

CHEROKEE COUNTY ARES

OPERATIONAL BINDER

PART 13 — MESH OPERATIONS

MeshCore Off-Grid Messaging: Install, Configure & Operate

Cherokee ARES Standard • Cherokee ARES Channel • Weekly Net Integration

Prepared for Cherokee County ARES members

DRAFT — Revision 0.2 — October 2026

Supersedes the prior Meshtastic-based version of Part 13. Working draft; will be refined with lessons learned.

Appendices B and C are maintained as separate stand-alone documents and are not included in this one.

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13.0 Purpose, Scope & Document Status

DRAFT — Working Document

This is a first draft. It captures our current configuration standard and the lessons learned so far, and it will be refined as the team gains hands-on experience. Items still being decided or verified are shown in amber [like this].

This section is the single operational and instructional reference for how Cherokee County ARES will install, configure, and use MeshCore — a LoRa-based, off-grid text messaging system — as a supplemental communications layer. It applies to all ARES members and to affiliated volunteers who carry a MeshCore device in support of county communications.

MeshCore does not replace our VHF/UHF voice nets, repeaters, or formal traffic handling. It adds a low-power, infrastructure-independent text channel that keeps working when cell service, internet, or voice repeaters are degraded, and it gives Net Control a second way to see who is reachable.

What this document covers

- Why Cherokee ARES is standardizing on MeshCore and how it differs from Meshtastic (Sections 13.1–13.3).
- What you need, and how to flash and configure your device to the ARES standard (Sections 13.4–13.8).
- Day-to-day operating practices, lessons learned, and how mesh fits into our weekly net (Sections 13.9–13.10).
- A preview of repeaters and coverage, troubleshooting, and open items (Sections 13.11–13.13).
- Appendices: A quick reference card, B private channels (members only, separate document), C ARES member contacts (separate document, updated regularly), D configuring a router, E glossary, and F references and links.

Coming in later revisions

- An advanced guide: manual paths (Out Path routes), repeaters, and room servers.
- More ARES member contact cards (users, repeaters, room servers) added to Appendix C.

13.1 Core Requirement: MeshCore Is the ARES Standard

Core requirement

Cherokee ARES will use MeshCore as its standard mesh solution.

Only devices running MeshCore firmware can interoperate with Cherokee ARES. Meshtastic devices cannot.

MeshCore and Meshtastic are two completely different systems. They use different firmware, routing, and message formats, so a MeshCore radio and a Meshtastic radio sitting side by side cannot hear each other — even though both run on much of the same inexpensive LoRa hardware.

Most popular LoRa boards (Heltec, RAK, LilyGo, Seeed and others) can be loaded with either firmware, but only one at a time. If you already own a Meshtastic device, you can re-flash it with MeshCore (Section 13.5); it will then no longer work on Meshtastic networks until you flash it back.

What this means for you

- To take part in Cherokee ARES mesh operations, your device must be flashed with MeshCore.
- Meshtastic is no longer the ARES standard. Existing Meshtastic nodes will not see ARES traffic and will not be seen by it.
- Our operational channel is the “Cherokee ARES” MeshCore channel (Section 13.7).

Licensing note

In the United States, MeshCore devices operate in the unlicensed 902–928 MHz ISM band as Part 15 devices, so no amateur license is required to carry one. Licensed operators are asked to put their callsign in their device name (Section 13.6), which also keeps our team consistent and recognizable.

13.2 Understanding MeshCore

Before configuring a device, everyone should understand what MeshCore is, how it moves messages, and what it is not. Most of the configuration choices in this document make more sense once you see the model.

13.2.1 LoRa in one paragraph

LoRa (“Long Range”) is a radio modulation that trades data speed for range and battery life. It can pull a usable signal out of noise far below what a conventional narrowband radio could decode, which is why a few hundred milliwatts can cover miles in good conditions. The cost is a very low data rate — think short text messages, not photos or voice.

13.2.2 What is MeshCore?

MeshCore is a free, open-source (MIT licensed) system for secure, text-based communication over LoRa radio. It is promoted for off-grid communication, emergency response and disaster recovery, outdoor activities, and sensor networks. Messages are encrypted, and adverts (a node announcing itself) are cryptographically signed to prevent spoofing.

The most important idea: in MeshCore, the devices in your pocket are not the network. A small number of purpose-placed repeaters carry the traffic.

13.2.3 Device roles

Role	What it does	Who runs it
Companion	Your personal messaging device. Pairs to a phone app (Bluetooth) or computer (USB). Does NOT relay other people’s traffic.	Every ARES member
Repeater	Fixed infrastructure that forwards MeshCore packets toward their destination. It does not blindly rebroadcast everything. Best placed high up.	Designated hosts (Section 13.11)
Room Server	A simple bulletin-board (BBS-like) server that stores message history so people who were offline can catch up later.	Future ARES use
Sensor	Reports sensor data on the mesh.	Not used yet

Important

Companions do not repeat. Do NOT turn on ‘Enable Repeat Mode’ on your personal device. Repeating is a specific job for repeaters; doing it from a companion works against how the network is designed (Section 13.6).

13.2.4 How a message travels

- **Channel messages (group):** are flooded. A channel is ‘one to everyone’, so there is no single destination path. Repeater rebroadcast them, and a repeater administrator can limit how far flooded traffic goes.

- **Direct messages (person to person):** the first message floods to find the destination. The destination returns a delivery report listing the repeaters used, and your device stores that path. Later messages carry the path, so only the matching repeaters retransmit. If a stored path fails, the app retries and can fall back to flooding to learn a new path.
- **Why this matters for ARES:** channels are the simplest and most reliable way to talk. Your device finds its own way through the repeaters without you managing routes. Direct messages and manual paths are covered in the advanced guide.

13.2.5 Adverts

An advert is how a node announces its name, position, and public key. MeshCore companions only advertise when you tell them to, which keeps airtime free. There are two kinds:

- **Zero-hop advert:** heard only by nodes that can receive you directly.
- **Flood advert:** repeated by every repeater that hears it, so it spreads across the mesh.

Repeaters send a flood advert on their own roughly every 12 hours by default. If your position on the map is stale, send an advert yourself (Section 13.9).

