

MeshCore Operators Manual for ABQMesh

By Isaac Nguyen (KM6MZF)

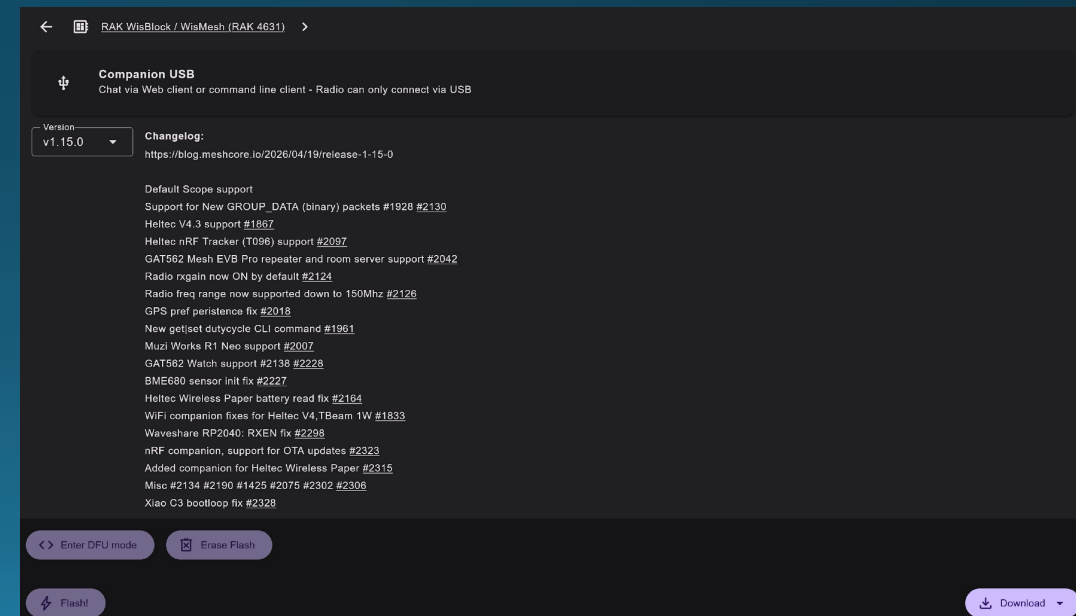
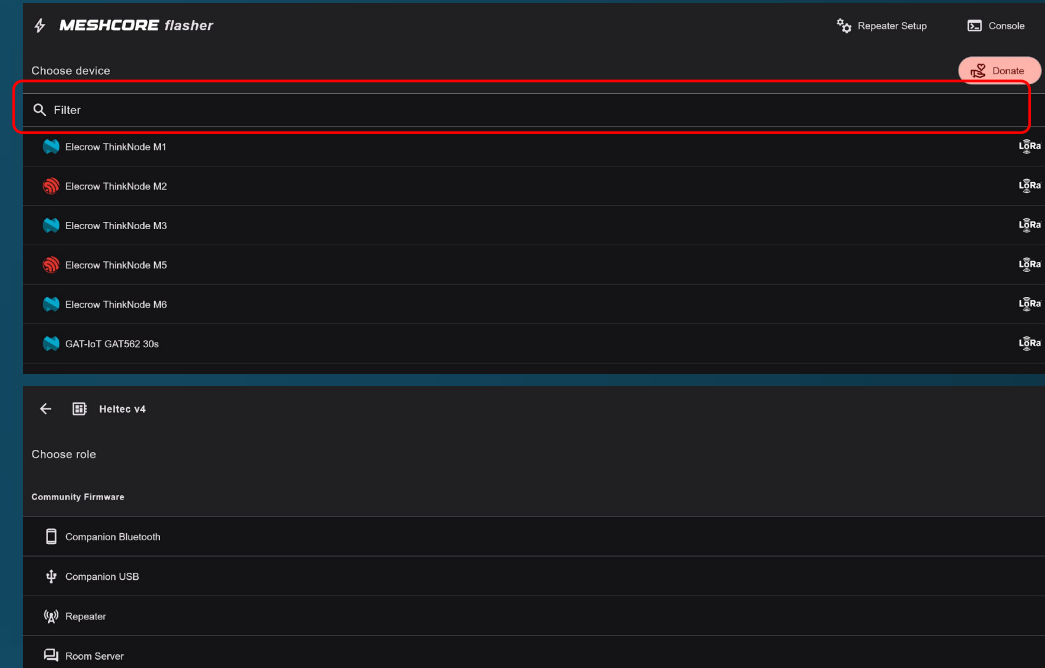
Companion/client radio setup and operation

- Flashing your radio to Meshcore
- Downloading the MeshCore app
- Pairing MeshCore companion
- Radio setup on the MeshCore app
- Channel Setup
- Contact Sharing
- Adding Contacts
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- Telemetry Settings
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- Backup and Restore
- MeshCore Tools
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 - Antenna Coverage
 - Line of Sight
 - RX Log
 - Discover Nearby Nodes
 - Noise Floor
- MeshCore Bot
- Mesh Mapper



Radio Flashing

1. What you will need:
 - USB Cable C and a Computer with Chrome or Edge Web Browser installed.
2. Go to <https://flasher.meshcore.io/>
3. Find your device and search for it in the search bar where it says filter.
4. For wireless use for your phone or pc using Bluetooth select "Companion Bluetooth", if you are flashing one for wired operation for a web browser or want a wired one for your phone use "Companion USB".
5. If applicable for nRF units: Click "Enter DFU Mode"
6. Click Erase Flash
 - Select Com Port associated with your radio
7. Finally click flash!
 - Select Com Port associated with your radio



How to pair to the MeshCore App

1. Download the MeshCore App
2. Open MeshCore APP
3. Click Connect on the upper right corner
4. There might be several devices listed under there.
5. Select the device that corresponds to the ID displayed on your radio. This could be something like Meshcore-XX
6. Enter the pin listed on the device screen.
7. You are paired now!



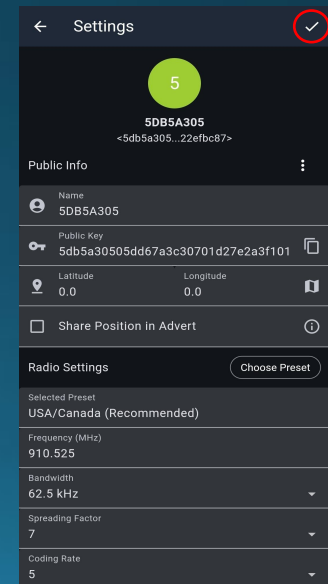
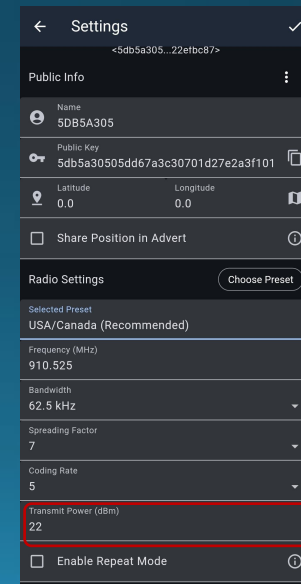
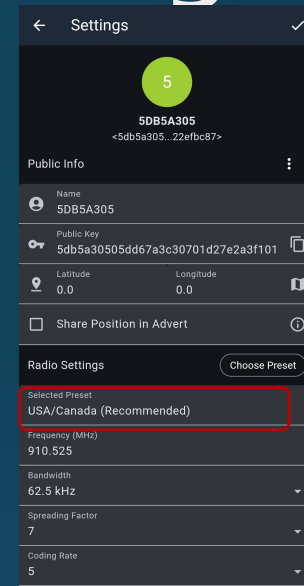
Android



iOS

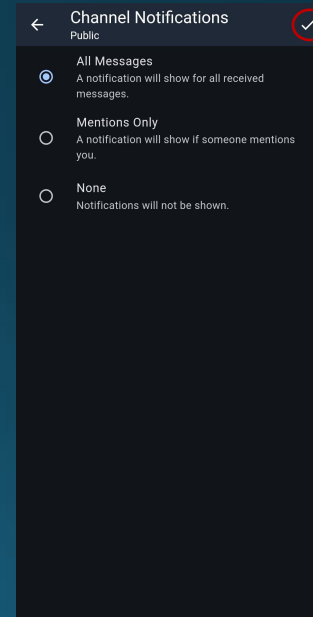
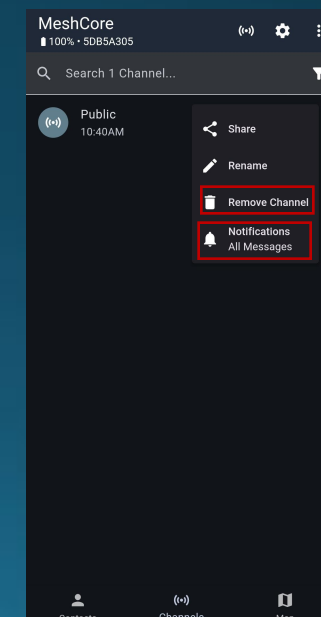
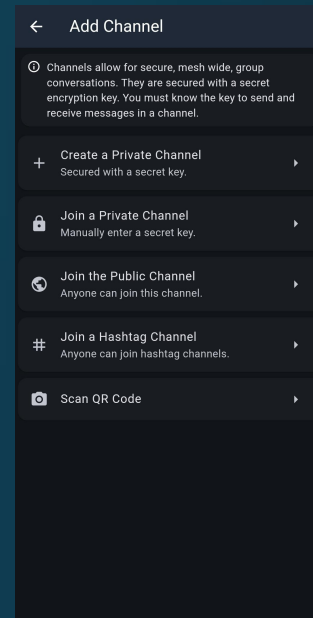
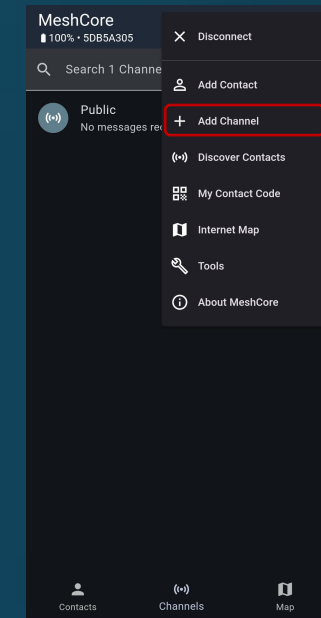
MeshCore Companion Radio Settings

1. Once paired to the MeshCore app, Select the gear icon which is in the top right corner. (It is the middle icon)
2. You can create a custom name for your node. This will be your username, you can add emojis as well with the username. This will appear on your icon to other users.
3. Scroll down to "Radio Settings" and tap "Selected Preset"
4. Make sure you select "USA/Canada (Recommended)"
5. Go down to "Transmit Power (dBm)", set the power to 22 for max power. For minimum power select 0.
6. Once you made all these settings tap the check mark at the top right corner of the screen.



