Bay Area Mesh

A Modern Approach to Emergency Communications

Agenda

- Re-Thinking Emergency Communications

- Introduction to the Amateur Radio Emergency Data Network (AREDN)

- Introduction to the Bay Area Mesh

- What is an Amateur Radio Mesh Network

- Getting Started Building an Amateur Radio Mesh Network

- SFWEM / BAM Grant – Kings Mountain and Beyond

- Services on the Mesh Network

- What's New

Re-Thinking Emergency Communications

- How well are we serving our served agencies?

- There is no doubt that traditional ham radios provide a reliable, proven method of communications, especially during a disaster

  - However, voice communications, especially when passing complex traffic, can be tedious and error prone
  - Data communications such as packet radio can be quite slow

- To many of our served agencies ham radio is a mystery and seems quaint and perhaps outdated

- They are used to communicating via email, text and phones

- What can we do provide these types of services during a disaster in order to make our communities more resilient?

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Re-Thinking Emergency Communications

Amateur

Radio

Emergency

Data

Network

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4
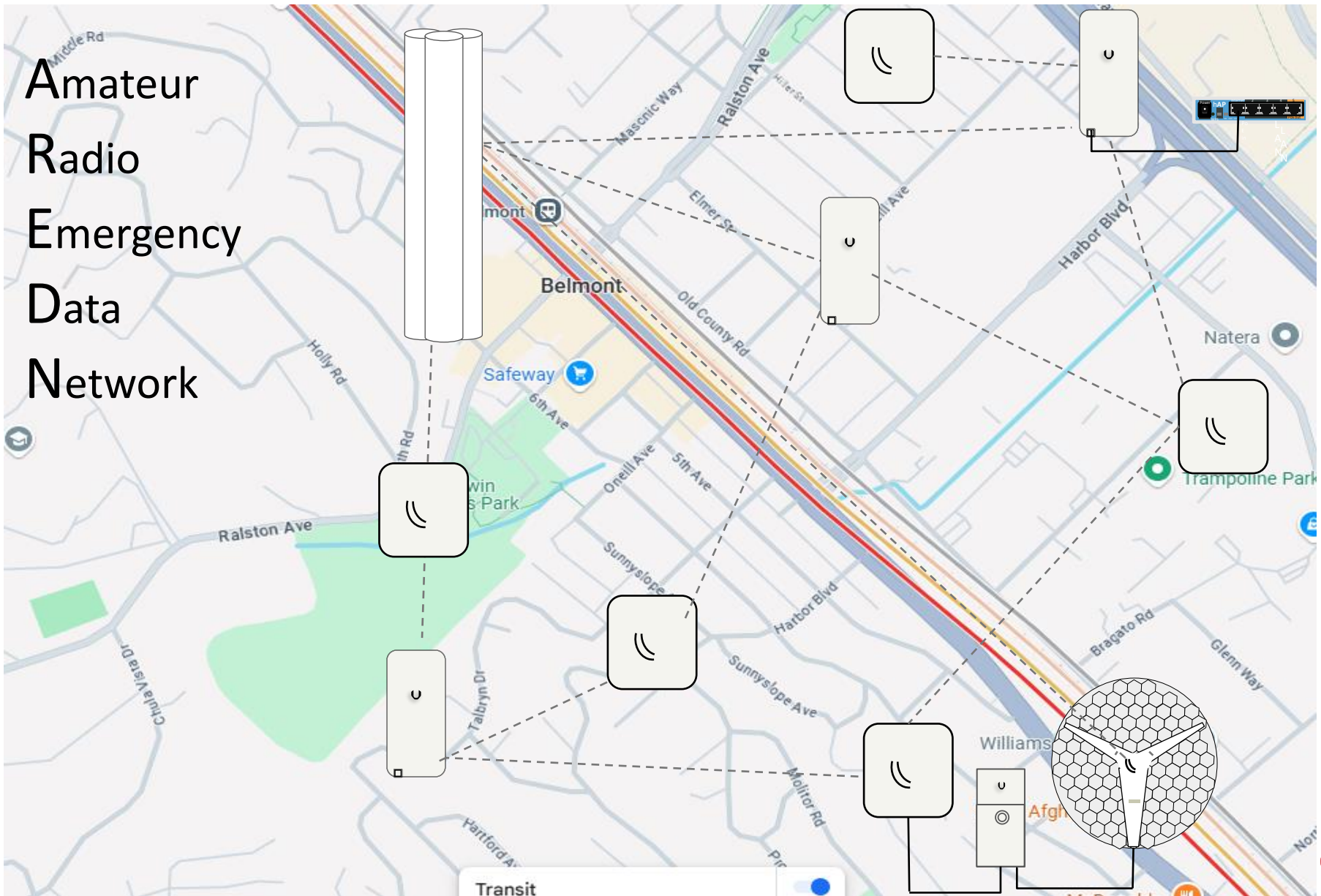
What is the AREDN Mesh Network System

- AREDN is the Amateur Radio Emergency Data Network

- Founded as a Non-Profit in Feb 2015 by former members of the Broadband Hamnet dev team

- Team members are volunteers who provide project management, development engineering and QA / Testing

- Ad Hoc TCP / IP based network

- Minimal configuration required with auto-discovery and self-healing capabilities

- Acts as a platform to provide network services such as chat / instant messaging, email, voice over IP, file and information sharing

- Uses off the shelf networking equipment

- Designed so that the average amateur radio operator can configure and manage their own mesh node

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5

What is the AREDN Mesh Network System

- Each Mesh Node is a self-contained single-board computer that runs the AREDN software

  - Linux – Base Operating System
  - OpenWRT – Open source wireless router project
  - AREDN – The various components used to connect multiple nodes together such as
    - Optimized Link State Routing (OLSR) – Routing protocol for adhoc networks. Will soon be deprecated in favor on Babel
    - Link Quality Manager (LQM)
    - Tunnel Server
    - Tunnel Client
    - And so on…

- AREDN 3.25.02.0 was just released!

  - The "Old UI" option is no longer available
  - New Mobile GUI
  - Backup / Restore Node Configuration
  - Upgraded to OpenWRT 24.10
  - Bug Fixes

https://www.arednmesh.org/

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6

What is the Bay Area Mesh Organization

- Bay Area Mesh (Formerly San Francisco Wireless Emergency Mesh) has been the driving force behind connecting the entire Bay Area to a common mesh network

- In Nov 2020 SFWEM was awarded a $100,000 grant from the Amateur Radio Digital Communications (ARDC) foundation

- With that grant, they were able to provide many organizations within the Bay Area with networking equipment to help jumpstart the mesh network in under served areas

- They continue to be the driving force behind the overall Bay Area mesh infrastructure

https://www.sfwem.net/

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7

Bay Area Mesh Map

BayArea AREDN

Band	Nodes
900 MHz	1
2.4 GHz	24
3.4 GHz	4
5 GHz	272
Supernode	1
No RF	139
Total	441

Last updated 11/15/2024, 4:16:57 PM

Ch 179

Ch 175

https://sfmap.xojs.org/#

Rachel Kinoshita – KK6DAC
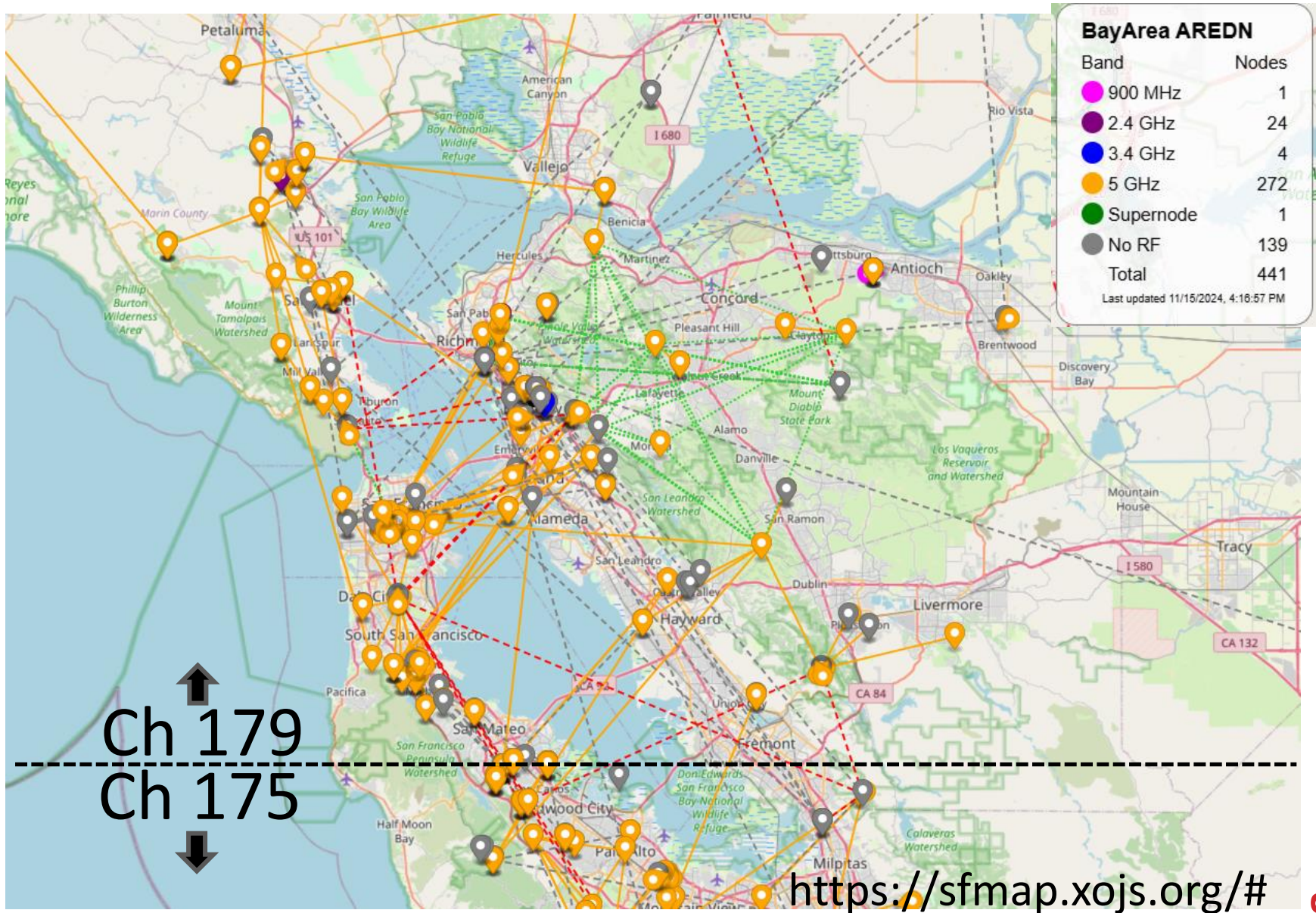
Bay Area Mesh Map (Peninsula)

BayArea AREDN

Band	Nodes
900 MHz	1
2.4 GHz	24
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5 GHz	272
Supernode	1
No RF	139
Total	441

Last updated 11/15/2024, 4:16:57 PM

Ch 179

Ch 175

https://sfmap.xojs.org/#

Rachel Kinoshita – KK6DAC
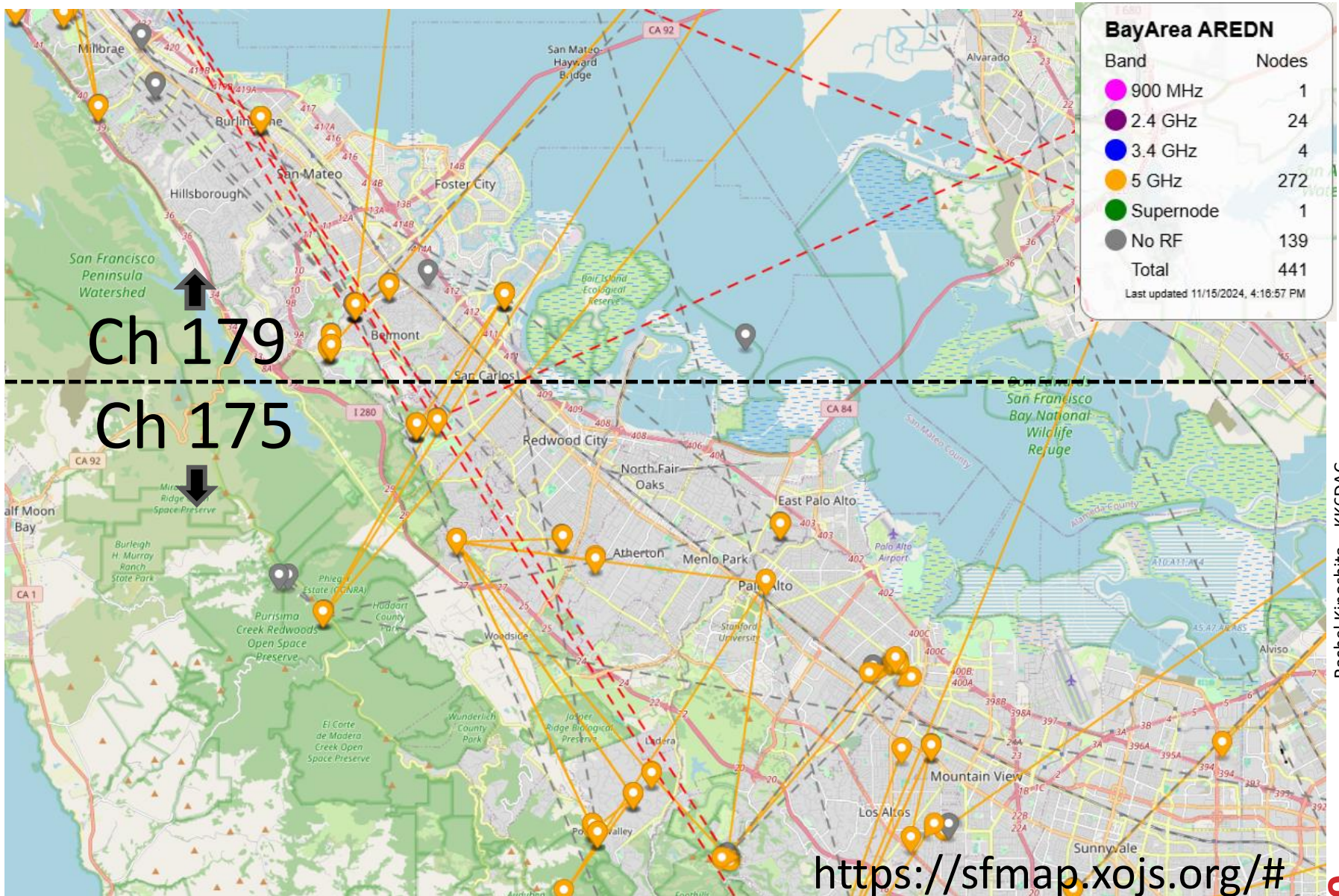
What is an Amateur Radio Mesh Network

As long as each node uses the same SSID, frequency and channel width and they are within range, the nodes will auto-discover each other
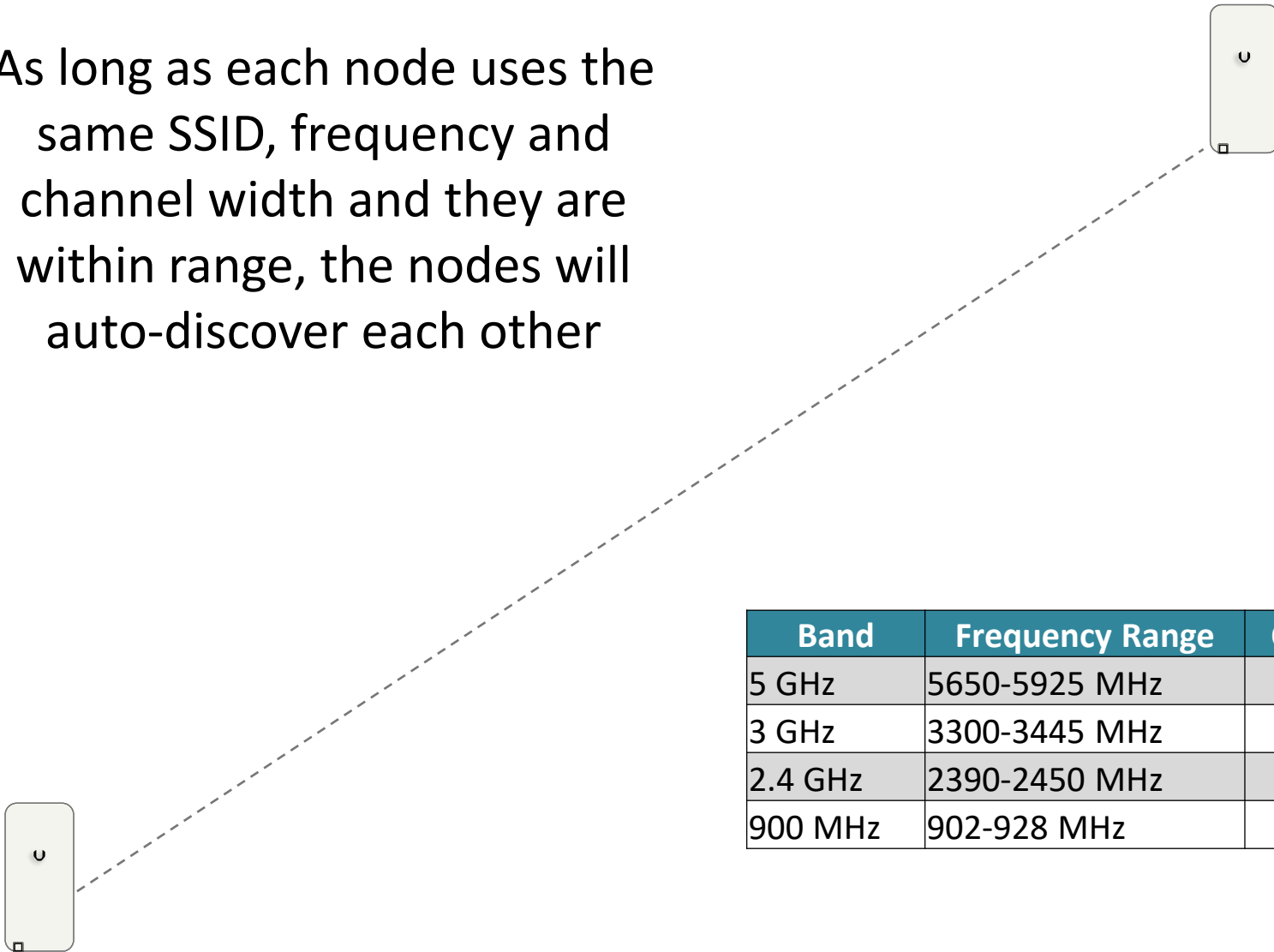
Band	Frequency Range	Channels
5 GHz	5650-5925 MHz	54
3 GHz	3300-3445 MHz	14
2.4 GHz	2390-2450 MHz	10
900 MHz	902-928 MHz	4

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What is an Amateur Radio Mesh Network

Mesh RF (5GHz)

Enable	☑
IP Address	10.212.134.10
Netmask	255.0.0.0
SSID	AREDN -10-v3
Channel	175 (5875) ⌄ ⊘
Channel Width	10 MHz ⌄

Mesh RF (5GHz)

Enable	☑
IP Address	10.212.134.10
Netmask	255.0.0.0
SSID	AREDN -10-v3
Channel	175 (5875) ⌄ ⊘
Channel Width	

157 (5785) ▲
158 (5790)
159 (5795)
160 (5800)
161 (5805)
162 (5810)
163 (5815)
164 (5820)
165 (5825)
166 (5830)
167 (5835)
168 (5840)
169 (5845)
170 (5850)
171 (5855)
172 (5860)
173 (5865)
174 (5870)
175 (5875)
176 (5880) ▼

Tx Power

Max Distance

Min SNR

Min Quality

ude 37.4613

tude -122.15...

