

jjOpenWrt User Guide

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1. OpenWrt Buildroot – Installation

OpenWrt Buildroot is the buildsystem for the OpenWrt Linux distribution. OpenWrt Buildroot works on Linux, BSD or MacOSX operating system. A case-sensitive filesystem is required.

It is recommended that you use a Linux distribution (Debian), either a standalone installation or one running in a virtual environment (VMware or Qemu).

Cygwin(Windows) will not be supported because of the lack of case sensitiveness in the file system.

Outdated information for old Buildroot versions, old Linux variants is archived at: buildroot.exigence.org


⚠ For common problems, benchmarks, common optimizations see development

1.1 Prerequisites

To generate an installable OpenWrt firmware image file with a size of e.g. 8MB:

- ca. 200 MB of hard disk space for OpenWrt Buildroot
- ca. 300 MB of hard disk space for OpenWrt Buildroot + OpenWrt Feeds
- ca. 2.1 GB of hard disk space for source packages downloaded during build from OpenWrt Feeds
- ca. 3-4 GB of available hard disk space to build (i.e. cross-compile) OpenWrt and generate the firmware file
- ca. 1-4 GB of RAM to build Openwrt.(build x86's img need 4GB RAM)

1.2 Install procedure on Linux



1. Do everything as non-root user!
2. Issue all OpenWrt Buildroot commands in the <buildsystem root> directory, e.g. `~/openwrt/trunk/`
3. Do not build in a directory that has spaces in its full path
4. Change Ownership other than root user, of the directory where you Download the OpenWrt (`sudo chown -R user:user /openwrt/`)

- a) Install git , to conveniently download the OpenWrt source code, and build tools to do the cross-compilation process:

```
sudo apt-get update
sudo apt-get install git-core build-essential libssl-dev libncurses5-dev unzip
```

Some feeds might not available over git but only via subversion (short: svn) or mercurial. If you want to obtain their source-code, you need to install svn and mercurial as well:

```
sudo apt-get install subversion mercurial
```

- for information about the build tools see make and build-essential
- for information about git see git(7)
- for information about the subversion tool see svn and subversion documentation (multiple languages)

- b) Download the OpenWrt bleeding edge (trunk Version) with git:

```
git clone git://git.openwrt.org/openwrt.git
```

this creates a directory 'openwrt', which is the OpenWrt Buildroot build-directory
the OpenWrt toolchain "OpenWrt Buildroot" is included

- c) (optional) Download and install all available "feeds" (see OpenWrt Feeds for more options!):

```
cd openwrt
./scripts/feeds update -a
./scripts/feeds install -a
```

- d) Make OpenWrt Buildroot check for missing packages on your build-system using one of the following commands:

```
make defconfig
make prereq
make menuconfig
```

There you will need to select what you want to compile.

- e) Proceed with build (i.e. cross-compile the downloaded sources to binaries)

After the cross-compilation process the "trunk"-directory contained 244,451 files with a total size of 3.2GiB!

1.3 Corresponding packages Installations

Here is the package name for each prerequisite separated for different GNU/Linux and Unix like distributions.

- **Debian 7 Wheezy:**

```
apt-get install libncurses5-dev zlib1g-dev gawk
```

- **Fedora 20 – 64Bit**(Maybe also for lower versions, some packages seem to be missing above):

```
yum install -y subversion binutils bzip2 gcc gcc-c++ gawk gettext flex ncurses-devel  
zlib-devel make patch unzip perl-ExtUtils-MakeMaker glibc glibc-devel glibc-static  
quilt ncurses-lib sed sdcc intltool sharutils bison wget
```

- **openSUSE 13.2**

```
zypper install asciidoc bash bc binutils bzip2 fastjar flex git-core gcc-c++ gcc  
util-linux gawk gtk2-devel intltool jikes zlib-devel mercurial make genisoimage  
ncurses-devel libopenssl-devel patch perl-ExtUtils-MakeMaker python-devel rsync ruby  
sdcc unzip wget gettext-tools libxslt-tools zlib-devel subversion
```

