



# Cable Modem Termination System

Provisioning and Access Manager  
User Guide

Part No. 10038238  
Version Number 1.0





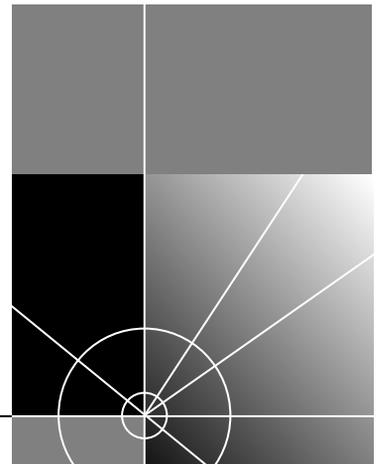


# Cable Modem Termination System

## Provisioning and Access Manager User Guide

<http://www.3com.com/>

Part No. 10038238  
Published September 2000



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# ABOUT THIS GUIDE

*About This Guide* provides an overview of this guide, tells where to look for specific information, lists guide conventions, related documentation, and product compatibility, and provides contacting 3Com information.

This document describes how to install the *optional* 3Com Provisioning and Access Manager (PAM) and related software, and configure a sample network to illustrate the concept.

This guide is intended for experienced cable data network administrators and technicians who are responsible for installing, configuring, and maintaining the 3Com data-over-cable network. It assumes a basic knowledge of Internet Protocol (IP) networking, and an advanced knowledge of Radio Frequency (RF) technology and practices.



*Release Notes are issued with some products—refer to our website at <http://totalservice.3com.com>. If the information in the Release Notes differs from the information in this guide, follow the instructions in the Release Notes.*

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## Finding Specific Information in This Guide

This table shows the location of specific information in this guide.

**Table 1** Locations of Specific Information in this Guide

<b>If you are looking for</b>	<b>Turn to</b>
An overview of the product	Chapter 1
How to set up the required software applications	Chapter 2
How to set up a sample network	Chapter 3
Information about Microsoft SQL System 7.0	Chapter 4
Information on the sample Application Programming Interface (API) program	Appendix A
PAM License Code Information Request Form	Appendix B

## Conventions

These tables list conventions used throughout this guide.

**Table 2** Notice Icon Descriptions

Icon	Notice Type	Description
	Information note	Information that contains important features or instructions.
	Caution	Information to alert you to potential damage to a program, system, or device.
	Warning	Information to alert you to potential personal injury or fatality. May also alert you to potential electrical hazard.

**Table 3** Text Convention Descriptions

Convention	Description
Text represented as a screen display	This typeface represents displays that appear on your terminal screen, for example:  Netlogin:
Text represented as <b>commands</b>	<b>This typeface</b> represents commands that you enter for example:  <b>setenv TCMHOME directory</b>  <i>This guide always gives the full form of a command in uppercase and lowercase letters. However, you can abbreviate commands by entering only the uppercase letters and the appropriate value. Commands are not case-sensitive.</i>
Text represented as <b>menu</b> or <b>sub-menu names</b> .	<b>This typeface</b> represents all menu and sub-menu names within procedures, for example:  On the <b>File</b> menu, click <b>New</b> .

## Related Documentation

The following 3Com documents provide information related to using 3Com data over cable products.

- *Cable Modem Termination System Release Notes*: Contains helpful information that was not available when the *Cable Modem Termination System (CMTS) User Guide* was printed.
- *Cable Modem Termination System Software Upgrade Instructions*: Provides detailed instructions for upgrading your CMTS software to the latest version.

- *Cable Modem Termination System User Guide*: Contains product descriptions, installation, management, and troubleshooting information.
- *Cable Access Router Command Line Interface Reference Guide*: Contains descriptions and examples of all Cable Access Router (CAR) CLI commands.
- *QAM Modulator Network Interface Card Getting Started Guide*: Provides information required to install and configure the Single Channel QAM Modulator NIC.
- *Upstream Receiver Card Network Application Card Getting Started Guide*: Provides information required to install and configure the Upstream Receiver Card to work with the CAR.
- *Cable Management System User Guide*: Provides information on how to use the optional Cable Maintenance System (CMS) Graphical User Interface (GUI) software to manage all aspects of the 3Com data over cable network.

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## **Year 2000 Compliance**

Provisioning and Access Manager is Year 2000 compliant.

For information on Year 2000 compliance and other 3Com products, visit the 3Com Year 2000 web page.

<http://www.3Com.com/products/yr2000.html>

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## **Compatibility**

PAM is compatible with System Release (SR) 2.5.1 or greater.



## Contacting 3Com Carrier Systems



Call the appropriate toll-free number listed below for technical support.

*For European countries that do not have a toll free number listed, call +31 30 602 9900.*

## Phone Numbers

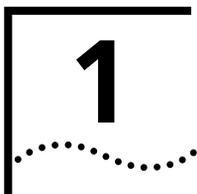
Call the appropriate phone number listed below for technical support.

**Table 4** 3Com Carrier System Technical Support Contact Phone Numbers

Country	Toll Free Number	Country	Toll Free Number
Austria	06 607468	Netherlands	0800 0227788
Belgium	0800 71429	Norway	800 11376
Canada	18883263844	Poland	00800 3111206
Denmark	800 17309	Portugal	0800 831416
Finland	0800 113153	South Africa	0800 995014
France	0800 917959	Spain	900 983125
Germany	0800 1821502	Sweden	020 795482
Hungary	00800 12813	Switzerland	0800 553072
Ireland	1800 553117	UK	0800 966197
Israel	0800 9453794	United States	1888 3263844
Italy	1678 79489		



*For information about Customer Service, including support, training, contracts, and documentation, visit our website at <http://totalservice.3com.com>.*



# PRODUCT OVERVIEW

This chapter describes the *optional* 3Com Provisioning and Access Manager (PAM) for use in conjunction with the 3Com CMTS that has Relay Agent Information Option capability. This single DHCP option has one or more sub-options supplied by a specific agent. PAM provides ease of integration between the various components of back-office provisioning systems.

---

## Introduction

PAM is a highly scalable solution that provides for Cable Modem (CM) boot file management, IP service classes, DHCP filtering, DHCP forwarding, CM settings recording, and automated provisioning in the existing 3Com data-over-cable network architecture.

As a Microsoft Windows-based, DOCSIS-compliant policy management system, PAM allows Multiple System Operators (MSOs) to assign IP addresses and CM boot files based on the MAC address of the CM and the ability to enable and disable CMs. It also allows CPEs attached to CMs to receive IP addresses that represent different classes of service.

You can use PAM alone, or in conjunction with BandWidthManager (BWM), a product that allows you to set up traffic policies, or tiers of service, by defining a range of address to allow a user a piece of bandwidth. Using both together augments the capabilities of each product.

---

## Product Features

PAM is the 3Com-recommended edge solution for DOCSIS policy management and multiple access provisioning solutions. This easy-to-install and easy-to-use integrated software package provisions the entire DOCSIS network edge from the subscriber's devices all the way to the regional back office. Transport-only mapping is left to proprietary core policies, is easily reconciled by edge statistics and reports, and is

intended for all DOCSIS-certified edge devices, DOCSIS-qualified routers (U1), super headends, and DOCSIS server farms.

**Feature List** PAM provides easy integration with the following back office provisioning components.

### **Subscriber Management**

- DOCSIS RKS, Record Keeping Server (SQL 7 based)
- Network-aware DOCSIS API billing and service management interface

### **Servers:**

- DOCSIS DHCP
- DOCSIS PPPoE
- DOCSIS RADIUS
- DOCSIS TOD
- DOCSIS TFTP
- STANDARD IIA, DDNS, LDAP

### **ISP**

- Cooperative DHCP Management
- Cooperative ISP Router Management
- Cooperative VPN Management

**Administrative API** The Administrative API allows customers to programmatically access PAM to query the PAM database and perform functions similar to those provided through the Load CM and Dump CM functions on the PAM Admin Tool GUI.

**Automated Install Including TFTP Server** A GUI-based automated install creates the needed database tables and stored procedures, copies files, and installs the Microsoft TFTP Server. Use the install to upgrade older systems or install a new copy of the software.

It is highly recommended that you install the Microsoft TFTP Server. The install process creates, on the same drive as the tool, a directory called **tftpdroot** into which files to be TFTPd are placed. This is a multi-threaded server which allows simultaneous processing of files, as opposed to single file processing of most TFTP servers. There is no GUI for the TFTP server.

**Automatic Provisioning**

Customers can purchase their CM and have service start immediately after plugging into the cable network. This is possible because new customers can be identified and will be given access to only the internal sign-up web server. After the new customer has signed up, their CM receives a boot file based on the subscribed service plan, and their CPE(s) gets an IP address based on the subscribed class of service.

**Boot File Management**

DOCSIS CMs require unique binary-encoded boot files to register to a DOCSIS CMTS. These boot files contain quality of service (QoS) and channel allocation policies and system management information to match with a given modem's capabilities. The SQL7-based Record Keeping Server (RKS) ties these boot files to the CM MAC address. Customers can be uniquely identified and directed to appropriate configurations.

**Service Classes**

When a customer is provisioned (either automatically or by CSR), that customer's CM MAC address, boot file, and service class are all stored in the PAM database in the RKS. When the CM comes online, it is assigned the specified boot file. After the CM has booted and received an IP address, all CPEs attached to the CM are able to request an IP address from DHCP. The RKS is used to determine the policy set at the CM and which IP address to return, based on the customer service class.

**Modem Filtering**

Operators can restrict the vendor and version of the CMs allowed on their networks. If filtering is enabled, PAM compares the first 3 bytes of the CM MAC address of all incoming CM DHCP request packets. If it matches the list of allowable addresses, the transaction proceeds. If the given CM MAC prefix is not allowed, the packet is dropped and the CM will not receive an IP address.

**DHCP Forwarding**

DHCP forwarding allows either CPE DHCP requests or both CPE and CM DHCP requests to be forwarded to an external DHCP server. The server administrator preconfigures the IP address of all DHCP providers to which the packets could be forwarded. The default is to use the DHCP server co-resident with PAM. However, if forwarding is enabled, subscriber requests still have the appropriate policies processed as set for the subscriber and then they are forwarded based on the attributes of the individual CM.

**CM Settings  
Recording**

DOCSIS specifications allow for CMs to send their capabilities to the DHCP server contained in the DHCP Option 60 parameter. These values are stored, if present, in the appropriate RKS entry for later use. A processing flag is also set to signal background processing elements to implement office policies based on modem capabilities.

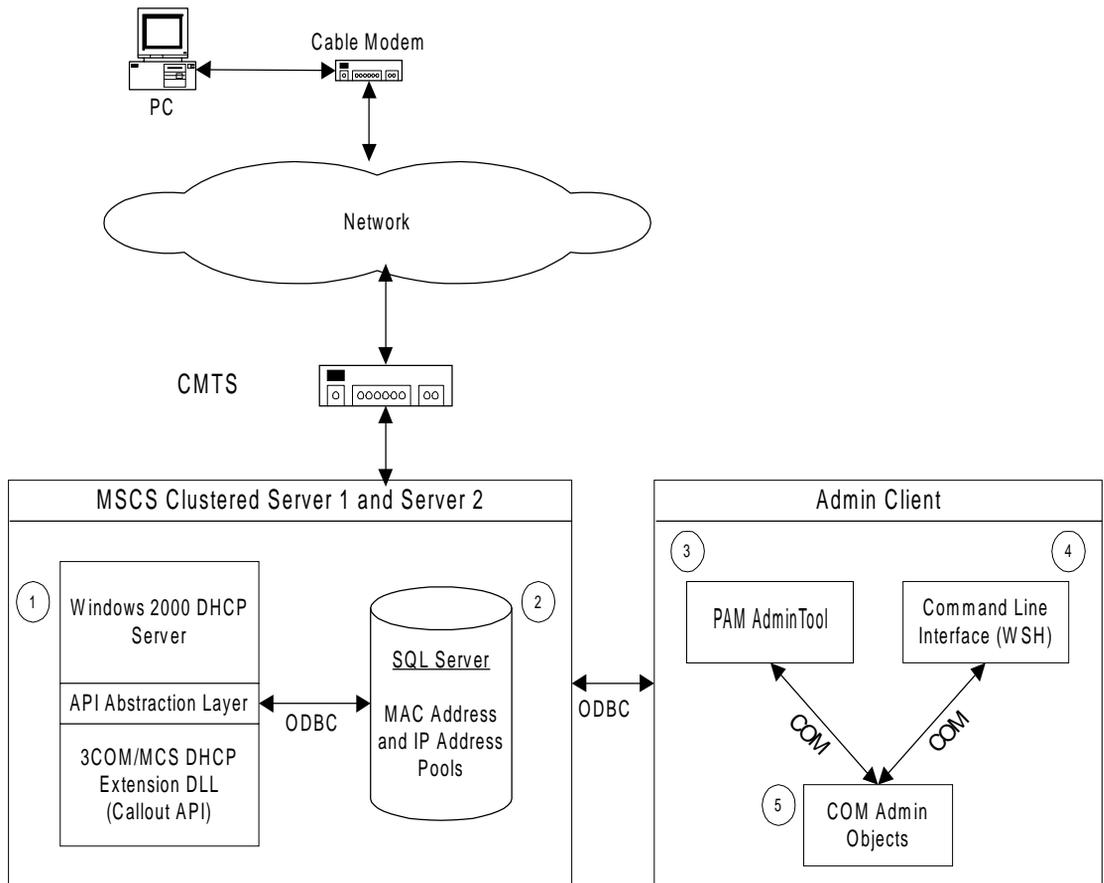
**DHCP Relay Agent  
Information Option**

DOCSIS 1.0 and DOCSIS 1.1 specifications require the Relay Agent Information Option to address security and scaling problems when using DHCP to assign CPE host IP addresses over LANs.

