INTRODUCTION TO SCARES MESH NETWORK

For

SCARES

South County Amateur Radio Emergency Service

Amateur Radio EMCOMM

Gary Aden, K6GDA
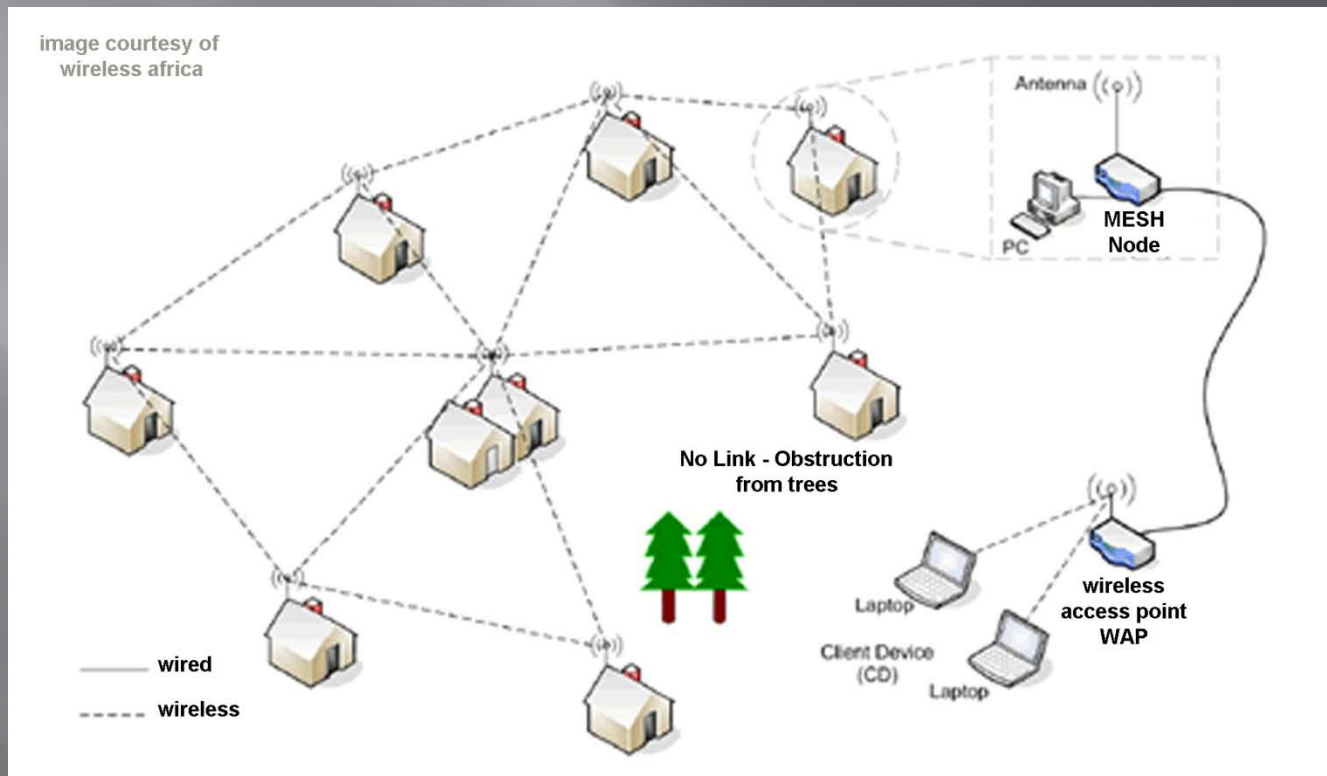
Nov 19, 2015

Outline

