

Digital HotSpots For Ham Radio

Richardson Amateur Radio Club
Aug 2018

KF5ZBL - Bill
KG5EIU - David

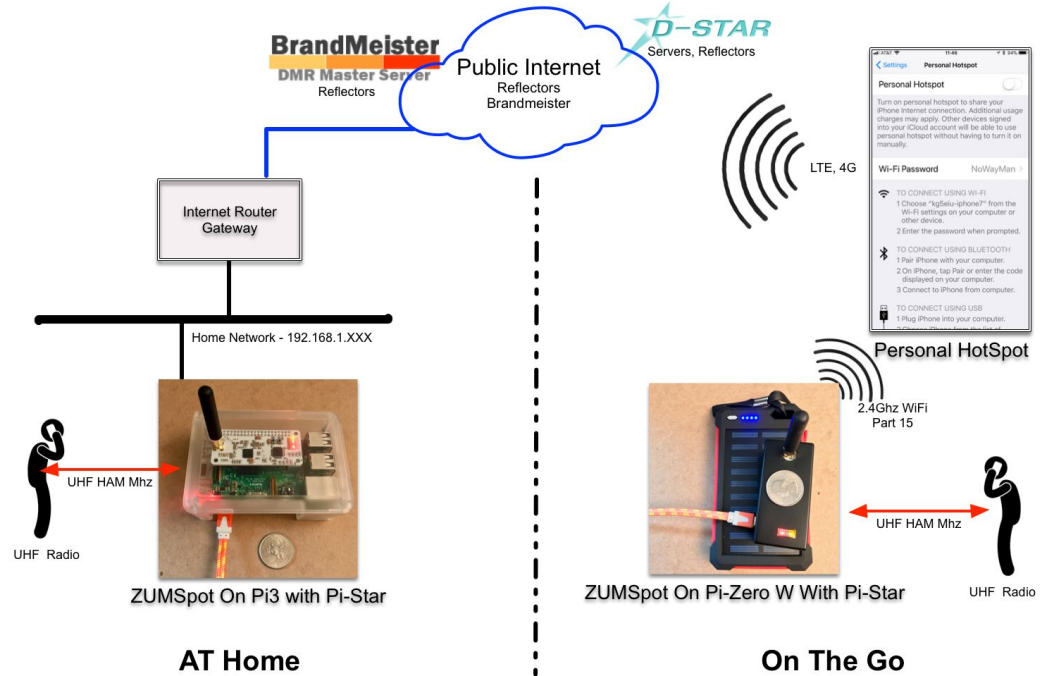


DAPNET
decentralized amateur paging network



Why HotSpots - System Diagram/Use

- Gives Radio Operator fast easy access globally
- High Quality Digital Audio Experience
- No Repeater Access needed
- Multiple Digital Modes Available
- Most still require a radio
- Most require a computer or Raspberry PI



HotSpot Types/Categories

No Operator Radio Needed (usually USB dongles)

- **Uses a computer + hardware dongle/vocoder + software**
- **Requires computer mic and headset plus USB port to power dongle**
- **Requires good Internet connection to/from computer**

Operator Radio Needed (HT or mobile/base)

- **Uses computer + hardware dongle and software + Operator RADIO**
- **Uses hotspot/appliance/transceiver + Operator RADIO**
- **Requires good internet to/from computer and/or hotspot/appliance**

DV Dongle - D-Star Only

- **Good for when there's no local D-Star repeater and you don't own a radio and just want to get on D-Star**
- **Requires Computer with good internet connection, headphones and Mic**
- **Requires USB port on computer**
- **Requires D-star registration**
- **Connects to D-Star Gateways & Reflectors worldwide**
- **Software – DV Tool – free download and runs on Microsoft Windows XP/Vista, Mac OS X, or many flavors of Linux.**



DV Dongle

http://www.dvdongle.com/DV_Dongle/Home.html

DV Access Point or DVAP - D-Star Only

- **Creates instant local access point for small area without D-STAR repeater**
- **Connects to Computer via USB**
- **Includes a 10mw 2m or 70cm transceiver and stubby antenna**
- **Use HT or other D-STAR radio nearby for full network access without local repeater.**
- **Software module for configuration and operation using Windows XP/Vista/7/8, Mac OS X Leopard/Snow Leopard, or many flavors of Linux**



