

# BROADBAND HAM NETWORK

SLSRC Meeting

Friday, September 27, 2013

Bill Wallace – W0WHW

# BROADBAND HAM NETWORK

Tonight, I want to cover;

- A little bit of history - how we got to this point
- Who is using mesh technology
- What does mesh technology look like
- How does mesh technology work
- What can mesh technology do
- Why mesh for amateur radio

# BROADBAND HAM NETWORK

January 2001 ARRL Board of Directors met and decided that:

- the ARRL should develop high-speed radio digital Networks
- The ARRL President appointed a group of individuals to form the working group

# BROADBAND HAM NETWORK

ARRL Technology Task Force 2000

Encourage development of:

- high-speed amateur digital radio network
- high-speed digital Audio/video radio
- Data links up to 20 mega bits per second

# BROADBAND HAM NETWORK

The Broadband Ham Network effort is not a Mode or Frequency!

It is one way the Ham community can develop a Ham network with high data capability at low cost.



# BROADBAND HAM NETWORK

## Who is using MeshNetworks?

- Military
- Utilities
- Law enforcement
- Fire and Rescue

# BROADBAND HAM NETWORK

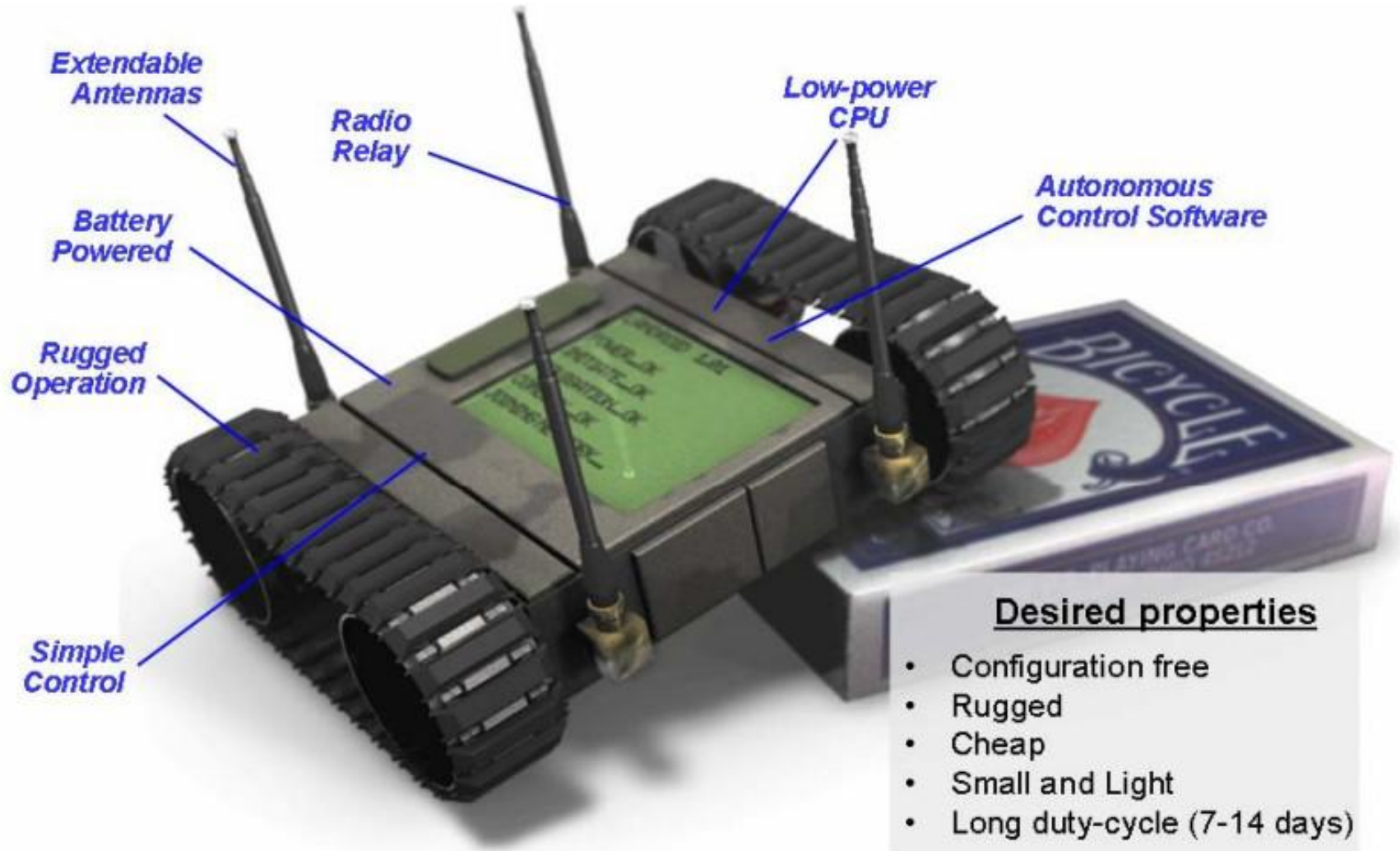


Figure 1 – Notional LANDroid

# BROADBAND HAM NETWORK

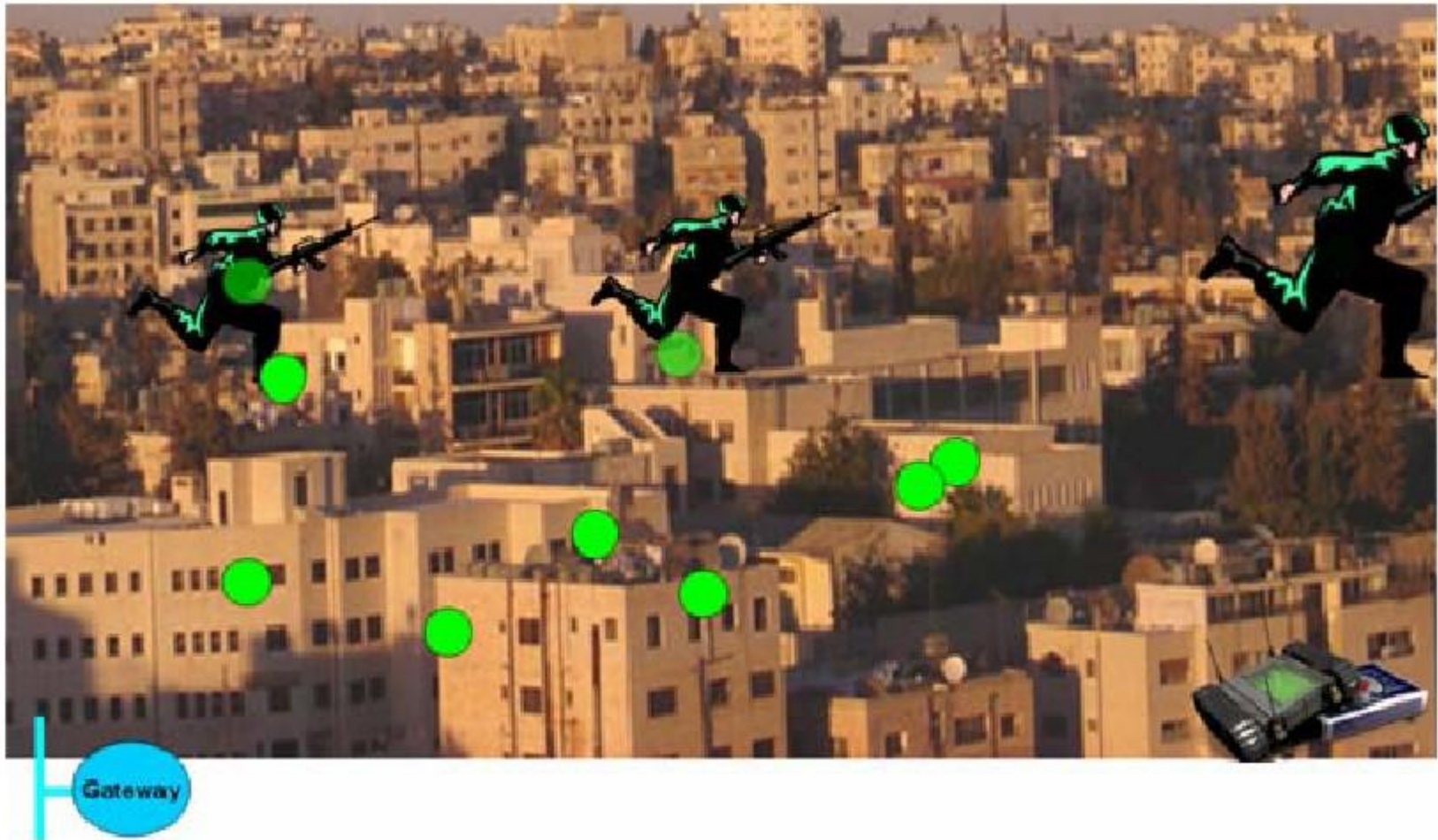


Figure 2 – LANdroids (Green Dots) Will Be Deployed as The Warfighters Deploy



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Figure 3 –Self-Configuring Multi-path, Multi-hop Mesh Network Routes Packets (Yellow Dots)

