V2403 Series Linux Software User’s Manual

The software described in this manual is furnished under a license agreement and may be used only in accordance with the terms of that agreement.

Copyright Notice
© 2015 Moxa Inc. All rights reserved.

Trademarks
The MOXA logo is a registered trademark of Moxa Inc.
All other trademarks or registered marks in this manual belong to their respective manufacturers.

Disclaimer
Information in this document is subject to change without notice and does not represent a commitment on the part of Moxa.

Moxa provides this document as is, without warranty of any kind, either expressed or implied, including, but not limited to, its particular purpose. Moxa reserves the right to make improvements and/or changes to this manual, or to the products and/or the programs described in this manual, at any time.

Information provided in this manual is intended to be accurate and reliable. However, Moxa assumes no responsibility for its use, or for any infringements on the rights of third parties that may result from its use.

This product might include unintentional technical or typographical errors. Changes are periodically made to the information herein to correct such errors, and these changes are incorporated into new editions of the publication.

Technical Support Contact Information

www.moxa.com/support

Moxa Americas
Toll-free: 1-888-669-2872
Tel: +1-714-528-6777
Fax: +1-714-528-6778

Moxa Europe
Tel: +49-89-3 70 03 99-0
Fax: +49-89-3 70 03 99-99

Moxa India
Tel: +91-80-4172-9088
Fax: +91-80-4132-1045

Moxa China (Shanghai office)
Toll-free: 800-820-5036
Tel: +86-21-5258-9955
Fax: +86-21-5258-5505

Moxa Asia-Pacific
Tel: +886-2-8919-1230
Fax: +886-2-8919-1231
## Table of Contents

1. **Introduction** .......................................................................................................................... 1-1
   - Overview ................................................................................................................................. 1-2
2. **Software Configuration** ........................................................................................................ 2-1
   - Starting from an HDMI Console ......................................................................................... 2-2
   - Connecting from an SSH Console ....................................................................................... 2-3
     - Windows Users ...................................................................................................................... 2-3
     - Linux Users .......................................................................................................................... 2-3
   - Adjusting the System Time ..................................................................................................... 2-4
     - Setting the Time Manually .................................................................................................. 2-4
     - NTP Client ............................................................................................................................. 2-4
     - Updating the Time Automatically ....................................................................................... 2-5
   - Enabling and Disabling Daemons ......................................................................................... 2-6
   - Cron—Daemon for Executing Scheduled Commands ............................................................. 2-6
   - Inserting a USB Storage Device into the Computer ............................................................... 2-7
   - Checking the Linux Version ................................................................................................... 2-8
   - APT—Installing and Removing Packages ............................................................................... 2-8
3. **Managing Communications** .................................................................................................. 3-1
   - Detecting Network Interfaces ............................................................................................... 3-2
   - Changing the Network Settings ........................................................................................... 3-2
     - Adjusting IP Addresses with "ifconfig" ............................................................................. 3-2
   - Serial Port Operation Mode .................................................................................................... 3-4
   - DNS Client ............................................................................................................................... 3-4
   - /etc/hostname ......................................................................................................................... 3-4
   - /etc/resolv.conf ...................................................................................................................... 3-4
   - /etc/nsswitch.conf ................................................................................................................. 3-5
   - Configuring Ethernet Bonding .............................................................................................. 3-5
   - Apache Web Server ................................................................................................................. 3-7
     - Default Homepage ............................................................................................................... 3-7
     - Disabling the CGI Function ................................................................................................. 3-7
   - IPTABLES ................................................................................................................................. 3-8
     - IPTABLES Hierarchy ............................................................................................................ 3-9
     - IPTABLES Modules .............................................................................................................. 3-9
     - Observe and Erase Chain Rules ......................................................................................... 3-10
     - Define Policy for Chain Rules ......................................................................................... 3-11
     - Append or Delete Rules ....................................................................................................... 3-11
   - NAT (Network Address Translation) .................................................................................... 3-12
     - NAT Example ...................................................................................................................... 3-12
     - Enabling NAT at Bootup ...................................................................................................... 3-12
   - NFS (Network File System) Client ......................................................................................... 3-13
   - OpenVPN ................................................................................................................................. 3-15
     - Ethernet Bridging for Private Networks on Different Subnets ......................................... 3-16
     - Ethernet Bridging for Private Networks on the Same Subnet .......................................... 3-19
     - Wi-Fi Module ....................................................................................................................... 3-20
8. **Programmer’s Guide** ............................................................................................................ 4-1
   - Device API ............................................................................................................................... 4-2
   - Getting the Product Serial Number ...................................................................................... 4-2
   - Digital I/O ................................................................................................................................ 4-3
     - Special Note .......................................................................................................................... 4-3
     - Examples ............................................................................................................................... 4-5
   - WDT (Watch Dog Timer) ......................................................................................................... 4-5
     - Introduction .......................................................................................................................... 4-5
     - Watchdog Usage .................................................................................................................. 4-5
     - How the WDT Works ........................................................................................................... 4-6
     - Watchdog Device IOCTL Commands.................................................................................. 4-7
     - Examples ............................................................................................................................... 4-8
5. **System Recovery** .................................................................................................................... 5-1
   - Recovery Environment ............................................................................................................ 5-2
   - Recovery Procedure ............................................................................................................... 5-2
     - Saving the System to the USB Drive .................................................................................. 5-14
6. Proactive Monitoring ............................................................................................................................... 6-1
A. Software Components ............................................................................................................................. A-1
Thank you for purchasing the Moxa V2403 Series of x86 ready-to-run embedded computers. This manual introduces the software configuration and management of the V2403-LX, which runs the Linux operating system. For hardware installation, connector interfaces, setup, and upgrading the BIOS, please refer to the “V2403 Series 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 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 Moxa V2403 series fanless x86 embedded computer is based on the Intel® 3rd gen Core-i™ series processor, features the most reliable I/O design to maximize connectivity, and supports dual wireless modules, making it suitable for a diverse range of communication applications. The computer’s thermal design ensures reliable system operation in temperatures ranging from -40 to 70°C (with a special purpose Moxa wireless module installed). The V2403 series supports “Moxa Proactive Monitoring” for device I/O status monitoring and alerts, system temperature monitoring and alerts, and system power management. Monitoring system status closely makes it easier to recover from errors and provides the most reliable platform for your applications.

Software Specifications

The Linux operating system pre-installed on the V2403 embedded computer is the Debian Jessie 8.1 distribution. The Debian project is a worldwide group of volunteers who endeavor to produce an operating system distribution that 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:

![Software Architecture Diagram]

**ATTENTION**

Refer to http://www.debian.org/ and http://www.gnu.org/ for information and documentation of the Debian GNU/Linux and 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 V2403 Linux models are pre-installed with the Debian Jessie 8.1 Linux distribution. For the software components, see “Appendix A.”
In this chapter, we explain how to operate a V2403-LX computer directly or your desktop. There are three ways to connect to the V2403-LX computer: through an HDMI monitor, or by using an SSH console from a Windows or Linux machine. This chapter describes basic Linux operating system configurations. The advanced network management and configuration will be described in the next chapter "Managing Communications."

The following topics are covered in this chapter:

- Starting from an HDMI 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
- Cron—Daemon for Executing Scheduled Commands
- Inserting a USB Storage Device into the Computer
- Checking the Linux Version
- APT—Installing and Removing Packages
Starting from an HDMI Console

Connect the display monitor to the V2403-LX HDMI connector, and then power it up by connecting it to the power adaptor. It takes about 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 moxa.

Login: moxa
Password: moxa

Moxa login: moxa
Password:

For further information check:
http://www.moxa.com/

moxa@Moxa:$
Connecting from an SSH Console

The V2403-LX computer supports an SSH Console to offer users with better security over the network compared to 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 V2403-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 V2403-LX’s console utility via SSH.

```
# ssh moxa@192.168.3.127
```

Select yes to open the connection.

```
[moxa@Moxa:~]$# ssh moxa@192.168.3.127
The authenticity of host '192.168.3.127 (192.168.3.127)' can't be established.
Are you sure you want to continue connection (yes/no)? yes
```
Adjusting the System Time

The V2403-LX has two time settings. One is the system time, and the other is provided by an RTC (Real Time Clock) built into the V2403-LX’s hardware.

Setting the Time Manually

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

Use the following command to set the system time.

```
moxa@Moxa:~# date MMDDhhmmYYYY
```

<table>
<thead>
<tr>
<th>MM:</th>
<th>Month</th>
</tr>
</thead>
<tbody>
<tr>
<td>DD:</td>
<td>Date</td>
</tr>
<tr>
<td>hhmm</td>
<td>Hour and Minute</td>
</tr>
<tr>
<td>YYYY</td>
<td>Year</td>
</tr>
</tbody>
</table>

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

```
root@Moxa:~# hwclock
```

```
root@Moxa:/home/moxa# date ; hwclock
Mon Jun 30 11:39:04 CST 2014
Mon 30 Jun 2014 11:39:05 AM CST -0.860107 seconds
root@Moxa:/home/moxa#

root@Moxa:/home/moxa# ntpdate time.stdtime.gov.tw
21 Aug 15:28:10 ntpdate[5876]: step time server 118.163.81.61 offset 36042533.994253 sec

root@Moxa:/home/moxa#

root@Moxa:/home/moxa# hwclock -w
root@Moxa:/home/moxa# date ; hwclock
Fri Aug 21 15:28:18 CST 2015
Fri 21 Aug 2015 03:28:19 PM CST -0.078792 seconds
root@Moxa:/home/moxa#
```

NTP Client

The V2403-LX has a built-in NTP (Network Time Protocol) client that is used to initialize a time request to a remote NTP server. Use `ntptime` to update the system time.

```
# ntpdate time.stdtime.gov.tw

# hwclock -w
```
Visit http://www.ntp.org for more information about NTP and NTP server addresses.

```
root@Moxa:~# date ; hwclock
Wed Dec 16 16:36:12 CST 2009
Wed 16 Dec 2009 03:38:13 AM CST -0.016751 seconds
root@Moxa:~# ntpdate time.stdtime.gov.tw
16 Dec 03:49:48 ntpdate[2510]: step time server 220.130.158.52 offset 155905087.984256 sec
root@Moxa:~# hwclock -w
root@Moxa:~# date ; hwclock
Wed Dec 16 03:51:07 CST 2009
Wed 16 Dec 2009 03:51:07 AM CST -0.016771 seconds
root@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 updating the system time periodically

```bash
#!/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

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

```bash
moxa@Moxa:~# chmod 755 fixtime
```

Next, use `vi` editor to edit the file `/etc/inittab`.

```bash
moxa@Moxa:~# vi /etc/inittab
```

Add the following line to the bottom of the file:

```bash
ntp : 2345 : respawn : /etc/init.d/fixtime
```

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

```bash
moxa@Moxa:~# init q
```
Enabling and Disabling Daemons

Only the following daemons are enabled in the V2403 by default:
- `sftpd` SFTP Server / Client daemon
- `sshd` Secure Shell Server daemon

You may manage what services to run in the background by the command `insserv`. Below example shows how to add the apache daemon in current runlevel.

```
moxa@Moxa:~$ sudo insserv -d apache2
```

Apache will not activate in the current boot session, but will be running in the background from the next boot session. To disable the apache daemon, use the following command:

```
moxa@Moxa:~$ sudo insserv -r apache2
```

Linux daemons can be started or stopped in the current boot session by using of the scripts in `/etc/init.d`. To start the apache daemon, use:

```
moxa@Moxa:~$ sudo /etc/init.d/apache2 start
```

To stop the apache daemon, use:

```
moxa@Moxa:~$ sudo /etc/init.d/apache2 stop
```

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 in that minute. 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
```

For example, if you want to launch a program at 8:00 every day.

```
#minute hour date month week user command
0 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 mode of `fixtime.sh`
   ```
moxa@Moxa:~$# chmod 755 fixtime.sh
```

3. Modify `/etc/crontab` file to run `fixtime.sh` at 8:00 every day.
   Add the following line to the end of crontab:
   ```
   0 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` 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.

```
root@Moxa:~# mount
sysfs on /sys type sysfs (rw,nosuid,nodev,noexec,relatime)
proc on /proc type proc (rw,nosuid,nodev,noexec,relatime)
udev on /dev type devtmpfs (rw,relatime,size=10240k,nr_inodes=492181,mode=755)
devpts on /dev/pts type devpts
  (rw,nosuid,nodev,relatime,gid=5,mode=620,ptmxmode=000)
tmpfs on /run type tmpfs (rw,nosuid,relatime,size=790820k,mode=755)
/dev/sda1 on / type ext4 (rw,noatime,errors=remount-ro,data=ordered)
securityfs on /sys/kernel/security type securityfs (rw,nosuid,nodev,noexec,relatime)
tmpfs on /dev/shm type tmpfs (rw,nosuid,nodev)
tmpfs on /run/lock type tmpfs (rw,nosuid,nodev,relatime,size=5120k)
tmpfs on /sys/fs/cgroup type tmpfs (ro,nosuid,nodev,mode=755)
cgroup on /sys/fs/cgroup/systemd type cgroup
  (rw,nosuid,nodev,relatime,xattr,release_agent=/lib/systemd/systemd-cgroups_
   agent,name=systemd)
psstore on /sys/fs/pstore type pstore (rw,nosuid,nodev,relatime)
cgroup on /sys/fs/cgroup/cpu,cpuacct type cgroup (rw,nosuid,nodev,relatime,cpuset)
cgroup on /sys/fs/cgroup/freezer type cgroup (rw,nosuid,nodev,relatime,freezer)
cgroup on /sys/fs/cgroup/net_cls,net_prio type cgroup
  (rw,nosuid,nodev,relatime,net_cls,net_prio)
cgroup on /sys/fs/cgroupblkio type cgroup (rw,nosuid,nodev,relatime,blkio)
cgroup on /sys/fs/cgroup/perf_event type cgroup
  (rw,nosuid,nodev,relatime,perf_event)
tmpfs on /etc/machine-id type tmpfs (ro,relatime,size=790820k,mode=755)
systemd-1 on /proc/sys/fs/binfmt_misc type autofs
  (rw,relatime,fd=21,pgrp=1,timeout=300,minproto=5,maxproto=5,direct)
hugetlbfs on /dev/hugepages type hugetlbfs (rw,relatime)
mqueue on /dev/mqueue type mqueue (rw,relatime)
debugfs on /sys/kernel/debug type debugfs (rw,relatime)
bifnft_misc on /proc/sys/fs/binfmt_misc type bifnft_misc (rw,relatime)
  /dev/sdb1 on /media/usb0 type vfat
  (rw,nodev,noexec,noatime,nodev,shortname=mixed,errors=remount-ro)
/dev/sdc1 on /media/usb1 type vfat
  (rw,nodev,noexec,noatime,nodev,shortname=mixed,errors=remount-ro)
```

**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.

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:

```
root@Moxa:~# uname -a
Linux Moxa 3.16.0-4-amd64 #1 SMP Debian 3.16.7-ckt9-2 (2015-04-13) x86_64 GNU/Linux
root@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`.

1. Next, configure the `/etc/apt/sources.list` using `vi` editor.

```
root@Moxa:~# vi /etc/apt/sources.list
```

```
deb http://ftp.us.debian.org/debian/ jessie main contrib non-free
deb-src http://ftp.us.debian.org/debian/ jessie main contrib non-free

deb http://ftp.us.debian.org/debian/ jessie-updates main contrib non-free
deb-src http://ftp.us.debian.org/debian/ jessie-updates main contrib non-free

deb http://security.debian.org/ jessie-updates main contrib non-free
deb-src http://security.debian.org/ jessie-updates main contrib non-free

deb http://ftp.debian.org/debian jessie-backports main contrib non-free
deb-src http://ftp.debian.org/debian jessie-backports main contrib non-free
```

2. Update the source list after you configure it.

```
root@Moxa:~# apt-get update
root@Moxa:~#
```

3. Once you indicate which package you want to install (vim, for example), type:

```
root@Moxa:~# apt-get install vim
root@Moxa:~#
```

4. Use one of the following commands to remove a package:

   (a) For a simple package removal:

```
root@Moxa:~# apt-get remove vim
root@Moxa:~#
```

   (b) For a complete package removal:

```
root@Moxa:~# apt-get remove vim --purge
root@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.

```
ATTENTION
You can free up the cache space with the command `# apt-get clean`
```

```
root@Moxa:~# apt-get clean
root@Moxa:~#
```
Managing Communications

The V2403-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"
- Serial Port Operation Mode
- DNS Client
  - /etc/hostname
  - /etc/resolv.conf
  - /etc/nsswitch.conf
- Configuring Ethernet Bonding
- Apache Web Server
  - Default Homepage
  - Disabling the CGI Function
- 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
- NFS (Network File System) Client
- SNMP
- OpenVPN
  - Ethernet Bridging for Private Networks on Different Subnets
  - Ethernet Bridging for Private Networks on the Same Subnet
  - Routed IP
  - Cellular Module
  - Wi-Fi Module
Detecting Network Interfaces

Debian Linux systems use udevd to detect new network interfaces, including Ethernet interfaces and wireless interfaces. One of the rules is /lib/udev/rules.d/75-persistent-net-generator.rules for creating a persistent network interface naming order. The content in /etc/udev/rules.d/70-persistent-net.rules is similar to the following:

```bash
# PCI device 0x10ec:0x8168 (r8169)
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 (r8169)
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 V2403 computer has two 10/100 or 10/100/1000 Ethernet ports named LAN1 and LAN2. The default IP addresses and netmasks of these network interfaces are:

<table>
<thead>
<tr>
<th></th>
<th>Default IP Address</th>
<th>Netmask</th>
</tr>
</thead>
<tbody>
<tr>
<td>LAN1</td>
<td>192.168.3.127</td>
<td>255.255.255.0</td>
</tr>
<tr>
<td>LAN2</td>
<td>192.168.4.127</td>
<td>255.255.255.0</td>
</tr>
</tbody>
</table>

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.
   ```bash
   moxa@MOXA:~# cd /etc/network
   ```

2. Type `vi interfaces` to edit the network configuration file with vi editor. You can configure the V2403’s Ethernet ports for static or dynamic (DHCP) IP addresses.
   ```bash
   moxa@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
```

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@MOXA:~# ifconfig eth0 192.168.1.1
moxa@MOXA:~#
```
Serial Port Operation Mode

The V2403-LX computer has 4 serial ports named COM1, COM2, COM3, and COM4. The ports support RS-232, RS-422, 2-wire RS-485, and 4-wire RS-485 operation modes with baudrate settings up to 921600 bps.

By default, the serial interface is set to RS-232. You can use the `setinterface` command to change the serial port operation mode, as indicated below:

```
setinterface device-node [interface-no]
```

- `device-node`: /dev/ttyM0 to /dev/ttyM3
- `interface-no`:
  - 0: set to RS232 interface
  - 1: set to RS485-2WIRES interface
  - 2: set to RS422 interface
  - 3: set to RS485-4WIRES interface

For example, use the following commands to set /dev/ttyM0 to RS-422:

```
root@Moxa:/home/moxa# setinterface /dev/ttyM0 2
root@Moxa:/home/moxa# setinterface /dev/ttyM0
Now setting is RS422 interface.
```

DNS Client

The V2403-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.

   ```
   root@Moxa:~# /etc/init.d/hostname.sh start
   ```

3. Check the new hostname.

   ```
   root@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

root@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, load the bonding driver. Then use ifenslave to add the Ethernet interface into the bond0 interface. The following script bonds eth1 and eth2 together; you can place the script 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:
V2403 Series Linux Software
Managing Communications

# 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 use insserv to add this to run level.

```
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.conf`, with the default homepage located at `/var/www/html/index.html`.

Save your own homepage to the following directory:

`/var/www/html`

Save your CGI page to the following directory:

`/var/www/html/cgi-bin/`

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.conf`

1. Type `# vi/etc/apache2/sites-enabled/000-default.conf` to edit the configuration file.

   Comment out the following lines:

   ```
   #ScriptAlias /cgi-bin/ /var/www/apache2-default/cgi-bin/
   #<Directory "/var/www/apache2 default/cgi-bin/">
   # AllowOverride None
   # Options ExecCGI -MultiViews +SymLinksIfOwnerMatch
   # Order allow,deny
   # Order deny,allow
   # Allow from all
   #</Directory>
   ```

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

2. Re-start the apache server.

   ```
   root@Moxa:~# /etc/init.d/apache2 restart
   ```
ATTENTION
When you develop your own CGI application, make sure your CGI file is executable.

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 V2403-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 V2403-LX supports the following sub-modules. Use the module that matches your application.

<table>
<thead>
<tr>
<th>Module</th>
<th>Module</th>
<th>Module</th>
<th>Module</th>
</tr>
</thead>
<tbody>
<tr>
<td>arptable_filter.ko</td>
<td>arp_tables.ko</td>
<td>arpt_mangle.ko</td>
<td>ip_conntrack_amanda.ko</td>
</tr>
<tr>
<td>ip_conntrack_ftp.ko</td>
<td>ip_conntrack_h323.ko</td>
<td>ip_conntrack_irc.ko</td>
<td>ip_conntrack_ko</td>
</tr>
<tr>
<td>ip_conntrack_netbios_ns.ko</td>
<td>ip_conntrack_netlink.ko</td>
<td>ip_conntrack_pptp.ko</td>
<td>ip_conntrack_proto_sctp.ko</td>
</tr>
<tr>
<td>ip_conntrack_sip.ko</td>
<td>ip_conntrack_tftp.ko</td>
<td>ip_nat_amanda.ko</td>
<td>ip_nat_ftp.ko</td>
</tr>
<tr>
<td>ip_nat_h323.ko</td>
<td>ip_nat_irc.ko</td>
<td>ip_nat.ko</td>
<td>ip_nat_pptp.ko</td>
</tr>
<tr>
<td>ip_nat_snmp_basic.ko</td>
<td>ip_nat_tftp.ko</td>
<td>ip_queue.ko</td>
<td></td>
</tr>
<tr>
<td>iptable_filter.ko</td>
<td>iptable_mangle.ko</td>
<td>iptable_nat.ko</td>
<td>iptable_raw.ko</td>
</tr>
<tr>
<td>ip_tables.ko</td>
<td>ipt_addrtype.ko</td>
<td>ipt_ah.ko</td>
<td>ipt_CLUSTERIP.ko</td>
</tr>
<tr>
<td>ipt_dscp.ko</td>
<td>ipt_DSCP.ko</td>
<td>ipt_ecn.ko</td>
<td>ipt_ECN.ko</td>
</tr>
<tr>
<td>ipt_hashlimit.ko</td>
<td>ipt_iprange.ko</td>
<td>ipt_LOG.ko</td>
<td>ipt_MASQUERADE.ko</td>
</tr>
<tr>
<td>ipt_NETMAP.ko</td>
<td>ipt_owner.ko</td>
<td>ipt_recent.ko</td>
<td>ipt_REDIRECT.ko</td>
</tr>
<tr>
<td>ipt_REJECT.ko</td>
<td>ipt_SAME.ko</td>
<td>ipt_TCPMSS.ko</td>
<td>ipt/tos.ko</td>
</tr>
<tr>
<td>ipt_TOS.ko</td>
<td>ipt_ttl.ko</td>
<td>ipt_TTL.ko</td>
<td>ipt_ULOG.ko</td>
</tr>
</tbody>
</table>
The basic syntax to enable and load an IPTABLES module is as follows:

```bash
# 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 V2403-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.