When the CMTS sees a DHCP discover from a CPE, the CMTS modifies the DHCP discover message, enabling the DHCP agent info option in the DHCP discover message. It then copies the MAC address of the CM behind which the CPE sits. In providing this information to the DHCP server, it tells the server behind which CM the CPE sits.

## System Design

The following diagram illustrates the architecture of the PAM system.



**Figure 1-1** PAM System Architecture

The following points correspond to the numbers shown in Figure 1-1.

- 1 The stock Windows 2000 DHCP Server with an abstraction layer is placed on top of the DHCP callout API. The DHCP Server is configured with scopes for CMTS, and different scopes for each CPE class of service. All non-standard configuration information is stored in the SQL Server database.
- 2 SQL Server 7.0 or greater database. The database holds all PAM configurations, and the configuration for all discovered cable modems.

- 3** The PAM AdminTool provides the ability to query, add, delete, and modify configurations for individual CM MAC addresses, and to change server configuration options. The PAM AdminTool uses the published PAM Admin API.
- 4** The CLI provides all GUI administration functionality through a command line interface. The CLI is provided by windows scripting host (WSH) scripts.
- 5** A fully-documented COM PAM Admin API provides access to administration functionality programmatically.

# 2

## INSTALLING THE SOFTWARE

This chapter lists the system requirements for the 3Com PAM application and outlines specific instructions for installing the software and setting the login password.

---

### System Requirements

PAM setup requires you to supply or install the following.

- Microsoft Windows 2000 Server Hardware Requirements
  - 400 MHz Pentium processor
  - Minimum 8 GB HDD
  - Minimum 128 MB RAM
  - 100BaseT Ethernet NIC
  - Ethernet cables
- Software Requirements
  - Microsoft Windows 2000 Server
  - Microsoft SQL Server 7.0
  - WinZip 7.0
- Other Hardware Requirements
  - DOCSIS CMTS System Release (SR) 2.5.1 with Agent Relay option

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## Checking Package Contents

Before you begin, locate the necessary PAM components.

The PAM software package includes the following items, sealed in the license envelope.

- Installation CD
- Release Notes
- PAM License Key Information Request Form

---

## Software Installation

This section describes how to install the software required to run PAM. The pieces are:

- Microsoft SQL Server 7.0 database software
- PAM GUI

### Installing Microsoft SQL Server 7.0

This section details installing the Microsoft SQL Server 7.0 database software onto your server. This is required for the PAM RKS.

- 1 Insert the CD into the CD drive and the Install screen automatically appears.



**Figure 2-1** Microsoft SQL Server Install Screen

- 2 Select **Install Microsoft SQL Server 7.0 Components**. The following window appears.



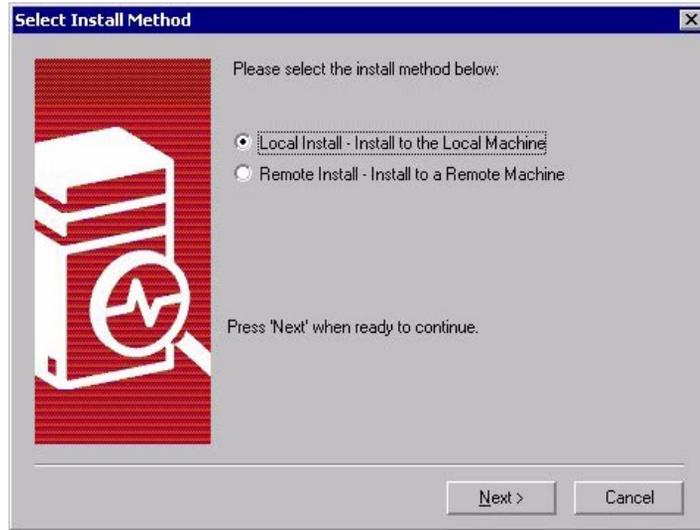
*You don't need to install the Prerequisites as the Microsoft Windows 2000 server contains all the necessary prerequisites for Microsoft SQL Server 7.0.*



**Figure 2-2** Install Microsoft SQL Server 7.0 Components Screen

- 3 Select **Database Server – Standard Edition**.

The following window appears.



**Figure 2-3** Select Install Method Dialog

- 4 Select Local or Remote Install. Click **Next** to continue.

The following window appears.

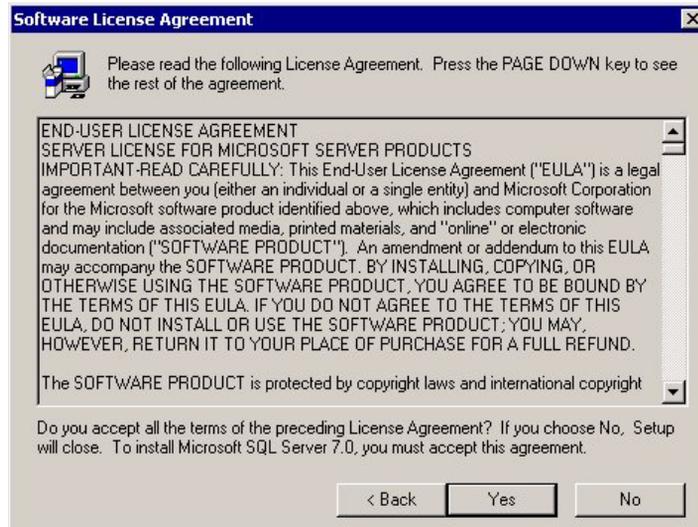


*This example illustrates performing a local install.*



**Figure 2-4** Welcome Screen

- 5 Read the information and click **Next** to continue.  
The following window appears.



**Figure 2-5** Software License Agreement Screen

- 6 Read the license information and click **Yes** to continue.  
The following window appears.



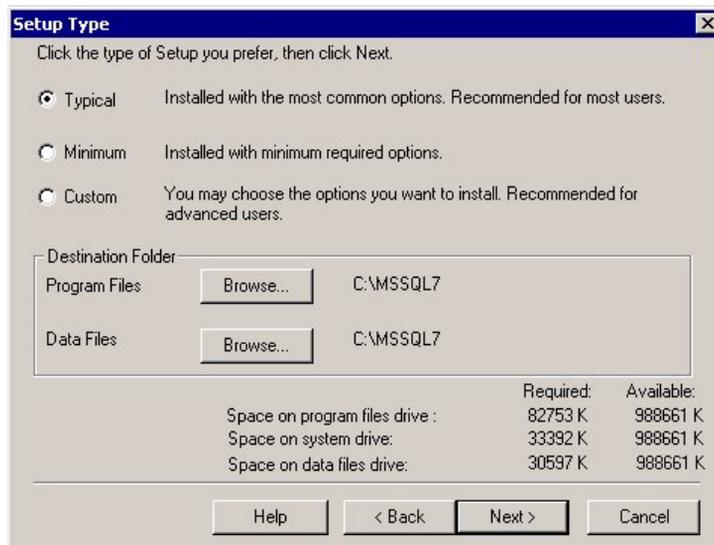
**Figure 2-6** User Information Dialog

- 7 Enter your Name and Company information and click **Next** to continue. The following window appears.



**Figure 2-7** CD Key Setup Dialog

- 8 Enter your CD Key and click **OK** to continue. The following window appears.



**Figure 2-8** Setup Type Dialog

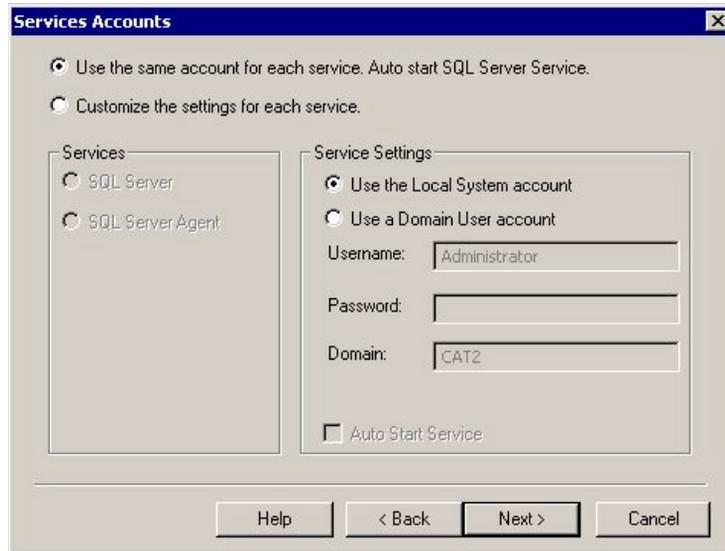
- 9 Select the Setup type and Destination Folder and click **Next** to continue.

The **Typical** setup is recommended for most users. You can accept the Destination Folder defaults or browse to install in another directory.



*Be sure you have enough available space to complete your install. Check the bottom of this screen for space information.*

The following window appears.



**Figure 2-9** Service Accounts Dialog

- 10 Match your settings with those shown in Figure 2-9 and click **Next** to continue.

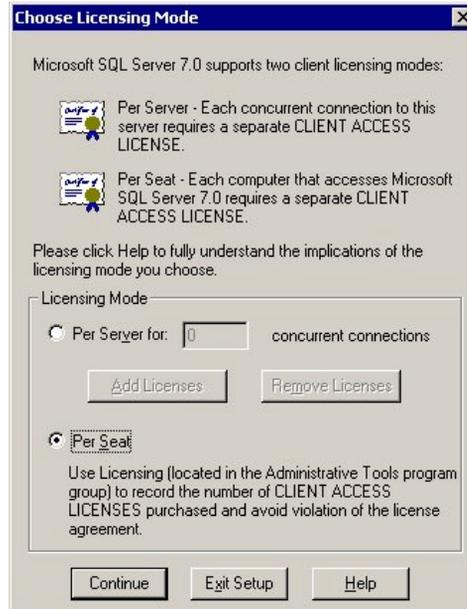
The following window appears.



**Figure 2-10** Start Copying Files Screen

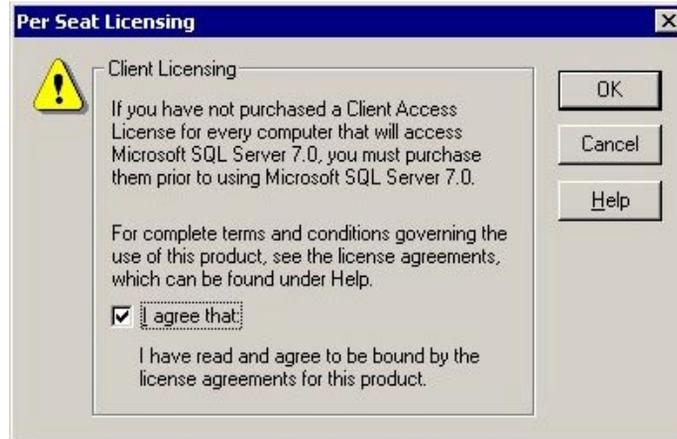
- 11 Click **Next** to continue.

The following window appears.



**Figure 2-11** Choose Licensing Mode Dialog

- Click **Per Seat**, then click **Continue** to continue.  
The following window appears.



**Figure 2-12** Per Seat Licensing Dialog

- Read the licensing information and click **I agree that:** and click **OK** to continue.  
After a period of time, the following window appears.



**Figure 2-13** Setup Complete Screen

- 14 Click **Finish** to complete the installation.  
When installation has been completed, the following screen appears.