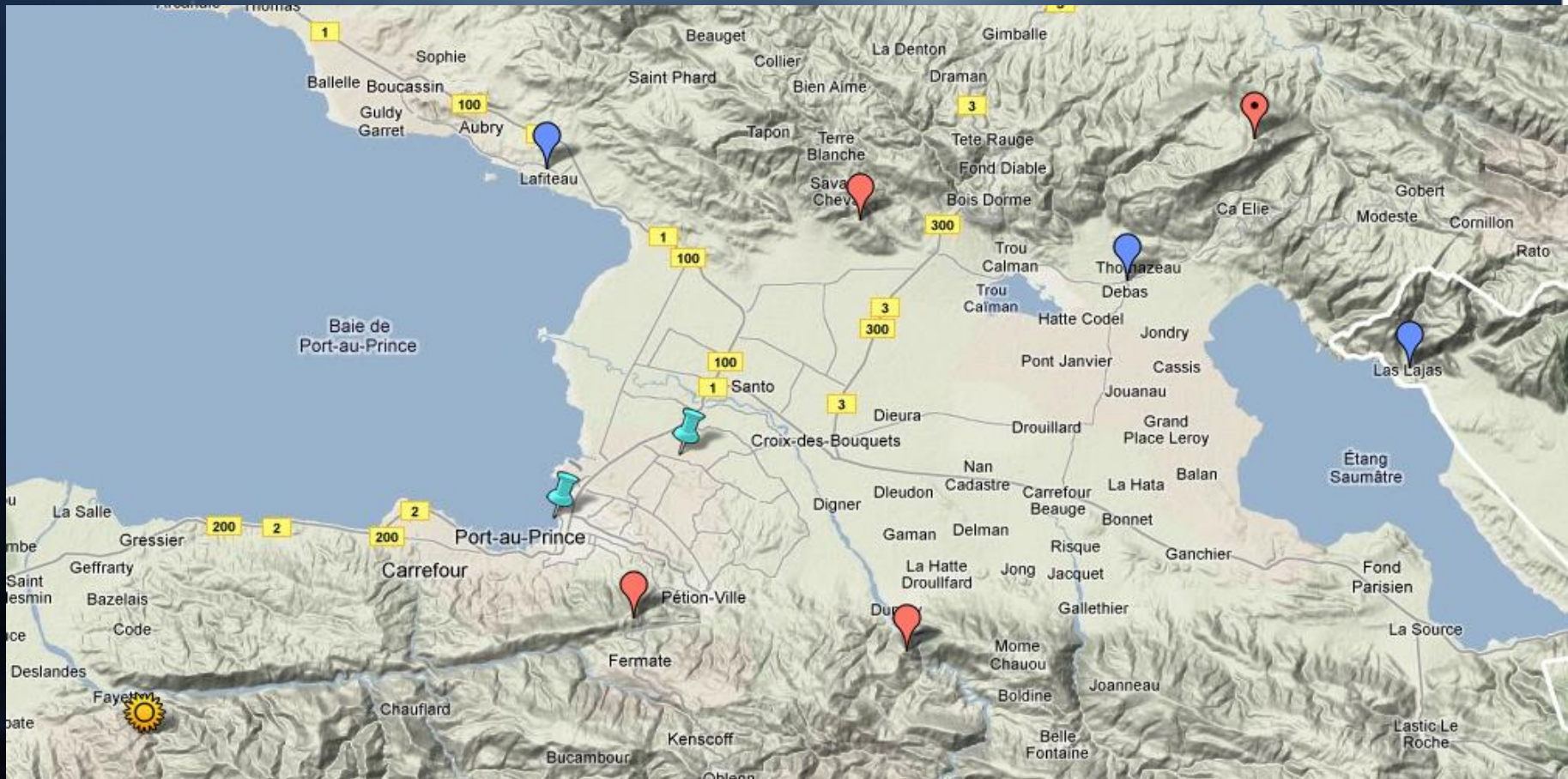
# BROADBAND HAM NETWORK

Invenco works to bring  
communications infrastructure  
To under developed countries.



