

D-STAR
(Digital Smart Technology for
Amateur Radio)
—Some Basics

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Outline

- What is D-STAR?
- High Level Capabilities
- Hardware Implementation
- Operational Implementation
- Unique Features
- Some General Stats
- Data Interfaces
- Pros and Cons

What is D-STAR?

- Digital Radio capability—
 - Voice and Data at low speed on any VHF/UHF band
 - Currently implemented on 2M and 70cm
 - High speed data on 1.2 GHz only
 - Supports voice as well
 - Capabilities resident in compliant radios and repeaters without need of additional equipment
- Open protocol published in 2001
 - Research funded by Japanese government and administered (and owned?) by the Japanese Amateur Radio League
 - Open to anyone to implement
 - Icom appears to be the lone vendor (reference to Kenwood set appears questionable)

High Level Capabilities

- Digital Voice (DV) data stream
 - supports both voice (3600 bps including error correction) and data (1200 bps) on any band
 - RS-232 or USB 1.0 connection to computer or even PDA
 - Codec for voice is AMBE® (Advanced Multi-Band Excitation)
 - Unsure about voice input modes other than at handset
- Digital Data (DD) data stream
 - 128Kbps only on 1.2 GHZ
 - Ethernet connection
 - Web browser interface

Hardware Implementation

- Complete Icom product catalog
 - HT (1): 2M/70cm (basic radio needs digital module)
 - Low Speed Mobile (2): 2M (needs digital module) and 2M/70cm (w analog FM voice)
 - High Speed Mobile: 1.2 GHz (128Kbps data, 4.8Kbps voice, w analog FM voice, Internet capable)
 - 1.2 GHz Repeater controller, Voice repeater, Data repeater, 10 GHz microwave backbone equipment

Operational Implementation

- Radio-to-Radio (RF)
- Radio-to-Repeater (RF)
- Repeater-to-Repeater Gateway
 - RF link
 - Microwave link
 - Internet
- Repeater to D-STAR zone with single Gateway

Unique D-STAR Features

- On initial transmission your call sign is registered and shared around the D-STAR system
- Call sign (and CQ message, if desired) incorporated in every transmission
 - If the called station is not currently registered on the system, the call is routed to the last repeater on which the station was registered.
- Allows call sign squelch

Some General Stats

	D-STAR	PACKET
Voice Codec	3600 (4800?) bps AMBE	None
Data Speed	DV: 1200 bps (net 950 bps) DD: 128Kbps (net 90K bps)	LS: 1200 bps HS: 9600 bps
Bandwidth	DV: 6 kHz DD: 150 kHz	20 KHz
Frequency	DV: Any VHF/UHF band DD: 1.2 GHz	Any VHF/UHF band
Cost	DV: HT = approx \$430 (IC-V82 + UT-118 module) Mobile = \$748 (ID-800H) DD: \$1600 (ID-1)	LS: Mobile (IC-2200) + TNC = \$430 HS: Mobile +TNC = \$630

Data Interfaces

	D-STAR	PACKET
Data Interface	DV: RS-232 (3-wire) or USB 1.0 DD: Ethernet w RJ-45 jack	RS-232
Data Format	Same as Ethernet (data encapsulated as an Ethernet packet within D-STAR packet)	7-bit ASCII text
Air Link	D-STAR packet format and 0.5GMSK (Gaussian Minimum Shift Keying) modulation	LS: AX.25 using Bell 202 Modulation HS: AX.25 using K9NG Bell 212A Modulation
Network & Transport	DV: Transparent point-to-point (CRC error detection) DD: TCP/IP	AX.25 or TCP/IP

Pros and Cons

- Pros
 - Open Protocol
 - Significant potential for innovation
 - Developers tool kit?
 - True Digital Radio
 - No TNC required
 - Voice and data over same link
 - System registration/routing process
 - Call sign squelch, D-PRS
- Cons
 - Hardware is somewhat expensive, sparsely deployed
 - Icom is, apparently, the sole hardware producer
 - Not fast enough to suit many
 - Significant potential for innovation...