Introduction to AREDN

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This presentation

Available at:

https://github.com/hwdornbush/A1-IntroductionToAREDN

All presentations available at:

https://github.com/hwdornbush

What is AREDN

Amateur Radio Emergency Data Network

- Amateur Radio
- Emergency
- Data
- Network

Amateur Radio …

Reprograms off-the-shelf Wi-Fi equipment to use Amateur Radio frequencies

- 900 MHz
- 2.4 GHz
- 5.8 GHz – what we are deploying in greater Hamilton County
- Subject to Part 97 rules
  - You must have an amateur radio license – any class
  - You are using a radio – with data and voice capabilities
  - No encryption
  - No commercial use

… Emergency …

Developed for use in emergency and public service communication

- Emergency Management needs data for decision making
- AREDN can provide
  - Real time messaging
  - VOIP telephone calls within the AREDN network
  - Video camera access within the AREDN network

… Data …

Creates high-speed data networks

- Instant messaging / Chat
- Email
- VOIP telephone
- IP Video
- And more

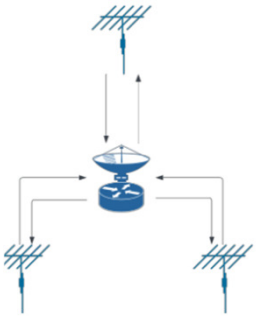
… Network

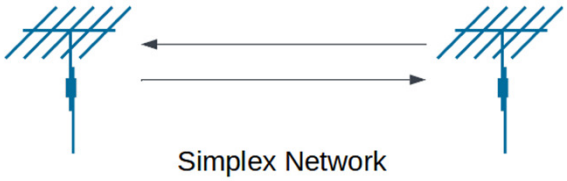
Creates a high-speed data network of the “mesh” style

- When you deploy a node
  - Node: one instance of a radio operating using AREDN software
- Your node looks for other nodes it can reach
- It automatically configures itself into the mesh network
- And the other nodes also add it to the network

Other networks

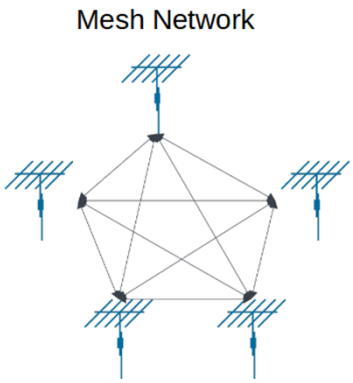
Star Network





Simplex Network

Mesh Network



Another Tool

AREDN is another tool for you to use as a ham

It may or may not be the right tool for the task

- Good for high speed data networking
- Supports TCP/IP networking
  - Network applications
  - Can link to Winlink
- **Not** connected to the Internet
  - Think of it as a private Internet
  - May be a gateway
- **Requires** line of sight between nodes using RF
  - No trees or other physical obstructions
  - Can go 30 miles or more

Services

- Keyboard to keyboard chat e.g. meshchat
- Email (may not be connected to THE email network)
- CITADEL server – provides chat, email, bulletin board
  - Supports Thunderbird email client
- File sharing e.g. Synology
- VOIP phone e.g. GRANDSTREAM GXP1625 or softphone
- Audio / video conferencing e.g. TeamTalk
- Surveillance cameras

Packages generally run on separate LAN-connected computer

Use Case: Home Station

Not RF

Access mesh via tunnel

Desktop router such as MikroTik hAP ac 2

For IP Phone: Grandstream 1625

Check things out

Use Case: Home mesh access point

Connect via RF

Can also connect to the Home Station router

Equipment

- Any of MikroTik SXTsq series, LHG series or the LDF series listed devices
- Any of the Ubiquiti series listed devices

Use Case: Private Network

Provide tunnel server

Connect to wider area network

Equipment: MicroTik hAP 2 for tunnel server

- And other use case equipment

How can I connect to other nodes

RF – radio frequency connection

DtD –Device to Device
- For nodes located at same place
- Use Ethernet cables and switches
- Allows connection of different frequencies

Tunnel
- Internet connection to other AREDN “mesh islands” not reachable by RF
- Provides redundant connection to other nodes

AREDN chooses the connection with the lowest link cost

What nodes exist

Repeater backbone sites
- Signal Mountain
- Missionary Ridge
- White Oak Mountain

We are in start-up mode

Other experimental nodes
- KE4IDH tunnel server, app server
- AA6BD tunnel client/DtD node, local DtD/RF node, 2 RF nodes

What hardware is in use by AA6BD

Mikrotik hAP ac Lite dual band (local or travel router and omni RF node)

Mikrotik hAP ac3 dual band (tunnel connection, local router and omni RF node)

Mikrotik SXTsq Lite5 (5x5 directional RF node 23 degree)

Ubiquiti NSM5 (long stick directional RF node 60 degree)

Grandstream GXP1625

What hardware is in use by AK4ZX

GL.iNet Microuter (refurbished)

