

Configuring Accounting

The AAA accounting feature enables you to track the services users are accessing as well as the amount of network resources they are consuming. When **aaa accounting** is enabled, the network access server reports user activity to the TACACS+ or RADIUS security server (depending on which security method you have implemented) in the form of accounting records. Each accounting record contains accounting attribute-value (AV) pairs and is stored on the security server. This data can then be analyzed for network management, client billing, and/or auditing.

This chapter describes the following topics and tasks:

- AAA Accounting Types
- AAA Accounting Prerequisites
- AAA Accounting Configuration Task List
- Enable Accounting
- Monitor Accounting
- Accounting Attribute-Value Pairs
- Accounting Configuration Example

For a complete description of the accounting commands used in this chapter, refer to the “Accounting Commands” chapter in the *Security Command Reference*. To locate documentation of other commands that appear in this chapter, use the command reference master index or search online.

AAA Accounting Types

Cisco IOS software supports five different kinds of accounting:

- Network Accounting
- Connection Accounting
- EXEC Accounting
- System Accounting
- Command Accounting

Network Accounting

Network accounting provides information for all PPP, SLIP, or ARAP sessions, including packet and byte counts.

The following example shows the information contained in a RADIUS network accounting record for a PPP user who comes in through an EXEC session:

```
Wed Jun 25 04:44:45 1997
NAS-IP-Address = "172.16.25.15"
NAS-Port = 5
User-Name = "fgeorge"
Client-Port-DNIS = "4327528"
Caller-ID = "562"
Acct-Status-Type = Start
Acct-Authentic = RADIUS
Service-Type = Exec-User
Acct-Session-Id = "0000000D"
Acct-Delay-Time = 0
User-Id = "fgeorge"
NAS-Identifier = "172.16.25.15"
```

```
Wed Jun 25 04:45:00 1997
NAS-IP-Address = "172.16.25.15"
NAS-Port = 5
User-Name = "fgeorge"
Client-Port-DNIS = "4327528"
Caller-ID = "562"
Acct-Status-Type = Start
Acct-Authentic = RADIUS
Service-Type = Framed
Acct-Session-Id = "0000000E"
Framed-IP-Address = "10.1.1.2"
Framed-Protocol = PPP
Acct-Delay-Time = 0
User-Id = "fgeorge"
NAS-Identifier = "172.16.25.15"
```

```
Wed Jun 25 04:47:46 1997
NAS-IP-Address = "172.16.25.15"
NAS-Port = 5
User-Name = "fgeorge"
Client-Port-DNIS = "4327528"
Caller-ID = "562"
Acct-Status-Type = Stop
Acct-Authentic = RADIUS
Service-Type = Framed
Acct-Session-Id = "0000000E"
Framed-IP-Address = "10.1.1.2"
Framed-Protocol = PPP
Acct-Input-Octets = 3075
Acct-Output-Octets = 167
Acct-Input-Packets = 39
Acct-Output-Packets = 9
Acct-Session-Time = 171
Acct-Delay-Time = 0
User-Id = "fgeorge"
NAS-Identifier = "172.16.25.15"
```

```
Wed Jun 25 04:48:45 1997
NAS-IP-Address = "172.16.25.15"
NAS-Port = 5
User-Name = "fgeorge"
Client-Port-DNIS = "4327528"
Caller-ID = "408"
```

```

Acct-Status-Type = Stop
Acct-Authentic = RADIUS
Service-Type = Exec-User
Acct-Session-Id = "0000000D"
Acct-Delay-Time = 0
User-Id = "fgeorge"
NAS-Identifier = "172.16.25.15"

