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PCBSD[®] 10.1

USERS HANDBOOK

PCBSD[®] 10.1

USERS HANDBOOK



Table of Contents

1 Introduction	10
1.1 Goals and Features	11
1.2 What's New in 10.1	12
1.3 PC-BSD® for Linux Users	13
1.3.1 Filesystems	13
1.3.2 Device Names	14
1.3.3 Feature Names	14
1.3.4 Commands	15
1.3.5 Additional Resources	16
2 Pre-Installation Tasks	16
2.1 Hardware Requirements	17
2.1.1 Minimum System Requirements	17
2.1.2 Recommended System Requirements	17
2.1.3 Supported Processors	17
2.1.4 Supported Video Cards	17
2.1.5 Wireless Cards	18
2.1.6 Checking Hardware Compatibility	18
2.2 Laptops	18
2.2.1 ThinkPads with Known Bugs	19
2.2.2 Touch Screens	19
2.3 Partitioning the Hard Drive	19
2.3.1 Shrinking a Drive in Windows 7	20
2.3.2 Using Parted Magic to Create a Primary Partition	22
2.4 Obtaining PC-BSD®	23
2.4.1 Data Integrity Check	23
2.5 Burning the Installation Media	24
2.5.1 Burning to DVD on Windows	24
2.5.1.1 Windows 7 Disc Image Burner	25
2.5.1.2 InfraRecorder	25
2.5.2 Burning to DVD on a BSD or Linux System	26
2.5.2.1 K3B	26
2.5.2.2 Brasero	28
2.5.2.3 growisofs	30
2.5.3 Burning to DVD on a Mac OS X System	30
2.5.4 Writing to a USB Device	30
2.5.4.1 Writing to USB on a Linux or BSD System	30
2.5.4.2 Writing to USB on a Windows System	31
2.5.4.3 Writing to USB on a Mac OS X System	31
2.6 Using VirtualBox	32
2.6.1 Creating a Virtual Machine	32
2.6.1.1 Configuring the Network Adapter	38
2.6.1.2 Configuring the Storage Device	38
2.6.2 Using the Downloadable VirtualBox or VMWare Disk	39
3 Installing PC-BSD®	40

3.1 Language Selection Screen.....	41
3.2 System Selection Screen.....	42
3.3 Disk Selection Screen.....	44
3.3.1 Basic Mode.....	46
3.3.2 Advanced Mode.....	46
3.3.2.1 ZFS Overview.....	48
3.3.2.2 ZFS Layout.....	49
3.3.3 FreeBSD Expert Mode.....	53
3.4 Installation Progress Screen.....	53
3.5 Installation Finished Screen.....	54
4 Post Installation Configuration and Installation Troubleshooting.....	54
4.1 Booting Into PC-BSD®.....	55
4.1.1 If you Encrypted Your Disks.....	55
4.1.2 Interrupting the Boot to Access the Boot Menu.....	56
4.1.3 If Your Display is Not Automatically Detected.....	57
4.2 Language Screen.....	58
4.3 Time Zone Selection Screen.....	59
4.4 Set Root Password Screen.....	60
4.5 Create a User Screen.....	61
4.6 Connect to a Wireless Network.....	62
4.7 Post Install Finished Screen.....	63
4.8 Logging In.....	64
4.8.1 Welcome & Getting Started.....	65
4.9 Installation Troubleshooting.....	66
4.9.1 Installation Starts But Fails.....	66
4.9.2 System Does Not Boot Into the Installer.....	66
4.9.3 USB Keyboard Does Not Work in Installer.....	67
4.9.4 mountroot prompt.....	67
4.9.5 Getting Help.....	67
5 Advanced Installation Topics.....	67
5.1 Using the Text Installer.....	68
5.1.1 Using the System Utilities Menu.....	75
5.2 Install a Server.....	76
5.3 Using the TrueOS® CD.....	82
5.4 Convert a FreeBSD System to PC-BSD®.....	83
5.4.1 Switching to the PC-BSD® pkgng Repository.....	83
5.4.2 Converting FreeBSD to a PC-BSD® Desktop.....	85
5.4.3 Converting FreeBSD to a TrueOS® Server.....	85
5.5 Dual Booting.....	85
5.5.1 Choosing the Installation Partition.....	86
5.5.2 GRUB Boot Loader.....	86
5.6 Creating an Automated Installation with pc-sysinstall.....	86
5.6.1 Determine Which Variables you Wish to Customize.....	87
5.6.2 Create a Customized Configuration.....	91
5.6.3 Create a Custom Installation Media or Installation Server.....	91
6 Desktops.....	92
6.1 Awesome.....	93

6.2 Cinnamon.....	94
6.3 Fluxbox.....	95
6.4 FVWM.....	96
6.5 GNOME.....	98
6.6 i3.....	101
6.7 IceWM.....	101
6.8 KDE4.....	102
6.9 Lumina.....	104
6.9.1 System Dashboard.....	105
6.9.2 Right-Click Menu.....	106
6.9.3 Lumina Configuration Utility.....	107
6.9.4 Lumina Screenshot.....	111
6.9.5 Insight File Manager.....	112
6.9.6 Lumina Open.....	113
6.10 LXDE.....	114
6.11 Mate.....	116
6.12 Openbox.....	117
6.13 Ratpoison.....	119
6.14 spectrwm.....	119
6.15 WindowLab.....	120
6.16 Window Maker.....	120
6.16.1 Working with the Dock.....	122
6.16.2 DockApps.....	122
6.17 XFCE4.....	122
6.17.1 XFCE Plugins.....	127
7 Installing Applications and Keeping PC-BSD® Updated.....	127
7.1 AppCafe®.....	128
7.1.1 Finding and Installing Software.....	128
7.1.2 Managing Installed Software.....	132
7.1.3 Updating Installed Software.....	134
7.1.4 File Menu.....	135
7.1.5 Configure Menu.....	135
7.1.6 Install View Menu.....	136
7.1.7 Browser View Menu.....	139
7.1.8 Using the CLI pkg Utilities.....	140
7.1.8.1 Upgrading Packages.....	140
7.2 Update Manager.....	141
7.2.1 Applying a System Update (GUI Method).....	142
7.2.1.1 Applying a System Update (CLI Method).....	143
7.2.2 Upgrading from 9.x to 10.x.....	144
7.2.3 Upgrading from 10.x to 10.1.....	144
7.3 PBI Manager.....	145
7.3.1 pbi.....	145
7.3.2 pbi_add.....	145
7.3.3 pbi.conf.....	146
7.3.4 pbi_delete.....	146
7.3.5 pbi_icon.....	147

7.3.6 pbi_info.....	147
7.3.7 pbi_makeindex.....	147
7.3.8 pbi_updateindex.....	147
7.4 Create Your Own PBI Repository.....	148
7.4.1 Create the Signing Key.....	148
7.4.2 Create the Customized Modules.....	148
7.4.3 Generate the Custom INDEX.....	148
7.4.4 Import the Repository.....	149
7.5 AppCafe® Remote.....	149
7.5.1 Home Tab.....	151
7.5.2 Installed Apps Tab.....	152
7.5.3 App Search Tab.....	153
7.5.4 Warden Tab.....	154
8 Control Panel.....	157
8.1 EasyPBI.....	160
8.1.1 Creating a PBI Module.....	161
8.1.1.1 XDG Shortcuts Tab.....	163
8.1.1.2 Scripts Tab.....	165
8.1.1.3 Service Configuration Tab.....	166
8.1.2 Bulk Module Creator.....	168
8.1.3 EasyPBI Settings.....	169
8.1.4 PBI Module Components.....	170
8.1.4.1 LICENSE File.....	171
8.1.4.2 pbi.conf.....	171
8.1.4.3 resources/.....	172
8.1.4.4 xdg-menu/ and xdg-desktop/.....	172
8.1.4.5 xdg-mime/.....	173
8.2 About.....	173
8.3 Active Directory & LDAP.....	175
8.3.1 Connecting to Active Directory.....	176
8.3.2 Connecting to an OpenLDAP Server.....	177
8.4 Boot Manager.....	178
8.4.1 Managing Boot Environments Using Boot Manager.....	179
8.4.2 Managing Boot Environments from the Command Line.....	181
8.5 Hardware Compatibility.....	182
8.6 Login Manager.....	183
8.7 Service Manager.....	185
8.8 System Manager.....	186
8.8.1 General Tab.....	186
8.8.2 Tasks Tab.....	188
8.8.3 Misc Tab.....	188
8.9 User Manager.....	189
8.9.1 Managing User Accounts.....	189
8.9.2 Managing Groups.....	192
8.10 Bluetooth Manager.....	193
8.11 Disk Manager.....	195
8.11.1 Managing ZFS Datasets.....	195

8.11.2	Managing the ZFS Pool.....	198
8.11.3	Disk Management.....	200
8.12	Display.....	200
8.12.1	Desktop Effects and Compositing.....	202
8.12.2	Troubleshooting.....	204
8.13	Mount Tray.....	205
8.14	Printing.....	206
8.14.1	Researching your Printer.....	206
8.14.2	Adding a Printer.....	208
8.14.3	Manually Adding a Driver.....	211
8.14.4	Printer Troubleshooting.....	213
8.15	Scanner.....	214
8.16	Sound Configuration.....	214
8.16.1	Using Mixer.....	215
8.16.2	Troubleshooting Sound.....	217
8.17	Firewall Manager.....	217
8.18	Network Configuration.....	219
8.18.1	Devices: Ethernet Adapters.....	220
8.18.2	Devices: Wireless Adapters.....	223
8.18.3	Network Configuration (Advanced).....	228
8.18.4	Proxy Settings.....	230
8.18.5	Configuring a Wireless Access Point.....	231
8.18.6	Troubleshooting Network Settings.....	233
8.18.6.1	Useful Files and Commands.....	233
8.19	Life Preserver.....	235
8.19.1	Using the Life Preserver GUI.....	236
8.19.1.1	View Menu and Configure Button.....	240
8.19.1.2	Restore Data Tab.....	241
8.19.1.3	File Menu.....	242
8.19.1.4	Classic Backups Menu.....	243
8.19.1.5	Snapshots Menu.....	243
8.19.1.6	Disks Menu.....	244
8.19.2	Using the Command Line Version of Life Preserver.....	244
8.19.2.1	Mirroring the System to a Local Disk.....	246
8.19.3	Backing Up to a FreeNAS® System.....	247
8.19.4	Restoring the Operating System From a Life Preserver Backup.....	250
8.20	Report a bug.....	253
8.20.1	Writing Good Bug Reports.....	256
8.21	Warden®.....	256
8.21.1	Creating a Jail using the GUI Version of Warden®.....	256
8.21.1.1	Traditional or Ports Jail.....	259
8.21.1.2	Linux Jail.....	260
8.21.2	Configuring Existing Jails From the GUI.....	262
8.21.2.1	Info Tab.....	266
8.21.2.2	Tools Tab.....	268
8.21.2.3	Snapshots Tab.....	269
8.21.2.4	Configure Menu.....	271

8.21.2.5 Right-Click Menu.....	271
8.21.2.6 Importing a Jail.....	272
8.21.2.7 Using Template Manager.....	272
8.21.3 Using the Command Line Version of Warden®.....	274
8.21.3.1 Creating and Accessing a Jail.....	275
8.21.3.2 Managing Jails From the Command Line.....	277
9 Using PC-BSD®.....	278
9.1 Java, Flash, and Fonts.....	278
9.1.1 Java.....	278
9.1.2 Adobe Flash.....	278
9.1.3 Installing Custom Fonts.....	280
9.1.3.1 Using KDE.....	280
9.1.3.2 Using GNOME.....	281
9.1.3.3 Using XFCE.....	281
9.1.3.4 From the Command Line.....	281
9.2 Multimedia.....	282
9.3 Files and File Sharing.....	283
9.3.1 File Managers and File Structure.....	283
9.3.2 Samba.....	284
9.3.2.1 Using the Samba Client.....	285
9.4 Windows Emulation.....	285
9.4.1 Installing and Using Wine.....	285
9.5 Remote Desktop.....	288
9.5.1 Connecting to Another Computer With RDP.....	288
9.5.1.1 Preparing the Remote System.....	289
9.5.1.2 Connecting with KDE's KRDC.....	289
9.5.1.3 Connecting with VNC.....	292
9.5.2 Allowing Another Computer to Connect Using Desktop Sharing.....	292
9.6 Thin Client.....	294
9.6.1 Creating a PXE Boot Desktop Server.....	295
9.6.1.1 Connecting to the PXE Boot Desktop Server.....	296
9.6.1.2 Uninstalling the PXE Boot Desktop Server.....	297
9.6.2 Creating a PXE Boot Install Server.....	297
9.6.2.1 Connecting to and Customizing the PXE Boot Install Server.....	298
9.7 Security.....	299
9.8 Accessibility.....	300
9.8.1 GNOME Universal Access.....	300
9.8.2 KDE Accessibility Tools.....	302
10 Finding Help.....	303
10.1 PC-BSD® Forums.....	304
10.2 IRC Channel.....	308
10.3 Mailing Lists.....	308
10.4 FreeBSD Handbook and FAQ.....	309
10.5 Social Media.....	309
10.6 Search and Portals.....	310
10.7 Other Resources.....	310
11 Supporting PC-BSD®.....	310

11.1 Become a Beta Tester.....	311
11.2 Become a Translator.....	311
11.2.1 Join the Translations Mailing List.....	311
11.2.2 Interface Translation.....	312
11.2.2.1 Editing a Translation.....	313
11.2.3 Documentation Translation.....	314
11.2.4 Website Translation.....	315
11.3 Become a Developer.....	316
11.3.1 Getting the Source Code and Development Tools.....	316
11.3.2 Basic Guidelines for Writing a PC-BSD® Utility.....	317
11.3.2.1 File Menus.....	317
11.3.2.2 File Menu Icons.....	318
11.3.2.3 Buttons.....	318
11.3.2.4 Keyboard Shortcuts.....	318
11.3.2.5 Saving Settings in a Qt Application.....	319
11.3.3 Resources.....	319
11.4 Make Minor Modifications to a PBI Module.....	319
11.5 Purchase PC-BSD® Swag.....	320
11.6 Become an Advocate.....	320

Preface

Written by users of the PC-BSD® operating system.

Version 10.1

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Welcome to PC-BSD®! This Handbook covers the installation and use of PC-BSD® 10.0.2. This Handbook is a work in progress and relies on the contributions of many individuals. If you are interested in assisting with the Handbook, visit the [PC-BSD® wiki](#) and create a login account for yourself. If you use IRC Freenode, you are welcome to join the #pcbsd channel where you will find other PC-BSD® users.

Previous versions of the Handbook in various formats and languages are available from ftp.pcbsd.org/pub/handbook/.

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Typographic Conventions

The PC-BSD® 10.1 Handbook uses the following typographic conventions:

bold text: represents a command written at the command line. In usage examples, the font is changed to Courier 10 with any command output displayed in unbolded text.

italic text: used to represent device names or file name paths.

bold italic text: used to emphasize an important point.

1 Introduction

Welcome to PC-BSD®!

[PC-BSD®](#) began in 2005 when Kris Moore presented the first beta version of a [FreeBSD](#) operating system pre-configured for desktop use. Since then, PC-BSD® has matured into a polished, feature-rich, free-of-charge, open source operating system that meets the desktop needs of the beginner to the advanced user alike.

PC-BSD® is essentially a customized installation of FreeBSD, not a forked derivative. Since the underlying FreeBSD system has been kept intact, you have a fully functional FreeBSD system under the hood. PC-BSD® provides a graphical installer which can be used to easily install a desktop or a server version of FreeBSD known as TrueOS®. Other differences include:

- PC-BSD® pre-configures at least one desktop environment during a desktop installation.
- The PC-BSD® graphical installer supports additional features such as configuring ZFS during installation.
- PC-BSD® provides a graphical software management system for the desktop and a command line equivalent for the server.
- PC-BSD® provides a [Control Panel](#) of utilities for configuring the system. The graphical versions of these utilities are available on the desktop and the command line versions are available on both the desktop and server.
- PC-BSD® comes pre-configured with a number of automatic scripts to perform tasks such as connecting digital cameras or USB memory sticks.

PC-BSD® started off as an independent project, but since October, 2006 PC-BSD® is financially backed and supported by the enterprise-class hardware solutions provider [iXsystems](#).

The rest of this section discusses:

- [Goals and Features](#)
- [What's New in 10.1](#)
- [PC-BSD® for Linux Users](#)

1.1 Goals and Features

PC-BSD® provides the following features:

- **Easy installation:** to install either a graphical desktop or command-line server version of PC-BSD®, simply insert the installation media, reboot the system to start the installer, and answer a few questions in the installation menus.
- **Automatically configured hardware:** video, sound, network, and other devices are automatically configured for you.
- **Intuitive desktop interface:** PC-BSD® comes with a choice of [desktop environments](#) to support your day-to-day computing needs.
- **Easy software management:** with [AppCafe®](#), installing, upgrading, and uninstalling software is safe and easy.
- **Lots of software available:** in addition to its own software, PC-BSD® can install software that has been ported to FreeBSD (currently over 24,000 applications).
- **Easy to update:** PC-BSD® provides a built-in [Update Manager](#) that will notify you of available updates and allow you to apply operating system security fixes, bug fixes and system enhancements as well as upgrade to newer versions of the operating system or installed software.
- **Virus-free:** PC-BSD® is not affected by viruses, spyware, or other malware.
- **No defragmentation:** PC-BSD® hard drives do not need to be defragmented and do not slow down over time. PC-BSD® uses [ZFS](#) which is a self-healing filesystem.

- **Laptop support:** provides power saving and swap space encryption and automatically switches between wired and wifi network connections.
- **Secure environment:** PC-BSD® provides a pre-configured [PF firewall](#) and a built-in Host-based Intrusion Detection System with [Fail2ban](#).
- **Easy system administration:** PC-BSD® provides a [Control Panel](#) containing many graphical tools for performing system administration tasks.
- **Localization:** PC-BSD® supports a number of [native languages](#) and locales.
- **Vibrant community:** PC-BSD® has a friendly and helpful [support community](#).
- **Professional support:** professional email and phone support is available from [iXsystems](#).

1.2 What's New in 10.1

The following features or enhancements were introduced for PC-BSD® 10.1:

- Based on FreeBSD 10.1-RELEASE which adds [these features](#).
- UEFI support has been added to the installer and the boot manager. This includes ACPI detection and setup of RSDP, XDST, and RSDT pass-through values to the kernel. Note that ***a new installation will be needed in order to install UEFI support*** as it requires the creation of a small FAT partition. The current UEFI does not support secureboot. If a secureboot option exists in the BIOS, disable it.
- Pre-configured virtual images are available in `.vmdk`, `.vdi`, and `.raw` formats.
- A CD installer version is available for installing a command-line only version of TrueOS® using the text installer.
- Linux compatibility libraries have been updated to CentOS 6.6.
- [Lumina](#) has been updated to version 0.7.1.
- A browser-based application, **pc-softweb**, combines the functionality of AppCafe® and Warden® and can be used to remotely manage software and jails from another system or mobile device. The TrueOS® installer provides options to configure remote access to **pc-softweb**. Graphical desktop users can configure remote access as described in [AppCafe® Remote](#).
- The following components have been added to the installation media: [QGit](#), [LibreOffice](#), [Pipelight](#), [HexChat](#), [IcedTea](#), [OpenJDK](#) version 7 and 8, [KRDC](#), [Pidgin](#), [OpenVPN](#), and [SaltStack](#).
- The “Installing to SSD” box has been removed from the installer as the installation is now optimized for both disk and SSD installations.
- GELI full-disk encryption has been added back to the graphical and text installers.
- PEFS encryption has been removed for now. This means that the option to encrypt files has been removed from the [Create a User Screen](#) and from [User Manager](#).
- The ability to select MBR or GPT has been added to the text installer.
- The “fixgrub” option has been added to the [System Utilities](#) menu of the text installer. This can be used to restamp the GRUB loader on an existing PC-BSD® or TrueOS® installation that no longer boots.
- The “Install in Jail” button has been added to [AppCafe®](#), making it possible to create a new jail and install the specified application into it.
- The “Automatic updates check” option has been added to the right-click menu of [Update Manager](#).

- The **-J** option has been added to **pbi_add**, making it possible to create a new jail and install a PBI into it with one command.
- The **-f** and **-j** options have been added to **pbi_delete**.
- The ability to configure a wireless device as a wireless access point has been added to [Network Configuration](#).
- The “Service Configuration” tab has been added to [EasyPBI](#).
- The “Start Replication” option has been added to the “Snapshots” tab of [Life Preserver](#).
- When replicating to a remote host using Life Preserver, the remote dataset is based upon the hostname. This allows a single SSH key and user account to be used when backing up multiple systems. During a system restore, the replication server will display which hosts' datasets are available.
- The **cronscrub** option has been added to **lpreserver**.
- The **zfsmksnap**, **zfslistclone**, **zfslistsnap**, **zfsclonesnap**, **zfscreensnap**, **zfsrevertsnap**, **zfsrmclone**, and **zfsrmsnap** options to the command line version of **warden** have been replaced by the **snap**, **clone**, and **cronsnap** options.
- The **bulk**, **ip4pool**, and **autoipv4** options have been added to **warden create**.

1.3 PC-BSD® for Linux Users

PC-BSD® is based on [BSD Unix](#), meaning that it is not a Linux distribution. If you have used Linux before, you will find that some features that you are used to have different names on a BSD system and that some commands are different. This section covers some of these differences.

1.3.1 Filesystems

BSD and Linux use different filesystems during installation. Many Linux distros use EXT2, EXT3, EXT4, or ReiserFS, while PC-BSD® uses UFS or ZFS. This means that if you wish to dual-boot with Linux or access data on an external drive that has been formatted with another filesystem, you will want to do a bit of research first to see if the data will be accessible to both operating systems.

Table 1.3a summarizes the various filesystems commonly used by desktop systems. Most of the desktop managers available from PC-BSD® should automatically mount the following filesystems: FAT16, FAT32, EXT2, EXT3 (without journaling), EXT4 (read-only), NTFS5, NTFS6, and XFS. See the [section on Files and File Sharing](#) for more information about available file manager utilities.

Table 1.3a: Filesystem Support on PC-BSD®

Filesystem	Native to	Type of non-native support	Usage notes
Btrfs	Linux	none	
exFAT	Windows	none	requires a license from Microsoft
EXT2	Linux	r/w support loaded by default	
EXT3	Linux	r/w support loaded by default	since EXT3 journaling is not supported, you will not be able to mount a filesystem requiring a journal replay unless you fsck it using an external utility such as e2fsprogs .

Filesystem	Native to	Type of non-native support	Usage notes
EXT4	Linux	r/o support loaded by default	EXT3 journaling, extended attributes, and inodes greater than 128-bytes are not supported; EXT3 filesystems converted to EXT4 may have better performance
FAT16	Windows	r/w support loaded by default	
FAT32	Windows	r/w support loaded by default	
JFS	Linux	none	
NTFS5	Windows	full r/w support loaded by default	
NTFS6	Windows	r/w support loaded by default	
ReiserFS	Linux	r/o support is loaded by default	
UFS2	PC-BSD® FreeBSD	check if your Linux distro provides <code>ufsutils</code> ; r/w support on Mac; UFS Explorer can be used on Windows	changed to r/o support in Mac Lion
ZFS	PC-BSD®, FreeBSD		

1.3.2 Device Names

Linux and BSD use different naming conventions for devices. For example:

- in Linux, Ethernet interfaces begin with *eth*; in BSD, interface names indicate the name of the driver. For example, an Ethernet interface may be listed as *re0*, indicating that it uses the Realtek *re* driver. The advantage of this convention is that you can read the **man 4** page for the driver (e.g. type **man 4 re**) to see which models and features are provided by that driver.
- BSD disk names differ from Linux. IDE drives begin with *ad* and SCSI and USB drives begin with *da*.

1.3.3 Feature Names

Some of the features used by BSD have similar counterparts to Linux, but the name of the feature is different. Table 1.3b provides some common examples:

Table 1.3b: Names for BSD and Linux Features

PC-BSD®	Linux	Description
PF	iptables	default firewall

PC-BSD®	Linux	Description
<i>/etc/rc.d/</i> for operating system and <i>/usr/local/etc/rc.d/</i> for applications	<i>rc0.d/</i> , <i>rc1.d/</i> , etc.	in PC-BSD® the directories containing the startup scripts do not link to runlevels as there are no runlevels; system startup scripts are separated from third-party application scripts
<i>/etc/ttys</i> and <i>/etc/rc.conf</i>	telinit and <i>init.d/</i>	terminals are configured in <i>ttys</i> and <i>rc.conf</i> indicates which services will start at boot time

1.3.4 Commands

If you are comfortable with the command line, you may find that some of the commands that you are used to have different names on BSD. Table 1.3c lists some common commands and what they are used for.

Table 1.3c: Common BSD and Linux Commands

Command	Used to:
dmesg	discover what hardware was detected by the kernel
sysctl dev	display configured devices
pciconf -l -cv	show PCI devices
dmesg grep usb	show USB devices
kldstat	list all modules loaded in the kernel
kldload <module>	load a kernel module for the current session
pbi_add -r <pbiname>	install software from the command line
sysctl hw.realmem	display hardware memory
sysctl hw.model	display CPU model
sysctl hw.machine_arch	display CPU Architecture
sysctl hw.ncpu	display number of CPUs
uname -vm	get release version information
gpart show	show device partition information
fuser	list IDs of all processes that have one or more files open

1.3.5 Additional Resources

The following articles and videos provide additional information about some of the differences between BSD and Linux:

- [Comparing BSD and Linux](#)
- [FreeBSD: An Open Source Alternative to Linux](#)
- [FreeBSD Quickstart Guide for Linux® Users](#)
- [BSD vs Linux](#)
- [Why Choose FreeBSD?](#)
- [Interview: BSD for Human Beings](#)
- [Video: BSD 4 Linux Users](#)
- [Why you should use a BSD style license for your Open Source Project](#)
- [A Sysadmin's Unixersal Translator \(ROSETTA STONE\)](#)

2 Pre-Installation Tasks

While the PC-BSD® installer is very easy to use, installing a brand new operating system can sometimes be a daunting task.

Before you begin, there are a few things you should check to ensure that your system is ready to install PC-BSD®.

- **Are you dual-booting or installing over the entire drive?** If you are dual-booting you will need to ensure that you have a primary partition available. Refer to the section on [Dual Booting](#).
- **Have you backed up your important data?** Any irreplaceable data, such as emails, bookmarks, or important files and documents should *always* be backed up to an external media, such as a removable drive or another system, *before* installing or upgrading any operating system.

If you wish to determine if your hardware is detected by PC-BSD®, start an installation and click the [Hardware Compatibility](#) button in the [first screen of the installer](#).

Should you run into an issue with your installation there are many different [ways to get help](#).

This section discusses the following topics:

- [Hardware Requirements](#)
- [Laptops](#)
- [Partitioning the Hard Drive](#)
- [Obtaining PC-BSD®](#)
- [Burning the Installation Media](#)
- [Using VirtualBox](#)

2.1 Hardware Requirements

PC-BSD® has moderate hardware requirements and commonly uses less resources than its commercial counterparts. Before installing PC-BSD®, make sure that your hardware or virtual machine at least meets the minimum requirements. To get the most out of your PC-BSD® experience, refer to the recommended system requirements.

2.1.1 Minimum System Requirements

At a bare minimum, you need to meet these requirements in order to install PC-BSD®:

- 64-bit processor
- 1 GB RAM
- 20GB of free hard drive space on a primary partition for a TrueOS® server installation
- Network card

2.1.2 Recommended System Requirements

The following are the minimum recommended requirements. The more RAM and available disk space, the better your computing experience:

- 64-bit processor
- 4 GB of RAM
- 50GB of free hard drive space on a primary partition for a desktop installation
- Network card
- Sound card
- NVIDIA 3D accelerated video card

The PC-BSD® installer's hardware check will display a warning message if the selected partition contains less than 20GB for a server installation or less than 50GB for a desktop installation. The installation itself does not require this much disk space. Instead the minimum recommendation is to provide sufficient room for the installation of multiple desktops, applications, and to store local ZFS snapshots.

You can never have too much RAM, so install as much as you can afford. To play modern video games, you should use a fast CPU. If you want to create a collection of tunes and movies on your computer, you will want a large hard disk drive which can be internal or external.

2.1.3 Supported Processors

PC-BSD® should install on any system containing a 64-bit (also called amd64) processor. Despite the amd64 name, a 64-bit processor does *not need* to be manufactured by AMD in order to be supported. The [FreeBSD FreeBSD Hardware Notes](#) lists the amd64 processors known to work.

2.1.4 Supported Video Cards

Like most open source operating systems, PC-BSD® uses X.org drivers for graphics support. PC-BSD® will automatically detect the optimal video settings for supported video drivers. You can verify that your graphics hardware is supported by clicking the [Hardware Compatibility](#) icon within the installer.

Support for the major graphic vendors is as follows:

NVIDIA: if you want to use 3D acceleration, NVIDIA is currently the best supported as there is a native driver for PC-BSD®. If an NVIDIA video card is detected, an “nVidia settings” icon will be added to the Control Panel for managing NVIDIA settings.

Intel: 3D acceleration on most Intel graphics is supported. Due to the current KMS support, you will not be able to switch between the graphical console and a virtual console using Ctrl+Alt+F#.

ATI/Radeon: 3D acceleration on most ATI and Radeon cards is supported.

Optimus: at this time [Bumblebee](#) has not been ported to FreeBSD, meaning that there is no switching support between the two graphics adapters provided by Optimus. Optimus implementations vary, so PC-BSD® may or may not be able to successfully load a graphics driver on your hardware. If you get a blank screen after installation, check your BIOS to see if it has an option to disable one of the graphics adapters or to set “discrete” mode. If the BIOS does not provide a discrete mode, PC-BSD® will default to the 3D Intel driver and disable NVIDIA. This will change in the future when the NVIDIA driver supports Optimus.

2.1.5 Wireless Cards

PC-BSD® has built-in support for dozens of wireless networking cards. You can check if your card has [a FreeBSD driver](#). If it does, it should “just work”. A list of supported Atheros devices and known limitations can be found on the [FreeBSD wiki](#).

PC-BSD® will automatically detect available wireless networks for supported wireless devices. You can verify that your device is supported by clicking the [Hardware Compatibility](#) icon within the installer. If it an external wireless device, insert it before running the Hardware Compatibility utility.

Certain Broadcom devices, typically found in cheap laptops, are quite buggy and can have lockups when in DMA mode. If the device freezes, try switching to PIO mode in the BIOS. Alternately, add the line `hw.bwn.usedma=0` to `/boot/loader.conf` and reboot to see if that makes a difference.

2.1.6 Checking Hardware Compatibility

If you wish to check your hardware before installing PC-BSD®, a good place to start is the [FreeBSD 10.1 Hardware Notes](#). Another good resource is to start the installer and click the [Hardware Compatibility](#) icon.

While most hardware “just works” with PC-BSD®, it is possible that you will run across a piece of hardware that does not. It should be remembered that PC-BSD® is really FreeBSD, meaning that any hardware that works on FreeBSD will work on PC-BSD®. If you are experiencing problems with a device, start with a web search for the term “FreeBSD” plus the type and model of the hardware. This will let you know if there is a known issue with the device. If there are many search results, concentrate on the most recent ones as often hardware that used to be problematic has since been fixed or the missing driver will be available in an upcoming release of FreeBSD. If you experience problems with a device that should work but does not or you can not find any existing problem reports for your hardware, you can help improve hardware support for all PC-BSD® users by [reporting the problem](#) so that it can be addressed by the developers.

2.2 Laptops

Many PC-BSD® users successfully run PC-BSD® on their laptops. However, depending upon the model of laptop, you may run across some issues. These typically deal with:

- **Sleep/suspend:** unfortunately, [ACPI](#) is not an exact science, meaning that you may have to experiment with various `sysctl` variables in order to achieve successful sleep and suspend states on your particular laptop model. If your laptop is a ThinkPad, [Thinkwiki](#) is an excellent source. For other types of laptops,

try reading the SYSCTL VARIABLES section of **man 4 acpi** and check to see if there is an ACPI man page specific to your vendor by typing **apropos acpi**. The [Tuning with sysctl\(8\)](#) section of the FreeBSD Handbook demonstrates how to determine your current **sysctl** values, modify a value, and make a modified value persist after a reboot. If the battery reading is incorrect, try the workaround in this [PR](#).

- **Internal wireless:** some chipsets do not have a FreeBSD driver yet.
- **Synaptics:** depending upon the hardware, you may or may not be able to disable the system's touchpad. This [forum post](#) describes how to enable Synaptics and some of the **sysctl** options that this feature provides.
- **Optimus graphics:** the current workaround is to disable Optimus in the BIOS, set the onboard Intel video to be dominant, or to change the graphics mode to discrete.

If you wish to test your laptop's hardware, use the Hardware Compatibility icon [in the first screen of the installer](#) before continuing with the installation.

If you would like to install PC-BSD® onto an Asus Eee, read the [FreeBSD Eee page](#) first.

The [FreeBSD Tuning Power Consumption page](#) has some tips for reducing power consumption.

2.2.1 ThinkPads with Known Bugs

The ThinkPad T420 may panic during install. If it does, go into the BIOS and set the video mode to “discrete” which should allow you to complete an installation.

Some Thinkpads have a BIOS bug that prevents them from booting from GPT labelled disks. If you are unable to boot into a new installation, restart the installer and go into Advanced Mode in the [Disk Selection Screen](#). Make sure that the “Partition disk with GPT” box is unchecked. If it was checked previously, redo the installation with the box unchecked.

2.2.2 Touch Screens

PC-BSD® should automatically detect USB-based touch screen devices. If your display is USB and is not auto-detected, send the output of **usbconfig** and your `/etc/X11/xorg.conf` file using the [PC-BSD® bug reporting tool](#).

2.3 Partitioning the Hard Drive

PC-BSD® does not come with a built-in partition manager. The installer assumes that the drive is already prepared for an installation. If you are not planning to install PC-BSD® onto the entire hard drive, you will need to use a third-party application in order to prepare a primary partition to use as the destination for your PC-BSD® install.

NOTE: PC-BSD® will not install into a secondary or logical partition, it must be a *primary* or a *GPT* partition.

Before creating or editing your hard drive's partitions, make sure that you first back up your valuable data to an external media such as a removable USB drive!

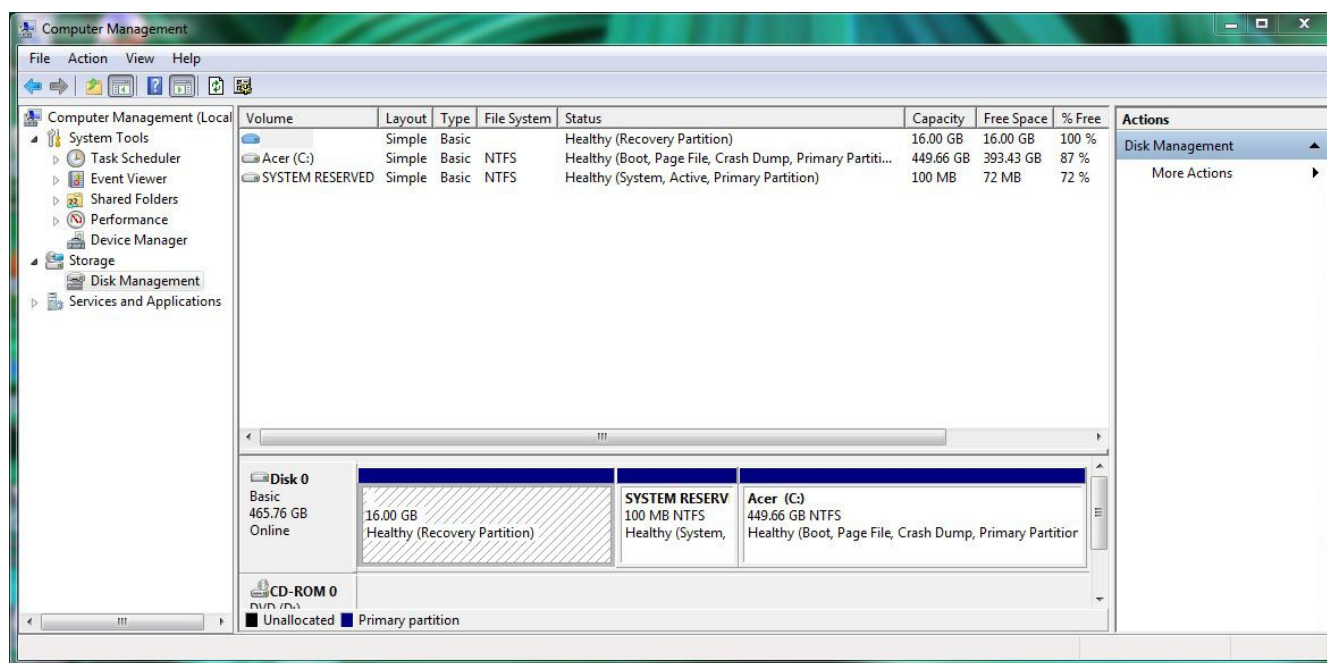
This section demonstrates how to create free space within Windows 7 and how to use Parted Magic to create a primary partition from the free space.

2.3.1 Shrinking a Drive in Windows 7

If you are currently running Windows 7, it is using the entire hard drive. This means that you will need to first shrink the drive in order to make room to create a new partition. Shrinking is an operation that retains the current data on the partition, while reducing the size of the partition.

To shrink the drive, go to Start menu → right-click Computer → Manage → Storage → Disk Management. Figure 2.3a shows an example of a system running Windows 7. In this example, Windows has created three partitions: a 16GB recovery partition, a 100MB system partition, and a 450GB data partition.

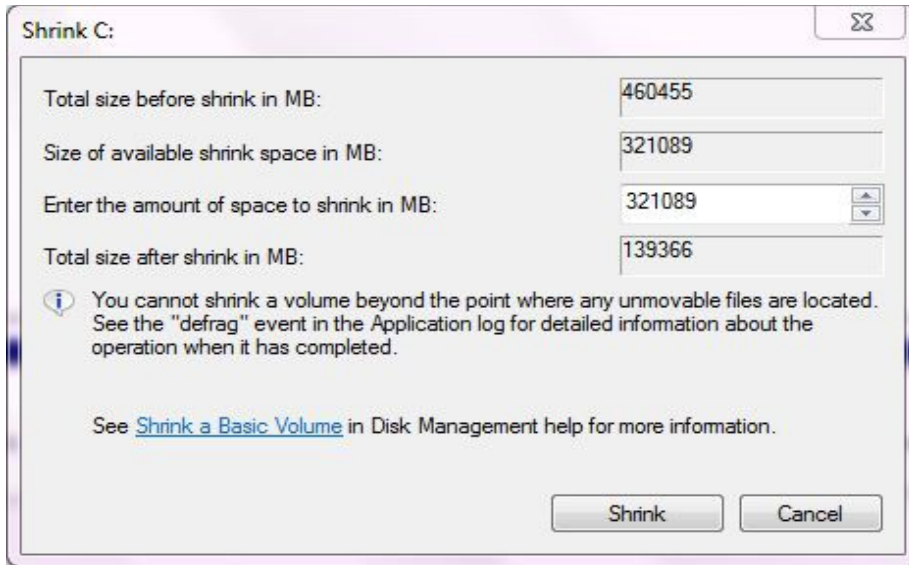
Figure 2.3a: Viewing Disk Layout in Disk Management



NOTE: if you plan to dual-boot with Windows, it is important that you do not choose to install PC-BSD® into any of these three partitions when you get to the [Disk Selection Screen](#) of the installer. It is a good idea to write down the sizes of the partitions so that you will recognize them when the PC-BSD® installer displays your current partitions.

Since the three Windows partitions are using the entire disk, the data partition needs to be shrunk in order to create space to install PC-BSD® into. To shrink the data partition, right-click the partition, in this example it is called *Acer (C:)*, and select “Shrink Volume”. Wait a moment as it queries the volume for available shrink space; the results will be displayed as seen in the example in Figure 2.3b.

Figure 2.3b: Available Shrink Space

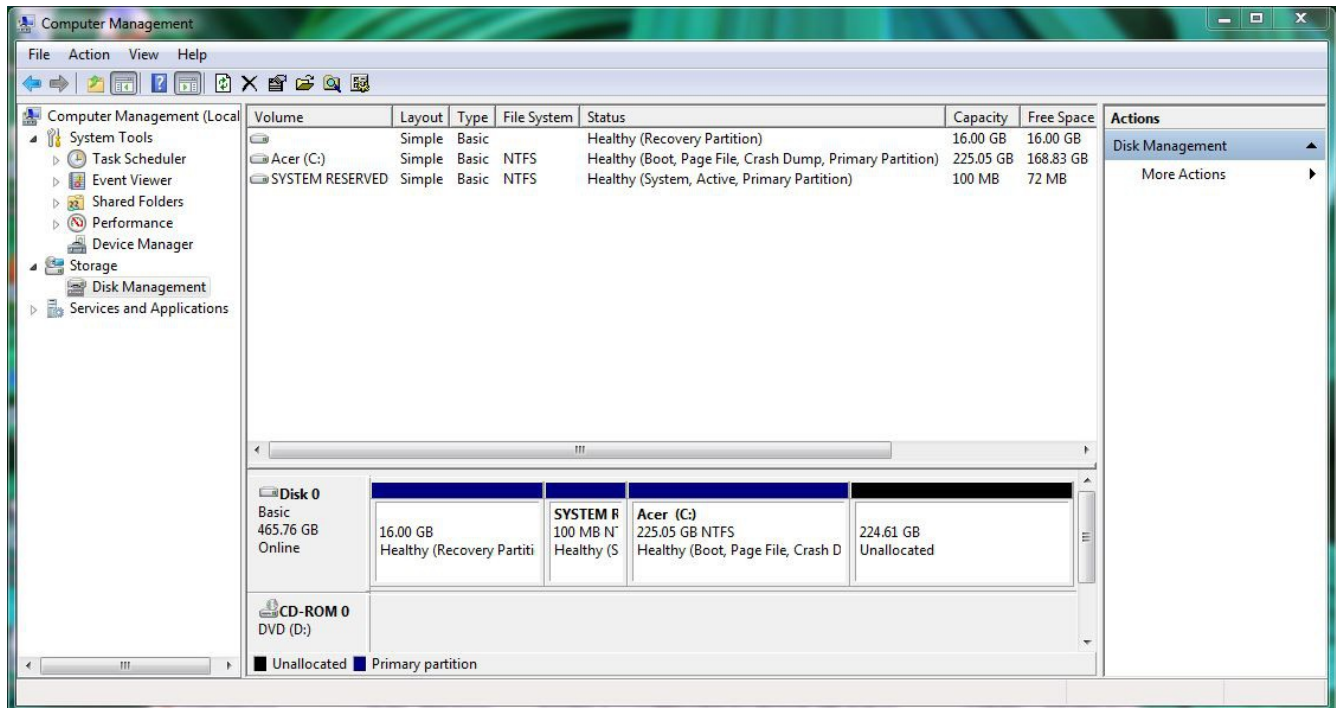


In this example, 321089MB of space is available. To divide the partition between Windows and PC-BSD®, change that number to 230000 and click the “Shrink” button. When finished, the newly created free space will be displayed, as seen in Figure 2.3c.

You can now format the newly created free space using a utility such as Parted Magic, as described in the next section.

NOTE: while the Disk Management utility in Windows 7 indicates that it will let you format a primary partition, in reality it will only create an extended partition which will not allow you to install PC-BSD®. This means that you still need another utility such as Parted Magic.

Figure 2.3c: Disk Now Has Free Space



2.3.2 Using Parted Magic to Create a Primary Partition

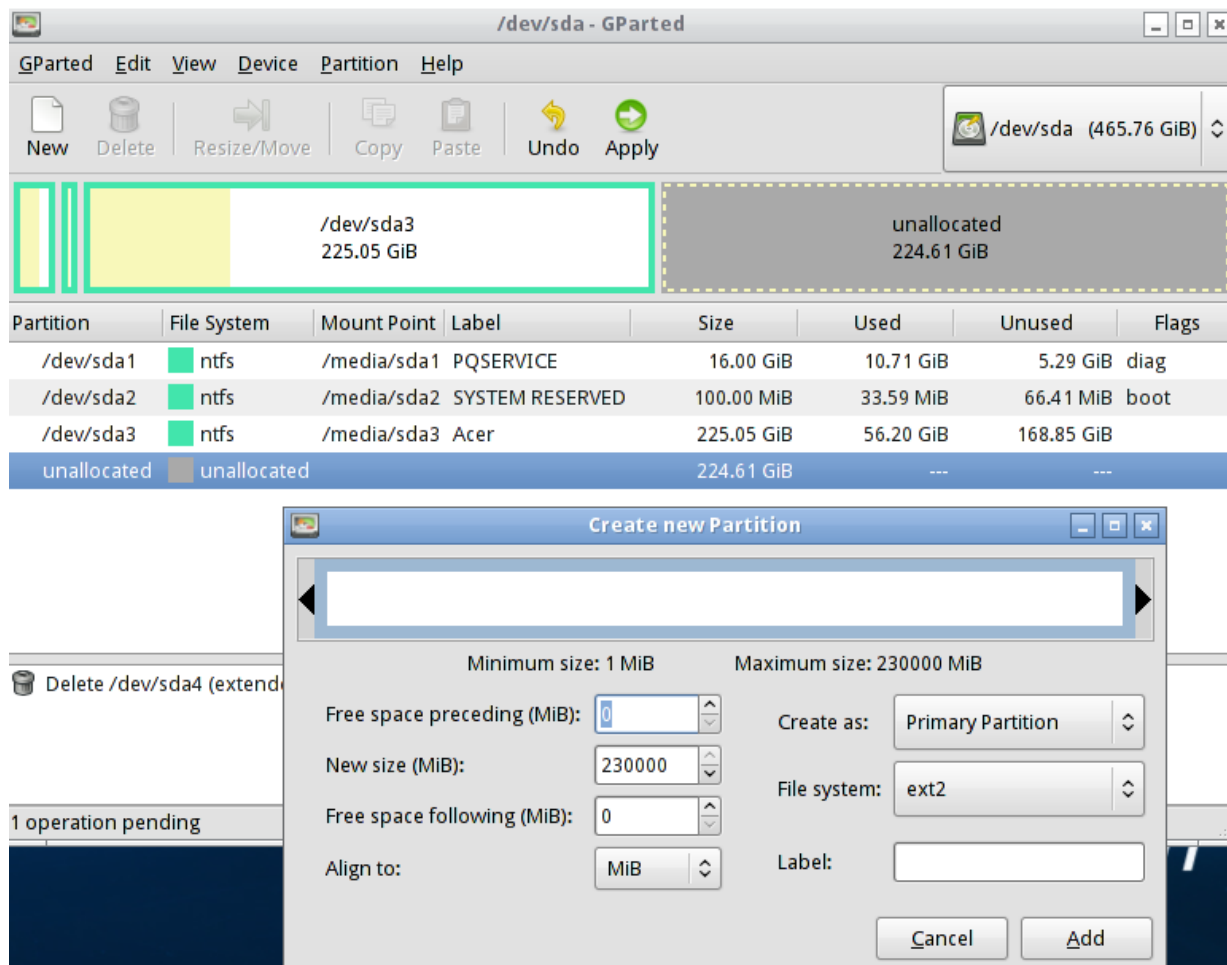
[Parted Magic](#) is a graphical, easy-to-use partition editor that is packaged on a live CD. It can be used to shrink an existing partition and to create a primary partition from existing free space.

To use Parted Magic, download the latest *.iso.zip* file, unzip it, and burn it to CD. Boot the system with the CD and let it boot into “Default settings (Runs from RAM)”. Wait for it to boot into the graphical screen, then select the “Partition Editor” desktop icon.

Figure 2.3d shows the same Windows 7 system in Partition Editor. The 225.05GB partition is the Windows data partition (which was displayed as drive C within Windows 7) and the 224.61GB of unallocated space was created using the Windows Disk Management utility. The “Create new Partition” screen was opened by right-clicking on the unallocated space and selecting “New” from the menu.

When creating your partition from unallocated space, make sure that “Primary Partition” is selected. The filesystem type does not matter as the PC-BSD® installer will reformat it. It is a good idea to write down the size and filesystem type so that you will recognize the partition that you will be installing PC-BSD® into. Once you have made your selections, click the “Add” button. Note that the partition will not actually be created until you click the “Apply” button to apply your changes. A popup menu will prompt you to make sure that you have selected the correct partition as formatting a partition destroys all data on that portion of the disk. Once the operation is complete, you can reboot and start the PC-BSD® installation.

Figure 2.3d: Formatting the Unallocated Space into a Primary Partition



2.4 Obtaining PC-BSD®

PC-BSD® version numbers are similar to those used by FreeBSD. In addition, PC-BSD® provides two branches. The branch that you choose to install or upgrade determines whether or not you will receive updates as new features and drivers are added to the operating system. Image names will include the version number, where 10.1 is the most recent version, and either the word *RELEASE* or *STABLE*, where:

- **RELEASE:** indicates that new drivers and features will not be added to the operating system until the next RELEASE version becomes available and the user upgrades to that new version. If reliability is more important to you than new features or drivers, use the RELEASE version.
- **STABLE:** around the 1st of each month, [Update Manager](#) will provide a patch which will update the operating system to include all of the new features and drivers. If you wish to have or test the latest features and drivers as they become available and can tolerate possible breakage caused by new features being available before the next RELEASE, use the STABLE version.

The installation file for the current RELEASE can be downloaded from the [PC-BSD® website](#). Earlier versions and STABLE versions can be downloaded from the [PC-BSD® CDN](#).

The file that you download will end in an *.iso* file extension. If you plan to install a graphical desktop, download the file with *PCBSD* in its name and either burn it to a DVD media or write it to a removable USB device. If you prefer to install a command-line only server, you can either download the same ISO or download the ISO with *TRUEOS* in the name. The *TRUEOS* download is smaller and can be burned to a CD or written to a removable USB device.

NOTE: PC-BSD® 10.1 also provides virtual image files which end in an *.xz* extension. See [Using the Downloadable VirtualBox or VMWare Disk](#) for instructions on how to use these files.

This section demonstrates how to verify the downloaded file's checksum. The next section will demonstrate how to burn the file to bootable media. You can install additional components and applications after the installation using [AppCafe®](#).

If you have a slow download connection or wish to support the PC-BSD® project financially, you can purchase PC-BSD® DVDs from the [FreeBSD Mall](#).

Members of the PC-BSD® project attend many IT conferences across the globe and give out PC-BSD® DVDs at conference booths. Visiting a PC-BSD® booth is an excellent way to meet other PC-BSD® users and to get your questions answered. Check the [PC-BSD® Blog](#) to see if any events are happening near you. If you are organizing a PC-BSD® booth, [contact us](#) to arrange for DVDs.

2.4.1 Data Integrity Check

After downloading the *.iso* file, it is a good idea to check that the file is exactly the same as the one on the PC-BSD® server. While downloading, a portion of the file may get damaged or lost, making the installation file unusable. Each PC-BSD® installation file has an associated MD5 and SHA256 checksum. If a checksum of the file you downloaded matches, your download was successful. If a checksum does not match, try downloading the file again. In order to verify a checksum, you will need to use a checksum verification utility.

NOTE: you only need to verify one of the checksums. The [PC-BSD® website](#) only lists the SHA256 while the [PC-BSD® CDN](#) lists both the *.md5* and the *.sha256* checksum files. This section demonstrates how to verify an MD5 checksum.

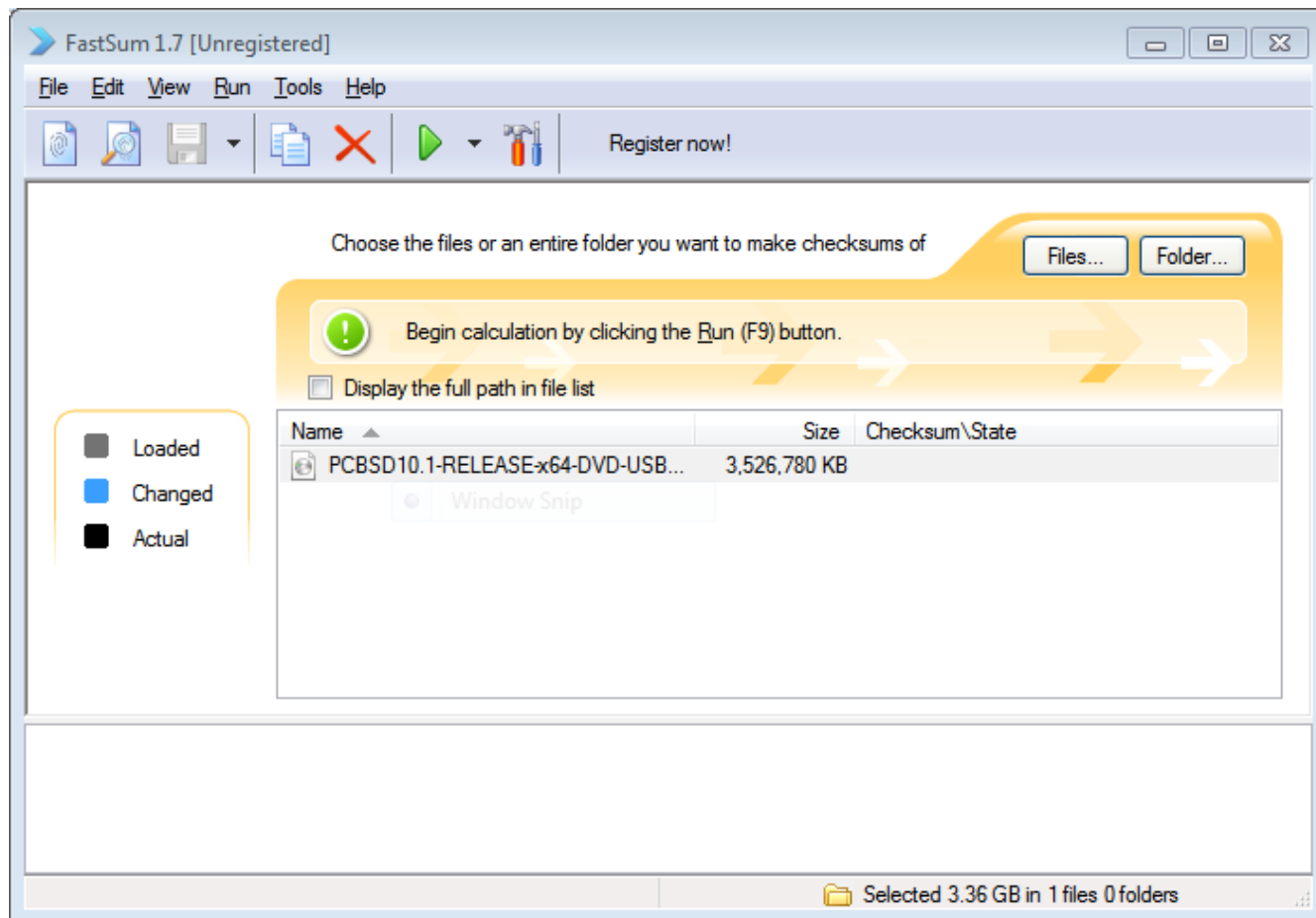
If you are currently using a Windows system, you can download and install the [FastSum](#) utility in order to verify the MD5 checksum. Once installed, launch the program and click the “Files” button, shown in Figure 2.4a, to browse to the location of your downloaded file.

Once the file is selected, click the green arrow to calculate the checksum. Once calculated, it will be listed in the “Checksum\State” column, though FastSum will capitalize the letters.

On Linux and BSD systems you can use the built-in **md5** (or **md5sum**) command line tool to check the MD5 checksum. In this example, the file is located in the *Downloads* subdirectory directory. You should substitute the name and location of the file that you downloaded:

```
md5 Downloads/PCBSD10.1-RELEASE-x64-DVD-USB.iso
```

Figure 2.4a: Verifying a Checksum Using FastSum



2.5 Burning the Installation Media

Once you have downloaded PC-BSD® and verified its checksum, burn the file to either a DVD or removable USB device. This section demonstrates how to do so using several different applications and operating systems.

2.5.1 Burning to DVD on Windows

Several burning applications are available for Windows. This section will demonstrate how to use Windows 7's Disc Image Burner and InfraRecorder.

2.5.1.1 Windows 7 Disc Image Burner

Windows 7 has built-in support for writing ISO images to disc. Right-click on the *.iso* file in Windows Explorer and select “Burn disk image”. Select the DVD device in the “Disk Burner” drop-down menu and then click “Burn” to write the disc. See the Microsoft article [Burn a CD or DVD from an ISO file](#) for more detailed instructions.

2.5.1.2 InfraRecorder

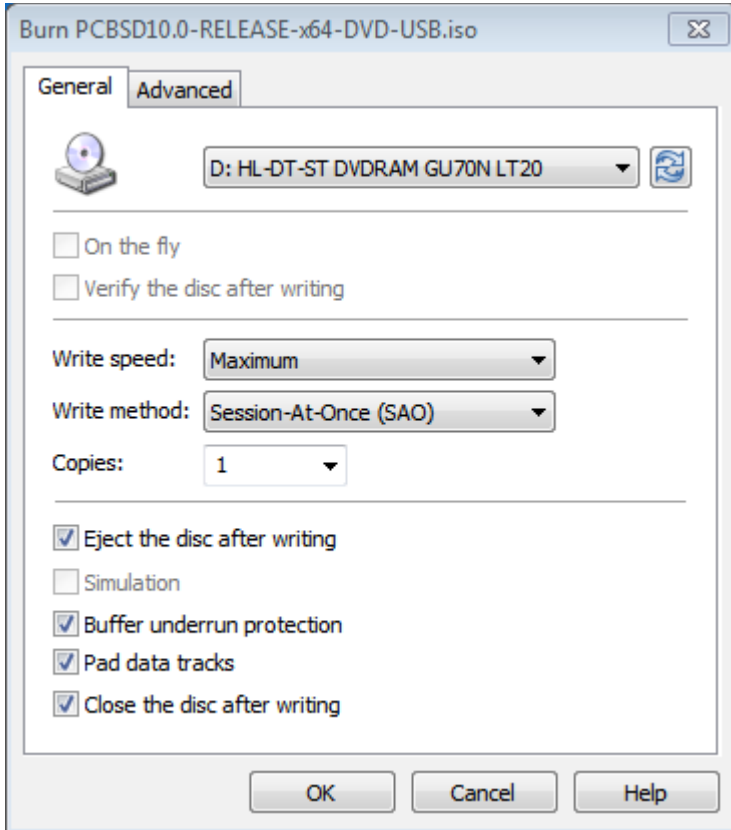
[InfraRecorder](#) is an open source burning application for both CDs and DVDs. Once installed, open InfraRecorder and click on the “Write Image” button shown in Figure 2.5a.

InfraRecorder will display a screen where you can browse to the location of the *.iso* file. Once selected, you will be presented with an options screen shown in Figure 2.5b. You can accept the defaults and click OK to start the burn. When finished, the burner tray will open and a dialog box will appear indicating that the burning process has finished.

Figure 2.5a: Initial InfraRecorder Screen



Figure 2.5b: Burn Options in InfraRecorder



2.5.2 Burning to DVD on a BSD or Linux System

This section demonstrates how to burn the installation ISO on a Linux or BSD system using the following tools: K3B, Brasero, and **growisofs**.

2.5.2.1 K3B

[K3B](#) is an easy-to-use graphical burning application for Linux and BSD systems. If KDE is installed, it can be run from any desktop by typing **k3b**.

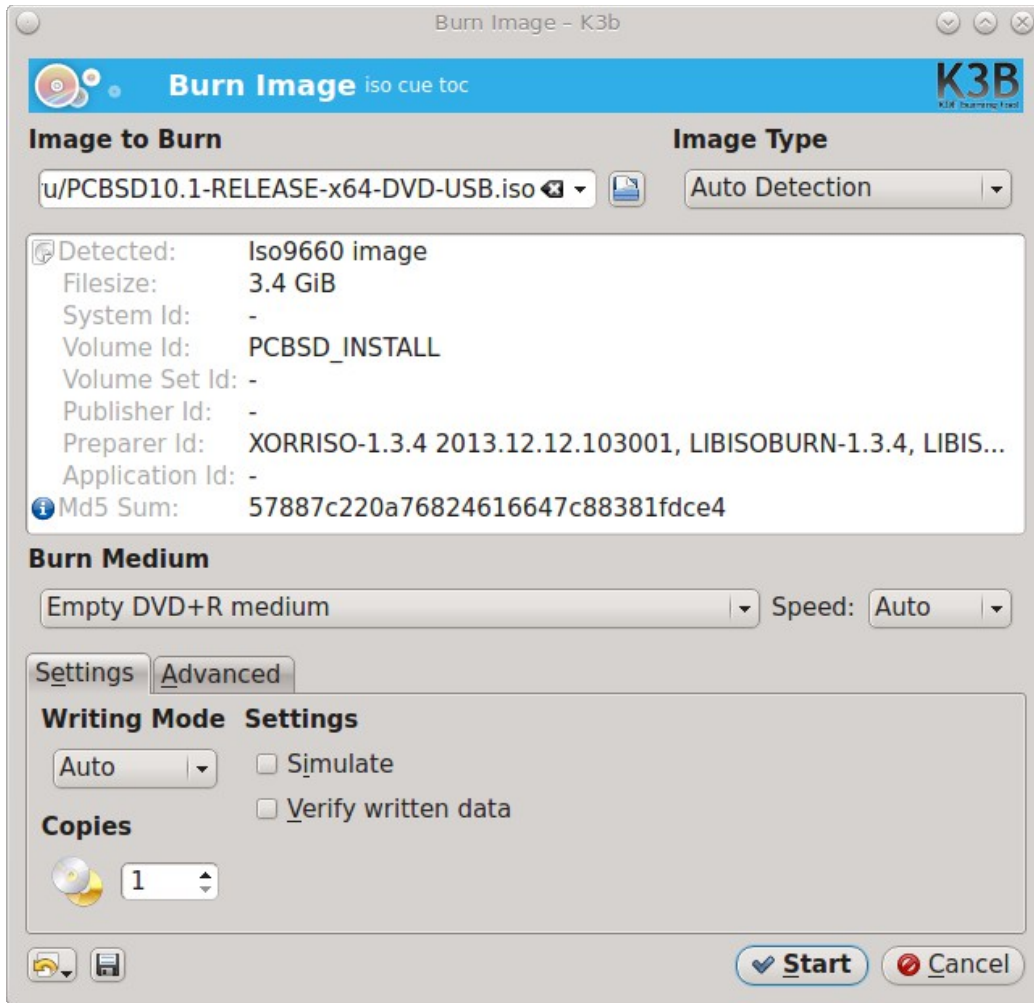
To burn your ISO, launch K3B, browse to the location of the *.iso* file in the screen shown in Figure 2.5c and click Tools → Burn Image... to see the screen in Figure 2.5d.

Click the “Start” button to burn the file. K3B will automatically eject the media once the burn is complete.

Figure 2.5c: Selecting the Burn Image Tool Within K3B



Figure 2.5d: K3B's Burn Image Screen



2.5.2.2 Brasero

[Brasero](#) is an easy to use burning application included with the [GNOME](#) desktop. A PBI is also available within AppCafe®. Once installed, Brasero can be launched by typing **brasero** from within any window manager. Figure 2.5e shows the initial Brasero screen.

Click Burn image to open the screen seen in Figure 2.5f. Use the “Click here to select a disk image” button to select your .iso file.

The name and size of your .iso file should appear and Brasero will indicate the size of the media. The lower portion of Figure 2.5f shows the menu that appears if you click on the “Properties” button. You can change these options if you wish, but it is fine to keep the default settings. When you are ready, click the “Burn” button and Brasero will burn your ISO.

Figure 2.5e: Brasero's Initial Screen

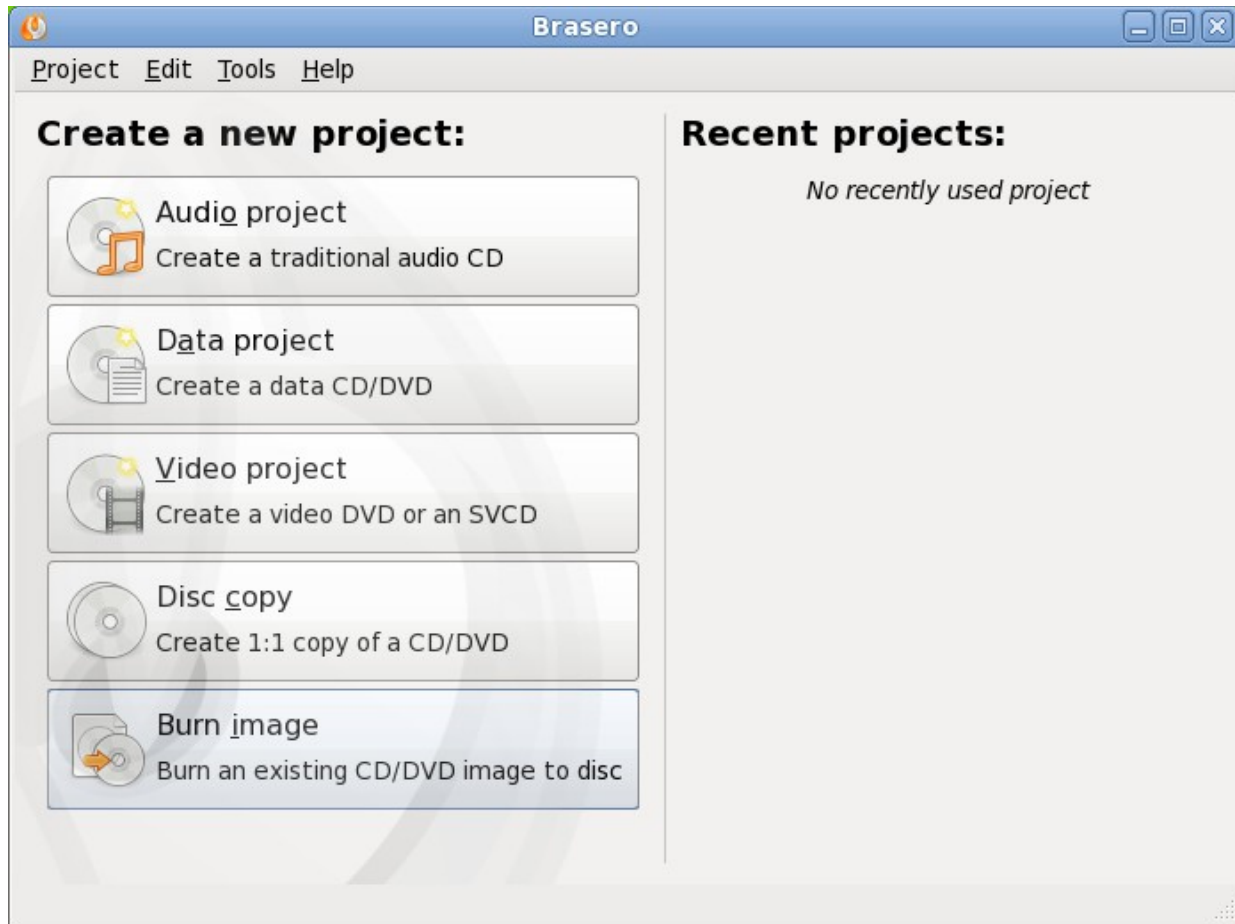
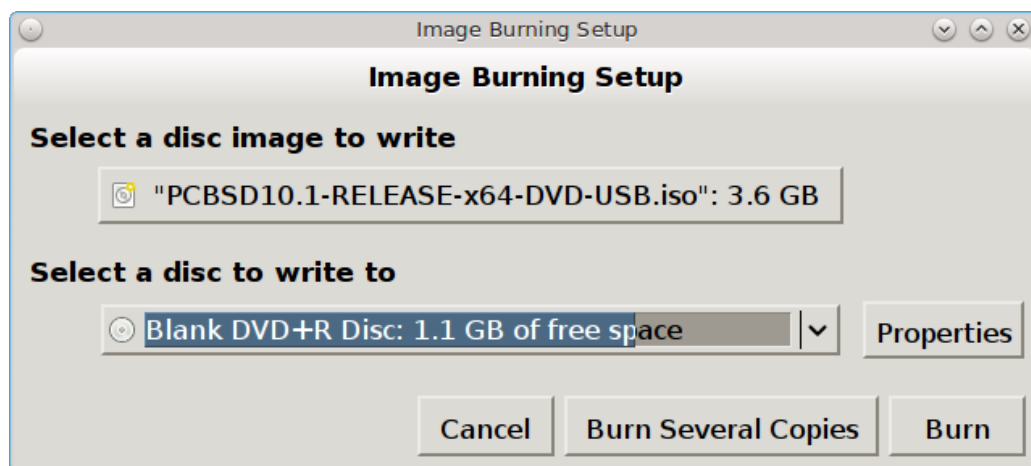


Figure 2.5f: Brasero Image Burning Setup



2.5.2.3 growisofs

If you are familiar with using the command line on a FreeBSD or PC-BSD® system, you can use the **growisofs** command line utility to burn the DVD. This utility is included with the dvd+rw-tools FreeBSD port which is installed by default on a PC-BSD® system. If that software is not yet installed on a FreeBSD system, issue this command as the superuser:

```
pkg install dvd+rw-tools
```

Depending upon the type of DVD burner hardware, you may have to configure the system to use it. If the device is ATAPI (i.e. not USB or SCSI), the ATAPI driver must be loaded. The superuser can issue this command:

```
kldload atapicam
```

If you just get your prompt back, the driver successfully loaded. If you get the message “kldload: can't load atapicam: File exists”, this means that the driver was already loaded. If the device is USB or SCSI, no additional drivers need to be loaded if you are running the generic FreeBSD kernel. After inserting the DVD media into the device, you can start the burn using this command:

```
growisofs -Z /dev/cd0=PCBSD10.1-RELEASE-x64-DVD-USB.iso
```

If your device is not the first CD device, change the number 0 accordingly. If your ISO has a different name, substitute the correct name in the command shown above.

2.5.3 Burning to DVD on a Mac OS X System

To burn the ISO on a Mac OS X system, go to Finder → Applications → Utilities → Disk Utility. With a blank media inserted into the burner, highlight the device representing the DVD writer and click the “Burn” button. This will open up a browser where you can select the ISO to burn.

Once the ISO is highlighted, click the “Burn” button. A pop-up message will indicate that the device is ready to burn. Click burn once more and Disk Utility will write the ISO to the DVD media.

2.5.4 Writing to a USB Device

To write to a USB device, you will need the following:

- a utility that can write the image to a USB media; the utility that you use will depend upon your operating system
- a USB thumb drive or hard drive large enough to hold the image

Once the image is written, boot from the removable device and proceed with the PC-BSD® installation.

NOTE: if there is a card reader on the system or used via USB dongle, the device enumeration may be affected. For example, with the USB card reader dongle as the destination for the image burn below, the device name would be `/dev/dal` instead of `/dev/da0`.

2.5.4.1 Writing to USB on a Linux or BSD System

To write the `.iso` file to a flash card or removable USB drive on a BSD or Linux system, use the **dd** command line utility. On a FreeBSD system, the superuser can use this command to write the file to the first plugged in USB device:

```
dd if=PCBSD10.1-RELEASE-x64-DVD-USB.iso of=/dev/da0 bs=1m
3658+1 records in
3658+1 records out
3836317696 bytes transferred in 670.278574 secs (5723468 bytes/sec)
```

When using the **dd** command:

- **if=** refers to the input file to be written; it should end with an *.img* extension
- **of=** refers to the output file (the device name of the flash card or removable USB drive); increment the number in the name if it is not the first USB device
- **bs=** refers to the block size

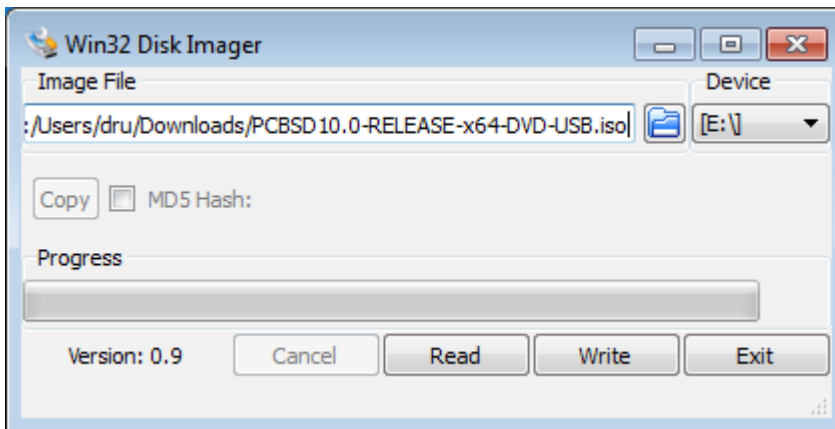
NOTE for Linux users: if you type **mount** with the USB stick inserted, you will see two or more device nodes corresponding to the USB stick. For example, */dev/sdc* and */dev/sdc1*, where */dev/sdc1* corresponds to the primary partition of the USB stick. Before using the **dd** command, ensure that the usb stick is first unmounted. When using the **dd** command, remember to use */dev/sdc* (device node without the number) as the option for the output file **of=**. Once the **dd** completes, you might not be able to mount the USB stick on Linux as Linux has very limited support for UFS, the BSD filesystem that gets created on the USB stick.

2.5.4.2 Writing to USB on a Windows System

To burn the image file on a Windows system, you can use [win32-image-writer](#). When downloading win32-image-writer, download the latest version that ends in *-binary.zip* and use a utility such as Windows Explorer or 7zip to unzip the executable.

If you launch **win32-image-writer.exe**, it will start the Win32 Disk Imager utility, shown in Figure 2.5g. Use the “browse” button to browse to the location of the *.img* file. Insert a USB thumb drive and select its drive letter (in this example, drive D). Click the “Write” button and the image will be written to the USB thumb drive.

Figure 2.5g: Using Win32 Disk Imager to Write the Image



2.5.4.3 Writing to USB on a Mac OS X System

To burn the *.iso* file on Mac OS X, insert a USB stick and open Terminal. Run the **diskutil list** command to find out the device name of the USB disk, unmount the USB disk, then use **dd** to write the image to the raw disk (*rdisk*). In the following example, an 8GB USB stick has a device name of */dev/disk1* and a raw device name of */dev/rdisk1*.

```
diskutil list
/dev/disk0
#:          TYPE NAME              SIZE          IDENTIFIER
0:    GUID_partition_scheme      *500.1 GB     disk0
1:                  EFI              209.7 MB     disk0s1
2:    Apple_HFS Macintosh HD       499.2 GB     disk0s2
3:    Apple_Boot Recovery HD       650.0 MB     disk0s3
/dev/disk1
#:          TYPE NAME              SIZE          IDENTIFIER
0:    FDisk_partition_scheme      *8.0 GB      disk1
1:      DOS_FAT_32 UNTITLED        8.0 GB      disk1s1
```

```
diskutil unmountDisk /dev/disk1
Unmount of all volumes on disk1 was successful
```

```
sudo dd if=/Users/dru/Downloads/PCBSD10.1-RELEASE-x64-DVD-USB.iso of=/dev/rdisk1 bs=4m
Password:
3658+1 records in
3658+1 records out
3836317696 bytes transferred in 670.278574 secs (5723468 bytes/sec)
```

2.6 Using VirtualBox

A virtualized environment allows you to test drive an operating system without overwriting your current operating system. This is an excellent way to practice installation, determine whether all of your hardware is supported, or to try multiple versions of different operating systems. Virtualization software effectively creates windows (known as virtual machines) into which you can install and use an operating system. The only limitation to virtualization is your hardware as each virtual machine uses CPU and RAM. Depending upon the amount of CPU and RAM in your computer, you may find that the operating system you install using virtualization software runs slowly. If your computer slows down greatly, try closing other applications running on your computer to free up some RAM.

PC-BSD® automatically installs the [VirtualBox](#) open source virtualization program and the [VirtualBox Guest Additions](#) with the operating system. The guest additions add mouse pointer integration, shared folders between the host and guest, better video support, and a shared clipboard.

If your computer is running another operating system, download the binary for your operating system from the [VirtualBox Downloads page](#). VirtualBox runs on Windows, Linux, Macintosh, and OpenSolaris and supports a large number of operating systems that can be installed into a virtual machine.

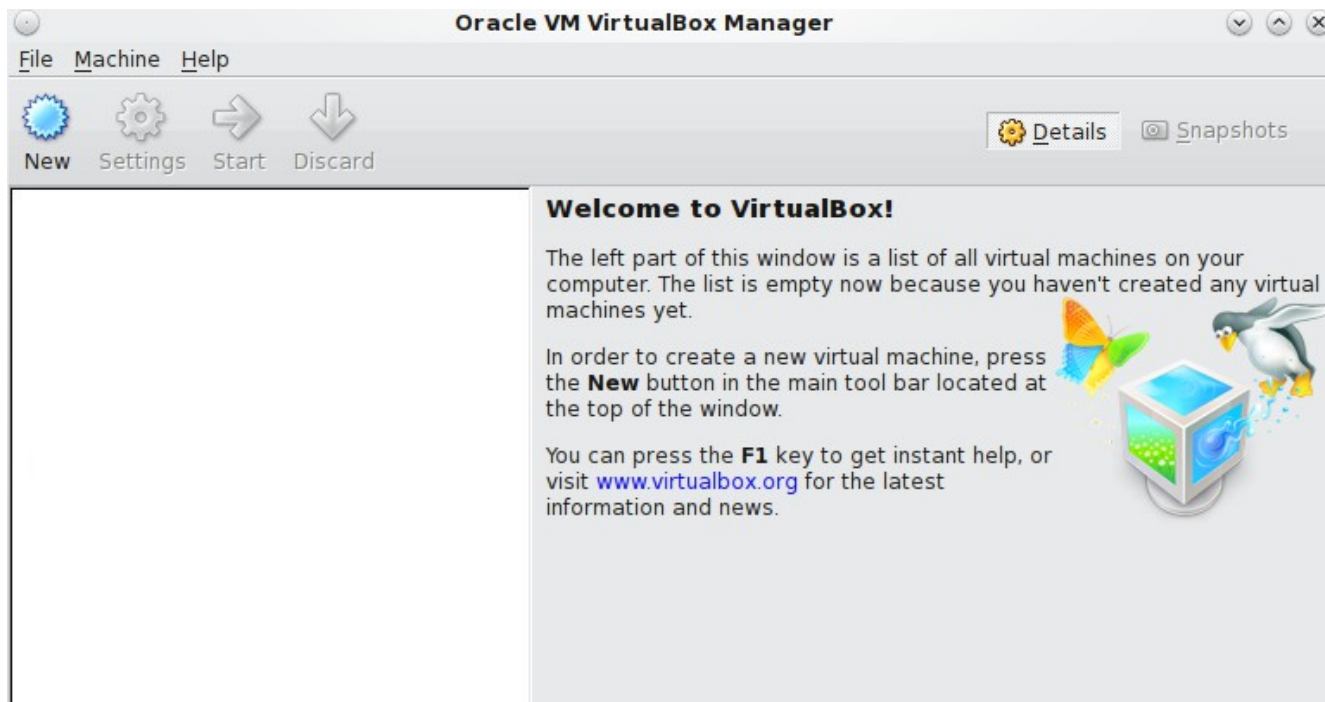
In order to use PC-BSD® within VirtualBox, you will need to download the PC-BSD® ISO, create your own virtual machine, and use the ISO to install PC-BSD® into the virtual machine. You will also need to first create a virtual machine that meets the following minimum requirements:

- 1024 MB base memory size
- a virtual disk *at least 20 GB in size* for a TrueOS® installation or *at least 50 GB in size* for a PC-BSD® installation
- a bridged adapter

2.6.1 Creating a Virtual Machine

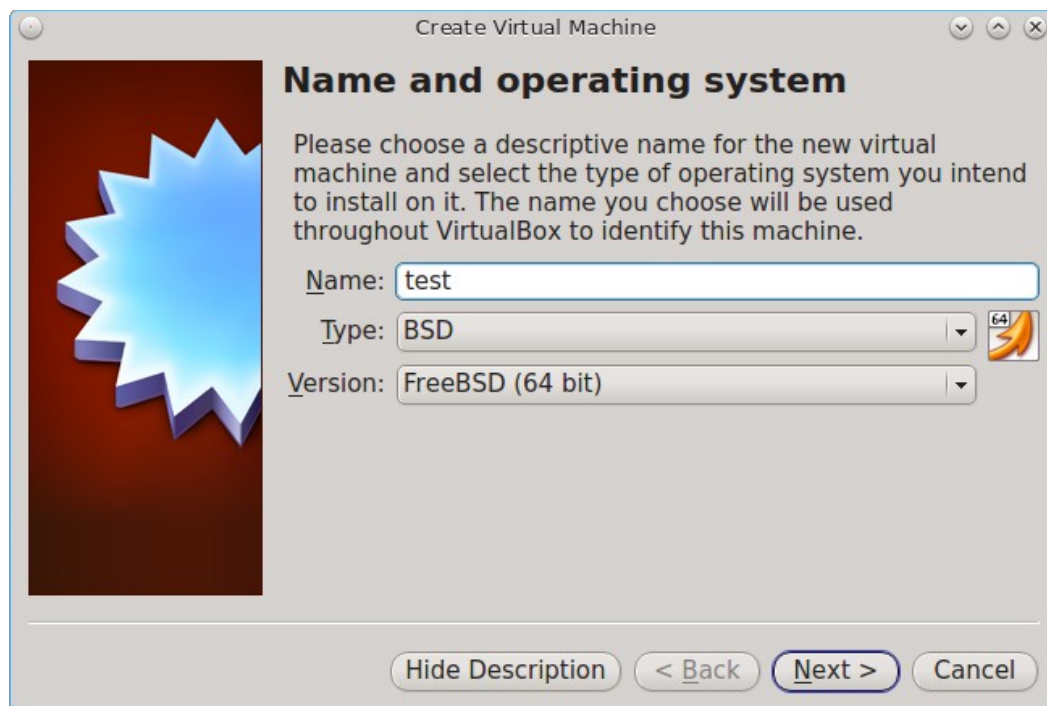
Once installed, start VirtualBox to see the screen shown in Figure 2.6a.

Figure 2.6a: Initial VirtualBox Screen



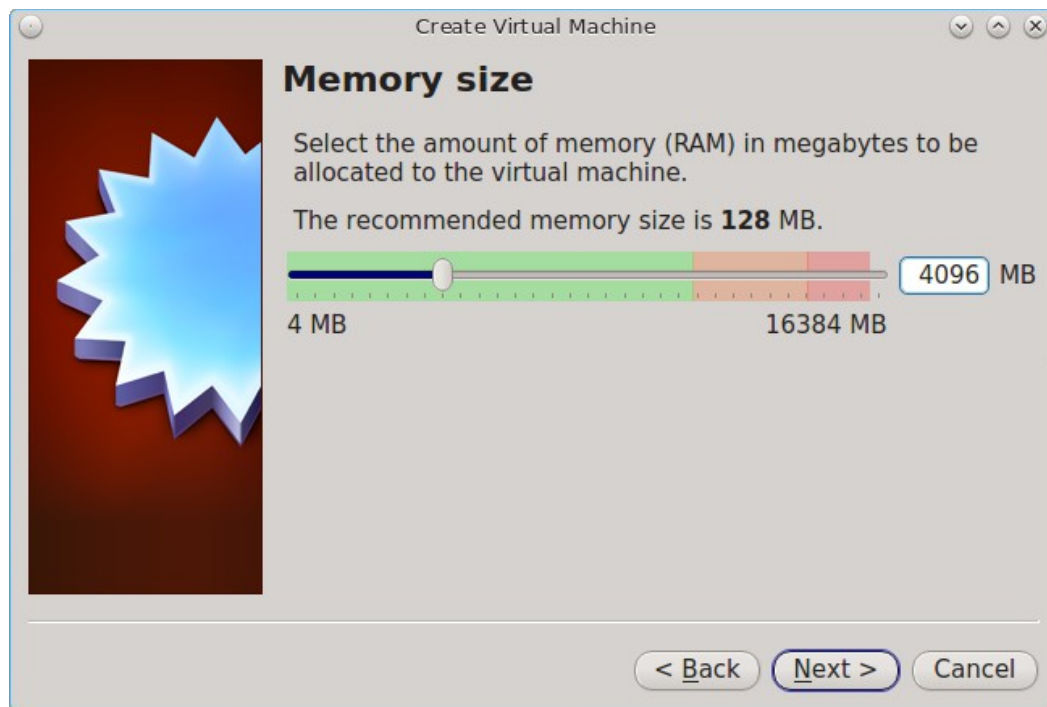
To create the virtual machine, click the “New” button to start the new virtual machine wizard. Click the “Next” button to see the screen in Figure 2.6b.

Figure 2.6b: Type in a Name and Select the Operating System for the New Virtual Machine



Enter a name for your virtual machine, which can be anything that makes sense to you. Click the “Operating System” drop-down menu and select “BSD”. In the “Version” drop-down menu, select “FreeBSD (64 bit)”. Click Next to see the screen in Figure 2.6c.

Figure 2.6c: Select the Amount of Memory Reserved for the Virtual Machine



The base memory size must be changed to *at least 1024 MB*. If your system has a lot of RAM, use more. Any number within the green area is considered a safe value by VirtualBox, meaning it should not slow down your computer too much. When finished, click Next to see the screen in Figure 2.6d.

This screen is used to create the virtual hard drive--in other words, the amount of disk space that will be available to the virtual machine. If this is your first virtual machine, keep the default of “Create a virtual hard drive now” and click “Create” to go to the screen shown in Figure 2.6e. If you have created a virtual machine in the past and wish to reuse its disk space, select “Use an existing virtual hard drive file” from the drop-down menu. You can create as many virtual machines as you wish. However, if your computer is getting low on disk space, you should consider reusing existing virtual hard drives to prevent your physical hard drive from being used up by old virtual machines.

Select “VDI” and click the “Next” button to see the screen in Figure 2.6f.

Figure 2.6d: Select Whether to Use an Existing or Create a New Virtual Hard Drive

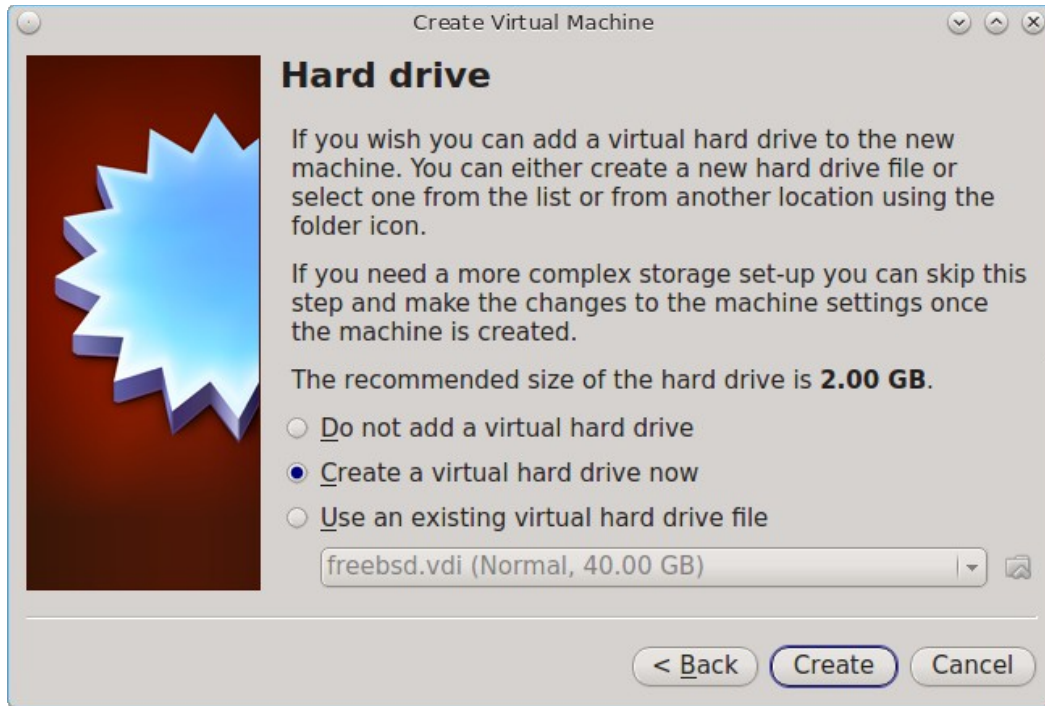
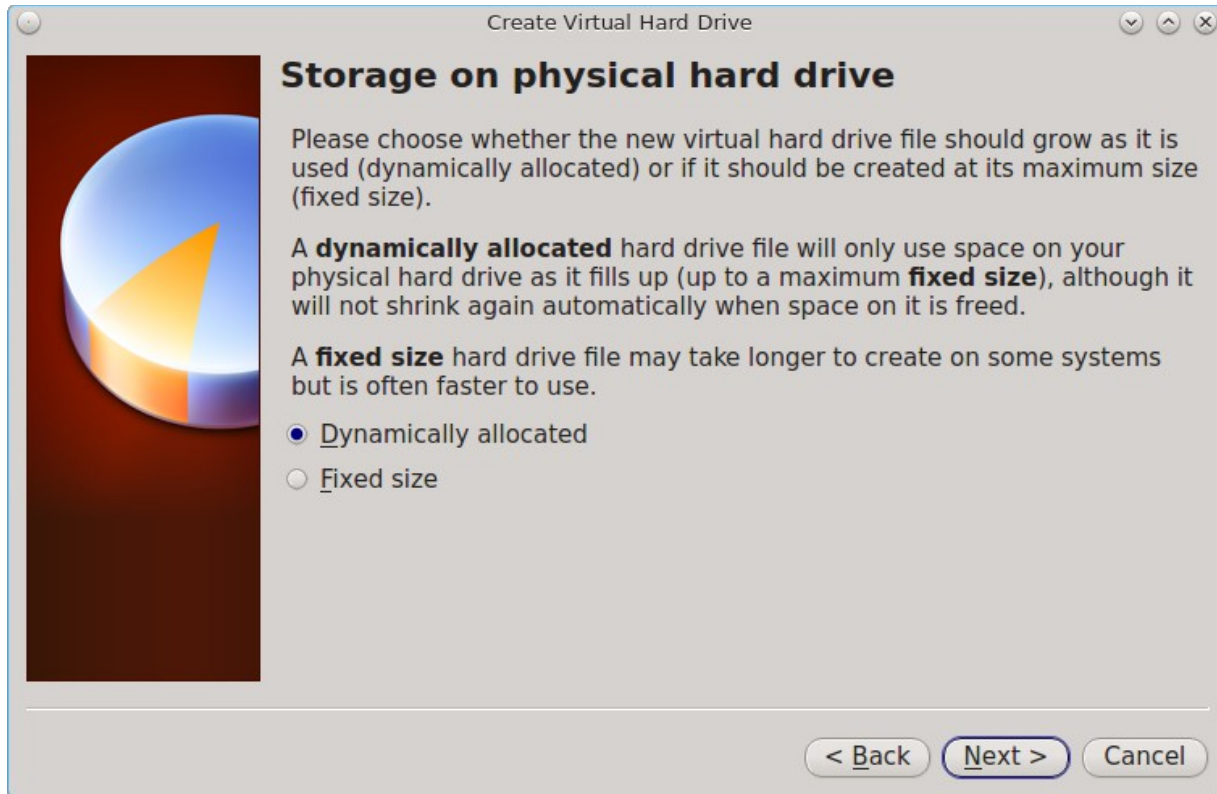


Figure 2.6e: Select the Hard Drive Type



Figure 2.6f: Select the Storage Type



You can now choose whether you want “Dynamically allocated” or “Fixed size” storage. The first option uses disk space as needed until it reaches the maximum size that you will set in the next screen. The second option creates a disk the same size as that specified amount of disk space, whether it is used or not. Choose the first option if you are worried about disk space; otherwise choose the second option as it allows VirtualBox to run slightly faster. Once you select Next, you will see the screen in Figure 2.6g.

This screen is used to set the size (or upper limit) of the virtual machine. If you plan to install PC-BSD® into the virtual machine, **increase the size to at least 20 GB** or you will receive an error during the PC-BSD® installation. If you plan to install KDE, GNOME, multiple desktop managers, or applications within the virtual machine, you will probably want to choose at least 50GB. Whatever size you set, make sure that your computer has enough free disk space to support it. Use the folder icon to browse to a directory on disk with sufficient space to hold your virtual machine.

Once you make your selection and press “Next”, you will see a summary of your choices. You can use the “Back” button to return to a previous screen if you wish to change any values. Otherwise, click “Create” to finish using the wizard. Your virtual machine should now show up in the left box, as seen in the example in Figure 2.6h.

Figure 2.6g: Select the File Name and Size of the Virtual Disk

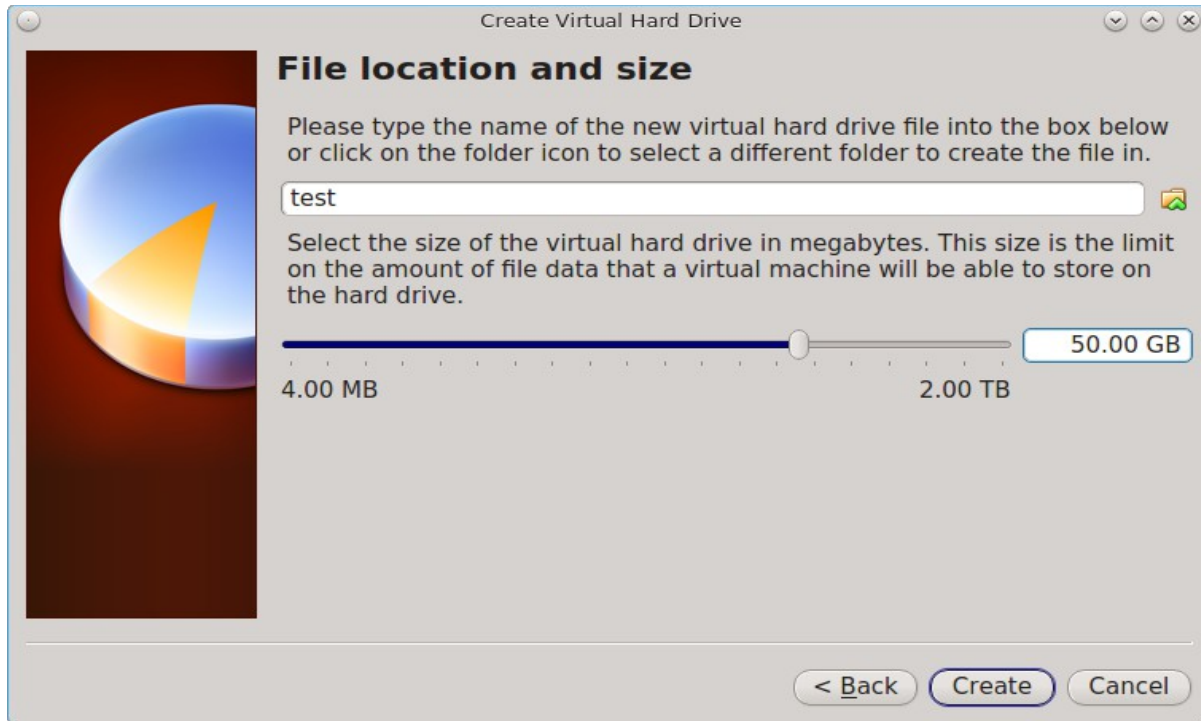
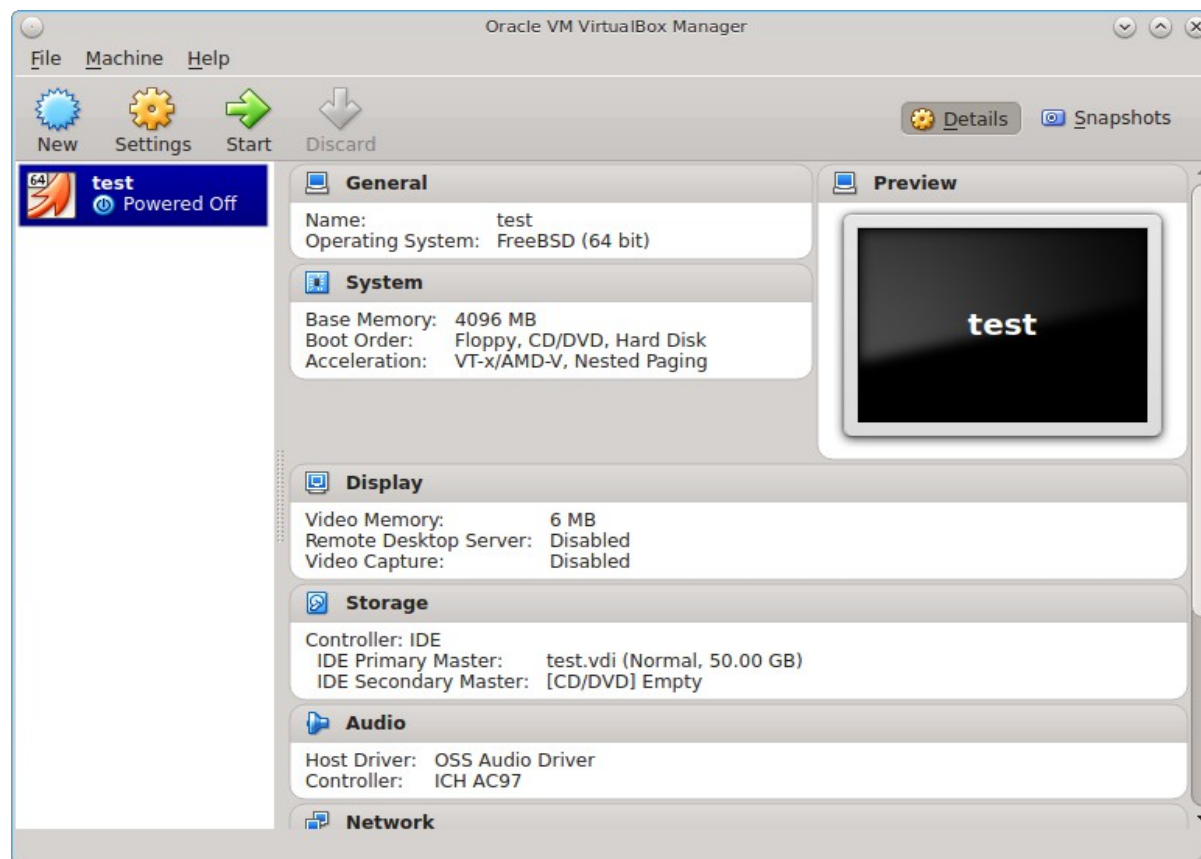


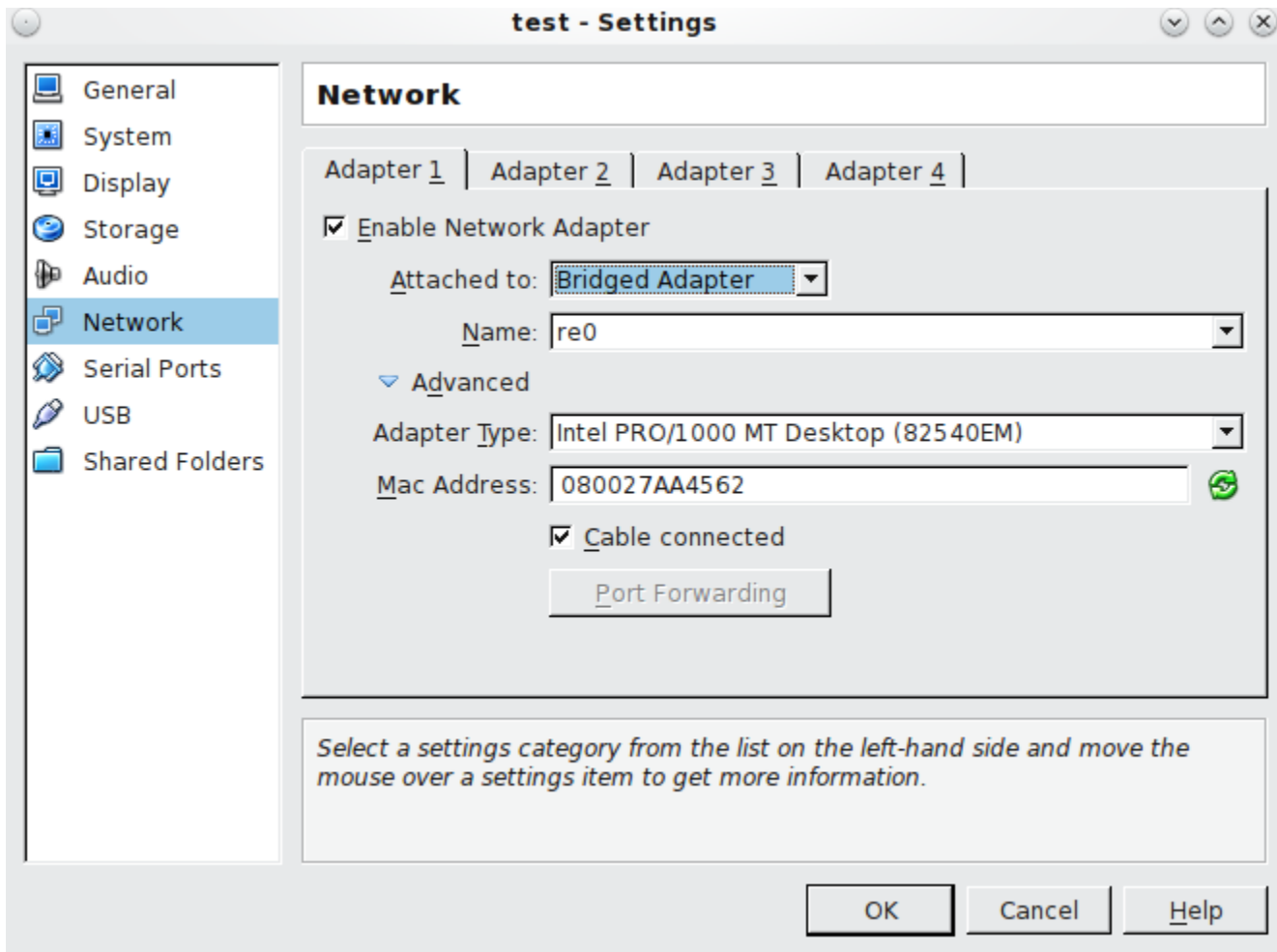
Figure 2.6h: The New Virtual Machine



2.6.1.1 Configuring the Network Adapter

If you wish to use your network card, you will need to configure bridging on your virtual machine. To do this, go to Settings → Network. In the “Attached to” drop-down menu select “Bridged Adapter” then select the name of the physical interface from the “Name” drop-down menu. In the example shown in Figure 2.6i, the Intel Pro/1000 Ethernet card is attached to the network and has a device name of *re0*.

Figure 2.6i: Configuring a Bridged Adapter in VirtualBox



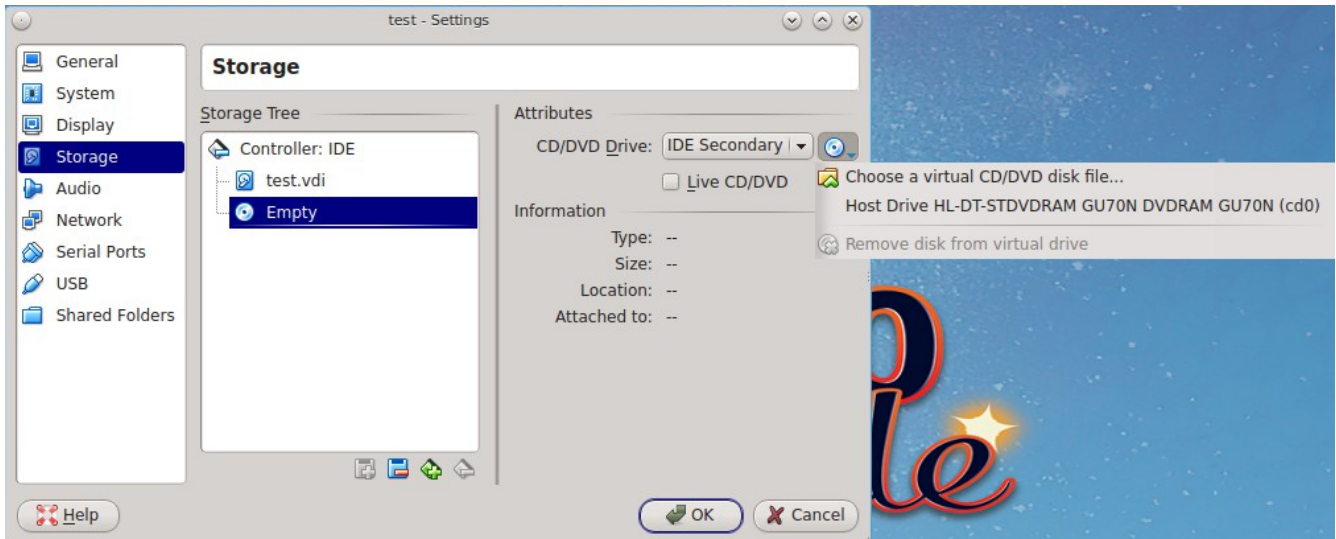
2.6.1.2 Configuring the Storage Device

Before starting your virtual machine, you will want to configure it to use your installation media. Click the Storage hyperlink in the right frame to access the storage screen seen in Figure 2.6j.

Double-click the word Empty, which represents your DVD reader. If you wish to access the PC-BSD® installer from your DVD reader, double-check that the Slot is pointing to the correct location (e.g. IDE Secondary Master) and use the drop-down menu to change it if the location is incorrect. Click the “CD/DVD Device” drop-down menu to change it from empty to the Host Drive value.

If you prefer to use an ISO that is stored on your hard disk, click the DVD icon → “Choose a virtual CD/DVD disk file” to open a browser menu where you can navigate to the location of the ISO. Highlight the desired ISO and click Open. The name of the ISO will now appear in the Storage Tree section.

Figure 2.6j: The Storage Settings of the Virtual Machine



You are now ready to install PC-BSD® into your virtual machine. Simply highlight the virtual machine and click on the green Start icon. A window will open indicating that the virtual machine is starting. If you have a DVD inserted, you should hear it spin and it should start to boot into the installation program. If it does not or if you are using an ISO stored on the hard disk, press F12 to select the boot device when you see the message to do so, then press “c” to boot from CD-ROM. You can then proceed through the installation as described in the next section.

2.6.2 Using the Downloadable VirtualBox or VMWare Disk

PC-BSD® provides pre-built VirtualBox and VMWare disks which create a a pre-made virtual machine with PC-BSD® already installed. The VirtualBox file ends in a `.vdi.xz` extension and the VMWare disk file ends in a `.vmdk.xz` extension. The `.xz` means that the file needs to be unzipped first so that it just ends with a `.vdi` or `.vmdk` extension.

On a Linux or BSD system, use the `xz` command by giving it the name of the file which you downloaded:

```
xz -d PCBSD10.1-RELEASE-x64-consumer-desktop-VMWARE.vmdk.xz
```

Since this is a large file, the command will take a few minutes to extract the image. You will receive the prompt back when it has finished.

On a Windows system, you can use a utility such as [7-Zip](#). On a Mac OS X system, simply double-click the file in "Finder" to extract it.

Once the file is unzipped, open VirtualBox. When you get to Figure 2.6d, select "Use an existing virtual hard drive file".

Use the browse icon to browse to the location of the `.vdi` or `.vmdk` file then press "Next". A message will indicate that the virtual machine will be created; click the "Create" button to finish the wizard. You can then configure the network adapter and start the virtual machine.

The virtual machine will boot into the post installation configuration screens so that the system can be configured. Once the display wizard is finished and the login menu appears, input the username and password that you configured at the [Create a User Screen](#).

3 Installing PC-BSD®

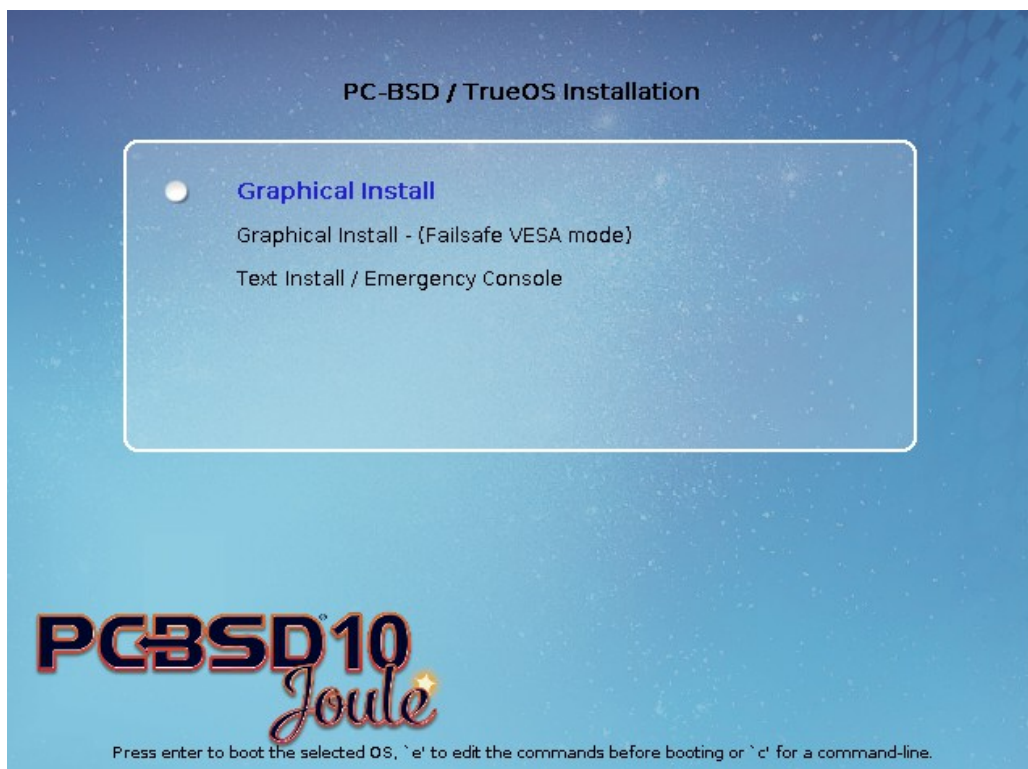
This chapter describes how to install a graphical desktop using the graphical installer. If you have downloaded the CD version of TrueOS® or prefer to use a text based installer, refer to [Using the Text Installer](#).

PC-BSD® can be installed from the installation media directly onto a hard drive or into a virtual machine using virtualization software such as [Virtualbox](#).

To begin the PC-BSD® installation, insert the boot media and boot the system. If the computer boots into an existing operating system instead of the installer, reboot and check your computer's BIOS program to ensure that the drive containing the installation media is listed first in the boot order. Save your BIOS changes and reboot.

The initial boot screen, shown in Figure 3a, offers a choice of using either the graphical or the text based installer. Unless you select otherwise, the graphical installer will load. To instead use the text based installer, use the arrow keys to select that option. If the graphical installer hangs when loading the graphics driver, try selecting the VESA mode option of the graphical installer.

Figure 3a: PC-BSD® Installer Boot Menu



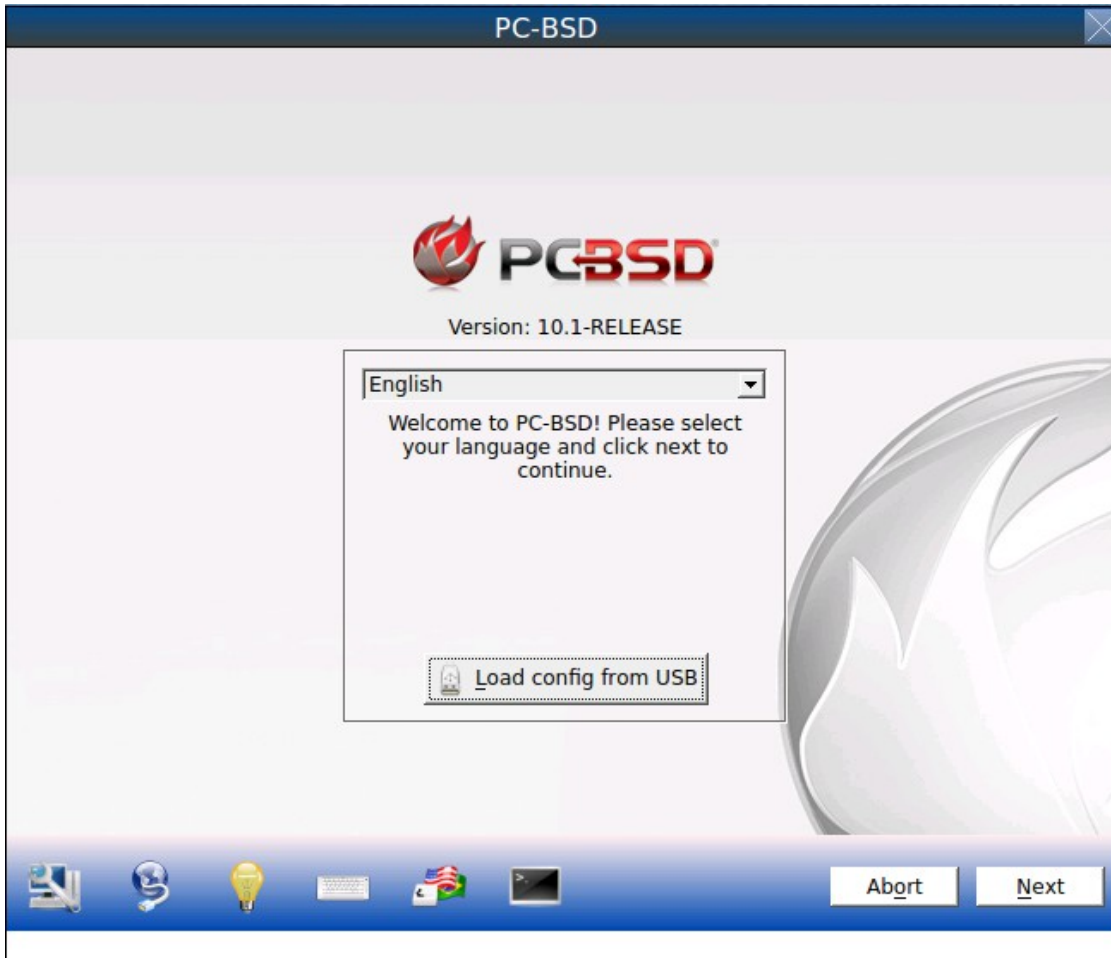
This chapter describes the following screens of the graphical installer:

- [Language Selection Screen](#)
- [System Selection Screen](#)
- [Disk Selection Screen](#)
- [Installation Progress Screen](#)
- [Installation Finished Screen](#)

3.1 Language Selection Screen

The first graphical installer screen, seen in Figure 3.1a, indicates that the installer successfully loaded and is ready to present you with its options:

Figure 3.1a: Welcome and Language Selection Screen



Starting on the left-hand side, the icons in the bottom navigation area allow you to:

- access [hardware compatibility](#) information
- manage [network connectivity](#) for a system restore
- read that screen's Help text
- use the onscreen keyboard
- switch between the US keyboard layout and a user selected layout
- access the emergency shell described in [Using the System Utilities Menu](#)
- abort the installation
- navigate to a previous or upcoming screen

Hover over an icon to view its description in the tip bar at the bottom of the screen.

NOTE: the default keyboard layout can be changed now, during [post-install configuration](#), or [during login](#).

A button is also provided to “Load config from USB”. If you have saved the configuration from a previous installation, it can be loaded at this time from a FAT-formatted USB stick.

This initial screen allows you to select your language. The menus in PC-BSD® have been translated to several different languages and you can see the status of your native language at the [PC-BSD® Translation Site](#). If your language does not show 100% translation at this website, it means that not all of the menus have been translated yet and that the untranslated menus will instead display in English. You are welcome to join the [PC-BSD® Translators Mailing List](#) if you would like to assist in translating menus to your native language.

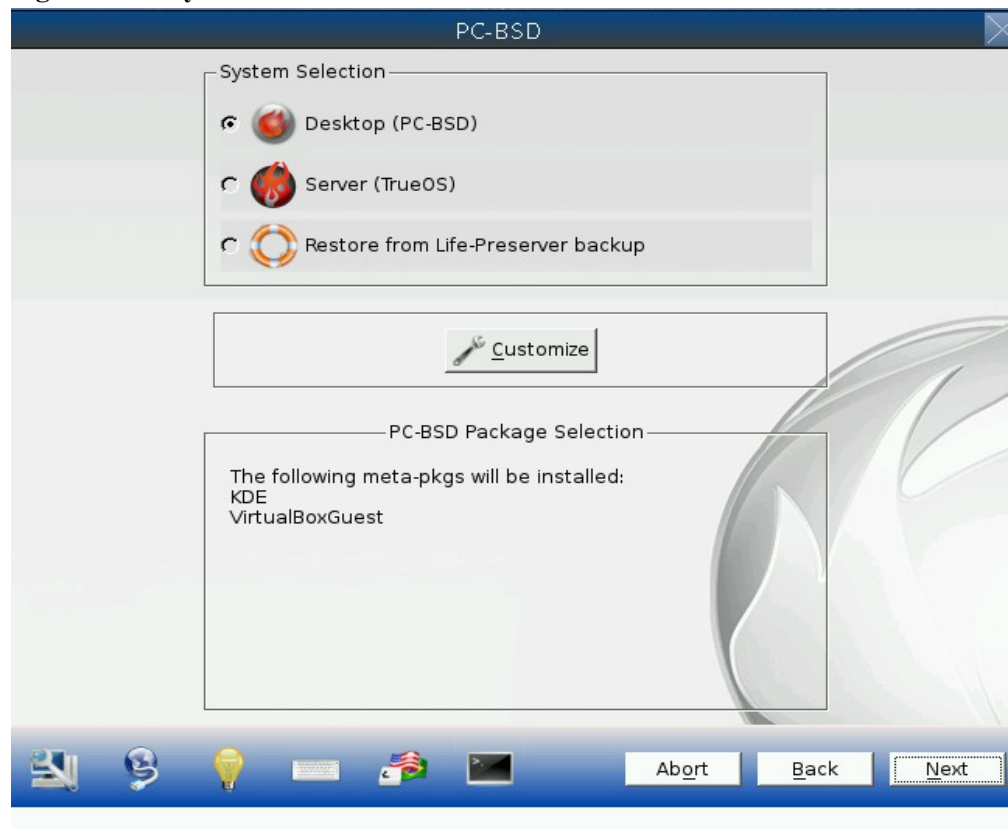
By default, PC-BSD® menus will display in English, unless you select another language in the drop-down menu in this screen.