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What is an Amateur Radio Mesh Network

Each node does not have to talk directly to other nodes in order to communicate
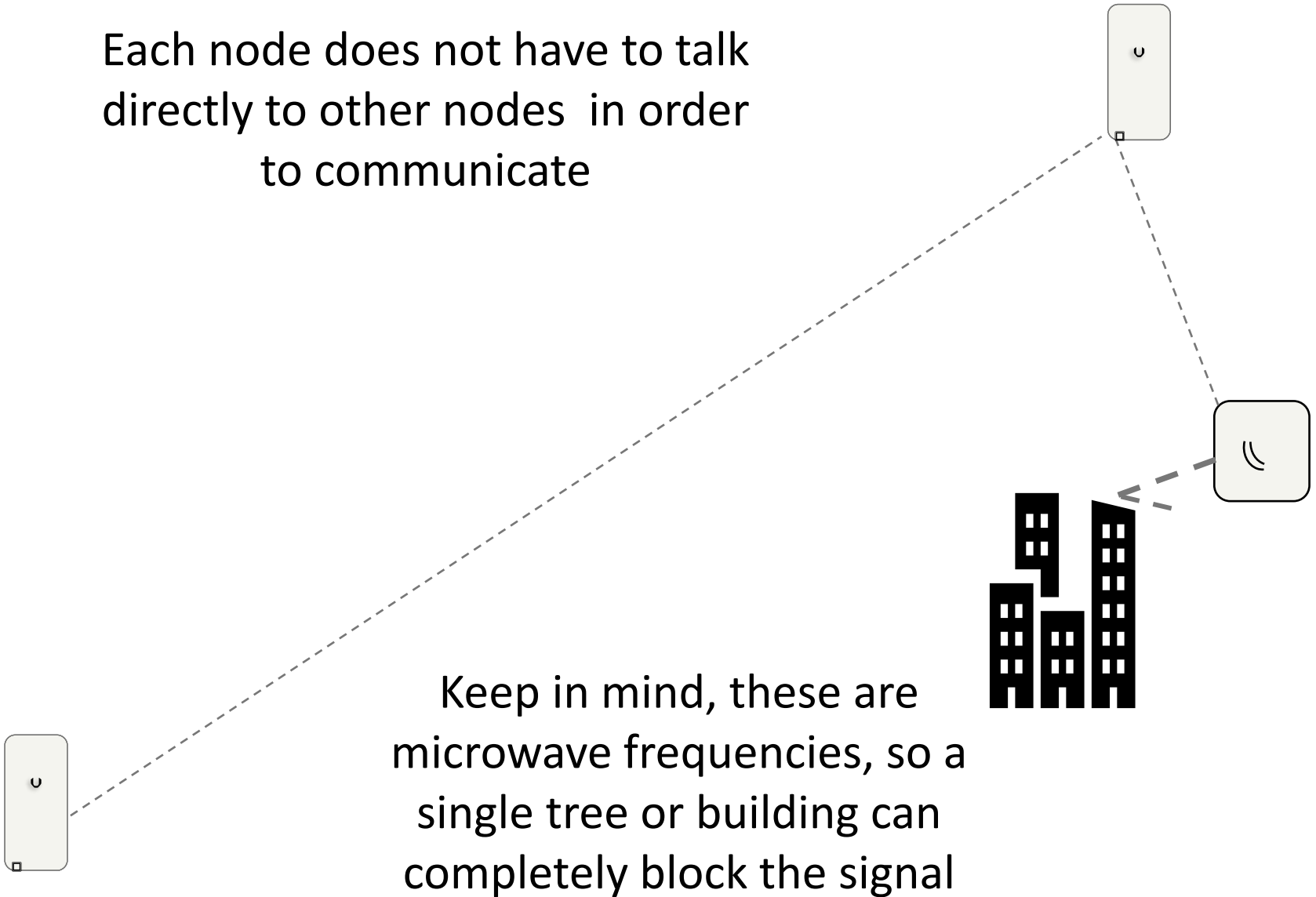
Keep in mind, these are microwave frequencies, so a single tree or building can completely block the signal

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What is an Amateur Radio Mesh Network

There is a fresnel zone between two nodes that must be clear of obstructions
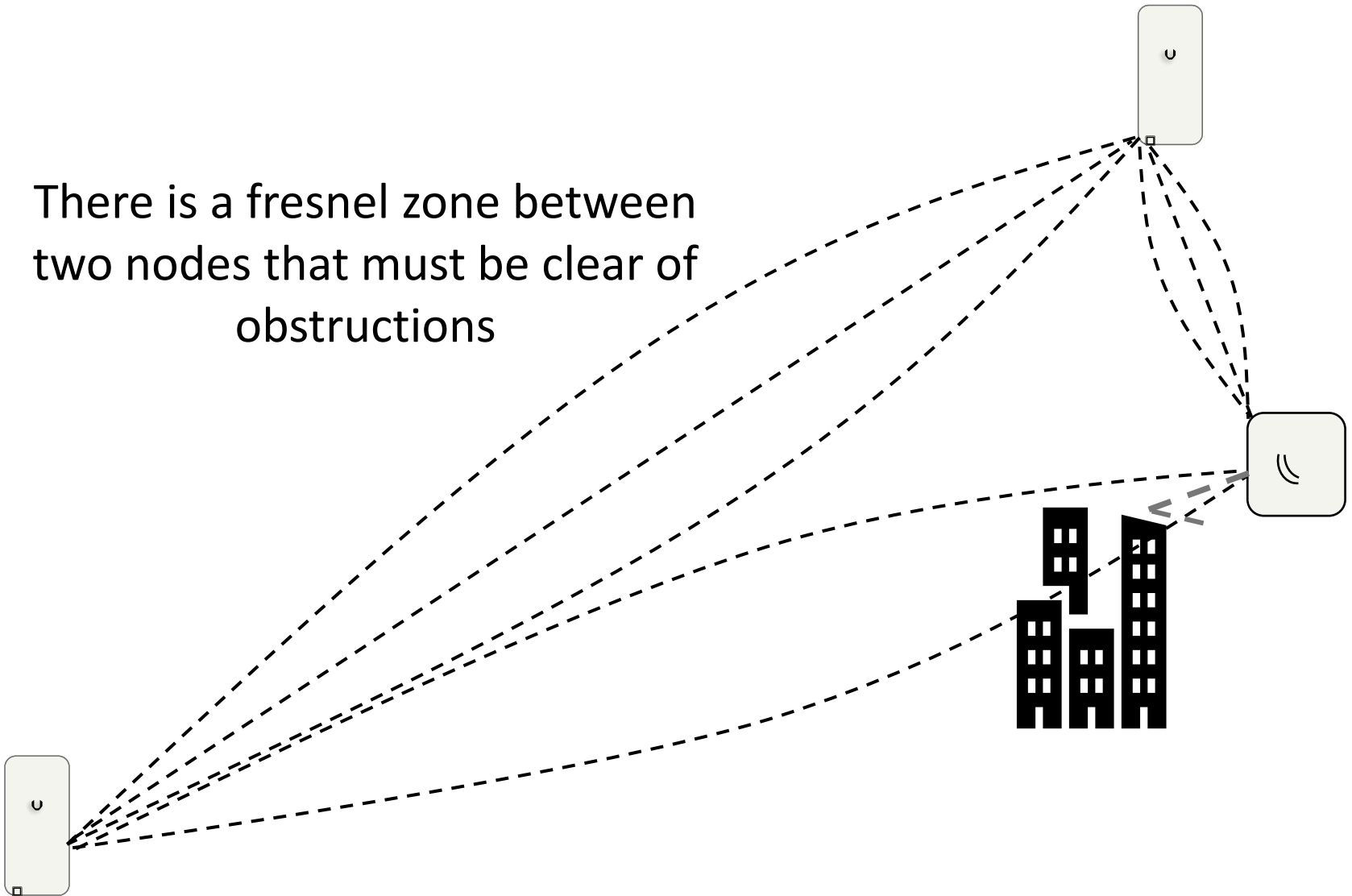
What is an Amateur Radio Mesh Network
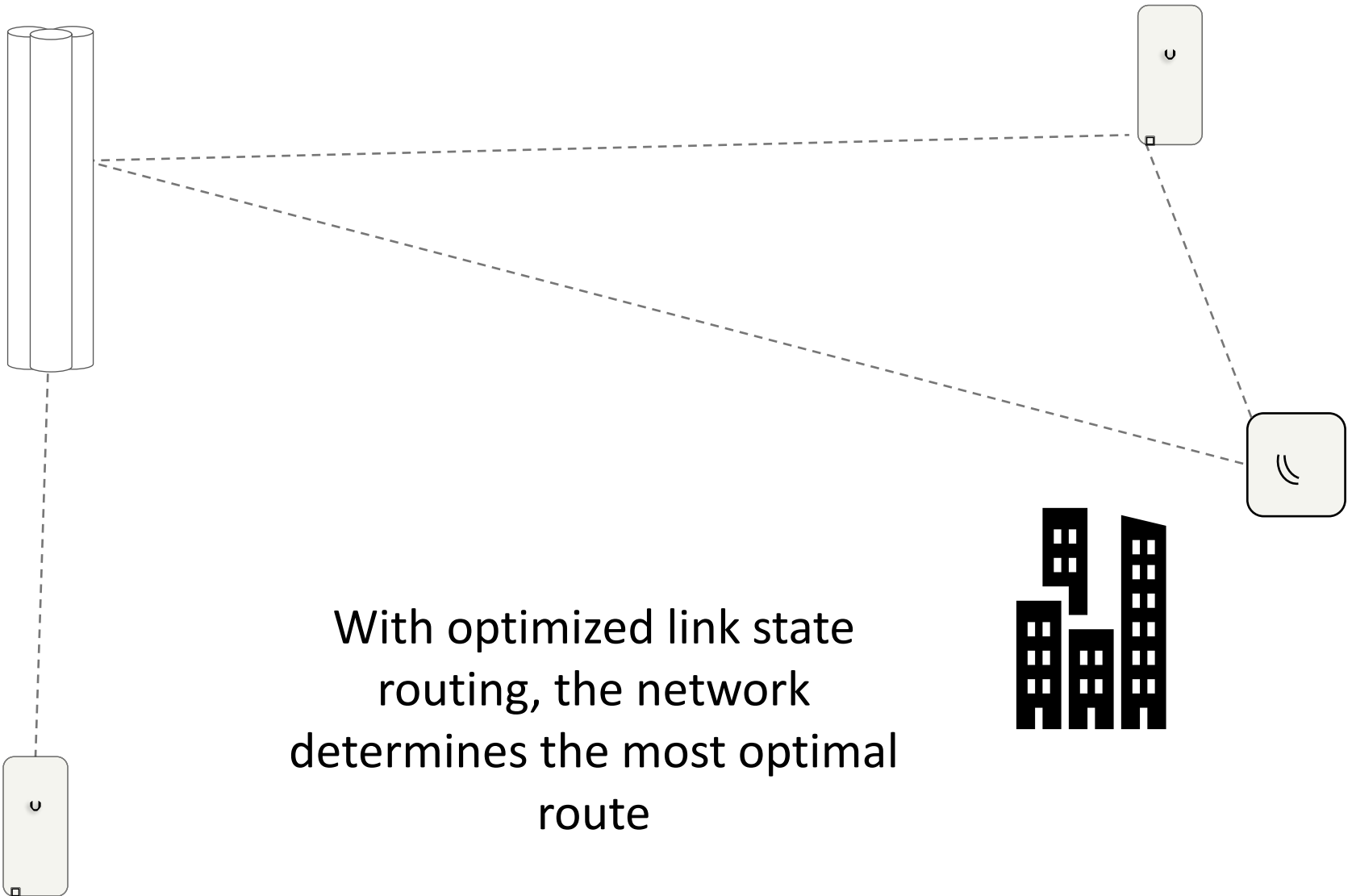
With optimized link state routing, the network determines the most optimal route

14

What is an Amateur Radio Mesh Network

Mesh nodes and cameras can be installed in remote areas to assist in monitoring for wildfires. Remote nodes can easily be powered by battery / solar

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15

What is an Amateur Radio Mesh Network

Mesh networks can be set up and torn down quickly to service specific events

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What is an Amateur Radio Mesh Network

Mesh networks can be set up and torn down quickly to service specific events

What is an Amateur Radio Mesh Network

Or after a disaster to provide communications to the effected community

What is an Amateur Radio Mesh Network

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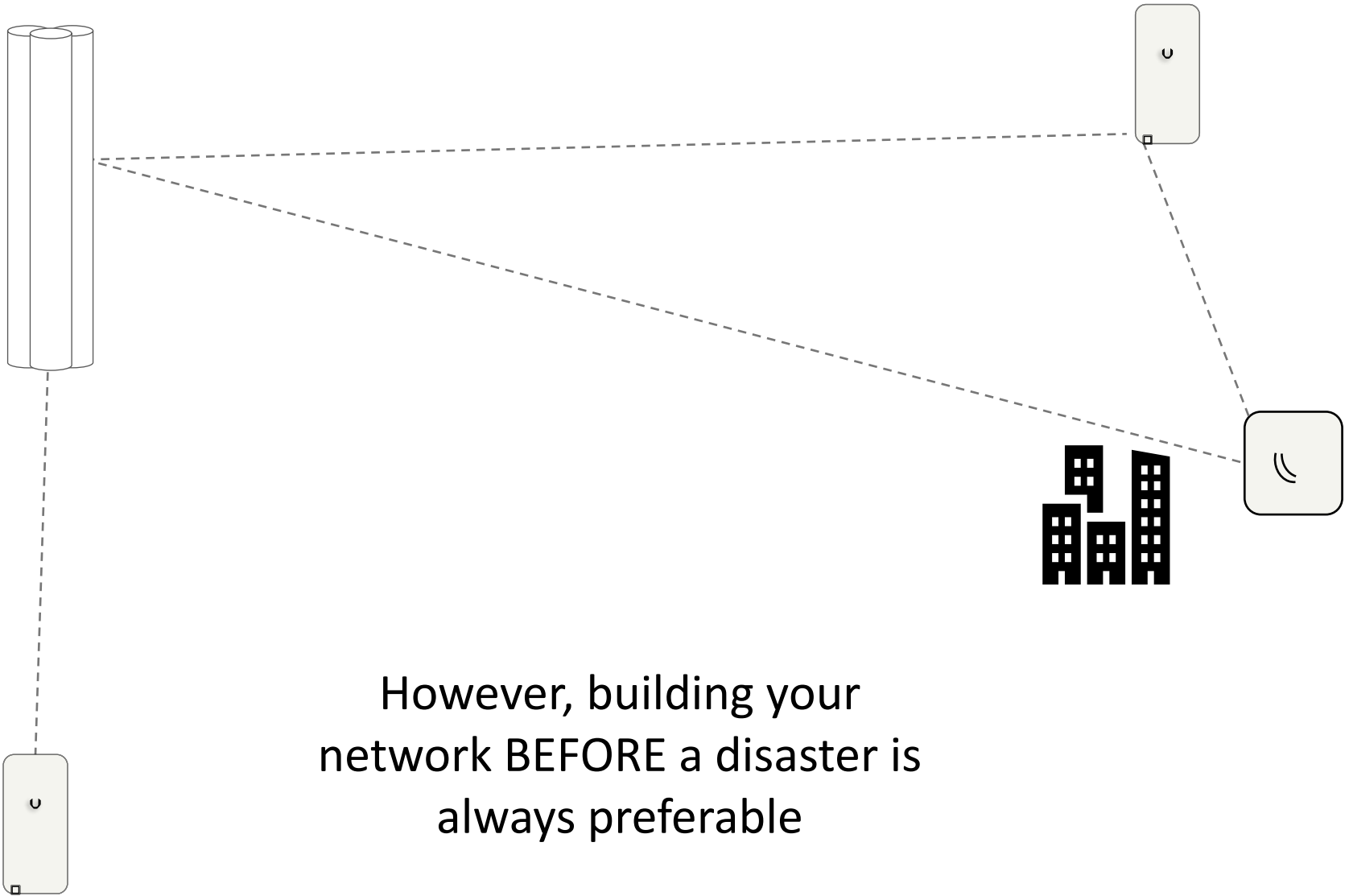
However, building your network BEFORE a disaster is always preferable

What is an Amateur Radio Mesh Networking

This allows you to build, test and practice on your network to ensure the highest quality communications
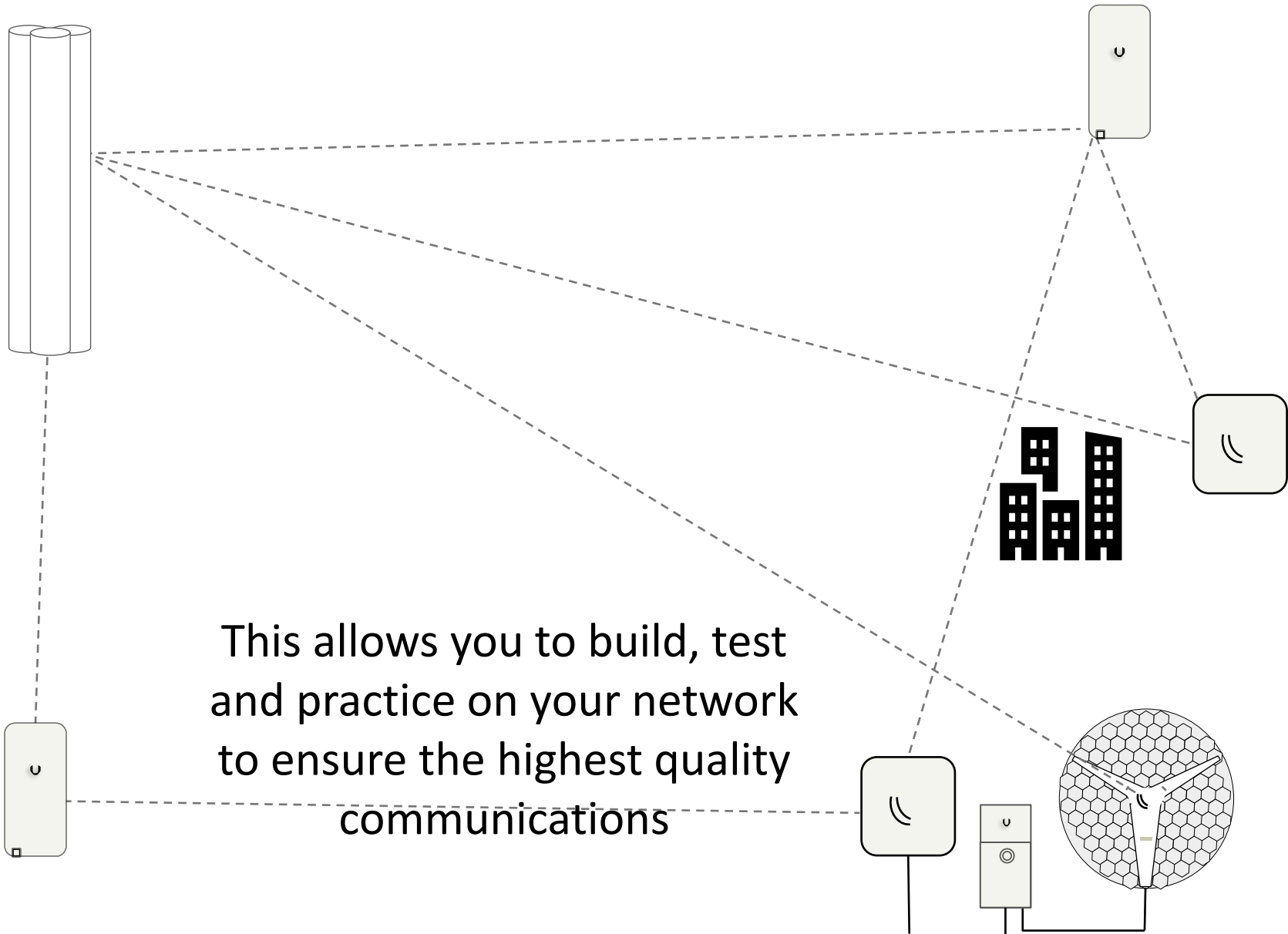
What is an Amateur Radio Mesh Networking

