



What is MeshCore?

MeshCore is an off-grid messaging system that uses LoRa radio to pass messages between devices without relying on cell towers, the internet, WiFi, or any commercial communications infrastructure. Your phone connects to a small radio device called a companion using Bluetooth, and messages then travel across the mesh through nearby companions and repeaters. It works completely independently of the systems we normally take for granted.

What phone do I need?

Any modern Android or iPhone works. You connect to your companion over Bluetooth using the MeshCore app, which is available for both platforms. You do not need a special phone or an active phone plan to use MeshCore.

Do I need a ham radio license?

No. In the United States, you generally do not need an amateur radio license to use MeshCore when it is operating in the unlicensed ISM portion of the 915 MHz LoRa band, and that is how most MeshCore users in Connecticut are operating today. MeshCore uses LoRa radios, not traditional ham radios, and most networks in the US run on license-free frequencies and power levels. You can legally use companions, repeaters, and all messaging features without a ham license in those configurations, as long as you stay within the allowed power limits. Many MeshCore users are also ham operators because the skills naturally overlap, but the license itself is not required for normal MeshCore use.

What is a Companion?

A companion is the small radio device you carry or keep nearby that connects to your phone through Bluetooth. It allows you to send and receive messages, see nearby nodes, access bots and tools, and connect to the larger mesh network. Companions are usually battery powered and portable, making them easy to take anywhere.

What is a Repeater?

A repeater is a node designed to stay in one fixed location and forward traffic for other users. Repeaters extend coverage, help bridge long distances, and form the backbone of the network. They usually work best when placed at high

elevations. A single well-placed repeater can dramatically improve local coverage for everyone in the area.

Do I Need My Own Repeater?

No. You can participate in MeshCore using only a companion. That said, a nearby repeater can greatly improve reliability, and having your own repeater may help you connect to the larger network. In areas with few repeaters, coverage can be unpredictable, so as the network in your area grows, things generally improve.

What is BDL?

BDL is the MeshCore region used by most users in Connecticut and parts of the surrounding area. MeshCore regions across the country are generally named after nearby airports, and in Connecticut the region name "BDL" comes from Bradley International Airport. Regions help organize and separate large MeshCore networks. Most Connecticut repeaters and companions are operating within the BDL region, and devices configured incorrectly for the region may have trouble communicating reliably.

What does One Byte vs Two Byte mean?

MeshCore uses short hash identifiers to help devices recognize and route traffic. Originally, many regions used one-byte hashes, which worked well for smaller networks. As Connecticut expanded rapidly, collisions became more common because too many nodes were sharing similar identifiers. The BDL region largely moved to two-byte hashes to improve routing reliability, node identification, and performance on larger networks. If you are operating in the Connecticut BDL region, your companion should normally be configured for two-byte operation.

How Do I Enable Two-Byte on My Companion?

Open the MeshCore app and connect to your companion. Go into Settings, then open Experimental Settings, and locate the hash or path hash setting. Enable two-byte operation, save or apply the setting, and reboot the companion if required. Exact wording may vary slightly depending on your firmware version. After enabling two-byte, your device should communicate more reliably within the Connecticut BDL region and your node identification will be more unique.

How Far Can a Message Travel?

It depends heavily on terrain and repeater coverage. A companion talking directly to another companion might reach a mile or two in open flat terrain, but much less in a city or hilly area. Through a well-placed repeater on high ground, messages can travel tens of miles. Through a chain of repeaters, a message can

cross an entire state. Distance is less about power and more about having good repeater coverage along the path.

What is Flooding?

When you send a message, your companion broadcasts it to nearby devices. Those devices re-broadcast it to their neighbors, and so on across the network. This spreading process is called flooding, and it is how messages travel across the mesh without needing a fixed predetermined route. The downside is that busy networks can become congested from too many retransmissions happening at once.

What is a Channel?

