

Cactus Intertie Annual Meeting

Andre, Hansen, K6AH

Cactus Intertie Annual Meeting, 2019
Lake Havasu City, AZ
March 2, 2019

What is the AREDN Project?



HSMM Mesh

- Repurpose WISP routers - replaces OEM FW
- In the Ham Bands (.9, 2.4, 3.4, & 5.8 GHz)
- Part 97 Tech License
- Up to 144 Mbps IP Network (802.11n)
- Nodes are comprised of:
 - Linux computer w/Ethernet I/F
 - Software Defined Radio (SDR)
 - Amplifier
 - Often includes an antenna
 - \$45-\$90

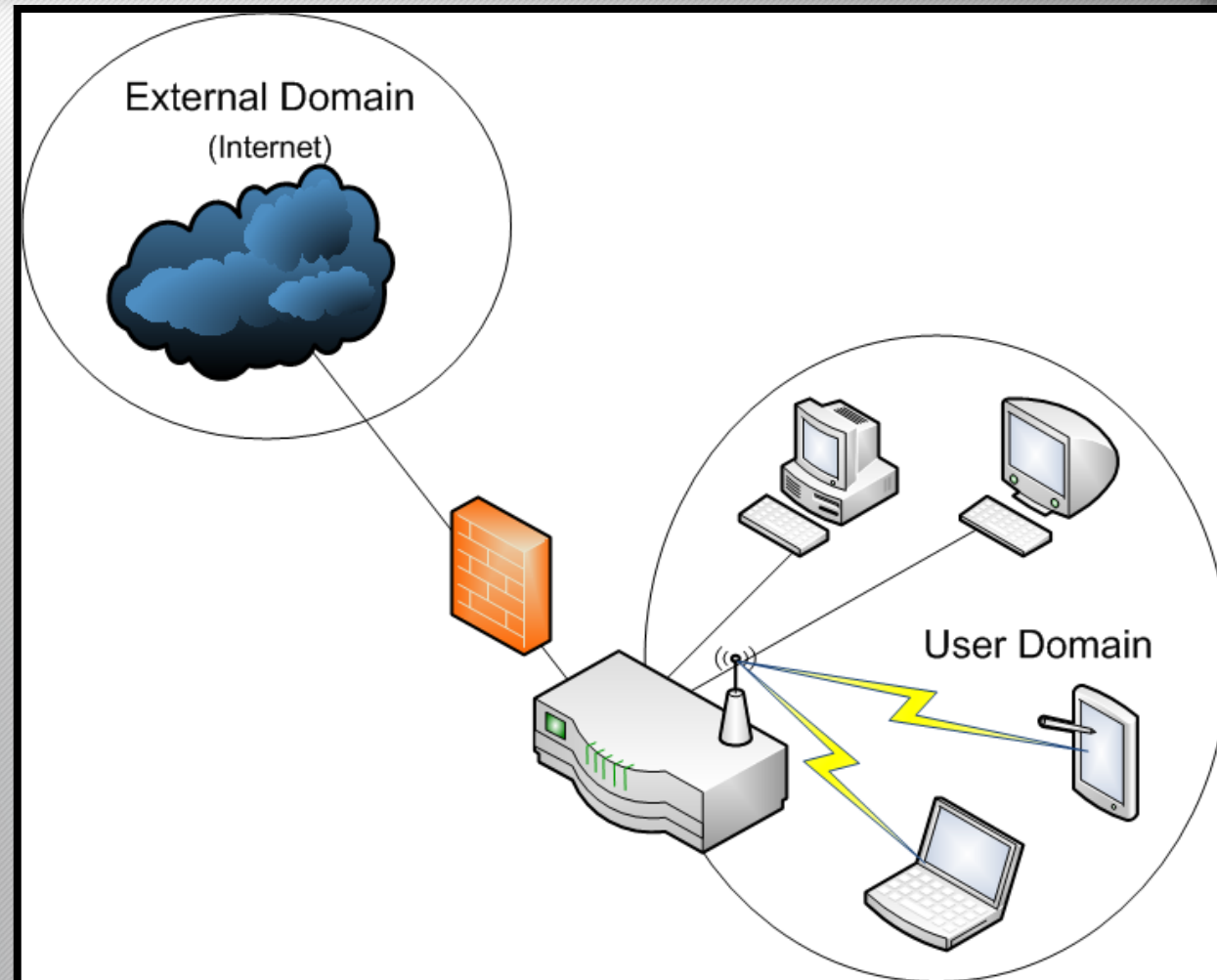
What is the AREDN Project?



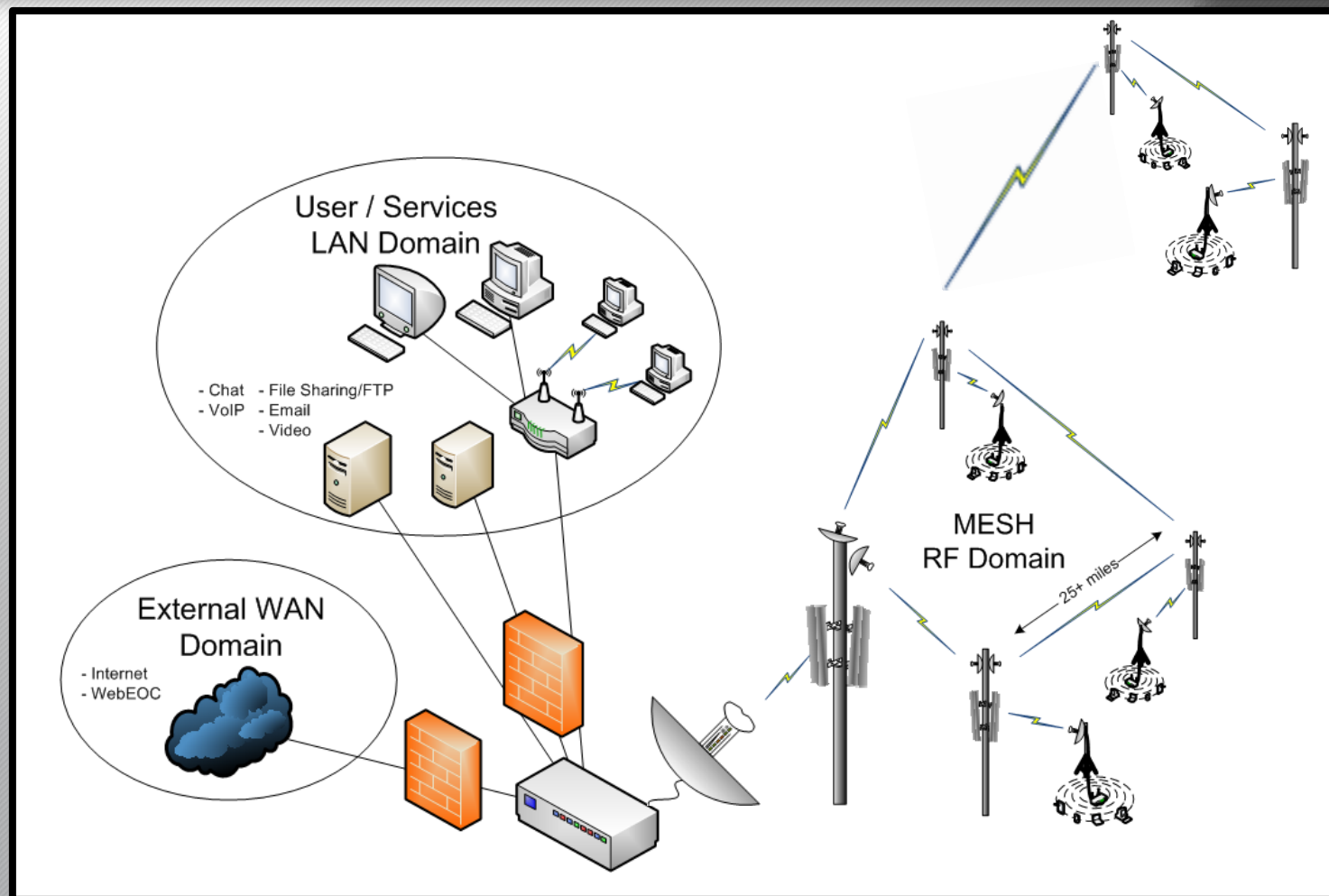
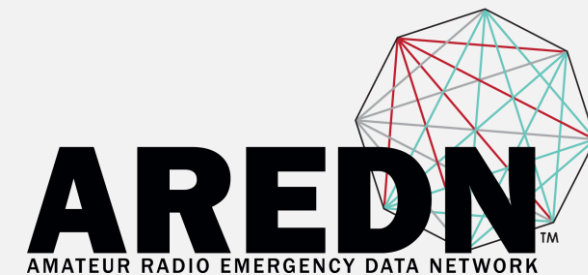
Software

- OpenSource development project
- Distributed under Free Software Foundation GNU GPL version 3
- Free to Hams (and anyone else for that matter)
- Focused on AuxComm/Emcomm
- Active user forum
- Agile, flexible dev model
- Nightly builds available
- Entirely a Ham volunteer effort
- Developers also implement

