

# Configuring Accounting

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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 activated, 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 is comprised of accounting attribute-value (AV) pairs and is stored in a log file on the access control server. This log file can then be analyzed for network management, client billing, and auditing.

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**Note** For additional information about these security tools and features, refer to the *Security Configuration Guide* or the *Security Command Reference*.

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## AAA Accounting Types

Cisco IOS Release 11.3 supports five different kinds of accounting:

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

## 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      dpeng  tty3      4082329430/4327528  stop
task_id=3      service=shell  priv-lvl=1      cmd=show version <cr>
Wed Jun 25 03:46:58 1997      172.16.25.15      dpeng  tty3      4082329430/4327528  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      dpeng  tty3      4082329430/4327528  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  dpeng  tty3  4082329430/4327528  stop
task_id=6      service=shell  priv-lvl=15      cmd=configure terminal <cr>
Wed Jun 25 03:47:21 1997      172.16.25.15  dpeng  tty3  4082329430/4327528  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  dpeng  tty3  4082329430/4327528  stop
task_id=8      service=shell  priv-lvl=15      cmd=ip address 1.1.1.1 255.255.255.0 <cr>
```

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

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## 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 assembler-disassembler (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 = "dpeng"
Client-Port-DNIS = "4327528"
Caller-ID = "4082329477"
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 = "dpeng"
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 = "dpeng"
Client-Port-DNIS = "4327528"
Caller-ID = "4082329477"
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 = "dpeng"
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  dpeng  tty3  4082329430/4327528  start
task_id=10      service=connection      protocol=telnet  addr=171.68.202.158  cmd=telnet
dpeng-sun
Wed Jun 25 03:48:38 1997      172.16.25.15  dpeng  tty3  4082329430/4327528  stop
task_id=10      service=connection      protocol=telnet  addr=171.68.202.158  cmd=telnet
dpeng-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 = "dpeng"
Client-Port-DNIS = "4327528"
Caller-ID = "4082329477"
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 = "dpeng"
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 = "dpeng"
Client-Port-DNIS = "4327528"
Caller-ID = "4082329477"
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 = "dpeng"
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  dpeng  tty3  4082329430/4327528  start
task_id=12      service=connection      protocol=rlogin  addr=171.68.202.158  cmd=rlogin
dpeng-sun /user dpeng
Wed Jun 25 03:51:37 1997      172.16.25.15  dpeng  tty3  4082329430/4327528  stop
task_id=12      service=connection      protocol=rlogin  addr=171.68.202.158  cmd=rlogin
dpeng-sun /user dpeng 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:

```
Wed Jun 25 03:53:06 1997      172.16.25.15  dpeng  tty3  4082329430/4327528  start
task_id=18      service=connection  protocol=lat  addr=VAX  cmd=lat  VAX
Wed Jun 25 03:54:15 1997      172.16.25.15  dpeng  tty3  4082329430/4327528  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 user name, 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 = "dpeng"
Client-Port-DNIS = "4327528"
Caller-ID = "4082329483"
Acct-Status-Type = Start
Acct-Authentic = RADIUS
Service-Type = Exec-User
Acct-Session-Id = "00000006"
Acct-Delay-Time = 0
User-Id = "dpeng"
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 = "dpeng"
Client-Port-DNIS = "4327528"
Caller-ID = "4082329483"
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 = "dpeng"
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  dpeng  tty3  4082329430/4327528  start
task_id=2      service=shell
Wed Jun 25 04:08:55 1997      172.16.25.15  dpeng  tty3  4082329430/4327528  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 = "dpeng"
  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 = "dpeng"
  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 = "dpeng"
  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 = "dpeng"
  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    dpeng    tty26    171.68.202.158
starttask_id=41      service=shell
Wed Jun 25 04:07:02 1997      172.16.25.15    dpeng    tty26    171.68.202.158
stoptask_id=41      service=shell    elapsed_time=9
```

## 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 = "dpeng"
  Client-Port-DNIS = "4327528"
  Caller-ID = "408"
  Acct-Status-Type = Start
  Acct-Authentic = RADIUS
  Service-Type = Exec-User
  Acct-Session-Id = "0000000D"
  Acct-Delay-Time = 0
  User-Id = "dpeng"
  NAS-Identifier = "172.16.25.15"
```

## AAA Accounting Types

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```
Wed Jun 25 04:45:00 1997
NAS-IP-Address = "172.16.25.15"
NAS-Port = 5
User-Name = "dpeng"
Client-Port-DNIS = "4327528"
Caller-ID = "408"
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 = "dpeng"
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 = "dpeng"
Client-Port-DNIS = "4327528"
Caller-ID = "408"
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 = "dpeng"
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  dpeng  tty4  408/4327528
starttask_id=28  service=shell
Wed Jun 25 04:00:46 1997      172.16.25.15  dpeng  tty4  408/4327528
starttask_id=30  addr=10.1.1.1  service=ppp
Wed Jun 25 04:00:49 1997      172.16.25.15  dpeng  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  dpeng  tty4  408/4327528  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  dpeng  tty4  408/4327528  stoptask_id=28
service=shell  elapsed_time=57
```

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 = "dpeng"
  Client-Port-DNIS = "4327528"
  Caller-ID = "408"
  Acct-Status-Type = Start
  Acct-Authentic = RADIUS
  Service-Type = Framed
  Acct-Session-Id = "0000000B"
  Framed-Protocol = PPP
  Acct-Delay-Time = 0
  User-Id = "dpeng"
  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 = "dpeng"
  Client-Port-DNIS = "4327528"
  Caller-ID = "408"
  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 = "dpeng"
  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  dpeng  Async5  408/4327528
starttask_id=35      service=ppp
Wed Jun 25 04:02:25 1997      172.16.25.15  dpeng  Async5  408/4327528  update
task_id=35      service=ppp      protocol=ip      addr=10.1.1.2
Wed Jun 25 04:05:03 1997      172.16.25.15  dpeng  Async5  408/4327528
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
```

## 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
```

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.

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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*.

## Configuring AAA Accounting

This chapter describes the following tasks:

- Enable Accounting
- Monitor Accounting

### Prerequisites

Before configuring AAA accounting, you must first:

- Enable AAA on your network access server.
- Define the characteristics of your RADIUS or TACACS+ security server.

## Enable Accounting

The **aaa accounting** command allows 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.	<b>aaa accounting</b> {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 process and a stop accounting notice at the end of the process. You can further control access and accounting by using the **wait-start** keyword, which ensures that the RADIUS or TACACS+ security server receives the start notice before granting the user’s process request.

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. To prevent accounting records from being generated for users who 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.	<b>aaa accounting suppress null-username</b>

## 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” chapter in the *Security Configuration Guide*. For a list of supported TACACS+ accounting AV pairs, refer to the “TACACS+ AV Pairs” chapter in the *Security Configuration Guide*.

## Monitor Accounting

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

Task	Command
Step through all active sessions to print all the accounting records for the actively accounted functions.	<b>show accounting</b>

## Accounting Example

In the following sample configuration, RADIUS-style authorization is used to track all usage of the following:

- EXEC commands
- Network services, such as SLIP, PPP, and ARAP
- System-level events not associated with users

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

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

```
Active Accounted actions on tty0, User billw 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 bill Priv 1
Task ID 4, EXEC Accounting record, 00:00:53 Elapsed
task_id=4 service=shell
```