Channels are named group conversations. Users on the same channel can see each other's messages, similar to a group chat. There are often default public channels for general use, and you can join or participate in others. Channels help organize conversations across the mesh.

Why Might My Message Not Reach Someone?

MeshCore does not guarantee delivery. Messages can fail for many reasons including not enough repeaters, weak signal, terrain blockage, RF interference, a congested network, or simply because the destination device is offline or low on battery. A message may disappear somewhere along the network and you may never know exactly where it stopped. If you are unsure whether your device is working at all, try messaging a bot first. Bots are automated and respond quickly, making them the easiest way to confirm your connection is working.

What Does "Dead Ending" Mean?

Sometimes a repeater hears your message but cannot forward it any farther. The message effectively stops there and never reaches the intended destination. This is called a dead end. Common causes include weak links between repeaters, poor repeater elevation, no onward neighbors in range, interference, or simply sparse network coverage in that area.

Why Do Some Messages Show Repeaters Heard Them While Others Just Say "Sent"?

When your device says a repeater heard the message, it means at least one repeater successfully received it. If it only says "sent," it usually means your companion transmitted successfully but no repeater confirmed hearing it. That does not always mean failure — another node may still have received the message even without a confirmation showing up on your end. But you may want to consider sending it again.

What is a Gateway?

A gateway is a node that bridges the mesh to the internet. This can allow messages to potentially travel between geographically distant mesh networks that would otherwise have no radio path between them. Gateways are not always available and are not part of every regional network, but they can significantly extend the reach of the mesh when present.

Can I Send Messages to Other States or Countries?

Only if there is a connected mesh path or gateway between you and the destination. MeshCore does not connect to the internet on its own, so there is no automatic bridge to other regions. Some regions experiment with internet-linked gateways that allow longer-distance connectivity, but this is not standard and varies by area.

What Are Bots?

Bots are automated services on the mesh that respond to commands. They can provide weather information, testing tools, path information, network diagnostics, and system status. Bots are particularly useful when you are getting started because they help you test connectivity, learn routing behavior, and verify that your device is working properly, all without needing another live person to be on the network at the same time.

Bots are accessed by sending a message to the bot node on the mesh, just like you would send a direct message to another user. Once connected, you type a command word and the bot replies with information or a result. To see the full list of available commands, simply send **help** and the bot will respond with what it supports. You can also send **help** followed by a specific command name — for example, **help wx** — to get more detail on how that particular command works.

The most commonly used commands are:

- **test** — Sends a test message back to you. This is usually the first thing a new user should try. If you get a response, your device is working and you have a path to the bot.
- **ping** — Similar to test, ping checks whether the bot can hear you and respond. Useful for quickly confirming connectivity.
- **path** — Asks the bot to report the path your message took to reach it. This is extremely helpful for understanding how your signal is traveling across the mesh, which repeaters heard you, and how many hops it took.
- **wx** — Returns a local weather report. A quick and practical tool when you are out in the field.

- **aqi** — Returns the current Air Quality Index for your area. Useful during wildfire season or periods of poor air quality.
- **hfcond** — Reports HF propagation conditions. More relevant to ham operators, but interesting for anyone curious about current radio conditions.
- **sun** — Returns sunrise and sunset times for your location.
- **moon** — Returns current moon phase information.
- **hello** — A friendly greeting command. Some bots respond with network information or a welcome message.

If a bot does not respond, it does not necessarily mean your device is broken. The bot may be offline, out of range, or the mesh path between you and the bot may be incomplete. Try again from a different location or at a different time.

Can I Direct Message Someone?

Yes. You can send direct messages to individual users. Your device usually needs to know about that node first, which typically happens as your node learns about others through normal mesh activity. If someone direct messages you, you will receive a notification inside the app and the message will appear similarly to a text message conversation.

Can I Use Any Name I Want?

Yes. MeshCore does not require real names. You can use a callsign, nickname, tactical name, or stay anonymous. Keep in mind that unusual names may make you difficult for friends to find. Many users include their callsign, town, or a role identifier in their name. Tactical naming can also be useful during emergency or SHTF situations.