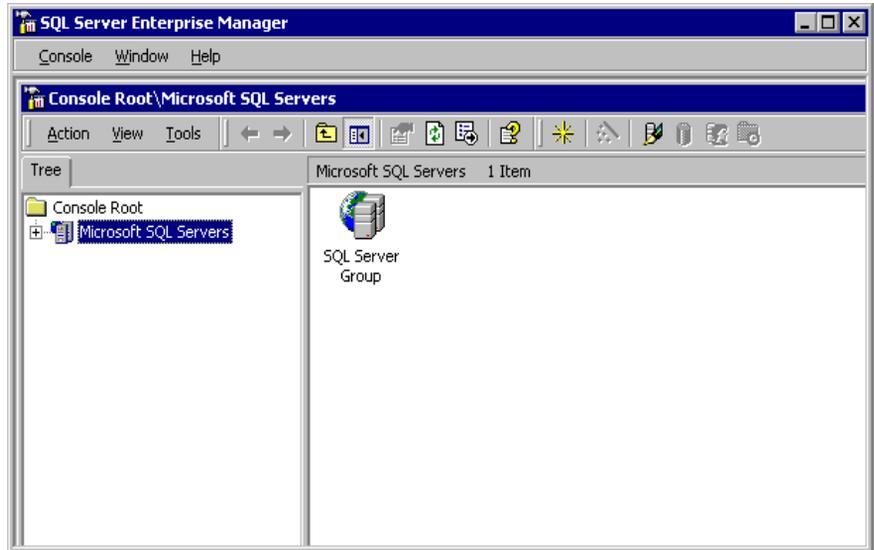
**Figure 2-14** Install Components Screen

- 15 Click **Exit**.  
You have successfully installed Microsoft SQL Server.

## Setting the SQL Server Login Password

After you install Microsoft SQL Server 7.0, you must set up the login password.

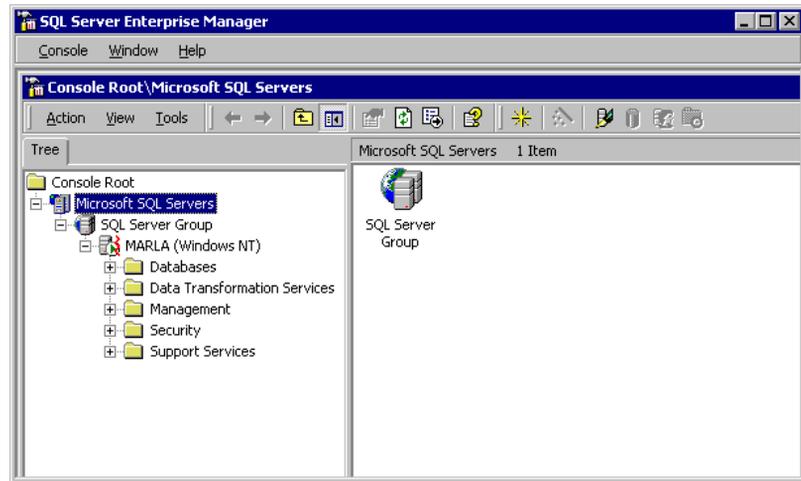
- 1 Click **Start | Programs | Microsoft SQL Server 7.0 | Enterprise Manager**. The following screen appears.



**Figure 2-15** Microsoft SQL Servers Folder

- 2 Click the **+** next to **Microsoft SQL Servers** to expand the folder.
- 3 Click the **+** next to **SQL Server Group**.
- 4 Click the **+** next to, in this example, MARLA (**Windows NT**).

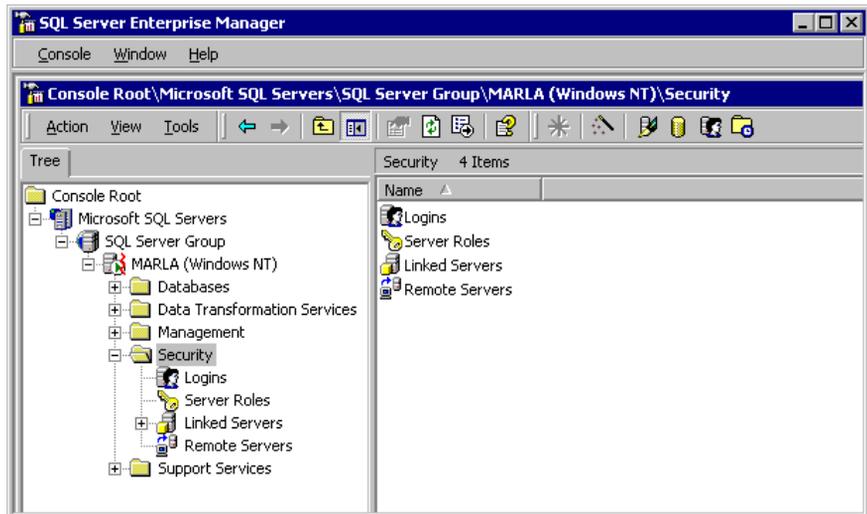
The following screen appears.



**Figure 2-16** Microsoft SQL Servers Folder Expanded

5 Double-click **Security**.

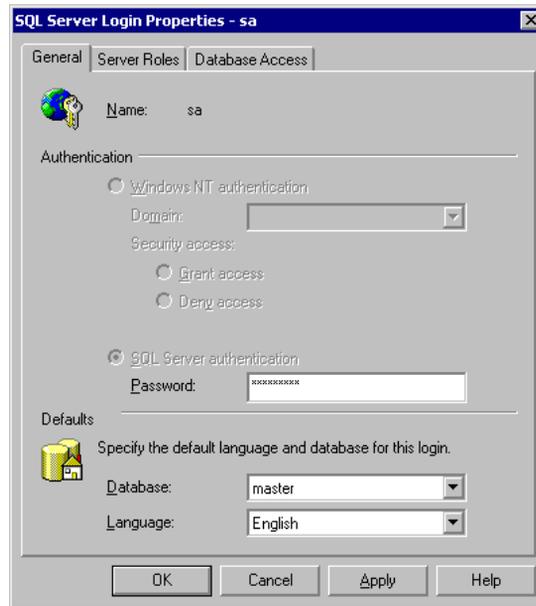
The following screen appears.



**Figure 2-17** Microsoft SQL Servers Folder Security

6 Double click **Logins**, then double click **sa**.

The following screen appears.



**Figure 2-18** Microsoft SQL Servers Login Properties Dialog

- 7 Click **SQL Server authentication** and enter a password, and click **Apply**.

The following screen appears.



**Figure 2-19** Confirm Password Dialog

- 8 Re-enter your password, then click **OK**. You are returned to the previous screen.
- 9 Click **OK** and close the Enterprise Manager.

**Installing PAM** This section details installing the PAM software.



*Be sure to obtain the License Code for access to PAM. Without the License Code, PAM is not fully functional. See Appendix B for the PAM License Code Information Request Form.*

Follow these steps to install PAM.



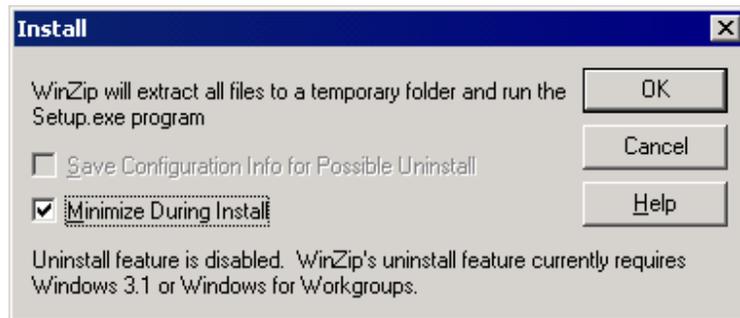
*Be sure to have WinZip 7.0 or another unzip utility installed on the server. This procedure uses WinZip.*

- 1 Copy the **PAMInstall.zip** file from the CD to the desktop.
- 2 Open Microsoft Windows Explorer and create the following folder in the root directory on the same drive on which Microsoft SQL Server 7.0 and Microsoft Windows 2000 were installed. In our example, the following folder is created in the **E:\** drive:

**E:\PAM**

- 3 Double click on **PAMInstall.zip** file to initiate the WinZip program.
- 4 On the WinZip toolbar, click the **Install** button.

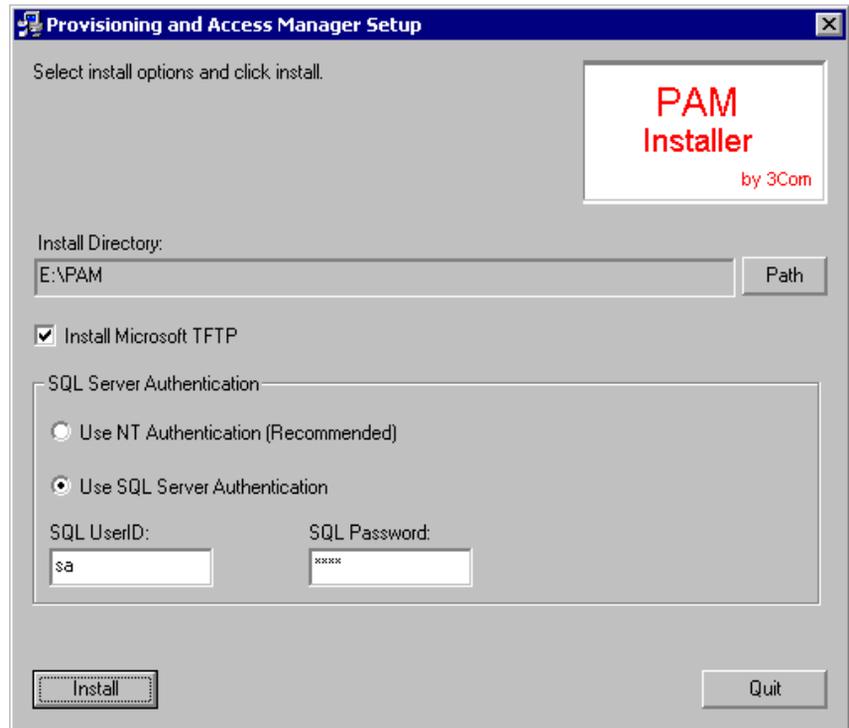
The following screen appears.



**Figure 2-20** PAM Install Dialog

- 5 Select **Minimize During Install** and click **OK**.

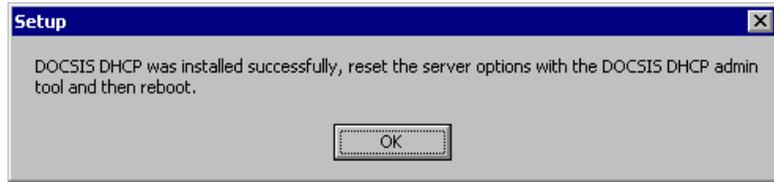
The following screen appears.



**Figure 2-21** PAM Setup Dialog

- 6** Click **Path** to browse for and select **\PAM** for the Install Directory.
- 7** In the SQL Server Authentication section, do the following:
  - a** Click **Use SQL Server Authentication**.
  - b** Enter **sa** for the **SQL UserID**.
  - c** For **SQL Password**, enter the password that you defined on page 2-13.
- 8** Click **Install**.

The following screen indicates that the install was successful.



**Figure 2-22** PAM Successful Setup Screen

- 9 Click **OK**.

# 3

## CONFIGURING PAM

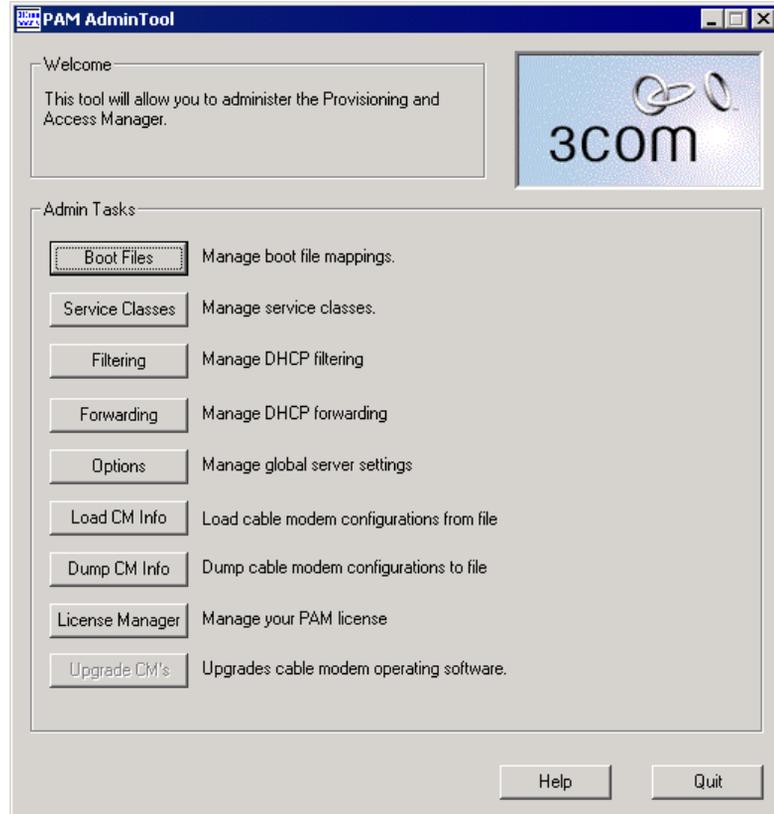
This chapter contains information on configuring the various elements of PAM.

