

# AllStarLink

Jason McCormick N8EI



**SILVERCREEK AMATEUR RADIO ASSOCIATION**  
**W8WKY.ORG**



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# Three General Types of Repeater Linking

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## 1. Fully Digital over Data Links (usually IP)

- Digitized audio end-to-end - from your microphone to their speaker
- Requires new radios & repeaters, all require some proprietary, closed components
- Examples: DMR, DSTAR, System Fusion

## 2. Analog over IP

- Analog RF to repeater - digital IP between repeaters, simplex nodes, computers
- Overlays nicely on top of existing radios and repeaters
- Can add Internet connections from PCs, smartphones
- Examples: IRLP, Echolink, AllStar

## 3. Analog over analog radio

- Analog (usually FM) end-to-end
- Limited distance, can lose quality with each hop
- Examples: FM radio links, split-site repeaters

# ALLSTAR LINK

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- Repeater controller based on the Asterisk PBX
- Add-on module to Asterisk adds repeater functionality
- All RF is standard analog FM
- Control by DTMF codes
- Can be grafted onto almost any radio stack
- Create many links – scheduled, ad-hoc
- Supports Echolink on the repeater



## **Allstar Link Main Project**

<https://www.allstarlink.org>

## **HamVOIP Pi Distribution**

<https://hamvoip.org>

# Why Asterisk?

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- In telephony, communication streams need to be “real time” and PBX software is designed to handle that
- For repeater links, one wants the same “real time” operation
- No wheel reinvention
  - A “link” is just a “call”
  - Links (calls) are made using a well-tested, stable protocol
  - Encoding/decoding of the audio is built in using open telephony standards

# Technology You Don't Need to Know About

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## **PBX – Private Branch Exchange**

- Basically a phone system

## **IAX – VoIP protocol for linking PBX systems**

- Carries both signaling and media
- Simple to permit through firewalls, NATs, etc.

## **Audio Codecs**

### **G.711 (default)**

- 64 kbit/s rate
- 300 – 3400 Hz @ 8000 samples/s
- “Phone Quality Audio”

### **G.722**

- 64 kbit/s rate
- 50 – 7000 Hz @ 16k samples/s + compression
- “HD Audio”

### **G.726**

- 32 kbit/s rate (main reason to use it)
- “Phone Quality Audio”

### **G.729**

- 8 kbit/s rate
- “You're in a tin can but need to communicate”
- Designed for very low bandwidth situations

# Allstar Statistics

- 22,624 Nodes
- 24,267 Users



## AllStar Link Node List

Show  nodes Filter:

Node	User ID	Node ID	Freq	Tone	Location	Country	Site Name	Affiliation	Last Seen
43078 wt	W8WKY	W8WKY	442.275	110.9	Doylestown OH	United States	Doylestown OH	Silvercreek ARA	
43211 wt	W8WKY	W8WKY	147.390+	114.8	Doylestown OH Connect to 48496	United States	Connect to 48496 please	Silvercreek ARA	2022-01-17 22:28
45839 wt	W8WKY	W8WKY-R	Echolink		Services	United States	Conference-Echolink Hub	SARA	2022-01-17 22:30
47735 wt	W8WKY	W8WKY	Broadcastify		Services	United States	Conference-Echolink Hub	SARA	2022-01-17 22:28
48496	WW8TF	W8WKY	SARAHub Connect Here		in the Cloud	United States		Wayne Technical Fanatics	2022-01-17 22:28

