

Hound Dog Terminal Manager

User Guide

Release V1R0M1

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Introduction

Computer labs in today's businesses contain many Linux systems to run their operations. Computer labs can contain many computer systems in a single 19 inch rack, in lab rows of hundreds of feet, accounting for hundreds or thousands of computer systems. Often these systems are only available thru IP access, using such tools as Putty, requiring command line syntax to view and monitor system health, activity, and configuration.

While web server interfaces can be deployed, these tools are usually designed to perform specific tasks. As a result, terminal sessions are often resorted to, using such tools as Putty to satisfy various queries and maintenance.

Because terminal sessions are character-based, it is assumed that benefits found in GUI interfaces such as point-and-click cannot be implemented in terminal sessions. The Hound Dog Terminal Manager addresses this need.

The Hound Dog Terminal Manager provides comprehensive insights into the configuration and activity of a Linux System using a "point and click" user interface developed specifically for a Terminal Window. Instead of having to remember command line syntax and keystrokes, the HDog Terminal Manager allows these input queries and commands to be issued using Menus, Pulldowns, and Push Buttons and presents its results in a structured, easy to understand format.

The Hound Dog Terminal Manager provides three distinct features:

- A GUI-like user interface for easy, error-free user interaction.
 - A user modifiable and extendable menu structure built from an XML file.
 - A public API that includes SDK functionality for functionality extensions.
- An additional feature of the Hound Dog Terminal Manager is that it provides a consistent user interface across different variants of Linux. This release of HDog provides support for Ubuntu and Fedora, but future releases will provide support for other Linux variants such as openSUSE, PCLinuxOS, Debian, Mandriva, and Sabayon/Gentoo. Instead of having to remember the variations of command line syntax associated with these Linux variants, HDog accounts for those differences while providing a consistent, easy-to-understand user interface.

Product Versions

The Hound Dog Terminal Manager is installed as an Evaluation Version. This Evaluation Version can be used on the installed system for 30 days.

You must purchase a registration key within this 30 day window or it will expire. After expiration, if/when you invoke the Hound Dog Terminal Manager, only the Registration option can be performed.

You can purchase this registration key on the www.hounddogtech.us website or by requesting via email to hdogtech@comcast.net. Paypal is the preferred payment type but other forms of payment can be made.

You can purchase either of the two Registered Versions:

Local Version

The Hound Dog Terminal Manager Local Version can be installed on up to two computers. This is a complete, independent installation on each system.

Network Version

The Hound Dog Terminal Manager Network Version can be installed on up to four computers and contains all the features and characteristics of the Local Version.

Each installation of the Hound Dog Terminal Manager Network Version can support up to 100 remote Linux systems in the network. The Hound Dog Terminal Manager will securely perform its functions on the Remote Systems and return its results to the user on the installed system.

This Network Version has the advantage of not needing to install the Hound Dog Terminal Manager on each Linux system it needs to run on. It may provide an ideal solution for configurations that contain multiple embedded Linux systems connected in a private network with a single Linux system having public network access. In those cases, the Hound Dog Terminal Manager would be installed on the Linux system with public network access and use private network to perform actions on the embedded Linux systems.

The Network Version also provides for Secure Socket Trust to be established between the Hound Dog Terminal Manager signon User ID on the local Linux system with a User account on a remote Linux system using user-friendly point and click actions.

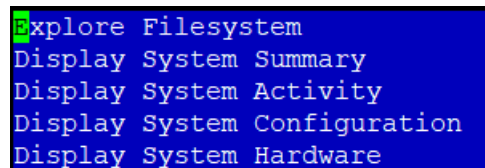
Note: The Evaluation Version supports up to one Remote System to be specified.

User Interface

The Hound Dog Terminal Manager, (**HDog**), user interface utilizes colors and attributes to depict point-and-shoot screen objects like Menu Items, Push Buttons, and Pulldowns. Keyboard use of **Tab** and **Arrow** keys, as well as an attached mouse, allow the user to point to the task s/he would like to perform.

Consider the Menu Items on the right →

The cursor indicates that the **Explore Filesystem** menu item is the current selection. Pressing **Enter** or clicking the mouse on this entry will cause that function to be performed. Likewise, Tabbing to another menu item and/or clicking on another menu item will cause that selected menu item function to be performed.



```
Explore Filesystem
Display System Summary
Display System Activity
Display System Configuration
Display System Hardware
```

Consider the Action Bar on the right →



```
Forward Return Save Print Help Exit
```

The cursor indicates that the current Push Button is for the Forward action. Tabbing will jump to the **Return, Save, Print, Help, and Exit** Push Buttons. Pressing **Enter** or a mouse click on a Push Button will cause that function to be performed.

When **HDog** starts up the user will be presented with the **HDog Main Menu**. Selecting a Submenu such as **Display System Hardware** will cause that submenu to be presented. Submenus will have an additional Push Button displayed called **Return**. Upon selection, the **Return** Push Button will cause the next 'Higher' menu to be presented.

Pressing the **Exit** Push Button will cause **HDog** to immediately terminate normally.

Here is some information of the other **HDog** Push Buttons.

Help: Help information is provided for the panel.

Forward: This Push Button is only displayed when **HDog** realizes that there is more information left. Selecting this Push Button will cause **HDog** to page forward.

Save: Saves the current action's contents as a new dataset in the /tmp folder.

Print: Prints the current action's contents using the **lpr** utility.

A typical Putty screen is comprised of 24 rows with 80 columns each. These screens can be expanded to over 50 rows and 180 columns. **HDog** makes use of any screen expansion to provide as much information for the user as possible.

Main Menu (Local Version)

```
Linux #37-Ubuntu          Hound Dog Terminal Manager          ID: bob
4.4.0-21-generic         Local Version                          10/11/2017
bob-OptiPlex-780

  Explore Filesystems
  Display System Summary
  Display System Activity
  Display System Configuration
  Display System Hardware
  Manage Preferences
  Product Information
  Command Shell
  Sample Scripts

Click selection or Tab and press Enter.

  Exit  Help

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```

Figure 1: Main Menu.

Above is the Hound Dog Terminal Manager, (**HDog**), **Main Menu**. The content of the **Main Menu** is dynamically built from the `hdog.xml` file, which can be modified by the user as required. Information about the system is displayed in the upper left and the user id and time is displayed in the upper right.

The user can click on a particular Menu Item, or **Tab** to a desired Menu Item and press **Enter**.

Among the above selections:

- **Explore Filesystem:** Beginning at the root folder, display the files and folders of the system.
- **Display System Summary:** Provide a summary of the system's hardware components.
- **Display System Activity:** Submenu of System Activity Menu Items.
- **Display System Configuration:** Submenu of System Configuration Items.
- **Display System Hardware:** Submenu of System Hardware Components.
- **Manage Preferences:** Customize color and attribute preferences.
- **Product Information:** Provide information about the HDog product.
- **Command Shell:** Enter the Linux Command Shell.
- **Help:** Provide Help information.
- **Exit:** Exit the Hound Dog Terminal Manager.

Main Menu (Network Version)

```
Linux #37-Ubuntu          Hound Dog Terminal Manager          ID: bob
4.4.0-21-generic         Network Version: 10.0.0.96          10/10/2017
bob-OptiPlex-780

  Explore Filesystems
  Display System Summary
  Display System Activity
  Display System Configuration
  Display System Hardware
  Connect To Remote Systems
  Manage Preferences
  Product Information
  Command Shell
  Sample Scripts

Click selection or Tab and press Enter.

Exit  Help  Disconnect

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```

Figure 2: Main Menu (Network Version)..

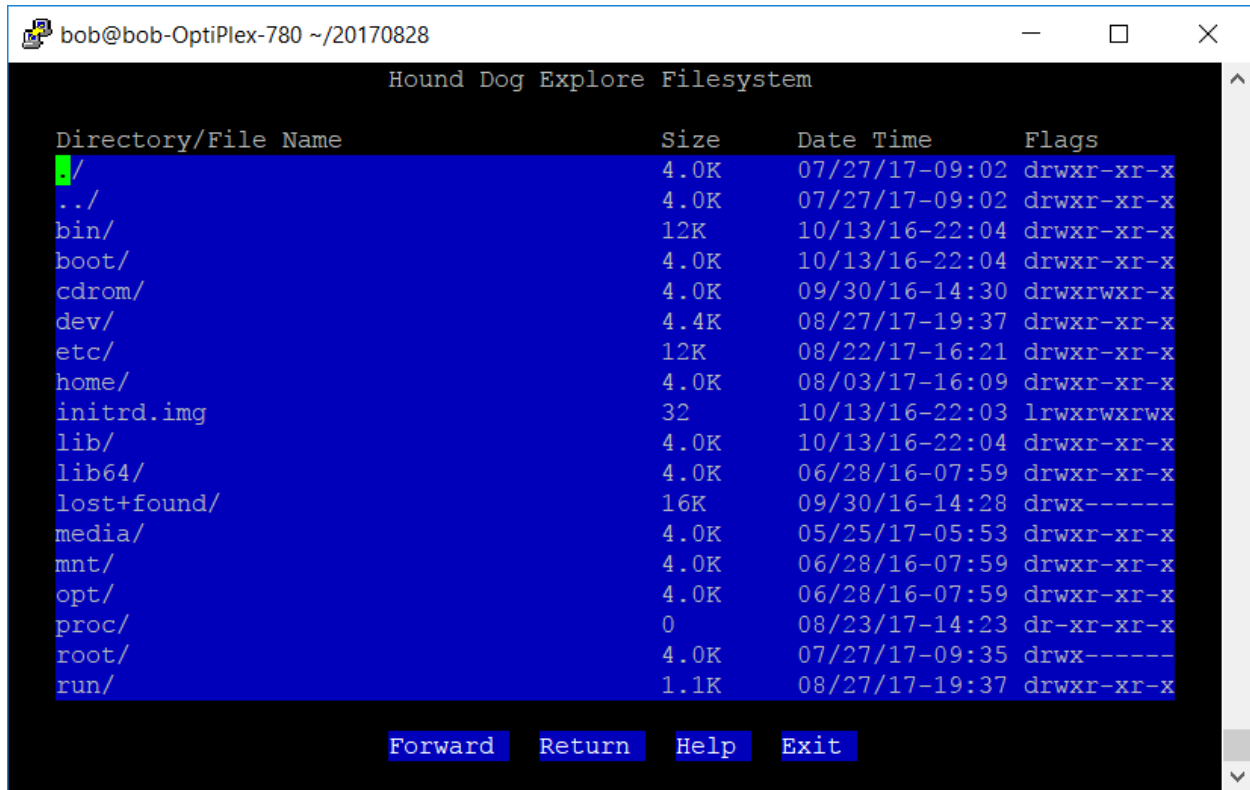
The Hound Dog Terminal Manager Network Version **Main Menu** is identical to the Local Version with the following exceptions:

- An additional Menu Item is displayed with the title **Connect to Remote Systems**. When selected, a panel will be presented to allow you to select a Remote System to Connect to using its predefined IP, Port, and User ID. Once connected, the actions that you select will be performed on that Remote System with the output being presented back on this panel.
- When a Remote System is connected, its IP will be appended to the above panel title. In the sample panel above, this IP is 10.0.0.96.
- A **Disconnect** push button is added to the Action Bar if a Remote System is currently connected. When the **Disconnect** Push Button is selected, the currently connected Remote System will be disconnected and subsequent actions will be performed on the Local Linux system.

The Network version allows you to install the Hound Dog Terminal Manager on one system and perform actions on up to 100 Remote Systems that are network attached to the local system.

Note: The **Manage Preferences** and **Product Information** actions will be performed on the Local Linux system regardless of whether or not a Remote System has been connected.

Explore Filesystems



The screenshot shows a terminal window titled "Hound Dog Explore Filesystem" with a black background and blue text. The window title bar indicates the user is "bob" on a machine named "bob-OptiPlex-780" at the directory "~/20170828". The main content is a table listing the contents of the root directory. The table has four columns: "Directory/File Name", "Size", "Date Time", and "Flags". The first row, representing the root directory "/", is highlighted in green. Below the table are four buttons: "Forward", "Return", "Help", and "Exit".

Directory/File Name	Size	Date Time	Flags
/	4.0K	07/27/17-09:02	drwxr-xr-x
../	4.0K	07/27/17-09:02	drwxr-xr-x
bin/	12K	10/13/16-22:04	drwxr-xr-x
boot/	4.0K	10/13/16-22:04	drwxr-xr-x
cdrom/	4.0K	09/30/16-14:30	drwxrwxr-x
dev/	4.4K	08/27/17-19:37	drwxr-xr-x
etc/	12K	08/22/17-16:21	drwxr-xr-x
home/	4.0K	08/03/17-16:09	drwxr-xr-x
initrd.img	32	10/13/16-22:03	lrwxrwxrwx
lib/	4.0K	10/13/16-22:04	drwxr-xr-x
lib64/	4.0K	06/28/16-07:59	drwxr-xr-x
lost+found/	16K	09/30/16-14:28	drwx-----
media/	4.0K	05/25/17-05:53	drwxr-xr-x
mnt/	4.0K	06/28/16-07:59	drwxr-xr-x
opt/	4.0K	06/28/16-07:59	drwxr-xr-x
proc/	0	08/23/17-14:23	dr-xr-xr-x
root/	4.0K	07/27/17-09:35	drwx-----
run/	1.1K	08/27/17-19:37	drwxr-xr-x

Figure 2: Explore Filesystems.

The term **filesystem** used here refers to the entire hierarchy of directories (also referred to as the **directory tree**) that is used to organize files on this system.

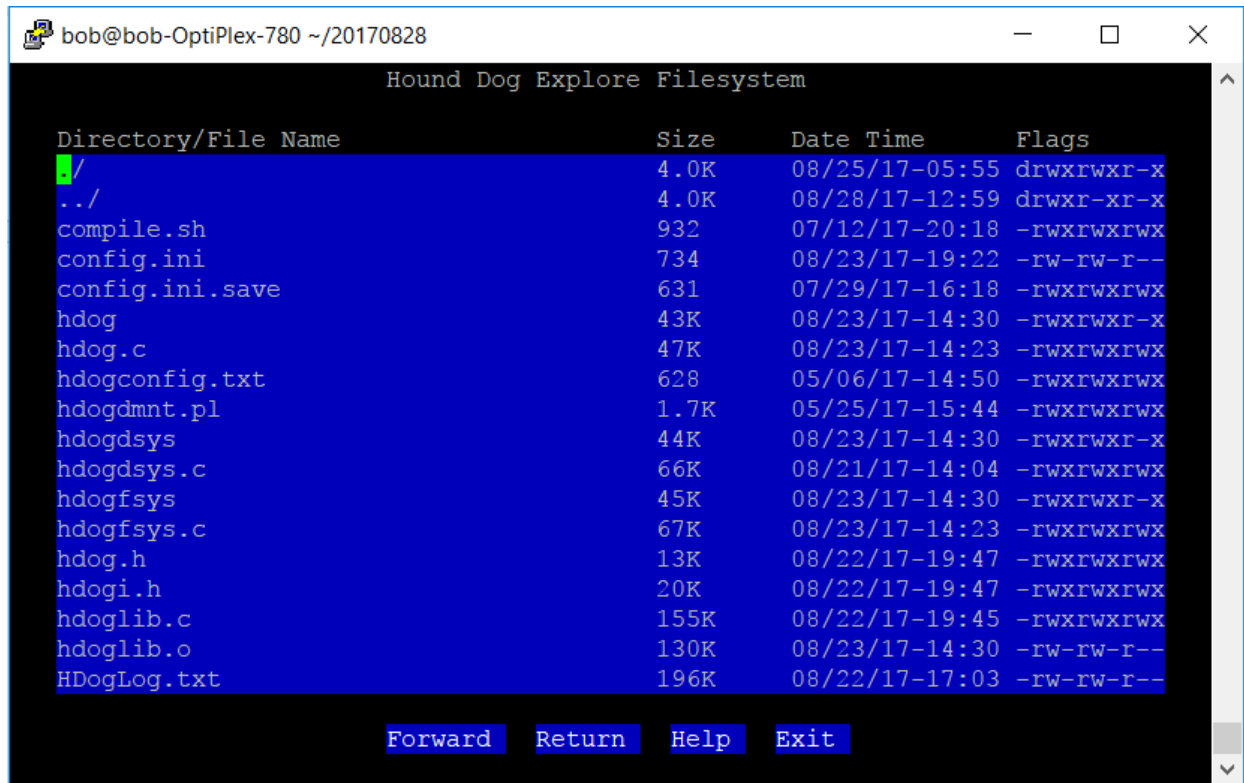
The directories start with the **root directory**, (**/**), which contains a series of subdirectories, each of which, in turn, contains further subdirectories, etc. Subdirectories are displayed with a trailing **'/'** in their name.

Clicking on a **Subdirectory** will result in a display of that **Subdirectory's** contents.

Clicking on a **File** will return detail information about that **File** along with the option to **browse** or **edit** the file if you are authorized to do so.

Clicking on the **../ Subdirectory** name will result in a display of the most recent 'upper' **directory**.

Exploring Folders



The screenshot shows a terminal window titled "bob@bob-OptiPlex-780 ~/20170828" with a window icon in the top right. The terminal content is titled "Hound Dog Explore Filesystem" and displays a directory listing with columns for Directory/File Name, Size, Date Time, and Flags. The listing includes entries like "/", "../", "compile.sh", "config.ini", "config.ini.save", "hdog", "hdog.c", "hdogconfig.txt", "hdogdmt.pl", "hdogdsys", "hdogdsys.c", "hdogfsys", "hdogfsys.c", "hdog.h", "hdogi.h", "hdoglib.c", "hdoglib.o", and "HDogLog.txt". At the bottom of the terminal, there are four buttons: "Forward", "Return", "Help", and "Exit".

Directory/File Name	Size	Date Time	Flags
/	4.0K	08/25/17-05:55	drwxrwxr-x
../	4.0K	08/28/17-12:59	drwxr-xr-x
compile.sh	932	07/12/17-20:18	-rwxrwxrwx
config.ini	734	08/23/17-19:22	-rw-rw-r--
config.ini.save	631	07/29/17-16:18	-rwxrwxrwx
hdog	43K	08/23/17-14:30	-rwxrwxr-x
hdog.c	47K	08/23/17-14:23	-rwxrwxrwx
hdogconfig.txt	628	05/06/17-14:50	-rwxrwxrwx
hdogdmt.pl	1.7K	05/25/17-15:44	-rwxrwxrwx
hdogdsys	44K	08/23/17-14:30	-rwxrwxr-x
hdogdsys.c	66K	08/21/17-14:04	-rwxrwxrwx
hdogfsys	45K	08/23/17-14:30	-rwxrwxr-x
hdogfsys.c	67K	08/23/17-14:23	-rwxrwxrwx
hdog.h	13K	08/22/17-19:47	-rwxrwxrwx
hdogi.h	20K	08/22/17-19:47	-rwxrwxrwx
hdoglib.c	155K	08/22/17-19:45	-rwxrwxrwx
hdoglib.o	130K	08/23/17-14:30	-rw-rw-r--
HDogLog.txt	196K	08/22/17-17:03	-rw-rw-r--

Figure 3: Explore Folder.

Above you will see a subdirectory 'below' the root directory. This subdirectory happens to only contain files.

Clicking on a **File** such as **hdog.h** will return detail information about that **File** along with the option to **browse** or **edit** it if you are authorized to do so.

On the next page you will see the response when you click on the **hdog.h** file entry.

Exploring File Information

```

bob@bob-OptiPlex-780 ~/20170823
Hound Dog File Details

Name: /home/bob/20170816/hdog.h

Type: Regular File

Owner: bob
Group: bob

Permissions: Read Write Exec          Device: [8,1]
Owner: Yes Yes Yes                    INode: 12719860
Group: Yes Yes Yes                    Links: 1
Others: Yes Yes Yes
bob: Yes Yes Yes (Owner Match)

Last Access: 08/16/2017 15:56          Bytes: 12659
Last Change: 08/16/2017 15:56          Blocks: 32
Last Status: 08/16/2017 15:56          Block Size: 4096

Return Browse Edit Help Exit

```

Figure 4: Explore File Information.

Above you will see detail information above a file called **hdog.h**.

The file can be of the following types:

- Block Device:** A file that refers to a **block device**.
- Character Device:** A file that refers to a **character device**.
- DirectoryFIFO/Pipe:** A named pipe.
- Symlink:** A symbolic link.
- Regular File:** A regular file.
- Socket:** A special **file** used for inter-process communication.
- Unknown Type:** An unknown file type.

