Montgomery County ARES/RACES MESH PROJECT

A UNIQUE OPPORTUNITY TO COMBINE RADIO AND COMPUTER SKILLS FOR EMERGENCY COMMUNICATIONS

Phil-Mont ARC Meeting October 10, 2018

What is a MESH Network

- A wireless invisible highway over which data travels.
- NODEs are routers along the highway that route traffic throughout the mesh.
- Per FCC part 97 regs, NODEs are repeaters

NODE Characteristics

•are standard network devices that have been re-programmed to operate on amateur frequencies,
•2.397 ghz in our case.

•are **self discovering, self configuring, self advertising and fault tolerant**

•are a data network without the wires

•Most tasks that you can do over a wired or wireless network at your home or office will work on a mesh node.

•are small, portable, low-power and inexpensive

•They are easily battery powered.

•If one endpoint cannot see its desired destination, but CAN see nodes in between, the data will hop from one to the next until the final connection is made…. Completely automatically.

NODE Characteristics

•All nodes are remotely managed, you do not need physical access once a node is installed.

•Mesh nodes can easily have a range of ***10 miles or more using stock power*** and gain antennas if you have true line of sight.

•Mesh nodes communicate with other nodes over Wi-Fi frequencies and ***only talk to other mesh nodes on the wireless port*** .

•It is possible to extend a mesh network with a properly restricted access point (AP) where only hams are given access

•If any node is connected to resources (internet, video camera, file server, mail server, VOIP server, etc.) it can provide access to the entire network

•Computers connect to mesh nodes with an Ethernet cable or WiFi APs and control them using a web browser

Why MESH for EmComm?

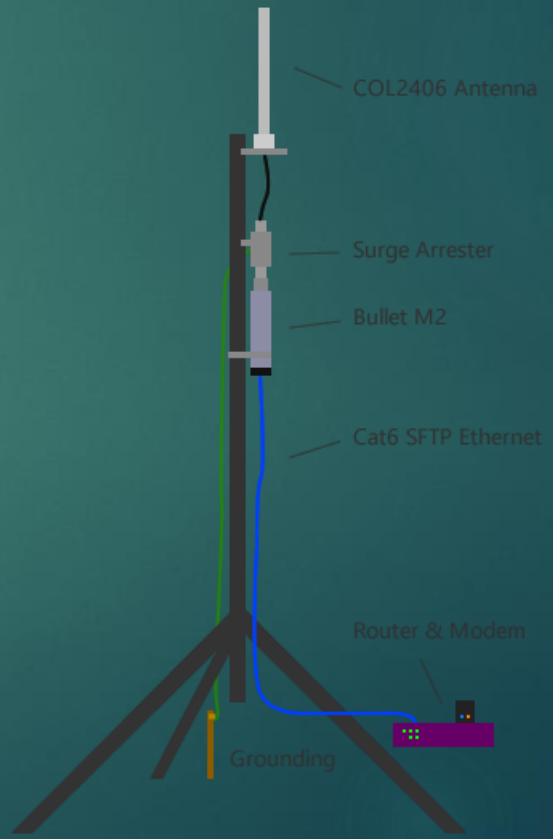
- We live in a digital world.
  - Cell phones and apps, tablets, web apps
  - PDFs, Excel Files, Word docs
  - E-mail, text messaging
  - Video feeds
  - VOIP telephone
- High speed data is the norm; not the exception.
- To be relevant EmComm must provide more than voice and slow speed data to our served agencies
- Our role as communicators is to get the message (data) through in the most efficient method available to us.