---

### The PAM AdminTool

After the PAM installation is complete, the PAM AdminTool dialog box automatically opens. The following buttons are displayed.

- **Boot Files** - Manages boot file mappings.
- **Service Classes** - Manages service classes.
- **Filtering** - Manages DHCP filtering.
- **Forwarding** - Manages DHCP forwarding.
- **Options** - Manages global server settings
- **Load CM Info** - Loads your CM configurations from a text file.
- **Dump CM Info** - Saves your CM configurations to a text file.
- **License Manager** - Sets and manages your PAM license.



**Figure 3-1** PAM AdminTool Dialog Box



*You can also double-click this icon to open to this screen. During the installation process, it was created on your Desktop.*



**Figure 3-2** PAM AdminTool Application Icon

## Setting the License Code

PAM is not fully functional without a valid license code, which determines the maximum number of CMs the server will allow. See Appendix B for information on obtaining the License Code.

Before you configure a CM, you must use the **License Manager** dialog box to set the license code. To set the License Code, follow this procedure.



*After setting the License Code, restart the DHCP server for the changes to take effect.*

- 1 Click the **License Manager** button.

The **License Manager** dialog box appears.



**Figure 3-3** License Manager Dialog Box

- 2 Enter the new code into the **New License Code** field.
- 3 Click **Set Code**.

The code now appears in the **Current License Code** field. The **Current License Amount** and **Current Licenses in use** fields display updated information.

**4** Click **Quit**.

The License Code is set and you are returned to the main screen of the **PAM AdminTool**.

**5** Restart the DHCP server for the changes to take effect.**1** Go to **Start | Programs | Administrative Tools | Services**.**2** Right-click **DHCP Server** and select **Stop**.**3** Right-click **DHCP Server** again and select **Start** to restart the service.

---

**Configuring PAM**

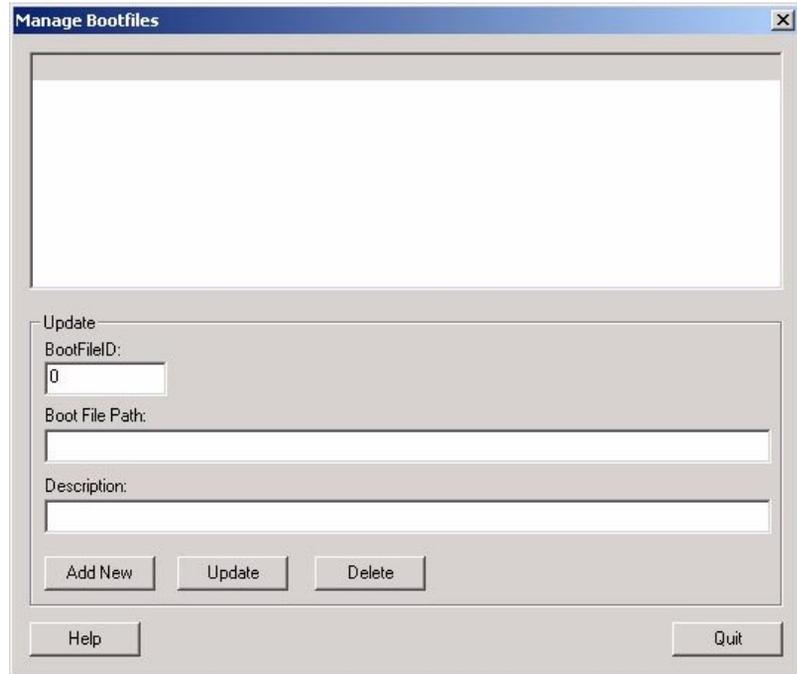
This section describes the functions of each of the PAM AdminTool buttons.

**Configuring Boot Files**

Standards-based DOCSIS cable modems require special binary-encoded boot files to register to a DOCSIS CMTS. These boot files contain Quality of Service (QoS) and channel allocation policies and system management information to match with a given modem's capabilities. The RKS ties these boot files to the CM MAC address. Customers can be uniquely identified and directed to appropriate configurations. Based on a customer's service plan, CMs can be served individual boot files which add or restrict network-based features based on operator's context.

Use the **Manage Bootfiles** dialog box to create, update, and delete boot file mappings.

- 1 Click the **Boot Files** button on the main screen.  
The **Manage Bootfiles** dialog box appears.



**Figure 3-4** Manage Bootfiles Dialog Box

- 2 Type the entries described in Table 3-1

**Table 3-1** Bootfile Parameters

Field or Button	Description
BootFileID	Unique identifier for the specified CM boot file, used when new CM MAC addresses are added to the system.
Boot File Path	The name of the boot file located on a TFTP server. inserted into the outgoing DHCP packet for CMs. (The boot files need to be loaded in the c:\TFTPd Root directory.)
Description	A brief description of the boot file, in 250 or fewer characters.

- 3 Click **Add New** to create a new boot file entry.  
The information you just typed appears on the screen.  
Click **Update** to change the values of the boot file path and description.  
Click **Delete** to remove the selected boot file entry.
- 4 Add other boot files in the same manner.  
When completed, the screen contains the information for all boot file entries.



*Click on a boot file entry to cause the selected boot file attributes to appear in the Update fields.*

### Configuring Service Classes

The RKS identifies a customer before they receive an IP address and offers service class features by correct IP assignment of all subscriber equipment.

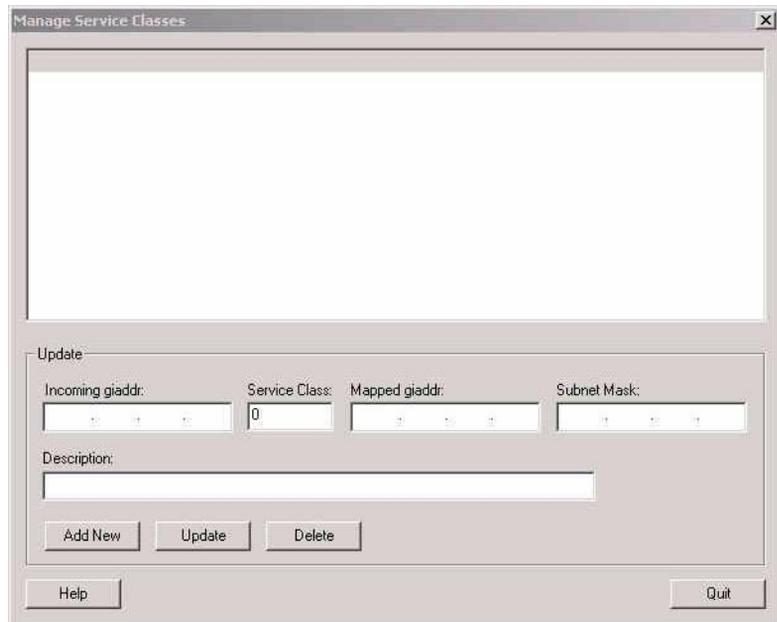
The **Manage Service Classes** dialog box allows for mapping service classes to different IP address pools. Each CMTS is configured to have one **giaddr** (cpegiaddr) for CPE requests. This works fine for CMTSs that have one downstream for CPE addresses. However, for CMTSs that have multiple downstreams for CPE addresses, a mapped giaddr must be placed in the incoming DHCP request.

For single CPE downstreams, the mapped giaddr is the same as the incoming giaddr. (The incoming giaddr is the same as the cpegiaddr in the CMTS.)

In multiple CPE downstreams, the incoming giaddr is the same as the cpegiaddr in the CMTS, and a service class is created for each of the CPE downstreams. For more information about configuring a service class, see *Configuring Service Classes* on page 4-7.

- 1 Click the **Service Class** button.

The **Manage Service Class** dialog box appears.



**Figure 3-5** Manage Service Class Dialog Box

- 2 Type the entries described in Table 3-2.

**Table 3-2** Manage Service Classes Field Descriptions

Field or Button	Description
Incoming giaddr	The IP address of the relay agent (the cpegiaddr in the CMTS).
Service Class	Numeric identifier for the service class. This value does not have to be unique, the unique key is a combination of incoming giaddr and service class.
Mapped giaddr	The CPE downstream IP address that is mapped from the incoming giaddr.
Subnet Mask	The subnet mask for this service class.
Description	Description of the service class in 250 or fewer characters.

**3** Click **Add New**.

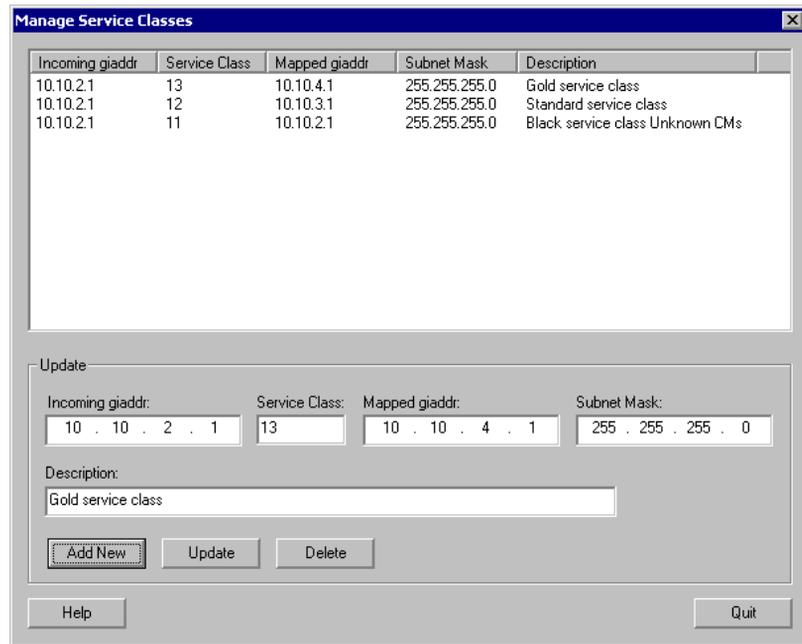
The information you just typed appears on the screen.

Click **Update** to change the values of the mapped giaddr, subnet mask, and description.

Click **Delete** to remove the service class.

**4** Add any other Service Classes in the same manner.

When completed, the screen looks similar to that shown in Figure 3-6.



**Figure 3-6** Configured Service Classes

**5** Click **Quit** to return to the main screen.



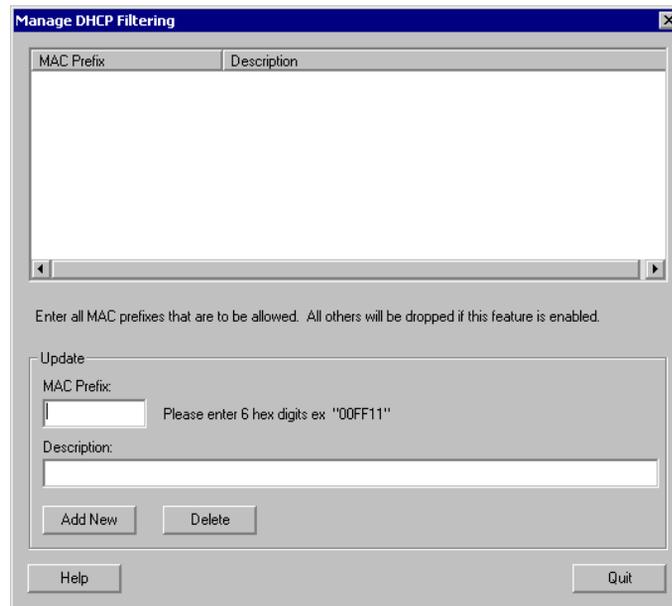
*If you want to delete a Service Class, click that Service Class in the window and click **Delete**.*

*If you want to change a parameter in an existing Service Class, click the Service Class in the window. All parameters are listed in the editing portion of the screen. Make the changes, then click the **Update** button.*

**DHCP Filtering** DHCP Filtering blocks access to CMs that do not have an allowed MAC prefix. When this feature is enabled, the DHCP server scans all requests to determine whether or not the first three bytes of the CM MAC address reside in the table of allowed MAC prefixes. If the prefix is not found, the packet is dropped.