DV Access Point Dongle

http://www.dvapidongle.com/DV_Access_Point_Dongle/Home.html

DV3000U ThumbDV - D-Star Only

- The DV3000U adds D-STAR DV capability to your computer or laptop. Allowing you to get on the D-STAR network without a radio.
- The FTDI USB to serial converter has preinstalled driver support for Windows and Linux Mac OS X is available from FTDI.
- 2 different Baud rate versions
- Requires Computer USB Port with good internet connection
- Requires headphones & mic on the Computer
- Requires registration
- Connects to Gateways & Reflectors worldwide
- Uses WinDV or BlueDV software
- Allows Dstar HF operation on certain Flex Radio's

NW Digital Radio

<http://nwdigitalradio.com/products/>



DV4Mini, DV4mini AMBE

- **USB Stick**
- **On board transceiver 2M vhf or 70cm uhf**
- **Multiprotocol - D-Star, DMR. Fusion, APCO25 and DMR**
- **Need Computer/Raspberry Pi 3**
- **Need Operator Radio's (DV4Mini)**
- **AMBE model allows computer mic and headphones or with operator radio's**

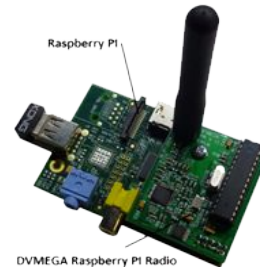


DV4Mini by Wireless Holdings, LLC
<http://wirelesshold.com/modems.aspx>

DV Mega RPI Radio Module

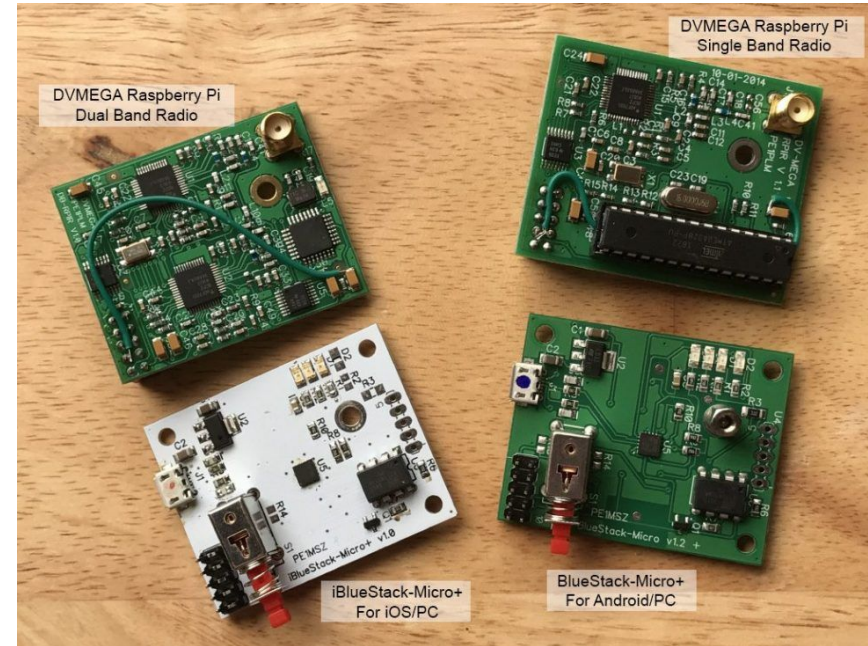
- **DVMEGA RPI - a radio module that fits without a modem or node adapter directly on the Raspberry PI. The combination RPI and DVMEGA radio is a complete D-Star and DMR compatible hotspot with an output power of 10mW.**
- **This works with all versions of the Raspberry PI**
- **Two versions. A UHF board and a Dual band VHF/UHF version.**
- **Needs operator radio's**