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:**

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

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

```bash
# 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:**

```bash
# 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.

```bash
# iptables -F
# iptables -X
# iptables -Z
```
Define Policy for Chain Rules

Usage:

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

**-P:** Set the policy for the chain to the given target.
- **INPUT:** For packets coming into the V2403-LX.
- **OUTPUT:** For locally-generated packets.
- **FORWARD:** For packets routed out through the V2403-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
```

- **-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 V2403-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 V2403-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 V2403-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 on the following link for more information about NAT:

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 V2403-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.
#echo 1 > /proc/sys/net/ipv4/ip_forward#modprobe ipt_MASQUERADE#iptables –t nat –A POSTROUTING –o eth0 –j MASQUERADE

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 V2403-LX without worrying about the amount of disk space that will be available. The V2403-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**

The V2403-LX comes with the SNMP (Simple Network Management Protocol) agent software pre-installed. It supports **RFC 1213 MIB-II**.

By default, snmpd listens for connections from the local system. To prevent listening, remove the configuration text `agentAddress udp:127.0.0.1:161` from the system file: `/etc/snmp/snmpd.conf`.

**Example:**

```
root@Moxa:~# vi /etc/snmp/snmpd.conf
```

```bash
# AGENT BEHAVIOUR

# Listen for connections from the local system only
# agentAddress udp:127.0.0.1:161
# Listen for connections on all interfaces (both IPv4 *and* Ipv6)
agentAddress udp:161,udp6:[:1]:161
```

After editing the config file, restart the snmpd daemon.

```bash
root@Moxa:~# /etc/init.d/snmpd restart
```

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

```bash
root@Moxa:~# snmpwalk -v 1 -c public 192.168.3.127
iso.3.6.1.2.1.1.1.0 = STRING: "Linux Moxa 3.16.0-0.bpo.4-amd64 #1 SMP Debian 3.16.7-ckt4-3-bpo70+1 (2015-02-12) x86_64"
iso.3.6.1.2.1.1.2.0 = OID: iso.3.6.1.4.1.8691.12.2400
iso.3.6.1.2.1.1.3.0 = Timeticks: (400) 0:00:04.00
iso.3.6.1.2.1.1.4.0 = STRING: "Moxa Inc., Embedded Computing Business. <www.moxa.com>"
iso.3.6.1.2.1.1.5.0 = STRING: "Moxa"
iso.3.6.1.2.1.1.6.0 = STRING: "Fl.4, No.135, Lane 235, Baoquao Rd., Xindian Dist., New Taipei City, Taiwan, R.O.C."
iso.3.6.1.2.1.1.7.0 = INTEGER: 72
iso.3.6.1.2.1.1.8.0 = Timeticks: (1) 0:00:00.01
iso.3.6.1.2.1.1.9.1.2.1 = OID: iso.3.6.1.6.3.10.3.1.1
iso.3.6.1.2.1.1.9.1.2.2 = OID: iso.3.6.1.6.3.11.3.1.1
```
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
LAN1: 192.168.2.171
      local net
LAN1: 192.168.2.173

LAN2: 192.168.8.173

OpenVPN A

LAN1: 192.168.4.172
      local net
LAN1: 192.168.4.174

LAN2: 192.168.8.174

OpenVPN B

Host B
```

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
   `

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`.
   ```
   #!/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-------------------
   ```
And then configure the bridge interface in `/etc/openvpn/bridge`.

```bash
#!/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"
...
```

Start the bridge script file to configure the bridge interface:
```bash
# /etc/openvpn/bridge restart
```

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

```bash
# 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
```

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

```bash
#!/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
```

And then configure the bridge interface in `/etc/openvpn/bridge`.

```bash
#!/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"

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

7. 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

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

<table>
<thead>
<tr>
<th>Destination</th>
<th>Gateway</th>
<th>Genmask</th>
<th>Flags</th>
<th>Metric</th>
<th>Ref</th>
<th>Use</th>
<th>Iface</th>
</tr>
</thead>
<tbody>
<tr>
<td>192.168.5.0</td>
<td>0.0.0.0</td>
<td>255.255.255.0</td>
<td>U</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>eth2</td>
</tr>
<tr>
<td>192.168.4.0</td>
<td>0.0.0.0</td>
<td>255.255.255.0</td>
<td>U</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>br0</td>
</tr>
<tr>
<td>192.168.3.0</td>
<td>0.0.0.0</td>
<td>255.255.255.0</td>
<td>U</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>eth0</td>
</tr>
<tr>
<td>192.168.30.0</td>
<td>0.0.0.0</td>
<td>255.255.255.0</td>
<td>U</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>eth3</td>
</tr>
<tr>
<td>192.168.8.0</td>
<td>0.0.0.0</td>
<td>255.255.255.0</td>
<td>U</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>br0</td>
</tr>
</tbody>
</table>

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.

9. 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.

10. 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.

![Diagram of Ethernet Bridging for Private Networks on the Same Subnet]

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.

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

Routed IP

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

![Diagram of Routed IP]
2. On machine OpenVPN A, modify the remote address in configuration file `/etc/openvpn/tun.conf`.

```bash
# 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`.

```bash
#!/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
```

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

```bash
# 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`.

```bash
#!/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
```

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`.

<table>
<thead>
<tr>
<th>Destination</th>
<th>Gateway</th>
<th>Genmsk</th>
<th>Flags</th>
<th>Metric</th>
<th>Ref</th>
<th>Use</th>
<th>Iface</th>
</tr>
</thead>
<tbody>
<tr>
<td>192.168.4.174</td>
<td>*</td>
<td>255.255.255.255</td>
<td>UH</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>tun0</td>
</tr>
<tr>
<td>192.168.4.0</td>
<td>192.168.4.174</td>
<td>255.255.255.0</td>
<td>UG</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>tun0</td>
</tr>
<tr>
<td>192.168.2.0</td>
<td>*</td>
<td>255.255.255.0</td>
<td>U</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>eth1</td>
</tr>
<tr>
<td>192.168.8.0</td>
<td>*</td>
<td>255.255.255.0</td>
<td>U</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>eth0</td>
</tr>
</tbody>
</table>
ATTENTION

For more information about wpa_supplicant.conf, go to the following websites:
http://www.daemon-systems.org/man/wpa_supplicant.conf.5.html
http://linux.die.net/man/5/wpa_supplicant.conf

Cellular Module

Read below on to find out how to understand cellular signal strength from signal indicators, how to dial up on V2403, and several advanced setting in cellular module.

The MC7304, MC7354, and MC9090 cellular modules can be used with the V2403 series. Specifications can be found in the product’s datasheet. You may use the V2403 cellular connection utility cell_mgmt to establish a cellular connection.

Cellular Signal Strength

<table>
<thead>
<tr>
<th>Value</th>
<th>RSSI dbm</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 to 30</td>
<td>-73 to -53</td>
<td>Excellent</td>
</tr>
<tr>
<td>10 to 19</td>
<td>-93 to -74</td>
<td>Good</td>
</tr>
<tr>
<td>2 to 9</td>
<td>-109 to -94</td>
<td>Marginal</td>
</tr>
<tr>
<td>Else</td>
<td>Else</td>
<td>No signal</td>
</tr>
</tbody>
</table>

Cellular Dial-Up mode

For the 2 modules provided, it is suggested to dial up from QMI interface with QMI commands instead of using AT commands from the AT ports.

<table>
<thead>
<tr>
<th>Dial Up mode</th>
<th>QMI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>/dev/cdc-wdm0</td>
</tr>
<tr>
<td>AT Port</td>
<td>/dev/ttyUSB2</td>
</tr>
<tr>
<td>GPS port</td>
<td>/dev/ttyUSB0</td>
</tr>
</tbody>
</table>

cell_mgmt Usage

Manual page

"cell_mgmt" is a utility to handle cellular module-related behavior.

```
moxa@Moxa:~$ sudo cell_mgmt help
[sudo] password for moxa:
Usage:
   ./cell_mgmt [OPTIONS]

OPTIONS
   start [APN=[APN],Username=[user],Password=[pass],PIN=[pin_code]]
      Start network.

   example:
      cell_mgmt start
      cell_mgmt start APN=internet
      cell_mgmt start APN=internet PIN=0000
      cell_mgmt start APN=internet Username=moxa Password=pass PIN=0000

   stop
      Stop network.
```
restart
  Restart network.
reset
  Reset cellular.
power_on
  Power ON.
power_off
  Power OFF.
gps_on
  GPS ON.
gps_off
  GPS OFF.
status
  Query network connection status.
signal
  Get signal strength.
at ['AT_COMMAND']
  Input AT Command.
  Must use SINGLE QUOTATION to enclose AT Command.
  example:
    cell_mgmt at 'AT+CSQ'
sim_status
  Query sim card status.
set_pin [PIN]
  Set PIN code to configuration file and verify.
pin_protection [PIN][PIN2] [enable|disable] [current_PIN]
  Set PIN protection in the UIM.
  example:
    cell_mgmt pin_protection PIN enable 0000
version
  Cellular management version.
interface [num]
  Set the interface wwan[num] for cell_mgmt.

Automatic dial up

It will set DNS and default gateway automatically.
Please clean up your computer’s default gateway first, if you want to use cellular interface’s gateway.

**cell_mgmt start APN=[APN] Username=[user] Password=[pass] PIN=[pin_code]**

moxa@Moxa:/home/moxa# cell_mgmt start APN="internet"
warning : file /etc/qmi-network.conf does not exist.
Loading profile...
  APN: internet
Starting network with 'qmicli -d /dev/cdc-wdm1 --wds-start-network=internet --client-no-release-cid --device-open-net=net-802-3|net-no-qos-header'...
Saving state... (CID: 8)
Saving state... (PDH: 1205656072)
Network started successfully
There is no PIN code
APN, Username, Password, PIN will be written in config file: /etc/qmi-network.conf when use "cell_mgmt start". Next time you can use "cell_mgmt start" without OPTIONs if OPTIONs are the same as last time set.

**cell_mgmt stop**

Stop network.

```bash
moxa@Moxa:/home/moxa# cell_mgmt stop
Loading profile...
   APN: internet
Loading previous state...
   Previous CID: 8
   Previous PDH: 1205656072
Stopping network with 'qmicli -d /dev/cdc-wdm1 --wds-stop-network=1205656072 --client-cid=8'...
Network stopped successfully
Clearing state...
```

**cell_mgmt restart**

Restart network.

```bash
moxa@Moxa:/home/moxa# cell_mgmt restart
Loading profile...
   APN: internet
Loading previous state...
   Previous CID: 8
   Previous PDH: 1205716376
Stopping network with 'qmicli -d /dev/cdc-wdm1 --wds-stop-network=1205716376 --client-cid=8'...
Network stopped successfully
Clearing state...
Loading profile...
   APN: internet
Starting network with 'qmicli -d /dev/cdc-wdm1 --wds-start-network=internet --client-no-release-cid --device-open-net=net-802-3|net-no-qos-header'...
Saving state... (CID: 8)
Saving state... (PDH: 1205652720)
Network started successfully
There is no PIN code
```

**Cellular module**

**cell_mgmt reset**

Reset cellular module.

```bash
moxa@Moxa:/home/moxa# cell_mgmt restart
Loading profile...
   APN: internet
Loading previous state...
   Previous CID: 8
   Previous PDH: 1205716376
Stopping network with 'qmicli -d /dev/cdc-wdm1 --wds-stop-network=1205716376 --client-cid=8'...
Network stopped successfully
Clearing state...
Loading profile...
   APN: internet
```
Starting network with 'qmicli -d /dev/cdc-wdm1 --wds-start-network=internet --client-no-release-cid --device-open-net=net-802-3|net-no-qos-header'...
Saving state... (CID: 8)
Saving state... (PDH: 1205652720)
Network started successfully
There is no PIN code

**cell_mgmt power_on**
Turn on cellular module power.

```bash
moxa@Moxa:/home/moxa# cell_mgmt power_on
```

**cell_mgmt power_off**
Turn off cellular module power.

```bash
moxa@Moxa:/home/moxa# cell_mgmt power_off
```

**cell_mgmt gps_on**
Turn on gps power.

```bash
moxa@Moxa:/home/moxa# cell_mgmt gps_on
```

GPS function is *ENABLE*

**cell_mgmt gps_off**
Turn off gps power.

```bash
moxa@Moxa:/home/moxa# cell_mgmt gps_off
```

GPS function is *DISABLE*

**cell_mgmt status**
Query network connection status.

```bash
moxa@Moxa:/home/moxa# cell_mgmt status
```

Status: disconnected

**cell_mgmt signal**
Get signal strength.

```bash
moxa@Moxa:/home/moxa# cell_mgmt signal
```

-86 dbm

**cell_mgmt at ['AT_COMMAND']**
Input AT Command.

Must use SINGLE QUOTATION to enclose AT Command.

for example input the at command AT+GMR

```bash
moxa@Moxa:/home/moxa# cell_mgmt at 'AT+GMR'
```

please wait...

--- AT COMMAND: AT+GMR ---

OK

SWI9X15C_05.05.16.02 r21040 carmd-fwbuild1 2014/03/17 23:49:48

OK
Sim card

**cell_mgmt sim_status**

Query sim card status.

sim card had been locked or failed.

```
moxa@Moxa:/home/moxa# cell_mgmt sim_status
[/dev/cdc-wdm1] UIM state retrieved:
  State: 'locked-or-failed'
```

sim card initialization-completed.

```
moxa@Moxa:/home/moxa# cell_mgmt sim_status
[/dev/cdc-wdm1] UIM state retrieved:
  State: 'initialization-completed'
```

**cell_mgmt set_pin [PIN]**

Set PIN code to configuration file and verify.

```
moxa@Moxa:/home/moxa# cell_mgmt set_pin 0000
old PIN=, new PIN=0000
[/dev/cdc-wdm1] PIN verified successfully
```

**cell_mgmt pin_protection [PIN|PIN2] [enable|disable] [current_PIN]**

Set PIN protection in the UIM.

enable PIN protection

```
moxa@Moxa:/home/moxa# cell_mgmt pin_protection PIN enable 0000
[/dev/cdc-wdm1] PIN protection updated
```

disable PIN protection

```
moxa@Moxa:/home/moxa# cell_mgmt pin_protection PIN disable 0000
[/dev/cdc-wdm1] PIN protection updated
```

Set interface

**cell_mgmt interface [num]**

Set the interface wwan[num] for cell_mgmt.

Check the interface current using.

```
moxa@Moxa:/home/moxa# cell_mgmt interface
[0] wwan0  <Current>
[1] wwan1
```

Set interface to wwan[num]

```
moxa@Moxa:/home/moxa# cell_mgmt interface 1
set interface=1
moxa@Moxa:/home/moxa# cell_mgmt interface
[0] wwan0
[1] wwan1  <Current>
```
cellular management

**cell_mgmt version**

Cellular management version.

```bash
moxa@Moxa:/home/moxa# cell_mgmt version
cell_mgmt
version:1.7.0
```

## Wi-Fi Module

In this section we show you how to connect to an 802.11 access point. The connection program we will use is **wpa_supplicant**.

There are two ways to use **wpa_supplicant**. You can use wifi_mgmt, which is offered by Moxa or use the use **wpa_supplicant** command.

### wifi_mgmt Usage

**Manual page**

**wifi_mgmt help**

* wifi_mgmt* is a utility for handling wifi module-related behavior.

```bash
moxa@Moxa:~$ sudo wifi_mgmt help
[sudo] password for moxa:
Usage:
  /sbin/wifi_mgmt [OPTIONS]

OPTIONS
  start Type=[type] SSID=[ssid] Password=[password]
  Insert an AP information to the managed AP list and then connect to the
  AP.

  [type]          open/wep/wpa/wpa2
  [ssid]          access point's SSID
  [password]      access point's password

  example:
  wifi_mgmt start Type=wpa SSID=moxa_ap Password=moxa
  wifi_mgmt start Type=open SSID=moxa_ap

  start [num]
  Connect to AP by the managed AP list number.

  start
  Connect to the last time AP that was used.

  scan -d
  Scan all the access points information and show the detail message.

  scan
  Scan all the access points information.

  signal
  Show the AP's signal.

  list
  Show the managed AP list.

  insert Type=[type] SSID=[ssid] Password=[password]
  Insert a new AP information to the managed AP list.
```
Connect to an AP

There are three ways to connect to an AP. The DNS and default gateway will be configured automatically. If you want to use the wireless interface’s gateway, be sure to clean up your computer’s default gateway first.

**wifi_mgmt start Type=[type] SSID=[ssid] Password=[password]**

Insert the AP information in the managed AP list and then connect to an AP.

```bash
root@Moxa:~ # wifi_mgmt start Type=wpa SSID=moxa_ap Password=moxa
wpa_state=COMPLETED
*** Get DHCP IP address from AP ***
*** Get DHCP IP from AP! ***
```

**wifi_mgmt start [num]**

Connect to the AP using the managed AP list number. If you have inserted AP information before, some AP information will still be in the managed AP list. Check the managed AP list with the wifi_mgmt list command.

```bash
root@Moxa:~ # wifi_mgmt list
network id / ssid / bssid / flags
0      MOXA_AP1  any     [LAST USED]
1      MOXA_AP2  any     [DISABLED]
2      MOXA_AP3  any     [DISABLED]
```

Choose an AP number to start.

```bash
root@Moxa:~ # wifi_mgmt start 1
wpa_state=COMPLETED
*** Get DHCP IP address from AP ***
*** Get DHCP IP from AP! ***
```
**wifi_mgmt start**
Connect to the previous AP that was used.

