

Linux and Amateur Radio

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What Is Linux

- Linux is a free and Open Source Operating System for Computers, not unlike Windows (by Microsoft) or MacOS (by Apple).

- There are a great many differences between them, though... more than just "cost":

Linux tends to be stable on just about any hardware, both PC and Mac.

Linux is also capable of running on older hardware (that old PC you don't know what to do with).

Linux can and does also run on Phones and Tablets (Android is a form of Linux).

- There are also a lot of similarities:

Linux has a UI (but can also be run like DOS of yesteryear).

Linux can run all manner of programs

It uses a keyboard, mouse, and works with most other hardware, speakers, etc.

Flavors of Linux

- Linux also comes in a variety of roots:
 - Debian
 - Slackware
 - Red Hat
- Each of these roots have spawned sub distributions:
 - Ubuntu, Knoppix
 - SUSE
 - Mandrake, Fedora Core, CentOS
- And in succession, each of these subs have spawned other distros:
 - Mint
 - openSUSE
 - Mandria, Mageia
- There are others, too, which are independent:
 - Puppy
 - Arch

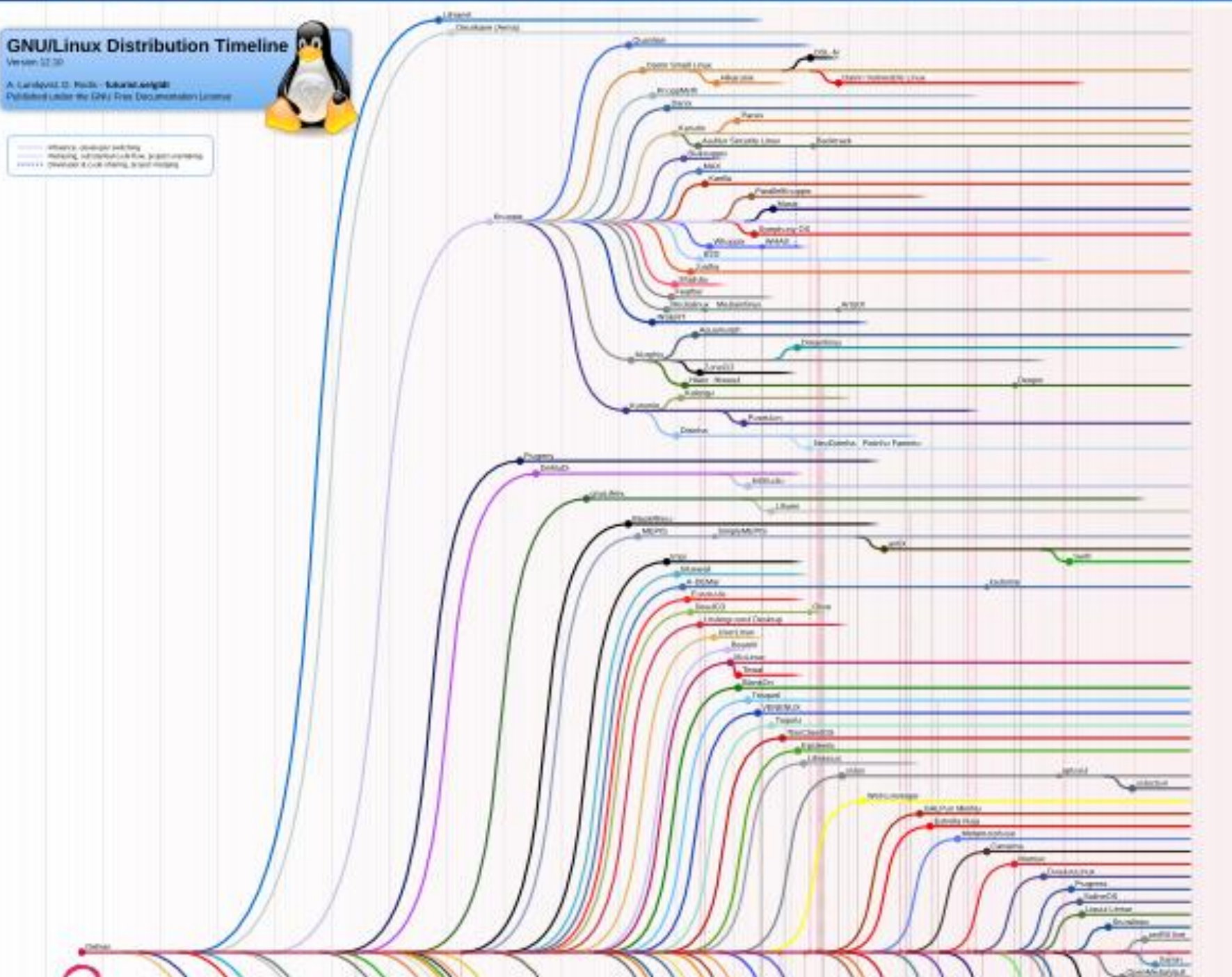
GNU/Linux Distribution Timeline

Version 02.30

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- always developer switching
- releasing infrastructure, programming
- developer & code sharing, brand history



Computers in Amateur Radio

- Amateur Radio has been around longer than Computers
- Natural evolution, curiosity and good old-fashioned ingenuity has brought Radios and Computers together (in more than one way)
- Everything from
Hardware and Software that allows your computer to interface with your radio:



- To
Hardware and Software that allows you to turn your computer into a radio:



Radio in Computers

- And even Radio Communications used exclusively for Computers:
- **Bluetooth and WiFi are 5 or 2.4 GHz**
Bluetooth is on the ISM band that is 83 MHz-wide. Bluetooth uses Frequency Hopping Spread Spectrum (FHSS) and is allowed to hop between 79 different 1 MHz-wide channels in this band.

WiFi has 25 channels available for use in the 802.11a standard (5GHz), 11 channels available for the 802.11b (2.4GHz), forward error correction for the 802.11g (2.4GHz), and MiMo for the 802.11n (2.4GHz)

