MeshCore – Part 1

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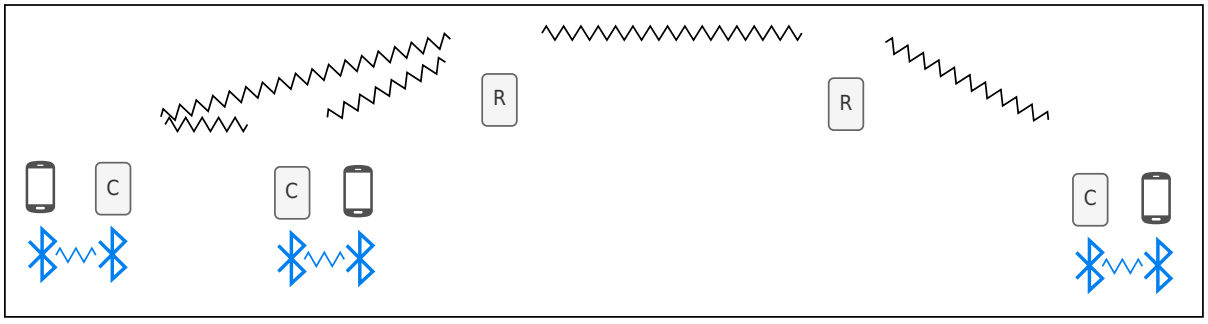
This is the first part of the guide. The second part is about repeaters and other more advanced setups.

Introduction

From Wikipedia:

> MeshCore is an open-source mesh networking protocol and software platform designed for off-grid, low-power text communication using LoRa (Long Range) radio technology. The system enables decentralized, multi-hop wireless messaging without reliance on cellular networks or internet infrastructure.
>
> Use cases include emergency and disaster communications, outdoor and remote activities, [...] and experimental and educational deployments of low-power mesh networking.
>
> [It] is designed to [...] operate in unlicensed ISM frequency bands such as 868 MHz and 915 MHz, depending on regional regulations.

The idea is that each person has a small *companion* device C paired to their cellphone via Bluetooth, and via that device, they can text each other or post public messages using the 915 MHz band, all without a special license. The signal can travel directly between *companion* devices if they are close enough, or via a series of *repeaters* R to extend coverage.



MeshCore devices used as *companion*.

A MeshCore device setup as a *repeater*.

Companions

What is needed to use MeshCore?

- The MeshCore app downloaded to your cellphone or computer.
- A device with the MeshCore *companion* firmware paired to your cellphone.
- If needed, a device with the MeshCore *repeater* firmware to extend messaging range.

Each person who wants to send messages needs their own *companion* device.

Download the MeshCore App

- Search for “MeshCore” by “Liam Cottle” on Google Play or the Apple App Store.
- Alternatively, an offline copy can be downloaded for Android, Windows, macOS, Linux, and Web from https://meshcore.io. It's a good idea to have an offline copy in case of emergency. Meshy is also a nice third party program for Linux and macOS.

Where to buy MeshCore devices?

- Recommended devices are listed at https://meshcore.io
- Alternatively, supported devices listed on https://meshcore.io/flasher can be purchased online from overseas suppliers such as AliExpress or Seeed Studio, or in Canada from Robot Shop.

Flash the Firmware

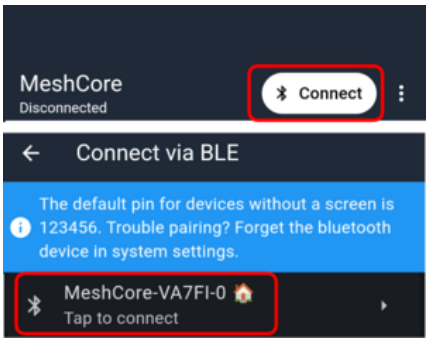
- Use a Chromium-based web browser like Brave.
- On Linux, you may have to add the “`dialout`” group to your user. To do that, type the following in the terminal replacing “USER” with your username and reboot your computer: **`sudo usermod -a -G dialout USER`**
- If MeshCore is already installed and you are re-installing it, go to the Appendix at the end.

To flash the MeshCore firmware:

- Connect the companion device to your computer via USB.
- Go to https://meshcore.io/flasher (using a **Chromium Browser**).
- Select your device.
- Select Companion Bluetooth.
- Select Enter DFU Mode.
- Select Erase Flash.
- Select Flash.

Connect to your MeshCore Device

- Turn on your device.
- Open the MeshCore App.
- Tap the “`Connect`” button in the top right corner.
- Tap the “`MeshCore-XXXX`” device that matches the name shown on your MeshCore device’s screen.
- Enter the PIN displayed on your MeshCore device’s screen. If your device doesn’t have a screen, the default PIN is “123456”.
- Once pairing is successful, you’ll be taken to the main screen.



If you’re having trouble pairing with Bluetooth, try rebooting your phone.

Settings

- Tap the settings icon in the top right corner.

