D-STAR for the Technically Curious

A quick overview of current development projects and building blocks for the D-STAR experimenter or integrator.

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Disclaimer

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The use of the term D-STAR in this presentation means “compatible with the D-STAR protocol” and does not represent the views, sanction, or endorsement of Icom Incorporated or the JARL.

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Hardware

• Dongles (by AA4RC)
  - DV Dongle
  - DVAP

• Node Adapters
  - Satoshi Yasuda 7M3TJZ/AD6GZ
  - Mark Phillips G7LTT/NI2O
  - Fred van Kempen PA4YBR/KA4YBR
DV Dongle

- AMBE Chip to generate D-STAR voice
- Computer Interface USB
- No radio component
- No GMSK Modem
- DV Dongle.com
- OpenDSTAR.org

Image courtesy of AA4RC
DVAP Dongle

- 2 meter transceiver
- Built-in GMSK modem
- No AMBE Chip
- D-STAR air protocol
- Analog FM
- Program by AA4RC
- USB Interface

Image courtesy of AA4RC
Node Adapter Basics

- Radio Interface
  - 9600 baud Ports tend to work
    - Discriminator
    - Modulator
    - PTT
    - COR (opt)

- Computer Interface
  - USB (2.0)

- Contain GMSK Modem
- Firmware to talk to computer
- 2 firmware lines: “Satoshi” and “Fred”
“Satoshi” Node Adapter

- Earliest Commercial Entry
- Now in Seventh Generation
- Kits and Assembled
- 7M3TJZ Design
- d-star.dyndns.org
Not Quite So Mini-Hotspot

- US Distribution
- Refined from multiple generation design
- USB Firmware Loads
- Kits and Assembled
- G7LTT Design
- enicomms.com

Image courtesy of NI2O/G7LTT
Dutch*Star Mini Hotspot

- Compatible Fork from G7LTT Designs
- European Distribution
- Kit or Assembled
- Part of family of products by PA4YBR
- dutch-star.eu

Image courtesy of PA4YBR
Dutch*Star DVA

- Digital Voice Adapter
- Mates to Hotspot
- AMBE 2020
Dutch*Star Option Board

- Display Driver
- Accessible Data Pins
- Real Time Clock
- Temp Sensor
Dutch*Star (In Design)

Analog Repeater board; implements a dual-mode DV/Analog repeater

Icom RP2C connector, as per Michael Carey VK5ZEA's work

Analog Link, implementing an analog mini-transceiver for LPD/PMR/FRS access and DV Access Point mode
Node Adapter Firmware

- Satoshi
  - Closed Source
  - Assembly
  - High fees for non-Satoshi hardware
  - Restrictive licensing

- Dutch*Star
  - Closed Source
  - Compiled “C”
  - Simple fee for any board that will run it
  - “Common Sense” licensing
Software Projects - Repeaters

Open or Available Source

- PCRepeaterController by G4KLX (Free)
- RPTR / RPTR_MUX by KI4LKF et al (Free)

Closed Source

- Firmware from Satoshi or Dutch*STAR (Pay)
- NI-STAR component by G4ULF (Free)
PC Repeater Controller by G4KLX

- Open Source. Linux and Windows
  - Soundcard for GMSK encode/decode or
  - Node Adapter with Satoshi Firmware (beta) or Dutch*Star Firmware (soon)
  - GUI or CLI (w/configuration)
  - Full analog repeater controller (dual mode possible)
  - Yahoo! Group pcrepeatercontroller
RPTR / RPTR_MUX

- Written by KI4LKF with the assistance of others such as DG1HT
- Not currently being developed or maintained.
- Uses a node adapter for radio interface.
  - Satoshi OK
  - Dutch*Star special build (minor issue)
Sources can be found. Open Source status in question.

Written in C++ for both Linux and Windows.

