V2616A Linux Software Manual

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V2616A Linux Software Manual

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1

Introduction

Thank you for purchasing the Moxa V2616A series of x86 ready-to-run embedded computers. This manual introduces the software configuration and management of the V2616A-LX, which runs the Linux operating system. For hardware installation, connector interfaces, setup, and upgrading the BIOS, please refer to the "V2616A Hardware User's Manual."

Linux is an open, scalable operating system that allows you to build a wide range of innovative, small footprint devices. Software written for desktop PCs can be easily ported to the Linux-based embedded computer with a GNU cross compiler and a minimum of source code modifications. A typical Linux-based device is designed for a specific use, and is often not connected to other computers, or a number of such devices connect to a centralized, front-end host. Examples include enterprise tools such as industrial controllers, communications hubs, point-of-sale terminals, and display devices, which include HMIs, advertisement appliances, and interactive panels.

The following topics are covered in this chapter:

- **Overview**
- **Software Specifications**
- **Software Components**

Overview

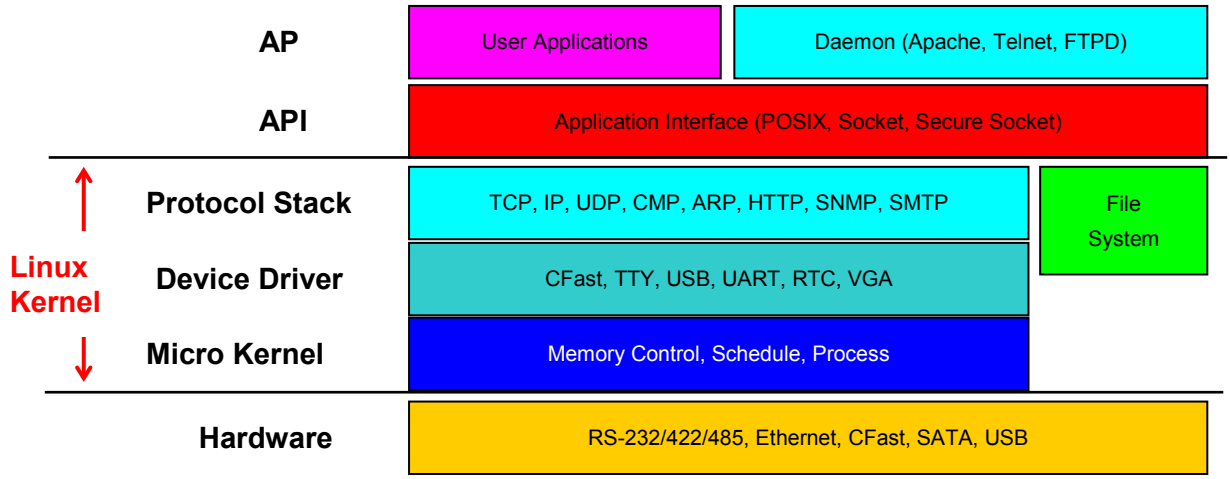
The V2616A series embedded computers are based on the Intel 3rd-generation processor and feature two serial ports, dual 10/100/1000 Mbps LAN ports, three USB 2.0 hosts, and a CFast socket. The V2616A series offers both VGA and DVI-D outputs, making it exceptionally well suited for industrial applications such as SCADA and factory automation.

The V2616A's 2 serial ports make it ideal for connecting a wide range of serial devices, and the dual 10/100/1000 Mbps Ethernet ports offer a reliable solution for network redundancy, which taken together promise continuous data communication and management operations. For added convenience, the V2616A computers have 6 DIs and 2 DOs for connecting digital input/output devices. In addition, the CFast socket and USB ports provide V2616A computers with data buffering and storage expansion, which provide the necessary reliability for industrial applications.

Pre-installed with Linux, the V2616A series provides programmers with a friendly environment for developing sophisticated, bug-free application software at a lower cost.

Software Specifications

The Linux operating system pre-installed on the V2616A embedded computers is the **Debian Wheezy 7.2** distribution. The Debian project involves a worldwide group of volunteers who endeavor to produce an operating system distribution composed entirely of free software. The Debian GNU/Linux follows the standard Linux architecture, making it easy to use programs that meet the POSIX standard. Program porting can be done with the GNU Tool Chain provided by Moxa. In addition to Standard POSIX APIs, device drivers for Moxa UART and other special peripherals are also included. An example software architecture is shown below:



ATTENTION

Refer to http://www.debian.org/ and http://www.gnu.org/ for information and documentation related to Debian GNU/Linux and the free software concept.

ATTENTION

The above software architecture is only an example. Different models or different build revisions of the Linux operating system may include components not shown in the above graphic.

Software Components

The V2616A-LX computers are pre-installed with the Debian Wheezy 7.2 Linux distribution. For the software components, see "Appendix A."

2

Software Configuration

In this chapter, we explain how to operate a V2616A-LX computer directly from your desktop. There are three ways to connect to the V2616A-LX computer: through a VGA monitor, via Telnet over the network, or with an SSH console from a Windows or Linux machine. This chapter describes basic Linux operating system configurations. Advanced network management and configuration instructions will be described in the next chapter, "Managing Communications."

The following topics are covered in this chapter:

- **Account Management**
- **Starting from a VGA Console**
- **Connecting from a Telnet Console**
- **Connecting from an SSH Console**
  - Windows Users
  - Linux Users
- **Adjusting the System Time**
  - Setting the Time Manually
  - NTP Client
  - Updating the Time Automatically
- **Enabling and Disabling Daemons**
- **Setting the Run-Level**
- **Managing Service with insserv**
- **Cron—Daemon for Executing Scheduled Commands**
- **Inserting a USB Storage Device into the Computer**
- **Audio Playback and Record**
- **Checking the Linux Version**
- **APT—Installing and Removing Packages**
- **Setting up Desktop Environment**

Account Management

Connect the V2616A to a display and turn on the computer. Enter the following information to log in to the computer:

Login: moxa

Password: moxa

For security reasons, we strongly suggest you disable the root account and change the password upon your first login. After successfully logging in, the computer is configured to force you to first reset a new password:

```
login as: moxa
moxa@192.168.27.42's password:
You are required to change your password immediately (root enforced)
Linux Moxa 3.2.0-4-amd64 #1 SMP Debian 3.2.46-1 x86_64

   ####       ####   ######   ####### ######     ##
    ###      ####   ###   ###   ####   ####     ###
     ###     ###   ###     ###   ###    ##      ###
     ###    ####   ##       ##   ###   #       ####
     ####   # ##  ###       ###   ### ##       ## ##
    ## ##   # ##  ###        ##    ####        #  ##
    ## ###  ## ##  ##         ##    ####        #  ###
    ##  ##  #  ##  ##         ##     ###       #######
    ##  ##  #  ##  ###        ###    #####      #   ##
    ##   ###   ##  ###       ###   ##  ###     #   ###
    ##   ###   ##   ##       ##    ##   ###    ##    ##
    ##   ###   ##    ##     ##     #    ###    #     ##
   ######  #  ######   ########  ####### ##########  ######

For further information check:
http://www.moxa.com/
Mount user file system.

moxa@Moxa:~#
```

To run commands as root, users shold not log in to the computer with the root account. Instead, users should use the **sudo** command to run commands with root privileges. To do this, users must first be added to the sudo group. Once a user is added to the sudo group, they may run commands requiring super-user privileges by prefacing them with the sudo command. For example, to reconfigure the IP address of Ethernet port 1, a user with sudo privileges will type **sudo ifconfig eth0 192.168.100.100**; the OS will then require the user to enter his or her password before executing the command, as below:

```
moxa@Moxa:~# sudo ifconfig eth0 192.168.100.100
[sudo] password for moxa:
moxa@Moxa:~$ sudo ifconfig eth1
[sudo] password for moxa:
eth1      Link encap:Ethernet  HWaddr 00:90:e8:00:df:fe
          inet addr:192.168.100.100  Bcast:192.168.100.255  Mask:255.255.255.0
          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:41 Base address:0xe000
moxa@Moxa:~$
```

If a user must log in to the root account, it is advised to first take the computer offline, and then use the command **sudo –i**, as below:.

```
moxa@Moxa:~# sudo –i
[sudo] password for moxa:
root@Moxa:~$
```

ATTENTION

To enable sudo on your computer, you must fisrt add a user to the sudo group. To add a user to the sudo group, use the **useradd** command, as below:

useradd [USER-ACCOUNT-NAME-HERE] sudo

Using the **sudoers** file, sudo may be carefully tailored on a user-by-user basis to allow a specific hierarchy of privileges that can be tailored to individual computers within the network. For more information on configuration, usage, and best practices with the sudo command, you may refer to the following websites:

Linux.com's introduction to sudo:

http://www.linux.com/learn/tutorials/306766:linux-101-introduction-to-sudo

Debian introduction to the **sudo** command:

https://wiki.debian.org/sudo

Ubuntu (a Debian sub-distribution) documentation for the **sudoers** file**:**

https://help.ubuntu.com/community/Sudoers

A sample sudoers file for an extended network:

http://www.sudo.ws/sudo/sample.sudoers

Starting from a VGA Console

Connect the display monitor to the V2616A-LX VGA connector, and then power it up by connecting it to the power adaptor. It takes approximately 30 to 60 seconds for the system to boot up. Once the system is ready, a login screen will appear on your monitor.

To log in, type the login name and password as requested. The default values are both **root**.

Login: root

Password: root

```
Moxa login: root
Password:
Last login: Thu Sep 15 22:46:00 CST 2011 on tty1
Linux Moxa 2.6.32-5-amd64 #1 SMP Tue Jun 14 09:42:28 UTC 2011 x86_64
The programs included with the Debian GNU/Liux system are free software;
The exact distribution terms for each program are described in the
Individual files in /usr/share/doc/*/copyright.
Debian GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent
Permitted by applicable law.
root@Moxa:~#
```

Connecting from a Telnet Console

The V2616A-LX computers come with two Gigabit ports named LAN1 and LAN2. The default IP addresses and netmasks of the network interfaces are as follows:

	Default IP Address	Netmask
LAN 1	192.168.3.127	255.255.255.0
LAN 2	192.168.4.127	255.255.255.0

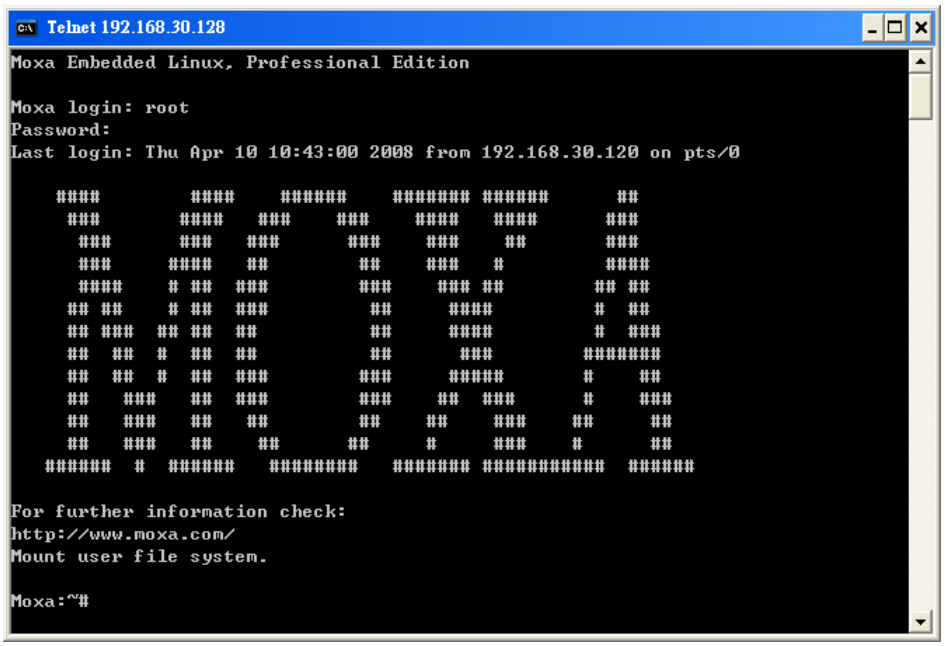
Before using the Telnet client, you should change the IP address of your development workstation so that the network ports are on the same subnet as the IP address for the LAN port that you will connect to. For example,

if you will connect to LAN1, you could set your PC's IP address to 192.168.3.126, and the netmask to 255.255.255.0. If you will connect to LAN2, you could set your PC's IP address to 192.168.4.126, and the netmask to 255.255.255.0.

Use a cross-over Ethernet cable to connect your development workstation directly to the target computer, or use a straight-through Ethernet cable to connect the computer to a LAN hub or switch. Next, use a Telnet client on your development workstation to connect to the target computer. After a connection has been established, type the login name and password as requested to log on to the computer. The default values are both **root**.

Login: root

Password: root

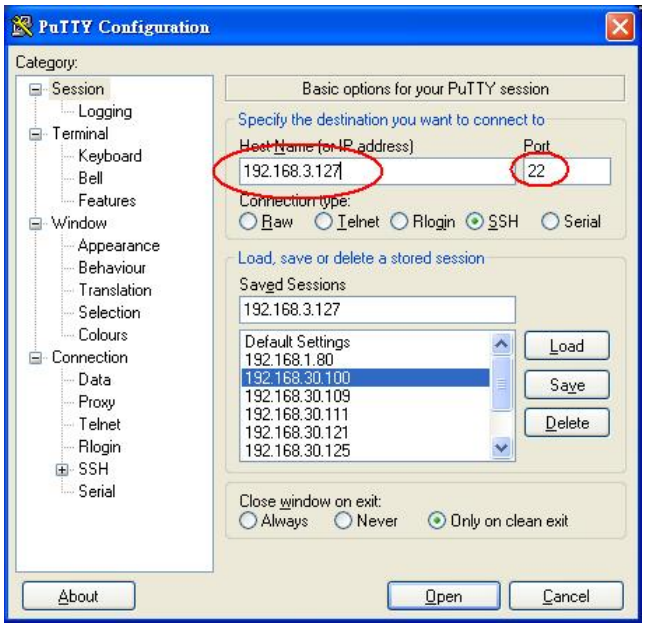


Connecting from an SSH Console

The V2616A-LX computers support an SSH console to offer users better network security than the Telnet.

Windows Users

Click on the link http://www.chiark.greenend.org.uk/~sgtatham/putty/download.html to download **PuTTY** (free software) to set up an SSH console for the V2616A-LX in a Windows environment. The following screen shows an example of the configuration that is required.



Linux Users

From a Linux machine, use the **ssh** command to access the V2616A-LX's console utility via SSH.

root@Moxa:~# ssh 192.168.3.127

Select **yes** to open the connection.

```
root@Moxa:~# ssh 192.168.3.127
The authenticity of host '192.168.3.127 (192.168.3.127)' can't be established.
RSA key fingerprint is 8b:ee:ff:84:41:25:fc:cd:2a:f2:92:8f:cb:1f:6b:2f.
Are you sure you want to continue connection (yes/no)? yes_
```

Adjusting the System Time

The V2616A-LX has two time settings. One is the system time, and the other is provided by an RTC (Real Time Clock) built into the V2616A-LX's hardware.

Setting the Time Manually

Use the **date** command to query the current system time or to set a new system time. Use **hwclock** to query the current RTC time or to set a new RTC time.

Use the following command to set the system time.

root@Moxa:~# date MMDDhhmmYYYY

MM:	Month
DD:	Date
hhmm:	Hour and Minute
YYYY:	Year

Use the following command to write the current system time to the RTC.

root@Moxa:~# hwclock –w

```
MOXA:~# date
           Wed Dec 16 03:34:46 CST 2009

MOXA:~# hwclock
Wed 16 Dec 2009 03:35:16 AM CST  -0.017600 seconds
MOXA:~# date 121616352009
Wed Dec 16 16:35:00 CST 2009
MOXA:~# hwclock -w
MOXA:~# date ; hwclock
Wed Dec 16 16:36:12 CST 2009
Wed 16 Dec 2009 03:38:13 AM CST -0.016751 seconds
MOXA:~#
```

NTP Client

The V2616A-LX has a built-in NTP (Network Time Protocol) client that is used to initialize a time request to a remote NTP server. Use **ntpdate** to update the system time.

root@Moxa:~#ntpdate time.stdtime.gov.tw
root@Moxa:~#hwclock –w

Visit http://www.ntp.org for more information about NTP and NTP server addresses.

```
MOXA:~# date ; hwclock
Wed Dec 16 16:36:12 CST 2009
Wed 16 Dec 2009 03:38:13 AM CST -0.016751 seconds
MOXA:~#
MOXA:~# ntpdate time.stdtime.gov.tw
 16 Dec 03:49:48 ntpdate[2510]: step time server 220.130.158.52 offset 155905087.9
84256 sec
MOXA:~#
MOXA:~# hwclock -w
MOXA:~# date ; hwclock
Wed Dec 16 03:51:07 CST 2009
Wed 16 Dec 2009 03:51:07 AM CST   -0.016771 seconds
MOXA:~#
```

ATTENTION

Before using the NTP client utility, check your IP address and network settings (gateway and DNS) to make sure an Internet connection is available.

Updating the Time Automatically

This section describes how to use a shell script to update the time automatically.

Example shell script for periodically updating the system time

```
#!/bin/sh
ntpdate time.stdtime.gov.tw
# You can use the time server's ip address or domain
# name directly. If you use domain name, you must
# enable the domain client on the system by updating
# /etc/resolv.conf file.
hwclock –w
sleep 100
# Updates every 100 seconds. The min. time is 100 seconds.
# Change 100 to a larger number to update RTC less often.
```

Save the shell script using any file name. For example, **fixtime**.

How to run the shell script automatically when the kernel boots up

Because the root file system is mounted in Read-only mode, we need to re-mount it using writable permission.

```
root@Moxa:~# mount -o remount,rw /
```

Copy the example shell script **fixtime** to the directory **/etc/init.d**, and then use **chmod 755 fixtime** to change the shell script mode.

```
root@Moxa:~# chmod 755 fixtime
```

Next, add the following line to the bottom of the file **/etc/inittab**:

```
root@Moxa:~# echo 'ntp : 2345 : respawn : /etc/init.d/fixtime' >> /etc/inittab
```

After you finish writing or modifying the code, remember to execute **umount /** to change the root directory back to Read-only mode.

```
root@Moxa:~# umount /
```

Use the command **#init q** to re-initialize the kernel.

```
root@Moxa:~# init q
```

Enabling and Disabling Daemons

The following daemons are already enabled when the V2616A-LX boots up for the first time.

Snmpd: SNMP Agent Daemon

Telnetd: Telnet Server/Client Daemon

Inetd: Internet Daemons

Ftpd: FTP Server/Client Daemon

Sshd: Secure Shell Server Daemon

Httpd: Apache WWW Server Daemon

Type the command **root@Moxa:~#ps –ef** to list all processes currently running.

```
Moxa:~# ps -ef
UID        PID  PPID  C STIME TTY          TIME CMD
root         1     0  0 00:02 ?        00:00:00 init [2]
root         2     0  0 00:02 ?        00:00:00 [kthreadd]
root         3     2  0 00:02 ?        00:00:00 [migration/0]
root         4     2  0 00:02 ?        00:00:00 [ksoftirqd/0]
root         5     2  0 00:02 ?        00:00:00 [watchdog/0]
root         6     2  0 00:02 ?        00:00:00 [migration/1]
root         7     2  0 00:02 ?        00:00:00 [ksoftirqd/1]
root         8     2  0 00:02 ?        00:00:00 [watchdog/1]
root         9     2  0 00:02 ?        00:00:00 [events/0]
root        10     2  0 00:02 ?        00:00:00 [events/1]
root        11     2  0 00:02 ?        00:00:00 [cpuset]
root        12     2  0 00:02 ?        00:00:00 [khelper]
root        13     2  0 00:02 ?        00:00:00 [netns]
root        14     2  0 00:02 ?        00:00:00 [async/mgr]
root        15     2  0 00:02 ?        00:00:00 [pm]
root        17     2  0 00:02 ?        00:00:00 [sync_supers]
root        18     2  0 00:02 ?        00:00:00 [bdi-default]
root        19     2  0 00:02 ?        00:00:00 [kintegrityd/0]
root        20     2  0 00:02 ?        00:00:00 [kintegrityd/1]
root        21     2  0 00:02 ?        00:00:00 [kblockd/0]
root        22     2  0 00:02 ?        00:00:00 [kblockd/1]
root        23     2  0 00:02 ?        00:00:00 [kacpid]
root        24     2  0 00:02 ?        00:00:00 [kacpi_notify]
root        25     2  0 00:02 ?        00:00:00 [kacpi_hotplug]
root        26     2  0 00:02 ?        00:00:00 [ata/0]
root        27     2  0 00:02 ?        00:00:00 [ata/1]
www-data  2707  2664  0 00:03 ?     00:00:00 /usr/sbin/apache2 -k start
www-data  2708  2664  0 00:03 ?     00:00:00 /usr/sbin/apache2 -k start
www-data  2709  2664  0 00:03 ?     00:00:00 /usr/sbin/apache2 -k start
www-data  2710  2664  0 00:03 ?     00:00:00 /usr/sbin/apache2 -k start
root      2720  2700  0 00:15 tty1    00:00:00 -bash
root      2724     2  0 00:15 ?       00:00:00 [flush-8:0]
root      2745  2536  1 00:21 ?       00:00:00 sshd: root@pts/0
root      2747  2745  0 00:21 pts/0   00:00:00 -bash
root      2751  2747  0 00:21 pts/0   00:00:00 ps -ef
Moxa:~#
```

To run a private daemon, you can edit the file **rc.local**, as shown below:

1. Because the root file system is mounted in Read-only mode, you need to re-mount it with write permission.

```
MOXA:~# mount -o remount,rw /
```

2. Type **cd /etc/** to change directories.

```
MOXA:~# cd /etc/
```

3. Type **vi rc.local** to edit the configuration file with vi editor.

```
MOXA:/etc/# vi rc.local
```

4. Next, add the application daemon that you want to run. We use the example program **tcps2-release**, which you can find on the CD, to illustrate, and configure it to run in the background.

```
# !/bin/sh
# Add you want to run daemon
/home/your program &
```

5. After you finish writing or modifying the code, remember to execute **umount /** to change the root directory back to Read-only mode.

```
MOXA:~# umount /
```

6. The enabled daemon should be running and displayed in yoru process list after you reboot the system:

```
MOXA:~# ps -ef
    PID  Uid        VmSize Stat  Command
      1  root         1296 S    init
      2  root              S    [keventd]
      3  root              S    [ksoftirqd_CPU0]
      4  root              S    [kswapd]
      5  root              S    [bdflush]
      6  root              S    [kupdated]
      7  root              S    [mtdblockd]
      8  root              S    [khubd]
     10  root              S    [jffs2_gcd_mtd3]
     32  root              D    [ixp425_csr]
     38  root         1256 S    stdef
     47  root         1368 S    /usr/sbin/inetd
     53  root         4464 S    /usr/sbin/httpd
     63  nobody       4480 S    /usr/sbin/httpd
     64  nobody       4480 S    /usr/sbin/httpd
     65  nobody       4480 S    /usr/sbin/httpd
     66  nobody       4480 S    /usr/sbin/httpd
     67  nobody       4480 S    /usr/sbin/httpd
     92  bin          1460 S    /sbin/portmap
     97  root         1264 S    /root/tcps2-release
    105  root         1556 S    /usr/sbin/rpc.statd
    109  root         4044 S    /usr/sbin/snmpd -s -l   /dev/null
    111  root         2832 S    /usr/sbin/snmptrapd -s
    140  root         1364 S    /sbin/cardmgr
    144  root         1756 S    /usr/sbin/rpc.nfsd
    146  root         1780 S    /usr/sbin/rpc.mountd
    153  root         2960 S    /usr/sbin/sshd
    161  root         1272 S    /bin/reportip
    162  root         3464 S    /bin/massupfirm
    163  root         1532 S    /sbin/getty 115200 ttyM0
    164  root         1532 S    /sbin/getty 115200 ttyM1
    166  root         3464 S    /bin/massupfirm
    168  root         3464 S    /bin/massupfirm
    171  root         3652 S    /usr/sbin/sshd
    172  root         2200 S    -bash
    174  root         1592 S    ps -ef
MOXA:~#
```

Changing Run-Levels

To assign a program to a run-level with an execution priority, following the instructions below.

Because the root file system is mounted in read-only mode, we need to re-mount it with write permission:

```
MOXA:~# mount -o remount,rw /
```

Edit a shell script to execute **/root/tcps2-release** and save it to **tcps2** as an example.

MOXA:~# cd /etc/rc2.d

MOXA:~#ln –s /etc/root/tcps2 S60tcps2

or

MOXA:~#ln –s /etc/root/tcps2 k30tcps2

```
MOXA:~# cd /etc/rc2.d
MOXA:/etc/rc2.d#
MOXA:/etc/rc2.d# ls
S19nfs-common       S25nfs-user-server  S99showreadyled
S20snmpd            S55ssh
S24pcmcia           S99rmnologin
MOXA:/etc/rc2.d#
MOXA:/etc/rc2.d# ln -s /root/tcps2-release S60tcps2
MOXA:/etc/rc2.d# ls
S19nfs-common       S25nfs-user-server  S99rmnologin
S20snmpd            S55ssh              S99showreadyled
S24pcmcia           S60tcps2
```

The command **SxxRUNFILE** has the following meaning:

S: **Start the run file while Linux boots up.**

xx: **A number between 00 and 99. The smaller number has a higher priority.**

RUNFILE: **The script file name**

The command **KxxRUNFILE** has the following meaning:

K: **Start the run file while Linux shuts down or halts.**

xx: **A number between 00 and 99. The smaller number has a higher priority.**

RUNFILE: **The script file name**

To remove the daemon, use the following command to remove the run file from /etc/rc2.d by:

```
MOXA:~# rm -f /etc/rc2.d/S60tcps2
```

After you finish writing or modifying the code, remember to remount the root directory in read-only mode. You may do this with the following command:

```
MOXA:~# umount /
```

Managing Services with insserv

Linux services can be started or stopped using the scripts in **/etc/init.d/**. If you want to start up some service, you can use insserv to add or remove the service in the specific run level, **/etc/rcX.d/**. You can follow this tutorial to add or remove some service from the run levels. First, you should write a start-stop script named **tcps2** in **/etc/init.d/**.

```
# !/bin/sh
### BEGIN INIT INFO
# Provides:          tcps2
# Required-Start:
# Required-Stop:
# Default-Start:      2 3 4 5
# Default-Stop:       0 1 6
```

```
# Short-Description:    tcps2
### END INIT INFO

. /lib/lsb/init-functions

export PATH="${PATH:+$PATH:}/usr/sbin:/sbin"

case "$1" in
  start)
       start-stop-daemon --start --quiet --oknodo --pidfile /var/run/tcps2.pid --exec
/usr/sbin/tcps2
       ;;
  stop)
       start-stop-daemon --stop --quiet --oknodo --pidfile /var/run/tcps2.pid
       ;;
esac

exit 0
```

Then add a service by insserv. If you want to add a service to be started at boot time, you can use:

```
moxa@Moxa:~# sudo insserv -v -d tcps2
```

Check the run level with the following command.

```
moxa@Moxa:~# ls -l /etc/rc?.d/*tcps*
lrwxrwxrwx 1 root root 15 Jul  6 09:40 /etc/rc2.d/S18tcps2 -> ../init.d/tcps2
lrwxrwxrwx 1 root root 15 Jul  6 09:40 /etc/rc3.d/S18tcps2 -> ../init.d/tcps2
lrwxrwxrwx 1 root root 15 Jul  6 09:40 /etc/rc4.d/S18tcps2 -> ../init.d/tcps2
lrwxrwxrwx 1 root root 15 Jul  6 09:40 /etc/rc5.d/S18tcps2 -> ../init.d/tcps2
moxa@Moxa:~#
```

If you want to remove a service from run-level, you can use this command:

```
moxa@Moxa:~# insserv -r tcps2
```

Check the run level removement with the following command.

```
moxa@Moxa:~# ls -l /etc/rc?.d/*tcps*
ls: cannot access /etc/rc?.d/*tcps*: No such file or directory
moxa@Moxa:~#
```

Cron—Daemon for Executing Scheduled Commands

The Cron daemon will search **/etc/crontab** for crontab files.

Cron wakes up every minute and checks each command to see if it should be run at that time. When executing commands, output is mailed to the owner of the **crontab** (or to the user named in the MAILTO environment variable in the **crontab**, if such a user exists).

Modify the file **/etc/crontab** to set up your scheduled applications. **Crontab** files have the following format:

mm	h	dom	mon	dow	user	command
minute	hour	date	month	week	user	command
0-59	0-23	1-31	1-12	0-6 (0 is Sunday)		

For example, issue the following command if you want to launch a program at 8:00 every day:

```
#minute hour  date  month  dow  user   command
```

```
*       8    *     *      *    root   /path/to/your/program
```

The following example demonstrates how to use **Cron** to update the system time and RTC time every day at 8:00.

1. Write a shell script named fixtime.sh and save it to **/home/**.
   #!/bin/sh
   ntpdate time.stdtime.gov.tw
   hwclock –w
   exit 0
2. Change the mode of **fixtime.sh**
   # chmod 755 fixtime.sh
3. Modify the **/etc/crontab** file to run fixtime.sh at 8:00 every day.
   Add the following line to the end of crontab:
   *** 8 * * *root   /home/fixtime.sh**

Inserting a USB Storage Device into the Computer

Since mounting USB storage devices manually can be difficult, a Debian package named **usbmount** is used to mount the USB drivers automatically. **usbmount** relies on **udev** to mount USB storage devices automatically at certain mount points. The USB storage devices will be mounted on **/media/usb0, /media/usb1**, etc.

```
MOXA:~# mount
/dev/hda1 on / type ext2 (rw,errors=remount-ro)
tmpfs on /lib/init/rw type tmpfs (rw,nosuid,mode=0755)
proc on /proc type proc (rw,noexec,nosuid,nodev)
sysfs on /sys type sysfs (rw,noexec,nosuid,nodev)
procbususb on /proc/bus/usb type usbfs (rw)
udev on /dev type tmpfs (rw,mode=0755)
tmpfs on /dev/shm type tmpfs (rw,nosuid,nodev)
devpts on /dev/pts type devpts (rw,noexec,nosuid,gid=5,mode=620)
/dev/hdb2 on /home type ext2 (rw)
nfsd on /proc/fs/nfsd type nfsd (rw)
rpc_pipefs on /var/lib/nfs/rpc_pipefs type rpc_pipefs (rw)
/dev/sda1 on /media/usb0 type vfat
(rw,noexec,nodev,sync,noatime,gid=25,dmask=0007,fmask=0117)
/dev/sdb1 on /media/usb1 type vfat
(rw,noexec,nodev,sync,noatime,gid=25,dmask=0007,fmask=0117)
MOXA:~#
```

Note that usbmount is a light-weight solution for text mode, and does not fully support the gnome desktop environment. For better supportability, install gnome-volume-manager instead of usbmount:

```
MOXA:~# mount -o,remount rw /
MOXA:~# apt-get remove usbmount
MOXA:~# apt-get install gnome-volume-manager
MOXA:~# umount /
```

ATTENTION

Remember to type the command # sync before you disconnect the USB storage device. If you do not issue the command, you may lose data.

