



Bonner County Amateur Radio Club

Meeting July 12, 2023

VFW Post

1325 Pine Street, Sandpoint, ID 83864

18:00 hrs. – Informal Discussions & Eyeball QSO's

18:30 hrs. - Meeting

Why Are We Here? Per the Bylaws BCARC

- 1. Facilitate communication and fellowship among amateur radio operators*
- 2. Increase the number of licensed amateur radio operators through training and community awareness and promote active use of the hobby, and provide assistance to new operators to help them get on the air*

Introductions - Guests, New Members, Members

Current Membership

As of June 2023

Total	53
Extra	14
General	27
Technician	9
No Callsign	3

Thank You!

- Thanks to everyone who took part in our two recent activities
 - Field Day –very successful!
 - Everyone seemed to have fun
 - More than double last years QSO count
 - Score TBD
 - 4th of July Parade
 - Good turnout
 - Good event

Field Day Summary

Total Contacts by Band and Mode:

Band	CW	Power	Dig	Power	Phone	Power	Total	%
80	1		29		0		30	7
20	49		0		253		302	70
15	0		91		0		91	21
SAT	0		0		7		7	2
Total	50		120		260		430	100

MESH Networking

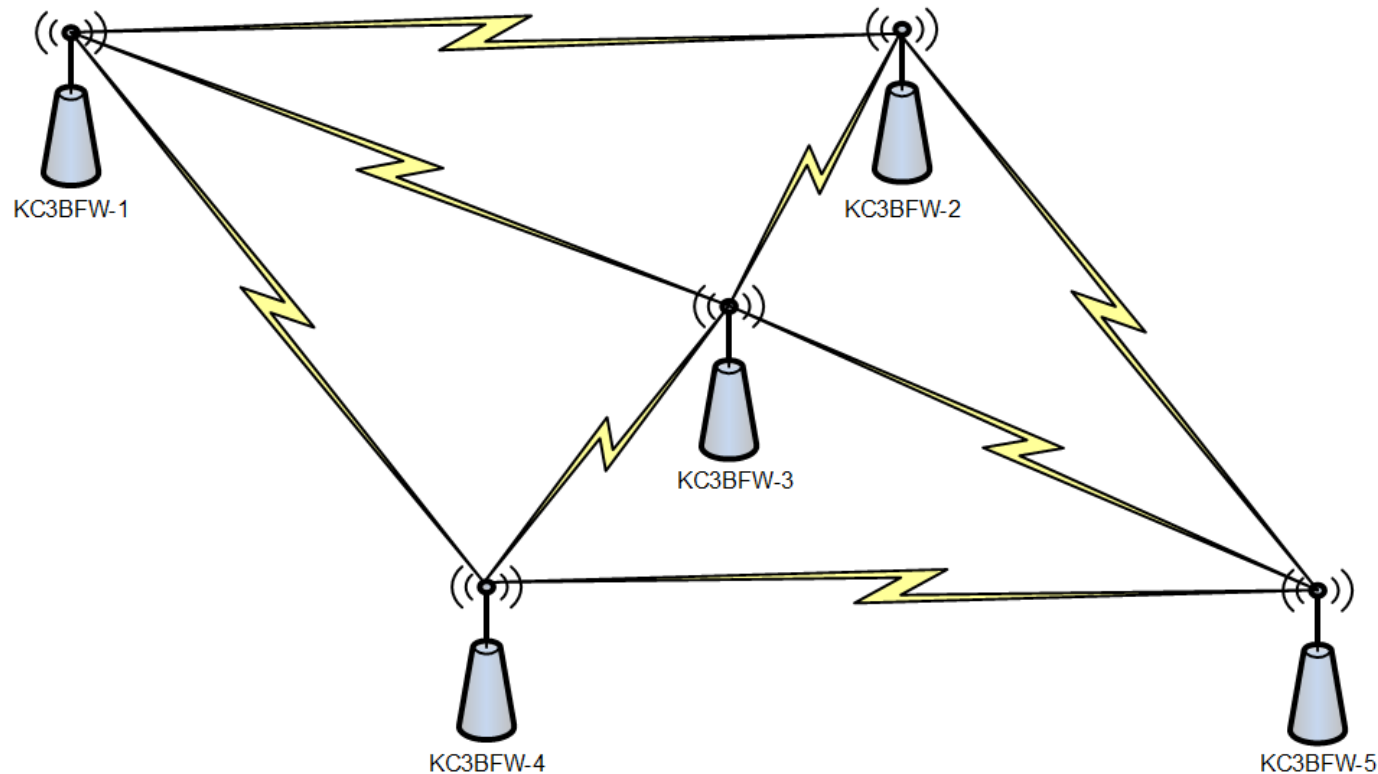
Scott Rasmus

KC3BFW

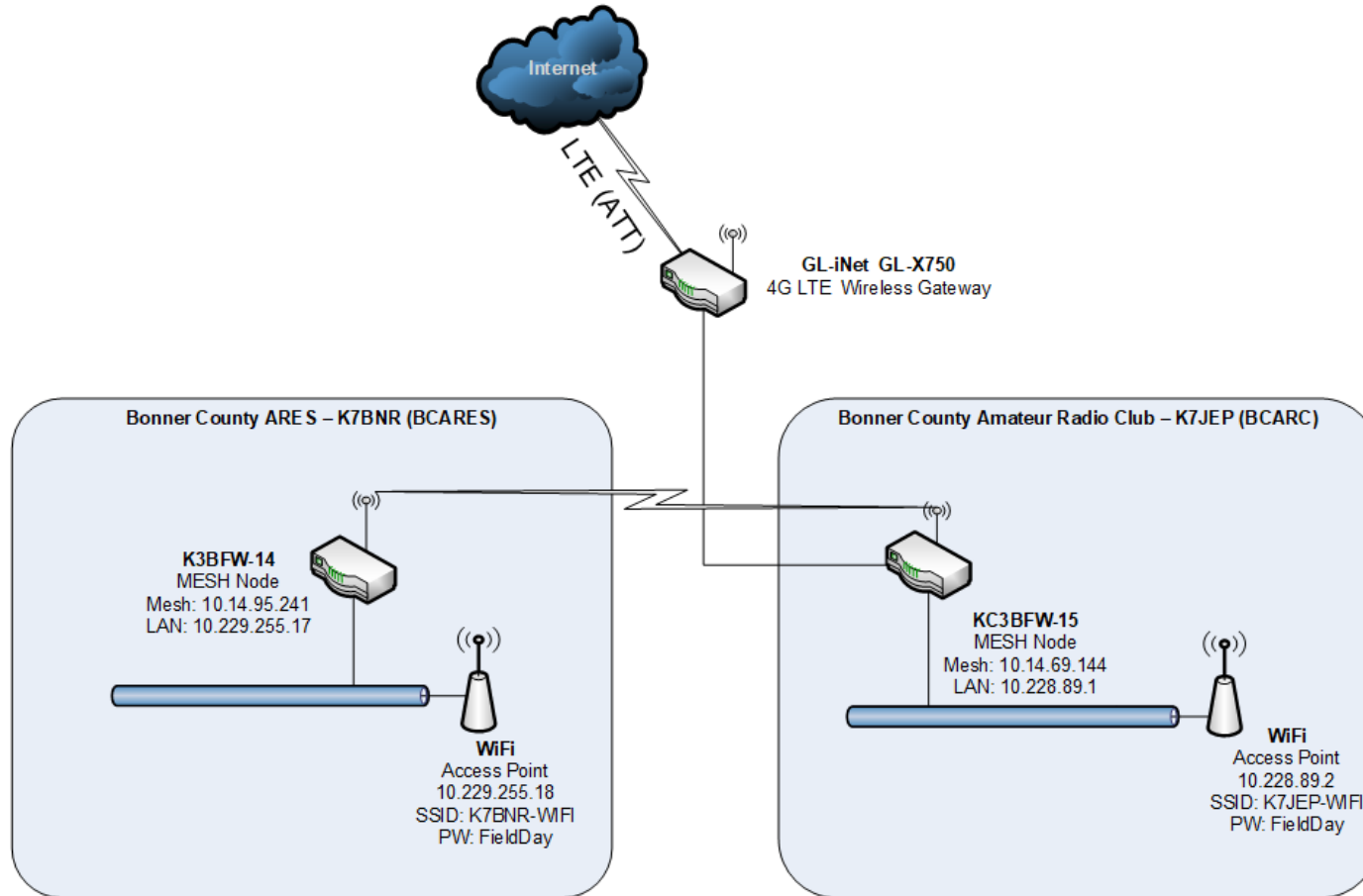
kc3bfw@arrl.net

What is a mesh network?

- A group of devices that act as a single network



2023 BRARC & BCARES Field Day Network



What are the benefits of a mesh network?