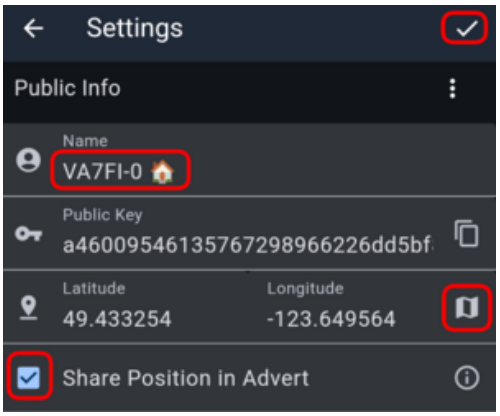
Quick Checklist:

- Share Position in Advert
- Use 2-byte Path Hash Size
- Disable Auto Add of Contacts
- Disable GPS Mode
- Send a Flood Advert

Public Info

You should now rename and set a location for your MeshCore node. These settings will be seen by other users on the MeshCore network (and online!) and can be changed anytime.

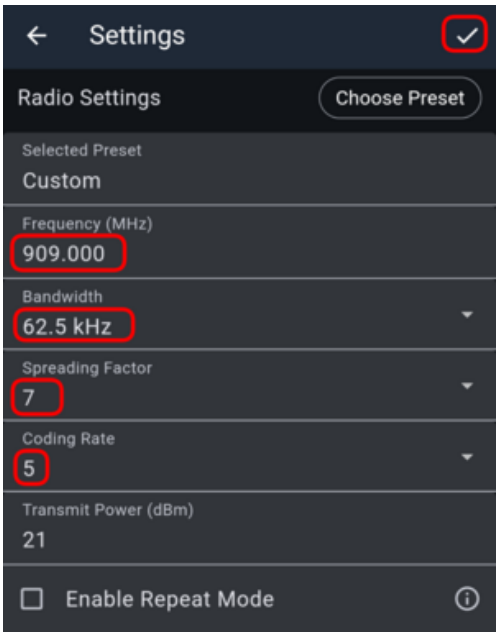
- Write a name that is somewhat descriptive (your name or callsign).
- Tap the map icon to pick your location. This could be shared online so you might want to select a street corner that's **close to but not exactly** where you live. It should be close enough to be useful for your neighbours to identify you as part of the neighbourhood.
- Check the “`Share Position in Advert`”
- Tap the ☑ icon in the top right corner to save the settings.



The device name in Bluetooth will not update until you reboot your node.

Radio Settings

MeshCore can be used all over the world. Different countries have different regulations on which radio frequencies can be used for public, license-free communication. To ensure your node is operating legally, please make sure to select radio settings that are compliant in your country.



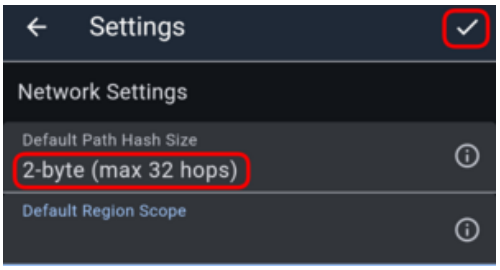
The MeshCore app provides a list of radio presets that have been suggested by the community for use in specific countries/regions, but in the SWBC region, we use different settings (see here for more details):

- Tap the Selected Preset field and select "`Canada`". After you save, this will change to "`Custom`".
- Change the Frequency (MHz) to "`909.000`"
- Make sure the other settings match the picture and tap the ☑ icon in the top right corner to save the settings.

The max transmit power depends on the device.

Network Settings

The Path Hash Size is a chunk of data that is sent with your messages to identify who you are on the mesh (kind of like your node's address). It is the first 1, 2, or 3 bytes of your public key.



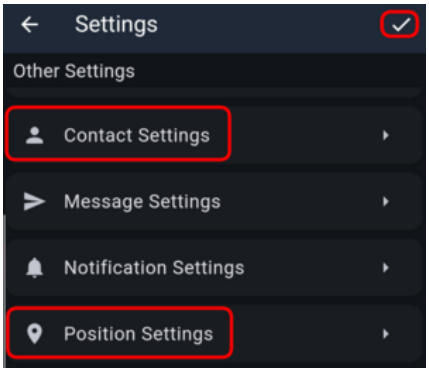
There's a trade-off between how many hops a message can go and how many unique addresses each hash size can have. When two nodes have the same path hash, messages can be routed to the wrong place.

Path Hash Size	Number of unique addresses	Max Hops	Recommended for
1-byte	256 (16^2)	64	Avoid
2-byte	65536 (16^4)	32	Companions
3-byte	16 million (16^6)	21	Repeaters

This page shows nodes with duplicate addresses, which can be fixed by increasing the path hash size.

- Tap the "`Default Path Hash Size`" and select "`2-byte`" for companions, or "`3-byte`" for repeaters.
- Tap the ☑ icon in the top right corner to save the settings.

