

HamWAN: Modern IP Networking on Ham Bands

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What is it?

- Modern microwave network for amateur radio
- Connects computers together
- Currently deployed in Seattle area (PSDR)
- Cellular design *not* mobile ad-hoc like Broadband-Hamnet™

How can I use it?



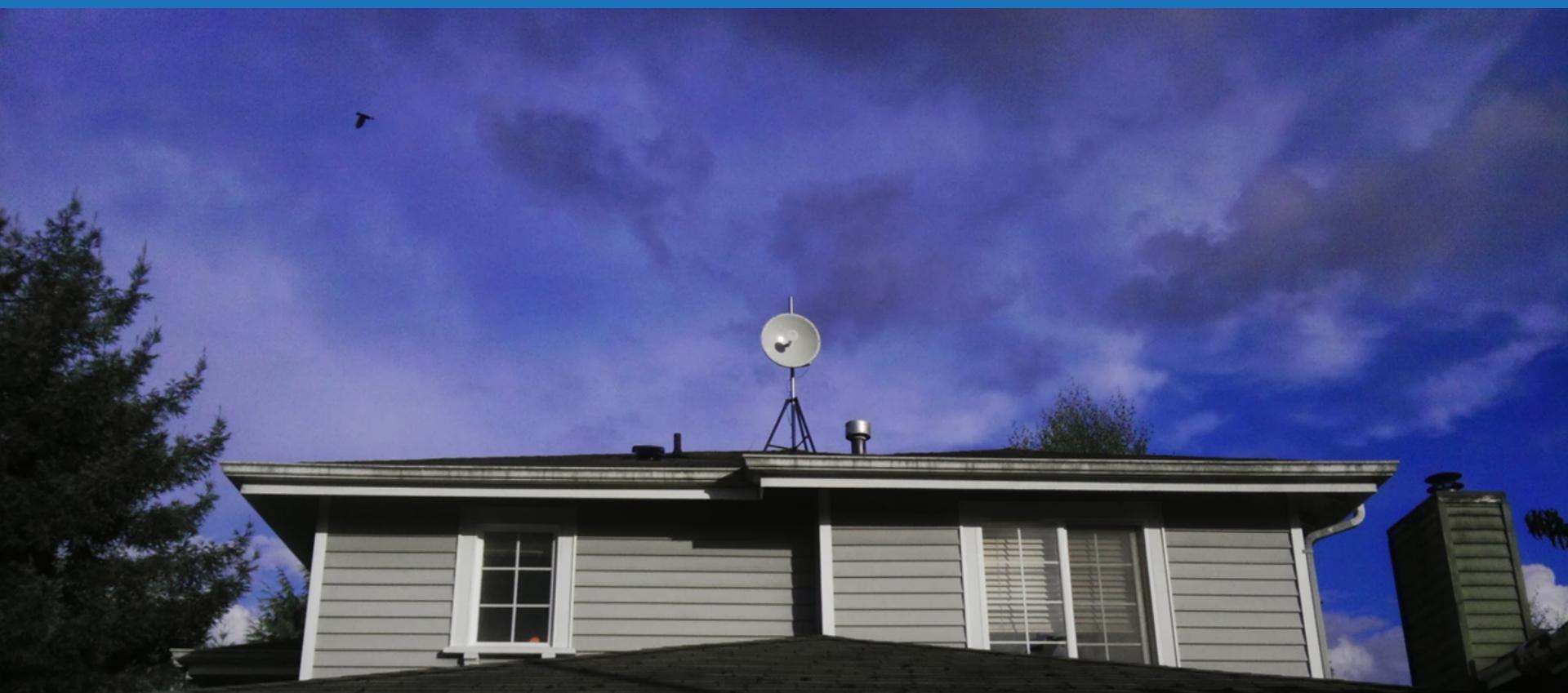
- Support existing ham infrastructure
- Natural evolution of traditional packet
- New ham applications for existing systems
- Learning new technology
- Contribute to the state of the art high-speed wireless

How do I connect?

