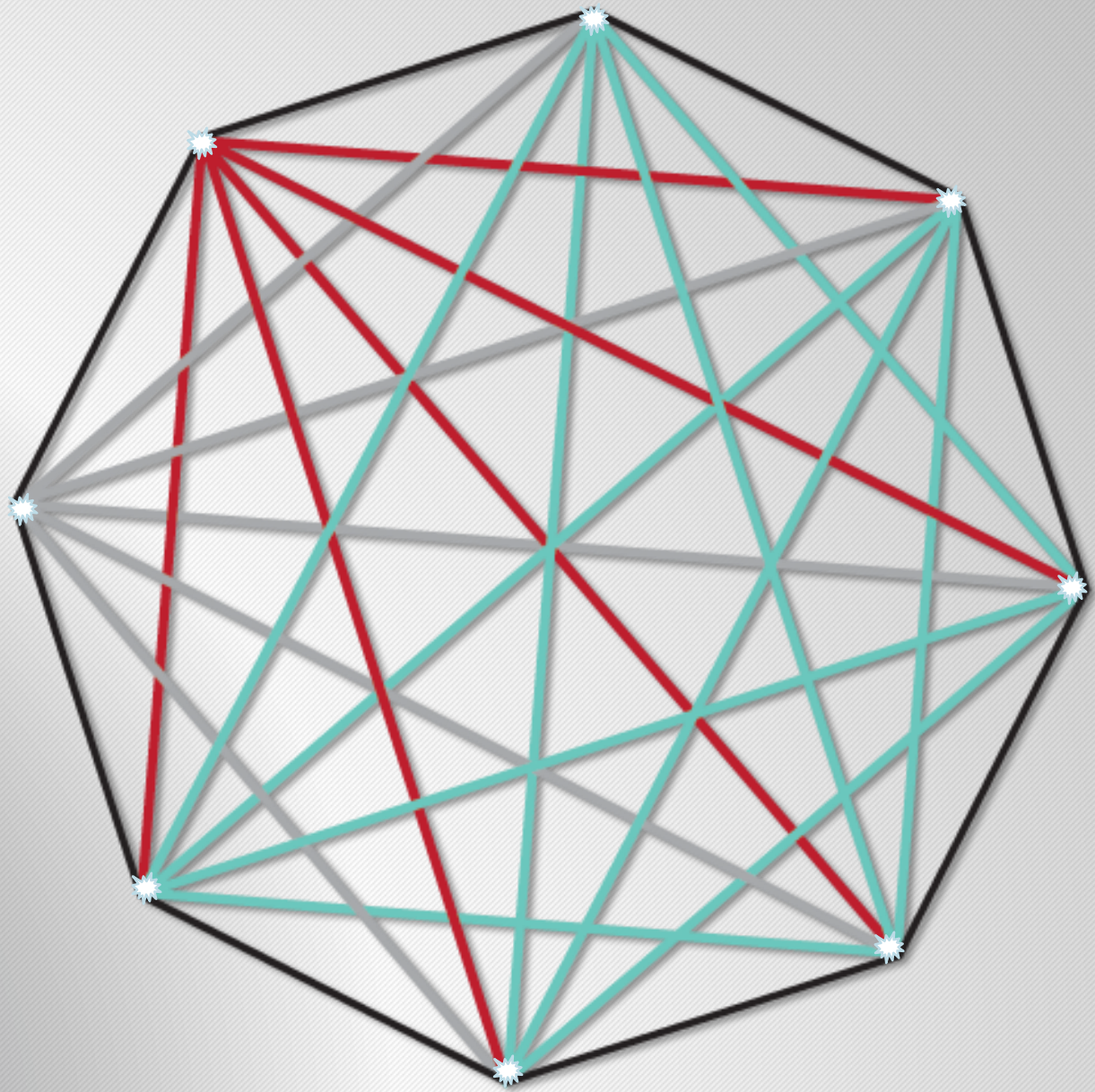
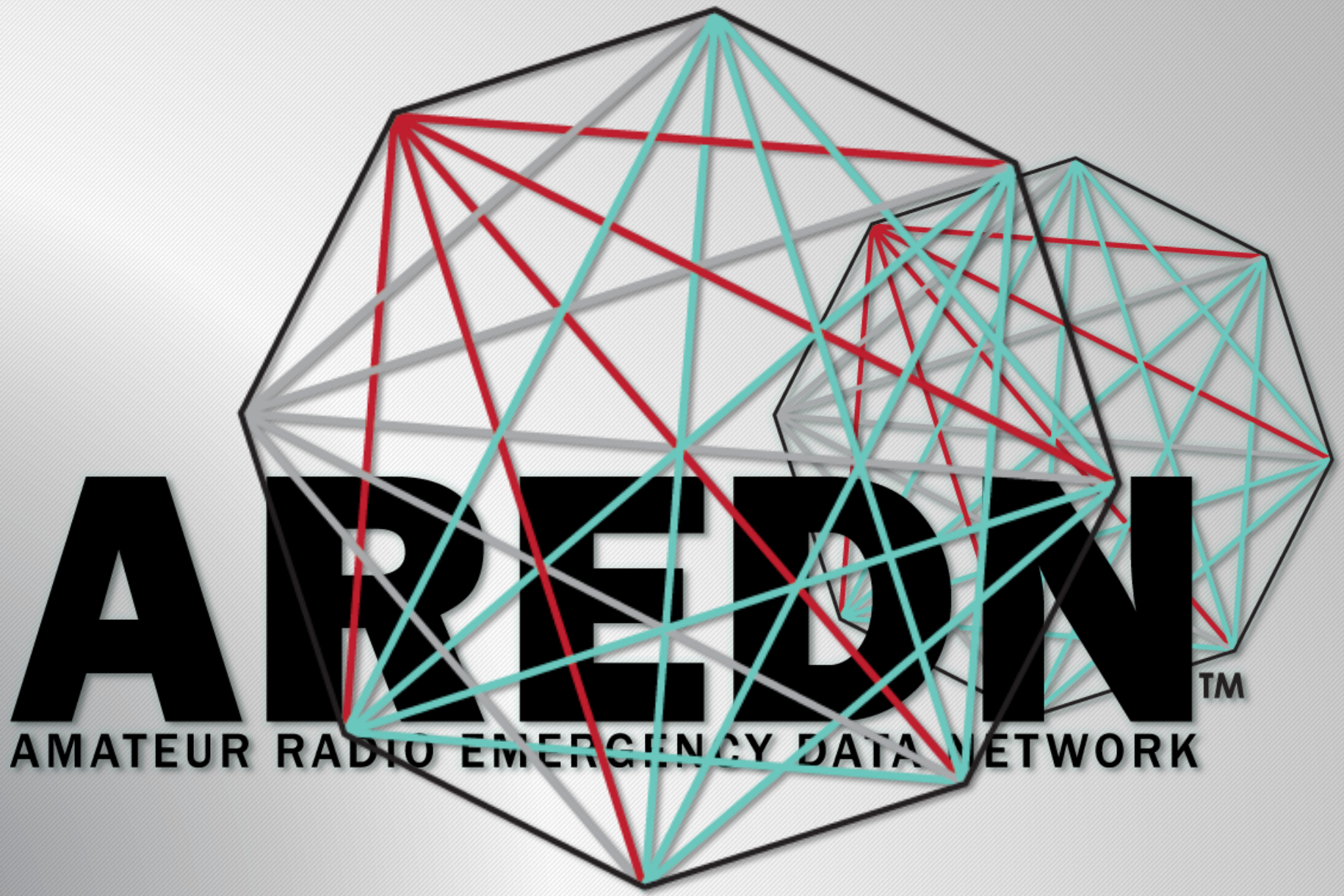