<http://www.dvmega.auria.nl>



BlueStack Micro + DVMega Board

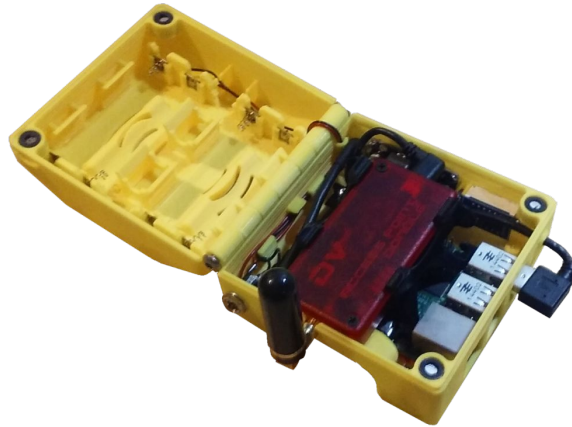
- BlueStack
- Android,IOS, Windows, Linux versions
- Uses DVMega boards
- BlueDV app or software
- Dstar, DMR, Fusion
- App connects via bluetooth or USB
- App has to be running for unit to work
- Needs operator radio



DHAP Digital HAM Access Point

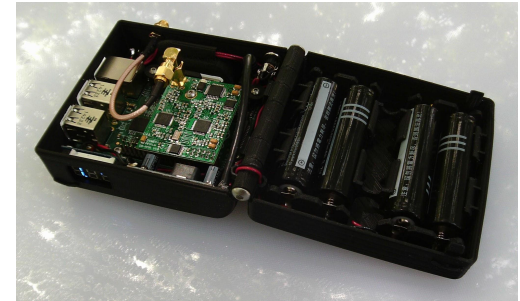
DHAP Mini

- Custom 3D case
- Raspberry Pi 3
- Built in battery
- DVAP based
- Need operator Radio's



DHAP Mini Mega

- Custom 3D case
- Raspberry Pi 3
- DVMega board based
- Need operator Radio's



DHAP Mini by Hardened Power Systems

<https://www.portableuniversalpower.com/our-products/ham-radio-power/dhap-mini/>

Shark RF OpenSPOT

- Stand alone appliance has on-board transceiver 20mW RF output
- Requires good wired ethernet connection via RJ45 NO WIFI
- Multi-protocol support - D-Star or System Fusion and/or DMR
- Cross mode with DMR and System Fusion (on board cross mode)
- Simple web interface GUI, HTTP, UDP/TCP API support
- USB Powered
- Runs embedded software/OS - no linux/windows, no memory card
- Firmware easily upgradable
- Need operator Radio's



<https://www.sharkrf.com>



NANO-SPOT

- Stand alone self-contained digital hotspot has onboard transceiver 20mW RF output
- Requires good WiFi-based Internet connection
- Multi-protocol support - D-Star, System Fusion, DMR, P25, NXDN
- Simple Pi-Star web interface GUI, HTTP, UDP/TCP API support
- USB Powered
- Running “Pi-Star”
- Needs operator Radio’s

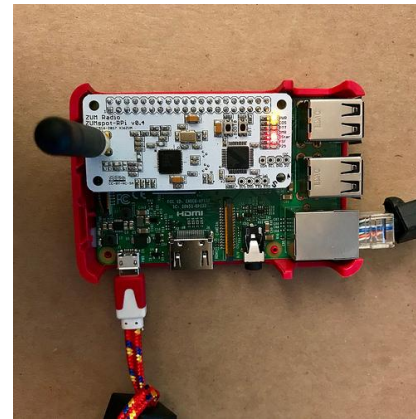
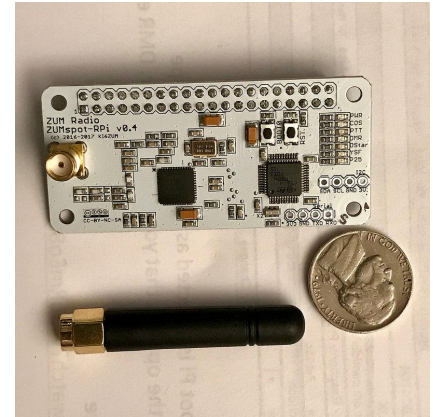


