

D-STAR 101

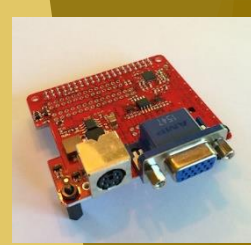
Digital Voice and Digital Data on VHF/UHF/Above

Northern Utah Technical Society

NU7TS

Ted McArthur – AC7II

D-Star Radios & Equipment



What is D-STAR

- **Digital Smart Technologies for Amateur Radio**

- 1999 Funded by the Japanese Government and administered by the Japanese Amateur Radio League (JARL)
- 2001 Open Specification Published – anyone can implement <http://www.jarl.com/d-star/shogen.pdf> or <http://www.arrl.org/files/file/D-STAR.pdf>
- 2004 ICOM released “D-STAR optional” hardware
- Current Implementations
 - Digital Voice (w/simultaneous data)
 - 2 m, 70 cm, and 23 cm
 - Digital Data (data only)
 - 23 centimeters
 - Repeater Networking
 - RF link
 - Gateway

What Can D-STAR Do?

- Transmit or receive voice and 1200 bps data simultaneously on 2m, 70cm and 23cm bands (no TNC required)
- High speed 128 Kbps data transmission on 23cm band with Internet connectivity (Ethernet bridge to Internet with IP address)
- Digitally sending your ID on every transmission
- D-PRS (digital APRS) automatic position reporting of your GPS location simultaneous with voice
- Flexible repeater linking with Gateway and Internet connection
- Reflectors act as conference bridge for linking multiple repeaters (64 now in operation worldwide)
- DV Dongle and DV Access Point (DVAP) allow voice and data access to D-STAR via Internet connection (similar to EchoLink)

