RADIUS™
Administrator's Guide

Livingston Enterprises, Inc.
4464 Willow Rd
Pleasanton, CA 94588
(510) 737-2100
(800) 458-9966

May 1997

950-1185B

Copyright and Trademarks

Disclaimer

Livingston Enterprises, Inc. makes no express or implied representations or warranties with respect to the contents or use of this manual, and specifically disclaims any implied warranties of merchantability or fitness for a particular purpose. Livingston Enterprises, Inc. further reserves the right to revise this manual and to make changes to its content at any time, without obligation to notify any person or entity of such revisions or changes.

Contents

About This Guide

Figures

Tables

About This Guide

The *RADIUS™ Administrator's Guide* provides complete installation and configuration instructions for the Livingston™ Enterprises, Inc. Remote Authentication Dial-In User Service (RADIUS). This guide covers RADIUS server release 2.0.

RADIUS can be used with the Livingston PortMaster™ family of products, as well as with the ChoiceNet client/server packet-filtering software. To install and configure these products, see "Related Documentation" on page xii of About This Guide.

Audience

This guide is designed to be used by qualified system administrators and network managers. Knowledge of UNIX or Windows NT and basic networking concepts is required to successfully install RADIUS.

Preview of This Guide

The *RADIUS Administrator's Guide* includes the following chapters:

Chapter 1, "Introducing RADIUS," gives an introduction to RADIUS.

Chapter 2, "Configuring a RADIUS Server," provides step-by-step configuration instructions for RADIUS servers.

Chapter 3, "Configuring a RADIUS Client," provides step-by-step configuration instructions for RADIUS clients.

Chapter 4, "Configuring User Information," describes how to configure user entries on the RADIUS server.

Chapter 5, "Configuring RADIUS Menus," describes the RADIUS menu feature.

Chapter 6, "Installing and Configuring SecurID," provides a quick reference for Security Dynamics ACE/Server and ACE/Client installation.

Chapter 7, “Implementing RADIUS Accounting,” describes how to log RADIUS security information.

Troubleshooting information is included in Appendix A.

Related Documentation

The following manuals are available from Livingston. These manuals are included with most Livingston products; if they were not shipped with your unit, contact Livingston for ordering information.

The manuals are also provided as PDF and PostScript files on the *PortMaster Software CD* shipped with your PortMaster.

- Installation guides

  These guides contain complete hardware installation instructions. An installation guide is available for each PortMaster product line—IRX™, Office Router, Communications Server, and Integrated Access Server.

- *Configuration Guide for PortMaster Products*

  This guide provides instructions for configuring PortMaster products.

- *Command Line Administrator’s Guide*

  This guide provides the complete description and syntax of each command in the ComOS™ command set.

- *PMconsole for Windows Administrator’s Guide*

  This guide covers PMconsole™ Administration Software for Microsoft Windows, a graphical tool for configuring the PortMaster. The majority of the material in this guide also applies to the UNIX version of PMconsole.

- *ChoiceNet™ Administrator’s Guide*

  This guide provides complete installation and configuration instructions for ChoiceNet Server software.

Additional References

RFCs

Use any World Wide Web browser to find a Request for Comments (RFC) online.

RFC 768, *User Datagram Protocol*

RFC 791, *Internet Protocol*

RFC 792, *Internet Control Message Protocol*

RFC 793, *Transmission Control Protocol*

RFC 1035, *Domain Names—Implementation and Specification*

RFC 1700, *Assigned Numbers*

RFC 2138, *Remote Authentication Dial In User Service (RADIUS)*

RFC 2139, *RADIUS Accounting*

Books

Building Internet Firewalls. D. Brent Chapman and Elizabeth D. Zwicky. Sebastopol, CA: O'Reilly & Associates, Inc., 1995. (ISBN 1-56592-124-0)

DNS and BIND, 2nd ed. Paul Albitz and Cricket Liu. Sebastopol, CA: O'Reilly & Associates, Inc., 1992. (ISBN 1-56592-236-0)

Firewalls and Internet Security: Repelling the Wily Hacker. William R. Cheswick and Steven M. Bellovin. Reading, MA: Addison-Wesley Publishing Company, 1994. (ISBN 0-201-63357-4) Japanese translation is available (ISBN 4-89052-672-2). Errata are available from **ftp://ftp.research.att.com/dist/internet_security/firewall.book**.

Document Conventions

The following conventions are used in this guide:

Convention	Use	Examples
Bold font	Indicates a user entry—a command, menu option, button, or key—or the name of a file, directory, or utility, except in code samples.	• Enter **version** to display the version number. • Press **Enter**. • Open the **permit_list** file.
Italic font	Identifies a command-line placeholder. Replace with a real name or value.	• **set** *Ether0* **address** *Ipaddress* • Replace *Area* with the name of the OSPF area.
Square brackets ([])	Enclose optional keywords and values in command syntax.	• **set nameserver** [**2**] *Ipaddress* • **set** *S0* **destination** *Ipaddress* [*Ipmask*]
Vertical bar (|)	Separates two or more possible options in command syntax.	• **set** *S0* | *W1* **ospf on** | **off** • **set** *S0* **host default** | **prompt** | *Ipaddress*

Contacting Livingston Technical Support

The PortMaster comes with a 1-year hardware warranty.

To obtain technical support, contact Livingston Enterprises Monday through Friday between the hours of 6 a.m. and 5 p.m. (GMT -8). Please record your Livingston ComOS version number and report it to the technical support staff.

- By voice, dial (800) 458-9966 within the USA (including Hawaii), Canada, and the Caribbean, or +1 (510) 737-2100 from elsewhere.
- By FAX, dial +1 (510) 737-2110.
- By electronic mail (email), send mail to **support@livingston.com**.
- Using the World Wide Web, see **http://www.livingston.com/**.

You can schedule 1-hour software installation appointments in advance by calling the technical support telephone number listed above.

New releases and upgrades of Livingston software are available by anonymous FTP from **ftp.livingston.com**.

Subscribing to Livingston Mailing Lists

Livingston maintains the following Internet mailing lists for PortMaster users:

- **portmaster-users**—a discussion of general and specific PortMaster issues, including configuration and troubleshooting suggestions. To subscribe, send email to **majordomo@livingston.com** with **subscribe portmaster-users** in the body of the message.

  The mailing list is also available in a daily digest format. To receive the digest, send email to **majordomo@livingston.com** with **subscribe portmaster-users-digest** in the body of the message.
- **portmaster-radius**—a discussion of general and specific RADIUS issues, including configuration and troubleshooting suggestions. To subscribe, send email to **majordomo@livingston.com** with **subscribe portmaster-radius** in the body of the message.

  The mailing list is also available in a daily digest format. To receive the digest, send email to **majordomo@livingston.com** with **subscribe portmaster-radius-digest** in the body of the message.

- **portmaster-announce**—announcements of new PortMaster products and software releases. To subscribe, send email to **majordomo@livingston.com** with **subscribe portmaster-announce** in the body of the message. All announcements to this list also go to the portmaster-users list. You do not need to subscribe to both lists.

Introducing RADIUS 1

Introduction to RADIUS

The Remote Authentication Dial-In User Service (RADIUS) is a client/server security protocol created by Livingston Enterprises. Security information is stored in a central location, known as the **RADIUS server**.

RADIUS **clients** (such as a PortMaster communications server) communicate with the RADIUS server to authenticate users. Although the term RADIUS refers to the network protocol that the client and server use to communicate, it is often used to refer to the entire client/server system.

Overview of RADIUS Features

RADIUS offers the following features:

- Tight security

  In large networks, security information may be scattered throughout the network on different devices. RADIUS allows user information to be stored on one host, minimizing the risk of security loopholes. All authentication and access to network services is managed by the host functioning as the RADIUS server.

- Flexibility

  RADIUS server software is distributed in source code format to Livingston customers. Using modifiable “stubs,” RADIUS can be adapted to work with existing security systems and protocols. You adapt the RADIUS server to your network, rather than adjusting your network to work with RADIUS.

  RADIUS may be used with any communications server that supports the RADIUS protocol. When new security technology becomes available or your security needs increase, RADIUS can be expanded to offer new services.

- Simplified management

  The RADIUS server stores security information in text files at a central location; you add new users to the database or modify existing user information by editing these text files.

- Extensive logging capabilities

  RADIUS provides extensive audit trail capabilities, referred to as RADIUS accounting. Information collected in a log file can be analyzed for security purposes, or used for billing.

The RADIUS server is available for the following operating systems:

- AIX 4.1
- Alpha Digital UNIX 3.0
- BSD/OS 2.0
- HP-UX 10.01
- IRX 5.2
- Linux 1.2.13 (ELF)
- Solaris 2.5.1
- Solaris x86 2.5.1
- SunOS 4.1.4
- Windows NT 4.0 Workstation
- Windows NT 4.0 Server

How RADIUS Works

RADIUS performs three primary functions. RADIUS version 2.0 includes enhancements for ease of use.

Basic RADIUS Functions

The primary functions of RADIUS are authentication, authorization, and accounting.

- Authentication

  RADIUS authenticates users for dial-in remote access. Authentication information is stored in a local **users** file or accessed from external authentication mechanisms such as a UNIX password file, Windows NT password database, or SecurID ACE/Server.

  For example, when user *bob* attempts to log in to a PortMaster, the following authentication sequence takes place:

1. The PortMaster prompts *bob* for his username and password, and then compares the username-password pair to the PortMaster User Table.
2. If the username is not found in the User Table and security for the port is set to **on**, the PortMaster sends an **access-request** message to the RADIUS server, if one is defined. This message requests the RADIUS server to authenticate the user.
3. The RADIUS server checks its database to determine if user *bob* is present. For *bob*'s login to be successful, a matching username and password must be found in the RADIUS database.
4. User *bob* is either accepted or rejected:
   - If a matching password is found in the RADIUS users file, the RADIUS server sends an **access-accept** message to the PortMaster, which lets the PortMaster know that *bob* has been successfully authenticated. It also sends authorization information about the services *bob* may access and configuration information about his connection.
   - If a matching password is not found in the RADIUS users file, the RADIUS server sends an **access-reject** packet, which lets the PortMaster know that the authentication attempt has failed. The PortMaster prevents *bob*'s connection attempt.

- Authorization

  Authorization controls access to specific services on the network. Once a user is authenticated, RADIUS tells the PortMaster what a user is **authorized** (permitted) to access. For example, user *bob* may be authorized to use PPP for his connection, use IP address **192.168.200.4**, and use packet filter **std.ppp**.

- Accounting

  RADIUS accounting permits system administrators to track dial-in use. This information is often used for billing purposes. See Chapter 7, “Implementing RADIUS Accounting,” for more information.

Ease-of-Use Enhancements

RADIUS version 2.0 provides the following enhancements to improve RADIUS functionality:

- Menus of login options

  When RADIUS menus are used, users are presented with a list of login options after they are authenticated. The RADIUS administrator may customize menus, including “chaining” one menu to other menus. See Chapter 5, “Configuring RADIUS Menus,” for more details.

- SecurID authentication

  SecurID authentication, based on Security Dynamics’ token technology, is offered in UNIX versions of the RADIUS server. SecurID authenticates users using a patented time-synchronization method. The RADIUS 2.0 server can forward some or all authentication requests to a SecurID ACE/Server running on the same host as the RADIUS server.

  For more information, see Chapter 2, “Configuring a RADIUS Server,” and Chapter 6, “Installing and Configuring SecurID.”

- Easy access to multiple accounts

  Prefixes and Suffixes allow a user to access multiple accounts by prepending or appending a string of characters defined by the administrator to the username.

- Session time limit

  The Session-Timeout reply item specifies the time limit for a session. Session-Timeout is specified as a particular number of seconds, up to a maximum of 31536000 (1 year).

- Idle session time limit

  The Idle-Timeout reply item controls the maximum time that a session may be idle before it is disconnected. Idle-Timeout is specified as a number of seconds between 120 (2 minutes) and 14400 (4 hours).

- ISDN port limit

  The Port-Limit reply item controls the maximum number of ports available for a Multilink PPP or Multilink V.120 connection. Port-Limit only applies to ISDN connections; other connection types are not affected by this setting.

- Port type restriction

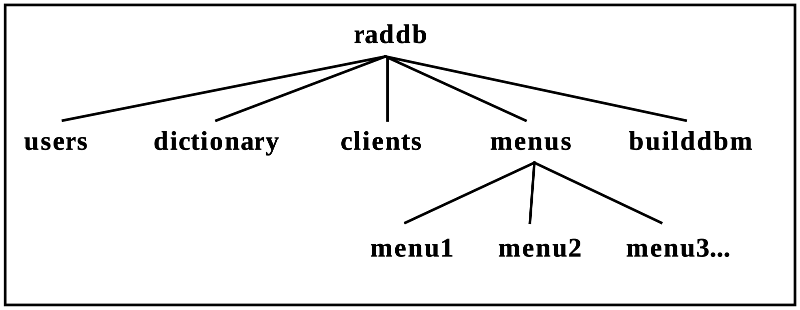
  The NAS-Port-Type check item restricts the type of port. The user may use one of the following port types: asynchronous, synchronous, ISDN, ISDN-V120, or ISDN-V110.

RADIUS Directory Structure

RADIUS server files are stored in the raddb (RADIUS database) directory. On UNIX, the raddb directory is typically placed within the **/etc** directory. Livingston recommends that RADIUS NT users store RADIUS files in the **\system32\drivers\etc** folder located in the folder containing the Windows NT files.

The raddb directory contains files and subdirectories organized as shown in Figure 1-1 on page 1-6.

Figure 1-1 RADIUS Directory Structure



The RADIUS server uses the UDP protocol, and listens for UDP packets on port 1645.

To configure RADIUS user information, see Chapter 4. To configure RADIUS accounting, see Chapter 7.

Configuring a RADIUS Server 2

This chapter includes the following topics:

- "Getting Started" on page 2-1
- "Installing RADIUS on a UNIX Host" on page 2-2
- "Installing RADIUS on a Windows NT Host" on page 2-7
- "Configuring Client Information" on page 2-14

Getting Started

Before installing and configuring RADIUS software, you select a host or hosts to use as a RADIUS server and determine one or more shared secrets for authentication.

Selecting a RADIUS Server

Primary RADIUS Authentication Server. Select a host with the following characteristics to use as a RADIUS authentication server:

- Secure physical location
- Root access limited to the security officer or system administrator
- Limited number of user accounts—preferably none
- Basic memory and disk space
- Database support (RADIUS NT only)

Livingston suggests the following additional characteristics for the host:

- Inaccessibility from outside your local network
- Absence of public network services such as email, FTP, HTTP, or Telnet

Secondary RADIUS Authentication Server. Livingston recommends the use of a secondary RADIUS server. The PortMaster always queries the primary RADIUS server first; if the server does not respond, it is queried a second time. Then both the primary and secondary servers are queried alternately up to eight times at 3-second intervals until one responds or 30 seconds elapse without a response.