Micro-Node International

<http://www.micro-node.com/index.shtml>

ZUMSpot Board - UHF Transceiver Pi-Hat

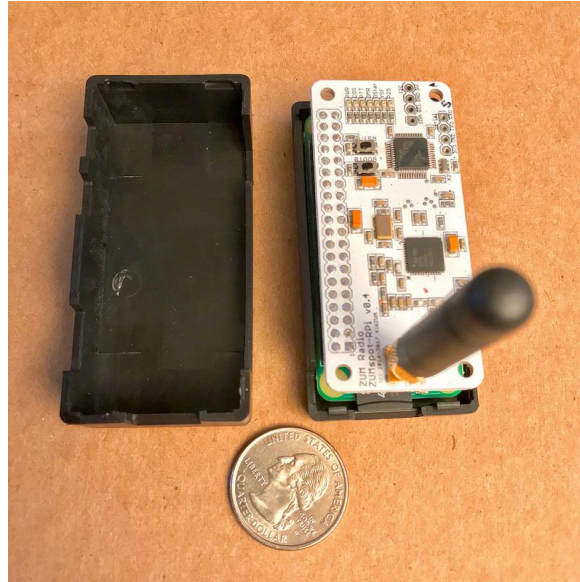
- 32-bit ARM Processor
- 10mW RF Power
- SMA Antenna Connector
- DMR, P-25, D-Star, System Fusion, NXDN
- Firmware pre-loaded
- Displays: NEXTION, I2C Support
- Status LEDs
- Needs operator radio's
- YSF2DMR Gateway



ZumSpot

<https://www.hamradio.com/detail.cfm?pid=H0-015993>

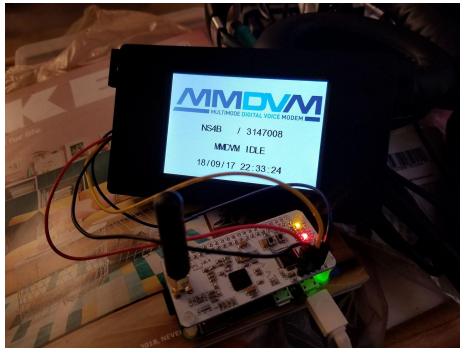
ZUMSpot Board - Examples



More Photos In The Flickr Gallery - <https://flic.kr/s/aHsm3gQNuo>

Better Together - Hardware + Software

- MMDVM - Open Source Multi-Protocol Digital Voice Modem
- ZUMSpot - Radio Module Board (UHF Transceiver) For Pi Hat
- Raspberry Pi - Credit-Card-Sized Computer (P2, Pi3, Pi-ZeroW)
- Pi-Star - Custom Software Image For Pi (Raspbian + MMDVM)

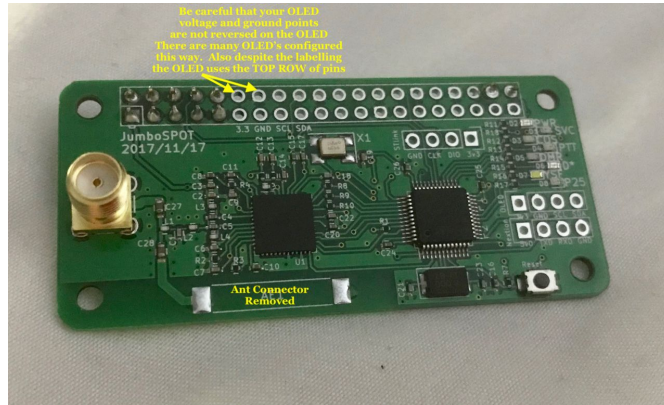
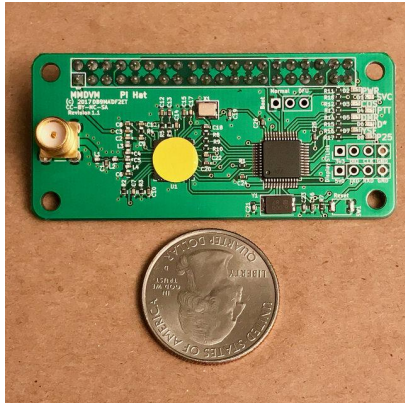