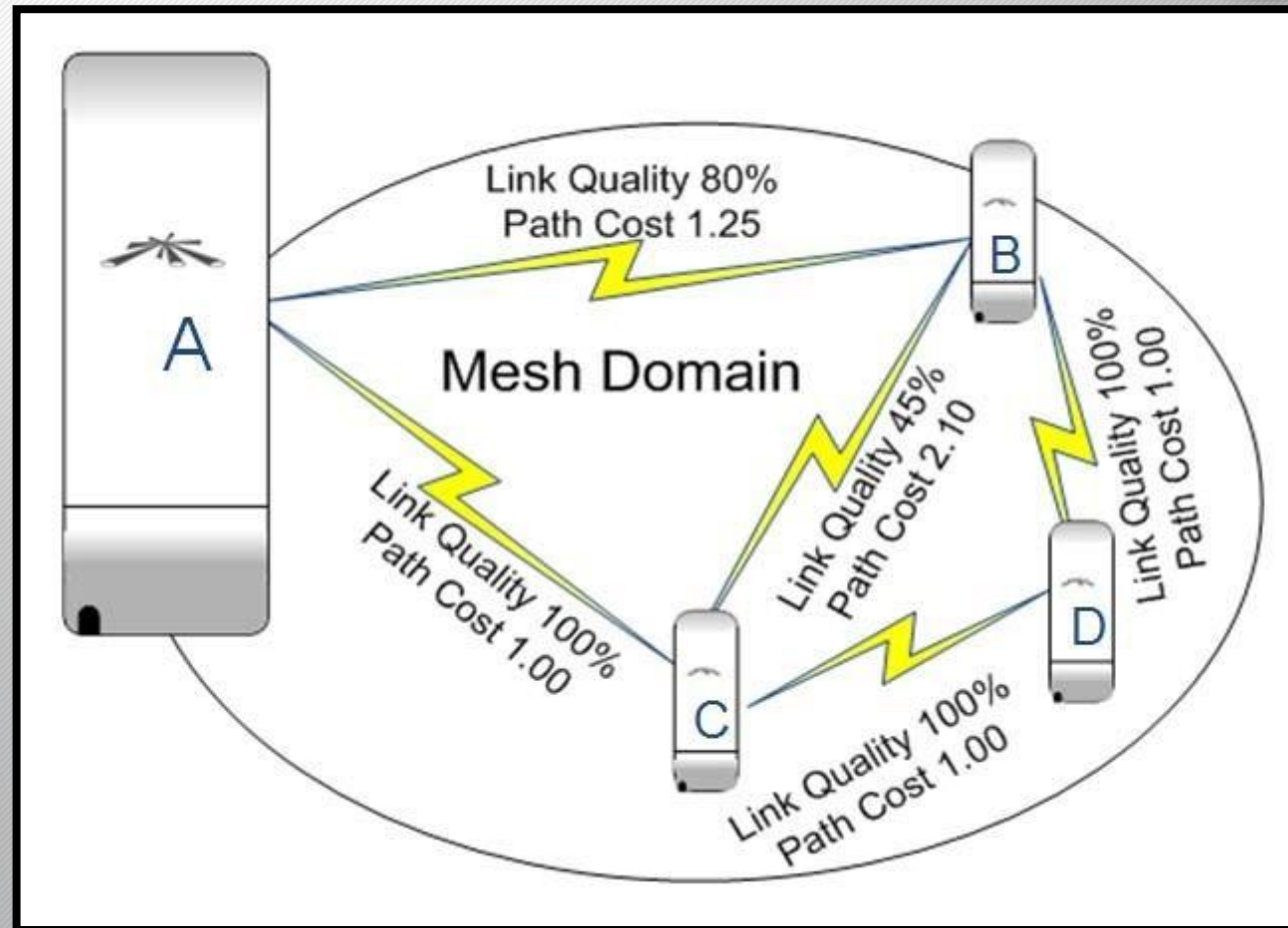
Typical WiFi



Repurposed Hardware



Optimized Link State Routing



Ubiquiti

Wide variety of devices for all topologies



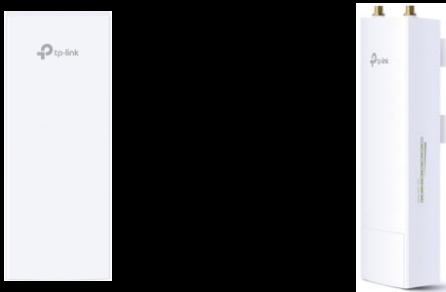
Mikrotik

Wide variety of devices for all topologies



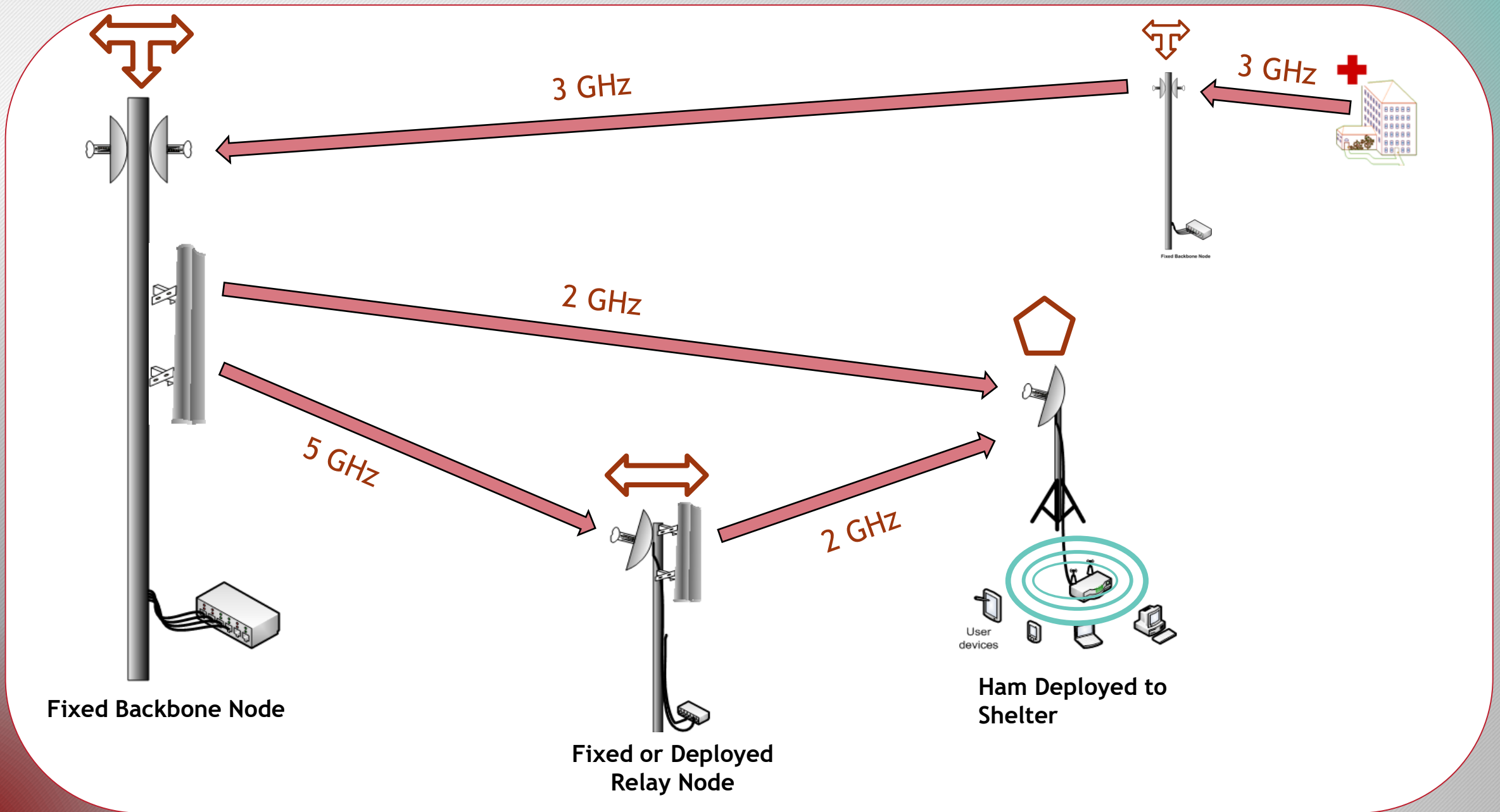
TP-Link

NanoStation and Rocket look-alikes



Robust Specifications

- Power Output: 23 - 28 dBm (200mW - 630mW)
- Antenna Gain: 11 - 30 dBi
- Some configurations capable of 50+ mile range
- Temperature: -40° to 176° F



Design Considerations



Backbone

Elevation
High-gain/high power
Point-to-Point 3 GHz
or 5 GHz
Distribution downward
2 and 5 GHz



Deployed Nodes

Typically be Ham-owned
Inexpensive <\$100
12v power
Augment go-kits
Typically 2 GHz (channel
-2, 2397 MHz)



Relay Nodes

High-gain upwards
Broad-coverage down
Cross-band 5 to 2 GHz
Strategically placed
Path prediction tools
greatly simplify
locating these

Construction Considerations



Backbone

Mountains, water
towers, buildings,
towers
Dish 24-30 dBi
Rockets (MIMO)
Sector distribution
downward