- What is a Mesh network
- What is a MESH node?
- Advantages of Mesh Networks
- MESH and Amateur Radio
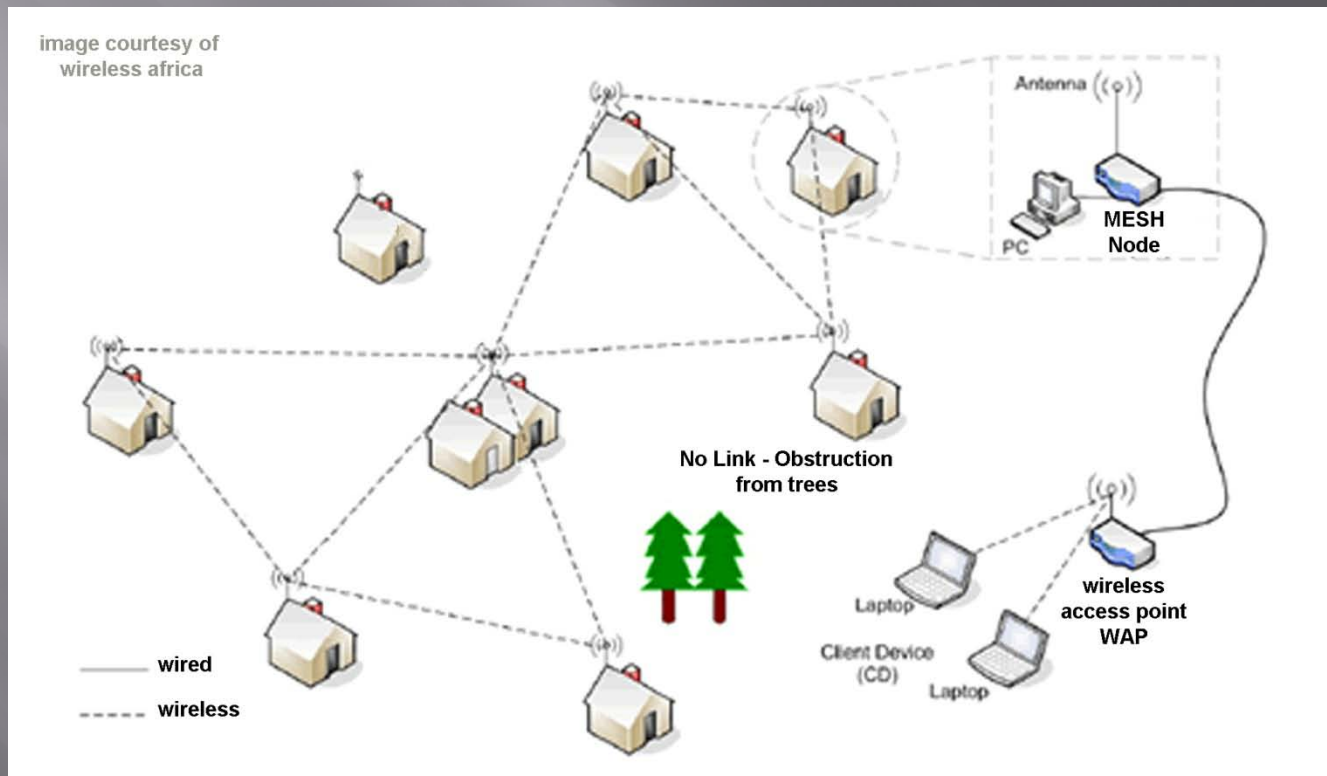- Hardware
- Software
- The SCARES MESH

What is a MESH Network?

