Configuring Accounting

The AAA accounting feature allows the services that users are accessing and the amount of network resources that users are consuming to be tracked. When AAA accounting is enabled, the network access server reports user activity to the TACACS+ or RADIUS security server (depending on which security method is 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 auditing.

- Prerequisites for Configuring Accounting, on page 1
- Restrictions for Configuring Accounting, on page 1
- Information About Configuring Accounting, on page 2
- How to Configure AAA Accounting, on page 15
- Configuration Examples for AAA Accounting, on page 22
- Additional References for Configuring Accounting, on page 26
- Feature History for Configuring Accounting, on page 26

Prerequisites for Configuring Accounting

The following tasks must be performed before configuring accounting using named method lists:

- Enable AAA on the network access server by using the `aaa new-model` command in global configuration mode.

- Define the characteristics of the RADIUS or TACACS+ security server if RADIUS or TACACS+ authorization is issued. For more information about configuring the Cisco network access server to communicate with the RADIUS security server, see the Configuring RADIUS module. For more information about configuring the Cisco network access server to communicate with the TACACS+ security server, see the Configuring TACACS+ module.

Restrictions for Configuring Accounting

- Accounting information can be sent simultaneously to a maximum of only four AAA servers.
Information About Configuring Accounting

Named Method Lists for Accounting

Similar to authentication and authorization method lists, method lists for accounting define the way accounting is performed and the sequence in which these methods are performed.

Named accounting method lists allow particular security protocol to be designated and used on specific lines or interfaces for accounting services. The only exception is the default method list (which is named default). The default method list is automatically applied to all interfaces except those that have a named method list explicitly defined. A defined method list overrides the default method list.

A method list is simply a named list describing the accounting methods to be queried (such as RADIUS or TACACS+), in sequence. Method lists allow one or more security protocols to be designated and used for accounting, thus ensuring a backup system for accounting in case the initial method fails. Cisco IOS software uses the first method listed to support accounting; if that method fails to respond, the Cisco IOS software selects the next accounting method listed in the method list. This process continues until there is successful communication with a listed accounting method, or all methods defined are exhausted.

The Cisco IOS software attempts accounting with the next listed accounting method only when there is no response from the previous method. If accounting fails at any point in this cycle—meaning that the security server responds by denying the user access—the accounting process stops and no other accounting methods are attempted.

Accounting method lists are specific to the type of accounting being requested. AAA supports seven different types of accounting:

- **Network**: Provides information for all PPP, SLIP, or ARAP sessions, including packet and byte counts.
- **EXEC**: Provides information about user EXEC terminal sessions of the network access server.
- **Commands**: Provides information about the EXEC mode commands that a user issues. Command accounting generates accounting records for all EXEC mode commands, including global configuration commands, associated with a specific privilege level.
- **Connection**: 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.
- **System**: Provides information about system-level events.
- **Resource**: Provides “start” and “stop” records for calls that have passed user authentication, and provides “stop” records for calls that fail to authenticate.
- **VRRS**: Provides information about Virtual Router Redundancy Service (VRRS).

System accounting does not use named accounting lists; only the default list for system accounting can be defined.
When a named method list is created, a particular list of accounting methods for the indicated accounting type are defined.

Accounting method lists must be applied to specific lines or interfaces before any of the defined methods are performed. The only exception is the default method list (which is named “default”). If the `aaa accounting` command for a particular accounting type is issued without specifying a named method list, the default method list is automatically applied to all interfaces or lines except those that have a named method list explicitly defined (A defined method list overrides the default method list). If no default method list is defined, then no accounting takes place.

This section includes the following subsections:

**Method Lists and Server Groups**

A server group is a way to group existing RADIUS or TACACS+ server hosts for use in method lists. The figure below shows a typical AAA network configuration that includes four security servers: R1 and R2 are RADIUS servers, and T1 and T2 are TACACS+ servers. R1 and R2 comprise the group of RADIUS servers. T1 and T2 comprise the group of TACACS+ servers.

In Cisco IOS software, RADIUS and TACACS+ server configurations are global. A subset of the configured server hosts can be specified using server groups. These server groups can be used for a particular service. For example, server groups allow R1 and R2 to be defined as separate server groups (SG1 and SG2), and T1 and T2 as separate server groups (SG3 and SG4). This means either R1 and T1 (SG1 and SG3) or R2 and T2 (SG2 and SG4) can be specified in the method list, which provides more flexibility in the way that RADIUS and TACACS+ resources are assigned.

Server groups also can include multiple host entries for the same server, as long as each entry has a unique identifier. The combination of an IP address and a UDP port number creates a unique identifier, allowing different ports to be individually defined as RADIUS hosts providing a specific AAA service. In other words, this unique identifier enables RADIUS requests to be sent to different UDP ports on a server from the same IP address. If two different host entries on the same RADIUS server are configured for the same service: for example, accounting; the second host entry configured acts as failover backup to the first one. Using this example, if the first host entry fails to provide accounting services, the network access server tries the second host entry configured on the same device for accounting services (The RADIUS host entries are tried in the order in which they are configured).

For more information about configuring server groups and about configuring server groups based on Dialed Number Identification Service (DNIS) numbers, see the “Configuring RADIUS” or “Configuring TACACS+” modules.

**AAA Accounting Methods**

The following two methods of accounting are supported:

- **TACACS+:** The network access server reports user activity to the TACACS+ security server in the form of accounting records. Each accounting record contains accounting AV pairs and is stored on the security server.

