AREDN

Amateur Radio Emergency Data Network

Agenda

- Overview
- Infrastructure vs Applications
- Gwinnett AREDN Development / Agenda
- Getting Started

What is AREDN?

- AREDN is the **Amateur Radio Emergency Data Network**. It is made up of nodes that form a self healing mesh. This creates a stable working computer network much like the internet, but does not rely on existing infrastructure and repairs itself if some nodes in the system drop out.
- Leverages Part 15 consumer hardware flashed with custom firmware to leverage privileges of Part 97

Where AREDN fits in?

- First, it is just another tool in the tool box.
- It provides capacity similar to what served agencies are using daily.
- Today's ham radio experience is often quite hybrid using the internet where available as part of its infrastructure. AREDN can be Internet independent or be tunneled through the internet bringing the assets of the entire AREDN network to each user. All assets in a mesh network are available to all stations.
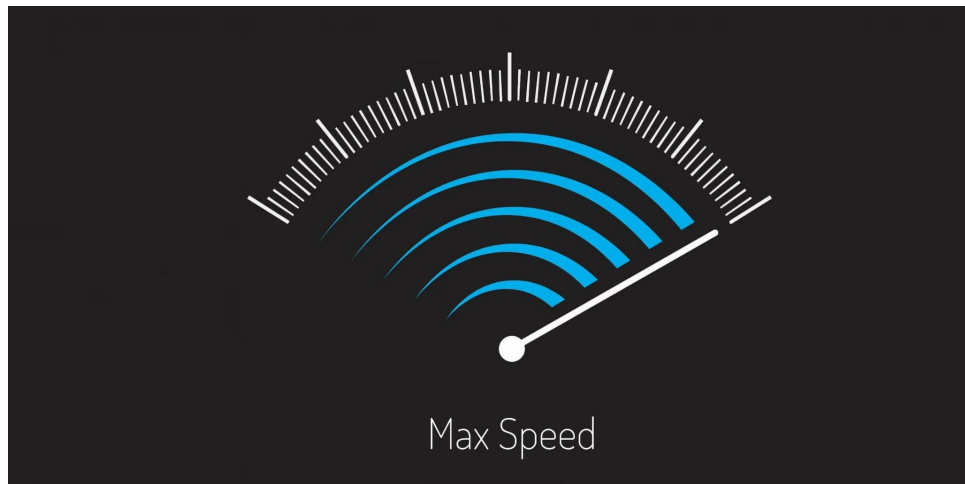
Digital Communications

Served agency communications are increasing more data intensive pushing more communications toward digital modes over voice.

Packet - up to 1.2 kbits/second

VaraFM - up to 25 kbits/second

AREDN - up to 100 Mbits/second

Max Speed

Infrastructure vs Applications

Tools served agencies use daily

Communication

- VoIP
  - Direct dial (via IP) or using extension with a PBX
  - Good brands to look
    - Grandstream
    - Yealink
  - Look for models that support FreePBX or SIP programming directly - avoid Cisco phones that require their management software

Communication

- Text-based chat programs
  - Meshchat - designed for AREDN and works well in a decentralized environment.
  - Mattermost - similar to Discord or Slack and can be self-hosted
  - Talk / Chat in NextCloud
- Most tools in this space will be client / server so server needs robust connections
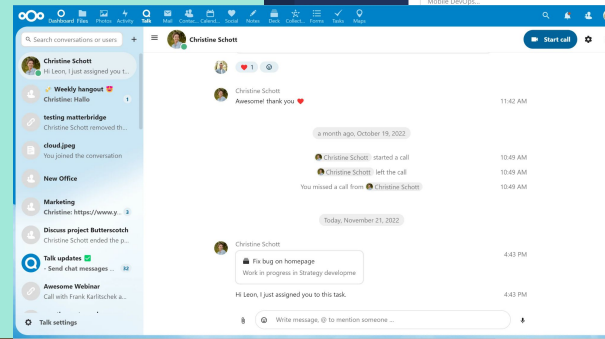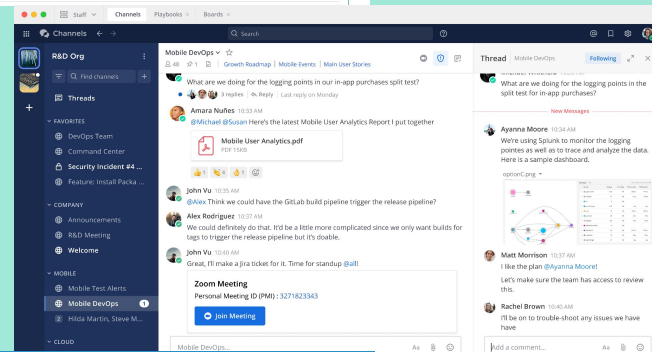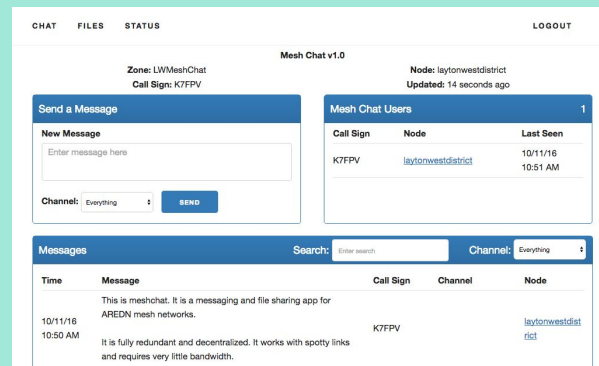
Communication

