New Mode, New Opportunity

TAPR DCC

September 24, 2005

Jim McClellan, N5MIJ

Introduction

Texas Interconnect Team

K5TIT

Jim McClellan, N5MIJ

Bill Moore, N5ZPR

Pete Loveall, AE5PL

And a cast of others…

Perspective & Qualifications

- Users
- Not Icom Employees
- Working with live D-Star for almost two years
- Repeater with gateway for 7 months

- What it really is – no sales brochures

Objectives

- Background
- Texas Interconnect Team Involvement
- Hardware – What's available?
- Gateway – Concepts & Implementation
- Applications
- Opportunities
- Resources
- Questions?

D-Star History

- Digital Smart Technology for Amateur Radio
- Plenty of Information Available
- Insert in October 2005 QST
- Handouts at D-Star table in Demo Room

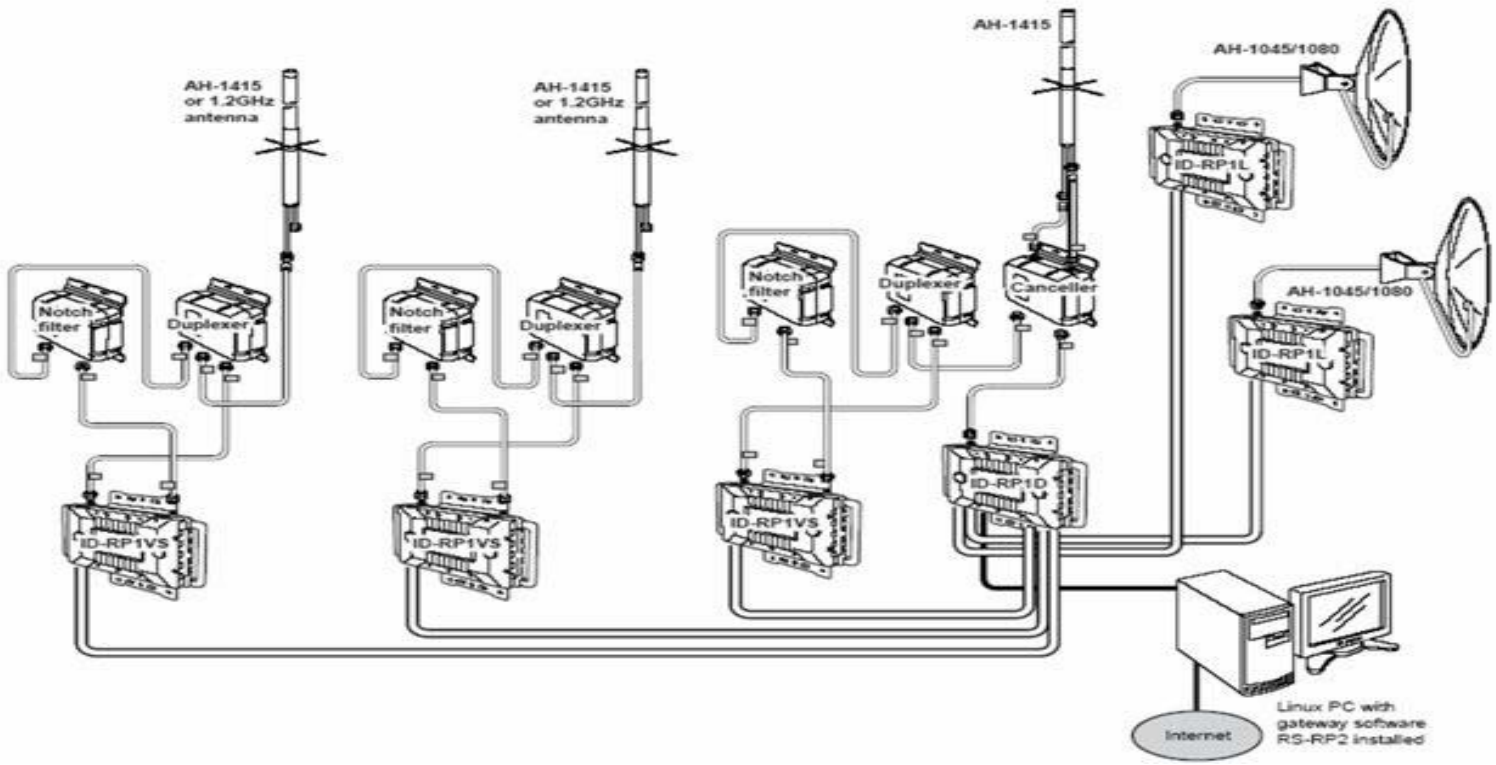
Timeline

- First saw ID-1 at Dayton in 2002
- Our original goal – mobile Internet data
- Persistent calls to Icom
- Price announcement September 2003
- Purchased two ID-1’s
- “Icom Days” at Texas Towers, December 2003

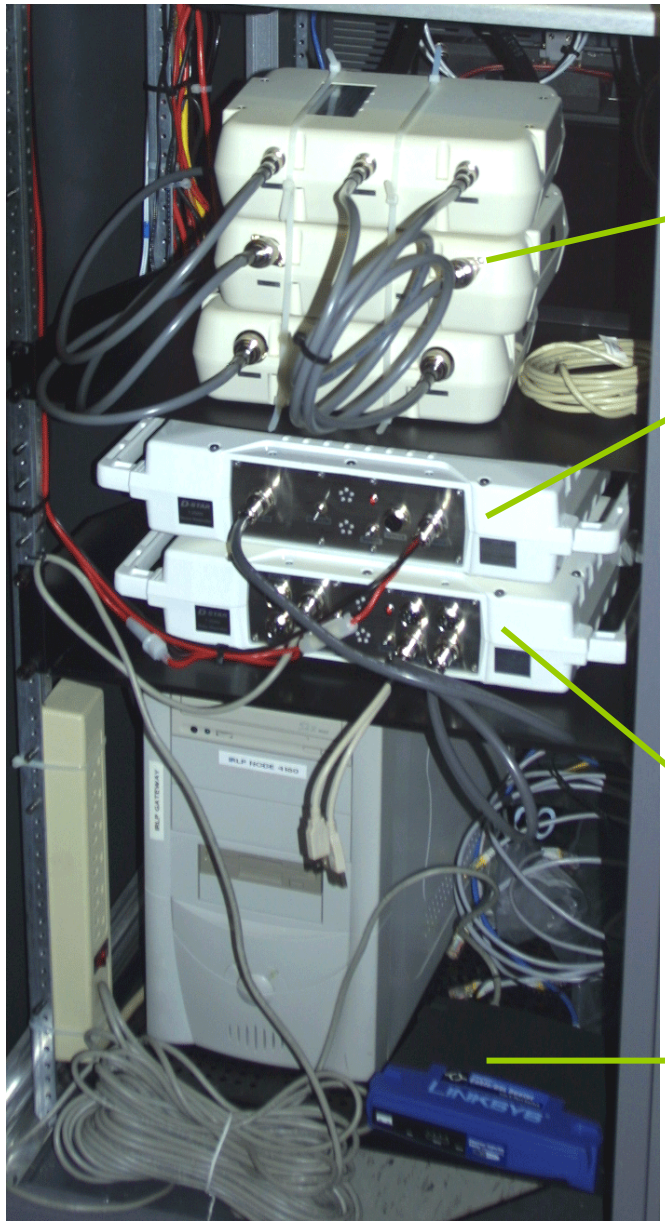
Preparing for Icom Days at Texas Towers

- December 3, 2003
- Jim McClellan, Bill Moore, Matt Yellen
- Installed
  - RP-1 Repeater System
  - Icom supplied filters
  - Icom supplied antenna