NOTE: small screens may not display the entire installer window, which means that the buttons at the bottom of the window are hidden and inaccessible. There are two solutions for this situation: press Alt while dragging the window with the mouse, or press Alt+N to select the next button of the window. When you are finished, click the “Next” button to go to the next installation screen.

3.2 System Selection Screen

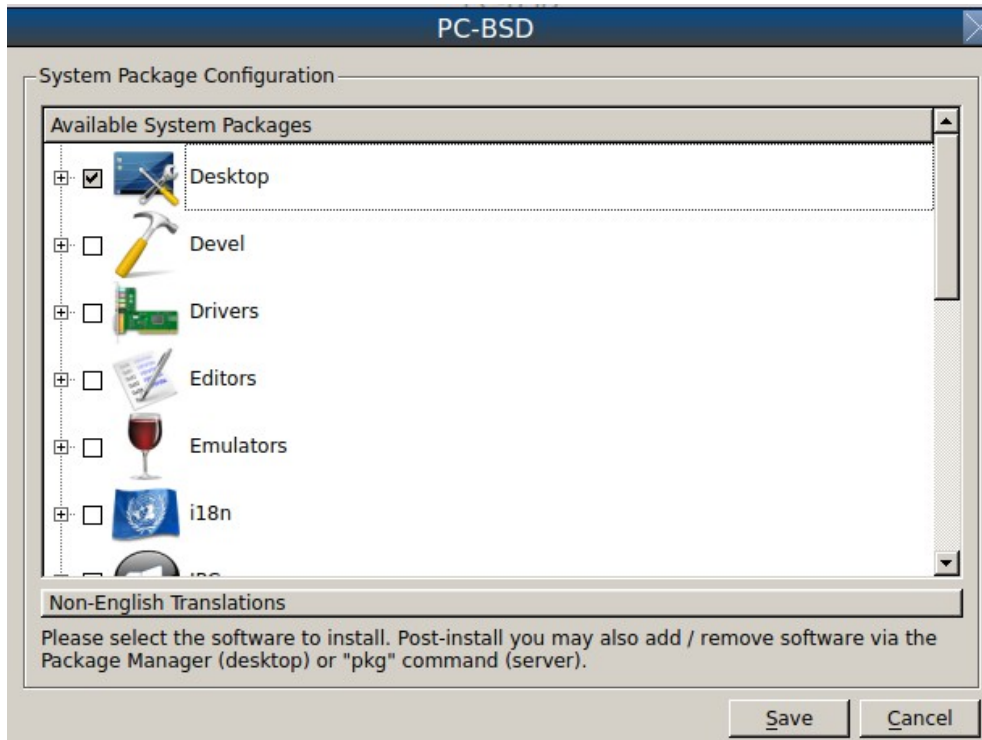
The “System Selection” screen, shown in Figure 3.2a, allows you to install a desktop (PC-BSD®) or a server (TrueOS®) operating system. It also allows you to [restore the operating system from a Life Preserver backup](#). The rest of this chapter concentrates on a desktop installation. Refer to [Install a Server](#) for instructions on how to install a command-line only server.

Figure 3.2a: System Selection Screen



By default, PC-BSD® will be selected and the default window manager will depend upon the amount of RAM on the system. Systems containing more than 2GB of RAM will default to the KDE desktop and all other systems will default to the LXDE desktop. To change the default window manager or to browse for additional desktops and components to install, click the “Customize” button which will open the screen shown in Figure 3.2b. Check the box of a component that has a + next to it in order to check or uncheck its sub-components. All components that are checked will be installed. If you highlight then right-click a component and select “View Packages”, a pop-up menu will list the packages that are installed with that component.

Figure 3.2b: Browsing Additional System Components



The following components are available for installation.

- **Desktops:** the following desktops are available: [Awesome](#), [Cinnamon](#), [FVWM](#), [GNOME3](#), [i3](#), [IceWM](#), [KDE4](#), [Lumina](#), [LXDE](#), [Mate](#), [Openbox](#), [Ratpoison](#), [spectrwm](#), [WindowLab](#), [Window Maker](#), and [XFCE4](#). Each desktop that is selected will be installed and will appear in the login menu of the installed PC-BSD® system.

NOTE: [Fluxbox](#) is always installed and available in the login menu of a PC-BSD® system.

- **Devel:** if you expand the + you can select to install [QGit](#).
- **Drivers:** if you have an NVIDIA video card, make sure this box is checked so that the required drivers are installed.
- **Editors:** if you expand the + you can select to install [LibreOffice](#).
- **Emulators:** if you expand the + you can select to install [Pipelight](#), [VirtualBox](#), and [Windows Emulation](#).
- **i18n:** if you expand the + you can select to install localization for for the KDE desktop and for the operating system.
- **IRC:** if you expand the + you can select to install [HexChat](#).

- **Java:** if you expand the + you can select to install [IcedTea](#) and [OpenJDK](#) version 7 and 8.
- **Mail:** check this box to install the [Thunderbird](#) email client.
- **Net:** check this box to install the [KRDC](#) remote desktop client.
- **Net-IM:** check this box to install the [Pidgin](#) IRC client.
- **Security:** check this box to install the [OpenVPN](#) VPN client.
- **SysUtils:** check this box to install the [PySalt](#) distributed remote execution and configuration management system.
- **Virtualization:** if you expand the + you can install [VirtualBox Guest additions](#) and [VMwareGuest](#).
- **Web:** if you expand the + you can select to install the [Chromium](#) and [Firefox](#) web browsers.

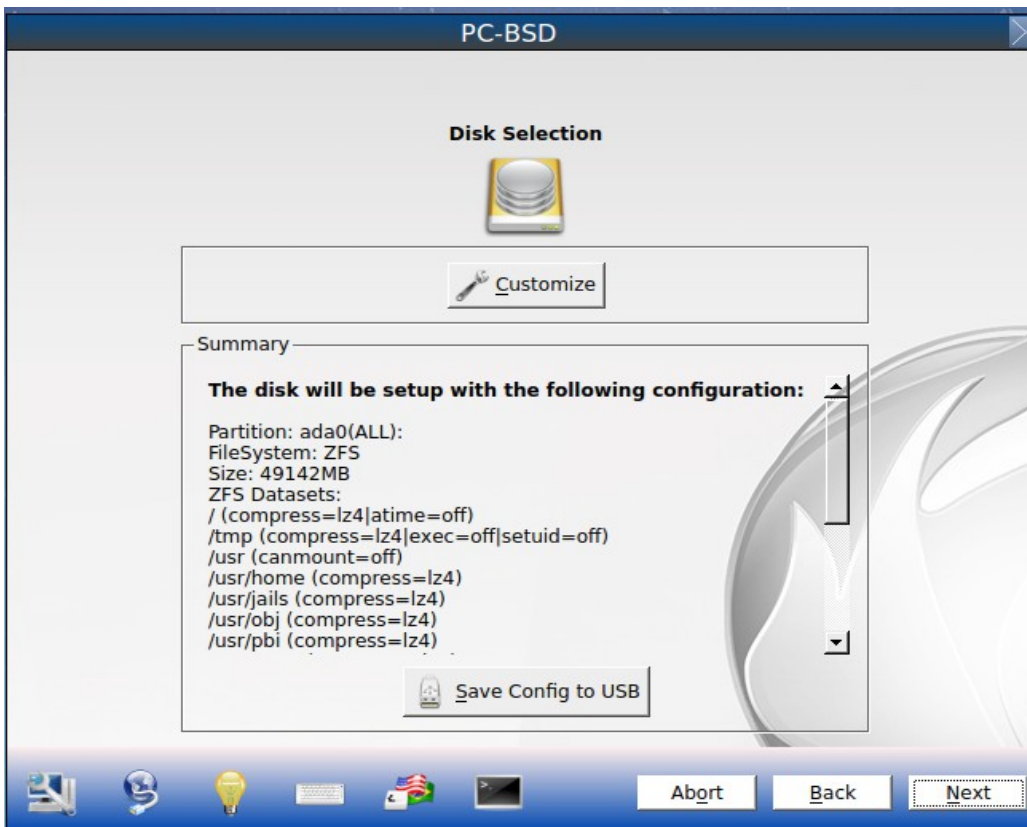
Once you have made your selection(s), click the “Save” button to save your selections. The “PC-BSD Package Selection” box will list the components that you selected for installation. You can now click the “Next” button to proceed to the next screen.

NOTE: if you are installing a desktop, the installer will display a pop-up message if it cannot find a physical or virtual disk that does not meet the recommended minimum size of 50GB. It will let you continue an installation on a smaller disk, but you may run into disk space issues on smaller disks.

3.3 Disk Selection Screen

The “Disk Selection” screen, seen in Figure 3.3a, summarizes the default disk configuration.

Figure 3.3a: Disk Selection Screen

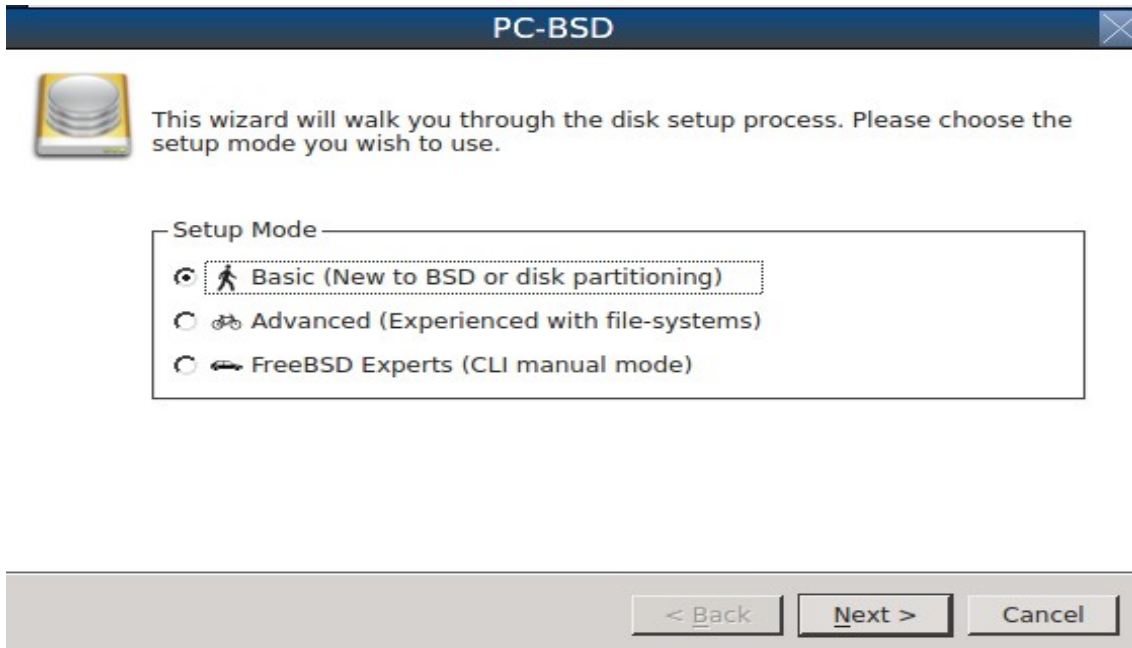


By default, PC-BSD® will assume that you wish to install on the entire first disk.

DANGER! *If you are installing PC-BSD® as the only operating system on your computer, simply click “Next” to start the installation. However, if this is not your intent, review the rest of this section to determine how to layout your disk. If you plan on booting PC-BSD® with another operating system, you should also review the section on [Dual Booting](#).*

If you wish to select which disk or partition to install PC-BSD® into, click the “Customize” button to start the Disk Setup Wizard, shown in Figure 3.3b.

Figure 3.3b: Disk Setup Wizard



The wizard provides three modes of operation. The rest of this section describes these modes in detail.

- **Basic:** (default) select this mode if you wish to specify which partition, disk, or SSD to install to.
- **Advanced:** select this mode if you wish to specify the installation partition or disk, use GPT partitioning, force the block size, install to an SSD, change the boot manager, change the default ZFS pool name, or specify the filesystem layout.
- **FreeBSD Expert:** select this mode if you prefer to drop down to a shell to manually enter the commands to setup your disk.

Regardless of the mode that you select, once the disk wizard completes and you click “Next” at the disk “Summary” screen, a pop-up window will ask if you would like to start the installation. Be sure to review the disk summary before clicking “Yes” and starting the installation.

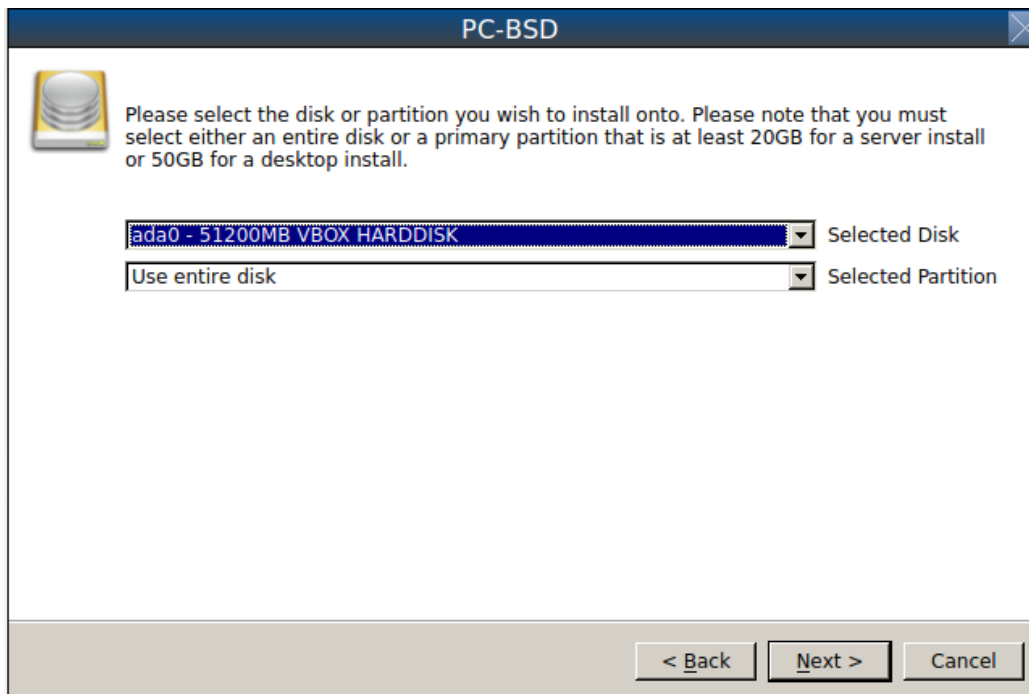
NOTE: the disk “Summary” screen is your *very last chance* to make sure that you are ready. Once you click “Yes”, the selected hard drive or partition will be formatted and any data it contains will be lost.

Once you have finished configuring your disks, you can save the finished configuration to re-use it at a later time. Insert a FAT-formatted USB stick and click “Save Config to USB”.

3.3.1 Basic Mode

If you select “Basic” mode, the wizard will display the screen shown in Figure 3.3c.

Figure 3.3c: Select a Disk or Partition



By default, the first hard disk will be selected. If you wish to install on a different disk, use the “Selected Disk” drop-down menu to select the disk to install into.

By default, the entire selected disk will be formatted. If the disk has been divided into partitions and you wish to install into a specific partition, use the “Selected Partition” drop-down menu to select the desired primary partition.

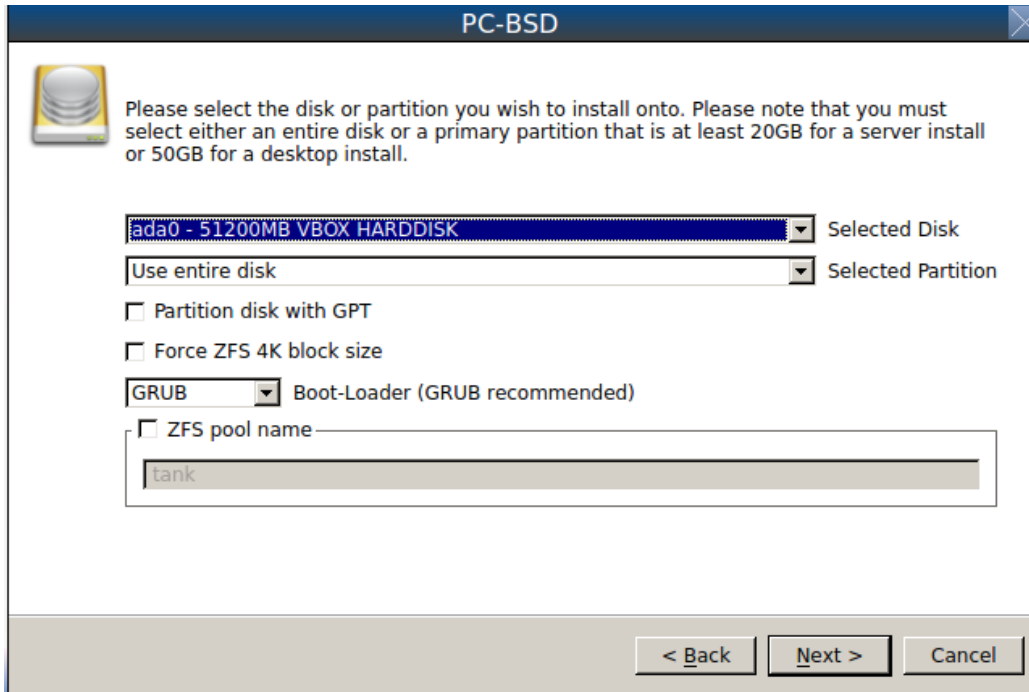
NOTE: PC-BSD® will only install into a primary or GPT partition. That is, you can not install PC-BSD® into a secondary or an extended partition. If you wish to create a new primary partition to install into, see [Partitioning the Hard Drive](#) for instructions on how to do this.

Once you have selected the disk and partition, click “Next” to return to the disk “Summary” screen so that you can review your selections. If you wish to change anything, use the “Back” button to return to a previous screen. Otherwise, click “Finish” to leave the wizard. Click “Next” then “Yes” to start the installation.

3.3.2 Advanced Mode

If you select advanced mode, the wizard will display the screen shown in Figure 3.3d.

Figure 3.3d: Advanced Mode Options



This screen provides the following options:

- **Partition disk with GPT:** [GPT](#) is a partition table layout that supports larger partition sizes than the traditional MBR layout. *If your installation disk/partition is larger than 2 TB, this box must be checked*, otherwise checking this box is optional. Some older motherboards do not support this option. If the installation fails with this option checked, try again with the box unchecked. When in doubt, leave this box unchecked. Checking this box will grey out the “Force ZFS 4K block size” box as using both of these options will cause the boot to fail.
- **Force ZFS 4k block size:** this option should only be checked if you know for sure that the disk supports 4k, even though it lies and reports its size as 512b. Use with caution as it may cause the installation to fail.
- **Boot-Loader:** changing the default of *GRUB* will disable [Boot Manager](#). Choices are *GRUB* (required to use multiple boot environments), *GRUB-slice* (installs GRUB on the partition instead of the MBR so that it can be chain loaded from a different boot loader), *BSD* (installs the FreeBSD boot manager), or *NONE* (does not install a boot manager).
- **ZFS pool name:** if you wish to use a pool name other than the default of *tank*, check this box and input the name of the pool.

After making your selections click “Next” to access the ZFS configuration screens. The rest of this section provides a ZFS overview and demonstrates how to customize the ZFS layout. Note that *root* is a reserved term and can not be used as a pool name.

3.3.2.1 ZFS Overview

ZFS is an enterprise grade file-system, which provides many features including: support for high storage capacities, high reliability, the ability to quickly take snapshots, boot environments, continuous integrity checking and automatic repair, RAIDZ which was designed to overcome the limitations of hardware RAID, and native NFSv4 ACLs.

If you are new to ZFS, the [Wikipedia entry on ZFS](#) provides an excellent starting point to learn about its features. These resources are also useful to bookmark and refer to as needed:

- [ZFS Evil Tuning Guide](#)
- [FreeBSD ZFS Tuning Guide](#)
- [ZFS Best Practices Guide](#)
- [ZFS Administration Guide](#)
- [Becoming a ZFS Ninja \(video\)](#)
- [blog post explaining how ZFS simplifies the storage stack](#)

The following is a glossary of terms used by ZFS:

Pool: a collection of devices that provides physical storage and data replication managed by ZFS. This pooled storage model eliminates the concept of volumes and the associated problems of partitions, provisioning, wasted bandwidth and stranded storage. Thousands of filesystems can draw from a common storage pool, each one consuming only as much space as it actually needs. The combined I/O bandwidth of all devices in the pool is available to all filesystems at all times. The [Storage Pools Recommendations](#) of the ZFS Best Practices Guide provides detailed recommendations for creating the storage pool.

Mirror: a form of RAID where all data is mirrored onto two or more disks, creating a redundant copy should a disk fail.

RAIDZ: ZFS software solution that is equivalent to RAID5 in that it allows one disk to fail without losing data. Requires a minimum of 3 disks though 5 disks is recommended.

RAIDZ2: double-parity ZFS software solution that is similar to RAID6 in that it allows two disks to fail without losing data. Requires a minimum of 4 disks.

RAIDZ3: triple-parity ZFS software solution. RAIDZ3 offers three parity drives and can operate in degraded mode if up to three drives fail with no restrictions on which drives can fail.

Dataset: once a pool is created, it can be divided into datasets. A dataset is similar to a folder in that it supports permissions. A dataset is also similar to a filesystem in that you can set properties such as quotas and compression.

Snapshot: a read-only point-in-time copy of a filesystem. Snapshots can be created quickly and, if little data changes, new snapshots take up very little space. For example, a snapshot where no files have changed takes 0MB of storage, but if you change a 10GB file it will keep a copy of both the old and the new 10GB version. Snapshots provide a clever way of keeping a history of files, should you need to recover an older copy or even a deleted file. For this reason, many administrators take snapshots often (e.g. every 15 minutes), store them for a period of time (e.g. for a month), and store them on another system. Such a strategy allows the administrator to roll the system back to a specific time or, if there is a catastrophic loss, an off-site snapshot can restore the system up to the last snapshot interval (e.g. within 15 minutes of the data loss). Snapshots can be cloned or rolled back, but the files on the snapshot can not be accessed independently.

Clone: a writable copy of a snapshot which can only be created on the same ZFS volume. Clones provide an extremely space-efficient way to store many copies of mostly-shared data such as workspaces, software installations, and diskless clients. Clones do not inherit the properties of the parent dataset, but rather inherit the properties based on where the clone is created in the ZFS pool. Because a clone initially shares all its disk space with the original snapshot, its used property is initially zero. As changes are made to the clone, it uses more space.

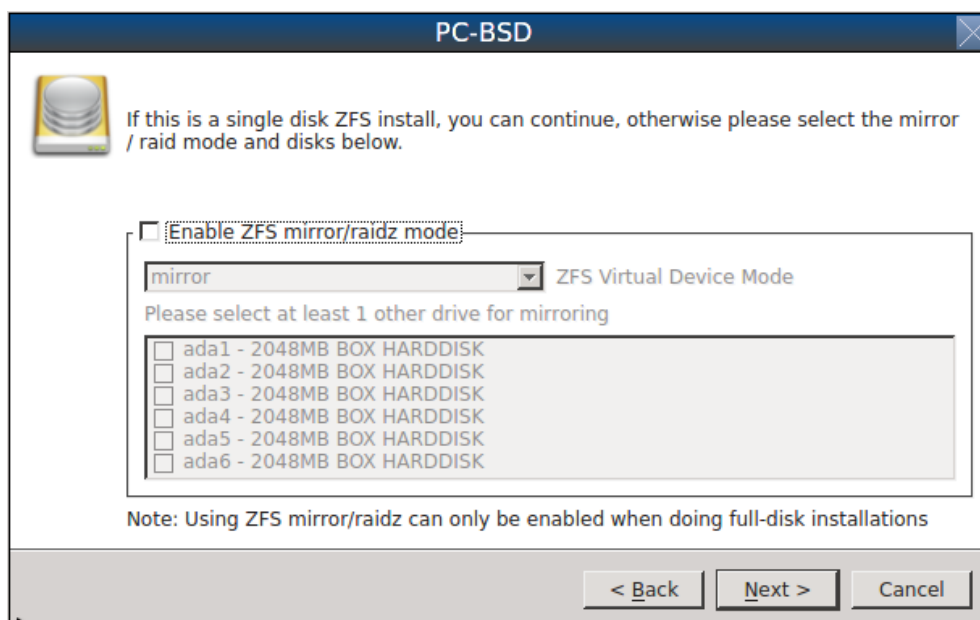
ZIL: ([ZFS Intent Log](#)) is effectively a filesystem journal that manages writes. The ZIL is a temporary storage area for sync writes until they are written asynchronously to the ZFS pool. If the system has many sync writes, such as from a database server, performance can be increased by adding a dedicated log device known as a SLOG (Secondary LOG). If the system has few sync writes, a SLOG will not speed up writes. When creating a dedicated log device, it is recommended to use a fast SSD with a supercapacitor or a bank of capacitors that can handle writing the contents of the SSD's RAM to the SSD. If you decide to create a dedicated log device, the SSD should be half the size of system RAM as anything larger than that is unused capacity. Note that a dedicated log device can not be shared between ZFS pools and that the same device cannot hold both a log and a cache device.

L2ARC: ZFS uses a RAM cache to reduce read latency. If an SSD is dedicated as a cache device, it is known as an L2ARC and ZFS uses it to store more reads which can increase random read performance. However, adding a cache device will not improve a system with too little RAM and will actually decrease performance as ZFS uses RAM to track the contents of L2ARC. RAM is always faster than disks, so always add as much RAM as possible before determining if the system would benefit from a L2ARC device. If you have a lot of applications that do large amounts of random reads, on a dataset small enough to fit into the L2ARC, read performance may be increased by adding a dedicated cache device. SSD cache devices only help if your working set is larger than system RAM, but small enough that a significant percentage of it will fit on the SSD. Note that a dedicated L2ARC device can not be shared between ZFS pools.

3.3.2.2 ZFS Layout

In Advanced Mode, the disk setup wizard allows you to configure your ZFS layout. The initial ZFS configuration screen is seen in Figure 3.3e.

Figure 3.3e: ZFS Configuration



If your system contains multiple drives and you would like to use them to create a ZFS mirror or RAIDZ, check the box “Enable ZFS mirror/raidz mode” which will enable the rest of the options in this screen. In the example shown in Figure 3.3e, the system has 7 disks, all of which are the same size. The first disk, *ada0*, was pre-selected in Figure 3.3d and the remaining 6 disks (*ada1* to *ada6*) are available to be added to the ZFS pool.

NOTE: the PC-BSD® installer requires you to use entire disks (not partitions) when creating a ZFS mirror or RAIDZ.

If you have never configured a RAIDZ before, take the time to read the [RAIDZ Configuration Requirements and Recommendations](#) first. It indicates the optimum number of disks for each type of configuration. While ZFS will let you use disks of different sizes, this is discouraged as it will decrease decrease storage capacity and performance of the ZFS system.

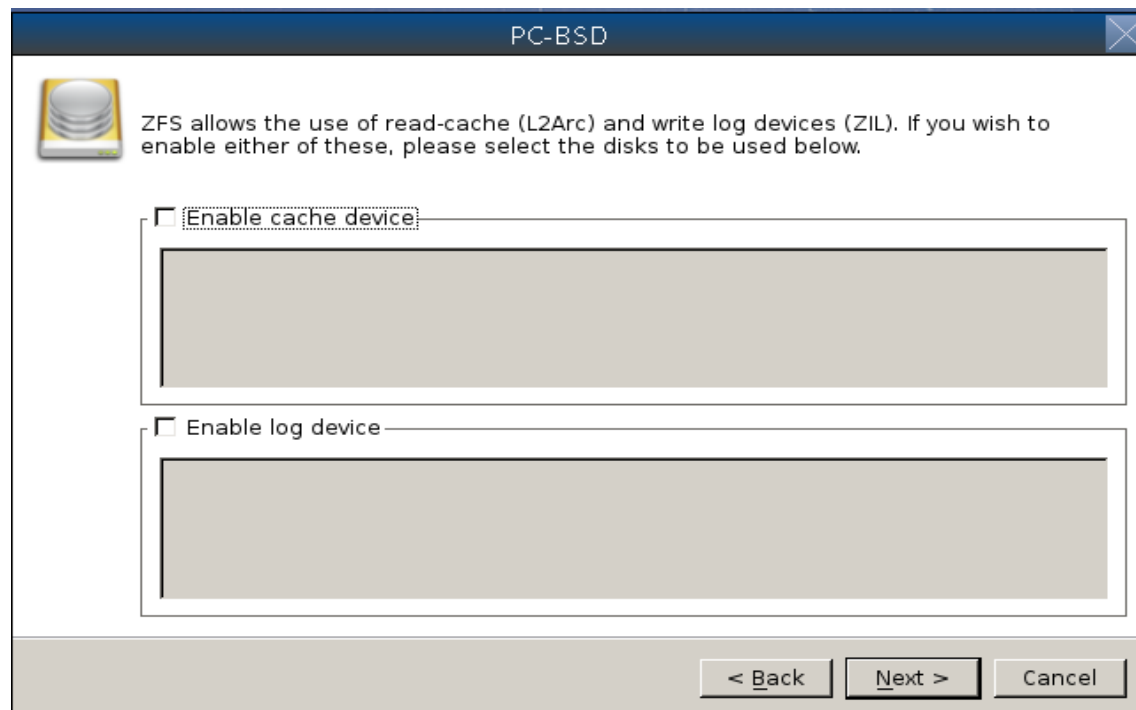
The PC-BSD® installer supports the following ZFS configurations:

- mirror: requires a minimum of 2 disks.
- RAIDZ1: requires a minimum of 3 disks. For best performance, a maximum of 9 disks is recommended.
- RAIDZ2: requires a minimum of 4 disks. For best performance, a maximum of 10 disks is recommended.
- RAIDZ3: requires a minimum of 5 disks. For best performance, a maximum of 11 disks is recommended.

The installer will not let you save a configuration if your system does not meet the minimum number of disks required by that configuration. As you select a configuration, a message will indicate how many more disks you need to select.

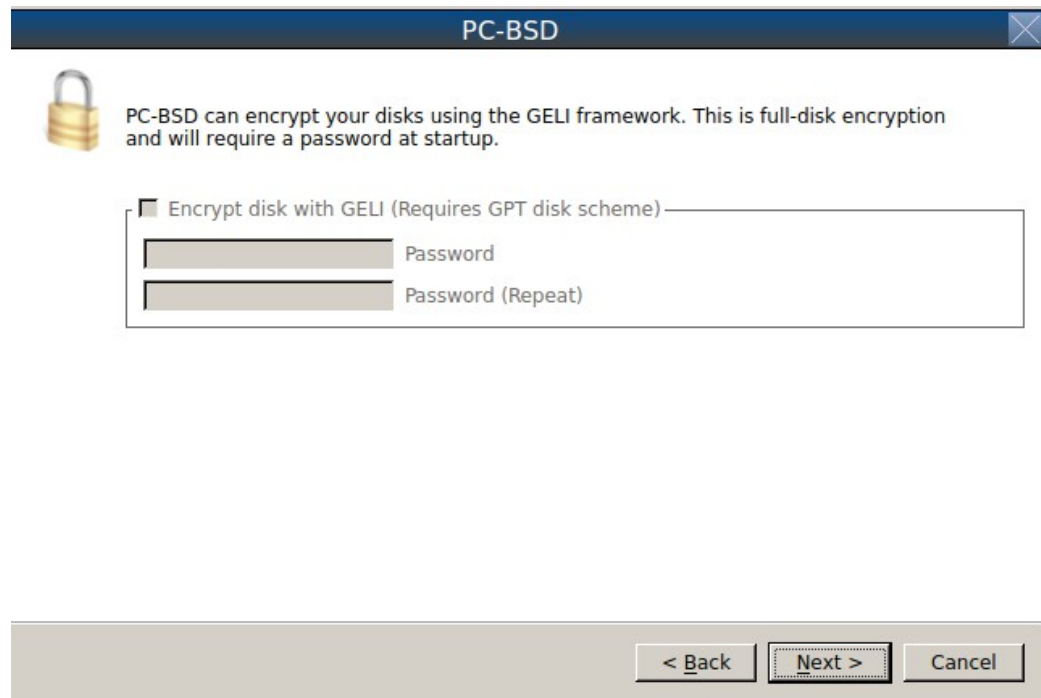
To use multiple disks, select the type of configuration from the “ZFS Virtual Device Mode” drop-down menu, then check the box for each disk that you would like to add to that configuration. When finished, click the “Next” button to see the screen shown in Figure 3.3f.

Figure 3.3f: Add L2ARC or ZIL



This screen can be used to specify an SSD to use as an L2ARC or a secondary log device. Note that a separate SSD is needed for each type of device. Refer to the descriptions for ZIL and L2ARC in the [ZFS Overview](#) section to determine if your system would benefit from any of these devices before adding them in this screen. When finished, click “Next” to see the screen shown in Figure 3.3g.

Figure 3.3g: Configure Encryption



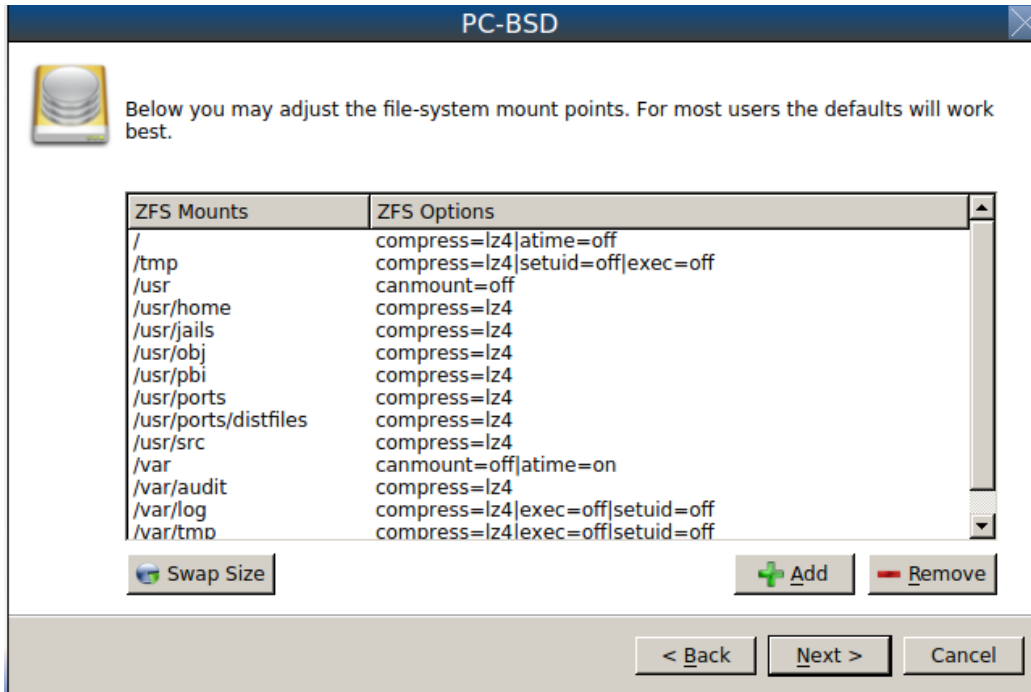
This screen can be used to configure full-disk encryption which is meant to protect the data on the disks should the system itself be lost or stolen. This type of encryption prevents the data on the disks from being available during bootup, unless the correct passphrase is typed at the bootup screen. Once the passphrase is accepted, the data is unencrypted and can easily be read from disk.

To configure full disk encryption, check the box “Encrypt disk with GELI”. This option will be greyed out if “Partition disk with GPT” is not selected as GELI does not support MBR partitioning at this time. If needed, use the “Back” button to go back to the screen and check the box for GPT partitioning. Once the “Encrypt disk with GELI” box is checked, input a good passphrase twice into the “Password” fields. This password should be long and something that you will not forget, but hard for other users, especially those who know you, to guess.

DANGER: if you ever forget this passphrase, you will be unable to decrypt the disks and will lose access to their data!

When finished, click “Next” to move on the screen shown in Figure 3.3h.

Figure 3.3h: Default ZFS Layout



Regardless of how many disks you selected for your ZFS configuration, the default layout will be the same. ZFS does not require separate partitions for `/usr`, `/tmp`, or `/var`. Instead, you create one ZFS partition (pool) and specify a mount for each dataset. A `/boot` partition is not mandatory with ZFS as the PC-BSD® installer puts a 64k partition at the beginning of the drive.

NOTE: *do not remove any of the default mount points* as they are used by PC-BSD®.

You can use the “Add” button to add additional mount points. You will only be prompted for the name of the mount point as size is not limited at creation time. Instead, the data on any mount point can continue to grow as long as space remains within the ZFS pool.

If you wish to set the swap size, click the “Swap Size” button. This will prompt you to enter a size in MB. If you have created a RAIDZ or mirror, a swap partition of the specified size will be created on each disk and mirrored between the drives. For example, if you specify a 2048MB swap size, a 2GB swap partition will be created on all of the specified disks, yet the total swap size will be 2GB, due to redundancy.

If you right-click any mount point, you can toggle between enabling or disabling any of the following ZFS properties.

- **atime:** when set to “on”, controls whether the access time for files is updated when they are read. When set to “off”, this property avoids producing write traffic when reading files and can result in significant performance gains, though it might confuse mailers and some other utilities.
- **canmount:** if set to “off”, the filesystem can not be mounted.
- **checksum:** automatically verifies the integrity of the data stored on disks. *Setting this property to “off” is highly discouraged.*
- **compression:** if set to “on”, automatically compresses stored data to conserve disk space.
- **exec:** if set to “off”, processes can not be executed from within this filesystem.

Once you click “Next”, the wizard will show a summary of your selections. If you wish to change anything, use the “Back” button to return to a previous screen. Otherwise, click “Finish” to leave the wizard and return to the “Disk Selection” screen.

3.3.3 FreeBSD Expert Mode

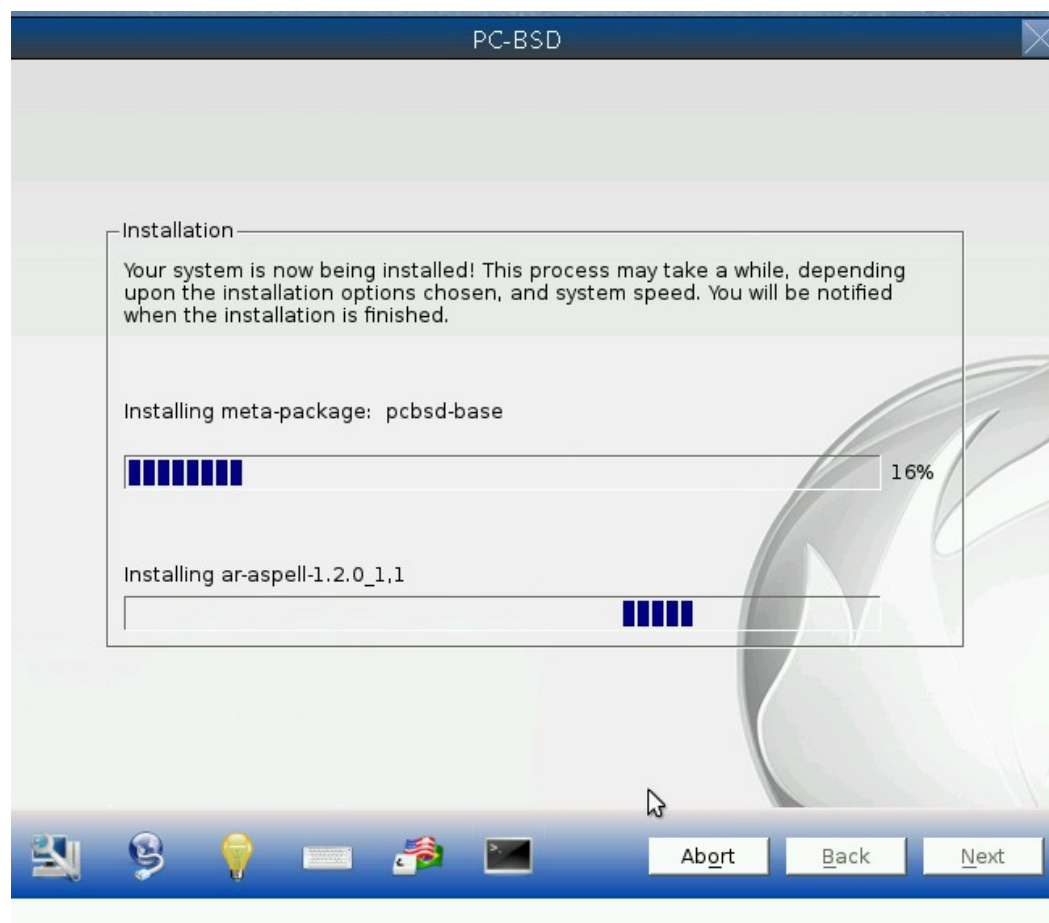
If you select FreeBSD expert mode, you will be prompted to launch a terminal where you can use command line utilities such as `bsdinstall` to manually configure the partitions. When you are finished, type `exit` to leave the terminal, then click “Next” to review the disk summary. If you wish to change anything, use the “Back” button to return to a previous screen. Otherwise, click “Finish” to leave the wizard and return to the “Disk Selection” screen.

3.4 Installation Progress Screen

Once you select “Yes” to start the installation, a progress screen, seen in Figure 3.4a, provides a progress bar and messages so that you can watch the installation's progress.

How long the installation takes depends upon the speed of your hardware, the installation type you selected, and the number of components to be installed. A typical installation takes between 15 and 30 minutes.

Figure 3.4a: Installation Progress Screen

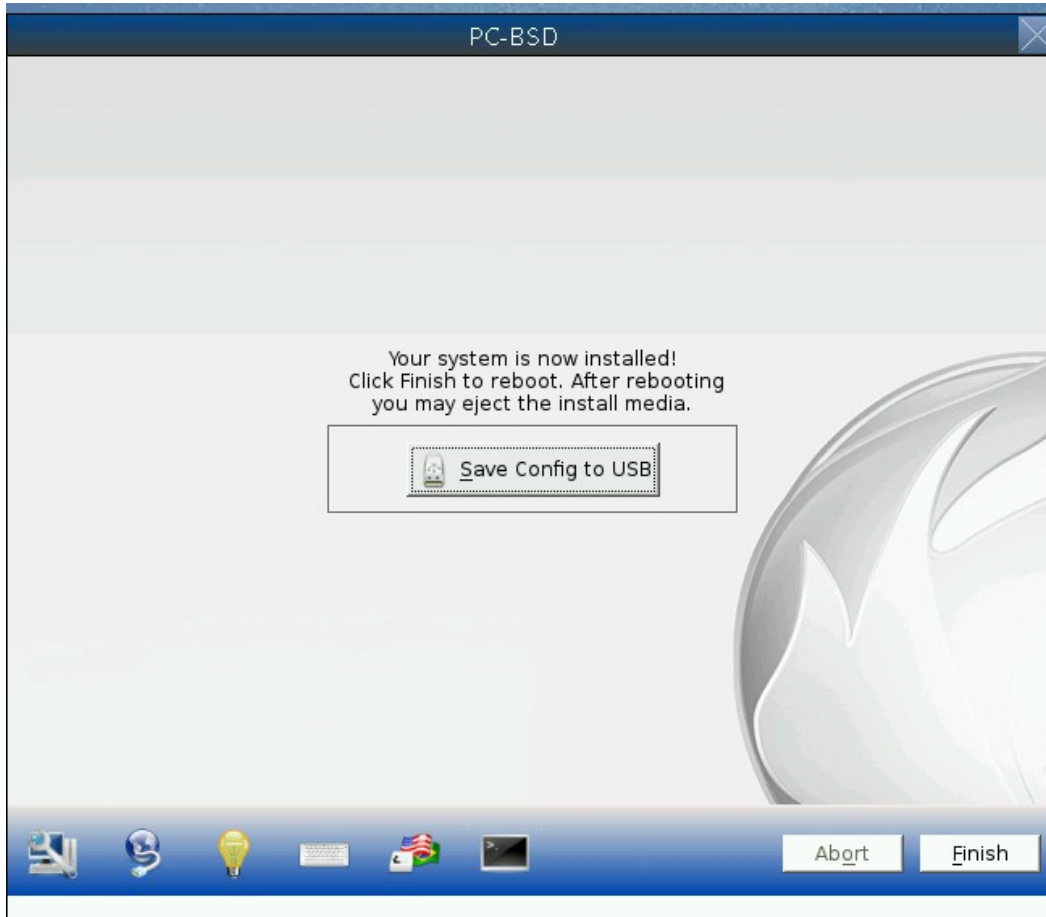


3.5 Installation Finished Screen

The screen shown in Figure 3.5a appears once the installation is complete.

Click the “Finish” button to reboot into your PC-BSD® installation. Wait until the installer exits before removing the installation media.

Figure 3.5a: PC-BSD® Installation is Now Complete



4 Post Installation Configuration and Installation Troubleshooting

Once PC-BSD® is installed, it will reboot into the new operating system.

Once the PC-BSD® system has finished booting for the first time, the installer will present you with some additional screens so that you can configure your system. This section describes the following post-installation steps and provides some troubleshooting tips for failed installations.

- [Booting Into PC-BSD®](#)
- [Language Screen](#)
- [Time Zone Selection Screen](#)
- [Set Root Password Screen](#)

- [Create a User Screen](#)
- [Connect to a Wireless Network](#)
- [Post Install Finished Screen](#)
- [Logging In](#)
- [Installation Troubleshooting](#)

4.1 Booting Into PC-BSD®

After installation, PC-BSD® will reboot and you will be prompted to configure your system and to login to a desktop.

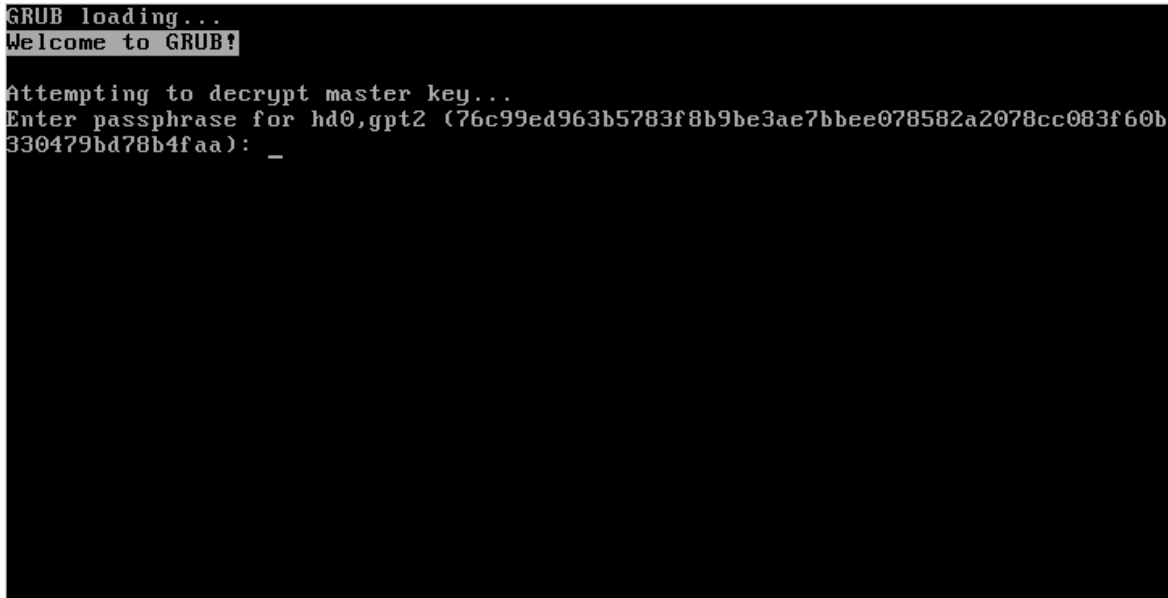
Once the first boot is complete, the installer will attempt to set the optimal display settings. A pop-up menu will ask if you would like to accept these settings. Simply click “Yes” to continue. PC-BSD® will then proceed to the first [post-configuration screen](#).

Read through the rest of this section if you have encrypted your disk(s), your system hangs at boot time, or if you have problems setting the display settings. If you are dual booting and your other operating system was not automatically added to the graphical boot menu by the installer, refer to [Dual Booting](#).

4.1.1 If you Encrypted Your Disks

If you selected the “Encrypt disk with GELI” checkbox during installation, you will need physical access to the PC-BSD® system when it boots. As the system starts to boot, it will display a message similar to the one shown in Figure 4.1a.

Figure 4.1a: Input Password to Decrypt Master Key

A screenshot of a terminal window during the GRUB boot process. The text displayed is as follows:

```
GRUB loading...
Welcome to GRUB!

Attempting to decrypt master key...
Enter passphrase for hd0,gpt2 (76c99ed963b5783f8b9be3ae7bbe078582a2078cc083f60b
330479bd78b4faa): _
```

The rest of the terminal area is blacked out, indicating that the password input is hidden.

The boot process will wait for you to successfully input the password that you created in the installation screen shown in Figure 3.3g. If the correct password is typed in, the system will continue to boot.

4.1.2 Interrupting the Boot to Access the Boot Menu

By default, the graphical PC-BSD® bootloader menu shown in Figure 4.1b is not displayed at boot time.

Figure 4.1b: PC-BSD® Graphical Boot Menu

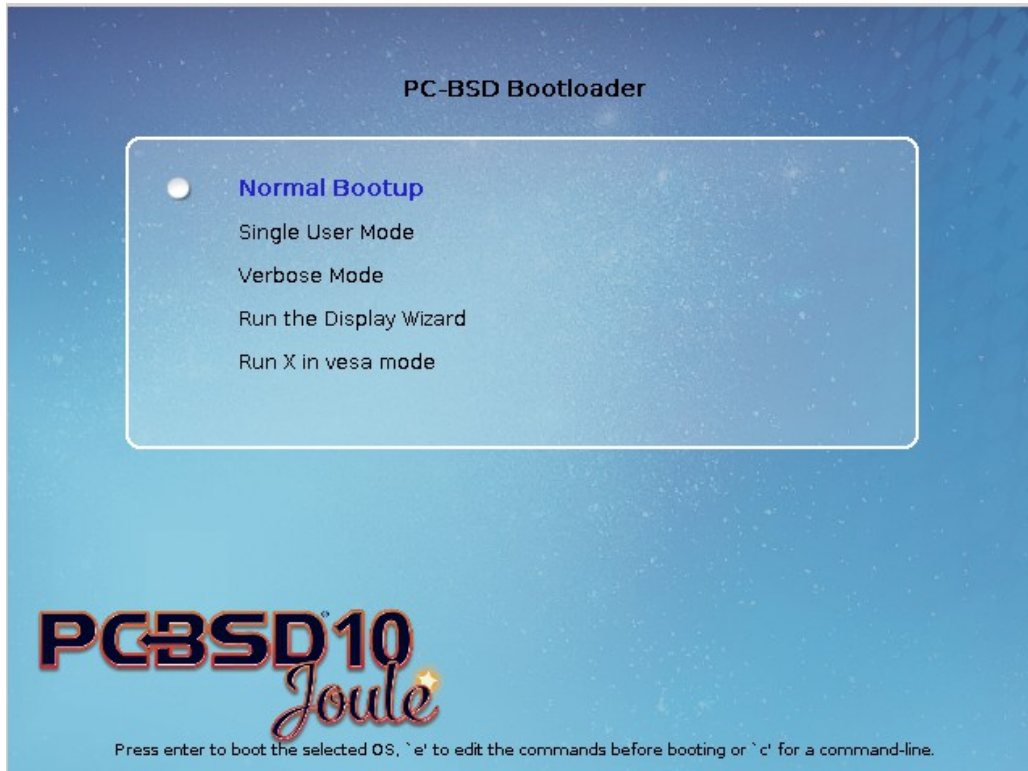


This menu is used to display the installation of PC-BSD®, any boot environments created with [Boot Manager](#), and other operating systems installed on a dual-boot system.

To access this menu, you have to be quick. As soon as the boot process starts and you see a “GRUB loading” message in the upper left corner, press the left Shift button. After the system boots, you can increase the timer value in [Boot Manager](#) if you find that the boot delay is too quick.

Once you access the graphical menu, it will pause for a few seconds then continue to boot PC-BSD®. If you wish to select a different operating system or specify how PC-BSD® boots, press a key to pause this screen. If multiple operating systems are available and you want to boot into PC-BSD®, make sure it is highlighted and press enter. This will load the PC-BSD® boot options screen shown in Figure 4.1c.

Figure 4.1c: PC-BSD® Graphical Boot Menu Options



The following boot options are available:

- **Normal Bootup:** continues to boot PC-BSD®.
- **Single User Mode:** advanced users can select this option to fix critical system failures.
- **Verbose Mode:** select this option if you would like to see more detailed messages during the boot process. This can be useful if you are troubleshooting a piece of hardware.
- **Run the Display Wizard:** if you are unable to access the GUI due to a display setting, enable this option to boot into the display settings wizard.
- **Run X in vesa mode:** try this option if the screen goes black or the system freezes when booting into PC-BSD®.

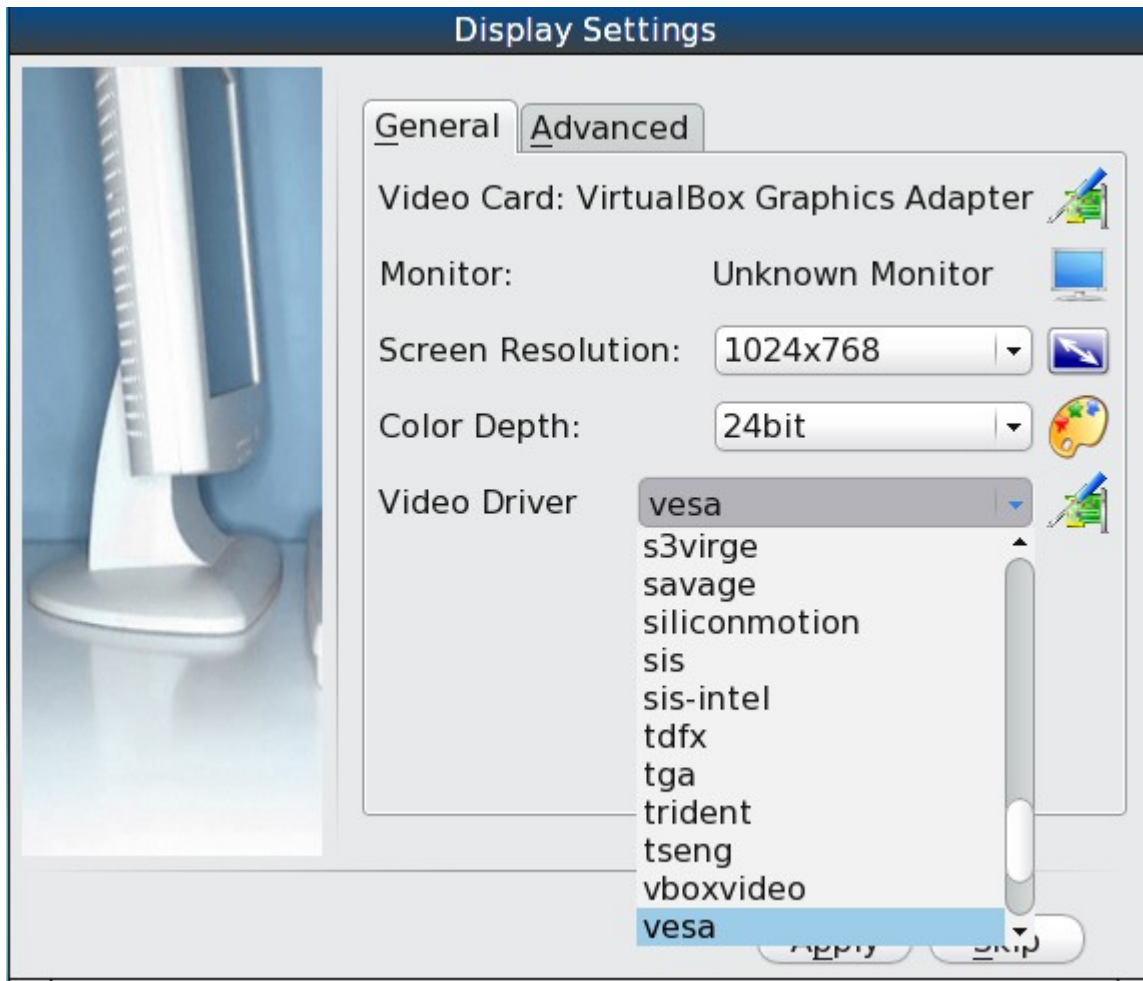
Use the arrow keys to select an option then press enter to boot using that option.

This menu is provided by GRUB. If you are familiar with editing GRUB, you can press *e* to access the GRUB editor or *c* to access the GRUB command line.

4.1.3 If Your Display is Not Automatically Detected

If the optimal display settings can not be determined during first boot, if you select “No” in the “Confirm Resolution” screen when asked to confirm the display settings, or if you select “Run the Display Wizard” from the boot menu, the “Display Settings” screen shown in Figure 4.1d will launch.

Figure 4.1d: Display Settings Wizard



The settings in this screen are described in more detail in [Display](#). If you wish to return to this display wizard at a later time, go to Control Panel → Display.

If you change any display settings, click the “Apply” button for the settings to be tested. If anything goes wrong during testing, you will be taken back to the “Display Settings” screen so that you can try another setting. Once you are happy with the tested setting, click the “Yes” button to save the setting and to proceed.

4.2 Language Screen

The language selection screen is seen in Figure 4.2a.

Figure 4.2a: Language Selection Screen



This allows you to select the language you will use to access the installed system.

Once you have made your selection, click “Next” to go to the next configuration screen.

4.3 Time Zone Selection Screen

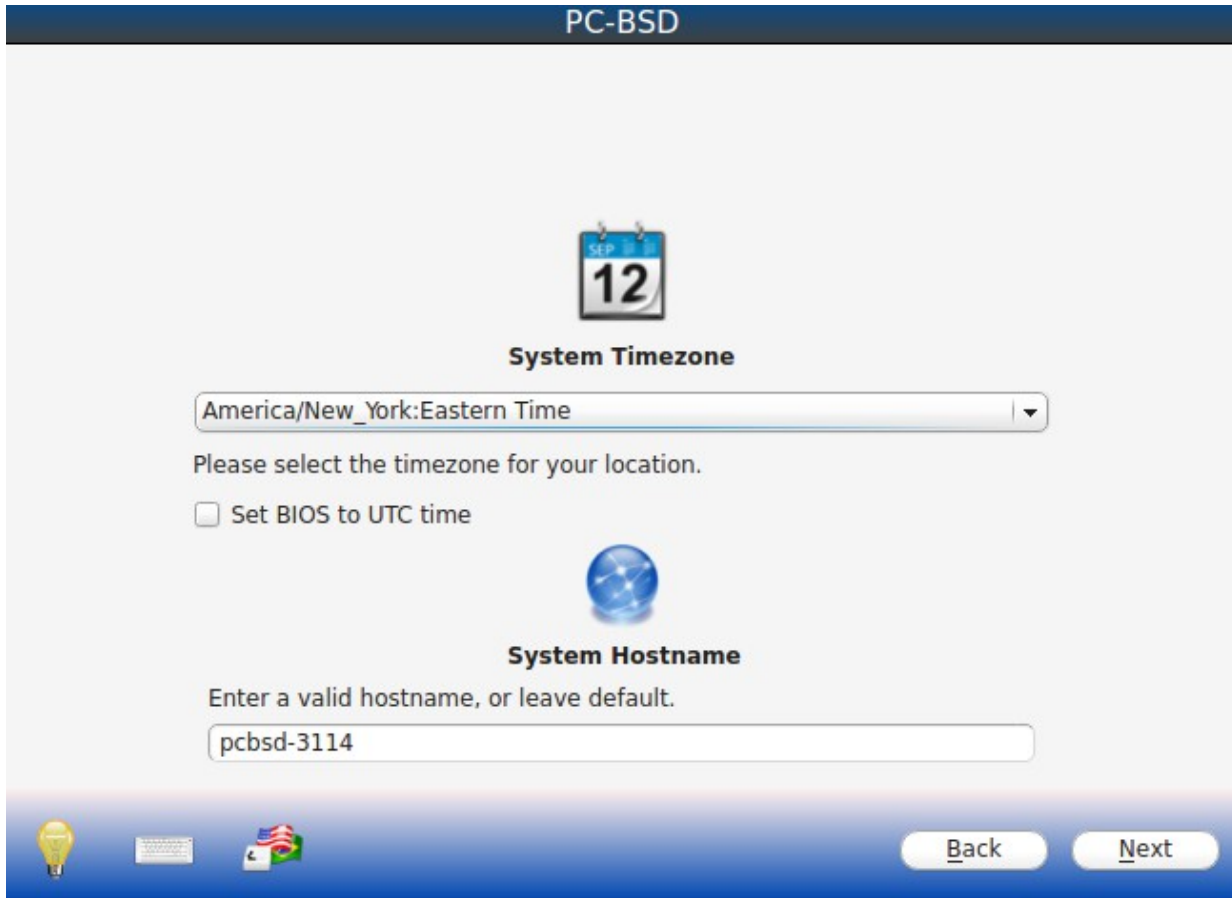
The next configuration screen, shown in Figure 4.3a, allows you to select your timezone. Use the drop-down menu to select the city closest to your location. If the system is connected to the Internet, the installer will most likely have the correct timezone already selected.

If the system is dual booting and the other operating system expects the BIOS to use UTC, also check the box “Set BIOS to UTC time”.

A default system hostname will be created for you. If you wish to change the default, type in the desired hostname in the “System Hostname” field.

When finished, click “Next” to proceed to the next screen.

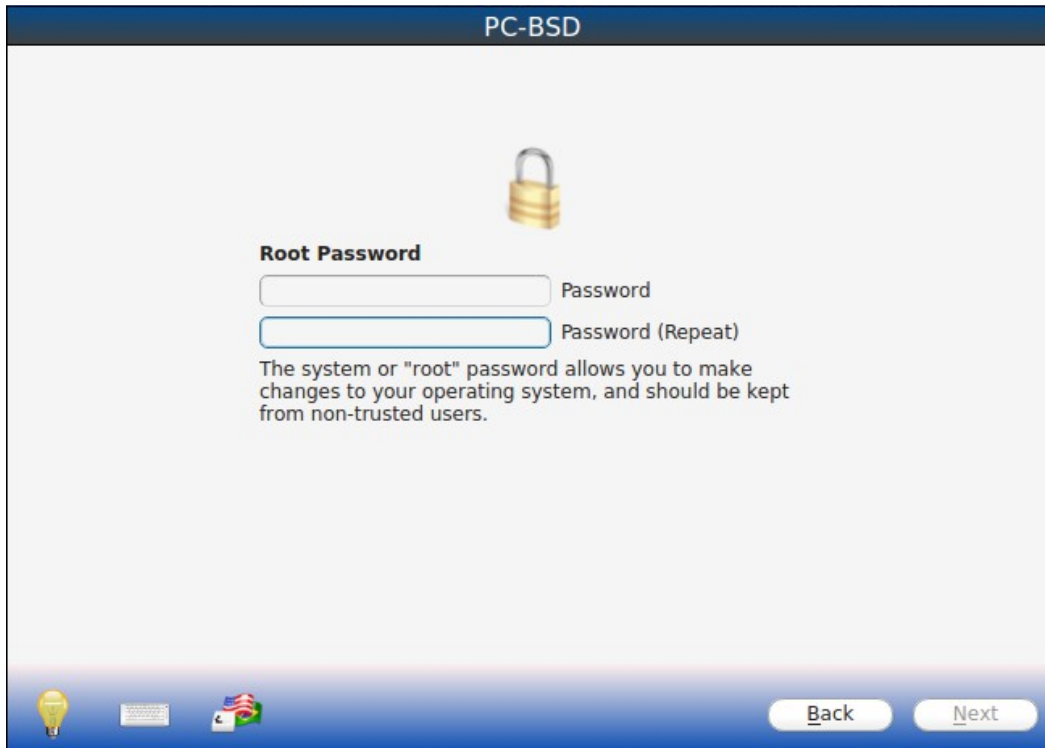
Figure 4.3a: Select Time Zone



4.4 Set Root Password Screen

This configuration screen, seen in Figure 4.4a, requires you to set the root password. The password must be a minimum of 4 characters and you are required to type it in twice to confirm the password. Click the “Next” button when you are finished.

Figure 4.4a: Set Root Password



4.5 Create a User Screen

This screen is used to create the primary user account that will be used to login to the system. Set a good value for the password as it is used whenever the system indicates that administrative access is required.

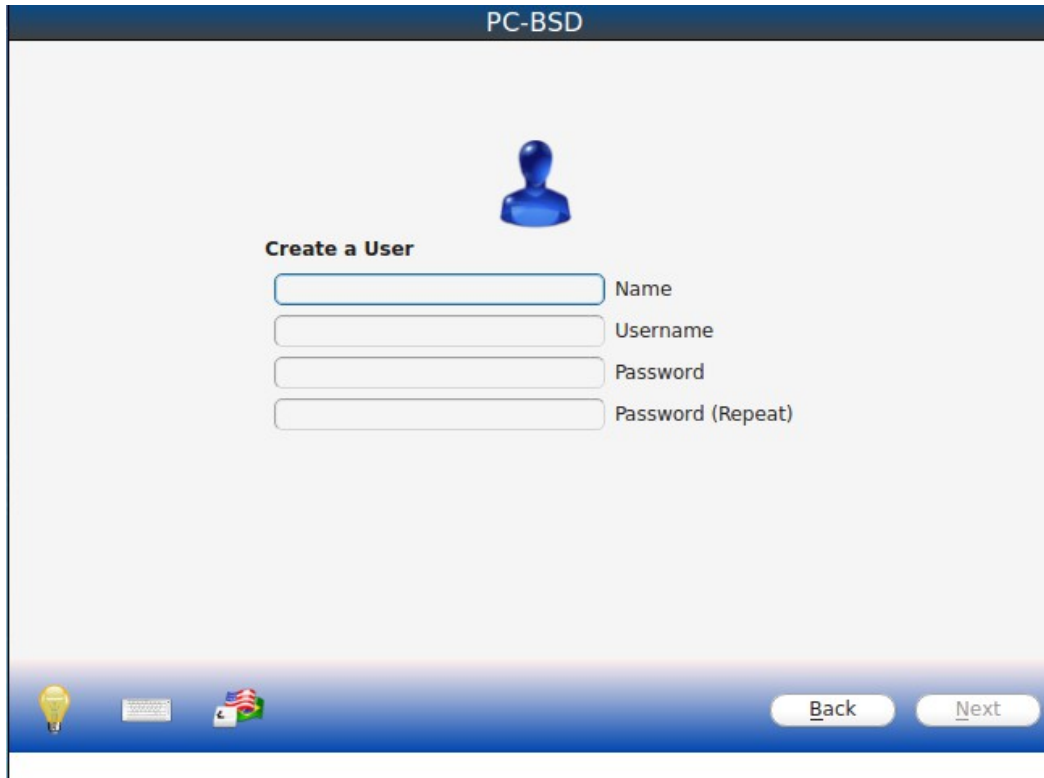
Figure 4.5a shows the configuration screen used to create the initial user account.

This screen requires you to complete the following fields:

- **Name:** this value will be displayed in the login screen. It can be your full name and can contain capital letters and spaces.
- **Username:** this is the name you will use when logging in. It can not contain spaces and is case sensitive (e.g. Kris is a different username than kris).
- **Password:** this is the password you will use when logging in. You must type it twice in order to confirm it.

If you share your computer with other users, you will be able to create additional user accounts once you are logged in using Control Panel → [User Manager](#).

Figure 4.5a: User Creation Screen



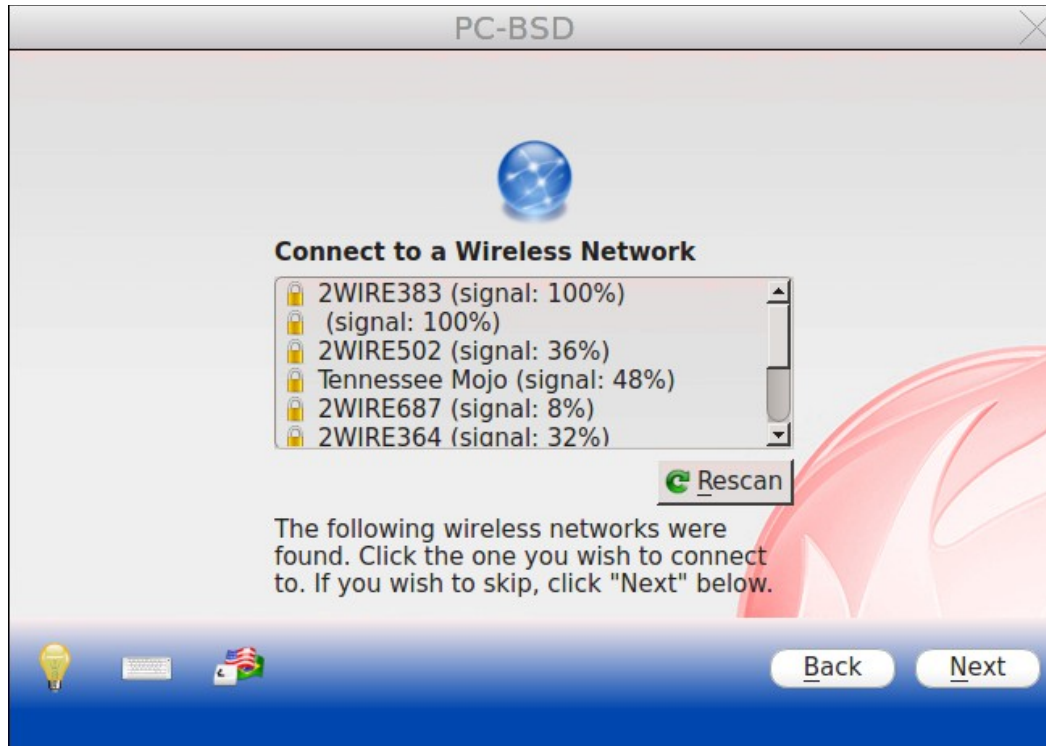
4.6 Connect to a Wireless Network

If the system has an active wireless interface, a screen similar to Figure 4.6a will indicate the wireless networks which were automatically detected.

If you would like to set the default wireless connection, highlight the network that you would like to connect to. If the network does not appear, you can click the “Rescan” button. If you are unable to connect or you wish to configure the connection at a later time, see the section on [Network Configuration](#).

When finished, click the “Next” button to continue the post-configuration tasks.

Figure 4.6a: Connect to a Wireless Network



4.7 Post Install Finished Screen

The screen in Figure 4.7a indicates that the post-installation setup is complete. Click the “Finish” button to access the login menu.

Figure 4.7a: Setup is Complete



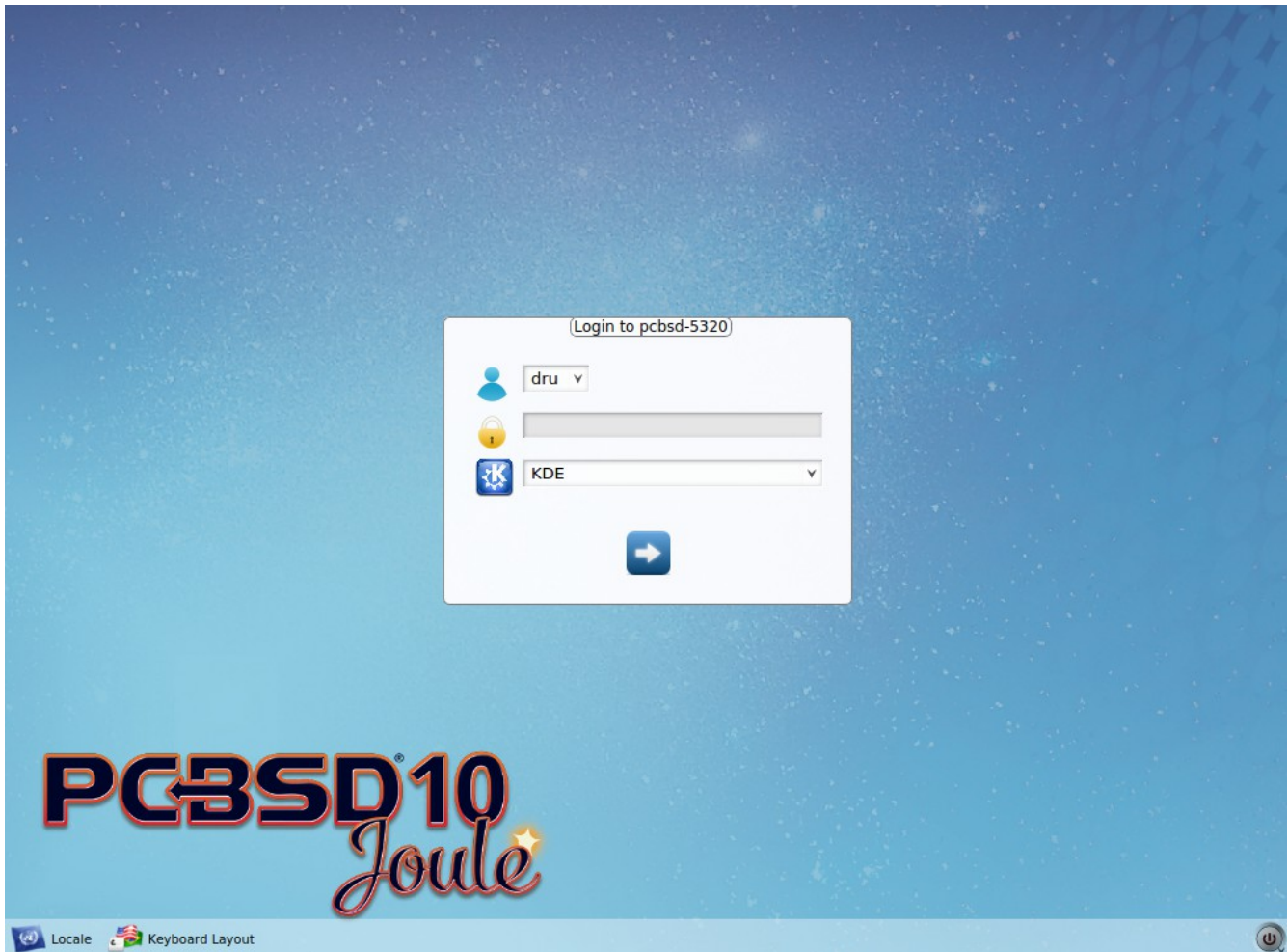
4.8 Logging In

Once you have finished setting up your system, you will be presented with the PCDM (PC-BSD® Display Manager) graphical login screen seen in Figure 4.8a.

The hostname of the system will be displayed at the top of the login window. In this example, it is *pcbsd-5320*. The login window lets you select or input the following:

- **user:** the first time you login, the Username that you created in the [Create a User Screen](#) will be the only available user to login as. Later, if you create additional users using [User Manager](#), they will be added to the drop-down menu so you choose which user to login as. PCDM will not let you login as the *root* user. Instead, whenever you access a utility that requires administrative access, PC-BSD® will first ask you to confirm your password.
- **password:** input the password associated with the selected user.
- **desktop:** if you installed any desktops, use the drop-down menu to select the desktop to log into. If you did not install any desktops, Fluxbox will be the only available desktop. You can install or uninstall desktops using AppCafe®.

Figure 4.8a: PC-BSD® Login Screen



The toolbar at the bottom of the screen allows you to select the following options:

- **Locale:** if you did not set the localization during installation or wish to change it, click this icon to set the locale for the login session.
- **Keyboard Layout:** click this icon to change the keyboard layout for the login session.
- **Restart/Shut Down:** if you wish to restart or shutdown the system without logging in, click the icon in the lower, far right corner.

These options allow you to select your language, keyboard layout, and desktop to use for the login session. Once you have made your selections, input the password associated with the selected user and press enter.

Once you have made your selections, click the blue arrow icon to login.

4.8.1 Welcome & Getting Started

The first time you log in, the PC-BSD® “Getting Started” screen will load as seen in Figure 4.8b.

Figure 4.8b: PC-BSD® Getting Started Screen



If you click the “Next” button, you can read an overview of the utilities that are used to configure your network connection, install applications, configure your system, make a backup, and keep the system updated, as well as how to get involved with the PC-BSD® community. Check the box “Don't show on next startup” if you do not want to see this screen the next time you log in. To re-open the screen after checking that box, type **pc-welcome**.

4.9 Installation Troubleshooting

Installing PC-BSD® is usually an easy process that “just works”. However, sometimes you will run into a problem. This section will look at solutions to the most common installation problems.

4.9.1 Installation Starts But Fails

The PC-BSD® installer creates a log which keeps a record of all the steps that are completed as well as any errors. When an installation error occurs, the PC-BSD® installer will ask if you would like to generate an error report. If you click “Yes”, a pop-up message will ask if you would like to save the error log to a USB stick. Type **y** and insert a FAT formatted USB thumb drive to copy the log.

While in the installer, you can read this log to see what went wrong. Right-click an area on the desktop outside of the installation window and select “xterm” from the menu. You can read the log with this command:

```
more /tmp/.SysInstall.log
```

If you can not figure out how to fix the error or believe that you have discovered an installation bug, send the log that was saved on the USB stick using the [PC-BSD® Bug Reporting tool](#).

4.9.2 System Does Not Boot Into the Installer

If the installer does not make it to the initial GUI installer screen, try unplugging as many devices as possible, such as webcams, scanners, printers, USB mice and keyboards. If this solves the problem, plug in one piece of hardware at a time, then reboot. This will help you pinpoint which device is causing the problem.

If your computer freezes while probing hardware and unplugging extra devices does not fix the problem, it is possible that the installation media is corrupt. If the [checksum](#) on the file you downloaded is correct, try burning the file again at a lower speed.

If the system freezes and you suspect the video card to be the cause, review your system's BIOS settings. If there is a setting for video memory, set it to its highest value. Also check to see if the BIOS is set to prefer built-in graphics or a non-existent graphics card. On some systems this is determined by the order of the devices listed; in this case, make sure that the preferred device is listed first. If you can not see your BIOS settings you may need to move a jumper or remove a battery to make it revert to the default of built-in graphics; check your manual or contact your manufacturer for details.

If that change did not help, try rebooting and selecting option “Graphical Install (Failsafe VESA mode)” from the boot menu shown in Figure 3a.

A not uncommon cause for problems is the LBA (Logical Block Addressing) setting in the BIOS. If your PC is not booting up before or after installation, check your BIOS and turn LBA off (do not leave it on automatic).

If the SATA settings in your BIOS are set to “compatibility” mode, try changing this setting to “AHCI”. If the system hangs with a BTX error, try turning off AHCI in the BIOS.

4.9.3 USB Keyboard Does Not Work in Installer

If the USB keyboard is non-functional, check if there is an option in your BIOS for “legacy support” in relation to the keyboard or to USB, or both. Enabling this feature in your BIOS may solve this issue.

4.9.4 mountroot prompt

If you boot your system and you receive a *mountroot>* command prompt, it may be due to a change in the location of the boot device. This can occur when the installation was made on another machine and then transferring the HDD without an adjustment to the */etc/fstab* file, or if a card reader is involved (including card readers on a USB dongle). The solution is to enter *ufs:/dev/dal* at the prompt (it will always be *ufs* for the installer media). Depending on the exact location of the boot media, it may be different than *dal*. Typing *?* at the prompt should display available devices.

4.9.5 Getting Help

If none of the above has fixed your problem, search the [PC-BSD® forums](#) to see if a solution exists, try a web search, or check the section on [Finding Help](#).

5 Advanced Installation Topics

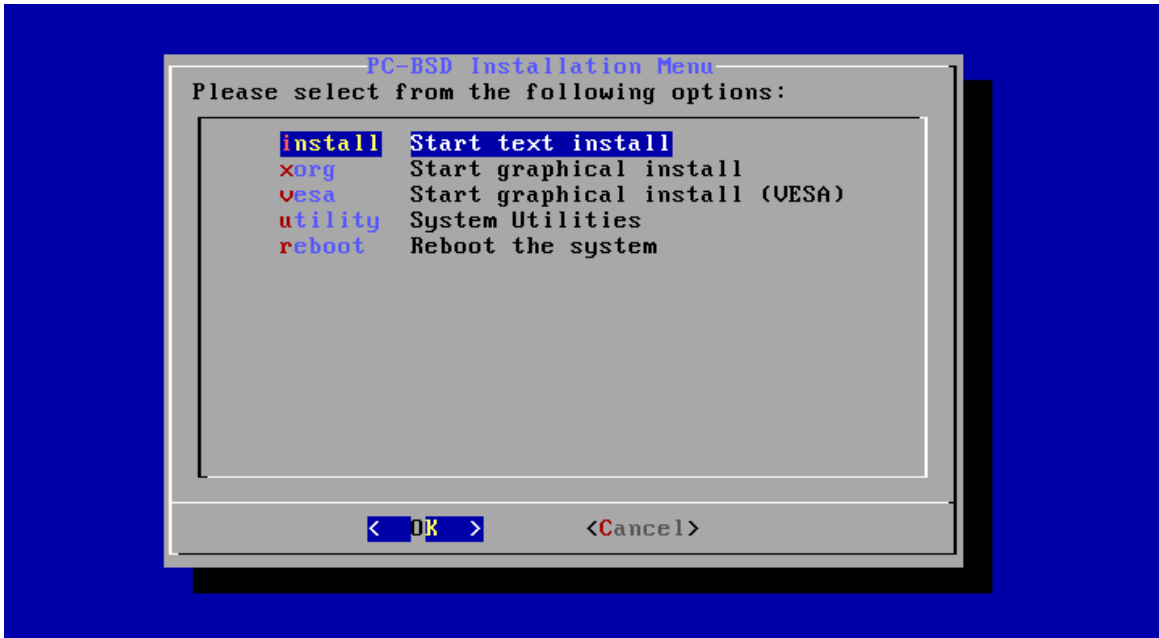
The previous section discussed a default installation of PC-BSD®. This section covers the following advanced installation topics:

- [Using the Text Installer](#)
- [Install a Server](#)
- [Using the TrueOS® CD](#)
- [Convert a FreeBSD System to PC-BSD®](#)
- [Dual Booting](#)
- [Creating an Automated Installation with pc-sysinstall](#)

5.1 Using the Text Installer

If you prefer to perform an installation using an ncurses menu rather than a full graphical installer, select the option “Text Install/Emergency Console” from the PC-BSD® installer boot menu shown in Figure 3a. Once the installer finishes loading, you will see the screen shown in Figure 5.1a.

Figure 5.1a: Text Installation Menu



This initial menu provides the following options:

- **install:** continues the installation using the text-based installer.
- **xorg:** launches the graphical installer described in [Installing PC-BSD®](#).
- **vesa:** launches the graphical installer in VESA mode.
- **utility:** launches the menu described in [Using the System Utilities Menu](#).
- **reboot:** exits the installer and reboots the system.

Use the up/down arrows to highlight a menu item then press the spacebar to select the highlighted item. When finished, press enter to save the selection and move on to the next screen. If you keep the default selection of “install”, the next screen will prompt to install a desktop or a server, as seen in Figure 5.1b.

If you choose to install a desktop, the KDE and Fluxbox window managers will be installed and configured for you. After the installation is complete, the system will boot into the usual [post-installation configuration screens](#).

If you choose to install a server, neither X nor a window manager will be installed, resulting in a command-line only [TrueOS® installation](#). Before the installation starts, you will be prompted to enter and confirm the *root* password (which will not be echoed to the screen) and to enter a username, password, real name, and shell in order to create a user account to use for logins. After installation, the system will boot into a command prompt where you can enter the username and password that was created.

After making a selection and pressing enter, the next screen will display the available disks on the system. In the example shown in Figure 5.1c, one disk is available.

Figure 5.1b: Select Desktop or Server

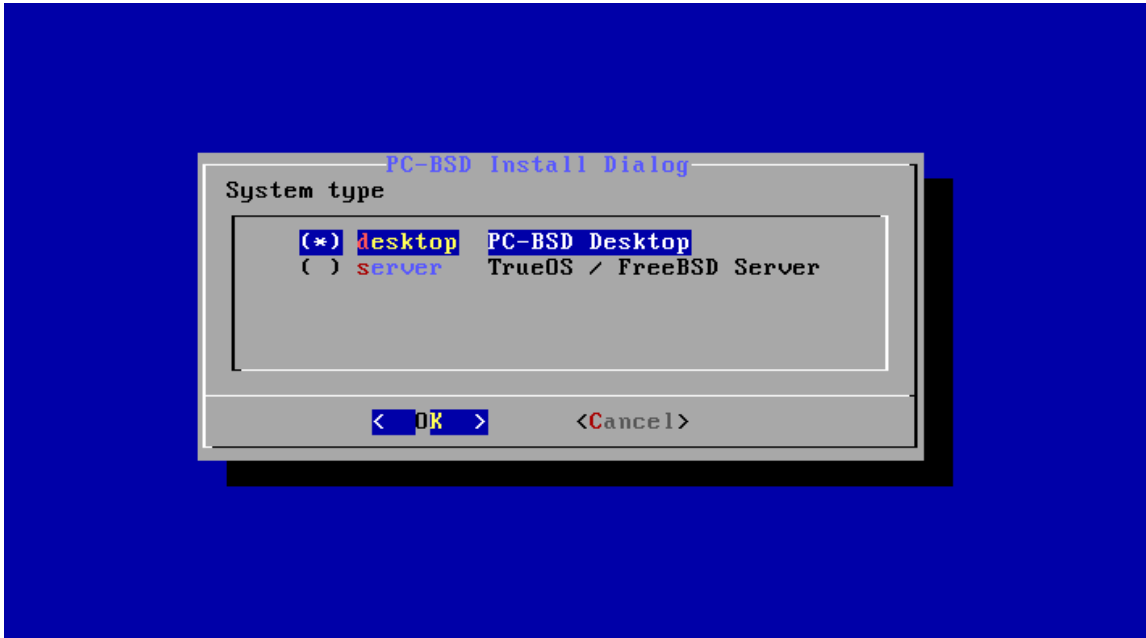
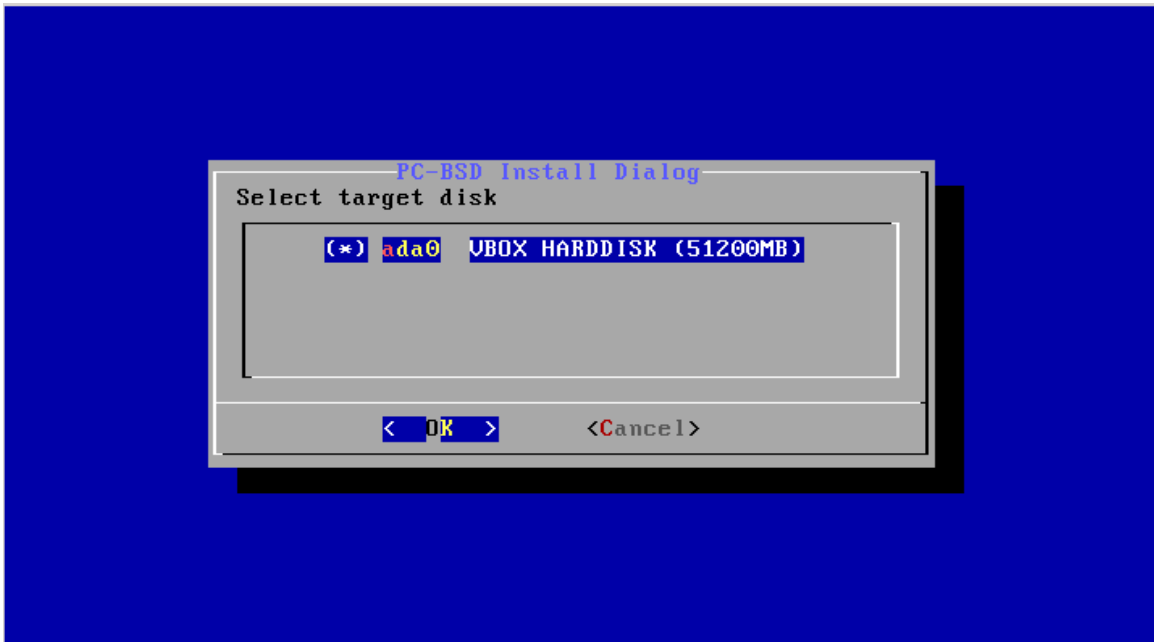
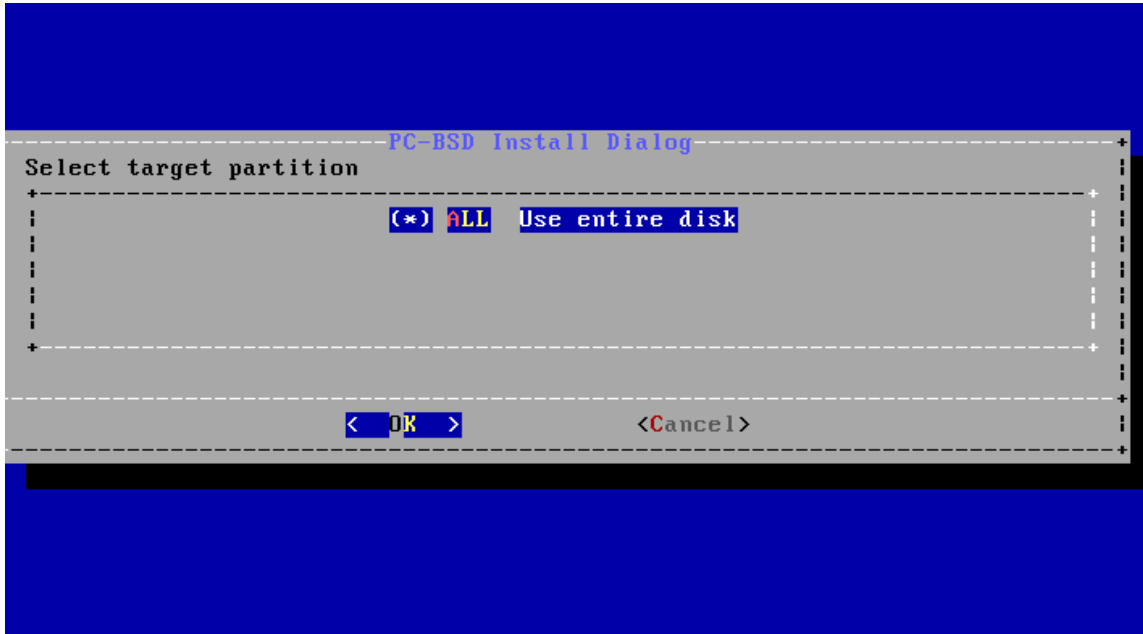


Figure 5.1c: Select Installation Disk



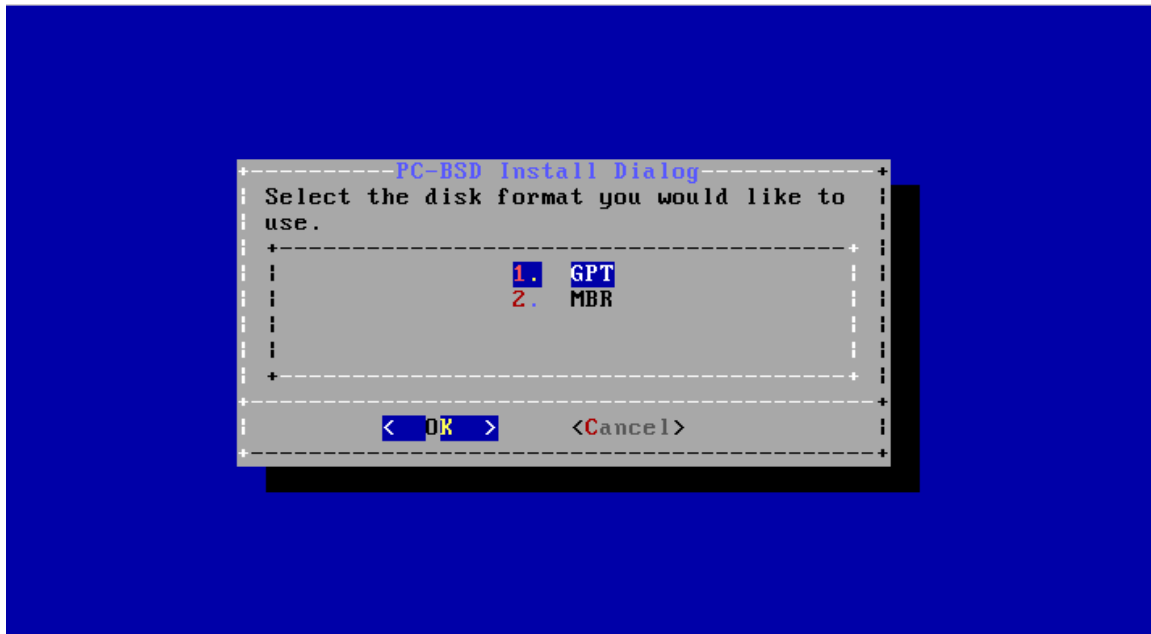
Select the disk to install into and press enter. In the next screen, the installer will display all available primary or GPT partitions. In the example shown in Figure 5.1d, there is only one partition and the installer has selected the default of installing to the entire disk. *If you have multiple partitions and disks, carefully select the disk and partition to install to.*

Figure 5.1d: Select Partition



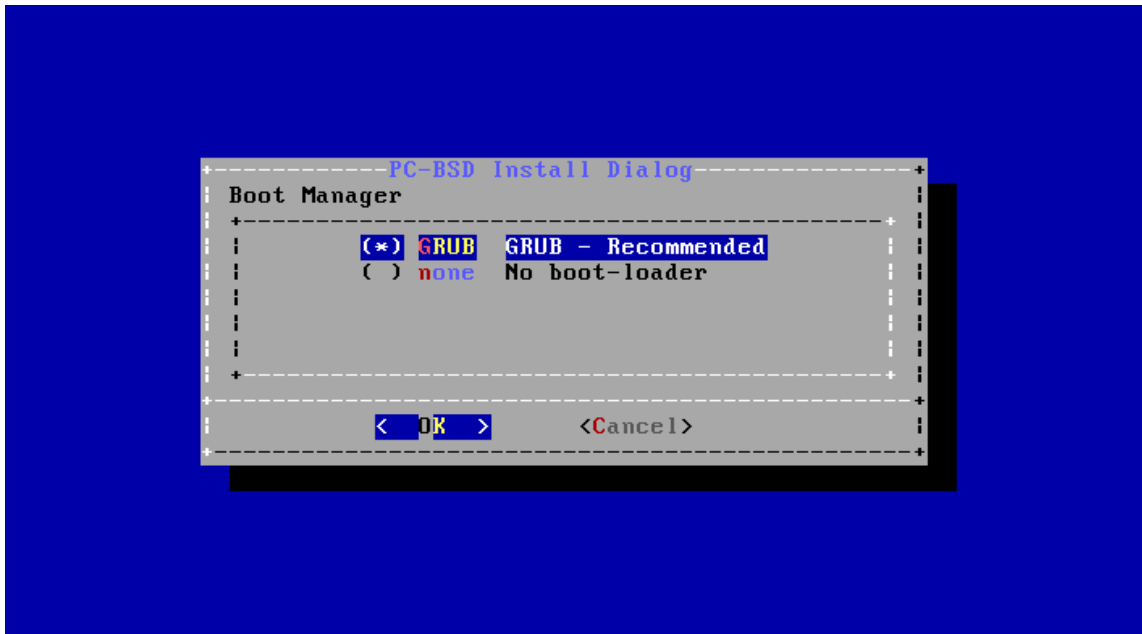
The next screen, shown in Figure 5.1e, is used to select the type of disk format. If the installation disk or partition is larger than 2 TB, *GPT must* be selected. Otherwise, selecting *GPT* should work for most hardware. When installing on older hardware, or if the newly installed system will not boot after selecting *GPT*, select *MBR* instead.

Figure 5.1e: Select Disk Format



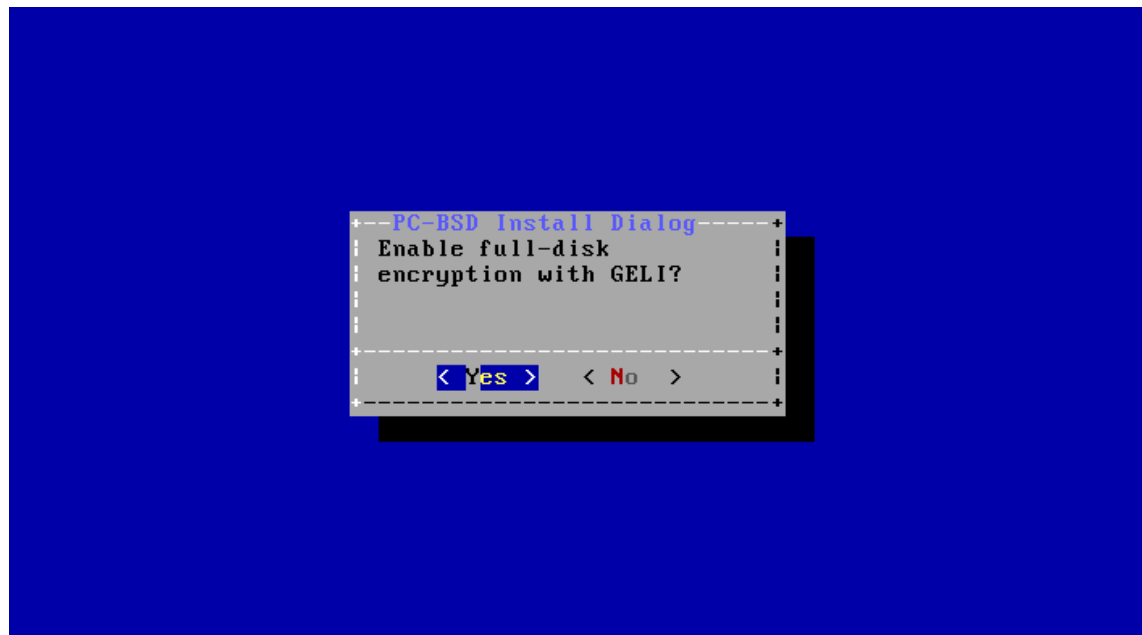
The next screen, shown in Figure 5.1f, is used to select whether or not to use the GRUB boot manager. The default is to use *GRUB* as it is required to support [multiple boot environments](#). If you select *none*, no boot manager will be installed and boot environments will not be available.

Figure 5.1f: Select Boot Manager



The next screen is shown in Figure 5.1g.

Figure 5.1g: Full Disk Encryption



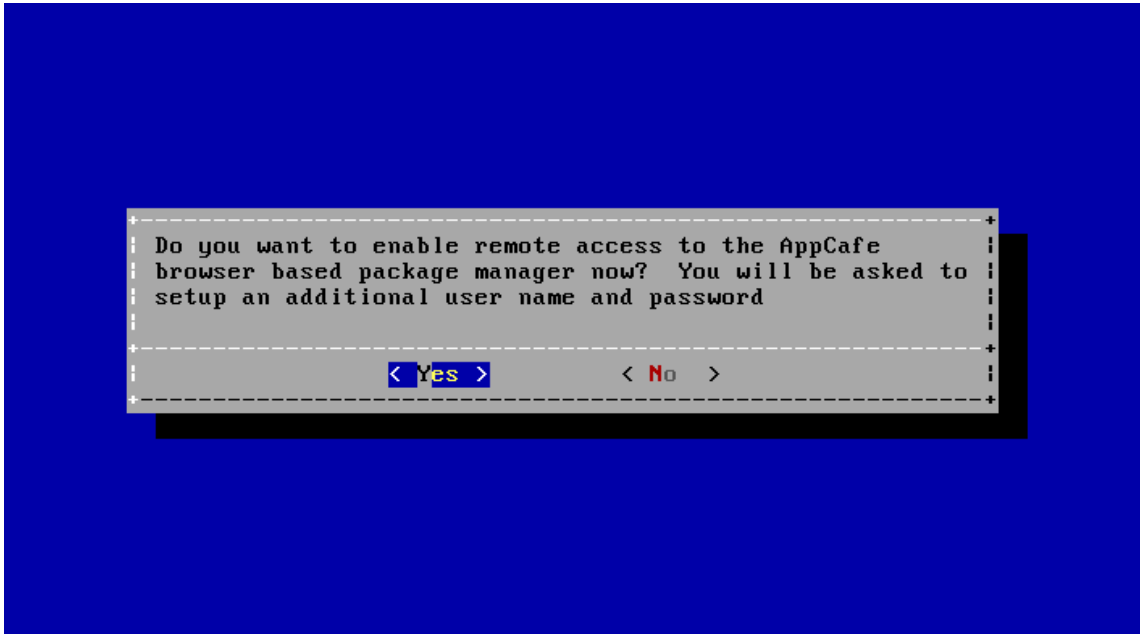
This screen provides the option to encrypt the selected disk(s) with the FreeBSD [GELI](#) framework. If you keep the default of *Yes* and press enter, you will be prompted to enter and confirm a passphrase. You will be prompted to enter this passphrase whenever you boot into PC-BSD®. This means that if someone else boots your computer, they will not be able to boot into PC-BSD® if they do not know your passphrase. ***However, if you forget your passphrase, you will not be able to access PC-BSD® either.*** For these reasons, it is important to choose a good passphrase that other users will not guess and which you will not forget. Passphrases are case-

sensitive and can contain spaces. The passphrase should be memorable to you, such as a line from a song or piece of literature, but hard to guess in that people who know you should not be able to guess your favorite line from a song or piece of literature.

NOTE: be careful if you have changed your keyboard variant and layout. At this time, the GELI encryption framework only supports QWERTY passphrases, so do not use any characters not found on a QWERTY keyboard in your passphrase. **DO NOT** set a passphrase with accents or special characters which are not found on a US keyboard. This is a limitation in FreeBSD as the keymap is not loaded until after the passphrase is entered, meaning that such a passphrase will render that partition as inaccessible.

The next screen is shown in Figure 5.1h.

Figure 5.1h: Configure Remote Access to AppCafe



If you would like to manage installed software or jails from your phone or a remote system, press enter to select the default option of *Yes*. If you only plan to use [AppCafe®](#) from the system you are installing, arrow over to *No* instead.

If you select *Yes*, you will be prompted to input a username, password, and port number to use when accessing AppCafe® from another device.

The next screen is shown in Figure 5.1i.

Figure 5.1i: Review Installation Options

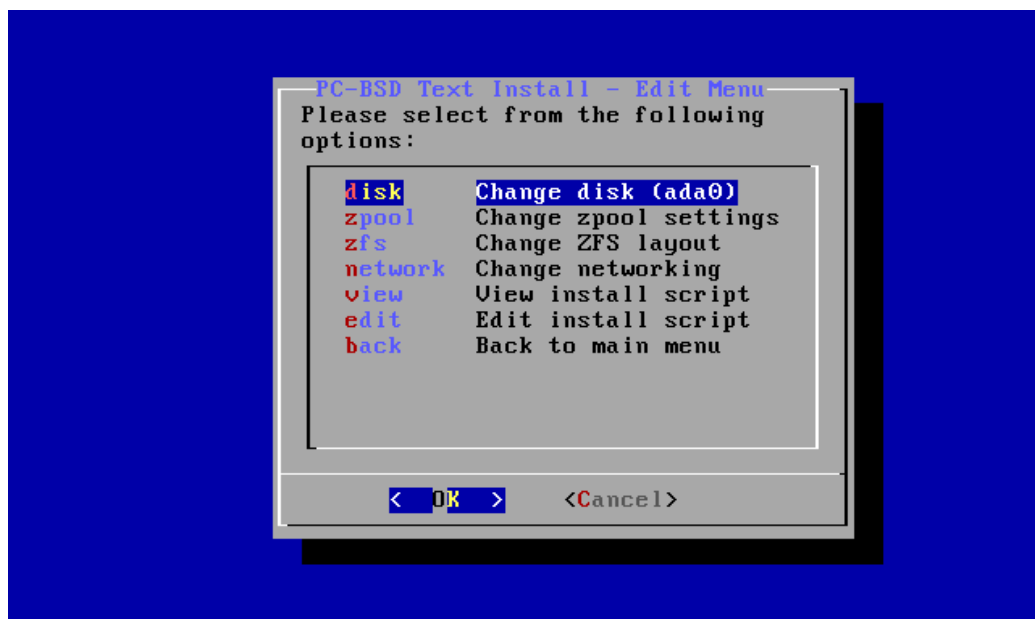


To start the installation, press enter to select *install*.

To re-run the text installer, and re-input your selections, select *wizard*.

To review, and possibly change any of the installation parameters, select *edit* to see the screen shown in Figure 5.1j.

Figure 5.1j: Edit Menu

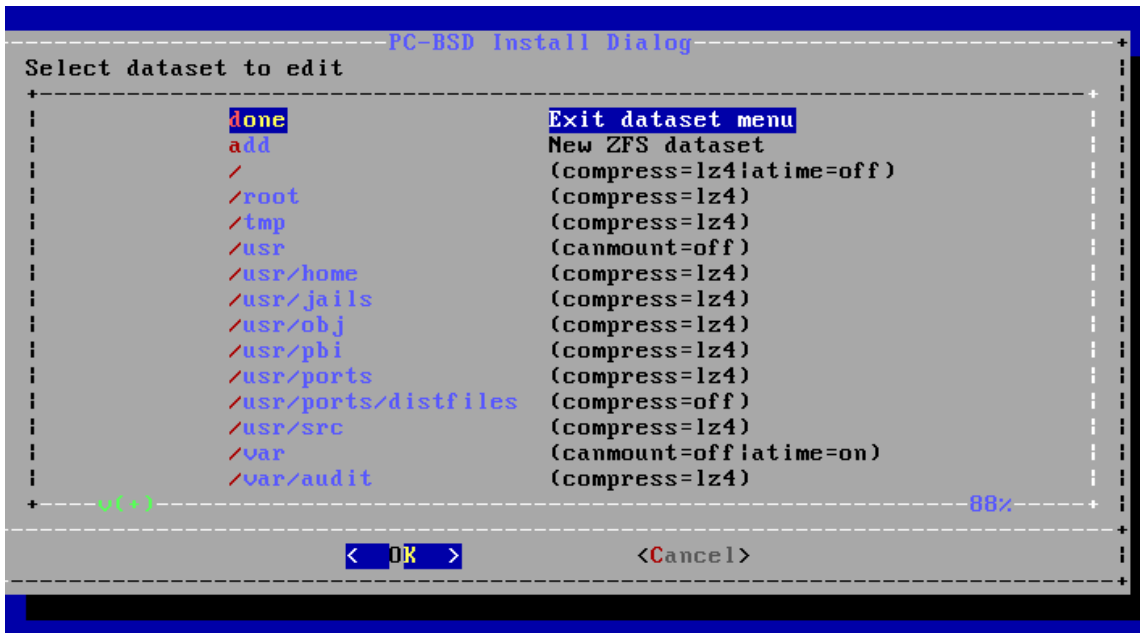


To change the disk to install into, select *disk*. This will re-open the screens shown in Figures 5.1c through 5.1g, and then return you to the menu shown in Figure 5.1j.

If the system contains multiple disks and you wish to change the disk layout to a mirror or RAIDZ, select *zpool*. The allowable layouts for the number of disks will be displayed so that you can select the desired layout.

To modify the default ZFS layout, select *zfs* which will open the screen shown in Figure 5.1k.

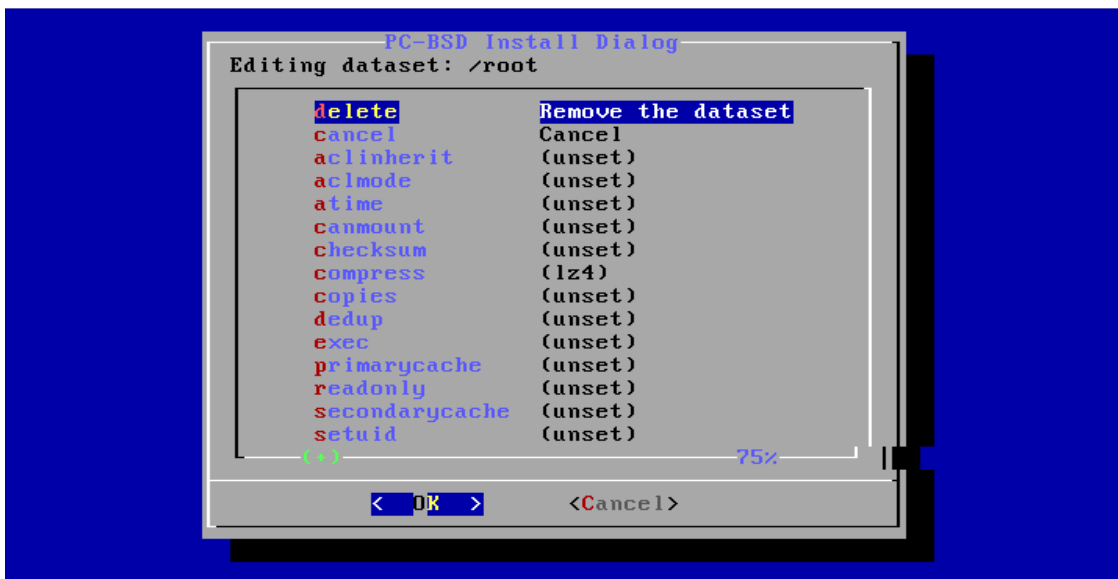
Figure 5.1k: ZFS Layout



To edit the properties of an existing dataset, highlight the dataset's name and press enter. This will show the list of available ZFS properties for that dataset, as seen in the example shown in Figure 5.1l. To change the value of a ZFS property, highlight it and press enter. The available values will vary, depending upon the selected property.

NOTE: while you can delete a dataset, the default datasets are needed for boot environments. For this reason, *it is not recommended to delete any default datasets*. ZFS options are described in [zfs\(8\)](#) and you should not change any options unless you are familiar with the ramifications of doing so.

Figure 5.1l: ZFS Properties for a Dataset



If you wish to add additional datasets, select *add* in the screen shown in Figure 5.1k. This will prompt for the full path of the mountpoint to create. For example, you could create a dataset named */usr/shares*. The dataset you create will be added to the bottom of the list. If you select the dataset and press enter, you can set its ZFS properties.

Once you are finished customizing the ZFS layout, select *done* in the screen shown in Figure 5.1k which will return you to the screen shown in Figure 5.1j.

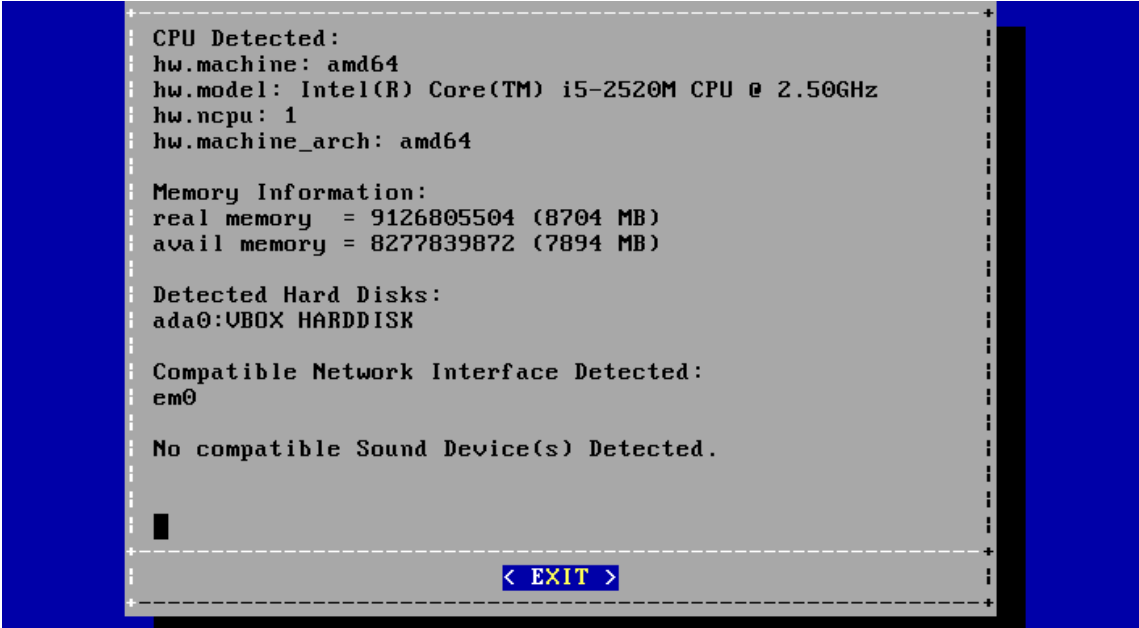
To configure networking, select *network* in the screen shown in Figure 5.1j. You will be prompted to enter a hostname, to select either automatic DHCP configuration on all interfaces or to specify the interface to configure, and whether or not to enable SSH. Once finished, you will be returned to the screen shown in Figure 5.1j.

If you select *view* in the screen shown in Figure 5.1j, the ASCII text file containing the configuration script will be displayed. If you instead select *edit*, this script will open in the *ee* editor, allowing you to make changes. The parameters supported by the installation script are described in [Creating an Automated Installation with pc-sysinstall](#).

Once you are finished with your customizations, select *back* to return to the screen shown in Figure 5.1i.

If you select *hardware* from the screen shown in Figure 5.1i, the installer will provide a hardware summary. The example shown in Figure 5.1m is from a system with a disabled sound card and no wireless card.

Figure 5.1m: Hardware Summary



```
CPU Detected:
hw.machine: amd64
hw.model: Intel(R) Core(TM) i5-2520M CPU @ 2.50GHz
hw.ncpu: 1
hw.machine_arch: amd64

Memory Information:
real memory = 9126805504 (8704 MB)
avail memory = 8277839872 (7894 MB)

Detected Hard Disks:
ada0:UBOX HARDDISK

Compatible Network Interface Detected:
em0

No compatible Sound Device(s) Detected.

< EXIT >
```

To exit the the menu shown in Figure 5.1i, select *quit*. This will return you to the main menu shown in Figure 5.1a.

5.1.1 Using the System Utilities Menu

The text installer contains some handy tools for troubleshooting and fixing an existing PC-BSD® or TrueOS® installation.

If you click the *utility* option in the main menu of the text based installer shown in Figure 5.1a, it will open the screen shown in Figure 5.1n.

Figure 5.1n: System Utilities Menu



This screen provides the following options:

- **shell:** this option is useful if you are troubleshooting a PC-BSD® system that no longer boots. It will open a shell with administrative access that includes the base FreeBSD utilities. You can use this shell to try to determine what the problem is and, if necessary, to create a backup or copy essential files to another system. When you are finished using the shell, type **exit** to return to the screen shown in Figure 5.1n.
- **zimport:** this option will import and mount a ZFS pool in order to do some maintenance. The pool will be mounted to `/mnt` so you can chroot or manipulate files as needed.
- **fixgrub:** this option can be used to restamp the GRUB boot loader should the installed system no longer boot. When this option is selected, it will first show the available ZFS pools and prompt you to input the name of the pool to import.
- **exit:** this option will return you to the main menu seen in Figure 5.1a.

5.2 Install a Server

The [System Selection](#) screen of the PC-BSD® installer can be used to install TrueOS®, a FreeBSD-based server operating system, rather than a PC-BSD® desktop operating system.

TrueOS® adds the following to a vanilla installation of FreeBSD: [PBI Manager](#), the command line version of [warden](#), and the command line versions of most of the [Control Panel](#) utilities. You will find those utilities in `/usr/local/bin/pc-*`. It also installs this [list](#) of additional shells and utilities.

For a server installation, using the PC-BSD® installer rather than the FreeBSD installer offers several benefits:

- the ability to easily [configure ZFS](#) during installation
- the ability to configure ZFS [multiple boot environments](#)
- a wizard (described in this section) is provided during installation to configure the server for first use.

NOTE: this section describes how to install a command-line only server using the PC-BSD® graphical installer. Alternately, you can also install a server using the TrueOS® CD, using the instructions in [Using the TrueOS® CD](#).

To perform a server installation, [start the PC-BSD® installation](#) as usual. When you get to the [System Selection](#) screen of the installer, select “Server (TrueOS)”, as shown in Figure 5.2a.

Click “Next” to start the “Server Setup Wizard” then click “Next” again to see the screen shown in Figure 5.2b.