AREDN™
AMATEUR RADIO EMERGENCY DATA NETWORK

AREDN™
AMATEUR RADIO EMERGENCY DATA NETWORK

New Developments in Software / Implementations in the SW Division

Andre, Hansen, K6AH

Yuma Hamfest - 2019
Yuma County Fairgrounds
February 16, 2019

- New Team Members
- Device Support
- Firmware Installation
- Documentation
- User Applications
- Network Growth in the SW Division

Presentation Overview

AREDN™
AMATEUR RADIO EMERGENCY DATA NETWORK

AREDN™
AMATEUR RADIO EMERGENCY DATA NETWORK

Team Members

- Randy, WU2S, Webmaster, President
- Joe, AE6XE – Lead Developer
- Darryl, K5DLQ - Lead Developer
- Andre, K6AH, Project Manager

Core Team

AREDN™
AMATEUR RADIO EMERGENCY DATA NETWORK

- Andrew, KK4ZUZ – new device support
- Eric, KC6WXC – various
- Peter, KK6RUH – new device support
- Ray, KK6RAY – new UI
- Steve, KC0EUW – documentation
- Patrick, KE0RSX – new device support

New Contributors

AREDN™
AMATEUR RADIO EMERGENCY DATA NETWORK

AREDN™
AMATEUR RADIO EMERGENCY DATA NETWORK

New Device Support

Ubiquiti

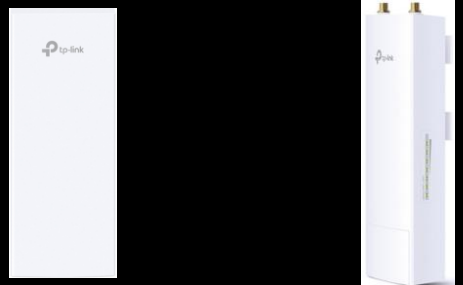
Wide variety of devices for all topologies

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

AREDN™
AMATEUR RADIO EMERGENCY DATA NETWORK

Firmware Installation

Firmware Installation

- Simplifying a complex situation
- Administrative F/W Update
  - Performed from the nodes user interface
  - Easy and convenient
  - Usable on all devices once it is running AREDN F/W
  - Use “sysupgrade” firmware files

- Trivial File Transfer Protocol (TFTP)
  - Performed with a LAN-connected PC (Windows or Linux)
  - Use when the manufacturers' firmware is installed or after a 20-second reset
  - Once TFTP is configured on your computer it is much easier to use
  - Use “factory” firmware files

AREDN™
AMATEUR RADIO EMERGENCY DATA NETWORK

Documentation

Documentation

AREDN™
AMATEUR RADIO EMERGENCY DATA NETWORK

AREDN Documentation
latest
Search docs

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 Overvie

AREDN Over

The AREDN™ acronym s
for *Amateur Radio* operat
service-oriented commu

For many years amateur
transmissions for emerge
involved conveying the n
ICS-213 form. The mess
or type it on another ICS
delivered to the recipien
then be handled through

This tried-and-true scen
emergency and event tra
of traditional methods ar
electronic form, with me
Pactor, Fldigi, and others

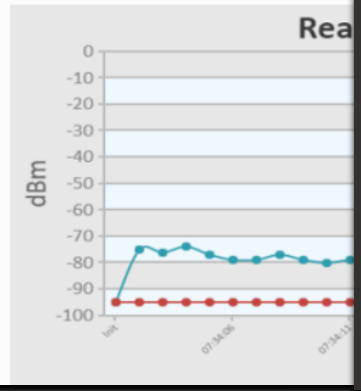
In today's high-tech soci
accustomed to different
communication needs. T
short messaging and key

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 achiev
antennas so that one is vertically po
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

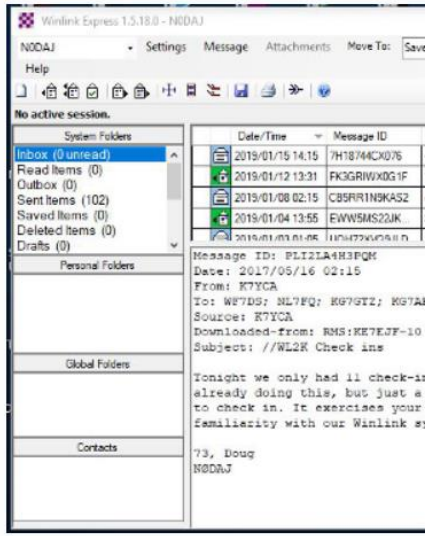
The AREDN™ web interface provide
being installed to form a link. On the
Signal to Noise graph. Slowly turn an
you see the best signal, as shown be
focus on the antenna position witho
Sound feature and align the antenna
Signal to Noise Ratio of 15 dB is ade



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
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

Using WinLink to Send Email

Although it is not typically used as a TCP/IP netw
familiar with WinLink 2000 for sending message
amateur radio frequencies. It is possible to config
P2P for sending email with attachments across a
Windows computer with plenty of memory to ru
information link below for details about the spec
maximum attachment size is currently 5MB per m
HF and Packet RMS stations. For additional infor
on Winlink located here: Winlink Forum



AREDN™
AMATEUR RADIO EMERGENCY DATA NETWORK

Applications for AREDN

How will you use AREDN ?

- 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

EmComMap

CERT Damage Assessment

MeshChat

Weather Stations

Remote cameras

VoIP telephony (226 assigned numbers)

Winlink

DMR linking

Web-based Email

Mattermost

FTP / fileshare

Website with network/node info

Applications Running on AREDN Networks

AREDN™
AMATEUR RADIO EMERGENCY DATA NETWORK

PBX Configuration for VoIP Phones

AREDN™
AMATEUR RADIO EMERGENCY DATA NETWORK

MeshChat

AREDN™
AMATEUR RADIO EMERGENCY DATA NETWORK

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

Enter message here

Channel:

Everything

Mesh Chat Users 2

Call Sign	Node	Last Seen
K6AH	kd7vea-rocketdish-to-westmountain	2/14/19 9:33 AM
[illegible]	[illegible]	2/14/19

Messages

Search: Enter search

Channel: Everything

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

AREDN™
AMATEUR RADIO EMERGENCY DATA NETWORK

TOUGHSwitch PoE PRO

STATUS | DEVICE | PORTS | VLANS | ALERTS

Tools: ▼ Logout

Status

Device Name:	K6AH-Elsinore-ToughSwitch	Date:	2015-07-17 22:51:24
Device Location:		Uptime:	1 day 19:18:30
Firmware:	SW.v1.3.2	Device MAC:	80:2A:A8:DF:8F:23