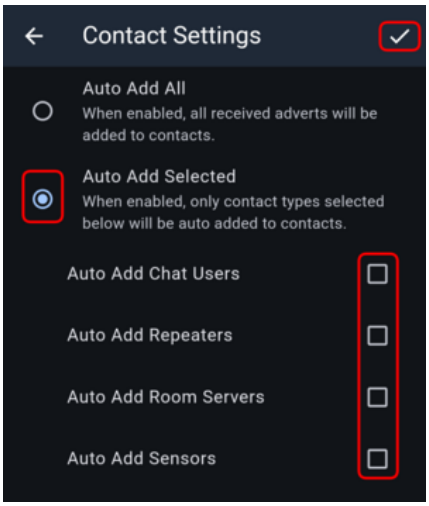
Other Settings



In this section, we'll change two settings:

- Contact Settings
- Position Settings

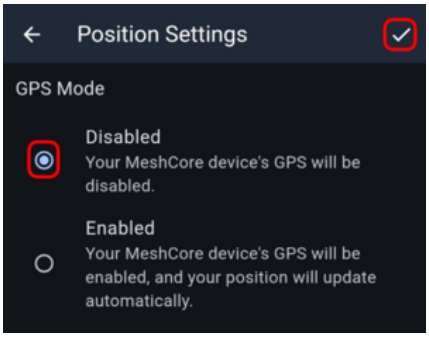
Contact Settings



By default, the app adds every node it hears to the contact list, but it can only store 350 contacts. It's better to let the user add contacts manually:

- Select "`Auto Add Selected`"
- Uncheck all four options
- Tap the ✔ icon in the top right corner to save the settings.

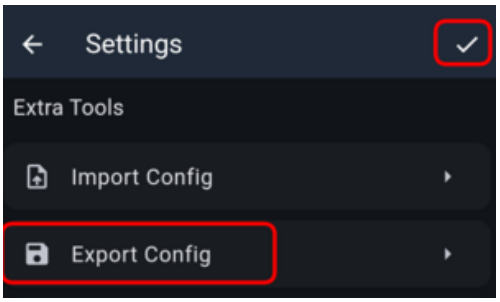
Position Settings



By default, the app can change your location based on your GPS coordinate. Since we've already set an approximate location earlier, we'll want to disable this option. It can be temporarily enabled if you're going somewhere you'd like others to be able to track you (for example).

- Select "`Disabled`"
- Tap the ✔ icon in the top right corner to save the settings.

Extra Tools



The last thing we'll do before exiting the settings is to back up all our configs:

- Tap "`Export Config`"
- "`Select All`"
- Tap the ✔ icon in the top right corner to save the settings.

Finally, let's tap the ✔ icon in the top right corner one last time to save the settings before exiting.

Contacts

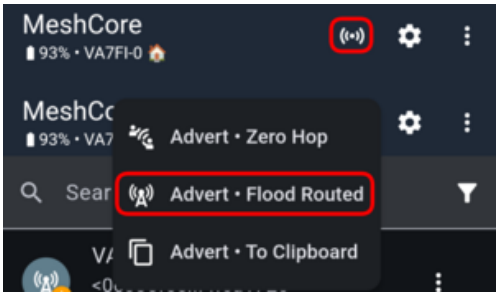
Unlike SMS, you can only send a private message to someone if you are **both** in each other's contacts.

In this section, we'll see four different ways of sharing contact information:

1. Advert/Discover
2. QR Code
3. Link to Clipboard
4. In a Channel

Advert/Discover

Advert



An advert is an unencrypted packet transmitted by your MeshCore node. It includes your node name, location and type, public identity key and a cryptographic signature to prevent anyone from tampering with the information as it’s sent across the mesh.

You can send two types of adverts:

- `Zero Hop`:
  - The advert won’t be retransmitted by any repeaters.
  - Your contact details will only be received by nearby nodes.
- `Flood Routed`:
  - The advert will be rebroadcast by all repeaters that hear it.
  - Your contact details could be received by everyone on the mesh.

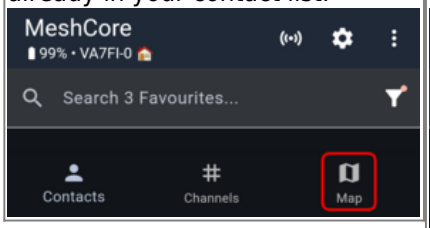
There was a deliberate decision made to prevent auto advert for companions (but not for repeaters). As such, you should flood advert at least once a week so that new users can find and add you to their contact list.

- Tap the “wave” icon just to the left of the gears at the top
- Tap “Advert • Flood Routed”

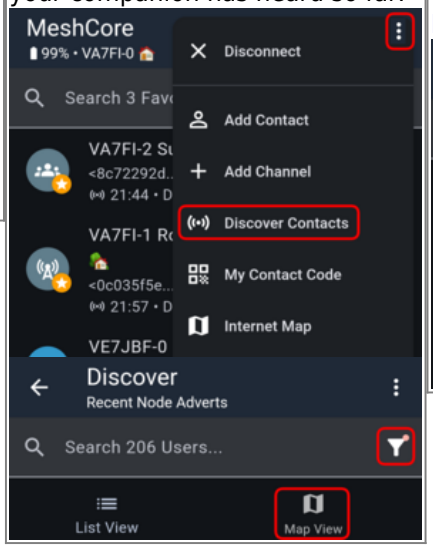
Discover

The easiest way to add nodes that are in your neighbourhood is to use the map feature. However, there are three different kinds of maps in MeshCore:

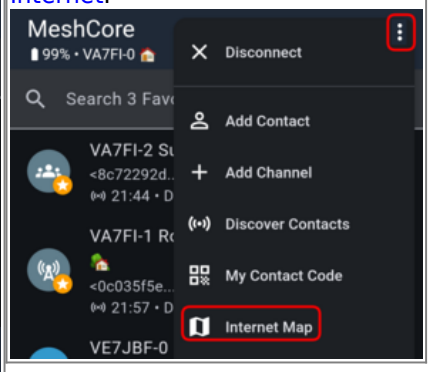
1) The map at the bottom of the main page only shows nodes already in your contact list.