- **RADIUS:** The network access server reports user activity to the RADIUS security server in the form of accounting records. Each accounting record contains accounting AV pairs and is stored on the security server.
Passwords and accounting logs are masked before being sent to the TACACS+ or RADIUS security servers. Use the `aaa accounting commands visible-keys` command to send unmasked information to the TACACS+ or RADIUS security servers.

### Accounting Record Types

For minimal accounting, use the `stop-only` keyword, which instructs the specified method (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. To stop all accounting activities on this line or interface, use the `none` keyword.

### Accounting Methods

The table below lists the supported accounting methods.

**Table 1: AAA Accounting Methods**

<table>
<thead>
<tr>
<th>Keyword</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>group radius</code></td>
<td>Uses the list of all RADIUS servers for accounting.</td>
</tr>
<tr>
<td><code>group tacacs+</code></td>
<td>Uses the list of all TACACS+ servers for accounting.</td>
</tr>
<tr>
<td><code>group group-name</code></td>
<td>Uses a subset of RADIUS or TACACS+ servers for accounting as defined by the server group <code>group-name</code>.</td>
</tr>
</tbody>
</table>

The method argument refers to the actual method the authentication algorithm tries. Additional methods of authentication are used only if the previous method returns an error, not if it fails. To specify that the authentication should succeed even if all other methods return an error, specify additional methods in the command. For example, to create a method list named acct_tac1 that specifies RADIUS as the backup method of authentication in the event that TACACS+ authentication returns an error, enter the following command:

```plaintext
aaa accounting network acct_tac1 stop-only group tacacs+ group radius
```

To create a default list that is used when a named list is not specified in the `aaa accounting` command, use the `default` keyword followed by the methods that are wanted to be used in default situations. The default method list is automatically applied to all interfaces.

For example, to specify RADIUS as the default method for user authentication during login, enter the following command:

```plaintext
aaa accounting network default stop-only group radius
```

AAA Accounting supports the following methods:

- **group tacacs**: To have the network access server send accounting information to a TACACS+ security server, use the `group tacacs+ method` keyword.

- **group radius**: To have the network access server send accounting information to a RADIUS security server, use the `group radius method` keyword.
Accounting method lists for SLIP follow whatever is configured for PPP on the relevant interface. If no lists are defined and applied to a particular interface (or no PPP settings are configured), the default setting for accounting applies.

Note

- **group group-name**: To specify a subset of RADIUS or TACACS+ servers to use as the accounting method, use the `aaa accounting` command with the `group group-name` method. To specify and define the group name and the members of the group, use the `aaa group server` command. For example, use the `aaa group server` command to first define the members of `group loginrad`:

  ```
  aaa group server radius loginrad
  server 172.16.2.3
  server 172.16.2.17
  server 172.16.2.32
  ```

  This command specifies RADIUS servers 172.16.2.3, 172.16.2.17, and 172.16.2.32 as members of the `group loginrad`.

  To specify `group loginrad` as the method of network accounting when no other method list has been defined, enter the following command:

  ```
  aaa accounting network default start-stop group loginrad
  ```

  Before a group name can be used as the accounting method, communication with the RADIUS or TACACS+ security server must be enabled.

### AAA Accounting Types

#### 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 27 04:44:45 2001
  NAS-IP-Address = "172.16.25.15"
  NAS-Port = 5
  User-Name = "username1"
  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 = "username1"
  NAS-Identifier = "172.16.25.15"

Wed Jun 27 04:45:00 2001
  NAS-IP-Address = "172.16.25.15"
  NAS-Port = 5
  User-Name = "username1"
```
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 27 04:00:35 2001 172.16.25.15 username1 tty4 562/4327528 start
  service=shell
Wed Jun 27 04:00:46 2001 172.16.25.15 username1 tty4 562/4327528 start
  addr=10.1.1.1 service=ppp
Wed Jun 27 04:00:49 2001 172.16.25.15 username1 tty4 408/4327528 update
  addr=10.1.1.1 service=ppp protocol=ip addr=10.1.1.1
Wed Jun 27 04:01:31 2001 172.16.25.15 username1 tty4 562/4327528 stop
  addr=10.1.1.1 service=ppp protocol=ip addr=10.1.1.1
  bytes_in=2844 bytes_out=1682 paks_in=36
Wed Jun 27 04:01:32 2001 172.16.25.15 username1 tty4 562/4327528 stop
  service=shell elapsed_time=51
```

```
The precise format of accounting packets records may vary depending on the 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 27 04:30:52 2001
NAS-IP-Address = "172.16.25.15"
NAS-Port = 3
User-Name = "username1"
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 = "username1"
NAS-Identifier = "172.16.25.15"

Wed Jun 27 04:36:49 2001
NAS-IP-Address = "172.16.25.15"
NAS-Port = 3
User-Name = "username1"
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 = "username1"
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 27 04:02:19 2001 172.16.25.15 username1 Async5 562/4327528 start
service=ppp
Wed Jun 27 04:02:25 2001 172.16.25.15 username1 Async5 562/4327528 update
service=ppp protocol-ip addr=10.1.1.2
task_id=35
Wed Jun 27 04:05:03 2001 172.16.25.15 username1 Async5 562/4327528 stop
service=ppp protocol-ip addr=10.1.1.2
task_id=35
bytes_in=3366 bytes_out=2149 elapsed_time=164
paks_in=42
paks_out=28

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 27 04:26:23 2001**
- NAS-IP-Address = “172.16.25.15”
- NAS-Port = 1
- User-Name = “username1”
- 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 = “username1”
- NAS-Identifier = “172.16.25.15”

**Wed Jun 27 04:27:25 2001**
- NAS-IP-Address = “172.16.25.15”
- NAS-Port = 1
- User-Name = “username1”
- 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 = “username1”
- 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 27 03:46:21 2001**
- 172.16.25.15 username1 tty3 5622329430/4327528
- start
- task_id=2 service=shell

**Wed Jun 27 04:08:55 2001**
- 172.16.25.15 username1 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 27 04:48:32 2001**
- NAS-IP-Address = “172.16.25.15”
- NAS-Port = 26
- User-Name = “username1”
- Caller-ID = “10.68.202.158”
- Acct-Status-Type = Start
- Acct-Authentic = RADIUS
- Service-Type = Exec-User
- Acct-Session-Id = “00000010”
- Acct-Delay-Time = 0
- User-Id = “username1”
- NAS-Identifier = “172.16.25.15”

**Wed Jun 27 04:48:46 2001**
- NAS-IP-Address = “172.16.25.15”
- NAS-Port = 26
- User-Name = “username1”
- Caller-ID = “10.68.202.158”
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 = “username1”
NAS-Identifier = “172.16.25.15”

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

