

D-STAR

Digital Voice + Digital Data

DV + DD

Alabama D-STAR

Digital Radio Project

Presented by

Greg Sarratt, W4OZK

Alabama ARRL Section Manager



D-STAR

Digital Voice + Digital Data

DV+DD

Digital Radio Is Here



Digital, Amateur Radio mode for the 21st Century

D-STAR

Digital Voice + Digital Data

What is D-STAR?

- Digital Smart Technology for Amateur Radio
- Developed by JARL and industry
- Digitally Modulated voice and data comms
- Open Protocol Specification
- Manufactured by ICOM, Kenwood
- Nationwide Digital Network

D-STAR

Digital Voice + Digital Data

Advantages

Multitude of technical reasons

- Internet Linking capability
- 6.25 KHz emission
- Simultaneous Voice and Data capability
- High speed Data capability 128kb data
- Allows more channels in crowded spectrum
- Frequency Agile

D-STAR

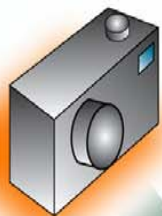
Digital Voice + Digital Data

Advantages

Multitude of non-technical reasons

- Emergency Communications
- New Technology
- Innovations
- Club projects
- Connects users together
- Leader in Digital D-STAR

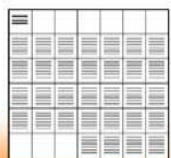
Images



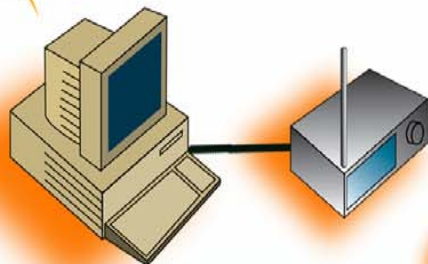
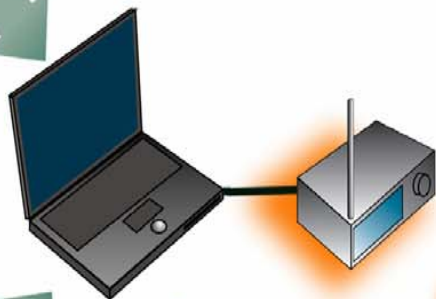
Email



Files



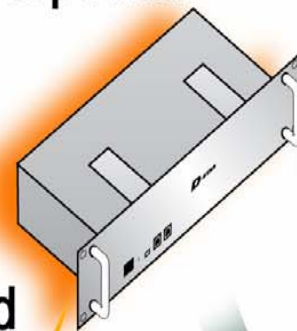
Direct
D-STAR
Connection



High-Speed
Data



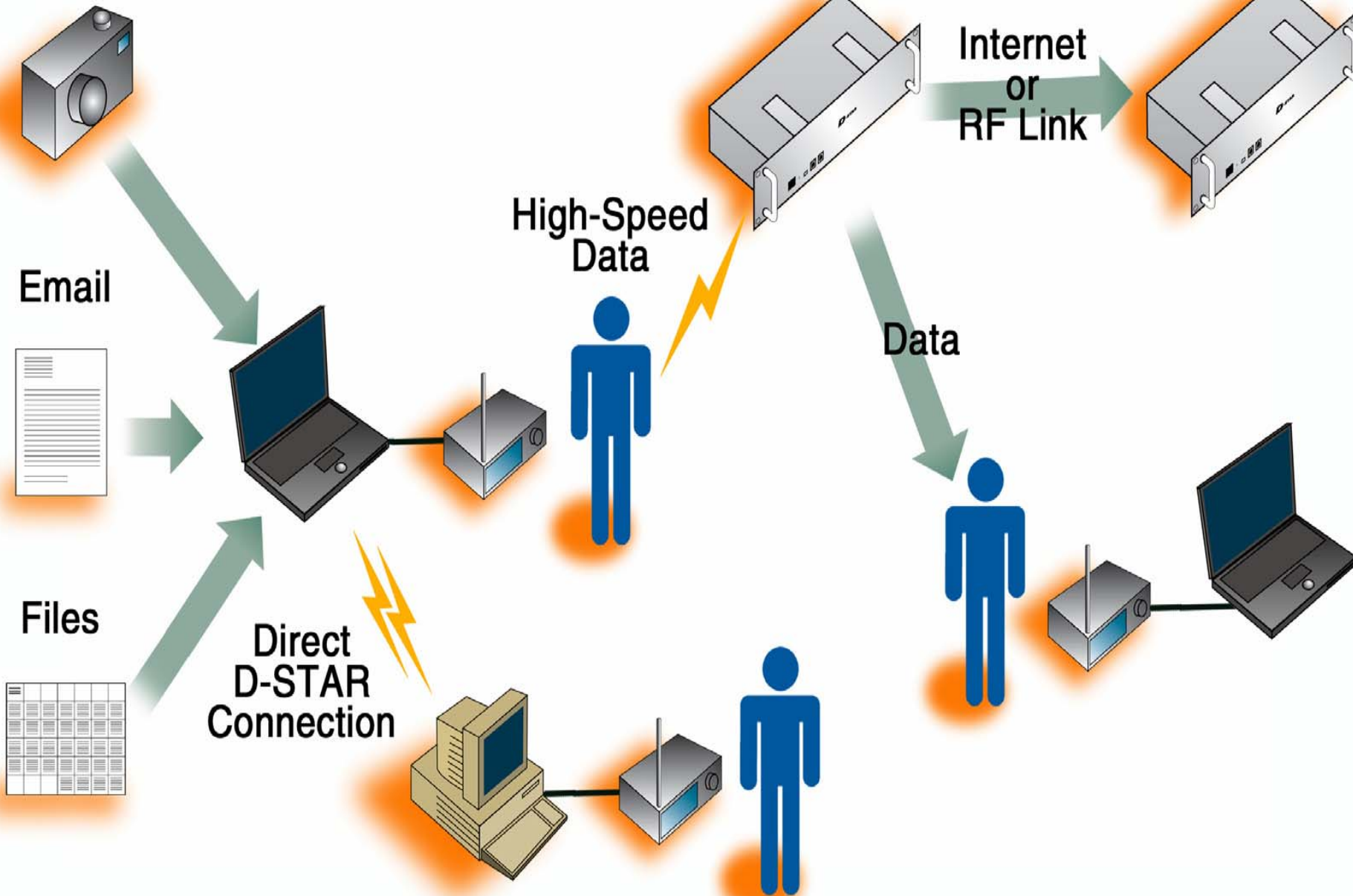
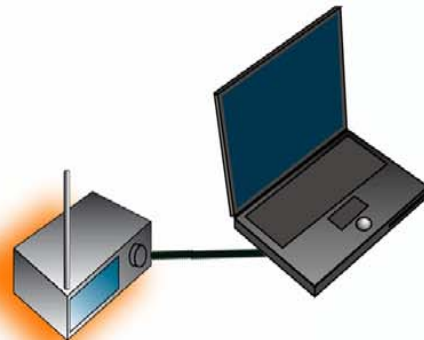
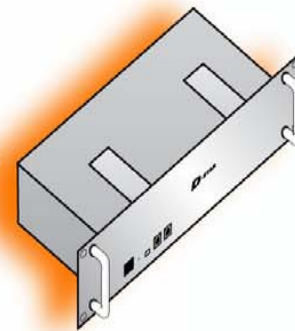
D-STAR
Repeater



