The D-Star System

Introduction

Digital - Smart Technologies

for

Amateur Radio

Started in Japan

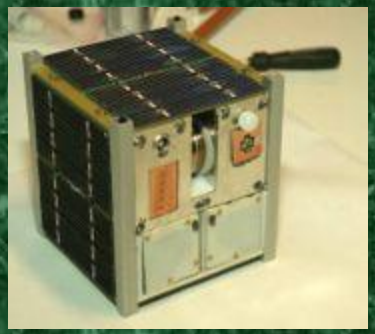
Japan Amateur Radio League

Basic Ingredients

- Need
  - Link all of Japan with digital communications
- Financial Backing
  - Japanese Government
- Support – Hardware and Software
  - ICOM
    - DVSI - AMBE2020™ Vocoder chip

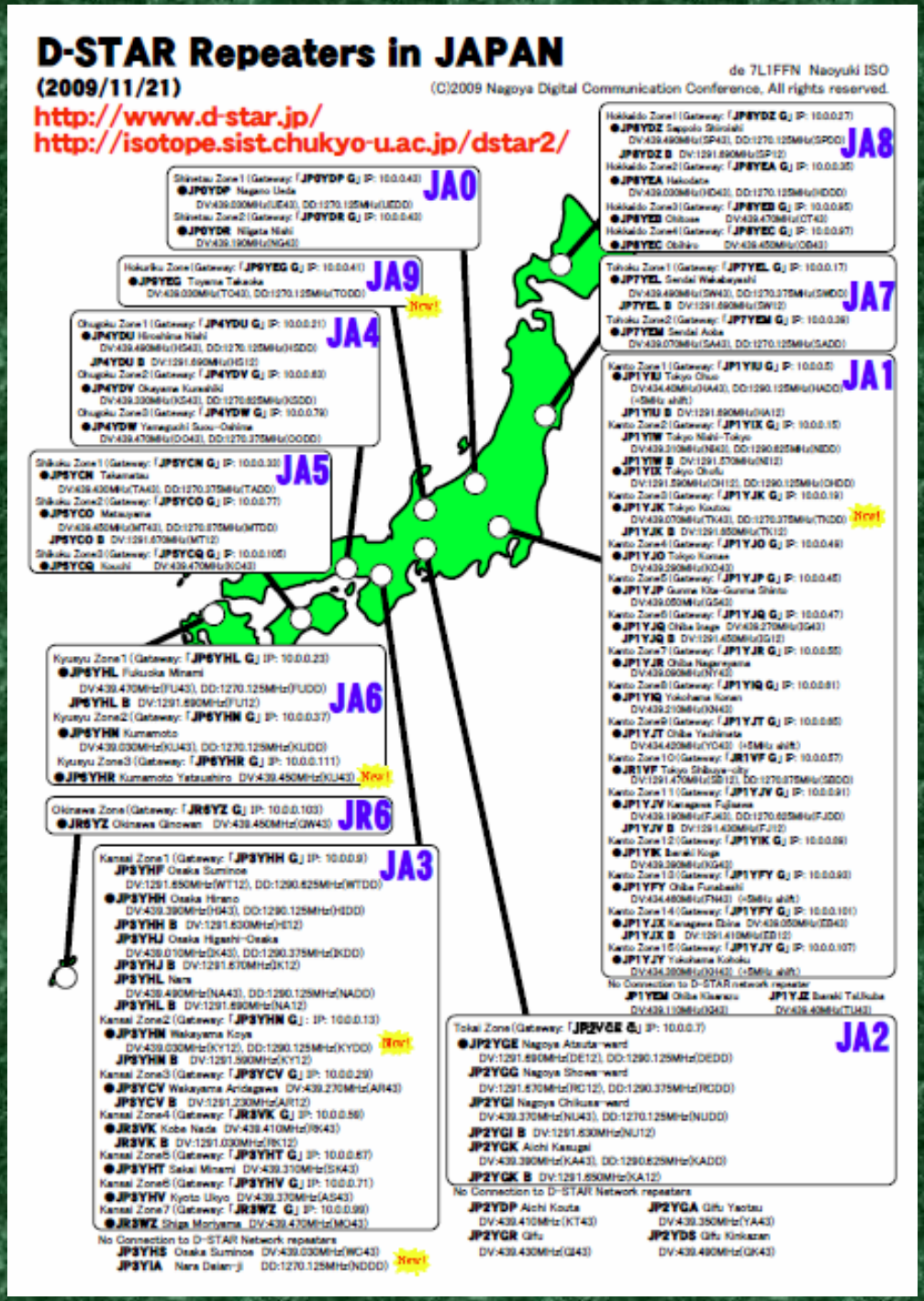
History

- 1999 – Research began
  - Funded by Japanese Government
  - Administered by JARL
- 2001 – ICOM begins introducing hardware
- 2004 – ID1 1.2 GHz full DD mode
- 2007 – First QSO using D-Star via Satellite
- 2010 – October launch of D-Star satellite
  - OUFTI-1 is a CubeSat
  - 10x10x10 cm (4”)