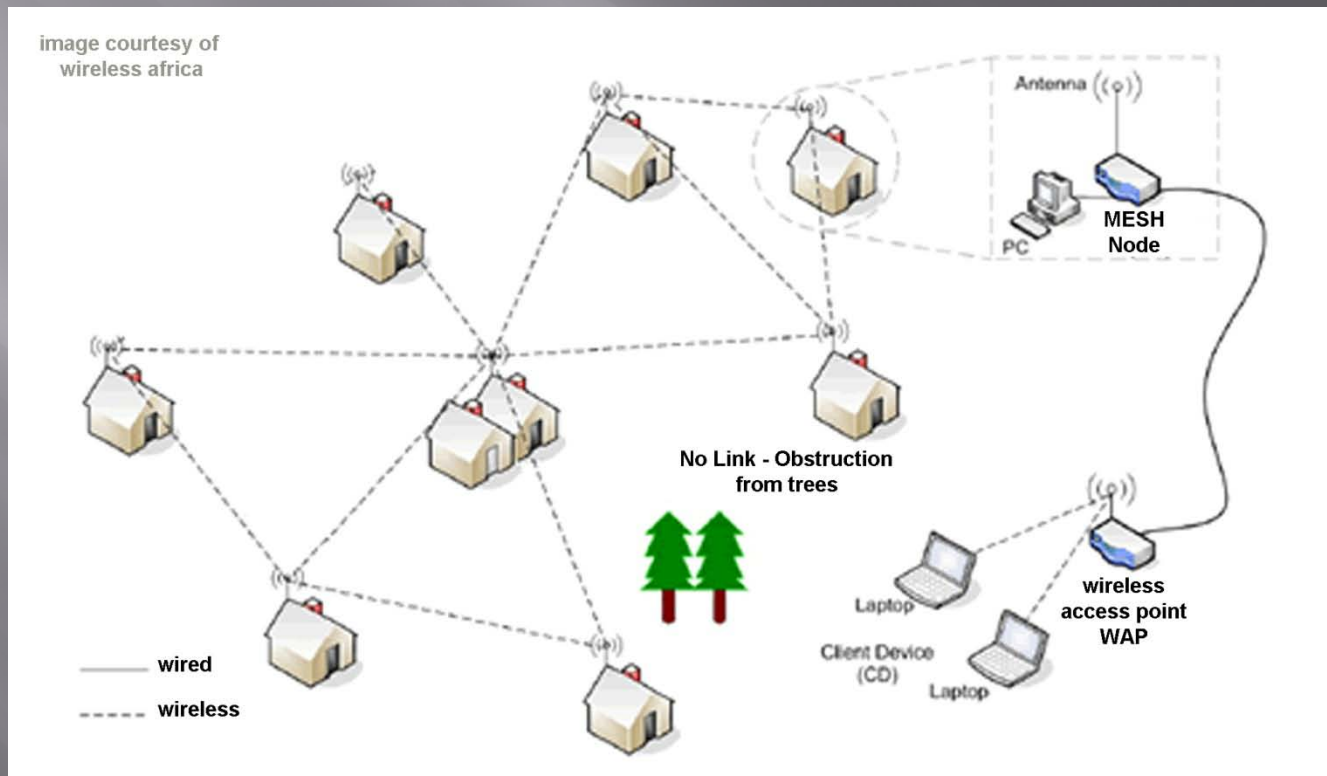- A MESH network is a group of MESH nodes that wirelessly communicate with each other

What is a MESH Network?

- If one MESH node drops the remainder of the MESH can still function
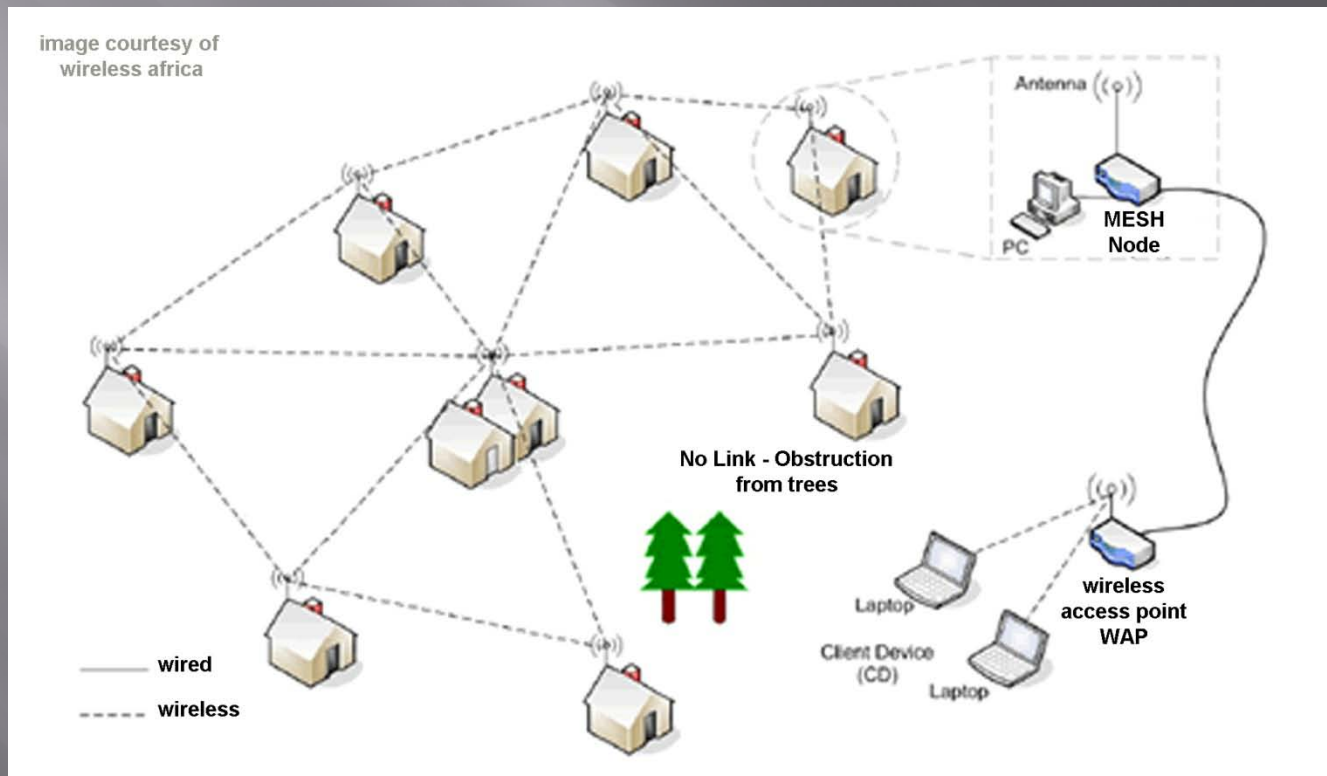
What is a MESH Network?

