



Amateur Radio Mesh Networks

Ted VE3TRQ



Amateur Mesh Networks - ERC

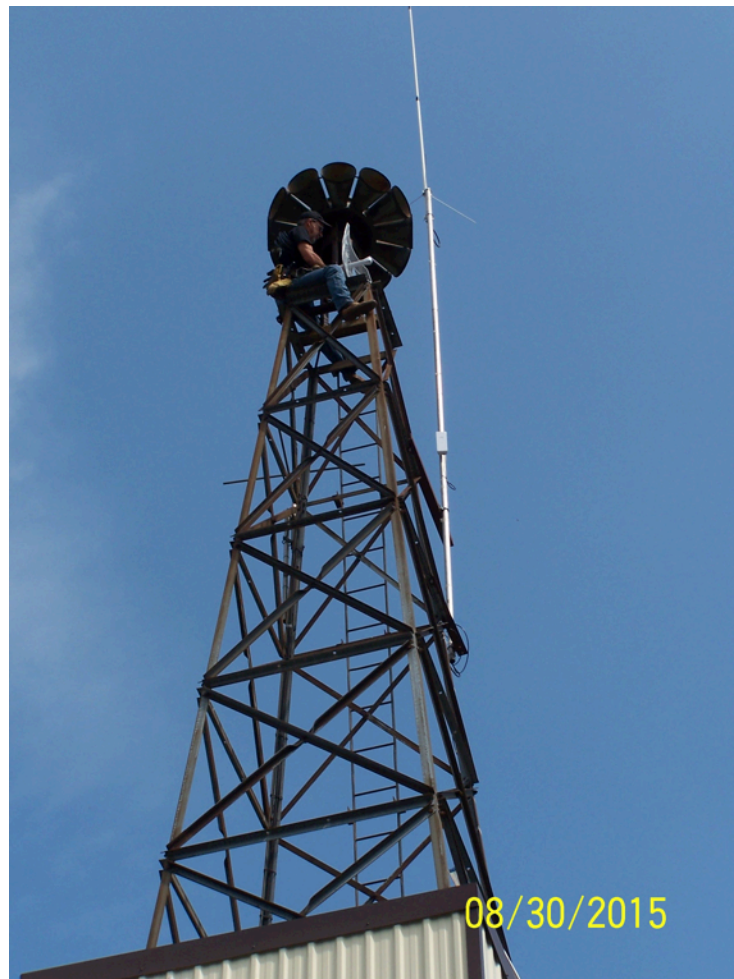
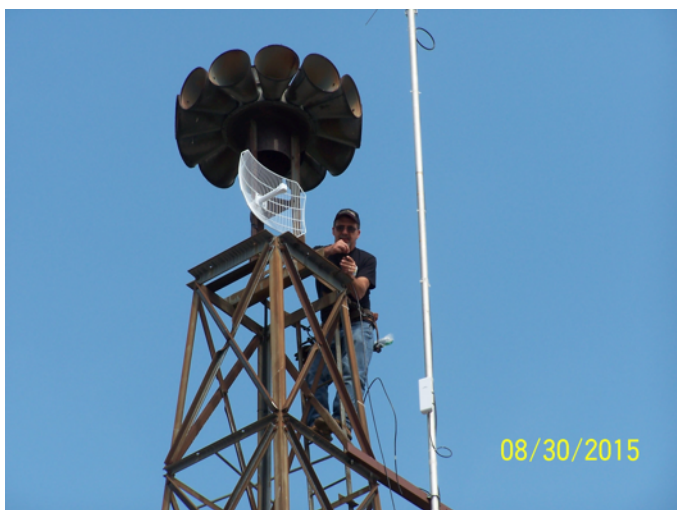


Presentation Outline

- What is a Mesh Network?
- Deployment - setting it up
- Demo / Setup, Questions



ERC Mesh Node Installations





What is a Mesh Network?