Data



Internet
or
RF Link

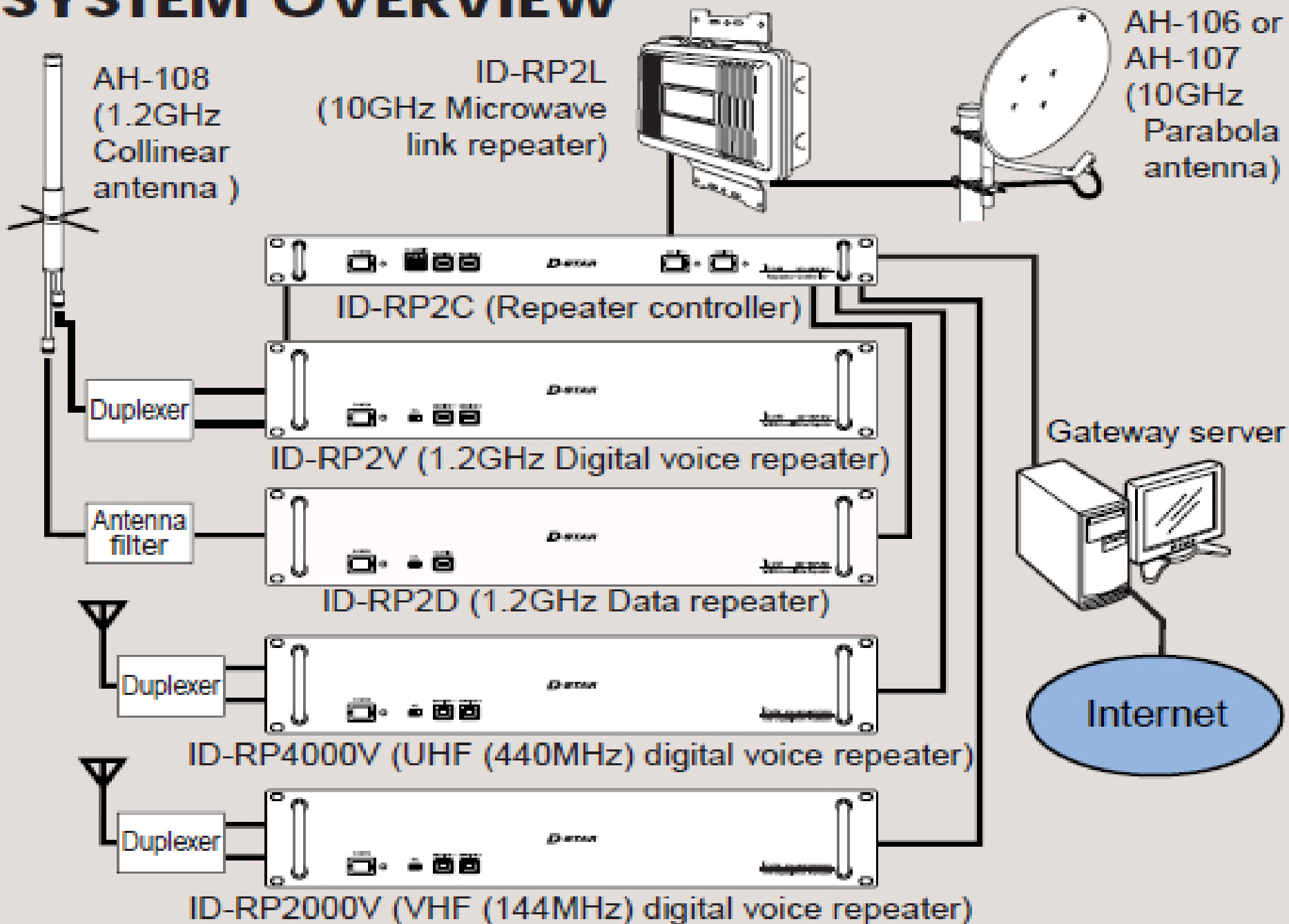


Repeater System Main Hardware

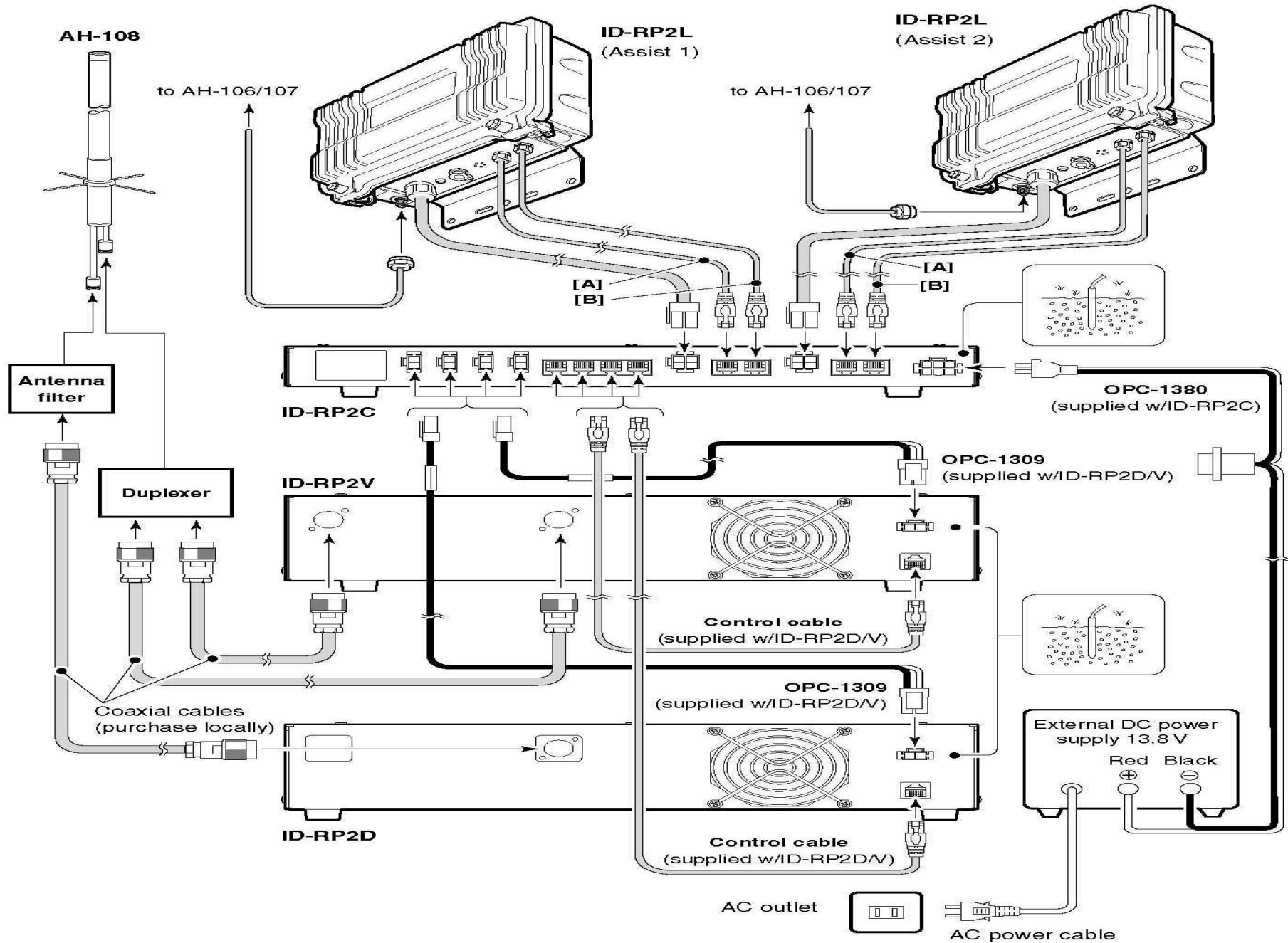
- Controller
- Server
- 2m digitized voice and low-speed data
- 70 cm digitized voice and low-speed data
- 23 cm digitized voice and low-speed data
- 23 cm high-speed data

