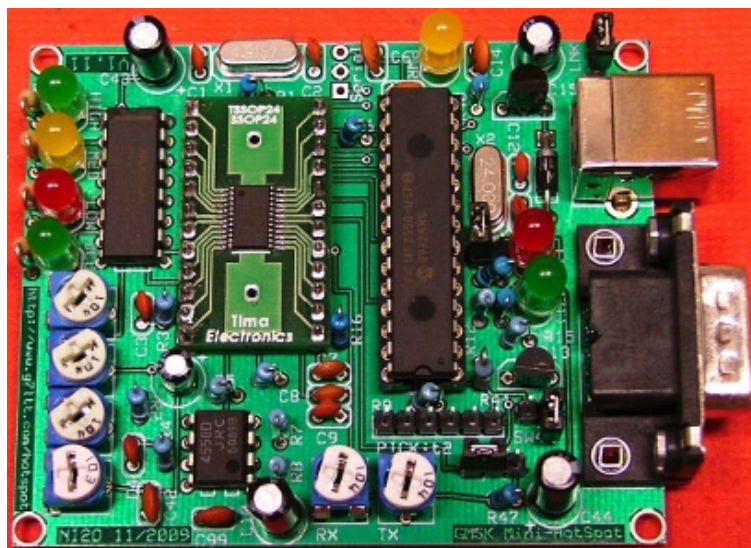
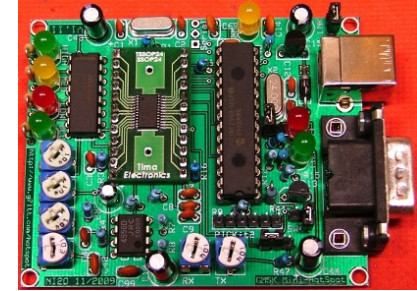


Building on D-Star DV



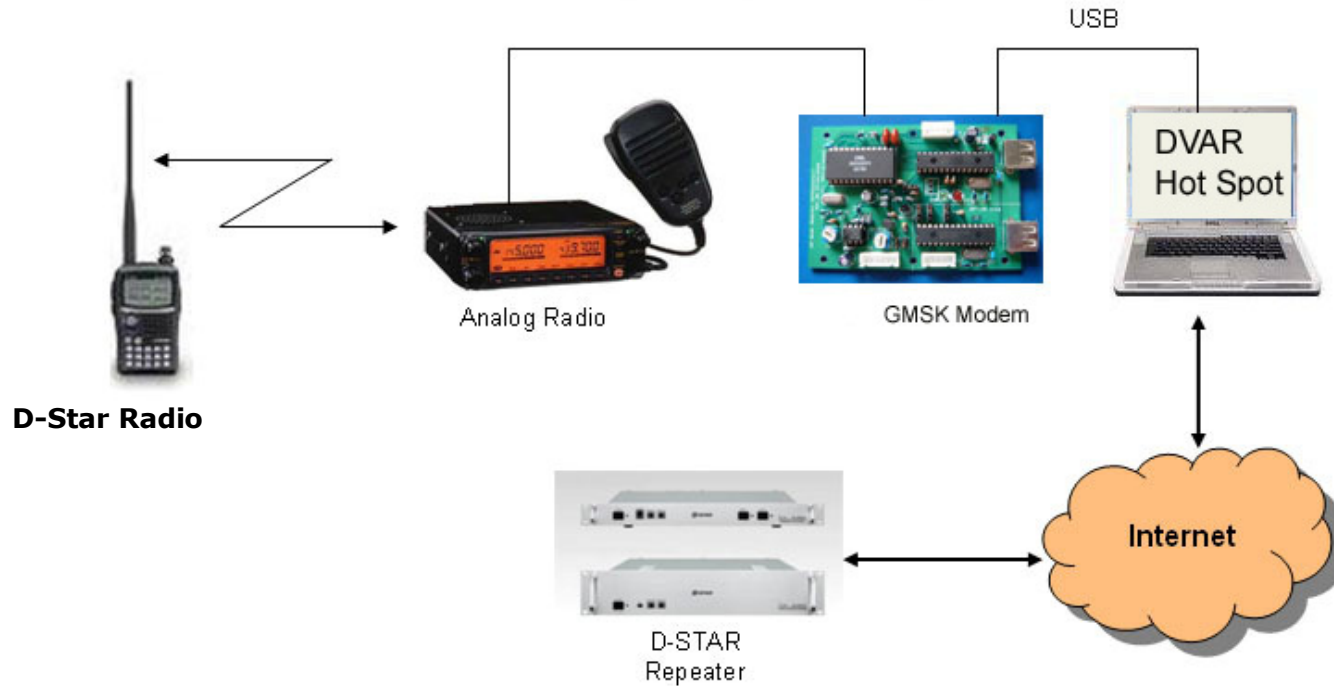
Jim Moen – K6JM
October 16, 2010
Pacificon