```
root@Moxa:~# wifi_mgmt list
network id / ssid / bssid / flags
0  MOXA_AP1  any     [LAST USED]
1  MOXA_AP2  any     [DISABLED]
2  MOXA_AP3  any     [DISABLED]
```

Use the command wifi_mgmt to connect to the AP "MOXA_AP1" that was used the previous time.

```
root@Moxa:~# wifi_mgmt start
wpa_state=COMPLETED
*** Get DHCP IP address from AP ***
*** Get DHCP IP from AP! ***
```

**Stop or restart network**

**wifi_mgmt stop**

```
root@Moxa:~# wifi_mgmt stop
wpa_supplicant is closed!!
```

**wifi_mgmt restart**

```
root@Moxa:~# wifi_mgmt restart
wpa_supplicant is closed!!
wpa_state=COMPLETED
*** Get DHCP IP address from AP ***
*** Get DHCP IP from AP! ***
```

**Insert an AP or choose another AP to connect.**

If you want to use another AP to connect, use the wifi_mgmt select command to switch to another AP.

```
root@Moxa:~# wifi_mgmt insert Type=wpa2 SSID=MOXA_AP3 Password=moxa
root@Moxa:~# wifi_mgmt list
network id / ssid / bssid / flags
0  MOXA_AP1  any     [DISABLED]
1  MOXA_AP2  any     [CURRENT]
2  MOXA_AP3  any     [DISABLED]
```

If you want to use another AP to connect, use the wifi_mgmt select command to switch to another AP.

```
root@Moxa:~# wifi_mgmt list
network id / ssid / bssid / flags
0  MOXA_AP1  any     [DISABLED]
1  MOXA_AP2  any     [CURRENT]
2  MOXA_AP3  any     [DISABLED]
root@Moxa:~# wifi_mgmt select 2
wpa_state=COMPLETED
*** Get DHCP IP address from AP ***
*** Get DHCP IP from AP! ***
```
Other functions

**wifi_mgmt scan**
Scan all of the access point information.

```
root@Moxa:~# wifi_mgmt scan
bssid / frequency / signal level / flags / ssid
2c:54:cf:fd:5a:cf       2437    -83     [WPA-PSK-TKIP][ESS]     5566fans
```

**wifi_mgmt scan -d**
Scan all of the access point information and show a detailed message.

```
root@Moxa:~# wifi_mgmt scan -d
wlan0     Scan completed :
   Cell 01 - Address: FC:F5:28:CB:8C:23
            Channel:1
            Frequency:2.412 GHz (Channel 1)
            Quality=51/70  Signal level=-59 dBm
            Encryption key:on
            ESSID:"MHQ-NB"
                9 Mb/s; 12 Mb/s; 18 Mb/s
            Mode:Master
                Group Cipher : CCMP
                Pairwise Ciphers (1) : CCMP
                Authentication Suites (1) : 802.1x
                Preauthentication Supported
   Cell 02 - Address: FE:F0:28:CB:5D:A8
            Channel:11
            Frequency:2.462 GHz (Channel 11)
            Quality=25/70  Signal level=-85 dBm
            Encryption key:on
            ESSID:"MHQ-Mobile"
                9 Mb/s; 12 Mb/s; 18 Mb/s
            Mode:Master
                Group Cipher : CCMP
                Pairwise Ciphers (1) : CCMP
                Authentication Suites (1) : 802.1x
                Preauthentication Supported
```
**wifi_mgmt signal**
Show the AP's signal.

```
root@Moxa:~# wifi_mgmt signal
level=-59 dBm
```

**wifi_mgmt delete**

```
root@Moxa:~# wifi_mgmt list
network id / ssid / bssid / flags
0     MOXA_AP1  any     [CURRENT]
1     MOXA_AP1  any     [DISABLED]
2     MOXA_AP3  any     [DISABLED]

root@Moxa:~# wifi_mgmt delete 2
***** WARNING *****
Are you sure that you want to delete network id 2 (y/n)y
```

```
network id / ssid / bssid / flags
0     MOXA_AP1  any
1     MOXA_AP2  any     [DISABLED]
```

**wifi_mgmt status**

```
root@Moxa:~# wifi_mgmt status
bssid=b0:b2:dc:dd:c9:e4
ssid=MOXA_AP1
id=0
mode=station
pairwise_cipher=TKIP
group_cipher=TKIP
key_mgmt=WPA-PSK
wpa_state=COMPLETED
ip_address=192.168.1.36
address=00:0e:8e:4c:13:5e
```

**wifi_mgmt interface [num]**
If there is more than one wifi interface, you can change the interface.

```
root@Moxa:~# wifi_mgmt interface
There is(are) 2 interface(s):
wlan0    [Current]
wlan1

root@Moxa:~# wifi_mgmt interface 1
Now is setting the interface as wlan1.
```

**wifi_mgmt reconnect**

```
root@Moxa:~# wifi_mgmt reconnect
wpa_state=SCANNING
wpa_state=SCANNING
wpa_state=COMPLETED
*** Get DHCP IP address from AP ***
*** Get DHCP IP from AP! ***
```

**wifi_mgmt version**

```
root@Moxa:~# wifi_mgmt version
wifi_mgmt version 1.0 Build 15050223
```
Configuring the Wireless LAN by \texttt{wpa\_supplicant.conf}

\textbf{WARNING}

You might encounter \textbf{compatibility issues} if you configure Wi-Fi settings using \texttt{wifi\_mgmt} instead of using \texttt{wpa\_supplicant.conf}. Because \texttt{wifi\_mgmt} edits \texttt{wpa\_supplicant.conf} dynamically, use \texttt{wifi\_mgmt} instead of editing \texttt{wpa\_supplicant.conf} by yourself.

\textit{Moxa strongly advises against using the WEP and WPA encryption standards.} Both are now officially deprecated by the Wi-Fi Alliance, and are considered insecure. To guarantee proper Wi-Fi encryption and security, please use WPA2 with the AES encryption algorithm.

You can configure the Wi-Fi connection using a configuration file or the \texttt{wpa\_supplicant} command.

The following example is for OPEN/WEP/WPA/WPA2 AP.

```
ctrl_interface=/var/run/wpa_supplicant
ctrl_interface_group=wheel
update_config=1

### Open system ###
#network={
#   ssid="Open"
#   key_mgmt=None
#}

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

##### WEP #####
#network={
#   ssid="WEP-ssid"
#   bssid=XX:XX:XX:XX:XX:XX
#   key_mgmt=None
#   wep_key0=KEY
#}

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

##### WPA/WPA2 PSK ######
#network={
#   ssid="WPA-ssid"
#   proto=WPA WPA2 RSN
#   key_mgmt=WPA-PSK
#   pairwise=TKIP CCMP
#   group=TKIP CCMP
#   psk="KEY"
#}

########################
```

The basic command to connect for \texttt{WPA-supplicant} is:

```
root@Moxa:~# wpa_supplicant -i <interface> -c <configuration file> -B
```

The \texttt{-B} option should be included because it forces the supplicant to run in the background.

1. Connect with the following command after editing \texttt{wpa\_supplicant.conf}:
   
   ```
   root@Moxa:~# wpa_supplicant -i wlan0 -c /etc/wpa_supplicant.conf -B
   ```
2. Use **iwconfig** to check the connection status. The response you receive should be similar to the following:

```
   wlan0      IEEE 802.11abgn  ESSID:"MOXA_AP"
           Mode:Managed  Frequency:2.462 GHz  Access Point: 00:1F:1F:8C:0F:64
           Bit Rate=36 Mb/s  Tx-Power=27 dBm
           Retry min limit:7  RTS thr:off  Fragment thr:off
           Encryption key:1234-5678-90  Security mode:open
           Power Management:off
           Link Quality=37/70  Signal level=-73 dBm
           Rx invalid nwid:0  Rx invalid crypt:0  Rx invalid frag:0
           Tx excessive retries:0  Invalid misc:0  Missed beacon:0
```

**ATTENTION**

For more information about `wpa_supplicant.conf`, go to the following websites:

- [http://www.daemon-systems.org/man/wpa_supplicant.conf.5.html](http://www.daemon-systems.org/man/wpa_supplicant.conf.5.html)
- [http://linux.die.net/man/5/wpa_supplicant.conf](http://linux.die.net/man/5/wpa_supplicant.conf)
The following topics are covered in this chapter:

- **Device API**
- **Getting the Product Serial Number**
- **RTC (Real Time Clock)**
- **Digital I/O**
  - Special Note
  - Examples
- **WDT (Watch Dog Timer)**
  - Introduction
  - Watchdog Usage
  - How the WDT Works
  - Watchdog Device IOCTL Commands
  - Examples
Device API

The V2403 supports control devices with the `ioctl` system API. The interface is shown below:

```c
int ioctl(int d, int request,...);
```

**Input:**
- `<d>` open device node return file handle
- `<request>` argument in or out

Refer to desktop Linux's man page for detailed documentation:

```bash
#man ioctl
```

Getting the Product Serial Number

Use `dmidecode` to ready the product information. The command is:

```bash
moxa@Moxa:~$ sudo dmidecode -s "baseboard-manufacturer"
MOXA
```

Refer to the following keywords to get other product information.

```bash
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 V2403 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.
   ```

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

<table>
<thead>
<tr>
<th>Function</th>
<th>int set_dout_state(int doport, int state)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>Set the DOUT port to high or low state.</td>
</tr>
<tr>
<td>Input</td>
<td>&lt;doport&gt; The DOUT port you want to set. Port starts from 0 to 1</td>
</tr>
<tr>
<td>Output</td>
<td>None</td>
</tr>
<tr>
<td>Return</td>
<td>refer to the error code</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Function</th>
<th>int get_din_state(int diport, int *state)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>Get the DIN port state</td>
</tr>
<tr>
<td>Input</td>
<td>&lt;diport&gt; The DIN port to get the state of. Port numbering is from 0 to 5</td>
</tr>
<tr>
<td>Output</td>
<td>&lt;state&gt; DIO_HIGH (1) for high, DIO_LOW (0) for low</td>
</tr>
<tr>
<td>Return</td>
<td>Refer to the error code</td>
</tr>
</tbody>
</table>
### 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 5. 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` 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 V2403 computers.

Examples

Example files `tdio.c` and `Makefile` are located in the folder `example` 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.

Watchdog Usage

Users can set the ack time from a minimum of 1 sec to a maximum of 1 day. The default timer is 60 seconds and NO WAY OUT is enabled by default; there is no way of disabling the watchdog once it has been started, so if the watchdog daemon crashes, the system will reboot after the timeout has passed. If the NO WAY OUT is disabled, the user can stop the timer.

Example of setting the default timer

Edit the `/etc/modprobe.d/watchdog.conf` file to set the default timer. The following commands set the default timer to 60 seconds:

```
vi /etc/modprobe.d/watchdog.conf
options moxa_v2100_wdt timer_margin=60
```

Enable or disable NO WAY OUT

Edit the `/etc/modprobe.d/watchdog.conf` file to enable or disable NO WAY OUT.

Enable NO WAY OUT:

```
vi /etc/modprobe.d/watchdog.conf
options moxa_v2100_wdt nowayout=1
```

Disable NO WAY OUT:

```
vi /etc/modprobe.d/watchdog.conf
options moxa_v2100_wdt nowayout=0
```
Magic close

If NO WAY OUT is disabled, you can stop the timer using magic close. Use the following commands to do this:

```
root@Moxa:~$ echo V > /dev/watchdog
root@Moxa:~$
```

How the WDT Works

The Debian project supports a watchdog daemon. The watchdog daemon checks if your system is still working. If programs are no longer executing, it will perform a hard reset of the system. The standard watchdog driver and package have been installed in the V2403. If you need to run the watchdog once the system boots up, you can use `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 configuration 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 needed by your application.

```
...
watchdog-device = /dev/watchdog
...
interval = 60
realtime = yes
priority = -10
...
```
Use the following command to remove it from run-level:

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

Check the run level removement.

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

## Watchdog Device IOCTL Commands

<table>
<thead>
<tr>
<th>IOCTL</th>
<th>WDIOC_GETSUPPORT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>Returns the support of the card itself</td>
</tr>
<tr>
<td>Input</td>
<td>None</td>
</tr>
<tr>
<td>Output</td>
<td>(struct watchdog_info *) arg</td>
</tr>
<tr>
<td>Return</td>
<td>On success, returns 0. Otherwise, returns a value &lt; 0.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>IOCTL</th>
<th>WDIOC_GETSTATUS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>Returns the status of the card</td>
</tr>
<tr>
<td>Input</td>
<td>None</td>
</tr>
<tr>
<td>Output</td>
<td>(int *)arg</td>
</tr>
<tr>
<td>Return</td>
<td>On success, returns 0. Otherwise, returns a value &lt; 0.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>IOCTL</th>
<th>WDIOC_GETBOOTSTATUS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>Returns the status of the card that was reported at bootup.</td>
</tr>
<tr>
<td>Input</td>
<td>None</td>
</tr>
<tr>
<td>Output</td>
<td>(int *)arg</td>
</tr>
<tr>
<td>Return</td>
<td>On success, returns 0. Otherwise, returns a value &lt; 0.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>IOCTL</th>
<th>WDIOC_SETOPTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>Lets you set the options of the card. You can either enable or disable the card.</td>
</tr>
<tr>
<td>Input</td>
<td>None</td>
</tr>
<tr>
<td>Output</td>
<td>(int *)arg</td>
</tr>
<tr>
<td>Return</td>
<td>On success, returns 0. Otherwise, returns a value &lt; 0.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>IOCTL</th>
<th>WDIOC_KEEPALIVE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>Pings the card to tell it not to reset your computer.</td>
</tr>
<tr>
<td>Input</td>
<td>None</td>
</tr>
<tr>
<td>Output</td>
<td>None</td>
</tr>
<tr>
<td>Return</td>
<td>On success, returns 0. Otherwise, returns a value &lt; 0.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>IOCTL</th>
<th>WDIOC_SETTIMEOUT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>Sets the watchdog timeout</td>
</tr>
<tr>
<td>Input</td>
<td>arg: 1 to 255 seconds</td>
</tr>
<tr>
<td>Output</td>
<td>None</td>
</tr>
<tr>
<td>Return</td>
<td>On success, returns 0. Otherwise, returns a value &lt; 0.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>IOCTL</th>
<th>WDIOC_GETTIMEOUT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>Gets the current watchdog timeout.</td>
</tr>
<tr>
<td>Input</td>
<td>None</td>
</tr>
<tr>
<td>Output</td>
<td>arg: 1 to 255 seconds</td>
</tr>
<tr>
<td>Return</td>
<td>On success, returns 0. Otherwise, returns a value &lt; 0.</td>
</tr>
</tbody>
</table>
**Examples**

The example `watchdog-test.c` acks the watchdog.

```c
/*
 * Watchdog Driver Test Program
 */

#include <stdio.h>
#include <stdlib.h>
#include <string.h>
#include <unistd.h>
#include <fcntl.h>
#include <signal.h>
#include <sys/ioctl.h>
#include <linux/types.h>
#include <linux/watchdog.h>

int fd;

/*
 * This function simply sends an IOCTL to the driver, which in turn ticks
 * the PC Watchdog card to reset its internal timer so it doesn't trigger
 * a computer reset.
 */
static void keep_alive(void)
{
    int dummy;

    ioctl(fd, WDIOC_KEEPALIVE, &dummy);
}

/*
 * The main program. Run the program with "-d" to disable the card,
 * or "-e" to enable the card.
 */
static void term(int sig)
{
    close(fd);
    fprintf(stderr, "Stopping watchdog ticks...\n");
    exit(0);
}

int main(int argc, char *argv[])
{
    int flags;
    unsigned int ping_rate = 1;

    fd = open("/dev/watchdog", O_WRONLY);

    if (fd == -1) {
        fprintf(stderr, "Watchdog device not enabled.\n");
        fflush(stderr);
    }
```
exit(-1);

if (argc > 1) {
    if (!strncasecmp(argv[1], "-d", 2)) {
        flags = WDIOS_DISABLECARD;
        ioctl(fd, WDIIOC_SETOPTIONS, &flags);
        fprintf(stderr, "Watchdog card disabled.\n");
        fflush(stderr);
        goto end;
    } else if (!strncasecmp(argv[1], "-e", 2)) {
        flags = WDIOS_ENABLECARD;
        ioctl(fd, WDIIOC_SETOPTIONS, &flags);
        fprintf(stderr, "Watchdog card enabled.\n");
        fflush(stderr);
        goto end;
    } else if (!strncasecmp(argv[1], "-t", 2) && argv[2]) {
        flags = atoi(argv[2]);
        ioctl(fd, WDIIOC_SETTIMEOUT, &flags);
        fprintf(stderr, "Watchdog timeout set to %u seconds.\n", flags);
        fflush(stderr);
        goto end;
    } else if (!strncasecmp(argv[1], "-p", 2) && argv[2]) {
        ping_rate = strtoul(argv[2], NULL, 0);
        fprintf(stderr, "Watchdog ping rate set to %u seconds.\n", ping_rate);
        fflush(stderr);
    } else {
        fprintf(stderr, "-d to disable, -e to enable, -t <n> to set " \n        "the timeout, -p <n> to set the ping rate, and \n");
        fprintf(stderr, "run by itself to tick the card.\n");
        fflush(stderr);
        goto end;
    }
}

fprintf(stderr, "Watchdog Ticking Away!\n");
flush(stderr);

signal(SIGINT, term);

while(1) {
    keep_alive();
    sleep(ping_rate);
}
end:
    close(fd);
    return 0;
The V2403-LX is installed with the Embedded Linux operating system, which is located in the CFast shipped with the V2403-LX computer. Although it rarely happens, you may find on occasion that operating system files and/or the disk file system are damaged. This chapter describes how to recover the Linux operating system.

The following topics are covered in this chapter:

- Recovery Environment
- Recovery Procedure
- Saving the System to the USB Drive
Recovery Environment

The recovery environment includes the V2403 embedded computer and a bootable USB disk with the recovery programs and system image file.

Hardware

The hardware used includes a PC, a V2403 computer and a USB disk with the recovery programs. (Note: The USB disk should be at least 2 GB.).

Recovery Procedure

Step 1: Prepare your USB drive

1. Execute `tuxboot-windows-23.exe` from the Recovery\ folder on the Software CD, select Pre Download, and then click "..."
2. Select the ISO file in the directory `<Software DVD> \Recovery`

3. Select **USB Drive** type, select a **Drive**, and then click **OK** to continue.
4. The boot files will be copied to your USB drive.

5. When finished, click **Exit** to stop the program.

6. Manually copy the **os_image** directory from the `<Software DVD>\Recovery\V2403-LX_V1.0_FWFR\V2400A-LX_V1.0_Build_15102815` on the Software DVD to `<home>\partimag\` on the USB drive.
Step 2: Change the BIOS Settings
You will need to change the BIOS settings to boot from the USB disk.

1. Turn on the computer and press **F2**. Select **SCU** in the following screen.

2. Select **Boot** and then select **Legacy**. Press **Enter** to continue.
3. Select **Boot Type Order**.

4. Select USB disk and then press "+" to move it to the first boot device position.

   **Warning**: An incorrect boot priority will lead to recovery failure.

5. Press **F10** and then press **Enter** to save and exit the BIOS setup.
Step 3: Restore the system from the USB drive

Connect the USB disk to any of the V2403’s USB ports and then reboot the computer. The system will boot from the USB disk and the Pre-installation Environment and the recovery utility will appear.

There are 2 kinds of recovery process in Clonezilla: **auto mode** and **expert mode**:

- Select **auto mode** to complete the recovery task if you want Clonezilla to help you recover the MBR and expand the image automatically.
- Select **expert mode** to see a list of selectable options for completing the recovery task.

**Auto mode:**

1. Select **clonezilla live restore disk**.

2. Wait for the USB drive boot process to finish.
3. Enter y to continue the restore process.

```
3. Enter y to continue the restore process.
```

```
The jobs in /etc/ocn/ocn-live.d/ are finished. Start "ocs-live-restore" now.

Setting the TERM as linux
******************************************************************************
clonezilla image dir: /home/partimag
******************************************************************************
Shutting down the Logical Volume Manager
No volume groups found
No volume groups found
Finished Shutting down the Logical Volume Manager
******************************************************************************
The following step is to restore an image to the hard disk/partition(s) on this machine: "/home/partimag/". Do so now!

WARNING!!! WARNING!!! WARNING!!! WARNING!!! WARNING!!! WARNING!!!
WARNING! THE EXISTING DATA IN THIS HARDISK/PARTITION(S) WILL BE OVERWRITTEN! ALL EXISTING DATA WILL BE LOST.
******************************************************************************
Machine: VirtualBox
```
```
sda [2.108_VBDX_HARDDISK__ata-VBDX_HARDDISK_VB1b6d4a0c-c9f7523d]
******************************************************************************
Are you sure you want to continue? y
[y/n] y
```

4. Enter y to confirm again.