- **Ubuntu 12.04LTS:**

```
sudo apt-get install build-essential subversion git-core libncurses5-dev zlib1g-dev  
gawk flex quilt libssl-dev xsltproc libxml-parser-perl mercurial bzip2 ecj cvs unzip
```

- **Ubuntu 64bit:**

```
sudo apt-get install build-essential subversion libncurses5-dev zlib1g-dev gawk  
gcc-multilib flex git-core gettext libssl-dev
```

1.4 Downloading Sources

15.05 branch (Chaos Calmer)

Main repository

```
git clone git://git.openwrt.org/15.05/openwrt.git
```

Packages feed

```
git clone git://git.openwrt.org/15.05/packages.git
```

2. jjPlus OpenWrt for 802.11ac

The openWrt buildroot system of jjPlus version is based on 15.05 branch version (Chaos Calmer), which is cooked in Ubuntu 12.04LTS 64-bit OS environment. This system has included Chaos Calmer basic package and jjplus patches, which is for jjPlus platform modifications only.

2.1 Setup Ubuntu Build Environment

Require to install each prerequisite of package on uBuntu 12.04LTS 64-bit GNU/Linux distribution.

Ubuntu 12.04LTS 64-bit:

```
sudo apt-get install build-essential subversion libncurses5-dev zlib1g-dev gawk  
gcc-multilib flex git-core gettext libssl-dev quilt xsltproc libxml-parser-perl mercurial  
bzip2 ecj cvs unzip
```

2.2 Install jjPlus Buildroot System

There are two package files “jjPlus-MIPS-openWrt_rYYYYY_xxxxxxx.tar.bz2” and “openWrt_rYYYYY-extra-tarballs.tar”.

- “jjPlus-MIPS-openWrt_rYYYYY_xxxxxxx” file is buildroot system source base.
- “openWrt_rYYYYY-extra-tarballs” file is extra source tarballs.

Please follow the steps to install jjPlus Buildroot System.

a) Make a folder name in ubuntu \$HOME path

```
$ mkdir -p ~/openwrt
```

b) Uncompress two package files into the created folder.

```
$ tar -xvf jjPlus-MIPS-openWrt_rYYYYY_xxxxxxx.tar.bz2 -C ~/openwrt  
$ tar -xvf openWrt_rYYYYY-extra-tarballs.tar -C ~/openwrt
```

c) Copy jjPlus platform config as buildroot system configuration file.

```
$ cd ~/openwrt  
$ cp jwapXXX_defconfig .config
```

d) Build jjPlus platform images

```
$ make V=s
```

Note: If you got any inappropriate problem in your PC environment, please use the following steps to fix it.

```
$ cd ~/openwrt
$ make distclean
$ ./scripts/feeds update -a
$ ./scripts/feeds install -a
$ cp jwapXXX_defconfig .config
$ make V=s menuconfig or make V=s
```

2.3 jjPlus Platform Firmware Update

Three images will be generated, “openwrt-jwapXXX-kernel.bin”, “openwrt-jwapXXX-rootfs-squashfs.bin” and “openwrt-jwapXXX-squashfs-sysupgrade.bin”.

- openwrt-jwapXXX-kernel.bin: The lzma-compressed kernel image.
- openwrt-jwapXXX-rootfs-squashfs.bin: The root file system of squash format image.
- openwrt-jwapXXX-squashfs-sysupgrade.bin: This image is included kernel and root file system.

Firmware Update Procedures:

- Setup a TFTP server on your PC, and copy the firmware “openwrt-jwapXXX-squashfs-sysupgrade.bin” in the directory of TFTP server program.
- Enter boot-loader mode from the serial console; just press any key on keyboard when the boot-loader displays the countdown screen.

```
Now running in RAM - U-Boot at: 87fc8000
Flash Manuf Id 0x1c, DeviceId0 0x30, DeviceId1 0x18
flash size 16MB, sector count = 256
Flash: 16 MB
In: serial
Out: serial
Err: serial
Net: ath_gmac_enet_initialize...
athrs_sgmii_res_cal: cal value = 0x6
Fetching MAC Address from 0x87fecc2c
Fetching MAC Address from 0x87fecc2c
ath_gmac_enet_initialize: reset mask:c02200
Scorpion ---> S17 PHY *
s17 phy0 register value 0x00004140
TEST: FINAL REG VAL after TX Calibration - 0x86000000
TEST: FINAL XMII VAL after RX Calibration - 0x96000000
TEST: FINAL ETH_CFG VAL after RX Calibration - 0x00000001
athrs17_reg_init:S17_ID:0x1302
athrs17_reg_init: complete
: cfg1 0x80000000 cfg2 0x7335
eth0: 00:15:61:97:cf:08
eth0 up
SGMII in forced mode
athr_gmac_sgmii_setup SGMII done
: cfg1 0x800c0000 cfg2 0x7214
eth1: 00:15:61:97:cf:09
eth1 up
eth0, eth1
Setting 0x18116290 to 0x58b0214f
Hit any key to stop autoboot: 0
955X> █
```

