Asterisk Arm-Allstar on the Raspberry Pi 2/3

Doug Crompton, WA3DSP
Modified by Robert Conklin, N4WGY

WHAT IS THE ALLSTAR LINK SYTEM?

- A melding of Asterisk PBX and Linux based repeater control code. Completely free and open source.
- Allows agile linking of single nodes, hubs, repeaters, link radios, mode bridges, phones, auto patch, etc.
- Independent operation, no mother ship.
- Strong user community support.
- Large and growing user base, 2080+ nodes online around the world at this time.

Comparison of Amateur Radio VOIP systems

Echolink

- Free and convenient
- Not open source – limited API (Application Programming Interface)
- Limited audio quality – GSM – half duplex
- Relatively easy to use
- Large user base
- Largely computer or phone originated
- Stable
- Not best choice for repeater linking

Comparison of Amateur Radio VOIP systems

IRLP – Internet Radio Linking Protocol

- Not open source – requires hardware purchase
- Good audio quality – ADPCM – half duplex
- Smaller user base
- Only radio originated
- Low number of nodes
- Limited linking agility

Comparison of Amateur Radio VOIP systems

Allstar

- Fully open source hardware & software - free
- Excellent audio quality – full duplex
- Full repeater control imbedded!!
- Choice of codecs to meet available bandwidth
- Smaller user base - growing FAST - 2080 online now
- Radio, SIP phone or smart phone or computer originated.
- Endless linking and bridging capabilities
- Low cost
- Echolink, d-star, C4FM, P25 and other service bridges
- Requires some LINUX knowledge
- Strong user base support

Comparison of Amateur Radio VOIP systems

Other formats – WiresX, D-Star, DMR, P25

- Mostly proprietary
- Varying audio quality
- Limited API

DMR
DIGITAL MOBILE RADIO ASSOCIATION

D-STAR

DIGITAL WIRELESS • SANS FIL NUMERIQUE • INALÁMBRICO DIGITAL
P25

WIRES-X
Wide-Coverage Internet Repeater Enhancement System

History of Asterisk

1999 – Mark Spencer (Huntsville AL) started a Linux software company

The company grew and needed phone services
They discovered available systems were very expensive
So they wrote their own PBX software
They formed a company called Digium in 2001 and their software… Asterisk… is now used to run the phone systems in
thousands of companies worldwide.

Asterisk Allstar Radio VOIP

History of app_rpt

Asterisk is written to allow additional applications
to extend its capability, it is its very nature!

The app_rpt application was written
by Jim Dixon, WB6NIL and Steve Rodgers, WA6ZFT
in the mid 2000's for fulfill his need for a
repeater controller and VOIP interface.

Original system used a Quad PCI radio interface card
Later used USB sound card interface

ARM (processor) Allstar for the Raspberry Pi

Features

- Linux operating system (Arch Linux distro)
- Fully open source – Modify and extend the code
- Easy to install and maintain – gets easier as time goes on and code matures.
- Runs on Rpi 2 or 3, not the Rpi model A or Pi Zero.
- Ability to select CODECS
- Great for restricted antenna areas – gives feel of radio
- Allows public or private connections
- Any number of nodes can be connected together
- Connection process totally at the discretion of the user
- Unlimited servers and nodes per IP address

ARM (processor) Allstar for the Raspberry Pi

Features Contined

- Full Duplex
- Integral Repeater Controller
- Connections to/from Phone PBX via a sip, iax
- No single point of failure – no mother ship
- Build the system the way you want

ARM (processor) Allstar for the Raspberry Pi

CODECS

A codec is a device or computer program capable of encoding or decoding a digital data stream or signal.

ULAW

- 64Khz
- Lossless
- Excellent quality
- Least used

G726aa

- modified G726a
- 48Khz sample rate
- Very good quality
- Most used

ILBC

- Internet Low Bandwidth Codec
- 1/3 BW of g726aa
- Very close to g726 quality

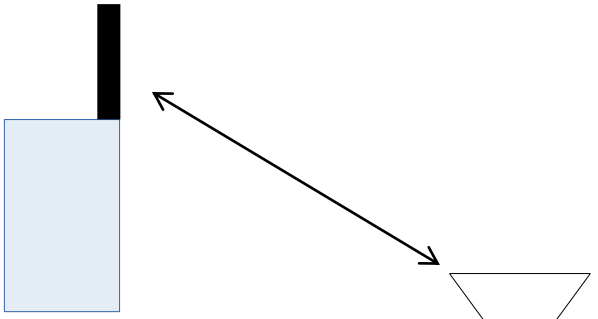
GSM

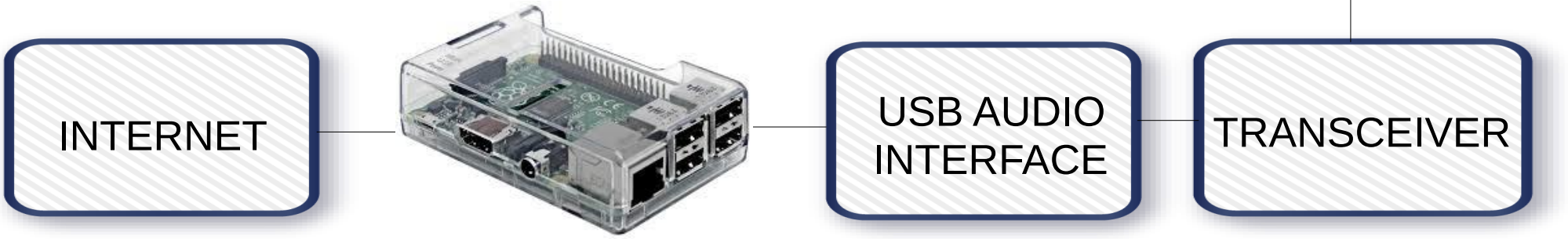
- Very low sample rates
- Low bandwidth
- Fair quality
- Seldom used over VOIP
- Local voice messages

Asterisk Allstar Radio VOIP

What does a simple Allstar node look like?