RP-1 Concept


AH-1415
or 1.2GHz
antenna
AH-1415
or 1.2GHz
antenna
AH-1415
AH-1045/1080
ID-RP1L
AH-1045/1080
ID-RP1L
Notch
filter
Duplexer
Notch
filter
Duplexer
Notch
filter
Duplexer
Canceller
ID-RP1VS
ID-RP1VS
ID-RP1VS
ID-RP1D
Internet
Linux PC with
gateway software
RS-RP2 installed

RP - 1


Filter Pack
RP-1 Voice Radio
RP-1 Data Radio & Controller
Gateway Router
Linksys

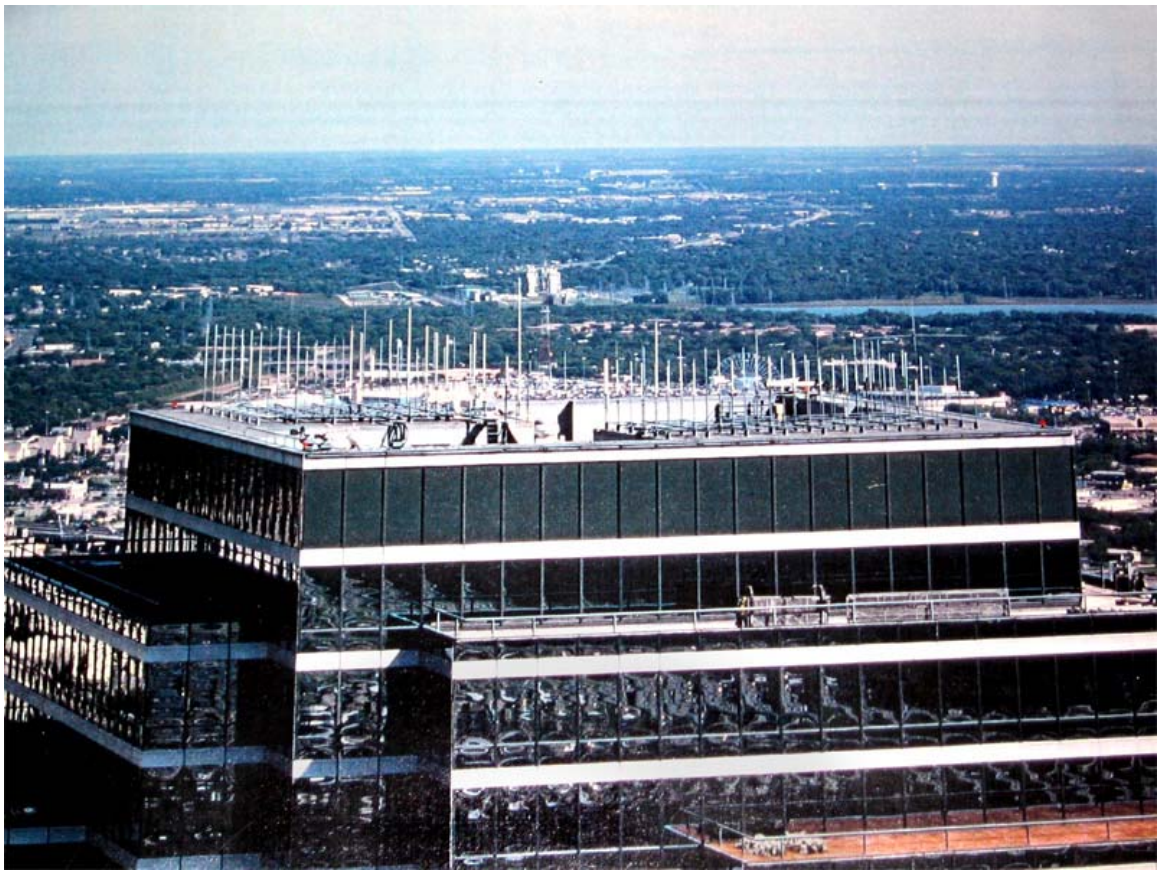
Icom Days
December 5, 2003

- Stormy night
- Approximately 27 people showed up
- Mediocre results
- Repeater did not cover to Texas Towers (17 miles away)

Performance Analysis & Improvement

- Site Environment
- Duplexer and Filter Performance
- Antenna Performance

Site Environment



922 ft AGL, Downtown Dallas

Duplexers and Filters

- Multiple Iterations
- Final Configuration
  - Pass/Notch Duplexers for Voice Repeater
  - Window Filter for Data Transceiver

Antennas

- Repeater
  - Multiple Iterations
  - Final Configuration dedicated, separate Comet GP–21's
- Mobile
  - ¼-λ
  - Gain
  - Procom