Jumbo Spot/China Spot/MMDVM_HS_HAT

- Clone/knock-off of MMDVM PiHat (all open source design)
- UHF or VHF Transceiver Raspberry Pi-Hat
- eBay.com, tindie.com
- Now upgradable

Setup Guide

http://www.hagensieker.com/blog/page/?post_id=99&title=jumbospot-dmr-hotspot



Other Hardware Choices

Stand Alone Appliances

- **Runs like a radio**
- **Needs good internet connection**
- **Has built in speaker and mic**
- **Both support D-Star, DMR, and C4FM/Fusion**



DV4Home Requires DV4Mini



MYDV Cast incorporates DVMega type board

Software And Firmware

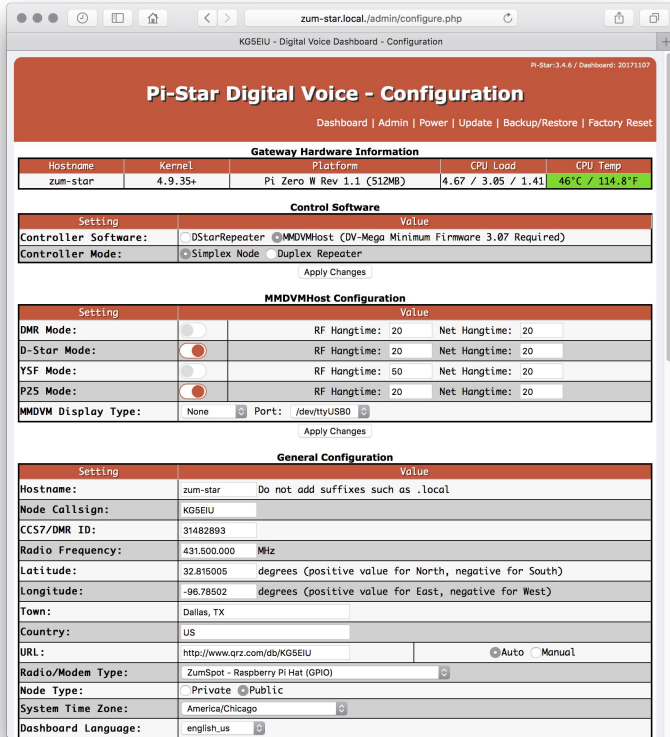
Dongles and USB Sticks

- Custom software and firmware provided by hardware vendor

RPi “images” Completely Open Source

- Pi-Star - Hardened Raspberry Pi OS with included MMDVM - Open Source Multi-Protocol Digital Voice Modem code.
- Firmware open sourced
- Several choices but Pi-Star most popular

Pi-Star - Software Image/Appliance



Pi-Star Digital Voice - Configuration

Dashboard | Admin | Power | Update | Backup/Restore | Factory Reset

Gateway Hardware Information

Hostname	Kernel	Platform	CPU Load	CPU Temp
zum-star	4.9.35+	Pi Zero W Rev 1.1 (S12MB)	4.67 / 3.05 / 1.41	46°C / 114.8°F

Control Software

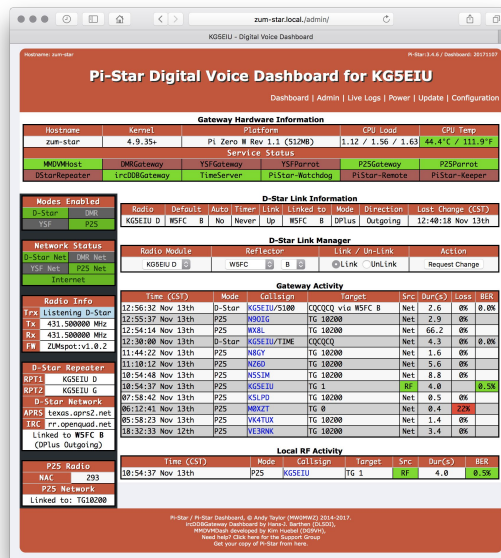
Setting	Value
Controller Software:	DStarRepeater @MMDVMHost (DV-Mega Minimum Firmware 3.07 Required)
Controller Mode:	Simplex Mode @Duplex Repeater