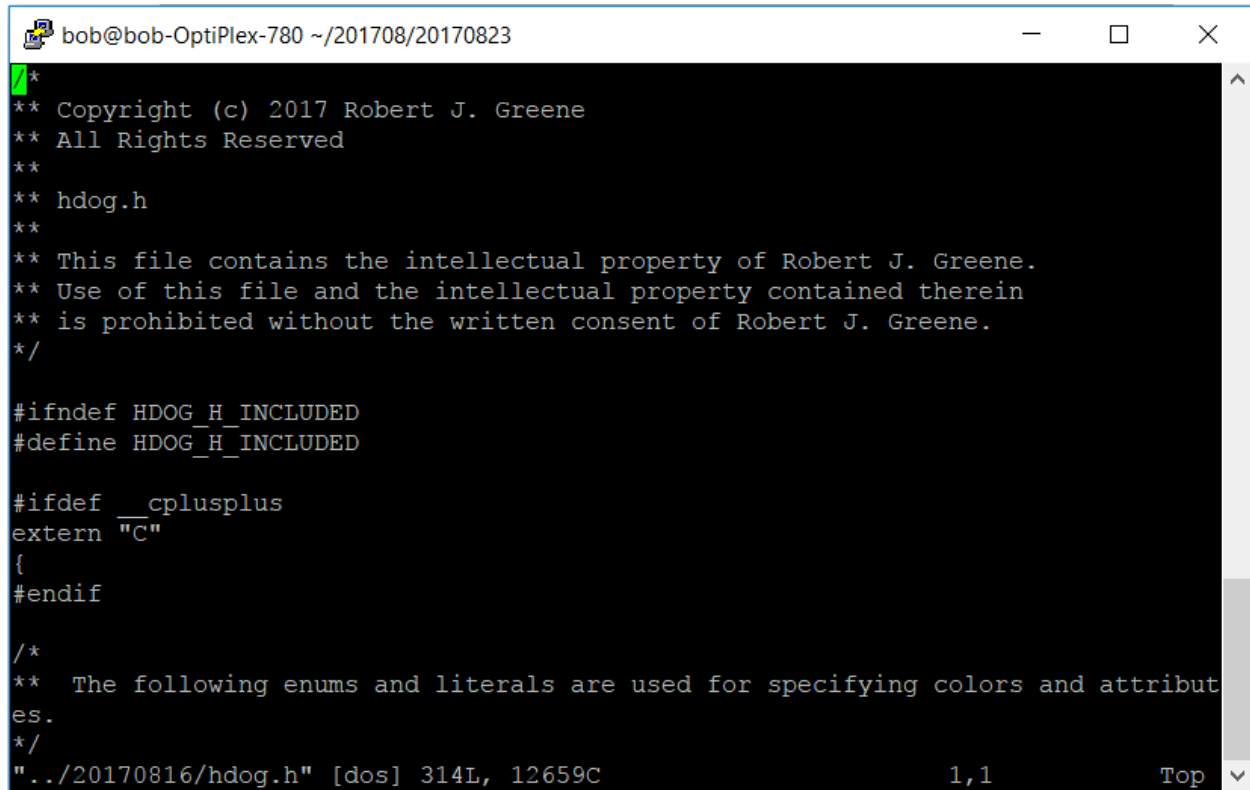
Read, Write, and Execute Permissions are listed for **Owner, Group, Others**, and the current logged on **User**. The logged on **User ID** is listed along with the type of **Permission** match that applies to this File.

File Size and Last Access, Last Change, and Last Status Dates are also displayed.

Browse and Edit Push Buttons will be displayed if the user is authorized to perform these actions. Selecting **Browse** or **Edit** will invoke a **vi** session of the file.

Clicking on **Return** will result in a redisplay of the **directory** that contains the above file.

Browsing and Editing Files



```
bob@bob-OptiPlex-780 ~/201708/20170823
/*
** Copyright (c) 2017 Robert J. Greene
** All Rights Reserved
**
** hdog.h
**
** This file contains the intellectual property of Robert J. Greene.
** Use of this file and the intellectual property contained therein
** is prohibited without the written consent of Robert J. Greene.
*/

#ifndef HDOG_H_INCLUDED
#define HDOG_H_INCLUDED

#ifdef __cplusplus
extern "C"
{
#endif

/*
** The following enums and literals are used for specifying colors and attribut
es.
*/
"../20170816/hdog.h" [dos] 314L, 12659C 1,1 Top
```

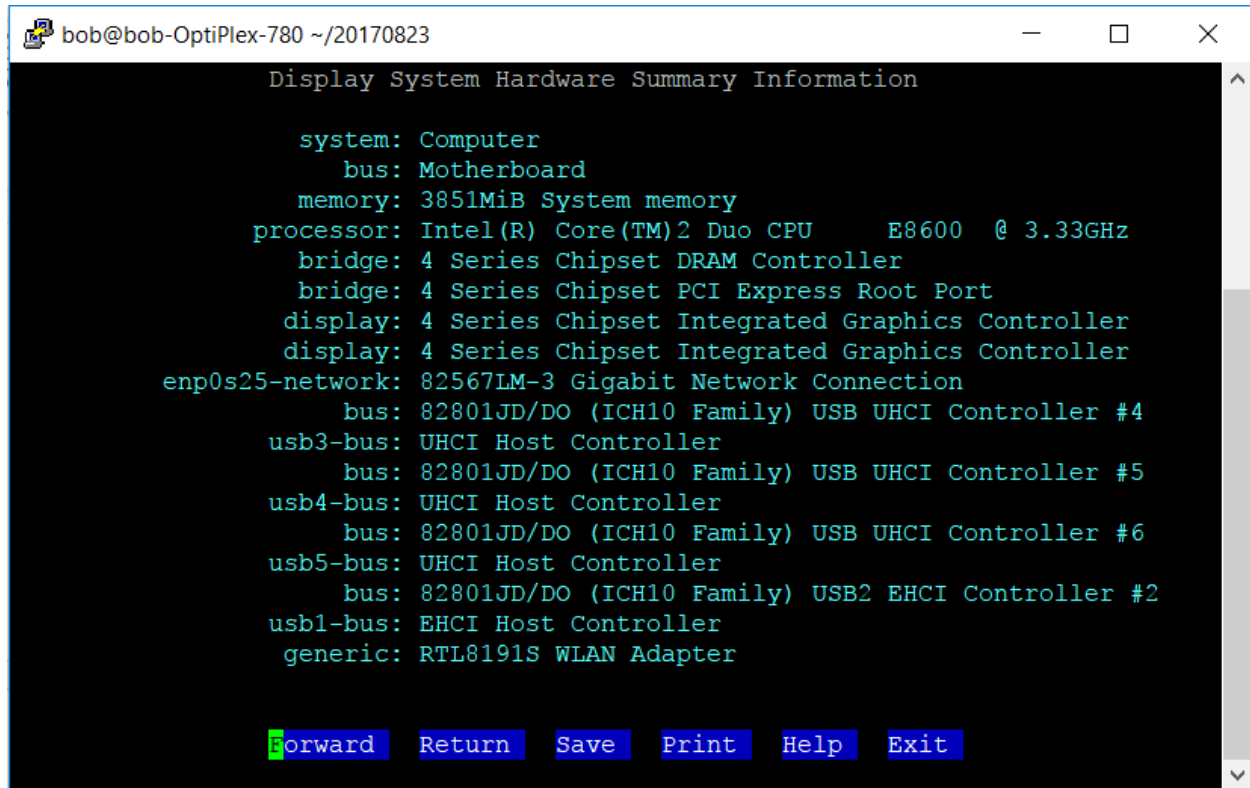
Figure 5: Browsing and Editing Files.

vi is invoked when a user selects a **File** to be browsed or edited.

The above example displays a **vi** session with the `hdog.h` file when the user has selected Browse in the previous panel.

When the user terminates the session, s/he will be returned to redisplay of the **directory** that contains the above file.

Display System Hardware Summary

A screenshot of a terminal window titled "bob@bob-OptiPlex-780 ~/20170823". The terminal displays "Display System Hardware Summary Information" in a monospaced font. The output lists various system components: system (Computer), bus (Motherboard), memory (3851MiB System memory), processor (Intel(R) Core(TM)2 Duo CPU E8600 @ 3.33GHz), bridge (4 Series Chipset DRAM Controller and PCI Express Root Port), display (4 Series Chipset Integrated Graphics Controller), network (enp0s25-network: 82567LM-3 Gigabit Network Connection), and several USB buses (usb3-bus, usb4-bus, usb5-bus, usb1-bus) with their respective controllers. At the bottom, there are six blue buttons labeled "Forward", "Return", "Save", "Print", "Help", and "Exit".

```
Display System Hardware Summary Information

system: Computer
  bus: Motherboard
memory: 3851MiB System memory
processor: Intel(R) Core(TM)2 Duo CPU      E8600  @ 3.33GHz
  bridge: 4 Series Chipset DRAM Controller
  bridge: 4 Series Chipset PCI Express Root Port
  display: 4 Series Chipset Integrated Graphics Controller
  display: 4 Series Chipset Integrated Graphics Controller
enp0s25-network: 82567LM-3 Gigabit Network Connection
  bus: 82801JD/DO (ICH10 Family) USB UHCI Controller #4
usb3-bus: UHCI Host Controller
  bus: 82801JD/DO (ICH10 Family) USB UHCI Controller #5
usb4-bus: UHCI Host Controller
  bus: 82801JD/DO (ICH10 Family) USB UHCI Controller #6
usb5-bus: UHCI Host Controller
  bus: 82801JD/DO (ICH10 Family) USB2 EHCI Controller #2
usb1-bus: EHCI Host Controller
generic: RTL8191S WLAN Adapter

Forward Return Save Print Help Exit
```

Figure 6: Display System Hardware Summary.

The **System Hardware Summary** display describes the basic components of this system. This includes information about the **Processor, Bridges, Buses, Display Controllers, Input Devices, Storage Disks, and Controllers.**

Display System Activity Submenu

```
Linux #37-Ubuntu          Hound Dog Terminal Manager          ID: bob
4.4.0-21-generic         Display System Activity              10/11/2017
bob-OptiPlex-780

Monitor System Activity
Display Memory Usage
Display Memory Events

Click selection or Tab and press Enter.

Return Help Exit

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```

Figure 7: Display System Activity Submenu.

The **Display System Activity Submenu** provides the following menu items:

- **Monitor System Activity:** This is a dynamic real-time view of the CPU and memory activity of this running system. It can display system summary information as well as a list of processes or threads currently being managed by the Linux kernel. This uses **Htop**, which is a free (GPL) ncurses-based process viewer for Linux.

Note: This menu item is currently not supported when connected to a Remote System.

- **Display Memory Usage:** This displays information about the systems **RAM** usage.
- **Display Memory Events:** Reports virtual memory statistics.

Monitor System Activity

```

bob@bob-OptiPlex-780 ~/20170823
1  [          0.0%]   Tasks: 83, 208 thr; 1 running
2  [||         1.3%]   Load average: 0.00 0.03 0.08
Mem[|||||]      443M/3.76G   Uptime: 00:20:28
Swp[           0K/3.90G]

  PID USER      PRI  NI  VIRT   RES   SHR  S   CPU% MEM%   TIME+  Command
 4713 bob        20   0 26020  3936  3252  R   0.0  0.1   0:00.04 htop
1417 bob        20   0 1669M 127M  51624 S   0.0  3.3   0:03.98 cinnamon --replac
   1 root        20   0  116M  5860  4012  S   0.0  0.1   0:01.42 /sbin/init splash
  317 root        20   0 32124  4292  3908  S   0.0  0.1   0:00.16 /lib/systemd/syst
  338 root        20   0 94772  1712  1536  S   0.0  0.0   0:00.00 /sbin/lvmetad -f
  349 root        20   0 46216  5432  3084  S   0.0  0.1   0:00.49 /lib/systemd/syst
  690 root        20   0 29008  3080  2804  S   0.0  0.1   0:00.00 /usr/sbin/cron -f
  788 root        20   0  329M  8636  6880  S   0.0  0.2   0:00.00 /usr/sbin/ModemMa
  797 root        20   0  329M  8636  6880  S   0.0  0.2   0:00.00 /usr/sbin/ModemMa
  693 root        20   0  329M  8636  6880  S   0.0  0.2   0:00.02 /usr/sbin/ModemMa
  789 root        20   0  269M  8336  5516  S   0.0  0.2   0:00.00 /usr/lib/accounts
  798 root        20   0  269M  8336  5516  S   0.0  0.2   0:00.00 /usr/lib/accounts
  699 root        20   0  269M  8336  5516  S   0.0  0.2   0:00.03 /usr/lib/accounts
  701 avahi       20   0 44920  3232  2900  S   0.0  0.1   0:00.06 avahi-daemon: run
  708 root        20   0 28672  3092  2708  S   0.0  0.1   0:00.01 /lib/systemd/syst
  783 syslog    20   0  250M  5492  2788  S   0.0  0.1   0:00.00 /usr/sbin/rsyslog

F1Help  F2Setup  F3Search F4Filter F5Tree  F6SortBy F7Nice - F8Nice + F9Kill  F10Quit

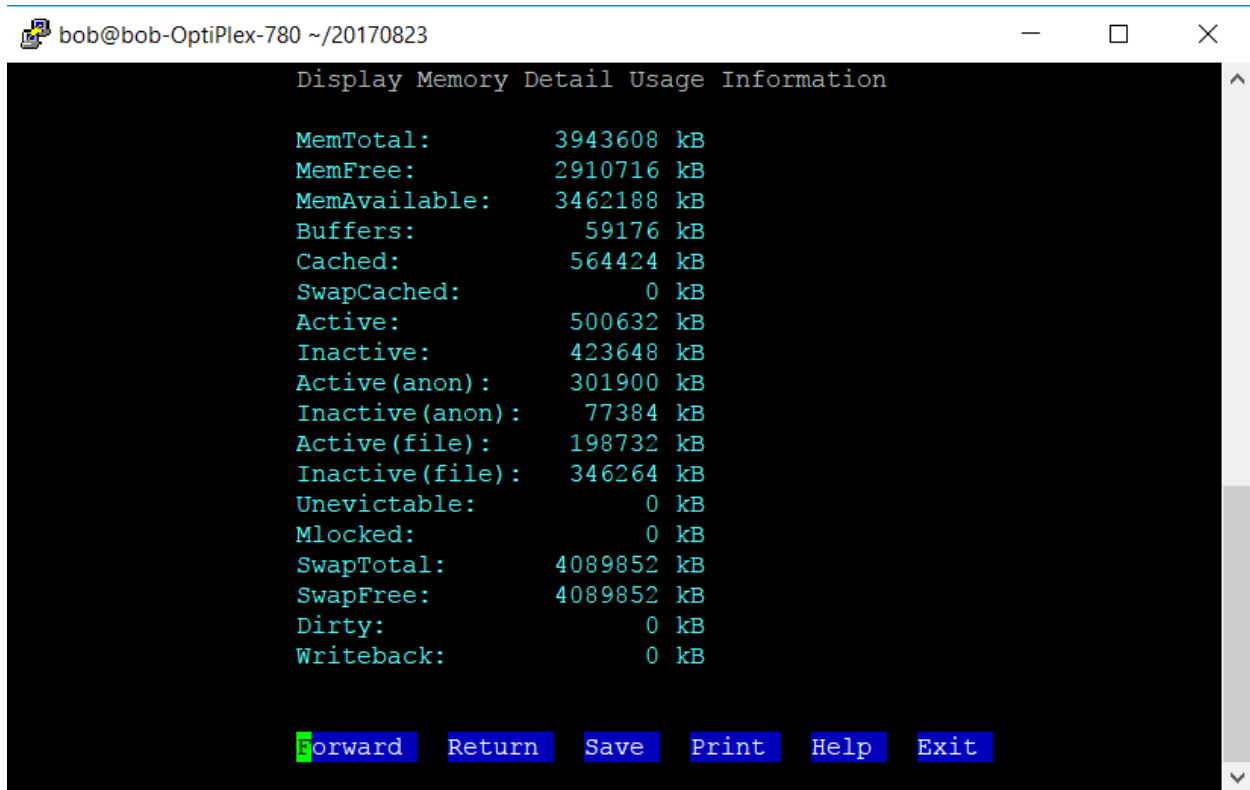
```

Figure 8: Monitor System Activity.

This is a dynamic real-time view of the **CPU** and memory activity of this running system. It can display system summary information as well as a list of processes or threads currently being managed by the Linux kernel. This uses **Htop**, which is a free (**GPL**) ncurses-based process viewer for Linux.

Note: This feature is not supported on Remote Systems.

Display Memory Usage

A screenshot of a terminal window titled "bob@bob-OptiPlex-780 ~/20170823". The terminal displays the command "Display Memory Detail Usage Information" and its output. The output lists various memory metrics in kilobytes (kB). At the bottom of the terminal, there are several colored buttons: Forward (green), Return (blue), Save (blue), Print (blue), Help (blue), and Exit (blue).

```
bob@bob-OptiPlex-780 ~/20170823
Display Memory Detail Usage Information
MemTotal:      3943608 kB
MemFree:       2910716 kB
MemAvailable:  3462188 kB
Buffers:       59176 kB
Cached:        564424 kB
SwapCached:    0 kB
Active:        500632 kB
Inactive:      423648 kB
Active(anon):  301900 kB
Inactive(anon): 77384 kB
Active(file):  198732 kB
Inactive(file): 346264 kB
Unevictable:   0 kB
Mlocked:       0 kB
SwapTotal:     4089852 kB
SwapFree:      4089852 kB
Dirty:         0 kB
Writeback:     0 kB

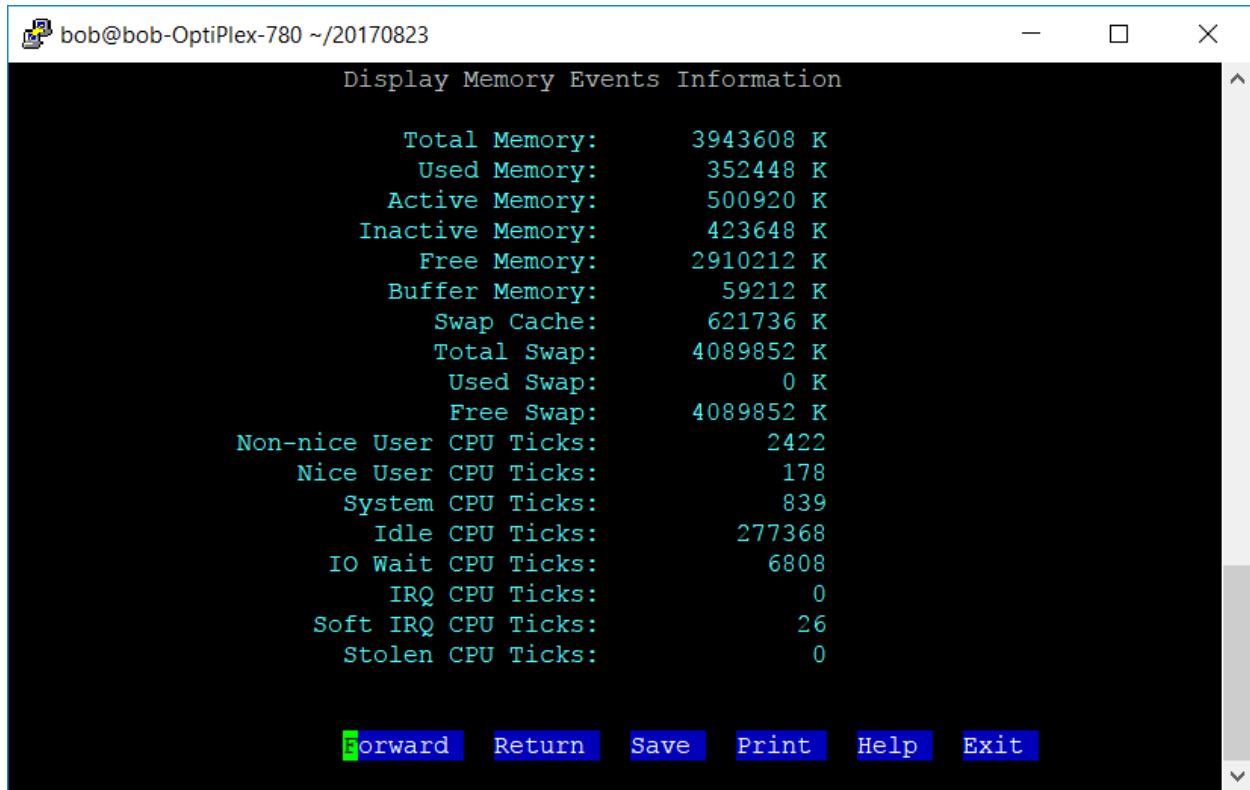
Forward Return Save Print Help Exit
```

Figure 9: Display Memory Usage.

This panel displays information about this system's **RAM** usage in Kilobytes. Here are some descriptions of the output:

- **MemTotal:** Total amount of physical **RAM**.
- **MemFree:** Amount of physical **RAM** left unused by the system.
- **Buffers:** Amount of physical **RAM** used for file buffers.
- **Cached:** Amount of physical **RAM** used as cache memory.
- **SwapCached:** Amount of swap used as cache memory.
- **Active:** Amount of buffer or page cache memory in active use.
- **Inactive:** Amount of buffer or page cache memory that are free.
- **SwapTotal:** Amount of swap available.
- **SwapFree:** Amount of swap free.
- **Dirty:** Memory amount waiting to be written back to the disk.
- **Writeback:** Memory amount actively being written back to the disk.
- **VMallocTotal:** Total allocated virtual address space amount.
- **VMallocUsed:** Used virtual address space amount.
- **VMallocChunk:** Largest contiguous virtual address space block.

Display Memory Events

A terminal window titled 'bob@bob-OptiPlex-780 ~/20170823' displays the output of the 'Display Memory Events Information' command. The output is a list of memory and CPU statistics. At the bottom of the terminal, there are six buttons: 'Forward', 'Return', 'Save', 'Print', 'Help', and 'Exit'.