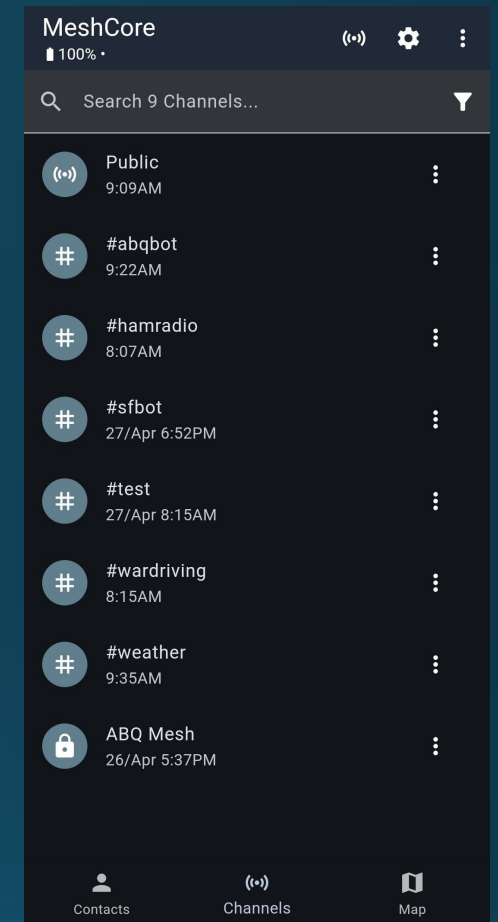
Channels

- Public Channel is the default channel which everyone can see.
- To add new channels you can go to the right and upper corner and “Add Channel”
- There are several options for channels
 - Create a private channel – Create an encrypted group chat that uses a key that you can share with others via text or qr code.
 - Join a Private channel – Enter in whatever name you desire and enter in the private key provided to you.
 - Public Channel is already included by default this channel is for everyone to use.
 - Hastag Channel - is like a public channel but can be added by anyone without a shared key.
 - Scan QR Code – This allows you to scan a QR Code such as another phone to share a private or hastag chanel without entering information manually.
 - Mention a # channel in any channel and you can tap on it to add it i.e. #sfbot.
- If you want to mute a channel so that you do not get notified for messages simply tap on the 3 dots to the right of the channel name.
- Tap notifications, then you can select from 3 options, which mentions only allows you to only get notified if someone mentions your contact's name or even mute messages completely.
- After you are finished tap to check mark in the upper right corner.
- You can also remove a channel if needed from tapping on the 3 dots and selecting “Remove Channel”



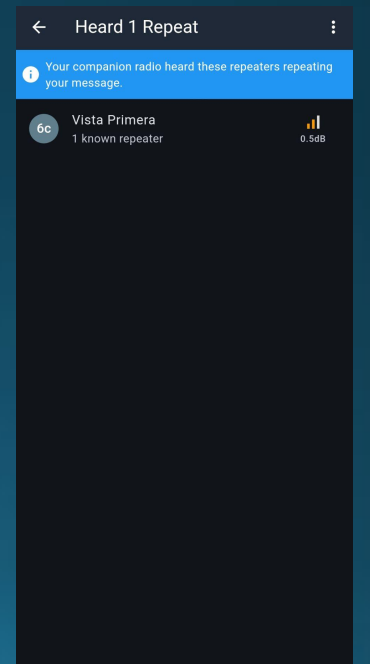
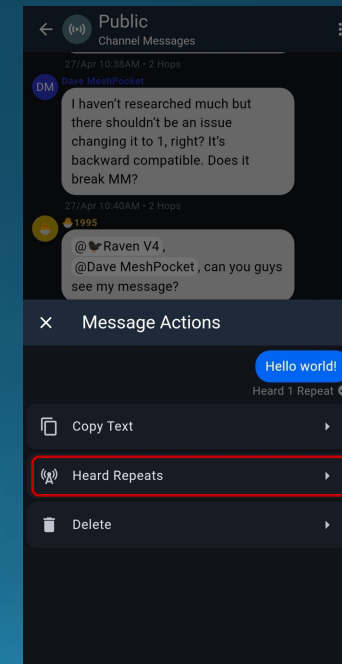
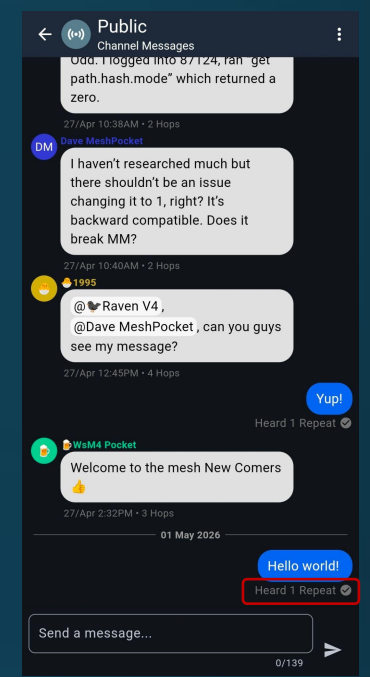
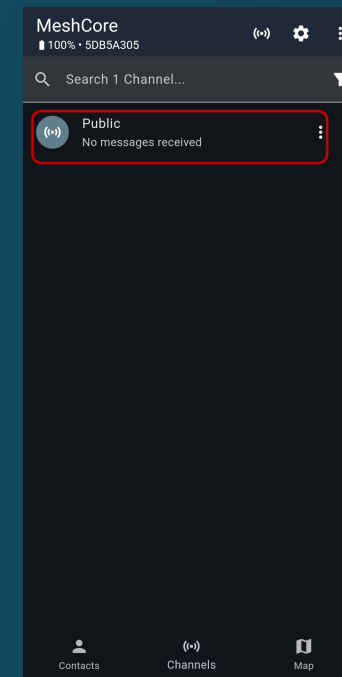
Commonly Used Channels

- Public
 - This is the default channel all companions will have this in their device.
 - This is the most commonly used one for general traffic.
- #abqbot
 - This channel is for using the MeshCore bot. (explained later in this personation).
- #sfbot
 - Similar to #abqbot just separated will work exactly the same.
- #hamradio
 - This channel is mostly for general Ham Radio chat but also has the “hfcond” bot command for HF Band conditions
- #test
 - Mostly for testing your companion however the “test” and “ping” bot commands are allowed on here.
- #weather
 - This channel is for the bot and can be used for the “wx”, “aqi”, and “solar” commands.
 - Currently this channel also gives weather alerts for the Santa Fe area.
- #wardriving
 - This is only used for the wardriving app to monitor MeshCore coverage. Mute this if you do not want to be consistently notified.
-  abqmesh
 - A little fun secured channel that is open to everyone, inquire on the public channel.
 - This is added by joining a private channel with the key.



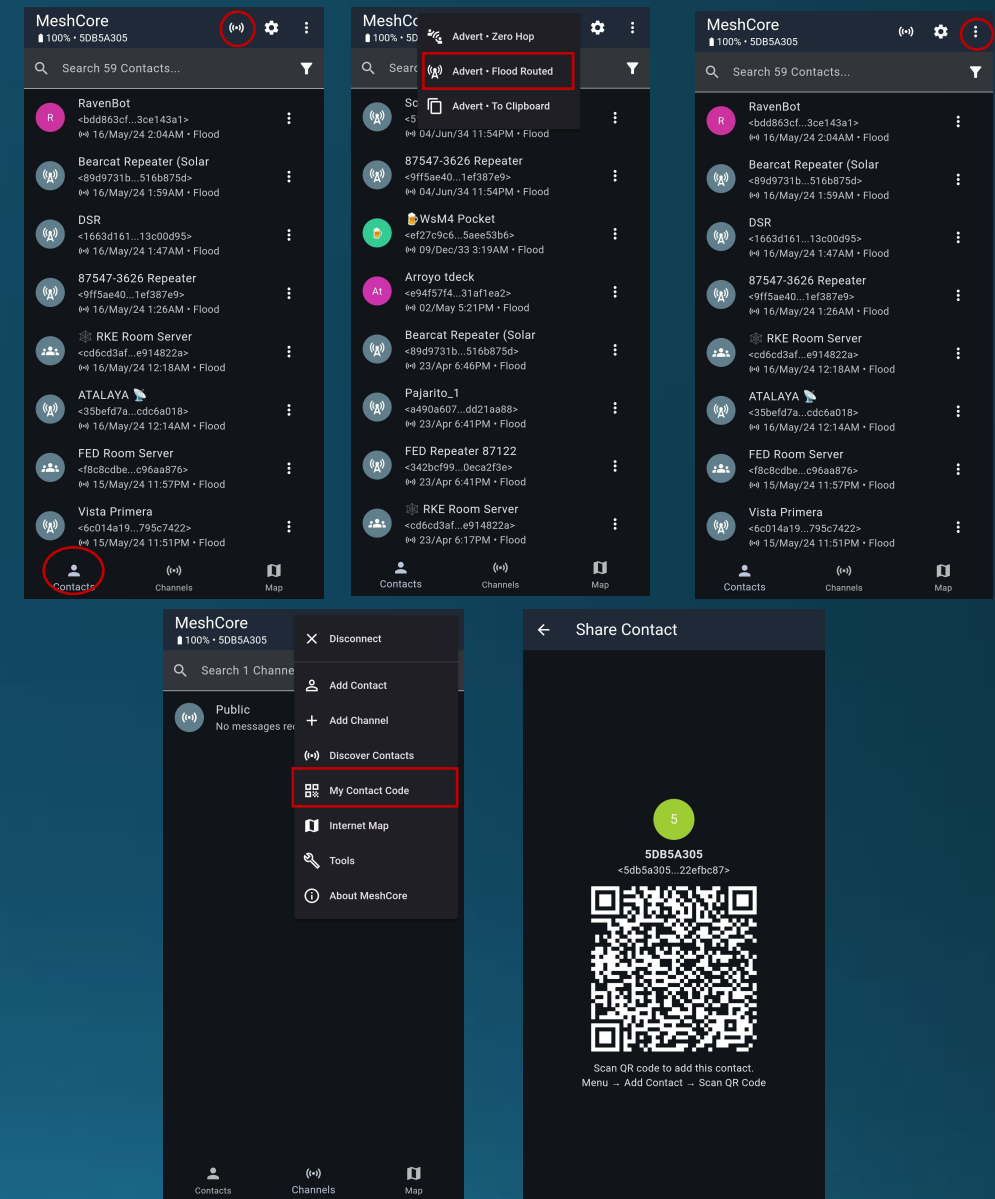
Sending Your First Message

- After getting your companion set up, you can send your first message on the public channel.
- Tap on the Public Channel
- From here you can send a message to the whole network and say hi!
- After you send your message you should get a confirmation with text on the bottom of your last message saying "Heard x Repeat".
- If you want to see what repeaters you were heard by you can hold your last message or any other message and then click "Heard Repeats".
- If you are not receiving a confirmation on your message you are out of range, too low of power for transmit, or too high of a noise floor. (covered later in this course)