13.2.6 Hops and path hash size

Every repeater a packet passes through is recorded in its path as a short ID taken from that repeater's public key. The ID can be 1, 2, or 3 bytes long:

Path hash size	Collision risk	Maximum hops
1-byte (original default)	High — only 254 usable IDs	64
2-byte (ARES standard)	Much lower	32
3-byte	Lowest	21

With 1-byte IDs, two different repeaters in a busy mesh often share the same ID, which makes paths ambiguous. Cherokee ARES uses 2-byte IDs for better reliability. Multi-byte paths require repeaters running firmware 1.14 or newer; older repeaters silently drop 2- and 3-byte packets (see the compatibility note in Section 13.6).

13.2.7 What MeshCore is not

- Not voice — it is text messaging, position, and small data.
- Not high-bandwidth — messages are short.
- Not self-sufficient without repeaters — companions do not relay, so coverage depends on repeater placement.
- Not a replacement for licensed voice nets or ARES message-handling procedures — it is an additional layer.
- Not ATAK-oriented — the MeshCore project states ATAK is not on its roadmap.

13.3 MeshCore vs. Meshtastic

Both systems run on the same kinds of radios, and both are good tools. They were built with different philosophies. The comparison below reflects the official MeshCore documentation and published reports from community networks such as Austin Mesh, which has operated both.

Topic	Meshtastic	MeshCore
Who relays	Almost every node (default Client role rebroadcasts).	Only repeaters (and room servers with repeat enabled). Companions do not.
Channel routing	Managed flooding.	Flooding, with repeater-side limits available.
Direct message routing	Flood to discover, then next-hop routing (v2.6+).	Flood once to learn a path, then use the stored path; flood as fallback.
Hop limit	Default 3, max 7.	Up to 64 (1-byte), 32 (2-byte), 21 (3-byte).
Background traffic	Periodic node info and telemetry (reduced in recent versions).	Minimal. Companion adverts are manual; telemetry is pulled on request.
US radio settings	LongFast: 250 kHz, SF11 (default).	USA/Canada: 910.525 MHz, 62.5 kHz, SF7, CR5.
Planning needed	Little. Self-organizing.	Yes — repeaters must be sited.
Offline catch-up	No built-in equivalent.	Room servers store and forward messages.
Best fit	Roaming groups, ad-hoc and highly mobile use, rich telemetry.	Repeater-backed, county/region-scale messaging.
Interoperability	Cannot talk to MeshCore.	Cannot talk to Meshtastic.

Why this suits Cherokee ARES

- Less airtime wasted — only repeaters rebroadcast, and companions stay quiet, leaving more capacity for real messages.
- More headroom — a far higher hop limit helps across rolling terrain where many repeats are needed.
- Predictable infrastructure — coverage is built from known, tracked repeaters instead of whatever nodes happen to be nearby.
- Store-and-forward option — room servers can hold messages for members who were out of range or powered off.
- Visibility and tuning — learned paths can be viewed and tested with tools such as Ping and Trace Path.
- Community reports describe noticeably more responsive delivery with MeshCore's narrower, faster radio settings.

Honest trade-offs

- Repeater are required. Without them, coverage is limited to what companions can reach directly, and siting repeaters takes coordination.

- Companions do not extend the network, so a group moving together in a dead zone gets no help from each other's radios.
- Highly mobile, ad-hoc groups can find Meshtastic's 'every node helps' model more forgiving.
- The ecosystem is newer and moving fast. Guidance on settings such as region scope and path hash size is still evolving, which is one reason this document is a draft.
- The main phone app is free for core messaging, with an optional paid unlock for some advanced features such as remote repeater administration without a wait timer.
- Existing Meshtastic equipment must be re-flashed, and Meshtastic-only users cannot join ARES traffic.

13.4 What You Need

Hardware

You need a LoRa device that supports MeshCore. For the United States, buy the 915 MHz variant of whatever board you choose. The project lists these among the supported families, with more added regularly:

- LilyGo T-Deck, T-Deck Plus, T-Pager (standalone, no phone required)
- RAK Wireless WisBlock RAK4631 kits
- Heltec V3, V4, and T114
- Seeed Studio SenseCAP T1000-E and Wio Tracker L1
- Station G2, Seeed XIAO-based boards, and others

For an up-to-date list, check the flasher site (Appendix F). Prefer a device with a good external antenna connection and, for personal use, a battery that lasts the whole day.

Hardware tip

Some boards (for example the Heltec V3) have a very small onboard Bluetooth antenna with limited range, so the phone can drop the connection. Keep the phone close, or choose a board with better Bluetooth performance.

Firmware choice: which one do I flash?

Firmware	Use it for	ARES guidance
Companion — Bluetooth (BLE)	A personal messaging device paired to the MeshCore iOS/Android app.	Standard for most members.
Companion — USB Serial	A device connected to a computer running the web app.	Optional.
Repeater	Fixed infrastructure that forwards traffic.	Designated hosts only (13.11).
Room Server	Message storage for offline members.	Future use.

If you have one device, flash BLE Companion firmware and use it as your client. If you have two, you can run one as a companion and later use the other as a repeater in a window or attic.

Apps and tools

- MeshCore mobile app (iOS/Android) — the main interface. Windows and Mac versions are also available.
- MeshCore web app and Flasher — for flashing and configuring from a computer (Google Chrome required).
- A USB data cable (not a charge-only cable).

One of W1JKU's favorite apps: Cairn

A free iPhone/iPad companion app for MeshCore with more functionality than the standard app, including **Apple CarPlay** hands-free messaging with Siri, a mesh map with offline regions, Trace Path, Line of Sight, and repeater login with a remote CLI.

It needs iOS/iPadOS 18+ and is in beta on TestFlight. Details: cvhvisuals.com/cairn.html. Confirm features in the app; it does not replace the Section 13.6 settings.



Cairn dashboard (cvhvisuals.com)

13.5 Step 1: Flash Your Device

Before you start

Use Google Chrome on a laptop or desktop. The browser needs USB serial access to flash your radio. If this device was previously on Meshtastic, flashing MeshCore replaces it.

1. Connect your device to your computer with a USB data cable.
2. Open the MeshCore Flasher in Chrome: meshcore.io/flasher (or directly at flasher.meshcore.io).
3. Select your device model from the list.
4. Choose Companion Bluetooth firmware and the latest stable version.
5. Follow the prompts. nRF-based devices (RAK, T114, T1000-E, XIAO) may ask you to enter DFU mode first; ESP32 devices such as Heltec V3 usually flash directly.
6. Click Flash and wait for it to finish. Do not unplug the device.
7. When flashing completes, the same site shows a Launch App button. Clicking it lets your browser connect to the device so you can finish configuring it.