Simplex Radio Node

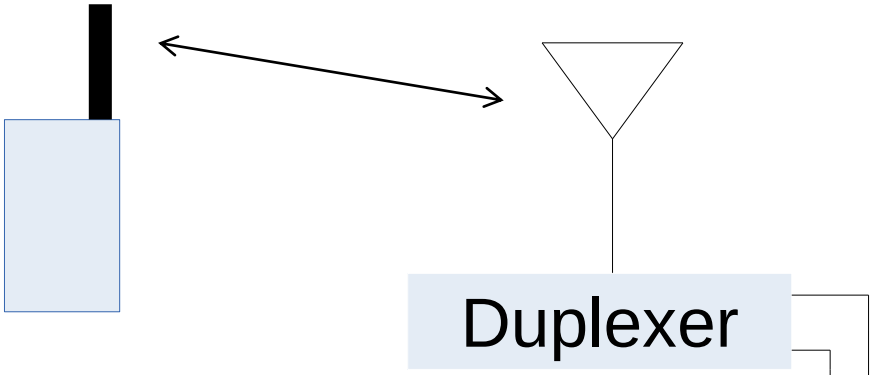


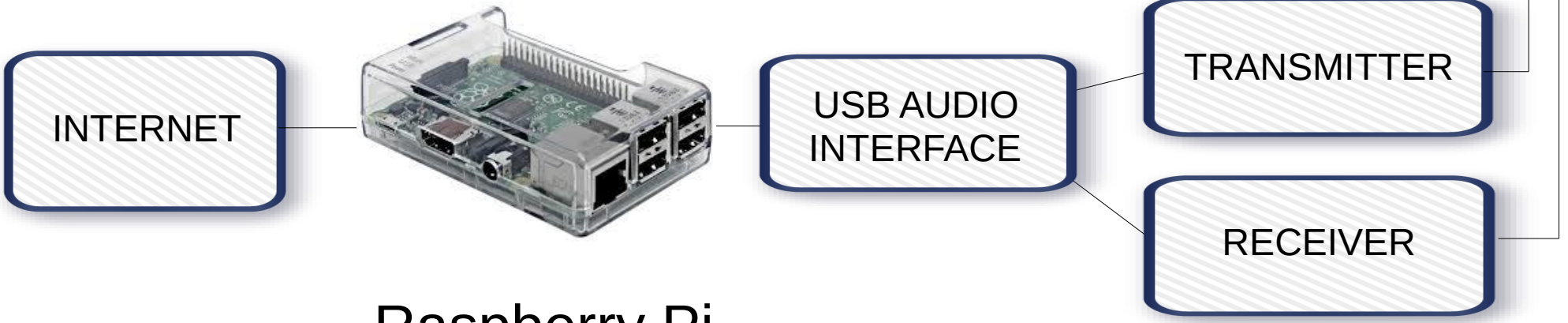


Raspberry Pi

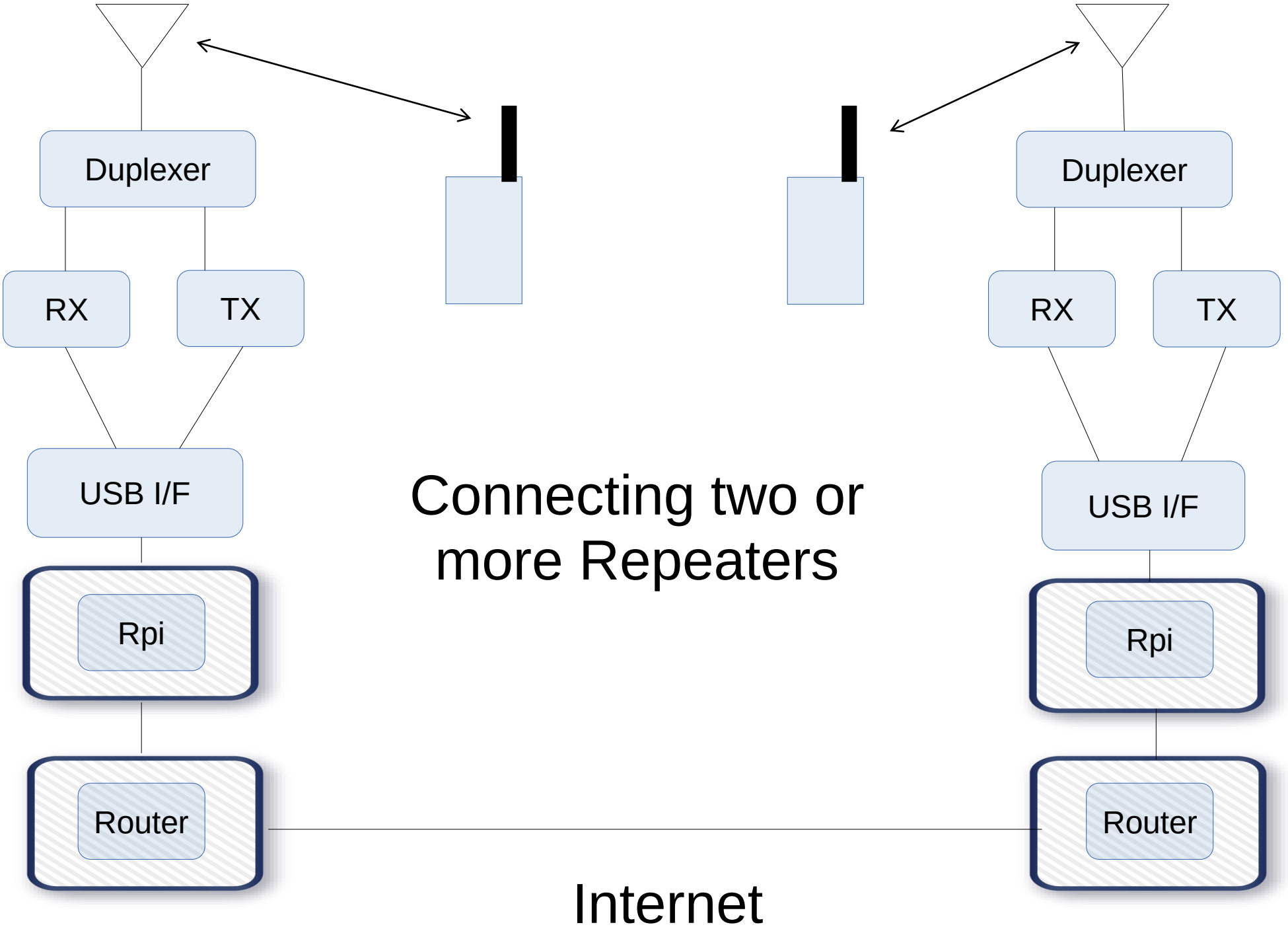
Asterisk Allstar Radio VOIP

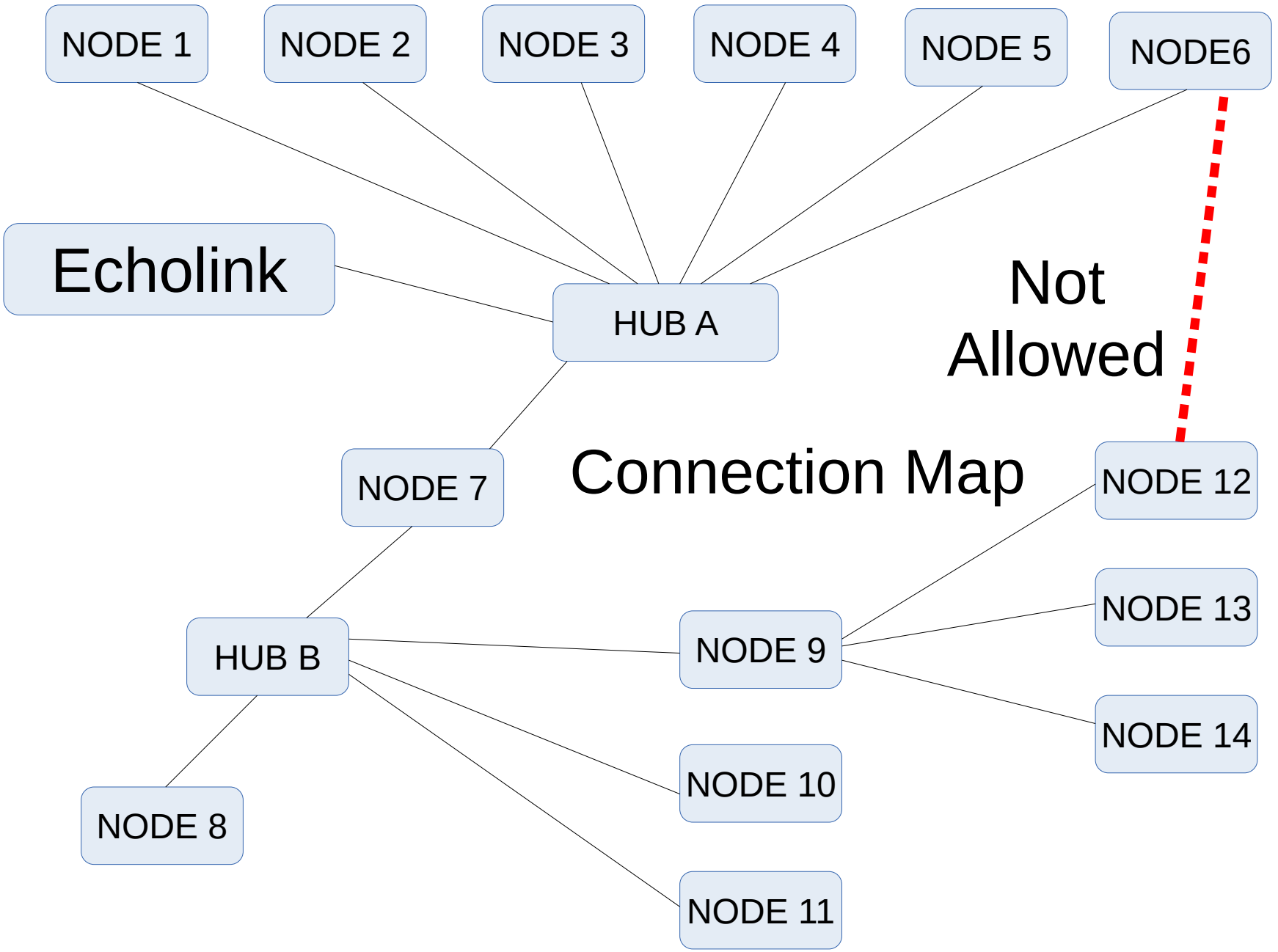