2) The map under “Discover Contacts” shows all the nodes that your companion has heard so far.



3) The “Internet Map” shows a map of all the nodes heard by “observers” that are shared to the Internet.



To populate your contact list, use the map under “Discover Contacts”. You might have to leave your node on for a bit for it to hear all the nodes in your area since they need to advert or transmit for your node to see them:

- Tap on “`Discover Contacts`”
- Tap on “`Map View`”
- Tap on the filter icon and select “`Users`”.
- Tap on this ⋮ in the top right and **un**check “`Show Added Contacts`”

The map will only show users that have not been added yet. To add them:

- Tap on a node
- Under the node's name, tap on “`Add`”

If you go back to the main page's “`Map`” (1), you should now see that contacts you've added.

The maps only show nodes that have shared their Position in Advert. Nodes that have not shared their location will still show in the “`List View`”, but you won't be able to tell where they are located. That's why it's important to share your approximate location: so others in your neighbourhood can add you to their contact list.

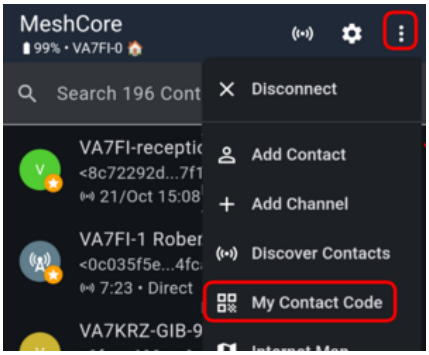
QR Code

The fastest way to share your contact information with someone next to you is to use QR Codes. However, don't text or email these out; for that, there's a better way...

Share

To share your contact details privately via QR Code:

- Tap on this ⋮ in the top right.
- Tap the "`My Contact Code`" menu item.
- Show the QR Code to the other person.



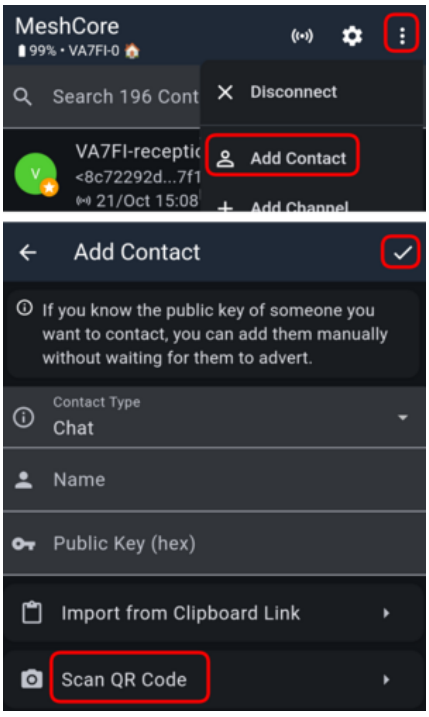
The QR Code contains your Node Name, Node Type and Public Identity Key. Your contact details will not be transmitted over the mesh. Only the person who scans your QR Code will receive your contact details.

Add

To add a contact via QR Code:

- Tap on this ⋮ in the top right.
- Tap the "`Add Contact`" menu item.
- Tap the "`Scan QR Code`" button (if requested, grant access to the device's camera).
- Point the device's camera at the QR Code.
- The contact details will be automatically added to your contacts list.
- Tap the ✔ icon to add.

You may need to accept a permissions request for the MeshCore app to access your camera. This permission must be granted to be able to scan the QR Code.

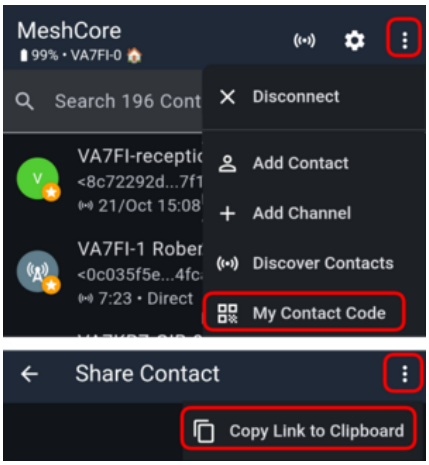


Link to Clipboard

The easiest way to share your contacts via email or SMS is to use a contact link.