RADIUS Accounting Servers. If you implement RADIUS accounting, you must also select one or more RADIUS accounting servers. The RADIUS accounting server can be located on the same host as the RADIUS server used for authentication, or on a separate host. You can define a secondary accounting server to serve as a backup if the primary server cannot be contacted. See Chapter 7, “Implementing RADIUS Accounting,” for more information.

Determining a Shared Secret

Each PortMaster using RADIUS and its RADIUS server(s) share an authentication key—called the shared secret—that consists of up to 15 printable, nonspace, ASCII characters. Each PortMaster can share a different secret with the RADIUS server, or multiple PortMasters can share the same secret.

You configure the shared secret on each RADIUS server and the PortMaster. It is stored as clear text on the RADIUS server and in the nonvolatile memory of the PortMaster. See “Configuring Client Information” on page 2-14 for more information.

Installing RADIUS on a UNIX Host

Use one of the following installation methods:

- Install RADIUS with the **pminstall** utility shipped on the *PortMaster Software CD*.
- Install RADIUS without **pminstall**.

Note – Always use the latest version of **pminstall**, available by anonymous FTP from **ftp://ftp.livingston.com/pub/le/software**.

Installation with pminstall

To install RADIUS using **pminstall**, complete the following steps.

1. **Log in to the selected RADIUS server as root.**
2. **Mount the CD using the instructions in the CD booklet.**
3. **Install the PortMaster software by one of the following methods:**
   - Run **/cdrom/lei/unix/setup**.
   - Follow the instructions in the CD booklet.
4. **Enter the /usr/portmaster/pminstall command at the UNIX prompt.**

   The following list of choices appears:

```
% /usr/portmaster/pminstall

1. PortMaster Internet Address Setup
2. Host Installation
3. PortMaster Upgrade
4. Host Upgrade
5. Install RADIUS
6. Exit

Please select an option from above:
```

5. **Choose the Install RADIUS option to install all RADIUS files.**
   - The server prompts you for directory names:

```
Database installation directory (/etc/raddb):
RADIUS accounting log directory (/usr/adm/radacct):
Directory to install radiusd in (/etc):
```

6. **Provide directory information for RADIUS files by one of the following methods:**
   - Enter the appropriate directory.
   - Select the default directory (shown in parentheses) by pressing the **Return** or **Enter** key.

7. **When RADIUS installation is complete, select the Exit option to quit pminstall.**
8. **Enter the following command to start the RADIUS server:**

```
/etc/radiusd
```

Note – radiusd is a standalone process; it cannot be run from **/etc/inetd.conf**.

For a list of optional flags for the **radiusd** command, see Table 2-1 on page 2-6.

9. **Go to "Configuring Client Information" on page 2-14.**

Installation without pminstall

To install RADIUS without **pminstall**, complete the following steps:

1. **If you are running NIS or NIS+, add the lines in Step 4 to the services NIS map on your NIS master and push the maps.**

Note – Pushing the maps updates the database to include recently entered information. Use the **make** *mapname* command on the NIS master. For more details, consult your UNIX system documentation.

2. **Log in to the selected RADIUS server as root.**
3. **Mount the CD on /cdrom using the instructions in the CD booklet.**
4. **If you are not running NIS or NIS+, add the following lines to the /etc/services file:**

```
radius  1645/udp                              radiusd
radacct 1646/udp
```

5. **As root, enter the following commands on the RADIUS server:**

```
umask 022
mkdir /etc/raddb /usr/adm/radacct
chmod 700 /etc/raddb /usr/adm/radacct
```

The commands in this example create two directories, **raddb** and **radacct**. All RADIUS files (except the **radiusd** executable) are stored in the **/etc/raddb** directory. The **radacct** directory is used to store RADIUS accounting logs.

The **umask** and **chmod** commands affect the **raddb** and **radacct** directory permissions; root access is required for read, write, and execute privileges.

Caution – If you are upgrading from an existing installation of RADIUS 2.0, save the files in **/etc/raddb** before performing Step 6.

6. **Copy all files in /cdrom/lei/unix/radius/raddb to the /etc/raddb directory:**

```
cp -r /cdrom/lei/unix/radius/raddb/* /etc/raddb
```

In RADIUS version 1.16, the **raddb** directory contains three files: **users**, **clients**, and **dictionary**. In RADIUS version 2.0, the raddb directory contains an additional directory named **menus**.

7. **Copy the radiusd file to the /etc directory (or if you prefer, to another directory such as /usr/sbin):**

```
cp /cdrom/lei/unix/platform/radiusd /etc/radiusd
```

8. **Copy the builddbm utility to /etc/raddb/builddbm. Replace *platform* with the name of your operating system—for example, sun4_4.1.**

```
cp /cdrom/lei/unix/platform/builddbm /etc/raddb/builddbm
```

9. **Use the radiusd command to start RADIUS:**

```
/etc/radiusd
```

radiusd spawns the RADIUS accounting server as a child process. For more information about RADIUS accounting, see Chapter 7.

Note – radiusd is a standalone process; it cannot be run from **/etc/inetd.conf**.

radiusd can be used with any of the flags shown in Table 2-1.

Table 2-1 r**adiusd** Flags

Flag	Purpose
-a	Specifies an alternate directory for RADIUS accounting. The default directory is **/usr/adm/radacct**.
-b	Uses the DBM version of the users file. See “Caching User Requests” on page 4-21 for more information.
-d	Specifies an alternate directory for RADIUS configuration files. The default directory is **/etc/raddb**.
-l	Specifies a RADIUS logfile to use instead of syslog.
-s	Runs RADIUS in single-threaded mode without spawning a child process to handle each authentication request.
-v	Displays the version of RADIUS without starting the **radiusd** daemon.
-x	Debug mode. To send debug output to syslog, use **-x -l syslog**.

10. **To start the radiusd daemon each time the RADIUS server is booted, place radiusd in the /etc/rc.local file as shown in the example below.**

    On some systems this might be **/etc/rc2.d/S99radiusd** or another file; consult your UNIX system documentation for more information.

```
#
# Start RADIUS
#
if [ -f /etc/radiusd ]; then
        echo “RADIUS”
        /etc/radiusd
fi
```

Note – radiusd does not need to be restarted each time the clients or users files are modified. This daemon only needs to be restarted when the dictionary file is modified.

11. Continue to "Configuring Client Information" on page 2-14.

Installing RADIUS on a Windows NT Host

RADIUS NT consists of two sets of files—the RADIUS NT server software and associated files, and the Data Access Objects (DAO) database engine used for caching purposes. To install RADIUS NT, two files are required: **setupdao.exe** and **radiusnt.exe**. Ensure that you have these files before beginning installation. They are available on the Livingston *PortMaster Software CD* and by anonymous FTP from **ftp://ftp.livingston.com/pub/le/software/pc**.

Note – Always use the latest files, available from the Livingston FTP site.

Complete the following steps to install RADIUS NT:

Note – If you are updating to a newer version of RADIUS NT, you must first remove or uninstall the previous version from your Windows NT server or workstation.

1. Copy setupdao.exe and radiusnt.exe to separate, empty directories.

For example, copy **setupdao.exe** to **C:\temp\dao** and copy **radiusnt.exe** to **C:\temp\rad**.

2. Double-click setupdao.exe to expand the compressed DAO files.

3. Double-click Setup.exe to run the DAO setup program.

a. Read the information displayed.

b. Click the **Next** button to continue installation.

4. Double-click radiusnt.exe to expand the compressed RADIUS NT server files.

Overwrite the **Setup.exe** file when prompted.

5. Double-click Setup.exe to run the RADIUS NT setup program.

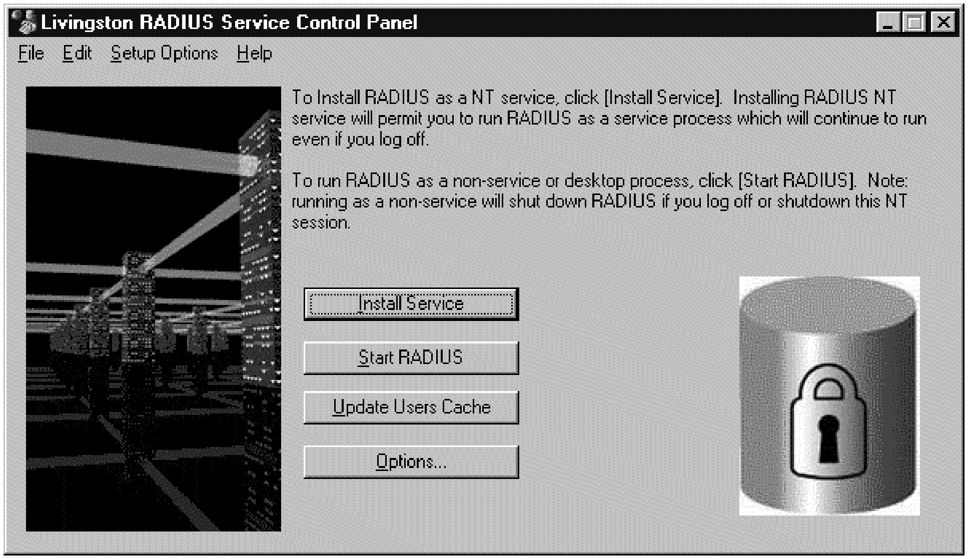
a. Follow the instructions on each screen.

b. Click the **Finished** button at the end of the setup program to complete installation.

The RADIUS NT setup program places the RADIUS NT files in **C:\WINNT\system32\drivers\etc**. It also creates a Livingston RADIUS NT folder within the Program Manager Start menu.

6. To start RADIUS, choose RADIUS NT from the RADIUS NT folder in the Start menu.

The RADIUS Control Panel appears.



To Install RADIUS as a NT service, click [Install Service]. Installing RADIUS NT service will permit you to run RADIUS as a service process which will continue to run even if you log off.

To run RADIUS as a non-service or desktop process, click [Start RADIUS]. Note: running as a non-service will shut down RADIUS if you log off or shutdown this NT session.

You can run RADIUS NT as a Windows NT service or as a nonservice or desktop process.

Note – Livingston recommends that you run RADIUS NT as a Windows NT service. Running RADIUS NT in this manner enables you to log out of your Windows NT session without affecting the operation of RADIUS NT; the service will continue to run.

To run RADIUS NT as a Windows NT service, complete the following steps:

a. To install RADIUS NT as a Windows NT service, click the **Install Service** button.

b. To start the service, click the **Start RADIUS Service** button. To stop the service, click the **Stop RADIUS Service** button.

c. If you have previously installed RADIUS NT and want to update the users cache, click the **Update Users Cache** button or choose the corresponding menu item from the File menu.

If you run RADIUS NT as a nonservice, RADIUS will shut down when you log off or close the NT session. To run RADIUS NT as a nonservice, complete the following steps:

a. To start the service, click the **Start RADIUS** button. To stop the service, click the **Stop RADIUS** button.

b. If you have previously installed RADIUS NT and want to update the users cache, click the **Update Users Cache** button or choose the corresponding menu item from the File menu.

Configuring RADIUS on a Windows NT Host

You configure RADIUS options from the **Logging**, **Users Cache**, **Multitask Authentication**, and **Directories** tabs in the Service Options window.

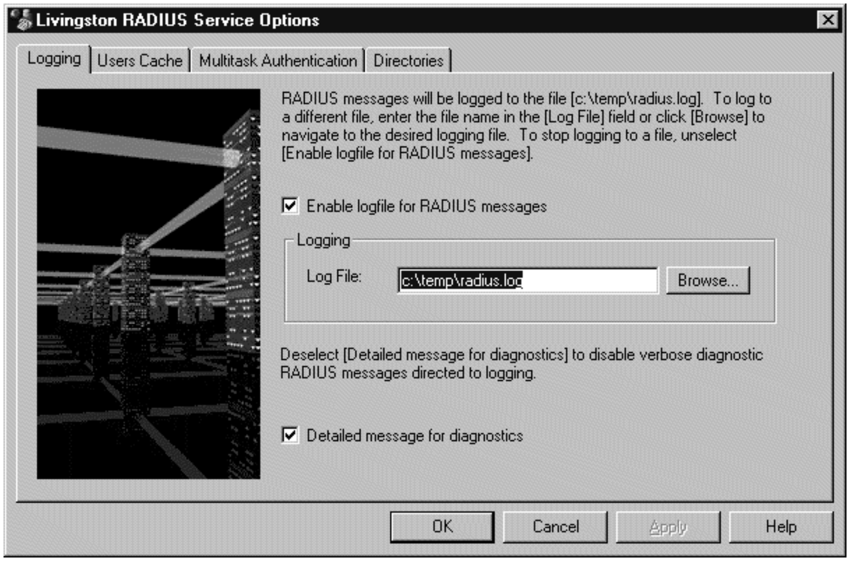
Navigate to the desired tab by one of the following methods:

- From the RADIUS Service Control Panel, do one of the following:
  - Choose the desired tab from the Setup Options menu.
  - Click the **Options** button to display the Service Options window, and then click the desired tab.
- From the Service Options window, click the desired tab.

When you alter a configuration value in the Service Options window, the **Apply** button becomes operational. You can click on **Apply** to save your changes and leave the window open. Or you can click the **OK** button to save your changes, close the Service Options window, and return to the Service Control Panel. You must stop and restart RADIUS NT for the configuration changes to take effect. Clicking on the **Cancel** button does not save your changes.

1. **To log RADIUS messages to a file for monitoring or debugging purposes, complete the following steps:**

   a. Display the **Logging** tab.



RADIUS messages will be logged to the file [c:\temp\radius.log]. To log to a different file, enter the file name in the [Log File] field or click [Browse] to navigate to the desired logging file. To stop logging to a file, unselect [Enable logfile for RADIUS messages].

☑ Enable logfile for RADIUS messages

Logging

Log File: c:\temp\radius.log

Deselect [Detailed message for diagnostics] to disable verbose diagnostic RADIUS messages directed to logging.

☑ Detailed message for diagnostics

   b. Ensure that the **Enable logfile for RADIUS messages** option is checked.