Duplex Repeater Node

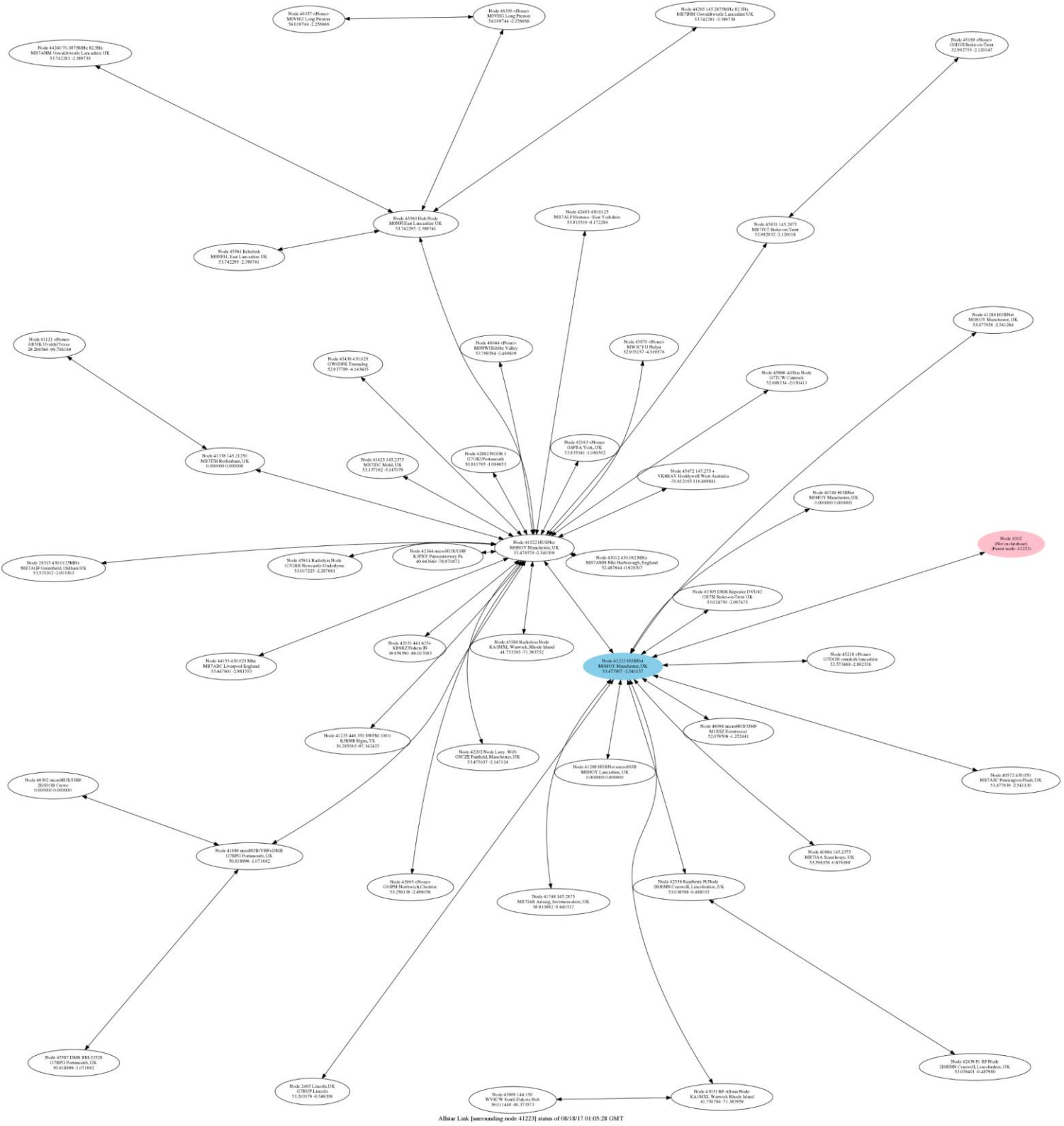




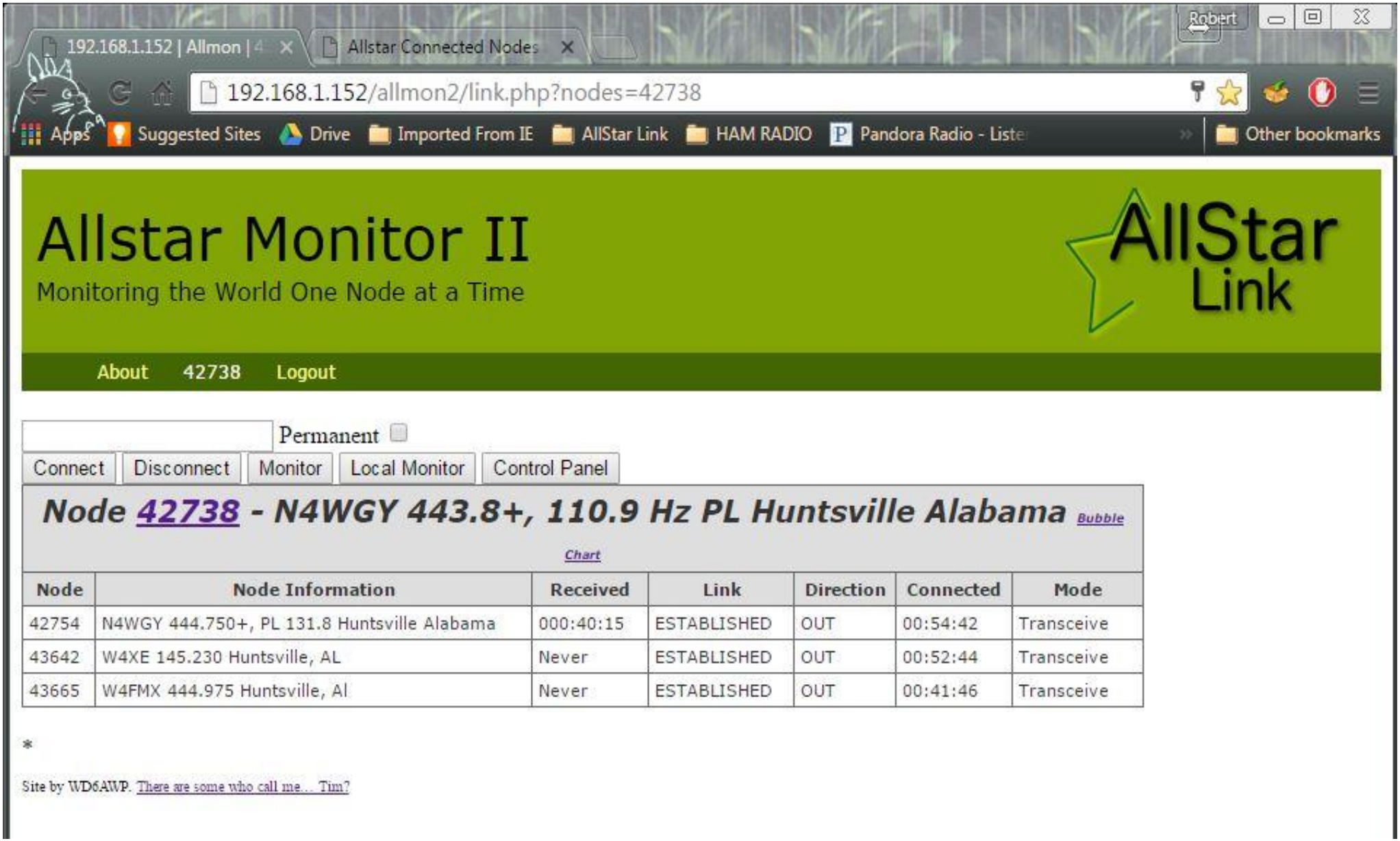
Raspberry Pi


Duplexer
RX
TX
USB I/F
Rpi
Router
Duplexer
RX
TX
USB I/F
Rpi
Router
Connecting two or more Repeaters
Internet


NODE 1
NODE 2
NODE 3
NODE 4
NODE 5
NODE6
Echolink
HUB A
Not
Allowed
Connection Map
NODE 7
NODE 12
NODE 13
HUB B
NODE 9
NODE 14
NODE 10
NODE 8
NODE 11



Screenshot of one AllStar hub's Bubble chart. Approximately 4 countries represented. Node 41223.