My Topics Today



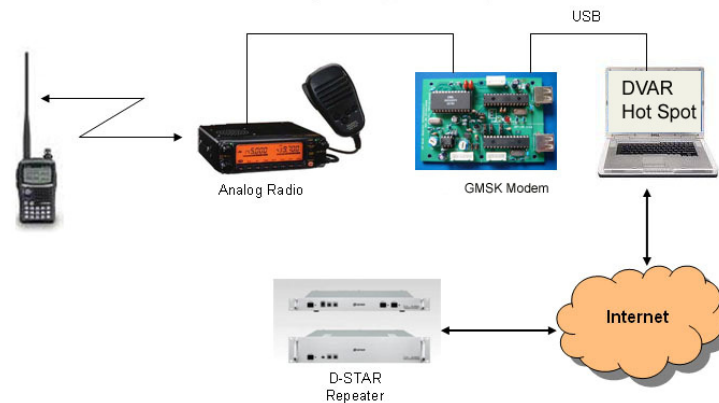
- D-Star and Homebrewing
 - Most Hams buy their D-Star radios (I have two)
 - Still room for homebrewing & experimentation
- Homebrew Solutions:
 - **HotSpots**: Extending the reach of the D-Star Network
 - Ideal for locations without RF access to D-Star repeaters
 - Inexpensive hardware, free software
 - Supports DPlus, but is not full D-Star (no callsign routing)
 - This technology is stable and easy to put on the air
 - **Digital Voice Adapters** to add DV to analog radios
 - Several choices available
 - Both hardware and software based

HotSpot Block Diagram



- Extends access to DPlus-linked DStar Repeaters and Reflectors
- RF handled by analog FM radio
- D-Star radio is needed to communicate
- GMSK Modem does not decode or encode the DV payload, it just passes it from and to the internet

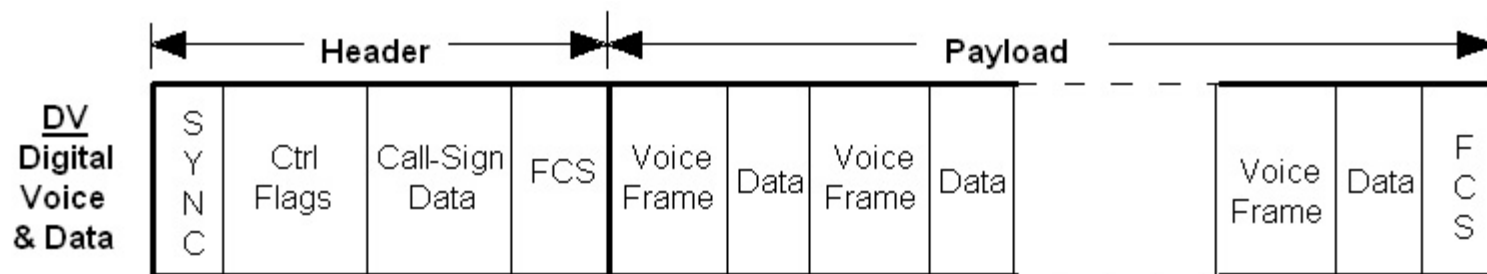
Why HotSpots?