- ~\$167 for radio and antenna
- Connects to your existing home network
- Configuration tool makes setup simple
- Offers routing to APRNet



How do I connect?

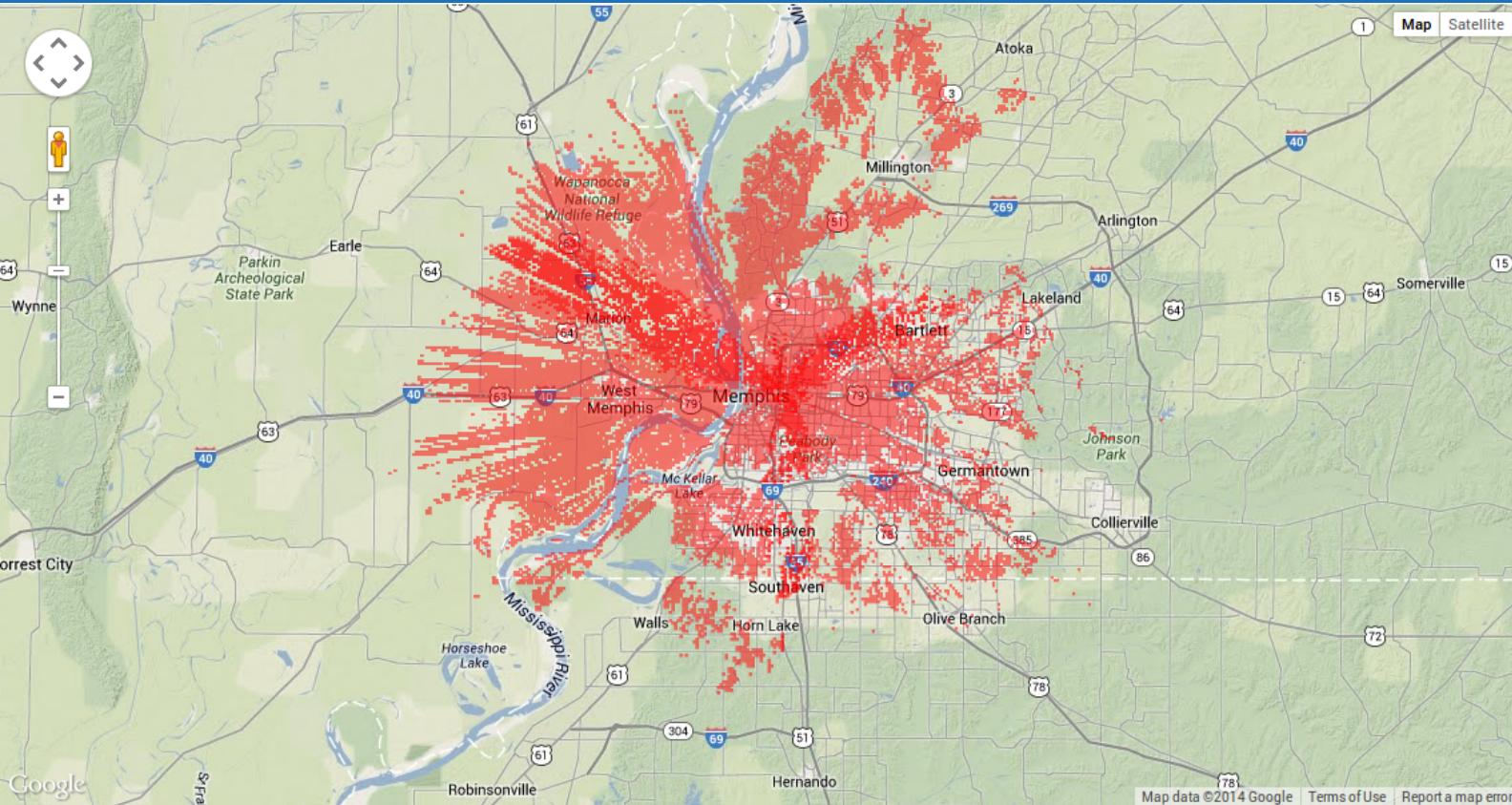


What stage is Memphis in?



