

OpenWrt – Part 3

NetGear Wireless-N 300 Modem router DGN2200

Many thanks to Ian Young for providing the Modem



Waikato Linux Users Group
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OpenWrt – Part 3

NetGear Wireless-N 300 Modem router DGN2200

Contents of Presentation:

- Overview the DGN2200.
- Check-out the DGN web-server based setup
- Add a console terminal emulator
- Add a tftp server
- Install OpenWrt firmware
- Boot OpenWrt and login via console
- Login via web-browser, use GUI.
- Login via Secure Shell (SSH)
- Uplink to another Router for internet connection
- Packages Update
- Add / Remove python3 modules

NetGear Wireless-N 300 Modem router DGN2200

Features.

Administration Settings:

<http://www.routerlogin.net>

192.168.0.1

User name: admin

Password: password



Ports:

4 x RJ45 10/100 Mb/s ethernet

1 x USB

1 x RJ11 ADSL

1 x Wifi



Console:

PCB has TTL console pin-out.

NetGear Wireless-N 300 Modem router DGN2200

Connections provided by Netgear firmware:

Plug in a PC via ethernet cable and DGN2200 supplies a DHCP address. E.g. 192.168.0.2

PC web-browser connecting to the http server in the DGN2200.

Enter into PC's web-browser *http://routerlogin.net* to access the GUI administration. Translates as 192.168.0.1

SSH:

? - Not permitted

NetGear Wireless-N 300 Modem router DGN2200

Screenshots of the web-based administration.

The screenshot shows the NetGear DGN2200 web-based administration interface accessed via Mozilla Firefox. The browser window title is "NETGEAR Router DGN2200 - Mozilla Firefox". The address bar shows the URL "192.168.0.1/start.htm". The page features the NetGear logo and "SMARTWIZARD™ router manager" branding, identifying the device as an "N300 Wireless ADSL2+ Modem Router model DGN2200". A "Select Language:" dropdown menu is set to "English" with an "Apply" button.

The main content area is titled "Setup Wizard" and includes the following sections:

- Select Country:** A dropdown menu currently showing "UK".
- Auto-Detect Connection Type:** A section explaining that the wizard can detect the Internet connection type. It asks, "Do you want the Smart Setup Wizard to try and detect the connection type now?" with two radio button options:
 - ☒ Yes.
 - ☐ No. I want to configure the router myself.
- Next:** A button to proceed to the next step in the wizard.

A left-hand navigation menu lists various configuration options: Setup Wizard, Add WPS Client, Setup (highlighted), Basic Settings, ADSL Settings, Wireless Settings, USB Storage, Basic Settings, Advanced Settings, Content Filtering, Logs, Block Sites, Firewall Rules, Services, Schedule, E-mail, Maintenance, Router Status, and Attached.

The right-hand side of the page contains a "Smart Setup Wizard Help" section. It explains that after connecting the router, configuration is required and can be done using the Smart Setup Wizard, which attempts to autodetect the Internet service type. It recommends using the wizard for inexperienced users. It also states that configuration will use information from the "Installation Guide".

To get started:

1. Select **Yes** if you want to use the Smart Setup Wizard.
or
Select **No** to configure the router manually.
2. Click **Next**.

NetGear Wireless-N 300 Modem router DGN2200

Screenshots 2/7

The screenshot shows the NetGear DGN2200 router's web interface accessed via a Mozilla Firefox browser. The browser window title is "NETGEAR Router DGN2200 - Mozilla Firefox". The address bar shows the URL "192.168.0.1/start.htm". The page features the NetGear logo and "SMARTWIZARD™ router manager" branding, identifying the device as an "N300 Wireless ADSL2+ Modem Router model DGN2200". A "Select Language:" dropdown menu is set to "English" with an "Apply" button. A left-hand navigation menu lists various settings categories: Setup Wizard, Add WPS Client, Setup (Basic Settings, ADSL Settings, Wireless Settings), USB Storage (Basic Settings, Advanced Settings), Content Filtering (Logs, Block Sites, Firewall Rules, Services, Schedule, E-mail), and Maintenance (Router Status, Attached). The main content area is titled "Add WPS Client" and describes the process of connecting a wireless client using Wi-Fi Protected Setup (WPS). It includes a "Next" button. A right-hand sidebar titled "Add WPS Client Help" provides detailed instructions on the WPS process, explaining the Push Button and PIN Number methods.

NETGEAR SMARTWIZARD™ router manager
N300 Wireless ADSL2+ Modem Router model DGN2200

Select Language:
English
Apply

- Setup Wizard
- Add WPS Client
- Setup
 - Basic Settings
 - ADSL Settings
 - Wireless Settings
- USB Storage
 - Basic Settings
 - Advanced Settings
- Content Filtering
 - Logs
 - Block Sites
 - Firewall Rules
 - Services
 - Schedule
 - E-mail
- Maintenance
 - Router Status
 - Attached

Add WPS Client

New and easy way to connect to the wireless router using Wi-Fi Protected Setup (WPS)

A wireless client has to support the WPS function if you want to use this wizard to add the client to your WPS-enabled wireless router.

Please check the user manual and gift box of your wireless client to see whether it supports the WPS function. If your wireless client does not support the WPS function, you have to configure your wireless client manually so that it has the same SSID and wireless security settings as this router.

Next

Add WPS Client Help

WPS stands for Wi-Fi Protected Setup. This is a process that lets you add a wireless client to the network easily, without the need to specifically configure the wireless settings such as SSID, security mode, and passphrase.

You can select to add a wireless client using either the Push Button or PIN Number method.

With the Push Button method, you complete the process by clicking a button on the client (either a physical hardware button or a software button on the client's utility GUI).

With the PIN Number method, you have to enter the client's PIN here. You have to start the client WPS process at the same time. You can find the client's PIN on the client's utility GUI.

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Screenshots 3/7

NETGEAR Router DGN2200 - Mozilla Firefox

File Edit View History Bookmarks Tools Help

NETGEAR Router DGN2200 x +

192.168.0.1/start.htm

NETGEAR SMARTWIZARD™ router manager

N300 Wireless ADSL2+ Modem Router model DGN2200

Select Language: English Apply

- Setup Wizard
- Add WPS Client
- Setup
 - Basic Settings
 - ADSL Settings
 - Wireless Settings
- USB Storage
 - Basic Settings
 - Advanced Settings
- Content Filtering
 - Logs
 - Block Sites
 - Firewall Rules
- Services
 - Schedule
 - E-mail
- Maintenance
 - Router Status
 - Attached

Basic Settings

Does your Internet connection require a login?

☒ Yes ☐ No

Encapsulation: PPPoA (PPP over ATM)

Login: guest

Password:

Connection Mode: Always On

Idle Timeout (In Minutes): 5

Internet IP Address: ☒ Get Dynamically from ISP ☐ Use Static IP Address

0 . 0 . 0 . 0

Help

The DGN2200 Settings pages allow you to configure, upgrade and check the status of your NETGEAR ADSL Router.

Click an item in the leftmost column. The current settings or information for that area appear in the center column.

Helpful information related to the selected Settings page appears in this column. If you are using Internet Explorer, you may click an item in the center column to jump directly to the related help section; otherwise, scroll down until you reach it.

Basic Settings Help

Note: If you are setting up the Router for the first time, the default settings may work for you with no changes.

Does Your Internet Connection Require A Login?

Select this option based on the type of account you have with your ISP. If you need to enter login information every time you connect to the Internet or you have a PPPoE account with your ISP, select **Yes**. Otherwise, select **No**.

Note: If you have installed PPP software such as WinPoET (from Earthlink) or Enternet (from PacBell), then you have PPPoE. Select **Yes**. After selecting **Yes** and configuring your Router, you will not need to run the PPP software on your PC to connect to the Internet.

Encapsulation

NetGear Wireless-N 300 Modem router DGN2200

Screenshots 4/7

The screenshot shows the NetGear DGN2200 router's configuration page in a Mozilla Firefox browser. The browser window title is "NETGEAR Router DGN2200 - Mozilla Firefox". The address bar shows "192.168.0.1/start.htm". The page features the NetGear logo and "SMARTWIZARD™ router manager" branding. A "Select Language:" dropdown is set to "English".

The left sidebar contains a navigation menu with the following items:

- Router Upgrade
- Advanced
- Wireless Settings
- Wireless Repeating Function
- WAN Setup
- Dynamic DNS
- LAN Setup
- QoS Setup
- Remote Management
- Static Routes
- UPnP
- Traffic Meter
- USB Settings
- Advanced - VPN
- VPN Wizard
- VPN Policies
- VPN Status
- Web Support

The main content area is titled "Advanced Wireless Settings" and includes the following sections:

- Advanced Wireless Settings**
 - ☒ Enable Wireless Router Radio
 - Fragmentation Length (256-2346): 2346
 - CTS/RTS Threshold (1-2347): 2347
 - Preamble Mode: Long Preamble
- WPS Settings**
 - Router's PIN: 40827339
 - ☐ Disable Router's PIN
 - ☐ Keep Existing Wireless Settings
- Wireless Card Access List**
 - Set Up Access List

At the bottom of the main content area are "Apply" and "Cancel" buttons.

The right sidebar is titled "Advanced Wireless Help" and contains the following text:

Warning: The wireless router is already configured with the optimum settings. Do not alter these settings unless directed by NETGEAR support. Incorrect settings might disable the wireless router unexpectedly.

Wireless Router Settings

Enable Wireless Router Radio

The wireless access point of this router can be enabled or disabled to allow wireless access. The Wireless LED on the front of the router will also display the current status of the wireless access point to let you know if it is disabled or enabled. If it is enabled, wireless stations will be able to access the Internet. If it is disabled, wireless stations will not be able to access the Internet. Fragmentation Threshold, CTS/RTS Threshold, Preamble Mode

These settings are reserved for wireless testing and advanced configuration only. Do not change these settings.

WPS Settings

Router's PIN

This is the PIN number you use on a registrar (e.g., from Network Explorer on a Vista Windows PC) to configure the router's wireless settings through WPS. You can also find the PIN on the router's product label.

NetGear Wireless-N 300 Modem router DGN2200

Screenshots 5/7

The screenshot shows the NetGear DGN2200 router's configuration interface in a Mozilla Firefox browser window. The browser's address bar shows the URL `192.168.0.1/start.htm`. The page title is "NETGEAR Router DGN2200 - Mozilla Firefox".

The main content area is titled "WAN Setup" and includes the following options:

- ☐ Disable Port Scan and DoS Protection
- ☐ Default DMZ Server (IP address: 192 . 168 . 0 . 0)
- ☐ Respond to Ping on Internet Port
- MTU Size(in bytes): 1458
- NAT Filtering: ☒ Secured ☐ Open
- ☐ Disable SIP ALG

At the bottom of the WAN Setup section are "Apply" and "Cancel" buttons.

On the right side, there is a "WAN Setup Help" section with the following text:

WAN Setup Help

Using this page, you can set up a Default DMZ Server and allow the router to respond to a 'ping' from the internet. Both of these options have security issues, so use them carefully.

Disable Port Scan and DoS Protection - The DoS Protection protects your LAN against Denial of Service attacks. This should only be disabled in special circumstances.

Default DMZ Server

Specifying a Default DMZ Server allows you to set up a computer or server that is available to anyone on the Internet for services that you haven't defined. There are security issues with doing this, so only do this if you're willing to risk open access. If you do not assign a Default DMZ Server, the router discards any incoming service requests which are undefined.

To assign a computer or server to be a DMZ server:

1. Click the *Default DMZ Server* check box
2. Type the IP address for that server.
3. Click **Apply**.

Respond To Ping On Internet Port

If you want the Router to respond to a 'Ping' from the Internet, click this check box. This can be used as a diagnostic tool. Again, like the DMZ server, this can be a security problem. You shouldn't check this box unless you have a specific reason to do so.

On the left side, there is a navigation menu with the following items:

- Devices
- Backup Settings
- Set Password
- Diagnostics
- Router Upgrade
- Advanced
- Wireless Settings
- Wireless Repeating Function
- WAN Setup
- Dynamic DNS
- LAN Setup
- QoS Setup
- Remote Management
- Static Routes
- UPnP
- Traffic Meter
- USB Settings
- Advanced - VPN

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Screenshots 6/7

The screenshot shows the NetGear DGN2200 router's web interface accessed via a Mozilla Firefox browser. The browser's address bar shows the URL `192.168.0.1/start.htm`. The page title is "NETGEAR Router DGN2200 - Mozilla Firefox".

The interface features a purple header with the "NETGEAR SMARTWIZARD™" logo and the text "router manager N300 Wireless ADSL2+ Modem Router model DGN2200". A "Select Language:" dropdown menu is set to "English" with an "Apply" button.

A left sidebar contains a navigation menu with the following items: Wireless Settings, USB Storage, Basic Settings, Advanced Settings, Content Filtering, Logs, Block Sites, Firewall Rules, Services, Schedule, E-mail, Maintenance, Router Status, Attached Devices, Backup Settings, Set Password, Diagnostics, Router Upgrade, and Advanced.