The Results

53 Repeaters

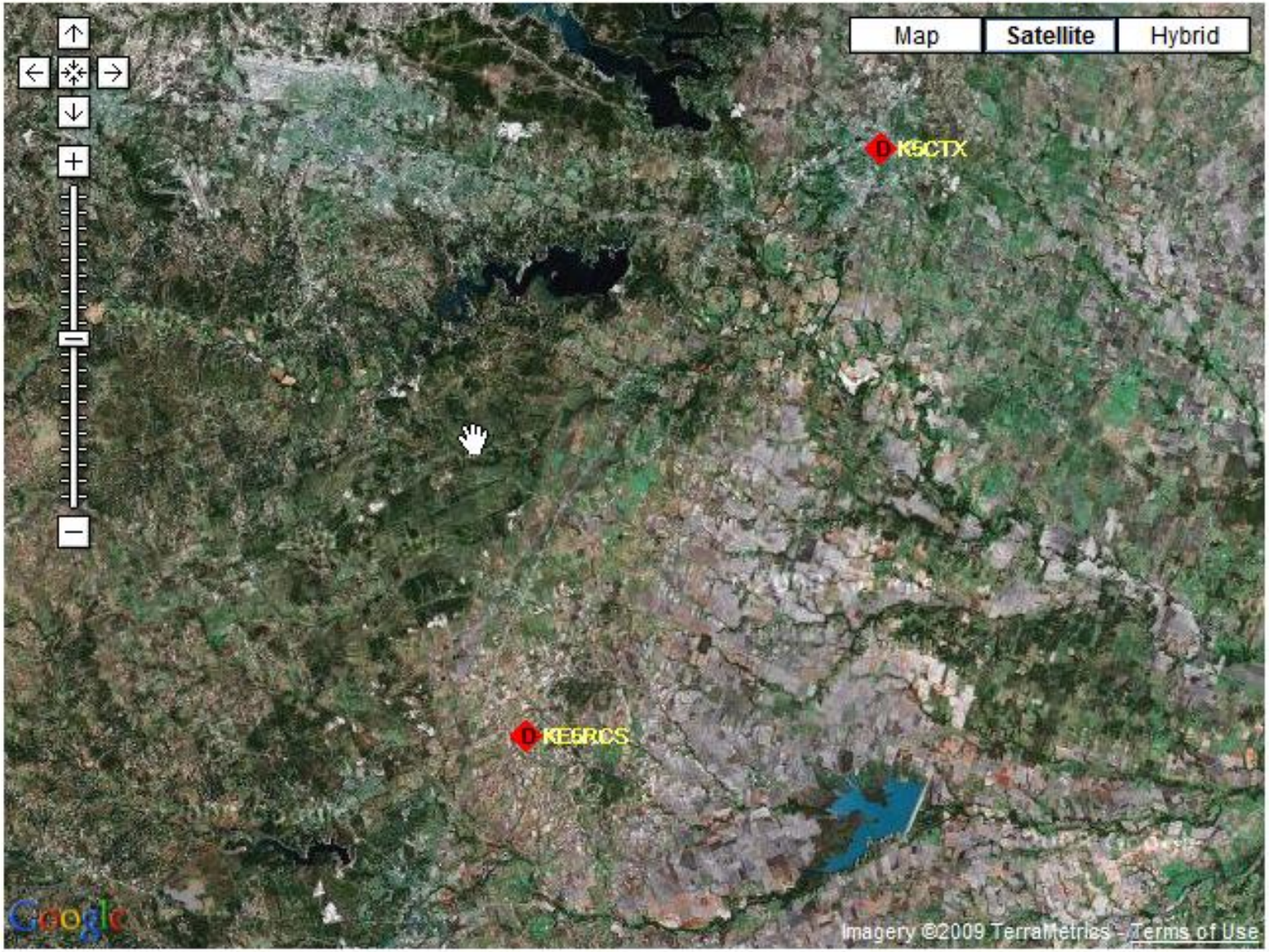


March 2010

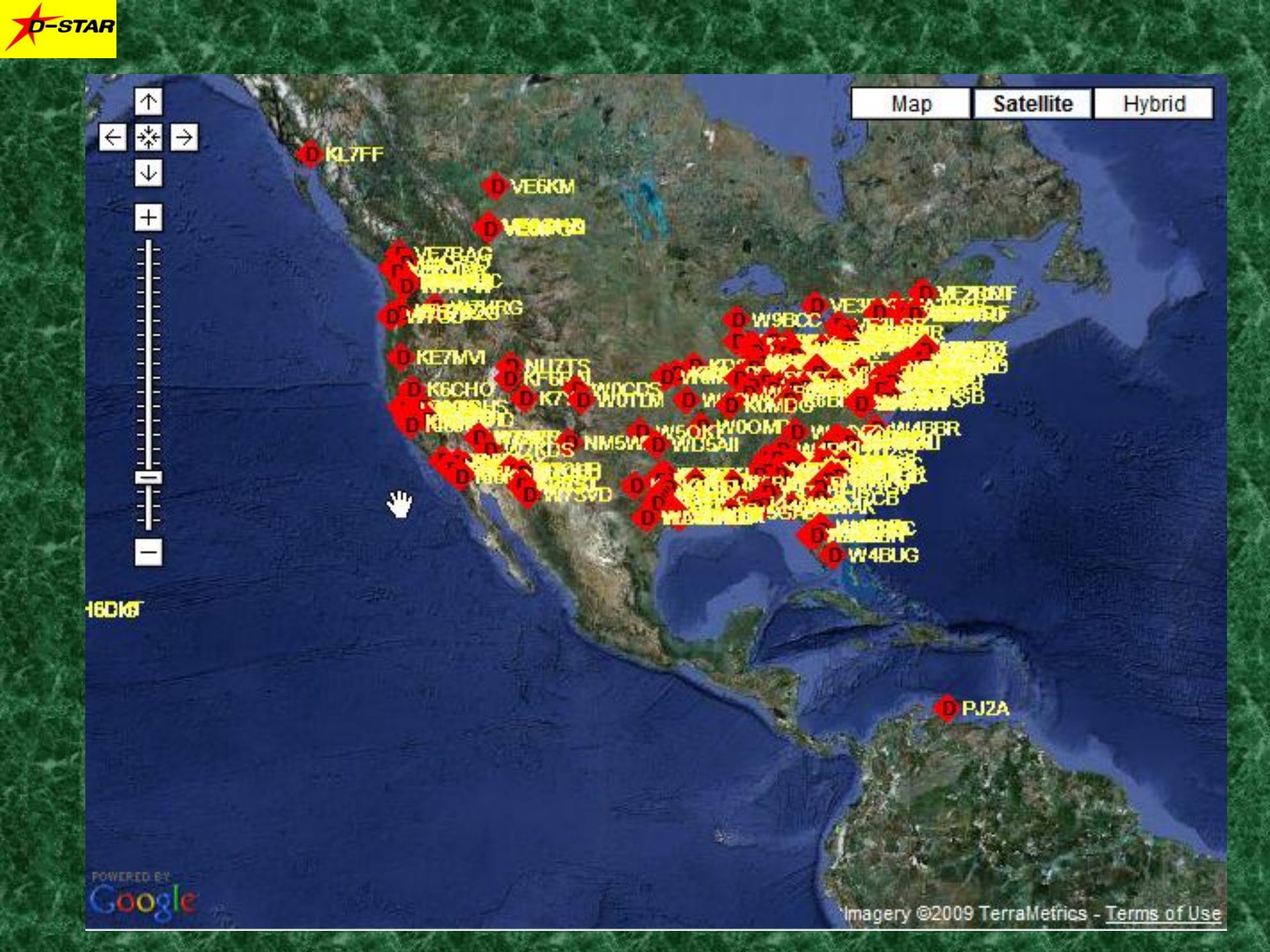
What about the rest of the world?

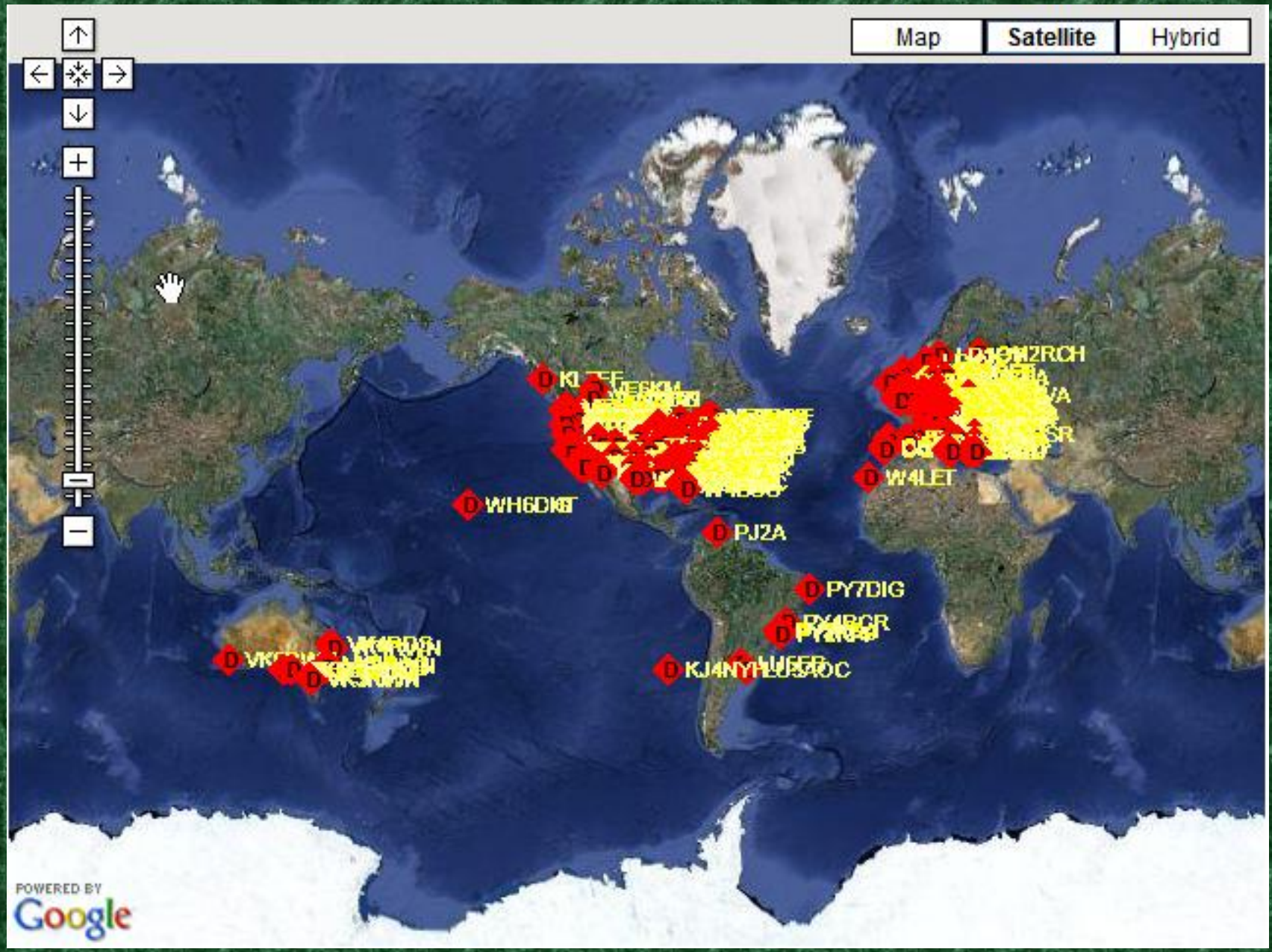
jFindu Locator Site

Recent Activity Map




Map
Satellite
Hybrid
KC5OLO
K5NEM
W5SHV
W5ZDN
W5HAT
K5CTX
KE5RCS
N5MDS
K5PLD
Google
Imagery ©2009 TerraMetrics - Terms of Use


D-STAR
Map
Satellite
Hybrid
KL7FF
VE6KM
VE7BAG
W9BCC
KE7MVI
K6CHO
NM5W
W4BUG
PJ2A
POWERED BY
Google
Imagery ©2009 TerraMetrics - Terms of Use


Map
Satellite
Hybrid
W4LET
WH6DKT
PJ2A
PY7DIG
POWERED BY
Google

World Wide Right now!