```
4. Enter y to confirm again.
```

```
The jobs in /etc/ocn/ocn-live.d/ are finished. Start "ocs-live-restore" now.

Setting the TERM as linux
******************************************************************************
clonezilla image dir: /home/partimag
******************************************************************************
Shutting down the Logical Volume Manager
No volume groups found
No volume groups found
Finished Shutting down the Logical Volume Manager
******************************************************************************
The following step is to restore an image to the hard disk/partition(s) on this machine: "/home/partimag/". Do so now!

WARNING!!! WARNING!!! WARNING!!! WARNING!!! WARNING!!! WARNING!!! WARNING!!!
WARNING! THE EXISTING DATA IN THIS HARDISK/PARTITION(S) WILL BE OVERWRITTEN! ALL EXISTING DATA WILL BE LOST.
******************************************************************************
Machine: VirtualBox
```
```
sda [2.108_VBDX_HARDDISK__ata-VBDX_HARDDISK_VB1b6d4a0c-c9f7523d]
******************************************************************************
Are you sure you want to continue? y
[y/n] y
```

```
4. Enter y to confirm again.
```

```
The jobs in /etc/ocn/ocn-live.d/ are finished. Start "ocs-live-restore" now.

Setting the TERM as linux
******************************************************************************
clonezilla image dir: /home/partimag
******************************************************************************
Shutting down the Logical Volume Manager
No volume groups found
No volume groups found
Finished Shutting down the Logical Volume Manager
******************************************************************************
The following step is to restore an image to the hard disk/partition(s) on this machine: "/home/partimag/". Do so now!

WARNING!!! WARNING!!! WARNING!!! WARNING!!! WARNING!!! WARNING!!! WARNING!!!
WARNING! THE EXISTING DATA IN THIS HARDISK/PARTITION(S) WILL BE OVERWRITTEN! ALL EXISTING DATA WILL BE LOST.
******************************************************************************
Machine: VirtualBox
```
```
sda [2.108_VBDX_HARDDISK__ata-VBDX_HARDDISK_VB1b6d4a0c-c9f7523d]
******************************************************************************
Are you sure you want to continue? y
[y/n] y
```

"""
5. Wait for the process to finish.

**NOTE** You can press any key or use **CTRL+C** to cancel the recovery process and exit Clonezilla.

6. Select **(0) Poweroff** to power off the computer.

```
Restoring the first 446 bytes of MBR data, i.e. executable code area, for sda... done!

You resize the partition for sda1
ntfsresize -f /dev/sda1
ntfsresize 2.0.0 (12Jun10 10:00)
Device name : /dev/sda1
NTFS volume version: 3.1
Cluster size : 2048 bytes
Current volume size: 20651488 bytes (2045 MB)
New volume size : 20651488 bytes (2045 MB)
Nothing to do. Volume size is already OK.

The grub directory IS NOT found. Maybe it does not exist (so other boot manager exists) or the file system is not supported in the kernel. Skip running grub-install.

Found NTFS boot partition among the restored partition(s): /dev/sda1
Mount and sector no. 0 of /dev/sda1 from E0D: 64, 63.
The start sector of NTFS partition /dev/sda1: 65
Adjust filesystem geometry for the NTFS partitions: /dev/sda1
Running: partclone.ntfs1-boot -w -h 64 -t 63 -s 63 /dev/sda1
ntfs1boot version 0.5
Done!

Spcific RESTORE" is finished.
You can choose to:
(0) Forward
(1) Reboot
(2) Enter command line prompt
(3) Start over
```

7. Remove the USB drive after the computer has been powered off.
Step 4: Change the BIOS Settings to Boot from the Original Disk

Now you will need to change the boot priority so that it can boot from the original disk. As the system reboots, press **F2** to enter the BIOS setup menu.

1. Select **Hard Disk Drive** and then press + to move to the first boot device position, and then press **Enter**. Make sure the hard disk has first boot priority.

2. Press **F10** and then press **Enter** to save and exit BIOS settings.

**Expert mode:**

1. Select **clonezilla live restore disk(expert mode)**.

2. Wait for the USB drive boot process to finish.

   A number of storage areas will be shown for you to confirm; press **Enter** to continue the restore process.

   ```
   The jobs in /etc/occ/occ-live.d/ are finished. Start `occ-live-restore` now.
   Found occ_prenum parameter in boot parameters...
   The order to run: occ_prenum occ_prenum
   Now run `occ_prenum1`'s mount --bind /lib/live/mount/medium/home/partimag /home/partimag/...
   Now run `occ_prenum2`'s: sudo /lib/live/mount/medium/live/restore_prenum.sh y y
   count=2
   ```
3. Choose which storage area you want to restore.
   If your device only has one storage area, this step will be skipped.

4. If you want to restore MBR (Master Boot Record), press y to continue the restore process.

5. If you want to expand the file system (modify the partition table), press y to continue the restore process.
After confirming the storage information, press **Enter** to continue the restore process.

```
# ocs_live_run_tty is the tty for the ocs_live_run. Default it will be "/dev/tty1"
ocs_live_run_tty=""
ocs_encrypt.k_cipher="ocs"
ocs_encrypt.k_key_bytes="16"
Press any key to restore MBR... (y/n)? y
1+0 records in
1+0 records out
68 bytes (512 B) copied, 0.0230961 s, 22.2 k/s
warning: Unable to open /dev/sr0 read-write (read-only file system). /dev/sr0 has been opened read-only.
warning: Unable to open /dev/sr0 read-write (read-only file system). /dev/sr0 has been opened read-only.

Disk /dev/sda: 9 Gb, 9663676416 bytes, 18874688 sectors
Units: sectors of 1 + 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disk identifier: 0x00000000

Device Boot Start End Sectors Size Id Type
/dev/sda1 1 2048 1024047 3024000 83 Linux
/dev/sda2 1024048 15649767 15627200 To be Linux LVM

Do you want to expand filesystem (y/n)? y

-------------------------------------
TARGETDEVICE_PARTITION_ARRAY=2
TARGETDEVICE_PARTITION_ARRAY=[-1]=1
TARGETDEVICE_LAST_PARTITION=/dev/sda2

Press any key to continue.
```

7. Enter **y** to continue the restore process.

```
The following step is to restore an image to the hard disk/partition(s) on this machine: '/home/partition/image.iso' -> '/dev/sda1' sda2
The image was created at: 2015-10-04 00:03

WARNING!!! WARNING!!! WARNING!!!
WARNING, THE EXISTING DATA IN THIS HARDDISK/PARTITION(S) WILL BE OVERWRITTEN! ALL EXISTING DATA WILL BE LOST.

*****************************************************************************
Machine: VMware Virtual Platform
sda (VMware_Virtual_S_No_disk_serial_no)
sda1 (VMware_Virtual_S_No_disk_serial_no)

*****************************************************************************
Are you sure you want to continue? (y/n)? y
```

8. Enter **y** to confirm again.

```
WARNING!!! WARNING!!! WARNING!!!
WARNING, THE EXISTING DATA IN THIS HARDDISK/PARTITION(S) WILL BE OVERWRITTEN! ALL EXISTING DATA WILL BE LOST.
*****************************************************************************
Machine: VMware Virtual Platform
sda (VMware_Virtual_S_No_disk_serial_no)
sda1 (VMware_Virtual_S_No_disk_serial_no)

*****************************************************************************
Are you sure you want to continue? (y/n)? y
```
9. Wait for the process to finish.

10. Choose which storage in the file system you want to resize.

```
Ending /usr/sbin/pcs-sr at 2015-10-23 03:37:38 UTC...
'bcs-live-restore' finished.
Check /var/log/clonezilla.log for more details.
The order to run: pcs_postrun1
Now run "pcs_postrun1": sudo /lib/live/mount/medium/live/restore_postrun.sh y n ...
TARGET_DEVICE=/dev/sda
device_count=2
[0] /dev/sdb_VMware_3G
[1] /dev/sdb_VMware_4G
Please Enter the target device number:0
```

11. If you want to resize the file system, press `y` to continue the restore process.

```
Now run "pcs_postrun1": sudo /lib/live/mount/medium/live/restore_postrun.sh y n ...
TARGET_DEVICE=/dev/sda
device_count=2
[0] /dev/sdb_VMware_3G
[1] /dev/sdb_VMware_4G
Please Enter the target device number:0
Do you want to resize filesystem(y/n)?n
```

12. Select `reboot` to reboot the computer.

```
Now you can choose to:
poweroff Poweroff
reboot Reboot
```

13. Remove the USB drive after the computer has been rebooted.
Saving the System to the USB Drive

You may also save the current system to the USB drive for system recovery in case the system crashes. Before saving the system to the USB drive, we suggest removing all files under `\home\partimag\` on the USB drive.

In addition, change the BIOS settings to make the USB drive the first boot priority.

When the system has been launched, take the following steps.

**Auto mode:**
1. Select `clonezilla live save disk`. (If you want to configure more parameters, refer to the next section on "Expert mode.")

2. Wait for the USB drive boot process to finish.
3. Enter `y` to continue.

```
V2403 Series Linux Software System Recovery

3. Enter y to continue.

Setting the TERM as linux
******************************************************************************
Clonezilla image dir: /home/partimage
******************************************************************************
Shutting down the Logical Volume Manager
   No volume groups found
Finishing shutting down the Logical Volume Manager
The selected devices: sda
******************************************************************************
Activating the partition info in /proc... done!
Selected device [sda] found!
The selected devices: sda
searching for data partition(s)...
Excluding busy partitions or disk...
unmounted partitions (including extended or swap): sda1
Collecting info... done
Searching for swap partition(s)...
Excluding busy partitions or disk...
unmounted partitions (including extended or swap): sda1
Collecting info... done
The data partition to be saved: sda1
The swap partition to be saved:
Activating the partition info in /proc... done!
Selected device [sda1] found!
The selected devices: sda1
Getting /dev/sda1 info...
******************************************************************************
The following step is to save the hard disk/partition(s) on this machine as an image:
******************************************************************************
Machine: VirtualBox

sda (data/HD_500G/HARDDRIV_GET-x86-544400-c9f7525d)
sda1 (data/HD_500G/HARDDRIV_GET-x86-544400-c9f7525d)

******************************************************************************
-> /home/partimage/xpe_savedisk"
Are you sure you want to continue? [y/n] y
```

4. Wait for the process to finish.

```
/home/sda1: read failed after 8 of 2449 at 0: Input/output error
No volume groups found
Finishing shutting down the Logical Volume Manager
Reading the partition table for /dev/sda... KEYWR=0
******************************************************************************
Checking the integrity of partition table in the disk /dev/sda...
******************************************************************************
Done
saving the MBR data for sda...
106 records in
106 records out
512 bytes (512 B) copied. 0.0000161 s, 31.33kB/s
******************************************************************************
Starting copying /dev/sda1 as /home/partimage/xpe_savedisk/sda1.XXX...
new sda1 filesystem: ext3.
******************************************************************************
Checking NTFS integrity in /dev/sda1... done!
Checking the disk space...
Use nttsclean with gzip to save the image.
Image file will be split with size limit 1000000 MB.
******************************************************************************
If this action fails or hangs, check:
* Is the disk full?
******************************************************************************

ntttsclean v2.0.0 (Lambert 10/9/01)
NTFS version 5.1
Cluster size: 4096 bytes
Current volume size: 204640768 bytes (2048 MB)
Current device size: 204619920 bytes (2048 MB)
Scanning volume... 100.00 percent completed
accounting clusters... 0 unwritten

Space in use: 1760 MB (85.7%)
Saving NTFS to image... 0.64 percent completed
```
5. Select (0) Poweroff so that the computer will power off when the process is finished.

Expert mode:

1. Select clonezilla live save disk(expert mode).

2. Wait for the USB drive boot process to finish.

Choose which storage area you want to save.

If your device only has one storage area, this step will be skipped.
3. If you want to resize the file system, press $y$ to continue the restore process.

```
# batch mode or not (yes/no), if no. will run Interactively.
acs_live_batch="yes"
# acs_lang is the language used in Clonezilla live. Available values: en_US.UTF-8, zh_TW.UTF-8... (see
# $HOME/SCRIPT_PATH/lisp/bash/
acs_lang="en"
# acs_live_run.tty is the tty for the acs_live.run. Default it will be "/dev/tty1"
acs_live_run.tty="/dev/tty1"
acs_encrypts_cipher="aes"
acs_encrypts_key_bits="128"
do you want to resize filesystem(y/n)? y
```

4. Enter $y$ to continue the restore process.

```
The following step is to save the hard disk/partition(s) on this machine as an image:

```
Partclone
Partclone v0.2.78 http://partclone.org
Starting to clone device (/dev/vg1/vg_root) to image (-)
Reading Super Block
Calculating bitmap... Please wait... done!
File system: EXTFS
Device size:  5.7 GB = 1631232 Blocks
Space in use: 875.5 MB = 213753 Blocks
Free Space:  5.8 GB = 1417499 Blocks
Block size:  4096 Byte
```
Elapsed: 00:00:01 Remaining: 00:01:39 Rate: 0.00byte/min
Current Block: 0 Total Block: 1631232
Data Block Process:  0.00%
Total Block Process:  0.00%
```
```
5. Wait for the process to finish.

