

# 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

D-STAR is a protocol designed by the Japanese Amateur Radio League (JARL) and is also a trademark of Icom Incorporated in the United States and other countries.

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.

The projects and products are the property of their respective owners and do not purport to be a D-STAR product with respect to the Icom Incorporated trademark.

# Hardware

- Dongles (by AA4RC)
  - DV Dongle
  - DVAP
- Node Adapters
  - Satoshi Yasuda 7M3TJZ/AD6GZ
  - Mark Phillips G7LTT/NI2O
  - Fred van Kempen PA4YBR/KA4YBR

# DV Dongle



Image courtesy of AA4RC

- AMBE Chip to generate D-STAR voice
- Computer Interface USB
- No radio component
- No GMSK Modem
- [DVDongle.com](http://DVDongle.com)
- [OpenDSTAR.org](http://OpenDSTAR.org)

# DVAP Dongle



Image courtesy of AA4RC

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

# 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



Image from d-star.dyndns.org

- Earliest Commercial Entry
- Now in Seventh Generation
- Kits and Assembled
- 7M3TJZ Design
- [d-star.dyndns.org](http://d-star.dyndns.org)



# Not Quite So Mini-Hotspot

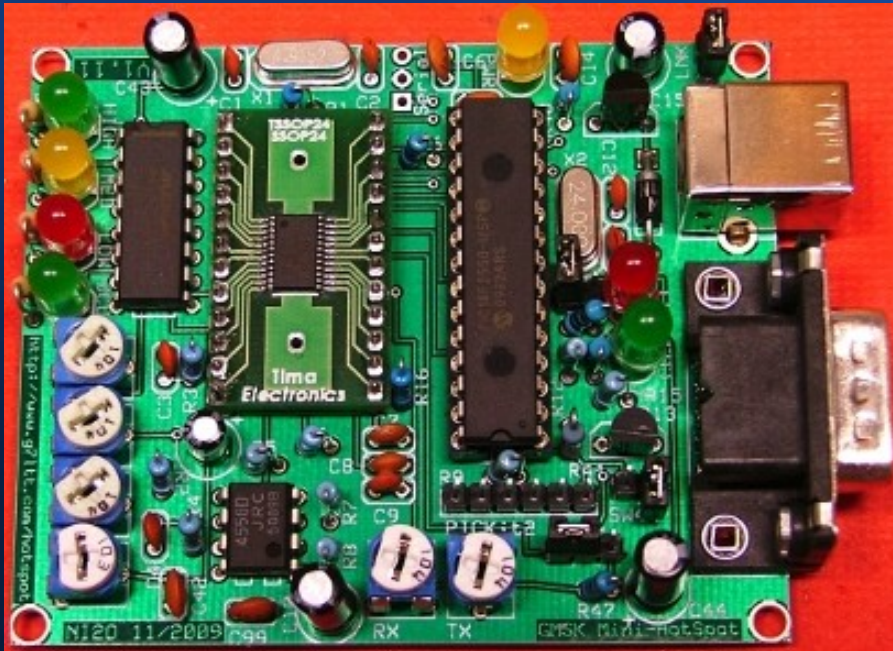


Image courtesy of NI20/G7LTT

- US Distribution
- Refined from multiple generation design
- USB Firmware Loads
- Kits and Assembled
- G7LTT Design
- [enicomms.com](http://enicomms.com)