c) Set the TFTP server IP as PC's IP address.

```
> setenv serverip "PC's IP Address"
```

d) Update the firmware image by the following commands

```
> tftp 0x80060000 openwrt-jwapXXX-squashfs-sysupgrade.bin
> erase 0x9f050000 +0xfa0000 && cp.b $fileaddr 0x9f050000 $filesize
```

```
955X> print bootargs
bootargs=console=ttyS0,115200 root=31:02 rootfstype=jffs2 init=/sbin/init mtdpar
ts=ath-nor0:256k(u-boot),64k(u-boot-env),6336k(rootfs),1408k(uImage),8256k(mib0)
,64k(ART) board=jwap230
955X> tftp 0x80060000 openwrt-jwap230-squashfs-sysupgrade.bin
Trying eth0
eth0 link down
FAIL
Trying eth1
dup 1 speed 1000
Using eth1 device
TFTP from server 192.168.1.10; our IP address is 192.168.1.1
Filename 'openwrt-jwap230-squashfs-sysupgrade.bin'.
Load address: 0x80060000
Loading: #####
#####
#####
#####
#####
```

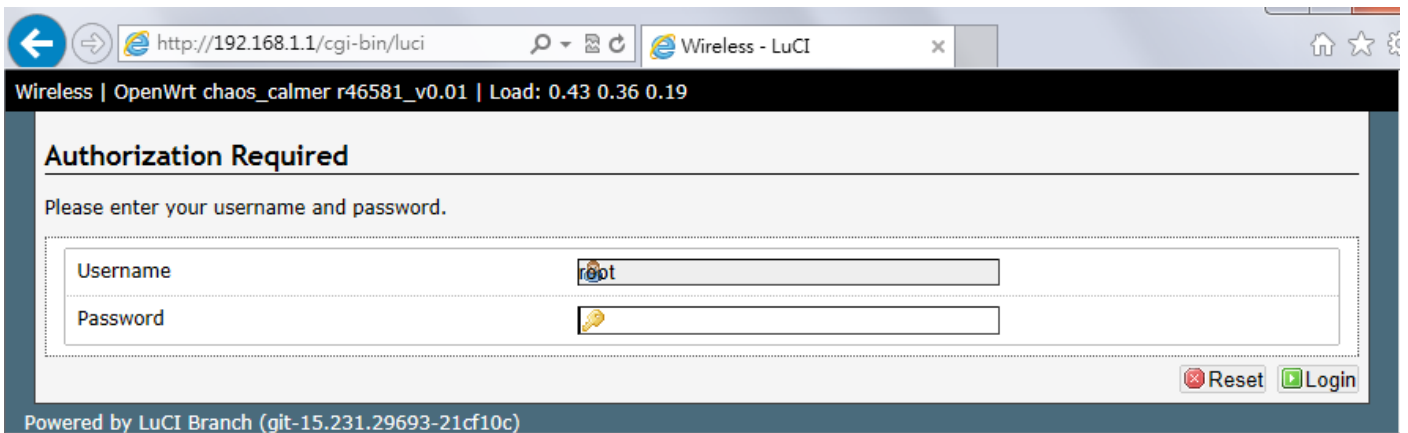
```
#####
#####
#####
#####
#####
done
Bytes transferred = 16034230 (f4a9be hex)
955X> erase 0x9f050000 +0xfa0000&&cp.b $fileaddr 0x9f050000 $filesize
Erasing flash...
First 0x5 last 0xfe sector size 0x10000 254
Erased 250 sectors
Copy to Flash... write addr: 9f050000
done
955X> █
```