ATTENTION

Remember to exit the /media/usb0 or /media/usb1 directory when you disconnect the USB storage device. If you stay in /media/usb0 or /media/usb1, the automatic un-mount process will fail. If that happens, type # umount /media/usb0 to un-mount the USB device manually.

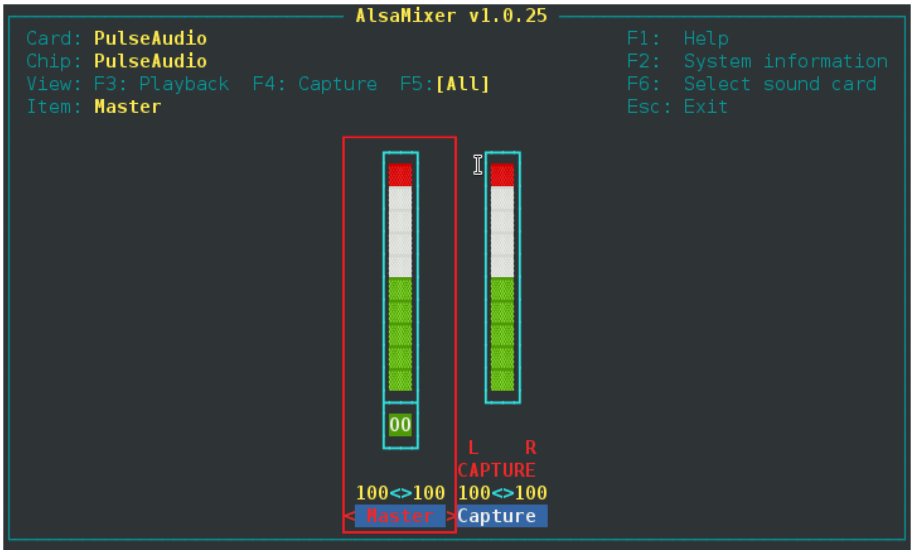
Audio Playback and Record

The V2616A has a built-in audio system which provides the line-in and line-out interfaces in M12 connectors for audio playback or record. You can follow these commands to playback the audio files on the V2616A.

To control the volumn of Master, use the following command.

```
moxa@MOXA:~# alsamixer
```

Press ***<TAB>*** to select the Master as the playback source and press <***UP***> and <***DOWN***> to adjust the volume.



To play the wave file, use the following command.

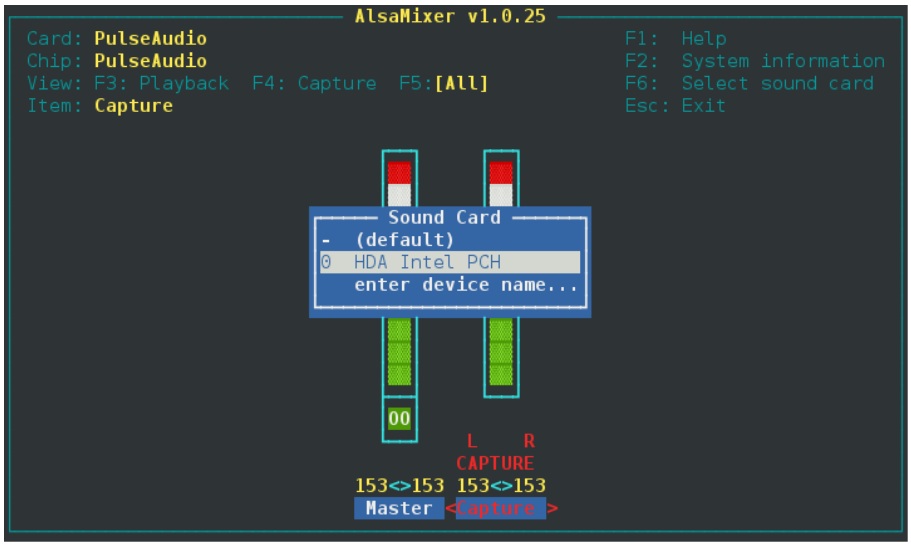
```
moxa@MOXA:~# aplay -t wav /PATH/TO/test.wav
```

The V2616A has a Line-in interface for recording audio. You can follow these commands to record audio on V2616A.

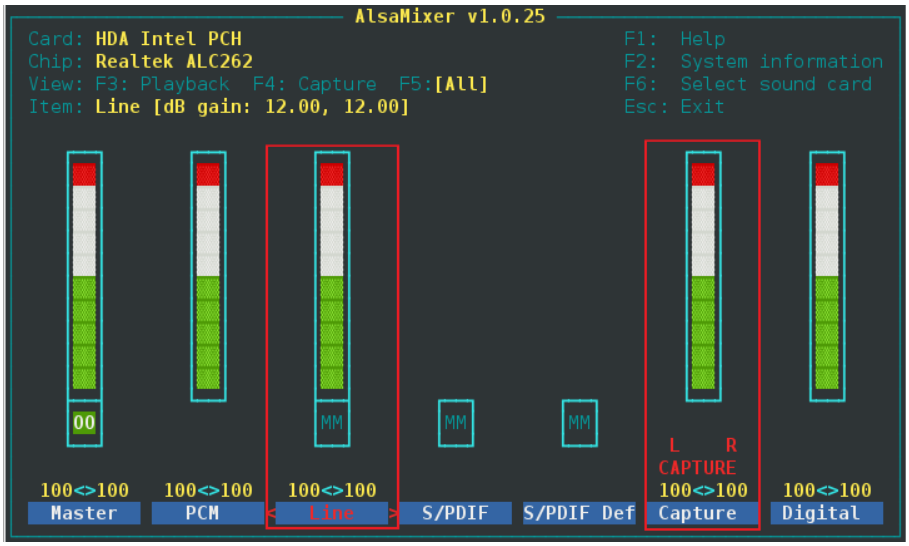
To control the volumn of Capture, use the following command.

```
moxa@MOXA:~# alsamixer
```

Press <***F6***> to select the device - "HDA Intel PCH".



Press ***<TAB>*** to select the Line and Capture as capture and press <***UP***> and <***DOWN***> to adjust the volume.



To record the audio in wave format, use the following command.

```
moxa@MOXA:~# arecord -t wav -f cd -c 2 /dev/shm/aaa.wav
```

Checking the Linux Version

The program **uname**, which stands for "Unix Name" and is part of the Unix operating system, prints the name, version, and other details about the operating system running on the computer. Use the -**a** option to generate a response similar to the one shown below:

```
MOXA:~# uname -a
Linux Moxa 2.6.32-5-amd64 #1 SMP Tue Jun 14 09:42:28 UTC 2011 x86_64 GNU/Linux
MOXA:~#
```

APT—Installing and Removing Packages

APT is the Debian tool used to install and remove packages. Before installing a package, you need to configure the apt source file, **/etc/apt/sources.list**, which is located in the read-only partition.

1. Mount the root file system with write permission.

```
MOXA:~# mount -o remount,rw
```

2. Next, use vi editor to configure **/etc/apt/sources.list**.

```
MOXA:~# vi /etc/apt/sources.list
#
# deb cdrom:[Debian GNU/Linux 6.0.2.1 _Squeeze_ - Official amd64 NETINST Binary-1
20110628-12:58]/ Squeeze main
#deb cdrom:[Debian GNU/Linux 6.0.2.1 _Squeeze_ - Official amd64 NETINST Binary-1
20110628-12:58]/ Squeeze main
deb http://ftp.us.debian.org/debian/ squeeze main
deb-src http://ftp.us.debian.org/debian/ squeeze main
deb http://security.debian.org/ squeeze/updates main
deb-src http://security.debian.org/ squeeze/updates main
# squeeze-updates, previously known as 'volatile'
deb http://ftp.us.debian.org/debian squeeze-updates main
deb-src http://ftp.us.debian.org/debian squeeze-updates main
```

3. Update the source list after you configure it.

```
MOXA:~# apt-get update
MOXA:~#
```

4. Once you indicate which package you want to install (**openswan**, for example), type:

```
MOXA:~# apt-get install openswan
MOXA:~#
```

5. Use one of the following commands to remove a package:
   a. For a simple package removal:

```
MOXA:~# apt-get remove openswan
MOXA:~#
```

   b. For a complete package removal:

```
MOXA:~# apt-get remove openswan --purge
MOXA:~#
```

6. If the installation is complete, remember to umount the root directory back to read-only mode.

```
MOXA:~# umount /
MOXA:~#
```

ATTENTION

The APT cache space /var/cache/apt is located in tmpfs. If you need to install a huge package, link /var/cache/apt to USB mass storage or mount it to an NFS space to generate more free space. Use df –h to check how much free space is available on tmpfs.

```
Moxa:~# df -h
Filesystem          Size  Used Avail Use% Mounted on
rootfs              1.5G 1001M  440M  70% /
udev                 10M  748K  9.3M   8% /dev
/dev/sda1           1.5G 1001M  440M  70% /
tmpfs               501M     0  501M   0% /lib/init/rw
tmpfs               501M     0  501M   0% /dev/shm
none                501M   19M  482M   4% /tmp
/dev/sda2           270M  130M  126M  51% /home
Moxa:~#
```

ATTENTION

You can free up the cache space with the command **# apt-get clean**.

```
MOXA:~# apt-get clean
MOXA:~#
```

Setting up Desktop Environment

This section introduces the desktop environment setup for the V2616A serie, because the V2616A Linux operating system does not come with a pre-installed desktop environment by default. Debian supports all kinds of fully-featured graphical environments, such as Gnome, KDE, lighter environment like Xfce and LXDE. Users can choose to install one of these desktop systems in the V2616A.

To install Gnome, use the following command.

```
moxa@MOXA:~# sudo apt-get install gnome-desktop
```

To install KDE, use the following command.

```
moxa@MOXA:~# sudo apt-get install kde-standard
```

To install Xfce, use the following command.

```
moxa@MOXA:~# apt-get install xfce4 xfce4-goodies thunar-archive-plugin
```

To install the minimum LXDE, use the following command.

```
moxa@MOXA:~# sudo apt-get install lxde-core lxde
```

3

Managing Communications

The V2616A-LX ready-to-run embedded computer is a network-centric platform designed to serve as a front-end for data acquisition and industrial control applications. This chapter describes how to configure the various communication functions supported by the Linux operating system.

The following topics are covered in this chapter:

- **Detecting Network Interfaces**
- **Changing the Network Settings**
  - Changing the "interfaces" Configuration File
  - Adjusting IP Addresses with "ifconfig"
- **Telnet/TFTP Server**
  - Enabling the Telnet/TFTP Server
  - Disabling the Telnet/TFTP Server
- **DNS Client**
  - /etc/hostname
  - /etc/resolv.conf
  - /etc/nsswitch.conf
- **Configuring Ethernet Bonding**
- **Apache Web Server**
  - Default Homepage
  - Disabling the CGI Function
  - Saving Web Pages to a USB Storage Device
- **IPTABLES**
  - IPTABLES Hierarchy
  - IPTABLES Modules
  - Observe and Erase Chain Rules
  - Define Policy for Chain Rules
  - Append or Delete Rules
- **NAT (Network Address Translation)**
  - NAT Example
  - Enabling NAT at Bootup
- **PPP (Point to Point Protocol)**
  - Connecting to a PPP Server over a Simple Dial-up Connection
  - Connecting to a PPP Server over a Hard-wired Link
  - Checking the Connection
  - Setting up a Machine for Incoming PPP Connections
- **Routed IP the mini-PCIE module**
- **PPPoE**
- **NFS (Network File System) Client**
- **SNMP (Simple Network Management Protocol)**
- **OpenVPN**
  - Ethernet Bridging for Private Networks on Different Subnets
  - Ethernet Bridging for Private Networks on the Same Subnet
- **Routed IP**

Detecting Network Interfaces

Linux systems use **udevd** to detect new network interfaces, including Ethernet interfaces and wireless interfaces. The result is saved in **/etc/udev/rules.d/70-persistent-net.rules**. The content is similar to the following:

```
# PCI device 0x10ec:0x8168 (r8168)
SUBSYSTEM=="net", ACTION=="add", DRIVERS=="?*",
ATTR{address}=="00:90:e8:00:00:20", ATTR{dev_id}=="0x0", ATTR{type}=="1",
KERNEL=="eth*", NAME="eth0"

# PCI device 0x10ec:0x8168 (r8168)
SUBSYSTEM=="net", ACTION=="add", DRIVERS=="?*",
ATTR{address}=="00:90:e8:00:00:21", ATTR{dev_id}=="0x0", ATTR{type}=="1",
KERNEL=="eth*", NAME="eth1"
```

The above example indicates that the system has detected two Ethernet interfaces.

ATTENTION

When replacing or connecting a network interface, the system may keep the old record in **/etc/udev/rules.d/70-persistent-net.rules**, which could cause network interfaces to be detected abnormally. To avoid this problem, delete the content of the file /etc/udev/rules.d/70-persistent-net.rules and reboot the system.

Changing the Network Settings

The V2616A-LX computer has two 10/100/1000 Ethernet ports named LAN1 and LAN2. The default IP addresses and netmasks of these network interfaces are:

	Default IP Address	Netmask
LAN1	192.168.3.127	255.255.255.0
LAN2	192.168.4.127	255.255.255.0

These network settings can be modified by changing the **interfaces** configuration file, or they can be adjusted temporarily with the **ifconfig** command.

Changing the "interfaces" Configuration File

1. Type **cd /etc/network** to change directories.

```
MOXA:~# cd /etc/network
```

2. Type **vi interfaces** to edit the network configuration file with **vi** editor. You can configure the V2616A-LX's Ethernet ports for static or dynamic (DHCP) IP addresses.

```
MOXA:/etc/network# vi interfaces
```

Static IP Address

As shown in the following example, the default static IP addresses can be modified.

```
# The loopback network interface
auto lo
iface lo inet loopback

# The primary network interface
```

```
auto eth0
iface eth0 inet static
       address 192.168.3.127
       netmask 255.255.255.0
       broadcast 192.168.3.255

auto eth1
iface eth1 inet static
       address 192.168.4.127
       netmask 255.255.255.0
       broadcast 192.168.4.255
```

Dynamic IP Address using DHCP

To configure one or both LAN ports to request an IP address dynamically, replace **static** with **dhcp** and then delete the rest of the lines.

```
# The primary network interface
auto eth0
iface eth0 inet dhcp
```

After modifying the boot settings of the LAN interface, issue the following command to activate the LAN settings immediately.

 # /etc/init.d/networking restart

```
MOXA:~# /etc/init.d/networking restart
```

Adjusting IP Addresses with "ifconfig"

IP settings can be adjusted during run-time, but the new settings will not be saved to the flash ROM without modifying the file **/etc/network/interfaces**. For example, type the command **# ifconfig eth0 192.168.1.1** to change the IP address of LAN1 to 192.168.1.1.

```
MOXA:~# ifconfig eth0 192.168.1.1
MOXA:~#
```

Telnet/TFTP Server

In addition to supporting Telnet client/server and FTP client/server, the V2616A-LX also supports SSH and sftp client/server. To enable or disable the Telnet/ftp server, you need to edit the file **/etc/inetd.conf**.

1. Mount the root file system with write permission.

```
MOXA:~# mount -o remount,rw /
```

2. Type **# cd /etc** to change the directory.

```
MOXA:~# cd /etc
```

3. Type **# vi inetd.conf** to edit the configuration file.

```
MOXA:/etc# vi inetd.conf
```

Enabling the Telnet/TFTP Server

The following example shows the default content of the file **/etc/inetd.conf**. The default is to "enable the Telnet/ftp server:"

```
telnet        stream  tcp    nowait  telnetd /usr/sbin/tcpd  /usr/sbin/in.telnetd
tftp          dgram   udp    wait    nobody  /usr/sbin/tcpd  /usr/sbin/in.tftpd
```

```
/srv/tftp
```

Disabling the Telnet/TFTP Server

Disable the daemon by typing "**#**" in front of the first character of the row to comment out the line. For example, to disable the **TFTP** server, use the following commands:

```
telnet        stream  tcp    nowait  telnetd /usr/sbin/tcpd  /usr/sbin/in.telnetd
#tftp         dgram   udp    wait    nobody  /usr/sbin/tcpd  /usr/sbin/in.tftpd
/srv/tftp
```

After you finish writing or modifying the code, remember to execute "umount /" to change the root directory back to Read-only mode.

```
MOXA:~# umount /
```

DNS Client

The V2616A-LX supports DNS client (but not DNS server). To set up DNS client, you need to edit three configuration files: **/etc/hostname, /etc/resolv.conf,** and **/etc/nsswitch.conf**.

/etc/hostname

1. Edit /etc/hostname:

```
moxa@MOXA:~# sudo vi /etc/hostname
MOXA
```

2. Re-configure the hostname.

```
moxa@MOXA:~# sudo /etc/init.d/hostname.sh start
```

3. Check the new hostname.

```
moxa@MOXA:~# hostname
```

/etc/resolv.conf

This is the most important file that you need to edit when using DNS. For example, before using **# ntpdate time.stdtime.gov.tw** to update the system time, you will need to add the DNS server address to the file. Ask your network administrator which DNS server address you should use. The DNS server's IP address is specified with the **nameserver** command. For example, add the following line to /etc/resolv.conf (assuming the DNS server's IP address is 168.95.1.1): **nameserver 168.95.1.1**

```
MOXA:/etc# cat resolv.conf
#
# resolv.conf  This file is the resolver configuration file
# See resolver(5).
#
#nameserver 192.168.1.16
nameserver 168.95.1.1
nameserver 140.115.1.31
nameserver 140.115.236.10
MOXA:/etc#
```

/etc/nsswitch.conf

This file defines the sequence of files, **/etc/hosts** or **/etc/resolv.conf**, to be read to resolve the IP address. The **hosts** line in **/etc/nsswitch.conf** means use **/etc/host** first and DNS service to resolve the address.

```
# /etc/nsswitch.conf
#
# Example configuration of GNU Name Service Switch functionality.
# If you have the `glibc-doc-reference' and `info' packages installed, try:
# `info libc "Name Service Switch"' for information about this file.

passwd:         compat
group:          compat
shadow:         compat

hosts:          files dns
networks:       files

protocols:      db files
services:       db files
ethers:         db files
rpc:            db files

netgroup:       nis
```

Configuring Ethernet Bonding

The Linux bonding driver provides a method for aggregating multiple network interfaces into a single logical "bonded" interface. To use the bonding feature, you have to load the bonding driver with mode setting. Then use ifenslave to add the Ethernet interface into bond0 interface. Here is the script bonded eth1 and eth2 together, you can put it in **/etc/init.d/bonding.sh**.

```
#! /bin/bash

#### BEGIN INIT INFO
# Provides:           bonding
# Short-Description: Start the bonding service, bond eth1 and eth2.
# Required-Start:     $all
# Required-Stop:      $all
# Should-Start:
# Should-Stop:
# Default-Start:      2 3 4 5
# Default-Stop:       0 1 6
### END INIT INFO

NAME=bonding
PATH=/bin:/usr/bin:/sbin:/usr/sbin

case "$1" in
  start)
    # to set ethX interfaces as slave the bond0 must have an ip
    if [ "$2" == "" ]; then
      $0
      exit 1
```

```
    fi
    echo "Starting bonding service: $NAME."
    modprobe bonding mode=1 miimon=100          # load bonding module

    ifdown eth2                         # putting down eth2
    ifdown eth1                         # putting down eth1

    ifconfig bond0 hw ether 00:90:E8:00:00:60      # change mac address
    ifconfig bond0 $2 netmask 255.255.255.0 up     # set ip address

    ifenslave bond0 eth2                # set eth2 in slave for bond0
    ifenslave bond0 eth1                # set eth1 in slave for bond0
    ;;

  stop)
    echo "Stopping bonding service: $NAME"
    ifenslave -d bond0 eth2                 # release eth2 from bond0
    ifenslave -d bond0 eth1                 # release eth1 from bond0

    ifconfig bond0 down                     # putting down bond0
    modprobe -r bonding                     # unload bonding module

    ifup eth2
    ifup eth1
    ;;

  restart)
    $0 stop
    $0 start $2
    ;;

  *)
    echo "Usage: /etc/init.d/$NAME {start|stop|restart} [ip address]"
    exit 1
    ;;
esac

exit 0
```

You can add this to run level by insserv.

```
moxa@MOXA:~# sudo insserv -v -d bonding.sh
```

To remove it from run level, use the following command.

```
moxa@MOXA:~# sudo insserv -r bonding.sh
```

Apache Web Server

Default Homepage

The Apache web server's main configuration file is **/etc/apache2/sites-enabled/000-default**, with the default homepage located at **/var/www/apache2-default/index.html**.

Save your own homepage to the following directory:

/var/www

Save your CGI page to the following directory:

/var/www

Before you modify the homepage, use a browser (such as Microsoft Internet Explore or Mozilla Firefox) from your PC to test if the Apache web server is working. Type the LAN1 IP address in the browser's address box to open the homepage. For example, if the default IP address 192.168.3.127 is still active, type:

http://192.168.3.127/

To test the default CGI page, type:

http://192.168.3.127/cgi-bin/w3mmail.cgi

Disabling the CGI Function

The CGI function is enabled by default. If you want to disable the function, modify the file **/etc/apache2/sites-enabled/000-default**.

1. Type **# vi/etc/apache2/sites-enabled/000-default** to edit the configuration file. Comment out the following lines:

#ScriptAlias /cgi-bin/ /var/www/cgi-bin/
#<Directory "/var/www/cgi-bin/">
 # AllowOverride None
 # Options ExecCGI -MultiViews +SymLinksIfOwnerMatch
 # #Order allow,deny
 # Order deny,allow
 # Allow from all
#</Directory>

```
MOXA:/etc# vi /etc/apache2/sites-available/default
#ScriptAlias /cgi-bin/ /var/www/cgi-bin/
#<Directory "/var/www/cgi-bin/">
#     AllowOverride None
#     Options ExecCGI -MultiViews +SymLinksIFOwnerMatch
#     #Order allow,deny
#     Order deny,allow
#     Allow from all
#</Directory>
```

2. Re-start the apache server.

```
moxa@MOXA:~# sudo service apache2 restart
```

ATTENTION

When you develop your own CGI application, make sure your CGI file is executable.

Saving Web Pages to a USB Storage Device

Some applications may have web pages that take up a lot of storage space. This section describes how to save web pages to the USB mass storage device, and then configure the Apache web server's DocumentRoot to open these pages. The files used in this example can be downloaded from Moxa's website.

1. Prepare the web pages and then save the pages to the USB storage device. Click on the following link to download the web page test suite: **http://www.w3.org/MarkUp/Test/HTML401.zip**.
2. Uncompress the zip file to your desktop PC, and then use FTP to transfer it to the V2616A-LX's **/media/usb0** directory.

3. Mount the root file system with write permission.

```
MOXA:~# mount -o remount,rw /
```

4. Type **# vi /etc/apache2/sites-avaliable/default and # vi /etc/apache2/sites-avaliable/default-ssl** to edit the configuration file.

```
MOXA:/etc# MOXA:/etc# vi /etc/apache2/sites-avaliable/default
MOXA:/etc# vi /etc/apache2/sites-avaliable/default-s
```

5. Change the DocumentRoot directory to the USB storage directory **/media/usb0/www**.

```
...
<VirtualHost *:80>
...
...
       DocumentRoot /media/usb0/www
       <Directory />
              Options FollowSymLinks
              AllowOverride None
       </Directory>
...
...
       ScriptAlias /cgi-bin/ /media/usb0/www/cgi-bin/
       <Directory "/media/usb0/www/cgi-bin/">
              AllowOverride None
              Options ExecCGI -MultiViews +SymLinksIfOwnerMatch
              Order allow,deny
              Allow from all
       </Directory>
...
</VirtualHost>
"etc/apache2/sites-avaliable/default"
<VirtualHost *:443>
...
...
       DocumentRoot /media/usb0/www
       <Directory />
              Options FollowSymLinks
              AllowOverride None
       </Directory>
...
...
       ScriptAlias /cgi-bin/ /media/usb0/www/cgi-bin/
       <Directory "/media/usb0/wwwz/cgi-bin/">
              AllowOverride None
              Options ExecCGI -MultiViews +SymLinksIfOwnerMatch
              Order allow,deny
              Allow from all
       </Directory>
...
</VirtualHost>
/etc/apache2/sites-avaliable/default-ssl"
```

6. Use the following commands to restart the Apache web server:
   #cd /etc/init.d
   #./apache2 restart
7. Start your browser and connect to the V2616A-LX by typing the current LAN1 IP address in the browser's address box.
8. Remember to execute "umount /" to change the root directory back to Read-only mode.

```
MOXA:~# umount /
```

9. Re-start the apache server.

```
MOXA:~# /etc/init.d/apache2 restart
```

ATTENTION

Visit the Apache website at http://httpd.apache.org/docs/ for more information about setting up Apache servers.

IPTABLES

IPTABLES is an administrative tool for setting up, maintaining, and inspecting the Linux kernel's IP packet filter rule tables. Several different tables are defined, with each table containing built-in chains and user-defined chains.

Each chain is a list of rules that apply to a certain type of packet. Each rule specifies what to do with a matching packet. A rule (such as a jump to a user-defined chain in the same table) is called a **target**.

The V2616A-LX supports three types of IPTABLES: Filter tables, NAT tables, and Mangle tables.

Filter Table—includes three chains:

- **INPUT chain**
- **OUTPUT chain**
- **FORWARD chain**

NAT Table—includes three chains:

- **PREROUTING chain**—transfers the destination IP address (DNAT).
- **POSTROUTING chain**—works after the routing process and before the Ethernet device process to transfer the source IP address (SNAT).
- **OUTPUT chain**—produces local packets.

Sub-tables

- **Source NAT (SNAT)**—changes the first source IP address of the packet.
- **Destination NAT (DNAT)**—changes the first destination IP address of the packet.
- **MASQUERADE**—a special form for SNAT. If one host can connect to the Internet, then the other computers that connect to this host can connect to the Internet when the computer does not have an actual IP address.
- **REDIRECT**—a special form of DNAT that re-sends packets to a local host independent of the destination IP address.

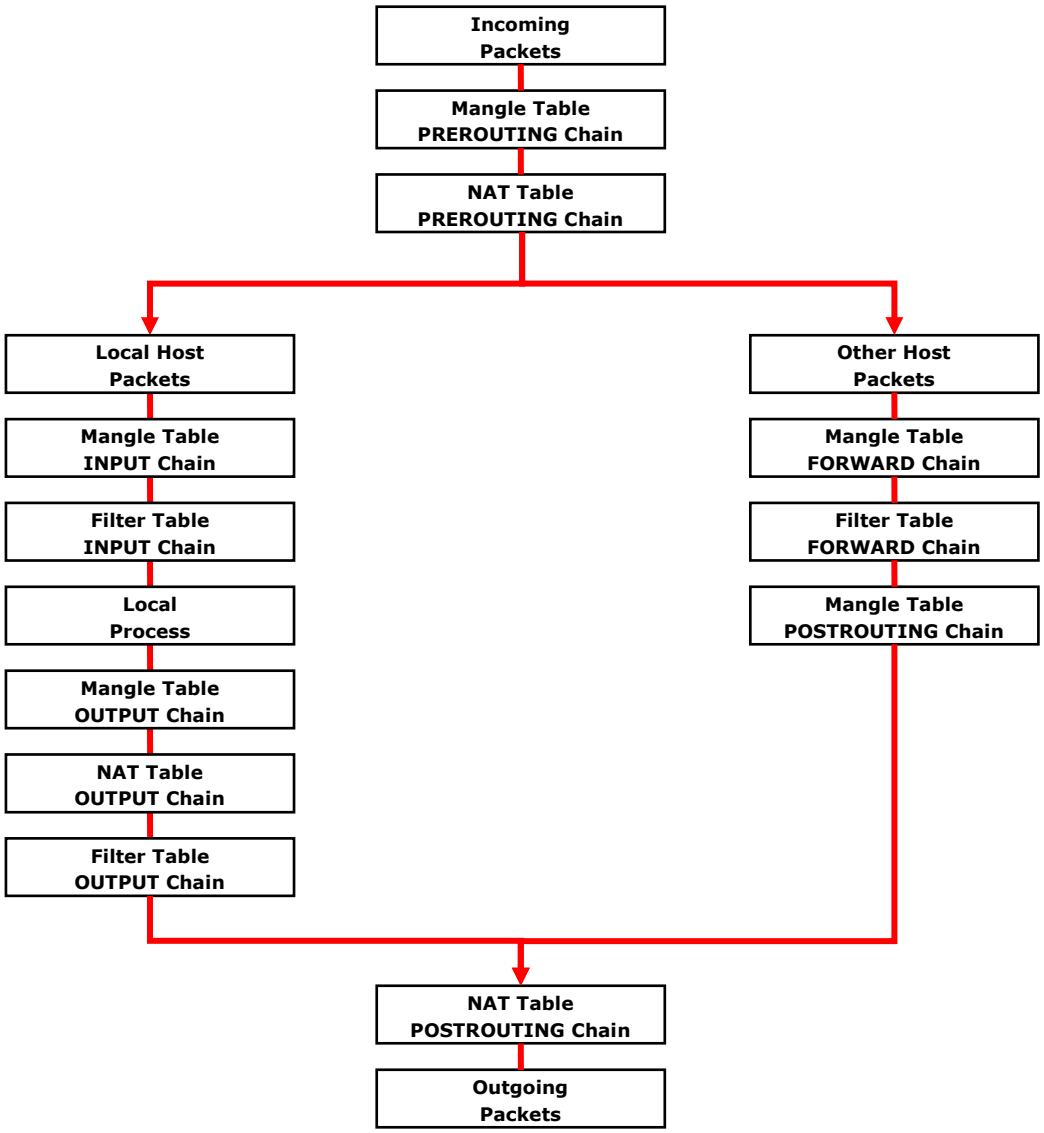
Mangle Table—includes two chains

- **PREROUTING chain**—pre-processes packets before the routing process.
- **OUTPUT chain**—processes packets after the routing process.

Mangle tables can have one of three extensions—TTL, MARK, TOS.

IPTABLES Hierarchy

The following figure shows the IPTABLES hierarchy.



