

The LWA1 User Computing Facility

Ver. 2

J. Dowell*

May 22, 2014

Contents

1	Introduction	2
2	Available Hardware and Software	2
3	Networking	2
4	Storage	3
5	User Management and Access	3
6	Usage and Storage Policy	4
7	Document History	5
A	Currently Installed Ubuntu Packages	7

*University of New Mexico. E-mail: jdowell@unm.edu

1 Introduction

The LWA1 User computing facility (UCF) is a six node cluster available to LWA1 users for reducing LWA1 data. The cluster is located in two racks in the old correlator room in the VLA control building. This location was selected in order to decrease the turn around time for data processing by moving the processing equipment closer to the data. This document describes the hardware and software setup of the cluster, and provides information about user access.

2 Available Hardware and Software

Each of the nodes consists of:

- an Intel(R) Core(TM) i7-3930K six core CPU with a clock rate of 3.20GHz;
- 32 GB of RAM;
- an Nvidia GeForce GTX6800 graphics card with
 - 2 GB of RAM,
 - 1536 CUDA cores, and
 - CUDA compute capability 3.0;
- an Nvidia Telsa C2075 graphics card with
 - 6 GB of RAM,
 - 448 CUDA cores, and
 - CUDA compute capability 2.0;
- a four port 10 GbE fiber card; and
- four 3 TB hard drives.

Each node runs the desktop version of Ubuntu 12.04 LTS¹ and has a variety of software installed by default, including ATLAS, bbcp, CASA, FFTW, PRESTO, LSL², OpenMPI, TEMPO, and TEMPO2. A complete listing of currently installed `.deb` software packages is given in Appendix A. Users requiring additional software should contact the cluster administrator, Jayce Dowell, via e-mail.

3 Networking

The UCF nodes are physically connected to each other via 10Gbase-SR 10 GbE fiber modules and 50/125 multimode fiber patch cables. The topology of the network is based on a torus and is one dimensional for the current complement of six nodes. In order to resolve loops within this topology the spanning tree protocol is used. The cluster is connected to the LWA1 Monitor and Control (MCS) 10.1.1.* network via a 10 GbE connection to the shelter. See [1] for details of the network configuration.

¹<http://releases.ubuntu.com/precise/>

²The LSL Commissioning, Pulsar, and SessionSchedules exentsion are also available on each node under `/usr/local/extensions/`.

4 Storage

Data storage for the UCF is divided into three tiers: user-specific storage, temporary local storage, and temporary massive data storage.

1. The first tier is implemented through an NFS mounted home directory available on all of the nodes and bare 3 TB drives known as “toasters”. The total storage under `/home/` is 3.6 TB which is shared among all users. This mount point is intended to store the user’s personal files as well as any final data products waiting to be transferred out of the cluster. Backups of the home directory are irregular and users are encouraged to actively backup files they are interested in preserving. The toasters, available on each node under the `/mnt/toaster/` mount point, serve a similar purpose but can be easily removed and shipped to the user.
2. The second tier is implemented as a temporary “scratch space” where users of the node can store intermediate data products that require further manipulation. This area is mounted as `/data/local/` on each node and is world writable for all users of that particular node.
3. The final tier of storage is a distributed Gluster file system³ with a current total capacity of 50 TB. This file system, mounted on `/data/network/`, is constructed to be distributed, i.e., files are distributed across the various nodes that are part of the cluster. This arrangement allows for efficient access to the large data files that are to be stored on this file system. Since this file system is intended to only store raw data it is world readable but write permissions are restricted to the LWA1 operator. Users can request that files in this directory be deleted using the `rmrd` command. This will stage the files for deletion within 24 to 48 hours after the request is made.

Data and MCS0030 metadata [2] files are copied over to the Gluster file system through mount points on each of the five data recorders. The copying process is initiated and monitored by the LWA1 operator on duty.

5 User Management and Access

Users of the UCF are given individual unprivileged accounts which work on all nodes via a light-weight directory access protocol (LDAP) server running on node #1. All remote access to the cluster will be handled through secure shell (SSH) sessions. Since the cluster is located within the MCS network, users of the cluster will first need to connect to one of the UNM machines, e.g., `lwalab.phys.unm.edu` or `hercules.phys.unm.edu` and use an OpenVPN⁴ tunnel to access the cluster nodes. The cluster LDAP information will also be available on `lwalab.phys.unm.edu` so that users will only need one set of credentials to access the cluster.

Time on one or more of the cluster nodes is allocated based on requests in the LWA1 observing proposals. See [3] for details on how time is requested. Users needing to copy data off the cluster should contact the cluster administrator to schedule a window for the copy. This is required to ensure that data transfers do not interfere with the operation of LWA1 or other user requests. Files can be copied off using a number of programs such as `scp`, `rsync`, and `bbcp`.

³<http://www.gluster.org/>

⁴<http://openvpn.net/index.php/open-source/overview.html>

6 Usage and Storage Policy

Since the cluster is a shared resource, it is possible for multiple users to access the same node concurrently. Users are responsible for monitoring their processes to ensure that the nodes they are using do not become overburdened or hang. The state of the machines can be checked using standard UNIX tools such as `ps`, `top`, and `free` or via the LWAUCF Operations Screen page at <http://lwalab.phys.unm.edu/CompScreen/cs.php>.

Users are also responsible for monitoring their disk space usage on the `/home`, `/data/local`, and `/data/network` drives. Although there are currently no quotas on these drives, there are file age limits on `/data/network`. This filesystem is monitored on a monthly basis to identify files between 180 and 270 days old, and files older 270 days. Users with files meeting this first criterion will be notified by e-mail in order to determine whether or not the indicated files can be deleted. Files that are older than 270 days (9 months) are subject to automatic deletion two weeks after the user is notified by e-mail. Any user with files in this category can request that the files be saved by notifying the observatory staff. Files to be saved will be transferred to an external disk. For further details about the management of data files see [3].