MikroTik hAP ac2

MikroTik hAP ac3

What hardware is in use by KE4IDH

MikroTik hAP AC Lite

MikroTik hAP AC 2

MikroTik LHG 5

MikroTik SXTsq Lite5

MikroTik LDF 5

What hardware is in use by KQ4KIH

MikroTik hAP ac3

MikroTik SXTsq 5 ac

Grandstream GXP1625

What hardware is in the Go-Box

MikroTik hAP AC2

Mikrotik SXTsq Lite5

Grandstream GXP1625

Supported Devices

On the arednmesh.org web site, you can find a list of supported devices:

https://downloads.arednmesh.org/snapshots/SUPPORTED_DEVICES.md

Mikrotik hAP AC lite/2/3

Five-port router provides a seamless method for integrating the ham radio network into your ham shack network. When running AREDN® firmware, it provides:

- One port to connect to your outside node (a “DtD” - Device to Device port). POE power for the node can be enabled on this port.
- One port to connect to your home router, for Internet access [necessary if you need to tunnel your node to another node for network access].
- Three ports that can be used to connect your shack PC to both the Internet and the mesh network (eliminating the need for two computers in the shack, one on each network), with two spare ports for things like cameras, VOIP phones or Raspberry Pis.

Mikrotik hAP AC Lite/2/3

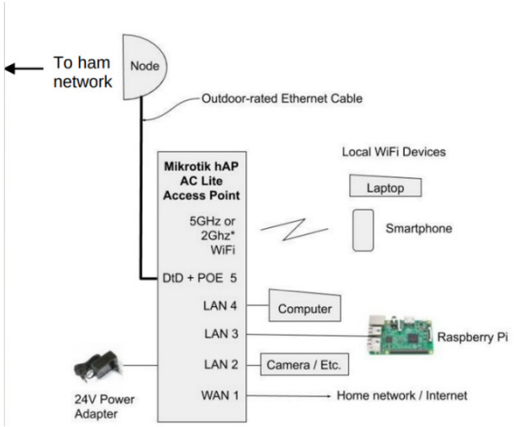
The hAP AC has two internal radios, a 2.4 and a 5.8 GHz.

The 2.4 GHz radio can be configured as a mesh node OR as a wireless access point.

The 5.8 GHz radio can be configured as a mesh node OR a wireless access point.

Having a wireless Part 15 access point on your shack’s ham network is very handy - you can link your laptop or smartphone to it wirelessly and have access to both the Internet and the ham net

Mikrotik hAP AC Lite/2/3



- Port 1 – Wired connection to home network
- Ports 2-4 – other devices on your ham network
- Port 5 provides POE power plus DtD (Device to Device) link for routing info to/from node – your link to the mesh network
- 2 & 5 GHz internal radios can be used as ham network node (2 GHz only), wireless access points or wireless access clients.
- Wired this way, devices on ports 2-4 or connected via the internal wireless access point have access to both the hamnet and the internet.
- The AREDN software firewalls the hamnet off from your home network.

What hardware is suggested

Choose gigabit speed equipment where possible
- Maximize data throughput

Directional antennas
- Dish or panel
- Electronics integrated into the dish feedpoint: two transceivers, two modems, and an embedded computer with RAM, ROM and a network interface.
- They are all POE enabled (Power Over Ethernet).
  - One cable on mast
  - Managed by web interface

At least 8 MB of flash and 64 MB of RAM

Combination of directional and omni for local and tunnel use

Caution

Microwave energy

Do not stand in front of the radio for extended periods of time when it's powered on.

NEVER look into the focus of the radio when it's powered on.

What do I want to do with AREDN

Before purchasing equipment, determine what you want to accomplish with AREDN

- Emergency communication to backbone
- Event support
- Participate with your team (ARES, CARC, private)
- Are you connecting wirelessly to an existing mesh network?
- Is there a node within range to connect wirelessly?
- Are you setting up a "community" node or just one for your own use?
- What services do you expect to be able to access via the mesh network?
- Will you be hosting your own resources, or using those hosted by others?

What should I expect when starting

AREDN is not designed, not intended, and could never be a replacement to the real Internet, but it can assist in local connectivity when the Internet is down or otherwise unavailable tunnel connection

We are working to make RF connection more available
- But you must have line of sight to node
- Aiming can be challenging
- Tools to help

Plan to connect your nodes full time if possible
- Minimize DNS issues

What will I experience

There is a learning curve and rough edges

AREDN is maintained by volunteers
- E.g. new UI is coming

You will experience challenges such as
- Configuration
- Upgrading firmware
- Managing browser connection to node

How do I get started

Determine your goals and equipment

Next workshop: Flashing (uploading) AREDN firmware to your node and configuration

- You will need to bring your node(s) to the workshop

We are working to provide flashing assistance

Detailed instructions on https://arednmesh.org

Demonstration Devices

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Grandstream GXP1625

Demonstration

Access node

Node status

Mesh status
- Navigate to other nodes

Setup
- Tunnel client
- Administration

IP Phone conversation

Resources

Presentation: https://github.com/hwdornbush/A1-IntroductionToAREDN

Local: https://ka4ema.net/

Global: https://arednmesh.org
- https://www.arednmesh.org/presentation-archive-page