192.168.1.152 | Allmon |
Allstar Connected Nodes
Robert
192.168.1.152/allmon2/link.php?nodes=42738
Apps
Suggested Sites
Drive
Imported From IE
AllStar Link
HAM RADIO
Pandora Radio - Liste
Other bookmarks
Allstar Monitor II
Monitoring the World One Node at a Time
AllStar Link
About
42738
Logout
Permanent
Connect
Disconnect
Monitor
Local Monitor
Control Panel
Node 42738 - N4WGY 443.8+, 110.9 Hz PL Huntsville Alabama
Bubble
Chart
Node
Node Information
Received
Link
Direction
Connected
Mode
42754
N4WGY 444.750+, PL 131.8 Huntsville Alabama
000:40:15
ESTABLISHED
OUT
00:54:42
Transceive
43642
W4XE 145.230 Huntsville, AL
Never
ESTABLISHED
OUT
00:52:44
Transceive
43665
W4FMX 444.975 Huntsville, Al
Never
ESTABLISHED
OUT
00:41:46
Transceive
*
Site by WD6AWP. There are some who call me... Tim?

Robert
Allstar Connected Nodes
Inbox (678) - conklinrw86
192.168.1.144/cgi-bin/lsnodes_web?node=42754
Apps Suggested Sites Drive Imported From IE AllStar Link HAM RADIO Pandora Radio - Liste DISTILLATION Toshiba Other bookmarks

Status for N4WGY - Node 42754

Last update - 06/03/2016 19:19:11 My IP - 216.186.222.26

View this Node Graphically | Search/Command another Node

Selected system state	0
Signal on input	NO
System	ENABLED
Parrot Mode	DISABLED
Scheduler	ENABLED
Tail Time	STANDARD
Time out timer	ENABLED
Incoming connections	ENABLED
Time out timer state	ARMED
Time outs since system initialization	0
Identifier state	CLEAN
Kerchunks today	2
Kerchunks since system initialization	2
Keyups today	5
Keyups since system initialization	5
DTMF commands today	1
DTMF commands since system initialization	1
Last DTMF command executed	327066
TX time today	00:00:26494
TX time since system initialization	00:00:26494
Uptime	00:25:52
Nodes currently connected to us	27066
Autopatch	ENABLED
Autopatch state	DOWN
Autopatch called number	N/A
Reverse patch/IAXRPT connected	DOWN
User linking commands	ENABLED
User functions	ENABLED

Node	Call	Description	Location
42754	N4WGY	444.750+, PL 131.8	Huntsville Alabama
2536	GB3NU	430.8875 +7.6	Sheringham Norfolk UK
27066*	UK_HUB	UK ALLSTAR HUB	Manchester, UK
27370	XRF044A	XRF044 Hub Node	Norfolk UK
28315	G3SNA	430.0125MHz/82.5Hz	Greenfield, Oldham UK
28934	MB7IJD	29.280Mhz	Scotland NT62
29368	G4NJI/L	430.0625	Rotherham South Yorkshire UK
29773	G3SNA	Portable Node	Greenfield, Oldham UK
973498	M0HOY-L	ECHOLINK	
40572	M0HOY	430.050	Pennington Flash, UK
40827	2E0EVP	2E0EVP-HUB 1	Rotherham UK
40864	MB7IAA	145.2375	Scunthorpe, UK
41135	G4MUV	434.500 MHz	Redditch Worcestershire
41223	M0HOY	UK ALLSTAR NETWORK	Hub Node
41235	K5ENB	446.350 SWFM RPi2	Elgin, TX
41425	MB7IDC	145.2375	Mold, UK
41521	MB7ILV	145.2125	Liverpool, UK
41522	UK_HUB	UK AllStar HUB	Manchester, UK
41593	G7OEA		Liverpool
41625	M0NCZ	Echolink Gateway	Manchester, UK
41633	MB7ISJ	145.2125 77hz	Northwich, UK
41788	2E0DVU	430.150	Hednesford
42066	G3TMD		Scotter
42163	G4FBA		York, UK
42175	Northwich		Repeater Group HUB UK
42178	G1LDC		Northwich
42202	G8CZE	70cm	Manchester UK
42358	G8HAV	435.9125	Winsford United Kingdom
42380	M0NCZ	Phone Portal	Manchester, UK
42398	BroadNet		Link
42645	MB7INK	50.5200	Bolton, UK
42646	G6GMR	RAYNET	Littleborough, Lancashire
42995	G0SPH		Northwich,Cheshire
43012	2E0XVX	UHF Node 43012	Market Harborough - Leics
43031	KA1MXL		Warwick Rhode Island
43259	N4XAT	147.590	Villas, New Jersey
43305	GB7SI	439.525 -9.0MHz	Stoke-on-Trent UK
43379	G8PYT	Comnet V-ICCS GW1	Stourbridge UK
43405	2E0XVX	Hub Node 43405	Market Harborough
43412	MB7IBK	145.2125	Broadstairs, Kent, UK

Node	Peer	Reconnects	Direction	Connect Time	Connect State
27066	93.170.96.14	0	OUT	00:00:07.815	ESTABLISHED