```
start task_id=41 service=shell
stop task_id=41 service=shell elapsed_time=9
```

**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 27 03:46:47 2001 172.16.25.15 username1 tty3 5622329430/4327528
stop task_id=3 service=shell priv-lvl=1 cmd=show version <cr>
Wed Jun 27 03:46:58 2001 172.16.25.15 username1 tty3 5622329430/4327528
stop task_id=4 service=shell priv-lvl=1 cmd=show interfaces Ethernet 0 <cr>
Wed Jun 27 03:47:03 2001 172.16.25.15 username1 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 27 03:47:17 2001 172.16.25.15 username1 tty3 5622329430/4327528
stop task_id=6 service=shell priv-lvl=15 cmd=configure terminal <cr>
Wed Jun 27 03:47:21 2001 172.16.25.15 username1 tty3 5622329430/4327528
stop task_id=7 service=shell priv-lvl=15 cmd=interface Serial 0 <cr>
Wed Jun 27 03:47:29 2001 172.16.25.15 username1 tty3 5622329430/4327528
stop task_id=8 service=shell priv-lvl=15 cmd-ip address 10.1.1.1 255.255.255.0 <cr>
```

The Cisco implementation of RADIUS does not support command accounting.

**Connection Accounting**

Connection accounting provides information about all outbound connections made from the network access server such as Telnet, LAT, TN3270, PAD, and rlogin.

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

```
Wed Jun 27 03:47:43 2001 172.16.25.15 username1 tty3 5622329430/4327528
start task_id=10 service=connection protocol=telnet addr=10.68.202.158 cmd=telnet
username1-sun
```

```
Wed Jun 27 03:48:38 2001 172.16.25.15 username1 tty3 5622329430/4327528
stop task_id=10 service=connection protocol=telnet addr=10.68.202.158 cmd=telnet
username1-sun bytes_in=4467 bytes_out=96 paks_in=61 paks_out=72 elapsed_time=55
```

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

```
NAS-IP-Address = "172.16.25.15"
NAS-Port = 2
User-Name = "username1"
Client-Port-DNIS = "4327528"
Caller-ID = "5622329477"
Acct-Status-Type = Start
Acct-Authentic = RADIUS
Service-Type = Login
Acct-Session-Id = "0000000A"
Login-Service = Telnet
Login-IP-Host = "10.68.202.158"
Acct-Delay-Time = 0
User-Id = "username1"
NAS-Identifier = "172.16.25.15"

NAS-IP-Address = "172.16.25.15"
NAS-Port = 2
User-Name = "username1"
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 = "10.68.202.158"
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 = "username1"
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 27 04:28:00 2001
NAS-IP-Address = "172.16.25.15"
NAS-Port = 2
User-Name = "username1"
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 = "10.68.202.158"
Acct-Delay-Time = 0
User-Id = "username1"
NAS-Identifier = "172.16.25.15"
```

The following example shows the information contained in a RADIUS connection accounting record for an outbound rlogin connection:
Login-IP-Host = "10.68.202.158"
Acct-Delay-Time = 0
User-Id = "username1"
NAS-Identifier = "172.16.25.15"

Wed Jun 27 04:30:09 2001
NAS-IP-Address = "172.16.25.15"
NAS-Port = 2
User-Name = "username1"
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 = "10.68.202.158"
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 = "username1"
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 27 03:48:46 2001 172.16.25.15 username1 tty3 5622329430/4327528
start task_id=12 service=connection protocol=rlogin addr=10.68.202.158 cmd=rlogin
username1-sun /user username1

Wed Jun 27 03:51:37 2001 172.16.25.15 username1 tty3 5622329430/4327528
stop task_id=12 service=connection protocol=rlogin addr=10.68.202.158 cmd=rlogin
username1-sun /user username1 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 27 03:53:06 2001 172.16.25.15 username1 tty3 5622329430/4327528
start task_id=18 service=connection protocol=lat addr=VAX cmd=lat VAX

Wed Jun 27 03:54:15 2001 172.16.25.15 username1 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

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 shows a typical TACACS+ system accounting record server indicating that AAA Accounting has been turned off:

service-system
event=sys_acct reason=reconfigure
The precise format of accounting packets records may vary depending on the TACACS+ daemon.