Does MeshCore Use Encryption?

Yes. MeshCore traffic is encrypted, which helps prevent casual monitoring of messages over the air. That said, no system should ever be considered perfectly secure. Metadata may still exist, observers may still see routing activity, and RF transmissions themselves are still detectable. Encryption protects message content — it does not make you invisible on the airwaves.

Do Messages Persist Between Reboots?

Sometimes. Message history may be lost if your device is rebooted, firmware is updated, the app cache is cleared, or the device loses power unexpectedly. Persistence behavior varies between firmware versions and device types. MeshCore generally does not operate like email or SMS with guaranteed

storage and later delivery, so if your companion was powered off or out of range when a message was sent, you will likely miss it.

Can I Use My Companion Inside My Car?

Yes, but performance is usually worse inside a vehicle because metal blocks RF signals and vehicle structure weakens reception. For best results, place antennas near windows, use external antennas when possible, and consider mounting repeaters outside the vehicle if you are doing mobile operations.

Why Does Height Matter So Much?

In MeshCore, height is usually more important than transmit power. A low-power repeater on a hill will often outperform a much stronger repeater sitting in a valley. Good repeater locations include rooftops, towers, hilltops, water tanks, and tall buildings. When evaluating a location for a repeater, elevation is the first thing to consider.

Why Do Some Repeaters Work Better Than Others?

Performance depends on elevation, antenna quality and tuning, the local noise floor, feedline quality, RF congestion, and power stability. A repeater with modest hardware in a great location often outperforms expensive equipment in a poor location. Antenna quality and placement make a larger difference than most beginners expect.

How Much Does a Companion Cost?

Typical companions usually cost between \$25 and \$60 depending on the hardware. Price varies based on whether it includes a battery, case, display, antenna, and what board type is used. You do not have to spend a lot to get started.

Do I Have to Build My Own Companion?

No. Many people buy prebuilt units, partially assembled kits, or purchase from local builders in the community. Building your own can be a great way to learn the system, customize your antenna setup, or add solar or battery systems — but it is absolutely not required to participate.

Why Doesn't a Repeater Show on the Map?

In the Neighbors tool, a repeater may appear in the node list but not show up on the map. This usually happens because the repeater is not in your contacts or your node lacks the full stored information needed for mapping. A repeater can still be fully functional even if it is missing from the map view. Always check both the neighbor list and the map display rather than relying on just one.

What Is an Observer?

An observer is a special node that monitors and reports mesh activity. Observers help users analyze traffic, study repeater coverage, watch packet flow, and troubleshoot routing. They only report traffic they can personally hear, so they do not see the entire mesh — just the portion within their radio range.

Why is it important for MeshCore repeaters to have the correct time?

Accurate time helps MeshCore make good decisions about how messages and packets move through the network. Repeaters use timestamps to determine the age of messages, track network activity, prevent duplicate packet processing, and maintain accurate logs. Features such as observers, analyzers, and packet capture systems also rely on correct timestamps to provide meaningful information about what is happening on the network.

For most MeshCore users, a repeater clock that is within a few seconds of the correct time is ideal, but being within 30 seconds is generally more than sufficient. As a repeater's clock drifts further from the actual time, strange behavior can begin to appear. Messages may seem older or newer than they really are, analyzer maps may display inaccurate activity times, and troubleshooting network paths can become more difficult. In extreme cases, clocks that are off by hours can lead to confusing logs and unexpected packet handling.

The good news is that minor time differences rarely prevent a network from functioning. A repeater that is a minute or two off will usually continue forwarding traffic normally. However, maintaining accurate time helps keep the entire network healthier, makes diagnostic tools more reliable, and provides a better experience for everyone connected to the mesh. When possible, repeaters should be synchronized using a reliable time source such as GPS or NTP.

