Cisco Broadband Access Center Installation and Setup Guide

Release 4.1.0.1
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Installation and Setup Guide for Cisco Broadband Access Center 4.1.0.1

CONTENTS

Preface

The *Cisco Broadband Access Center 4.1.0.1 Installation and Setup Guide* describes general requirements and installation procedures for Cisco Broadband Access Center, which is called Cisco BAC throughout this guide.

This preface provides an outline of the other chapters in this guide, details information about related documents that support this Cisco BAC release, and demonstrates the styles and conventions used in the guide.

This preface contains the following sections:

Audience

System integrators, network administrators, and network technicians use this installation guide to install Cisco BAC on the Solaris and Linux operating systems and to set up the Device Provisioning Engine (DPE).

Note Within this installation guide you will encounter references to Cisco BAC. With two exceptions, these references are to the Cisco BAC software. The exceptions are when you are prompted to enter specific data that may also contain references to Cisco BAC, and references made to specific files, directories, or pathnames. In such instances, you must enter the characters exactly as they appear in this guide.

How This Guide Is Organized

The major sections of this guide are:

Title	Description
Overview	Provides general requirements for a successful installation of Cisco BAC.
Installation of Broadband Access Center on Solaris	Describes how to install Cisco BAC on Solaris.
Installation of Broadband Access Center on Linux	Describes how to install Cisco BAC on Linux.
Setting Up a Device Provisioning Engine	Describes how to configure a Cisco BAC component, the DPE.
Network Registrar Configuration File Example	Provides examples of files used to configure Cisco Network Registrar (CNR) for high-speed data and voice technology deployments.
Installation Worksheet	Provides you with a worksheet to note down the values that you enter while installing Cisco BAC.

Conventions

This document uses the following conventions:

Item	Convention
Commands and keywords	**boldface** font
Variables for which you supply values	*italic* font
Displayed session and system information	`screen` font
Information you enter	**`boldface screen`** font
Variables you enter	*`italic screen`* font
Menu items and button names	**boldface** font
Selecting a menu item in paragraphs	**Option > Network Preferences**
Selecting a menu item in tables	Option > Network Preferences

Caution Means *be careful*. In this situation, you might do something that could result in equipment damage or loss of data.

Note Means *take note*. Notes contain helpful suggestions or references to material not covered in the publication.

Tip Means *a helpful hint*. The description can present an optimum action to take.

Product Documentation

Note We sometimes update the printed and electronic documentation after original publication. Therefore, you should also review the documentation on Cisco.com for any updates.

Table 1 describes the documentation that is available for this Cisco BAC release.

Table 1 Product Documentation

Document Title	Available Format
Release Notes for Cisco Broadband Access Center, Release 4.1.0.1	• PDF file on the product CD-ROM • On Cisco.com: http://cisco.com/en/US/products/sw/netmgtsw/ps529/prod_release_notes_list.html
Installation and Setup Guide for Cisco Broadband Access Center, Release 4.1.0.1	• PDF file on the product CD-ROM • On Cisco.com: http://cisco.com/en/US/products/sw/netmgtsw/ps529/prod_installation_guides_list.html
Cisco Broadband Access Center Administrator Guide, Release 4.1	• PDF file on the product CD-ROM • On Cisco.com: http://cisco.com/en/US/products/sw/netmgtsw/ps529/prod_maintenance_guides_list.html
Cisco Broadband Access Center DPE CLI Reference, Release 4.1	• PDF file on the product CD-ROM • On Cisco.com: http://cisco.com/en/US/products/sw/netmgtsw/ps529/prod_command_reference_list.html

Related Documentation

Note We sometimes update the printed and electronic documentation after original publication. Therefore, you should also review the documentation on Cisco.com for any updates.

Table 2 describes additional documentation that is available for this release of Cisco BAC.

Table 2 Related Documentation

Document Title	Available Format
Release Notes for Cisco Network Registrar 7.1.2.1	On Cisco.com: http://www.cisco.com/en/US/docs/net_mgmt/network_registrar/7.1.2.1/release/notes/CNR7121ReleaseNotes.html
Installation Guide for Cisco Network Registrar, Release 7.1	On Cisco.com http://cisco.com/en/US/products/sw/netmgtsw/ps1982/prod_installation_guides_list.html
User Guide for Cisco Network Registrar, Release 7.1	On Cisco.com: http://cisco.com/en/US/products/sw/netmgtsw/ps1982/products_user_guide_list.html
Command Reference Guide for Cisco Network Registrar, 7.1	As an HTML document that you can view in your web browser when you install the software. The document is available at Start > Programs > Network Registrar > Network Registrar CLI Reference Guide. On Cisco.com: http://cisco.com/en/US/products/sw/netmgtsw/ps1982/prod_command_reference_list.html
Quick Start Guide for Cisco Network Registrar, Release 7.1	On Cisco.com: http://cisco.com/en/US/products/sw/netmgtsw/ps1982/prod_installation_guides_list.html

Obtaining Documentation and Submitting a Service Request

For information on obtaining documentation, submitting a service request, and gathering additional information, see the monthly *What's New in Cisco Product Documentation*, which also lists all new and revised Cisco technical documentation, at:

http://www.cisco.com/en/US/docs/general/whatsnew/whatsnew.html

Subscribe to *What's New in Cisco Product Documentation* as a Really Simple Syndication (RSS) feed and set content to be delivered directly to your desktop using a reader application. The RSS feeds are a free service and Cisco currently supports RSS version 2.0.

CHAPTER 1

Overview

This chapter gives an overview of Cisco Broadband Access Center (Cisco BAC), and describes the factors that you must consider before installing Cisco BAC.

This chapter describes:

Product Overview

Cisco BAC is a distributed and scalable application that automates the tasks of provisioning and managing cable devices in a broadband service provider network. It provides a simple and easy way to deploy high-speed data, voice technology, and home networking devices. The application interfaces with Cisco Network Registrar, which includes a high-speed DHCP for IP address management and a Domain Name System (DNS) server.

Cisco BAC can be scaled to suit networks of virtually any size. It also offers high availability, made possible by the product's distributed architecture with centralized management.

Cisco BAC enables you to provision and manage cable modems compliant with the DOCSIS 3.0 specification. With IP version 6 (IPv6) being a significant feature of DOCSIS 3.0, this release supports DHCPv6 and DNSv6.

Cisco BAC can be run on a Solaris operating system as a non-root user.

For optimum performance and reliability of the Cisco BAC database, ZFS file system has been introduced. For details on ZFS, see File-System Block Size, page 2-6.

Operating System Requirements

For Solaris, you must install Cisco BAC on a Sun SPARC platform running the Solaris 10 operating system with at least 4 GB of memory. We recommend that you use a Sun SPARC multiprocessor platform.

Note Before installing Cisco BAC, download and install the recommended Solaris patches from the Sun Microsystems support site.
Cisco BAC ships with the required JRE version 1.6.0_23, which resides in the *BPR_HOME/jre* directory.

You must also download and install the Java Platform Standard Edition (Java SE) cluster patches recommended by Sun Microsystems to install Cisco BAC on a system that runs Solaris 10, see Table 1-1.

Table 1-1 Java Standard Edition Cluster Patches for Solaris 10

Patch	Description
120900-04	Libzonecfg patch
121133-02	Zones library and zones utility patch
119254-44	Install and patch utilities patch, for more information, see Chapter 3, "Installation of Broadband Access Center on Solaris"
118918-24	Solaris crypto framework patch
119042-10	Svccfg and svcprop patch
119578-30	FMA patch
118833-36	Kernel patch

For Linux, you must install Cisco BAC on Red Hat Enterprise Linux 5.3 (2.6.18 or higher) using x86 and 64 bit hardware system with at least 4 GB of memory. The selinux should be disabled.

Cisco Network Registrar Requirements

Note If you are not installing Cisco BAC extensions on CNR, you do not need to install CNR.

Before installing Cisco BAC extensions, be aware of these CNR requirements:

- You must install CNR 7.1.2.1 with Cisco BAC 4.1.0.1.
- You must install a CNR DHCP server on a computer running Solaris 10.
- In a failover deployment of Cisco BAC, you must configure two redundant DHCP servers for failover.
- After you install Cisco BAC, ensure that CNR scopes are configured to reflect failover capability and the topology of the network on which Cisco BAC is installed. For information on configuring failover on CNR servers, see the *User Guide for Cisco Network Registrar, 7.1*.

Cisco BAC Components at a Glance

A Cisco BAC installation requires:

- A Regional Distribution Unit (RDU)

  The RDU is the primary server in a Cisco BAC deployment. It contains the central Cisco BAC database and is the sole entry point for processing requests from the API.

- One or more Device Provisioning Engines (DPEs)

  A DPE caches provisioning information and configuration requests, including the transfer of configuration files to devices. It is the major component of the provisioning group, handling all device interactions with the RDU.

  The DPE is integrated with the CNR DHCP server to control the assignment of IP addresses. Multiple DPEs can communicate with a single DHCP server.

  Note This release of Cisco BAC does not support installing the DPE on a hardware appliance.

- A Key Distribution Center (KDC)

  The KDC, along with the DPE registration service, handles the authentication of all voice technology media terminal adapters (MTAs).

  Note The KDC is required only when configuring a system to support voice technology operations using PacketCable.

  For performance reasons, install the KDC on a separate server.

- One or more CNR servers

  CNR provides the DHCP and DNS functionality. Implementing DNS Update within CNR increases the number of servers you need to deploy.

Type of Installation

This guide describes the individual component installation, which installs one or more components of Cisco BAC: the RDU, one or more DPEs, CNR extensions, and the KDC. For detailed procedures on installing components in the interactive or non-interactive modes, see Chapter 3, “Installation of Broadband Access Center on Solaris.” or Chapter 4, “Installation of Broadband Access Center on Linux.”

Note This release does not feature a lab installation, but you can perform its equivalent by installing all Cisco BAC components on a single machine. To perform such an installation, we recommend that you have at least 500 MB of disk space available.

CHAPTER 2

Before Installing Cisco Broadband Access Center

This chapter explains how to prepare for a successful installation of Cisco Broadband Access Center (Cisco BAC) and describes:

Cisco BAC Components

The Cisco BAC component installation program prompts you to install:

- Regional Distribution Unit (RDU)

  The RDU is the primary server in the Cisco BAC provisioning system. You should install the RDU on a server that fulfills the requirements that are described in Chapter 1, "Overview."

  The RDU:

  - Manages the generation of device configurations.
  - Processes application programming interface (API) requests for all Cisco BAC functions.
  - Manages the Cisco BAC system.

  When you install the RDU, the installation program also installs the administrator user interface. The program also preloads required data into the RDU database, and starts the RDU daemon through the Cisco BAC process watchdog. The SNMP agent is also installed for the RDU. For details on configuring the SNMP agent, see the *Cisco Broadband Access Center DPE CLI Reference 4.1*. For information on the Cisco BAC process watchdog, see the *Cisco Broadband Access Center Administrator Guide 4.1*.

- Device Provisioning Engine (DPE)

  The DPE is the major component of the provisioning group, handling all device interactions with the RDU. You should install a DPE on a server that meets the requirements described in Chapter 1, "Overview."

  The DPE:

  - Caches device configurations generated at the RDU.
  - Manages various CPE protocol services. These services obtain their operating instructions from the instruction cache.

  The installation program installs a CLI on your system to help configure the DPE. The Cisco BAC process watchdog and the SNMP agent are installed for the DPE also. For information on configuring the DPE and configuring the SNMP agent, see the *Cisco Broadband Access Center DPE CLI Reference 4.1*.

  Note The DPE is separately licensed and must be installed from the administrator user interface. For details on licensing in this Cisco BAC release and how to install your license, see Licensing Cisco BAC, page 5-1.

- CNR extensions

  The CNR extensions are the link between Cisco BAC and CNR. You should install this component on all CNR servers in your Cisco BAC environment. If you are deploying Cisco BAC in a failover environment, ensure that you install the extensions on the failover servers also.

  Note You must install the Cisco BAC CNR extensions on a server running Network Registrar 7.1.2.1. If you do not want to install these extensions, you are not required to install CNR.

- Key Distribution Center (KDC)

  The KDC, along with the DPE registration service, handles the authentication of all PacketCable voice technology MTAs. For performance reasons, install the KDC on a separate server that meets the requirements described in Chapter 1, "Overview."

  The KDC requires service keys, which allow it to communicate with the DPE. For details, see the *Cisco Broadband Access Center DPE CLI Reference 4.1* and the *Cisco Broadband Access Center Administrator Guide 4.1*.

  Note The KDC requires a license, which continues to be proprietary, as in previous Cisco BAC releases, and is licensed during Cisco BAC installation. For information on installing a KDC license, see Installing Your KDC License, page 5-4.

Installation and Startup Process

To ensure a smooth installation and startup process:

Step 1 Determine the computers and servers on which you are installing the Cisco BAC components.

Step 2 Verify the file-system block size of the directory in which you intend to install the Cisco BAC database and the database transaction log files. See Database Requirements, page 2-6.

Step 3 Review the installation checklist described in Table 2-1.

Step 4 Install the RDU. Ensure that you know the location for the:

- Home directory
- Data directory
- Database logs directory

Step 5 Install a DPE. Ensure that you know the location for the:

- Home directory
- Data directory
- Database logs directory

Step 6 After installing the RDU, ensure that you:

a. Obtain a valid Cisco BAC license file to provision all technologies. For details on obtaining and installing your license file, see Obtaining a Permanent License, page 5-2.

You still require separate licenses—permanent or evaluation—for the following Cisco BAC components:

- The DPE
- The KDC, if you configure your network to support voice technology

b. Verify that the RDU is running by starting the administrator user interface.

To launch the administrator user interface, enter the administrator's location from your web browser using:

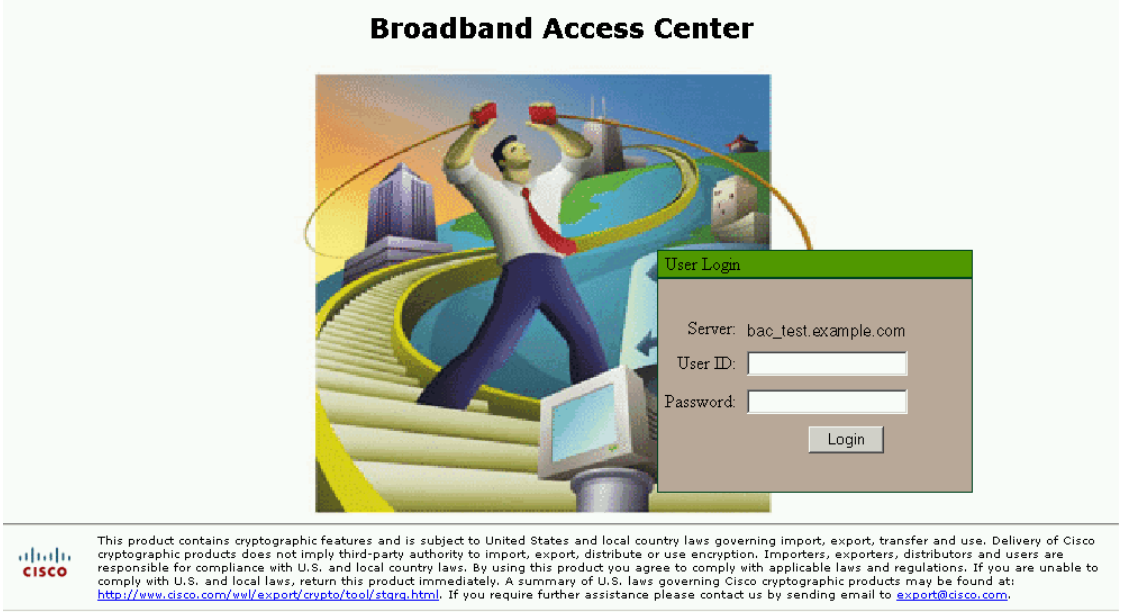
http://*machine_name:port_number*/

Note To access the administrator user interface using HTTP over SSL, enter: https://*machine_name:port_number*/

- *machine_name*—Identifies the computer on which the RDU is running.
- *port_number*—Identifies the computer port on which the server side of the administrator application is running. By default, this port number is:
  - 8100 for HTTP over TCP
  - 8443 for HTTP over SSL

The main login screen, as shown in Figure 2-1, appears.

Figure 2-1 Login Screen



c. Change the Cisco BAC administrator's password.

To change the password, enter the default username (**admin**) and password (**changeme**).

Click **Login**.

The Change Password screen appears.

Enter a new password; ensure that this password has at least 8 characters.

Click **Login**.

Step 7 Optionally, configure the syslog file for alerts. See Configuring the Syslog Utility to Receive Alerts from Cisco BAC, page 5-5. You can set up the syslog file on any Cisco BAC component server.

Step 8 After installing the DPE, ensure that you:

a. Change the DPE login password and the privileged password from the command-line interface (CLI).

– To change the login password, access the CLI in the privileged mode, and enter:

```
bac_dpe# password password
```

where *password* identifies the new DPE password.

– To change the DPE privileged password, enter:

```
bac_dpe# enable password password
```

where *password* identifies the local configured password currently in effect or, optionally, provides a new password. If this parameter is omitted, you are prompted for the password.

For more information, see the *Cisco Broadband Access Center DPE CLI Reference 4.1*.

b. Configure the DPE from the CLI as required. For configuration instructions, see the *Cisco Broadband Access Center DPE CLI Reference 4.1*.

Step 9 Install and configure CNR, if it is not already installed on your system. We recommend that you use CNR 7.1.2.1. For more information on installing CNR, see the *Installation Guide for Cisco Network Registrar 7.1*.

- When you install the CNR Local Cluster (LCCM), ensure that you:
  a. Obtain a valid CNR license file for the local cluster.
  b. On all CNR local cluster servers, install Cisco BAC extensions. See Installing Cisco BAC, page 3-4
  c. Configure CNR, including its extensions. Specifically, you need to configure scopes, policies, client classes, and selection tags. See Configuring Extensions, page 3-17. Also see the *User Guide for Cisco Network Registrar 7.1*.
  d. Configure the CNR syslog for alerts and debugging information. See Configuring the Syslog Utility to Receive Alerts from Cisco BAC, page 5-5.
  e. Validate the installation by connecting to the CNR web UI and viewing it.
- When you install CNR Regional Cluster (RCCM), ensure that you:
  a. Identify the master server for CNR Regional Installation, which administers all the configured CNR local clusters. This server can be Solaris, Windows, or Linux. However, we recommend that you have the Solaris operating system on the CNR Regional Server.
  b. Obtain a valid central-cluster license file for the CNR Regional Server.
  c. After you install the Cisco BAC extensions on all CNR local servers, replicate the local data into regional and pull the replica address space. For more information, see the *User Guide for Cisco Network Registrar 7.1*.
  d. Alternatively, you can also create subnets, client classes, policies, and so on at RCCM and push them to the required LCCM DHCP server. For more information, see the *User Guide for Cisco Network Registrar 7.1*.

Step 10 Install and configure the KDC. When you install the KDC, ensure that you:

- Obtain a valid Cisco BAC license. The KDC license is proprietary and is licensed during Cisco BAC installation. For information on installing the KDC license, see Licensing Cisco BAC, page 5-1.
- Have the following information at hand:
  – KDC realm—Identified by a unique name, the KDC realm consists of a KDC and the clients and servers registered to that KDC.

  Note The realm must match the certificate chain at the KDC.

  – KDC FQDN—Identifies the fully qualified domain name on which the KDC server is located.
  – KDC interface address—Identifies the interface (generally the IP address of the KDC server) on which the KDC listens for requests.

Database Requirements

Before you install Cisco BAC, be aware of these database considerations:

- File-system block size
- Large file support

File-System Block Size

For optimum performance and reliability of the Cisco BAC database, configure the file system or systems that contain the database files and database log files with an 8 KB or greater block size. If your system configuration does not support an 8-KB block size, then configure the block size in multiples of 8 KB; for example, 16 KB or 32 KB.

Note The block size cannot be changed once the Unix File System (UFS) is mounted with a value. The value has to be set during Solaris disk partition.

ZFS is a new file system in Solaris 10 OS which provides excellent data integrity and performance compared to other file systems. The benefit of using ZFS in a container is that the storage pool inside the container can then be given a particular amount of storage from the global storage pool and hence the global pool can be managed easily.

The steps required are:

- Creating zone.
- Creating zpool, which is the actual storage pool.
- Allocating a ZFS file system to the zone.

In Cisco BAC, the RDU and DPE file system supports a blocksize of 8 KB to 64 KB. The DPE and RDU will restart if the block size configured is greater than 8 KB.

The installation program prompts you to specify a directory in which to install database files, and database transaction log files. These directories are identified in Cisco BAC with the system variables *BPR_DATA*, and *BPR_DBLOG,* respectively.

To verify that a directory resides on a file system with a minimum of 8-KB block size:

Step 1 Run the UNIX **mount** command without any parameters to determine on which file-system device the directory resides. The default directory is */var/CSCObac*.

For example:

```
# mount
/var on /dev/dsk/c0t0d0s4 read/write/setuid/intr/largefiles/logging/xattr/onerror=panic/
dev=2200004 on Thu Jun 15 16:58:21 2006
```

In this example, the file-system device is */dev/dsk/c0t0d0s4*.

Step 2 To determine the file-system block size, use the **df** command.

For example:

```
# df -g /dev/dsk/c0t0d0s4

/var     (/dev/dsk/c0t0d0s4):    8192 block size    1024 frag size
  961240 total blocks    851210 free blocks    755086 available    243712 total files
   239730 free files    35651588 filesys id
     ufs fstype    0x00000004 flag    255 filename length
```

In this example, the block size is 8192 bytes, which is 8 KB. The block size of the selected directory, therefore, is correct.

Large File Support

Ensure that the file system in which you place database files is configured to support files larger than 2 GB. To verify large file support:

Step 1 Run the UNIX **mount** command without parameters.

Step 2 Note whether the intended file system contains the keyword **largefiles**.