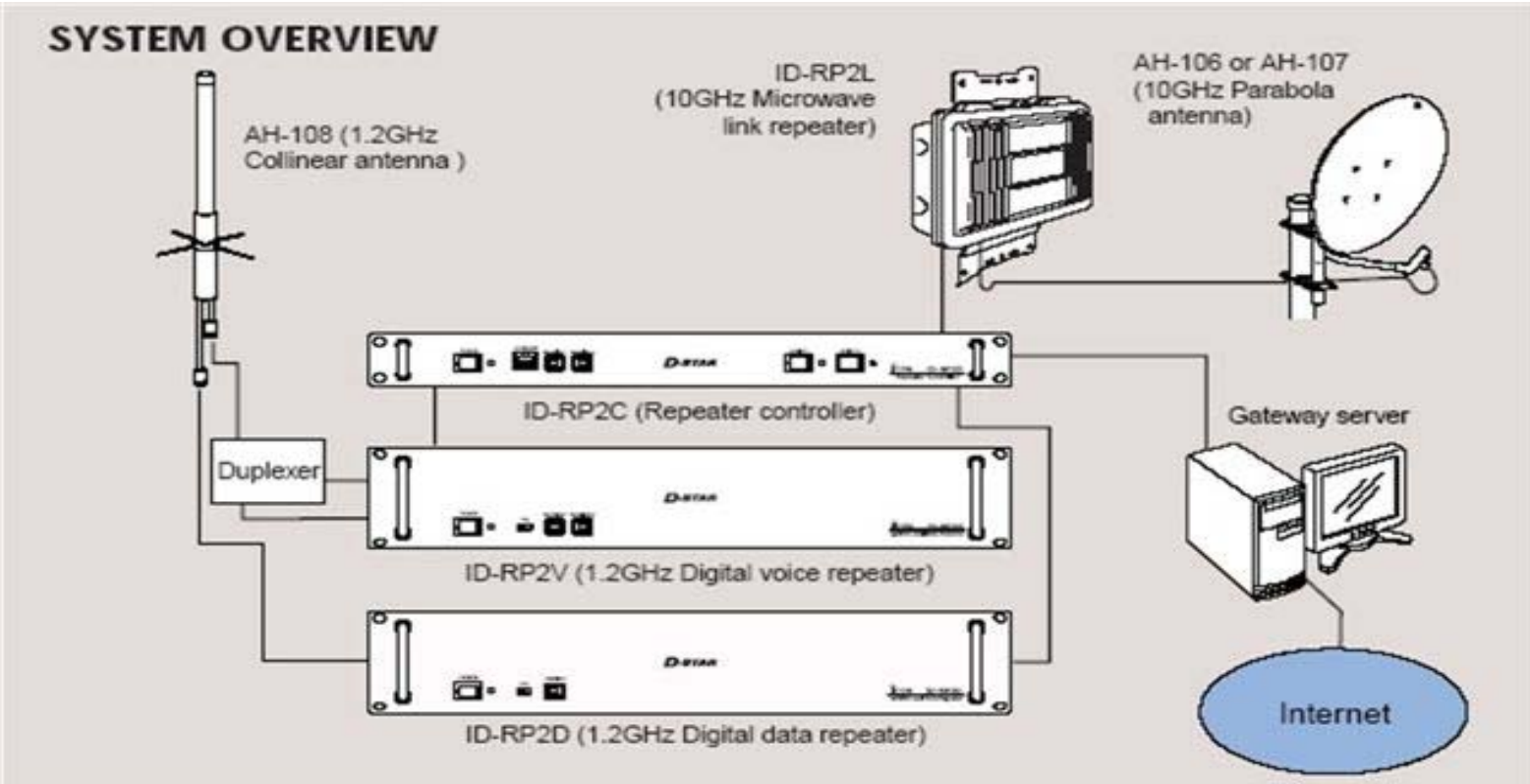
Improvement Results

- Good Data throughput
- Coverage – depending on terrain –
  25 miles +
- Mobile – Mobile from Greenville -> More than 40 miles!

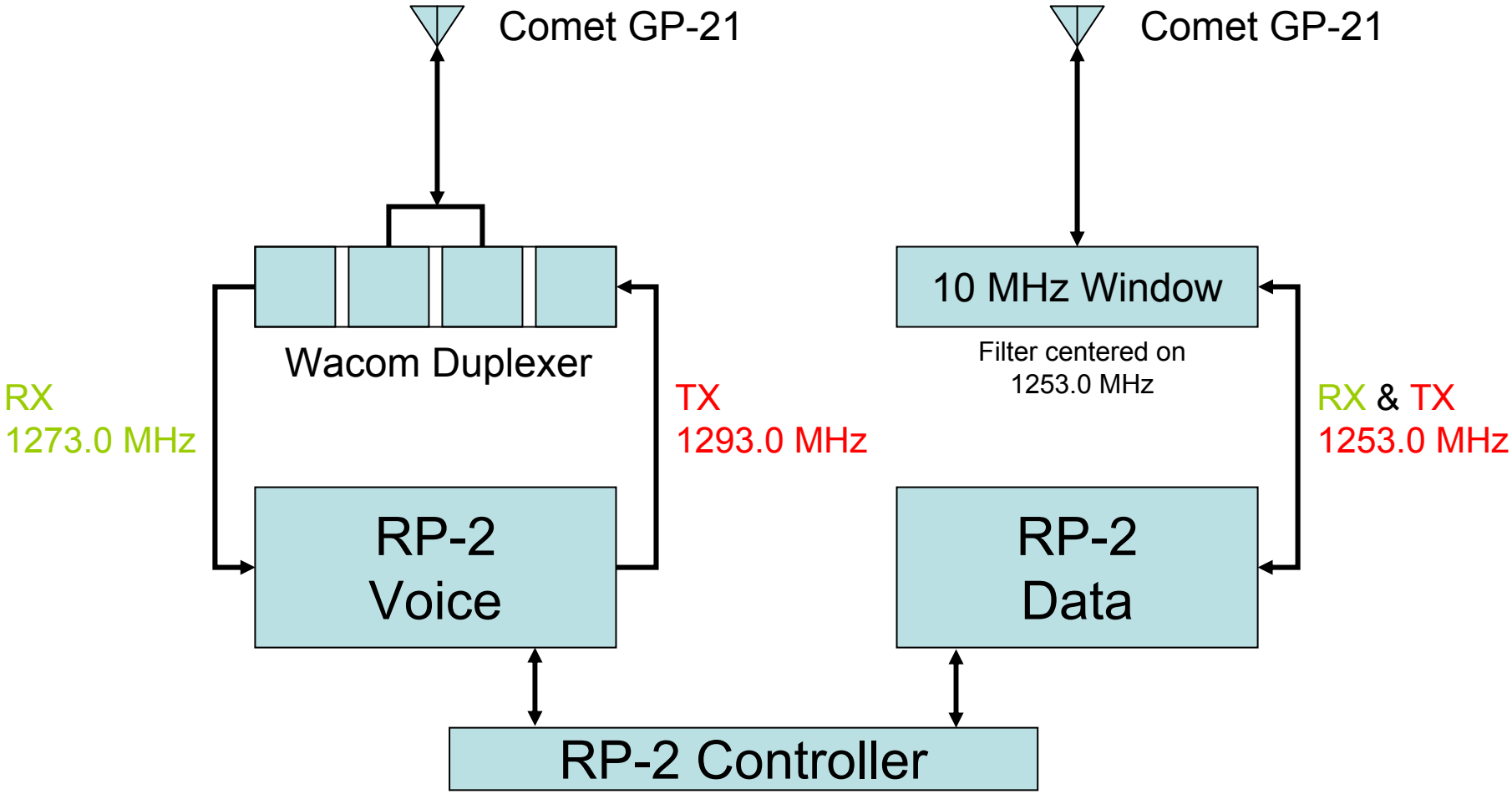
First Quarter 2005

- Installed second generation RP-2 radios
- Installed and configured gateway
- Talked via internet with Icom America HQ in Washington
- Tour of area demonstrating coverage
- Talked via internet with Icom Japan