MMDVMHost Configuration

Setting	Value
DMR Mode:	<input type="radio"/> RF Hangtime: 20 Net Hangtime: 20
D-Star Mode:	<input checked="" type="radio"/> RF Hangtime: 20 Net Hangtime: 20
YSF Mode:	<input type="radio"/> RF Hangtime: 50 Net Hangtime: 20
P25 Mode:	<input type="radio"/> RF Hangtime: 20 Net Hangtime: 20
MMDVM Display Type:	None Port: /dev/ttyUSB0

General Configuration

Setting	Value
Hostname:	zum-star Do not add suffixes such as .local
Node Callign:	KG5EUI
CCS7/DMR ID:	31482893
Radio Frequency:	431.500.000 Mhz
Latitude:	32.815005 degrees (positive value for North, negative for South)
Longitude:	-96.78502 degrees (positive value for East, negative for West)
Town:	Dallas, TX
Country:	US
URL:	http://www.qrz.com/db/KG5EUI Auto Manual
Radio/Modem Type:	ZumSpot - Raspberry Pi Hat (GPIO)
Node Type:	Private @Public
System Time Zone:	America/Chicago
Dashboard Language:	english_us



Pi-Star Digital Voice Dashboard for KG5EUI

Dashboard | Admin | Live Logs | Power | Update | Configuration

Gateway Hardware Information

Hostname	Kernel	Platform	CPU Load	CPU Temp
zum-star	4.9.35+	Pi Zero W Rev 1.1 (S12MB)	1.12 / 1.56 / 1.63	44.4°C / 111.9°F

Nodes Enabled

Node	Mode
YSF	P25

Network Status

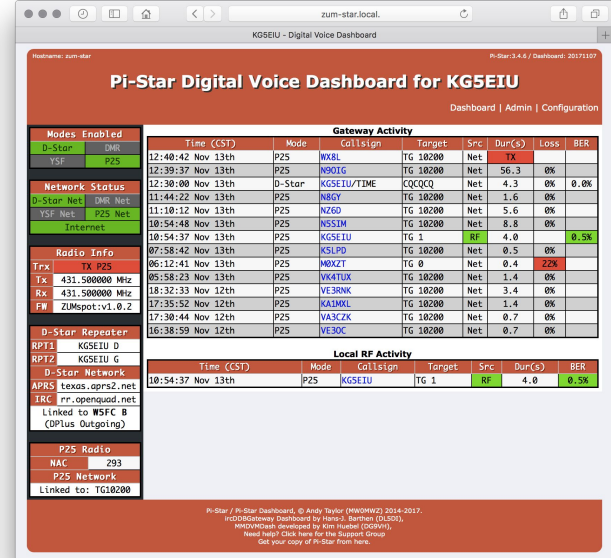
Node	Mode	Net
D-Star Net	DMR	Net
YSF Net	P25	Net

Gateway Activity

Time (CST)	Mode	Call Sign	Target	Src	Dur(S)	Loss	BER
12:56:32 Nov 13th	D-Star	KG5EUI/S100	CCCCQ via WSFC B		2.6	0%	0.0%
12:55:37 Nov 13th	P25	NB0IG	TG 18200	Net	2.9	0%	
12:54:14 Nov 13th	P25	WXBL	TG 18200	Net	66.2	0%	
12:30:00 Nov 13th	D-Star	KG5EUI/TIME	CCCCQ	Net	4.3	0%	0.0%
11:44:22 Nov 13th	P25	NB0Y	TG 18200	Net	1.6	0%	
11:18:12 Nov 13th	P25	NZ6D	TG 18200	Net	5.6	0%	
10:54:48 Nov 13th	P25	N5SIW	TG 18200	Net	6.8	0%	
05:58:23 Nov 13th	P25	KSLPD	TG 18200	Net	4.0	0.5%	
06:32:41 Nov 13th	P25	WXATX	TG 0	Net	0.5	0%	2%
05:18:23 Nov 13th	P25	WXATX	TG 18200	Net	1.4	0%	
18:32:33 Nov 12th	P25	VE3RNX	TG 18200	Net	3.4	0%	