Port Status

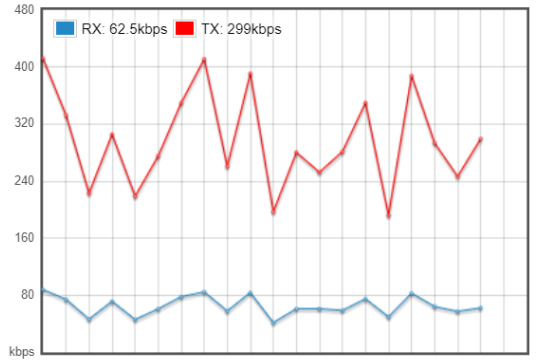
Port	Name	Port Status	Link Status	PoE	STP State	MTU	Alerts
1	5GHz Backbone to Redlands	Enabled	100Mbps-Full	24V	Forwarding	1518	Off
2	3GHz Downlink to N Riverside	Enabled	100Mbps-Full	24V	Forwarding	1518	Off
3	2GHz Downlink to S Riverside	Enabled	100Mbps-Full	24V	Forwarding	1518	Off
4	2GHz Downlink to 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

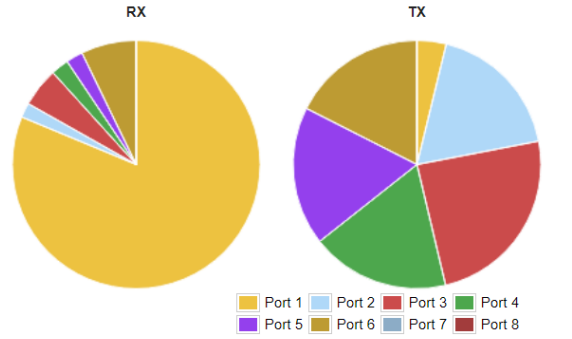
Reset Statistics

Total Throughput



Data Distribution

All | Last 20 sec

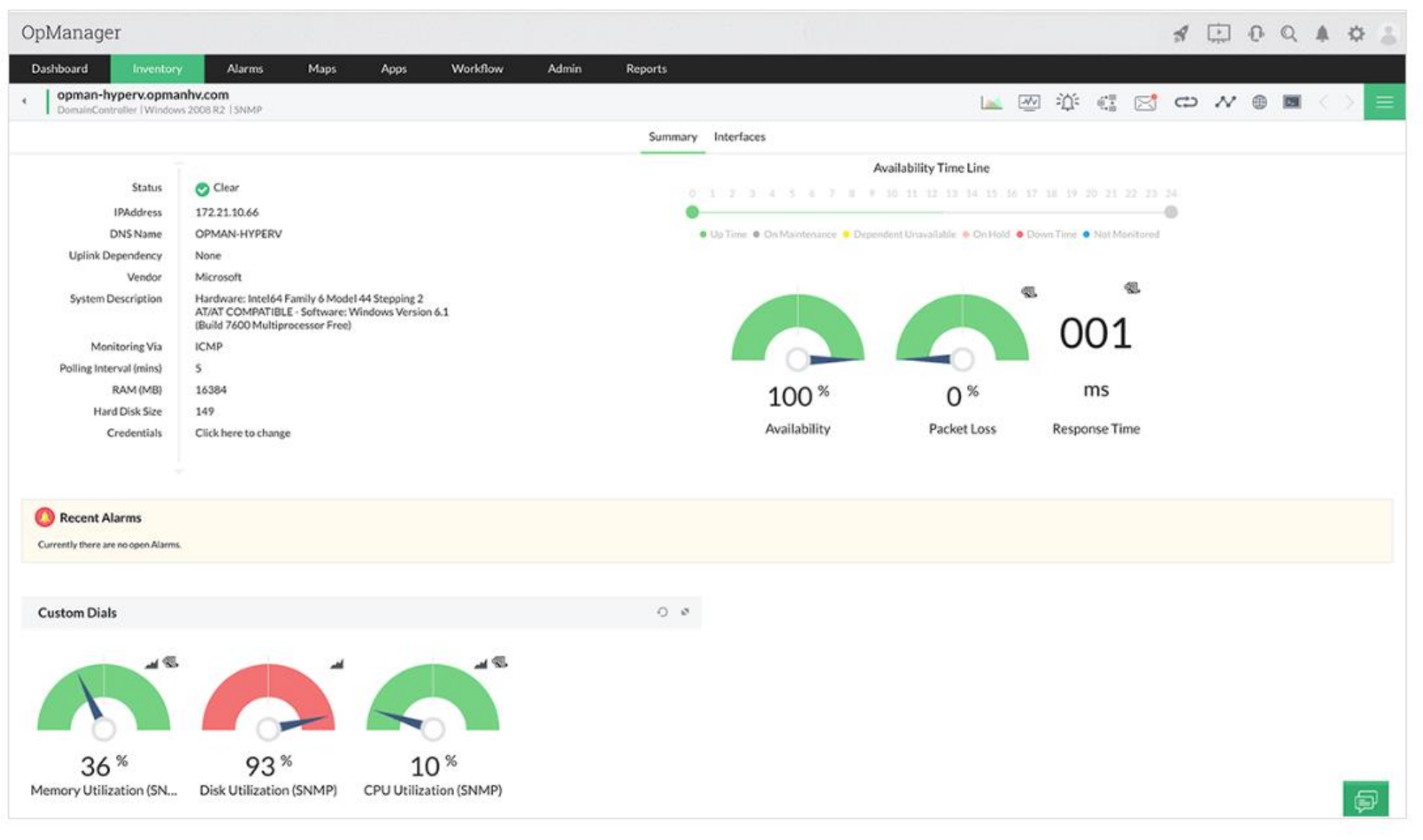


GENUINE PRODUCT

© Copyright 2006-2015 Ubiquiti Networks, Inc.