- If the MESH node is restored then the net is self discovering and…

image courtesy of wireless africa

What is a MESH Network?

- If the MESH node is restored then the net is self discovering and…self healing

What is a MESH Node?

- Each node…
  - Is a radio transmitter/receiver with router…
  - builds a routing table that tracks the other nodes…
  - will pass data from one to the next until the final connection is made…. completely automatically …
  - can be remotely managed, you do not need physical access once installed.
- If any node is connected to resources it can provide access to the entire network.
  - internet, video camera, fileserver, mail server, etc.

Advantages of a MESH Network

- Does not use or rely on the internet
- Does not use or rely on cell towers
- Is relatively inexpensive to implement (~ $200/node)
- Is self forming and self healing
- Can still operates even if part of the mesh network goes down
- Has a very low power requirement
- Supports relatively high demand
- Can pass written text and pictures

MESH and Amateur Radio

802.11g Wireless Band
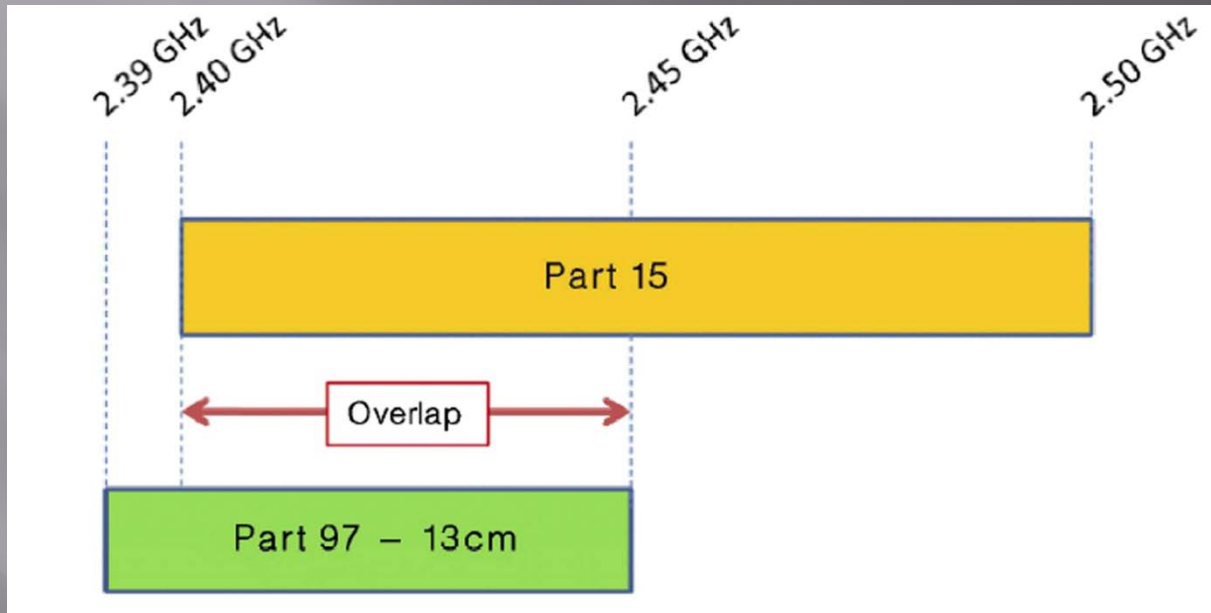
2.4 GHz	Channel	-2	-1	0*	1	2	3	4	5	6
	Status	Ham Band			Shared Ham and ISM/WiFi Band					
	Freq	2.397	2.402	2.407	2.412	2.417	2.422	2.427	2.432	2.437