What happens when a node falls out of the network?
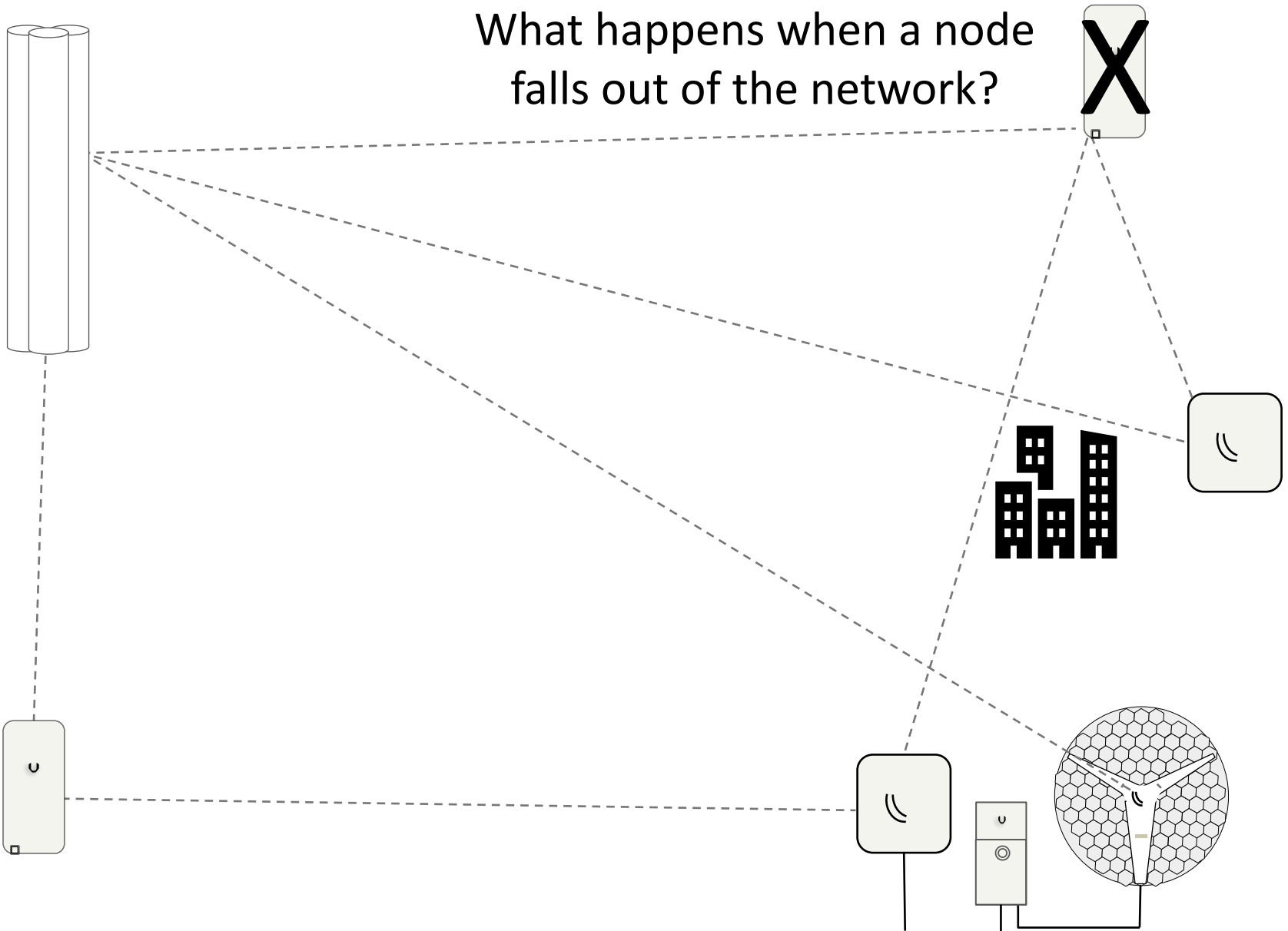
What is an Amateur Radio Mesh Networking

The mesh network "self-heals"
and continues to work

22
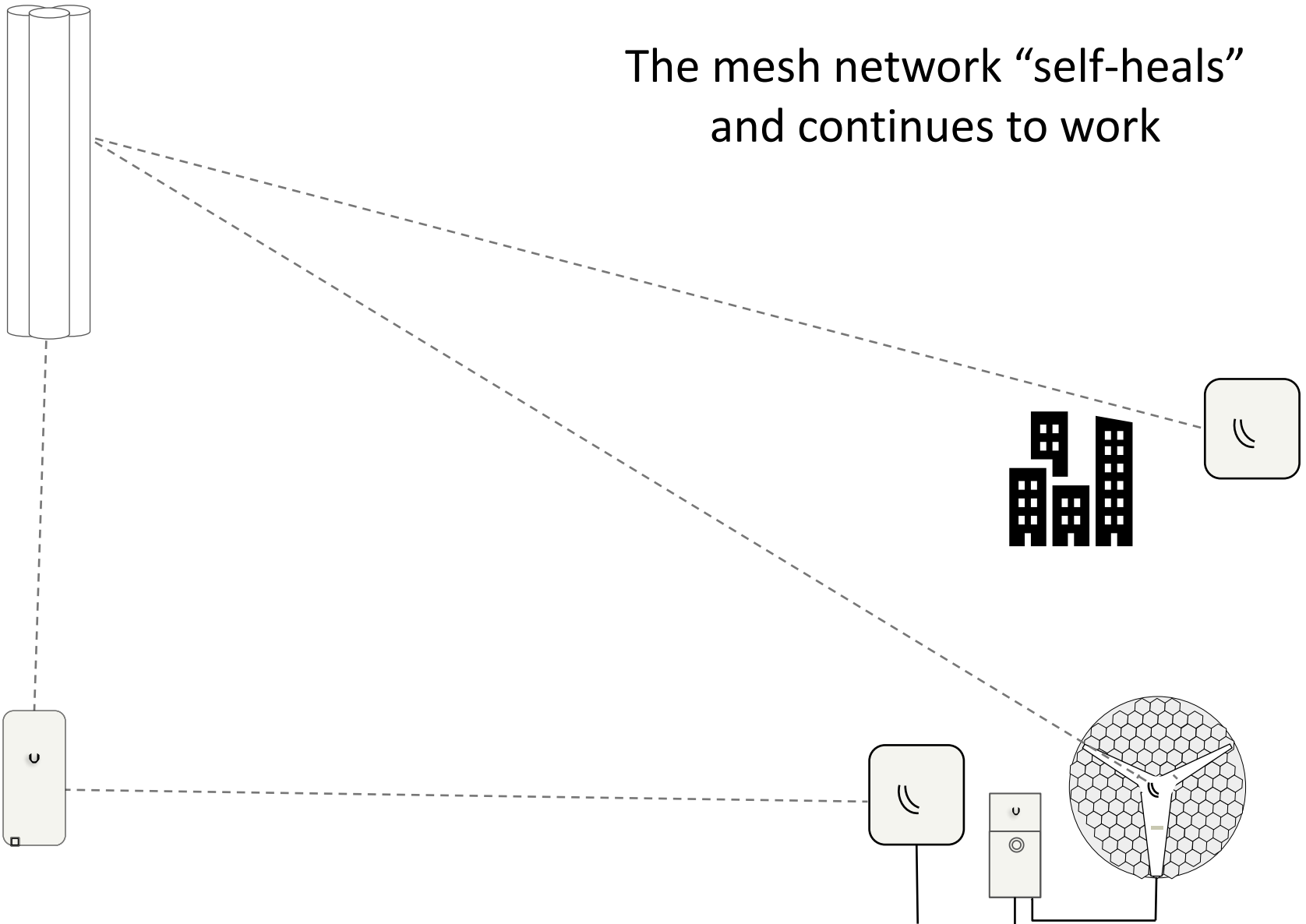
What is an Amateur Radio Mesh Networking

Once the node comes back online, it automatically rejoins the network

What Are SuperNodes

Bay Area Mesh

Oklahoma Mesh

Internet

So Cal Mesh

Texas Mesh

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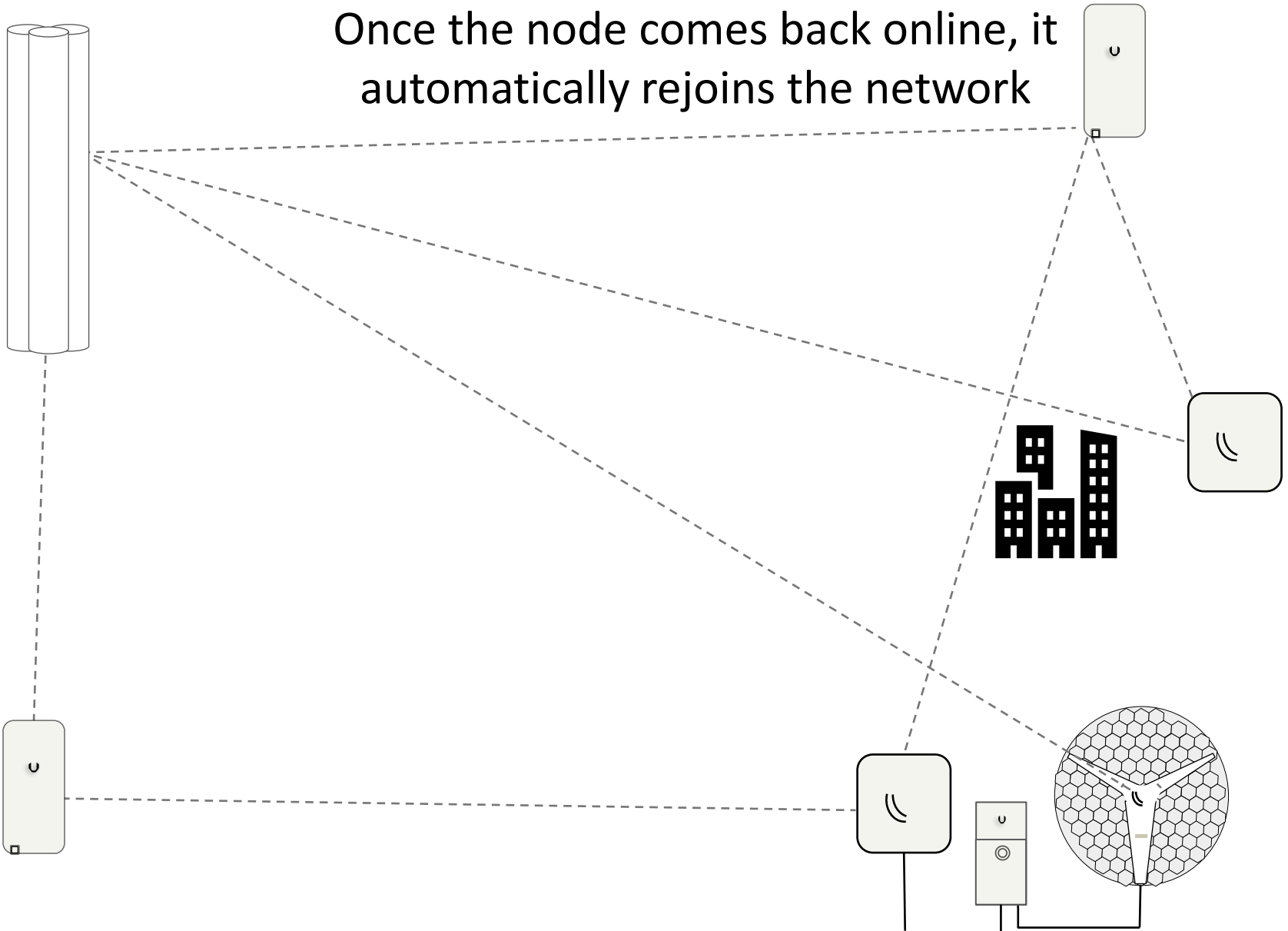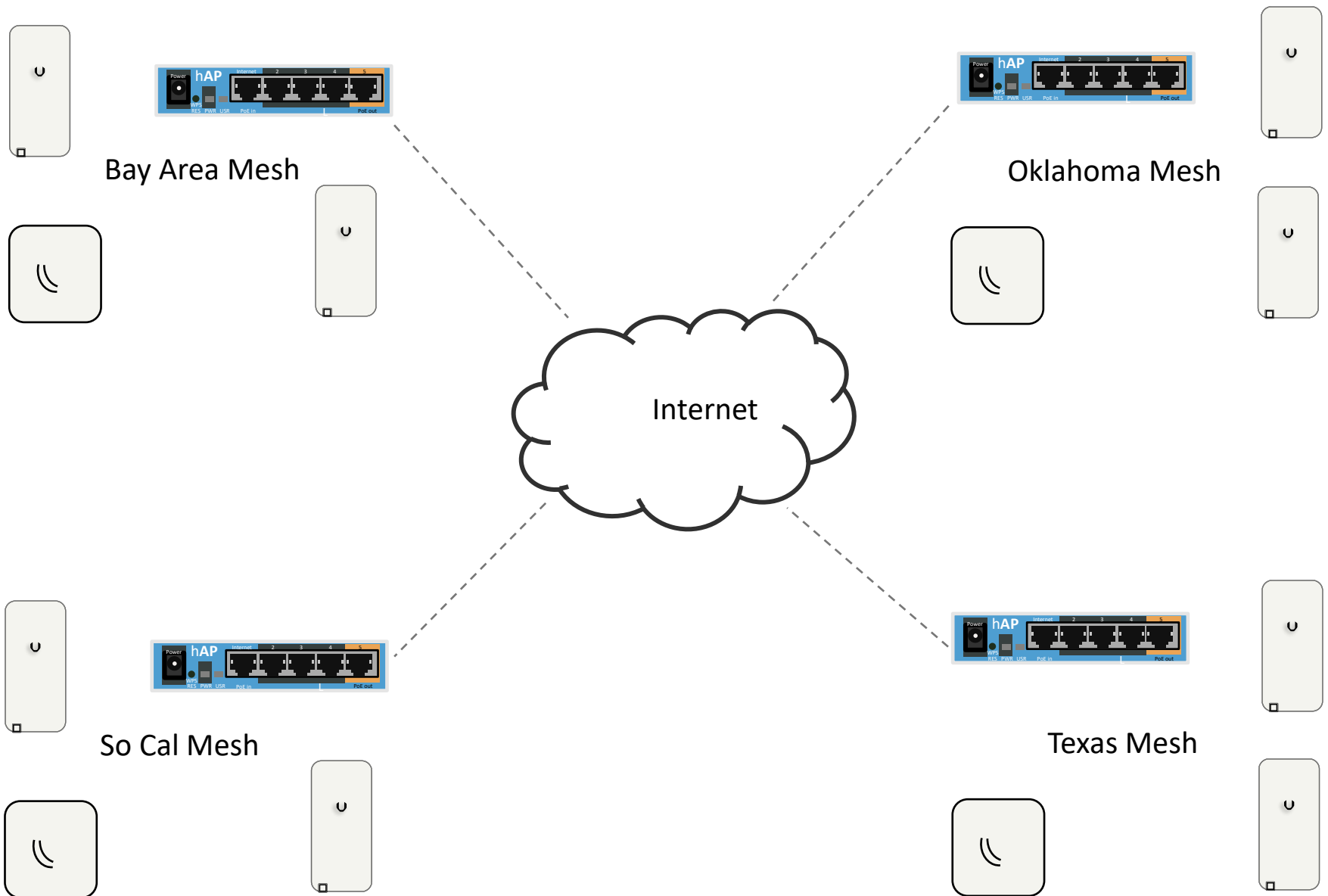
What Are SuperNodes

KN6PLV-BAM-SUPERNODE mesh

Search the mesh ...

EXCELLENT

KN6PLV-BAM-SUPERNODE 0	KE5YZP-NTX-SUPERNODE 0.1
VE3KPG-Kawarthas-Supernode 0.1	K5DLQ-HOU-TX-SUPERNODE 0.1
KN6PLV-HE-VERA 0.1	K1VL-SHREWSBURYVT-SUPERNODE 0.1

bambox2
kn6plv-graylog
bam-wiki   Wiki ⓘ
bam-uisp   UISP 🖥
kn6plv-grafana   Grafana 🖥
kn6plv-prometheus
kn6plv-he-ntp   NTP 🕐

W6BI-SOCAL-SUPERNODE 0.1	K7SWI-BOI-SUPERNODE 0.1
lan.W6BI-SOCAL-SUPERNODE.local.mesh	
K6GWE-tunnel-server 0.1	W3EX-PHL-SUPERNODE 0.1
	w3ex-piwxrx
	W3EX-PBX
WH6AV-SUPERNODE 0.1	KO7W-YAKIMA-SUPERNODE 0.1
KE6BXT-LASVEGAS-SUPERNODE 0.1	KI7LXY-AZ-SUPERNODE 0.1
HB9FTS-SO-SUPERNODE 0.1	KN6PLV-test-supernode 0.1
	lan.KN6PLV-test-supernode.local.mesh
KL7AA-AK-SUPERNODE 0.1	KU7PDX-HIO-SUPERNODE 0.1
KD9LPW-CHICAGO-SUPERNODE 0.1	KN6PLV-TEST-AR150 0.2
	lan.KN6PLV-TEST-AR150.local.mesh
KE5YZP-Colo-13-129-72 0.2	KN6PLV-TEST-AR750 0.2
	lan.KN6PLV-TEST-AR750.local.mesh
KN6PLV-TEST-HAP-AC2 0.2	KM6SLF-OC-SUPERNODE 0.2
lan.KN6PLV-TEST-HAP-AC2.local.mesh	km6slfdemo AREDN Demo🔗
KK6UC-SANDIEGO-SUPERNODE 0.2	KN6PLV-TEST-AR300M16 0.2
	lan.KN6PLV-TEST-AR300M16.local.mesh

VE3KPG-GATEWAY 0.2   DIRECT IP Dial 10.157.187.148
                           DIAL 1001 for Meshphone or
ve3kpg-meshserver   MeshMap🔗
                           MeshChat-Kawarthas🔗
                           Info🔗
VE3KPG-RMS   BPQ-32🔗

N9JIM-ALLISON-HAPAC2 0.2
AllisonCRS   AllisonRouter🔗

KN6PLV-TEST-ROCKET-M2-XM 0.2	
lan.KN6PLV-TEST-ROCKET-M2-XM.local.mesh	
KO7W-Ahtanum 0.2	
KO7W-RCEA8 earthquake monitoring🔗	

Getting Started Building an Amateur Radio Mesh Network

- Home / Edge Station

  - Mesh Node

    - MikroTik SXTsq 5 AC

    - Nanobeam AC

    - Nanostation AC

  - Outdoor UV rated ethernet cable

  - Wireless Access Point

- Hub / Backbone Station

  - Mesh Node

    - MikroTik mANTBox 15s

    - MikroTik mANTBox 19s

    - Ubiquiti Rocket AC Lite 5

    - Outdoor UV rated ethernet cable MikroTik super Low Loss 50cm RPSMA Cable

  - Backup Power (battery / solar), generator

https://bamwiki.xojs.org/index.php/Radios

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26

Home / Edge Nodes

Where to buy:
https://www.streakwave.com/

Ubiquiti
Nanostation AC

MikroTik SXTsq 5 AC

27

Hub Nodes

MikroTik
mANTBox 19s

Ubiquiti Rocket
5AC Lite

Ubiquiti Sector

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28

Plugging in Your Node

LAN = Local Area Network   POE = Power Over Ethernet

No POE   24vdc POE

LAN   POE
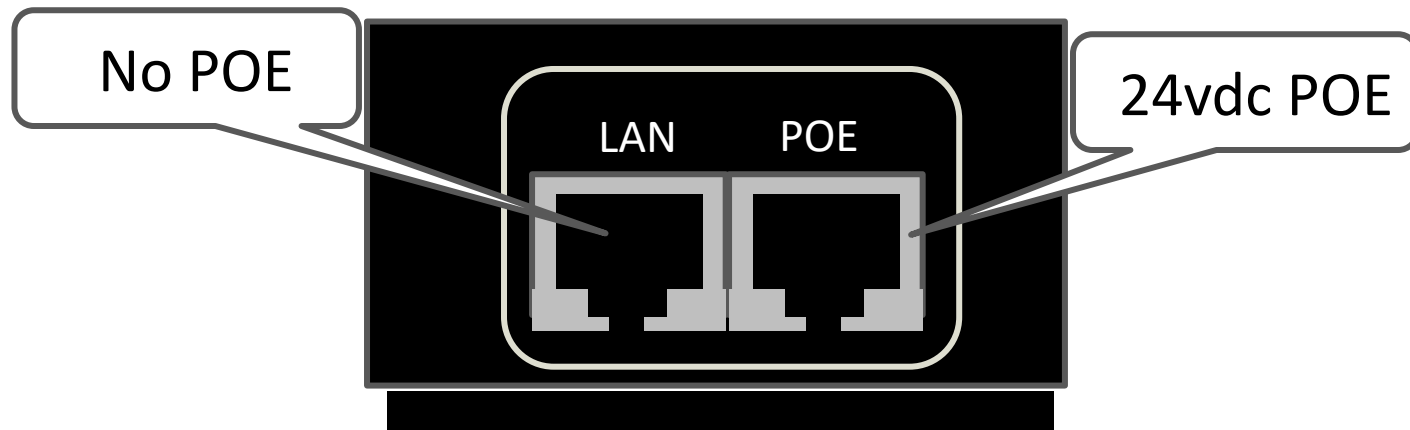
The POE Adapter is essentially a two port network switch