- If your QTH has no RF access to a D-Star repeater
- Or (like my QTH) is in a multipath shadow
- Your D-Star radio can link to DPlus Repeaters and Reflectors
- Analog Radio must provide access to discriminator and to direct FM modulator (9600 Data Port normally works)
- PC runs DVAR Hot Spot software (Mark McGregor, KB9KHM)
- GMSK Modem interfaces the PC and the radio
- Architecturally like DVAP, but somewhat greater power/range
- HotSpot can be configured as DPlus Repeater (Rich KC6OBJ Sunday 8am Salon 1)

D-Star's Protocol

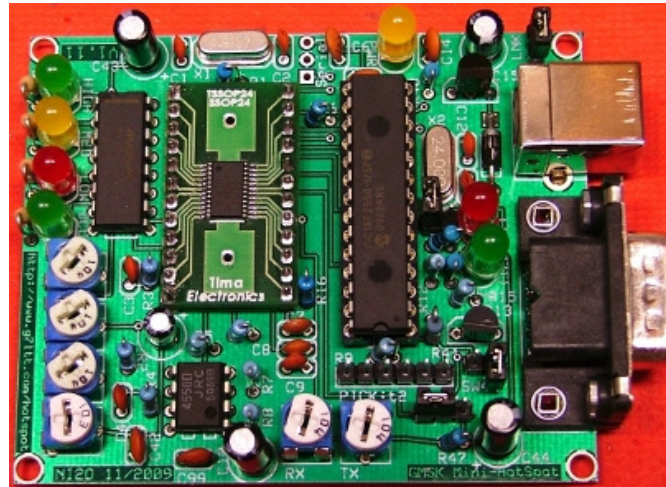
- D-Star contains both voice and data for total of 4800 bps
 - 2400 bps Digital Voice
 - 1200 bps FEC on Digital Voice
 - 1200 bps low speed data



Note: 11 Voice & Data Frames/Packet - 1056 bits

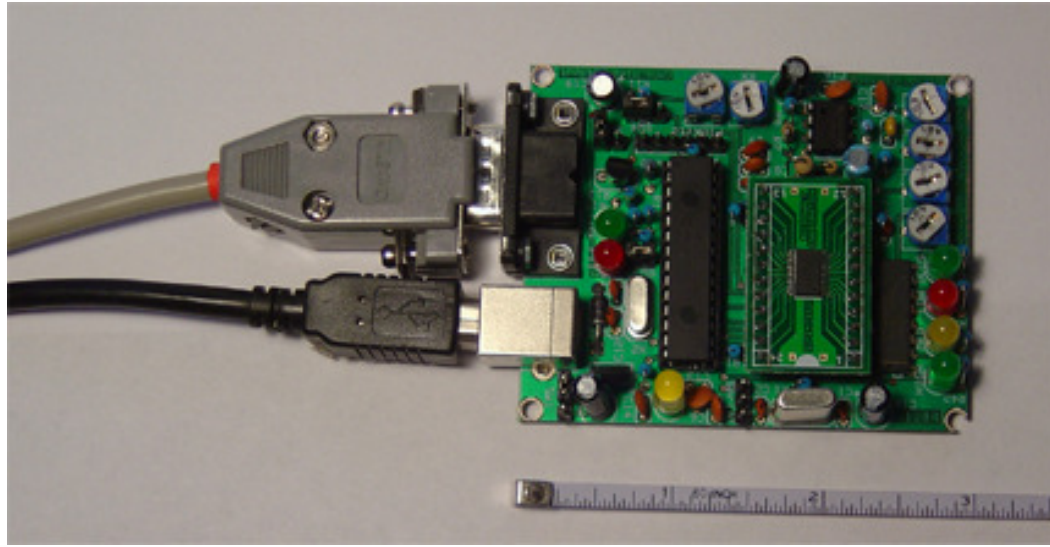
- Header is not encrypted
- GMSK modem sees header fields & passes them to PC
- DV Payload created by codec in AMBE chip
- HotSpot GMSK modem passes DV payload as a stream of bits without decoding

GMSK Modem



- Also called Mini Hot Spot (MHS) or Node Adapter
- TX, generates gmsk audio for analog FM transmitter
- RX, demodulates audio for processing by PC
- Decodes the gmsk protocol (headers, routing info)
- Does NOT decode or generate Digital Voice stream
- So you need a D-Star radio to use it
- Inexpensive (kits approx. \$80, built \$130)