Host	Node	State
67.215.233.178:4569	42754	Registered

LSNODES Node Statistics Panel

Selected system state	0
Signal on input	NO
System	ENABLED
Parrot Mode	DISABLED
Scheduler	ENABLED
Tail Time	STANDARD
Time out timer	ENABLED
Incoming connections	ENABLED
Time out timer state	RESET
Time outs since system initialization	0
Identifier state	CLEAN
Kerchunks today	2
Kerchunks since system initialization	2
Keyups today	5
Keyups since system initialization	5
DTMF commands today	1
DTMF commands since system initialization	1
Last DTMF command executed	327066
TX time today	00:00:3333
TX time since system initialization	00:00:3333
Uptime	00:26:56
Nodes currently connected to us	27066
Autopatch	ENABLED
Autopatch state	DOWN
Autopatch called number	N/A
Reverse patch/IAXRPT connected	DOWN
User linking commands	ENABLED
User functions	ENABLED

LSNODES Connected Nodes Display

Node	Call	Description	Location
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42645	MB7INK	50.5200	Bolton, UK
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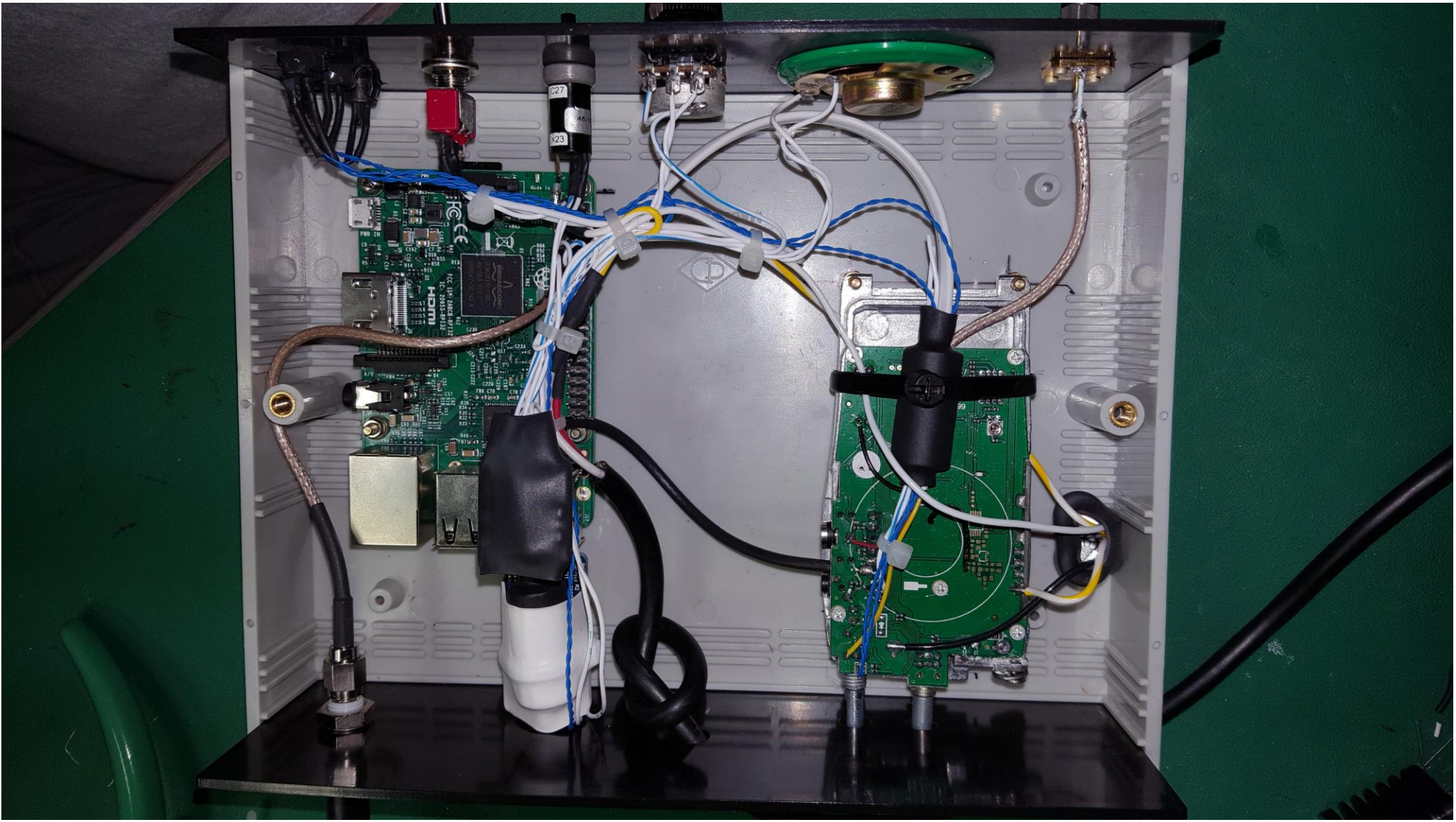
43405	2E0XVX	Hub Node 43405	Market Harborough
43412	MB7IBK	145.2125	Broadstairs, Kent, UK

Node	Peer	Reconnects	Direction	Connect Time	Connect State
27066	93.170.96.14	0	OUT	00:04:31.800	ESTABLISHED