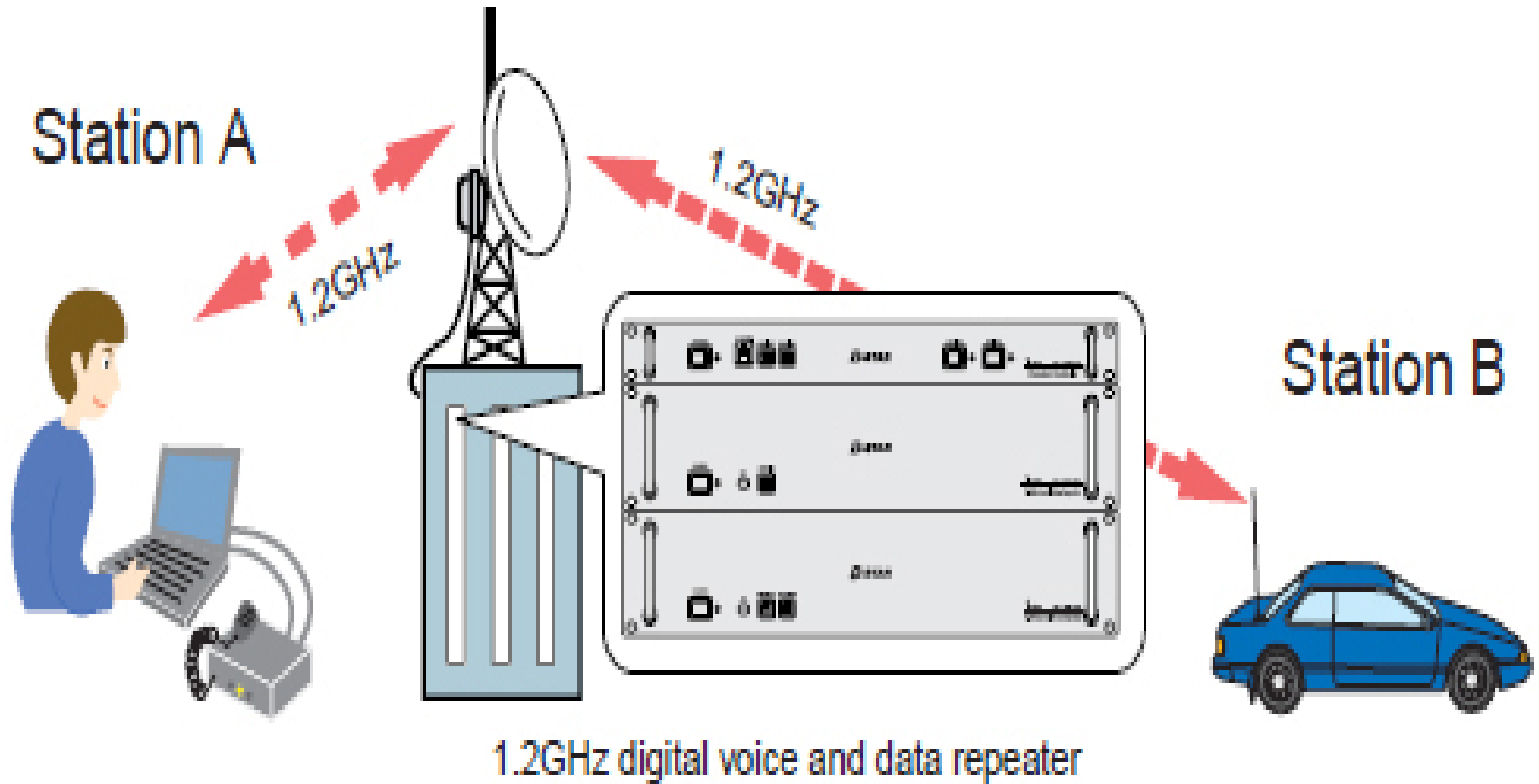


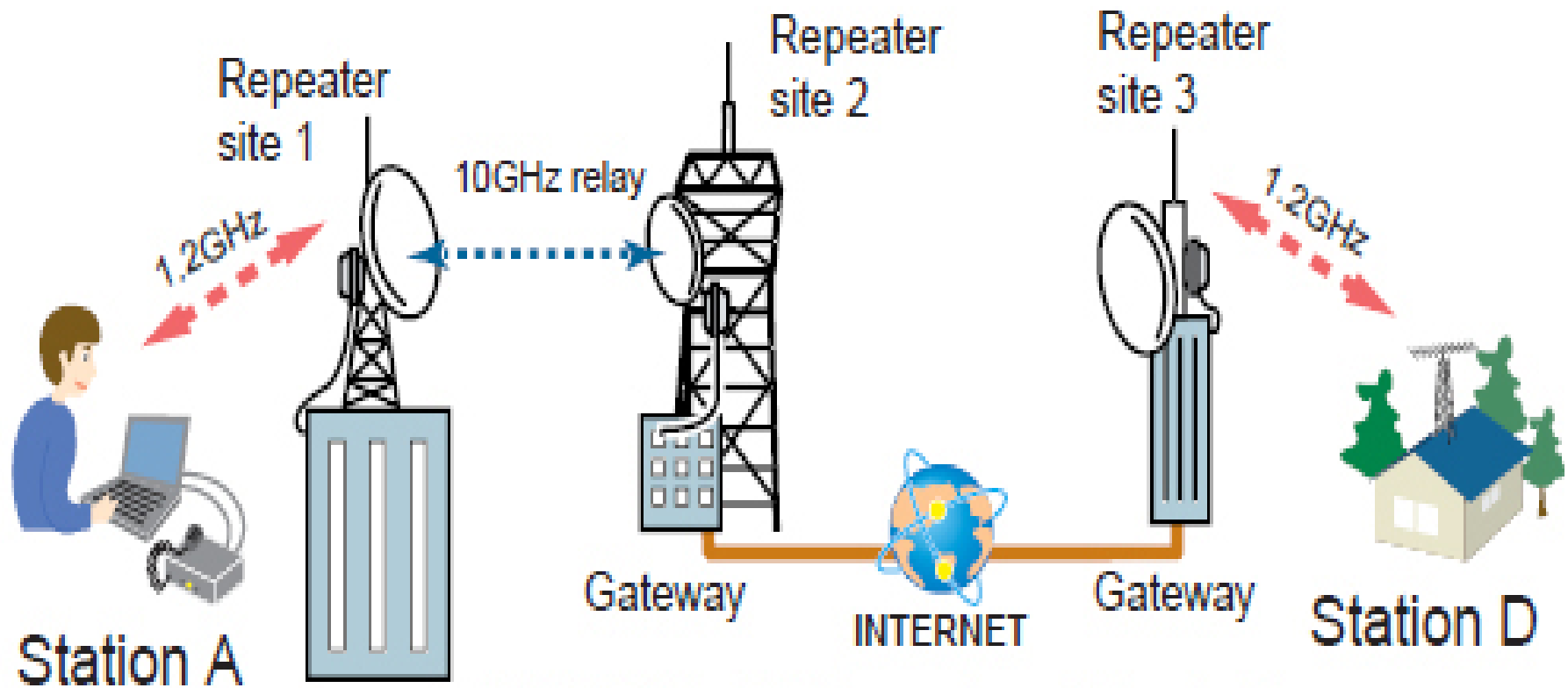
SYSTEM OVERVIEW



System connections







1.2GHz digital voice/data repeater and Internet gateway

D-STAR


Digital Voice + Digital Data

DV + DD

D-STAR is the fastest growing technology in amateur radio today!