Sharing Contacts

- Before direct messaging on MeshCore you may need to share your contact with someone.
- One way of doing it is sending an advert which will share your contact info to others this is located in the top right corner the 1st of the 3 options. You can also share your location if you desire by “Share Position in Advert”, **This will share your location with everyone on MeshCore.**
- The other way is by sharing via QR Code this is done by clicking the 3 dots, then clicking “My Contact Code”. You can then either screen shot this to share with others or by someone using the add contact and scanning your contact by camera.
- You can also share other contacts by tapping on the 3 dots to the right of the contact



Adding Contacts

- Once you have a contact shared to you, there are several ways to add the contact depending on how it was shared to you.

1. Click the 3 dots in the right upper corner.

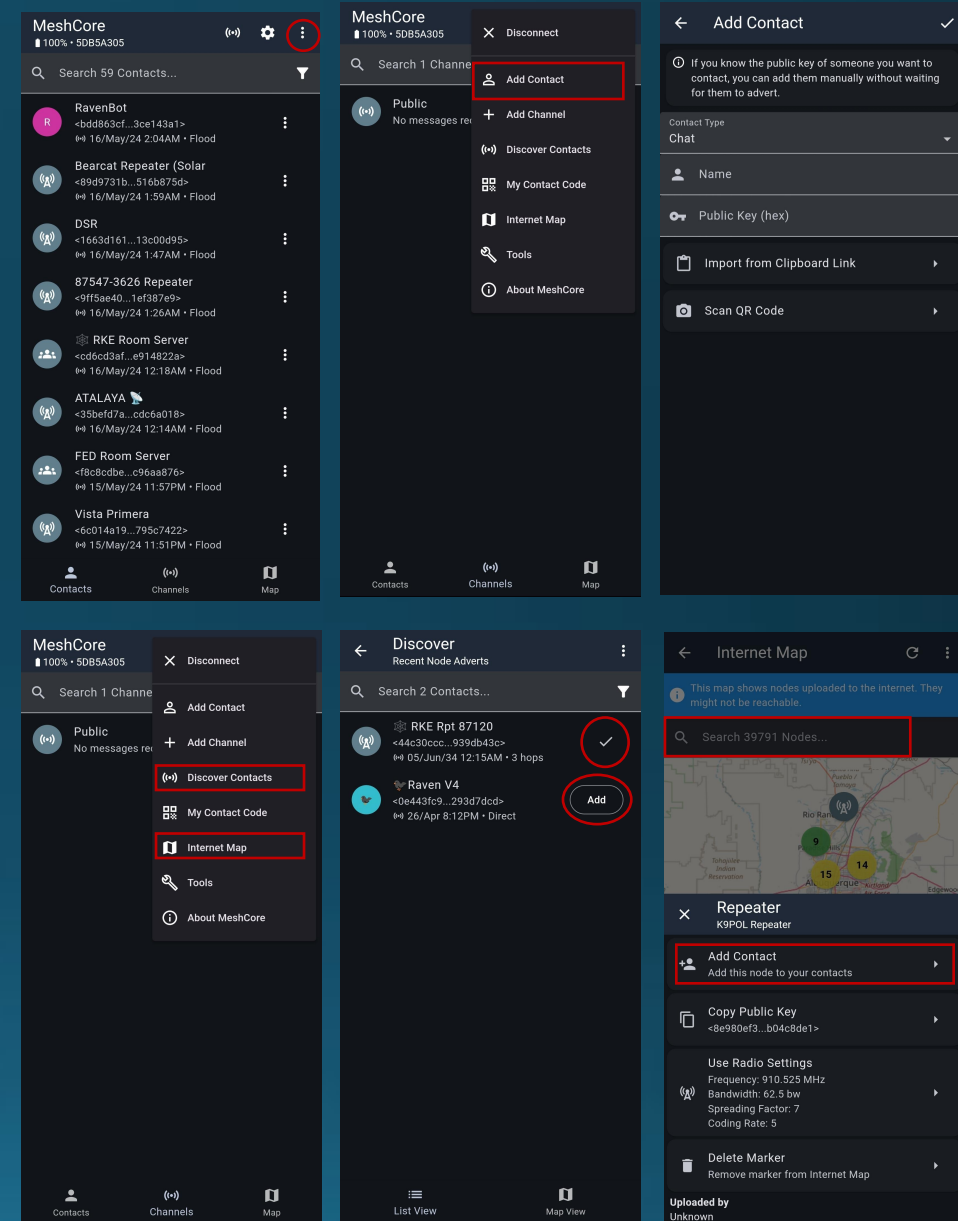
2. Click “Add Contact”

3. From here you can enter in the public key manually, import from clipboard which can be helpful if you received a QR Code via screenshot or “Scan QR Code” if you have the QR Code to where you can use your camera.

4. The last way to add Contacts or Repeaters is by going back to the 3 dots and selecting “Discover Contacts” which will allow you to find contacts that were advertised that were cached on your phone and not auto added.

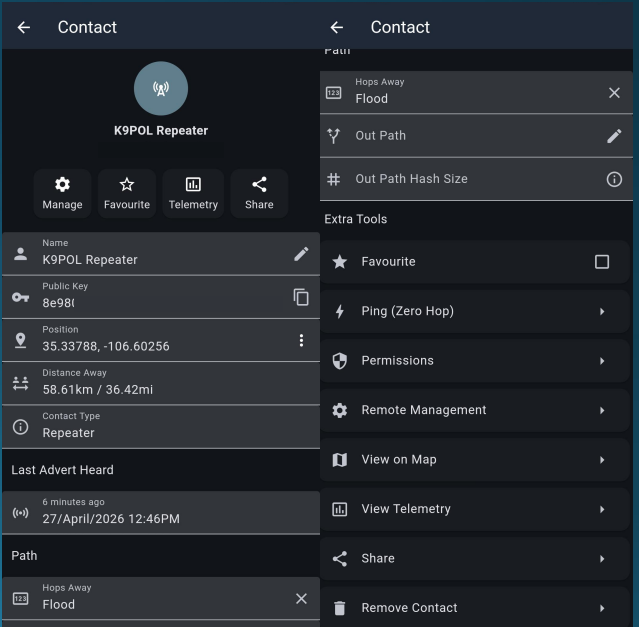
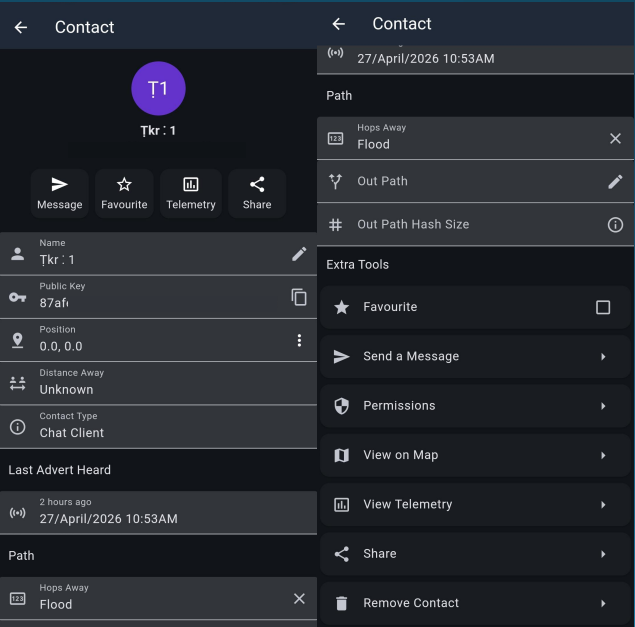
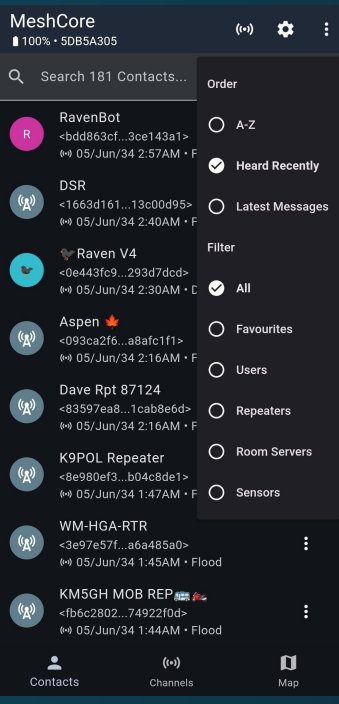
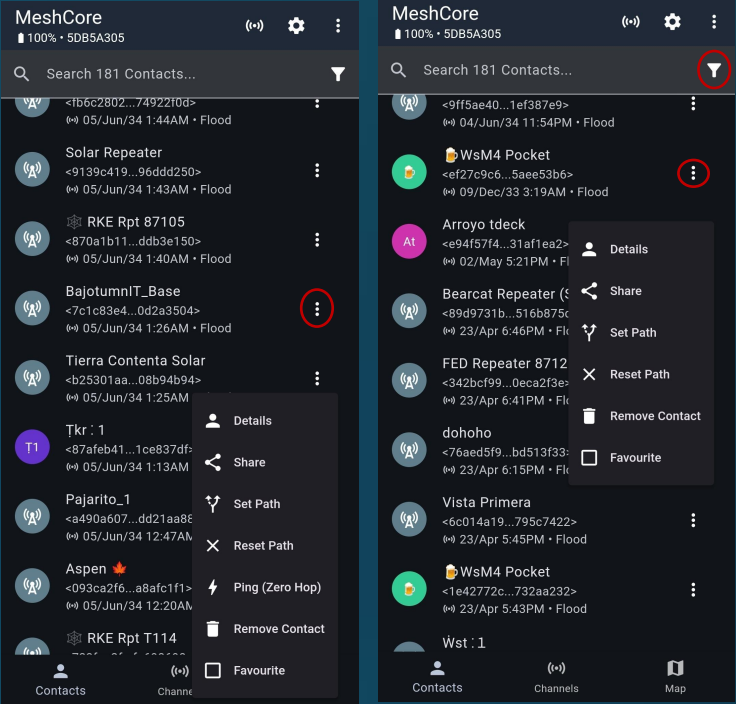
- Contacts that were already added will have a check mark by them for ones that have not been added will have the option to add them.