Looks like an Icom controller to a gateway (Almost)

MUX allows multiple instances and/or an RP2C to interface to a gateway.
NI-STAR and Firmware

- NI-STAR
  - Closed Source
  - Integral part of NI-STAR Package
  - Works with Satoshi and Dutch*Star

- Firmware
  - Closed Source
  - Allows standalone repeater with just a Node Adapter
Realtime Routing Updates
IRCDDDB

- Free Open Source
- Uses Internet Relay Chat to update gateways of routing changes. (PTT update as station moves from one location to another)
- Voluntary and OK to use on the USRoot Trust, standalone gateways, and Multi-Trust
- Enables callsign routing between networks
- ircddb.net
Gateway Software

- NI-STAR
- Open G2
- IRCDBDB based
NI-STAR

- Closed Source developed by G4ULF
- Authorized on the USRoot Trust, should work on Multi-Trust
- Release “any picosecond now” (running on NW7DR)
- Works with DPLUS, JavaAPRS/DPRS, etc.
- Includes both repeater control on Node Adapters using either firmware with all gateway functions
- Already deployed on several test systems.
Open G2

- Developed by KI4LKF
- Source and binaries can be found in the Yahoo! Group pcrepeatercontroller files section
- No current “owner” though builds and deploys continue
Open G2 (cont.)

- Emulates Icom G2 software (reverse engineered)
- Not approved for USRoot Trust
- Very common on the Multi-Trust
- Works with RP2C (through MUX), pcrepeatercontroller (very common), and RPTR
IRCDDB Based Gateway

- New Project
- Will use the IRCDDB to provide all routing information
- Does not require user radio registration
- Full feature set TBD
- G4KLX project so should be Open Source
Gateway and Reflector Linking

- Linking is not native to D-STAR
- D-STAR is mostly “stateless” on the frame/packet level.
- Linking uses a separate infrastructure from native D-STAR callsign routing to move DV around.
- Most used application of D-STAR
Gateway and Reflector Linking

- Three major implementations
  - DPLUS
  - DEXTRA
  - D-RATS (DV-DATA)
DPLUS

- Developed by AA4RC
- Uses “packet sniffing” on the gateway to find traffic and commands.
- Uses separate UDP/TCP ports to transfer traffic
- Enables DV Dongle, DVAP, and Reflectors
- Used by DVAR Hotspot
- Closed source
- Security Enhancements
DEXTRA

- Developed by KI4LKF, being enhanced by G4KLX
- Available source (Yahoo! Group pcrepeatercontroller)
- Copies base functionality of DPLUS, but does not use security enhancements or interoperate with DPLUS
- Has clients for DV Dongle, R2G2 “Hotspot” functionality and Reflectors (Linux and Windows)
- Not common on USRoot Trust, “preferred” on Multi-Trust
D-RATS

- Attend the D-RATS session by Dan Smith KK7DS
- Open Source, multi-platform
DVAR Hotspot

- Closed source Windows application by KB9KHM
- DPLUS Only – uses Node Adapter to RF
- Large user base for simplex/repeater access points
- Does not provide native D-STAR networking, no callsign routing
- Used to link to repeaters and reflectors.
Digital Voice by G4KLX

- Three Open Source Applications
  - DExtraClient
  - DStarClient
  - DVToolReader
- groups.yahoo.com/group/dstar_development/files
- Open Source
DExtraClient

- Requires DV Dongle
- Windows Application
- Connect to predefined list of DExtra Reflectors and Gateways
- Equivalent to DPLUS / DVTool
DStarClient

- Requires:
  - DVDongle
  - Windows Computer
  - 2 soundcards (Node Adapter planned)
  - Radio fit for 9600 baud packet
  - Control (Velleman, Serial, URI, …)

= Home built DV compatible radio!
Other Programs

- **AE7Q**
  - D-STARCOM
  - D-STARLET
- **KK7DS**
  - ChiRP
- **Others**
  - DSTAR TV
  - DSTAR CHAT
- **Others that I have missed.**
Some things I'd like to see...

- D-STAR to SIP gateway for Autopatch/Reverse Autopatch – DID to Callsign mapping.
- Callsign routed “Net/Roundtable” server (I've started coding this)
- DD compatible box
  - 23 cm
  - Sealed Box
  - POE
  - Couple of watts
  - N – Connector
  - Control by Web
Questions and Comments?

Your Ideas?

Visit
k7ve.org
dstarusers.org
dstarinfo.com
Yahoo! Group dstar_digital
Thank You

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