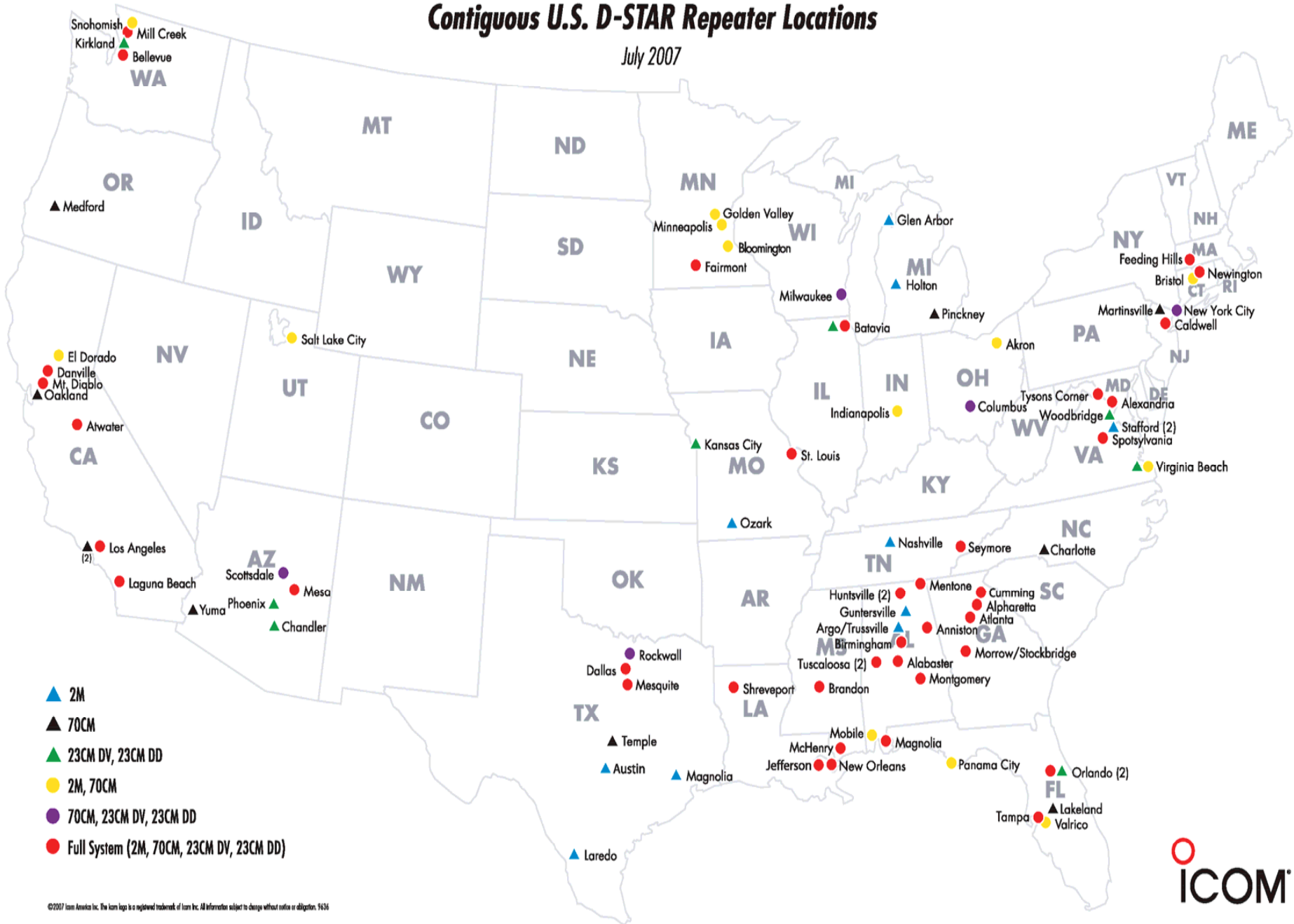
Network User Growth



<u>Users</u>	<u>Date</u>	<u>Delta</u>
1	03-Feb-05	1 st user
10	20-Jul-05	167 Days
20	15-Oct-05	87 Days
50	23-May-06	220 Days
100	29-Sep-06	128 Days
200	02-Dec-06	65 Days
300	08-Feb-07	64 Days
400	26-Mar-07	49 Days
500	10-May-07	45 Days
600	06-Jun-07	27 Days
721	15-Aug-07	9 Days

Contiguous U.S. D-STAR Repeater Locations

July 2007



D-STAR

Digital Voice + Digital Data

ALABAMA D★STAR



**Amateurs
Clubs
Groups
Repeater Council
Repeater owners and groups
ARRL**

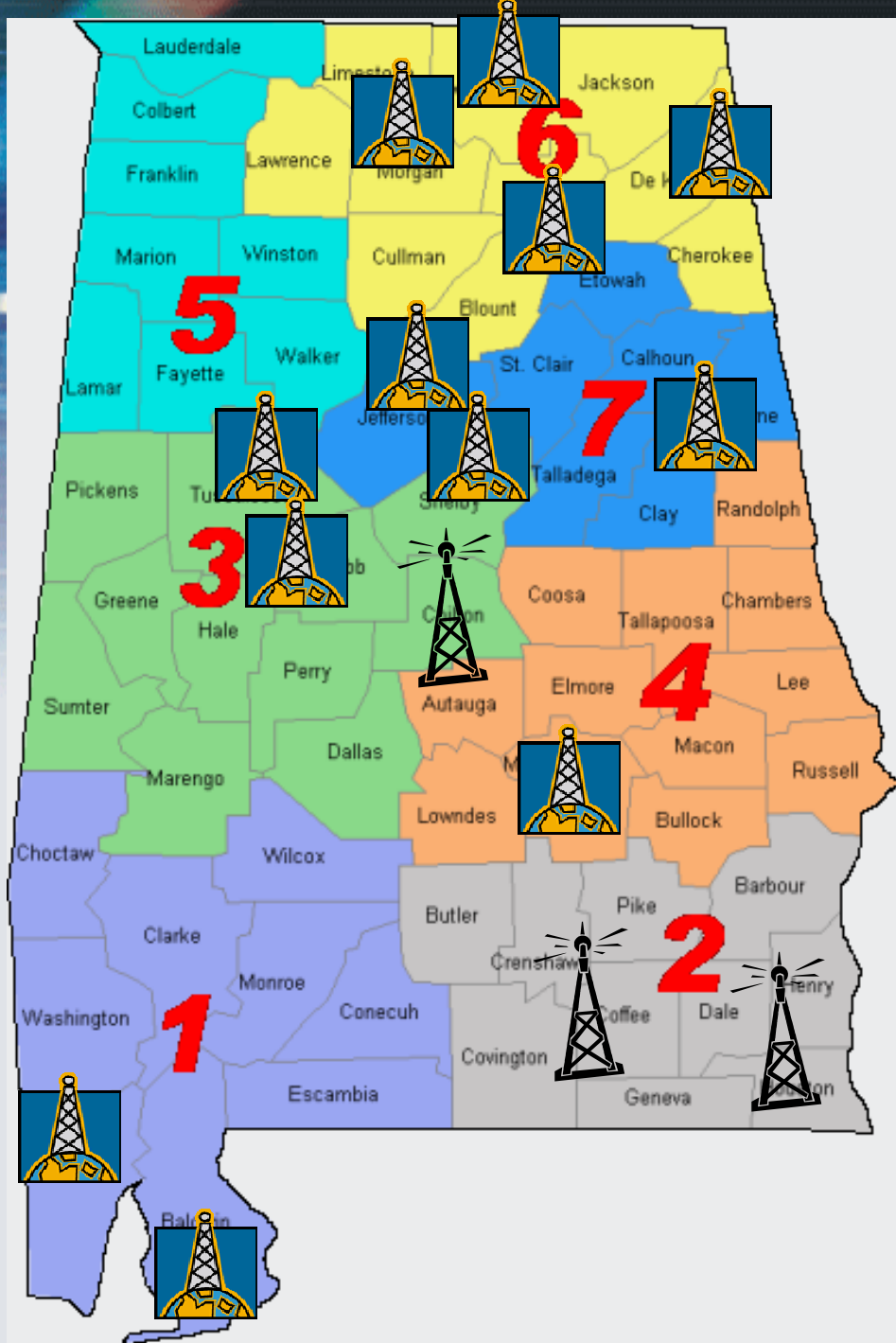
Location	Call	Status	DV			DD
			2M	70cm	23cm	23cm
Huntsville	KI4PPF	* On The Air	✓	✓	✓	✓
Huntsville, experimental	KI4QMQ	On The Air	✓	✓	✓	✓
Cheaha, Anniston	WB4GNA	On The Air	✓	✓	coming soon	
Tuscaloosa, Hospital	W4KQCQ	* On The Air	✓	✓	coming soon	
Tuscaloosa, Tall Tower	W4TTR	On The Air	✓	✓	coming soon	
Magnolia Springs	KI4SAZ	* On The Air	✓	✓	✓	✓
Birmingham	K4DSO	On The Air	✓	✓		
Guntersville	KI4RYX	On The Air	✓			
Mentone	KI4SAY	On The Air	✓	✓	✓	✓
Pelham	KI4SCO	On The Air	✓	✓		
Mobile	W4IAX	On The Air	✓	✓		
Montgomery	W4AP	coming soon	✓	✓	✓	✓
Clanton						