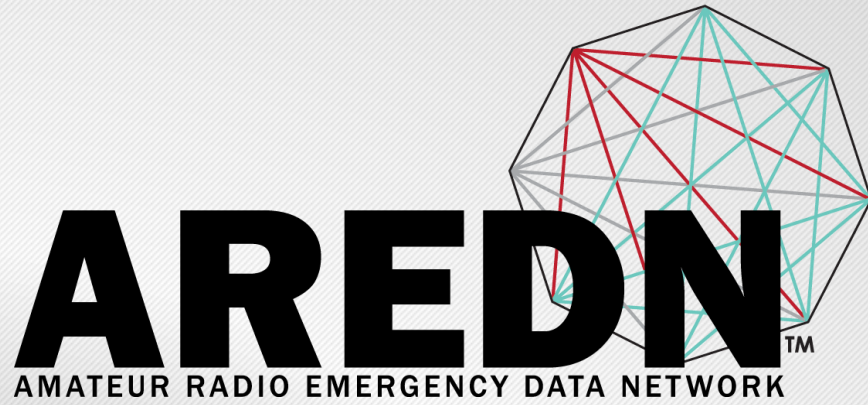
Deployed Nodes

NanoBeam
WIFI Access Point
10-20' mast
Keep it simple

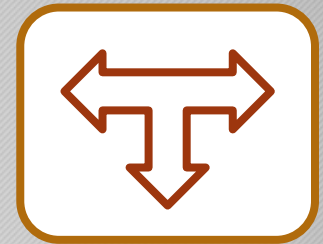


Relay Nodes

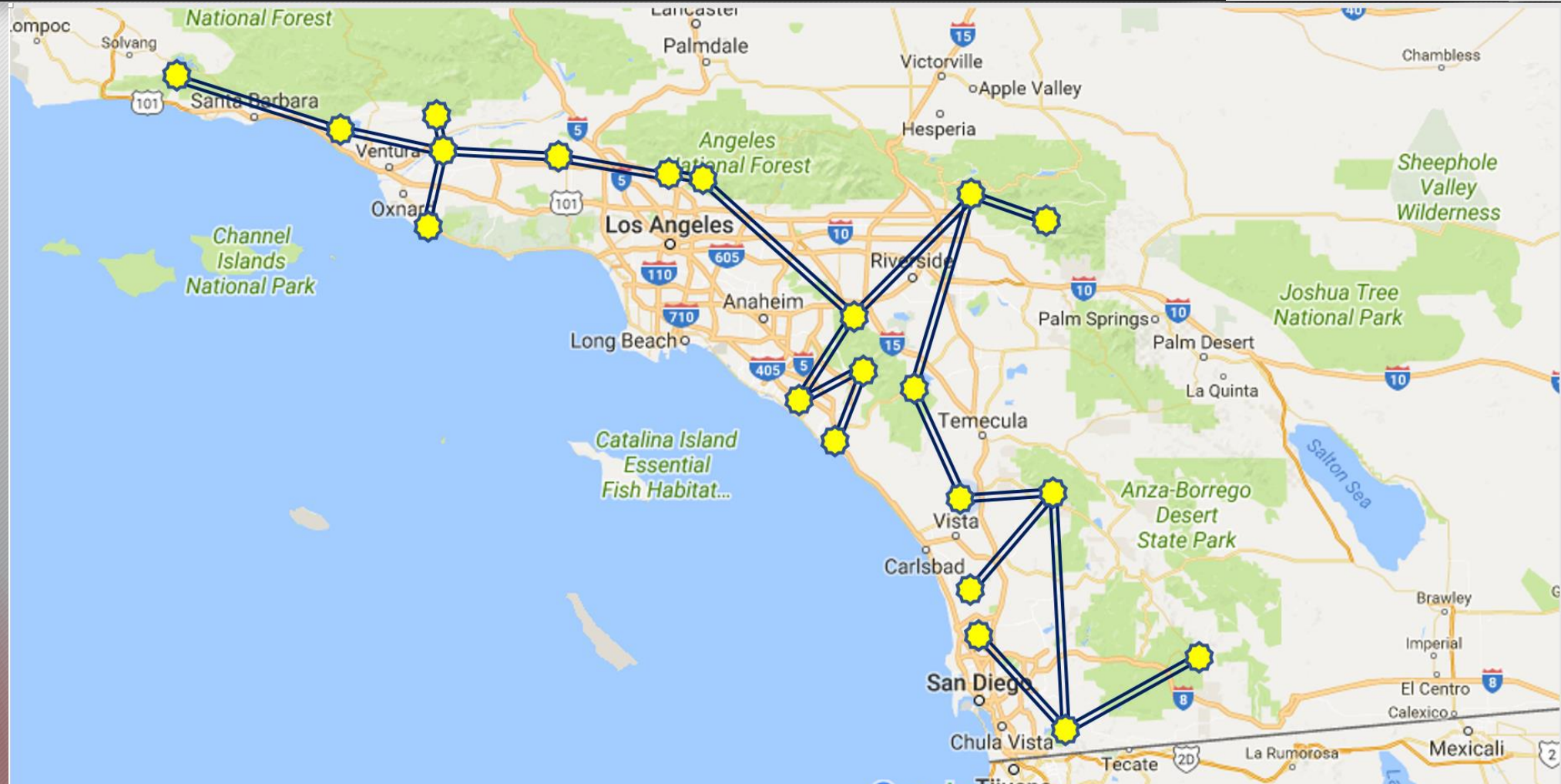
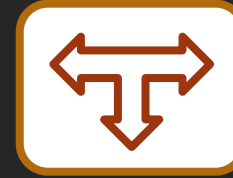
Hills, tall masts,
buildings
RadioMobile to
determine location
Up: NanoBeam,
PowerBeam
Down: NanoStations



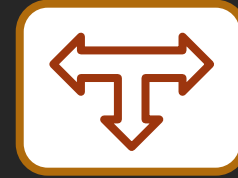
Backbone Sites



The SoCA AREDN Federation



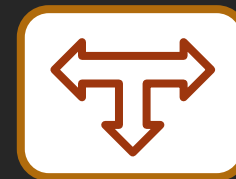
Using the Vertical Dimension





Effective Use of High Ground

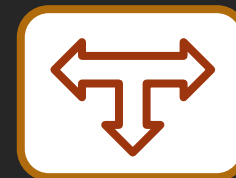
Mt. Palomar, 6200' ASL to Mt. Otay at 49 miles





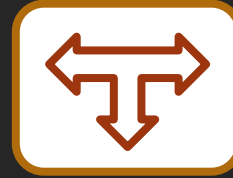
2 GHz and 5 GHz Downlinks

Mt. Palomar at Ham's Mountain Cabin



Club Repeater Site Towers

Mt Otay - Doghouse Junction, CA



Benefits

Cheap or free

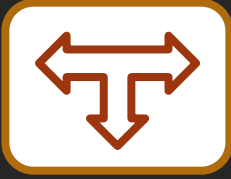
Gets the club involved

No QRM from ISPs



Commercial Towers

- Elsinore Peak - Cleveland NF, CA



Benefits

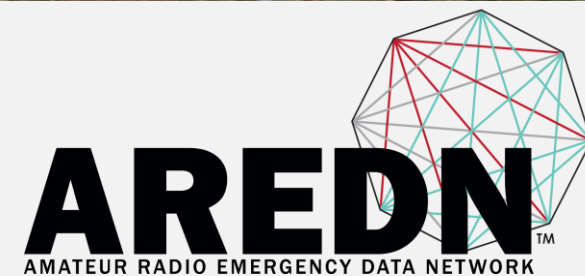
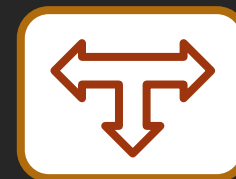
Generally well-placed
Often much taller
May be ham-owned

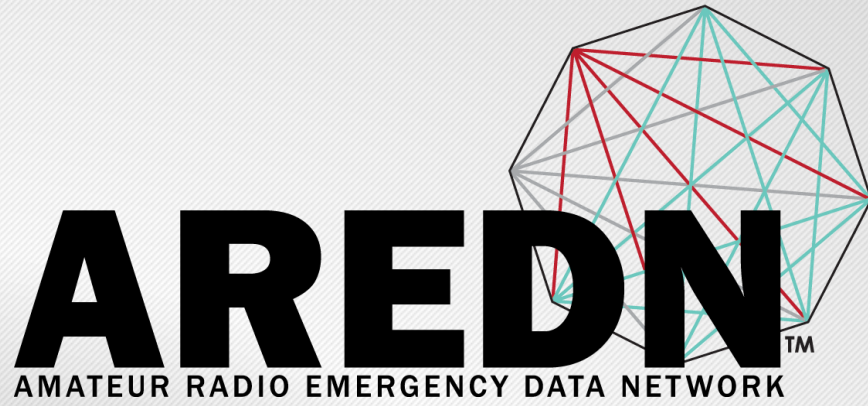




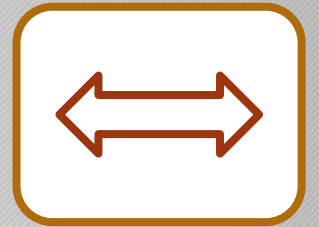
Self Contained Backbone Site

Ventura County - Camarillo Hills, CA





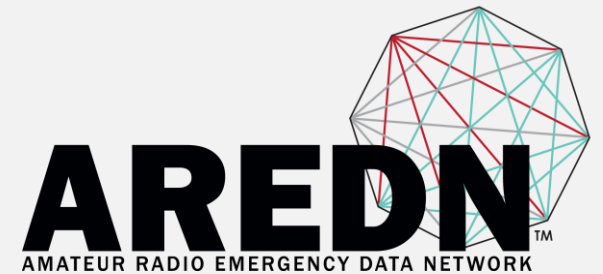
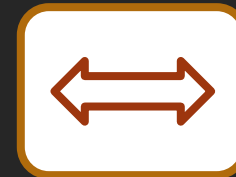
Relay Sites





Relay Node “In the Wild”

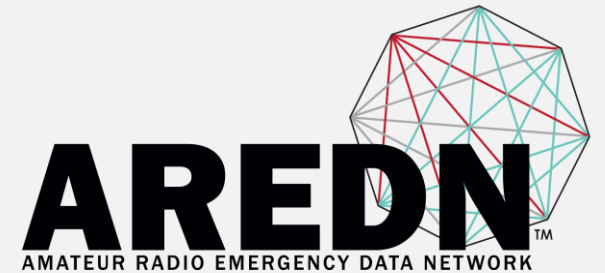
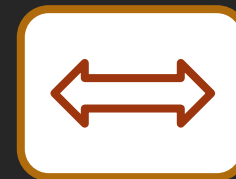
Unspecified location