7 Document History

- Version 2 (May 22, 2014): Updated for the new home directory size and monitoring of the data directory. Added information about the “toasters” on each node. Added a list of `.deb` packages that are installed. Added a usage and storage policy.
- Version 1 (Nov 25, 2012): First version.

References

- [1] J. Craig et al., “LWA1 Local Area Network Configuration”, Ver. 7.0, MCS Memo No. 33, Oct 25, 2012.
- [2] S. Ellingson, “LWA Station-Level Observing Procedure and Associated Metadata”, Ver. 5.0, MCS Memo No. 30, Apr 13, 2011.
- [3] G. Taylor et al., “LWA Data Management”, Ver. 2.0, LWA Memo No. 177, Nov 20, 2012.

A Currently Installed Ubuntu Packages

accountsservice	bamfdaemon	cpp-4.6
acl	baobab	crda
acpi-support	base-files	cron
acpid	base-passwd	cryptsetup-bin
activity-log-manager-common	bash	csch
activity-log-manager-control-center	bash-completion	cups
adduser	bc	cups-bsd
adium-theme-ubuntu	bind9-host	cups-client
aisleriot	binutils	cups-common
alacarte	bison	cups-filters
alsa-base	blcr-util	cups-pk-helper
alsa-utils	blt	cups-ppdc
anacron	bluez	cvs
apache2	bluez-alsa	cython
apache2-mpm-prefork	bluez-cups	dash
apache2-utils	bluez-gstreamer	dbus
apache2.2-bin	bmon	dbus-x11
apache2.2-common	branding-ubuntu	dc
apg	brasero	dconf-gsettings-backend
app-install-data	brasero-cdrkit	dconf-service
app-install-data-partner	brasero-common	debconf
apparmor	bridge-utils	debconf-i18n
appmenu-gtk	brltty	debianutils
appmenu-gtk3	bsdmainutils	default-jre
appmenu-qt	bsdutils	default-jre-headless
appport	busybox-initramfs	deja-dup
appport-gtk	busybox-static	desktop-file-utils
appport-symptoms	bzip2	dictionaries-common
apt	ca-certificates	diffutils
apt-transport-https	ca-certificates-java	dkms
apt-utils	ccrypt	dmidecode
apt-xapian-index	checkbox	dmsetup
aptdaemon	checkbox-qt	dmz-cursor-theme
aptdaemon-data	cifs-utils	dnsmasq-base
apturl	cmake	dnsutils
apturl-common	cmake-data	doc-base
aspell	cmap-adobe-japan2	docbook-xml
aspell-en	colord	docbook-xsl
at	command-not-found	docutils-common
at-spi2-core	command-not-found-data	docutils-doc
attr	compiz	dos2unix
auth-client-config	compiz-core	dosfstools
autoconf	compiz-gnome	dpkg
autoconf2.13	compiz-plugins-default	duplicity
automake	compiz-plugins-main-default	dvd+rw-tools
automake1.4	compizconfig-backend-gconf	dvipng
autotools-dev	console-setup	e2fslibs
avahi-autoipd	consolekit	e2fsprogs
avahi-daemon	coreutils	ed
avahi-utils	cpio	efibootmgr
	cpp	eject

emacs	foomatic-db-engine	gir1.2-gtk-2.0
emacs23	foomatic-filters	gir1.2-gtk-3.0
emacs23-bin-common	freenx	gir1.2-gtksource-3.0
emacs23-common	freenx-rdp	gir1.2-gudev-1.0
emacsen-common	freenx-server	gir1.2-indicate-0.7
empathy	freenx-smb	gir1.2-javascriptcoregtk-3.0
empathy-common	freenx-vnc	gir1.2-launchpad-integration-3.0
enchant	friendly-recovery	gir1.2-notify-0.7
eog	ftp	gir1.2-panelapplet-4.0
espeak	fuse	gir1.2-pango-1.0
espeak-data	fuse-utils	gir1.2-peas-1.0
ethtool	g++	gir1.2-rb-3.0
evince	g++-4.6	gir1.2-soup-2.4
evince-common	gadmin-openvpn-server	gir1.2-totem-1.0
evolution-data-server	gcalctool	gir1.2-totem-plparser-1.0
evolution-data-server-common	gcc	gir1.2-ubuntuoneui-3.0
example-content	gcc-4.6	gir1.2-unity-5.0
expect	gcc-4.6-base	gir1.2-vte-2.90
fakeroot	gccxml	gir1.2-webkit-3.0
ffmpeg	gconf-service	gir1.2-wnck-3.0
file	gconf-service-backend	git
file-roller	gconf2	git-man
findutils	gconf2-common	gkrellm
finger	gcp	gksu
firefox	gdb	glib-networking
firefox-globalmenu	gedit	glib-networking-common
firefox-gnome-support	gedit-common	glib-networking-services
firefox-locale-en	genisoimage	glusterfs-client
flex	geoclue	glusterfs-common
folks-common	geoclue-ubuntu-geoip	glusterfs-server
fontconfig	geoip-database	gnome-accessibility-themes
fontconfig-config	gettext	gnome-applets
fonts-kacst	gettext-base	gnome-applets-data
fonts-kacst-one	gfortran	gnome-bluetooth
fonts-khmeros-core	gfortran-4.6	gnome-control-center
fonts-lao	ghostscript	gnome-control-center-data
fonts-liberation	ghostscript-cups	gnome-desktop3-data
fonts-nanum	ghostscript-x	gnome-disk-utility
fonts-opensymbol	ginn	gnome-font-viewer
fonts-takao-pgothic	gir1.2-appindicator3-0.1	gnome-games-data
fonts-thai-tlwg	gir1.2-atk-1.0	gnome-icon-theme
fonts-tlwg-garuda	gir1.2-atspi-2.0	gnome-icon-theme-symbolic
fonts-tlwg-kinnari	gir1.2-dbusmenu-glib-0.4	gnome-keyring
fonts-tlwg-loma	gir1.2-dbusmenu-gtk-0.4	gnome-media
fonts-tlwg-mono	gir1.2-dee-1.0	gnome-menus
fonts-tlwg-norasi	gir1.2-freedesktop	gnome-nettool
fonts-tlwg-purisa	gir1.2-gconf-2.0	gnome-online-accounts
fonts-tlwg-sawasdee	gir1.2-gdkpixbuf-2.0	gnome-orca
fonts-tlwg-typewriter	gir1.2-glib-2.0	gnome-panel
fonts-tlwg-typist	gir1.2-gmenu-3.0	gnome-panel-data
fonts-tlwg-typo	gir1.2-gnomebluetooth-1.0	gnome-power-manager
fonts-tlwg-umpush	gir1.2-gnomekeyring-1.0	gnome-screensaver
fonts-tlwg-waree	gir1.2-gst-plugins-base-0.10	gnome-screenshot
foomatic-db-compressed-ppds	gir1.2-gstreamer-0.10	