D-STAR

Alabama EMA Districts

&

ALABAMA D★STAR



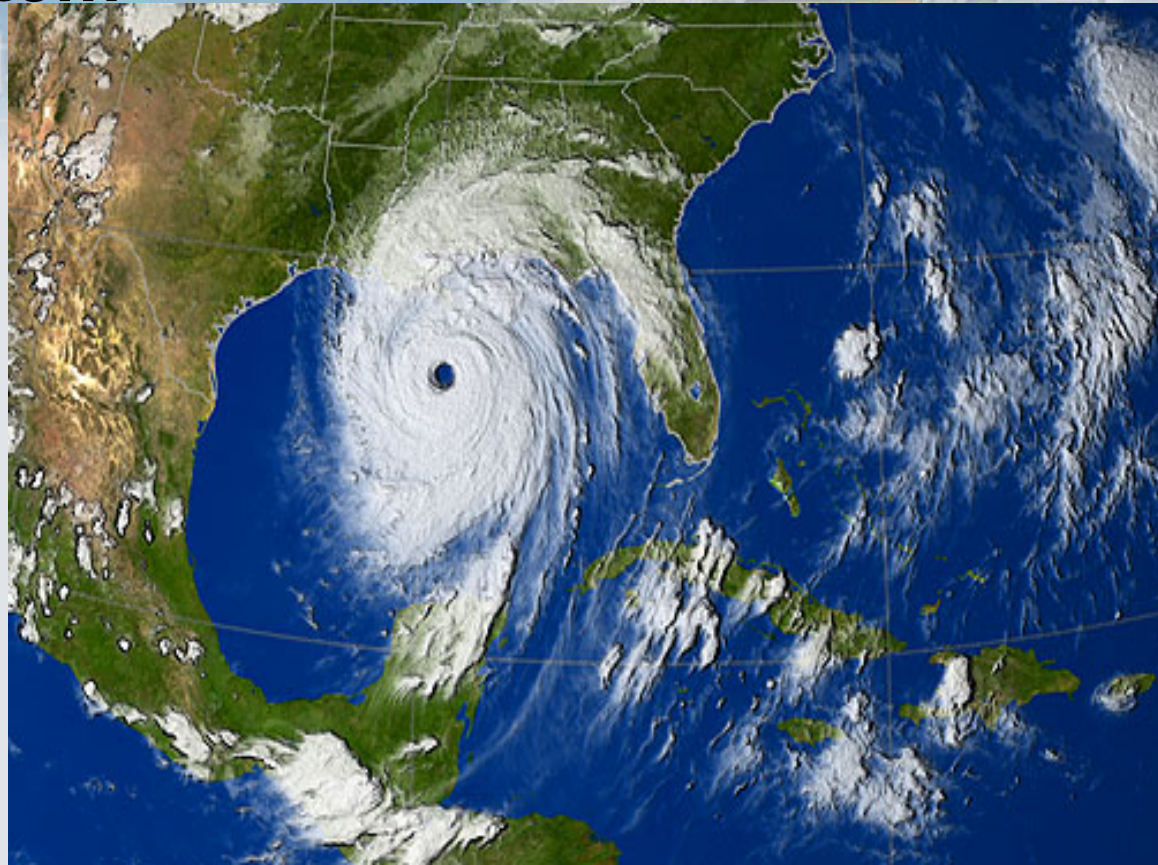
Data

D-STAR

Digital Voice + Digital Data

Alabama's Reasons

- Emergency Communications
- Repeater Link System
- New Technology
- Innovations
- Education
- FUN
- Advancement
of the hobby



D-STAR

Digital Voice + Digital Data

DV+DD

Emergency Communications

- Alabama Repeater Link System
- Remote Connectivity
- Accurate Data
- Digital Data
- Personnel Tracking
- Internet capability

D-STAR

Digital Voice + Digital Data

DV + DD

Emergency Communications

MIC

SP

- Radios automatically transmit call sign with voice communications
- GPS location transmit along with voice communications
- Digital Data - Ends needless chatter

D-STAR

Digital Voice + Digital Data

Emergency Communications Partnership

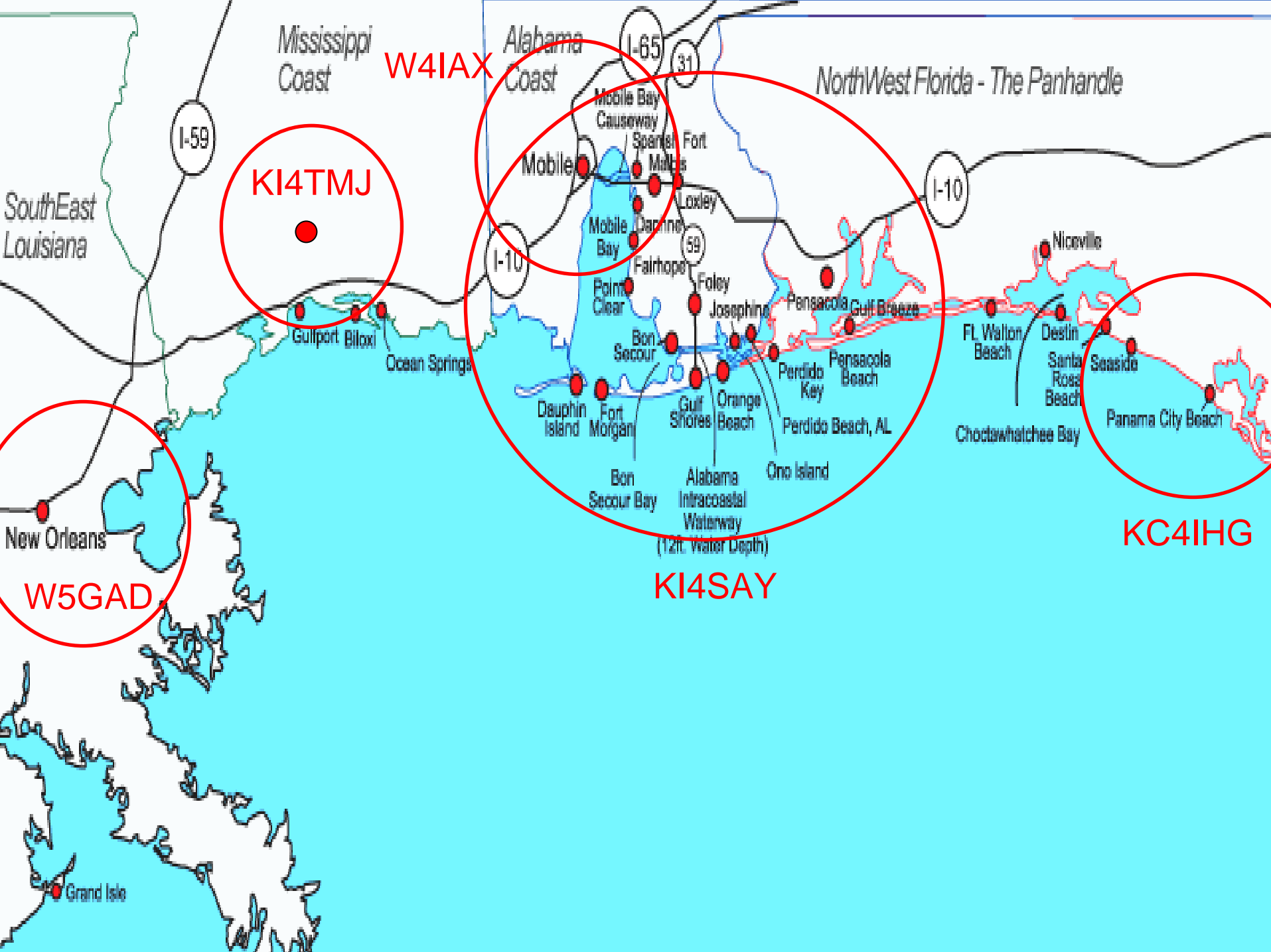
ALABAMA
D★STAR



Emergency Communications

- 2 Full Portable Deployable systems
- Develop critical location systems
- Link select In-State stations
- Link select Out of State stations
- Link directly to State EMA,
NAMB, ARRL





Mississippi Coast

W4IAX

Alabama Coast

NorthWest Florida - The Panhandle

KI4TMJ

I-59

I-65

31

I-10

I-10

59

SouthEast Louisiana

Gulfport Biloxi

Ocean Springs

Mobile

Mobile Bay

Point Clear

Bon Secour

Dauphin Island

Fort Morgan

Bon Secour Bay

Alabama Intracoastal Waterway (12ft. Water Depth)