```
Display Memory Events Information
Total Memory:      3943608 K
Used Memory:       352448 K
Active Memory:     500920 K
Inactive Memory:   423648 K
Free Memory:       2910212 K
Buffer Memory:     59212 K
Swap Cache:        621736 K
Total Swap:        4089852 K
Used Swap:         0 K
Free Swap:         4089852 K
Non-nice User CPU Ticks: 2422
Nice User CPU Ticks: 178
System CPU Ticks:  839
Idle CPU Ticks:   277368
IO Wait CPU Ticks: 6808
IRQ CPU Ticks:    0
Soft IRQ CPU Ticks: 26
Stolen CPU Ticks: 0

Forward Return Save Print Help Exit
```

Figure 10: Display Menu Events.

This panel displays information about this system's Memory and CPU usage. Here are some descriptions of the output:

Memory Usage:

- **Total Memory:** Total amount of physical **RAM**.
- **Free Memory:** Amount of physical **RAM** left unused by the system.
- **Buffer Memory:** Amount of physical **RAM** used for file buffers.
- **Total Swap:** Amount of swap available.
- **Free Swap:** Amount of swap free.

CPU Usage:

- **Non-Nice User CPU Ticks:** User **CPU** time that was not niced.
- **System CPU Ticks:** **CPU** Time spent running kernel code.
- **Idle CPU Ticks:** **CPU** Time spent running kernel code.
- **IO Wait CPU Ticks:** Time spent waiting for **IO** to complete.

Display System Configuration Submenu

```
Linux #37-Ubuntu          Hound Dog Terminal Manager          ID: bob
4.4.0-21-generic         Display System Configuration        10/11/2017
bob-OptiPlex-780

Display BIOS
Display Block Devices
Display File Partitions
Display Memory Setup
Display Network Configuration

Click selection or Tab and press Enter.

Return Help Exit

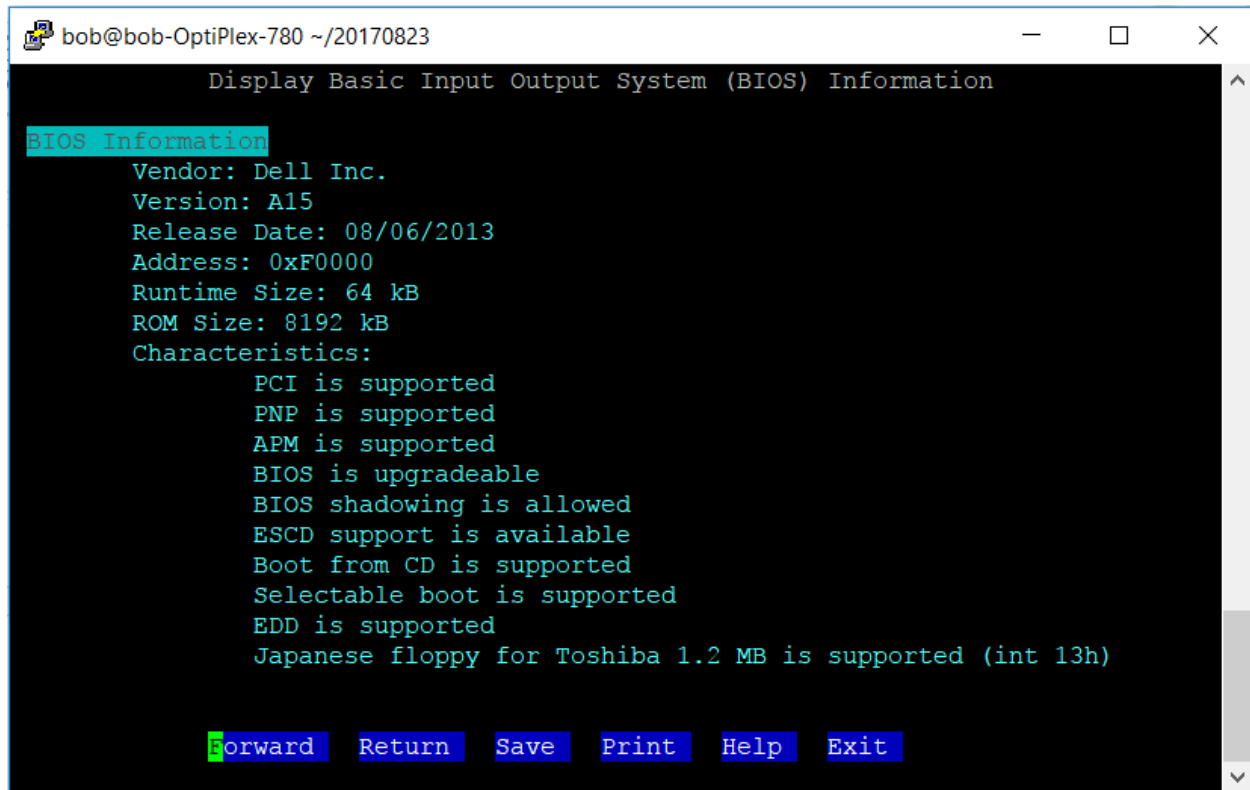
Copyright © 2017 Robert J. Greene. All rights reserved.
```

Figure 11: Display System Configuration Submenu.

This Submenu displays various configuration setup of this system:

- **Display BIOS:** Lists non-volatile firmware settings that used to perform hardware initialization during the booting process.
- **Display Block Devices:** Lists all block devices (except **RAM** disks) in a tree-like format.
- **Display File Partitions:** Lists the system partition table.
- **Display Memory Setup:** List physical memory devices.

Display Basic Input Output System (BIOS) Information

A screenshot of a terminal window titled "bob@bob-OptiPlex-780 ~/20170823". The terminal displays the command "Display Basic Input Output System (BIOS) Information" and its output. The output is as follows:

```
BIOS Information
Vendor: Dell Inc.
Version: A15
Release Date: 08/06/2013
Address: 0xF0000
Runtime Size: 64 kB
ROM Size: 8192 kB
Characteristics:
  PCI is supported
  PNP is supported
  APM is supported
  BIOS is upgradeable
  BIOS shadowing is allowed
  ESCD support is available
  Boot from CD is supported
  Selectable boot is supported
  EDD is supported
  Japanese floppy for Toshiba 1.2 MB is supported (int 13h)
```

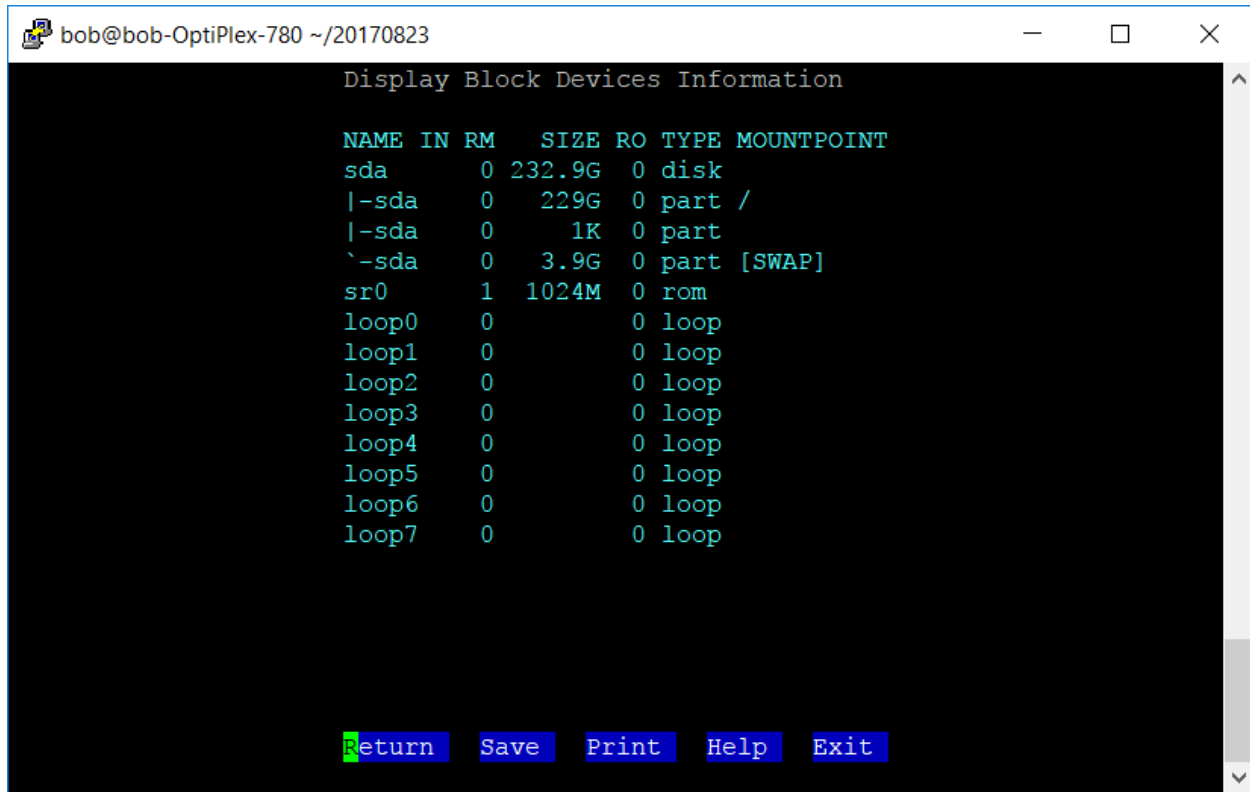
At the bottom of the terminal, there are several menu options: "Forward", "Return", "Save", "Print", "Help", and "Exit".

Figure 12: Display Basic Input Output System (BIOS) Information.

BIOS (an acronym for **Basic Input/Output System**) is non-volatile firmware used to perform hardware initialization during the booting process, and to provide runtime services for operating systems and programs. The **BIOS** firmware comes pre-installed on a computer system board, and it is the first software run when powered on. The **BIOS** in modern PCs initializes and tests the system hardware components, and loads a boot loader or operating system from a mass memory device. Most **BIOS** implementations are specifically designed to work with a particular computer or motherboard model, by interfacing with various devices that make up the complementary system chipset.

Unified Extensible Firmware Interface (UEFI) is the successor to **BIOS**. **UEFI** also works with a new partitioning scheme called **GUID Partition Table (GPT)**. Support for **GPT** in Linux is enabled by turning on the option **CONFIG_EFI_PARTITION** during kernel configuration. This option allows Linux to recognize and use **GPT** disks after the system firmware passes control to Linux.

Display Block Devices Information



```
bob@bob-OptiPlex-780 ~/20170823
Display Block Devices Information

NAME IN RM  SIZE RO TYPE MOUNTPOINT
sda   0 232.9G 0 disk
|-sda 0  229G  0 part /
|-sda 0   1K  0 part
`sda  0  3.9G  0 part [SWAP]
sr0   1 1024M  0 rom
loop0 0      0 loop
loop1 0      0 loop
loop2 0      0 loop
loop3 0      0 loop
loop4 0      0 loop
loop5 0      0 loop
loop6 0      0 loop
loop7 0      0 loop

Return Save Print Help Exit
```

Figure 13: Display Block Devices Information.

A **Block Device** is a computer data storage device that supports reading and (optionally) writing data in fixed-size blocks, sectors, or clusters. These blocks are generally 512 bytes or a multiple thereof in size.

This panel displays information about all available **Block Devices**. It includes all **Block Devices** (except **RAM** disks) in a tree-like format. Here is a description of the output columns:

NAME: The device name.
SIZE: The size of the device.
RM: Whether the device is removable. (0 = No, 1 = Yes).
RO: Whether the device is read-only. (0 = No, 1 = Yes).
TYPE: Type of device.
MOUNTPOINT: Mount point for device.

Display Disk Partition Information

```

Display Disk Partition Information

Disk /dev/ram15: 64 MiB, 67108864 bytes, 131072 sectors
Units: sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 4096 bytes
I/O size (minimum/optimal): 4096 bytes / 4096 bytes

Disk /dev/sda: 232.9 GiB, 250059350016 bytes, 488397168 sectors
Units: sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 4096 bytes
I/O size (minimum/optimal): 4096 bytes / 4096 bytes
Disklabel type: dos
Disk identifier: 0xa9448a87

Device      Boot      Start          End  Sectors  Size Id Type
/dev/sda1   *          2048 480215039 480212992 229G 83 Linux
/dev/sda2           480217086 488396799  8179714   3.9G  5 Extended
/dev/sda5           480217088 488396799  8179712   3.9G 82 Linux swap / Solaris

Forward Return Save Print Help Exit

```

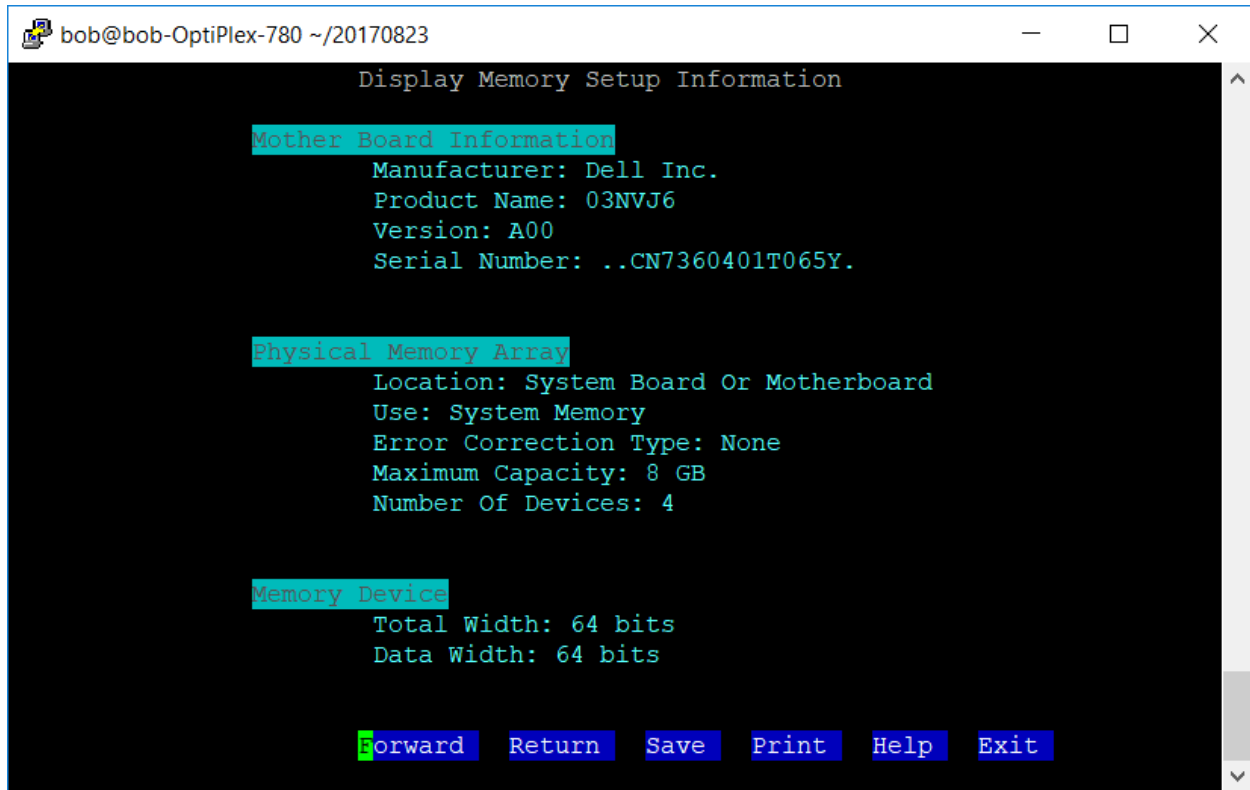
Figure 14: Display Disk Partition Information.

A hard disk can be divided into several **partitions**. Each **partition** functions as if it were a separate hard disk. This panel displays information about all available **Disks** along with any **Partitions**.

Here is a description of the output columns for Disk Partitions:

- Device:** Name of the **Partition**. This is typically the name of the Disk with a suffix of 1, 2, 3, etc.
- Boot:** Whether this is a bootable **Partition**. * indicates Yes.
- Start:** Starting sector.
- End:** Ending sector.
- Sectors:** Number of sectors.
- Size:** Size of the **Partition**.
- Id:** ID of the **Partition**.
- Type:** Type of **Partition**.

Display Memory Setup Information

A screenshot of a terminal window titled "bob@bob-OptiPlex-780 ~/20170823". The terminal displays the command "Display Memory Setup Information" and its output. The output is organized into three sections: "Mother Board Information", "Physical Memory Array", and "Memory Device". At the bottom of the terminal, there are six menu options: "Forward", "Return", "Save", "Print", "Help", and "Exit".

```
bob@bob-OptiPlex-780 ~/20170823
Display Memory Setup Information

Mother Board Information
  Manufacturer: Dell Inc.
  Product Name: 03NVJ6
  Version: A00
  Serial Number: ..CN7360401T065Y.

Physical Memory Array
  Location: System Board Or Motherboard
  Use: System Memory
  Error Correction Type: None
  Maximum Capacity: 8 GB
  Number Of Devices: 4

Memory Device
  Total Width: 64 bits
  Data Width: 64 bits

Forward Return Save Print Help Exit
```

Figure 15: Display Memory Setup Information.

The two widely used forms of modern **Random Access Memory (RAM)** are static **RAM (SRAM)** and dynamic **RAM (DRAM)**. **SRAM** is more expensive to produce, but is generally faster and requires less dynamic power than **DRAM**. In modern computers, **SRAM** is often used as cache memory.

Because **DRAM** is less expensive to produce than static **RAM**, it is the predominant form of computer memory used in modern computers.

Synchronous dynamic random-access memory (SDRAM) is any dynamic random-access memory (**DRAM**) where the operation of its external pin interface is coordinated by an externally supplied clock signal. **SDRAM** is currently widely used for computer memory. Beyond the original **SDRAM**, further generations of double data rate **RAM** have entered the mass market - **DDR** (also known as **DDR1**), **DDR2**, **DDR3**, **DDR4**, and **DDR5**.

Computer memory (**RAM**) is stored in **Memory Devices** in **Physical Memory arrays** on a **Motherboard**.

Display Network Configuration

```

bob@bob-OptiPlex-780 ~/20170823
Display Network Configuration

enp0s25  Link encap:Ethernet  HWaddr a4:ba:db:ea:c6:e8
UP BROADCAST MULTICAST  MTU:1500  Metric:1
RX packets:0 errors:0 dropped:0 overruns:0 frame:0
TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
collisions:0 txqueuelen:1000
RX bytes:0 (0.0 B)  TX bytes:0 (0.0 B)
Interrupt:21 Memory:f7ae0000-f7b00000

lo      Link encap:Local Loopback
inet addr:127.0.0.1  Mask:255.0.0.0
inet6 addr: ::1/128 Scope:Host
UP LOOPBACK RUNNING  MTU:65536  Metric:1
RX packets:55 errors:0 dropped:0 overruns:0 frame:0
TX packets:55 errors:0 dropped:0 overruns:0 carrier:0
collisions:0 txqueuelen:1
RX bytes:5303 (5.3 KB)  TX bytes:5303 (5.3 KB)

wlx00871103118b Link encap:Ethernet  HWaddr 00:87:11:03:11:8b
inet addr:10.0.0.225 Bcast:10.0.0.255  Mask:255.255.255.0
inet6 addr: 2601:196:8501:3555:50f4:8bad:b218:4758/64 Scope:Global
inet6 addr: fe80::825f:d612:95c7:192b/64 Scope:Link
inet6 addr: 2601:196:8501:3555:4c66:d321:1ed1:41d4/64 Scope:Global
inet6 addr: 2601:196:8501:3555::c03b/128 Scope:Global
UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
RX packets:11524 errors:0 dropped:1967 overruns:0 frame:0
TX packets:3646 errors:0 dropped:0 overruns:0 carrier:0
collisions:0 txqueuelen:1000
RX bytes:5897219 (5.8 MB)  TX bytes:532880 (532.8 KB)

Return Save Print Help Exit

```

Figure 16: Display Network Configuration.

This panel displays shows details of the **network interfaces** that are up and running in your computer. Here is a description of some of the output columns:

Link encap:Ethernet:	The interface is an Ethernet related device.
HWaddr:	This is the hardware address or MAC address.
inet addr:	This system's IPv4 address.
Mask:	The network mask.
UP:	Ethernet interface Kernel modules are loaded.
BROADCAST:	The Ethernet device supports broadcasting.
RUNNING:	The interface is ready to accept data.

Display System Hardware Submenu

```
Linux #37-Ubuntu          Hound Dog Terminal Manager          ID: bob
4.4.0-21-generic         Display System Hardware              10/11/2017
bob-OptiPlex-780

Display Bridges
Display Buses
Display Cache
Display Console
Display CPU Information
Display Disk Storage
Display Expansion Slots
Display Input Devices
Display Motherboard
Display Multimedia Devices
Display Network Interfaces
Display Port Connectors
Display Storage Interfaces
Display Tape Devices
Display System Volume

Click selection or Tab and press Enter.