Figure 5.2a: Selecting to Install TrueOS®

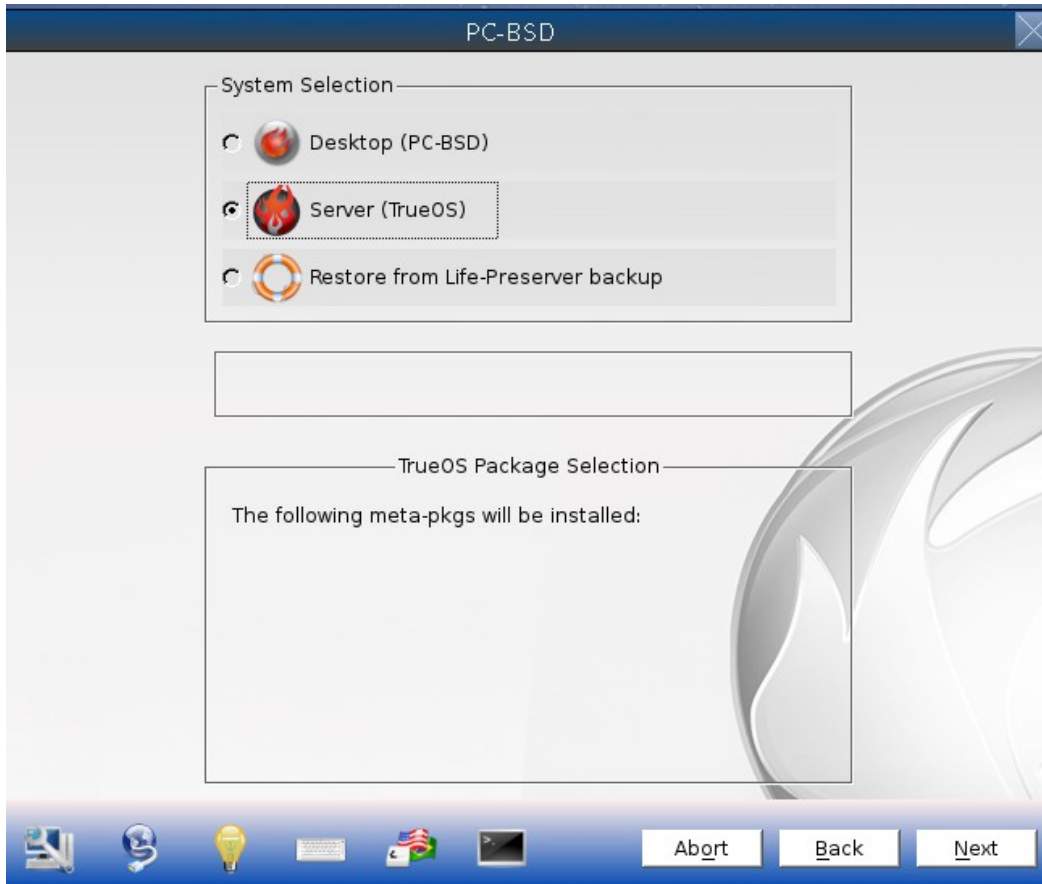
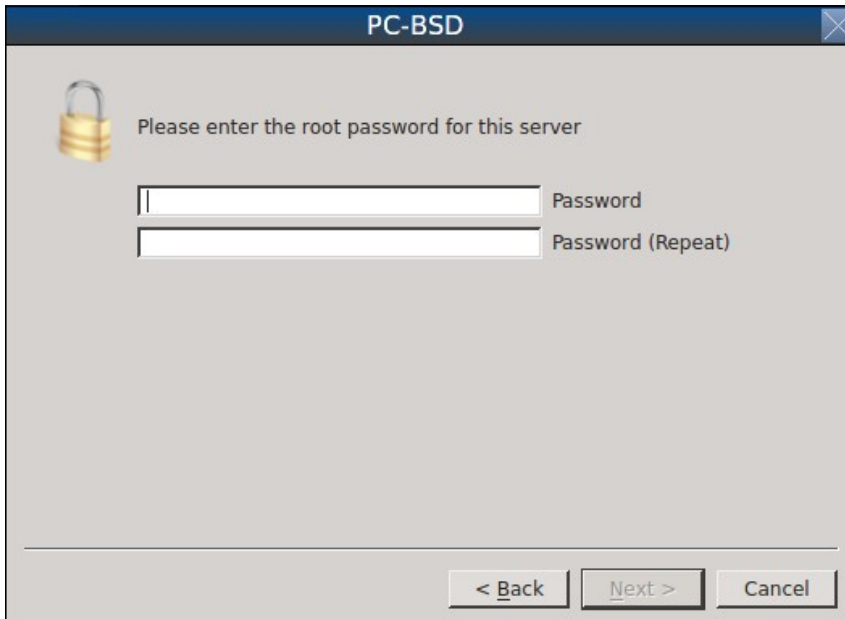
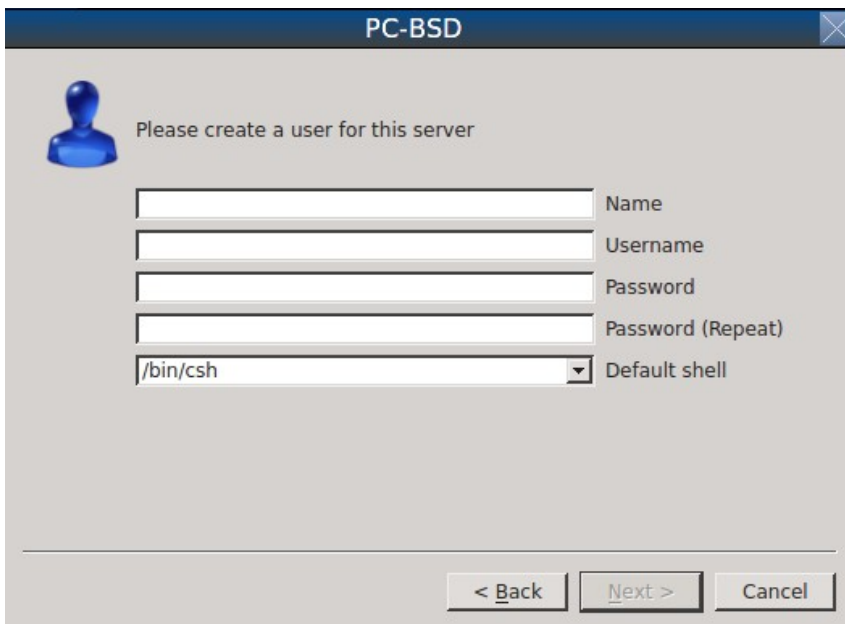


Figure 5.2b: Set the Root Password



Input and confirm the root password then click “Next” to proceed to the screen shown in Figure 5.2c.

Figure 5.2c: Create the Primary User Account



For security reasons, you should not login as the *root* user. For this reason, the wizard requires you to create a primary user account that will be used to login to the FreeBSD system. This account will automatically be added to the *wheel* group, allowing that user to **su** to the root account when administrative access is required.

This screen contains the following fields:

- **Name:** can contain capital letters and spaces.

- **Username:** the name used when logging in. Can not contain spaces and is case sensitive (e.g. *Kris* is a different username than *kris*).
- **Password:** the password used when logging in. You must type it twice in order to confirm it.
- **Default shell:** use the drop-down menu to select the **cs**, **tc**, or **sh** login shell.

When finished, click “Next” to proceed to the screen shown in Figure 5.2d.

Input the system's hostname. If you will be using **ssh** to administer the system, check the box “Enable remote SSH login”. Click Next to proceed to the network configuration screen shown in Figure 5.2e.

Figure 5.2d: Set the Hostname

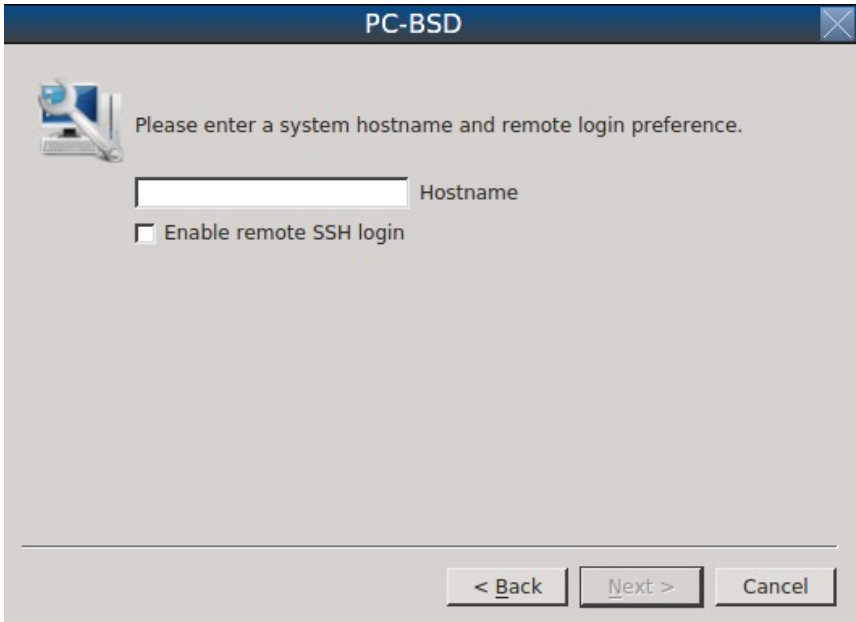
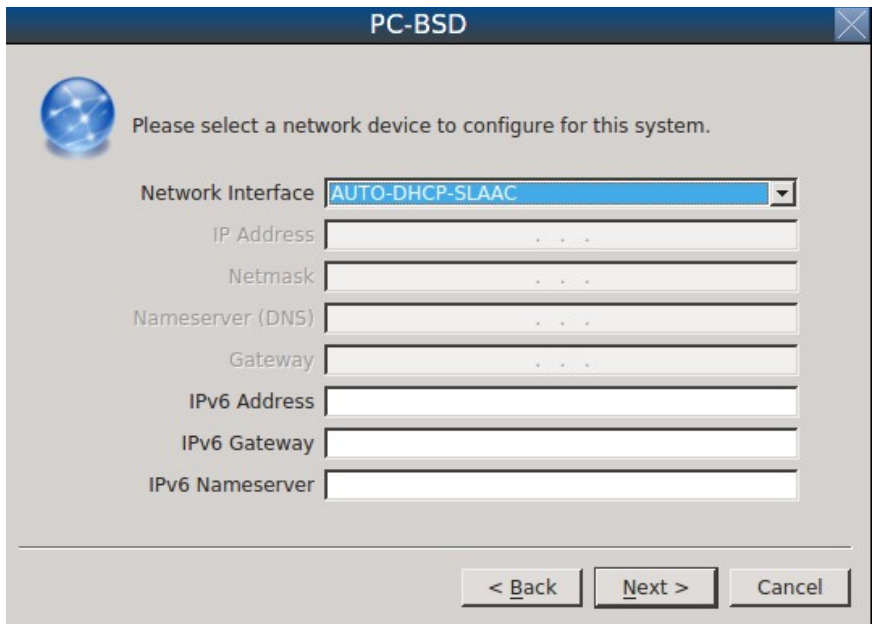


Figure 5.2e: Configure the Network

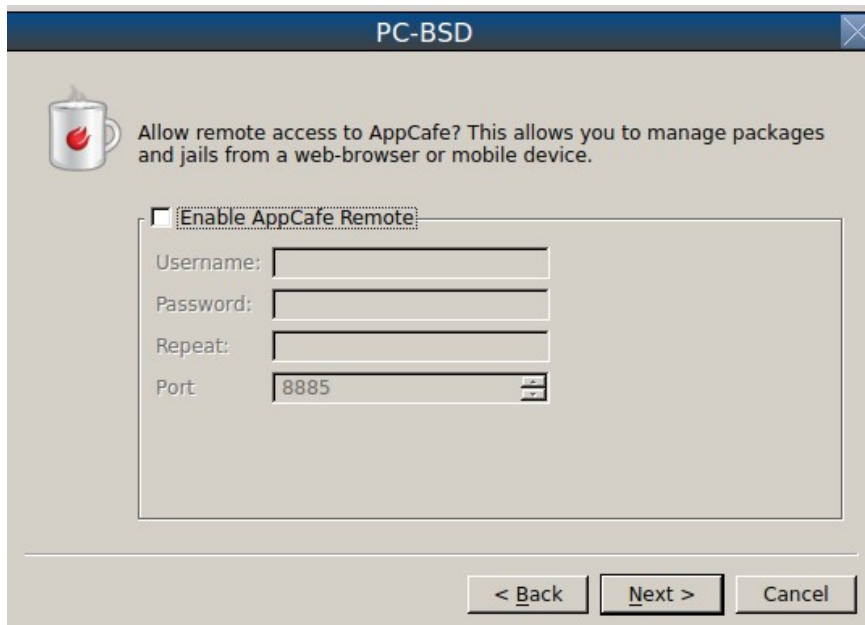


Use the “Network Interface” drop-down menu to select from the following:

- **AUTO-DHCP-SLAAC:** (default) will configure every active interface for DHCP and for both IPv4 and IPv6
- **AUTO-DHCP:** will configure every active interface for DHCP and for IPv4
- **IPv6-SLAAC:** will configure every active interface for DHCP and for IPv6

Alternately, select the device name for the interface that you wish to manually configure and input the IPv4 and/or IPv6 addressing information. When finished, click “Next” to proceed to the screen shown in Figure 5.2f.

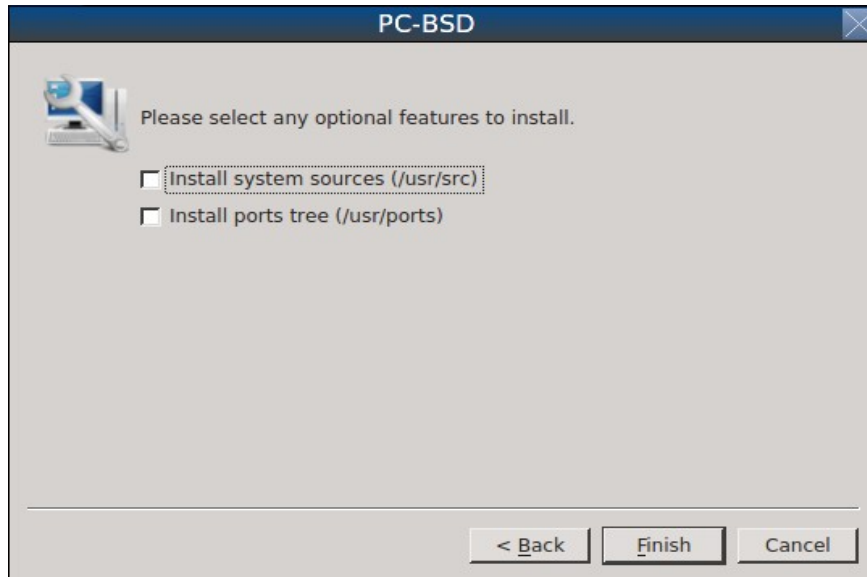
Figure 5.2f: Configure Remote Access to AppCafe



If you would like to manage installed software or jails from your phone or a remote system, check the box “Enable AppCafe Remote”. If you only plan to use [AppCafe®](#) from the system you are installing, click “Next” to instead continue to the next screen.

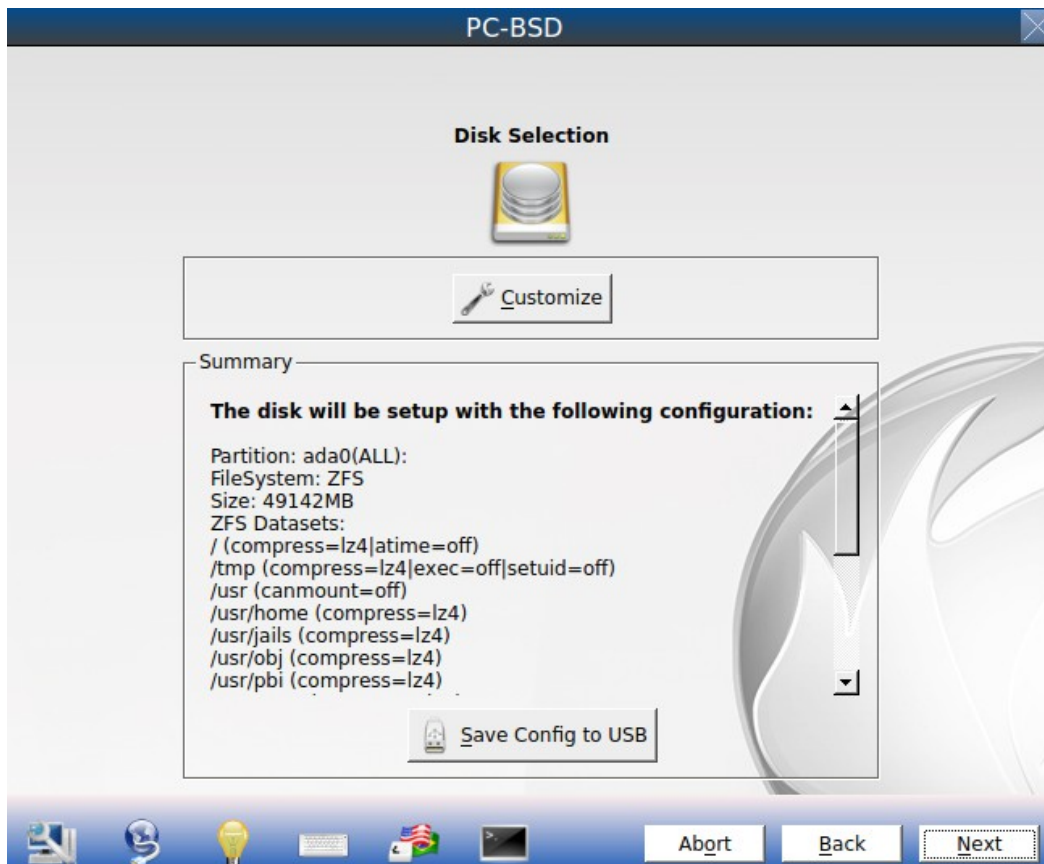
If you check the box to configure remote access, input a username and password and select the port number to use when accessing AppCafe® from another device. When finished, click “Next” to access the screen shown in Figure 5.2g.

Figure 5.2g: Install Source or Ports



If you wish to install FreeBSD source or ports, check the associated box(es) then click “Finish” to exit the wizard and access the summary screen shown in Figure 5.2h.

Figure 5.2h: Review Installation Summary



Click “Customize” if you wish to proceed to the [Disk Selection](#) screen in order to configure the system's disk(s). If you wish to save the finished configuration to re-use it at a later time, insert a FAT-formatted USB stick and click “Save Config to USB”.

Once you are ready to start the installation, click “Next”. A pop-up menu will ask if you would like to start the installation now.

Once the system is installed, it will boot to a command-line login prompt. Login using the primary user account that was configured during installation. You can now configure and use the server as you would any other FreeBSD server installation. The [FreeBSD Handbook](#) is an excellent reference for performing common FreeBSD server tasks.

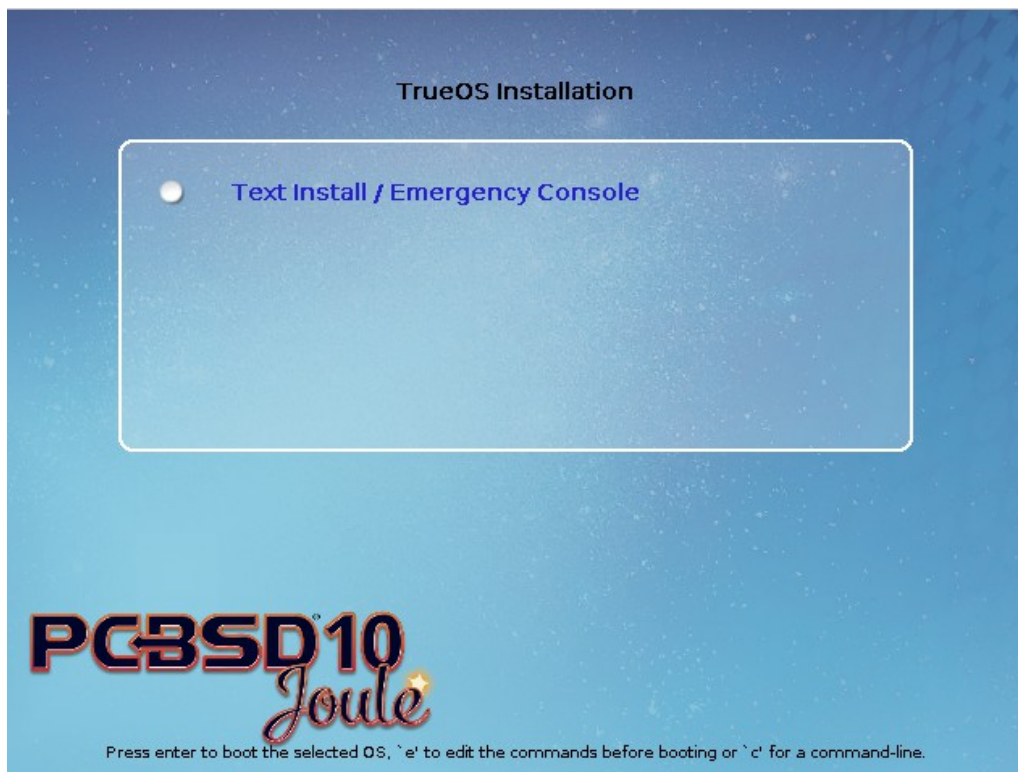
5.3 Using the TrueOS® CD

Beginning with 10.1, the PC-BSD Project provides a TrueOS® ISO which provides an ncurses installer for installing a command-line version of TrueOS®. If your intent is to only install servers and you do not need a graphical installer, this ISO is convenient to use and quick to download.

NOTE: the benefits of installing TrueOS® instead of vanilla FreeBSD are described in [Install a Server](#).

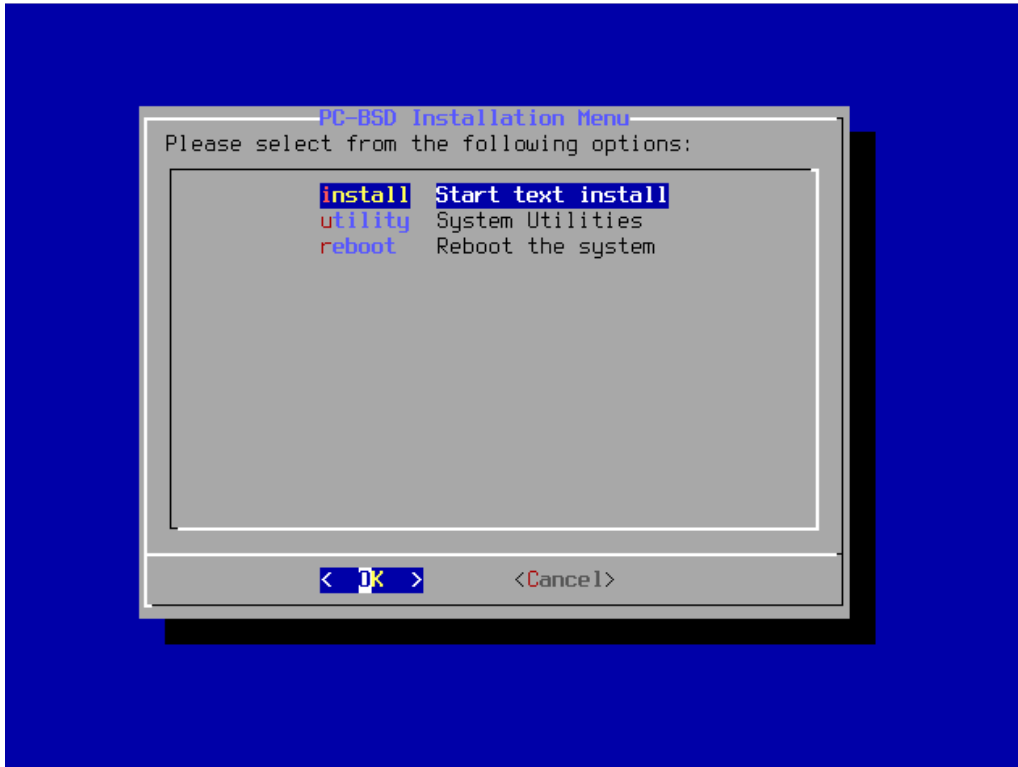
To start a server installation using the TrueOS® ISO, insert the prepared boot media. The initial boot menu, shown in Figure 5.3a, indicates that this is a TrueOS® installation.

Figure 5.3a: TrueOS® Boot Menu



The installer will finish booting and display the installation menu shown in Figure 5.3b.

Figure 5.3b: TrueOS® Installation Menu



To begin the installation, press enter. The installation will proceed through the screens shown in Figure 5.1c through 5.1g. Next, additional menu screens will prompt you to set and confirm the *root* password, create a login user and set and confirm that user's password, select the user's shell, and setup networking. It will then proceed to the screens shown in Figure 5.1h and 5.1i. If desired, the installation parameters can be reviewed or edited, as described in [Using the Text Installer](#).

The TrueOS® boot media can also be used to repair an existing installation, using the instructions in [Using the System Utilities Menu](#).

5.4 Convert a FreeBSD System to PC-BSD®

An existing FreeBSD 10.x installation can be easily converted to either a PC-BSD® desktop or server through the installation of a package which is available from the PC-BSD® package repository. The converted desktop will contain all of the graphical utilities that come with PC-BSD® and the converted server will contain all of their command line equivalents.

NOTE: while not required, ZFS is recommended as most of the PC-BSD® utilities rely on ZFS. Beginning with 10.1, the FreeBSD installer provides an option to create a ZFS pool during installation.

5.4.1 Switching to the PC-BSD® pkgng Repository

This section demonstrates how to configure a FreeBSD 10.x system to use the PC-BSD® pkgng repository. Once this configuration is complete, you can then convert that FreeBSD system to either a PC-BSD® desktop or a TrueOS® server as described in the next two sections.

Before switching to the PC-BSD® repository, make sure that pkg is installed on the FreeBSD system! If it is not yet installed, you will see the following when you type **pkg**. Type in **y** to install it.

pkg

```
The package management tool is not yet installed on your system.  
Do you want to fetch and install it now? [y/N]: y
```

If **pkg** is already installed, you will instead get the error message “not enough arguments” if you just type **pkg**.

Next, make sure that pkgng is bootstrapped:

pkg upgrade

Then, disable the FreeBSD package repository:

```
mv /etc/pkg/FreeBSD.conf /root/FreeBSD.conf-old
```

Now create this directory:

```
mkdir -p /usr/local/etc/pkg/repos
```

Then, create the file `/usr/local/etc/pkg/repos/pcbsd.conf` with the following contents. When the repository is used, it will automatically grab the correct package set to match the operating system version.

```
pcbsd: {  
    url: "http://pkg.cdn.pcbsd.org/10.0-RELEASE/amd64",  
    signature_type: "fingerprints",  
    fingerprints: "/usr/local/etc/pkg/fingerprints/pcbsd",  
    enabled: true  
}
```

Next, create the following directories:

```
mkdir -p /usr/local/etc/pkg/fingerprints/pcbsd/revoked  
mkdir -p /usr/local/etc/pkg/fingerprints/pcbsd/trusted
```

Then, download the repository's fingerprint file:

```
fetch --no-verify-peer https://github.com/pcbsd/pcbsd/raw/master/src-sh/pc-  
extractoverlay/ports-overlay/usr/local/etc/pkg/fingerprints/pcbsd/trusted/  
pkg.cdn.pcbsd.org.20131209
```

```
mv pkg.cdn.pcbsd.org.20131209 /usr/local/etc/pkg/fingerprints/pcbsd/trusted/
```

Finally, update the package database and any installed packages using the following command:

```
pkg upgrade -fy
```

Depending upon what is already installed, you may have to resolve some error messages in order to successfully upgrade all packages. To install and delete packages, use the **pkg** command as described in [Section 5.4.3 of the FreeBSD Handbook](#).

5.4.2 Converting FreeBSD to a PC-BSD® Desktop

Once the repository configuration is complete, it is now easy to convert a FreeBSD system into a PC-BSD® desktop using the following commands as the superuser:

```
fetch --no-verify-peer -o /etc/freebsd-update.conf \  
'https://github.com/pcbbsd/freebsd/raw/master/etc/freebsd-update.conf'  
freebsd-update fetch  
freebsd-update install  
pkg install -fy pcbbsd-base  
rehash  
pbreg set /PC-BSD/SysType PCBSD  
pc-extractoverlay ports  
pc-extractoverlay desktop
```

Next, reboot the system and the PC-BSD® login manager will start, allowing you to login to the desktop. If you want the [PC-BSD® display wizard and first boot wizards](#) to run first, run these commands before rebooting:

```
touch /var/.runxsetup  
touch /var/.pcbbsd-firstboot  
touch /var/.pcbbsd-firstgui
```

NOTE: if you are using NVIDIA video hardware, load the driver before rebooting into the display wizard by running the command **pkg install pcbbsd-meta-nvidia**.

5.4.3 Converting FreeBSD to a TrueOS® Server

If you wish to convert a FreeBSD server to TrueOS®, install the server package instead, then extract the installed utilities:

```
pkg install -fy pcbbsd-utils  
rehash  
pbreg set /PC-BSD/SysType TRUEOS  
pc-extractoverlay ports  
pc-extractoverlay server
```

These steps will install the following: [PBI Manager](#), the command line version of [warden](#), and the command line versions of most of the [Control Panel](#) utilities. You will find those utilities in `/usr/local/bin/pc-*`.

5.5 Dual Booting

A PC-BSD® installation assumes that you have an existing primary partition to install into. If your computer has only one disk and PC-BSD® will be the only operating system, it is fine to accept the default partitioning scheme. However, if you will be sharing PC-BSD® with other operating systems, care has to be taken that PC-BSD® is installed into the correct partition; otherwise, you may inadvertently overwrite an existing operating system.

If you wish to install multiple operating systems on your computer, you will need the following:

- a partition for each operating system. Many operating systems, including PC-BSD®, can only be installed into a primary or GPT partition. This means that you will need to use partitioning software as described in [Partitioning the Hard Drive](#).

- a boot loader that allows you to select which operating system you wish to boot into. By default, PC-BSD® installs and uses the GRUB boot loader as it supports [boot environments](#).
- a backup of any existing data. This backup should not be stored on your computer's hard drive but on another computer or on a removable media such as a USB drive or burnt onto a DVD media. If you are careful in your installation, everything should go fine. However, you will be glad that you made a backup should something go wrong.

5.5.1 Choosing the Installation Partition

When installing PC-BSD® onto a computer that is to contain multiple operating systems, care must be taken to *select the correct partition* in the [Disk Selection](#) screen of the installation. On a system containing multiple partitions, each partition will be listed. Highlight the partition that you wish to install into and *make sure that you do not select a partition that already contains an operating system or data that you wish to keep*.

DANGER! *make sure that you click the “Customize” button while in the “Disk Selection” screen. If you just click Next without customizing the disk layout, the installer will overwrite the contents of the primary disk.*

5.5.2 GRUB Boot Loader

If you install PC-BSD® on a computer that already contains an operating system, an entry for PC-BSD® will automatically be added to the [PC-BSD® boot menu](#). Depending upon which other operating systems are installed, the installer may or may not automatically detect and add entries for the other operating systems.

If your other operating system is not found, use the [PC-BSD® Bug Reporting](#) tool to create a bug report. Include the version of the missing operating system and on which disk and partition that operating system is installed. If you are already familiar with how to create GRUB entries and are successful in manually adding an entry, include that entry in your bug report. This way, other PC-BSD® users with similar layouts can benefit when the required GRUB entry is added to the installer's logic.

5.6 Creating an Automated Installation with *pc-sysinstall*

PC-BSD® provides a set of Bourne shell scripts that allow advanced users to create automatic or customized PC-BSD® installations. **pc-sysinstall** is the name of the master script; it reads a customizable configuration file and uses dozens of backend scripts to perform the installation. You can read more about this utility by typing **man pc-sysinstall**.

Here is a quick overview of the components used by **pc-sysinstall**:

- `/usr/local/share/pc-sysinstall/backend/` contains the scripts used by the PC-BSD® installer. Scripts have been divided by function, such as `functions-bsdlabel.sh` and `functions-installcomponents.sh`. If you have ever wondered how the PC-BSD® installer works, read through these scripts. This directory also contains the `parseconfig.sh` and `startautoinstall.sh` scripts which **pc-sysinstall** uses to parse the configuration file and begin the installation.
- `/usr/local/share/pc-sysinstall/backend-partmanager/` contains the scripts which are used by the installer to create and delete partitions.
- `/usr/local/share/pc-sysinstall/backend-query/` contains the scripts which are used by the installer to detect and configure hardware.
- `/usr/local/share/pc-sysinstall/conf/` contains the configuration file `pc-sysinstall.conf`. It also contains a file indicating which localizations are available (`avail-langs`), and a `licenses/` subdirectory containing text files of applicable licenses.

- `/usr/local/share/pc-sysinstall/doc/` contains the help text that is seen if you run `pc-sysinstall` without any arguments.
- `/usr/local/share/pc-sysinstall/examples/` contains several example configuration files for different scenarios (e.g. `upgrade`, `fsd-netinstall`). The `README` file in this directory should be considered as mandatory reading before using `pc-sysinstall`.
- `/usr/sbin/pc-sysinstall` this is the script that is used to perform a customized installation.

To create a custom installation, perform the following steps:

1. Determine which variables you wish to customize.
2. Create a customized configuration.
3. Create a custom installation media or installation server.

These steps are discussed in more detail below.

5.6.1 Determine Which Variables you Wish to Customize

A list of possible variables can be found in `/usr/local/share/pc-sysinstall/examples/README` and in Table 5.6a. Note that the Table is meant as a quick reference to determine which variables are available. The `README` file contains more complete descriptions for each variable.

Table 5.6a: Available Variables for Customizing a PC-BSD® Installation

Variable	Options	Description
hostname=	should be unique for the network	optional as installer will auto-generate a hostname if empty
installMode=	fresh, upgrade, extract, or zfsrestore	sets the installation type
installLocation=	/path/to/location	used only when <i>installMode</i> is extract and should point to an already mounted location
installInteractive=	yes or no	set to no for automated installs without user input
netDev=	AUTO-DHCP or FreeBSD interface name	type of network connection to use during the installation
netIP=	IP address of interface used during installation	only use if <i>netDev</i> is set to an interface name
netMask=	subnet mask of interface	only use if <i>netDev</i> is set to an interface name
netNameServer=	IP address of DNS server	only use if <i>netDev</i> is set to an interface name
netDefaultRouter=	IP address of default gateway	only use if <i>netDev</i> is set to an interface name
netSaveDev=	AUTO-DHCP or FreeBSD interface name(s) (multiple allowed separated by	type of network configuration to enable on the installed system; can set multiple interfaces

Variable	Options	Description
	spaces)	
netSaveIP=	IP address of interface <interface_name> or DHCP	only use if <i>netSaveDev</i> is set to an interface name or a list of interface names (repeat for each interface)
netSaveMask=	subnet mask of interface <interface_name>	only use if <i>netSaveDev</i> is set to an interface name or a list of interface names (repeat for each interface)
netSaveNameServer=	IP address of DNS server (multiple allowed separated by spaces)	only use if <i>netSaveDev</i> is set to an interface name or a list of interface names (do not repeat for each interface)
netSaveDefaultRouter=	IP address of default gateway	only use if <i>netSaveDev</i> is set to an interface name or a list of interface names (do not repeat for each interface)
disk0=	FreeBSD disk device Name, (e.g. <i>ad0</i>)	see <i>README</i> for examples
partition=	all, free, s1, s2, s3, s4, image	see <i>README</i> for examples
partscheme=	MBR or GPT	partition scheme type
mirror=	FreeBSD disk device name (e.g. <i>ad1</i>)	sets the target disk for the mirror (i.e. the second disk)
mirrorbal=	load, prefer, round-robin, split	defaults to round-robin if the <i>mirrorbal</i> method is not specified
bootManager=	none, bsd, GRUB	when using GRUB, include its package in <i>installPackages=</i>
image=	/path/to/image	will write specified image file
commitDiskPart		this variable is mandatory and must be placed at the end of each <i>diskX</i> section; create a <i>diskX</i> section for each disk you wish to configure.
encpass=	password value	at boot time, system will prompt for this password in order to mount the associated GELI encrypted partition
commitDiskLabel		this variable is mandatory and must be placed at the end of disk's partitioning settings; see the <i>README</i> for examples on how to set the <File System Type> <Size> <Mountpoint> entries for each disk
installMedium=	dvd, usb, ftp, rsync, image	source to be used for installation

Variable	Options	Description
localPath=	/path/to/files	location of directory containing installation files
installType=	PCBSD, FreeBSD	determines whether this is a desktop or a server install
installFile=	e.g. fbsd-release.tbz	only set if using a customized installer archive
packageType=	tar, uzip, split, dist	the archive type on the installation media
distFiles=	base src kernel	list of FreeBSD distribution files to install when using <i>packageType=dist</i>
ftpPath=	e.g. ftp://iso.cdn.pcbsd.org/9.1/amd64/netinstall/	location of the installer archive when using <i>installMedium=ftp</i>
rsyncPath=	e.g. life-preserver/back-2011-09-12T14_53_14	location of the rsync data on the remote server when using <i>installMedium=rsync</i>
rsyncUser=	username	set when using <i>installMedium=rsync</i>
rsyncHost=	IP address of rsync server	set when using <i>installMedium=rsync</i>
rsyncPort=	port number	set when using <i>installMedium=rsync</i>
installComponents=	e.g. amarok,firefox,ports	components must exist in <i>/PCBSD/pc-sysinstall/components/</i> ; typically, <i>installPackages=</i> is used instead
installPackages=	e.g. Xorg cabextract	list of traditional or pkgng packages to install; requires <i>pkgExt=</i>
pkgExt=	txz, tbz	specify the extension used by the type of package to be installed
upgradeKeepDesktopProfile=	yes or no	specify if you wish to keep your existing user's desktop profile data during an upgrade
rootPass=	password	set the root password of the installed system to the specified string
rootEncPass=	encrypted string	set root password to specified encrypted string
userName=	case sensitive value	create a separate block of user values for each user you wish to create
userComment=	description	description text can include spaces
userPass=	password of user	
userEncPass	encrypted string	set user password to specified encrypted string
userShell=	e.g. <i>/bin/csh</i>	path to default shell

Variable	Options	Description
userHome=	e.g. /home/username	path to home directory
userGroups=	e.g. wheel,operator	comma separated (no spaces) list of groups
commitUser		mandatory, must be last line in each user block
runCommand=	path to command	run the specified command within chroot of the installed system, after the installation is complete
runScript=	path to script	runs specified script within chroot of the installed system, after the installation is complete
runExtCommand=	path to command	runs a command outside the chroot
timeZone=	e.g. America/New_York	location must exist in /usr/share/zoneinfo/
enableNTP=	yes or no	enable/disable NTP
localizeLang=	e.g. en	sets the system console and Desktop to the target language
localizeKeyLayout=	e.g. en	updates the system's Xorg config to set the keyboard layout
localizeKeyModel=	e.g. pc104	updates the system's Xorg config to set the keyboard model
localizeKeyVariant=	e.g. intl	updates the Xorg config to set the keyboard variant
autoLoginUser=	username	user will be logged in automatically without entering a password
sshHost=	hostname or IP address	the address of the remote server when using <i>installMode=zfsrestore</i>
sshPort=	e.g. 22	the SSH port number of the remote server when using <i>installMode=zfsrestore</i>
sshUser=	string	the username on the remote server when using <i>installMode=zfsrestore</i>
sshKey=	e.g. /root/id_rsa	path to the SSH key file on the remote server when using <i>installMode=zfsrestore</i>
zfsProps=	e.g. .lp-props-tank#backups#mybackup	location of dataset properties file created by Life Preserver during replication when using <i>installMode=zfsrestore</i>
zfsRemoteDataset=	e.g. tank/backups/mybackup	location of remote dataset to restore from when using <i>installMode=zfsrestore</i>

5.6.2 Create a Customized Configuration

One way to create a customized configuration file is to read through the configuration examples in `/usr/local/share/pc-sysinstall/examples/` to find the one that most closely matches your needs. Copy that file to any location and customize it so that it includes the variables and values you would like to use in your installation.

An alternate way to create this file is to start an installation, configure the system as desired, and save the configuration to a USB stick (with or without actually performing the installation). You can use that saved configuration file as-is or customize it to meet an installation's needs. This method may prove easier to use if you are performing complex disk layouts.

If you wish to perform a fully-automated installation that does not prompt for any user input, you will also need to review `/usr/local/share/pc-sysinstall/examples/pc-autoinstall.conf` and place a customized copy of that file into `/boot/pc-autoinstall.conf` on your installation media.

Table 5.6b summarizes the additional variables that are available for fully automatic installations. More detailed descriptions can be found in the `/usr/local/share/pc-sysinstall/examples/pc-autoinstall.conf` file. Note that the variables in this file use a different syntax than those in Table 5.6a in that the values follow a colon and a space rather than the equals sign.

Table 5.6b: Additional Variables for Automated Installations

Variable	Options	Description
<code>pc_config</code>	URL or <code>/path/to/file</code>	location of customized <code>pc-sysinstall.conf</code>
<code>confirm_install</code>	yes or no	should be set to yes, otherwise booting the wrong disk will result in a system wipe
<code>shutdown_cmd</code>	e.g. shutdown -p now	good idea to run a shutdown, but can be any command/script you wish to execute post-install
<code>nic_config</code>	<code>dhcp-all</code> or <code><interface name></code> <code><IP address></code> <code><subnet mask></code>	will attempt dhcp on all found NICs until the installation file can be fetched or will setup specified interface
<code>nic_dns</code>	DNS server to use	
<code>nic_gateway</code>	IP address	default gateway to use

5.6.3 Create a Custom Installation Media or Installation Server

`pc-sysinstall` supports the following installation methods:

- from a CD, DVD, or USB media
- from an installation directory on an HTTP, FTP, SSH+rsync, or a [PXE Boot Install](#) server

The easiest way to create a custom installation media is to modify an existing installation image. For example, if you have downloaded an ISO for the PC-BSD® version that you wish to customize, the superuser can access the contents of the ISO as follows:

```
mdconfig -a -t vnode -f PCBSD10.1-RELEASE-x64-DVD-USB.iso -u 1
mount -t cd9660 /dev/md1 /mnt
```

Make sure you have `cd` 'd into a directory where you would like to copy the contents of the ISO. In the following examples, `/tmp/custominstall/` was created for this purpose:

```
cd /tmp/custominstall
tar -C /mnt -cf - . | tar -xvf -
umount /mnt
```

Alternately, if you have inserted an installation CD or DVD, you can mount the media and copy its contents to your desired directory:

```
mount -t cd9660 /dev/cd0 /mnt
cp -R /mnt/* /tmp/custominstall/
umount /mnt
```

If you are creating an automated installation, copy your customized *pc-autoinstall.conf* to */tmp/custominstall/boot/*.

Copy your customized configuration file to */tmp/custominstall/*. Double-check that the “installMedium=” variable in your customized configuration file is set to the type of media that you will be installing from.

You may also need to add some extra files if you set the following variables in your custom configuration file:

- **installComponents=** make sure that any extra components you wish to install exist in *extras/PBI/* (if they end in the *.pbi* extension) or *extras/components/* (if they end in *.tbz*)
- **runCommand=** make sure the command exists in the specified path
- **runScript=** make sure the script exists in the specified path
- **runExtCommand=** make sure the command exists in the specified path

If the installation media is a CD or DVD, you will need to create a bootable media that contains the files in your directory. To create a bootable ISO:

```
cd /tmp/custominstall
mkisofs -V mycustominstall -J -R -b boot/cdboot -no-emul-boot -o myinstall.iso
```

You can then use your favorite burning utility to burn the ISO to the media.

To begin an installation that requires user interaction:

```
pc-sysinstall -c /path_to_your_config_file
```

To begin a fully automated installation, insert the installation media and reboot.

If you are using an HTTP, FTP, or SSH server as the installation media, untar or copy the required files to a directory on the server that is accessible to users. Be sure to configure the server so that the installation files are accessible to the systems that you wish to install. If you are using a PXE Boot Install server, follow the instructions at [Connecting to and Customizing the PXE Boot Install Server](#).

6 Desktops

Once you have installed PC-BSD®, you will want to become familiar with your desktop environment. This section discusses the desktops which can be selected during the installation of PC-BSD® or installed afterwards using [AppCafe](#).

NOTE: Fluxbox is always installed and available in the login menu of a PC-BSD® system.

The following desktops, when installed, will appear in the list of available desktops when a user logs in:

- [Awesome](#)
- [Cinnamon](#)
- [Fluxbox](#)
- [FVWM](#)
- [GNOME](#)
- [i3](#)
- [IceWM](#)
- [KDE4](#)
- [Lumina](#)
- [LXDE](#)
- [Mate](#)
- [Openbox](#)
- [Ratpoison](#)
- [spectrwm](#)
- [XFCE4](#)
- [WindowLab](#)
- [Window Maker](#)

The rest of this chapter provides an overview of each of these desktops.

For the desktops that support desktop icons, three PC-BSD® icons will appear on the desktop:



AppCafe®: graphical utility used to install, uninstall, and upgrade software. See the section on [AppCafe®](#) for more details.



PC-BSD® Control Panel: contains applications for administering the computer. See the section on [Control Panel](#) for more details.



PC-BSD® Handbook: a PDF version of the PC-BSD® 10.1 Users Handbook (this document).

Even more desktops are available for installation from AppCafe®, if “Raw Packages” is checked in “Browser View”. These can be browsed in the “X11 - Window Managers” category. Note that if the desktop is not listed above, it will not automatically be added to the login manager.

6.1 Awesome

[Awesome](#) is a highly configurable and fast window manager that is primarily targeted at power users who prefer to use the command line within their graphical environment.

Figure 6.1a shows a screenshot of Awesome running on PC-BSD® 10.1. The user has right-clicked the desktop in order to launch the awesome application manager.

Figure 6.1a: Awesome Window Manager on PC-BSD®



If you click `awesome` → `manual`, the man page for awesome will open in a terminal. If you click `awesome` → `edit config`, the awesome configuration file will open in the `nano` text editor. The numbers in the upper left corner represent virtual desktops. For example, you can have different terminals open in each virtual desktop.

Bluetooth Manager (if the system has a Bluetooth interface), Update Manager, Wireless Configuration Manager (if your wireless card is detected), and Life Preserver are located in the system tray near the clock in the upper right corner. If you wish to access Control Panel type `pc-controlpanel` in a terminal. To launch AppCafe®, type `pc-su appcafe` in a terminal.

6.2 Cinnamon

NOTE: Cinnamon requires 3D acceleration. If your video driver does not support this, you should not install Cinnamon.

[Cinnamon](#) is a desktop environment developed by the Linux Mint project. Figure 6.2a shows a screenshot of Cinnamon on a PC-BSD® 10.1 system with the applications “Menu” open.

Figure 6.2a: Cinnamon Desktop on a PC-BSD® System



Hover over a category in the menu to see its available applications. Alternately, use the search bar to find a specific application.

Click the wrench icon in the upper left corner to access the “Cinnamon Settings” menu, where you can configure backgrounds, desktop effects, themes, applets, desklets, extensions, menu items, the screensaver, and so on. Additional themes, applets, desklets, and extensions can be downloaded from the [Cinnamon website](#).

6.3 Fluxbox

[Fluxbox](#) is a light-weight and fast window manager. Regardless of the window managers that you have selected to install, Fluxbox is always available as an option in the login menu.

Figure 6.3a shows a screenshot of Fluxbox running on PC-BSD®. In this example, the user has launched the Application menu by right-clicking on the desktop.

Fluxbox provides many configuration files which can be edited in order to customize the desktop. The [Features](#) page of the Fluxbox website lists the available configuration files and links to instructions for getting the most out of Fluxbox.

Figure 6.3a: Fluxbox on PC-BSD®



The following resources are useful when customizing Fluxbox:

- [Creating the Perfect Fluxbox Desktop on Linux](#)
- [Fluxconf How-To at Tux Magazine](#)
- [Fluxbox wiki](#)
- [FAQ](#)

6.4 FVWM

[FVWM](#) is a powerful and highly configurable desktop window manager for the X Window system. It supports any number of virtual desktops, each divided into multiple pages. It also supports side title bars, including vertical text.

When you install FVWM on PC-BSD®, it also installs [FVWM-Crystal](#). Both window managers will be added to the login menu.

Figure 6.4a shows the default PC-BSD® desktop if you select FVWM from the login menu. The application menu was opened by clicking the mouse anywhere on the desktop.

Figure 6.4a: FVWM Running on PC-BSD®



Figure 6.4b shows the default PC-BSD® desktop if you select FVWM-Crystal from the login menu. To open an xterm in FVWM-Crystal, right-click any area of the desktop.

Figure 6.4b: FVWM-Crystal Running on PC-BSD®



The [FVWM Documentation](#) provides information about configuring FVWM.

6.5 GNOME

When you install GNOME on PC-BSD®, it installs both GNOME2 and GNOME3. GNOME2 will appear in the login menu as “GNOME Classic” and GNOME3 will be listed in the login menu as “GNOME”.

NOTE: GNOME3 requires 3D acceleration. If your video driver does not support this, you should use GNOME2 instead.

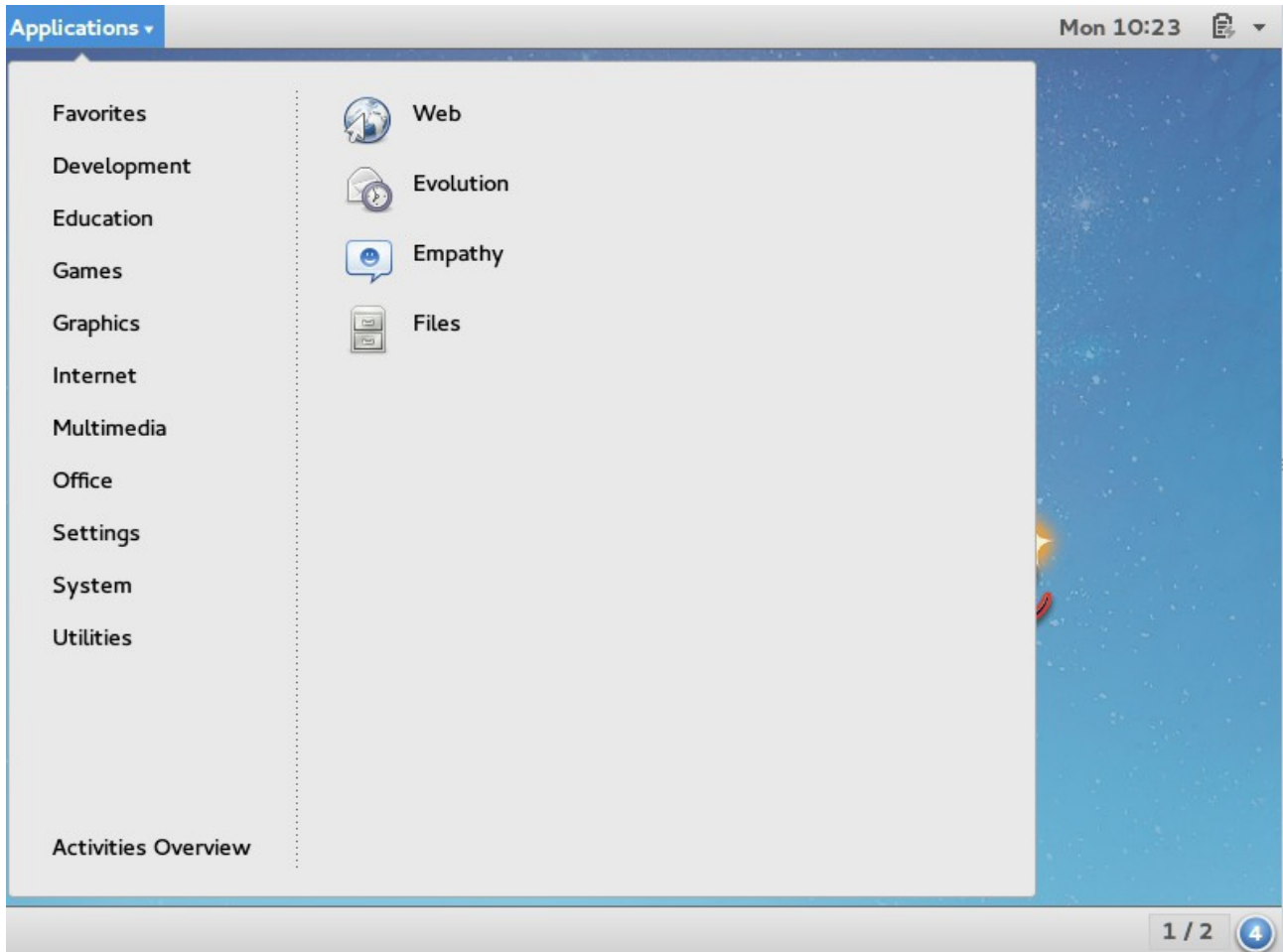
[GNOME3](#) is a popular desktop environment that provides many built-in utilities. Figure 6.5a shows a screenshot of GNOME3 on a PC-BSD® 10.1 system. To access the icons shown in this screen, click “Activities” then the 9-dot icon at the bottom of the left-hand panel. Alternately, if you know the name of an application to open, click “Activities” and type the application's name into the search bar.

Figure 6.5a: GNOME3 Desktop on a PC-BSD® System



Figure 6.5b shows a screenshot of GNOME2 on a PC-BSD® 10.1 system with the “Applications” menu open.

Figure 6.5b: GNOME2 Desktop on a PC-BSD® System



If you are new to GNOME, take some time to discover which applications best suit your needs. Some of the applications which are provided by GNOME include:

- **Image Viewer**: Eye of GNOME image viewer.
- **Web**: web browser.
- **Brasero**: CD/DVD burning software.
- **Videos**: movie player.
- **Evolution**: email client with address book and calendar.
- **Nautilus**: Nautilus file manager.

NOTE: some games, such as Lights Off, Quadrapassel, and Swell Foop, require 3D acceleration. If your video driver does not support this, you will not be able to launch those games.

You can find additional themes and wallpapers at gnome-look.org.

6.6 i3

[i3](#) is a lightweight, tiling window manager. Keyboard shortcuts are provided to open xterms in order to start applications from the command line.

i3 provides a panel and on PC-BSD® that panel will contain icons for Bluetooth Manager (if the system has a Bluetooth interface), Update Manager, Wireless Configuration Manager (if your wireless card is detected), and Life Preserver.

Figure 6.6a shows a screenshot of i3 running on PC-BSD® 10.1.

Figure 6.6a: i3 Window Manager on PC-BSD®



To open an xterm, use Alt+Enter. Windows do not provide minimize/maximize or close buttons, so type **exit** when you are finished using an xterm. To leave the window manager and return to the login screen, type **killall i3** from within an xterm.

The [i3 Users Guide](#) contains the default key bindings and instructions for customizing i3.

6.7 IceWM

[IceWM](#) is a light-weight window manager. Figure 6.7a shows a screenshot of IceWM running on PC-BSD®. In this example, the user has launched the Application menu by clicking on the IceWM button in the lower left corner. This menu can also be launched by right-clicking anywhere on the desktop.

Figure 6.7a: IceWM on PC-BSD®



If you are new to IceWM, see the [IceWM FAQ and Howto](#) for more information about configuration, customization, and keyboard shortcuts.

6.8 KDE4

The [KDE](#) desktop environment provides many features and applications. However, it is hardware intensive and may run slowly on a computer with an older processor or a small amount of RAM. Figure 6.8a shows a screenshot of KDE4 running on PC-BSD® 10.1 with the “Applications” menu open.

Figure 6.8a: Applications Menu of KDE4



Each category in the “Applications” menu contains many applications and the “Settings” and “System” categories contain many utilities for configuring your system. If you are new to KDE4, take some time to discover which applications best suit your needs. Some of the applications which are provided by KDE4 include:

- **[Konqueror](#)**: file manager, web browser, and SSH client found in Internet → Web Browser.
- **[Okular](#)**: document viewer and annotator found in Office - Document Viewer. Supports PDF, OpenOffice, and Postscript files.
- **[Dolphin](#)**: file manager found in System → File Manager. Dolphin provides many features for manipulating files such as comments, tags, search, encryption, and archival (zip/unzip) functions.

By default, desktop effects are disabled as not all video cards support them. If your video card supports 3D effects and you would like to enable them in KDE, go to System Settings → Desktop Effects → General and check the box “Enable desktop effects at startup”.

Some of KDE's games require 3D support. If your video card does not support 3D, these games will fail to start.

If you have KDE installed and are currently logged into a different window manager, you can still run any KDE application by specifying its name. For example, type **konqueror** to run the Konqueror web browser or **dolphin** to access the Dolphin File Manager.

[KDE Applications](#) includes descriptions and screenshots of all of KDE's applications as well as links to their handbooks.

kde-look.org contains additional themes and wallpapers.

6.9 Lumina

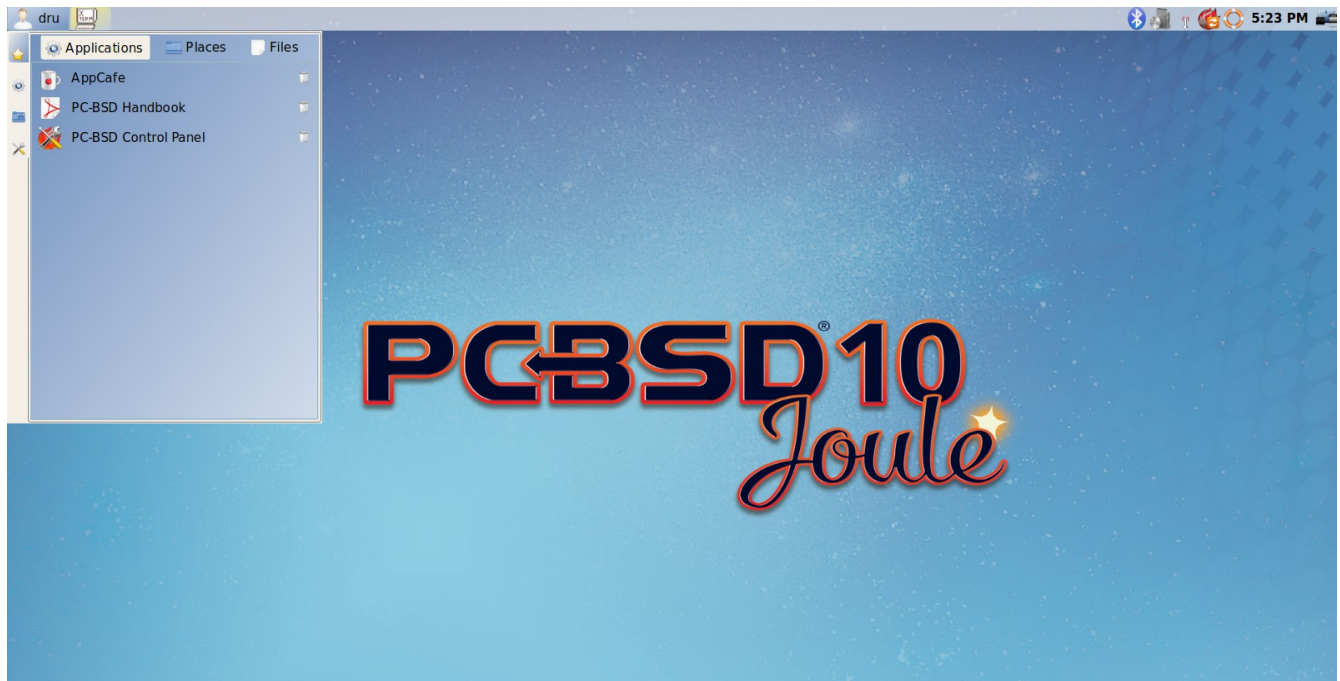
The Lumina Desktop Environment (Lumina for short) is a lightweight, XDG-compliant, BSD-licensed desktop environment that focuses specifically on streamlining the ability to get work done while minimizing system overhead. It is specifically designed for PC-BSD® and FreeBSD, but has also been ported to many other BSD and Linux operating systems. It is based on the Qt graphical toolkit and the Fluxbox window manager, and uses a small number of X utilities for various tasks, such as numlockx and xscreensaver.

Lumina's features include:

- Very little system overhead.
- Intelligent “favorites” system for creating quick shortcuts to applications, files, and directories.
- ZFS file restore functionality through the “Insight” file manager.
- Desktop system is plugin-based, which is similar to Android or other modern operating systems.
- Simple access to operating system-specific functionality such as screen brightness, audio volume, and battery status.

Figure 6.9a shows a screenshot of Lumina on a PC-BSD® 10.0.3 system with the “User” button clicked.

Figure 6.9a: Lumina Desktop



NOTE: while the PCDM login manager will automatically display Lumina in the desktop menu on a PC-BSD® system, users of other operating systems can add “Lumina-DE” as the name of the binary in their `.startx`, `.xinitrc`, or similar startup file.

The “User” button provides quick access for user interaction with the system. The left frame of this menu contains the following 4 tabs:

1. The first and default tab (yellow star icon) allows the user to quickly launch anything that was setup as a “favorite”. Favorites can be applications, files, or directories, and are separated into those three categories. Favorites can be removed by clicking the small button on the right side of the entry. If the button icon is a red minus sign, removing the favorite does not actually delete the file as just its link is removed. If the button icon is a trash can, the file will actually get deleted permanently. Note that anything that exists in the users Desktop folder (*~/Desktop*) is automatically treated as a favorite.
2. The second tab (white and blue gear icon) lets the user browse all the applications currently registered on the system. By default, applications are listed alphabetically, but the list can be narrowed down by category using the drop-down list at the top of the tab. If you are running PC-BSD® or another operating system that has a pre-defined application “store”, you will also have a shortcut at the top of the tab which will open up that application store. On a PC-BSD® system, the shortcut is to AppCafe®. Each application has a little “star” button on the right side of the entry. This allows you to mark an application as a favorite and have it appear on your personal list of quick shortcuts.
3. The third tab (blue folder icon) lets the user quickly browse through all the directories in their home and open any of them in the Insight file manager by clicking the “Browse” button. You also have the same little “star” on directories that can be clicked to mark that directory as a favorite if you want quick access to it later.
4. The fourth tab (yellow tool icon) provides quick shortcuts to system and desktop configuration utilities. If you are on PC-BSD®, or a supported operating system, you should have links to the operating system's control panel, the desktop configuration utility (**lumina-config**), **qt-config** (if it is installed), and the screensaver configuration utility.

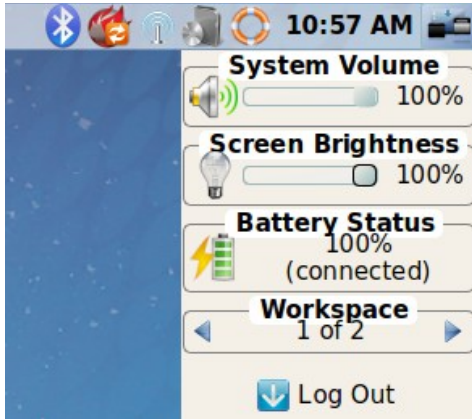
Any open windows or applications will have a button appear in the section of the panel near the “User” button. If the application provides an icon, the button will appear as that icon and if you mouse over it, the tooltip will show the name of the application. If you have multiple copies of an application running, it will combine all those entries into a single button and list the number of windows after the icon. If you click on a button, it will automatically make that window active. If there are multiple windows, you can select the particular window you want from a drop-down menu. The color of the button will change depending on the state of the window: grey for a hidden or minimized window, white for a visible but inactive window, yellow for the active window, and orange for a window that needs attention.

The system tray is located in the right portion of the panel. Any applications that register a tray icon will appear in this area. Clicking an icon to interact with that application directly. The current system time shown by the clock is in the default format for the current locale.

6.9.1 System Dashboard

The “System Dashboard” button is located at the far right of the panel and shown in Figure 6.9b.

Figure 6.9b: System Dashboard Menu



This button provides quick access to hardware-specific information or operations, as supported by your operating system. The possible menu entries are:

- A slider for changing the audio volume for the system from 0% to 100%. If the operating system provides a mixer utility, an icon will also appear. Click the icon to launch that mixer utility for advanced control of the audio system.
- A slider for changing the screen brightness from 0% to 100%.
- The current status of the battery, if your system has one, and the estimated time remaining if that battery is discharging.
- A listing of the number of virtual workspaces that are in use, with buttons to switch between the different workspaces.
- The log out button for ending the desktop session. When the log out button is clicked, a window of choices will be displayed in the middle of the screen. The choices include: Log Out, Restart (if the user has permission), Shutdown (if the user has permission), Cancel (to exit the choice menu), and Lock Screen.

6.9.2 Right-Click Menu

If the user right-clicks on the desktop, a menu of quick shortcuts will appear for instant access and the title of the menu will indicate the name of the workspace. While this menu can be customized, here is a quick summary of the default items on the menu.

- **Terminal:** used to launch a system terminal. The default is `xterm`, but this can be customized.
- **Browse System:** launches the file manager. The default file manager, Insight, recommended, but this can be customized.
- **Applications:** provides a drop-down menu of all the applications registered on the system, organized by category and name. Click an application to launch it. There are also a few shortcuts at the top of the application menu: one for opening the user's home directory, one for launching the control panel, if the operating system provides one, and one for launching the graphical application installer, if the operating system provides one.
- **Desktop Settings:** contains shortcuts to configuration utilities for the Lumina desktop environment, such as the control panel, if provided by the operating system, the screensaver configuration utility, the

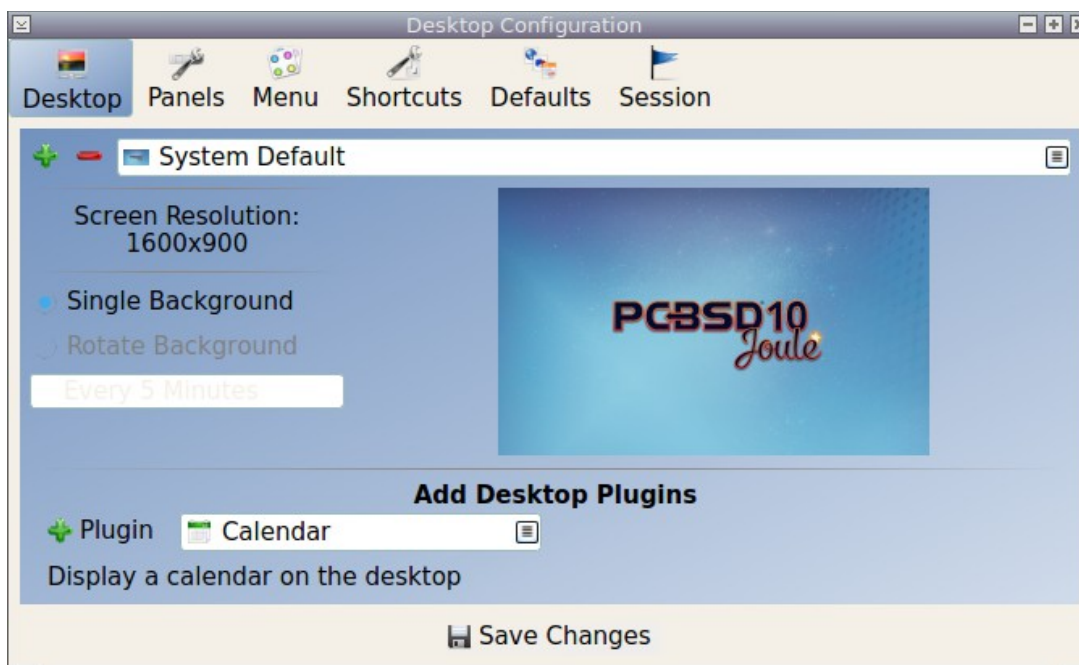
desktop configuration utility (**lumina-config**), and the Qt configuration utility (if installed).

- **Unlock/Lock Desktop:** used to lock or unlock the desktop plugins. When unlocked, desktop plugins become “active” and can be moved, resized, or removed from the desktop. It is recommended to leave the desktop locked during normal operations.
- **Snap Plugins to Grid:** this option only appears when the desktop is unlocked. Used to align and resize all the desktop plugins on an invisible 32x32 pixel grid, with special adjustments to align on the bottom and right screen edges if necessary, in order to provide a uniform appearance.
- **Log Out:** opens the system log out window, with options to shutdown/restart the system (if the user has permission), log out of the desktop session, lock the system, or cancel the log out window.

6.9.3 Lumina Configuration Utility

The Lumina Configuration utility, shown in Figure 6.9c, allows the user to configure every aspect of the desktop and is the recommended way to make changes. To launch this utility right-click the desktop and select Desktop Settings → Desktop or type **lumina-config** from an xterm.

Figure 6.9c: Lumina Desktop Configuration



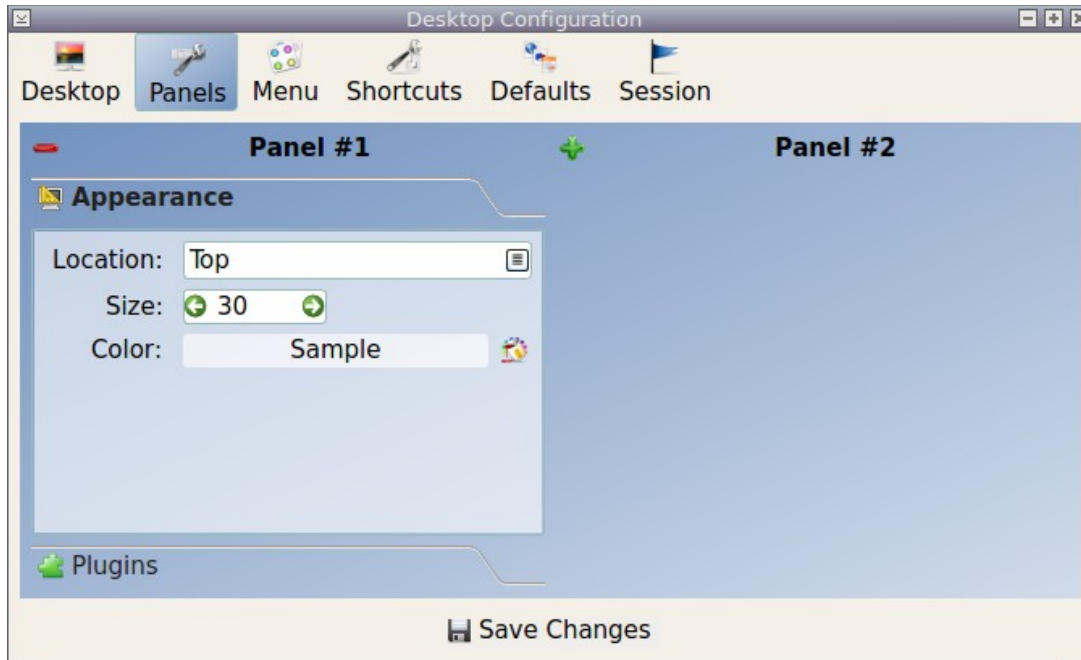
Each of the tabs at the top configures a different area of the system, with the most frequently changed options on the left side. Once changes have been made, the “Save Changes” button at the bottom of the window will become active. This allows the user to setup multiple changes in any tabs and apply them all at the same time. The following tabs are available:

Desktop: this tab is used to change the visual appearance and functionality of the desktop on a per-screen basis. It can be used to add or remove the image(s) to use for the desktop's wallpaper. If multiple images are selected, the “Rotate Background” button can be selected as well as a specified time interval in minutes to rotate to the next image.

New plugins can be added using the bottom of this tab. Select the type of plugin from the drop-down menu then click the “+” button to immediately add it to the desktop.

Panels: the “Panels” tab, shown in Figure 6.9d, allows the user to add, remove, and configure the desktop panel. Panels must be aligned along a screen edge, opposite screen edges in the case of two panels, and may have any width, color, or transparency. Use the “Location” drop-down menu to set the location of the panel and the “Size” and “Color” options to set the panel width and color.

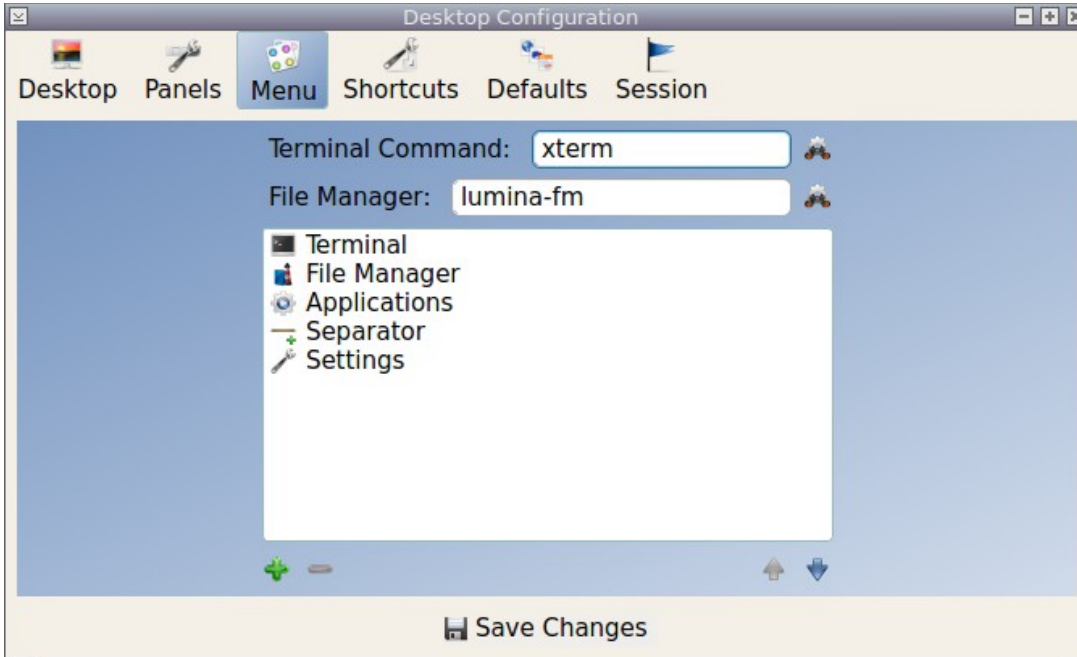
Figure 6.9d: Lumina Panels Configuration



Once a panel's appearance has been configured, plugins can be added by clicking the “+” button and selecting a plugin from the list that appears. Similarly, clicking the “-” button will remove the selected plugin, and the arrow buttons can be used to move the location of the plugin on the panel. The top of the list corresponds to either the top of a vertical panel or the left side of a horizontal panel.

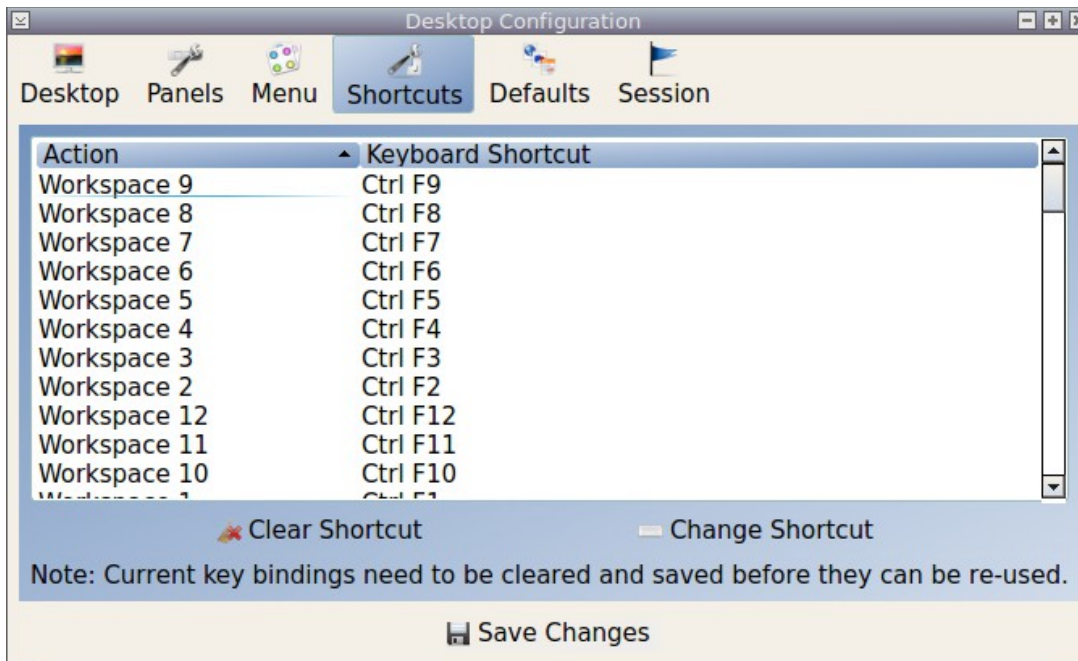
Menu: the “Menu” tab, shown in Figure 6.9e, allows the user to configure the right-click desktop menu with plugins as well as set the default application to use for the terminal and file manager. Click the “+” or “-” buttons to add or remove a plugin and the arrow buttons to change its order in the right-click menu.

Figure 6.9e: Lumina Menu Configuration



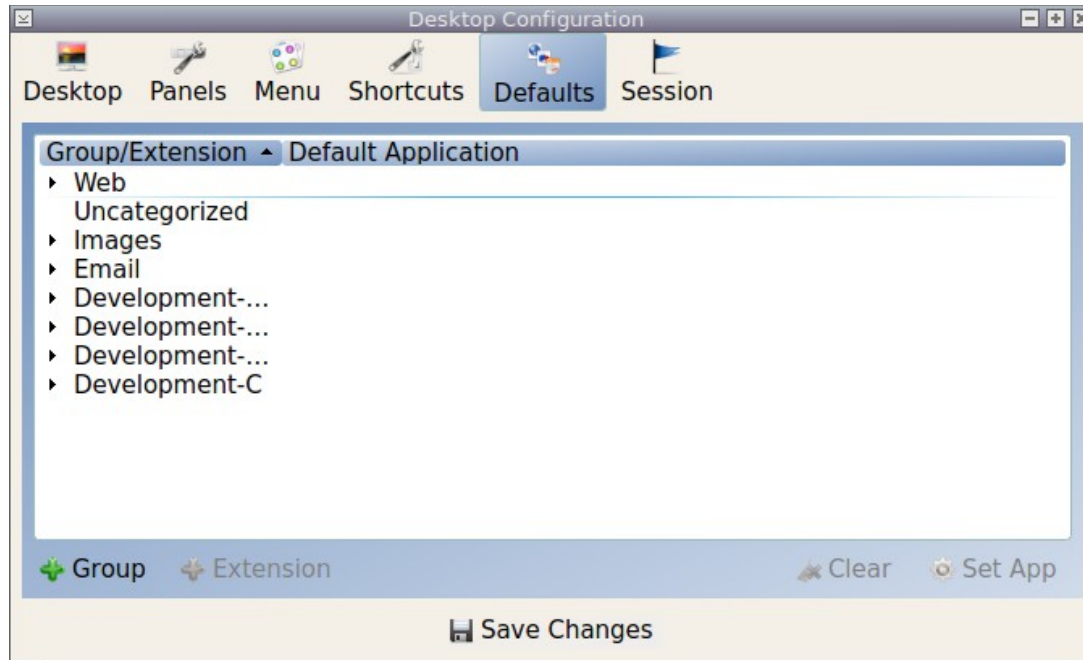
Shortcuts: the “Shortcuts” tab, shown in Figure 6.9f, allows the user to configure various keyboard shortcuts for system or window tasks. Most of these options relate to window and workspace management, such as moving windows between workspaces, but there are also options for changing the system audio volume or screen brightness. Note that a shortcut that is already in use can **not** be assigned to another action. First, that shortcut needs to be cleared and saved, before that key press will be detectable when creating or changing a shortcut.

Figure 6.9f: Lumina Shortcuts Configuration



Defaults: the “Defaults” tab, shown in Figure 6.9g, allows the user to configure the default application used for opening types of files. The file types are categorized into several pre-defined groups and new file extensions or groups may be defined with the two “+” buttons. If a group is selected when a default application is set or cleared, it will apply that default to every file type within that group.

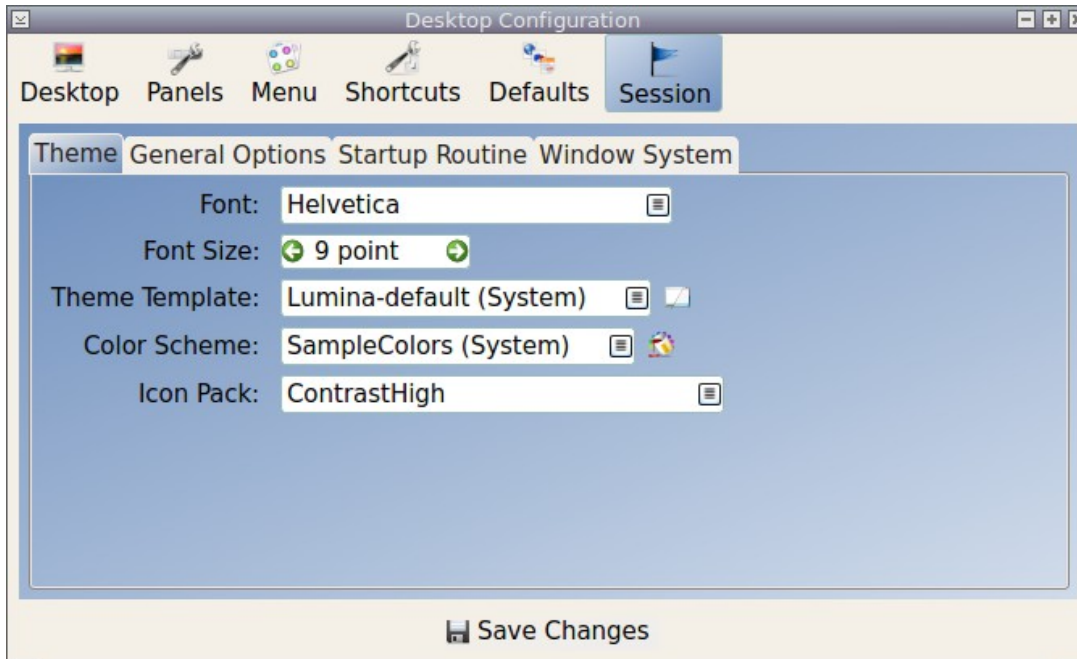
Figure 6.9g: Lumina Defaults Configuration



TIP: some applications, such as web browsers, keep their own internal lists of default applications for opening particular types of files. If you set that application to use the **lumina-open** or **xdg-open** utilities, it will use the default applications that are set here instead so that there is only a single list of default applications for the system.

Session: the “Session” tab, shown in Figure 6.9h, governs the general settings for the desktop session. These settings are usually not changed on a frequent basis.

Figure 6.9h: Lumina Session Configuration



This section is further subdivided into tabs that are used for various areas of the system:

- **Theme:** this tab allows the user to change the default font, font size, theme template, color scheme, and icon pack. It is possible to create your own theme template or color scheme by clicking the buttons next to those options and changing the settings as necessary. Note that the theme templates are written as Qt stylesheets, so some scripting experience may be helpful when configuring a theme.
- **General Options:** this tab contains the option to have numlock automatically enabled when the session is started. Additional option may also be added here in the future.
- **Startup Routine:** this tab is used to configure applications, files, or binaries to automatically run when the desktop session is started. This is useful if you always open a particular application or file every time you log in to the system and can streamline the workflow of the user.
- **Window System:** this tab allows the user to setup various configuration options for the window manager. These options include the number of workspaces, where new windows are placed on the screen, when windows receive focus, and the appearance of the frame around application windows.

NOTE: if you make any changes in any of the tabs, click “Save Changes” before exiting this utility in order to save them.

6.9.4 Lumina Screenshot

This utility can be used to take screenshots of the desktop or applications and save them as PNG image files. To launch this utility, right-click the desktop and select Applications → Utility → Lumina Screenshot or type **lumina-screenshot** from an xterm.

To take a screenshot, click the “Snap” button in the upper-right corner of the screen shown in Figure 6.9i.

Figure 6.9i: Lumina Screenshot



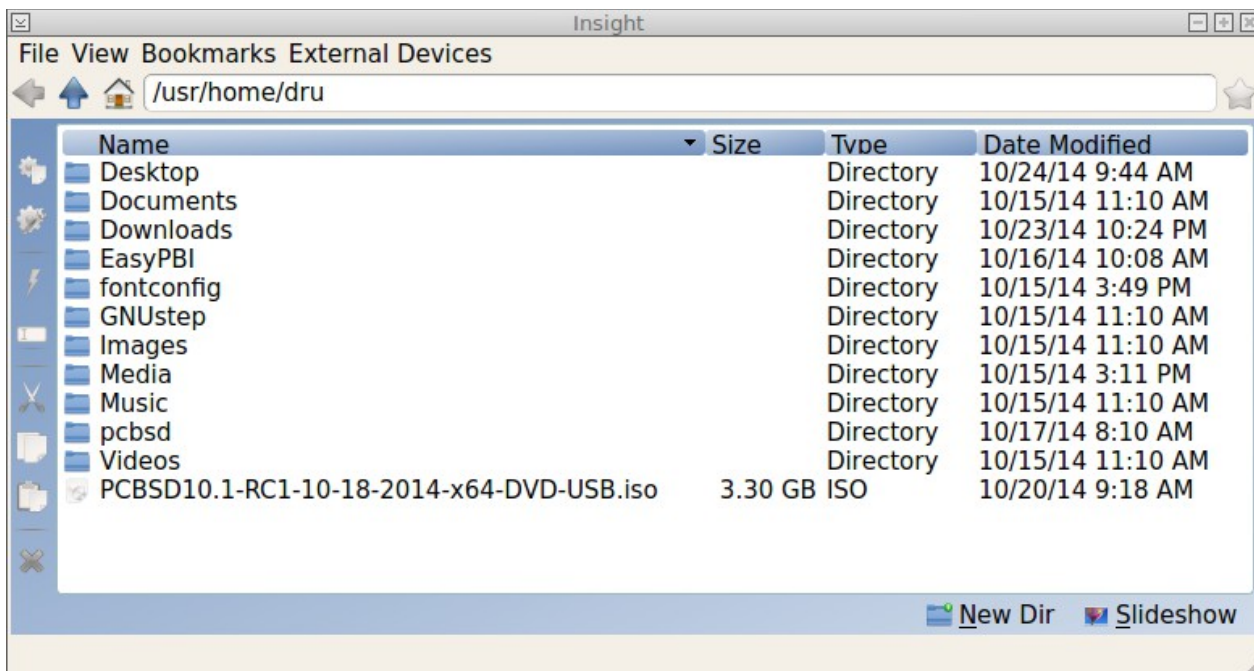
The settings at the bottom of the window can be used to select the “Entire Screen” or to “Select Window”. The delay, in number of seconds, can also be configured in order to give time to setup the screenshot. If you like the look of the taken screenshot, as shown in the preview, click the “Save” button to open a window where you can specify the name and location of the saved screenshot.

NOTE: the “Print Screen” keyboard shortcut is set to run this utility by default.

6.9.5 Insight File Manager

The Insight file manager, shown in Figure 6.9j, allows the user to easily browse and modify files on the local system on a per-directory basis. To open Insight, right-click the desktop and select “Browse System” or type `lumina-fm` from an xterm.

Figure 6.9j: Insight File Manager



It is possible to open up additional directories through the tab system (use “Ctrl-T” or click File → New Tab), allowing the user to easily manage multiple locations on the system. Insight also features the ability to “bookmark” locations on the system for instant access via the “star” button. Once a location has been bookmarked, it will be available via the “Bookmarks” menu at the top of the window. Any removable devices that are available on the system will show up in the “External Devices” menu, if supported by the operating system. When an item is selected, the options on the left side of the screen will show the possible actions that may be taken with regards to that item. Possible actions include: open, open with (will prompt for the application to use), add to favorites, rename, cut, copy, paste, and delete. By default, the actions buttons are visible. They can be made invisible by clicking View → Show Action Buttons.

A few additional options may be available at the bottom of the window, depending on the directory being viewed and the types of files that are in it:

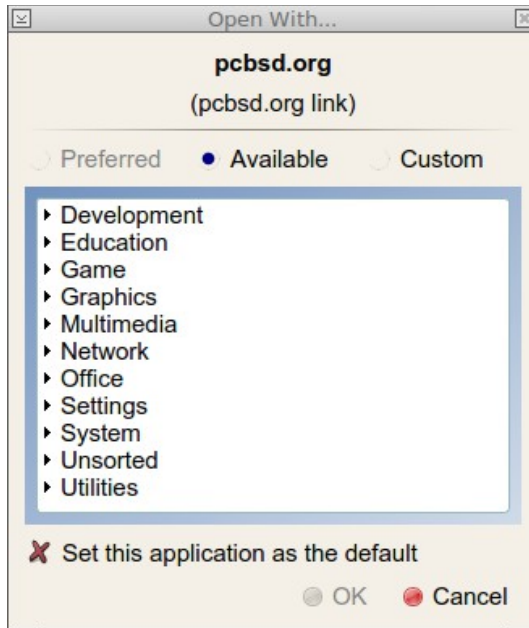
- **New Dir:** the ability to create a new directory will become available if the user has permission to modify the contents of the current directory.
- **Slideshow:** if there are image files in the directory, there is an option to view those image files as a slideshow.
- **Play:** will appear if there are supported multimedia files in the directory. The types of files that are supported depends on what multimedia plugins are installed on the system. If a particular file is not recognized as a multimedia file, install the associated multimedia codec using the operating system's application management software and restart the file manager.
- **Backups:** if the system is formatted with ZFS and snapshots of the current directory are available, this button will appear. Snapshots are organized from oldest to newest, with the most recent snapshot selected by default, and the contents of the directory at the time of that snapshot are displayed. To restore a file or multiple files, select them from the list and click the “Restore Selection” button. If those files still exist and you want to overwrite them, make sure the “Overwrite Existing Files” option is checked first. Otherwise, if a file with that name exists, the restore will append a number to the end of the filename. For example, the first restored version of *testfile.txt* will become *testfile-1.txt*.

6.9.6 Lumina Open

To open a file, directory, or URL from the command line, use **lumina-open** followed by the full path to the file or the URL. This utility will look for an appropriate application to use to open the specified file or URL. If there is no default application registered for the input type, a small dialog will prompt the user to select which application to use, and optionally set it as the default application for this file type. As seen in Figure 6.9k, this dialog organizes the available applications into three types:

- **Preferred:** these applications have registered their Mime type with the system and can open that type of file. Also included are any applications that have been used to open this type of file before as it keeps track of the last three applications used for that file type.
- **Available:** displays all the applications installed on the system, organized by category and name.
- **Custom:** lets the user manually type in the binary name or path of the application to use. It also provides a small button to let the user graphically search the system for the binary. Whenever text is entered, a check is performed to determine whether that is a valid binary and the icon will change between a green checkmark or a red X as appropriate.

Figure 6.9j: Lumina Open

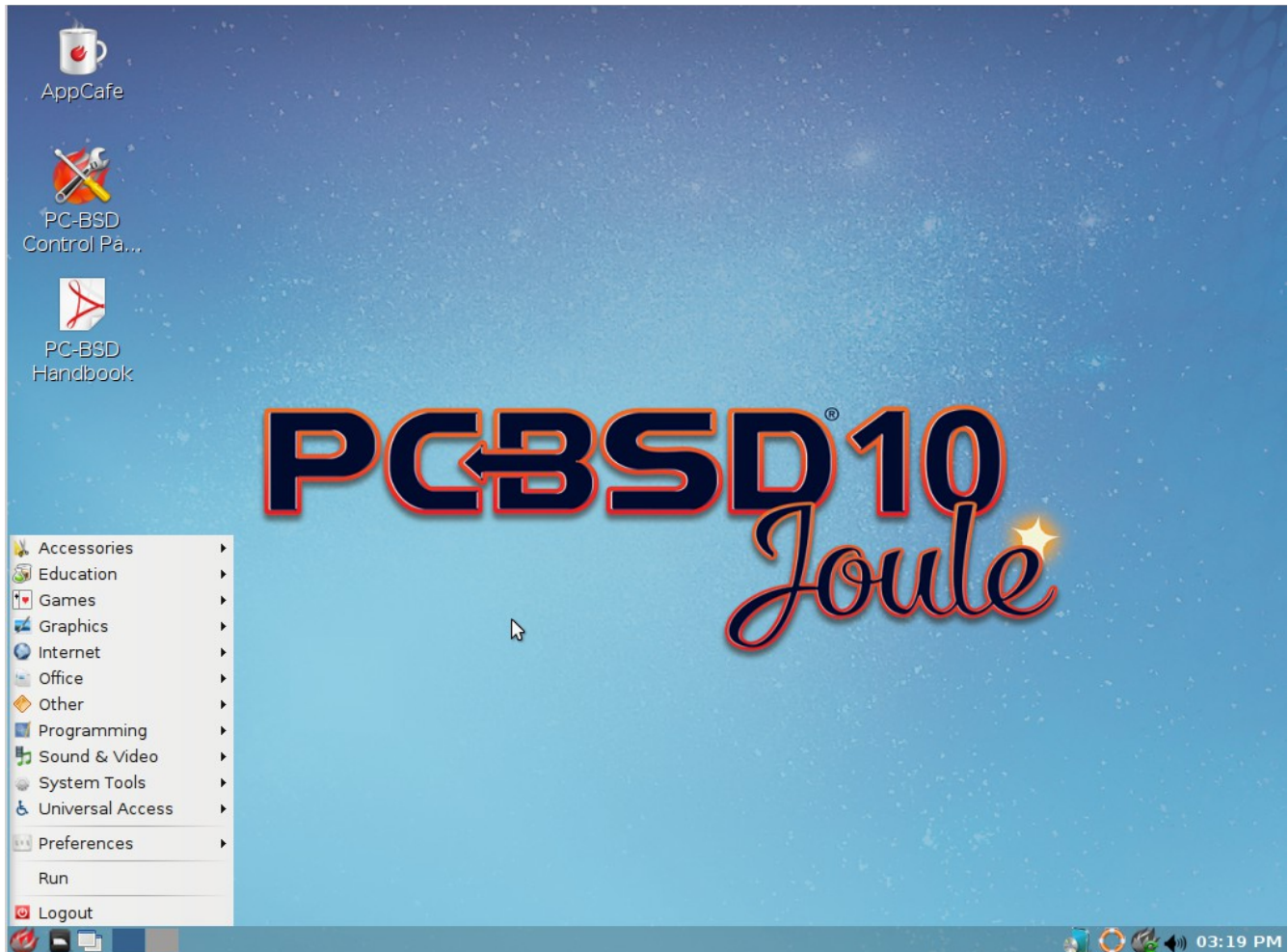


6.10 LXDE

[LXDE](#) is the Lightweight X11 Desktop Environment. It is an excellent choice for older hardware or for users who want a complete desktop environment without all of the overhead required by KDE or GNOME. Since it is XDG-compliant, the PC-BSD® Control Panel, AppCafe®, and Life Preserver are available on the desktop and integrated into LXDE's menus.

Figure 6.10a shows a screenshot of the default LXDE installation with the LXPanel open.

Figure 6.10a: LXDE Desktop on a PC-BSD® System



In addition to the PC-BSD® utilities, LXDE provides the following utilities:

- **LXPanel**: desktop panel which is launched by clicking on the PC-BSD® icon in the lower right corner of the desktop. To configure the panel, right-click the PC-BSD® icon and select “Panel Settings” or “Add/Remove Panel Items” from the right-click menu.
- **PCManFM**: found in Accessories → File Manager PCManFM. A file manager with features like drag and drop, tabbed browsing, built-in file search, file association with default application, thumbnails for images, bookmarks, and support for non-UTF-8 encoded filenames.
- **GPicView**: fast image viewer found in Accessories → Image Viewer.
- **Leafpad**: a light-weight graphical text editor found in Accessories → Leafpad.
- **LXTerminal**: terminal emulator found in Accessories → LXTerminal
- **Xarchiver**: archiver utility that supports the 7z, ARJ, bzip2, gzip, lzma, RAR, RPM, DEB, tar, and ZIP file formats. Found in Accessories → Xarchiver.
- **epdfview**: a PDF viewer with printing support found in Office → Document Viewer.

- **LXTask**: task manager and system monitor found in System Tools → Task Manager.
- **LXAppearance**: a theme switcher for customizing the widgets, colors, icons, mouse cursors, and sound effects used by applications. Found in Preferences → Customize Look and Feel.
- **LXInput**: a tool to configure your keyboard and mouse found in Preferences → Keyboard and Mouse.
- **Openbox**: the window manager used by LXDE. You can configure settings such as themes, appearance, mouse, and margins by going to Preferences → Openbox Configuration Manager.

This [forum post](#) describes how to configure an application to autostart when you login to LXDE.

6.11 Mate

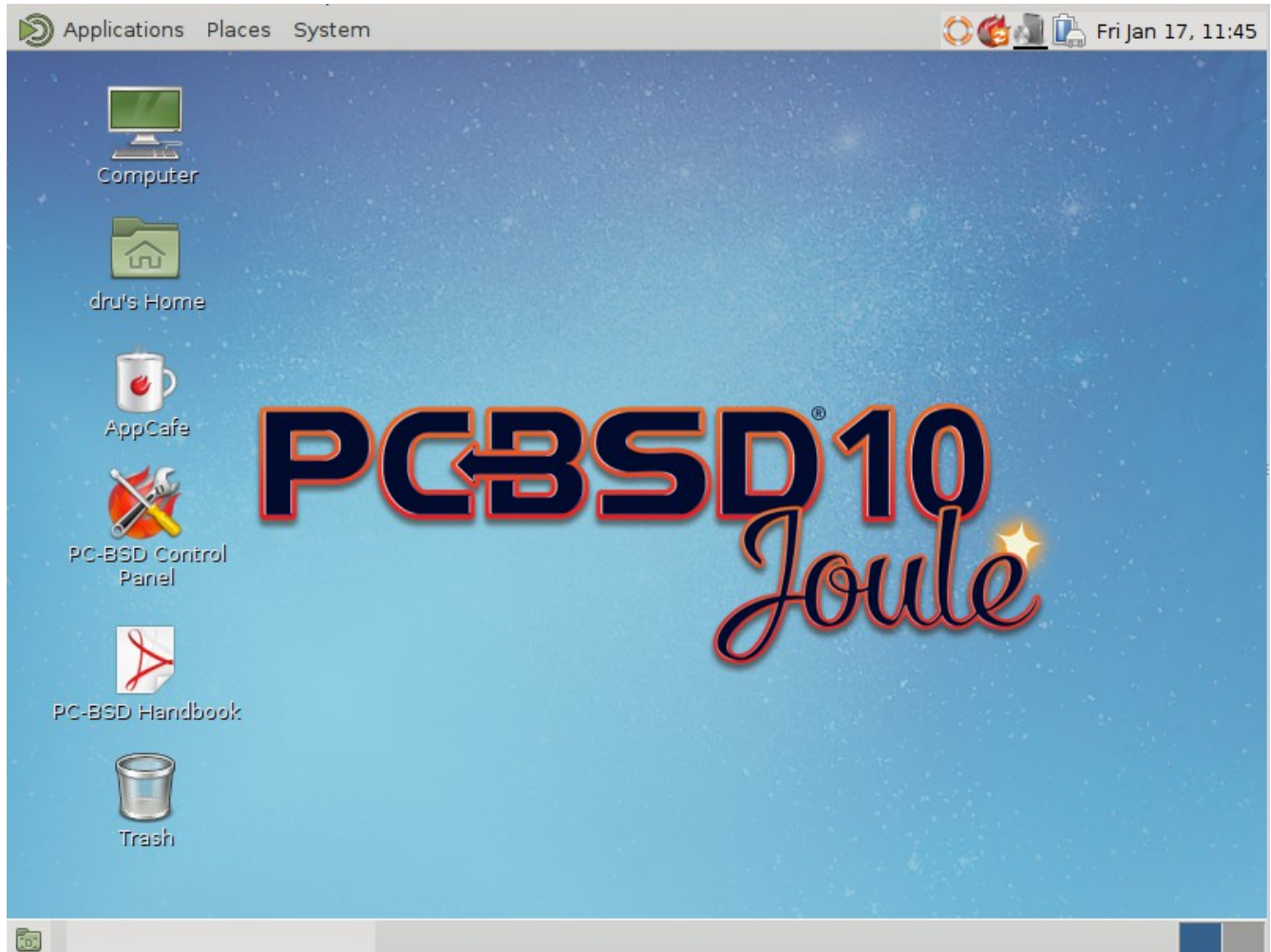
[MATE](#) is a fork of the popular, but now unmaintained, GNOME2 desktop environment. MATE is under active development to add support for new technologies while preserving the traditional GNOME desktop experience and its many built-in utilities. Figure 6.11a shows a screenshot of MATE on a PC-BSD® 10.1 system with the “Applications” menu open.

Each category in the “Applications” menu contains many applications and the System → Preferences category contains many utilities for configuring your system. If you are new to MATE, take some time to discover which applications best suit your needs. Some of the applications which are provided by MATE include:

- **Engrampa**: archive manager found in Accessories → Engrampa Archive Manager.
- **Eye of MATE**: image viewer found in Graphics → Eye of MATE Image Viewer.
- **Atril**: PDF document viewer found in Graphics → Atril Document Viewer.
- **Caja**: file manager found in System Tools → Caja. It is a fork of Nautilus.

You can find additional themes and wallpapers at gnome-look.org.

Figure 6.11a: MATE Desktop on a PC-BSD® System



6.12 Openbox

[Openbox](#) is a highly configurable, minimalist window manager. It is the window manager used by LXDE but can also be run separately from LXDE.

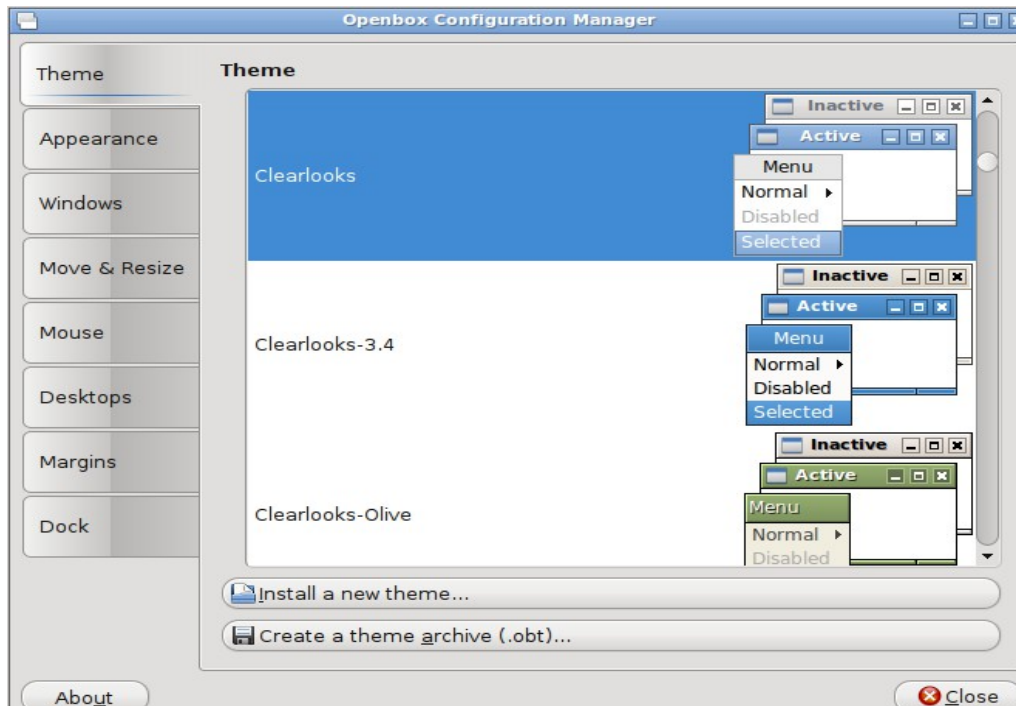
Figure 6.12a provides a screenshot of Openbox running on a PC-BSD® system. The application menu was launched by right-clicking on an area of the desktop.

The application menu contains an entry for the Openbox Configuration Manager which can be used to customize settings such as themes, appearance, mouse, and margins. A screenshot of this configuration utility is shown in Figure 6.12b.

Figure 6.12a: Openbox on a PC-BSD® System



Figure 6.12b: Openbox Configuration Manager



A list of websites containing additional themes is available from the [Openbox wiki](#).

6.13 Ratpoison

[Ratpoison](#) is a simple window manager with no fat library dependencies, no fancy graphics, or window decorations.

Figure 6.13a provides a screenshot of Ratpoison running on a PC-BSD® system:

Figure 6.13a: Ratpoison on a PC-BSD® System



Ratpoison uses keyboard shortcuts. To view the shortcuts, press Ctrl-t then ?. To leave this help screen, press enter.

To open an xterm, press Ctrl-t then c. Type **exit** to close the xterm. Type **killall ratpoison** with an xterm to leave Ratpoison and return to the login screen.

The [Ratpoison wiki](#) contains an FAQ and tips for setting keyboard shortcuts.

6.14 spectrwm

[spectrwm](#), formerly known as scrotwm, is a minimalist window manager written by OpenBSD hackers. It provides keyboard shortcuts, a configuration file, and assumes that the user prefers to use the command line. If you have not used spectrwm before, spend some time reading through its [man page](#) first.

To launch applications within spectrwm, start an xterm by pressing Alt+Shift+Return. Once you have an xterm, you can start any program you wish. For example, to start Control Panel type **pc-controlpanel**. spectrwm does not provide minimize, maximize, or close buttons within its windows. To close a GUI application, use CTRL-c within the xterm you used to launch the application. To leave this desktop, type **killall spectrwm** from an xterm.

6.15 WindowLab

[WindowLab](#) is a small and simple window manager. It uses a window resizing mechanism that allows one or many edges of a window to be changed in one action, and an innovative menubar that shares the same part of the screen as the taskbar. It follows a click-to-focus but not raise-on-focus policy. This means that when a window is clicked it gets focus, but it is not redrawn to obscure other windows. This allows one, for example, to switch to a terminal to enter commands while keeping documentation visible in a web browser.

Use the right mouse button to display the top menu panel. Use the left mouse button or hover over a taskbar entry to open that application.

To add the applications you use most often to the menubar, select “Edit menu” while holding the right mouse button.

To leave the WindowLab session, select “Quit” from the menubar.

6.16 Window Maker

[Window Maker](#) is a light-weight window manager that was designed to reproduce the elegant look and feel of the [NEXTSTEP](#) user interface.

Figure 6.16a shows a screenshot of Window Maker running on PC-BSD®. In this example, the user launched the Application menu by right-clicking an area of the desktop.

In addition to the PC-BSD® utilities, Window Maker provides the following applications:

- **WPrefs**: located in Appearance → Preferences Utility. Allows you to configure window focus, window placement, menu alignment, icons, keyboard actions, mouse, fonts, and various other window manager settings.
- **wmakerconf**: found in Utils → wmakerconf. Allows you to fine-tune your menu entries as well as your desktop's appearance, themes, background, mouse, and special effects. Figure 6.16b shows wmakerconf with the “Menu” button selected.

Figure 6.16a: Window Maker on PC-BSD®

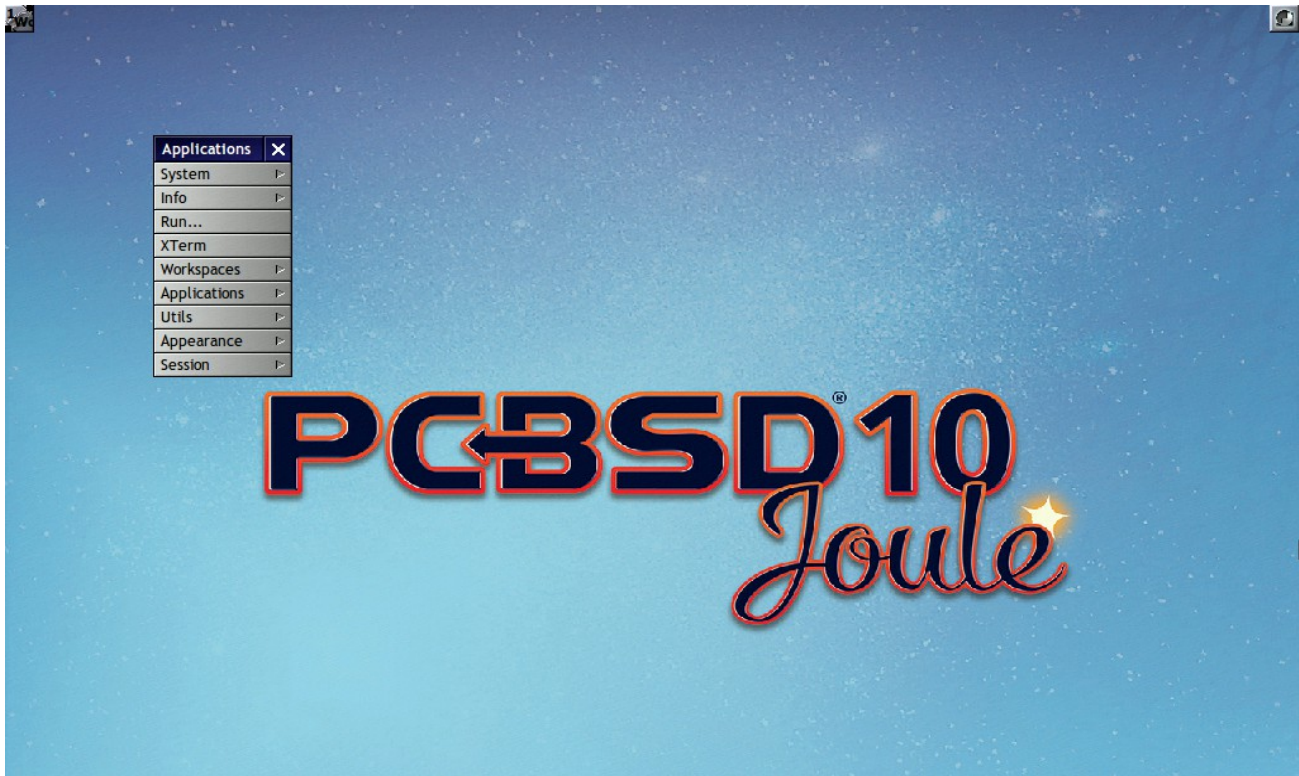
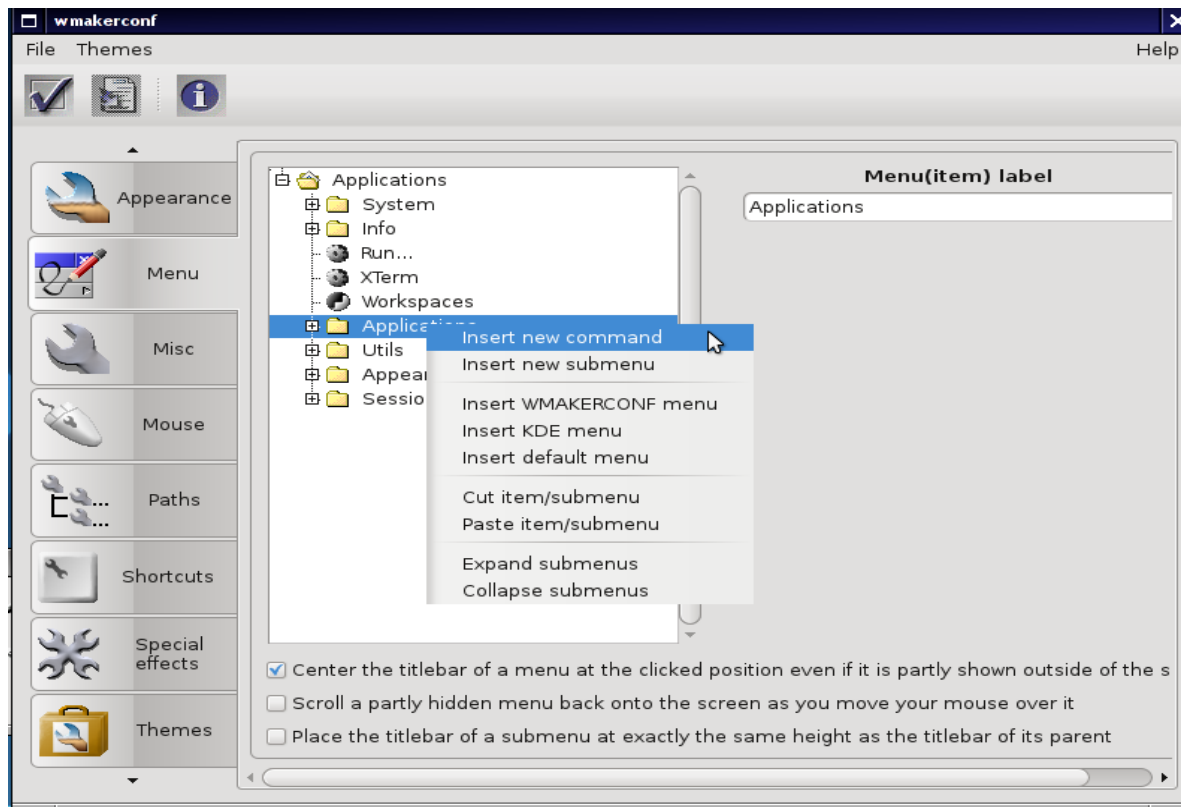


Figure 6.16b: Editing the Application Menu Using wmakerconf



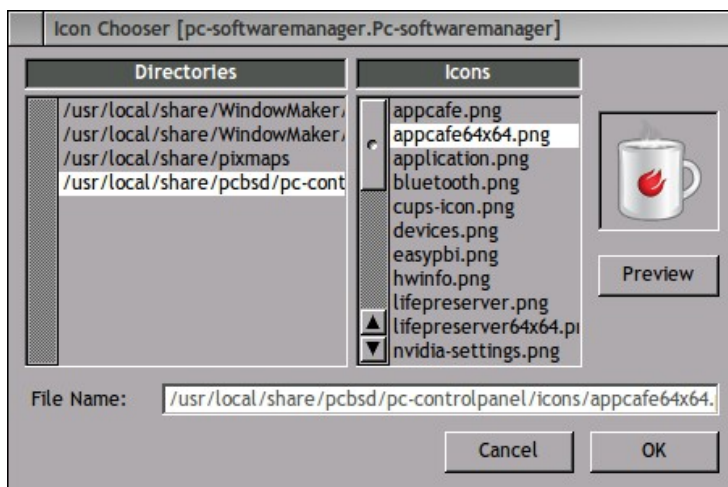
6.16.1 Working with the Dock

Window Maker uses a dock to store application shortcuts. The dock appears as a series of icons in the upper right corner of the desktop. Docked applications always show on the desktop, even after you close an application or close and restart your Window Maker session.

Whenever you start an application, an icon will appear in the lower left corner of the screen. You can move that icon elsewhere on the desktop with your mouse. If you right-click the icon, you have the option to hide/unhide the icon, set icon (change its picture), or kill the application. If you drag the icon onto the dock, it will remain on the desktop.

Once an icon is docked, a settings menu is added to the icon's right-click menu. Figure 6.16c demonstrates how to configure an icon for AppCafe®.

Figure 6.16c: Configuring an Icon



You will find the icons for AppCafe® and Control Panel in `/usr/local/share/pcbsd/pc-controlpanel/icons`. Choose the 64x64 versions as this is the size that Window Maker users. The application name for AppCafe® is **appcafe** and for Control Panel it is **pc-controlpanel**.

6.16.2 DockApps

Window Maker supports dockapps which are applications that were designed to work with Window Maker but which are separate from the Window Maker project. Dockapps tend to be small and designed to perform a particular function. For example, there are clocks, weather applications, and CPU monitors. Most dockapps have been ported to FreeBSD and the port always begins with “wm”. You can search for these at [FreshPorts](#) by entering a “Short Description” containing “dockapp”.

If your favorite dockapp has not been ported to FreeBSD, you can request that a port be created on the Ports Requests forum using these [instructions](#).

6.17 XFCE4

[Xfce](#) is a lightweight desktop environment that aims to be low on system resources and fast, while still being visually appealing and user friendly. More information about XFCE, including usage tips, can be found at the [XFCE FAQ](#).

The first time you start XFCE4, you will see the message shown in Figure 6.17a.

Figure 6.17a: Panel Welcome Message



In XFCE, a [panel](#) is a bar which can hold many items such as application launchers, window lists, a clock, a notification area, and application menus. Your initial panel setup options are:

- **Migrate old config:** select this option if you wish to have a single panel with an application launcher and other icons as shown in Figure 6.17b. The application launcher menu may be reached from the upper left, or by right-clicking the desktop.
- **Use default config:** this option will install a large panel across the top and a small, minimal panel centered on the bottom. The application launcher menu may be accessed by the fireball icon in the lower left, or by a right-click on the desktop.
- **One empty panel:** this option will install a panel with no icons. The application menu is available by right-clicking the desktop as shown in Figures 6.17b and 6.17c.

If you wish to change your configuration choice at a later time, reset the panel using Applications → Settings → Settings Editor, as shown in Figure 6.17d, then exit to the login prompt without saving session info. The next login to XFCE will present the panel configuration choice again.