gnome-session	gvfs-libs	intltool-debian
gnome-session-bin	gwibber	iperf
gnome-session-canberra	gwibber-service	iproute
gnome-session-common	gwibber-service-facebook	iptables
gnome-session-fallback	gwibber-service-identica	iputils-arping
gnome-settings-daemon	gwibber-service-twitter	iputils-ping
gnome-sudoku	gzip	iputils-tracepath
gnome-system-log	h5utils	ipython
gnome-system-monitor	hdf5-tools	irqbalance
gnome-terminal	hdfview	isc-dhcp-client
gnome-terminal-data	hdparm	isc-dhcp-common
gnome-user-guide	heirloom-mailx	iso-codes
gnome-user-share	hicolor-icon-theme	iw
gnomine	hostname	java-common
gnupg	hplip	java-wrappers
gnuplot	hplip-data	jockey-common
gnuplot-nox	htop	jockey-gtk
gnuplot-x11	humanity-icon-theme	kate
gpgv	hunspell-en-us	kate-data
graphviz	hwdata	katapult
grep	hyphen-en-us	kbd
groff	ibus	kde-runtime
groff-base	ibus-gtk	kde-runtime-data
growisofs	ibus-gtk3	kdelibs-bin
grub-common	ibus-pinyin	kdelibs5-data
grub-efi	ibus-pinyin-db-android	kdelibs5-plugins
grub-efi-amd64	ibus-table	kdoctools
grub-efi-amd64-bin	icedtea-6-jre-cacao	kerneloops-daemon
grub2-common	icedtea-6-jre-jamvm	keyboard-configuration
gs-cjk-resource	icedtea-netx	keyutils
gsettings-desktop-schemas	icedtea-netx-common	klibc-utils
gsfonts	icoutils	krb5-locales
gststreamer0.10-alsa	ifupdown	kubuntu-debug-installer
gststreamer0.10-gconf	im-switch	landscape-client-ui-install
gststreamer0.10-nice	imagemagick	language-pack-en
gststreamer0.10-plugins-base	imagemagick-common	language-pack-en-base
gststreamer0.10-plugins-base-apps	indicator-applet-complete	language-pack-gnome-en
gststreamer0.10-plugins-good	indicator-application	language-pack-gnome-en-base
gststreamer0.10-pulseaudio	indicator-appmenu	language-selector-common
gststreamer0.10-tools	indicator-datetime	language-selector-gnome
gststreamer0.10-x	indicator-messages	laptop-detect
gtk2-engines	indicator-power	launchpad-integration
gtk2-engines-murrine	indicator-printers	ldap-auth-client
gtk3-engines-unico	indicator-session	ldap-auth-config
gucharmap	indicator-sound	ldap-utils
guile-1.8-libs	indicator-status-provider-mc5	ldapscripts
gv	info	less
gvfs	initramfs-tools	libaa1
gvfs-backends	initramfs-tools-bin	libaccountsservice0
gvfs-bin	initscripts	libacl1
gvfs-common	inputattach	libaio1
gvfs-daemons	insserv	libamd2.2.0
gvfs-fuse	install-info	libapache2-mod-php5
	intel-gpu-tools	libappindicator1

libappindicator3-1	libboost-date-time1.46-dev	libburn4
libapr1	libboost-date-time1.46.1	libbz2-1.0
libaprutil1	libboost-dev	libc-bin
libaprutil1-dbd-sqlite3	libboost-filesystem-dev	libc-dev-bin
libaprutil1-ldap	libboost-filesystem1.46-dev	libc6
libapt-inst1.4	libboost-filesystem1.46.1	libc6-dev
libapt-pkg4.12	libboost-graph-dev	libcaca0
libarchive12	libboost-graph-parallel-dev	libcairo-gobject2
libarpack2	libboost-graph-parallel1.46-dev	libcairo-perl
libart-2.0-2	libboost-graph-parallel1.46.1	libcairo2
libasn1-8-heimdal	libboost-graph1.46-dev	libcairomm-1.0-1
libasound2	libboost-graph1.46.1	libcamel-1.2-29
libasound2-plugins	libboost-iostreams-dev	libcanberra-gtk-module
libaspell15	libboost-iostreams1.46-dev	libcanberra-gtk0
libasyncns0	libboost-iostreams1.46.1	libcanberra-gtk3-0
libatasmart4	libboost-math-dev	libcanberra-gtk3-module
libatk-adaptor	libboost-math1.46-dev	libcanberra-pulse
libatk-adaptor-schemas	libboost-math1.46.1	libcanberra0
libatk-wrapper-java	libboost-mpi-dev	libcap-ng0
libatk-wrapper-java-jni	libboost-mpi-python-dev	libcap2
libatk1.0-0	libboost-mpi1.46-dev	libcap2-bin
libatk1.0-data	libboost-mpi1.46.1	libccolamd2.7.1
libatkmm-1.6-1	libboost-program-options-dev	libcdio-cdda1
libatlas-base-dev	libboost-program-options1.46-dev	libcdio-paranoia1
libatlas-dev	dev	libcdio13
libatlas3gf-base	libboost-program-options1.46.1	libcdparanoia0
libatspi2.0-0	libboost-python-dev	libcdt4
libattica0.3	libboost-python1.46-dev	libcfitsio3
libattr1	libboost-python1.46.1	libcfitsio3-dev
libaudio2	libboost-regex-dev	libcgraph5
libav-tools	libboost-regex1.46-dev	libcholmod1.7.1
libavahi-client3	libboost-regex1.46.1	libck-connector0
libavahi-common-data	libboost-serialization-dev	libclass-isa-perl
libavahi-common3	libboost-serialization1.46-dev	libclucene0ldbl
libavahi-core7	libboost-serialization1.46.1	libcmis-0.2-0
libavahi-glib1	libboost-signals-dev	libcolamd2.7.1
libavahi-gobject0	libboost-signals1.46-dev	libcolord1
libavahi-ui-gtk3-0	libboost-signals1.46.1	libcomerr2
libavc1394-0	libboost-system-dev	libcompizconfig0
libavcodec53	libboost-system1.46-dev	libcr0
libavdevice53	libboost-system1.46.1	libcroco3
libavfilter2	libboost-test-dev	libcrypt-passwdmd5-perl
libavformat53	libboost-test1.46-dev	libcryptsetup4
libavutil51	libboost-test1.46.1	libcups2
libbamf0	libboost-thread-dev	libcupsgei1
libbamf3-0	libboost-thread1.46-dev	libcupsdriver1
libbind9-80	libboost-thread1.46.1	libcupsfilters1
libbison-dev	libboost-wave-dev	libcupsimage2
libblas-dev	libboost-wave1.46-dev	libcupsmime1
libblas3gf	libboost-wave1.46.1	libcupsppdc1
libblkid1	libboost1.46-dev	libcurl3
libbluetooth3	libbrasero-media3-1	libcurl3-gnutls
libboost-all-dev	libbrlapi0.5	libcurl3-nss
libboost-date-time-dev	libbsd0	libcxsparse2.2.3