5. You can also add contacts via The “Internet Map” as well which will show you nodes that were shared manually via the “Internet Map”. You can add nodes by tapping on an icon and clicking “Add Contact”. You can also search for a node by searching for it via the search box below the blue banner.



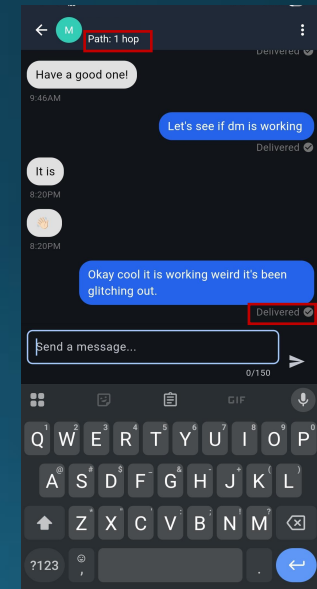
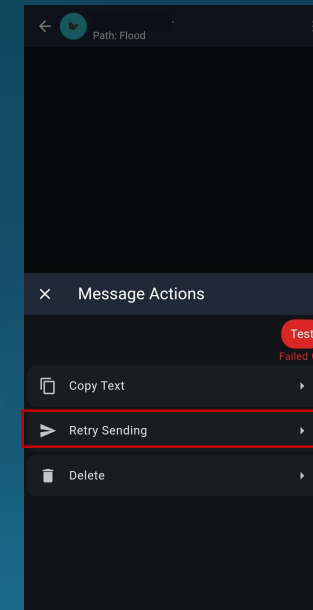
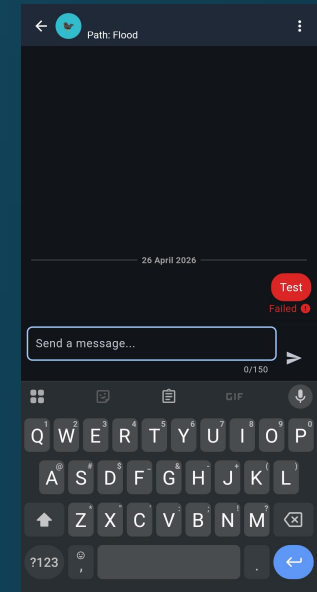
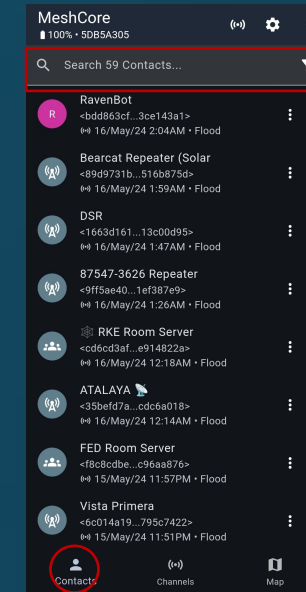
Other Contact Features

- There are several other contact features you can use on MeshCore.
- Many of these features can be utilized in the contact menu by tapping the 3 dots to the right of the contact's name.
- There are many features but they vary from Client, Room Server, and Repeater. However, Repeater and Room Servers are very similar for these features.
- Most options can be accessed from 3 dot menu important ones that you may use are ping for repeaters, share, and path options as they may help for routing for direct messages, room servers, and repeaters.
- You can also favorite nodes to separate them from the other ones. But also filter them which is done by the icon left of the search bar.
- Details will give you additional options but also more details about the contact. Such as distance, public key, and last time it was heard by your companion.



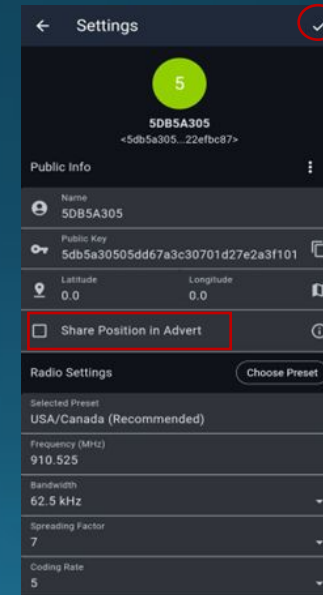
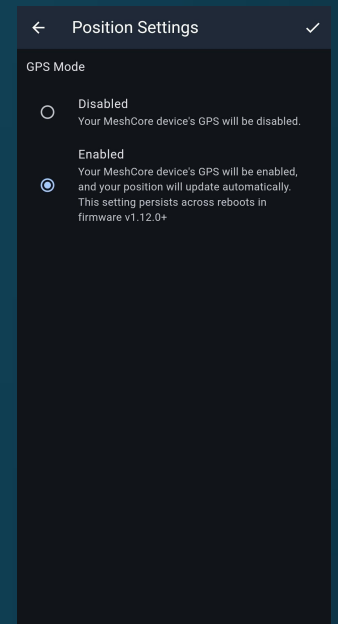
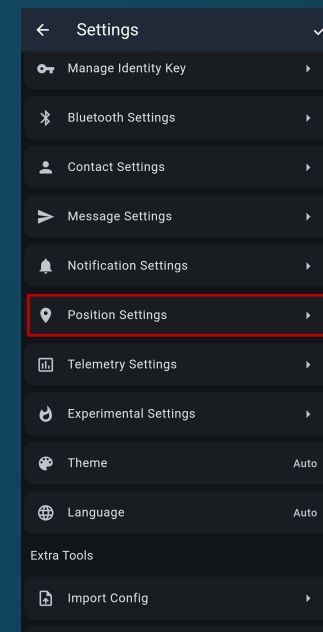
Direct Messaging

- Direct messages are routed through specific repeaters instead of flooding like group messages
- Direct messages are all encrypted.
- To message someone directly:
 1. First select contacts at the bottom right corner of the screen.
 2. Then at the top, search for the contact in the search bar.
 3. Once you have found the contact you want to contact, tap on that contact.
 4. Text them the way you usually do (character limit is 150 characters).
 - Messages may fail this is because their device is either not on or you are not getting replies. To correct this, hold the chat bubble down and tap “retry sending” (this may need to be done several time to find a new route through repeaters).
 5. Once successful, you should get a confirmation that says “Delivered” with a check mark along with a hop count or direct on the top of the screen.



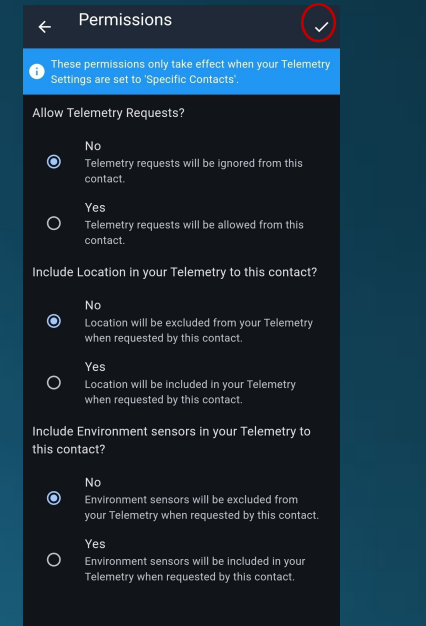
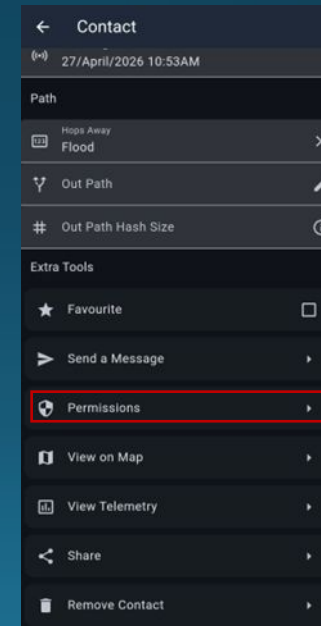
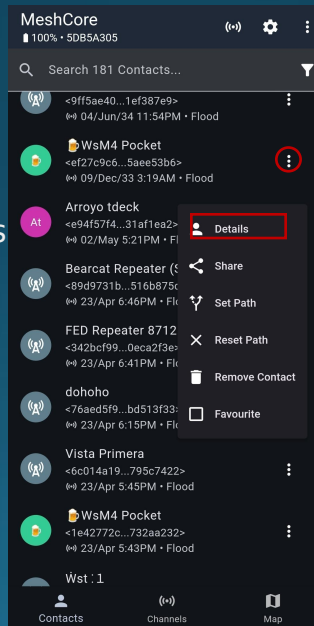
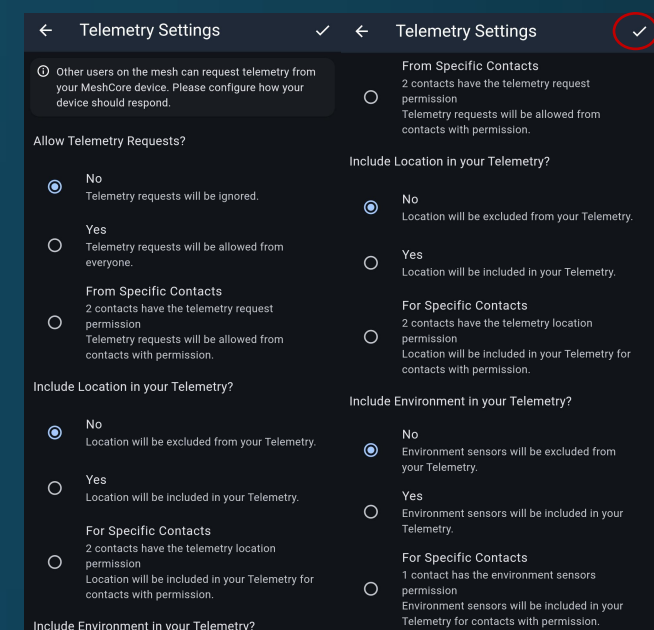
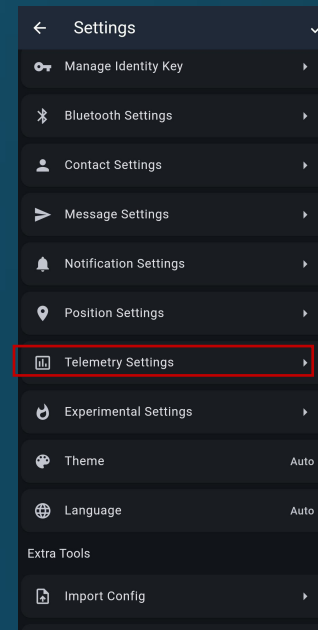
Location