Finish configuration: your options

- **Web:** use the Launch App button, or go directly to app.meshcore.nz.
- **Mobile app (optional):** pair your phone to the device over Bluetooth and do the same configuration there. The default Bluetooth pairing PIN is 123456.
- Either way, apply the Cherokee ARES settings in Section 13.6.

Re-flashing later? Read this first

If you ever re-flash your device, you must delete (forget) the Bluetooth pairing for it on your phone or laptop before reconnecting. The pairing settings change when the device is re-flashed, and the old pairing will not work.

Before re-flashing, use Extra Tools → Export Config in the app so you can re-import your configuration afterward (Section 13.6).

13.6 Step 2: Configure to the ARES Standard

These are the Cherokee ARES settings. Apply them in the MeshCore app (mobile or web) after flashing. Menu names can differ slightly between app versions; if a label does not match exactly, look for the closest one in the same settings screen.

Identity & Public Information

Setting	ARES standard	Why
Name	Callsign-xx, a space, then your first name (up to 25 characters). Example: W1JKU-01 Rob	Consistent names across teams. Use xx to number multiple devices.
Latitude / Longitude	Populated	Lets Net Control and others see where you are.
Share Position in Advert	Checked	When you advert, your position is sent.

Radio

Setting	ARES standard	Notes
Preset / Region	Canada, USA (Recommended)	Official US/Canada preset.
Frequency	910.525 MHz	Part of the preset.
Bandwidth	62.5 kHz	Narrow setting fits between ISM-band interference.
Spreading Factor	7	Part of the preset.
Coding Rate	5	Part of the preset.
Transmit Power	22–30 dBm	Never exceed your device's rated maximum (see warning below).

Transmit power warning

Transmit power is device-dependent. Amplified boards (such as the Station G2, Heltec V4, and Ikoka E22-900M30S/M33S sticks) use different in-app values than their output ratings, and incorrect settings can permanently damage the radio. Check the MeshCore FAQ power table (Appendix F) before raising power on one of these devices.

Network

Setting	ARES standard	Notes
Default Path Hash Size	2-byte (max 32 hops)	Strongly discouraged: 1-byte. Use 3-byte only for airborne meshes.
Default Region Scope	Leave empty	See note below.

Why 2-byte, and what it requires

1-byte path IDs leave only 254 usable values, so repeaters in a busy mesh collide and, in our experience, the mesh is less stable. 2-byte IDs avoid most of that at the cost of fewer maximum hops (32, still plenty for our county).

Compatibility: repeaters on firmware older than 1.14 silently drop 2- and 3-byte packets, and the MeshCore project advises moving off 1-byte only once most regional repeaters are on 1.14 or newer. Cherokee ARES uses 2-byte because it is working very reliably in our area. If you cannot reach a repeater that others can, ask whether it needs a firmware update.

Region scope: online guidance is conflicting, and if set incorrectly, some repeaters in our area will block your traffic. Leave the default empty until we have hard data. This is subject to change.

Contacts

Setting	ARES standard	Notes
Auto Add Contacts	Enabled	Optional but suggested.
Show Public Keys	Enabled	
Pull to Refresh	Enabled	Optional but suggested.

Messages

Setting	ARES standard	Notes
Auto Retry	Enabled	
Auto Reset Path	Do NOT enable	
Direct Message Acks	2	Helps ensure the calling station receives your acknowledgement.
Mark Delivered Faster	Enabled	

Notifications

Enable: Contact Messages, Channel Messages, Room Messages, New Messages while Disconnected, and Contacts Full. Disable: When a new contact is discovered. Channel-level notification settings are covered in Section 13.7 so your phone does not go off all day.

Position & Telemetry

Setting	ARES standard	Notes
GPS Mode	Enabled	
Allow Telemetry Requests	Yes	It helps to know what each member is experiencing.
Include Location in Telemetry	Yes	
Include Environment in Telemetry	Yes	

Experimental

Enable Faster Channel Syncing (iOS BLE State Restoration). Path hash size may also appear here, labeled Hop Bytes. [Confirm exact labels by app version.]

Do NOT select 'Enable Repeat Mode'

Leave Repeat Mode off under Settings. Your personal device is a companion; only designated repeaters relay traffic.

Save your work: export your configuration

Once your device works, go to Extra Tools and choose Export Config (also shown as Export Settings). Keep the file so you can re-import it after a re-flash, factory reset, or corruption.

13.7 Step 3: Channels

Why we use Channels

By using Channels to communicate, your mesh device will attempt to find the best path to get to the recipient without you having to manually find a good path through either direct messages or various repeaters. This is the most reliable method. We will cover setting paths in an advanced document later; for now, we are keeping this simple and low-stress.

In the app, each channel shows its name with three dots on the right. Tap them to adjust that channel's settings.

Channels at a glance

Channel	Who may use it	Intended use
Public	Anyone	General public traffic. Treat everything as visible to anyone.
#wx4car-chokeee	Open to the public	Amateur radio discussions and activities in Cherokee County and the surrounding area.
Cherokee ARES	ARES members only (private)	ARES nets and team traffic. Key not published on the website.

Channels vs. Direct Messages: our go-to method

MeshCore lets you talk two ways: on a Channel, or by Direct message to one person. For Cherokee ARES we rely on Channels. The next two pictures show why.

A channel message floods the mesh

When you send on a channel, you do not choose a route and you do not need to know where anyone is. Your radio sends the message once. Every repeater that hears it rebroadcasts it, and each repeater only sends a given message once, so duplicates die out. The message spreads across the mesh until everyone on the channel who is in reach of a repeater has received it.