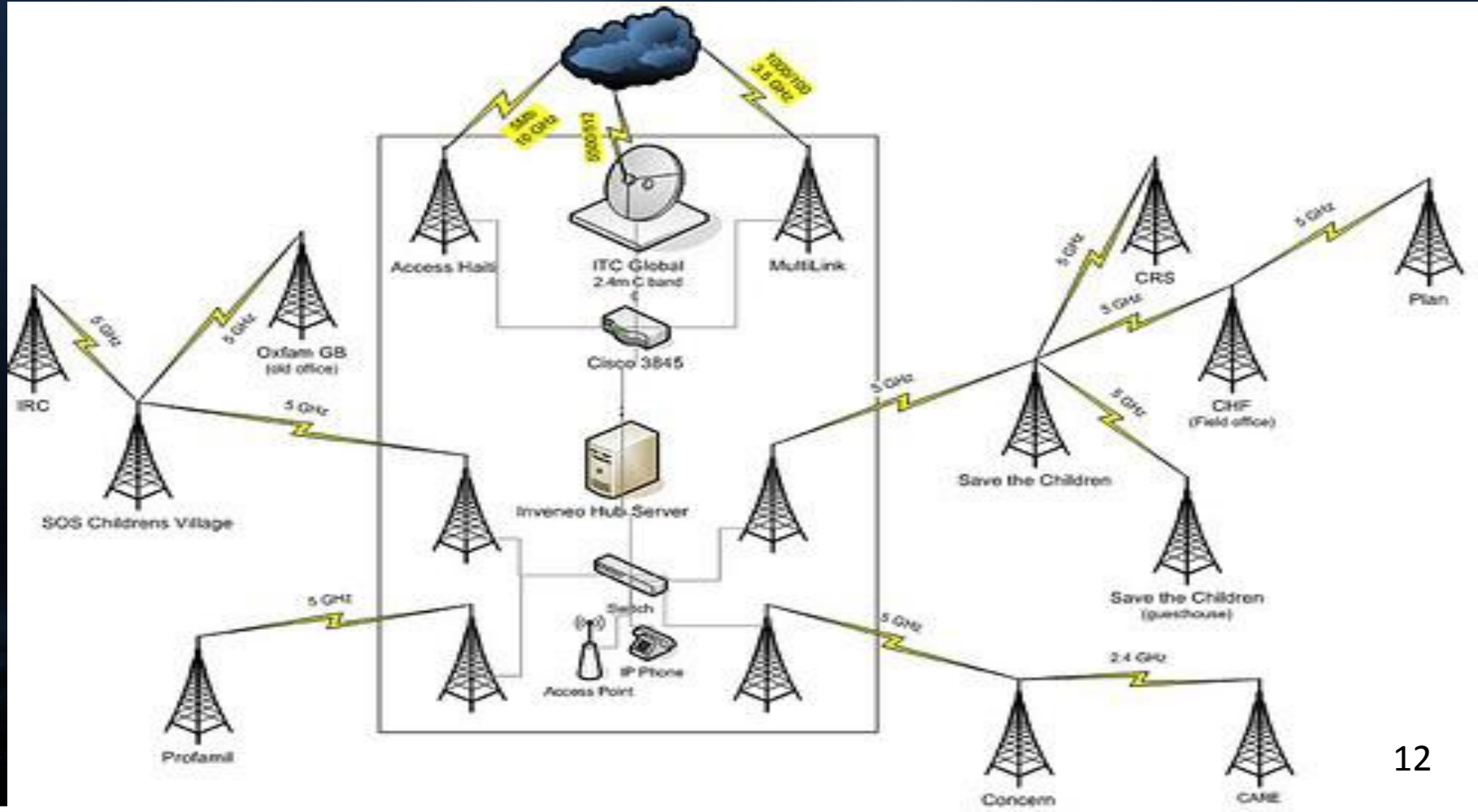


# BROADBAND HAM NETWORK



# BROADBAND HAM NETWORK

Inveneo quickly deployed an emergency network that served





# BROADBAND HAM NETWORK

All emergency communications organizations are making wide use of broadband

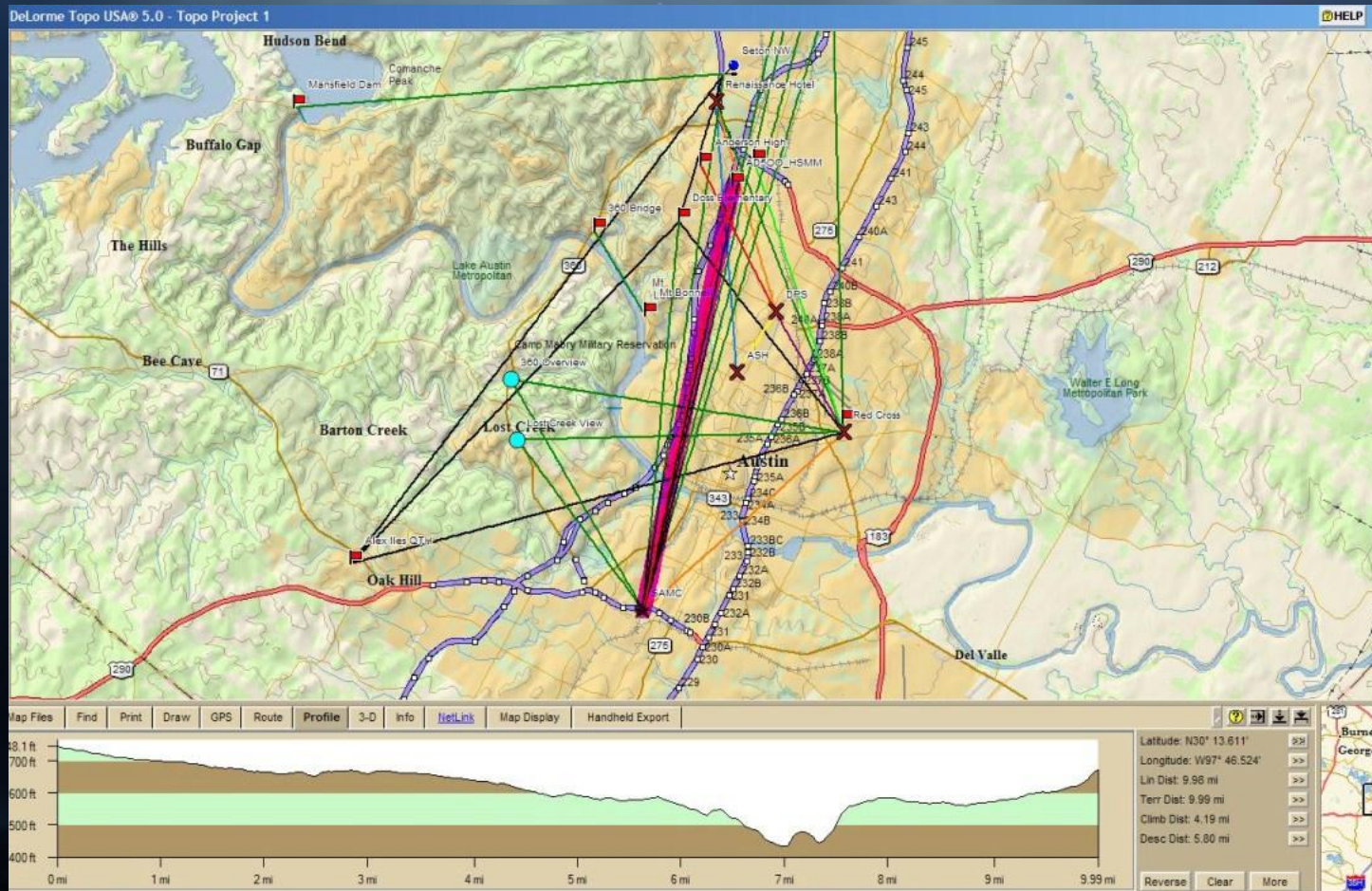
RF communications techniques  
– ***except amateur radio.***

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What does a node look like?



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# BROADBAND HAM NETWORK





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What can you do with the network?