The main content area is titled "Logs" and displays the following log entries:

```
Current Time: Wednesday, Jan 01, 2003 00:08:54
[Admin login] from source 192.168.0.2.
[Admin login] from source 192.168.0.2.
[Initialized, firmware version:
V1.0.0.36 7.0.36]
[DHCP IP: (192.168.0.2)] to MAC address
00:1F:16:16:8F:5A.
```

Below the log entries are three buttons: "Refresh", "Clear Log", and "Send Log".

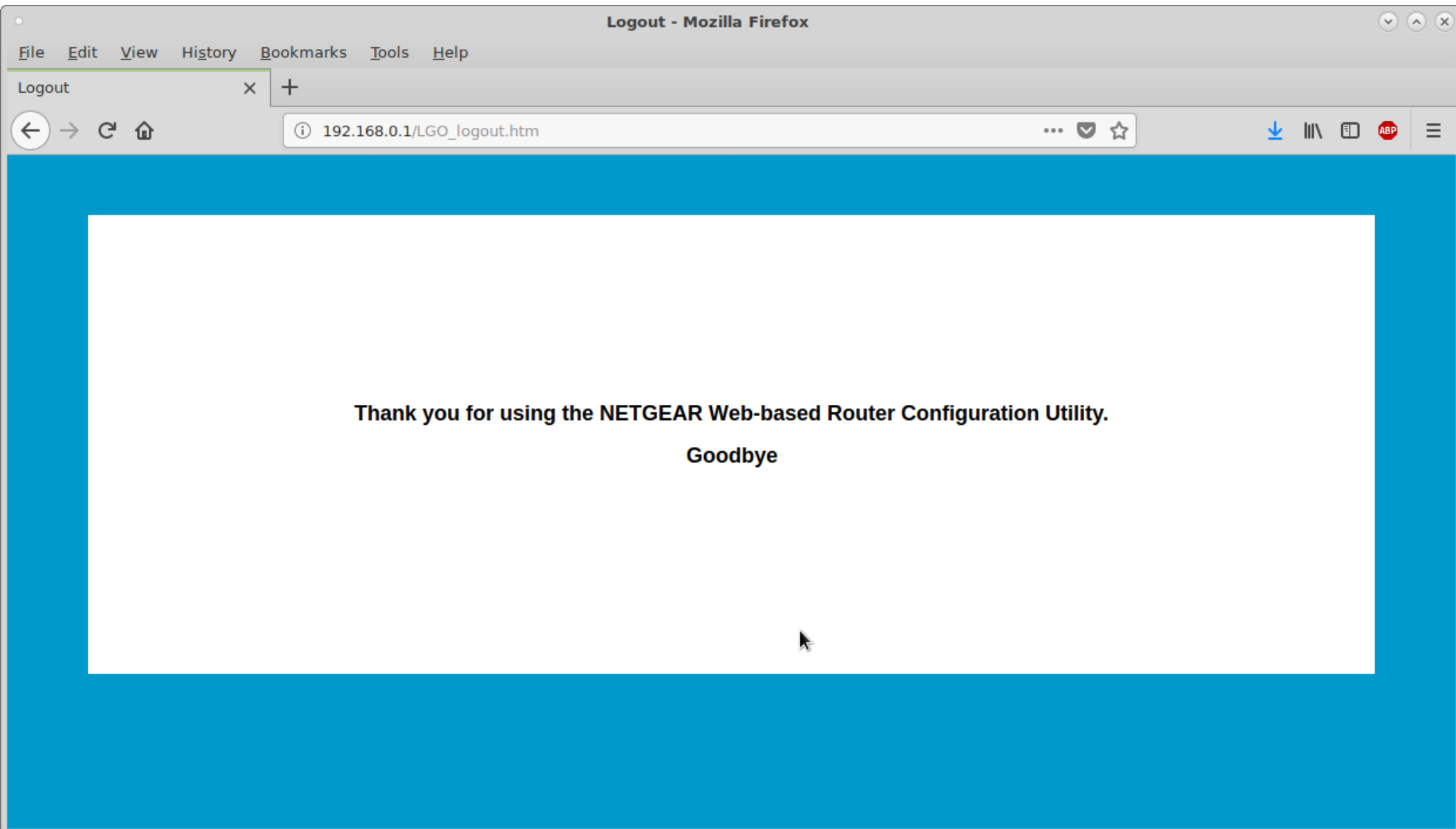
At the bottom, the "Include in Log" section has two checked options:

- ☒ Attempted access to blocked sites
- ☒ Connections to the Web-based interface of this Router

The right sidebar, titled "Logs Help", provides information about the logs and includes a "Syslog" section with three options: "Disable", "Broadcast on LAN", and "Send to this Syslog server IP address".

NetGear Wireless-N 300 Modem router DGN2200

Farewell to Netgear firmware



NetGear Wireless-N 300 Modem router DGN2200

OpenWrt Information page for DGN2200

<https://openwrt.org/toh/netgear/dgn2200>

Highlights:

SoC: BCM6358U

Instruction set: MIPS

Switch: BCM5325

Wireless: BCM43222 (Proprietary drivers)

RAM size: 32 MiB

Flash size: 8192 KiB

Download location for OpenWrt firmware image...

<http://downloads.openwrt.org/releases/18.06.2/targets/brcm63xx/smp/openwrt-18.06.2-brcm63xx-smp-96358VW-generic-squashfs-cfe.bin>

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How to install the OpenWrt firmware.

Serial Console

- Add TTL console pin-out and to PCB.
- Convert the TTL, to RS232, to a USB serial port.
- Install PuTTY application on your PC to be the console terminal emulator.
- You can now watch Netgear firmware boot and log into its version of Linux.

Ethernet connection

- Connect an ethernet cable from your PC to an RJ45 port on the DGN2200.
- Install a Trivial File Transfer Protocol Server application on the PC. (TFTP)
- Set PC / TFTP server to 192.168.1.100.
- Place OpenWrt firmware in TFTP server folder.

NetGear Wireless-N 300 Modem router DGN2200

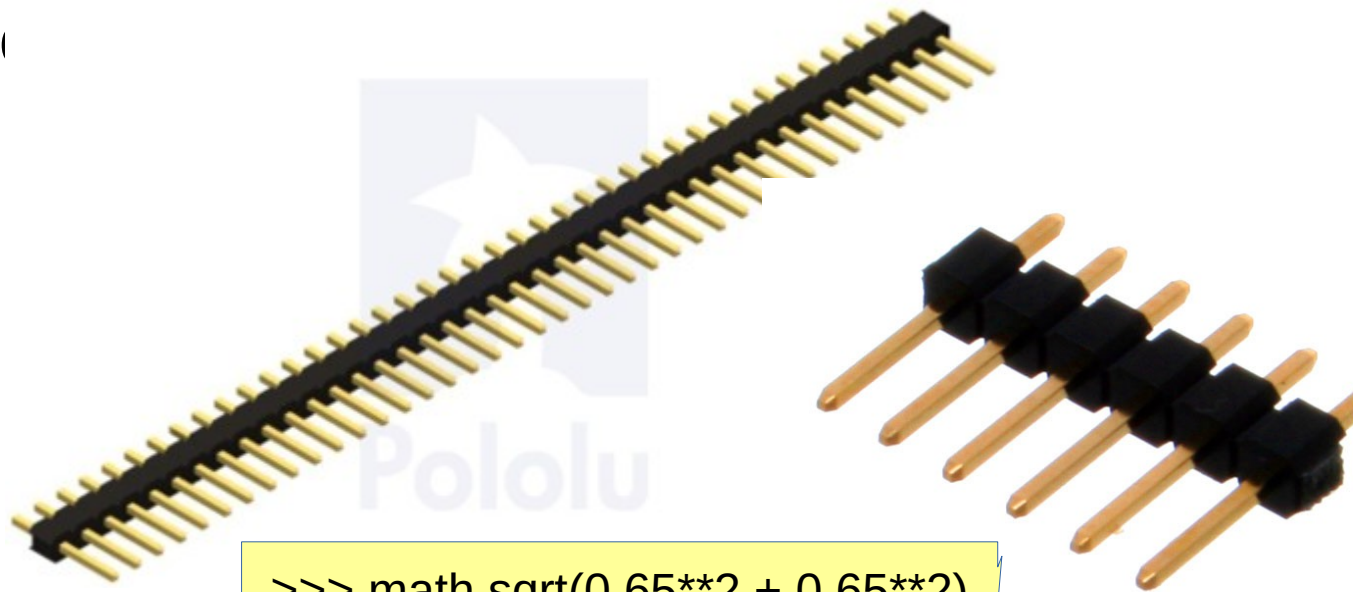
Adding the Serial Console

Tools:

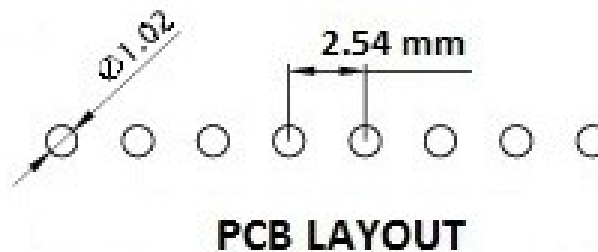
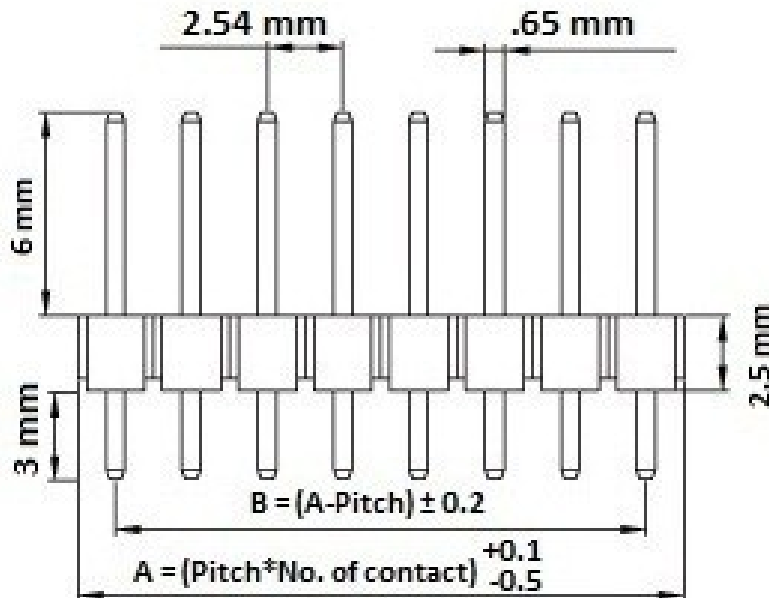
- Soldering Iron
- Solder sucker
- Drill bit 1mm

Extras:

- Berg pins x 6



```
>>> math.sqrt(0.65**2 + 0.65**2)  
0.9192388155425119
```

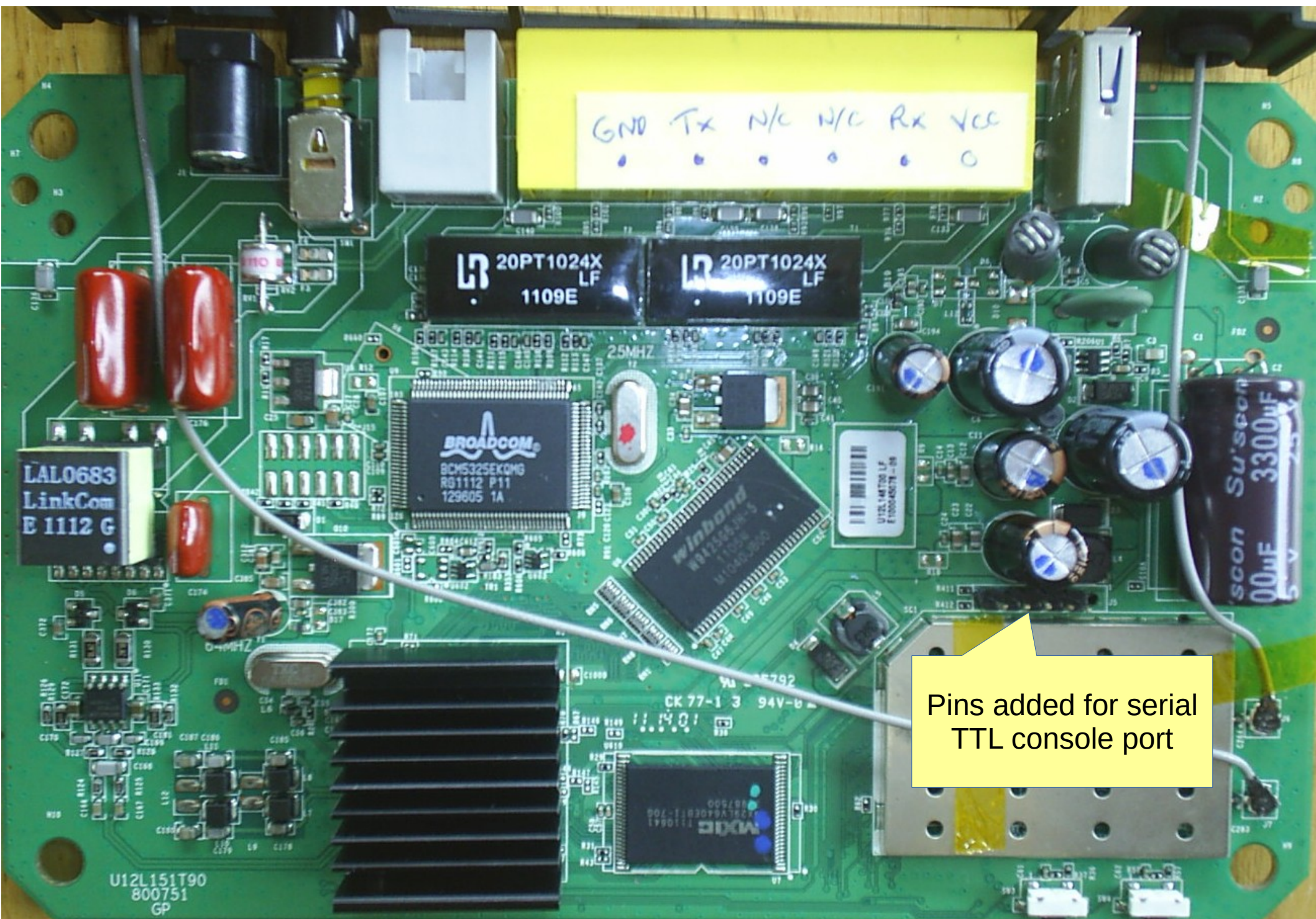


Pins added for serial
TTL console port

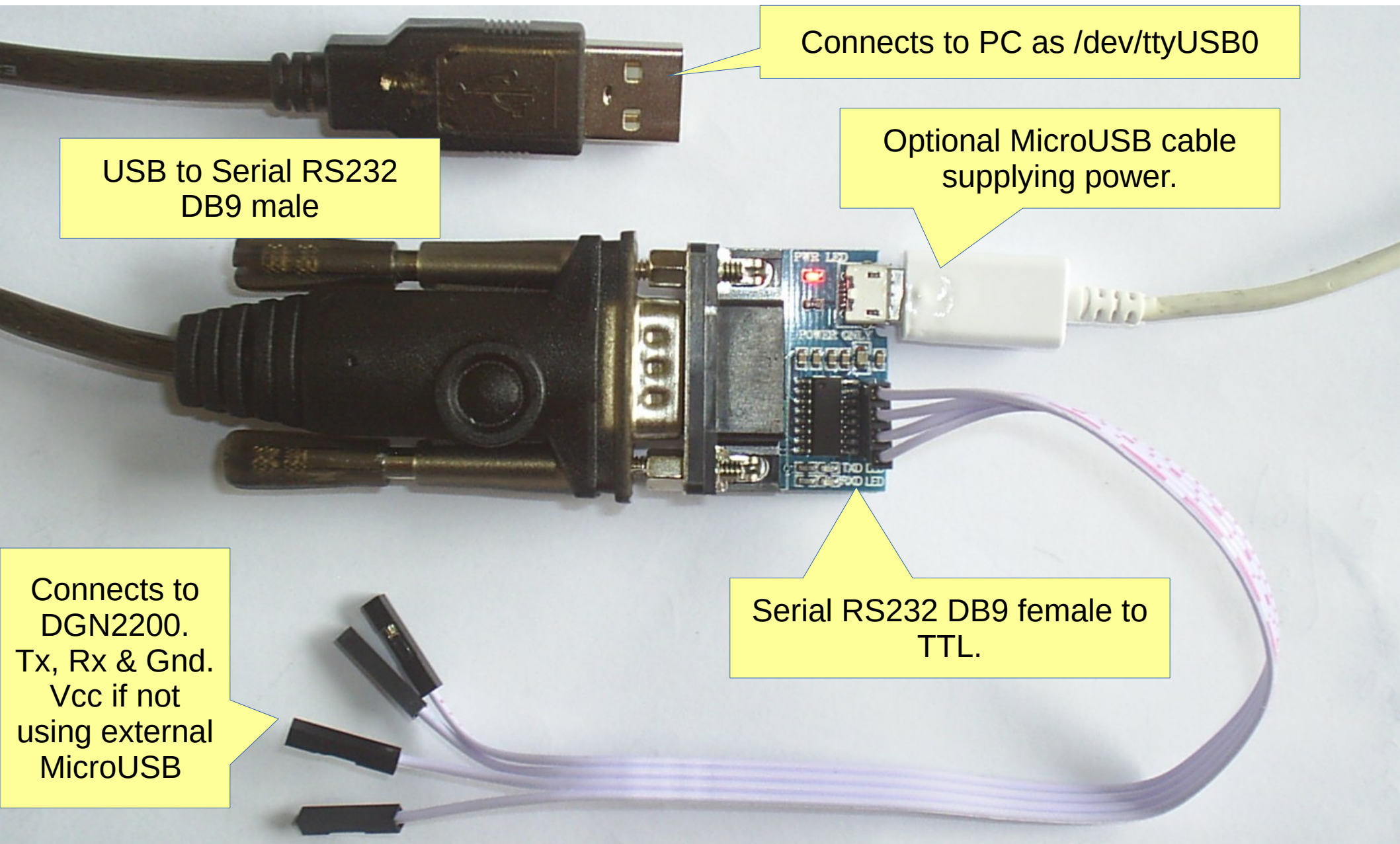
Suggestion: 0.5mm drill, wire up Tx, Rx,
Gnd to 3.5mm RTS socket.



NetGear Wireless-N 300 Modem router DGN2200



NetGear Wireless-N 300 Modem router DGN2200



NetGear Wireless-N 300 Modem router DGN2200

USB Type A to DB9 male (RS232) serial port.

Device: /dev/ttyUSB0

RS232: 0 (space) Asserted +3 to +15 V

RS232: 1 (mark) Deasserted -15 to -3 V

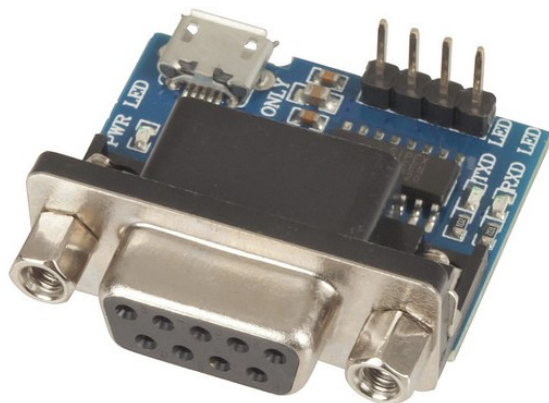
DB9 female (RS232) to Transistor-Transistor-Logic

TTL Tx: 0 to 0.5 = 0 and 2.7 to 5V = 1

TTL Rx: 0 to 0.8 = 0 and 2.0 to 5V = 1

Pins: Tx, Rx, +Vcc, Gnd

MicroUSB: Power if not using +Vcc



USB to RS232 DB9 male:

<https://www.pbtech.co.nz/product/ADPDNX0810/Unitek-BF-810Y-15M-USB-to-Serial-DB9-RS232-Cable-Y>

RS232 DB9 female to TTL Tx, Rx Gnd, Vcc

<https://www.jaycar.co.nz/rs-232-to-ttl-uart-converter-module/p/XC3724>

NetGear Wireless-N 300 Modem router DGN2200

How to install the OpenWrt firmware.

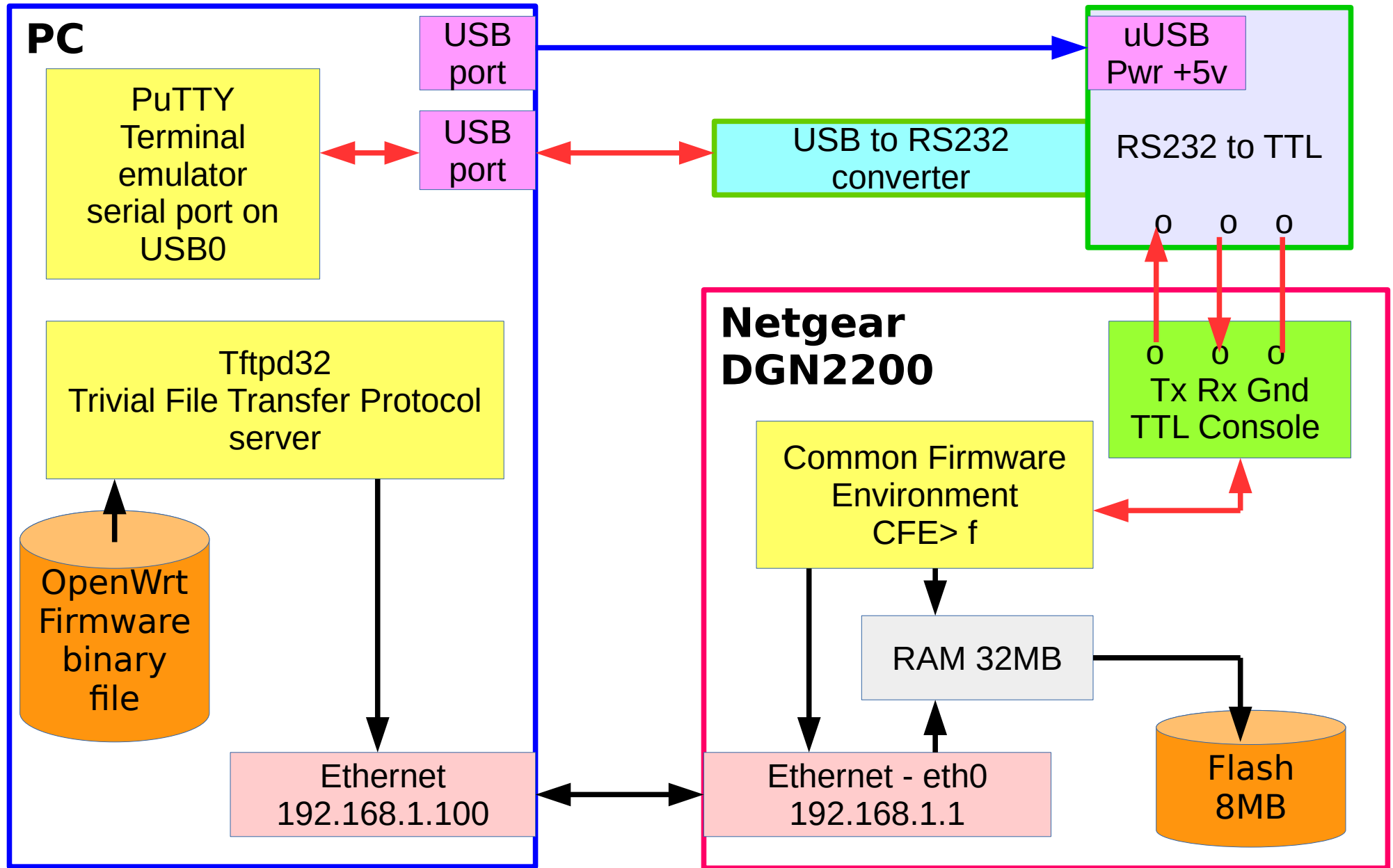
- Power on DGN2200 and press a key to enter into Common Firmware Environment. CFE> prompt.
- eth0 needs to have its gateway defined. With the command: CFE> ifconfig eth0 -gw=192.168.1.1
- CFE command *f* to download and flash the image. E.g. CFE> f 192.168.1.100:openwrt_firmware.bin

Firmware downloads...

Firmware written to flash...

DGN2200 reboots and comes up running OpenWrt.

DGN2200 - Installing OpenWrt firmware



USB to RS232 DB9 male:

<https://www.pbtech.co.nz/product/ADPDNX0810/Unitek-BF-810Y-15M-USB-to-Serial-DB9-RS232-Cable-Y>

RS232 DB9 female to TTL Tx, Rx Gnd, Vcc

<https://www.jaycar.co.nz/rs-232-to-ttl-uart-converter-module/p/XC3724>

DGN2200 – Booting Netgear firmware

DGN2200 Boot Code V1.0.6

CFE version 1.0.37-102.9 for BCM96358 (32bit,SP,BE)

Build Date: Fri Nov 6 12:05:36 CST 2009 (weal@svn)

Copyright (C) 2000-2009 Broadcom Corporation.