For example:

```
/var on /dev/dsk/c0t0d0s4 read/write/setuid/intr/largefiles/onerror=panic/dev=2200004 on
Thu Jun 15 08:07:53
```

In this example, the output contains the keyword **largefiles**. This file system, therefore, can support files larger than 2 GB.

CHAPTER 3

Installation of Broadband Access Center on Solaris

This chapter explains the procedure and sequence of event for a successful installation of Cisco Broadband Access Center (Cisco BAC) on Solaris. It covers the following topics:

Preinstallation Tasks

Before you begin to install BAC on Solaris, you need to perform the following set of tasks:

- Create users and groups.
- Assign privileges to users.

Following are the preinstallation procedures that a root user should perform:

Step 1 Create users and groups.

A new user is created by the system administrator.

For example:

```
useradd -u 102 -g 1110 -d /home/user -m -s /bin/sh -c "Test User" user
```

where -u is the user name

-g is the group name

-d is the directory location

A group is created and the user is assigned to that group.

For example:

```
groupadd -g 1110 baceng
```

where -g is the group name

Step 2 Assign privileges to users.

For example:

```
usermod -K defaultpriv=file_chown, file_link_any, file_owner, net_privaddr, proc_exec,
proc_fork,proc_info, proc_owner, proc_session, proc_setid user
```

Privileges are assigned to a new user by the system administrator to run the product.

To configure RBAC feature of Solaris, see *System Administration Guide: Security Services for configuring RBAC* in *http://docs.sun.com/app/docs/doc/816-4557/rbactask-30?a=view.*

Note During installation, it may be necessary to install several Solaris patches on your computer. Should patch installation become necessary, see the Sun Microsystems support site to download these patches. For a list of recommended patches, see Operating System Requirements, page 1-2.

Installing Cisco Broadband Access Center

This chapter explains the procedures you must follow to install Cisco Broadband Access Center (Cisco BAC) in a Solaris operating system environment.

This chapter includes:

Before you install Cisco BAC, ensure that you are ready by reviewing the checklist that Table 3-1 describes.

Table 3-1 Installation Checklist

Task	Checkoff
1. Verify if your system meets the minimum system hardware and software requirements described in Chapter 1, "Overview."	❑
2. Ensure that you have access to the computers on which you intend to install Cisco BAC components.	❑
3. Save your license file on the system from which you intend to launch the Cisco BAC administrator user interface via a web browser. You need a valid service license file to configure Cisco BAC licensing.	❑
4. Determine the home directory (*BPR_HOME*) in which you want to install the Cisco BAC component or components. The default directory is */opt/CSCObac*. Ensure that the target installation directory has enough disk space. **Note** We recommend that you have at least 500 MB of disk space available otherwise installation will not take place.	❑
5. For the RDU, determine where you want to install the data directory (*BPR_DATA*) and the database logs (*BPR_DBLOG*). The default directory is */var/CSCObac*. Ensure that the target installation directory has enough disk space. **Note** We recommend that you locate the data directory on a different physical disk than the home directory; for example, */var/disk0/CSCObac*. The disk should have at least 1 GB and up to 30 GB of free space. The installation program, by default, installs the data directory, the database transaction logs directory, and the logs directory in the same location. We recommend that you locate the database transaction logs directory on the fastest disk on the system. Also, ensure that 1 GB of disk space is available.	❑
6. Verify that you have minimum 500 MB of free space available in the /tmp directory for successful installation.	❑
7. For the RDU, determine the listening port number. The RDU uses this interface to communicate with other Cisco BAC components, such as DPEs and CNR extension points. The default port is 49187.	❑
8. For the RDU, determine the shared secret password that Cisco BAC servers on your network use as a token to authenticate communication with one another. The shared secret password should be the same for all Cisco BAC servers on your network.	❑
9. For the RDU, determine the ports through which you will access the administrator user interface using HTTP or HTTP over SSL (HTTPS). The default ports are: • 8100 for HTTP • 8443 for HTTPS	❑

Table 3-1 Installation Checklist (continued)

Task	Checkoff
10. Ensure that CNR 7.1.2.1 is installed and running on the servers on which you are installing Cisco BAC extensions. **Note** To enable IPv6 support in Cisco BAC, you must install version 7.1.2.1 of CNR.	❑
11. For the CNR extensions, determine the name of the provisioning group to which the CNR server belongs.	❑
12. For the CNR extensions, determine where you want to install the data directory (*BPR_DATA*). The default directory is */var/CSCObac*.	❑
13. Verify that you have the necessary CNR configuration files. For an example of these configuration files, see Appendix A, "Network Registrar Configuration File Example."	❑
14. Verify that you have the necessary KDC servers available.	❑

15. Enable your machine to support IPv6.
 	
To enable IPv6, log in as *root*, and run:
 	
`# ifconfig intf inet6 plumb up`
`# /usr/lib/inet/in.ndpd`
`# touch /etc/hostname6.intf`
 	
where *intf* identifies the interface on which you want to enable IPv6.
	❑

Installing Cisco BAC

This section describes how to work with the installation program and the initial installation steps. The initial steps in the Cisco BAC installation program are identical regardless of the component you are installing.

Note The procedure of running Cisco BAC as a non-root user is similar to that of a root user. The non-root user should have appropriate permissions to run the product. For list of permissions, see Preinstallation Tasks, page 3-1

To install Cisco BAC:

Step 1 Log in to the intended Cisco BAC host as *root*.

Step 2 At the Solaris system prompt, change directory to your CD-ROM drive or other installation media.

Ensure that the **gzip** and **gtar** utilities are available on your system to decompress and unpack the Cisco BAC installation file, and:

a. Change to the directory in which you will decompress and extract the installation file.

b. Decompress the file with the *.gtar.gz* extension. Enter:

```
gunzip -d BAC_4101_SolarisK9.gtar.gz
```

c. Unpack the file with the *.gtar* extension that gunzip decompressed. Enter:

```
gtar -xvf BAC_4101_SolarisK9.gtar
```

The utility creates the *BAC_4101_SolarisK9* directory into which the installation program is extracted.

Note If the program displays a checksum error while unpacking, specify the path to the GNU tar on your machine.

Step 3 After the installation program is extracted, you can choose to install the components in interactive mode or noninteractive mode.

- Installing Components in Interactive Mode, page 3-5
- Installing Components in Noninteractive Mode, page 3-22

Installing Components in Interactive Mode

This section explains the procedures that you follow to install one or more Cisco BAC components interactively from the command line.

If you have not enabled IPv6 on your machine, a message similar to the following appears during installation:

```
Warning: IPv6 is not enabled on this system.
```

You can choose to enable IPv6 later, by running these commands:

```
# ifconfig intf inet6 plumb up
# /usr/lib/inet/in.ndpd
# touch /etc/hostname6.intf
```

where *intf* identifies the interface on which you want to enable IPv6.

Note Before you begin any of these procedures, you must complete the initial procedure described in Installing Cisco Broadband Access Center, page 3-2.

This section provides instructions on installing components in interactive mode:

- Installing the RDU in Interactive Mode, page 3-6
- Installing a DPE in Interactive Mode, page 3-10
- Installing CNR Extensions in Interactive Mode, page 3-13
- Installing the KDC in Interactive Mode, page 3-19

Installing the RDU in Interactive Mode

Install the RDU on a server running Solaris 10 that meets the requirements described in Operating System Requirements, page 1-2. You should install the RDU on a high-end system that is the most reliable server in your network.

Before installation, remove */rdu/db* from */var/CSCObac/* directory.

Note We recommend that you configure the RDU server to use a static IP address.

To install the RDU, complete the initial installation described in Installing Cisco Broadband Access Center, page 3-2. Then:

Step 1 To start the installation program in interactive mode, enter:

```
# pkgadd -d install-path/BAC_4101_SolarisK9/CSCObac.pkg CSCObac
```

where *install-path* specifies the complete path to the directory in which the *BAC_4101_SolarisK9* directory has been created.

The installation program verifies that you have installed the required patches to the Solaris operating system. When the verification ends, welcome information appears as:

```
Welcome to the Cisco Broadband Access Center for Cable 4.1.0.1 (BAC) installation
program. This installation program installs BAC 4.1.0.1 on your system.

The installer for Cisco Broadband Access Center for Cable 4.1.0.1 enables
non-root user, who has appropriate permission to run the product.

The non-root user can run the product, provided the user has the following
privileges:

file_chown, file_link_any, file_owner, net_privaddr, proc_exec, proc_fork,
proc_info, proc_owner, proc_session, proc_setid

In order to allow the non-root user or non-root users who belong to a specific
group to run Cisco BAC, specify the name of the non-root user and the
group in the "User and Group" prompt that appears next.

Else, to run as root user, specify the name as "root" and group as "root" in
the "User and Group" prompt that appears next.
```

Step 2 Press **Enter** to continue.

The program prompts you to add user name and user group name.

```
------------------ User and Group ----------------------

Enter the name of the user [?,q] user1

Enter the name of the group [?,q] group1
```

Step 3 Specify the user name and group name to run Cisco BAC.

Note If you want to run BAC as a root user, provide user and user group as root.

Step 4 Press **Enter** to continue.

The installation program prompts you to select one or more components.

Step 5 Enter **y** and press **Enter** at the RDU prompt.

To skip installing a DPE, CNR extension points, and the KDC, enter **n** and press **Enter**. You can choose to install these components later.

For example:

```
-------------- Installation Components ------------

Regional Distribution Unit (RDU) (y/n)? [n] y
Device Provisioning Engine (DPE) (y/n)? [n] n
Cisco Network Registrar extension points (y/n)? [n] n
Key Distribution Center (KDC) (y/n)? [n] n
```

Step 6 Confirm the components that you want to install; enter **y** and press **Enter**.

The program prompts you to confirm the components that you want to install.

```
------------------ Confirmation --------------
Install RDU: y
Install DPE: n
Install KDC: n
Install CNR_EP: n

Is this correct (y/n/q)? [y] y
```

Step 7 Enter **y** and press **Enter** to continue.

Cisco BAC performs lease query requests by binding to the IP addresses and ports that are described in Table 3-2.

Table 3-2 Lease Query Address for Binding

Protocol	IP Address	Port
IPv4	Wildcard[1]	67
IPv6	Wildcard	547

1. The wildcard is a special local IP address. It usually means "any" and can only be used for bind operations.

If the installation program detects that either of these ports is being used by another process, it recommends that you use the dynamic ports that the operating system selects.

For example:

```
DHCPv4/DHCPv6 lease query port(s) (Udp/67 and Udp/547) is in use.
Configuring the RDU to use a dynamic port for DHCPv4/DHCPv6 lease query.
```

If port 67 and port 547 are available on the RDU, the installation program displays the home directory prompt.

Step 8 To accept the default directory, */opt/CSCObac*, press **Enter**; or enter a different directory.

For example:

```
-------------- Home Directory -----------

   Home Directory [/opt/CSCObac]
```

A confirmation prompt appears.

Step 9 To confirm the home directory location, enter **y** and press **Enter**.

The program prompts you to enter the data directory location.

Step 10 To accept the default directory, */var/CSCObac*, press **Enter**; or enter a different directory.

For example:

```
-------------- Data Directory -----------

   DB Data Directory [/var/CSCObac] /var/disk0/CSCObac
```

A confirmation prompt appears.

Step 11 To confirm the data directory location, enter **y** and press **Enter**.

The database log directory prompt appears.

Step 12 To accept the default directory, */var/CSCObac*, press **Enter**; or enter another directory.

For example:

```
----------------- DB Log Directory -------------

   DB Logs Directory [/var/CSCObac] /var/disk1/CSCObac
```

A confirmation prompt appears.

Step 13 To confirm the directory, enter **y** and press **Enter** to continue.

The program prompts you to enter the information related to the RDU, specifically the IP address and the listening port.

While the installation program obtains the IP address of the RDU automatically, you must enter a value for the listening port. The listening port is the port number that the RDU uses to communicate with other Cisco BAC components, such as DPEs and CNR extension points.

Step 14 To accept the default port number, 49187, press **Enter**; or enter another port number.

Caution If you change the default listening port value, ensure that the new value does not conflict with any existing port assignments. Also, ensure that you configure all DPEs with the correct RDU port number. For details on configuring the DPE, see the *Cisco Broadband Access Center DPE CLI Reference, 4.1*.

For example:

```
----------------- RDU information ----------------


Enter the listening port of Regional Distribution Unit (RDU).

   RDU Listening Port [49187]
```

Step 15 Confirm the listening port number; enter **y** and press **Enter** to continue.

The program prompts you to enter the shared secret password.

Step 16 Enter the shared secret password that you want to use for authentication among Cisco BAC servers, and confirm the password.

Note You must use the same shared secret password for the RDU, all DPEs, and CNR extension points in your network.

For example:

```
Enter the password to be used for authentication between BAC servers.

   Enter the shared secret password [] <changeme>

   Enter the shared secret password again [] <changeme>
```

Step 17 Press **Enter** to continue.

The program displays the parameters you have selected to install the RDU.

Step 18 Enter **y** and press **Enter** to confirm the installation parameters.

For example:

```
-------------------- Confirmation ----------------------
Home directory: /opt/CSCObac
DB Data directory: /var/disk0/CSCObac
DB Log directory: /var/disk1/CSCObac
RDU Port: 49187
```

The program prompts you to enter the HTTP port for the administrator user interface.

Step 19 To accept the default port, 8100, press **Enter**; or enter another port number.

For example:

```
Please enter Admin UI http port [8100]
```

Step 20 Confirm the HTTP port; enter **y** and press **Enter**.

For example:

```
------------------ Admin UI Information ----------------


   Please enter Admin UI HTTP port [8100]


------------------ Confirmation --------------------
Admin UI HTTP port: 8100

   Is this correct (y/n/q)? [y] y
```

The program prompts you to enter the HTTPS port for the user interface.

Step 21 To accept the default port, 8443, press **Enter**; or enter another port number.

For example:

```
Please enter Admin UI HTTPS port [8443]
```

Step 22 Confirm the HTTPS port; enter **y** and press **Enter**.

The program displays the parameters you have selected to install the administrator user interface.

Step 23 Enter **y** and press **Enter**.

For example:

```
---------------------- Confirmation --------------------
Admin UI information
Installation directory: /opt/CSCObac/rdu
HTTP Port: 8100
HTTPS Port: 8443

   Is this correct (y/n/q)? [y] y
```

The program prompts you to continue with the installation.

Step 24 Enter **y** and press **Enter**.

For example:

```
This package contains scripts which will be executed with super-user
permission during the process of installing this package.

Do you want to continue with the installation of <CSCObac> [y,n,?] y
```

After successful installation, the following message appears:

```
Installation of <CSCObac> was successful.
```

Installing a DPE in Interactive Mode

Install the DPE on a server running Solaris 10 that meets the requirements described in Operating System Requirements, page 1-2.

Note We recommend that you configure the DPE server to use a static IP address.

During DPE installation, if the program detects a TFTP server or a ToD server running on the same server as the DPE, the installation displays an error message and quits. To kill the TFTP or ToD server, carry out the steps that the error message lists.

To install the DPE, complete the initial installation described in Installing Cisco Broadband Access Center, page 3-2. Then:

Step 1 To start the installation program in interactive mode, enter:

```
# pkgadd -d install-path/BAC_4101_SolarisK9/CSCObac.pkg CSCObac
```

where *install-path* specifies the complete path to the directory in which the *BAC_4101_SolarisK9* directory has been created.

The installation program verifies that you have installed the required patches to the Solaris operating system. When the verification ends, welcome information appears.

```
Welcome to the Cisco Broadband Access Center for Cable 4.1.0.1 (BAC) installation
program. This installation program installs BAC 4.1.0.1 on your system.

The installer for Cisco Broadband Access Center for Cable 4.1.0.1 enables
non-root user, who has appropriate permission to run the product.

The non-root user can run the product, provided the user has the following
privileges:

file_chown, file_link_any, file_owner, net_privaddr, proc_exec, proc_fork,
proc_info, proc_owner, proc_session, proc_setid

In order to allow the non-root user or non-root users who belong to a specific
group to run Cisco BAC, specify the name of the non-root user and the
group in the "User and Group" prompt that appears next.

Else, to run as root user, specify the name as "root" and group as "root" in
the "User and Group" prompt that appears next.
```

Step 2 Press **Enter** to continue.

The program prompts you to add user name and user group name.

```
------------------ User and Group ----------------------

Enter the name of the user [?,q] user1

Enter the name of the group [?,q] group1
```

Step 3 Specify the user name and group name to run Cisco BAC.

Step 4 Press **Enter** to continue.

The installation program prompts you to select one or more components.

Step 5 Enter **y** and press **Enter** at the DPE prompt

To skip installing the RDU, CNR extension points, and the KDC, enter **n** and press **Enter**.

For example:

```
-------------- Installation Components ------------

Regional Distribution Unit (RDU) (y/n)? [n] n
Device Provisioning Engine (DPE) (y/n)? [n] y
Cisco Network Registrar extension points (y/n)? [n] n
Key Distribution Center (KDC) (y/n)? [n] n
```

Step 6 Confirm the components that you want to install; enter **y** and press **Enter**.

The program prompts you to confirm the components that you want to install.

```
------------------ Confirmation --------------
Install RDU: n
Install DPE: y
Install KDC: n
Install CNR_EP: n

   Is this correct (y/n/q)? [y] y
```

Step 7 Enter **y** and press **Enter** to continue.

The home directory prompt appears.

Step 8 To accept the default directory, */opt/CSCObac*, press **Enter**; or enter another directory.

For example:

```
-------------- Home Directory -----------

   Home Directory [/opt/CSCObac]
```

Step 9 Confirm the directory location; enter **y** and press **Enter**.

The data directory prompt appears.

Step 10 To accept the default directory, */var/CSCObac*, press **Enter**; or enter another directory.

For example:

```
-------------- Data Directory -----------

   DB Data Directory [/var/CSCObac]
```

Step 11 Confirm the directory location; enter **y** and press **Enter**.

The program prompts you to enter the shared secret password.

Step 12 Enter the shared secret password that you want to use for authentication between the Cisco BAC servers.

Note You must use the same shared secret password for the RDU, all DPEs, and CNR extension points in your network.

For example:

```
------------------ DPE information ---------------


Enter the password to be used for authentication between BAC servers.

   Enter the shared secret password [] <changme>

   Enter the shared secret password again [] <changme>
```

Step 13 Reenter the password for confirmation, and press **Enter**.

The program prompts you to confirm the installation.

Step 14 Enter **y** and press **Enter**.

Note If you choose not to proceed, the following message appears and the installation quits:

```
Installation of <CSCObac> was terminated due to user request.
No changes were made to the system.
```

The program begins the installation process. After successful installation, the following message appears:

```
Installation of <CSCObac> was successful.
```

Installing CNR Extensions in Interactive Mode

Install Cisco BAC extensions on all CNR servers in your Cisco BAC environment. If you are deploying Cisco BAC in a failover environment, you also must install the extensions on the failover servers. After you install extensions, you must configure them. This section explains how to install, configure, and validate these extensions.

Note We recommend that you configure the CNR server to use a static IP address.

Before you install CNR extensions, complete the initial installation described in Installing Cisco Broadband Access Center, page 3-2. Also, ensure that CNR is running. Then:

Step 1 To start the installation program in interactive mode, enter:

```
# pkgadd -d install-path/BAC_4101_SolarisK9/CSCObac.pkg CSCObac
```

where *install-path* specifies the complete path to the directory in which the *BAC_4101_SolarisK9* directory has been created.

The installation program verifies that you have installed the required patches to the Solaris operating system. When the verification ends, welcome information appears.

```
Welcome to the Cisco Broadband Access Center for Cable 4.1.0.1 (BAC) installation
program. This installation program installs BAC 4.1.0.1 on your system.

The installer for Cisco Broadband Access Center for Cable 4.1.0.1 enables
non-root user, who has appropriate permission to run the product.

The non-root user can run the product, provided the user has the following
privileges:

file_chown, file_link_any, file_owner, net_privaddr, proc_exec, proc_fork,
proc_info, proc_owner, proc_session, proc_setid

In order to allow the non-root user or non-root users who belong to a specific
group to run Cisco BAC, specify the name of the non-root user and the
group in the "User and Group" prompt that appears next.

Else, to run as root user, specify the name as "root" and group as "root" in
the "User and Group" prompt that appears next.
```

Step 2 Press **Enter** to continue.

This program prompts you to add user name and user group name.

```
------------------ User and Group ----------------------

Enter the name of the user [?,q] user1

Enter the name of the group [?,q] group1
```

Step 3 Specify the user name and group name to run Cisco BAC.

Step 4 Press **Enter** to continue.

The installation program prompts you to select one or more components.

Step 5 Enter **y** and press **Enter** at the CNR Extension Points prompt.

To skip installing the RDU, a DPE, and the KDC, enter **n** and press **Enter**.

For example:

```
-------------- Installation Components ------------

Regional Distribution Unit (RDU) (y/n)? [n] n
Device Provisioning Engine (DPE) (y/n)? [n] n
Cisco Network Registrar extension points (y/n)? [n] y
Key Distribution Center (KDC) (y/n)? [n] n
```

Note The installation program validates your CNR installation. You must install CNR 7.1.2.1 on your server. If the required version is not installed, the installation process terminates, and you must upgrade to the required CNR version before proceeding.

Step 6 Confirm the components that you want to install; enter **y** and press **Enter**.

The program prompts you to confirm the components that you want to install.

```
------------------ Confirmation --------------
Install RDU: n
Install DPE: n
Install KDC: n
Install CNR_EP: y

   Is this correct (y/n/q)? [y] y
```

Step 7 Enter **y** and press **Enter** to continue.

The home directory prompt appears.

Step 8 To accept the default directory, */opt/CSCObac*, press **Enter**; or enter another directory.

For example:

```
-------------- Home Directory -----------

   Home Directory [/opt/CSCObac]
```

The program then prompts you to confirm the directory.

Step 9 Press **y** and **Enter** to continue.

The data directory prompt appears.