Share

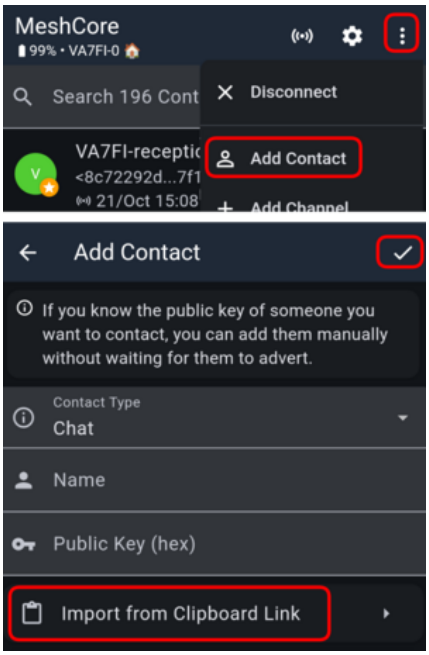
To share your contact link:



- Tap on this ⋮ in the top right.
- Tap the "`My Contact Code`" menu item.
- Tap on this ⋮ in the top right.
- Tap on "`Copy Link to Clipboard`"
- Paste the link in an email or SMS

Add

To add a contact link:



- Copy the contact link you were sent to your phone's clipboard.
- In the MeshCore app, tap on ⋮ in the top right.
- Tap on "`Add Contact`"
- Tap on "`Import from Clipboard Link`"
- Tap the ✔ icon to add.

In a Channel

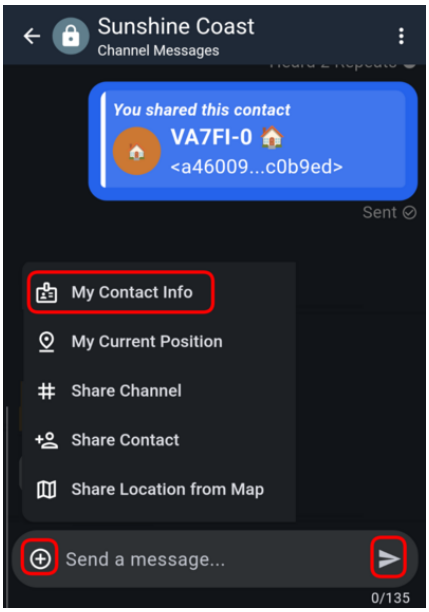
We haven't discussed Channels yet, so feel free to come back to this section later.

Share

Here's how to share your contact information with everyone in the Channel:

- In a channel, tap the ⊕ icon at the bottom left
- Tap "`My Contact Info`" and tap the "send" icon at the bottom right.

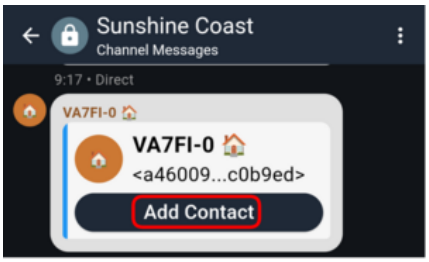
You'll see a message that says: "*You shared this contact*"

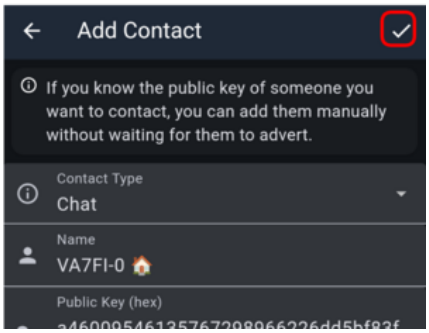


Add

To add a contact shared in a channel:

- Simply tap the "`Add Contact`" button. This will populate the name and public key in the `Add Contact` window.
- Tap ✔ icon to add.





Direct, Private Messages

To send a direct, private message to someone, you **both** need to be in each other's contact lists.

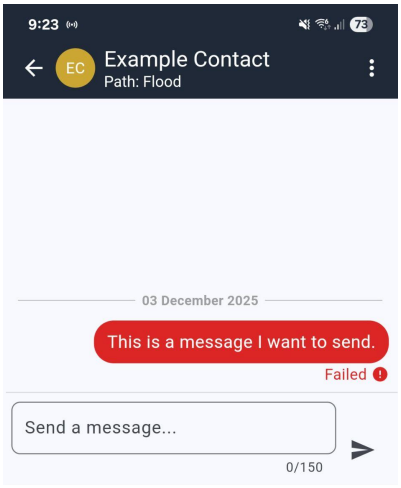
- Use one of the four methods for sharing contact info.
- From the "`Contacts`" screen, tap on a contact.
- Type your message as you would an SMS.

When you send a direct message to someone, it's possible that it may not go through after several automatic attempts. This can happen for many different reasons, such as:

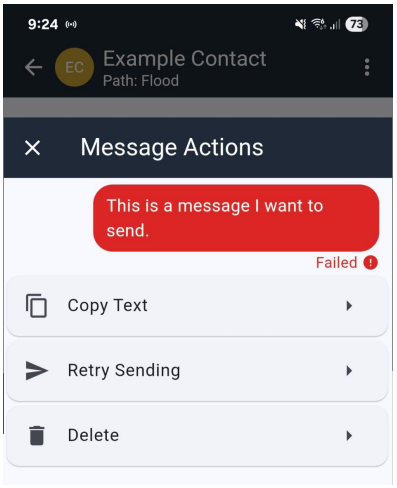
- Being out of range of the intended recipient.
- There are no repeaters in between you and the intended recipient.
- The intended recipient's radio might be turned off.
- There might be interference on the radio spectrum.
- The recipient doesn't have you in their contact list.