Orange Beach

Gulf Shores

Perdido Beach, AL

Perdido Key

One Island

Alabama

Florida

Fort

Mobile

Mobile Bay Causeway

Spanish Fort

Orange Beach

Orange Beach

Orange Beach

Orange Beach

Orange Beach

Orange Beach

Orange Beach

Orange Beach

KI4SAY

Alabama

Florida

Fort

Mobile

Mobile Bay Causeway

Spanish Fort

Orange Beach

Orange Beach

Orange Beach

Foley

Josephina

Pensacola

Gulf Breeze

Pensacola Beach

Perdido Key

One Island

Alabama

Florida

Fort

Mobile

Mobile Bay Causeway

Spanish Fort

Orange Beach

Orange Beach

Orange Beach

Orange Beach

Orange Beach

Orange Beach

Orange Beach

Orange Beach

Orange Beach

Orange Beach

FL Walton Beach

Destin

Santa Rosa Beach

Seaside

Panama City Beach

Choctawhatchee Bay

Alabama

Florida

Fort

Mobile

Mobile Bay Causeway

Spanish Fort

Orange Beach

Orange Beach

Orange Beach

Orange Beach

Orange Beach

Orange Beach

Orange Beach

Orange Beach

Orange Beach

Orange Beach

Orange Beach

KC4IHG

Alabama

Florida

Fort

Mobile

Mobile Bay Causeway

Spanish Fort

Orange Beach

Orange Beach

Orange Beach

Orange Beach

Orange Beach

W5GAD

Alabama

Florida

Fort

Mobile

Mobile Bay Causeway

Spanish Fort

Orange Beach

Orange Beach

Orange Beach

New Orleans

Alabama

Florida

Fort

Mobile

Mobile Bay Causeway

Spanish Fort

Orange Beach

Orange Beach

Orange Beach

Orange Beach

Orange Beach

Grand Isle

Portable EMCOMM

D-STAR

802.11

Generator

Antennas

FM Repeater

Radios

Wi-Fi
802.11b

Tower acc

APRS Digi



D-STAR

Digital Voice + Digital Data

DV + DD



Exercises

21 July 2007



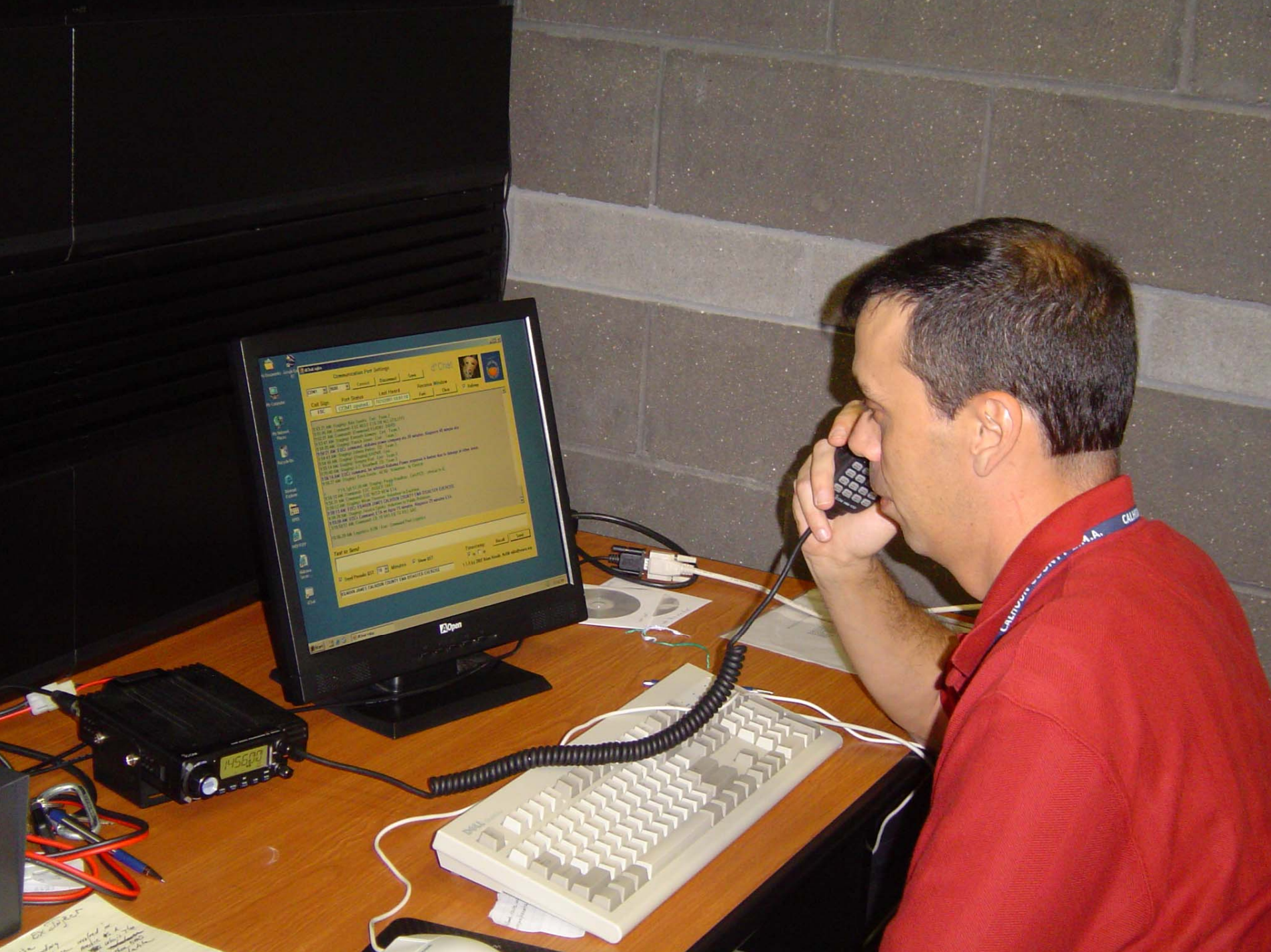
**CALHOUN COUNTY
EMERGENCY MANAGEMENT
AGENCY**







Hardee's
More Southern Burgers
and More Than 100
Other Specialty Items

DATE	TIME	LOCATION	STATUS
10/10/11	10:00	...	...
10/10/11	11:00	...	...
10/10/11	12:00	...	...
10/10/11	13:00	...	...
10/10/11	14:00	...	...
10/10/11	15:00	...	...
10/10/11	16:00	...	...
10/10/11	17:00	...	...
10/10/11	18:00	...	...
10/10/11	19:00	...	...
10/10/11	20:00	...	...
10/10/11	21:00	...	...
10/10/11	22:00	...	...
10/10/11	23:00	...	...
10/10/11	00:00	...	...



- My Documents
- Google Earth
- My Computer
- My Network Places
- Recycle Bin
- Internet Explorer
- EMIS
- WEB PUFF
- Alabama Server...
- dchat

Communication Port Settings

d*Chat  

Call Sign **Port Status** **Last Heard**

RxBeep

9:53:21 AM: Staging> Alex Sparks Cert Team 2

9:51:46 AM: Command> EOC NEED ETA ON ALL UTILITIES

9:52:01 AM: Command> (Command) KG4VNY- DAVID

9:53:41 AM: Staging> Kenneth Gowens Cert Team 1

9:54:05 AM: Staging> Patrick Jones Cert Team 1

9:54:21 AM: EOC> command, alabama power company eta 20 minutes. Alagasco 40 minute eta

9:54:43 AM: Staging> Johnny Binton CD Team 3

9:54:48 AM: Staging> (Staging) KI4DWE- Lisa

9:55:14 AM: Staging> Gregory Rod Cert Team 3

9:55:40 AM: Staging> J.C. Broadwell CD Team 3

9:56:16 AM: EOC> command, be advised Alabama Power response is limited due to damage in other areas