Step 10 To accept the default directory, */var/CSCObac*, press **Enter**; or enter another directory.

Note The installation program, by default, installs the data directory (*BPR_DATA*) on a different directory than the home directory (*BPR_HOME*). We recommend that the data directory be on a different physical disk than the home directory; for example, */var/disk0/CSCObac*.

For example:

```
-------------- Data Directory -----------

   DB Data Directory [/var/CSCObac] /var/disk0/CSCObac
```

Step 11 To confirm the directory, enter **y** and press **Enter**.

The program prompts you to enter information on the RDU required to install the extensions.

Step 12 Enter the IP address (or hostname) and the listening port of the host on which you have installed the RDU. To accept the default information, press **Enter**; or enter alternative information.

For example:

```
------------------ CNR EP Info ---------------

   Enter RDU IP Address or Hostname [bachost-rdu.example.com]
   Enter RDU Listening Port [49187]
```

You are then prompted to enter the name of the extension point provisioning group.

Step 13 Enter the name of the CNR extension point group.

For example:

```
Enter the Cisco Network Registrar extension point provisioning group.
This a required field.  The value you specify must contain only  alphanumeric
characters without spaces. You can use the BAC command-line tool to
change this value after you complete this installation.

   Enter Extension Point Provisioning Group [] group1
```

The program then asks you if you intend to provision PacketCable or voice technology devices.

Step 14 Enter **y** and press **Enter** if you are using PacketCable devices; press **Enter** if you are not.

For example:

```
Are you going to use devices that support PacketCable voice technology? [n]
```

If you enter **n**, omit Step 16 to 18. If you enter **y**, the program prompts you to enter several voice technology properties.

Step 15 The program prompts you to confirm the installation.

```
------------------ Confirmation --------------------
RDU IP Address: 10.10.10.10
RDU IP Port: 49187
Extention Point Provisioning Group: group1
PacketCable: y
```

Step 16 Enter details on the KDC realm name, the IP addresses for the primary and secondary DHCP servers, and the primary and secondary DNS servers.

For example:

```
------------------ PacketCable Configuration --------------

   Enter KDC realm Name [CISCO.COM]

   Enter IP Address for Primary DHCP [10.81.88.9]

   Enter IP Address for Primary DNS [10.81.88.9]

   Enter IP Address for Secondary DHCP []

   Enter IP Address for Secondary DNS []
```

Step 17 Confirm the information; enter **y** and press **Enter**.

```
------------------- Confirmation ------------------------
KDC Realms: CISCO.COM
Primary DHCP: 10.81.88.9
Primary DNS: 10.81.88.9
Secondary DHCP:
Secondary DNS:

   Is this correct (y/n/q)? [y] y
```

Step 18 Press **Enter** to continue.

Step 19 Enter the shared secret password that you want to use for authentication among Cisco BAC servers. You must use the same shared secret password for all Cisco BAC servers on your network.

For example:

```
Enter the password to be used for authentication between BAC servers.

   Enter the shared secret password [] <changeme>

   Enter the shared secret password again [] <changeme>
```

Step 20 Press **Enter**.

The program displays the installation parameters you have selected.

Step 21 Enter **y** and press **Enter** to confirm the parameters, and install the CNR extensions.

For example:

```
------------------ Confirmation --------------------
RDU IP Address: 10.10.10.10
RDU IP Port: 49187
Extention Point Provisioning Group: default
PacketCable: n
```

Step 22 Press **Enter** to continue.

The program prompts you to confirm the installation.

Step 23 Enter **y** and press **Enter**.

For example:

```
This package contains scripts which will be executed with super-user
permission during the process of installing this package.

Do you want to continue with the installation of <CSCObac> [y,n,?] y
```

The installation proceeds, and displays the following message after successful installation:

```
Installation of <CSCObac> was successful.
```

Configuring Extensions

After you install the Cisco BAC extensions on the CNR server, you must configure the extensions. The procedure described in this section assumes that:

- The Cisco BAC component is installed in */opt/CSCObac*.
- CNR is installed in */opt/nwreg2*.
- The CNR username is **admin** and the password is **changeme**.

To configure extensions:

Step 1 Log in to the CNR server, with *root* access.

Step 2 At the command line, enter:

```
# NR_HOME/local/usrbin/nrcmd -N admin -P changeme -b <
BAC_HOME/cnr_ep/bin/bpr_cnr_enable_extpts.nrcmd
```

Step 3 To reload the CNR server, enter:

```
# /etc/init.d/nwreglocal stop
# /etc/init.d/nwreglocal start
```

Alternatively, to reload the DHCP server alone, enter:

```
# NR_HOME/local/usrbin/nrcmd -N admin -P changeme "dhcp reload"
```

Note Before you can use the CNR server, you must configure client classes, scope-selection tags, policies, and scopes. In an IPv6 environment, you must configure links and prefixes as well. See the *User Guide for Cisco Network Registrar 7.1*.

Validating Extensions

To validate the extensions installed on the CNR server, from the CNR Command Line Tool (**nrcmd**), run:

Note Depending on whether you installed a local or regional cluster, the **nrcmd** tool is located in:

- Local—*/opt/nwreg2/local/usrbin*
- Regional—*/opt/nwreg2/regional/usrbin*

```
nrcmd> extension list
       100 Ok
       dexdropras:
           entry = dexdropras
           file = libdexextension.so
           init-args =
           init-entry =
           lang = Dex
           name = dexdropras
       preClientLookup:
           entry = bprClientLookup
           file = libbprextensions.so
           init-args = BPR_HOME=/opt/CSCObac,BPR_DATA=/var/CSCObac
           init-entry = bprInit
           lang = Dex
           name = preClientLookup
       prePacketEncode:
           entry = bprExecuteExtension
           file = libbprextensions.so
           init-args =
           init-entry = initExtPoint
       lang = Dex
           name = prePacketEncode

nrcmd>
```

Note The *BPR_HOME* and *BPR_DATA* values may be different in your installation.

Also in the **nrcmd** program, run:

```
nrcmd> dhcp listextensions
100 Ok
post-packet-decode: dexdropras
pre-packet-encode: prePacketEncode
pre-client-lookup: preClientLookup
post-client-lookup:
post-send-packet:
pre-dns-add-forward:
check-lease-acceptable:
post-class-lookup:
lease-state-change:
generate-lease:
environment-destructor:
pre-packet-decode:
post-packet-encode:

nrcmd>
```

Installing the KDC in Interactive Mode

You must install the KDC only when configuring a system to support voice technology operations.

Install the KDC on a Solaris 10 server that meets the requirements described in Operating System Requirements, page 1-2. For performance reasons, you should install the KDC on a separate server.

To install the KDC, complete the initial installation described in Installing Cisco Broadband Access Center, page 3-2. Then:

Step 1 To start the installation program in interactive mode, enter:

```
# pkgadd -d install-path/BAC_4101_SolarisK9/CSCObac.pkg CSCObac
```

where *install-path* specifies the complete path to the directory in which the *BAC_4101_SolarisK9* directory has been created.

The installation program verifies that you have installed the required patches to the Solaris operating system. When the verification ends, welcome information appears.

```
Welcome to the Cisco Broadband Access Center for Cable 4.1.0.1 (BAC) installation
program. This installation program installs BAC 4.1.0.1 on your system.

The installer for Cisco Broadband Access Center for Cable 4.1.0.1 enables
non-root user, who has appropriate permission to run the product.

The non-root user can run the product, provided the user has the following
privileges:

file_chown, file_link_any, file_owner, net_privaddr, proc_exec, proc_fork,
proc_info, proc_owner, proc_session, proc_setid

In order to allow the non-root user or non-root users who belong to a specific
group to run Cisco BAC, specify the name of the non-root user and the
group in the "User and Group" prompt that appears next.

Else, to run as root user, specify the name as "root" and group as "root" in
the "User and Group" prompt that appears next.
```

Step 2 Press **Enter** to continue.

The program prompts you to add user name and user group name.

```
------------------ User and Group ----------------------

Enter the name of the user [?,q] user1

Enter the name of the group [?,q] group1
```

Step 3 Specify the user name and group name to run Cisco BAC.

Step 4 Press **Enter** to continue.

The installation program prompts you to select one or more components.

Step 5 Enter **y** and press **Enter** at the KDC prompt.

To skip installing the RDU, a DPE, and the CNR extension points, enter **n** and press **Enter**.

For example:

```
-------------- Installation Components ------------

Regional Distribution Unit (RDU) (y/n)? [n] n
Device Provisioning Engine (DPE) (y/n)? [n] n
Cisco Network Registrar extension points (y/n)? [n] n
Key Distribution Center (KDC) (y/n)? [n] y
```

Step 6 Confirm the components that you want to install; enter **y** and press **Enter**.

The program prompts you to confirm the components that you want to install.

```
------------------ Confirmation --------------
Install RDU: n
Install DPE: n
Install KDC: y
Install CNR_EP: n

   Is this correct (y/n/q)? [y] y
```

Step 7 Enter **y** and press **Enter** to continue.

The home directory prompt appears.

Step 8 To accept the default directory, */opt/CSCObac*, press **Enter**; or enter another directory.

For example:

```
-------------- Home Directory -----------

   Home Directory [/opt/CSCObac]
```

A confirmation prompt appears.

Step 9 Enter **y** and press **Enter**.

The data directory prompt appears.

Step 10 To accept the default directory, */var/CSCObac*, press **Enter**; or enter another directory.

For example:

```
-------------- Data Directory -----------

   DB Data Directory [/var/CSCObac]
```

Step 11 To confirm, enter **y** and press **Enter**.

The KDC Configuration prompt appears.

Step 12 Enter the KDC interface address, the fully qualified domain name (FQDN), and the Kerberos realm name. The realm name should be consistent with the realm you give to the DPEs that belong to this provisioning group.

For example:

Note The warning in this example appears if there is more than one interface on your system.

```
------------------ KDC Configuration --------------

Key Distribution Center (KDC) Realm Name
Enter the Kerberos realm name for the KDC:
The realm name should be consistent with the realm you give to DPEs in this
provisioning group.

   KDC Interface Address [10.10.10.22]:
   KDC FQDN [bachost.example.com]:
   KDC Realm [EXAMPLE.COM]:
```

Step 13 To confirm your entry and continue, enter **y** and press **Enter**.

The program prompts you to enter a password to generate the KDC service key.

Step 14 For each DPE, enter a password from 6 to 20 characters. The KDC service key mentioned here is one that you must generate on the DPE and the KDC to enable communication between the two components. To generate this service key, the password that you enter for the KDC must match the one that you enter for the corresponding DPE; otherwise, the DPE does not function.

For example:

```
Enter Password to generate Service-Key [] <changeme>

Enter Password to generate Service-Key again [] <changeme>
```

Note To generate the service key on the:

- DPE, use the **service packetcable** *1* **registration kdc-service-key** command from the DPE CLI. For details, see the *Cisco Broadband Access Center DPE CLI Reference 4.1*.
- KDC, use the KeyGen tool. For details, see the *Cisco Broadband Access Center Administrator Guide 4.1*.

Step 15 Press **Enter**.

Step 16 To confirm and continue, enter **y** and press **Enter**.

The program prompts you to enter the DPE FQDN.

Step 17 Enter the FQDN of the DPE, and press **Enter**.

For example:

```
Enter your DPE FQDN [] bac-dpe1.example.com
```

Step 18 Enter **y** and press **Enter** to confirm and continue.

Step 19 To add another DPE, enter **y** and press **enter**, or enter **n** and press **Enter**. The installation program uses the same voice technology shared key for all DPEs.

The program prompts you to confirm the installation.

Step 20 Enter **y** and press **Enter**.

For example:

```
This package contains scripts which will be executed with super-user
permission during the process of installing this package.

Do you want to continue with the installation of <CSCObac> [y,n,?] y
```

The installation proceeds, and displays the following message after successful installation:

```
Installation of <CSCObac> was successful.
```

Caution After installing the KDC, install the licenses and the chain of certificates; otherwise, you cannot launch the KDC.

Installing Components in Noninteractive Mode

This section explains the procedures that you follow to install one or more Cisco BAC components from the command line in noninteractive mode.

In order to install Cisco BAC in noninteractive mode, you must first generate a response file, in which you store values for installing a component. You then use the response file as input while installing that component. For subsequent installations of the same component, you only need to use a single command, which removes all installation prompts and installs the component using the values contained in the response file.

To install Cisco BAC in noninteractive mode, you must perform two steps, each of which is described in detail in subsequent sections:

1. Generate a response file, using:

   # **pkgask -r response -d** *install-path*/**BAC_4101_SolarisK9/CSCObac.pkg CSCObac**

   where *install-path* specifies the complete path to the directory in which the *BAC_4101_SolarisK9* directory has been created.

   Running this command does not install Cisco BAC on your system; it only generates the response file in which you store values for installation.

   Note that there can only be one response file. As a result, you can use the response file only to install the component for which you generate the response file. If you want to install another component, you must generate a response file for that component and install that component using the response file generated for it.

   For example, if you generate a response file to install the DPE and, subsequently, you want to install CNR extensions, you must generate a response file separately to install CNR extensions. You cannot use the response file that you generated to install the DPE to install CNR extensions.

2. After you generate the response file, start the installation program in noninteractive mode, using:

```
# pkgadd -n -r response -a BAC_4101_SolarisK9/bacadmin -d
BAC_4101_SolarisK9/CSCObac.pkg
```

For subsequent installations of the same component, you only need to run this **pkgadd** command.

If you have not enabled IPv6 on the machine, a warning message similar to the following appears:

```
Warning: IPv6 is not enabled on this system.
```

You can choose to enable IPv6 later, by running these commands:

```
# ifconfig intf inet6 plumb up
# /usr/lib/inet/in.ndpd
# touch /etc/hostname6.intf
```

where *intf* identifies the interface on which you want to enable IPv6.

Note Before you begin any of the procedures described in this section, complete the initial installation procedure described in Installing Cisco Broadband Access Center, page 3-2.

This section provides instructions on installing components in noninteractive mode:

- Installing the RDU in Noninteractive Mode, page 3-23
- Installing a DPE in Noninteractive Mode, page 3-29
- Installing CNR Extensions in Noninteractive Mode, page 3-32
- Installing the KDC in Noninteractive Mode, page 3-37

Installing the RDU in Noninteractive Mode

Install the RDU on a server running Solaris 10 that meets the requirements described in Operating System Requirements, page 1-2. You should install the RDU on a high-end system that is the most reliable server in your network.

Note We recommend that you configure the RDU server to use a static IP address.

To install the RDU, complete the initial installation described in Installing Cisco Broadband Access Center, page 3-2. Then complete these procedures:

- Generating the Response File for the RDU, page 3-24
- Installing the RDU Using the Response File, page 3-28

Generating the Response File for the RDU

Use this procedure to generate a response file for RDU installation:

Step 1 To generate the response file, enter:

```
# pkgask -r response -d install-path/BAC_4101_SolarisK9/CSCObac.pkg CSCObac
```

where *install-path* specifies the complete path to the directory in which the *BAC_4101_SolarisK9* directory has been created.

Note The response file is created in the directory in which you run the **pkgask -r** command. If you want the response file to be generated in a specific location, enter:

 # pkgask -r *response-file-path* **-d CSCObac.pkg**

where *response-file-path* specifies the path to the directory in which you want the response file to be generated; for example, */tmp/response*. You can also give the response file any name; for example, *outputFile*.

The installation program verifies that you have installed the required patches to the Solaris operating system. When the verification ends, welcome information appears.

```
Welcome to the Cisco Broadband Access Center for Cable 4.1.0.1 (BAC) installation
program. This installation program installs BAC 4.1.0.1 on your system.

The installer for Cisco Broadband Access Center for Cable 4.1.0.1 enables
non-root user, who has appropriate permission to run the product.

The non-root user can run the product, provided the user has the following
privileges:

file_chown, file_link_any, file_owner, net_privaddr, proc_exec, proc_fork,
proc_info, proc_owner, proc_session, proc_setid

In order to allow the non-root user or non-root users who belong to a specific
group to run Cisco BAC, specify the name of the non-root user and the
group in the "User and Group" prompt that appears next.

Else, to run as root user, specify the name as "root" and group as "root" in
the "User and Group" prompt that appears next.
```

Step 2 Press Enter to continue.

The program prompts you to add user name and user group name.

```
------------------ User and Group ----------------------

Enter the name of the user [?,q] user1

Enter the name of the group [?,q] group1
```

Step 3 Press **Enter** to continue.

The installation program prompts you to select one or more components.

Step 4 Enter **y** and press **Enter** at the RDU prompt.

To skip installing a DPE, CNR extension points, and the KDC, enter **n** and press **Enter**. You can choose to install these components later.

For example:

```
-------------- Installation Components ------------

Regional Distribution Unit (RDU) (y/n)? [n] y
Device Provisioning Engine (DPE) (y/n)? [n] n
Cisco Network Registrar extension points (y/n)? [n] n
Key Distribution Center (KDC) (y/n)? [n] n
```

The program prompts you to confirm the components that you want to install.

Step 5 Enter **y** and press **Enter** to continue.

Cisco BAC performs lease query requests by binding to the IP addresses and ports that are described in Table 3-3.

Table 3-3 Lease Query Address for Binding

Protocol	IP Address	Port
IPv4	Wildcard[1]	67
IPv6	Wildcard	547

1. The wildcard is a special local IP address. It usually means "any" and can only be used for bind operations.

If the installation program detects that either of these ports is being used by another process, it recommends that you use the dynamic ports that the operating system selects.

For example:

```
DHCPv4/DHCPv6 lease query port(s) (Udp/67 and Udp/547) is in use.
Configuring the RDU to use a dynamic port for DHCPv4/DHCPv6 lease query.
```

If port 547 and port 67 are available, the installation program displays the home directory prompt.

Step 6 To accept the default directory, */opt/CSCObac*, press **Enter**; or enter a different directory.

For example:

```
-------------- Home Directory -----------

   Home Directory [/opt/CSCObac]
```

A confirmation prompt appears.

Step 7 To confirm the home directory location, enter **y** and press **Enter**.

The program prompts you to enter the data directory location.

Step 8 To accept the default directory, */var/CSCObac*, press **Enter**; or enter a different directory.

For example:

```
-------------- Data Directory -----------

   DB Data Directory [/var/CSCObac] /var/disk0/CSCObac
```

A confirmation prompt appears.

Step 9 To confirm the data directory location, enter **y** and press **Enter**.

The database log directory prompt appears.

Step 10 To accept the default directory, */var/CSCObac*, press **Enter**; or enter another directory.

For example:

```
----------------- DB Log Directory -------------

   DB Logs Directory [/var/CSCObac] /var/disk1/CSCObac
```

A confirmation prompt appears.

Step 11 To confirm the directory, enter **y** and press **Enter** to continue.

The program prompts you to enter the information related to the RDU, specifically the IP address and the listening port.

While the installation program obtains the IP address of the RDU automatically, you must enter a value for the listening port. The listening port is the port number that the RDU uses to communicate with other Cisco BAC components, such as DPEs and CNR extension points.

Step 12 To accept the default port number, 49187, press **Enter**; or enter another port number.

Caution If you change the default listening port value, ensure that the new value does not conflict with any existing port assignments. Also, ensure that you configure all DPEs with the correct RDU port number. For details on configuring the DPE, see the *Cisco Broadband Access Center DPE CLI Reference, 4.1*.

For example:

```
----------------- RDU information ---------------


Enter the listening port of Regional Distribution Unit (RDU).

   RDU Listening Port [49187]
```

Step 13 Confirm the listening port number; enter **y** and press **Enter** to continue.

The program prompts you to enter the shared secret password.

Step 14 Enter the shared secret password that you want to use for authentication among Cisco BAC servers, and confirm the password.

Note You must use the same shared secret password for the RDU, all DPEs, and CNR extension points in your network.

For example:

```
Enter the password to be used for authentication between BAC servers.

   Enter the shared secret password [] <changeme>

   Enter the shared secret password again [] <changeme>
```

Step 15 Press **Enter** to continue.

The program displays the parameters you have selected to install the RDU.

Step 16 Enter **y** and press **Enter** to confirm the installation parameters.

For example:

```
-------------------- Confirmation ----------------------
Home directory: /opt/CSCObac
DB Data directory: /var/CSCObac
DB Log directory: /var/CSCObac
RDU Port: 49187
```

The program prompts you to enter the HTTP port for the administrator user interface.

Step 17 To accept the default port, 8100, press **Enter**; or enter another port number.

For example:

```
------------------ Admin UI Information ----------------


   Please enter Admin UI HTTP port [8100]
```

Step 18 Confirm the HTTP port; enter **y** and press **Enter**.

For example:

```
------------------ Confirmation --------------------
Admin UI HTTP port: 8100

   Is this correct (y/n/q)? [y]
```

The program prompts you to enter the HTTPS port for the user interface.

Step 19 To accept the default port, 8443, press **Enter**; or enter another port number.

For example:

```
Please enter Admin UI HTTPS port [8443]
```

Step 20 Confirm the HTTPS port; enter **y** and press **Enter**.

The program displays the parameters you have selected to install the administrator user interface.

Step 21 To confirm the parameters, enter **y** and press **Enter**.

For example:

```
--------------------- Confirmation --------------------
Admin UI information
Installation directory: /opt/CSCObac/rdu
HTTP Port: 8100
HTTPS Port: 8443

   Is this correct (y/n/q)? [y]
```

Step 22 To continue, press **Enter**.

A message appears indicating that a response file has been created.

For example:

```
Response file </tmp/response> was created.

Processing of request script was successful.
```

Installing the RDU Using the Response File

After you generate the response file for the RDU, you can subsequently install the RDU using the following command:

```
# pkgadd -n -r response -a BAC_4101_SolarisK9/bacadmin -d BAC_4101_SolarisK9/CSCObac.pkg
CSCObac
```

Once you run the above command, the program installs the RDU. After successful installation, the following message appears:

```
# Linking /etc/rc2.d/S81bprAgent to /etc/init.d/bprAgent
# Linking /etc/rc1.d/K05bprAgent to /etc/init.d/bprAgent
# Linking /etc/rc0.d/K05bprAgent to /etc/init.d/bprAgent
Starting BAC Process Watchdog...
BAC Process Watchdog has started.

Registry update completed

Installation of <CSCObac> was successful.
```

Installing a DPE in Noninteractive Mode

Install the DPE on a server running Solaris 10 that meets the requirements described in Operating System Requirements, page 1-2.