The following accounting record shows a TACACS+ system accounting record indicating that AAA Accounting has been turned on:

```
Wed Jun 27 03:55:22 2001 172.16.25.15 unknown unknown unknown stop task_id=23
service=system
event=sys_acct reason=reconfigure
```

**Resource Accounting**

The Cisco implementation of AAA accounting provides “start” and “stop” record support for calls that have passed user authentication. The additional feature of generating “stop” records for calls that fail to authenticate as part of user authentication is also supported. Such records are necessary for users employing accounting records to manage and monitor their networks.

This section includes the following subsections:

**AAA Resource Failure Stop Accounting**

Before AAA resource failure stop accounting, there was no method of providing accounting records for calls that failed to reach the user authentication stage of a call setup sequence. Such records are necessary for users employing accounting records to manage and monitor their networks and their wholesale customers.

This functionality generates a “stop” accounting record for any calls that do not reach user authentication; “stop” records are generated from the moment of call setup. All calls that pass user authentication behave as they did before; that is, no additional accounting records are seen.

The figure below illustrates a call setup sequence with normal call flow (no disconnect) and without AAA resource failure stop accounting enabled.

**Figure 1: Modem Dial-In Call Setup Sequence With Normal Flow and Without Resource Failure Stop Accounting Enabled**

The figure below illustrates a call setup sequence with normal call flow (no disconnect) and with AAA resource failure stop accounting enabled.
AAA Resource Accounting for Start-Stop Records

AAA resource accounting for start-stop records supports the ability to send a “start” record at each call setup, followed by a corresponding “stop” record at the call disconnect. This functionality can be used to manage and monitor wholesale customers from one source of data reporting, such as accounting records.

With this feature, a call setup and call disconnect “start-stop” accounting record tracks the progress of the resource connection to the device. A separate user authentication “start-stop” accounting record tracks the user management progress. These two sets of accounting records are interlinked by using a unique session ID for the call.

The figure below illustrates a call setup sequence with AAA resource start-stop accounting enabled.
AAA Accounting Enhancements

AAA Broadcast Accounting

AAA broadcast accounting allows accounting information to be sent to multiple AAA servers at the same time; that is, accounting information can be broadcast to one or more AAA servers simultaneously. This functionality allows service providers to send accounting information to their own private AAA servers and to the AAA servers of their end customers. It also provides redundant billing information for voice applications.

Broadcasting is allowed among groups of RADIUS or TACACS+ servers, and each server group can define its backup servers for failover independently of other groups.

Thus, service providers and their end customers can use different protocols (RADIUS or TACACS+) for the accounting server. Service providers and their end customers can also specify their backup servers independently. As for voice applications, redundant accounting information can be managed independently through a separate group with its own failover sequence.

AAA Session MIB

The AAA session MIB feature allows customers to monitor and terminate their authenticated client connections using Simple Network Management Protocol (SNMP). The data of the client is presented so that it correlates directly to the AAA Accounting information reported by either the RADIUS or the TACACS+ server. AAA session MIB provides the following information:

- Statistics for each AAA function (when used in conjunction with the `show radius statistics` command)
- Status of servers providing AAA functions
- Identities of external AAA servers
- Real-time information (such as idle times), providing additional criteria for use by SNMP networks for assessing whether or not to terminate an active call

The table below shows the SNMP user-end data objects that can be used to monitor and terminate authenticated client connections with the AAA session MIB feature.

Table 2: SNMP End-User Data Objects

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SessionId</td>
<td>The session identification used by the AAA Accounting protocol (same value as reported by RADIUS attribute 44 (Acct-Session-ID)).</td>
</tr>
<tr>
<td>UserId</td>
<td>The user login ID or zero-length string if a login is unavailable.</td>
</tr>
<tr>
<td>IpAddr</td>
<td>The IP address of the session or 0.0.0.0 if an IP address is not applicable or unavailable.</td>
</tr>
</tbody>
</table>
The elapsed time in seconds that the session has been idle.

Disconnect The session termination object used to disconnect the given client.

CallId The entry index corresponding to this accounting session that the Call Tracker record stored.

The table below describes the AAA summary information provided by the AAA session MIB feature using SNMP on a per-system basis.

Table 3: SNMP AAA Session Summary

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ActiveTableEntries</td>
<td>Number of sessions currently active.</td>
</tr>
<tr>
<td>ActiveTableHighWaterMark</td>
<td>Maximum number of sessions present at once since last system reinstallation.</td>
</tr>
<tr>
<td>TotalSessions</td>
<td>Total number of sessions since last system reinstallation.</td>
</tr>
<tr>
<td>DisconnectedSessions</td>
<td>Total number of sessions that have been disconnected using since last system reinstallation.</td>
</tr>
</tbody>
</table>

**Accounting Attribute-Value Pairs**

The network access server monitors the accounting functions defined in either TACACS+ AV pairs or RADIUS attributes, depending on which security method is implemented.