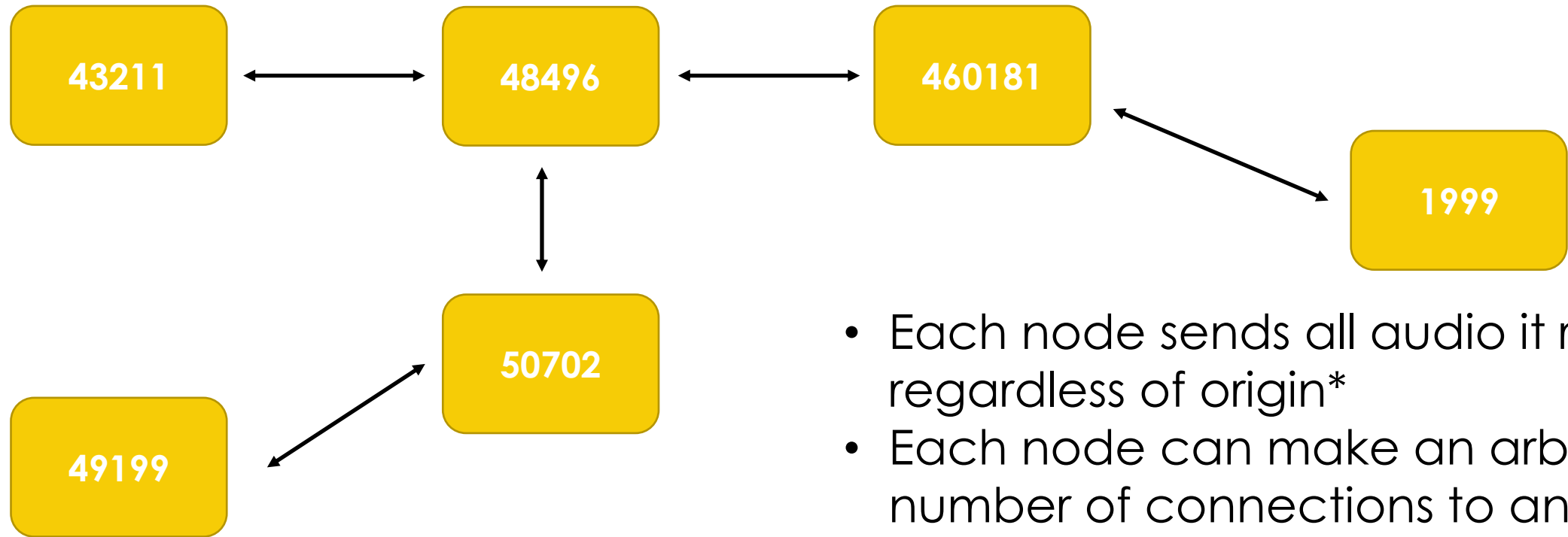
Showing 1 to 5 of 5 nodes (filtered from 22,624 total nodes)

Generated 22:27:56 2022-01-17  
This count of registered nodes is generated every 60 seconds and automatically refreshes.