Note We recommend that you configure the DPE server to use a static IP address.

During DPE installation, if the program detects a TFTP server or a ToD server running on the same server as the DPE, the installation displays an error message and quits. To kill the TFTP or ToD server, carry out the steps that the error message lists.

To install the DPE, complete the initial steps described in Installing Cisco Broadband Access Center, page 3-2. Then complete these procedures:

- Generating the Response File for the DPE, page 3-29
- Installing the DPE Using the Response File, page 3-32

Generating the Response File for the DPE

Use this procedure to generate a response file for DPE installation:

Step 1 To generate the response file, enter:

```
# pkgask -r response -d install-path/BAC_4101_SolarisK9/CSCObac.pkg CSCObac
```

where *install-path* specifies the complete path to the directory in which the *BAC_4101_SolarisK9* directory has been created.

Note The response file is created in the directory in which you run the **pkgask -r** command. If you want the response file to be generated in a specific location, enter:

```
# pkgask -r response-file-path -d CSCObac.pkg
```

where *response-file-path* specifies the path to the directory in which you want the response file to be generated; for example, */tmp/response*. You can also give the response file any name; for example, *outputFile*.

The installation program verifies that you have installed the required patches to the Solaris operating system. When the verification ends, welcome information appears.

```
Welcome to the Cisco Broadband Access Center for Cable 4.1.0.1 (BAC) installation
program. This installation program installs BAC 4.1.0.1 on your system.

The installer for Cisco Broadband Access Center for Cable 4.1.0.1 enables
non-root user, who has appropriate permission to run the product.

The non-root user can run the product, provided the user has the following
privileges:

file_chown, file_link_any, file_owner, net_privaddr, proc_exec, proc_fork,
proc_info, proc_owner, proc_session, proc_setid

In order to allow the non-root user or non-root users who belong to a specific
group to run Cisco BAC, specify the name of the non-root user and the
group in the "User and Group" prompt that appears next.

Else, to run as root user, specify the name as "root" and group as "root" in
the "User and Group" prompt that appears next.
```

Step 2 Press **Enter** to continue.

The program prompts you to add user name and user group name.

```
------------------ User and Group ----------------------

Enter the name of the user [?,q] user1

Enter the name of the group [?,q] group1
```

Step 3 Press **Enter** to continue.

The installation program prompts you to select one or more components.

Step 4 Enter **y** and press **Enter** at the DPE prompt.

To skip installing the RDU, CNR extension points, and the KDC, enter **n** and press **Enter**.

For example:

```
-------------- Installation Components ------------

Regional Distribution Unit (RDU) (y/n)? [n] n
Device Provisioning Engine (DPE) (y/n)? [n] y
Cisco Network Registrar extension points (y/n)? [n] n
Key Distribution Center (KDC) (y/n)? [n] n
```

The program prompts you to confirm the components that you want to install.

Step 5 Enter **y** and press **Enter** to continue.

The home directory prompt appears.

Step 6 To accept the default directory, */opt/CSCObac*, press **Enter**; or enter another directory.

For example:

```
-------------- Home Directory -----------

   Home Directory [/opt/CSCObac]
```

Step 7 Confirm the directory location; enter **y** and press **Enter**.

The data directory prompt appears.

Step 8 To accept the default directory, */var/CSCObac*, press **Enter**; or enter another directory.

For example:

```
-------------- Data Directory -----------

   DB Data Directory [/var/CSCObac]
```

Step 9 Confirm the directory location; enter **y** and press **Enter**.

The program prompts you to enter the shared secret password.

Step 10 Enter the shared secret password that you want to use for authentication between the Cisco BAC servers. You must use the same shared secret password for the RDU, all DPEs, and CNR extension points in your network.

For example:

```
Enter the password to be used for authentication between BAC servers.

   Enter the shared secret password [] <changeme>

   Enter the shared secret password again [] <changeme>
```

Step 11 Reenter the password for confirmation, and press **Enter**.

A message appears indicating that a response file has been created.

For example:

```
Response file </tmp/response> was created.

Processing of request script was successful.
```

Installing the DPE Using the Response File

After you generate the response file for the DPE, you can subsequently install DPEs using the following command:

```
# pkgadd -n -r response -a BAC_4101_SolarisK9/bacadmin -d BAC_4101_SolarisK9/CSCObac.pkg
CSCObac
```

Once you run the above command, the program installs the DPE. After successful installation, the following message appears:

```
# Linking /etc/rc2.d/S81bprAgent to /etc/init.d/bprAgent
# Linking /etc/rc1.d/K05bprAgent to /etc/init.d/bprAgent
# Linking /etc/rc0.d/K05bprAgent to /etc/init.d/bprAgent
Starting BAC Process Watchdog...
BAC Process Watchdog has started.


Registry update completed

Installation of <CSCObac> was successful.
```

Installing CNR Extensions in Noninteractive Mode

Install Cisco BAC extensions on all CNR servers in your Cisco BAC environment. If you are deploying Cisco BAC in a failover environment, you also must install the extensions on the failover servers. After you install extensions, you must configure them. This section explains how to install, configure, and validate these extensions.

Note We recommend that you configure the CNR server to use a static IP address.

Before you install CNR extensions, complete the initial installation described in Installing Cisco Broadband Access Center, page 3-2. Also, ensure that CNR is running. Then, complete the procedures described in this section:

- Generating the Response File for CNR Extensions, page 3-33
- Installing CNR Extensions Using the Response File, page 3-37

Generating the Response File for CNR Extensions

Use this procedure to generate a response file to install CNR extensions:

Step 1 To generate the response file, enter:

```
# pkgask -r response -d install-path/BAC_4101_SolarisK9/CSCObac.pkg CSCObac
```

where *install-path* specifies the complete path to the directory in which the *BAC_4101_SolarisK9* directory has been created.

Note The response file is created in the directory in which you run the **pkgask -r** command. If you want the response file to be generated in a specific location, enter:

```
# pkgask -r response-file-path -d CSCObac.pkg
```

where *response-file-path* specifies the path to the directory in which you want the response file to be generated; for example, */tmp/response*. You can also give the response file any name; for example, *outputFile*.

The installation program verifies that you have installed the required patches to the Solaris operating system. When the verification ends, welcome information appears.

```
Welcome to the Cisco Broadband Access Center for Cable 4.1.0.1 (BAC) installation
program. This installation program installs BAC 4.1.0.1 on your system.

The installer for Cisco Broadband Access Center for Cable 4.1.0.1 enables
non-root user, who has appropriate permission to run the product.

The non-root user can run the product, provided the user has the following
privileges:

file_chown, file_link_any, file_owner, net_privaddr, proc_exec, proc_fork,
proc_info, proc_owner, proc_session, proc_setid

In order to allow the non-root user or non-root users who belong to a specific
group to run Cisco BAC, specify the name of the non-root user and the
group in the "User and Group" prompt that appears next.

Else, to run as root user, specify the name as "root" and group as "root" in
the "User and Group" prompt that appears next.
```

Step 2 Press **Enter** to continue.

The program prompts you to add user name and user group name.

```
------------------ User and Group ----------------------

Enter the name of the user [?,q] user1

Enter the name of the group [?,q] group1
```

Step 3 Press **Enter** to continue.

The installation program prompts you to select one or more components.

Step 4 Enter **y** and press **Enter** at the CNR Extension Points prompt.

To skip installing the RDU, a DPE, and the KDC, enter **n** and press **Enter**.

For example:

```
-------------- Installation Components ------------

Regional Distribution Unit (RDU) (y/n)? [n] n
Device Provisioning Engine (DPE) (y/n)? [n] n
Cisco Network Registrar extension points (y/n)? [n] y
Key Distribution Center (KDC) (y/n)? [n] n
```

Note The installation program validates your CNR installation. You must install CNR 7.1.2.1 on your server. If the required version is not installed, the installation process terminates, and you must upgrade to the required CNR version before proceeding.

The program prompts you to confirm the components that you want to install.

Step 5 Enter **y** and press **Enter** to continue.

The home directory prompt appears.

Step 6 To accept the default directory, */opt/CSCObac*, press **Enter**; or enter another directory.

For example:

```
-------------- Home Directory -----------

   Home Directory [/opt/CSCObac]
```

The program then prompts you to confirm the directory.

Step 7 Press **y** and **Enter** to continue.

The data directory prompt appears.

Step 8 To accept the default directory, */var/CSCObac*, press **Enter**; or enter another directory.

Note The installation program, by default, installs the data directory (*BPR_DATA*) on a different directory than the home directory (*BPR_HOME*). We recommend that the data directory be on a different physical disk than the home directory; for example, */var/disk0/CSCObac*.

For example:

```
-------------- Data Directory -----------

   DB Data Directory [/var/CSCObac] /var/disk0/CSCObac
```

Step 9 To confirm the directory, enter **y** and press **Enter**.

The program prompts you to enter information on the RDU required to install the extensions.

Step 10 Enter the IP address (or hostname) and the listening port of the host on which you have installed the RDU. To accept the default information, press **Enter**; or enter alternative information.

For example:

```
------------------ CNR EP Info ---------------

   Enter RDU IP Address or Hostname [bachost-rdu.example.com]
   Enter RDU Listening Port [49187]
```

You are then prompted to enter the name of the extension point provisioning group.

Step 11 Enter the name of the CNR extension point group.

For example:

```
Enter the Cisco Network Registrar extension point provisioning group.
This a required field.  The value you specify must contain only  alphanumeric
characters without spaces. You can use the BAC command-line tool to
change this value after you complete this installation.

   Enter Extension Point Provisioning Group [] group1
```

The program then asks you if you intend to provision PacketCable or voice technology devices.

Step 12 Enter **y** and press **Enter** if you are using PacketCable devices; press **Enter** if you are not.

For example:

```
Are you going to use devices that support PacketCable voice technology? [n]
```

If you enter **n**, omit Step 16 till Step 20. If you enter **y**, the program prompts you to enter several voice technology properties.

Step 13 The program displays the installation parameters you have selected, confirm the information.

For example:

```
------------------ Confirmation --------------------
RDU IP Address: 10.10.10.10
RDU IP Port: 49187
Extention Point Provisioning Group: group1
PacketCable: y
```

Step 14 Press **Enter** to confirm the parameters, and install the CNR extensions.

Step 15 Confirm the information; enter **y** and press **Enter**.

Step 16 Press **Enter** to continue.

Step 17 Enter details on the KDC realm name, the IP addresses for the primary and secondary DHCP servers, and the primary and secondary DNS servers.

For example:

Note The warning in this example appears if there is more than one interface on your system.

```
------------------ PacketCable Configuration --------------

   Enter KDC realm Name [EXAMPLE.COM]

   Enter IP Address for Primary DHCP [10.10.10.1]

   Enter IP Address for Primary DNS [10.10.10.3]

   Enter IP Address for Secondary DHCP [10.10.10.2]

   Enter IP Address for Secondary DNS [10.10.10.4]
```

Step 18 Press **Enter**.

Step 19 The program displays the PacketCable Configuration parameters you have selected, confirm the information.

Step 20 Enter **y** and press **Enter**.

Step 21 Press **Enter** to continue.

Step 22 Enter the shared secret password that you want to use for authentication among Cisco BAC servers. You must use the same shared secret password for all Cisco BAC servers on your network.

For example:

```
Enter the password to be used for authentication between BAC servers.

   Enter the shared secret password [] <changeme>

   Enter the shared secret password again [] <changeme>
```

Step 23 To continue, press **Enter**.

A message appears indicating that a response file has been created.

For example:

```
Response file </tmp/response> was created.

Processing of request script was successful.
```

Installing CNR Extensions Using the Response File

After you generate the response file for CNR extensions, you can subsequently install extensions using the following command:

```
# pkgadd -n -r response -a BAC_4101_SolarisK9/bacadmin -d BAC_4101_SolarisK9/CSCObac.pkg
CSCObac
```

Once you run the above command, the program installs CNR extensions. After successful installation, the following message appears:

```
Starting BAC Process Watchdog...

Installation of <CSCObac> was successful.
```

After you install the extensions, you must configure and validate them. For details, see Configuring Extensions, page 3-17, and Validating Extensions, page 3-18.

Installing the KDC in Noninteractive Mode

You must install the KDC only when configuring a system to support voice technology operations.

Install the KDC on a Solaris 10 server that meets the requirements described in Operating System Requirements, page 1-2. For performance reasons, you should install the KDC on a separate server.

To install the Key Distribution Center (KDC), complete the initial installation described in Installing Cisco Broadband Access Center, page 3-2. Then complete the procedures described in this section:

- Generating the Response File for the KDC, page 3-37
- Installing the KDC Using the Response File, page 3-41

Generating the Response File for the KDC

Use this procedure to generate a response file for KDC installation:

Step 1 To generate the response file, enter:

```
# pkgask -r response -d install-path/BAC_4101_SolarisK9/CSCObac.pkg CSCObac
```

where *install-path* specifies the complete path to the directory in which the *BAC_4101_SolarisK9* directory has been created.

Note The response file is created in the directory in which you run the **pkgask -r** command. If you want the response file to be generated in a specific location, enter:

```
# pkgask -r response-file-path -d CSCObac.pkg
```

where *response-file-path* specifies the path to the directory in which you want the response file to be generated; for example, */tmp/response*. You can also give the response file any name; for example, *outputFile*.

The installation program verifies that you have installed the required patches to the Solaris operating system. When the verification ends, welcome information appears.

```
Welcome to the Cisco Broadband Access Center for Cable 4.1.0.1 (BAC) installation
program. This installation program installs BAC 4.1.0.1 on your system.

The installer for Cisco Broadband Access Center for Cable 4.1.0.1 enables
non-root user, who has appropriate permission to run the product.

The non-root user can run the product, provided the user has the following
privileges:

file_chown, file_link_any, file_owner, net_privaddr, proc_exec, proc_fork,
proc_info, proc_owner, proc_session, proc_setid

In order to allow the non-root user or non-root users who belong to a specific
group to run Cisco BAC, specify the name of the non-root user and the
group in the "User and Group" prompt that appears next.

Else, to run as root user, specify the name as "root" and group as "root" in
the "User and Group" prompt that appears next.
```

Step 2 Press **Enter** to continue.

The program prompts you to add user name and user group name.

```
------------------ User and Group ----------------------

Enter the name of the user [?,q] user1

Enter the name of the group [?,q] group1
```

Step 3 Press **Enter** to continue.

The installation program prompts you to select one or more components.

Step 4 Enter **y** and press **Enter** at the KDC prompt.

To skip installing the RDU, a DPE, and the CNR extension points, enter **n** and press **Enter**.

For example:

```
-------------- Installation Components ------------

Regional Distribution Unit (RDU) (y/n)? [n] n
Device Provisioning Engine (DPE) (y/n)? [n] n
Cisco Network Registrar extension points (y/n)? [n] n
Key Distribution Center (KDC) (y/n)? [n] y
```

Step 5 Confirm the component(s) that you want to install; enter **y** and press **Enter**.

The home directory prompt appears.

Step 6 To accept the default directory, */opt/CSCObac*, press **Enter**; or enter another directory.

For example:

```
-------------- Home Directory -----------

   Home Directory [/opt/CSCObac]
```

A confirmation prompt appears.

Step 7 Enter **y** and press **Enter**.

The data directory prompt appears.

Step 8 To accept the default directory, */var/CSCObac*, press **Enter**; or enter another directory.

For example:

```
-------------- Data Directory -----------

  DB Data Directory [/var/CSCObac]
```

Step 9 To confirm, enter **y** and press **Enter**.

The KDC Configuration prompt appears.

Step 10 Enter the KDC interface address, the fully qualified domain name (FQDN), and the Kerberos realm name. The realm name should be consistent with the realm you give to the DPEs that belong to this provisioning group.

For example:

Note The warning in this example appears if there is more than one interface on your system.

```
------------------ KDC Configuration --------------

Key Distribution Center (KDC) Realm Name
Enter the Kerberos realm name for the KDC:
The realm name should be consistent with the realm you give to DPEs in this
provisioning group.

   KDC Interface Address [10.10.10.22]:
   KDC FQDN [bachost.example.com]:
   KDC Realm [EXAMPLE.COM]:
```

Step 11 To confirm your entry and continue, enter **y** and press **Enter**.

The program prompts you to enter a password to generate the KDC service key.

Step 12 For each DPE, enter a password from 6 to 20 characters. The KDC service key mentioned here is one that you must generate on the DPE and the KDC to enable communication between the two components. To generate this service key, the password that you enter for the KDC must match the one that you enter for the corresponding DPE; otherwise, the DPE does not function.

For example:

```
Enter Password to generate Service-Key [] <changeme>

Enter Password to generate Service-Key again [] <changeme>
```

Note To generate the service key on the:

- DPE, use the **service packetcable** *1* **registration kdc-service-key** command from the DPE CLI. For details, see the *Cisco Broadband Access Center DPE CLI Reference 4.1*.
- KDC, use the KeyGen tool. For details, see the *Cisco Broadband Access Center Administrator Guide 4.1*.

Step 13 Press **Enter**.

Step 14 To confirm and continue, enter **y** and press **Enter**.

The program prompts you to enter the DPE FQDN.

Step 15 Enter the FQDN of the DPE.

For example:

```
Enter your DPE FQDN [] bac-dpe1.example.com
```

Step 16 Press **Enter** to confirm and continue.

Step 17 To add another DPE, enter **y** and press **enter**, or enter **n** and press **Enter**. The installation program uses the same voice technology shared key for all DPEs.

A message appears indicating that a response file has been created.

For example:

```
Response file </tmp/response> was created.

Processing of request script was successful.
```

Installing the KDC Using the Response File

After you generate the response file for the KDC, you can subsequently install the KDC using the following command:

```
# pkgadd -n -r response -a BAC_4101_SolarisK9/bacadmin -d BAC_4101_SolarisK9/CSCObac.pkg
CSCObac
```

Once you run the above command, the program installs the KDC. After successful installation, the following message appears:

```
# Linking /etc/rc2.d/S81bprAgent to /etc/init.d/bprAgent
# Linking /etc/rc1.d/K05bprAgent to /etc/init.d/bprAgent
# Linking /etc/rc0.d/K05bprAgent to /etc/init.d/bprAgent
Starting BAC Process Watchdog...
BAC Process Watchdog has started.


Installation of <CSCObac> was successful.
```

Adding Components

This section describes how you can add one component of Cisco BAC to a system on which other components have already been installed. This situation arises largely in a deployment similar to a lab installation, where, for the purposes of testing, more than one component is installed on a single machine. The definitions file (*bpr_definitions.sh*) is updated whenever you add new components.

Note Before proceeding to add components, ensure that all the components belong to the Cisco BAC 4.1.0.1 version.

When the installation program detects the presence of one component on your system, it does not allow you the option of adding that particular component. It prompts you to add or install other components only.

For example, if you installed a DPE on a system and then rerun the installation program, the program does not give you the option of installing the DPE.

```
Regional Distribution Unit (RDU) (y/n)? [n] n
Cisco Network Registrar extension points (y/n)? [n] n
Key Distribution Center (KDC) (y/n)? [n] n
```

The procedures for adding a component are similar to those for a fresh installation, except that the program does not allow you to add the component that you have already installed.

Note You cannot reinstall a component that you have already installed. If you must carry out a reinstallation, first uninstall that component, and then install it again.

Upgrading Cisco Broadband Access Center

This section describes how to upgrade a Cisco Broadband Access Center for Cable (Cisco BAC) 2.7.1.x and 4.0.1.x installation to Cisco Broadband Access Center 4.1.0.1.

This Cisco BAC release supports online migration, using which you can migrate one server at a time without disrupting the entire Cisco BAC deployment.

Before upgrading to Cisco BAC 4.1.0.1, ensure that you obtain the license file that this release supports. Once the upgrade is complete, the installation program deletes all existing license keys. You must then install the license file that Cisco BAC 4.1.0.1 supports, using the administrator user interface. For details on obtaining and installing the license file, see the *Release Notes for the Cisco Broadband Access Center 4.1.0.1*.

You must stop the process watchdog (bprAgent) before upgrading. Once the upgrade is complete, Cisco BAC does not restart the process watchdog automatically. You must migrate your existing database first before starting the watchdog. For details on migration process, refer Migrating the RDU Database.

When upgrading from Cisco BAC 2.7.1.x or Cisco BAC 4.0.1.x to Cisco BAC 4.1.0.1, you must enter a new target location for these directories:

- Data (*BPR_DATA*)
- Database logs (*BPR_DBLOG*)

Note License is required to upgrade Cisco BAC 2.7.1.x to Cisco BAC 4.1.0.1.

The Cisco BAC upgrade procedure requires that you upgrade the components in the sequence recommended in below-mentioned sections. Performing the upgrade in any other sequence results in error during provisioning.

1. Before You Begin, page 3-43
2. Upgrading the RDU, page 3-43
3. Upgrading the DPE, page 3-47
4. Upgrading CNR Extensions, page 3-49
5. Upgrading the KDC, page 3-52

Before You Begin

Before upgrading Cisco BAC components, ensure that you backup the RDU database files. Throttling limits the I/O bandwidth used by the DB with backup utility. Throttle option specifies the rate at which the backup tool reads the files it copies. While using this option, if the reading rate is high, the tool goes to sleep mode till the rate comes down.

Note It is recommended to use the throttle option always since it is not an I/O intensive operation.

To back up the RDU database, run the **backupDb.sh** script in the *BPR_HOME/rdu/bin* directory.

For example:

```
# backupDb.sh /var/backup -throttle 500/opt/
```

where */var/backup* identifies the database backup directory.