Figure 6.17b: XFCE with Complete Panel Migrated From Old Config

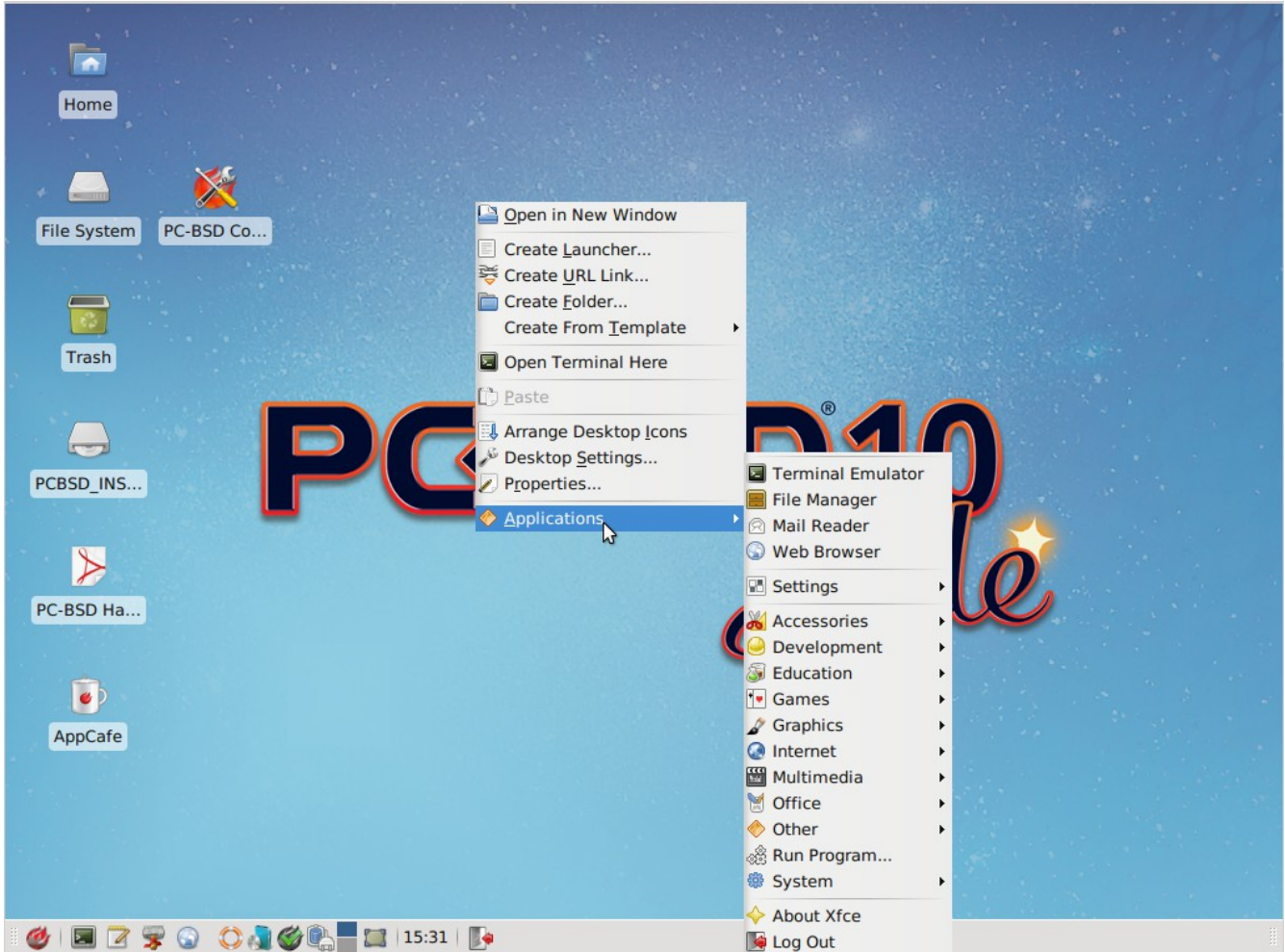


Figure 6.17c: XFCE with Minimal Panel Using Default Config

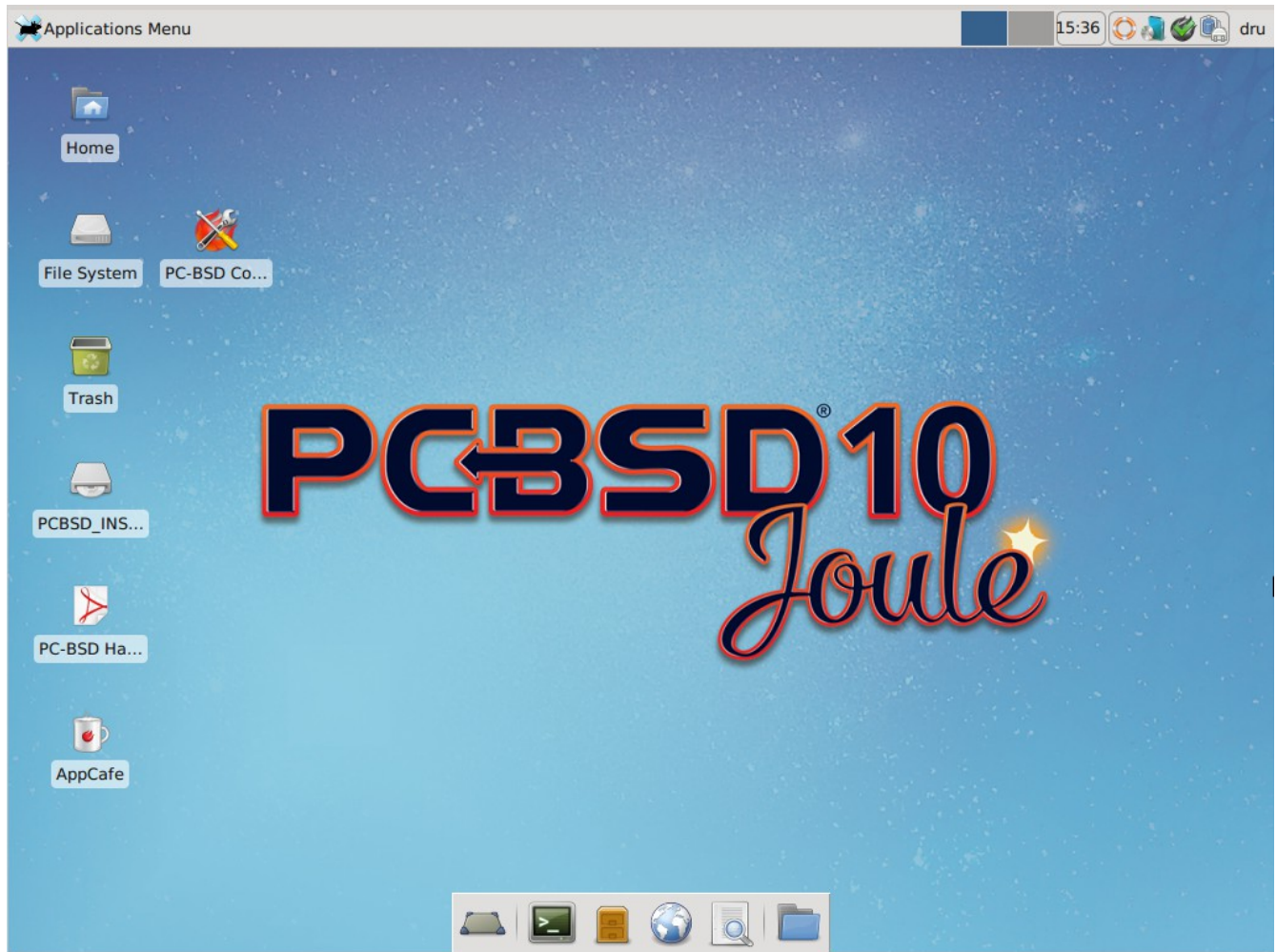
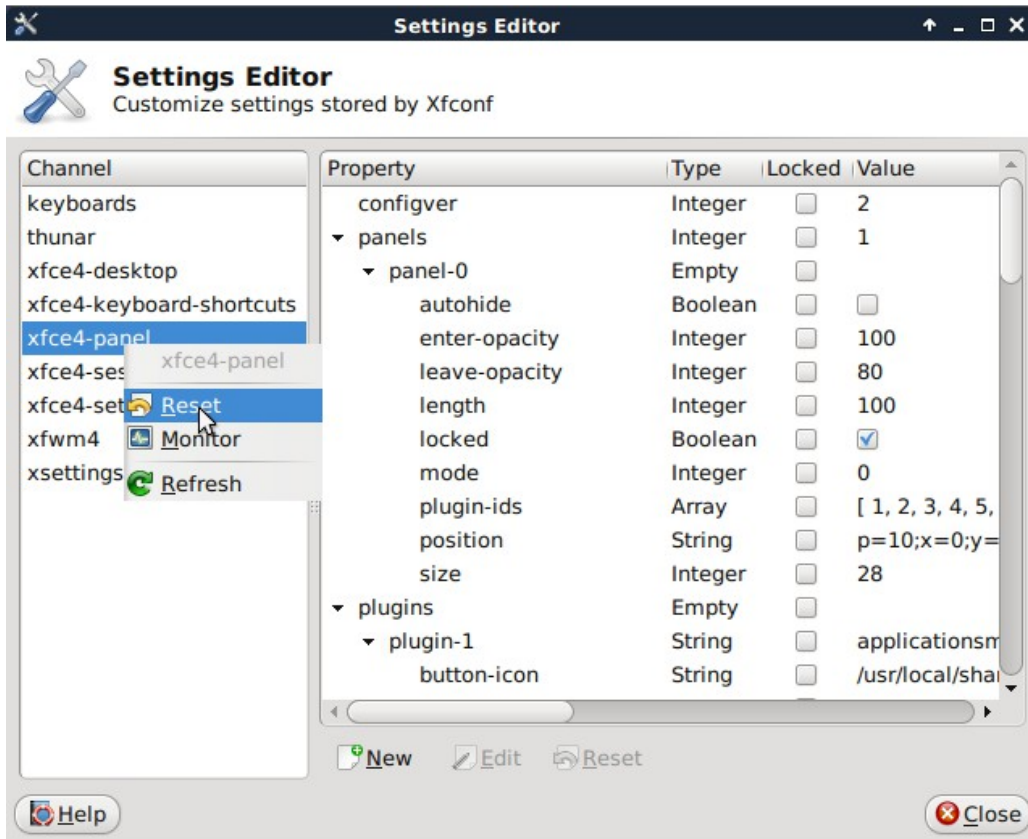


Figure 6.17d: Using Settings Editor to Reset Panel



In addition to the PC-BSD® utilities, XFCE provides the following utilities:

- **Xfdesktop**: desktop manager found in Settings → Desktop. Sets the background image, provides a right-click menu to launch applications, and can show files (including application launchers) or iconified windows.
- **Xfwm4**: window manager found in Settings → Window Manager. It provides window decorations, virtual desktops, multiscreen mode, transparency and a keyboard shortcuts editor.
- **Ristretto**: fast and light-weight picture viewer found in Graphics → Ristretto Image Viewer.
- **Midori**: light-weight graphical browser found in Internet → Midori.
- **Xfburn**: CD/DVD burning tool found in Multimedia → Xfburn.
- **Orage**: calendar and reminder daemon found in Office → Orage Calendar.
- **Thunar**: file manager found in System → Thunar File Manager.
- **Task Manager**: graphical task manager found in System → Task Manager.

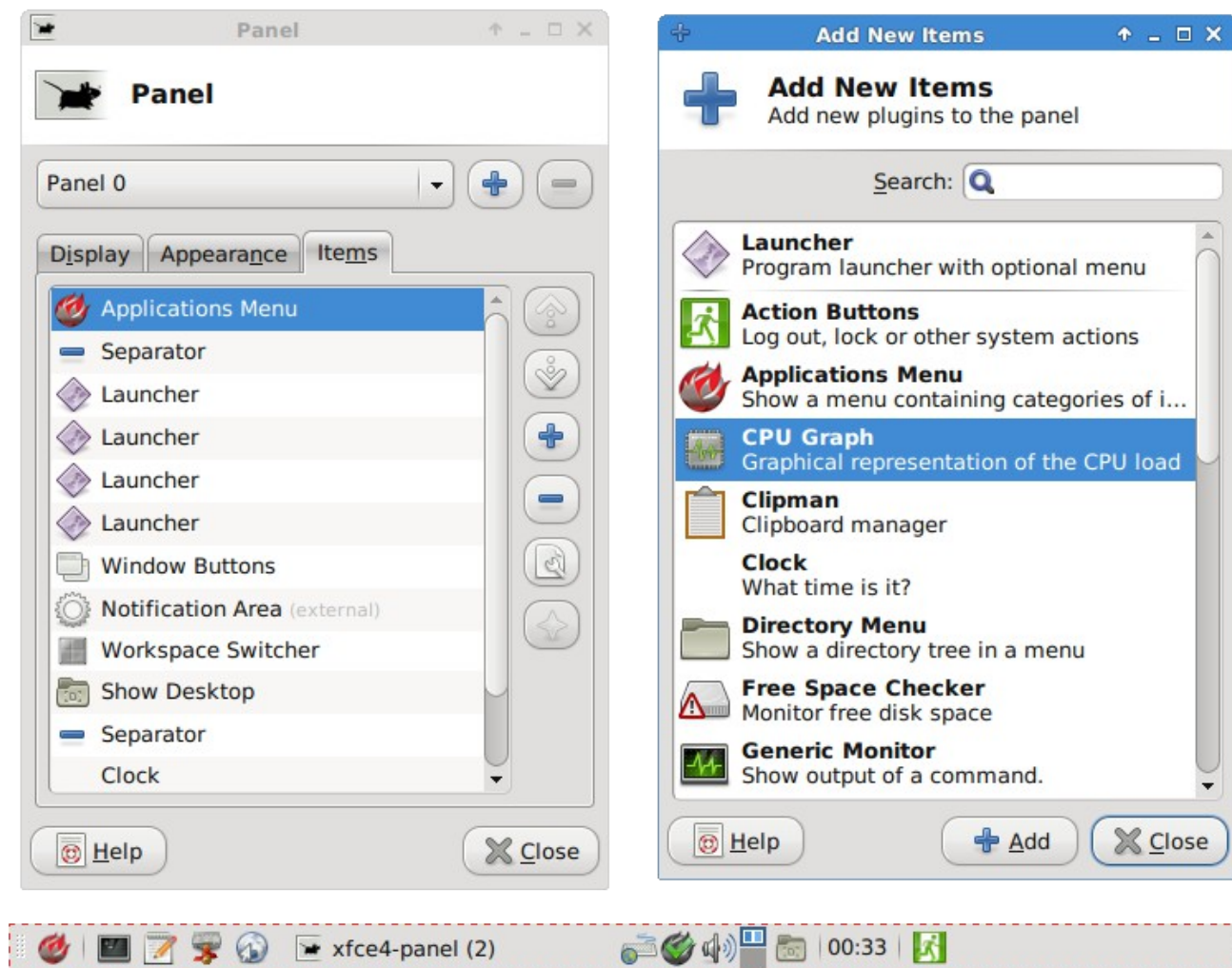
A list of recommended applications for XFCE can be found on the [XFCE Wiki](#).

6.17.1 XFCE Plugins

XFCE supports many plugins which provide additional applications that are separate from the official XFCE distribution. You can browse for plugins and read descriptions for each at the XFCE [goodies website](#). If you find a plugin that is not available within AppCafe®, this [README](#) explains how to determine if a FreeBSD port is available, how to request a PBI if a port is available, and how to request a port if one does not already exist.

After installing a plugin, go to Settings → Panel → Items and click the + button in the right column to see the “Add New Items” screen shown in Figure 6.17e.

Figure 6.17e: Adding a Plugin to the Panel



Select your new plugin from the list, and click the “+Add” button. It will immediately be added as an icon in the panel.

7 Installing Applications and Keeping PC-BSD® Updated

Both PC-BSD® and TrueOS® provide tools to make it easy to manage software and to keep both the operating system and installed software up-to-date. PC-BSD® provides the graphical [AppCafe®](#) and [Update Manager](#) utilities for managing and upgrading software. Since TrueOS® is a command-line only install and some users

prefer to use command-line utilities, both PC-BSD® and TrueOS® provide the [PBI Manager](#) suite of command line utilities and [pkgng](#) to manage software and **pc-updatemanager** to manage updates. Beginning with version 10.1, [AppCafe® Remote](#) can be used to remotely manage software and jails from a web browser or mobile device. If you install software using any of the tools described in this chapter, you will automatically be notified whenever a newer version of software is available.

In PC-BSD®, software is available in three different formats:

- **PBIs:** PC-BSD® provides a unique file format known as a PBI (Push Button Installer). PBI files end with the *.pbi* extension and are self-contained installation programs. A PBI file includes all the runtime and library dependencies required by the application. This means that the initial download of a PBI is a large file. During installation, the PBI system compares the currently installed libraries and files with the ones contained within the PBI file and only installs the ones that are not already installed on the system. A hash database is used to eliminate dependency problems while allowing the computer to share libraries between different programs. Subsequent downloads to upgrade a PBI are significantly smaller as only what has changed in the new version will be downloaded.
- **Meta-packages:** installable software collections similar to system components. Meta-packages can be selected during installation and include desktops and hardware drivers.
- **Packages:** additional software which includes the default software that is installed with the PC-BSD® operating system. Packages provide a mechanism for quickly installing open source software that has been specifically ported to FreeBSD. Currently, over 23,000 packages are available for installation.

The rest of this chapter demonstrates how to use the built-in graphical and command-line tools for managing software and upgrades. It also describes how to create a custom repository.

7.1 AppCafe®

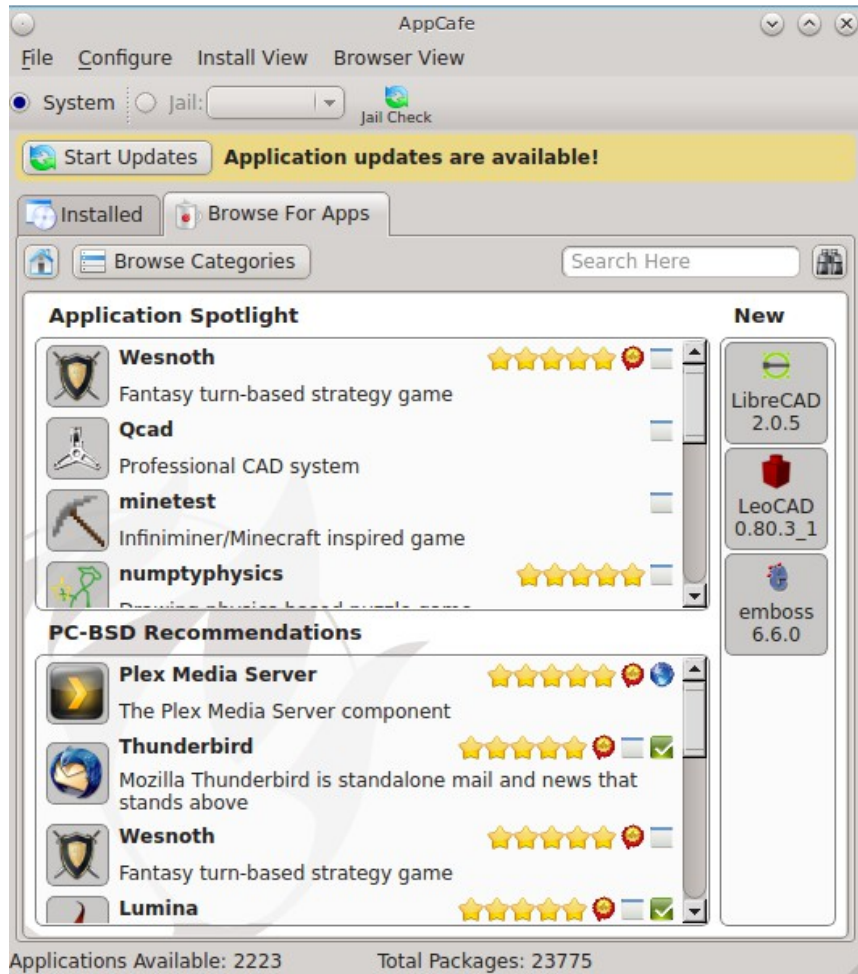
AppCafe® provides an intuitive, graphical method for installing, managing, and upgrading PBIs and packages. AppCafe® does not require the root password to install software. This means that you do not have to give out the root password on multi-user systems. However, it will prompt for the user's password and will fail if that user is not a member of the *wheel* group. This allows you to control which users are able to manage software.

If you prefer to manage PBIs from the command line, see the section on using the [PBI Manager](#) suite of command line utilities. Refer to [Using the CLI pkg Utilities](#) for instructions on managing packages from the command line.

7.1.1 Finding and Installing Software

To manage software, start AppCafe® by double-clicking its icon on the Desktop, going to Control Panel → AppCafe®, or by typing **pc-su appcafe** from a command prompt. When prompted, input your password. As seen in Figure 7.1a, AppCafe® will open into the “Browse for Apps” tab.

Figure 7.1a: Browsing for Software Using AppCafe®

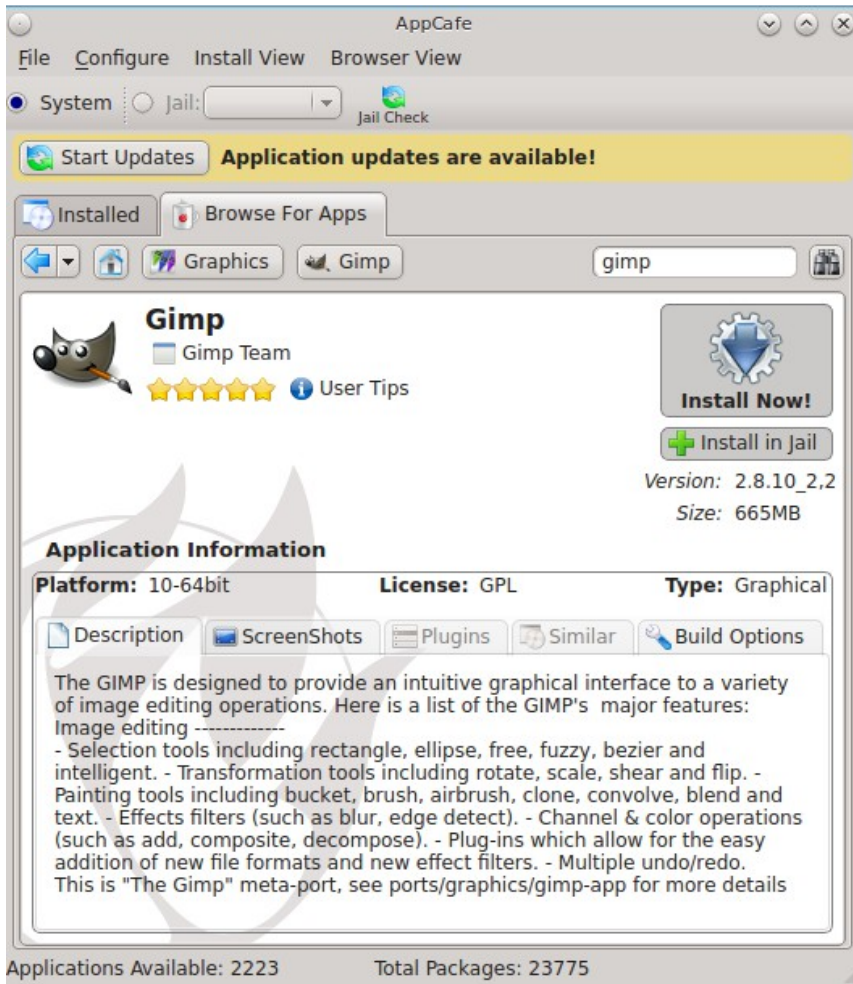


In the example shown in Figure 7.1a, 2,223 PBIs and 23,775 packages are currently available. This tab provides several buttons and panes:

- **Back button:** click the drop-down menu to return to a previous search or category.
- **Home button:** click this button to return back to this initial screen.
- **Browse Categories button:** click this button to access a list of software categories. Click on the name of a software category to browse for its available software.
- **Search bar/button:** if you know the name of the application you would like to install, type its name into the “Search Here” bar and either press enter or click the search (binoculars) button.
- **Application Spotlight pane:** software the PC-BSD® team recommends as being notable for their software category.
- **PC-BSD Recommendations pane:** a list of essential applications for new users.
- **New pane:** software which has been recently added to the AppCafe®.

In the example shown in Figure 7.1b, the user searched for the “gimp” application, then clicked the search result.

Figure 7.1b: Browsing the Information Available for a PBI



The following information is available for each application. Note that the rating and tips information is interactive, allowing users to share their tips with other PC-BSD® users. In order to do so, first create a wiki account at wiki.pcbsd.org, click on the activation email for the account, and login.

- The software category for the application. In this case, “Gimp” is in the “Graphics” category.
- Name and icon of the application.
- A hyperlink to the application's website. In this example, clicking “GIMP Team” will open gimp.org in the user's default web browser.
- A rating of up to five stars. Click the stars to open the PC-BSD® wiki page for the application. If you login to the wiki and hover the mouse over the number of stars to select, it will add your ranking and increment the vote number. If you make a mistake in your vote, refresh the browser, click the “remove” button, and re-select the desired number of stars.
- A “User Tips” link. Click the link to open the PC-BSD® wiki page for the application. If you login to the wiki, you can add your own usage tips for the application.
- An “Install Now!” icon. If the application is already installed, this will either be an “Upgrade” icon (if a newer version is available) or a “Downgrade” button (if the previous version is available).

- An “Install in Jail” button. Selecting this option will first create a new jail, then install that application into the jail.
- The version of the application.
- The download size.
- The application's platform (32-bit or 64-bit). If the application only provides a 32-bit version, AppCafe® will install the 32-bit application and PC-BSD® will still be able to run the program.
- The license used by the software.
- The “Type” will indicate whether the application is graphical or text (command line).

The following tabs are also available. If a tab is greyed out, it means that that information is not currently available for this particular application.

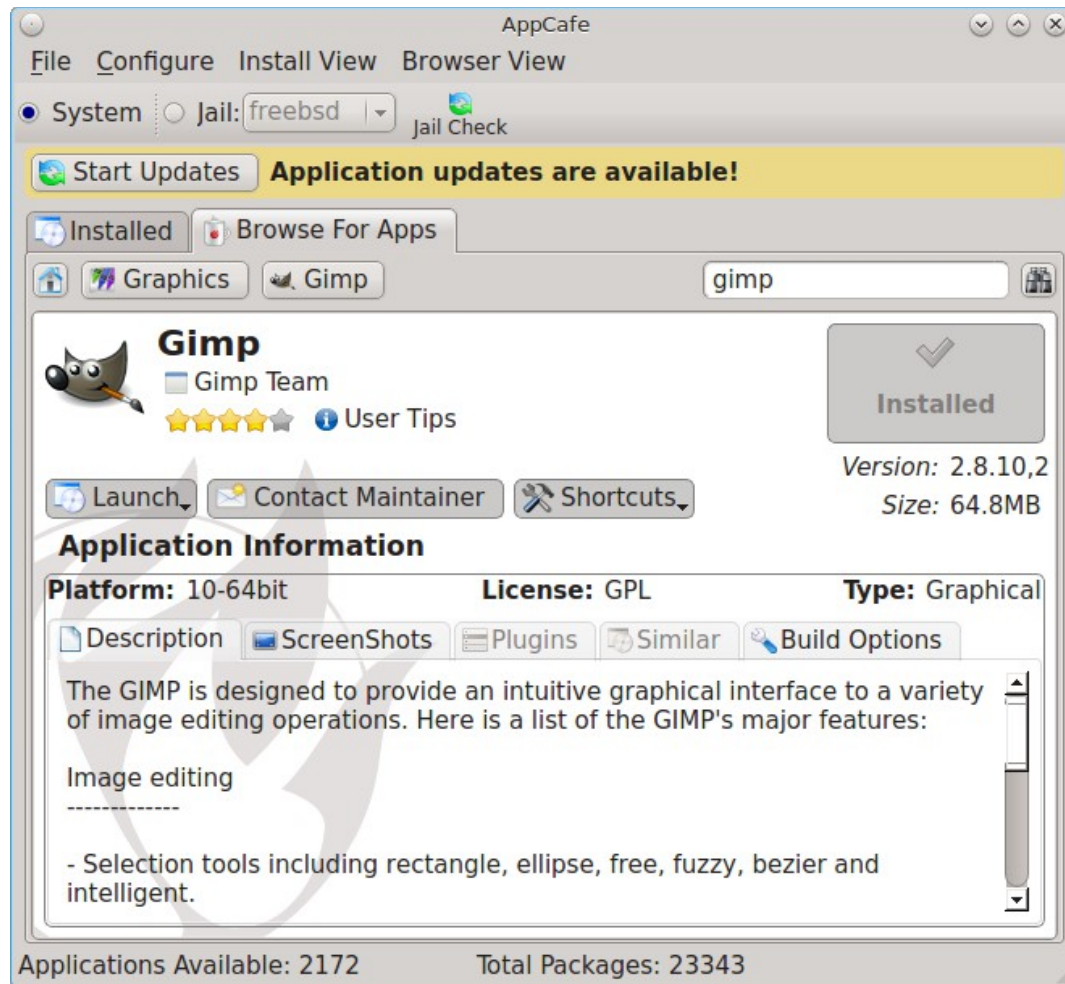
- **Description:** of the software.
- **Screenshots:** click the “View Full Size” button under the screenshot to view the full screen version of the screenshot.
- **Plugins:** provides an installable list of associated plugins. For an example, search for “firefox” and open its “Plugins” tab.
- **Similar:** provides an installable list of applications that provide similar functionality.
- **Build Options:** shows the values of the **make** options that the PBI or package was built with.

Once you find an application that you would like to install, click on its “Install Now!” icon. A yellow status bar at the bottom of the screen will show the download and installation status. Once the installation is complete, some of the contents of this screen will change, as seen in the example in Figure 7.1c.

The “Install Now!” button will change to “Installed” and the following buttons are now available:

- **Launch:** provides a drop-down menu for starting the application from its available start modes. Some applications start in graphical mode, some in command-line mode, and some offer both modes.
- **Contact Maintainer:** if this button is clicked, a pop-up message offers to launch the default email client, if one has been configured. It also indicates the email address of the FreeBSD port maintainer for that application in case one prefers to manually open their email client. If a default email client is configured, it will automatically fill in this email address as well as the important information regarding the PBI such as the build date, architecture, FreeBSD version, and version number. This allows you to send an error report or a patch to the maintainer.
- **Shortcuts:** click this button to add or remove a desktop shortcut to the application.

Figure 7.1c: Viewing the Information for an Installed Application

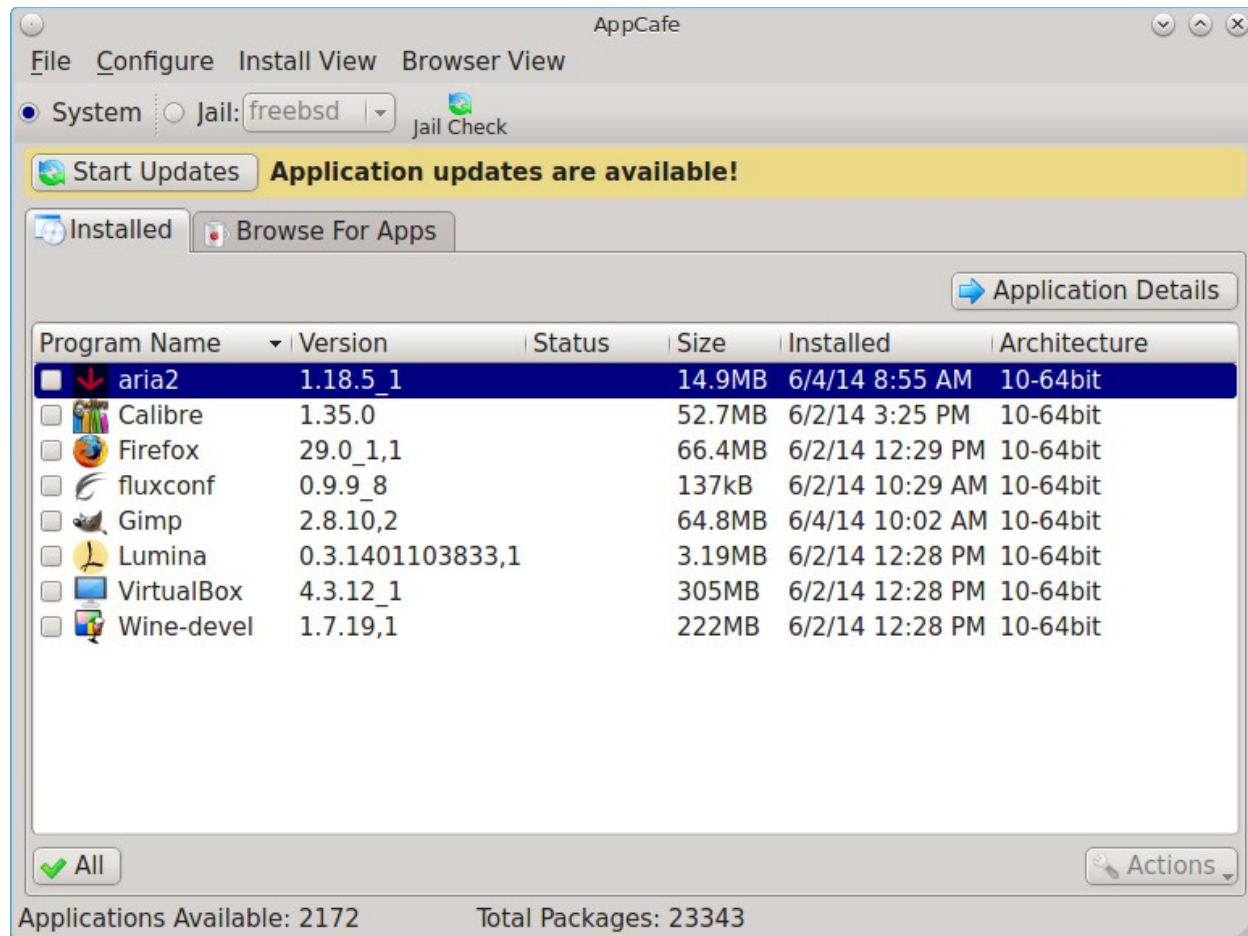


7.1.2 Managing Installed Software

To manage software that is currently installed, use the “Installed” tab. Figure 7.1d shows a screenshot of this tab after “gimp” is successfully installed.

The list of installed applications can be sorted by “Program Name”, “Version”, “Status” (of any running/pending “Actions”), “Size”, “Installed” (date of installation), and “Architecture”. Click the name of the desired column to change the sorting.

Figure 7.1d: Viewing the List of Installed Software in AppCafe®



If you check the box for at least one installed application and click the “Actions” button, the following actions become available:

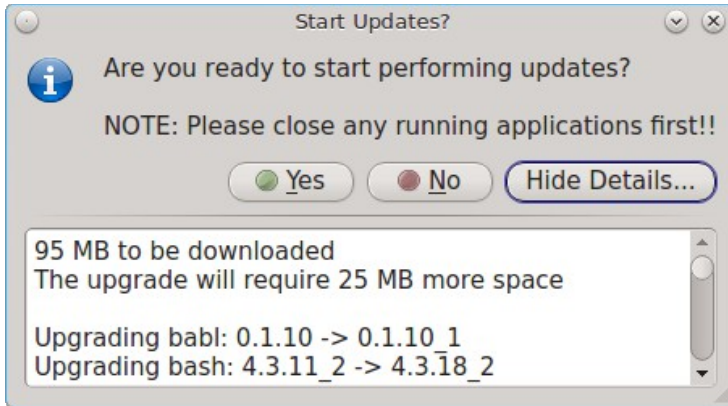
- **Desktop Icons:** used to add or remove a shortcut to the application on any installed desktop that supports icons.
- **Version Lock:** used to “Lock Current Version” so that it will not be updated until “Unlock Application” is selected. An application that is locked will have a lock icon next to its “Version”. Locking an application can be appropriate if there is a known issue in a more recent version of the application.
- **Uninstall:** will uninstall the checked applications. Once the removal is complete, that software will be removed from the “Installed” list.
- **Cancel Actions:** cancels any currently pending or running operations such as uninstallation, updating, or installation.

If you click the “Application Details” button, it will display the details for the application, as seen in the example shown in Figure 7.1c.

7.1.3 Updating Installed Software

As seen in the previous screenshots, AppCafe® will indicate if “Application updates are available!”. This message will automatically appear when any installed software has a newer version available. To start an update, click the “Start Updates” button. This will open the screen shown in Figure 7.1e.

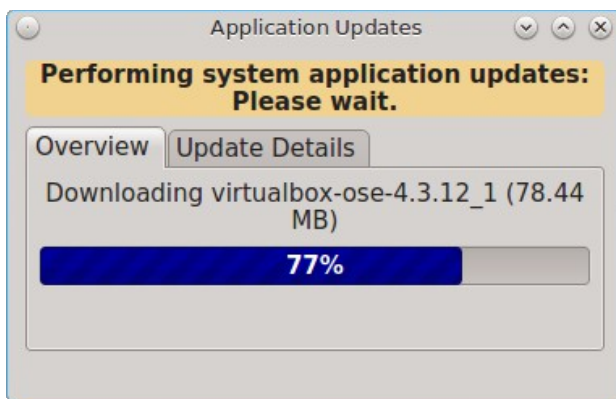
Figure 7.1e: Upgrading Installed PBIs



In this example, the “Show Details” button was clicked in order to view the list of outdated software. The listing will show the current version as well as the newer version for the software as well as any affected dependencies and will end with the size for the amount of new software to be downloaded. Click “Yes” to start the upgrade or “No” to cancel the upgrade request.

As seen in Figure 7.1f, once the upgrade is started, a status bar will indicate the progress of the download and upgrade process in an “Overview” tab. To see more detailed messages, click the “Update Details” tab. The upgrade process will first create a boot environment and add it to the boot menu. It will also save all of the current version's settings. For example, when Firefox is upgraded, it will keep all of your bookmarks, history, and cache.

Figure 7.1f Watching the Upgrade Progress



This screen will indicate when the upgrade is finished and will offer to reboot the system if the upgrade requires a reboot. If a reboot is needed and you cancel it, finish saving your work then reboot the system manually.

7.1.4 File Menu

The “File” menu provides the following options:

- **Vulnerability Info:** if you click this menu option, the FreshPorts VuXML page will open in the default web browser. This contains a list of all known vulnerabilities to software which has been ported to FreeBSD, and is thus available for installation in PC-BSD®. By default, the most recent vulnerabilities are shown first. There is a link on that web page to order the list of vulnerabilities by package name.
- **Import PBI List:** if you click this option, it will ask you to browse to the location of an existing PBI list, an ASCII text file ending with a *.pbilist* extension that contains the names of PBIs (without a version number), one per line. An example is seen in Example 7.1a. If you import a PBI list into AppCafe®, it will add those applications to the installation queue so that they can be installed. AppCafe® will ignore any invalid lines and PBIs which are already installed.
- **Export PBI List:** if you click this option on a system that already has PBIs installed, you can then import that list into another PC-BSD® system. By default, the exported list will be saved as *exportfile.pbilist*.
- **Quit:** click this option to close AppCafe®.

Example 7.1a: Sample PBI List

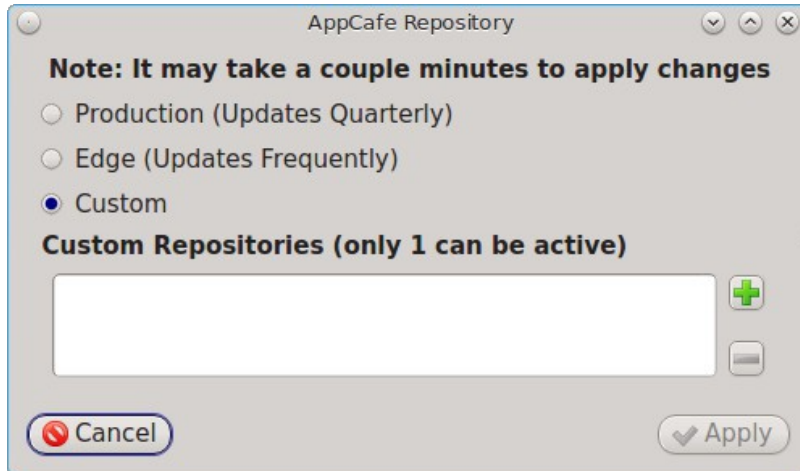
```
apacheopenoffice  
thunderbird  
firefox  
qtcreator  
scite  
gimp  
pithos  
quassel  
ksnapshot  
openjdk7
```

7.1.5 Configure Menu

The “Configure” menu contains the following options:

- **Repository Settings:** as seen in Figure 7.1g, this option is used to select the package set. “Production” is the default and recommended setting for most users. Software updates are provided every three months, which gives sufficient time for new software versions to be tested. “Edge” is meant for users who wish to assist with software testing or who can tolerate the occasional breakage caused by installing new software versions. Software updates are provided approximately every two weeks. “Custom” is for administrators who have [created their own PBI repository](#); click the “+” button to browse to the location of the custom *.rpo* file. To allow switching between custom repositories, multiple custom repositories can be listed, but only the one marked as active will be used.
- **Refresh PBI Index:** click this option to get the latest copy of the list of available PBIs and packages. Otherwise, this list is automatically refreshed each time AppCafe® is started.
- **Developer Mode:** check this box to add a pane of debugging messages to the bottom of AppCafe®. This can be useful to help determine the problem if there is an error in installing or upgrading software.

Figure 7.1g: AppCafe® Repository Settings Menu



7.1.6 Install View Menu

The default AppCafe® view only provides information about PBIs but does not provide information about packages. This means that the “Installed” tab will only show installed PBIs and the “Browse for Apps” tab and search function will only display available PBIs. This default can be changed using the options in the “Install View” menu, which changes the appearance of the “Install” tab, and “Browser View” menu, which changes the appearance of the “Browse for Apps” tab.

The “Install View” menu contains the following options:

- **Show Raw Packages:** when this box is checked, it adds the list of installed packages to the list of installed PBIs. An example is seen in Figure 7.1h.
- **Show Orphan Packages:** when this box is checked, the contents of the “Installed” tab change to the list of installed software which are not dependencies of any other installed application. An example is shown in Figure 7.1i. The list will either be PBIs or PBIs and packages, depending upon whether or not “Show Raw Packages” is also checked.
- **Show Base Packages:** when this box is checked, the contents of the “Installed” tab change to the list of installed base system packages, or the packages which get installed with the operating system. If “Show Raw Packages” is also checked, the listing will include every installed package rather than just the name of the system component. An example is seen in Figure 7.1j.

Figure 7.1h: List of Raw Packages

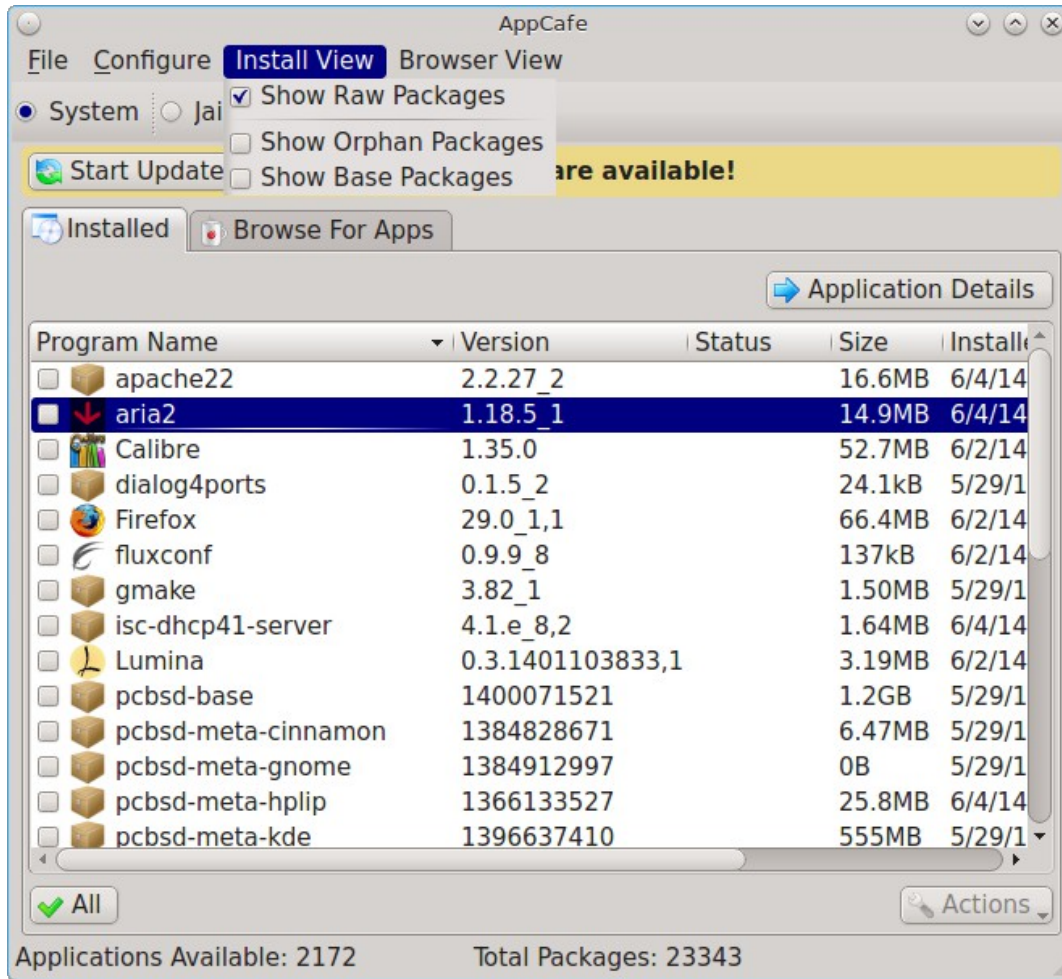


Figure 7.1i: List of Orphan Packages

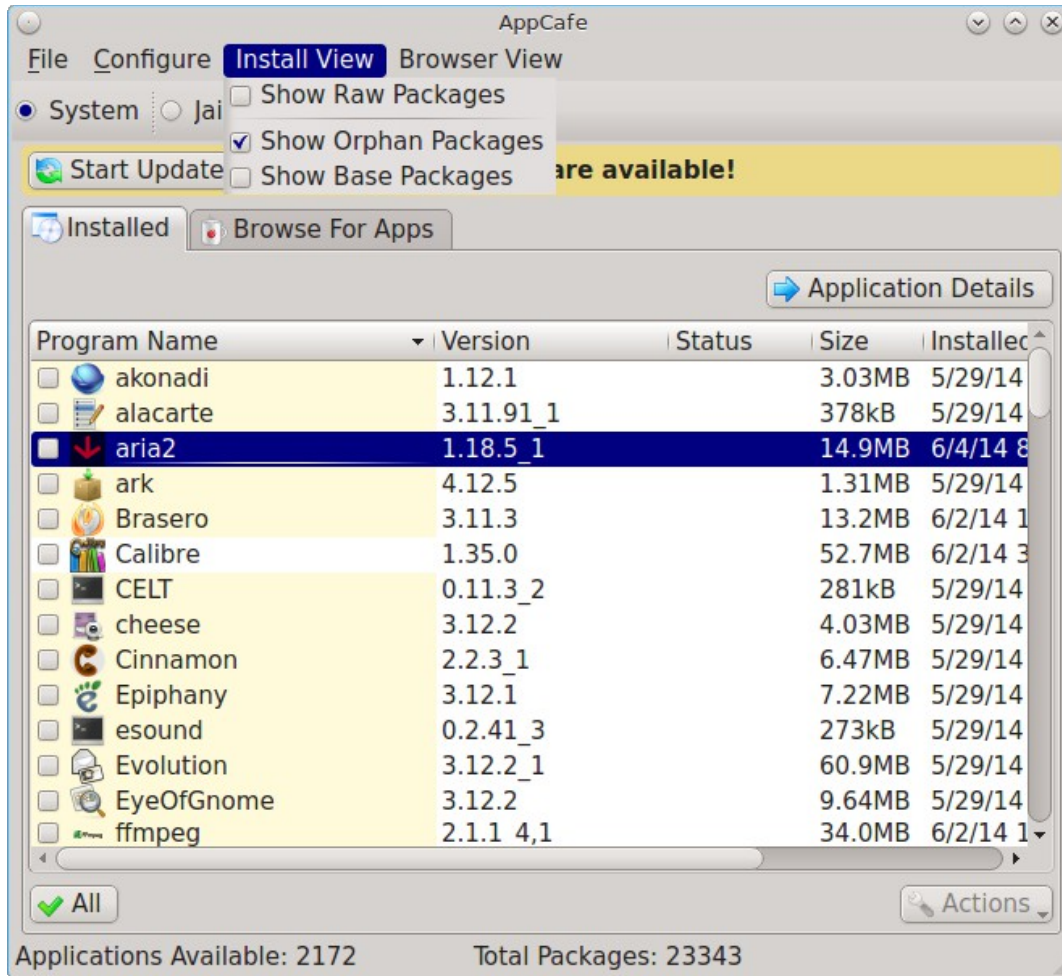
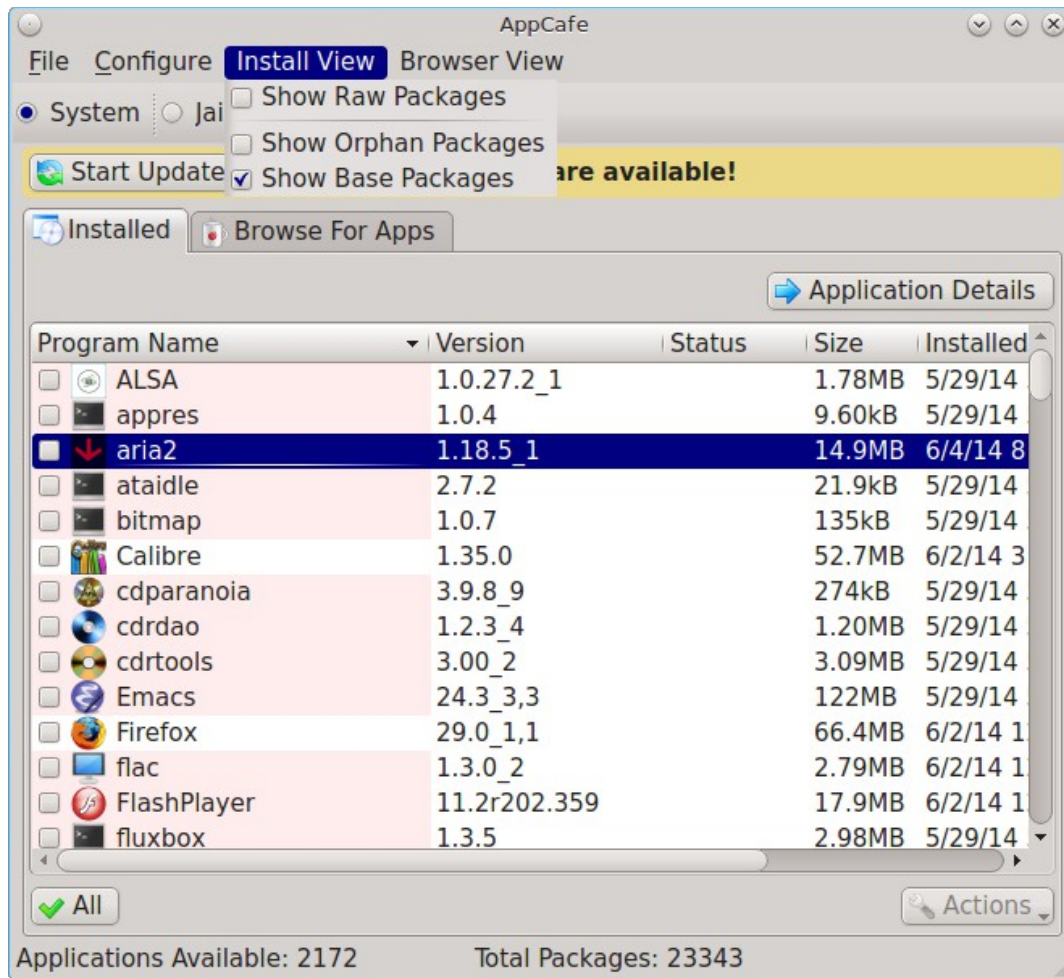


Figure 7.1j: List of Base Packages



By default, AppCafe® displays software information for the computer running PC-BSD®. It can also be used to manage the software running in a jail, as long as at least one jail [has been created](#) and is running. To manage a jail, click the “Jail” button and select the name of the jail in the drop-down menu. If this button and menu are greyed out, it means that no jails are running. Start the desired jail in Warden® and click the “Jail Check” button to tell AppCafe® to look for the running jail.

7.1.7 Browser View Menu

The “Browser View” menu determines which software appears in the “Browse for Apps” tab and the results of a software search. By default, the following options are checked: “Graphical Apps” (white window with blue stripe icon), “Text Apps” (black terminal icon), and “Server Apps” (blue globe icon).

To also view packages, check the box for “Raw Packages” (brown box icon). It may take a minute or two for the list of available packages to populate.

Any combination of checked boxes is supported, making it easier to zero in on the types of applications one is interested in finding.

7.1.8 Using the CLI pkg Utilities

For managing packages from the command line, PC-BSD® uses [pkgng](#), the next generation package management system for FreeBSD. To manage PBIs from the command line, refer to [PBI Manager](#).

If you are used to using the traditional FreeBSD package system, take note that the commands used to install and manage software differ slightly. For example, instead of using **pkg_add** to install a package from a remote repository, use **pkg install** or **pc-pkg install** (notice there is now a space instead of an underscore).

The [FreeBSD Handbook](#) provides an introduction to using pkgng. Section 5.4.1 is not needed on a PC-BSD® or TrueOS® system as the operating system installation does this for you. The various pkgng commands have associated man pages. Type **man pkg** for an overview of general usage; the names of the associated man pages will be found towards the bottom of this man page. Once you know the name of a command, you can also use the built-in help system to get more information about that command. For example, to learn more about **pkg install**, type **pkg help install**.

7.1.8.1 Upgrading Packages

In addition to the **pkg upgrade** command provided by pkgng, PC-BSD® provides the **pc-updatemanager** command for upgrading packages.

To determine if newer versions of packages are available using this command, type the command as the superuser.

```
sudo pc-updatemanager pkgcheck
Updating repository catalogue
Upgrades have been requested for the following 253 packages:
<list of packages snipped>
The upgrade will require 70 MB more space
439 MB to be downloaded
To start the upgrade run "/usr/local/bin/pc-updatemanager pkgupdate"
```

In this example, newer versions are available for 253 packages. The list of package names was snipped from the sample output. If no updates were available, the output would have instead said “All packages are up to date!”.

If updates are available, you can install them with this command:

```
sudo pc-updatemanager pkgupdate
Updating repository catalogue
snip downloading and reinstalling output
[253/253] Upgrading pcbsd-base from 1374071964 to 1378408836... done
Extracting desktop overlay data...DONE
```

While the output has been snipped from this example, the update process will download the latest versions of the packages which need updating, displaying the download progress for each file. Once the downloads are complete, it will display the reinstallation process for each file. The last step of the update process is to extract the desktop (or server) overlay and then to return the prompt.








How long the package upgrade takes depends upon the number of packages and the speed of the Internet connection. If you run this command on a desktop, you should log out and log in again so that you load the latest version of the desktop and its applications. If you run this command on a server while running the tcsh shell, type **rehash** in order to tell the shell that new applications have been installed.

7.2 Update Manager

Update Manager provides a graphical interface for updating the version of PC-BSD® and for applying security updates. This utility can be started from Control Panel or by typing **pc-updat.gui**. It can also be accessed from its icon in the system tray, if you are logged into a desktop that provides a system tray.

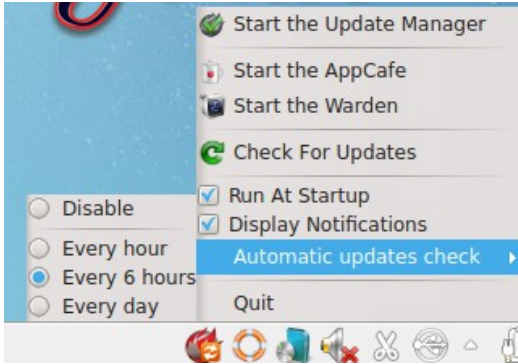
The status of the icon lets you determine at a glance if any of your installed applications are out-of-date, if a system update is available, or if a new version of the operating system is available. Table 7.2a summarizes the possible statuses of this icon.

Table 7.2a: Update Manager Status

	your system is up-to-date
	the system is currently checking for updates and patches
	your operating system is out-of-date and system update(s) or patch(es) are available
	newer versions of installed applications are available
	the system was unable to check for updates, meaning you should check your Internet connection
	the system is currently updating
	the system needs to restart in order for the newly installed update to take effect

If you right-click the icon, you will see the menu shown in Figure 7.2a. As seen in the menu, Update Manager will automatically track updates to software installed using either the graphical or command line equivalents of [AppCafe®](#) and [Warden®](#).

Figure 7.2a: Right-click Menu for Update Manager

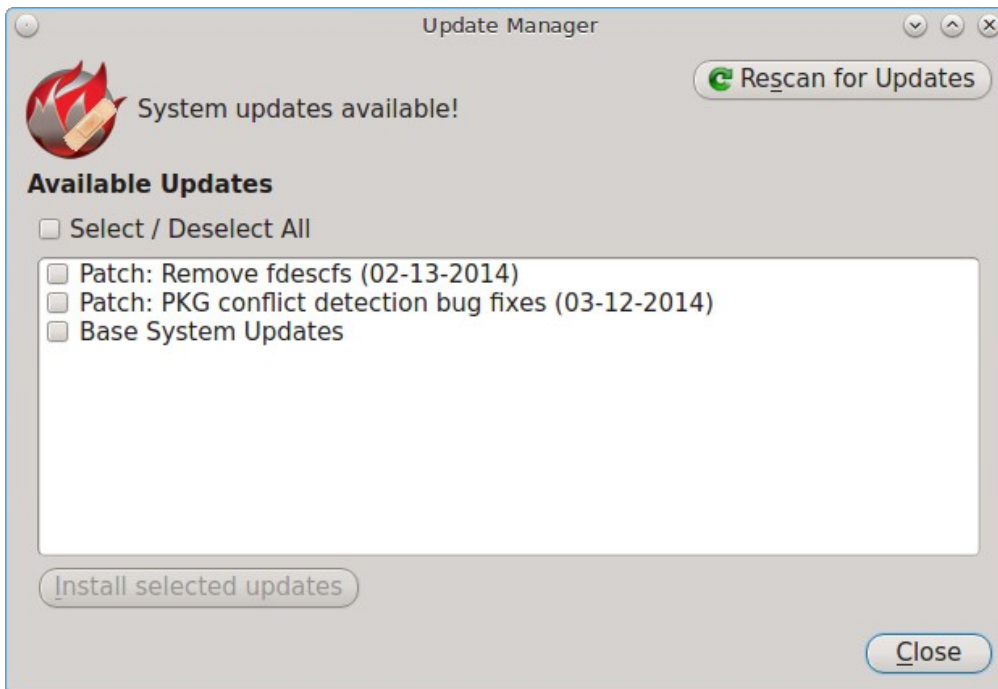


By default, updates are checked every 24 hours or whenever you boot the system. You can check for updates now by selecting “Check for updates”. To disable the update check when the system boots, uncheck the “Run at startup” box. To disable the pop-up message over the icon when an update becomes available, uncheck the “Display notifications” box. To change how often the update check occurs, click “Automatic updates check” and select a schedule from its menu. To remove Update Manager from the system tray, click “Quit”. You can put the icon back into the tray by typing `pc-systemupdatertray`.

7.2.1 Applying a System Update (GUI Method)

Occasionally, the PC-BSD® project releases a system update which addresses a fixed security vulnerability or a bug which impacts the use of the operating system. If the update is based on a FreeBSD security advisory, the update is usually available within 24 hours of the FreeBSD security announcement. To install a system update, open Update Manager and input your password when prompted. Figure 7.2b shows an example of a system where several updates are available .

Figure 7.2b: Applying a System Update



If your system is fully up-to-date, there will not be any entries in Update Manager.

Depending upon the type of update, an “Update Details” pane may or may not appear when you check the box next to the update.

To update the system, check the boxes to select the updates to install or check the “Select/Deselect All” box. Once the updates are selected, click the “Install selected updates” button. A progress bar will indicate the progress of the update.

If the update requires a reboot, you will be notified to do so after the update has been installed. If a reboot is needed, clicking the “Close” button at the informational message will not automatically reboot the system. Finish whatever you are doing and reboot the computer to finish the update process.

NOTE: system updates are one-way, meaning you cannot unapply an update once it is installed. However, PC-BSD® 10.0.2 and higher automatically creates a boot environment before applying each system update. If there is an issue with the update, reboot the system and select the entry that represents the time before that update occurred. This will reboot the version of the operating system before the update was applied. For systems earlier than 10.0.2, create a manual boot environment using [Boot Manager](#) *before* applying any updates

7.2.1.1 Applying a System Update (CLI Method)

TrueOS® users, or those who prefer to use a command-line utility, can use **pc-updatemanager**, the command line equivalent to Update Manager, to apply system updates. If you type **pc-updatemanager**, it will show its available options:

```
pc-updatemanager
/usr/local/bin/pc-updatemanager - Usage
----
branches           - List available system branches
chbranch <tag>     - Change to new system branch
check              - Check for system updates
install <tag>,<tag2> - Install system updates
pkgcheck           - Check for updates to packages
pkgupdate          - Install packages updates
synconf           - Update PC-BSD pkgng configuration
confcheck         - Check PC-BSD pkgng configuration
-j <jail>          - Operate on the jail specified
```

To determine if any system updates are available, type the following command:

```
sudo pc-updatemanager check
Checking for FreeBSD updates... The following updates are available:
-----
NAME: FreeBSD system update
TYPE: System Update
Install: "freebsd-update fetch && freebsd-update install"

NAME: Remove fdscfs
TYPE: PATCH
TAG: fdsc-rollback-02132014
DETAILS: http://trac.pcbsd.org/wiki/patch-20140211-fdesc
DATE: 02-13-2014
SIZE: 1Mb
To install: "pc-updatemanager install fdsc-rollback-02132014"
```

```
NAME: PKG conflict detection bug fixes
TYPE: PATCH
TAG: pkgng-conflict-03122014
DETAILS: http://trac.pcbsd.org/wiki/patch-20140312-updater
DATE: 03-12-2014
SIZE: 1Mb
To install: "pc-updatemanager install pkgng-conflict-03122014"
```

This is the command line equivalent of the results seen in Figure 7.2b. Follow the instructions to install each update. For example, this will apply the “Remove fdscfs” patch:

```
sudo pc-updatemanager install fdesc-rollback-02132014
DOWNLOADING: fdesc-rollback-02132014 /usr/local/tmp/patch-fdesc-rollback-
02132014.t100% of 312 B 14 kBps 00m00s
DOWNLOADFINISHED: fdesc-rollback-02132014
Creating new boot-environment...
GRUB configuration updated successfully
Created successfully
Pruning old boot-environments...
TOTALSTEPS: 3
SETSTEPS: 1
umount: /dev/fd: not a file system root directory
SETSTEPS: 3
INSTALLFINISHED: fdesc-rollback-02132014
```

Note that a boot environment is created before the patch is applied as this system is running 10.1.

7.2.2 Upgrading from 9.x to 10.x

IMPORTANT NOTE--README !

PC-BSD® has switched to ZFS-only. This means that you can not upgrade a system that is either 32-bit or formatted with UFS. If the hardware supports 64-bit, you will need to backup your important data to another system or external drive and then perform a new installation. The new installation will perform a format of the selected disk(s) with ZFS.

The boot loader and default ZFS layout has changed to support [boot environments](#) and ZFS snapshot management with [Life Preserver](#). For this reason, we recommend that 9.x users backup their important data to another system or external drive and then perform a new installation which will create the required ZFS layout.

7.2.3 Upgrading from 10.x to 10.1

Upgrading from any 10.x version to 10.1 is the same as applying any system update. This means that the update to 10.1 will either appear in the graphical Update Manager or in the listing for pc-updatemanager check. It will be listed as *10.1-update-11032014-10* with a description of "Update system to 10.1-RELEASE".

NOTE: a fresh install, rather than an update, is required if you wish to either take advantage of UEFI boot or encrypt the disks. This means that you will have to backup your data to an external drive or another system, perform the install, than restore your data from backup.

7.3 PBI Manager

PBI Manager is a suite of command line utilities which can be used to install, remove, and manage PBIs.

This chapter provides an overview of the commands that are installed by PBI Manager. When using these commands, note that single character options can not be stacked. As an example, you must type **pbi_add -i -v** as **pbi_add -iv** will fail with a syntax error.

7.3.1 pbi

The **pbi** meta-command can be used to install, uninstall, and get information about PBIs. Unlike the other **pbi_*** commands, it uses a space instead of an underscore. For example, **pbi add** is equivalent to **pbi_add** and either command can be used to install a PBI.

This meta-command expects to be given a sub-command, and then a suitable option for that sub-command. To see the available options for a sub-command, use the built-in help system. For example, to see the available options for the **add** sub-command, type **pkg help add**. Table 7.3a summarizes the available sub-commands.

Table 7.3a: pbi Sub-Commands

Sub-Command	Description
add	installs the specified PBI
delete	uninstalls the specified PBI
help	shows the options for the specified sub-command
icon	adds or deletes the PBI's desktop icon, menu icon, or MIME registration
info	shows all available PBIs or lists the packages installed into a specified jail
install	equivalent to add

7.3.2 pbi_add

The **pbi_add** command is used to install a specified PBI. Table 7.3b summarizes the available options.

Table 7.3b: pbi_add Options

Switch	Description
-f	force installation, overwriting an already installed copy of the application
-i	display information about specified PBI; if combined with -v , will display all of the files that will be installed with the PBI
-j <jailname>	installs the PBI into the specified jail
-J	used to create a new jail and install specified PBI into it
-l	display <i>LICENSE</i> text for specified PBI
-v	enable verbose output

The following example installs the alpine PBI. When prompted, input your password.

```
sudo pbi_add alpine
```

```
Password:
```

```
Updating repository catalogue
```

```
Installing: alpine The following 2 packages will be installed:
```

```

    Installing pico-alpine: 2.00_1
    Installing alpine: 2.00_4
The installation will require 9 MB more space
2 MB to be downloaded
pico-alpine-2.00_1.txz 100% 314KB 313.9KB/s 313.9KB/s 00:01
alpine-2.00_4.txz 100% 1701KB 1.7MB/s 1.4MB/s 00:01
Checking integrity... done The following 2 packages will be installed:
    Installing pico-alpine: 2.00_1
    Installing alpine: 2.00_4
The installation will require 9 MB more space
0 B to be downloaded
Checking integrity... done
[1/2] Installing pico-alpine-2.00_1... done
[2/2] Installing alpine-2.00_4... done
*****
*** To use GnuPG with Alpine, take a look at the mail/pine-gpg-filters port ***
*****

```

7.3.3 pbi.conf

The `pbi_*` commands support several environment variables which can be stored in the ASCII text configuration file, `/usr/local/etc/pbi.conf`. These proxy variables are only needed if the system uses a proxy server to access the Internet. Table 7.3c lists the supported variables.

Table 7.3c: pbi.conf Variables

Variable	Description
PBI_PROXYURL	proxy server IP address
PBI_PROXYPORT	proxy server port number
PBI_PROXYTYPE	can be HTTP or SOCKS5
PBI_PROXYUSER	username used to authenticate with proxy server
PBI_PROXYPASS	password used to authenticate with proxy server

7.3.4 pbi_delete

The `pbi_delete` command removes an installed PBI from the system. Table 7.3d summarizes its one available option:

Table 7.3d: pbi_delete Options

Switch	Description
<code>-f</code>	force the removal of the application, even if other applications depend upon it
<code>-j <jail></code>	deletes the application from the specified jail
<code>-v</code>	enable verbose output

The following example uninstalls the previously installed alpine PBI:

```

sudo pbi_delete alpine
Password:
Updating repository catalogue
Deinstallation has been requested for the following 1 packages:
    alpine-2.00_4
The deinstallation will free 8 MB

```

```
[1/1] Deleting alpine-2.00_4... done
Deinstallation has been requested for the following 2 packages:
  openjpeg-2.1.0
  pico-alpine-2.00_1
The deinstallation will free 2 MB
[1/2] Deleting openjpeg-2.1.0... done
[2/2] Deleting pico-alpine-2.00_1... done
```

7.3.5 pbi_icon

The **pbi_icon** command provides a number of options for adding desktop icons, menu entries, and MIME data for an installed PBI. Not all PBIs will contain desktop/menu/MIME data. Additionally, the window manager must be [XDG](#)-compliant to understand a PBI's icon and MIME settings. Table 7.3e summarizes this command's options:

Table 7.3e: pbi_icon Options

Switch	Description
add-desktop	installs desktop icon; should be run as regular user
add-mime	installs mime information; should be run as root
add-menu	installs menu icons; should be run as root
del-desktop	removes desktop icon; should be run as regular user
del-menu	removes menu icons; should be run as root
del-mime	removes mime information; should be run as root

7.3.6 pbi_info

The **pbi_info** command is used to determine which PBIs are currently installed. Table 7.3f summarizes the available options.

Table 7.3f: pbi_info Options

Switch	Description
-a	list all PBIs installed on the system; same as running pbi_info without an argument
-j <jailname>	list PBIs installed in the specified jail
-v	includes verbose information about each PBI

7.3.7 pbi_makeindex

This command is used to make the INDEX for a custom PBI repository which can then be used in AppCafe®. Refer to [Create Your Own PBI Repository](#) for instructions on how to create a custom repository.

7.3.8 pbi_updateindex

To check for a newer version of the PC-BSD® *PBI-INDEX.txz* file, type **sudo pbi_updateindex** and input your password when prompted. If a newer version is available, this command fetches and extracts it so that the system has the most recent list of available PBIs.

7.4 Create Your Own PBI Repository

By default, AppCafe® displays the PBIs which are available from the official PC-BSD® repository. It also supports custom repositories.

In order to create a custom repository, you need to:

- create the OpenSSL signing key which will be used to sign the repository's *INDEX*
- create the customized modules using EasyPBI
- generate the custom *INDEX* and sign it with the key
- import the repository into AppCafe® or configure PBI Manager to use the custom repository

This section describes these steps in more detail.

7.4.1 Create the Signing Key

The *INDEX* of a PBI repository must be digitally signed for security and identification purposes. In order to sign the *INDEX*, first create an OpenSSL key pair using the following commands:

```
openssl genrsa -out privkey.pem 4096
Generating RSA private key, 4096 bit long modulus
.....++
.....++
e is 65537 (0x10001)

openssl rsa -in privkey.pem -pubout > pub.key
writing RSA key
```

These commands will create the files *privkey.pem* and *pub.key*.

7.4.2 Create the Customized Modules

To create the customized PBI modules, follow the instructions in [EasyPBI](#) and [Bulk Module Creator](#). If the repository directory is *~/myrepo/*, make sure that all of the custom modules are listed as subdirectories of that directory.

Next, configure a FTP, HTTP, or HTTPS server to host the directory containing the custom PBI modules. The server can be a public URL on the Internet or a private LAN server, as long as it is accessible to your target audience. Ensure that this directory is browsable by an FTP client or web browser from a client system before moving on to the next step.

7.4.3 Generate the Custom INDEX

To generate the signed *INDEX*, **cd** to the directory containing the PBI modules and run **pbi_makeindex**, specifying the path to the private key. In this example, the PBI modules are located in *~/myrepo* and the key is located in the user's home directory (*~*). Be patient as it will take a few minutes to generate the *INDEX* and return the command prompt.

```
cd ~/myrepo
fetch https://github.com/pcbsd/pcbsd/raw/master/pbi-modules/PBI-categories
pbi_makeindex ../privkey.pem
Building PBI-INDEX... This may take a few moments...
Fetching PBI ratings file...
```

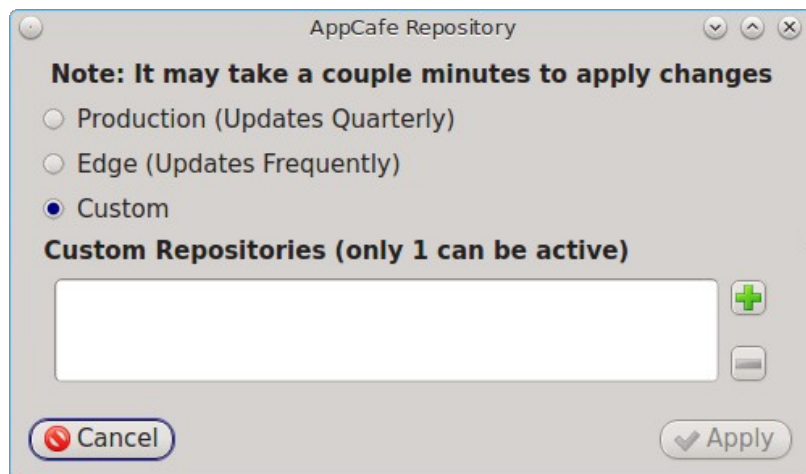
```
/tmp/.PBI.19956/.ratings          100% of 71 kB 134 kBps 00m00s
Adding additional package information to PBI-INDEX...
Compressing PBI-INDEX...
```

This will create the files *PBI-INDEX.txz* and *PBI-INDEX.txz.sha1*.

7.4.4 Import the Repository

To configure [AppCafe®](#) to use the custom repository, go to Configure → Repository Settings. Click “Custom” in the screen shown in Figure 7.4a, then the “+” button. Input the URL to the repository and click “OK”.

Figure 7.4a: Add the Custom Repository to AppCafe®

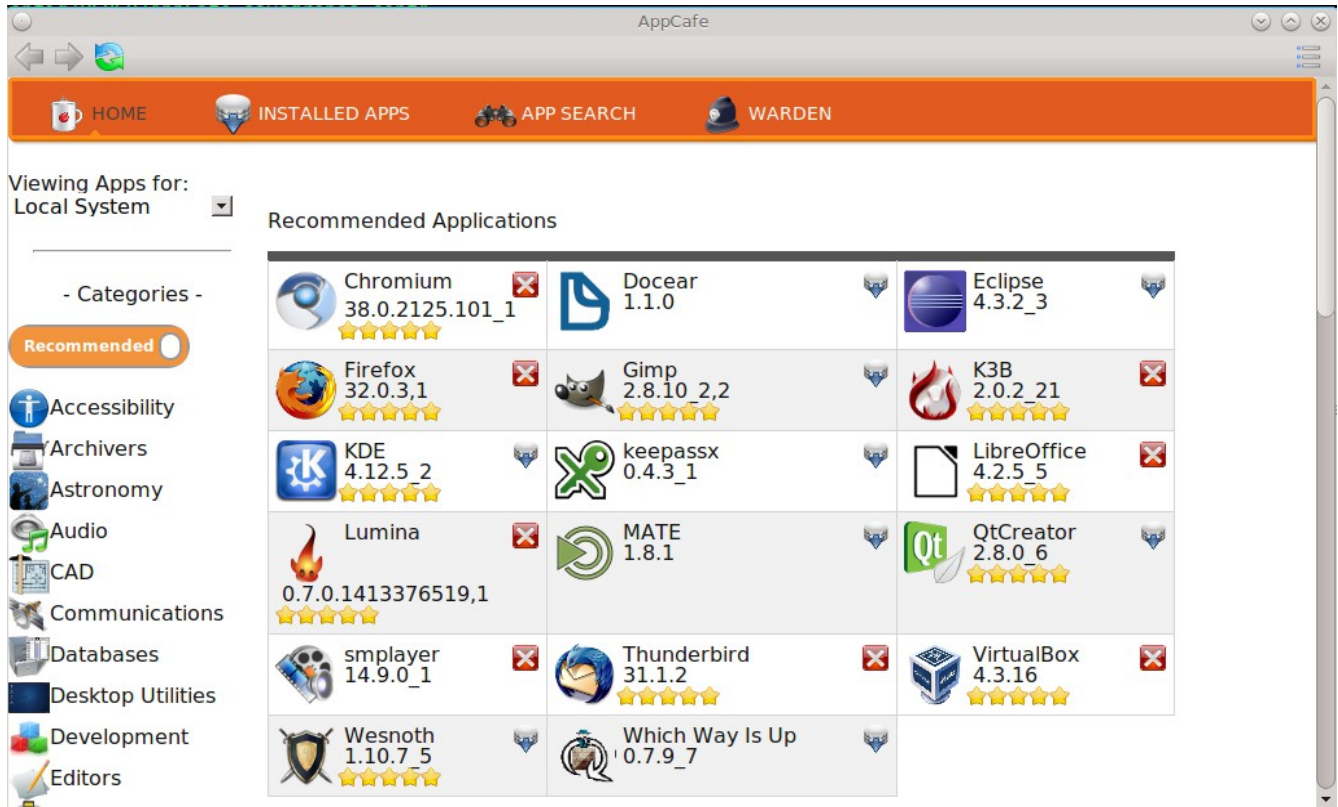


It will take a few minutes for AppCafe® to read in the *INDEX* for the custom repository.

7.5 AppCafe® Remote

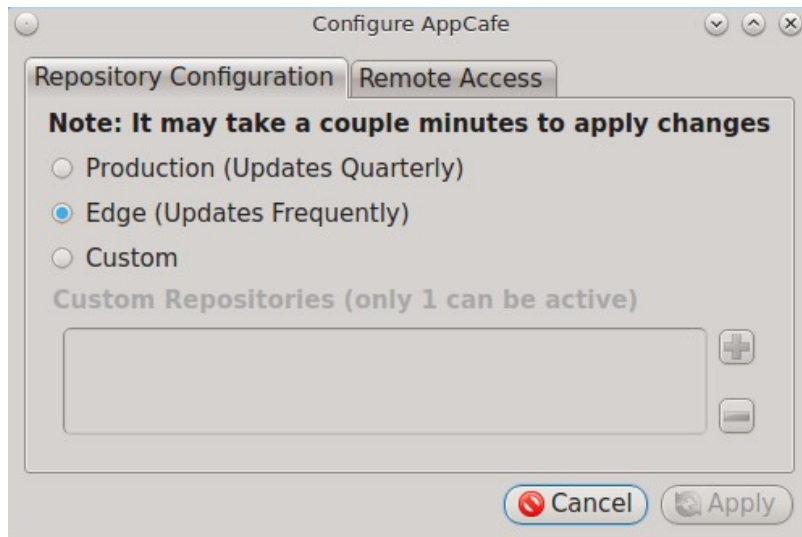
Beginning with version 10.1, PC-BSD® includes the ability to remotely manage software and jails from another system or mobile device. During the installation of a TrueOS® server, the installer provides the ability to configure the user, password, and port number for accessing AppCafe® Remote from any device with a web browser. On a desktop installation, AppCafe® Remote can be run as a local application and optionally configured for remote access. To launch the AppCafe® Remote application on a PC-BSD® desktop, type **pc-softweb**. This will open the screen shown in Figure 7.5a.

Figure 7.5a: Running AppCafe® Remote from a Desktop



The top bar contains navigational arrows and a refresh icon. Click the icon at the far right of this bar to either configure or close AppCafe® Remote. Figure 7.5b shows the menu that appears if you click “Configure”.

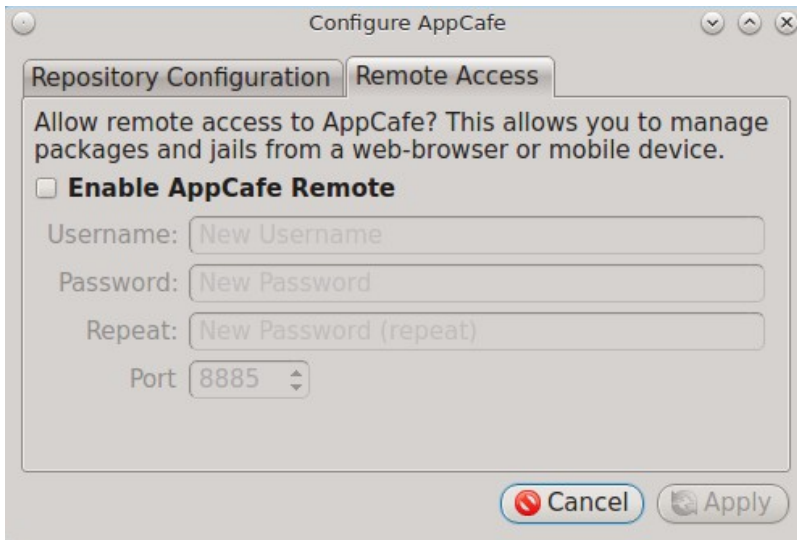
Figure 7.5b: Configuring the AppCafe® Repository



The “Repository Configuration” tab is used to determine which package set to use, as described in the [AppCafe® Configure Menu](#).

To configure remote access, use the “Remote Access” tab shown in Figure 7.5c.

Figure 7.5c: Configuring Remote Access



Check the box to “Enable AppCafe Remote”. Then, input a username and password to use for remote access and select a port number. If the system has a public IP address, be sure to use a hard-to-guess username and password. If you change the port number, make sure it does not conflict with another application running on the system. Click “Apply” to complete the configuration. You will be prompted to input your password to save the configuration.

When using AppCafe Remote® to access a system with a public network it is highly recommended to configure the network firewall to only allow connections over the specified port number and from allowed IP address(es).

Once remote access is configured, use `https://` and specify the IP address of the system and configured port number in a web browser. You will then be prompted to input the configured username and password. The AppCafe Remote® interface will load in the web browser. It will be similar to the one shown in Figure 7.5a, except the top navigational buttons and configure button will not be displayed and a “Logout” option will be added to the orange bar.

The rest of this section describes how to use AppCafe Remote®.

7.5.1 Home Tab

The “Home” tab is used to browse for available PBIs. Applications which are already installed, have a red “X”. If you click that “X”, a pop-up message will ask if you would like to uninstall that application. Applications which are not installed have a grey download icon. Click the icon to install that application.

The default view displays applications which are recommended by other PC-BSD® users and whether or not an application is installed is from the perspective of the local system. If you have created any jails, click the drop-down menu “Viewing Apps for” and change “Local System” to the name of the jail that you would like to manage.

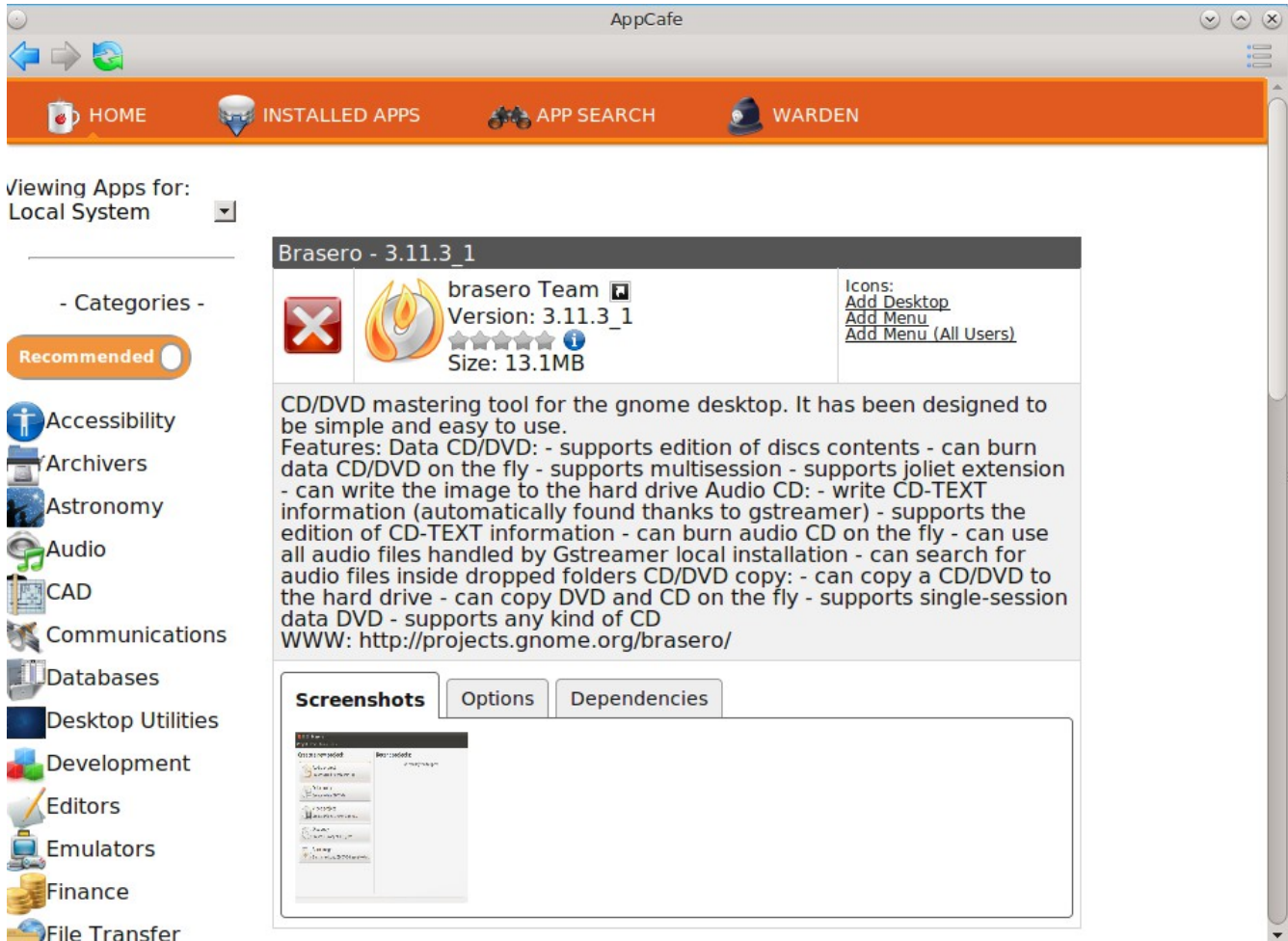
The left pane contains the available software categories. By default, only the recommended applications for each category are shown. To instead view all of the PBIs for each category, click the orange “Recommended” button which will change to a grey “All Apps”. Click the name of a category to view the available PBIs within that category.

7.5.2 Installed Apps Tab

To view all of the applications installed on the system or jail you are “Viewing Apps for”, click “Installed Apps” in the orange bar. The applications will be listed in alphabetical order. Click the name of an application to view more information about the application. Click the application's red “X” to uninstall the application.

In the example shown in Figure 7.5d, the user has clicked “Brasero” on a system that has Brasero installed.

Figure 7.5d: Viewing the Details of an Installed Application



The information for an application includes the following:

- Name, version, and icon of the application.
- A hyperlink to the application's website. In this example, clicking “brasero Team” will open the application's website in the user's default web browser.
- A rating of up to five stars. Click the stars to open the PC-BSD® wiki page for the application. If you login to the wiki and hover the mouse over the number of stars to select, it will add your ranking and increment the vote number. If you make a mistake in your vote, refresh the browser, click the “remove” button, and re-select the desired number of stars. This page will also contain any contributed “User Tips”. If you login to the wiki, you can add your own usage tips for the application.
- An “Install in Jail” button. Selecting this option will first create a new jail, then install that application

into the jail.

- The download size.
- Hyperlinks to add an icon for the application to the desktop (on window managers that support desktop icons), to add an entry for the application to the desktop menu for the logged on user only (on window managers that provide desktop menus), or to add an entry to the desktop menu of all users.
- A description of the application.

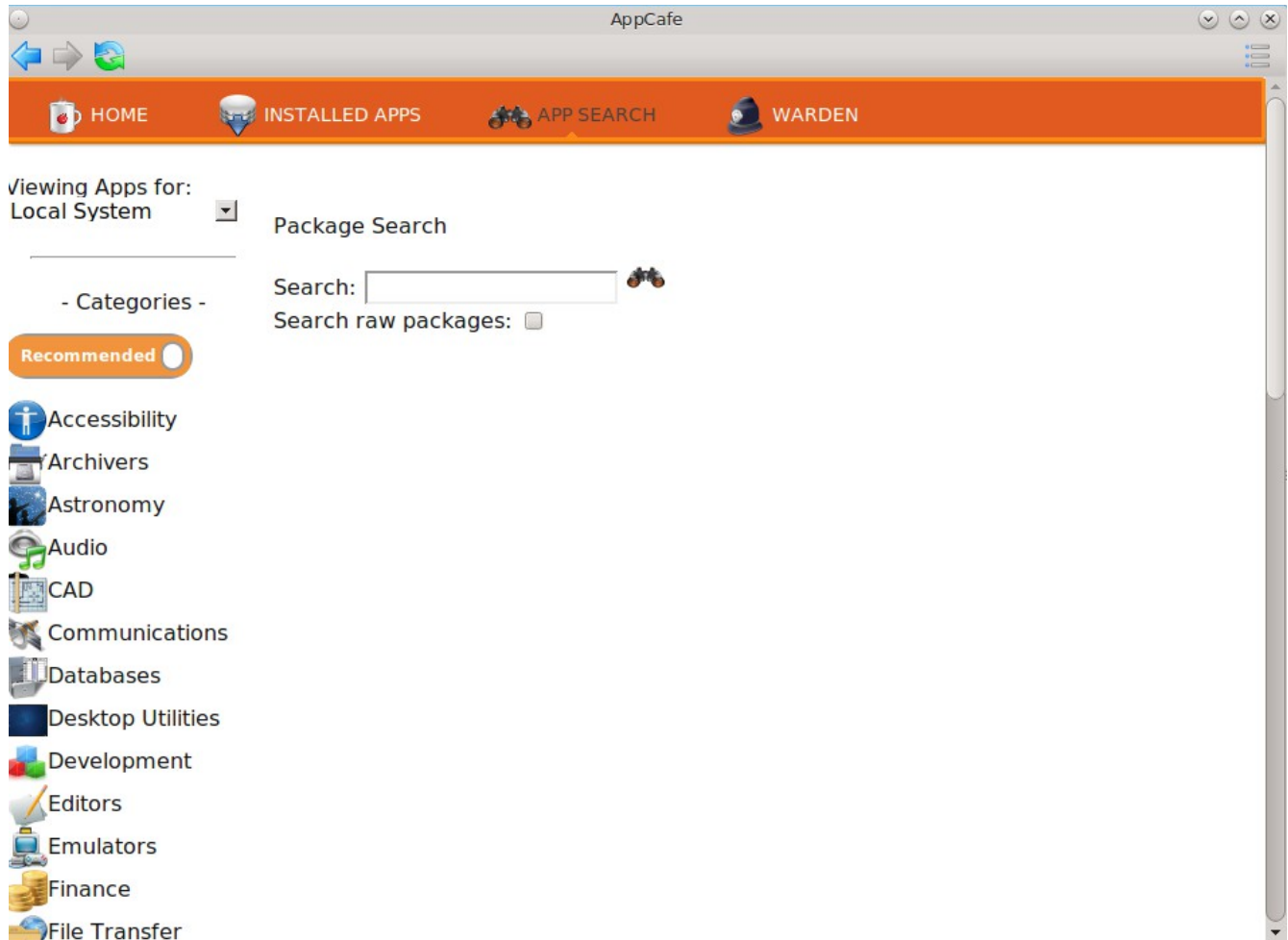
The following tabs may also be displayed. If a tab is not displayed, it means that that information is not currently available for this particular application.

- **Screenshots:** click the “View Full Size” button under the screenshot to view the full screen version of the screenshot.
- **Related:** provides an installable list of applications that provide similar functionality.
- **Plugins:** provides an installable list of associated plugins. For an example, search for “firefox” and open its “Plugins” tab.
- **Options:** shows the values of the make options that the PBI or package was built with.
- **Dependencies:** lists the packages that are dependencies of this application.

7.5.3 App Search Tab

The “App Search” tab is shown in Figure 7.5e.

Figure 7.5e: Searching for Applications



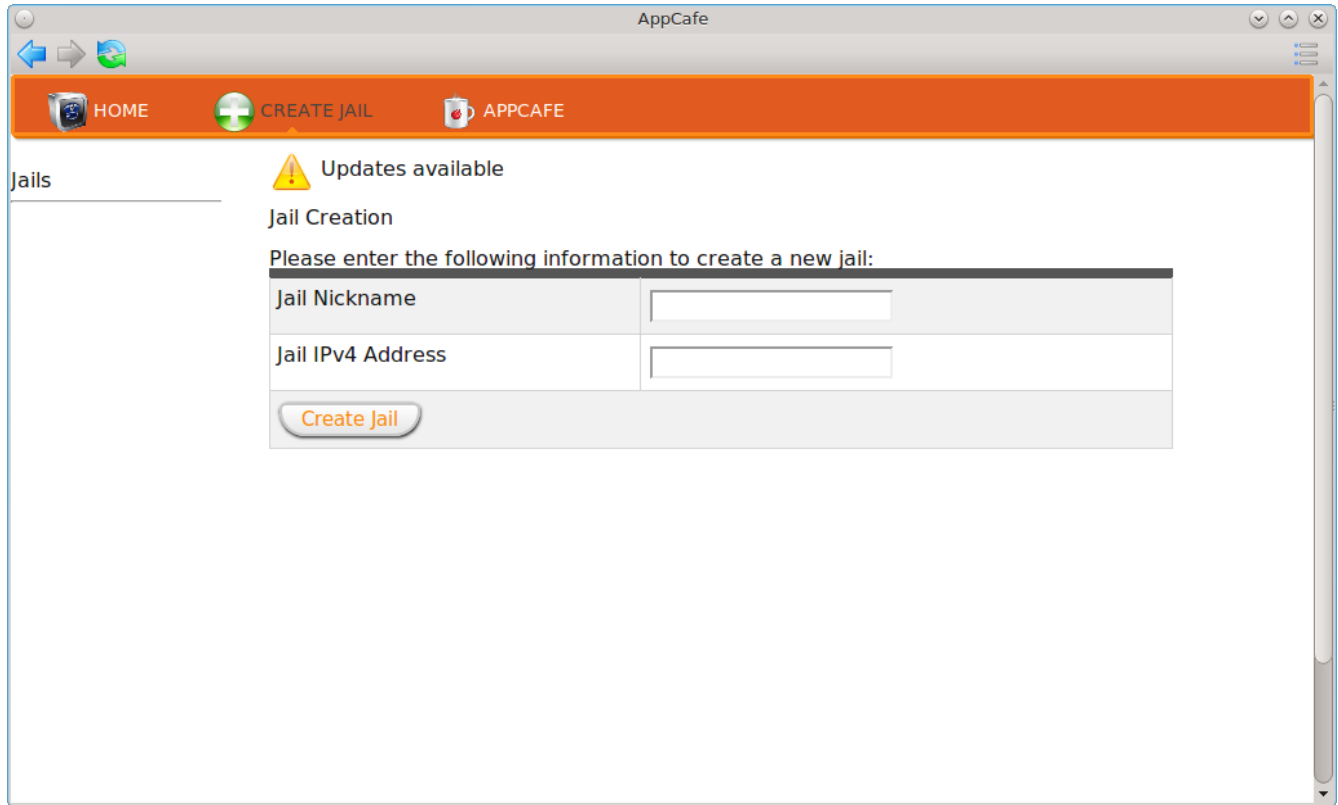
To find an application, enter its name. Alternately, enter a description. For example, a search for “browser” will display all software with “browser” in the name as well as applications which provide browser functionality, such as Firefox.

By default, only PBIs are searched. To search for all available software, include packages, click the “Search raw packages” box.

7.5.4 Warden Tab

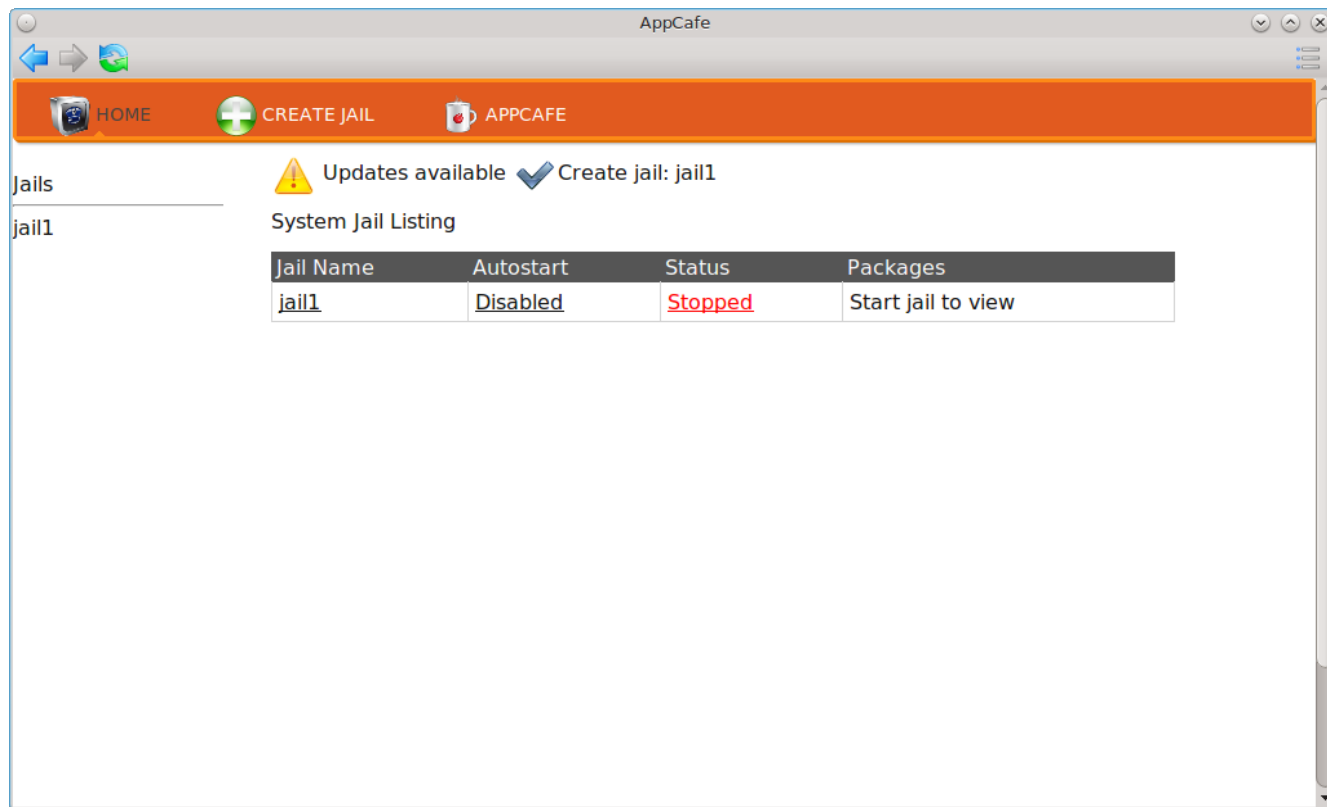
To create, delete, and manage jails, click “Warden” in the orange bar, then “Create Jail”. This will open the screen shown in Figure 7.5f.

Figure 7.5f: Adding a New Jail



Input a name for the jail and an IP address that won't conflict with any other systems on the network. Click the "Create Jail" button which will queue the jail creation so that you can continue to use AppCafe® Remote while the jail template is downloaded and installed. Once the jail is complete, it will be listed, as seen in the example in Figure 7.5g.

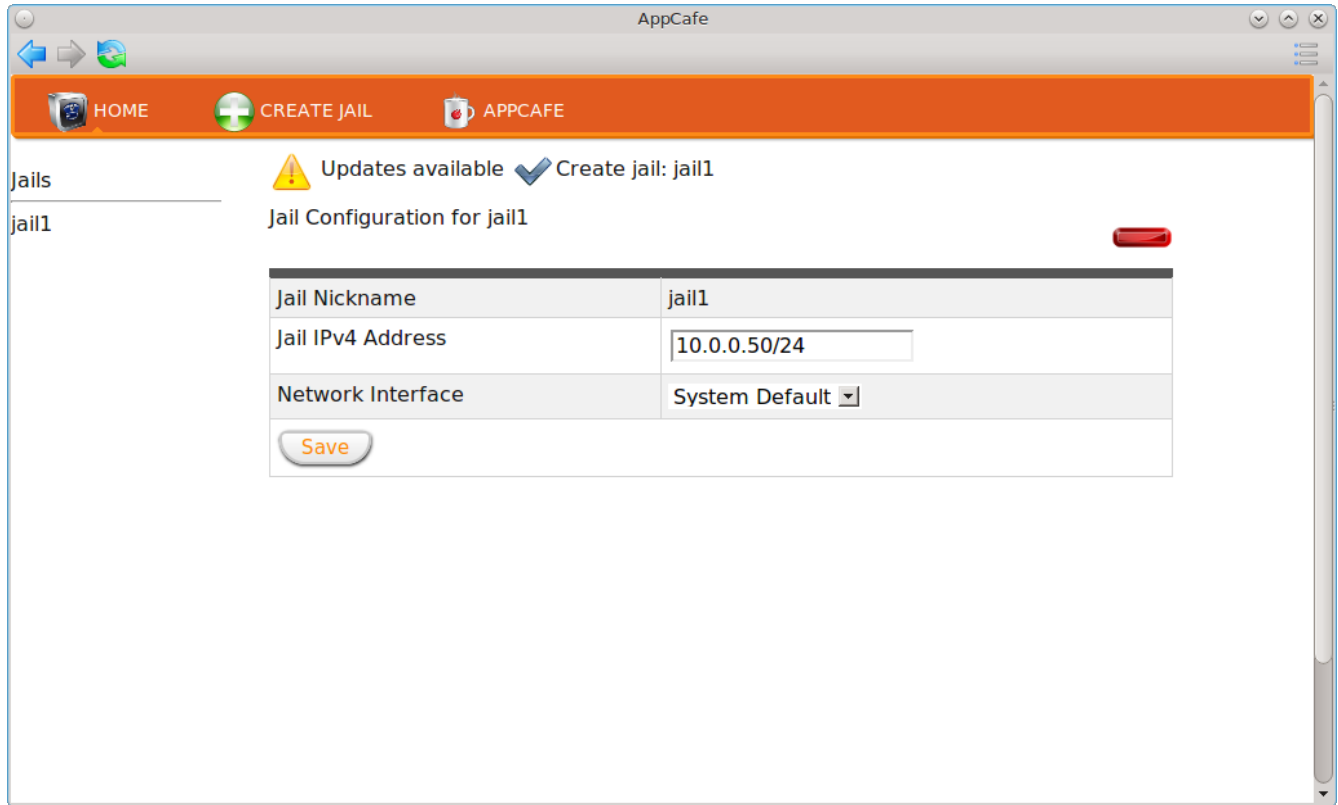
Figure 7.5g: Managing Installed Jails



The jail can then be managed by clicking on the hyperlinks for the jail under the following columns:

- **Jail Name:** click the jail's name, in this example *jail1*, to open the screen shown in Figure 7.5h. This screen can be used to change the jail's IP address or subnet mask and to specify the network interface to use for the jail. If you change a setting, click the “Save” button to save the changes. If you click the red bar in the upper right corner, a pop-up message will ask you to confirm whether or not you want to delete the jail. Alternately, click the “Home” button to return to the screen shown in Figure 7.5g.
- **Autostart:** indicates whether or not the jail is set to start automatically when the system boots. Click the link to toggle between *Disabled* and *Enabled*.
- **Status:** indicates whether or not the jail is currently running, and thus available. Click the link to toggle between *Stopped* and *Running*.
- **Packages:** if the jail is not running, a message will indicate that you need to first *Start jail to view*. Click the *Stopped* link so that it changes to *Running*. This will change the message to *View Packages*. Click this link to view which packages are currently installed in the jail. This will also display the application categories so that you can install packages into the specified jail.

Figure 7.5h: Editing the Specified Jail



8 Control Panel

PC-BSD® provides a Control Panel which contains tools for managing your system. The Control Panel is available from any desktop, meaning it is available regardless of which desktop you log into.

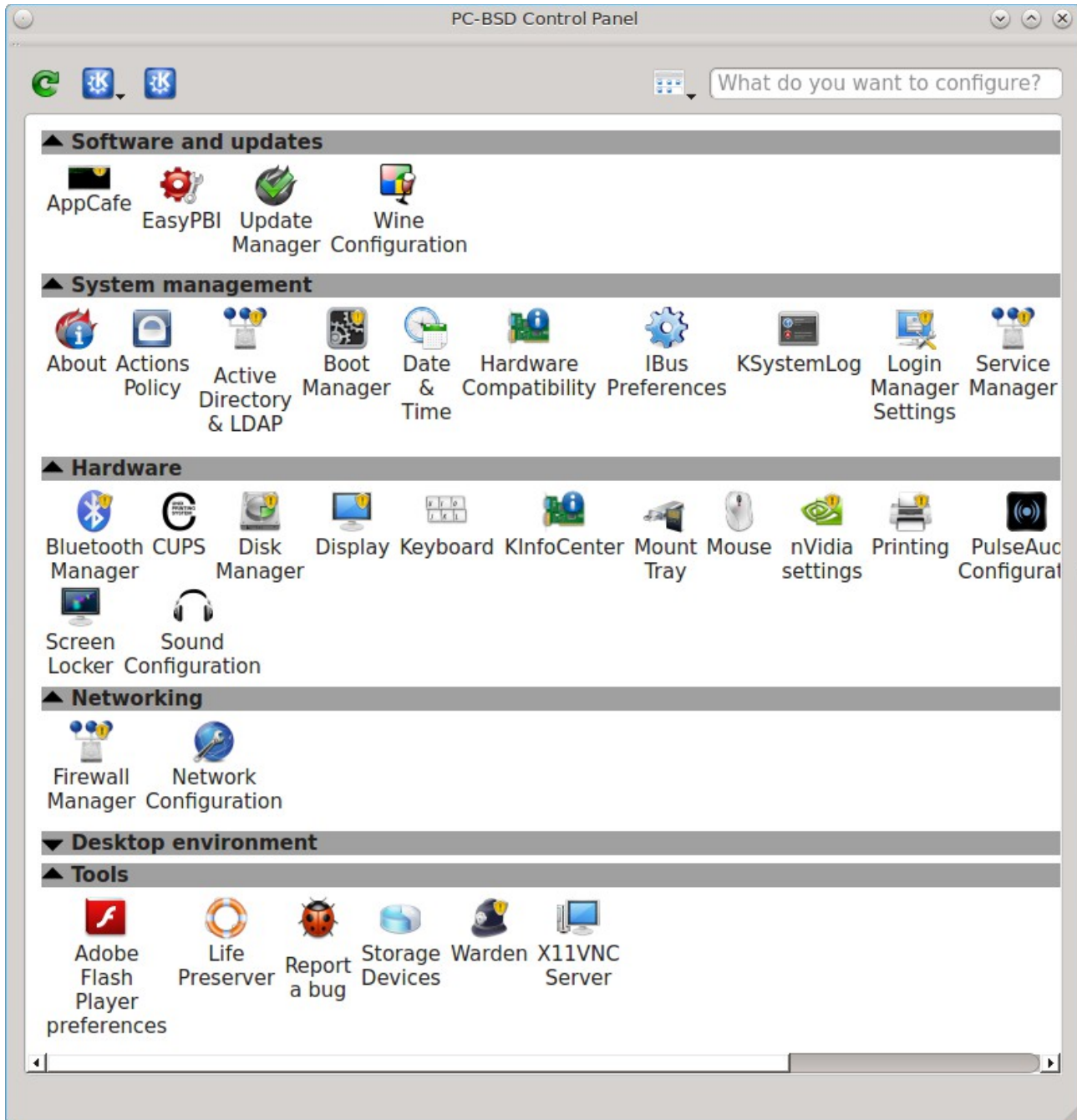
NOTE: if a desktop does not contain an icon or menu item for Control Panel, type **pc-controlpanel** from a shell prompt to launch the Control Panel.

A screenshot of Control Panel started from the KDE desktop can be seen in Figure 8.a.

The available utilities are divided into sections. If you click a grey section bar, you can toggle between displaying (bar has up arrow) or hiding (bar has down arrow) its icons. In this example, the display for the “Desktop environment” section is hidden.

The search box in the upper right can be used to find the proper control panel item if you know what you would like to configure but are uncertain which utility to use. The icon next to the search box can be used to change the size of the icons, change the view from a grid to a list, and organize the icons into a fixed layout.

Figure 8.a: PC-BSD® Control Panel



If an icon includes a yellow exclamation mark, you will need to input your password in order to access that configuration utility.

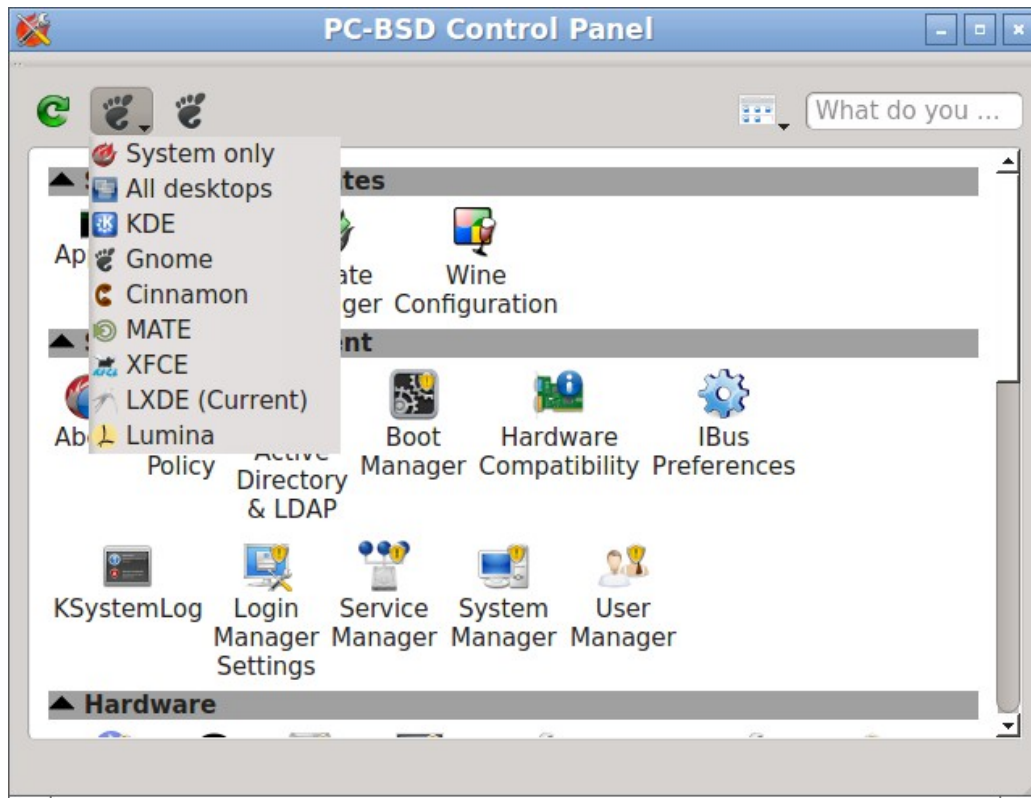
NOTE: if your user account is not a member of the *wheel* group, you will not see the configuration utilities in Control Panel that require a password. By default, the first user account that you create is made a member of the *wheel* group. You can log in as that user and use [User Manager](#) to add other accounts to this group.

Desktop Selector

Control Panel includes a desktop selector menu which allows you to load the configuration utilities from all installed desktops, KDE, GNOME, Cinnamon, MATE, XFCE4, LXDE, or Lumina, assuming that they are installed, or just the utilities that came with PC-BSD®. Figure 8.b shows the desktop selector menu in use. In this example, the user is currently logged into the LXDE desktop but they have chosen to view the GNOME utilities. The menu icon indicates the control panel view while “(current)” will be beside the desktop that is presently active.

Switching between the icons in the selector changes the icons displayed within the control panel window to match those used in that desktop. If “All desktops” is set by the desktop selector, you will see every utility that is available, depending upon which desktops are currently installed. You can change which desktops are installed using [AppCafe®](#).

Figure 8.b: Desktop Selector Menu



Included Utilities

The following utilities are found in the Control Panel of a PC-BSD® system, regardless of the desktop that is installed:

Software and updates

- [AppCafe®](#)
- [EasyPBI](#)
- [Update Manager](#)

System management

- [About](#)
- [Active Directory & LDAP](#)
- [Boot Manager](#)
- [Hardware Compatibility](#)
- [Login Manager](#)
- [Service Manager](#)
- [System Manager](#)
- [User Manager](#)

Hardware

- [Bluetooth Manager](#)
- [Display](#)
- [Disk Manager](#)
- [Mount Tray](#)
- [Printing](#)
- [Scanner](#)
- [Sound Configuration](#)

Networking

- [Firewall Manager](#)
- [Network Configuration](#)

Tools

- [Life Preserver](#)
- [Report a bug](#)
- [Warden®](#)

8.1 *EasyPBI*

PBIng provides an information wrapper around existing FreeBSD packages. This wrapper, known as a PBI module, contains the metadata which displays information about the PBI in [AppCafe®](#), such as screenshots, similar applications, search terms, and plugins. With PBIng, you no longer have to build PBIs. Instead, you can modify the information contained in PBI modules in order to create a custom PBI repository which can be added to AppCafe®. Since PBI modules are comprised of ASCII text files, they can be easily edited using the graphical EasyPBI utility or manually with a text editor.

This chapter demonstrates how to use EasyPBI, which is the recommended method for customizing PBI modules. It then describes the files contained in a PBI module for those users who prefer to edit files manually or

who want a better understanding of the components of a PBI module. Once you have created your custom modules, refer to [Create Your Own PBI Repository](#) for instructions on how to add the custom repository to AppCafe®.

NOTE: if your goal is to make a change to a single PBI, not a custom repository, refer to [Make Minor Modifications to a PBI Module](#).

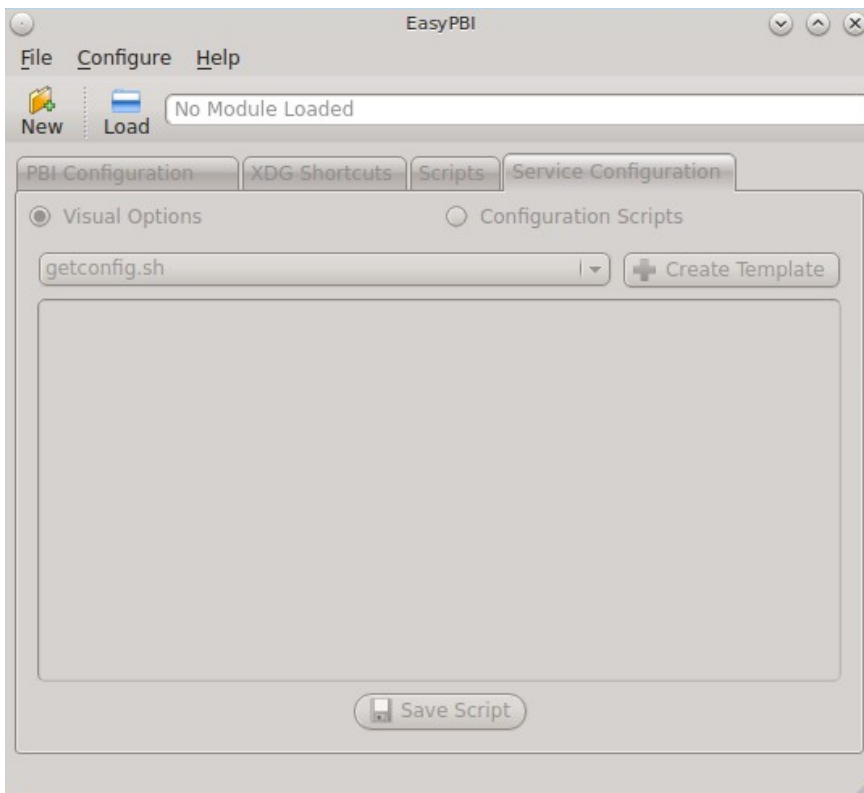
8.1.1 Creating a PBI Module

EasyPBI can be launched from Control Panel or by typing **EasyPBI**.

NOTE: do not use EasyPBI while [AppCafe®](#) is running as both applications place a lock on the package database.

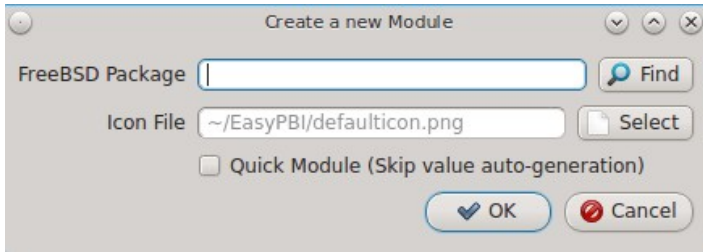
When you first launch EasyPBI, everything will be greyed out, as seen in Figure 8.1a. This is because you have not created any modules yet.

Figure 8.1a: Initial EasyPBI Graphical Interface



Click the “New” button to create a PBI module and to open the screen shown in Figure 8.1b.

Figure 8.1b: Create a New Module Screen

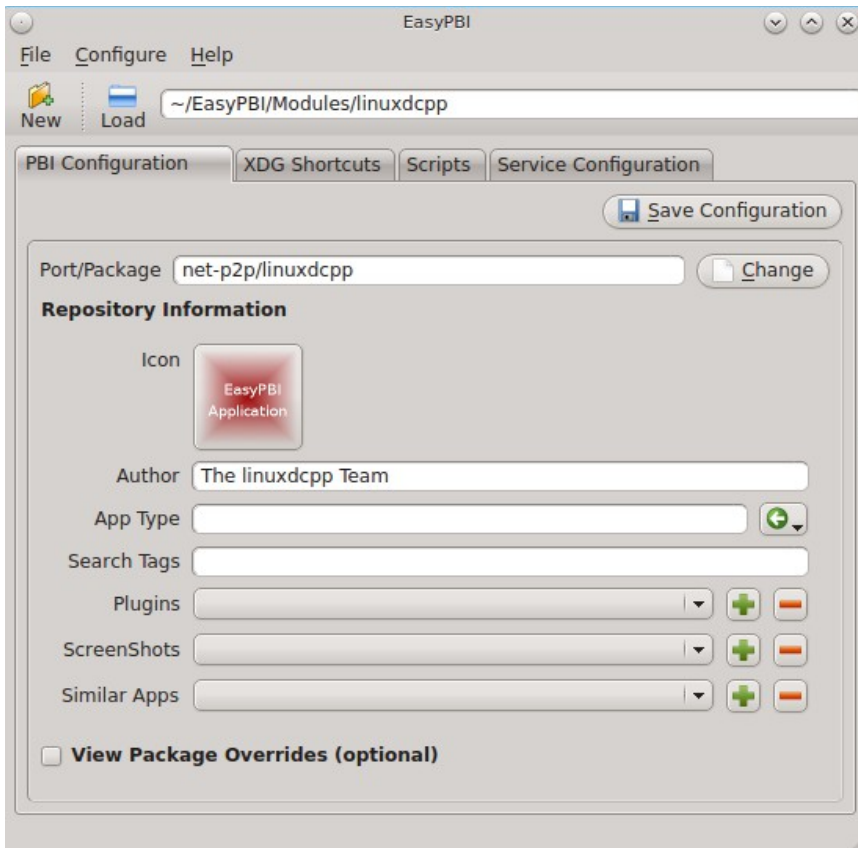


The following options are available when creating a new module:

- **FreeBSD Package:** click the “Find” button to browse the available categories and to select the package to convert into a PBI.
- **Icon File:** by default, a generic PBI icon will be used. If the application has its own icon, use the “Select” button to browse to the location of the icon. When selecting a custom icon, use a 64x64 .png file with a transparent background.
- **Quick Module:** check this box if the system is not currently connected to the Internet. Otherwise, EasyPBI does a scan of the package in order to automatically fill in the module's information. This information can be filled in manually, as described in the next screen.

After making your selections, click “OK”. The information for the module will appear as seen in the example in Figure 8.1c. In this example, the *net-p2p/linuxdcpp* port has been selected.

Figure 8.1c: PBI Configuration Screen



The “Port/Package” and “Author” fields are mandatory and should be auto-filled for you, unless you checked the “Quick Module” box. If the port does not supply the “Author” name, check the application's website to see if you can find one. Otherwise, input the email address of the port maintainer. A generic icon will be supplied for the module. You can change the default icon by clicking it.

The other items in the “PBI Configuration” tab are optional:

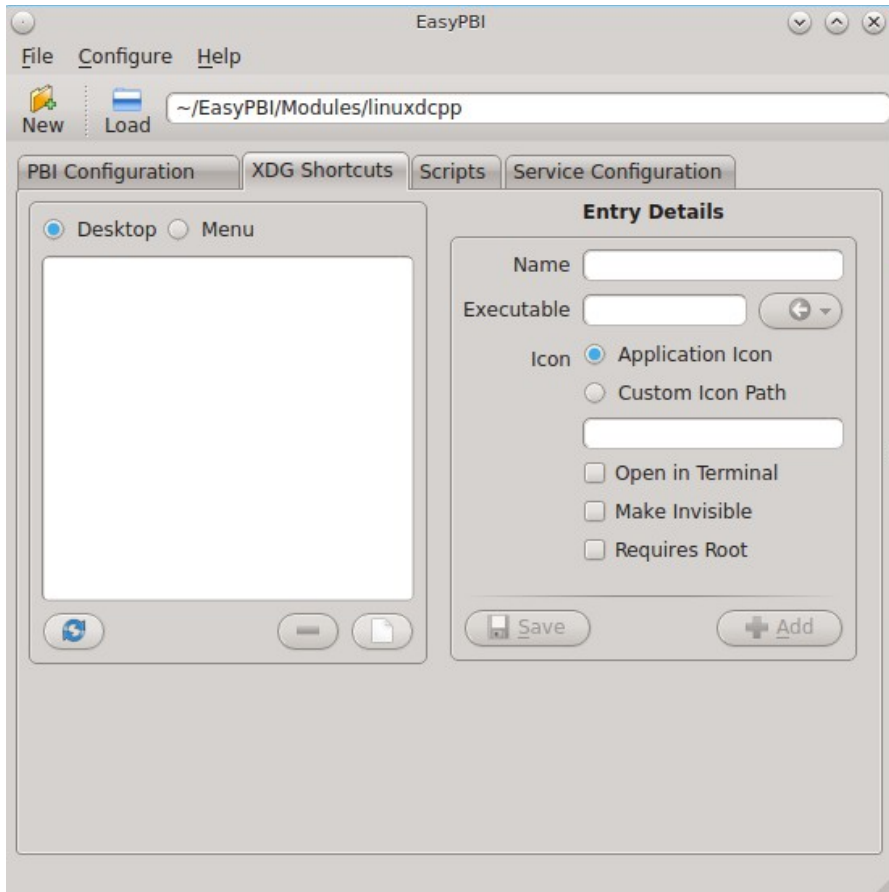
- **App Type:** if this is empty, the PBI will not appear in an AppCafe® search unless “Raw Packages” is checked in the “[Browser View](#)” menu. Otherwise, click the green arrow to select “Graphical”, “Text”, or “Server”. The PBI will be assigned the icon for that search selection and will appear in that “Browser View”.
- **Search Tags:** a comma delimited with no space list of tags. If a user types one of the tags into the search bar of AppCafe®, the PBI will be listed, assuming the “App Type” matches the user's configured “Browser View”.
- **Plugins:** if the application, such as a web browser, has associated plugins, click the “+” button to browse to the location of the plugin packages. These will be added to the “Plugins” tab for the PBI in [AppCafe®](#).
- **Screenshots:** to include a screenshot of the application, click the “+” button and browse to the location of the screenshot in *.jpg* or *.png* format. The added screenshot(s) will appear in the “Screenshots” tab for the PBI in [AppCafe®](#).
- **Similar Apps:** if there are any other packages with similar functionality, click the “+” button to browse to the location of the plugin packages. These will be added to the “Similar” tab for the PBI in [AppCafe®](#).
- **View Package Overrides:** check this box to display additional settings . By default, the PBI will be built using the default options provided by the package. Some defaults can be overridden in this section: the default PBI name, URL for the application's website, license text, summary, and description. You can also add additional packages to install with the PBI or delete a package that is typically installed with the application. Note that you typically should not need to make any of these changes.