Click on the tower

Plenty of Information

www.dstarusers.org

More Information

www.dstarinfo.com

Why D-STAR?

- **Pure Digital**
  - Clarity
  - Scanners
  - DV - Voice and text message 2.4 Kbps (V=950 bps)
  - DD - High Speed Data at 128 Kbps
- **10 GHz Linking of repeaters**
- **Reflectors**

Why D-STAR?

- Gateway Linking
  - Internet
  - Repeater routing
  - Call sign routing

Why D-STAR?

- D-Rats
  - EmComm - Oriented
  - Files
  - Images - ICS 210
  - Email – BBS-centric
  - GPS

Building a D-STAR Repeater

Putting it together!

First we need a repeater

2 m – Digital Voice

$1399.95

…or two

70 cm – Digital Voice

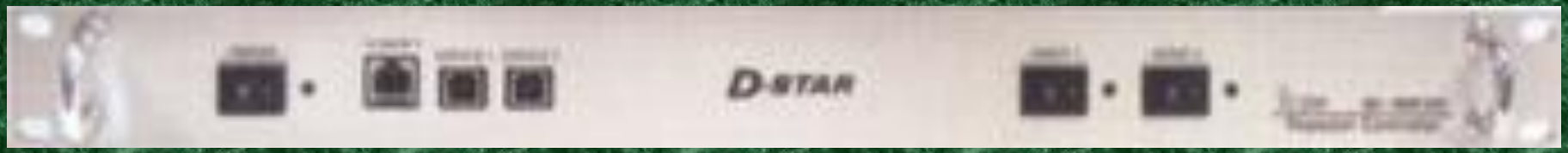
$1399.95

…or even three

23 cm – Digital Voice

$1559.99

…then we add a



Controller

$1459.95

… and do not forget

High Speed Digital Data
128 Kbps - 23 cm

$1112.99

Photo	Item	Your Price
	**ID-RP 2C** Repeater Controller Handles up to four RF modules.	**$1459.99**
	**ID-RP 2D** 23cm (1.2 GHz) Data Module Access point with a data rate of 128kbps.	**$1112.99**
	**ID-RP 2V** 23cm (1.2 GHz) Voice Module	**$1559.99**
	**ID-RP4000V** 70cm (440 MHz) Voice Module	**$1399.99**
	**ID-RP2000V** 2 Meter Voice Module	**$1399.99**
	RSRP2 G2 DSTAR Gateway Software	**$ 359.95**

$7,292.90 +

…and a

Gateway

$750.00

Now all you need is…

- Location
- Antennas
  - 2m
  - 70m
  - 23m
- Duplexers
- Preamps
- Power (including backup)
- Internet Access
- Administration

Frequencies


Walburg, TX
23 cm
70 cm
2 m
D-STAR

Walburg, TX

250’

- 2 m
- 70 cm
- 23 cm

“Support your local D-Star repeater group”

HOTERA

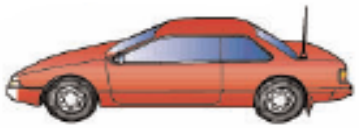
Heart of Texas Emergency Repeater Association