In this example, all backup database files are stored in a directory called */var/backup/rdu-backup-20071116-031028*. The last subdirectory (*rdu-backup-20070316-111028*) is automatically created with a current time stamp.

Note The time-stamped subdirectory format is *rdu-backup-yyyyMMdd-HHmmss*. In this example, the subdirectory would be *rdu-backup-20071116-031028*, meaning that the directory contains a backup that was started at 3:10:28 a.m. on November 16, 2007.

For additional information on using the **backupDb.sh** tool, see the *Cisco Broadband Access Center Administrator Guide 4.1*.

Upgrading the RDU

Before upgrading the RDU, we recommend that you archive your files in the *BPR_HOME/rdu/conf* directory.

Also, stop the bprAgent before upgrade using following command:

```
/etc/init.d/bprAgent stop
```

You can upgrade the RDU from:

Cisco BAC 2.7.1.x to Cisco BAC 4.1.0.1

Cisco BAC 4.0.1.x to Cisco BAC 4.1.0.1

Cisco BAC 2.7.1.x to Cisco BAC 4.1.0.1

Step 1 Disable access to the RDU from the operations support system.

Step 2 Back up the existing RDU database, using the **backupDb.sh** tool. For details, see the *Cisco Broadband Access Center Administrator Guide 4.1*.

For example:

```
# /opt/CSCObpr/rdu/bin/backupDb.sh -nosubdir /disk1/backup
```

- **-nosubdir**—Disables the automatic creation of a subdirectory. If you do not use this option, a subdirectory is created and reported to the console.
- */disk1/backup*—Identifies the location for the database backup files.

Step 3 Verify if the database has been backed up by checking the *history.log* file, which resides in the *BPR_DATA* directory.

Step 4 Restore the database that you have backed up to a consistent state, using the **recoverDb.sh** tool. For details, see the *Cisco Broadband Access Center Administrator Guide 4.1*.

For example:

```
# /opt/CSCObpr/rdu/bin/recoverDb.sh /disk1/backup
```

where */disk1/backup* identifies the location of the database backup files.

Step 5 Copy the backed-up database to a safe location.

Step 6 If the operating system (OS) on which the existing Cisco BAC version runs does not meet the requirements for the 4.1.0.1 release, upgrade the OS.

Step 7 Install the 4.1.0.1 version.

For example:

```
# pkgadd -d BAC_4101_SolarisK9/CSCObac.pkg -a BAC_4101_SolarisK9/bacadmin CSCObac
```

When upgrading from 2.7.1.x, the installation program prompts you to enter locations for the:

- Home directory (*BPR_HOME*)

Note The home directory will be replaced if installation is done on the existing Cisco BAC *BPR_HOME* directory.

- Database directory (*BPR_DATA*)

Note The *BPR_DATA* directory should be removed manually after upgrade.

- Database logs directory (*BPR_DBLOG*)

It then upgrades the necessary libraries and property files but leaves your RDU database intact.

Step 8 After the installation is complete, upgrade the RDU database by following the steps described in Migrating the RDU Database, page 3-54.

Cisco BAC 4.0.1.x to Cisco BAC 4.1.0.1

Step 1 Disable access to the RDU from the operations support system.

Step 2 Back up the existing RDU database, using the **backupDb.sh** tool. For details, see the *Cisco Broadband Access Center Administrator Guide 4.1*.

For example:

```
# /opt/CSCObac/rdu/bin/backupDb.sh -nosubdir /disk1/backup
```

- **-nosubdir**—Disables the automatic creation of a subdirectory. If you do not use this option, a subdirectory is created and reported to the console.

- */disk1/backup*—Identifies the location for the database backup files.

Step 3 Verify if the database has been backed up by checking the *history.log* file, which resides in the *BPR_DATA* directory.

Step 4 Restore the database that you have backed up to a consistent state, using the **recoverDb.sh** tool. For details, see the *Cisco Broadband Access Center Administrator Guide 4.1*.

For example:

```
# /opt/CSCObac/rdu/bin/recoverDb.sh /disk1/backup
```

where */disk1/backup* identifies the location of the database backup files.

Step 5 Copy the backed-up database to a safe location.

Step 6 If the operating system (OS) on which the existing Cisco BAC version runs does not meet the requirements for the 4.1.0.1 release, upgrade the OS.

Step 7 To install the 4.1.0.1 version, run the **pkgadd -d BAC_4101_SolarisK9/CSCObac.pkg -a BAC_4101_SolarisK9/bacadmin CSCObac** command.

Output similar to the following appears. The output has been trimmed for brevity.

```
Processing package instance <CSCObac> from </var/CSCObac.pkg>

Cisco BAC product(sparc) 4.1.0.1

Welcome to the Cisco Broadband Access Center for Cable 4.1.0.1 (BAC) installation
program. This installation program installs BAC 4.1.0.1 on your system.

The installer for Cisco Broadband Access Center for Cable 4.1.0.1 enables
non-root user, who has appropriate permission to run the product.

The non-root user can run the product, provided the user has the following
privileges:

file_chown, file_link_any, file_owner, net_privaddr, proc_exec, proc_fork,
proc_info, proc_owner, proc_session, proc_setid

In order to allow the non-root user or non-root users who belong to a specific
group to run Cisco BAC, specify the name of the non-root user and the
group in the "User and Group" prompt that appears next.

Else, to run as root user, specify the name as "root" and group as "root" in
the "User and Group" prompt that appears next.

   Press Enter to Continue or q to Quit:
```

Step 8 Press Enter to continue.

The program prompts you to add user name and user group name.

Step 9 Specify the user name and group name to run Cisco BAC.

```
------------------ User and Group ------------------------
Enter the name of the user [?,q] user1
Enter the name of the group [?,q] group1
```

Step 10 Press Enter to continue.

The program prompts you to confirm upgrading.

Step 11 To confirm that you want to upgrade; enter **y** and press **Enter**.

```
Upgrading BAC from 4.0.1.7 to 4.1.0.1. Are you sure? [n]: y
```

Step 12 To accept the default directory, */opt/CSCObac*, press **Enter**; or enter another directory. The program prompt also display the available disk space.

For example:

```
-------------- Home Directory -----------

   Home Directory [/opt/CSCObac]

   Available disk space for /opt/CSCObac is 3458249 kilobytes.
```

Step 13 Confirm the directory location; enter **y** and press **Enter**.

The data directory prompt appears.

Step 14 To accept the default directory, */var/CSCObac*, press **Enter**; or enter another directory. The program prompt also display the available disk space.

For example:

```
-------------- Data Directory -----------

   DB Data Directory [/var/CSCObac]

   Available disk space for /var/CSCObac is 2614226 kilobytes.
```

Step 15 Confirm the directory location; enter **y** and press **Enter**.

Step 16 The program begins the installation process. After successful installation, the following message appears:

```
Installing Cisco BAC product as <CSCObac>

...

Installation of <CSCObac> was successful.
```

Step 17 To verify if the version information indicates Cisco BAC release 4.1.0.1, enter:

```
# pkgparam CSCObac VERSION
```

Step 18 You must manually restart the DPE process to finish the upgrade process.

For example, from the command line, run:

```
# /etc/init.d/bprAgent start
```

It then upgrades the necessary libraries and property files but leaves your RDU database intact.

Upgrading the DPE

Before upgrading your DPE, we recommend that you archive your files in the *BPR_HOME/dpe/conf* directory.

Also, stop the bprAgent before upgrade using following command:

```
/etc/init.d/bprAgent stop
```

You can upgrade the DPE from:

Cisco BAC 2.7.1.x to Cisco BAC 4.1.0.1

Cisco BAC 4.0.1.x to Cisco BAC 4.1.0.1

Cisco BAC 2.7.1.x to Cisco BAC 4.1.0.1

Step 1 Run the **pkgadd -d BAC_4101_SolarisK9/CSCObac.pkg -a BAC_4101_SolarisK9/bacadmin CSCObac** command.

Output similar to the following appears. The output has been trimmed for brevity.

```
Processing package instance <CSCObac> from </var/CSCObac.pkg>

Cisco BAC product
(sparc) 4.1.0.1
CSCObpr


Welcome to the Cisco Broadband Access Center for Cable 4.1.0.1 (BAC) installation
program. This installation program installs BAC 4.1.0.1 on your system.

The installer for Cisco Broadband Access Center for Cable 4.1.0.1 enables
non-root user, who has appropriate permission to run the product.

The non-root user can run the product, provided the user has the following
privileges:

file_chown, file_link_any, file_owner, net_privaddr, proc_exec, proc_fork,
proc_info, proc_owner, proc_session, proc_setid

In order to allow the non-root user or non-root users who belong to a specific
group to run Cisco BAC, specify the name of the non-root user and the
group in the "User and Group" prompt that appears next.

Else, to run as root user, specify the name as "root" and group as "root" in
the "User and Group" prompt that appears next.

   Press Enter to Continue or q to Quit:

   Upgrading BAC from 2.7.1.2 to 4.1.0.1. Are you sure? [n]: y

   Stopping BAC Process Watchdog...

...

File installation completed.
...

Installation of <CSCObac> was successful.
```

Step 2 To verify if the version information indicates Cisco BAC release 4.1.0.1, enter:

```
# pkgparam CSCObac VERSION
```

Step 3 You must manually restart the DPE process to finish the upgrade process.

For example, from the command line, run:

```
# /etc/init.d/bprAgent start dpe
```

Cisco BAC 4.0.1.x to Cisco BAC 4.1.0.1

Step 1 Run the **pkgadd -d BAC_4101_SolarisK9/CSCObac.pkg -a BAC_4101_SolarisK9/bacadmin CSCObac** command.

Output similar to the following appears. The output has been trimmed for brevity.

```
Processing package instance <CSCObac> from </var/CSCObac.pkg>

Cisco BAC product(sparc) 4.1.0.1

Welcome to the Cisco Broadband Access Center for Cable 4.1.0.1 (BAC) installation
program. This installation program installs BAC 4.1.0.1 on your system.

The installer for Cisco Broadband Access Center for Cable 4.1.0.1 enables
non-root user, who has appropriate permission to run the product.

The non-root user can run the product, provided the user has the following
privileges:

file_chown, file_link_any, file_owner, net_privaddr, proc_exec, proc_fork,
proc_info, proc_owner, proc_session, proc_setid

In order to allow the non-root user or non-root users who belong to a specific
group to run Cisco BAC, specify the name of the non-root user and the
group in the "User and Group" prompt that appears next.

Else, to run as root user, specify the name as "root" and group as "root" in
the "User and Group" prompt that appears next.

   Press Enter to Continue or q to Quit:
```

Step 2 Press Enter to continue.

The program prompts you to add user name and user group name.

Step 3 Specify the user name and group name to run Cisco BAC.

```
------------------ User and Group -----------------------
Enter the name of the user [?,q] user1
Enter the name of the group [?,q] group1
```

Step 4 Press Enter to continue.

The program prompts you to confirm upgrading.

Step 5 To confirm that you want to upgrade; enter **y** and press **Enter**.

```
Upgrading BAC from 4.0.1.7 to 4.1.0.1. Are you sure? [n]: y
```

Step 6 To accept the default directory, */opt/CSCObac*, press **Enter**; or enter another directory. The program prompt also display the available disk space.

For example:

```
-------------- Home Directory -----------

   Home Directory [/opt/CSCObac]

   Available disk space for /opt/CSCObac is 3458249 kilobytes.
```

Step 7 Confirm the directory location; enter **y** and press **Enter**.

The data directory prompt appears.

Step 8 To accept the default directory, */var/CSCObac*, press **Enter**; or enter another directory. The program prompt also display the available disk space.

For example:

```
-------------- Data Directory -----------

   DB Data Directory [/var/CSCObac]

   Available disk space for /var/CSCObac is 2614226 kilobytes.
```

Step 9 Confirm the directory location; enter **y** and press **Enter**.

Step 10 The program begins the installation process. After successful installation, the following message appears:

```
Installing Cisco BAC product as <CSCObac>

...

Installation of <CSCObac> was successful.
```

Step 11 To verify if the version information indicates Cisco BAC release 4.1.0.1, enter:

```
# pkgparam CSCObac VERSION
```

Step 12 You must manually restart the DPE process to finish the upgrade process.

For example, from the command line, run:

```
# /etc/init.d/bprAgent start
```

Upgrading CNR Extensions

Before upgrading CNR extensions, we recommend that you archive your files in the *BPR_HOME/cnr_ep/conf* directory.

Also stop the DHCP server and disable the CNR extension points before upgrade using following commands respectively:

```
/etc/init.d/nwreglocal Stop
/opt/nwreg2/local/usrbin/nrcmd -s < /opt/CSCObac/cnr_ep/bin/bpr_cnr_disable_extpts.nrcmd
```

To upgrade the CNR extensions from:

You can upgrade the DPE from:

Cisco BAC 2.7.1.x to Cisco BAC 4.1.0.1

Cisco BAC 4.0.1.x to Cisco BAC 4.1.0.1

Cisco BAC 2.7.1.x to Cisco BAC 4.1.0.1

Step 1 Run the **pkgadd -d BAC_4101_SolarisK9/CSCObac.pkg -a BAC_4101_SolarisK9/bacadmin CSCObac** command.

Step 2 Enable the CNR extension points and restart the DHCP server using following commands respectively:

```
/opt/nwreg2/local/usrbin/nrcmd -s < /opt/CSCObac/cnr_ep/bin/bpr_cnr_enable_extpts.nrcmd
/etc/init.d/nwreglocal Start
```

The upgrade script automatically copies the upgraded extension point files to the required directories. When complete, it prompts you to restart the CNR Server Agent.

Step 3 To verify if the output information indicates Cisco BAC release 4.1.0.1, enter:

```
# pkgparam CSCObac VERSION
```

Step 4 Go to the *BPR_HOME/lib* directory. If the upgrade was successful, the directory content appears similar to the list of installed files for the DPE upgrade with the addition of the `libbprextensions-2x.so` file.

Step 5 If a second check is required to verify upgrade success, go to the *CNR_HOME/extensions/dhcp/dex* directory and verify that these files appear:

```
-rwxr-xr-x 1 root bin 60904 Oct 29 2003 libdexextension.so
-rwxr-xr-x 1 root other 1530628 Jul 22 12:43 libbprextensions-2x.so
-rwxr-xr-x 1 root other 1560748 Aug 11 12:49 libbprextensions.so
```

Depending on the components installed, the directory content shown in this procedure may differ from the output featured above.

Cisco BAC 4.0.1.x to Cisco BAC 4.1.0.1

Step 1 Run the **pkgadd -d BAC_4101_SolarisK9/CSCObac.pkg -a BAC_4101_SolarisK9/bacadmin CSCObac** command.

Step 2 Also stop the DHCP server and disable the CNR extension points before upgrade using following commands respectively:

```
/opt/nwreg2/local/usrbin/nrcmd -s < /opt/CSCObac/cnr_ep/bin/bpr_cnr_enable_extpts.nrcmd
/etc/init.d/nwreglocal Start
```

Step 3 Output similar to the following appears. The output has been trimmed for brevity.

```
Processing package instance <CSCObac> from </var/CSCObac.pkg>

Cisco BAC product(sparc) 4.1.0.1

Welcome to the Cisco Broadband Access Center for Cable 4.1.0.1 (BAC) installation
program. This installation program installs BAC 4.1.0.1 on your system.

The installer for Cisco Broadband Access Center for Cable 4.1.0.1 enables
```

```
non-root user, who has appropriate permission to run the product.

The non-root user can run the product, provided the user has the following
privileges:

file_chown, file_link_any, file_owner, net_privaddr, proc_exec, proc_fork,
proc_info, proc_owner, proc_session, proc_setid

In order to allow the non-root user or non-root users who belong to a specific
group to run Cisco BAC, specify the name of the non-root user and the
group in the "User and Group" prompt that appears next.

Else, to run as root user, specify the name as "root" and group as "root" in
the "User and Group" prompt that appears next.

   Press Enter to Continue or q to Quit:
```

Step 4 Press Enter to continue.

The program prompts you to add user name and user group name.

Step 5 Specify the user name and group name to run Cisco BAC.

```
------------------ User and Group ----------------------
Enter the name of the user [?,q] user1
Enter the name of the group [?,q] group1
```

Step 6 Press Enter to continue.

The program prompts you to confirm upgrading.

Step 7 To confirm that you want to upgrade; enter **y** and press **Enter**.

```
Upgrading BAC from 4.0.1.5 to 4.1.0.1. Are you sure? [n]: y
```

Step 8 To accept the default directory, */opt/CSCObac*, press **Enter**; or enter another directory. The program prompt also display the available disk space.

For example:

```
-------------- Home Directory -----------

   Home Directory [/opt/CSCObac]

   Available disk space for /opt/CSCObac is 3458249 kilobytes.
```

Step 9 Confirm the directory location; enter **y** and press **Enter**.

The data directory prompt appears.

Step 10 To accept the default directory, */var/CSCObac*, press **Enter**; or enter another directory. The program prompt also display the available disk space.

For example:

```
-------------- Data Directory -----------

   DB Data Directory [/var/CSCObac]

   Available disk space for /var/CSCObac is 2614226 kilobytes.
```

Step 11 Confirm the directory location; enter **y** and press **Enter**.

Step 12 The program begins the installation process. After successful installation, the following message appears:

```
Installing Cisco BAC product as <CSCObac>

...

Installation of <CSCObac> was successful.
```

Step 13 To verify if the version information indicates Cisco BAC release 4.1.0.1, enter:

```
# pkgparam CSCObac VERSION
```

Upgrading the KDC

To upgrade the KDC from:

Cisco BAC 2.7.1.x to Cisco BAC 4.1.0.1

Cisco BAC 4.0.1.x to Cisco BAC 4.1.0.1

Cisco BAC 2.7.1.x to Cisco BAC 4.1.0.1

Step 1 Run the **pkgadd -d BAC_4101_SolarisK9/CSCObac.pkg -a BAC_4101_SolarisK9/bacadmin CSCObac** command.

Step 2 Manually start the Cisco BAC process watchdog to complete the upgrade process.

Step 3 To verify if the output information indicates Cisco BAC release 4.1.0.1, enter:

```
# pkgparam CSCObac VERSION
```

Note The Cisco BAC 4.1.0.1 KDC requires a new license. Before you start the Cisco BAC process watchdog, ensure that the correct license and certificates are installed.

Cisco BAC 4.0.1.x to Cisco BAC 4.1.0.1

Step 1 Run the **pkgadd -d BAC_4101_SolarisK9/CSCObac.pkg -a BAC_4101_SolarisK9/bacadmin CSCObac** command.

Output similar to the following appears. The output has been trimmed for brevity.

```
Processing package instance <CSCObac> from </var/CSCObac.pkg>

Cisco BAC product(sparc) 4.1.0.1

Welcome to the Cisco Broadband Access Center for Cable 4.1.0.1 (BAC) installation
program. This installation program installs BAC 4.1.0.1 on your system.

The installer for Cisco Broadband Access Center for Cable 4.1.0.1 enables
non-root user, who has appropriate permission to run the product.

The non-root user can run the product, provided the user has the following
privileges:

file_chown, file_link_any, file_owner, net_privaddr, proc_exec, proc_fork,
```

```
proc_info, proc_owner, proc_session, proc_setid

In order to allow the non-root user or non-root users who belong to a specific
group to run Cisco BAC, specify the name of the non-root user and the
group in the "User and Group" prompt that appears next.

Else, to run as root user, specify the name as "root" and group as "root" in
the "User and Group" prompt that appears next.

   Press Enter to Continue or q to Quit:
```

Step 2 Press Enter to continue.

The program prompts you to add user name and user group name.

Step 3 Specify the user name and group name to run Cisco BAC.

```
------------------ User and Group -----------------------
Enter the name of the user [?,q] user1
Enter the name of the group [?,q] group1
```

Step 4 Press Enter to continue.

The program prompts you to confirm upgrading.

Step 5 To confirm that you want to upgrade; enter **y** and press **Enter**.

```
Upgrading BAC from 4.0.1.7 to 4.1.0.1. Are you sure? [n]: y
```

Step 6 To accept the default directory, */opt/CSCObac*, press **Enter**; or enter another directory. The program prompt also display the available disk space.

For example:

```
-------------- Home Directory -----------

   Home Directory [/opt/CSCObac]

   Available disk space for /opt/CSCObac is 3458249 kilobytes.
```

Step 7 Confirm the directory location; enter **y** and press **Enter**.

The data directory prompt appears.

Step 8 To accept the default directory, */var/CSCObac*, press **Enter**; or enter another directory. The program prompt also display the available disk space.

For example:

```
-------------- Data Directory -----------

   DB Data Directory [/var/CSCObac]

   Available disk space for /var/CSCObac is 2614226 kilobytes.
```

Step 9 Confirm the directory location; enter **y** and press **Enter**.

Step 10 The program begins the installation process. After successful installation, the following message appears:

```
Installing Cisco BAC product as <CSCObac>

...
```

```
Installation of <CSCObac> was successful.
```

Step 11 To verify if the version information indicates Cisco BAC release 4.1.0.1, enter:

```
# pkgparam CSCObac VERSION
```

Step 12 Manually start the Cisco BAC process watchdog to complete the upgrade process.

For example, from the command line, run:

```
# /etc/init.d/bprAgent start
```

Note The Cisco BAC 4.1.0.1 KDC requires a new license. Before you start the Cisco BAC process watchdog, ensure that the correct license and certificates are installed.

Migrating the RDU Database

When the product is installed over the previous versions from which the user can migrate to Cisco BAC 4.1.0.1, the installer detects that RDU DB-Migration is needed, the necessary files should be updated along with package database. The user must run the "migrateDb.sh" shell script which will be located under BPR_HOME/migration.

The RDU database migration script allows you to migrate your RDU database from:

- Cisco BAC 2.7.1.x to Cisco BAC 4.1.0.1
- Cisco BAC 4.0.1.x to Cisco BAC 4.1.0.1

Backwards Compatibility

You can use the 4.1.0.1 RDU with a migrated database to operate with earlier versions of Solaris DPEs and CNR servers for gradual online migration.