*Not available for use

Hardware – Ubiquity

Ubiquiti 2.4GHz (13 cm band)
- Pico M2, $79
- Bullet M2 HP, $76 + antenna
- AirGrid M2 HP, $69
- NanoStation Loco M2, $69
- NanoStation M2, $79
- Rocket M2, $79 + antenna

Rocket M2   Nano M2   Loco M2   Pico M2-HP   Bullet M2-HP   NanoBridge M2   AirGrid M2

Software – AREDN

AMATEUR RADIO EMERGENCY DATA NETWORK

- AREDN Project software
  - written for MESH emergency data network
  - a new method of providing high-speed data
  - uses in the amateur radio frequencies
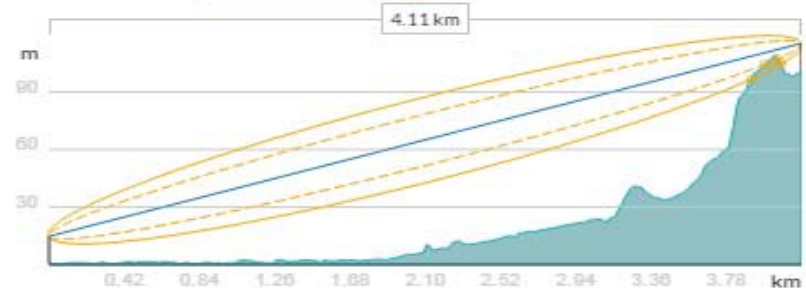- It comes in part from the developers of Broadband Hamnet which was formerly known as HSMM-MESH.