NOTE: changes within this screen will not be saved until you click the “Save Configuration” button. Be sure to save any changes before leaving this tab.

8.1.1.1 XDG Shortcuts Tab

This tab, shown in Figure 8.1d, is used to create desktop icons and menu entries so that the application can be easily started from within a desktop environment. This is important step for graphical applications as it configures the primary method for interacting with the program.

Figure 8.1d: XDG Shortcuts Configuration



Any entries currently configured for the module will appear in the left side of the tab. Click an existing entry to display its details on the right. You can remove a highlighted entry by clicking the “-” (minus sign) button, or create a new entry by clicking on the white paper button under the entry list. On the right side of this tab, you can edit the currently selected entry and click the “Save” button to overwrite the current entry with the new settings. Alternately, click “Add” to copy the existing details to a new entry.

The “Entry Details” section of this tab are as follows when the “Desktop” button is selected:

- **Name:** this is the text that will appear for the desktop menu entry, and is usually the full name of the application.
- **Executable:** input the name of the executable to run. EasyPBI will automatically generate the PBI-specific path to the binary.
- **Icon:** when using a custom icon, click “Custom Icon Path” and input the full path to the icon file.
- **Open in Terminal:** check this box if the application needs to be opened in an X terminal. This is useful for running some text-based programs that need to be embedded into a console for user interaction.
- **Make Invisible:** if checked, the entry will be hidden. This is not as useful for desktop entries but can be handy with menu entries.
- **Requires Root:** if checked, the user will be prompted for their password when the application starts. This is important if the program requires special users or groups to be created or an installation script needs access to the local system to make modifications.

If you click “Menu”, two more fields will be added to the “Entry Details” section:

- **Category:** indicates the menu category that the entry will be placed under when listed in the desktop environment. Click the green arrow to see the available menu categories. The recommended category will have a small black arrow next to it.
- **MIME Patterns:** used to associate a space-separated list of file types with the application. This is useful when paired with the “Make Invisible” option. For example, consider an application which has two binaries representing two different aspects of the program and an additional binary that asks which of the two you want to use. You could create menu entries for all three binaries, but make the two specific ones invisible and associate file types with them. This means that when a user tries to open one of those file types, it will automatically run the particular binary that uses it, rather than prompting the user for input about what to do with the file.

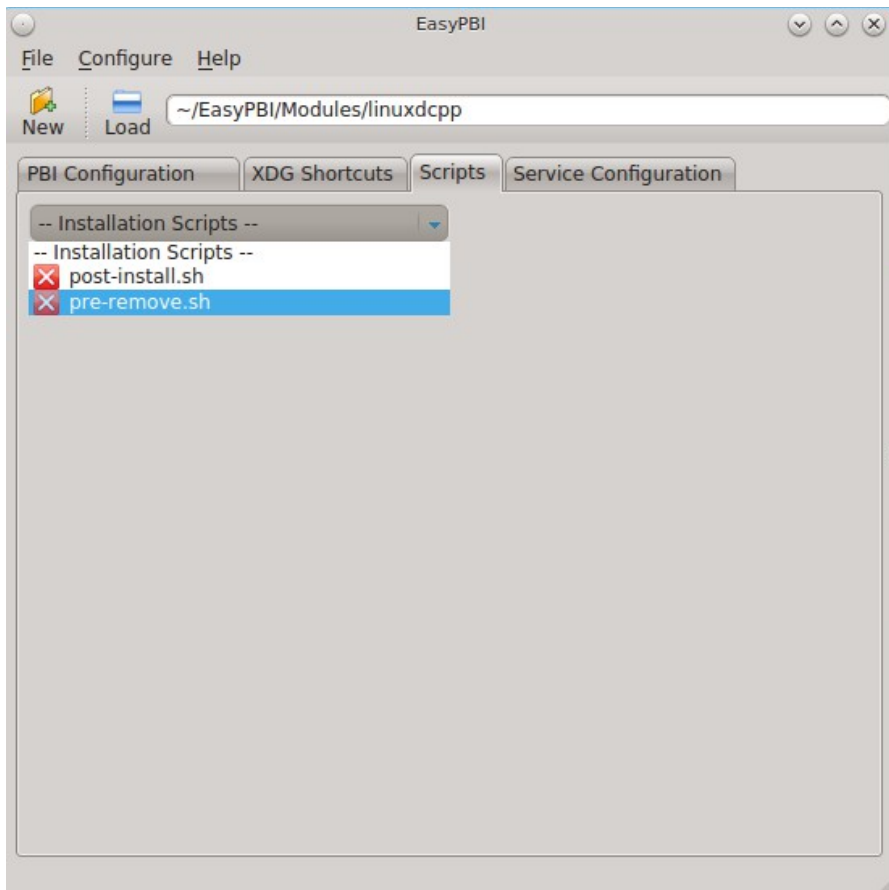
If you make any changes in this tab, click the “Save” button to save them.

8.1.1.2 Scripts Tab

This tab, shown in Figure 8.1e, is used to create custom installation and removal scripts for the PBI.

If you click on the drop-down menu, you will see a list of available script types, with an icon indicating whether or not a custom script exists in the module. Selecting a script type will activate a “Create” button if the script does not exist, or will display the full script in a box for editing.

Figure 8.1e: Scripts Configuration



The possible script types are:

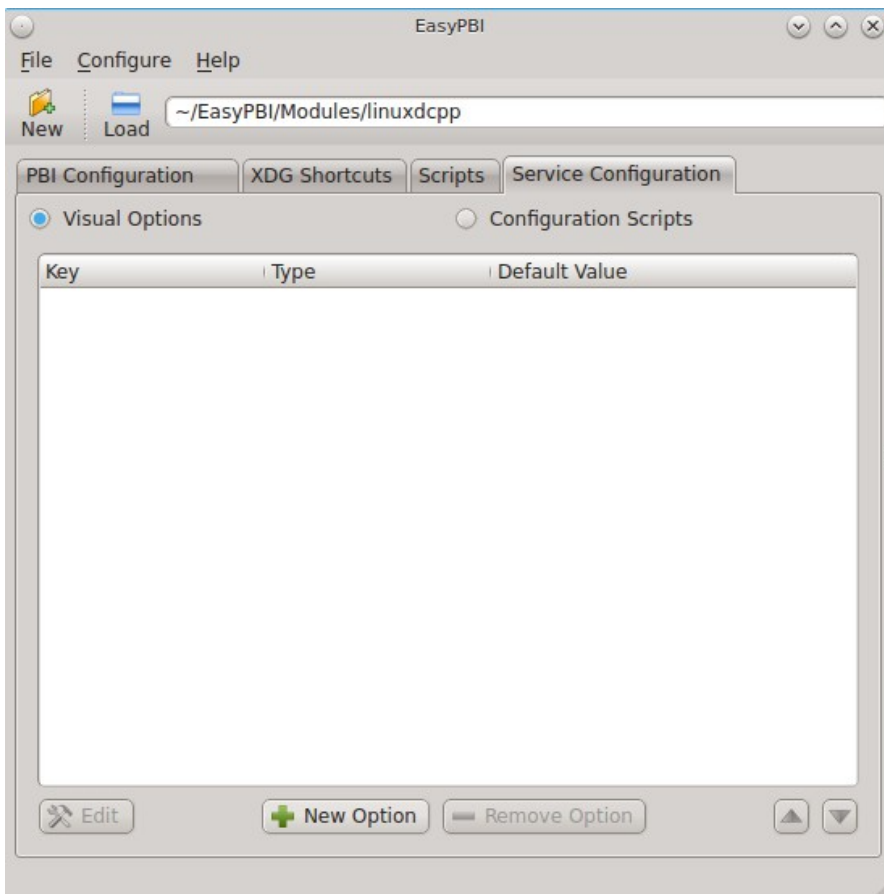
- **post-install.sh**: script run after installation of the PBI.
- **pre-remove.sh**: script run before deletion of the PBI.

If you add or remove any scripts in this tab, click the “Save” button to save them.

8.1.1.3 Service Configuration Tab

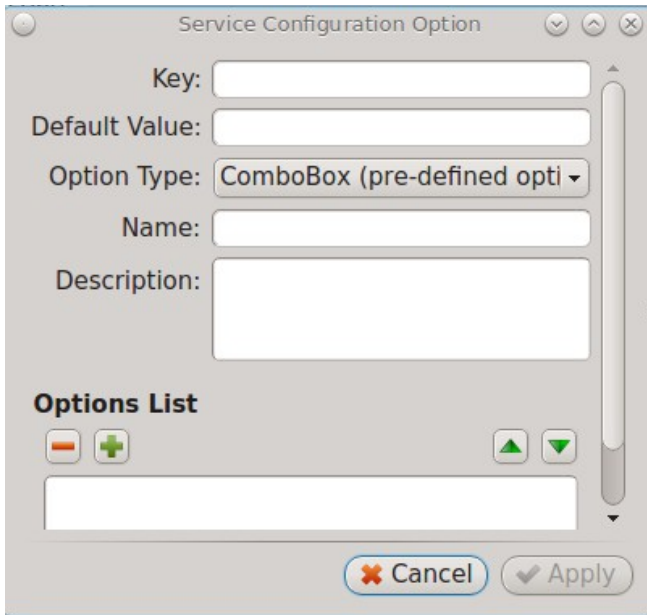
The “Service Configuration” tab, shown in Figure 8.1f, allows you to setup a remote graphical configuration interface for the application. This is generally used for services or daemons that do not have a configuration interface and lets the user perform tasks with that service such as modifying runtime configuration options or starting, stopping, and restarting the service. Any configurations will appear in the new AppCafe web interface (**pc-softweb**), which allows the user to manage those services from remote systems or phones.

Figure 8.1f: Service Configuration



The “Visual Options” list is used to setup the options for controlling the service. To add an entry to this list, click “New Option” which will open the screen shown in Figure 8.1g.

Figure 8.1g: Adding a Visual Option



The following fields are available when adding a visual option. Examples for values to use in these fields can be found in the [service configuration file for irc/bitlbee](#).

- **Key:** the option to set.
- **Default Value:** the default value for the option.
- **Option Type:** supported types are *ComboBox*, *NumberBox*, or *TextBox*.
- **Name:** the name that will appear.
- **Description:** the description that will appear.
- **Options List:** appears when the *ComboBox* “Option Type” is selected. Use the “+” and “-” buttons to add or remove options to appear in the list and the up and down arrow buttons to order the items in the list.
- **Number Limits:** appears when the *NumberBox* “Option Type” is selected. Set the “Maximum” and “Minimum” numbers for the selection, where the default of 0 is unlimited.
- **Text Options:** appears when the *TextBox* “Option Type” is selected. Set the “Max Length” of allowed user input, where the default of 0 is unlimited. If the text should be hidden, for example when the user is inputting a password, check the box “Hide Text”.

If you create a new visual option, click the “Configuration Scripts” button as these are required for the service management configuration to work properly. Three configuration scripts are required:

- **getconfig.sh:** script for retrieving the current value for a given “Key” from the service configuration.
- **setconfig.sh:** script for changing a configuration value for the service.
- **doneconfig.sh:** script that is run after changing configuration values. Usually used for starting or restarting the service.

Since none of the configuration scripts are created by default, you will need to click the “Create Template” button for each script to open an editable version of the template. Each template includes a description of the

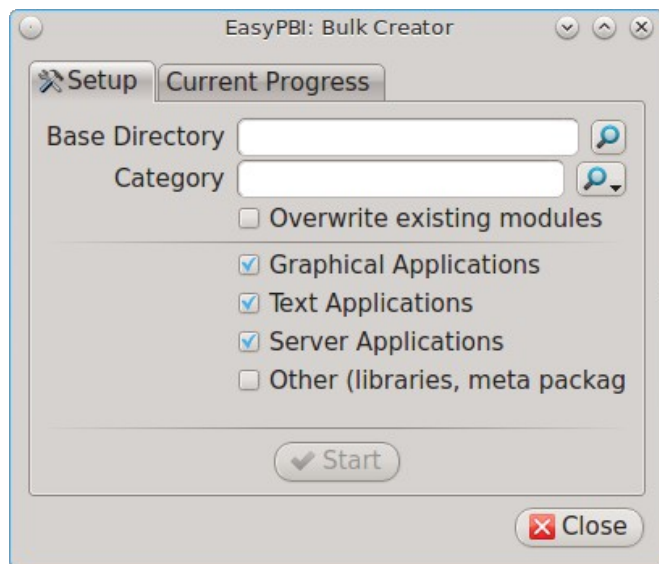
script, how it is run, and lists its input variables. Edit the template as needed and click the “Save Script” button to save the script. Repeat for each of the three required scripts.

Once you have configured a PBI module, you can create additional modules by clicking the “New” button. To edit an existing module, click the “Load” button and select the module name.

8.1.2 Bulk Module Creator

When creating a custom repository, it can be convenient to quickly create all of the modules for a port category, then customize the modules as needed. To do this, click File → Bulk Module Creator which will open the screen shown in Figure 8.1h.

Figure 8.1h: Bulk Module Creator



Click the icon next to “Base Directory” and browse to the location to hold the modules. For example, if the custom repository is being created in `~/myrepo`, browse to that directory.

Next, click the icon next to “Category” and select the ports category to recreate in the “Base Directory”. For example, if you select the “accessibility” category, it will create a directory called `~/myrepo/accessibility/` containing subdirectories which represent the PBI modules for the existing packages in that directory.

If the selected “Base Directory” and “Category” already exist and you want to overwrite any existing PBI modules, check the box for “Overwrite existing modules”. Otherwise, the Bulk Creator will ignore any existing modules.

If you only want to create certain types of applications, check or uncheck the boxes for the application types: graphical, text, server, other. “Other” is any package that does not install any graphical images, does not install any files into `/usr/local/bin/` or `/usr/local/sbin/`, and does not install any files into `/usr/local/etc/rc.d/`. This generally occurs with packages that just install libraries or plugins, and meta-packages which do not install anything and just have a bunch of dependencies.

After making your selections, click the “Start” button. A progress bar will indicate the status, which goes by quickly, and then summarize the number of modules built. An example is shown in Figure 8.1i. After reviewing the summary, click the “Close” button to return to the main EasyPBI screen.

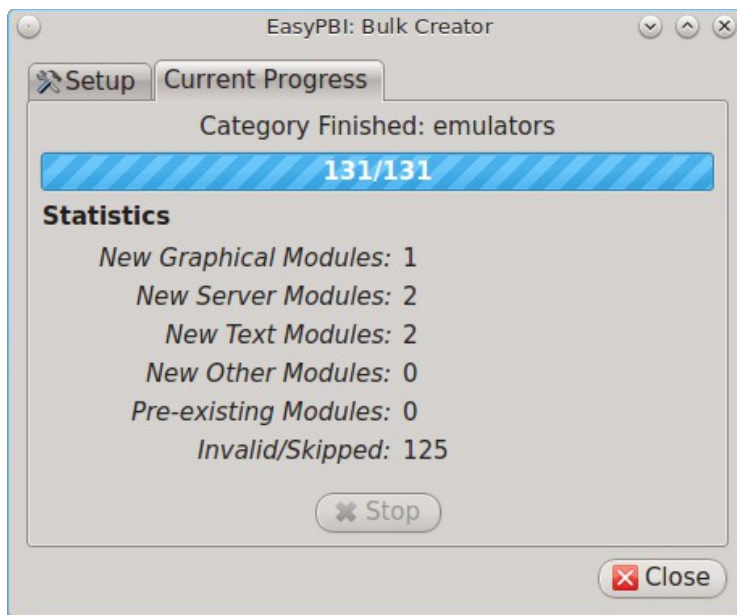
When creating modules, Bulk Creator will skip the following:

- any existing modules, unless “Overwrite existing modules” is checked
- any package types which were unchecked
- if the package is not found in the repository

NOTE: if all modules are skipped, check the Internet connection as Bulk Creator needs Internet access to get the package information.

Repeat for each category that you want to include in the custom repository.

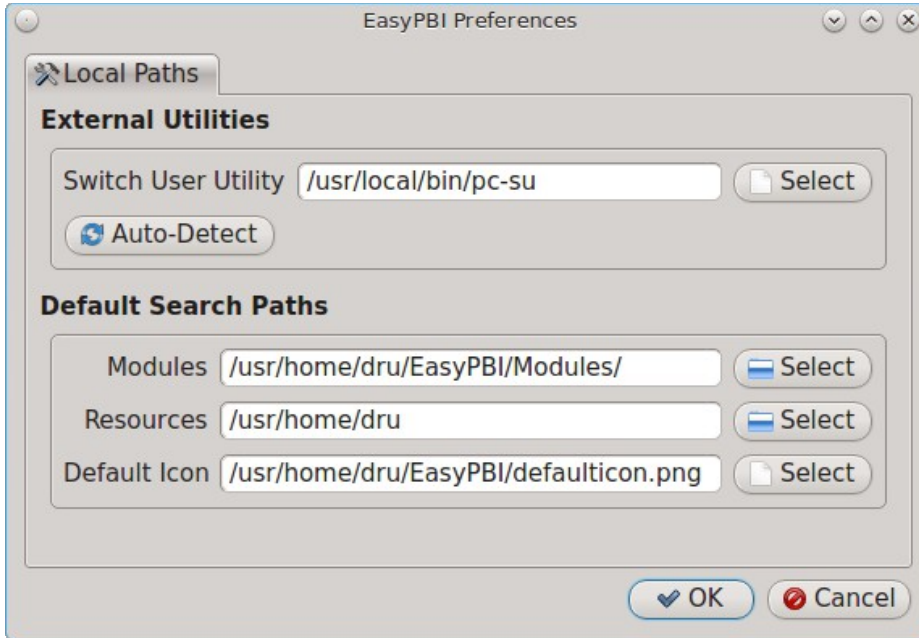
Figure 8.1i: Summary of Modules



8.1.3 EasyPBI Settings

To edit EasyPBI's settings, click Configure → Settings to open the screen shown in Figure 8.1j.

Figure 8.1j: EasyPBI Settings



The options in this screen allow you to configure the following:

Switch User Utility: the full path to the binary which is used to switch to administrative access. By default, it is **pc-su**.

Auto-Detect: if this button is clicked, a pop-up message will indicate that it will return all of the EasyPBI settings back to their defaults. Click “Yes” to do so or “No” to cancel the operation.

Modules: the full path to the directory to save modules which are created with the “New” button.

Resources: the full path to the directory to store any extra resources. These are described in [resources/](#).

Default Icon: the full path to the default icon used by PBI modules.

The “Configure” menu contains two other options:

- **Package Module:** when this option is clicked, a pop-up message will indicate that a copy of the current module has been packaged within the module directory.
- **Refresh Module:** click to refresh the module's settings.

The “Help” menu contains three options:

- **About:** displays the EasyPBI version, license, and development history.
- **FreeBSD Ports:** opens [FreshPorts.org](#) in the default browser.
- **PBI Modules:** opens the PBI Module Builder Guide in the default browser.

8.1.4 PBI Module Components

While EasyPBI is the recommended way for creating PBI modules, it is possible to manually create the various ASCII text files used in the modules. This section describes the various files that comprise a PBI module. A PBI module is simply a collection of files which controls the contents of the PBI and its appearance in [AppCafe®](#).

When creating a PBI module, create a directory on your computer to hold the module's files. For example, if you are creating a PBI module for firefox, create the following directory using this command:

```
mkdir -p ~/my_pbis/www/firefox
```

As you create the subdirectories and files needed by the PBI module, save them to the directory for that module.

8.1.4.1 LICENSE File

If the application requires the user to read a license agreement, save that license as a file named *LICENSE* in the directory of the PBI module. This file is optional unless the underlying port is restricted and requires the user to accept a license in order to install and use the software.

8.1.4.2 pbi.conf

The *pbi.conf* file is mandatory. It is a simple shell script that contains the information needed to build the PBI. Here is an example of the *pbi.conf* file for firefox. When creating your file, modify the text in red to meet the needs of the PBI.

```
#!/bin/sh
# PBING Module Config
# -- Program Base Information --
PBI_ORIGIN="www/firefox"
PBI_PROGNAME="Firefox"
PBI_PROGWEB=""
PBI_PROGAUTHOR="Firefox Team"
# -- Additional repo information (optional) --
PBI_LICENSE="MPL"
PBI_TAGS="Firefox, Browser, Web, Mozilla, www"
PBI_PROGTYPE="Graphical"
PBI_CATEGORY="Web"
# -- Additional package to install along with ORIGIN
PBI_OTHERPKGS="www/linux-c6-flashplugin11 www/nspluginwrapper"
# -- Optional related packages to show user
PBI_PLUGINS="www/gecko-mediaplayer www/firefox-118n java/icedtea-web"
# -- Space delimited list of URLs to screenshots
PBI_SCREENSHOTS="http://www.pcbsd.org/appcafe/screenshots/www/firefox/screen1.png
http://www.pcbsd.org/appcafe/screenshots/www/firefox/screen2.png"
# -- Other PBIs which are similar to this PBI
PBI_RELATED="www/chromium www/opera www/seamonkey"
export PBI_ORIGIN PBI_PROGNAME PBI_PROGWEB PBI_PROGAUTHOR
export PBI_LICENSE PBI_TAGS PBI_PROGTYPE PBI_CATEGORY
export PBI_OTHERPKGS PBI_PLUGINS
export PBI_SCREENSHOTS PBI_RELATED
```

Table 8.1a describes the most commonly used variables.

Table 8.1a: Commonly Used pbi.conf Variables

Variable	Description
PBI_ORIGIN=	mandatory; the category/portname of the FreeBSD package
PBI_PROGNAME=	mandatory; name of the application
PBI_PROGWEB=	mandatory unless does not exist; website for the application

Variable	Description
PBI_PROGAUTHOR=	mandatory; often found at the website for the application
PBI_LICENSE=	the type of open source license used by the application
PBI_TAGS=	a comma separated list (no spaces) of search terms associated with the application
PBI_PROGTYPE=	mandatory; use “Graphical” or “Text”
PBI_CATEGORY=	the category to place the application into; click “Browse Categories” within AppCafe® to see the list of categories
PBI_OTHERPKGS=	a space separated list in the format <i>category/portname</i> of other applications to bundle into the PBI
PBI_PLUGINS=	a space separated list in the format <i>category/portname</i> of similar “raw packages”
PBI_SCREENSHOTS=	a space separated list of URLs to screenshots in <i>.png</i> or <i>.jpg</i> format
PBI_RELATED=	a space separated list in the format <i>category/portname</i> of similar PBIs
export	mandatory; followed by a list of all of the variables that will be included when the PBI is built

8.1.4.3 resources/

The *resources/* directory can contain extra files you wish copied into the PBI application directory. This is often the best place for the *LICENSE* file and other files not included with a port.

8.1.4.4 xdg-menu/ and xdg-desktop/

The *xdg-menu/* and *xdg-desktop/* directories can be used to supply menu and desktop icons, respectively. The file that you place in these directories should be in the format *pbiname.desktop*. Example 8.1a shows the *firefox.desktop* files for the firefox PBI.

Example 8.1a: Firefox XDG Entries

```
more xdg-menu/firefox.desktop
#!/usr/bin/env xdg-open
[Desktop Entry]
Value=1.0
Type=Application
Exec=firefox %U
Path=
Icon=share/pixmaps/FireFox-128.png
StartupNotify=true
Name=Firefox

more xdg-desktop/firefox.desktop
#!/usr/bin/env xdg-open
[Desktop Entry]
```

```
Value=1.0
Type=Application
Exec=firefox %U
Path=
Icon=share/pixmaps/FireFox-128.png
StartupNotify=true
Name=Firefox
```

Exec= should reference the PBI's executable and any required switches.

If *Icon*= is blank, the PBI will automatically use the icon.png located in the module's directory.

For more details on the XDG menu specifications, please refer to the [freedesktop specifications](#).

8.1.4.5 xdg-mime/

The *xdg-mime/* directory is used to register file associations according to the [freedesktop MIME specs](#). This requires the creation of an XML file. The example shown in Figure 8.1b adds the MIME information for gimp, so that it can be available as an application choice in a web browser:

Example 8.1b: Gimp MIME Info

```
more xdg-mime/gimp-xdg.xml
```

```
<?xml version="1.0"?>
<mime-info xmlns='http://www.freedesktop.org/standards/shared-mime-info'>
  <mime-type type="application/x-gimp">
    <comment>Gimp File</comment>
    <glob weight="100" pattern="*.xcf"/>
    <glob weight="100" pattern="*.XCF"/>
  </mime-type>
</mime-info>
```

8.2 About

The “About” icon of Control Panel can be used to quickly find information about the PC-BSD® system. To start the application, double-click its icon in Control Panel or type **about-gui**. An example is seen in Figure 8.2a.

The displayed information includes the version of PC-BSD® and the PC-BSD® utilities, whether the system is using the PRODUCTION or EDGE package set, the hostname of the system, the underlying version of FreeBSD, the architecture, the name of the kernel (ident), the type of CPU, and the amount of installed memory.

If you click the “System components” button, the X.org version and revision numbers of the PC-BSD command line and graphical utilities will be displayed, as seen in the example shown in Figure 8.2b.

Figure 8.2a: About Information

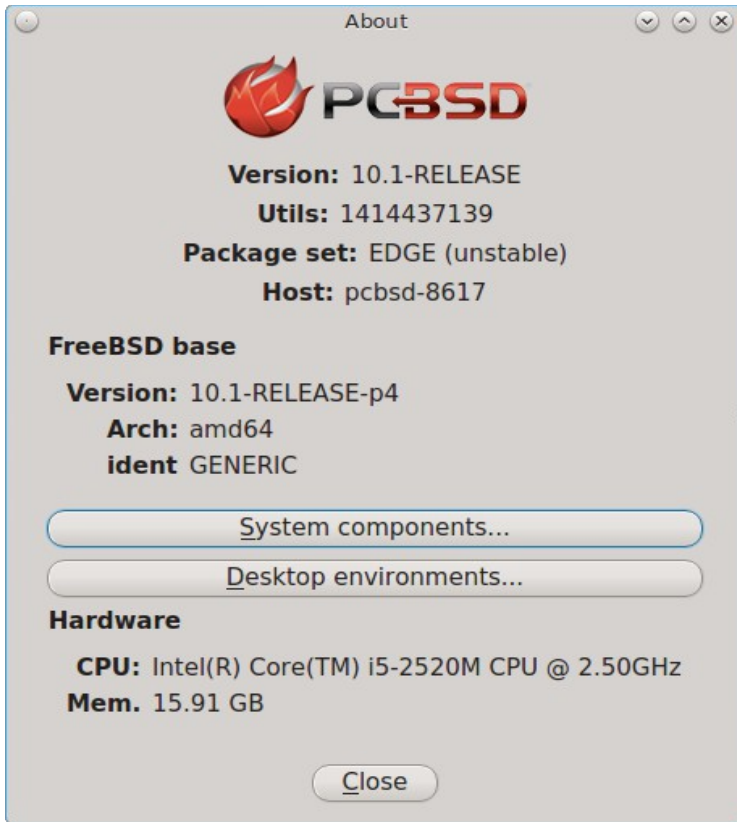
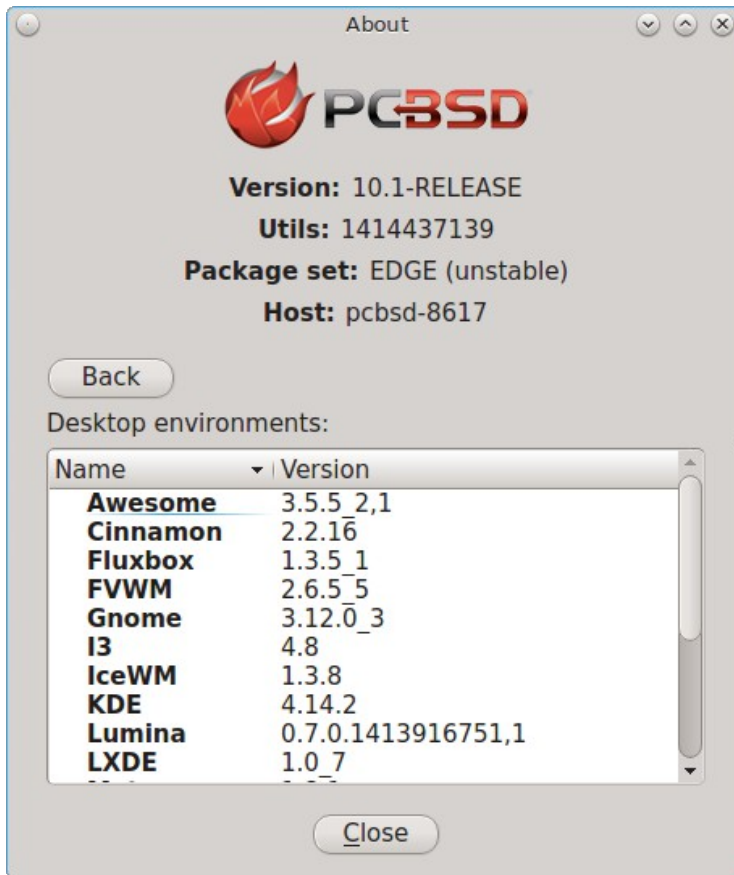


Figure 8.2b: System Components Screen



If you click “Back” and then the “Desktop environments” button, the currently installed desktops and their versions will be displayed, as seen in the example in Figure 8.2c.

Figure 8.2c: Desktop Environments Screen



8.3 Active Directory & LDAP

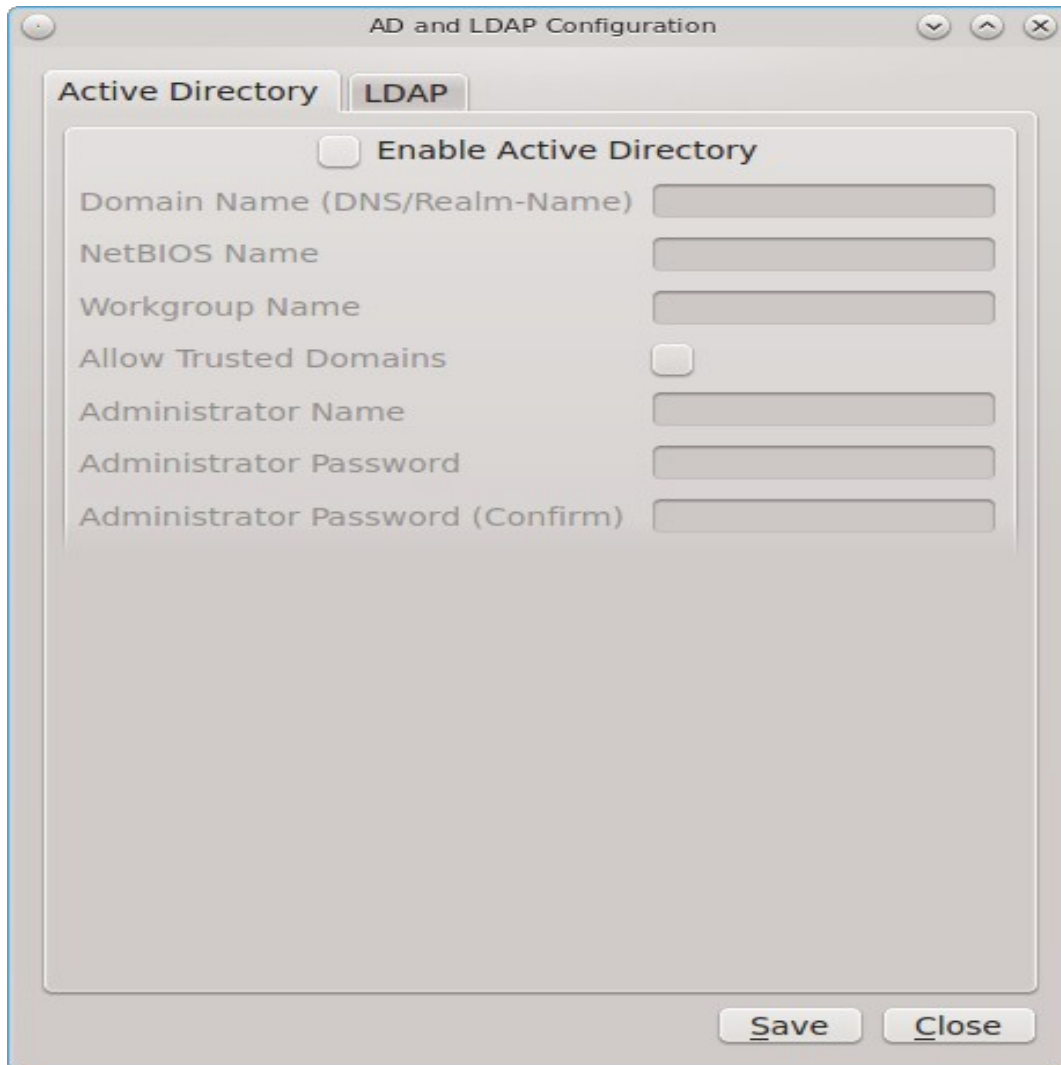
The “Active Directory & LDAP” icon is used for managing connections to an Active Directory or OpenLDAP domain. If your network contains an Active Directory or OpenLDAP server, use this icon to input the settings needed to connect to your account information stored on the network.

This utility is to manage the settings of the client, not the Active Directory or OpenLDAP server itself. This application also needs more testing from users. If you have trouble using this utility or find a bug, please post the details using the [PC-BSD® Bug Reporting](#) tool.

To start the application, double-click its icon in Control Panel or type **pc-su pc-adsldap**. You will be prompted to input your password. Figure 8.3a shows the configuration utility with the Active Directory tab open.

NOTE: to prevent “DNS Update for localhost.pcbsd-3881 failed: ERROR_DNS_UPDATE_FAILED” errors, set the PC-BSD® hostname to include the realm name. For example, if the current hostname is “pcbsd-3881” and the realm name is “maloney.local”, change the hostname to “pcbsd-3881.maloney.local” in Control Panel → Network Configuration → [Network Configuration \(Advanced\)](#) → Misc.

Figure 8.3a: Initial Active Directory & LDAP Screen



8.3.1 Connecting to Active Directory

If you need to connect to a network running Active Directory, check the box “Enable Active Directory”. This will change the greyed-out status of the rest of the screen, allowing you to configure the following:

- **Domain Name (DNS/Realm-Name):** input the name of the Active Directory domain (e.g. example.com) or child domain (e.g. sales.example.com). This setting is mandatory.
- **NetBIOS Name:** input the hostname of the PC-BSD® system as listed in the [About](#) icon.
- **Workgroup Name:** input the name of the Windows workgroup. Unless the administrator has changed it, the default workgroup name is *WORKGROUP*.
- **Allow Trusted Domains:** only check this box if the network has [active domain/forest trusts](#).

- **Administrator Name:** input the name of the Active Directory Administrator account.
- **Administrator Password:** input and confirm the password for the Active Directory Administrator account.

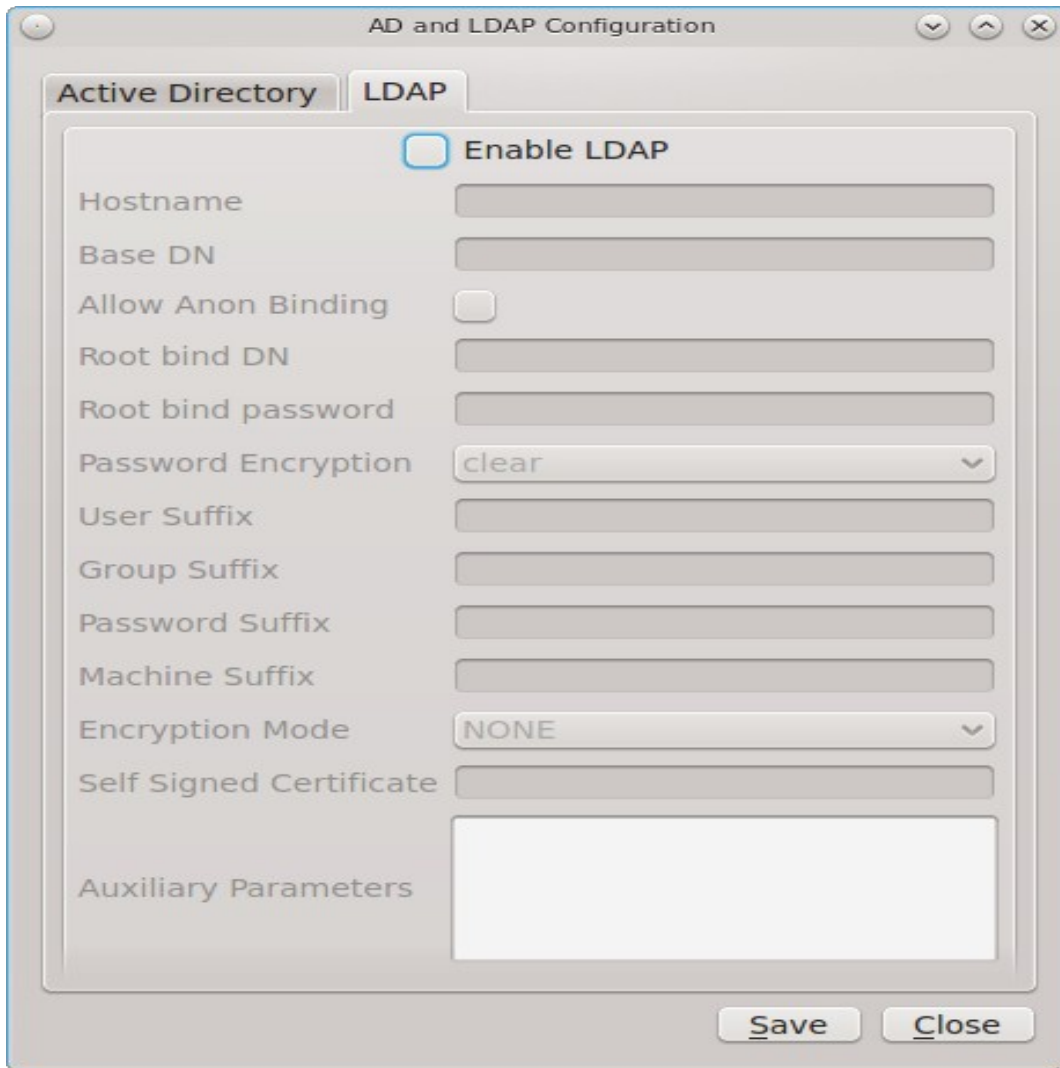
The values that you input using this GUI are saved to `/usr/local/etc/pc-activedirectory.conf`.

NOTE: once you enable AD, you can no longer use [auto login](#) as users will now authenticate with the Active Directory server.

8.3.2 Connecting to an OpenLDAP Server

Figure 8.3b shows the configuration utility with the LDAP tab open.

Figure 8.3b: Managing LDAP Client Settings



If you need to connect to a network which contains a configured LDAP server, check the box “Enable LDAP”. This will change the greyed-out status of the rest of the screen, allowing you to configure the following:

- **Hostname:** input the hostname or IP address of the OpenLDAP server. This setting is mandatory.

- **Base DN:** input the top level of the LDAP directory tree to be used when searching for resources (e.g. `dc=test,dc=org`).
- **Allow Anon Binding:** only check this box if the LDAP server allows read and write access without requiring authentication.
- **Root bind DN:** input the name of the administrative account on the LDAP server (e.g. `cn=Manager,dc=test,dc=org`).
- **Root bind password:** input the password for the *Root bind DN*.
- **Password Encryption:** select a type supported by the LDAP server, choices are: clear (unencrypted), crypt, md5, nds, racf, ad, or exop.
- **User Suffix:** this setting is optional and is usually a dept. or company name. The input value will be added to the name when a user account is added to the LDAP directory
- **Group Suffix:** this setting is optional and is usually a dept. or company name. The input value will be added to the name when a group is added to the LDAP directory.
- **Password Suffix:** this setting is optional. The input value will be added to the password when a password is added to the LDAP directory.
- **Machine Suffix:** this setting is optional and usually represents a description such as server or accounting. The input value will be added to the name when a system is added to the LDAP directory.
- **Encryption Mode:** choices are Off, SSL, or TLS. The selected type must be supported by the LDAP server.
- **Self Signed Certificate:** used to verify the certificate of the LDAP server if SSL connections are used. Paste the output of the command `openssl s_client -connect server:port -showcerts`.
- **Auxiliary Parameters:** [ldap.conf\(5\)](#) options, one per line, not covered by other options in this screen.

The values that you input into this tab are saved to `/usr/local/etc/pc-ldap.conf`.

If you are new to LDAP terminology, you may find it useful to skim through the [OpenLDAP Software 2.4 Administrator's Guide](#).

8.4 Boot Manager

PC-BSD® supports a feature of ZFS known as multiple boot environments (BEs). With multiple boot environments, the process of updating software becomes a low-risk operation as you can backup your current boot environment before upgrading or making software updates to your system. If needed, you also have the option of booting into a backup boot environment. For example:

- if you are making software changes to a boot environment, you can take a snapshot of that environment at any stage during the modifications.
- you can save multiple boot environments on your system and perform various updates on each of them as needed. You can install, test, and update different software packages on each.
- you can mount a boot environment in order to **chroot** into the mount point and update specific packages on the mounted environment.
- you can move a boot environment to another machine, physical or virtual, in order to check hardware support.

NOTE: for boot environments to work properly, *do not delete the default ZFS mount points during*

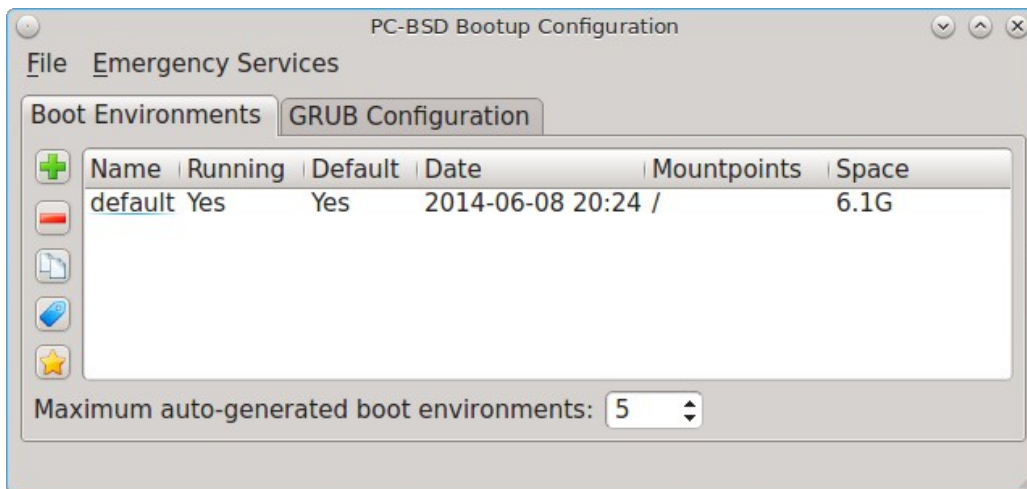
installation. The default ZFS layout ensures that when you create multiple boot environments, the `/usr/pbi/`, `/usr/local/`, `/usr/home/`, `/usr/ports/`, `/usr/src/` and `/var/` directories remain untouched. This way, if you rollback to a previous boot environment, you will not lose data in your home directories, any installed applications, or downloaded src or ports. During installation, you can add additional mount points, just don't delete the default ones.

8.4.1 Managing Boot Environments Using Boot Manager

To create and manage boot environments using a graphical interface, go to Control Panel → Boot Manager or type **pc-su pc-bootconfig**. You will be prompted to enter your password.

During installation, PC-BSD® creates a boot environment named *default*. As seen in Figure 8.4a, an entry for this boot environment will be displayed in the Boot Manager screen.

Figure 8.4a: Managing Boot Environments



Anything outside of the *default* dataset will not be included in the boot environment. To ensure that the files that the operating system needs are included when the system boots, all boot environments include `/usr`, `/usr/local`, and `/var`. User-specific data is **not** included in the boot environment. This means that `/usr/home`, `/usr/jails`, `/var/log`, `/var/tmp`, and `/var/audit` will not change, regardless of which boot environment is selected at system boot.

From top to bottom, the icons on the far left are used to:

Create: a new boot environment. You should do this before making any changes to the system that may impact on your current boot environment. You will be prompted for a name which can only contain letters or numbers. Once you click OK, the system will create the environment, then add it to the list of boot environments.

Remove: will delete the highlighted boot environment. You can not delete the boot environment which has a *Running* status of *Yes* as that is the current boot environment.

Copy: creates a copy of an existing boot environment.

Rename: used to rename the highlighted boot environment. The name is what appears in the boot menu when the system boots. You cannot rename the BE you are currently booted into and an error message will occur if you try to do so.

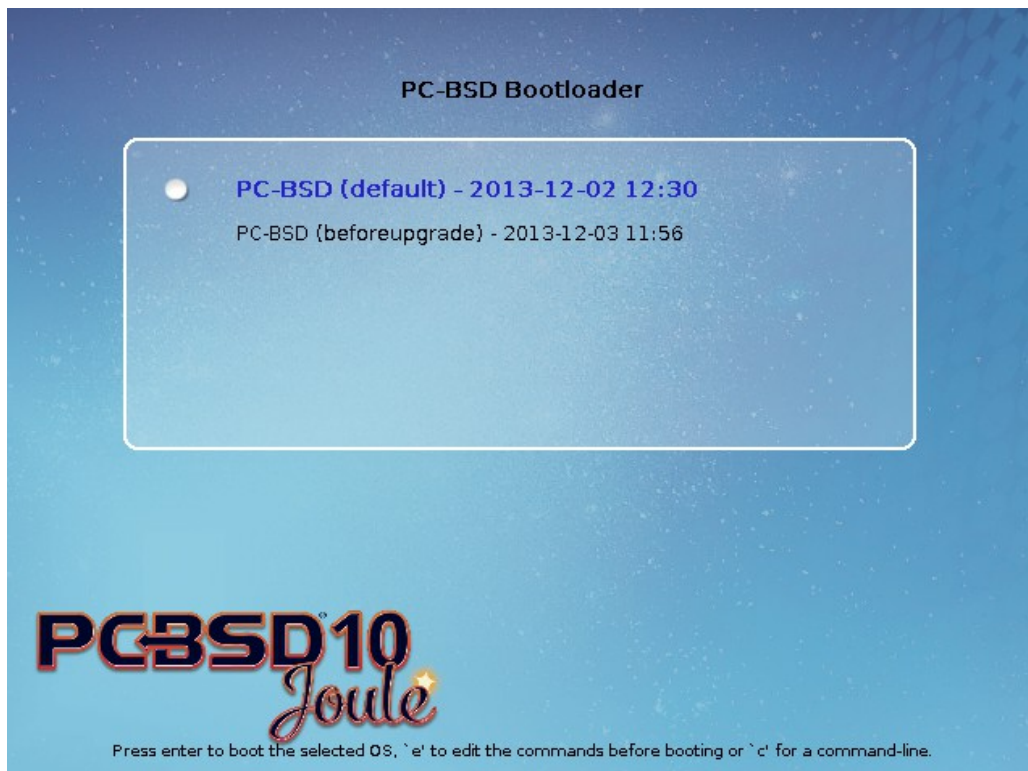
Activate: tells the system to boot into the highlighted boot environment at next system boot. The *Default* will change to *Yes*, but the *Running* will remain the same. In other words, *Running* refers to the boot environment the system last booted into (is currently running from) whereas *Default* indicates which boot environment the system

will boot into at next system boot.

This screen also lets you set the “Maximum auto-generated boot environments”. The default is 5 and the range is from 1 to 10. PC-BSD® automatically creates a boot environment before updating any software and the operating system as well as before applying a system update. Once the configured maximum number of boot environments is reached, PC-BSD® will automatically prune (delete) the oldest automatically created boot environment. However, it will not delete any boot environments you create manually.

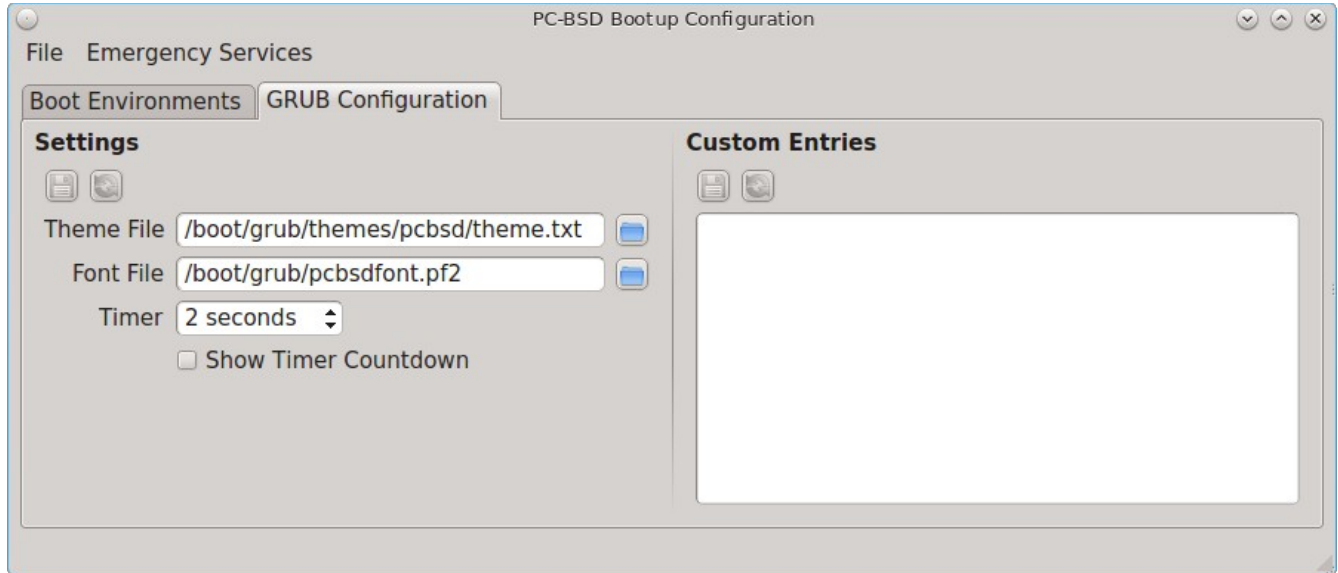
If you create any boot environments, a boot menu similar to the one seen in Figure 8.4b will appear for two seconds during system boot. The menu contains the names of the boot environments and the date each was created. If you don't make a selection, the system will automatically boot into either the last “Running” boot environment or, if you have activated another boot environment, the environment that was set as the “Default”.

Figure 8.4b: Boot Menu Shows Created Boot Environments



To customize this menu, click the “Grub Configuration” tab to see the screen seen in Figure 8.4c.

Figure 8.4c: Managing GRUB Configuration



The fields in this screen are used to configure the:

- **Theme File:** used to customize the look of the GRUB menu. The theme file format is described in [this section of the GRUB Manual](#). The [GRUB 2 Theme Reference](#) provides additional information.
- **Font File:** before a font can be used in the GRUB menu, it must first be converted to *.pf2* format using the `grub-mkfont(1)` command.
- **Timer:** sets the delay time for accessing the GRUB menu. By default it is 2 seconds, so if you find that the time to access the menu goes by too quickly, increase this timer. If you would like the graphical PC-BSD® bootloader menu to be displayed during boot, check the box “Show Timer Countdown”.
- **Custom Entries:** if you have an existing GRUB configuration that you would like to add to the menu, cut and paste it into the box. Refer to the [GRUB Manual](#) for more information on creating a custom GRUB configuration.

If you make any changes in this tab, the two buttons below “Settings” or “Custom Entries” will be activated. Use them to save your changes or to re-load the GRUB configuration. If you forget to do so, a pop-up message will remind you that you have unsaved changes when you exit Boot Manager. If you do not save the changes using these buttons, the boot menu will remain the same.

TIP: the “Emergency Services” menu can be used to “Rebuild GRUB Menu” or to “Restore GRUB Defaults”. If you make any changes to `/boot/loader.conf`, remember to use the “Rebuild GRUB Menu” so that GRUB is aware of the changes to this file.

8.4.2 Managing Boot Environments from the Command Line

If you are running TrueOS® or prefer to use the command line, you can manage boot environments using the `beadm` command as the superuser. For example, this command creates a boot environment named *beforeupgrade*:

```
beadm create beforeupgrade
GRUB configuration updated successfully
Created successfully
```

To view all boot environments, use the **list** command:

```
beadm list
```

```
BE           Active Mountpoint Space Created
default      NR      /           9.1G 2013-12-05 09:03
beforeupgrade -      -           2.1M 2013-12-06 10:14
```

The possible flags in the “Active” field are as follows:

- **R:** active on reboot
- **N:** active now
- **-:** inactive

In this example, the current boot environment is called *default*, it is active now, will be used at next reboot, and it is mounted. The newly created *beforeupgrade* boot environment exists, but is inactive and unmounted. To activate the new boot environment:

```
beadm activate beforeupgrade
```

```
Activated successfully
```

```
beadm list
```

```
BE           Active Mountpoint Space Created
default      N        /           3.1M 2013-12-05 09:03
beforeupgrade R      -           9.1G 2013-12-06 10:14
```

The flags now indicate that the system is currently booted into *default*, but at next boot the system will boot into *beforeupgrade*.

The boot menu configuration can be found in the ASCII text file */usr/local/etc/default/grub*:

```
more /usr/local/etc/default/grub
```

```
GRUB_THEME=/boot/grub/themes/pcbsd/theme.txt
GRUB_FONT=/boot/grub/pcbsdfont.pf2
GRUB_HIDDEN_TIMEOUT_QUIET=false
GRUB_TIMEOUT=2
GRUB_DEFAULT=1
```

8.5 Hardware Compatibility

The PC-BSD® installer allows you to quickly determine if your system's video card, Ethernet card, wireless device, and sound card are compatible with PC-BSD®.

A “Hardware Compatibility” icon in Control Panel provides a quick overview of the system's detected hardware. To start the application, double-click its icon in Control Panel or type **pc-sysinstaller -checkhardware**.

In the example shown in Figure 8.5a, this system has a detected NVIDIA video card with a configured resolution of 1600x900, one Ethernet device using the [em\(4\)](#) driver, and one wireless device using the [iwn\(4\)](#) driver. Currently no sound card is detected, meaning that the user should configure and test their sound card using the [Sound Configuration](#) icon in Control Panel.

Hardware that is currently incompatible may show with a green checkbox after a system upgrade or update. This indicates that the update added the driver for the device.

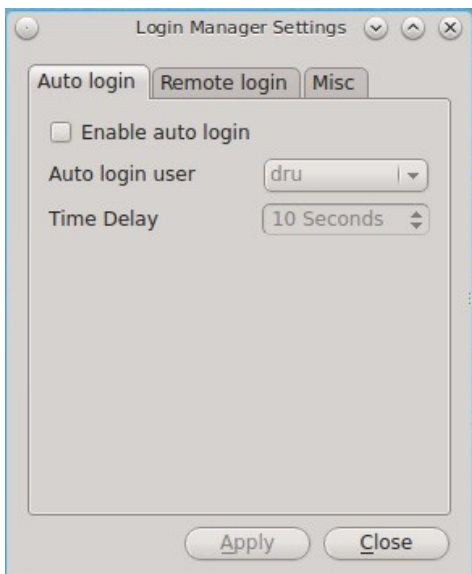
Figure 8.5a: Sample Hardware Compatibility



8.6 Login Manager

A Login Manager utility is available in Control Panel. Figure 8.6a shows the initial screen when you click on this icon in Control Panel or type `pc-su pc-dmconf` at the command line. Note that this utility will prompt you for your password.

Figure 8.6a: Login Manager



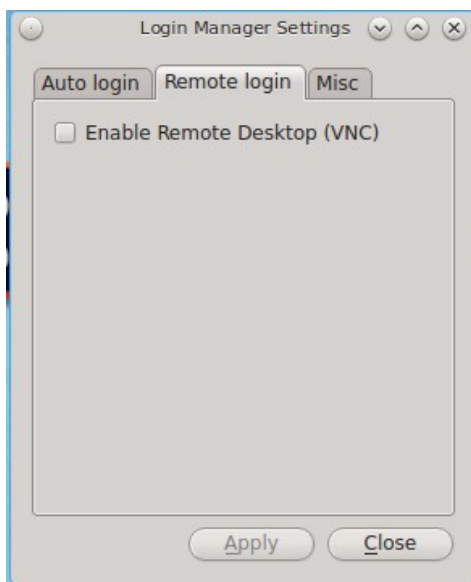
For security reasons, PC-BSD® defaults to a login screen. This means that users are required to input their password before logging into the PC-BSD® system. If you are the only user on the PC-BSD® computer, always use the same window manager, and do not consider it a security risk for the system to automatically boot into that window manager, you can enable auto-login using the “Auto login” tab.

As seen in the example in Figure 8.6a, the “Enable auto login” box is unchecked by default. If you check the box, the “Auto login user” drop-down menu will be activated. Select the user account to automatically login as. If desired, the “Time Delay” can be changed to control how long the login manager will wait for the user to cancel the automated login. Don't set this setting too low if there are times that you wish to login as a different user or to select a different desktop. When finished, click “Apply” and you will be prompted to input the selected user's password.

NOTE: this change requires a reboot. Once the system is rebooted, a login screen will no longer appear unless the user interrupts the automatic boot or until this setting is changed again in Login Manager.

The “Remote login” tab, shown in Figure 8.6b, is used to enable a remote user to connect to a desktop session using [VNC](#). Check the “Enable Remote Desktop (VNC)” box to enable this service. You will be prompted for the name and password of the user. Reboot in order to activate the VNC service over port 5900. You will also need to open TCP port 5900 using [Firewall Manager](#). You can test the connection using the “vnc” option of KRDC (shown in Figure 9.5a) or from another VNC client.

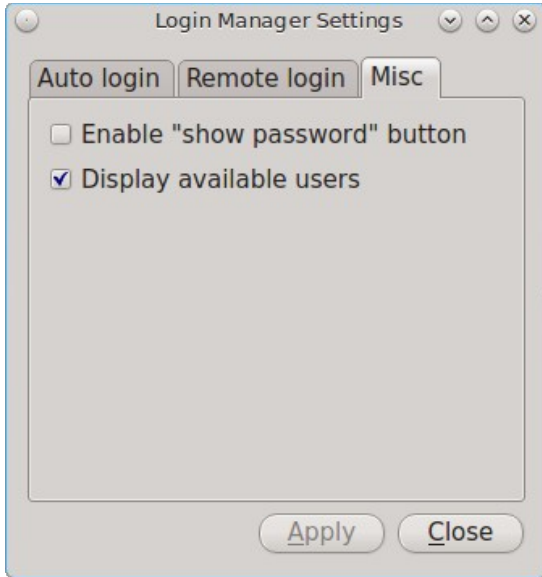
Figure 8.6b: Configuring Remote Login



DANGER! use *extreme caution* when enabling this option as it makes your system available to anyone over the network. There is an additional risk when a user logs in over VNC as their password is sent in clear text. If you need someone to access your PC-BSD® system to assist with troubleshooting, consider using [Desktop Sharing](#) instead, which allows you to send an invitation to connect. Always disable any type of remote login *immediately* after finishing your troubleshooting session. If you are instead using this option to login to your desktop from a remote location such as work or school, configure your network's firewall to only allow VNC connections from the specific IP address you will be using to make the connection.

The “Misc” tab is shown in Figure 8.6c.

Figure 8.6c: Miscellaneous Options



By default, when a user types their password at the login prompt shown in Figure 4.8a, * characters are displayed as the password is typed in order to prevent another user from seeing the password as it is typed. When “Enable "show password" button” box is checked, and the user clicks the lock icon next to the typed password in the login screen, the asterisks will change to reveal the password.

By default, the list of available users is displayed in the login screen. To hide this list and force the user to input their username, uncheck the “Display available users” box.

NOTE: for security reasons, the Login Manager will refuse logins from the *root* and *toor* accounts.

8.7 Service Manager

Service Manager, seen in Figure 8.7a, provides a graphical utility for managing PC-BSD® services. Buttons make it easy to start, stop, or restart services and to set the highlighted service to be enabled or disabled whenever the system boots. To access this utility, go to PC-BSD® Control Panel → Service Manager or type **pc-su pc-servicemanager**. You will be prompted to your password.

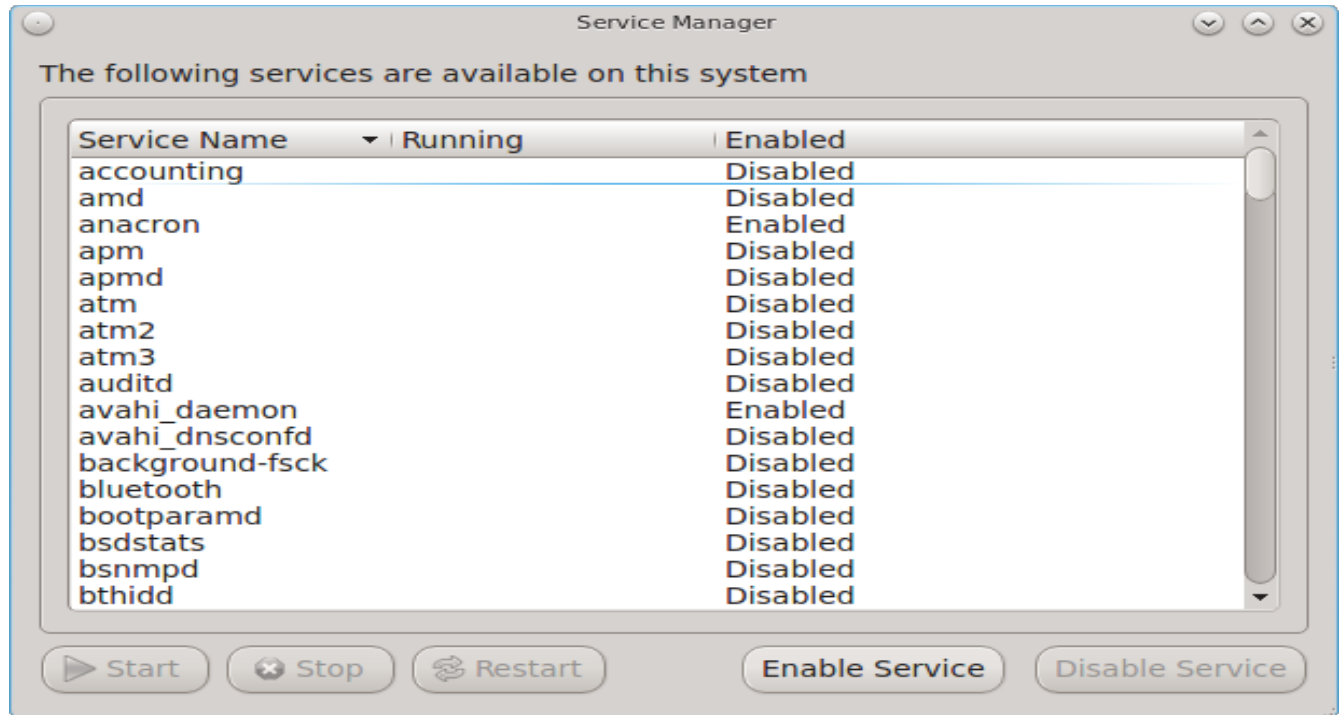
By default, services will be listed alphabetically. You can reorder the services by clicking on the “Service Name”, “Running”, or “Enabled” header. Service Manager is a graphical front-end to the rc scripts located in */etc/rc.d*.

If you do not know what a service does, do not change its settings in Service Manager. If you would like to learn more about a service, try seeing if there is a man page for it. For example, type **man apm** or **man bootparamd**. If a man page does not exist, try seeing what man pages are associated with that keyword. For example:

apropos accounting

```
ac(8)          - connect time accounting
acct(2)       - enable or disable process accounting
acct(5)       - execution accounting file
accton(8)     - enable/disable system accounting
ipfw(4)       - IP packet filter and traffic accounting
pac(8)        - printer/plotter accounting information
pam_lastlog(8) - login accounting PAM module
sa(8)         - print system accounting statistics
```

Figure 8.7a: Managing Services Using Service Manager



8.8 System Manager

This section describes the various tasks that can be performed using the graphical System Manager utility. System Manager can be accessed from Control Panel → System Manager or by typing **pc-sysmanager**. You will be prompted to input your password.

8.8.1 General Tab

The “General” tab, shown in Figure 8.8a, displays the following system information:

- the version numbers for the PC-BSD® base and its command-line and graphical utilities
- the version of the underlying FreeBSD base
- the CPU type and speed
- the amount of physical memory

Figure 8.8a: General Tab of System Manager Utility



The “Generate” button can be used to create a report that includes the following items:

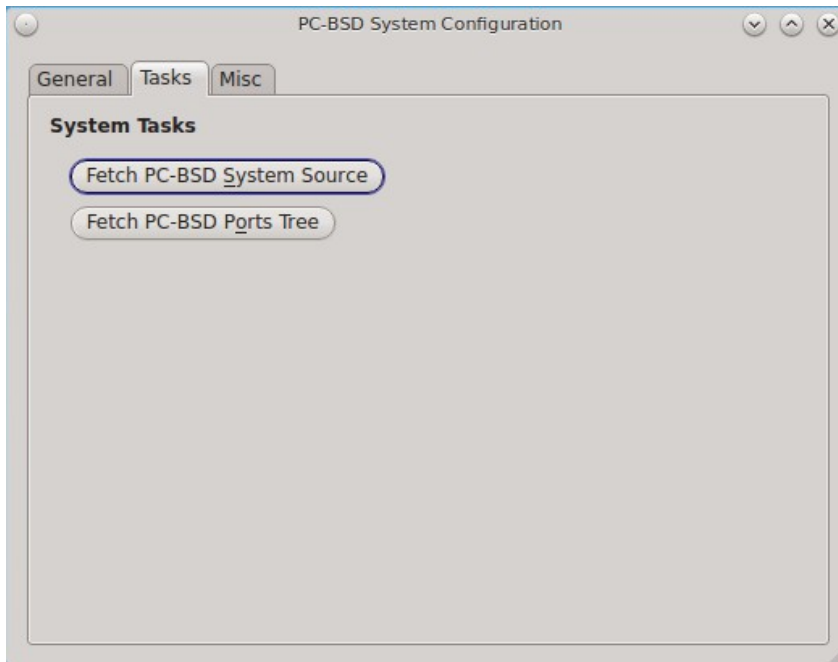
- a listing of the installed components and their versions
- the output of the **dmesg** command, which shows messages from the kernel
- the last few lines of the `/var/log/messages` log file
- the output of the **pciconf -lv** command, which lists all the devices that were found when the system booted
- your X configuration file, which shows your display settings
- your `/etc/rc.conf` file, which shows your startup settings
- your `/boot/loader.conf` file, which shows which drivers are loaded at boot time
- the output of the command **df -m**, which shows your amount of free disk space
- a listing from the **top** command, which shows the currently running processes

When you click the “Generate” button, you will be prompted to input the name and location of the text file that will be created. Since it is a text file, you can view its contents in any text editor. When troubleshooting your system, this file is handy to include when [reporting a bug](#).

8.8.2 Tasks Tab

During the installation of PC-BSD® you had an opportunity to install FreeBSD source and ports. If you did not and wish to do so after installation, use the “Tasks” tab of System Manager, shown in Figure 8.8b.

Figure 8.8b: Tasks Tab of the System Manager Utility



This tab provides a graphical interface for installing system source or the ports tree using **git**.

If you click the “Fetch PC-BSD System Source” button, a progress screen will indicate that sources are being downloaded to `/usr/src/`. Once the download is complete, a “Finished!” message will appear and you can click the “Close” button to exit this screen.

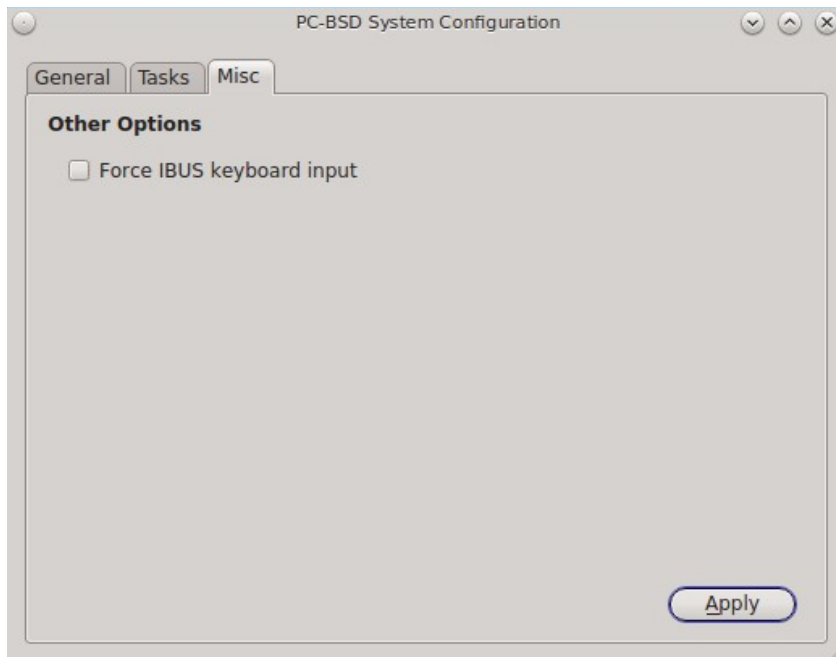
If you click the “Fetch PC-BSD Ports Tree” button, a message will indicate that ports are being fetched and will indicate when this is complete by adding a “Finished!” message to the lower left corner of the message. Ports will be installed to `/usr/ports/`.

8.8.3 Misc Tab

The “Misc” tab of System Manager is seen in Figure 8.8c.

This tab contains a checkbox to “Force IBUS keyboard input”. Check this box if you wish to input Chinese, Japanese, Korean or Indic characters using a Latin keyboard.

Figure 8.8c: Misc Tab of the System Manager Utility



8.9 User Manager

The PC-BSD® User Manager utility allows you to easily add and delete users and groups, as well as change a user's or the administrative password. To access this utility, go to Control Panel → User Manager or type **pc-su** **pc-usermanager**. You will need to input your password in order to access this utility.

8.9.1 Managing User Accounts

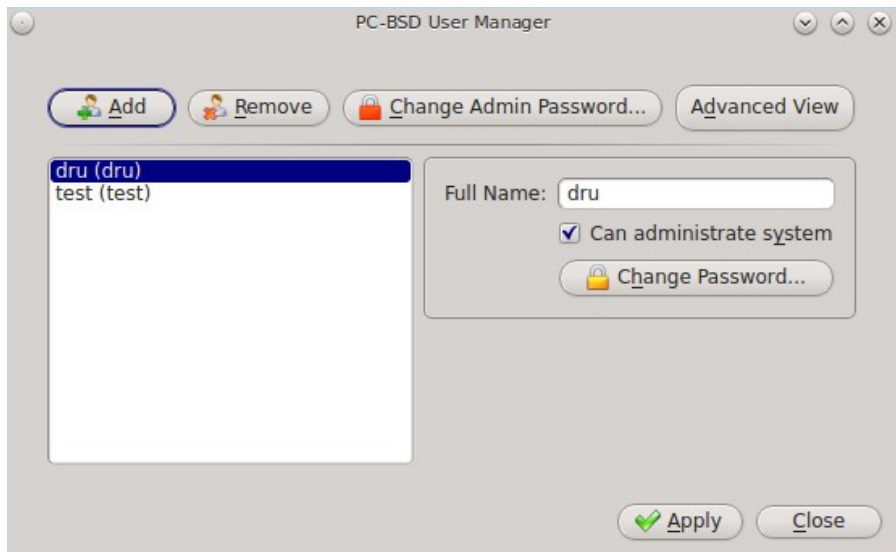
In the example shown in Figure 8.9a, the system has two user accounts. The *dru* account has the ability to become the superuser as the “Can administrate system” checkbox is checked.

If you click the “Remove” button for a highlighted user, a pop-up menu will ask if you would like to also delete the user's home directory (along with all of their files). If you click “No”, the user will still be deleted but their home directory will remain. If you have only created one user account, the “Remove” button will be greyed out as you need at least one user to be able to login to the PC-BSD® system.

NOTE: while a removed user will no longer be listed, the user account will not actually be deleted until you click the “Apply” button. A pop-up message will indicate that you have pending changes if you close User Manager without clicking “Apply”. If you change your mind, click “No” and the user account will not be deleted; otherwise, click “Yes” and the user will be deleted and User Manager will close.

The password for any user can be changed by first highlighting the user name then clicking the “Change Password” button. You will not be prompted for the old password in order to reset a user's password; this can be handy if a user has forgotten their password and can no longer log into the PC-BSD® system. If you click the “Change Admin Password” button, you can change the root user's password.

Figure 8.9a: Viewing User Accounts in User Manager



DANGER! do not change the user's password if you checked the “Encrypt user files” box in either the *Create a User* screen or by clicking the “Add” button within *User Manager*. The password is associated with the user's encryption key, meaning that the contents of the user's home directory will become permanently inaccessible if the password is changed. A future version of PC-BSD® will add a utility to make it easy to change the password for a user with an encrypted home directory.

If you click the “Advanced View” button, this screen will change to show all of the accounts on the system, not just the user accounts that you created. An example is seen in Figure 8.9b.

The accounts that you did not create are known as system accounts and are needed by the operating system or installed applications. You should not delete any accounts that you did not create yourself as doing so may cause a previously working application to stop working. Advanced View provides additional information associated with each account, such as the user ID number, full name (description), home directory, default shell, and primary group. System accounts usually have a shell of *nologin* for security reasons, meaning that an attacker can not try to login to the system using that account name.

Figure 8.9c shows the add user account creation screen that opens when you click the “Add” button.

NOTE: if you click the “Add” button while in Simple View, you will only be prompted to enter the username, full name, password, and to optionally encrypt that user's files.

Figure 8.9b: Viewing All Accounts and Their Details

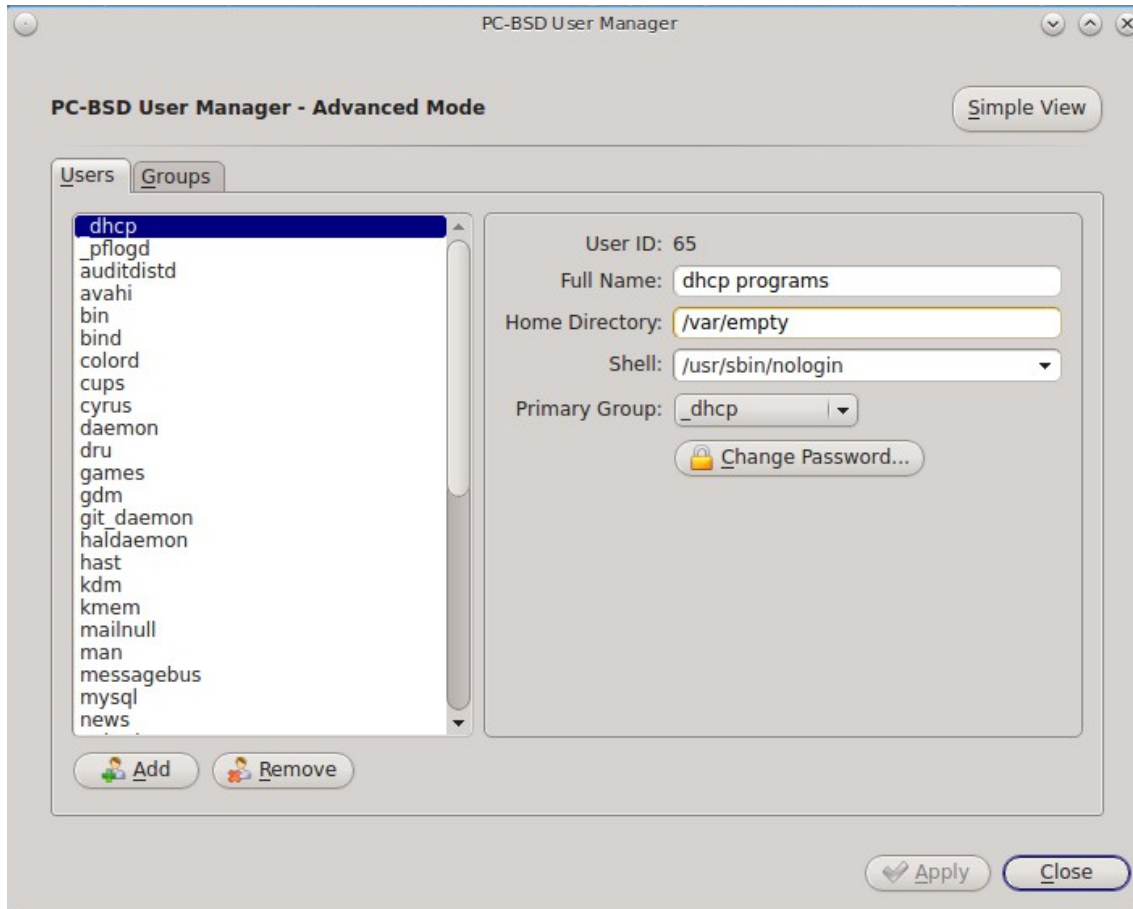
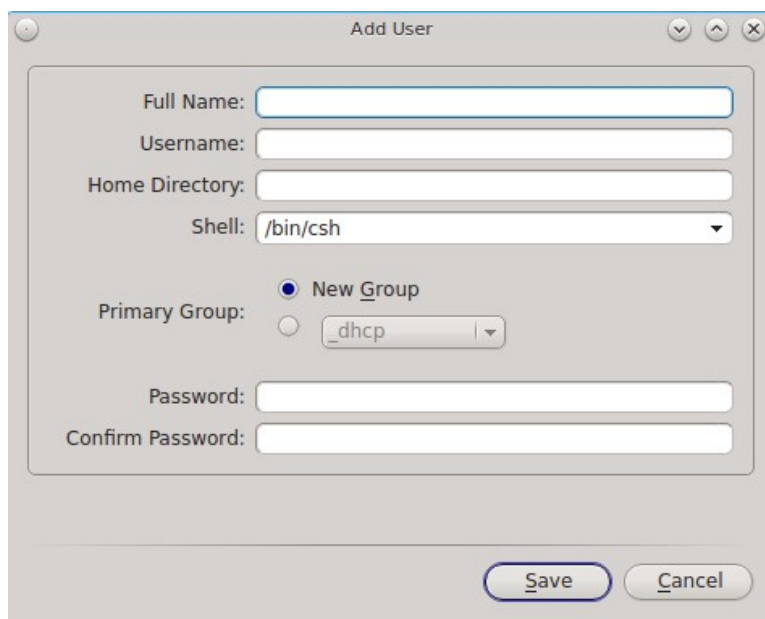


Figure 8.9c: Creating a New User Account



This screen is used to input the following information when adding a new user or system account:

Full Name: this field provides a description of the account and can contain spaces. If it is a user account, use the person's first and last name. If it is a system account, input a description to remind you which application uses the account.

Username: the name the user will use when they log in to the system; it is case sensitive and can not contain any spaces. If you are creating a system account needed by an application, use the name provided by the application's installation instructions. If the name that you choose already exists as an account, it will be highlighted in red and the utility will prompt you to use another name.

Home Directory: leave this field empty for a user account as the system will automatically create a ZFS dataset for the user's home directory under `/usr/home/username`. However, if you are creating a system account it is important to override this default by typing in `/var/empty` or `/nonexistent` unless the application's installation instructions specify that the account needs a specific home directory.

Shell: this drop-down menu contains the shells that are available to users when they are at a command prompt. You can either keep the default or select a shell which the user prefers.

Primary Group: if you leave the default button of “New Group” selected, a group will be created with the same name as the user. This is usually what you want unless you are creating a system account and the installation instructions specify a different group name. Note that the drop-down menu for specifying a group name will only show existing groups, but you can quickly create a group using the “Groups” tab.

Password: the password is case-sensitive and needs to be confirmed.

Once you have made your selections, press the “Save” button to create the account.

8.9.2 Managing Groups

If you click the “Groups” tab, you can view all of the groups on the system, as seen in Figure 8.9d.

This screen has 3 columns:

Groups: shows all of the groups on the system.

Available: shows all of the system and user accounts on the system in alphabetical order.

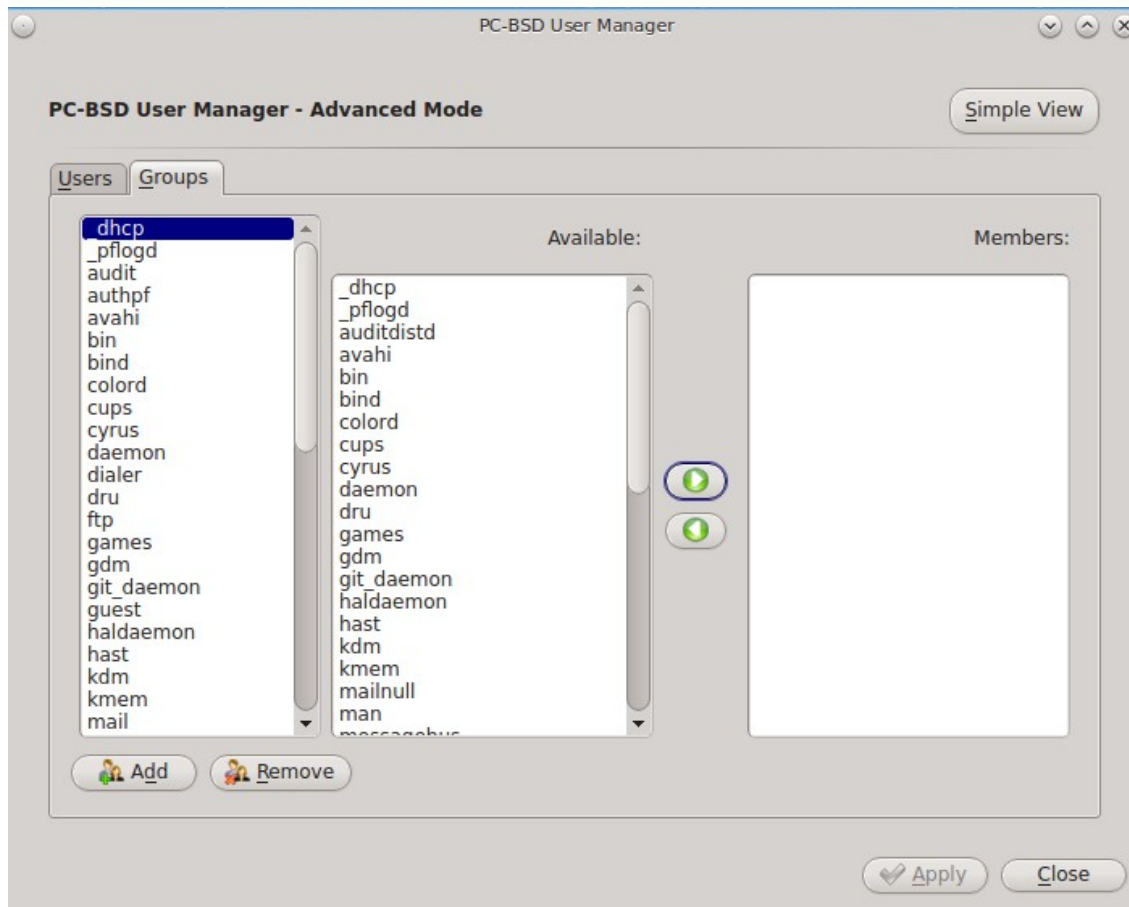
Members: indicates if the highlighted group contains any user accounts.

To add an account to a group, highlight the group name in the first column. Then, highlight the account name in the “Available” column. Click the right arrow and the selected account will appear in the “Members” column. You should only add user accounts to groups that you create yourself or when an application's installation instructions indicate that an account needs to be added to a group.

If you click the “Add” button, a pop-up menu will prompt you for the name of the new group. Once you press “OK”, the group will be added to the “Groups” column.

If you click the “Remove” button, the highlighted group will automatically be deleted after you press the “Apply” button, so be sure to do this with care. Again, do not remove any groups that you did not create yourself or applications that used to work may stop working.

Figure 8.9d: Managing Groups Using User Manager



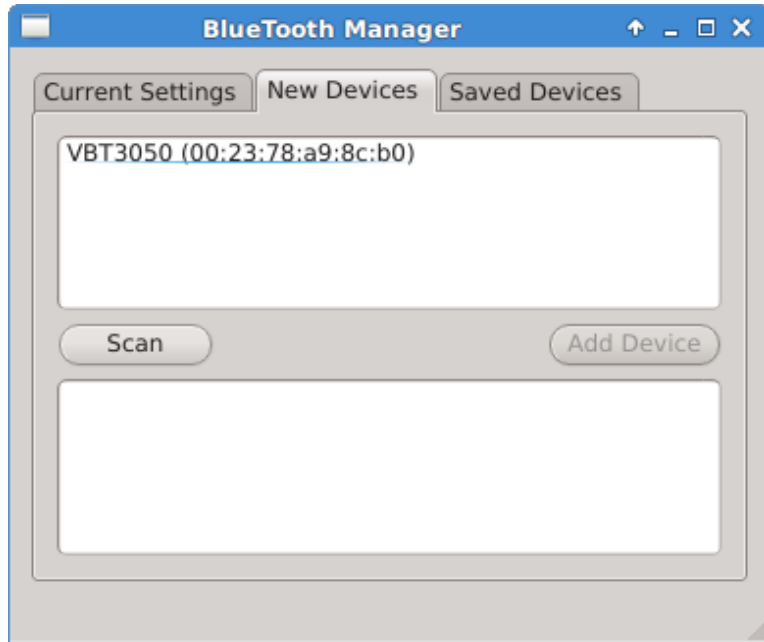
8.10 Bluetooth Manager

Bluetooth Manager can be used to configure Bluetooth device pairing (authentication) and provides a graphical front-end to support FreeBSD's [hcid\(8\)](#) daemon which controls the link keys and PIN codes which are used by Bluetooth pairing. FreeBSD supports all Bluetooth USB dongle devices that conform with Bluetooth specification v1.1.

NOTE: Bluetooth Manager *only* sets up pairing/connections between devices, it does not currently facilitate the activation/usage of other bluetooth services such as file sharing. You will still need to use the [command-line FreeBSD utilities](#) for starting and using bluetooth services as necessary after the pairing is complete.

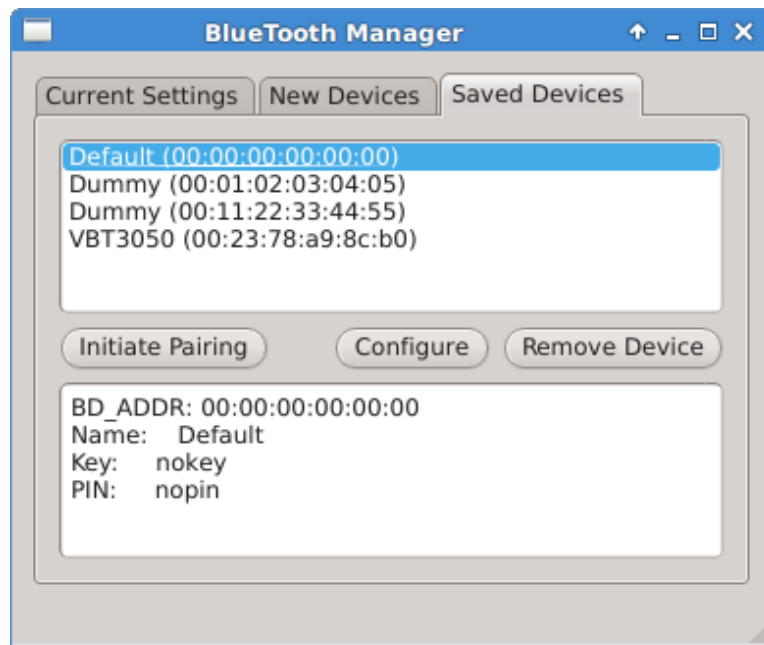
To launch Bluetooth Manager, either click its icon in Control Panel or type **pc-su pc-bluetoothmanager**. You will be prompted for your password. If you plug in a Bluetooth USB dongle device and click on the “New Devices” tab, it should be displayed as seen in the example in Figure 8.10a. If the device is not found, a message in the lower half of the screen will prompt you to put the device in discovery mode and then to rescan by clicking the “Scan” button.

Figure 8.10a: New Device Detected in Bluetooth Manager



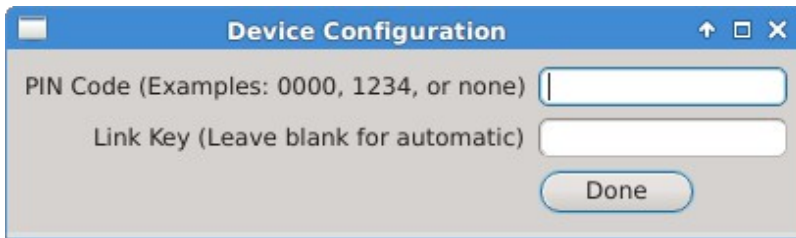
If the device, such as a cell phone, requires a PIN key in order to access a service, use the “Saved Devices” tab to view and configure pairing. In the example shown in Figure 8.10b, the first three entries (Default, Dummy, and Dummy) are three FreeBSD sample entries and the fourth entry is for the inserted device. The sample entries are included as they provide examples of valid link keys and PIN codes. You can remove any entry by highlighting it and clicking the “Remove Device” button.

Figure 8.10b: Configure Bluetooth Pairing



To modify an existing configuration, highlight the device and click the “Configure” button. In the screen shown in Figure 8.10c, input the PIN code required by the provider. The system will automatically generate the link key for you.

Figure 8.10c: Input the PIN Code



The image shows a window titled "Device Configuration" with a blue header bar containing window control icons. The main area is light gray and contains two text input fields. The first field is labeled "PIN Code (Examples: 0000, 1234, or none)" and is currently empty. The second field is labeled "Link Key (Leave blank for automatic)" and is also empty. Below these fields is a rounded "Done" button.

If you wish to add the Bluetooth Manager to the system tray, type **pc-su pc-bluetoothtray** and input your password. The Bluetooth tray icon will only automatically appear in the system tray if the USB dongle is plugged in when you log into the system.

Since the developers do not have access to every possible Bluetooth device, it is possible that your device will not be recognized. If this is the case, please take the time to [report a bug](#) so that the developers can work with you to fix the issue.

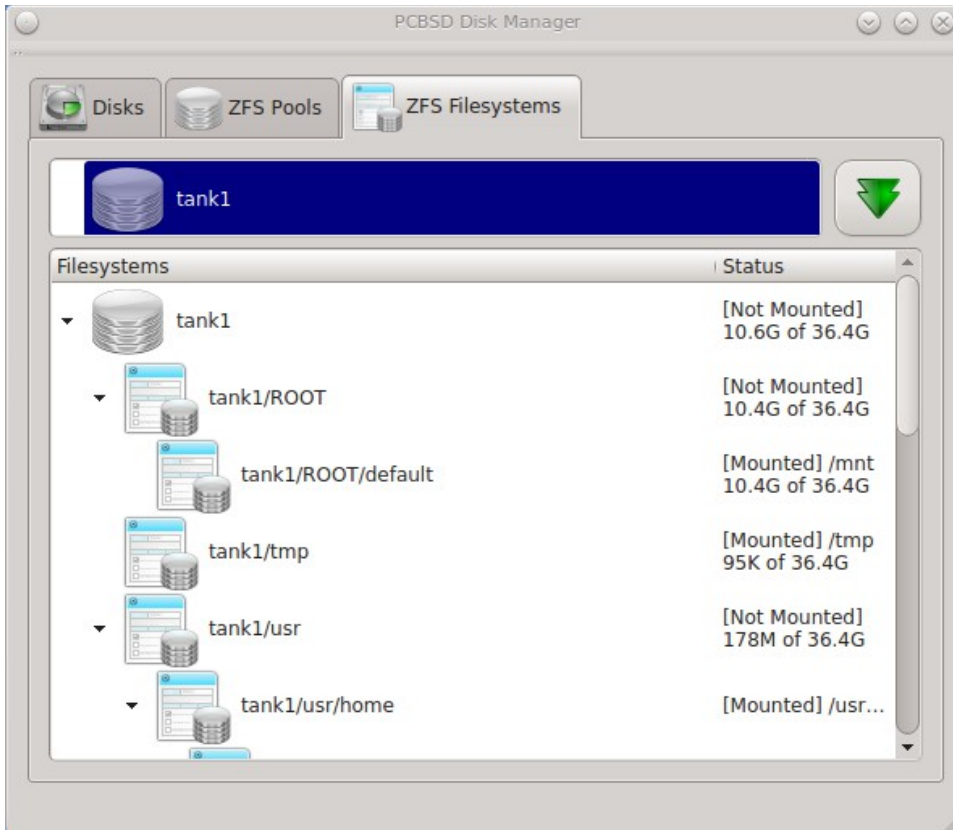
8.11 Disk Manager

The PC-BSD® Disk Manager can be used to manage ZFS pools and datasets as well as the disks attached to the system. To access this utility, use Control Panel → Disk Manager or type **pc-su pc-zmanager** from within an xterm. You will need to input your password in order to access this utility.

8.11.1 Managing ZFS Datasets

As seen in the example in Figure 8.11a, the utility will open in the “ZFS Filesystems” tab and will display the system's ZFS datasets, the amount of space available to each dataset, and the amount of space each dataset is using.

Figure 8.11a: Viewing the System's ZFS Datasets

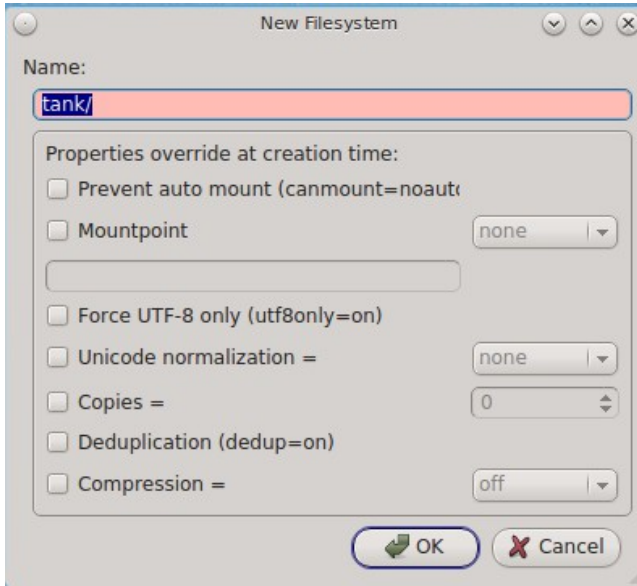


The name of the pool in this example is *tank*. If the system has multiple pools, click the green arrow to select the desired pool.

If you right-click the pool name, the following options are available:

- **Mount:** whether or not the filesystem can be mounted depends upon the value of the “canmount” property of the dataset.
- **Create new dataset:** Figure 8.11b shows the options that are available when you create a new dataset.
- **Create a clone dataset:** creates a copy of the dataset.
- **Take a snapshot:** will prompt for the name of the snapshot. The field is pink to remind you to type the snapshot name in immediately after the pool name and @ symbol. In this example, *tank@* will be displayed in the name field. An example snapshot name could be *tank@snapshot1* or *tank@201312031353* to denote the date and time the snapshot was created. The snapshot creation will be instantaneous and the new snapshot will be added to the list of datasets and will have a camera icon. Click the entry for the snapshot entry if you wish to rename it, clone it, destroy it, rollback the system to that point in time, or edit its properties. If you forget when you made the snapshot, pick “Edit properties” from the snapshot's right-click menu as it will show its “creation” property.
- **Edit properties:** allows you modify the ZFS properties for the pool, as seen in the example shown in Figure 8.11c. The available options depend upon the property being modified. The options which are read-only will have a red minus sign icon next to them. ZFS options are described in **man zfs** and you should not change any options unless you are familiar with the ramifications of doing so.

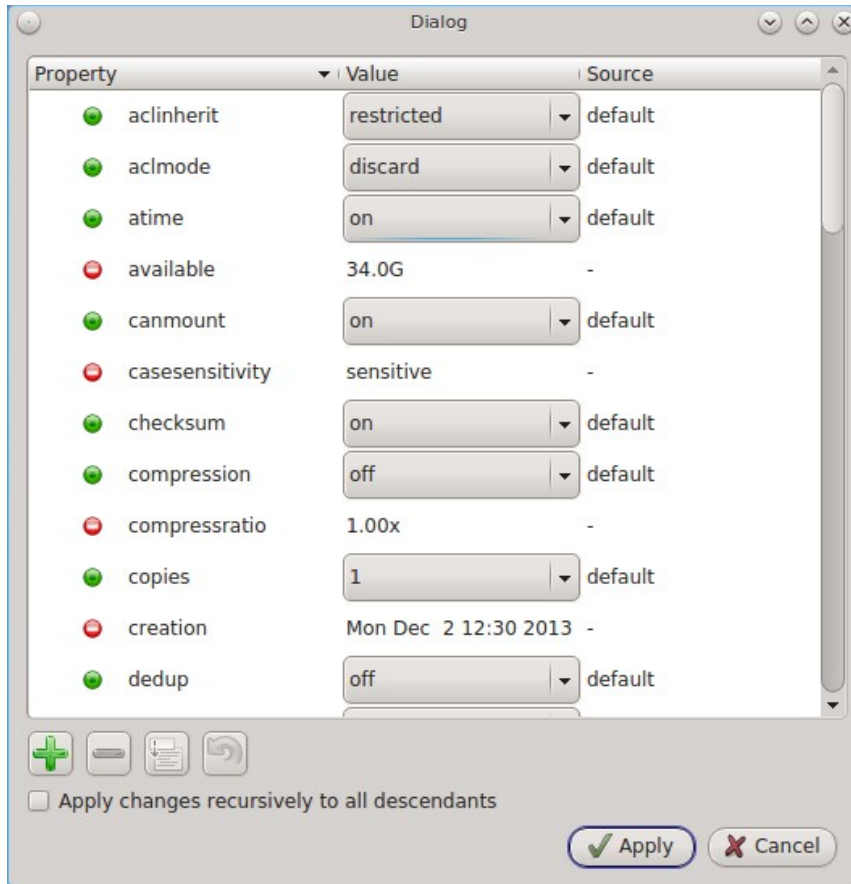
Figure 8.11b: Creating a New ZFS Dataset



When creating a new dataset or clone, the following options are available. Again, these options are described in **man zfs** and you should not change any options unless you are familiar with the ramifications of doing so.

- **Name:** this field is pink as a reminder to type in the dataset name immediately after the trailing “/” of the displayed pool name.
- **Prevent auto mount:** if the box is checked, the dataset will not be mounted at boot time and must instead be manually mounted as needed.
- **Mountpoint:** choices are *none*, *legacy*, or *[path]*.
- **Force UTF-8 only:** if checked, you will not be able to save any filenames that are not in the UTF-8 character code set.
- **Unicode normalization:** if checked, indicate whether unicode normalization should occur when comparing filenames, and if so, which normalization algorithm to use. Choices are *none*, *formD*, or *formKCF*.
- **Copies:** if checked, indicates the number of copies (0 to 3) of data to store in the dataset. The copies are in addition to any redundancy and are stored on different disks when possible.
- **Deduplication:** enables deduplication. **Do not** enable this option if the system has less than the minimum recommended 5GB of RAM per TB of storage to be deduplicated.
- **Compression:** if checked and a compression algorithm is selected in the drop-down menu, data will automatically be compressed as it is written and uncompressed as it is read. The algorithm determines the amount and speed of compression, where typically increased compression results in decreased speed. The *lz4* algorithm is recommended as it provides very good compression at near real-time speed.

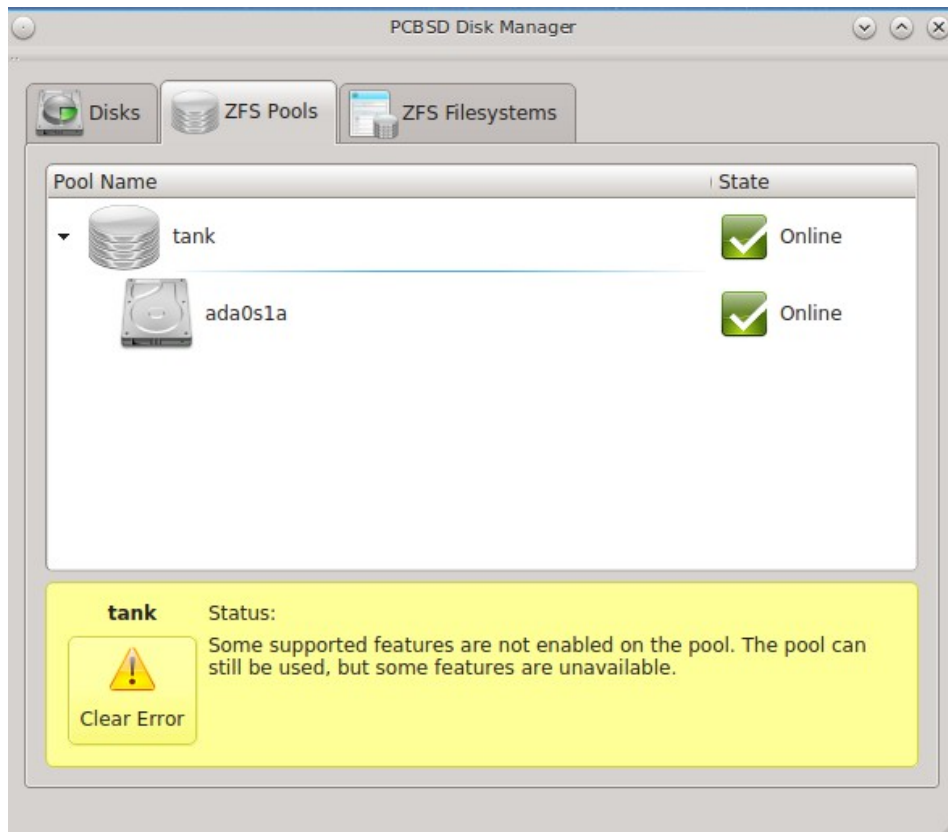
Figure 8.11c: Editing the Pool's ZFS Properties



8.11.2 Managing the ZFS Pool

To view the status of the ZFS pools and the disk(s) in the pool, click the “ZFS Pools” tab. In the example, shown in Figure 8.11d, the ZFS pool named *tank* was created from one disk. The state of “Online” indicates that the pool is healthy.

Figure 8.11d: Viewing the Status of the ZFS Pool



NOTE: in order to provide compatibility with other operating systems that support ZFS, PC-BSD® disables some ZFS feature flags. This allows a ZFS pool that was created on a PC-BSD® system to be imported on another operating system. This means that you can safely ignore the message in the yellow box shown in Figure 8.11d.

If you right-click the pool, which is named *tank* in this example, the following options are available:

- **Create new pool:** use this option if additional disks are available and you would like to create another pool instead of adding them to the existing pool. This will open a screen that allows you to name the new pool, select which additional disks will go into it, and select how to configure the disks.
- **Rename pool:** will prompt you to input the new name for the pool.
- **Destroy pool:** *do not select this option unless you want to destroy all of the data on the disks.*
- **Add devices:** depending upon the type of disk configuration, you may be able to extend the size of the pool by adding an equal number of disks.
- **Add log devices:** used to add an SSD or disk as a secondary ZIL.
- **Add cache devices:** used to add an SSD or disk as an L2ARC.
- **Add spare devices:** at this time, FreeBSD does not support hot spares.
- **Scrub:** will start a ZFS scrub now. This option can be I/O intensive so it isn't recommended to do this while the system is in use.
- **Export pool:** this action should be performed if you will be physically moving the disks from one

system to another.

- **Properties:** used to manage the default properties of the pool. Datasets inherit the default properties, unless a property is set to a different value on the dataset.

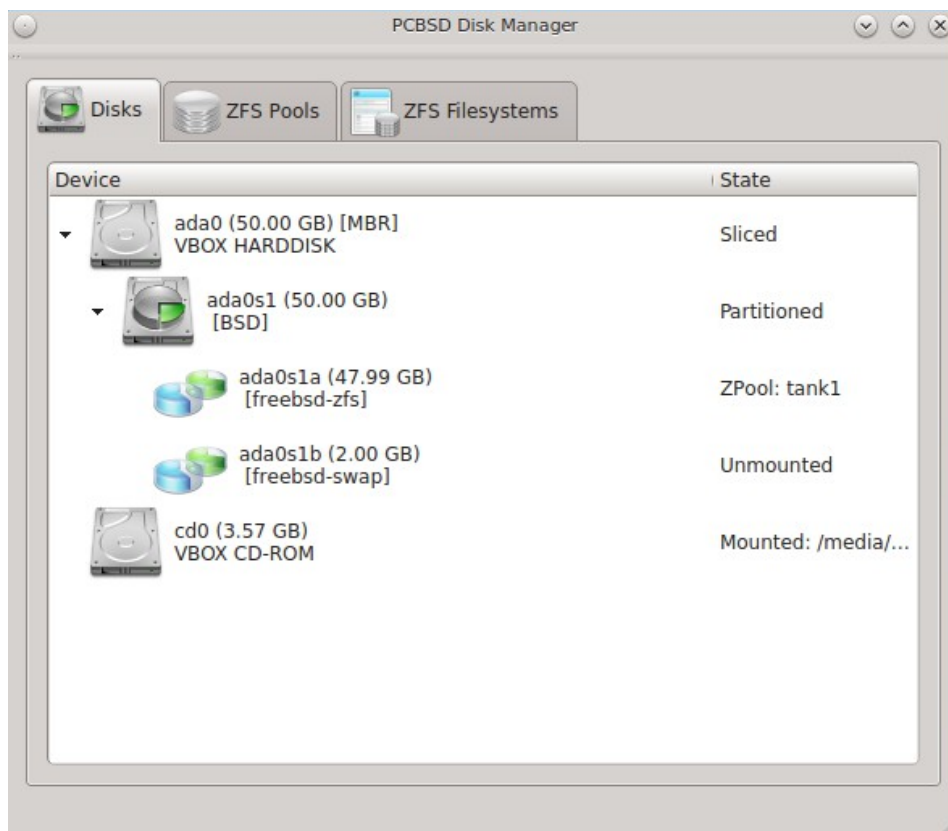
If you right-click a disk entry, such as *ada0s1a* in this example, the following options are available:

- **Attach (mirror) device:** if you wish to mirror additional disk(s), this option will open a screen which allows you to specify the disk(s) to add.
- **Take offline:** if you need to replace a bad disk, select this option before physically removing the disk.

8.11.3 Disk Management

An example of the “Disks” tab is seen in Figure 8.11e.

Figure 8.11e: Managing Disks



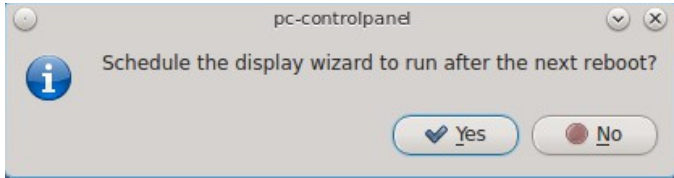
This screen shows the size of each disk as well as the partitioning scheme. If an unformatted disk or free disk space is available, right-click the device to format it.

8.12 Display

Control Panel → Display can be used to configure the system to run the display wizard the next time the system boots. This allows you to reconfigure your video driver and display settings.

If you click this icon in Control Panel, you will receive the message shown in Figure 8.12a.

Figure 8.12a: Display Wizard Will Run at Next Boot



Select “Yes” which will prompt for your password. You should then save your work and reboot the system.

Alternately, you can use the boot menu to start the display wizard. As soon as the system starts to boot, press the left Shift button to access the GRUB boot menu. Unless you are dual booting or have configured boot environments, there will be one entry named “PC-BSD (default)” in the boot menu. Press enter and select “Run the Display Wizard” from the menu.

Regardless of whether you started the Display Wizard from Control Panel or from the boot menu, it will finish booting the system and then prompt you to confirm the resolution if it finds an optimal one. To configure a different resolution, click “No” to access the display wizard, shown in Figure 8.12b.

This screen can be used to select the desired screen resolution, color depth, and video driver. If you select the “vesa” driver, it will always work but will provide sub-optimal performance. Click on the drop-down menu to select the driver that most closely matches your video card name.

You can also use the drop-down menus to change the screen resolution and color depth values. If the value you desire is not listed, it may be that the selected driver does not support that resolution or depth.

Advanced users can select their monitor’s horizontal sync and vertical refresh rate in the “Advanced” tab, seen in Figure 8.12c.

Figure 8.12b: Display Settings Wizard

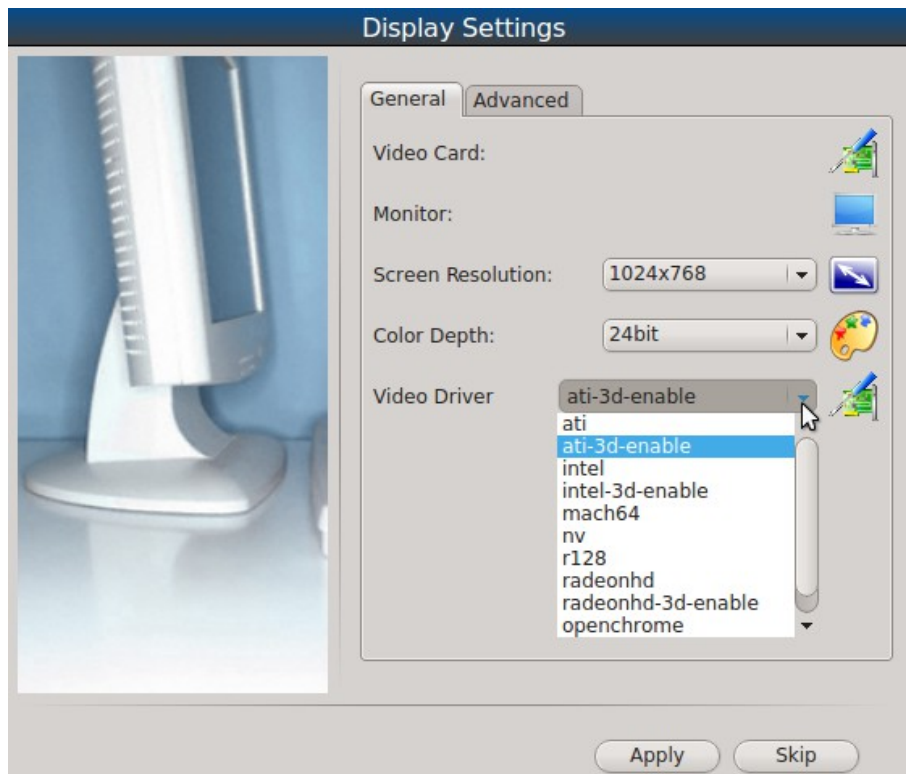
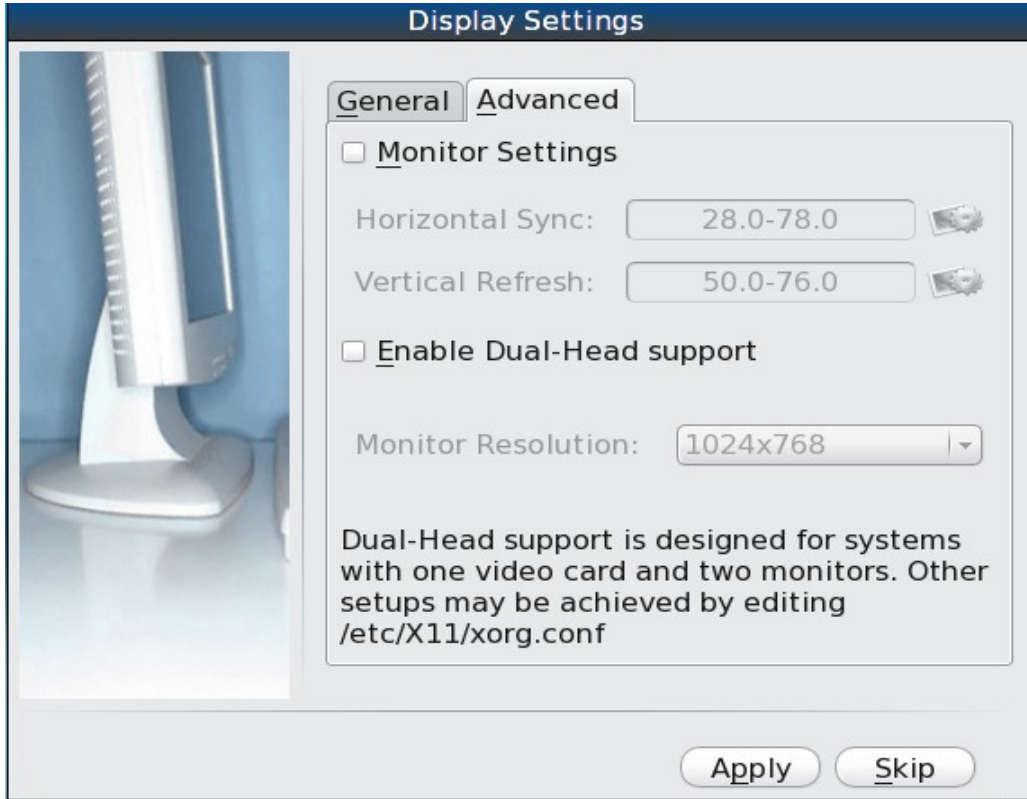


Figure 8.12c: Advanced Tab of Display Settings



Use caution and refer to your monitor's documentation if you make any changes here. If you are not sure what you are doing, leave the default values as-is.

If your computer is connected to two monitors, check the box "Enable Dual-Head support".

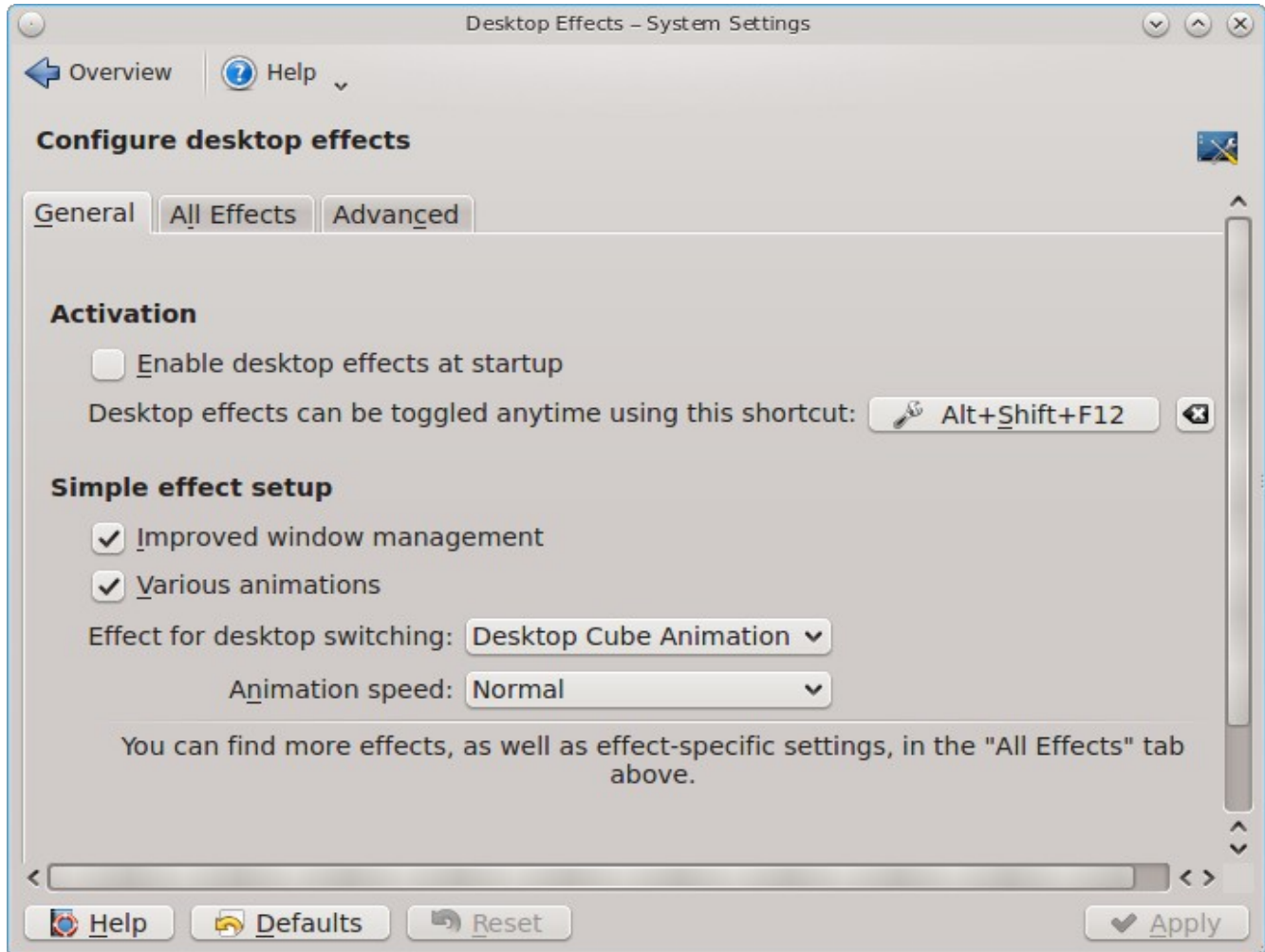
When you are finished, click the "Apply" button for your settings to be tested. If anything goes wrong during testing, you should be taken back to the "Display Settings" screen so that you can try another setting. Once you are satisfied with the settings, click "Yes" when prompted to accept them.