**How to Configure AAA Accounting**

**Configuring AAA Accounting Using Named Method Lists**

To configure AAA Accounting using named method lists, perform the following steps:

- **Procedure**
  
<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong></td>
<td></td>
</tr>
<tr>
<td>enable</td>
<td>Enables privileged EXEC mode.</td>
</tr>
<tr>
<td>Example:</td>
<td>• Enter your password if prompted.</td>
</tr>
<tr>
<td>Device&gt; enable</td>
<td></td>
</tr>
<tr>
<td><strong>Step 2</strong></td>
<td></td>
</tr>
<tr>
<td>configure terminal</td>
<td>Enters global configuration mode.</td>
</tr>
<tr>
<td>Example:</td>
<td></td>
</tr>
</tbody>
</table>

- **Note**
  
  System accounting does not use named method lists. For system accounting, define only the default method list.
### Purpose

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Device# configure terminal</td>
<td></td>
</tr>
<tr>
<td><strong>Step 3</strong></td>
<td></td>
</tr>
<tr>
<td>aaa accounting {system</td>
<td>network</td>
</tr>
<tr>
<td>Example:</td>
<td></td>
</tr>
<tr>
<td>Device(config)# aaa accounting system</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Step 4</strong></td>
<td></td>
</tr>
<tr>
<td>Do one of the following:</td>
<td></td>
</tr>
<tr>
<td>• line [aux</td>
<td>console</td>
</tr>
<tr>
<td>• interface interface-type interface-number</td>
<td>Enters the interface configuration mode for the interfaces to which the accounting method list is applied.</td>
</tr>
<tr>
<td>Example:</td>
<td></td>
</tr>
<tr>
<td>Device(config)# line aux line1</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Step 5</strong></td>
<td></td>
</tr>
<tr>
<td>Do one of the following:</td>
<td></td>
</tr>
<tr>
<td>• accounting {arap</td>
<td>commands level</td>
</tr>
<tr>
<td>• ppp accounting{default</td>
<td>list-name}</td>
</tr>
<tr>
<td>Example:</td>
<td></td>
</tr>
<tr>
<td>Device(config-line)# accounting arap default</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Step 6</strong></td>
<td></td>
</tr>
<tr>
<td>end</td>
<td>(Optional) Exits line configuration mode and returns to privileged EXEC mode.</td>
</tr>
<tr>
<td>Example:</td>
<td></td>
</tr>
<tr>
<td>Device(config-line)# end</td>
<td></td>
</tr>
</tbody>
</table>

### Suppressing 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, use the following command in global configuration mode:
Generating Interim Accounting Records

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

<table>
<thead>
<tr>
<th>Command</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Device(config)# aaa accounting suppress null-username</td>
<td>Prevents accounting records from being generated for users whose username is NULL.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Command</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Device(config)# aaa accounting update newinfo</td>
<td>Enables periodic interim accounting records to be sent to the accounting server.</td>
</tr>
<tr>
<td>Device(config)# aaa accounting update periodic number</td>
<td>Enables periodic interim accounting records to be sent to the accounting server.</td>
</tr>
</tbody>
</table>

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 are 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 includes 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 `number` argument. The interim accounting record contains all of the accounting information recorded for that user up to the time the interim accounting record is sent.

⚠️ **Caution**

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

Configuring an Alternate Method to Enable Periodic Accounting Records

You can use the following alternative method to enable periodic interim accounting records to be sent to the accounting server.
Generating Interim Service Accounting Records

Perform this task to enable the generation of interim service accounting records at periodic intervals for subscribers.

Before you begin

RADIUS Attribute 85 in the user service profile always takes precedence over the configured interim-interval value. RADIUS Attribute 85 must be in the user service profile. See the RADIUS Attributes Overview and RADIUS IETF Attributes feature document for more information.
If RADIUS Attribute 85 is not in the user service profile, then the interim-interval value configured in Generating Interim Accounting Records is used for service interim accounting records.

### Procedure

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong></td>
<td></td>
</tr>
<tr>
<td>enable</td>
<td>Enables privileged EXEC mode.</td>
</tr>
<tr>
<td><em>Example:</em></td>
<td>- Enter your password if prompted.</td>
</tr>
<tr>
<td>Device&gt; enable</td>
<td></td>
</tr>
<tr>
<td><strong>Step 2</strong></td>
<td></td>
</tr>
<tr>
<td>configure terminal</td>
<td>Enters global configuration mode.</td>
</tr>
<tr>
<td><em>Example:</em></td>
<td></td>
</tr>
<tr>
<td>Device# configure terminal</td>
<td></td>
</tr>
<tr>
<td><strong>Step 3</strong></td>
<td></td>
</tr>
<tr>
<td>subscriber service accounting interim-interval minutes</td>
<td>Enables the generation of interim service accounting records at periodic intervals for subscribers. The <em>minutes</em> argument indicates the number of periodic intervals to send accounting update records from 1 to 71582 minutes.</td>
</tr>
<tr>
<td><em>Example:</em></td>
<td></td>
</tr>
<tr>
<td>Device(config)# subscriber service accounting interim-interval 10</td>
<td></td>
</tr>
<tr>
<td><strong>Step 4</strong></td>
<td></td>
</tr>
<tr>
<td>end</td>
<td>Exits global configuration mode and returns to privileged EXEC mode.</td>
</tr>
<tr>
<td><em>Example:</em></td>
<td></td>
</tr>
<tr>
<td>Device(config)# end</td>
<td></td>
</tr>
</tbody>
</table>

### Generating Accounting Records for a Failed Login or Session

When AAA accounting is activated, the Cisco IOS XE software does not generate accounting records for system users who fail login authentication, or who succeed in login authentication but fail PPP negotiation for some reason.

To specify that accounting stop records be generated for users who fail to authenticate at login or during session negotiation, use the following command in global configuration mode:

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>aaa accounting send stop-record authentication failure</td>
<td>Generates “stop” records for users who fail to authenticate at login or during session negotiation using PPP.</td>
</tr>
</tbody>
</table>

### Specifying Accounting NETWORK-Stop Records Before EXEC-Stop Records

For PPP users who start EXEC terminal sessions, it can be specified that NETWORK records be generated before EXEC-stop records. In some cases, such as billing customers for specific services, is can be desirable
to keep network start and stop records together, essentially “nesting” them within the framework of the EXEC start and stop messages. For example, a user dialing in using PPP can create the following records: EXEC-start, NETWORK-start, EXEC-stop, NETWORK-stop. By nesting the network accounting records, NETWORK-stop records follow NETWORK-start messages: EXEC-start, NETWORK-start, NETWORK-stop, EXEC-stop.

