Inline Switch
Tri-Band Radio
140, 220, 440 MHz
Roll-Up J-Pole Antenna

12VDC
Battery
12VDC
12VDC

Power Distributor
⚡ **Powerwerx PD-8**
12VDC

(1) or (2)

12VDC 24VDC

(2) If distance between nodes is more than 10 ft, use step up power converter for 24V output (shown in black outline at left).

Ubiquiti Nanostation
5.8 GHz

Equipment Box
10.5" L x 8" W x 6.5" H

MikroTik hAP ac Lite
2.4 GHz
CAT6

BLACK BOX SOLUTION
K6NHI Mesh Go Kit 2.0

THINK OUTSIDE THE BOX ...

Create a cross-band and/or cross-channel repeater for an ad-hoc mesh network in the field. Devices can link to the mesh nodes via wifi or wired ethernet.

MikroTik Router
Ubiquiti NanoStation
Ubiquiti NanoBeam
Mikrotik SXTsq
Mikrotik LHG

24VDC
CAT6

POE Injector
or (3)
(2)

CAT6
CAT6   CAT6

Ubiquiti Nodes
10.5V-25.5V input
Mikrotik Nodes
10V-30V input

24VDC

Power Distributor
VOIP Phone
IP Camera
Tablet/Phone
Computer

5VDC
12V-48VDC

(via wifi connection)

Devices may require voltage other than 12V. Use power converters to correct voltage output as needed.

12VDC

Battery

... AND COMMUNICATE
Free software applications to communicate on the mesh

WINLINK Global Radio Email
Linphone Open source VOIP project
VLC MEDIA PLAYER

K6NHI MESH GO KIT 2.0

The parts list below is a work in progress. These items were selected to make an ultra portable, multi-function go kit. The add-ons will enhance versatility, and allow other configurations for different use cases. Depending on availability of parts, substitutions may be needed.

MESH NODES
(a) **2.4 GHz Node:** MikroTik hAP ac Lite (RB952Ui-5ac2nD-US)
(b) **5.8 GHz Node:** Ubiquiti NanoStation Loco M5
(c) **Connectors:** Cat 6 Flat Ethernet Cables (3 ft, 6 ft, and 100 ft* length)

UHF/VHF RADIO STATION
(a) **Radio:** BTECH MINI UV-25X4 Tri-band, with Anderson Powerpole end
(b) **Connector:** Right Angle Connector PL259 UHF Male to BNC Female
(c) **Antenna:** Ed Fong DBJ-2 Roll-Up J-Pole Dual Band Band Antenna

POWER SUPPLY
(a) **Battery:** Bioenno Power 12V, 12Ah LiFePO4 Battery, buy with AC-to-DC wall charger
(b) **Inline Switch:** Yak-Power YP-ILS16 Inline 12v Switch, replaced Anderson Powerpole ends
(c) **Power Distributor:** Powerwerx PD-8 Power Distribution for Anderson Powerpoles or West Mountain Radio RIGrunner 4004U Power Strip with USB
(d) **Power Cables:** DC Power Pigtail 12V 5A Male Connector with Anderson Powerpole end, for charging MikroTik hAP ac Lite (add for phone, camera, and/or POE injector as needed)
(e*) **Power Over Ethernet:** iCreatin 4 port POE Injector Adapter, for charging multiple devices
(f*) **Power Converter:** DC 12V Step Up to 24V Converter Regulator 5A 120W
(g*) **Battery Charger:** Instapark Mercury27 27-Watt Solar-Powered Charger with 12V Output
(h*) **Solar Charge Controller:** Bioenno Power 12V/24V, 20A Universal Solar Charge Controller

ASSEMBLY & ADD-ONS*
(a) **Equipment Case:** MCM 10.5 inch Black Tactical Weatherproof Equipment Case
(b) **Reclosable Fastener:** 3M Dual Lock TB4575 Low Profile Black
(c) **Gear Tie:** Nite Ize GLC12-33-R3 Reusable Rubber Twist Tie with S-Biner Clip (12 inch)
(d) **Gear Tie:** Kotap BB-6B Ball Bungee (6 inch)
(e*) **Tripod:** Universal Speaker Tripod Stand Mount Adjustable Up to 6 Feet

Mesh Nodes
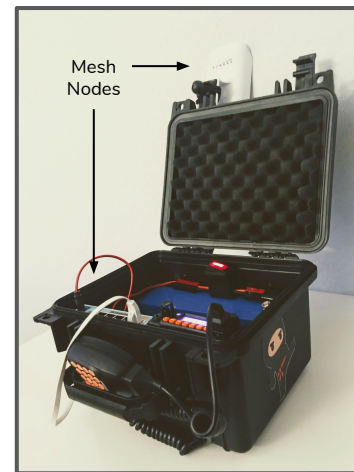
Many, many thanks to Oliver K6OLI, Mike KK6EZP, Dave W6JDG, Jeff W2JCL, Mike KM6KAQ, Tom KN6BKT, Rob KE6YZF, Gary W6GSW, and Orv W6BI for inspiring this guide, for your input to improving it, and <u>especially</u> for your willingness to MESH at every opportunity!