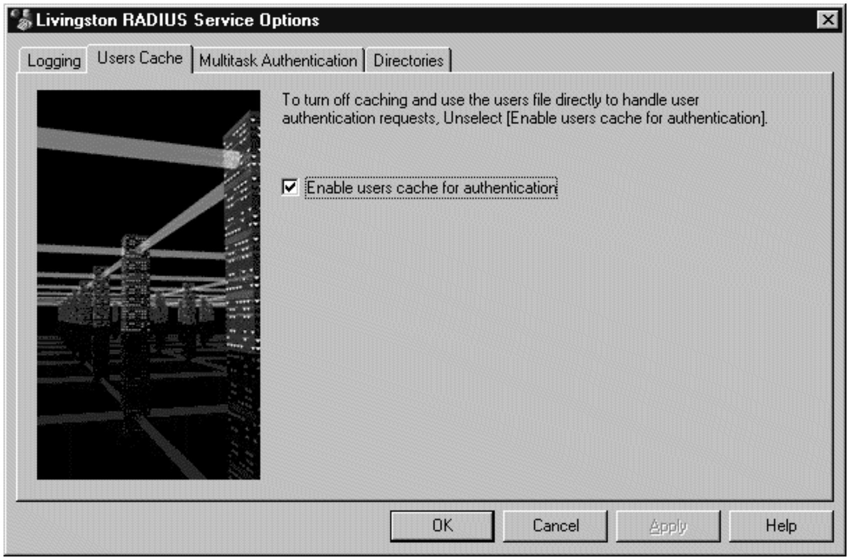
Note – The Windows NT Event Log is not affected by this selection. RADIUS events continue to be logged to the Event Log.

   c. The location of the log file appears in the text box. By default, the log file **radius.log** is placed in **C:\temp**. To change the location of the log file, enter the filename manually in the text box, or click the **Browse** button and select the location.

   d. By default, verbose (detailed) messages are stored in the log file. To turn off verbose logging, ensure that the **Detailed messages for diagnostics** option is unchecked.

2. **To configure caching options, complete the following steps:**

a. Display the **Users Cache** tab.



Livingston RADIUS Service Options

To turn off caching and use the users file directly to handle user authentication requests, Unselect [Enable users cache for authentication].

☑ Enable users cache for authentication

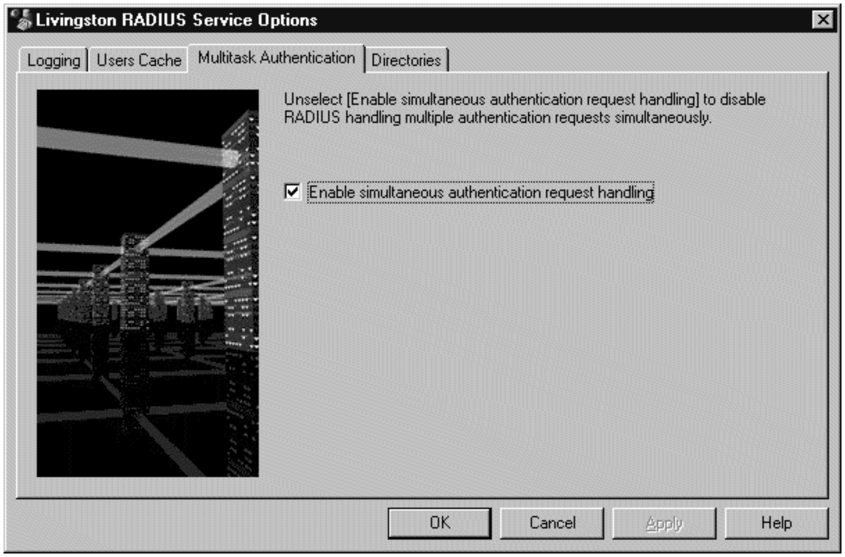
b. To use the database to cache user requests, ensure that the **Enable users cache for authentication** option is checked.

Livingston recommends caching user requests when the users file contains more than 500 users.

If caching is used, you must update the database each time the users file is updated. To update the database, click the **Update Users Cache** button on the RADIUS Control Panel, or choose **Update Users Cache** from the File menu on the RADIUS Control Panel.

3. **To configure multitask authentication, complete the following steps:**

   a. Display the **Multitask Authentication** tab.



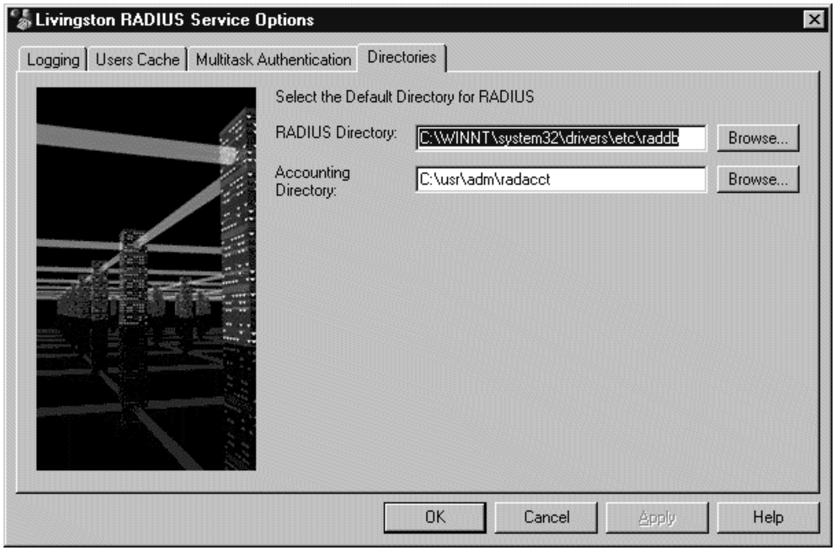
Unselect [Enable simultaneous authentication request handling] to disable RADIUS handling multiple authentication requests simultaneously.

☑ Enable simultaneous authentication request handling

   b. When multitask authentication is on, RADIUS NT handles multiple simultaneous authentication requests. To use this feature, ensure that the **Enable simultaneous authentication request handling** option is checked. To turn off multitask authentication, uncheck this option.

4. **To change the default directories for RADIUS server and accounting files, complete the following steps:**

   a. Display the **Directories** tab.



Livingston RADIUS Service Options

Select the Default Directory for RADIUS

RADIUS Directory: C:\WINNT\system32\drivers\etc\raddb

Accounting Directory: C:\usr\adm\radacct

   b. Enter the desired directory locations manually in the text boxes, or click the **Browse** button and select the desired directory locations.

   C:\WINNT\system32\drivers\etc\raddb is the default RADIUS NT directory. The default Accounting directory is **C:\usr\adm\radacct**.

5. **When you have finished configuring the options in the RADIUS Control Panel, click the Apply button to apply your changes and then click the OK button.**

6. **Continue to “Configuring Client Information” on page 2-14.**

Configuring Client Information

/etc/raddb/clients is a flat text file installed on the RADIUS server. The **clients** file stores information about RADIUS clients, including each client's name or IP address and its shared secret.

On a UNIX host, use any text editor to edit the **clients** file.

On a Windows NT host, open the RADIUS NT control panel and choose **Clients** from the Edit menu. The **clients** file is automatically opened in Notepad.

1. **To add a client, enter the client's name or IP address and the shared secret. To add a comment, preface the desired line with the number sign (#).**

   Shared secrets must consist of 15 or fewer printable, nonspace, ASCII characters. There is no limit to the number of clients that you can add to this file.

   Examples of client names and shared secrets are displayed below.

```
#Client Name                                Shared Secret
#---------------------------------------------------------
portmaster1                                 wP40cQ0
portmaster2                                 A3X445A
192.168.1.2                                 wer369st
```

2. **Because the clients file contains the shared secrets for the RADIUS clients, verify that only root users have read and write access to the file.**

```
-rw-------  1 root daemon 802 Jul 15 00:21 clients
```

3. **Continue to Chapter 3 to configure the PortMaster as a RADIUS client.**

Configuring a RADIUS Client 3

This chapter covers configuration of the PortMaster as a RADIUS client. You must configure the following items on each PortMaster:

- IP addresses of the primary and optional alternate RADIUS servers
- IP addresses of the primary and optional alternate RADIUS accounting servers, if accounting is to be performed
- RADIUS shared secret

There are two steps to configure a RADIUS client: adding the PortMaster and shared secret to the **clients** file on the RADIUS server (see page 2-14), and configuring the shared secret and address of the RADIUS server on the PortMaster.

You can configure RADIUS clients using the PortMaster command line interface (see the following section) or using PMconsole (see page 3-3).

Configuration Using the Command Line Interface

To configure the PortMaster using the command line interface, complete the following steps:

1. **Enable port security on all ports using the set all security on command:**

   ```
   Command> set all security on
   ```

   When port security is enabled, each user attempting to log in to the port must be authenticated using the PortMaster User Table or RADIUS.

2. **Enter the IP address of the primary RADIUS server using the following command:**

   ```
   Command> set authentic Ipaddress
   ```

3. **Optionally, specify an alternate RADIUS server:**

```
Command> set alternate Ipaddress
```

   The primary RADIUS server is consulted first. If the server does not respond, it is queried a second time; then both servers are queried up to eight additional times at 3-second intervals.

4. **To log activity using RADIUS accounting, enter the IP address of the primary accounting server:**

```
Command> set accounting Ipaddress
```

   Optionally, specify an alternate accounting server:

```
Command> set accounting 2 Ipaddress
```

5. **Enter the secret shared by the PortMaster and RADIUS server using the set secret command.**

   This is the same shared secret entered in the clients file on the RADIUS server (see page 2-14).

```
Command> set secret String
```

   The shared secret is a string of up to 15 printable, nonspace, ASCII characters. If a secret longer than 15 characters is specified, an error message is displayed.

6. **Save your changes using the save all command; then reset all ports.**

```
Command> save all
Command> reset all
```

Caution - Resetting all ports disconnects any user sessions in progress.

7. **Continue to Chapter 4, "Configuring User Information."**

Configuration Using PMconsole

To configure the PortMaster using PMconsole, complete the following steps:

1. **Choose RADIUS from the Edit menu.**
2. **In the dialog box that appears, enter the IP address of the primary and optional alternate RADIUS servers.**
3. **To log activity using RADIUS accounting, enter the IP address of the primary and optional alternate accounting servers.**
4. **Enter the secret shared by the RADIUS client and RADIUS server. For security reasons, the secret is not displayed in the dialog box.**

   The shared secret is case-sensitive, and must consist of 15 or fewer printable, nonspace, ASCII characters. Control characters may not be used.

Note – Do not press the **Return** key when the cursor is in the RADIUS Secret field of the dialog box. Pressing the **Return** key at this point will erase the secret when the **Save** button is pressed.

5. **To save the RADIUS settings, click the Save button.**
6. **To leave the window, click the Done button.**
7. **On each port, turn Security on; then click the Save button to save the port setting to nonvolatile memory on the PortMaster.**

   When port security is enabled, each user attempting to log in to the port must be authenticated by the PortMaster User Table or RADIUS.

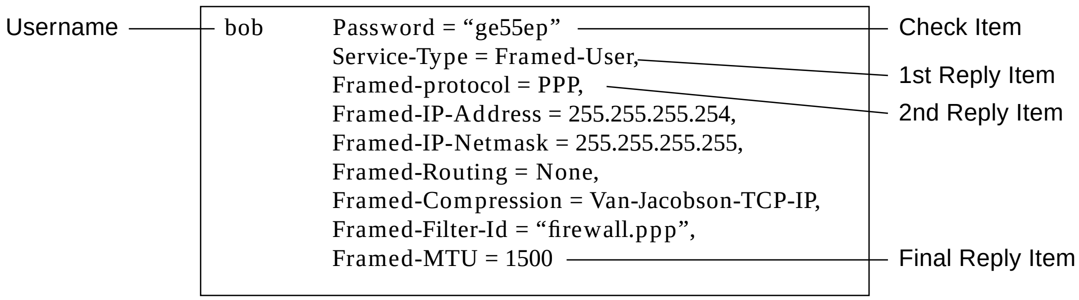
Note – Some older versions of PMconsole display the **Pass-Thru Login** option instead of the **Security** option in this dialog box. In this case, ensure that **Pass-Thru Login** is **disabled**; this has the same effect as turning **Security** on.

8. **Click the Remote Reset button, then click the Done button to close the dialog box.**
9. **Continue to Chapter 4, “Configuring User Information.”**

Configuring User Information 4

The RADIUS **users** file is a flat text file on the RADIUS server. The **users** file stores authentication and authorization **information** for all users authenticated with RADIUS. For each user, you must create an **entry** that consists of three parts: the **username**, a list of **check items**, and a list of **reply items**. Figure 4-1 displays an example.

Figure 4-1 User Entry



```
bob     Password = “ge55ep”
        Service-Type = Framed-User,
        Framed-protocol = PPP,
        Framed-IP-Address = 255.255.255.254,
        Framed-IP-Netmask = 255.255.255.255,
        Framed-Routing = None,
        Framed-Compression = Van-Jacobson-TCP-IP,
        Framed-Filter-Id = “firewall.ppp”,
        Framed-MTU = 1500
```

- Username

  The username is the first part of each user entry. Usernames consist of up to 63 printable, nonspace, ASCII characters. If SecurID or a system password file is used for authentication, the username must conform to any host password limitations.

- Check items

  Check items are listed on the first line of a user entry, separated by commas. For an access-request (see “How RADIUS Works” on page 1-3) to succeed, all check items in the user entry must be matched in the access-request.

  In Figure 4-1, *bob*’s password is the only check item. To successfully authenticate *bob*, the RADIUS server must receive this password in bob’s access-request.

Note – The line in the user entry that contains the username and check items must not exceed 255 characters.

- Reply items

  Reply items give the PortMaster information about the user's connection—for example, whether PPP or SLIP is used or whether the user's IP address is negotiated. In Figure 4-1, Framed-Protocol is a reply item. The value of Framed-Protocol is PPP, indicating that *bob* uses PPP for his connection.

  If all check items in the user entry are satisfied by the access-request, the RADIUS server sends the reply items to the PortMaster to configure the connection.

  Several common user entries are listed in "Examples" on page 4-29. All check items and reply items are summarized in Table 4-4 on page 4-23.

Editing User Profiles

User profiles are maintained in the **users** file. On a UNIX host, use any text editor to edit the **/etc/raddb/users** file.

On a Windows NT host, open the RADIUS NT control panel and choose **Users** from the Edit menu. The **users** file is automatically opened in Notepad.

Username

Each user entry must have a username. As stated in the previous section, a username must consist of up to 63 printable, nonspace, ASCII characters.

Check Items

Check items can consist of any of the following: password information, client information, prefixes, suffixes, or group.

Passwords

If you are using ComOS 3.5 or later, the user's password can be up to 48 printable, nonspace, ASCII characters. If you are using an earlier version of ComOS, the password must not exceed 16 characters.

You can specify two different password characteristics in a user entry: the password's location and its expiration date.

Password Locations

Use the **Auth-Type** check item to specify the type of authentication to use for a particular user. Auth-Type can be set to one of the following: Local, System, or SecurID. If this check item is omitted from the user entry, Local is assumed.

- Local

  To indicate that a user’s password is stored in the RADIUS **users** file, use the **Local** Auth-Type. To set the user’s password, use the Password check item. An example line from a user entry is displayed below.

```
bob     Auth-Type = Local, Password = “ge55ep”
```

Note – When a user’s password is stored locally, you can omit the Auth-Type check item; only the Password check item is required.