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Plugging in Your Node
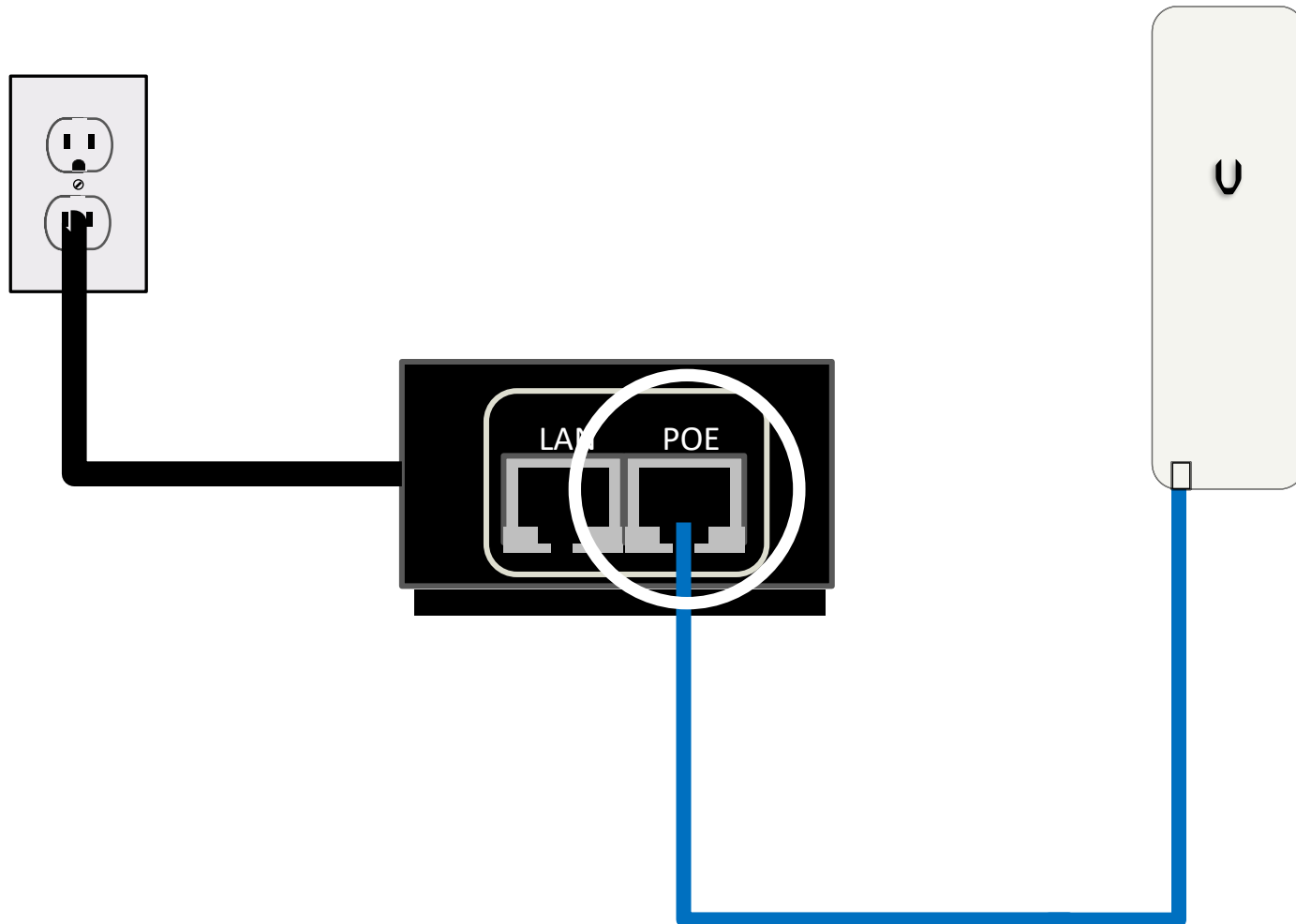
Supplies both power to the Nanostation
and Ethernet Connection

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Plugging in Your Node

LAN POE

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KK6DAC-NanoM5-01
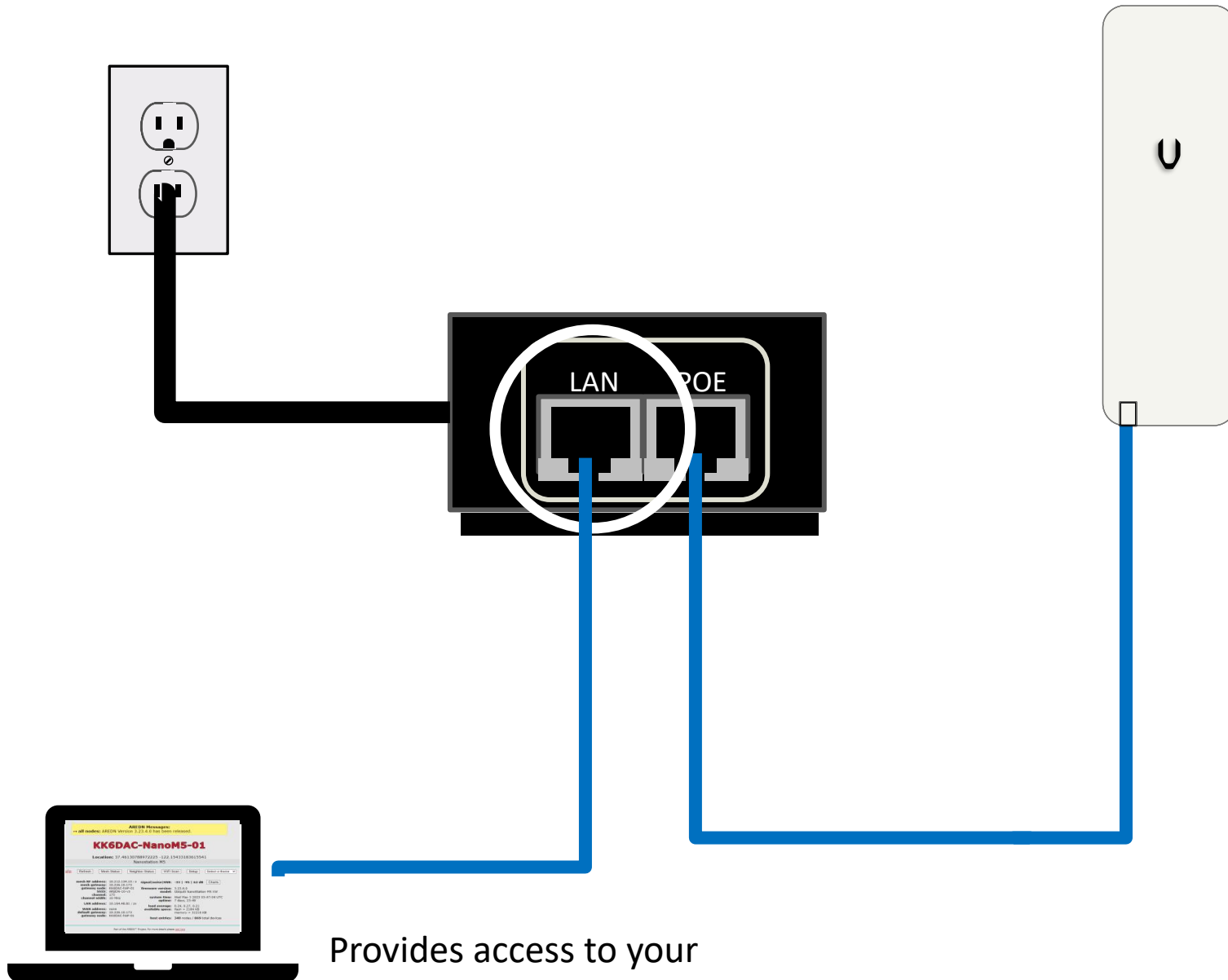
Provides access to your
mesh node

Plugging in Your Node

LAN

POE

KK6DAC-NanoM5-01

WIRELSS ROUTER
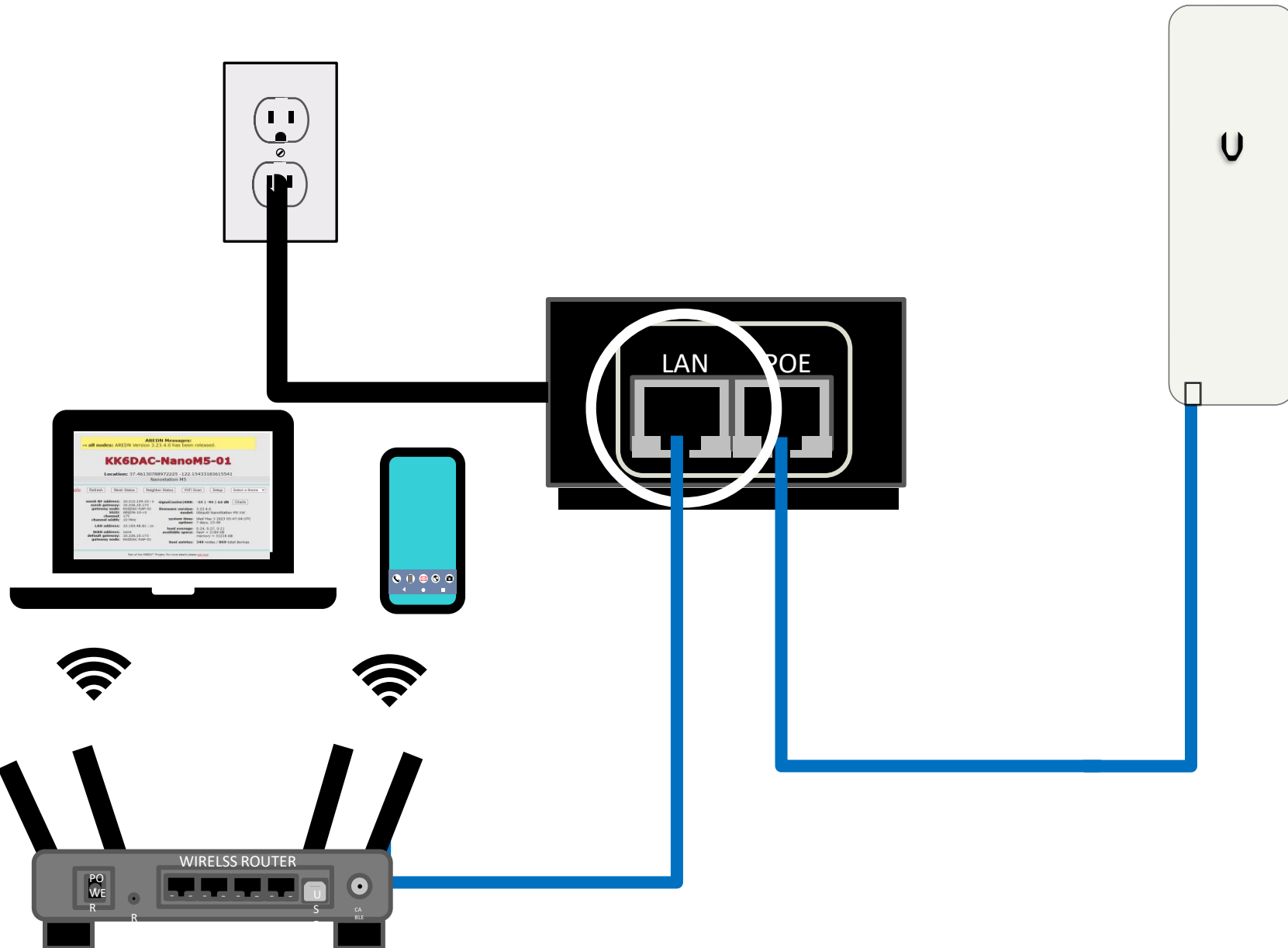
Plugging in Your Node

Connecting multiple nodes via Device to Device (DtD)

LAN POE   LAN POE   LAN POE

Simple Unmanaged Switch

NETWORK   Unmanaged Ethernet Switch

Power   1   2   5

When using a managed switch, create a VLAN for the Mesh ports

Plugging in Your Node

5ghz

5ghz

2.4ghz

LAN POE

LAN POE

LAN POE

DtD

NETWORK   Unmanaged Ethernet Switch

POWER   WIRELSS ROUTER

RESET   CABLE

Device to Device (DtD)

Device to Device (DtD)

Plugging in Your Node

5ghz

5ghz

2.4ghz

Ubiquiti NanoSwitch

Device to Device (DtD)

Device to Device (DtD)

POWER · WIRELSS ROUTER · USB

RESET · CABLE

LAN · POE
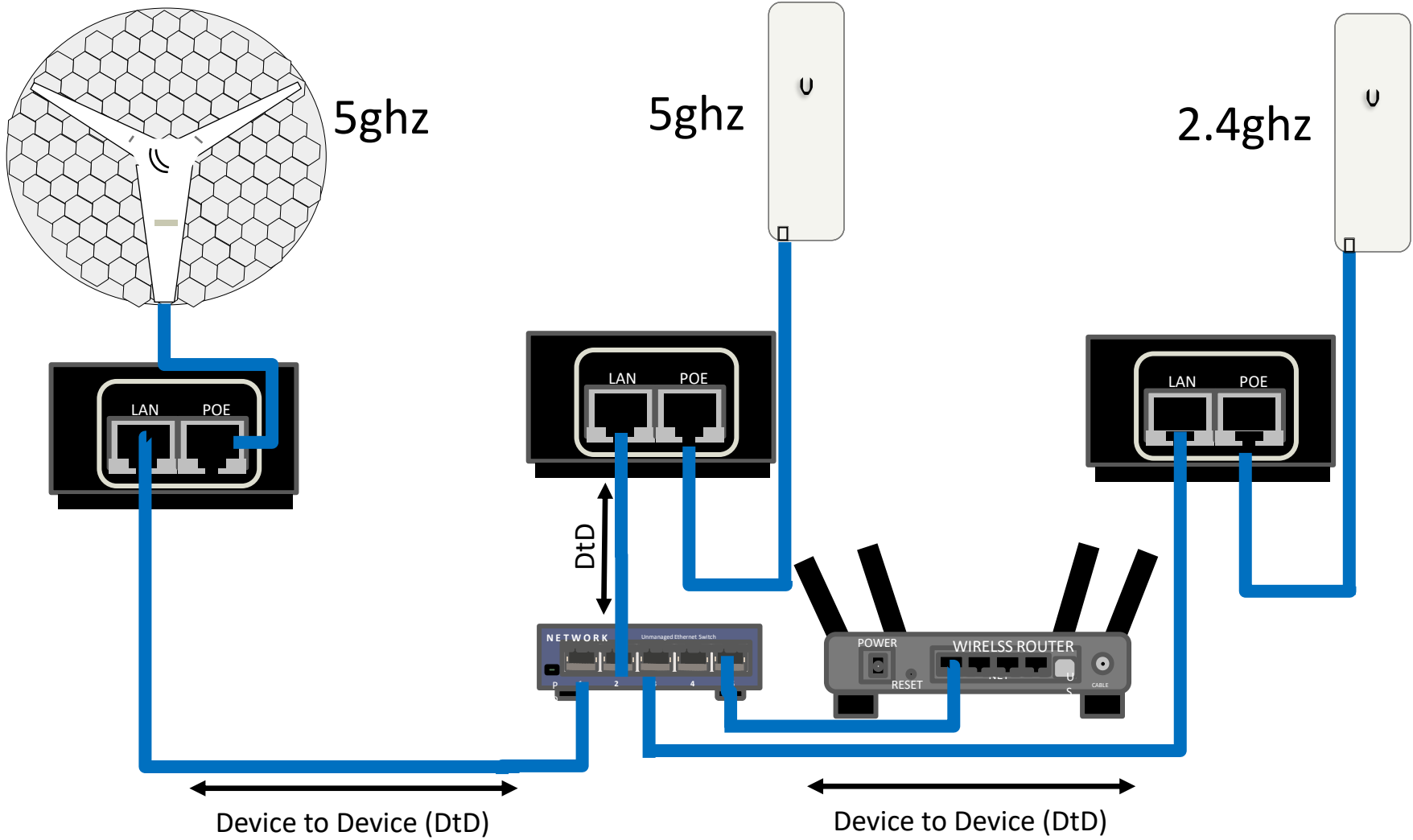
Plugging in Your Node (Battery)
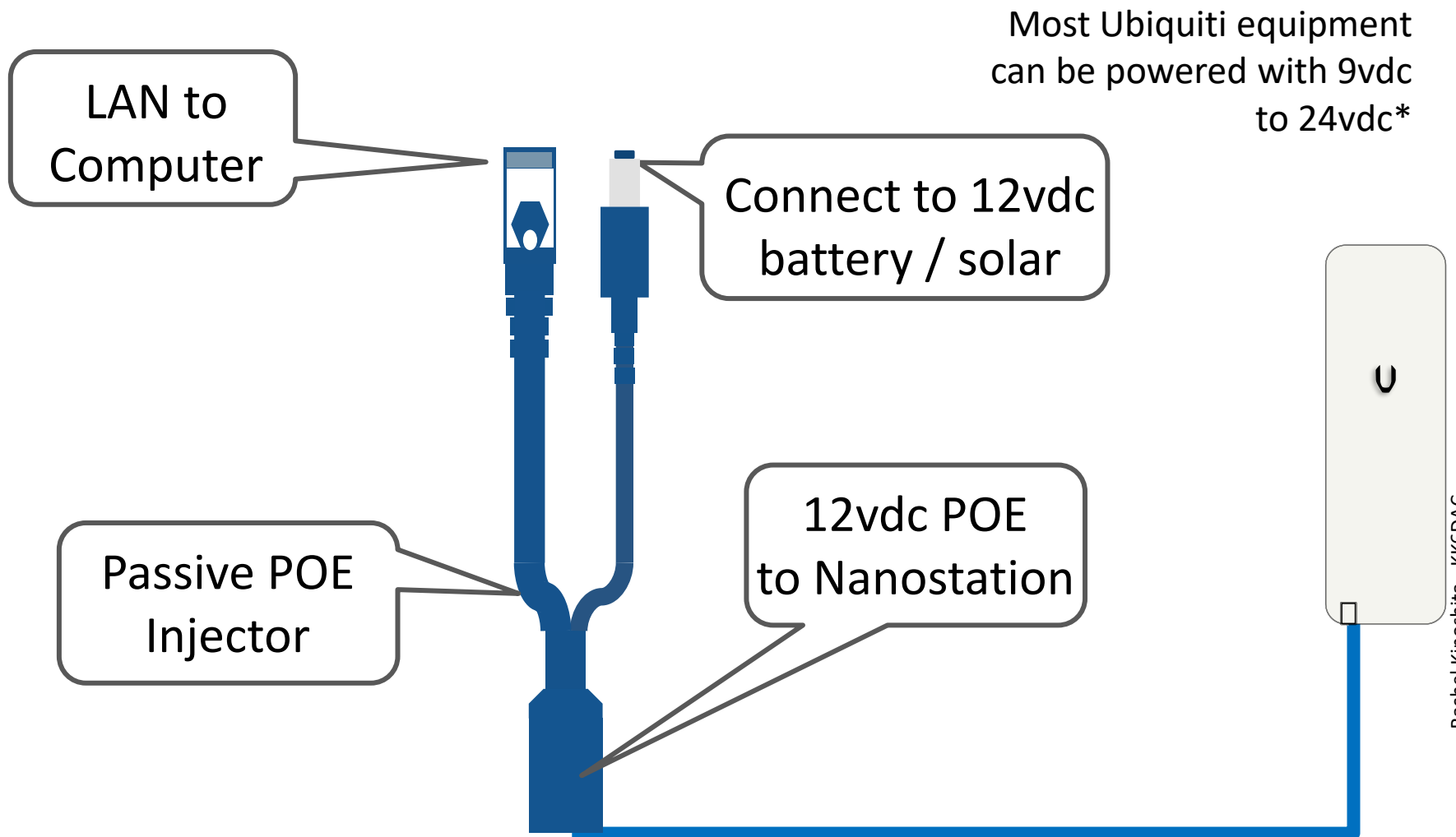
Most Ubiquiti equipment can be powered with 9vdc to 24vdc*