- 1 Click the **Filtering** button.

The **Manage DHCP Filtering** dialog box appears.



**Figure 3-7** Manage DHCP Filtering Dialog Box

- 2 Type the entries described in Table 3-3.

**Table 3-3** Manage DHCP Filtering Field Descriptions

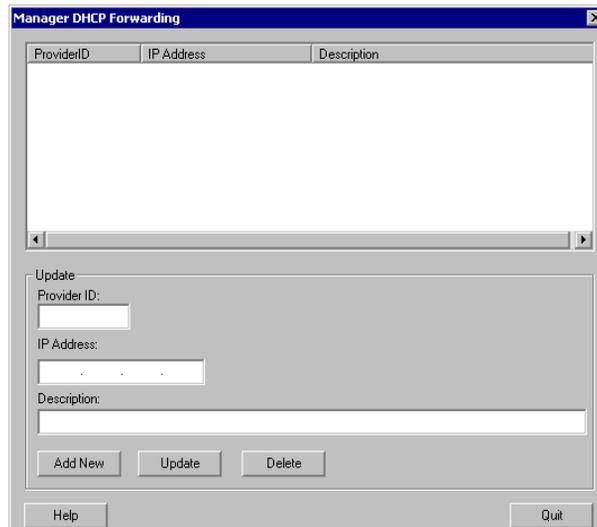
Field or Button	Description
MAC Prefix	The three-byte MAC prefix value.
Description	250 or fewer characters describing the service class.

- 3 Click **Add New** to create the new allowed MAC prefix.  
To remove a MAC prefix, select it and click **Delete**.
- 4 Click **Quit**.

**DHCP Forwarding** DHCP Forwarding allows DHCP requests to be forwarded to other DHCP servers based on the CM MAC address. When DHCP Forwarding is enabled, either CPE requests or all requests can be forwarded. Each CM MAC is assigned a provider ID that maps to a DHCP server's IP address. The server simply forwards the request to the specified DHCP server and does not attempt further processing of the packet.

- 1 Click the **Forwarding** button.

The **Manage DHCP Forwarding** dialog box appears.



**Figure 3-8** Manage DHCP Forwarding Dialog Box

- 2 Type the entries described in Table 3-4

**Table 3-4** Manage DHCP Forwarding Field Descriptions

Field or Button	Description
Provider ID	The unique number that identifies this provider.
IP Address	The IP address of the DHCP provider to which requests are forwarded.
Description	250 or fewer characters describing the service class.

- 3 Click **Add New** to create a new forwarding provider.

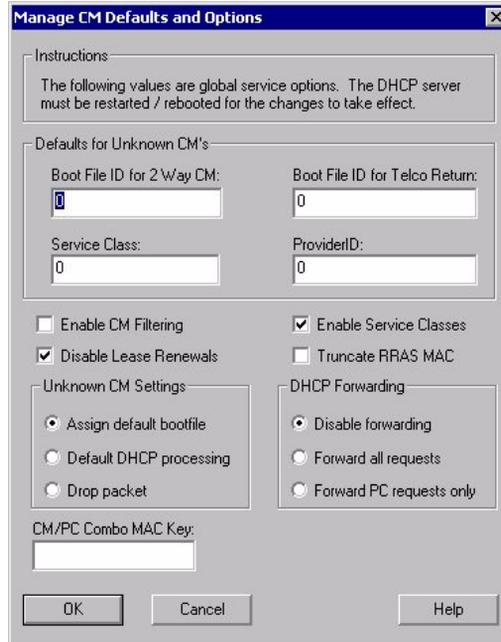
Click **Update** to change the IP address and Description of a specified Provider ID.

Click **Delete** to remove a selected forwarding provider.

**Configuring Options** The **Manage CM Defaults and Options** dialog box allows you to set, enable, or disable service-wide options and defaults such as DHCP filtering and forwarding, service classes, provider IDs, truncating Routing and Remote Access Service (RRAS), and lease renewals.

- 1 Click the **Options** button.

The **Manage CM Defaults and Options** dialog box appears.



**Figure 3-9** Manage CM Defaults And Options Dialog Box

- 2 Type the entries described in Table 3-5.

**Table 3-5** Manage CM Defaults and Options Field Descriptions

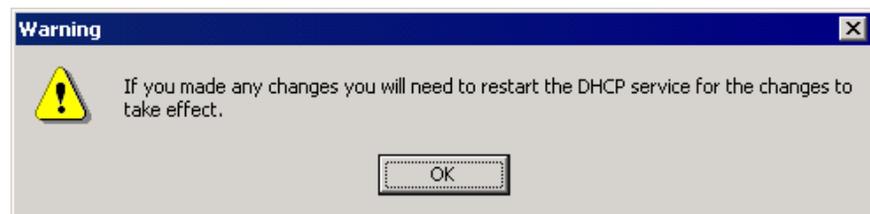
Field	Description
Boot File ID for 2 Way CM	Default boot file assigned to 2-way CMs that make DHCP requests but are not yet provisioned in the PAM database.
Service Class	Default Service Class assigned to CMs that make DHCP requests but are not already provisioned in the PAM database.
Boot File ID for Telco Return	Default boot file ID assigned to telco-return CMs that make DHCP requests but are not already provisioned in the PAM database.

**Table 3-5** Manage CM Defaults and Options Field Descriptions (continued)

ProviderID	Default provider ID assigned to CMs that use other DHCP servers but are not already provisioned in the PAM database.
Enable CM Filtering	Enables (or disables) DHCP filtering.
Disable Lease Renewals	This feature is necessary for automatic provisioning. When enabled, all DHCP rebind requests are denied which forces the CPE or CMs to start the process over with a discover message.
Enable Service Classes	Enables (or disables) the Service Class feature.
Truncate RRAS MAC	Truncates all incoming hardware addresses to 6 bytes, blocking Routing and Remote Access Service (RRAS) DHCP queries.
Assign default bootfile	Add unknown CM to the database with the default boot file, service class, and provider ID.
Default DHCP processing	DHCP server performs stock services for the request and does not add it to the database.
Drop packet	Drops the packet.
Disable forwarding	Disables DHCP forwarding to other DHCP servers.
Forward all requests	Enables forwarding for CPE and CM requests.
Forward CPE requests only	Enables forwarding for CPE requests only.
CM/CPE Combo MAC Key	The 12-character hex number identifying the CM/CPE combination card CM. PAM uses this wildcard value to treat CM/CPE combination cards as both a CM and a CPE. This value can also be left blank.

- 3 Click **OK** to return to the main screen.

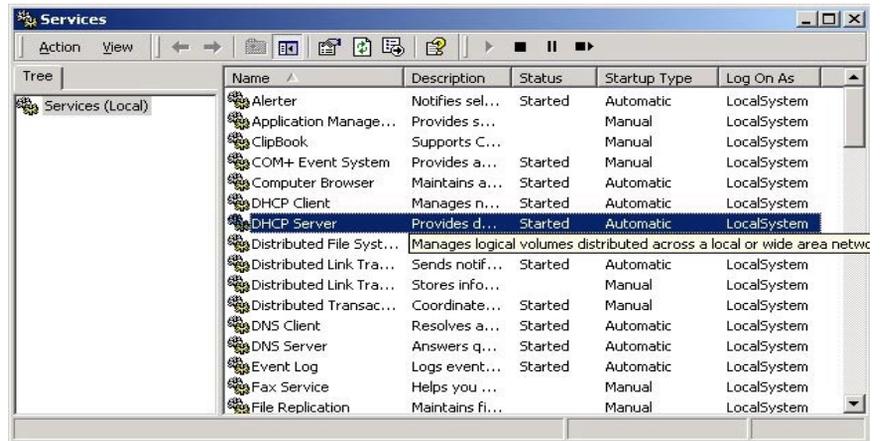
Before you can return to the main screen, the following warning appears.

**Figure 3-10** Warning Dialog

- 4 Click **OK**.

- Restart the DHCP service. Go to **Start | Programs | Administrative Tools | Services**.

The following screen appears.



**Figure 3-11** DHCP Services Directory

- Highlight **DHCP Server**, and right click with the mouse to **Stop** the Service.
- After the service has stopped, right click again and **Start** the service. Your options are now in effect, and you can close the **Services** window.

### Saving and Loading CM Information

The **Admin Task** buttons **Dump CM Info** and **Load CM Info** are used for saving and loading CM configurations to and from the PAM database.

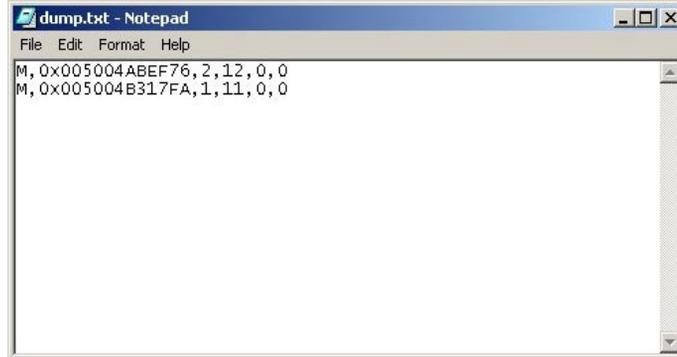
#### Dump CM Info

You can create and edit text files containing CM configuration information. When you want to save the CM configuration file, click the **Dump CM Info** button to save (or, dump) all the CM configuration records as text files in the PAM database, one record for each CM in the network.

File requirements are as follows.

- Only one record per line is allowed.
- The format is "M,0xFFFFFFFF,12,22,0,0"
- The first field, an action or control code, must be a '**M**' for add/modify or '**D**' for delete.
- The second field must be **0x** followed by 12 hex characters which identify the CM MAC address being added.
- The third field represents the Boot File ID (the boot file the CM is to receive).
- The fourth field represents the Service Class ID (the service class the CPE should receive).
- The fifth field represents the ProviderID (the provider to which DHCP requests are forwarded).
- The sixth field represents Flags.

The following screen illustrates a typical dump file.



**Figure 3-12** Example of Typical Dump Text File

### Example of Creating a CM Configuration File

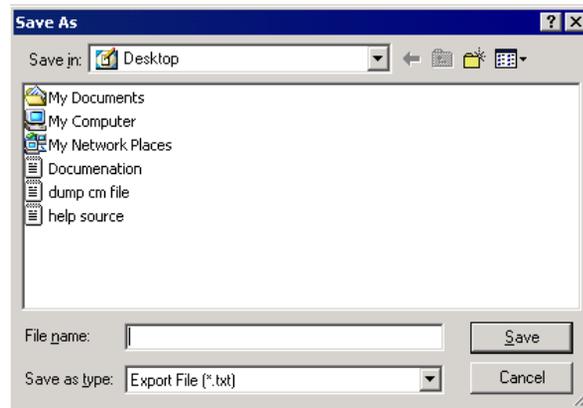
- 1 In a screen editor, edit the file using *Action M* to modify or add a new record, or **D** to delete a record.



*When editing for Dump CM Info, Action will always be **M**. When deleting a record all fields must be preset, but only **Action** and **MAC Address** need to be valid.*

- 2 Click the **Dump CM Info** button.

The **Save As** dialog box appears.



**Figure 3-13** Saving the CM Text File

- 3 Select a destination location, name the file, and select **Save as type** Export file (.txt).
- 4 Click **Save**.

The CM configuration text file is now saved to the specified location.

### Load CM Info

Use the **Load CM Info** button to open a formatted text file and import the CM configurations into the PAM database. The text file requirements are the same as those found on page 3-13 under the section *Dump CM Info*.

- 1 Click the **Load CM Info** button.
- 2 Select the file you want imported into the system and click **Open**.