# 6526

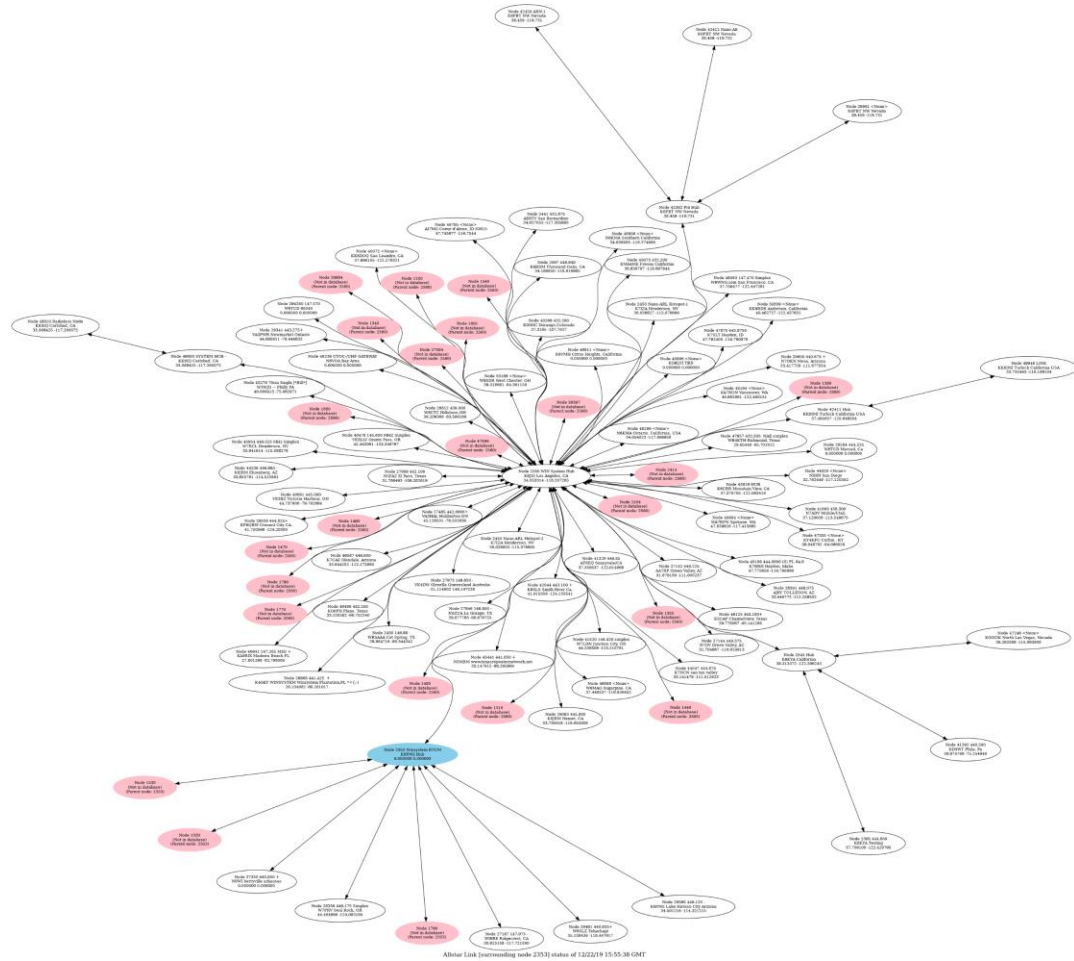


# Nodes

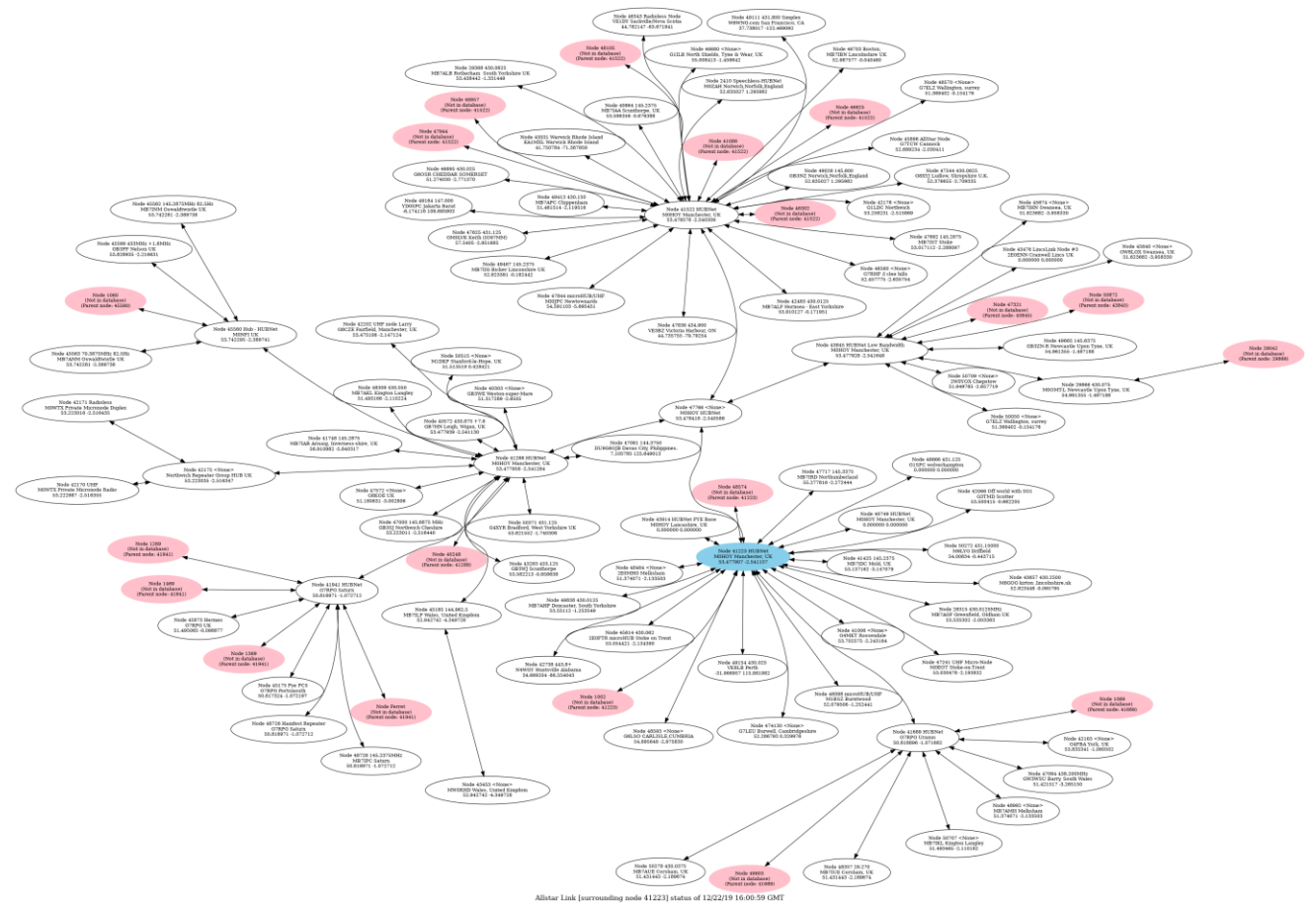


- Each node sends all audio it receives regardless of origin\*
- Each node can make an arbitrary number of connections to any other node
- “Hubs” are just another node with a name and/or purpose

# LARGE ALLSTAR MESHES ARE ACHIEVABLE



Western Intertie Network System (WINSsystem)



MOHOY HUBNet





# First Rule of AllStar

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If you don't want to interact with AllStar, then don't. The repeater will work just fine without doing a thing.

# Second Rule of Allstar

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Your normal FM radio works with AllStar – no special equipment needed. If you can talk on the repeater, you can use AllStar.

# Basic Allstar Commands

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AllStar adds and removes links based on DTMF commands starting with a \* (star)

- \*3<NODE>      Connect a node
- \*1<NODE>      Disconnect a node
- \*70            Announce all connected nodes
- \*76            Disconnect all nodes
- \*82            Very inefficient way to find out the current time

# What's a Node?

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- It's just a number, like a short telephone number (which it IS)
- It is NOT a DMR ID
- Most nodes are a five-digit number
- Newer AllStarLink numbering is an “extension” to your existing node rather than assigning new numbers
  - 43211 becomes 432111, 432112, etc...
  - 46018 becomes 460181, 460188, etc...
- Look up nodes by callsign, location, etc. at <https://www.allstarlink.org/nodelist/>