- Winlink
  - Allows emergency communicators to leverage a similar program / communication method
  - Via the mesh, Winlink can be run in
    - Post Office Box mode
    - Peer to Peer mode

Knowledge Sharing

- File sharing
  - NextCloud - think private and portable G Suite / Office 365
    - Collaboratively edit and share files
- Examples
  - Storage of SOP, ICS forms, etc for field use
  - Workload sharing for traffic - radio operator and form / messaging operator
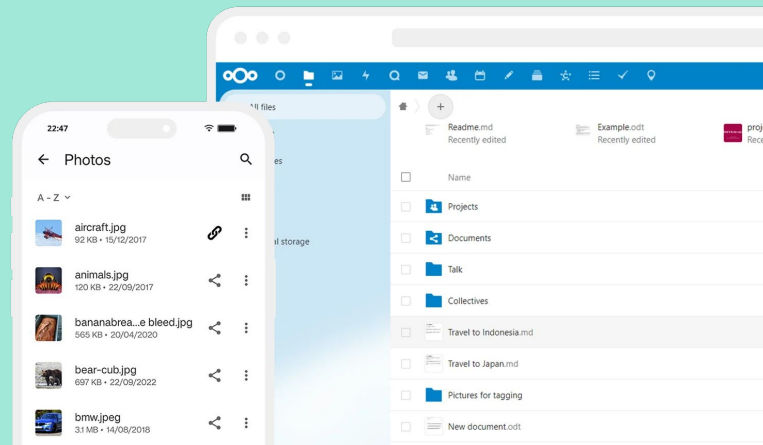
Knowledge Sharing

- CCTV
  - Power over Ethernet (POE) cameras
  - Allows users to see what's going vs having to have it relayed to them
  - Easily ran from boosted 12v power sources
- NVR (Network Video Recorder)
  - Frigate - open source container-based NVR

What equipment is used?

Local / Last Mile

- Your connection to the mesh - either your computer connected wired or wirelessly to a router
- Your router connects to the broader mesh either via direct RF (most likely through an external node antenna setup as a DtD - Device to Device) or through a tunnel to another node

Relay / Middle Mile

- Similar to a fill-in digipeater
- Highly directional antenna(s) to connect to the back-bone with less directional / segment antennas to providing connections to operator's local setups
- Used to increase coverage footprint
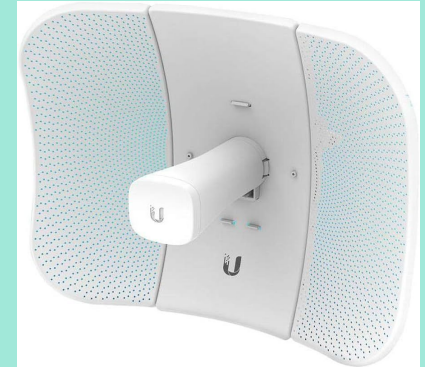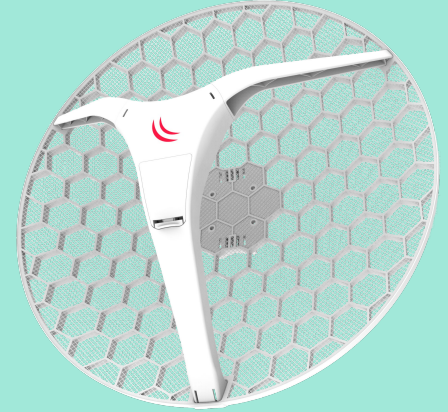
Backbone

- Usually point to point links between high points and are long haul connections
- Can provide local relay coverage for operators within their footprint

# Gwinnett AREDN Development

Current State

- Proof of Concept / Ground floor interest
    - Educating people on the capabilities of AREDN
    - Learn, prototype, and demonstrate these capabilities through deployments
    - Planning
        - Channels
        - SSID
        - Potential relay and backbone sites