Parallel flash device: name AM29DL800B, id 0x22cb, size 8192KB

CPU type 0x2A010: 300MHz, Bus: 133MHz, Ref: 64MHz

CPU running TP0

Total memory: 33554432 bytes (32MB)

Boot Address 0xbe000000

Board IP address : 192.168.1.1:ffffff00

Host IP address : 192.168.1.100

Gateway IP address :

Run from flash/host (f/h) : f

Default host run file name : vmlinux

Default host flash file name : bcm963xx_fs_kernel

Boot delay (0-9 seconds) : 1

Board Id (0-5) : 96358VW

Number of MAC Addresses (1-32) : 11

Base MAC Address : a0:21:b7:74:1b:e6

PSI Size (1-64) KBytes : 48

Main Thread Number [0|1] : 0

*** Press any key to stop auto run (1 seconds) ***

Auto run second count down: 111

CFE>

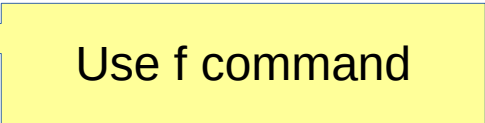
Key pressed on
keyboard.
CFE> prompt

DGN2200 – Common Firmware Environment

CFE> **help**

Available commands:

tftpd	Start TFTP server
sm	Set memory or registers.
dm	Dump memory or registers.
w	Write the whole image start from beginning of the flash
e	Erase [n]vram or [a]ll flash except bootrom
r	Run program from flash image or from host depend on [f/h] flag
p	Print boot line and board parameter info
c	Change bootline parameters
f	Write image to the flash
i	Erase persistent storage data
b	Change board parameters
reset	Reset the board
flashimage	Flashes a compressed image after the bootloader.
ifconfig	Configure the Ethernet interface
help	Obtain help for CFE commands



For more information about a command, enter 'help command-name'

*** command status = 0

CFE> **ifconfig**

Device eth0: hwaddr A0-21-B7-74-1B-E6, ipaddr 192.168.1.1, mask 255.255.255.0
gateway not set, nameserver not set

*** command status = 0

DGN2200 – Booting Netgear firmware

```
CFE> f 192.168.1.100:openwrt-18.06.2-brcm63xx-smp-96358VW-generic-  
squashfs-cfe.bin
```

```
Loading 192.168.1.100:openwrt-18.06.2-brcm63xx-smp-96358VW-generic-  
squashfs-cfe.bin ...
```

```
Loading failed.: CFE error -21
```

```
*** command status = -21
```

```
CFE> ifconfig eth0 -gw=192.168.1.1
```

```
Device eth0: hwaddr A0-21-B7-74-1B-E6, ipaddr 192.168.1.1, mask 255.255.  
gateway 192.168.1.1, nameserver not set
```

```
*** command status = 0
```

```
CFE> f 192.168.1.100:openwrt-18.06.2-brcm63xx-smp-96358VW-generic-  
squashfs-cfe.bin
```

```
Loading 192.168.1.100:openwrt-18.06.2-brcm63xx-smp-96358VW-generic-  
squashfs-cfe.bin ...
```

```
Finished loading 3211268 bytes
```

```
Flashing root file system and kernel at
```

```
0xbe010000: .....
```

```
.
```

```
*** Image flash done *** !
```

```
Resetting board...
```


DGN2200 – Booting Netgear/Broadcom CFE

Resetting board...

GN2200 Boot Code V1.0.6

CFE version 1.0.37-102.9 for BCM96358 (32bit,SP,BE)

Build Date: Fri Nov 6 12:05:36 CST 2009 (weal@svn)

Copyright (C) 2000-2009 Broadcom Corporation.

Parallel flash device: name AM29DL800B, id 0x22cb, size 8192KB

CPU type 0x2A010: 300MHz, Bus: 133MHz, Ref: 64MHz

CPU running TP0

Total memory: 33554432 bytes (32MB)

Boot Address 0xbe000000

Board IP address : 192.168.1.1:ffffffff00

Host IP address : 192.168.1.100

Gateway IP address :

Run from flash/host (f/h) : f

Default host run file name : vmlinux

Default host flash file name : bcm963xx_fs_kernel

Boot delay (0-9 seconds) : 1

Board Id (0-5) : 96358VW

Number of MAC Addresses (1-32) : 11

Base MAC Address : a0:21:b7:74:1b:e6

PSI Size (1-64) KBytes : 48

Main Thread Number [0|1] : 0

DGN2200 – Booting OpenWrt Linux 4.9.152

*** Press any key to stop auto run (1 seconds) ***

Do not press
keyboard key.
Continues to boot

Auto run second count down: 110

Booting from only image (0xbe010000) ...

Code Address: 0x80A00000, Entry Address: 0x80a00000

LZMA: Prossible old LZMA format, trying to decompress..

Decompression OK!

Entry at 0x80a00000

Closing network.

Closing DMA Channels.

Starting program at 0x80a00000

[0.000000] Linux version 4.9.152 (buildbot@7befac494a11) (gcc version

(OpenWrt GCC 7.3.0 r7676-cddd7b4c77)) #0 SMP Wed Jan 30 12:21:02 2019

[0.000000] Detected Broadcom 0x6358 CPU revision a1

[0.000000] CPU frequency is 300 MHz

[0.000000] 32MB of RAM installed

[0.000000] board_bcm963xx: Boot address 0xbe000000

[0.000000] board_bcm963xx: CFE version: 1.0.37-102.9

[0.000000] bootconsole [early0] enabled

[0.000000] CPU0 revision is: 0002a010 (Broadcom BMIPS4350)

[0.000000] board: board name: 96358VW

[0.000000] MIPS: machine is Broadcom BCM96358VW reference board

[0.000000] Determined physical RAM map:

[0.000000] memory: 02000000 @ 00000000 (usable)

[0.000000] Initrd not found or empty - disabling initrd

[0.000000] Primary instruction cache 32kB, VIPT, 2-way, linesize 16

[0.000000] Primary data cache 16kB, 2-way, VIPT, cache aliases, line

DGN2200 - Booted OpenWrt 18.06.2

```
[ 42.780495] jffs2_build_filesystem(): erasing all blocks after the er
[ 53.424307] random: crng init done
[ 53.427782] random: 2 urandom warning(s) missed due to ratelimiting
```

Booting has finished.
Pressed Enter key

```
BusyBox v1.28.4 () built-in shell (ash)
```

```

|_| .----- .----- .----- .----- .----- .----- .----- .-----
|_| - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
|_| _| W I R E L E S S F R E E D O M
```

```
-----
OpenWrt 18.06.2, r7676-cddd7b4c77
-----
```

```
=== WARNING! =====
```

```
There is no root password defined on this device!
Use the "passwd" command to set up a new password
in order to prevent unauthorized SSH logins.
```

```
-----
root@OpenWrt:/#
```

/#
At top of the tree

DGN2200 - OpenWrt 1/2

```
root@OpenWrt:/# & <tab> <tab>
```

[grep	mkswap	sleep
[[gunzip	mktemp	sort
ash	gzip	modinfo	ssh
askfirst	halt	modprobe	start-stop-daemon
awk	head	mount	strings
basename	hexdump	mount_root	swconfig
board_detect	hotplug-call	mtd	switch_root
brctl	hwclock	mv	sync
bunzip2	id	nc	sysctl
busybox	ifconfig	netifd	sysupgrade
bzcat	ifdown	netmsg	tail
cat	ifstatus	netstat	tar
chgrp	ifup	nice	tee
chmod	init	nslookup	test
chown	insmod	ntpd	time
chroot	ip	ntpd-hotplug	top
clear	ip6tables	odhcp6c	touch
cmp	ip6tables-restore	odhcpd	tr
config_generate	ip6tables-save	odhcpd-update	traceroute
cp	ipcalc.sh	opkg	traceroute6
crond	iptables	opkg-key	true
crontab	iptables-restore	passwd	ubus
cut	iptables-save	pgrep	ubusd

...continues on next slide...

DGN2200 – OpenWrt 2/2

date	jffs2mark	pidof	uci
dbclient	jffs2reset	ping	uclient-fetch
dd	jshn	ping6	udevtrigger
devstatus	jsonfilter	pivot_root	udhcpd
df	kill	poweroff	uhttpd
dirname	killall	pppd	umount
dmesg	kmodloader	printf	uname
dnsmasq	ldd	procd	uniq
dropbear	led.sh	ps	upgraded
dropbearkey	less	pwd	uptime
du	ln	readlink	urandom_seed
echo	lock	reboot	usign
egrep	logd	reload_config	validate_data
env	logger	reset	vi
expr	login	rm	wc
false	logread	rmdir	wget
fgrep	ls	rmmod	which
find	lsmod	route	wifi
firstboot	lua	rpcd	xargs
flock	luci-bwc	scp	xtables-multi
free	luci-reload	sed	yes
fsync	md5sum	seq	zcat
fw3	mkdir	sh	
fwtool	mkfifo	sha256sum	
getrandom	mknod	signify	

DGN2200 - OpenWrt directory structure

```
root@OpenWrt:/# ls
```

```
bin      etc      mnt      proc     root     sys      usr      www
dev      lib      overlay  rom      sbin     tmp      var
```

DGN2200 – GUI web-based administration

Connect via ethernet address: 192.168.1.1

OpenWrt - LuCI - Mozilla Firefox

File Edit View History Bookmarks Tools Help

OpenWrt - LuCI

192.168.1.1/cgi-bin/luci

OpenWrt

No password set!

There is no password set on this router. Please configure a root password to protect the web interface and enable SSH.

[Go to password configuration...](#)

Authorization Required

Please enter your username and password.

Username

Password

[Login](#) [Reset](#)

Powered by LuCI openwrt-18.06 branch (git-19.020.41695-6f6641d) / OpenWrt 18.06.2 r7676-cddd7b4c77

DGN2200 - GUI web-based administration

OpenWrt - Overview - LuCI - Mozilla Firefox

File Edit View History Bookmarks Tools Help

OpenWrt - Overview - LuCI

192.168.1.1/cgi-bin/luci/

OpenWrt Status System Network Logout

AUTO REFRESH ON

No password set!

There is no password set on this router. Please configure a root password to protect the web interface and enable SSH.

[Go to password configuration...](#)

Status

System

Hostname	OpenWrt
Model	Broadcom BCM96358VW reference board
Architecture	bcm63xx/96358VW (0x6358/0xA1)
Firmware Version	OpenWrt 18.06.2 r7676-cddd7b4c77 / LuCI openwrt-18.06 branch (git-19.020.41695-6f6641d)
Kernel Version	4.9.152
Local Time	Wed Jan 30 12:24:23 2019
Uptime	0h 1m 56s
Load Average	0.46, 0.25, 0.10

DGN2200 - SSH

```
ian@X200:~$ ssh 192.168.1.1
```

```
@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@
```

```
@  WARNING: REMOTE HOST IDENTIFICATION HAS CHANGED!  @
```

```
@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@
```

```
IT IS POSSIBLE THAT SOMEONE IS DOING SOMETHING NASTY!
```

```
Someone could be eavesdropping on you right now (man-in-the-middle attack)!
```

```
It is also possible that a host key has just been changed.
```

```
The fingerprint for the RSA key sent by the remote host is
```

```
SHA256:JOdX4tbN5/ttneNFo4/qSoXhQ4qSSBgAmHaSLYfb1js.
```

```
Please contact your system administrator.
```

```
Add correct host key in /home/ian/.ssh/known_hosts to get rid of this message.
```

```
Offending RSA key in /home/ian/.ssh/known_hosts:1
```

```
remove with:
```

```
ssh-keygen -f "/home/ian/.ssh/known_hosts" -R 192.168.1.1
```

```
RSA host key for 192.168.1.1 has changed and you have requested strict checking.
```

```
Host key verification failed.
```

```
ian@X200:~$ ssh-keygen -f "/home/ian/.ssh/known_hosts" -R 192.168.1.1
```

```
# Host 192.168.1.1 found: line 1
```

```
/home/ian/.ssh/known_hosts updated.
```

```
Original contents retained as /home/ian/.ssh/known_hosts.old
```

```
ian@X200:~$ ssh 192.168.1.1
```

```
The authenticity of host '192.168.1.1 (192.168.1.1)' can't be established.
```

```
RSA key fingerprint is SHA256:JOdX4tbN5/ttneNFo4/qSoXhQ4qSSBgAmHaSLYfb1js.
```

```
Are you sure you want to continue connecting (yes/no)? yes
```

```
Warning: Permanently added '192.168.1.1' (RSA) to the list of known hosts.
```

```
ian@192.168.1.1's password:
```

DGN2200 – SSH account root

Permission denied, please try again.

ian@192.168.1.1's password:

Permission denied, please try again.

ian@192.168.1.1's password:

Authentication failed.

```
ian@X200:~$
```

```
ian@X200:~$ ssh root@192.168.1.1
```

```
BusyBox v1.28.4 () built-in shell (ash)
```

OpenWrt 18.06.2, r7676-cddd7b4c77

=== WARNING! =====

There is no root password defined on this device!

Use the "passwd" command to set up a new password

in order to prevent unauthorized SSH logins.