- System

  To indicate that a user’s password is stored in a system password file, use the System Auth-Type. System can be a password file in UNIX such as **/etc/passwd**, **/etc/shadow**, a Windows NT password database, or a password map in NIS or NIS+. When the RADIUS server receives a username-password pair from the client, it queries the operating system to determine if there is a matching username-password pair.

```
bob     Auth-Type = System
```

Note – Windows NT user accounts must have batch capability in order to be authenticated.

The System Auth-Type is equivalent to the RADIUS 1.16 **Password = “UNIX”** check item, which is also permitted in RADIUS 2.0 for backward compatibility.

```
bob     Password = “UNIX”
```

- SecurID

  The SecurID Auth-Type indicates that the user’s password should be authenticated by a SecurID ACE/Server.

  ```
  bob     Auth-Type = SecurID
  ```

  To receive a passcode from SecurID, the ACE/Server software must be running on the same UNIX host as the RADIUS server. In this case, the RADIUS server serves as an ACE/Server Master. If the ACE/Server Master is installed on a different host, the RADIUS server must be configured as an ACE/Server Slave. See Chapter 6, “Installing and Configuring SecurID,” for instructions.

Note – SecurID authentication is not currently implemented in RADIUS NT.

Password Expiration Date

To disable logins after a particular date, complete the following steps:

1. **Specify the date of expiration using the Expiration check item.**

   The date must be specified in **“*Mmm dd yyyy*”** format; an example is shown below.

   ```
   bob     Password = “ge55gep”, Expiration = “Dec 04 1996”
   ```

2. **Edit the Password-Expiration and Password-Warning values in /etc/raddb/dictionary to meet your security needs.**

   ```
   VALUE       Server-Config    Password-Expiration       30
   VALUE       Server-Config    Password-Warning          5
   ```

   The first parameter, **Password-Expiration**, updates the Expiration date in the users file when a user changes his password. In this example, Password-Expiration is set to 30. If user *bob* changes his password on January 1, 1997, his Expiration date in the **users** file changes to **Jan 31, 1997**.

Password-Warning controls when users are notified that their accounts are about to expire. In the example above, users receive warning messages 5 days before their password expiration date.

Note – A mechanism to permit users to change their passwords is outside the scope of RADIUS.

3. **If you modified the dictionary file, kill and restart the radiusd daemon (UNIX hosts) or stop and start the RADIUS NT service (Windows NT hosts).**

Client Information

Use the **NAS-IP-Address** check item to specify the IP address of a particular PortMaster. When this setting is used as a check item in a user entry, the user must attempt to start a connection on the specified PortMaster for the connection to succeed.

Use the **NAS-Port** check item to specify a particular PortMaster port. To be successfully authenticated, the user must attempt to log in to this port.

Use the **NAS-Port-Type** check item to specify the type of port. Options for the NAS-Port-Type are as follows: Async, Sync, ISDN, ISDN-V120, or ISDN-V110. The PortMaster must run ComOS release 3.3.1 or later to support NAS-Port-Type.

The following example displays a user entry containing the NAS-IP-Address and NAS-Port-Type settings.

```
bob     Password = “ge55gep”, NAS-IP-Address = 192.168.1.54, NAS-Port-Type = ISDN
        Service-Type = Framed-User,
        Framed-Protocol = PPP
```

Prefixes and Suffixes

Use the **Prefix** and **Suffix** check items to allow a user to access multiple services by prepending or appending a series of characters to his username.

Prefixes and suffixes are most useful when defined in a DEFAULT user entry (see the example on page 4-30). However, they can also be used with individual user entries (see the example below). Prefix and Suffix strings must consist of 16 or fewer printable, nonspace, ASCII characters.

```
Pbob   Auth-Type = System, Prefix = “P”
       Framed-Protocol = PPP,
```

In the above example, *bob*’s username and password are stored in a system password file. For *bob* to use this particular account, he must specify a username of **Pbob** when attempting to connect to the PortMaster.

The RADIUS server strips any prefixes and suffixes and looks up the username. In the previous example, the RADIUS server strips the **P** and checks the system password for *bob*.

```
DEFAULT     Auth-Type = System, Suffix = “%slip”
            Framed-Protocol = SLIP,
```

If *bob* specified a username of **bob%slip**, the RADIUS server would configure *bob*’s connection using the settings in the DEFAULT entry.

See “Default User Entries” on page 4-19 for information on using prefixes and suffixes in a DEFAULT entry.

Group

You can define a **group** of users to simplify authentication. If a user entry contains the Group check item, only users that are defined as members of the specified group are authenticated.

The Group string consists of up to 63 printable, nonspace, ASCII characters.

If you specify multiple groups in a user entry, the user must be a member of each group to be authenticated. In the following example, user *bob* is authenticated only if *bob* is a member of both the Engineering group and the Hardware group.

```
bob    Group = “Engineering”, “Hardware”
```

On UNIX hosts, groups are defined in **/etc/group** or via NIS. Refer to your system documentation for instructions on creating groups and adding members to groups.

On Windows NT hosts, groups are defined with the User Manager in the Administration Tools (Common) menu. Refer to your system documentation for instructions on creating groups and adding members to groups.

Reply Items

Service Type

You must specify the type of service provided to the user, called the **Service-Type**, in each user entry. Service-Type must be set to one of the values shown in Figure 4-1.

Table 4-1 Service-Type

Service-Type	**Explanation**
Login-User	User connects via Telnet, rlogin, **in.pmd**, or TCP-Clear.
Framed-User	User uses PPP or SLIP for the connection.
Outbound-User	User uses Telnet for outbound connections.
Callback-Login-User	The PortMaster verifies the user's identity by disconnecting the port and dialing the user back at a specified number. The user's identity must be verified before the connection is permitted.
Callback-Framed-User	The PortMaster verifies the user's identity by disconnecting the port and dialing the user back using a specified Location Table entry. When the user's identity is verified, PPP or SLIP is used for the connection.
Administrative-User	The PortMaster grants the user a full administrative login—as if the user had logged in using **!root**. The user has full configuration ability and access to all PortMaster commands. This Service-Type is available only with ComOS 3.5 or later versions.

Table 4-1 Service-Type *(Continued)*

Service-Type	**Explanation**
NAS-Prompt-User	The PortMaster grants the user a limited administrative login. The user can use the following commands: **ifconfig**, **ping**, **ptrace**, **reboot**, **reset**, **set console**, **set debug**, **show**, **traceroute**, and any nonconfiguration commands. The following commands are not permitted: **add**, **delete**, **erase**, **save**, **tftp**, and any **set** commands other than those listed above. This Service-Type is available only with ComOS 3.5 or later versions.

Note – If the RADIUS server is used with non-Livingston products, the Administrative-User and NAS-Prompt-User Service-Types must not be used unless the other vendor's implementation of these types is compatible with Livingston's implementation.

Note – To configure the callback number or location, see "Callback Information" on page 4-11.

In the following example, user *bob*'s Service-Type is **Framed-User**.

```
bob    Auth-Type = System
       Service-Type = Framed-User
```

Framed Protocol

When the Service-Type is Framed-User, you must include the **Framed-Protocol** reply item in the user entry to indicate whether PPP or SLIP is used. For example, user *bob* is a PPP user. His user entry includes the following lines:

```
bob     Auth-Type = System
        Service-Type = Framed-User,
        Framed-Protocol = PPP
```

Framed-Protocol can also be used as a reply item requiring PPP autodetection by the PortMaster.

```
bob     Auth-Type = System, Framed-Protocol = PPP
        Service-Type = Framed-User,
        Framed-Protocol = PPP
```

To authenticate a user using PAP, set the Auth-Type to any of the following: **Local**, **System**, or **SecurID**. To authenticate a user using CHAP, the Auth-Type must be **Local** and you must turn off PAP using the following command on the PortMaster:

```
Command> set pap off
```

Framed IP Address

Use the **Framed-IP-Address** reply item to specify the user's IP address.

When Framed-IP-Address is set to 255.255.255.255, the PortMaster negotiates the address with the end-node (dial-in user). When it is set to 255.255.255.254 (or omitted), the PortMaster assigns an IP address to the dial-in user from the assigned address pool.

Note – To create an assigned address pool for the PortMaster, see the *Configuration Guide for PortMaster Products*.

Framed IP Netmask

You can specify a netmask for a user using the **Framed-IP-Netmask** reply item. If this reply item is omitted, the default subnet mask of 255.255.255.255 is used.

Framed Route

Use the **Framed-Route** reply item to add a route to the PortMaster routing table when service to the user begins. Three pieces of information are required: the destination IP address, gateway IP address, and metric. An example is shown below.

```
bob   Auth-Type = System
      Service-Type = Framed-User,
      Framed-Protocol = PPP,
      Framed-IP-Address = 150.128.1.1
      Framed-Route = “150.128.1.0 150.128.1.1 1”
```

In this example, 150.128.1.0 is the IP address of a destination network. 150.128.1.1 is the IP address of the gateway for this network, and 1 is the metric (hop count).

If 0.0.0.0 is specified as the gateway IP address, the user’s IP address is substituted for the gateway.

Outbound-User

The **Outbound-User** setting allows a user to gain outbound access to network device ports using Telnet. This feature is supported in ComOS version 3.3.2 or later and RADIUS 2.0. To use this feature, you must set the relevant PortMaster port to **device /dev/network** or **twoway /dev/network**.

To restrict users to outbound access, you must include the **Service-Type = Outbound-User** check item in the user entry. The **Login-TCP-Port** setting may be used to specify the TCP port for the connection; the port number must be between 10000 and 10100. An example is displayed below.

```
bob   Password = “ge55gep”, Service-Type = Outbound-User
      Service-Type = Outbound-User,
      Login-Service = Telnet,
      Login-TCP-Port = 10000
```

In the above example, when user *bob* is attempting an outbound connection, the PortMaster client checks its local User Table for an entry for *bob*. If *bob* is not found in the table, the PortMaster sends an access-request to the RADIUS server indicating that *bob* is an Outbound-User.

The RADIUS server examines *bob*'s entry in the users file. If Outbound-User is included as a reply item, the PortMaster is notified to permit the connection.

The PortMaster should be configured as shown in the example below. This example configures port **s1**; however, you can configure multiple ports to listen at different TCP port numbers or at the same TCP port number to create a pool of devices.

```
Command> set s1 device /dev/network
Command> set s1 service_device telnet 10000
Command> set s1 modem off
```

Callback Information

For a user to be authenticated using callback, a phone number or location must be specified in the user's entry.

Callback-Login-User

When a user's Service-Type is **Callback-Login-User**, specify a phone number using the **Callback-Number** reply item. An example is displayed below.

```
bob     Password = “ge55gep”
        Service-Type = Callback-Login-User,
        Callback-Number = “9,1-800-555-1212”
```

After the RADIUS server verifies the password for user *bob*, it sends an access-accept message including the Callback-Number to the PortMaster. The PortMaster calls the user back at the specified number; if the user is reached successfully, the PortMaster prompts the user to reenter his password and then sets up the connection.

Callback-Framed-User

When a user’s service type is **Callback-Framed-User**, you must specify a location using the **Callback-Id** setting. An example is displayed below.

```
bob    Password = “ge55gep”
       Service-Type = Callback-Framed-User,
       Callback-Id = “bobhome”
```

After the RADIUS server verifies the password for user *bob*, it sends an access-accept message including the Callback-Id to the PortMaster. The PortMaster checks its local Location Table; if there is a matching location name, it makes the connection using that location’s settings.

Note – To create Location Table entries, see the information on configuring dial-out locations in the *Configuration Guide for PortMaster Products.*

Routing

Use **Framed-Routing** reply item to control how RIP is used on the user’s interface. RIP options are explained in Table 4-2.

Table 4-2 Framed-Routing Options

Option	**Explanation**
None	Disables RIP on the interface.
Broadcast	The interface sends RIP updates.
Listen	The interface listens for RIP updates.
Broadcast-Listen	The interface sends and listens for RIP updates.

The following example displays user *bob*’s user entry. Framed-Routing is set to **None**; *bob*’s interface neither sends nor listens for RIP updates.

```
bob    Password = “ge55gep”
       Service-Type = Framed-User,
       Framed-Protocol = PPP,
       Framed-Routing = None,
```

Typically, Framed-Routing is set to **Broadcast-Listen** for connections to other routers, and set to **None** for user connections.

Packet Filters

Use the **Filter-Id** reply item to associate packet filters with each PPP or SLIP user authenticated with RADIUS. In the following example, the **firewall** filter is used during *bob*’s connection:

```
bob    Password = “ge55gep”
       Service-Type = Framed-User,
       Framed-Protocol = PPP,
       Filter-Id = “firewall”
```

You must define filters on each PortMaster the user accesses. To control whether the filter restricts incoming or outgoing traffic, the filter defined on the PortMaster must have an **.in** or **.out** suffix attached to its name. In the above example, the filter **firewall.in** is used as a filter for packets entering the PortMaster via the interface, and **firewall.out** is used as an output filter for packets leaving the PortMaster via the interface.

You need not specify the **.in** and **.out** suffixes in the user entry. When a user dials in to the PortMaster, the **.in** or **.out** suffix is automatically appended to the filter name provided by RADIUS.

Note – To configure filters on a PortMaster, see the information on configuring filters in the *Configuration Guide for PortMaster Products.*

Access Filters

Use the **Filter-Id** reply item to associate an access filter with each host prompt login user authenticated with RADIUS. In the following example, the **gnric** filter is used to restrict the hosts that *bob* can access during a connection:

```
bob     Password = “ge55gep”
        Service-Type = Login-User,
        Login-IP-Host = 255.255.255.255,
        Login-Service = Telnet,
        Login-TCP-Port = 23,
        Filter-Id = “gnric”
```

You must define access filters on each PortMaster the user accesses, using the same name as the Filter-Id. The access filter name defined in the user record must be exactly the same as the filter name defined on the PortMaster. The PortMaster does not append anything to the name of an access filter, unlike packet filters.

Remote Host Information

When a user’s Service-Type is Login-User or Callback-Login-User, two pieces of information may be supplied: the service used to connect to the host, and the name or IP address of the remote host. You can also specify a TCP port number.

To specify the login service, use the **Login-Service** reply item. All Login-Service values are described in Table 4-2.

Table 4-3 Login-Service

Login-Service	**Description**
Telnet	Establishes a Telnet connection to the remote host.
Rlogin	Establishes an rlogin connection to the remote host.
TCP-Clear	Establishes a TCP clear connection to the remote host. 8-bit data is passed through this connection without interpretation. This option is the equivalent of the **netdata** login service on the PortMaster.