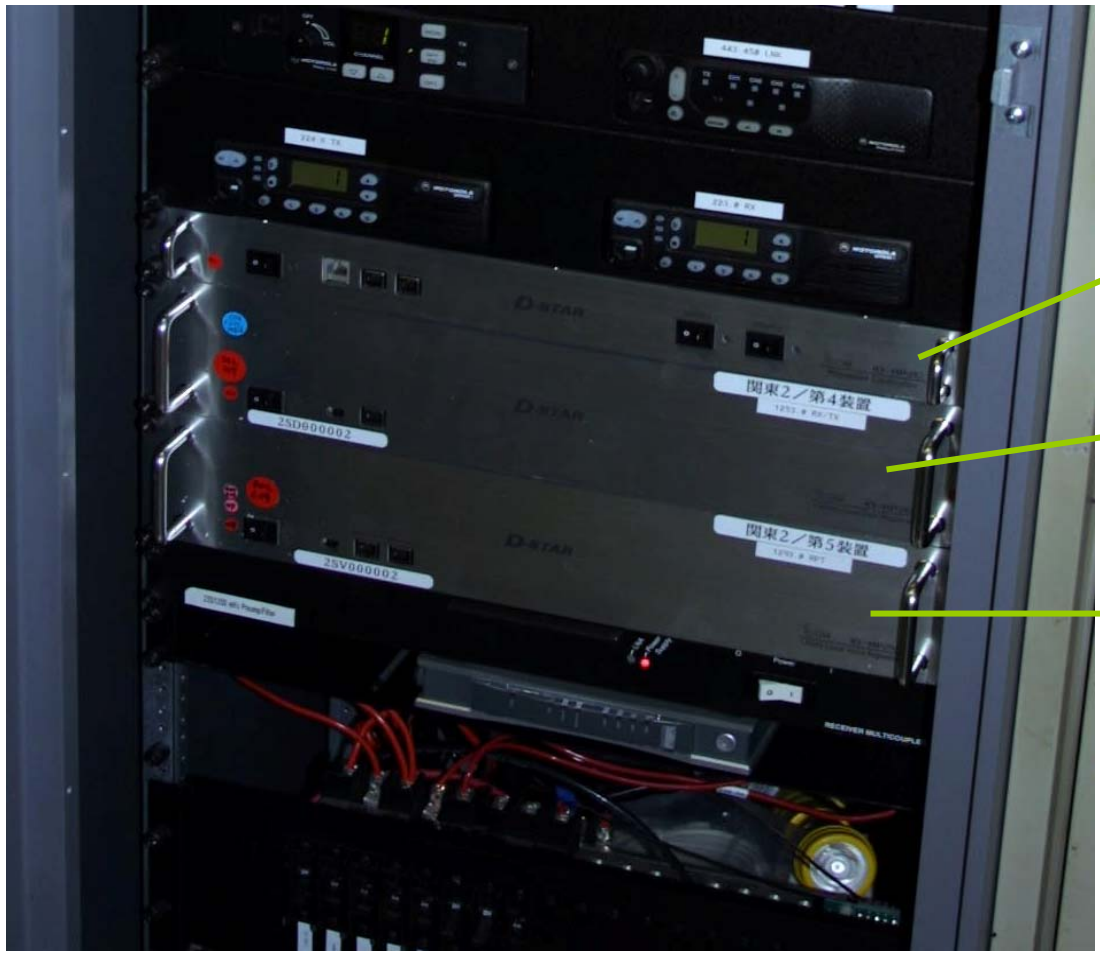
RP-2 Concept


SYSTEM OVERVIEW
AH-108 (1.2GHz Collinear antenna)
ID-RP2L (10GHz Microwave link repeater)
AH-106 or AH-107 (10GHz Parabola antenna)
ID-RP2C (Repeater controller)
Duplexer
Gateway server
ID-RP2V (1.2GHz Digital voice repeater)
ID-RP2D (1.2GHz Digital data repeater)
Internet

K5TIT D-Star Block Diagram



RP - 2



RP-2C Controller

RP-2D
Data Transceiver

RP-2V
Voice Repeater

Current Projects

- Rapid deployment packages
- Application Development
  - D-PRS™
  - Query Kiosk
  - User Activity Display
  - User Accounting
- Assisting other groups with implementations

- FUN!

By the way…

- Original Presentation constructed during Dayton trip *while en route*
  - Most graphics work done in one vehicle, content in the other
  - D-STAR used to transfer PPT between vehicles for updates
  - UHF channel used for coordination

Hardware

- Icom first manufacturer to release product
- Radios Available on 2m, 70cm, and 23cm
- Common Features
  - Analog FM voice mode
  - Digital voice mode
  - Low Speed Data
- Unique Features
  - 2m, 70cm have GPS mode
  - 23 cm has High Speed Data

Icom Radios

- Mobiles
  - 2m — IC-2200 with UT-118
  - 2m/70cm — ID-800
  - 23cm — ID-1
- Handhelds
  - 2m — V82 with UT-118
  - 70cm — U82 with UT-118
- Repeater
  - — RP2C — Controller
  - 23cm — RP2V — Digital Voice Repeater
  - 23cm — RP2D — Data Transceiver