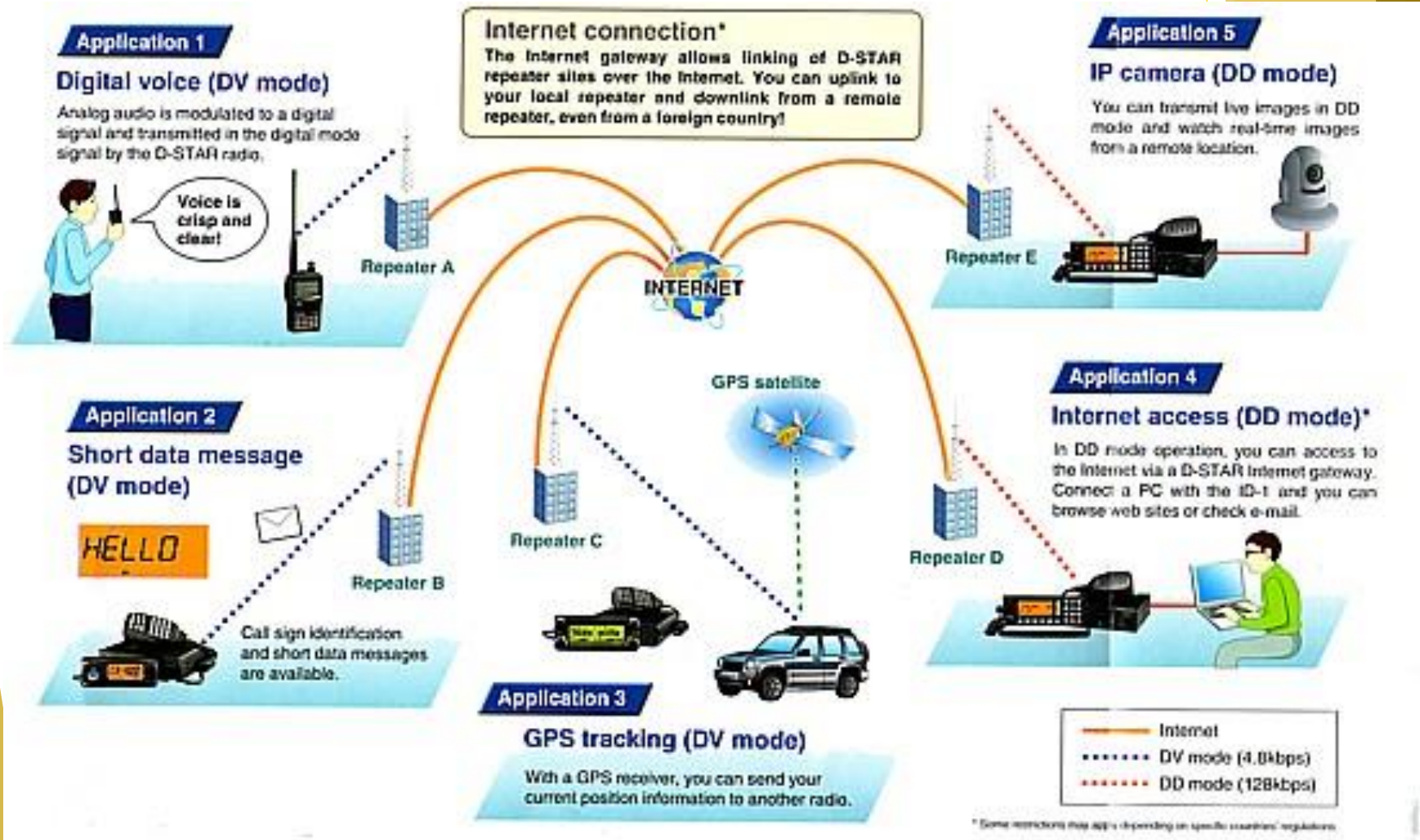
Spectral Efficiency

- D-STAR Digital Voice (DV) mode occupies 6.25 kHz bandwidth, where FM occupies 15 kHz
- 10 kHz channel spacing (reasonable)
- More efficient use of available bandwidth
- Allows more channels in crowded spectrum
- Better performance compared to analog FM
 - As long as the signal strength is above a minimum threshold, and no multi-path is occurring, the quality of the data received is better than an analog signal at the same strength.
 - 10% to 15% more range.
 - Same power in less bandwidth (SSB vs. AM)



DStarWeakvsFM_KC5ZRQ.mp3

Repeater Networking



Gateway

- Gateways utilize the Internet to provide global D-STAR connectivity
- Callsign registration is Required for gateway operation
 - Get with your local gateway administrator to get registered
 - Registering more than once can mess up Gateway Data Base
- No Callsign registration required for local repeater use
- Nationwide Routed Callsign Calling Via Gateway
 - No Need To Know QTH Of Target
 - Key-up Networked D-STAR Repeater And The World Knows Your QTH
- Callsign Routing
 - User determines the route his transmission takes
 - Enter callsign of destination, either individual or repeater, directly into your radio and start talking
 - Multicasting -communicate with multiple repeaters in a group at once

Reflector

- A reflector can be considered to be similar to a repeater, but with no RF capabilities
- A Reflector is a gateway that acts as a central conference hub where multiple D-STAR nodes (repeaters) / DV Dongle users can gather and talk to each other.
- Hub and spoke model
- Issue a command to local repeater and “link up” to the reflector
- Many type of reflectors
 - REF – runs on the D-Plus network (all ICOM stacks run this)
 - X – X-Reflectors on the DExtra network (ircDDB)
 - DCS – X-Net (next generation of X-Reflectors)

Repeater Basics

- The 8th character in a repeater callsign field (i.e., NU7TS..B) is a port designator for the System/Gateway [the • represents a space] (if the 8th position is left blank, the system assumes PORT A is used)
- A – 1.2 GHz (23cm high speed data, DD)
- A – 1.2 GHz (23cm voice, DV)
- B – UHF (70cm, DV)
- C – VHF (2m, DV)
- Additional functions available using DPLUS
 - G – Gateway
 - D – D-RATS
 - E – Echo Test
 - I – Identification
 - L – Link Repeater
 - U – Unlink Repeater

Four Callsign Fields Used for Routing

- **YOUR call** (command field- Linking unlinking ect)
 - Callsign of the person, group, or repeater you want to talk to
 - D-star spec calls this the “Companion Callsign”)
 - This is the key to determine where your signal is heard
- **RPT1**
 - Callsign of the repeater port you use to access the local repeater
 - D-Star spec calls this the “Departure Repeater Callsign”
 - Set it for the local repeater callsign and input port: Example: NU7TS B
- **RPT2**
 - Callsign of the repeater port you use to leave the local repeater
 - D-Star spec calls this the “Destination Repeater Callsign”
 - Set it for the local repeater callsign and exit port: Example: NU7TS C
- **MY call**
 - This is the callsign you are using
 - D-Star spec calls this “Own Callsign”