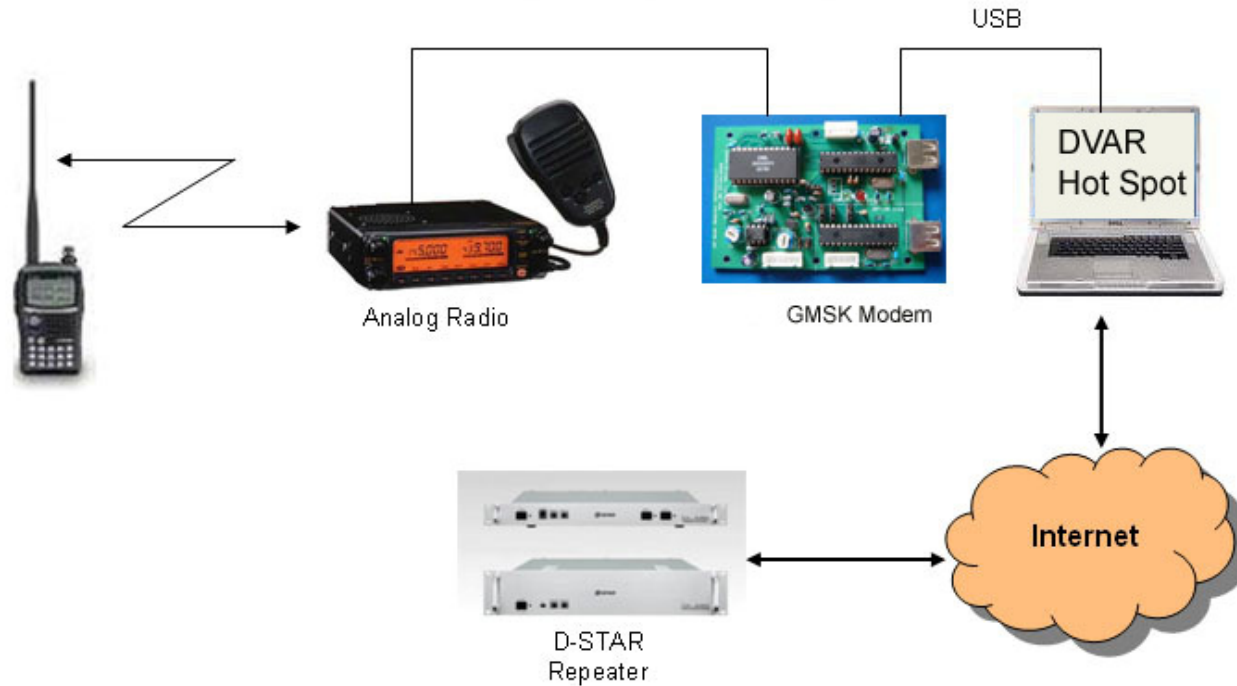
GMSK Modem Sources



My NQSMHS
from G7LTT

- **Satoshi Yasuda** 7M3TJZ/AD6GZ
 - <http://d-star.dyndns.org/>. Designed the first Node Adapter. Also produces firmware.
- **Fred van Kempen** PA4YBR
 - <http://www.dutch-star.eu>. Provides “mini hotspot” boards, related hardware and firmware.
- **Mark Phillips** G7LTT/NI2O
 - <http://www.gmskhotspot.com>. Provides similar hotspot boards. Located in New Jersey.

HotSpot Software

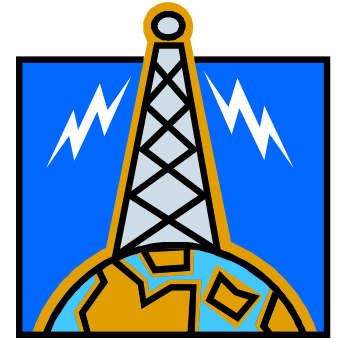


- Software: DVAR Hot Spot by Mark McGregor KB9KHM is frequently used for HotSpots
- Available in Files section of gmsk_dv_node Yahoo Group
- Also can download from www.dutch-star.eu/software/

Successful HotSpot Builder Warren KØTMU 82 years young



HotSpot Lessons



- Kits are fun. Have a mentor to help you
- Built boards are not much more expensive
- Start by registering your hotspot “terminal”
- Lots of support at “gmsk_dv_node” group
- HotSpots can link to other HotSpots
 - Router (allow incoming UDP on port 20001 and port forward 20001)
 - Configure DVAR to accept incoming
- Check out www.k6jm.com/dstar for details

Digital Voice Adapters

Purpose: Add D-Star Compatible DV to many analog radios via 9600 Data port

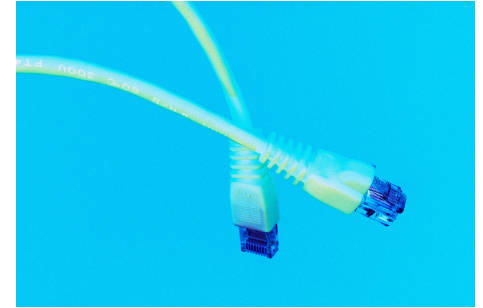


Why?