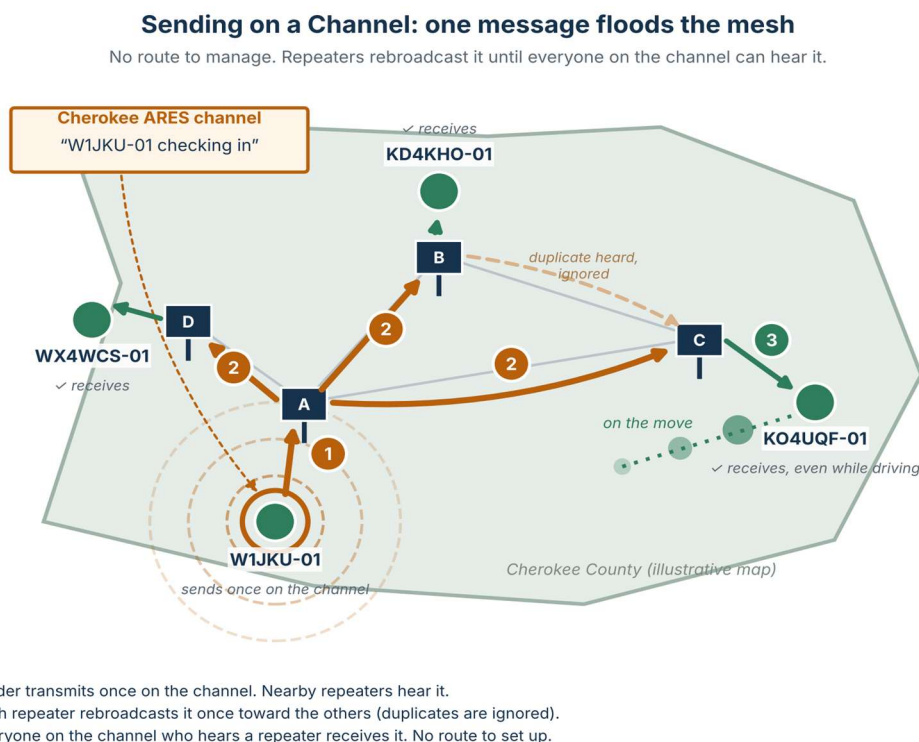


Figure 13-1. W1JKU-01 sends once on the channel. KD4KHO-01, WX4WCS-01 and KO4UQF-01 all receive it, including KO4UQF-01 while driving. Positions are illustrative.

- **No path to manage.** The repeaters find their own way. Nobody has to learn or fix a route.
- **Works while moving.** A sender or a recipient driving through the county does not break anything, because there is no route to go stale.
- **One message reaches everyone.** That is what a net check-in needs: one post, and every member on the channel sees it.
- **The trade-off.** A flood uses airtime across the mesh, and a channel message does not report back whether each person received it. Keep messages short and to the point, and use the net procedure (Section 13.10) to confirm traffic.

A direct message follows a stored route

A direct message goes to one person. The first message floods to find them, and the delivery report tells your device which repeaters were used. Your device stores that route, and later messages carry it, so only those

repeaters retransmit. This can be efficient and gives per-message delivery status, but it depends on the route staying valid.

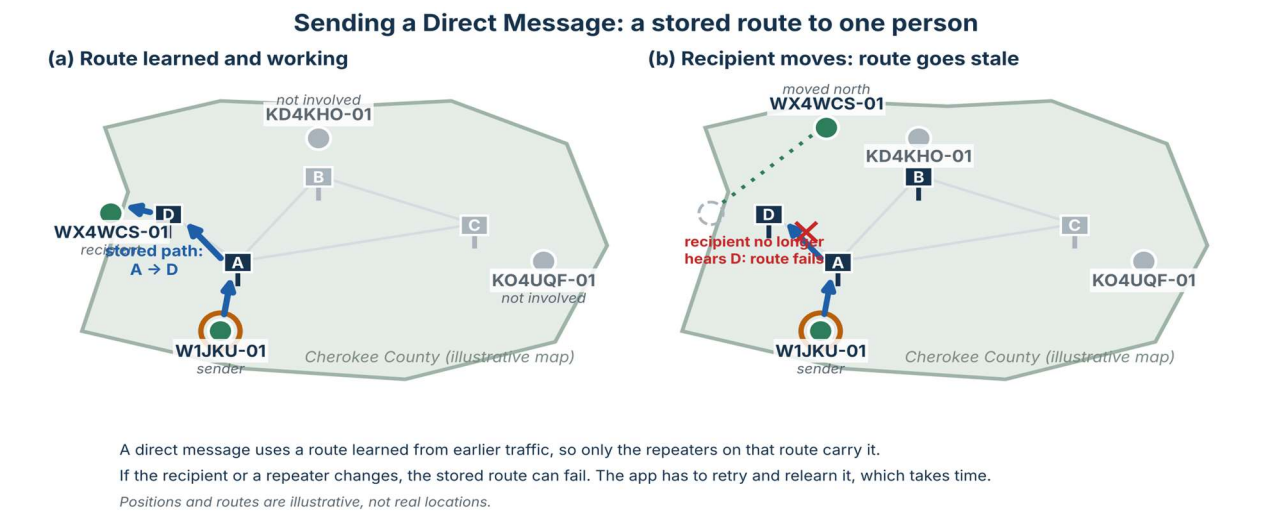


Figure 13-2. (a) W1JKU-01 reaches WX4WCS-01 over the stored route A to D. (b) WX4WCS-01 moves, so the stored route no longer reaches them. Positions are illustrative.

If the recipient moves, or a repeater on the route drops out, the stored route can fail. The app then retries and can fall back to flooding to learn a new route, which costs time and airtime. When sender or recipient is moving, that is a poor fit.

	Channel	Direct message
Who gets it	Everyone on the channel	One person
Route	None to manage. Flooded.	Learned, stored, and managed by your device
Moving stations	Works well	Route can go stale
Confirmation	No per-message delivery report	Delivery status per message
Best for	Check-ins, nets, team traffic	Close, controlled operations

Cherokee ARES rule: Channels first

For Cherokee ARES we will rely on Channels, not Direct messages, for day-to-day and net traffic.

Direct messages have a place and a purpose. Use them when we are operating in controlled proximity, such as Field Day, the GA Death Race, and the GA Jewel, where you can manage the routes. Managing routes is more complex, and it is covered in the advanced guide.

Public channel (leave it, but adjust)

- Keep the Public channel, then open Channel Settings.
- **Notifications: None** (otherwise your phone will go off day and night).
- **Message Retention: 3 days** (there is a lot of traffic).

Public uses a well-known default key, so treat anything posted there as visible to anyone.

WX4CAR-Cherokee County ARES channel (public)

This public channel is open to everyone. It is intended for amateur radio discussions and activities in Cherokee County and the surrounding area. Any club member, and any licensed amateur, may use it. It is not private, so do not post anything you would not say on the air, and use the Cherokee ARES private channel for ARES operational traffic.

#wx4car-cherokee is a hashtag channel: its name starts with #, and the key is calculated from the name, so there is no separate key to type. You can add it either way:

1. **Scan the QR code** below: Menu → Add Channel → Scan QR Code. The channel name fills in for you.
2. **Enter it by hand.** Menu → Add Channel, and for the channel name enter **#wx4car-cherokee** (including the #). Screens may differ slightly by app version.