MESH – Can You Connect?
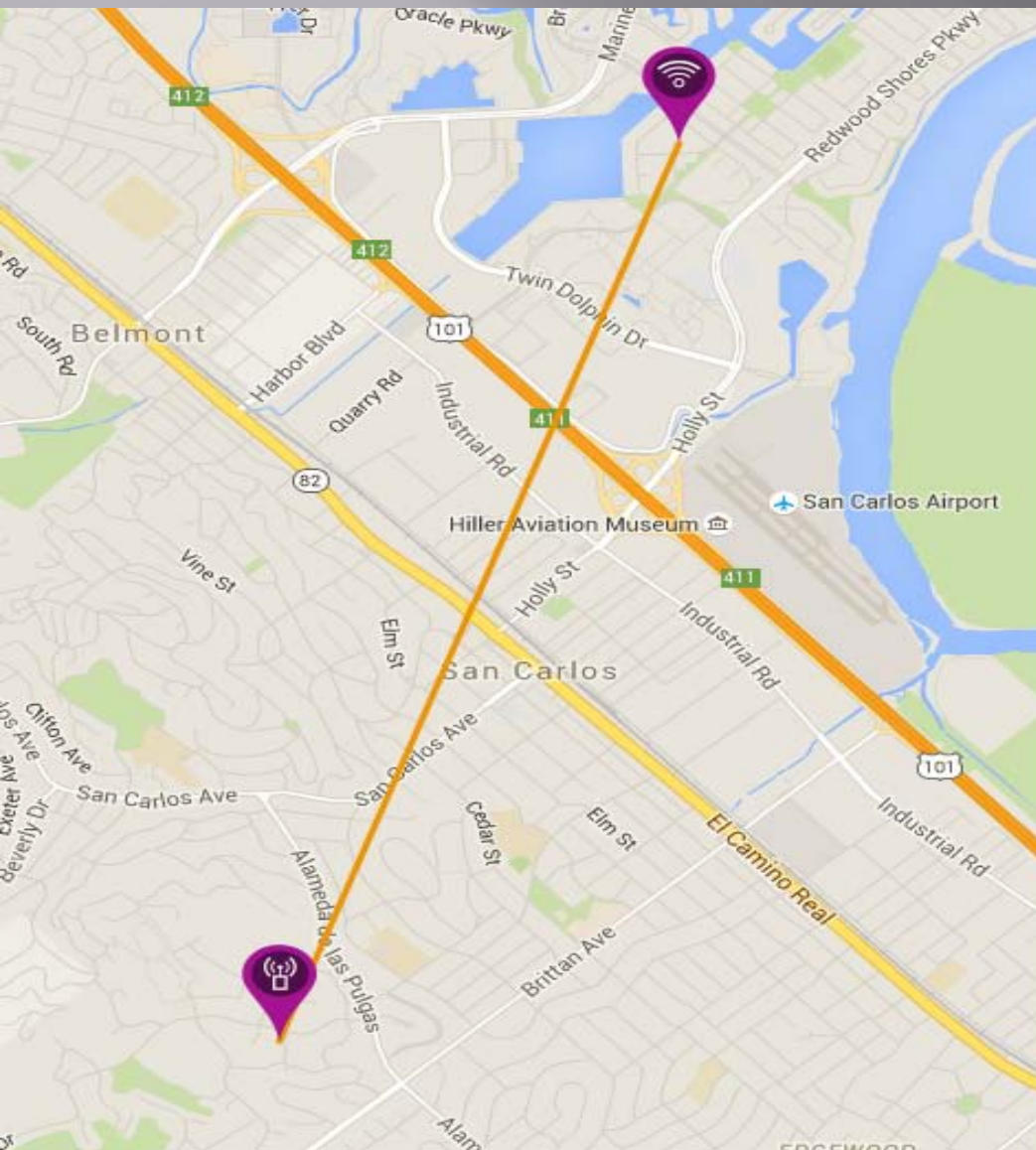
Link Simulator

DETAILS   ADVANCED

4.11 km

○ LOS PATH   ○ 1ST FRESNEL ZONE   ⊙ 60% CLEARANCE ZONE

ACCESS POINT   **STATION**

AP Tx Capacity
84.50 Mbps

Station Tx Capacity
84.50 Mbps

AP Rx Signal Level
-52.89 dBm

Station Rx Signal Level
-52.89 dBm

Location
37.52757885512352,-122.25469

Location
37.49274071662582,-122.27026

Frequency
900 MHz

Technology
AIRMAX AC   **AIRMAX**

Channel Width
● 20 MHz

Height
12 m

TX Power
27 dBm

Height
12 m

TX Power
27 dBm

Antenna Gain
● 12 dBm

Antenna Gain
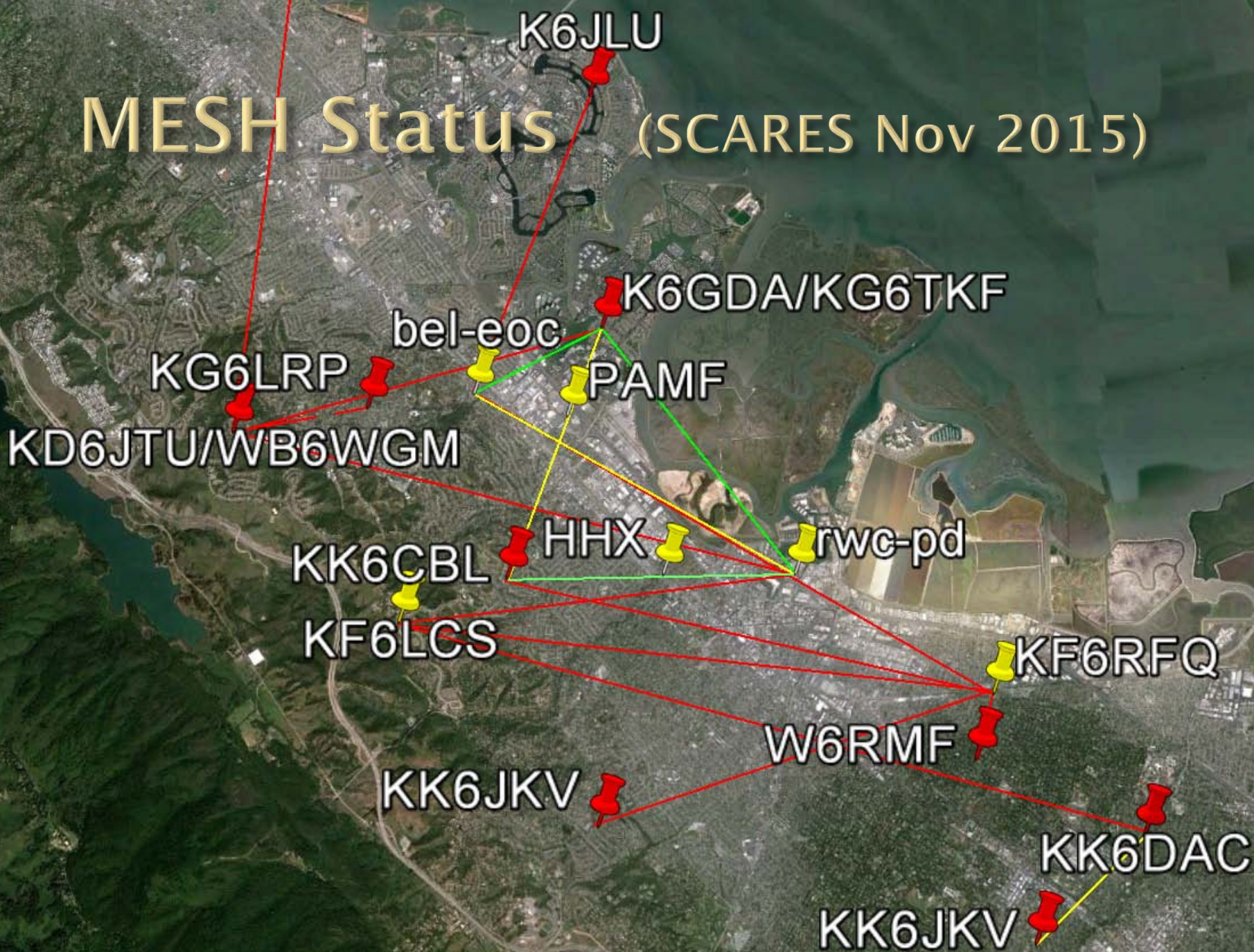● 12 dBm

Typical MESH Status

K6GDA-Omni mesh status

(Refresh)   (Auto)   (Quit)

Local Hosts	Services
K6GDA-Omni.local.mesh	

Remote Nodes	ETX	Services
WB6WGM-PB24-H-North.local.mesh	3.47	
WB6WGM-omni27.local.mesh	3.47	
WB6WGM-PB20-V-portable.local.mesh	4.37	
KD6JTU-Pico.local.mesh	4.68	
K6GSE-BRK-PB-180d.local.mesh	4.84	
K6MPN-RWC-PD-Nano.local.mesh	5.31	
K6MPN-RWC-PD-omni.local.mesh	5.41	
HPLJ400-RWCPD.local.mesh		RWC-printer
KK6CBL-SC-Node1.local.mesh	6.31	
KF6LCS-Nano.local.mesh	6.91	
KF6RFQ-Bullet-Omni.local.mesh	7.37	
K6GDA-Nano4.local.mesh	8.01	