libdaemon0	libffi6	libgl1-mesa-dri
libdatrie1	libfftw3-3	libgl1-mesa-glx
libdb4.8	libfftw3-dev	libglade2-0
libdb5.1	libfile-basedir-perl	libglapi-mesa
libdbus-1-3	libfile-copy-recursive-perl	libglew1.6
libdbus-glib-1-2	libfile-desktopentry-perl	libglewmx1.6
libdbusmenu-glib4	libfile-listing-perl	libglib-perl
libdbusmenu-gtk3-4	libfile-mimeinfo-perl	libglib2.0-0
libdbusmenu-gtk4	libfl-dev	libglib2.0-bin
libdbusmenu-qt2	libflac8	libglib2.0-data
libdc1394-22	libftk1.1	libglib2.0-dev
libdconf-dbus-1-0	libfolks-eds25	libglibmm-2.4-1c2a
libdconf-qt0	libfolks-telepathy25	libglpk0
libdconf0	libfolks25	libglu1-mesa
libdecoration0	libfont-afm-perl	libgmime-2.6-0
libdee-1.0-4	libfontconfig1	libgmp10
libdevmapper-event1.02.1	libfontenc1	libgnome-bluetooth8
libdevmapper1.02.1	libframe6	libgnome-control-center1
libdiscid0	libfreerdp-plugins-standard	libgnome-desktop-3-2
libdjvulibre-text	libfreerdp1	libgnome-keyring-common
libdjvulibre21	libfreetype6	libgnome-keyring0
libdlrestrictions1	libfribidi0	libgnome-media-profiles-3.0-0
libdmapsharing-3.0-2	libfs6	libgnome-menu-3-0
libdns81	libfuse-dev	libgnome-menu2
libdotconf1.0	libfuse2	libgnome2-common
libdrm-intel1	libgail-3-0	libgnomekbd-common
libdrm-nouveau1a	libgail-common	libgnomekbd7
libdrm-radeon1	libgail18	libgnutls-openssl27
libdrm2	libgcc1	libgnutls26
libdv4	libgck-1-0	libgoa-1.0-0
libebook-1.2-1	libgconf-2-4	libgoa-1.0-common
libebook-1.2-12	libgconf2-4	libgomp1
libecal-1.2-10	libgcr-3-1	libgpg-error0
libedata-book-1.2-11	libgcr-3-common	libgpgme11
libedata-cal-1.2-13	libgcrypto11	libgphoto2-2
libedataserver-1.2-15	libgd2-xpm	libgphoto2-l10n
libedataserverui-3.0-1	libgdata-common	libgphoto2-port0
libedit2	libgdata13	libgpm2
libelf1	libgdbm-dev	libgpod-common
libenchant1c2a	libgdbm3	libgpod4
libencode-locale-perl	libgdk-pixbuf2.0-0	libgrail5
libept1.4.12	libgdk-pixbuf2.0-common	libgraph4
liberror-perl	libgdu-gtk0	libgraphicsmagick++3
libespeak1	libgdu0	libgraphicsmagick3
libevent-2.0-5	libgee2	libgrip0
libevince3-3	libgeis1	libgs9
libexempi3	libgeoclue0	libgs9-common
libexif12	libgeoip1	libgs10-dev
libexiv2-11	libgettextpo0	libgs10ldbl
libexpat1	libgexiv2-1	libgsm1
libexpat1-dev	libgfortran3	libgssapi-krb5-2
libexttextcat-data	libgif4	libgssapi3-heimdal
libexttextcat0	libgirepository-1.0-1	libgssdp-1.0-3
libfarstream-0.1-0	libgksu2-0	libgssglue1