GEAR

- Point-to-Point / PtP 2.4 Ghz **DIRECTIONAL**
- **Ubiquiti NanoStation M2 AirMax 2.4GHz CPE 150+ Mbps real outdoor throughput and up to 15km+ range. $80-$100**

GEAR

- **Ubiquiti BulletM2-HP BM2HP 802.11n airMAX Integrated Radio 2.4GHz + (AU24G6-NF) 6dBi WiFi Omni Antenna. $100**



GEAR

- **Ubiquiti AIRROUTER-HP airRouter AR-HP IEEE 802.11n Ethernet Wireless Router - 2.40 GHz ISM Band - 1 x Antenna1 x External) - 656.2 ft Indoor Range - 150 Mbps Wireless Speed - 4 x Network Port - 1 x Broadband Port - USB - Fast Ethernet - No Desktop $70**

airGateway

- Provides for wifi access to your mesh network.
- Attaches to POE adapter.
- No Ethernet cable required between transceiver and computer.

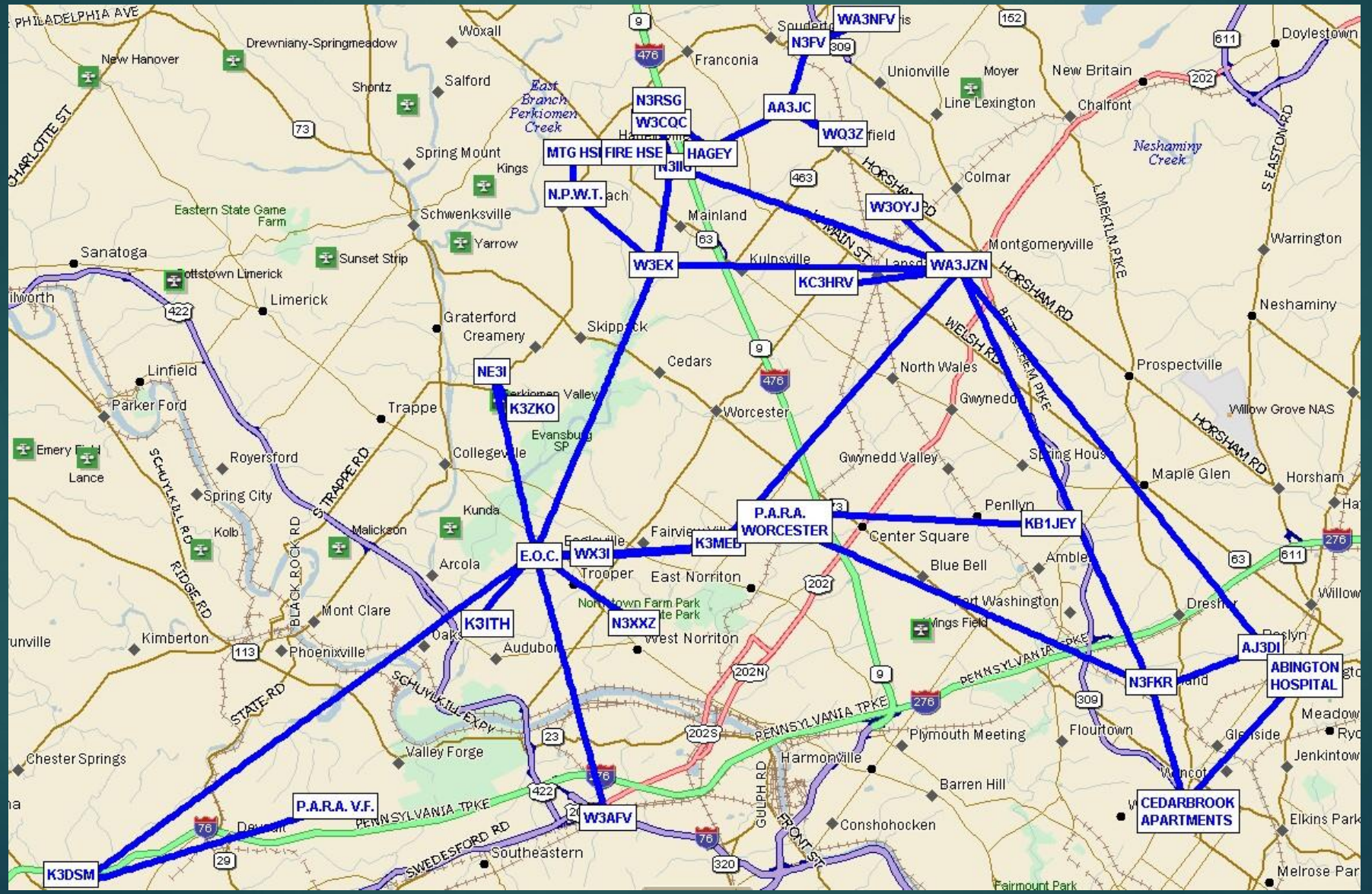
MODIFICATION OF THE GEAR

- All equipment must be modified to work in the 13 cm ham band.
  - 2397 mhz (2.300 GHz – 2.450 GHz)
- Requires some computer and networking skills.

MCAR MESH SYSTEM

- Three directional nodes covering 120 degrees each
- One on each side of the tower.
- End of year completion
- Expand throughout the county