Table 4-3 Login-Service *(Continued)*

Login-Service	**Description**
PortMaster	Establishes a connection to the remote host using the PortMaster login service. To use this setting with UNIX versions of RADIUS, you must install the **in.pmd** daemon on the remote host. (Note: **in.pmd** is not required for or applicable to RADIUS NT.)

To specify the name or IP address of the remote host, use the **Login-IP-Host** reply item. If the user is to log in to a particular TCP port on the remote host, specify the port number with the **Login-TCP-Port** reply item.

An example is displayed below. In this entry, user *bob* is authenticated, then called back at the Callback-Number. If successfully authenticated, a Telnet connection to port 23 on host 192.168.1.76 is established.

```
bob    Password = “ge55gep”
       Service-Type = Callback-Login-User,
       Login-IP-Host = 192.168.1.76,
       Login-Service = Telnet,
       Login-TCP-Port = 23,
       Callback-Number = “9,1-800-555-1234”
```

If Login-IP-Host is set to 0.0.0.0 or omitted, the host defined for the port is used. If Login-IP-Host is set to 255.255.255.255, the user is presented with a **Host:** prompt where he enters the hostname or the host’s IP address.

MTU

Use the **Framed-MTU** reply item to configure the number of bytes in the maximum transmission unit (MTU) for a user’s connection.

```
Framed-MTU = 1500
```

Framed-MTU is used only for PPP and SLIP connections. For PPP connections, the Framed-MTU can be between 100 and 1520 bytes. SLIP connections can have an MTU between 100 and 1006 bytes. On IPX networks, set Framed-MTU to at least 600 bytes.

Note – If PPP negotiates an MTU for the connection, the Framed-MTU setting is ignored.

Compression

Van Jacobson TCP/IP header compression is enabled by default. To disable compression, set the **Framed-Compression** setting to **None**.

```
Framed-Compression = None
```

IPX Network

When an IPX network is used for a particular user’s connection, you must include the **Framed-IPX-Network** reply item in the user entry. The PortMaster supports IPX over PPP.

Specify Framed-IPX-Network in dotted decimal notation (*xx.xx.xx.xx*). For example, the hexadecimal network number 123456 must be expressed as 0.18.52.86.

```
bob     Password = “testing”
        Service-Type = Framed-User,
        Framed-Protocol = PPP
        Framed-IPX-Network = 0.18.52.86
```

To convert an IPX hexadecimal network number to dotted decimal notation, use the following PERL script:

```
#!/usr/local/bin/perl
# hex   - convert ip addresses to hexadecimal and vice versa
for (@ARGV) {
        if (/\./) {             # convert . to hex
                @octets = split(/\./,$_);
                for $octet (@octets) {
                        printf “%02X”,$octet;
                }
                print “\n”;
        } else {                # convert hex to .
                $buf = '';
                while (s/\w\w//) {
                        $buf .= hex($&).'.';
                }
                $buf =~ s/\.$/\n/;
                print $buf;
        }
}
```

Session-Timeout

Use **Session-Timeout** to specify the time limit for a session. If this reply item appears in a user entry, the user is disconnected when the time limit is reached. Session-Timeout is specified as a particular number of seconds, up to a maximum of 31536000 (1 year).

```
bob     Password = “ge55gep”
        Service-Type = Framed-User,
        Framed-Protocol = PPP,
        Session-Timeout = 7200
```

In the above example, user *bob* is automatically disconnected after 7200 seconds (2 hours).

Idle-Timeout

Use **Idle-Timeout** to specify the number of seconds a session can be idle before it is disconnected. Idle-Timeout can range between 120 seconds (2 minutes) and 14400 seconds (4 hours), and is rounded down to a multiple of 60.

```
bob    Password = “ge55gep”
       Service-Type = Framed-User,
       Framed-Protocol = PPP,
       Idle-Timeout = 600
```

In the above example, if the session is inactive longer than 600 seconds (10 minutes), user *bob* is disconnected.

Note – Idle-Timeout and Session-Timeout values are specified in **seconds** in the RADIUS users file. If you set these timeout values using the PortMaster command line interface or PMconsole, you specify them in **minutes**.

Port-Limit

Use the **Port-Limit** reply item to control the maximum number of ports available for a Multilink PPP or Multilink V.120 connection. Port-Limit applies only to ISDN connections; other connection types are not affected.

The Port-Limit value can be as high as the maximum number of B channels available for the ISDN ports. For example, if a PortMaster has 15 ISDN BRI ports, the Port-Limit value can be as high as 30.

```
bob    Password = “ge55gep”, NAS-Port-Type = ISDN
       Service-Type = Framed-User,
       Framed-Protocol = PPP,
       Port-Limit = 1
```

In the above example, user *bob*’s connection can use only one B channel.

Default User Entries

When the RADIUS server receives a username-password pair from a PortMaster, the RADIUS server scans the users file for a match, starting from the top of the file. If a match is located, RADIUS authenticates the user using the information in that user entry. If a matching user entry is not found during the scan, but a matching DEFAULT entry is located, RADIUS uses the DEFAULT entry for authentication.

The DEFAULT entry is typically used when the Auth-Type is System or SecurID. These entries should appear at the end of the users file; the RADIUS server stops scanning entries when a matching DEFAULT entry is found.

```
DEFAULT     Auth-Type = System
            Service-Type = Framed-User,
            Framed-Protocol = PPP,
            Framed-IP-Address = 255.255.255.254,
            Framed-Routing = None,
            Filter-Id = “firewall”,
            Framed-MTU = 1500
```

For example, user *bob*’s password is stored in a UNIX password file. When he attempts to connect to the network, the RADIUS server scans the users file to determine if there is a matching user entry. If a matching entry is not found before the DEFAULT entry is found, the DEFAULT entry is used. Since the DEFAULT entry includes **Framed-Protocol = PPP** as a reply item, PPP is used for *bob*’s connection.

RADIUS 2.0 permits multiple DEFAULT user entries. Use the **Prefix** and **Suffix** settings to distinguish among DEFAULT entries. When users prepend or append the prefix or suffix to their username, the RADIUS server matches them to the corresponding DEFAULT entry.

```
DEFAULT    Auth-Type = System, Prefix = “P”
           Service-Type = Framed-User,
           Framed-Protocol = PPP,
           Framed-IP-Address = 255.255.255.254,
           Framed-Routing = None,
           Framed-MTU = 1500

DEFAULT    Auth-Type = System, Suffix = “%C”
           Service-Type = Framed-User,
           Framed-Protocol = CSLIP,
           Framed-IP-Address = 255.255.255.254,
           Framed-MTU = 1006

DEFAULT    Auth-Type = System, Prefix = “S”
           Service-Type = Framed-User,
           Framed-Protocol = SLIP,
           Framed-IP-Address = 255.255.255.254,
           Framed-Compression = None,
           Framed-MTU = 1006
```

In the above example, assume that user *bob*’s password is stored in a UNIX password file and that there is not a matching entry in the RADIUS users file. If *bob* uses **Pbob** as his username, the first DEFAULT entry is used, and *bob* is authenticated as a PPP user. If *bob* logs in as **bob%C**, the second DEFAULT entry is used and he is authenticated as a CSLIP user.

You can name DEFAULT entries simply **DEFAULT**, or append a number to the end of the entry name—for example, **DEFAULT1**, **DEFAULT2**, and so on. An example is shown below.

```
DEFAULT1   Auth-Type = System, Prefix = “P”
           Service-Type = Framed-User,
           Framed-Protocol = PPP,
           Framed-IP-Address = 255.255.255.254,
           Framed-Routing = None,
           Framed-MTU = 1500

DEFAULT2   Auth-Type = System, Suffix = “%C”
           Service-Type = Framed-User,
           Framed-Protocol = CSLIP,
           Framed-IP-Address = 255.255.255.254,
           Framed-MTU = 1006

DEFAULT3   Auth-Type = System, Prefix = “S”
           Service-Type = Framed-User,
           Framed-Protocol = SLIP,
           Framed-IP-Address = 255.255.255.254,
           Framed-Compression = None,
           Framed-MTU = 1006
```

Caching User Requests

RADIUS offers support for caching user requests, which increases the speed of user lookups. Livingston recommends caching user requests when the users file contains more than 500 users.

Configuring Caching on UNIX Hosts

The **builddbm** utility included with UNIX RADIUS converts the **users** text file to the UNIX DBM format, which increases the speed of user lookups.

To run **builddbm**, use the following commands:

```
cd /etc/raddb
./builddbm
```

To run the **radiusd** daemon after the users file is converted to DBM, execute radiusd with the **-b** option.

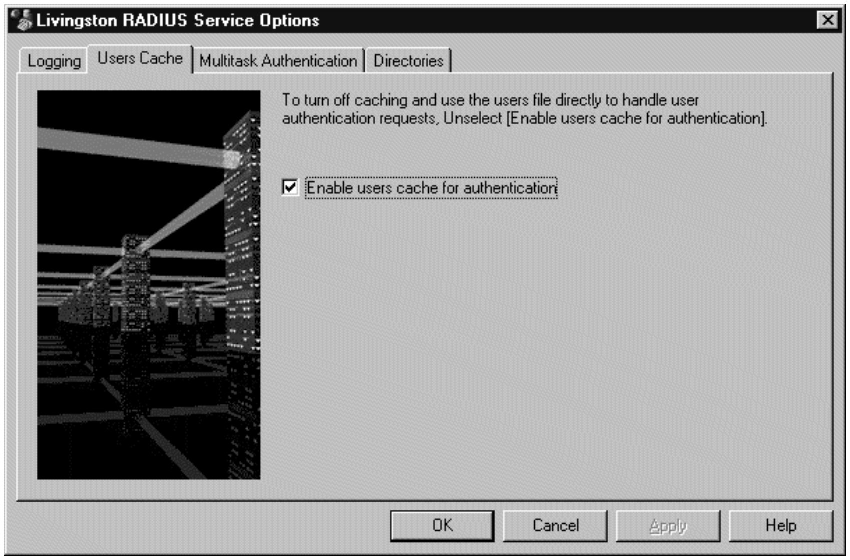
```
/etc/radiusd -b
```

builddbm generates the **users.dir** and **users.pag** files, which are used by the **radiusd** daemon. On some versions of UNIX a single **users.db** file is created instead.

Note – After the **users** file has been converted to the DBM format, you must run builddbm again if you make any changes to the user entries.

Configuring Caching on Windows NT Hosts

To configure caching options, choose **Users Cache** from the Setup Options menu. Or, click the **Options** button, and then click the **Users Cache** tab.



To turn off caching and use the users file directly to handle user authentication requests, Unselect [Enable users cache for authentication].

☑ Enable users cache for authentication

To use the database to cache user requests, ensure that the **Enable users cache for authentication** option is checked.

If caching is used, you must update the database each time the users file is updated. To update the database, click the **Update Users Cache** button on the Control Panel initial dialog, or choose **Update Users Cache** from the File menu. A pop-up window displays the number of user and DEFAULT entries in the **users** file.

User Entry Check and Reply Items: Complete Listing

Table 4-4 summarizes all user entry check and reply items.

Table 4-4 User Entry Check and Reply Items

Item	**Options**	**Explanation**	**Can be Used as Check item?**	**Can be Used as Reply item?**
User-Name	User's name—up to 63 characters.		N/A	No
Password	User's password		Yes	No
Auth-Type	Local	User's password is stored in the RADIUS users file. Default.	Yes	No
	System	User's password is stored in a system password file.	Yes	No
	SecurID	User is authenticated via SecurID.	Yes	No
Expiration	Must be specified in "*Mmm dd yyyy*" format	Date that user's password expires.	Yes	No

Table 4-4 User Entry Check and Reply Items *(Continued)*

Item	Options	Explanation	Can be Used as Check item?	Can be Used as Reply item?
Prefix	String of characters in double quotation marks (“”)	Prepended to username to match a user to a particular user entry. Used primarily for DEFAULT entries.	Yes	No
Suffix	String of characters in double quotation marks (“”)	Appended to username to match a user to a particular user entry. Used primarily for DEFAULT entries.	Yes	No
Group	String of characters in double quotation marks (“”)	List of users—group members—that user must match.	Yes	No
NAS-IP-Address	IP address	PortMaster’s IP address.	Yes	No
NAS-Port	Number	The PortMaster port number that the user is dialed in to (for example, 2 = S2).	Yes	No
NAS-Port-Type	ISDN	ISDN port.	Yes	No
	Async	Asynchronous port.	Yes	No
	Sync	Synchronous port.	Yes	No
	ISDN-V120	ISDN in V.120 mode.	Yes	No
	ISDN-V110	ISDN in V.110 mode.	Yes	No
Service-Type	Login-User	User connects via Telnet, Rlogin, PortMaster, or TCP-Clear login service.	No	Yes

Table 4-4 User Entry Check and Reply Items *(Continued)*

Item	**Options**	**Explanation**	**Can be Used as Check item?**	**Can be Used as Reply item?**
	Framed-User	User uses PPP or SLIP for the connection.	Yes	Yes
Service-Type	Outbound-User	User uses Telnet for outbound connections.	Yes	Yes
	Callback-Login-User	Calls user back and connects via Telnet, rlogin, PortMaster, or TCP-Clear login service.	No	Yes
	Callback-Framed-User	Calls user back and establishes a framed connection (PPP or SLIP).	No	Yes
	Administrative-User	Grants user full access to all configuration commands.	No	Yes
	NAS-Prompt-User	Grants user limited access to commands (nonconfiguration only).	No	Yes
Login-Service	Telnet	Establishes a Telnet connection to the remote host.	No	Yes
	Rlogin	Establishes an rlogin connection to the remote host.	No	Yes
	TCP-Clear	Establishes a TCP clear connection to the remote host.	No	Yes

Table 4-4 User Entry Check and Reply Items *(Continued)*

Item	**Options**	**Explanation**	**Can be Used as Check item?**	**Can be Used as Reply item?**
	PortMaster	Establishes a connection to the remote host using the PortMaster login service.	No	Yes
Login-IP-Host	IP address	Address of the remote host.	No	Yes
Login-TCP-Port	TCP port number	TCP port number of the Login-Service.	No	Yes
Framed-Protocol	PPP	PPP is used for the connection.	Yes	Yes
	SLIP	SLIP is used for the connection.	No	Yes
Framed-IP-Address	IP Address	The user's IP address.	No	Yes
Framed-IP-Netmask	Netmask	The user's netmask.	No	Yes
Framed-Route	None	Disables RIP on the interface.	No	Yes
	Broadcast	The interface sends RIP updates.	No	Yes
	Listen	The interface listens to RIP updates.	No	Yes
	Broadcast-Listen	The interface sends and listens to RIP updates.	No	Yes
Filter-Id	Filter name	Filter name to be used for packet or access filtering on the interface.	No	Yes

Table 4-4 User Entry Check and Reply Items *(Continued)*

Item	Options	Explanation	Can be Used as Check item?	Can be Used as Reply item?
Framed-MTU	Number	Number of bytes in maximum transmission unit (MTU).	No	Yes
Framed-Compression	None	If this reply item is omitted, Van Jacobson TCP/IP header compression is used.	No	Yes
	Van-Jacobson-TCP-IP	Van Jacobson TCP/IP header compression is used for the connection. Default.	No	Yes
Reply-Message	Text message in double quotation marks (“ ”)	Displays a message—235 characters maximum—to the user after authentication.	No	Yes
Callback-Number	Phone number in double quotation marks (“ ”)	Specify only for Service-Type = Callback-Login-User.	No	Yes
Callback-Id	Location name in double quotation marks (“ ”)	Specify only for Service-Type = Callback-Framed-User.	No	Yes
Framed-IPX-Network	Dotted decimal IPX network number	IPX network number.	No	Yes
Port-Limit	Number of B channels for ISDN Multilink PPP or multilink V.120	Specifies the number of B channels a user might have.	No	Yes
Session-Timeout	In seconds	Specifies the time limit for a session.	No	Yes

Table 4-4 User Entry Check and Reply Items *(Continued)*

Item	**Options**	**Explanation**	**Can be Used as Check item?**	**Can be Used as Reply item?**
Idle-Timeout	In seconds	Specifies the idle time limit for a session.	No	Yes
Menu	Menu name in double quotation marks (“ ”)	Defines a menu in a user record. See Chapter 5, “Configuring RADIUS Menus.”	No	Yes
Termination-Menu	Menu name in double quotation marks (“ ”)	Menu to display after service is terminated. This item can be set only in a menu.	No	Yes

Examples

User entries can be configured in a number of ways to fit network security requirements. The following examples illustrate a series of typical RADIUS user entries.