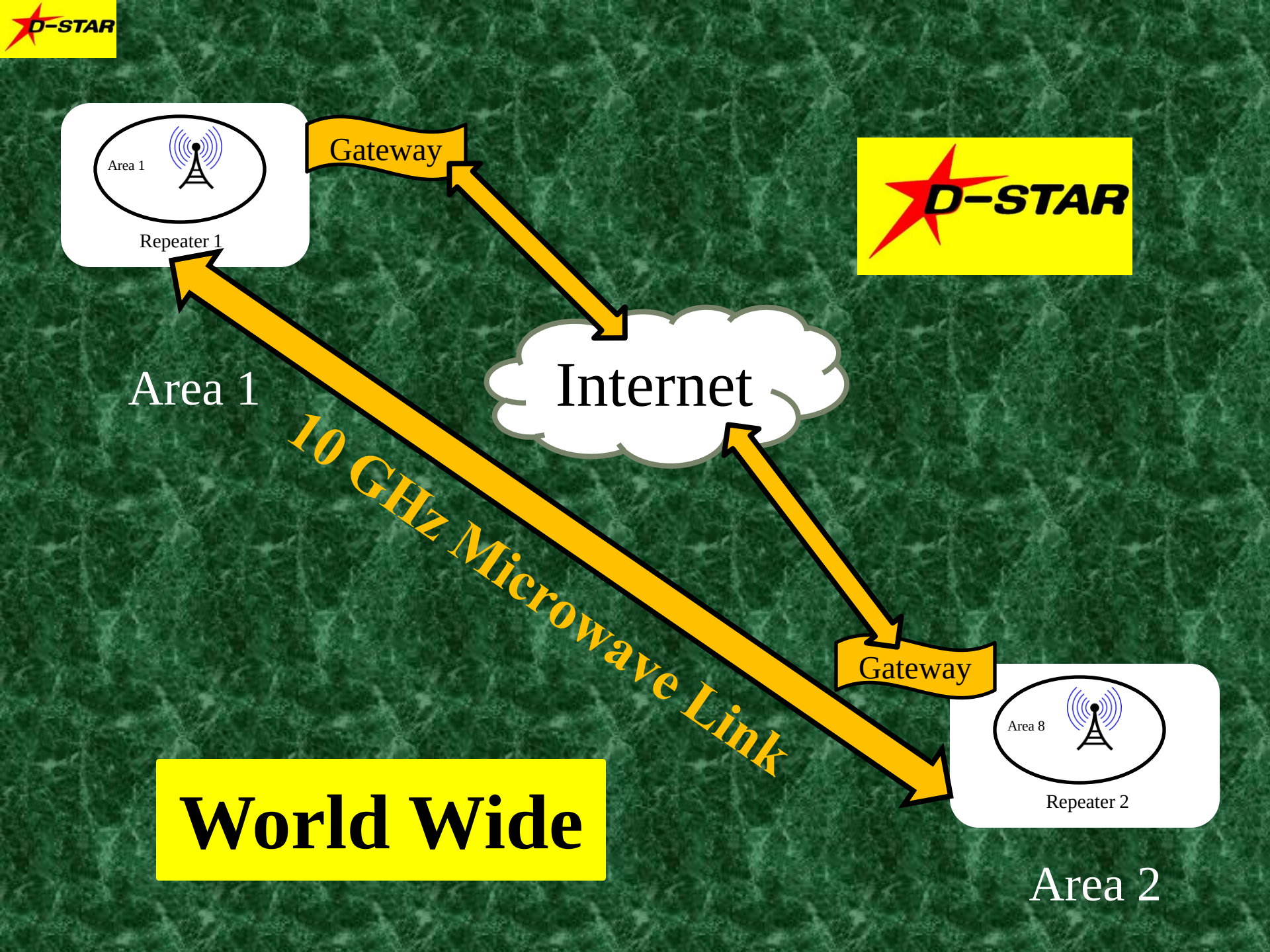
Click on the antenna

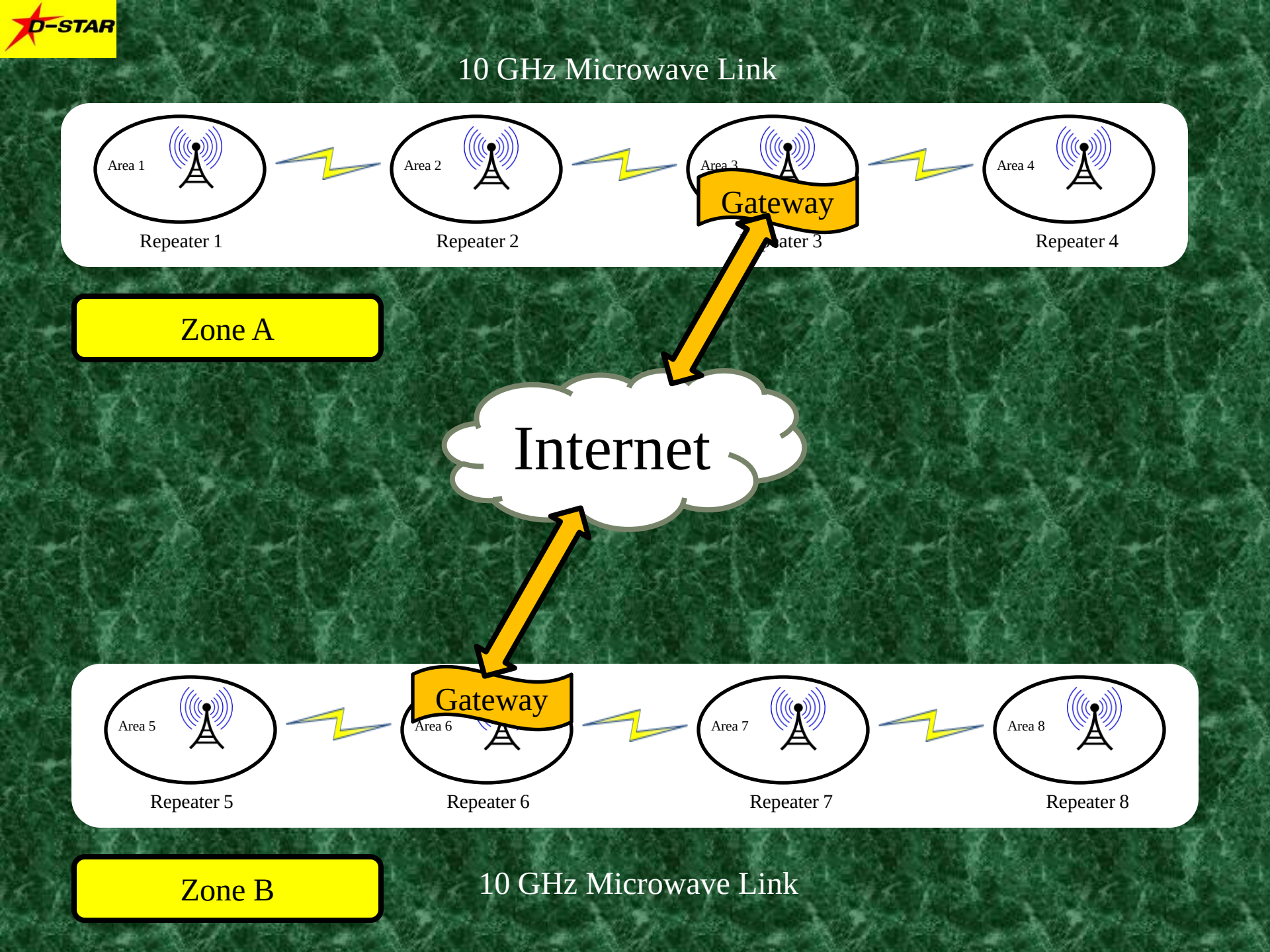
Implementing D-STAR

Local Communications

AREA



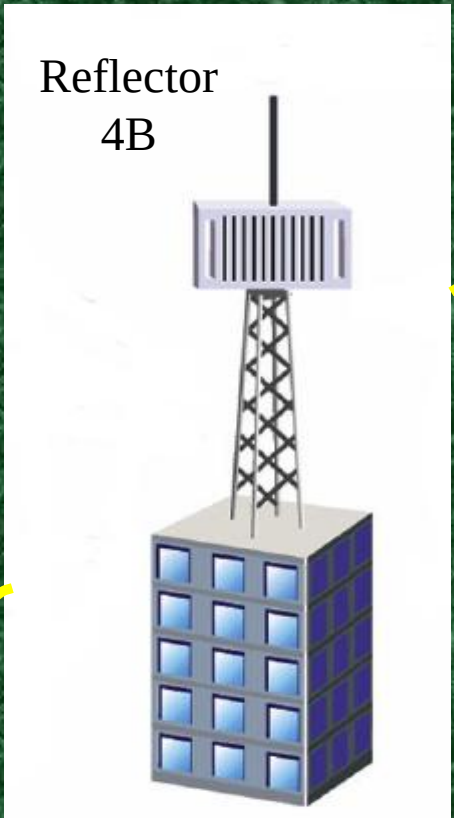

D-STAR
Area 1
Repeater 1
Gateway
D-STAR
Area 1
Internet
10 GHz Microwave Link
Gateway
Area 8
Repeater 2
World Wide
Area 2

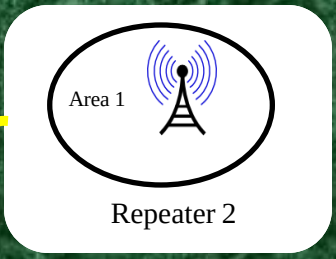

10 GHz Microwave Link
Area 1
Area 2
Area 3
Area 4
Gateway
Repeater 1
Repeater 2
Repeater 4
Zone A
Internet
Area 5
Area 6
Area 7
Area 8
Gateway
Repeater 5
Repeater 6
Repeater 7
Repeater 8
Zone B
10 GHz Microwave Link

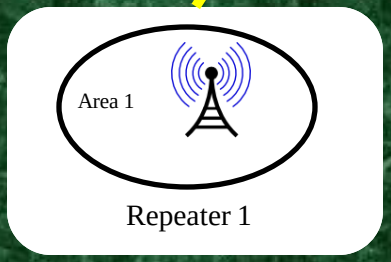
Reflectors

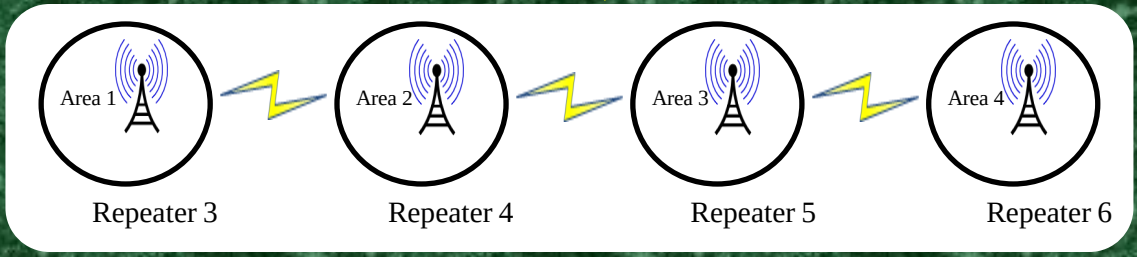
- Conference Hub – PC Server
  - Multiple D-STAR repeater nodes
  - Connected VIA Gateways
  - Dongle Users
- World Wide Net held in 2008
  - 28 D-STAR Nodes (repeaters)
  - 18 Dongle Users
  - And it worked “Flawlessly”

Multiple Connections









Radios and Dongles

ICOM ID - 1

- 1200 MHz
- Digital Voice – 4.8 Kbps
- Digital Data – 128 Kbps

$999.95

ICOM ID – 2820H

- DUAL Band
  - 2 M
  - 70 cm
- GPS
- Digital Voice – 2.4 Kbps
- Digital Messages