Email Server

Web Server

Stream Video

Send Pictures

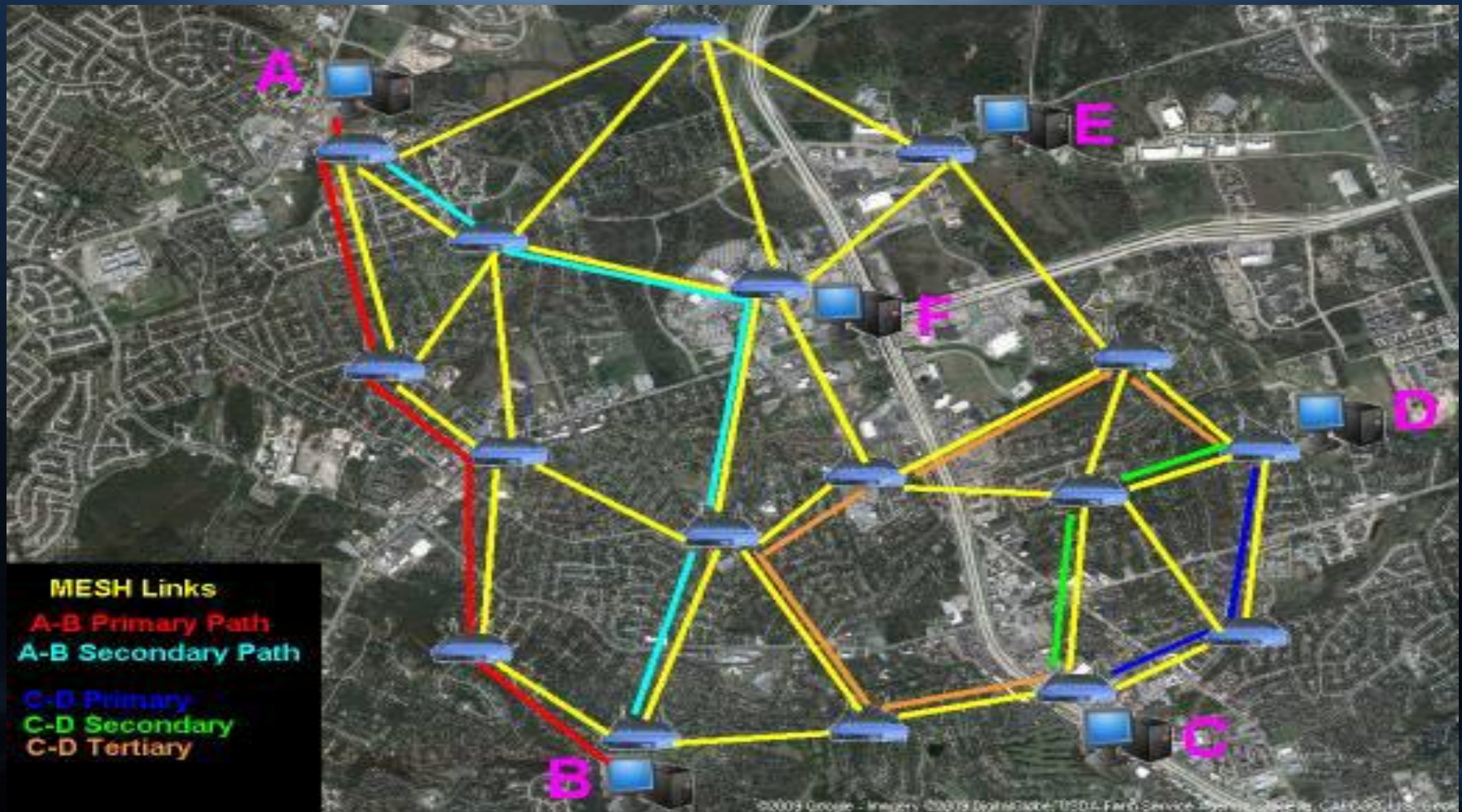
Video Conferencing Server

Telephone Server

Send Documents

Send any kind of files

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- Self Forming
  - Mesh forms automatically
- Fault Tolerance
  - Data automatically rerouted if a node fails
- Self Healing
  - Once fixed, node rejoins the mesh seamlessly

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# BROADBAND HAM NETWORK

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A NEW NAME FOR AN OLD IDEA

ORIGINAL NAME WAS **HIGH SPEED MULTIMEDIA**

Digital Radio – but not keyboard communications

All Modes are supported at very high  
transmission rates and error correction.

Digital Voice

Data



# BROADBAND HAM NETWORK

## Let's talk speed

The BROAD BAND HAM RADIO RF links are  
around **26 Mbps**

### Amateur Service

- Packet Radio/APRS **.0012 Mbps**
- Pactor III **.003 Mbps**
- D-Star DD **.128 Mbps**

# BROADBAND HAM NETWORK

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## Home Services

- FiOS (Fiberoptics)      2 Mbps up / 15 Mbps down
- T1      1.5 Mbps
- DSL up to      1.5 Mbps up / 6 Mbps down •
- Dialup 0.014 –      .056 Mbps

# A PART 15 WIFI NETWORK

<i><b>Permissible under Part 15:</b></i>	Max. Transmitter RF power	Ant. gain (dBi)	EIRP (W)
2.4 GHz omni- directional	30 dBm (1 W)	6	3.98
2.4 GHz directional	29 dBm (800 mW)	9	6.35
	28 dBm (640 mW)	12	10.14
	27 dBm (500 mW)	15	15.81
	26 dBm (400 mW)	18	25.23
	25 dBm (320 mW)	21	40.28
	24 dBm (250 mW)	24	62.79
	23 dBm (200 mW)	27	100.2
	22 dBm (160 mW)	30	160.0

# A PART 97 HAM NETWORK

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*Achievable under  
Part 97*