Local RF Activity

Time (CST)	Mode	Call Sign	Target	Src	Dur(S)	BER
10:54:37 Nov 13th	P25	KG5EUI	TG 1	RF	4.0	0.5%



Pi-Star Digital Voice Dashboard for KG5EUI

Dashboard | Admin | Configuration

Modes Enabled

Mode	DMR
D-Star	<input checked="" type="checkbox"/>
YSF	<input type="checkbox"/>

Network Status

Node	Mode	Net
D-Star Net	DMR	Net
YSF Net	P25	Net

Gateway Activity

Time (CST)	Mode	Call Sign	Target	Src	Dur(S)	Loss	BER
12:40:42 Nov 13th	P25	WXBL	TG 18200	Net	TX		
12:39:37 Nov 13th	P25	NB0IG	TG 18200	Net	56.3	0%	
12:30:00 Nov 13th	D-Star	KG5EUI/TIME	CCCCQ	Net	4.3	0%	0.0%
11:44:22 Nov 13th	P25	NB0Y	TG 18200	Net	1.6	0%	
11:18:12 Nov 13th	P25	NZ6D	TG 18200	Net	5.6	0%	
10:54:48 Nov 13th	P25	N5SIW	TG 18200	Net	6.8	0%	
10:54:37 Nov 13th	P25	KG5EUI	TG 1	RF	4.0		0.5%
07:58:42 Nov 13th	P25	KSLPD	TG 18200	Net	0.5	0%	
05:12:41 Nov 13th	P25	WXATX	TG 0	Net	0.4		22%
05:58:23 Nov 13th	P25	WXATX	TG 18200	Net	1.4	0%	
18:32:33 Nov 12th	P25	VE3RNX	TG 18200	Net	3.4	0%	
17:35:52 Nov 12th	P25	KAJMKL	TG 18200	Net	1.4	0%	
17:30:44 Nov 12th	P25	V43CZK	TG 18200	Net	0.7	0%	
16:38:59 Nov 12th	P25	VE3OC	TG 18200	Net	0.7	0%	

Local RF Activity

Time (CST)	Mode	Call Sign	Target	Src	Dur(S)	BER
10:54:37 Nov 13th	P25	KG5EUI	TG 1	RF	4.0	0.5%

P25 Radio

NAC	293
P25 Network	
Linked to:	TG18200

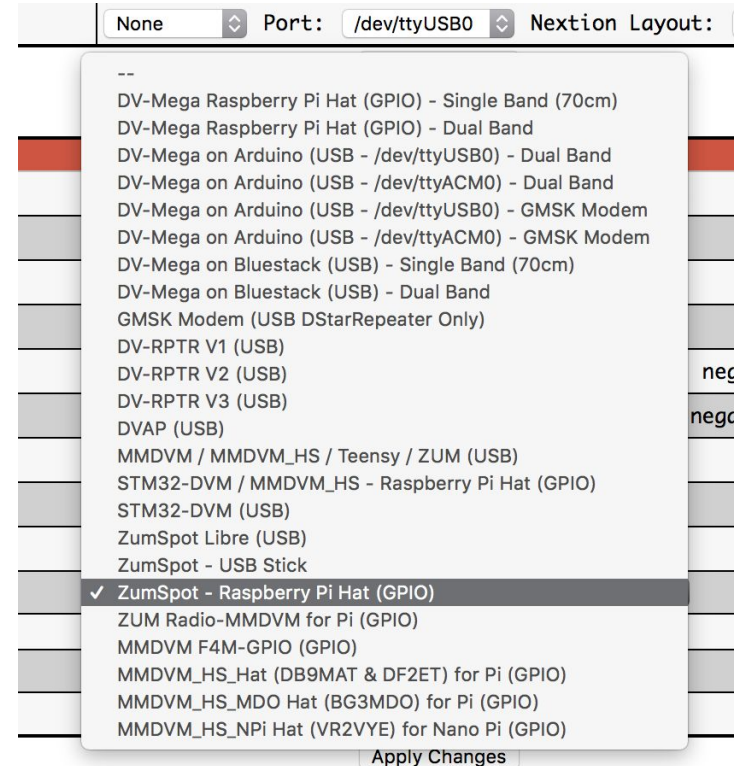
Current Version as of July 22, 2018: v3.4.16
Updated frequently