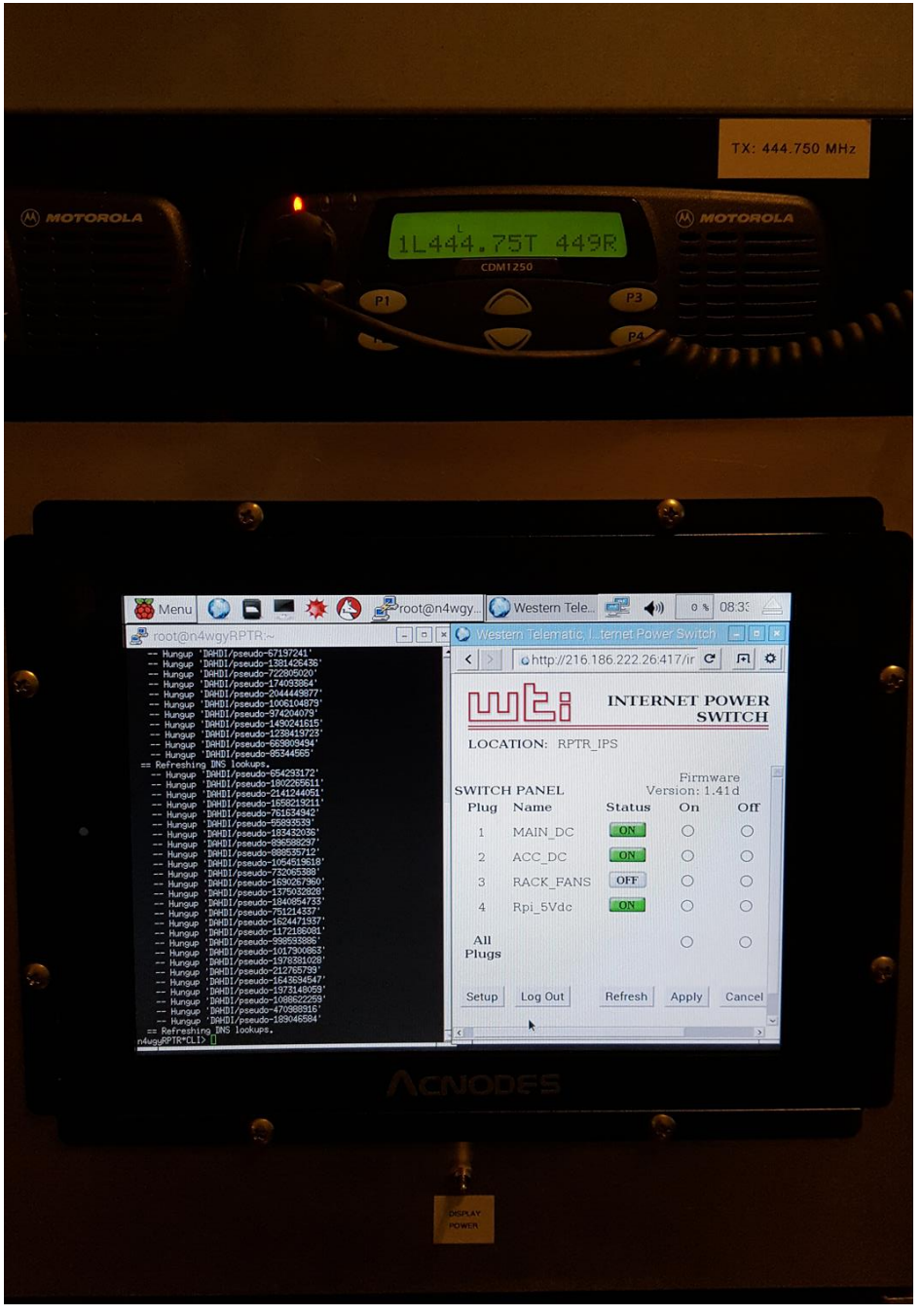
Host	Node	State
67.215.233.178:4569	42754	Registered



- ❑ A complete Arm-Allstar UHF simplex node.
- ❑ Rpi-3
- ❑ Baofeng BF-888 handheld transceiver
- ❑ USB Soundcard fob

- ❑ A complete UHF repeater.
- ❑ Motorola CDM radios.
- ❑ DMK Engineering Radio Interface
- ❑ Rpi3
- ❑ Mobile duplexer

The N4WGY 444.75Mhz is a Allstar/Echolink/Autopatch repeater, fully controlled with Asterisk/Allstar on an Rpi!



NARA – North Alabama Repeater Association
Uses Allstar on link radio's and controller ports to greatly enhance repeater linking and mode bridging options.

Allstar Link websites

www.hamvoip.org

www.allstarlink.org

www.crompton.com/hamradio/BeagleBoneBlackAllstar/

http://75.76.59.101:22649/supermon/link.php?nodes=42754

http://192.168.2.196/supermon/link.php?nodes=42738

http://stats.allstarlink.org/

www.n4hsv.net

http://dmkeng.com/

http://www.repeater-builder.com/products/usb-rim.html

http://www.repeater-builder.com/products/usb-rim-lite.html

DOWNLOAD OF THIS PRESENTATION WIL BE AVAILABLE AT WWW.N4HSV.NET

444.750 MHz +5, PL 131.8 Hz, N4WGY
Allstar Node 42754
EchoLink node 552261 (N4WGY-L)

443.80 MHz +5, PL 110.9 Hz, W4PS
Allstar Node 42738
EchoLink Node 704319 (N4WGY-R)

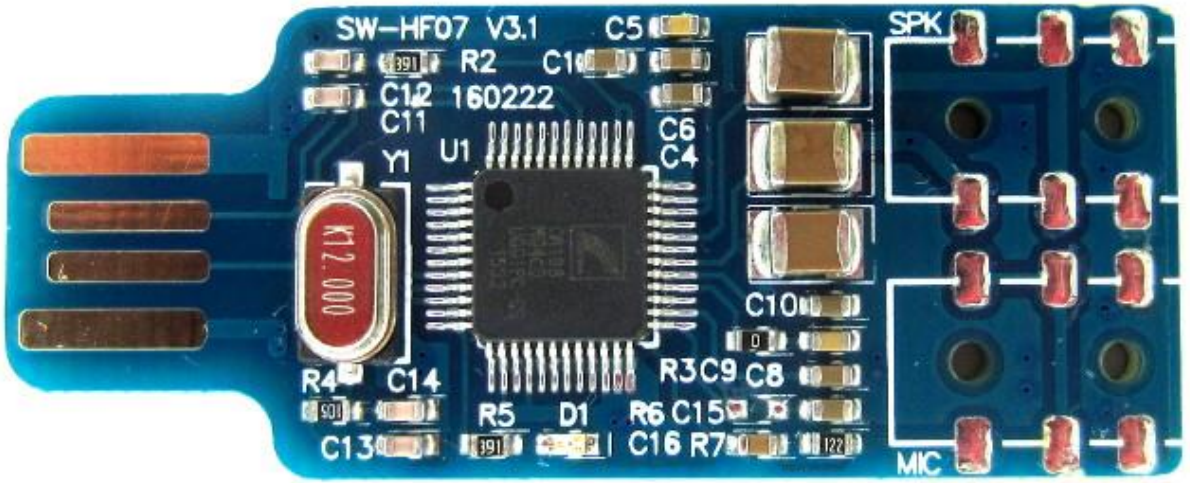
DTMF Commands for linking and basic controller commands:
Please disconnect links after you are done with them.