- **Self discovering:** As nodes are added the rest of the network is made aware of new node.
- **Flexible coverage:** Additional nodes can be added to get better coverage in hard-to-cover areas.
- **Direct path:** Since all the nodes are connected to each other, data can take several paths toward its destination, and it'll always choose the best route.
- **Self healing:** In a mesh network, if one nodes goes down, communication is simply rerouted through another node.

Mesh Network Nodes

- Each node is a router.
- Each node builds routing tables to track which nodes are currently connected to the mesh to enable routing messages through the mesh.
- If one endpoint cannot see its desired destination, but CAN see nodes in between, the data will hop from one to the next until the final connection is made.... completely automatically.
- If any node is connected to resources (internet, video camera, file server, mail server, etc.) it can provide access to the entire network.
- All nodes can be remotely managed, you do not need physical access once installed.

FCC Rules & Regulations

- **Part 15** - Wi-Fi Rules & Regulations – unlicensed, restrictions on power and antenna size.
- **Part 97** - Amateur Radio Rules & Regulations – licensed, allows higher power and high gain antennas.

Amateur Radio Guidelines

- As always, we must operate under FCC Part 97 rules and regulations: no music, no profanity, no business activity, etc.
- Maximum Power Output: An amateur station must use the minimum transmitter power necessary to carry out the desired communications. FCC 97.313
- The Node Name (included with every transmission) must include your call sign. Common practice is to append a few additional identifying characters (e.g., KC3BFW-12), since your call sign may be associated with several nodes.
- Only licensed amateur radio operators should be able to access Part 97 hardware (in this case, modified Part 15 devices). So, take steps to prevent unauthorized users.
- Safety First! These are microwave frequencies

Uses

Anything that can be done over an existing network can be done over a mesh network, including:

- Email
- Keyboard chatting (IRC)
- File transfers (Word, Excel, PDF....)
- Streaming video
- Voice over IP (VoIP)
- Web applications
- WebEOC
- Field Day/Contest Logging
- Repeater control, linking, and administration

Within the bounds of FCC Part 97 regulations, this is being done within the ham radio spectrum.

Simpler Network Is Better

Applications that auto discover each other to share a common data source are harder to setup on mesh networks

- N3FJP Field Day Contest Log
- N1MM Logging

Amateur Radio Mesh Network Systems

Broadband-Hamnet – HSMM-MESH

<http://www.broadband-hamnet.org>

Supported Hardware: Linksys and Ubiquiti

ARDEN (Amateur Radio Emergency Data Network)