- Some people like to homebrew
- Use HF radio: D-Star on 6 & 10 m

Different DV Adapters

- DUTCH*Star HSA & DVA
 - DVA has AMBE chip, basic operation
 - Plans for full service controller
- GMSKClient s/w & DVDongle & GMSK modem
- DStarClient s/w & DVDongle & soundcard
 - Both clients require PC, but no internet connection
- FunkAmateur DV Adapter 2.0
 - Uses ICOM UT-118 D-Star card
 - Full service controller
- Satoshi DV Adapter v1.04 (no longer available)



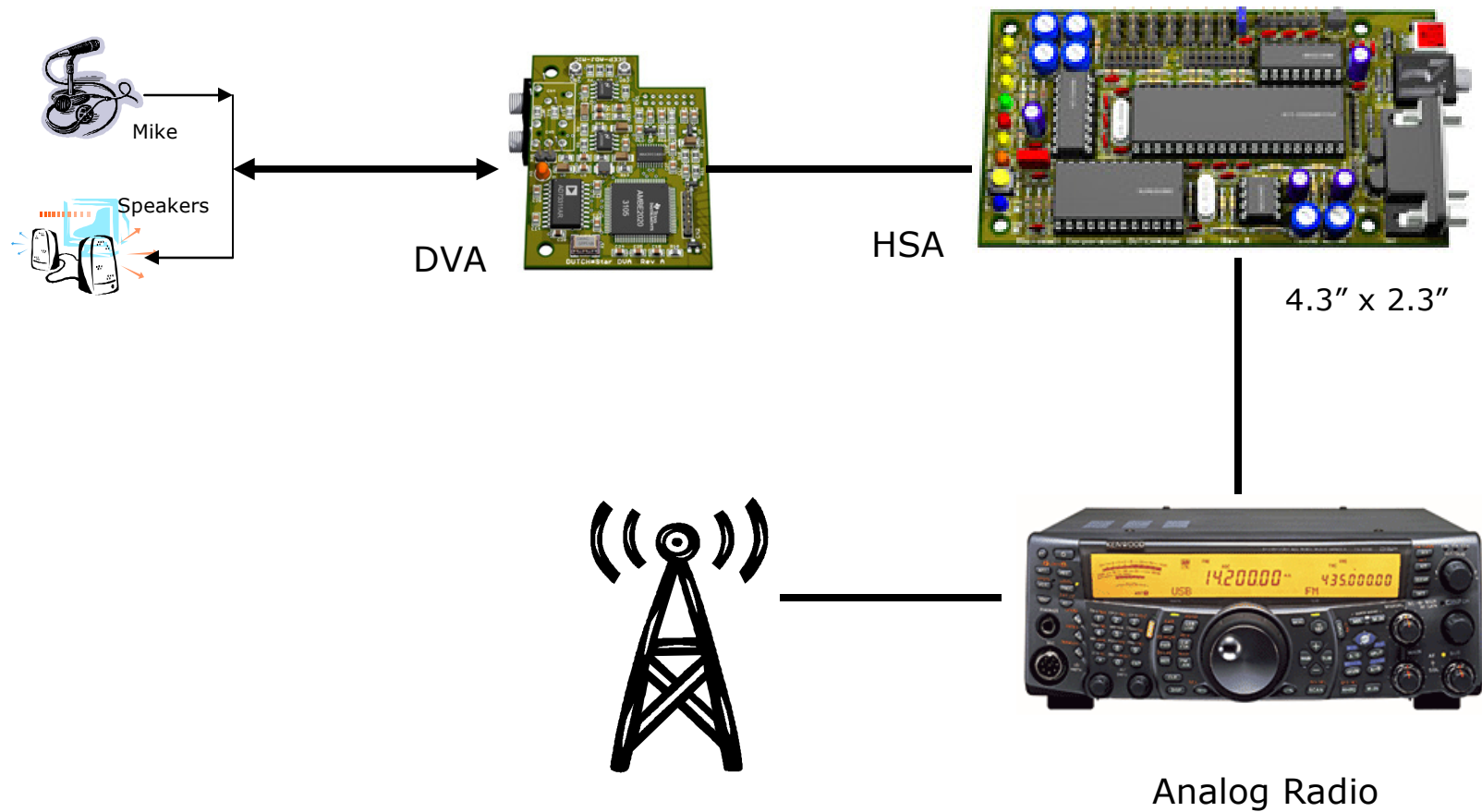
Adapter vs. HotSpot?