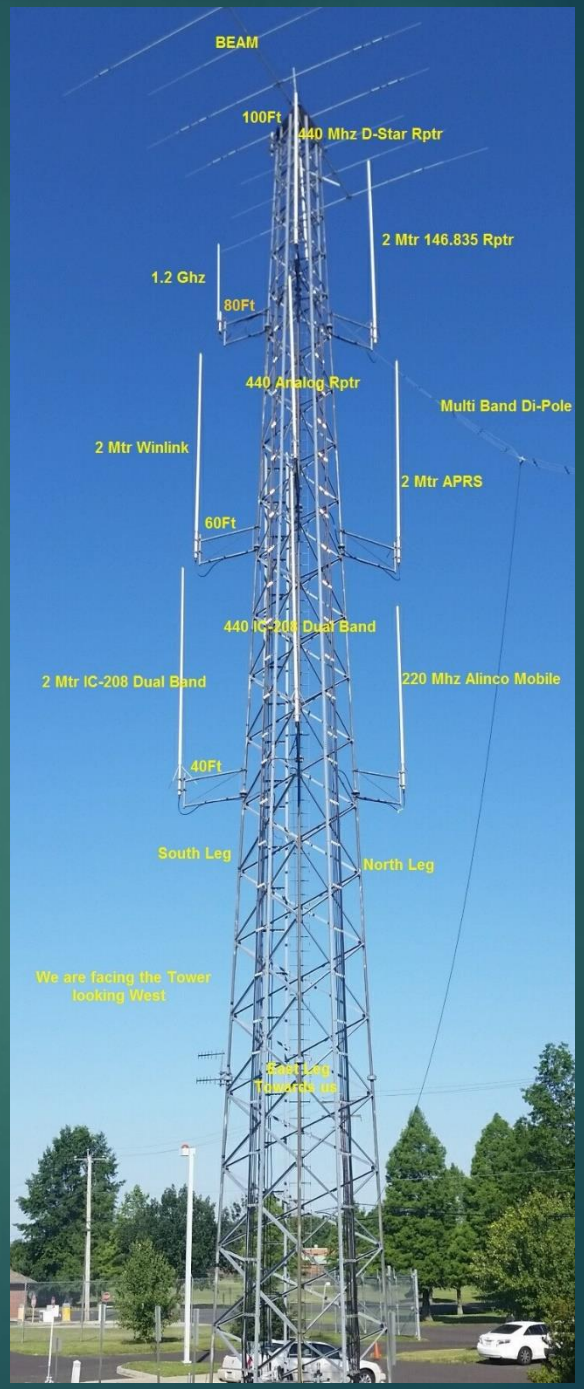
Current Nodes



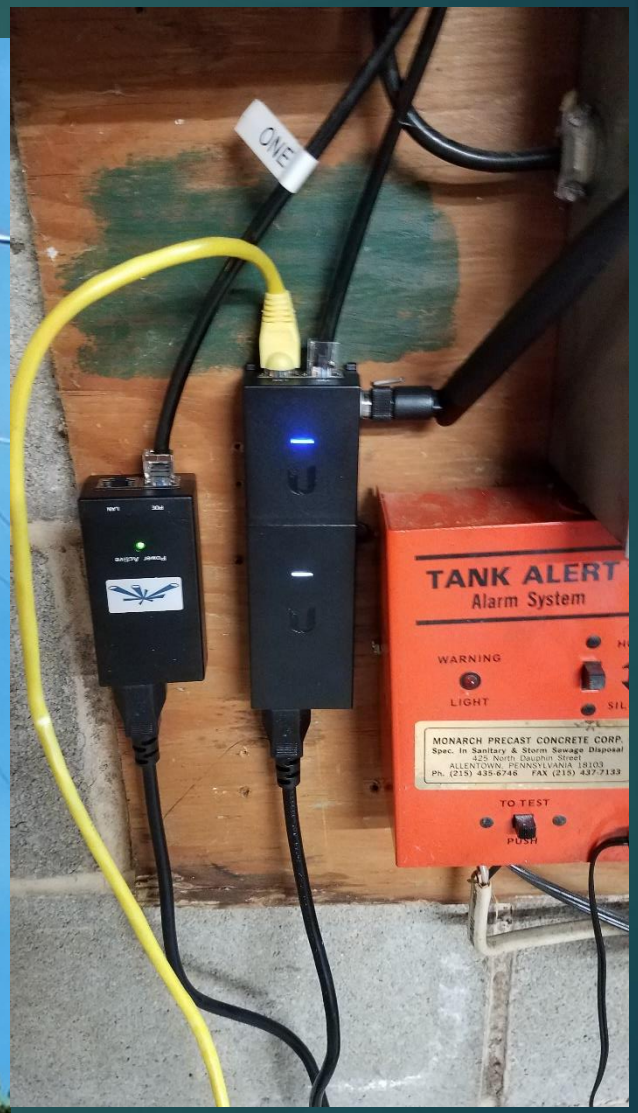
Current and Proposed Locations

NAME	CALL	LATITUDE	LATTUDE	LONG	LONG	ELEV.	ELEV.
MONTCO E.O.C.	AA3E	40-09-29.38	40.158161	75-25-05.91	-75.418308	477 FT ASL	145.39 M
Dick Stewart	K3ITH	40-08-21.15	40.139208	75-26-22.78	-75.439661	243 FT ASL	74.07 M
Tom Nolan	W3EX	40-14-39.63	40.244342	75-22-11.68	-75.369911	252 FT ASL	76.81 M
Rocky Pistilli	N3FKR	40-07-08.83	40.119119	75-10-36.23	-75.176731	269 FT ASL	81.99 M
Guy Gibbs	WA3JZN	40-14-34.47	40.242908	75-15-17.69	-75.254914	422 FT ASL	128.63 M
Ron Cohen	K3ZKO	40-12-06.17	40.201713	75-25-34.88	-75.426375	270 FT ASL	82.30 M
Lou Ruh	WX3I	40-09-28.89	40.158025	75-23-53.58	-75.398217	465 FT ASL	141.73 M
Jim Fisher	AJ3DI	40-07-50.91	40.130808	75-08-02.98	-75.134161	263 FT ASL	80.16 M
Jim Linden	N3IIG	40-16-28,24	40.274514	75-21-48.25	-75.363403	326 FT ASL	99.37 M
Marcus Barboni	K3MEB	40-09-38.51	40.160697	75-20-42.94	-75.345261	279 FT ASL	85.04 M
Tom Riethof	W3CQC	40-17-21.77	40.289381	75-22-11.29	-75.369803	333 FT ASL	101.50 M