```

The following example shows the information contained in a TACACS+ network accounting record for a PPP user who first started an EXEC session:

```

Wed Jun 25 04:00:35 1997      172.16.25.15   fgeorge  tty4   562/4327528
starttask_id=28      service=shell
Wed Jun 25 04:00:46 1997      172.16.25.15   fgeorge  tty4 562/4327528
starttask_id=30      addr=10.1.1.1  service=ppp
Wed Jun 25 04:00:49 1997      172.16.25.15   fgeorge  tty4 408/4327528  update
task_id=30          addr=10.1.1.1  service=ppp  protocol=ip  addr=10.1.1.1
Wed Jun 25 04:01:31 1997      172.16.25.15   fgeorge  tty4 562/4327528
stoptask_id=30      addr=10.1.1.1  service=ppp  protocol=ip  addr=10.1.1.1
bytes_in=2844      bytes_out=1682  paks_in=36   paks_out=24   elapsed_time=51
Wed Jun 25 04:01:32 1997      172.16.25.15   fgeorge  tty4 562/4327528
stoptask_id=28      service=shell  elapsed_time=57

```

Note The precise format of accounting packets records may vary depending on your particular security server daemon.

The following example shows the information contained in a RADIUS network accounting record for a PPP user who comes in through autoselect:

```

Wed Jun 25 04:30:52 1997
NAS-IP-Address = "172.16.25.15"
NAS-Port = 3
User-Name = "fgeorge"
Client-Port-DNIS = "4327528"
Caller-ID = "562"
Acct-Status-Type = Start
Acct-Authentic = RADIUS
Service-Type = Framed
Acct-Session-Id = "0000000B"
Framed-Protocol = PPP
Acct-Delay-Time = 0
User-Id = "fgeorge"
NAS-Identifier = "172.16.25.15"

Wed Jun 25 04:36:49 1997
NAS-IP-Address = "172.16.25.15"
NAS-Port = 3
User-Name = "fgeorge"
Client-Port-DNIS = "4327528"
Caller-ID = "562"
Acct-Status-Type = Stop
Acct-Authentic = RADIUS
Service-Type = Framed
Acct-Session-Id = "0000000B"
Framed-Protocol = PPP
Framed-IP-Address = "10.1.1.1"
Acct-Input-Octets = 8630
Acct-Output-Octets = 5722
Acct-Input-Packets = 94

```

```
Acct-Output-Packets = 64
Acct-Session-Time = 357
Acct-Delay-Time = 0
User-Id = "fgeorge"
NAS-Identifier = "172.16.25.15"
```

The following example shows the information contained in a TACACS+ network accounting record for a PPP user who comes in through autoselect:

```
Wed Jun 25 04:02:19 1997      172.16.25.15   fgeorge   Async5   562/4327528
starttask_id=35      service=ppp
Wed Jun 25 04:02:25 1997      172.16.25.15   fgeorge   Async5   562/4327528   update
task_id=35          service=ppp   protocol=ip   addr=10.1.1.2
Wed Jun 25 04:05:03 1997      172.16.25.15   fgeorge   Async5   562/4327528
stoptask_id=35      service=ppp   protocol=ip   addr=10.1.1.2   bytes_in=3366
bytes_out=2149      paks_in=42    paks_out=28   elapsed_time=164
```

Connection Accounting

Connection accounting provides information about all outbound connections made from the network access server, such as Telnet, local-area transport (LAT), TN3270, packet assembly-disassembly (PAD), and rlogin.