e) Reboot the system when update firmware is done.

```
> reset
```

3. Software Features of jjOpenWrt

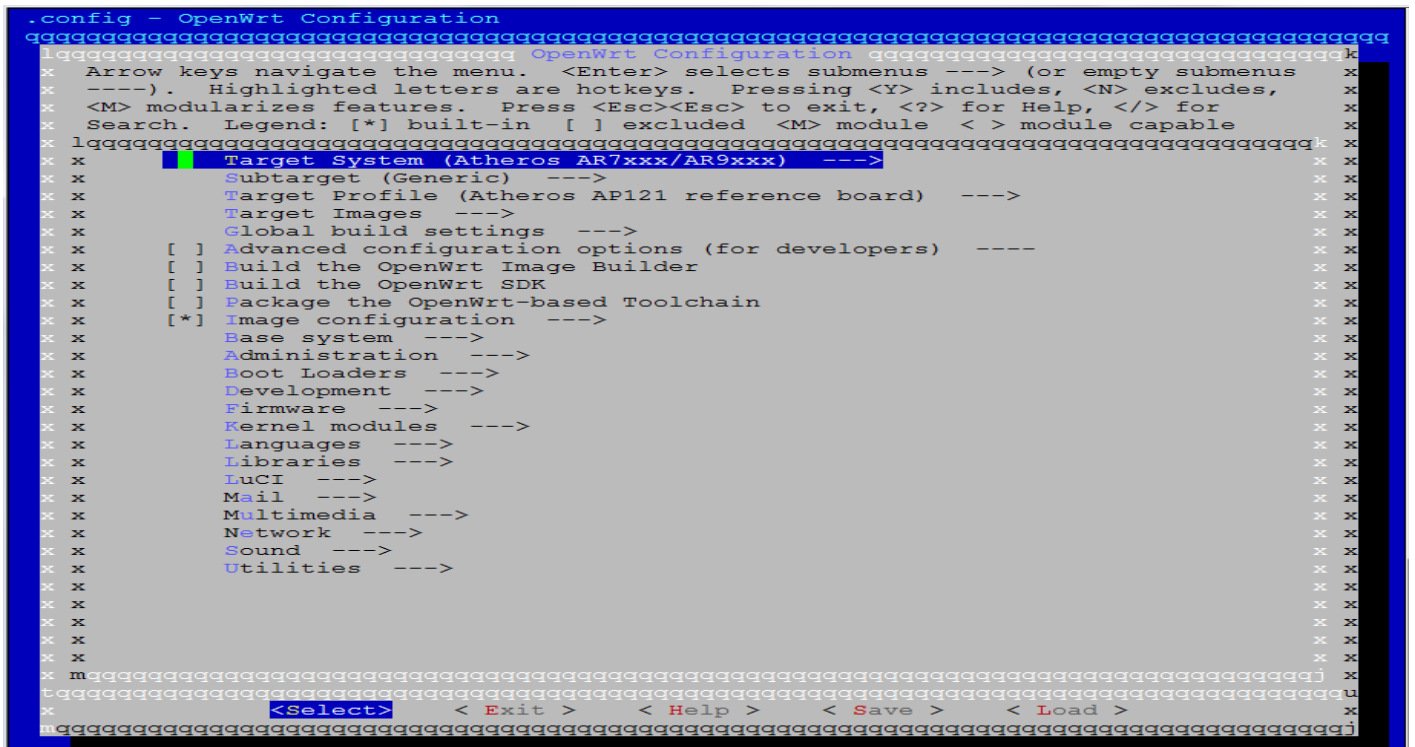
Launch a web browser and enter the default IP address “192.168.1.1” of the jjOpenWrt system. The default account information is “Username: root / Password: admin”.