Item	Value
Channel name	#wx4car-cherokee
Channel type	Hashtag channel (open to the public)
Use	Amateur radio discussions and activities, Cherokee County and surrounding area



#wx4car-cherokee

Cherokee ARES private channel (members only)

The Cherokee ARES channel is private and is for ARES members. Its QR code and security key are not found on our website. They are communicated directly to members through one of our non-public methods, such as the ARES Groups.io group, and are kept in Appendix B, a separate document that is never posted publicly. Other club members should use the public channels above.

- Add the channel named Cherokee ARES by scanning the QR code in Appendix B, or enter the Security Key (hex) manually.
- **Notifications: All.**
- **Message Retention: 7 days.**

Item	Value
Channel name	Cherokee ARES
QR code and security key	Appendix B (members only). Not published on the website.

Personal channels

You can create your own channels and share them with others. A channel is defined by its name and security key, so only share the key with the people you want in the conversation.

13.8 Step 4: Contacts

Cherokee ARES member contact cards (QR code, callsign, name and public key) are in Appendix C, a separate document that is updated regularly. Only ARES members are recorded there, because they are given access to the Cherokee ARES private channel. Scan a card's QR code in the MeshCore app (or paste the public key) to add that member as a contact.

Category	What it is
Users	Clients you can send messages to.
Repeaters	Repeaters you can use to route a message to another client.
Room Servers	To be expanded when we support them.
Favorites	Contacts you marked as favorites (users, repeaters, room servers, etc.), available through that filter.

Make key contacts Favorites

Open a contact's details and tap the favorite icon. If your device fills up with contacts, favorites are not deleted. Do this for the key ARES contacts and repeaters.

13.9 Operating Practices & Lessons Learned

Living list

This section will grow as we learn. Send lessons learned to ARES leadership so they can be added.

Day-to-day practices

1. **Use channels, not direct messages, for day-to-day traffic.** Direct messaging makes you manage the Out Path (route). That can help in certain deployments, but channels are far more reliable and easier.
2. **Use channels if you carry more than one device.** Others may direct-message a node you are not carrying. Channels reach you whichever device you are using.
3. **Ping (Zero Hop) tests direct reach.** It shows whether you can reach a specific repeater or contact directly — similar to a simplex test.
4. **Trace Path checks a route.** Use it to see whether a manually configured Out Path actually reaches the destination.
5. **Do not enable Repeat Mode** on your personal device.
6. **Send adverts manually.** MeshCore does not automatically send your location to the MeshCore map as you move; it requires a manual advert to limit congestion. If the map shows you in the wrong place, send an advert.
7. **Re-flashing resets the Bluetooth link.** Delete the device's Bluetooth pairing on your phone or laptop before reconnecting.
8. **Inside a building, you may need a repeater.** From a home or other building, install MeshCore repeater firmware on a spare device and place it near a window or the highest point so it can repeat to your other device in an interior room or basement. (More in the advanced document.)

Adding yourself to the MeshCore map

1. Tap the MAP button.
2. Tap Internet Map.
3. Tap the three dots, then choose Add me to the Map.

Map site: see Appendix F.

13.10 Weekly Net Integration

Cherokee ARES will incorporate the Cherokee ARES channel into our weekly nets. The following is a proposed procedure for members with a MeshCore device. [Draft — to be refined together, including how it fits the Monday 19:30 Pre-Net check-in.]

Proposed procedure

1. Before the net, confirm your companion is connected and Cherokee ARES channel notifications are set to All.
2. If you have moved or your map position is stale, send a manual advert.
3. During the check-in window, post on the Cherokee ARES channel: your callsign, “checking in,” and your area. Example: “W1JKU checking in, Woodstock.”
4. Net Control (or a mesh liaison) monitors the channel alongside the voice net and logs mesh check-ins.
5. If you cannot reach the voice net but can reach MeshCore, check in on MeshCore anyway — that is exactly what it is for.
6. Keep the channel clear for operational traffic. Move routine chatter elsewhere.

Precedence

Mesh check-in supplements the voice net; it does not replace it for members who can reach us by voice. Emergency and priority traffic always takes precedence.

Channel messages are either received when sent or missed if you are out of range, so no reply does not always mean not received. Net Control may acknowledge on the channel.

13.11 Coverage & Repeaters (Preview)

Because companions do not relay traffic, our county coverage is built from repeaters. A repeater placed high — a roof, mast, tower, or tall pole above the tree line — does more for the whole team than any amount of handheld range. The advanced document will cover repeaters in detail; this is the preview.

What repeaters do

- Forward MeshCore packets toward their destination (they do not blindly rebroadcast everything).
- Send their own flood advert about every 12 hours by default.
- Can be administered over USB, through the web config tool, or remotely from a companion app.

If you host or build a repeater

- Run repeater firmware 1.14 or newer so it forwards 2-byte traffic (Section 13.6).
- **Change the default passwords.** The default admin password is “password” (and “hello” for a room server guest). Change both immediately.
- Set the frequency for our region and the repeater’s latitude and longitude so it can appear on the map.
- Choose a public key whose first byte is not already in use nearby, to reduce path ID collisions.
- Register it with ARES leadership so it can be listed under Repeaters in the member contact cards (Appendix C).
- Run repeater and room server on separate devices.
- Step-by-step router setup, settings, and a checklist are in Appendix D.

Call for repeater hosts

[Proposed] Cherokee ARES is looking for members with elevated, powered, secure locations willing to host a repeater. Good sites have wide line of sight, reliable power, weatherproof mounting, and spacing that overlaps neighbors without stacking nodes on the same ridge. Contact ARES leadership if you can help.

13.12 Troubleshooting

Symptom	Likely cause / fix
Cannot reconnect after re-flashing	Delete the Bluetooth pairing for the device on your phone or laptop, then pair again. Default PIN is 123456.
Device does not appear over Bluetooth	You may have flashed USB-only companion firmware. Re-flash Companion Bluetooth (BLE).
Bluetooth keeps dropping (e.g. Heltec V3)	The onboard Bluetooth antenna has very short range. Keep the phone close, or use a device with better Bluetooth.
Contacts show “last seen” many days ago	Usually a clock problem. A client or repeater with the wrong time causes this. Fix the time on the device.
My position is wrong on the map	Send a manual advert. Confirm Share Position in Advert is checked and GPS is enabled.
I do not see ARES traffic	Confirm the Cherokee ARES channel key matches exactly, notifications are on, and radio settings (910.525 MHz, 62.5 kHz, SF7, CR5) are correct.
Messages not getting through	Run Ping (Zero Hop) and Trace Path. Confirm 2-byte hash and that nearby repeaters are on firmware 1.14 or newer. Move toward a window or higher ground.
Phone buzzing constantly	Set Public channel notifications to None and retention to 3 days.
Device acting corrupted	Export settings, Factory Reset, remove the Bluetooth pairing, reconnect, then import your settings.