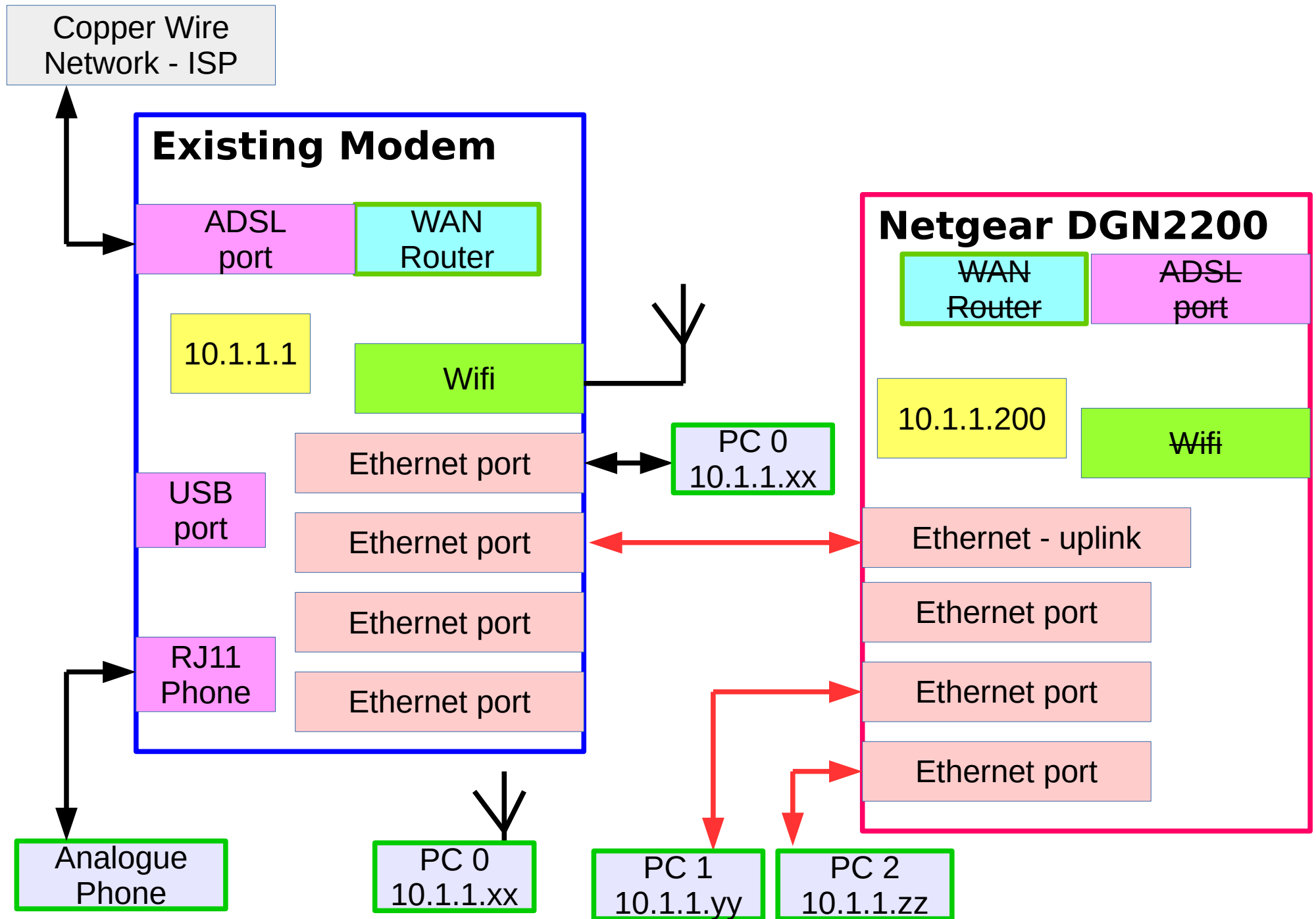
```
root@OpenWrt:~#
```

DGN2200 – OpenWrt Functionality

Default action

- Any ethernet port will act as an uplink to another router.
- That port will be dhcp server by the other router and given an IP address. E.g 10.1.1.10
- PC's plugged into other ports will be served by the other router DHCP addresses.
- No longer able to connect in via 192.168.1.1 using browser or ssh
- i.e. Unable to manage via ssh
- Try setting to 10.1.1.200 and see if I can connect when already assigned to a 10.1.1.x address
- Set gateway to 10.1.1.1 and DNS to 8.8.8.8
- Installed Python. Used up most of the free memory.

DGN2200 - OpenWrt functionality



DGN2200 - Up-link to 10.1.1.1 router

Setting DGN2200 from 192.168.1.1 to 10.1.1.200

OpenWrt - Interfaces - LuCI - Mozilla Firefox

File Edit View History Bookmarks Tools Help

Logout

192.168.1.1/cgi-bin/luci/admin/network/network/lan

OpenWrt Status System Network Logout

UNSAVED CHANGES: 2 AUTO REFRESH OFF

WAN

Device unreachable!

Could not regain access to the device after applying the configuration changes. You might need to reconnect if you modified network related settings such as the IP address or wireless security credentials.

Interface

On this page you can configure the network interfaces. You can bridge several interfaces by ticking the "bridge interfaces" field and enter the names of several network interfaces separated by spaces. You can also use VLAN notation `INTERFACE.VLANNR` (e.g.: `eth0.1`).

Common Configuration

General Setup Advanced Settings Physical Settings Firewall Settings

Status

Device: br-lan
Uptime: 0h 7m 26s
MAC: A0:21:B7:74:1B:E7
RX: 233.43 KB (2758 Pkts.)
TX: 523.21 KB (1685 Pkts.)
IPv4: 192.168.1.1/24
IPv6: fd59:2888:b145::1/60

Protocol: Static address

IPv4 address: 10.1.1.200

IPv4 netmask: 255.255.255.0

Was: 192.168.1.1

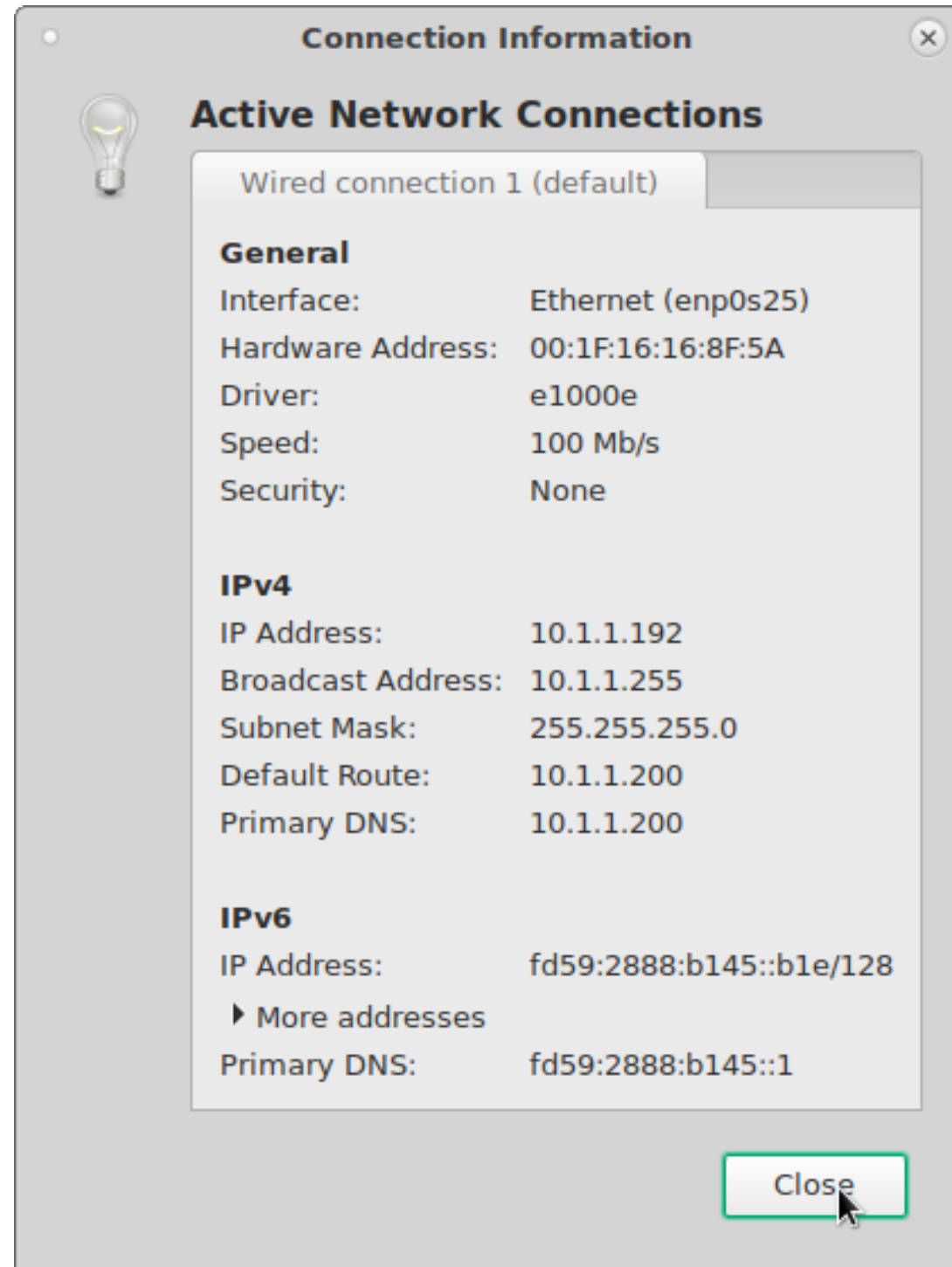
Change to: 10.1.1.200
Up-link router is 10.1.1.1

PC – Access to DNG2200 administration

DHCP served by up-link
router 10.1.1.192

Have access to internet.

Enter 10.1.1.200 in
browser and can connect
to DNG2200 for
administration.



DGN2200 – GUI Access to administration

View Interfaces, etc.

The screenshot shows a web browser window titled "OpenWrt - Interfaces - LuCI - Mozilla Firefox". The address bar displays "10.1.1.200/cgi-bin/luci/admin/network/network". The page header includes "OpenWrt" and navigation links for "Status", "System", "Network", and "Logout". A green "AUTO REFRESH ON" button is in the top right. Below the header, there are tabs for "WAN", "WAN6", and "LAN", with "LAN" currently selected. The main section is titled "Interfaces" and lists three network interfaces:

Interface	Protocol	Uptime	MAC	RX	TX	IPv4	IPv6	Buttons
LAN br-lan	Static address	0h 2m 40s	A0:21:B7:74:1B:E7	133.58 KB (1633 Pkts.)	261.54 KB (1437 Pkts.)	10.1.1.200/24	fd59:2888:b145::1/60	Restart Stop Edit Delete
WAN eth0	DHCP client		A0:21:B7:74:1B:E6	0 B (0 Pkts.)	0 B (0 Pkts.)			Restart Stop Edit Delete
WAN6 eth0	DHCPv6 client		A0:21:B7:74:1B:E6	0 B (0 Pkts.)	0 B (0 Pkts.)			Restart Stop Edit Delete

At the bottom of the interface list, there is a green button labeled "Add new interface...". Below this, the section "Global network options" is partially visible.

DGN2200 – GUI Access to administration

Flash Memory available for additional software
Packages Installed...

The screenshot shows the OpenWrt LuCI web interface in a Mozilla Firefox browser window. The browser's address bar displays the URL `192.168.1.1/cgi-bin/luci/admin/system/packages?display=installed&query=`. The interface has a dark header bar with the 'OpenWrt' logo and navigation links for 'Status', 'System', 'Network', and 'Logout'. Below the header, the 'Software' section is active, with tabs for 'Actions' and 'Configuration'. It shows a message 'No package lists available' with an 'Update lists' button. A progress bar indicates 'Free space: 94% (4.53 MB)'. There are input fields for 'Download and install package:' and 'Filter:', each with an associated button ('OK' and 'Find package' respectively). The 'Status' section has tabs for 'Available packages' and 'Installed packages'. The 'Installed packages' tab is selected, showing a table with two rows: 'base-files' (version 194.2-r7676-cddd7b4c77) and 'busybox' (version 1.28.4-2). Each row has a 'Remove' button to its right.