(all with increasing bandwidth and lower power usage)



HAM Radio and Linux

- Linux is still not as popular with most people as MacOS or even Windows
- And finding software and hardware for your PC or Mac machine might be limited only by cost
- So, what about Linux?
- By far the most popular Linux distributions come from Debian: Ubuntu and Linux Mint
- These have good support for HAM Radio Enthusiasts



Finding and Adding Programs

- Linux uses a program called "apt" or "aptitude". It can be run from the command line, or used through the "Software Center" (in my case, the Ubuntu Software Center).
- A quick search of the default Ubuntu library gives the following programs: wsjtx, wsjt, hamFax, gpsk31, fldigi, flmsg, linpsk, flwarp, xdx, flarq, klog, twclock, cqrllog, xlog, and Ham Exam
- There are others that can be found on the web like: DReaM, Qsstv, Xdemorse, xfhell, xgridloc, xhamlog, xnec2c, xpsk31, xsatcom, xwxapt, APRStracker
- "Wine" links the "Windows World" with the "Linux World". You can use "Wine" as installed with Linux or buy it in a more refined package called "Crossover" by CodeWeavers.
This allows you to install Windows programs on your Linux operating system

Software Center

- Each version of Linux has a “Software Center” where you can search for, find, and install software:

The screenshot displays the Ubuntu Software Center window. The title bar reads "Ubuntu Software Center" and the menu bar includes "File", "Edit", "View", and "Help". The main navigation bar contains icons for "All Software", "Installed", "History", and "Progress", along with a search bar. The main content area features a large orange star icon and the text "Our star apps" and "Come and explore our favourites". Below this, there are several sections: "Accessories" (Books & Magazines, Developer Tools, Education, Fonts, Games, Graphics, Internet, Office, Science & Engineering, Sound & Video, System, Themes & Tweaks, Universal Access), "What's New" (Slimjet Web Browser, PicaPi Artist Maker, VyprVPN CLI for Linux, kMusicplay, U-Voice, EasyCraft, Senet Online, SuperCalc, Jungle), "Recommended For You" (Turn On Recommendations), and "Top Rated" (GParted Partition Editor, Geany, GeoGebra, VLC media player, Battle for Wesnoth).