- See what is linked at <http://stats.allstarlink.org/>

# Basic Interaction

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Example connection from W8WKY to W8WOO

1. (PTT) \*350702
2. Listen for “Node W8WKY connected to W8WOO” or “Node 43211 connected to node 50702” (depends on if the “callsigns” are configured for playback)
3. Do your QSO or whatever
4. When you’re done (PTT) \*150702 and listen for the disconnect notice

# Basic Operational Courtesy

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- Avoid quick-keying. This is ALWAYS a good practice, but it's much more important with network-connected nodes.
  - Leave at least a second after you hear the telemetry tone of the last transmission before you key up.
  - Repeaters will have different courtesy tone lengths and hangtimes
- Listen before you transmit after linking – be courteous about interrupting an in-progress QSO on a remote system
- Be smart about linking up a big Allstar network mesh or a busy net
- Always unlink when you're done

# Dueling Allstars

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## AllStarLink.org (ASL)

- Original project
- Serves as the de facto registration hub and directory
- Slower-moving community
  - ASL v1 is still the “production” version and is very old
  - ASL v2 is still in “testing” (but should be good for just about everyone)

## HamVOIP.org

- Forked from the original project
- Optimized for Raspberry Pi computers
- Nice additions for managing the USB audio device
- Does not contribute its code (causes lots of flame wars about GPL licensing)

# Building an “Allstar Node”

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Basically, you always need a computer