9:56:27 AM: Staging> Dave Dostie AE9Q Volunteer to Clerical

z ????L?g9:57:20 AM: Staging> Peggy Hamilton Cert/PCD clerical to IC

9:56:10 AM: Command> EOC ROGER THAT

9:56:31 AM: Command> EOC NEED NEW ETA

9:58:12 AM: Staging> Miram Thornton Volunteer to Backhoe

9:58:13 AM: EOC> KG4HXN JAMES CALHOUN COUNTY EMA DISASTER EXERCISE

9:58:38 AM: Staging> Jessica Spinks Volunteer to Public Relations

9:59:08 AM: EOC> Command, ETA on Apco 15 minutes. Alagasco 25 minutes ETA

%79:58:51 AM: Command> CD 10 HAS EQ TO KILL GAS

10:06:28 AM: Logistics> KI3N - Ken - Command Post Logistics

Text to Send

Send Periodic QST Minutes Show QST

Timestamp tx rx
 1.1.5 (c) 2007 Brian Roode, NJ6N nj6n@soara.org



D-STAR

Digital Voice + Digital Data

DV + DD



Applications

D-STAR

Digital Voice + Digital Data

DV + DD

Applications



➤ **E-Mail**

➤ **Internet**

➤ **Digital Data**

➤ **Forms**

D-STAR

Digital Voice + Digital Data

DV + DD

Applications

MIC
SP

➤ **Text Messaging**

Transmitter

T/R SW



➤ _____

➤ _____

➤ _____

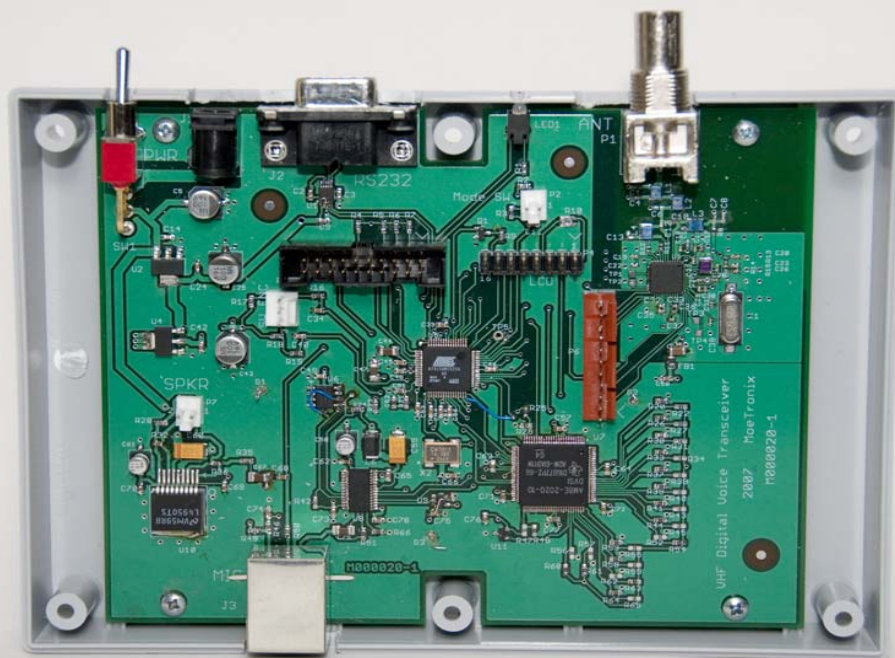
D-STAR

Digital Voice + Digital Data

DVX - Digital Voice Transceiver by Moe Wheatley - AE4JY

<http://www.moetronix.com>

Open Source/Design



D-STAR

Digital Voice + Digital Data

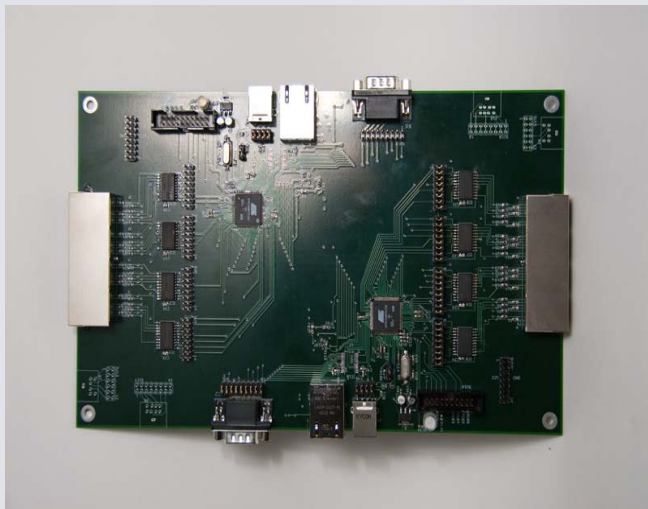
DV+DD

D-Star Widget

by Robin Cutshaw – AA4RC

Replaces D-Star Controller or extends distance between controller and repeater modules

Open D-Star library encodes and decodes raw D-Star frames



```
#ifndef _DSTARLIB_H

#include <netinet/in.h>

// dstarhdr_s length without crcstatus, 660 before convolution, 328 after
// the 328 bits (41 bytes) have "00" appended for 2*330=660 post convolution
#define DSTAR_HEADER_ENC_LEN 660 // convoluted length (328 + 2) * 2
#define DSTAR_HEADER_DEC_LEN 328 // viterbi decoded length 41 bytes

// dstarhdr->crcstatus values
#define DSTARHDR_CRCSTATUS_GOOD 1
#define DSTARHDR_CRCSTATUS_BAD 0

struct dstarhdr_s {
    unsigned char flags1;
    unsigned char flags2;
    unsigned char flags3;
    unsigned char rpt2[8];
    unsigned char rpt1[8];
    unsigned char urcall[8];
    unsigned char mycall[8];
    unsigned char mysuffix[4];
    unsigned char pfcs[2];
};
```

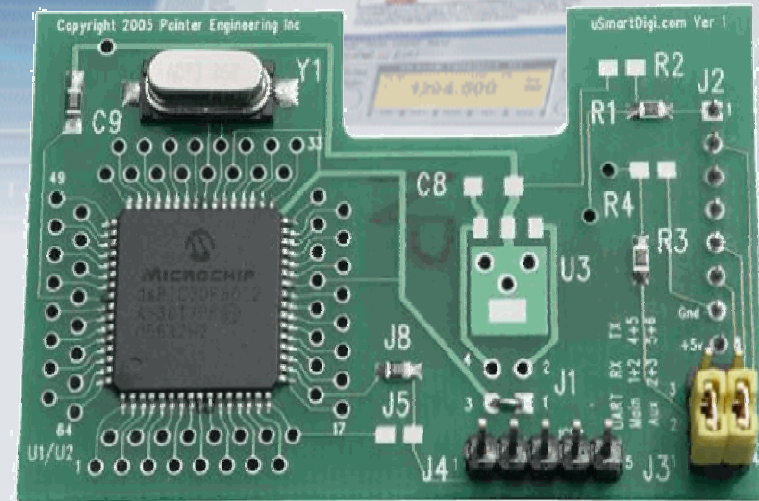
Applications

➤ **μSmartDigi™ D-Gate**

D-PRS® to APRS

APRS to D-PRS®

Rich Painter, AB0VO



➤ **D-STAR Monitor**

Server based software package

Display user status

D-STAR

Digital Voice + Digital Data

Applications

➤ www.dstarusers.org
Additional Stats for SYSOP

➤ **D-STARLet**

A Web-based text messaging application

Uses D-STAR Digital technology

Dean Gibson, AE7Q

www.dstarlet.com



TARC - Control Panel

2006-08-12 18:16:04



Servlet is running: **Stop** connected as KG4MPU to D-Star @ COM1:9600

Refresh every seconds **Update**

Create Message **View Log** **Help**

Precedence	Outgoing Messages TimeStamp	To
Draft		
Outbox		
Sent		
Immediate	2006.0812-1814.33983	w4MD
Priority	2006.0812-1813.36350	w4MD
Routine	2006.0812-1434.33572	w4MD
Routine	2006.0812-1643.38178	w4MD
Routine	2006.0812-1706.37301	w4MD
Routine	2006.0812-1756.36614	w4MD
Failed		

Precedence	Incoming Messages TimeStamp	From
Inbox		
Rcvd		
Routine	2006.0812-1706.09901	w4MD
Routine	2006.0812-1708.40929	w4MD
Routine	2006.0812-1727.04235	w4MD

D-STAR

Digital Voice + Digital Data

DV + DD

Applications

➤ **d*Chat**



A simple D-STAR keyboard to keyboard chat application for Windows.