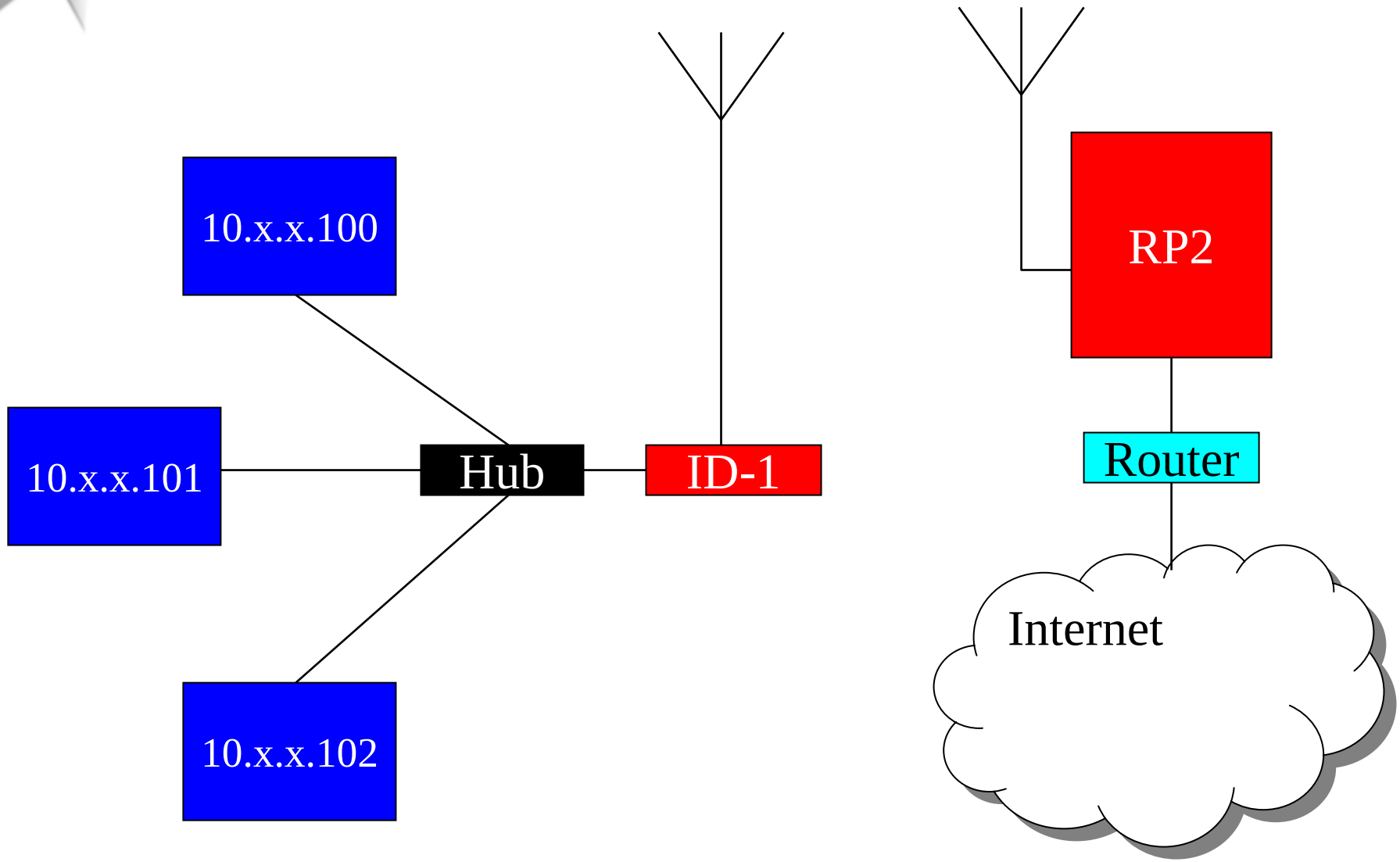
Digital Operation

- Voice
  - Local Repeater Operation
    - Behaves just like familiar FM repeaters
    - Digital, includes call sign in every frame
    - Allows Call Sign Squelch (NOT directed exclusive calls)

Digital Operation

- Data
  - GPS Mode
  - SMS
  - High Speed Data
    - Internet
    - Unit to Unit limitations (point to point, not multipoint)
  - Gateway NOT necessary for Internet data
  - DHCP limitations vs. fixed IP design

Digital Operation



Additional Considerations

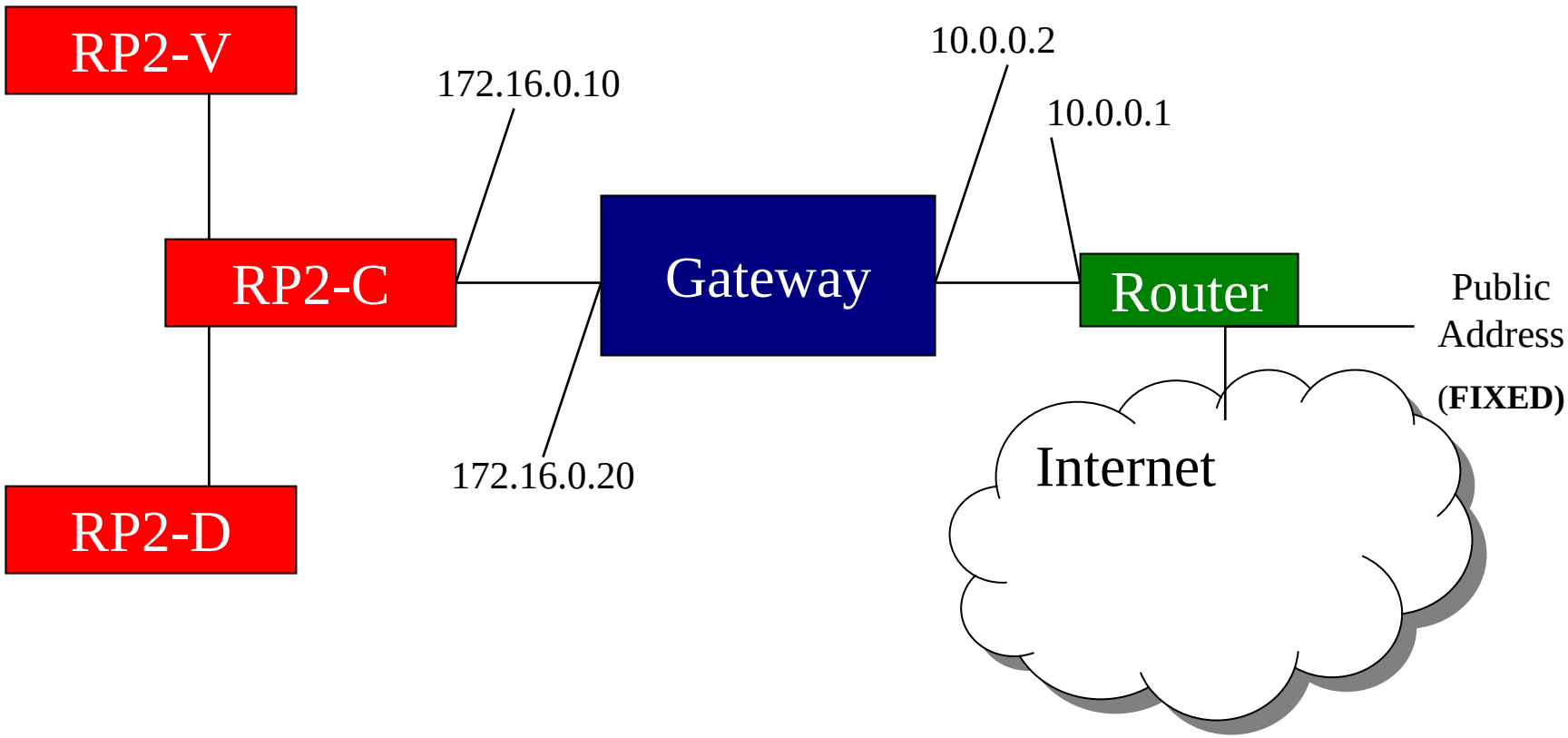
- RP2D necessary for multi user LAN operations
- No back to back mobiles for repeaters – Call signs
- Protocol restrictions

Gateway

DISCLAIMER

Ignore ALL assumptions!!!