libgstreamer-plugins-base0.10-0	libidl-common	libkeyutils1
libgstreamer0.10-0	libidl0	libkfile4
libgtk-3-0	libidn11	libkhtml5
libgtk-3-bin	libido3-0.1-0	libkidletime4
libgtk-3-common	libiec61883-0	libkio5
libgtk2-perl	libieee1284-3	libkjsapi4
libgtk2.0-0	libijs-0.35	libkjsembed4
libgtk2.0-bin	libilmbase6	libklibc
libgtk2.0-common	libimobiledevice2	libkmediaplayer4
libgtkmm-3.0-1	libindicate-gtk3	libknewstuff2-4
libgtksourcview-3.0-0	libindicate5	libknewstuff3-4
libgtksourcview-3.0-common	libindicator-messages-status-provider1	libknotifyconfig4
libgtkspell-3-0	libindicator3-7	libkntlm4
libgtop2-7	libindicator7	libkparts4
libgtop2-common	libio-pty-perl	libkpathsea5
libgucharmap-2-90-7	libio-socket-inet6-perl	libkpty4
libgudev-1.0-0	libio-socket-ssl-perl	libkrb5-26-heimdal
libgupnp-1.0-4	libisc83	libkrb5-3
libgupnp-igd-1.0-4	libisc83	libkrb5support0
libgutenprint2	libisccc80	libkrosscore4
libgvc5	libisccfg82	libktexteditor4
libgvpr1	libisofs6	liblapack3gf
libgweather-3-0	libiw30	liblaunchpad-integration-3.0-1
libgweather-common	libjack-jackd2-0	liblaunchpad-integration-common
libgwibber-gtk2	libjasper1	liblcms1
libgwibber2	libjavascriptcoregtk-3.0-0	liblcms2-2
libhcrypto4-heimdal	libjbig2dec0	libldap-2.4-2
libhdf4-0	libjgraph-java	liblightdm-gobject-1-0
libhdf5-serial-1.8.4	libjhdf4-java	liblircclient0
libhdf5-serial-dev	libjhdf4-jni	libllvm3.0
libheimbase1-heimdal	libjhdf5-java	liblocale-gettext-perl
libheimntlm0-heimdal	libjhdf5-jni	liblockfile-bin
libhpmud0	libjpeg-turbo8	liblockfile1
libhtml-form-perl	libjpeg-turbo8-dev	liblouis-data
libhtml-format-perl	libjpeg8	liblouis2
libhtml-parser-perl	libjpeg8-dev	liblqr-1-0
libhtml-tagset-perl	libjs-jquery	libltdl-dev
libhtml-tree-perl	libjs-sphinxdoc	libltdl7
libhttp-cookies-perl	libjs-underscore	liblua5.1-0
libhttp-daemon-perl	libjson-glib-1.0-0	liblvm2app2.2
libhttp-date-perl	libjson0	liblwp-mediatypes-perl
libhttp-message-perl	libjte1	liblwp-protocol-https-perl
libhttp-negotiate-perl	libk5crypto3	liblwres80
libhunspell-1.3-0	libkateinterfaces4	liblzma5
libhx509-5-heimdal	libkatepartinterfaces4	liblzo2-2
libhyphen0	libkcmutils4	libm17n-0
libibus-1.0-0	libkde3support4	libmagic1
libibverbs-dev	libkdeclarative5	libmagiccore4
libibverbs1	libkdecore5	libmagiccore4-extra
libical0	libkdesu5	libmagicwand4
libice-dev	libkdeui5	libmail-sendmail-perl
libice6	libkdewebkit5	libmailtools-perl
libicu-dev	libkdnssd4	libmatheval1
libicu48	libkemoticons4	

libmeanwhile1	libntrack0	libplist1
libmetacity-private0	libnuma1	libplymouth2
libmhash2	libnux-2.0-0	libpng12-0
libminiupnpc8	libnux-2.0-common	libpng12-dev
libmission-control-plugins0	libnx-xorg	libpolkit-agent-1-0
libmng1	liboauth0	libpolkit-backend-1-0
libmount1	libodbc1	libpolkit-gobject-1-0
libmpc2	libogg0	libpolkit-qt-1-1
libmpfr4	libopenc1	libpoppler-glib8
libmtdev1	libopenexr6	libpoppler19
libmtp-common	libopenmpi-dev	libpopt0
libmtp-runtime	libopenmpi1.3	libportaudio2
libmtp9	libopenobex1	libpostproc52
libmusicbrainz3-6	libopts25	libprotobuf7
libmysqlclient18	liborbit2	libprotoc7
libmythes-1.2-0	liborc-0.4-0	libproxy1
libnautilus-extension1a	libossp-uuid16	libproxy1-plugin-gsettings
libncurses5	libotf0	libproxy1-plugin-networkmanager
libncurses5-dev	liboverlay-scrollbar-0.2-0	libpth20
libncursesw5	liboverlay-scrollbar3-0.2-0	libpthread-stubs0
libneon27-gnutls	libp11-kit0	libpthread-stubs0-dev
libnepomuk4	libpackagekit-glib2-14	libpulse-mainloop-glib0
libnepomukdatamanagement4	libpam-cap	libpulse0
libnepomukquery4a	libpam-ck-connector	libpulsedsp
libnepomuksync4	libpam-gnome-keyring	libpurple-bin
libnepomukutils4	libpam-ldap	libpurple0
libnet-http-perl	libpam-modules	libpython2.7
libnet-ssleay-perl	libpam-modules-bin	libqapt-runtime
libnetfilter-contrack3	libpam-runtime	libqapt1
libnetpbm10	libpam0g	libqca2
libnettle4	libpanel-applet-4-0	libqhull5
libnewt0.52	libpango-perl	libqrupdate1
libnfnetworklink0	libpango1.0-0	libqt4-dbus
libnfsidmap2	libpangomm-1.4-1	libqt4-declarative
libnice10	libpaper-utils	libqt4-designer
libnih-dbus1	libpaper1	libqt4-network
libnih1	libparpack2	libqt4-opengl
libnl-3-200	libparted0debian1	libqt4-qt3support
libnl-genl-3-200	libpathplan4	libqt4-script
libnl-route-3-200	libpcap0.8	libqt4-sql
libnm-glib-vpn1	libpci3	libqt4-sql-sqlite
libnm-glib4	libpciaccess0	libqt4-svg
libnm-gtk-common	libpcre3	libqt4-xml
libnm-gtk0	libpcre3-dev	libqt4-xmlpatterns
libnm-util2	libpcrecpp0	libqtbamfl
libnotify-bin	libpcsclite1	libqtcore4
libnotify4	libpeas-1.0-0	libqtdee2
libnspr4	libpeas-common	libqtgconf1
libnss-ldap	libperl5.14	libqtgui4
libnss-mdns	libphonon4	libqtwebkit4
libnss3	libpipeline1	libquadmath0
libnss3-1d	libpixman-1-0	libquvi-scripts
libntlm0	libpkcs11-helper1	libquvi7
libntrack-qt4-1	libplasma3	libraptor2-0