- Besides messaging functionalities, MeshCore can share location data.
- GPS is likely to use slightly more battery when it is on.
- To enable/disable GPS on your device via app:
 - Select the gear icon on the app
 - Select "Position Settings"
 - Toggle GPS enable or disable
 - Then to confirm your setting click the checkmark in the upper right corner.
- To enable/disable GPS on your device via the device directly:
 - Use the multifunction button to toggle the menus until you get to the GPS information menu.
 - Press and hold the multifunction button until you get a message that the GPS is on/off.
- If you want to share your location with everyone on the Meshcore Network when you advert:
 - Tap the gear icon
 - Check "Share Position in Advert"
 - Lastly, tap the checkmark to save the settings.



Telemetry Sharing

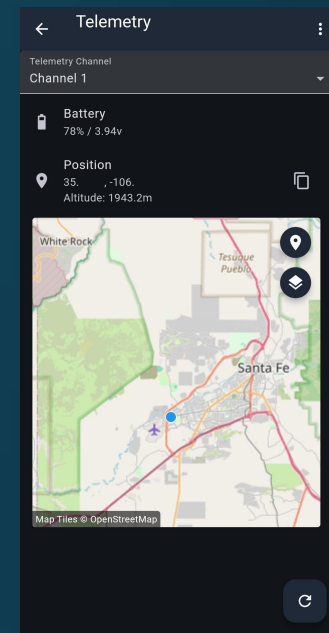
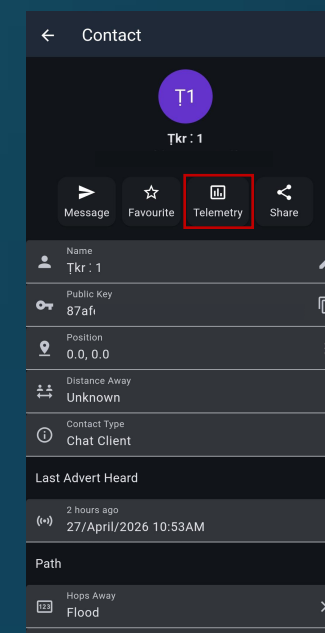
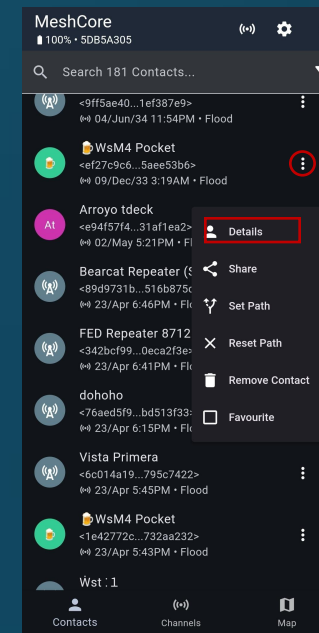
- Telemetry can be used for various things such as environmental sensors, GPS location, battery percentage, and CPU Temperature.
- Many of these items on clients have to be granted permission which can be done at a contact-by-contact basis or by everyone.
- By default, telemetry is allowed on repeaters without a password.
- To setup permissions form a specific client to share telemetry:
 1. Tap the gear icon
 2. Select “Telemetry Settings”
 3. Then select what telemetry you want shared and include “allow telemetry requests” to ensure desired users can access the device’s telemetry.
 4. Yes, will allow everyone to access the telemetry, “For Specific Contacts” will allow only contacts you select via the contact list to access it.
- To allow specific clients to access telemetry on this device:
 1. Locate the contact that you want to allow to access telemetry.
 2. Once located tap on the 3 dots beside the contact and tap details.
 3. Scroll down and tap “Permissions”
 4. From here you can select what you want this specific client to access for telemetry.



Telemetry Viewing

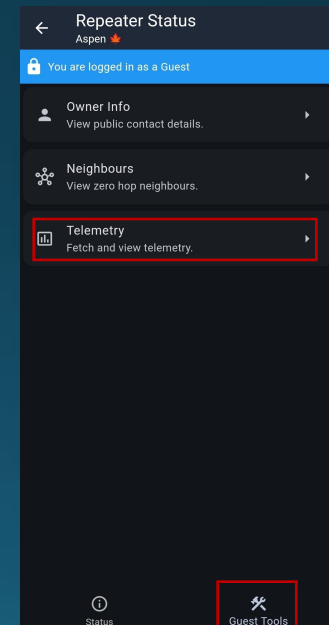
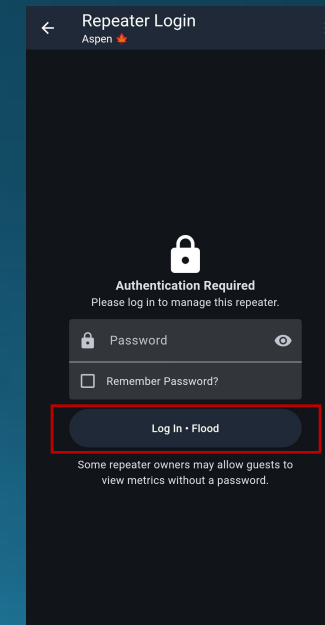
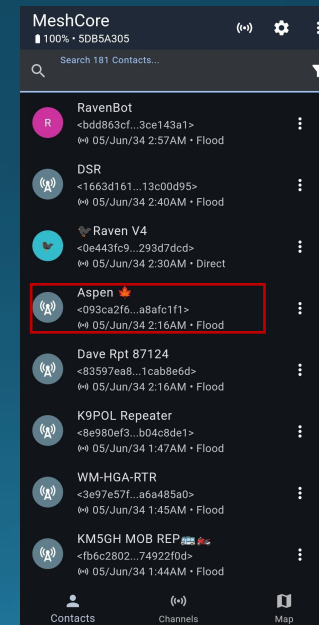
- To view telemetry from a client:

1. Find the desired contact to view.
2. Tap the 3 dots to the right of the contact.
3. Tap details
4. Then tap "Telemetry"
5. This will show telemetry that was enabled or allowed by that user.



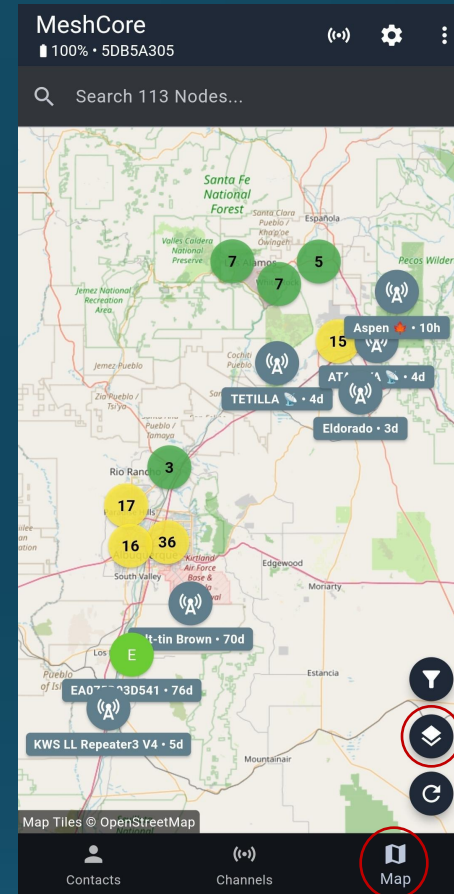
- To view telemetry from a repeater:

1. Find the desired repeater to view
2. Tap the repeater
3. Tap "Log In" (most repeaters will allow for guest access)
 - If you have trouble logging in you may need to flood as the existing path might be unavailable. Hold the login button and tap "Log In Flood"
4. Tap guest access on the lower right side
5. Then tap "Telemetry"
6. Most repeaters will only give you battery level and CPU temp.



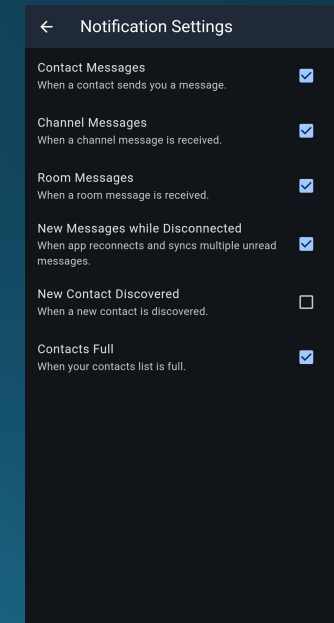
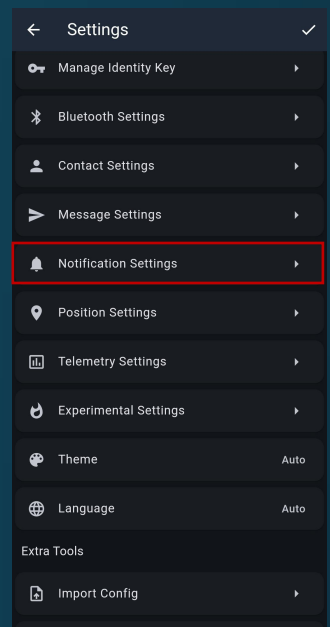
Map Features

- The map tab on the app allows for you to view nodes on the map that were advertised with a location.
 - This may be helpful for you for locating repeaters or sharing location with the “mesh” as a whole.
- This map will be similar with other tools in the tool menu.
- You can also select different map layers if you desire.