8.12.1 Desktop Effects and Compositing

To prevent problems with video cards that do not support them, desktop effects (used by KDE) and display compositing (used by XFCE) are disabled by default. You can change this default if your video card supports desktop effects.

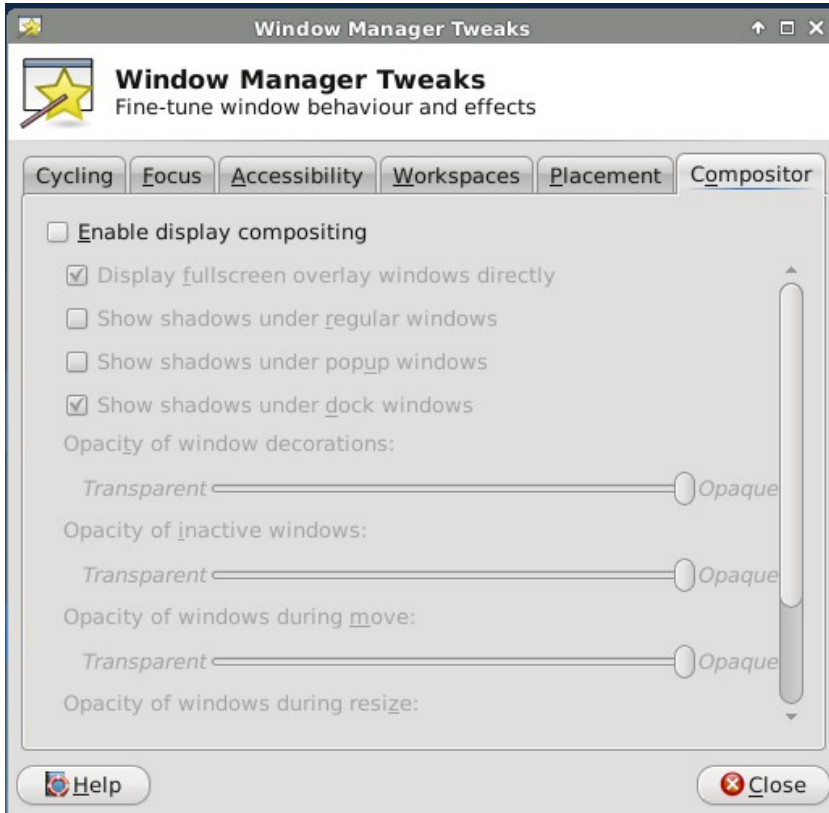
To enable desktop effects while logged into KDE, click Favorites → System Settings → Desktop Effects to access the configuration screen shown in Figure 8.12d. Check the box "Enable desktop effects at startup". You can use the "All Effects" tab to get more information about each possible effect and to enable the effects that interest you.

Figure 8.12d: Enabling Desktop Effects in KDE



To enable display compositing while logged into XFCE, go to Settings → Window Manager Tweaks → Compositor. In the screen shown in Figure 8.12e, check the “Enable display compositing” box to enable the compositing options.

Figure 8.12e: Enabling Compositing in XFCE



8.12.2 Troubleshooting

If you are having problems with your display settings and would like to manually edit `/etc/X11/xorg.conf` or run **Xorg --config**, first tell the PC-BSD® system to not automatically start X. To do so, add this temporary line to `/etc/rc.conf`, then reboot the system:

```
pcdm_enable="NO"
```

The system will reboot to a login prompt. After logging in, try the instructions in the [FreeBSD Handbook](#) to manually configure and test Xorg. Once you have a configuration that works for you, save it to `/etc/X11/xorg.conf`. Then, remove that temporary line from `/etc/rc.conf` and start PCDM:

```
service pcdm start
```

If your graphics white-out after a suspend or resume, try running this command as the superuser:

```
sysctl hw.acpi.reset_video=1
```

If that fixes the problem, carefully add this line to `/etc/sysctl.conf`:

```
hw.acpi.reset_video=1
```

If the monitor goes blank and does not come back, try running this command as your regular user account:

```
xset -dpms
```

If that fixes the problem, add that line to the `.xprofile` file in your home directory.

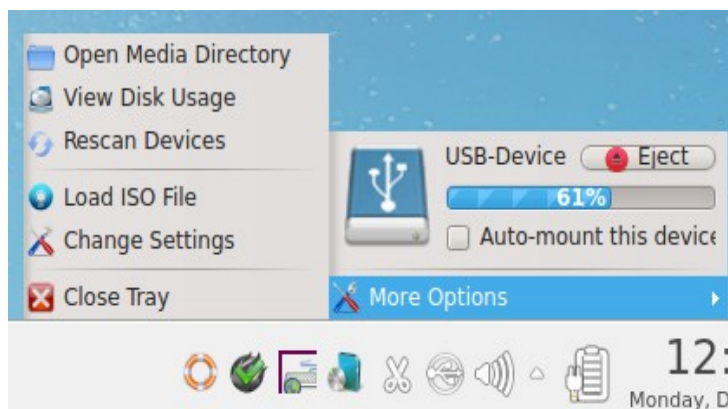
8.13 Mount Tray

The Mount Tray application is used to facilitate the mounting and unmounting of filesystems on internal disks and USB storage devices. It is included in the system tray, meaning that it can be used within any window manager that provides a system tray. If you remove the icon from the system tray, you can re-add it using Control Panel → Mount Tray or by typing `pc-mountray &`.

When you insert a USB drive, a “New Device” message should appear in the system tray, followed by a message indicating that the device has mounted. The contents of the device should then be displayed in the default file manager for the desktop. A list of available file managers can be found [here](#).

In the example shown in Figure 8.13a, a USB device was automatically mounted as it was inserted. The user then clicked the Mount Tray icon and its “More Options” menu.

Figure 8.13a: Mount Tray Example



The following options are available:

- **Open Media Directory:** click this if the default file manager does not automatically open. If the desktop does not provide a default file manager, Mount Tray will provide an “open with” dialogue so that you can select the utility to use to browse the contents of the USB device.
- **View Disk Usage:** in the example shown in Figure 8.13b, a UFS formatted USB device is mounted at `/media/USB-Device`. The amount of disk space used by the system hard drive and the USB drive is shown in both GB and as a percentage of available disk space. The mount tray will turn yellow if disk space is over 70% and red if disk space is over 90%. If the internal disk drives are partitioned with any other filesystems, these will also appear in Mount Tray. [Table 1.3a](#) lists which filesystems are supported by Mount Tray.
- **Rescan Devices:** click this option if an entry for the USB device does not automatically appear.
- **Load ISO File:** used to mount an ISO to a memory disk. When the ISO is unmounted, the memory disk is also detached from the system.
- **Change Settings:** as seen in Figure 8.13c, this screen allows you to configure how often Mount Tray checks the disk space used by mounted devices. Leave the checkbox checked if you would like it to automatically check disk space when a disk is mounted.
- **Close Tray:** click this option to remove Mount Tray from the system tray.

Figure 8.13b: View Disk Usage Using Mount Tray

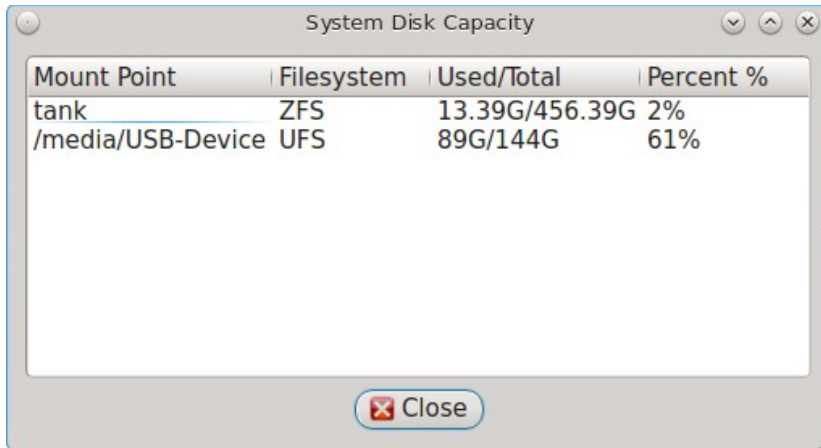
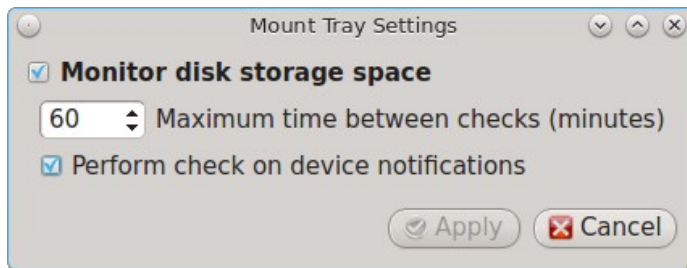


Figure 8.13c: Configure Disk Space Check



When you are finished using the device or filesystem, click that entry's "Eject" button. A pop-up message will indicate that the device has been unmounted and that it is now safe to remove the device.

NOTE: while Mount Tray will allow you to physically remove a USB device without unmounting it first, it is recommended to always "Eject" the drive first.

8.14 Printing

Like many open source operating systems, PC-BSD® uses the Common Unix Printing System ([CUPS](#)) to manage printing. Control Panel provides a graphical front-end for adding and managing printers.

While the graphical utility is easy to use, it may or may not automatically detect your printer depending upon how well your printer is supported by an open source print driver. This section will walk you through a sample configuration for a HP Officejet 4500 printer. Your printer may "just work", allowing you to breeze through the configuration screens. If your printer configuration does not work, read this section more closely for hints on how to locate the correct driver for your printer.

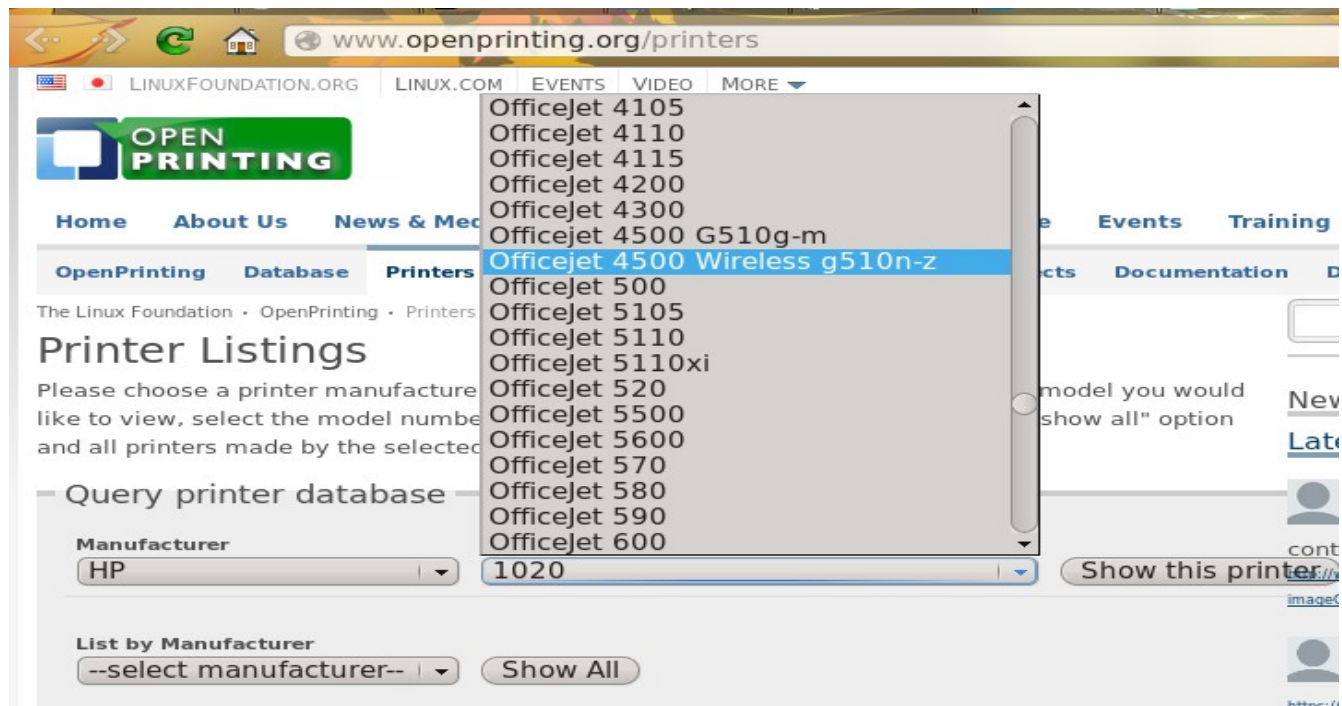
8.14.1 Researching your Printer

Before configuring your printer, it is worth the time to see if a print driver exists for your particular model, and if so, which driver is recommended. If you are planning to purchase a printer, this is definitely good information to know beforehand. You can look up the vendor and model of the printer in the [Open Printing Database](#) which will indicate if the model is supported and if there are any known caveats with the print driver.

Figure 8.14a shows a search for our example printer. There are two models in this series and this particular

hardware supports wireless.

Figure 8.14a: Using Open Printing Database to Locate a Driver



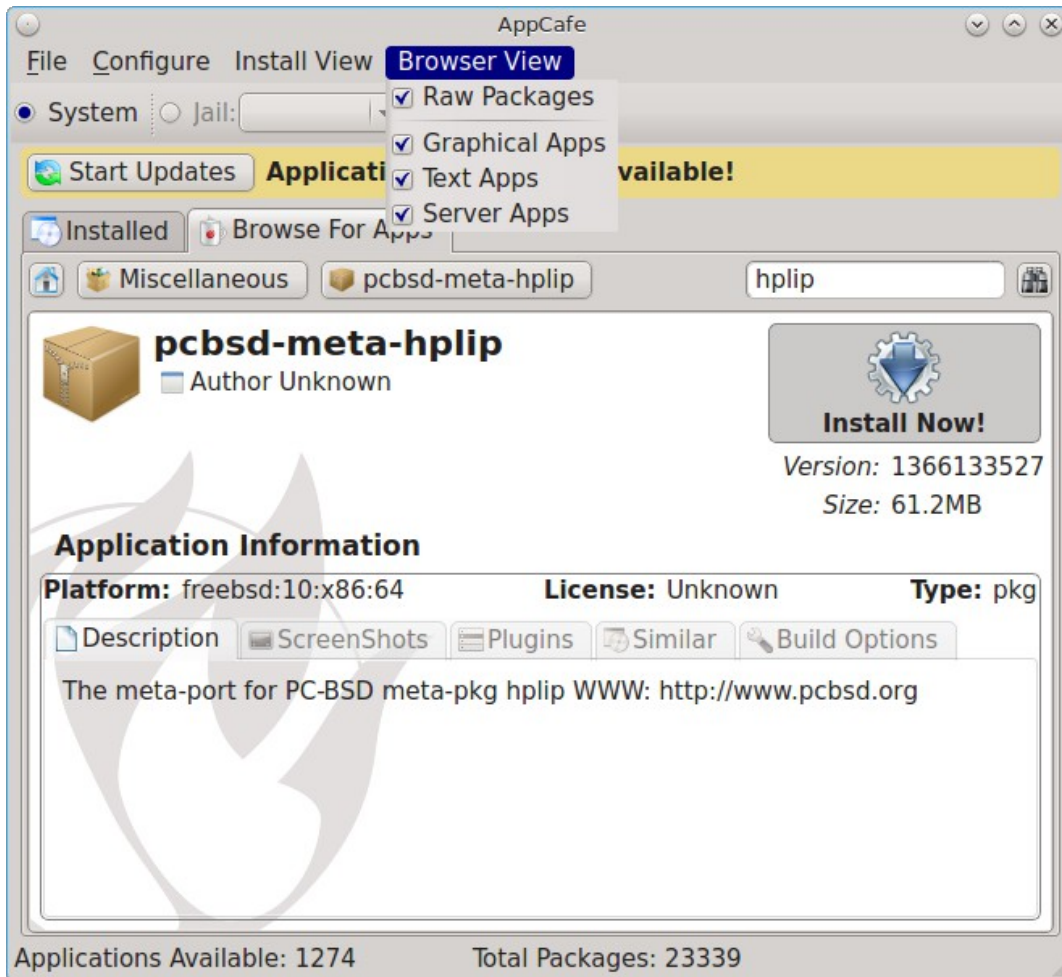
Once the model is selected, click on the “Show this printer” button to see the results, as demonstrated in Figure 8.14b.

Figure 8.14b: Driver Recommendation from Open Printing Database



For this model, the HPLIP driver is recommended. In PC-BSD®, the HPLIP driver is available as an optional system component called “pcbsd-meta-hplip”. You can see if the driver is installed, and install it if it is not, using AppCafe®. In order to see the driver shown in Figure 8.14c, make sure that the “Raw Packages” box is checked in the “Browser View” menu.

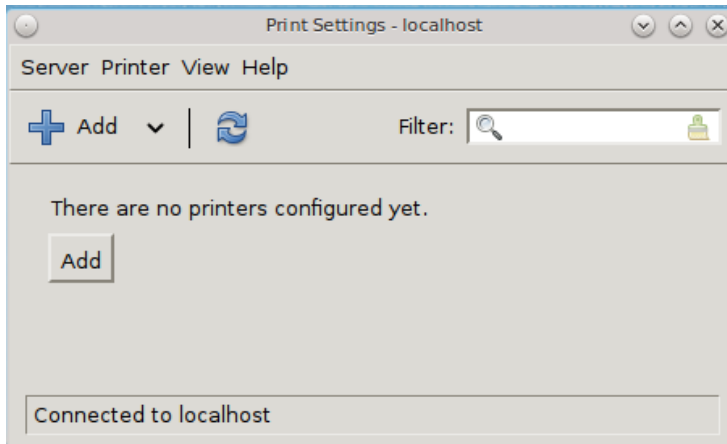
Figure 8.14c: Installing the HPLIP Driver



8.14.2 Adding a Printer

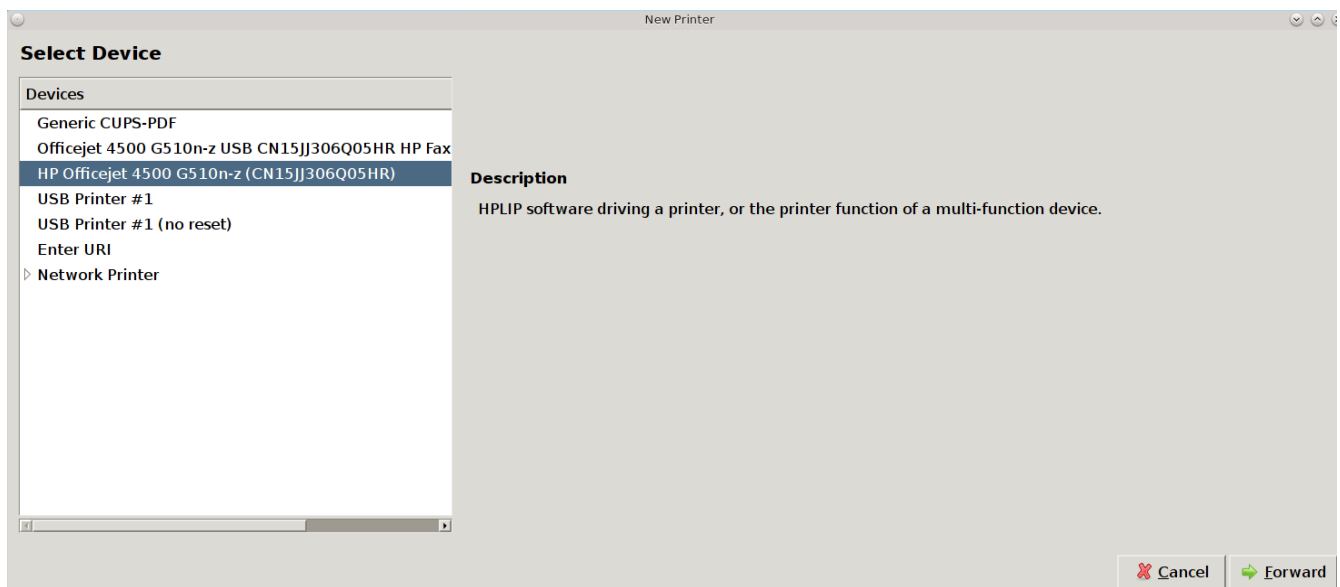
Once you know that your printer is supported, make sure that the printer is plugged into your computer or, if the printer is a network printer, that both your computer and the printer are connected to the network. Then, go to Control Panel → Printing or type **pc-su pc-cupscfg**. Input your password to see a window similar to Figure 8.14d.

Figure 8.14d: Printer Configuration Utility



To add a new printer, click the “+Add” button. The printing utility will pause for a few seconds as the wizard searches to see if any printers are connected to your computer or network. When it is finished, you should see a screen similar to Figure 8.14e.

Figure 8.14e: Select a Print Device



In this example, the wizard has found this printer and highlighted the entry for the HP OfficeJet 4500. To also install the fax capability, instead select the driver which includes “HP Fax”. The wizard should find any supported printer that is attached to the computer or network and list it as the highlighted entry in the “Devices” frame. Click “Forward” and the wizard will attempt to load the correct driver for the device. If it is successful, it will display the screen shown in Figure 8.14f. If it does not automatically find your printer, read the section on [Manually Adding a Driver](#).

Figure 8.14f: Describe Printer Screen

The image shows a window titled "New Printer" with a sub-dialog titled "Describe Printer". The dialog contains three sections, each with a text input field:

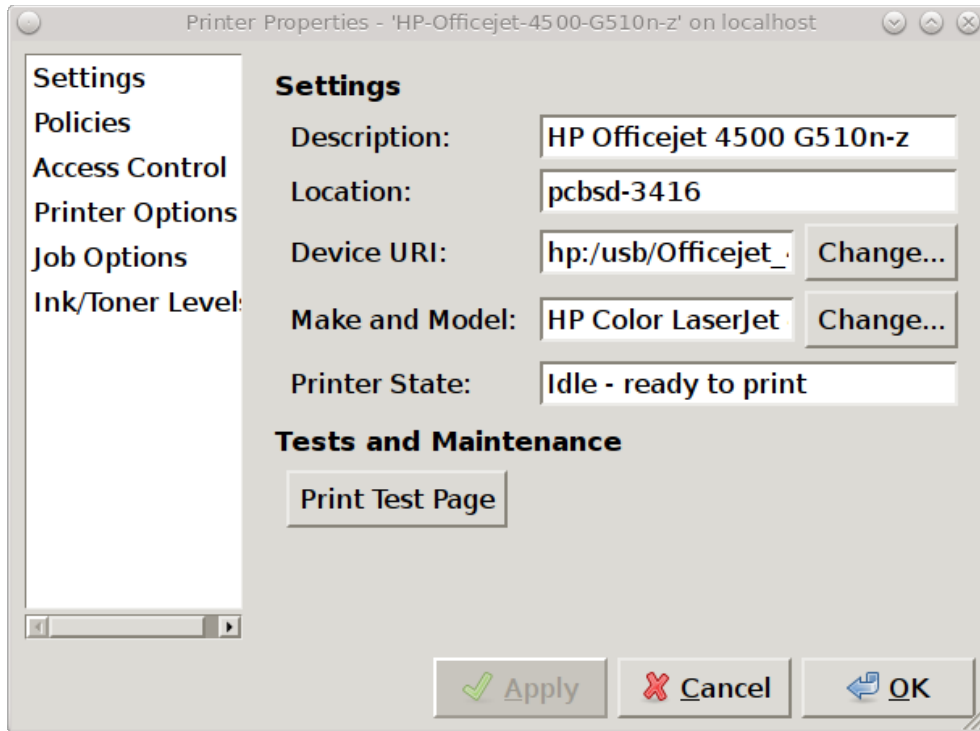
- Printer Name**: "Short name for this printer such as "laserjet"". The input field contains "HP-Officejet-4500-G510n-z".
- Description (optional)**: "Human-readable description such as "HP LaserJet with Duplexer"". The input field contains "HP Officejet 4500 G510n-z".
- Location (optional)**: "Human-readable location such as "Lab 1"". The input field contains "pcbsd-3416".

At the bottom of the dialog are three buttons: "Back" (with a left arrow icon), "Cancel" (with a red X icon), and "Apply" (with a green checkmark icon).

Since the configuration wizard found this printer, the “Describe Printer” screen automatically fills out the printer model series, a description, and the hostname of your computer, if the printer is locally attached, or the hostname of the network printer. If you wish, you can change the printer's name or description. Once you click the “Apply” button, the wizard will ask if you would like to print a test page. Ensure the printer has paper and click Yes to print the test page. If you can not print a successful test page, see the [Printer Troubleshooting](#) section.

Once the printer is created, a screen will open where you can set the properties of the printer. Our sample printer's properties screen is shown in Figure 8.14g.

Figure 8.14g: Viewing the Settings of the Newly Created Printer



You may wish to take a few minutes to review the settings in “Policies”, “Access Control”, “Printer Options”, and “Job Options” tabs as these allow you to configure options such as print banners, permissions, the default paper size, and double-sided printing. The available settings will vary, depending upon the capabilities of the print driver.

8.14.3 Manually Adding a Driver

If the print configuration wizard fails, double-check that the printer is supported as described in the [Researching your Printer](#) section and that HPLIP is installed if it is a HP printer. Also check that the printer is plugged in and powered on.

If the wizard is unable to even detect the device, try to manually add the print device. In the “Select Device” screen (Figure 8.14e) you will need to highlight and configure the type of connection to the printer:

USB: this entry will only appear if a printer is plugged into a USB port and the number of entries will vary depending upon the number of USB ports on the system. If there are multiple USB entries, highlight the one that represents the USB port your printer is plugged into.

Enter URI: this option allows you to manually type in the URI to the printer. A list of possible URIs is available on the [cups site](#).

AppSocket/HP JetDirect: select this option if you are connecting to an HP network printer. You will need to input the IP address of the printer in the “Host” field. Only change the port number if the printer is using a port other than the default of 9100.

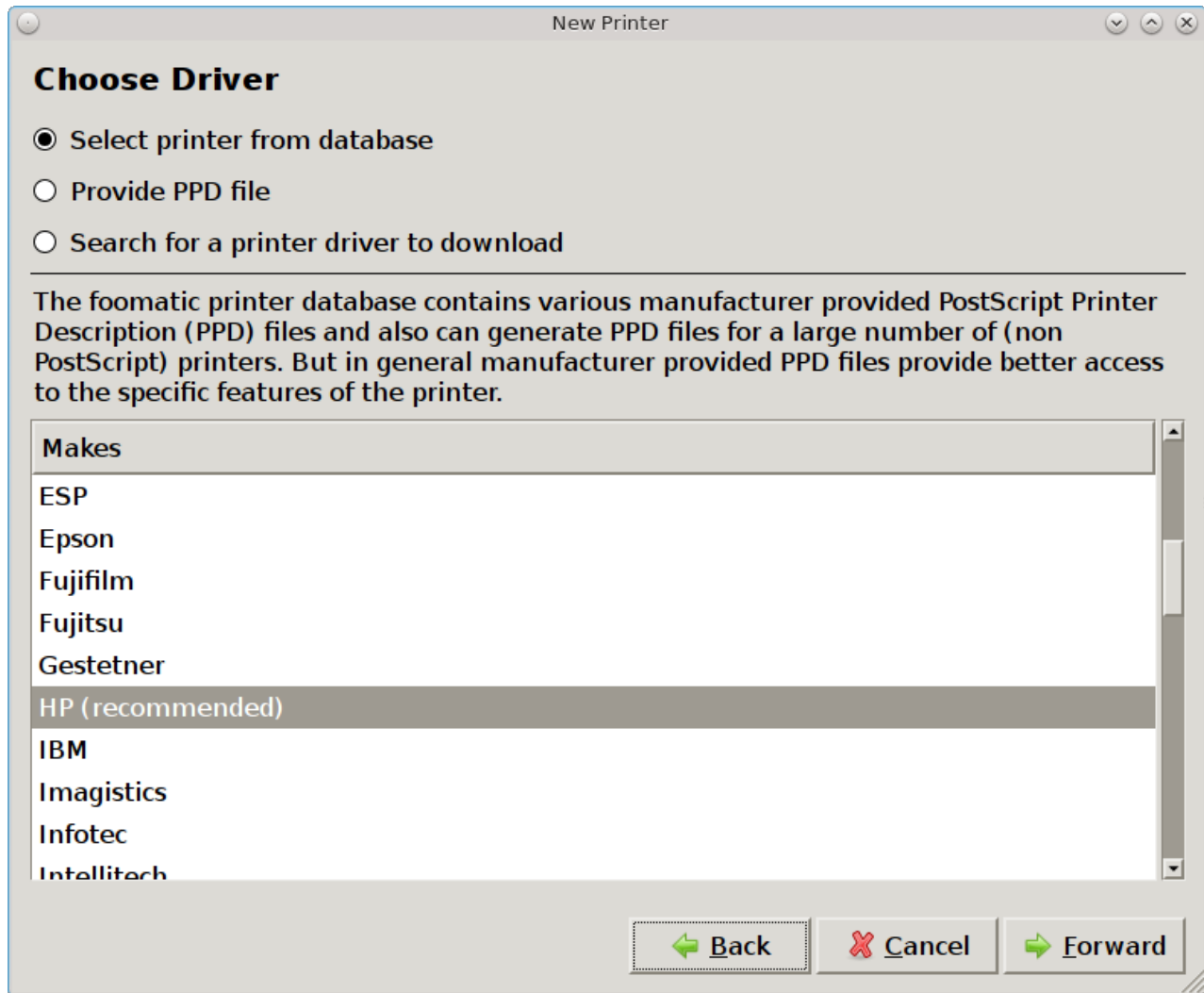
IPP: select this option if you are connecting to a printer cabled to another computer (typically running a Microsoft operating system) that is sharing the printer using IPP. You will need to input the IP address of the printer in the “Host” field and the name of the print queue. You can then click the “Verify” button to ensure that you can connect to the print queue.

LPD/LPR: select this option if you are connecting to a printer which is cabled to a Unix computer that is using LPD to share the printer. You will need to select the hostname and queue name from the drop-down menus.

Once you have input the information for the type of printer, press “Forward” for the wizard to continue.

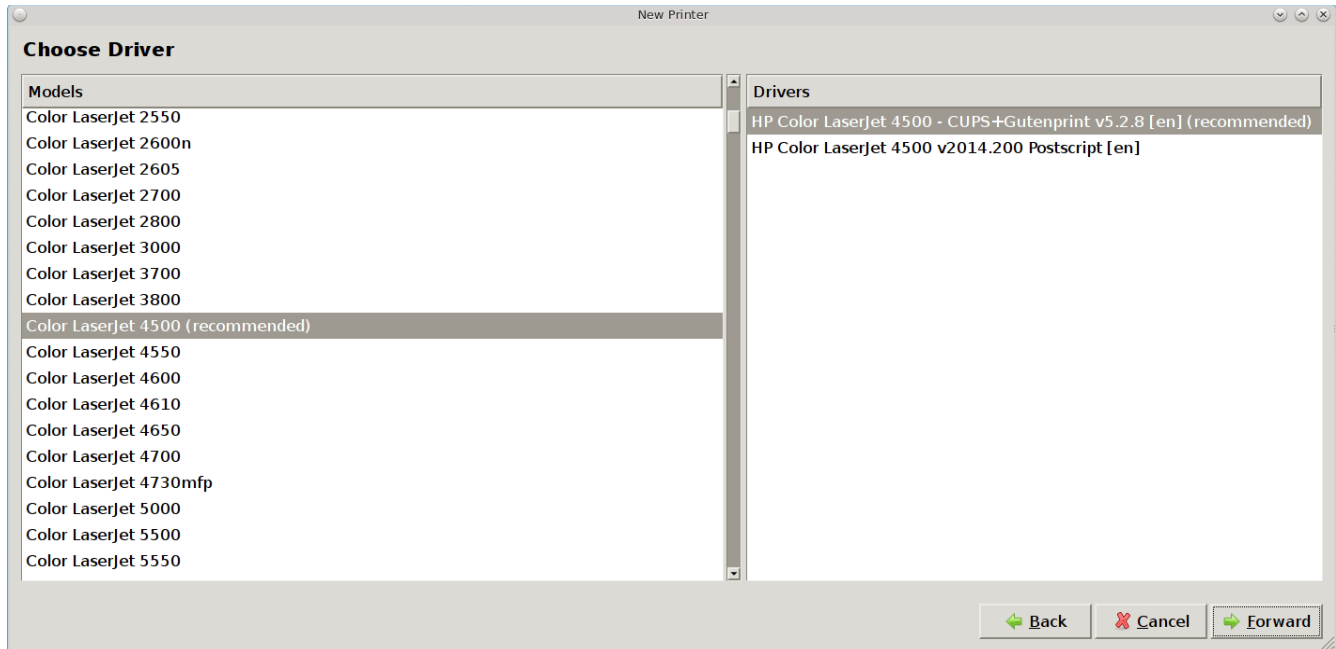
If the wizard is able to find the printer but is unable to locate the correct driver for the printer, it will display the screen shown in in Figure 8.14h instead of the the “Describe Printer” screen.

Figure 8.14h: Manually Select the Manufacturer



Select the manufacturer name and then click “Forward” to select the model, as seen in the example in Figure 8.14i.

Figure 8.14i: Manually Select the Driver



Click “Forward” and the wizard should continue to the “Describe Printer” screen.

If the selected driver does not work, go back to the “Choose Driver” screen shown in Figure 8.14h. This screen provides two additional options for installing the driver:

1. **Provide PPD file:** a PostScript Printer Description (PPD) is a driver created by the manufacturer that ends in a *.ppd* extension. Sometimes the file will end with a *.ppd.gz* extension, indicating that it has been compressed with **gzip**. If the driver you need was not automatically found, see if there is a PPD file on the driver CD that came with the printer or if one is available for download from the manufacturer's website. If you find a PPD, select this option and browse to the location of that file. Then, click “Forward” to continue with the printer configuration.
2. **Search for a printer driver to download:** if you know the name of the driver that you are looking for, try typing its name or number into the “Search” box. If found, it will display in the “Printer” model drop-down menu.

8.14.4 Printer Troubleshooting

Here are some solutions to common printing problems:

- **A test page prints but it is all garbled:** this typically means that you are using the wrong driver. If your specific model was not listed, click the “Change” button in the “Driver Details” section of the “Settings” tab of the printer and try choosing another driver model that is close to your model number. If trial and error does not fix the problem, see if there are any suggestions for your model in the [Open Printing database](#). A web search for the word `freebsd` followed by the printer model name may also help you to find the correct driver to use.
- **Nothing happens when you try to print:** in this case, type `tail -f /var/log/cups/error_log` in a console and then print a test page. The error messages should appear in the console. If the solution is not obvious from the error messages, try a web search for the error message. If you are still stuck, post the error, the model of your printer, and your version of PC-BSD® using the [PC-BSD® Bug Reporting](#) tool.

8.15 Scanner

Control Panel provides an icon for accessing [XSane](#), a graphical utility for managing scanners.

To use your scanner, make sure the device is plugged into the PC-BSD® system and click the Scanner icon in Control Panel or type `xsane` from the command line. A pop-up message will indicate that XSane is detecting devices and will prompt you to accept the XSane license if a device is detected. If a device is not detected, search for your device at the [list of supported scanners](#).

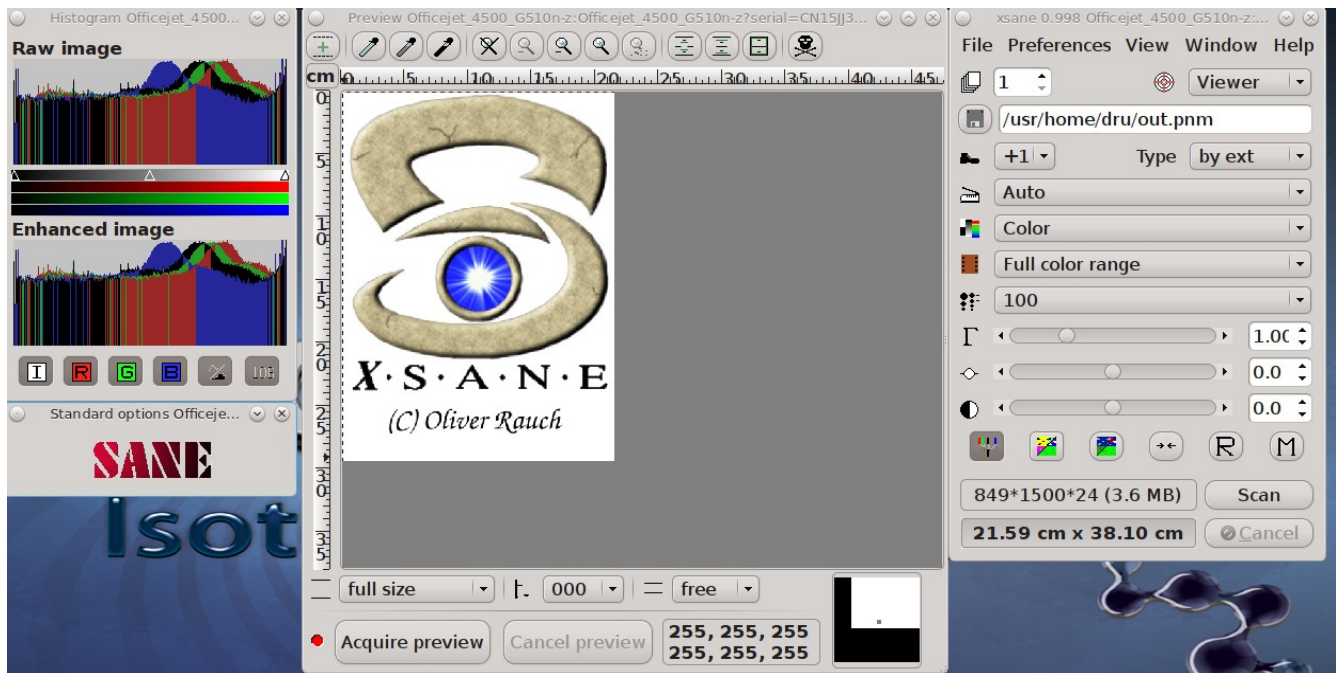
NOTE: if the scanner is part of an HP All-in-One device, make sure that the “pcbsd-meta-hplip” package is installed. You can see if the driver is installed, and install it if it is not, using AppCafe®. In order to see the driver shown in Figure 8.14c, make sure that the “Raw Packages” box is checked in the “Browser View” menu.

Figure 8.15a shows the XSane interface running on a PC-BSD® system attached to an HP OfficeJet.

The [XSane Documentation](#) contains details on how to perform common tasks such as saving an image to a file, photocopying an image, and creating a fax. It also describes all of the icons in the interface and how to use them.

By default, XSane uses the default browser when you click F1 to access its built-in documentation. How to configure the default browser varies by window manager so you may need to do an Internet search if you need to set that configuration setting and can not find it.

Figure 8.15a: XSane Interface

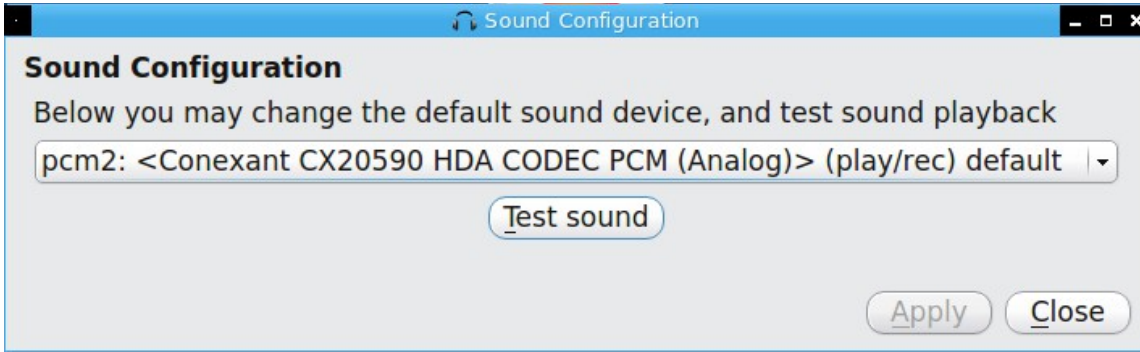


8.16 Sound Configuration

A “Sound Configuration” icon is available which automatically determines which audio devices are available and provides a button to play a test sound. To access this utility, use Control Panel → Sound Configuration or type `pc-soundconfig`.

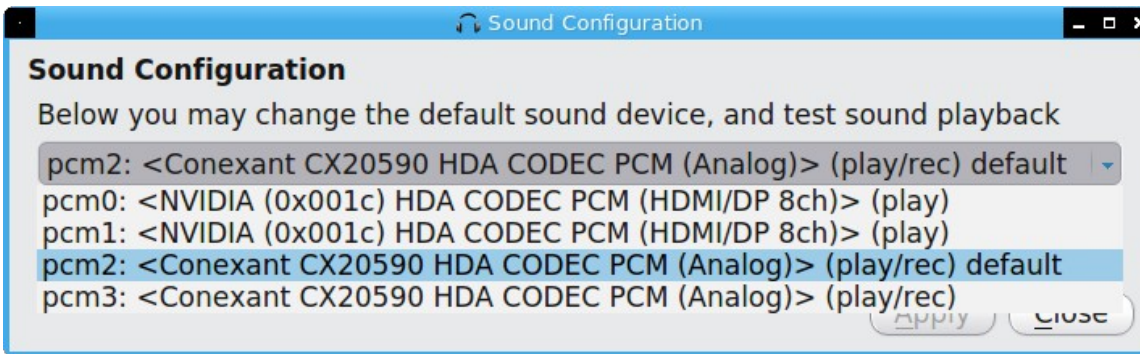
An example of the “Sound Configuration” screen is shown in Figure 8.16a.

Figure 8.16a: Sound Configuration Utility



To determine which audio devices are available, click the drop-down menu. In the example shown in Figure 8.16b, this system has four available sound devices with the FreeBSD device names *pcm0* to *pcm3*. The default device is the Conexant CX20590 on *pcm2*.

Figure 8.16b: Selecting the Audio Device



To change the default audio device, select the desired device from the drop-down menu and test that it works by clicking the “Test sound” button. To make the change permanent, click the “Apply” button.

If you connect a USB headset, PC-BSD® will detect the new device and will automatically change the audio device to the USB input. At this time, if you insert a headset into an audio jack, the system will not detect the new input so you will have to manually change the default device using “Sound Configuration”.

8.16.1 Using Mixer

Desktops that include a system tray will have a speaker icon which can be used to fine-tune sound settings. If this icon does not appear in the system tray, type **pc-mixer** to add it.

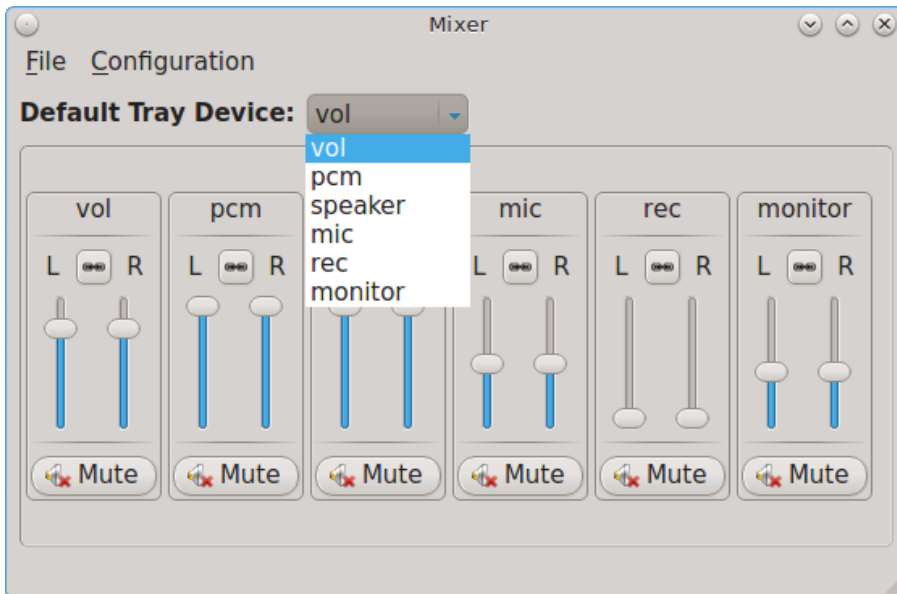
If you right-click this icon, you will see a screen similar to Figure 8.16c.

Figure 8.16c: Mixer Icon



In this example, the volume is less than 100% and sound is currently on or unmuted. Click the button with the red “X” to mute the sound. To see the screen shown in Figure 8.16d, click the “Mixer” button.

Figure 8.16d: Mixer Settings



This screen provides sliders to modify the left and right channels that control volume, pcm (the sound driver), the speaker, the microphone, the recording level, and the sound provided by the monitor. The drop-down menu is used to determine which of those bars shows when you right-click the speaker icon in the tray.

The “File” menu can be used to quit this mixer screen or to close both this screen and remove the icon from the system tray.

The “Configuration” menu provides options for accessing the “Sound Configuration”, “PulseAudio Mixer”, and “PulseAudio Settings” utilities. PC-BSD® provides full [PulseAudio](#) support and these utilities can be used to configure discoverable network sound devices and mixer levels.

If you are unable to get sound working using the sound configuration utility, you can try using **mixer** from the command line. As your regular user, type **mixer** to see your current settings.

```
mixer
Mixer vol      is currently set to 0:0
Mixer pcm      is currently set to 100:100
Mixer mic      is currently set to 50:50
Mixer mix      is currently set to 60:60
Mixer rec      is currently set to 75:75
```



```
Mixer igain      is currently set to 100:100
Mixer ogain      is currently set to 100:100
```

If any of these settings are set to *0*, set them to a higher value, by specifying the name of the mixer setting and a percentage value up to *100*:

```
mixer vol 100
```

Setting the mixer vol from 0:0 to 100:100.

You can make that change permanent by creating a file named *.xprofile* in your home directory that contains the corrected mixer setting.

8.16.2 Troubleshooting Sound

If you only get one or two mixer settings, you need to change the default mixer channel. As the superuser, try this command:

```
sysctl -w hw.snd.default_unit=1
```

To see if that changed to the correct channel, type **mixer** again. If you still only have one or two mixer settings, try setting the sysctl value to 2, and if necessary, to 3.

Once you have all of the mixer settings and none are set to *0*, your sound should work. If it still doesn't, these resources may help you to pinpoint the problem:

- [FreeBSD Handbook: Setting Up the Sound Card](#)
- [FreeBSD Wiki: Sound](#)

If you still have problems with sound, see the section on [Finding Help](#) to determine which help resources are available. When reporting your problem, include your version of PC-BSD® and the name of your sound card.

8.17 Firewall Manager

PC-BSD® uses the [PF firewall](#) to protect your system. By default, the firewall is configured to let your system make Internet connections, use the **ping** utility, and to communicate with other Windows and Unix-like systems using SMB and NFS.

Advanced users who are already familiar with pf will find the default rulebase in */etc/pf.conf*. Users who are not familiar with directly editing this file can instead use the Firewall Manager GUI utility to view and modify the existing firewall rules.

NOTE: typically it is not necessary to change the firewall rules. You should not remove any existing rules unless you fully understand what the rule does. Similarly, you should only add rules if you understand the security implications of doing so, especially if the rule allows connections to your computer.

To access the Firewall Manager, go to Control Panel → Firewall Manager or type **pc-su pc-pfmanager**. You will be prompted to input your password. Figure 8.17a shows the initial screen when you launch this utility.

Figure 8.17a: Firewall Manager Utility



The “General Settings” tab of this utility allows you to:

- determine whether or not the firewall starts when the system boots; unless you have a reason to do so and understand the security implications, this box should be so that your system is protected by the firewall
- start, stop, or restart the firewall: if you add, delete, or modify a firewall rule, restart the firewall for your changes to take effect
- restore default configuration: this button allows you to return to the original, working configuration should you not like the changes you make to your firewall rules

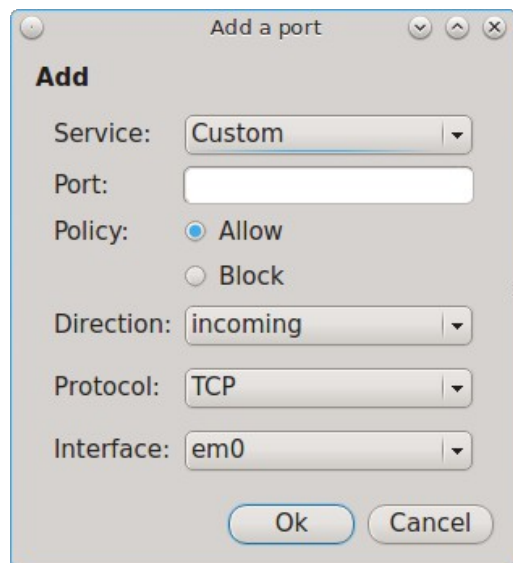
To view or modify the firewall rules, click “Exceptions” → “Add entry” to open the screen shown in Figure 8.17b.

The following information is needed when creating a rule:

- **Service or Port:** you can either select the name of the service you wish to allow or block from the drop-down menu or type in the number of the port used by the service. Which you choose does not matter as the firewall will match the name and number for you and display both after you save the rule. By default, the name “Custom” is selected for you and you only need to enter the port number.
- **Policy:** you need to choose whether to allow or block this service/port.
- **Direction:** use the drop-down menu to determine whether the policy applies to incoming or outgoing connections. The direction is from the perspective of your computer. Do you want others to connect to your service (incoming) or do you want to connect to the service running on another system (outgoing).
- **Protocol:** use the drop-down menu to select whether the service uses the TCP or UDP protocol.
- **Interface:** use the drop-down menu to select the interface that will make or receive the connection.

Once you have made your selections, press “Ok” to save the new rule.

Figure 8.17b: Adding a New Firewall Rule



NOTE: the new rule will not be used by the firewall until the firewall is restarted by clicking the “Restart” button in the “General” tab.

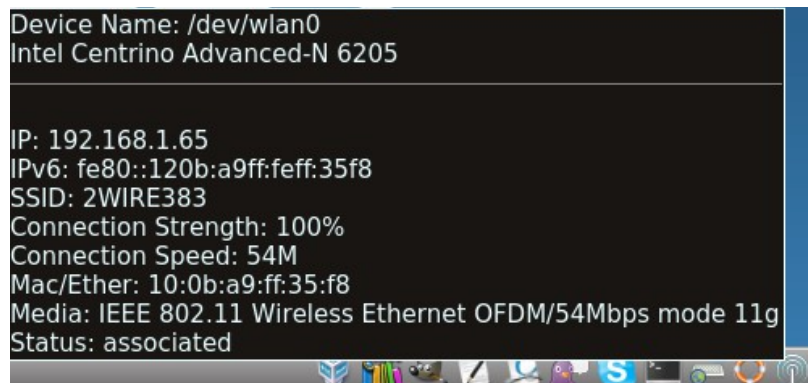
Test that your new rule(s) work as expected. For example, if you create a rule to allow an SSH connection, try connecting to your PC-BSD® system using SSH to verify that the firewall is now allowing the connection.

8.18 Network Configuration

During installation, PC-BSD® configures your Ethernet interfaces to use DHCP and provides a [post-install configuration screen to configure your wireless connection](#). In most cases, this means that your connected interfaces should “just work” whenever you use your PC-BSD® system.

For desktops that provide a system tray, a wireless configuration icon will appear if PC-BSD® detects a supported wireless card. If you hover over the wireless icon, shown in Figure 8.18a, it will indicate if the interface is associated and provide information regarding the IP address, IPv6 address, SSID, connection strength, connection speed, MAC address, and type of wireless device.

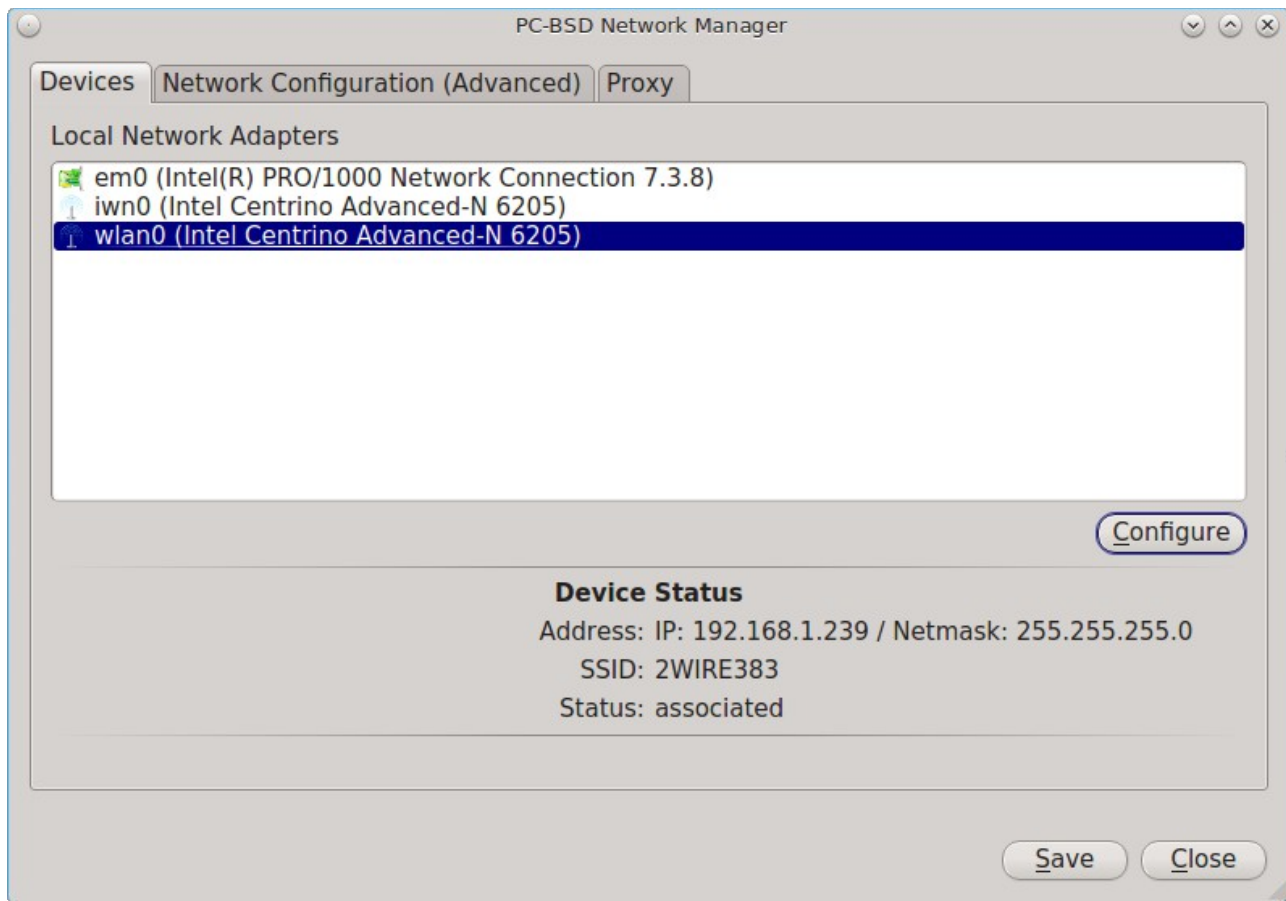
Figure 8.18a: Wireless Information in System Tray



If you right-click the wireless icon, you will see a list of detected wireless networks. Simply click the name of a network to associate with it. The right-click menu also provides options to configure the wireless device, start the Network Manager, restart the network (useful if you need to renew your DHCP address), and to close the Network Monitor so that the icon no longer shows in the system tray. If you have multiple wireless devices, each will have its own icon in the system tray. If you do not use one of the devices, click “Close the Network Monitor” to remove it from the tray.

To view or manually configure all of your network interfaces click Control Panel → Network Configuration or type **pc-su pc-netmanager**. If a new device has been inserted (e.g. a USB wireless interface), a pop-up message will open when you start Network Configuration, indicate the name of the new device, and ask if you would like to enable it. Click “Yes” and the new device will be displayed with the list of network interfaces that PC-BSD® recognizes. In the example seen in Figure 8.18b, the system has one Intel Ethernet interface that uses the *em* driver and an Intel wireless interface that uses the *wlan* driver.

Figure 8.18b: Network Configuration Utility



The rest of this section describes each tab of the Network Configuration utility and demonstrate how to view and configure the network settings for both Ethernet and wireless devices. It will then present some common troubleshooting scenarios, known issues, and suggestions for when a device does not have a built-in driver.

8.18.1 Devices: Ethernet Adapters

If you highlight an Ethernet interface in the “Devices” tab and either click the “Configure” button or double-click the interface name, you will see the screen shown in Figure 8.18c.

Figure 8.18c: Network Settings for an Ethernet Interface



There are two ways to configure an Ethernet interface:

1. **Use DHCP:** this method assumes that your Internet provider or network assigns your addressing information automatically using the DHCP protocol. Most networks are already setup to do this. This method is recommended as it should “just work”.
2. **Manually type in the IP addressing information:** this method requires you to understand the basics of TCP/IP addressing or to know which IP address you should be using on your network. If you do not know which IP address or subnet mask to use, you will have to ask your Internet provider or network administrator.

By default, PC-BSD® will attempt to obtain an address from a DHCP server. If you wish to manually type in your IP address, check the box “Assign static IP address”. Type in the IP address, using the right arrow key or the mouse to move between octets. Then, double-check that the subnet mask (Netmask) is the correct value and change it if it is not.

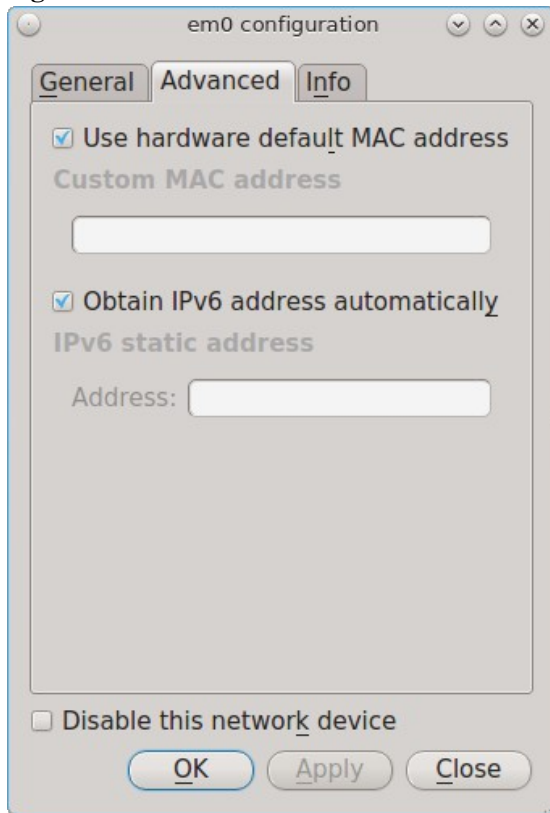
If the Ethernet network uses 802.1x authentication, check the box “Enable WPA authentication” which will enable the “Configure WPA” button. Click this button to select the network and to input the authentication values required by the network.

By default, the “Disable this network device” box is unchecked. If you check this checkbox, PC-BSD® will immediately stop the interface from using the network. The interface will remain inactive until this checkbox is unchecked.

The “Advanced” tab, seen in Figure 8.18d, allows advanced users to change their [MAC address](#) and to use DHCP to automatically obtain an [IPv6 address](#). Both boxes should remain checked unless you are an advanced user who has a reason to change the default MAC or IPv6 address and you understand how to input an

appropriate replacement address.

Figure 8.18d: Advanced Tab of an Ethernet Interface's Network Settings

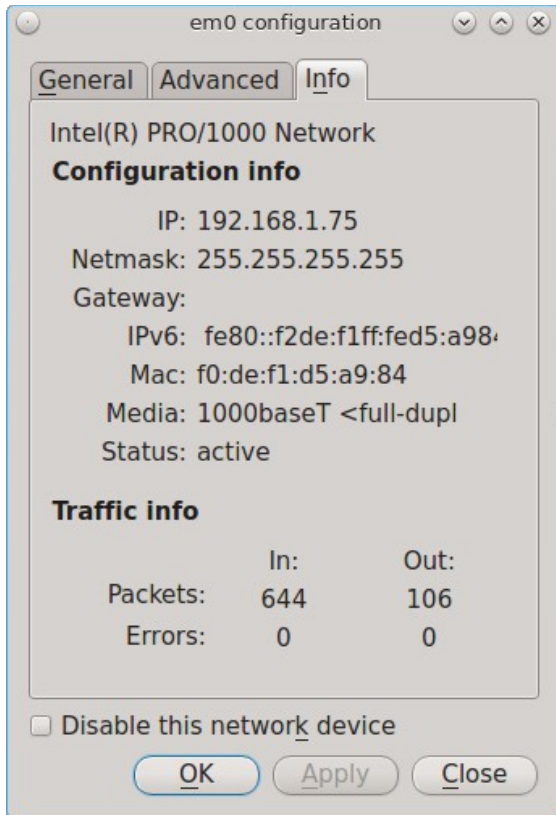


The “Info” tab, seen in Figure 8.18e, will display the current network address settings and some traffic statistics.

If you make any changes within any of the tabs, click the “Apply” button to activate them. Click the “OK” button when you are finished to go back to the main Network Configuration window.

You can repeat this procedure for each network interface that you wish to view or configure.

Figure 8.18e: Info Tab of an Ethernet Interface's Network Settings



8.18.2 Devices: Wireless Adapters

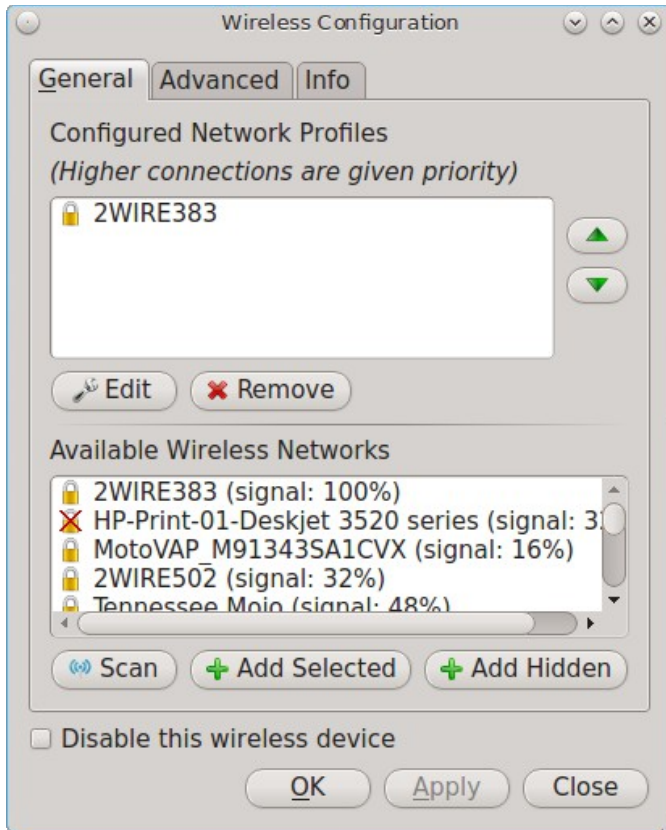
If your wireless interface does not automatically associate with a wireless network, you probably need to configure a wireless profile that contains the security settings required by the wireless network. Double-click the wireless icon in the system tray or highlight the wireless interface displayed in the “Devices” tab of Network Configuration and click the “Configure” button. Figure 8.18f demonstrates that this system's wireless interface is currently associated with the wireless network listed in the “Configured Network Profiles” section.

To associate with a wireless network, click the “Scan” button to receive the list of possible wireless networks to connect to. Highlight the network you wish to associate with and click the “Add Selected” button. If the network requires authentication, a pop-up window will prompt you for the authentication details. Input the values required by the network then click the “Close” button. PC-BSD® will add an entry for the network in the “Configured Network Profiles” section.

If the network is hidden, click the “Add Hidden” button, input the name of the network in the pop-up window, and click “OK”.

If you add multiple networks, use the arrow keys to place them in the desired connection order. PC-BSD® will try to connect to the first profile in the list and will move down the list in order if it is unable to connect. When finished, click the “Apply” button. A pop-up message will indicate that PC-BSD® is restarting the network. If all went well, there should be an IP address and status of “associated” when you hover over the wireless icon in the system tray. If this is not the case, double-check for typos in your configuration values and read the section on [Troubleshooting Network Settings](#).

Figure 8.18f: Wireless Configuration Window of Network Configuration Utility



PC-BSD® supports the types of authentication shown in Figure 8.18g. You can access this screen (and change your authentication settings) by highlighting an entry in the “Configured Network Profiles” section and clicking the “Edit” button.

Figure 8.18g: Configuring Wireless Authentication Settings



This screen allows you to configure the following types of wireless security:

- **Disabled:** if the network is open, no additional configuration is required.
- **WEP:** this type of network can be configured to use either a hex or a plaintext key. If you click WEP then the “Configure” button, you will see the screen shown in Figure 8.18h. Type the key into both network key boxes. If the key is complex, check the “Show Key” box to make sure that the passwords are correct and that they match. Uncheck this box when you are finished to replace the characters in the key with the * symbol. A wireless access point that uses WEP can store up to 4 keys; the number in the key index indicates which key you wish to use.
- **WPA Personal:** this type of network uses a plaintext key. If you click WPA Personal then the “Configure” button, you will see the screen shown in Figure 8.18i. Type in the key twice to verify it. If the key is complex, you can check the “Show Key” box to make sure the passwords match.
- **WPA Enterprise:** if you click WPA Enterprise then the “Configure” button, you will see the screen shown in Figure 8.18j. Select the authentication method (EAP-TLS, EAP-TTLS, or EAP-PEAP), input the EAP identity, browse for the CA certificate, client certificate and private key file, and input and verify the password.

NOTE: if you are unsure which type of encryption is being used, ask the person who setup the wireless router. They should also be able to give you the value of any of the settings seen in these configuration screens.

Figure 8.18h: WEP Security Settings

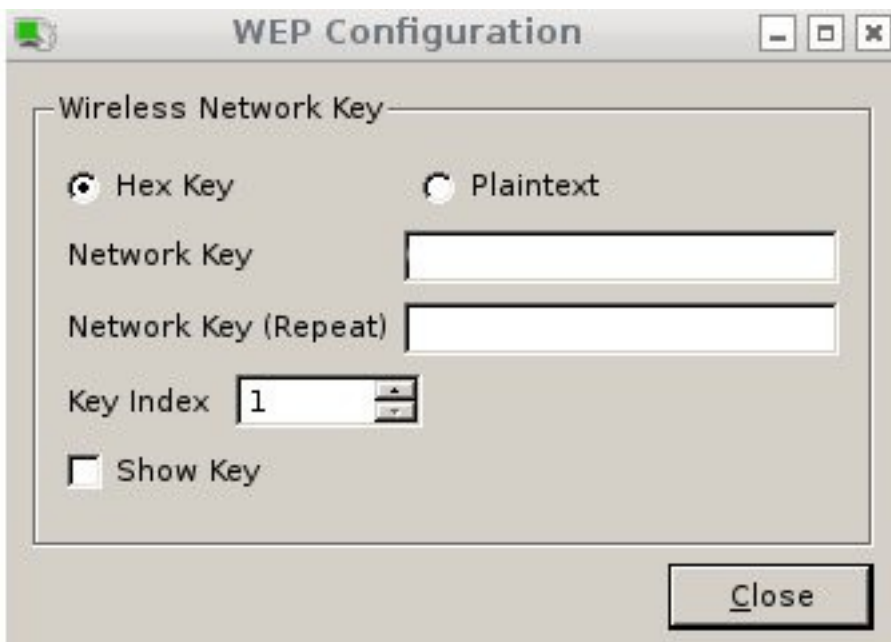


Figure 8.18i: WPA Personal Security Settings

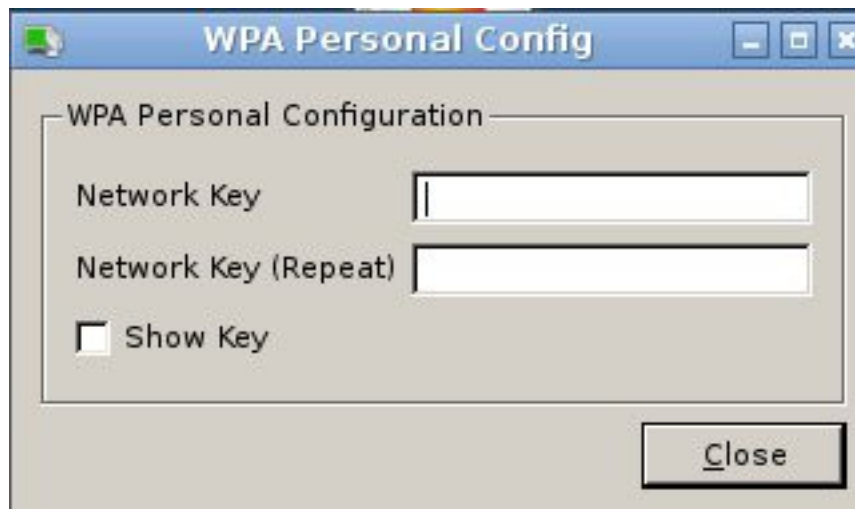
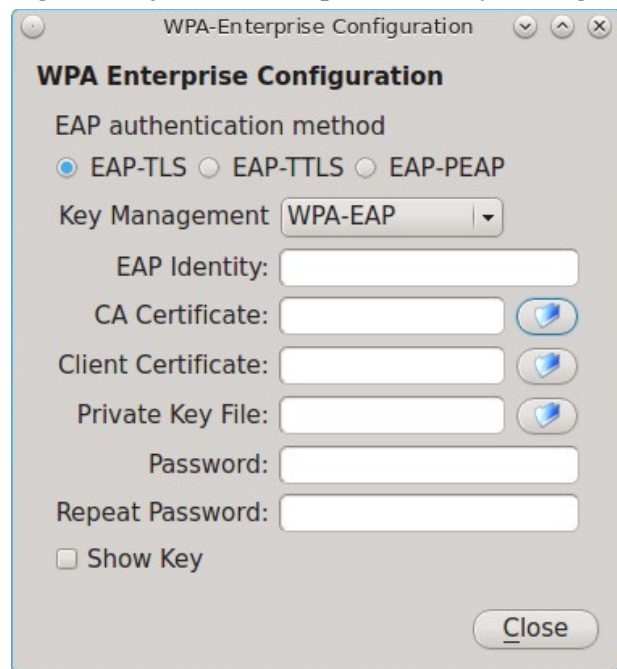


Figure 8.18j: WPA Enterprise Security Settings



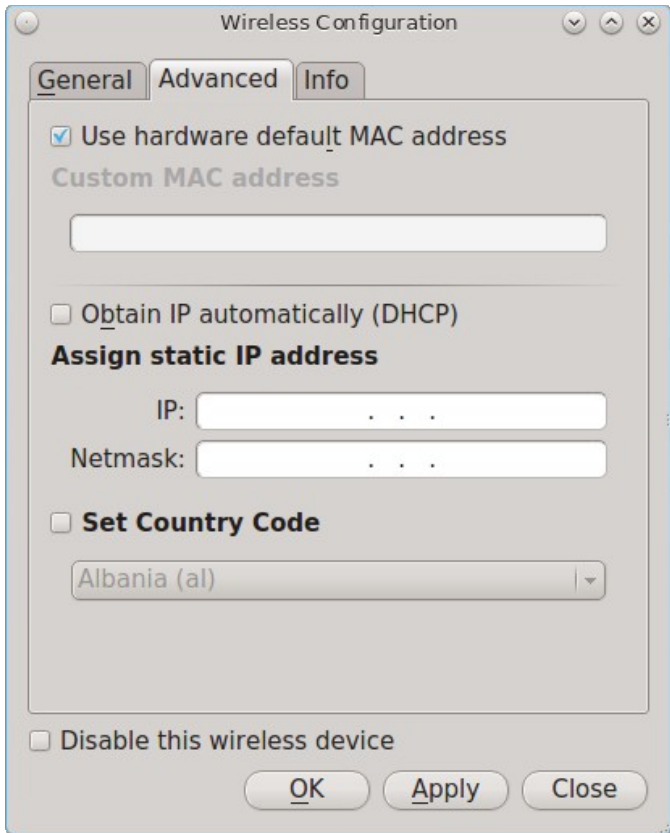
If you wish to disable this wireless interface, check the box “Disable this wireless device”. This setting can be desirable if you want to temporarily prevent the wireless interface from connecting to untrusted wireless networks.

The “Advanced” tab, seen in Figure 8.18k, allows you to configure the following:

- a custom MAC address. This setting is for advanced users and requires the “Use hardware default MAC address” box to be unchecked.
- how the interface receives its IP address information. If the network contains a DHCP server, check the box “Obtain IP automatically (DHCP)”. Otherwise, input the IP address and subnet mask to use on the network.

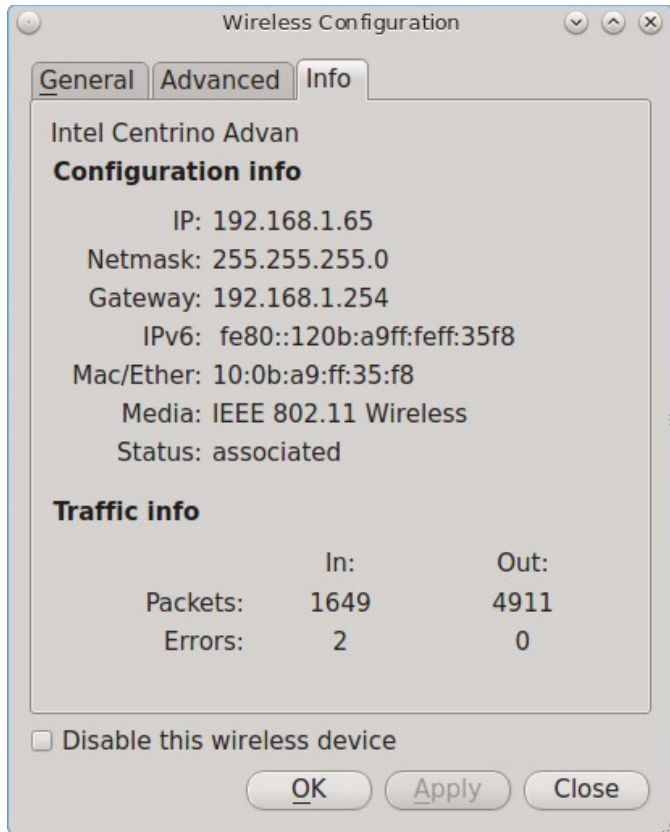
- the country code. This setting is not required if you are in North America. For other countries, check the “Set Country Code” box and select your country from the drop-down menu.

Figure 8.18k: Advanced Tab of a Wireless Interface



The “Info” tab, seen in Figure 8.18l, shows the current network status and statistics for the wireless interface.

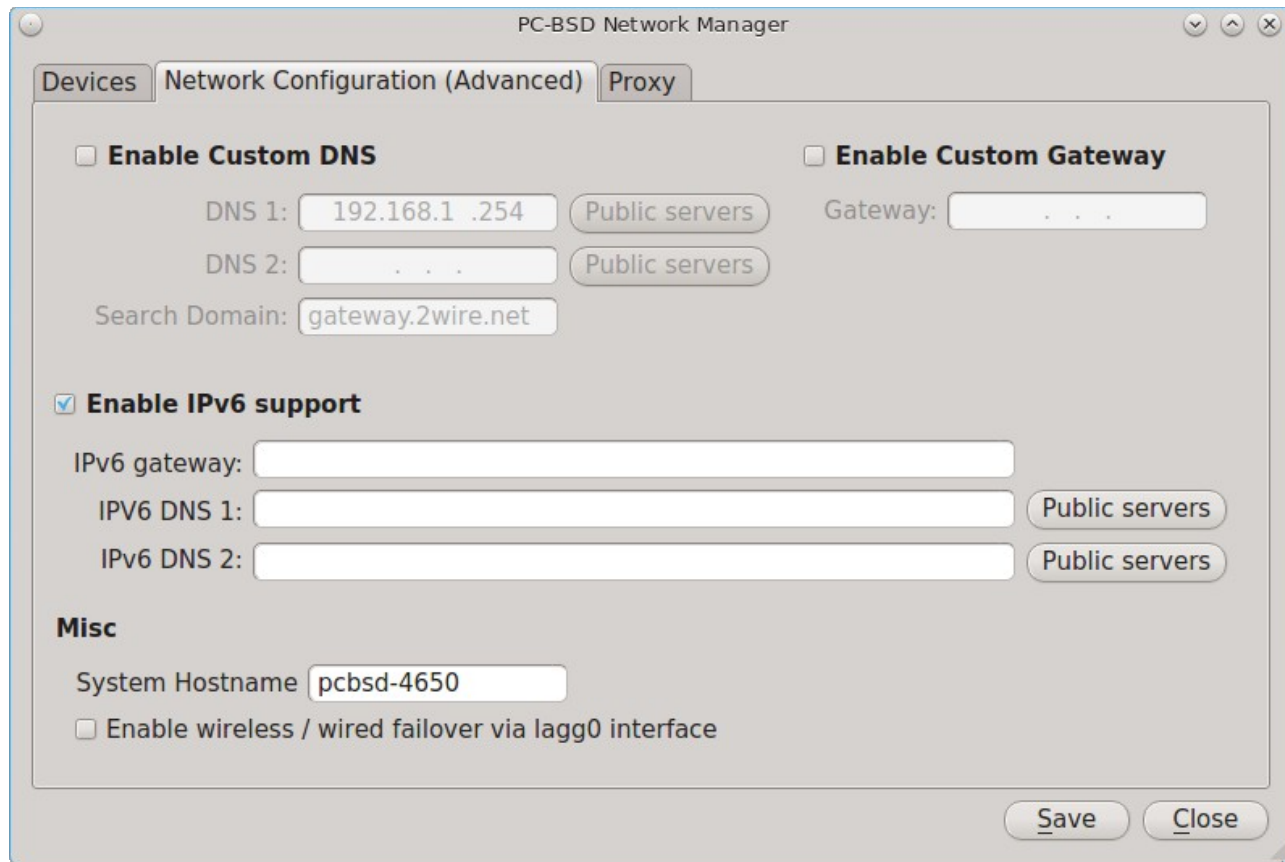
Figure 8.18l: Info Tab of a Wireless Interface



8.18.3 Network Configuration (Advanced)

The “Network Configuration (Advanced)” tab of the Network Configuration utility is seen in Figure 8.18m. The displayed information is for the currently highlighted interface. If you wish to edit these settings, make sure that the interface that you wish to configure is highlighted in the “Devices” tab.

Figure 8.18m: Network Configuration (Advanced) tab of the Network Configuration Utility



If the interface receives its IP address information from a DHCP server, this screen allows you to view the received DNS information. If you wish to override the default DNS settings or set them manually, check the “Enable Custom DNS” box. You can then set the following:

DNS 1: the IP address of the primary DNS server. If you do not know which IP address to use, click the “Public servers” button to select a public DNS server.

DNS 2: the IP address of the secondary DNS server.

Search Domain: the name of the domain served by the DNS server.

If you wish to change or set the default gateway, check the “Enable Custom Gateway” box and input the IP address of the default gateway.

The following settings can be modified in the IPv6 section:

Enable IPv6 support: if this box is checked, the specified interface can participate in IPv6 networks.

IPv6 gateway: the IPv6 address of the default gateway used on the IPv6 network.

IPv6 DNS 1: the IPv6 address of the primary DNS server used on the IPv6 network. If you do not know which IP address to use, click the “Public servers” button to select a public DNS server.

IPv6 DNS 2: the IPv6 address of the secondary DNS server used on the IPv6 network.

The “Misc” section allows you to configure these options:

System Hostname: the name of your computer. It must be unique on your network.

Enable wireless/wired failover via lagg0 interface: the `lagg` interface allows you to seamlessly switch between using an Ethernet interface and a wireless interface. If you want this functionality, check this box.

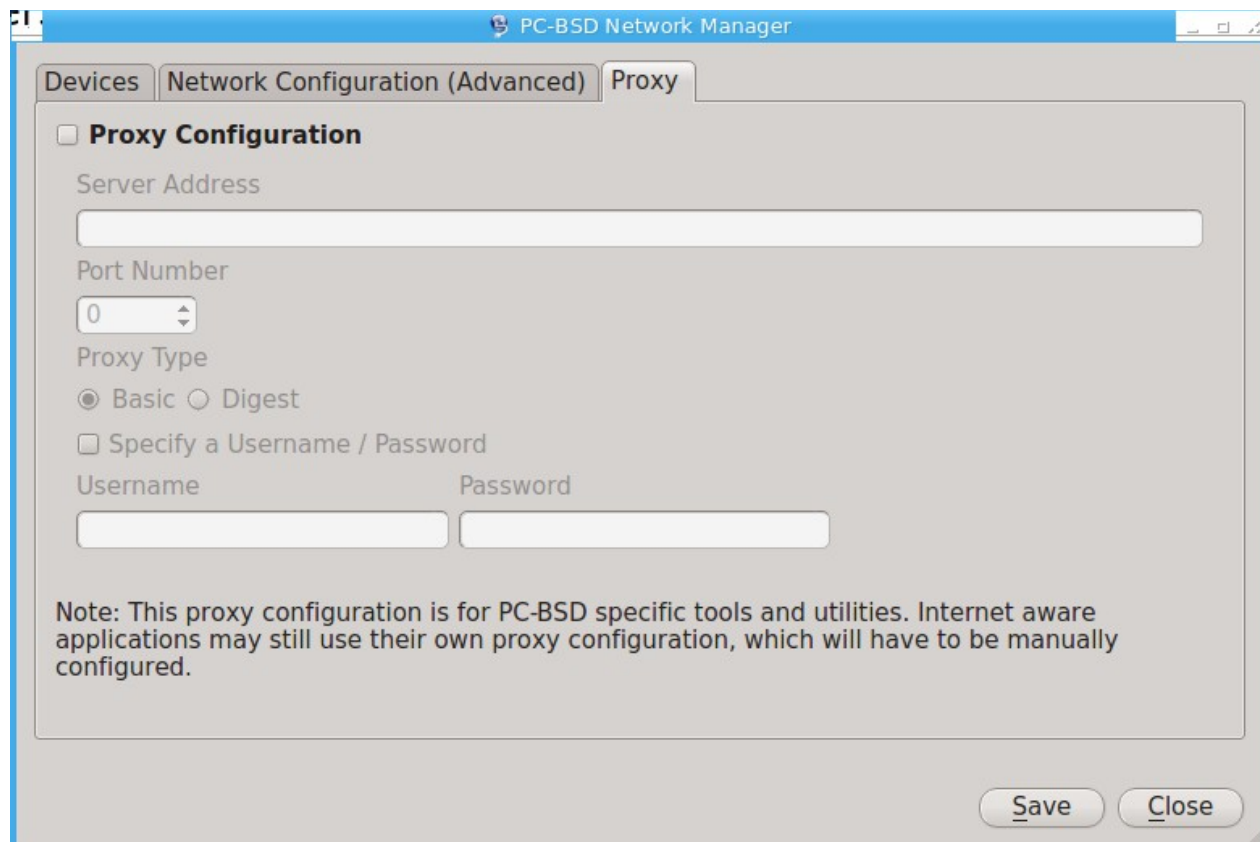
NOTE: some users experience problems using `lagg`. If you have problems connecting to a network using an interface that previously worked, uncheck this box and remove any references to “`lagg`” in your `/etc/rc.conf` file.

If you make any changes within this window, click the “Save” button to apply them.

8.18.4 Proxy Settings

The “Proxy” tab, shown in Figure 8.18n, is used when your network requires you to go through a proxy server in order to access the Internet.

Figure 8.18n: Proxy Settings Configuration



Check the “Proxy Configuration” check box to activate the settings. The follow settings can be configured in this screen:

Server Address: enter the IP address or hostname of the proxy server.

Port Number: enter the port number used to connect to the proxy server.

Proxy Type: choices are “Basic” (sends the username and password unencrypted to the server) and “Digest” (never transfers the actual password across the network, but instead uses it to encrypt a value sent from the server). Do not select “Digest” unless you know that the proxy server supports it.

Specify a Username/Password: check this box and input the username and password if they are required to connect to the proxy server.

Proxy settings are saved to the `/etc/profile` and `/etc/csh.cshrc` files so that they are available to the PC-BSD® utilities as well as any application that uses **fetch**.

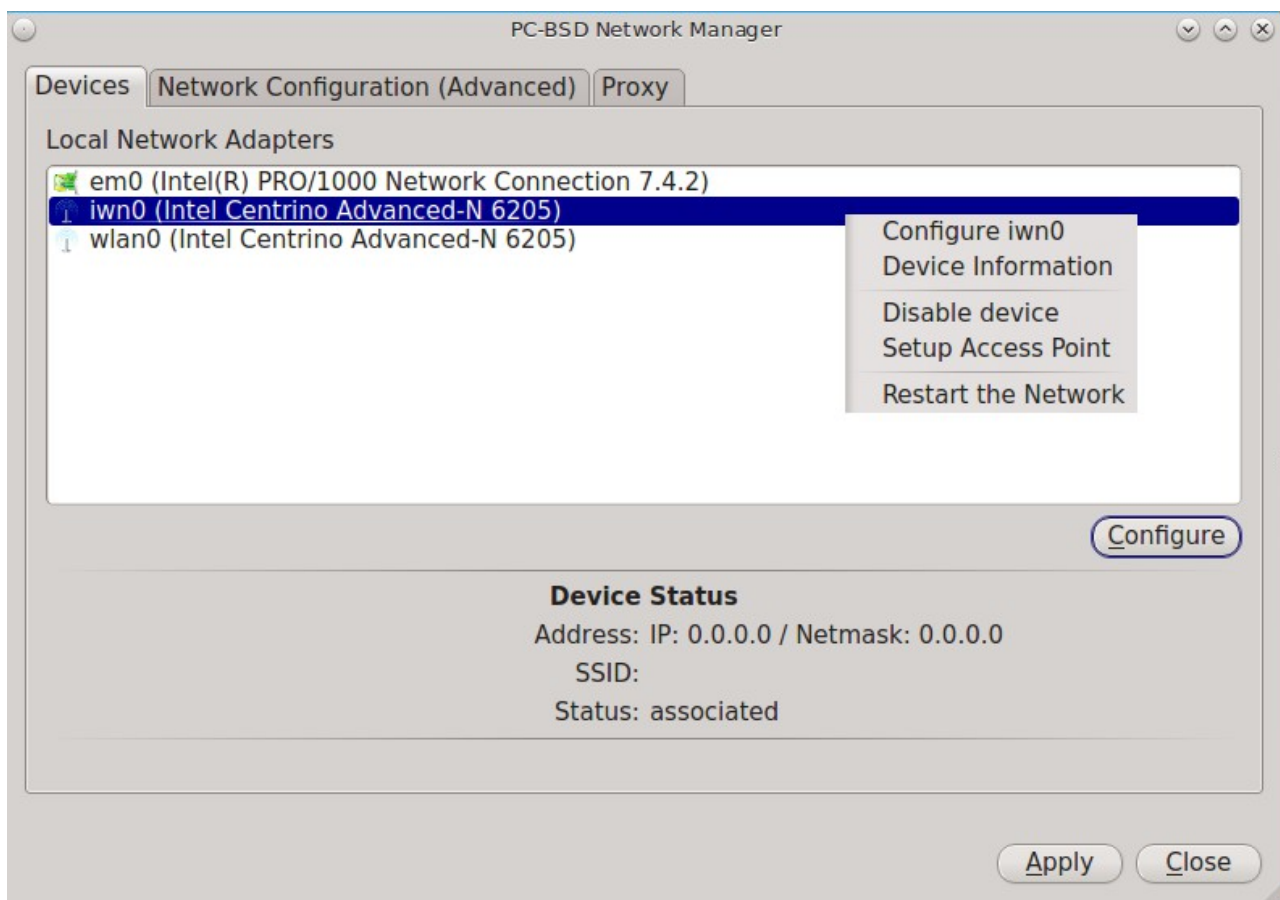
Applications that did not come with the operating system, such as web browsers, may require you to configure proxy support using that application's configuration utility.

If you save any changes to this tab, a pop-up message will warn that you may have to logout and back in in order for the proxy settings to take effect.

8.18.5 Configuring a Wireless Access Point

Beginning with PC-BSD® 10.1, if you click the entry for a wireless device, as seen in Figure 8.18o, the right-click menu has an option to “Setup Access Point”.

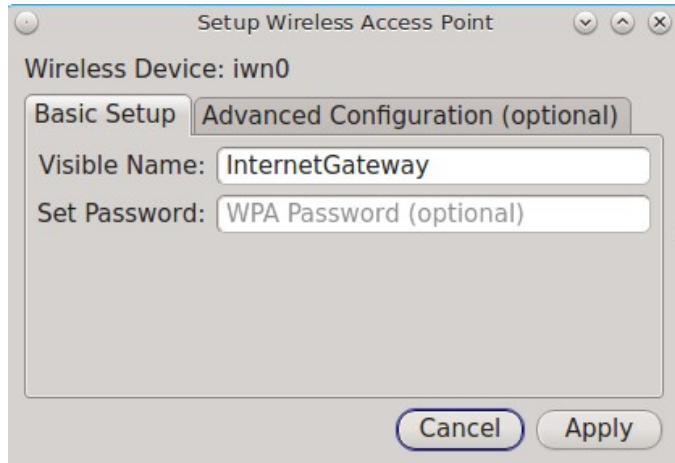
Figure 8.18o: Setup Access Point Option



NOTE: be sure to select the driver name, `iwnc0` in this example, not `wlan0`. If the device is already setup as an access point, the right-click menu option will instead be displayed as “Disable Access Point”.

Figure 8.18p shows the configuration screen if you select “Setup Access Point”.

Figure 8.18p: Access Point Basic Setup

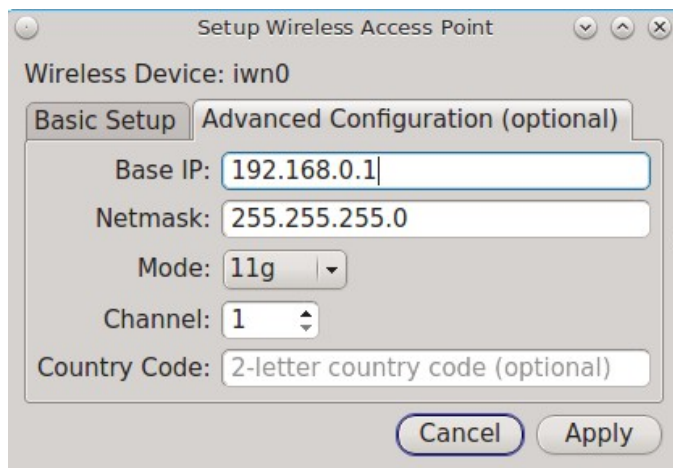


This screen contains two options:

- **Visible Name:** this is the name that will appear when users scan for available access points.
- **Set Password:** setting a WPA password is optional, though recommended if you only want authorized devices to use the access point. If used, the password must be a minimum of 8 characters.

Figure 8.18q shows the “Advanced Configuration (optional)” screen.

Figure 8.18q: Access Point Advanced Setup



The settings in this screen are optional and allow you to fine-tune the access point's configuration:

- **Base IP:** the IP address of the access point.
- **Netmask:** the associated subnet mask for the access point.
- **Mode:** available modes are *11g* (for 802.11g), *11ng* (for 802.11n on the 2.4-GHz band), or *11n* (for 802.11n).
- **Channel:** select the channel to use.
- **Country Code:** the two letter country code of operation.

8.18.6 Troubleshooting Network Settings

While Ethernet networking usually “just works” on a PC-BSD® system, users sometimes encounter problems, especially when connecting to wireless networks. Sometimes the problem is due to a configuration error; sometimes a driver is buggy or is not yet available. This section is meant to help you pinpoint the problem so that you can either fix it yourself or give the developers the information they need to fix or create the driver.

8.18.6.1 Useful Files and Commands

When troubleshooting your network configuration, use the following files and commands:

/etc/rc.conf

This file is read when the system boots up. In order for the system to configure an interface at boot time, an entry must exist for it in this file. Entries are automatically created for you during installation for each interface that is active. An entry will be added (if it does not exist) or modified (if it already exists) when you configure an interface using the Network Configuration utility.

Here is an example of the *rc.conf* entries for an ethernet driver (*em0*) and a wireless driver (*run0*):

```
ifconfig_em0="DHCP"  
wlans_run0="wlan0"  
ifconfig_wlan0="WPA SYNCDHCP"
```

When reading through your own file, look for lines that begin with *ifconfig*. For a wireless interface, also look for lines containing *wlans*.

NOTE: unlike Linux interface driver names, FreeBSD/PC-BSD® interface driver names indicate the type of chipset. Each driver name has an associated man page where you can learn which devices use that chipset and if there are any configuration options or limitations for the driver. When reading the man page, do not include the interface number. In the above example, you could read **man em** and **man run**.

/etc/wpa_supplicant.conf

This file is used by wireless interfaces and contains the information needed to connect to a WPA network. If this file does not already exist, it is created for you when you enter the “Configuration” screen of a wireless interface.

ifconfig

This command shows the current state of your interfaces. When reading through its output, check that your interface is listed, has a status of “active”, and has an IP address. Here is a sample **ifconfig** output showing the entries for the *re0* Ethernet interface and the *run0* wireless interface:

```
re0: flags=8843<UP,BROADCAST,RUNNING,SIMPLEX,MULTICAST> metric 0 mtu 1500  
options=389b<RXCSUM, TXCSUM, VLAN_MTU, VLAN_HWTAGGING, VLAN_HWCSUM, WOL_UCAST, WOL_MCAST,  
WOL_MAGIC>  
  ether 60:eb:69:0b:dd:4d  
  inet 192.168.1.3 netmask 0xffffffff broadcast 192.168.1.255  
  media: Ethernet autoselect (100baseTX <full-duplex>)  
  status: active  
run0: flags=8843<UP,BROADCAST,RUNNING,SIMPLEX,MULTICAST> metric 0 mtu 2290  
  ether 00:25:9c:9f:a2:30  
  media: IEEE 802.11 Wireless Ethernet autoselect mode 11g  
  status: associated  
wlan0: flags=8843<UP,BROADCAST,RUNNING,SIMPLEX,MULTICAST> metric 0 mtu 1500  
  ether 00:25:9c:9f:a2:30
```

```
media: IEEE 802.11 Wireless Ethernet autoselect (autoselect)
status: no carrier
ssid "" channel 10 (2457 MHz 11g)
country US authmode WPA1+WPA2/802.11i privacy ON deftxkey UNDEF
txpower 0 bmiss 7 scanvalid 60 protmode CTS wme roaming MANUAL
bintval 0
```

In this example, the ethernet interface (*re0*) is active and has an IP address. However, the wireless interface (*run0*, which is associated with *wlan0*) has a status of “no carrier” and does not have an IP address. In other words, it has not yet successfully connected to the wireless network.

dmesg

This command lists the hardware that was probed during boot time and will indicate if the associated driver was loaded. If you wish to search the output of this command for specific information, pipe it to **grep** as seen in the following examples:

```
dmesg | grep Ethernet
```

```
re0: <RealTek 8168/8111 B/C/CP/D/DP/E PCIe Gigabit Ethernet> port 0xc000-0xc0ff mem
0xd0204000-0xd0204fff,0xd0200000-0xd0203fff irq 17 at device 0.0 on pci8
re0: Ethernet address: 60:eb:69:0b:dd:4d
```

```
dmesg |grep re0
```

```
re0: <RealTek 8168/8111 B/C/CP/D/DP/E PCIe Gigabit Ethernet> port 0xc000-0xc0ff mem
0xd0204000-0xd0204fff,0xd0200000-0xd0203fff irq 17 at device 0.0 on pci8
re0: Using 1 MSI messages
re0: Chip rev. 0x28000000
re0: MAC rev. 0x00000000
miibus0: <MII bus> on re0
re0: Ethernet address: 60:eb:69:0b:dd:4d
re0: [FILTER]
re0: link state changed to DOWN
re0: link state changed to UP
```

```
dmesg | grep run0
```

```
run0: <1.0> on usb3
run0: MAC/BBP RT3070 (rev 0x0201), RF RT2020 (MIMO 1T1R), address 00:25:9c:9f:a2:30
run0: firmware RT2870 loaded
```

pciconf

If your interface does not show up in **ifconfig** or **dmesg**, it is possible that a driver for this card is not provided with the operating system. If the interface is built into the motherboard of the computer, you can use the **pciconf** command to find out the type of card.

```
pciconf -lv | grep Ethernet
```

```
device      = 'Gigabit Ethernet NIC(NDIS 6.0) (RTL8168/8111/8111c)'
```

```
pciconf -lv | grep wireless
```

```
device      = 'Realtek RTL8191SE wireless LAN 802.11N PCI-E NIC (RTL8191SE?)'
```

In this example, there is a built-in Ethernet device that uses a driver that supports the RTL8168/8111/8111c chipsets. As we saw earlier, that driver is *re0*. The built-in wireless device was also found but the `?` indicates that a driver for the RTL8191SE chipset was not found. A web search for “FreeBSD RTL8191SE” will give an indication of whether a driver exists (perhaps in a version of FreeBSD that has not been released yet) or if a driver is being developed.

The FreeBSD Handbook chapter on [Wireless Networking](#) provides a good overview of how wireless works and offers some troubleshooting suggestions.

8.19 Life Preserver

The built-in Life Preserver utility was designed to take full advantage of ZFS snapshot functionality. This utility allows you to schedule snapshots of a local ZFS pool and to optionally replicate those snapshots to another system using SSH. This design provides several benefits:

- a snapshot provides a “point-in-time” image of the ZFS pool. In one way, this is similar to a full system backup as the snapshot contains the information for the entire filesystem. However, it has several advantages over a full backup. Snapshots occur instantaneously, meaning that the filesystem does not need to be unmounted and you can continue to use applications on your system as the snapshot is created. Since snapshots contain the meta-data ZFS uses to access files, the snapshots themselves are small and subsequent snapshots only contain the changes that occurred since the last snapshot was taken. This space efficiency means that you can take snapshots often. Snapshots also provide a convenient way to access previous versions of files as you can simply browse to the point-in-time for the version of the file that you need. Life Preserver makes it easy to configure when snapshots are taken and provides a built-in graphical browser for finding and restoring the files within a snapshot.
- replication is an efficient way to keep the files on two systems in sync. In the case of Life Preserver, the snapshots taken on the PC-BSD system will be synchronized with their versions stored on the backup server.
- SSH means that the snapshots will be sent to the backup server over an encrypted connection, which protects the contents of the snapshots.
- having a copy of the snapshots on another system makes it possible to restore the pool should your PC-BSD® system become unusable.

If you decide to replicate the snapshots to a backup server, keep the following points in mind when choosing which system to use as the backup server:

- the backup server ***must be formatted with the latest version of ZFS***, also known as ZFS feature flags or ZFSv5000. Operating systems that support this version of ZFS include PC-BSD® and FreeBSD 9.2 or higher, and FreeNAS 9.1.x or higher.
- that system must have SSH installed and the SSH service must be running. If the backup server is running PC-BSD, SSH is already installed and you can start SSH using [Service Manager](#). If that system is running FreeNAS®, SSH is already installed and how to configure this service is described in [Backing Up to a FreeNAS® System](#). If the system is running FreeBSD, SSH is already installed, but you will need to start SSH.
- if the backup server is running PC-BSD, you will need to open TCP port 22 (SSH) using [Firewall Manager](#). If the server is running FreeBSD and a firewall has been configured, add rules to open this port in the firewall ruleset. FreeNAS® does not run a firewall by default.

8.19.1 Using the Life Preserver GUI

An icon to the Life Preserver utility, seen in Figure 8.19a, can be found in the system tray.

Figure 8.19a: Life Preserver Icon in System Tray



If you right-click this icon, the following options are available:

- **Open Life Preserver:** starts Life Preserver, which will prompt for your password. The first time this utility is run, it will display the screen shown in Figure 8.19b.
- **View Messages:** opens a pop-up menu to display information messages and the Life Preserver log file. There won't be any until after Life Preserver is configured and starts to create backups. If a configured Life Preserver task fails, such as replication, check the “Log Files” tab.
- **Popup Settings:** configures Life Preserver to display its notifications over the Life Preserver icon. Choices are “Show all”, which includes notifications for when a backup/replication starts or finishes, “Warnings only”, which only displays warning and error messages, and “None” which disables pop-up notification. The default setting is “Warnings only”. This setting does not affect critical messages which will always open a window that requires attention.
- **Refresh Tray:** by default, Life Preserver checks the status of the pool and available disk space every 30 minutes. Click this option to check the current status of a scrub or to check the current disk space after removing a snapshot.
- **Close Tray:** will remove the icon from the system tray. To re-add it to the tray, go to Control Panel → Life Preserver or type **life-preserver-tray &** at the command line. If your desktop manager does not provide a system tray, you will need to instead [manage snapshots from the command line](#).

The status of this icon changes when a snapshot, scrub, or replication task is occurring. If you hover over the icon during this time, a tooltip will describe the current status of the running task.

To create a backup schedule, click File → Manage Pool and select the name of the pool to manage. The following examples are for a pool named *tank*. This will launch the the “New Life Preserver Wizard”, allowing you to configure the backup schedule. Click “Next” to see the screen in Figure 8.19c.

Figure 8.19b: Initial Life Preserver Screen

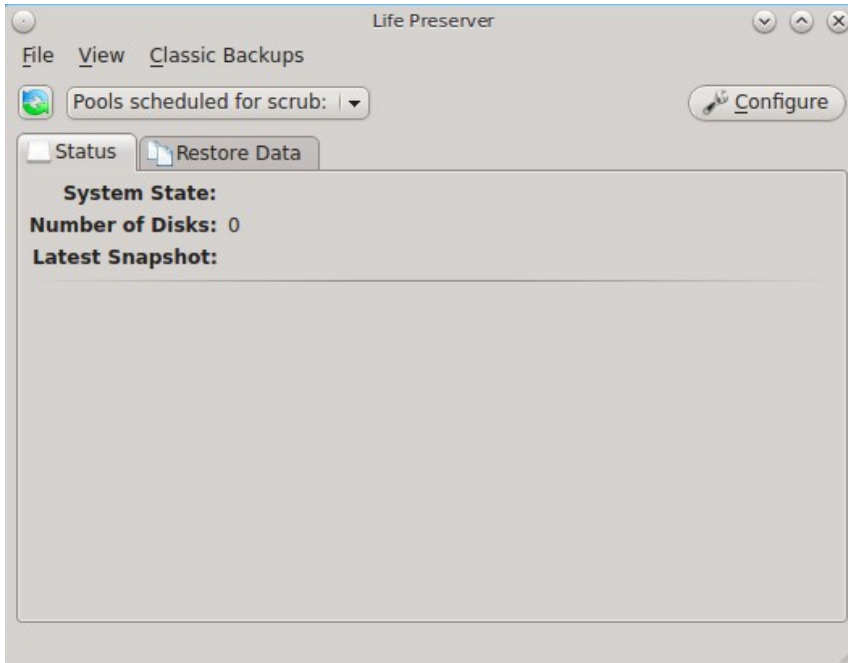
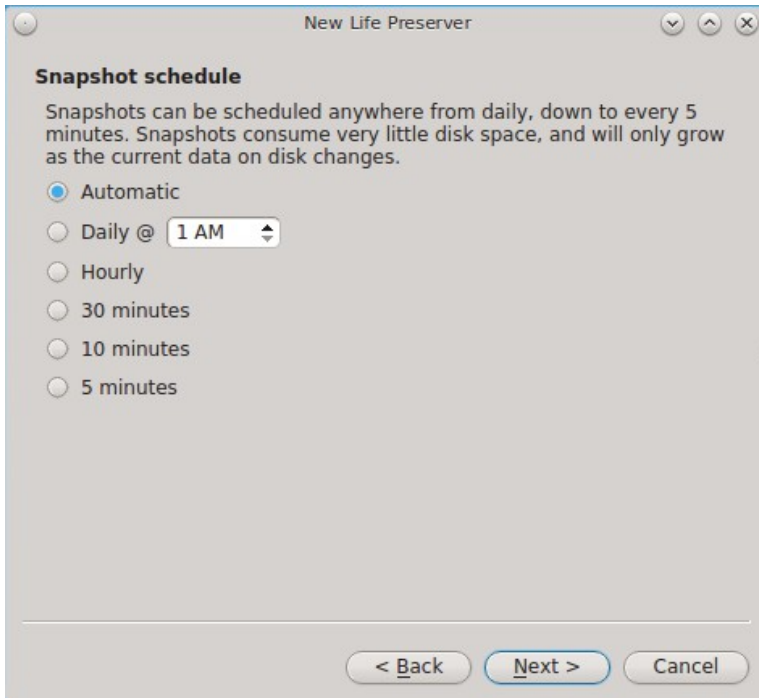


Figure 8.19c: Snapshot Schedule Screen

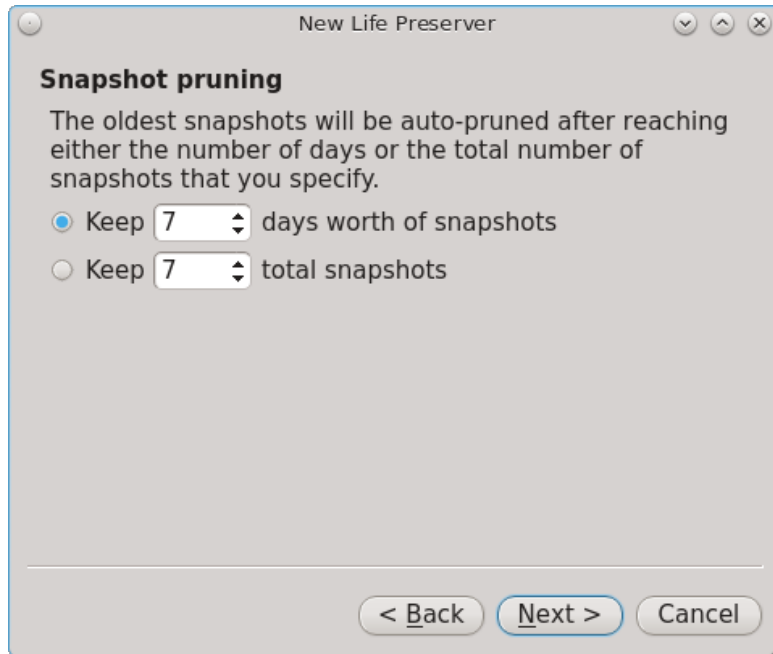


This screen is used to schedule how often a snapshot is taken of the system. The default of “Automatic” creates a snapshot every 5 minutes, which are kept for an hour, then the hourly is kept for 24 hours, the daily is kept for a month, and the monthly is kept for a year. You can change this default to take one daily snapshot at a specified time or to take a snapshot once every hour, 30 minutes, 10 minutes or 5 minutes.

If you change the default of “Automatic”, the next screen, shown in Figure 8.19d, is used to configure how long to keep the snapshots. Snapshots can be configured to be pruned after the specified number of days or after the specified number of snapshots. This screen will not appear for “Automatic” as it has its own pruning schedule, as explained in the previous paragraph.

NOTE: auto-pruning only occurs on the snapshots generated by Life Preserver according to the configured schedule. Auto-pruning will not delete any snapshots you create manually from the “Snapshots” tab.

Figure 8.19d: Snapshot Pruning Screen



After making your selection, press “Next” to see the screen shown in Figure 8.19e.

If you wish to keep a copy of the snapshots on another system, this screen is used to indicate which system to send the snapshots to. If you do not have another system available, you can click “Next” and then “Finish” to complete the configuration.

Figure 8.19e: Replication Server Screen

New Life Preserver

Replication Server

Replication will keep a copy of your data on a remote system in the case of a total disk failure.

NOTE: A valid replication target system must be running a compatible version of ZFS and have SSH enabled, such as on a FreeNAS system.

Replicate my data

Scan Network

Host Name

User Name

SSH Port

Remote Dataset

Frequency

Sync with snapshots | @ 1 AM

< Back Next > Cancel

If you do have another system available which is running the same version of ZFS and has SSH enabled, click the “Replicate my data” box, then input the following information. *Before entering the information in these fields, you need to first configure the backup system.* An example configuration is demonstrated in [Backing Up to a FreeNAS® System](#).

- **Host Name:** of the remote system that will store your backup. If the backup server is on your local network, the host name must be in your hosts file or in the database of the local DNS server. You may find it easier to instead input the IP address of the backup server as this will eliminate any host name resolution problems.
- **User Name:** this user must have permission to log in to the system that will hold the backup. If the account does not already exist, you should create it first on the backup server.
- **SSH Port:** port 22, the default port used by SSH is selected for you. You only need to change this if the remote system is using a non-standard port to listen for SSH connections. In that case, use the up/down arrows or type in the port number.
- **Remote Dataset:** input the name of an existing ZFS dataset on the backup server. This is where the backups will be stored. To get a list of existing datasets, type `zfs list` on the remote server. The “NAME” column in the output of that command gives the fullname of each dataset. Type the fullname of the desired dataset into this field. When selecting a dataset, make sure that the selected “User Name” has permission to write to the dataset.
- **Frequency:** snapshots can either be sent the same time that they are created or you can set a time or the schedule when the queued snapshots are sent.

Once you have input the information, click “Next” and then “Finish”. If replication is configured, Life Preserver will check that it can connect to the backup server and will prompt for the password of “User Name”. A second pop-up message will remind you to save the SSH key to a USB stick (as described below) as this key is required

should you ever need to perform an [operating system restore](#).

NOTE: if you don't receive the pop-up message asking for the password, check that the firewall on the backup system, or a firewall within the network, is not preventing access to the configured “SSH Port”.

Once the wizard completes, a system snapshot will be taken. If you also configured replication, Life Preserver will begin to replicate that snapshot to the remote system. Note that the first replication can take several hours to complete, depending upon the speed of the network. Subsequent replications will only have changed data and will be much smaller.

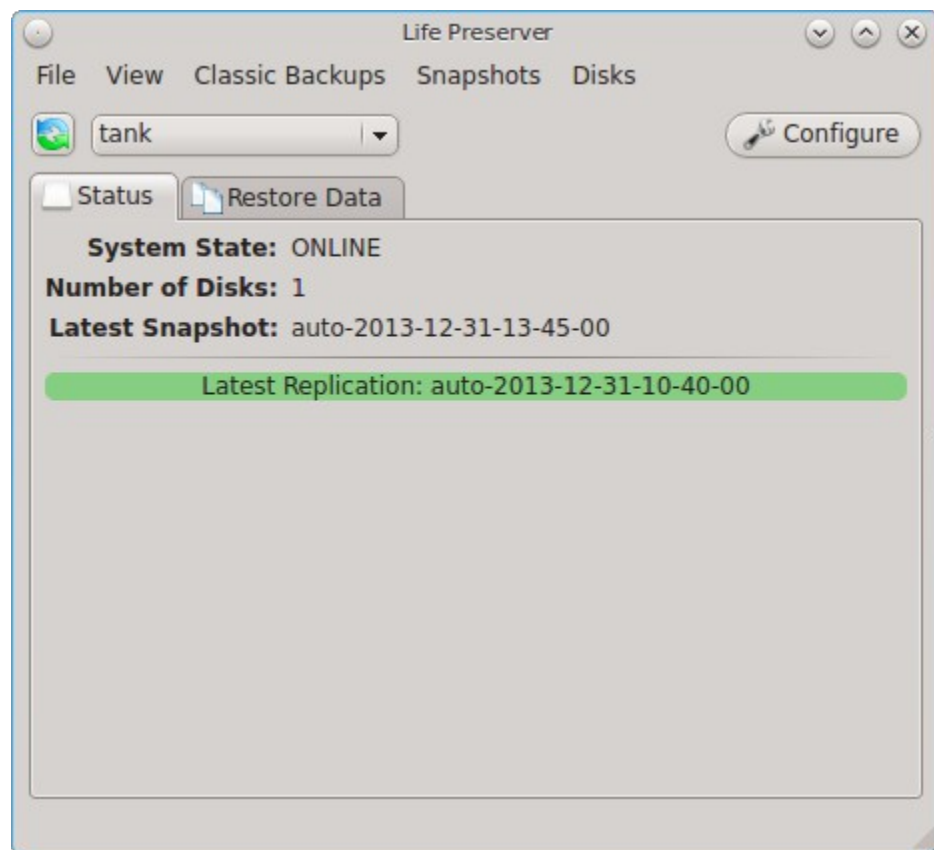
Life Preserver uses backend checks so that it is safe to keep making snapshots while a replication is in process. It will not prune any existing snapshots until the replication is finished and it will not start a second replication before the first replication finishes.

The rest of this section demonstrates the tasks that can be performed from the Life Preserver GUI now that the pool has an initial configuration.

8.19.1.1 View Menu and Configure Button

Once the schedule for *tank* has been created, the “Status” tab shown in Figure 8.21f will become active and will show the current state of the pool. The “View” menu lets you select “Basic” or “Advanced” view. “Advanced” view has been selected in the example shown in Figure 8.19f.

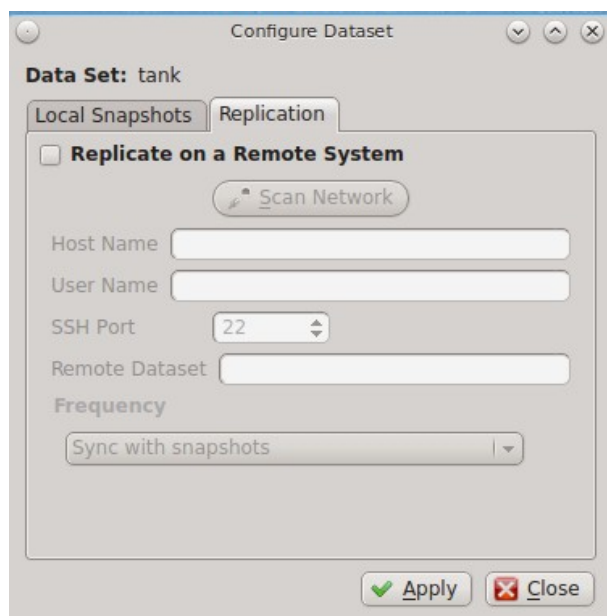
Figure 8.19f: Life Preserver in Advanced View



In this example, the ZFS pool is active, is comprised of one disk, and the date and time of the last snapshot is displayed. The green status indicates that the latest scheduled replication was successful.

If you click the “Configure” button, the screen shown in Figure 8.19g will open. This allows you to modify the settings of the replication server in the “Replication” tab and to change the schedule and pruning options in the “Local Snapshots” tab.

Figure 8.19g: Modifying the Configuration



8.19.1.2 Restore Data Tab

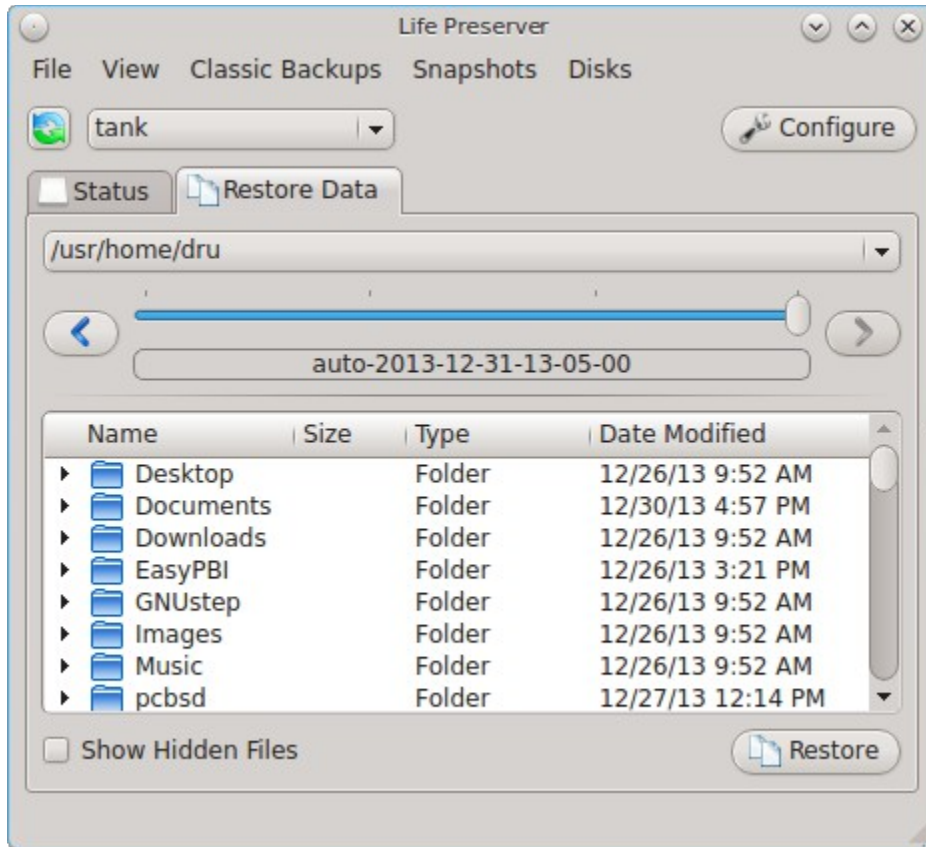
The “Restore Data” tab, seen in Figure 8.19h, is used to view the contents of the local snapshots and to easily restore any file which has since been modified or deleted.

In this example, the system has been configured to make a snapshot every 5 minutes. Since files have been modified on this system, the blue time slider bar indicates that several snapshots are available as a snapshot only occurs if changes have been made within the scheduled time increment. Click the arrows to go back or forward one snapshot at a time. Alternately, click the slider until you are viewing the desired time of the snapshot.

Once you have selected the desired date and time, use the drop-down menu to select the portion of the filesystem to view. In this example, the user has selected `/usr/home/dru` as that is the user's home directory. The user can now expand the directory names to view the files within each directory.

If your intent is to restore an earlier version of a file or a file that has been deleted, go back to the desired date and time, highlight the file, and click the “Restore” button. A copy of that file as it appeared at that point in time will be created in the same directory, with `-reversion#` added to the filename. This way, any current version or restored version of the file will never be overwritten.