IPTABLES Modules

The V2616A-LX supports the following sub-modules. Be sure to use the module that matches your application.

arptable_filter.ko	arp_tables.ko	arpt_mangle.ko	ip_conntrack_amanda.ko
ip_conntrack_ftp.ko	ip_conntrack_h323.ko	ip_conntrack_irc.ko	ip_conntrack.ko
ip_conntrack_netbios_ns.ko	ip_conntrack_netlink.ko	ip_conntrack_pptp.ko	ip_conntrack_proto_sctp.ko
ip_conntrack_sip.ko	ip_conntrack_tftp.ko	ip_nat_amanda.ko	ip_nat_ftp.ko
ip_nat_h323.ko	ip_nat_irc.ko	ip_nat.ko	ip_nat_pptp.ko
ip_nat_sip.ko	ip_nat_snmp_basic.ko	ip_nat_tftp.ko	ip_queue.ko
iptable_filter.ko	iptable_mangle.ko	iptable_nat.ko	iptable_raw.ko
ip_tables.ko	ipt_addrtype.ko	ipt_ah.ko	ipt_CLUSTERIP.ko
ipt_dscp.ko	ipt_DSCP.ko	ipt_ecn.ko	ipt_ECN.ko
ipt_hashlimit.ko	ipt_iprange.ko	ipt_LOG.ko	ipt_MASQUERADE.ko
ipt_NETMAP.ko	ipt_owner.ko	ipt_recent.ko	ipt_REDIRECT.ko
ipt_REJECT.ko	ipt_SAME.ko	ipt_TCPMSS.ko	ipt_tos.ko
ipt_TOS.ko	ipt_ttl.ko	ipt_TTL.ko	ipt_ULOG.ko

The basic syntax to enable and load an IPTABLES module is as follows:

```
# lsmod
# modprobe ip_tables
# modprobe iptable_filter
#modprobe iptable_mangle
#modprobe iptable_nat
```

Use **lsmod** to check if the **ip_tables** module has already been loaded in the V2616A-LX. Use **modprobe** to insert and enable the module.

Use **iptables**, **iptables-restore**, and **iptables-save** to maintain the database.

ATTENTION

IPTABLES plays the role of packet filtering or NAT. Be careful when setting up the IPTABLES rules. If the rules are not correct, remote hosts that connect via a LAN or PPP may be denied. We recommend using the VGA console to set up the IPTABLES. Click on the following links for more information about IPTABLES.

http://www.linuxguruz.com/iptables/
http://www.netfilter.org/documentation/HOWTO//packet-filtering-HOWTO.html

Since the IPTABLES command is very complex, to illustrate the IPTABLES syntax we have divided our discussion of the various rules into three categories: **Observe and erase chain rules**, **Define policy rules**, and **Append or delete rules**.

Observe and Erase Chain Rules

Usage:

 # iptables [-t tables] [-L] [-n]

-t tables: Table to manipulate (default: 'filter'); example: nat or filter.
-L [chain]: List List all rules in selected chains. If no chain is selected, all chains are listed.
-n: Numeric output of addresses and ports.

 # iptables [-t tables] [-FXZ]

-F: Flush the selected chain (all the chains in the table if none is listed).
-X: Delete the specified user-defined chain.
-Z: Set the packet and byte counters in all chains to zero.

Example:

 # iptables -L -n

In this example, since we do not use the -t parameter, the system uses the default "filter" table. Three chains are included: INPUT, OUTPUT, and FORWARD. INPUT chains are accepted automatically, and all connections are accepted without being filtered.

 # iptables –F
 # iptables –X
 # iptables -Z

Define Policy for Chain Rules

Usage:

 # iptables [-t tables] [-P] [INPUT, OUTPUT, FORWARD, PREROUTING, OUTPUT, POSTROUTING] [ACCEPT, DROP]

-P: Set the policy for the chain to the given target.
INPUT: For packets coming into the V2616A-LX.
OUTPUT: For locally-generated packets.

FORWARD: For packets routed out through the V2616A-LX.

PREROUTING: To alter packets as soon as they come in.

POSTROUTING: To alter packets as they are about to be sent out.

Example:

#iptables –P INPUT DROP
#iptables –P OUTPUT ACCEPT
#iptables –P FORWARD ACCEPT
#iptables –t nat –P PREROUTING ACCEPT
#iptables –t nat –P OUTPUT ACCEPT
#iptables -t nat –P POSTROUTING ACCEPT

In this example, the policy accepts outgoing packets and denies incoming packets.

Append or Delete Rules

Usage:

 # iptables [-t table] [-AI] [INPUT, OUTPUT, FORWARD] [-io interface] [-p tcp, udp, icmp, all] [-s IP/network] [--sport ports] [-d IP/network] [--dport ports] –j [ACCEPT. DROP]

-A: Append one or more rules to the end of the selected chain.

-I: Insert one or more rules in the selected chain as the given rule number.

-i: Name of an interface via which a packet is going to be received.

-o: Name of an interface via which a packet is going to be sent.

-p: The protocol of the rule or of the packet to check.

-s: Source address (network name, host name, network IP address, or plain IP address).

--sport: Source port number.

-d: Destination address.

--dport: Destination port number.

-j: Jump target. Specifies the target of the rules; i.e., how to handle matched packets.

For example, ACCEPT the packet, DROP the packet, or LOG the packet.

Examples:

Example 1: Accept all packets from the lo interface.

 # iptables –A INPUT –i lo –j ACCEPT

Example 2: Accept TCP packets from 192.168.0.1.

 # iptables –A INPUT –i eth0 –p tcp –s 192.168.0.1 –j ACCEPT

Example 3: Accept TCP packets from Class C network 192.168.1.0/24.

 # iptables –A INPUT –i eth0 –p tcp –s 192.168.1.0/24 –j ACCEPT

Example 4: Drop TCP packets from 192.168.1.25.

 # iptables –A INPUT –i eth0 –p tcp –s 192.168.1.25 –j DROP

Example 5: Drop TCP packets addressed for port 21.

 # iptables –A INPUT –i eth0 –p tcp --dport 21 –j DROP

Example 6: Accept TCP packets from 192.168.0.24 to V2616A-LX's port 137, 138, 139

 # iptables –A INPUT –i eth0 –p tcp –s 192.168.0.24 --dport 137:139 –j ACCEPT

Example 7: Log TCP packets that visit V2616A-LX's port 25.

 # iptables –A INPUT –i eth0 –p tcp --dport 25 –j LOG

Example 8: Drop all packets from MAC address 01:02:03:04:05:06.

 # iptables –A INPUT –i eth0 –p all –m mac --mac-source 01:02:03:04:05:06 –j DROP

ATTENTION

In Example 8, remember to issue the command **# modprobe ipt_mac** first to load the module ipt_mac.

NAT (Network Address Translation)

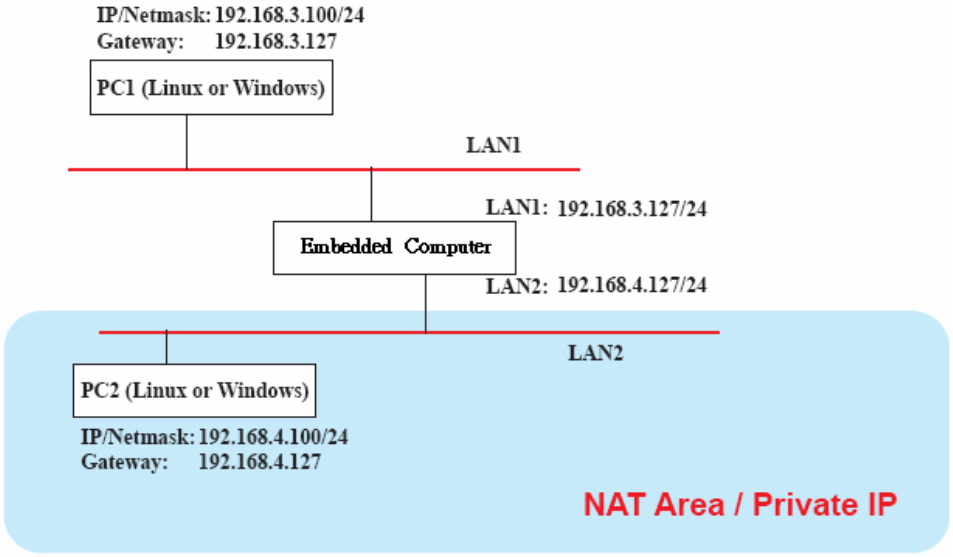
The NAT (Network Address Translation) protocol translates IP addresses used on one network into IP addresses used on a connecting network. One network is designated the inside network and the other is the outside network. Typically, the V2616A-LX connects several devices on a network and maps local inside network addresses to one or more global outside IP addresses, and un-maps the global IP addresses on incoming packets back into local IP addresses.

ATTENTION

Click the following link for more information on NAT:
http://www.netfilter.org/documentation/HOWTO//packet-filtering-HOWTO.html

NAT Example

The IP address of all packets leaving LAN1 are changed to **192.168.3.127** (you will need to load the module **ipt_MASQUERADE**):



Enabling NAT at Bootup

In most real world situations, you will want to use a simple shell script to enable NAT when the V2616A-LX boots up. The following script is an example.

```
#!/bin/bash
# If you put this shell script in the /home/nat.sh
# Remember to chmod 744 /home/nat.sh
# Edit the rc.local file to make this shell startup automatically.
# vi /etc/rc.local
# Add a line in the end of rc.local /home/nat.sh
EXIF= "eth0"  #This is an external interface for setting up a valid IP address.
EXNET= "192.168.4.0/24"  #This is an internal network address.
# Step 1. Insert modules.
```

```
# Here 2> /dev/null means the standard error messages will be dump to null device.
modprobe ip_tables  2> /dev/null
modprobe ip_nat_ftp  2> /dev/null
modprobe ip_nat_irc  2> /dev/null
modprobe ip_conntrack  2> /dev/null
modprobe ip_conntrack_ftp  2> /dev/null
modprobe ip_conntrack_irc  2> /dev/null
# Step 2. Define variables, enable routing and erase default rules.
PATH=/bin:/sbin:/usr/bin:/usr/sbin:/usr/local/bin:/usr/local/sbin
export PATH
echo "1" > /proc/sys/net/ipv4/ip_forward
/sbin/iptables -F
/sbin/iptables -X
/sbin/iptables -Z
/sbin/iptables -F -t nat
/sbin/iptables -X -t nat
/sbin/iptables -Z -t nat
/sbin/iptables -P INPUT ACCEPT
/sbin/iptables -P OUTPUT ACCEPT
/sbin/iptables -P FORWARD ACCEPT
/sbin/iptables -t nat -P PREROUTING ACCEPT
/sbin/iptables -t nat -P POSTROUTING ACCEPT
/sbin/iptables -t nat -P OUTPUT ACCEPT
# Step 3. Enable IP masquerade.
#ehco 1 > /proc/sys/net/ipv4/ip_forward#modprobe ipt_MASQUERADE#iptables –t nat –
A POSTROUTING –o eth0 –j MASQUERADE
```

PPP (Point to Point Protocol)

PPP (Point to Point Protocol) is used to run IP (Internet Protocol) and other network protocols over a serial link. PPP can be used for direct serial connections (using a null-modem cable) over a Telnet link, and links established using a modem over a telephone line.

Modem/PPP access is almost identical to connecting directly to a network through the V2616A-LX Ethernet port. Since PPP is a peer-to-peer system, the V2616A-LX can also use PPP to link two networks (or a local network to the Internet) to create a Wide Area Network (WAN).

ATTENTION

Click on the following links for more information about PPP:

http://tldp.org/HOWTO/PPP-HOWTO/index.html
http://axion.physics.ubc.ca/ppp-linux.html

Connecting to a PPP Server over a Simple Dial-up Connection

The following command is used to connect to a PPP server by modem. Use this command for old ppp servers that prompt for a login name (replace "username" with the correct name) and password (replace "password" with the correct password). Note that "debug crtscts" and "defaultroute 192.1.1.17" are optional.

```
#pppd connect 'chat -v "" ATDT5551212 CONNECT ""' ogin: username word: password' /dev/
ttyMUE0 115200 debug crtscts modem defaultroute 192.1.1.17
```

If the PPP server does not prompt for the username and password, the command should be entered as follows (replace "username" with the correct username and replace "password" with the correct password):

#pppd connect 'chat -v "" ATDT5551212 CONNECT "" ' user username password password /dev/ ttyMUE0 115200 crtscts modem

The pppd options are described below:

connect 'chat etc...' This option gives the command to contact the PPP server. The **chat** program is used to dial a remote computer. The entire command is enclosed in single quotes because pppd expects a one-word argument for the **connect** option. The options for **chat** are given below:

-v verbose mode; log what we do to syslog

" " Double quotes—don't wait for a prompt, but instead do ... (note that you must include a space after the second quotation mark)

ATDT5551212 Dial the modem, and then ...

CONNECT Wait for an answer.

" " Send a return (null text followed by the usual return)

ogin: username word: password
Log in with username and password.

Note: Refer to the chat man page, chat.8, for more information about the **chat** utility.

/dev/ Specify the callout serial port.

115200 The baud rate.

debug Log status in syslog.

crtscts Use hardware flow control between the computer and modem (at baudrate of 115200 this is a must).

modem Indicates that this is a modem device; pppd will hang up the phone before and after making the call.

defaultroute Once the PPP link is established, make it the default route; if you have a PPP link to the Internet, this is probably what you want.

192.1.1.17 This is a degenerate case of a general option of the form x.x.x.x:y.y.y.y. Here x.x.x.x is the local IP address and y.y.y.y is the IP address of the remote end of the PPP connection. If this option is not specified, or if just one side is specified, then x.x.x.x defaults to the IP address associated with the local machine's hostname (located in /**etc/hosts**), and y.y.y.y is determined by the remote machine.

Connecting to a PPP Server over a Hard-wired Link

If a username and password are not required, use the following command (note that **noipdefault** is optional):

#pppd connect 'chat –v" " " " ' noipdefault /dev/ttyMUE0 19200 crtscts

If a username and password is required, use the following command (note that **noipdefault** is optional, and the username and password are both "root"):

#pppd connect 'chat –v" " " " ' user root password root noipdefault /dev/ ttyMUE0 19200 crtscts

Checking the Connection

Once you have set up a PPP connection, there are some steps you can take to test the connection. First, type:

#/sbin/ifconfig

Depending on your distribution, the command might be located elsewhere. After executing the command, you should be able to see all of the network interfaces that are UP.

ppp0 should be one of the network interfaces. You should recognize the first IP address as the IP address of the computer, and **P-t-P address** is the IP address of the server. The output should be similar to the following:

```
lo      Link encap Local Loopback
        inet addr 127.0.0.1   Bcast 127.255.255.255 Mask 255.0.0.0
        UP LOOPBACK RUNNING   MTU 2000   Metric 1
        RX packets 0 errors 0 dropped 0 overrun 0

ppp0    Link encap Point-to-Point Protocol
        inet addr 192.76.32.3   P-t-P 129.67.1.165 Mask 255.255.255.0
        UP POINTOPOINT RUNNING   MTU 1500   Metric 1
        RX packets 33 errors 0 dropped 0 overrun 0
        TX packets 42 errors 0 dropped 0 overrun 0
```

Now, type:

#ping z.z.z.z

where z.z.z.z is the address of your name server. The output should be similar to the following:

```
MOXA:~# ping 129.67.1.165
PING 129.67.1.165 (129.67.1.165): 56 data bytes
64 bytes from 129.67.1.165: icmp_seq=0 ttl=225 time=268 ms
64 bytes from 129.67.1.165: icmp_seq=1 ttl=225 time=247 ms
64 bytes from 129.67.1.165: icmp_seq=2 ttl=225 time=266 ms
^C
--- 129.67.1.165 ping statistics ---
3 packets transmitted, 3 packets received, 0% packet loss
round-trip min/avg/max = 247/260/268 ms
MOXA:~#
```

Try typing:

#netstat -nr

You should see three routes similar to the following:

```
Kernel routing table
Destination   Gateway   Genmask         Flags   Metric  Ref Use
iface
129.67.1.165  0.0.0.0   255.255.255.255 UH      0       0   6
ppp0
127.0.0.0     0.0.0.0   255.0.0.0       U       0       0   0 lo
0.0.0.0       129.67.1.165  0.0.0.0     UG      0       0   6298
ppp0
```

If your output looks similar but does not have the "destination 0.0.0.0" line (which refers to the default route used for connections), you may have run pppd without the **defaultroute** option. At this point, you can try using Telnet, ftp, or finger, bearing in mind that you will have to use numeric IP addresses unless you have configured **/etc/resolv.conf** correctly.

Setting up a Machine for Incoming PPP Connections

Method 1: pppd dial-in with pppd commands

This first example applies to using a modem, and requiring authorization with a username and password.

#pppd /dev/ttyMUE0 115200 crtscts modem 192.168.16.1:192.168.16.2 login auth

You should also add the following line to the file **/etc/ppp/pap-secrets**:

*** * "" ***

The first star (*) lets everyone login. The second star (*) lets every host connect. The pair of double quotation marks ("") indicates that the file **/etc/passwd** can be used to check the password. The last star (*) is to let any IP connect.

The following example does not check the username and password:

 # pppd/dev/ttyMUE0 115200 crtscts modem 192.168.16.1:192.168.16.2

Method 2: pppd dial-in with pppd script

Configure a dial-in script **/etc/ppp/peer/dialin**

```
# You usually need this if there is no PAP authentication
noauth
#auth
#login

# The chat script (be sure to edit that file, too!)
init "/usr/sbin/chat -v -f /etc/ppp/ppp-ttyMUE0.chat"

# Set up routing to go through this PPP link
defaultroute

# Default modem (you better replace this with /dev/ttySx!)
/dev/ttyMUE0

# Speed
115200

# Keep modem up even if connection fails
persist
crtscts
modem
192.168.16.1:192.168.16.2
debug
-detach
```

Configure the chat script **/etc/ppp/ppp-ttyMUE0.chat**

```
SAY    'Auto Answer ON\n'
''     ATS0=1
```

Start the **pppd** dial-in service.

```
# pppd call dialin
```

ATTENTION

If you would like to have auto dial-in service, you can launch the dial-in service in **/etc/inittab** with the respawn command.

```
MOXA:~# mount -o remount,rw /dev/hda1 /
MOXA:~# echo "p0:2345:respawn:pppd call dialin" >> /etc/inittab
MOXA:~# umount /
```

Routed IP the mini-PCIE module

In some situation, the mini-PCIE module could work abnormally and cannot communicate. At this moment, you can reset it by using the mx_pcie_reset utility.

To reset the PH8 module, use the following command.

```
root@Moxa:/# mx_pcie_reset
Turn off the mini PCIe slot 1
Turn on the mini PCIe slot 1
root@Moxa:/#
```

PPPoE

Use the following procedure to configure PPPoE:

1. Connect the V2616A-LX's LAN port to an ADSL modem with a cross-over cable, HUB, or switch.
2. Log in to the V2616A-LX as the root user.
3. Edit the file **/etc/ppp/chap-secrets** and add the following:
   "username@hinet.net" * "password" *

```
# Secrets for authentication using CHAP
# client        server  secret                  IP addresses

# PPPOE example, if you want to use it, you need to unmark it and modify it
 "username@hinet.net"   *       "password"      *
```

   username@hinet.net is the username obtained from the ISP to log in to the ISP account. **password** is the corresponding password for the account.

4. Edit the file **/etc/ppp/pap-secrets** and add the following:
   "username@hinet.net" * "password" *

```
# ATTENTION: The definitions here can allow users to login without a
# password if you don't use the login option of pppd! The mgetty Debian
# package already provides this option; make sure you don't change that.

# INBOUND connections

# Every regular user can use PPP and has to use passwords from /etc/passwd
*       hostname        ""      *
 "username@hinet.net"   *       "password"      *

# UserIDs that cannot use PPP at all. Check your /etc/passwd and add any
# other accounts that should not be able to use pppd!
guest   hostname        "*"     -
master  hostname        "*"     -
root    hostname        "*"     -
support hostname        "*"     -
stats   hostname        "*"     -

# OUTBOUND connections
```

   username@hinet.net is the username obtained from the ISP to log in to the ISP account. **password** is the corresponding password for the account.

5. Edit the file **/etc/ppp/options** and add the following line:
   plugin rp-pppoe

```
# received.  Note: it is not advisable to use this option with the persist
# option without the demand option.  If the active-filter option is given,
```

```
# data packets which are rejected by the specified activity filter also
# count as the link being idle.
#idle <n>

# Specifies how many seconds to wait before re-initiating the link after
# it terminates.  This option only has any effect if the persist or demand
# option is used.  The holdoff period is not applied if the link was
# terminated because it was idle.
#holdoff <n>

# Wait for up n milliseconds after the connect script finishes for a valid
# PPP packet from the peer.  At the end of this time, or when a valid PPP
# packet is received from the peer, pppd will commence negotiation by
# sending its first LCP packet.  The default value is 1000 (1 second).
# This wait period only applies if the connect or pty option is used.
#connect-delay <n>

# Load the pppoe plugin
plugin rp-pppoe.so

# ---<End of File>---
```

6. If you use LAN1 to connect to the ADSL modem, add the file **/etc/ppp/options.eth0**, if you use LAN2 to connect to the ADSL modem, add **/etc/ppp/options.eth1**, etc.

```
name username@hinet.net
mtu 1492
mru 1492
defaultroute
noipdefault
~
~
 "/etc/ppp/options.eth0" 5 lines, 67 characters
```

Type your username (the one you set in the **/etc/ppp/pap-secrets and /etc/ppp/chap-secrets** files) after the **name** option. You may add other options as needed.

7. Set up DNS.
   If you are using DNS servers supplied by your ISP, edit the file **/etc/resolv.conf** by adding the following lines of code:

   nameserver ip_addr_of_first_dns_server
   nameserver ip_addr_of_second_dns_server

   For example:

   nameserver 168.95.1.1
   nameserver 139.175.10.20

```
MOXA:/etc# cat resolv.conf
#
# resolv.conf  This file is the resolver configuration file
# See resolver(5).
#
nameserver 168.95.1.1
nameserver 139.175.10.20
MOXA:/etc#
```

Use the following command to create a **pppoe** connection:
#pppd eth0

8. The ADSL modem is connected to the **LAN1** port, which is named **eth0**. If the ADSL modem is connected to **LAN2**, use **eth1**, etc.
9. Type **#ifconfig ppp0** to check if the connection is OK. If the connection is OK, you should see the IP address of ppp0. Use **#ping** to test the IP address.

```
ppp0    Link encap Point-to-Point Protocol
        inet addr 192.76.32.3   P-t-P 129.67.1.165 Mask 255.255.255.0
        UP POINTOPOINT RUNNING   MTU 1500   Metric 1
        RX packets 33 errors 0 dropped 0 overrun 0
        TX packets 42 errors 0 dropped 0 overrun 0
```

10. If you want to disconnect the connection, use the kill command to kill the **pppd** process.

NFS (Network File System) Client

The Network File System (NFS) is used to mount a disk partition on a remote machine (as if it were on a local hard drive), allowing fast, seamless sharing of files across a network. NFS allows users to develop applications for the V2616A-LX without worrying about the amount of disk space that will be available. The V2616A-LX only supports NFS client protocol.

ATTENTION

Click on the following links for more information about NFS.

http://www.ietf.org/rfc/rfc1213.txt
http://www.faqs.org/rfcs/rfc1317.html

The following procedures illustrate how to mount a remote NFS Server.

1. Scan the NFS Server's shared directory:
   #showmount –e HOST
   showmount: Shows the mount information of an NFS Server
   -e: Shows the NFS Server's export list.
   HOST: IP address or DNS address
2. Establish a mount point on the NFS Client site:
   #mkdir –p /home/nfs/public
3. Mount the remote directory to a local directory:
   # mount -t nfs -o nolock 192.168.3.100:/home/public /home/nfs/public
   (This is where 192.168.3.100 is the example IP address of the NFS server.)

SNMP (Simple Network Management Protocol)

The V2616A comes with the SNMP v2c (Simple Network Management Protocol) software package. It supports **RFC 1213 MIB-II**. In addition, it also supports the Moxa defined MIB which supports following catagories of Moxa defined OIDs. This MIB is listed in Appendix B.

Product Table	BIOSMgmt
SensorMgmt	PeriperiphalMgmt
Programmable LED	Serial Port Type
USB Port	Watchdog
NotificationMgmt	

You can use this command to install this package

```
moxa@Moxa:~$ sudo dpkg -i /home/moxa/moxa-snmp-V2616A-1.0.deb
[sudo] password for moxa:
Selecting previously unselected package moxa-snmp-V2616A.
(Reading database ... 31498 files and directories currently installed.)
```

```
Unpacking moxa-snmp-V2616A (from .../moxa/moxa-snmp-V2616A-1.0.deb) ...
Setting up moxa-snmp-V2616A (1.0) ...
update-rc.d: using dependency based boot sequencing
insserv: warning: script 'moxa_snmpd' missing LSB tags and overrides
Starting Moxa SNMP...
(standard_in) 2: syntax error
Starting Moxa SNMP OK
moxa@Moxa:~$
```

Then you can check if the snmpd is running.

```
moxa@Moxa:~# ps -ef
…
root    18140    1  1 10:23 pts/2    00:00:00 /bin/bash /etc/mxAgent/scripts/s
root    18147    1  0 10:23 ?       00:00:00 /bin/mxAgent -c /etc/mxAgent/mxA
root    18155    1  0 10:23 ?       00:00:00 /sbin/snmpd -Lf /var/log/snmpd.l
…
moxa@Moxa:~$
```

The following example shows an SNMP agent responding to a query from the SNMP browser on the host site:

```
SNMPv2-MIB::sysDescr.0 = STRING: Linux Moxa 3.2.0-4-amd64 #1 SMP Debian 3.2.46-1
 x86_64
SNMPv2-MIB::sysObjectID.0 = OID: SNMPv2-SMI::enterprises.8691.12.2616
DISMAN-EVENT-MIB::sysUpTimeInstance = Timeticks: (11383) 0:01:53.83
SNMPv2-MIB::sysContact.0 = STRING: \"Moxa Inc., Embedded Computing Business.\"
SNMPv2-MIB::sysName.0 = STRING: Moxa
SNMPv2-MIB::sysLocation.0 = STRING: \"6F., No. 135, Ln. 235, Baoquao Rd., Xindia
n Dist., New Taipei City 231, Taiwan (R.O.C.)\"
SNMPv2-MIB::sysORLastChange.0 = Timeticks: (0) 0:00:00.00
SNMPv2-MIB::sysORID.1 = OID: SNMP-NOTIFICATION-MIB::snmpNotifyFullCompliance
SNMPv2-MIB::sysORID.2 = OID: SNMPv2-MIB::snmpMIB
SNMPv2-MIB::sysORID.3 = OID: SNMP-VIEW-BASED-ACM-MIB::vacmBasicGroup
SNMPv2-MIB::sysORID.4 = OID: SNMP-MPD-MIB::snmpMPDCompliance
SNMPv2-MIB::sysORID.5 = OID: SNMP-USER-BASED-SM-MIB::usmMIBCompliance
SNMPv2-MIB::sysORID.6 = OID: SNMP-FRAMEWORK-MIB::snmpFrameworkMIBCompliance
SNMPv2-MIB::sysORDescr.1 = STRING: The MIB modules for managing SNMP Notificatio
n, plus filtering.
SNMPv2-MIB::sysORDescr.2 = STRING: The MIB module for SNMPv2 entities
SNMPv2-MIB::sysORDescr.3 = STRING: View-based Access Control Model for SNMP.
SNMPv2-MIB::sysORDescr.4 = STRING: The MIB for Message Processing and Dispatchin
g.
SNMPv2-MIB::sysORDescr.5 = STRING: The management information definitions for th
e SNMP User-based Security Model.
…
```

To remove the moxa-snmp-V2616A package, use the following command.

```
moxa@Moxa:~$ sudo dpkg -r moxa-snmp-V2616A
(Reading database ... 31739 files and directories currently installed.)
Removing moxa-snmp-V2616A ...
Stopping Moxa SNMP ...
Stopping Moxa SNMP OK
update-rc.d: using dependency based boot sequencing
moxa@Moxa:~$
```

ATTENTION

In the MIB file we provide the CPU voltage and temperature information. The voltage value varies on different CPUs. The reference values list in below.

V_CPU: The value is dependent on the CPU.
V_GFX: The value is dependent on the CPU.
VTT_CPU: 1.06V
VCCSA_CPU: 0.9V
V1.05: 1.05V
V5.0: 4.99V

The temperature value varies on different CPUs. The reference values list in below.

CPU: In high temperature: actual=80..2° C，display=84° C，In regular: actual=54° C，display=44.8° C
System: In high temperature: actual=81..5° C，display=82° C，In regular: actual=48° C，display=46.6 ° C

OpenVPN

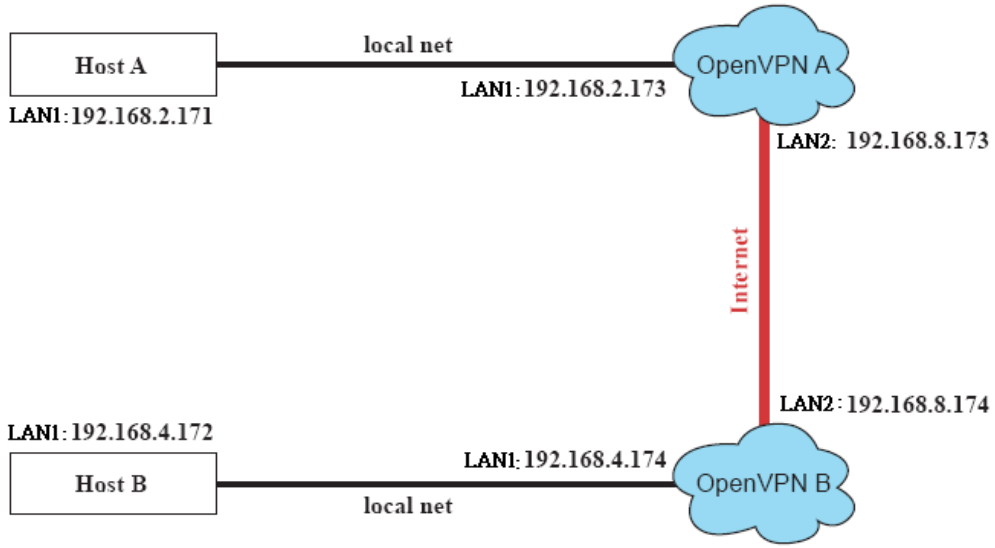
OpenVPN provides two types of tunnels for users to implement VPNS: **Routed IP Tunnels** and **Bridged Ethernet Tunnels**.

An Ethernet bridge is used to connect different Ethernet networks together. The Ethernets are bundled into one bigger, "logical" Ethernet. Each Ethernet corresponds to one physical interface (or port) that is connected to the bridge.

On each OpenVPN machine, you should carry out configurations in the **/etc/openvpn** directory, where script files and key files reside. Once established, all operations will be performed in that directory.