librarian0	libsndfile1	libbuntuoneui-3.0-1
librasqal3	libsocket6-perl	libudev0
libraw1394-11	libsolid4	libumfpack5.4.0
libraw5	libsonic0	libunique-3.0-0
librdf0	libsoprano4	libunistring0
librdmacm1	libsoup-gnome2.4-1	libunity-2d-private0
libreadline-dev	libsoup2.4-1	libunity-core-5.0-5
libreadline5	libspectre1	libunity-misc4
libreadline6	libspeechd2	libunity9
libreadline6-dev	libspeex1	libupower-glib1
libreoffice-base-core	libspeexdsp1	liburi-perl
libreoffice-calc	libsqlite3-0	libusb-0.1-4
libreoffice-common	libss2	libusb-1.0-0
libreoffice-core	libssh-4	libusbmuxd1
libreoffice-draw	libssl-dev	libutempter0
libreoffice-emailmerge	libssl-doc	libutouch-evemu1
libreoffice-gnome	libssl1.0.0	libutouch-frame1
libreoffice-gtk	libstartup-notification0	libutouch-geis1
libreoffice-help-en-us	libstdc++6	libutouch-grail1
libreoffice-impress	libstdc++6-4.6-dev	libuuid-perl
libreoffice-math	libstreamanalyzer0	libuuid1
libreoffice-style-human	libstreams0	libv4l-0
libreoffice-style-tango	libsvn1	libv4lconvert0
libreoffice-writer	libswitch-perl	libva1
librest-0.7-0	libswscale2	libvirtodbc0
librhythmbox-core5	libsyncdaemon-1.0-1	libvisual-0.4-0
libroken18-heimdal	libsys-hostname-long-perl	libvisual-0.4-plugins
librsvg2-2	libsysfs2	libvncserver0
librsvg2-common	libt1-5	libvorbis0a
librsync1	libtag1-vanilla	libvorbisenc2
librtmp0	libtag1c2a	libvorbisfile3
libsamplerate0	libtalloc2	libvpx1
libsane	libtasn1-3	libvte-2.90-9
libsane-common	libtdb1	libvte-2.90-common
libsane-hpaio	libtelepathy-farstream2	libvte-common
libsasl2-2	libtelepathy-glib0	libvte9
libsasl2-modules	libtelepathy-logger2	libwacom-common
libschroedinger-1.0-0	libtext-charwidth-perl	libwacom2
libSDL1.2debian	libtext-iconv-perl	libwavpack1
libselinux1	libtext-wrapi18n-perl	libwbclient0
libselinux1-dev	libthai-data	libwebkitgtk-3.0-0
libsensors4	libthai0	libwebkitgtk-3.0-common
libsepol1	libtheora0	libwind0-heimdal
libsepol1-dev	libthreadweaver4	libwmf0.2-7
libsgutils2-2	libtiff4	libwmf0.2-7-gtk
libshout3	libtimedate-perl	libwnck-3-0
libsigc++-2.0-0c2a	libtimezonemap1	libwnck-3-common
libslang2	libtinfo-dev	libwnck-common
libslp1	libtinfo5	libwnck22
libsm-dev	libtirpc1	libwpg-0.9-9
libsm6	libtool	libwpg-0.2-2
lib smbclient	libtorque2	libwps-0.2-2
libsndfile1	libtotem-plparser17	libwrap0
libsndmp-base	libtotem0	libwww-perl

libwww-robotrules-perl	libxt-dev	linux-image-generic
libwxbase2.8-0	libxt6	linux-libc-dev
libwxgtk2.8-0	libxtst6	linux-sound-base
libx11-6	libxv1	lm-sensors
libx11-data	libxvmc1	lmodern
libx11-dev	libxxf86dga1	locales
libx11-doc	libxxf86vm1	lockfile-progs
libx11-xcb1	libyajl1	login
libx86-1	libyaml-tiny-perl	logrotate
libxapian22	libyelp0	lsb-base
libxatracker1	libzeitgeist-1.0-1	lsb-release
libxau-dev	libzephyr4	lshw
libxau6	light-themes	lsuf
libxaw7	lightdm	ltrace
libxcb-dri2-0	linux-firmware	luatex
libxcb-glx0	linux-generic	m17n-contrib
libxcb-render0	linux-headers-3.2.0-23	m17n-db
libxcb-shape0	linux-headers-3.2.0-23-generic	m4
libxcb-shm0	linux-headers-3.2.0-32	mahjongg
libxcb-util0	linux-headers-3.2.0-32-generic	make
libxcb1	linux-headers-3.2.0-58	makedev
libxcb1-dev	linux-headers-3.2.0-58-generic	man-db
libxcomp3	linux-headers-3.2.0-60	manpages
libxcompext3	linux-headers-3.2.0-60-generic	manpages-dev
libxcomposite1	linux-headers-3.2.0-61	mawk
libxcompshad3	linux-headers-3.2.0-61-generic	mdadm
libxcursor1	linux-headers-generic	media-player-info
libxdamage1	linux-image-3.2.0-23-generic	memtest86+
libxdmcp-dev	linux-image-3.2.0-31-generic	menu
libxdmcp6	linux-image-3.2.0-32-generic	metacity
libxext-dev	linux-image-3.2.0-33-generic	metacity-common
libxext6	linux-image-3.2.0-34-generic	migrationtools
libxfixes3	linux-image-3.2.0-35-generic	mime-support
libxfont1	linux-image-3.2.0-36-generic	mlocate
libxft2	linux-image-3.2.0-37-generic	mobile-broadband-provider-info
libxi6	linux-image-3.2.0-38-generic	info
libxinerama1	linux-image-3.2.0-39-generic	modemmanager
libxkbfile1	linux-image-3.2.0-40-generic	module-init-tools
libxklavier16	linux-image-3.2.0-41-generic	mosh
libxml2	linux-image-3.2.0-43-generic	mount
libxml2-utils	linux-image-3.2.0-44-generic	mountall
libxmlrpc-core-c3	linux-image-3.2.0-45-generic	mousetweaks
libxmu-dev	linux-image-3.2.0-48-generic	mpi-default-bin
libxmu-headers	linux-image-3.2.0-51-generic	mpi-default-dev
libxmu6	linux-image-3.2.0-52-generic	mscompress
libxmuu-dev	linux-image-3.2.0-53-generic	mtools
libxmuu1	linux-image-3.2.0-54-generic	mtr-tiny
libxp6	linux-image-3.2.0-55-generic	multiarch-support
libxpm4	linux-image-3.2.0-56-generic	myspell-en-au
libxrandr2	linux-image-3.2.0-57-generic	myspell-en-gb
libxrender1	linux-image-3.2.0-58-generic	myspell-en-za
libxres1	linux-image-3.2.0-59-generic	mysql-common
libxslt1.1	linux-image-3.2.0-60-generic	mythes-en-us
libxss1	linux-image-3.2.0-61-generic	nano