3.1 jjOpenWrt Features List

If you want to customize jjOpenWrt features/functions, you can use the “make menuconfig” command to customize it.

```
$ cd ~/openwrt
$ make V=s menuconfig
```



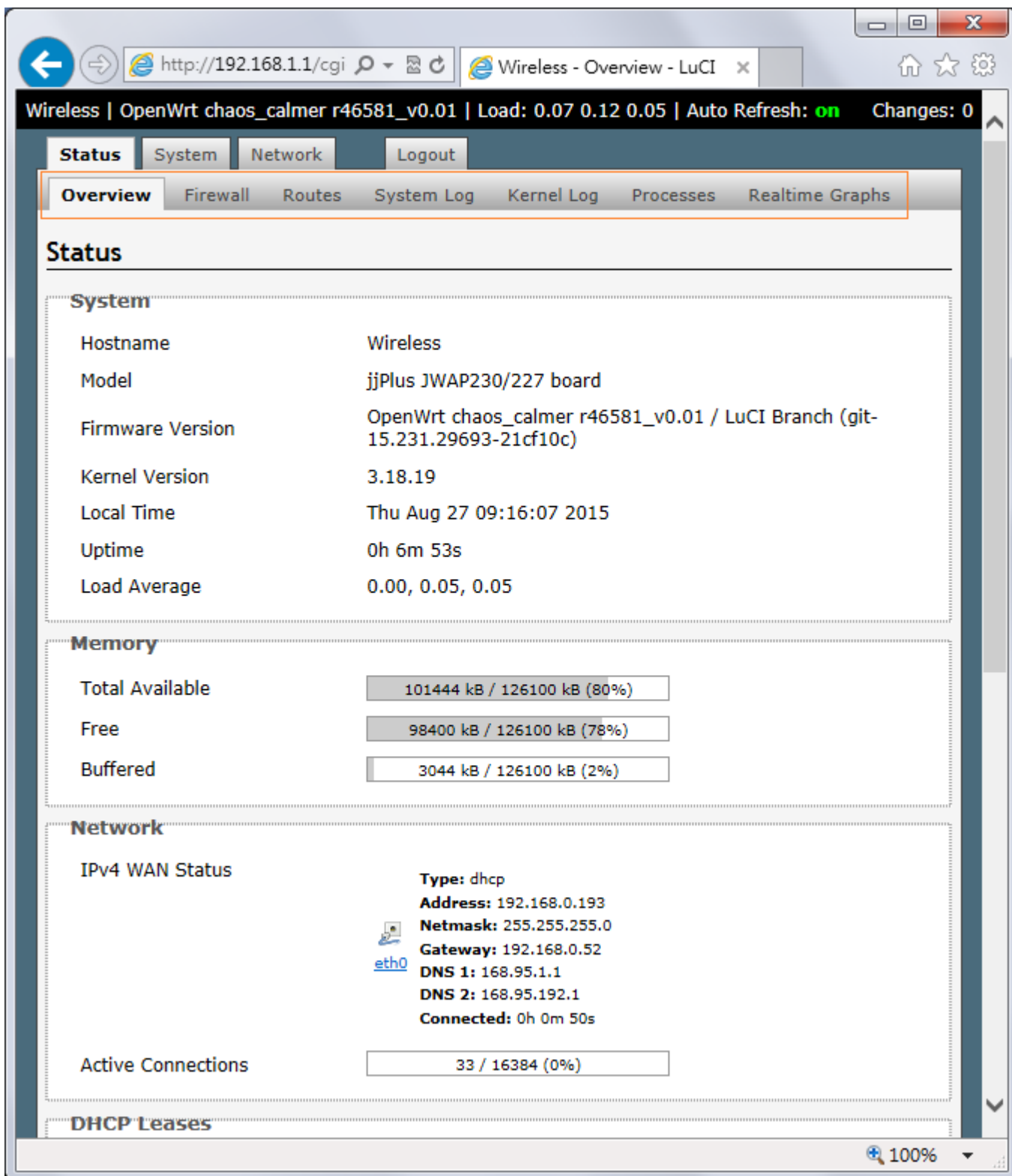
jjOpenWrt Features / Functions List:

Tab Name	Features	Sub-Features	Items Name	Sub-Items	Functions
Status					
	Overview				
	Firewall				
	Routes				
	System Log				
	Kernel Log				
	Processes				
	Realtime Graphs				
		<i>Load</i>			
		<i>Traffic</i>			
		<i>Wireless</i>			
		<i>Connections</i>			
System					
	System				
		<i>System Properties</i>			
		<i>Time Sync.</i>			
	Administration				
		<i>Router Password</i>			
		<i>SSH Access</i>			
	Startup				
	Scheduled Tasks				
	LED Configuration				
	Backup / Flash Firmware				
		<i>Backup / Restore</i>			
		<i>Flash new firmware image</i>			
	Reboot				
Network					
	Interfaces				
		<i>Interface Configuration</i>			
	Wifi				
		<i>Wireless Configuration</i>			

			Device Configuration		
				<i>General Setup</i>	
					Wireless network --- [Disabled / Enabled]
					Operating frequency --- [Legacy / N / AC]
					Transmit Power
				<i>Advanced Settings</i>	
					Country Code
					Distance Optimization
					Fragmentation Threshold
					RTS/CTS Threshold
			Interface Configuration		
				<i>General Setup</i>	
					ESSID
					Mode --- [Access Point / Client / Ad-Hoc / 802.11s / Pesudo Ad-Hoc / Monitor / Access Point (WDS) / Client (WDS)]
					Hide ESSID
					WMM Mode
				<i>Wireless Security</i>	
					Encryption --- [No Encry. / WEP Open System / WEP Shared Key / WPA-PSK / WPA2-PSK / WPA-PSK_WPA2-PSK Mixed]
				<i>MAC-Filter</i>	
					MAC-Address Filter --- [disable / Allow listed only / Allow all except listed]
		<i>Associated Stations</i>			
	Switch				
		<i>Switch Configuration</i>			
		<i>VLANs Configuration</i>			
	DHCP and DNS				
		<i>Server Settings</i>			
		<i>Active DHCP Leases</i>			
		<i>Active DHCPv6 Leases</i>			
		<i>Static Leases</i>			

	Hostnames				
	Static Routes				
	Firewall				
		<i>General Settings</i>			
		<i>Port Forwards</i>			
		<i>Traffic Rules</i>			
		<i>Custom Rules</i>			
	Diagnostics				
	QoS				
		<i>QoS Configuration</i>			
		<i>Classification Rules</i>			
Logout					

3.2 Status Tab Page



The screenshot shows the LuCI web interface for a wireless device. The browser address bar displays `http://192.168.1.1/cgi`. The page title is "Wireless - Overview - LuCI". The status bar at the top indicates "Wireless | OpenWrt chaos_calmer r46581_v0.01 | Load: 0.07 0.12 0.05 | Auto Refresh: on | Changes: 0".

The main navigation menu includes "Status", "System", "Network", and "Logout". The "Status" sub-menu is expanded, showing "Overview", "Firewall", "Routes", "System Log", "Kernel Log", "Processes", and "Realtime Graphs".

Status

System

Hostname	Wireless
Model	jjPlus JWAP230/227 board
Firmware Version	OpenWrt chaos_calmer r46581_v0.01 / LuCI Branch (git-15.231.29693-21cf10c)
Kernel Version	3.18.19
Local Time	Thu Aug 27 09:16:07 2015
Uptime	0h 6m 53s
Load Average	0.00, 0.05, 0.05

Memory

Total Available	101444 kB / 126100 kB (80%)
Free	98400 kB / 126100 kB (78%)
Buffered	3044 kB / 126100 kB (2%)

Network

IPv4 WAN Status

Type:	dhcp
Address:	192.168.0.193
Netmask:	255.255.255.0
Gateway:	192.168.0.52
DNS 1:	168.95.1.1
DNS 2:	168.95.192.1
Connected:	0h 0m 50s