To nest accounting records for user sessions, use the following command in global configuration mode:

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>aaa accounting</td>
<td>Nests network accounting</td>
</tr>
<tr>
<td>nested</td>
<td>records.</td>
</tr>
</tbody>
</table>

**Suppressing System Accounting Records over Switchover**

To suppress the system accounting-on and accounting-off messages during switchover, use the following command in global configuration mode:

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>aaa accounting</td>
<td>Suppresses the system accounting messages during</td>
</tr>
<tr>
<td>redundancy</td>
<td>switchover.</td>
</tr>
<tr>
<td>suppress</td>
<td>system-records.</td>
</tr>
</tbody>
</table>

**Configuring AAA Resource Failure Stop Accounting**

To enable resource failure stop accounting, use the following command in global configuration mode:

<table>
<thead>
<tr>
<th>Command</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Device(config)# aaa accounting</td>
<td>Generates a “stop” record for any calls that do not reach user</td>
</tr>
<tr>
<td>resource</td>
<td>authentication.</td>
</tr>
<tr>
<td>method-list stop-failure group</td>
<td></td>
</tr>
<tr>
<td>server-group</td>
<td></td>
</tr>
</tbody>
</table>

**Note**

Before configuring this feature, the tasks described in the *Prerequisites for Configuring Accounting, on page 1* section must be performed, and SNMP must be enabled on the network access server.

**Configuring AAA Resource Accounting for Start-Stop Records**

To enable full resource accounting for start-stop records, use the following command in global configuration mode:

<table>
<thead>
<tr>
<th>Command</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Device(config)# aaa accounting</td>
<td>Supports the ability to send a “start” record at each call setup,</td>
</tr>
<tr>
<td>resource</td>
<td>followed with a corresponding “stop” record at the call disconnect.</td>
</tr>
<tr>
<td>method-list start-stop group</td>
<td></td>
</tr>
<tr>
<td>server-group</td>
<td></td>
</tr>
</tbody>
</table>

**Note**

Before configuring this feature, the tasks described in the *Prerequisites for Configuring Accounting, on page 1* section must be performed, and SNMP must be enabled on the network access server.
AAA Broadcast Accounting

AAA broadcast accounting allows accounting information to be sent to multiple AAA servers at the same time; that is, accounting information can be broadcast to one or more AAA servers simultaneously. This functionality allows service providers to send accounting information to their own private AAA servers and to the AAA servers of their end customers. It also provides redundant billing information for voice applications.

Broadcasting is allowed among groups of RADIUS or TACACS+ servers, and each server group can define its backup servers for failover independently of other groups.

Thus, service providers and their end customers can use different protocols (RADIUS or TACACS+) for the accounting server. Service providers and their end customers can also specify their backup servers independently. As for voice applications, redundant accounting information can be managed independently through a separate group with its own failover sequence.

Configuring Per-DNIS AAA Broadcast Accounting

To configure AAA broadcast accounting per DNIS, use the `aaa dnis map accounting network` command in global configuration mode:

<table>
<thead>
<tr>
<th>Command</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>`Device(config)# aaa dnis map dnis-number accounting network [start-stop</td>
<td>Allows per-DNIS accounting configuration. This command has precedence over the global <code>aaa accounting</code> command.</td>
</tr>
<tr>
<td>stop-only</td>
<td>none]</td>
</tr>
<tr>
<td>[broadcast] method1 [method2...]</td>
<td></td>
</tr>
</tbody>
</table>

Establishing a Session with a Device if the AAA Server Is Unreachable

To establish a console session with a device if the AAA server is unreachable, use the following command in global configuration mode:

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>no aaa accounting system guarantee-first</code></td>
<td>The <code>aaa accounting system guarantee-first</code> command guarantees system accounting as the first record, which is the default condition.</td>
</tr>
<tr>
<td></td>
<td>In some situations, users may be prevented from starting a session on the console or terminal connection until after the system reloads, which can take more than three minutes. To resolve this problem, use the <code>no aaa accounting system guarantee-first</code> command.</td>
</tr>
</tbody>
</table>

Monitoring Accounting

No specific `show` command exists for either RADIUS or TACACS+ accounting. To obtain accounting records displaying information about users logged in, use the following command in privileged EXEC mode:
### Purpose

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>show accounting</td>
<td>Allows display of the active accountable events on the network and helps collect information in the event of a data loss on the accounting server.</td>
</tr>
</tbody>
</table>

### Troubleshooting Accounting

To troubleshoot accounting information, use the following command in privileged EXEC mode:

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>debug aaa accounting</td>
<td>Displays information on accountable events as they occur.</td>
</tr>
</tbody>
</table>