Figure 8.19h: Viewing the Contents of the Snapshots



8.19.1.3 File Menu

The “File” menu contains the following options:

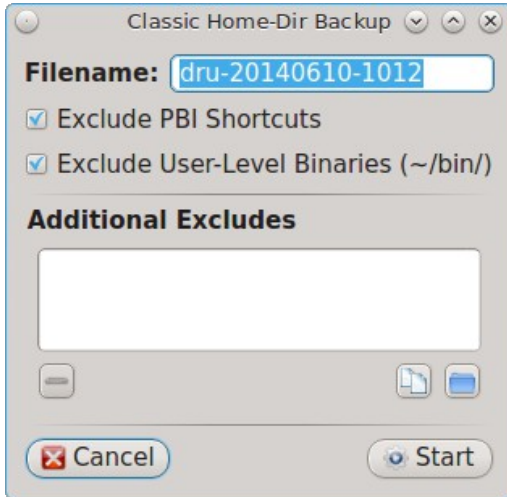
- **Manage Pool:** this will be greyed out if you have already configured your ZFS pool. If you have a second ZFS pool, you can select this option in order to start the Life Preserver Configuration Wizard for that pool.
- **Unmanage Pool:** if you wish to disable ZFS snapshots, select the ZFS pool name. Pop-up menus will ask if you are sure and then ask if you also want to delete the local snapshots from the system. If you choose to delete these snapshots, you will lose all of the older versions of the files contained in those backups. Once you have unmanaged a pool, you will need to use “Manage Pool” to rerun the Life Preserver Configuration Wizard for that pool.
- **Save Key to USB:** when you configure the replication of local snapshots to a remote system, you should immediately copy the automatically generated SSH key to a USB stick. Insert a FAT32 formatted USB stick and wait for [Mount Tray](#) to mount it. Then, click this option to copy the key.
- **Close Window:** closes the Life Preserver window. However, Life Preserver will continue to reside in the system tray.

8.19.1.4 Classic Backups Menu

This menu can be used to create an as-needed tarball of the user's home directory. This can be handy if you would like to make a backup of just your home directory in order to restore it in another directory or on another system.

To make a tar backup, click Classic Backups → Compress Home Dir and select the name of the user. This will open the screen shown in Figure 8.19i.

Figure 8.19i: Backing Up a User's Home Directory



If you want, you can change the name of the archive to create. By default it will be in the format *username-YYYYMMDD-HHMM*. This screen also allows you to define which files to exclude from the backup. By default, it will exclude PBI shortcuts and, if it exists, the */bin* directory in the user's home directory. To exclude a specific file, click the white file icon to browse to the location of the file. To exclude a specific directory, click the blue directory icon to browse to the location of the directory.

Press “Start” to start the backup. A progress bar will indicate the status and size of the backup. Once the backup is complete, click the “Finished” button to exit this screen.

The “Extract Home Dir” option can be used to restore a previously made home directory backup. ***Be sure this is what you want to do before using this option, as it will overwrite the current contents of the user's home directory.*** If your goal is to restore files without destroying the current versions, use the [Restore Data Tab](#) instead.

8.19.1.5 Snapshots Menu

The snapshots tab allows you to create or delete snapshots outside of the configured snapshot creation and pruning schedules. This tab contains these options:

- **New Snapshot:** click this button to create a snapshot now, instead of waiting for the schedule. For example, you can create a snapshot before making changes to a file, so that you can preserve a copy of the previous version of the file. Or, you can create a snapshot as you make modifications to the system or upgrade software. When creating a snapshot, a pop-up message will prompt you to input a name for the snapshot, allowing you to choose a name that is useful in helping you remember why you took the snapshot.
- **Delete Snapshot:** selecting this option will display the list of locally stored snapshots, listed in order from the oldest to the newest. If you select a snapshot, a warning will remind you that this is a permanent

change that can not be reversed. In other words, the versions of files at that point in time will be lost.

- **Start Replication:** if you have configured a remote server, this option will start a replication now, rather than waiting for the scheduled time.

8.19.1.6 Disks Menu

This tab provides the same functionality of [Mirroring the System to a Local Disk](#), but from the GUI rather than the command line. You should read that section before attempting to use any of the Disk options in this menu. It also lets you start and stop a ZFS scrub.

The options available in this menu are:

- **Attach Disk:** if you wish to mirror another internal disk or an inserted external USB disk, select this option. The disk must be at least the same size as the PC-BSD® disk and you must be willing to have that disk be re-formatted. *Do not select this option if you have any data on the disk that you wish to keep.* This option is the GUI front-end to the `lpreserver zpool attach` command.
- **Detach Disk:** if you wish to remove an attached disk from the mirror, use this option. This option is the GUI front-end to the `lpreserver zpool detach` command.
- **Set Disk Online/Offline:** if you need to temporarily disconnect or reconnect an attached external USB drive, select the appropriate option. This is the GUI equivalent to running `lpreserver zpool offline` or `lpreserver zpool online`.
- **Start/Stop Scrub:** it is a good idea to regularly perform a ZFS scrub to verify the integrity of the ZFS pool. Typically, a scrub is run once a week or before performing operations such as adding more disks to a pool. The status and results of the scrub can be viewed from the command line by typing `zpool status`. When viewing the results of the scrub, check to see if there were any errors, as this is typically an early indication of a failing disk. If you are getting errors, consider backing up your data and replacing the failing disk. Since a scrub is I/O intensive, it is recommended to start the scrub when the system is not in use, such as before going to bed. Depending upon the size of the pool, the scrub may take some time.

8.19.2 Using the Command Line Version of Life Preserver

The `lpreserver` command line utility can be used to manage snapshots and replication from the command line of a PC-BSD® or TrueOS® system. This command needs to be run as the superuser. To display its usage, type the command without any arguments:

```
lpreserver
Life-Preserver
-----
Available commands
Type in help <command> for information and usage about that command
  help - This help file or the help for the specified command
  cronsnap - Schedule snapshot creation via cron
  cronscrub - Schedule scrub via cron
  get - Get list of lpreserver options
  listcron - Listing of scheduled snapshots
  listsnap - List snapshots of a zpool/dataset
  mksnap - Create a ZFS snapshot of a zpool/dataset
  replicate - Enable / Disable ZFS replication to a remote system
  revertsnap - Revert zpool/dataset to a snapshot
  rmsnap - Remove a snapshot
  set - Set lpreserver options
```

```
status - List datasets, along with last snapshot / replication date
zpool - Manage a zpool by attaching / detaching disks
```

Each command has its own help text that describes its parameters and provides a usage example. For example, to receive help on how to use the **lpreserver cronsnap** command, type:

lpreserver help cronsnap

Life-Preserver

Help cronsnap

Schedule a ZFS snapshot

Usage:

For a listing of all scheduled snapshots

```
# lpreserver listcron
```

or

To start / stop snapshot scheduling

```
# lpreserver cronsnap <dataset> <action> <frequency> <numToKeep>
```

action = start / stop

```
frequency = auto / daily@XX / hourly / 30min / 10min / 5min
```

^^ Hour to execute

numToKeep = Number of snapshots to keep total

NOTE: When Frequency is set to auto the following will take place:

- * Snapshots will be created every 5 minutes and kept for an hour.
- * A hourly snapshot will be kept for a day.
- * A daily snapshot will be kept for a month.
- * A Monthly snapshot will be kept for a year.
- * The life-preserver daemon will also keep track of the zpool disk space, if the capacity falls below 75%, the oldest snapshot will be auto-pruned.

Example:

```
lpreserver cronsnap tank1/usr/home/kris start daily@22 10
```

or

```
lpreserver cronsnap tank1/usr/home/kris stop
```

Table 8.19a shows the command line equivalents to the graphical options provided by the Life Preserver GUI. Note that some options are only available from the command line.

Table 8.19a: Command Line and GUI Equivalents

Command Line	GUI	Description
cronsnap	Configure → Local Snapshots	schedule when snapshots occur and how long to keep them; the stop option can be used to disable snapshot creation
cronscrub		schedule a ZFS scrub
get		list Life Preserver options
listcron		list which ZFS pools have a scheduled snapshot
listsnap	Restore Data	list snapshots of specified dataset
mksnap	Snapshots → New Snapshot	create and replicate a new ZFS snapshot; by default, snapshots are recursive, meaning that a snapshot is taken of every dataset within a pool
replicate	Configure → Replication	used to list, add, and remove backup server; read the help for this command for examples

Command Line	GUI	Description
revertsnap		revert dataset to the specified snapshot version
rmsnap	Snapshots → Delete Snapshot	deletes specified snapshot; by default, all datasets within the snapshot are deleted
set		configures Life Preserver options; read help for the list of configurable options
status	Status	lists the last snapshot name and replication status
zpool	Disks → Attach Disk and Disks → Detach Disk	used to attach/detach drives from the pool; read help for examples

8.19.2.1 Mirroring the System to a Local Disk

In addition to replicating to a remote server, the **lpreserver** command also provides a method for attaching a new disk drive to an existing ZFS pool, and live-mirroring all data to that disk as data changes on the pool. The attached disk drive can be another internal disk or an external USB disk. When the new disk is attached for the first time, it will be erased and used solely as a mirror of the existing system drive. In addition, it will be made bootable, allowing you to boot from and use the new disk should the primary disk fail. In order to use this feature you will need the following:

- an internal or external disk drive that is the same size or larger than the existing system disk.
- since the disk will be formatted, it must be either blank or not have any data that you wish to keep intact.
- in order to boot from the disk should the primary disk fail, the system must support booting from the new disk. For example, if you are using a USB disk, make sure that the BIOS is able to boot from a USB disk.

The superuser can setup the new disk using the following command. Replace *tank1* with the name of your ZFS pool and */dev/da0* with the name of the disk to format. For example, the first USB disk will be */dev/da0* and the second internal hard disk will be */dev/ad1*.

```
lpreserver zpool attach tank1 /dev/da0
```

When the disk is first attached, it will be formatted with ZFS and configured to mirror the size of the existing disk. GRUB will also be stamped on the new disk, making it bootable should another drive in the array go bad. You can add multiple disks to the pool in this manner, giving any level of redundancy that you require.

Once the disk is attached, it will begin to resilvering. This process mirrors the data from the primary disk to the newly attached disk. This may take a while, depending upon the speed of the disks and system load. Until this is finished you should not reboot the system, or detach the disk. You can monitor the resilvering process by typing **zpool status**.

To get a listing of the disks in your mirror, run this command, replacing *tank1* with the name of the pool:

```
lpreserver zpool list tank1
```

If you are using an external drive, there may be occasions where you wish to disconnect the backup drive, such as when using a laptop and going on the road. In order to do so safely, it is recommended that you first offline the external disk using the following command:

```
lpreserver zpool offline tank1 /dev/da0
```

Then when you re-connect the drive, you can place it in online mode again using:

```
lpreserver zpool online tank1 /dev/da0
```

Sometimes, the disk name will change as a result of being disconnected. The **lpreserver zpool list tank1** command can be used to get the proper device ID.

If you wish to permanently remove a disk from the mirror, run the following command. If you decide to re-attach this disk later, a full disk copy will again have to be performed.

```
lpreserver zpool detach tank1 /dev/da0
```

NOTE: in addition to working with mirrors, the **lpreserver zpool** command can also be used to manage a RAIDZ configuration, although you will probably not want to use external disks in this case.

8.19.3 Backing Up to a FreeNAS® System

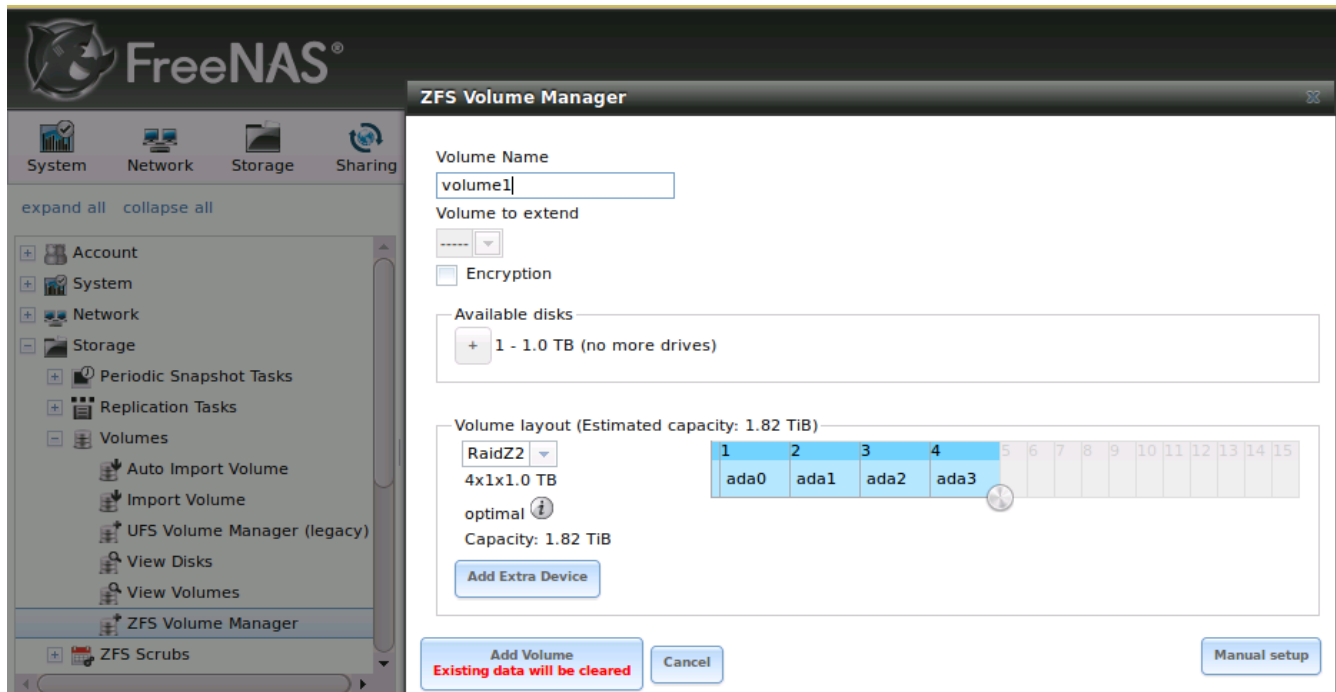
[FreeNAS®](#) is an open source Networked Attached Storage (NAS) operating system based on FreeBSD. This operating system is designed to be installed onto a USB stick so that it is kept separate from the storage disk(s) installed on the system. You can download the latest version of FreeNAS® as well as a PDF of its Users Guide from the [download page](#) of the FreeNAS® website.

This section demonstrates how to configure FreeNAS® 9.2.1.8 as the backup server for Life Preserver to replicate to. It assumes that you have already installed this version of FreeNAS® using the installation instructions in the [FreeNAS® 9.2.1 Users Guide](#) and are able to access the FreeNAS® system from a web browser.

In order to prepare the FreeNAS® system to store the backups created by Life Preserver, you will need to create a ZFS volume, create and configure the dataset to store the backups, create a user account that has permission to access that dataset, and enable the SSH service.

In the example shown in Figure 8.19j, the system has four 1TB drives and the user has clicked Storage → Volumes → ZFS Volume Manager in order to create the ZFS volume.

Figure 8.19j: Creating a ZFS Volume in FreeNAS® 9.2.1.8

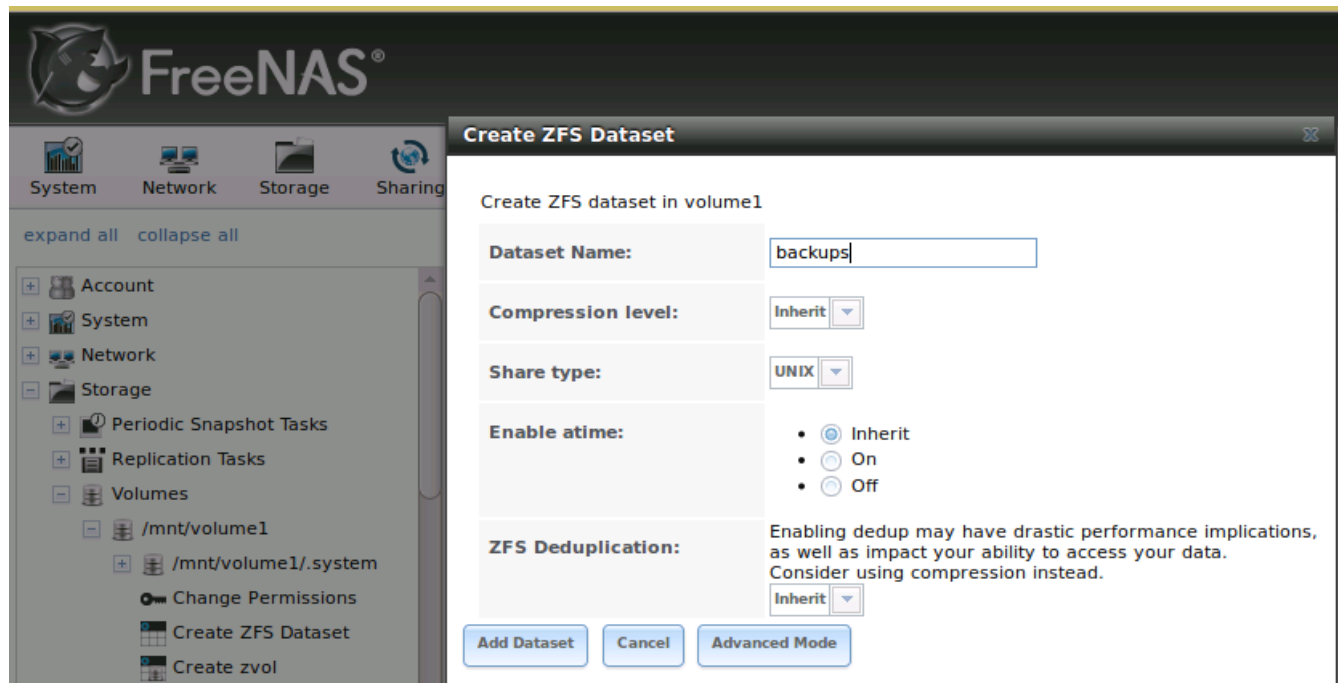


Input a “Volume Name”, drag the slider to select the number of available disks, and click the “Add Volume” button. The ZFS Volume Manager will automatically select the optimal layout for both storage capacity and redundancy. In this example, a RAIDZ2 named *volume1* will be created.

To create the dataset to backup to, click the + next to the entry for the newly created volume, then click “Create ZFS Dataset”. In the example shown in Figure 8.19k, the “Dataset Name” is *backups*. Click the “Add Dataset” button to create the dataset.

NOTE: make sure that the dataset is large enough to hold the replicated snapshots. To determine the size of the initial snapshot, run **zpool list** on the PC-BSD® system and look at the value in the “ALLOC” field. Subsequent snapshots will be smaller and will be the size of the data that has changed.

Figure 8.19k: Creating a ZFS Dataset in FreeNAS® 9.2.1.8



To create the user account, go to Account → Users → Add User. In the screen shown in Figure 8.19l, input a “Username” that will match the “User Name” configured in Life Preserver. Under “Home Directory”, use the browse button to browse to the location that you made to store the backups. Input a “Full Name”, then input and confirm a “Password”. When finished, click the “OK” button to create the user.

Next, give the user permissions to the dataset by going to Storage → Volumes, click the + next to the name of the volume, click the + next to the name of the dataset, then click “Change Permissions” for the expanded dataset. In the screen shown in Figure 8.19m, change the “Owner (user)” and “Owner (group)” to the user that you created. Click “Change” to save the change.

Figure 8.19l: Creating a User in FreeNAS® 9.2.1.8

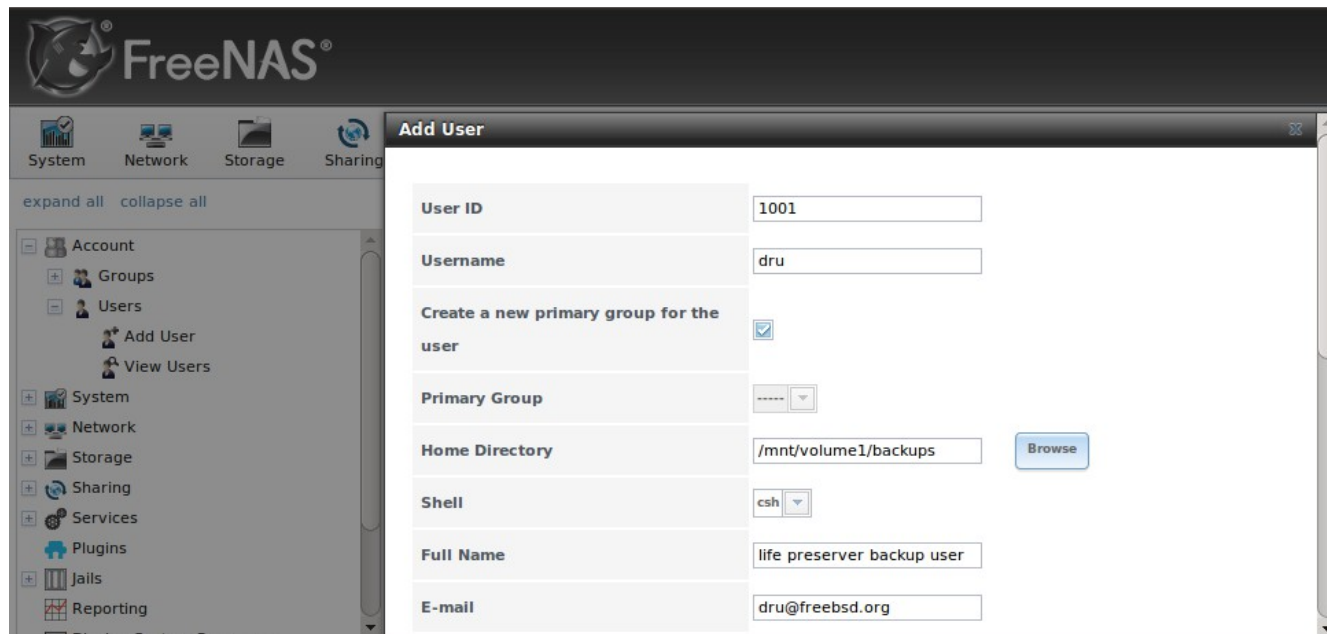
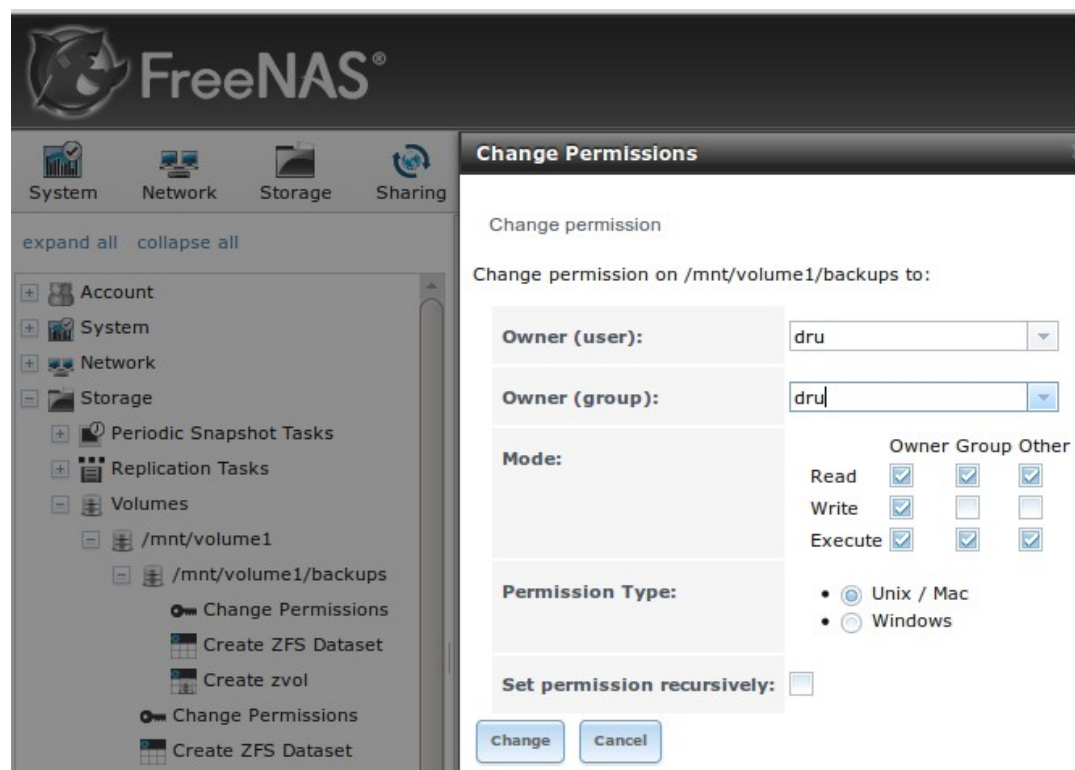


Figure 8.19m: Setting Permissions in FreeNAS® 9.2.1.8

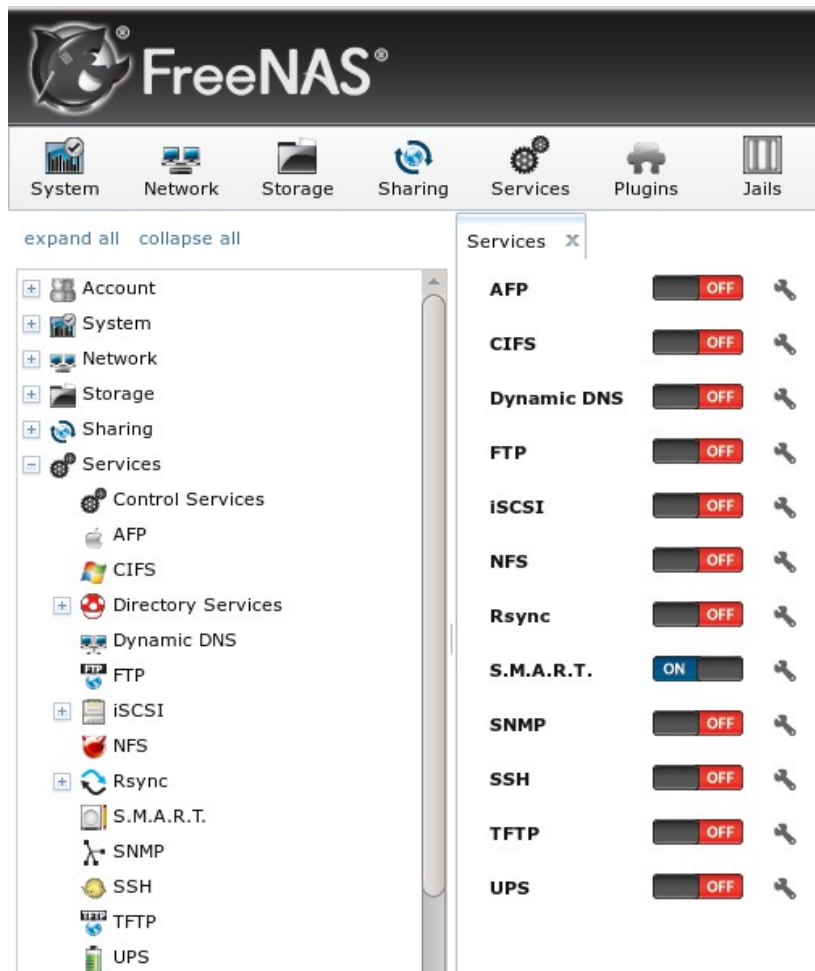


Next, click on Shell and type the following command, replacing *dru* and *volume1/backups* with the name of the user, volume, and dataset that you created:

```
zfs allow -u dru create,receive,mount,userprop,destroy,send,hold volume1/backups
```

Click the x in the upper right corner to close Shell. Then, to enable the SSH service, go to Services → Control Services, shown in Figure 8.19n.

Figure 8.19n: Start SSH in FreeNAS® 9.2.1.8



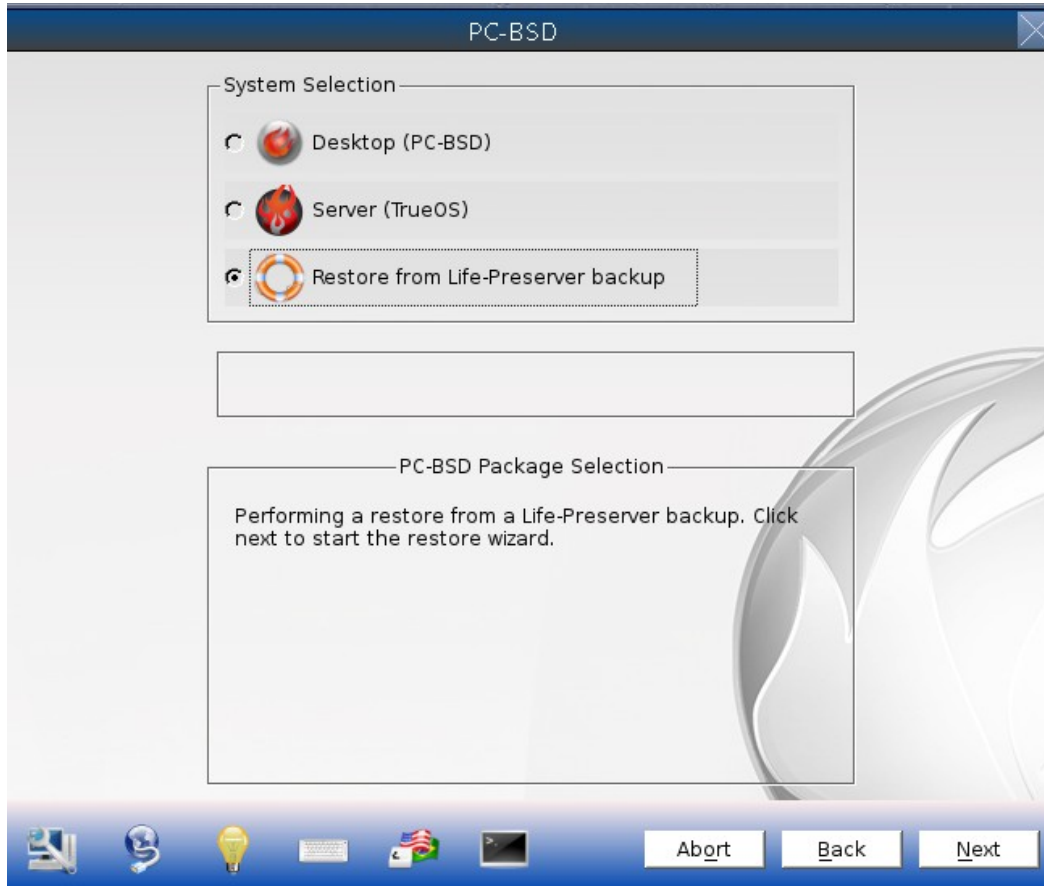
Click the red “OFF” button next to SSH to enable that service. Once it turns to a blue “ON”, the FreeNAS® system is ready to be used as the backup server.

To finish the configuration, go to the PC-BSD® system. In the Life Preserver screen shown in Figure 8.19d, input the IP address of the FreeNAS® system in the “Host Name” field, the name of the user you created in the “User Name” field, and the name of the dataset you created (in this example it is *volume1/backups*) in the “Remote Dataset” field. You should be prompted for the user's password and to save a copy of the SSH key to a USB stick.

8.19.4 Restoring the Operating System From a Life Preserver Backup

If you have replicated the system's snapshots to a backup server, you can use a PC-BSD® installation media to perform an operating system restore or to clone another system. Start the installation as usual until you get to the screen shown in Figure 8.19o.

Figure 8.19o: Selecting to Restore/Clone From Backup



Before you can perform a restore, the network interface must be configured. Click the “network connectivity” icon (second from the left) in order to determine if the network connection was automatically detected. If it was not, [configure the network connection](#) before continuing.

Next, click “Restore from Life-Preserver backup” and the “Next” button. This will start the Restore Wizard. Click “Next” to see the screen shown in Figure 8.19p.

Input the IP address of the backup server and the name of the user account used to replicate the snapshots. If the server is listening on a non-standard SSH port, change the “SSH port” number. Click “Next” to see the screen shown in Figure 8.19q.

Figure 8.19p: Select the Backup Server

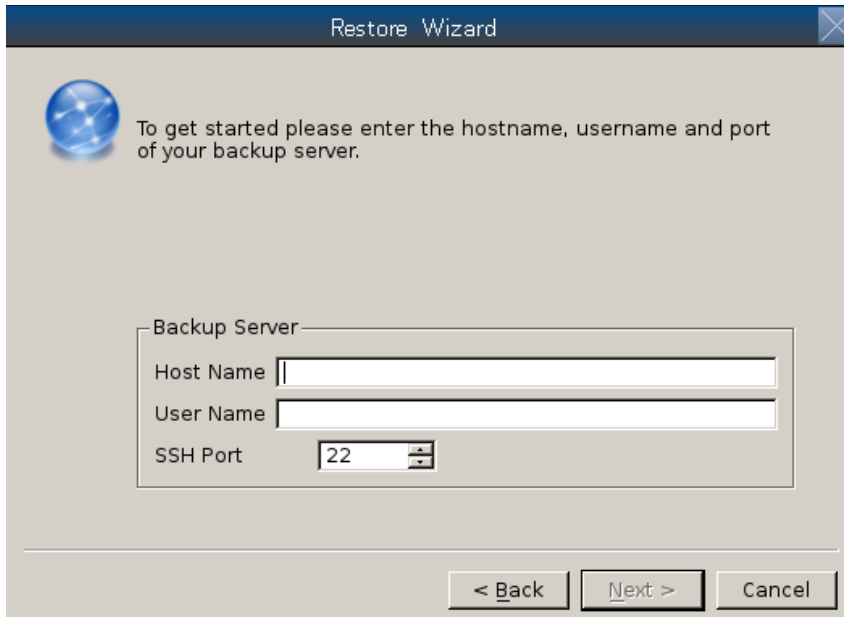
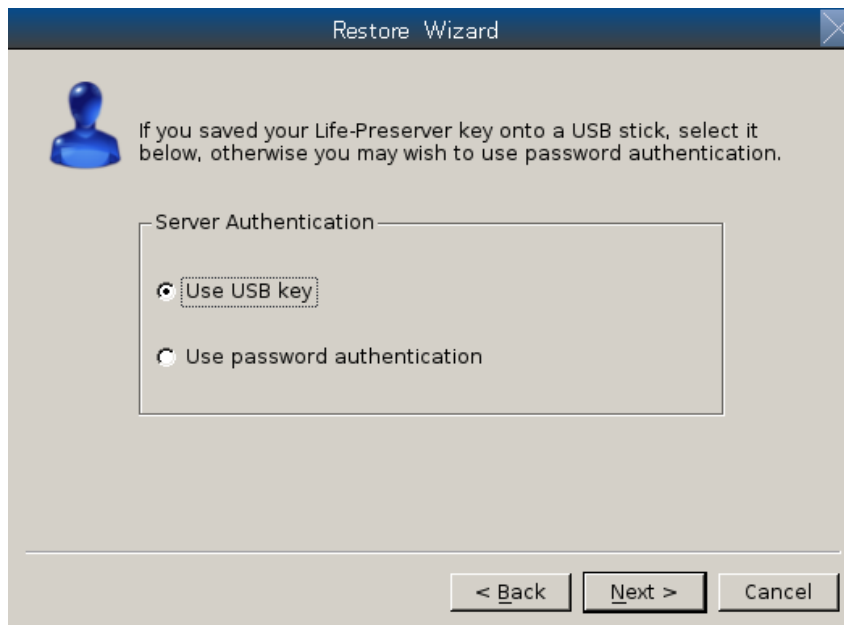


Figure 8.19q: Select the Authentication Method

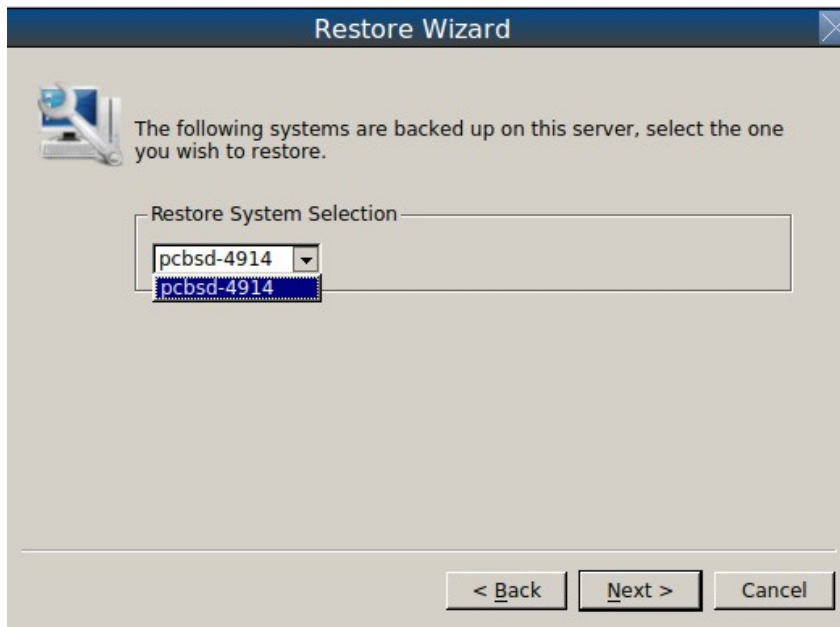


If you previously saved the SSH key to a USB stick, insert the stick then press “Next”. Otherwise, change the selection to “Use password authentication” and press “Next”. The next screen will either read the inserted USB key or prompt for the password, depending upon your selection. The wizard will then attempt a connection to the server.

If the connection succeeds, you will be able to select which host to restore. In the example shown in Figure 8.19r, only one host has been backed up to the replication server. After making your selection, click “Next”. The restore wizard will provide a summary of which host it will restore from, the name of the user account associated with the replication, and the hostname of the target system. Click “Next” and the installer will proceed to the

[Disk Selection Screen](#) shown in Figure 3.3a. At this point, you can click the “Customize” button to customize the disk options. However, in the screen shown in Figure 3.3h, the ZFS datasets will be greyed out as they will be recreated from the backup during the restore. Once you are finished any customizations, click “Next” to perform the restore.

Figure 8.19r: Select the Host to Restore

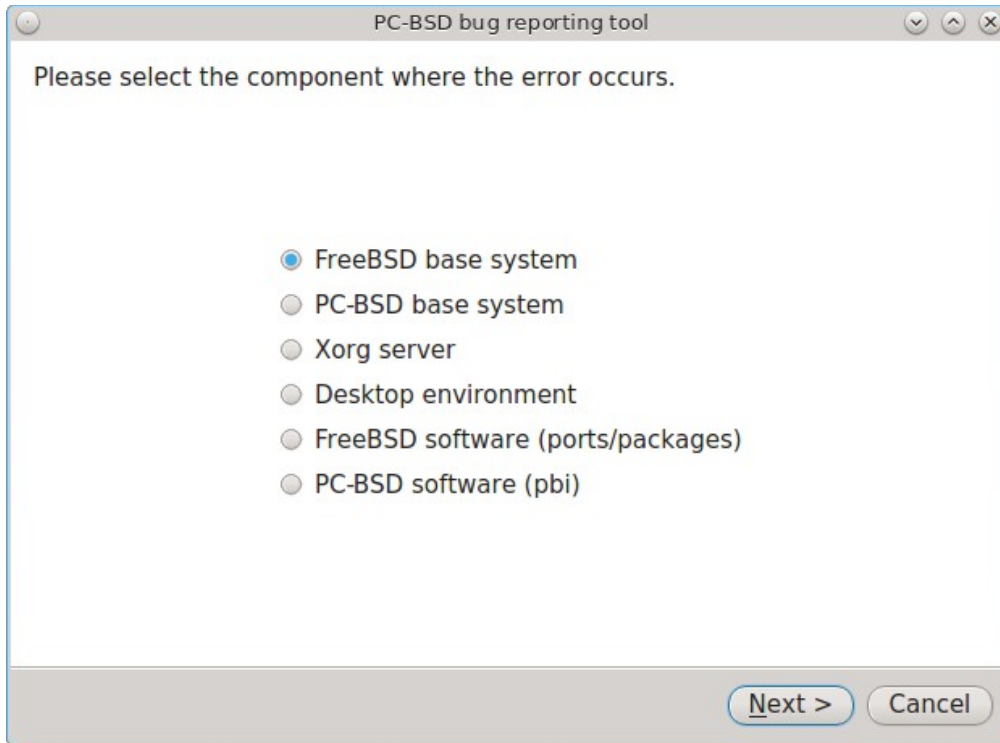


8.20 Report a bug

The bug reporting tool in Control Panel can be used to easily send a bug report to the development team responsible for the software which produced the bug.

To access this tool, go to Control Panel → Report a bug or type **pc-bugreport** from the command line. The initial screen for this tool is shown in Figure 8.20a.

Figure 8.20a: PC-BSD® Bug Reporting Utility

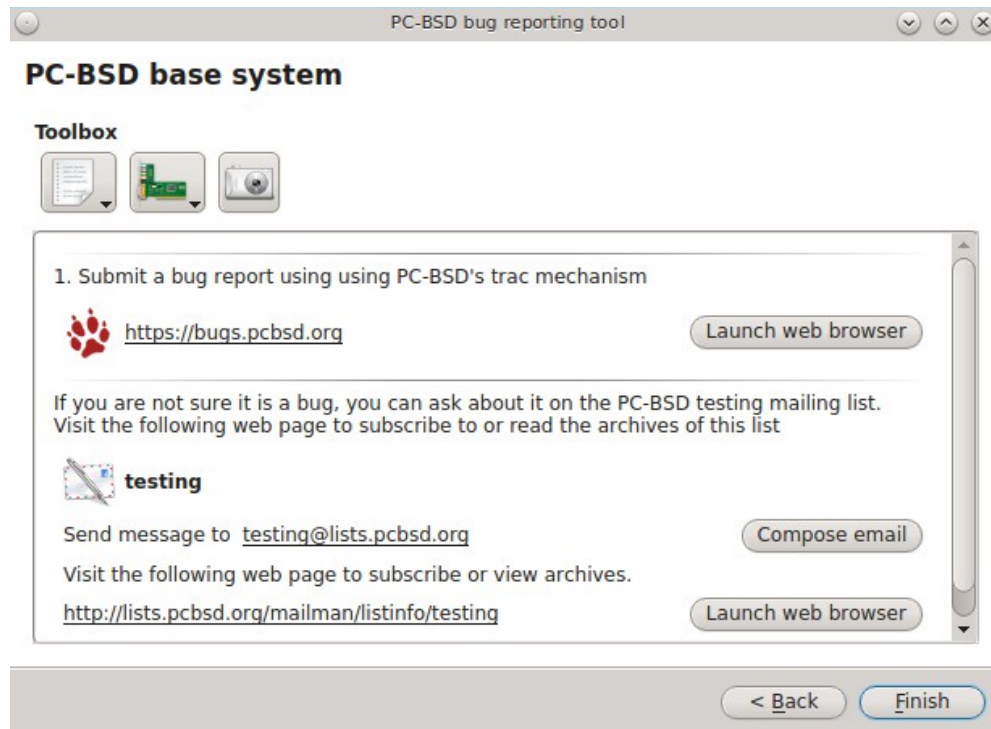


Select the software component that most closely matches where the bug occurs. For example, if the bug occurs when using a KDE utility, select “Desktop environment”, or if the bug occurs when using an application that was installed using AppCafe®, select “PC-BSD software (pbi)”. When in doubt, select “PC-BSD base system”.

In the example shown in Figure 8.20b, the user has selected “PC-BSD base system” then “Next”.

NOTE: regardless of the selection, the resulting screen will be similar to 8.20b. The various screens only differ in which bug tracking system or mailing list is used by the development team for that component. If you select “Desktop environment” you will also be asked to indicate which desktop so that the correct information is displayed for that development team. Similarly, if you select “PBI software” you will be asked to select which PBI produces the error.

Figure 8.20b: Reporting a Bug



If the development team has a bug tracker, its URL will be displayed. If you click the “Launch web browser” button, that website will be opened in the default web browser so that you can search for existing bugs and create a new bug if one does not already exist. Note that you will need to register first if this is your first bug and that you must be logged in in order to create a new bug.

If the development team has a mailing list, its email address will be listed. The URL to the mailing list will also be displayed so that you can search its archives and subscribe to the list. Note that you will need to be subscribed to a mailing list before you can report a bug on that list. To report the bug, click the “Compose email” button to open the default mail application. To subscribe to or read the archives of the list, click the “Launch web browser” button.

The three icons in the “Toolbox” section can be used to gather useful information to include in your bug report. If you click the first icon on the left, a pop-up menu allows you to create any of the following:

- Diagnostic report
- FreeBSD version (`uname -a`)
- **dmesg** output
- Xorg version
- Xorg log

If you click an entry in the menu, the results will be displayed in a window so that you can copy the contents into your bug report.

If you click the second icon, it will generate a PCI devices list. This is useful information if your built-in wireless card is not working.

If you click the third icon, the default snapshot utility for the desktop will open so that you can include a snapshot in your bug report.

8.20.1 Writing Good Bug Reports

While this utility makes it easy to find the correct place to send a bug report, it is still up to you to make sure that your report includes the information that developers need to recreate and eventually fix the bug. The following resources contain useful tips for the various development teams for the bugs you may encounter when using PC-BSD®: Before reporting:

- a bug about the “FreeBSD base system” or “FreeBSD software (ports/packages)”, read through [the FreeBSD Bug Reports page](#).
- a bug about the “Xorg server”, read through the [Xorg FAQ](#).
- a KDE bug, read through [How to file a bug-free bug report in KDE](#).
- a GNOME bug, read through [How to file a bug on GNOME's bugzilla?](#)
- a LXDE bug, read through [Read this first if you want to report a bug or send a patch!](#)
- a XFCE bug, read through [XFCE Bug Reporting](#).

8.21 Warden®

Warden® is an easy to use, graphical [jail](#) management program. Using Warden®, it is possible to create multiple, isolated virtual instances of FreeBSD which can be used to run services such as Apache, PHP, or MySQL in a secure manner. Each jail is considered to be a unique FreeBSD operating system and whatever happens in that jail will not affect your operating system or other jails running on the PC-BSD® system.

Some of the features in Warden® include the ability to:

- create three types of jails: a traditional FreeBSD jail for running network services, a (less secure) ports jail for safely installing and running FreeBSD ports/packages from your PC-BSD® system, and a Linux jail for installing Linux
- set multiple IPv4 and IPv6 addresses per jail
- quickly install common network server applications on a per-jail basis
- update installed software on a per-jail basis
- manage user accounts on a per-jail basis
- manage ZFS snapshots on a per-jail basis
- export a jail which can be then be imported into the same or a different jail

8.21.1 Creating a Jail using the GUI Version of Warden®

Warden® can be started by clicking on its icon in Control Panel or by typing **pc-su warden gui** from the command line. You will be prompted for your password as administrative access is needed to create and manage jails. The initial Warden® configuration screen is shown in Figure 8.21a.

To create your first jail, click the “New Jail” button or go to File → New Jail. A jail creation wizard, seen in Figure 8.21b, will launch.

Figure 8.21a: Initial Warden® Screen

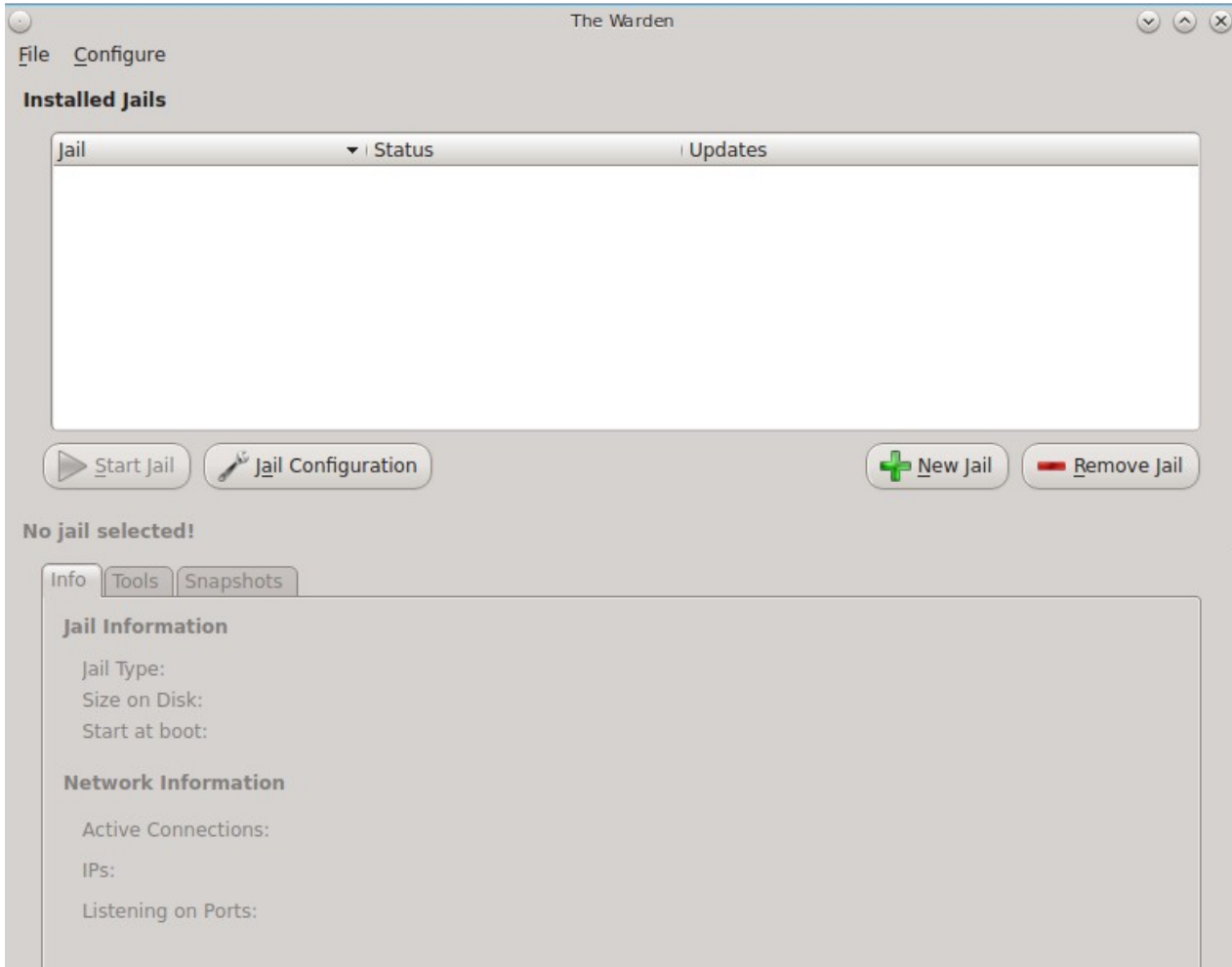


Figure 8.21b: Creating the New Jail



The first screen in the jail creation wizard will prompt you for the following information:

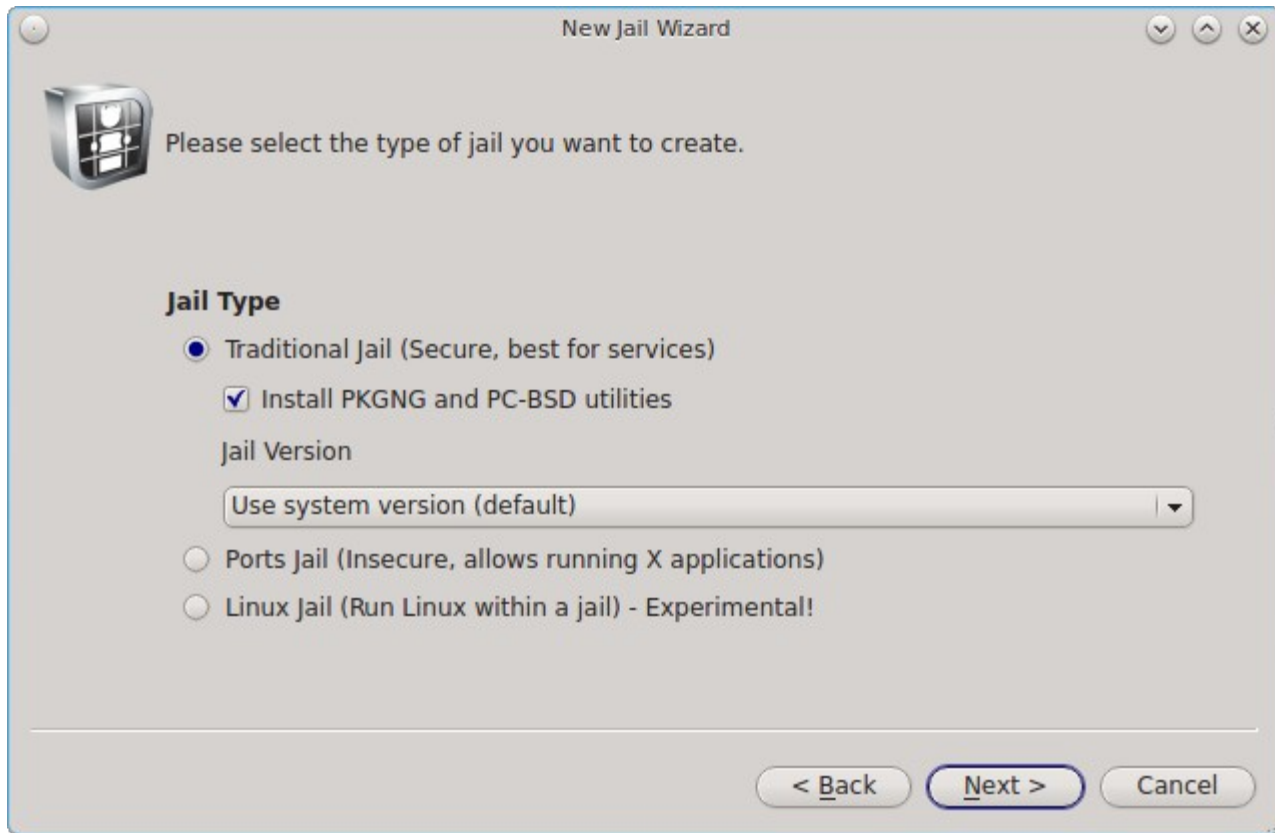
Hostname: you can change the default of “Jailbird” to another value. The hostname must be unique on your network and can not contain a space. Use a hostname that reminds you of the type of jail and your reason for creating it.

IPv4 Address: if you plan to access the jail and its contents using IPv4, input the IPv4 address to be used by the jail and access its contents. Choose an address on your network that is not already in use by another computer or jail and which will not conflict with the address range assigned by a DHCP server.

IPv6 Address: if you plan to access the jail and its contents using IPv6, check the “IPv6 Address box and input an IPv6 address that is not already in use by another computer or jail on your network.

When finished, click “Next” to select the type of jail, as shown in Figure 8.21c:

Figure 8.21c: Select the Type of Jail



There are three types of jails supported by Warden®:

Traditional Jail: select this type if you are creating the jail in order to install and run network services. For example, this type of jail is appropriate if you wish to run a web server or a database which is accessible to other systems on a network or over the Internet. This is the most secure type of jail as it is separate from the PC-BSD® host and any other jails that you create using Warden®. By default, FreeBSD's next generation of package management, known as pkgng, and the command line versions of the PC-BSD® utilities are added to a default FreeBSD installation. If you do not plan to use these tools, uncheck the box “Install PKGNG and PC-BSD utilities”. If you have already created a [jail template](#), select the desired operating system version from the “Jail Version” drop-down menu.

Ports Jail: select this type of jail if your intention is to install software using FreeBSD packages and ports and you wish to have access to that software from your PC-BSD® system or if you plan to install any GUI applications within the jail. This type of jail is less secure than a traditional jail as applications are shared between the jail and the PC-BSD® system. This means that you should not use this type of jail to install services that will be available to other machines over a network.

Linux Jail: select this type of jail if you would like to install a Linux operating system within a jail. Linux jail support is considered to be experimental and is limited to 32-bit.

The remaining screens will differ depending upon the type of jail that you select.

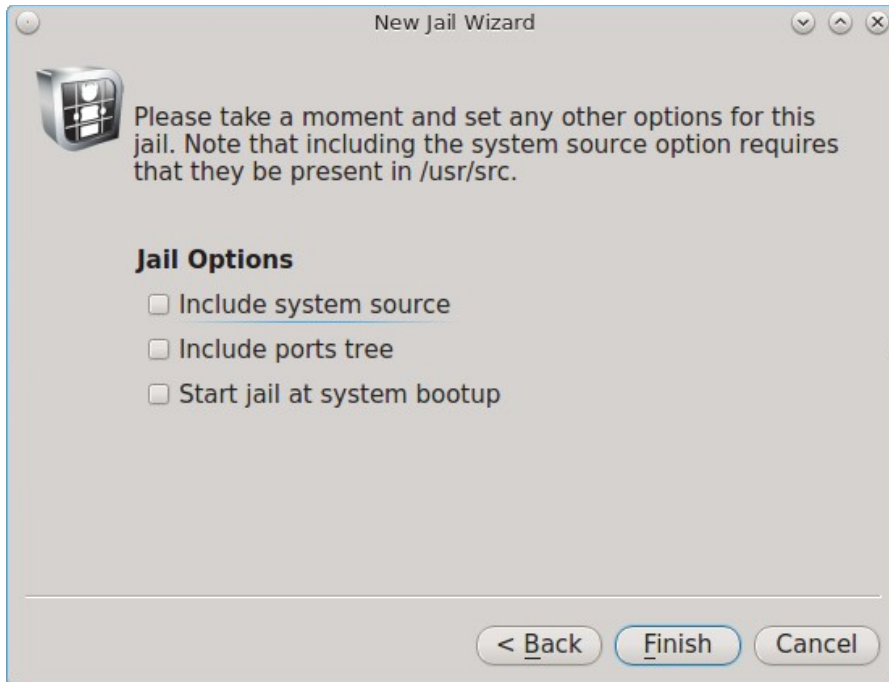
8.21.1.1 Traditional or Ports Jail

If you select “Traditional Jail”, you will be prompted to set the root password as seen in Figure 8.21d. Input and confirm the password then press “Next” to see the screen shown in Figure 8.21e. If you instead select to create a “Ports Jail”, you will go directly to Figure 8.21e.

Figure 8.21d: Setting the Traditional Jail's Root Password



Figure 8.21e: Select the Jail Options



This screen allows you to install the following options:

Include system source: if you check this box, make sure that `/usr/src/` exists on the PC-BSD system as the source is copied to the jail from this location. If it is not installed, use Control Panel → System Manager → [Tasks](#) → Fetch PC-BSD System Source to install it.

Include ports tree: if you check this box, the latest version of the ports tree will be downloaded into `/usr/ports/` of the jail. This will allow you to compile FreeBSD ports within this jail.

Start jail at system bootup: if this box is checked, the jail will be started (become available) whenever you boot your main system. If the box is not checked, you can manually start the jail whenever you wish to access it using Warden®.

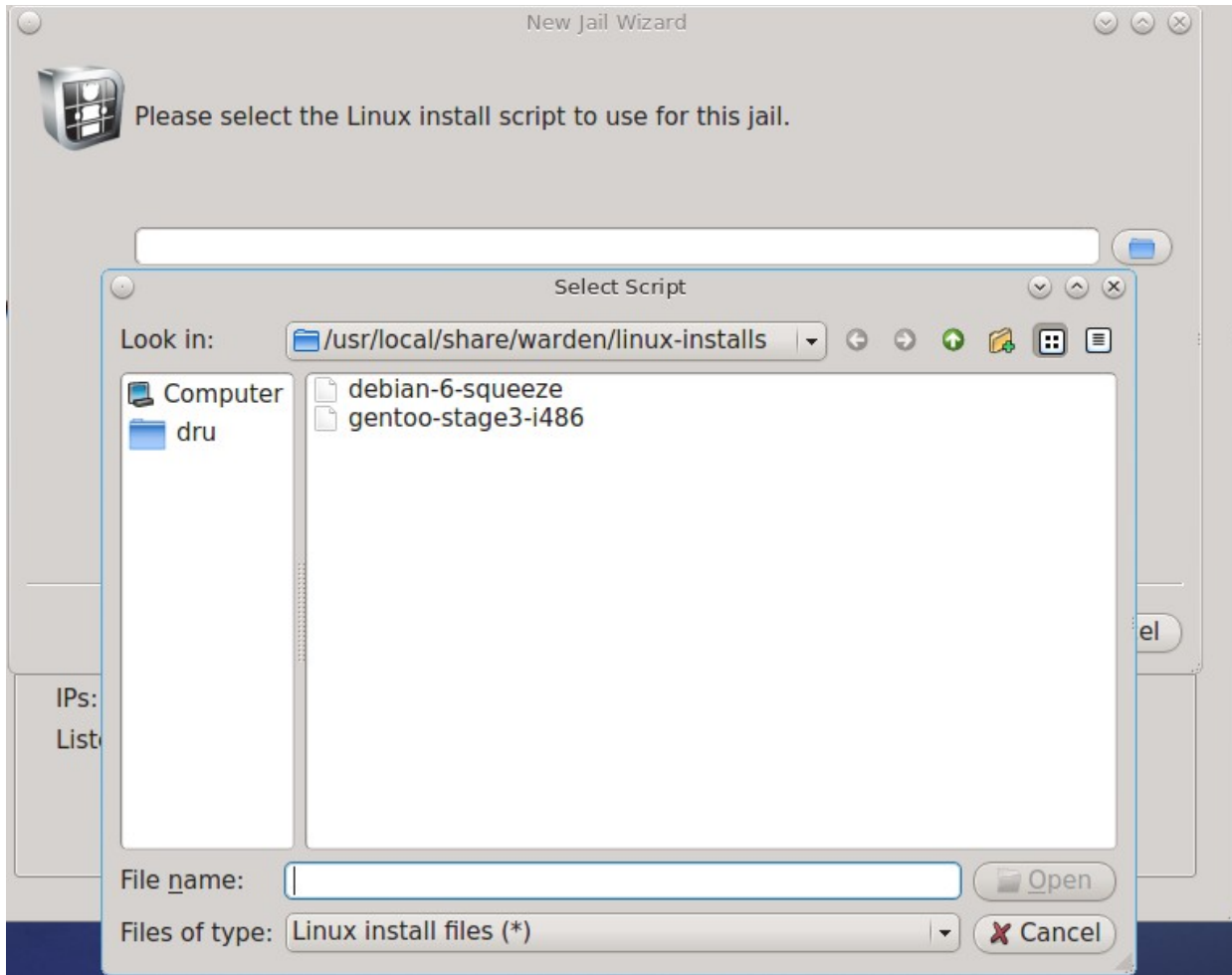
Once you have made your selections, click the “Finish” button to create the jail. Warden® will display a pop-up window containing status messages as it downloads the files it needs and creates and configures the new jail.

Once Warden® is finished creating the jail, a message should appear at the bottom of the pop-up window indicating that the jail has been successfully created. Click the “Close” button to return to the main screen.

8.21.1.2 Linux Jail

If you select the “Linux Jail” and click “Next”, you will be prompted to set the root password as seen in Figure 8.21d. After inputting the password, the wizard will prompt you to select a Linux install script, as seen in Figure 8.21f.

Figure 8.21f: Select the Linux Distribution to Install

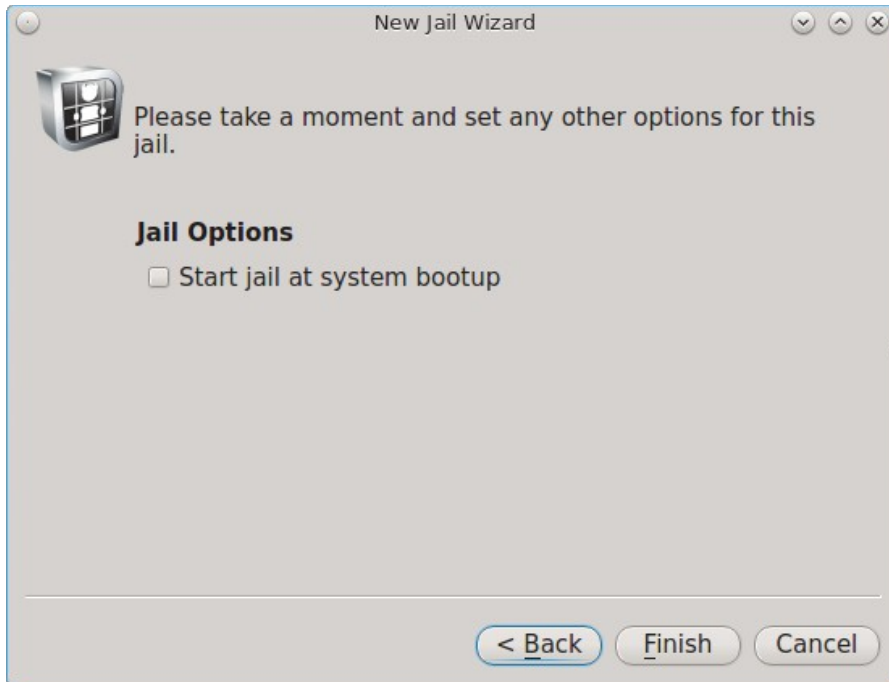


The installation script is used to install the specified Linux distribution. At this time, installation scripts for Debian Squeeze and for Gentoo are provided.

NOTE: a Linux installation script is simply a shell script which invokes a Linux network installation. In the case of Debian Squeeze, it invokes the **debootstrap** command.

Once you select the install script, the wizard will ask if you would like to start the jail at boot time as seen in Figure 8.21g.

Figure 8.21g: Linux Jail Options



Click the “Finish” button to begin the Linux installation.

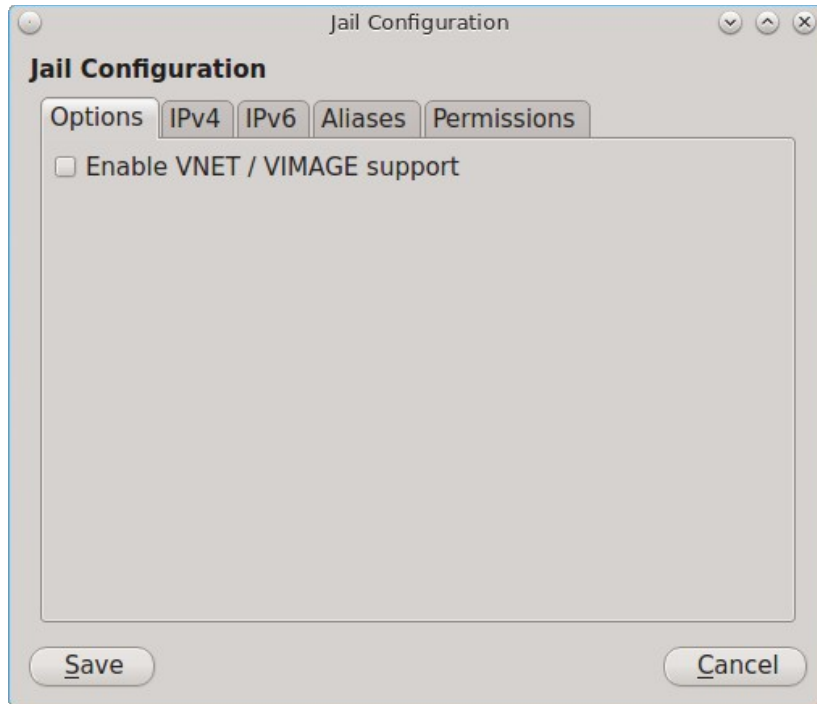
8.21.2 Configuring Existing Jails From the GUI

Once a jail is created, an entry for the jail will be added to the “Installed Jails” box and the tabs within Warden® will become available. Each entry indicates the jail's hostname, whether or not it is currently running, and whether or not any updates are available for the meta-packages installed within the jail. The buttons beneath the “Installed Jails” box can be used to start/stop the highlighted jail, configure the jail, add a new jail, or delete the highlighted jail.

If you highlight a jail and click “Jail Configuration”, the screen shown in Figure 8.21h will open.

The Options tab has one checkbox for enabling or disabling VNET/VIMAGE support. This option provides that jail with its own, independent networking stack. This allows the jail to do its own IP broadcasting, which is required by some applications. However, it breaks some other applications. If an application within a jail is having trouble with networking, try changing this option to see if it fixes the issue.

Figure 8.21h: Jail Configuration Options



The IPv4 tab is shown in Figure 8.21i.

This screen allows you to configure the following:

IPv4 Address: uncheck this box if you do not want the jail to have an IPv4 address.

IPv4 Bridge Address (Requires VNET): if this box is checked, an IP address is input, and the “IPv4 Default Router” box is left unchecked, the bridge address will be used as the default gateway for the jail. If the “IPv4 Default Router” address is also configured, it will be used as the default gateway address and the bridge address will be used as just another address that is configured and reachable. This option requires the “Enable VNET/VIMAGE support” checkbox to be checked in the Options tab.

IPv4 Default Router: check this box and input an IP address if the jail needs a different default gateway address than that used by the PC-BSD® system. This option requires the “Enable VNET/VIMAGE support” checkbox to be checked in the Options tab.

The IPv6 tab is shown in Figure 8.21j.

Figure 8.21i: Jail IPv4 Options

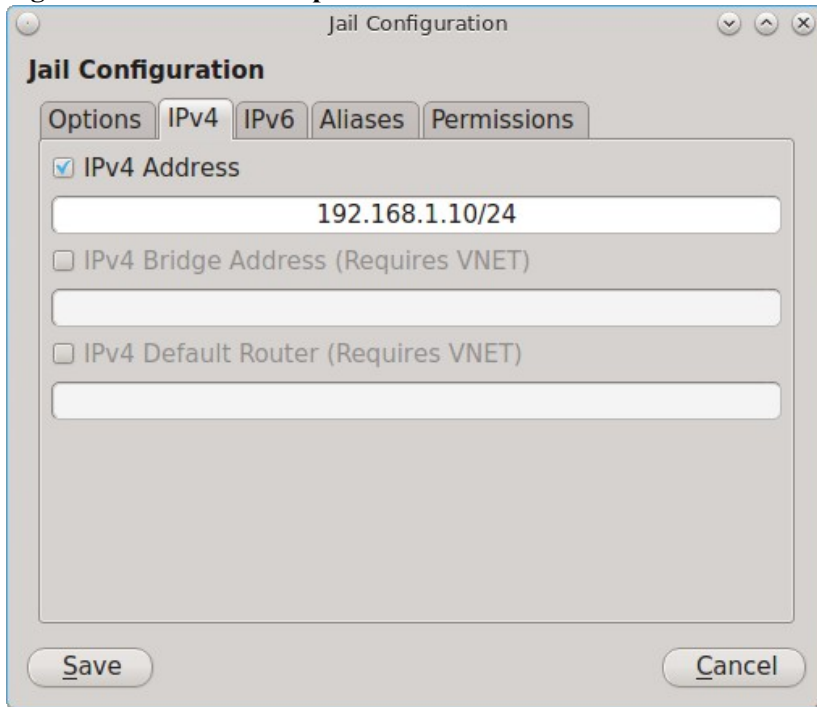
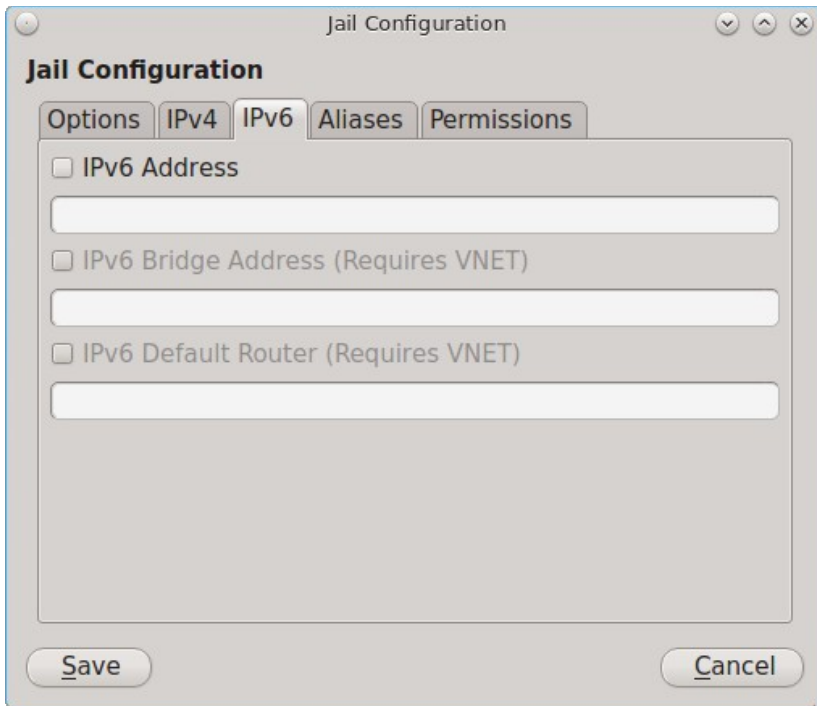


Figure 8.21j: Jail IPv6 Options



This screen allows you to configure the following:

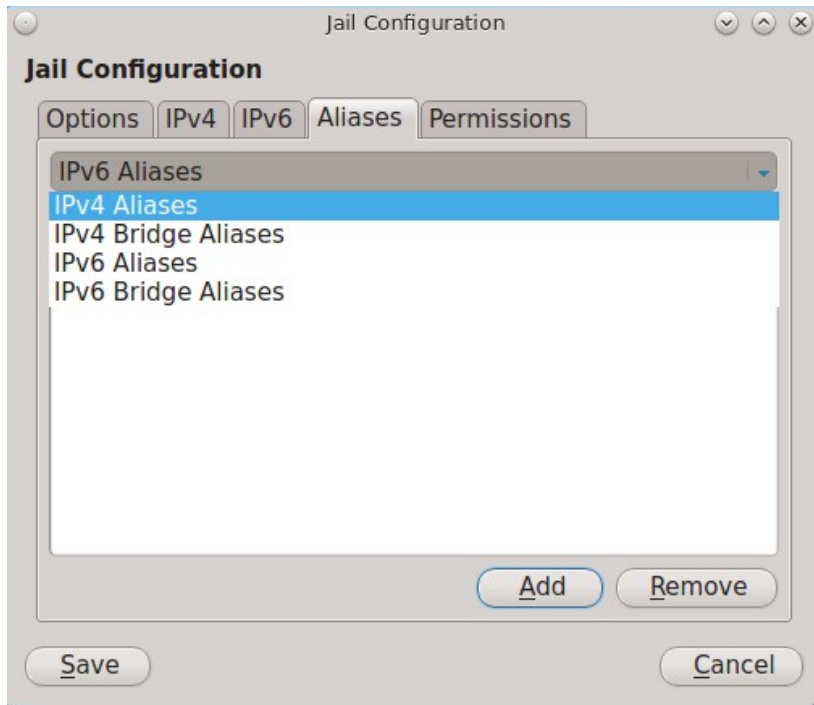
IPv6 Address: check this box if you want the jail to have an IPv6 address.

IPv6 Bridge Address (Requires VNET): if this box is checked, an IPv6 address is input, and the “IPv6 Default Router” box is left unchecked, the bridge address will be used as the default gateway for the jail. If the “IPv6 Default Router” address is also configured, it will be used as the default gateway address and the bridge address will be used as just another address that is configured and reachable. This option requires the “Enable VNET/VIMAGE support” checkbox to be checked in the Options tab.

IPv6 Default Router: check this box and input an IPv6 address if the jail needs a different default gateway address than that used by the PC-BSD® system. This option requires the “Enable VNET/VIMAGE support” checkbox to be checked in the Options tab.

The Aliases tab is shown in Figure 8.21k.

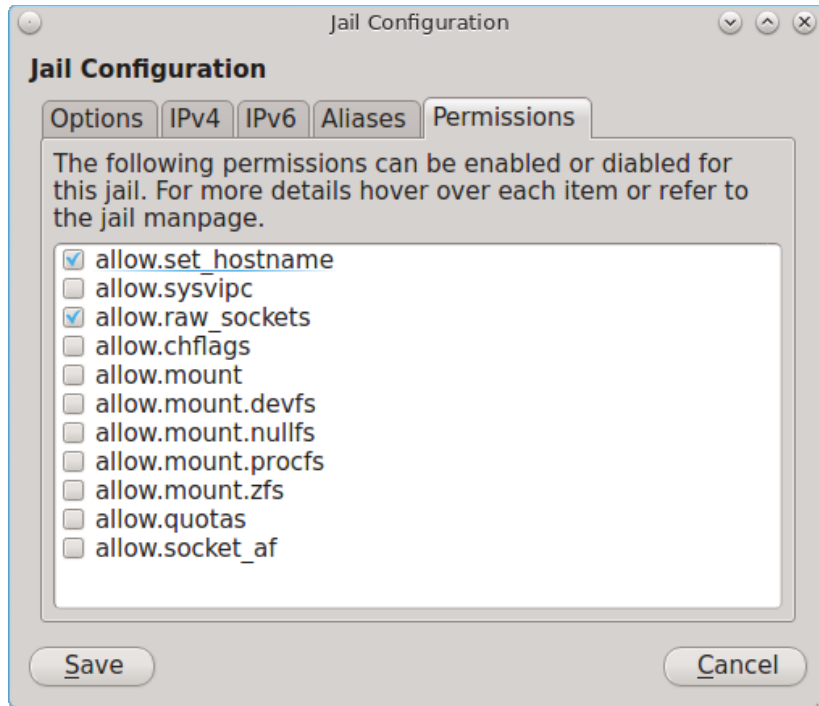
Figure 8.21k: Jail Aliases Options



Click the drop-down menu to see all of the options shown in Figure 8.21l. An alias allows you to add additional IP addresses to an interface. Select the type of address you would like to add an alias to, click the Add button, type in the IP address to add and click OK.

The Permissions tab is shown in Figure 8.21l. This screen can be used to easily enable or disable the sysctl values that are available for jails.

Figure 8.21: Jail Permissions

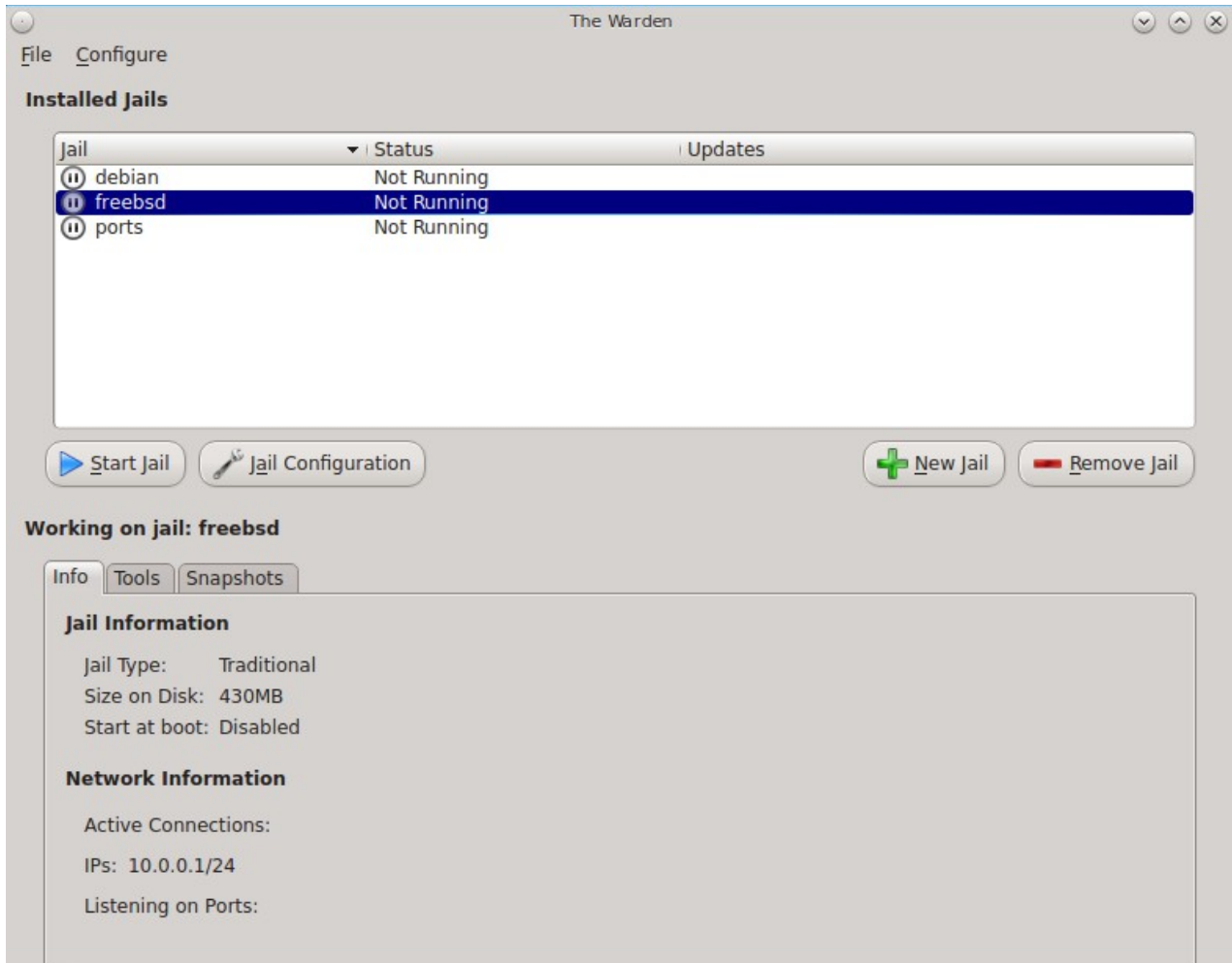


8.21.2.1 Info Tab

The “Info” tab, as seen in the example in Figure 8.21m, provides an overview of a jail's configuration. If you have created multiple jails, the “Info” tab displays the configuration of the currently highlighted jail.

In the example shown in Figure 8.21m, three jails have been created: a traditional jail, a ports jail, and Debian Squeeze has been installed into a Linux jail.

Figure 8.21m: Info Tab of Warden®



The “Info” tab contains the following information:

- **Jail Type:** will indicate if the jail is a Traditional, Ports, or Linux jail.
- **Size on Disk:** indicates the amount of space being used by the jail. The jail itself takes up about 300MB of space, source is about 300MB, and ports are about 850MB.
- **Start at boot:** a status of “Enabled” indicates that the jail will automatically start when the system reboots. “Disabled” means that you will manually start the jail as needed.
- **Active Connections:** will list the number of active connections to the jail (e.g. through ssh or one of the running services).
- **IPs:** lists the jail's IP address as well as any configured aliases.
- **Listening on Ports:** indicates which ports are currently listening for connections.

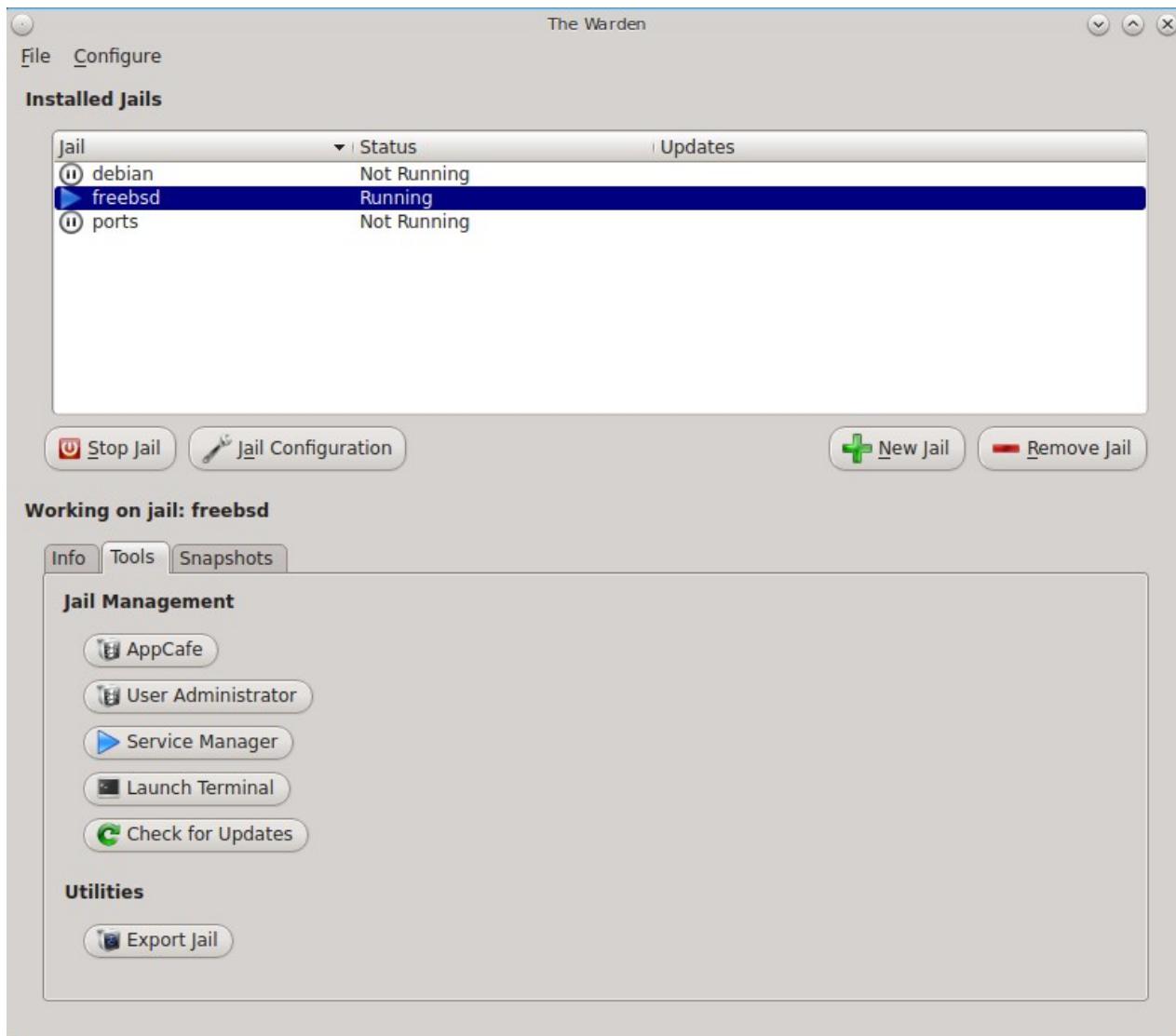
You can sort the jail listing by clicking on the “Jail”, “Status”, or “Updates” header name. The “Updates” column will indicate if a software or system update is available for a jail.

8.21.2.2 Tools Tab

The “Tools” tab, shown in Figure 8.21n, allows you to manage common configuration tasks within a jail.

NOTE: make sure that the desired jail is highlighted when using the “Tools” tab.

Figure 8.21n: Tools Tab for the Highlighted Jail



This tab provides the following buttons:

- **AppCafe:** opens [AppCafe®](#) so that you can install packages within the specified traditional or ports jail. Software installed using this method will be tracked by [Update Manager](#), meaning that Warden® will be notified when updates are available for the installed software. Since BSD-based packages are not available for Linux jails, this button is not available if a Linux jail is highlighted.

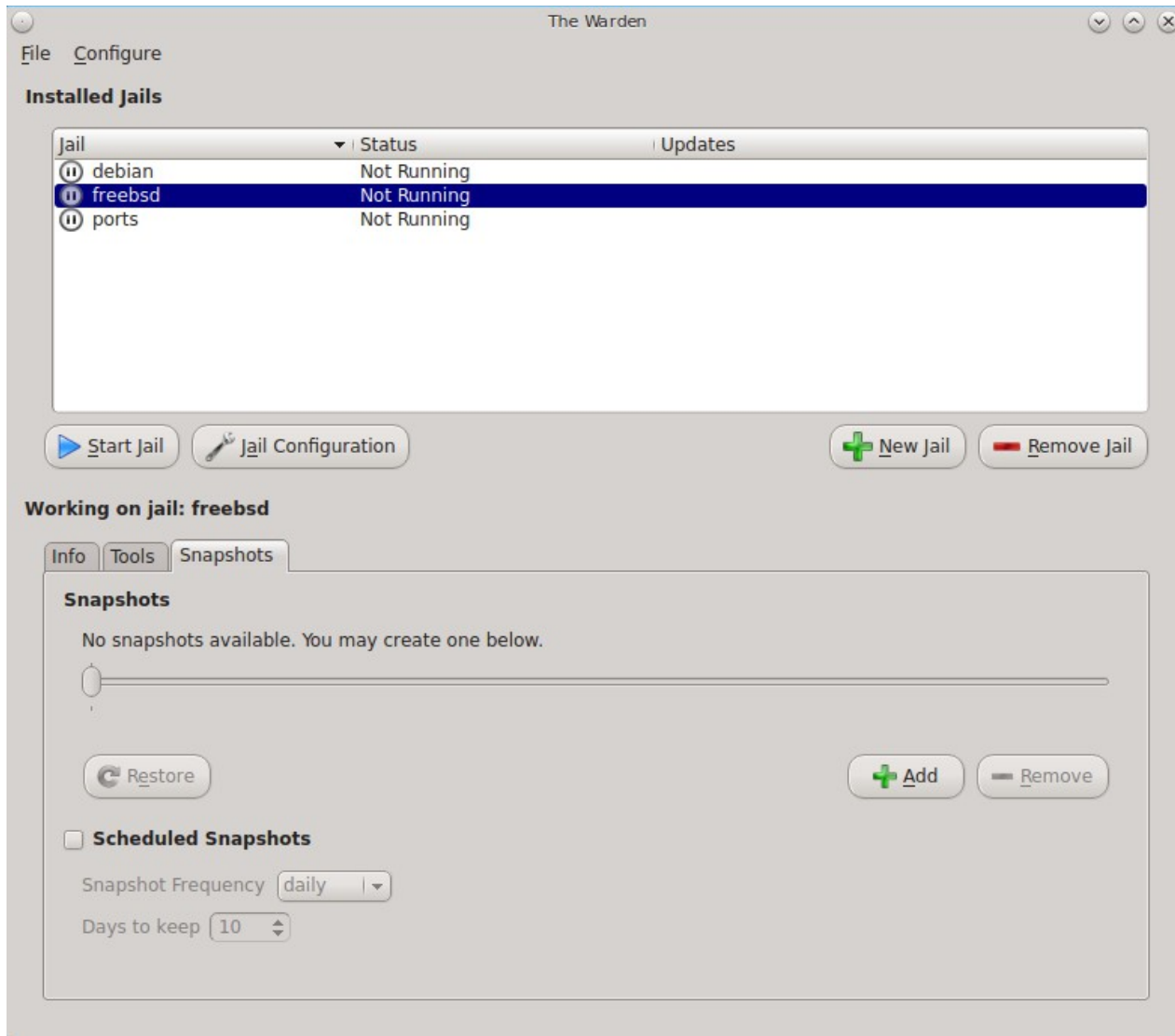
- **User Administrator:** opens [User Manager](#) so that you can manage the highlighted jail's user accounts and groups. The title bar will indicate that you are “Editing Users for Jail: Jailname”. Note that any users and groups that you have created on your PC-BSD® system will not be added to a traditional jail as each traditional jail has its own users and groups. However, a ports jail has access to the users and groups that exist on the PC-BSD® system, yet the users you create on a ports jail will only be available within the ports jail. This button is not available if a Linux jail is highlighted.
- **Service Manager:** opens [Service Manager](#) so that you can view which services are running in the jail and configure which services should start when the jail is started. Note that this button is not available if a Linux jail is highlighted.
- **Launch Terminal:** opens a terminal with the root user logged into the jail. This allows you to administer the jail from the command line. This button will be greyed out if the highlighted jail is not running. You can start a jail by right-clicking its entry and selecting “Start this Jail” from the menu or by clicking “Start Jail”.
- **Check for Updates:** launches [Update Manager](#) to determine if any system updates are available to be installed into the jail. Note that this button is not available if a Linux jail is highlighted. By default, Update Manager automatically checks for updates every 12 hours to see if there are any system updates or if any of the applications installed within a ports or traditional jail have newer versions. If an update is found, the text “Updates available!” will appear in the “Updates” column for that jail.
- **Export Jail:** launches a pop-up window prompting you to choose the directory in which to save a backup of the jail (and all of its software, configuration, and files) as a *.wdn* file. Creating the *.wdn* file may take some time, especially if you have installed src, ports, or software.

8.21.2.3 Snapshots Tab

The “Snapshots” tab, shown in Figure 8.21o, is used to create and manage ZFS snapshots within the currently highlighted jail. The ZFS snapshot feature can be used to make point in time filesystem backups of jails. A snapshot is essentially a picture of what the filesystem looked like at that point in time. Snapshots are space efficient in that they take up zero space when created and the snapshot only grows in size as files contained within the snapshot are modified after the snapshot was taken. In other words, ZFS manages the changes between snapshots, providing a way to return to what a file looked like at the time a snapshot was taken.

Since jails share the filesystem used by PC-BSD®, any type of jail, including a Linux jail, can take advantage of this ZFS feature.

Figure 8.21o: Snapshots Tab for the Highlighted Jail



To create a snapshot of the jail, click the “+Add” button. A snapshot indicating the date and time will be added to the slider bar. If you create multiple snapshots at different times, use the slider bar to select a snapshot.

Once you have created a snapshot, the following actions can be used to manage the snapshot. Make sure that the desired snapshot is highlighted in the slider bar before clicking these buttons:

- **Restore:** returns the system to what it looked like at the time the snapshot was taken. *Think about what you wish to accomplish before using this option* as any changes to files that occurred after the snapshot was taken will be lost.
- **Add:** use this button to create additional snapshots.
- **Remove:** use this button to remove the highlighted snapshot.

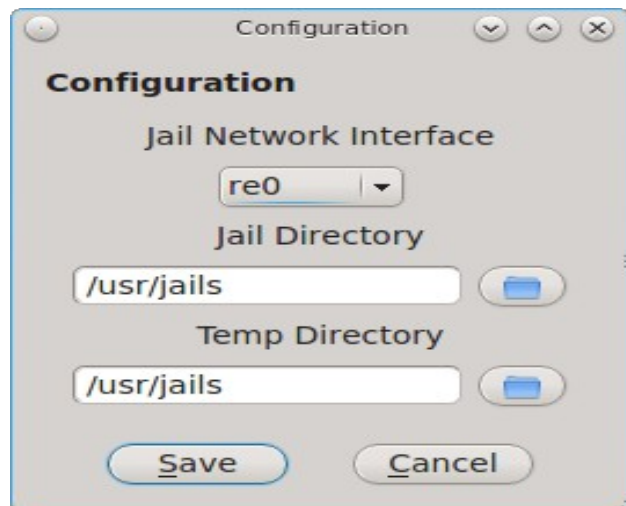
This screen also allows you to schedule automatic snapshots. To enable this feature, check the box “Scheduled Snapshots”. Use the drop-down menu to set the frequency to daily or hourly. You can also type in or use the arrows to configure the number of days to keep each snapshot.

8.21.2.4 Configure Menu

To refresh the settings for all jails, use Configure → Refresh Jails.

To configure Warden®, click Configure → Settings which will open the screen shown in Figure 8.21p.

Figure 8.21p: Warden® Configuration



This screen allows you to configure the following:

- **Jail Network Interface:** all jails created within Warden® share the same physical interface. Use the drop-down menu to select the network interface to be used by the jails. Note that *your jails may not work if the wrong interface is configured*.
- **Jail Directory:** contains all of the created jails where each jail has its own sub-directory named after its IP address. By default, it is `/usr/jails`. If you change this directory, make sure the location has sufficient space to hold the jails.
- **Temp Directory:** used when exporting and importing jails. Make sure that the directory has sufficient space to create a tar file of the jail and its contents.

8.21.2.5 Right-Click Menu

If you highlight a jail, its right-click menu contains the following options:

- **Start or Stop this Jail:** allows you to start a jail (if it is currently not running) or to stop a jail (if it is currently running). You will not be able to access a jail that has not been started. The icon next to the jail will change to indicate the current status.
- **Toggle Autostart:** toggles a jail's Autostart between “Disabled” (does not automatically start when the PC-BSD® system is booted) and “Enabled” (will start the jail when the PC-BSD® system is booted). The “Info” tab will be updated to indicate the new “Start at boot” status. Note that toggling autostart will not affect the current running status of the jail (i.e. it does not start or stop the jail right now) as autostart is only used when the system boots.
- **Export jail to .wdn file:** allows you to save the jail (and all of its software, configuration, and files) as a `.wdn` file. This allows you to quickly clone a pre-configured jail to a new jail on either the same or another PC-BSD® system. The exported jail will end with a `.wdn` extension and the filename will be the IP address of the jail. When exporting a jail, a pop-up window will prompt you to choose the directory in

which to store the backup. A progress bar will indicate that the export is in progress. Creating the *.wdn* file may take some time, especially if you have installed *src*, ports, or software.

NOTE: you should close all network connections to the jail before exporting it as Warden® will need to stop the jail in order to back it up. If your jail is running services (e.g. a webserver), export the jail at a time that will least impact network connections to the jail.

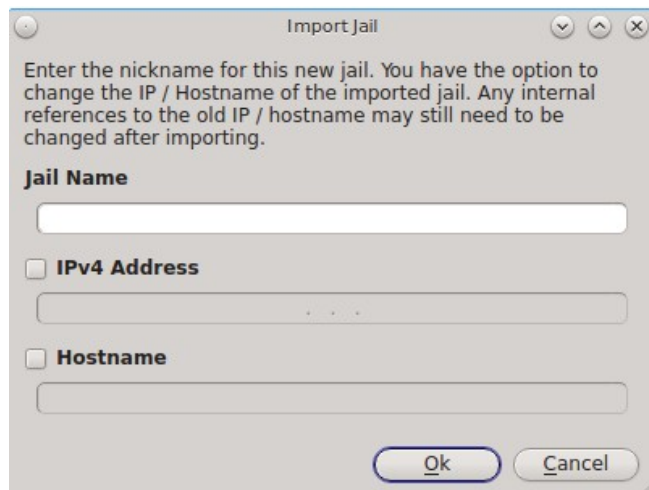
- **Clone this Jail:** creates an instantaneous copy of the specified jail. It will prompt for a hostname for the new jail. Highlight the new clone and click “Jail Configuration” to set the addressing information for the new jail.
- **Delete Jail:** removes the jail and all of its contents from the PC-BSD® system. You will be prompted to confirm this action.

8.21.2.6 Importing a Jail

The “File” menu can be used to create a new jail, import a jail, create templates, or exit Warden®.

If you click File → Import Jail you will be prompted to browse to the location of a previously created *.wdn* file. After selecting the file, you will then see the screen shown in Figure 8.21q.

Figure 8.21q: Importing a Jail



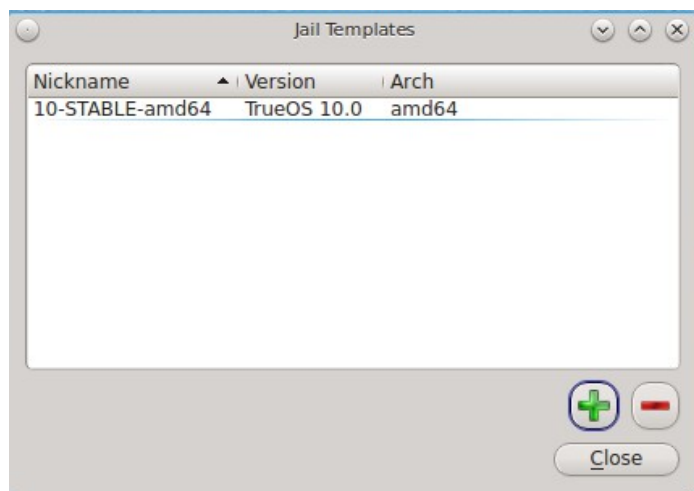
Input a name for the new jail. If you are creating a new jail on the same system that still has the original jail installed, check the “IPv4 Address” box and input an unused IP address for the new jail. Then, check the box “Hostname” and input an unused hostname for the new jail. However, if you have deleted the original jail or need to restore that same jail on another computer (for example, there was a hardware failure on the system containing the original jail), you can choose to leave both boxes unchecked and to reuse the same IP address and hostname. Once you press OK, Warden® will recreate the jail with all of the original settings. Whether or not those settings include the original IP address and hostname depends upon your selections.

8.21.2.7 Using Template Manager

The built-in template manager can be used to create and manage jail templates. Once created, templates can be used when installing a new jail. A template specifies the version and architecture of FreeBSD to be used as the operating system running in the jail. Templates have been tested from FreeBSD versions 4.1.1 to FreeBSD-CURRENT. Until you create your own templates and specify them during jail creation, the default version and architecture of the operating system used in the jail will be the same as that running on the PC-BSD® system.

To create a template, click File → Template Manager to see the screen shown in Figure 8.21r.

Figure 8.21r: Template Manager

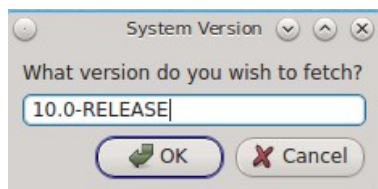


The default icon will indicate the version of TrueOS® used by the underlying PC-BSD® system. To create a new template, click the + button. In the “System Type” drop-down menu select either:

- **TrueOS:** adds the command line versions of the PC-BSD® utilities to the FreeBSD base.
- **FreeBSD:** uses only the FreeBSD base without any of the PC-BSD® utilities.

Press OK to see the screen shown in Figure 8.21s.

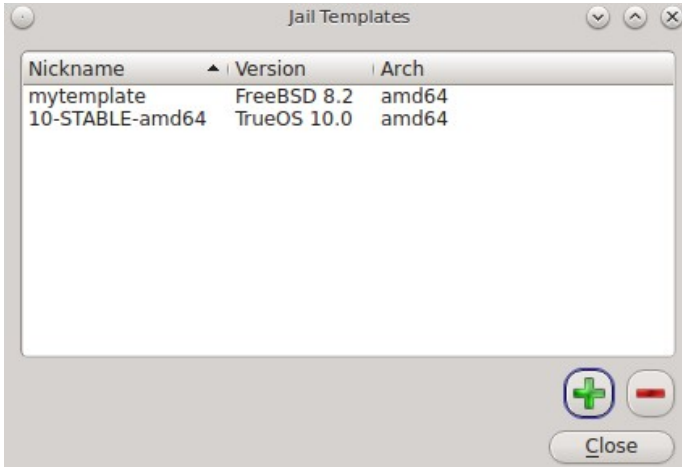
Figure 8.21s: Select the Operating System Version



If desired, change the *10.0* in this example to the release number to use. If you selected *FreeBSD* as the system type, a list of available release numbers can be found [here](#). If you selected *TrueOS*, the list of available release numbers is currently limited to 9.0, 9.1, 9.2, 9.3, 10.0, and 10.1.

Press OK. In the “System Architecture” drop-down menu, select either *amd64* (for 64-bit) or *i386* (for 32-bit). Press OK and input a nickname for the template. Click OK and the files needed for that version will be downloaded. Once the template is created, it will appear in the Template Manager as seen in the example in Figure 8.21t.

Figure 8.21t: New Template Added



To delete a template, highlight it and click the - button. Note that Warden® will not let you delete a template if any jails exist which are using the template.

To use the template when creating a new jail, click the “Jail Version” drop-down menu shown in Figure 8.23c and select the desired template.

8.21.3 Using the Command Line Version of Warden®

The Warden® GUI is based on a Bourne shell script. This script can be manually run from the command line on a PC-BSD® server or by users who prefer using the command line. Advanced users can also refer to the command line version in their own scripts.

If you type **warden** at the command line, you will receive a summary of its usage:

warden

Warden version 1.4

Available commands

Type in help <command> for information and usage about that command

- help - This help file
- gui - Launch the GUI menu
- auto - Toggles the autostart flag for a jail
- bspkgng - BootStrap pkgng and setup TrueOS repo
- checkup - Check for updates to a jail
- chroot - Launches chroot into a jail
- create - Creates a new jail
- details - Display usage details about a jail
- delete - Deletes a jail
- export - Exports a jail to a .wdn file
- fstab - Start users \$EDITOR on jails custom fstab
- get - Gets options list for a jail
- import - Imports a jail from a .wdn file
- list - Lists the installed jails
- pkgs - Lists the installed packages in a jail
- pbis - Lists the installed pbi's in a jail
- set - Sets options for a jail
- start - Start a jail

```

    stop - Stops a jail
    type - Set the jail type (pbibox|pluginjail|portjail|standard)
template - Manage jail templates
    snap - Jail snapshot management
    clone - Clone an existing jail to a new jail
cronsnap - Schedule snapshot creation via cron

```

Each command has its own help text that describes its parameters and provides a usage example. For example, to receive help on how to use the **warden create** command, type:

```
warden help create
```

```
Warden version 1.4
```

```
-----
```

```
Help create
```

```
Creates a new jail, with options for system source, ports and autostarting.
```

```
Available Flags:
```

```

-32                Create 32bit jail on 64bit system
--autoipv4         Use the next available IPv4 address from the pool
--ipv4=<ip/mask>   Set primary IPv4 address for jail
--ipv6=<ip/mask>   Set primary IPv6 address for jail
--archive <tar>    Use specified tar file for BSD jail creation
--bulk <number>    Create <number> of new jails, using default IP4 pool or
                  address pool specified with --ip4pool
--ip4pool <address> Starting IPv4 address to use when creating jails in bulk
--linuxjail <script> Make this a linux jail and use supplied script for
                  installation
--linuxarchive <tar> Use specified tar file for Linux jail creation
--pluginjail       Make this a pluginjail
--ports            Includes the ports tree
--portjail         Make this a portjail
--src              Includes /usr/src system source
--startauto       Start this jail at system boot
--template <string> Specify a jail template to build with
--vanilla          Don't install PC-BSD pkgng repo and utilities
--version <string> Use this instead of /etc/version

```

```
Usage:
```

```
warden create <JAILNAME> <flags>
```

```
Example:
```

```
warden create jailbird --ipv4=192.168.0.25/24 --src --ports --startauto
```

You do not need superuser access to use the view commands but will for any commands that create or manage a jail. The **warden** command will display an error message if a command requires superuser access and you currently are not the superuser. On PC-BSD®, you can put **pc-su** at the beginning of the **warden** command to be prompted for your password. On a FreeBSD server, you can type **su** to become superuser, then repeat the **warden** command.

8.21.3.1 Creating and Accessing a Jail

Before creating a jail, verify the network settings in */usr/local/etc/warden.conf*.

```

#!/bin/sh
# Configuration options for the Warden
#####
# Network Interface for the jails to use
NIC:

# Directory to use for compressing / decompressing files
WTMP: /usr/jails

# Location of the jails
JDIR: /usr/jails

# When automatically creating jails with unspecified IPv4 addresses, use this
# address at the starting point for new addresses
IP4POOL: 192.168.0.220

```

You can either specify the FreeBSD interface name to use in the *NIC* field or specify the IP address range starting point with the *IP4POOL* field. When using *IP4POOL* on a network containing a DHCP server, ensure that the DHCP server has reserved the range of addresses to be used by jails in order to prevent IP address conflicts.

To create a jail, specify a unique IP address and hostname for the jail:

```

warden create jail1 -ipv4 10.0.0.1
DEF: 10.1-RELEASE amd64
Fetching jail environment. This may take a while...
<snip download messages>
Creating ZFS tank/usr/jails/.warden-template-10.1-RELEASE-amd64 dataset...
Creating jail template: 10.1-RELEASE-amd64
Building new Jail... Please wait...
<snip install messages>
Extracting ports overlay data...DONE
Extracting server overlay data...DONE
Success!
Jail created at /usr/jails/jail1

```

Before you can access the jail, you will need to start it:

```
warden start jail1
```

As the jail starts, the SSH host keys will be generated and **sshd** will start. At this point, you can use the **warden chroot** command to access the jail from the host system. Alternately, to access the jail over the network using **ssh**, you will need to first create a user account.

To access the jail in order to create that user:

```

warden chroot jail1
Started shell session on jail1 . Type exit when finished.
adduser

```

Follow the prompts of the **adduser** script in order to create a user. When you get to the following prompt, do not press enter. Instead type in *wheel* so that the user can use the **su** command to become the superuser within the jail.

```
Login group is username. Invite username into other groups? [] wheel
```

When you are finished creating the user, you can type **exit** to exit the jail. Test that **ssh** works by specifying the username that you created:

```
ssh username@jail1
```

To create multiple jails simultaneously, use the **--bulk <number>** and **--ip4pool <starting address>** options to specify the number of jails and the starting IP address. Alternately, instead of **--ip4pool**, use the **--autoipv4** option as it automatically assigns the next available IP address from the pool, as defined by the *IP4POOL* option in */usr/local/etc/warden.conf*.

8.21.3.2 Managing Jails From the Command Line

Table 8.21a shows the command line equivalents to the graphical options provided by the Warden® GUI. To get usage examples for each command, insert **help** into the command. For example, to get help on the **auto** command, type **warden help auto**. Note that some options are only available from the command line.

Table 8.21a: Command Line and GUI Equivalents

Command Line	GUI	Description
auto	right-click highlighted jail and click Autostart	toggles the jail's autostart between Enabled and Disabled
bspkng	in the GUI, this happens automatically during jail creation unless “Install PKGNG and PC-BSD utilities” is unchecked	adds the PC-BSD® utilities to an existing jail
checkup	in the GUI, update checks occur automatically and any un-applied updates are shown in the Updates column	checks for updates to either the specified jail or all jails
chroot	Tools → Launch Terminal	opens a terminal with the root user logged into the jail
create	+ button or File → New Jail	creates a new jail with specified attributes
details	Info tab	provides an overview of specified jail's configuration
delete	- button or right-click jail → Delete Jail	deletes the specified jail
export	right-click → Export jail to .wdn file	saves the specified jail and all of its software, configuration, and files as a .wdn file.
fstab		opens the jail's <i>/etc/fstab</i> in an editor
get	configure (wrench) icon for highlighted jail	lists the various IP addresses used by the jail
import	File → Import Jail	import a previously created .wdn file
list	“Installed Jails” section of GUI	list all jails
pkgs	Tools → AppCafe	lists packages installed into specified jail
pbis		list PBIs installed into specified jail
set	right-click jail	used to set options, addresses, aliases, and permissions in specified jail
start	right-click jail → Start this Jail	starts the specified jail
stop	right-click jail → Stop this Jail	stops the specified jail
type	“Jail Type” during jail creation	types differ as choices are <i>pbibox</i> , <i>portjail</i> ,

Command Line	GUI	Description
		<i>pluginjail</i> , or <i>standard</i> ; to create a Linux jail, instead use the <i>linuxjail</i> option with the create command
template	File → Template Manager	used to create, delete, or list templates
snap	Snapshots	snapshot management for specified jail
clone	right-click → Clone this Jail	clones an existing jail
cronsnap	Snapshots → Scheduled Snapshots	schedules ZFS snapshot creation

9 Using PC-BSD®

This section discusses how to perform common tasks that were not discussed in the [Control Panel](#) section. This section contains the following categories:

- [Java, Flash, and Fonts](#)
- [Multimedia](#)
- [Files and File Sharing](#)
- [Windows Emulation](#)
- [Remote Desktop](#)
- [Thin Client](#)
- [Security](#)
- [Accessibility](#)

9.1 Java, Flash, and Fonts

This section demonstrates how to install and configure Java, Flash, and fonts to improve your desktop experience.

9.1.1 Java

The IcedTea-Web PBI provides an open source Java browser plugin which automatically works with the FireFox, Chromium, and Opera web browsers without any additional configuration. To install this PBI, search for “iced” within [AppCafe®](#).

9.1.2 Adobe Flash

PC-BSD® installs and configures the Adobe Flash player (version 11) plugin for you. This means that flash should “just work” when browsing the web. You will find several web browsers in the Web Browsers category of AppCafe®, including Firefox, Opera, and Chromium.

If Adobe Flash does not seem to be working, running the following command as your regular user account should fix the problem:

```
flashpluginctl on
```

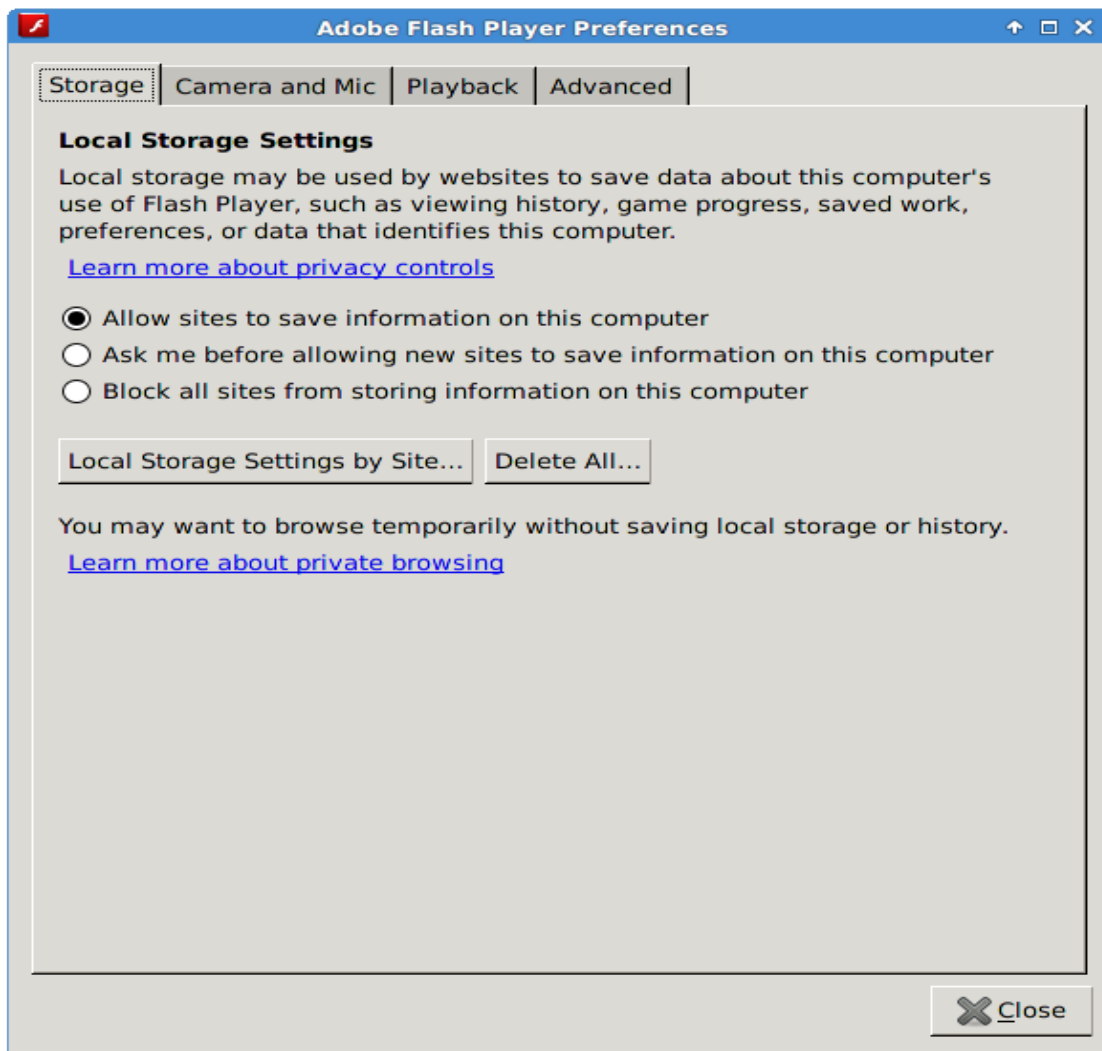
The Adobe Flash Player preferences icon in [Control Panel](#) can be used to modify how websites interact with your browser using Adobe Flash. Many of the same configurations can be done via right-click within an active flash object in a web browser.

To access the utility shown in Figure 9.1a, use Control Panel → Adobe Flash Player preferences or type **flash-player-properties**.

The options available in each tab and when to use them are described at the Adobe website:

- **[Storage](#)**: describes private browsing support and the privacy issues associated with local storage of flash information.
- **[Camera and Mic](#)**: controls how websites can use your computer’s camera and microphone.
- **[Playback](#)**: describes how to configure peer-assisted networking to improve bandwidth.
- **[Advanced](#)**: controls how Flash Player handles browsing data, updates, trusted locations, and protected content.

Figure 9.1a: Flash Player Configuration Utility



9.1.3 Installing Custom Fonts

PC-BSD® installs Microsoft TrueType fonts for you which includes the Times New Roman, Courier New, Georgia, Trebuchet MS, Comic Sans MS Arial, Arial Black, Verdana, Andale Mono, and Impact fonts.

If you have a collection of fonts that you have downloaded or purchased, you can configure your PC-BSD® system to also use these fonts. Which utility you use depends upon which window manager you have logged into.

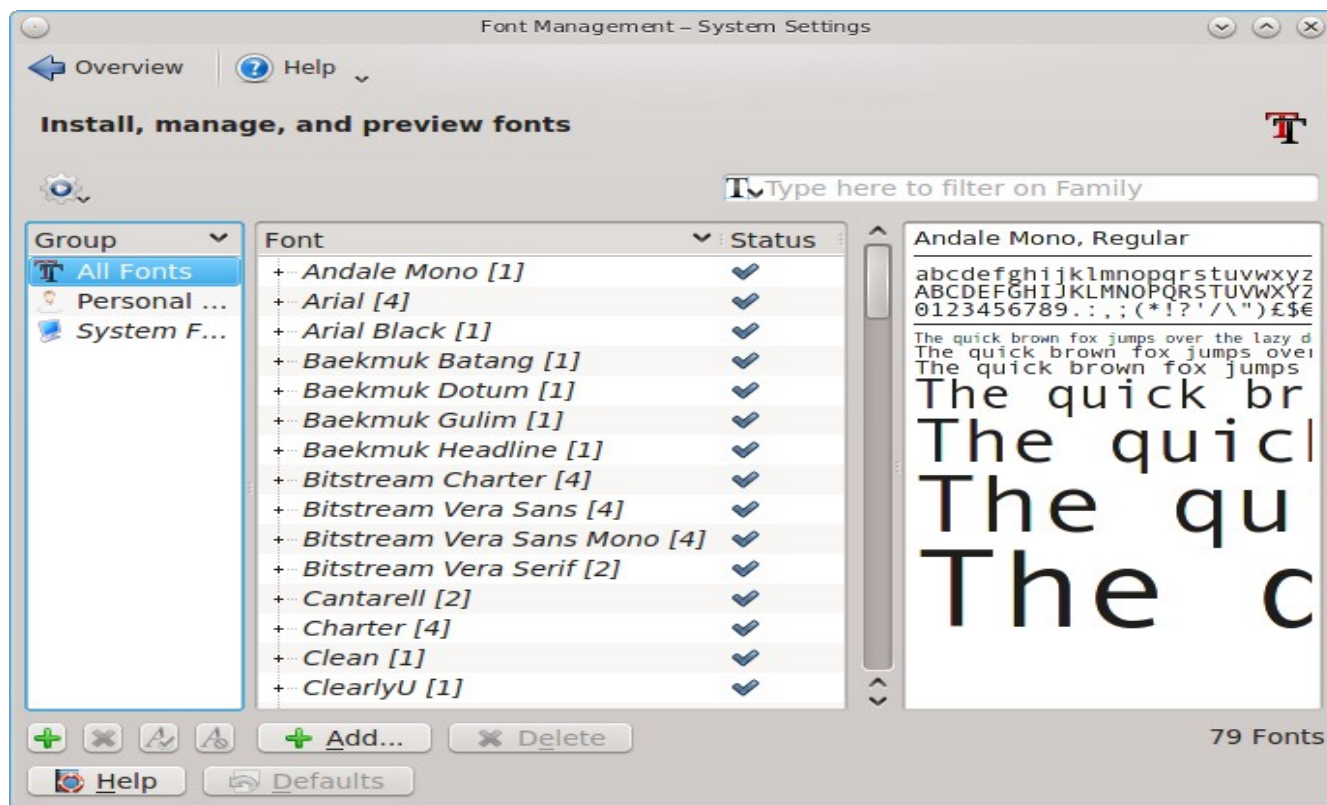
NOTE: many fonts are available from [AppCafe®](http://AppCafe.com). To search for these fonts, first check “Raw Packages” in the “Browser View” menu. Any font installed using AppCafe® should not require any additional configuration to “just work”.