eth0

Active Connections	33 / 16384 (0%)
--------------------	-----------------

DHCP Leases

100%

3.3 System Tab Page

The screenshot shows a web browser window displaying the LuCI interface for the 'System' tab. The browser's address bar shows the URL `http://192.168.1.1/cgi-bin/lu`. The page title is 'Wireless - System - LuCI'. The status bar at the top indicates 'Wireless | OpenWrt chaos_calmer r46581_v0.01 | Load: 0.08 0.05 0.05 | Auto Refresh: on' and 'Changes: 0'. The main navigation menu includes 'Status', 'System', 'Network', and 'Logout'. The 'System' sub-menu is active, showing options like 'Administration', 'Startup', 'Scheduled Tasks', 'LED Configuration', 'Backup / Flash Firmware', and 'Reboot'. The 'System' section is titled 'System' and contains the text: 'Here you can configure the basic aspects of your device like its hostname or the timezone.' Below this is the 'System Properties' section, which has three sub-tabs: 'General Settings', 'Logging', and 'Language and Style'. The 'General Settings' sub-tab is selected and contains the following fields:

- Local Time: Thu Aug 27 09:18:51 2015, with a 'Sync with browser' button.
- Hostname: Wireless
- Timezone: UTC

The 'Time Synchronization' section contains the following options:

- Enable NTP client:
- Provide NTP server:
- NTP server candidates: A list of four entries, each with a delete (X) and add (+) button:
 - 0.openwrt.pool.ntp.org
 - 1.openwrt.pool.ntp.org
 - 2.openwrt.pool.ntp.org
 - 3.openwrt.pool.ntp.org

At the bottom of the configuration area, there are three buttons: 'Reset', 'Save', and 'Save & Apply'. The footer of the page reads 'Powered by LuCI Branch (git-15.231.29693-21cf10c)' and the browser's zoom level is set to 100%.

3.4 Network Tab Page

The screenshot shows the LuCI web interface for managing network interfaces. The browser address bar shows `http://192.168.1.1/cgi-bin/luci/s`. The page title is "Wireless - Interfaces - LuCI". The navigation menu includes "Status", "System", "Network", and "Logout". The "Network" tab is active, and the "Interfaces" sub-tab is selected. The main content area is titled "Interfaces" and contains an "Interface Overview" section. This section displays a table of network interfaces with columns for "Network", "Status", and "Actions".

Network	Status	Actions
LAN br-lan	Uptime: 0h 10m 13s MAC-Address: 00:15:61:97:CF:09 RX: 159.26 KB (1601 Pkts.) TX: 341.04 KB (1564 Pkts.) IPv4: 192.168.1.1/24	Connect Stop Edit Delete
WAN eth0	Uptime: 0h 4m 30s MAC-Address: 00:00:00:00:00:00 RX: 294.02 KB (2230 Pkts.) TX: 45.49 KB (193 Pkts.) IPv4: 192.168.0.193/24	Connect Stop Edit Delete
WAN6 eth0	Uptime: 0h 10m 11s MAC-Address: 00:00:00:00:00:00 RX: 294.02 KB (2230 Pkts.) TX: 45.49 KB (193 Pkts.) IPv4: 192.168.0.193/24	Connect Stop Edit Delete

Below the table is a button labeled "Add new interface...". At the bottom of the page, it says "Powered by LuCI Branch (git-15.231.29693-21cf10c)" and the zoom level is set to 100%.

3.4.1 WiFi Configuration Page

Wireless | OpenWrt chaos_calmer r46581_v0.01 | Load: 0.50 0.26 0.10 | Auto Refresh: **on** Changes: 0

Status System **Network** Logout

Interfaces **Wifi** Switch DHCP and DNS Hostnames Static Routes Firewall Diagnostics QoS

radio0: Master "OpenWrt0-11g" radio1: Master "OpenWrt1-11a"

Wireless Overview

Generic MAC80211 802.11bgn (radio0) Channel: 11 (2.462 GHz) | Bitrate: ? Mbit/s Scan Add

0% **SSID:** OpenWrt0-11g | **Mode:** Master Disable Edit Remove
BSSID: 00:15:61:97:CF:A0 | **Encryption:** None

Qualcomm Atheros QCA9880 802.11nac (radio1) Channel: 36 (5.180 GHz) | Bitrate: ? Mbit/s Scan Add

0% **SSID:** OpenWrt1-11a | **Mode:** Master Disable Edit Remove
BSSID: 00:15:61:20:4E:08 | **Encryption:** None

Associated Stations

No information available

No information available

Powered by LuCI Branch (git-15.231.29693-21cf10c) 100%