To try sending the failed message again:

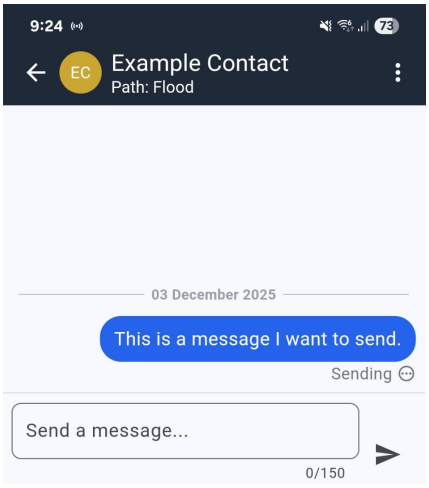
- Long-press the failed message shown in red.
- Tap the "`Retry Sending`" button shown in the message actions pop-up.
- Your message will try sending again.



Long-press the failed message shown in red.



Tap the "Retry Sending" message action.



Your message will try sending again.

Channels

Channels are “places” for people to share messages with groups of people. It's not possible to know who did and did not receive messages posted in channels. There is also no “storing” capability, so if someone's node is out of reach, they will miss these messages.

There are three types of channels:

The Public channel	has a known public/private key pair so every device can send messages to and read messages from that channel.
Hashtag channels	can be created and joined by anyone. The public/private key pair is derived from the hashtag name so anyone who knows the hashtag can join. These are public channels based on different topics or regions.
Private channels	have randomly generated keys. So only those who know the private key can join the channel. Messages there are private insofar as the private key is not distributed outside the intended circle.

See the Public-Key Cryptography section in the appendix to learn more about how MeshCore uses public/private key pairs.

The Public Channel

By default, messages sent to the “`Public`” channel can be seen by anyone on the MeshCore network. They are repeated across the mesh by all repeaters that hear them. Other mesh nodes in range of you or a repeater that rebroadcast the message should receive it.

To send a message:

- Tap the channels tab at the bottom of the screen.
- Tap the “`Public`” channel.
- Type a message and press the send icon.

To join the “`Public`” channel if it's not there:

- Tap on ⋮ in the top right.
- Tap on “`Add Channel`”
- Tap on “`Join the Public Channel`”
- Leave the Channel Name as “`Public`” and tap “`Join Channel`”

Hashtag Channel

Hashtag channels are public channels based on topics or regions. To join an existing hashtag channel, or create a new one:

- Tap on ⋮ in the top right.
- Tap on "`Add Channel`"
- Tap on "`Join a Hashtag Channel`"
- Type the channel name after the # symbol and tap "`Join Channel`"

Here are a few channels used in the South West region of BC:

For chat and testing

`#bc`	For chatting in BC
`#ssi`	For chatting on Salt-Spring Island
`#news`	For posting news-related items
`#test`	For testing. Bot maintained by VE7WWC
`#kod-bot`	For testing. Bot maintained by VE7KOD.

Some common commands for test channels with bots:

- `test` (or `t`)
- `path` (or `p`)
- `cmd`

See this GitHub page for a complete list of commands.

For alerts and emergencies

`#drivebc`	A bot that sends Drive BC notifications
`#alert`	For posting non-emergency alerts here. No bots.
`#emergency`	For sending emergency messages affecting a large group of people (like an earthquake). No bots.
`#sos`	For sending emergency messages affecting one person or group who needs help (like during a hike without cell service). No bots.

The reason for using the `#emergency` or `#sos` channels instead of the `Public` channel is that:

- Messages sent to the `Public` channel could be buried by other chatter.
- Many people have the notifications for the `Public` channel set to "`Mentions Only`".

To help with monitoring the `#sos` channel:

- Join the channel.
- Send one – just one – "`test`" message.
- Leave your notifications for that channel set to "`All Messages`" (see the Notifications section below).
- For more information about the `#sos` channel, see: https://ridgeline.ve7kod.ca/channels There you can see all messages sent to the channel the list of who is monitoring. You can also sign up to receive automated emails when keywords are sent to the `#sos` channel.

To use the `#sos` channel in case of a real emergency:

- Write a clear and concise message with your location (see the Quick Share Menu section below for how to do this quickly).
- Add a key word like "`sos`", "`life-threatening`", "`call 911`", "`help me`", "`needs help`". This will trigger the Ridgeline bot to notify those who subscribe to email notifications.

Private Channel

Private channels create their key pairs randomly and independently of the channel name. As such, a private channel can be renamed without affecting its “identity”. Here are a list of some private channels used in the South West region of BC.

`Sunshine Coast`	Private channel for the Sunshine Coast
`VanIsle`	Private channel for Vancouver Island

There may be more that we are not aware of, and we will not list the private keys for these channels here.

To join an existing private channel:

- Obtain the private key from someone in that channel.
- Tap on ⋮ in the top right.
- Tap on “`Add Channel`”
- Tap on “`Join a Private Channel`”
- Type the channel name, the secret key (private key), and tap “`Join Channel`”

To create a new private channel:

- Obtain the private key from someone in that channel.
- Tap on ⋮ in the top right.
- Tap on “`Add Channel`”
- Tap on “`Create a Private Channel`”
- Type the channel name and copy the secret key (you can do this later).