Our star apps
Come and explore our favourites

Accessories
Books & Magazines
Developer Tools
Education
Fonts
Games
Graphics
Internet
Office
Science & Engineering
Sound & Video
System
Themes & Tweaks
Universal Access

What's New

- Slimjet Web Browser** Web Browsers Free
- PicaPi Artist Maker** Drawing US\$ 3
- VyprVPN CLI for Linux** Internet Free
- kMusicplay** Sound & Video US\$ 6.00
- U-Voice** Accessories US\$ 2.99
- EasyCraft** Games US\$ 2.99
- Senet Online** Board Games (5) Free
- SuperCalc** Accessories (1) US\$ 2.99
- Jungle** Accessories US\$ 2.99

Recommended For You

To make recommendations, Ubuntu Software Center will occasionally send to Canonical a list of software currently installed.

Top Rated

- GParted Partition Editor** Themes & Tweaks (559) Free
- Geany** IDEs (463) Free
- GeoGebra** Mathematics (72) Free
- VLC media player** Sound & Video (1972) Free
- Battle for Wesnoth** Games (129) Free
- Battle for Wesnoth** Games (129) Free

Linux Inner Workings

- You can subscribe to the Linux Hams PPA...
- This will give you access to other programs like:
CHIRP, D-Rats, fccexam, FDMDV, gpredict
- Adding the ppa or other repositories can be done either through the GUI or on the Command line:

```
sudo add-apt-repository ppa:ubuntu-hams-updates/ppa
```

```
sudo apt-get update
```

```
sudo apt-get install xyz
```

- **CHIRP or CHIRP Daily:**

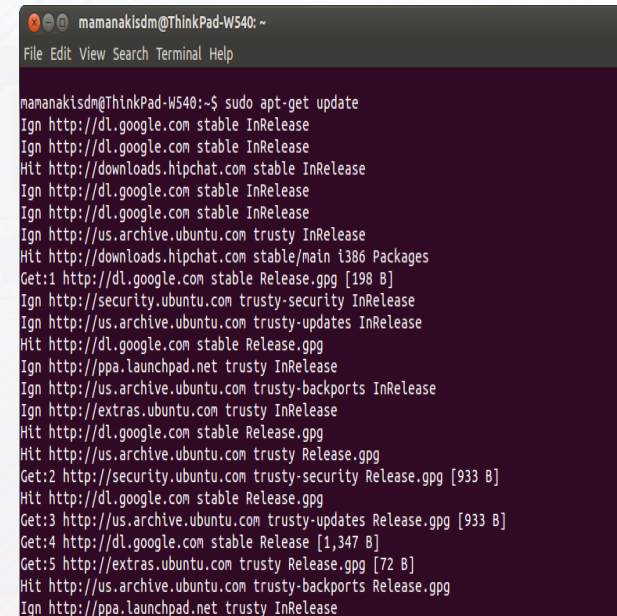
CHIRP can be installed using the Software Center

CHIRP Daily needs to be installed the "hard way":

Download it, extract it, and go into the root

```
> sudo usermod -aG dialout [enter your username]
```