Griff Griffiths	NE3I	40-12-42.98	40.211939	75-26-02.37	-75.433992	232 FT ASL	70.71 M
Joe Frounjian	W3OYJ	40-12-07.06	40.201960	75-16-41.36	-75.278156	326 FT ASL	99.65 M
Al Mc Crae	KA3ODI	40-25-22.07	40.422796	75-20-38.74	-75.344094	514 FT ASL	156.67 M
Mike Davis	KB1JEY	40-10-09.33	40.169261	75-12-55.10	-75.215379	308 FT ASL	93.88 M
Nate Rosenthal	N2ADD	40-15-17.14	40.254762	75-38-43.13	-75.645313	184 FT ASL	56.08 M
Chuck Farrell	W3AFV	40-04-45.00	40.080855	75-23-21.00	-75.388926	194 FT ASL	59.13 M
Fancy Hill	----------	40-19-33.20	40.325889	75-42-14.83	-75.704122	1,080 FT ASL	392.18 M
Salford Mtg Hse	----------	40-16-33.00	40.275870	75.24-07.00	-75.402071	356 FT ASL	108.51 M
Abington Hosp.	----------	40-07-10.00	40.119518	75-07-15.00	-75.120880	351 FT ASL	106.99 M
U.S. ARMY WORCESTER	----------	40-10-42.32	40.178422	75-20-12.53	-75.336815	454 FT ASL	138.38 M
BACTON HILL	K3DSM	40-03-38.20	40.060611	75-35-34.35	-75.592875	717 FT ASL	218.54 M
PARA WORCESTER	----------	40-10-24.01	40.173337	75-20-33.76	-75.342710	436 FT ASL	132.89 M