All the new values will be added to the database. You can load a file that was exported via the **Dump CM Info** button



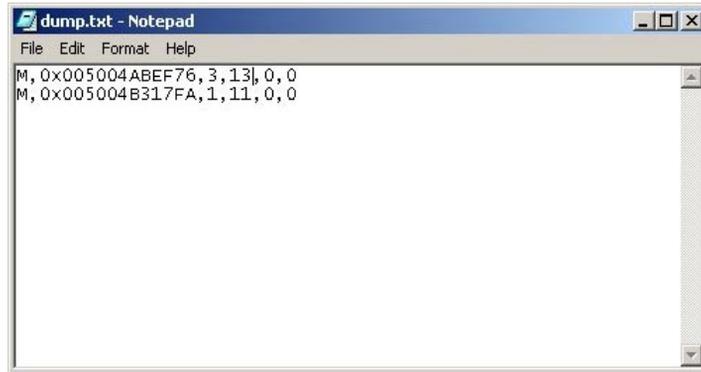
*Load CM Info could take a long time to complete. Estimate 1000 records per minute on a 200 MHz machine.*

### Example of Modifying CM Info

As an example (using the previous dump information), we want to change the Boot File and Service Class for the cable modem with the MAC address 005004ABEF76 to the gold.cfg (BootFileID = 3), and gold

service class (ServiceClass = 13).

- 1 Edit the file to look as follows (Action = M as we are modifying a record).



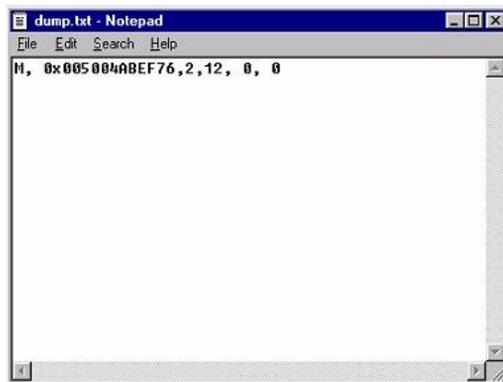
**Figure 3-14** Modifying CM Information

- 2 Save it as a .txt file.
- 3 Click the **Load CM Info** button.

Example: we want to delete the cable modem with the MAC address of 005004B317FA.

- 4 Edit the file using **Action = D**:
- 5 Save it as a .txt file.
- 6 Click the **Load CM Info** button.

If you click on the Dump CM Info button, your file will look as follows.



**Figure 3-15** Example of Modified CM File

# 4

## CONFIGURING A SAMPLE NETWORK

This chapter contains information and procedures for configuring a sample network and its related elements, and values and parameters specific to the sample network. For basic configuration, follow the procedures in Chapter 3, *Configuring PAM*.

---

### Before You Begin

To use this sample network, you must configure several external items, including the following.

- DHCP Server
- PAM

---

### Configuring the CAR

Configure the CAR as you normally would configure a Two-way Cable Modem system. Refer to the *3Com Cable Management System User Guide* for information on GUI configuration or the *3Com Cable Access Router Command Line Interface Guide* for information on configuring using CLI commands.

### Network Interface Configuration

Define your network interfaces as shown in Table 4-1.

**Table 4-1** Network Interface Configuration Values

Name	Prot	Int	State	Type	Network Address
ether	IP	eth:1	ENA	STAT	10.10.1.31/C
2waycm	IP	qam:1	ENA	STAT	10.10.1.1/C
pc_gold	IP	qam:1	ENA	STAT	10.10.4.1/C
pc_black	IP	qam:1	ENA	STAT	10.10.2.1/C
IP-loopback	IP	loopback	ENA	AUTO	127.0.0.1/A
pc_standard	IP	qam:1	ENA	STAT	10.10.3.1/C

**DHCP Option Configuration** Use the **set dhcp** command to configure the DHCP options, using the values listed in Table 4-2.

**Table 4-2** DHCP Option Values

DHCP Option	Description	Sample Network Value
server		10.10.1.6
cmgiaddr	Two-way cable modem (CM) gateway interface address. Enter the name of the cable IP network through which you want DHCP responses routed for downstream transmission to Two-way cable modems.	2waycm
cpegiaddr	Customer premises equipment (CPE) gateway interface address. Enter the name of the defined Cable IP Network you want DHCP responses routed through for downstream transmission to CPEs (e.g. CPEs connected to two-way cable modems). This becomes your incoming giaddr in PAM.	pc_black
agentinfooption	The agent information option must be enabled for PAM to function. When enabled, the CMTS modifies the DHCP packet, turns on the agent information option feature in the DHCP packet, and then copies the MAC address of the cable modem into the DHCP packet. It then forwards the modified DHCP packet to the DHCP server. If it is disabled, the regular DHCP server is in effect.	enabled

## Configuring the DHCP Server

A scope is range of IP addresses that can be assigned to DHCP clients by the DHCP service. Configure the DHCP Server and create DHCP scopes using the following steps.

- 1 Click **Start | Programs | Administrative Tools | DHCP**.
- 2 Click on **Action**, then **New Scope**.  
The **New Scope Wizard** appears and guides you through the process.
- 3 Set the DHCP options that are appropriate for your network.
  - Create scopes for 2WayCM (10.10.1.0) using the information in Table 4-3.

**Table 4-3** Scope Information for 2WayCm

Option Name	Vendor	Value	Class
003 Router	Standard	10.10.1.1	None
067 Bootfile Name	Standard	cm.cfg	None
002 Time Offset	Standard	0x5	None
004 Time Server	Standard	10.1.1.6	None
066 Boot Server Host Name	Standard	Betty	None

- Create scopes for PC\_Black (10.10.2.0) using the information in Table 4-4.

**Table 4-4** Scope Information for PC\_Black

Option Name	Vendor	Value	Class
003 Router	Standard	10.10.2.1	None
002 Time Offset	Standard	0x5	None
004 Time Server	Standard	10.1.1.6	None
066 Boot Server Host Name	Standard	Betty	None

- Create scopes for PC\_Standard (10.10.3.0) using the information in Table 4-5.

**Table 4-5** Scope Information for PC\_Standard

Option Name	Vendor	Value	Class
003 Router	Standard	10.10.3.1	None
002 Time Offset	Standard	0x5	None
004 Time Server	Standard	10.1.1.6	None
066 Boot Server Host Name	Standard	Betty	None

- Create scopes for PC\_Black (10.10.4.0) using the information in Table 4-6.

**Table 4-6** Scope Information for PC\_Gold

Option Name	Vendor	Value	Class
003 Router	Standard	10.10.4.1	None
002 Time Offset	Standard	0x5	None
004 Time Server	Standard	10.1.1.6	None
066 Boot Server Host Name	Standard	Betty	None

---

## Configuring PAM For a Sample Network

This section describes the steps for configuring PAM for use on a sample network. See *Chapter 3, Configuring PAM* for detailed instructions on configuring all elements of PAM.

After the PAM installation is complete, the main administrative screen opens automatically.

### Setting the License Code

PAM is not fully functional without a valid license code, which is necessary to determine the maximum number of cable modems that the server will allow. Before you configure a CM, you must use the **License Manager** dialog to set the license code. See *Setting the License Code* on page 3-3.



*After setting the License Code, restart the DHCP server for the changes to take effect.*

### Configuring Boot Files

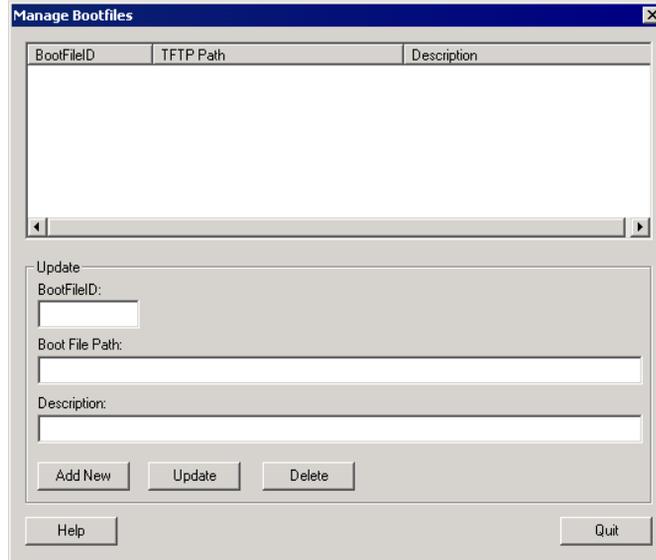
The first step in setting up the sample network is to configure the boot files. The **Manage Bootfiles** dialog allows for the creation and deletion of boot file mappings.

This example configures three sample Boot Files with the elements needed for a valid **BootFileID**. Use the following information for the sample Boot Files.

**Table 4-7** Boot File Configuration Table

BootFileID	TFTP Path	Description
1	black.cfg	Unknown CM default .cfg file
2	standard.cfg	Standard COS .cfg file
3	gold.cfg	Gold COS .cfg file

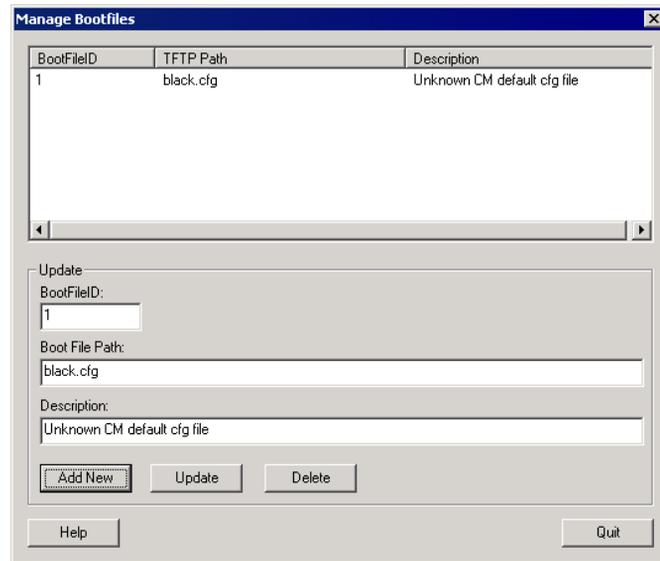
- 1 Click the **Boot Files** button on the main screen.  
The **Manage Bootfiles** dialog appears.



**Figure 4-1** Manage Bootfiles Dialog Box

- 2 Fill in these fields with the following information.  
In the **BootFileID** field, type *1*.  
In the **Boot File Path** field, type *black.cfg*  
In the **Description** field, type *Unknown CM default cfg file*.
- 3 Click **Add New**.

The following screen appears, containing the information you just typed.



**Figure 4-2** Manage Bootfiles Dialog Box

- 4 Add the other two boot files in the same manner using the information from Table 4-7. All boot file information is now displayed on the screen. Click on a boot file entry to view the updated attributes.

## Configuring Service Classes

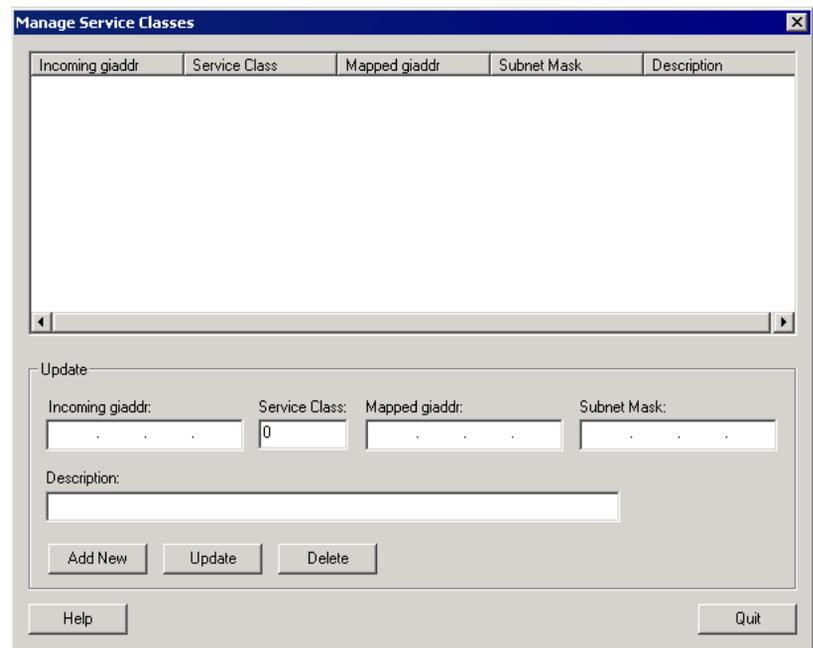
The second step in setting up the sample network is to configure the service classes. In this example, we will configure the service classes using the values shown in Table 4-8.

**Table 4-8** Sample Network Configuration Values

Incoming giaddr	Service Class	Mapped giaddr	Subnet Mask	Description
149.112.10.1	11	149.112.10.1	255.255.255.0	Black service class, Unknown CMs
149.112.10.1	12	149.112.11.1	255.255.255.0	Standard service class
149.112.10.1	13	149.112.12.1	255.255.255.0	Gold service class

- 1 Click the **Service Class** button.