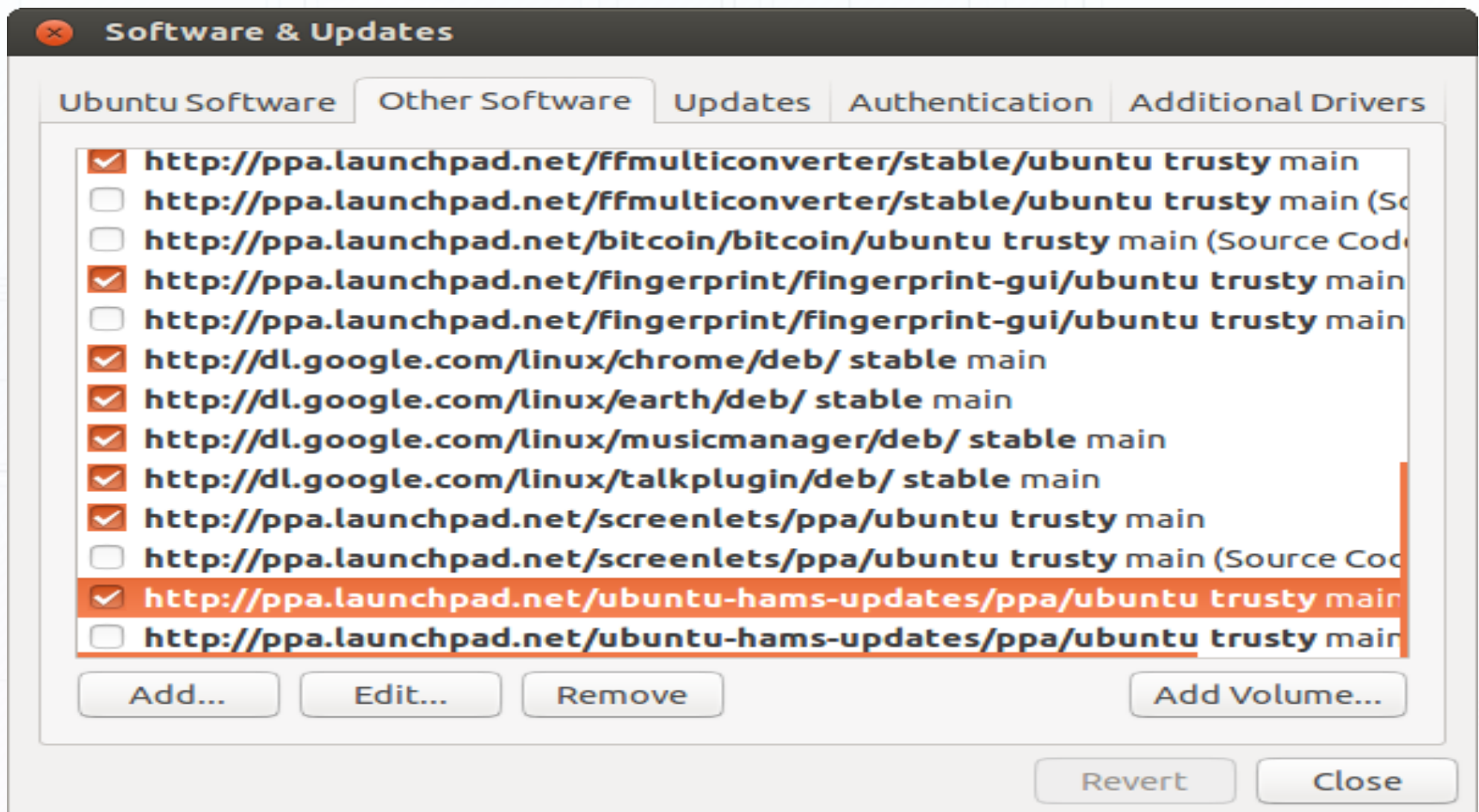
```
> sudo ./chirpw
```



```
mamanakisd@mamanakisd@ThinkPad-W540: ~  
File Edit View Search Terminal Help  
mamanakisd@mamanakisd@ThinkPad-W540:~$ sudo apt-get update  
Ign http://dl.google.com stable InRelease  
Ign http://dl.google.com stable InRelease  
Hit http://downloads.hipchat.com stable InRelease  
Ign http://dl.google.com stable InRelease  
Ign http://dl.google.com stable InRelease  
Ign http://us.archive.ubuntu.com trusty InRelease  
Hit http://downloads.hipchat.com stable/main i386 Packages  
Get:1 http://dl.google.com stable Release.gpg [198 B]  
Ign http://security.ubuntu.com trusty-security InRelease  
Ign http://us.archive.ubuntu.com trusty-updates InRelease  
Hit http://dl.google.com stable Release.gpg  
Ign http://ppa.launchpad.net trusty InRelease  
Ign http://us.archive.ubuntu.com trusty-backports InRelease  
Ign http://extras.ubuntu.com trusty InRelease  
Hit http://dl.google.com stable Release.gpg  
Hit http://us.archive.ubuntu.com trusty Release.gpg  
Get:2 http://security.ubuntu.com trusty-security Release.gpg [933 B]  
Hit http://dl.google.com stable Release.gpg  
Get:3 http://us.archive.ubuntu.com trusty-updates Release.gpg [933 B]  
Get:4 http://dl.google.com stable Release [1,347 B]  
Get:5 http://extras.ubuntu.com trusty Release.gpg [72 B]  
Hit http://us.archive.ubuntu.com trusty-backports Release.gpg  
Ign http://ppa.launchpad.net trusty InRelease
```