$549.95

284.95 D-STAR

$834.90

ICOM ID – 880H

- 1052 Memory Channels
- DUAL Band
  - 2 M
  - 70 cm
- Digital Voice – 2.4 Kbps
- Digital Messages
- Software

$549.95

ICOM ID – 80AD

- 1052 Memory Channels
- DUAL Band
  - 2 M
  - 70 cm
- Digital Voice – 2.4 Kbps
- Digital Messages
- Software

$419.95 - Radio
$199.95 – GPS Mic

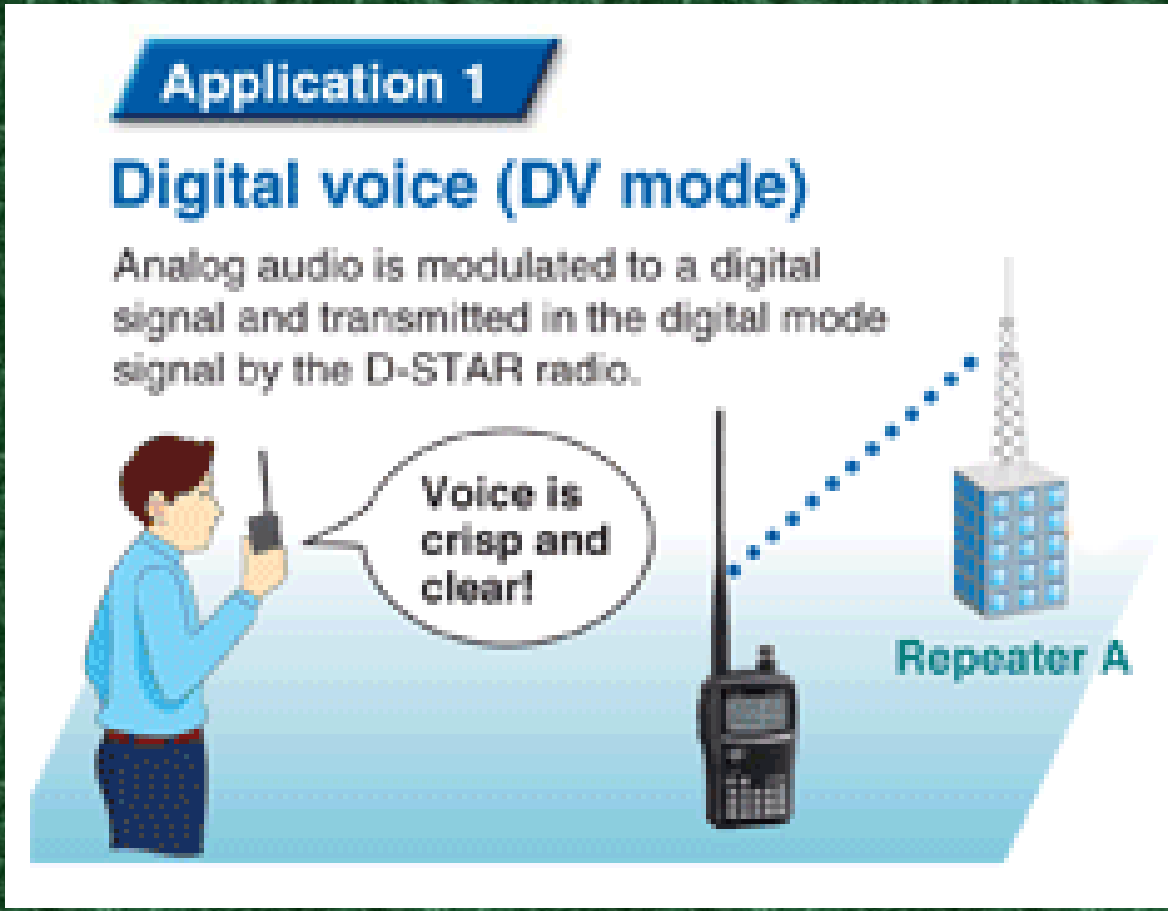
DV Dongle

- D-Plus
- Robin Cutshaw, AA4RC
- PC - USB
- Gateways & Reflectors

$200.00
$250.00

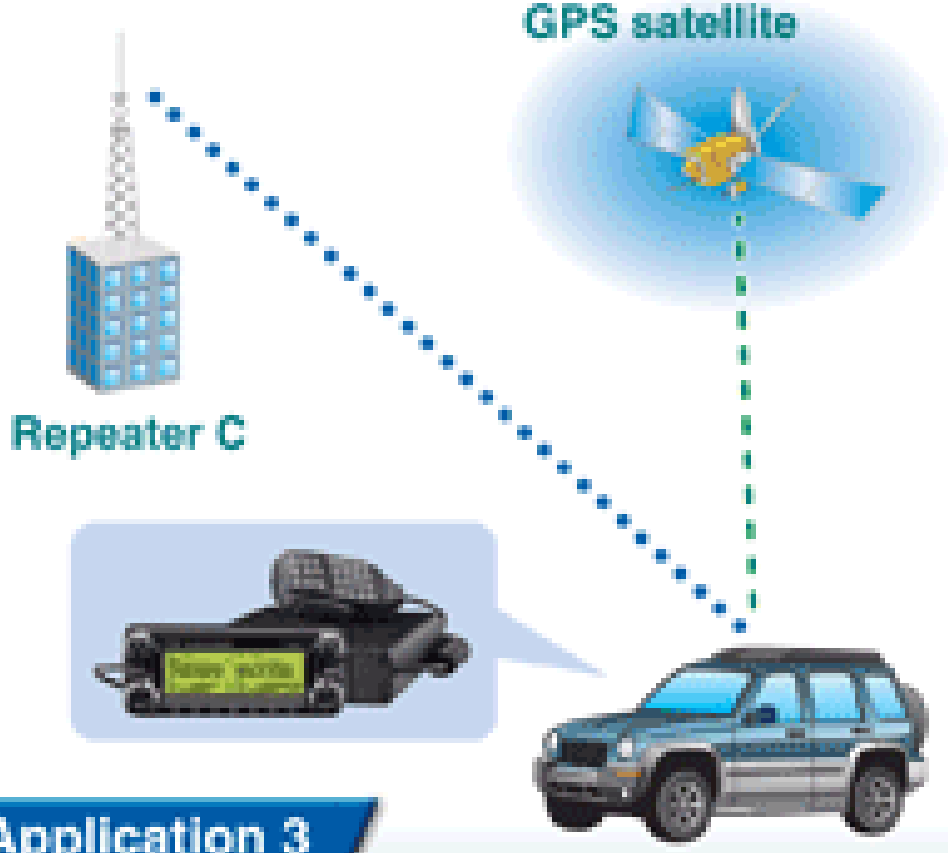
Applications

How can I use D-STAR?



Application 2

Short data message (DV mode)



Application 3

GPS tracking (DV mode)