Ethernet Bridging for Private Networks on Different Subnets

1. Set up four machines, as shown in the following diagram.



Host A represents the machine that belongs to OpenVPN A, and Host B represents the machine that belongs to OpenVPN B. The two remote subnets are configured for a different range of IP addresses. When this configuration is moved to a public network, the external interfaces of the OpenVPN machines should be configured for static IPs, or connected to another device (such as a firewall or DSL box) first.

2. Generate a preset shared key by typing the following command:
   # openvpn --genkey --secret secrouter.key

3. Copy the file that is generated to the OpenVPN machine:
   # scp /etc/openvpn/secrouter.key 192.168.8.174:/etc/openvpn

ATTENTION

A preshared key is located at **/etc/openvpn/secrouter.key**. You can use it for testing purposes. We suggest creating a new key for non-testing purposes.

4. On machine OpenVPN A, modify the remote address in configuration file **/etc/openvpn/tap0-br.conf**.

```
# point to the peer
remote 192.168.8.174
dev tap0
port 1194
secret /etc/openvpn/secrouter.key
cipher DES-EDE3-CBC
auth MD5
tun-mtu 1500
tun-mtu-extra 64
ping 40
up /etc/openvpn/tap0-br.sh
#comp-lzo
```

5. Next, modify the routing table in **/etc/openvpn/tap0-br.sh script**.

```
#-------------------------Start--------------------------
#!/bin/sh
# value after "-net" is the subnet behind the remote peer
route add -net 192.168.4.0 netmask 255.255.255.0 dev br0
#-------------------------end--------------------------
```

6. And then configure the bridge interface in **/etc/openvpn/bridge**.

```
#!/bin/bash
# Create global variables
# Define Bridge Interface
br="br0"
# Define list of TAP interfaces to be bridged,
# for example tap="tap0 tap1 tap2".
tap="tap0"
# Define physical ethernet interface to be bridged
# with TAP interface(s) above.
eth="eth1"
eth_ip="192.168.8.173"
eth_netmask="255.255.255.0"
eth_broadcast="192.168.8.255"
#gw="192.168.8.174"
...
```

7. Start the bridge script file to configure the bridge interface:
   # /etc/openvpn/bridge restart

8. On machine OpenVPN B, modify the remote address in configuration file **/etc/openvpn/tap0-br.conf.**

```
# point to the peer
remote 192.168.8.173
dev tap0
```

```
secret /etc/openvpn/secrouter.key
cipher DES-EDE3-CBC
auth MD5
tun-mtu 1500
tun-mtu-extra 64
ping 40
up /etc/openvpn/tap0-br.sh
#comp-lzo
```

9. Next modify the routing table in **/etc/openvpn/tap0-br.sh script** file.

```
#---------------------------------Start-----------------------------
#!/bin/sh
# value after "-net" is the subnet behind the remote peer
route add -net 192.168.2.0 netmask 255.255.255.0 dev br0
#--------------------------------- end ----------------------------
```

10. Then configure the bridge interface in **/etc/openvpn/bridge**.

```
#!/bin/bash
# Create global variables
# Define Bridge Interface
br="br0"
# Define list of TAP interfaces to be bridged,
# for example tap="tap0 tap1 tap2".
tap="tap0"
# Define physical ethernet interface to be bridged
# with TAP interface(s) above.
eth="eth1"
eth_ip="192.168.8.174"
eth_netmask="255.255.255.0"
eth_broadcast="192.168.8.255"
#gw="192.168.8.173"
...
```

11. Start the bridge script file to configure the bridge interface.
    # /etc/openvpn/bridge restart

ATTENTION

Select cipher and authentication algorithms by specifying cipher and auth. To see which algorithms are available, type:

openvpn --show-ciphers
openvpn --show-auths

12. Start both OpenVPN peers on machine OpenVPN A and OpenVPN B.
    # openvpn --config /etc/openvpn/tap0-br.conf&

    If you see the line **Peer Connection Initiated with 192.168.8.173:5000**on each machine, the connection between OpenVPN machines has been established successfully on UDP port 5000.

ATTENTION

You can create link symbols to start the OpenVPN service at boot time:

```
# ln -sf /etc/init.d/openvpn /etc/rc2.d/S16openvpn
```

To stop the service, you should create these links:

```
# ln -sf /etc/init.d/openvpn /etc/rc0.d/K80openvpn
# ln -sf /etc/init.d/openvpn /etc/rc6.d/K80openvpn
```

13. On each OpenVPN machine, check the routing table by typing the command **# route**

```
Destination     Gateway Genmsk          Flags   Metric  Ref Use Iface
192.168.5.0     0.0.0.0 255.255.255.0   U       0       0   0   eth2
192.168.4.0     0.0.0.0 255.255.255.0   U       0       0   0   br0
192.168.3.0     0.0.0.0 255.255.255.0   U       0       0   0   eth0
192.168.30.0    0.0.0.0 255.255.255.0   U       0       0   0   eth3
192.168.8.0     0.0.0.0 255.255.255.0   U       0       0   0   br0
```

Interface **eth1** and device **tap0** both connect to the bridging interface, and the virtual device **tun** sits on top of **tap0**. This ensures that all traffic coming to this bridge from internal networks connected to interface eth1 write to the TAP/TUN device that the OpenVPN program monitors. Once the OpenVPN program detects traffic on the virtual device, it sends the traffic to its peer.

14. To create an indirect connection to Host B from Host A, you need to add the following routing item:
 # route add –net 192.168.4.0 netmask 255.255.255.0 dev eth0

To create an indirect connection to Host A from Host B, you need to add the following routing item:
 # route add –net 192.168.2.0 netmask 255.255.255.0 dev eth0

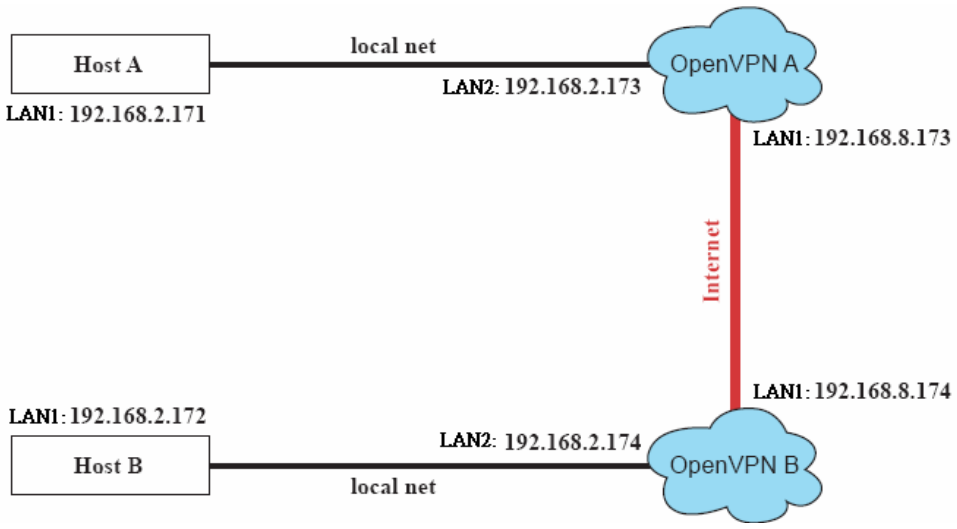
Now ping Host B from Host A by typing:
 # ping 192.168.4.174

A successful ping indicates that you have created a VPN system that only allows authorized users from one internal network to access users at the remote site. For this system, all data is transmitted by UDP packets on port 5000 between OpenVPN peers.

15. To shut down OpenVPN programs, type the command:
 # killall -TERM openvpn

Ethernet Bridging for Private Networks on the Same Subnet

1. Set up four machines, as shown in the following diagram.

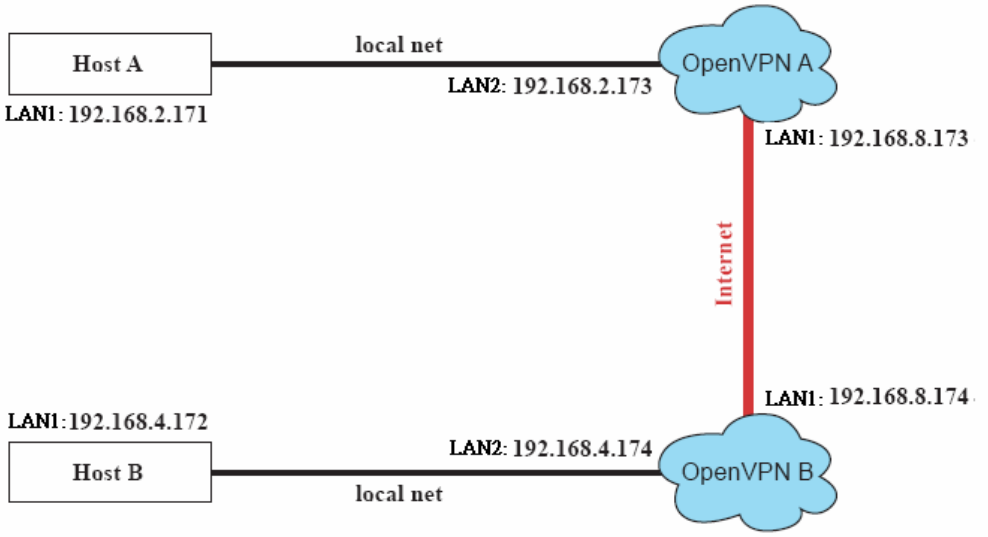


2. The configuration procedure is almost the same as for the previous example. The only difference is that you will need to comment out the parameter **up** in **/etc/openvpn/tap0-br.conf** of OpenVPN A and **/etc/openvpn/tap0-br.conf** of OpenVPN B.

```
# point to the peer
remote 192.168.8.174
dev tap0
secret /etc/openvpn/secrouter.key
cipher DES-EDE3-CBC
auth MD5
tun-mtu 1500
tun-mtu-extra 64
ping 40
#up /etc/openvpn/tap0-br.sh
#comp-lzo
```

Routed IP

1. Set up four machines, as shown in the following diagram.



2. On machine OpenVPN A, modify the remote address in configuration file **/etc/openvpn/tun.conf**.

```
# point to the peer
remote 192.168.8.174
dev tun
secret /etc/openvpn/secrouter.key
cipher DES-EDE3-CBC
auth MD5
tun-mtu 1500
tun-mtu-extra 64
ping 40
ifconfig 192.168.2.173 192.168.4.174
up /etc/openvpn/tun.sh
-----
```

3. Next, modify the routing table in script file **/etc/openvpn/tun.sh**.

```
#----------------------------Start-----------------------------
#!/bin/sh
# value after "-net" is the subnet behind the remote peer
route add -net 192.168.2.0 netmask 255.255.255.0 gw $5
#-----------------------------end-----------------------------
```

4. On machine OpenVPN B, modify the remote address in configuration file **/etc/openvpn/tun.conf**.

```
# point to the peer
remote 192.168.8.173
dev tun
secret /etc/openvpn/secrouter.key
cipher DES-EDE3-CBC
auth MD5
tun-mtu 1500
tun-mtu-extra 64
ping 40
ifconfig 192.168.4.174 192.168.2.173
up /etc/openvpn/tun.sh
```

And then modify the routing table in script file **/etc/openvpn/tun.sh**.

```
#-------------------------Start----------------------------
#!/bin/sh
# value after "-net" is the subnet behind the remote peer
route add -net 192.168.2.0 netmask 255.255.255.0 gw $5
#---------------------------end----------------------------
```

The first argument of parameter **ifconfig** is the local internal interface and the second argument is the internal interface at the remote peer.

$5 is the argument that the OpenVPN program passes to the script file. Its value is the second argument of **ifconfig** in the configuration file.

5. Check the routing table after you run the OpenVPN programs, by typing the command **# route**.

```
Destination     Gateway         Genmsk          Flags   Metric  Ref Use Iface
192.168.4.174   *               255.255.255.255 UH      0       0   0   tun0
192.168.4.0     192.168.4.174   255.255.255.0   UG      0       0   0   tun0
192.168.2.0     *               255.255.255.0   U       0       0   0   eth1
192.168.8.0     *               255.255.255.0   U       0       0   0   eth0
```

4

Programming Guide

The following topics are covered in this chapter:

- **Getting Product Serial Number**
- **RTC (Real Time Clock)**
- **UART**
- **Programmable LED Indicators**
- **Digital I/O**
  - Special Note
  - Examples
- **WDT (Watch Dog Timer)**
  - Introduction
  - How the WDT Works
  - The Watchdog Device IOCTL Commands
  - Examples
- **Hot-swap Hard Disk**
  - Define Documentation
  - Function Documentation

Getting Product Serial Number

The product information can read by dmidecode. You can use following commands to get these information

```
moxa@Moxa:~$ sudo dmidecode -s "baseboard-manufacturer"
MOXA
moxa@Moxa:~$ sudo dmidecode -s "baseboard-serial-number"
TACCA1000000
```

Refer to the following keywords for getting other product information.

```
bios-vendor
bios-version
bios-release-date
system-manufacturer
system-product-name
system-version
system-serial-number
system-uuid
baseboard-manufacturer
baseboard-product-name
baseboard-version
baseboard-serial-number
baseboard-asset-tag
chassis-manufacturer
chassis-type
chassis-version
chassis-serial-number
chassis-asset-tag
processor-family
processor-manufacturer
processor-version
processor-frequency
```

RTC (Real Time Clock)

The device node is located at **/dev/rtc**. The V2616A-LX supports standard Linux simple RTC control. You must include **<linux/rtc.h>**.

1. Function: RTC_RD_TIME

```
int ioctl(fd, RTC_RD_TIME, struct rtc_time *time);
Description: read time information from the RTC. It will return the value on
argument 3.
```

2. Function: RTC_SET_TIME

```
int ioctl(fd, RTC_SET_TIME, struct rtc_time *time);
Description: set RTC time. Argument 3 will be passed to RTC.
```

UART

The normal tty device nodes are **/dev/ ttyMUE0** and **/det/ ttyMUE1**. The V2616A-LX supports standard Linux termios control with RS-232/422/485 serial ports.

Usage: muestty <operation> device

Device: The MUE series device node

Operation: -h Help

-g Get interface and terminator type

-i intf Set interface type with options below

-t value Set termination resistor with options below

intf RS232 RS-232 mode

RS422 RS-422 mode

RS4852W RS-485 2-wire mode

RS4854W RS-485 4-wire mode

value NONTERM Non termination resistor

120TERM 120ohm termination resistor

For example:

To set the MUE interface

muestty –i RS422 /dev/ttyMUE2

To set the MUE termination resistor

muestty –t 120TERM /dev/ttyMUE2

Programmable LED Indicators

There are four programmable LED indicators on the front panel of the V2616A. The programmable LED device file is located at **/dev/pled**. Each LED can be accessed via **/dev/pled** device node. These are the examples to control the programable LED indicators.

Example to turn on/off the LED:

To turn on the first LED and turn off the second, third and fourth LED:

```
# echo 10000000 > /dev/pled
```

To turn off all the LEDs:

```
# echo 00000000 > /dev/pled
```

To turn on the second LED and turn off other LEDs:

```
# echo 01000000 > /dev/pled
```

To turn on the first and the last LEDs and turn off the second and third LEDs:

```
# echo 11010000 > /dev/pled
```

Digital I/O

Digital Output channels can be set to high or low. The channels are controlled by the function call **set_dout_state( )**. Use the digital input channels to detect the state change of the digital input signal. The DI channels can also be used to detect whether or not the state of a digital signal changes during a fixed period of time. This can be done with the function call **set_din_event( )**.

Return error code definitions:

```
#define DIO_ERROR_PORT -1 // no such port
#define DIO_ERROR_MODE -2 // no such mode or state
#define DIO_ERROR_CONTROL -3 // open or ioctl fail
#define DIO_ERROR_DURATION -4 // The value of duration is not 0 or not in the range,
40 <= duration <= 3600000 milliseconds (1 hour)
#define DIO_ERROR_DURATION_20MS -5 // The value of duration must be a multiple of 20
ms
#define DIO_OK 0
```

DIN and DOUT definitions:

```
#define DIO_HIGH 1
#define DIO_LOW 0
```

Moxa functions for DI/DO

Function	**int set_dout_state(int doport, int state)**
Description	Set the DOUT port to high or low state.
Input	<doport> The DOUT port you want to set. Port starts from 0 to 3 <state> Set high or low state; DIO_HIGH (1) for high, DIO_LOW (0) for low.
Output	None
Return	refer to the error code

Function	**int get_din_state(int diport, int *state)**
Description	Get the DIN port state
Input	<diport> The DIN port to get the state of. Port numbering is from 0 to 3 <state> Save the current state
Output	<state> DIO_HIGH (1) for high, DIO_LOW (0) for low
Return	Refer to the error code

Function	**int get_dout_state(int doport, int *state)**
Description	Get the DOUT port state
Input	<doport> The DOUT port to get the state of. <state> Save the current state.
Output	<state> DIO_HIGH (1) for high, DIO_LOW (0) for low
Return	Refer to the error code

Function	**int set_din_event(int diport, void (*func)(int diport), int mode, long int duration)**
Description	Set the DIN event when the state is changed from high to low or from low to high
Input	<diport> The port that will be used to detect the DIN event. Port numbering is from 0 to 3. This value depends on your device. <(*func) (int diport)> Not NULL: Returns the call back function. When the event occurs, the call back function will be invoked. NULL: Clear this event <mode> DIN_EVENT_HIGH_TO_LOW (1): From high to low DIN_EVENT_LOW_TO_HIGH (0): From low to high DIN_EVENT_CLEAR (-1): Clear this event <duration> 0: Detect the din event DIN_EVENT_HIGH_TO_LOW or DIN_EVENT_LOW_TO_HIGH without duration Not 0: Detect the din event DIN_EVENT_HIGH_TO_LOW or DIN_EVENT_LOW_TO_HIGH with duration.

	Note: The value of "duration" must be a multiple of 20 milliseconds. The range of "duration" is 0, or 40 <= duration <= 3600000 milliseconds. The error of the measurement is 24 ms. For example, if the DIN duration is 200 ms, this event will be generated when the DIN pin stays in the same state for a time between 176 ms and 200 ms.
Output	None
Return	Refer to the error code

Function	**int get_din_event(int diport, int *mode, long int *duration)**
Description	To retrieve the DIN event configuration, including mode (DIN_EVENT_HIGH_TO_LOW or DIN_EVENT_LOW_TO_HIGH), and the value of "duration."
Input	<diport> Which DIN port you want to retrieve <mode> Save the set event. <duration> The duration the DIN port is kept in high or low state. - return to the current duration value of diport
Output	<mode> DIN_EVENT_HIGH_TO_LOW (1): From high to low DIN_EVENT_LOW_TO_HIGH(0): From low to high DIN_EVENT_CLEAR(-1): Clear this event <duration> The value of duration should be 0 or 40 <= duration <= 3600000 milliseconds.
Return	Refer to the error code

Special Note

1. You need to build the moxalib in advance for DI/DO. The moxalib is included in the folder **\example\moxalib** on the CD.
2. Make sure to link the library **libmoxalib** for DI/DO programming, and include the header file **moxadevice.h**. Only one program at a time can use the DI/DO library.
3. Due to hardware limitations, you need to modify MIN_DURATION as 60 for V2616A-LX computers.

Examples

Example files **tdio.c** and **Makefile** are located in the folder **\example\tdio** on the CD.

WDT (Watch Dog Timer)

Introduction

The WDT works like a watchdog function, and can be enabled or disabled. When the WDT function is enabled and the application does not acknowledge it, the system will reboot. The acknowledgement time can be set to any number between 1 millisecond and 255 seconds.

How the WDT Works

Debian project supports a watchdog daemon. The watchdog daemon checkes if your system is still working. If programs are no longer executed it will perform the hard reset of the system. The standard watchdog driver and package have been installed in the V2616A. If you need to run the watchdog once the system boots up, you can use the **insserv** to enable the watchdog function.

```
moxa@Moxa:~$ sudo insserv -v -d watchdog
[sudo] password for moxa:
insserv: enable service ../init.d/watchdog -> /etc/init.d/../rc0.d/K01watchdog
insserv: enable service ../init.d/watchdog -> /etc/init.d/../rc1.d/K01watchdog
insserv: enable service ../init.d/watchdog -> /etc/init.d/../rc2.d/S23watchdog
insserv: enable service ../init.d/watchdog -> /etc/init.d/../rc3.d/S23watchdog
insserv: enable service ../init.d/watchdog -> /etc/init.d/../rc4.d/S23watchdog
insserv: enable service ../init.d/watchdog -> /etc/init.d/../rc5.d/S23watchdog
insserv: enable service ../init.d/watchdog -> /etc/init.d/../rc6.d/K01watchdog
insserv: creating .depend.boot
insserv: creating .depend.start
insserv: creating .depend.stop
moxa@Moxa:~$
```

Check the run level.

```
moxa@Moxa:~$ ls -l /etc/rc?.d/*watchdog*
lrwxrwxrwx 1 root root 18 Nov  8 15:48 /etc/rc0.d/K01watchdog -> ../init.d/watchdog
lrwxrwxrwx 1 root root 18 Nov  8 15:48 /etc/rc1.d/K01watchdog -> ../init.d/watchdog
lrwxrwxrwx 1 root root 18 Nov  8 15:48 /etc/rc2.d/S23watchdog -> ../init.d/watchdog
lrwxrwxrwx 1 root root 18 Nov  8 15:48 /etc/rc3.d/S23watchdog -> ../init.d/watchdog
lrwxrwxrwx 1 root root 18 Nov  8 15:48 /etc/rc4.d/S23watchdog -> ../init.d/watchdog
lrwxrwxrwx 1 root root 18 Nov  8 15:48 /etc/rc5.d/S23watchdog -> ../init.d/watchdog
lrwxrwxrwx 1 root root 18 Nov  8 15:48 /etc/rc6.d/K01watchdog -> ../init.d/watchdog
moxa@Moxa:~$
```

The watchdog configure file is located in **/etc/watchdog.conf**. Currently we configure the watchdog daemon to acknowledge the watchdog device in 60 seconds. The realtime is to lock itself into memory, so it is never swapped out to prevent the delay of watchdog acknowledge. You can configure this file to enable the watchdog as your system requirement.

```
…
watchdog-device = /dev/watchdog
…
interval             = 60
realtime             = yes
priority             = -10
…
```

If you want to remove it from run-level, you can use this command:

```
moxa@Moxa:~# sudo insserv -r watchdog
```

Check the run level removement.

```
moxa@Moxa:~# ls -l /etc/rc?.d/*watchdog*
ls: cannot access /etc/rc?.d/*watchdog*: No such file or directory
moxa@Moxa:~#
```

The Watchdog Device IOCTL Commands

IOCTL	**WDIOC_GETSUPPORT**
Description	This returns the support of the card itself
Input	None
Output	(struct watchdog_info *) arg
Return	On success, return 0. Otherwise, return < 0 value.
IOCTL	**WDIOC_GETSTATUS**
Description	This returns the status of the card

Input	None
Output	(int *)arg
Return	On success, return 0. Otherwise, return < 0 value.
IOCTL	**WDIOC_GETBOOTSTATUS**
Description	This returns the status of the card that was reported at bootup.
Input	None
Output	(int *)arg)
Return	On success, return 0. Otherwise, return < 0 value.
IOCTL	**WDIOC_SETOPTIONS**
Description	This lets you set the options of the card. You can either enable or disable the card this way.
Input	None
Output	(int *)arg)
Return	On success, return 0. Otherwise, return < 0 value.
IOCTL	**WDIOC_KEEPALIVE**
Description	This pings the card to tell it not to reset your computer.
Input	None
Output	None
Return	On success, return 0. Otherwise, return < 0 value.
IOCTL	WDIOC_SETTIMEOUT
Description	Set the watchdog timeout
Input	arg: 1 ~ 255 seconds
Output	None
Return	On success, return 0. Otherwise, return < 0 value.
IOCTL	WDIOC_GETTIMEOUT
Description	Get the current watchdog timeout.
Input	None
Output	arg: 1 ~ 255 seconds
Return	On success, return 0. Otherwise, return < 0 value.

Examples

The example file **watchdog-simple.c** acks the watchdog every 10 seconds.

```
#include <stdio.h>
#include <stdlib.h>
#include <unistd.h>
#include <fcntl.h>

int main(void)
{
	int fd = open("/dev/watchdog", O_WRONLY);
	int ret = 0;
	if (fd == -1) {
		perror("watchdog");
		exit(EXIT_FAILURE);
	}
	while (1) {
		ret = write(fd, "\0", 1);
		if (ret != 1) {
			ret = -1;
			break;
		}
		sleep(10);
	}
```

```
        close(fd);
        return ret;
}
```

Hot-swap Hard Disk

A development library is provided to help you develop your applications. All of the code can be found at **/example/hotswap** in the CD

Define Documentation

#define mxhtsp_close(fd) close(fd)	
Description	Close the hotswap devices.
Parameters	*fd*: the open port
Returns	None

Function Documentation

int mxhtsp_check_partition_usage (const char * partition_name)	
Description	Get what percentage of a partition is in use.
Parameters	*partition_name*: the name of the partition being checked. In linux, it should be /media/diskxpx
Returns	None

int mxhtsp_is_button_pressed (int fd, int btn_num)	
Description	Check if a button is pressed.
Parameters	*fd*: the open port *btn_num*: the button number
Returns	1: pressed 0: not pressed -1: fail

int mxhtsp_is_disk_busy (int fd, int disk_num)	
Description	Check if a disk is busy.
Parameters	*fd*: the open port *disk_num*: the disk number
Returns	1: busy 0: idle -1: fail

int mxhtsp_is_disk_plugged (int fd, int disk_num)	
Description	Check if a disk is plugged in.
Parameters	*fd*: the open port *disk_num*: the disk number
Returns	1: plugged 0: unplugged -1: fail

Open the hotswap devices.	
Description	Check if a disk is plugged in.
Returns	*fd* if successful -1: fail

int mxhtsp_set_led (int fd, int led_num, int on)	
Description	Set the led to on/off.
Parameters	*fd*: the open port *led_num*: the led number 1 on 0 off
Returns	0: success -1: fail

5

Managing Disks

The V2616A-LX computers come with a software-RAID management platform designed to serve as a front-end for data acquisition and industrial control applications. This chapter describes how to configure the volume supported by the Linux operating system.

The following topics are covered in this chapter:

- **Software RAID --- mdadm**
  - Create Software RAID Volume
  - Check Software RAID Status
  - Replace the Failed Disk

Software RAID --- mdadm

mdadm is a Linux utility used to manage software RAID devices. The name is derived from the "md" (multiple device) device nodes it "administers or manages, and it replaced a previous utility mdctl. The original name was "Mirror Disk", but was changed as the functionality increased. The RAID volume is built in Linux, not in BIOS.

Create Software RAID Volume

The V2616A-LX computers come with 2 SATA disk slots. Users can manage linear, RAID0, RAID1 volume on these two SATA disks. Follow these steps.

1. If the RAID device is created, you should stop it and create your own RAID devices.

```
root@Moxa:~# cat /proc/mdstat
Personalities: [raid0]
md0: active raid0 sdc[0] sdb[1]
            195371008 blocks super 1.2 512k chunks

root@Moxa:~# mdadm –stop /dev/md0
root@Moxa:~# cat /proc/mdstat
Personalities : [raid0]
Unused devices: <none>
```

2. Unmount the disks if they are mounted by mxhtspd, stop the mxhtspd service and remove the run level.

```
root@Moxa:~# umount /media/disk1p1
root@Moxa:~# umount /media/disk2p1
root@Moxa:~# /etc/init.d/mxhtspd.sh stop
```

3. Because the mxhtspd hotswap daemon only supports the general disk hotswap management, the RAID management features is not included. We suggest you disable it with RAID management features. You can use this command to remove the mxhtspd service from run-level:

```
moxa@Moxa:~# insserv -r mxhtspd.sh
```

4. Create the partitions on the disk.

```
root@Moxa:~# fdisk /dev/sdb1
root@Moxa:~# fdisk /dev/sdc1
```

5. Create the RAID volume. mdadm options are using for the RAID volume creation. You can choose to create a linear mode, striping mode or mirror mode in RAID volume.

```
-C: create
-v: verbose
-l: RAID level, options are: linear, raid0, 0, stripe, raid1, 1, mirror, raid4, 4, raid5, 5, raid6, 6, raid10, 10, multipath, mp, faulty. Obviously some of these are synonymous.
-n: the number of disks
```

6. Create a linear mode software RAID.

```
root@Moxa:~# mdadm -Cv -llinear -n2 /dev/md0 /dev/sd{b,c}1
```

Or create a striping mode software RAID 0.

```
root@Moxa:~# mdadm -Cv –l0 -n2 /dev/md0 /dev/sd{b,c}1
```

Or create a mirror mode software RAID 1.

```
root@Moxa:~# mdadm -Cv -l1 -n2 /dev/md0 /dev/sd{b,c}1
```

7. Then you can check the RAID device information from /proc/mdstat.

```
root@Moxa:~# cat /proc/mdstat
Personalities: [raid0] [linear]
md0: active raid0 sdb1[1] sdc1[0]
     195369504 blocks super 1.2 OK rounding

Unused devices: <none>
```

8. Format the RAID

```
root@Moxa:~# mkfs.ext4 /dev/md0
```

9. Mount the RAID device manually

```
root@Moxa:~# mount /dev/md0 /mnt/raid
```

10. Start the RAID volume automatically in next booting. If you need to start the array automatically, you should edit /etc/mdadm/mdadm.conf.

```

root@Moxa:~# mdadm --detail --scan >> /etc/mdadm/mdadm.conf
```

11. Edit /etc/mdadm/mdadm.conf.

```
DEVICE /dev/sdb1 /dev/sdc1
CREATE owner=root group=disk mode=0660 auto=yes
HOMEHOST <system>
MAILADDR your_email@xxx.com
ARRAY /dev/md0 metadata=1.2 name=Moxa:0
UUID=45ae9dbe:f30741ec:b22eff98:2dadb12d
```

12. Add to mount the RAID volume in /etc/fstab.

```
/dev/md0    /mnt/raid   ext4    defaults    0   2
```

13. Unmount the root file system and reboot. The array should be started and mount at /mnt/raid.

```
root@Moxa:~# umount /
```

Check Software RAID Status

The software RAID status can check via reading /proc/mdstat. Reading the arrays status if array is running.

```
root@Moxa:~# cat /proc/mdstat
Personalities : [linear]
md0 : active linear sdb1[1] sdc1[0]
     23436724 blocks super 1.2 0k rounding
```

If the array is not running, the status will be like this:

```
root@Moxa:~# cat /proc/mdstat
Personalities : [linear]
unused devices: <none>
```

Replace the Failed Disk

If the array is running in mirror mode and one of the disks fails, you should remove the failed disk with a new one. In this case, the sdb1[0](F) means that the sdb disk is failed.

```
md1 : active raid1 sdb1[1] sdc1[0](F)
17920384 blocks [2/1] [_U]
```

You can simulate this by manage one of the disk fail.

```
root@Moxa:~# mdadm --manage /dev/md0 --fail /dev/sdb1
mdadm: set /dev/sdb1 faulty in /dev/md0
root@Moxa:~# sync
```

Use this command to remove the fail disk from raid.

```
root@Moxa:~# mdadm -r /dev/md0 /dev/sdb1
mdadm: hot removed /dev/sdb1 from /dev/md0
```

Then replace the first drive with the new disk and add it into array.

```
root@Moxa:~# mdadm -a /dev/md0 /dev/sdb1
```

Check mdstat and the array is automatically recovering now.

```
root@Moxa:~# cat /proc/mdstat
Personalities : [raid1]
md0 : active raid1 sdb1[0] sdc1[1]
      7806522 blocks super 1.2 [2/1] [_U]
      [==>..................]  recovery = 10.6% (831488/7806522) finish=0.9min
speed=118784K/sec
```

6

Hot-swap Function

The V2616A computers come with two removable and hot-swappable slots for inserting additional storage media such as hard disks or SSD drives. It also supports hot swapping for convenient, fast, and easy storage expansion, and provides user-defined programmable LEDs and the related API for storage management. Storage plug/unplug functionality, automatic storage removal, and storage status display are all supported.