Notification Settings

- By Default, you will get notification settings for many things on MeshCore.
 - Contact Messages
 - These are direct messages received
 - Channel Messages
 - These are for messages that were received from channels
 - Room Messages
 - These are messages received from room servers
 - New Messages while Disconnected
 - This will notify you that messages were received if your companion was disconnected from the app
 - New Contact Discovered
 - This notifies you that a new contact or repeater was discovered when it advertised. (Most annoying)
 - Contacts Full
 - Will notify you when your contact list is full based off the companion node. (Usually 250-300 contacts.)
- To edit notification settings:
 1. Click on the gear icon.
 2. Scroll down to notification settings.
 3. Then check what notifications you want to be notified of.
 4. Click back to save settings.



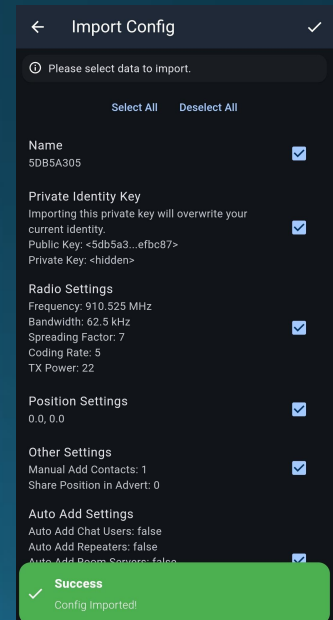
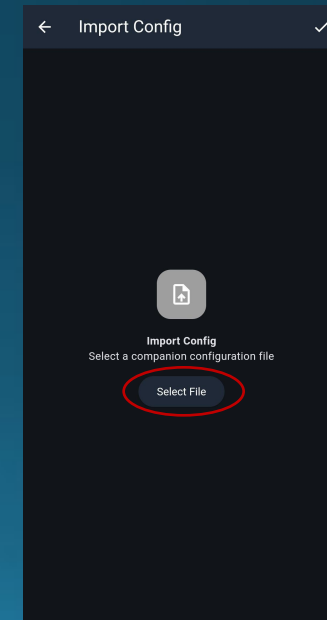
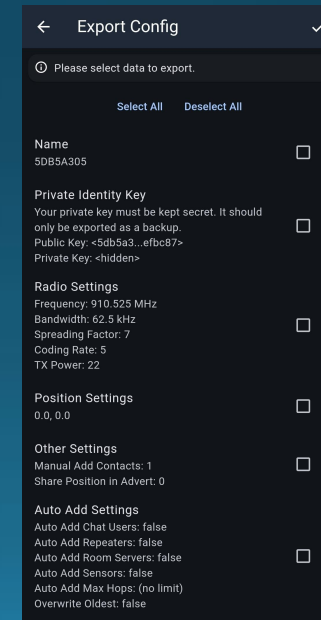
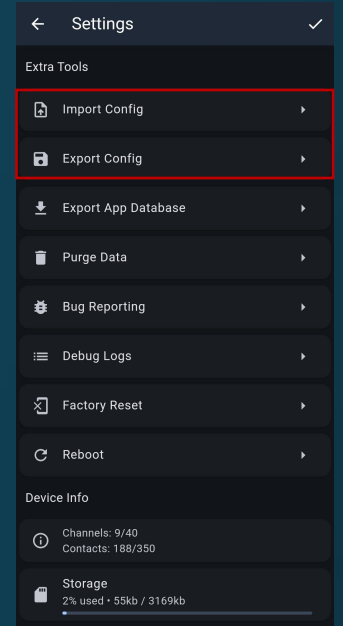
Node Backup and Restore

- Backup your node:

1. Click on the gear icon
2. Scroll down to “Extra Tools”
3. Tap “Export Config”
 - This may take time to generate the config for export
4. Then you will be prompted to select what you want to backup.
 - This will backup most if not everything including radio settings your public keys, Channels, Contacts, your contact name, along with location, and other settings.
5. Then save the config

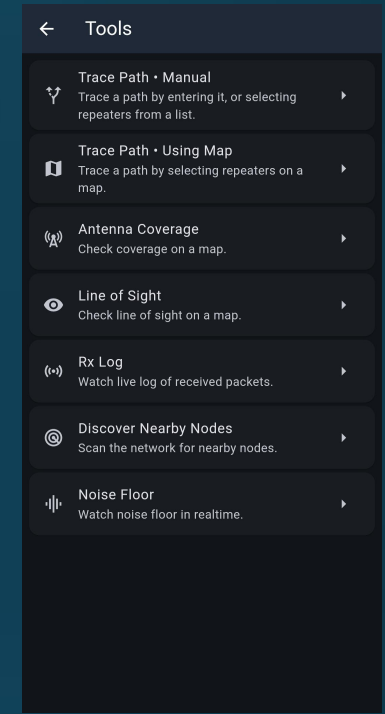
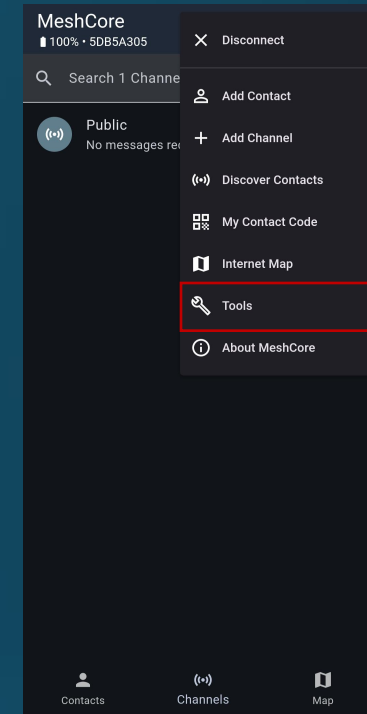
- Restore your node:

1. Click the gear Icon
2. Scroll down to “Extra Tools”
3. Tap “Import Config”
4. Tap “Select File”
5. Select the file that has your contact name on it as this is likely the correct backup.
6. Then select what you want to recover and then tap the checkmark when you are done.
7. You will get a green conformation box indicating that the config was imported successfully.



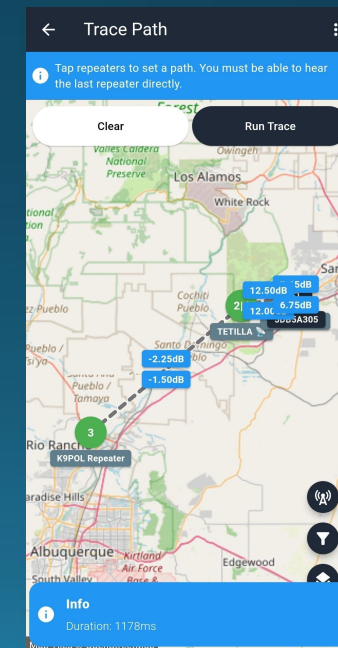
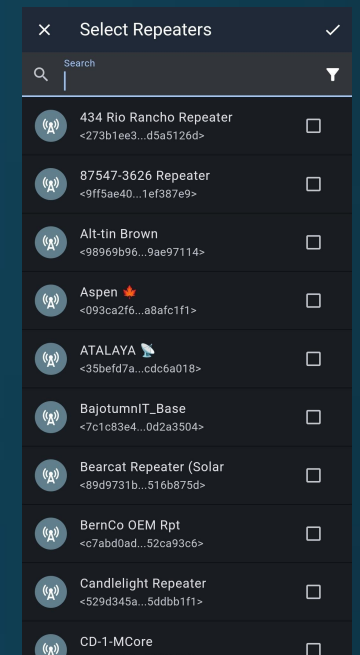
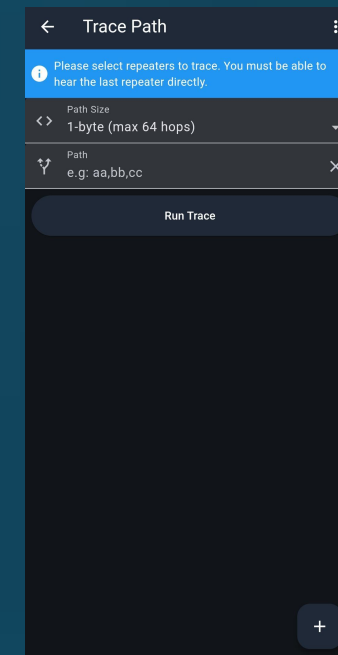
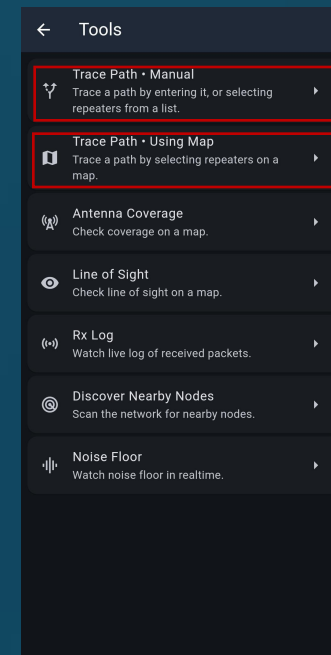
MeshCore Tools

- There are various helpful tools that are provided in the MeshCore App.
- These tools can help you with things like checking repeater coverage, check if you're "in service range", tracing repeater paths, and checking your noise floor.
- To access these tools, tap on the 3 dots in the right top corner and select "Tools".
- The tools on MeshCore are more versatile and verbose compared to Meshtastic.