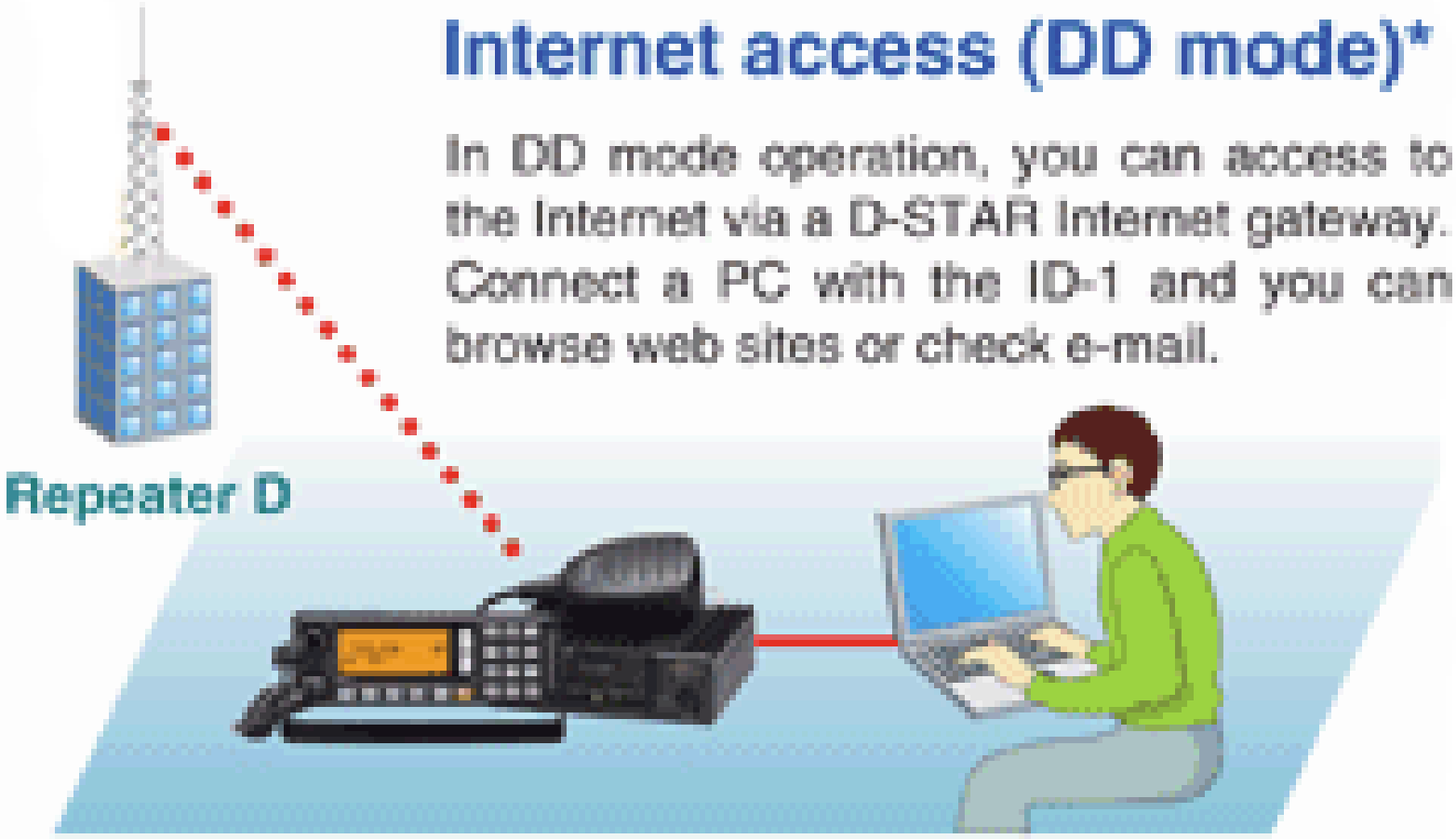
With a GPS receiver, you can send your current position information to another radio.

D-STAR

Application 4

Internet access (DD mode)*

In DD mode operation, you can access to the Internet via a D-STAR Internet gateway. Connect a PC with the ID-1 and you can browse web sites or check e-mail.



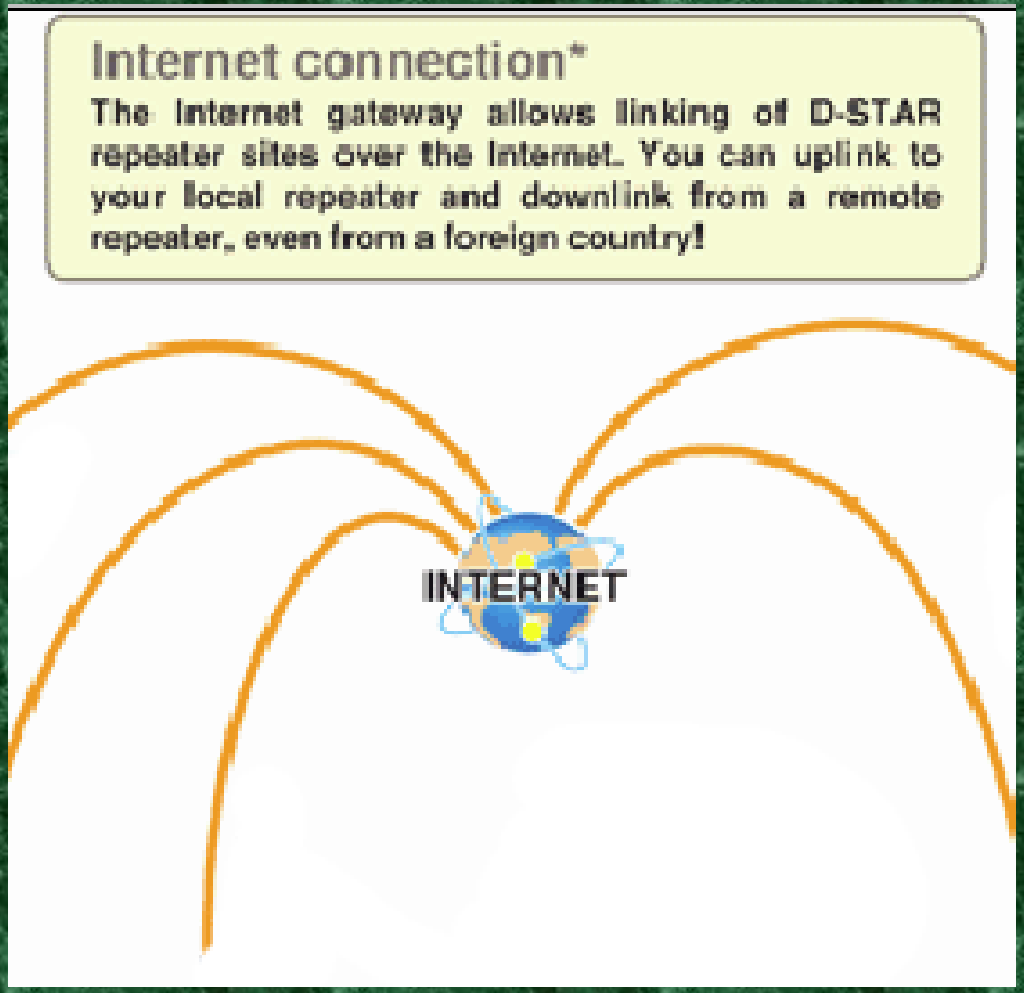
D-STAR

Application 5

IP camera (DD mode)

You can transmit live images in DD mode and watch real-time images from a remote location.

Add the Internet



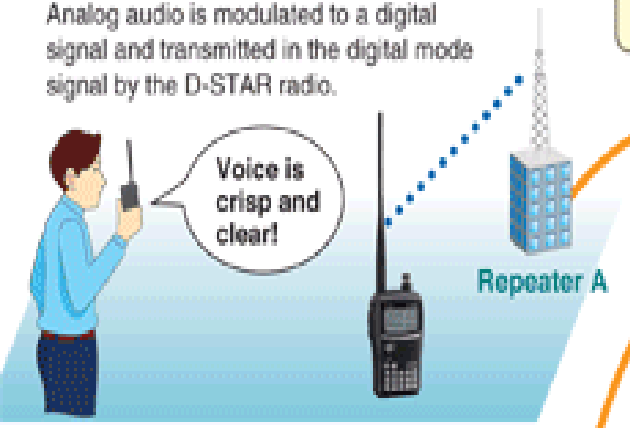
Internet connection*

The Internet gateway allows linking of D-STAR repeater sites over the Internet. You can uplink to your local repeater and downlink from a remote repeater, even from a foreign country!

Application 1

Digital voice (DV mode)

Analog audio is modulated to a digital signal and transmitted in the digital mode signal by the D-STAR radio.



Application 5

IP camera (DD mode)

You can transmit live images in DD mode and watch real-time images from a remote location.

Application 2

Short data message (DV mode)

Application 4

Internet access (DD mode)*

In DD mode operation, you can access to the Internet via a D-STAR Internet gateway. Connect a PC with the ID-1 and you can browse web sites or check e-mail.

Application 3

GPS tracking (DV mode)

With a GPS receiver, you can send your current position information to another radio.

Internet
DV mode (4.8kbps)
DD mode (128kbps)

* Some restrictions may apply depending on specific countries' regulations.