Max. PEP RF  
power

Ant. gain

EIRP

2.4 GHz (spread  
spectrum i.e. 802.11  
or 802.11b)

10 watts

24 dBi partial  
parabolic

2511.89 watts

2.4 GHz (non  
spread spectrum i.e.  
802.11g)

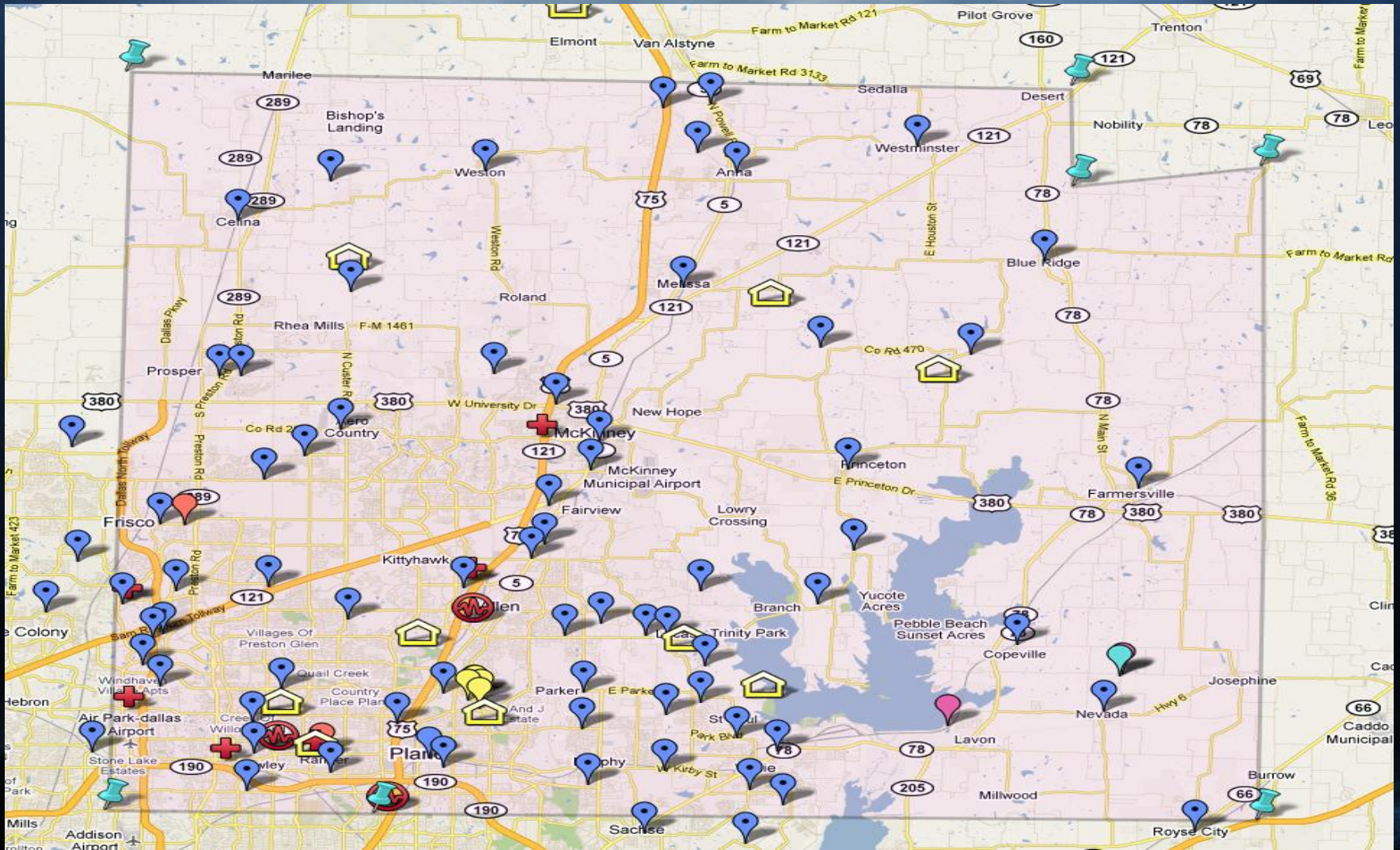
1500 watts

24 dBi partial  
parabolic

**376.8 Kilo-watts**



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## Community Ownership

- Ownership is shared, node by node
- Low Cost Infrastructure
  - Built using low cost off the shelf consumer equipment
- Incremental Cost of Expansion is Low
  - Adding node expands area coverage for the cost of the node
- Ease of Deployment
  - Little or no training needed



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Part 97 use:

- Channels 1, 6, and 11 are non-overlapping
- Channel 1, 6 are in Ham band,  
**We are primary in this band!!!!!!!!!!**
- Need Clear Line of Sight
  - Trees attenuate a lot
  - Hills, buildings block



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WRT54G (v1-4)

- USR5461
- WE800G
- WRT150N
- WRT54G3G
- WRT54GS (v4)