The following example shows the information contained in a RADIUS connection accounting record for an outbound Telnet connection:

```
Wed Jun 25 04:28:00 1997
NAS-IP-Address = "172.16.25.15"
NAS-Port = 2
User-Name = "fgeorge"
Client-Port-DNIS = "4327528"
Caller-ID = "5622329477"
Acct-Status-Type = Start
Acct-Authentic = RADIUS
Service-Type = Login
Acct-Session-Id = "00000008"
Login-Service = Telnet
Login-IP-Host = "171.68.202.158"
Acct-Delay-Time = 0
User-Id = "fgeorge"
NAS-Identifier = "172.16.25.15"

Wed Jun 25 04:28:39 1997
NAS-IP-Address = "172.16.25.15"
NAS-Port = 2
User-Name = "fgeorge"
Client-Port-DNIS = "4327528"
Caller-ID = "5622329477"
Acct-Status-Type = Stop
Acct-Authentic = RADIUS
Service-Type = Login
Acct-Session-Id = "00000008"
Login-Service = Telnet
Login-IP-Host = "171.68.202.158"
Acct-Input-Octets = 10774
Acct-Output-Octets = 112
Acct-Input-Packets = 91
Acct-Output-Packets = 99
Acct-Session-Time = 39
Acct-Delay-Time = 0
User-Id = "fgeorge"
NAS-Identifier = "172.16.25.15"
```

The following example shows the information contained in a TACACS+ connection accounting record for an outbound Telnet connection:

```
Wed Jun 25 03:47:43 1997      172.16.25.15    fgeorge  tty3    5622329430/4327528
start   task_id=10      service=connection  protocol=telnet addr=171.68.202.158
cmd=telnet fgeorge-sun
Wed Jun 25 03:48:38 1997      172.16.25.15    fgeorge  tty3    5622329430/4327528 stop
task_id=10      service=connection  protocol=telnet addr=171.68.202.158 cmd=telnet
fgeorge-sun  bytes_in=4467  bytes_out=96  paks_in=61      paks_out=72 e
lapsed_time=55
```

The following example shows the information contained in a RADIUS connection accounting record for an outbound rlogin connection:

```
Wed Jun 25 04:29:48 1997
NAS-IP-Address = "172.16.25.15"
NAS-Port = 2
User-Name = "fgeorge"
Client-Port-DNIS = "4327528"
Caller-ID = "5622329477"
Acct-Status-Type = Start
Acct-Authentic = RADIUS
Service-Type = Login
Acct-Session-Id = "0000000A"
Login-Service = Rlogin
Login-IP-Host = "171.68.202.158"
Acct-Delay-Time = 0
User-Id = "fgeorge"
NAS-Identifier = "172.16.25.15"

Wed Jun 25 04:30:09 1997
NAS-IP-Address = "172.16.25.15"
NAS-Port = 2
User-Name = "fgeorge"
Client-Port-DNIS = "4327528"
Caller-ID = "5622329477"
Acct-Status-Type = Stop
Acct-Authentic = RADIUS
Service-Type = Login
Acct-Session-Id = "0000000A"
Login-Service = Rlogin
Login-IP-Host = "171.68.202.158"
Acct-Input-Octets = 18686
Acct-Output-Octets = 86
Acct-Input-Packets = 90
Acct-Output-Packets = 68
Acct-Session-Time = 22
Acct-Delay-Time = 0
User-Id = "fgeorge"
NAS-Identifier = "172.16.25.15"
```

The following example shows the information contained in a TACACS+ connection accounting record for an outbound rlogin connection:

```
Wed Jun 25 03:48:46 1997      172.16.25.15    fgeorge  tty3    5622329430/4327528
start   task_id=12      service=connection  protocol=rlogin addr=171.68.202.158
cmd=rlogin fgeorge-sun /user fgeorge
Wed Jun 25 03:51:37 1997      172.16.25.15    fgeorge  tty3    5622329430/4327528 stop
task_id=12      service=connection  protocol=rlogin addr=171.68.202.158 cmd=rlogin
fgeorge-sun /user fgeorge bytes_in=659926 bytes_out=138  paks_in=2378  paks_
out=1251      elapsed_time=171
```

The following example shows the information contained in a TACACS+ connection accounting record for an outbound LAT connection:

AAA Accounting Types

```
Wed Jun 25 03:53:06 1997      172.16.25.15   fgeorge  tty3   5622329430/4327528
start  task_id=18      service=connection  protocol=lat  addr=VAX      cmd=lat VAX
Wed Jun 25 03:54:15 1997      172.16.25.15   fgeorge  tty3   5622329430/4327528 stop
task_id=18      service=connection  protocol=lat  addr=VAX      cmd=lat VAX
bytes_in=0      bytes_out=0      paks_in=0      paks_out=0      elapsed_time=6
```

EXEC Accounting

EXEC accounting provides information about user EXEC terminal sessions (user shells) on the network access server, including username, date, start and stop times, the access server IP address, and (for dial-in users) the telephone number the call originated from.