WEST CHESTER EOC	W3EOC	39-57-37.34	39.960372	75-35-04.18	-75.584495	471 FT ASL	143.56 M
PARA VLY FORGE	W3PHL	40-05-03.95	40.084439	75-29-39.20	-75.494221	595 FT ASL	181.36 M
WILLOW GROVE N.A.S.	----------	40-12-39.98	40.210272	75-08-45.90	-75.140608	290 FT ASL	88.39 M
Robert Antal	KC3HRV	40-17-39.09	40.294192	75-34-48.88	-75.580244	282 FT ASL	85.95 M
Paul Antal	KC3HSQ	40-14-16.11	40.237808	75-18-13.50	-75.303750	322 FT ASL	98.15 M
Joseph Caltabiano	AA3JC	40-15-41.61	40.261558	75-16-13.87	-75.270519	313 FT ASL	95.02 M
Dan Mitten	WA3NFV	40-19-01.74	40.317150	75-17-18.81	-75.288558	584 FT ASL	178.00 M
Richard Freeman	N3FV	40-18-33.94	40.309428	75-18-41.06	-75.311406	502 FT ASL	153.01 M
Alan Gray	W3BV	40-26-02.50	40.434028	75-13-50.77	-75.230769	525 FT ASL	160.02 M
W3EX-AUX	EX-AUX	40-16-06.93	40.268592	75-20-25.92	-75.340533	325 FT ASL	99.06 M
Harleysville Fire House	H-F-H	40-16-38.10	40.277250	75-22-49.62	-75.380450	300 FT ASL	91.44 M
North Penn Water Tower	W-T	40-15-53.69	40.264914	75-24-04.68	-75.401300	384 FT ASL	117.04 M