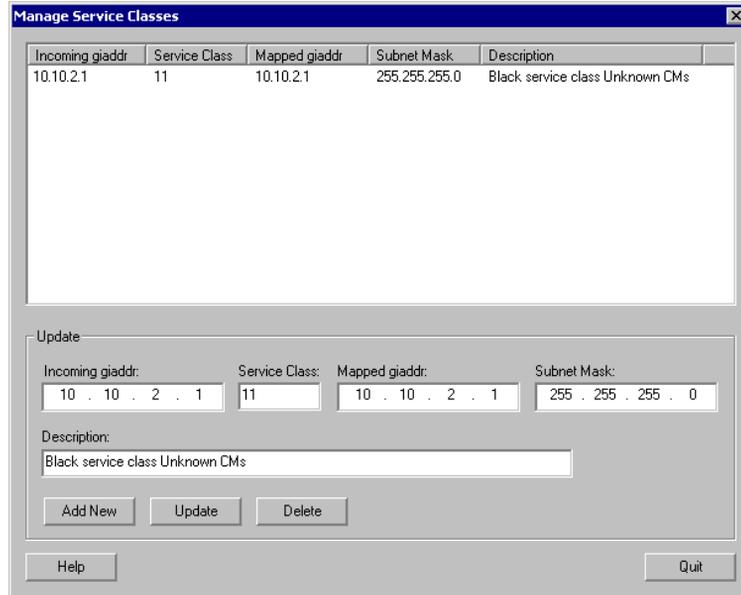
The **Manage Service Class** dialog appears.



**Figure 4-3** Manage Service Class Dialog Box

Fill in the fields using the information in the first row of Table 4-8 and click **Add New**.

The following screen appears.



**Figure 4-4** Configured Service Class

- 2 Add the other two service classes in the same manner, using the data from the second and third rows in Table 4-8. All service class information is now listed.
- 3 Click **Quit** to return to the main screen.



*If you want to delete a Service Class, click that Service Class in the window and click **Delete**.*

*If you want to change a parameter in an existing Service Class, click the Service Class in the window. All parameters are listed in the editing portion of the screen. Make the changes, then click the **Update** button.*

#### **DHCP Filtering**

*The DHCP Filtering feature is not being used in setting up the sample network.*

#### **DHCP Forwarding**

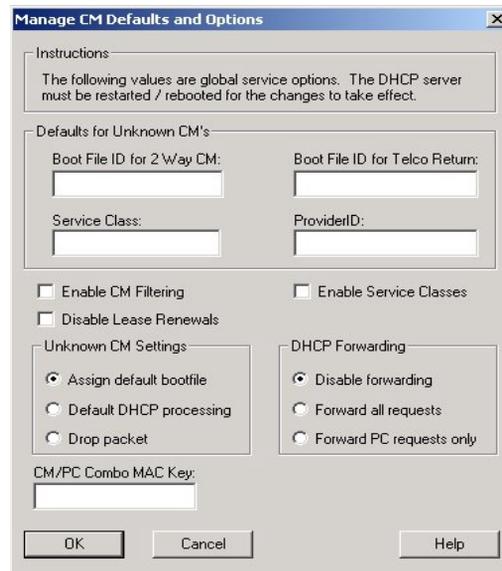
*The DHCP Forwarding feature is not being used in setting up the sample network.*

## Configuring Options

The third step in setting up the sample network is configuring the Options. The **Manage CM Defaults and Options** dialog allows you to set, enable, and disable service-wide options and defaults.

- 1 Click the **Options** button.

The **Manage CM Defaults and Options** dialog appears.



**Figure 4-5** Manage CM Defaults and Options Dialog Box

### Manage CM Defaults and Options Field Entries

For our sample network, we will define the **Boot File** and **Service Class** for all unknown CMs. We have defined the black.cfg (BootFileID=1) file for the unknown CM Boot File, and the black service class (Service Class=11) for the unknown CM Service Class.



*For purposes of this example, we have not defined **Boot Files** or **Service Classes** for Telco Return CMs.*

We will enable the **Disable Lease Renewals** feature. This forces the CMs to perform DHCP Discovers whenever its lease expires rather than renewals.

- 2 Based on this information, enter the following defaults for unknown CMs:

**Boot File ID for 2 Way CM** - enter 1

**Service Class** - enter 11

**Boot File ID for Telco Return** - enter 0

**ProviderID** - enter 0

- 3 Select the **Disable Lease Renewals** and **Enable Service Classes** checkboxes.
- 4 Under **Unknown CM Settings** click **Assign default bootfile**.
- 5 Under **DHCP Forwarding** click **Disable forwarding**.
- 6 Click **OK** to return to the main screen.

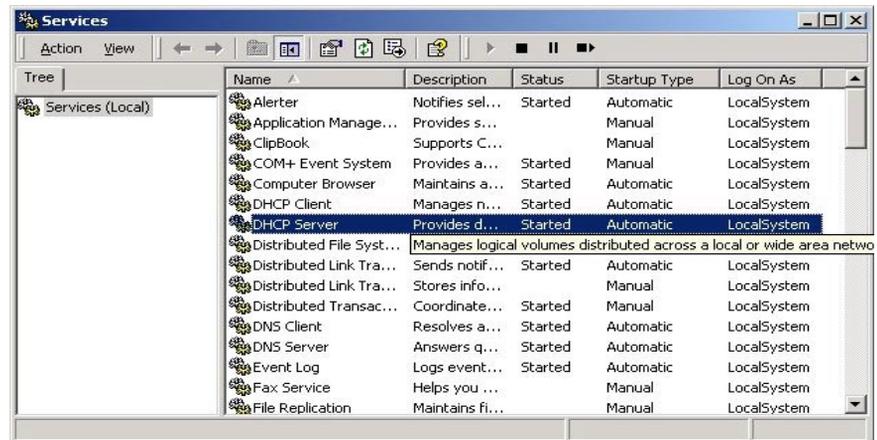
Before you can return to the main screen, the following warning appears, reminding you to restart the DHCP service to enable your changes.



**Figure 4-6** Warning Screen

- 7 Click **OK**.
- 8 Restart the DHCP service. Go to **Start | Programs | Administrative Tools | Services**.

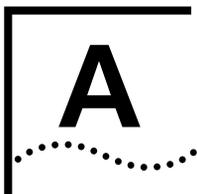
The following screen appears:



**Figure 4-7** Services Directory

- 9 Highlight the **DHCP Server**, and right-click with the mouse to **Stop** the Service.
- 10 After the service has stopped, right-click again, then **Start** the service. Your options are now in effect, and you can close the Services window.





# USING THE ADMIN API

---

## Introduction

This appendix defines the functionality that PAM allows programmatic access to. Using the **Admin API**, you can allow external systems to interact with the DOCSIS DHCP server by creating programs which give you to access PAM. You can then query the PAM database and perform functions similar to those provided by the **Load CM Info** and **Dump CM Info** buttons found on the PAM AdminTool.

An Application Programming Interface (API) contains functions which have been defined and stored in library files (DLLs). You can use these functions to define how PAM will communicate with a program, for example, a Provisioning and Billing system.

You interact with PAM programmatically by using the Component Object Model (COM) interface, a set of methods off a single COM class, as defined below. The COM interface is the standard way for objects to communicate. A **C** wrapper could easily be built around this COM interface to support Java JNI and RMI. For more information on the COM interface, point your browser to this internet link:

[www.microsoft.com/com](http://www.microsoft.com/com)

---

## Requirements

The Admin API can be accessed by any COM-accessible language, such as C++, Delphi, VBScript, JScript or Java. You should be proficient in one of these languages to use the Admin API.

The Test Admin API sample was written in Visual Basic 6.0 and requires Visual Basic to compile and run.

## APISample Folder

When you install PAM, a folder called **ApiSample** is placed into the PAM installation directory. In this ApiSample directory is a sample program (testapi.exe) which was created using the Admin API. This ApiSample folder contains the following files:

- adminapi.tlb Type library file
- Form1.frm The form file which holds the actual code
- testapi.exe The application file
- testapi.vbp The Visual Basic project file which holds the project definition
- testapi.vbw The Visual Basic workspace which holds only workspace settings such as font size

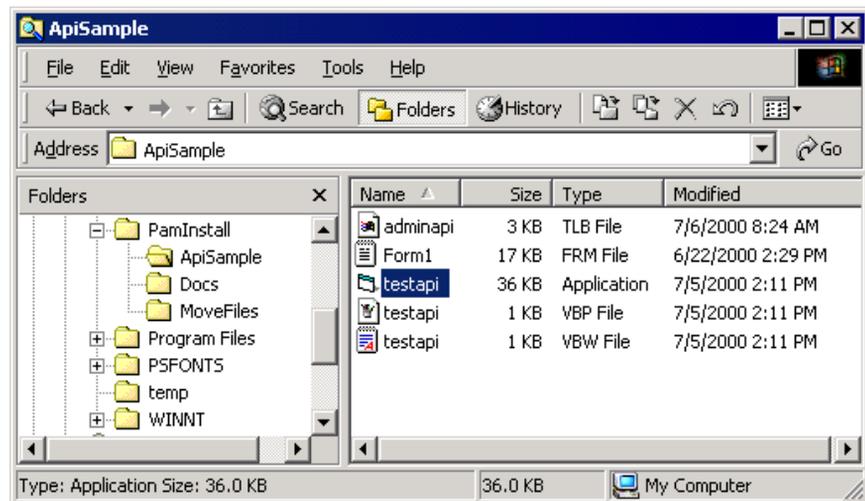


Figure A-1 APISample Files

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## COM Interface Methods

Methods are functions associated with an object. For example, GetCmlInfo is a method that gets information for the subscriber.

The methods used in this API are listed below and are described in this section.

- GetVersion
- SetCmlInfo
- GetCmlInfo
- DeleteCm
- DumpCmlInfoToFile
- GetCmlInfoFromFile
- GetIpForCmMac
- GetCmMacFromIp
- GetAssignedMacFromIp
- GetNbrOfLic
- GetLastError

**GetVersion** **GetVersion** returns the version of the Admin API as a whole number. The current version is 1.

### Function Declaration

GetVersion() as integer

**SetCmInfo** Use **SetCMInfo** to create a new entry if the CM MAC address does not exist in the database. It then overwrites BootFileID, PCServiceClass ProviderID, and Flags with the new passed-in values. Returns non-zero (-1) if successful, zero (0) if function failed.

**Table A-1** SetCMInfo Parameters and Descriptions

Parameters	Description
CmMacAddr	A 12-character hex representation of the CM's MAC address. This parameter must contain all 12 hex characters, for example: 00FA69557912
BootFileID	Number identifying the boot file that this CM should use. This number maps to a real bootfile name. The network administrator should publish the valid values.
PCServiceClass	Number identifying the class of service that PCs attached to this CM should receive. The network administrator should publish the valid values.
ProviderID	Number that identifies a provider to which DHCP messages will be forwarded. Can be zero for not forwarding.
Flags	Bit field of values. The Flags field is 0 in all cases except when the option 60 value is valid, in which case the Flags field will be 1.

### Function Declaration

SetCMInfo (CmMacAddr [in] as string, BootFileID [in] as integer, PCServiceClass [in] as integer, ProviderID as integer, Flags as integer) as Boolean.

### Sample Code

```
Private Sub btnSetCmInfo_Click()
Dim obj As Object
Dim ErrorCode As Variant, ErrorDesc As Variant
Set obj = CreateObject("DOCSIS.AdminMain")
Dim rc As Integer

rc = obj.SetCmInfo(edSetMac.Text, edSetBootID.Text,
edSetClass.Text,
edProviderIDIn.Text, edFlagsIn.Text)
If rc = 0 Then
    obj.GetLastError ErrorCode, ErrorDesc
    MsgBox "Error Code: " & ErrorCode & " Error Desc: " &
ErrorDesc
Else
    MsgBox "Success"
End If
End Sub
```

**GetCmInfo** **GetCmInfo** retrieves the information about a given CM. Returns non-zero if successful or zero if function failed.

**Table A-2** GetCmInfo Parameters and Descriptions

Parameters	Description
CmMacAddr	A 12-character hex representation of the CM's MAC address. This parameter must contain all 12 hex characters, for example: 00FA69557912
BootFileID	Number identifying the boot file that this CM should use. This number maps to a real bootfile name. The network administrator should publish the valid values.
PCServiceClass	Number identifying the class of service that PCs attached to this CM should receive. The network administrator should publish the valid values.
ProviderID	Number that identifies a provider to which DHCP messages will be forwarded. Can be zero for not forwarding.
Flags	Bit field of values. The Flags field is 0 in all cases except when the option 60 value is valid, in which case the Flags field will be 1.
Settings	String containing hex characters representing the option 60 length and value for this CM.