### Configuration Examples for AAA Accounting

#### Example: Configuring a Named Method List

The following example shows how to configure a Cisco device (enabled for AAA and communication with a RADIUS security server) in order for AAA services to be provided by the RADIUS server. If the RADIUS server fails to respond, then the local database is queried for authentication and authorization information, and accounting services are handled by a TACACS+ server.

```plaintext
Device# configure terminal  
Device(config)# aaa new-model  
Device(config)# aaa authentication login admins local  
Device(config)# aaa authentication ppp dialins group radius local  
Device(config)# aaa authorization network network1 group radius local  
Device(config)# aaa accounting network network2 start-stop group radius group tacacs+  
Device(config)# username root password ALongPassword  
Device(config)# tacacs-server host 172.31.255.0  
Device(config)# tacacs-server key goaway  
Device(config)# radius server isp  
Device(config-sg-radius)# key myRaDiUSpassWoRd  
Device(config)# interface group-async 1  
Device(config-if)# group-range 1 16  
Device(config-if)# encapsulation ppp  
Device(config-if)# ppp authentication chap dialins  
Device(config-if)# ppp authorization network1  
Device(config-if)# ppp accounting network2  
Device(config-if)# exit  
Device(config)# line 1 16  
Device(config-line)# autoselect ppp  
Device(config-line)# autoselect during-login  
Device(config-line)# login authentication admins  
Device(config-line)# modem dialin  

Device(config-line)# end
```

The lines in this sample RADIUS AAA configuration are defined as follows:

- The **aaa new-model** command enables AAA network security services.
• The **aaa authentication login admins local** command defines a method list, “admins”, for login authentication.

• The **aaa authentication ppp dialins group radius local** command defines the authentication method list “dialins”, which specifies that first RADIUS authentication and then (if the RADIUS server does not respond) local authentication is used on serial lines using PPP.

• The **aaa authorization network network1 group radius local** command defines the network authorization method list named “network1”, which specifies that RADIUS authorization is used on serial lines using PPP. If the RADIUS server fails to respond, then local network authorization is performed.

• The **aaa accounting network network2 start-stop group radius group tacacs+** command defines the network accounting method list named “network2”, which specifies that RADIUS accounting services (in this case, start and stop records for specific events) are used on serial lines using PPP. If the RADIUS server fails to respond, accounting services are handled by a TACACS+ server.

• The **username** command defines the username and password to be used for the PPP Password Authentication Protocol (PAP) caller identification.

• The **tacacs-server host** command defines the name of the TACACS+ server host.

• The **tacacs-server key** command defines the shared secret text string between the network access server and the TACACS+ server host.

• The **radius server** command defines the name of the RADIUS server host.

• The **key** command defines the shared secret text string between the network access server and the RADIUS server host.

• The **interface group-async** command selects and defines an asynchronous interface group.

• The **group-range** command defines the member asynchronous interfaces in the interface group.

• The **encapsulation ppp** command sets PPP as the encapsulation method used on the specified interfaces.

• The **ppp authentication chap dialins** command selects Challenge Handshake Authentication Protocol (CHAP) as the method of PPP authentication and applies the “dialins” method list to the specified interfaces.

• The **ppp authorization network1** command applies the blue1 network authorization method list to the specified interfaces.

• The **ppp accounting network2** command applies the red1 network accounting method list to the specified interfaces.

• The **line** command switches the configuration mode from global configuration to line configuration and identifies the specific lines being configured.

• The **autoselect ppp** command configures the Cisco IOS XE software to allow a PPP session to start up automatically on these selected lines.

• The **autoselect during-login** command is used to display the username and password prompt without pressing the Return key. After the user logs in, the autoselect function (in this case, PPP) begins.

• The **login authentication admins** command applies the admins method list for login authentication.
• The **modem dialin** command configures modems attached to the selected lines to accept only incoming calls.

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

```
Active Accounted actions on tty1, User username2 Priv 1
  Task ID 5, Network Accounting record, 00:00:52 Elapsed
  task_id=5 service=ppp protocol=ip address=10.0.0.98
```

The table below describes the fields contained in the preceding output.

**Table 4: show accounting Field Descriptions**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active Accounted actions on tty1</td>
<td>Terminal line or interface name user with which the user logged in.</td>
</tr>
<tr>
<td>User</td>
<td>User’s ID.</td>
</tr>
<tr>
<td>Priv</td>
<td>User’s privilege level.</td>
</tr>
<tr>
<td>Task ID</td>
<td>Unique identifier for each accounting session.</td>
</tr>
<tr>
<td>Accounting Record</td>
<td>Type of accounting session.</td>
</tr>
<tr>
<td>Elapsed</td>
<td>Length of time (hh:mm:ss) for this session type.</td>
</tr>
<tr>
<td>attribute=value</td>
<td>AV pairs associated with this accounting session.</td>
</tr>
</tbody>
</table>

**Example: Configuring AAA Resource Accounting**

The following example shows how to configure the resource failure stop accounting and resource accounting for start-stop records functions:

```
!Enable AAA on your network access server.
Device(config)# aaa new-model
!Enable authentication at login and list the AOL string name to use for login authentication.
Device(config)# aaa authentication login AOL group radius local
!Enable authentication for ppp and list the default method to use for PPP authentication.
Device(config)# aaa authentication ppp default group radius local
!Enable authorization for all exec sessions and list the AOL string name to use for authorization.
Device(config)# aaa authorization exec AOL group radius if-authenticated
!Enable authorization for all network-related service requests and list the default method to use for all network-related authorizations.
Device(config)# aaa authorization network default group radius if-authenticated
!Enable accounting for all exec sessions and list the default method to use for all start-stop accounting services.
Device(config)# aaa accounting exec default start-stop group radius
!Enable accounting for all network-related service requests and list the default method to use for all start-stop accounting services.
Device(config)# aaa accounting network default start-stop group radius
!Enable failure stop accounting.
Device(config)# aaa accounting resource default stop-failure group radius
```
Enable resource accounting for start-stop records.
Device(config)# aaa accounting resource default start-stop group radius