Return Help Exit

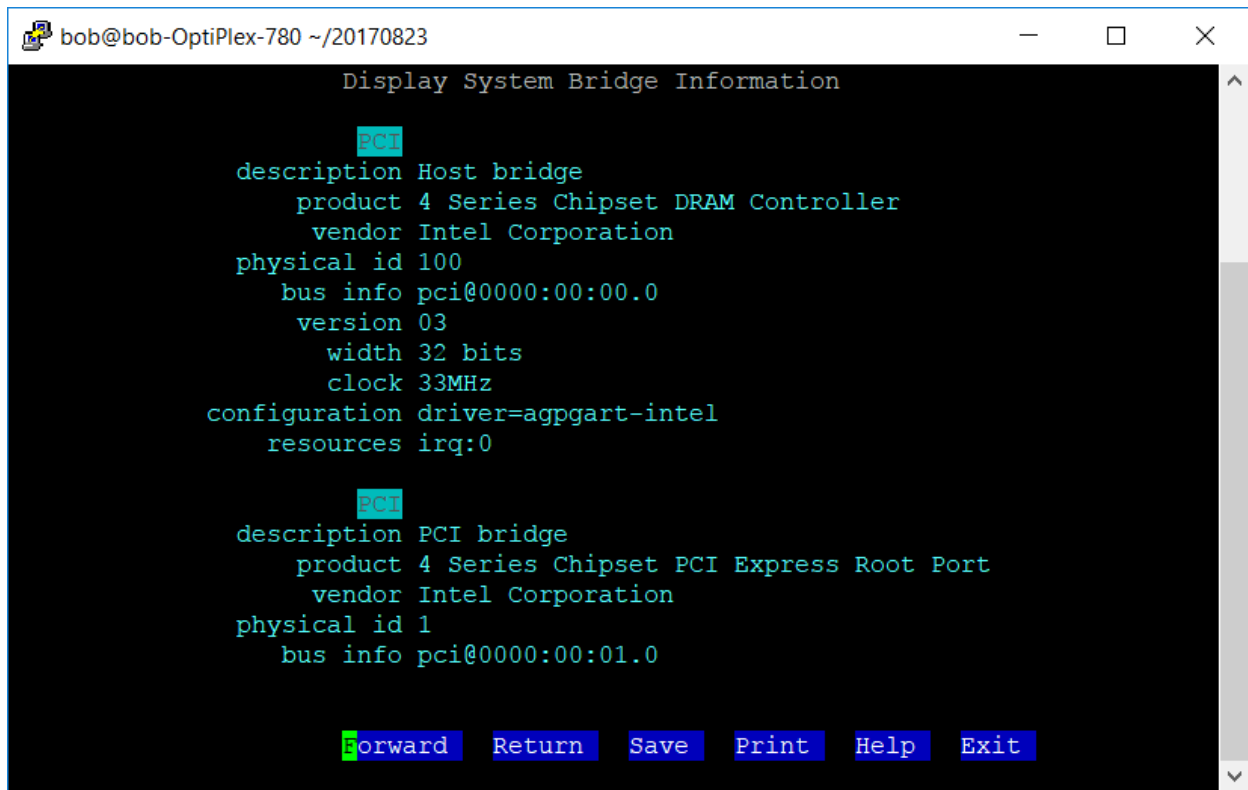
Copyright © 2017 Robert J. Greene. All rights reserved.
```

Figure 17: Display System Hardware Submenu.

This Submenu displays various hardware components of this system:

Display Bridges:	Bridges connect buses with different capacities.
Display Buses:	Transfers data between computer components.
Display Cache:	High-speed computer memory.
Display Connectors:	Connectors such as USB and parallel ports.
Display Console:	Computer display components.
Display CPU:	Computer processor.
Display Slots:	Expansion slots.
Display Input Devices:	Input components such as keyboard and mouse.
Display Motherboard:	Printed circuit board.
Display Multimedia:	Devices such as audio, video, and Text devices.
Display Networking:	Networking components.
Display Storage:	Storage components and Interfaces.
Display Tapes:	Attached Tape devices.
Display System Volume:	Storage volume system the system filesystem is based upon.

Display System Bridge Information

A screenshot of a terminal window titled "bob@bob-OptiPlex-780 ~/20170823". The terminal displays the command "Display System Bridge Information" and its output. The output is divided into two sections, each starting with a cyan "PCI" label. The first section describes a "Host bridge" with details like "product 4 Series Chipset DRAM Controller", "vendor Intel Corporation", "physical id 100", "bus info pci@0000:00:00.0", "version 03", "width 32 bits", "clock 33MHz", "configuration driver=agpgart-intel", and "resources irq:0". The second section describes a "PCI bridge" with details like "product 4 Series Chipset PCI Express Root Port", "vendor Intel Corporation", "physical id 1", and "bus info pci@0000:00:01.0". At the bottom of the terminal, there are six blue buttons labeled "Forward", "Return", "Save", "Print", "Help", and "Exit".

```
bob@bob-OptiPlex-780 ~/20170823
Display System Bridge Information

PCI
description Host bridge
  product 4 Series Chipset DRAM Controller
  vendor Intel Corporation
physical id 100
  bus info pci@0000:00:00.0
  version 03
  width 32 bits
  clock 33MHz
configuration driver=agpgart-intel
resources irq:0

PCI
description PCI bridge
  product 4 Series Chipset PCI Express Root Port
  vendor Intel Corporation
physical id 1
  bus info pci@0000:00:01.0

Forward Return Save Print Help Exit
```

Figure 18: Display System Bridge Information.

A **Bridge** connects two **Buses** with different capacities (bandwidths) inside a computer.

A **Bus** is a communication system that transfers data between computer components. The entire **Bus System** starts close to the **CPU**, where the traffic is greatest.

A **Northbridge** or **Host Bridge** is one of the two chips in the core logic chipset architecture on a PC motherboard, the other being the **Southbridge**. Unlike the **Southbridge**, **Northbridge** is connected directly to the **CPU** via the **Front-Side Bus (FSB)** and is thus responsible for tasks that require the highest performance, such as the flow of data between the **CPU** and **RAM**, and to the **Accelerated Graphics Port (AGP)**.

Southbridge is an Intel chipset that manages the basic forms of **Input/Output (I/O)** such as **Serial**, **Universal Serial Bus (USB)**, **Integrated Drive Electronics (IDE)**, **Audio**, and **Industry Standard Architecture (ISA) I/O** in a computer.

Display System Bus Information

```

bob@bob-OptiPlex-780 ~/20170823
Display System Bus Information

Core
description Motherboard
physical id 0

Universal Serial Bus (USB)
description USB controller
product 82801JD/DO (ICH10 Family) USB UHCI Controller #4
vendor Intel Corporation
physical id 1a
bus info pci@0000:00:1a.0
version 02
width 32 bits
clock 33MHz
capabilities uhci bus_master cap_list
configuration driver=uhci_hcd latency=0
resources irq:16 ioport:ff20(size=32)

Universal Serial Bus Host
product UHCI Host Controller
vendor Linux 4.4.0-21-generic uhci_hcd
physical id 1
bus info usb@3
logical name usb3
version 4.04
capabilities usb-1.10
configuration driver=hub slots=2 speed=12Mbit/s

Universal Serial Bus (USB)
description USB controller
product 82801JD/DO (ICH10 Family) USB UHCI Controller #5

Forward Return Save Print Help Exit

```

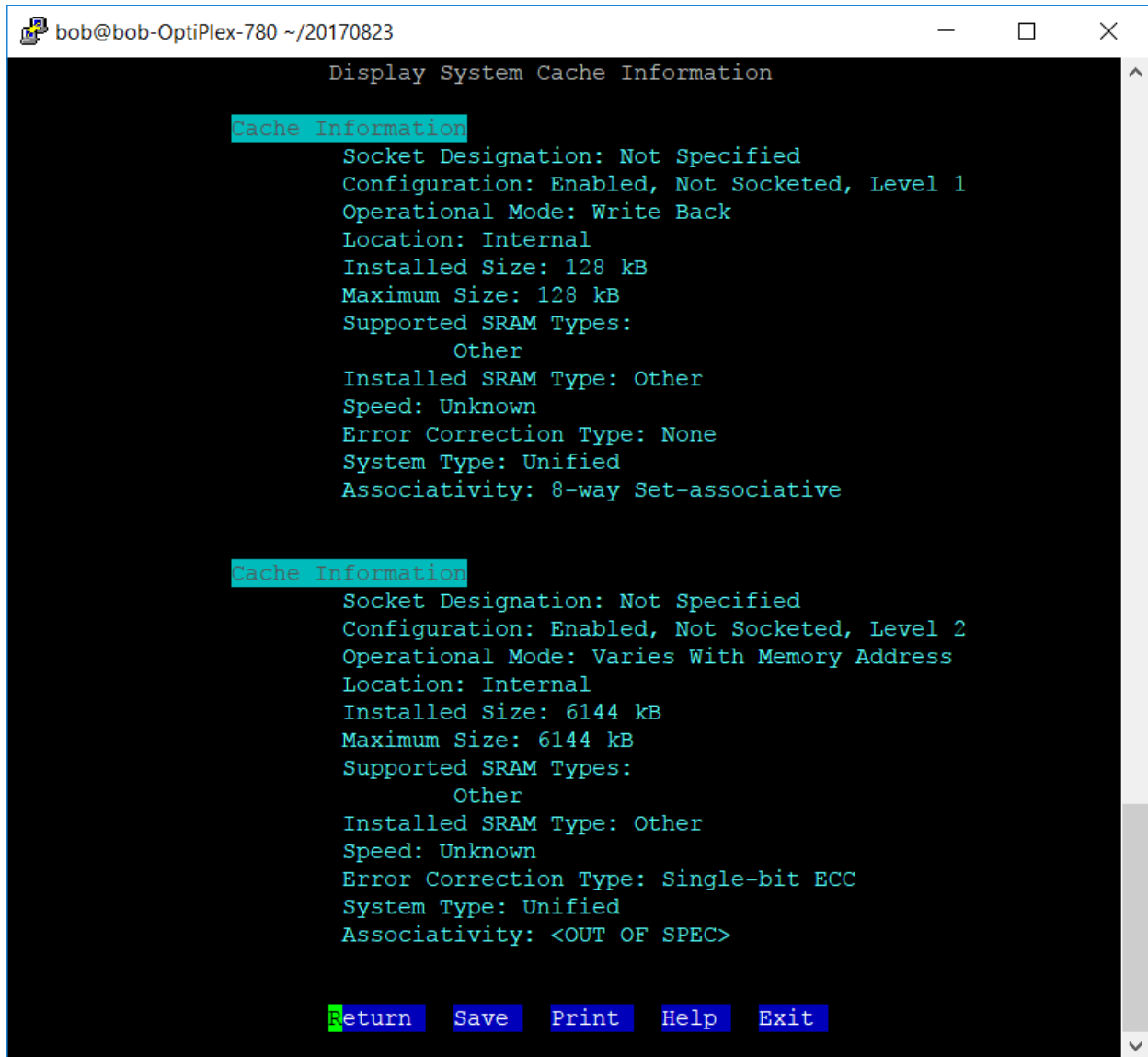
Figure 19: Display System Bus Information.

A **Bus** is a communication system that transfers data between components inside a computer. It is these **Buses** which connect all of the components to each other on a **Motherboard**.

The entire **Bus** System starts close to the **CPU**, where the traffic is greatest. **RAM** is the component which has the very greatest data traffic, and is therefore connected directly to the CPU by a particularly powerful **Bus** that is called the **Front Side Bus (FSB)**.

The **Buses** connecting the motherboard to the **PC** peripheral devices are called **I/O Buses**. Data packets (of 8, 16, 32, 64 or more bits at a time) are constantly being moved back and forth between the **CPU** and all the other components. There are several **Buses** on a **Motherboard** but they are all connected, so that data can run from one to another and reach all of the **Motherboard** components.

Display System Cache Information



```
bob@bob-OptiPlex-780 ~/20170823
Display System Cache Information

Cache Information
Socket Designation: Not Specified
Configuration: Enabled, Not Socketed, Level 1
Operational Mode: Write Back
Location: Internal
Installed Size: 128 kB
Maximum Size: 128 kB
Supported SRAM Types:
    Other
Installed SRAM Type: Other
Speed: Unknown
Error Correction Type: None
System Type: Unified
Associativity: 8-way Set-associative

Cache Information
Socket Designation: Not Specified
Configuration: Enabled, Not Socketed, Level 2
Operational Mode: Varies With Memory Address
Location: Internal
Installed Size: 6144 kB
Maximum Size: 6144 kB
Supported SRAM Types:
    Other
Installed SRAM Type: Other
Speed: Unknown
Error Correction Type: Single-bit ECC
System Type: Unified
Associativity: <OUT OF SPEC>

Return Save Print Help Exit
```

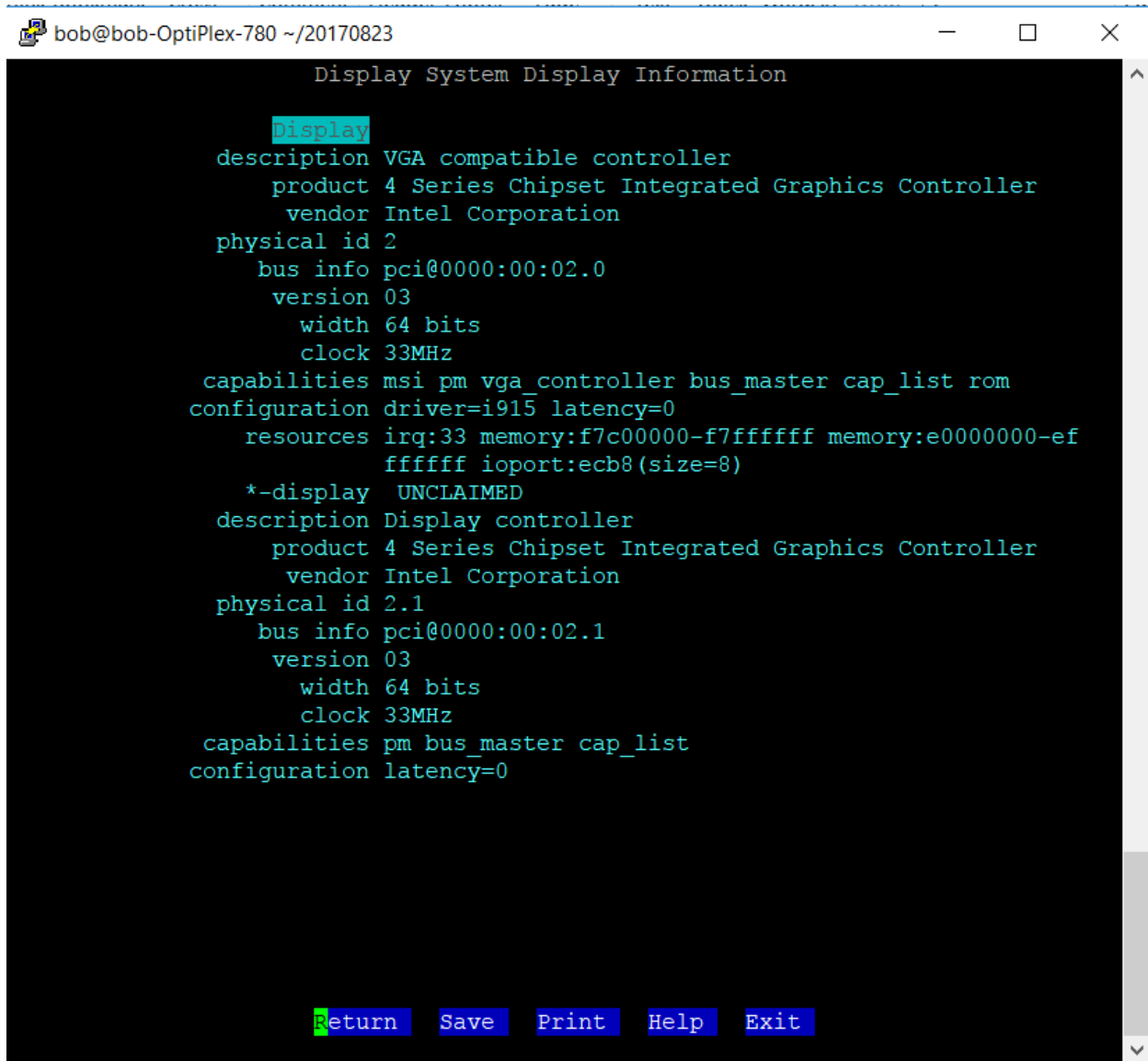
Figure 20: Display System Cache Information.

A **Memory Cache**, sometimes called a cache store or **RAM** cache, is a portion of memory often made of high-speed static **RAM (SRAM)** instead of the slower and cheaper dynamic **RAM (DRAM)** used for main memory.

In **SRAM**, a bit of data is stored using the state of a six transistor memory cell. This form of **RAM** is more expensive to produce, but is generally faster and requires less dynamic power than **DRAM**.

Memory caching is effective because most programs access the same data or instructions over and over. By keeping as much of this information as possible in **SRAM**, the computer avoids accessing the slower **DRAM**.

Display System Display Information

A terminal window titled 'bob@bob-OptiPlex-780 ~/20170823' displays the output of the 'lspci' command for display controllers. The output is as follows:

```
Display System Display Information
Display
description VGA compatible controller
  product 4 Series Chipset Integrated Graphics Controller
  vendor Intel Corporation
physical id 2
  bus info pci@0000:00:02.0
  version 03
  width 64 bits
  clock 33MHz
capabilities msi pm vga_controller bus_master cap_list rom
configuration driver=i915 latency=0
  resources irq:33 memory:f7c00000-f7ffffff memory:e0000000-ef
  ffffff ioport:ecb8(size=8)
*-display UNCLAIMED
description Display controller
  product 4 Series Chipset Integrated Graphics Controller
  vendor Intel Corporation
physical id 2.1
  bus info pci@0000:00:02.1
  version 03
  width 64 bits
  clock 33MHz
capabilities pm bus_master cap_list
configuration latency=0
```

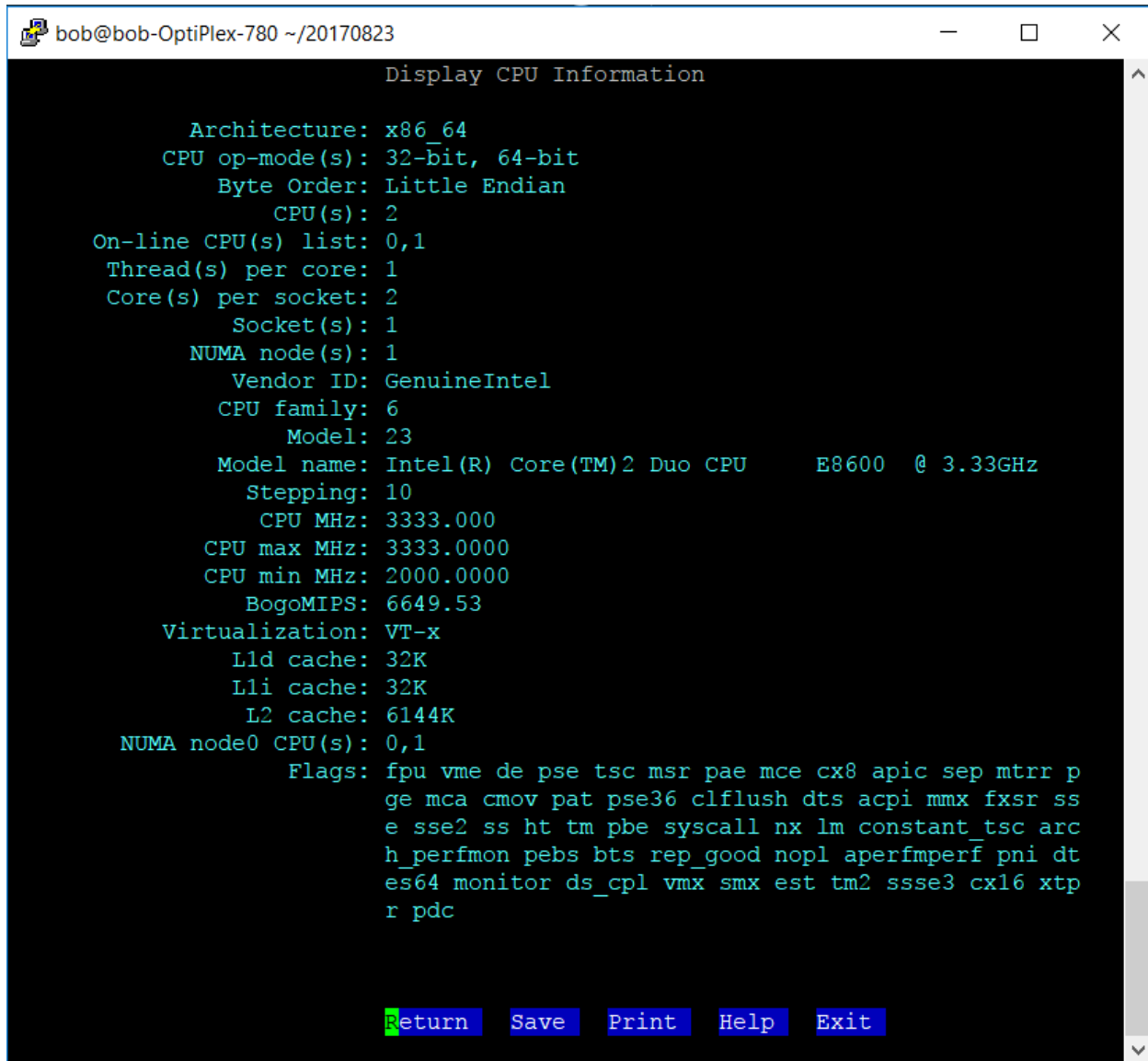
At the bottom of the terminal, there are five buttons: 'Return', 'Save', 'Print', 'Help', and 'Exit'.

Figure 21: Display System Display Information.

The **Linux Console** is a **System Console** internal to the **Linux Kernel**. A **System Console** is the device which receives all **Kernel** messages and warnings and which allows logins in single user mode. The **Linux Console** provides a way for the kernel and other processes to send text output to the user, and to receive text input from the user. The user typically enters text with a **Computer Keyboard** and reads the output text on a **Computer Monitor**.

The **Linux Kernel** supports virtual consoles - consoles that are logically separate, but which access the same physical keyboard and display. The **Linux Console** (and **Linux Virtual Consoles**) are implemented by the **VT Subsystem** of the **Linux Kernel**, and do not rely on user space software. This is in contrast to a **Terminal Emulator**, which is a user space process that emulates a terminal, and is typically used in a graphical display environment.

Display System CPU Information

A screenshot of a terminal window titled "bob@bob-OptiPlex-780 ~/20170823". The terminal displays the output of a command to show system CPU information. The text is as follows:

```
Display CPU Information

Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian
CPU(s): 2
On-line CPU(s) list: 0,1
Thread(s) per core: 1
Core(s) per socket: 2
Socket(s): 1
NUMA node(s): 1
Vendor ID: GenuineIntel
CPU family: 6
Model: 23
Model name: Intel(R) Core(TM)2 Duo CPU      E8600  @ 3.33GHz
Stepping: 10
CPU MHz: 3333.000
CPU max MHz: 3333.0000
CPU min MHz: 2000.0000
BogoMIPS: 6649.53
Virtualization: VT-x
L1d cache: 32K
L1i cache: 32K
L2 cache: 6144K
NUMA node0 CPU(s): 0,1
Flags: fpu vme de pse tsc msr pae mce cx8 apic sep mtrr p
ge mca cmov pat pse36 clflush dts acpi mmx fxsr ss
e sse2 ss ht tm pbe syscall nx lm constant_tsc arc
h_perfmon pebs bts rep_good nopl aperfmperf pni dt
es64 monitor ds_cpl vmx smx est tm2 ssse3 cx16 xtp
r pdc
```

At the bottom of the terminal window, there are five buttons: "Return", "Save", "Print", "Help", and "Exit".

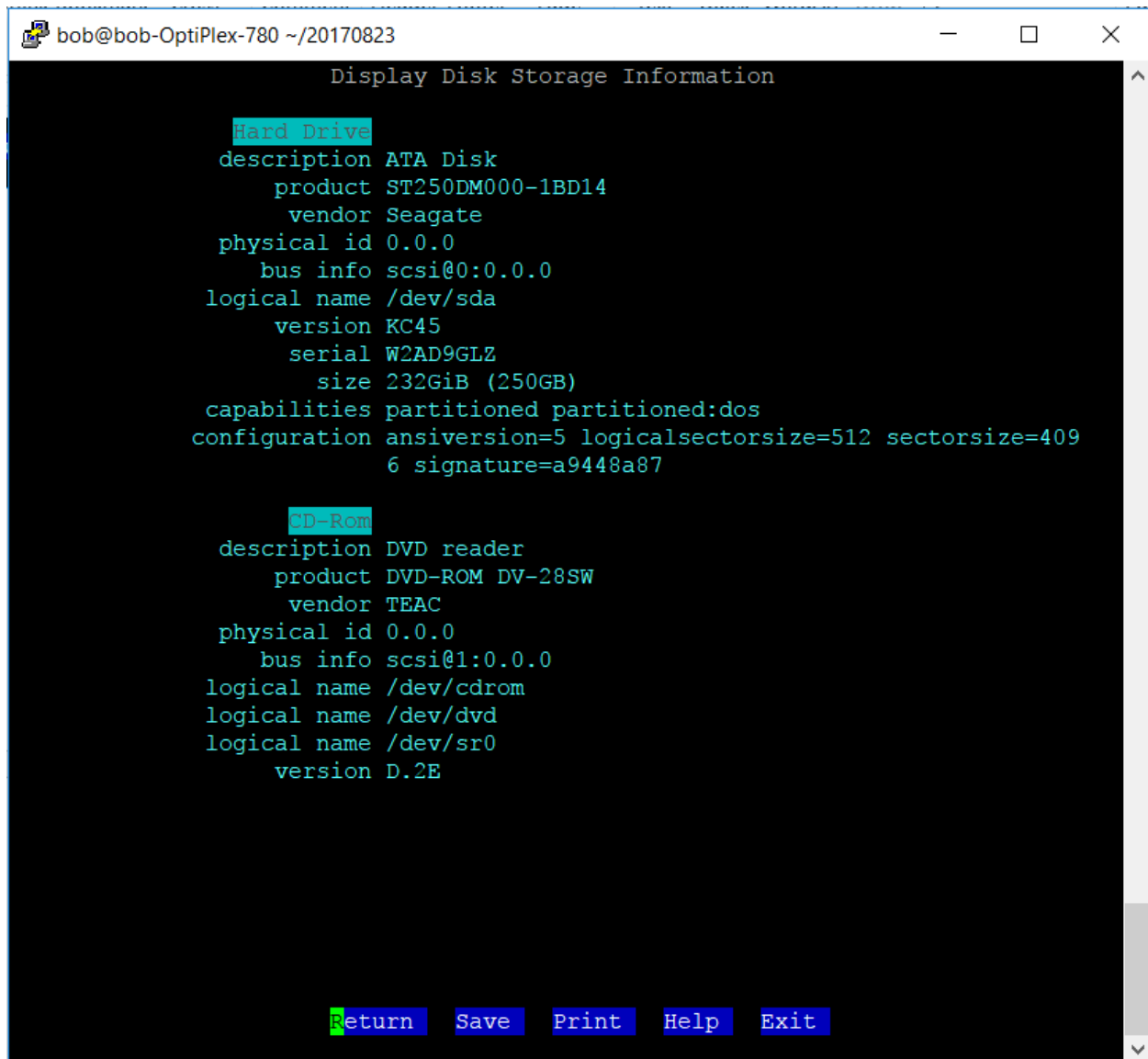
Figure 22: Display System CPU Information.

A **Central Processing Unit (CPU)** is the electronic circuitry within a computer that carries out the instructions of a computer program by performing the basic arithmetic, logical, control, and **Input/Output (I/O)** operations specified by the instructions.

Principal components of a **CPU** include the **Arithmetic Logic Unit, (ALU)**, that performs arithmetic and logic operations, **Processor Registers** that supply operands to the **ALU** and store the results of **ALU** operations, and a **Control Unit** that performs the fetching (from memory) and execution of instructions by directing the coordinated operations of the **ALU, Registers**, and other components.

Most modern **CPU**s are **microprocessors**, meaning they are contained on a single integrated circuit chip. Many computers contain a **multi-core processor**- a chip containing multiple **CPU**s called **Cores**.

Display Disk Storage Information



```
bob@bob-OptiPlex-780 ~/20170823
Display Disk Storage Information

Hard Drive
description ATA Disk
  product ST250DM000-1BD14
  vendor Seagate
physical id 0.0.0
  bus info scsi@0:0.0.0
logical name /dev/sda
  version KC45
  serial W2AD9GLZ
  size 232GiB (250GB)
capabilities partitioned partitioned:dos
configuration ansiversion=5 logicalsectorsize=512 sectorsize=409
  6 signature=a9448a87

CD-Rom
description DVD reader
  product DVD-ROM DV-28SW
  vendor TEAC
physical id 0.0.0
  bus info scsi@1:0.0.0
logical name /dev/cdrom
logical name /dev/dvd
logical name /dev/sr0
  version D.2E

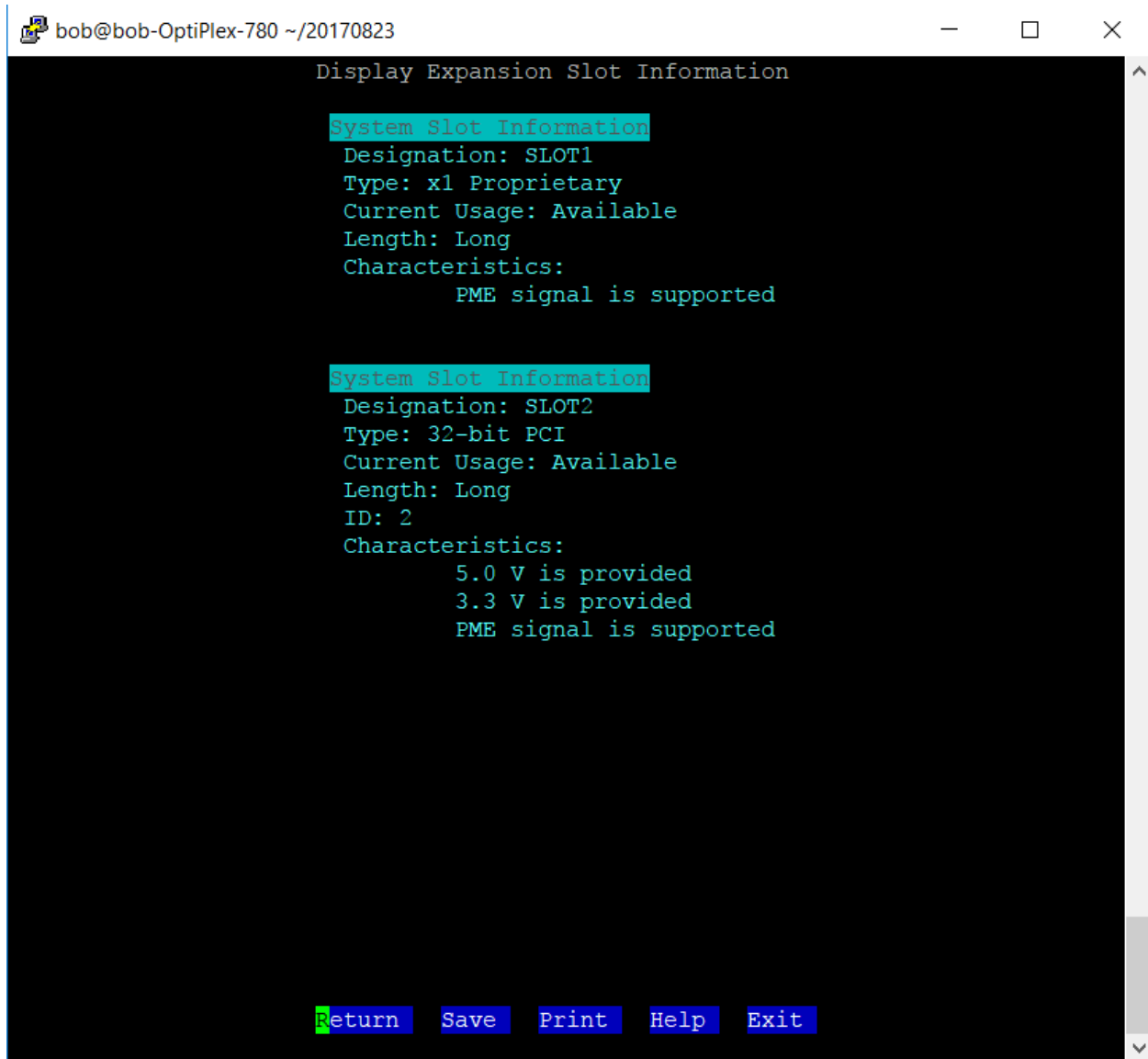
Return Save Print Help Exit
```

Figure 23: Display Disk Storage Information.

Disk Storage is a general category of storage mechanisms where data are recorded by various electronic, magnetic, optical, or mechanical changes to a surface layer of one or more rotating disks. Notable disk drive types are the **Hard Disk Drive (HDD)**, the **Floppy Disk Drive (FDD)**, and various **Optical Disc Drives**.

Many modern Computers contain **Solid-State Drives** which are solid-state **Storage Devices** using Integrated circuit assemblies as memory to store data persistently. **SSD** technology primarily uses electronic interfaces compatible with traditional **Block input/output (I/O)** hard disk drives, which permit simple replacements in common applications. New **I/O** interfaces like **SATA Express** and **M.2** have been designed to address specific requirements of the **SSD** technology.

Display Expansion Slot Information



```
bob@bob-OptiPlex-780 ~/20170823
Display Expansion Slot Information

System Slot Information
Designation: SLOT1
Type: x1 Proprietary
Current Usage: Available
Length: Long
Characteristics:
    PME signal is supported

System Slot Information
Designation: SLOT2
Type: 32-bit PCI
Current Usage: Available
Length: Long
ID: 2
Characteristics:
    5.0 V is provided
    3.3 V is provided
    PME signal is supported

Return Save Print Help Exit
```

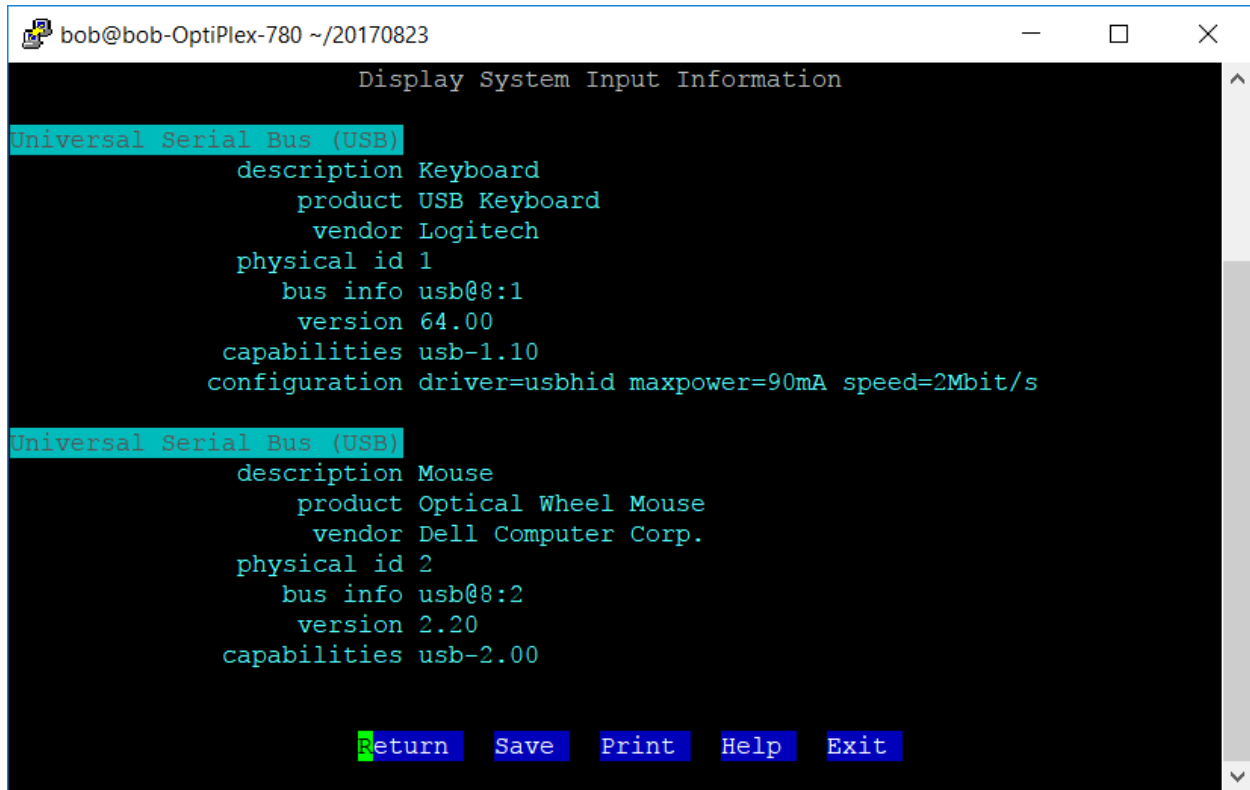
Figure 24: Display Expansion Slot Information.

An **Expansion slot** is a connection or port located inside a computer on the **motherboard** or **riser board** that allows a computer hardware **expansion card** to be connected.

An **expansion card**, **expansion board**, **adapter card** or **accessory card**, is a **printed circuit board** that can be inserted into an **electrical connector**, or **expansion slot** on a computer **motherboard**, **backplane**, or **riser card** to add functionality to a computer system using the **expansion bus**.

Some examples of **Expansion cards** include **Network cards**, **Sound cards**, **Video cards**, and **Interface cards** for **ATA**, **Bluetooth**, **EIDE**, **Firewire**, **IDE**, **Parallel**, **RAID**, **SCSI**, **Serial**, **USB**, **Fibre Channel**, and **FICON**.

Display System Input Information



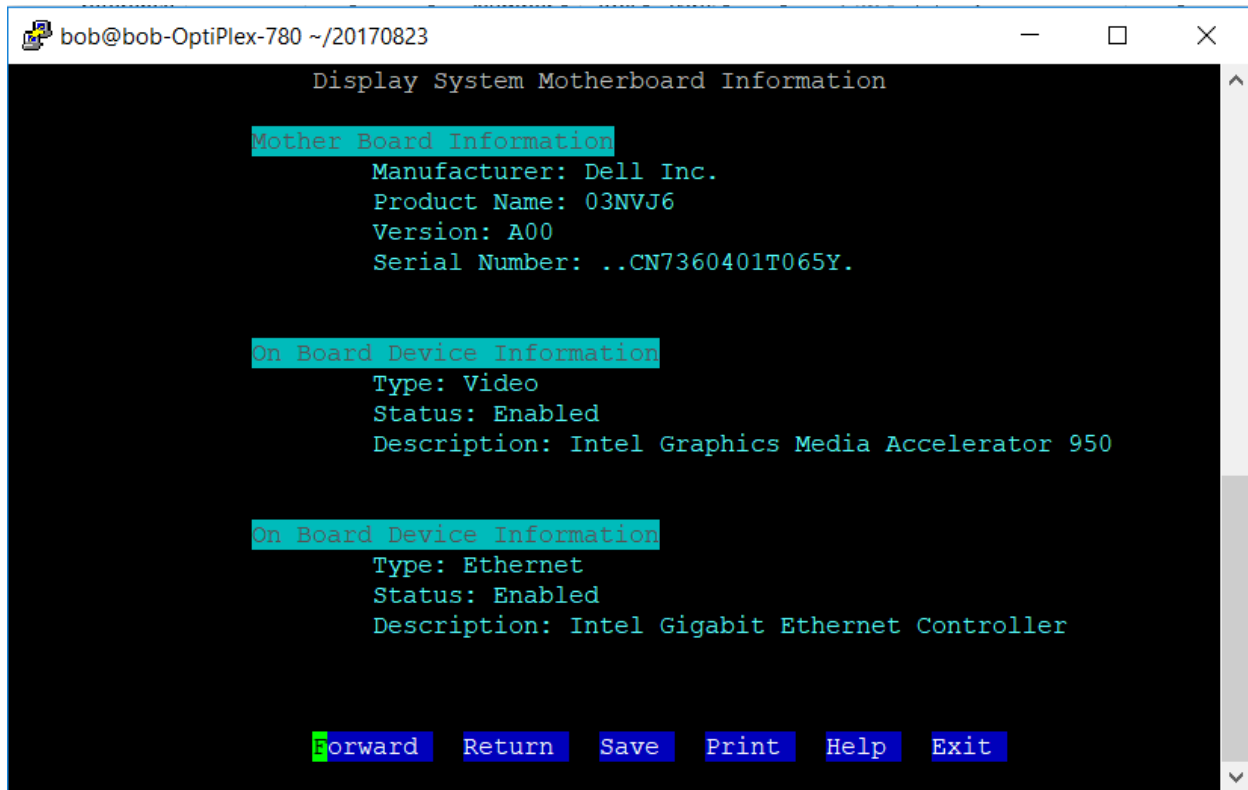
```
bob@bob-OptiPlex-780 ~/20170823
Display System Input Information
Universal Serial Bus (USB)
  description Keyboard
  product USB Keyboard
  vendor Logitech
  physical id 1
  bus info usb@8:1
  version 64.00
  capabilities usb-1.10
  configuration driver=usbhid maxpower=90mA speed=2Mbit/s
Universal Serial Bus (USB)
  description Mouse
  product Optical Wheel Mouse
  vendor Dell Computer Corp.
  physical id 2
  bus info usb@8:2
  version 2.20
  capabilities usb-2.00
Return Save Print Help Exit
```

Figure 25: Display System Input Information.

In computing, an **input device** is a piece of computer hardware equipment used to provide data and control signals to an information processing system such as a computer or information appliance.

Examples of input devices include a **Keyboard, Mouse, Scanner, Digital Camera, and Joystick.**

Display System Motherboard Information

A screenshot of a terminal window titled "bob@bob-OptiPlex-780 ~/20170823". The terminal displays the command "Display System Motherboard Information" and its output. The output is organized into three sections, each with a cyan header: "Mother Board Information", "On Board Device Information" (for video), and another "On Board Device Information" (for ethernet). At the bottom, there are six blue buttons labeled "Forward", "Return", "Save", "Print", "Help", and "Exit".