Migration preserves the device record revision numbers used in DPE synchronization. As a result, DPE repopulation is not triggered after the RDU database upgrade, ensuring the least disruption until you upgrade the specific DPE.

Note This Cisco BAC release provides multivendor support via Option 43 and its suboptions. When using this option, ensure that you modify templates used in earlier releases to be compatible with the template grammar that Cisco BAC 4.1.0.1 uses.

Verifying Database Integrity

We recommend that you perform a dry run of the migration process on a staging (nonproduction) system, instead of on a live system during RDU downtime. These steps may not be practical during live migration, because in the case of a large database, verification can take an extended length of time.

To verify the database:

- Before migration, run the **verifyDb.sh tool** on a backup snapshot.

Note To verify the database before migration, use the **verifyDb.sh** tool from the Cisco BAC installation corresponding to the version of the database. You cannot verify a nonmigrated database with the Cisco BAC 4.1.0.1 version of **verifyDb.sh**.

For example, enter:

```
# /opt/BPR_HOME/rdu/internal/db/bin/verifyDb.sh -dbdir /disk1/backup
```

This pathname is specific to the Cisco BAC installation version before migration.

- After migration, run the **verifyDb.sh** tool on the migrated database.

  For example, enter:

  ```
  # /opt/BPR_HOME/rdu/internal/db/bin/verifyDb.sh -dbdir /disk2/target
  ```

For details on the **verifyDb.sh** tool, see the *Cisco Broadband Access Center Administrator Guide 4.1*.

Cisco BAC 2.7.1.x to Cisco BAC 4.1.0.1

Migrating the RDU database from Cisco BAC 2.7.1.x to Cisco BAC 4.1.0.1 consists of two phases:

1. Phase 1—This phase is executed after installation via the **migrateDb.sh** tool.
2. Phase 2—This phase is executed when the RDU is first started up after the Phase 1 migration is completed.

The migration script (**migrateDb.sh**) is automatically installed when you run the Cisco BAC 4.1.0.1 installation program (**pkgadd**). Migration is accomplished by reading from the original database and writing it into a new database. For this purpose, you must allocate additional disk space for accommodating the newly created database.

The status of the first phase of migration is recorded in a migration log file, which is stored in the migrated database directory. The *migration.log* file identifies the version of the database that is being migrated and provides status messages for the migration process.

Note Migration deletes any outstanding jobs stored in the database, such as reliable batches that did not finish execution or pending Configuration Regeneration Service (CRS) jobs.

Migration Performance

A large Cisco BAC RDU database can be several gigabytes in size, and may take an extended length of time to migrate. The length of time that database migration takes depends largely on your hardware, hence using faster disks improves the time significantly.

Migration automatically compacts your database that may be fragmented. However, this Cisco BAC release stores additional data for every device. You can expect the size of the database to increase after migration by as much as 10 percent.

The migration process is optimized for speed and database compactness. As a result, migration requires a large amount of process heap size (memory). For example, migrating a 7-million device database requires approximately 1,024 MB of process heap size. Since the migration process is limited to 4 GB of heap space, migration is effectively limited to a database size of approximately 25-30 million devices.

The **-Xmx** parameter in the **migrateDb.sh** script determines the maximum process heap size for migration. The default setting of 3,072 MB for this parameter is sufficient for migrating a 20-million device database. You may need to fine-tune this setting to suit your environment. For example, to migrate smaller databases running on low-end systems with less memory, you can reduce the value of the maximum heap size setting. For databases that exceed the maximum supported scale, you may need to increase this setting.

To change the heap size parameter, in the **migrateDb.sh** script edit the value for the **-Xmx** parameter.

Licensing After Migration

The licensing scheme changes significantly in this release. You cannot use the license keys from earlier 2.7.1.x versions of Cisco BAC to provision your network using Cisco BAC 4.1.0.1. Any existing license keys are automatically deleted during database migration. To configure Cisco BAC licensing, you must obtain the license files via a license claim process and install them using the administrator user interface. For details, see the *Release Notes for Cisco Broadband Access Center 4.1.0.1*.

During migration, device counters are recalculated based on the number of devices in each provisioning group found in the database. New counters are recorded in the new database and used for licensing.

RDU Extension Migration

During database migration, custom extensions are reset to 4.1.0.1 defaults. Custom extensions must be updated to operate in the 4.1.0.1 environment. If you require custom extensions after migration, you must add them using the administrator user interface. For details, see the *Cisco Broadband Access Center Administrator Guide 4.1*.

Migration of Duplicate Class of Service and Node Name

This Cisco BAC release does not support duplicate names across technologies for Class of Service and nodes. If Cisco BAC detects duplicate names during database migration, the duplicate entries are automatically renamed in the following format:

- Class of Service—{*Technology_Name*}_{*Original_ClassOfService_Name*}
- Nodes—{*Node_Type*}_{*Node_Name*}

For example, if Cisco BAC encounters a **gold** Class of Service for a computer and a DOCSIS modem, either the computer Class of Service is renamed **Computer_gold** or the DOCSIS modem Class of Service is renamed **DOCSISModem_gold**. The appropriate warnings are issued to the console and migration log, and all properties containing the specific Class of Service value are automatically updated.

Table 3-4 describes the process of migration from 2.7.1.x to 4.1.0.1 using examples that assume that:

- Cisco BAC is installed in the default home directory (*/opt/CSCObac*).
- The backup of the previous version of the RDU database is located in the */disk1/backup* directory.

Table 3-4 RDU Migration Workflow from 2.7.1.x to 4.1.0.1

	Task	Refer to...
Step 1	Select two disk partitions: one for the migrated database, and another as a temporary storage directory for the database transaction logs. **Note** For performance reasons, we recommend that you configure these disks on a fast I/O system, such as a RAID array with battery-backup write cache or a RAM disk. For details on migrating using a RAM disk, see Migrating Using a RAM Disk, page 3-62. The partitions that are used in the examples in this procedure are: • Volume */disk2/target*—Used to write the migrated database data. The available disk space for the migrated database should be at least 120 percent of the size of the original database (which is the *bpr.db* file in the backup directory). • Volume */disk3/target*—Used as the temporary storage directory. The available space on the temporary storage disk must be at least 2 GB. For performance reasons, however, we recommend that you locate this directory on a different disk from the backup database and the target database location.	Solaris documentation
Step 2	Run the **migrateDb.sh** tool on the backed-up database. The **migrateDb.sh** script resides in the *BPR_HOME/migration* directory. For a description of all arguments that this tools supports, see Using the migrateDb.sh Tool, page 3-59. For example: `# /opt/CSCObac/migration/migrateDb.sh -dbdir /disk1/backup -targetdbdir /disk2/target -targetdblogdir /disk3/target &> /var/run/migration-console.log &` • **-dbdir**—Specifies the location of the database backup that is to be migrated; in this case, */disk1/backup*. • **-targetdbdir**—Specifies the target location where the migrated database should be placed; in this case, */disk2/target*. This directory is created automatically during migration and must not exist before the script is executed. • **-targetdblogdir**—Specifies the target location for the temporary migration transaction log files; in this case, */disk3/target*. This directory is created automatically during migration and must not exist before the script is executed. **Note** New database log files are created in this directory and later destroyed automatically during migration. Once migration is complete, all the necessary files are automatically copied from this directory to */disk2/target*. After migration, you can delete this directory.	*Cisco Broadband Access Center Administrator Guide 4.1*

Table 3-4 RDU Migration Workflow from 2.7.1.x to 4.1.0.1 (continued)

	Task	Refer to...
Step 3	Observe the migration progress using the *migration.log* file. For example: `# tail -f /disk2/target/migration.log`	Solaris documentation

Step 4	Verify if the migration is complete using the *migration.log* file. If you find any warnings or notices, use the **grep** command-line tool.
	For example:
	`# tail /disk2/target/migration.log`
	…
	`Tue Oct 16 15:36:20 EDT 2007: Phase 1 of RDU database migration to BAC 4.1.0.1 completed with 1 warning(s) and 2 notice(s).`
	`# cat migration.log | grep "WARNING"`
	`Tue Oct 16 15:57:23 EDT 2007: WARNING: Duplicate Class of Service name [cg814wg_chn_n05] detected for [CableHomeWanMan] technology. Class of Service object was renamed to [CableHomeWanMan_cg814wg_chn_n05].`
	`# cat migration.log | grep "NOTICE"`
	`Tue Oct 16 19:06:23 EDT 2007: NOTICE: A deprecated property [/dhcp/client-policy/response/boot-file] was found on object with oid [2882304375712137210]. Property will be declared as custom property.`
	Tip You may also find it useful to examine the device statistics printed at the end of the *migration.log* file.
		Solaris documentation

Step 5	Restore the migrated database into the target directories for the 4.1.0.1 RDU. This process copies the migrated database to the RDU *BPR_DATA* and *BPR_DBLOG* directories. For example: `# /opt/CSCObac/rdu/bin/restoreDb.sh /disk2/target` **Note** Once the migration process is complete, you can delete the content of */disk2/target* and */disk3/target* directories.	*Cisco Broadband Access Center Administrator Guide 4.1*
Step 6	Start the RDU process from the Cisco BAC watchdog process command line, and look for messages on successful initialization in the *rdu.log* file. For example: `# /etc/init.d/bprAgent start rdu`	*Cisco Broadband Access Center Administrator Guide 4.1*
Step 7	Verify if the second phase of migration has started. For example, *rdu.log* should include similar messages: `bac-test.example.com: 2007 10 17 02:36:28 EDT: %BAC-RDU-6-0695: [Starting Phase 2 of RDU db migration].`	Solaris documentation

Table 3-4 RDU Migration Workflow from 2.7.1.x to 4.1.0.1 (continued)

	Task	Refer to...

Step 8	Observe the progress of the migration.
	For example, *rdu.log* should include similar messages:
	`bac-test.example.com: 2007 10 10 02:50:36 EDT: %BAC-RDU-6-0695: [Progress report for selection process...].`
	`bac-test.example.com: 2007 10 10 02:50:36 EDT: %BAC-RDU-6-0695: [Selection process stats: Read a total of 400000 DOCSISModem device records].`
	`bac-test.example.com: 2007 10 10 02:50:36 EDT: %BAC-RDU-6-0695: [Selection process stats: Read a total of 400000 device records].`
	`bac-test.example.com: 2007 10 10 02:50:36 EDT: %BAC-RDU-6-0695: [Selection process stats: Ran selection on 398228 eligible devices].`
		Solaris documentation

Step 9	Verify if the second phase of migration is complete.
	For example, *rdu.log* should include a similar message:
	`bac-test.example.com: 2007 10 17 03:28:58 EDT: %BAC-RDU-6-0695: [Completed Phase 2 of RDU db migration].`
	`bac-test.example.com: 2007 10 17 03:28:58 EDT: %BAC-RDU-6-0695: [RDU db migration has been finalized].`
	Also, you can check if the *BPR_DATA/rdu/db/DB_VERSION* file indicates the database version as 4.1.0.1.
		Cisco Broadband Access Center Administrator Guide 4.1

	Note Migration preserves the device record revision numbers used in DPE synchronization. As a result, DPE repopulation is not triggered after the RDU database upgrade, ensuring the least disruption until you upgrade the specific DPE.	
Step 10	Verify the RDU operations by logging in to the administrator user interface. From **Servers > RDU**, you can check the RDU version and device count statistics.	*Cisco Broadband Access Center Administrator Guide 4.1*

Using the migrateDb.sh Tool

Table 3-5 describes the arguments that you can use with the **migrateDb.sh** tool.

Table 3-5 Arguments for migrateDb.sh Tool for migration from 2.7.1.x to 4.1.0.1

Argument	Description	Required	Optional	Default
-dbdir *dir*	Specifies the location of the database backup that is to be migrated	✓		None
-dblogdir *dir*	Specifies the location of the database logs that are to be migrated		✓	The directory that the -dbdir option specifies

Table 3-5 Arguments for migrateDb.sh Tool for migration from 2.7.1.x to 4.1.0.1 (continued)

Argument	Description	Required	Optional	Default
-targetdbdir *dir*	Specifies the target location where the migrated database will be placed	✓		None
-targetdblogdir *dir*	Specifies the target location in which the migrated database transaction log files are stored temporarily during migration	✓		None
-cachesize *value*	Specifies, in MB, the size of the memory cache. This paramater is optional. If you use this parameter, you must not exceed the 100-MB limit, unless you reduce the value of the **-Xmx** variable in the migrateDb.sh script by double the increase in the cache size. For example, if you set cache size to 200 MB, you must reduce the value of **-Xmx** thus: (200-100)*2 = 200 MB		✓	100 MB
-cmtsv *value*	Specifies the CMTS DOCSIS version that is to be used during service selection. The service is selected based on the minimum version that the CMTS and the cable modem supports. The DOCSIS version that the cable modem supports is determined by the value of the **dhcp-client-identifier** option. The acceptable values are: • 1.0 • 1.1 • 2.0		✓	1.1
-help	Specifies usage for the tool		✓	None

Table 3-5 Arguments for migrateDb.sh Tool for migration from 2.7.1.x to 4.1.0.1 (continued)

Argument	Description	Required	Optional	Default
You can use a number of arguments, as described in the following section, to specify the Class of Service and DHCP Criteria for promiscuous devices. These arguments are optional, provided the default objects, as specified here, exist in the database. The first phase of migration uses these objects to select the service for the devices granted promiscuous access. During the second phase of migration, the standard selection process for each device is performed according to the policies found in the RDU database. Any discrepancies are addressed in favor of the configuration found in the database. However, the migration process is most efficient if few discrepancies are encountered. **Tip** While it may not be possible for you to specify these policy objects accurately if devices of the same type use different promiscuous policy objects, migration will be more efficient if you specify the most frequently used promiscuous objects.				
-pcospc *value*	Specifies the name of the most frequently used Class of Service for promiscuous computers		✓	unprovisioned-computer
-pcosmta *value*	Specifies the name of the most frequently used Class of Service for promiscuous MTAs		✓	unprovisioned-packet-cable-mta
-pcoschwd *value*	Specifies the name of the most frequently used Class of Service for promiscuous CableHome WAN-Data devices		✓	unprovisioned-cablehome-wan-data
-pcoschwm *value*	Specifies the name of the most frequently used Class of Service for promiscuous CableHome WAN-MAN devices		✓	unprovisioned-cablehome-wan-man
-pcoscpe *value*	Specifies the name of the most frequently used Class of Service for promiscuous custom CPE		✓	unprovisioned-customcpe
-pdcpc *value*	Specifies the name of the most frequently used DHCP Criteria for promiscuous computers		✓	genericCPE
-pdcmta *value*	Specifies the name of the most frequently used DHCP Criteria for promiscuous MTAs		✓	genericCPE
-pdcchwd *value*	Specifies the name of the most frequently used DHCP Criteria for promiscuous CableHome WAN-Data devices		✓	genericCPE

Table 3-5 Arguments for migrateDb.sh Tool for migration from 2.7.1.x to 4.1.0.1 (continued)

Argument	Description	Required	Optional	Default
-pdcchwm *value*	Specifies the name of the most frequently used DHCP Criteria for promiscuous CableHome WAN-MAN devices		✓	genericCPE
-pdccpe *value*	Specifies the name of the most frequently used DHCP Criteria for promiscuous custom CPE		✓	genericCPE

Migrating Using a RAM Disk

The RAM disk is a Solaris feature that allows you to mount a portion of the RAM as a disk volume. Disk I/O operations on such volumes are considerably faster and can be useful when you have large databases on systems with sufficient memory.

The procedures described in this section are optional and describe how to create and use different RAM disks to migrate your database instead of a regular disk volume, such as a fast RAID array with battery-backed write cache:

- Creating RAM Disk Volumes for Migration, page 3-62
- Using the RAM Disk Volumes for Migration, page 3-63

Creating RAM Disk Volumes for Migration

The following procedure creates three volumes for migration and assumes that the size of the original database is 9 GB. Adjust the volume sizes as required for your database and according to what the available memory permits.

Using the following procedure, you can create three RAM disks that you could use for migration:

- */ram-disk1*—To contain the source database
- */ram-disk2*—To contain the migrated database directory
- */ram-disk3*—To contain the temporary migration transaction logs

Step 1 Ensure that enough memory is allocated to the RAM disk in the */etc/system* file. This figure is a percentage of the total RAM on the system. Assuming a 64-GB RAM, this setting dedicates 32 GB to the RAM disk.

For example:

```
# less /etc/system
…
set ramdisk:rd_percent_physmem=50
```

Note If you also set the **segmap_percent** parameter, which determines the quantity of memory allocated to the OS I/O buffer cache, make sure that there is sufficient memory for both settings and some space is left for the OS operation.

Step 2 Reboot the system.

For example:

```
# shutdown -i6 -g0 -y
```

Step 3 Create three RAM volumes.

For example:

```
# ramdiskadm -a volume1 10g
# ramdiskadm -a volume2 12g
# ramdiskadm -a volume3 2g
```

Step 4 Create new file systems on each volume.

For example:

```
# newfs /dev/ramdisk/volume1
# newfs /dev/ramdisk/volume2
# newfs /dev/ramdisk/volume3
```

Step 5 Mount the volumes.

For example:

```
# rmdir /ram-disk1
# rmdir /ram-disk2
# rmdir /ram-disk3

# mkdir /ram-disk1
# mkdir /ram-disk2
# mkdir /ram-disk3

# mount /dev/ramdisk/volume1 /ram-disk1
# mount /dev/ramdisk/volume2 /ram-disk2
# mount /dev/ramdisk/volume3 /ram-disk3
```

Step 6 Verify the mount points and their size.

For example:

```
# df -kh
```

Using the RAM Disk Volumes for Migration

To use the RAM-disk volumes that you have created for migration:

Step 1 Copy the backup of your database to */ram-disk1*.

For example:

```
# mkdir /ram-disk1/backup
# cp /disk1/backup/* /ram-disk1/backup/.
```

Step 2 Perform the first phase of migration according to the procedure that Table 3-4 describes. Remember to use a command similar to the one described here instead of the one mentioned in Step 2 of the table.

For example:

```
# /opt/CSCObac/migration/migrateDb.sh -dbdir /ram-disk1/backup
-targetdbdir /ram-disk2/target -targetdblogdir /ram-disk3/target
&> /var/run/migration-console.log &
```

Step 3 To ensure that the second phase of migration is executed with the database of the RAM disk:

a. Install the 4.1.0.1 RDU such that the database directory and the database logs directory (defined by the *BPR_DATA* and *BPR_DBLOG* variables, respectively) point to the volumes on the RAM disk.

b. After the second phase of migration is complete, stop the Cisco BAC process watchdog, using the **/etc/init.d/bprAgent stop** command from the Cisco BAC process watchdog command line.

c. Back up the database using:

BPR_HOME/**rdu/bin/backupDb.sh -nosubdir /ram-disk***X***/migrated-db/**

- *BPR_HOME*—Specifies the home directory, which is by default */opt/CSCObac*.
- *X*—Specifies the RAM disk to which the RDU database is migrated.

d. Edit the *bpr_definitions.sh* file that is found in the home directory (by default */opt/CSCObac*) and change the *BPR_DATA* and *BPR_DBLOG* locations to new directories located on permanent storage drives.

e. Recover and restore the database to the new RDU locations. Run the **recoverDb.sh** and the **restoreDb.sh** scripts, respectively, using:

BPR_HOME/**rdu/bin/recoverDb.sh**

where *BPR_HOME* specifies the home directory, which is by default */opt/CSCObac*.

BPR_HOME/**rdu/bin/restoreDb.sh /ram-disk***X***/migrated-db/**

- *BPR_HOME*—Specifies the home directory, which is by default */opt/CSCObac*.
- *X*—Specifies the RAM disk to which the RDU database is migrated.

For details on using these scripts, see the *Cisco Broadband Access Center Administrator Guide 4.1*.

f. Start the process watchdog, by running the **/etc/init.d/bprAgent start** command.

Cisco BAC 4.0.1.x to Cisco BAC 4.1.0.1

Migration of the RDU database from Cisco BAC 4.0.1.x to Cisco BAC 4.1.0.1 must be performed after you install Cisco BAC 4.1.0.1. You must use the **migrateDb.sh** tool to migrate the RDU database.

Note Migration from Cisco BAC 4.0.1 to Cisco BAC 4.1.0.1 takes less time and space.

Table 3-6 describes the process of migration from 4.0.1.x to 4.1.0.1 using examples that assume that:

- Cisco BAC is installed in the default home directory (*/opt/CSCObac*).
- The migration from Cisco BAC 4.0.1.x to Cisco BAC 4.1.0.1 is an inline migration where the source and the target DB are same and a separate target DB need not be created. The source DB is restored once the migration is complete.
- The backup of the previous version of the RDU database is located in the */disk4/backup* directory.

Table 3-6 RDU Migration Workflow from 4.0.1.x to 4.1.0.1

	Task	Refer to...
Step 1	Run the **migrateDb.sh** tool on the backed-up database. The **migrateDb.sh** script resides in the *BPR_HOME/migration* directory. For a description of all arguments that this tools supports, see Using the migrateDb.sh Tool, page 3-59. For example: `# /opt/CSCObac/migration/migrateDb.sh -dbdir /disk4/backup` **-dbdir**—Specifies the location of the database backup that is to be migrated; in this case, */disk4/backup*.	Solaris documentation
Step 2	Observe the migration progress using the *migration.log* file. For example: `# tail -f /disk4/backup/migration.log`	Solaris documentation

Step 3	Verify if the migration is complete using the *migration.log* file. If you find any warnings or notices, use the **grep** command-line tool to search them.
	For example:
	`# tail /disk4/backup/migration.log`
	`Completed database migration to BAC 4.1.0.1 release`
		Cisco Broadband Access Center Administrator Guide 4.1

Step 4	Restore the migrated database into the RDU *BPR_DATA* and *BPR_DBLOG* directories. For example: `# /opt/CSCObac/rdu/bin/restoreDb.sh /disk4/backup`	*Cisco Broadband Access Center Administrator Guide 4.1*
Step 5	Start the RDU process from the Cisco BAC watchdog process command line, and look for messages on successful initialization in the *rdu.log* file, it will be up and running. For example: `# /etc/init.d/bprAgent start rdu`	*Cisco Broadband Access Center Administrator Guide 4.1*
Step 6	Also, you can check if the *BPR_DATA/rdu/db/DB_VERSION* file indicates the database version as 4.1.0.1.	*Cisco Broadband Access Center Administrator Guide 4.1*
	Note Migration preserves the device record revision numbers used in DPE synchronization. As a result, DPE repopulation is not triggered after the RDU database upgrade, ensuring the least disruption until you upgrade the specific DPE.	
Step 7	Verify the RDU operations by logging in to the administrator user interface. From **Servers > RDU**, you can check the RDU version and device count statistics.	*Cisco Broadband Access Center Administrator Guide 4.1*

Using the migrateDb.sh Tool

Table 3-7 describes the arguments that you can use with the **migrateDb.sh** tool for migration from 4.0.1.x to 4.1.0.1.