- Planning first deployment
- Securing early sites and partners
- Need help from interested persons and organizations
- Network should arrive early summer

First potential site/partner



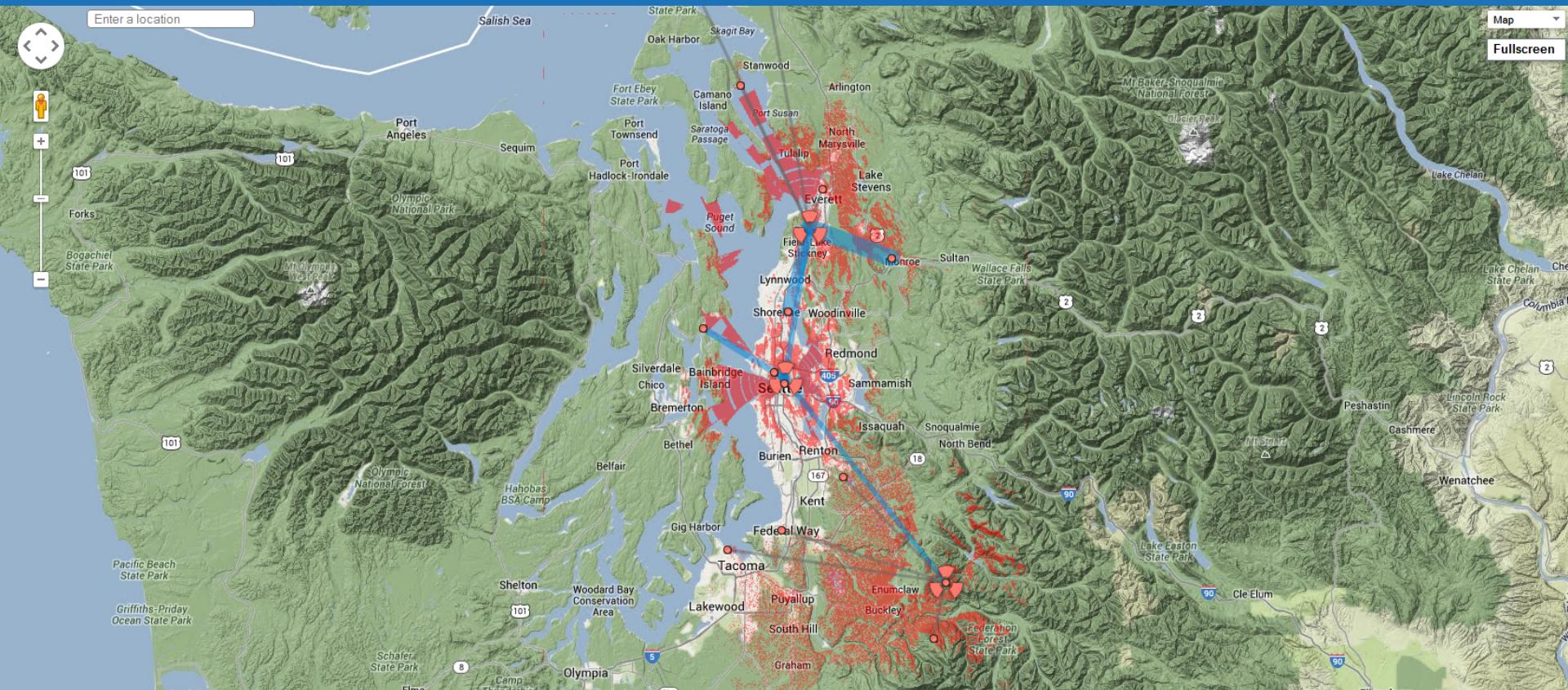
Generated on 5 February 2014 using Radio Mobile with appropriate radio, site, and antenna settings.