```
bob@bob-OptiPlex-780 ~/20170823
Display System Motherboard Information

Mother Board Information
Manufacturer: Dell Inc.
Product Name: 03NVJ6
Version: A00
Serial Number: ..CN7360401T065Y.

On Board Device Information
Type: Video
Status: Enabled
Description: Intel Graphics Media Accelerator 950

On Board Device Information
Type: Ethernet
Status: Enabled
Description: Intel Gigabit Ethernet Controller

Forward Return Save Print Help Exit
```

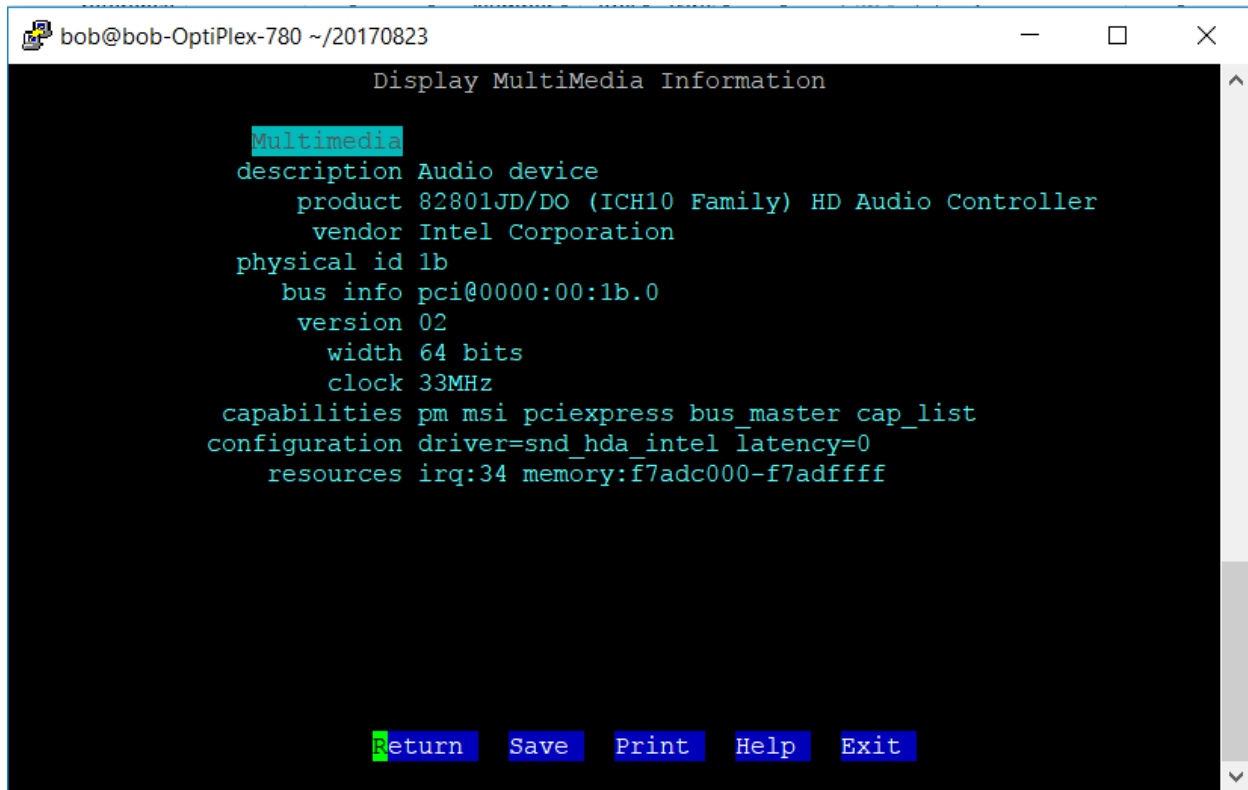
Figure 26: Display System Motherboard Information.

A **Motherboard** is the main **Printed Circuit Board (PCB)** found in general purpose **Microcomputers** and other expandable systems. It holds and allows communication between many of the crucial electronic components of a system, such as the **Central Processing Unit (CPU)** and **Memory**, and provides connectors for other peripherals.

A **Motherboard** usually contains significant Subsystems such as the **Central Processor**, the **Chipset's Input/Output** and **Memory Controllers, Interface Connectors**, and other components integrated for general purpose use.

An important component of a **motherboard** is the **Microprocessor's** supporting **Chipset**, which provides the supporting interfaces between the **CPU** and the various **Buses** and external components. This **Chipset** determines the features and capabilities of the **Motherboard**.

Display Multimedia Information



```
bob@bob-OptiPlex-780 ~/20170823
Display MultiMedia Information

Multimedia
description Audio device
  product 82801JD/DO (ICH10 Family) HD Audio Controller
  vendor Intel Corporation
physical id 1b
  bus info pci@0000:00:1b.0
  version 02
  width 64 bits
  clock 33MHz
capabilities pm msi pciexpress bus_master cap_list
configuration driver=snd_hda_intel latency=0
resources irq:34 memory:f7adc000-f7adffff

Return Save Print Help Exit
```

Figure 27: Display Multimedia Information.

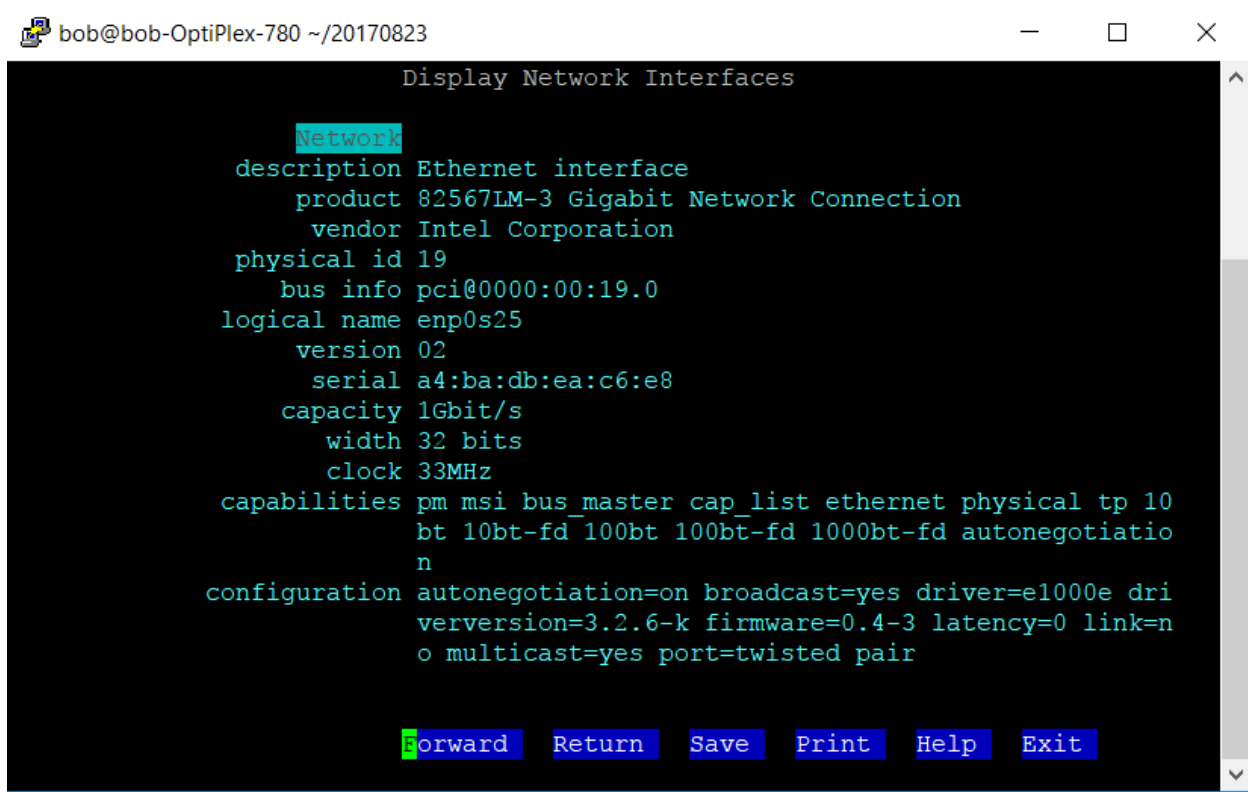
Multimedia Devices are electronic media devices used to store and experience multimedia content.

Multimedia is content that uses a combination of different content forms such as text, audio, images, animations, video and interactive content.

Multimedia contrasts with media that use only rudimentary computer displays such as text-only or traditional forms of printed or hand-produced material.

Types of **Multimedia Devices** include **Microphones, Speakers, Cameras, and Headphones.**

Display Network Interfaces



```
bob@bob-OptiPlex-780 ~/20170823
Display Network Interfaces

Network
description Ethernet interface
product 82567LM-3 Gigabit Network Connection
vendor Intel Corporation
physical id 19
bus info pci@0000:00:19.0
logical name enp0s25
version 02
serial a4:ba:db:ea:c6:e8
capacity 1Gbit/s
width 32 bits
clock 33MHz
capabilities pm msi bus_master cap_list ethernet physical tp 10
bt 10bt-fd 100bt 100bt-fd 1000bt-fd autonegotiation
configuration autonegotiation=on broadcast=yes driver=e1000e dri
verversion=3.2.6-k firmware=0.4-3 latency=0 link=
no multicast=yes port=twisted pair

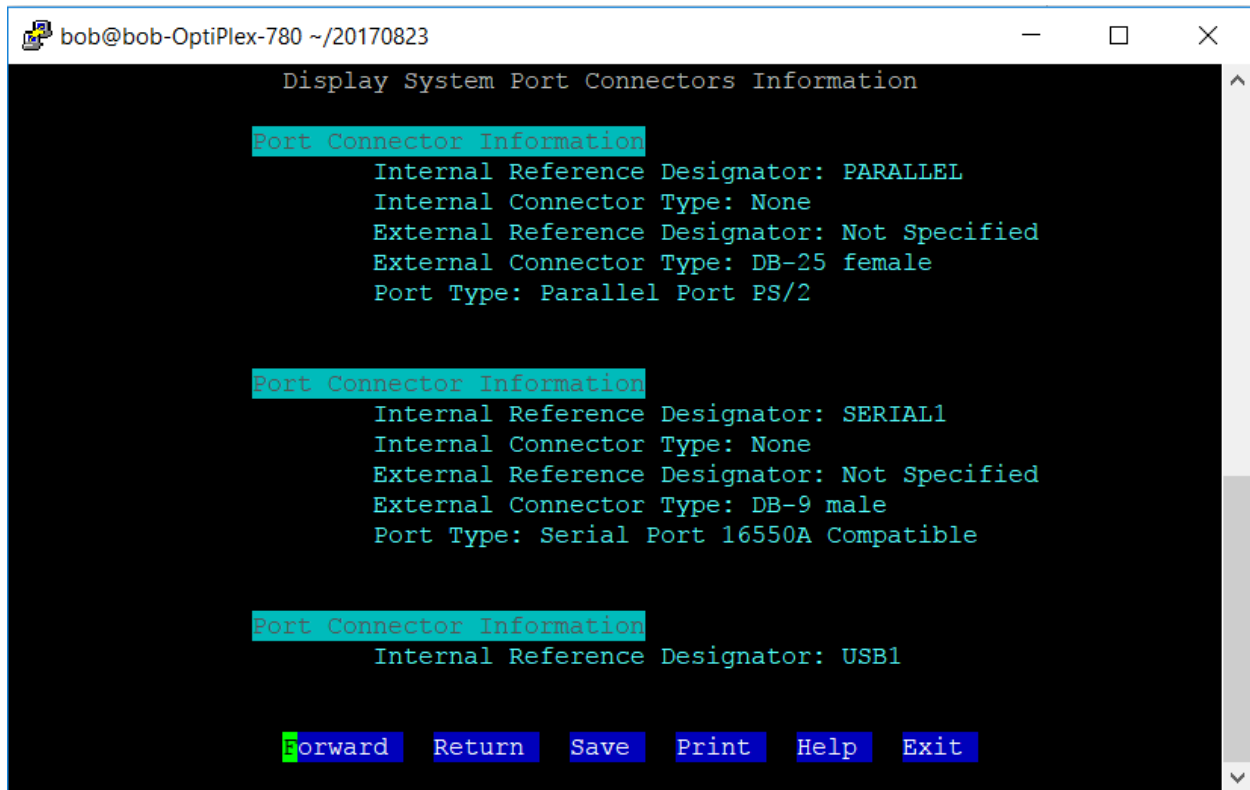
Forward Return Save Print Help Exit
```

Figure 28: Display Network Interfaces.

A **Network Interface Controller** is a computer hardware component that connects a computer to a computer network. Modern **Network Interface Controllers** offer advanced features such as interrupt and **DMA** interfaces to the host **Processors**, support for multiple receive and transmit queues, partitioning into multiple logical interfaces, and on-controller network traffic processing such as the **TCP Offload Engine (TOE)**.

The **Network Controller** implements the electronic circuitry required to communicate using a specific physical layer and data link layer standard such as **Ethernet**, **Fibre Channel**, or **Wi-Fi**. This provides a base for a full network protocol stack, allowing communication among small groups of computers on the same local area network and large-scale network communications through routable protocols, such as **Internet Protocol (IP)**.

Display System Port Connectors Information

A screenshot of a terminal window titled "bob@bob-OptiPlex-780 ~/20170823". The terminal displays the command "Display System Port Connectors Information" and its output. The output is organized into three sections, each starting with a cyan-colored header "Port Connector Information". The first section lists: Internal Reference Designator: PARALLEL, Internal Connector Type: None, External Reference Designator: Not Specified, External Connector Type: DB-25 female, and Port Type: Parallel Port PS/2. The second section lists: Internal Reference Designator: SERIAL1, Internal Connector Type: None, External Reference Designator: Not Specified, External Connector Type: DB-9 male, and Port Type: Serial Port 16550A Compatible. The third section lists: Internal Reference Designator: USB1. At the bottom of the terminal, there are six cyan-colored buttons labeled "Forward", "Return", "Save", "Print", "Help", and "Exit".

```
bob@bob-OptiPlex-780 ~/20170823
Display System Port Connectors Information

Port Connector Information
  Internal Reference Designator: PARALLEL
  Internal Connector Type: None
  External Reference Designator: Not Specified
  External Connector Type: DB-25 female
  Port Type: Parallel Port PS/2

Port Connector Information
  Internal Reference Designator: SERIAL1
  Internal Connector Type: None
  External Reference Designator: Not Specified
  External Connector Type: DB-9 male
  Port Type: Serial Port 16550A Compatible

Port Connector Information
  Internal Reference Designator: USB1

Forward Return Save Print Help Exit
```

Figure 29: Display System Port Connectors Information.

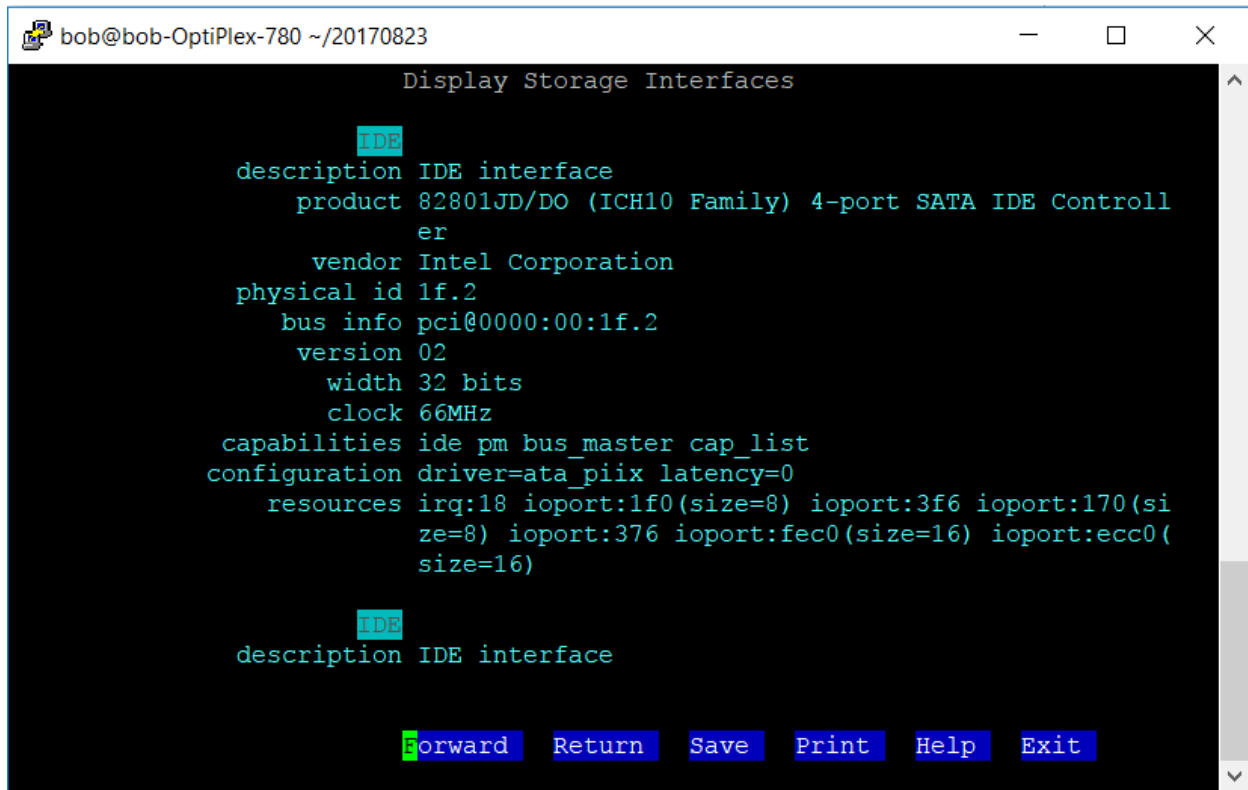
A **Port Connector** serves as an interface between the computer and other computers or peripheral devices. In computer terms, a **Port** generally refers to the female part of connection.

Computer Ports have many uses, to connect a **Monitor, Webcam, Speakers**, or other peripheral devices.

On the physical layer, a computer **Port** is a specialized outlet on a piece of equipment to which a plug or cable connects.

Electronically, the several conductors where the **Port** and cable contacts connect, provide a method to transfer signals between devices.

Display Storage Interfaces