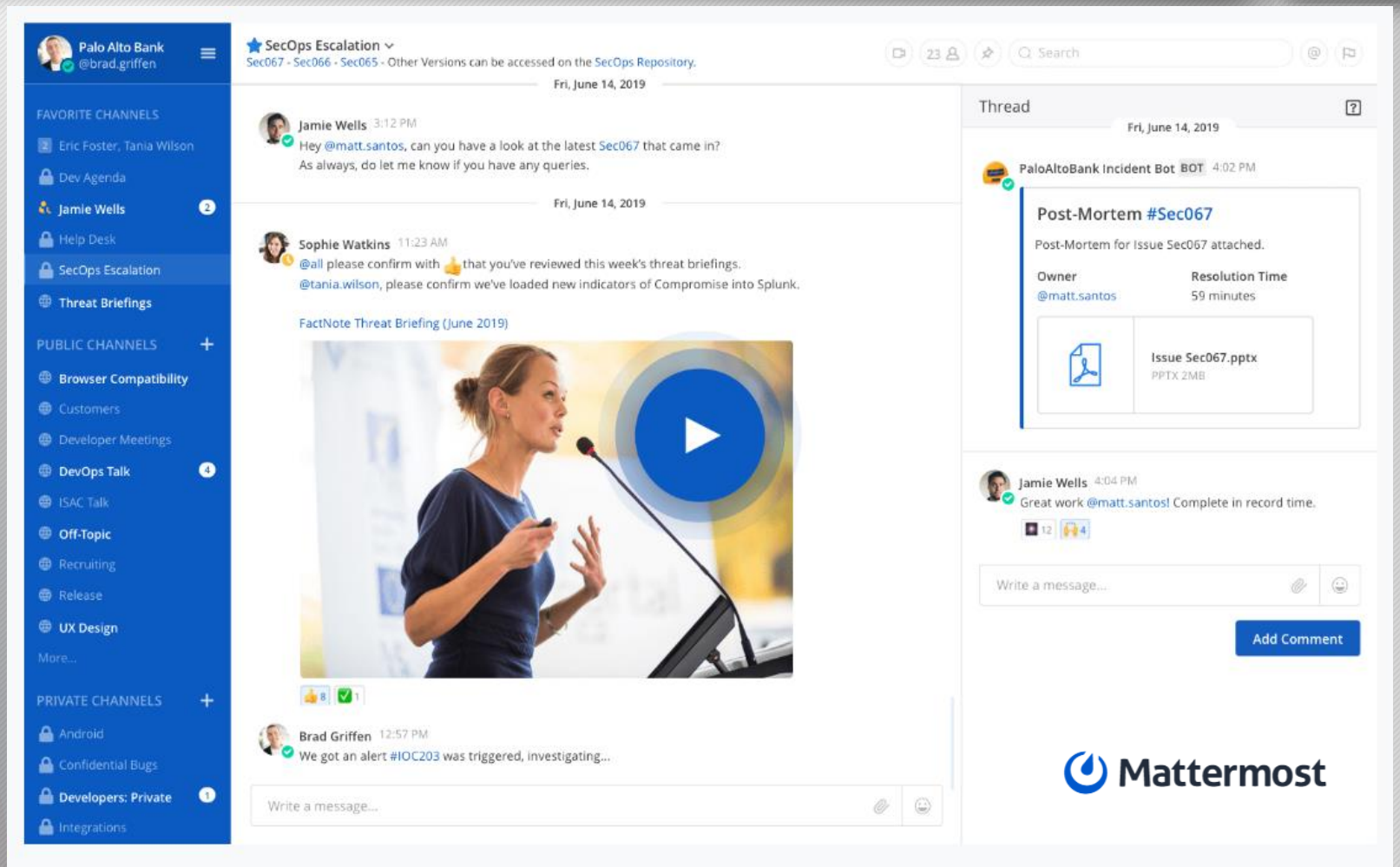
Network Management with SNMP

AREDN™
AMATEUR RADIO EMERGENCY DATA NETWORK



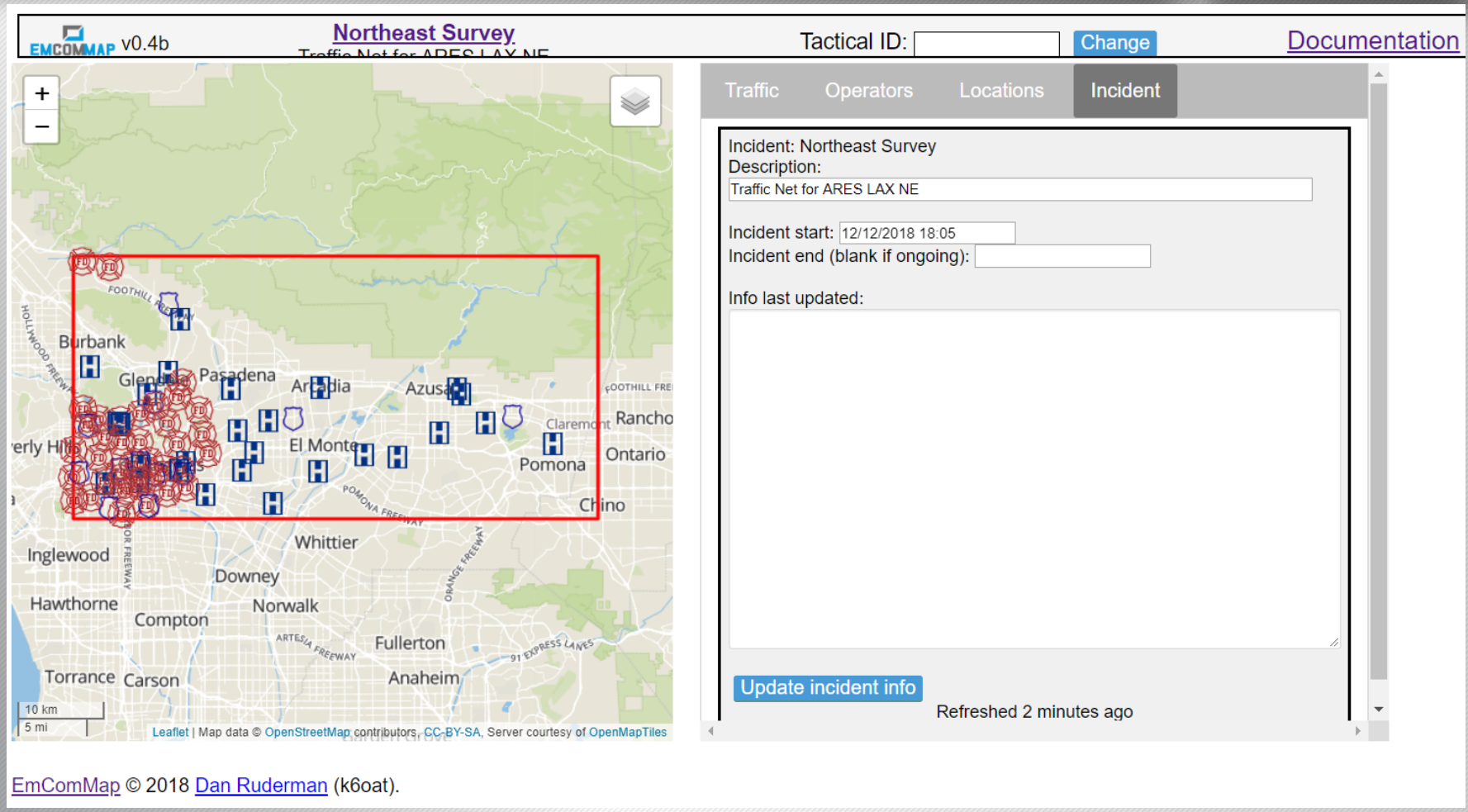
Team Collaboration Systems

AREDN™
AMATEUR RADIO EMERGENCY DATA NETWORK



EmComMap

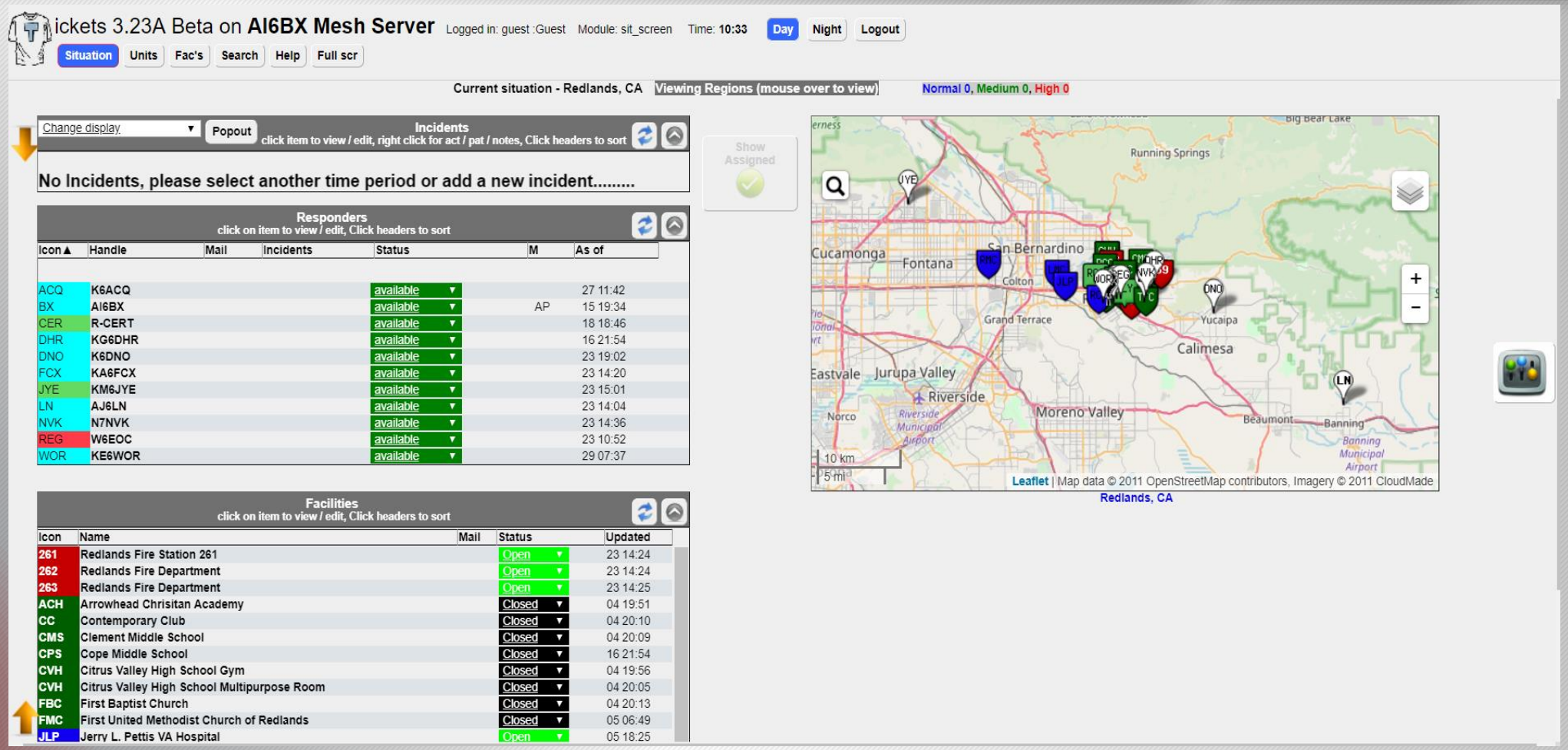
AREDN™
AMATEUR RADIO EMERGENCY DATA NETWORK



EmComMap © 2018 Dan Ruderman (k6oat).