Gateway

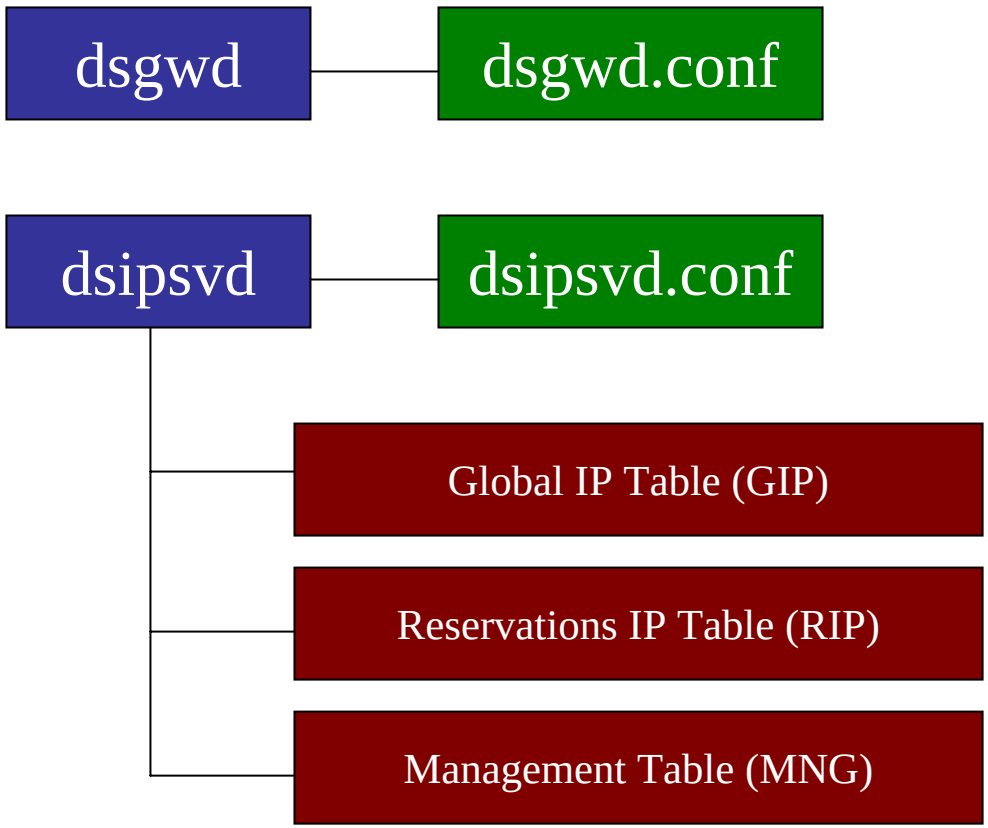

RP2-V
RP2-C
RP2-D
172.16.0.10
172.16.0.20
Gateway
10.0.0.2
10.0.0.1
Router
Public
Address
(FIXED)
Internet

Gateway

- When in place, controls all traffic crossing it – both voice and data
- Performs authorization and routing functions
- Call Sign Routing
- One-to-One linking – no multipoint (will revisit)

- NOT network definition of gateway! Better term might be “GateKeeper” or even “Troll”

Gateway


dsgwd
dsgwd.conf
dsipsvd
dsipsvd.conf
Global IP Table (GIP)
Reservations IP Table (RIP)
Management Table (MNG)

Gateway

- Global IP Table

IP Address	Timestamp	Valid	Deleted
216.130.244.123	1125424366	1	1
209.189.233.188	1125418421	1	1
65.102.167.145	1125418421	1	1
217.37.123.125	1123800437	1	1

Gateway

- Reservations IP Table

Address Block	Gateway	Timestamp	Delete
10.140.194.32	209.189.233.188	1106090837	0
10.103.135.192	65.102.167.145	1104190648	0
10.187.194.160	217.37.123.125	1115974810	0

Gateway

- Management Table

Gateway	Rpt1	Rpt2	User	DNS ID	User IP	Created	Deleted	Updated
217.37.123.125	GB7DS	GB7DS A	G4ICM	g4icm	10.187.194.160	1115975102	0	1115975102
217.37.123.125	GB7DS	GB7DS A	G4TKR	g4tkr	10.187.194.161	1115975150	0	1115975150
209.189.233.188	K5TIT	K5TIT A	K5LRM	k5lrm	10.140.194.41	1121000629	0	1121000629
209.189.233.188	K5TIT	K5TIT A	K5TCP	k5tcp	10.140.194.40	1120952160	0	1120952160
65.102.167.145	N7IH	N7IH A	K7DN	k7dn	10.103.135.202	1121885097	0	1121885097
209.189.233.188	K5TIT	K5TIT A	K7SY	n7ih	10.103.135.192	1116693449	0	1104191165
65.102.167.145	N7IH	N7IH A	KB7UUX	kb7uux	10.103.135.199	1117727735	0	1117727735
209.189.233.188	K5TIT	K5TIT A	KE5FDH	ke5fdh	10.140.194.37	1119119562	0	1119119562
65.102.167.145	N7IH	N7IH A	KE7CFW	ke7cfw	10.103.135.203	1121885162	0	1121885162
65.102.167.145	N7IH	N7IH A	KE7DIQ	ke7diq	10.103.135.200	1121884903	0	1121884903
65.102.167.145	N7IH	N7IH A	KE7DIQ B	ke7diqb	10.103.135.201	1121885003	0	1121885003
209.189.233.188	K5TIT	K5TIT A	N5AC	n5ac	10.140.194.38	1124196819	0	1120951725
209.189.233.188	K5TIT	K5TIT A	N5AC B	n5acb	10.140.194.39	1120952147	0	1120952147
209.189.233.188	K5TIT	K5TIT A	N5MIJ	n5mij	10.140.194.35	1107452762	0	1107452762
209.189.233.188	K5TIT	K5TIT A	N5MIJ A	n5mija	10.140.194.32	1106094178	0	1106094178
209.189.233.188	K5TIT	K5TIT A	N5MIJ B	n5mijb	10.140.194.36	1123963532	0	1107452782
209.189.233.188	K5TIT	K5TIT A	N5ZPR	n5zpr	10.140.194.33	1116880334	0	1115662922
209.189.233.188	K5TIT	K5TIT A	N5ZPR B	n5zprb	10.140.194.34	1107452483	0	1107452483
65.102.167.145	N7IH	N7IH A	N7IA	n7ia	10.103.135.204	1121885386	0	1121885386
65.102.167.145	N7IH	N7IH A	N7IH	n7ih2	10.103.135.205	1121885435	0	1121885435
65.102.167.145	N7IH	N7IH A	N7IH B	n7ihb	10.103.135.206	1122501226	0	1122501226
65.102.167.145	N7IH	N7IH S	N7IH S	n7ihs	10.103.135.194	1107215959	0	1107215959
65.102.167.145	N7IH	N7IH A	W7JRL	w7jrl	10.103.135.196	1111688612	0	1111688612

Gateway

- **Commands**

- **Parameters**
- <<TABLE> select GIP or RIP or MNG table
- <GWIP> GW & IP Server's IP address
- <CS> Callsign (8 bytes)
- <FILEPATH> absolute file path
- <HOSTNAME> valid regex is '[a-zA-Z-]+'

Gateway

- **Commands**

- sync operations
- sync_self <TABLE> <GW_IP> two way syncronization of self managed records
- sync_all <TABLE> <GW_IP> two way syncronization of all records

- file operations
- write <TABLE> <FILEPATH>
- read <TABLE> <FILEPATH>

Gateway

- **Commands**

- **RIP table operations**
- reserve allocation to the world

- - **MNG table operations**
- add <TARGET_CS>|<AREA_CS>|<ZONE_CS>|<GW_IP>|<TARGET_IP>|<HOSTNAME>
- del <TARGET_CS>

- - **GIP table operations**
- connect <GWIP>
- deny <GWIP>
- allow <GWIP>
- disconnect<GWIP>

Gateway

- **Command Example**

- add <TARGET_CS>|<AREA_CS>|<ZONE_CS>|<GW_IP>|<TARGET_IP>|<HOSTNAME>

- echo “N5ZPR |K5TIT A|K5TIT |209.189.233.188|10.140.194.34|n5zpr” > dsipsvd-cmdin