PPP User Entry

This example illustrates a typical RADIUS entry for a PPP user.

```
bob     Password = “ge55gep”
        Service-Type = Framed-User,
        Framed-Protocol = PPP,
        Framed-IP-Address = 255.255.255.254,
        Framed-Routing = None,
        Framed-Compression = Van-Jacobson-TCP-IP,
        Framed-MTU = 1500,
        Filter-Id = “firewall”
```

In this example, user *bob* has password **ge55gep**. He is a Framed-User, which indicates that he uses SLIP or PPP for his connections. The following line, **Framed-Protocol**, specifies PPP.

An IP address of 255.255.255.254 is specified, indicating that an IP address is assigned to *bob* from the PortMaster assigned address pool.

Note – To create an assigned address pool, see the *Configuration Guide for PortMaster Products*.

Framed-Routing is set to **None**, which disables RIP for *bob*’s interface. RIP packets are not sent or listened for. Van Jacobson TCP/IP compression is used for the connection, and the MTU is set to 1500 bytes.

The Filter-Id identifies the packet filter used for the connection; if they exist on the PortMaster, **firewall.in** is used as an input filter and **firewall.out** is used as an output filter.

Using Prefixes or Suffixes

Creating multiple DEFAULT entries can eliminate the time required to create multiple accounts for users. Users prepend or append the prefix or suffix to their username when they attempt to log in to the PortMaster; the RADIUS server uses these prefixes and suffixes to match the user to the corresponding DEFAULT entry.

In the following example, the users file contains four DEFAULT entries—one entry each for PPP, SLIP, CSLIP, and Telnet users:

```
DEFAULT1   Auth-Type = System, Prefix = “P”
           Service-Type = Framed-User,
           Framed-Protocol = PPP,
           Framed-IP-Address = 255.255.255.254,
           Framed-Routing = None,
           Filter-Id = “firewall”,
           Framed-MTU = 1500

DEFAULT2   Auth-Type = System, Prefix = “S”
           Service-Type = Framed-User,
           Framed-Protocol = SLIP,
           Framed-IP-Address = 255.255.255.254,
           Framed-Compression = None

DEFAULT3   Auth-Type = System, Prefix = “C”
           Service-Type = Framed-User,
           Framed-Protocol = CSLIP,
           Framed-IP-Address = 255.255.255.254,
           Framed-Compression = Van-Jacobson-TCP-IP

DEFAULT4   Auth-Type = System
           Service-Type = Login-User,
           Login-IP-Host = 172.16.1.4,
           Login-Service = Telnet
```

If user *bob* enters **Pbob** as his username, he is authenticated as a PPP user. If he enters **bob** as a username, he is authenticated as a Telnet user. If he enters **Sbob** as a username, he is authenticated as a SLIP user.

Configuring RADIUS Menus 5

RADIUS menus allow a user to select different login options after being authenticated. Menus allow a user with several different account types to select different options without reconnecting.

How Menus Work

RADIUS menus are implemented as text files located in the **/etc/raddb/menus** (UNIX) or **\etc\raddb\menus** (Windows NT) directory on the RADIUS server. The number of menu files under the **menus** directory is unlimited. A menu file can accommodate up to 2KB of data. A menu can refer to other menus or be a single-level menu.

Menu File Format

Menu files contain the **menu** and **end** keywords, each on a separate line, to indicate the start and end of the text displayed to the user. Text between the **menu** and **end** keywords can be any printable, nonspace, ASCII characters. The text in the menu file is case-sensitive.

Each menu selection entry consists of the menu choice shown at the beginning of a line, followed by one or more lines of reply items—one per line—starting with spaces or tabs. You can enter comments among the menu selection entries by starting each comment line with a number sign (#).

The special menu choice DEFAULT must be the last menu selection entry. The DEFAULT menu is called when the user enters no choice or a choice that does not match a menu selection entry in the menu file.

Use the special menu choice EXIT for a menu selection—such as “Quit”—that disconnects the user.

Refer to “Single-Level Menu” on page 5-3 and “Nested Menus” on page 5-4 for menu file examples.

Menus Called by Reference

Any user entry in the **users** file—including the DEFAULT entry—can call a menu by reference. The Menu reply item is the only reply item in the user entry when a menu is referenced.

```
DEFAULT     Auth-Type = System
            Menu = “menu1”
```

In the above example, after user *bob* is authenticated, the **menu1** menu is displayed and he is prompted to make a selection. When *bob* selects a menu option, the corresponding service is provided.

Menu Filenames

You must create the menu filename under the **/etc/raddb/menus** (UNIX) or **\etc\raddb\menus** (Windows NT) directory of the RADIUS server. Menu names can consist of up to 120 printable, nonspace, ASCII characters and must be enclosed in double quotation marks (“ ”).

Single-Level Menu

A single-level menu does not reference other menus. An example menu file named **/etc/raddb/menus/menu1** is displayed below.

```
menu
        *** Welcome to EDU OnLine ***
Please select an option:

        1.  Start CSLIP session
        2.  Start PPP Session
        3.  Quit

        Option:
end
1
        Service-Type = Framed-User,
        Framed-Protocol = SLIP,
        Framed-IP-Address = 255.255.255.254,
        Framed-Routing = None,
        Framed-MTU = 1006,
        Termination-Menu = “menu1”
#
2
        Service-Type = Framed-User,
        Framed-Protocol = PPP,
        Framed-IP-Address = 255.255.255.254,
        Framed-Routing = None,
        Termination-Menu = “menu1”
#
3
        Menu = “EXIT”
#
DEFAULT
        Menu = “menu1”
```

In this example, after RADIUS authenticates the user, **menu1** is displayed and the user is prompted to select a service from this menu. Once the user has finished the SLIP or PPP session, the termination menu is displayed and the user is prompted to select a new service. If a Termination-Menu is not included in the reply items, the user is disconnected immediately after the SLIP or PPP session.

Nested Menus

Nested menus refer to other menus. In the example menu file below, the menu has an **other** option; if a user chooses this option, a second menu is displayed.

```
menu
*** Welcome to the Internet Service ***
Please enter an option:
        ppp - Start PPP session
        telnet - Begin login session with a host
        other - Display a second menu
Option:
end
ppp
        Service-Type = Framed-User
        Framed-Protocol = PPP,
        Framed-IP-Address = 255.255.255.254,
        Framed-Routing = None,
        Framed-MTU = 1500
#
telnet
        Service-Type = Login-User,
        Login-IP-Host = 172.16.1.81,
        Login-Service = Telnet,
        Login-TCP-Port = 23
#
other
        Menu = “menu3”
#
DEFAULT
        Menu = “menu2”
```

Installing and Configuring SecurID 6

This chapter is an overview of the installation and configuration of SecurID when used with RADIUS. This chapter is applicable only to UNIX versions of the RADIUS server.

This information is intended to serve as a quick reference guide for the ACE/Server and ACE/Client software. Refer to the Security Dynamics manual set for future ACE/Server software releases and detailed features of SecurID.

Note – Livingston Technical Support does not provide support for the ACE/Server and ACE/Client installation and configuration. Contact Security Dynamics Technical Support at (617) 547-7820. Livingston Technical Support provides support for RADIUS when used with SecurID only after the **sdshell** utility has verified that the ACE/Server is working properly.

The ACE/Server and ACE/Client software version 2.1.1 is supported on the following platforms:

- SunOS version 4.1.4 on a Sun SPARCstation
- Sun Solaris version 2.5 on a Sun SPARCstation
- HP-UX version 10.01 on a Hewlett-Packard HP 9000 Series 7*xx* or 8*xx*
- AIX version 3.2.5 on an IBM RISC System/6000

Overview of SecurID Components

The Security Dynamics authentication system (generally referred to as SecurID) consists of the following components:

- ACE/Server authentication server

  Stores usernames and serial numbers of tokens and performs calculations to verify the identity of users.

- ACE/Server client

  Machine generating the SecurID authentication attempt.

- Token

  A small, handheld device that generates a random number. A new number is generated and displayed every 60 seconds.

  There are three types of tokens supported in SecurID: the standard SecurID card, the SecurID Key Fob, and the SecurID PINPAD.

- PASSCODE

  A two-part password, consisting of a memorized personal identification number (PIN) followed by the current number displayed on the token.

Note – To use RADIUS with SecurID, you must run the ACE/Server software on the same host as the RADIUS server. If the ACE/Server software is installed on a different machine, then the RADIUS server must be an ACE/Server slave.

How SecurID Works with RADIUS

When SecurID is used with RADIUS, a connection proceeds as follows:

1. A remote user initiates a connection by dialing in to the PortMaster.
2. The PortMaster prompts for the user's username and password.
3. The user enters a username. At the password prompt, the user enters a PASSCODE (PIN followed by the currently displayed number on the token).
4. The PortMaster forwards this information to the RADIUS server for authentication.
5. The RADIUS server examines the user file, scanning for the appropriate username. When the entry is located, it is examined to determine the user's authentication method.
6. When the RADIUS server discovers that the authentication method is SecurID, it forwards the username and PASSCODE to the ACE/Server for authentication.
7. The ACE/Server examines its database for the username and serial number of the user's token. It uses the serial number to verify the PASSCODE entered by the user. It also verifies that the time on the token is synchronized with the ACE/Server.

8. The ACE/Server sends the result of the database lookup (identity verified or not verified) to the RADIUS server.
9. If the user's identity was verified by the ACE/Server, the RADIUS server sends an access-accept message to the PortMaster along with the additional information from the RADIUS user entry. If the ACE/Server rejected the user's PASSCODE, the RADIUS server sends an access-reject message to the PortMaster.

SecurID Installation

The SecurID software package consists of a number of applications and utilities. This section covers the installation and use of two components, Progress and ACE/Server, and two utilities, **sdshell** and **sdadmin**.

SecurID software is not shipped with the PortMaster. This software must be ordered directly from Security Dynamics at (617) 547-7820.

Progress

Progress is an application development environment; you must install this software before you install any additional SecurID software. To run Progress software with ACE/Server version 2.1.1, the Progress software version must be V7.3C01 or later.

Progress requires serial and control numbers for installation. Have these numbers available before beginning the installation.

To install Progress, follow the instructions in the *Progress Installation Notes* shipped with the Progress software. Note that Progress installs its software using the **proinst** utility, which must be run in an xterm window. To display an xterm on SunOS or Solaris, use the following command:

```
/usr/openwin/bin/xterm &
```

ACE/Server

The RADIUS 2.0 server is compatible with ACE/Server version 1.3 or higher. To install ACE/Server and ACE/Server client, complete the following steps:

1. **Log in as root.**
2. **Read the ACE/Server tape in to the ace_install directory of the ACE/Server machine.**

   ACE/Server installs its software using the **sdsetup** utility.

3. **If you are installing ACE/Server 2.0.1 on SunOS 4.1.4 or Solaris 2.5, modify the check_os_version subroutine of sdsetup to add the 4.1.4 or 2.5 string.**

   If the appropriate string is not added, **sdsetup** stops and displays an “unsupported OS” message.

   Change the **check_os_version** subroutine of **sdsetup** to contain the following lines:

```
case “$SUN_OS” in
‘4.1.3’ | ‘4.1.4’ ) VALID_OS=TRUE;;
      *     ) VALID_OS=FALSE;;

case “$SOL_OS” in
‘5.3’ | ‘5.4’ | ‘5.5’ ) VALID_OS=TRUE;;
      *     ) VALID_OS=FALSE;;
```

4. **Run sdsetup to install ACE/Server.**

Caution – sdsetup cannot be run while the **sdconnect** process or **aceserver** daemon are running. Stop these processes before attempting to run sdsetup.

```
ace_install/sdsetup
```

The ACE/Server software is typically installed on the same machine as the RADIUS server. To run ACE/Server on a different machine, you must configure the RADIUS server as an ACE/Server slave. See the *ACE/Server Installation and Configuration Guide* from Security Dynamics for instructions on configuring the ACE/Server Slave.

5. **The sdsetup utility stops during the installation; at this point, add the SecurID UDP port number to the /etc/services file as follows:**

```
securid      5500/udp                      #ACE/Server
securidprop  5100/udp                      #ACE/Server Slave
```

To configure a slave server in addition to a master server, add the **securidprop** entry. If you are using NIS or NIS+, add these entries to the services NIS map on your NIS master and push the maps.

Note – Pushing the maps updates the database to include recently entered information. Use the **make services** command on the NIS master. For more details, consult your UNIX system documentation.

6. **Continue sdsetup to install the ACE/Server client software.**

Complete instructions are given in Part 2 of the *ACE/Server Installation and Configuration Guide*.

sdadmin

sdadmin is an ACE/Server administration utility. Using **sdadmin**, you can add and delete users, assign PINs and tokens, and monitor network activity. You can run **sdadmin** in GUI (the default) or character mode.

To use **sdadmin**, complete the following steps:

1. **Ensure that you are in the directory that contains the ACE/Server files. By default, ACE/Server software is installed in the /usr/ace directory.**
2. **Start the database broker (sdconnect) as root.**

```
/usr/ace/sdconnect start
```

To stop the database broker, use the **sdconnect stop** command.