OpenWrt - Software - LuCI - Mozilla Firefox

File Edit View History Bookmarks Tools Help

OpenWrt - Software - LuCI

192.168.1.1/cgi-bin/luci/admin/system/packages?display=installed&query=

OpenWrt Status System Network Logout

Software

Actions Configuration

No package lists available [Update lists](#)

Free space: 94% (4.53 MB)

Download and install package: [OK](#)

Filter: [Find package](#)

Status

Available packages Installed packages

Package name	Version	
base-files	194.2-r7676-cddd7b4c77	Remove
busybox	1.28.4-2	Remove

SSH root@10.1.1.200

```
root@10.1.1.200's password:
```

```
BusyBox v1.28.4 () built-in shell (ash)
```

OpenWrt 18.06.2, r7676-cddd7b4c77

```
root@OpenWrt:~#
```

DGN2200 – Access to administration

SSH

```
root@OpenWrt:~# pwd
/root
```

```
root@OpenWrt:~# cd ..
```

```
root@OpenWrt:/# ls
```

bin	etc	mnt	proc	root	sys	usr	www
dev	lib	overlay	rom	sbin	tmp	var	

```
root@OpenWrt:/# cat /etc/openwrt_release
```

```
DISTRIB_ID='OpenWrt'
```

```
DISTRIB_RELEASE='18.06.2'
```

```
DISTRIB_REVISION='r7676-cddd7b4c77'
```

```
DISTRIB_TARGET='brcm63xx/smp'
```

```
DISTRIB_ARCH='mips_mips32'
```

```
DISTRIB_DESCRIPTION='OpenWrt 18.06.2 r7676-cddd7b4c77'
```

```
DISTRIB_TAINTS=' '
```

```
root@OpenWrt:/# cat /etc/openwrt_version
```

```
r7676-cddd7b4c77
```

DGN2200 – Access to administration

root@OpenWrt:/# opkg list-installed ~ Total of 80

base-files	kmod-nf-ipt	liblucihttp-lua	luci-theme-bootstrap
busybox	kmod-nf-ipt6	libnl-tiny	mtdd
dnsmasq	kmod-nf-nat	libpthread	netifd
dropbear	kmod-nf-reject	libubox	odhcp6c
firewall	kmod-nf-reject6	libubus	odhcpd-ipv6only
fstools	kmod-ppp	libubus-lua	openwrt-keyring
fwtool	kmod-pppoe	libuci	opkg
ip6tables	kmod-pppox	libuclient	ppp
iptables	kmod-slhcc	libxtables	ppp-mod-pppoe
jshn	libblobmsg-json	logd	procd
jsonfilter	libc	lua	rpcd
kernel	libgcc	luci	rpcd-mod-rrdns
kmod-gpio-button-hotplug	libip4tc	luci-app-firewall	swconfig
kmod-ip6tables	libip6tc	luci-base	ubox
kmod-ipt-contrack	libiwinfo	luci-lib-ip	ubus
kmod-ipt-core	libiwinfo-lua	luci-lib-jsonc	ubusd
kmod-ipt-nat	libjson-c	luci-lib-nixio	uci
kmod-lib-crc-ccitt	libjson-script	luci-mod-admin-full	uclient-fetch
kmod-nf-contrack	liblua	luci-proto-ipv6	uhttpd
kmod-nf-contrack6	liblucihttp	luci-proto-ppp	usign

DGN2200 – Adding Packages

OpenWrt web-site for mips architecture compiled packages...

https://downloads.openwrt.org/releases/18.06.2/packages/mips_mips32/

DGN2200 – Adding Packages

Use GUI to Update Package Lists

OpenWrt Status ▾ System ▾ Network ▾ Logout

Software

Actions

Configuration

No package lists available

Update lists

Free space: 94% (4.53 MB)



Fails...

OpenWrt Status ▾ System ▾ Network ▾ Logout

Software

Actions

Configuration

Downloading <http://downloads.openwrt.org/releases/18.06.2/targets/brcm63xx/smp/packages/Packages.gz>

*** Failed to download the package list from <http://downloads.openwrt.org/releases/18.06.2/targets/brcm63xx/smp/packages/Packages.gz>

Downloading http://downloads.openwrt.org/releases/18.06.2/packages/mips_mips32/base/Packages.gz

*** Failed to download the package list from http://downloads.openwrt.org/releases/18.06.2/packages/mips_mips32/base/Packages.gz

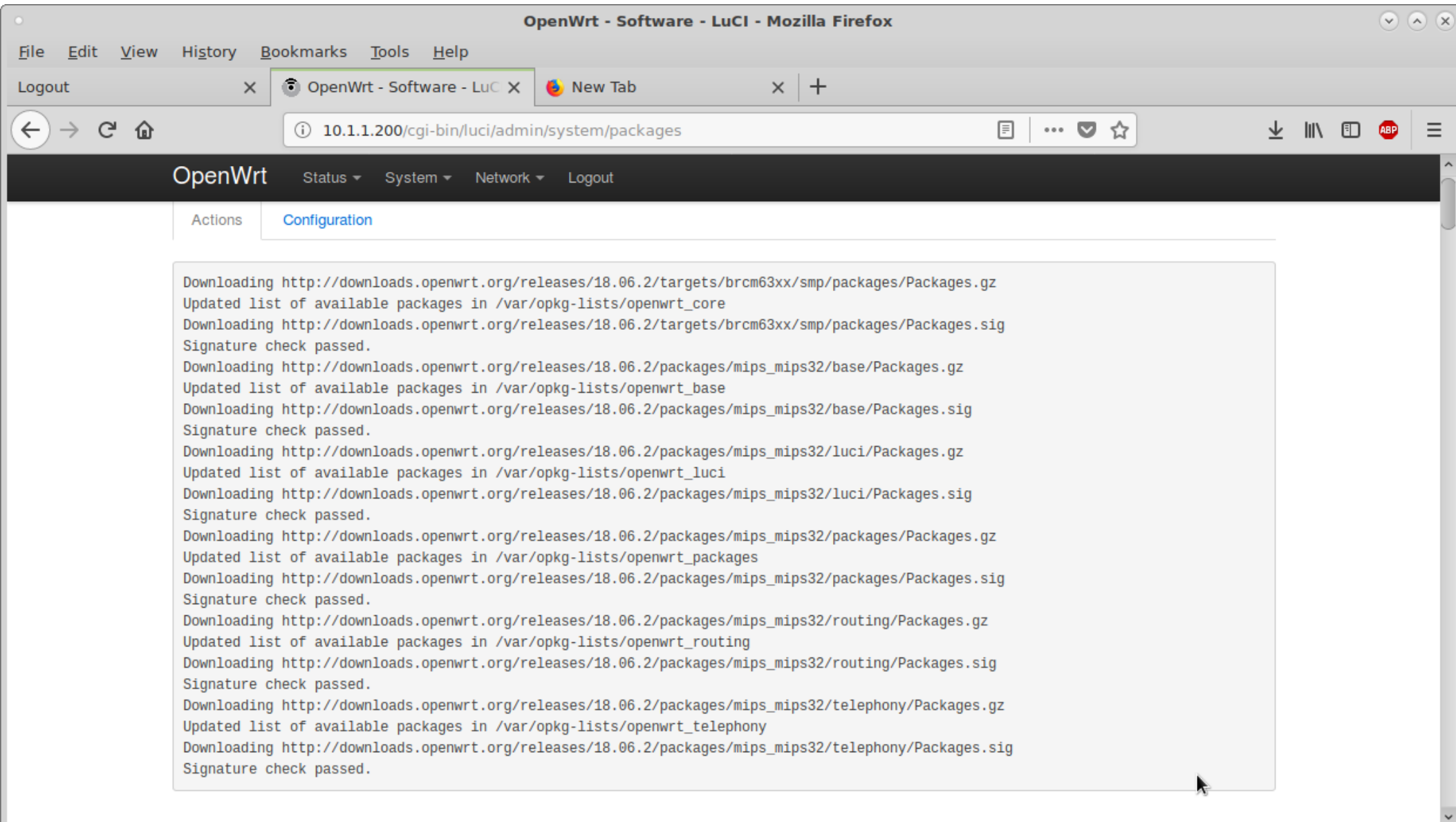
Downloading http://downloads.openwrt.org/releases/18.06.2/packages/mips_mips32/luci/Packages.gz

*** Failed to download the package list from http://downloads.openwrt.org/releases/18.06.2/packages/mips_mips32/luci/Packages.gz

Downloading http://downloads.openwrt.org/releases/18.06.2/packages/mips_mips32/packages/Packages.gz

DGN2200 – Adding Packages

Set DGN2200 to have Gateway of 10.1.1.1.
Now able to download the package lists...



OpenWrt - Software - LuCI - Mozilla Firefox

File Edit View History Bookmarks Tools Help

Logout x OpenWrt - Software - LuCI x New Tab x +

10.1.1.200/cgi-bin/luci/admin/system/packages

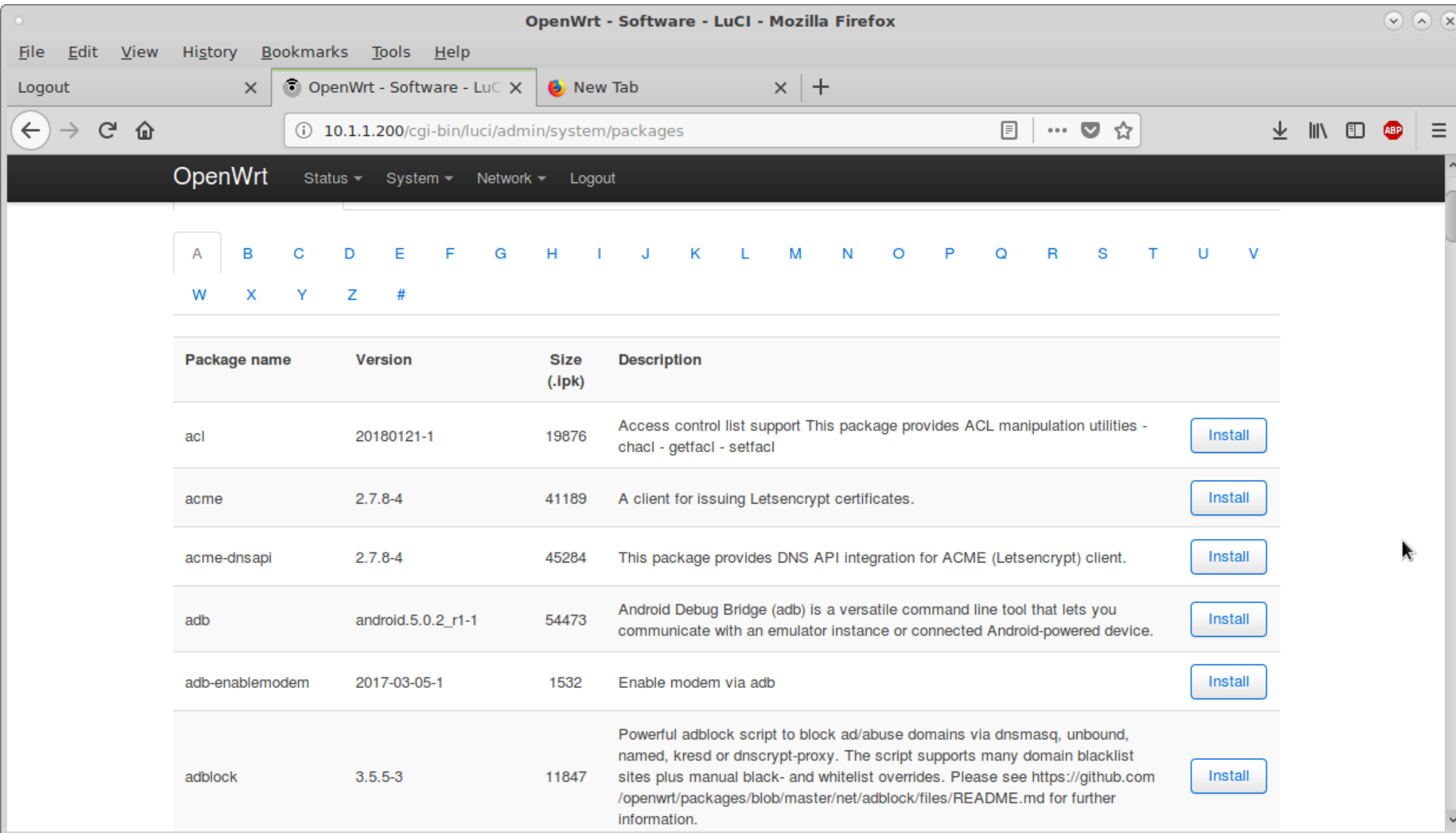
OpenWrt Status System Network Logout

Actions Configuration

```
Downloading http://downloads.openwrt.org/releases/18.06.2/targets/brcm63xx/smp/packages/Packages.gz
Updated list of available packages in /var/opkg-lists/openwrt_core
Downloading http://downloads.openwrt.org/releases/18.06.2/targets/brcm63xx/smp/packages/Packages.sig
Signature check passed.
Downloading http://downloads.openwrt.org/releases/18.06.2/packages/mips_mips32/base/Packages.gz
Updated list of available packages in /var/opkg-lists/openwrt_base
Downloading http://downloads.openwrt.org/releases/18.06.2/packages/mips_mips32/base/Packages.sig
Signature check passed.
Downloading http://downloads.openwrt.org/releases/18.06.2/packages/mips_mips32/luci/Packages.gz
Updated list of available packages in /var/opkg-lists/openwrt_luci
Downloading http://downloads.openwrt.org/releases/18.06.2/packages/mips_mips32/luci/Packages.sig
Signature check passed.
Downloading http://downloads.openwrt.org/releases/18.06.2/packages/mips_mips32/packages/Packages.gz
Updated list of available packages in /var/opkg-lists/openwrt_packages
Downloading http://downloads.openwrt.org/releases/18.06.2/packages/mips_mips32/packages/Packages.sig
Signature check passed.
Downloading http://downloads.openwrt.org/releases/18.06.2/packages/mips_mips32/routing/Packages.gz
Updated list of available packages in /var/opkg-lists/openwrt_routing
Downloading http://downloads.openwrt.org/releases/18.06.2/packages/mips_mips32/routing/Packages.sig
Signature check passed.
Downloading http://downloads.openwrt.org/releases/18.06.2/packages/mips_mips32/telephony/Packages.gz
Updated list of available packages in /var/opkg-lists/openwrt_telephony
Downloading http://downloads.openwrt.org/releases/18.06.2/packages/mips_mips32/telephony/Packages.sig
Signature check passed.
```


DGN2200 – Adding Packages

List of packages starting with “A”



The screenshot shows the OpenWrt LuCI web interface in a Mozilla Firefox browser. The browser's address bar displays the URL `10.1.1.200/cgi-bin/luci/admin/system/packages`. The interface features a navigation bar with the OpenWrt logo and links for Status, System, Network, and Logout. Below this, a tabbed interface allows filtering packages by letter, with 'A' currently selected. The main content area displays a table of packages starting with 'A', including their names, versions, sizes, and descriptions, with an 'Install' button for each.