Challenges

- Remember - all of these systems require line of sight
- We don't have any large elevation above average ground sites / we have a lot of rolling terrain
- Defining critical links between key sites and key operators
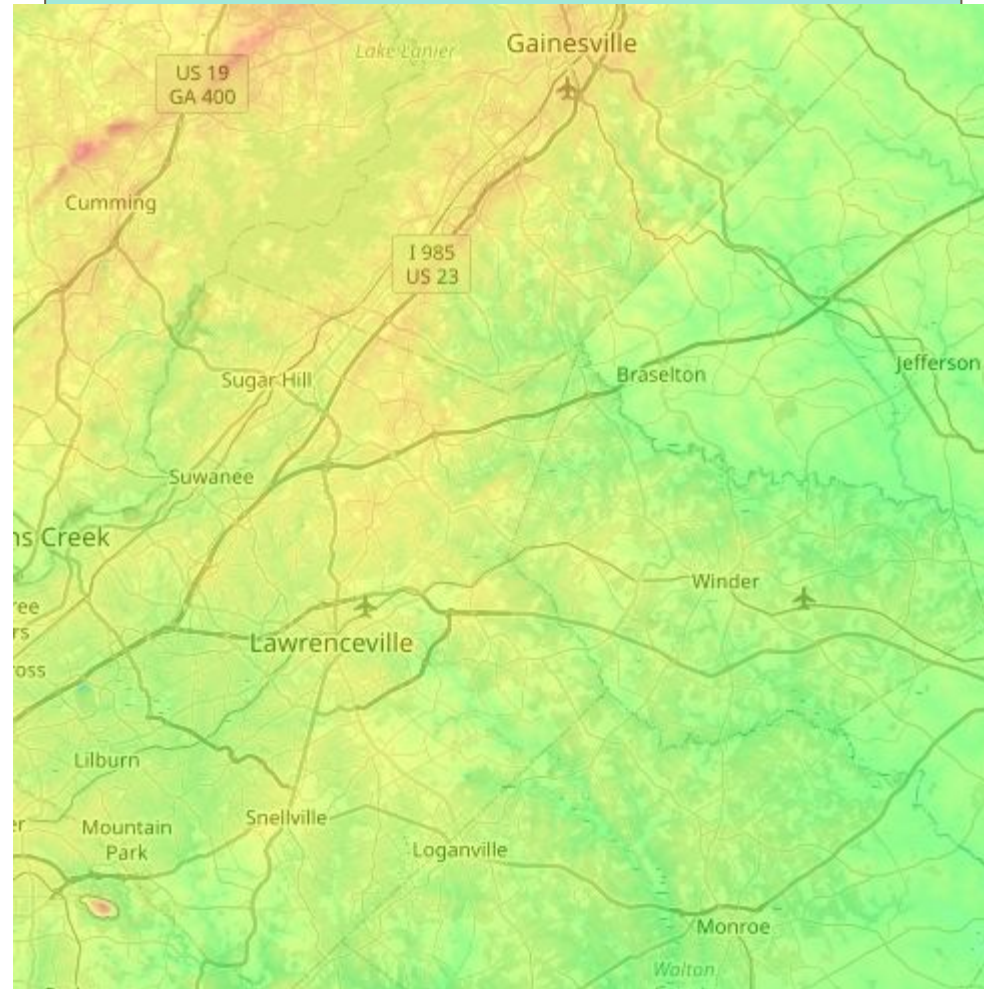
Upcoming Deployments

- Memorial Day Parade
  - Provide camera support for assembly point at church and high school to parade director
  - Potential VoIP communication between parade director and assembly point
- GA Death Race
  - Ultramarathon in N GA Mountains
  - Provide camera support to ensure runner check-ins aren't missed
  - Provide race status / communication to aid stations to allow them to self-serve
  - Balance workload among operators

Getting Started

First Hardware

- Mikrotik HAP AC Lite
    - The original workhorse of AREDN
    - Starting to show its age with hardware specifications and port speeds
- OR Mikrotik HAP AC2
    - While more expensive than the AC Lite, the AC2 is new, has better specs, and more future proof
- Un-managed switch for flashing firmware
    - TP-Link TL-SG105 is simple and cheap
- Computer to flash firmware

Documentation

- **http://www.arednmesh.org** is the go-to site for AREDN
  - Supported Devices: http://downloads.arednmesh.org/firmware/html/SUPPORTED_DEVICES.md
  - Current Software: https://www.arednmesh.org/content/current-software
- YouTube videos
  - Overview - https://www.youtube.com/watch?v=zXEV18FuruM
  - Flashing Mikrotik Nodes - https://www.youtube.com/watch?v=B3LEAAsIWEA

First Steps

- Flash your router with latest firmware and configure your node
- If you have an RF mesh network available in your area,
  - You will likely need an more directional node to connect to the mesh and your router via DtD
  - Reach out to local operator to see what are the channel and SSID configurations for the local mesh
    - The current meshmap is a great way to find users in your area - http://usercontent.arednmesh.org/K/5/K5DLQ/livemap2.html
    - Reach out to your local radio club
- If you don't have RF mesh access, you will need a tunnel
  - Similar to above, reach out to a local ham using the mesh map or your local club

Gotchas and Friendly Reminders

- Part 97 requires messages in the clear with no encryption, so no SSL / HTTPS when using services over the air on the mesh
  - SSL / HTTPS should be ok when tunneling

Questions ?