The following topics are covered in this chapter:

- **File Overview**
- **Hot-swap Daemon Configuration**
- **Handling an Event with Hot-swap Daemon**
- **Logging the Hot-swap Daemon Message**
- **An Example for Deploying mxhtspd Daemon**

File Overview

The major files are listed below:

mxhtspd: a daemon for monitoring hot-swap events

mxhtspd-setled: a command to set up LED signals

/etc/mxhtspd/scripts: scripts executed when an event occurs; the following files are included:

action-btn-long-pressed

action-btn-short-pressed

action-disk-plugged

action-disk-unplugged

action-part-over-usage

/etc/mxhtspd/mxhtspd.conf: configuration file for the mxhtspd daemon

libmxhtsp.so: library

Hot-swap Daemon Configuration

An **mxhtspd** daemon is provided for the V2616A hot-swap function. It is launched with the **/etc/init.d/mxhtspd.sh** script at startup and will detect the disk status in the background.

You can configure mxhtspd with the following options:

-t time: time in seconds to identify how long a button is pressed

-i interval: interval in seconds to check partition usage

-l facility_num: log daemon's message by rsyslogd with LOCAL[facility_num]

-v: run in verbose mode

-h: print usage

The following example shows how to use the –v option to modify **/etc/init.d/mxhtspd.sh**:

```
...
start)
        echo "Starting mxhtspd daemon..."
        sleep 1
        mxhtspd -v &
...
```

The mxhtspd daemon also provides the capability to monitor partition usage. You can configure the **mxhtspd.conf** file to monitor a mount point of hotswap disks such as **/medik/disk1p1**. Note that disk*n*p*m* is the *m*-th partition of hotswap disk *n*.

An example of **mxhtspd.conf** is shown below:

```
#mount point    usage limit(%)
/media/disk2p1 90
/media/disk1p1 90
...
```

When more than 90% of either partition 1 of disk 2, or partition 1 of disk 1 is in use, the corresponding event will be triggered.

Handling an Event with Hot-swap Daemon

mxhtspd will be triggered when the following events occur:

1. **A disk is plugged in**

When a disk n with m partitions has been plugged in, the system will automatically mount its partitions on /media/disknpm, where m ranges from 1 to m. For example, if disk 1 has two partitions, they would be mounted on /media/disk1p1 and /media/disk1p2.

The action-disk-plugged script will be triggered with the disk number as argument. By default it will scan the disk on the SATA bus. You can add some operations here when necessary.

Execute the mount command to check the disk mounting situation. The following example shows the status of 2 disks with 2 partitions separately.

```
Moxa:~# mount
rootfs on / type rootfs (rw)
none on /sys type sysfs (rw,nosuid,nodev,noexec,relatime)
none on /proc type proc (rw,nosuid,nodev,noexec,relatime)
udev on /dev type tmpfs (rw,relatime,size=10240k,mode=755)
/dev/hda1 on / type ext2 (ro,relatime,errors=remount-ro)
tmpfs on /lib/init/rw type tmpfs (rw,nosuid,relatime,mode=755)
usbfs on /proc/bus/usb type usbfs (rw,nosuid,nodev,noexec,relatime)
tmpfs on /dev/shm type tmpfs (rw,nosuid,nodev,relatime)
devpts on /dev/pts type devpts
(rw,nosuid,noexec,relatime,gid=5,mode=620,ptmxmode=000)
none on /tmp type tmpfs (rw,relatime)
/dev/hda2 on /home type ext2 (rw,relatime,errors=continue)
/dev/sda1 on /media/disk2p1 type ext3 (rw,relatime,errors=continue,data=ordered)
/dev/sda2 on /media/disk2p2 type ext3 (rw,relatime,errors=continue,data=ordered)
/dev/sdb1 on /media/disk1p1 type ext3 (rw,relatime,errors=continue,data=ordered)
/dev/sdb2 on /media/disk1p2 type ext3 (rw,relatime,errors=continue,data=ordered)
```

2. **The X1 button is pressed**

When X1 button is pressed less than 5 seconds, which usually indicates a quick button press, the **action-btn-pressed** script will be executed. It will umount all partitions on both SATA-A, SATA-B disks and the LED will blink 3 times at 1 second intervals to indicate that the disk has been successfully unmounted, and that users can remove that hard disk from the storage tray.

3. **A disk is unplugged**

When disk on SATA-A or SATA-B is unplugged, the **action-disk-unplugged** script will be triggered with argument *n*. It will check if all partitions on disk *n* have been umounted before they were unplugged and warn the user if they weren't. The correct procedure is first press the button to umount the partitions and then unplug the disk. The only purpose of this script is to warn of misuse or incorrect operation.

4. **A monitored partition is over the specific usage limit, or does not exist**

When /media/disknpm detects this situation, the daemon will show an error message and blink the warning LED n at 1 second intervals. In addition, the action-part-over-usage script will be launched with argument /media/disknpm.

ATTENTION

Be sure to press the button before removing the disks. The LEDs will blink 3 times to indicate that the disks have been successfully unmounted from the system, and that you can remove the disks from the computer.

Logging the Hot-swap Daemon Message

The section describes how to log the **mxhtspd** message with the **rsyslogd** daemon. Use the following steps:

Check your run level in the **/etc/inittab** file; the default is 2.

```
# The default runlevel.
id:2:initdefault:
```

Enable **rsyslogd** at startup.

```
Moxa:/etc/rc2.d# mv N10rsyslog S10rsyslog
```

Add **-l 0** options in the **/etc/init.d/mxhtspd.sh** script to enable the mxhtspd logging function with local 0.

```
#Add parameter if necessary
mxhtspd -l 0&
```

Edit the configuration file **/etc/rsysload.conf**.

```
#Uncomment below lines for mxhtspd with local 0
local0.*                    -/var/log/mxhtspd.log
```

mxhtspd will use the local0 facility to log a message. The destination file is /var/log/mxhtspd.log. The minus (-) sign indicates to omit syncing the file after every logging.

Restart your computer to activate the settings.

ATTENTION
When you run rsyslogd daemon to log messages at startup, take care to prevent excessive disk usage.

An Example for Deploying mxhtspd Daemon

In this section we use a real example to illustrate how to deploy **mxhtspd**. The program is named **log_application** and its major task is to collect important data and save the data to the disk drive daily. The following settings will illustrate how to identify that the saved disk is full, and how to start or stop the application without using an external monitor.

Start or stop the daemon when button X1 is pressed longer than 5 seconds. Add the following lines in the **action-btn-pressed** file to trigger your program.

```
#!/bin/sh
file=`basename $0`
num=$1

#Add your commands here
/home/log_application

echo $file: Button $num is long pressed
```

7

System Recovery

The V2616A-LX ready-to-run embedded computers are an embedded Linux platform. This chapter describes the recovery process in the event of system instability.

The following topics are covered in this chapter:

- **Overview**
- **Setting Up the Recovery Environment**
- **Recovering from the Factory Default Image**
  - Step 1: Prepare the USB Drive
  - Step 2: Setting the BIOS to Boot via USB
  - Step 3: Performing a System Recovery
  - Step 4: Reset the BIOS to its Original State
- **Creating a Custom System Image**

Overview

This section describes the recovery process in the event of system instability. Users can perform the system recovery from two sources: factory default image or user's image.

Setting Up the Recovery Environment

A V2616A computer, a 4 GB (min.) USB drive, and a copy of the recovery suite are all required to set up the V2616A's system recovery environment.
The recovery procedure itself requires only a V2616A computer and a bootable USB drive.

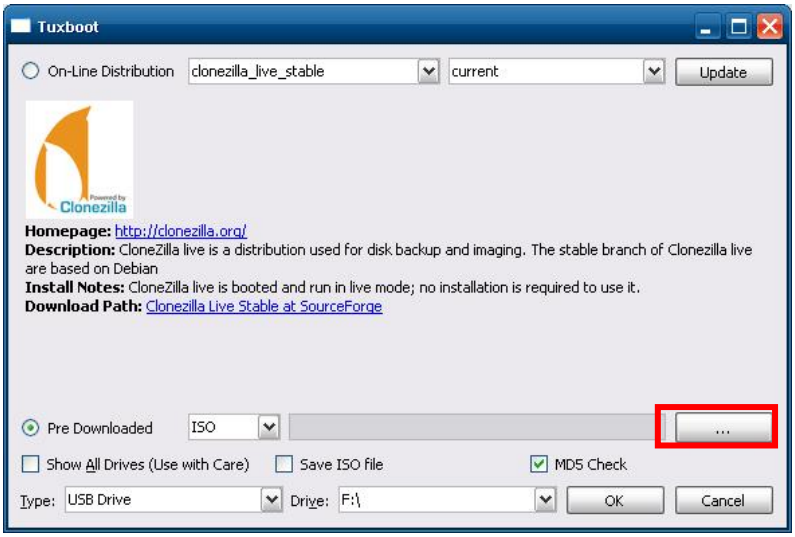
The following steps describe the basic process of setting up the system recovery environment:

1. First, prepare the USB drive by copying over to it a bootable recovery environment; ths comes in the form of an ISO image, and can be found on your software CD.
2. Here, you may choose to create a bare-bones stock OS recovery image; if you choose this option as your recovery method, keep in mind that any applications or scripts you install later will be lost if a recovery is required.
3. Here, you will reset the BIOS so the USB port is the first boot priority. **If you are initiating a recovery from a key you have already configured, this will be your starting point.** The system will re-booted into the Clonezilla recovery environment found on the USB
4. This step describes how to create an exact copy of a fully configured system on the USB drive. This is the alternative to the stock OS recovery offered in Step 2.
5. This step describes how to perform a recovery; you may use it to run a trial recovery and test your setup.
6. This step explains how and why to return the BIOS to its original state.

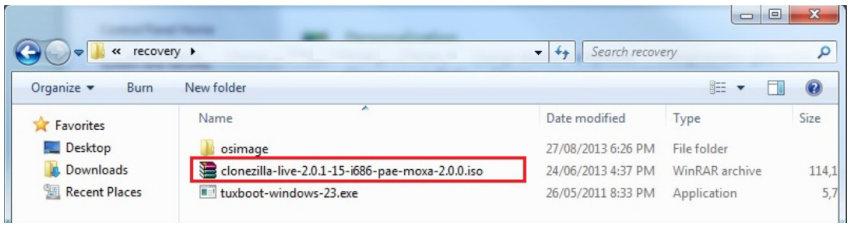
Recovering from the Factory Default Image

Step 1: Prepare the USB Drive

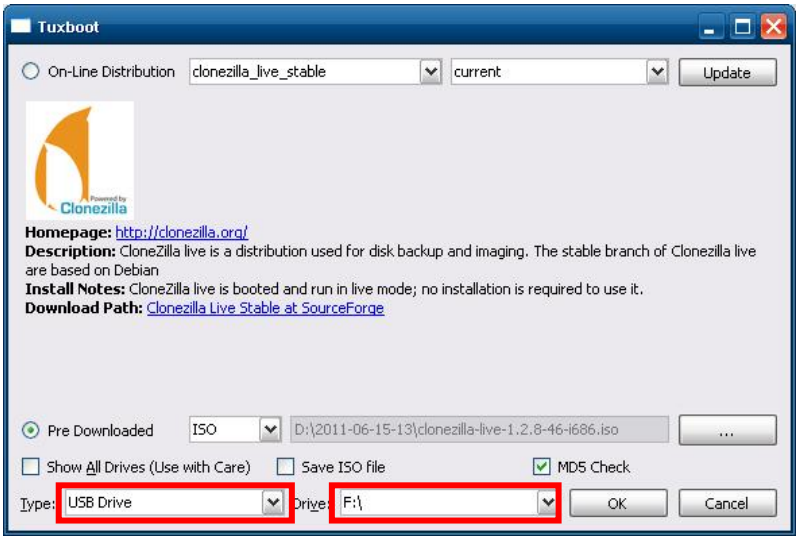
1. From the software DVD that came with your computer **start the Clonezilla imaging program** (within the current OS) by starting `tuxboot-windows-23.exe`, which is found in the `\recovery\V2616A-LX_Recovery\clonezilla` directory.
2. At the right, select **Pre-Downloaded** and set the dropdown to **ISO**.
3. **Browse the CD to locate the Clonezilla ISO image** by clicking the button with an ellipsis (**...**).



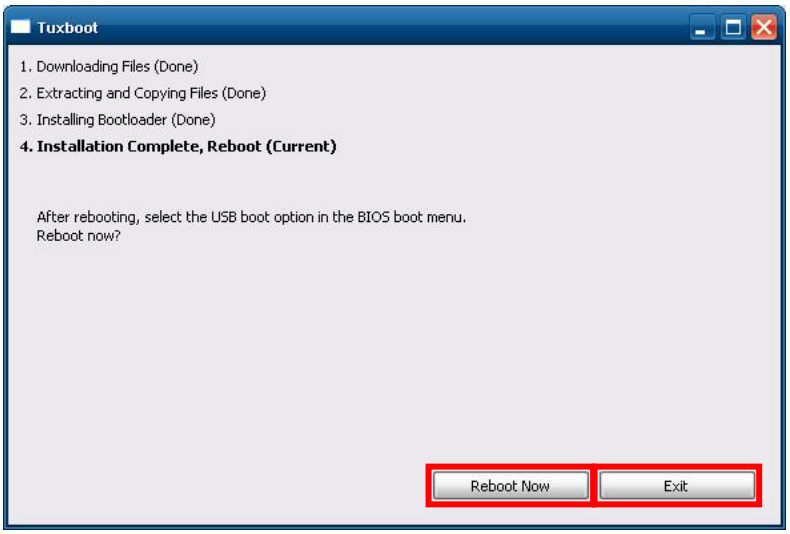
4. Navigate the file manager to **\Recovery\V2616A-LX_Recovery\clonezilla** directory on the software DVD and select the Clonezilla recovery environment's ISO image.



5. Set the **Device Type** (lower left-hand corner) as **USB Drive**, then set the **Drive** dialog to the letter under which the USB is currently mounted.



6. Click **OK**, and the Clonezilla recovery environment (plus bootloader) will be copied to your USB drive.



7. When finished, select **Exit** to leave.

ATTENTION

You must manually delete the **EFI** directory on the USB.

8. Next, copy the stock OS image (found on the software CD that shipped with your computer) over to the USB drive; the image will be found in the **recovery** directory, **/media/cd0/recovery/os_image,** and will be copied to the USB file tree at **/media/usb0/home/partimag.** Depending on how the USB and CD have been automounted, you will use a command much like this:

```
moxa@Moxa:~# cp -a /media/cd0/recovery/os_image  /media/usb0/home/partimag/
```

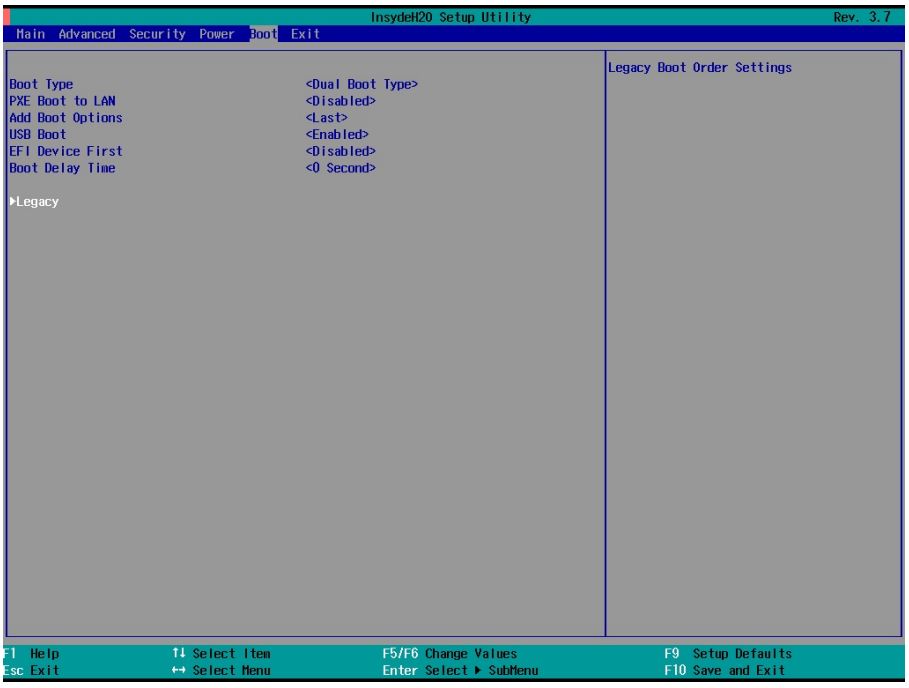
9. You have now configured a USB recovery key that will recover your computer to the stock operating system it shipped with. However, if you want to recover from your own image, you need to perform system image backup first. Refer to Create a Custom System Image.

Step 2: Setting the BIOS to Boot via USB

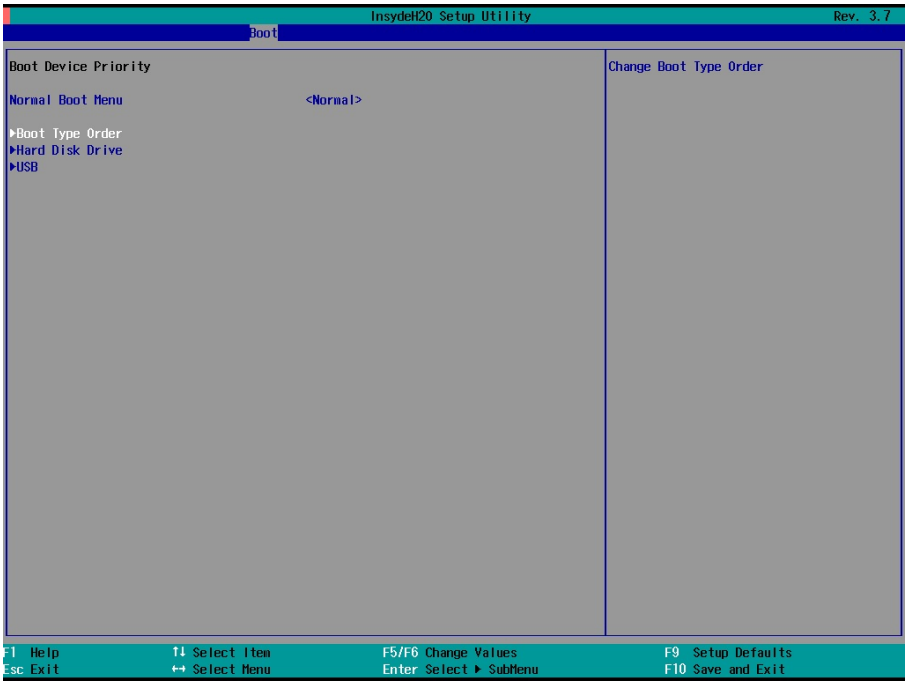
At this stage, users will reset the BIOS so that the system boots directly from the USB. This must be done before the rest of the system recovery environment may be configured.

1. Reboot the system, and, during the POST process, press F2 until you hear a long beep. You should then enter the BIOS setup menu. Select **SCU** to enter the BIOS setup menu.

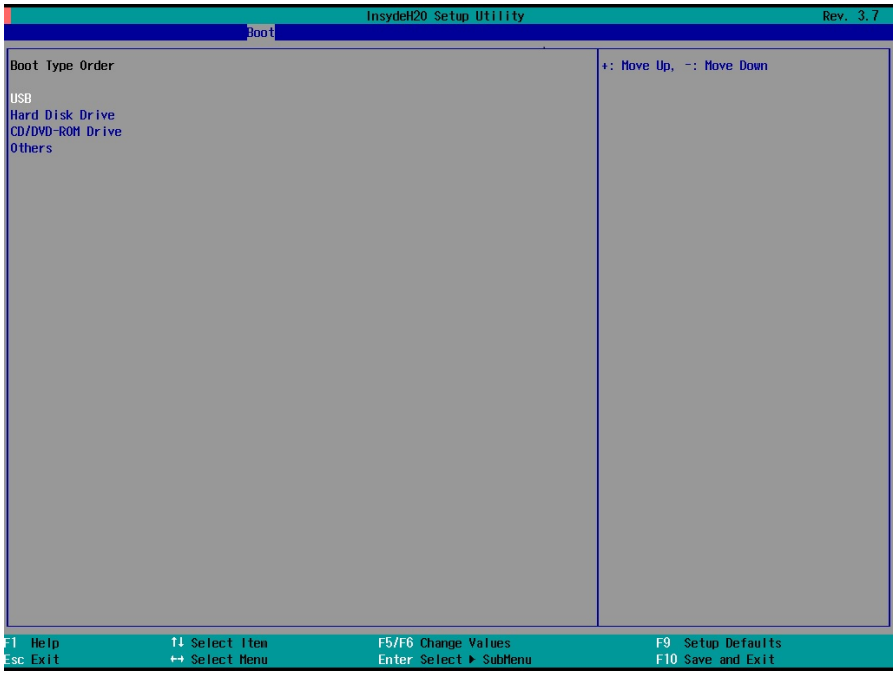
1. Use the left/right arrow keys to navigate to the **Boot** tab, and then press **Enter**.
2. Use the up/down arrows to highlight **Legacy** in the boot tab's menu, and press **Enter**.



3. Use the up/down arrow keys to navigate to the **Boot Type Order** link, and then press **Enter**.



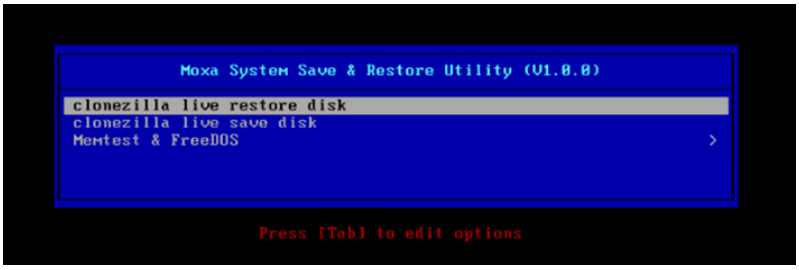
4. Use the up/down arrows to highlight **USB** and then use the plus/minus signs (**+ -**) to move it to the first boot priority position



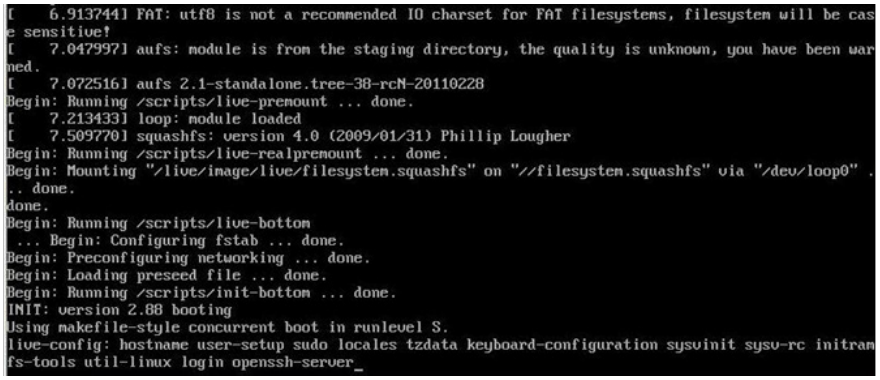
Step 3: Performing a System Recovery

Connect the USB drive to any of the V2616A's USB ports and then reboot the computer. The system will boot from the USB into the Clonezilla boot loader.

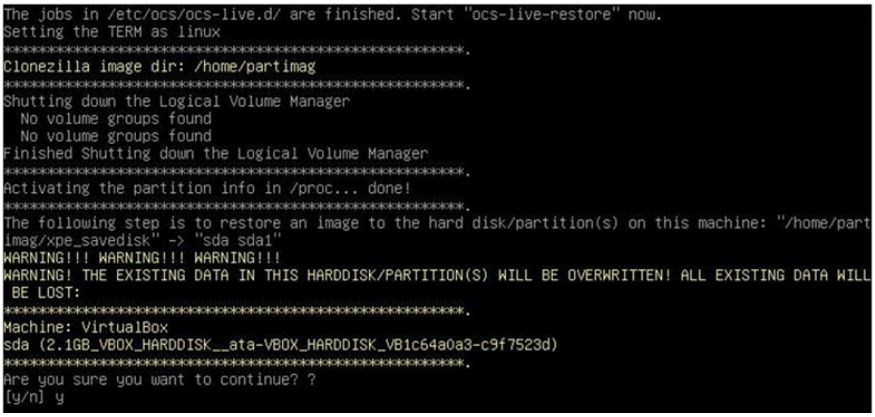
1. Select **Clonezilla Live Restore Disk** to boot into the system restoration environment.



2. Wait for the boot process to finish.

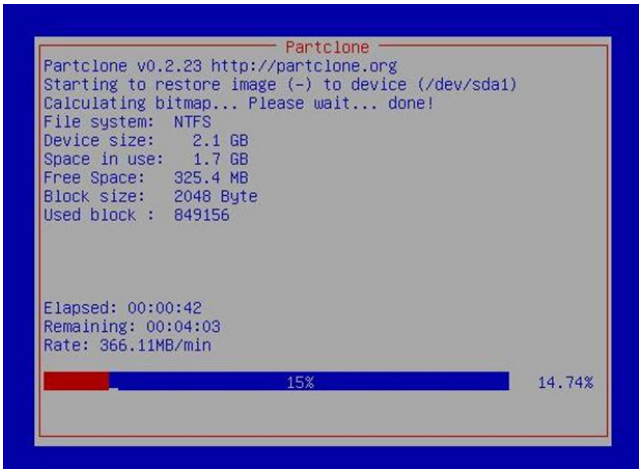


3. At this point, the system will remind you that you are about to overwrite your entire operating system with a new drive image, and ask you if you want to continue. When prompted, enter **Y** (case insensitive) from the keyboard to start the system restoration process. Any other letter or **Ctrl-C** will cancel it and exit Clonezilla.

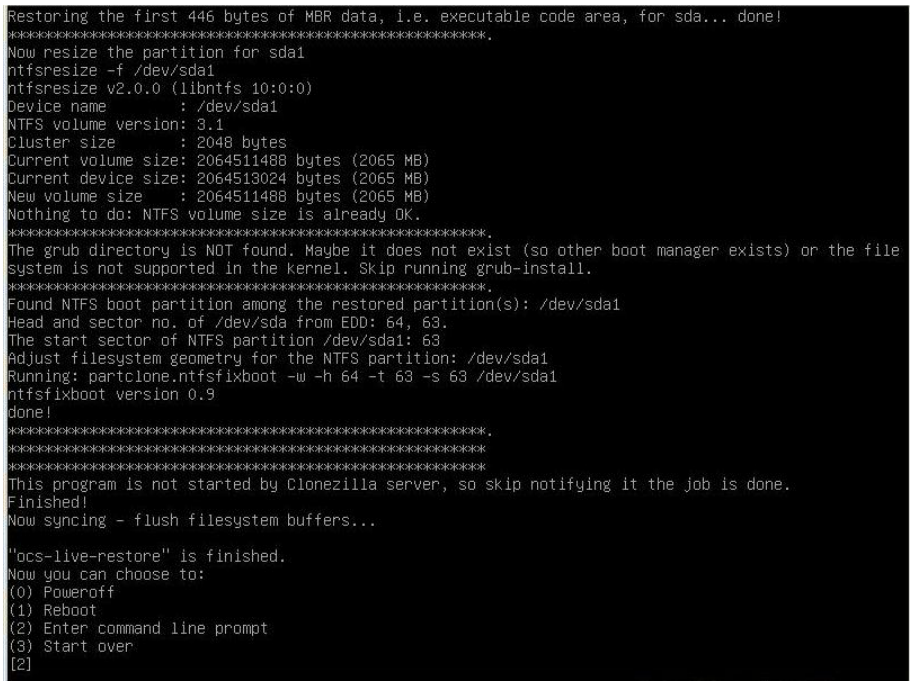


4. The system will give you another warning that you are about to overwrite your hard drive, and erase all data on the partition listed (**sda1**, in the example below). If you wish to continue, enter **Y** (case insensitive).

5. Now, Clonezilla will copy the system image you have configured on to your primary system drive. Your original system (and any stored data or configurations that were made after the recovery disk was created) will be entirely wiped clean. Wait for the process to finish; depending on the system, this should take about 10 minutes.



6. At this point, complete the restoration by selecting (**0**) **Poweroff**. This will shut down the computer; however, if the **Power Switch** remains inserted in the front panel of the computer and is left in the **ON** position, then the system will immediately initiate a soft reboot. To avoid this, users may use the switch to cut power to the computer immediately following the shutdown, or may simply remove the power switch from the front panel and then use the console to shut down the computer by pressing **0**.



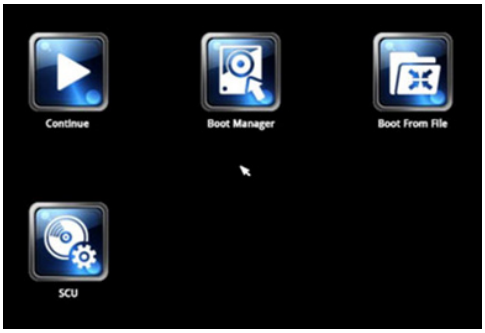
7. After the computer has powered down, remove the USB drive and store it in a safe place.