<https://www.arednmesh.org>

Supported Hardware: Mikrotik, Ubiquiti, TP-Link, and CL.iNET

HamWAN

<http://hamwan.org>

Supported Hardware: Mikrotik

Hardware

Broadband-Hamnet		ARDEN
Linksys <ul style="list-style-type: none">• WRT54GS, WRT54G, WRT54GL, Ubiquiti <ul style="list-style-type: none">• Rocket M2• Bullet M2 HP• AirGrid M2 HP• NanoStation Loco M2• NanoStation M2	Mikrotik <ul style="list-style-type: none">• LHG (\$75-\$130)• hAP AC Lite (\$50)• LDF (\$60)• QRT (\$200)• SXT (\$60)• mANTBox (\$114) TP-Link <ul style="list-style-type: none">• CPE (v1.0, v1.1, v2.0)• CPE210 (\$50)• CPE220 (\$90)• CPE610• WBS210• WBS510 <p>* Sunset - this device has been sunsetted and support will be deprecated at some point.</p>	GL.iNET <ul style="list-style-type: none">• AR150• AR300M16 (\$30)• AR750 (Creta) (\$50 or \$75 ext.)• USB150 Ubiquiti <ul style="list-style-type: none">• AirGrid *• AirRouter \$50), HP (\$130)• Bullet (\$90), Bullet Titanium *• LiteBeam (\$88)• NanoBeam (\$130)• NanoBridge *• NanoStation (\$88) *• NanoStation Loco (\$72)• PicoStation *• PowerBeam (\$120)• Rocket (\$94), Rocket Titanium

ARDEN MESH Network



Formation - Development Team was formed February of 2015 by former members of the BBHN Dev team

Mission - To provide the Amateur Radio Community with a quality solution for supporting the needs of high-speed data in the Amateur Radio and Emergency Communications field.

Group Responsibilities - The AREDN[®] team strives to create quality software releases for use on commercial-off-the-shelf (COTS) devices with a primary focus on meeting the needs of emergency communications data networks.

ARDEN Project Objectives

The focus is Emergency Communications (EmComm). It seeks to provide hams a means to implement this technology in practical ways to support local and regional emergency communications needs. To that end, the project's objectives are to enable hams to:

- Stand up a working mesh node with minimal expertise and effort
- Configure the mesh network automatically so that advanced network knowledge is not needed
- Use low-cost, reliable commercial equipment
- Define standards for internetwork integration
- Support those in the process of designing and implementing EmComm networks
- Refine the software to make implementation easier, more reliable, and more manageable

Features and Benefits

- Getting out of the WIFI band and onto ham-only channels on 2.4 and 3.4 GHz SIGNIFICANTLY improved the performance of our local network,
- Tools and metrics in the latest release give a much better understanding of our link performance.

Features and Benefits

Exclusive Part 97 Channels	AREDN™ offers two channels on 2.4 GHz, 24 channels on 3.4 GHz and 7 non-shared channels on 5.8 GHz that are not shared with Part 15 users.
Over-the-Air firmware upgrades	Changes to firmware can be done over an RF link without physical access to the node.
Maximum data rate of 130 Mbps	802.11n has been added to the RF protocol. This improves the maximum data rate capability from 54 Mbps to 130 Mbps and allows AREDN™ nodes to take advantage of the Ubiquiti MIMO (concurrent data channels in both the vertical and horizontal polarization domains), although proportional data rate increases can also be achieved on non-MIMO devices.

Features and Benefits (cont.)

Low investment entry	Portable nodes with cable and network switch can be established inexpensively; backbone nodes with multiple transceivers and cable are affordable.
Rapid deployment and Implementation	Portable nodes can be setup in a few minutes.
Multiple antenna choices	There are many choices for sector (60-, 90- and 120-degree) antennas and highly directional (Yagi and dish) antennas.
Interfaces easily with other Internet capable devices	An AREDN™ network enables emergency responders to use familiar devices such as smart phones, tablets and laptop computers.

MESH Spectrum – 900 MHz & 2.4 GHz

900 MHz	Channel	4	5	6	7
	Ctr Freq	907	912	917	922
	Status	Shared with US unlicensed			

You are responsible for using frequencies, channels, bandwidths, and power levels that comply with your country's amateur radio license requirements.