LAN to Computer

Connect to 12vdc battery / solar

Passive POE Injector

12vdc POE to Nanostation

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*Ubiquiti AC devices require a minimum of 14.6+vdc

Off-Grid Battery / Solar Single-Node Home / Edge
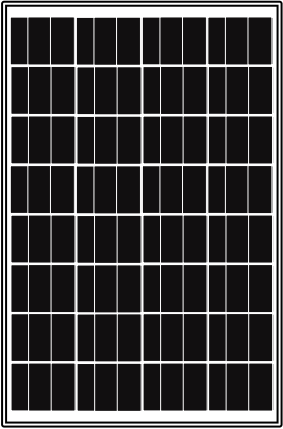
25 or 50W monocrystalline solar

6 or 10Ah @ 11.1vdc 3s TalentCell Lithium Ion

Generic 3a MPPT Charge Controller

4.5Ah @12.8vdc 4s Bioenno Power LiFePO4

Bioenno Power   12v 4.5Ah
P/N S83FS8A

Lithium Iron Phosphate

Genasun MPPT Charge Controller
Available for 4s LiFePO4 and 3s Lithium Ion

Mesh Node
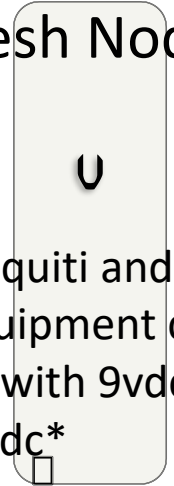
Most Ubiquiti and MikroTik equipment can be powered with 9vdc to 24vdc*

*Ubiquiti AC devices require a minimum of 14.6+vdc
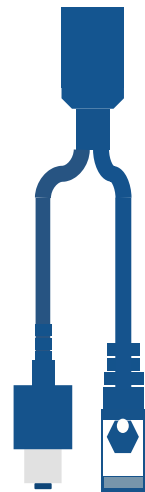
Passive POE Injector
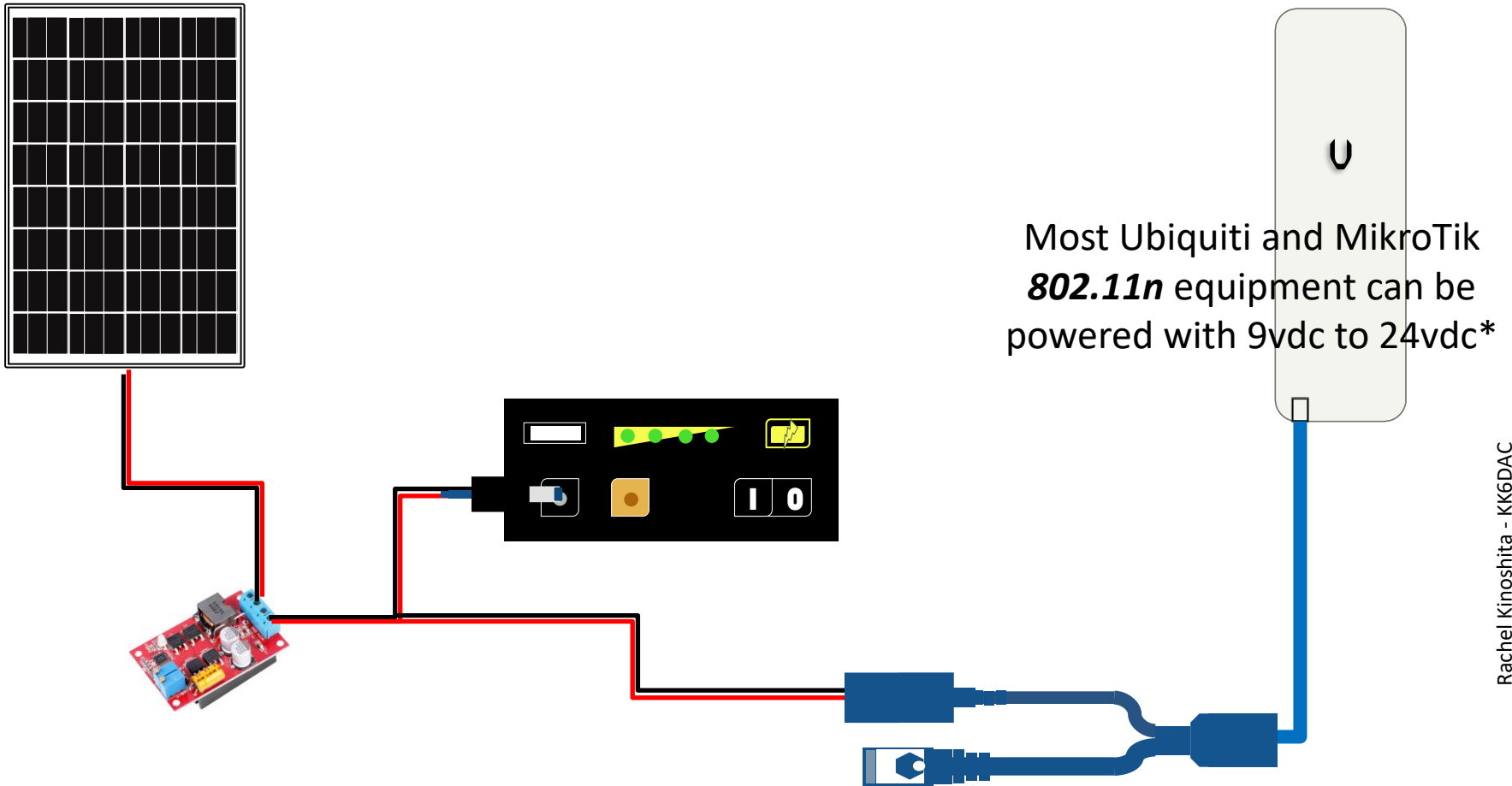
Rachel Kinoshita - KK6DAC

Off-Grid Battery / Solar Single-Node Home / Edge

Most Ubiquiti and MikroTik *802.11n* equipment can be powered with 9vdc to 24vdc*

Rachel Kinoshita - KK6DAC

*Ubiquiti AC devices require a minimum of 14.6+vdc

Off-Grid Battery / Solar Single-Node Home / Edge

Most Ubiquiti and MikroTik ***802.11n*** equipment can be powered with 9vdc to 24vdc*

GENASUN

LiFePO4 (4S) / 5A

PANEL

BATT

LOAD

Bioenno Power   12v 4.5Ah
                 P/N S83FS8A

Lithium Iron Phosphate

*Ubiquiti AC devices require a minimum of 14.6+vdc

Rachel Kinoshita - KK6DAC

Off-Grid Battery / Solar Single-Node Home / Edge

Most Ubiquiti and MikroTik
802.11AC equipment can be
powered with 14v to 24v*

GENASUN

LiFePO4 (4S) / 5A

PANEL

BATT

LOAD

Bioenno Power

12v 4.5Ah
P/N S83FS8A

Lithium Iron Phosphate

12 to 24v DC to
DC Upconverter

*Ubiquiti AC devices require a minimum of 14.6+vdc

Rachel Kinoshita - KK6DAC
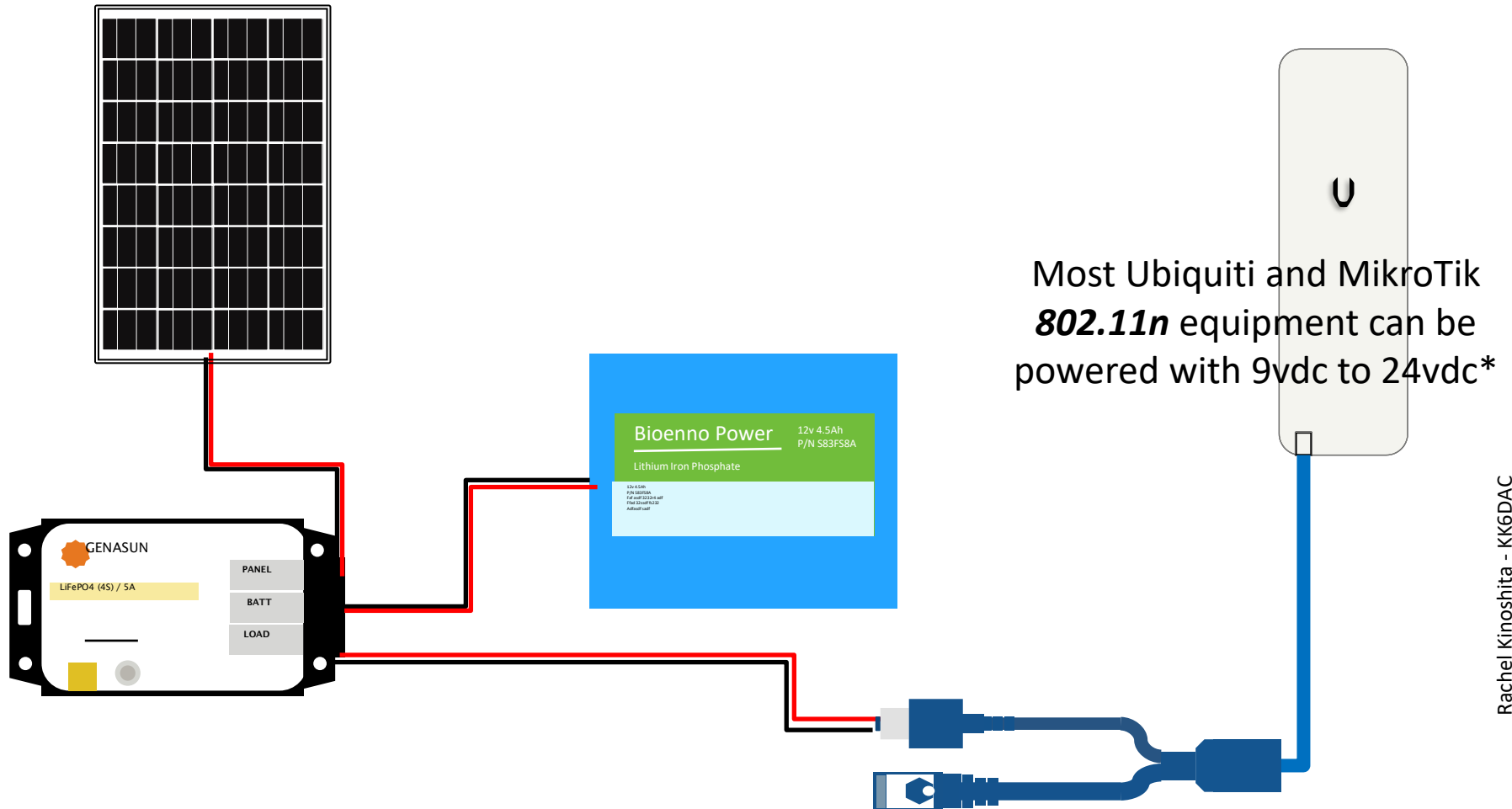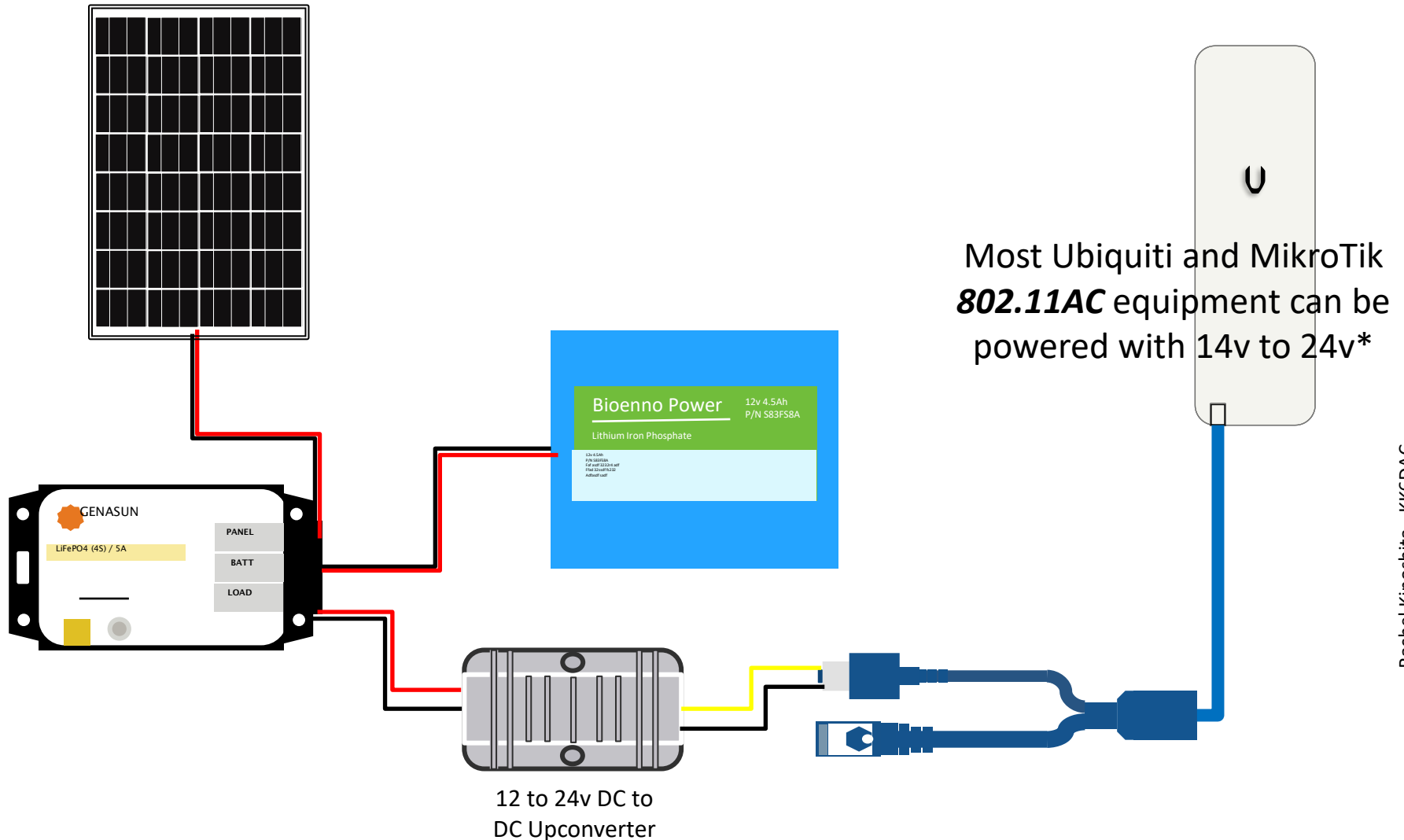
Off-Grid Battery / Solar Hub Station

24v Solar Panel or
2x 12v Solar Panels in
Series
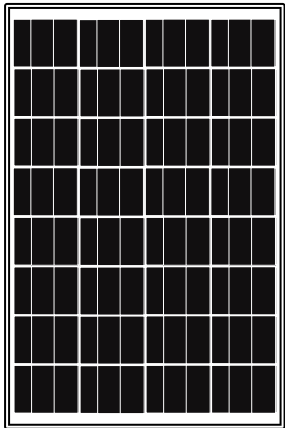
Ubiquiti SolarPoint

SolarPoint
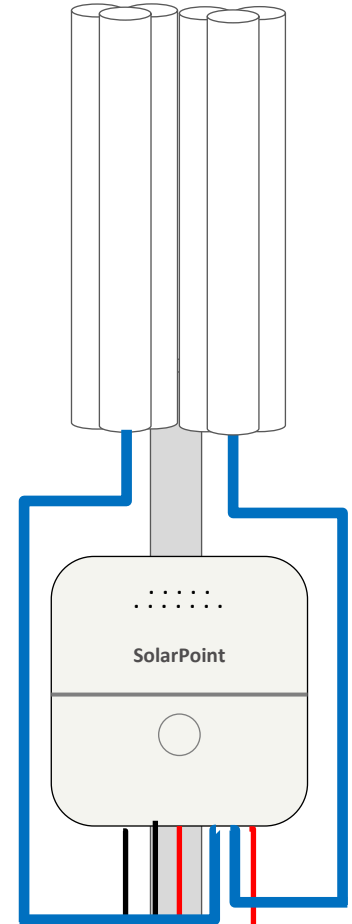
24v SLA battery or 2x 12v
Batteries in Series

SLA
Battery

SLA
Battery

Rachel Kinoshita - KK6DAC

44
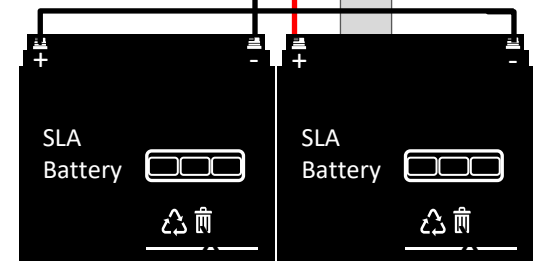
Bay Area Mesh -> SCARES Grant

- As part of the ARDC Grant, SFWEM/BAM offered "sub-grants" to clubs that committed to helping build out the mesh network

- SCARES applied for a grant for mesh nodes, cameras, outdoor UV resistant CAT 6 ethernet cable, RJ-45 connectors, etc

- Two Ubiquiti Rockets and 120-degree sector antennas and a PTZ camera have been installed on the Kings Mountain Radio Tower*

- 40 Nanostations have been distributed to our members and EOCs**

- 5 Ubiquiti PowerBeams to be used at EOCs

- Ethernet cables have been built and distributed

*Replaced with two Rocket AC Lites from SCARES budget
**Replaced strategic nodes with Nanostation AC from SCARES budget

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Typical Home Station
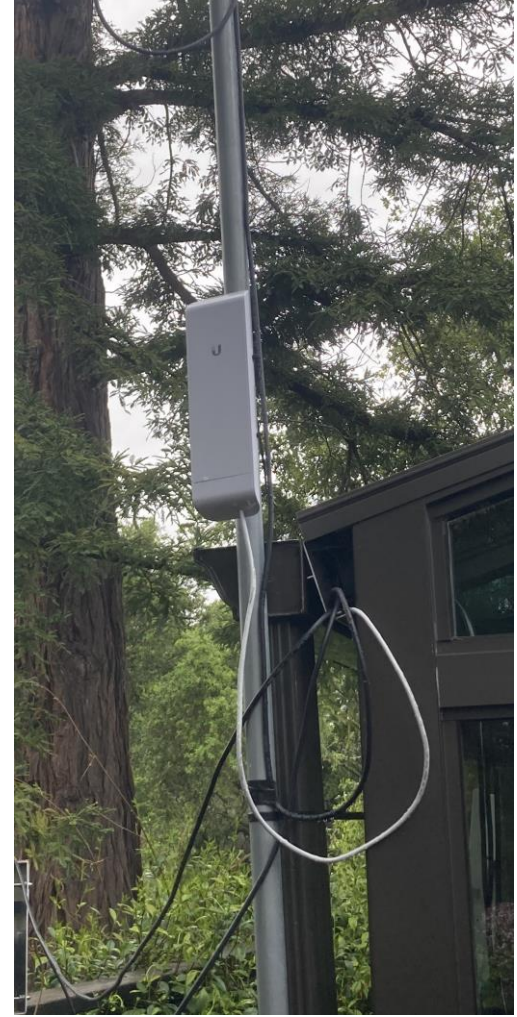
Typical Home Station

