input queue 0/75, 0 drops
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
     76 packets input, 3658 bytes, 0 no buffer
     Received 0 broadcasts, 0 runts, 0 giants
     0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
     141 packets output, 2909 bytes, 0 underruns
     0 output errors, 0 collisions, 0 interface resets
     0 output buffer failures, 0 output buffers swapped out
     0 carrier transitions

Router2# show ip interface virtual-access 1

Virtual-Access1 is up, line protocol is up
  Interface is unnumbered.  Using address of Ethernet0 (172.21.114.132)
  Broadcast address is 255.255.255.255
  Peer address is 10.0.0.1
  MTU is 1500 bytes
  Helper address is not set
  Directed broadcast forwarding is enabled
  Outgoing access list is not set
  Inbound  access list is Virtual-Access1#1
  Proxy ARP is enabled
  Security level is default
```

```
  Split horizon is enabled
  ICMP redirects are always sent
  ICMP unreachables are always sent
  ICMP mask replies are never sent
  IP fast switching is disabled


Router2# debug ip packet

IP packet debugging is on
Router2#
*Apr  4 08:30:42: IP: s=172.21.114.129 (Ethernet0), d=255.255.255.255, len 186, rcvd 2
*Apr  4 08:30:42: IP: s=10.0.0.1 (Virtual-Access1), d=172.21.114.132, len 104, a*Apr  4
08:30:42: IP: s=10.0.0.1 (Virtual-Access1), d=172.21.114.132, len 104, access denied
*Apr  4 08:30:42: IP: s=172.21.114.132 (local), d=10.0.0.1 (Virtual-Access1), len 4,
sending
*Apr  4 08:30:42: IP: s=10.0.0.1 (Virtual-Access1), d=172.21.114.132, len 104, access
denied
*Apr  4 08:30:44: IP: s=10.0.0.1 (Virtual-Access1), d=172.21.114.132, len 104, access
denied
*Apr  4 08:30:44: IP: s=172.21.114.132 (local), d=10.0.0.1 (Virtual-Access1), len 16,
sending
*Apr  4 08:30:44: IP: s=10.0.0.1 (Virtual-Access1), d=172.21.114.132, len 104, access
denied
```

IPX Per-User SAP Filters Using IPXWAN and Virtual Profiles by a Synchronous Interface

The following examples show a remote peer (Router1) configured to dial in to a synchronous interface on a Cisco network access server (Router2), which requests user configuration information from an AAA server (radiusd):

RADIUS User File (Router 1)

```
Password = "welcome"
User-Service-Type = Framed-User,
Framed-Protocol = PPP,
cisco-avpair = "ipx:sap=101 CYBER-01 40.0000.0000.0001 400 10",
cisco-avpair = "ipx:sap=202 CYBER-02 40.0000.0000.0001 401 10",
cisco-avpair = "ipx:sap=303 CYBER-03 40.0000.0000.0001 402 10",
cisco-avpair = "ipx:sap-fltr-out#20=deny 40 101",
cisco-avpair = "ipx:sap-fltr-out#21=deny 40 202",
cisco-avpair = "ipx:sap-fltr-out#22=permit -1",
cisco-avpair = "ipx:sap-fltr-in#23=permit 30 444",
cisco-avpair = "ipx:sap-fltr-in#23=deny -1"
```

Current Remote Peer (Router 1) Configuration

```
hostname Router1
!
enable password lab
!
username Router2 password 7 140017070F0B272E
ip host Router1 172.21.114.131
ip name-server 172.19.2.132
ip name-server 192.168.30.32
ipx routing 0000.0c47.090d
ipx internal-network 30
!
interface Ethernet0
 ip address 172.21.114.131 255.255.255.224
!
```