Local Call on Simplex

Radio to Radio, No Repeater

- General Call

- YOUR: CQCQCQ
- RPT1:
- RPT2:
- MY: KE7IK

- Specific Station

- YOUR: AC7II
- RPT1:
- RPT2:
- MY: KE7IK

- General Call

- Calling CQ (to anybody)
- Roundtables/Nets
- Most Common

- Specific Station

- When other station is using call sign squelch (CQSL)
- Send Message

Local Call On Same Repeater

- General Call

- YOUR: CQCQCQ
- RPT1: NU7TS B
- RPT2:
- MY: KE7IK

- Specific Station

- YOUR: AC7II
- RPT1: NU7TS B
- RPT2:
- MY: KE7IK

- General Call

- Calling CQ (to anybody)
- Roundtables/Nets
- Most Common

- Specific Station

- When other station is using call sign squelch (CQSL)
- Send Message

Local Call on Repeater Stack, Different Band

- General Call

- YOUR: CQCQCQ
- RPT1: NU7TS B
- RPT2: NU7TS C
- MY: KE7IK

- Specific Station

- YOUR: AC7II
- RPT1: NU7TS B
- RPT2: NU7TS C
- MY: KE7IK

- General Call

- Calling CQ from local UHF repeater to local VHF repeater
- Roundtables/Nets
- Most Common

- Specific Station

- When other station is using call sign squelch (CQSL)
- Send Message

Gateway Routing

Routing defined in the D-Star standard

- General Call

- YOUR: /KF6RALC
- RPT1: NUT7S B
- RPT2: NUT7S G
- MY: KE7IK

- Specific Station

- YOUR: K2NWS
- RPT1: NU7TS B
- RPT2: NUT7S G
- MY: KE7IK

- General Call Through Gateway

- Calling CQ on a distant repeater zone
- This routes the call to KF6RAL repeater and Port C
- This is called '**Port Routing**'
- No way to call all ports on a distant repeater

- Specific Station Through Gateway

- Calling specific Station
- Don't need to know other station's location (City, Repeater, Freq., ...)
- This is called '**User Routing**'
- When other station is using call sign squelch (CQSL)
- Send Message

Gateway Linking to Repeater/Reflector

Linking defined by D-Plus

- To “Link”
 - YOUR: KF6RALBL
 - RPT1: NUT7S B
 - RPT2: NUT7S G
 - MY: KE7IK
- Then for QSO
 - YOUR: CQCQCQ
 - RPT1: NUT7S B
 - RPT2: NUT7S G
 - MY: KE7IK
- Linking repeater to another repeater or reflector
 - YOUR field must contain repeater or reflector callsign and an **L** in the 8th character on first transmission
 - After pressing PTT, should hear “Remote System Linked” message
 - Before second transmission, must change the YOUR field to CQCQCQ via One Touch CQ Button



One Touch
CQ Button
IC-92AD

Gateway Unlinking from Repeater/Reflector

- To “Unlink”

- YOUR: U
- RPT1: NU7TS B
- RPT2: NUT7S G
- MY: KE7IK

- Then for local QSO

- YOUR: CQCQCQ
- RPT1: NUT7S B
- RPT2: NUT7S G
- MY: KE7IK

- Unlinking repeater/reflector

- The YOUR field must have 7 spaces then **U** in 8th character position
- After pressing PTT, should hear “Remote System Unlinked” message
- Before transmitting again, must change the YOUR field to CQCQCQ via One Touch CQ Button



One Touch
CQ Button
IC-92AD

Repeater / Reflector Status

- Repeater Status - Dashboard
 - <https://ac70.dstargateway.org/status.html>
-
- Reflector Status - Dashboard
 - <https://ref030.dstargateway.org/status.html>