Tickets

AREDN™
AMATEUR RADIO EMERGENCY DATA NETWORK



Allstar Management via Web GUI

AREDN™
AMATEUR RADIO EMERGENCY DATA NETWORK

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

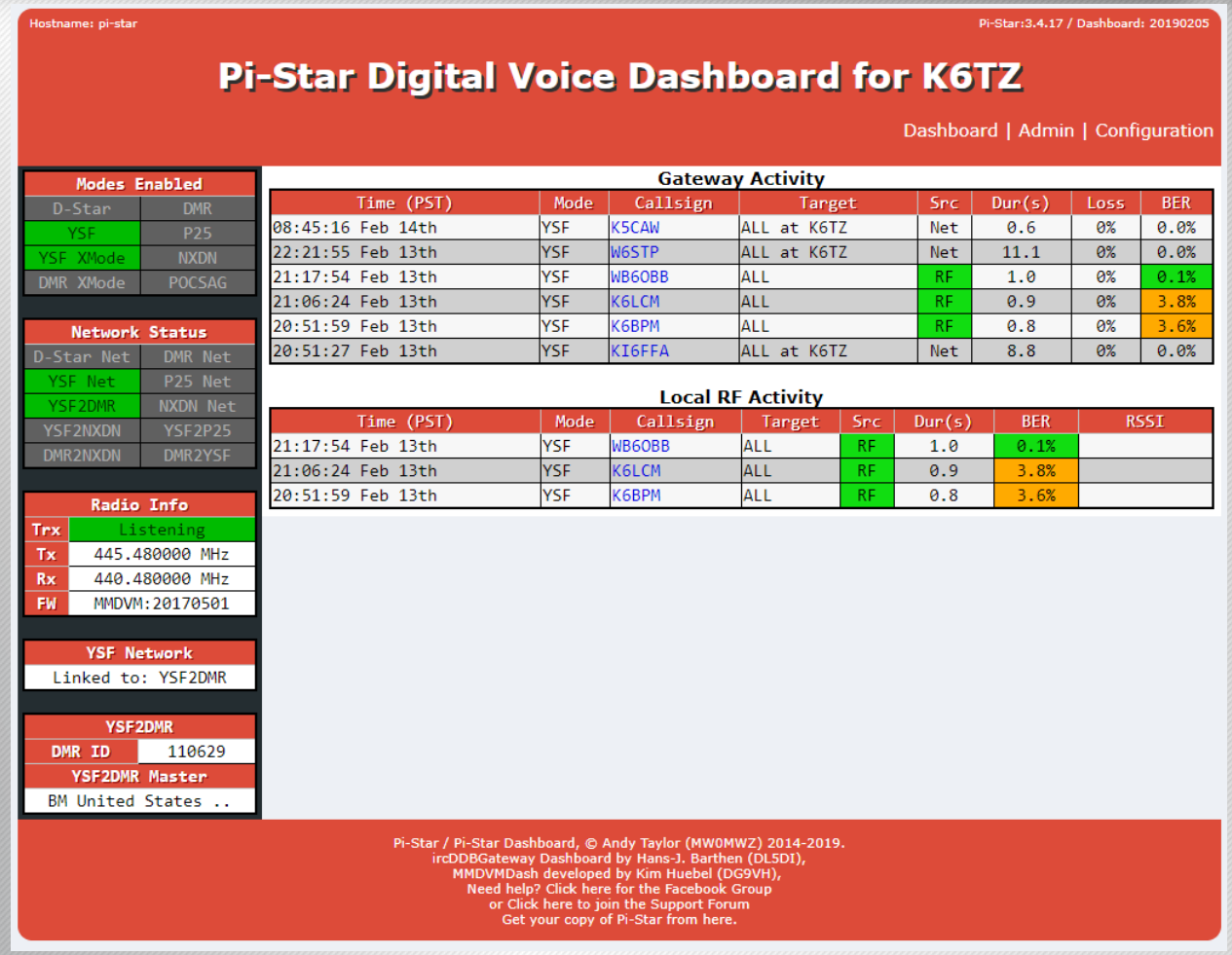
Node	Call	Description	Location
44098	K8BKT	449.775 -	Pleasant Grove, Utah
2256*	VE3RTR	444.975-	Cobourg, ON