Adding PPA (Repositories) via GUI

- You can add anything via the Command Line (as in the previous slide) or you can do it through the UI:



- Hardware looks weird to your programs in Linux:
- CHIRP: Your radio will be attached to the USB port
`/dev/ttyUSB0`
- SSTV: Your web cam will be attached to the video port
`/dev/video0`

The screenshot shows the CHIRP software window with a menu bar (File, Edit, View, Radio, Help) and a toolbar. Below the toolbar is a 'Memories' section with a 'Memory range' field set to '1' and '250', and a 'Go' button. There are also checkboxes for 'Special Channels' (unchecked) and 'Show Empty' (checked). The main area contains a table of memory entries.

D-STAR	Loc	Frequency	Name	Tone Mode	Tone	ToneSql	DTCS Code	DTCS Pol	Duplex	Off
	1	145.110000	W7EXH	Tone	100.0	88.5	023	NN	-	0.6f
	2	145.110000	KB7PSM	Tone	103.5	88.5	023	NN	-	0.6f
	3	145.110000	W7EXH	Tone	100.0	88.5	023	NN	-	0.6f
	4	145.110000	KB7LNR	Tone	162.2	88.5	023	NN	-	0.6f
	5	145.130000	K7TVL	Tone	100.0	88.5	023	NN	-	0.6f
	6	145.150000	W7NYW	Tone	100.0	88.5	023	NN	-	0.6f
	7	145.150000	WA7ROB	Tone	94.8	88.5	023	NN	-	0.6f
	8	145.150000	W7NYW	Tone	110.9	88.5	023	NN	-	0.6f
	9	145.150000	WA7TYD	Tone	162.2	88.5	023	NN	-	0.6f
	10	145.150000	N7EZY	Tone	162.2	88.5	023	NN	-	0.6f
	11	145.170000	W7NYW	Tone	110.9	88.5	023	NN	-	0.6f
	12	145.170000	W7EXH	Tone	100.0	88.5	023	NN	-	0.6f
	13	145.190000	WA7ABU	Tone	100.0	88.5	023	NN	-	0.6f
	14	145.190000	K6QIE	Tone	162.2	88.5	023	NN	-	0.6f
	15	145.190000	W7OC	Tone	146.2	88.5	023	NN	-	0.6f
	16	145.190000	W7NTO	(None)	88.5	88.5	023	NN	-	0.6f
	17	145.210000	WA6RHK	Tone	136.5	88.5	023	NN	-	0.6f
	18	145.210000	N7HTN	Tone	110.9	110.9	023	NN	-	0.6f
	19	145.210000	WA7COK	Tone	88.5	88.5	023	NN	-	0.6f

[0] Completed Getting memory 250 (idle)

Things you can DO with Linux:

- IRLP: a combination of: 1) a Radio, 2) a Computer, 3) the Linux OS and 4) Speak Freely
<http://speak-freely.sourceforge.net/userguide/ar01s03.html>
<http://www.irlp.net/>
- RaspberryPi, a simple, low-power computer, can be turned into an IRLP node
<http://www.irlp.net/pi/>
<http://www.crompton.com/hamradio/irlp/PiIRLP.html>
<http://www.ka1mzy.com/RPI-IRLP-SETUP.html>
- SSTV
It will even use your webcam, no special camera or equipment needed
- CW
- RTTY
- PSK31, etc.