2.4 GHz	Channel	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8*
	Ctr Freq	2.387	2.392	2.397	2.402	2.407	2.412	2.417	2.422	2.427	2.432	2.437	2.442	2.447
	Status	non-US only		Unshared		Cannot Use	Shared with US unlicensed							

* Only 5 MHz channel width is available on channel 8

MESH Spectrum – 3.4 GHZ


3.4 GHz	Channel	76	77	78	79	80	81	82	83	84	85	86	87	88	89
	Ctr Freq	3.380	3.385	3.390	3.395	3.400	3.405	3.410	3.415	3.420	3.425	3.430	3.435	3.440	3.445
	Status	Shared with US non-Amateur users													
		90	91	92	93	94	95	96	97	98	99				
		3.450	3.455	3.460	3.465	3.470	3.475	3.480	3.485	3.490	3.495				
		Non-US Amateurs only													

MESH Spectrum – 5.8 GHZ

5.8 GHz	Channel	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148
	Ctr Freq	5.655	5.660	5.665	5.670	5.675	5.680	5.685	5.690	5.695	5.700	5.705	5.710	5.715	5.720	5.725	5.730	5.735	5.740
	Status	Shared with US unlicensed indoor/outdoor DFS & Radar Avoidance (max EIRP 1000mW)															Shared with Unlicensed...		
		149	150	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166
		5.745	5.750	5.755	5.760	5.765	5.770	5.775	5.780	5.785	5.790	5.795	5.800	5.805	5.810	5.815	5.820	5.825	5.830
		Shared with US unlicensed indoor/outdoor (max EIRP 200W)																	
		167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184
		5.835	5.840	5.845	5.850	5.855	5.860	5.865	5.870	5.875	5.880	5.885	5.890	5.895	5.900	5.905	5.910	5.915	5.920
		...Shared with Unlicensed				Shared with US unlicensed mainly indoor (max EIRP 200W)									Shared with Intelligent Transportation System				

Power limits shown are for non-Amateur services which share the specified channels.

ARDEN Interface



KC3BFW-AR750


Location Not Available
GL-AR750

[Help](#)

Wifi address	10.26.122.233 / 8	Signal/Noise/Ratio	-26 / -75 / 49 dB	<input type="button" value="Charts"/>
LAN address	10.211.215.73 / 29	firmware version	3.22.6.0	
WAN address	none	model	GL.iNet GL-AR750	
default gateway	none	system time	Sat Apr 16 2022 14:46:25 UTC	
SSID	AREDN-20-v3	uptime	0:06	
Channel	-2	load average	0.00, 0.11, 0.07	
Bandwidth	20 MHz	free space	flash = 10648 KB /tmp = 62528 KB memory = 81208 KB	
		OLSR Entries	Total = 2 Nodes = 1	

Part of the AREDN™ Project. For more details please [see here](#)

ARDEN – Mesh Status



KC3BFW-AR750 mesh status

Location Not Available
GL-AR750

RefreshAutoQuit

Local Hosts	Services	Current Neighbors	LQ	NLQ	TxMbps	Services
KC3BFW-AR750		KC3BFW-AR300M16	100%	100%	0.0	


Remote Nodes	ETX	Services	Previous Neighbors	When
none			none	

OLSR Entries

Total	2
Nodes	1

Part of the AREDN™ Project. For more details please [see here](#)

ARDEN - Setup



ARDEN
AMATEUR RADIO EMERGENCY DATA NETWORK

[Node Status](#)[Basic Setup](#)[Port Forwarding,
DHCP, and
Services](#)[Tunnel
Server](#)[Tunnel
Client](#)[Administration](#)[Advanced
Configuration](#)

[Help](#)[Save Changes](#)[Reset Values](#)[Default Values](#)[Reboot](#)

Node NameKC3BFW-AR750

Password

Node Description (optional)GL-AR750

Verify Password

Mesh RF (2GHz)

Enable☒

IP Address10.26.122.233

Netmask255.0.0.0

SSIDAREDN

Channel-20-v3

Channel-2 (2397)

Channel Width20 MHz

Power & Distance

Tx Power23 dBm

Distance to FARTHEST Neighbor0 mi0 km0 m

'0' is auto

Apply

LAN

LAN Mode5 host Direct

IP Address10.211.215.73

Netmask255.255.255.248

DHCP Server☒

DHCP Start74

DHCP End78

LAN Access Point

Enable☒

AP band5GHz

SSIDKC3BFW-06-ARDEN

Channel36

EncryptionWPA2 PSK

Password

WAN

ProtocolDHCP

DNS 18.8.8.8

DNS 28.8.4.4

Advanced WAN Access

Allow others to use my WAN☐

Prevent LAN devices from accessing WAN☐

Optional Settings

Next Steps

- Get equipment and get familiar with mesh networking
- Meet with other Hams to share your experiences
- Determine how your organization can use mesh networking to help the community
- Put mesh networking to use