Small Footprints / Wide Coverage

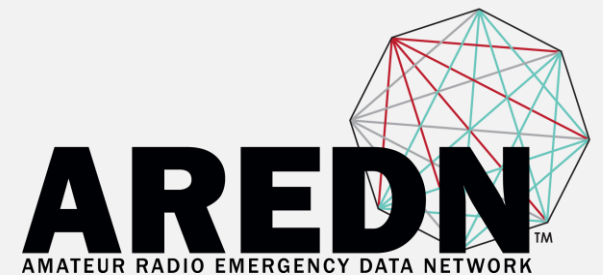
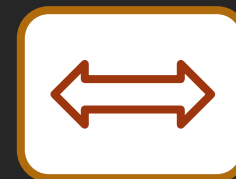
Chatsworth Peak - Ventura County, CA





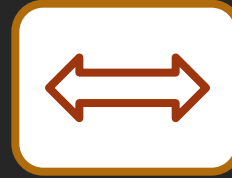
Small Footprints / Wide Coverage

Saddleback Peak - Mission Viejo, CA



Water Tower Relay Site

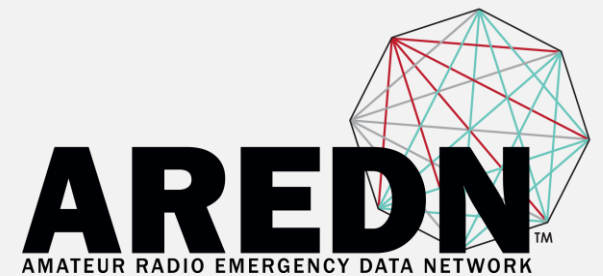
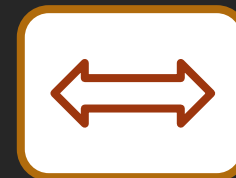
San Bernardino County - Redlands, CA

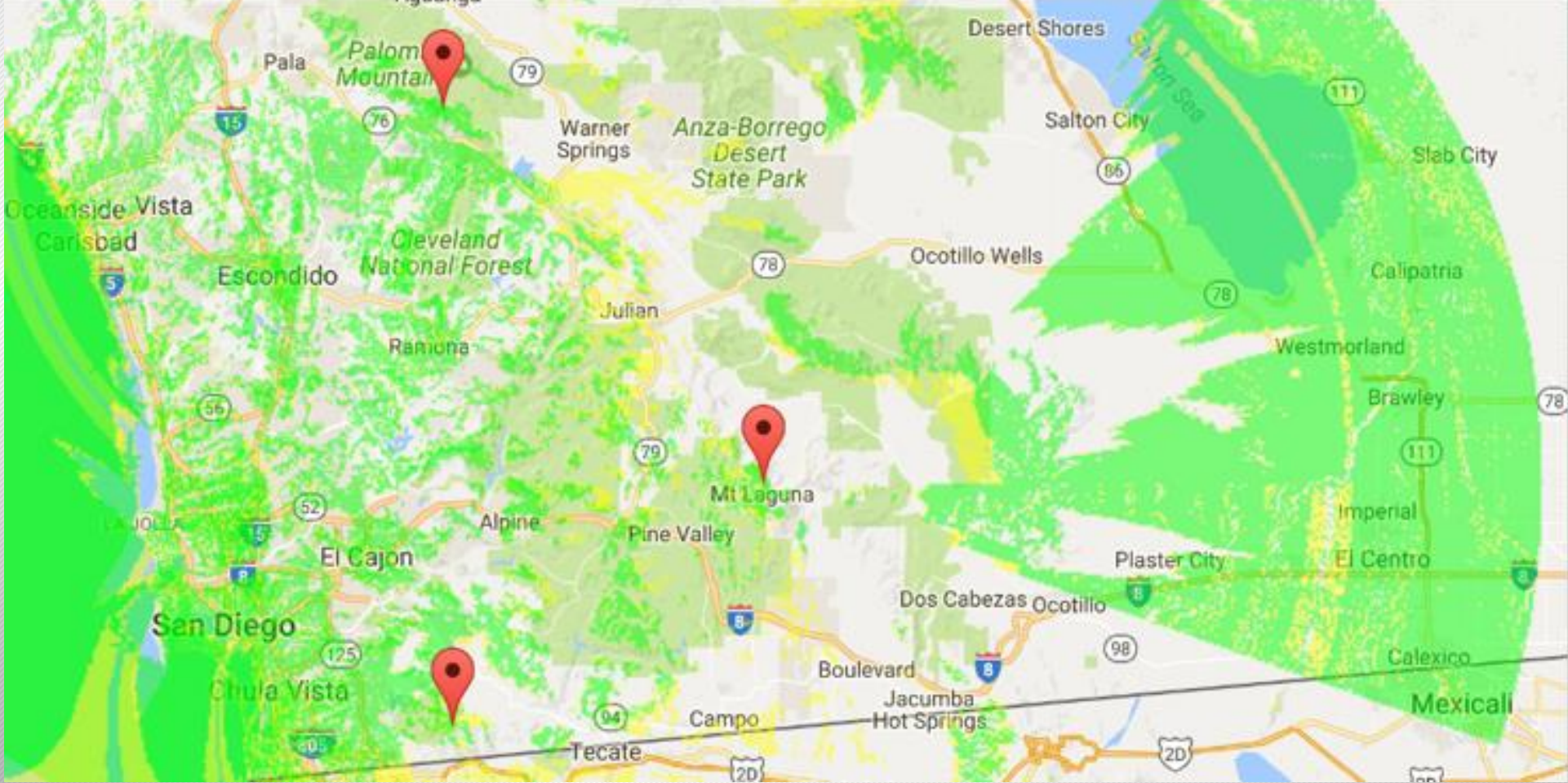




Deployed Relay Node

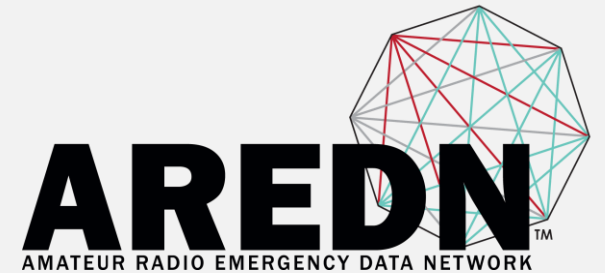
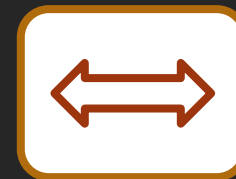
Temporary Shelter Deployment

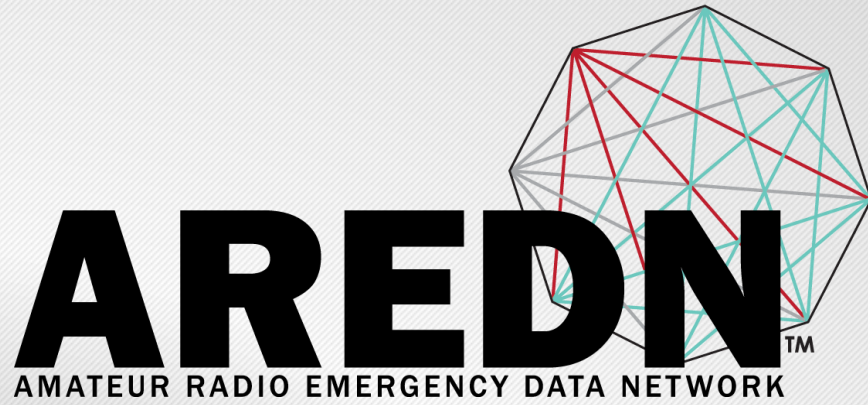




Predicting Coverage

RadioMobile





Documentation

Documentation



AREDN Documentation

latest

GETTING STARTED GUIDE

AREDN Overview

- Selecting Radio Hardware
 - Downloading AREDN Firmware
 - Installing AREDN Firmware
 - Basic Radio Setup
 - Node Status Display
 - Mesh Status Display
 - Advanced Configuration
- ### NETWORK DESIGN GUIDE
- Networking Overview
 - Network Topologies
 - Radio Spectrum Characteristics
 - Channel Planning
 - Network Modeling
- ### APPLICATIONS AND SERVICES GUIDE
- AREDN Services Overview
 - Chat Programs
 - Email Programs

[Docs](#) » [AREDN Overview](#)

AREDN Overview

The AREDN™ acronym stands for *Amateur Radio* emergency data network, a service-oriented communication system.

For many years amateur radio operators have made transmissions for emergency and event traffic involved conveying the message in ICS-213 form. The message is typically typed on another ICS-213 form and delivered to the recipient via radio or then be handled through a network.

This tried-and-true scenario is being replaced by emergency and event traffic of traditional methods and electronic form, with mesh networking, Pactor, Fldigi, and others.

In today's high-tech society, people are accustomed to different communication needs. Text, short messaging and key communication, along with

Radio Spectrum Characteristics

Channel Planning

- Channel Contention
- Route Flapping
- Collocated Nodes
- Aligning Link Nodes
- Channel Planning Tips

Network Modeling

APPLICATIONS AND SERVICES GUIDE

AREDN Services Overview

- Chat Programs
- Email Programs
- File Sharing Programs
- VoIP Audio/Video Conferencing
- Video Streaming and Surveillance
- Computer Aided Dispatch
- Other Possible Services

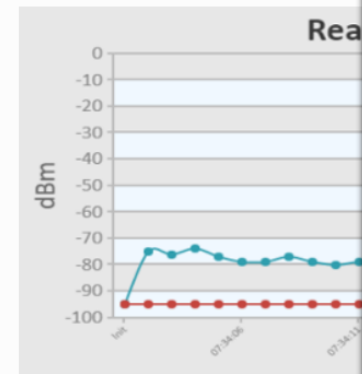
HOW-TO GUIDES

- AREDN How-to Guides Overview
 - How-to Use PuTTYGen on Windows to Make SSH Keys and Use Them on AREDN™ Nodes
 - Settings for Radio Mobile
- ### APPENDIX
- Frequencies and Channels

Most of the latest AREDN™ devices that exploit multipath propagation. "chain" radios, another way to achieve a signal separation of up to 20 dB. V less susceptible to reflections and ra signal with clear line of sight. Note t the same way.