Package name	Version	Size (.ipk)	Description	Install
acl	20180121-1	19876	Access control list support This package provides ACL manipulation utilities - chacl - getfacl - setfacl	Install
acme	2.7.8-4	41189	A client for issuing Letsencrypt certificates.	Install
acme-dnsapi	2.7.8-4	45284	This package provides DNS API integration for ACME (Letsencrypt) client.	Install
adb	android.5.0.2_r1-1	54473	Android Debug Bridge (adb) is a versatile command line tool that lets you communicate with an emulator instance or connected Android-powered device.	Install
adb-enablemodem	2017-03-05-1	1532	Enable modem via adb	Install
adblock	3.5.5-3	11847	Powerful adblock script to block ad/abuse domains via dnsmasq, unbound, named, kresd or dnscrypt-proxy. The script supports many domain blacklist sites plus manual black- and whitelist overrides. Please see https://github.com/openwrt/packages/blob/master/net/adblock/files/README.md for further information.	Install

DGN2200 – Adding Packages

Install python3 package

The screenshot shows the OpenWrt LuCI web interface in a Mozilla Firefox browser. The browser's address bar displays the URL `10.1.1.200/cgi-bin/luci/admin/system/packages?display=available&letter=P`. The interface features a top navigation bar with links for Logout, Status, System, Network, and Logout. Below this, a table lists available software packages. The 'python3' package is highlighted, and its 'Install' button is being clicked by a mouse cursor.

Package Name	Version	Size	Description	Action
python3	3.6.5-3	1019	This package contains the (almost) full Python install. It's python3-light + all other packages.	Install
python3-asn1crypto	0.23.0-1	123388	Fast ASN.1 parser and serializer with definitions for private keys, public keys, certificates, CRL, OCSP, CMS, PKCS#3, PKCS#7, PKCS#8, PKCS#12, PKCS#5, X.509 and TSP . (Variant for Python3)	Install
python3-asyncio	3.6.5-3	124985	Python 3.6 asyncio module	Install
python3-asyncio-src	3.6.5-3	89874	. (Contains the Python3 sources for this package).	Install
python3-attrs	18.1.0-1	31649	attrs is an MIT-licensed Python package with class decorators that ease the chores of implementing the most common attribute-related object protocols. . (Variant for Python3)	Install
python3-attrs-src	18.1.0-1	20536	attrs is an MIT-licensed Python package with class decorators that ease the chores of implementing the most common attribute-related object protocols. . (Variant for Python3). (Contains the Python3 sources for this package).	Install

DGN2200 – Adding Packages

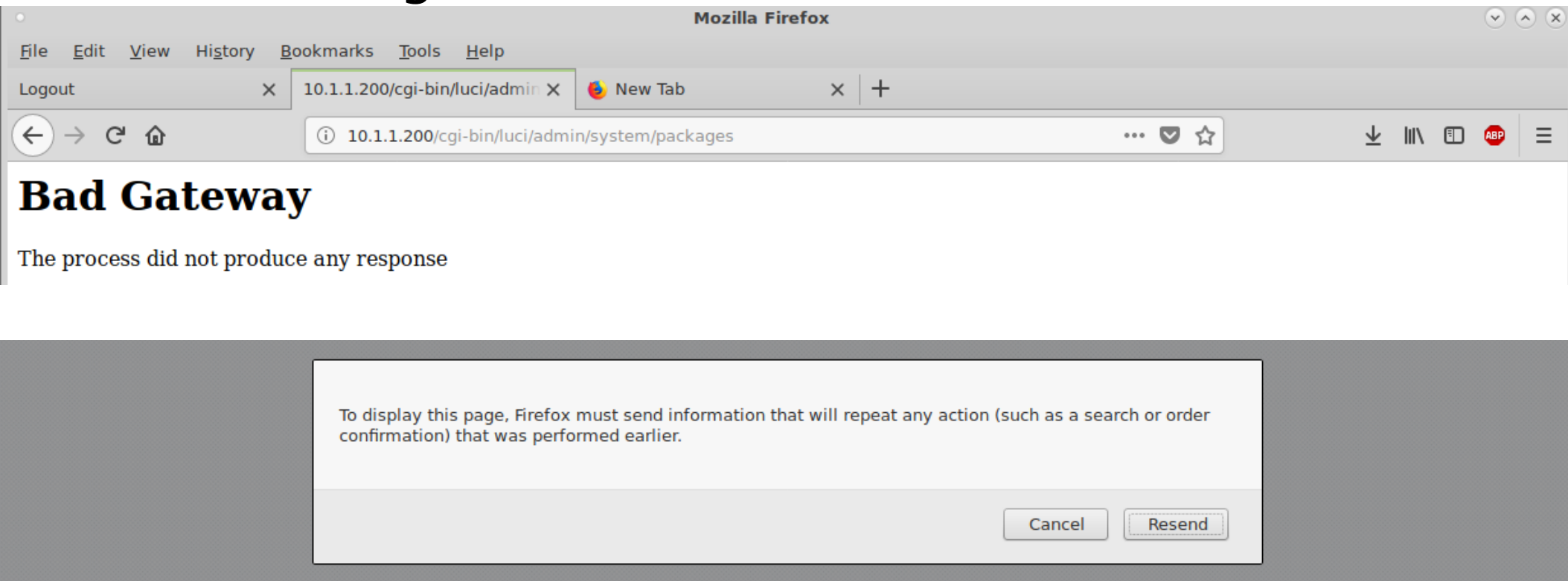
Confirm Python3 install

The screenshot shows the OpenWrt LuCI web interface in a Mozilla Firefox browser. The browser's address bar displays the URL `10.1.1.200/cgi-bin/luci/admin/system/packages?display=available&letter=P`. The interface features a top navigation bar with links for 'Logout', 'Status', 'System', 'Network', and 'Logout'. Below this, a table lists available packages. A modal dialog box is centered on the screen, asking 'Install "python3" ?' with 'Cancel' and 'OK' buttons. The 'OK' button is being clicked by the mouse.

Package Name	Version	Size	Description	Action
python3	3.6.5-3	124985	Python 3.6 asyncio module	Install
python3-attrs	18.1.0-1	31649	attrs is an MIT-licensed Python package with class decorators that ease the chores of implementing the most common attribute-related object protocols. (Variant for Python3)	Install
python3-attrs-src	18.1.0-1	20536	attrs is an MIT-licensed Python package with class decorators that ease the chores of implementing the most common attribute-related object protocols. (Variant for Python3). (Contains the Python3 sources for this package).	Install
python3-asyncio	3.6.5-3	89874	. (Contains the Python3 sources for this package).	Install
python3-asyncio-src	3.6.5-3	89874	. (Contains the Python3 sources for this package).	Install
python3-asn1crypto	0.23.0-1	124985	definitions for private keys, public PKCS#3, PKCS#7, PKCS#8, PKCS#12, PKCS#5, X.509 and TSP. (Variant for Python3)	Install
python3-zope-interface	4.5.0-1	80749	This package provides an implementation of "object interfaces" for Python. Interfaces are a mechanism for labeling objects as conforming to a given API	Install
python3-zope-interface-src	4.5.0-1	43	Interfaces are a mechanism for labeling objects as conforming to a given API	Install

DGN2200 – Adding Packages

Some minor glitches...



More ooops...

Software

Actions

Configuration

Collected errors:

* `opkg_conf_load`: Could not lock `/var/lock/opkg.lock`: Resource temporarily unavailable.

Free space: 64% (3.07 MB)



DGN2200 – Adding Packages

Running out of space installing python3...



Software

Actions

Configuration

Free space: 4% (220.00 KB)



Download and install package:

OK

Filter:

Find package

Status

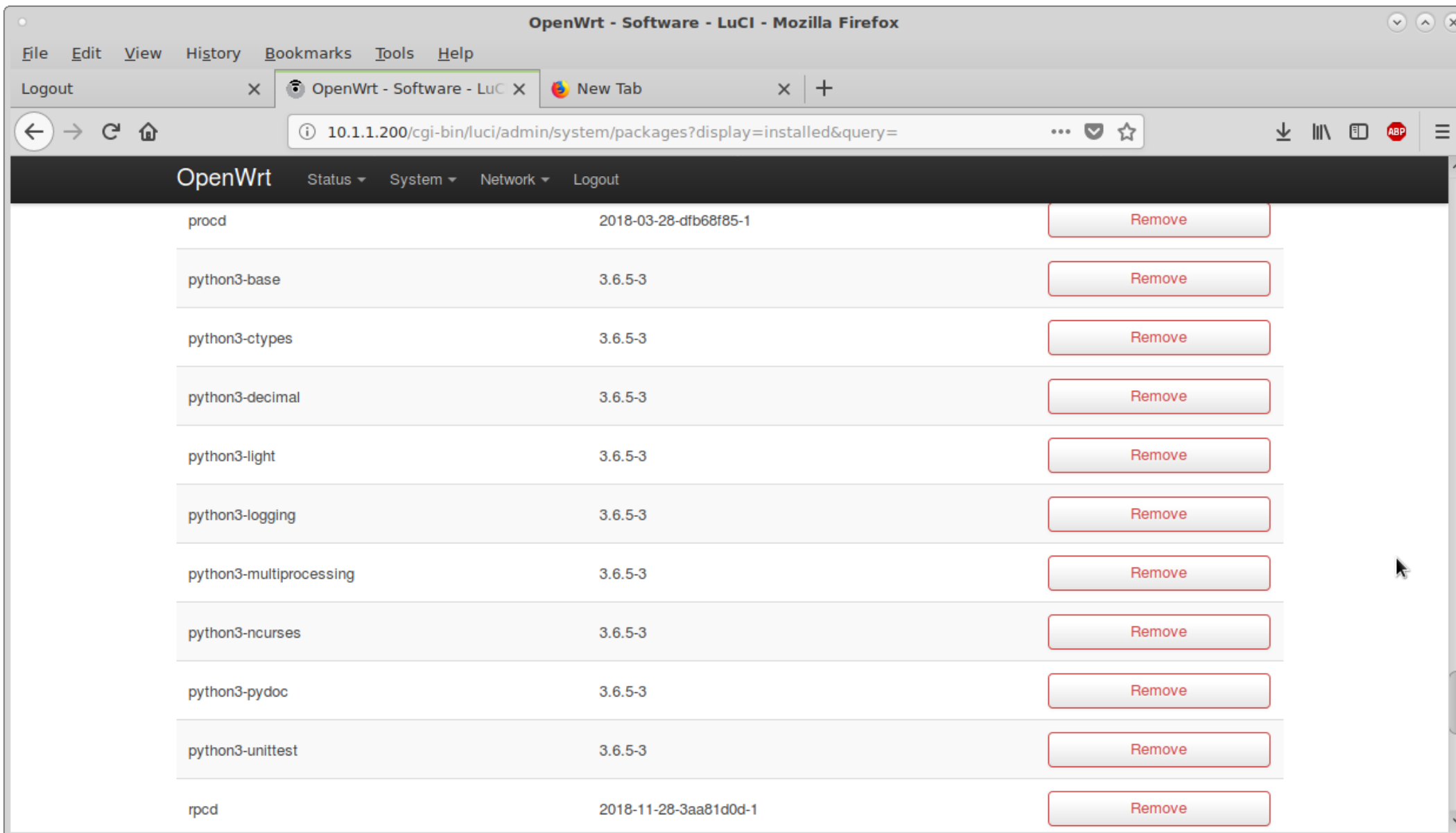
Available packages

Installed packages

Package name	Version	
base-files	194.2-r7676-cddd7b4c77	Remove
busybox	1.28.4-2	Remove
dnsmasq	2.80-1.2	Remove

DGN2200 – Adding Packages

9 x Python3 packages now installed...