- Multipoint-to-Multipoint ad-hoc WiFi data network
 - Self-routing (OLSR)
 - Self-building (Ad Hoc)
 - Self-healing (Fault tolerant)
- All nodes know how to get to all other nodes
- Services are advertised to, and available to, all other nodes
- Allows building out a network piecemeal
- Nodes can come and go without breaking the network
- Perfect for amateur use - build it as you can, survives failure



Hardware – Routers and Access Points

- Ubiquiti Access Points and WISP Devices

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- Types of radios / Access Points available / supported



- NanoStation M2 / M5*, \$115 new
 - MIMO panel antennas, 11/16 dBi gain
 - To 23 dBm Tx power
 - To -96 dBm Rx sensitivity
 - Range 10 to 20 Km

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- AirGrid M2 / M5*, \$80 / \$95 new
 - H or V polarization, Wire grid dish, 20 / 27 dBi gain
 - To 28 dBm Tx power (23 dBm 5.8 GHz)
 - To -97 dBm Rx sensitivity
 - Range 30+ Km under good conditions

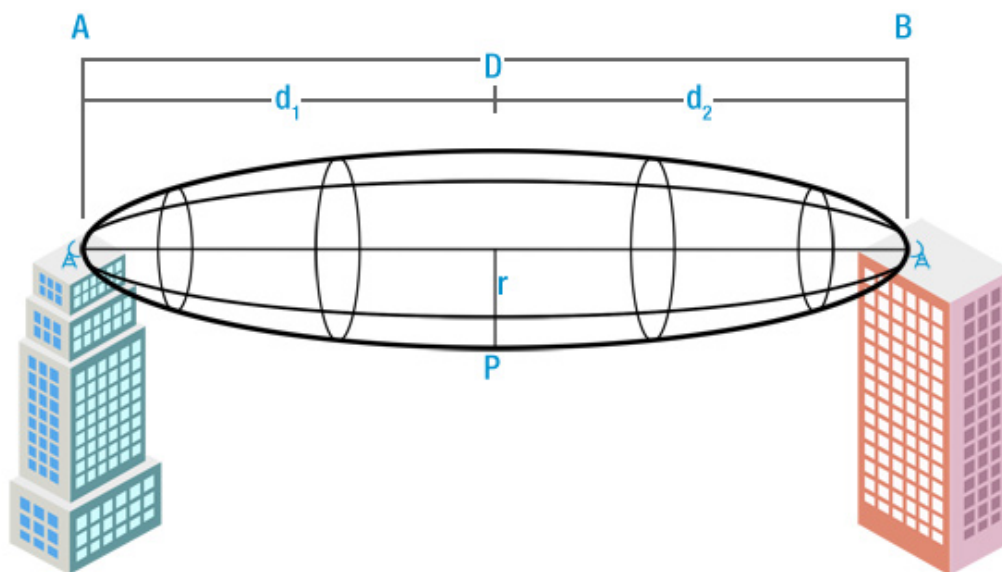


Mesh Network Deployment

- Line of Sight (LoS) and clear Fresnel zone is needed
 - 5 GHz has a narrower Fresnel zone, better for distance, terrain
 - Fresnel zone is dependent on distance and frequency

- Elliptical zone with end-points at antennas
- radius = $8.66 \times \sqrt{D/f}$,
D in Km, f in GHz,
- radius in metres
- 60% clear in this zone

1st Fresnel Zone





Resources

- *Wireless Networking in the Developing World*
 - Available as a free PDF file / eBook – <http://wndw.net/>
 - The “Bible” on wireless mesh networks
- arednmesh.org
- broadband-hamnet.org
- openwrt.org



Demo

- NanoStation M5 (VE3TRQ-NSM5-1) Local
With consumer WiFi AP attached
Provides 5G Point-to-Point to remote site, local Mesh
- AirGrid M2 (VE3TRQ-AGM2-1) Local
Connected via DtD link (Device-to-Device Cat5 cable)
Provides 2G Mesh at local site
- AirGrid M5 (VE3TRQ-AGM5-1)
Connected remotely via Mesh network
Provides remote PTZ camera access
- Running AREDN 3.16.1.0



Questions and Demo