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

AREDN™
AMATEUR RADIO EMERGENCY DATA NETWORK



Fileshare / FTP

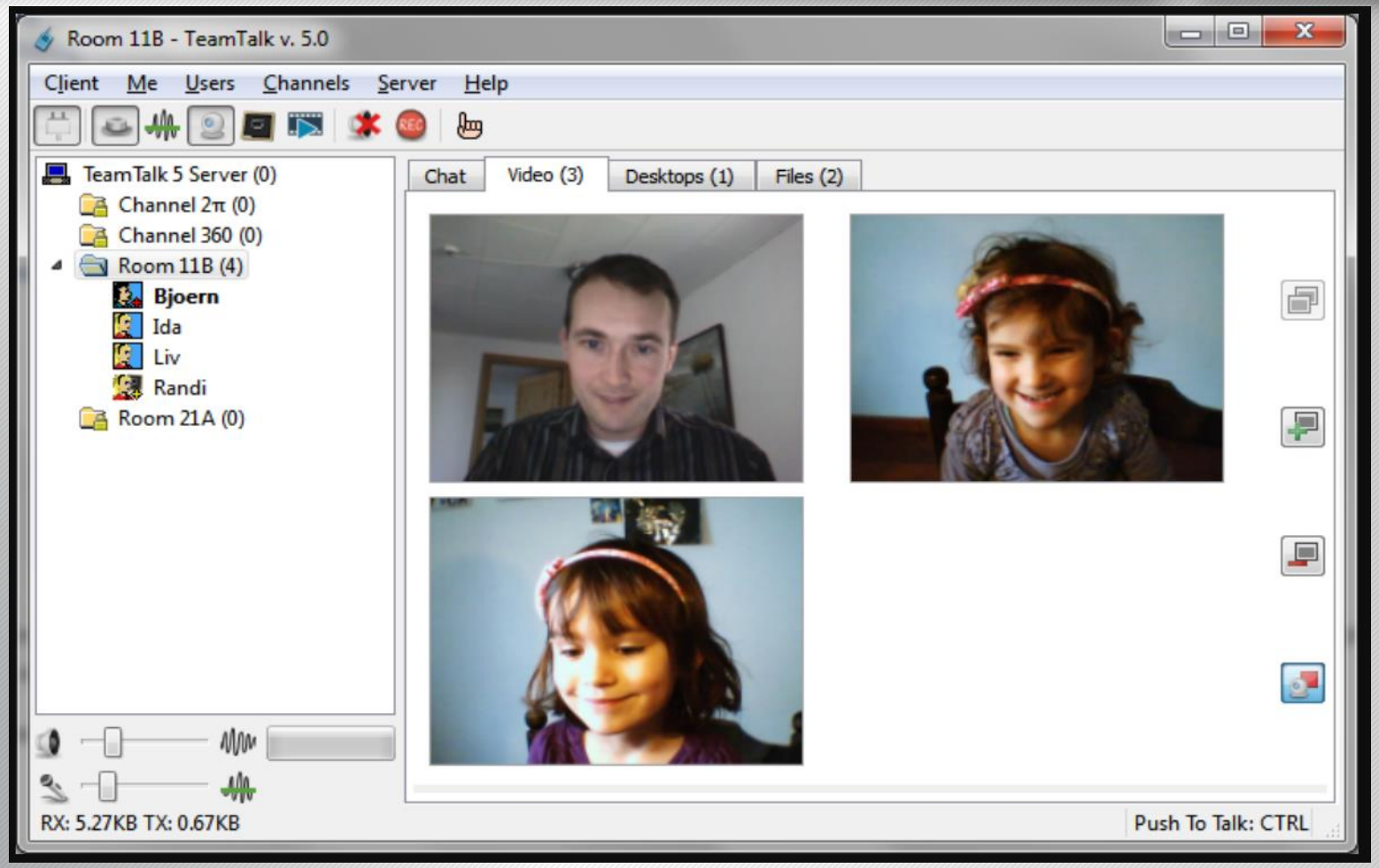
AREDN™
AMATEUR RADIO EMERGENCY DATA NETWORK