The following example shows the information contained in a RADIUS EXEC accounting record for a dial-in user:

```
Wed Jun 25 04:26:23 1997
NAS-IP-Address = "172.16.25.15"
NAS-Port = 1
User-Name = "fgeorge"
Client-Port-DNIS = "4327528"
Caller-ID = "5622329483"
Acct-Status-Type = Start
Acct-Authentic = RADIUS
Service-Type = Exec-User
Acct-Session-Id = "00000006"
Acct-Delay-Time = 0
User-Id = "fgeorge"
NAS-Identifier = "172.16.25.15"
```

```
Wed Jun 25 04:27:25 1997
NAS-IP-Address = "172.16.25.15"
NAS-Port = 1
User-Name = "fgeorge"
Client-Port-DNIS = "4327528"
Caller-ID = "5622329483"
Acct-Status-Type = Stop
Acct-Authentic = RADIUS
Service-Type = Exec-User
Acct-Session-Id = "00000006"
Acct-Session-Time = 62
Acct-Delay-Time = 0
User-Id = "fgeorge"
NAS-Identifier = "172.16.25.15"
```

The following example shows the information contained in a TACACS+ EXEC accounting record for a dial-in user:

```
Wed Jun 25 03:46:21 1997      172.16.25.15   fgeorge  tty3   5622329430/4327528
start  task_id=2      service=shell
Wed Jun 25 04:08:55 1997      172.16.25.15   fgeorge  tty3   5622329430/4327528 stop
task_id=2      service=shell  elapsed_time=1354
```

The following example shows the information contained in a RADIUS EXEC accounting record for a Telnet user:

```
Wed Jun 25 04:48:32 1997
  NAS-IP-Address = "172.16.25.15"
  NAS-Port = 26
  User-Name = "fgeorge"
  Caller-ID = "171.68.202.158"
  Acct-Status-Type = Start
  Acct-Authentic = RADIUS
  Service-Type = Exec-User
  Acct-Session-Id = "00000010"
  Acct-Delay-Time = 0
  User-Id = "fgeorge"
  NAS-Identifier = "172.16.25.15"
```

```
Wed Jun 25 04:48:46 1997
  NAS-IP-Address = "172.16.25.15"
  NAS-Port = 26
  User-Name = "fgeorge"
  Caller-ID = "171.68.202.158"
  Acct-Status-Type = Stop
  Acct-Authentic = RADIUS
  Service-Type = Exec-User
  Acct-Session-Id = "00000010"
  Acct-Session-Time = 14
  Acct-Delay-Time = 0
  User-Id = "fgeorge"
  NAS-Identifier = "172.16.25.15"
```

The following example shows the information contained in a TACACS+ EXEC accounting record for a Telnet user:

```
Wed Jun 25 04:06:53 1997      172.16.25.15   fgeorge   tty26   171.68.202.158
starttask_id=41      service=shell
Wed Jun 25 04:07:02 1997      172.16.25.15   fgeorge   tty26   171.68.202.158
stoptask_id=41      service=shell   elapsed_time=9
```

System Accounting

System accounting provides information about all system-level events (for example, when the system reboots or when accounting is turned on or off). The following accounting record is an example of a typical TACACS+ system accounting record server indicating that AAA accounting has been turned off:

```
Wed Jun 25 03:55:32 1997      172.16.25.15   unknown unknown unknown start   task_id=25
service=system event=sys_acct reason=reconfigure
```

Note The precise format of accounting packets records may vary depending on your particular TACACS+ daemon.