Table 3-7 Arguments for migrateDb.sh Tool for 4.0.1.x to 4.1.0.1 migration

Argument	Description	Required	Optional	Default
-dbdir *dir*	Specifies the location of the database backup that is to be migrated	✓		None
-dblogdir *dir*	Specifies the location of the database logs that are to be migrated		✓	The directory that the -dbdir option specifies
-cachesize *value*	Specifies, in MB, the size of the memory cache. This paramater is optional. If you use this parameter, you must not exceed the 100-MB limit, unless you reduce the value of the **-Xmx** variable in the migrateDb.sh script by double the increase in the cache size. For example, if you set cache size to 200 MB, you must reduce the value of **-Xmx** thus: (200-100)*2 = 200 MB		✓	100 MB
-help	Specifies usage for the tool		✓	None

Uninstalling Cisco Broadband Access Center

This chapter describes how you can uninstall Cisco Broadband Access Center (Cisco BAC).

The procedure described in this chapter uninstalls the RDU, CNR extensions, the DPE, and the KDC, but it does not uninstall the CNR application. Before removing Cisco BAC you must manually remove the Cisco BAC configuration on CNR.

The uninstallation program removes all files found in the installation directory (the default directory is */opt/CSCObac*). The program also shuts down and removes these processes, if they are detected: RDU, KDC, SNMP Agent, Tomcat, Cisco BAC agent, and DPE.

The uninstallation program does not remove files that were placed outside the installation directory. For example, a component installation places the database and database logs directories under */var/CSCObac*. These files must be removed manually. (Subsequent sections describe how to delete these files.) Also, the program does not remove any files found in the CNR directory.

If you have installed Cisco BAC extensions on CNR, you must uninstall those extensions to completely uninstall the Cisco BAC program; otherwise, an error message similar to the following appears:

```
The uninstall program found a copy of the BAC extensions in the NR extension
directory(/opt/nwreg2/local/extensions/dhcp/dex/libbprextensions.so), please disable
the extensions and remove the library before uninstalling BAC.
```

Note The path to the CNR extensions differs based on the location where you have installed CNR; the default location is */opt/nwreg2*.

If the uninstallation program fails to uninstall Cisco BAC, error messages appear.

This chapter describes:

- Uninstalling Cisco BAC, page 3-67
- Post-Uninstallation Task, page 3-68

Uninstalling Cisco BAC

This section describes the procedures to uninstall Cisco BAC.

After uninstalling Cisco BAC, manually remove the data and database logs directories. See Post-Uninstallation Task, page 3-68.

To uninstall Cisco BAC from the command line:

Step 1 Log in as *root*.

Step 2 Manually remove the configuration of the Cisco BAC extensions on the CNR server. You can do this from any server that has **nrcmd** installed and connectivity with CNR.

a. To uninstall the Cisco BAC extensions from your CNR configuration, enter:

```
# NR_HOME/local/usrbin/nrcmd -N admin -P changeme -b <
BPR_HOME/cnr_ep/bin/bpr_cnr_disable_extpts.nrcmd
```

b. To reload your DHCP server, enter:

```
# /etc/init.d/nwreglocal stop
# /etc/init.d/nwreglocal start
```

Alternatively, enter:

```
# NR_HOME/local/usrbin/nrcmd -N admin -P changeme "dhcp reload"
```

c. To remove the Cisco BAC extensions from the CNR extensions directory, enter:

```
# rm -rf NR_HOME/local/extensions/dhcp/dex/libbprextensions.so
```

Step 3 At the CLI prompt, enter:

```
# pkgrm CSCObac
```

The following information appears:

```
The following package is currently installed:

CSCObac          Cisco BAC product
                    (sparc) 4.1.0.1.

   Do you want to remove this package? [y,n,?,q] y
```

Step 4 Enter **y**, and press **Enter** to start uninstalling.

```
   ## Removing installed package instance <CSCObac>

   This package contains scripts which will be executed with super-user
   permission during the process of removing this package.

   Do you want to continue with the removal of this package [y,n,?,q] y
```

Step 5 Enter **y** and press **Enter**.

When uninstalling is complete, the following message appears:

```
Removal of <CSCObac> was successful.
```

Post-Uninstallation Task

After you have uninstalled Cisco BAC, you must manually remove the data and database logs directories. To remove these directories:

Step 1 Log in as *root*.

Step 2 Remove the data and the database logs directories. (The default directory for both is */var/CSCObac*.)

For example, enter:

```
# rm -rf /var/CSCObac
```

The data and the database logs directories are deleted.

CHAPTER 4

Installation of Broadband Access Center on Linux

This chapter explains the procedure and sequence of event for a successful installation of Cisco Broadband Access Center (Cisco BAC) on Linux 5. It covers the following topics:

Note Only DPE and CNR components can be installed in Linux.

Installing Cisco Broadband Access Center

This section explains the procedures you must follow to install Cisco Broadband Access Center (Cisco BAC) in a Linux operating system environment.

This chapter includes:

Before you install Cisco BAC, ensure that you are ready by reviewing the checklist that Table 4-1 describes.

Table 4-1 Installation Checklist

Task	Checkoff
1. Verify if your system meets the minimum system hardware and software requirements described in Chapter 1, "Overview."	❑
2. Ensure that you have access to the computers on which you intend to install Cisco BAC components.	❑
3. Save your license file on the system from which you intend to launch the Cisco BAC administrator user interface via a web browser. You need a valid service license file to configure Cisco BAC licensing.	❑

Table 4-1 Installation Checklist (continued)

Task	Checkoff
4. Determine the home directory (*BPR_HOME*) in which you want to install the Cisco BAC component or components. The default directory is */opt/CSCObac*. Ensure that the target installation directory has enough disk space. **Note** We recommend that you have at least 200 MB of disk space available otherwise installation will not take place.	❑
5. Verify that you have minimum 500 MB of free space available in the /tmp directory for successful installation.	❑
6. Ensure that CNR 7.1.2.1 is installed and running on the servers on which you are installing Cisco BAC extensions. **Note** To enable IPv6 support in Cisco BAC, you must install version 7.1.2.1 of CNR.	❑
7. For the CNR extensions, determine the name of the provisioning group to which the CNR server belongs.	❑
8. For the CNR extensions, determine where you want to install the data directory (*BPR_DATA*). The default directory is */var/CSCObac* with a disk space requirement of 200 MB.	❑
9. Verify that you have the necessary CNR configuration files. For an example of these configuration files, see Appendix A, "Network Registrar Configuration File Example."	❑

10. Enable your machine to support IPv6.
 	
To configure a static IPv6 address to an interface, add these lines:
 	
`# IPv6init="yes"`
`# IPv6addr=<ipv6address>`
to `/etc/sysconfig/network-scripts/ifcfg-ifname file`
 	
where *ifname* matches network interface, reboot the network interface
	❑

Installing Cisco BAC

The initial steps in the Cisco BAC installation program are identical regardless of the component you are installing. This section describes how to work with the installation program and the initial installation steps.

To install Cisco BAC:

Step 1 Log in to the intended Cisco BAC with your user name and password.

Step 2 At the Linux system prompt, change directory to your CD-ROM drive or other installation media.

Ensure that the **gzip** and **gtar** utilities are available on your system to decompress and unpack the Cisco BAC installation file, and:

a. Change to the directory in which you will decompress and extract the installation file.

b. Decompress the file with the *.gtar.gz* extension. Enter:

```
gunzip -d BAC_4101_LinuxK9.gtar.gz
```

c. Unpack the file with the *.gtar* extension that gunzip decompressed. Enter:

```
gtar -xvf BAC_4101_LinuxK9.gtar
```

The utility creates the *BAC_4101_Linux* directory into which the installation program is extracted.

Note If the program displays a checksum error while unpacking, specify the path to the GNU tar on your machine.

Step 3 After the installation program is extracted, you can choose to install the components in interactive mode or noninteractive mode.

- Installing Components in Interactive Mode, page 4-3
- Uninstalling Cisco Broadband Access Center, page 4-9

Installing Components in Interactive Mode

This section explains the procedures that you follow to install one or more Cisco BAC components interactively from the command line.

If you have not enabled IPv6 on your machine, a message similar to the following appears during installation:

```
Warning: IPv6 is not enabled on this system.
```

You can choose to enable IPv6 later.

Note Before you begin any of these procedures, you must complete the initial procedure described in Installing Cisco Broadband Access Center, page 4-1.

This section provides instructions on installing components in interactive mode:

- Installing CNR Extensions in Interactive Mode, page 4-5
- Installing DPE in Interactive Mode, page 4-3

Installing DPE in Interactive Mode

Install the DPE on a server running Linux that meets the requirements described in Operating System Requirements, page 1-2.

Note We recommend that you configure the DPE server to use a static IP address.

During DPE installation, if the program detects a TFTP server or a ToD server running on the same server as the DPE, the installation displays an error message and quits. To kill the TFTP or ToD server, carry out the steps that the error message lists.

To install the DPE, complete the initial installation described in Installing Cisco Broadband Access Center, page 4-1. Then:

Step 1 To start the installation program in interactive mode, enter:

```
# install-path/BAC_4101_Linux/install_bac.sh
```

where *install-path* specifies the complete path to the directory in which the *BAC_4101_Linux* directory has been created.

The installation program verifies that you have installed the required patches to the Linux operating system. When the verification ends, welcome information appears.

```
Welcome to the Cisco Broadband Access Center (BAC) installation program.
This installation program installs BAC on your system.
```

Step 2 Press **Enter** to continue.

The home directory prompt appears.

Step 3 To accept the default directory, */opt/CSCObac*, press **Enter**; or enter another directory.

For example:

```
------------- Home Directory-----------

   Home Directory Destination [/opt/CSCObac]
```

Step 4 Confirm the directory location; enter **y** and press **Enter**.

The data directory prompt appears.

Step 5 To accept the default directory, */var/CSCObac*, press **Enter**; or enter another directory.

For example:

```
------------- Data Directory-----------

Data Directory Destination [/var/CSCObac]
```

Step 6 Confirm the directory location; enter **y** and press **Enter**.

Before installation, a message appears:

```
Installation is about to begin.
```

Step 7 Enter **y** and press **Enter** to continue.

The program begins the installation process.

Step 8 The installation program will prompt you to configure CNR extension points.

For example:

```
Configure the Cisco Network Registrar extension points (y/n/q)? [n]:
```

Step 9 Enter **n** and press Enter.

Step 10 The installation program will prompt you to configure DPE.

For example:

```
Configure the Cisco Device Provisioning (DPE) (y/n/q)? [n]:
```

Step 11 Enter **y** and press **Enter**.

Step 12 The installation proceeds, and displays the following message after successful installation:

```
Finished
```

Installing CNR Extensions in Interactive Mode

Install Cisco BAC extensions on all CNR servers in your Cisco BAC environment. If you are deploying Cisco BAC in a failover environment, you also must install the extensions on the failover servers. After you install extensions, you must configure them. This section explains how to install, configure, and validate these extensions.

Note We recommend that you configure the CNR server to use a static IP address.

Before you install CNR extensions, complete the initial installation described in Installing Cisco Broadband Access Center, page 4-1. Also, ensure that CNR is running. Then:

Step 1 To start the installation program in interactive mode, enter:

```
# install-path/BAC_4101_Linux/install_bac.sh
```

where *install-path* specifies the complete path to the directory in which the *BAC_4101_Linux* directory has been created.

The installation program verifies that you have installed the required patches to the Linux operating system. When the verification ends, welcome information appears.

```
Welcome to the Cisco Broadband Access Center (BAC) installation program.
This installation program installs BAC on your system.
```

Step 2 Press **Enter** to continue.

The home directory prompt appears.

Step 3 To accept the default directory, */opt/CSCObac*, press **Enter**; or enter another directory.

For example:

```
------------- Home Directory-----------

   Home Directory Destination [/opt/CSCObac]
```

Step 4 Confirm the directory location; enter **y** and press **Enter**.

The data directory prompt appears.

Step 5 To accept the default directory, */var/CSCObac*, press **Enter**; or enter another directory.

For example:

```
------------- Data Directory-----------

Data Directory Destination [/var/CSCObac]
```

Step 6 Confirm the directory location; enter **y** and press **Enter**.

Before installation, a message appears:

```
Installation is about to begin.
```

Step 7 Enter **y** and press **Enter** to continue.

The program begins the installation process.

Step 8 The installation program will prompt you to configure CNR extensions points.

For example:

```
Configure the Cisco Network Registrar extension points (y/n/q)? [n]:
```

Step 9 Enter **y** and press **Enter**.

Step 10 The installation program will prompt you to enter details for RDU component.

For example:

```
Enter RDU IP Address or Hostname [bachost-rdu.example.com]: bacdevlab-linux-5
Enter RDU Listening Port [49187]: 49187
Enter the provisioning group name: group1
Are you going to use devices that support PacketCable voice technology (y/n)? [n]:
```

The program asks you if you intend to provision PacketCable or voice technology devices.

Step 11 Enter **y** and press **Enter** if you are using PacketCable devices, else enter **n** and press Enter.

Step 12 If you enter **n**, follow Step 13. If you enter **y**, the program prompts you to enter several voice technology properties.

For example:

```
Enter the KDC realm name [CISCO.COM]:
Enter IP address for the primary DHCP server [10.81.89.144]:
Enter IP address for the primary DNS server [10.81.89.144]:
Enter IP address for the secondary DHCP server []:10.81.89.144
Enter IP address for the secondary DNS server []:10.81.89.144

-------------- Confirmation --------------
KDC realm: CISCO.COM
Primary DHCP: 10.81.89.144
Primary DNS: 10.81.89.144
Secondary DHCP: 10.81.89.144
Secondary DNS: 10.81.89.144

Is this correct (y/n/q)? [y]:
```

Step 13 Press **y** and **Enter** to continue.

Step 14 Enter the shared secret password that you want to use for authentication between the Cisco BAC servers.

Note You must use the same shared secret password for all DPEs and CNR extension points in your network.

For example:

```
Enter the shared secret password [] <changeme>
Enter the shared secret password again [] <changeme>
```

Step 15 Reenter the password for confirmation, and press **Enter**.

The program prompts you to confirm the installation.

Step 16 Enter **y** and press **Enter**.

Note If you choose not to proceed, the following message appears and the installation quits:

```
Installation of <CSCObac> was terminated due to user request.
No changes were made to the system.
```

The program begins the installation process. After successful installation, the following message appears:

```
Installation of <CSCObac> was successful
```

Configuring Extensions

After you install the Cisco BAC extensions on the CNR server, you must configure the extensions. The procedure described in this section assumes that:

- The Cisco BAC component is installed in */opt/CSCObac*.
- CNR is installed in */opt/nwreg2*.
- The CNR username is **admin** and the password is **changeme**.

To configure extensions:

Step 1 Log in to the CNR server, with *root* access.

Step 2 At the command line, enter:

```
# NR_HOME/local/usrbin/nrcmd -N admin -P changeme -b <
BAC_HOME/cnr_ep/bin/bpr_cnr_enable_extpts.nrcmd
```

Step 3 To reload the CNR server, enter:

```
# /etc/init.d/nwreglocal stop
# /etc/init.d/nwreglocal start
```

Alternatively, to reload the DHCP server alone, enter:

```
# NR_HOME/local/usrbin/nrcmd -N admin -P changeme "dhcp reload"
```

Note Before you can use the CNR server, you must configure client classes, scope-selection tags, policies, and scopes. In an IPv6 environment, you must configure links and prefixes as well. See the *User Guide for Cisco Network Registrar 7.1*.

Validating Extensions

To validate the extensions installed on the CNR server, from the CNR Command Line Tool (**nrcmd**), run:

Note Depending on whether you installed a local or regional cluster, the **nrcmd** tool is located in:

- Local—*/opt/nwreg2/local/usrbin*
- Regional—*/opt/nwreg2/regional/usrbin*

```
nrcmd> extension list
       100 Ok
       dexdropras:
           entry = dexdropras
           file = libdexextension.so
           init-args =
           init-entry =
           lang = Dex
           name = dexdropras
       preClientLookup:
           entry = bprClientLookup
           file = libbprextensions.so
           init-args = BPR_HOME=/opt/CSCObac,BPR_DATA=/var/CSCObac
           init-entry = bprInit
           lang = Dex
           name = preClientLookup
       prePacketEncode:
           entry = bprExecuteExtension
           file = libbprextensions.so
           init-args =
           init-entry = initExtPoint
           lang = Dex
           name = prePacketEncode

nrcmd>
```

Note The *BPR_HOME* and *BPR_DATA* values may be different in your installation.

Also in the **nrcmd** program, run:

```
nrcmd> dhcp listextensions
100 Ok
post-packet-decode: dexdropras
pre-packet-encode: prePacketEncode
pre-client-lookup: preClientLookup
post-client-lookup:
post-send-packet:
pre-dns-add-forward:
check-lease-acceptable:
post-class-lookup:
lease-state-change:
generate-lease:
environment-destructor:
pre-packet-decode:
post-packet-encode:

nrcmd>
```

Uninstalling Cisco Broadband Access Center

This chapter describes how you can uninstall Cisco Broadband Access Center (Cisco BAC).

The procedure described in this chapter uninstalls the DPE and CNR extensions but it does not uninstall the CNR application. Before removing Cisco BAC you must manually remove the Cisco BAC configuration on CNR.

The uninstallation program removes all files found in the installation directory (the default directory is */opt/CSCObac*). The program also shuts down and removes these processes, if they are detected: SNMP Agent, Tomcat, Cisco BAC agent, and DPE.

The uninstallation program does not remove files that were placed outside the installation directory. For example, a component installation places the database and database logs directories under */var/CSCObac*. These files must be removed manually. (Subsequent sections describe how to delete these files.) Also, the program does not remove any files found in the CNR directory.

If you have installed Cisco BAC extensions on CNR, you must uninstall those extensions to completely uninstall the Cisco BAC program; otherwise, an error message similar to the following appears:

```
The uninstall program found a copy of the BAC extensions in the NR extension
directory(/opt/nwreg2/local/extensions/dhcp/dex/libbprextensions.so), please disable
the extensions and remove the library before uninstalling BAC.
```

Note The path to the CNR extensions differs based on the location where you have installed CNR; the default location is */opt/nwreg2*.

If the uninstallation program fails to uninstall Cisco BAC, error messages appear.

This chapter describes:

Uninstalling Cisco BAC

This section describes the procedures to uninstall Cisco BAC.

After uninstalling Cisco BAC, manually remove the data and database logs directories. See Post-Uninstallation Task, page 4-10.

To uninstall Cisco BAC from the command line:

Step 1 Log in using user name and password.

Step 2 Manually remove the configuration of the Cisco BAC extensions on the CNR server. You can do this from any server that has **nrcmd** installed and connectivity with CNR.

a. To uninstall the Cisco BAC extensions from your CNR configuration, enter:

```
# NR_HOME/local/usrbin/nrcmd -N admin -P changeme -b <
BPR_HOME/cnr_ep/bin/bpr_cnr_disable_extpts.nrcmd
```

b. To reload your DHCP server, enter:

```
# /etc/init.d/nwreglocal stop
# /etc/init.d/nwreglocal start
```

Alternatively, enter:

```
# NR_HOME/local/usrbin/nrcmd -N admin -P changeme "dhcp reload"
```

c. To remove the Cisco BAC extensions from the CNR extensions directory, enter:

```
# rm -rf NR_HOME/local/extensions/dhcp/dex/libbprextensions.so
```

Step 3 At the CLI prompt, enter:

```
# rpm -e CSCObac
```

Following information appears:

```
To remove files generated or changed by BAC, please execute the following commands:

    rm -rf /opt/CSCObac
    rm -rf /var/CSCObac
```

Step 4 Execute the commands and press **Enter** to start uninstalling.

Step 5 The CLI prompt appears once uninstallation is complete.

Post-Uninstallation Task

After you have uninstalled Cisco BAC, you must manually remove the data and database logs directories. To remove these directories, see Step 3 of Uninstalling Cisco BAC, page 4-9.

CHAPTER 5

Post-Installation Activities

This chapter describes the tasks that you perform after installing Cisco Broadband Access Center (Cisco BAC):

Licensing Cisco BAC

This Cisco BAC release enables licensing using a service file. These licenses allow you to provision a set number of services using Cisco BAC. Each service translates to three IP addresses provisioned in the system; thus, a 10,000 service license equates to 30,000 IP addresses. The license file that you receive will contain the number of IP addresses that are licensed, not the number of services that you purchased.

Cisco BAC allows permanent and evaluation licenses in the RDU at the same time. It allows you to install an evaluation license along with your existing permanent license. The evaluation license expires in a stipulated time period.

Caution Do not edit your license file. Changing the data in any way invalidates the license file.