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

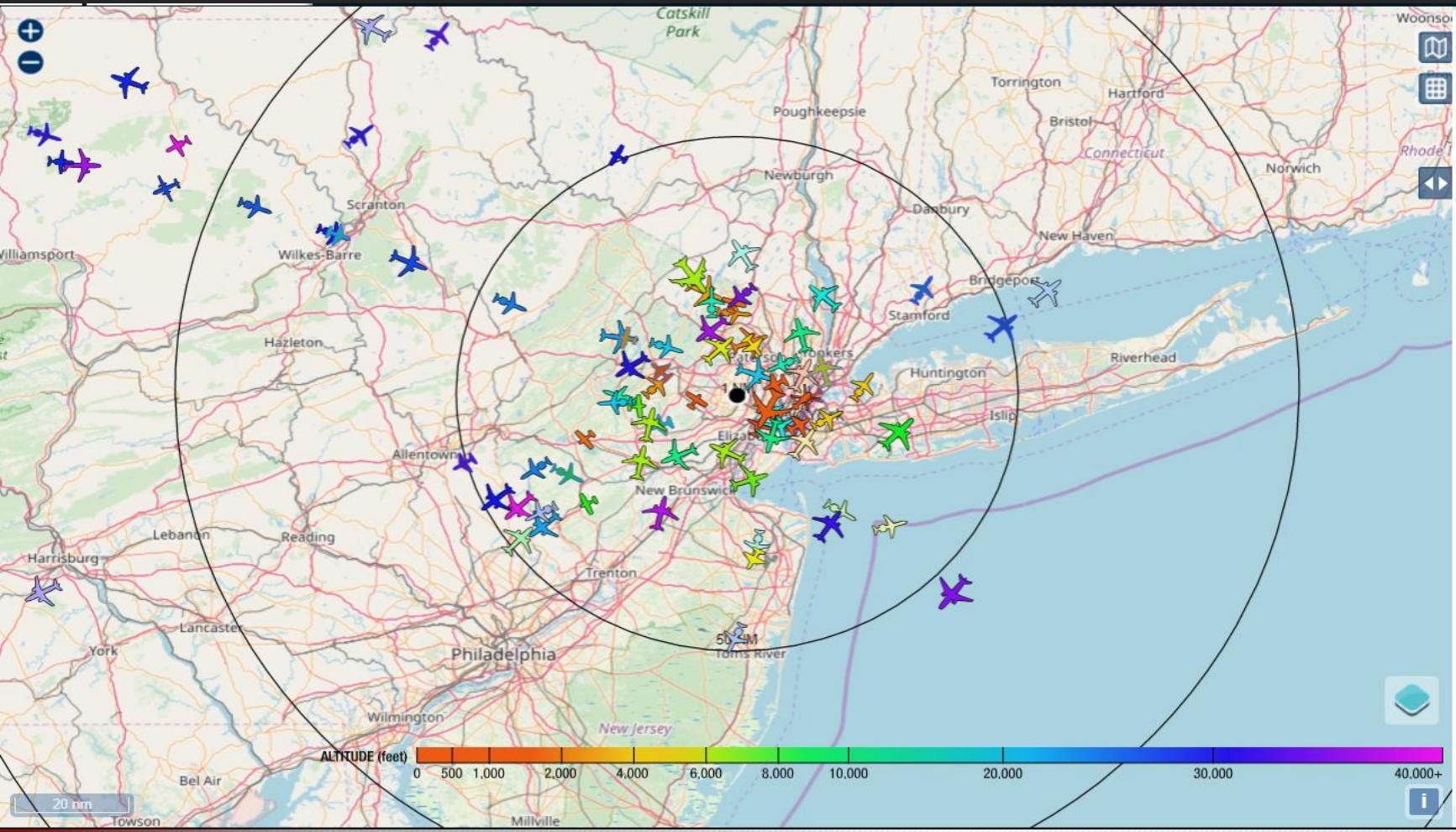
TeamTalk Video Conferencing / Fileshare

AREDN™
AMATEUR RADIO EMERGENCY DATA NETWORK



Air Traffic ADS-B / SDR Dongle

AREDN™
AMATEUR RADIO EMERGENCY DATA NETWORK



3.6.3~bpo8+1

Total Aircraft: 102 **Messages:** 635.6/sec
With Positions: 85 **History:** 5757 positions

Filter by Altitude: ft to ft Filter Reset

ICAO		Ident	Squawk	Altitude (ft)	Speed (kt)	Distance (NM)	Headi
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*
A9BA85		N726H	0307	1,900	6	13.2	23

ARES Informational Site

AREDN™
AMATEUR RADIO EMERGENCY DATA NETWORK

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.

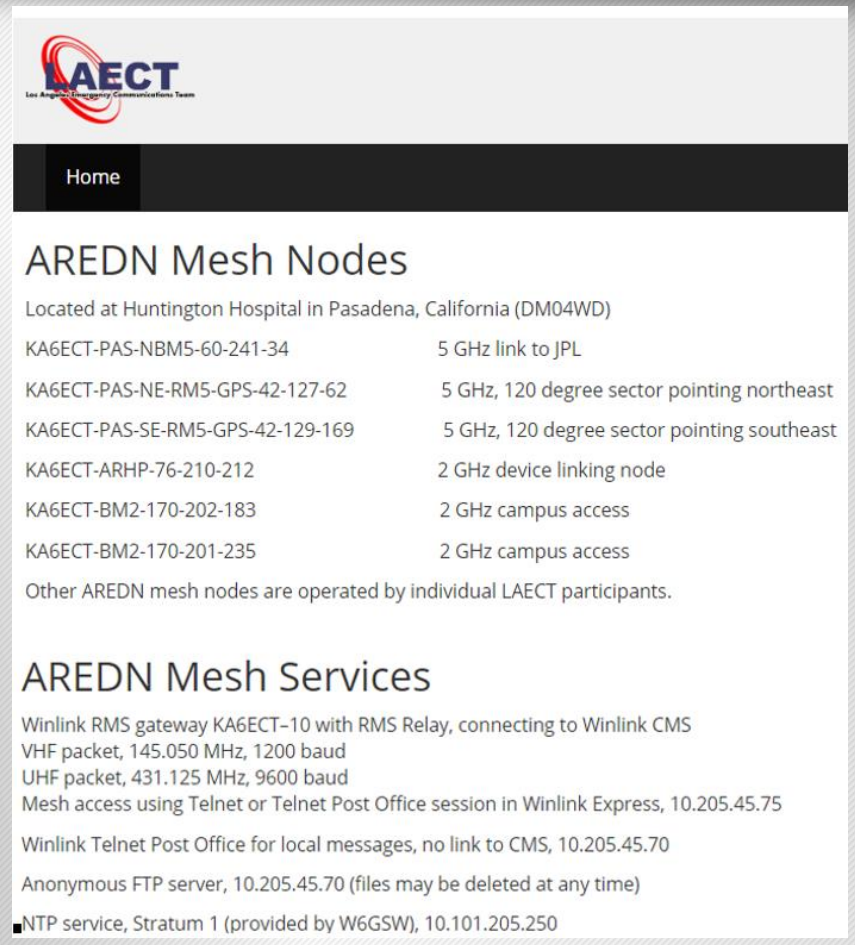
LAECT partners with cities, community groups and other preparedness organizations to coordinate and provide practical preparedness and communications training throughout Southern California. Its members have received specialized training related to emergency preparedness, including Community Emergency 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 ("ARESLAX"). ARESLAX encompasses all of Los Angeles County, encompassing more than 4000 square miles, and its more than 10 million residents. ARESLAX is the largest ARES Section, and the only one com-prised of a single county. There are more than 22,000 Amateur Radio operators licensed in Los Angeles County.

As its primary mission, ARESLAX 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). ARESLAX 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