Kings Mountain Radio Tower
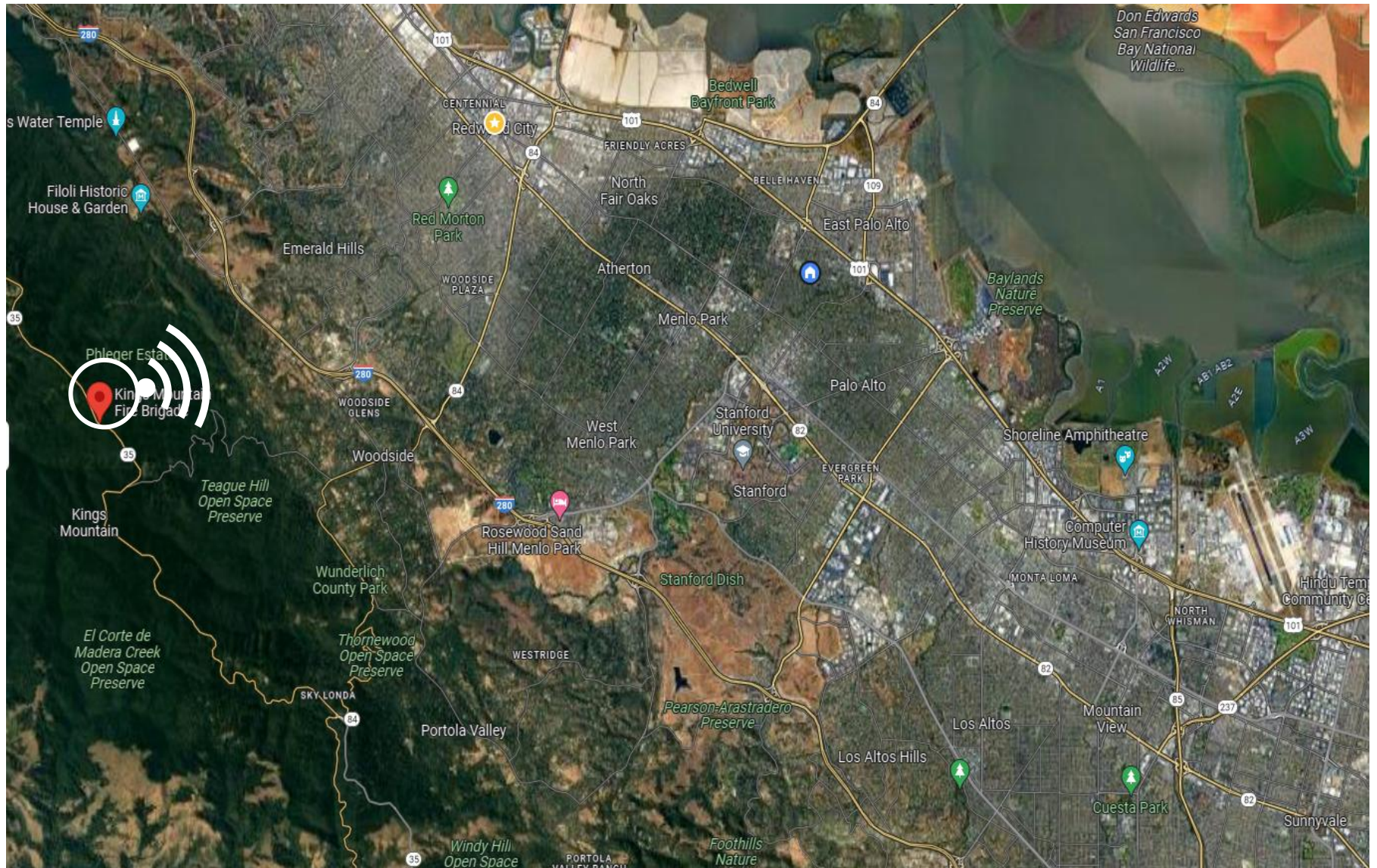
48

View from the Kings Mountain Radio Tower

Image courtesy of Frank Adams – N6YP

Rachel Kinoshita - KK6DAC

49

View from the Kings Mountain Radio Tower
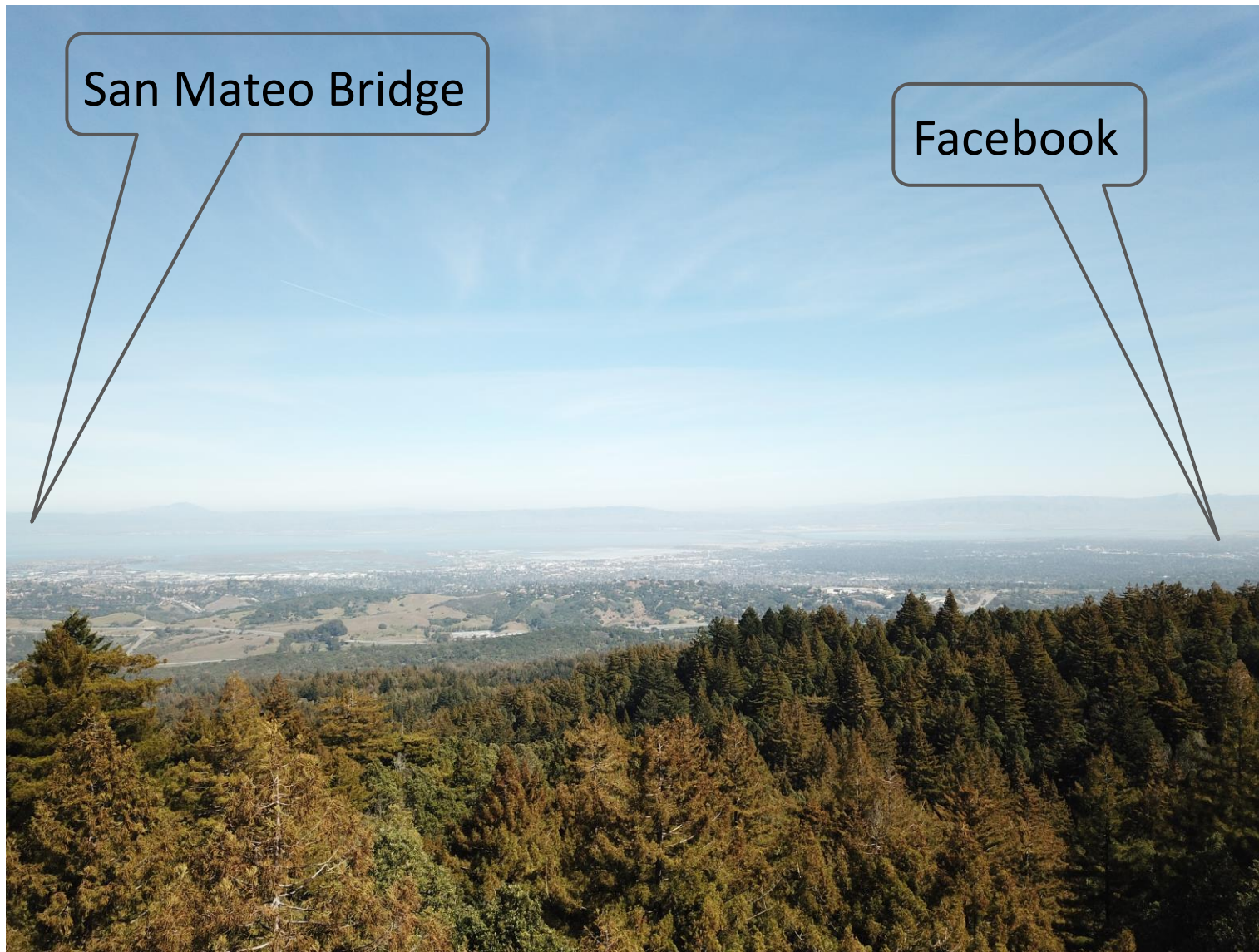
Image courtesy of Frank Adams – N6YP

K6MPN-Kings-Mtn-North and South
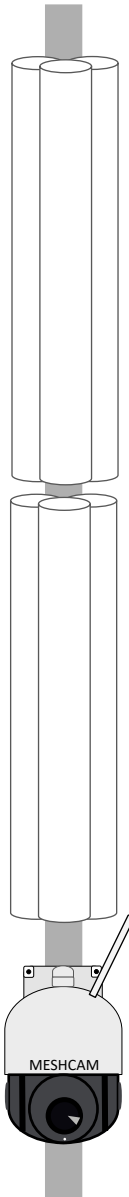
Ubiquiti Rocket AC attached to a Ubiquiti 120-degree sector antenna. North uses channel **179**

Ubiquiti Rocket AC attached to a Ubiquiti 120-degree sector antenna. South uses channel **175**

MESHCAM

Foscam PTZ Camera

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K6MPN-Kings-Mtn-North and South

On 30 March 2024 there was a lightning strike on or near the Kings Mountain Radio Tower. While there was lots of smoke and the smell of burnt electronics in the machine room,   most of our equipment survived. Unfortunately, the MikroTik hAP, Raspberry Pi and 12v to 5v converter were destroyed and had to be replaced.

Since then, a great deal of time and money has been spent to harden the systems to prevent future events from causing further damage.

K6MPN-Kings-Mtn-North and South

120 degree sector antenna facing east. The radio is on channel 175

120 degree sector antenna facing east. The radio is on channel 179

Pan, Tilt, Zoom (PTZ) Camera. Can be viewed at http://kk6dac-rp41.local.mesh/camera/ from the mesh

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53

K6MPN-Kings-Mtn-North and South

K6MPN-Kings-Mtn-North and South

Rachel Kinoshita - KK6DAC

K6MPN-Kings-Mtn-North and South

Replaced the Rocket M5s with Rocket AC Lites and Installed a New PTZ Camera

K6MPN-Kings-Mtn-North and South

K6MPN-Kings-Mtn-North and South

Rachel Kinoshita - KK6DAC

K6MPN-Kings-Mtn-North and South

2025-02-10 06:36:01
KingsMntn_camera

Rachel Kinoshita - KK6DAC

K6MPN-Kings-Mtn-North and South

Rachel Kinoshita – KK6DAC

60
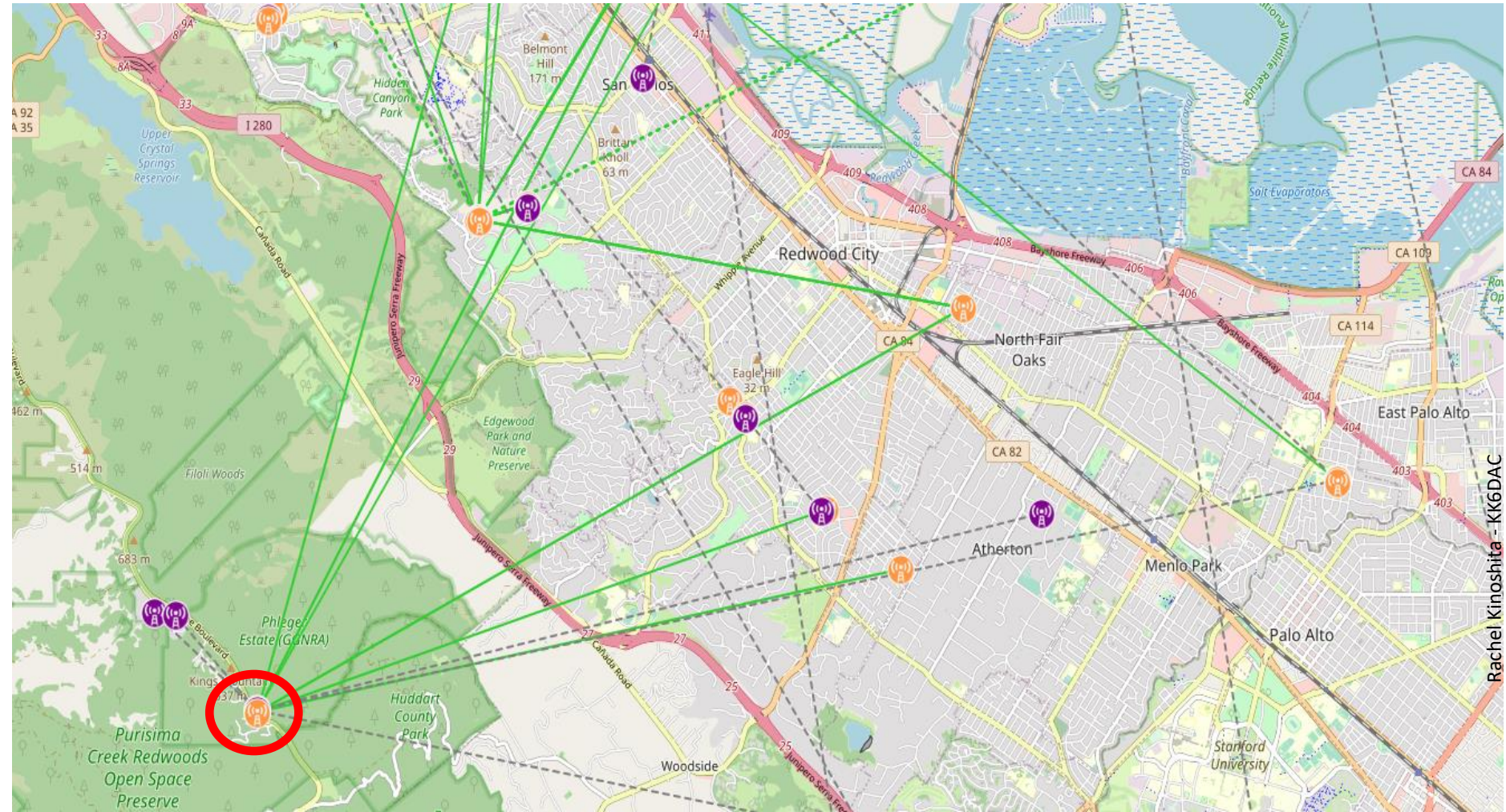
K6MPN-Kings-Mtn-North and South

Current Neighbors	LAN Hostname	LQ	NLQ	TxMbps	Service Name
K6GDA-NS-RWC-Home-200		86%	64%	24.0	
K6KBL-SL-NSM5		62%	90%	9.0	
K6MPN-Kings-Mntn-South (dtd)	firecam	100%	100%		
K6MPN-Kings-Mntn-hAP-01 (dtd)	KM-VOIP N6YP-UCM-PBX	100%	100%		
N6IMY-Nano1		65%	92%	12.0	
Previous Neighbors					
K6ORI-LPD-WIEDEMANN-OMNI	4.8 hours ago				

(dtd) means it's a device to device connection. This means the two nodes are connected via Ethernet

K6MPN-Kings-Mtn-North and South

Remote Nodes	LAN Hostname	ETX	Service Name
N6YP-hAP-02 (tun*1)		0.20	
	IP-Phone		
N6YP-hAP-01 (tun*1)		0.20	
K6WX-Node1		0.20	
KK6DAC-hAP-01 (tun*2)		0.20	
	KK6DAC-GS-VOIP-04		
	KK6DAC-UCM-PBX		
	KK6DAC-RP40		Wikipedia
			OwnCloud
			RoundCube
	KK6DAC-RP41		Team talk 5
			MeshChat
			Citadel
KF6NHT-hAP-01 (tun*1)		0.20	
	WP810		
	IP-Phone		
K6GDA-hAP-01 (tun*3)		0.30	
KK6DAC-NanoM5-01		0.30	
KK6DAC-LHG5-01		0.30	
w6rmf-hap-01 (tun*1)		0.40	
K6MPN-hAP-52 (tun*1)		0.40	
W6RMF-NSM5-PV3		0.50	
KK6DAC-NanoM5-02		1.30	
K6GDA-NanoM2-10		1.30	
N6AMQ-HM1 (wan)		1.33	
	n6amq-hm-host		Meshmap
			Weather Camera
K6GDA-NS-Home-130		1.40	
W6RMF-PicoM2-PV4		1.40	
N6IMY-hAP1 (wan)		1.77	
K6GDA-NS-RWC-Home-330		1.92	
KK6DAC-hAP-07		2.19	
	voip-01		
KK6DAC-NanoM5-05		2.38	
K6GDA-RWC-NS5-30		2.64	
WB6WGM-Belmont-PB400		3.24	
KK6DAC-SXTsq5HP-01		3.38	
AJ6VV-SC-90Sect-345		4.24	
WB6WGM-Belmont-NS-45		4.24	
WB6WGM-Belmont-NS-180		4.24	
K6KLY-LHG-XL-1		4.24	
AJ6VV-SC-hAP1 (tun*3)		4.34	

> The Estimated Transmissions (ETX) value can be thought of as the "cost" generated by the OLSRd. The lower the cost, the better the connection.

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62

Emerald Hills Easter Cross Water Tank

63
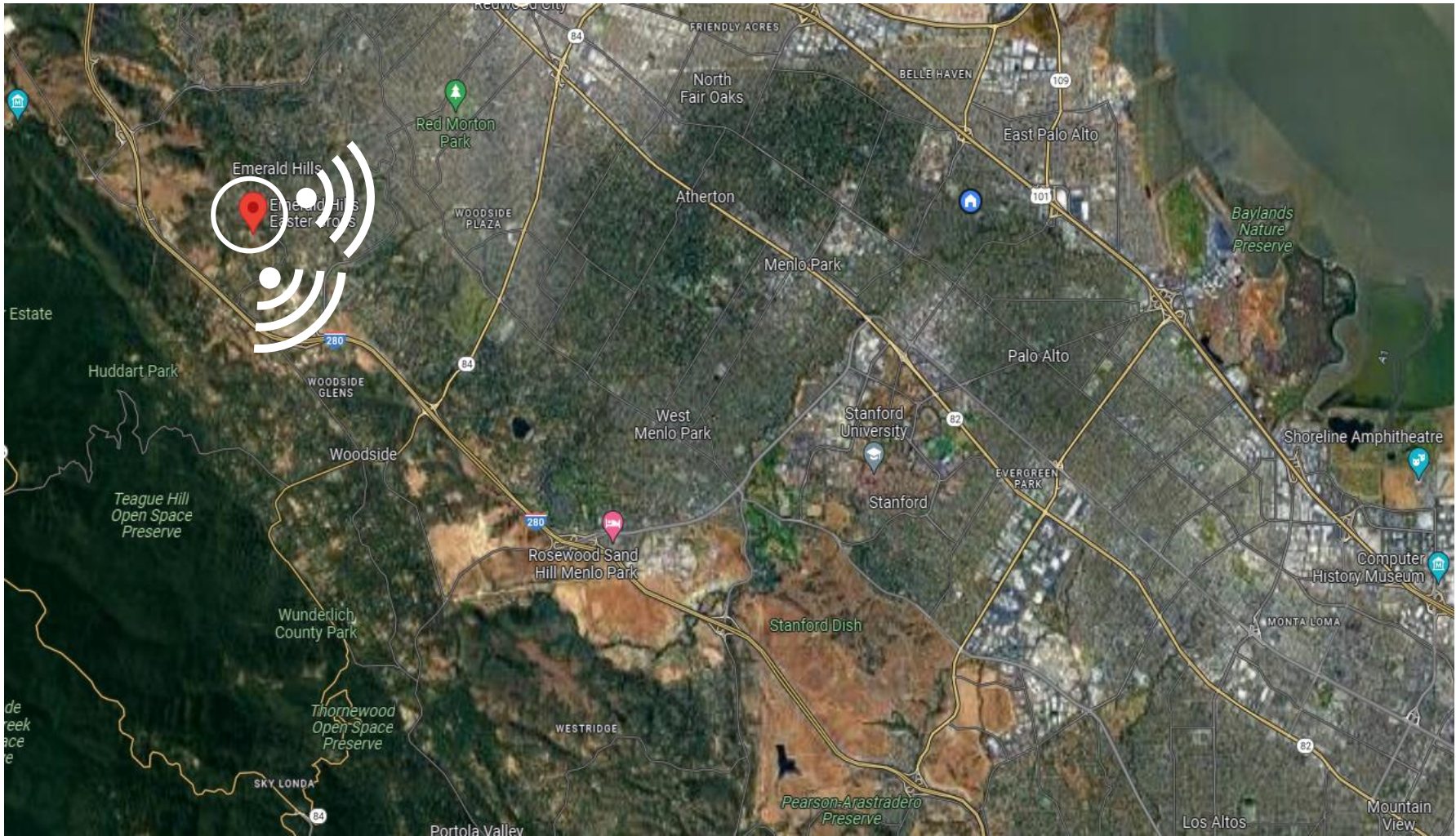
Emerald Hills Easter Cross Water Tank

Portola Valley

Menlo Park / Redwood City

64

Emerald Hills Easter Cross Water Tank

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Services on the Mesh

- Remote Cameras

- Mesh Maps

- Kiwix - Offline Wikipedia

- OwnCloud – A Dropbox Like System

- Team Talk – A Zoom Like System

- Email Servers – POP/IMAP/SMTP

- WinLink

- Chat / IM Servers – MeshChat, Jabber (XMPP)

- Voice Over Internet Protocol (VOIP) Telephony

- And Much More…

Services on the Mesh

Node Name	LAN Hostname	Service Name
KK6DAC-hAP-01		
	KK6DAC-RP41	Team talk 5
		MeshChat
		Citadel
	KK6DAC-RP40	Wikipedia
		RoundCube
		OwnCloud
	KK6DAC-UCM-PBX	
	KK6DAC-GS-VOIP-04	

Kiwix - Offline Wikipedia

🏠 Wikipedia ⬡ 🔍

Welcome to Wikipedia

The free encyclopedia.