Notifications

Each channel can be configured with one of three different notification levels:

`All Messages`	A notification will show for all received messages.
`Mentions Only`	A notification will show if someone mentions you.
`None`	Notifications will not be shown.

To change a channel's default notification settings:

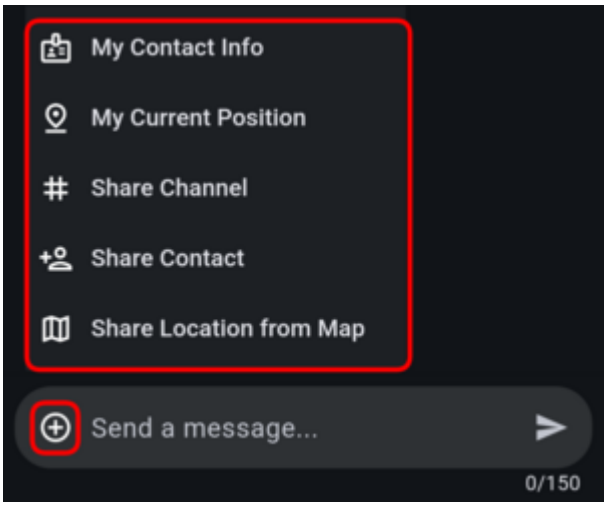
- Tap on ⋮ beside the channel you want to change.
- Tap on “`Notifications`”
- Select the notification level you want
- Tap the ✓ icon to save the settings.

There are two ways to mention someone in a channel so they get notified:

- Long-press on one of their messages.
- Tap “`Reply`”
- Type your message after the string that's automatically added.

- Or, type: “`@[TheirMeshCoreName]`” somewhere in the message (it doesn't have to be at the beginning).

Quick Share Menu



In any message window, you can quickly share contact or location information by tapping the ⊕ icon at the bottom left.

`My Contact Info`
Adds text that will convert to a button that others can tap on to add you to their contact list. See the In a Channel section for more info.

`My Current Position`
Adds Lat, Lon coordinates based either on the preset location or the companion's GPS. See the Public Info and Position Settings sections for more details.

`Share Channel`
Opens a selection of channels in your list to choose from. Tap on the channel and tap the send button. The string of text will convert into a button the recipient can tap to add the channel to their list.

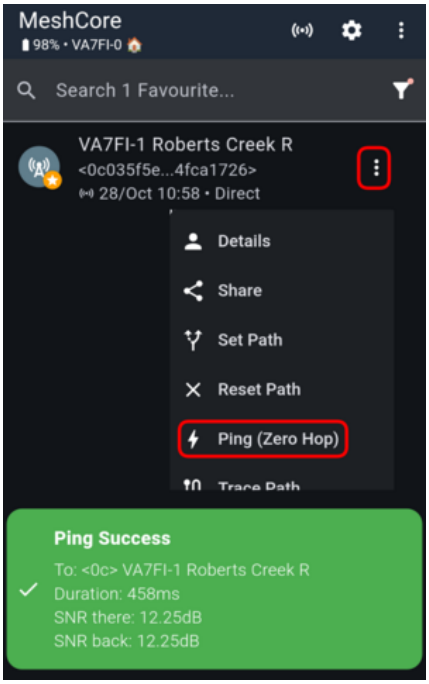
`Share Contact`
Works the same as `Share Channel` but for contacts instead of channels.

`Share Location from Map`
Opens a map. Navigate to the location you want to share, tap the map until the blue dot is where you want, and tap the ✓ icon in the top right corner. This adds lat, Lon coordinates to the message window.

Ping a Repeater

To check the signal strength to and from a nearby repeater, you can run a ping test:

- Tap on this ⋮ icon next to a repeater contact.
- Tap the "`Ping (Zero Hop)`" menu item.
- A green pop-up will show signal strengths if successful.
- A red pop-up will show "Timeout" if your companion didn't hear the repeater.



Ping tests do not hop through multiple repeaters. You must be in range of the specific repeater you are ping testing. For a ping test to be successful, the repeater must hear your companion signal directly, and your companion must hear the repeater signal directly. If you're not in range of the repeater, the ping test will fail with a timeout error.

Resources

Online Tools and Maps

https://app.meshcore.nz	The browser version of the MeshCore app
https://map.meshcore.io	Official MeshCore Node map
https://swbc.meshmapper.net	Community-generated map
https://ridgeline.ve7kod.ca	MeshCore Observatory by VE7KOD
https://analyzer.letsmesh.net	MeshCore Analyser
https://heywhatsthat.com	Path Profiler

More Information

https://meshcore.io	Official MeshCore website
https://github.com/meshcore-dev/MeshCore	Official MeshCore Github
https://youtu.be/OwmkVkZQTf4	Youtube Presentation by Liam Cottle
https://scottbaker.ca/meshcore	Scott Baker's website
https://ve7lee.tedlee.ca/mesh.html	VE7LEE's MeshCore website
https://www.austinmesh.org/learn/meshcore-vs-meshtastic	MeshCore vs Meshtastic
https://idahomesh.org/meshcore-channels-rooms-and-dms	Channels vs Rooms vs DMs
https://discord.gg/vHUqyBSTPe	Vancouver Island Amateur Radio Discord Server

Appendix

Re-Flash the Firmware

If you already have MeshCore installed and want to re-flash the firmware, back up your current settings:

- Open the MeshCore app
- Navigate to the Settings (the gear in the top right corner)
- Scroll down to the "`Extra Tools`" section and select "`Export Config`"
- Tap "`Select All`" and tap the ✔ icon to save the "`.json`" file to your phone.