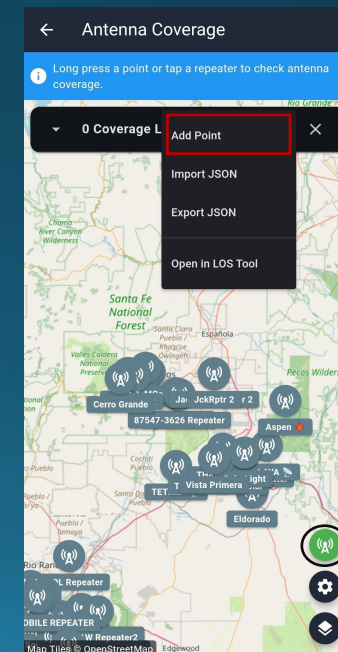
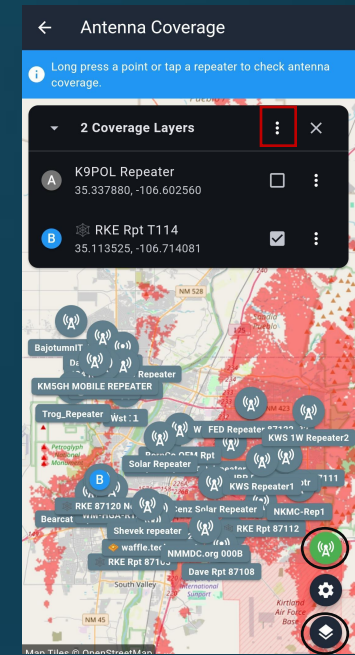
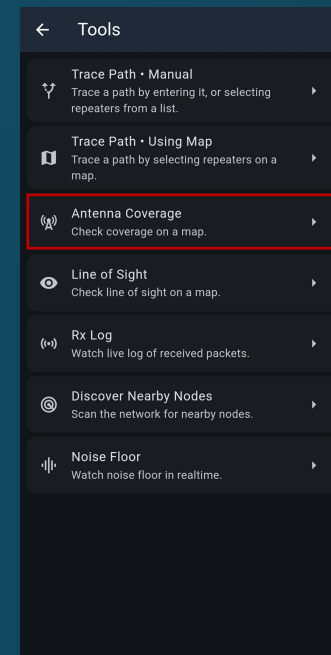
Trace Path

- Trace Path is a useful tool that can let you trace repeaters and check if they can create a path.
- There are two ways you can check path:
 1. You can check manually by searching for repeaters via name or ID
 - When using this you will need to list the repeaters sequentially
 2. You can check visually by using the map (this will not work if the repeater's location is not advertised)
 - This method is more user friendly
 - You tap the repeater that you want to ping first then the next one and so forth.
 - You can tap those repeaters in reverse order to have it route back to the original repeater if you desire (most effective test).



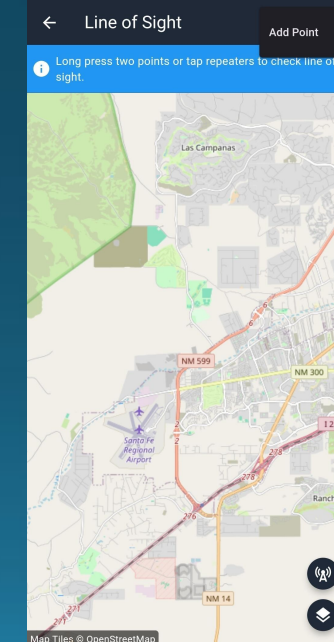
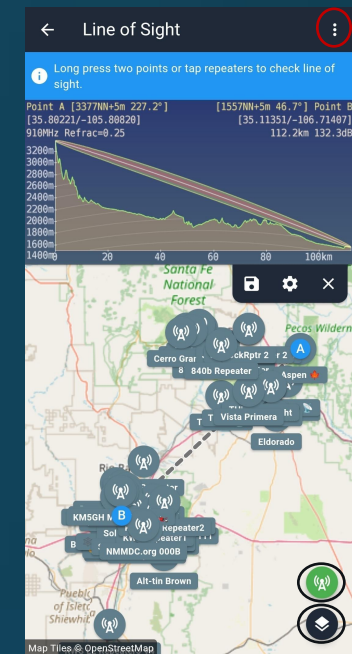
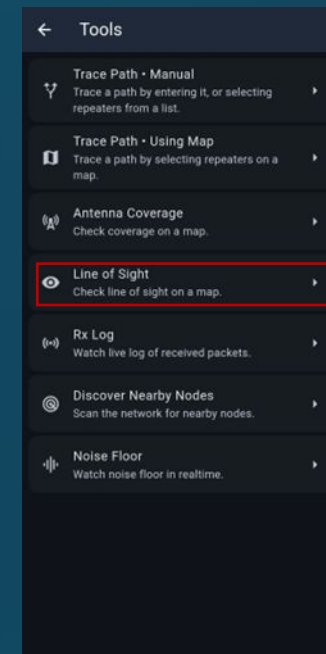
Antenna Coverage

- Antenna Coverage is a very useful tool that can estimate coverage for repeaters.
- This works both for current repeaters along with planning out new repeater deployments.
- There are various layers of maps including topo maps on the bottom right corner.
- To show/hide repeaters tap the antenna icon on the bottom right.
- You can simply tap on a repeater to see its proposed coverage area you can also tap on other repeaters to see overlap between the repeaters. The red represents coverage.
- This tool also works for estimating new potential repeaters. Just find a spot on the map and press and hold on the screen to create a new point or go tap on the 3 dots to the right of where it says "X Coverage Layers" and enter in coordinates in DD format by tapping "Add Point".
- **Not as accurate as professional software as you cannot put detailed parameters in.**



Line of Sight

- Line of Sight is similar to Antenna Coverage however, it is for measuring the RF path from one point to another.
- Ideal for measuring from one repeater to another.
- Helpful when deploying directional antennas.
- To manually enter in coordinates, tap the 3 dots in the upper right corner, tap “Add Point”, and enter in coordinates in DD format.
- To show/hide repeaters tap the antenna icon on the bottom right.
- There are various layers of maps including topo maps on the bottom right corner.



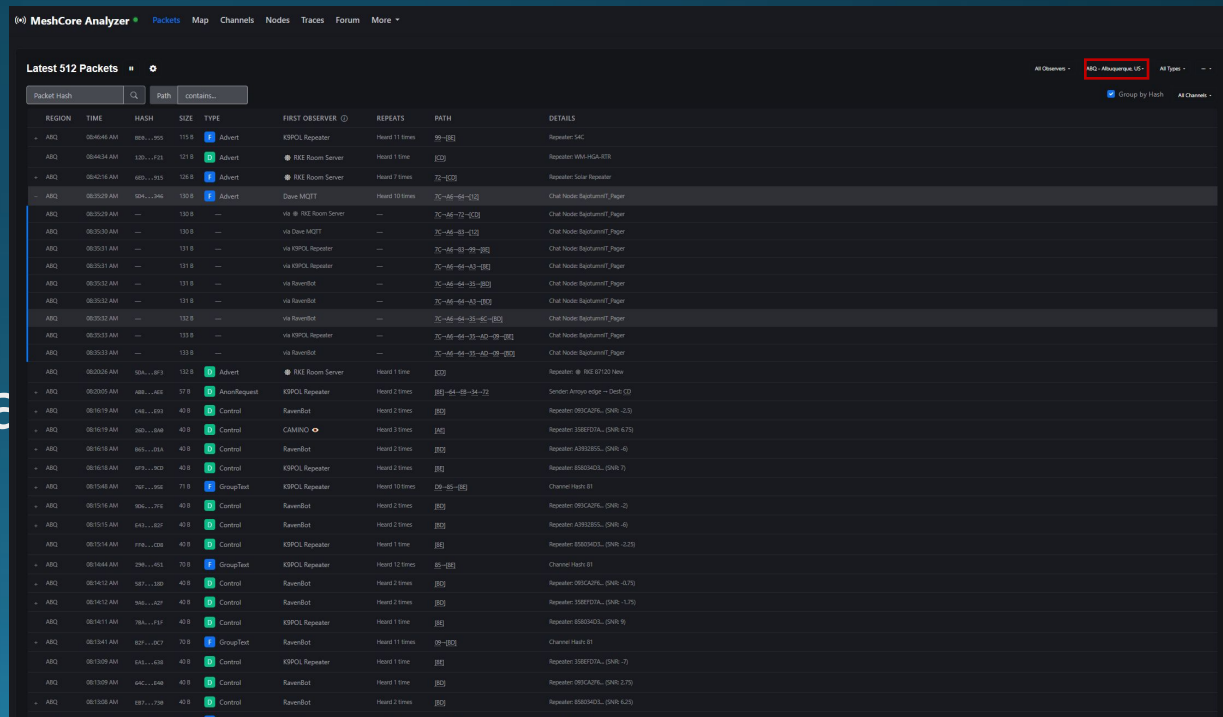
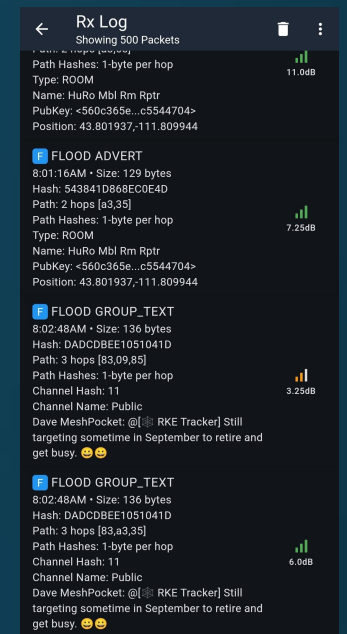
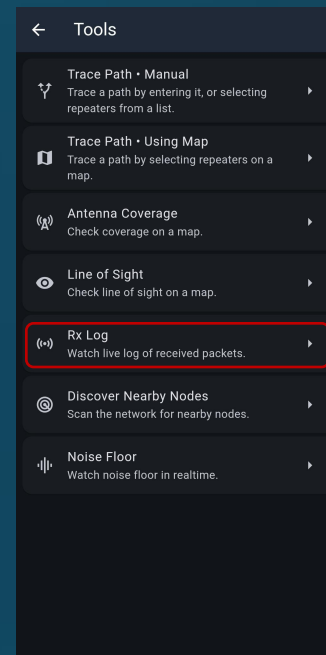
RX Log

- RX Log is mainly used as a diagnostic tool shows data such as hop count, hop detail, signal to noise ratio received, public key of sender, GPS Location (if applicable), and type of message.

- Shows the last 500 packets.