LAECT

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

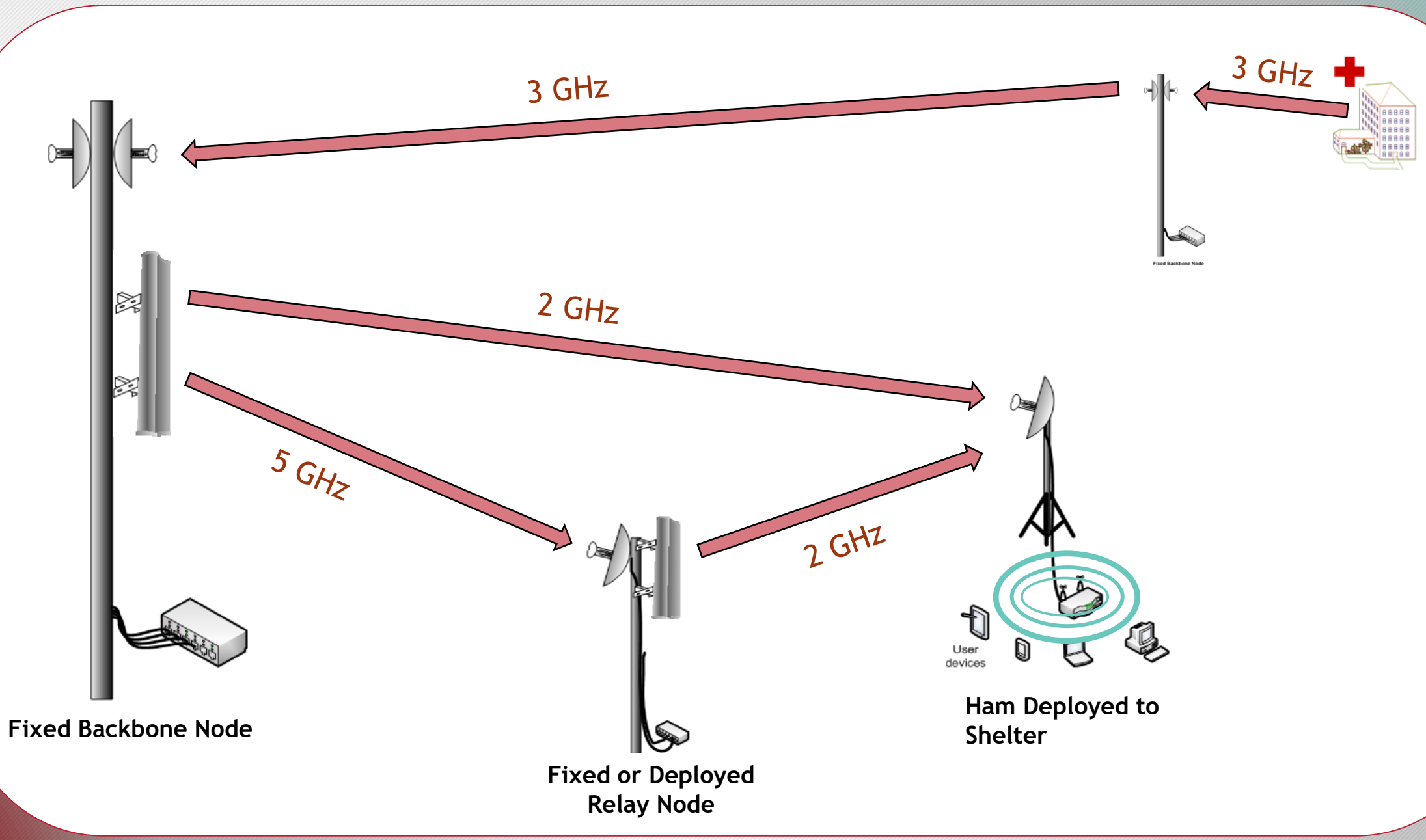
Winlink Telnet Post Office for local messages, no link to CMS, 10.205.45.70

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

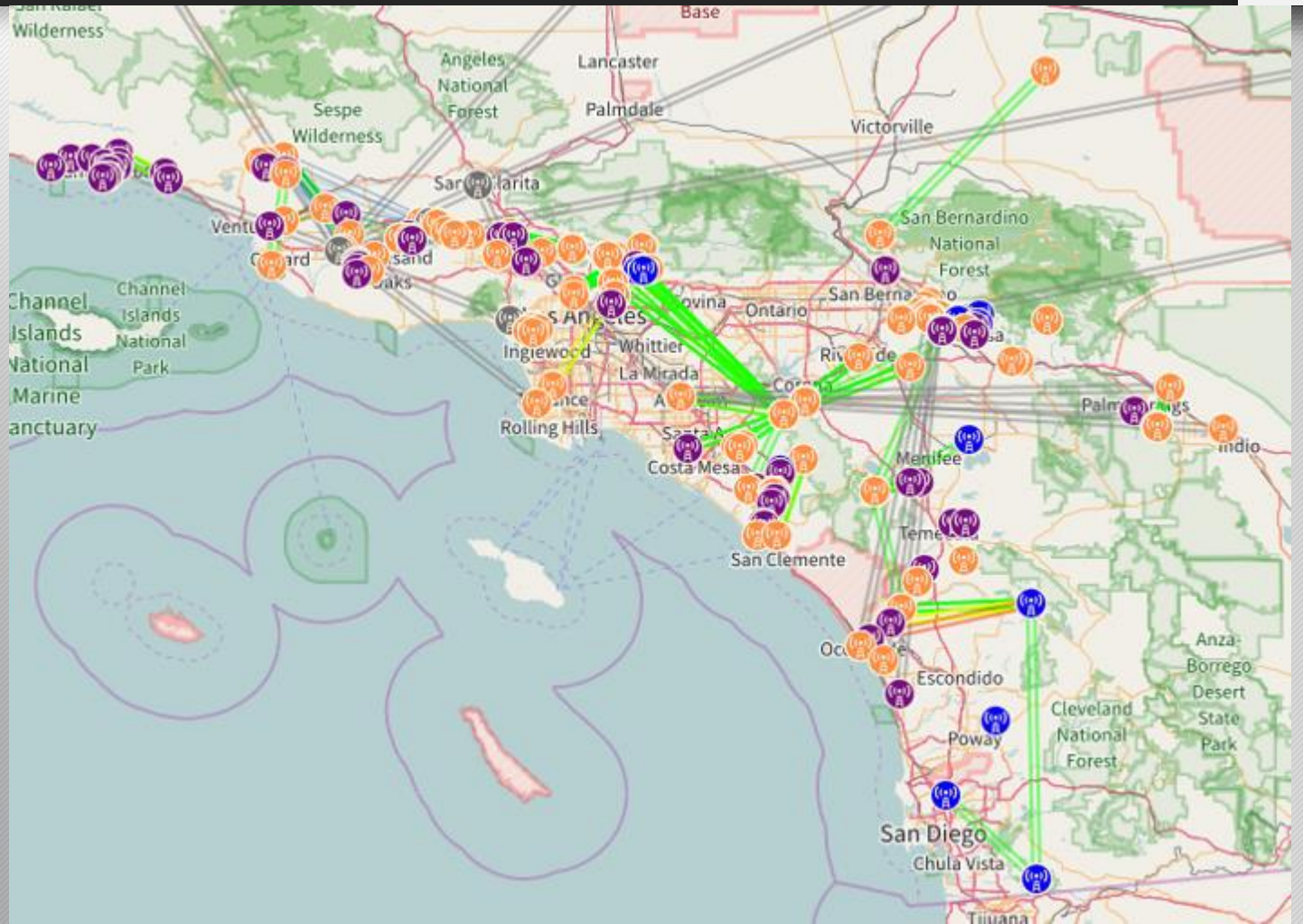
AREDN™
AMATEUR RADIO EMERGENCY DATA NETWORK

AREDN in the SW Division


3 GHz
3 GHz
2 GHz
5 GHz
2 GHz
User devices
Fixed Backbone Node
Fixed or Deployed Relay Node
Ham Deployed to Shelter

Southwestern Division

AREDN™
AMATEUR RADIO EMERGENCY DATA NETWORK



Nodes: 450+
OLSR Routes: 1200+

AREDN™
AMATEUR RADIO EMERGENCY DATA NETWORK

For More Info

- www.arednmesh.org
- QST June 2017, ARRL
- TAPR/ARRL DCC Proceedings 2015
- TAPR/ARRL DCC Proceedings 2016
- Search YouTube, HamRadioNow, HamNation videos

AREDN™
AMATEUR RADIO EMERGENCY DATA NETWORK

Contact Info

Andre Hansen, K6AH

www.arednmesh.org/forum