- Raspberry Pis are most popular

And then you need an audio device and a radio device

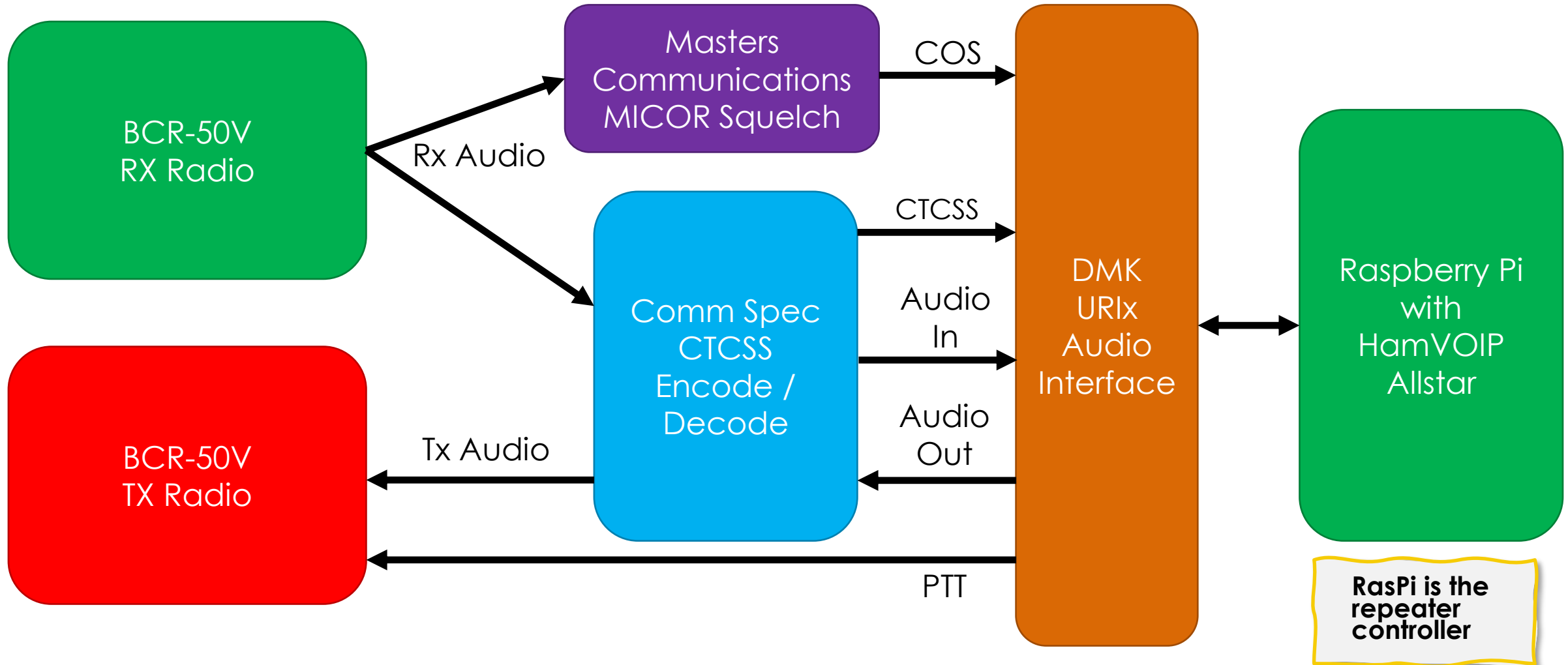
- Masters Communications RA-25 or RA-40 for audio
- DMK URI-X
- W6IPA's PIRIM Board (has place for optional SA-818 RF)
- SHARI (full featured simplex “hotspot”)