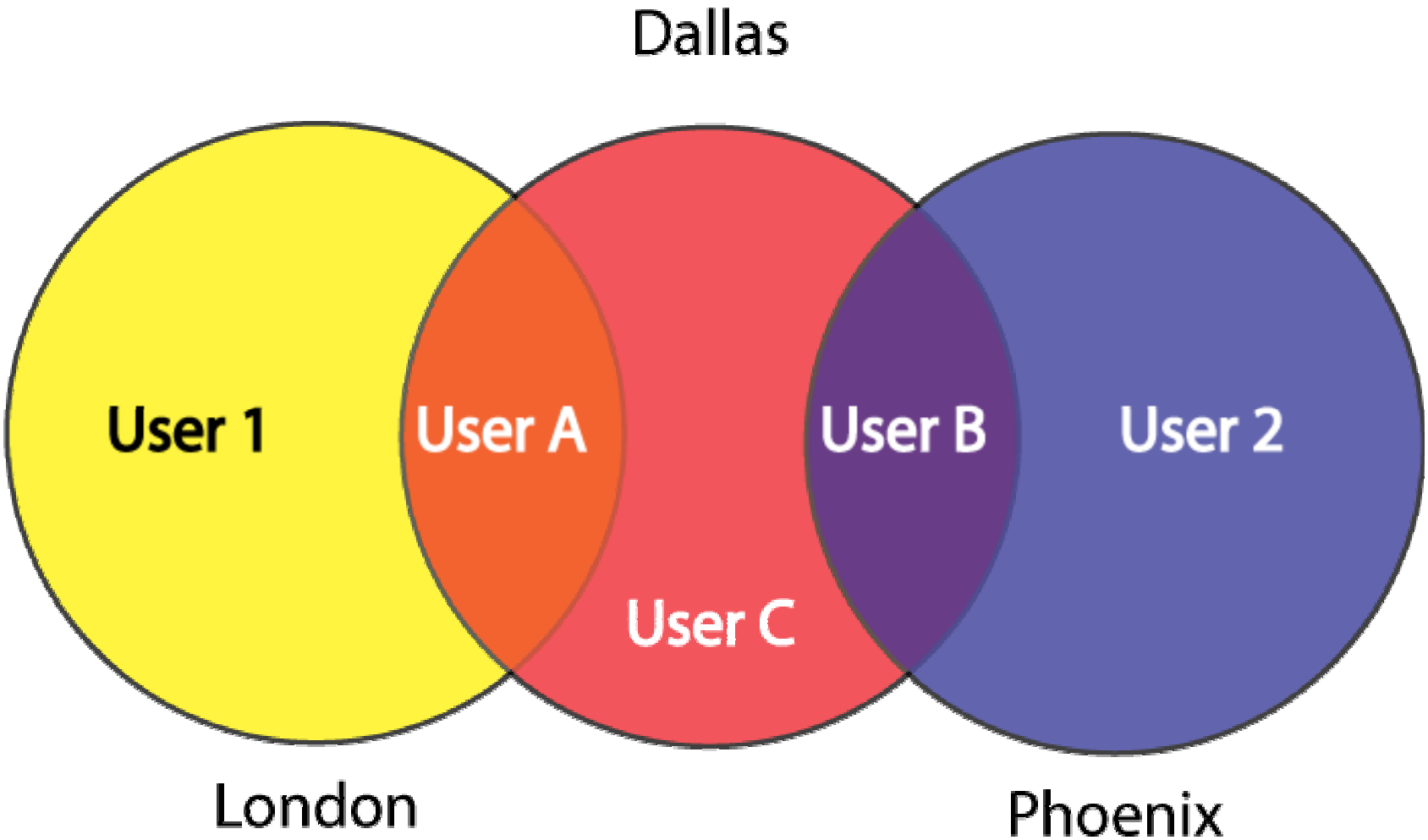
- **Constraints**
  - Calls **MUST** be exactly 8 characters long. Blank pad if necessary.
  - Call sign modifiers in position #8.
  - Syntax is critical.
  - Ensure that the output is checked.
  - DNS Name must be unique, not validated.

Gateway

- **Interesting Concepts**

- NOT site-to-site linking, although heard as such
  - User-to-User linking, but not private
  - Creates interesting situations
    - You can hear someone to whom you can't talk
      - Auto RxReg parameter
    - Your transmission may not be directed where you think

Gateway



Gateway

- Controller to Gateway communications
  - Everything that crosses Gateway
  - Initiation and Termination of local communications
- Interface Capture point
  - Allows LOTS of potential for applications

Applications

- D-PRS™
  - Pete Loveall, AE5PL
  - javAPRSSrvr module
  - Interface from D-Star to APRS-IS
  - Bi-Directional
  - APRS client on other side of user radio sees TNC data stream
  - Requires dedicated receiver with serial port
    - Repeater has no serial port