### Function Declaration

GetCmInfo (CmMacAddr [in] as string, BootFileID [out] as variant, PCServiceClass [out] as variant, ProviderID[out] as variant, Flags[out] as variant) as Boolean.

### Sample Code

```
Private Sub bnGetCmInfo_Click()
Dim obj As Object
Set obj = CreateObject("DOCSIS.AdminMain")
Dim rc As Integer
Dim lBootID As Variant, lClass As Variant, ProviderID As
Variant, Flags As
Variant
Dim CmSettings As Variant

rc = obj.GetCmInfo(edGetMac.Text, lBootID, lClass,
ProviderID, Flags,
CmSettings)
edGetBootID.Text = lBootID
edGetClass.Text = lClass
edProviderID.Text = ProviderID
edFlags.Text = Flags
edSettings.Text = CmSettings
```

```
MsgBox ("Returned " & rc)
```

```
End Sub
```

**DeleteCm** **DeleteCm** removes the record associated with the specified CM from the system. Returns non-zero if successful, zero if function failed.

**Parameters.**

**Table A-3** DeleteCM Parameter and Description

Parameters	Description
CmMacAddr	12-character hex representation of the CM's MAC address. This parameter must contain all 12 hex characters, for example: 00FA69557912

**Function Declaration**

DeleteCm (CmMacAddr [in] as string) as Boolean.

**Sample Code**

```
Private Sub bnDelCm_Click()
Dim obj As Object
Set obj = CreateObject("DOCSIS.AdminMain")
Dim rc As Integer

rc = obj.DeleteCm(edDelCmMac.Text)
MsgBox ("Returned " & rc)2

End Sub
```

**DumpCmInfoToFile** Dumps the entire contents of the CmConfig table to a *comma delimited file*. The FullFilePath can be either a local path such as `c:\temp\somefile.txt` or a UNC name such as `\\someserver\someshare\somefile.txt`.

See Dump CM Info on page 3-13 for text file requirements.

Returns non-zero if successful or zero if function failed.

### Parameters

**Table A-4** DumpCmInfoToFile Parameter and Description

Parameters	Description
FullFilePath	String containing the full path to the desired output file.

### Function Declaration

DumpCmInfoToFile (FullFilePath [in] as string) as Boolean.

### Sample Code

```
Private Sub btnDump_Click()  
Dim obj As Object  
Set obj = CreateObject("DOCSIS.AdminMain")  
Dim rc As Integer  
  
rc = obj.DumpCmInfoToFile(edDumpFilePath.Text)  
MsgBox ("Returned " & rc)  
  
End Sub
```

**GetCmInfoFromFile** Gets CM configuration information from the specified text file. The text file will have the same format as *DumpCmInfoToFile*. If the MAC address already exists, the other fields will be set to the values in the file. Returns non-zero if successful or zero if function failed.

### Parameters

**Table A-5** GetCmInfoFromFile Parameter and Description

Parameters	Description
FullFilePath	String containing the full path to the desired output file.

### Function Declaration

Bool GetCmInfoFromFile (FullFilePath [in] as string) as Boolean.

### Sample Code

```
Private Sub bnGetFileInfo_Click()  
Dim obj As Object  
Set obj = CreateObject("DOCSIS.AdminMain")  
Dim rc As Integer  
  
rc = obj.GetCmInfoFromFile(edGetFilePath.Text)  
MsgBox ("Returned " & rc)  
  
End Sub
```

**GetIpForCmMac** Gets the IP address for the specified MAC address. Returns non-zero if successful, zero if function failed.

### Parameters

**Table A-6** GetIpForCmMac Parameters and Descriptions

Parameters	Description
CmMac	String containing a CM MAC address.
IpAddress	String containing the IP address for the specified MAC address.

### Function Declaration

Bool GetIpForCmMac (CmMac as string, IpAddress[out] as variant).

### Sample Code

```
Private Sub bnIpmapping_Click()  
Dim obj As Object  
Set obj = CreateObject("DOCSIS.AdminMain")  
Dim rc As Integer  
  
If Option1.Value = True Then 'GetCmMacFromIp  
    rc = obj.GetCmMacFromIp(edIpAddr.Text, vntTmp)  
    edCmMacIp.Text = vntTmp  
End If  
If Option2.Value = True Then 'GetAssignedMacFromIp  
    rc = obj.GetAssignedMacFromIp(edIpAddr.Text, vntTmp)  
    edCmMacIp.Text = vntTmp  
End If  
  
If Option3.Value = True Then 'GetIpForCmMac  
    rc = obj.GetIpForCmMac(edCmMacIp.Text, vntTmp)  
    edIpAddr.Text = vntTmp  
End If  
  
MsgBox ("Returned " & rc)  
End Sub
```

**GetCmMacFromIp**

Gets the CM MAC address for the specified IP address. The IP address could be the CM's IP address or an IP address of a PC attached to the CM. Returns non-zero if successful, zero if function failed.

**Parameters****Table A-7** GetCmMacFromIp Parameters and Descriptions

Parameters	Description
CmMac	String containing a CM MAC address.
IpAddress	String containing the IP address for the specified MAC address.

**Function Declaration**

```
Bool GetCmMacFromIp (IpAddress as string, CmMAC[out] as string).
```

**Sample Code**

```
Private Sub bnIpmapping_Click()
Dim obj As Object
Set obj = CreateObject("DOCSIS.AdminMain")
Dim rc As Integer

If Option1.Value = True Then 'GetCmMacFromIp
    rc = obj.GetCmMacFromIp(edIpAddr.Text, vntTmp)
    edCmMacIp.Text = vntTmp
End If

If Option2.Value = True Then 'GetAssignedMacFromIp
    rc = obj.GetAssignedMacFromIp(edIpAddr.Text, vntTmp)
    edCmMacIp.Text = vntTmp
End If

If Option3.Value = True Then 'GetIpForCmMac
    rc = obj.GetIpForCmMac(edCmMacIp.Text, vntTmp)
    edIpAddr.Text = vntTmp
End If

MsgBox ("Returned " & rc)
End Sub
```

**GetAssignedMacFromIp**

Gets the MAC address for the IpAddress passed in, this could be a CM or a PC MAC address.

**Parameters****Table A-8** GetAssignedMacFromIp Parameters and Descriptions

Parameters	Description
Mac	String containing the MAC address.
IpAddress	String containing the IP address for the specified MAC address.

**Function Declaration**

Bool GetAssignedMacFromIp(IpAddress as string, MAC[out] as variant).

**Sample Code**

```
Private Sub bnIpmapping_Click()
Dim obj As Object
Set obj = CreateObject("DOCSIS.AdminMain")

Dim rc As Integer

If Option1.Value = True Then 'GetCmMacFromIp
    rc = obj.GetCmMacFromIp(edIpAddr.Text, vntTmp)
    edCmMacIp.Text = vntTmp
End If

If Option2.Value = True Then 'GetAssignedMacFromIp
    rc = obj.GetAssignedMacFromIp(edIpAddr.Text, vntTmp)
    edCmMacIp.Text = vntTmp
End If

If Option3.Value = True Then 'GetIpForCmMac
    rc = obj.GetIpForCmMac(edCmMacIp.Text, vntTmp)
    edIpAddr.Text = vntTmp
End If

MsgBox ("Returned " & rc)
End Sub
```

**GetNbrOfLic** Gets the maximum number of licenses that PAM is currently configured to allow.

### Parameters

**Table A-9** GetNbrOfLic Parameter and Description

Parameters	Description
MaxLics	Number that contains the maximum number of licenses that PAM is currently configured to allow.

### Function Declaration

Bool GetNbrOfLic(MaxLics[out] as variant).

### Sample Code

```
Private Sub bnGetLic_Click()  
Dim obj As Object  
Dim rc As Integer  
Dim Lics  
Set obj = CreateObject("DOCSIS.AdminMain")  
rc = obj.GetNbrOfLic(Lics)  
If rc <> 0 Then  
    MsgBox "You have a " & Lics & " CM entry license"  
Else  
    MsgBox "An error has occurred."  
End If  
  
End Sub
```

**GetLastError** Gets the error code and description for the last error to occur for this object instance.

### Parameters

**Table A-10** GetLastError Parameters and Descriptions

Parameters	Description
ErrorCode	Number that uniquely identifies the error that occurred.
ErrorDesc	String description of the error that has occurred.

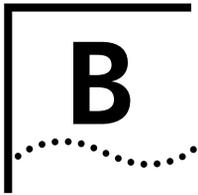
### Function Declaration

Bool GetLastError(ErrorCode[out] variant, ErrorDesc[out] variant).

### Sample Code

```
Private Sub btnGetLastError_Click()  
Dim obj As Object  
Dim rc As Integer  
Dim ErrorCode As Variant  
Dim ErrorDesc As Variant  
Set obj = CreateObject("DOCSIS.AdminMain")  
rc = obj.GetLastError(ErrorCode, ErrorDesc)  
If rc <> 0 Then  
    MsgBox "Error Code: " & ErrorCode & " Error Desc: " &  
ErrorDesc  
Else  
    MsgBox "Get Last Error Failed."  
End If  
End Sub
```





# PAM LICENSE CODE INFORMATION REQUEST FORM

This appendix provides information about the PAM License Code discussed on page 2-14, and a copy of the PAM License Key Information Request Form.

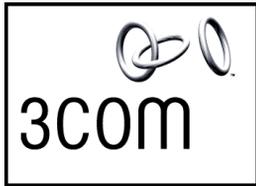


*The License Code is also referred to as the License Key.*

---

## **Obtaining the PAM License Code**

PAM is not fully functional without the License Code, also referred to as the License Key. Please provide the information requested on the PAM License Code Information Request Form on the next page. Be sure to read the form for information on how to deliver your request to 3Com.



## PAM License Code Information Request

Dear Customer:

Thank you for purchasing the Provisioning Access Manager (PAM) Software and License Code.

This document provides information on how license codes work and details the information that is needed by 3Com to supply various PAM license codes to our customers.

### How the License Code Works

License Codes are mechanisms for unlocking functionality within the software code for various Total Control system components.

Each code is based on the number of users that PAM will support. Once the code is entered into PAM, the functionality is enabled for the amount of users the code supports. Therefore, a separate code is needed for an upgrade beyond the current amount of supported users.

### Purchasing License Codes

If you are planning on purchasing a license code upgrade, please contact your 3Com Sales Representative or the appropriate reseller. Once you have purchased an upgrade, you may contact the PAM Coordinator at [Carrier\\_featurekeys@3com.com](mailto:Carrier_featurekeys@3com.com) to obtain upgraded code. If you just purchased PAM software, you also need to contact PAM Coordinator to get the free license code for 3K users.

### Additional Information Needed

The following information is needed in order for 3Com to process your request:

- Company Name: \_\_\_\_\_
- Company Address: \_\_\_\_\_  
\_\_\_\_\_
- Contact Name: \_\_\_\_\_
- Contact Phone Number: \_\_\_\_\_
- Contact Fax Number: \_\_\_\_\_
- Contact Email Address: \_\_\_\_\_
- Reseller Name and Contact: \_\_\_\_\_  
\_\_\_\_\_
- **Current License Code (required if purchasing 1K upgrades):** \_\_\_\_\_
- **New License Code Required – Number of users (required if purchasing 1K upgrades):** \_\_\_\_\_
- **A copy of the invoice showing proof of purchase for one of the following PAM License Codes:**
  - 3C05-8880-00 PAM Software and 3000 User License
  - 3C05-8881-00 1K User Upgrade
  - 3C05-8882-00 Unlimited User Upgrade

Please send the above information back to 3Com in English via either of the following methods:

#### Email

Information sent by email should go to [Carrier\\_featurekeys@3com.com](mailto:Carrier_featurekeys@3com.com). Please include "PAM License Code" in the subject line.

#### Facsimile

Information can be faxed to 847-262-2750, Attn: PAM Coordinator

### Delivery of the License Codes

Requests are processed during normal business hours, 8am -5 PM CST (excluding 3Com US holidays and weekends). 3Com is committed to servicing your license code in an efficient manner. If, in the unfortunate event, you do not receive your license code within 24 hours, please send an email inquiry to [Carrier\\_featurekeys@3Com.com](mailto:Carrier_featurekeys@3Com.com).

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**Y**

Year 2000 compliance ix





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