KK6DAC-Nano-02.local.mesh	8.03	
KK6JKV-RWC-Omni.local.mesh	8.74	
KK6JKV-RWC-Sector2MP.local.mesh	8.80	
KK6DAC-Bullet-Omni.local.mesh	9.03	
W6RMF-Nano-4.local.mesh	9.64	
W6RMF-Pico1.local.mesh	10.64	
W6RMF-TiOmni.local.mesh	10.64	
W6RMF-Nano-2.local.mesh	10.64	

Current Neighbors	LQ	NLQ	Services
K6GDA-Nano1.local.mesh	100%	100%	
K6GDA-Pico.local.mesh	100%	100%	
K6MPN-BEL-CH-Nano.local.mesh	89%	73%	
K6MPN-BEL-CH-omni.local.mesh	89%	80%	
K6MPN-BEL-EOC-Nano.local.mesh	50%	0%	
HP-Envy4502.local.mesh			Bel-Printer
MPN-server.local.mesh			Email
WB6WGM-Nano-South.local.mesh	0%	0%	
WB6WGM-PB24-V-East.local.mesh	60%	50%	
WGM-PBX.local.mesh			
WGM-server.local.mesh			Citadel

Previous Neighbors	When
WB6WGM-Loco	2.2 hours ago

MESH Status (SCARES Nov 2015)

K6JLU
K6GDA/KG6TKF
bel-eoc
PAMF
KG6LRP
KD6JTU/WB6WGM
rwc-pd
KK6CBL
HHX
KF6LCS
KF6RFQ
KK6JKV
W6RMF
KK6DAC
KK6JKV

MESH-What's Next?

- Get more SCARES nodes active
- Get more EOC's connected
- Start connecting CERT trailers
- Set up a protocol for using a MESH in an emergency
- Start practicing using MESH along with Voice
- Set up Demo's for the cities and county SCARES serves

MESH

- Thank you