5,734,527 articles in **English**

Arts

Architecture • Books • Cinematography • Dance • Design • Fashion • Films • Gastronomy • Literature • Magic (illusion) • Music • Painting • Photography • Poetry • Sculpture • Theatre

Geography

Africa • Antarctica • Arctic • Asia • Caribbean • Central America • Europe • Latin America • Mediterranean • Middle East • North America • Oceania • South America • Cartography

History

Ancient Egypt • Ancient Greece • Ancient Japan • Ancient Near East • Ancient Rome • Archaeology • British Empire • Byzantine Empire • Classical civilisation • Colonialism • Crusades • Heraldry • History of science • Imperial China • Indian independence movement • Middle Ages • Mughal Empire • Ottoman Empire • Russian Empire • Sasanian Empire • Seljuk Empire • Soviet Union • War

Sciences

Agriculture • Applied mathematics • Architecture • Computer science • Engineering • Forensics • Optics • Dentistry • Medicine • Nursing • Pharmacy • Social work • Veterinary medicine • Astronomy • Biology • Chemistry • Earth sciences • Physics • Social sciences

Society

Biography • Community • Culture • Death • Education • Freedom of speech • Human rights • Internet • Law • Philosophy • Politics • Religion • Sexuality • Social movements

Kiwix - Offline Wikipedia

🏠 | Wikipedia | ⬡   🔍

ARRL Radiogram

An **ARRL radiogram** is an instance of formal written message traffic routed by a network of amateur radio operators through traffic nets, called the National Traffic System (NTS).

It is a plaintext message, along with relevant metadata (headers), that is placed into a traffic net by an amateur radio operator. Each radiogram is relayed, possibly through one or more other amateur radio operators, to a radio operator who volunteers to deliver the radiogram content to its destination.

historic ARRL radiogram form

Form overview

Radiogram forms facilitate a standard protocol between amateur radio operators, allowing much faster relay of formal messages. They do this by always having the message headers in a certain order, allowing operators to read and understand the headers without explicit verbal labels. This is especially important in hectic and stressful environments such as during a disaster, when many parties call upon radio operators to quickly transfer messages in and out of the affected areas.

A typical form has a place for the plaintext message, as well as for several headers that are important for routing the message to its proper destination in a timely manner. These fields include the message's priority, the callsign of the station of origin (the amateur radio operator who placed the message onto the message net), the date and time of origin, contact information of the message's recipient, as well as the callsign of the station that delivered the message.

The headers' purpose and order is logical and intuitive enough that many amateur radio operators have memorized it and in extremis can transmit and receive radiograms without referring to the form.

Preamble part

All messages must have a preamble. The preamble of the message contains information about the message necessary to keep track of it as it passes through the amateur system. The parts of the preamble, except for the check as noted later, are NOT changed by any station relaying or delivering the message. They are permanent parts of the message created by the station of origin and must remain with the message all the way to the delivery point. Preamble information is used to service undeliverable messages and to generate replies to specific handling instructions.

Message number

The message number is selected by the station originating the message and it must be on all messages. It stays with the message all the way to the point of delivery. The delivering station may need to reply to the station of origin and refer to this number. Use number digits only, no letters, leading zeros, or dashes. Numbers are usually begun with 1 at the start of a year or month at the pleasure of the originating station.

OwnCloud – A Dropbox Like System

OwnCloud – A Dropbox Like System

OwnCloud – A Dropbox Like System

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TeamTalk - A Zoom Like System

TeamTalk - A Zoom Like System

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Email Servers

Neighborhood Survey
After a Disaster
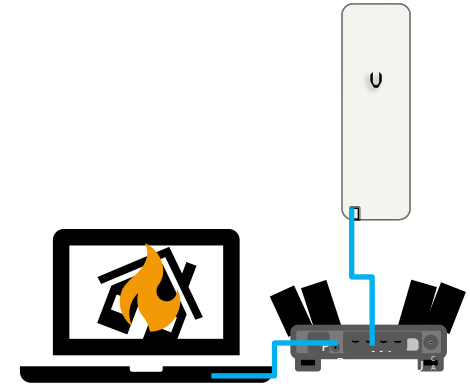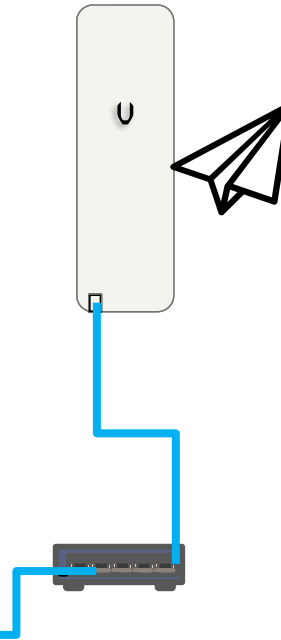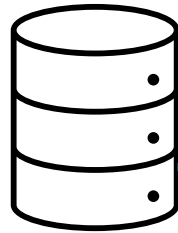
Emergency
Operations
Center

Email Servers - Citadel

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Email Servers - Citadel

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Chat / Instant Messaging

MeshChat
Jabber (XMPP)

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78
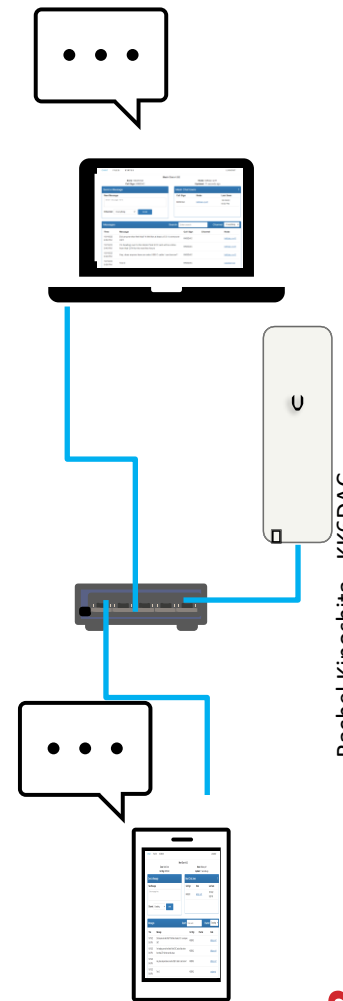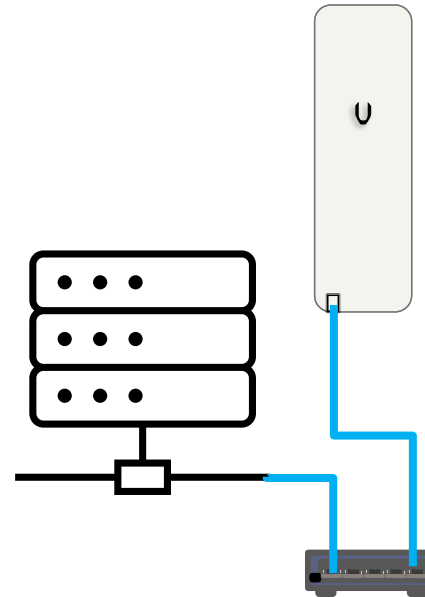
Chat / Instant Messaging - MeshChat

Mesh Chat v1.02

Zone: MeshChat
Call Sign: KK6DAC

Node: kk6dac-rp41
Updated: 11 seconds ago

Send a Message

New Message

Enter message here

Channel: Everything ⌄   **SEND**

Mesh Chat Users   1

Call Sign	Node	Last Seen
KK6DAC	kk6dac-rp41	10/19/22 9:50 PM

Messages

Search: Enter search   **Channel:** Everything ⌄

Time	Message	Call Sign	Channel	Node
10/19/22 9:50 PM	Did anyone else feel that? It felt like at least a 5.0. Is everyone OK?	KK6DAC		kk6dac-rp41
10/19/22 9:49 PM	I'm heading over to the Menlo Park EOC and will be online from that QTH for the next few hours	KK6DAC		kk6dac-rp41
10/19/22 9:48 PM	Hey, does anyone have an extra USB C cable I can borrow?	KK6DAC		kk6dac-rp41
10/18/22 9:56 PM	Test 3	KK6DAC		raspberrypi

Chat / Instant Messaging – Citadel - XMPP

Voice Over Internet Phones

Emergency Operations
Center
10.186.156.94

Police Department
10.186.156.94

Phones call direct IP dial to
other phones

Emergency Shelter
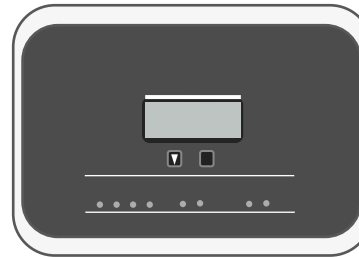10.187.92.173

Hospital
10.187.31.42

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Voice Over Internet Phones
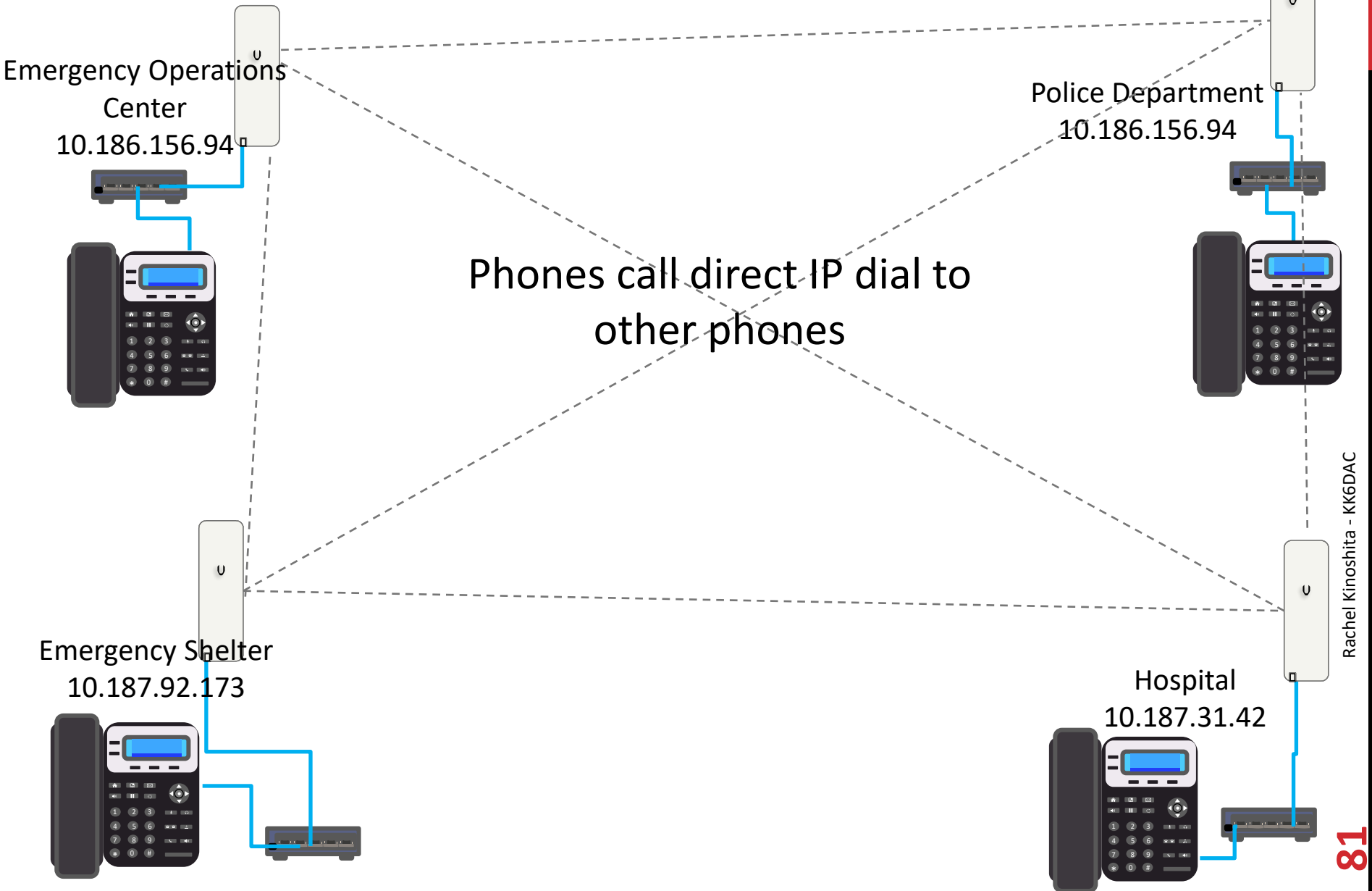
Emergency Operations Center

However, adding a PBX server provides extension numbers, voicemail, directories, etc

Police Department

Grandstream PBX

Emergency Shelter

Or a Raspberry Pi running RasPBX

Hospital

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82
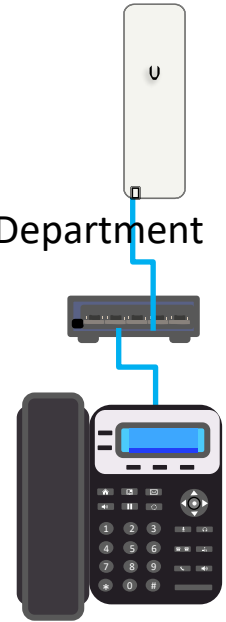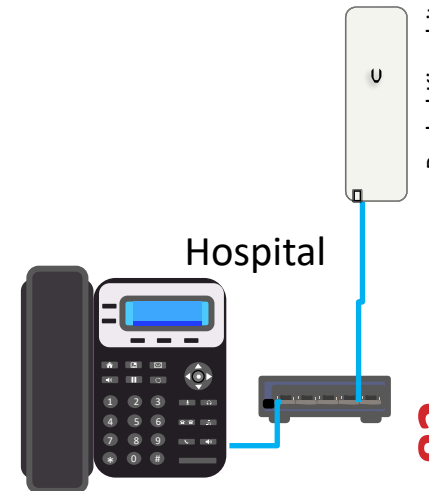
What's New

- New Standards

  - 802.11AC or more commonly known as WiFi 5
  - OpenWRT 24.10

- New Supported Devices

  - Ubiquiti Nanostation AC
  - Ubiquiti Rocket AC Lite
  - MikroTik SXT AC

- New Key Locations

  - San Bruno Mountain
  - Sonol Ridge
  - Black Mountain
  - Downtown Palo Alto

- New AREDN Firmware

  - 3.25.02 – Released in Feb 2025
  - New GUI

New Standards

- 802.11AC

  - Available on 5 GHz only
  - 3x faster than the previous version (1,300 Mbps)
  - More bandwidth
  - Improved connectivity (increased range)
  - Improved power management