Assumes that node is using radio and antenna we recommend at a height of 10 m (32 ft) AGL.

Does not account for all obstructions (most notably trees and small buildings).

What about HamWAN?

HamWAN
MEMPHIS METRO



What about HamWAN?

HamWAN
MEMPHIS METRO



HamWAN is OS



- Fully documented, free to use
- Custom software is all on GitHub



Questions?



- Technical details come next
- Check www.hamwan.org for more information about the project overall!

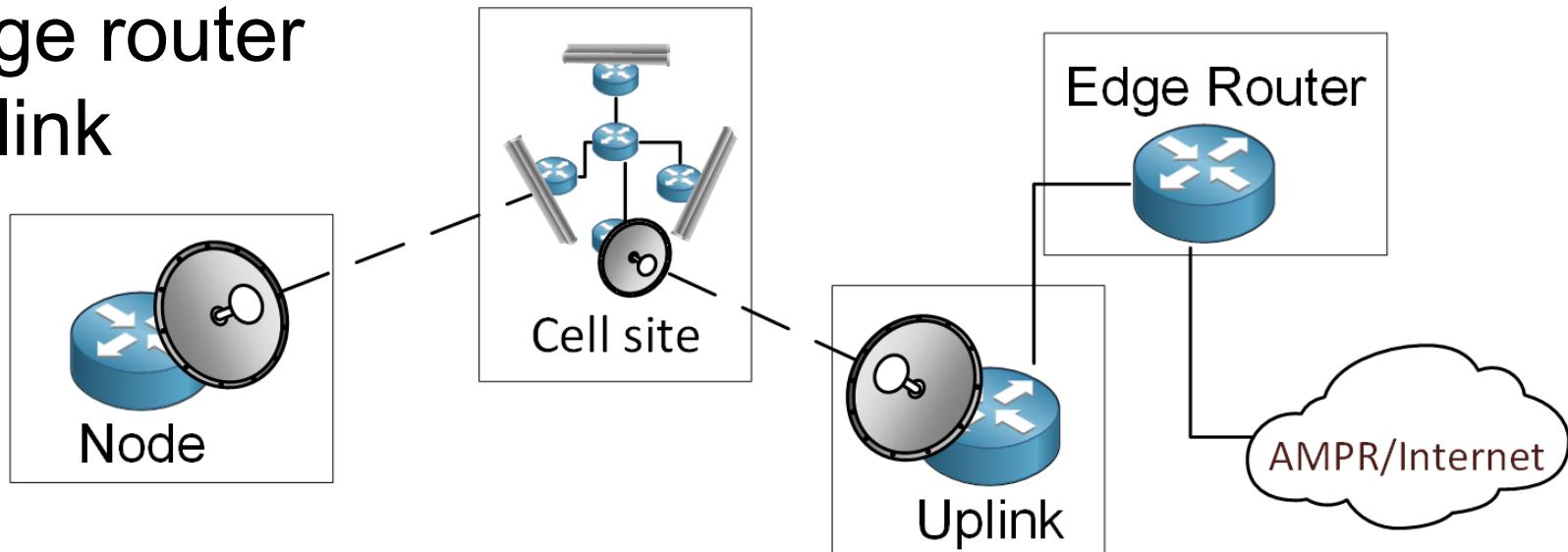
The good stuff: tech details



- Infrastructure
- Radio engineering
- Network engineering
- Follow a packet along the network
- What sort of speeds
- Why not mesh?