Using DR Mode Programming

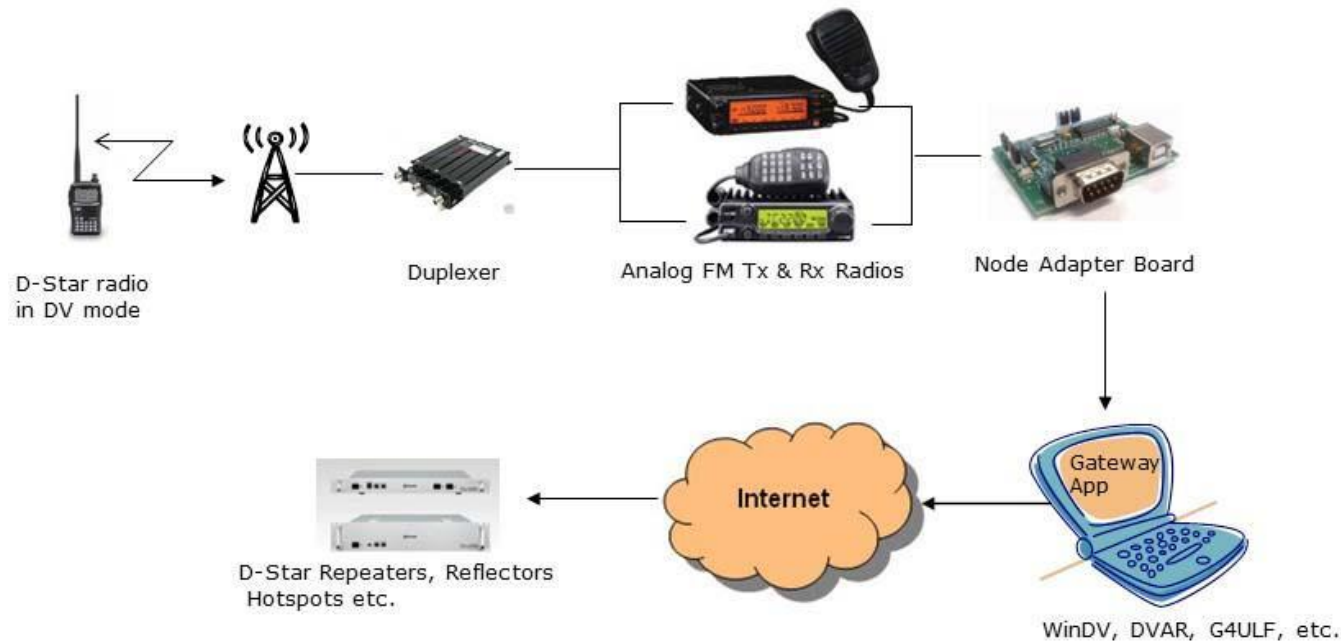
- ID-31, ID-51, ID-5100, ID-4100, ID-7100, ID-9100 & ID-880 have the ability of DR programming.
- Go to Repeater Downloads and download the file for your area and load in your in your radio.
<http://www.dstarinfo.com/RepeaterDownloads.aspx>
- Having your location with GPS or Manually enter the list will come up by closest to you.
- You can auto program Repeaters and or Reflectors and link them to your local Repeater or gateway device...
[\OneDrive\Documents\Wondershare%20Filemora\Output\Utah%20DCC%20D-](#)

Don't have a D-Star Repeater close to you?

- There are several Hotspot options available for low costs
- Repeaters
- Simplex
- PC
- Raspberry Pi
- Linux
- Android

Hot Spot Repeater

A GMSK Node Adapter D-Star Compatible Repeater



The ircDDB Repeater



DV Dongle

- Connects to your PC or Mac via USB port
- Provides encoding/decoding of compressed audio using DVS1 AMBE2000 full duplex vocoder DSP chip
- DVTool 2.0beta5 software (www.opendstar.org/tools) runs on Windows, Mac, and Linux
- User may connect to and communicate with D-STAR DPlus gateways and reflectors around the world



DV Access Point (DVAP) Dongle

- Connects to your PC or Mac via USB port
- Provides 2 m or 70 cm Access Point for use with a D-STAR radio
- DVAPTools software runs on Windows, Mac, and Linux
 - Connects to DPlus gateways and reflectors
 - Software available to use with DCS & X Reflectors
- Use with Raspberry Pi for a inexpensive, miniature personal DSTAR hotspot