Step 4: Reset the BIOS to its Original State

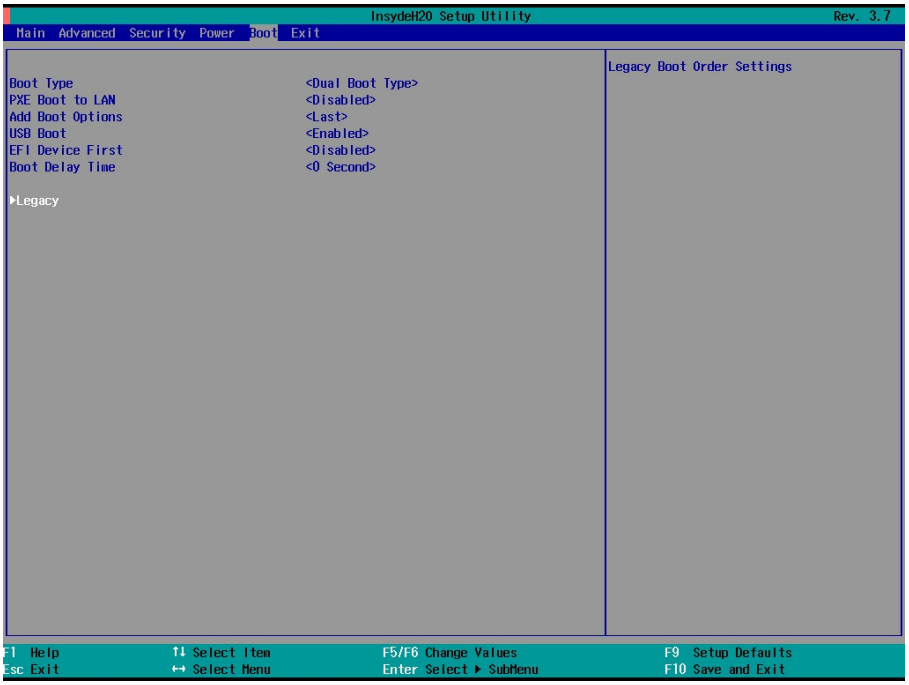
Now you will need to return the boot priority to its original configuration so that the system will boot from the original disk. This is done for two reasons; the first is security, so that the machine may not be rebooted from unauthorized USB drives

The second reason, however, is functional: currently, if the V2616A is set to boot from the USB drive, then ***the V2616A will hang any time a USB data drive (i.e.: non-bootable image) is inserted in the machine at boot time***. The V2616A does not currently have the capacity to distinguish between simple USB data drives and boot-capable OS drives.

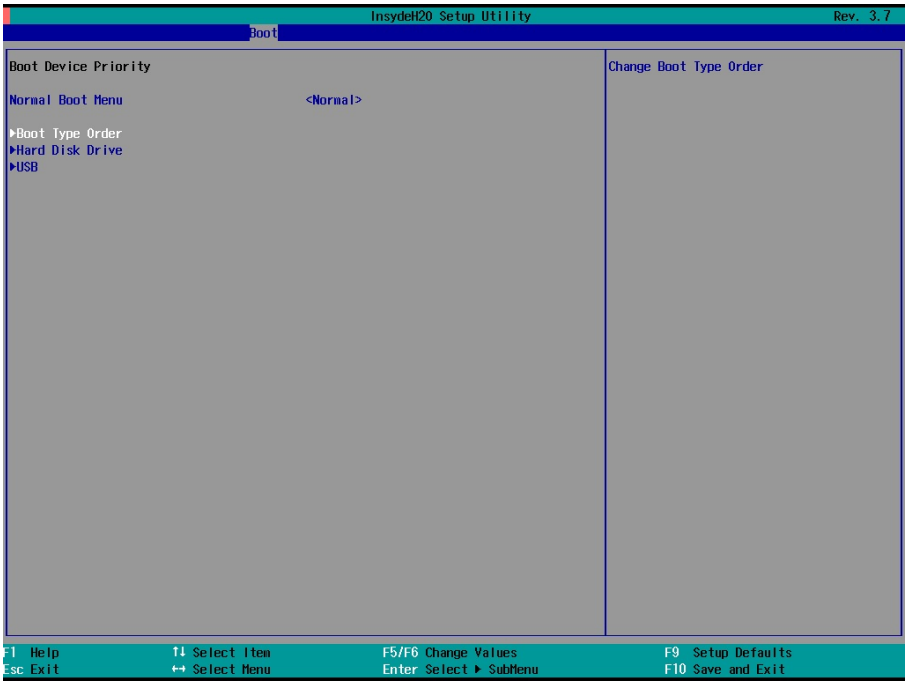
2. Reboot the system, and, during the POST process, press F2 until you hear a long beep. You should then enter the BIOS setup menu. Select **SCU** to enter the BIOS setup menu.



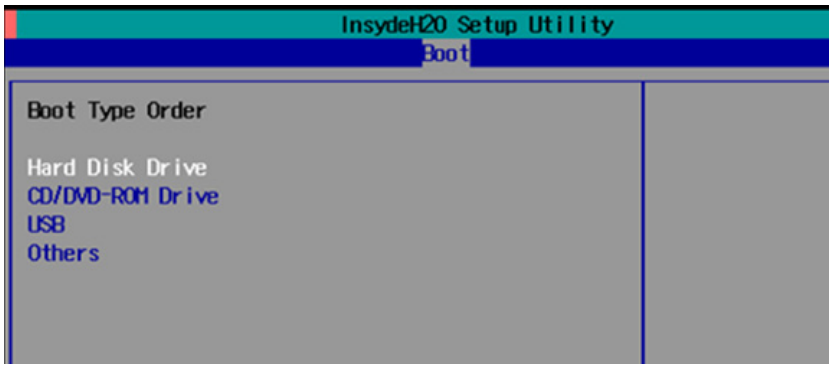
5. Use the left/right arrow keys to navigate to the **Boot** tab, and then press **Enter**.
6. Use the up/down arrows to highlight **Legacy** in the boot tab's menu, and press **Enter**.



7. Use the up/down arrow keys to navigate to the **Boot Type Order** link, and then press **Enter**.



8. Use the up/down arrows to highlight **Hard Disk Drive** and then use the plus/minus signs (**+ -**) to move it to the first boot priority position



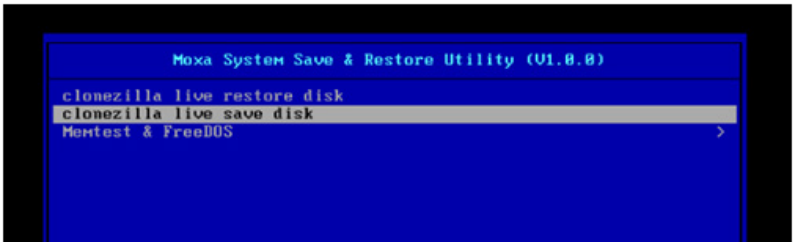
9. Press F10 and then press **Enter** to save and exit the BIOS configuration interface. This should initiate the next reboot, and your system should now boot from the USB drive.

Creating a Custom System Image

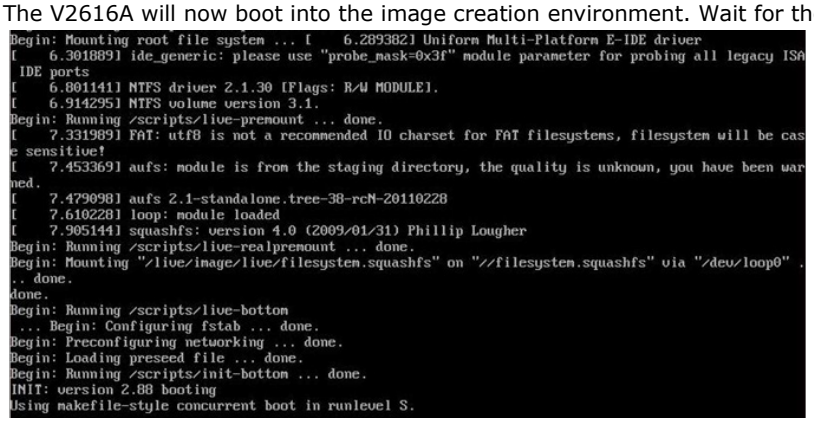
The procedure below describes a configuration for restoring a complete system that has been customized with user applications and scripts. Here, you will save to the USB drive a copy of the entire system as it is currently configured to be used as a full system recovery image should the system crash. During this process, ***all files on your USB that are mounted under*** *F:\home\partimag* ***will be overwritten***.

You should have already changed the BIOS settings to set the USB drive as the first boot priority. If you have not yet reset the boot priority, first return to **Step 2: Setting the BIOS to Boot via USB** and follow the directions there.

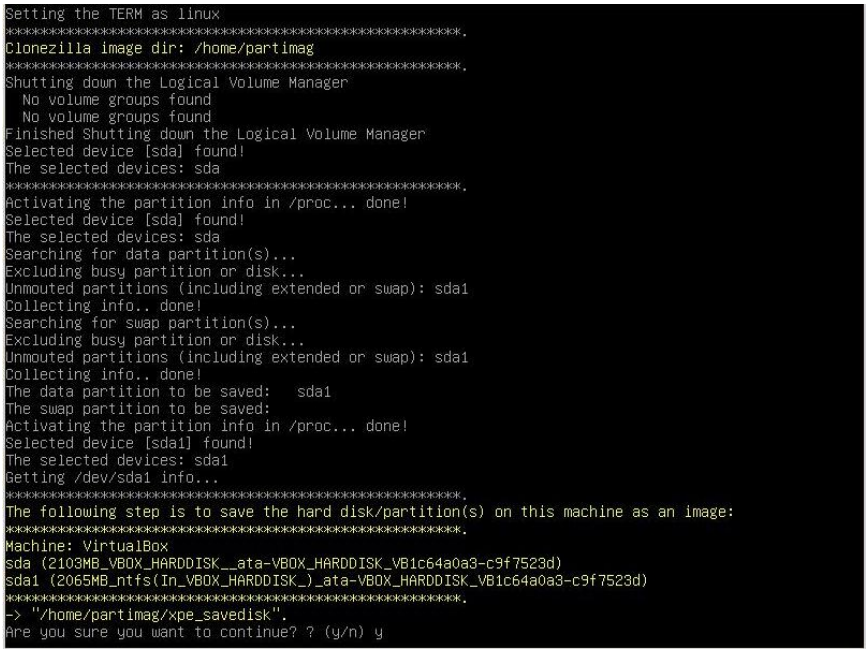
1. Once the system has launched and the V2616A has booted the recovery environment from the USB drive, navigate to the entry Clonezilla Live Save Disk, and select it by pressing Enter. This will take you into the recovery image creation environment, allowing you to copy your full system setup to the USB drive.



2. The V2616A will now boot into the image creation environment. Wait for the boot process to finish.



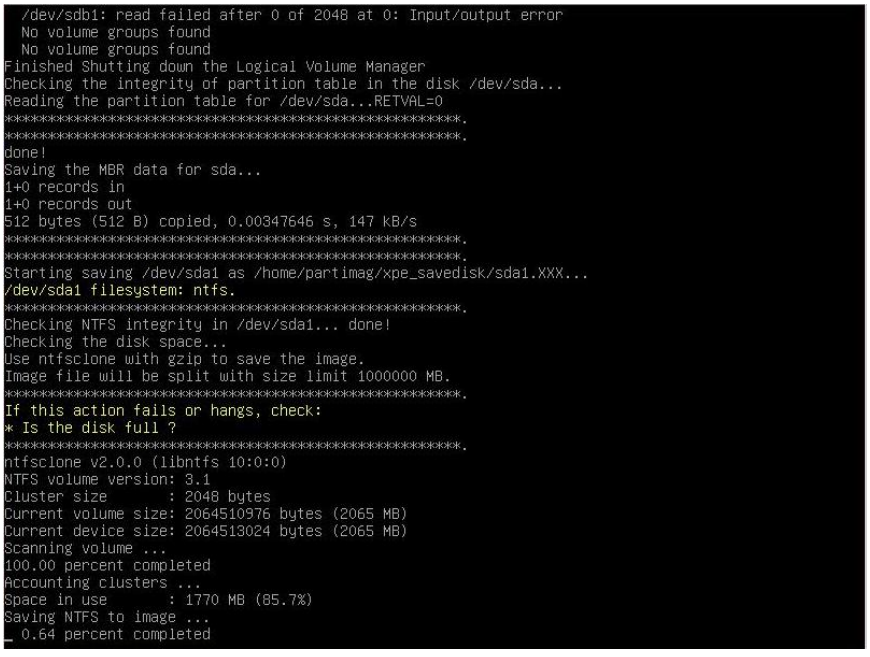
3. Once the image creation environment has completed booting up, you will be given a warning and asked if you wish to continue. Please keep in mind that if you create the recovery image, then any residual files currently copied to the /home/partimag directory will be deleted. If there are any files remaining in the USB partition image directory and you wish to save them, you must exit the recovery environment and copy these files to another disk. If you wish to continue with the image creation, press Y (case insensitive) to continue (screenshot on the next page).



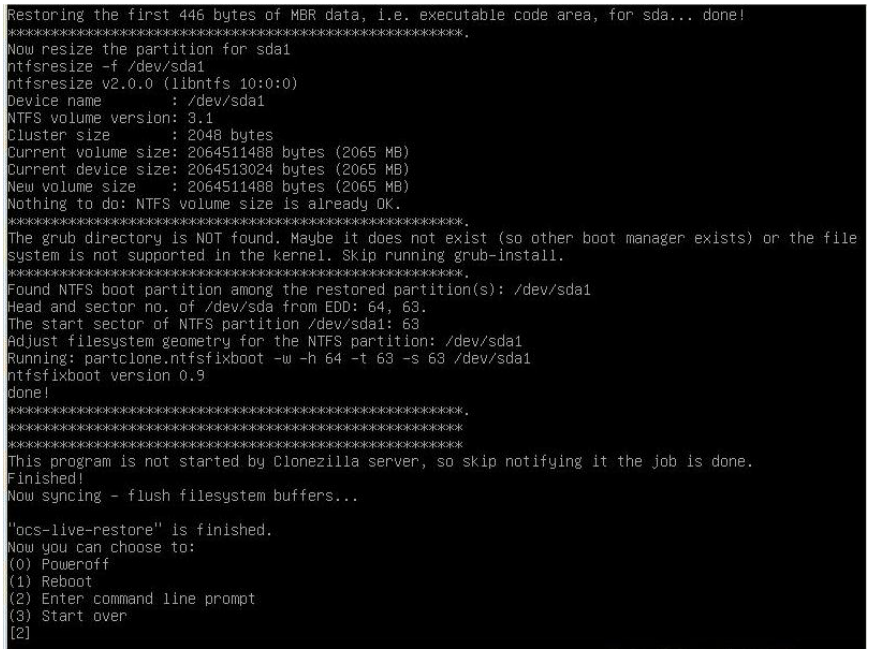
WARNING

The same filename is used for all recovery images, whether for the full system backup or for the clean OS image installation. This means that currently, it is impossible to have more than one system image per USB drive.

4. At this point, the recovery environment will copy of the entire hard drive to your USB drive. This will likely take several minutes, and perhaps as long as half an hour. Do not remove the USB drive during this time; wait patiently for the process to finish. Depending on the speed of your USB drive, this may be a good time to get a cup of coffee, or take a nap.



5. At this point you may choose to power down the computer (press 0), reboot (press 1), enter a console terminal (access a console TTY -- press 2), or re-initiate the entire procedure (press 3). Do not remove the USB drive until you have rebooted or powered down the system.



6. Once you have powered down the system and removed the USB drive, you have finished configuring the recovery environment. The USB drive should be clearly labeled and stored in a safe place. You may now continue to Step 4: Reset the BIOS to its Original State, or you may go to and test the recovery procedure for successful configuration (Step 5).

A

Software Components

acpi	1.5-2	displays information on ACPI devices
acpi-support-base	0.137-5	scripts for handling base ACPI events such as the power button
acpid	1:2.0.7-1	Advanced Configuration and Power Interface event daemon
adduser	3.112+nmu2	add and remove users and groups
alacarte	0.13.2-1	easy GNOME menu editing tool
alsa-base	1.0.23+dfsg-2	ALSA driver configuration files
alsa-utils	1.0.23-3	Utilities for configuring and using ALSA
apache2	2.2.16-6+squeeze1	Apache HTTP Server metapackage
apache2-mpm-prefork	2.2.16-6+squeeze1	Apache HTTP Server - traditional non-threaded model
apache2-utils	2.2.16-6+squeeze1	utility programs for webservers
apache2.2-bin	2.2.16-6+squeeze1	Apache HTTP Server common binary files
apache2.2-common	2.2.16-6+squeeze1	Apache HTTP Server common files
app-install-data	2010.11.17	Application Installer Data Files
apt	0.8.10.3+squeeze1	Advanced front-end for dpkg
apt-utils	0.8.10.3+squeeze1	APT utility programs
apt-xapian-index	0.41	maintenance and search tools for a Xapian index of Debian packages
aptitude	0.6.3-3.2	terminal-based package manager (terminal interface only)
aspell	0.60.6-4	GNU Aspell spell-checker
aspell-en	6.0-0-6	English dictionary for GNU Aspell
at	3.1.12-1	Delayed job execution and batch processing
at-spi	1.30.1-3	Assistive Technology Service Provider Interface
autoconf	2.67-2	automatic configure script builder
autoconf2.13	2.13-60	automatic configure script builder (obsolete version)
automake	1:1.11.1-1	A tool for generating GNU Standards-compliant Makefiles
automake1.4	1:1.4-p6-13.1	A tool for generating GNU Standards-compliant Makefiles
autotools-dev	20100122.1	Update infrastructure for config.{guess,sub} files
base-files	6.0squeeze2	Debian base system miscellaneous files
base-passwd	3.5.22	Debian base system master password and group files
bash	4.1-3	The GNU Bourne Again SHell
bash-completion	1:1.2-3	programmable completion for the bash shell
bc	1.06.95-2	The GNU bc arbitrary precision calculator language
bind9-host	1:9.7.3.dfsg-1~squeeze3	Version of 'host' bundled with BIND 9.X
binutils	2.20.1-16	The GNU assembler, linker and binary utilities
brasero	2.30.3-2	CD/DVD burning application for GNOME
brasero-common	2.30.3-2	Common files for the Brasero CD burning application and library

bridge-utils	1.4-5	Utilities for configuring the Linux Ethernet bridge
bsdmainutils	8.0.13	collection of more utilities from FreeBSD
bsdutils	1:2.17.2-9	Basic utilities from 4.4BSD-Lite
busybox	1:1.17.1-8	Tiny utilities for small and embedded systems
bzip2	1.0.5-6	high-quality block-sorting file compressor - utilities
ca-certificates	20090814+nmu2	Common CA certificates
capplets-data	1:2.30.1-2	configuration applets for GNOME - data files
cdrdao	1:1.2.3-0.1	records CDs in Disk-At-Once (DAO) mode
console-setup	1.68+squeeze2	console font and keymap setup program
console-terminus	4.30-2	Fixed-width fonts for fast reading on the Linux console
consolekit	0.4.1-4	framework for defining and tracking users, sessions and seats
coreutils	8.5-1	GNU core utilities
cpio	2.11-4	GNU cpio -- a program to manage archives of files
cpp	4:4.4.5-1	The GNU C preprocessor (cpp)
cpp-4.3	4.3.5-4	The GNU C preprocessor
cpp-4.4	4.4.5-8	The GNU C preprocessor
cpufrequtils	007-1	utilities to deal with the cpufreq Linux kernel feature
cron	3.0pl1-116	process scheduling daemon
dash	0.5.5.1-7.4	POSIX-compliant shell
dbus	1.2.24-4+squeeze1	simple interprocess messaging system
dbus-x11	1.2.24-4+squeeze1	simple interprocess messaging system (X11 deps)
debconf	1.5.36.1	Debian configuration management system
debconf-i18n	1.5.36.1	full internationalization support for debconf
debian-archive-keyring	2010.08.28	GnuPG archive keys of the Debian archive
debian-faq	4.0.4+nmu1	The Debian FAQ
debianutils	3.4	Miscellaneous utilities specific to Debian
defoma	0.11.11	Debian Font Manager -- automatic font configuration framework
deskbar-applet	2.32.0-1	universal search and navigation bar for GNOME
desktop-base	6.0.5squeeze1	common files for the Debian Desktop
desktop-file-utils	0.15-2	Utilities for .desktop files
dictionaries-common	1.5.17	Common utilities for spelling dictionary tools
diffutils	1:3.0-1	File comparison utilities
discover	2.1.2-5	hardware identification system
discover-data	2.2010.10.18	Data lists for Discover hardware detection system
dmidecode	2.9-1.2	Dump Desktop Management Interface data
dmraid	1.0.0.rc16-4.1	Device-Mapper Software RAID support tool
dmsetup	2:1.02.48-5	The Linux Kernel Device Mapper userspace library
dmz-cursor-theme	0.4.3	Style neutral, scalable cursor theme
dnsutils	1:9.7.3.dfsg-1~squeeze3	Clients provided with BIND
docbook-xml	4.5-7	standard XML documentation system for software and systems
dosfstools	3.0.9-1	utilities for making and checking MS-DOS FAT filesystems
dpkg	1.15.8.11	Debian package management system
dvd+rw-tools	7.1-6	DVD+-RW/R tools
e2fslibs	1.41.12-4stable1	ext2/ext3/ext4 file system libraries
e2fsprogs	1.41.12-4stable1	ext2/ext3/ext4 file system utilities
eject	2.1.5+deb1+cvs20081104-7.1	ejects CDs and operates CD-Changers under Linux
esound-common	0.2.41-8	Enlightened Sound Daemon - Common files

ethtool	1:2.6.34-3	display or change Ethernet device settings
evolution-data-server	2.30.3-2	evolution database backend server
evolution-data-server-common	2.30.3-2	architecture independent files for Evolution Data Server
exim4-base	4.72-6+squeeze2	support files for all Exim MTA (v4) packages
exim4-config	4.72-6+squeeze2	configuration for the Exim MTA (v4)
exim4-daemon-light	4.72-6+squeeze2	lightweight Exim MTA (v4) daemon
exuberant-ctags	1:5.8-3squeeze1	build tag file indexes of source code definitions
fancontrol	1:3.1.2-6	utilities to read temperature/voltage/fan sensors
file	5.04-5	Determines file type using "magic" numbers
file-roller	2.30.2-2	an archive manager for GNOME
findutils	4.4.2-1+b1	utilities for finding files--find, xargs
fontconfig	2.8.0-2.1	generic font configuration library - support binaries
fontconfig-config	2.8.0-2.1	generic font configuration library - configuration
ftp	0.17-23	The FTP client
fuse-utils	2.8.4-1.1	Filesystem in USErspace (utilities)
g++	4:4.4.5-1	The GNU C++ compiler
g++-4.4	4.4.5-8	The GNU C++ compiler
gcc	4:4.4.5-1	The GNU C compiler
gcc-4.3	4.3.5-4	The GNU C compiler
gcc-4.3-base	4.3.5-4	The GNU Compiler Collection (base package)
gcc-4.4	4.4.5-8	The GNU C compiler
gcc-4.4-base	4.4.5-8	The GNU Compiler Collection (base package)
gconf2	2.28.1-6	GNOME configuration database system (support tools)
gconf2-common	2.28.1-6	GNOME configuration database system (common files)
gdb	7.0.1-2+b1	The GNU Debugger
gdbserver	7.0.1-2+b1	The GNU Debugger (remote server)
gdm3	2.30.5-6squeeze3	Next generation GNOME Display Manager
genisoimage	9:1.1.11-1	Creates ISO-9660 CD-ROM filesystem images
geoip-database	1.4.7~beta6+dfsg-1	IP lookup command line tools that use the GeoIP library (country database)
gettext-base	0.18.1.1-3	GNU Internationalization utilities for the base system
gksu	2.0.2-5	graphical frontend to su
gnome-about	2.30.2-2	The GNOME about box
gnome-applets	2.30.0-3	Various applets for the GNOME panel - binary files
gnome-applets-data	2.30.0-3	Various applets for the GNOME panel - data files
gnome-control-center	1:2.30.1-2	utilities to configure the GNOME desktop
gnome-desktop-data	2.30.2-2	Common files for GNOME desktop apps
gnome-dictionary	2.30.0-2	GNOME dictionary application
gnome-icon-theme	2.30.3-2	GNOME Desktop icon theme
gnome-keyring	2.30.3-5	GNOME keyring services (daemon and tools)
gnome-media	2.30.0-1	GNOME media utilities
gnome-media-common	2.30.0-1	GNOME media utilities - common files
gnome-menus	2.30.3-1	an implementation of the freedesktop menu specification for GNOME
gnome-mime-data	2.18.0-1	base MIME and Application database for GNOME.
gnome-netstatus-applet	2.28.1-1	Network status applet for GNOME
gnome-panel	2.30.2-2	launcher and docking facility for GNOME
gnome-panel-data	2.30.2-2	common files for the GNOME Panel
gnome-power-manager	2.32.0-2	power management tool for the GNOME desktop
gnome-screensaver	2.30.0-2squeeze1	GNOME screen saver and locker
gnome-session	2.30.2-3	The GNOME Session Manager - GNOME 2 session

gnome-session-bin	2.30.2-3	The GNOME Session Manager - Minimal runtime
gnome-session-common	2.30.2-3	Common files for the GNOME session manager
gnome-settings-daemon	2.30.2-2+squeeze1	daemon handling the GNOME session settings
gnome-system-monitor	2.28.1-1	Process viewer and system resource monitor for GNOME
gnome-terminal	2.30.2-1	The GNOME terminal emulator application
gnome-terminal-data	2.30.2-1	Data files for the GNOME terminal emulator
gnome-themes	2.30.2-1	official themes for the GNOME desktop
gnome-utils-common	2.30.0-2	data files for the GNOME utilities
gnupg	1.4.10-4	GNU privacy guard - a free PGP replacement
gpgv	1.4.10-4	GNU privacy guard - signature verification tool
grep	2.6.3-3	GNU grep, egrep and fgrep
groff-base	1.20.1-10	GNU troff text-formatting system (base system components)
gstreamer0.10-alsa	0.10.30-1	GStreamer plugin for ALSA
gstreamer0.10-plugins-base	0.10.30-1	GStreamer plugins from the "base" set
gstreamer0.10-plugins-good	0.10.24-1	GStreamer plugins from the "good" set
gstreamer0.10-plugins-ugly	0.10.15-1	GStreamer plugins from the "ugly" set
gstreamer0.10-x	0.10.30-1	GStreamer plugins for X11 and Pango
gtk2-engines	1:2.20.1-1	theme engines for GTK+ 2.x
gtk2-engines-pixbuf	2.20.1-2	Pixbuf-based theme for GTK+ 2.x
gvfs	1.6.4-3	userspace virtual filesystem - server
gvfs-backends	1.6.4-3	userspace virtual filesystem - backends
gzip	1.3.12-9	GNU compression utilities
hdparm	9.32-1	tune hard disk parameters for high performance
heirloom-mailx	12.4-2	feature-rich BSD mail(1)
hicolor-icon-theme	0.12-1	default fallback theme for FreeDesktop.org icon themes
host	1:9.7.3.dfsg-1~squeeze3	Transitional package
hostname	3.04	utility to set/show the host name or domain name
hunspell-en-us	20070829-4	English_american dictionary for hunspell
hwdata	0.230-1	hardware identification / configuration data
ifrename	30~pre9-5	Rename network interfaces based on various static criteria
ifupdown	0.6.10	high level tools to configure network interfaces
initramfs-tools	0.98.8	tools for generating an initramfs
initscripts	2.88dsf-13.1	scripts for initializing and shutting down the system
insserv	1.14.0-2	Tool to organize boot sequence using LSB init.d script dependencies
install-info	4.13a.dfsg.1-6	Manage installed documentation in info format
iproute	20100519-3	networking and traffic control tools
iptables	1.4.8-3	administration tools for packet filtering and NAT
iputils-ping	3:20100418-3	Tools to test the reachability of network hosts
isc-dhcp-client	4.1.1-P1-15+squeeze2	ISC DHCP client
isc-dhcp-common	4.1.1-P1-15+squeeze2	common files used by all the isc-dhcp* packages
iso-codes	3.23-1	ISO language, territory, currency, script codes and their translations

kbd	1.15.2-2	Linux console font and keytable utilities
keyboard-configuration	1.68+squeeze2	system-wide keyboard preferences
klibc-utils	1.5.20-1+squeeze1	small utilities built with klibc for early boot
liba52-0.7.4	0.7.4-14	library for decoding ATSC A/52 streams
libaa1	1.4p5-38	ascii art library
libacl1	2.2.49-4	Access control list shared library
libao-common	1.0.0-5	Cross Platform Audio Output Library (Common files)
libao4	1.0.0-5	Cross Platform Audio Output Library
libapache2-mod-php5	5.3.3-7+squeeze3	server-side, HTML-embedded scripting language (Apache 2 module)
libapr1	1.4.2-6+squeeze3	The Apache Portable Runtime Library
libaprutil1	1.3.9+dfsg-5	The Apache Portable Runtime Utility Library
libaprutil1-dbd-sqlite3	1.3.9+dfsg-5	The Apache Portable Runtime Utility Library - SQLite3 Driver
libaprutil1-ldap	1.3.9+dfsg-5	The Apache Portable Runtime Utility Library - LDAP Driver
libarchive1	2.8.4-1	Single library to read/write tar, cpio, pax, zip, iso9660, etc.
libart-2.0-2	2.3.21-1	Library of functions for 2D graphics - runtime files
libasound2	1.0.23-2.1	shared library for ALSA applications
libaspell15	0.60.6-4	GNU Aspell spell-checker runtime library
libasyncns0	0.3-1.1	Asyncronous name service query library
libatasmart4	0.17+git20100219-2	ATA S.M.A.R.T. reading and parsing library
libatk1.0-0	1.30.0-1	The ATK accessibility toolkit
libatk1.0-data	1.30.0-1	Common files for the ATK accessibility toolkit
libatspi1.0-0	1.30.1-3	C binding libraries of at-spi for GNOME Accessibility
libattr1	1:2.4.44-2	Extended attribute shared library
libaudiofile0	0.2.6-8	Open-source version of SGI's audiofile library
libaudit0	1.7.13-1+b2	Dynamic library for security auditing
libavahi-client3	0.6.27-2+squeeze1	Avahi client library
libavahi-common-data	0.6.27-2+squeeze1	Avahi common data files
libavahi-common3	0.6.27-2+squeeze1	Avahi common library
libavahi-glib1	0.6.27-2+squeeze1	Avahi glib integration library
libavc1394-0	0.5.3-1+b2	control IEEE 1394 audio/video devices
libbind9-60	1:9.7.3.dfsg-1~squeeze3	BIND9 Shared Library used by BIND
libblas3gf	1.2-8	Basic Linear Algebra Reference implementations, shared library
libblkid1	2.17.2-9	block device id library
libbluetooth3	4.66-3	Library to use the BlueZ Linux Bluetooth stack
libbonobo2-0	2.24.3-1	Bonobo CORBA interfaces library
libbonobo2-common	2.24.3-1	Bonobo CORBA interfaces library -- support files
libbonoboui2-0	2.24.3-1	The Bonobo UI library
libbonoboui2-common	2.24.3-1	The Bonobo UI library -- common files
libboost-iostreams1.42.0	1.42.0-4	Boost.Iostreams Library
libbrasero-media0	2.30.3-2	CD/DVD burning library for GNOME - runtime
libbsd0	0.2.0-1	utility functions from BSD systems - shared library
libburn4	0.8.0.pl00-2+squeeze1	library to provide CD/DVD writing functions
libbz2-1.0	1.0.5-6	high-quality block-sorting file compressor library - runtime
libc-bin	2.11.2-10	Embedded GNU C Library: Binaries
libc-dev-bin	2.11.2-10	Embedded GNU C Library: Development binaries