3. **Start the ACE/Server daemon using the following command:**

```
/usr/ace/aceserver start
```

To stop ACE/Server, use the **aceserver stop** command.

4. **To automatically start the ACE/Server processes (sdconnect and aceserver) after the host is rebooted, add the following lines to /etc/rc.local or equivalent boot file of your UNIX system:**

```
if [ -x /usr/ace/aceserver ]; then
        /usr/ace/aceserver stop
        /usr/ace/sdconnect stop
        /usr/ace/sdconnect start
        /usr/ace/aceserver start
else
        echo “Cannot start aceserver”
fi
```

5. **Launch sdadmin in GUI or character mode.**

Character mode requires the use of the **-c** switch, shown below.

```
/usr/ace/sdadmin &
or
/usr/ace/sdadmin -c &
```

To run **sdadmin** in GUI mode, the host’s window environment must be an implementation of X11R5 or later. If you are running SunOS on a SPARCstation, Sun OpenWindows is an X11R4 implementation, and you must therefore install the X11R5 kit shipped with the ACE/Server software. See Part 1 of the *ACE/Server Installation and Configuration Guide* for instructions.

6. **Using the instructions in the** *ACE/Server Administration Manual***, add users to the database, activate users on the client, and assign tokens to the users.**

7. **Choose a method of PIN assignment using the instructions for pin administration in the** *ACE/Server Administration Manual***.**

   Note that you can assign PINs using RADIUS.

sdshell

sdshell is an ACE/Server client utility used to assign new PINs to users. You can also use it as a troubleshooting method to verify ACE/Server client/server communication before configuring RADIUS.

To run **sdshell**, you must also have the **sdconnect** and **aceserver** daemons running.

To use **sdshell**, assign tokens to each user (see “sdadmin” on page 6-5) and instruct a user to log in to his or her account and run **sdshell**. **sdshell** runs through a PIN assignment sequence, as displayed in the example on the next page.

Instruct the user to enter a new PIN or press **Return** to have a PIN automatically generated. You must configure the user-generated PIN or system-generated PIN for the user when adding the user to the ACE/Server database.

```
% sdshell
Enter PASSCODE:

Enter your new PIN, containing 4 to 8 digits,
        or
Return to generate a new PIN and display it on the screen,
        or
Ctrl d to cancel the new PIN procedure:

Please re-enter new PIN:

Wait for the code on your token to change, then log in with the new PIN

Enter PASSCODE:
PASSCODE Accepted
```

The PIN options in **sdshell** (user-selected or system-generated) might vary, depending on how the PIN mode is configured. See the PIN administration information in the *ACE/Server Administration Manual* for configuration instructions.

If the user's new PASSCODE is accepted, communication between the ACE/Server client and server is successful. Proceed to the next section, "RADIUS Configuration."

Note – Livingston Technical Support does not provide support for the ACE/Server and ACE/Client installation and configuration problems. Contact Security Dynamics Technical Support at (617) 547-7820. Livingston Technical Support provides support for RADIUS when used in conjunction with SecurID only after the **sdshell** utility has verified that the ACE/Server is working properly.

RADIUS Configuration

Each SecurID user must have an entry in the RADIUS **users** file or must use a DEFAULT entry. In the entry, the Auth-Type check item must be **SecurID**, as shown in the following example:

```
DEFAULT    Auth-Type = SecurID
           Service-Type = Framed-User,
           Framed-Protocol = PPP,
           Framed-Address = 255.255.255.254,
           Framed-Routing = None,
           Framed-MTU = 1500
```

Use the **sdadmin** utility, as discussed under "sdadmin" on page 6-5, to activate and assign tokens to users authenticated with this DEFAULT entry.

When user *bob* dials in to the PortMaster, the following prompts are displayed:

```
login: <enter username>
Password: <enter PIN number followed by a token code>
```

New PIN Assignment Using RADIUS

When a new user is added to the ACE/Server database, a token is assigned to the user. If the token does not have a PIN number, the user is put in a New PIN mode by the ACE/Server during the first connection attempt. To be authenticated in this mode, the user must select a PIN number.

You can force users in to New PIN mode by the ACE administrator if he or she has forgotten the PIN number or an attacker has learned the PIN number.

A New PIN mode user can assign the PIN number using RADIUS when he is dialing in to the network. Refer to information on pin administration in the *ACE/Server Administration Manual* for more information on New PIN mode.

User-Generated PIN

When a user in New PIN mode is forced to create a PIN number via RADIUS, the “New PIN required” prompt appears to instruct the user to enter a PIN number.

```
login: bob
Password: <token code>
New PIN required: 1234
```

In the above example, when user *bob* dials in to the network, he enters his login name at the login prompt. At the “Password” prompt, he enters the token code number, and the PortMaster sends an access-request to the RADIUS server. The ACE/Server searches its database and recognizes user *bob* as a new PIN mode user. It sends an access-challenge to the PortMaster, and the “New PIN required” prompt is displayed prompting *bob* to enter a PIN number.

After *bob* enters his PIN number, the RADIUS server responds with the following message:

```
New PIN Accepted:  Wait for the next card code to login
Password:
```

In the subsequent login, at the “Password” prompt, *bob*’s password will be a PIN number followed by a token code.

System-Generated PIN

The ACE/Server provides a system-generated PIN using the **sdshell** utility as described on page 6-7. **sdshell** displays the number on the screen for the user to memorize.

Note – sdshell displays the system-generated PIN for only 10 seconds. After the PIN number disappears, it cannot be viewed again.

When dialing in to the network, the user enters his system-generated PIN at the “New PIN required” prompt.

Next Cardcode

If a user enters a valid PIN and an invalid token code, the “Next Cardcode” prompt is displayed. This prompt also appears if the user’s token is not synchronized with the ACE/Server.

If an authorized user’s token is not synchronized with the ACE/Server, the user must wait until the token code changes and then enter the new token code number at the Next Cardcode prompt. After the system verifies the second token code, the user is authenticated.

If an unauthorized user enters a stolen PIN followed by a guessed token code, he is given three opportunities to enter the correct token code. If three invalid token codes are entered, the unauthorized user is disconnected.

```
login: bob
Password: <PIN number followed by invalid token code>
Next Cardcode:
```

In the above example, *bob* has entered a valid PIN number followed by an invalid token code. The “Next Cardcode” prompt appears, indicating that *bob*’s token is not synchronized with the ACE/Server. *Bob* must wait for 60 seconds for a new token code and then must enter this code at the “Next Cardcode” prompt.

Troubleshooting SecurID

Progress version V7.3C01 has some known bugs that might cause problems during SecurID installation. This section covers the three bugs that you are most likely to encounter and suggests solutions for them. If you still have problems after trying these solutions, contact Security Dynamics Technical Support at (617) 547-7820.

sdadmin Cannot Find First Token

When **sdadmin** is launched for the first time, the error message “cannot find first token, database may be empty” appears. To correct this problem, complete the following steps:

1. **Log in as root.**
2. **Run sdnewdb, located in the /usr/ace directory:**

```
/usr/ace/sdnewdb
```

3. **Choose the Select All option to create a new server and log databases.**
4. **Run the sdimport utility to read the serial numbers of the tokens into the database.**

   Each batch of tokens from Security Dynamics is accompanied by a file. The filename consists of a 6-digit number and the **.asc** suffix.

```
/usr/ace/sdimport filename.asc
```

5. **Relaunch sdadmin using either of the following commands:**

```
/usr/ace/sdadmin &
or
/usr/ace/sdadmin -c &
```

sdserv.bi and sdlog.bi Consume Too Much Disk Space

The **sdserv.bi** and **sdlog.bi** files (located in the **/usr/ace** directory) occasionally need to be truncated. If they are not truncated, they might consume too much disk space and cause problems for the ACE/Server database. To truncate these files, use the following commands:

```
/usr/dlc/bin/_proutil -c truncate sdserv.bi
/usr/dlc/bin/_proutil -c truncate sdlog.bi
```

sdadmin Runs out of Memory

When **sdadmin** is executed on Solaris 2.4 or HP-UX 9.03 hosts, an “out of memory” message is displayed. To correct this problem, complete the following steps:

1. **Add the kernel parameters shown in the following example to the /etc/system file on the ACE/Server host.**

```
set semsys:seminfo_semmni=64
set semsys:seminfo_semmns=200
set semsys:seminfo_semmnu=100
set semsys:seminfo_semmsl=50

set shmsys:shminfo_shmmax=16777216
set shmsys:shminfo_shmmni=100
set shmsys:shminfo_shmseg=16
```

2. **Reboot the host using the following command**:

```
reboot -rv
```

Implementing RADIUS Accounting 7

RADIUS accounting logs information about dial-in connections. This information is often used for billing purposes. RADIUS accounting consists of a client/server format; as transactions occur, they are recorded in a file named **radacct/***portmastername***/detail** (UNIX) or **radacct\***portmastername***\\detail** (Windows NT) on the RADIUS accounting server.

How RADIUS Accounting Works

RADIUS accounting consists of an accounting server and accounting clients (PortMaster products). The **radiusd** daemon for accounting is a child process of the **radiusd** authentication daemon; it starts automatically when **radiusd** is executed.

The RADIUS accounting server uses the UDP protocol, and listens for UDP packets at port 1646.

RADIUS accounting consists of the following steps:

1. The PortMaster (accounting client) sends an **accounting-request** packet containing the record of an event to the accounting server.
2. The accounting server sends an **accounting-response** packet back to the PortMaster to acknowledge receipt of the request.
3. If the PortMaster does not receive a response, it continues to send accounting-requests until it receives a response.

   A backoff algorithm is used to determine the delay between accounting-requests if an accounting-response is not received.

4. The PortMaster records the number of seconds that have passed between the event and the current attempt to send the record; this number is the **Acct-Delay-Time** value. As additional time passes before an accounting-response is received, the Acct-Delay-Time is updated.

5. When the user is connected, a Start accounting record is recorded in a file called **/usr/adm/radacct/***portmastername***/detail** (UNIX) or **\usr\adm\radacct\***portmastername***\detail** (Windows NT) on the accounting server.

   The Start record typically contains the Session-Id, the User-Name, Service-Type, Login-Service, Login-IP-Host, Acct-Delay-Time, and other relevant information from a user's entry in the users file.

Note – When the user is disconnected, a Stop record is generated. This record contains the same information as the Start record; however, it also includes **Acct-Session-Time**, which records the time (in seconds) of a user's session.

Getting Started

Select a host to use as the RADIUS accounting server. This host can be the same host as the RADIUS server used for authentication or a separate host.

Choose a host with the following characteristics:

- Secure physical location
- Root access limited to the security officer or system administrator
- Limited number of user accounts—preferably none
- Basic memory
- Enough disk space to store the RADIUS accounting **detail** files

  For typical installations, allocate 50MB per 1000 users if the logs are rotated monthly. Keep in mind that it is much better to allocate too much space than too little; your usage may vary.

  For example, if you have 1000 users, one port for every 10 users, an average connection time per user of 1 hour, and all ports in use around the clock, one month of logs would require 50MB of disk space:

```
700 bytes/session * 1000 users * 1 port/10 users * 1 session/hour * 24 hours/day * 30 days/month
```

Livingston recommends the use of a secondary RADIUS accounting server. The primary accounting server is always used first; if this server is unavailable, the secondary server is used.

Client Configuration

To configure RADIUS accounting information on a PortMaster, see Chapter 3, “Configuring a RADIUS Client.”

Server Configuration

Note – This section applies to UNIX hosts only. For RADIUS NT server configuration instructions, see “Installing RADIUS on a Windows NT Host” on page 2-7.

To install the RADIUS accounting server, log in to the selected accounting server as root. Create a **radacct** directory within the **/usr/adm** directory.

```
mkdir /usr/adm/radacct
chmod 700 /usr/adm/radacct
```

RADIUS accounting automatically creates subdirectories within the **/usr/adm/radacct** directory for each PortMaster serving as a RADIUS accounting client and logs the accounting start and stop records to the **detail** file in the directory.

Customizing RADIUS Accounting

Note – This section applies to UNIX hosts only. For RADIUS NT customization instructions, see “Installing RADIUS on a Windows NT Host” on page 2-7.

UNIX flags associated with the parent **radiusd** are described in Table 2-1 on page 2-6.

The **radiusd** accounting daemon may also be used with the flags shown in Table 7-1.

Table 7-1 **radiusd** Accounting Daemon Flags

Flag	Purpose
-a	Specifies an alternate directory for RADIUS accounting logs. The default directory is **/usr/adm/radacct**.
-v	Displays the RADIUS version number without starting the **radiusd** daemon. This flag also applies to the RADIUS authentication server; the RADIUS authentication and accounting servers have the same version number.

Accounting Attributes

For RADIUS accounting to function, a series of accounting attributes are defined in the **dictionary** file on the RADIUS server and appear in the Start and Stop accounting records. Use the following descriptions to help you interpret Start and Stop records.

Acct-Status-Type

Acct-Status-Type has two values: **Start** and **Stop**. A Start record is created when a user session begins. A Stop record is recorded when the session ends.

Acct-Delay-Time

The PortMaster records the number of seconds that have passed between the event and the current attempt to send the record; this number is the **Acct-Delay-Time** value.

You can determine the approximate time of an event by subtracting the Acct-Delay-Time value from the time of the record’s arrival on the RADIUS accounting server.

Acct-Session-Id

Acct-Session-Id is a unique number assigned to each Start and Stop record to make it easy to match the Start and Stop records in a detail file, and to eliminate duplicate records.

The Acct-Session-Id is a string consisting of eight uppercase hexadecimal digits. The first two digits increment each time the PortMaster is rebooted. The next six digits begin at 0 (for the first user login after a reboot) and increment up to approximately 16 million logins. This is equal to one user logging in to each port of a 30-port unit every minute for an entire year.

Acct-Authentic

Acct-Authentic records whether the user was authenticated via RADIUS or by the PortMaster User Table. Accounting records are not generated for passthrough users, because those users are authenticated by the destination host.

Acct-Session-Time

Acct-Session-Time records the user’s connection time in seconds. This information is included only in Stop records.

NAS-Port-Type

NAS-Port-Type records the type of port used in the connection. The port type can be any of the following: Async, Sync, ISDN, ISDN-V120, or ISDN-V110.

Acct-Input-Octets and Acct-Output-Octets

Acct-Input-Octets records the number of bytes received and **Acct-Output-Octets** records the number sent during a session. These values appear only in Stop records.

Called-Station-Id and Calling-Station-Id

Called-Station-Id and **Calling-Station-Id** record the called and calling numbers. This information is recorded when the NAS-Port-Type is ISDN, ISDN-V120, or ISDN-V110 where supported by the local telephone company. On the PortMaster 3, this information is available for asynchronous calls as well, where supported by the local telephone company.

Timestamp

Timestamp records the time of arrival on the RADIUS Accounting host measured in seconds since the epoch (00:00 January 1, 1970).