MONTCO ARES/RACES



Typical Installations



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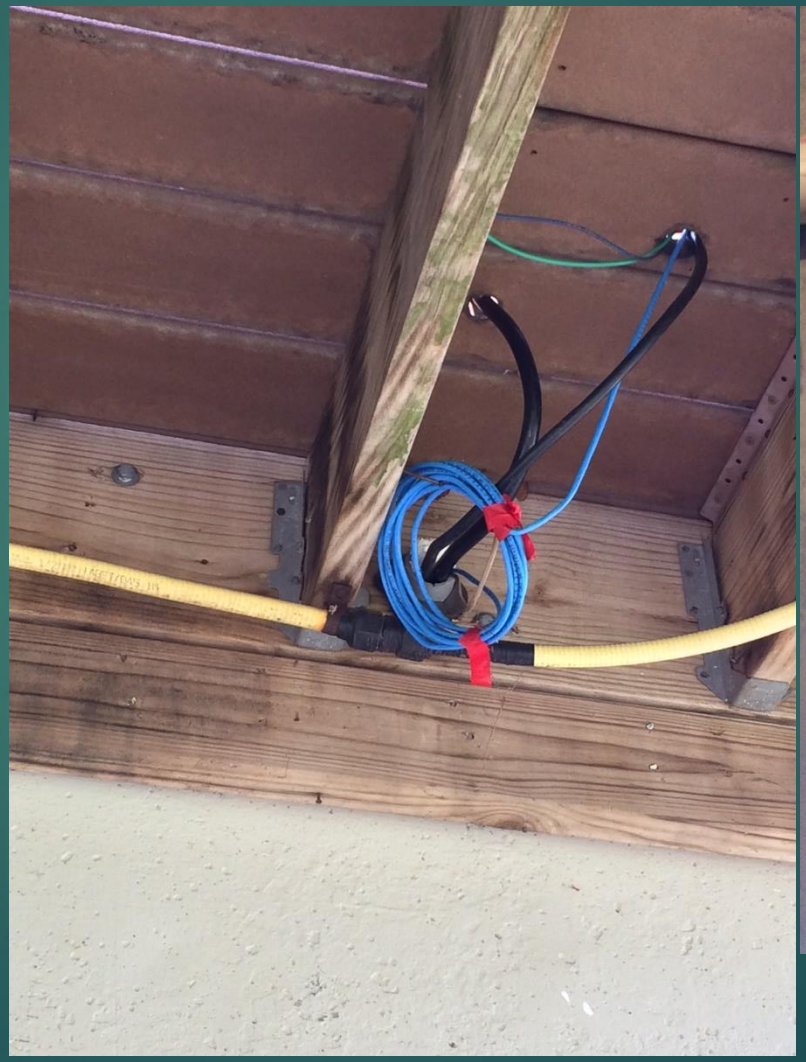
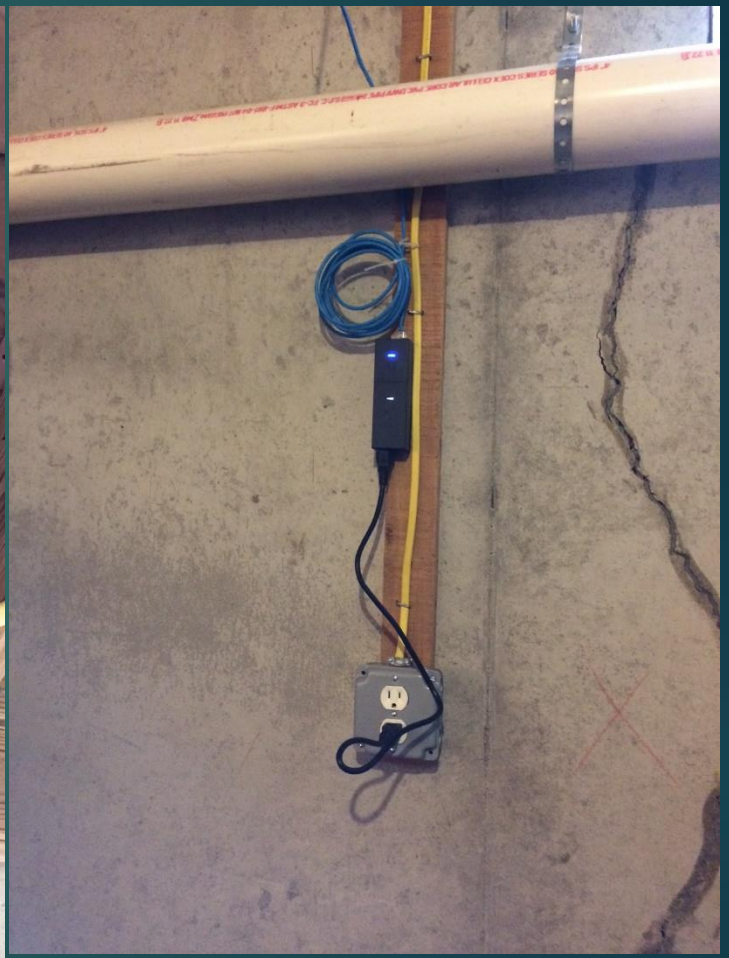
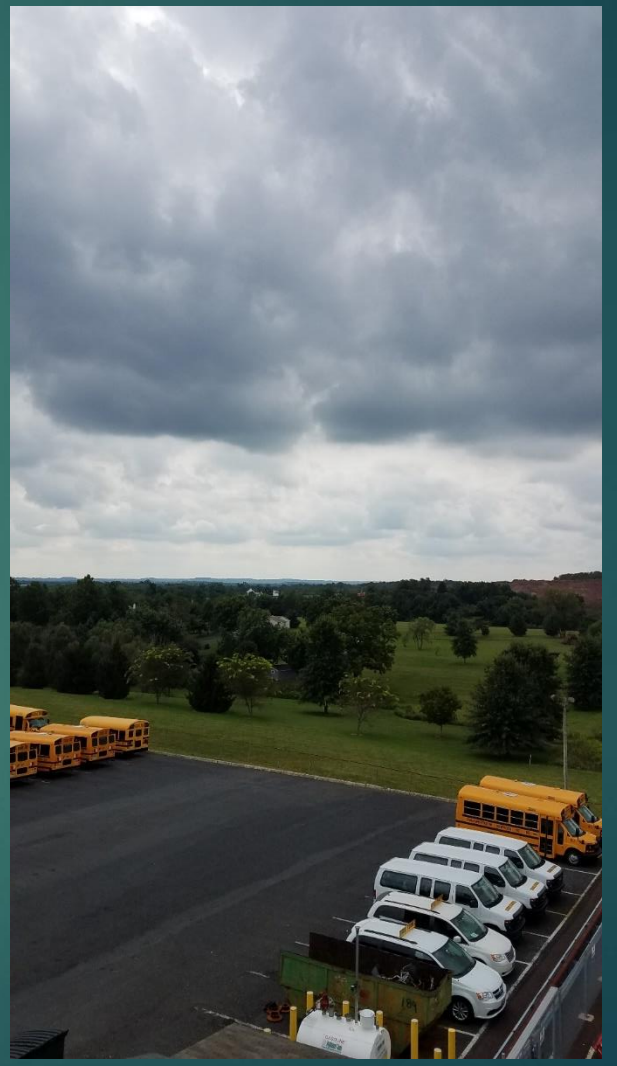