```
bob@bob-OptiPlex-780 ~/20170823
Display Storage Interfaces

IDE
description IDE interface
  product 82801JD/DO (ICH10 Family) 4-port SATA IDE Controll
  er
  vendor Intel Corporation
  physical id 1f.2
  bus info pci@0000:00:1f.2
  version 02
  width 32 bits
  clock 66MHz
  capabilities ide pm bus_master cap_list
  configuration driver=ata_piix latency=0
  resources irq:18 ioport:1f0(size=8) ioport:3f6 ioport:170(si
  ze=8) ioport:376 ioport:fec0(size=16) ioport:ecc0(
  size=16)

IDE
description IDE interface

Forward Return Save Print Help Exit
```

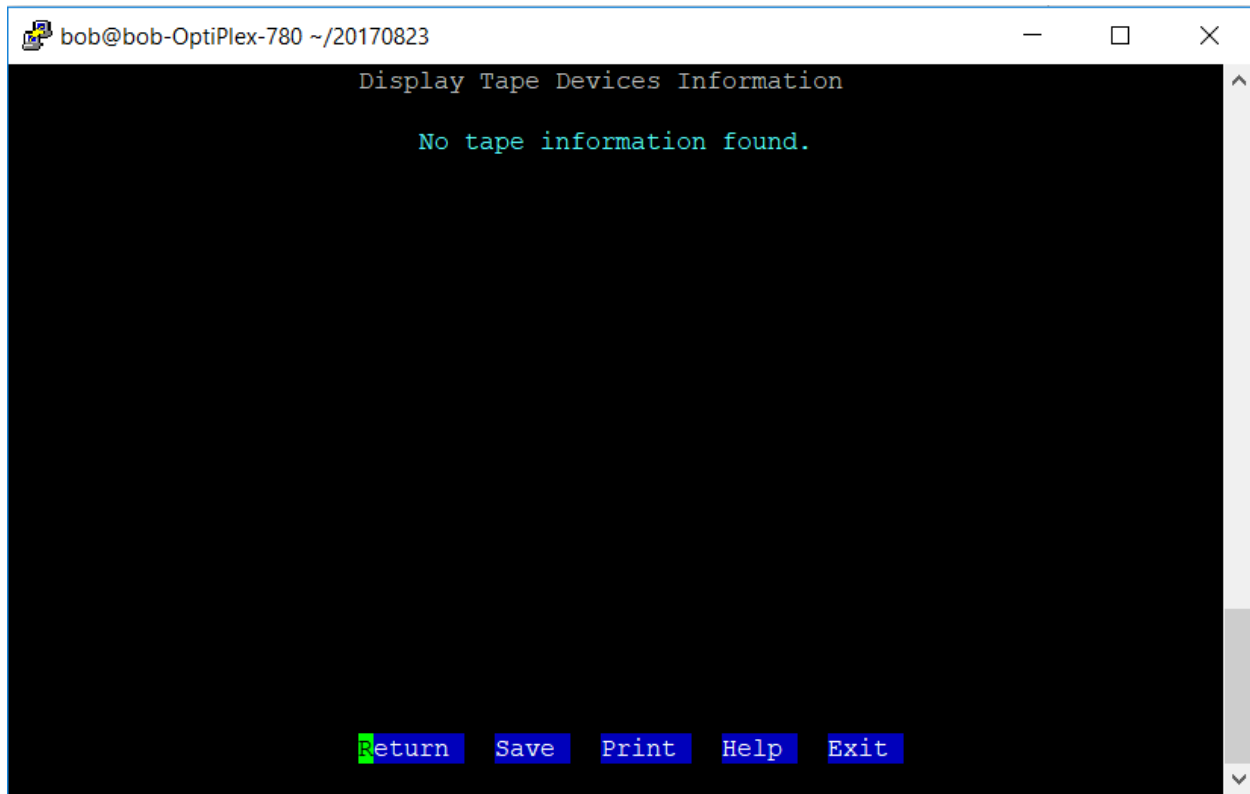
Figure 30: Display Storage Interfaces.

Hard Disk Drives are accessed over one of a number of **Storage Interfaces**, including parallel **ATA (PATA**, also called **IDE** or **EIDE**; described before the introduction of **SATA** as **ATA**), **Serial ATA (SATA)**, **SCSI**, **Serial Attached SCSI (SAS)**, and **Fibre Channel**.

Bridge circuitry is sometimes used to connect **Hard Disk Drives** to **Buses** with which they cannot communicate natively, such as **IEEE 1394**, **USB**, and **SCSI**.

Solid State Drives typically use storage interfaces such as **SATA**, **SAS**, or **Fibre Channel**. **Solid State Card (SSC) Solid State Storage** that resides on a printed circuit board may utilize a standard card form factor such as a **PCI** card and use an interface such as **PCIe**.

Display Attached Tape Drives



```
bob@bob-OptiPlex-780 ~/20170823
Display Tape Devices Information
No tape information found.

Return Save Print Help Exit
```

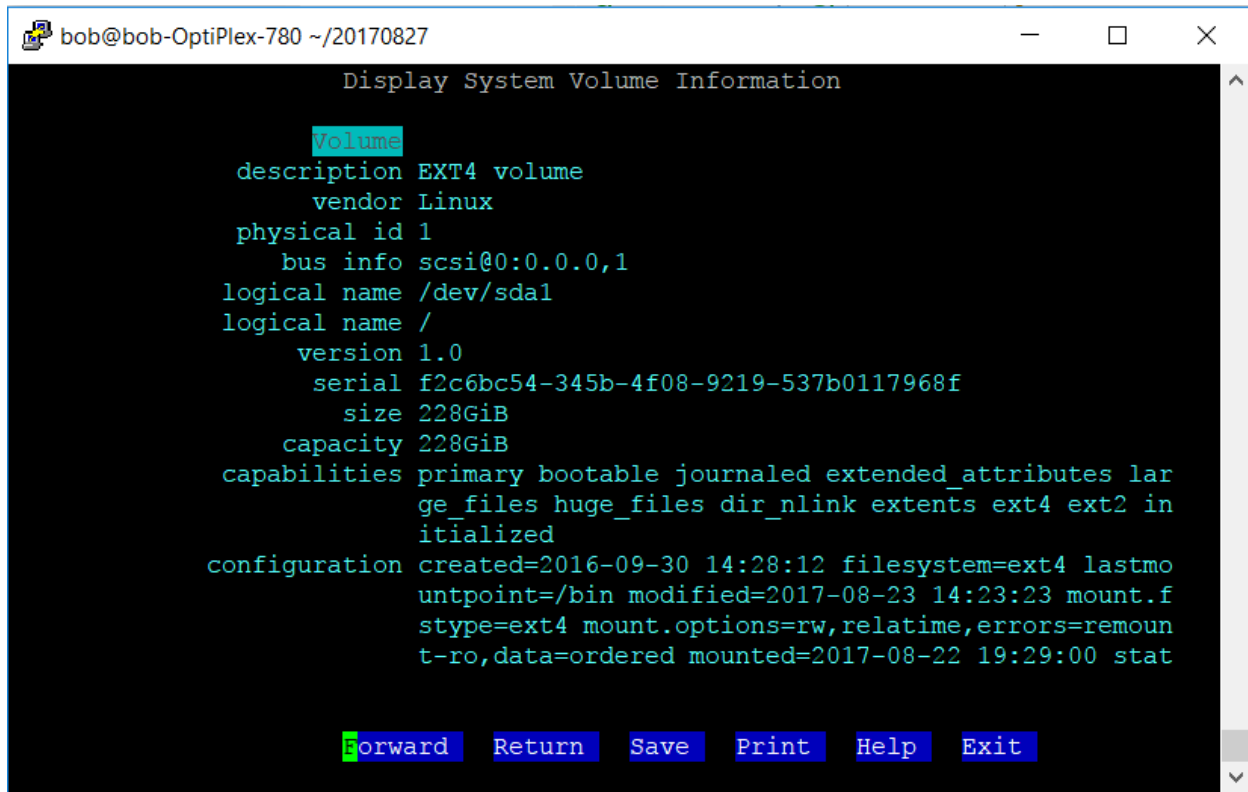
Figure 31: Display attached Tape Drives.

A **Tape Drive** is a data storage device that reads and writes data on a magnetic tape. Magnetic tape data storage is typically used for offline, archival data storage. Tape media generally has a favorable unit cost and a long archival stability.

A **Tape Drive** provides sequential access storage, unlike a **Hard Disk Drive**, which provides direct access storage. A **Disk Drive** can move to any position on the disk in a few milliseconds, but a Tape Drive must rewind to the start of data to read at random positions. As a result, **Tape Drives** have very slow average seek times but can stream data quickly when the required position has been reached.

SCSI Tape Device names begin with **/dev/st** or **/dev/nst**, while **IDE Tape Device** names begin with **/dev/ht** or **/dev/nht**, depending upon whether **auto rewind** is supported. First device has a suffix of 1 with subsequent devices numbered accordingly.

Display System Volume Information



```
bob@bob-OptiPlex-780 ~/20170827
Display System Volume Information

Volume
description EXT4 volume
vendor Linux
physical id 1
  bus info scsi@0:0.0.0,1
logical name /dev/sda1
logical name /
  version 1.0
  serial f2c6bc54-345b-4f08-9219-537b0117968f
  size 228GiB
  capacity 228GiB
capabilities primary bootable journaled extended_attributes lar
ge_files huge_files dir_nlink extents ext4 ext2 in
itialized
configuration created=2016-09-30 14:28:12 filesystem=ext4 lastmo
untpoint=/bin modified=2017-08-23 14:23:23 mount.f
stype=ext4 mount.options=rw,relatime,errors=remoun
t-ro,data=ordered mounted=2017-08-22 19:29:00 stat

Forward Return Save Print Help Exit
```

Figure 32: Display System Volume Information.

A **System Volume** or logical drive is a single accessible storage area with a single file system, typically (though not necessarily) resident on a single partition of a hard disk.

Although a **System Volume** might be different from a physical disk drive, it can still be accessed with an operating system's logical interface.

Volumes other than the boot volume have a mount-point somewhere within the **filesystem**, represented by a path. Logically, the directory tree stored on the volume is grafted in at the **mountpoint**.

By convention, mount-points will often be placed in a directory called **'/mnt'**, though **'/media'** and other terms are sometimes used.

To use a given path as a mount-point for another volume, an empty directory (sometimes called a folder) must exist there.

Linux operating systems use the **mount** command to manipulate mount points for volumes.

Manage Preferences

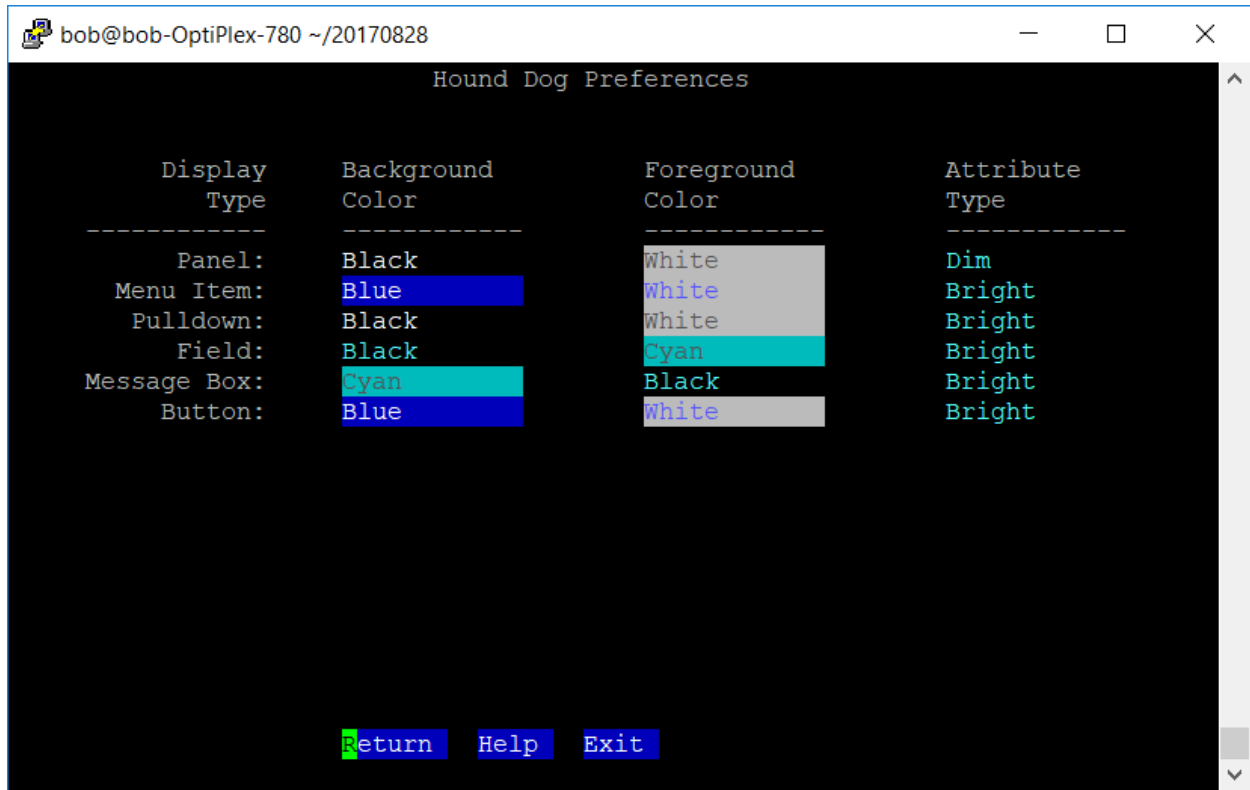
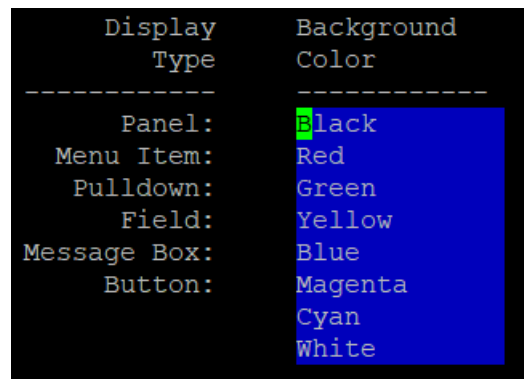


Figure 33: Manage Preferences.

This panel allows for customization of settings. This is currently limited to default colors and attributes.

To Change a preference, **Click** or **Tab** and Press **Enter** to select the Preference value you which to change. Select a choice and **Click** or press **Enter** to complete.

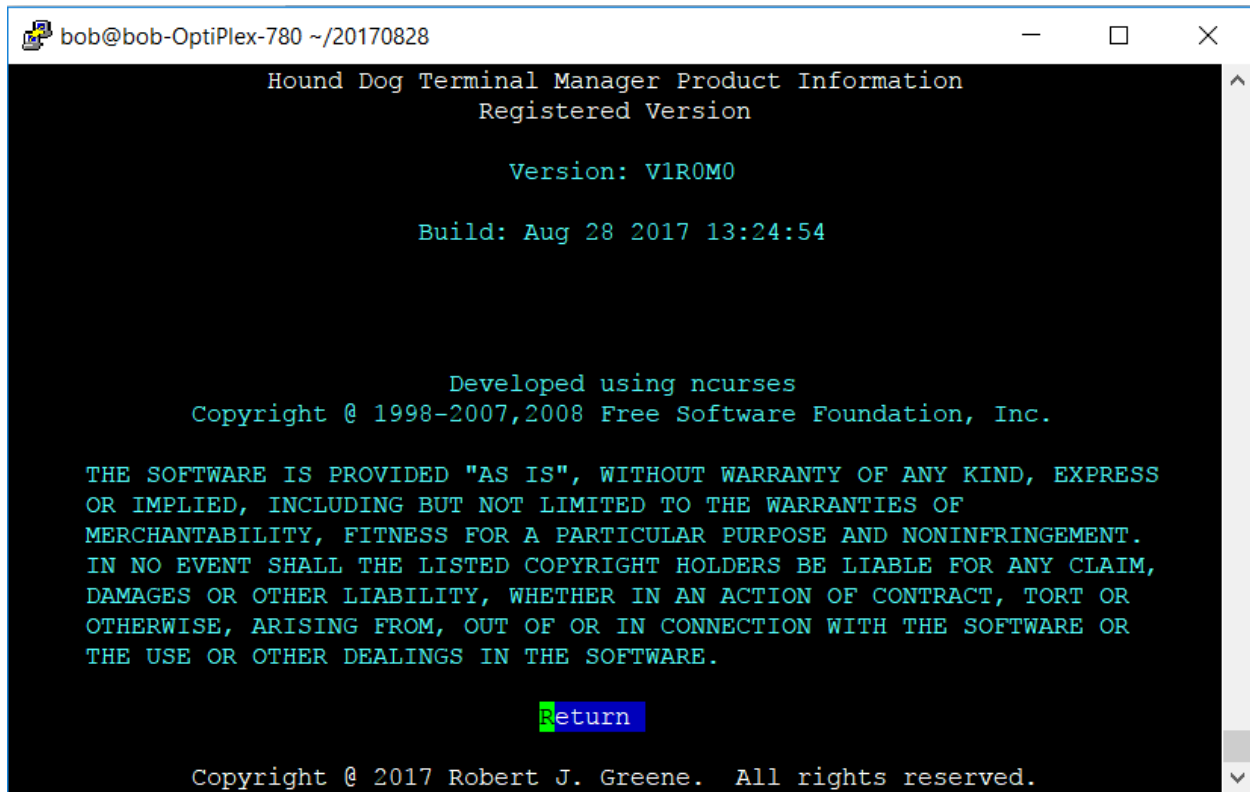
Here is a snapshot of the pulldown presented when you select the Background color for the Display Type **Panel**. →



Colors and Attributes can be set for:

- Panel:** Panel Background and literals.
 - Menu Item:** Items that appear on menu.
 - Pulldown:** Choices that appear in Pulldowns.
 - Field:** Items that have informational content.
 - Button:** Push Buttons.
 - Message Box:** Message notifications.
-
- Colors:** White, Red, Blue, Cyan, Green, Black, Magenta, Yellow.
 - Attributes:** Bright, Dim, Underline, Reverse Video.

Display Product Information

A screenshot of a terminal window titled "bob@bob-OptiPlex-780 ~/20170828". The terminal displays the following text:

```
Hound Dog Terminal Manager Product Information
Registered Version

Version: V1R0M0

Build: Aug 28 2017 13:24:54

Developed using ncurses
Copyright © 1998-2007,2008 Free Software Foundation, Inc.

THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS
OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF
MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT.
IN NO EVENT SHALL THE LISTED COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM,
DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR
OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR
THE USE OR OTHER DEALINGS IN THE SOFTWARE.

return

Copyright © 2017 Robert J. Greene. All rights reserved.
```

Figure 34: Display Product Information.

The HDog Terminal Manager is being initially released as Shareware, providing a 30 day trial period. Registration must be completed prior to the end of the 30 day trial to continue use.

The first release id will be V1R0M1 and is currently available. Installation packages can be downloaded from the www.hounddogtech.us website.

The HDog Terminal Manager is written in GNU C and was developed using ncurses and other GNU libraries. ncurses is copyrighted software of the Free Software Foundation, Inc.

This software is provided "As Is", without warranty of any kind, expressed or implied including but not limited to the warranties of merchantability, fitness for a particular purpose and non-infringement. In no event shall the listed copyright holders be liable for any claim, damages or other liability, whether in an action of contract, tort, or otherwise, arising from, out or in connection with the software or the use of other dealings in the software.

Command Shell

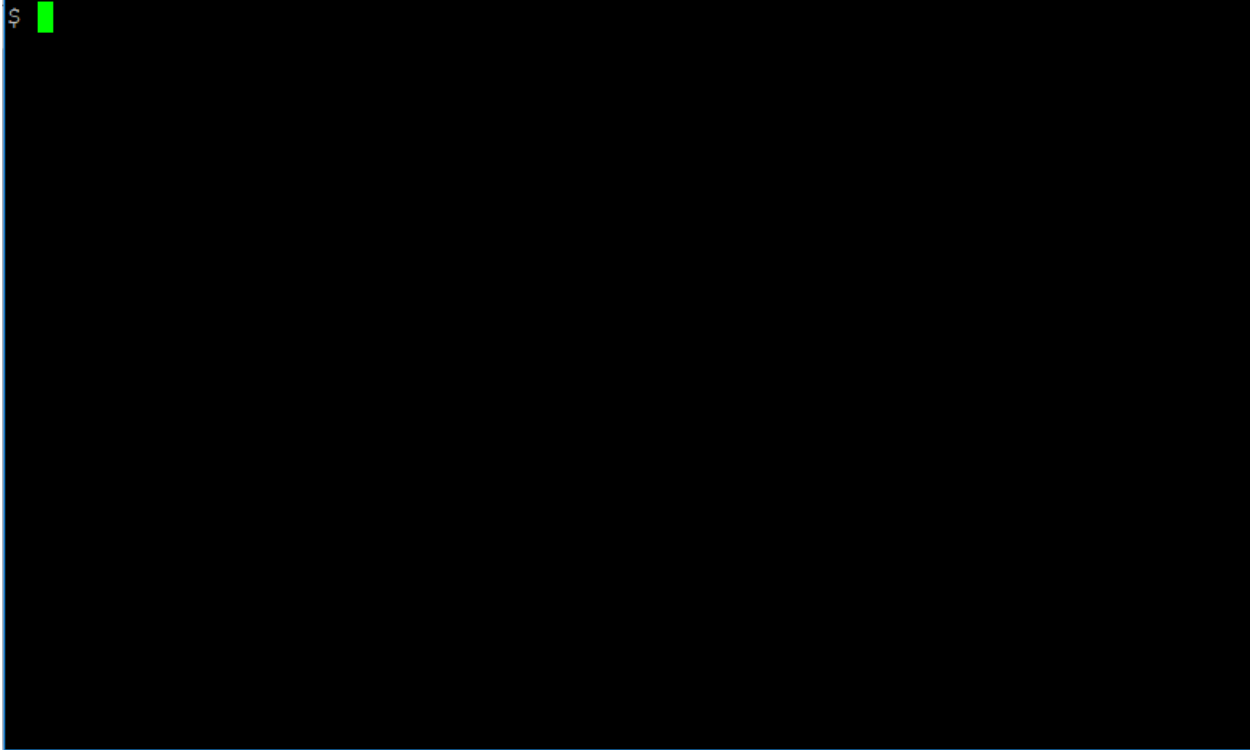


Figure 35: Command Shell.

When the command shell is selected, a panel like the one above will be presented. You are free to perform any shell commands you wish. When you type **exit**, you be returned to the Hound Dog Terminal Manager.

Network Version Feature

The Hound Dog Terminal Manager Network Version can be installed on one Linux System and have its actions performed on up to 100 Remote Linux Systems. You will setup each Remote System with an IP address, Port, and User ID to use. You may also assign a Nickname. The Hound Dog Terminal Manager will use Secure Sockets to connect and execute the actions you specify and return the results back. Here are the details of this feature:

Main Menu

Here is an example of the Hound Dog Terminal Manager Network Version Main Menu panel:

```
Linux #37-Ubuntu          Hound Dog Terminal Manager          ID: bob
4.4.0-21-generic         Network Version: 10.0.0.96          10/11/2017
bob-OptiPlex-780

  Explore Filesystems
  Display System Summary
  Display System Activity
  Display System Configuration
  Display System Hardware
  Connect To Remote Systems
  Manage Preferences
  Product Information
  Command Shell
  Sample Scripts

Click selection or Tab and press Enter.

Exit  Help  Disconnect

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```

The Main Menu panel has the following differences from the Local Version:

- Connect to Remote Systems Menu Item ->

Connect To Remote Systems

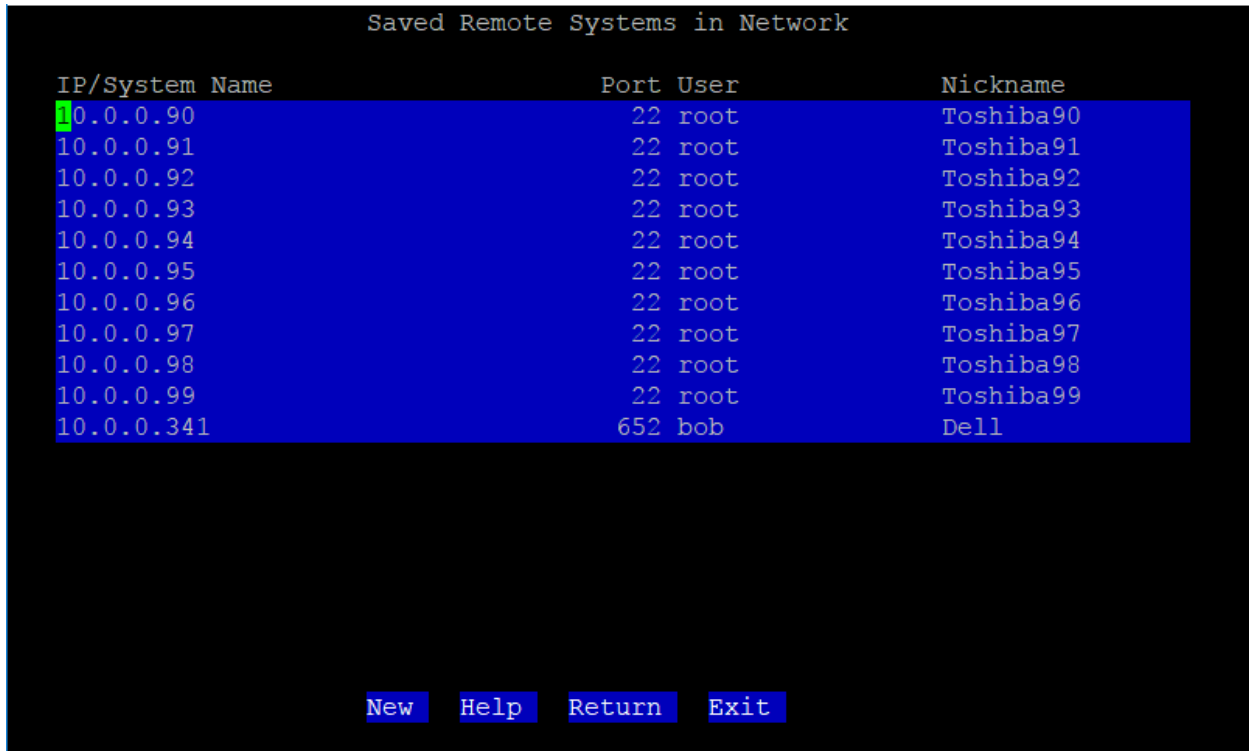
Clicking on this Menu Item will result in a list of predefined Remote Systems to select from.

- Remote System IP in Title when a Remote System has been connected. In the example a Remote System with an IP of 10.0.0.96 is currently connected.

Hound Dog Terminal Manager
Network Version: 10.0.0.96

- Disconnect Push Button: When a Remote System is currently connected, a Disconnect Push Button is displayed.

Saved Remote Systems in Network Panel



IP/System Name	Port	User	Nickname
10.0.0.90	22	root	Toshiba90
10.0.0.91	22	root	Toshiba91
10.0.0.92	22	root	Toshiba92
10.0.0.93	22	root	Toshiba93
10.0.0.94	22	root	Toshiba94
10.0.0.95	22	root	Toshiba95
10.0.0.96	22	root	Toshiba96
10.0.0.97	22	root	Toshiba97
10.0.0.98	22	root	Toshiba98
10.0.0.99	22	root	Toshiba99
10.0.0.341	652	bob	Dell

New Help Return Exit

When the **Connect to Remote Systems** Menu Item is selected from the **Main Menu**, A list of Remote Systems will be displayed. Up to 100 Remote Systems can be defined. The list will include the IP or Host Name, Port and User ID to use, and an optional Nickname. The Hound Dog Terminal Manager will use Secure Sockets to execute actions on the Remote System.

Click on the **New** Push Button to add a new Remote System. If no Remote Systems has been defined yet, you will be presented with an entry panel to add a new Remote System.

Clicking on a Remote System list will result in a Remote System Detail panel like the example on the next page.

The Remote System list can be sorted ascending or descending by IP/System Name, Port, User, or Nickname. Simply click on the respective heading to cause the sort to occur. Clicking the first time on a particular heading will cause the list to be sorted ascending. Clicking on the sorted-ascending list's heading a second time will cause the list to be presented in descending order.

Adding a New Remote System

```
Remote System Update Information
IP: █
Port: _____
User ID: _____
Nickname: _____

Ping Save Cancel Help Exit
```

Above is an example of the response you will see when you select the **New** Push Button on the **Saved Remote Systems in Network Panel**. After entering the above information, select **Save** to save your new Remote System entry or **Cancel** to cancel your changes. You may also select **Ping** to ensure that the Remote System is reachable.

Remote System Detail

```
Remote System Detail Information

      IP: 10.0.0.96
      Port: 22
      User ID: root
      Nickname: Toshiba96

      Last Ping: 10/11/2017-16:33
      Last Trust: 10/01/2017-12:14
      Last Connect: 10/10/2017-20:27

Ping Trust Connect Edit Delete Help Return Exit
```

Clicking on a Remote System on the **Saved Remote Systems in Network Panel** will return a panel like above. The **Remote System Detail** panel provides for managing a Remote System. Here is a list of the actions that you can do:

- **Edit:** Edit the **IP/Name, Port, User ID, and Nickname** for the Remote System.
- **Delete:** Delete the Remote System.
- **Ping:** Ping the IP/Name of the Remote System to ensure that it is reachable.
- **Trust:** Establish Secure Shell (SSH) Trust between your signed-on Linux System and User ID with the Remote Linux System and User ID. This will eliminate having to reenter user id passwords each time that the Hound Dog Terminal Manager executes an action on the Remote System.

Note: On Ubuntu systems, many actions must be executed with the **sudo** command, (Super User Do). Use the **visudo** command on the Remote System to add an entry for the User ID to avoid having to enter a password each time the **sudo** command is executed on the Remote System.

- **Connect:** Connect to the Remote System. This will result in actions being performed on the Remote System until a Disconnect is selected.

The following pages display examples of executing the above actions.

Remote System Detail - Ping

```
Remote System Detail Information

      IP: 10.0.0.96
      Port: 22
      User ID: root
      Nickname: Toshiba96

      Last Ping: 10/13/2017-07:24
      Last Trust: 10/01/2017-12:14
      Last Connect: 10/11/2017-20:44

PING 10.0.0.96 (10.0.0.96) 56(84) bytes of data.

--- 10.0.0.96 ping statistics ---
1 packets transmitted, 1 received, 0 0xeacket loss, time 0ms
rtt min/avg/max/mdev = 9.777/9.777/9.777/0.000 ms

      Ping successfully completed.

Ping Trust Connect Edit Delete Help Return Exit
```

The **Remote System Detail** panel displayed is an example of the result when you select the **Ping** Push Button. In the above example the Ping was successfully completed, showing that the IP/Name is reachable.

Remote System Detail- Trust

```
Remote System Detail Information

      IP: 10.0.0.96
      Port: 22
      User ID: root
      Nickname: Toshiba96

      Last Ping: 10/13/2017-07:24
      Last Trust: 10/13/2017-07:32
      Last Connect: 10/11/2017-20:44

      SSH Trust completed.

Ping Trust Connect Edit Delete Help Return Exit
```

The **Remote System Detail** panel displayed is an example of the result when you select the **Trust** Push Button. In the above example Secure Sockets Trust was established between your signon Linux System and UserID with the IP/Name-UserID that you set up for this Remote System.

Note: When establishing Trust, you may be prompted to enter the Remote System's UserID password multiple times. Below is an example of the prompt that you will see:

```
root@10.0.0.96's password: █
```

Remote System Detail- Connect

```
Linux #37-Ubuntu          Hound Dog Terminal Manager          ID: bob
4.4.0-21-generic         Network Version: 10.0.0.96          10/13/2017
bob-OptiPlex-780

Explore Filesystems
Display System Summary
Display System Activity
Display System Configuration
Display System Hardware
Connect To Remote Systems
Manage Preferences
Product Information
Command Shell
Sample Scripts

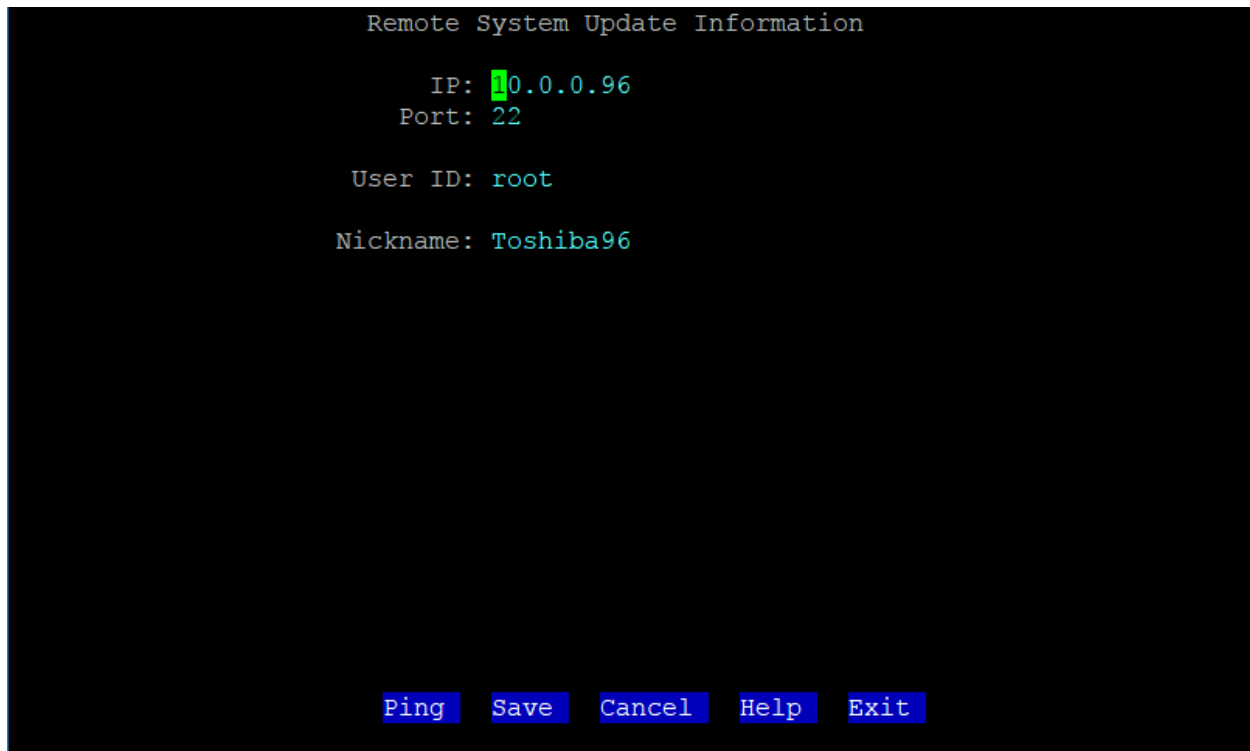
Click selection or Tab and press Enter.

Exit Help Disconnect

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```

Above is an example of selecting the Connect Push Button on the Remote System Detail panel for IP/Name 10.0.0.96. A ping will be performed on the IP/Name value to ensure the Remote System is reachable. If successful, you will be returned to the Hound Dog Terminal Manager Main Menu with the Remote System set as the Connected Remote System.

Remote System Detail- Update



When you select the **Edit** Push Button on the Remote System Detail Panel, you will be presented with a Remote System Update panel like above. Make any changes and use the **Save** Push Button to save your changes and the **Cancel** Push Button to cancel any unsaved updates.

Shareware Evaluation Mode

```
Linux #37-Ubuntu          Hound Dog Terminal Manager      ID: bob
4.4.0-21-generic         Evaluation Version                10/11/2017
bob-OptiPlex-780                                     07:08:46

Explore Filesystems
Display System Summary
Display System Activity
Display System Configuration
Display System Hardware
Connect To Remote Systems
Manage Preferences
Product Information
Command Shell
Sample Scripts
Register Product

Click selection or Tab and press Enter.

Exit Help

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```

Figure 36: Shareware Evaluation Mode.

The HDog Terminal Manager is being initially released as Shareware, providing a 30 day trial period. Registration must be completed prior to the end of the 30 day trial to continue use.

The first release id isV1R0M1 and available in October, 2017. Single user licenses, (Registration), can be purchased on the www.hounddogtech.us website. You can also download the installation package and User Guide on that website.

After completing registration at the www.hounddogtech.us website, you will be given a registration key. Select the **Register Product** menu item above to complete registration.

Product Registration

```
Linux #37-Ubuntu Hound Dog Terminal Manager Product Registration ID: bob
4.4.0-21-generic Registration Entry 10/11/2017
bob-OptiPlex-780 07:17:38

Please enter registration id: █

Product Version: V1ROM0
Evaluation started on 10/11/2017 and expires on 11/10/2017

Registration can be completed at www.hounddogtech.us.

Cancel

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```

Figure 37: Product Registration.

The HDog Terminal Manager is being initially released as Shareware, providing a 30 day trial period. Registration must be completed prior to the end of the 30 day trial to continue use.

The first release id will be **V1ROM1** and is currently available. An installation package is available for download on the www.hounddogtech.us website.

In the evaluation period you will see an expiration message in the heading stating the expiration date. After completing registration at the www.hounddogtech.us website, you will be given a registration key.

After selecting the **Register Product** menu item from the Main Menu you will be presented with the above Product Registration Entry panel. Input the product key in the **registration id** prompt to complete registration.

Successful registration will result in a response such as this →

```
Please enter registration id: 715251
Registration Key validated!
Thank you for registering this product.
```

Setup and Customization Considerations

HDog RunTime Parameters

The HDog Terminal Manager accepts runtime parameters at startup. These parameters include:

- f xmlfilename:** The HDog XML file default location and name is in the same folder as the hdog executable. Specifying the **-f** runtime parameter allows you to specify a new location and/or name for this file.
- l logfile:** The HDog Terminal Manager writes log records to a log file when significant events occur. The default location name for this file is **/tmp/HDogLog.txt**. It will append new messages to this file over multiple sessions. Use the **-l** runtime option to specify a different log file location and name.
- d directoryname:** The HDog Terminal Manager uses a Configuration File to maintain options over multiple sessions. The location of this Configuration file defaults to the same folder as the hdog executable. Use **-d** parameter to specify a different location.
- debug:** The HDog Terminal Manager provides debugging information in its log file upon request. Specify **debug** to turn this feature on.

Menu Customizations

The Hound Dog Terminal Manager's menu structure is constructed using the `hdog.xml` file. This XML file is composed of `MenuItem` sections which define submenus and menu items presented to the user.

The figure below is an example of a `MenuItem` in the `hdog.xml` file that invokes the Explore Filesystem Menu Item in the Main Menu.

```
<MenuItem>
  <Title>Explore Filesystem</Title>
  <Invoke>./hdogfsys</Invoke>
  <Help>                                Explore Filesystem Help

  The term filesystem used here refers to the entire hierarchy
  of directories (also referred to as the directory tree) that
  is used to organize files on this system.
  The directories start with the root directory, (/), which
  contains a series of subdirectories, each of which, in turn,
  contains further subdirectories, etc. Subdirectories are
  displayed with a trailing '/' in their name.

  Clicking on a Subdirectory will result in a display of that
  Subdirectory's contents.

  Clicking on a File will return detail information about that
  File along with the option to browse or edit it if you are
  authorized to do so.

  Clicking on the '../' Subdirectory name will result in a
  display of the most recent 'upper' directory.
</Help>
</MenuItem>
```

Figure 38: Sample XML entry from `hdog.xml`.

The `MenuItem` Title section specifies the displayed title when included in a menu. When this menu item is selected by the user, the `Invoke` value is executed. Specifying a value of **SubMenu** for the `MenuItem` Title will result in a Submenu being presented to the user when the `MenuItem` is selected.

The User Interface can be extended by simply adding new `MenuItems` or modifying existing `MenuItems` in the `hdog.xml` file.

Help documentation inserted into the `MenuItem` Help section will be displayed when a user selects **Help** on the panel associated with `MenuItem`.

Below are a few more examples of MenuItem's that you can create for your use.

```
<MenuItem>
  <Title>List Mounted Filesystems</Title>
  <Invoke>Shell(clear;uname -a;echo "Mounted Filesystems follow:";cat
/etc/mstab;echo "Press any key to continue.";read -p " " cInputKey)</Invoke>
  <Help>                                Hound Dog Command Shell Help
  </Help>
</MenuItem>
```

Figure 39: Sample Shell Command Script that lists all Mounted Filesystems in a Linux System.

In the above example, a shell is created with the above commands being executed. The result is that the screen will be cleared and a title of "Mounted Filesystems follow:" will be printed. The next lines will be a list of the mounted filesystems. Note that when a Remote System has been connected, these commands will be executed on that system and displayed on your console.

Note: In the above Figure the <Invoke> command did not fit on the page. The commands are on a single line and included within the **Shell()** value.

Here is another example which lists all active Processes on a Linux System.

```
<MenuItem>
  <Title>List Active Processes</Title>
  <Invoke>Shell(clear;uname -a;ps -ef;echo "Press any key to
continue.";read -p " " cInputKey)</Invoke>
  <Help>                                Hound Dog Command Shell Help
  </Help>
</MenuItem>
```

Figure 40: Sample Shell CommandScript that lists all Active Processes in a Linux System.

The above examples are shown to help you create MenuItem's that you wish to include in your menus for your own purposes.