Aligning Link Nodes

The AREDN™ web interface provides being installed to form a link. On the *Signal to Noise* graph. Slowly turn an you see the best signal, as shown be focus on the antenna position witho *Sound* feature and align the antenna Signal to Noise Ratio of 15 dB is ade



Radio Spectrum Characteristics

Channel Planning

Network Modeling

APPLICATIONS AND SERVICES GUIDE

AREDN Services Overview

Chat Programs

Email Programs

- Citadel/UX
- Open Source Email Server
- Using WinLink to Send Email
- Example Email Service Comparison

File Sharing Programs

VoIP Audio/Video Conferencing

Video Streaming and Surveillance

Computer Aided Dispatch

Other Possible Services

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How-to Use PuTTYGen on Windows to Make SSH Keys and Use Them on AREDN™ Nodes

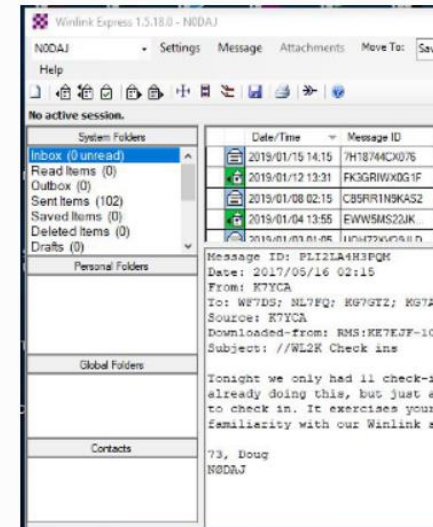
Settings for Radio Mobile

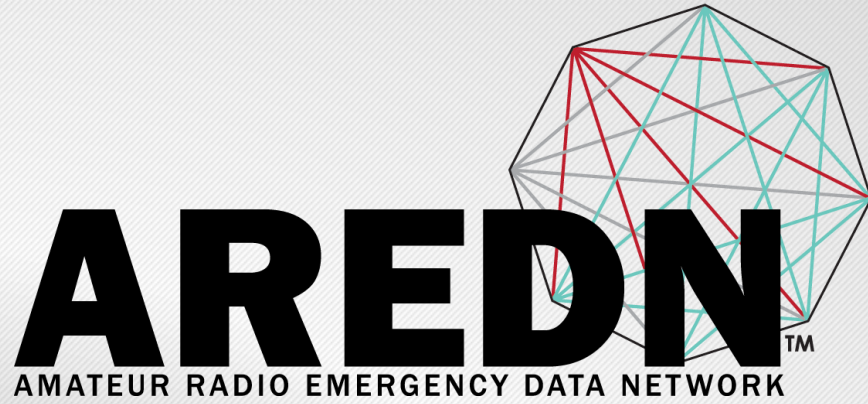
APPENDIX

Frequencies and Channels

Using WinLink to Send Email

Although it is not typically used as a TCP/IP network, WinLink is familiar with [WinLink 2000](#) for sending message across amateur radio frequencies. It is possible to configure WinLink for P2P for sending email with attachments across a network. A Windows computer with plenty of memory to run WinLink and information link below for details about the specifications. The maximum attachment size is currently 5MB per message. For HF and Packet RMS stations. For additional information on Winlink located here: [Winlink Forum](#)





Applications for AREDN


How will you use AREDN ?



WebEOC 8.2 Login

Username

Password





- Public Service / Public Safety
- Red Cross Disaster Services Technology
- Community Emergency Response Team
- Support MOUs with your municipal EOC
- Deliver paradigm changing services
 - VoIP & Chat with other sites
 - Cell Service Restoration - BYO
 - Access to cloud-based systems
 - Augment Winlink services



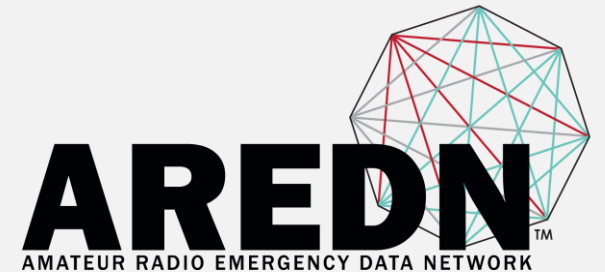
Administrative

Advanced config
iperf Speed Test
Network monitoring
(snmp)
UPS monitoring
NNTP Time services
Antenna pointing/peaking

User Applications

Air Traffic Control	Winlink
EmComMap	DMR linking
CERT Damage Assessment	Web-based Email
MeshChat	Mattermost
Weather Stations	FTP / fileshare
Remote cameras	Website with network/node info
VoIP telephony (226 assigned numbers)	

Applications Running on AREDN Networks



PBX Configuration for VoIP Phones



FreePBX Support

UCP



FreePBX Administration



User Control Panel



Get Support



FreePBX
let freedom ring™

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Sangoma Technologies Inc.
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SANGOMA

MeshChat



CHAT FILES STATUS LOGOUT

Mesh Chat v1.0
Zone: MeshChat
Call Sign: K6AH
Node: kd7vea-rocketdish-to-westmountain
Updated: 86 seconds ago

Send a Message
New Message

Channel:

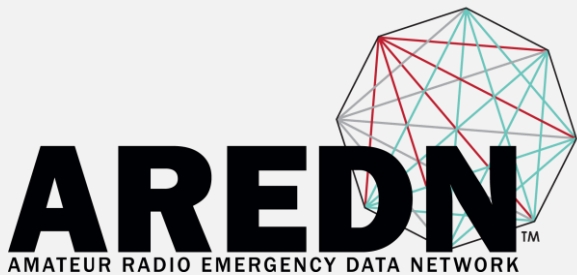
Mesh Chat Users 2

Call Sign	Node	Last Seen
K6AH	kd7vea-rocketdish-to-westmountain	2/14/19 9:33 AM
W6BI	ai6bx-2-chatpi	2/14/19

Messages

Time	Message	Call Sign	Channel	Node
2/13/19 6:02 PM	Testing...	W6BI		ai6bx-2-chatpi
2/13/19 6:01 PM	Just checking in	W6BI		ai6bx-2-chatpi

Node Management thru Smart Switches



TOUGHSwitch™ PoE PRO

STATUS

DEVICE

PORTS

VLANs

ALERTS

Tools:

Logout

Total Throughput

172 TX kbps

37.0 RX kbps

Status

Device Name: K6AH-Elsinore-ToughSwitch

Device Location:

Firmware: SW.v1.3.2

Date: 2015-07-17 22:51:24

Uptime: 1 day 19:18:30

Device MAC: 80:2A:A8:DF:8F:23

Port Status

Port	Name	Port Status	Link Status	PoE	STP State	MTU	Alerts
1	5GHz Backbone to Redlands	Enabled	100Mbps-Full	24V	Forwarding	1518	Off
2	3GHz Downlink to N Riverside	Enabled	100Mbps-Full	24V	Forwarding	1518	Off
3	2GHz Downlink to S Riverside	Enabled	100Mbps-Full	24V	Forwarding	1518	Off
4	2GHz Downlink to N Riverside	Enabled	100Mbps-Full	24V	Forwarding	1518	Off
5	3Ghz Downlink S Riverside	Enabled	100Mbps-Full	24V	Forwarding	1518	Off
6	5GHz Backbone to Sleeping Indian	Enabled	100Mbps-Half	24V	Forwarding	1518	Off
7	Camera	Enabled	100Mbps-Full	Off	Forwarding	1518	Off
8	Management	Enabled	Down	Off	Blocking	1518	Off

Port Statistics

Port	Name	RX Data	RX Packets	RX Errors	TX Data	TX Packets	TX Errors
1	5GHz Backbone to Redlands	1375945217	1234806	0	230703932	979975	0
2	3GHz Downlink to N Riverside	32296798	140863	0	1100714639	1132231	0
3	2GHz Downlink to S Riverside	86482703	439282	0	1472374475	1447618	0
4	2GHz Downlink to N Riverside	39250492	142563	0	1095815961	1134112	0
5	3Ghz Downlink S Riverside	37242938	145915	0	1096856328	1137787	0
6	5GHz Backbone to Sleeping Indian	121095258	281768	0	1056993576	1290701	151
7	Camera	1099545	15940	0	5044910	78361	0
8	Management	0	0	0	0	0	0