- OpenWRT 24.10

  - More devices supported
  - Improved security
  - Bug fixes

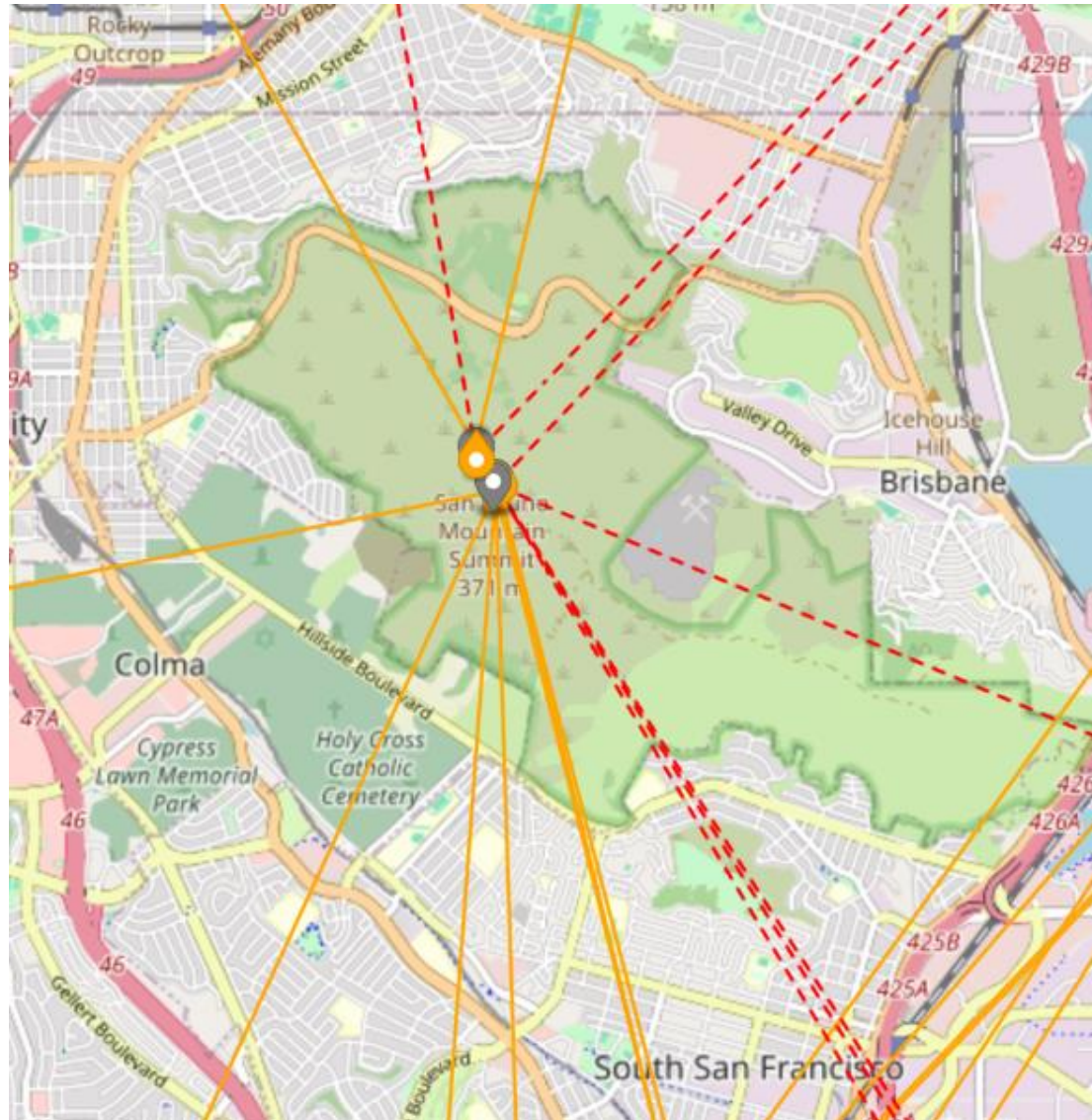# New Devices

Ubiquiti Nanostation AC
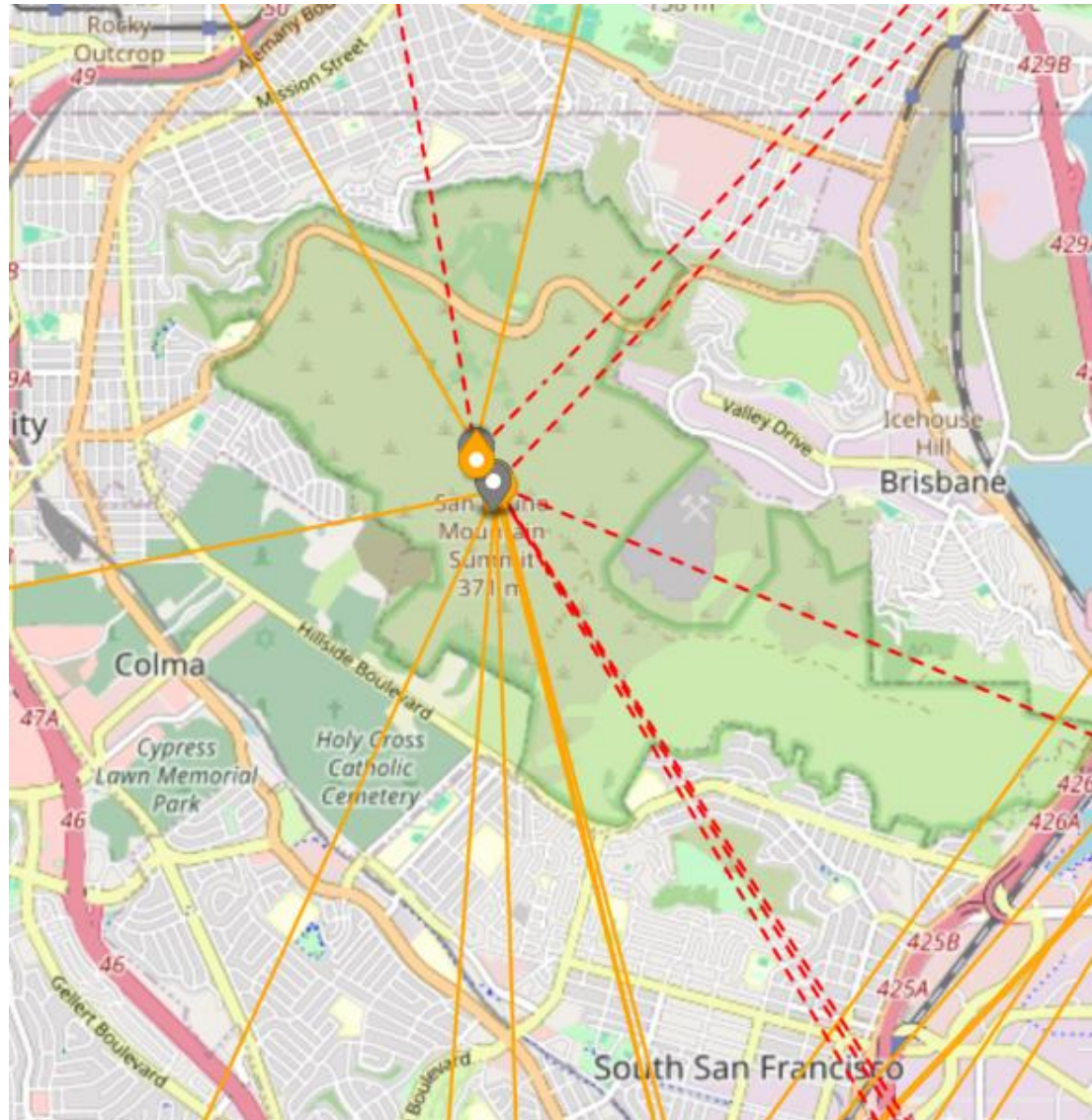
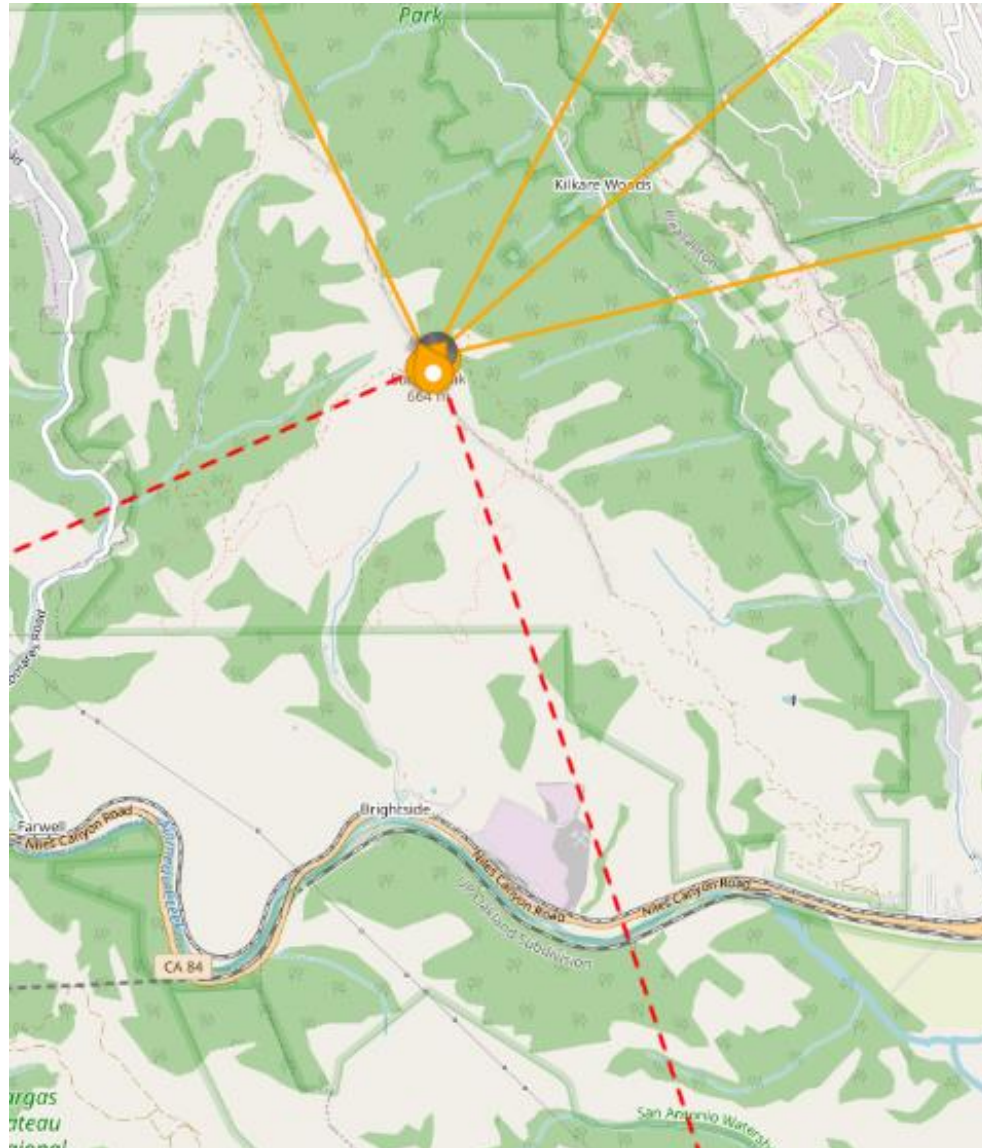Ubiquiti Rocket AC Lite

MikroTik SXT AC

New Key Locations

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86

New Key Locations

San Bruno Mountain

87

New Key Locations

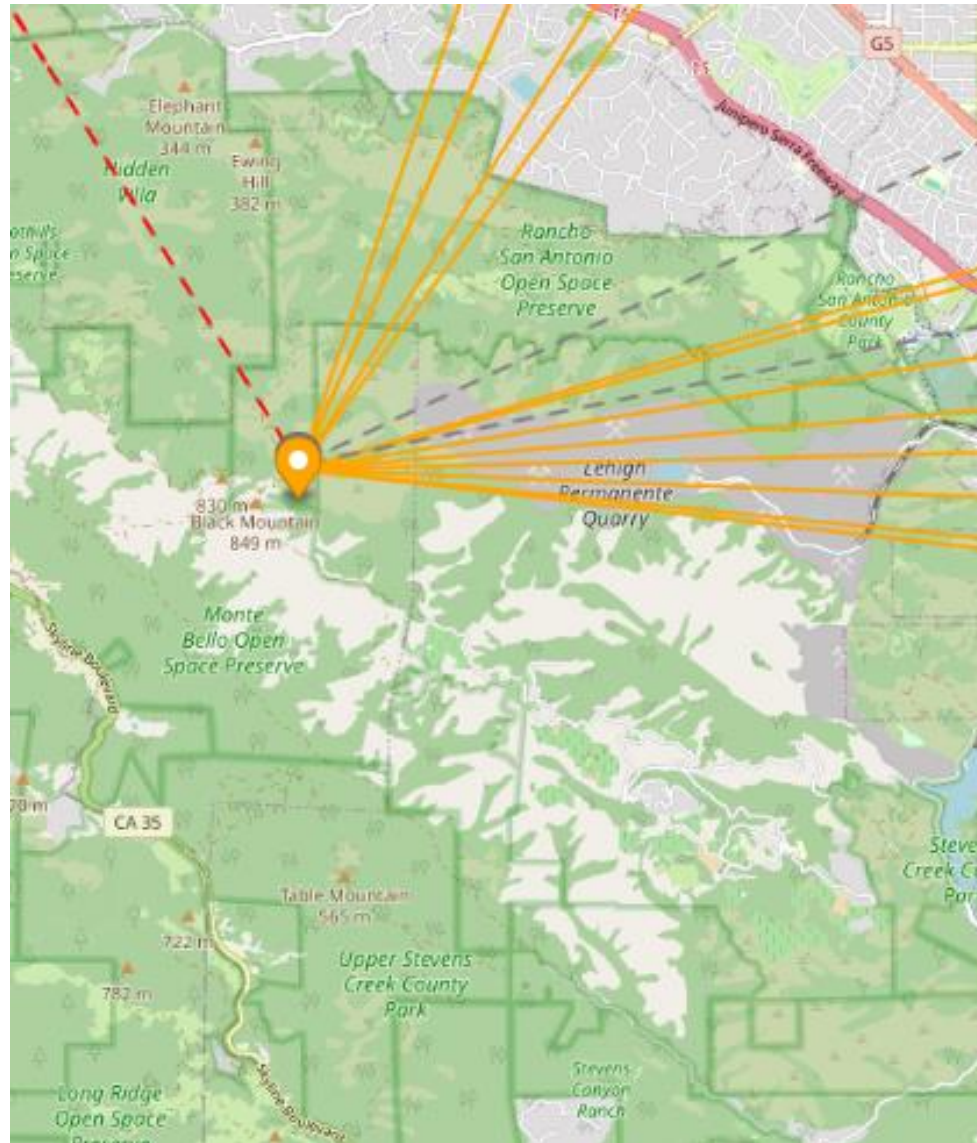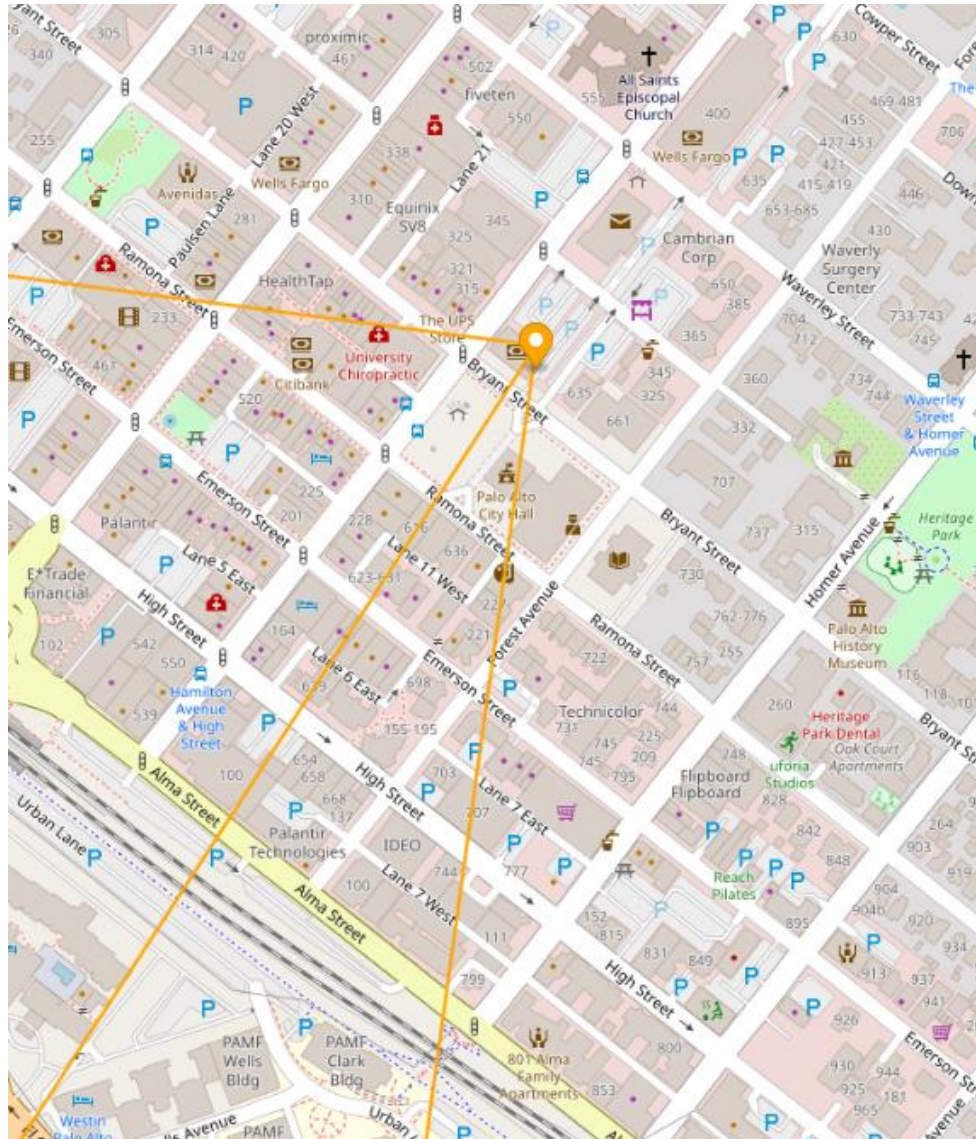## San Bruno Mountain

New Key Locations

Sunol Ridge

New Key Locations

Black Mountain

New Key Locations

Downtown Palo Alto

91

Conclusion

- Let's Bring Emergency Communications into the 21st Century

- The Bay Area Mesh has a Great Deal of Momentum and Will Continue to Grow

- The More Mesh Nodes in the Network, the More Performant, Resilient and Accessible it Becomes

- Our Served Agencies Will be Better Served

- Come Join Us

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Links

AREDN - https://www.arednmesh.org/

BAM - https://www.sfwem.net/

BAM Wiki - https://bamwiki.xojs.org/
index.php/Bay_Area_Mesh

BAM Mesh Map - https://sfmap.xojs.org/#

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Bay Area Mesh Demo

- Using an Internet Tunnel to tunnel into the mesh

LTE

BAM

KK6DAC-hAP-03

Internet

Comcast
Cable Modem

K6GDA-NS-Home

K6GDA-hAP-01

DtD

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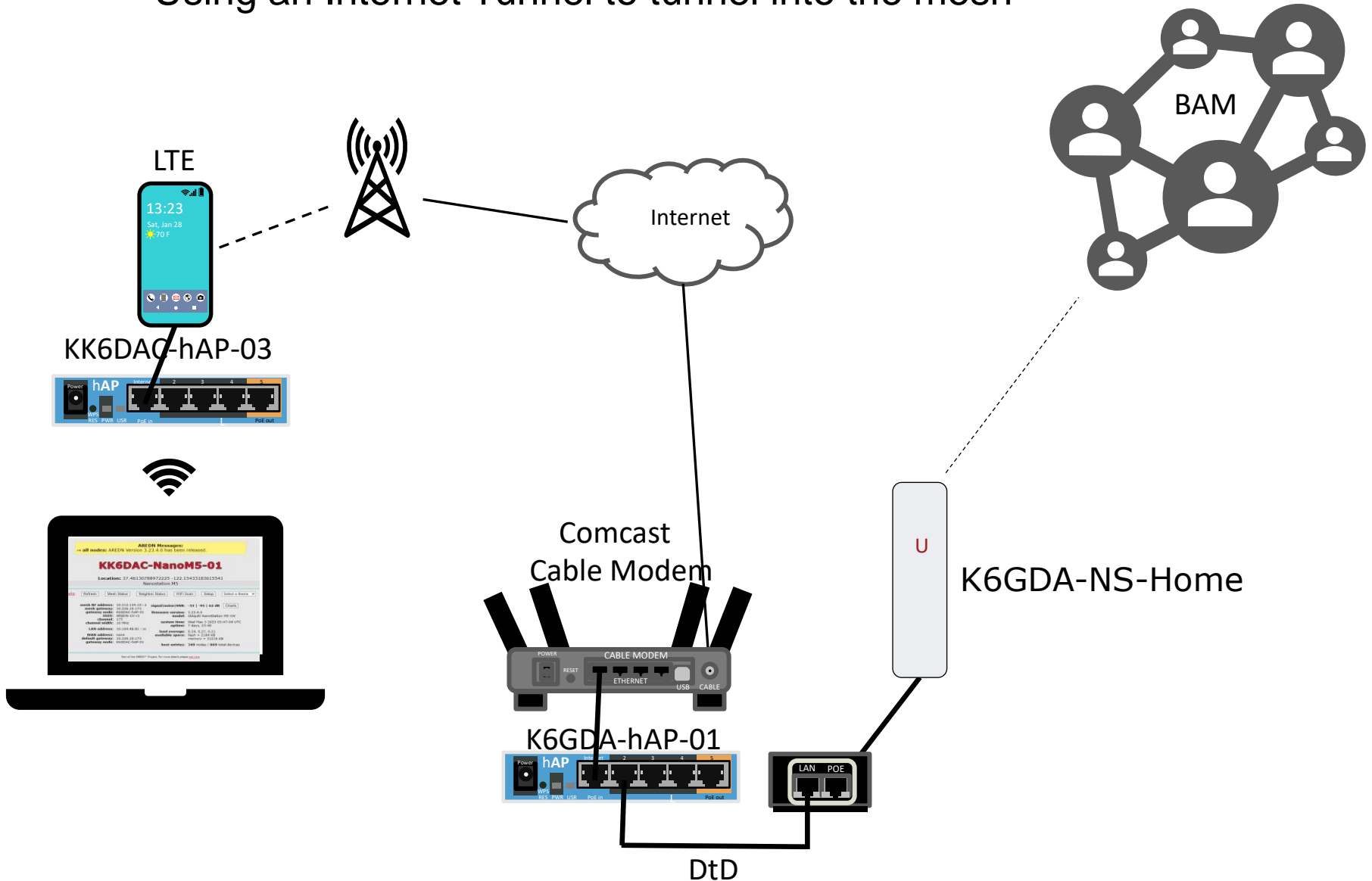
Questions

KK6DAC@arrl.net