nautilus	overlay-scrollbar	pulseaudio
nautilus-data	oxygen-icon-theme	pulseaudio-module-bluetooth
nautilus-sendto	parted	pulseaudio-module-gconf
nautilus-sendto-empathy	passwd	pulseaudio-module-x11
nautilus-share	patch	pulseaudio-utils
ncftp	pciutils	pwgen
ncurses-base	pcmciautils	python
ncurses-bin	perl	python-appindicator
net-tools	perl-base	python-appport
netbase	perl-modules	python-apt
netcat-openbsd	pgplot5	python-apt-common
netpbm	phonon	python-aptdaemon
network-manager	phonon-backend-gstreamer	python-aptdaemon.gtk3widgets
network-manager-gnome	php5-cli	python-aptdaemon.pkcompat
network-manager-pptp	php5-common	python-brlapi
network-manager-pptp-gnome	php5-fpm	python-cairo
nfs-common	php5-ldap	python-chardet
nfs-kernel-server	phpldapadmin	python-configglue
notify-osd	pkg-config	python-configobj
notify-osd-icons	plasma-scriptengine-javascript	python-crypto
nscd	plymouth	python-cups
ntfs-3g	plymouth-label	python-cupshelpers
ntp	plymouth-theme-ubuntu-logo	python-dateutil
ntpdate	plymouth-theme-ubuntu-text	python-dbus
ntrack-module-libnl-0	pm-utils	python-dbus-dev
nux-tools	po-debconf	python-debian
nvidia-common	policykit-1	python-debtagshw
nvidia-current-updates	policykit-1-gnome	python-decorator
nvidia-current-updates-dev	policykit-desktop-privileges	python-defer
nvidia-settings-updates	poppler-data	python-dev
nx-common	poppler-utils	python-dirspec
nxagent	popularity-contest	python-docutils
obex-data-server	postfix	python-egenix-mxdatetime
obexd-client	powermgmt-base	python-egenix-mxtools
octave3.2	ppp	python-gconf
octave3.2-common	pppconfig	python-gdbm
odbcinst	pppoeconf	python-gi
odbcinst1debian2	pptp-linux	python-gi-cairo
onboard	printer-driver-c2esp	python-glade2
oneconf	printer-driver-foo2zjs	python-gmenu
openjdk-6-jre	printer-driver-gutenprint	python-gnomekeyring
openjdk-6-jre-headless	printer-driver-hpcups	python-gnupginterface
openjdk-6-jre-lib	printer-driver-hpijs	python-gobject
openmpi-bin	printer-driver-min12xxw	python-gobject-2
openmpi-checkpoint	printer-driver-pnm2ppa	python-gst0.10
openmpi-common	printer-driver-postscript-hp	python-gtk2
openoffice.org-hyphenation	printer-driver-ptouch	python-h5py
openprinting-ppds	printer-driver-pxljr	python-httplib2
openssh-blacklist	printer-driver-sag-gdi	python-ibus
openssh-client	printer-driver-splix	python-imaging
openssh-server	procps	python-jinja2
openssl	protobuf-compiler	python-keyring
openvpn	psmisc	python-launchpadlib
os-prober	psutils	python-lazr.restfulclient