13.13 Open Items & Next Revisions

The following items are still open and will be filled in as we go:

Item	Status
Cherokee ARES private channel QR code and security key (Appendix B, members only)	[Done]
Add remaining ARES member contact cards to Appendix C	[In progress]
Confirm exact app labels (Faster Channel Syncing, Hop Bytes / Path Hash Size) by app version	[To verify]
Transmit power guidance by device model	[To refine]
Region scope guidance once we have hard data	[Watching]
Advanced guide: Out Paths, repeaters, room servers	[Planned]
Repeater siting plan and host list for the county	[Planned]
Appendix D router guide: confirm telemetry labels and regional names, add lessons learned	[To verify]
Weekly net procedure refinement	[Planned]

Appendix A Quick Reference Card

Print or screenshot this page and keep it with your go-kit.

Item	Value
Firmware	MeshCore — Companion Bluetooth (BLE)
Name format	Callsign-xx First Name (up to 25 chars). Example: W1JKU-01 Rob
Radio	Canada, USA — 910.525 MHz, 62.5 kHz, SF 7, CR 5
Transmit power	22–30 dBm (never above device rating)
Path hash size	2-byte (max 32 hops)
Region scope (default)	Leave empty
Repeat Mode	OFF — never enable on a personal device
Auto Retry / Auto Reset Path	Enabled / NOT enabled
Direct Message Acks	2
Share Position in Advert	Checked; GPS enabled
Public channel	Notifications None; retention 3 days
#wx4car-cherokee (public)	Hashtag channel; enter the name with the #
Cherokee ARES (private)	Notifications All; retention 7 days; key in Appendix B
Bluetooth PIN (default)	123456
After re-flash	Delete Bluetooth pairing, then reconnect
Stale map position	Send a manual advert
Back up	Extra Tools → Export Config

Appendix B Private Channels (Members Only)

PLACEHOLDER PAGE

Replace this page with the live Appendix B

Appendix B is managed outside this document for security reasons.

It holds the Cherokee ARES private channel QR code and security key, and is shared only with ARES members through non-public methods, such as the ARES Groups.io group.

Do not paste the live Appendix B into any copy of this document that will be posted on a website.

How to complete this document:

1. Delete this page.
2. In Word, place the cursor where this page was and choose Insert → Object → Text from File.
3. Select the current stand-alone Appendix B file.

Appendix C ARES Member Contacts

PLACEHOLDER PAGE

Replace this page with the live Appendix C

Appendix C is a stand-alone document because it is updated regularly.

It lists the ARES members with their callsign, name, public key, and QR code. Check the “last updated” date on the stand-alone copy so you have the latest.

How to complete this document:

1. Delete this page.
2. In Word, place the cursor where this page was and choose Insert → Object → Text from File.
3. Select the current stand-alone Appendix C file.

Appendix D Configuring a MeshCore Router (Repeater)

This appendix is for members who want to install a MeshCore router at home, at work, or on key terrain near them. In this document a **router** means a MeshCore node running **repeater** firmware. It is a different device type from a companion (client), room server or sensor, and it shows up that way in the MeshCore app. [Draft — to be refined with lessons learned from our first ARES routers.]

D.1 Why Install a Router?

A companion is a personal device. It sends and receives, but it does not relay anyone else's traffic. Adding more companions never extends coverage. Coverage comes from routers, and a router is also the fix for a companion that cannot get on the air by itself.

The indoor companion problem

- A companion on a desk, in a basement, or in an interior room is low, shielded by walls, roofing, metal, and foil-faced or low-e materials, and often has a poor antenna.
- At these frequencies that is often enough to hear no other mesh node at all, even when a repeater is only a few miles away.
- A router mounted high, outdoors or in an attic, with a good antenna and a short feed line, hears much farther. Your companion only has to reach that router, which can be a short, easy link. The router does the hard work of reaching the rest of the mesh.

Where a router helps most

- **Home:** puts your own companions on the air from any room, and gives you a reliable personal node for nets.
- **Work or a hosted site:** with the owner's permission, a building, tower, or tall structure gives the height a home often lacks.
- **Key terrain:** a ridge, hilltop, tall pole above the tree line, or tower. One well-placed router can connect whole neighborhoods, and it serves every ARES member and every other mesh user in its area, not only its owner.
- **Resilience and remote management:** a router on battery or solar keeps relaying when the grid is down, and it can be administered from your companion without a ladder.

D.2 How Your Router Connects You to the Mesh

1. **Phone to companion.** Your phone talks to your companion over Bluetooth. The companion is the device that transmits on LoRa.
2. **Companion to your router.** The companion sends on the same radio settings (Section 13.6). Your router, mounted high, hears it directly and becomes the companion's first hop.
3. **Your router to a neighbor router.** Your router forwards the traffic to a router it can hear directly. That link is what joins you to the mesh.
4. **Router to router to the team.** Routers relay hop by hop toward the destination, so your messages and adverts reach ARES members who could never hear your companion.

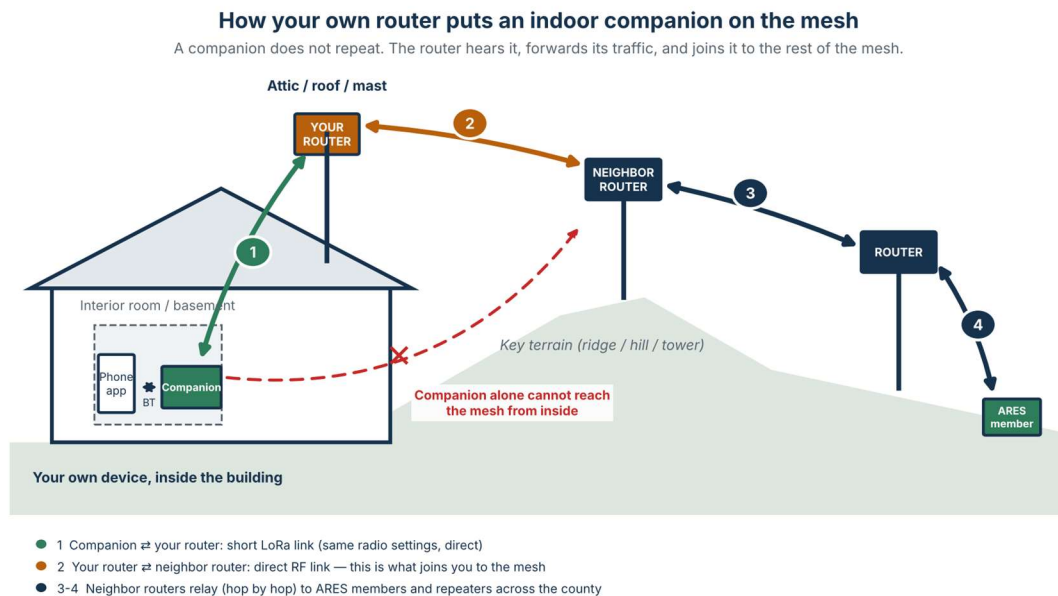


Figure D-1. An indoor companion reaches the mesh through the owner's own router. The router must also have a direct radio link to another router.