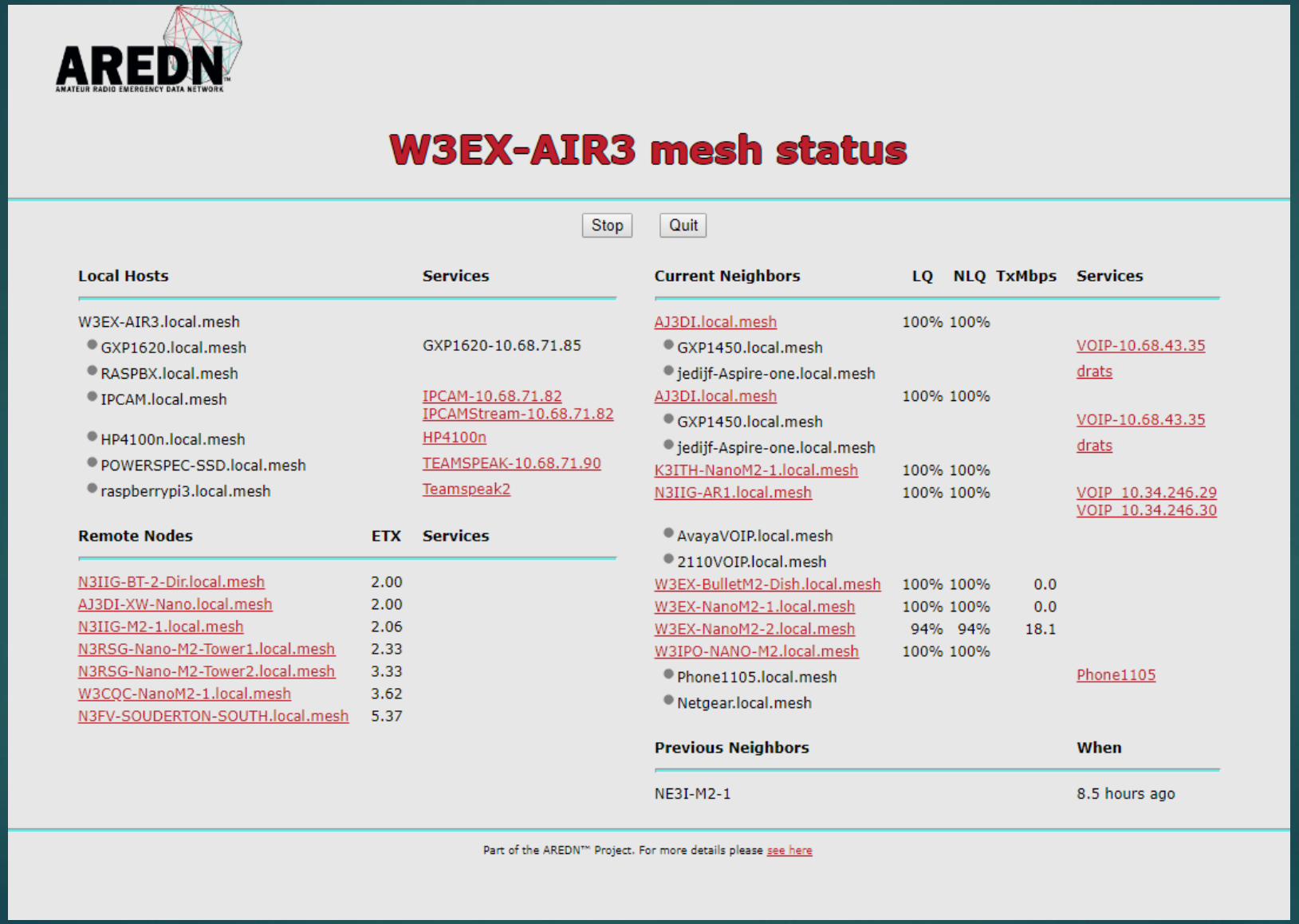


Future Installation
Lower Salford Township

Hagey Transportation Services



User Interface



POTENTIAL SERVICES

- EMAIL
- Text Messaging
- High Speed Data Transfer
- Video Camera Capability
- VOIP telephony
- Printers
- Remote rig control
- Links To Other Counties

CURRENT SERVICES RUNNING

- D-rats
  - Messaging
  - Email
  - File transfer
- Teamspeak
  - Peer to peer VOIP
- FreePBX
  - Fully functional VOIP phone system with voicemail etc.
- Printer
- Video

SOURCES OF MESH TECH INFO

- https://www.arednmesh.org/
- BROADBAND – HAMNET
- https://www.youtube.com/watch?v=hUeW2ju-RZk
- http://www.hotarc.org/mesh/
- Join our groups.io reflector

Thanks to:

- Jim Fisher AJ3DI from PDRA
- Jim Linden N3IIG
- Ron Cohen K3ZKO
- Rocky Pistilli N3FKR
- Tom Riethof W3CQC
- Marten Beels K3HUW
- Rich Freeman N3FV
- Dick Stewart K3ITH
- Montgomery County $$$