The screenshot shows the OpenWrt LuCI web interface in a Mozilla Firefox browser window. The browser's address bar displays the URL `10.1.1.200/cgi-bin/luci/admin/system/packages?display=installed&query=`. The interface features a top navigation bar with the 'OpenWrt' logo and links for 'Status', 'System', 'Network', and 'Logout'. Below this, a table lists installed packages. Each row contains the package name, its version, and a 'Remove' button. The packages listed are:

Package Name	Version	Action
procd	2018-03-28-dfb68f85-1	Remove
python3-base	3.6.5-3	Remove
python3-ctypes	3.6.5-3	Remove
python3-decimal	3.6.5-3	Remove
python3-light	3.6.5-3	Remove
python3-logging	3.6.5-3	Remove
python3-multiprocessing	3.6.5-3	Remove
python3-ncurses	3.6.5-3	Remove
python3-pydoc	3.6.5-3	Remove
python3-unittest	3.6.5-3	Remove
rpcd	2018-11-28-3aa81d0d-1	Remove

DGN2200 - Remove Packages

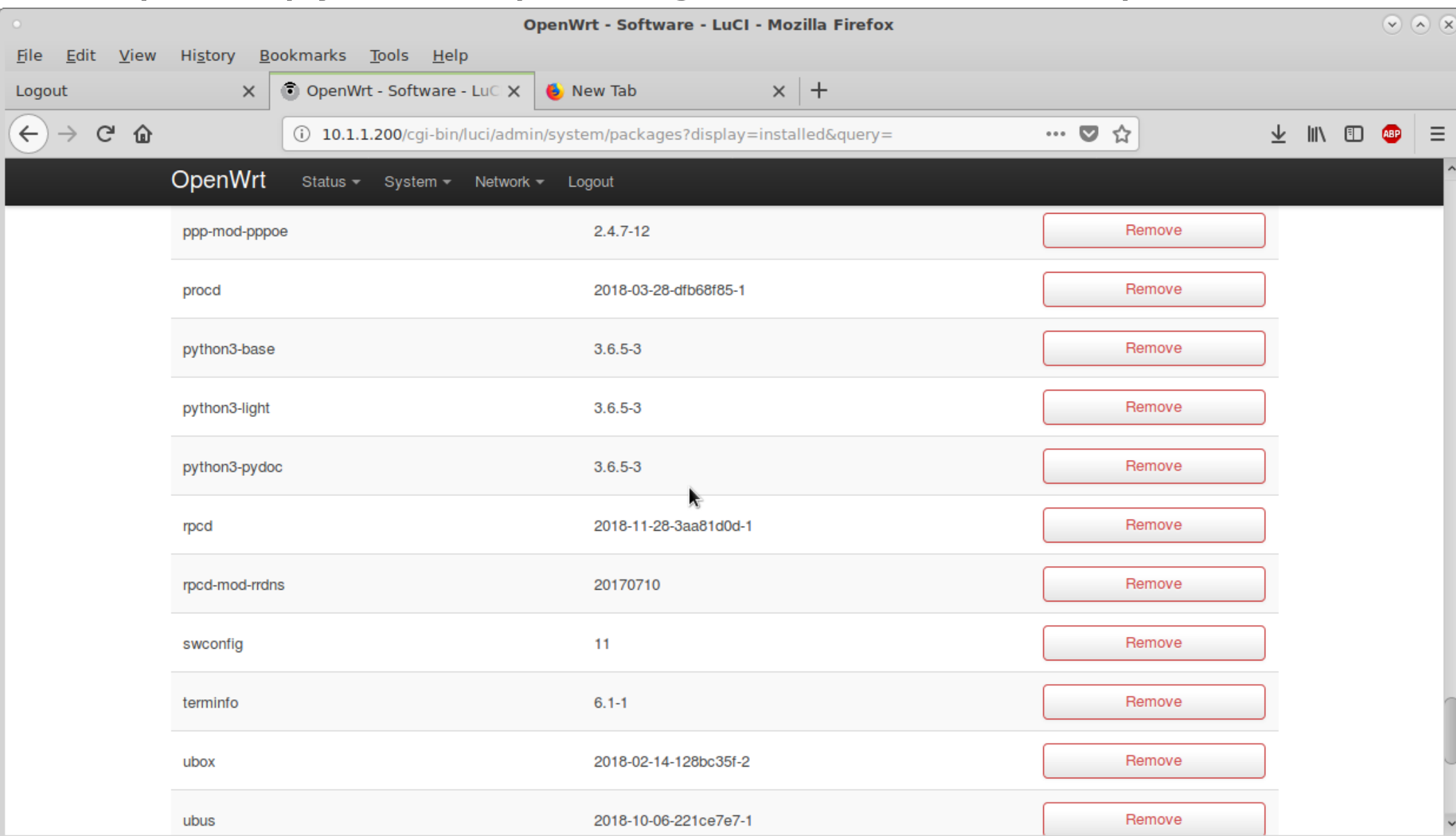
Remove some python3 packages...

The screenshot shows the OpenWrt LuCI web interface in a Mozilla Firefox browser. The browser's address bar displays the URL `10.1.1.200/cgi-bin/luci/admin/system/packages?display=installed&query=`. The interface features a top navigation bar with links for 'Status', 'System', 'Network', and 'Logout'. Below this, a table lists installed packages. A modal dialog box is centered on the screen, asking for confirmation to remove the package 'python3-unittest'. The dialog has 'Cancel' and 'OK' buttons, with the mouse cursor hovering over the 'OK' button.

Package Name	Version	Action
python3-base	3.6.5-3	Remove
python3-ctypes	3.6.5-3	Remove
python3-decimal		Remove
python3-light		Remove
python3-logging		Remove
python3-multiprocessing	3.6.5-3	Remove
python3-ncurses	3.6.5-3	Remove
python3-pydoc	3.6.5-3	Remove
python3-unittest	3.6.5-3	Remove
rpcd	2018-11-28-3aa81d0d-1	Remove
rpcd-mod-rrdns	20170710	Remove

DGN2200 – Packages

Keep 3 x python3 packages. ~50% Free space.



The screenshot shows the OpenWrt LuCI web interface in a Mozilla Firefox browser. The browser's address bar displays the URL `10.1.1.200/cgi-bin/luci/admin/system/packages?display=installed&query=`. The LuCI interface has a dark header with the 'OpenWrt' logo and navigation links for 'Status', 'System', 'Network', and 'Logout'. Below the header, a table lists installed packages. Each row contains the package name, its version, and a 'Remove' button. The packages listed are: ppp-mod-pppoe (2.4.7-12), procd (2018-03-28-dfb68f85-1), python3-base (3.6.5-3), python3-light (3.6.5-3), python3-pydoc (3.6.5-3), rpcd (2018-11-28-3aa81d0d-1), rpcd-mod-rrdns (20170710), swconfig (11), terminfo (6.1-1), ubox (2018-02-14-128bc35f-2), and ubus (2018-10-06-221ce7e7-1). A mouse cursor is hovering over the 'python3-pydoc' row.

Package Name	Version	Action
ppp-mod-pppoe	2.4.7-12	Remove
procd	2018-03-28-dfb68f85-1	Remove
python3-base	3.6.5-3	Remove
python3-light	3.6.5-3	Remove
python3-pydoc	3.6.5-3	Remove
rpcd	2018-11-28-3aa81d0d-1	Remove
rpcd-mod-rrdns	20170710	Remove
swconfig	11	Remove
terminfo	6.1-1	Remove
ubox	2018-02-14-128bc35f-2	Remove
ubus	2018-10-06-221ce7e7-1	Remove

DGN2200 – Adding Packages

Back to SSH to test python3

```
root@OpenWrt:~# python3
Python 3.6.5 (default, Jan 31 2019, 14:35:22)
[GCC 7.3.0] on linux
Type "help", "copyright", "credits" or "license" for more information.
>>>

>>> help()

Welcome to Python 3.6's help utility!
...
```

DGN2200 – Adding Packages

SSH: python3 modules (243)

```
help> modules
```

```
Please wait a moment while I gather a list of all available modules...
```

<code>__future__</code>	<code>atexit</code>	<code>inspect</code>	<code>shlex</code>
<code>_ast</code>	<code>audioop</code>	<code>io</code>	<code>shutil</code>
<code>_asyncio</code>	<code>base64</code>	<code>ipaddress</code>	<code>signal</code>
<code>_bisect</code>	<code>bdb</code>	<code>itertools</code>	<code>site</code>
<code>_blake2</code>	<code>binascii</code>	<code>json</code>	<code>smtpd</code>
<code>_bootlocale</code>	<code>binhex</code>	<code>keyword</code>	<code>smtplib</code>
<code>_bz2</code>	<code>bisect</code>	<code>linecache</code>	<code>sndhdr</code>
<code>_codecs</code>	<code>builtins</code>	<code>locale</code>	<code>socket</code>
<code>_collections</code>	<code>bz2</code>	<code>macpath</code>	<code>socketserver</code>
<code>_collections_abc</code>	<code>cProfile</code>	<code>macurl2path</code>	<code>spwd</code>
<code>_compat_pickle</code>	<code>calendar</code>	<code>mailbox</code>	<code>sre_compile</code>
<code>_compression</code>	<code>chunk</code>	<code>mailcap</code>	<code>sre_constants</code>
<code>_crypt</code>	<code>cmath</code>	<code>marshal</code>	<code>sre_parse</code>
<code>_csv</code>	<code>cmd</code>	<code>math</code>	<code>ssl</code>
<code>_datetime</code>	<code>code</code>	<code>mimetypes</code>	<code>stat</code>
<code>_dummy_thread</code>	<code>codecs</code>	<code>mmap</code>	<code>statistics</code>
<code>_functools</code>	<code>codeop</code>	<code>modulefinder</code>	<code>string</code>
<code>_heapq</code>	<code>collections</code>	<code>netrc</code>	<code>stringprep</code>
<code>_imp</code>	<code>colorsys</code>	<code>nntplib</code>	<code>struct</code>
<code>_io</code>	<code>compileall</code>	<code>ntpath</code>	<code>subprocess</code>
<code>_json</code>	<code>concurrent</code>	<code>nturl2path</code>	<code>sunau</code>
<code>_locale</code>	<code>configparser</code>	<code>numbers</code>	<code>symbol</code>

DGN2200 – Adding Packages

SSH python3 modules continued...

_lsprof	contextlib	opcode	symtable
_markupbase	copy	operator	sys
_md5	copyreg	optparse	sysconfig
_multibytecodec	crypt	os	syslog
_opcode	csv	ossaudiodev	tabnanny
_operator	datetime	parser	tarfile
_pickle	difflib	pathlib	telnetlib
_posixsubprocess	dis	pdb	tempfile
_pydecimal	doctest	pickle	termios
_pyio	dummy_threading	pickletools	textwrap
_random	encodings	pipes	this
_sha1	enum	pkgutil	threading
_sha256	errno	platform	time
_sha3	faulthandler	plistlib	timeit
_sha512	fcntl	poplib	token
_signal	filecmp	posix	tokenize
_sitebuiltins	fileinput	posixpath	trace
_socket	fnmatch	pprint	traceback
_sre	formatter	profile	tracemalloc
_stat	fractions	pstats	tty
_string	ftplib	pty	turtle
_strptime	functools	pwd	types
_struct	gc	py_compile	typing
_symtable	genericpath	pyclbr	urllib
_sysconfigdata	getopt	pydoc	uu
_thread	getpass	pydoc_data	uuid

DGN2200 – Adding Packages

SSH python3 modules continued...

_threading_local	gettext	queue	venv
_tracemalloc	glob	quopri	warnings
_warnings	grp	random	wave
_weakref	gzip	re	weakref
_weakrefset	hashlib	reprlib	wsgiref
abc	heapq	resource	xdrlib
aifc	hmac	rlcompleter	xxlimited
antigravity	html	runpy	xxsubtype
argparse	http	sched	zipapp
array	imaplib	secrets	zipfile
ast	imghdr	select	zipimport
asynchat	imp	selectors	zlib
asyncore	importlib	shelve	

DGN2200 - Summary

Ideally with OpenWrt / To do on DGN2200...

- Functioning OK as a switch.
- Install the Broadcom B43 drivers for wifi.
- Have one ethernet port dedicated as a WAN.
- With WAN then own network addresses.
- ADSL if required.
- USB port with 3G modem to connect to Internet.
- Static IP addresses for printers, etc.
- USB drive in USB port for shared storage.
- More...?