○ SDR

RTL2832U (RealTek dvb-t fm dab) + GnuRadio (rtl-sdr) + better antenna (and maybe an upconverter for more bandwidth, HAMitup RF upconverter)

<http://jeffskinnerbox.me/posts/2013/May/26/rtl-sdr-software-defined-radio-SDR-for-20/>

http://drm.sourceforge.net/wiki/index.php/RTL2832U_Guidance

○ Mesh Net

A Mesh Net is a radio communication "internet" or "intranet". It is created by taking certain routers (wireless) and re-programming them to allow them to communicate over 13 cm...

How does this apply to Linux? The Operating System of most (if not all) of these routers is Linux based. (prior to V.5 anyway)

To learn more, please visit:

- <http://www.broadband-hamnet.org/>

- **Radio Astronomy**

<https://www.linux.com/learn/tutorials/566992-weekend-project-discover-linux-astronomy-tools>

- **EchoLink**

Using SvxLink and Qtel

- **Many other programs and activities.**

My Projects

- I have put up a Nesh Net (well, a single node)
Still working on nodes 2 and 3...
- I intend to purchased a Raspberry Pi to put up a web server (etc)
- I also plan on putting a bridge to the internet, Teamspeak 4 (or IRC), Asterisk BPX, maybe APRS, and an Email Server (and just for fun, maybe a Minecraft server)
- I also have an SDR setup that I am trying to use:
Realtek TL2832U+R820T and rtl_sdr
gqrx-sdr (<http://gqrx.dk/download>)
- And SvxLink installed, so I can use QTel, a type of EchoLink
<http://www.svxlink.org/> (can be used to make a server, or use QTel to listen in.)

Did Someone Say "Android"

- Android is a type of Linux
- You can install the Android Emulator

Register for and Download genymotion:

- <https://www.genymotion.com/#!/download>
- move the file from the download directory to the home directory

Install virtualbox:

- `sudo apt-get install virtualbox`

Follow these instructions:

- <http://www.sysads.co.uk/2014/06/install-genymotion-in-ubuntu-14-04/>

- **Run It:**

From a Terminal Window, navigate to `/home/[username]/genymotion`
`./genymotion`

- Anything Android will run, you can now run on Linux
APRSDroid, EchoLink, etc.

Trying it Out

- Linux is also wonderful in the fact that it gives you the ability to run it, as a full operating system, without having to install it.
- LIVE CD:
<https://www.debian.org/distrib/>
<http://www.ubuntu.com/download>
<http://www.linuxmint.com/download.php>
- And if you are extremely adventurous, you can try Andy's Ham Linux (Recommended):
<http://sourceforge.net/projects/kb1oiq-andysham/>
- Or ShackBox:
<http://www.shackbox.net/downloads/>
- They all come in both 32 bit (older hardware) and 64 bit (newer hardware) versions

Demo



More Information

- For more information, you can visit the following sites:

<http://www.arrl.org/ubuntu-linux-for-hams>

<https://wiki.ubuntu.com/UbuntuHams>

<https://launchpad.net/~ubuntu-hams-updates/+archive/ubuntu/ppa>

<http://www.qsl.net/kf8gr/index.html>

<http://www.tigertronics.com/files/Signalink%20USB%20&%20Linux%20Article%20by%20N9VV.pdf>

http://chirp.danplanet.com/projects/chirp/wiki/Running_Under_Linux

<https://wiki.ubuntu.com/UbuntuHamsPackages>

<http://cqinet.sourceforge.net/>

<http://radio.linux.org.au/?sectpat=All>

<http://radio.linux.org.au/>

<http://www.dxzone.com/catalog/Software/Linux/>

<http://sourceforge.net/projects/svxlinc/>

http://www.kj6zd.net/?page_id=100

<https://www.linux.com/learn/tutorials/566992-weekend-project-discover-linux-astronomy-tools>