Software

- ICOM - Gateway
- D-Plus – Linking – AA4RC

- D-RATS – files, documents, images, email, chat, GPS
- D-PRS - APRS
- D-Chat
- DVTool - Dongle
- Programming for Radios 80AD/880H

Let's get down into the details!

Operation

- Basics
  - FM – Select Frequency and PTT
  - DV Mode (Digital Voice) - All users and repeaters must be registered with the D-STAR system
  - DV Mode – it is best that the radio is pre-programmed by the user based on call signs

Who / What has a "Call Sign"?

- Individual Hams – W5HMN
- D-STAR repeaters – KE5RCSxy
- D-STAR gateways – W5TITxxy
- D-STAR tools – K5CTXxxy

- Reflectors are special - REFxxxyz

What do I need to know to communicate using DV?

- DV Simplex is the easiest - CQ
- Repeater Use -
  - The call sign of the repeater (or HAM) — URCALL
  - Your own call sign — MYCALL
  - The call sign of the first repeater — RPT1
  - The call sign of the gateway — RPT2

What else do I need to know?

The **ID** of the repeaters to be used in DV mode

23 cm	xxxxxxx**A**	Echo	xxxxxxx**E**
70 cm	xxxxxxx**B**	Status	xxxxxxx**I**
2 m	xxxxxxx**C**	Link	xxxxxxx**L**
Gateway	xxxxxxx**G**	Unlink	xxxxxxx**U**
Repeater	**/**xxxxxxx (URCALL)		

Example 1

DV Mode

W5HMN

Anyone

In Memory

URCALL = CQCQCQ
RPT1 = N/A
RPT2 = N/A
MYCALL = W5HMN

PTT

Who can hear?

Anyone on frequency!
In digital mode

Local Simplex

Example 2

DV Mode

W5HMN **KE5RCS 70cm** **Anyone**

In Memory

URCALL = CQCQCQ
RPT1 = KE5RCS B
RPT2 = N/A
MYCALL = W5HMN

PTT

Who can hear?

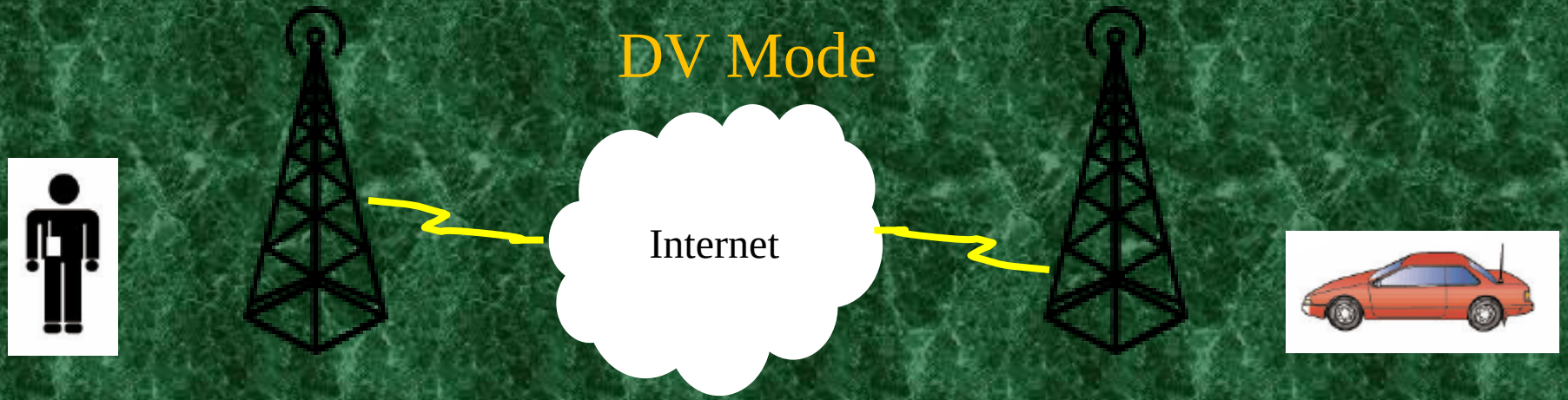
Anyone monitoring KE5RCS B

In digital mode

Using a Repeater

Example 3

DV Mode



K1LGJ **KE5RCS 70cm** **?** **KV5V**

In Memory

URCALL = KV5V
RPT1 = KE5RCS B
RPT2 = KE5RCS G
MYCALL = K1LGJ

PTT

Who can hear?

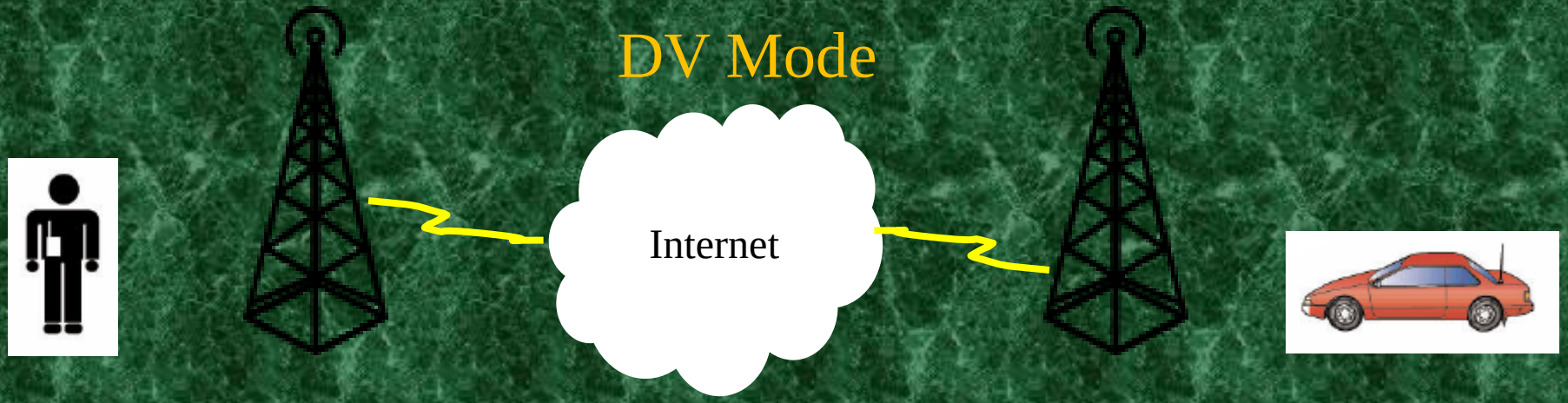
Anyone monitoring KE5RCS B & ?