MESH Networking Groups

- [Santa Barbara Amateur Radio Club](#)
- [Hawaii AREDN MESH Deployment](#)
- [Arizona Mesh Organization](#)
- [Mid-Atlantic Wireless Communication Group](#)
- [Amateur Radio Digital Communications](#)
- [North Bay Area Mesh](#)
- [Northwest Mesh](#)

Questions?

2.4 GHz Wi-Fi channel frequencies

- <https://www.electronics-notes.com/articles/connectivity/wifi-ieee-802-11/channels-frequencies-bands-bandwidth.php>

Questions Asked

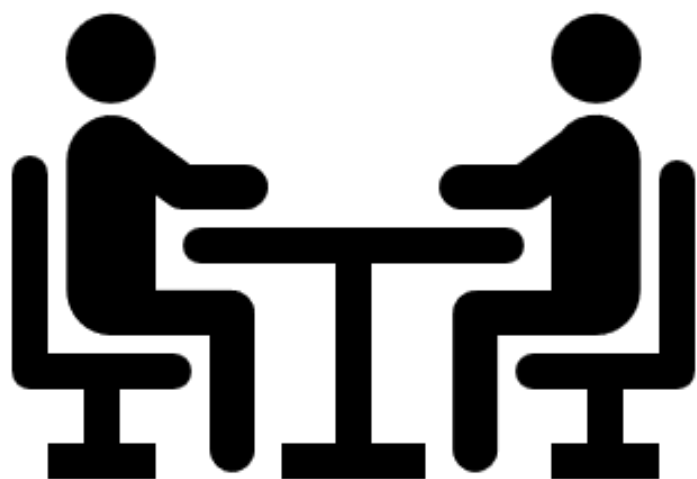
- What license class is needed?

Any except for Novice

- Max number of hops?

It depends, voice and video traffic would be impacted by higher hop counts.

- Encrypted web traffic for internet gateway?



BCARC Business Items and Activities

Ken Conradi KF7FDN and Friends

BCARC Sunday Night 2m Net Control

- BCARC 2m net
 - Sunday 19:30
 - North Idaho Repeater Group repeaters
 - Check in net – usually does not handle traffic
- Rick Lynskey, K7RDL, net control for last 9 years
 - Thank you, Rick!
- Looking for volunteers
 - Maybe more than one NC on a rotating basis?
 - Scripted net
- Please contact John Ailport, K7BSV, if interested in volunteering

Upcoming Activities

- Saturday, August 5th
 - Long Bridge Swim
 - John Ailport, K7BSV Point of Contact
 - Looking for Volunteers
- Saturday, August 12th
 - KARS Hamfest 8:00AM to 1:00PM
 - 2130 North Meyer Road, Post Falls, ID
- Saturday, August 12th
 - ARES VE Testing, Sandpoint Library (Community Room A)
 - 1407 Cedar Street, Sandpoint, ID
- Saturday August 27th to Sunday August 28th
 - Worldwide Digital DX Contest
 - Starts 12:00 UTC Saturday (05:00 AM Local)
 - Ends 11:59 UTC Sunday (04:59 AM Local)
 - Rules <https://www.digi.com/rules/>
 - Distance based scoring – the further away they are, the more points you get!
- Saturday, September 23rd
 - Spokane Hamfest 9:00AM to 4:00PM
 - University High School 12420 East 32nd Spokane Valley 99216

Breakfast at Connie's Cafe
323 Cedar Street, Sandpoint ID
July 22, 2023
09:00 hrs.

Next Meeting
August 9, 2022
VFW Post, Sandpoint, ID
18:00 hrs. Informal Discussions and Eyeball QSO's
18:30 hrs. Meeting
Topic: *Pico-Ballooning*
Joanne Cozen Michael & Friends



Tic Tac Code