Flash the MeshCore Firmware:

- Connect the companion device to your computer via USB.
- Go to https://meshcore.io/flasher (using a **Chromium Browser**).
- Select your device.
- Select Companion Bluetooth.
- Select Enter DFU Mode.
- Select Erase Flash (depending on whether you want to delete your settings).
- Select Flash.

To reload your previous config file (required only if you lost your configuration).

- Open the MeshCore App.
- Connect to the companion device, but it probably has a different Bluetooth name now.
- Enter the PIN displayed on your MeshCore device's screen. If your device doesn't have a screen, the default PIN is "`123456`".
- Skip Setup.
- Navigate to the Settings (the gear in the top right corner).
- Scroll down to the "`Extra Tools`" section and select "`Import Config`".
- Click on "`Select File`".
- Select the "`*.json`" file.
- Tap "`Select All`", and tap the ✔ icon to load your previous settings.

Public-key Cryptography

There are basically two different strategies for encrypting a message:

Symmetric-key cryptography is a system where the key to encrypt and decrypt a message is the same.

For example, if I generate a long random list of numbers between 1 and 26, I could use that to encrypt a message, and you could use the same list to decrypt it. Let's encrypt the word "*hello*" by shifting each letter by (1, 9, 2, 7, 3). The result is "*innsr*". You can then shift them back using the same key in reverse to recover "*hello*".

This can be very secure *if* the key is random, is as long as the message itself, and is never reused for other messages. A big practical problem is that I have to somehow give you a copy of the key without it getting intercepted. If I can do that, I might as well give you the unencrypted message.

Public-key cryptography bypasses the problem of sharing the key securely.

You start with a large random number and use that to generate a *pair* of keys that are "inverses" of each other in some sense. That way, a message encrypted with one key can only be decrypted with its pair. This is based on the idea that a lot of processes in math are not easily reversible, so deducing one key from its pair is almost impossible.

Once you have this pair of keys, you keep one secret, and you publish the other one. That's right, you share one of your keys with everyone! Here are two things that you can now do:

- If I use your public key to encrypt a message that I post on a public forum, you're the only one who will be able to decrypt it with your private key.
- If I use my private key to encrypt a message that I post on a public forum, everyone will be able to decrypt the message (because they have my public key), but they'll know that the message has not been tampered with, and that it really comes from me because I'm the only one with the private key that encrypted it. Most software publishers use this scheme to sign the programs they publish online.

MeshCore and Public-key Cryptography

MeshCore uses Public Key Cryptography to:

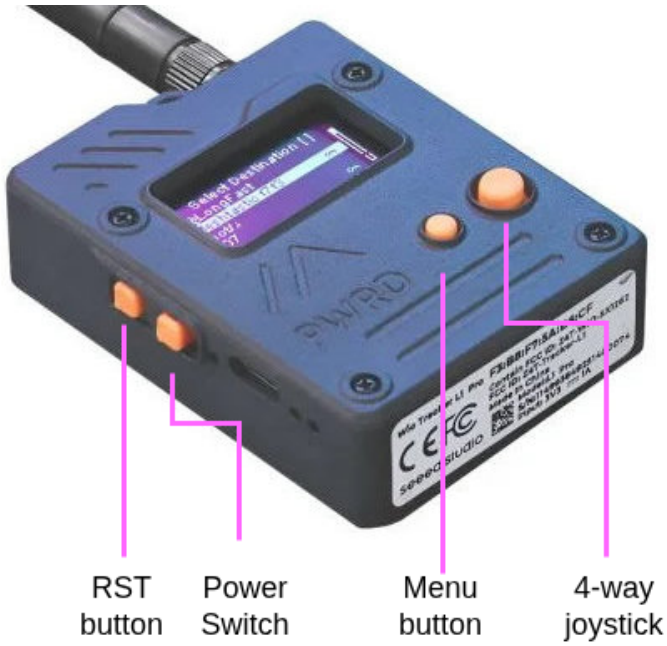
- Identify you uniquely: your public key is your unique ID. It's listed in System -> Public Info, and it's part of the Contact Info that you share with others for them to add you to their contact list. Your private key can be exported for backup purposes or in case you upgrade your device and want to keep the same ID. But don't share your private key with anyone.
- A private message is encrypted with the recipient's public key. So even though it's transmitted over RF and everyone is receiving the message, only the recipient's private key can decrypt it.
- Different types of channels use public/private key pairs in different ways to make the channel either public or private.

Wio Tracker L1 Pro

The Wio Tracker L1 Pro has a buzzer that chimes when a message is received. When the buzzer is turned off, a little speaker icon with an “X” appears on the left of the battery.

To toggle the buzzer on and off, click the menu button three times quickly.

Buzzer ON	Buzzer OFF



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A big part of this document used Liam Cottle's MeshCore Quick Start Guide from November 2025 (CC-BY-SA) as a starting point. We then updated and expanded his guide with regional settings used on the South West Coast of BC.