The following accounting record is an example of a TACACS+ system accounting record indicating that AAA accounting has been turned on:

```
Wed Jun 25 03:55:22 1997      172.16.25.15   unknown unknown unknown stop   task_id=23
service=system event=sys_acct reason=reconfigure
```

Note Cisco's implementation of RADIUS does not support system accounting.

Additional tasks for measuring system resources are covered in other chapters in the Cisco IOS software configuration guides. For example, IP accounting tasks are described in the "Configuring IP Services" chapter in the *Network Protocols Configuration Guide, Part 1*.

Command Accounting

Command accounting provides information about the EXEC shell commands for a specified privilege level that are being executed on a network access server. Each command accounting record includes a list of the commands executed for that privilege level, as well as the date and time each command was executed, and the user who executed it.

The following example shows the information contained in a TACACS+ command accounting record for privilege level 1:

```
Wed Jun 25 03:46:47 1997      172.16.25.15   fgeorge tty3   5622329430/4327528 stop
task_id=3      service=shell  priv-lvl=1      cmd=show version <cr>
Wed Jun 25 03:46:58 1997      172.16.25.15   fgeorge tty3   5622329430/4327528 stop
task_id=4      service=shell  priv-lvl=1      cmd=show interfaces Ethernet 0 <cr>
Wed Jun 25 03:47:03 1997      172.16.25.15   fgeorge tty3   5622329430/4327528 stop
task_id=5      service=shell  priv-lvl=1      cmd=show ip route <cr>
```

The following example shows the information contained in a TACACS+ command accounting record for privilege level 15:

```
Wed Jun 25 03:47:17 1997      172.16.25.15   fgeorge tty3   5622329430/4327528 stop
task_id=6      service=shell  priv-lvl=15     cmd=configure terminal <cr>
Wed Jun 25 03:47:21 1997      172.16.25.15   fgeorge tty3   5622329430/4327528 stop
task_id=7      service=shell  priv-lvl=15     cmd=interface Serial 0 <cr>
Wed Jun 25 03:47:29 1997      172.16.25.15   fgeorge tty3   5622329430/4327528 stop
task_id=8      service=shell  priv-lvl=15     cmd=ip address 1.1.1.1 255.255.255.0 <cr>
```

Note Cisco's implementation of RADIUS does not support command accounting.

AAA Accounting Prerequisites

Before configuring AAA accounting, you must first complete these tasks:

- Enable AAA on your network access server. For more information about the AAA security services and how to enable AAA, refer to the “AAA Overview” chapter.
- Define the characteristics of your RADIUS or TACACS+ security server. For more information about defining RADIUS security server attributes, refer to the “Configuring RADIUS” chapter. For more information about defining TACACS+ security server attributes, refer to the “Configuring TACACS+” chapter.

AAA Accounting Configuration Task List

This section describes the following tasks:

- Enable Accounting
- Monitor Accounting

For accounting configuration examples using the commands in this chapter, refer to the “Accounting Configuration Examples” section located at the end of the this chapter.

Enable Accounting

The **aaa accounting** command enables you to create a record for any or all of the accounting functions monitored. To enable AAA accounting, perform the following task in global configuration mode:

Task	Command
Enable accounting.	aaa accounting { system network connection exec command <i>level</i> } { start-stop wait-start stop-only } { tacacs+ radius }

For minimal accounting, use the **stop-only** keyword, which instructs the specified authentication system (RADIUS or TACACS+) to send a stop record accounting notice at the end of the requested user process. For more accounting information, use the **start-stop** keyword to send a start accounting notice at the beginning of the requested event and a stop accounting notice at the end of the event. You can further control access and accounting by using the **wait-start** keyword, which ensures that the RADIUS or TACACS+ security server acknowledges the start notice before granting the user’s process request.