Example: Configuring AAA Broadcast Accounting

The following example shows how to turn on broadcast accounting using the global `aaa accounting` command:

```
Device> enable
Device# configure terminal
Device(config)# aaa group server radius isp
Device(config-sg-radius)# server 10.0.0.1
Device(config-sg-radius)# server 10.0.0.2
Device(config-sg-radius)# exit
Device(config)# aaa group server tacacs+ isp_customer
Device config-sg-tacacs+)# server 172.0.0.1
Device config-sg-tacacs+)# exit
Device(config)# aaa accounting network default start-stop broadcast group isp group isp_customer
Device(config)# tacacs-server host 172.0.0.1 key key2
Device(config)# end
```

The `broadcast` keyword causes “start” and “stop” accounting records for network connections to be sent simultaneously to server 10.0.0.1 in the group isp and to server 172.0.0.1 in the group isp_customer. If server 10.0.0.1 is unavailable, failover to server 10.0.0.2 occurs. If server 172.0.0.1 is unavailable, no failover occurs because backup servers are not configured for the group isp_customer.

Example: Configuring per-DNIS AAA Broadcast Accounting

The following example shows how to turn on per-DNIS broadcast accounting using the global `aaa dnis map accounting network` command:

```
Device> enable
Device# configure terminal
Device(config)# aaa group server radius isp
Device(config-sg-radius)# server 10.0.0.1
Device(config-sg-radius)# server 10.0.0.2
Device(config-sg-radius)# exit
Device(config)# aaa group server tacacs+ isp_customer
Device config-sg-tacacs+)# server 172.0.0.1
Device config-sg-tacacs+)# exit
Device(config)# aaa dnis map enable
Device(config)# aaa dnis map 7777 accounting network start-stop broadcast group isp group isp_customer
Device(config)# tacacs-server host 172.0.0.1 key key_2
Device(config)# end
```

The `broadcast` keyword causes “start” and “stop” accounting records for network connection calls having DNIS number 7777 to be sent simultaneously to server 10.0.0.1 in the group isp and to server 172.0.0.1 in the group isp_customer. If server 10.0.0.1 is unavailable, failover to server 10.0.0.2 occurs. If server 172.0.0.1 is unavailable, no failover occurs because backup servers are not configured for the group isp_customer.
Example: AAA Session MIB

The following example shows how to set up the AAA session MIB feature to disconnect authenticated client connections for PPP users:

```
Device> enable
Device# configure terminal
Device(config)# aaa new-model
Device(config)# aaa authentication ppp default group radius
Device(config)# aaa authorization network default group radius
Device(config)# aaa accounting network default start-stop group radius
Device(config)# aaa session-mib disconnect
Device(config)# end
```

Additional References for Configuring Accounting

The following sections provide references related to the Configuring Accounting feature.

**MIBs**

<table>
<thead>
<tr>
<th>MIB</th>
<th>MIBs Link</th>
</tr>
</thead>
<tbody>
<tr>
<td>• CISCO-AAA-SESSION-MIB</td>
<td>To locate and download MIBs for selected platforms, Cisco IOS XE software releases , and feature sets, use Cisco MIB Locator found at the following URL: <a href="http://www.cisco.com/go/mibs">http://www.cisco.com/go/mibs</a></td>
</tr>
</tbody>
</table>

**RFCs**

**Technical Assistance**

<table>
<thead>
<tr>
<th>Description</th>
<th>Link</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Cisco Support website provides extensive online resources, including documentation and tools for troubleshooting and resolving technical issues with Cisco products and technologies. To receive security and technical information about your products, you can subscribe to various services, such as the Product Alert Tool (accessed from Field Notices), the Cisco Technical Services Newsletter, and Really Simple Syndication (RSS) Feeds. Access to most tools on the Cisco Support website requires a Cisco.com user ID and password.</td>
<td><a href="http://www.cisco.com/techsupport">http://www.cisco.com/techsupport</a></td>
</tr>
</tbody>
</table>

Feature History for Configuring Accounting

This table provides release and related information for features explained in this module.
These features are available on all releases subsequent to the one they were introduced in, unless noted otherwise.

<table>
<thead>
<tr>
<th>Release</th>
<th>Feature</th>
<th>Feature Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cisco IOS XE Gibraltar</td>
<td>AAA Broadcast</td>
<td>AAA broadcast accounting allows accounting information to be sent to multiple AAA servers at the same time; that is, accounting information can be broadcast to one or more AAA servers simultaneously.</td>
</tr>
<tr>
<td>16.11.1</td>
<td>Accounting</td>
<td></td>
</tr>
<tr>
<td></td>
<td>AAA Session MIB</td>
<td>The AAA session MIB feature allows customers to monitor and terminate their authenticated client connections using SNMP.</td>
</tr>
<tr>
<td></td>
<td>Connection</td>
<td>Connection accounting provides information about all outbound connections made from the network access server, such as Telnet, local-area transport, TN3270, packet assembler/disassembler (PAD), and rlogin.</td>
</tr>
<tr>
<td></td>
<td>Accounting</td>
<td></td>
</tr>
<tr>
<td></td>
<td>AAA Interim</td>
<td>AAA interim accounting allows accounting records to be sent to the accounting server every time there is new accounting information to report, or on a periodic basis.</td>
</tr>
<tr>
<td></td>
<td>Accounting</td>
<td></td>
</tr>
</tbody>
</table>

Use Cisco Feature Navigator to find information about platform and software image support. To access Cisco Feature Navigator, go to [http://www.cisco.com/go/cfn](http://www.cisco.com/go/cfn).