# Dutch\*Star Mini Hotspot

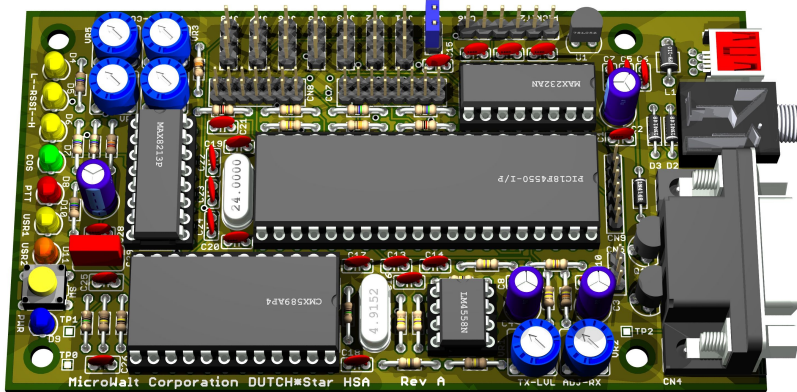
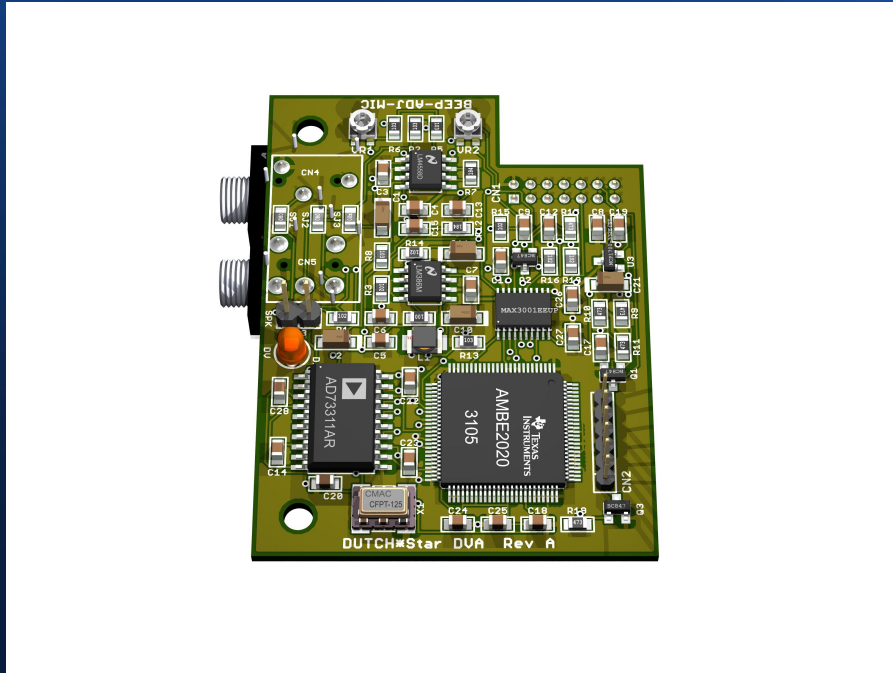


Image courtesy of PA4YBR

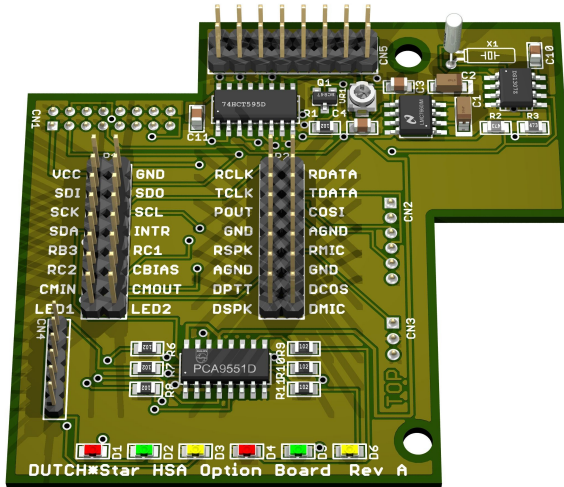
- Compatible Fork from G7LTT Designs
- European Distribution
- Kit or Assembled
- Part of family of products by PA4YBR
- [dutch-star.eu](http://dutch-star.eu)

# 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)

# RPTR / RPTR\_MUX (cont.)

- 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](http://ircddb.net)

# Gateway Software

- NI-STAR
- Open G2
- IRCDDDB 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

# IRCDDDB Based Gateway

- New Project
- Will use the IRCDDDB 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 DVDongle, 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 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](http://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:
  - DV Dongle
  - 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
- Others
  - DSTAR TV
  - DSTAR CHAT
- KK7DS
  - ChiRP
- 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](http://k7ve.org)

[dstarusers.org](http://dstarusers.org)

[dstarinfo.com](http://dstarinfo.com)

Yahoo! Group [dstar\\_digital](#)

# Thank You

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