Reset Statistics

Total Throughput

RX: 62.5kbps

TX: 299kbps

Data Distribution

RX

TX

All | Last 20 sec

Port 1

Port 2

Port 3

Port 4

Port 5

Port 6

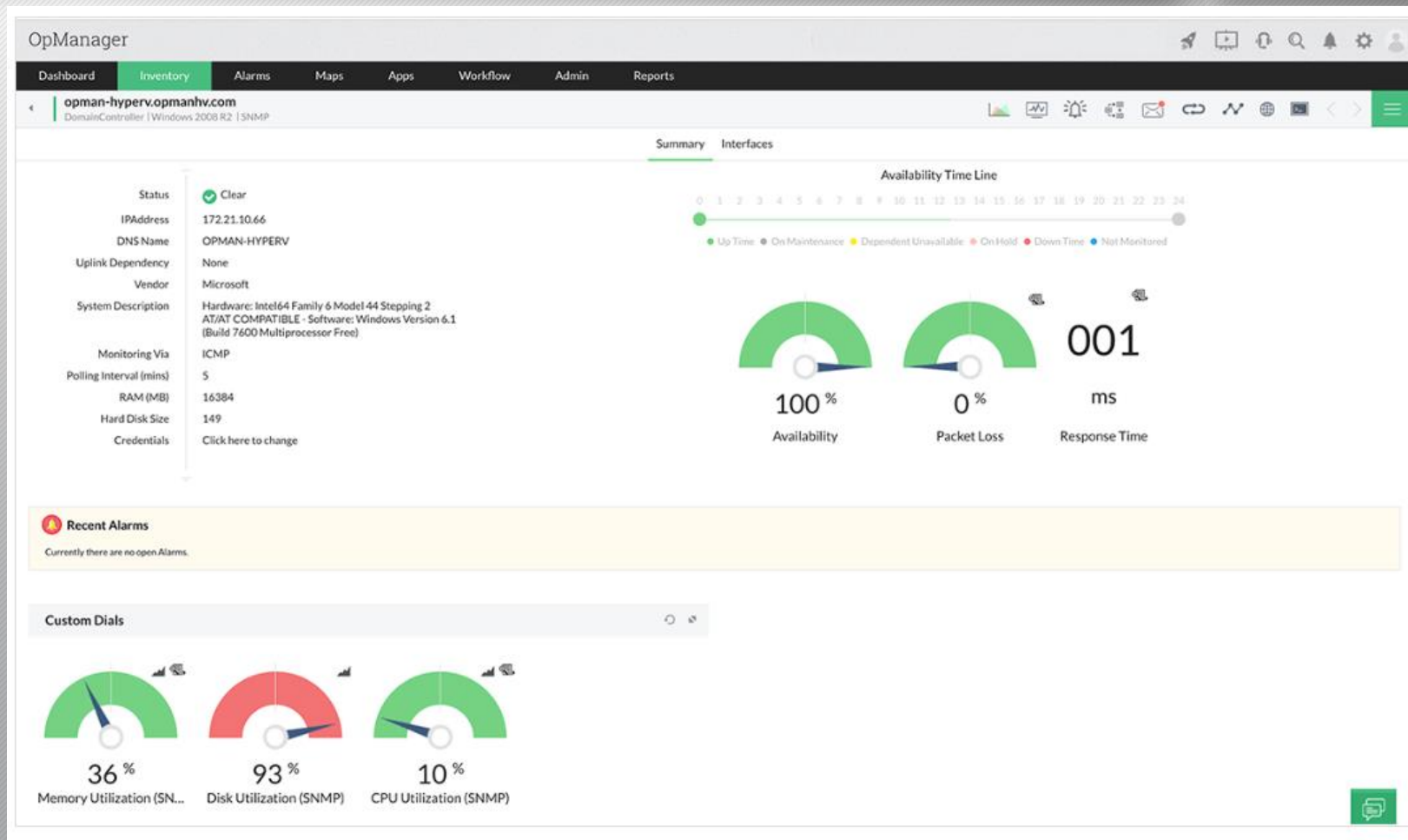
Port 7

Port 8

GENUINE PRODUCT


© Copyright 2006-2015 Ubiquiti Networks, Inc.

Network Management with SNMP



Team Collaboration Systems



**Palo Alto Bank**
@brad.griffen

FAVORITE CHANNELS

- Eric Foster, Tania Wilson
- Dev Agenda
- Jamie Wells** 2
- Help Desk
- SecOps Escalation**
- Threat Briefings**

PUBLIC CHANNELS +


- Browser Compatibility
- Customers
- Developer Meetings
- DevOps Talk** 4
- ISAC Talk
- Off-Topic
- Recruiting
- Release
- UX Design
- More...

PRIVATE CHANNELS +


- Android
- Confidential Bugs
- Developers: Private** 1
- Integrations

★ **SecOps Escalation** ▾
Sec067 - Sec066 - Sec065 - Other Versions can be accessed on the [SecOps Repository](#).


Fri, June 14, 2019


**Jamie Wells** 3:12 PM
Hey @matt.santos, can you have a look at the latest **Sec067** that came in?
As always, do let me know if you have any queries.


Fri, June 14, 2019

**Sophie Watkins** 11:23 AM
@all please confirm with 🙌 that you've reviewed this week's threat briefings.
@tania.wilson, please confirm we've loaded new indicators of Compromise into Splunk.

FactNote Threat Briefing (June 2019)






**Brad Griffen** 12:57 PM
We got an alert #IOC203 was triggered, investigating...

Write a message...


Thread
Fri, June 14, 2019


**PaloAltoBank Incident Bot** BOT 4:02 PM


Post-Mortem #Sec067
Post-Mortem for Issue Sec067 attached.

Owner
@matt.santos

Resolution Time
59 minutes


 Issue Sec067.pptx
PPTX 2MB

**Jamie Wells** 4:04 PM
Great work @matt.santos! Complete in record time.



Write a message...

Add Comment



EmComMap



EMCOMMAP v0.4b

Northeast Survey
Traffic Net for ARES LAX NE

Tactical ID: [Change](#) [Documentation](#)

+

-

Traffic

Operators

Locations

Incident

Incident: Northeast Survey

Description:

Incident start:

Incident end (blank if ongoing):

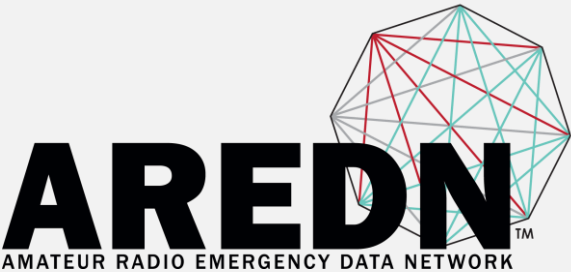
Info last updated:

[Update incident info](#)

Refreshed 2 minutes ago

Leaflet | Map data © OpenStreetMap contributors, CC-BY-SA, Server courtesy of OpenMapTiles

Tickets



Current situation - Redlands, CA Viewing Regions (mouse over to view) Normal 0, Medium 0, High 0

Change display: Popout

Incidents

click item to view / edit, right click for act / pat / notes, Click headers to sort

No Incidents, please select another time period or add a new incident.....

Responders

click on item to view / edit, Click headers to sort

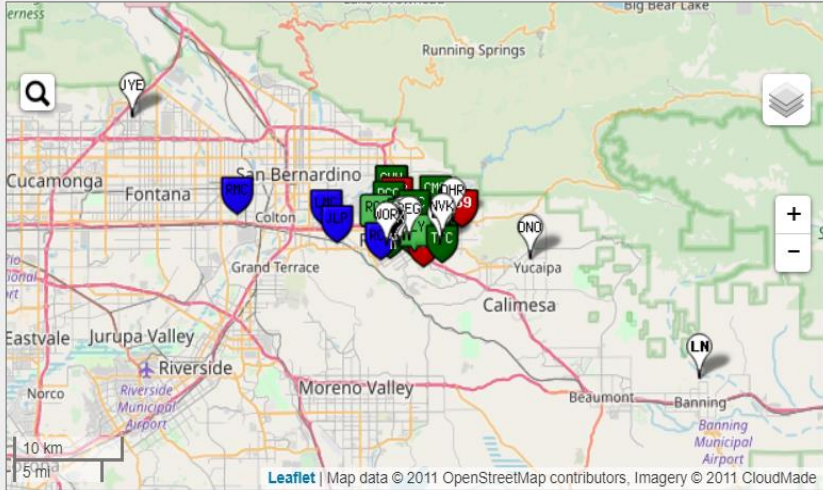
Icon ▲	Handle	Mail	Incidents	Status	M	As of
ACQ	K6ACQ			available ▼		27 11:42
BX	AI6BX			available ▼	AP	15 19:34
CER	R-CERT			available ▼		18 18:46
DHR	KG6DHR			available ▼		16 21:54
DNO	K6DNO			available ▼		23 19:02
FCX	KA6FCX			available ▼		23 14:20
JYE	KM6JYE			available ▼		23 15:01
LN	AJ6LN			available ▼		23 14:04
NVK	N7NVK			available ▼		23 14:36
REG	W6EOC			available ▼		23 10:52
WOR	KE6WOR			available ▼		29 07:37

Facilities

click on item to view / edit, Click headers to sort

Icon	Name	Mail	Status	Updated
261	Redlands Fire Station 261		Open ▼	23 14:24
262	Redlands Fire Department		Open ▼	23 14:24
263	Redlands Fire Department		Open ▼	23 14:25
ACH	Arrowhead Chrisitan Academy		Closed ▼	04 19:51
CC	Contemporary Club		Closed ▼	04 20:10
CMS	Clement Middle School		Closed ▼	04 20:09
CPS	Cope Middle School		Closed ▼	16 21:54
CVH	Citrus Valley High School Gym		Closed ▼	04 19:56
CVH	Citrus Valley High School Multipurpose Room		Closed ▼	04 20:05
FBC	First Baptist Church		Closed ▼	04 20:13
FMC	First United Methodist Church of Redlands		Closed ▼	05 06:49
JLP	Jerry L. Pettis VA Hospital		Open ▼	05 18:25

Show Assigned



Allstar Management via Web GUI



Status for K8BKT - Node 44098

Last update - 02/14/2019 11:40:15 My IP - 76.27.25.238

[View this Node Graphically](#) [Search/Command another Node](#)

Selected system state	0
Signal on input	NO
System	ENABLED
Parrot Mode	DISABLED
Scheduler	ENABLED
Tail Time	STANDARD
Time out timer	ENABLED
Incoming connections	ENABLED
Time out timer state	RESET
Time outs since system initialization	2
Identifier state	CLEAN
Kerchunks today	0
Kerchunks since system initialization	2662
Keyups today	61
Keyups since system initialization	26398
DTMF commands today	0
DTMF commands since system initialization	49
Last DTMF command executed	22256
TX time today	00:12:0675
TX time since system initialization	90:12:15148
Uptime	3211:51:54
Nodes currently connected to us	2256
Autopatch	ENABLED
Autopatch state	DOWN
Autopatch called number	N/A
Reverse patch/IAXRPT connected	DOWN
User linking commands	ENABLED
User functions	ENABLED

<u>Node</u>	<u>Call</u>	<u>Description</u>	<u>Location</u>
44098	K8BKT	449.775 -	Pleasant Grove, Utah
2256*	VE3RTR	444.975-	Cobourg, ON

Node	Peer	Reconnects	Direction	Connect Time	Connect State
2256	72.142.154.178	0	OUT	11:25:50.61	ESTABLISHED

Host	Node	State
44.98.254.145:4569	44098	Registered

Allstar via Pi-Star Application



Hostname: pi-star

Pi-Star:3.4.17 / Dashboard: 20190205

Pi-Star Digital Voice Dashboard for K6TZ

Dashboard | Admin | Configuration

Modes Enabled

D-Star	DMR
YSF	P25
YSF XMode	NXDN
DMR XMode	POCSAG

Network Status

D-Star Net	DMR Net
YSF Net	P25 Net
YSF2DMR	NXDN Net
YSF2NXDN	YSF2P25
DMR2NXDN	DMR2YSF

Radio Info

Trx	Listening
Tx	445.480000 MHz
Rx	440.480000 MHz
FW	MMDVM:20170501

YSF Network

Linked to: YSF2DMR

YSF2DMR

DMR ID	110629
YSF2DMR Master	
BM United States ..	