6. Select `reboot` to reboot the computer.

```
Now you can choose to:
 powernow Powernow
 reboot Reboot
 cmd Enter command line prompt
 remount Start over image repository (home/partimg, if mounted, will be unmounted
 remount2 Start_over (keep_image_repository /home/partimg, mounted) 
```
```
7. Remove the USB drive after the computer has been rebooted.
The Moxa V2403 series supports the "Moxa Proactive Monitoring" utility. See the "Moxa Proactive Monitoring Linux User’s Manual" for details. The manual can be found on the product CD/DVD, or downloaded from Moxa’s website. Note that the V2403 does not support hardware relay.
<table>
<thead>
<tr>
<th>Package</th>
<th>Version</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>acl</td>
<td>2.2.52-2</td>
<td>Access control list utilities</td>
</tr>
<tr>
<td>acpi</td>
<td>1.7-1</td>
<td>displays information on ACPI devices</td>
</tr>
<tr>
<td>adduser</td>
<td>3.113+nmu3</td>
<td>add and remove users and groups</td>
</tr>
<tr>
<td>anacron</td>
<td>2.3-23</td>
<td>cron-like program that doesn’t go by time</td>
</tr>
<tr>
<td>apache2</td>
<td>2.4.10-10</td>
<td>Apache HTTP Server</td>
</tr>
<tr>
<td>apache2-bin</td>
<td>2.4.10-10</td>
<td>Apache HTTP Server (modules and other binary files)</td>
</tr>
<tr>
<td>apache2-data</td>
<td>2.4.10-10</td>
<td>Apache HTTP Server (utility programs for web servers)</td>
</tr>
<tr>
<td>apt</td>
<td>1.0.9.8</td>
<td>commandline package manager</td>
</tr>
<tr>
<td>apt-listchanges</td>
<td>2.85.13+nmu1</td>
<td>package change history notification tool</td>
</tr>
<tr>
<td>apt-utils</td>
<td>1.0.9.8</td>
<td>package management related utility programs</td>
</tr>
<tr>
<td>aptitude</td>
<td>0.6.11-1+b1</td>
<td>terminal-based package manager</td>
</tr>
<tr>
<td>aptitude-common</td>
<td>0.6.11-1</td>
<td>architecture independent files for the aptitude package manager</td>
</tr>
<tr>
<td>aptitude-doc-en</td>
<td>0.6.11-1</td>
<td>English manual for aptitude, a terminal-based package manager</td>
</tr>
<tr>
<td>at</td>
<td>3.1.16-1</td>
<td>Delayed job execution and batch processing</td>
</tr>
<tr>
<td>avahi-autoipd</td>
<td>0.6.31-5</td>
<td>Avahi IPv4LL network address configuration daemon</td>
</tr>
<tr>
<td>base-files</td>
<td>8+deb8u1</td>
<td>Debian base system miscellaneous files</td>
</tr>
<tr>
<td>base-passwd</td>
<td>3.5.37</td>
<td>Debian base system master password and group files</td>
</tr>
<tr>
<td>bash</td>
<td>4.3-11+b1</td>
<td>GNU Bourne Again SHell</td>
</tr>
<tr>
<td>bash-completion</td>
<td>1:2.1-4</td>
<td>programmable completion for the bash shell</td>
</tr>
<tr>
<td>bc</td>
<td>1.06.95-9</td>
<td>GNU bc arbitrary precision calculator language</td>
</tr>
<tr>
<td>bind9-host</td>
<td>1:9.9.5.dfsg-9</td>
<td>Version of 'host' bundled with BIND 9.X</td>
</tr>
<tr>
<td>binutils</td>
<td>2.25-5</td>
<td>GNU assembler, linker and binary utilities</td>
</tr>
<tr>
<td>bluetooth</td>
<td>5.23-2</td>
<td>Bluetooth support</td>
</tr>
<tr>
<td>bluez</td>
<td>5.23-2+1</td>
<td>Bluetooth tools and daemons</td>
</tr>
<tr>
<td>bridge-utils</td>
<td>1.5-9</td>
<td>Utilities for configuring the Linux Ethernet bridge</td>
</tr>
<tr>
<td>bsdmainutils</td>
<td>9.0.6</td>
<td>collection of more utilities from FreeBSD</td>
</tr>
<tr>
<td>bsdtutils</td>
<td>1:2.25.2-6</td>
<td>basic utilities from 4.4BSD-Lite</td>
</tr>
<tr>
<td>build-essential</td>
<td>11.7</td>
<td>Informational list of build-essential packages</td>
</tr>
<tr>
<td>busybox</td>
<td>1:1.22.0-9+deb8u1</td>
<td>Tiny utilities for small and embedded systems</td>
</tr>
<tr>
<td>bzip2</td>
<td>1.0.6-7+b3</td>
<td>high-quality block-sorting file compressor - utilities</td>
</tr>
<tr>
<td>ca-certificates</td>
<td>20141019</td>
<td>Common CA certificates</td>
</tr>
<tr>
<td>console-setup</td>
<td>1.123</td>
<td>console font and keymap setup program</td>
</tr>
<tr>
<td>console-setup-linux</td>
<td>1.123</td>
<td>Linux specific part of console-setup</td>
</tr>
<tr>
<td>coreutils</td>
<td>8.23-4</td>
<td>GNU core utilities</td>
</tr>
<tr>
<td>Package</td>
<td>Version</td>
<td>Description</td>
</tr>
<tr>
<td>---------------------</td>
<td>----------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>cpio</td>
<td>2.11+dfsg-4.1</td>
<td>GNU cpio -- a program to manage archives of files</td>
</tr>
<tr>
<td>cpp</td>
<td>4:4.9.2-2</td>
<td>GNU C preprocessor (cpp)</td>
</tr>
<tr>
<td>cpp-4.8</td>
<td>4.8.4-1</td>
<td>GNU C preprocessor</td>
</tr>
<tr>
<td>cpp-4.9</td>
<td>4.9.2-10</td>
<td>GNU C preprocessor</td>
</tr>
<tr>
<td>crda</td>
<td>3.13-1</td>
<td>wireless Central Regulatory Domain Agent</td>
</tr>
<tr>
<td>cron</td>
<td>3.0.pl1-127</td>
<td>process scheduling daemon</td>
</tr>
<tr>
<td>dash</td>
<td>0.5.7-4+b1</td>
<td>POSIX-compliant shell</td>
</tr>
<tr>
<td>dbus</td>
<td>1.8.18-0+deb8u1</td>
<td>simple interprocess messaging system (daemon and utilities)</td>
</tr>
<tr>
<td>dc</td>
<td>1.06.95-9</td>
<td>GNU dc arbitrary precision reverse-polish calculator</td>
</tr>
<tr>
<td>debconf</td>
<td>1.5.56</td>
<td>Debian configuration management system</td>
</tr>
<tr>
<td>debconf-i18n</td>
<td>1.5.56</td>
<td>full internationalization support for debconf</td>
</tr>
<tr>
<td>debian-archive-keyring</td>
<td>2014.3</td>
<td>GnuPG archive keys of the Debian archive</td>
</tr>
<tr>
<td>debian-faq</td>
<td>5.0.3</td>
<td>Debian Frequently Asked Questions</td>
</tr>
<tr>
<td>debianutils</td>
<td>4.4+b1</td>
<td>Miscellaneous utilities specific to Debian</td>
</tr>
<tr>
<td>dictionaries-common</td>
<td>1.23.17</td>
<td>spelling dictionaries - common utilities</td>
</tr>
<tr>
<td>diffutils</td>
<td>1:3.3-1+b1</td>
<td>File comparison utilities</td>
</tr>
<tr>
<td>dmidecode</td>
<td>2.12-3</td>
<td>SMBIOS/DMI table decoder</td>
</tr>
<tr>
<td>dmsetup</td>
<td>2:1.02.90-2.2</td>
<td>Linux Kernel Device Mapper userspace library</td>
</tr>
<tr>
<td>dnsutils</td>
<td>1:9.9.5.dfsig-9</td>
<td>Clients provided with BIND</td>
</tr>
<tr>
<td>docutils-common</td>
<td>0.12+dfsg-1</td>
<td>text processing system for reStructuredText - common data</td>
</tr>
<tr>
<td>docutils-doc</td>
<td>0.12+dfsg-1</td>
<td>text processing system for reStructuredText - documentation</td>
</tr>
<tr>
<td>dpkg</td>
<td>1.17.25</td>
<td>Debian package management system</td>
</tr>
<tr>
<td>dpkg-dev</td>
<td>1.17.25</td>
<td>Debian package development tools</td>
</tr>
<tr>
<td>e2fslibs:amd64</td>
<td>1.42.12-1.1</td>
<td>ext2/ext3/ext4 file system libraries</td>
</tr>
<tr>
<td>e2fsprogs</td>
<td>1.42.12-1.1</td>
<td>ext2/ext3/ext4 file system utilities</td>
</tr>
<tr>
<td>easy-rsa</td>
<td>2.2.2-1</td>
<td>Simple shell based CA utility</td>
</tr>
<tr>
<td>emacsen-common</td>
<td>2.0.8</td>
<td>Common facilities for all emacsen</td>
</tr>
<tr>
<td>ethtool</td>
<td>1:3.16-1</td>
<td>display or change Ethernet device settings</td>
</tr>
<tr>
<td>fakeroot</td>
<td>1.20.2-1</td>
<td>tool for simulating superuser privileges</td>
</tr>
<tr>
<td>file</td>
<td>1:5.22+15-2</td>
<td>Determines file type using &quot;magic&quot; numbers</td>
</tr>
<tr>
<td>findutils</td>
<td>4.4.2-9+b1</td>
<td>utilities for finding files--find, xargs</td>
</tr>
<tr>
<td>firmware-linux-free</td>
<td>3.3</td>
<td>Binary firmware for various drivers in the Linux kernel</td>
</tr>
<tr>
<td>fontconfig</td>
<td>2.11.0-6.3</td>
<td>generic font configuration library - support binaries</td>
</tr>
<tr>
<td>fontconfig-config</td>
<td>2.11.0-6.3</td>
<td>generic font configuration library - configuration</td>
</tr>
<tr>
<td>fonts-dejavu-core</td>
<td>2.34-1</td>
<td>Vera font family derivate with additional characters</td>
</tr>
<tr>
<td>g++</td>
<td>4:4.9.2-2</td>
<td>GNU C++ compiler</td>
</tr>
<tr>
<td>g++-4.9</td>
<td>4.9.2-10</td>
<td>GNU C++ compiler</td>
</tr>
<tr>
<td>gcc</td>
<td>4:4.9.2-2</td>
<td>GNU C compiler</td>
</tr>
<tr>
<td>gcc-4.8</td>
<td>4.8.4-1</td>
<td>GNU C compiler</td>
</tr>
<tr>
<td>gcc-4.8-base:amd64</td>
<td>4.8.4-1</td>
<td>GCC, the GNU Compiler Collection (base package)</td>
</tr>
<tr>
<td>gcc-4.9</td>
<td>4.9.2-10</td>
<td>GNU C compiler</td>
</tr>
<tr>
<td>gcc-4.9-base:amd64</td>
<td>4.9.2-10</td>
<td>GCC, the GNU Compiler Collection (base package)</td>
</tr>
<tr>
<td>Package</td>
<td>Version</td>
<td>Description</td>
</tr>
<tr>
<td>--------------------</td>
<td>-----------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>geoip-database</td>
<td>20150317-1</td>
<td>IP lookup command line tools that use the GeoIP library (country database)</td>
</tr>
<tr>
<td>gettext-base</td>
<td>0.19.3-2</td>
<td>GNU Internationalization utilities for the base system</td>
</tr>
<tr>
<td>gnupg</td>
<td>1.4.18-7</td>
<td>GNU privacy guard - a free PGP replacement</td>
</tr>
<tr>
<td>gnupg-agent</td>
<td>2.0.26-6</td>
<td>GNU privacy guard - password agent</td>
</tr>
<tr>
<td>gnupg2</td>
<td>2.0.26-6</td>
<td>GNU privacy guard - a free PGP replacement (new v2.x)</td>
</tr>
<tr>
<td>gpgv</td>
<td>1.4.18-7</td>
<td>GNU privacy guard - signature verification tool</td>
</tr>
<tr>
<td>grep</td>
<td>2.20-4.1</td>
<td>GNU grep, egrep and fgrep</td>
</tr>
<tr>
<td>groff-base</td>
<td>1.22.2-8</td>
<td>GNU troff text-formatting system (base system components)</td>
</tr>
<tr>
<td>grub-common</td>
<td>2.02~beta2-22</td>
<td>GRand Unified Bootloader (common files)</td>
</tr>
<tr>
<td>grub-pc</td>
<td>2.02~beta2-22</td>
<td>GRand Unified Bootloader, version 2 (PC/BIOS version)</td>
</tr>
<tr>
<td>grub-pc-bin</td>
<td>2.02~beta2-22</td>
<td>GRand Unified Bootloader, version 2 (PC/BIOS binaries)</td>
</tr>
<tr>
<td>grub2-common</td>
<td>2.02~beta2-22</td>
<td>GRand Unified Bootloader (common files for version 2)</td>
</tr>
<tr>
<td>gzip</td>
<td>1.6-4</td>
<td>GNU compression utilities</td>
</tr>
<tr>
<td>hdparm</td>
<td>9.43-2</td>
<td>tune hard disk parameters for high performance</td>
</tr>
<tr>
<td>hicolor-icon-theme</td>
<td>0.13-1</td>
<td>default fallback theme for FreeDesktop.org icon themes</td>
</tr>
<tr>
<td>host</td>
<td>1:9.9.5.dfsg-9</td>
<td>Transitional package</td>
</tr>
<tr>
<td>hostname</td>
<td>3.15</td>
<td>utility to set/show the host name or domain name</td>
</tr>
<tr>
<td>iamerican</td>
<td>3.3.02-6</td>
<td>American English dictionary for ispell (standard version)</td>
</tr>
<tr>
<td>ibritish</td>
<td>3.3.02-6</td>
<td>British English dictionary for ispell (standard version)</td>
</tr>
<tr>
<td>ienglish-common</td>
<td>3.3.02-6</td>
<td>Common files for British and American ispell dictionaries</td>
</tr>
<tr>
<td>ifupdown</td>
<td>0.7.53.1</td>
<td>high level tools to configure network interfaces</td>
</tr>
<tr>
<td>init</td>
<td>1.22</td>
<td>System-V-like init utilities - metapackage</td>
</tr>
<tr>
<td>init-system-helper</td>
<td>1.22</td>
<td>helper tools for all init systems</td>
</tr>
<tr>
<td>initramfs-tools</td>
<td>0.12</td>
<td>generic modular initramfs generator</td>
</tr>
<tr>
<td>initscripts</td>
<td>2.88dsf-59</td>
<td>scripts for initializing and shutting down the system</td>
</tr>
<tr>
<td>insserv</td>
<td>1.14.0-5</td>
<td>boot sequence organizer using LSB init.d script dependency information</td>
</tr>
<tr>
<td>install-info</td>
<td>5.2.0.dfsg.1-6</td>
<td>Manage installed documentation in info format</td>
</tr>
<tr>
<td>iproute</td>
<td>1:3.16.0-2</td>
<td>transitional dummy package for iproute2</td>
</tr>
<tr>
<td>iproute2</td>
<td>3.16.0-2</td>
<td>networking and traffic control tools</td>
</tr>
<tr>
<td>iptables</td>
<td>1.4.21-2+b1</td>
<td>administration tools for packet filtering and NAT</td>
</tr>
<tr>
<td>iputils-ping</td>
<td>3:20121221-5+b2</td>
<td>Tools to test the reachability of network hosts</td>
</tr>
<tr>
<td>irqbalance</td>
<td>1.0.6-3</td>
<td>Daemon to balance interrupts for SMP systems</td>
</tr>
<tr>
<td>isc-dhcp-client</td>
<td>4.3.1-6</td>
<td>DHCP client for automatically obtaining an IP address</td>
</tr>
<tr>
<td>isc-dhcp-common</td>
<td>4.3.1-6</td>
<td>common files used by all of the isc-dhcp packages</td>
</tr>
<tr>
<td>iso-codes</td>
<td>3.57-1</td>
<td>ISO language, territory, currency, script codes</td>
</tr>
<tr>
<td>Package</td>
<td>Version</td>
<td>Description</td>
</tr>
<tr>
<td>---------------------------</td>
<td>-------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>ispell</td>
<td>3.3.02-6</td>
<td>International Ispell (an interactive spelling corrector)</td>
</tr>
<tr>
<td>iw</td>
<td>3.17-1</td>
<td>tool for configuring Linux wireless devices</td>
</tr>
<tr>
<td>kbd</td>
<td>1.15.5-2</td>
<td>Linux console font and keytable utilities</td>
</tr>
<tr>
<td>keyboard-configuration</td>
<td>1.123</td>
<td>system-wide keyboard preferences</td>
</tr>
<tr>
<td>klibc-utils</td>
<td>2.0.4-2</td>
<td>small utilities built with klibc for early boot</td>
</tr>
<tr>
<td>kmod</td>
<td>3月18日</td>
<td>tools for managing Linux kernel modules</td>
</tr>
<tr>
<td>krb5-locales</td>
<td>1.12.1+dfsg-19</td>
<td>Internationalization support for MIT Kerberos</td>
</tr>
<tr>
<td>less</td>
<td>458-3</td>
<td>pager program similar to more</td>
</tr>
<tr>
<td>libacl1:amd64</td>
<td>2.2.52-2</td>
<td>Access control list shared library</td>
</tr>
<tr>
<td>libalgorithm-c3-perl</td>
<td>0.09-1</td>
<td>Perl module for merging hierarchies using the C3 algorithm</td>
</tr>
<tr>
<td>libalgorithm-diff-perl</td>
<td>1.19.02-3</td>
<td>module to find differences between hierarchies</td>
</tr>
<tr>
<td>libalgorithm-diff-xs-perl</td>
<td>0.04-3+b1</td>
<td>module to find differences between files (XS accelerated)</td>
</tr>
<tr>
<td>libalgorithm-merge-perl</td>
<td>0.08-2</td>
<td>Perl module for three-way merge of textual data</td>
</tr>
<tr>
<td>libapache2-mod-php5</td>
<td>5.6.9+dfsg-0+deb8u1</td>
<td>server-side, HTML-embedded scripting language (Apache 2 module)</td>
</tr>
<tr>
<td>libapr1:amd64</td>
<td>1.5.1-3</td>
<td>Apache Portable Runtime Library</td>
</tr>
<tr>
<td>libaprutil1:amd64</td>
<td>1.5.4-1</td>
<td>Apache Portable Runtime Utility Library</td>
</tr>
<tr>
<td>libaprutil1-dbd-sqlite3:amd64</td>
<td>1.5.4-1</td>
<td>Apache Portable Runtime Utility Library - SQLite3 Driver</td>
</tr>
<tr>
<td>libaprutil1-ldap:amd64</td>
<td>1.5.4-1</td>
<td>Apache Portable Runtime Utility Library - LDAP Driver</td>
</tr>
<tr>
<td>libapt-inst1.5:amd64</td>
<td>1.0.9.8</td>
<td>deb package format runtime library</td>
</tr>
<tr>
<td>libapt-pkg4.12:amd64</td>
<td>1.0.9.8</td>
<td>package management runtime library</td>
</tr>
<tr>
<td>libarchive-extract-perl</td>
<td>0.72-1</td>
<td>generic archive extracting module</td>
</tr>
<tr>
<td>libasan0:amd64</td>
<td>4.8.4-1</td>
<td>AddressSanitizer -- a fast memory error detector</td>
</tr>
<tr>
<td>libasan1:amd64</td>
<td>4.9.2-10</td>
<td>AddressSanitizer -- a fast memory error detector</td>
</tr>
<tr>
<td>libasprintf0c2:amd64</td>
<td>0.19.3-2</td>
<td>GNU library to use fprintf and friends in C++</td>
</tr>
<tr>
<td>libassuan:amd64</td>
<td>2.1.2-2</td>
<td>IPC library for the GnuPG components</td>
</tr>
<tr>
<td>libatk1.0:amd64</td>
<td>2.14.0-1</td>
<td>ATK accessibility toolkit</td>
</tr>
<tr>
<td>libatk1.0-data</td>
<td>2.14.0-1</td>
<td>Common files for the ATK accessibility toolkit</td>
</tr>
<tr>
<td>libatomic1:amd64</td>
<td>4.9.2-10</td>
<td>support library providing __atomic built-in functions</td>
</tr>
<tr>
<td>libattr1:amd64</td>
<td>1:2.4.47-2</td>
<td>Extended attribute shared library</td>
</tr>
<tr>
<td>libaudit-common</td>
<td>1:2.4-1</td>
<td>Dynamic library for security auditing - common files</td>
</tr>
<tr>
<td>libaudit1:amd64</td>
<td>1:2.4-1+b1</td>
<td>Dynamic library for security auditing</td>
</tr>
<tr>
<td>libauthen-sasl-perl</td>
<td>2.1600-1</td>
<td>Authen::SASL - SASL Authentication framework</td>
</tr>
<tr>
<td>libavahi-client3:amd64</td>
<td>0.6.31-5</td>
<td>Avahi client library</td>
</tr>
<tr>
<td>libavahi-common-data:amd64</td>
<td>0.6.31-5</td>
<td>Avahi common data files</td>
</tr>
<tr>
<td>libavahi-common3:amd64</td>
<td>0.6.31-5</td>
<td>Avahi common library</td>
</tr>
<tr>
<td>libbind9-90</td>
<td>1:9.9.5+dfsg-98</td>
<td>BIND9 Shared Library used by BIND</td>
</tr>
<tr>
<td>libblkid1:amd64</td>
<td>2.25.2-6</td>
<td>block device id library</td>
</tr>
<tr>
<td>libboost-iostreams1.55.0:amd64</td>
<td>1.55.0+dfsg-3</td>