python-lazr.uri	python-ubuntuone-client	shared-desktop-ontologies
python-libproxy	python-ubuntuone-control-	shared-mime-info
python-libxml2	panel	sharutils
python-louis	python-ubuntuone-storageprotoco	shotwell
python-lxml	python-uno	simple-scan
python-mako	python-virtkey	slapd
python-markupsafe	python-wadllib	smartmontools
python-matplotlib	python-wxgtk2.8	smbclient
python-matplotlib-data	python-wxversion	smbfs
python-minimal	python-xapian	sni-qt
python-mlpy	python-xdg	software-center
python-mlpy-lib	python-xkit	software-center-aptdaemon-
python-mpi4py	python-zeitgeist	plugins
python-mysqldb	python-zope.interface	software-properties-common
python-notify	python2.7	software-properties-gtk
python-numpy	python2.7-dev	soprano-daemon
python-oauth	python2.7-minimal	sound-theme-freedesktop
python-openssl	qapt-batch	speech-dispatcher
python-packagekit	qdbus	sphinx-common
python-pam	qt-at-spi	sphinx-doc
python-paramiko	radeontool	ssh
python-pexpect	rarian-compat	ssh-askpass-gnome
python-piston-mini-client	rdesktop	ssh-import-id
python-pkg-resources	rdmacm-utils	ssl-cert
python-problem-report	readline-common	strace
python-progressbar	remmina	subversion
python-protobuf	remmina-common	sudo
python-pyatspi2	remmina-plugin-rdp	swig
python-pycurl	remmina-plugin-vnc	swig2.0
python-pygments	resolvconf	synaptic
python-pyinotify	rfskill	syslinux
python-pyparsing	rhythmbox	syslinux-common
python-pyrss2gen	rhythmbox-data	syslinux-legacy
python-renderpm	rhythmbox-mozilla	system-config-printer-common
python-reportlab	rhythmbox-plugin-cdrecorder	system-config-printer-gnome
python-reportlab-accel	rhythmbox-plugin-magnatune	system-config-printer-udev
python-roman	rhythmbox-plugin-zeitgeist	sysv-rc
python-scipy	rhythmbox-plugins	sysvinit-utils
python-serial	rhythmbox-ubuntuone	tar
python-setuptools	rpebind	tcl
python-simplegeneric	rsync	tcl8.5
python-simplejson	rsyslog	tcpd
python-smbc	rtdkit	tcpdump
python-software-properties	samba-common	tcsh
python-speechd	samba-common-bin	telepathy-gabble
python-sphinx	sane-utils	telepathy-haze
python-support	screen	telepathy-idle
python-tk	screen-resolution-extra	telepathy-indicator
python-twisted-bin	seahorse	telepathy-logger
python-twisted-core	sed	telepathy-mission-control-5
python-twisted-names	sensible-utils	telepathy-salut
python-twisted-web	sessioninstaller	telnet
python-tz	sgml-base	tex-common
python-ubuntu-sso-client	sgml-data	texinfo

texlive-base	unattended-upgrades	wireless-tools
texlive-binaries	unity	wodim
texlive-common	unity-2d	wpasupplicant
texlive-doc-base	unity-2d-common	x11-apps
texlive-luatex	unity-2d-panel	x11-common
thunderbird	unity-2d-shell	x11-session-utils
thunderbird-globalmenu	unity-2d-spread	x11-utils
thunderbird-gnome-support	unity-asset-pool	x11-xfs-utils
thunderbird-locale-en	unity-common	x11-xkb-utils
thunderbird-locale-en-us	unity-greeter	x11-xserver-utils
time	unity-lens-applications	x11proto-core-dev
tk	unity-lens-files	x11proto-input-dev
tk8.5	unity-lens-music	x11proto-kb-dev
toshset	unity-lens-video	x11proto-print-dev
totem	unity-scope-musicstores	x11proto-xext-dev
totem-common	unity-scope-video-remote	x11vnc
totem-mozilla	unity-services	x11vnc-data
totem-plugins	uno-libs3	xauth
traceroute	unzip	xaw3dg
transmission-common	update-inetd	xbitmaps
transmission-gtk	update-manager	xcursor-themes
ttf-dejavu-core	update-manager-core	xdg-user-dirs
ttf-dejavu-extra	update-notifier	xdg-user-dirs-gtk
ttf-freefont	update-notifier-common	xdg-utils
ttf-indic-fonts-core	upower	xdiagnose
ttf-lyx	upstart	xfonts-base
ttf-punjabi-fonts	ure	xfonts-encodings
ttf-ubuntu-font-family	ureadahead	xfonts-mathml
ttf-wqy-microhei	usb-creator-common	xfonts-scalable
tzdata	usb-creator-gtk	xfonts-utils
tzdata-java	usb-modeswitch	xfsprogs
ubuntu-artwork	usb-modeswitch-data	xinit
ubuntu-desktop	usbmuxd	xinput
ubuntu-docs	usbutils	xkb-data
ubuntu-extras-keyring	util-linux	xml-core
ubuntu-keyring	uuid	xorg
ubuntu-minimal	uuid-runtime	xorg-docs-core
ubuntu-mono	vbetool	xorg-sgml-doctools
ubuntu-sounds	vim	xserver-common
ubuntu-sso-client	vim-common	xserver-xorg
ubuntu-sso-client-gtk	vim-runtime	xserver-xorg-core
ubuntu-standard	vim-tiny	xserver-xorg-input-all
ubuntu-system-service	vino	xserver-xorg-input-evdev
ubuntu-wallpapers	virtuoso-minimal	xserver-xorg-input-evdev
ubuntu-wallpapers-precise	virtuoso-opensource-6.1-bin	xserver-xorg-input-mouse
ubuntuone-client	virtuoso-opensource-6.1-	xserver-xorg-input-synaptics
ubuntuone-client-gnome	common	xserver-xorg-input-vmouse
ubuntuone-control-panel	wamerican	xserver-xorg-input-wacom
ubuntuone-couch	wbritish	xserver-xorg-video-all
ubuntuone-installer	wget	xserver-xorg-video-ati
ucf	whiptail	xserver-xorg-video-cirrus
udev	whois	xserver-xorg-video-fbdev
udisks	whoopsie	xserver-xorg-video-intel
ufw	wireless-regdb	xserver-xorg-video-mach64
		xserver-xorg-video-mga

xserver-xorg-video-neomagic	xserver-xorg-video-tdfx	yelp
xserver-xorg-video-nouveau	xserver-xorg-video-trident	yelp-xsl
xserver-xorg-video-openchrome	xserver-xorg-video-vesa	zeitgeist
xserver-xorg-video-qxl	xserver-xorg-video-vmware	zeitgeist-core
xserver-xorg-video-r128	xterm	zeitgeist-datahub
xserver-xorg-video-radeon	xtrans-dev	zenity
xserver-xorg-video-s3	xul-ext-ubufox	zenity-common
xserver-xorg-video-savage	xvfb	zip
xserver-xorg-video-siliconmotion	xvnc4viewer	zlib1g
xserver-xorg-video-sis	xz-lzma	zlib1g-dev
xserver-xorg-video-sisusb	xz-utils	