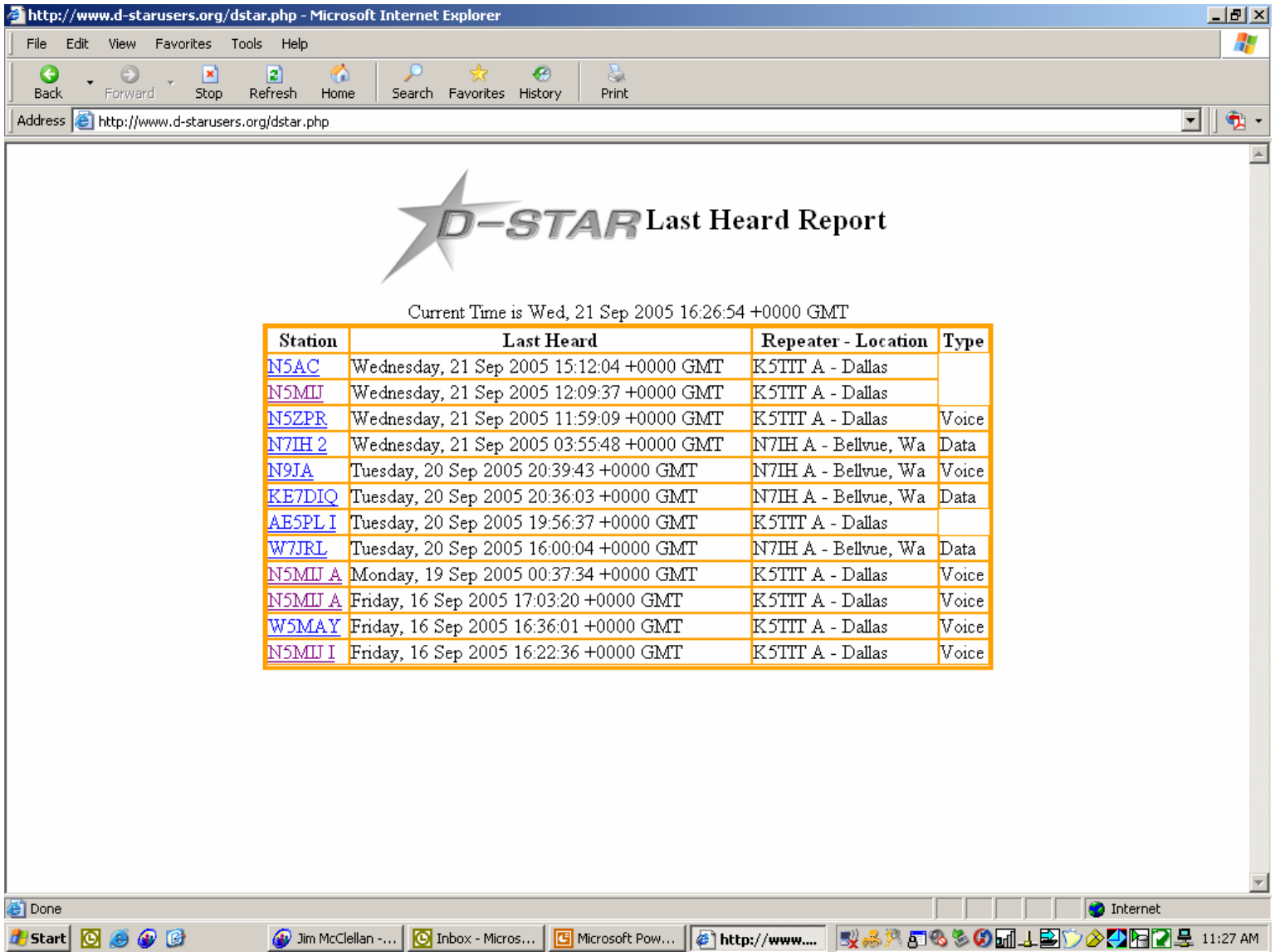
Applications

- User Accounting and Reporting
- New Challenges for Misuse and/or Abuse
- Potential point for user allocation
- DStarMonitor

Applications

- User Activity
  - “Who’s Where”, and “When”
  - Real-Time Reporting from participating Gateways

Applications



Station	Last Heard	Repeater - Location	Type
N5AC	Wednesday, 21 Sep 2005 15:12:04 +0000 GMT	K5TIT A - Dallas	
N5MIJ	Wednesday, 21 Sep 2005 12:09:37 +0000 GMT	K5TIT A - Dallas	
N5ZPR	Wednesday, 21 Sep 2005 11:59:09 +0000 GMT	K5TIT A - Dallas	Voice
N7IH 2	Wednesday, 21 Sep 2005 03:55:48 +0000 GMT	N7IH A - Bellvue, Wa	Data
N9JA	Tuesday, 20 Sep 2005 20:39:43 +0000 GMT	N7IH A - Bellvue, Wa	Voice
KE7DIQ	Tuesday, 20 Sep 2005 20:36:03 +0000 GMT	N7IH A - Bellvue, Wa	Data
AE5PL I	Tuesday, 20 Sep 2005 19:56:37 +0000 GMT	K5TIT A - Dallas	
W7JRL	Tuesday, 20 Sep 2005 16:00:04 +0000 GMT	N7IH A - Bellvue, Wa	Data
N5MIJ A	Monday, 19 Sep 2005 00:37:34 +0000 GMT	K5TIT A - Dallas	Voice
N5MIJ A	Friday, 16 Sep 2005 17:03:20 +0000 GMT	K5TIT A - Dallas	Voice
W5MAY	Friday, 16 Sep 2005 16:36:01 +0000 GMT	K5TIT A - Dallas	Voice
N5MIJ I	Friday, 16 Sep 2005 16:22:36 +0000 GMT	K5TIT A - Dallas	Voice

Applications

- User Activity
  - Enhancement – “Click to Call”
  - Programs User radio to call selected user
  - Control Codes published for ID-1 already

Applications

- Query Kiosk
  - Nationally Coordinated Simplex Channel
  - Simple “?D*xxxxxx?” format
  - Executes command “xxxxxx” on server, or sends file “xxxxxx.txt” to originating device.
  - Opportunities like
    - Repeaters – list of local repeater information
    - Meeting – information on next club meeting
    - Notices – important information to be published

Applications

- Representative examples only – we've just begun
- Limited only by our imaginations
- Applications, NOT technology, will attract users
  - Packet
    - Bulletin Boards, etc
    - APRS
    - DX Clusters

Opportunities and Challenges

- Information availability
  - Misinformed Opinions
  - Erroneous assumptions
  - Limited Experience

- Equipment Acquisition
  - Club/Individual Purchases
  - Potential Club subsidies
  - Infrastructure Grants
  - Current Icom Promotion

Icom Promotion

- Purchase ID-1's as a club/group before 30 Nov 05
- Get 1 Point per ID-1 in group purchase
- Redeem points for infrastructure equipment

• ID-RP2C	Repeater Controller	2 Points
• ID-RP2D	Data Repeater	3 Points
• ID-RP2V	Digital Voice Repeater	5 Points
• ID-RP2L	10 GHz Backbone	7 Points
• ID-RP2D/V	Complete Repeater Package	9 Points
• ID-RP2D/V + Link		16 Points

- Restrictions apply – see web site for details
  HTTP://WWW.IcomAmerica.Com/Support/Forums

Resources

- Icom Discussion Forum
  - HTTP://WWW.IcomAmerica.Com/Support/Forums/
- Texas Interconnect Team Forum
  - HTTP://WWW.K5TIT.Org/Forum/
- User Sites (Individuals)
  - HTTP://WWW.D-Star.US
  - HTTP://WWW.D-StarUsers.Org

Summary

Amateur radio has a long, proud history of innovation and paradigm shifts.

- SSB
- FM
- Packet

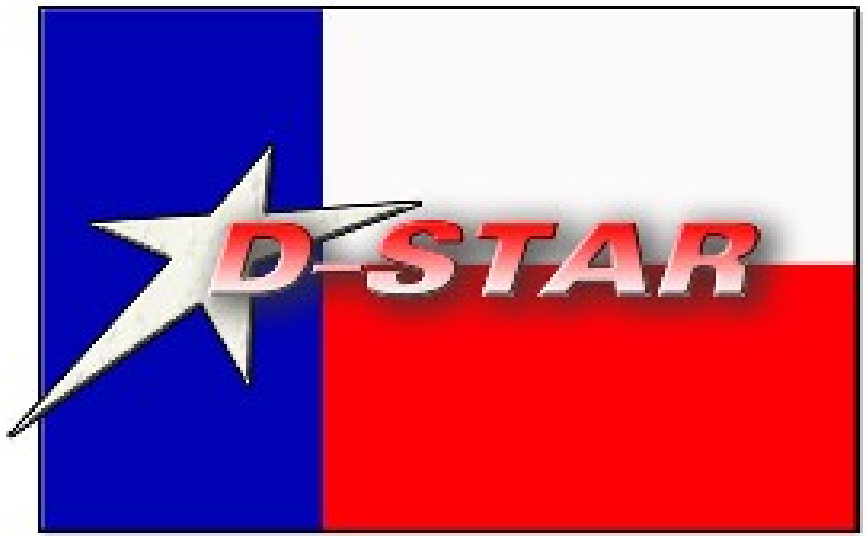
Each major milestone helps us to:

Move More Information
More Efficiently
More Reliably
More Rapidly

D-Star is the next milestone and a huge opportunity.

Presentation Available

- WWW.K5TIT.Org/Public/D-Star/TAPRDCC.ppt



K5TIT
Dallas, Tx