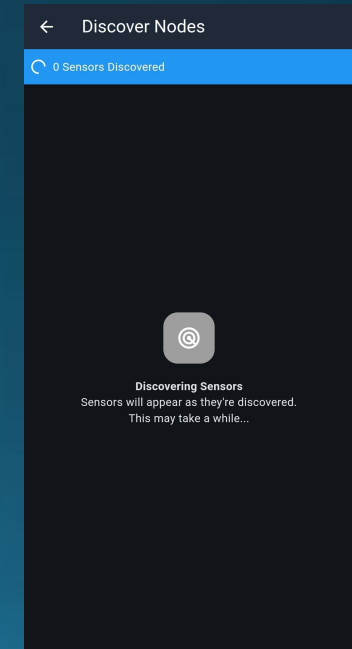
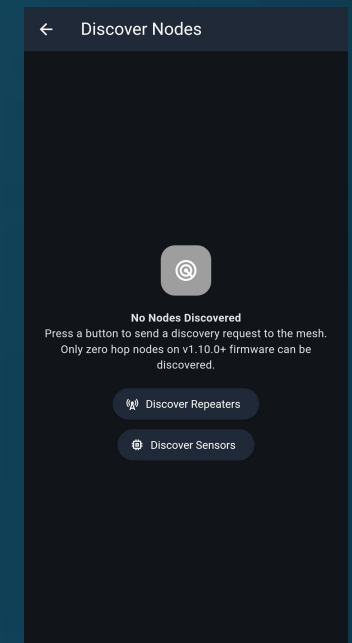
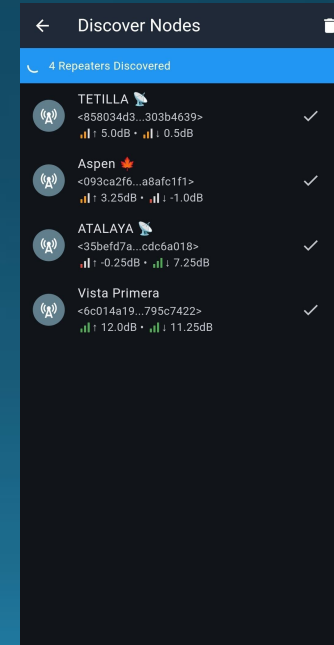
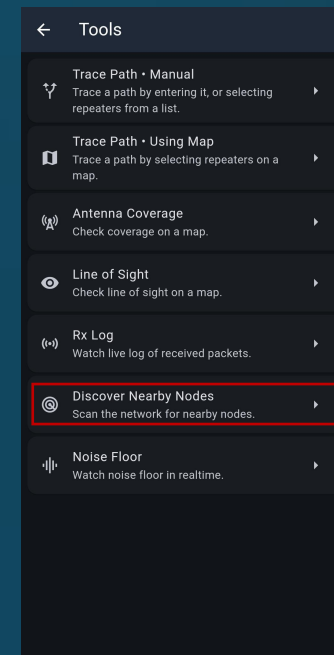
- If you want to see more detail about packets go to:

<https://analyzer.letsmesh.net/packets> and select ABQ as the region



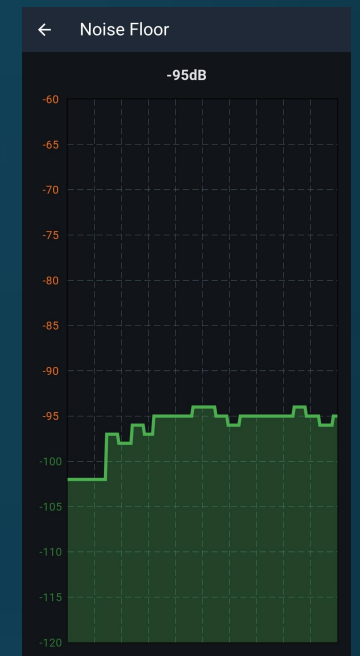
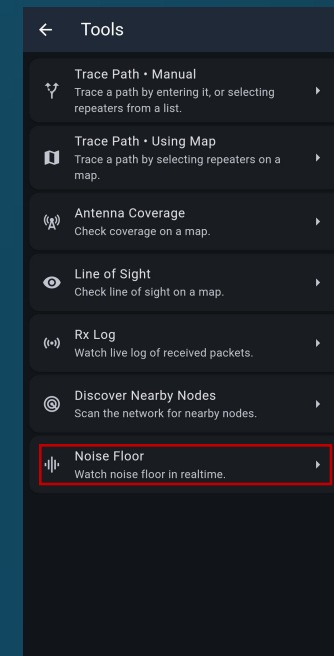
Discover Nearby Nodes

- Discover Nearby Nodes is a tool that you can use to search for repeaters or sensors within signal range.
- Sensors can be things like weather sensors or water level. These are sensors like we talked about in telemetry.
- The most useful use for this tool is to check if there are repeaters in range of your companion. This tool is a good way to check if you are within coverage range of a repeater to communicate out.
- To find repeaters tap “Discover Repeaters” (can take up to a minute).
- To find sensors tap “Discover Sensors”



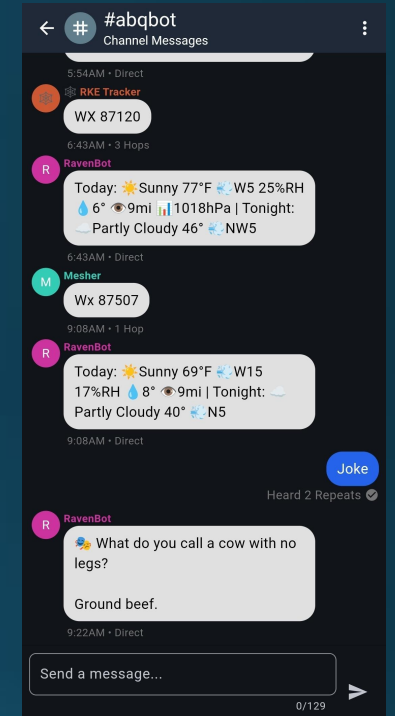
Noise Floor

- Noise Floor is the overall noise level of signals that are not the intended signal of what you are trying to receive.
- “Noisier” areas like cell towers or broadcast towers can affect your noise floor. This is especially important for repeaters.
- Your SNR (signal to noise ratio) is affected by your noise floor.
- This tool is useful for checking your overall noise floor.
 - Anything below -95dBm is usually bad you may need a filter
- Noise floor might be crucial to monitor on radios like the Heltec v4 as it has a receive amplifier which will raise the noise floor overall.
- If you have a high noise floor this could be a reason you are not receiving messages.
- To combat this, you may need a 915MHz bandpass filter or a ~900MHz to ~928MHz bandpass filter.



MeshCore Bot

- New feature!
- Deployed on a Linux OS and uses a typical LoRa node as a companion.
- Featured in channels #abqbot #sfbot #weather #test #hamradio
- Examples of commands and functions:
 - Weather: Wx (zipcode/city,state) i.e. wx 87507 featured on #abqbot, #sfbot, #weather. It also gives weather alerts based off of Santa Fe on #weather.
 - Ping: (#sfbot, #abqbot, #test) simple ping, pong reply.
 - Test: (#sfbot, #test, #abqbot) this will ping the bot and give you the info of what repeaters you went through via hex and the rssi/snr to the bot.
 - Jokes: (#sfbot, #abqbot): gives out jokes with commands like "joke", "momjoke", "dadjoke"
 - Hfcond: (#sfbot, #abqbot, #hamradio) type in "hfcond" it will give you the current Ham Radio HF conditions for each band in daytime and nighttime conditions.
 - Trace: (#sfbot, #abqbot, #test) lets you trace out repeaters from where the ravenbot is i.e. "trace cf, 09"
 - Aqi: (#sfbot, #abqbot, #weather) gives you air quality info of a location with zipcode or city and state.
 - Satpass: (#sfbot, #abqbot, #hamradio) this command will return predicted satellite pass info to the region based on NORAD info ie ISS.
 - Other commands worth mentioning on #abqbot, #sfbot: catfact, funfact, solar.



MeshMapper

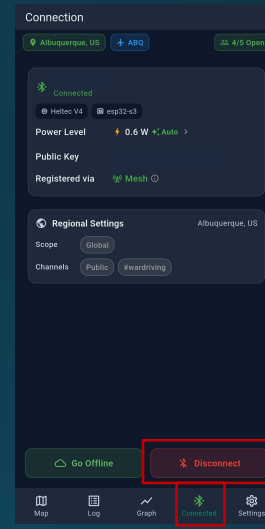
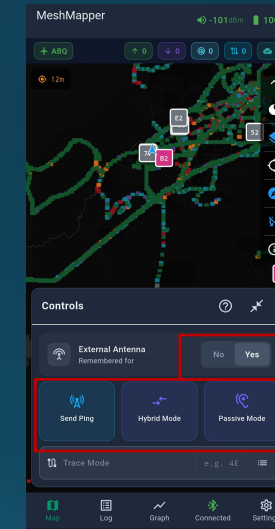
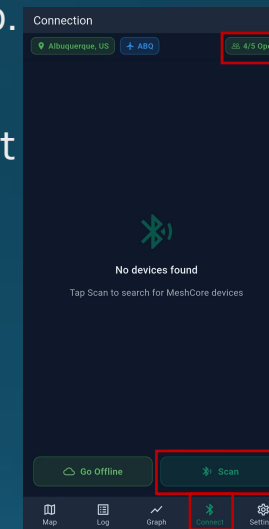
- MeshMapper is a way to “wardrive” the MeshCore Network via the MeshMapper App.
- This app will use your existing MeshCore Companion and connect to it with the app.
- To Download the app search for MeshMapper or scan the QR code.
- Only 5 active “wardrivers” can be active at a time which you will see on the top right corner of the screen.
- After downloading the app:
 1. Make sure for the first time disconnect your MeshCore companion app by going to the 3 dots in the top right corner and tapping disconnect.
 2. Open the MeshMapper app
 3. Tap Connect at the bottom of the screen.
 4. Tap Scan and select the companion that is associated to you.
 5. Tap Map at the bottom of the screen.
 6. Then select if you have an external antenna attached to your companion or not.
 7. Now you can either tap “Send Ping” (single ping) or “Hybrid Mode” which will send a ping every 30 seconds by default. “Passive Mode” allows for you to ping the network offline (no cell service) as this does not use the #wardriving channel.
 8. To stop automatic pings, tap the same mode that you select that should be highlighted.
 9. To disconnect tap the connected icon and then tap disconnect.



Android



iOS



Thank You!

Other classes to come:

- Standalone Meshcore Communicators
- Repeater management and building

Questions?

Feel free to contact me via Email
km6mzf@gmail.com

Resources

MeshCore Information:

<https://meshcore.io/>

MeshMapper:

<https://nodakmesh.org/blog/meshmapper-wardriving-coverage-guide>

<https://abq.meshmapper.net/>

MeshCore Analyzer:

<https://analyzer.letsmesh.net/packets>

MeshCore Bot:

<https://github.com/agessaman/meshcore-bot>