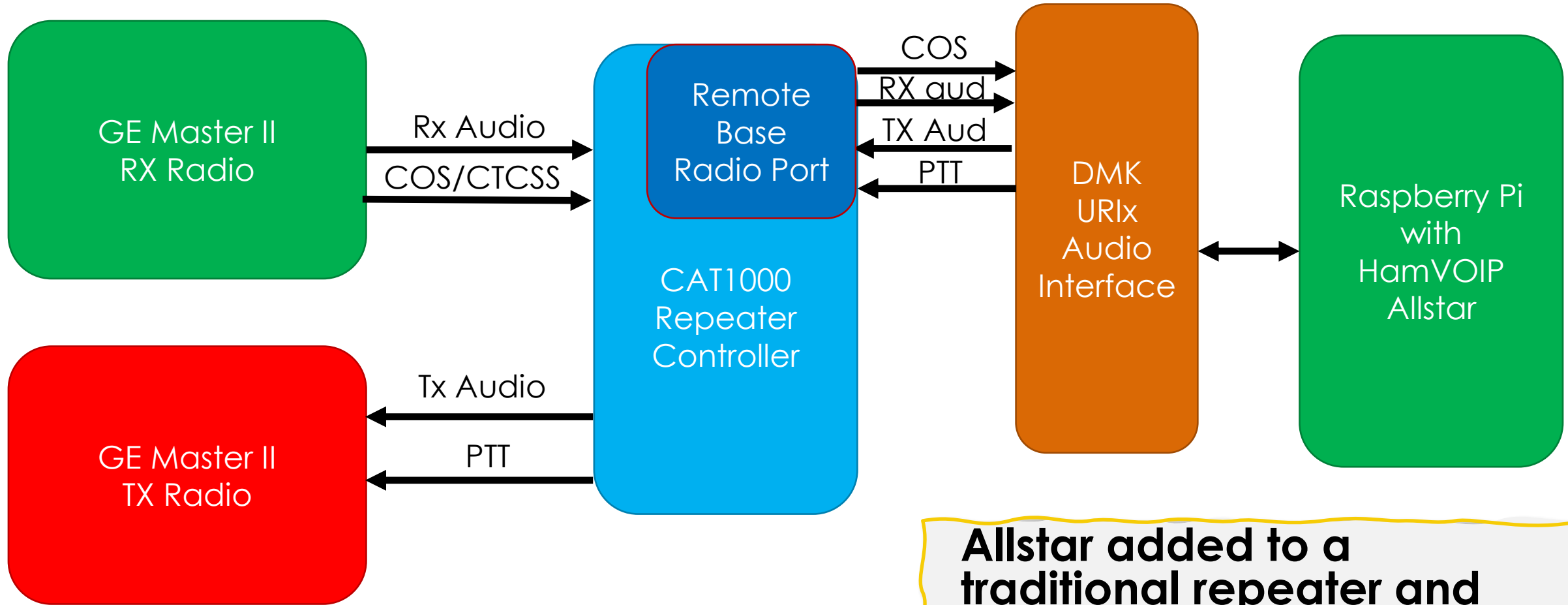
# ALLSTAR RECOMMENDED HARDWARE

Item	Vendor	Cost
Raspberry Pi 3B Kit  (Note: Don't use a Pi 4 yet; software is not ready)	Canakit Raspberry Pi 3 w/ case, heatsink, and power supply  Amazon Item: B01C6EQNNK	\$50
MicroSD Card	Samsung EVO Select 32G  Amazon Item: B06XWN9Q99	\$6.50  Do not use an old one!
USB Audio Adapter with repeater signaling	Masters Communications RA-40 <a href="https://www.masterscommunications.com/products/radio-adapter/ra40.html">https://www.masterscommunications.com/products/radio-adapter/ra40.html</a>  - or -  DMK URix <a href="https://dmkeng.com/Products.htm">https://dmkeng.com/Products.htm</a>	\$65 (RA-40 + Case + S/H)
	<b>TOTAL (except interface cable)</b>	<b>\$121.50</b>

# W8WKY 147.390 (Old Setup)



# N8XPK 53.17



**Allstar added to a traditional repeater and controller**

# REPEATER INTERFACE

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## Premade Cables

Many vendors

Example:

<http://www.uricables.com/>

## Custom Cabling

RA-25/40 has a D-Sub DB9 female port; DMK URix has D-SUB DB-25 female port. Easy to build:

- Audio In
- Audio Out
- PTT
- GND
- COS/COR Detect
- CTCSS Detect

Almost all repeaters and most radios can be lightly modified to connect to this port