<td>Boost.Iostreams Library</td>
</tr>
<tr>
<td>libbsd0:amd64</td>
<td>0.7.0-2</td>
<td>utility functions from BSD systems - shared library</td>
</tr>
<tr>
<td>Package</td>
<td>Version</td>
<td>Description</td>
</tr>
<tr>
<td>----------------------</td>
<td>------------------</td>
<td>----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>libbz2-1.0:amd64</td>
<td>1.0.6-7+b3</td>
<td>high-quality block-sorting file compressor library - runtime</td>
</tr>
<tr>
<td>libc-bin</td>
<td>2.19-18</td>
<td>GNU C Library: Binaries</td>
</tr>
<tr>
<td>libc-dev-bin</td>
<td>2.19-18</td>
<td>GNU C Library: Development binaries</td>
</tr>
<tr>
<td>libc6:amd64</td>
<td>2.19-18</td>
<td>GNU C Library: Shared libraries</td>
</tr>
<tr>
<td>libc6-dev:amd64</td>
<td>2.19-18</td>
<td>GNU C Library: Development Libraries and Header Files</td>
</tr>
<tr>
<td>libcairo2:amd64</td>
<td>1.14.0-2.1</td>
<td>Cairo 2D vector graphics library</td>
</tr>
<tr>
<td>libcap-ng0:amd64</td>
<td>0.7.4-2</td>
<td>An alternate POSIX capabilities library</td>
</tr>
<tr>
<td>libcap2:amd64</td>
<td>1:2.24-8</td>
<td>POSIX 1003.1e capabilities (library)</td>
</tr>
<tr>
<td>libcap2-bin</td>
<td>1:2.24-8</td>
<td>POSIX 1003.1e capabilities (utilities)</td>
</tr>
<tr>
<td>libcgi-fast-perl</td>
<td>1:2.04-1</td>
<td>CGI subclass for work with FCGI</td>
</tr>
<tr>
<td>libcgi-pm-perl</td>
<td>4.09-1</td>
<td>module for Common Gateway Interface applications</td>
</tr>
<tr>
<td>libcilkrts5:amd64</td>
<td>4.9.2-10</td>
<td>Intel Cilk Plus language extensions (runtime)</td>
</tr>
<tr>
<td>libclass-accessor-perl</td>
<td>0.34-1</td>
<td>Perl module that automatically generates accessors</td>
</tr>
<tr>
<td>libclass-c3-perl</td>
<td>0.26-1</td>
<td>pragma for using the C3 method resolution order</td>
</tr>
<tr>
<td>libclass-c3-xs-perl</td>
<td>0.13-2+b1</td>
<td>Perl module to accelerate Class:::C3</td>
</tr>
<tr>
<td>libclass-isa-perl</td>
<td>0.36-5</td>
<td>report the search path for a class's ISA tree</td>
</tr>
<tr>
<td>libcloog-isl4:amd64</td>
<td>0.18.2-1+b2</td>
<td>Chunky Loop Generator (runtime library)</td>
</tr>
<tr>
<td>libcomerr2:amd64</td>
<td>1.42.12-1.1</td>
<td>common error description library</td>
</tr>
<tr>
<td>libcpan-meta-perl</td>
<td>2.142690-1</td>
<td>Perl module to access CPAN distributions metadata</td>
</tr>
<tr>
<td>libcryptsetup4:amd64</td>
<td>2:1.6.6-5</td>
<td>disk encryption support - shared library</td>
</tr>
<tr>
<td>libcups2:amd64</td>
<td>1.7.5-11+deb8u1</td>
<td>Common UNIX Printing System(tm) - Core library</td>
</tr>
<tr>
<td>libcurl3-gnutls:amd64</td>
<td>7.38.0-4+deb8u2</td>
<td>easy-to-use client-side URL transfer library (GnuTLS flavour)</td>
</tr>
<tr>
<td>libcwidget3:amd64</td>
<td>0.5.17-2</td>
<td>high-level terminal interface library for C++ (runtime files)</td>
</tr>
<tr>
<td>libdaemon0:amd64</td>
<td>0.14-6</td>
<td>lightweight C library for daemons - runtime library</td>
</tr>
<tr>
<td>libdata-optlist-perl</td>
<td>0.109-1</td>
<td>module to parse and validate simple name/value option pairs</td>
</tr>
<tr>
<td>libdata-section-perl</td>
<td>0.200006-1</td>
<td>module to read chunks of data from a module's DATA section</td>
</tr>
<tr>
<td>libdatrie1:amd64</td>
<td>0.2.8-1</td>
<td>Double-array trie library</td>
</tr>
<tr>
<td>libdb5.3:amd64</td>
<td>5.3.28-9</td>
<td>Berkeley v5.3 Database Libraries [runtime]</td>
</tr>
<tr>
<td>libdbus-1-3:amd64</td>
<td>1.8.18-0+deb8u1</td>
<td>simple interprocess messaging system (library)</td>
</tr>
<tr>
<td>libdebcfclient0:amd64</td>
<td>0.192</td>
<td>Debian Configuration Management System (C-implementation library)</td>
</tr>
<tr>
<td>libdevmapper1.02.1:amd64</td>
<td>2:1.02.90-2.2</td>
<td>Linux Kernel Device Mapper userspace library</td>
</tr>
<tr>
<td>libdns-export100</td>
<td>1:9.9.5.dfsg-9</td>
<td>Exported DNS Shared Library</td>
</tr>
<tr>
<td>libdns100</td>
<td>1:9.9.5.dfsg-9</td>
<td>DNS Shared Library used by BIND</td>
</tr>
<tr>
<td>libdpkg-perl</td>
<td>1.17.25</td>
<td>Dpkg perl modules</td>
</tr>
<tr>
<td>libdrm-intel1:amd64</td>
<td>2.4.58-2</td>
<td>Userspace interface to intel-specific kernel DRM services -- runtime</td>
</tr>
<tr>
<td>libdrm-nouveaup2:amd64</td>
<td>2.4.58-2</td>
<td>Userspace interface to nouveau-specific kernel DRM services -- runtime</td>
</tr>
<tr>
<td>libdrm-radeon1:amd64</td>
<td>2.4.58-2</td>
<td>Userspace interface to radeon-specific kernel DRM services -- runtime</td>
</tr>
<tr>
<td>Package</td>
<td>Version</td>
<td>Description</td>
</tr>
<tr>
<td>--------------</td>
<td>-------------</td>
<td>----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>libdrm2:amd64</td>
<td>2.4.58-2</td>
<td>Userspace interface to kernel DRM services -- runtime</td>
</tr>
<tr>
<td>libedit2:amd64</td>
<td>3.1-20140620-2</td>
<td>BSD editline and history libraries</td>
</tr>
<tr>
<td>libelf1:amd64</td>
<td>0.159-4.2</td>
<td>library to read and write ELF files</td>
</tr>
<tr>
<td>libencodelocale-perl</td>
<td>1.03-1</td>
<td>utility to determine the locale encoding</td>
</tr>
<tr>
<td>libestr0</td>
<td>0.1.9-1.1</td>
<td>Helper functions for handling strings (lib)</td>
</tr>
<tr>
<td>libevent-2.0-5:amd64</td>
<td>2.0.21-stable-2</td>
<td>Asynchronous event notification library</td>
</tr>
<tr>
<td>libexpat1:amd64</td>
<td>2.1.0-6+b3</td>
<td>XML parsing C library - runtime library</td>
</tr>
<tr>
<td>libfakeroot:amd64</td>
<td>1.20.2-1</td>
<td>tool for simulating superuser privileges - shared libraries</td>
</tr>
<tr>
<td>libfcgi-perl</td>
<td>0.77-1+b1</td>
<td>helper module for FastCGI</td>
</tr>
<tr>
<td>libffi6:amd64</td>
<td>3.1-2+b2</td>
<td>Foreign Function Interface library runtime</td>
</tr>
<tr>
<td>libfile-fcntllock-perl</td>
<td>0.22-1+b1</td>
<td>Perl module for file locking with fcntl(2)</td>
</tr>
<tr>
<td>libfile-listing-perl</td>
<td>6.04-1</td>
<td>module to parse directory listings</td>
</tr>
<tr>
<td>libfont-afm-perl</td>
<td>1.20-1</td>
<td>Font::AFM - Interface to Adobe Font Metrics files</td>
</tr>
<tr>
<td>libfontconfig1:amd64</td>
<td>2.11.0-6.3</td>
<td>generic font configuration library - runtime</td>
</tr>
<tr>
<td>libfontenc1:amd64</td>
<td>1:1.1.2-1+b2</td>
<td>X11 font encoding library</td>
</tr>
<tr>
<td>libfreetype6:amd64</td>
<td>2.5.2-3</td>
<td>FreeType 2 font engine, shared library files</td>
</tr>
<tr>
<td>libfuse2:amd64</td>
<td>2.9.3-15+deb8u1</td>
<td>Filesystem in Userspace (library)</td>
</tr>
<tr>
<td>libgcc1:amd64</td>
<td>1:4.9.2-10</td>
<td>GCC support library</td>
</tr>
<tr>
<td>libglib2.0-0:amd64</td>
<td>2.24.25-3</td>
<td>GTK+ graphical user interface library</td>
</tr>
<tr>
<td>libgmp10:amd64</td>
<td>4.9.2-10</td>
<td>GCC support library</td>
</tr>
<tr>
<td>libgpg-error0:amd64</td>
<td>1.17-3</td>
<td>library for common error values and messages in GnuPG components</td>
</tr>
<tr>
<td>libgpgme11:amd64</td>
<td>1.5.1-6</td>
<td>GPGME - GnuPG Made Easy (library)</td>
</tr>
<tr>
<td>libgpm2:amd64</td>
<td>1.20.4-6.1+b2</td>
<td>General Purpose Mouse - shared library</td>
</tr>
<tr>
<td>libgraphite2-3:amd64</td>
<td>1.2.4-3</td>
<td>Font rendering engine for Complex Scripts -- library</td>
</tr>
<tr>
<td>libgssapi-krb5-2:amd64</td>
<td>1.12.1+dfsg-19</td>
<td>MIT Kerberos runtime libraries - krb5 GSS-API Mechanism</td>
</tr>
<tr>
<td>libgtk2.0-0:amd64</td>
<td>2.24.25-3</td>
<td>GTK+ graphical user interface library</td>
</tr>
<tr>
<td>libgtk2.0-bin</td>
<td>2.24.25-3</td>
<td>programs for the GTK+ graphical user interface library</td>
</tr>
<tr>
<td>libgtk2.0-common</td>
<td>2.24.25-3</td>
<td>common files for the GTK+ graphical user</td>
</tr>
<tr>
<td>Package Name</td>
<td>Version</td>
<td>Description</td>
</tr>
<tr>
<td>--------------</td>
<td>---------</td>
<td>-------------</td>
</tr>
<tr>
<td>libhrlbuzz0b:amd64</td>
<td>0.9.35-2</td>
<td>OpenType text shaping engine (shared library)</td>
</tr>
<tr>
<td>libhogweed2:amd64</td>
<td>2.7.1-5</td>
<td>low level cryptographic library (public-key cryptos)</td>
</tr>
<tr>
<td>libhtml-form-perl</td>
<td>6.03-1</td>
<td>module that represents an HTML form element</td>
</tr>
<tr>
<td>libhtml-format-perl</td>
<td>2.11-1</td>
<td>module for transforming HTML into various formats</td>
</tr>
<tr>
<td>libhtml-parser-perl</td>
<td>3.71-1+b3</td>
<td>collection of modules that parse HTML text documents</td>
</tr>
<tr>
<td>libhtml-tagset-perl</td>
<td>3.20-2</td>
<td>Data tables pertaining to HTML</td>
</tr>
<tr>
<td>libhtml-tree-perl</td>
<td>5.03-1</td>
<td>Perl module to represent and create HTML syntax trees</td>
</tr>
<tr>
<td>libhttp-cookies-perl</td>
<td>6.01-1</td>
<td>HTTP cookie jars</td>
</tr>
<tr>
<td>libhttp-daemon-perl</td>
<td>6.01-1</td>
<td>simple http server class</td>
</tr>
<tr>
<td>libhttp-date-perl</td>
<td>6.02-1</td>
<td>module of date conversion routines</td>
</tr>
<tr>
<td>libhttp-message-perl</td>
<td>6.06-1</td>
<td>perl interface to HTTP style messages</td>
</tr>
<tr>
<td>libhttp-negotiate-perl</td>
<td>6.00-2</td>
<td>implementation of content negotiation</td>
</tr>
<tr>
<td>libice6:amd64</td>
<td>2:1.0.9-1+b1</td>
<td>X11 Inter-Client Exchange library</td>
</tr>
<tr>
<td>libicu52:amd64</td>
<td>52.1-8</td>
<td>International Components for Unicode</td>
</tr>
<tr>
<td>libidn11:amd64</td>
<td>1.29-1+b2</td>
<td>GNU Libidn library, implementation of IETF IDN specifications</td>
</tr>
<tr>
<td>libintl-perl</td>
<td>1.23-1</td>
<td>Uniforum message translations system compatible i18n library</td>
</tr>
<tr>
<td>libio-html-perl</td>
<td>1.001-1</td>
<td>open an HTML file with automatic charset detection</td>
</tr>
<tr>
<td>libio-socket-ssl-perl</td>
<td>2.002-2</td>
<td>Perl module implementing object oriented interface to SSL sockets</td>
</tr>
<tr>
<td>libio-string-perl</td>
<td>1.08-3</td>
<td>Emulate IO::File interface for in-core strings</td>
</tr>
<tr>
<td>libirs-export91</td>
<td>1:9.9.5.dfsg-9</td>
<td>Exported IRS Shared Library</td>
</tr>
<tr>
<td>libisc-export95</td>
<td>1:9.9.5.dfsg-9</td>
<td>Exported ISC Shared Library</td>
</tr>
<tr>
<td>libisc95</td>
<td>1:9.9.5.dfsg-9</td>
<td>ISC Shared Library used by BIND</td>
</tr>
<tr>
<td>libisccfg90</td>
<td>1:9.9.5.dfsg-9</td>
<td>Command Channel Library used by BIND</td>
</tr>
<tr>
<td>libisccfg-export90</td>
<td>1:9.9.5.dfsg-9</td>
<td>Exported ISC CFG Shared Library</td>
</tr>
<tr>
<td>libisccfg90</td>
<td>1:9.9.5.dfsg-9</td>
<td>Config File Handling Library used by BIND</td>
</tr>
<tr>
<td>libis10:amd64</td>
<td>0.12.2-2</td>
<td>manipulating sets and relations of integer points bounded by linear constraints</td>
</tr>
<tr>
<td>libitm1:amd64</td>
<td>4.9.2-10</td>
<td>GNU Transactional Memory Library</td>
</tr>
<tr>
<td>libiw30:amd64</td>
<td>30~pre9-8</td>
<td>Wireless tools - library</td>
</tr>
<tr>
<td>libjasper1:amd64</td>
<td>1.900.1-debian1-2.4</td>
<td>JasPer JPEG-2000 runtime library</td>
</tr>
<tr>
<td>libjpeg62-turbo:amd64</td>
<td>1:1.3.1-12</td>
<td>libjpeg-turbo JPEG runtime library</td>
</tr>
<tr>
<td>libjson-c2:amd64</td>
<td>2.1-3.1</td>
<td>JBIGkit libraries</td>
</tr>
<tr>
<td>libk5crypto3:amd64</td>
<td>1.12.1+dfsg-19</td>
<td>MIT Kerberos runtime libraries - Crypto Library</td>
</tr>
<tr>
<td>libkeyutils1:amd64</td>
<td>1.5.9-5+b1</td>
<td>Linux Key Management Utilities (library)</td>
</tr>
<tr>
<td>libklibc</td>
<td>2.0.4-2</td>
<td>minimal libc subset for use with iniramfs</td>
</tr>
<tr>
<td>libkrbmod2:amd64</td>
<td>3月 18日</td>
<td>libkrbmod shared library</td>
</tr>
<tr>
<td>libkrb5-3:amd64</td>
<td>1.12.1+dfsg-19</td>
<td>MIT Kerberos runtime libraries</td>
</tr>
<tr>
<td>libkrb5s5support0:amd64</td>
<td>1.12.1+dfsg-19</td>
<td>MIT Kerberos runtime libraries - Support library</td>
</tr>
<tr>
<td>libksba8:amd64</td>
<td>1.3.2-1</td>
<td>X.509 and CMS support library</td>
</tr>
<tr>
<td>liblcms2-2:amd64</td>
<td>2.6-3+b3</td>
<td>Little CMS 2 color management library</td>
</tr>
<tr>
<td>libldap-2.4.2:amd64</td>
<td>2.4.40+dfsg-1</td>
<td>OpenLDAP libraries</td>
</tr>
<tr>
<td>libllvm3.5:amd64</td>
<td>1:3.5-10</td>
<td>Modular compiler and toolchain technologies, runtime library</td>
</tr>
<tr>
<td>Package Name</td>
<td>Version</td>
<td>Description</td>
</tr>
<tr>
<td>------------------------------</td>
<td>-----------</td>
<td>------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>liblocale-gettext-perl</td>
<td>1.05-8+b1</td>
<td>module using libc functions for internationalization in Perl</td>
</tr>
<tr>
<td>libblockfile-bin</td>
<td>1.09-6</td>
<td>support binaries for and cli utilities based on libblockfile</td>
</tr>
<tr>
<td>liblockfile1:amd64</td>
<td>1.09-6</td>
<td>NFS-safe locking library</td>
</tr>
<tr>
<td>liblog-message-perl</td>
<td>0.8-1</td>
<td>powerful and flexible message logging mechanism</td>
</tr>
<tr>
<td>liblog-message-simple-perl</td>
<td>0.10-2</td>
<td>simplified interface to Log::Message</td>
</tr>
<tr>
<td>liblogging-stderr0:amd64</td>
<td>1.0.4-1</td>
<td>easy to use and lightweight logging library</td>
</tr>
<tr>
<td>liblognorm1:amd64</td>
<td>1.0.1-3</td>
<td>Log normalizing library</td>
</tr>
<tr>
<td>libщуа5.1-0:amd64</td>
<td>5.1.5-7.1</td>
<td>Shared library for the Lua interpreter version 5.1</td>
</tr>
<tr>
<td>liblwp-mediatypes-perl</td>
<td>6.02-1</td>
<td>module to guess media type for a file or a URL</td>
</tr>
<tr>
<td>liblwp-protocol-https-perl</td>
<td>6.06-2</td>
<td>HTTPS driver for LWP::UserAgent</td>
</tr>
<tr>
<td>liblwres90</td>
<td>1:9.9.5.0fsg-9</td>
<td>Lightweight Resolver Library used by BIND</td>
</tr>
<tr>
<td>liblzma5:amd64</td>
<td>5.1.1alpha+20120614-2+b3</td>
<td>XZ-format compression library</td>
</tr>
<tr>
<td>liblzo2-2:amd64</td>
<td>2.08-1.2</td>
<td>data compression library</td>
</tr>
<tr>
<td>libmagic1:amd64</td>
<td>1:5.22+15-2</td>
<td>File type determination library using &quot;magic&quot; numbers</td>
</tr>
<tr>
<td>libmailtools-perl</td>
<td>2.13-1</td>
<td>Manipulate email in perl programs</td>
</tr>
<tr>
<td>libmnl0:amd64</td>
<td>1.0.3-5</td>
<td>minimalistic Netlink communication library</td>
</tr>
<tr>
<td>libmodule-build-perl</td>
<td>0.421000-2</td>
<td>framework for building and installing Perl modules</td>
</tr>
<tr>
<td>libmodule-pluggable-perl</td>
<td>5.1-1</td>
<td>module for giving modules the ability to have plugins</td>
</tr>
<tr>
<td>libmodule-signature-perl</td>
<td>0.73-1+deb8u2</td>
<td>module to manipulate CPAN SIGNATURE files</td>
</tr>
<tr>
<td>libmount1:amd64</td>
<td>2.25.2-6</td>
<td>device mounting library</td>
</tr>
<tr>
<td>libmpc3:amd64</td>
<td>1.0.2-1</td>
<td>multiple precision complex floating-point library</td>
</tr>
<tr>
<td>libmpfr4:amd64</td>
<td>3.1.2-2</td>
<td>multiple precision floating-point computation</td>
</tr>
<tr>
<td>libmro-compat-perl</td>
<td>0.12-1</td>
<td>mro::* interface compatibility for Perls &lt; 5.9.5</td>
</tr>
<tr>
<td>libcurses5:amd64</td>
<td>5.9+20140913-1+b1</td>
<td>shared libraries for terminal handling</td>
</tr>
<tr>
<td>libcurses5-dev:amd64</td>
<td>5.9+20140913-1+b1</td>
<td>developer's libraries for nucurses</td>
</tr>
<tr>
<td>libcursesw5:amd64</td>
<td>5.9+20140913-1+b1</td>
<td>shared libraries for terminal handling (wide character support)</td>
</tr>
<tr>
<td>libnet-http-perl</td>
<td>6.07-1</td>
<td>module providing low-level HTTP connection client</td>
</tr>
<tr>
<td>libnet-smtp-ssl-perl</td>
<td>1.01-3</td>
<td>Perl module providing SSL support to Net::SMTP</td>
</tr>
<tr>
<td>libnet-ssleay-perl</td>
<td>1.65-1+b1</td>
<td>Perl module for Secure Sockets Layer (SSL)</td>
</tr>
<tr>
<td>libnet-telnet-perl</td>
<td>3.04-1</td>
<td>Perl module to script telnetable connections</td>
</tr>
<tr>
<td>libnetfilter-acct1:amd64</td>
<td>1.0.2-1.1</td>
<td>Netfilter acct library</td>
</tr>
<tr>
<td>libnettle4:amd64</td>
<td>2.7.1-5</td>
<td>low level cryptographic library (symmetric and one-way cryptos)</td>
</tr>
<tr>
<td>libnewt0.52:amd64</td>
<td>0.52.17-1+b1</td>
<td>Not Erik's Windowing Toolkit - text mode windowing with slang</td>
</tr>
<tr>
<td>libnl-native:amd64</td>
<td>1.0.1-3</td>
<td>Netfilter netlink library</td>
</tr>
<tr>
<td>libnfsidmap2:amd64</td>
<td>0.25-5</td>
<td>NFS idmapping library</td>
</tr>
<tr>
<td>libnl-3-200:amd64</td>
<td>3.2.24-2</td>
<td>library for dealing with netlink sockets</td>
</tr>
<tr>