In digital mode

Call Sign Routing

Example 4

DV Mode



K1LGJ **KE5RCS 2m** **K5CTX 70cm** **W5HMN**

In Memory

URCALL = /K5CTX B
RPT1 = KE5RCS C
RPT2 = KE5RCS G
MYCALL = K1LGJ

PTT

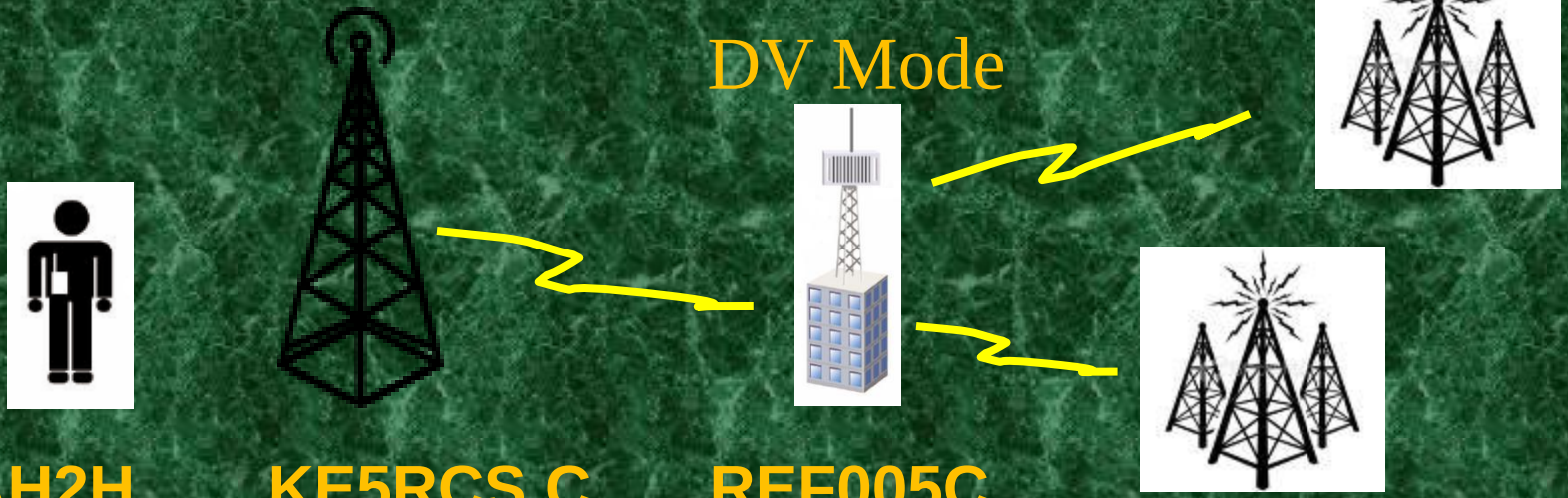
/ Repeater Routing

Who can hear?

Anyone monitoring
KE5RCS C
K5CTX B

Example 5

DV Mode



AH2H **KE5RCS C** **REF005C**

In Memory

URCALL = REF005CL
RPT1 = KE5RCS C
RPT2 = KE5RCS G
MYCALL = AH2H

PTT

Who can hear?

Anyone monitoring
KE5RCS C
REF005C

Reflector - Linking

Example 6

DV Mode

WA1KMA KE5RCS C **W5TSN**

In Memory

URCALL = W5TSN
RPT1 = KE5RCS C
RPT2 = N/A
MYCALL = WA1KMA

PTT

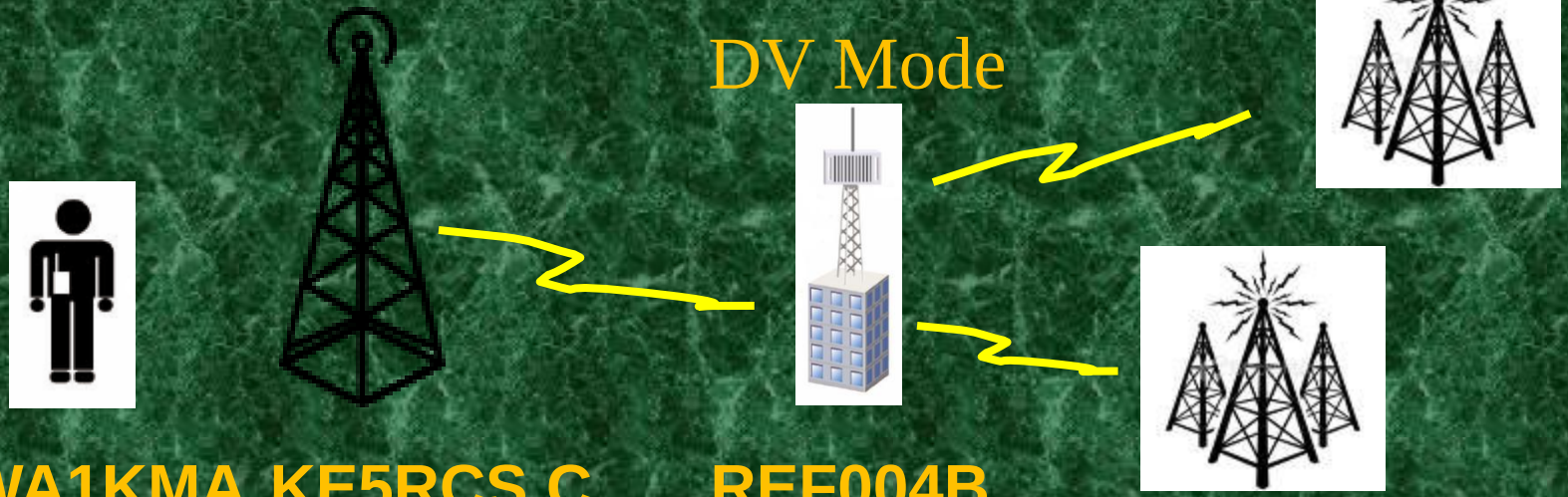
Who can hear?

Anyone monitoring
KE5RCS C
REF005C

Local Area Call

Example 6

DV Mode



WA1KMA KE5RCS C REF004B

In Memory

URCALL = U
RPT1 = KE5RCS C
RPT2 = KE5RCS G
MYCALL = WA1KMA

PTT

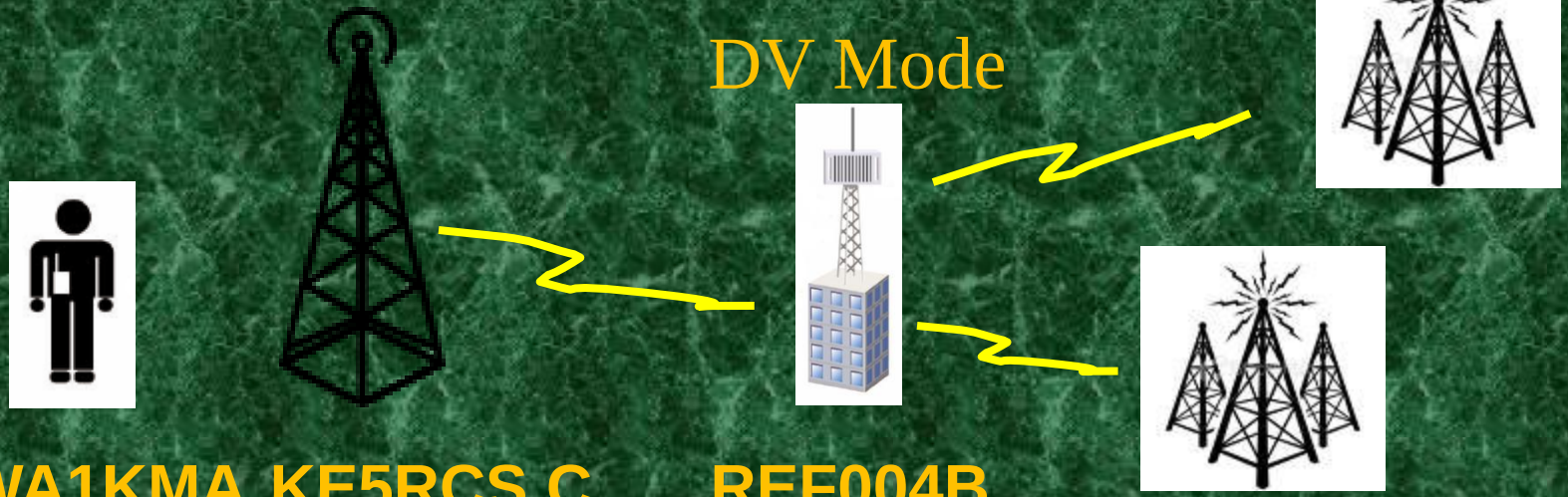
Who can hear?

N/A

Reflector - Unlinking

Example 7

DV Mode



WA1KMA KE5RCS C REF004B

In Memory

URCALL = KE5RCS I
RPT1 = KE5RCS C
RPT2 = KE5RCS G
MYCALL = WA1KMA

PTT

Who can hear?

N/A

Status - Inquiry

Which ones will work?

URCALL=
RPT1 =
RPT2 =
MYCALL=

1	2	3
WA1KMA KE5RCS B KE5RCS G KD4HNX	CQCQCQ N/A KE5RCS G W5TSN	CQCQCQ W4DOC C KE5RCS G AH2H
4	**5**	**6**
KE5RCS B REF005AL KE5RCS G W5HMN	W5TSN KE5RCS B KE5RCS C WA1KMA	/K5CTX U KE5RCS G K1LGJ

D-STAR

Click on
the calculator

www.dstarinfo.com

DEMOs

- DONGLE
- ICOM 91AD (HT)