This attribute provides a machine-friendly version of the logging time at the beginning of the accounting record. To find the actual time of the event, subtract Acct-Delay-Time from Timestamp.

Request-Authenticator

The **Request-Authenticator** attribute appears in an accounting record only when the RADIUS 2.0 server detects a problem with the accounting request's digital signature.

A Request-Authenticator of **None** means that the accounting request was not digitally signed, and was probably sent by a PortMaster running a version of ComOS that did not sign accounting packets. If the Request-Authenticator value is **Unverified**, the accounting request signature did not match the expected value. Ensure that the shared secret on the PortMaster matches the shared secret in the **/etc/raddb/clients** (UNIX) or **\etc\raddb\clients** (Windows NT) file.

Acct-Terminate-Cause

Acct-Terminate-Cause, shown in Table 7-1, indicates the cause of a session's termination. This information appears only in Stop records.

Table 7-2 Session Termination Causes

Termination Cause	**Meaning**
Admin-Reset	Port was reset by an administrator.
Host-Request	Session was disconnected or logged out by the Login-IP-Host. This attribute value can indicate normal termination of a login session, or that the remote host has crashed or become unreachable.
Idle-Timeout	Idle timer expired for user or port.

Table 7-2 Session Termination Causes *(Continued)*

Termination Cause	**Meaning**
Lost-Carrier	Session terminated when the modem dropped DCD. This value can indicate any of the following: • The user or his modem hung up the phone from their end (in which case there is no problem). • The line was dropped. • The line took a noise hit too severe for the modem to recover from. • The local modem dropped DCD for some other reason.
Port-Error	PortMaster had to reset the port. This error commonly occurs when a device attached to the port caused too many interrupts.
Session-Timeout	Session timer expired for user.
User-Error	PortMaster received a PPP Configuration Request or ACK when a session was already established, so it terminated the session. This error is caused by a PPP implementation error in the dial-in client.
User-Request	Dial-in PPP client requested that the PortMaster terminate the connection. This message is expected from a proper PPP client termination.

Examples

The following example displays Start and Stop accounting records in a PortMaster detail file.

```
Tue Jul 30 14:48:18 1996
        Acct-Session-Id = “35000004”
        User-Name = “bob”
        NAS-IP-Address = 172.16.64.91
        NAS-Port = 1
        NAS-Port-Type = Async
        Acct-Status-Type = Start
        Acct-Authentic = RADIUS
        Service-Type = Login-User
        Login-Service = Telnet
        Login-IP-Host = 172.16.64.25
        Acct-Delay-Time = 0
        Timestamp = 838763298

Tue Jul 30 14:48:39 1996
        Acct-Session-Id = “35000004”
        User-Name = “bob”
        NAS-IP-Address = 172.16.64.91
        NAS-Port = 1
        NAS-Port-Type = Async
        Acct-Status-Type = Stop
        Acct-Session-Time = 21
        Acct-Authentic = RADIUS
        Acct-Input-Octets = 22
        Acct-Output-Octets = 187
        Acct-Terminate-Cause = Host-Request
        Service-Type = Login-User
        Login-Service = Telnet
        Login-IP-Host = 172.16.64.25
        Acct-Delay-Time = 0
        Timestamp = 838763319
```

The Acct-Status-Type attribute in the record indicates whether the record was sent when the connection began (Start) or when it ended (Stop). In the Start record above, the Acct-Session-Id is listed at the beginning of the record. Note that this value matches the Acct-Session-Id of the Stop record, indicating that these records correspond to the same session.

User-Name specifies the username, in this case, *bob*. NAS-IP-Address specifies the IP address of the PortMaster. NAS-Port-Type specifies that this is an asynchronous connection. Acct-Authentic specifies that *bob* is authenticated via RADIUS. Service-Type and Login-Service specify that *bob* is a login user using Telnet. Login-IP-Host specifies the host that user *bob* logged in to.

In the Stop accounting record, Acct-Session-Time specifies that *bob*'s connection lasted 21 seconds. Acct-Input-Octets indicates that 22 bytes of incoming traffic were received; Acct-Output-Octets indicates that 187 bytes of outgoing traffic were sent.

The Acct-Terminate-Cause indicates that a Host-Request terminated the session, meaning that *bob* logged out of the host or that the host logged him out.
The Acct-Delay-Time is 0 seconds, indicating that the RADIUS accounting server received the accounting-request on the first try.

For more information on accounting attributes, see “Accounting Attributes” on page 7-4.

The following example displays Start and Stop accounting records for an ISDN PPP connection.

```
Wed May 8 10:51:12 1996
        Acct-Session-Id = “2400020E”
        User-Name = “Pbob”
        NAS-IP-Address = 172.16.1.21
        NAS-Port = 12
        NAS-Port-Type = ISDN
        Acct-Status-Type = Start
        Acct-Authentic = RADIUS
        Called-Station-Id = “5551111”
        Calling-Station-Id = “5105552222”
        Service-Type = Framed-User
        Framed-Protocol = PPP
        Framed-Address = 172.16.93.1
        Acct-Delay-Time = 0
        Timestamp = 838763356

Wed May 8 12:50:49 1996
        Acct-Session-Id = “2400020E”
        User-Name = “Pbob”
        NAS-IP-Address = 172.16.1.21
        NAS-Port = 12
        NAS-Port-Type = ISDN
        Acct-Status-Type = Stop
        Acct-Session-Time = 7177
        Acct-Authentic = RADIUS
        Acct-Input-Octets = 14994
        Acct-Output-Octets = 90862
        Called-Station-Id = “5551111”
        Calling-Station-Id = “5105552222”
        Service-Type = Framed-User
        Framed-Protocol = PPP
        Framed-Address = 172.16.93.1
        Acct-Delay-Time = 0
        Timestamp = 838763378
```

In the Start record of the example above, the NAS-Port-Type specifies that the user Pbob is using ISDN for his connection. Called-Station-Id and Calling-Station-Id specify the source and destination of the ISDN call. Service-Type and Framed-Protocol indicate that user Pbob is a framed user using PPP to establish the connection.

The Stop record in this example indicates that the login time for user *bob* was 7177 seconds or 1 hour, 59 minutes, and 37 seconds. The Acct-Input-Octets and Acct-Output-Octets indicate that the incoming traffic for this session was 14994 bytes, and outgoing traffic was 90862 bytes.

Note – Examples of PERL scripts to process the RADIUS accounting logs are available at Livingston’s FTP site at **ftp://ftp.livingston.com/pub/le/radius/**.

Troubleshooting RADIUS A

This appendix provides hints and tips for troubleshooting the RADIUS authentication server and the RADIUS accounting server.

Troubleshooting RADIUS Authentication

Most RADIUS authentication problems occur because the server or client was not configured correctly, or because a step was omitted during installation. Carefully check the instructions in Chapter 2, “Configuring a RADIUS Server,” and Chapter 3, “Configuring a RADIUS Client,” to ensure that the authentication server was properly installed and configured.

If you have not solved the problem after reviewing the instructions in Chapter 2 and Chapter 3, read the troubleshooting suggestions in this section.

Checking the radiusd Daemon (UNIX RADIUS)

1. **Use radiusd -v command to display the version number**:
2. **Make sure /etc/radiusd is running.**
3. **Make sure in the /etc/raddb directory (or wherever you specify with the -d flag) that you have the following files: dictionary, users, and clients.**

   If you are using RADIUS menus, check the **menus** subdirectory.

4. **Use radiusd -x to view incoming and outgoing packets from RADIUS.**

Checking the RADIUS NT Service (RADIUS NT)

1. **Go to the Services applet and ensure that RADIUS NT has been installed and is started.**
2. **Ensure that the buttons and the description in the RADIUS NT Control Panel state that RADIUS NT is currently running.**

Checking the PortMaster

1. **Make sure that the RADIUS server is reachable from the PortMaster.**
2. **Make sure that security is on for each port:**

   ```
   Command> set all security on
   Command> save all
   Command> reset all
   ```

   When security is on, the **show** *S0* command displays **(Security)** in the Port Type field of its output.

3. **Use the show global command to ensure that the RADIUS server IP address is set on the PortMaster.**
4. **Make sure the secret set on the PortMaster using the set secret** *password* **command matches the secret in the /etc/raddb/clients file on the RADIUS server.**

   The PortMaster will not display the shared secret; however, you can set the secret again if you are not sure that it is set properly. If you update the shared secret, make sure to use the **save all** command to save the shared secret in the PortMaster nonvolatile memory.

Checking /etc/raddb/users

1. **Items in the user entries are case-sensitive. You must do the following:**

   a. Verify the spelling and capitalization of each line of the users file.

   b. Compare keywords against the **/etc/raddb/dictionary** file to ensure that they are the same.

2. **Verify that the user can authenticate with a clear text password before authenticating with Auth-Type = System or Auth-Type = SecurID.**

Host Unavailable

If a "Host Unavailable" message is displayed after a username is entered at the login prompt, security for the port is not enabled and **rlogind** and **in.pmd** are not running on the host configured for that port. The PortMaster is attempting to do a passthrough login to a host that is not prepared to accept it.

To verify that security is not enabled, enter the following command. Replace **s1** with the port that you are using.

```
Command> show s1
```

If **(Security)** is not displayed in the Port Type field, enter the following commands to enabled security for the port:

```
Command> set s1 security on
Command> reset s1
Command> save all
```

Invalid Login after 30-second wait

The PortMaster sends 10 access-requests at 3-second intervals and then displays an “Invalid Login” message. This message can indicate one of the following problems:

- RADIUS is not running on the server. Check to ensure that **/etc/radiusd** or the RADIUS NT service is running.
- The RADIUS server is not defined correctly on the PortMaster. Check the RADIUS server information using the following commands:

  ```
  Command> show global
  Command> show netcon
  ```

- There is no entry for the PortMaster in the **/etc/raddb/clients** file. Verify this condition by doing one of the following:
  - With UNIX versions of RADIUS, run **radiusd -x**.
  - With RADIUS NT, choose **Logging** from the Setup Options menu within the RADIUS NT control panel. Ensure that the **Enable log file for RADIUS messages** option is checked.

  If the debugging output produces 10 access-requests with the same ID, but does not produce a corresponding access-accept or access-reject message, the PortMaster hostname is probably missing or is not defined correctly in the **/etc/raddb/clients** file.

- **radiusd** responses are not getting back to the PortMaster. Examine the routing table on the RADIUS server host, and ping the PortMaster from this host.
- The PortMaster is ignoring **radiusd** responses. This is a relatively rare occurrence, usually caused by one of the following:
  - Multiple IP addresses are assigned to a single Ethernet interface on the RADIUS server host.
  - Multiple Ethernet interfaces are enabled, and the RADIUS server is replying to a request from the PortMaster on a different interface from the interface that received the request.
  - The source of the access-accept or access-reject packet does not match the destination of the access-request packet.

Result of Debugging Output

If debugging output shows more than one access-reject packet sent for the same ID, check the following:

Note – To display debugging output with UNIX versions of RADIUS, run **radiusd -x**. With RADIUS NT, choose **Logging** from the Setup Options menu within the RADIUS NT control panel. Ensure that the **Enable log file for RADIUS messages** option is checked.

1. **Check the route back to the PortMaster; ensure that replies are getting to the PortMaster.**
2. **Check to see if the RADIUS server host has more than one Ethernet port or multiple IP addresses assigned to the same Ethernet interface.**
3. **Check for packet filters between the RADIUS server host and the PortMaster filtering out the RADIUS return packets.**
4. **On the PortMaster, use ptrace to show packets returning from the host running radiusd:**

```
Command> add filter r
Command> set filter r 1 permit udp src eq 1645
Command> set filter r 2 permit icmp
Command> ptrace r
```

Note – ptrace on a PortMaster does not show UDP or ICMP packets generated on the PortMaster itself. Outgoing RADIUS access requests are not shown; however, returning packets are displayed. To turn off tracing, use the **ptrace** command with no arguments.

5. **Check the source address of a packet during tracing.**

   A multihomed RADIUS host might be using the wrong source address when replying to access-request packets.

If debugging output shows an access-reject packet right away, check the following:

1. **Check the spelling of the username and password.**

   The capitalization must match exactly.

2. **Check syslog for errors from radiusd.**
3. **Use the show table user command to verify that the user is not in the PortMaster user table.**

   The local user table is always checked first during authentication attempts.

4. **If Auth-Type = System is not working, attempt to use a clear text password in the user entry.**
5. **If Auth-Type = System is specified on a UNIX system that has shadow passwords, ensure that radiusd is run as root to access the shadow passwords.**
6. **Verify the spelling, capitalization, and syntax of the /etc/raddb/users file.**

   If **radiusd** finds any errors in the user entry, it sends an access-reject message and logs an error to syslog.

7. **Check that the shared secret in /etc/raddb/clients matches the one set on the PortMaster with the set secret command**
8. **If using PMconsole, ensure that the Return key was not pressed when the cursor was in the RADIUS Secret field of the dialog box.**

   Pressing the **Return** key at this point erases the secret when the **Save** button is clicked.

Troubleshooting RADIUS Accounting

Most RADIUS accounting problems occur because a step was skipped during installation. Carefully check the instructions in Chapter 2, “Configuring a RADIUS Server,” and Chapter 3, “Configuring a RADIUS Client,” to ensure that the accounting server was properly installed and configured.

If you have not solved the problem after reviewing the instructions in Chapter 2 and Chapter 3, read the troubleshooting suggestions in this section.

1. **Make sure the /usr/adm/radacct directory exists and that the account used to execute radiusd or the RADIUS NT service has write permission to this directory.**
2. **Check the RADIUS version number to ensure that radiusd is version 1.16 or 2.0:**
   - With UNIX versions of RADIUS, run **radiusd** using the **-v** flag.
   - With RADIUS NT, choose **About RADIUS** from the Help menu within the RADIUS NT Control Panel.
3. **Make sure that you do not have any other process bound to UDP ports 1645 or 1646.**
   - With UNIX versions of RADIUS, kill **radiusd** and use the **netstat -a** command. Start **radiusd** and use the **netstat -a** command again. Note that some UNIX operating systems display the sockets symbolically as **.radius** and **.radacct** rather than .1645 and .1646.
   - With RADIUS NT, start and stop the RADIUS NT service.
4. **Use the show global command to verify that the IP address of the accounting host has been configured on the PortMaster.**

   If it has not been configured, set it using the **set accounting** *IPaddress* command on the PortMaster, where *IPaddress* is the IP address of the host running **radiusd**.

5. **Check syslog (auth.warning) for error messages from radiusd.**

   During normal use, very few error messages should appear.

6. **Ping the PortMaster from the RADIUS server to check connectivity.**
7. **If the previous suggestions do not solve the problem, run radiusd -x on the RADIUS server host and check to determine if accounting records are displayed.**

Index