Your router must have direct access to another router

A repeater can only forward what it hears directly. If your router cannot hear any other router, it is an island: it can serve your own companion, but it connects you to nothing, and it adds nothing to the mesh for anyone else.

Before you mount it permanently, test the site with a temporary setup. After you are on the air, use the Neighbors list (Section D.4) to confirm that your router hears at least one other router directly. Hearing two or more is better, because it gives your traffic more than one way out and keeps you connected if a neighbor goes down.

Choose a site that overlaps neighbors rather than stacking on the same ridge, and tell ARES leadership where it is (Section 13.11).

D.3 Before You Start

- **Flash repeater firmware, not companion firmware.** Use the MeshCore flasher (Section 13.5) and choose the Repeater image for your board. Use firmware 1.14 or newer so the router forwards our 2-byte path hash traffic (Section 13.6). Keep it on its own device, separate from your companion.
- **Connect an antenna before powering up or transmitting.** Transmitting without one can damage the radio.
- **Plan power, weatherproofing, and feed line.** Keep the cable short and low-loss, and protect the connection from water. Work safely at height, with a helper, away from power lines, and not in or near storms.
- **Know your tools.** You can configure a router over USB with the MeshCore config tool (config.meshcore.io, in Chrome), or remotely from the repeater management screens in the MeshCore app. CLI commands come from the MeshCore CLI reference (Appendix F); menu wording varies by version.

D.4 Router Configuration Settings

Apply every setting below, then set the clock and finish in Section D.6. Command names are from the MeshCore CLI reference for firmware 1.14+; use `ver` to check yours.

Setting	ARES value	CLI command / notes
Router name	Key terrain or a landmark, neighborhood, or mountain others will recognize. Do not add “Router.”	<code>set name <name></code>
Radio (USA/Canada)	910.525 MHz, bandwidth 62.5 kHz, spreading factor 7, coding rate 5	<code>set radio 910.525,62.5,7,5</code>
Path hash size	2 bytes (ARES standard, Section 13.6)	<code>set path.hash.mode 2</code>
Owner info	Your email address	<code>set owner.info <email></code>
Auto advert, zero hop (direct)	60 minutes (the minimum)	<code>set advert.interval 60</code>
Auto advert, flood	3 hours (the minimum)	<code>set flood.advert.interval 3</code>
Position	Enter latitude and longitude by hand. No GPS needed.	<code>set lat <lat> set lon <lon></code>
Admin password	Your own. Never leave the default.	<code>password <new-password></code>
Guest password	Leave at the default	<code>set guest.password</code> (blank by default)
Access control	Add the public key of each of your companions	Config tool or app. Lets you administer the router remotely.
Regions	Leave the default wildcard (*) alone. See Section D.5.	<code>region</code>
Repeat mode	ON	<code>set repeat on</code>
Telemetry	Enable all three	Base, Location, Environment (see below).

Radio settings and the path hash size take effect after a reboot (Section D.6).

Why each setting matters

- **Name.** Name it for something others will know: a neighborhood, a mountain, or the vicinity of a landmark. Other members who see it in their contacts can recognize it and decide to use it. Leave “Router” out of the name. The router is already a different device type from a client or room server, so the word is redundant and wastes limited name space (up to 23 bytes when location is included, 31 without).
- **Radio.** These are the USA/Canada defaults, and they must match the rest of the ARES mesh exactly or your router will not hear anyone.
- **Owner info.** Add your email. If someone has a question or sees a problem with your router, this is how they reach you.

- **Advert intervals.** An advert announces your router to others. A zero-hop advert is heard only by nodes that receive you directly, and refreshes every 60 minutes. A flood advert is repeated across the mesh, and refreshes every 3 hours. These are the shortest intervals the firmware allows (zero hop 60 to 240 minutes; flood 3 to 168 hours; flood default 12 hours).
- **Position.** A router does not move, so enter its latitude and longitude once. Skip GPS and save the power. You can power the GPS on occasionally to help set the time.
- **Access control.** Add the public key from your companion (and from any other companion you want to administer from) so you can change settings from the ground, without a ladder or roof. Logging in once with the admin password also adds that companion to the administrator list.
- **Admin password.** The default admin password is “password.” Choose one you will remember. A router with the default password can be reconfigured by anyone who finds it.
- **Guest password.** Leave this at the default. It lets others view non-sensitive information, including which routers yours hears directly, which helps everyone understand what your router is doing for the mesh.
- **Neighbors.** The neighbors command, or the Neighbors option in the app, shows the routers yours hears directly (from zero-hop adverts, most recent eight). It is the best check that your router is actually joined to the mesh.
- **Repeat mode: ON.** A router with repeat mode off does not forward anyone’s traffic. It can still be reached and administered, but it is not working as a repeater, and the mesh gets nothing from it. It must be on.
- **Telemetry: enable all three.** Base, Location and Environment. These let others see non-sensitive information from your router, see how well it works from their location, and discover it in real time by checking the path from their client or companion.

Note — screens may differ

The user interface may look slightly different from device to device and from firmware to firmware. Labels and menu locations can vary, so look for the closest match.

D.5 Regions: Why They Matter

MeshCore regions let a sender scope a flooded message to an area, and let each repeater decide which scoped traffic it will forward.