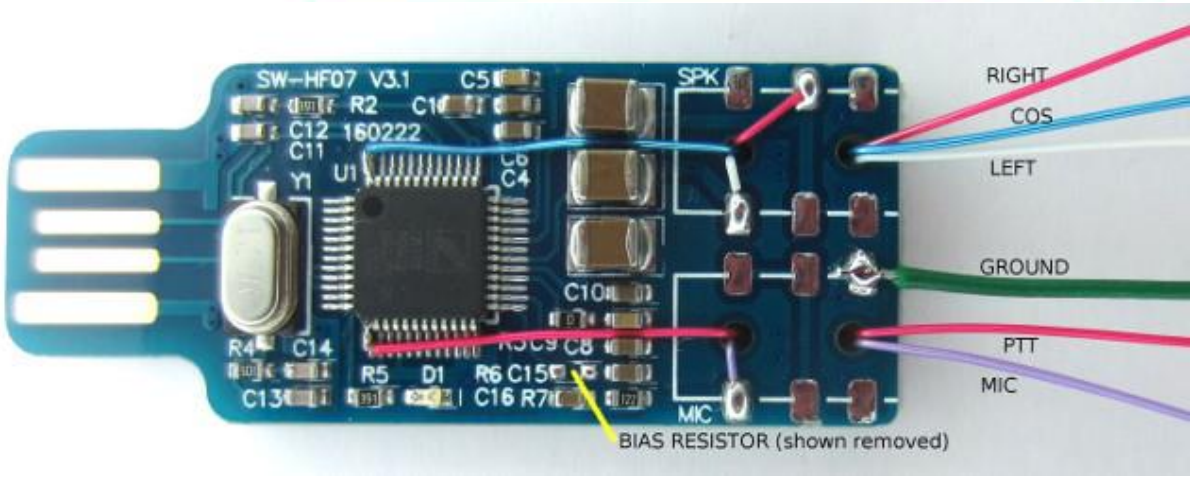
Allstar Node Linking/un-linking
*1 Link Disconnect (*1 plus the Allstar Node number you wish to unlink from)
*2 Link Connect (Monitor Only, *2 plus the Allstar node number you wish to monitor)
*3 link Connect (*3 plus the Allstar node number you wish to link to)
*51 Time of Day + ID
*66 Repeater DVR/Parrot mode (send *66 plus test speech without letting off PTT, repeater will parrot after release of PTT)
*70 Link Status
*73 Full Link Status
*76 Disconnect all links
*81 Time of day only
Telephone Auto Patch Access:
your ID and check repeater schedule and link status before using Auto Patch. You may not want linked nodes or hubs to hear your phone call.
***61 + area code + phone number**
To hang up send: ***0**
If you get a busy signal send ***0**
If the telephone side hangs up, no further action is necessary.
Say your ID at autopatch QSO end

EchoLink Access:
To connect to an EchoLink node:
*33 + node number padded with zeroes to 6 digits.
To disconnect to an EchoLink node:
*13 + node number padded with zeroes to 6 digits.
Examples:
To connect/disconnect to EchoLink node number 86082 = *33086082, *13086082
To connect/disconnect to EchoLink node number 9999 = *33009999, *13009999

SCHEDULE FOR BOTH REPEATERS:
ARRL News airs at 8:00PM Mondays
Amateur Radio Newsline (ARN) airs at 7:30PM Wednesdays
Alabama Friends Net 8:00PM Wednesdays
Ham Nation "After" Net from 9:00PM to 10:00PM Wednesdays
Re-airing of ARRL news at 8:00PM and ARN news at 9:00PM on Saturdays
UK Allstar Hub 41223, daily from 6:00 AM to 10:00 AM.

For list of active Allstar Nodes: http://stats.allstarlink.org/
A couple of my favorites:
41223: UK Allstar Hub
27066: UK Allstar Hub
27225: WA3DSP Philadelphia PA hub



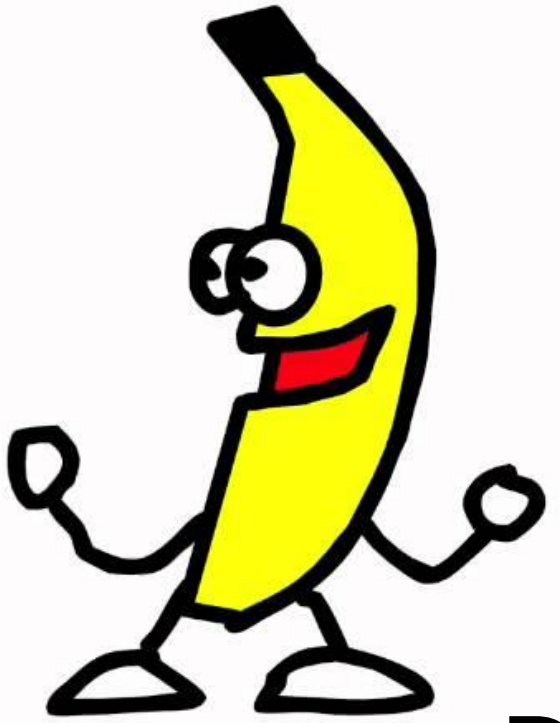


MODIFIED USB SOUNDCARD FOB.
CM108 USB AUDIO SOUND CHIP.

AVAILABLE ON EBAY, BANGGOOD AND OTHER ONLINE VENDORS FOR AN AVERAGE OF $5 APIECE.

SEARCH FOR “SANWU USB SOUND” OR “SANWU HF07”

DMK Engineering URI (Universal Radio Interface)
Little pricey ~$70, but works GREAT and has added benefit of providing diode protected onboard 5vdc GPIO. The DMK URI is particularly well suited for use in a duplex Allstar repeater.
http://dmkeng.com/



DEMO

IT'S PEANUT-BUTTER-~~JELLY~~ TIME