You still require separate licenses for the following Cisco BAC components:

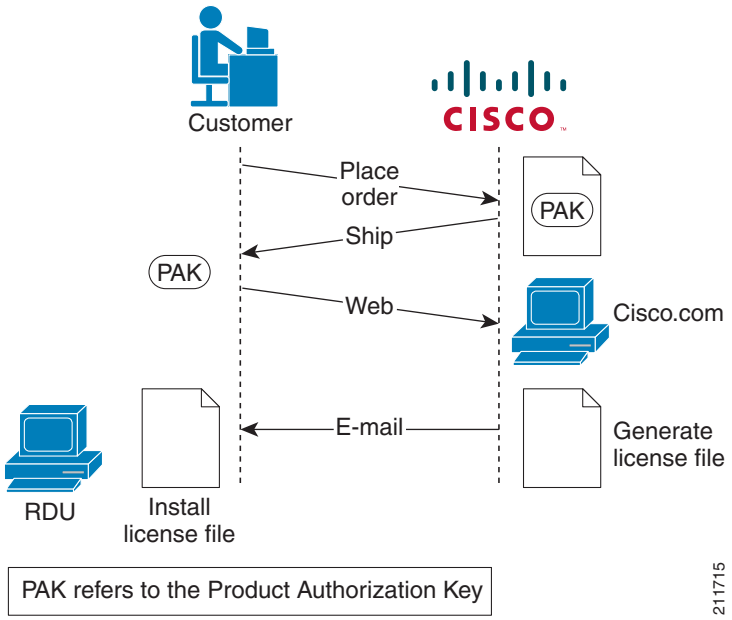
- The DPE
- The KDC, if you configure your network to support voice technology

The DPE license is contained within the license file and licenses the DPE when you install the license file from the administrator user interface. The KDC license continues to be proprietary, as in previous Cisco BAC releases, and is licensed during Cisco BAC installation.

Obtaining a Permanent License

To request a permanent license, follow the procedure that Figure 1 depicts.

Figure 5-1 License Claim Process



Note With FlexLM licensing, you receive a Product Authorization Key (PAK) for each software CD package that you purchase. The PAK is affixed as a sticky label on the Software License Claim Certificate card that is included in your CD-ROM package.

To obtain a permanent license:

Step 1 Keep your PAK handy and access http://www.cisco.com/go/license. You must have a valid Cisco.com account to log in to this site.

Step 2 The Product License Registration website appears.

Step 3 Complete the steps detailed at the Product License Registration page.

Note During license registration, submit each PAK that you have received. For each PAK that you submit, a license file is generated and sent to you via e-mail.

Step 4 Once you receive your license file, install it using the procedure described in Installing Your License File.

Obtaining an Evaluation License

For an evaluation license, contact your Cisco representative, who will generate the necessary key from the Cisco licensing website and e-mail it to you. Once you receive your license file, install it using the procedure described in Installing Your License File.

Installing Your License File

Before installing your license file, ensure that you back up your licenses in case you have to reinstall the Cisco BAC software.

To install your permanent or evaluation license:

Step 1 Once you receive your license file, save each file to the local system on which you intend to launch your web browser.

Step 2 Launch your web browser on that system.

Step 3 Enter the administrator's location using this syntax:

`http://machine_name:port_number/`

- *machine_name*—Identifies the computer on which the RDU is running.

  Note To access the administrator user interface via HTTP over SSL, also known as HTTPS, enter: `https://machine_name:port_number/`

- *port_number*—Identifies the computer port on which the server side of the administrator application runs. The default port number is:
  - 8100 for HTTP over TCP
  - 8443 for HTTP over SSL

The main login page appears.

Step 4 Enter the default username (**admin**) and password (**changeme**).

Note If you are logging in for the first time, the Change Password screen appears. Enter a new password and confirm it.

Step 5 Click **Login**.

The Main Menu page appears.

Step 6 Click the license link at the top of the Main Menu page, or choose **Configuration > License Keys**.

The Manage License Keys page appears.

Step 7 In the License File field, enter the complete path to the location of the license file on your local system. Remember to include the name of the license file while specifying the pathname.

Or, click **Browse** and navigate to the license file.

Step 8 Click **Add**.

The details regarding the number of services and the DPEs that you are licensed to use appear.

Installing Your KDC License

Obtain a KDC license from your Cisco representative and then install it in the correct directory.

To install the KDC license file (*backkdc.license*):

Step 1 Obtain your license file from your Cisco representative.

Step 2 Log in to the Cisco BAC host as root or non-root.

Step 3 Change to the *BPR_HOME/kdc* directory.

Step 4 Copy the license file to this *BPR_HOME/kdc* directory.

Caution Be careful not to copy the license file as an ASCII file. The file contains binary data susceptible to unwanted modification during an ASCII transfer.

Do not copy KDC license files between operating systems because the transfer process may damage the file.

Step 5 To restart the KDC server and make the changes take effect, run the **bprAgent restart kdc** command from the */etc/init.d* directory.

Enabling a CNR Spoofing DNS Server

A spoofing DNS server redirects all DNS requests to the same IP address. You can enable spoofing to enforce a self-provisioning flow for a new subscriber.

For example, assume that a DNS host is dns.example.com, and has an IP address of 10.10.10.5. Assume also that the web server with the self-provisioning flow is 10.10.10.6.

On the DNS server, set the following parameters in CNR:

```
nrcmd> zone . delete
nrcmd> zone . create primary dns.example.com postmaster.dns.example.com
nrcmd> zone . addrr * a 10.10.10.6
nrcmd> save
nrcmd> dns reload
```

When DNS reloads, the changes take effect.

On the DHCP server, set the following parameters in CNR:

```
nrcmd> policy unprovisioned setoption domain-name-servers 10.10.10.5
nrcmd> policy unprovisioned setoption domain-name example.com
nrcmd> save
nrcmd> dhcp reload
```

Configuring the Syslog Utility to Receive Alerts from Cisco BAC

You can configure the syslog file on any Cisco BAC component server to receive alerts and debugging information from the system.

Note Configuring the syslog file is an optional task.

Cisco BAC generates alerts through the Solaris syslog service. Syslog is a client-server protocol that manages the logging of information on UNIX. Cisco BAC syslog alerts are not a logging service; they notify that a problem exists, but do not necessarily define the specific cause of the problem. This information might reside in the appropriate Cisco BAC log files (*rdu.log* and *dpe.log*). If you choose to configure the syslog file, these alerts are directed to a separate log file.

For more information on error messages and alerts, see the *Cisco Broadband Access Center Administrator Guide 4.1*.

To configure the syslog utility on the CNR extension points and the RDU server:

Step 1 Log in, as *root,* on the CNR server.

Step 2 At the command line, create the log file.

For example:

```
# touch /var/log/bac.log
```

Step 3 Open the */etc/syslog.conf* file with a text editor, such as *vi*.

Step 4 Add this line to the */etc/syslog.conf* file:

```
local6.info        /var/log/bac.log
```

Note You must insert one or more tabs between the local6:info and */var/log/bpr.log* information.

Step 5 Save and close the */etc/syslog.conf* file.

Step 6 To force the syslog utility to accept the new configuration, enter:

```
# ps -ef  | grep syslogd
    root    217    1    0    Jun 26    ?    0:00    /usr/sbin/syslogd

# kill -HUP 217
```

Note The process ID (PID) in this example is 217, but may change when you run **ps -ef | grep syslogd**. Use the correct output from that command as the input to **kill -HUP**.

Syslog is now ready to receive alerts from Cisco BAC.

CHAPTER 6

Setting Up a Device Provisioning Engine

This chapter describes how you set up the Cisco Broadband Access Center (Cisco BAC) Device Provisioning Engine (DPE).

A DPE caches provisioning information and handles all configuration requests, including downloading configuration files to devices. It is integrated with the CNR DHCP server to control the assignment of IP addresses. Multiple DPEs can communicate with a single DHCP server.

To configure the DPE from the CLI, you must have a valid license. If you run the commands described in this chapter on an unlicensed DPE, the following message appears:

```
This DPE is not licensed. Your request cannot be serviced. Please check with your
system administrator for DPE licenses.
```

For details on DPE licensing and how to install your license, see Licensing Cisco BAC, page 5-1.

This chapter describes:

Accessing the DPE CLI

You can access the CLI of a DPE in one of two ways: from a local or remote host.

Accessing from a Local Host

To access the CLI from a local host, use:

```
# telnet localhost 2323
```

or

```
# telnet 0 2323
```

Accessing from a Remote Host

To access the CLI from a remote host, enter:

```
# telnet remote-hostname 2323
```

Note If you cannot establish a Telnet connection to the CLI, the CLI server is probably not running. You may need to start the server. To start the server, enter:

```
# /etc/init.d/bprAgent start cli
```

Logging In

To log in to the DPE:

Step 1 At the password prompt, enter the login password. The default user password is **changeme**.

For example:

```
Broadband Access Center 4.1.0.1 (SOL_BAC4_1_0_1_00000000_0000)
Device Provisioning Engine local_bac_dpe

User Access Verification

Password: <changeme>

bac_dpe>
```

For security reasons, we recommend that you change the original password.

Step 2 Enter the **enable** command to enter privileged mode. You must be working in privileged mode to configure the DPE.

For example:

```
bac_dpe> enable
```

Step 3 The system prompts you for the password to access the privileged mode. At the prompt, enter the password; the default is **changeme**.

The system displays the privileged mode prompt.

For example:

```
bac_dpe> enable
Password: <changeme>
bac_dpe#
```

Step 4 Change your login and privileged mode passwords.

a. To change the login password:

1. Access the DPE in the privileged mode. See Step 2.
2. At the prompt, enter the **password** command.

   For example:

   ```
   bac_dpe# password
   ```

3. At the password prompt, enter the new password, then re-enter it.

   For example:

```
New password: <password1>
Retype new password: <password1>
Password changed successfully.
```

b. To change the privileged mode password:

1. Access the DPE in the privileged mode. See Step 2.
2. At the prompt, enter the **enable password** command.

   For example:

```
bac_dpe# enable password
```

3. At the password prompt, enter the new password, then re-enter it.

   For example:

```
New enable password: <password2>
Retype new enable password: <password2>
Password changed successfully.
```

Configuring a DPE for Data

To configure a DPE, you must know the:

- IP address or fully qualified domain name (FQDN) of the RDU for the DPE.
- Provisioning group or groups to which the DPE belongs.

Tip You can use the **show run** command to view the running configuration. A complete list of commands is available through the use of the **show commands** command. For additional information, see the *Cisco Broadband Access Center DPE CLI Reference, 4.1*.

To configure a DPE:

Step 1 Configure the DPE interface to handle provisioning requests, by specifying the IP address of the interface in the IPv4 or the IPv6 addressing formats.

For example:

Using IPv4 format:

```
bac_dpe# interface ip 10.10.10.133 provisioning
% OK (Requires DPE restart "> dpe reload")
```

Using IPv6 format:

```
bac_dpe# interface ip 2001:0DB8:0:0:203:baff:fe12:d5ea provisioning
% OK (Requires DPE restart "> dpe reload")
```

Note The values provided here are sample values only. Use values appropriate for your network.

Step 2 Configure the IPv4 ONLY address for communication with CNR.

For example:

```
bac_dpe# interface ip 10.10.10.133 pg-communication
% OK (Requires DPE restart "> dpe reload")
```

Step 3 Enter the IP address for the RDU or its domain name if you are implementing DNS. Also, identify the port on which the RDU is listening. The default listening port is 49187.

For example:

```
bac_dpe# dpe rdu-server 10.10.10.1 49187
% OK (Requires appliance restart "> reload")
```

Step 4 Specify the provisioning group or groups of which the DPE is part. Where appropriate, specify the secondary provisioning group of which the DPE is a member.

For example:

```
bac_dpe# dpe provisioning-group primary group1
% OK (Requires appliance restart "> reload")
bac_dpe# dpe provisioning-group secondary group2
% OK (Requires appliance restart "> reload")
```

Step 5 Set the shared secret password to be the same as that on the RDU.

For example:

```
bac_dpe# dpe shared-secret secret
% OK (Requires DPE restart "> dpe reload")
```

Step 6 Enable the TFTP service running on the DPE.

For example:

Using IPv4:

```
bac_dpe# service tftp 1 ipv4 enabled true
% OK (Requires DPE restart "> dpe reload")
```

Using IPv6:

```
bac_dpe# service tftp 1 ipv6 enabled true
% OK (Requires DPE restart "> dpe reload")
```

Step 7 Enable the Time of Day (ToD) service running on the DPE.

For example:

Using IPv4:

```
bac_dpe# service tod 1 ipv4 enabled true
% OK (Requires DPE restart "> dpe reload")
```

Using IPv6:

```
bac_dpe# service tod 1 ipv6 enabled true
% OK (Requires DPE restart "> dpe reload")
```

Step 8 For the configuration to take effect, you must reload the DPE.

For example:

```
bac_dpe# dpe reload
dpe has been restarted
```

After you reload the DPE, you can establish a Telnet session to the DPE using its IP address. Remember to use the new login and enable password that you created in Logging In, page 6-2.

Configuring a DPE for Voice Technology

This section describes the configuration tasks that you must perform to set up a DPE to support voice technology.

The tips provided in this section see the *dpe.properties* file, located in the *BPR_HOME/dpe/conf* directory. You change the properties specified, as indicated in the tips, to enable the described feature. If you edit the properties, you must restart the DPE.

Caution In the *dpe.properties* file, there should be only one instance of each property described in these tips.

Setting Up Voice Technology

To set up voice technology on your DPE:

Step 1 To set the FQDN for each enabled DPE interface in the IPv4 or IPv6 format, enter:

interface ip *ip_address* **provisioning fqdn** *fqdn*

Tip dpe.properties: /server/provFQDNs=*FQDN[IP address]:port*. This could translate, for example, into c3po.pcnet.cisco.com[10.10.10.5]:49186.

The FQDN is sent as the SNMPEntity in DHCP option 177 suboption 3.

For example:

Using the IPv4 format:

```
bac_dpe# interface ip 10.10.1.2 provisioning fqdn dpe.example.com
% OK (Requires DPE restart "> dpe reload")
```

Using the IPv6 format:

```
bac_dpe# interface ip 2001:0DB8:0:0:203:baff:fe12:d5ea provisioning fqdn dpe.example.com
% OK (Requires DPE restart "> dpe reload")
```

Step 2 Configure the IPv4 ONLY address for communication with CNR.

For example:

```
bac_dpe# interface ip 10.10.10.133 pg-communication fqdn dpe.example.com
% OK (Requires DPE restart "> dpe reload")
```

Step 3 To configure voice technology at DPE, enter:

service packetcable *1* **registration kdc-service-key** *password*

Note The DPE password that you enter by using this CLI command must match the corresponding password used in the KeyGen utility when generating service keys for the KDC.

Tip dpe.properties: /pktcbl/regsvr/KDCServiceKey=*(xx: ... xx)*
where *(xx: ... xx)* represents a 24-byte randomly selected, colon-separated, hexadecimal value; for example: 31:32:33:34:35:36:37:38:39:30:31:32:33:34:3 5:36:37:38:39:30:31:32:33:34.

For example:

```
bac_dpe# service packetcable 1 registration kdc-service-key password3
% OK (Requires DPE restart "> dpe reload")
```

Step 4 To control the choice of encryption algorithm for use during SNMPv3, enter:

service packetcable *1* **registration policy-privacy** *value*

If you enter a value of zero (which is the default value) for this policy privacy, the MTA will choose a privacy option for SNMPv3. Entering any nonzero value means the Provisioning Server will set its privacy option in SNMPv3 to a specific protocol. Although, currently, DES is the only privacy option supported by voice technology.

Tip dpe.properties: /pktcbl/regsvr/policyPrivacy=1 (enables DES privacy)

For example:

```
bac_dpe# service packetcable 1 registration policy-privacy 1
% OK (Requires DPE restart "> dpe reload">
```

Step 5 Enter this command to set the SNMP service key used for SNMPv3 cloning to the RDU.

service packetcable *1* **snmp key-material** *password*

The default value for this command is **null**. Enter this default to disable SNMPv3 cloning on this DPE.

Caution To enable SNMP cloning, set this property to the identical 46 hexadecimal bytes that are used at the RDU (*rdu.properties* file, which resides in the */BPR_HOME/rdu/conf* directory).

Tip dpe.properties: to turn SNMPv3 cloning off, use /pktcbl/snmp/keyMaterial= ; to turn it on, use /pktcbl/snmp/keyMaterial=*key*. For example, /pktcbl/snmp/keyMaterial=31:32:33:34:35:36:37:38:39:30:31:32:33:34:35:36:37:38:39:30:31:32:33:34:35:36:37:38:39:30:31:32:33:34:35:36:37:38:39:30:31:32:33:34:35:36

For example:

```
bac_dpe# service packetcable 1 snmp key-material password4
% OK (Requires DPE restart "> dpe reload")
```

Step 6 Enter this command to enable the PacketCable voice technology.

service packetcable *1* **enable true**

You can disable voice technology by entering **service packetcable** *1* **enable false**.

Tip dpe.properties: /pktcbl/enable=enabled

For example:

```
bac_dpe# service packetcable 1 enable true
% OK (Requires DPE restart "> dpe reload")
```

Step 7 Run the **dpe reload** command.

For example:

```
bac_dpe# dpe reload
dpe has been restarted
```

Controls Available

The commands described in this section provide additional configuration settings.

- **service packetcable** *1* **registration encryption enable**—This command optionally enables encryption of the MTA configuration file.

Tip dpe.properties: /pktcbl/regsvr/configEncrypt=1

- **no service packetcable** *1* **registration encryption enable**—This command optionally disables encryption of the MTA configuration file.

Tip dpe.properties: /pktcbl/regsvr/configEncrypt=0

- **service packetcable** *1* **snmp timeout** *timeout*—This command dynamically sets the number of seconds that the DPE waits for a response to an SNMPv3 SET operation. The timeout is expressed in seconds and the default value is 10 seconds.

Tip dpe.properties: /pktcbl/snmp/timeout=1 and /pktcbl/snmp/timeout=10

APPENDIX A

Network Registrar Configuration File Example

This appendix describes the sample configuration file included with this installation of Cisco Broadband Access Center (Cisco BAC). This file is typical of the files you use during the Cisco BAC installation.

You can copy and use the sample configuration scripts to work with your Cisco BAC implementation. One script exists for DOCSIS modems and computers, while another script is available for DOCSIS modems and PacketCable MTAs.

Sample Script for DOCSIS Modems and Computers

The sample configuration nrcmd script (**bpr_cnr_hsd_sample_config.nrcmd**) is used for a high-speed data deployment of DOCSIS modems and computers in a multiple-host configuration with failover protection. It is installed in the *BPR_HOME/cnr_ep/samples* directory.

To create this script, assume that the:

- DHCP primary server IP address is: 192.168.0.32
- DNS primary server IP address is: 192.168.0.32

This sample script defines:

- Scope selection tag objects for provisioned client classes.
- Client-class objects for provisioned DOCSIS modems and computers.
- Policy objects for unprovisioned and provisioned devices. (The only difference is that DNS servers are not given to unprovisioned devices.)
- Scope and scope policy objects for unprovisioned and provisioned DOCSIS modems and computers.
- Disabled TFTP server.

To run this script, in the CNR **nrcmd** program, enter:

```
# NR_HOME/local/usrbin/nrcmd -N username -P password -b < bpr_cnr_hsd_sample_config.nrcmd
```

- *username*—Identifies the username.
- *password*—Identifies the password.

Sample Script for DOCSIS Modems and PacketCable MTAs

This sample configuration nrcmd script (**bpr_cnr_pktcbl_sample_config.nrcmd**) is used for a high-speed data deployment of DOCSIS modems and PacketCable MTAs. A multiple-host configuration with failover protection is also used, and the script is installed in the *BPR_HOME/cnr_ep/samples* directory.

To create this script, assume that the:

- DHCP primary server IP address is: 192.168.0.32
- DNS primary server IP address is: 192.168.0.32

This sample script defines objects similar to those described in Sample Script for DOCSIS Modems and Computers, page A-1.

To run this script, in the CNR **nrcmd** program, enter:

```
# NR_HOME/local/usrbin/nrcmd -N username -P password -b <
bpr_cnr_pktcbl_sample_config.nrcmd
```

- *username*—Identifies the username.
- *password*—Identifies the password.

APPENDIX B

Installation Worksheet

During the installation of Cisco Broadband Access Center (Cisco BAC), you are prompted for configuration information. Table B-1 is a worksheet that you can use to record the information specific to your installation.

Table B-1 Cisco BAC Installation Parameters

Prompt	Description	Default Value	Your Value
Home directory	Root directory to install Cisco BAC component	*/opt/CSCObac*	
Data directory	Root directory to install the data directory for Cisco BAC component	*/var/CSCObac*	
Database logs directory	Root directory to install the database transaction logs for Cisco BAC component	*/var/CSCObac*	
Logs directory	Root directory to install the general transaction logs for Cisco BAC components	*/var/CSCObac*	
RDU host	Hostname of the server on which the RDU is installed	None	
RDU port number	Port number through which the RDU communicates with other Cisco BAC components	49187	
CNR extension points provisioning group name	Name of the provisioning group for CNR extensions	None	
KDC realm name	Name of the Kerberos realm required by the KDC component	None	
KDC service key	Service key that the KDC server uses for communication with the provisioning FQDNs of DPEs	None	

Table B-1 Cisco BAC Installation Parameters (continued)

Prompt	Description	Default Value	Your Value
Response file	Name and location of the response file that you generate to install these components during a noninteractive installation: • RDU • DPE • CNR extensions • KDC	None	
Port number of administrator user interface	Port number through which you access the Cisco BAC administrator user interface using HTTP	8100	
	Port number through which you access the Cisco BAC administrator user interface using HTTP over SSL (HTTPS)	8443	
Administrator user interface user password	Password using which you access the Cisco BAC administrator user interface	changeme	
Web UI password	Password using which you access the CNR administrator user interface	changeme	
DPE password	Password using which you access the DPE in the login mode	changeme	
	Password using which you access the DPE in the privileged mode	changeme	
User and Group	Name of a root or non-root user.	root/user1	
	Name of a root or non-root group.	root/group1	

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