Gateway Activity

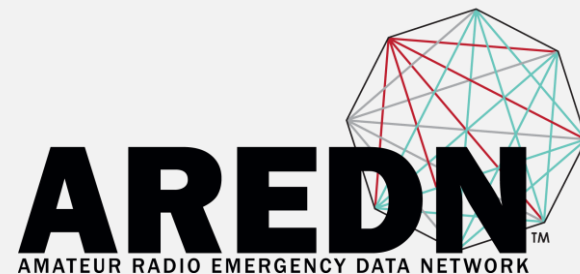
Time (PST)	Mode	Callsign	Target	Src	Dur(s)	Loss	BER
08:45:16 Feb 14th	YSF	K5CAW	ALL at K6TZ	Net	0.6	0%	0.0%
22:21:55 Feb 13th	YSF	W6STP	ALL at K6TZ	Net	11.1	0%	0.0%
21:17:54 Feb 13th	YSF	WB6OBB	ALL	RF	1.0	0%	0.1%
21:06:24 Feb 13th	YSF	K6LCM	ALL	RF	0.9	0%	3.8%
20:51:59 Feb 13th	YSF	K6BPM	ALL	RF	0.8	0%	3.6%
20:51:27 Feb 13th	YSF	K16FFA	ALL at K6TZ	Net	8.8	0%	0.0%

Local RF Activity

















Time (PST)	Mode	Callsign	Target	Src	Dur(s)	BER	RSSI
21:17:54 Feb 13th	YSF	WB6OBB	ALL	RF	1.0	0.1%	
21:06:24 Feb 13th	YSF	K6LCM	ALL	RF	0.9	3.8%	
20:51:59 Feb 13th	YSF	K6BPM	ALL	RF	0.8	3.6%	

Pi-Star / Pi-Star Dashboard, © Andy Taylor (MW0MWZ) 2014-2019.
ircDDBGateway Dashboard by Hans-J. Barthen (DL5DI),
MMDVMDash developed by Kim Huebel (DG9VH),
Need help? Click here for the Facebook Group
or Click here to join the Support Forum
Get your copy of Pi-Star from here.

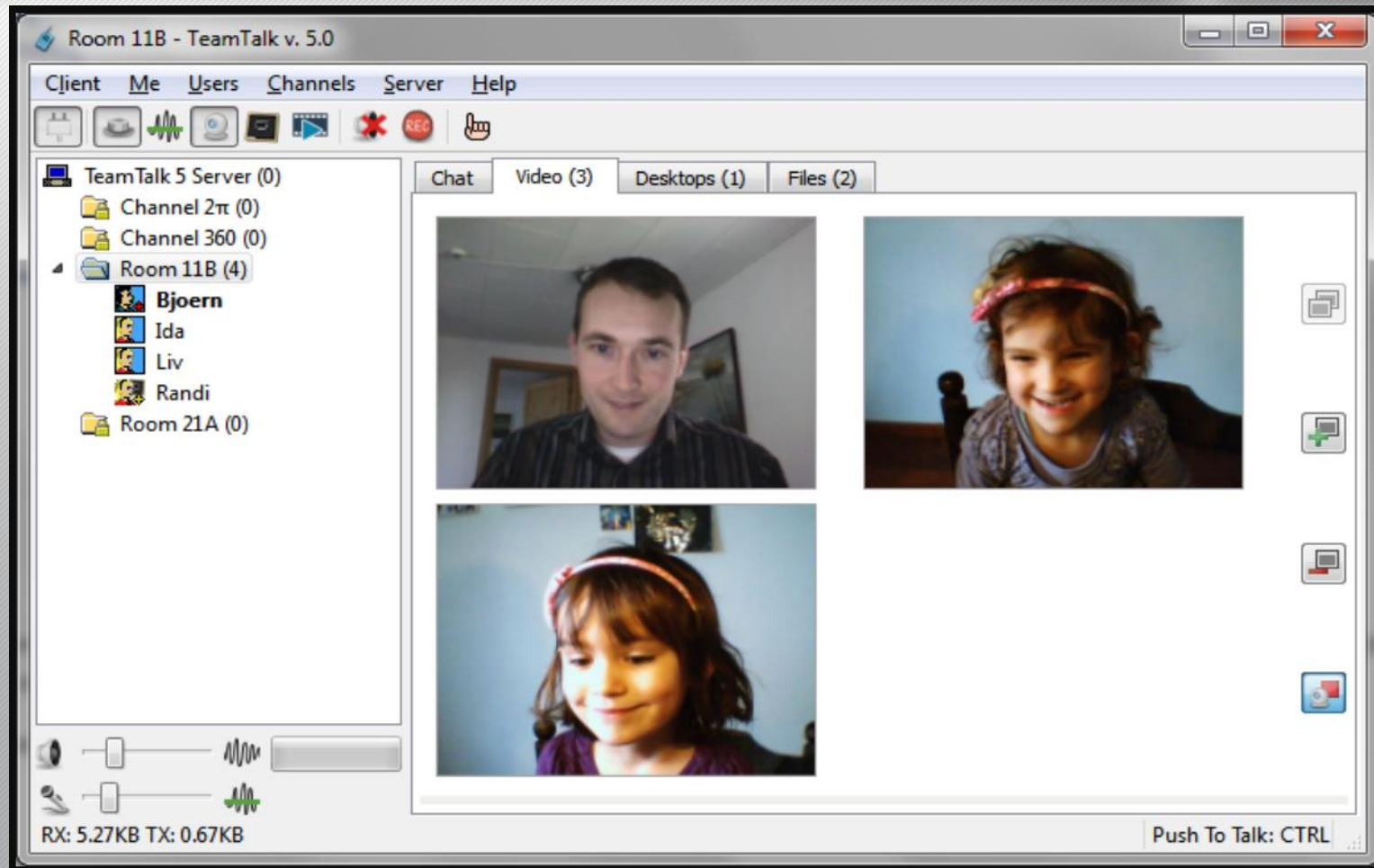
Fileshare / FTP



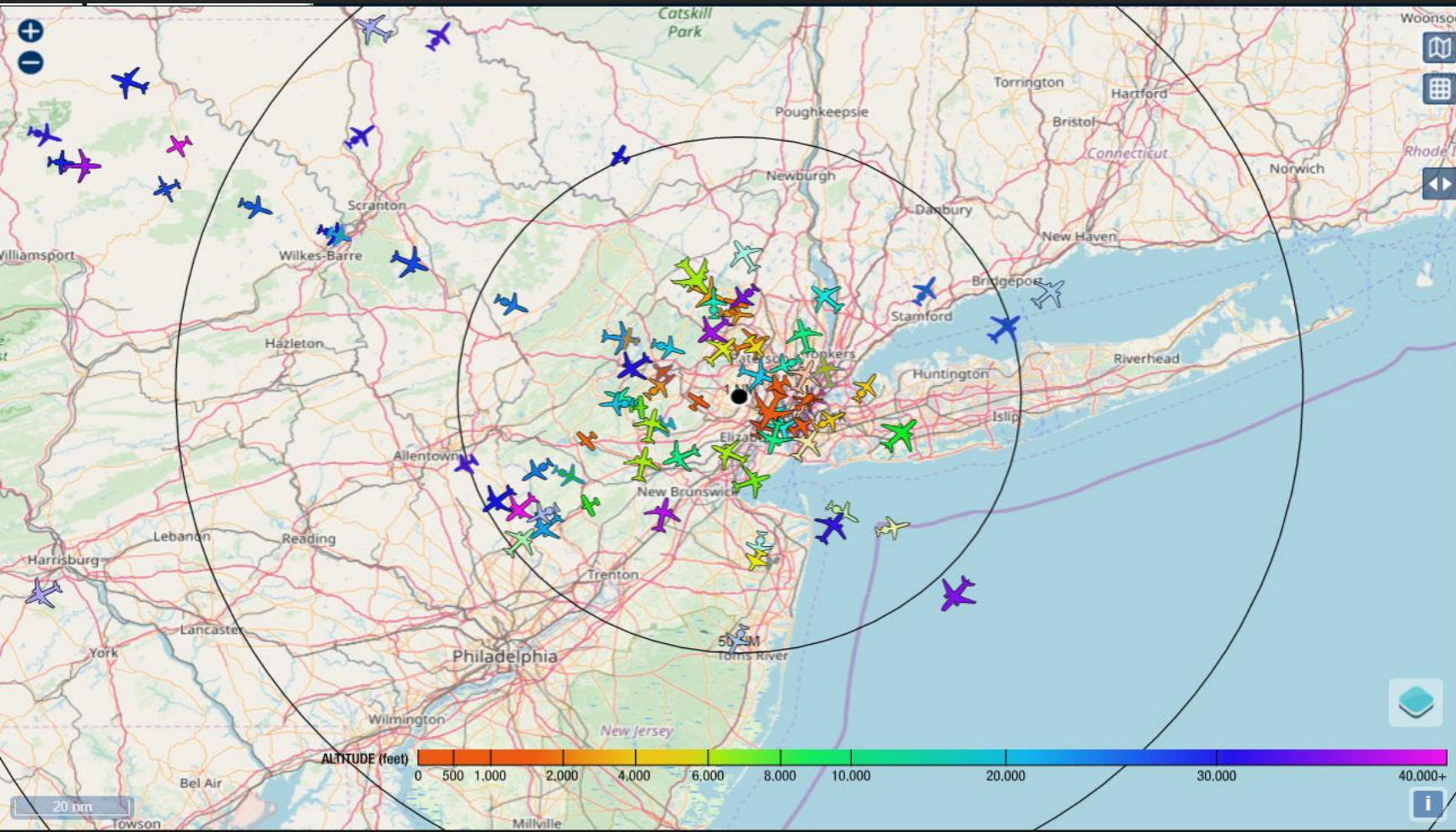
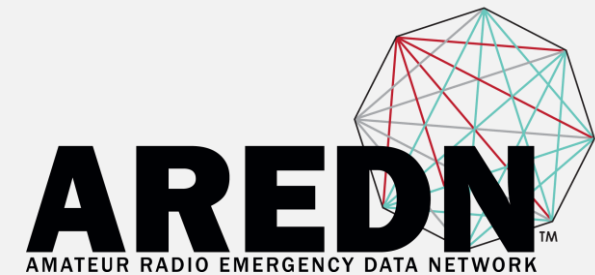
Index of /