<td>libnl-genl-3-200:amd64</td>
<td>3.2.24-2</td>
<td>library for dealing with netlink sockets - generic</td>
</tr>
<tr>
<td>Package</td>
<td>Version</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------------------------</td>
<td>-----------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>libnuma1:amd64</td>
<td>2.0.10-1</td>
<td>Libraries for controlling NUMA policy</td>
</tr>
<tr>
<td>libnuma2:amd64</td>
<td>5.9.5-3.2</td>
<td>Oniguruma regular expressions library</td>
</tr>
<tr>
<td>libp11-kit0:amd64</td>
<td>0.20.7-1</td>
<td>Library for loading and coordinating access to PKCS#11 modules - runtime</td>
</tr>
<tr>
<td>libpackage-constants-perl</td>
<td>0.04-1</td>
<td>List constants defined in a package</td>
</tr>
<tr>
<td>libpam-modules:amd64</td>
<td>1.1.8-3.1</td>
<td>Pluggable Authentication Modules for PAM</td>
</tr>
<tr>
<td>libpam-modules-bin</td>
<td>1.1.8-3.1</td>
<td>Pluggable Authentication Modules for PAM - helper binaries</td>
</tr>
<tr>
<td>libpam-runtime</td>
<td>1.1.8-3.1</td>
<td>Runtime support for the PAM library</td>
</tr>
<tr>
<td>libpam0g:amd64</td>
<td>1.1.8-3.1</td>
<td>Pluggable Authentication Modules library</td>
</tr>
<tr>
<td>libpango-1.0-0:amd64</td>
<td>1.36.8-3</td>
<td>Layout and rendering of internationalized text</td>
</tr>
<tr>
<td>libpangocairo-1.0-0:amd64</td>
<td>1.36.8-3</td>
<td>Layout and rendering of internationalized text</td>
</tr>
<tr>
<td>libpangoft2-1.0-0:amd64</td>
<td>1.36.8-3</td>
<td>Layout and rendering of internationalized text</td>
</tr>
<tr>
<td>libpaper-utils</td>
<td>1.1.24+nmu4</td>
<td>library for handling paper characteristics (utilities)</td>
</tr>
<tr>
<td>libpaper1:amd64</td>
<td>1.1.24+nmu4</td>
<td>library for handling paper characteristics</td>
</tr>
<tr>
<td>libparams-util-perl</td>
<td>1.07+2+b1</td>
<td>Perl extension for simple stand-alone param checking functions</td>
</tr>
<tr>
<td>libparse-debianchangelog-perl</td>
<td>1.20-1.1</td>
<td>parse Debian changelogs and output them in other formats</td>
</tr>
<tr>
<td>libpci3:amd64</td>
<td>1:3.2.1-3</td>
<td>Linux PCI Utilities (shared library)</td>
</tr>
<tr>
<td>libpciaccess0:amd64</td>
<td>0.13.2-3+b1</td>
<td>Generic PCI access library for X</td>
</tr>
<tr>
<td>libpcre3:amd64</td>
<td>2:8.35-3.3</td>
<td>Perl 5 Compatible Regular Expression Library - runtime files</td>
</tr>
<tr>
<td>libpcssc1ite1:amd64</td>
<td>1.8.13-1</td>
<td>Middleware to access a smart card using PC/SC (library)</td>
</tr>
<tr>
<td>libperl-dev</td>
<td>5.20.2-3+deb8u1</td>
<td>Perl library: development files</td>
</tr>
<tr>
<td>libperl4-corelibs-perl</td>
<td>0.003-1</td>
<td>libraries historically supplied with Perl 4</td>
</tr>
<tr>
<td>libperl5.20</td>
<td>5.20.2-3+deb8u1</td>
<td>shared Perl library</td>
</tr>
<tr>
<td>libpipeline1:amd64</td>
<td>1.4.0-1</td>
<td>pipeline manipulation library</td>
</tr>
<tr>
<td>libpixman-1-0:amd64</td>
<td>0.32.6-3</td>
<td>pixel-manipulation library for X and cairo</td>
</tr>
<tr>
<td>libpks11-helper1:amd64</td>
<td>1.11-2</td>
<td>library that simplifies the interaction with PKCS#11</td>
</tr>
<tr>
<td>libpng12-0:amd64</td>
<td>1.2.50-2+b2</td>
<td>PNG library - runtime</td>
</tr>
<tr>
<td>libpod-latex-perl</td>
<td>0.61-1</td>
<td>module to convert Pod data to formatted LaTeX</td>
</tr>
<tr>
<td>libpod-readme-perl</td>
<td>0.11-1</td>
<td>Perl module to convert POD to README file</td>
</tr>
<tr>
<td>libpopt0:amd64</td>
<td>1.16-10</td>
<td>lib for parsing cmdline parameters</td>
</tr>
<tr>
<td>libprocps3:amd64</td>
<td>2:3.3.9-9</td>
<td>library for accessing process information from /proc</td>
</tr>
<tr>
<td>libpsl0:amd64</td>
<td>0.5.1-1</td>
<td>Library for Public Suffix List (shared libraries)</td>
</tr>
<tr>
<td>libpth20:amd64</td>
<td>2.0.7-20</td>
<td>GNU Portable Threads</td>
</tr>
<tr>
<td>libpython-stdlib:amd64</td>
<td>2.7.9-1</td>
<td>interactive high-level object-oriented language (default python version)</td>
</tr>
<tr>
<td>libpython2.7-minimal:amd64</td>
<td>2.7.9-2</td>
<td>Minimal subset of the Python language (version 2.7)</td>
</tr>
<tr>
<td>libpython2.7-stdlib:amd64</td>
<td>2.7.9-2</td>
<td>Interactive high-level object-oriented language (standard library, version 2.7)</td>
</tr>
<tr>
<td>libqdbm14</td>
<td>1.8.78-5+b1</td>
<td>QDBM Database Libraries without GDBM wrapper[runtime]</td>
</tr>
<tr>
<td>libquadmath0:amd64</td>
<td>4.9.2-10</td>
<td>GCC Quad-Precision Math Library</td>
</tr>
<tr>
<td>libreadline6:amd64</td>
<td>6.3-8+b3</td>
<td>GNU readline and history libraries, run-time libraries</td>
</tr>
<tr>
<td>Package Name</td>
<td>Version</td>
<td>Description</td>
</tr>
<tr>
<td>------------------------------</td>
<td>-----------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>libregexp-common-perl</td>
<td>2013031301-1</td>
<td>module with common regular expressions</td>
</tr>
<tr>
<td>librtpm1:amd64</td>
<td>2.4+20150115.gita107cef-1</td>
<td>toolkit for RTMP streams (shared library)</td>
</tr>
<tr>
<td>librtmp1:amd64</td>
<td>2.1.26.dfsg1-13</td>
<td>Cyrus SASL - authentication abstraction library</td>
</tr>
<tr>
<td>librtmp2-modules:amd64</td>
<td>2.1.26.dfsg1-13</td>
<td>Cyrus SASL - pluggable authentication modules</td>
</tr>
<tr>
<td>librtmp2-modules-db:amd64</td>
<td>2.1.26.dfsg1-13</td>
<td>Cyrus SASL - pluggable authentication modules (DB)</td>
</tr>
<tr>
<td>libselinux1:amd64</td>
<td>2.3-2</td>
<td>SELinux runtime shared libraries</td>
</tr>
<tr>
<td>libsemanage-common</td>
<td>2.3-1</td>
<td>Common files for SELinux policy management libraries</td>
</tr>
<tr>
<td>libsemanage1:amd64</td>
<td>2.3-1+b1</td>
<td>SELinux policy management library</td>
</tr>
<tr>
<td>libsensors4:amd64</td>
<td>1:3.3.5-2</td>
<td>library to read temperature/voltage/fan sensors</td>
</tr>
<tr>
<td>libsepol1:amd64</td>
<td>2.3-2</td>
<td>SELinux library for manipulating binary security policies</td>
</tr>
<tr>
<td>libsigc++-2-0-c2a:amd64</td>
<td>2.4.0-1</td>
<td>type-safe Signal Framework for C++ - runtime</td>
</tr>
<tr>
<td>libsigsegv2:amd64</td>
<td>2.10-4+b1</td>
<td>Library for handling page faults in a portable way</td>
</tr>
<tr>
<td>libslang2:amd64</td>
<td>2.3.0-2</td>
<td>S-Lang programming library - runtime version</td>
</tr>
<tr>
<td>libsm6:amd64</td>
<td>2:1.2.2-1+b1</td>
<td>X11 Session Management library</td>
</tr>
<tr>
<td>libsmartcolos1:amd64</td>
<td>2.25.2-6</td>
<td>smart column output alignment library</td>
</tr>
<tr>
<td>libsnmp-base</td>
<td>5.7.2.1+dfsg-1</td>
<td>SNMP configuration script, MIBs and documentation</td>
</tr>
<tr>
<td>libsnmp30:amd64</td>
<td>5.7.2.1+dfsg-1</td>
<td>SNMP (Simple Network Management Protocol) library</td>
</tr>
<tr>
<td>libsoftware-license-perl</td>
<td>0.103010-3</td>
<td>module providing templated software licenses</td>
</tr>
<tr>
<td>libsqlite3-0:amd64</td>
<td>3.8.7.1-1+deb8u1</td>
<td>SQLite 3 shared library</td>
</tr>
<tr>
<td>libsqlite3-dev:amd64</td>
<td>3.8.7.1-1+deb8u1</td>
<td>SQLite 3 development files</td>
</tr>
<tr>
<td>libssh2-1:amd64</td>
<td>1.42.12-1.1</td>
<td>command-line interface parsing library</td>
</tr>
<tr>
<td>libssh2-1:amd64</td>
<td>1.4.3-4.1</td>
<td>SSH2 client-side library</td>
</tr>
<tr>
<td>libssh3:amd64</td>
<td>1.0.1k-3+deb8u1</td>
<td>Secure Sockets Layer toolkit - shared libraries</td>
</tr>
<tr>
<td>libstdc++-4.9-dev:amd64</td>
<td>4.9.2-10</td>
<td>GNU Standard C++ Library v3 (development files)</td>
</tr>
<tr>
<td>libstdc++-6:amd64</td>
<td>4.9.2-10</td>
<td>GNU Standard C++ Library v3</td>
</tr>
<tr>
<td>libsub-exporter-perl</td>
<td>0.986-1</td>
<td>sophisticated exporter for custom-built routines</td>
</tr>
<tr>
<td>libsub-install-perl</td>
<td>0.928-1</td>
<td>module for installing subroutines into packages easily</td>
</tr>
<tr>
<td>libsub-name-perl</td>
<td>0.12-1</td>
<td>module for assigning a new name to referenced sub</td>
</tr>
<tr>
<td>libswitch-perl</td>
<td>2.17-2</td>
<td>switch statement for Perl</td>
</tr>
<tr>
<td>libsystemd0:amd64</td>
<td>215-17+deb8u1</td>
<td>systemd utility library</td>
</tr>
<tr>
<td>libtasn1-6:amd64</td>
<td>4.2-3+deb8u1</td>
<td>Manage ASN.1 structures (runtime)</td>
</tr>
<tr>
<td>libterm-ui-perl</td>
<td>0.42-1</td>
<td>Term::ReadLine UI made easy</td>
</tr>
<tr>
<td>libtext-charwidth-perl</td>
<td>0.04-7+b3</td>
<td>get display widths of characters on the terminal</td>
</tr>
<tr>
<td>libtext-conv-perl</td>
<td>1.7-5+b2</td>
<td>converts between character sets in Perl</td>
</tr>
<tr>
<td>libtext-soundex-perl</td>
<td>3.4-1+b2</td>
<td>implementation of the soundex algorithm</td>
</tr>
<tr>
<td>libtext-template-perl</td>
<td>1.46-1</td>
<td>perl module to process text templates</td>
</tr>
<tr>
<td>libtext-unicode-perl</td>
<td>1.22-1</td>
<td>Text::Unicode -- US-ASCII transliterations of Unicode text</td>
</tr>
<tr>
<td>libtext-wrap18n-perl</td>
<td>0.06-7</td>
<td>internationalized substitute of Text::Wrap</td>
</tr>
<tr>
<td>libthai-data</td>
<td>0.1.21-1</td>
<td>Data files for Thai language support library</td>
</tr>
<tr>
<td>libthai0:amd64</td>
<td>0.1.21-1</td>
<td>Thai language support library</td>
</tr>
<tr>
<td>Package</td>
<td>Version</td>
<td>Description</td>
</tr>
<tr>
<td>---------------------</td>
<td>---------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>libtiff5:amd64</td>
<td>4.0.3-12.3</td>
<td>Tag Image File Format (TIFF) library</td>
</tr>
<tr>
<td>libtimedate-perl</td>
<td>2.3000-2</td>
<td>collection of modules to manipulate date/time information</td>
</tr>
<tr>
<td>libtinfo-dev:amd64</td>
<td>5.9+20140913-1+b1</td>
<td>developer's library for the low-level terminfo library</td>
</tr>
<tr>
<td>libtinfo5:amd64</td>
<td>5.9+20140913-1+b1</td>
<td>shared low-level terminfo library for terminal handling</td>
</tr>
<tr>
<td>libtirpc1:amd64</td>
<td>0.2.5-1</td>
<td>transport-independent RPC library</td>
</tr>
<tr>
<td>libtokyocabinet9:amd64</td>
<td>1.4.48-3</td>
<td>Tokyo Cabinet Database Libraries [runtime]</td>
</tr>
<tr>
<td>libtsan0:amd64</td>
<td>4.9.2-10</td>
<td>ThreadSanitizer -- a Valgrind-based detector of data races (runtime)</td>
</tr>
<tr>
<td>libtxc-dxtn-s2tc0:amd64</td>
<td>0~git20131104-1.1</td>
<td>Texture compression library for Mesa</td>
</tr>
<tr>
<td>libubsan0:amd64</td>
<td>4.9.2-10</td>
<td>UBSan -- undefined behaviour sanitizer (runtime)</td>
</tr>
<tr>
<td>libudev1:amd64</td>
<td>215-17+deb8u1</td>
<td>libudev shared library</td>
</tr>
<tr>
<td>liburi-perl</td>
<td>1.64-1</td>
<td>module to manipulate and access URI strings</td>
</tr>
<tr>
<td>libusb-0.1-4:amd64</td>
<td>2:0.1.12-25</td>
<td>userspace USB programming library</td>
</tr>
<tr>
<td>libustr-1.0-1:amd64</td>
<td>1.0.4-3+b2</td>
<td>Micro string library: shared library</td>
</tr>
<tr>
<td>libutempter0</td>
<td>1.1.5-4</td>
<td>A privileged helper for utmp/wtmp updates (runtime)</td>
</tr>
<tr>
<td>libuuid1:amd64</td>
<td>0.05-1+b1</td>
<td>Perl extension for using UUID interfaces as defined in e2fsprogs</td>
</tr>
<tr>
<td>libuuid1:amd64</td>
<td>0.05-1+b1</td>
<td>Universally Unique ID library</td>
</tr>
<tr>
<td>libwebp5:amd64</td>
<td>0.4.1-1.2+b2</td>
<td>Lossy compression of digital photographic images.</td>
</tr>
<tr>
<td>libwebpdmux1:amd64</td>
<td>0.4.1-1.2+b2</td>
<td>Lossy compression of digital photographic images.</td>
</tr>
<tr>
<td>libwebpmux1:amd64</td>
<td>0.4.1-1.2+b2</td>
<td>Lossy compression of digital photographic images.</td>
</tr>
<tr>
<td>libwrap0:amd64</td>
<td>7.6.q-25</td>
<td>Wietse Venema's TCP wrappers library</td>
</tr>
<tr>
<td>libwww-perl</td>
<td>6.08-1</td>
<td>simple and consistent interface to the world-wide web</td>
</tr>
<tr>
<td>libwww-robotrules-perl</td>
<td>6.01-1</td>
<td>database of robots.txt-derived permissions</td>
</tr>
<tr>
<td>libx11-6:amd64</td>
<td>2:1.6.2-3</td>
<td>X11 client-side library</td>
</tr>
<tr>
<td>libx11-data</td>
<td>2:1.6.2-3</td>
<td>X11 client-side library</td>
</tr>
<tr>
<td>libx11-xcb1:amd64</td>
<td>2:1.6.2-3</td>
<td>Xlib/XCB interface library</td>
</tr>
<tr>
<td>libx86-1:amd64</td>
<td>1.1+s11-10</td>
<td>x86 real-mode library</td>
</tr>
<tr>
<td>libxapian22</td>
<td>1.2.19-1</td>
<td>Search engine library</td>
</tr>
<tr>
<td>libxaw7:amd64</td>
<td>1:1.0.8-1</td>
<td>X11 authorisation library</td>
</tr>
<tr>
<td>libxcb-dri2-0:amd64</td>
<td>1.10-3+b1</td>
<td>X C Binding, dri2 extension</td>
</tr>
<tr>
<td>libxcb-dri3-0:amd64</td>
<td>1.10-3+b1</td>
<td>X C Binding, dri3 extension</td>
</tr>
<tr>
<td>libxcb-glx0:amd64</td>
<td>1.10-3+b1</td>
<td>X C Binding, glx extension</td>
</tr>
<tr>
<td>libxcb-present0:amd64</td>
<td>1.10-3+b1</td>
<td>X C Binding, present extension</td>
</tr>
<tr>
<td>libxcb-render0:amd64</td>
<td>1.10-3+b1</td>
<td>X C Binding, render extension</td>
</tr>
<tr>
<td>libxcb-shape0:amd64</td>
<td>1.10-3+b1</td>
<td>X C Binding, shape extension</td>
</tr>
<tr>
<td>libxcb-shm0:amd64</td>
<td>1.10-3+b1</td>
<td>X C Binding, shm extension</td>
</tr>
<tr>
<td>libxcb-sync1:amd64</td>
<td>1.10-3+b1</td>
<td>X C Binding, sync extension</td>
</tr>
<tr>
<td>libxcb1:amd64</td>
<td>1.10-3+b1</td>
<td>X C Binding</td>
</tr>
<tr>
<td>libxcomposite1:amd64</td>
<td>1:0.4.4-1</td>
<td>X11 Composite extension library</td>
</tr>
<tr>
<td>libxcursor1:amd64</td>
<td>1:1.1.14-1+b1</td>
<td>X cursor management library</td>
</tr>
<tr>
<td>libxdamage1:amd64</td>
<td>1:1.1.4-2+b1</td>
<td>X11 damaged region extension library</td>
</tr>
<tr>
<td>libxdmcp6:amd64</td>
<td>1:1.1.1-1+b1</td>
<td>X11 Display Manager Control Protocol library</td>
</tr>
<tr>
<td>Package</td>
<td>Version</td>
<td>Description</td>
</tr>
<tr>
<td>----------------------</td>
<td>---------</td>
<td>--------------------------------------------------</td>
</tr>
<tr>
<td>libxext6:amd64</td>
<td>2:1.3.3-1</td>
<td>X11 miscellaneous extension library</td>
</tr>
<tr>
<td>libxfixes3:amd64</td>
<td>1:5.0.1-2+b2</td>
<td>X11 miscellaneous 'fixes' extension library</td>
</tr>
<tr>
<td>libxft2:amd64</td>
<td>2.3.2-1</td>
<td>FreeType-based font drawing library for X</td>
</tr>
<tr>
<td>libxi6:amd64</td>
<td>2:1.7.4-1+b2</td>
<td>X11 Input extension library</td>
</tr>
<tr>
<td>libxinerama1:amd64</td>
<td>2:1.1.3-1+b1</td>
<td>X11 Xinerama extension library</td>
</tr>
<tr>
<td>libxml-libxml-perl</td>
<td>2.0.16+dbs+1+deb8u1</td>
<td>Perl interface to the libxml2 library</td>
</tr>
<tr>
<td>libxml-parse-support-perl</td>
<td>1.11-1</td>
<td>Perl module for supporting simple generic namespaces</td>
</tr>
<tr>
<td>libxml-parser-perl</td>
<td>2.41-3</td>
<td>Perl module for parsing XML files</td>
</tr>
<tr>
<td>libxml-sax-base-perl</td>
<td>1.07-1</td>
<td>base class for SAX drivers and filters</td>
</tr>
<tr>
<td>libxml-sax-expat-perl</td>
<td>0.40-2</td>
<td>Perl module for a SAX2 driver for Expat (XML::Parser)</td>
</tr>
<tr>
<td>libxml-sax-perl</td>
<td>0.99+dbs-2</td>
<td>Perl module for using and building Perl SAX2 XML processors</td>
</tr>
<tr>
<td>libxml2:amd64</td>
<td>2.9.1+dbs-1</td>
<td>GNOME XML library</td>
</tr>
<tr>
<td>libxmu6:amd64</td>
<td>2:1.1.2-1</td>
<td>X11 miscellaneous utility library</td>
</tr>
<tr>
<td>libxmu1:amd64</td>
<td>2:1.1.2-1</td>
<td>X11 miscellaneous micro-utility library</td>
</tr>
<tr>
<td>libxpm4:amd64</td>
<td>1:3.5.11-1+b1</td>
<td>X11 pixmap library</td>
</tr>
<tr>
<td>libxrandr2:amd64</td>
<td>2:1.4.2-1+b1</td>
<td>X11 RandR extension library</td>
</tr>
<tr>
<td>libxrender1:amd64</td>
<td>1:0.9.8-1+b1</td>
<td>X Rendering Extension client library</td>
</tr>
<tr>
<td>libxshmbfence1:amd64</td>
<td>1.1-4</td>
<td>X shared memory fences - shared library</td>
</tr>
<tr>
<td>libxt6:amd64</td>
<td>1:1.1.4-1+b1</td>
<td>X11 toolkit intrinsics library</td>
</tr>
<tr>
<td>libxtables10</td>
<td>1.4.21-2+b1</td>
<td>netfilter xtables library</td>
</tr>
<tr>
<td>libxtst6:amd64</td>
<td>2:1.2.2-1</td>
<td>X11 Testing -- Record extension library</td>
</tr>
<tr>
<td>libxv1:amd64</td>
<td>2:1.0.10-1+b1</td>
<td>X11 Video extension library</td>
</tr>
<tr>
<td>libxxf86dga1:amd64</td>
<td>2:1.1.4-1+b1</td>
<td>X11 Direct Graphics Access extension library</td>
</tr>
<tr>
<td>libxxf86vm1:amd64</td>
<td>1:1.1.3-1+b1</td>
<td>X11 XFree86 video mode extension library</td>
</tr>
<tr>
<td>linux-base</td>
<td>3.5</td>
<td>Linux image base package</td>
</tr>
<tr>