- **Unscoped traffic is unaffected.** Messages sent with no scope, the legacy default, flood everywhere and ignore regions. Adding regions to your router will not cut anyone off.
- **Scoped traffic is forwarded only when the router has that region.** On firmware 1.10 and newer, if a message is scoped to a region your router does not carry, your router will not forward it.
- **Matching is exact.** Each region name is matched on its own. A repeater with us-ga does not forward traffic scoped to us-ga-atl. A misspelling is a different region.
- **What goes wrong.** If a client later sets a region scope that your router does not carry, its flooded messages will stop at your router. Your client or router can then fail to reach other routers on the mesh, even though everything looks fine on the radio. Do not add regions you do not intend to relay, and never block the wildcard (do not use region denyf *).
- **Companions are only tagged on send.** A companion's scope limits only what it sends, not what it receives. Today the ARES standard leaves region scope empty on clients (Section 13.6).

What to do now

Leave the current default alone. Viewed from the command line it reflects *. Do not change or delete it. Add other regions only as described below.

Regions to consider adding as routing rules tighten

As the mesh adds routing restrictions, these regions may be needed. Cherokee ARES suggests the following names:

Region	Covers
us	Entire United States
us-southeast	Southeastern United States
us-se	Southeast (short form)
us-ga	Georgia
us-ga-atl	Georgia, Atlanta area
atl	Atlanta (short form)

Check names before adding

Names must match what the rest of the mesh uses, exactly. A community naming proposal for U.S. nodes uses forms such as us, us-southeast, us-ga, and an airport-code tag such as us-atl for the Atlanta metro. [Confirm which names the north Georgia mesh has adopted before adding any, and update this table.]

To add one: region put <name>. On firmware older than 1.15, follow it with region allowf <name>. Then region save. Check the list with region; each entry that floods shows F.

D.6 Setting the Time, Finishing, and Verifying

Set the clock first

Adverts carry a timestamp, so a wrong clock can confuse other nodes: contacts may show as last seen many days ago (Section 13.12), and adverts that look older than ones already received may be ignored. Many boards lose the time on power loss, so recheck after any outage.

1. Check the time. Run `clock`. It shows the time in UTC.
2. If your app offers a clock sync or set-time option for the router, use it.
3. Otherwise set it from the CLI with `time <epoch_seconds>`, using the current Unix time in seconds (always UTC).

Where	How to get the current epoch seconds
Mac or Linux terminal	<code>date -u +%s</code>
Windows PowerShell	<code>[DateTimeOffset]::UtcNow.ToUnixTimeSeconds()</code>

Run `clock` afterward to confirm. A few seconds of difference is fine. (The clock sync command works only on some devices, such as the T-Deck.)

Finish: advert, reboot, advert

With every setting and the clock done, now announce the router.

1. Confirm all of the settings in Section D.4 and the clock are applied.
2. **Send an advert** so the new settings are announced. In the CLI, `advert` sends a flood advert.
3. **Reboot the router.** The `reboot` command gives no reply. Wait for it to come back.
4. **Send another advert.** You want your router on the map, and nearby routers and clients to know you are on the air.
5. **Be patient.** It can take a while to show up. If it has not appeared within a few hours, send another advert by hand, then troubleshoot. The router will only try on its own every 3 hours.
6. **Check from your companion.** Look for the router in your contacts, run Trace Path and Ping, and review Neighbors on the router.

Router Checklist

☐ Repeater firmware 1.14+; antenna on	☐ Companion key(s) in access control
☐ Name set for key terrain (no “Router” in it)	☐ Regions: default * left alone
☐ Radio and 2-byte path hash set	☐ Repeat mode ON; telemetry (all three) ON
☐ Owner info has your email	☐ Clock set (clock shows correct UTC)
☐ Adverts: zero hop 60 minutes, flood 3 hours	☐ Advert, reboot, advert done
☐ Latitude and longitude entered	☐ Neighbors shows another router

☐ Admin password changed☐ ARES leadership told the location

Appendix E Glossary

Term	Meaning
LoRa	“Long Range” radio modulation; trades speed for range and battery life.
MeshCore	Open-source firmware and protocol for repeater-based LoRa messaging.
Companion	Personal MeshCore device paired to an app. Does not relay.
Repeater	Infrastructure node that forwards packets.
Room Server	Store-and-forward message server for offline members.
Advert	A node announcing its name, position, and public key.
Zero hop	Heard only by nodes that can receive you directly.
Flood	Repeated by all repeaters that hear it.
Path / Out Path	The list of repeaters a message uses to reach a contact.
Path hash size	Bytes used to identify each repeater in a path (1, 2, or 3).
Region scope	A setting repeaters use to limit where flooded traffic goes.
BW / SF / CR	Bandwidth, spreading factor, coding rate: LoRa radio settings.
Channel	Group conversation defined by a name and security key.
Favorite	A contact protected from automatic deletion.
Router	A MeshCore node running repeater firmware; forwards other nodes’ traffic. Also called a repeater.
Hashtag channel	A channel whose name starts with # (for example #wx4car-cherokee). Its key is calculated from the name, so anyone who knows the name can join. It is open, not private.
Neighbors	The routers a repeater hears directly, from zero-hop adverts.
Companion BLE	Companion firmware that pairs to a phone over Bluetooth.

Appendix F References & Links

Resource	Link
MeshCore main site	https://meshcore.io
Firmware Flasher	https://meshcore.io/flasher (also flasher.meshcore.io)
Web app / configuration	https://app.meshcore.nz
Repeater & room server config	https://config.meshcore.io
Official documentation & FAQ	https://docs.meshcore.io/faq/
Repeater / room server CLI	https://docs.meshcore.io/cli_commands/
Region filtering (MeshCore blog)	https://blog.meshcore.io/2026/01/20/region-filtering
U.S. regional settings (community)	https://areyoumeshingwith.us/docs/meshcore/regional-settings/
Radio presets	https://docs.meshcore.io/radio_presets/
MeshCore map	https://map.meshcore.io
Firmware source (GitHub)	https://github.com/meshcore-dev/MeshCore
Windows / Mac / Android apps	https://files.liamcottle.net/MeshCore
Cairn (iPhone/iPad MeshCore app, beta; a W1JKU favorite)	https://www.cvhvisuals.com/cairn.html
Community project list	https://github.com/samuk/awesome-meshcore
MeshCore vs. Meshtastic (Austin Mesh)	https://www.austinmesh.org/about/meshcore-vs-meshtastic/
Meshtastic to MeshCore (Xebia)	https://xebia.com/blog/meshtastic-to-meshcore/
Default region scope (MeshCore blog)	https://blog.meshcore.io/2026/04/17/default-scope
MeshCore community (Discord)	https://meshcore.gg
Cherokee ARES website	Cherokee-ARES.ORG