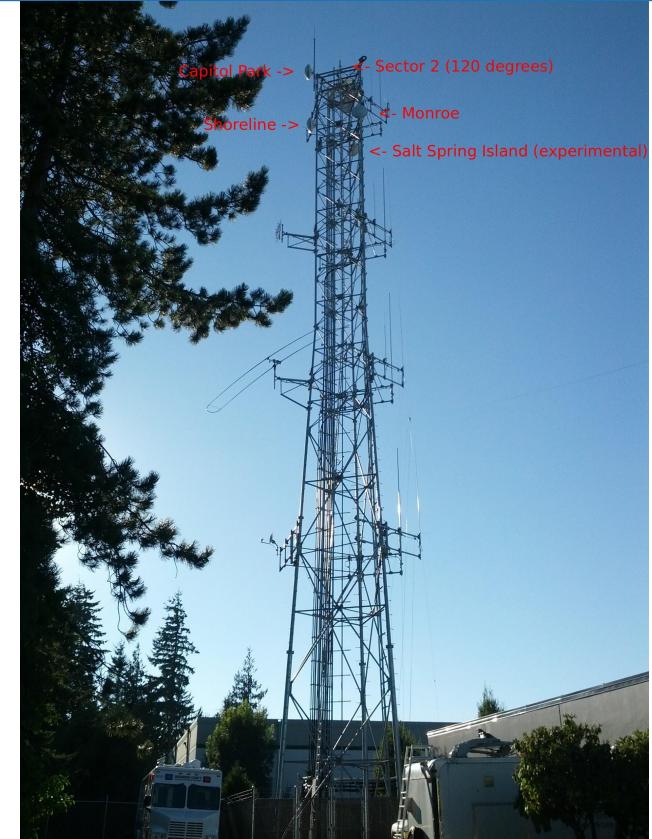
Infrastructure

- Node
- Cell site (PoPs)
- Edge router
- Uplink



Infrastructure: Cell Site

- Central node; other nodes connect to it
- Typically has a switched PDU, router, numerous modem/radios, and a server for anycast services



Infrastructure: Uplink



- Similar to node but with different configuration
- Connects node to edge router for AMPRnet access