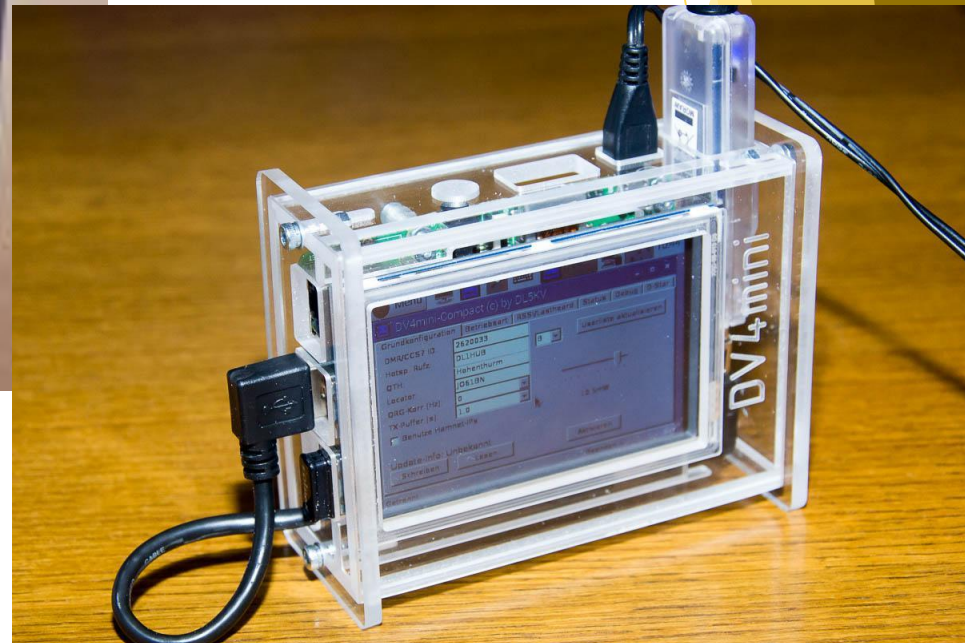
DV4Mini D-Star-DMR- Fusion-P-25

<http://wirelesshold.com/>



Windows PC

Raspberry Pi



BlueDV D-Star-DMR

<http://www.pa7lim.nl/bluedv/>

BlueTooth to Android
Device

BlueStack-Micro



DV-Mega



NW Digital UDRC D-Star-Fusion

Yeesu DR-1X



<http://nwdigitalradio.com/category/udrc/>

UDRC Raspberry Pi
Daughter Board



D-Star Repeaters

449.575(-)	NU7TS	Bill Neville	Wellsville	NU7TS B DV	D-Star
447.975(-)	N7RDS	Bill Neville	Riverside	N7RDS B DV	D-Star PCRepeater
447.950(-)	KF7VJO	Ted McArthur	Paradise	KF7VJO B DV	D-Star PCRepeater
447.975(-)	AC7O	Ted McArthur	Logan	AC7O B DV	D-Star
145.150(-)	AC7O	Ted McArthur	Logan	AC7O C DV	D-Star
1299.750	AC7O	Ted McArthur	Logan	AC7O A DD	D-Star

D-Star Repeaters

447.950(-)	WR7AAA	Don Blanchard	Cedar City	WR7AAA B DV	D-Star
145.150(-)	WR7AAA	Don Blanchard	Cedar City	WR7AAA C DV	D-Star
1287.250	WR7AAA	Don Blanchard	Cedar City	WR7AAA A DV	D-Star
448.075(-)	KF6RAL	Joe Lachacz	Farnsworth PK	KF6RAL B DV	D-Star
145.125(-)	KF6RAL	Joe Lachacz	Farnsworth PK	KF6RAL C DV	D-Star
1299.250	KF6RAL	Joe Lachacz	Farnsworth PK	KF6RAL A DD	D-Star
1287.000(-)	KF6RAL	Joe Lachacz	Farnsworth PK	KF6RAL A DD	D-Star

D-Star Repeaters

447.950(-)	KO7SLC	Pat Malan	IHC HOSP	KO7SLC B DV	D-Star
145.150(-)	KO7SLC	Pat Malan	IHC HOSP	KO7SLC C DV	D-Star
1298.750	KO7SLC	Pat Malan	IHC HOSP	KO7SLC A DV	D-Star
447.950(-)	KF7YIX	James Ashby	Hurricane Mesa	KF7YIX B DV	D-Star
145.150(-)	KF7YIX	James Ashby	Hurricane Mesa	KF7YIX C DV	D-Star
1299.250	KF7YIX	James Ashby	Hurricane Mesa	KF7YIX A DV	D-Star

D-Star Repeaters

447.950(-)	KE7EGG	Michael Querica	Ogden SO	KE7EGG B DV	D-Star
145.150(-)	KE7EGG	Michael Querica	Ogden SO	KE7EGG C DV	D-Star
1298.750	KE7EGG	Michael Querica	Ogden SO	KE7EGG A DV	D-Star
448.725(-)	WA7GIE	Dave Williams	Nelson PK	WA7GIE B DV	D-Star
147.380(+)	WA7GIE	Dave Williams	Nelson PK	WA7GIE C DV	D-Star
448.725(-)	K7YI	Brett Mills	Price	K7YI B DV	D-Star

D-Star Information

- www.DstarDB.com
- www.dstarinfo.com
- www.dstarusers.org
- www.jfindu.net
- www.aprs-is.net/DPRSCalc.aspx
- www.youtube.com/watch?v=ujoerfEjOMQ

The background features abstract, overlapping geometric shapes in various shades of yellow and gold, creating a modern, layered effect. The shapes are primarily triangular and polygonal, with some appearing as thin, translucent lines or planes.

Questions?

The background features abstract, overlapping geometric shapes in various shades of yellow and gold, creating a modern, layered effect. The shapes are primarily triangular and polygonal, with some appearing as thin, translucent lines or planes that intersect to form a complex, crystalline structure. The colors range from a bright, sunny yellow to a deeper, more metallic gold, with some areas showing a gradient or a slight shadow, giving the impression of depth and light reflecting off the surfaces.

Thank You!