<td>linux-compiler-gcc-4.8-x86</td>
<td>3.16.7.ckt11-1</td>
<td>Compiler for Linux on x86 (meta-package)</td>
</tr>
<tr>
<td>linux-headers-3.16.0-4-amd64</td>
<td>3.16.7.ckt11-1</td>
<td>Header files for Linux 3.16.0-4-amd64</td>
</tr>
<tr>
<td>linux-headers-3.16.0-4-common</td>
<td>3.16.7.ckt11-1</td>
<td>Common header files for Linux 3.16.0-4</td>
</tr>
<tr>
<td>linux-headers-amd64</td>
<td>3.16+63</td>
<td>Header files for Linux amd64 configuration    (meta-package)</td>
</tr>
<tr>
<td>linux-image-3.16.0-4-amd64</td>
<td>3.16.7.ckt11-1</td>
<td>Linux 3.16 for 64-bit PCs</td>
</tr>
<tr>
<td>linux-image-amd64</td>
<td>3.16+63</td>
<td>Linux for 64-bit PCs (meta-package)</td>
</tr>
<tr>
<td>linux-kbuild-3.16</td>
<td>3.16-3</td>
<td>Kbuild infrastructure for Linux 3.16</td>
</tr>
<tr>
<td>linux-libc-dev:amd64</td>
<td>3.16.7.ckt11-1</td>
<td>Linux support headers for userspace development</td>
</tr>
<tr>
<td>live-manual</td>
<td>1:4.0.1-1</td>
<td>Live Systems Documentation (metapackage)</td>
</tr>
<tr>
<td>live-manual-epub</td>
<td>1:4.0.1-1</td>
<td>Live Systems Documentation (epub)</td>
</tr>
<tr>
<td>live-manual-html</td>
<td>1:4.0.1-1</td>
<td>Live Systems Documentation (html)</td>
</tr>
<tr>
<td>live-manual-odf</td>
<td>1:4.0.1-1</td>
<td>Live Systems Documentation (odf)</td>
</tr>
<tr>
<td>live-manual-pdf</td>
<td>1:4.0.1-1</td>
<td>Live Systems Documentation (pdf)</td>
</tr>
<tr>
<td>live-manual-txt</td>
<td>1:4.0.1-1</td>
<td>Live Systems Documentation (txt)</td>
</tr>
<tr>
<td>live-tools</td>
<td>4.0.2-1.1</td>
<td>Live System Extra Components</td>
</tr>
<tr>
<td>locales</td>
<td>2.19-18</td>
<td>GNU C Library: National Language (locale) data [support]</td>
</tr>
<tr>
<td>lockfile-progs</td>
<td>0.1.17</td>
<td>Programs for locking and unlocking files and mailboxes</td>
</tr>
<tr>
<td>login</td>
<td>1:4.2-3</td>
<td>system login tools</td>
</tr>
<tr>
<td>logrotate</td>
<td>3.8.7-1+b1</td>
<td>Log rotation utility</td>
</tr>
<tr>
<td>lsb-base</td>
<td>4.1+Debian13+nmu1</td>
<td>Linux Standard Base 4.1 init script functionality</td>
</tr>
<tr>
<td>lsb-release</td>
<td>4.1+Debian13+nmu1</td>
<td>Linux Standard Base version reporting utility</td>
</tr>
<tr>
<td>Package</td>
<td>Version</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------</td>
<td>----------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>lsod</td>
<td>4.86+dfsg-1</td>
<td>Utility to list open files</td>
</tr>
<tr>
<td>m4</td>
<td>1.4.17-4</td>
<td>macro processing language</td>
</tr>
<tr>
<td>make</td>
<td>4.0-8.1</td>
<td>utility for directing compilation</td>
</tr>
<tr>
<td>man-db</td>
<td>2.7.0.2-5</td>
<td>on-line manual pager</td>
</tr>
<tr>
<td>manpages</td>
<td>3.74-1</td>
<td>Manual pages about using a GNU/Linux system</td>
</tr>
<tr>
<td>manpages-dev</td>
<td>3.74-1</td>
<td>Manual pages about using GNU/Linux for development</td>
</tr>
<tr>
<td>mawk</td>
<td>1.3.3-17</td>
<td>a pattern scanning and text processing language</td>
</tr>
<tr>
<td>memtest86+</td>
<td>5.01-2</td>
<td>thorough real-mode memory tester</td>
</tr>
<tr>
<td>menu</td>
<td>2.1.47</td>
<td>generates programs menu for all menu-aware applications</td>
</tr>
<tr>
<td>mime-support</td>
<td>3.58</td>
<td>MIME files 'mime.types' &amp; 'mailcap', and support programs</td>
</tr>
<tr>
<td>mlocate</td>
<td>0.26-1</td>
<td>quickly find files on the filesystem based on their name</td>
</tr>
<tr>
<td>mount</td>
<td>2.25.2-6</td>
<td>Tools for mounting and manipulating filesystems</td>
</tr>
<tr>
<td>multiarch-support</td>
<td>2.19-18</td>
<td>Transitional package to ensure multiarch compatibility</td>
</tr>
<tr>
<td>mutt</td>
<td>1.5.23-3</td>
<td>text-based mailreader supporting MIME, GPG, PGP and threading</td>
</tr>
<tr>
<td>ncurses-base</td>
<td>5.9+20140913-1</td>
<td>basic terminal type definitions</td>
</tr>
<tr>
<td>ncurses-bin</td>
<td>5.9+20140913-1+b1</td>
<td>terminal-related programs and man pages</td>
</tr>
<tr>
<td>ncurses-term</td>
<td>5.9+20140913-1</td>
<td>additional terminal type definitions</td>
</tr>
<tr>
<td>net-tools</td>
<td>1.60-26+b1</td>
<td>NET-3 networking toolkit</td>
</tr>
<tr>
<td>netbase</td>
<td>5.3</td>
<td>Basic TCP/IP networking system</td>
</tr>
<tr>
<td>netcat-traditional</td>
<td>1.10-41</td>
<td>TCP/IP swiss army knife</td>
</tr>
<tr>
<td>nfacct</td>
<td>1.0.1-1.1</td>
<td>netfilter accounting object tool</td>
</tr>
<tr>
<td>nfs-common</td>
<td>1:1.2.8-9</td>
<td>NFS support files common to client and server</td>
</tr>
<tr>
<td>ntpdate</td>
<td>1:4.2.6.p5+dfsg-7</td>
<td>client for setting system time from NTP servers</td>
</tr>
<tr>
<td>opensc</td>
<td>0.14.0-2</td>
<td>Smart card utilities with support for PKCS#15 compatible cards</td>
</tr>
<tr>
<td>opensc-pkcs11:amd64</td>
<td>0.14.0-2</td>
<td>Smart card utilities with support for PKCS#15 compatible cards</td>
</tr>
<tr>
<td>openssh-client</td>
<td>1:6.7p1-5</td>
<td>secure shell (SSH) client, for secure access to remote machines</td>
</tr>
<tr>
<td>openssh-server</td>
<td>1:6.7p1-5</td>
<td>secure shell (SSH) server, for secure access from remote machines</td>
</tr>
<tr>
<td>openssh-sftp-server</td>
<td>1:6.7p1-5</td>
<td>secure shell (SSH) sftp server module, for SFTP access from remote machines</td>
</tr>
<tr>
<td>openssl</td>
<td>1.0.1k-3+deb8u1</td>
<td>Secure Sockets Layer toolkit - cryptographic utility</td>
</tr>
<tr>
<td>openvpn</td>
<td>2.3.4-5</td>
<td>virtual private network daemon</td>
</tr>
<tr>
<td>os-prober</td>
<td>1.65</td>
<td>utility to detect other OSes on a set of drives</td>
</tr>
<tr>
<td>passwd</td>
<td>1:4.2-3</td>
<td>change and administer password and group data</td>
</tr>
<tr>
<td>patch</td>
<td>2.7.5-1</td>
<td>Apply a diff file to an original</td>
</tr>
<tr>
<td>pciutils</td>
<td>1:3.2.1-3</td>
<td>Linux PCI Utilities</td>
</tr>
<tr>
<td>perl</td>
<td>5.20.2-3+deb8u1</td>
<td>Larry Wall’s Practical Extraction and Report Language</td>
</tr>
<tr>
<td>perl-base</td>
<td>5.20.2-3+deb8u1</td>
<td>minimal Perl system</td>
</tr>
<tr>
<td>perl-modules</td>
<td>5.20.2-3+deb8u1</td>
<td>Core Perl modules</td>
</tr>
<tr>
<td>Package</td>
<td>Version</td>
<td>Description</td>
</tr>
<tr>
<td>------------------</td>
<td>------------------</td>
<td>--------------------------------------------------------------</td>
</tr>
<tr>
<td>php5</td>
<td>5.6.9+dfsg-0+deb8u1</td>
<td>server-side, HTML-embedded scripting language (metapackage)</td>
</tr>
<tr>
<td>php5-cli</td>
<td>5.6.9+dfsg-0+deb8u1</td>
<td>command-line interpreter for the php5 scripting language</td>
</tr>
<tr>
<td>php5-common</td>
<td>5.6.9+dfsg-0+deb8u1</td>
<td>Common files for packages built from the php5 source</td>
</tr>
<tr>
<td>php5-json</td>
<td>1.3.6-1</td>
<td>JSON module for php5</td>
</tr>
<tr>
<td>php5-readline</td>
<td>5.6.9+dfsg-0+deb8u1</td>
<td>Readline module for php5</td>
</tr>
<tr>
<td>pinentry-gtk2</td>
<td>0.8.3-2</td>
<td>GTK+-2-based PIN or pass-phrase entry dialog for GnuPG</td>
</tr>
<tr>
<td>pm-utils</td>
<td>1.4.1-15</td>
<td>utilities and scripts for power management</td>
</tr>
<tr>
<td>pmount</td>
<td>0.9.23-3+b1</td>
<td>mount removable devices as normal user</td>
</tr>
<tr>
<td>powermgmt-base</td>
<td>1.31+nmu1</td>
<td>Common utils and configs for power management</td>
</tr>
<tr>
<td>powertop</td>
<td>2.6.1-1</td>
<td>diagnose issues with power consumption and management</td>
</tr>
<tr>
<td>procps</td>
<td>2:3.3.9-9</td>
<td>/proc file system utilities</td>
</tr>
<tr>
<td>psmisc</td>
<td>22.21-2</td>
<td>utilities that use the proc file system</td>
</tr>
<tr>
<td>python</td>
<td>2.7.9-1</td>
<td>interactive high-level object-oriented language (default version)</td>
</tr>
<tr>
<td>python-apt</td>
<td>0.9.3.11</td>
<td>Python interface to libapt-pkg</td>
</tr>
<tr>
<td>python-apt-common</td>
<td>0.9.3.11</td>
<td>Python interface to libapt-pkg (locales)</td>
</tr>
<tr>
<td>python-charset</td>
<td>2.3.0-1</td>
<td>universal character encoding detector for Python2</td>
</tr>
<tr>
<td>python-debian</td>
<td>0.1.27</td>
<td>Python modules to work with Debian-related data formats</td>
</tr>
<tr>
<td>python-debianbts</td>
<td>1.12</td>
<td>Python interface to Debian's Bug Tracking System</td>
</tr>
<tr>
<td>python-defusedxml</td>
<td>0.4.1-2</td>
<td>XML bomb protection for Python stdlib modules (for Python 2)</td>
</tr>
<tr>
<td>python-docutils</td>
<td>0.12+dfsg-1</td>
<td>text processing system for reStructuredText (implemented in Python 2)</td>
</tr>
<tr>
<td>python-minimal</td>
<td>2.7.9-1</td>
<td>minimal subset of the Python language (default version)</td>
</tr>
<tr>
<td>python-pil:amd64</td>
<td>2.6.1-2</td>
<td>Python Imaging Library (Pillow fork)</td>
</tr>
<tr>
<td>python-pkg-resources</td>
<td>5.5.1-1</td>
<td>Package Discovery and Resource Access using pkg_resources</td>
</tr>
<tr>
<td>python-pygments</td>
<td>2.0.1+dfsg-1.1</td>
<td>syntax highlighting package written in Python</td>
</tr>
<tr>
<td>python-reportbug</td>
<td>6.6.3</td>
<td>Python modules for interacting with bug tracking systems</td>
</tr>
<tr>
<td>python-roman</td>
<td>2.0.0-1</td>
<td>module for generating/analyzing Roman numerals for Python 2</td>
</tr>
<tr>
<td>python-six</td>
<td>1.8.0-1</td>
<td>Python 2 and 3 compatibility library (Python 2 interface)</td>
</tr>
<tr>
<td>python-soappy</td>
<td>0.12.22-1</td>
<td>SOAP Support for Python</td>
</tr>
<tr>
<td>python-support</td>
<td>1.0.15</td>
<td>automated rebuilding support for Python modules</td>
</tr>
<tr>
<td>python-wstools</td>
<td>0.4.3-2</td>
<td>WSDL parsing tools Python module</td>
</tr>
<tr>
<td>python2.7</td>
<td>2.7.9-2</td>
<td>Interactive high-level object-oriented language (version 2.7)</td>
</tr>
<tr>
<td>python2.7-minimal</td>
<td>2.7.9-2</td>
<td>Minimal subset of the Python language (version 2.7)</td>
</tr>
<tr>
<td>readline-common</td>
<td>6.3-8</td>
<td>GNU readline and history libraries, common</td>
</tr>
<tr>
<td>Package</td>
<td>Version</td>
<td>Description</td>
</tr>
<tr>
<td>--------------------</td>
<td>------------------</td>
<td>--------------------------------------------------------------</td>
</tr>
<tr>
<td>rename</td>
<td>0.20-3</td>
<td>Perl extension for renaming multiple files</td>
</tr>
<tr>
<td>rpcbind</td>
<td>0.2.1-6</td>
<td>converts RPC program numbers into universal addresses</td>
</tr>
<tr>
<td>rsync</td>
<td>3.1.1-3</td>
<td>fast, versatile, remote (and local) file-copying tool</td>
</tr>
<tr>
<td>rsyslog</td>
<td>8.4.2-1</td>
<td>reliable system and kernel logging daemon</td>
</tr>
<tr>
<td>sed</td>
<td>4.2.2-4+b1</td>
<td>The GNU sed stream editor</td>
</tr>
<tr>
<td>sensible-utils</td>
<td>0.0.9</td>
<td>Utilities for sensible alternative selection</td>
</tr>
<tr>
<td>sgml-base</td>
<td>1.26+nmu4</td>
<td>SGML infrastructure and SGML catalog file support</td>
</tr>
<tr>
<td>shared-mime-info</td>
<td>1.3-1</td>
<td>FreeDesktop.org shared MIME database and spec</td>
</tr>
<tr>
<td>snmp</td>
<td>5.7.2.1+dfsg-1</td>
<td>SNMP (Simple Network Management Protocol) applications</td>
</tr>
<tr>
<td>snmpd</td>
<td>5.7.2.1+dfsg-1</td>
<td>SNMP (Simple Network Management Protocol) agents</td>
</tr>
<tr>
<td>sqlite3</td>
<td>3.8.7.1-1+deb8u1</td>
<td>Command line interface for SQLite 3</td>
</tr>
<tr>
<td>ssh</td>
<td>1:6.7p1-5</td>
<td>secure shell client and server (metapackage)</td>
</tr>
<tr>
<td>ssl-cert</td>
<td>1.0.35</td>
<td>simple debconf wrapper for OpenSSL</td>
</tr>
<tr>
<td>startpar</td>
<td>0.59-3</td>
<td>run processes in parallel and multiplex their output</td>
</tr>
<tr>
<td>sudo</td>
<td>1.8.10p3-1+deb8u2</td>
<td>Provide limited super user privileges to specific users</td>
</tr>
<tr>
<td>sysstat</td>
<td>11.0.1-1</td>
<td>system performance tools for Linux</td>
</tr>
<tr>
<td>systemd</td>
<td>215-17+deb8u1</td>
<td>system and service manager</td>
</tr>
<tr>
<td>systemd-sysv</td>
<td>215-17+deb8u1</td>
<td>system and service manager - SysV links</td>
</tr>
<tr>
<td>syssv-rc</td>
<td>2.88dsf-59</td>
<td>System-V-like runlevel change mechanism</td>
</tr>
<tr>
<td>sysvinit-utils</td>
<td>2.88dsf-59</td>
<td>System-V-like utilities</td>
</tr>
<tr>
<td>tar</td>
<td>1.27.1-2+b1</td>
<td>GNU version of the tar archiving utility</td>
</tr>
<tr>
<td>task-english</td>
<td>3.31+deb8u1</td>
<td>General English environment</td>
</tr>
<tr>
<td>task-laptop</td>
<td>3.31+deb8u1</td>
<td>laptop</td>
</tr>
<tr>
<td>task-ssh-server</td>
<td>3.31+deb8u1</td>
<td>SSH server</td>
</tr>
<tr>
<td>taskser</td>
<td>3.31+deb8u1</td>
<td>tool for selecting tasks for installation on Debian systems</td>
</tr>
<tr>
<td>taskser-data</td>
<td>3.31+deb8u1</td>
<td>official tasks used for installation of Debian systems</td>
</tr>
<tr>
<td>tcpd</td>
<td>7.6.q-25</td>
<td>Wietse Venema's TCP wrapper utilities</td>
</tr>
<tr>
<td>time</td>
<td>1.7-25</td>
<td>GNU time program for measuring CPU resource usage</td>
</tr>
<tr>
<td>traceroute</td>
<td>1:2.0.20-2+b1</td>
<td>Traces the route taken by packets over an IPv4/IPv6 network</td>
</tr>
<tr>
<td>tzdata</td>
<td>2015e-0+deb8u1</td>
<td>time zone and daylight-saving time data</td>
</tr>
<tr>
<td>ucf</td>
<td>3.003</td>
<td>Update Configuration File(s): preserve user changes to config files</td>
</tr>
<tr>
<td>udev</td>
<td>215-17+deb8u1</td>
<td>/dev/ and hotplug management daemon</td>
</tr>
<tr>
<td>usbmount</td>
<td>0.0.22</td>
<td>automatically mount and unmount USB mass storage devices</td>
</tr>
<tr>
<td>user-setup</td>
<td>1.61</td>
<td>Set up initial user and password</td>
</tr>
<tr>
<td>util-linux</td>
<td>2.25.2-6</td>
<td>Miscellaneous system utilities</td>
</tr>
<tr>
<td>util-linux-locales</td>
<td>2.25.2-6</td>
<td>Locales files for util-linux</td>
</tr>
<tr>
<td>uuid-runtime</td>
<td>2.25.2-6</td>
<td>runtime components for the Universally Unique ID library</td>
</tr>
<tr>
<td>Package</td>
<td>Version</td>
<td>Description</td>
</tr>
<tr>
<td>--------------</td>
<td>------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>vbetool</td>
<td>1.1-3</td>
<td>run real-mode video BIOS code to alter hardware state</td>
</tr>
<tr>
<td>vim</td>
<td>2:7.4.488-7</td>
<td>Vi IMproved - enhanced vi editor</td>
</tr>
<tr>
<td>vim-common</td>
<td>2:7.4.488-7</td>
<td>Vi IMproved - Common files</td>
</tr>
<tr>
<td>vim-runtime</td>
<td>2:7.4.488-7</td>
<td>Vi IMproved - Runtime files</td>
</tr>
<tr>
<td>vim-tiny</td>
<td>2:7.4.488-7</td>
<td>Vi IMproved - enhanced vi editor - compact version</td>
</tr>
<tr>
<td>w3m</td>
<td>0.5.3-19</td>
<td>WWW browsable pager with excellent tables/frames support</td>
</tr>
<tr>
<td>wamerican</td>
<td>7.1-1</td>
<td>American English dictionary words for /usr/share/dict</td>
</tr>
<tr>
<td>watchdog</td>
<td>5.14-3</td>
<td>system health checker and software/hardware watchdog handler</td>
</tr>
<tr>
<td>wget</td>
<td>1.16-1</td>
<td>retrieves files from the web</td>
</tr>
<tr>
<td>whiptail</td>
<td>0.52.17-1+b1</td>
<td>Displays user-friendly dialog boxes from shell scripts</td>
</tr>
<tr>
<td>whois</td>
<td>5.2.7</td>
<td>intelligent WHOIS client</td>
</tr>
<tr>
<td>wireless-regdb</td>
<td>2014.11.18-1</td>
<td>wireless regulatory database</td>
</tr>
<tr>
<td>wireless-tools</td>
<td>30~pre9-8</td>
<td>Tools for manipulating Linux Wireless Extensions</td>
</tr>
<tr>
<td>wpasupplicant</td>
<td>2.3-1+deb8u1</td>
<td>client support for WPA and WPA2 (IEEE 802.11I)</td>
</tr>
<tr>
<td>x11-common</td>
<td>1:7.7+7</td>
<td>X Window System (X.Org) infrastructure</td>
</tr>
<tr>
<td>x11-utils</td>
<td>7.7+2</td>
<td>X11 utilities</td>
</tr>
<tr>
<td>xauth</td>
<td>1:1.0.9-1</td>
<td>X authentication utility</td>
</tr>
<tr>
<td>xbitmaps</td>
<td>1.1.1-2</td>
<td>Base X bitmaps</td>
</tr>
<tr>
<td>xdg-user-dirs</td>
<td>0.15-2</td>
<td>tool to manage well known user directories</td>
</tr>
<tr>
<td>xkb-data</td>
<td>2.12-1</td>
<td>X Keyboard Extension (XKB) configuration data</td>
</tr>
<tr>
<td>xml-core</td>
<td>0.13+nmu2</td>
<td>XML infrastructure and XML catalog file support</td>
</tr>
<tr>
<td>xterm</td>
<td>312-2</td>
<td>X terminal emulator</td>
</tr>
<tr>
<td>xz-utils</td>
<td>5.1.1alpha+20120614-2+b3</td>
<td>XZ-format compression utilities</td>
</tr>
<tr>
<td>zlib1g:amd64</td>
<td>1:1.2.8.dfsg-2+b1</td>
<td>compression library - runtime</td>
</tr>
</tbody>
</table>