Connecticut MeshCore Resources

- **CTMesh.org** is the main Connecticut MeshCore information site and one of the best starting points for beginners. It includes setup guides, firmware guidance, community resources, frequency information, and network coordination.
<https://ctmesh.org>
- **CTMesh Map** shows repeaters and nodes across Connecticut, helping you visualize network coverage and identify nearby infrastructure. Keep in mind the map may not show every active node, and coverage changes

constantly.

<https://meshcore-map.ctmesh.org>

- **BDL MeshMapper** shows activity and coverage related to the BDL backbone repeater, helping you understand routing toward central Connecticut and check whether your repeater is reaching the backbone. Particularly useful when testing repeater placement.
<https://bdl.meshmapper.net>
- **New England Mesh Analyzer Map** is a more advanced network visualization tool that displays node activity, repeaters, companions, and helps analyze routes and relationships. More involved than the beginner maps, but extremely useful as you grow your knowledge.
<https://analyzer.newenglandme.sh/#/map>
- **Live Mesh Analyzer** provides live packet monitoring and real-time network activity, letting you observe traffic flowing across the mesh as it happens. Excellent for understanding flooding, routing, packet propagation, and how the network behaves under different conditions.
<https://analyzer.newenglandme.sh/#/live>

How Do I Set Up My Companion for the First Time?

Getting your companion on the air for the first time does not require a lot of technical knowledge, but a few key settings will make a big difference in whether your messages actually get through. Here is what to configure when you are just getting started.

Public Info — Name and Position

Open the app, connect to your companion, and go into Settings. The first thing to set is your name. This is how other users will see you on the mesh, so choose something recognizable — a callsign, a nickname, or your town and a handle. You can also enter your latitude and longitude here, and check the box for Share Position in Advert if you want your location to be visible to others on the network. Sharing your position helps you appear on mesh maps and makes it easier for others to see where nodes are located. If your device is GPS-enabled, these will be set for you dynamically.

Radio Settings — Use the USA/Canada Preset

Under Radio Settings, tap Choose Preset and select USA/Canada (Recommended). This will automatically configure your frequency, bandwidth, spreading factor, coding rate, and transmit power to the correct values for the US 915 MHz ISM band. For Connecticut and most of the Northeast, the standard settings this preset applies are 910.525 MHz, 62.5 kHz bandwidth, spreading factor 7, coding rate 5, and 22 dBm transmit power. Do not change

these unless you have a specific reason to — using the preset ensures you are on the same frequency as other nodes in your area.

Experimental Settings — Enable Two-Byte Path Hash

This one is important, especially if you are in Connecticut or anywhere in the BDL region. Go back into Settings and open Experimental Settings. You will see a warning that these settings are experimental — that is normal. Look for the Path Hash Size setting and make sure it is set to 2-byte. This is the standard for the BDL network and most of the Northeast. Leaving it on 1-byte means your device may not communicate reliably with the majority of nodes around you. Note that MeshCore firmware v1.14.0 or later is required to support this setting, so make sure your firmware is up to date. Once changed, reboot your companion.

A Note on Repeat Mode

You will also see an option called Enable Repeat Mode in the Radio Settings screen. Leave this unchecked for now. Repeat mode is for devices that are configured to act as repeaters. As a companion user just getting started, you do not need this enabled.

Once these settings are in place, try sending a message to a bot to confirm everything is working. If you get a response, you are on the air.

Final Advice for Beginners

MeshCore can feel confusing at first, and that is completely normal. It behaves differently from cell phones, text messaging, ham repeaters, and WiFi. Messages are not guaranteed, RF conditions change constantly, height matters enormously, and coverage in sparse areas can be unpredictable.

The best way to learn is to experiment, watch the analyzer tools, test from different locations, and talk to experienced users. Most people improve their setup dramatically over time just by getting out and trying things. Don't get discouraged if your first messages don't go through — everyone starts with limited range, and as you learn where repeaters are and how to position your companion, things improve quickly.