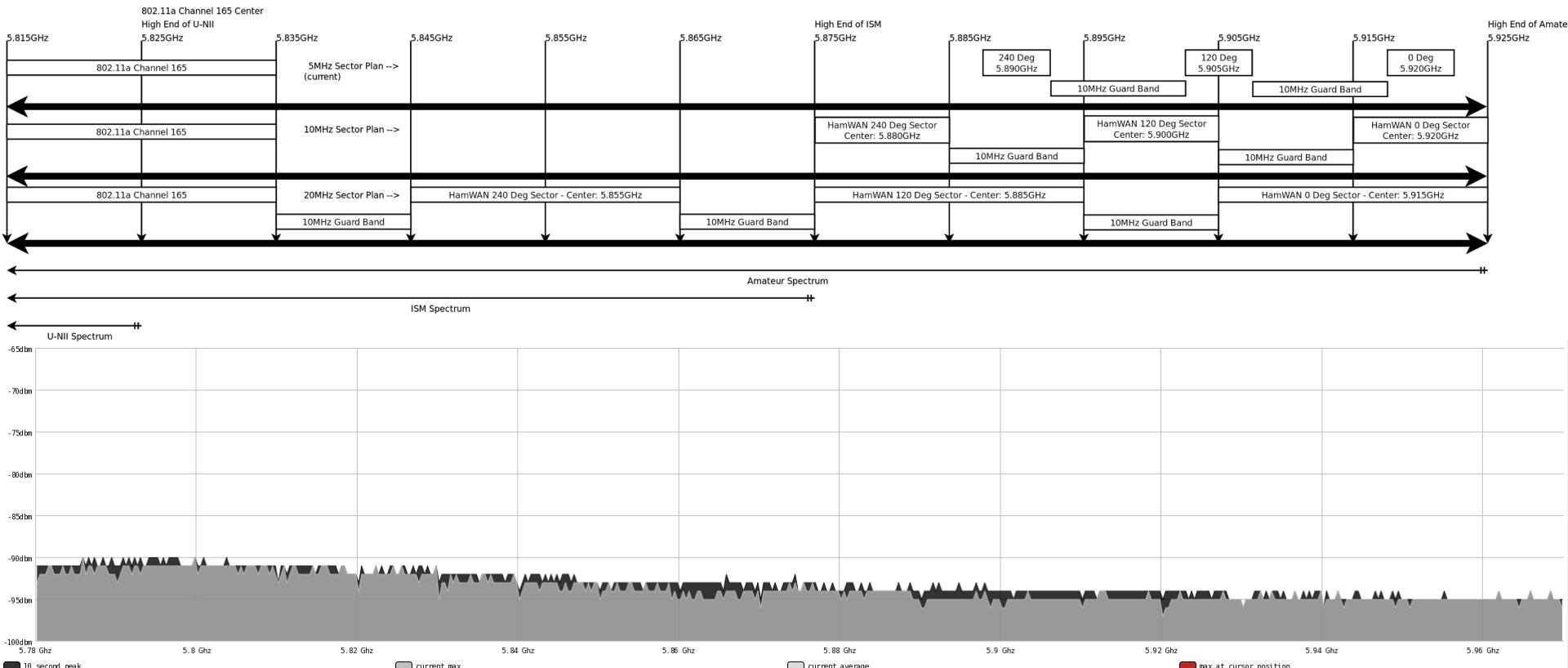
Infrastructure: Edge Router



- Routes to AMPR and internet
- Offered by industry partners who have capabilities to announce network
- Important for connecting with other ham networks



Radio Engineering



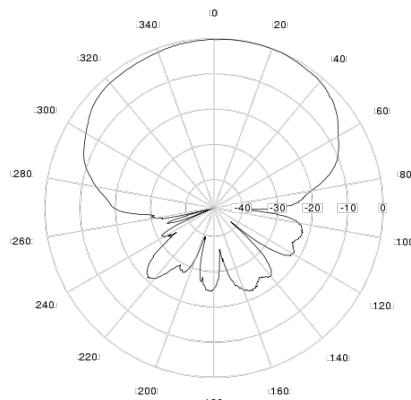
Radio: Sites

- 3 sectors (PtMP)
 - Serve the client nodes
 - Mikrotik Metal radios feeding at 1.3 watts
- Uplinks and site links (PtP)
 - Link sites together
 - Variety of radios, mix of single and dual polarity