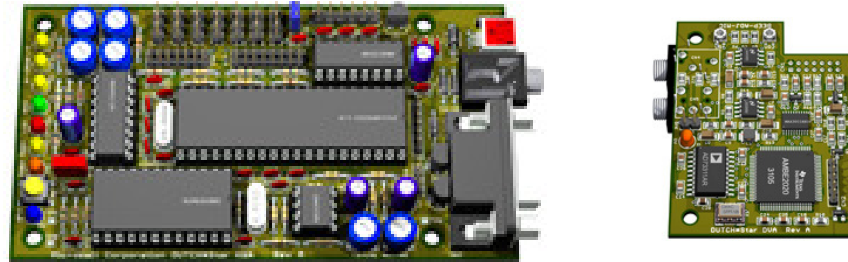
- HotSpots pass DV Audio between internet and analog radio without decoding
- So HotSpots don't have AMBE codec chip
- Adapters create standalone D-Star compatible radios
- Must have AMBE chip to decode/encode Digital Voice

DUTCH*Star Hotspot Adapter and DV Adapter

Example: Adapting analog radio to DV

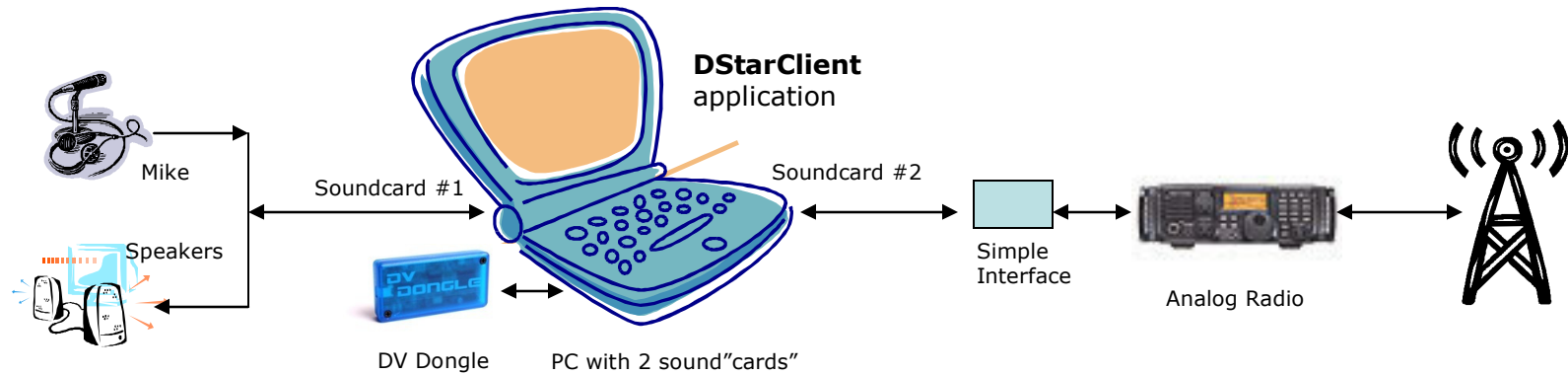


DUTCH*Star HSA & DVA



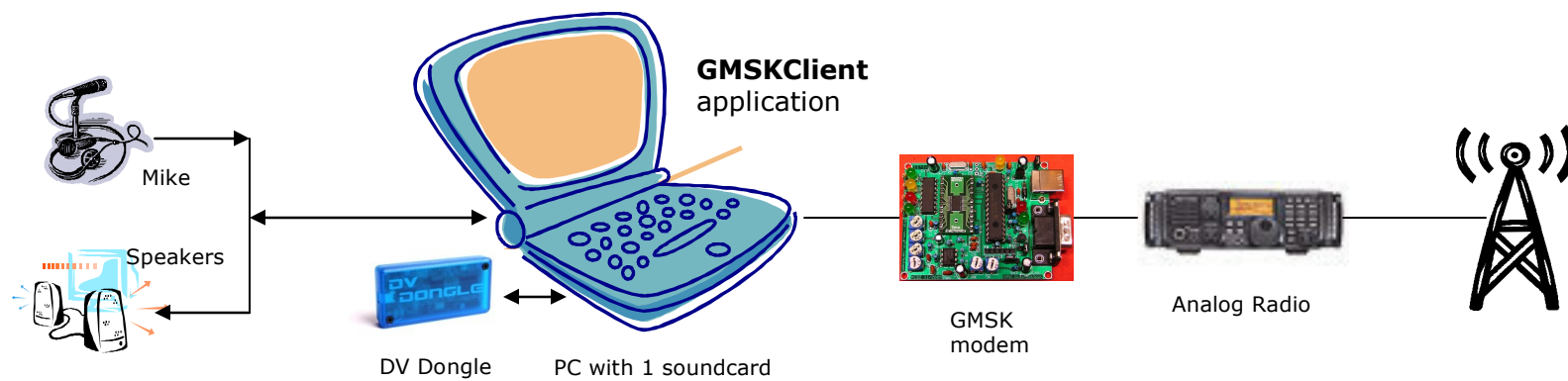
- HSA - full function Node Adapter GSMK modem
- DVA - pairs with HSA, has AMBE chip to encode/decode DV
- Opportunities:
 - Adapt analog radio to DV (radio needs 9600 Data port, VHF/UHF or HF)
 - Access D-Star repeaters and simplex radios with VHF/UHF radio
 - Simplex D-Star on 6 & 10 meters with HF radio
 - Talk to new ICOM 9100 with D-Star option
 - Basic control; future products will include separate control terminal
 - HotSpot with built-in DV (no D-Star radio needed)
 - Repeater running software like StarGate, with built-in DV
- Availability: Beta testing underway. Release date/price not announced
- See www.dutch-star.eu/products/hsa/ for more details

Soundcard Digital Voice Adapter for Analog Radios



- Transmit & Receive D-Star digital voice using analog transceiver
- Application: **DStarClient** by Jonathan Naylor, G4KLX (Windows, Linux)
Available from Files section of "dstar_development" Yahoo group
- Analog radio with 9600 Data port (VHF/UHF or HF)
- Interface from PC soundcard to radio: simple direct connect
Avoid PSK31-type interfaces with isolation transformers & filters that remove low audio frequencies used by gmsk
- Sound"card" #2: Cheap is best
