How many hops can a message travel?

Meshtastic Hop Limits

In Meshtastic, every packet is born with a "hop limit" - a countdown that decrements each time the packet is relayed by a node. When the hop limit reaches zero, the packet is dropped and not forwarded further.

- **Default hop limit: 3** - The hop limit counts relay hops, so a default of 3 lets a message pass through up to 3 relay nodes between sender and receiver (sender → relay → relay → relay → receiver).
- **Maximum configurable hop limit: 7** - Meshtastic enforces a hard cap of 7 to prevent runaway flooding
- **Recommended range: 3-5** - 3 for most local networks; 4-5 for large geographic deployments; 7 only in special circumstances

Configure in app: **Radio Config → LoRa → Hop Limit** or via CLI: `meshtastic --set lora.hop_limit 3`

MeshCore Hop Behavior

MeshCore uses path-based routing, where hop limits work differently. A route discovery (path discovery packet) flood uses its own hop limit; once a route is established, data packets are forwarded along the specific path. The practical maximum network diameter depends on how many repeaters are in the discovered path, bounded by the path discovery packet hop limit setting (default sufficient for most deployments).

Why Not Set Hop Limit to Maximum?

Higher hop limits mean more retransmissions, more airtime consumption, and greater risk of broadcast storms (loops where packets bounce indefinitely). On a small, sparse network, a higher hop limit lets messages travel farther. On a dense network with many relays, hop limit 7 can cause severe congestion. Start with the default (3) and only increase if users at the network edges report messages not arriving.

Practical Distance Per Hop

Each hop adds roughly 2-30 km of distance, depending heavily on terrain and antenna height. The figures below are rough field estimates, not specifications - actual per-hop and end-to-end distances vary widely with siting, and the high end of each range requires near-ideal, line-of-sight conditions. They are also best-case in another sense: every added hop lowers the end-to-end delivery probability (compounding packet loss and airtime), so the longer multi-hop ranges are achievable but not routine or reliable. Treat them as illustrative ceilings, not planning numbers:

Hop Count	Typical Coverage (flat terrain with rooftop repeaters)
1 hop	2-8 km from sender to first repeater (approximate, antenna/preset dependent)
3 hops	10-40 km end-to-end (illustrative, environment-dependent)
5 hops	20-80 km end-to-end (best-case, assumes strong links each hop)
7 hops	40-150+ km end-to-end (exceptional best-case, requires mountain repeaters and ideal line-of-sight - not typical)

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