9.1.3.1 Using KDE

To install custom fonts within KDE, go to System Settings → Font Management. In Figure 9.1b, “All Fonts” is currently selected under the “Group” column, showing all of the fonts installed on this system.

To install your fonts, highlight “Personal Fonts” under the “Group” column, then click the “+Add” button. This will allow you to browse to the font you wish to add. You can add multiple fonts in the same directory by holding down the Ctrl key while making your selection. Click the “Open” button, which will install the font for you. When it is finished, a pop-up message will indicate that you will need to restart any open applications for the font change to take affect. Your newly installed font(s) should now show up in the “Personal Fonts” section in the “Group” column and be available to the applications you use.

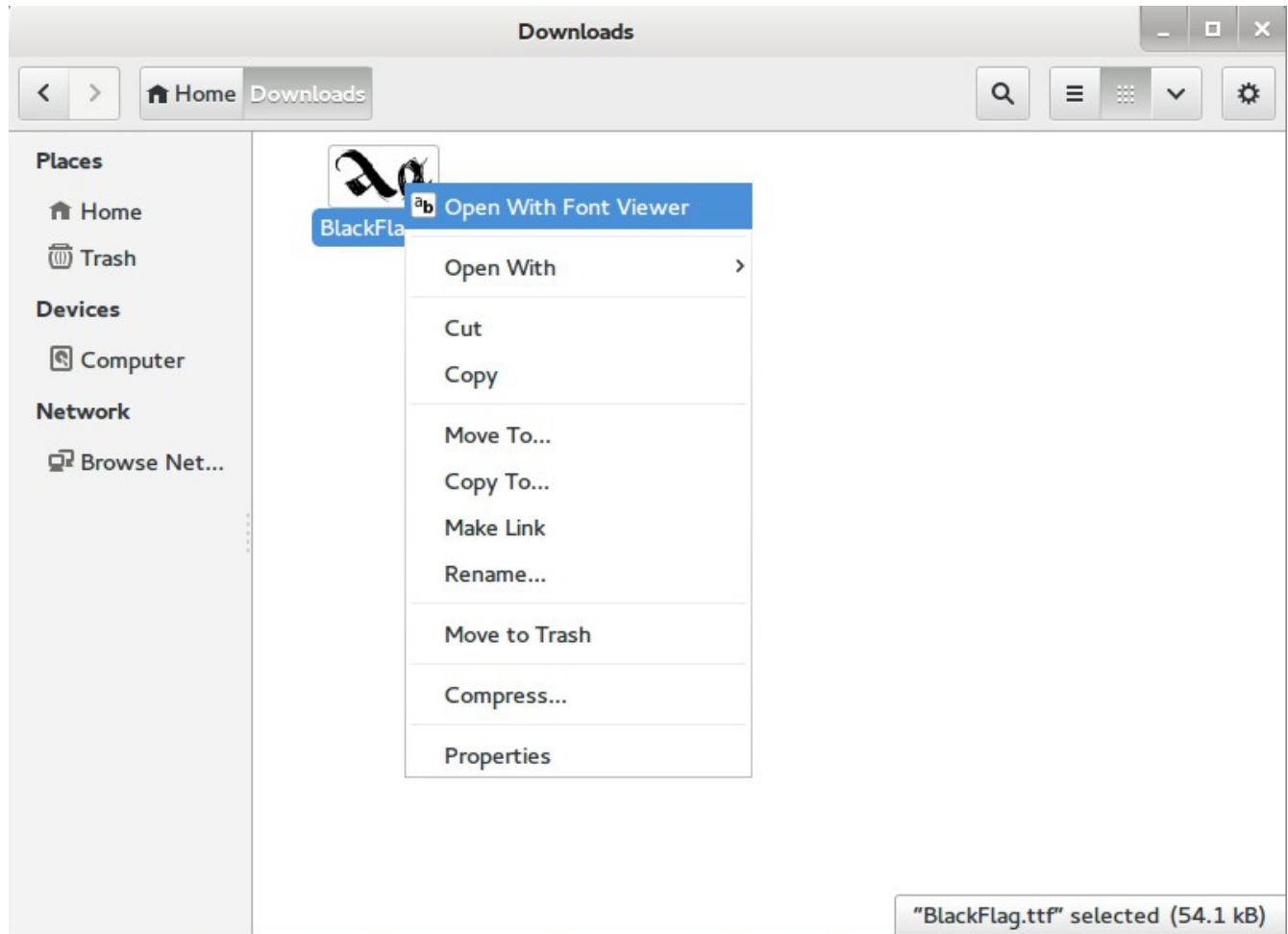
Figure 9.1b: Using KDE's Font Installer to Install Custom Fonts



9.1.3.2 Using GNOME

To install custom fonts within GNOME, go to Activities → Files. Navigate to the location of the font that you would like to install and either double-click the font name or select “Font Viewer” from the icon's right-click menu. This will open the font in Font Viewer, allowing you to view it. If you like the font, click the “Install Font” button to make it available to your applications. In the example shown in Figure 9.1c, the user is installing the BlackFlag font.

Figure 9.1c: Using Files to Install a Custom Font



9.1.3.3 Using XFCE

To install custom fonts within XFCE, use Applications → System → Thunar File Manager. Once you browse to the location of the font and double- or right-click it, you will see the same Font Viewer used by GNOME.

9.1.3.4 From the Command Line

If you prefer to install fonts from the command line, become the superuser and copy the downloaded font to the `/usr/local/share/fonts/` directory. Then, refresh the fonts cache:

```
fc-cache -f -v /usr/local/share/fonts/name_of_font
```

9.2 Multimedia

PC-BSD® has been pre-configured to support most multimedia formats and makes it easy to install most open source media applications [using AppCafe®](#). In addition, the following Control Panel icons are available, regardless of the desktop:

- [Sound Configuration](#): this utility displays the recognized audio devices and allows you to select and test which device to use by default.
- “PulseAudio Configuration” and “PulseAudio Mixer”: PC-BSD® provides full [PulseAudio](#) support. These utilities can be used to configure discoverable network sound devices and mixer levels.
- [Mount Tray](#): this application automatically detects the insertion and removal of media in USB devices. This means that any desktop should notify you if media is inserted into a USB CD/DVD device.

If you insert a CD/DVD media into an internal CD/DVD device and your desktop does not notify you, you can still mount the media manually as the superuser. This command will mount a CD inserted into the first internal CD device:

```
mount -t cd9660 /dev/cd0 /media
```

If you install your web browser using AppCafe®, you should be able to play most media formats, including YouTube videos, Internet radio, and many trailer and movie sites.

If people are blue in YouTube videos, this is due to a known issue in flash which Adobe hasn't fixed for open source players. To resolve this issue, right-click an area in the video, select “Settings”, then uncheck the box “Enable hardware acceleration”. Alternately, use the Minitube PBI to watch YouTube.

NOTE: if you happen to come across a file that you can not play in a web browser or media player, it is probably because it is in a proprietary format that requires a licensing fee or restricts distribution of the codec that is required to play that media format.

AppCafe® contains several dozen applications for playing and editing multimedia. It includes these popular applications (click the links to view screenshots):

- [aTunes](#): full-featured audio player and manager that can play mp3, ogg, wma, wav, flac, mp4 and radio streaming, allowing users to easily edit tags, organize music and rip audio CDs.
- [Audacity](#): multilingual audio editor and recorder.
- [Audacious](#): audio player with a focus on low resource usage, high audio quality, and support for a wide range of audio formats.
- [DeaDBeeF](#): music player that supports most audio formats.
- [Decibel-audio-player](#): audio player built around a highly modular structure that lets the user disable completely the features he does not need. Able to play CDs directly.
- [gtkpod](#): graphical user interface for the Apple iPod.
- [Miro](#): HD video player that can play almost any video file and offers over 6,000 free Internet TV shows and video podcasts.
- [SMPlayer](#): universal media player that can handle any media format and play audio CDs, DVDs, (S)VCDs, TV/radio cards, YouTube™ and SHOUTcast™ streams.

9.3 Files and File Sharing

This section describes the various file managers that are available for managing the files on your PC-BSD® system and the utilities that are available for accessing files over the network using the CIFS protocol.

9.3.1 File Managers and File Structure

Depending upon which window managers you have installed, different graphical file manager utilities may already be installed for you. You do not need to be logged into a specific window manager to use an installed file manager. For example, if KDE is installed, you can run its file manager from any window manager by typing **dolphin**. KDE, GNOME, LXDE, and XFCE install their own file managers while most of the other desktops assume that you will install your favorite file manager. Table 9.3a summarizes the available file managers and indicates which desktop they are installed with. Some file managers can be installed independent of a desktop using [AppCafe®](#) to install the PBI. Once a file manager is installed, type its name if you wish to run it from another desktop.

Table 9.3a: Available File Managers

File Manager	Desktop/PBI	Screenshots
dolphin	KDE	https://userbase.kde.org/Dolphin#Feature_Overview
emelfm2	PBI	http://emelfm2.net/wiki/ScreenShots
caja	Mate	http://mate-desktop.org/gallery/1.6/
mucommander	PBI	http://www.mucommander.com/screenshots.php
nautilus	GNOME , PBI	https://projects.gnome.org/nautilus/screenshots.html
pcmanfm	LXDE , PBI	http://lxde.org/easy_fast_file_management_pcmanfm
thunar	XFCE , PBI	http://www.xfce.org/projects/thunar
xfe	PBI	http://roland65.free.fr/xfe/index.php?page=screenshots

When working with files on your PC-BSD® system, save your own files to your home directory. Since most of the files outside of your home directory are used by the operating system and applications, you should not delete or modify any files outside of your home directory, unless you know what you are doing.

Table 9.3b summarizes the directory structure found on a PC-BSD® system. **man hier** explains this directory structure in more detail.

Table 9.3b: PC-BSD Directory Structure

Directory	Contents
/	pronounced as “root” and represents the beginning of the directory structure
/bin/	applications (binaries) that were installed with the operating system
/boot/	stores the startup code, including kernel modules (such as hardware drivers)
/compat/linux/	Linux software compatibility files
/dev/	files which are used by the operating system to access devices
/etc/	operating system configuration files

Directory	Contents
/etc/X11/	the <i>xorg.conf</i> configuration file
/etc/rc.d/	operating system startup scripts
/home/	subdirectories for each user account; each user should store their files in their own home directory
/lib/	operating system libraries needed for applications
/libexec/	operating system libraries and binaries
/media/	mount point for storage media such as DVDs and USB drives
/mnt/	another mount point
/proc/	the proc filesystem required by some Linux applications
/rescue/	necessary programs for emergency recovery
/root/	administrative account's home directory
/sbin/	operating system applications; typically only the superuser can run these applications
/tmp/	temporary file storage; files stored here may disappear when the system reboots
/usr/bin/	contains most of the command line programs available to users
/usr/local/	contains the binaries, libraries, startup scripts, documentation, and configuration files used by applications installed from ports or packages
/usr/pbi/	contains the binaries, libraries, startup scripts, documentation, and configuration files used by installed PBIs
/usr/local/share/fonts/	system wide fonts for graphical applications
/usr/local/share/icons/	system wide icons
/usr/ports/	location of system ports tree (if installed)
/usr/share/	system documentation and man pages
/usr/sbin/	command line programs for the superuser
/usr/src/	location of system source code (if installed)
/var/	files that change (vary), such as log files and print jobs

9.3.2 Samba

[Samba](#) allows any operating system to share volumes using Microsoft's CIFS protocol. There are two components to Samba:

- **client libraries:** this allows an operating system to access *existing* CIFS shares. The client is built into the Windows and Mac OS X operating systems and is installed for you during the PC-BSD® installation. Most Linux distros also install the Samba client; if your Linux distro does not, search its software repository.
- **server:** this allows a computer to act like a Windows server in that it can *create* shares and printers that are available to any CIFS client on the same network.

This section will demonstrate how to access shares using the Samba client.

9.3.2.1 Using the Samba Client

Since the Samba client libraries are pre-installed for you, you simply have to decide which utility you prefer to access existing Windows shares on your network. If a desktop is installed, you do not have to be logged into that desktop in order to use that utility.

Table 9.3c summarizes the available utilities (type a utility's name to launch it in any desktop), which desktop it installs with and whether or not a separate PBI is available, and a short description of how to access the available shares using that utility.

Table 9.3c: Utilities that Support Windows Shares

Utility	Desktop/PBI	How to Access Existing Shares
dolphin	KDE	in the left frame, click on Network → Samba Shares, then the Workgroup name; if the network requires a username and password to browse for shares, set this in Control Panel → System Settings → Sharing while in KDE or type systemsettings → Sharing while in another desktop
konqueror	KDE	in the location bar, type <i>smb:/</i>
mucommander	PBI	click on Go → Connect to server → SMB; input the NETBIOS name of server, name of share, name of domain (or workgroup), and the share's username and password
nautilus	GNOME , PBI	click on Browse Network → Windows Network
thunar	XFCE , PBI	in the left frame, click on Network → Windows Network

9.4 Windows Emulation

[Wine](#) is an application that allows you to create a Windows environment for installing Windows software. This can be useful if your favorite Windows game or productivity application has not been ported to Linux or BSD.

Wine is not guaranteed to work with every Windows application. If you are unsure if the application that you require is supported, search for it in the “Browse Apps” section of the [Wine Application Database](#). The [Wine Wiki](#) contains many resources to get you started and to refer to if you encounter problems with your Windows application.

9.4.1 Installing and Using Wine

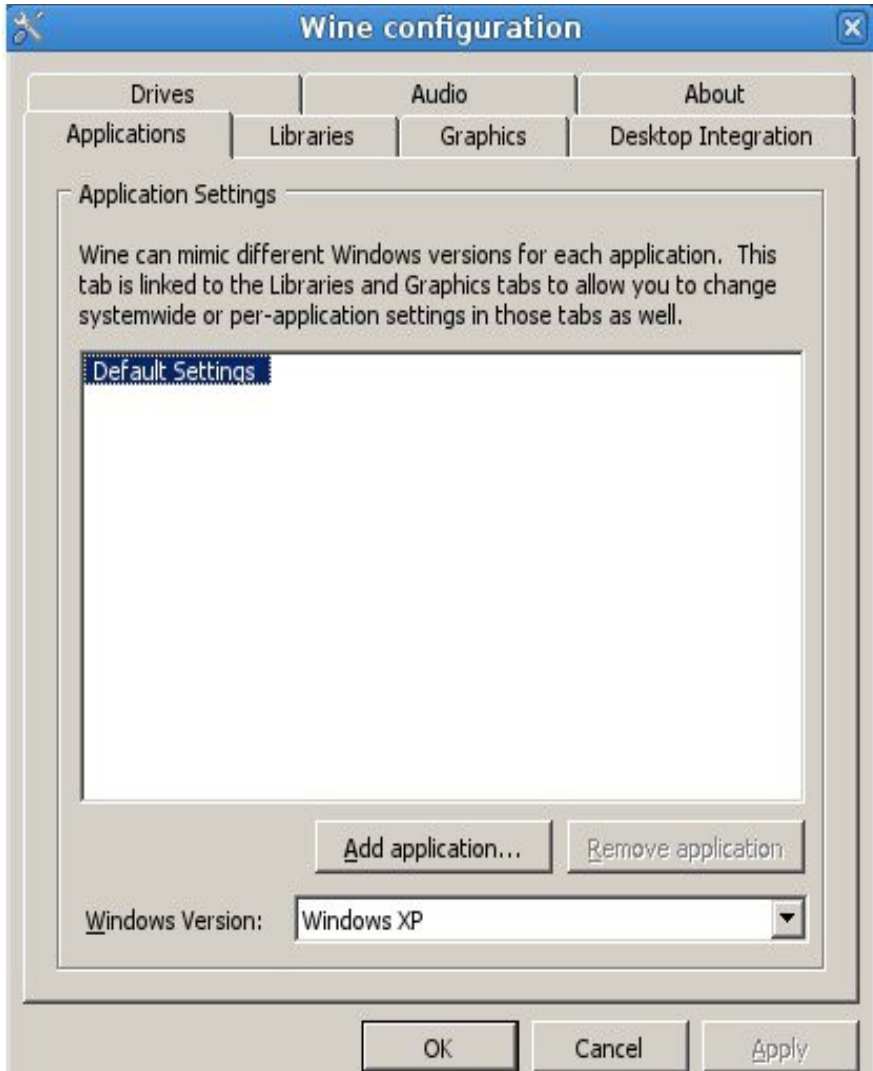
Wine can be installed during installation or from [AppCafe®](#). Once installed, it can be started by clicking the entry for “Wine Configuration” from the desktop's application menu or by typing **winecfg** at the command line. The initial Wine configuration menu shown in Figure 9.4a.

Click the “Add application” button to browse to the application's installer file. By default, the contents of your hard drive will be listed under “drive_c”. If the installer is on a CD/DVD, use the drop-down menu to browse to your home directory → *.wine* → *dosdevices* folder. The contents of the CD/DVD should be listed under *d:*. If they are not, the most likely reason is that your CD/DVD was not automatically mounted by the desktop. To mount the media, type the following as the superuser:

```
mount -t cd9660 /dev/cd0 /cdrom
```

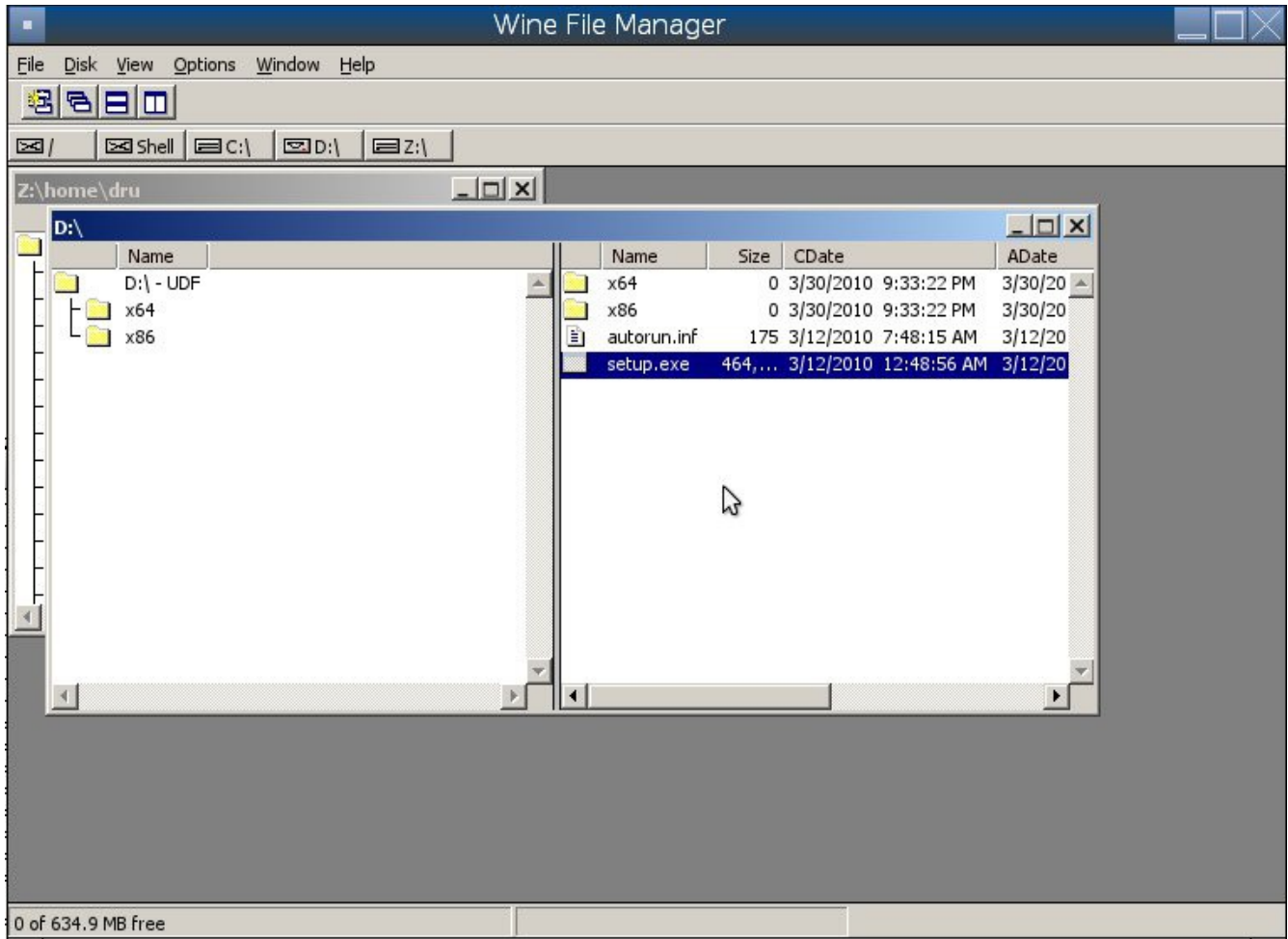
You should hear the media spin and be able to select the installer file. Once selected, press “Apply” then “OK” to exit the configuration utility.

Figure 9.4a: Wine Configuration Menu



To install the application, click the Winefile desktop icon or type **winefile** to see the screen shown in Figure 9.4b. Click the button representing the drive containing the installer (in this example, *D:*) and double click on the installation file (e.g. *setup.exe*). The installer should launch and you can proceed to install the application as you would on a Windows system.

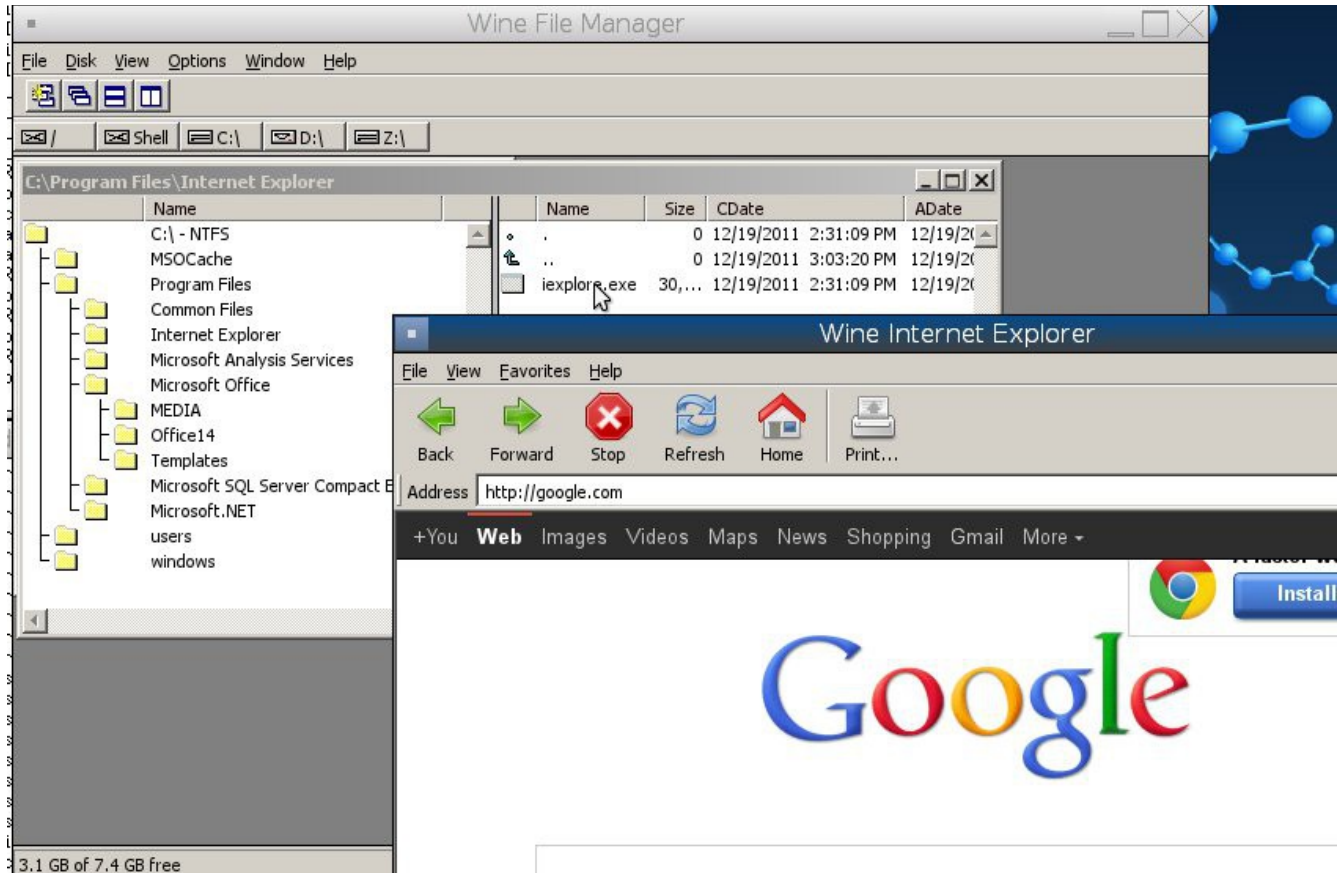
Figure 9.4b: Installing the Application Using winefile



NOTE: if you had to manually mount the CD/DVD, you will need to unmount it before it will eject. As the superuser, use the command **umount /mnt**.

Once the installation is complete, browse to **C:** and find the application's location. Figure 9.4c shows an example of running Internet Explorer within **winefile**.

Figure 9.4c: Running the Installed Application



9.5 Remote Desktop

Occasionally it is useful to allow connections between desktop sessions running on different computers. This can be handy when troubleshooting a problem since both users will be able to see the error on the problematic system and either user can take control of the mouse and keyboard in order to fix the problem. Typically this is a temporary situation as providing access to one's computer allows a remote user the ability to both view and modify its settings.

This section will demonstrate two remote desktop scenarios: how to configure an RDP connection to another computer from PC-BSD® and how to invite another computer to connect to your desktop session.

9.5.1 Connecting to Another Computer With RDP

The [remote desktop protocol \(RDP\)](#) can be used to make a connection to another computer. This section will demonstrate what is needed on the remote computer for an RDP connection, how to connect using KDE's KRDC, and how to connect using VNC.

9.5.1.1 Preparing the Remote System

Depending upon the operating system, you may have to first install or enable RDP software on the remote computer:

- not every edition of Windows provides a fully functional version of RDP; for example, it may not be fully supported in a Home Edition of Windows. Even if the full version of RDP is included, remote access may or may not be enabled by default. If you have trouble connecting using RDP, do a web search for “remote desktop” and the name of the version of Windows you are using to find out how to configure its remote desktop settings. If you still can not connect, you will need to download, install and configure [VNC](#) server software on the system.
- if the other computer you are connecting to is a Mac, Linux, or BSD system, you will have to first install either [xrdp](#) or a VNC server on the other system. Depending upon the operating system, either software may or may not already be installed. If it is not, check the software repository for the operating system or use a web search to find out how to install and configure one of these applications on that operating system. If you are connecting to another PC-BSD® system, the **krfb** VNC server is automatically installed with KDE and additional VNC server software is available in AppCafe®.

If the remote system is protected by a firewall, you will need to check that it allows connections to the TCP port required by the type of connection that you will be using:

- **RDP:** uses port 3389
- **VNC:** uses port 5900 (for the first connection, 5901 for the second connection, etc.)

If you need to manually add a firewall rule, it is best to only allow the IP address of the computer that will be connecting. You should immediately remove or disable this firewall rule after the connection is finished so that other computers do not try to connect to the computer. Since your PC-BSD® system is considered to be the client and will be initiating the connection, you do not have to modify the firewall on the PC-BSD® system.

9.5.1.2 Connecting with KDE's KRDC

KRDC can be used to initiate a connection request. This application can be installed as a “raw package” using [AppCafe®](#).

To launch this application, go to Applications → Internet → Remote Desktop Client within KDE or type **krdc** at the command line within any desktop. If you click F1 while in KRDC you can access the Remote Connection Desktop Handbook to learn more about how to use this application.

Figure 9.5a shows the initial KRDC screen which allows you to specify which system you wish to connect to.

Use the drop-down menu to indicate whether the remote system is using RDP or VNC for the connection. Then type in the IP address of the system you wish to connect to. If you are connecting to a VNC system, the IP address needs to be followed by a colon and a number indicating the number of the session. Typically, the number will be 1 unless the VNC server is hosting multiple simultaneous connections. Once you press enter, the connection will be initiated and, if it is an RDP connection, you will see the screen shown in Figure 9.5b.

Figure 9.5a: Creating a Connection Using KRDC

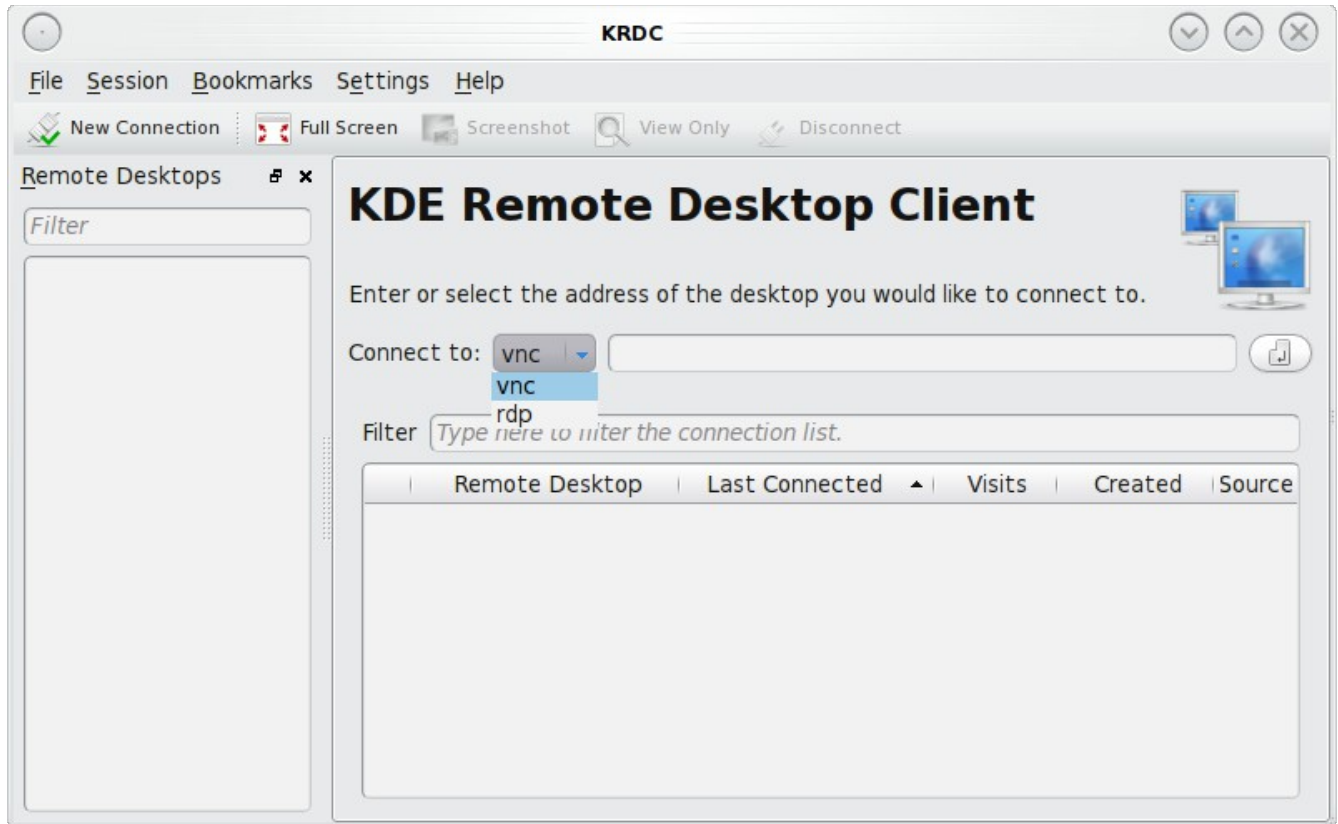
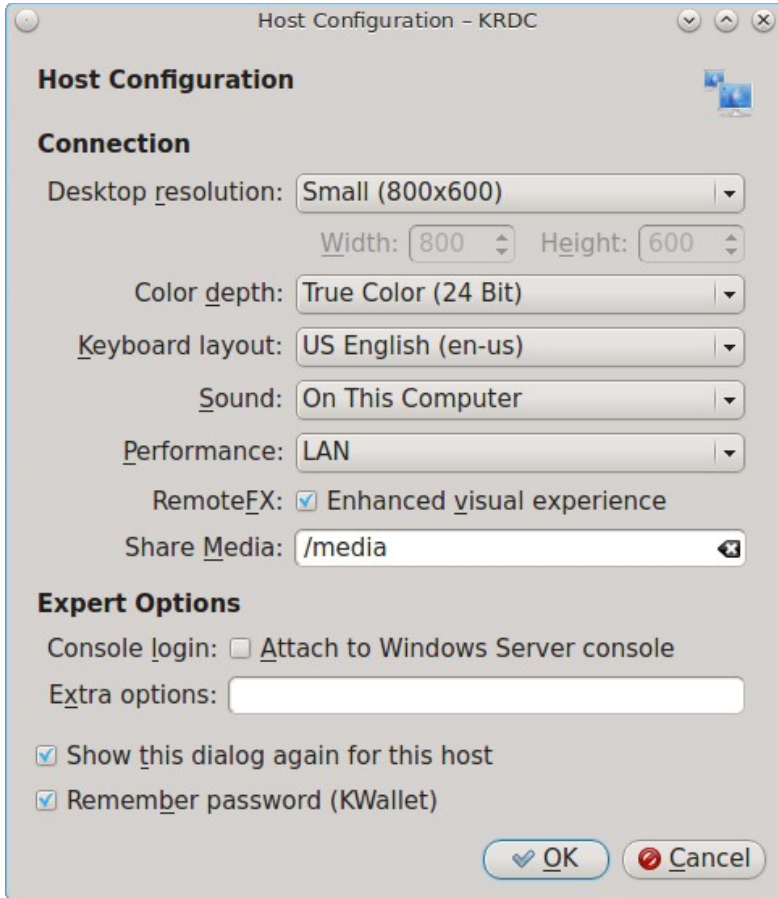


Figure 9.5b: Settings for the RDP Connection



Here is a quick overview of the settings:

Desktop resolution: since the contents of the screen are sent over the network, select the lowest resolution that still allows you to see what is happening on the other system. If you have a very fast network connection, you can choose a higher resolution; if you find that the other system is very slow to refresh its screen, try choosing a lower resolution.

Color depth: choose the lowest color depth that allows you to see the other system; you can choose a higher color depth if the network connection is fast.

Keyboard layout: this drop-down menu allows you to select the desired keyboard layout.

Sound: this drop-down menu allows you to choose whether any sounds heard during the connection are produced on this system, the remote system, or to disable sound during the connection.

Performance: select the option that best matches the network speed to the remote host. Choices are “Modem”, “Broadband”, or “LAN”.

RemoteFX: check this box if the remote system supports [RemoteFX](#) and hardware acceleration is desired.

Share Media: specifies a mount point for data to be shared between the systems.

Console login: if you are connecting to a Unix-like system, you can check this box if you wish to have access to the other system's command line console.

Extra options: allows you to specify [rdesktop switches](#) that are not covered by the other options in this screen.

Show this dialog again for this host: if you plan on using the same settings every time you connect to this computer, you can uncheck this box. If you need to change the settings at a later time, you can right-click the connection (which will appear in a list as a past connection) and choose Settings from the right-click menu.

Remember password: [KWallet](#) is KDE's password storage system. If this box stays checked, you will only need to input the password the first time you make this connection as it will be saved for you. If this is the first time you have stored a password using KWallet, it will prompt you for some information to set up your wallet.

If it is a VNC connection, you will be able to choose your connection type (speed), screen resolution, and have the option to remember the password.

Once you press OK, the connection should be initiated and you will receive pop-up messages asking for a username then a password; the details you provide must match a user account on the system you are connecting to. Once your authentication details are confirmed, you should see the desktop of the other system. If you move your mouse, it will move on the other desktop as well. Click the “View Only” button in the top toolbar whenever you wish to disable this mouse behavior. When you are finished your session, you can click the “Disconnect” button in the top toolbar.

NOTE: if the connection fails, check on the remote computer that either the RDP software is enabled or that the VNC server is listening for connections. Also double-check that a firewall is not preventing the connection.

9.5.1.3 Connecting with VNC

If you prefer to install VNC software instead of using KDE's KRDC, use [AppCafe®](#) to install a VNC client such as TightVNC. If you use VNC, the VNC server must be installed on the remote desktop.

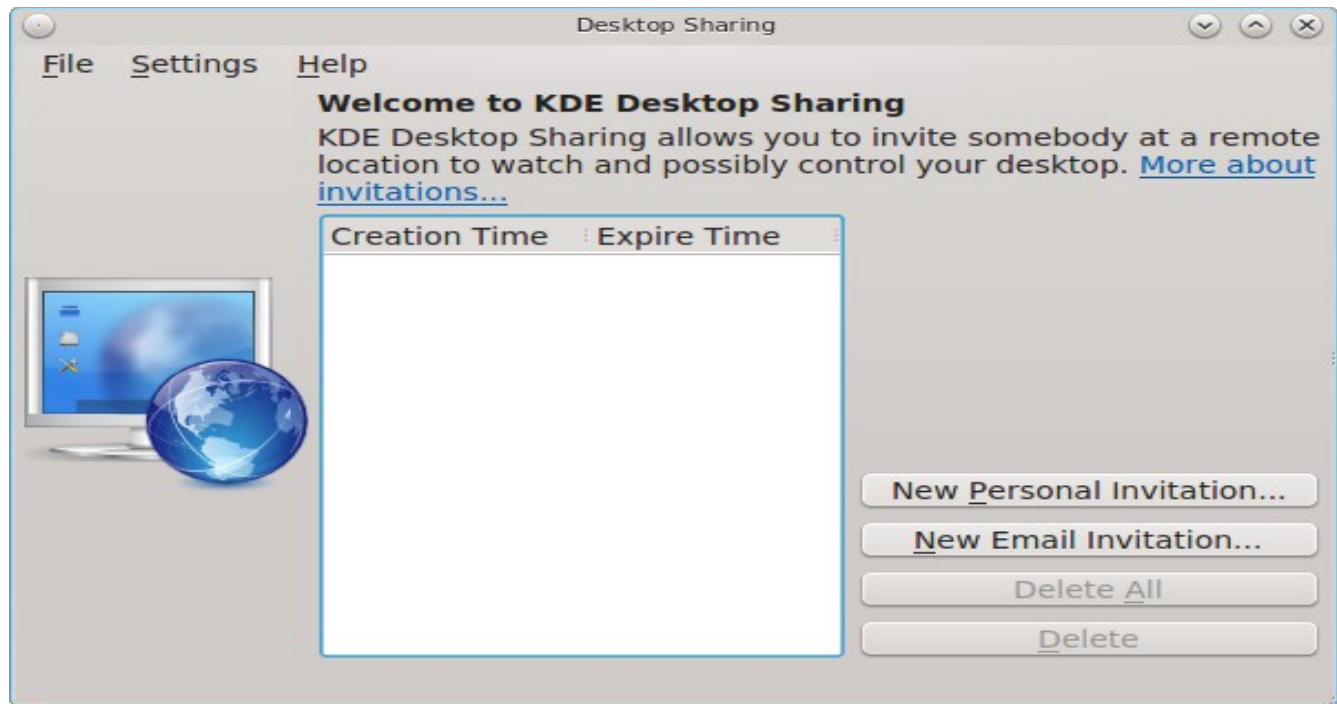
Once TightVNC is installed, type **vncviewer** to start the VNC client. A small window will appear, allowing you to type in the IP address of the remote system in the format *IP_ADDRESS:5801*. Change the *5801* if the VNC server is listening on a different port.

9.5.2 Allowing Another Computer to Connect Using Desktop Sharing

If you wish another user to connect to your computer, the KDE Desktop Sharing application can be used to generate a connection invitation. The “krfb” application can be installed as a “raw package” using [AppCafe®](#).

To launch this application within KDE, go to Applications → Internet → Desktop Sharing or type **krfb** from the command prompt of any desktop. If you press F1 while in this application, it will open the Desktop Sharing Handbook where you can learn more about using this utility. Figure 9.5c shows the initial screen for this application.

Figure 9.5c: Initiating a Connection Request Using krfb



There are two types of invitations that you can create:

Personal Invitation: if you click this button it will display the hostname that the other person will use to connect, a temporary password to use for the connection, and a connection request expiration time of one hour. It will include a warning reminding you to only give this information to the person you wish to connect as anyone can connect using that information. The connection itself can be made from any VNC client. If the person is using PC-BSD®, they can use **kdrc** or **vncviewer** as described above. On other operating systems, they will need to check if VNC is installed and download a VNC client if it is not. Once you press the “Close” button, the invitation expiry date will be listed in the main screen.

Email Invitation: if you click this button it will display a warning that anyone who reads the email containing the invitation can connect. Once you click the “Continue” button, the default email program will open the invitation so that you can input the email address of the recipient and send the email.

It should be noted that the most secure way to convey the invitation information is through an alternate communications channel such as a phone call. Ideally, you are speaking to the other person as they connect so that you can walk them through the problem you are experiencing and they can let you know what they are doing to your system as you watch them do it.

Figure 9.5d shows an example of a personal invitation.

Once the other person has the invitation, they should input the information in the invitation into their VNC client in order to start the connection. You will know when they try to connect as a pop-up message will appear on your screen similar to Figure 9.5e.

Figure 9.5d: Connection Invitation Created Using krfb



Figure 9.5e: The Other User is Trying to Connect Using the Invitation



In this example, a computer with an IP address of 192.168.1.111 is trying to connect. Buttons are provided to either accept or refuse the connection. You can also check or uncheck the box to “allow remote user to control keyboard and mouse”. If you accept the connection, the other user will be prompted to input the invitation password. Once the password is accepted, they will see your desktop.

9.6 Thin Client

PC-BSD® provides a Thin Client script which can be used to easily create a PXE Boot Desktop Server, to support thin clients, and a PXE Boot Install Server, for creating a central server which systems can connect to in order to be installed with PC-BSD®.

This section demonstrates how to configure and use both the PXE Boot Desktop Server and the PXE Boot Install Server.

9.6.1 Creating a PXE Boot Desktop Server

A PC-BSD® PXE Boot Desktop Server allows you to automatically configure a network of [diskless computers](#) where each computer has a network interface card capable of [PXE](#) booting. When a client boots from their network interface instead of their hard disk, they automatically connect to the PXE Boot Desktop Server and receive a login window. Once authenticated, they can use PC-BSD®, even if PC-BSD® is not installed on their own computer and even if their computer does not have a hard drive.

To prepare your PC-BSD® system for a PXE Boot Desktop Server configuration, perform these tasks first:

1. If the diskless clients will require Internet access, install two network cards where one NIC is connected to the Internet and the other is connected to a private LAN from which the thin clients can PXE boot from.
2. The PC-BSD® system should have lots of RAM installed, especially if multiple clients will be connecting. It is recommended that you use a 64-bit system with as much RAM installed as possible.

To configure the PC-BSD® system as a PXE Boot Desktop Server, run the following script as the superuser:

pc-thinclient

```
/usr/local/bin/pc-thinclient will install the components to convert this system
into a thin-client server.
```

```
Continue? (Y/N) y
```

```
Do you wish to install the dhcpd server port or use an external server?
```

```
If you wish to use an external server please make sure it supports adding next
server and bootfile name options.
```

```
(d/e)
```

If you wish to have the PC-BSD® system act as the DHCP server, type **d**. If the network already has a configured DHCP server, type **e**. The following example will install the DHCP server on the PC-BSD® system. After making your selection, press enter to continue:

```
Do you wish to make this a remote X desktop server or install server?
```

```
(r/i) r
```

If your intent is to install a PXE Boot Desktop Server, input **r** and press enter. If you previously typed **d** and a DHCP server is not already installed, it will be installed for you. Once the DHCP server is installed, the tools needed in the PXE environment will be installed and messages will indicate the progress. Once everything is installed, you will see this message:

```
Setting up system for PXE booting...
```

```
What NIC do you wish DHCPD to listen on? (I.E. re0)
```

```
nic) em0
```

Input the FreeBSD device name of the interface that is attached to the local network containing the diskless workstations. This interface will run the DHCP server and should not be connected to a network with another DHCP server running. In the example shown here, the user has input the *em0* interface. If you are unsure of the device name, type **ifconfig** from another terminal.

The script will now configure the specified interface and start the required services:

```
Starting /etc/rc.d/nfsd...OK
```

```
Starting /etc/rc.d/inetd...OK
```

```
Starting /usr/local/etc/rc.d/isc-dhcpd...OK
```

```
You will need to reboot the system for the login manager changes
to take effect.
```

Your system is now setup to do PXE booting!

Before rebooting, you may wish to customize the installation.

The installation creates a chroot directory that contains a small PXE image that is used by clients to launch Xorg and connect to the PXE Boot Desktop Server. You can access this chroot by typing this command as the superuser:

```
chroot /usr/home/thinclient
```

Running **pkg info** within the chroot will show which X components and drivers are available. Should you need to install additional video drivers, use **pkg install** within the chroot. When you are finished using the chroot, type **exit** to leave it.

The thin client script installs and configures the following services:

NFS: the Network File System is a protocol for sharing files on a network. It has been configured to allow clients on the network attached to the interface that you specified to connect to the thin client server. Its configuration file is located in */etc/exports*.

TFTP: the Trivial File Transfer Protocol is a light-weight version of FTP used to transfer configuration or boot files between machines. The PXE network cards on the diskless computers will use TFTP to receive their configuration information. This service was enabled in */etc/inetd.conf* with a home directory of */usr/home/thinclient*.

DHCP: the Dynamic Host Configuration Protocol is used to configure IP addressing info on the diskless workstations. If you selected to install a DHCP server, it will be configured to assign addresses for the network attached to the interface that you specified. Its configuration file is located in */usr/local/etc/dhcpd.conf*.

The thin client script also creates the *pxeboot* user with the default password *thinclient*. This username and password is used to save the working Xorg configuration files for each of the diskless computers. It is highly recommended that you change this password right away by running this command as the superuser:

```
passwd pxeboot
```

You will also need to create the users that will connect to the system. You can do so using [User Manager](#) or by typing **adduser** at the command line and following the prompts.

9.6.1.1 Connecting to the PXE Boot Desktop Server

After a successful installation and reboot of the PXE Boot Desktop Server, the DHCP service will be running on the NIC you specified. Make sure that this NIC and a PXE capable client are connected to the same hub or switch. When you boot up the client, PXE should automatically obtain an IP address and begin to load PC-BSD®. If it does not, review the boot order settings in the BIOS on the client to make sure that PXE is listed first.

After the boot process has finished, the client will be brought to this prompt:

```
No saved xorg-config for this MAC: <MAC_Address>
Do you wish to setup a custom xorg.conf for this system? (Y/N)
```

If you wait 10 seconds, this message will timeout, and the client will bring up X in 1024x768 mode. If this is not the resolution that you wish to use, type “Y” at the prompt and hit enter to bring up the Xorg Configuration screen. In this menu, you will be able to setup your own custom *xorg.conf* file, auto-detect settings, and test the new configuration. When finished, choose “Save working config” to send this configuration to the PXE Boot Desktop Server. This will prompt for the password of the pxeboot user. Once authenticated, the file will be saved

by the client's MAC address in `/home/pxeboot/mnt/xorg-config/<mac>.conf`. The next time you boot the client, it will automatically use the saved `xorg.conf` file and bring the system to the PC-BSD® login screen.

NOTE: in order for the login to succeed, the user account must already exist on the PXE Boot Desktop Server.

The client's boot environment is located in `/home/pxeboot`. This is mounted read-only during the PXE boot process to allow the client to bootstrap and create an XDCMP connection to the server.

Once logged in to the PXE Boot Desktop Server, using PC-BSD® will be the same as if you had installed PC-BSD® on the client system. You will be able to use [AppCafe®](#) to install software and to save and use the files in your home directory.

9.6.1.2 Uninstalling the PXE Boot Desktop Server

Use the **-remove** option if you wish to uninstall the PXE Boot Desktop Server:

```
pc-thinclient -remove
Removing /usr/home/thinclient
```

This will remove the PXE environment from the system. If you are finished using the PXE boot services, you can stop them using these commands:

```
service nfsd stop
service inetd stop
service isc-dhcpd stop
```

and prevent them from restarting by removing these lines from `/etc/rc.conf`:

```
# pc-thinclient configuration
dhcpd_enable="YES"
dhcpd_ifaces="em0"
portmap_enable="YES"
nfs_server_enable="YES"
inetd_enable="YES"
ifconfig_em0="192.168.2.2"
```

Your interface name and IP address may differ from those in the example. The `dhcpd` and `portmap` lines will not exist if you did not install a DHCP server.

9.6.2 Creating a PXE Boot Install Server

A PC-BSD® PXE Boot Install Server can be used to install PC-BSD®, FreeBSD, or TrueOS® onto computers who connect to the server using PXE. The installations can be interactive or fully automated. The PXE Boot Install Server supports multiple, concurrent installations with the only limiting factor being the server's disk I/O and the network's bandwidth.

The installation of the PXE Boot Install Server starts the same way, except this time you select **i** when prompted:

```
pc-thinclient
/usr/local/bin/pc-thinclient will install the components to convert this system
into a thin-client server.
Continue? (Y/N) y
Do you wish to install the dhcpd server port or use an external server?
If you wish to use an external server please make sure it supports adding next
server and bootfile name options.
(d/e) d
```

Do you wish to make this a remote X desktop server or install server?
(r/i) i

Once the environment is downloaded and configured, you will be asked if you would like to install the web interface:

PC-ThinClient includes a web-interface for client management.
Would you like to install the Apache / PHP packages required?
default: (y)

You will then be prompted to input the interface to be used by the server and then the services will be started:

```
All the webui files are located in /usr/local/share/pcbsd/pc-
thinclient/resources/webui
You will need to configure your web-server to serve this directory.
Please edit the file /usr/local/share/pcbsd/pc-
thinclient/resources/webui/config.php to set the user passwords / auth tokens for
the site.
Setting up system for PXE booting...
What NIC do you wish DHCPD to listen on? (I.E. re0)
nic) em0
Starting /etc/rc.d/nfsd...OK
Starting /etc/rc.d/inetd...OK
Starting /usr/local/etc/rc.d/isc-dhcpd...OK
```

To perform system installations, place your custom pc-sysinstall scripts in:
/usr/home/thinclient/installscripts
An example script is provided in the above directory
For unattended installations, save your pc-sysinstall script as:
/usr/home/thinclient/installscripts/unattended.cfg
Your system is now setup to do PXE booting!

9.6.2.1 Connecting to and Customizing the PXE Boot Install Server

Once the PXE Boot Install Server is installed, try to PXE boot a client which is connected to the same network. If the client boots successfully, you will see the installation screen shown in Figure 9.6a.

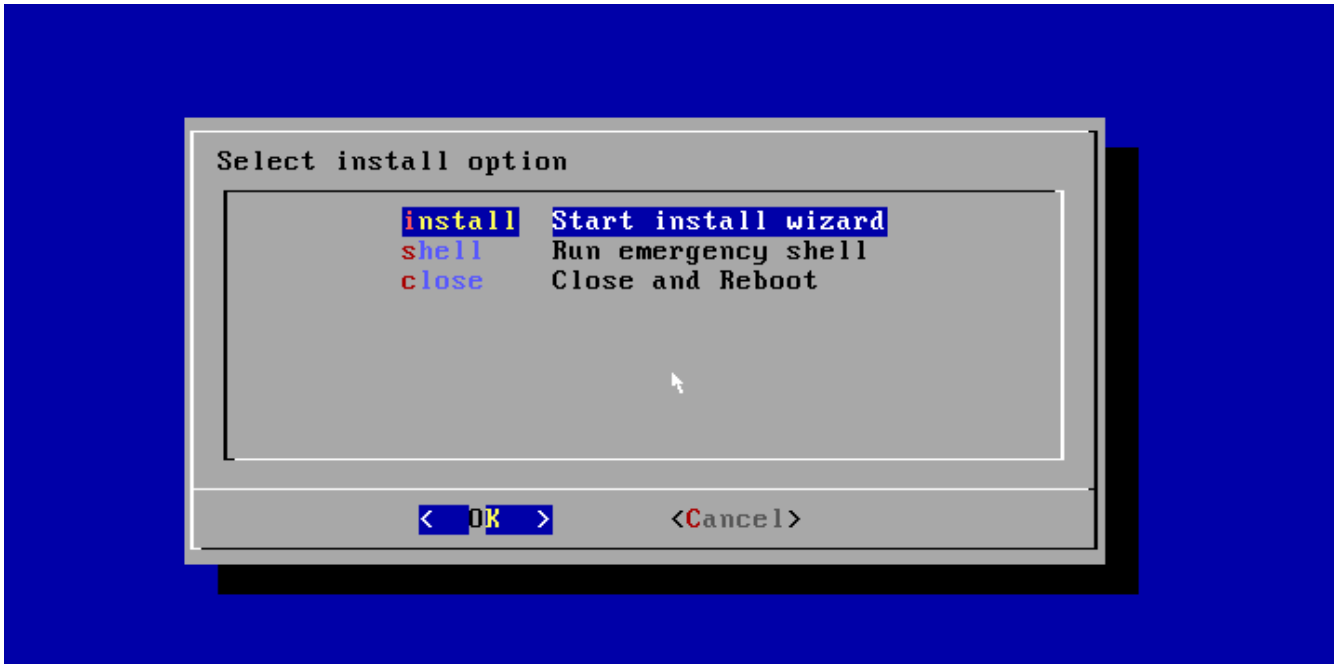
By default, selecting “install” from the boot menu will use the */usr/home/thinclient/installscripts/pc-sysinstall.example* script which installs a basic FreeBSD system. In addition to starting an installation, this menu provides an emergency shell prompt. This can be useful if you have a system which can no longer boot and you wish to either access the disk's contents or attempt to repair the installation.

Any scripts that you create and place in the */usr/home/thinclient/installscripts/* directory will be selectable as an installation option within the PXE client boot menu. Tables 5.5a and 5.5b in [Creating an Automated Installation with pc-sysinstall](#) summarize the available configuration options when creating an installation script. Alternately, every time you install PC-BSD, the installation script is automatically saved to */root/pc-sysinstall.cfg*. This means that if you wish to repeat an installation, you simply need to copy that file to the */usr/home/thinclient/installscripts/* directory on the PXE Boot Install Server.

The PXE Boot Install Server also supports completely unattended installations. To perform fully-automated installations over the PXE interface, create a configuration script named */usr/home/thinclient/installscripts/unattended.cfg*. When a PXE client first boots, it checks for the existence of the *unattended.cfg* file, and if found, it will automatically use it for installation. Some caution should be taken

when using this method since simply plugging a PXE boot client into the wrong LAN cable could cause it to be re-installed.

Figure 9.6a: PXE Boot Installation Menu



9.7 Security

Your PC-BSD® system is secure by default. This section provides an overview of the built-in security features and additional resources should you like to learn more about increasing the security of your system beyond its current level.

The security features built into PC-BSD® include:

- **Naturally immune to viruses and other malware:** most viruses are written to exploit Windows systems and do not understand the binaries or paths found on a PC-BSD® system. Antivirus software is still available in the Security section of [AppCafe®](#) as this can be useful if you send or forward email attachments to users running other operating systems.
- **Potential for serious damage is limited:** file and directory ownership and permissions along with separate user and group functions mean that as an ordinary user any program executed will only be granted the abilities and access of that user. A user that is not a member of the *wheel* group can not switch to administrative access and can not enter or list the contents of a directory that has not been set for universal access.
- **Built-in firewall:** the default firewall ruleset allows you to access the Internet and the shares available on your network. If there are no shared resources on your network, you can use [Firewall Manager](#) to further tighten the default ruleset. In addition, [Fail2ban](#) is installed. This service can be configured to identify possible break-in attempts and to respond with an action such as creating a firewall rule to ban the intruder. Instructions for configuring fail2ban can be found [here](#).

- **Very few services are enabled by default:** you can easily view which services are started at boot time using [Service Manager](#) or by reading through `/etc/rc.conf`. You can also disable the services that you do not use by disabling that service in Service Manager or by commenting out that line with a `#` in `/etc/rc.conf`.
- **SSH is disabled by default:** and can only be enabled by the superuser. This setting prevents bots and other users from trying to access your system. If you do need to use SSH, change the “NO” to a “YES” in the line `sshd_enable=` in the file `/etc/rc.conf`. You can start the service right away by typing `/service sshd start`. You will need to add a firewall rule to allow SSH connections from the systems that require SSH access.
- **SSH root logins are disabled by default:** if you enable SSH, you must login as a regular user and can use `su` or `sudo` when you need to perform administrative actions. You should not change this default as this prevents an unwanted user from having complete access to your system.
- **sudo is installed:** and configured to allow users in the `wheel` group permission to run an administrative command after typing their password. By default, the first user you create during installation is added to the `wheel` group. You can use [User Manager](#) to add other users to this group. You can change the default `sudo` configuration using the `visudo` command as the superuser.
- **AESNI support is loaded by default** for the Intel Core i5/i7 processors that support this encryption set. This support speeds up AES encryption and decryption.
- **Automatic notification of security advisories:** [Update Manager](#) will automatically notify you if an update is available as the result of a [FreeBSD security advisory](#) that affects PC-BSD®. This allows you to keep your operating system fully patched with just the click of a mouse.

If you would like to learn more about security on FreeBSD/PC-BSD® systems, **man security** is a good place to start. These resources provide more information about security on FreeBSD-based operating systems:

- [FreeBSD Security Information](#)
- [Security Section of FreeBSD Handbook](#)
- [Hardening FreeBSD](#)

9.8 Accessibility

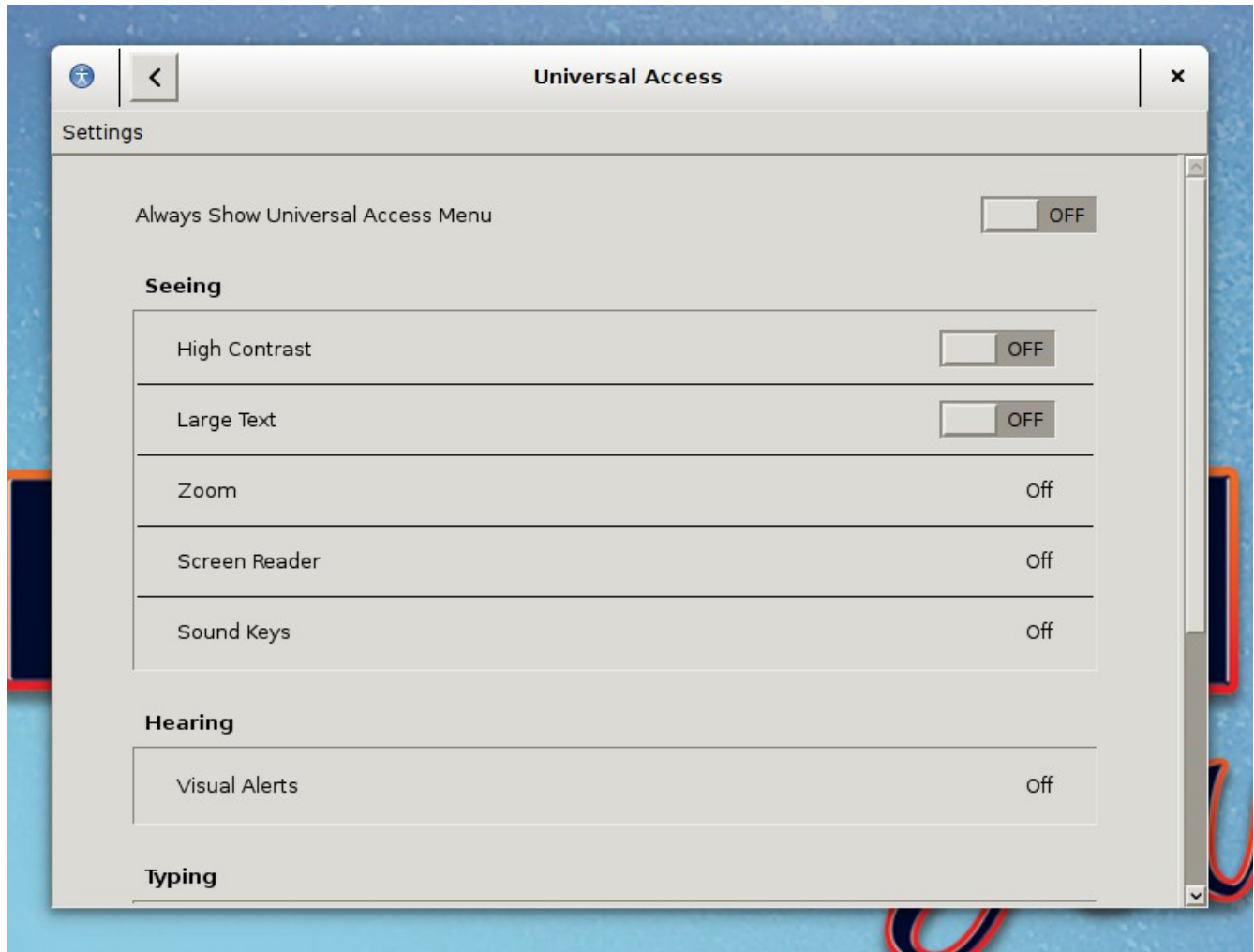
The GNOME and KDE desktop environments provide accessibility features to assist users with vision and mobility impairments. In PC-BSD®, these desktops can be installed either during installation or afterwards using [AppCafe®](#).

This section provides an overview of the features provided by each desktop and additional references to these features.

9.8.1 GNOME Universal Access

GNOME3 provides a “Universal Access” utility for configuring the desktop for accessibility. To open this utility, open “Activities” and search for “Universal Access”. This will open the screen shown in Figure 9.8a.

Figure 9.8a: Universal Access Screen

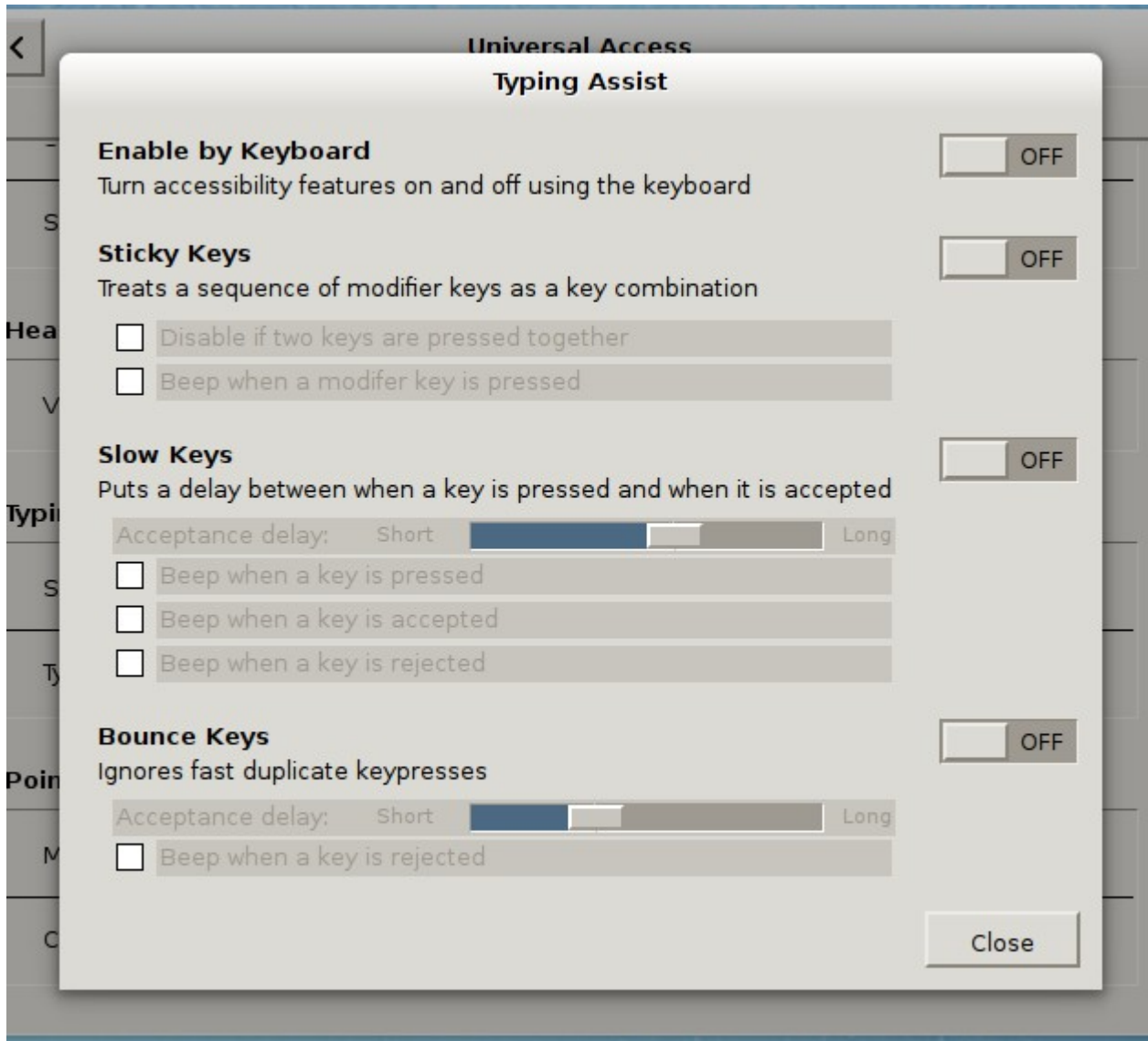


The “Seeing” section of this screen has options for assisting users with low vision.

Click “Off” in the “Hearing” section to open a pop-up screen used to enable visual alerts, either to the window title of the current window or the entire screen. The pop-up screen provides a “Test flash” button for testing the settings.

If you click “Off” next to “Typing Assist (AccessX)” in the “Typing” section, it will open the screen shown in Figure 9.8b. “Sticky Keys”, “Slow Keys”, and “Bounce Keys” can be enabled in this screen to assist users with mobility impairments.

Figure 9.8b: Keyboard and Key Options



If you click the “Off” next to “Click Assist” in the “Pointing and Clicking” section, you can configure a simulated secondary click and a hover click.

More information about the options provided by Universal Access can be found [here](#).

9.8.2 KDE Accessibility Tools

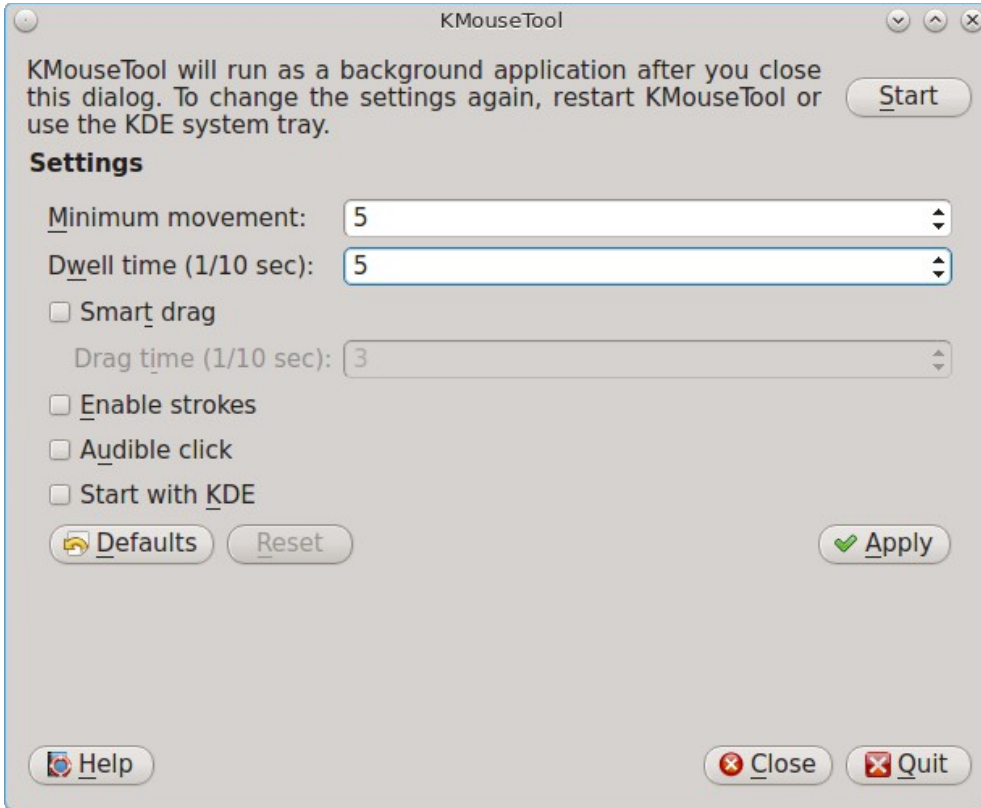
To install the KDE accessibility tools, install the “kdeaccessibility” package as a “raw package” using [AppCafe](#).

The KDE-Accessibility component installs the following software:

- **KMag**: a screen magnifier. In KDE, this application is in Applications → Utilities → Screen Magnifier or you can type **kmag** from the command line. Drag the magnifier window over the text you wish to magnify or click its “Settings” button to view the shortcuts for its various modes. Click F1 while the application is open to access the Kmagifier Handbook.

- **KMouseTool:** clicks the mouse whenever the mouse cursor pauses briefly. It can also drag the mouse, although this takes a bit more practice. To start this utility in KDE, click Applications → Utilities → Automatic Mouse Click or type **kmousetool** from the command line. In the screen shown in Figure 9.8c, check the settings you wish to use, click the “Apply” button, then click the “Start” button. If you quit this screen, it will be added to the system tray and will continue to run until you launch its icon and click the “Stop” button. A PDF of the KMouseTool Handbook can be downloaded from [here](#).

Figure 9.8c: Configuring KMouseTool



- **KMouth:** enables persons that cannot speak to speak through their computer. It keeps a history of spoken sentences from which the user can select to be re-spoken. To start this program, click Applications → Utilities → Speech Synthesizer Frontend or type **kmouth** from the command line. The first time you run this application, a configuration wizard will prompt you to set the command to use for speaking texts (such as `/usr/local/bin/espeak`), the character encoding, and a language phrase book. Refer to the [KMouth Handbook](#) for more information about configuring and using this tool.

10 Finding Help

We are doing our best to make PC-BSD® as easy as possible for newcomers. Should you need help, there are plenty of ways to get in touch with the PC-BSD® community. This section discusses the following help resources:

- [PC-BSD® Forums](#)
- [IRC Channel](#)
- [Mailing Lists](#)

- [FreeBSD Handbook and FAQ](#)
- [Social Media](#)
- [Search and Portals](#)
- [Other Resources](#)

As your teacher may have told you, “Do or Do Not, there is no try”, or more likely, that “there is no such thing as a stupid question”. However, there are better ways to ensure that you receive the response you seek and that it will be a productive exchange for all parties involved. The two articles below help to describe how and why it is important to follow certain protocols when requesting help:

- [Ask Smart Questions](#)
- [Smart Questions](#)

10.1 PC-BSD® Forums

The [PC-BSD® Forums](#) contain a wealth of information, tips and solutions which you can access from a web browser. There are many active members and you will find that most questions are replied to quickly. If you are having problems with something on your PC-BSD® system, try using the forum's search utility. You will often find that someone else has posted a similar question and that other users have responded with a fix or a how-to.

The Forums have been categorized, allowing users to skim through the categories that interest them while learning some things along the way. You do not have to create a login account in order to search or read through the forums. However, if you wish to ask or answer a question on a forum or subscribe to a forum or a thread (to be automatically notified when a new post is added), you will need to be logged in. To subscribe to a forum, open the page for the forum and select Forum Tools → Subscribe to this Forum. You will be prompted to choose how often to be notified whenever a post is added to the forum. If you wish to subscribe to a specific post, open the post and select Thread Tools → Subscribe to this Thread. You will be notified whenever someone responds to that post.

The current categories and the forum descriptions are described below:

The General category contains the following forums:

- [Announcements](#): contains announcements of new releases and news related to PC-BSD®. Subscribing to this forum is a good way to keep up-to-date with the latest news about PC-BSD®.
- [General Questions](#): use this forum if your question does not fit into any of the other forum categories.
- [The Lounge](#): this is a general discussion area for PC-BSD® users. Posts in this forum are not of a technical nature. Posts should be of interest to other PC-BSD® users and not contain any mature or slanderous content.
- [Advocacy](#): this is a brainstorming area for promoting PC-BSD®.
- [Guides](#): this forum contains how-tos and guides for performing specific tasks on PC-BSD®.
- [Tips and Tricks](#): this forum contains suggestions for configuring and tweaking your PC-BSD® system.
- [Books on PC-BSD®](#): this forum contains errata and discussion for published books about PC-BSD®.
- [PC-BSD® Server Edition](#): this forum is for the discussion of the FreeBSD server and TrueOS® editions of PC-BSD®.

The PC-BSD® Software (PBI files) category allows PBI developers to become aware of any problems with current PBIs and to receive requests for software that should be made into a PBI. If you start a post in any of these forums, subscribe to it so you can be notified of any responses to your post. The forums in this category include:

- [PBI Discussion](#): a general discussion area for resolving PBI problem reports. If you have a problem installing or using a PBI, post the details in this forum.
- [PBI Requests](#): do you have a favorite application that is not currently available as a PBI? You can request it in this forum. Be sure to read the [Readme first](#) post if this is your first PBI request.
- [Finished PBIs](#): once a new PBI is created as the result of a PBI request, the original request is moved to this forum.
- [Port Requests](#): do you have a favorite application that is not currently available as a FreeBSD port? You can request it here. If someone does make a port, it can also be converted into a PBI as PBIs are based on FreeBSD ports. Again, read the [Readme first](#) file if this is your first port request.
- [pkgng Discussion](#): if you have problems installing software using pkgng or running an application installed using pkgng, post the details here.
- [Lumina](#): this is for the discussion of the new [Lumina](#) desktop.

The Support category deals with the following types of support questions. PC-BSD® developers are subscribed to this list so they can help determine what is causing the problem, and if a fix is made available, can commit it for the next version of PC-BSD®. If you start a post in any of these forums, subscribe to it so you can be notified of any responses to your post.

- [General Bug Reports](#): if you are not sure if the problem you are seeing is a bug, you can discuss it here first before reporting it to bugs.pcbsd.org.
- [Installing PC-BSD®](#): if you are having problems installing PC-BSD®, post the details of your problem to this forum.
- [Startup Bug Reports](#): read-only archive as bug reports should instead be reported to bugs.pcbsd.org.
- [Usage Bug Reports](#): read-only archive as bug reports should instead be reported to bugs.pcbsd.org.
- [FreeBSD Help](#): if you suspect that your problem is not with PC-BSD® but with the underlying FreeBSD operating system, post the details of your problem in this forum. The [Looking for FreeBSD Help? README FIRST!](#) post should be read first.

The Hardware Support category is for reporting hardware-related problems. PC-BSD® developers are subscribed to this list so they can help determine what is causing the problem, and if a fix is made available, can commit it for the next version of PC-BSD®. If you start a post in any of these forums, subscribe to it so you can be notified of any responses to your post. Be sure to read the [README first](#) before posting.

- [General Support](#): if your hardware problem does not match any of the other forum categories, post the details of your problem in this forum.
- [Graphics Cards](#): if you are having problems with your video card settings, post the details of your problem to this forum.
- [Sound and Multimedia](#): if you are having problems with sound or in playing multimedia such as CDs or videos, post the details of your problem to this forum.
- [Networking](#): if you are having problems using or configuring a network interface, post the details of

your problem to this forum.

- [Laptops](#): if you are having problems with power management or other laptop-specific issues, post the details of your problem to this forum.
- [Drives](#): if you are having problems accessing or formatting CD, DVD, USB or hard drives, post the details of your problem to this forum.

The Development category contains the following forums:

- [Creating PC-BSD® Packages \(.pbi files\)](#): this is a discussion area for PBI developers who need help with or have questions about creating a PBI.
- [Feature Requests](#): do you have an idea for a feature that you would like to be available in PC-BSD®? This is the forum to request it.
- [Translations](#): this is a discussion area for translators who localize PC-BSD® menus or translate PC-BSD® documentation.
- [Documentation Project](#): this is a discussion area for those who wish to help with PC-BSD® documentation.
- [PC-BSD® Installer](#): this is a discussion area for feature requests and testing of the PC-BSD® installation program.

The Testing category is for PC-BSD® beta testers to report problems found in upcoming versions of PC-BSD®. It contains the following forums:

- [General Testing](#): if your problem is not related to one of the following desktop environments, report the problem in this forum. Be sure to read the sticky threads first as they contain useful information about beta testing and any known issues with the testing snapshot.
- [KDE](#): if your problem is related to the KDE desktop or KDE applications, report the problem in this forum. Be sure to read [README first](#) for instructions before posting.
- [Gnome](#): if your problem is related to the GNOME desktop or GNOME applications, report the problem in this forum. Be sure to read [README first](#) for instructions before posting.
- [XFCE](#): if your problem is related to the XFCE desktop, report the problem in this forum. Be sure to read [README first](#) for instructions before posting.
- [LXDE](#): if your problem is related to the LXDE desktop, report the problem in this forum. Be sure to read [README first](#) for instructions before posting.
- [Fluxbox](#): if your problem is related to the Fluxbox desktop, report the problem in this forum. Be sure to read [README first](#) for instructions before posting.
- [Ports Testers](#): if your problem is related to a FreeBSD package or port, you can report the problem in this forum. Be sure to read [README first](#) for instructions before posting.

The Hardware Compatibility category contains forums to help users determine if their hardware is compatible with PC-BSD®. It contains the following forums:

- [Motherboards](#)

- [Video Cards](#)
- [NICS](#)
- [Laptops](#)

The Server Administration category contains forums for discussing system administrative tasks system administration topics and questions for PC-BSD®, TrueOS®, FreeBSD, and Warden®. It contains the following forums:

- [System Administrators](#)
- [Jails](#)

The International category contains forums for non-English speakers for PC-BSD® related discussions in their native language. Each forum has its own categories for organizing posts. The following forums are available:

- [Chinese – 中文](#)
- [Japanese - 日本語 中文](#)
- [French - Français](#)
- [German – Deutsch](#)
- [Russian - Русский](#)
- [Slovene - Slovenščina](#)
- [Spanish - Español](#)

While logged into the forums, a link called “UserCP” will appear in the upper left hand corner. This is your control panel and it contains many settings to customize your forums experience. You should review the settings in your Control Panel.

Before asking a question on the forums or starting a new thread, first use the search utility to see if a similar thread already exists. If one does, you can add to the conversation by using the “Reply” button. If you find a thread useful, feel free to click the “Thanks” button to let the original poster know that you benefited from their knowledge.

If a similar thread does not already exist, review the forum categories to determine which one is the best fit for your post. When creating a new thread, use a useful “Title” name to describe your problem or question--remember, other users may be researching a similar issue and you want them to find your thread. Include enough details in your message so that others can quickly understand what you are experiencing--otherwise, they will have to ask you additional questions to understand your problem. Make sure you are subscribed to your thread so that you will receive a notification when someone responds to it.

You can ask a question by clicking on the “New Thread” button in the forum category that most closely matches your question. For example, if you are having problems with your video settings, you should create a new thread in the “Graphics” Card forum. If you do not see a category that matches your question, try the “General Support” category.

In addition to the forums available from the PC-BSD® Forums website, the following forums may assist you in troubleshooting your PC-BSD® system:

- [FreeBSD Forums](#): many PC-BSD® problems are related to the underlying FreeBSD operating system. The FreeBSD forums are very active and full of useful information that can apply to your PC-BSD®

system.

- [BSD Foren](#): these forums are in German and contain many categories for each of the BSD operating systems.
- [BSD Guru PC-BSD® Forum](#): this forum is in Polish and is specific to PC-BSD®, forums for the other BSD operating systems are also available at [BSD Guru](#).

10.2 IRC Channel

Like many open source projects, PC-BSD® has an [IRC channel](#) to connect supporters and users. To get connected, use the following information in your IRC client:

- **Server name:** irc.freenode.net
- **Channel name:** #pcbsd (note that the # is required)

[AppCafe®](#) has an IRC category where you can find PBIs for IRC clients. If you do not wish to install an IRC client, you can instead use the [the web interface to #pcbsd](#).

IRC is a great way to chat with other users and get answers to your questions. A few things to keep in mind if you ask a question on IRC:

- Most of the regular users are always logged in, even when they are away from their computer or are busy doing other computing tasks. If you do not get an answer right away, do not get mad, leave the channel and never come back again. Stick around for a while to see if anyone responds.
- IRC users represent many different time zones. It is quite possible that it is late at night or very early in the morning for some users when you ask a question.
- Do not post error messages in the channel as the IRC software will probably kick you out for flooding and it is considered to be bad etiquette. Instead, use a pasting service such as [pastebin](#) and refer to the URL on channel.
- Be polite and do not demand that others answer your question.
- It is considered rude to DM (direct message) someone who does not know you. If no one answers your question, do not start DMing people you do not know.
- The first time you join a channel, it is okay to say hi and introduce yourself.

10.3 Mailing Lists

Mailing lists are a handy way to discuss problems, solutions, and requested features as they create a searchable archive of discussions. The PC-BSD® Project offers the following [mailing lists](#) to cover a wide variety of discussion topics:

- **[Announce](#)**: a read-only, low frequency list used by the PC-BSD® team to make announcements to the community.
- **[Commits](#)**: lists commits as PC-BSD® code is added or modified by developers.
- **[Dev](#)**: for discussion related to PC-BSD® technical development.
- **[Docs](#)**: for communications between those who are involved, or interested in contributing to, the PC-BSD® documentation effort.
- **[Installer](#)**: for discussions about the backend to the **pc-sysinstall** utility.

- **[PBI-bugs](#)**: for users to report and discuss bugs found in PBI applications.
- **[PBI-dev](#)**: for discussions between PBI developers and users concerning PBI construction and maintenance.
- **[PBIbuild](#)**: lists commits as PBIs are added or modified by PBI developers.
- **[PCBSD-Malaysia](#)**: general discussion list for Malaysian users in their native language.
- **[PCBSD-warden](#)**: the place to discuss [Warden®](#).
- **[Public](#)**: general public list for discussion not related to the other mailing lists.
- **[Support](#)**: if you have a problem, you should report your issue or error messages on this list.
- **[Testing](#)**: for those wishing to participate in PC-BSD® beta testing and feedback.
- **[Trac-bugs](#)**: lists notifications about changes to PC-BSD® bug reports in Trac database.
- **[Translations](#)**: for those involved in translating for PC-BSD®.

Each mailing list includes a description of topics suitable for discussion on that list and indicates if it is read only or available for user discussion. Anyone can read the archives of a list. If you wish to send an email to a mailing list, you will need to first subscribe to the list. The link for each mailing list provides an interface for subscribing to that list. When you send an email to the list, remember to use the mailing address that you used when you subscribed to the list.

Several of the mailing lists are archived at [gmane](#). Gmane allows you to read the archives in several different formats. It also provides RSS feeds in various formats for keeping up-to-date on new messages and topics.

In addition to the official mailing lists, there are mailing lists set up by PC-BSD® users. Many of these lists are designed for discussion in other languages. A list of alternative PC-BSD® mailing lists can be found at [Google Groups](#).

10.4 *FreeBSD Handbook and FAQ*

PC-BSD® uses FreeBSD as its underlying operating system, so everything in the [FreeBSD Handbook](#) and [FreeBSD FAQ](#) applies to PC-BSD® as well. Both documents are very comprehensive and cover nearly every task you can accomplish on a FreeBSD system. They are also an excellent resource for learning how things work under the hood of your PC-BSD® system.

NOTE: some configurations described in the FreeBSD Handbook already “just work” on your PC-BSD® system as they have been pre-configured for you. In these instances, reading that FreeBSD Handbook section can help you to understand how your system is configured and why it works.

10.5 *Social Media*

The PC-BSD® project maintains several social media sites to help users keep up-to-date with what is happening and to provide venues for developers and users to network with each other. Anyone is welcome to join.

- [Official PC-BSD® Blog](#)
- [PC-BSD® on Twitter](#)
- [PC-BSD® Facebook Group](#)
- [PC-BSD® Google+ page](#)
- [PC-BSD® LinkedIn Group](#)

10.6 Search and Portals

Many BSD related search portals exist. If you can not find the answer that you are looking for in the forums or mailing lists, try searching these websites:

- [The OpenDirectory](#)
- [FreeBSD Search](#) (includes mailing list archives, man pages, and web pages)
- [FreeBSD News](#)
- [About BSD](#)
- [BSD Guides](#)
- [Slashdot BSD](#)
- [DistroWatch](#)
- [LinuxBSDos](#)

10.7 Other Resources

The following BSD sites and resources may also contain useful information:

- [The FreeBSD Diary](#)
- [PC-BSD® YouTube channel](#)
- [BSD YouTube channel](#)
- [BSD Talk](#)
- [BSD Now](#)
- [BSD Magazine](#) (free, monthly download)
- [FreeBSD Journal](#) (bi-monthly magazine)
- [BSD Hacks](#) (book)
- [The Best of FreeBSD Basics](#) (book)
- [Definitive Guide to PC-BSD®](#) (book)

11 Supporting PC-BSD®

PC-BSD® is a community project and relies on involvement from its users and supporters. This section lists some ideas for becoming involved.

- [Become a Beta Tester](#)
- [Become a Translator](#)
- [Become a Developer](#)
- [Make Minor Modifications to a PBI Module](#)
- [Purchase PC-BSD® Swag](#)
- [Become an Advocate](#)

11.1 Become a Beta Tester

If you like playing around with operating systems and have a bit of spare time, one of the most effective ways you can assist the PC-BSD® community is by reporting problems you encounter while using PC-BSD®.

If you have a spare system or virtual machine, you can also download and try out the latest alpha, beta or release candidate snapshots. These versions are still in testing and have not been officially released yet. Having as many people as possible using PC-BSD® on many different hardware configurations assists the project in finding and fixing bugs. This makes using PC-BSD® better for everyone. Subscribing to the [PC-BSD® blog](#) is a good way to keep up-to-date on the availability of testing snapshots and any major bugs that are found within a snapshot.

If becoming a tester interests you, subscribe to the [testing mailing list](#). As new testing versions become available they will be announced on this list. You will also be able to see what problems other testers are finding and can check to see if the problem exists on your hardware as well. You can also subscribe to [Gmane's RSS feeds](#) if you want a quick way to keep up with the subjects being discussed on the testing mailing list.

Anyone can become a beta tester. Follow these tips so that you can accurately describe your findings so they can be fixed as soon as possible:

- before [reporting a bug](#), search the testing mailing list to see if anyone else has reported a similar problem.
- when reporting a new issue, use a descriptive subject that includes the error and the version of PC-BSD®. Ideally, the subject is short (8 words or less) and contains key words about the error. An example would be “Warden on 10-STABLE-p4 fails to export jail”.
- ensure that the body of the bug report includes the PC-BSD® version.
- give a short (2-3 sentences) description of how to recreate the error (e.g. when I right click a jail in warden and select Export jail to a .wdn file, it lets me select a file name, but then it freezes). If there is an error message, include its text.
- include any other info that may be useful (e.g. this used to work on 9.2).
- if the problem appears to be hardware related, include a copy of `/var/run/dmesg.boot` as this file shows the hardware that was probed the last time the PC-BSD® system booted.

11.2 Become a Translator

If you are interested in translating PC-BSD® into your native language, there are three translation areas that you can choose to become involved in:

1. Translate the graphical menus within the PC-BSD® operating system.
2. Translate the documentation that is published with PC-BSD®.
3. Translate the PC-BSD® website.

This section describes each of these translation areas in more detail and how to get started as a translator.

11.2.1 Join the Translations Mailing List

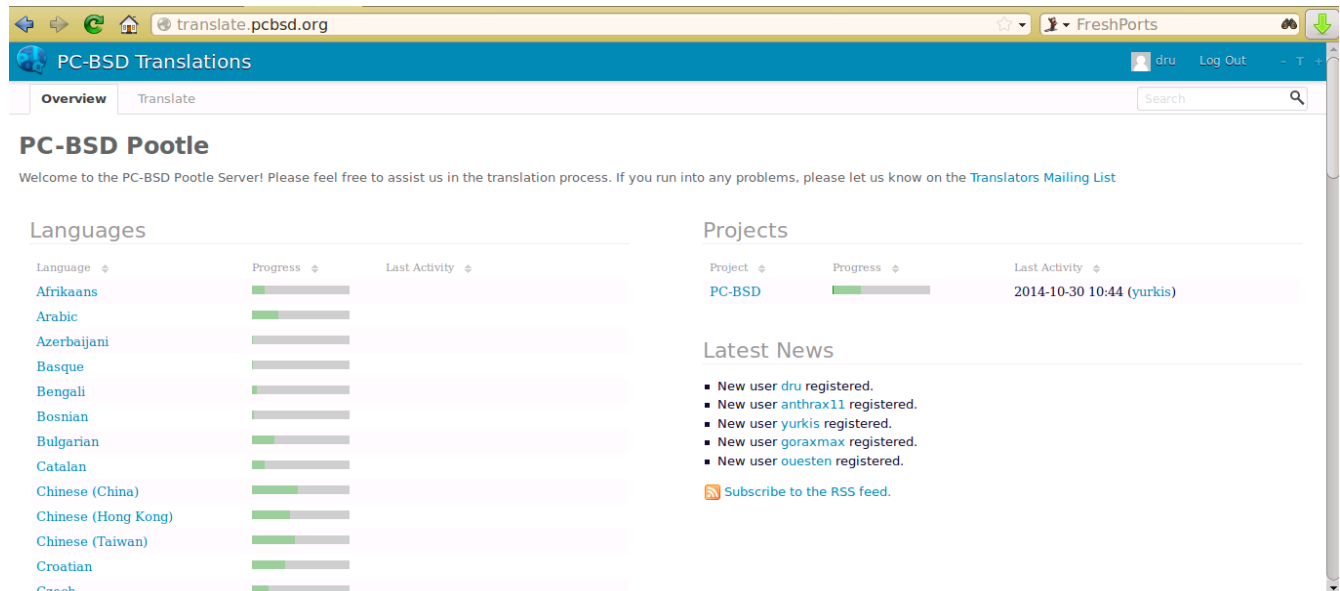
Regardless of the type of translation you are interested in, you should first join the [translations mailing list](#). When you join, send an email to introduce yourself and indicate which language(s) and which type(s) of translations you can assist with. This will allow you to meet other volunteers as well as keep abreast of any notices or updates that may affect translators.

11.2.2 Interface Translation

PC-BSD® uses [Pootle](#) for managing localization of the menu screens used by the installer and the PC-BSD® utilities. Pootle makes it possible to find out if your native language has been fully localized for PC-BSD®. Pootle also makes it easy for users to check and submit translated text as it provides a web editor and commenting system. This means that translators can spend their time making and reviewing translations rather than learning how to use a translation tool.

To see the status of a localization, open up the [PCBSD Translation System](#) in a web browser, as seen in Figure 11.2a.

Figure 11.2a: The PC-BSD® Pootle Translation System

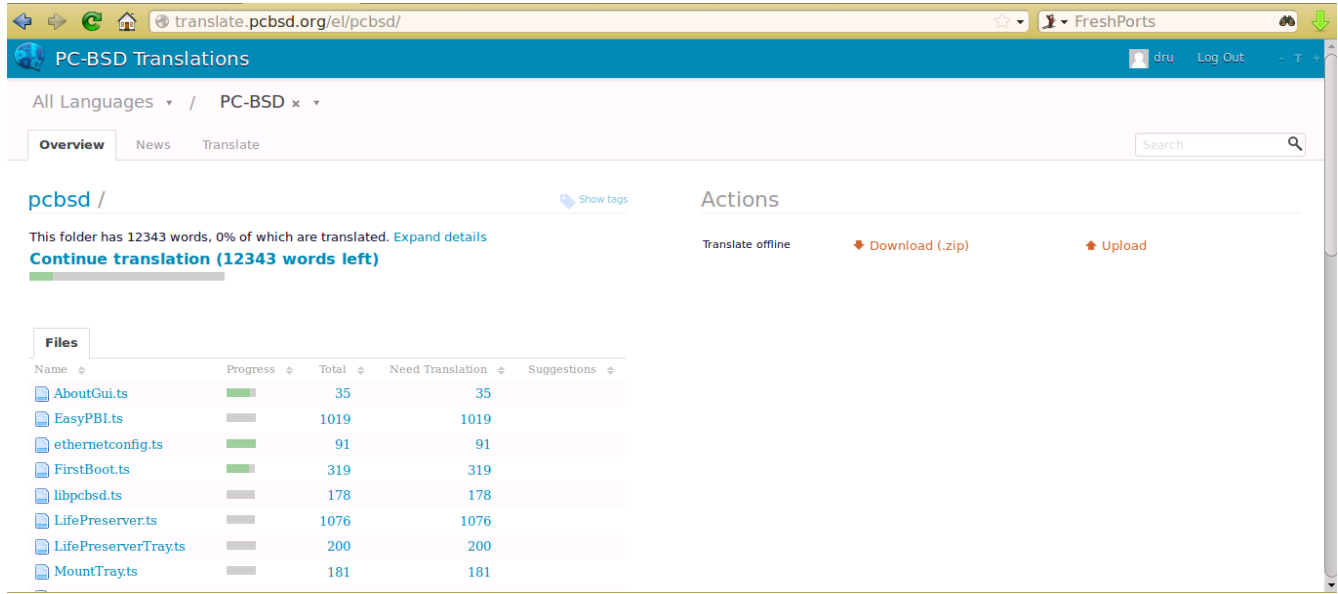


The localizations PC-BSD® users have requested are listed alphabetically on the left. If your language is missing and you would like to help in its translation, send an email to the [translations mailing list](#) so it can be added.

The green bar in the “Progress” column indicates the percentage of PC-BSD® menus that have been localized. If a language is not at 100%, it means that the menus that currently are not translated will appear in English instead of in that language.

If you click on a language name then click on the “PC-BSD” hyperlink under the “Name” column, you will see each menu item that is available for translation. The example shown in Figure 11.2b is for the Greek localization. In this example, the menu for “ethernetconfig” is complete, but the one for “LifePreserver” is not.

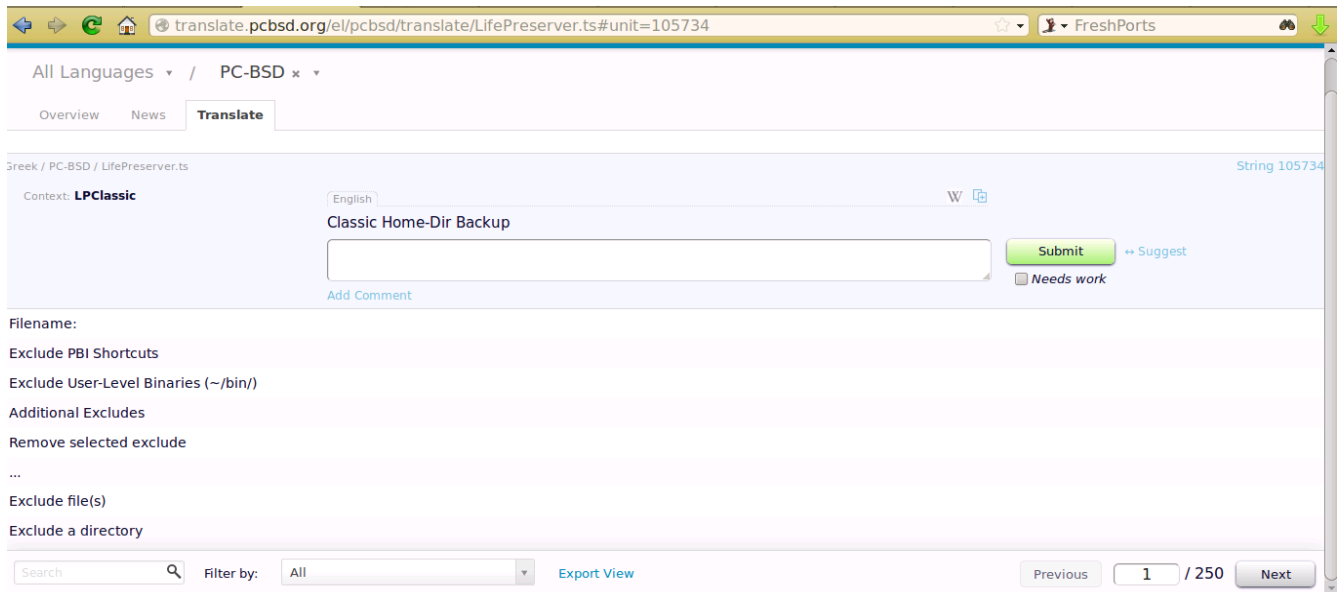
Figure 11.2b: Viewing a Language's Available Menus



11.2.2.1 Editing a Translation

In order to edit a translation, you need to first create a Pootle login account. Once you are logged in to Pootle, navigate to the menu item that you wish to translate. In Figure 11.2c, the translator has clicked on “LifePreserver.ts” then clicked the “Translate” tab.

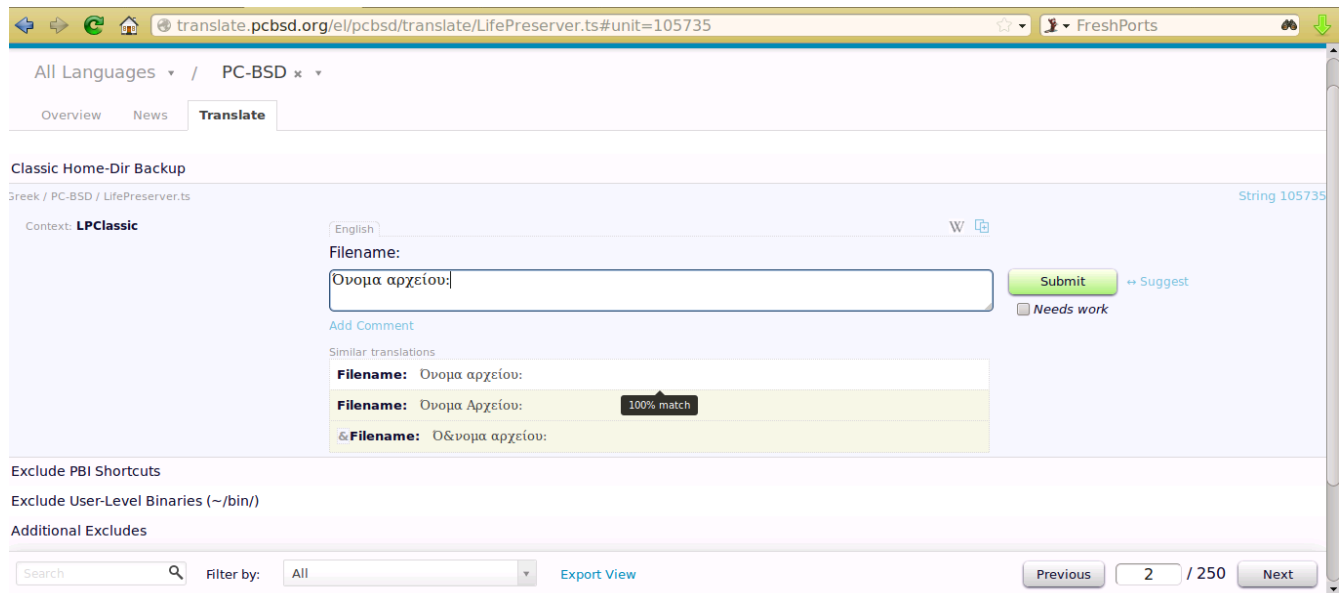
Figure 11.2c: Using the Pootle Interface to Edit a Translation String



In this example, the first string, the phrase “Classic Home-Dir Backup” has not yet been translated. To add the translation, type the translated text into the white text field and click the “Submit” button. To translate another text field, click on the hyperlink associated with its name, or use the “Next” and “Previous” links to navigate between text fields. Sometimes, a text field exists in another screen and already has a translation. Figure 11.2d

provides an example where the translator clicked the hyperlink for “Filename” which displays three previous translations. The translator then clicked the first suggestion and it was automatically added to the white text field.

Figure 11.2d: Selecting a Suggested Translation



If you need help with a translation or using the Pootle system, you can ask for help on the translations mailing list or in the [PC-BSD® Translations Forum](#).

11.2.3 Documentation Translation

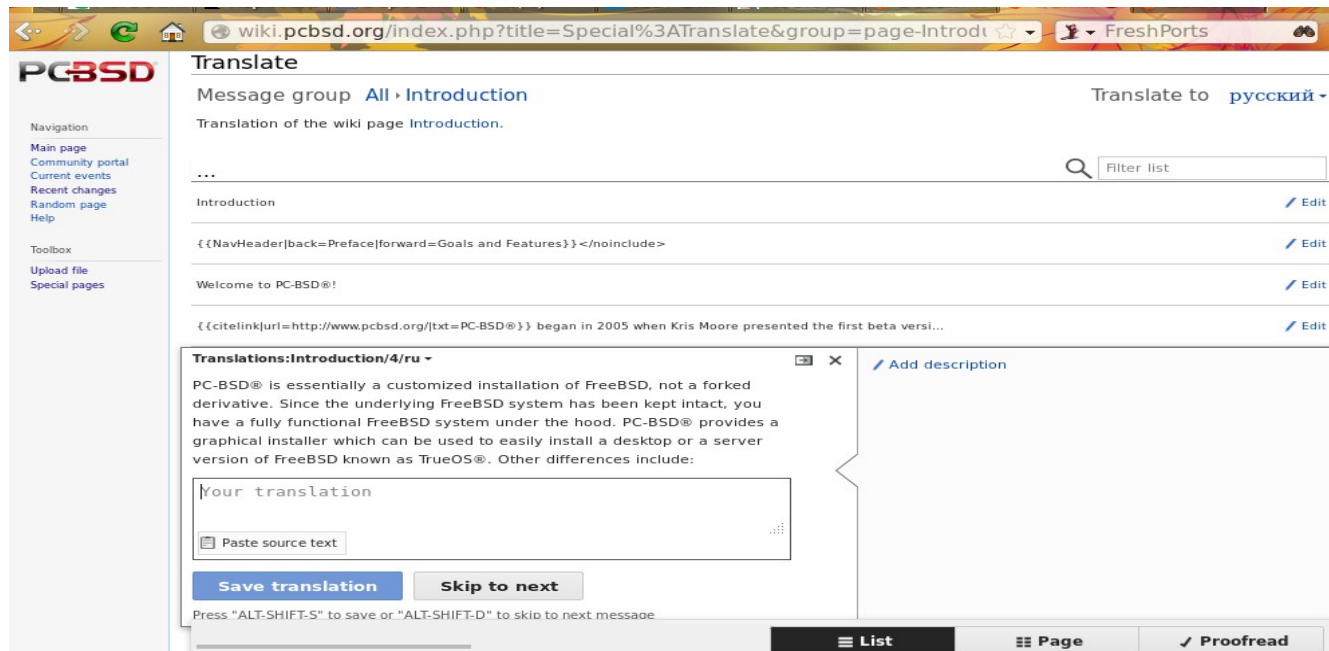
The PC-BSD® Users Handbook is published with each version of PC-BSD®. The PC-BSD® wiki is used to create the next version of the Handbook. As new features are added to the upcoming version of PC-BSD®, they are documented on the wiki.

The wiki has been configured with the [MediaWiki Translate Extension](#). Wiki pages that are to appear in the published version of the Handbook has been marked with the translate tag so that they can be translated by translators.

In order to translate a wiki page, you must first create a wiki account and log in.

To translate a page, click the “Translate this page” link at the top of the page. This will open the translation editor. In the upper right corner, click the “Translate to English” drop-down menu to select the language you wish to translate into. Once the language is selected, click the “Edit” link next to the string to be translated. This will open an editor where you can type in the translation. You can then either click the “Save translation” button to return to the previous page or click the “Skip to next” button to go to the next string to be translated. In the example shown in Figure 11.2e, the user selected the Introduction page, clicked to translate to Russian, and has selected a paragraph to translate.

Figure 11.2e: Translating a Wiki Page



You can review the status of the translation by clicking the “Page” button at the bottom of the screen. This will display the English and the translated versions side by side.

When translating, make sure to adhere to the following rules. This is important as it ensures that the formatting of the published document is consistent across all translations.

- do not translate any text between formatting tags which are enclosed within `<>` brackets.
- do not translate the names of a command (such as **pc-updatemanager**) or application (such as AppCafe®).
- do not translate the output of a command unless it appears differently in a localized version of PC-BSD®.
- do not translate or remove any text contained between comment tags `<!--` and `-->`.

11.2.4 Website Translation

If you are interested in translating the PC-BSD® website, send an email to the [translations mailing list](#). Someone will introduce you to the webmaster who will get you started on website translation.

Currently, the following translated websites are available:

- [Español](#)
- [Français](#)

11.3 Become a Developer

If you like programming, and especially coding on FreeBSD, we would love to see you join the [PC-BSD® Team](#) as a PC-BSD® committer. Developers who want to help improve the PC-BSD® codebase are always welcome! If you would like to participate in core development, subscribe to the [developers mailing list](#). Once you have signed up, feel free to browse the active tickets in the PC-BSD® [bugs database](#). If you see something that you want to work on, or have a proposal for a project you wish to add to PC-BSD®, please let us know via the developers list and we will be happy to help get you started.

Most of the PC-BSD® specific GUI tools are developed in C++ using the Qt Libraries, and other non-GUI development is done using standard Bourne shell scripts. There may be cases where other languages or libraries are needed, but those will be evaluated on a case-by-case basis, so feel free to let us know your proposals on the developers mailing list.

11.3.1 Getting the Source Code and Development Tools

The PC-BSD® source code is available from github and **git** needs to be installed in order to download the source code. When using PC-BSD®, **git** is included in the base install.

To download the source code, **cd** to the directory to store the source and type:

```
git clone git://github.com/pcbsd/pcbsd.git
```

This will create a directory named *pcbsd/* which contains the local copy of the repository. To keep the local copy in sync with the official repository, run **git pull** within the *pcbsd* directory.

PC-BSD® graphical applications use Qt version 4 and their source is located in *pcbsd/src-qt4/*. In order to compile the applications in this directory, install the “PC-BSD Build ToolChain” PBI using [AppCafe®](#). To instead install this PBI from the command line, install the “devel/pcbsd-toolchain” PBI using **pbi add**.

Most of the PC-BSD® source code is divided into two sub-categories:

- *src-sh/* contains shell and C programs which do not include GUIs. These are the command line utilities used in TrueOS® and PC-BSD® and which are installed by the FreeBSD sysutils/pcbsd-utils port.
- *src-qt4/* contains the Qt4-based GUIs seen in PC-BSD® and which are installed by the FreeBSD sysutils/pcbsd-utils-qt4 port

To compile the command line utilities:

```
cd src-sh make
```

To compile the graphical utilities:

```
cd src-qt4 qmake-qt4 make
```

Several Qt IDEs are available in AppCafe®. The [QTCreator](#) PBI is a full featured IDE designed to help new Qt users get up and running faster while boosting the productivity of experienced Qt developers. [Qt Designer](#) is lighter weight as it is only a *.ui* file editor and does not provide any other IDE functionality. It can be installed as the “qt4-designer” raw package using AppCafe® or **pkg install**.

If you plan to submit changes so that they can be included in PC-BSD®, fork the repository using the instructions at [Fork a repo](#). Make your changes to the fork, then submit them by issuing a [git pull request](#). Once your changes have been reviewed, they will be committed or sent back with suggestions.

11.3.2 Basic Guidelines for Writing a PC-BSD® Utility

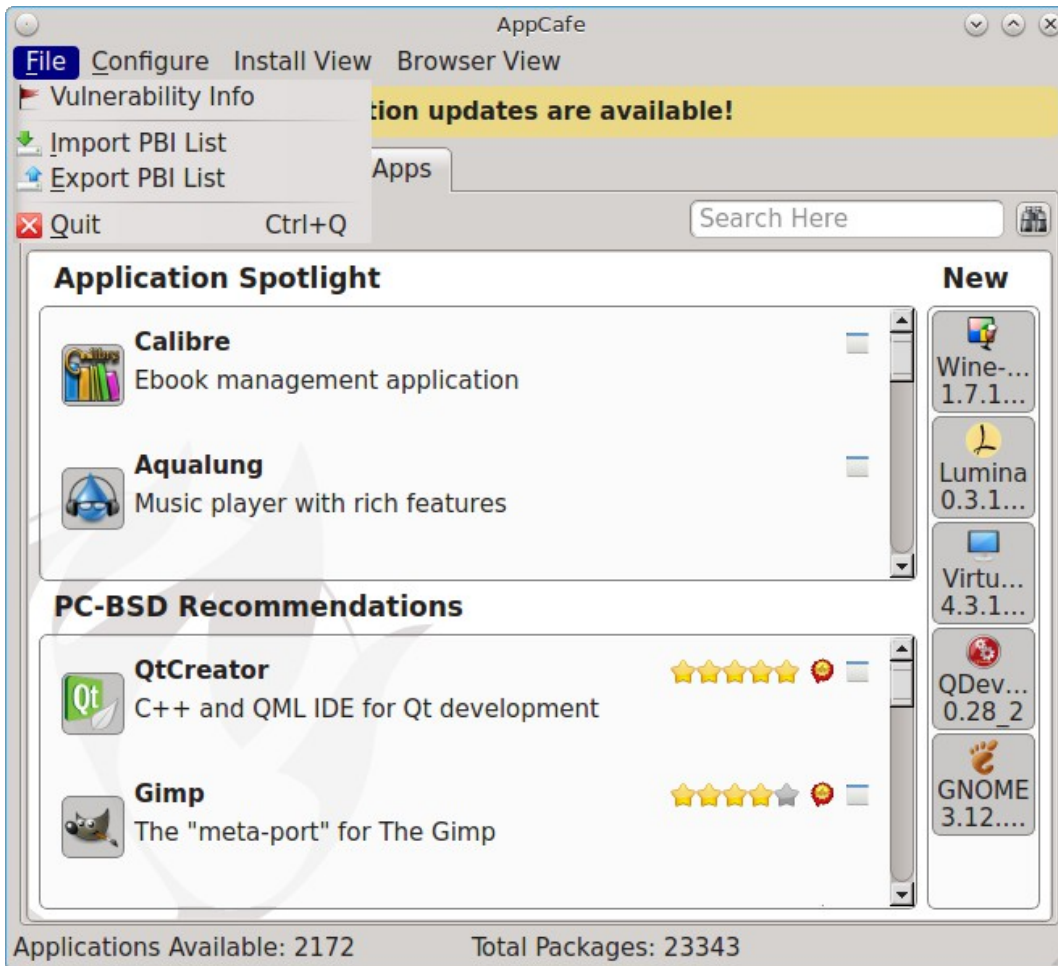
PC-BSD® is a community driven project that relies on the support of developers in the community to help in the design and implementation of new utilities and tools for PC-BSD®. Going forward, we aim to present a unified design so that programs feel familiar to users. As an example, while programs could have “File”, “Main”, or “System” as their first entry on the “File menu”, we want to present one option, “File”, as it is the accepted norm for the first category on the menu bar.

This section describes a small list of guidelines to menu and program design in PC-BSD®. Since most programs designed for the last couple of decades have followed this structure, it makes sense for us to follow the same standard.

11.3.2.1 File Menus

Any graphical program that is a full-featured utility, such as Warden® or AppCafe®, should have a file menu. However, file menus are not necessary for small widget programs or dialogue boxes. When making a file menu, a good rule of thumb is keep it simple. Most PC-BSD® utilities do not need more than two or three items on the file menu. An example of a well laid out “File” menu is AppCafe®, shown in Figure 11.3a.

Figure 11.3a: AppCafe® File Menu



“Configure” is our adopted standard for the category that contains “Settings” or other configuration related settings. If additional categories are needed, check to see what other PC-BSD® utilities are using.

11.3.2.2 File Menu Icons

File menu icons are taken from the KDE Oxygen theme located in `/usr/local/share/icons/oxygen`. Use these file menu icons so we do not have a bunch of different icons used for the same function. Table 11.3a lists the commonly used icons and their default file names.

Table 11.3a: Commonly Used File Menu Icons

Function	File Menu Icon	File Name
Quit	row 1, cell 2	window-close.png
Settings	row 2, cell 2	configure.png

11.3.2.3 Buttons

PC-BSD® utilities use these buttons as follows:

- **Apply:** applies settings and leaves the window open.
- **Close:** closes program without applying settings.
- **OK:** closes dialogue window and saves settings.
- **Cancel:** closes dialogue window without applying settings.
- **Save:** saves settings and closes window.

Fully functional programs like [AppCafe®](#) and [Warden®](#) do not use close buttons on the front of the application. Basically, whenever there is a “File” menu, that and an x in the top right corner of the application are used instead. Dialogues and widget programs are exceptions to this rule. A good example of a widget program would be [Update Manager](#).

11.3.2.4 Keyboard Shortcuts

Many users benefit from keyboard shortcuts and we aim to make them available in every PC-BSD® utility. Qt makes it easy to assign keyboard shortcuts. For instance, to configure keyboard shortcuts that browse the “File” menu, put `&File` in the text slot for the menu entry when making the application. Whichever letter has the `&` symbol in front of it will become the hot key. You can also make a shortcut key by clicking the menu or submenu entry and assigning a shortcut key. Be careful not to duplicate hot keys or shortcut keys. Every key in a menu and submenu should have a key assigned for ease of use and accessibility. Tables 11.3b and 11.3c summarize the commonly used shortcut and hot keys.

Table 11.3b: Shortcut Keys

Shortcut Key	Action
CTRL + Q	Quit
F1	Help

Table 11.3c: Hot Keys

Hot Key	Action
Alt + Q	Quit
Alt + S	Settings
Alt + I	Import
Alt + E	Export
ALT + F	File Menu
ALT + C	Configure Menu
ALT + H	Help Menu

11.3.2.5 Saving Settings in a Qt Application

When saving an application's settings, the `QSettings` class should be used if possible. There are two different “organizations”, depending on whether the application is running with root permissions or user permissions. Use “PCBSD” for the organization for applications that run with user permissions and “PCBSD-root” for applications that are started with root permissions via `sudo`. Proper use prevents the directory where settings files are saved from being locked down by root applications, allowing user applications to save and load their settings. Examples 11.3a and 11.3b demonstrate how to use the `QSettings` class for each type of permission.

Example 11.3a: User Permission Settings

(user application - C++ code):

```
QSettings settings("PCBSD", "myapplication");
```

Example 11.3b: Root Permission Settings

(root application - C++ code):

```
QSettings settings("PCBSD-root", "myapplication");
```

11.3.3 Resources

Developers will also find the following resources helpful:

- [Commits Mailing List](#)
- [qmake Manual](#)

11.4 Make Minor Modifications to a PBI Module

If you have a GitHub account and are logged in, you can contribute minor PBI changes to the [pbi-modules in the PC-BSD® repository](#) using a web browser. If you do not have a GitHub account, create one [here](#) and use a valid email address as you will need to confirm your email address.

For example, to add a screenshot for an application, upload the screenshot file to a publicly accessible site, then add the URL to the screenshot in between the quotes of the `PBI_SCREENSHOTS=""` line in the `pbi.conf` file for that module. Or, to add a similar application, put the package category and package name in between the

`PBI_PLUGINS=""` line in the `pbi.conf` file for that module. As an example, refer to the [pbi.conf for the www/firefox PBI module](#). More information about the the available `pbi.conf` variables can be found in Table 8.1a.

To make the edit, click on the `pbi.conf` file for the module, click the “Edit” button, make the change, then click the “Commit changes” button. This will issue a “git pull” request which will be reviewed by a developer who will either approve it or contact you if more information about the edit is needed. Once the request is approved, you will receive an email about the approval and the change will appear in [AppCafe®](#) when the next package set becomes available. How long that takes depends upon whether the system is set to use the PRODUCTION or EDGE package set.

11.5 Purchase PC-BSD® Swag

While PC-BSD® is free, some users may wish to purchase media or other items to show their support for the PC-BSD® Project. PC-BSD® items are available from the following websites:

- [FreeBSD Mall](#): sells PC-BSD® DVDs and subscriptions, stickers, The Definitive Guide to PC-BSD®, and apparel.
- [Amazon](#): sells The Definitive Guide to PC-BSD® (hard copy and Kindle formats) as well as the Kindle versions of the PC-BSD® Handbook. Items are available for purchase in your country may vary.
- [The PC-BSD® Corporate Storefront](#): sells high-quality apparel and accessories.

11.6 Become an Advocate

So you love PC-BSD®? Why not tell your family, friends, fellow students and colleagues about it? You will not be the only one that likes a virus-free, feature-rich, no-cost operating system. Here are some suggestions to get you started:

- Burn a couple of DVDs and pass them out. If your school or user group has an upcoming event where you can promote PC-BSD®, you can request additional DVDs from sales@pcbsd.com.
- Consider giving a presentation about PC-BSD® at a local community event or conference. Let us know about it and we will help you spread the word.
- Write a personal blog detailing your journey from your first PC-BSD® install experience to your most recent accomplishment. The blog could also be used to teach or explain how to perform tasks on PC-BSD®. A regional language blog may help build the community in your area and to find others with similar interests.