Avoid those with audio filters (USB sound fobs are ideal)
- DV Dongle provides access to AMBE codec chip used to encode/decode DV
- Very sensitive to which USB sound fob; very touchy adjusting sound levels
- Cost: If you already have the PC and analog radio, incremental cost is the DV Dongle
- Bottom line: Not as stable as GMSK solution but it's cheaper and it works

GMSK Digital Voice Adapter for Analog Radios



- Transmit & Receive D-Star digital voice using analog transceiver
- Application: **GMSKClient** by Jonathan Naylor, G4KLX (Windows, Linux)
 - Available from Files section of "dstar_development" Yahoo group
- Analog radio with 9600 Data port (VHF/UHF or HF)
- GMSK modem same as used by HotSpot
- DV Dongle provides access to AMBE codec chip used to encode/decode DV
- Easier to setup than soundcard interface, more stable solution
- Cost: GMSK modem & DV Dongle
- Bottom line: More stable interface to analog radio

Summary



- We are in a golden age of D-Star innovation and development
- New hardware and software are allowing build your own D-Star tools
- Homebrewing/experimentation are fun and can be relatively inexpensive
- This stuff is easy - We can all do it
- Lots of support available
 - See my website at www.k6jm.com/dstar
 - Yahoo Groups:
 - gmsk_dv_node
 - dstar_development
 - DVDongle
 - K6MDD
 - Vendors' sites:
 - GMSK modem: Fred van Kempen PA4YBR www.dutch-star.eu
 - GMSK modem: Mark Phillips G7LTT/NI2O www.gmskhotspot.com
 - GMSK modem: Satoshi Yasuda 7M3TJZ/AD6GZ d-star.dyndns.org/
 - DVAR Hot Spot: www.w9arp.com/hotspot/
 - DVDongle: www.dvdongle.com/
 - FunkAmateur DV Adapter: www.dstarradioclub-international.com/