	Name	Size	Date Modified
	3CXPhone6.msi	13.3 MB	8/21/16, 5:00:00 PM
	AV.exe	6.0 MB	9/5/18, 5:00:00 PM
	Camera Uploads/		1/28/19, 4:46:00 PM
	DMR Software/		12/25/16, 4:00:00 PM
	emergencycommplan.pdf	2.5 MB	10/14/18, 5:00:00 PM
	ExtIO_RTL_TCP.zip	58.2 kB	10/11/16, 5:00:00 PM
	HDSDR/		10/11/16, 5:00:00 PM
	ipscan-3.5.2-setup (1).exe	3.1 MB	7/23/18, 5:00:00 PM
	js8call-0.7.3-devel-win32.exe	18.3 MB	10/10/18, 5:00:00 PM
	KD7BKO Shared Docs/		3/19/17, 5:00:00 PM
	My radio software/		6/14/17, 5:00:00 PM
	P2P ID Finder Software/		9/30/16, 5:00:00 PM
	Packages/		10/23/16, 5:00:00 PM
	phpsysinfo/		11/5/16, 5:00:00 PM
	sdrsharp-x86/		11/10/16, 4:00:00 PM
	South-Tower-Camera/		4/18/17, 5:00:00 PM

TeamTalk Video Conferencing / Fileshare



Air Traffic ADS-B / SDR Dongle



Total Aircraft: 102
With Positions: 85

Messages: 635.6/sec
History: 5757 positions

Filter by Altitude: ft to ft Filter Reset

ICAO	Ident	Squawk	Altitude (ft)	Speed (kt)	Distance (NM)	Heading
AD6884	AAL2287	4033	18,975	397	5.2	10
A8C4D8	UAL18	2465	1,100 ▼	135	6.2	20
C01EC5	POE130		ground	19	7.0	2
AAB37C		3042	1,375	202	7.0	24
A936FA	N693MM	1200	1,025 ▲	104	7.5	3
ADA227	JBU516	3223	16,400 ▼	321	9.3	16
ACB285	AAL1489	3567	4,875 ▲	229	9.5	4
A2CFA2	SKW3846	1735	12,175 ▲	261	10.0	19
478F43	SAS909	2451	4,375 ▼	282	10.0	14
A6F280	LXJ547	2643	14,925	298	10.0	24
A48438	EJA390	3656	2,625 ▼	241	10.6	6
ACBF73	N920PD				11.0	
A1AD1F	N207MH	0327	1,425 ▲	85	11.1	1
AC0A22	AAL1333	3035	5,850 ▲	225	11.2	29
A07CBB	N130RU	1200	1,400	97	11.8	4
A08095			200 ▼	123	12.1	7
A7D464	N603WM	3310	1,300	192	12.3	2
2AC772			200 ▼	87	12.6	5
A9RA85	N726H	0307	1,900	6	13.2	23

ARES Informational Site



Los Angeles Emergency Communications Team

Home

Los Angeles Emergency Communications Team

The Los Angeles Emergency Communications Team ("LAECT") is a group of dedicated individuals committed to training and education in all aspects of emergency preparedness, management and response, with an emphasis on emergency communications.

LAECT partners with cities, community groups and other preparedness organizations to coordinate and provide practical preparedness and communications training throughout Southern California. Its members have received specialized training related to emergency preparedness, including Community Emergency Response Team ("CERT"), and the federal Incident Management System and National Incident Management System, both used to manage response to disasters and emergency situations by all levels of government. They also actively participate in numerous preparedness exercises each year, including the California ShakeOut, the California Statewide Medical and Healthcare Exercise and various local and regional exercises.


LAECT also works cooperatively with the Los Angeles Section of Amateur Radio Emergency Service ("ARES LAX"). ARES LAX encompasses all of Los Angeles County, encompassing more than 4000 square miles, and its more than 10 million residents. ARES LAX is the largest ARES Section, and the only one comprised of a single county. There are more than 22,000 Amateur Radio operators licensed in Los Angeles County.

As its primary mission, ARES LAX provides backup and emergency communications support to the Los Angeles County Medical Alert Center and almost 70 hospitals throughout the County, including virtually all "911 receiving" hospitals (those with emergency departments). ARES LAX is recognized as a formal component of the Los Angeles County Emergency Medical Services Agency Emergency Communications Plan.

FCC station license KA6ECT

Node and Service Info





Los Angeles Emergency Communications Team

Home

AREDN Mesh Nodes

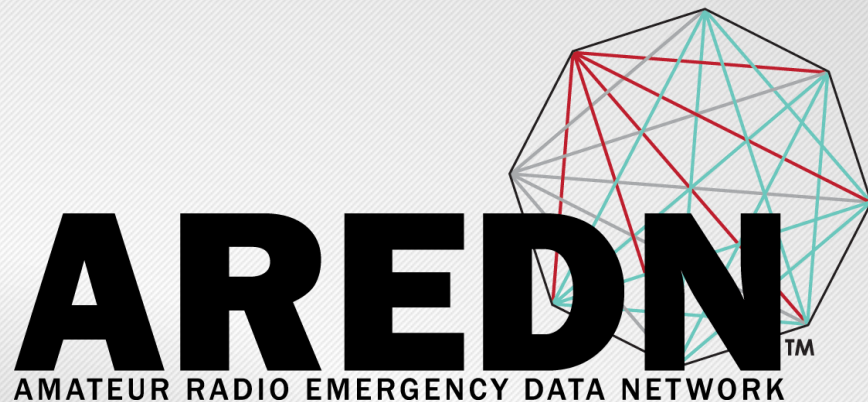
Located at Huntington Hospital in Pasadena, California (DM04WD)

KA6ECT-PAS-NBM5-60-241-34	5 GHz link to JPL
KA6ECT-PAS-NE-RM5-GPS-42-127-62	5 GHz, 120 degree sector pointing northeast
KA6ECT-PAS-SE-RM5-GPS-42-129-169	5 GHz, 120 degree sector pointing southeast
KA6ECT-ARHP-76-210-212	2 GHz device linking node
KA6ECT-BM2-170-202-183	2 GHz campus access
KA6ECT-BM2-170-201-235	2 GHz campus access

Other AREDN mesh nodes are operated by individual LAECT participants.

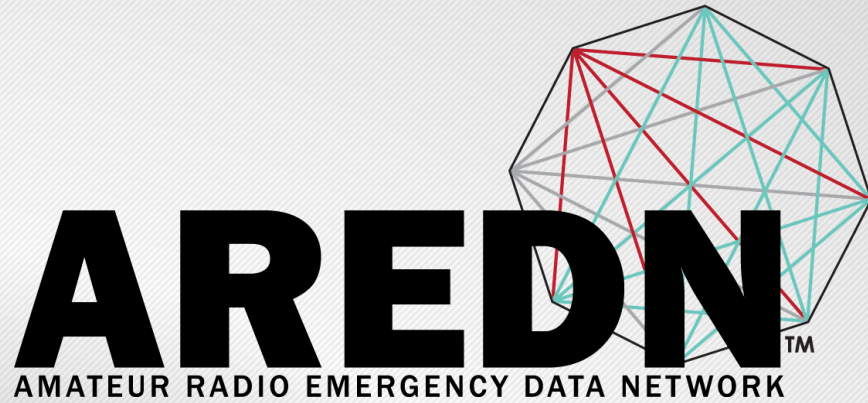
AREDN Mesh Services

Winlink RMS gateway KA6ECT-10 with RMS Relay, connecting to Winlink CMS
VHF packet, 145.050 MHz, 1200 baud
UHF packet, 431.125 MHz, 9600 baud
Mesh access using Telnet or Telnet Post Office session in Winlink Express, 10.205.45.75
Winlink Telnet Post Office for local messages, no link to CMS, 10.205.45.70
Anonymous FTP server, 10.205.45.70 (files may be deleted at any time)
■ NTP service, Stratum 1 (provided by W6GSW), 10.101.205.250



For More Info

- WWW.AREDNmesh.ORG
- QST June and September 2017, ARRL
- TAPR/ARRL DCC Proceedings 2015 and 2016
- Search YouTube, HamRadio360, HamRadioNow, HamNation videos



Contact Info

Andre Hansen, K6AH

www.arednmesh.org/forum