libc6	2.11.2-10	Embedded GNU C Library: Shared libraries
libc6-dev	2.11.2-10	Embedded GNU C Library: Development Libraries and Header Files
libc6-i386	2.11.2-10	Embedded GNU C Library: 32-bit shared libraries for AMD64
libcaca0	0.99.beta17-1	colour ASCII art library
libcairo-perl	1.070-1	Perl interface to the Cairo graphics library
libcairo2	1.8.10-6	The Cairo 2D vector graphics library
libcairomm-1.0-1	1.8.4-3	C++ wrappers for Cairo (shared libraries)
libcamel1.2-14	2.30.3-2	The Evolution MIME message handling library
libcanberra-gtk-module	0.24-1	translates Gtk+ widgets signals to event sounds
libcanberra-gtk0	0.24-1	Gtk+ helper for playing widget event sounds with libcanberra
libcanberra0	0.24-1	a simple abstract interface for playing event sounds
libcap2	1:2.19-3	support for getting/setting POSIX.1e capabilities
libcdio-cdda0	0.81-4	library to read and control digital audio CDs
libcdio-paranoia0	0.81-4	library to read digital audio CDs with error correction
libcdio10	0.81-4	library to read and control CD-ROM
libcdparanoia0	3.10.2+debian-9	audio extraction tool for sampling CDs (library)
libck-connector0	0.4.1-4	ConsoleKit libraries
libcomerr2	1.41.12-4stable1	common error description library
libcpufreq0	007-1	shared library to deal with the cpufreq Linux kernel feature
libcroco3	0.6.2-1	a generic Cascading Style Sheet (CSS) parsing and manipulation toolkit
libcups2	1.4.4-7	Common UNIX Printing System(tm) - Core library
libcwidget3	0.5.16-3	high-level terminal interface library for C++ (runtime files)
libdatrie1	0.2.4-1	Double-array trie library
libdb4.6	4.6.21-16	Berkeley v4.6 Database Libraries [runtime]
libdb4.7	4.7.25-9	Berkeley v4.7 Database Libraries [runtime]
libdb4.8	4.8.30-2	Berkeley v4.8 Database Libraries [runtime]
libdbus-1-3	1.2.24-4+squeeze1	simple interprocess messaging system
libdbus-glib-1-2	0.88-2.1	simple interprocess messaging system (GLib-based shared library)
libdevmapper1.02.1	2:1.02.48-5	The Linux Kernel Device Mapper userspace library
libdiscover2	2.1.2-5	hardware identification library
libdmraid1.0.0.rc16	1.0.0.rc16-4.1	Device-Mapper Software RAID support tool - shared library
libdns69	1:9.7.3.dfsg-1~squeeze3	DNS Shared Library used by BIND
libdrm-intel1	2.4.21-1~squeeze3	Userspace interface to intel-specific kernel DRM services -- runtime
libdrm-nouveau1	2.4.21-1~squeeze3	Userspace interface to nouveau-specific kernel DRM services -- runtime
libdrm-radeon1	2.4.21-1~squeeze3	Userspace interface to radeon-specific kernel DRM services -- runtime
libdrm2	2.4.21-1~squeeze3	Userspace interface to kernel DRM services -- runtime
libdv4	1.0.0-2.1	software library for DV format digital video (runtime lib)
libdvdnav4	4.1.3-7	DVD navigation library
libdvdread4	4.1.3-10	library for reading DVDs
libebackend1.2-0	2.30.3-2	Utility library for evolution data servers

libebook1.2-9	2.30.3-2	Client library for evolution address books
libecal1.2-7	2.30.3-2	Client library for evolution calendars
libedata-book1.2-2	2.30.3-2	Backend library for evolution address books
libedata-cal1.2-7	2.30.3-2	Backend library for evolution calendars
libedataserver1.2-13	2.30.3-2	Utility library for evolution data servers
libedataserverui1.2-8	2.30.3-2	GUI utility library for evolution data servers
libedit2	2.11-20080614-2	BSD editline and history libraries
libeggdbus-1-0	0.6-1	D-Bus bindings for GObject
libegroupwise1.2-13	2.30.3-2	Client library for accessing groupwise POA through SOAP interface
libelf1	0.148-1	library to read and write ELF files
libenchant1c2a	1.6.0-1	a wrapper library for various spell checker engines
libept1	1.0.4	High-level library for managing Debian package information
libesd0	0.2.41-8	Enlightened Sound Daemon - Shared libraries
libevent-1.4-2	1.4.13-stable-1	An asynchronous event notification library
libexempi3	2.1.1-1	library to parse XMP metadata (Library)
libexif12	0.6.19-1	library to parse EXIF files
libexpat1	2.0.1-7	XML parsing C library - runtime library
libfam0	2.7.0-17	Client library to control the FAM daemon
libffi5	3.0.9-3	Foreign Function Interface library runtime
libfile-copy-recursive-perl	0.38-1	Perl extension for recursively copying files and directories
libflac8	1.2.1-2+b1	Free Lossless Audio Codec - runtime C library
libfont-afm-perl	1.20-1	Font::AFM - Interface to Adobe Font Metrics files
libfont-freetype-perl	0.03-1	Read font files and render glyphs from Perl using FreeType2
libfontconfig1	2.8.0-2.1	generic font configuration library - runtime
libfontenc1	1:1.0.5-2	X11 font encoding library
libfreetype6	2.4.2-2.1	FreeType 2 font engine, shared library files
libfs6	2:1.0.2-1	X11 Font Services library
libfuse2	2.8.4-1.1	Filesystem in USErspace library
libgail-common	2.20.1-2	GNOME Accessibility Implementation Library -- common modules
libgail18	2.20.1-2	GNOME Accessibility Implementation Library -- shared libraries
libgc1c2	1:6.8-1.2	conservative garbage collector for C and C++
libgcc1	1:4.4.5-8	GCC support library
libgconf2-4	2.28.1-6	GNOME configuration database system (shared libraries)
libgcr0	2.30.3-5	Library for Crypto UI related task - runtime
libgcrypt11	1.4.5-2	LGPL Crypto library - runtime library
libgdata-google1.2-1	2.30.3-2	Client library for accessing Google POA through SOAP interface
libgdata1.2-1	2.30.3-2	Client library for accessing Google POA through SOAP interface
libgdbm3	1.8.3-9	GNU dbm database routines (runtime version)
libgdict-1.0-6	2.30.0-2	GNOME Dictionary base library - runtime
libgdu0	2.30.1-2	GObject based Disk Utility Library
libgeoip1	1.4.7~beta6+dfsg-1	A non-DNS IP-to-country resolver library
libgfortran3	4.4.5-8	Runtime library for GNU Fortran applications
libgksu2-0	2.0.13~pre1-3	library providing su and sudo functionality
libgl1-mesa-dri	7.7.1-4	A free implementation of the OpenGL API -- DRI

		modules
libgl1-mesa-glx	7.7.1-4	A free implementation of the OpenGL API -- GLX runtime
libglade2-0	1:2.6.4-1	library to load .glade files at runtime
libglib-perl	2:1.223-1	interface to the GLib and GObject libraries
libglib2.0-0	2.24.2-1	The GLib library of C routines
libglib2.0-data	2.24.2-1	Common files for GLib library
libglibmm-2.4-1c2a	2.24.2-1	C++ wrapper for the GLib toolkit (shared libraries)
libglu1-mesa	7.7.1-4	The OpenGL utility library (GLU)
libgmime-2.4-2	2.4.14-1+nmu1	MIME message parser and creator library - runtime
libgmp3c2	2:4.3.2+dfsg-1	Multiprecision arithmetic library
libgnome-desktop-2-17	2.30.2-2	Utility library for loading .desktop files - runtime files
libgnome-keyring0	2.30.1-1	GNOME keyring services library
libgnome-media0	2.30.0-1	runtime libraries for the GNOME media utilities
libgnome-menu2	2.30.3-1	an implementation of the freedesktop menu specification for GNOME
libgnome-window-settings1	1:2.30.1-2	Utility library for getting window manager settings
libgnome2-0	2.30.0-1	The GNOME library - runtime files
libgnome2-canvas-perl	1.002-2	Perl interface to the GNOME canvas library
libgnome2-common	2.30.0-1	The GNOME library - common files
libgnome2-perl	1.042-2	Perl interface to the GNOME libraries
libgnome2-vfs-perl	1.081-1	Perl interface to the 2.x series of the GNOME VFS library
libgnomecanvas2-0	2.30.1-1	A powerful object-oriented display - runtime files
libgnomecanvas2-common	2.30.1-1	A powerful object-oriented display - common files
libgnomekbd-common	2.30.2-2	GNOME library to manage keyboard configuration - common files
libgnomekbd4	2.30.2-2	GNOME library to manage keyboard configuration - shared library
libgnomeui-0	2.24.3-1	The GNOME libraries (User Interface) - runtime files
libgnomeui-common	2.24.3-1	The GNOME libraries (User Interface) - common files
libgnomevfs2-0	1:2.24.3-1	GNOME Virtual File System (runtime libraries)
libgnomevfs2-common	1:2.24.3-1	GNOME Virtual File System (common files)
libgnomevfs2-extra	1:2.24.3-1	GNOME Virtual File System (extra modules)
libgnutls26	2.8.6-1	the GNU TLS library - runtime library
libgomp1	4.4.5-8	GCC OpenMP (GOMP) support library
libgp11-0	2.30.3-5	Glib wrapper library for PKCS#11 - runtime
libgpg-error0	1.6-1	library for common error values and messages in GnuPG components
libgpgme11	1.2.0-1.2	GPGME - GnuPG Made Easy
libgphoto2-2	2.4.6-3	gphoto2 digital camera library
libgphoto2-port0	2.4.6-3	gphoto2 digital camera port library
libgpm2	1.20.4-3.3	General Purpose Mouse - shared library
libgsf-1-114	1.14.18-1	Structured File Library - runtime version
libgsf-1-common	1.14.18-1	Structured File Library - common files
libgssapi-krb5-2	1.8.3+dfsg-4squeeze1	MIT Kerberos runtime libraries - krb5 GSS-API Mechanism
libgssglue1	0.1-4	mechanism-switch gssapi library
libgssrpc4	1.8.3+dfsg-4squeeze1	MIT Kerberos runtime libraries - GSS enabled ONCRPC
libgstreamer-plugins-base0.10-0	0.10.30-1	GStreamer libraries from the "base" set

libgstreamer0.10-0	0.10.30-1	Core GStreamer libraries and elements
libgtk2-perl	2:1.222-1	Perl interface to the 2.x series of the Gimp Toolkit library
libgtk2.0-0	2.20.1-2	The GTK+ graphical user interface library
libgtk2.0-bin	2.20.1-2	The programs for the GTK+ graphical user interface library
libgtk2.0-common	2.20.1-2	Common files for the GTK+ graphical user interface library
libgtkmm-2.4-1c2a	1:2.20.3-1	C++ wrappers for GTK+ (shared libraries)
libgtop2-7	2.28.1-1	gtop system monitoring library (shared)
libgtop2-common	2.28.1-1	gtop system monitoring library (common)
libgucharmap7	1:2.30.3-1	Unicode browser widget library (shared library)
libgudev-1.0-0	164-3	GObject-based wrapper library for libudev
libgweather-common	2.30.3-1	GWeather common files
libgweather1	2.30.3-1	GWeather shared library
libhal-storage1	0.5.14-3	Hardware Abstraction Layer - shared library for storage devices
libhal1	0.5.14-3	Hardware Abstraction Layer - shared library
libhtml-format-perl	2.04-2	format HTML syntax trees into text, PostScript or RTF
libhtml-parser-perl	3.66-1	collection of modules that parse HTML text documents
libhtml-tagset-perl	3.20-2	Data tables pertaining to HTML
libhtml-tree-perl	3.23-2	Perl module to represent and create HTML syntax trees
libhunspell-1.2-0	1.2.11-1	spell checker and morphological analyzer (shared library)
libical0	0.44-3	iCalendar library implementation in C (runtime)
libice6	2:1.0.6-2	X11 Inter-Client Exchange library
libicu44	4.4.1-7	International Components for Unicode
libid3tag0	0.15.1b-10	ID3 tag reading library from the MAD project
libidl0	0.8.14-0.1	library for parsing CORBA IDL files
libidn11	1.15-2	GNU Libidn library, implementation of IETF IDN specifications
libiec61883-0	1.2.0-0.1	an partial implementation of IEC 61883
libimobiledevice1	1.0.2-1	Library for communicating with the iPhone and iPod Touch
libisc62	1:9.7.3.dfsg-1~squeeze3	ISC Shared Library used by BIND
libisccc60	1:9.7.3.dfsg-1~squeeze3	Command Channel Library used by BIND
libisccfg62	1:9.7.3.dfsg-1~squeeze3	Config File Handling Library used by BIND
libisofs6	0.6.32-2	library to create ISO9960 images
libiw30	30~pre9-5	Wireless tools - library
libjasper1	1.900.1-7+b1	The JasPer JPEG-2000 runtime library
libjpeg62	6b1-1	The Independent JPEG Group's JPEG runtime library (version 6.2)
libk5crypto3	1.8.3+dfsg-4squeeze1	MIT Kerberos runtime libraries - Crypto Library
libkadm5clnt-mit7	1.8.3+dfsg-4squeeze1	MIT Kerberos runtime libraries - Administration Clients
libkadm5srv-mit7	1.8.3+dfsg-4squeeze1	MIT Kerberos runtime libraries - KDC and Admin Server
libkdb5-4	1.8.3+dfsg-4squeeze1	MIT Kerberos runtime libraries - Kerberos database
libkeyutils1	1.4-1	Linux Key Management Utilities (library)
libklibc	1.5.20-1+squeeze1	minimal libc subset for use with initramfs
libkrb5-3	1.8.3+dfsg-4squeeze1	MIT Kerberos runtime libraries

libkrb5support0	1.8.3+dfsg-4squeeze1	MIT Kerberos runtime libraries - Support library
liblapack3gf	3.2.1-8	library of linear algebra routines 3 - shared version
libldap-2.4-2	2.4.23-7.2	OpenLDAP libraries
liblocale-gettext-perl	1.05-6	Using libc functions for internationalization in Perl
liblockfile1	1.08-4	NFS-safe locking library, includes dotlockfile program
libltdl7	2.2.6b-2	A system independent dlopen wrapper for GNU libtool
liblua5.1-0	5.1.4-5	Simple, extensible, embeddable programming language
liblwres60	1:9.7.3.dfsg-1~squeeze3	Lightweight Resolver Library used by BIND
liblzma2	5.0.0-2	XZ-format compression library
liblzo2-2	2.03-2	data compression library
libmad0	0.15.1b-5	MPEG audio decoder library
libmagic1	5.04-5	File type determination library using "magic" numbers
libmailtools-perl	2.06-1	Manipulate email in perl programs
libmetacity-private0	1:2.30.1-3	library for the Metacity window manager
libmpeg2-4	0.4.1-3	MPEG1 and MPEG2 video decoder library
libmpfr4	3.0.0-2	multiple precision floating-point computation
libnautilus-extension1	2.30.1-2squeeze1	libraries for nautilus components - runtime version
libncurses5	5.7+20100313-5	shared libraries for terminal handling
libncurses5-dev	5.7+20100313-5	developer's libraries and docs for ncurses
libncursesw5	5.7+20100313-5	shared libraries for terminal handling (wide character support)
libnet-dbus-perl	0.33.6-2	Extension for the DBus bindings
libnet-telnet-perl	3.03-3	Script telnetable connections
libnewt0.52	0.52.11-1	Not Erik's Windowing Toolkit - text mode windowing with slang
libnfnetlink0	1.0.0-1	Netfilter netlink library
libnfsidmap2	0.23-2	An nfs idmapping library
libnotify1	0.5.0-2	sends desktop notifications to a notification daemon
libnspr4-0d	4.8.6-1	NetScape Portable Runtime Library
libnss3-1d	3.12.8-1+squeeze1	Network Security Service libraries
libntfs-3g75	1:2010.3.6-1	ntfs-3g filesystem in userspace (FUSE) library
libntfs10	2.0.0-1+b1	library that provides common NTFS access functions
libogg0	1.2.0~dfsg-1	Ogg bitstream library
liboil0.3	0.3.17-2	Library of Optimized Inner Loops
libonig2	5.9.1-1	Oniguruma regular expressions library
liboobs-1-4	2.30.1-1	GObject based interface to system-tools-backends - shared library
libopencore-amrnb0	0.1.2-1	Adaptive Multi Rate speech codec - shared library
libopencore-amrwb0	0.1.2-1	Adaptive Multi-Rate - Wideband speech codec - shared library
liborbit2	1:2.14.18-0.1	libraries for ORBit2 - a CORBA ORB
liborc-0.4-0	1:0.4.6-2	Library of Optimized Inner Loops Runtime Compiler
libpam-ck-connector	0.4.1-4	ConsoleKit PAM module
libpam-gnome-keyring	2.30.3-5	PAM module to unlock the GNOME keyring upon login
libpam-modules	1.1.1-6.1	Pluggable Authentication Modules for PAM
libpam-runtime	1.1.1-6.1	Runtime support for the PAM library
libpam0g	1.1.1-6.1	Pluggable Authentication Modules library
libpanel-applet2-0	2.30.2-2	library for GNOME Panel applets
libpango-perl	1.221-2	Perl module to layout and render international text
libpango1.0-0	1.28.3-1+squeeze2	Layout and rendering of internationalized text
libpango1.0-common	1.28.3-1+squeeze2	Modules and configuration files for the Pango

libpangomm-1.4-1	2.26.2-1	C++ Wrapper for pango (shared libraries)
libparted0debian1	2.3-5	The GNU Parted disk partitioning shared library
libpcap0.8	1.1.1-2	system interface for user-level packet capture
libpci3	1:3.1.7-6	Linux PCI Utilities (shared library)
libpciaccess0	0.12.0-1	Generic PCI access library for X
libpcre3	8.02-1.1	Perl 5 Compatible Regular Expression Library - runtime files
libperl5.10	5.10.1-17squeeze2	shared Perl library
libpixman-1-0	0.16.4-1	pixel-manipulation library for X and cairo
libpkcs11-helper1	1.07-1	library that simplifies the interaction with PKCS#11
libplist1	1.3-2	Library for handling Apple binary and XML property lists
libpng12-0	1.2.44-1+squeeze1	PNG library - runtime
libpolkit-agent-1-0	0.96-4	PolicyKit Authentication Agent API
libpolkit-backend-1-0	0.96-4	PolicyKit backend API
libpolkit-gobject-1-0	0.96-4	PolicyKit Authorization API
libpolkit-gtk-1-0	0.96-3	PolicyKit GTK+ API
libpopt0	1.16-1	lib for parsing cmdline parameters
libproxy0	0.3.1-2	automatic proxy configuration management library (shared)
libpth20	2.0.7-16	The GNU Portable Threads
libpulse-mainloop-glib0	0.9.21-3+squeeze1	PulseAudio client libraries (glib support)
libpulse0	0.9.21-3+squeeze1	PulseAudio client libraries
libpython2.6	2.6.6-8+b1	Shared Python runtime library (version 2.6)
libqdbm14	1.8.77-4	QDBM Database Libraries [runtime]
librarian0	0.8.1-5	Documentation meta-data library (library package)
libraw1394-11	2.0.5-2	library for direct access to IEEE 1394 bus (aka FireWire)
libreadline5	5.2-7	GNU readline and history libraries, run-time libraries
libreadline6	6.1-3	GNU readline and history libraries, run-time libraries
librpcsecgss3	0.19-2	allows secure rpc communication using the rpcsec_gss protocol
librpm1	4.8.1-6	RPM shared library
librpmio1	4.8.1-6	RPM IO shared library
librsvg2-2	2.26.3-1	SAX-based renderer library for SVG files (runtime)
librsvg2-common	2.26.3-1	SAX-based renderer library for SVG files (extra runtime)
libsasl2-2	2.1.23.dfsg1-7	Cyrus SASL - authentication abstraction library
libsasl2-modules	2.1.23.dfsg1-7	Cyrus SASL - pluggable authentication modules
libselinux1	2.0.96-1	SELinux runtime shared libraries
libsensors4	1:3.1.2-6	library to read temperature/voltage/fan sensors
libsepol1	2.0.41-1	SELinux library for manipulating binary security policies
libsgutils2-2	1.29-1	utilities for devices using the SCSI command set (shared libraries)
libshout3	2.2.2-5+b1	MP3/Ogg Vorbis broadcast streaming library
libsidplay1	1.36.59-5	SID (MOS 6581) emulation library
libsigc++-2.0-0c2a	2.2.4.2-1	type-safe Signal Framework for C++ - runtime
libslab0a	2.30.0-1	beautification app library file
libslang2	2.2.2-4	The S-Lang programming library - runtime version
libsm6	2:1.1.1-1	X11 Session Management library
libsmbclient	2:3.5.6~dfsg-3squeeze4	shared library for communication with SMB/CIFS servers

libsndfile1	1.0.21-3+squeeze1	Library for reading/writing audio files
libsnmp-base	5.4.3~dfsg-2	SNMP (Simple Network Management Protocol) MIBs and documentation
libsnmp15	5.4.3~dfsg-2	SNMP (Simple Network Management Protocol) library
libsoup-gnome2.4-1	2.30.2-1	an HTTP library implementation in C -- GNOME support library
libsoup2.4-1	2.30.2-1	an HTTP library implementation in C -- Shared library
libspeex1	1.2~rc1-1	The Speex codec runtime library
libsqlite3-0	3.7.3-1	SQLite 3 shared library
libss2	1.41.12-4stable1	command-line interface parsing library
libssl0.9.8	0.9.8o-4squeeze1	SSL shared libraries
libstartup-notification0	0.10-1	library for program launch feedback (shared library)
libstdc++6	4.4.5-8	The GNU Standard C++ Library v3
libstdc++6-4.4-dev	4.4.5-8	The GNU Standard C++ Library v3 (development files)
libtag1-vanilla	1.6.3-1	TagLib Audio Meta-Data Library (Vanilla flavour)
libtag1c2a	1.6.3-1	TagLib Audio Meta-Data Library
libtalloc2	2.0.1-1	hierarchical pool based memory allocator
libtasn1-3	2.7-1	Manage ASN.1 structures (runtime)
libtdb1	1.2.1-2+b1	Trivial Database - shared library
libtext-charwidth-perl	0.04-6	get display widths of characters on the terminal
libtext-iconv-perl	1.7-2	converts between character sets in Perl
libtext-wrapi18n-perl	0.06-7	internationalized substitute of Text::Wrap
libthai-data	0.1.14-2	Data files for Thai language support library
libthai0	0.1.14-2	Thai language support library
libtheora0	1.1.1+dfsg.1-3	The Theora Video Compression Codec
libtie-ixhash-perl	1.21-2	ordered associative arrays for Perl
libtiff4	3.9.4-5+squeeze3	Tag Image File Format (TIFF) library
libtimedate-perl	1.2000-1	collection of modules to manipulate date/time information
libtokyocabinet8	1.4.37-6	Tokyo Cabinet Database Libraries [runtime]
libtotem-plparser17	2.30.3-1	Totem Playlist Parser library - runtime files
libtracker-client-0.8-0	0.8.17-1	metadata database, indexer and search tool - library
libtwolame0	0.3.12-1	MPEG Audio Layer 2 encoding library
libudev0	164-3	libudev shared library
libunique-1.0-0	1.1.6-1.1	Library for writing single instance applications - shared libraries
libupower-glib1	0.9.5-5	abstraction for power management - shared library
liburi-perl	1.54-2	module to manipulate and access URI strings
libusb-0.1-4	2:0.1.12-16	userspace USB programming library
libusb-1.0-0	2:1.0.8-2	userspace USB programming library
libusbmuxd1	1.0.4-1	USB multiplexor daemon for iPhone and iPod Touch devices - library
libuuid-perl	0.02-4	Perl extension for using UUID interfaces as defined in e2fsprogs
libuuid1	2.17.2-9	Universally Unique ID library
libv4l-0	0.8.0-1	Collection of video4linux support libraries
libvisual-0.4-0	0.4.0-3	Audio visualization framework
libvisual-0.4-plugins	0.4.0.dfsg.1-2	Audio visualization framework plugins
libvorbis0a	1.3.1-1	The Vorbis General Audio Compression Codec (Decoder library)
libvorbisenc2	1.3.1-1	The Vorbis General Audio Compression Codec (Encoder library)
libvorbisfile3	1.3.1-1	The Vorbis General Audio Compression Codec (High

		Level API)
libvte-common	1:0.24.3-2	Terminal emulator widget for GTK+ 2.0 - common files
libvte9	1:0.24.3-2	Terminal emulator widget for GTK+ 2.0 - runtime files
libwavpack1	4.60.1-1	an audio codec (lossy and lossless) - library
libwbclient0	2:3.5.6~dfsg-3squeeze4	Samba winbind client library
libwebkit-1.0-2	1.2.7-0+squeeze1	Web content engine library for Gtk+
libwebkit-1.0-common	1.2.7-0+squeeze1	Web content engine library for Gtk+ - data files
libwnck-common	2.30.4-2	Window Navigator Construction Kit - common files
libwnck22	2.30.4-2	Window Navigator Construction Kit - runtime files
libwrap0	7.6.q-19	Wietse Venema's TCP wrappers library
libwww-perl	5.836-1	Perl HTTP/WWW client/server library
libx11-6	2:1.3.3-4	X11 client-side library
libx11-data	2:1.3.3-4	X11 client-side library
libx11-xcb1	2:1.3.3-4	Xlib/XCB interface library
libx86-1	1.1+ds1-6	x86 real-mode library
libxapian22	1.2.3-2	Search engine library
libxau6	1:1.0.6-1	X11 authorisation library
libxaw7	2:1.0.7-1	X11 Athena Widget library
libxcb-atom1	0.3.6-1	utility libraries for X C Binding -- atom
libxcb-aux0	0.3.6-1	utility libraries for X C Binding -- aux
libxcb-dri2-0	1.6-1	X C Binding, dri2 extension
libxcb-event1	0.3.6-1	utility libraries for X C Binding -- event
libxcb-render-util0	0.3.6-1	utility libraries for X C Binding -- render-util
libxcb-render0	1.6-1	X C Binding, render extension
libxcb1	1.6-1	X C Binding
libxcomposite1	1:0.4.2-1	X11 Composite extension library
libxcursor1	1:1.1.10-2	X cursor management library
libxdamage1	1:1.1.3-1	X11 damaged region extension library
libxdmcp6	1:1.0.3-2	X11 Display Manager Control Protocol library
libxext6	2:1.1.2-1	X11 miscellaneous extension library
libxfixes3	1:4.0.5-1	X11 miscellaneous 'fixes' extension library
libxfont1	1:1.4.1-2	X11 font rasterisation library
libxft2	2.1.14-2	FreeType-based font drawing library for X
libxi6	2:1.3-6	X11 Input extension library
libxinerama1	2:1.1-3	X11 Xinerama extension library
libxkbfile1	1:1.0.6-2	X11 keyboard file manipulation library
libxklavier16	5.0-2	X Keyboard Extension high-level API
libxml-parser-perl	2.36-1.1+b1	Perl module for parsing XML files
libxml-twig-perl	1:3.34-1	Perl module for processing huge XML documents in tree mode
libxml-xpathengine-perl	0.12-2	re-usable XPath engine for DOM-like trees
libxml2	2.7.8.dfsg-2+squeeze1	GNOME XML library
libxmu6	2:1.0.5-2	X11 miscellaneous utility library
libxmuu1	2:1.0.5-2	X11 miscellaneous micro-utility library
libxpm4	1:3.5.8-1	X11 pixmap library
libxrandr2	2:1.3.0-3	X11 RandR extension library
libxrender1	1:0.9.6-1	X Rendering Extension client library
libxres1	2:1.0.4-1	X11 Resource extension library
libxslt1.1	1.1.26-6	XSLT 1.0 processing library - runtime library
libxss1	1:1.2.0-2	X11 Screen Saver extension library
libxt6	1:1.0.7-1	X11 toolkit intrinsics library
libxtst6	2:1.1.0-3	X11 Testing -- Record extension library

libxv1	2:1.0.5-1	X11 Video extension library
libxvmc1	2:1.0.5-1	X11 Video extension library
libxxf86dga1	2:1.1.1-2	X11 Direct Graphics Access extension library
libxxf86vm1	1:1.1.0-2	X11 XFree86 video mode extension library
linux-base	2.6.32-35	Linux image base package
linux-headers-2.6.32-5-amd64	2.6.32-35	Header files for Linux 2.6.32-5-amd64
linux-headers-2.6.32-5-common	2.6.32-35	Common header files for Linux 2.6.32-5
linux-image-2.6-amd64	2.6.32+29	Linux 2.6 for 64-bit PCs (meta-package)
linux-image-2.6.32-5-amd64	2.6.32-35	Linux 2.6.32 for 64-bit PCs
linux-kbuild-2.6.32	2.6.32-1	Kbuild infrastructure for Linux 2.6.32
linux-libc-dev	2.6.32-35	Linux support headers for userspace development
linux-sound-base	1.0.23+dfsg-2	base package for ALSA and OSS sound systems
lm-sensors	1:3.1.2-6	utilities to read temperature/voltage/fan sensors
locales	2.11.2-10	Embedded GNU C Library: National Language (locale) data [support]
lockfile-progs	0.1.15	Programs for locking and unlocking files and mailboxes
login	1:4.1.4.2+svn3283-2+squeeze1	system login tools
logrotate	3.7.8-6	Log rotation utility
lrzsz	0.12.21-5	Tools for zmodem/xmodem/ymodem file transfer
lsb-base	3.2-23.2squeeze1	Linux Standard Base 3.2 init script functionality
lsb-release	3.2-23.2squeeze1	Linux Standard Base version reporting utility
lsof	4.81.dfsg.1-1	List open files
m4	1.4.14-3	a macro processing language
make	3.81-8	An utility for Directing compilation.
man-db	2.5.7-8	on-line manual pager
mawk	1.3.3-15	a pattern scanning and text processing language
mdadm	3.1.4-1+8efb9d1	tool to administer Linux MD arrays (software RAID)
menu	2.1.44	generates programs menu for all menu-aware applications
menu-xdg	0.5	freedesktop.org menu compliant window manager scripts
metacity	1:2.30.1-3	lightweight GTK+ window manager
metacity-common	1:2.30.1-3	shared files for the Metacity window manager
mime-support	3.48-1	MIME files 'mime.types' & 'mailcap', and support programs
minicom	2.4-3	friendly menu driven serial communication program
mlocate	0.22.2-1	quickly find files on the filesystem based on their name
modconf	0.3.11	Device Driver Configuration
module-init-tools	3.12-1	tools for managing Linux kernel modules
mount	2.17.2-9	Tools for mounting and manipulating filesystems
mtools	4.0.12-1	Tools for manipulating MSDOS files
mutt	1.5.20-9+squeeze1	text-based mailreader supporting MIME, GPG, PGP and threading
nautilus	2.30.1-2squeeze1	file manager and graphical shell for GNOME
nautilus-data	2.30.1-2squeeze1	data files for nautilus
ncurses-base	5.7+20100313-5	basic terminal type definitions
ncurses-bin	5.7+20100313-5	terminal-related programs and man pages
ncurses-term	5.7+20100313-5	additional terminal type definitions
net-tools	1.60-23	The NET-3 networking toolkit