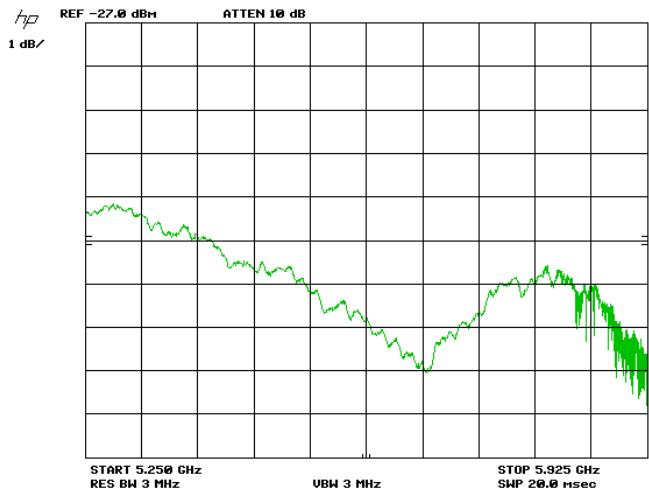
Radio: Sector Antenna



16 dBi, 97.8°, HPOL
Verified performance

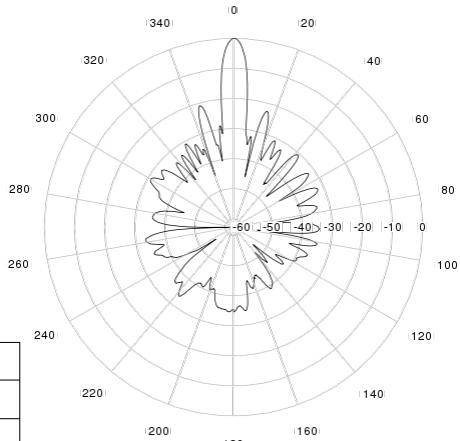
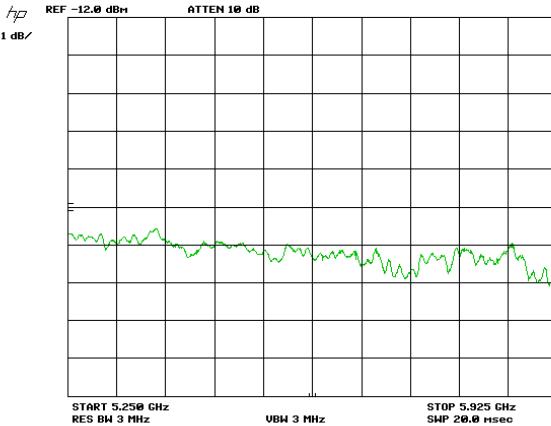


Laird SAH58-120-16-WB from Streakwave.com



Radio: Node Antenna

31 dBi, 5.6°
High value



Poynting K-GRID-003-06

Network Engineering



- Core Routing
- DNS
- IPsec
- Logging, monitoring

Network: Core Routing



- OSPF provides intelligent routing, fault tolerance
- BGP announcement makes it all routable to the rest of the world

Network: DNS



- Offers name addresses for internal services
- Provides rDNS for addresses

Network: IPsec



- Identity assurance
- Integrity assurance
- *Not* privacy

Network: Logging, Monitoring



- Used for network support and troubleshooting



A packet: node to google

#	Address	Latency	Link	Device
0				Client node K7JMM
1	44.24.240.17	6.2 ms	Air, 13.3 mi	Cell sector CapitolPark-S1
2	44.24.240.6	6.8 ms	Wired Ethernet	Cell PtP CapitolPark-PtP1
3	44.24.240.78	13.8 ms	Air, 0.6 mi	Uplink node NQ1E
4	44.24.242.0	42.5 ms	IPSEC Tunnel	Edge router Corvallis
5	198.178.136.1	87.8 ms	Internet	Xenotropic Router
14	8.8.8.8	141.9 ms	Internet	Google's DNS!

What sort of speeds?

- Depends on link quality
- -70 dBm will support about 10 Mbps @ 5 MHz

Purely empirical, non-scientific data:

Distance	Link	Signal Strength	Link Signal Speed
13.3 mi	True LoS, some reflection	-63 dBm	16.2 Mbps
1.8 mi	True LoS	-59 dBm	16.2 Mbps
17.9 mi	Obscured LoS (trees)	-77 dBm	9.7 Mbps
23.8 mi	True LoS	-65 dBm	7.5 Mbps (actual)

Taken from HamWAN.org on 1/27/2014.

Why not mesh?

HamWAN

- TDMA via NV2
- 5.9 GHz
- Cellular
- IPsec
- 44.0.0.0/8 address
- QoS for prioritization
- Wide range of supported user densities

Broadband-Hamnet™

- Regular WiFi
- 2.4 GHz
- MANET
- Obscurity security
- 10.0.0.0/8 address
- All traffic equal
- Critical user density window

Conclusion



- Applications for users, repeater sites, and emergency services
- Affordable to join and to build
- Scalable
- Flexible
- High-performance
- Memphis Metro is coming soon

Demonstration



- Ping
- Throughput Test
- File Transfer
- Webcam Stream
- RTL-SDR Raw IQ Stream

Get Involved



- Check out our website memhamwan.org
- Join our google group
- Join the IRC chatroom #HamWAN on Freenode

Questions?



Let's have the HamWAN PSDR team join us in a Google Hangout.