Brian Roode, NJ6N

http://nj6n.com/dstar/dstar_chat.html

- My Documents
- Google Earth
- My Computer
- My Network Places
- Recycle Bin
- Internet Explorer
- EMIS
- WEB PUFF
- Alabama Sever...
- dchat

Communication Port Settings

d*Chat  

Call Sign **Port Status** **Last Heard**

RxBeep

9:53:21 AM: Staging> Alex Sparks Cert Team 2

9:51:46 AM: Command> EOC NEED ETA ON ALL UTILITIES

9:52:01 AM: Command> (Command) KG4VNY- DAVID

9:53:41 AM: Staging> Kenneth Gowens Cert Team 1

9:54:05 AM: Staging> Patrick Jones Cert Team 1

9:54:21 AM: EOC> command, alabama power company eta 20 minutes. Alagasco 40 minute eta

9:54:43 AM: Staging> Johnny Binton CD Team 3

9:54:48 AM: Staging> (Staging) KI4DWE- Lisa

9:55:14 AM: Staging> Gregory Rod Cert Team 3

9:55:40 AM: Staging> J.C. Broadwell CD Team 3

9:56:16 AM: EOC> command, be advised Alabama Power response is limited due to damage in other areas

9:56:27 AM: Staging> Dave Dostie AE9Q Volunteer to Clerical

z ????L?g9:57:20 AM: Staging> Peggy Hamilton Cert/PCD clerical to IC

9:56:10 AM: Command> EOC ROGER THAT

9:56:31 AM: Command> EOC NEED NEW ETA

9:58:12 AM: Staging> Miram Thornton Volunteer to Backhoe

9:58:13 AM: EOC> KG4HXN JAMES CALHOUN COUNTY EMA DISASTER EXERCISE

9:58:38 AM: Staging> Jessica Spinks Volunteer to Public Relations

9:59:08 AM: EOC> Command, ETA on Apco 15 minutes. Alagasco 25 minutes ETA

%79:58:51 AM: Command> CD 10 HAS EQ TO KILL GAS

10:06:28 AM: Logistics> KI3N - Ken - Command Post Logistics

Text to Send

Send Periodic QST Minutes Show QST

Timestamp tx rx
 1.1.5 (c) 2007 Brian Roode, NJ6N nj6n@soara.org

Communication Port Settings

COM1 9600

d*Chat



Call Sign

Port Status

Last Heard

Receive Window

nj6n

COM1 opened.

 RxBeep*Text to Send* Send Periodic QST 30 Minutes

Timestamp

 tx rxWelcome to the K650A D-STAR repeater system! www.soara.org/dstar [aut

1.1.2 (c) 2007 Brian Roode. NJ6N nj6n@soara.org

D-STAR

Digital Voice + Digital Data

DV + DD

Hardware / Radios



Digital Repeater

2meter

70cm

23cm

23cm

D-STAR

Digital Voice + Digital Data

DV+DD

DIRofRXSTN 401km GP5-9) MAIN DV G ICOM



RX 35° 41' 16" N JQ1YLI A
139° 47' 24" E

MY 34° 37' 33" N
135° 34' 07" E

DATA POSI G-WR GMR R-WR MENU

FM Icom Inc G-D
STEP 145.000 GP5
S.Ok



BUSY HI MR 2



MIC

SP



D-STAR

Digital Voice + Digital Data

DV + DD



MIC
SP



Simple bandscope example



D-STAR

Digital Voice

Digital Data

Coming mid 2008

IC92-AD

The Icom IC-92AD is a rugged 5 watt dualband HT with D-STAR built-in! It is built military tough and is submersible (1 meter 30 minutes). Connect the optional HM-175GPS speaker mic to transmit position data - perfect for SAR.



D-STAR

DV + DD

Digital Voice + Digital Data



MIC
SP



Digital Voice + Digital Data

DV + DD

Digital Voice
DIGITAL
+ Data

D-STAR

Rugged
MIL-STD 810



N 34
LOW DV ATT

N 37.192
LOW DV ATT

Position display example
showing N 34° 37' 19.2"

D-STAR

Digital Voice + Digital Data

DV + DD



MIC
SP

SYSTEM
LINE IN
LINE OUT

D-STAR

Digital Voice + Digital Data

DV + DD



D-STAR

Digital Voice + Digital Data

IC-U82 and IC-V82

Features:

- Full sized and easy to use
- 5 / 7 watts output with supplied battery
- 200 Alphanumeric Channels
- Rugged MIL grade construction
- CTCSS/DTCS encode/decode with tone scan



D-STAR

Digital Voice + Digital Data

DV + DD

Conclusion

- Digital Radio Is Here!
- Alabama is on the Digital forefront!
- Everyone's a Winner
 - Amateurs
 - Emergency Communications
 - Public Service
 - Ham Radio

D-STAR

Digital Voice + Digital Data

DV + DD

Additional Information

➤ w4ozk@arrl.org

➤ www.arrl-al.org

➤ www.icomamerica.com/dstar



WHEN ALL ELSE FAILS...
AMATEUR RADIO
WWW.ARRL.ORG

ALABAMA D★STAR

D-STAR

Digital Voice + Digital Data

DV + DD



Backup Charts

D-STAR

Digital Voice

Digital Data

GigaParts[®]

Online Superstore!

Cost

Radios

Repeater

IC-91A/D **\$449.95**

ID-RP2000V 2m **\$1399.99**

ID-800 **\$609.99**

ID-RP4000V 70cm **\$1399.99**

IC-2820 **\$950.00**

ID-RP2V 23 cm **\$1559.99**

ID-1 **\$979.99**

ID-RP2D 23 cm **\$1112.99**

IC-2200 **\$139.95**

ID-RP2C Controller **\$1459.99**

IC-V82&V*83 **\$119.95**

Total = \$6933.95

UT-118 module for IC-2200,

IC-U82, & IC-V82 **\$189.00**

**+ Antennas, Feed line, Duplexers,
Server, Internet connection.**

Check for current prices

D-STAR

Digital Voice + Digital Data

SPECTRUM ANALYZER · 9 kHz ... 3 GHz · FSP



ROHDE & SCHWARZ

PRESET

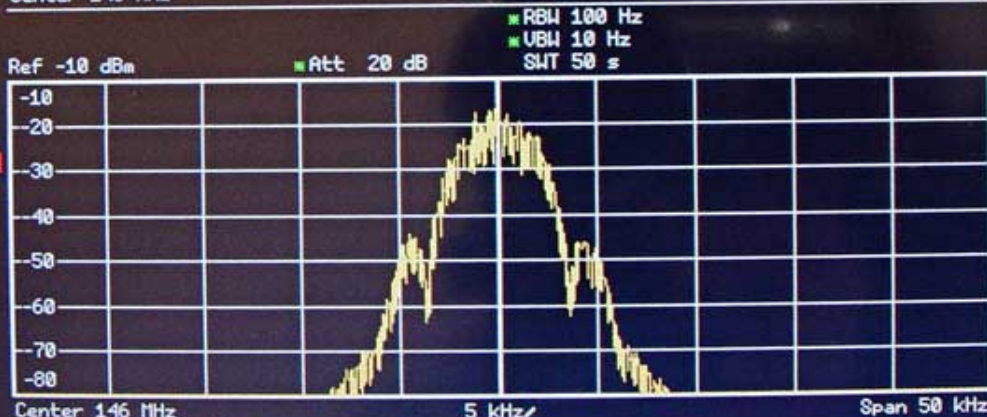
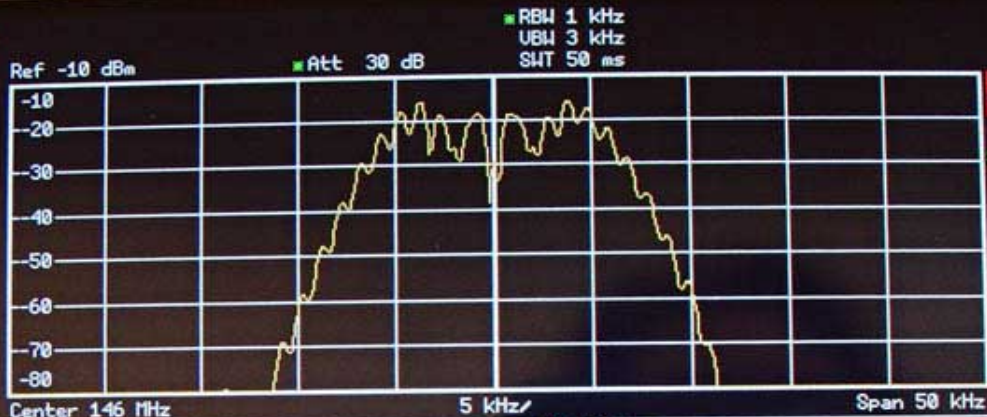
CAL

SETUP

HCOPIE

1 AP
VIEW

IF DUL
1 AP
VIEW



SPECTRUM

NETWORK

FM DEMOD

SCREEN A

SAVE

RECALL

EDIT
COMMENT

ITEMS TO
SAVE/RCL

DATA SET
LIST

DATA SET
CLEAR

DATA SET
CLEAR ALL

STARTUP
RECALL

FILE
MANAGER

PREV

NEXT