netbase	4.45	Basic TCP/IP networking system
netcat-traditional	1.10-38	TCP/IP swiss army knife
nfs-common	1:1.2.2-4	NFS support files common to client and server
notification-daemon	0.5.0-2	daemon to displays passive pop-up notifications
ntfs-3g	1:2010.3.6-1	read-write NTFS driver for FUSE
ntfsprogs	2.0.0-1+b1	tools for doing neat things in NTFS partitions from Linux
ntpdate	1:4.2.6.p2+dfsg-1+b1	client for setting system time from NTP servers
openbsd-inetd	0.20080125-6	The OpenBSD Internet Superserver
openssh-blacklist	0.4.1	list of default blacklisted OpenSSH RSA and DSA keys
openssh-blacklist-extra	0.4.1	list of non-default blacklisted OpenSSH RSA and DSA keys
openssh-client	1:5.5p1-6	secure shell (SSH) client, for secure access to remote machines
openssh-server	1:5.5p1-6	secure shell (SSH) server, for secure access from remote machines
openssl	0.9.8o-4squeeze1	Secure Socket Layer (SSL) binary and related cryptographic tools
openssl-blacklist	0.5-2	list of blacklisted OpenSSL RSA keys
openvpn	2.1.3-2	virtual private network daemon
openvpn-blacklist	0.4	list of blacklisted OpenVPN RSA shared keys
p7zip-full	9.04~dfsg.1-1	7z and 7za file archivers with high compression ratio
passwd	1:4.1.4.2+svn3283-2+ squeeze1	change and administer password and group data
pciutils	1:3.1.7-6	Linux PCI Utilities
perl	5.10.1-17squeeze2	Larry Wall's Practical Extraction and Report Language
perl-base	5.10.1-17squeeze2	minimal Perl system
perl-modules	5.10.1-17squeeze2	Core Perl modules
php5	5.3.3-7+squeeze3	server-side, HTML-embedded scripting language (metapackage)
php5-cli	5.3.3-7+squeeze3	command-line interpreter for the php5 scripting language
php5-common	5.3.3-7+squeeze3	Common files for packages built from the php5 source
php5-suhosin	0.9.32.1-1	advanced protection module for php5
pm-utils	1.3.0-3	utilities and scripts for power management
pmount	0.9.23-1	mount removable devices as normal user
policykit-1	0.96-4	framework for managing administrative policies and privileges
policykit-1-gnome	0.96-3	GNOME authentication agent for PolicyKit-1
portmap	6.0.0-2	RPC port mapper
powermgmt-base	1.31	Common utils and configs for power management
ppp	2.4.5-4	Point-to-Point Protocol (PPP) - daemon
pppconfig	2.3.18+nmu2	A text menu based utility for configuring ppp
pppoe	3.8-3	PPP over Ethernet driver
pppoeconf	1.19	configures PPPoE/ADSL connections
procps	1:3.2.8-9	/proc file system utilities
proftpd-basic	1.3.3a-6squeeze1	Versatile, virtual-hosting FTP daemon - binaries
psmisc	22.11-1	utilities that use the proc file system
python	2.6.6-3+squeeze6	interactive high-level object-oriented language (default version)
python-apt	0.7.100.1+squeeze1	Python interface to libapt-pkg
python-apt-common	0.7.100.1+squeeze1	Python interface to libapt-pkg (locales)
python-cairo	1.8.8-1+b1	Python bindings for the Cairo vector graphics library

python-central	0.6.16+nmu1	register and build utility for Python packages
python-chardet	2.0.1-1	universal character encoding detector
python-dbus	0.83.1-1	simple interprocess messaging system (Python interface)
python-debian	0.1.18	Python modules to work with Debian-related data formats
python-gconf	2.28.1-1	Python bindings for the GConf configuration database system
python-glade2	2.17.0-4	GTK+ bindings: Glade support
python-gmenu	2.30.3-1	an implementation of the freedesktop menu specification for GNOME
python-gnome2	2.28.1-1	Python bindings for the GNOME desktop environment
python-gnomeapplet	2.30.0-4	Python bindings for the GNOME panel applet library
python-gnomedesktop	2.30.0-4	Python bindings for the GNOME desktop library
python-gnomekeyring	2.30.0-4	Python bindings for the GNOME keyring library
python-gnupginterface	0.3.2-9.1	Python interface to GnuPG (GPG)
python-gobject	2.21.4+is.2.21.3-1	Python bindings for the GObject library
python-gtk2	2.17.0-4	Python bindings for the GTK+ widget set
python-minimal	2.6.6-3+squeeze6	minimal subset of the Python language (default version)
python-numpy	1:1.4.1-5	Numerical Python adds a fast array facility to the Python language
python-pyorbit	2.24.0-6	A Python language binding for the ORBit2 CORBA implementation
python-software-properties	0.60.debian-3	manage the repositories that you install software from
python-support	1.0.10	automated rebuilding support for Python modules
python-wnck	2.30.0-4	Python bindings for the WNCK library
python-xapian	1.2.3-3	Xapian search engine interface for Python
python2.6	2.6.6-8+b1	An interactive high-level object-oriented language (version 2.6)
python2.6-minimal	2.6.6-8+b1	A minimal subset of the Python language (version 2.6)
python3.1	3.1.3-1	An interactive high-level object-oriented language (version 3.1)
python3.1-minimal	3.1.3-1	A minimal subset of the Python language (version 3.1)
radeontool	1.6.1-1	utility to control ATI Radeon backlight functions on laptops
rarian-compat	0.8.1-5	Documentation meta-data library (compatibility tools)
readline-common	6.1-3	GNU readline and history libraries, common files
rpm-common	4.8.1-6	common files for RPM
rpm2cpio	4.8.1-6	tool to convert RPM package to CPIO archive
rsyslog	4.6.4-2	enhanced multi-threaded syslogd
sed	4.2.1-7	The GNU sed stream editor
sensible-utils	0.0.4	Utilities for sensible alternative selection
sgml-base	1.26+nmu1	SGML infrastructure and SGML catalog file support
sgml-data	2.0.4	common SGML and XML data
shared-mime-info	0.71-4	FreeDesktop.org shared MIME database and spec
snmp	5.4.3~dfsg-2	SNMP (Simple Network Management Protocol) applications
snmpd	5.4.3~dfsg-2	SNMP (Simple Network Management Protocol) agents
software-properties-gtk	0.60.debian-3	manage the repositories that you install software from
ssh	1:5.5p1-6	secure shell client and server (metapackage)
ssl-cert	1.0.28	simple debconf wrapper for OpenSSL

sudo	1.7.4p4-2.squeeze.2	Provide limited super user privileges to specific users
synaptic	0.70~pre1+b1	Graphical package manager
system-tools-backends	2.10.1-2	System Tools to manage computer configuration -- scripts
sysv-rc	2.88dsf-13.1	System-V-like runlevel change mechanism
sysvinit	2.88dsf-13.1	System-V-like init utilities
sysvinit-utils	2.88dsf-13.1	System-V-like utilities
tar	1.23-3	GNU version of the tar archiving utility
tasksel	2.88	Tool for selecting tasks for installation on Debian systems
tasksel-data	2.88	Official tasks used for installation of Debian systems
tcpd	7.6.q-19	Wietse Venema's TCP wrapper utilities
tcpdump	4.1.1-1	A powerful tool for network monitoring and data acquisition
telnet	0.17-36	The telnet client
telnetd	0.17-36	The telnet server
tftpd	0.17-18	Trivial file transfer protocol server
time	1.7-23.1	The GNU time program for measuring cpu resource usage
traceroute	1:2.0.15-1	Traces the route taken by packets over an IPv4/IPv6 network
ttf-dejavu-core	2.31-1	Vera font family derivate with additional characters
tzdata	2011d-0squeeze1	time zone and daylight-saving time data
ucf	3.0025+nmu1	Update Configuration File: preserve user changes to config files.
udev	164-3	/dev/ and hotplug management daemon
udisks	1.0.1+git20100614-3	abstraction for enumerating block devices
unattended-upgrades	0.62.2	automatic installation of security upgrades
update-inetd	4.38+nmu1	inetd configuration file updater
upower	0.9.5-5	abstraction for power management
usbmount	0.0.21	automatically mount and unmount USB mass storage devices
usbmuxd	1.0.4-1	USB multiplexor daemon for iPhone and iPod Touch devices
usbutils	0.87-5	Linux USB utilities
util-linux	2.17.2-9	Miscellaneous system utilities
vbetool	1.1-2	run real-mode video BIOS code to alter hardware state
vim	2:7.2.445+hg~cb94c42c0e1a-1	Vi IMproved - enhanced vi editor
vim-common	2:7.2.445+hg~cb94c42c0e1a-1	Vi IMproved - Common files
vim-runtime	2:7.2.445+hg~cb94c42c0e1a-1	Vi IMproved - Runtime files
vim-tiny	2:7.2.445+hg~cb94c42c0e1a-1	Vi IMproved - enhanced vi editor - compact version
w3m	0.5.2-9	WWW browsable pager with excellent tables/frames support
watchdog	5.9-1	A software watchdog
wget	1.12-2.1	retrieves files from the web
whiptail	0.52.11-1	Displays user-friendly dialog boxes from shell scripts
whois	5.0.10	an intelligent whois client
x-ttcidfont-conf	32	TrueType and CID fonts configuration for X
x11-apps	7.5+5	X applications

x11-common	1:7.5+8	X Window System (X.Org) infrastructure
x11-session-utils	7.5+1	X session utilities
x11-utils	7.5+4	X11 utilities
x11-xfs-utils	7.4+1	X font server utilities
x11-xkb-utils	7.5+5	X11 XKB utilities
x11-xserver-utils	7.5+3	X server utilities
xauth	1:1.0.4-1	X authentication utility
xbase-clients	1:7.5+8	miscellaneous X clients - metapackage
xfonts-base	1:1.0.1	standard fonts for X
xfonts-encodings	1:1.0.3-1	Encodings for X.Org fonts
xfonts-utils	1:7.5+2	X Window System font utility programs
xinit	1.2.0-2	X server initialisation tool
xkb-data	1.8-2	X Keyboard Extension (XKB) configuration data
xml-core	0.13	XML infrastructure and XML catalog file support
xserver-common	2:1.7.7-13	common files used by various X servers
xserver-xephyr	2:1.7.7-13	nested X server
xserver-xorg	1:7.5+8	the X.Org X server
xserver-xorg-core	2:1.7.7-13	Xorg X server - core server
xserver-xorg-input-all	1:7.5+8	the X.Org X server -- input driver metapackage
xserver-xorg-input-evdev	1:2.3.2-6	X.Org X server -- evdev input driver
xserver-xorg-input-synaptics	1.2.2-2	Synaptics TouchPad driver for X.Org server
xserver-xorg-input-wacom	0.10.5+20100416-1	X.Org X server -- Wacom input driver
xserver-xorg-video-all	1:7.5+8	the X.Org X server -- output driver metapackage
xserver-xorg-video-apm	1:1.2.2-2	X.Org X server -- APM display driver
xserver-xorg-video-ark	1:0.7.2-2	X.Org X server -- ark display driver
xserver-xorg-video-ati	1:6.13.1-2+squeeze1	X.Org X server -- AMD/ATI display driver wrapper
xserver-xorg-video-chips	1:1.2.3-1	X.Org X server -- Chips display driver
xserver-xorg-video-cirrus	1:1.3.2-2+squeeze1	X.Org X server -- Cirrus display driver
xserver-xorg-video-fbdev	1:0.4.2-2	X.Org X server -- fbdev display driver
xserver-xorg-video-i128	1:1.3.3-2	X.Org X server -- i128 display driver
xserver-xorg-video-intel	2:2.13.0-6	X.Org X server -- Intel i8xx, i9xx display driver
xserver-xorg-video-mach64	6.8.2-3	X.Org X server -- ATI Mach64 display driver
xserver-xorg-video-mga	1:1.4.11.dfsg-4+squeeze1	X.Org X server -- MGA display driver
xserver-xorg-video-neomagic	1:1.2.4-3	X.Org X server -- Neomagic display driver
xserver-xorg-video-nouveau	1:0.0.15+git20100329+7858345-5	X.Org X server -- Nouveau display driver (experimental)
xserver-xorg-video-nv	1:2.1.17-3	X.Org X server -- NV display driver
xserver-xorg-video-openchrome	1:0.2.904+svn842-2	X.Org X server -- VIA display driver
xserver-xorg-video-r128	6.8.1-3	X.Org X server -- ATI r128 display driver

xserver-xorg-video-radeon	1:6.13.1-2+squeeze1	X.Org X server -- AMD/ATI Radeon display driver
xserver-xorg-video-rendition	1:4.2.3-3	X.Org X server -- Rendition display driver
xserver-xorg-video-s3	1:0.6.3-2	X.Org X server -- legacy S3 display driver
xserver-xorg-video-s3virge	1:1.10.4-2	X.Org X server -- S3 ViRGE display driver
xserver-xorg-video-savage	1:2.3.1-2	X.Org X server -- Savage display driver
xserver-xorg-video-siliconmotion	1:1.7.3-2	X.Org X server -- SiliconMotion display driver
xserver-xorg-video-sis	1:0.10.3-1	X.Org X server -- SiS display driver
xserver-xorg-video-sisusb	1:0.9.3-2	X.Org X server -- SiS USB display driver
xserver-xorg-video-tdfx	1:1.4.3-2	X.Org X server -- tdfx display driver
xserver-xorg-video-trident	1:1.3.3-2	X.Org X server -- Trident display driver
xserver-xorg-video-tseng	1:1.2.3-2+squeeze1	X.Org X server -- Tseng display driver
xserver-xorg-video-vesa	1:2.3.0-3	X.Org X server -- VESA display driver
xserver-xorg-video-vmware	1:11.0.1-2	X.Org X server -- VMware display driver
xserver-xorg-video-voodoo	1:1.2.3-2	X.Org X server -- Voodoo display driver
xz-utils	5.0.0-2	XZ-format compression utilities
yelp	2.30.1+webkit-1	Help browser for GNOME
zenity	2.30.0-1	Display graphical dialog boxes from shell scripts
zlib1g	1:1.2.3.4.dfsg-3	compression library - runtime

B

Moxa MIB Files

This appendix describes the Moxa MIB files. Refer to the following content.

```
--
-- MOXA-SYS-MIB.txt
--

      MOXA-SYS-MIB DEFINITIONS ::= BEGIN

            IMPORTS
                  enterprises, IpAddress, Integer32, Gauge32, OBJECT-TYPE,
                  MODULE-IDENTITY, NOTIFICATION-TYPE
                        FROM SNMPv2-SMI
                  DisplayString
                        FROM SNMPv2-TC;



            -- 1.3.6.1.4.1.8691.17.1
            moxaSystem MODULE-IDENTITY
                  LAST-UPDATED "201203211854Z"          -- March 21, 2012 at 18:54 GMT
                  ORGANIZATION
                        "Moxa Techonology , Software Research Department"
                  CONTACT-INFO
                        "This mib is being maintained by the Moxa System Software R&D who handle product
line.

                              postal:     Taiwan,Taipei,ShienTien
                                          P.O. Box 222
                                          Phone:(02)8919-1230

                              email:      technical_support@moxa.com"
                  DESCRIPTION
```

```
                "MIB script for all serial product of Embedded Communication & Computing .Dep."
            REVISION "201203211854Z"          -- March 21, 2012 at 18:54 GMT
            DESCRIPTION
                "This file defines the private Moxa product MIB."
            ::= { embeddedComputer 1 }




--
-- Node definitions
--

        -- 1.3.6.1.4.1.8691
        moxa OBJECT IDENTIFIER ::= { enterprises 8691 }



-- Current Moxa System company and main entries:
        -- 1.3.6.1.4.1.8691.17
        embeddedComputer OBJECT IDENTIFIER ::= { moxa 17 }



-- product table checks
-- Mib sections utilizing the above conventions:
--    product manager: version, description, build date
--
        -- 1.3.6.1.4.1.8691.17.1.1
        productInfoMgmt OBJECT IDENTIFIER ::= { moxaSystem 1 }



        -- 1.3.6.1.4.1.8691.17.1.1.1
        productName OBJECT-TYPE
            SYNTAX DisplayString
            MAX-ACCESS read-only
            STATUS current
            DESCRIPTION
                "Showing product name eg. UC7110-LX/IA240-LX/DA683-LX/DA683-XPE."
            ::= { productInfoMgmt 1 }
```

```
        -- 1.3.6.1.4.1.8691.17.1.1.2
        productDesc OBJECT-TYPE
            SYNTAX DisplayString
            MAX-ACCESS read-only
            STATUS current
            DESCRIPTION
                "Showing product short description.(if one exists)."
            ::= { productInfoMgmt 2 }


        -- 1.3.6.1.4.1.8691.17.1.1.3
        productVersion OBJECT-TYPE
            SYNTAX DisplayString
            MAX-ACCESS read-only
            STATUS current
            DESCRIPTION
                "Showing product version eg. 1.0/1.0.1"
            ::= { productInfoMgmt 3 }


        -- 1.3.6.1.4.1.8691.17.1.1.4
        productBuildDate OBJECT-TYPE
            SYNTAX DisplayString
            MAX-ACCESS read-only
            STATUS current
            DESCRIPTION
                "Showing product last build date, the format is YYMMDDHH.
                eg. 2012/01/23 19:22 -> 12012319."
            ::= { productInfoMgmt 4 }


-- In biosMgmt section, all of write able object will not really write to BIOS
--   CMOS area when the BIOS write able object value modified. To save BIOS
--   setting, write biosSaveSetting to 1(apply), and wait the operate
--   complete(the biosSaveSetting is 0 (none)).
--
```

```
-- 1.3.6.1.4.1.8691.17.1.4
biosMgmt OBJECT IDENTIFIER ::= { moxaSystem 4 }


-- 1.3.6.1.4.1.8691.17.1.4.1
biosVersion OBJECT-TYPE
    SYNTAX DisplayString
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        "Showing the BIOS version. eg. V1.00S01"
    ::= { biosMgmt 1 }


-- 1.3.6.1.4.1.8691.17.1.5
sensorMgmt OBJECT IDENTIFIER ::= { moxaSystem 5 }


-- 1.3.6.1.4.1.8691.17.1.5.1
sensorObject OBJECT IDENTIFIER ::= { sensorMgmt 1 }


-- 1.3.6.1.4.1.8691.17.1.5.1.1
tempSensorsTable OBJECT-TYPE
    SYNTAX SEQUENCE OF TempSensorsEntry
    MAX-ACCESS not-accessible
    STATUS current
    DESCRIPTION
        "Table of temperature sensors and their values."
    ::= { sensorObject 1 }


-- 1.3.6.1.4.1.8691.17.1.5.1.1.1
tempSensorsEntry OBJECT-TYPE
    SYNTAX TempSensorsEntry
    MAX-ACCESS not-accessible
    STATUS current
    DESCRIPTION
```

```
            "An entry containing a device and its statistics."
        INDEX { tempSensorsIndex }
        ::= { tempSensorsTable 1 }


TempSensorsEntry ::=
        SEQUENCE {
            tempSensorsIndex
                Integer32,
            tempSensorsDevice
                DisplayString,
            tempSensorsValue
                Gauge32
         }

-- 1.3.6.1.4.1.8691.17.1.5.1.1.1.1
tempSensorsIndex OBJECT-TYPE
        SYNTAX Integer32 (1..65535)
        MAX-ACCESS read-only
        STATUS current
        DESCRIPTION
            "Reference index for each observed device."
        ::= { tempSensorsEntry 1 }


-- 1.3.6.1.4.1.8691.17.1.5.1.1.1.2
tempSensorsDevice OBJECT-TYPE
        SYNTAX DisplayString
        MAX-ACCESS read-only
        STATUS current
        DESCRIPTION
            "The name of the temperature sensor we are reading."
        ::= { tempSensorsEntry 2 }


-- 1.3.6.1.4.1.8691.17.1.5.1.1.1.3
tempSensorsValue OBJECT-TYPE
        SYNTAX Gauge32
```

```
        MAX-ACCESS read-only
        STATUS current
        DESCRIPTION
            "The temperature of this sensor in mC."
        ::= { tempSensorsEntry 3 }


-- 1.3.6.1.4.1.8691.17.1.5.1.2
voltSensorsTable OBJECT-TYPE
        SYNTAX SEQUENCE OF VoltSensorsEntry
        MAX-ACCESS not-accessible
        STATUS current
        DESCRIPTION
            "Table of voltage sensors and their values."
        ::= { sensorObject 2 }


-- 1.3.6.1.4.1.8691.17.1.5.1.2.1
voltSensorsEntry OBJECT-TYPE
        SYNTAX VoltSensorsEntry
        MAX-ACCESS not-accessible
        STATUS current
        DESCRIPTION
            "An entry containing a device and its statistics."
        INDEX { voltSensorsIndex }
        ::= { voltSensorsTable 1 }


VoltSensorsEntry ::=
        SEQUENCE {
            voltSensorsIndex
                Integer32,
            voltSensorsDevice
                DisplayString,
            voltSensorsValue
                Gauge32
         }
```

```
-- 1.3.6.1.4.1.8691.17.1.5.1.2.1.1
voltSensorsIndex OBJECT-TYPE
        SYNTAX Integer32 (1..65535)
        MAX-ACCESS read-only
        STATUS current
        DESCRIPTION
                "Reference index for each observed device."
        ::= { voltSensorsEntry 1 }


-- 1.3.6.1.4.1.8691.17.1.5.1.2.1.2
voltSensorsDevice OBJECT-TYPE
        SYNTAX DisplayString
        MAX-ACCESS read-only
        STATUS current
        DESCRIPTION
                "The name of the device we are reading."
        ::= { voltSensorsEntry 2 }


-- 1.3.6.1.4.1.8691.17.1.5.1.2.1.3
voltSensorsValue OBJECT-TYPE
        SYNTAX Gauge32
        MAX-ACCESS read-only
        STATUS current
        DESCRIPTION
                "The voltage in mV."
        ::= { voltSensorsEntry 3 }


-- 1.3.6.1.4.1.8691.17.1.6
peripheralMgmt OBJECT IDENTIFIER ::= { moxaSystem 6 }


-- 1.3.6.1.4.1.8691.17.1.6.1
perIoMgmt OBJECT IDENTIFIER ::= { peripheralMgmt 1 }
```

```
-- 1.3.6.1.4.1.8691.17.1.6.3
perSerialMgmt OBJECT IDENTIFIER ::= { peripheralMgmt 3 }


-- 1.3.6.1.4.1.8691.17.1.6.3.1
uartNumber OBJECT-TYPE
    SYNTAX Integer32 (0..65535)
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        "Number of internal UART in current system."
    ::= { perSerialMgmt 1 }


-- 1.3.6.1.4.1.8691.17.1.6.3.2
uartConfigTable OBJECT-TYPE
    SYNTAX SEQUENCE OF UartConfigEntry
    MAX-ACCESS not-accessible
    STATUS current
    DESCRIPTION
        "Table of internal UART and their values."
    ::= { perSerialMgmt 2 }


-- 1.3.6.1.4.1.8691.17.1.6.3.2.1
uartConfigEntry OBJECT-TYPE
    SYNTAX UartConfigEntry
    MAX-ACCESS not-accessible
    STATUS current
    DESCRIPTION
        "An entry containing a UART port and its statistics."
    INDEX { uartIndex }
    ::= { uartConfigTable 1 }


UartConfigEntry ::=
    SEQUENCE {
        uartIndex
```

```
                Integer32,
            uartType
                INTEGER
        }

-- 1.3.6.1.4.1.8691.17.1.6.3.2.1.1
uartIndex OBJECT-TYPE
    SYNTAX Integer32 (1..65535)
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        "Reference index for each UART port."
    ::= { uartConfigEntry 1 }


-- 1.3.6.1.4.1.8691.17.1.6.3.2.1.2
uartType OBJECT-TYPE
    SYNTAX INTEGER
        {
        rs232(0),
        rs485w2(1),
        rs422(2),
        rs485w4(3)
        }
    MAX-ACCESS read-write
    STATUS current
    DESCRIPTION
        "The UART mode, 0 is RS232, 1 is RS485 2 wires, 2 is RS422, 3 is RS485 4 wires."
    ::= { uartConfigEntry 2 }


-- 1.3.6.1.4.1.8691.17.1.6.4
perUsbMgmt OBJECT IDENTIFIER ::= { peripheralMgmt 4 }


-- 1.3.6.1.4.1.8691.17.1.6.4.1
usbObject OBJECT IDENTIFIER ::= { perUsbMgmt 1 }
```

```
        -- 1.3.6.1.4.1.8691.17.1.6.4.1.1
        usbNumber OBJECT-TYPE
            SYNTAX Integer32 (0..65535)
            MAX-ACCESS read-only
            STATUS current
            DESCRIPTION
                "The number of ports regardless of their current state
                in the usb general port table"
            ::= { usbObject 1 }


--  usb Device MIB
--
        -- 1.3.6.1.4.1.8691.17.1.6.4.1.3
        usbDeviceTable OBJECT-TYPE
            SYNTAX SEQUENCE OF UsbDeviceEntry
            MAX-ACCESS not-accessible
            STATUS current
            DESCRIPTION
                "A list of USB device ports. Usually the device has
                only one USB device port"
            ::= { usbObject 3 }


        -- 1.3.6.1.4.1.8691.17.1.6.4.1.3.1
        usbDeviceEntry OBJECT-TYPE
            SYNTAX UsbDeviceEntry
            MAX-ACCESS not-accessible
            STATUS current
            DESCRIPTION
                "Status and parameter values for the USB device port."
            INDEX { usbDeviceIndex }
            ::= { usbDeviceTable 1 }


        UsbDeviceEntry ::=
            SEQUENCE {
```

```
            usbDeviceIndex
                Integer32,
            usbDeviceVendorID
                OCTET STRING,
            usbDeviceProductID
                OCTET STRING,
            usbDeviceActiveClass
                INTEGER
        }

-- 1.3.6.1.4.1.8691.17.1.6.4.1.3.1.1
usbDeviceIndex OBJECT-TYPE
    SYNTAX Integer32 (1..65535)
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        "The index is identical to usbPortIndex for the
        correspondent USB port"
    ::= { usbDeviceEntry 1 }


-- 1.3.6.1.4.1.8691.17.1.6.4.1.3.1.2
usbDeviceVendorID OBJECT-TYPE
    SYNTAX OCTET STRING
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        "The USB device port vendor HEX-formatted string as it
        is provided to the USB host by the USB device"
    ::= { usbDeviceEntry 2 }


-- 1.3.6.1.4.1.8691.17.1.6.4.1.3.1.3
usbDeviceProductID OBJECT-TYPE
    SYNTAX OCTET STRING
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
```

```
                "The product ID HEX-formatted string as it is provided
                to the USB host by the USB device"
        ::= { usbDeviceEntry 3 }


    -- 1.3.6.1.4.1.8691.17.1.6.4.1.3.1.4
    usbDeviceActiveClass OBJECT-TYPE
        SYNTAX INTEGER
            {
            other(1),
            hid(2),
            mass(3)
            }
        MAX-ACCESS read-only
        STATUS current
        DESCRIPTION
            "This object returns USB Device Class type of the
            active configuration"
        ::= { usbDeviceEntry 4 }


    -- 1.3.6.1.4.1.8691.17.1.6.4.1.4
    usbPlugTrapEnable OBJECT-TYPE
        SYNTAX INTEGER
            {
            disable(0),
            enable(1)
            }
        MAX-ACCESS read-write
        STATUS current
        DESCRIPTION
            "Agent will send trap message when USB device inserted or removed and this object
enbeled."
        ::= { usbObject 4 }


    -- 1.3.6.1.4.1.8691.17.1.6.4.2
    usbNotification OBJECT IDENTIFIER ::= { perUsbMgmt 2 }
```

```
-- 1.3.6.1.4.1.8691.17.1.6.4.2.1
usbPlugEvent NOTIFICATION-TYPE
    STATUS current
    DESCRIPTION
        "This trap is sent when USB device inserted or removed."
    ::= { usbNotification 1 }
-- 1.3.6.1.4.1.8691.17.1.6.6
perSystemMgmt OBJECT IDENTIFIER ::= { peripheralMgmt 6 }


-- 1.3.6.1.4.1.8691.17.1.6.6.2
systemWatchdog OBJECT IDENTIFIER ::= { perSystemMgmt 2 }


-- 1.3.6.1.4.1.8691.17.1.6.6.2.1
watchdogPeriod OBJECT-TYPE
    SYNTAX Second (0..255)
    MAX-ACCESS read-write
    STATUS current
    DESCRIPTION
        "Watchdog period, 0 means disable watchdog monitor program; otherwise enable
watchdog monitor program and configure the expired time."
    ::= { systemWatchdog 1 }


-- 1.3.6.1.4.1.8691.17.1.6.6.2.2
watchdogStatus OBJECT-TYPE
    SYNTAX INTEGER
        {
        running(1),
        stopped(2)
        }
    MAX-ACCESS read-write
    STATUS current
    DESCRIPTION
        "To show the watchdog monitor program status."
```

```
        ::= { systemWatchdog 2 }


    -- 1.3.6.1.4.1.8691.17.1.9
    notificationMgmt OBJECT IDENTIFIER ::= { moxaSystem 9 }


    -- 1.3.6.1.4.1.8691.17.1.9.1
    moxaSystemTrapIP OBJECT-TYPE
        SYNTAX IpAddress
        MAX-ACCESS read-write
        STATUS current
        DESCRIPTION
            "Set Trap IP address. eg. 192.168.1.100"
        ::= { notificationMgmt 1 }


    -- 1.3.6.1.4.1.8691.17.1.9.2
    moxaSystemTrapCommunity OBJECT-TYPE
        SYNTAX OCTET STRING (SIZE (0..127))
        MAX-ACCESS read-write
        STATUS current
        DESCRIPTION
            "Trap community. eg. public"
        ::= { notificationMgmt 2 }


END

--
-- MOXA-SYS-MIB.txt
--
```