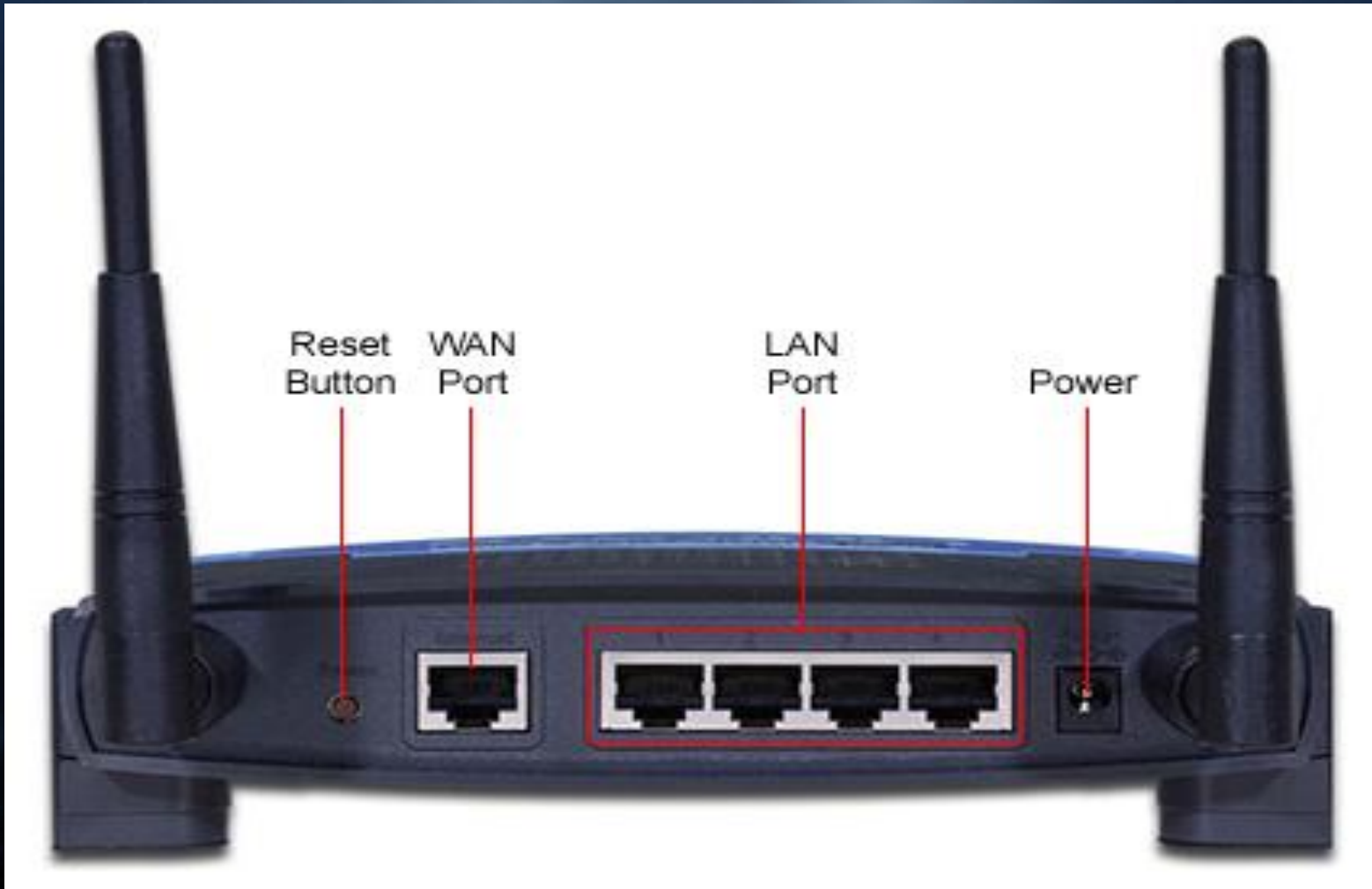
• WRT54GL (all)

- WA840G
- WR850G (v1-3)
- WRT300N (v1)
- WRT54GS (v1-3)
- WRTSL54GS (all)

**Stay with WRT54GL to be safest**

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Range is based on

- Antenna
- Noise
- Assume
- Clear Line of Sight
- Good Day
- 19 db Transmitter
  - Two 12 db - 5 mi
  - Two 15 db - 10 mi
  - **Two 19 db - 24 mi**

**Bigger is Better**



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Titan Wireless AT-15OM-24

- Lowest price **15 db Omni \$60**
- N connector
- Probably base the Collin County HSMM-MESH on this
  - High Gain
  - Low Cost
  - Fast Delivery



# BROADBAND HAM NETWORK

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## TTitan Wireless AT-8OM-24

- 8 db **omni \$29**
- About 1 foot tall
- Good for special events and short distances
- About 1 foot tall
- 



# BROADBAND HAM NETWORK

## HyperLink Die Cast Reflector Grid

### – Models

- 30 db 5.3° beam \$479.99
- 24 db 8° beam \$69.99
- 19 db 12° beam \$59.99
- 15 db 16° beam \$49.99
- 24 db is recommended

m





# BROADBAND HAM NETWORK



# BROADBAND HAM NETWORK

While I have you all here, I want to throw out an idea that I would like to promote in the St. Louis Metro area.

**I would like to suggest that we should have one evening a month in which anyone and everyone would get together for a digital workshop.**

# BROADBAND HAM NETWORK

**We could probably get a Red Cross Headquarters classroom, library room, or somewhere and all of us that are interested in Digital Amateur Radio could learn new ideas and help each other with better understanding and practicing the many digital modes and/or software.**

**WOULD ANYONE HERE BE INTERESTED AND WILLING TO HELP ME PUT IT ON?**



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QUESTIONS?

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THANK  
YOU