```
interface Serial1
 no ip address
 encapsulation ppp
 ipx ipxwan 0 unnumbered peer-Router1
 clockrate 4000000
!
ipx sap 444 ZEON-4 30.0000.0000.0001 444 10
ipx sap 555 ZEON-5 30.0000.0000.0001 555 10
ipx sap 666 ZEON-6 30.0000.0000.0001 666 10
!
...
version 12.1
service timestamps debug uptime
!
hostname Router2
!
aaa new-model
aaa authentication ppp default radius
aaa authorization network radius
enable password lab
!
username Router1 password 7 044C0E0A0C2E414B
ip host Router2 172.21.114.133
ip name-server 172.22.30.32
ip name-server 192.168.2.132
ipx routing 0000.0c47.12d3
ipx internal-network 40
!
interface Ethernet0
 ip address 172.21.114.133 255.255.255.224
!
interface Virtual-Template1
 no ip address
 ipx ipxwan 0 unnumbered nas-Router2
 no cdp enable
!
interface Serial1
 ip unnumbered Ethernet0
 encapsulation ppp
 ipx ipxwan 0 unnumbered nas-Router2
 ppp authentication chap
!
ipx sap 333 DEEP9 40.0000.0000.0001 999 10
!
virtual-profile vtemplate 1
radius-server host 172.21.114.130
radius-server key rad123
```

RADIUS debug Output

```
radrecv: Request from host ac157285 code=1, id=23, length=67
    Client-Id = 172.21.114.133
    Client-Port-Id = 1399128065
    User-Name = "Router1"
    CHAP-Password = "%"(\012I$\262\352\031\276\024\302\277\225\347z\274"
    User-Service-Type = Framed-User
    Framed-Protocol = PPP
Sending Ack of id 23 to ac157285 (172.21.114.133)
    User-Service-Type = Framed-User
    Framed-Protocol = PPP
    [Vendor 9] cisco-avpair = "ipx:sap=101 CYBER-01 40.0000.0000.0001 400 10"
    [Vendor 9] cisco-avpair = "ipx:sap=202 CYBER-02 40.0000.0000.0001 401 10"
    [Vendor 9] cisco-avpair = "ipx:sap=303 CYBER-03 40.0000.0000.0001 402 10"
    [Vendor 9] cisco-avpair = "ipx:sap-fltr-out#20=deny1 40 101"
```

```
    [Vendor 9] cisco-avpair = "ipx:sap-fltr-out#21=deny 40 202"
    [Vendor 9] cisco-avpair = "ipx:sap-fltr-out#22=permit -1"
    [Vendor 9] cisco-avpair = "ipx:sap-fltr-in#23=permit 30 444"
    [Vendor 9] cisco-avpair = "ipx:sap-fltr-in#23=deny -1"
```

Network Access Server show Command Output

```
Router2# show ipx servers

Codes: S - Static, P - Periodic, E - EIGRP, N - NLSP, H - Holddown, + = detail
5 Total IPX Servers

Table ordering is based on routing and server info

   Type Name                          Net     Address    Port     Route Hops Itf
s   101 CYBER-01                      40.0000.0000.0001:0400      conn  10  Int
s   202 CYBER-02                      40.0000.0000.0001:0401      conn  10  Int
s   303 CYBER-03                      40.0000.0000.0001:0402      conn  10  Int
S   333 DEEP9                         40.0000.0000.0001:0999      conn  10  Int
P   444 ZEON-4                        30.0000.0000.0001:0444      7/01  11  Vi1


Router1# show ipx servers

Codes: S - Static, P - Periodic, E - EIGRP, N - NLSP, H - Holddown, + = detail
5 Total IPX Servers

Table ordering is based on routing and server info

   Type Name                          Net     Address    Port     Route Hops Itf
P   303 CYBER-03                      40.0000.0000.0001:0402      7/01  11  Se1
P   333 DEEP9                         40.0000.0000.0001:0999      7/01  11  Se1
S   444 ZEON-4                        30.0000.0000.0001:0444      conn  10  Int
S   555 ZEON-5                        30.0000.0000.0001:0555      conn  10  Int
S   666 ZEON-6                        30.0000.0000.0001:0666      conn  10  Int

Router2# show ipx access-list

IPX sap access list Virtual-Access1#2
    permit 30 444
    deny FFFFFFFF
IPX sap access list Virtual-Access1#3
    deny 40 101
    deny 40 202
    permit FFFFFFFF
```