Suppress Generation of Accounting Records for Null Username Sessions

When **aaa accounting** is activated, the Cisco IOS software issues accounting records for all users on the system, including users whose username string, because of protocol translation, is NULL. An example of this is users who come in on lines where the **aaa authentication login method-list none** command is applied. To prevent accounting records from being generated for sessions that do not have usernames associated with them, perform the following task in global configuration mode:

Task	Command
Prevent accounting records from being generated for users whose username string is NULL.	aaa accounting suppress null-username

Generate Interim Accounting Records

To enable periodic interim accounting records to be sent to the accounting server, perform the following task in global configuration mode:

Task	Command
Enable periodic interim accounting records to be sent to the accounting server.	aaa accounting update { newinfo periodic number }

When the **aaa accounting update** command is activated, the Cisco IOS software issues interim accounting records for all users on the system. If the keyword **newinfo** is used, interim accounting records will be sent to the accounting server every time there is new accounting information to report. An example of this would be when IPCP completes IP address negotiation with the remote peer. The interim accounting record will include the negotiated IP address used by the remote peer.

When used with the keyword **periodic**, interim accounting records are sent periodically as defined by the argument number. The interim accounting record contains all of the accounting information recorded for that user up to the time the interim accounting record is sent.

Both of these keywords are mutually exclusive, meaning that whichever keyword is configured last takes precedence over the previous configuration. For example, if you configure **aaa accounting update periodic**, and then configure **aaa accounting update newinfo**, all users currently logged in will continue to generate periodic interim accounting records. All new users will generate accounting records based on the **newinfo** algorithm.



Caution Using the **aaa accounting update periodic** command can cause heavy congestion when many users are logged in to the network.

Monitor Accounting

No specific **show** command exists for either RADIUS or TACACS+ accounting. To obtain accounting records displaying information about users currently logged in, perform the following task in Privileged EXEC mode:

Task	Command
Step through all active sessions and print all the accounting records for the actively accounted functions.	show accounting

Accounting Attribute-Value Pairs

The network access server monitors the accounting functions defined in either TACACS+ attribute/value (AV) pairs or RADIUS attributes, depending on which security method you have implemented. For a list of supported RADIUS accounting attributes, refer to the “RADIUS Attributes” appendix in the *Security Configuration Guide*. For a list of supported TACACS+ accounting AV pairs, refer to the “TACACS+ AV Pairs” appendix in the *Security Configuration Guide*.

Accounting Configuration Example

In the following sample configuration, RADIUS-style accounting is used to track all usage of EXEC commands and network services, such as SLIP, PPP, and ARAP:

```
aaa accounting exec start-stop radius
aaa accounting network start-stop radius
```

The **show accounting** command yields the following output for the above configuration:

```
Active Accounted actions on tty0, User georgef Priv 1
Task ID 2, EXEC Accounting record, 00:02:13 Elapsed
task_id=2 service=shell
Task ID 3, Connection Accounting record, 00:02:07 Elapsed
task_id=3 service=connection protocol=telnet address=172.21.14.90 cmd=synth

Active Accounted actions on tty1, User rubble Priv 1
Task ID 5, Network Accounting record, 00:00:52 Elapsed
task_id=5 service=ppp protocol=ip address=10.0.0.98

Active Accounted actions on tty10, User georgef Priv 1
Task ID 4, EXEC Accounting record, 00:00:53 Elapsed
task_id=4 service=shell
```

Table 9 describes the fields contained in this example.

Table 9 Show Accounting Field Descriptions

Field	Description
Active Accounted actions on	Terminal line or interface name user with which the user logged in.
User	User's ID
Priv	User's privilege level.
Task ID	Unique identifier for each accounting session.
Accounting Record	Type of accounting session.
Elapsed	Length of time (hh:mm:ss) for this session type.
attribute=value	AV pairs associated with this accounting session.