STARTING TO MESH

A node must be "flashed" (or have its factory firmware replaced with AREDN firmware), then configured to the right bandwidth and channel, before it can connect to the mesh network.

The description below is a very simplified process. For detailed instructions, visit the AREDN documentation online at https://arednmesh.readthedocs.io/en/latest/.

1. FLASH NEW NODE

The flash process differs for Ubiquiti, TP-Link, Mikrotik, and GL-iNet devices.

Go to the AREDN documentation and see "Installing AREDN Firmware" for detailed instructions on how to flash a device supported by AREDN.

Pro Tip: Write down and save the new node's factory-installed firmware version (for Ubiquiti: XM or XW) and firmware license key (for Mikrotik). This information is helpful if ever the node has to be flashed again.

2. CONFIGURE NODE & REBOOT

After the new device has been flashed and rebooted, connect your computer to it and set the Node Name, Password, SSID, Channel, Bandwidth, and Distance. Go to the AREDN online documentation and see "Basic Radio Setup" for complete instructions.

Pro Tips: Write down your node's IP address. Bookmark the node status page using the node's IP address (http://10.xxx.xxx.xxx:8080). Reserve a DHCP address for your computer on the newly configured node. This will be useful for communicating on the mesh network.

AREDN Offers 2 Non-Shared Channels on 2.4 GHz

source: www.arednmesh.org

2.4 GHz	Channel	-2	-1	0*	1	2	3	4	5	6
	Status	Ham Band			Shared Ham and ISM/WiFi Band					
	Freq	2.397	2.402	2.407	2.412	2.417	2.422	2.427	2.432	2.437

*Not available for use

52 Channels, 7 Non-Shared, on 5.8 GHz

5.8 GHz	Channel	133	134	135	136	137	138	139	140	141	142	143	144	145
	Status	Shared Ham and ISM/WiFi Band												
	Freq	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

	146	147	148	149	150	151	152	153	154	155	156	157	158
	5.730	5.735	5.740	5.745	5.750	5.755	5.760	5.765	5.770	5.775	5.780	5.785	5.790

	159	160	161	162	163	164	165	166	167	168	169	170	171
	Shared Ham and ISM/WiFi Band												
	5.795	5.800	5.805	5.810	5.815	5.820	5.825	5.830	5.835	5.840	5.845	5.850	5.855

	172	173	174	175	176	177	178	179	180	181	182	183	184
	Ham Band												
	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

Refer to your local band plan for coordination

3. CHECK MESH STATUS

Go to http://localnode:8080 (or bookmark from above). Click the "Mesh Status" button to show a list of active mesh nodes, their link quality, and advertised services on the mesh network.

Local Hosts		Services		Current Neighbors	LQ	NLQ	TxMbps	Services
K6NHI-NSM5LocoXW-5GHz-003.local.mesh		LAECT-Chat		K6NHI-hAP-243-8-24.local.mesh (dtd)	100%	100%		
Remote Nodes	ETX	**Services**		● K6NHI-laptop.local.mesh				
				● K6NHI-phone.local.mesh				
● AG6ST-2.local.mesh	0.00	IperfSpeed		KA6ECT-PAS-South-RM5-GPS-42-129-169.local.mesh	100%	100%	12.6	
● AG6ST-2.local.mesh	0.00	IperfSpeed		**Previous Neighbors**				**When**
● AG6ST-2.local.mesh	0.00	IperfSpeed		none				
KA6ECT-NSM2-West-88-54-64.local.mesh	1.10			**OLSR Entries**				
KA6ECT-N8M5-JPL-60-241-34.local.mesh	1.10							
KA6ECT-PAS-NE-RM5-GPS-42-127-62.local.mesh	1.10			Total	1323			
● ka6ect-igate.local.mesh				Nodes	434			
KA6ECT-RM3-Pleasants-36-198-231.local.mesh	1.10							
KA6ECT-PH-AR-132-51-147.local.mesh	1.10	Stratum 1 NTP server 10.67.57.50						

Pro Tip: Go to the AREDN live map (https://mapping.kg6wxc.net/meshmap/map_display.php) to obtain information on other mesh nodes, including location, frequency, channel, and SSID.

AREDN — AMATEUR RADIO EMERGENCY DATA NETWORK

The Amateur Radio **Emergency Data** Network (AREDN) is a mesh network of interconnected devices (or nodes) that are self-organizing and self-configuring.
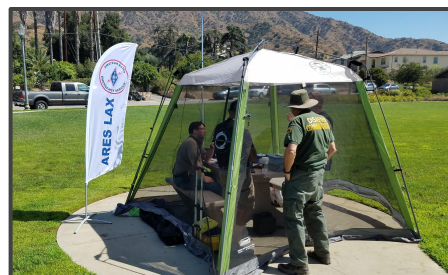

Endpoint Node

Relay Node

Endpoint Node

In 2 minutes you can transfer
... **10 kB** on Packet
... **60 kB** on VARA
... **150,000 kB** on mesh at 20 Mbps

... **IF** you have line of sight.

Mt. Islip (elevation 8,251 ft)

M E S H

A mesh allows transmissions to be distributed among interconnected nodes even if one or more connection goes down.

SoCal Mesh Backbone

AREDN in U.S.

2019-10-17 Thursday 11:27:35