Pi-Star Digital Voice Software - <http://www.pistar.uk>

Hardware Support With PiStar

PiStar

- **Custom RPI software, free and open source.**
- **Lots of dongles, boards, and USB sticks supported.** (as of Feb 2018)



PiStar Software Features

PiStar New Features As Of Aug 2018

- YSF 2 DMR
- YSF 2 NXDN
- DMR 2 YSF
- DNR 2 NXDN
- DAPNET Paging - hampager.de

Digital Modes As Of Aug 2018

- DMR
- D-Star
- YSF (fusion)
- P25
- NXDN
- POCSAG (paging)



Network Portals and Dashboards

Great way to see “what is going on” - in the Internet side
BrandMeister Dashboard (DMR) Self Help and more

- <https://brandmeister.network>

Xreflector

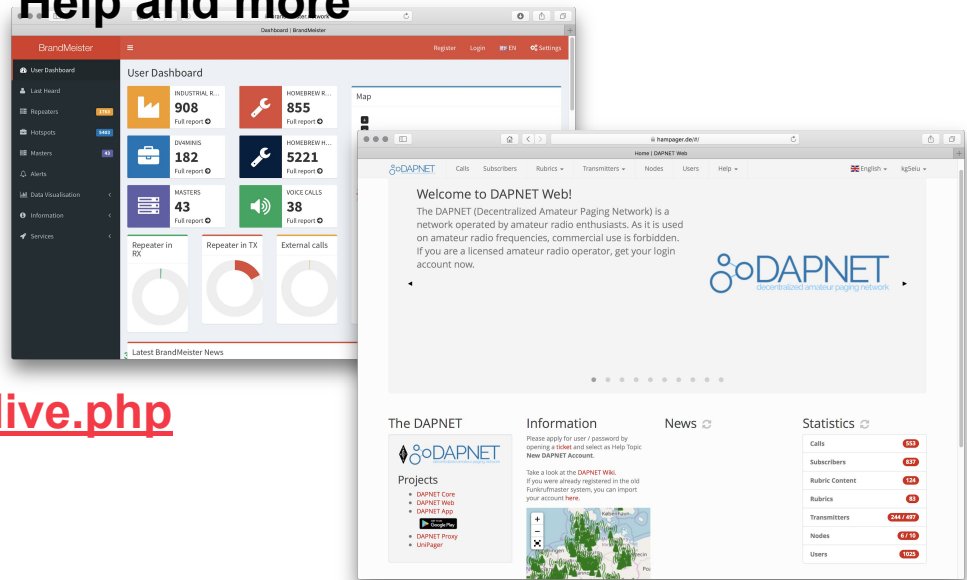
- <http://xreflector.net/neu3/>

DMR Plus CCS7

- <http://www.mw0mwz.co.uk/ccs-live.php>

DAPNET (Paging)

- <https://hampager.de/#/>



ZUMSpot Board - Reference Links

- MMDVM - <https://github.com/g4klx>
- ZUMSpot - (hamradio.com)
- MMDVM_HS_HAT rev 1.5 - tindie.com [N5BOC Store](https://www.tindie.com/products/1000000000000000000/)
- Raspberry Pi - <https://www.raspberrypi.org/products/>
- Pi-Star - <http://www.pistar.uk>
- Support/Latest Info - <https://www.facebook.com/groups/pistar/>
- Initial Setup Videos W1MSG-<https://youtu.be/B5G4gYDdJeQ>
- BrandMeister Network - <https://brandmeister.network>
- KG5EIU Photo Gallery - <https://flic.kr/s/aHsm3gQNuo>
- DAPNET - Decentralized Amateur Paging Network <https://hampager.de/#/>



Thank You!

Comments And questions?



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