LoRa Mesh Networking Glossary

Quick reference definitions for terminology used throughout this wiki. Terms are organized alphabetically.

A

ACK (Acknowledgment)
: A confirmation packet sent by the receiving node to confirm a message was received. Meshtastic uses ACKs for unicast (direct) messages; channel (broadcast) messages do not generate per-recipient ACKs - instead the sender gets an implicit ACK when it hears another node rebroadcast the packet.

Advertisement
: MeshCore term for a broadcast packet that announces a node's name, position, and public encryption key (the advert is also signed to prevent spoofing). Client nodes send adverts manually when the user initiates it; repeaters and room servers send them periodically (every 12 hours by default). Similar in purpose to Meshtastic's NodeInfo broadcast.

ARES (Amateur Radio Emergency Service)
: A volunteer organization affiliated with the ARRL that provides amateur radio communications support during emergencies. Some ARES groups have begun experimenting with LoRa mesh as a supplemental data layer.

Airtime
: The duration a LoRa radio is transmitting a packet. Determined mainly by Spreading Factor, Bandwidth, and message length (coding rate and preamble length also contribute). Longer airtime = more range but lower network capacity. At SF12/BW125, a short message can take 1-2 seconds of airtime; at SF7/BW500, milliseconds.

B

Bandwidth (BW)
: The frequency width of a LoRa signal in kHz. Common values: 62.5, 125, 250, 500 kHz. Wider bandwidth = faster data rate, slightly less range. One of the three parameters that define a modem preset.

BMS (Battery Management System)
: A circuit that protects a lithium battery from overcharge, overdischarge, overcurrent, and short circuit. Essential for bare lithium cells; many integrated battery packs include a BMS.

Broadcast storm
: A network condition where packets are retransmitted indefinitely, consuming all available airtime. Prevented in LoRa mesh by hop count limits and packet deduplication.

C

Channel
: In Meshtastic: a named communication group with a shared Pre-Shared Key (PSK). Nodes on the same channel can communicate. Up to 8 channels can be configured on one node. In MeshCore: the public or private channel with shared encryption key.

Channel utilization
: The percentage of time the LoRa channel is occupied by transmissions. Displayed in Meshtastic app. Values above 25% indicate congestion; above 50% the network becomes unreliable.

Coding Rate (CR)
: A LoRa parameter that adds forward error correction overhead. Common values: 4/5, 4/6, 4/7, 4/8. Higher coding rate provides better noise immunity at the cost of reduced data rate. One of three parameters in a modem preset.

Conducted power
: Transmit power measured at the antenna connector of the radio. FCC Part 15 limits this to 1W (30 dBm) for 902-928 MHz spread spectrum.

D-E

dBi
: Decibels relative to an isotropic radiator. A measure of antenna gain. Higher dBi means more focused signal in some directions. 0 dBi means gain equal to a hypothetical isotropic antenna that radiates equally in all directions; real antennas always have some directionality.

dBm
: Decibels relative to 1 milliwatt. Used to express absolute power levels. 0 dBm = 1 mW; 30 dBm = 1W; -120 dBm = approximate LoRa sensitivity at low spreading factors, while at SF12 sensitivity reaches roughly -137 dBm (BW125) to -148 dBm.

ECDH (Elliptic Curve Diffie-Hellman)
: A key exchange algorithm that allows two parties to derive a shared secret over an insecure channel without transmitting the secret. Used by MeshCore for all direct messages, and by Meshtastic DMs in firmware 2.5.0+.

EIRP (Effective Isotropic Radiated Power)

Total radiated power accounting for antenna gain and cable loss. EIRP = Conducted Power + Antenna Gain - Cable Loss. FCC 15.247 caps conducted power at 1 W (30 dBm) and requires dB-for-dB power reduction only for antenna gain above 6 dBi - with a 6 dBi antenna this works out to about 36 dBm (4 W) EIRP, though fixed point-to-point links are allowed higher EIRP.

F-H

Flood routing
: The routing method used by Meshtastic for broadcasts: it uses managed flooding, where a node rebroadcasts a packet unless it first hears another node rebroadcast it. Since firmware 2.6, direct messages use next-hop routing instead of flooding. Simple but can cause congestion at scale.

Fresnel zone
: An elliptical region around the direct path between two antennas. For reliable communication, approximately 60% of the first Fresnel zone should be free of obstructions. Trees, buildings, and terrain within the Fresnel zone cause signal loss even if the visual line-of-sight is clear.

Gateway
: A node that connects the local mesh network to the internet (via WiFi, cellular, or wired connection), enabling MQTT uplink/downlink and access to map services and remote monitoring.

Hop
: One radio transmission between adjacent nodes. A message that travels from Node A to Repeater B to Node C has taken 2 hops.

Hop limit
: The maximum number of hops a packet may take before being discarded. Decremented at each relay. Default 3 in Meshtastic; prevents broadcast storms.

I-L

ISM band
: Industrial, Scientific and Medical radio bands. In the US, license-free communications devices (FCC Part 15) may also operate in these bands. US bands include 902-928 MHz, 2.4 GHz (WiFi), and 5.8 GHz; in Europe, 863-870 MHz is used for LoRa.

LiFePO4 (Lithium Iron Phosphate)
: A lithium battery chemistry with superior DISCHARGE temperature tolerance (-20°C to 60°C), long cycle life (2,000-4,000 cycles), and high thermal stability (far more resistant to thermal runaway than LiPo, though not immune). Charging below 0°C damages the cells, so outdoor solar nodes need a low-temperature charge cutoff or a heated/self-heating battery. Recommended for outdoor LoRa deployments.

Link budget

The accounting of all gains and losses in a radio link. Received power = TX power + TX antenna gain - cable losses - path loss + RX antenna gain. Link margin = received power - receiver sensitivity; a positive margin means a workable link.

LMR-200 / LMR-400

Trade names for low-loss coaxial cable commonly used for LoRa antenna connections. LMR-200 is flexible and low-loss for runs under 10m. LMR-400 is larger, lower-loss, preferred for runs over 10m at 915 MHz.

LoRa

Long Range radio modulation technology using Chirp Spread Spectrum (CSS). Not a network protocol - just the radio layer. Used by Meshtastic, MeshCore, LoRaWAN, and other systems.

LoRaWAN

A centralized IoT network protocol that uses LoRa radio. NOT the same as Meshtastic or MeshCore. LoRaWAN requires gateways connected to a network server; it does not support peer-to-peer mesh networking.

M-P

MeshCore

An open-source peer-to-peer LoRa mesh networking protocol using path-based routing (path discovery/acknowledgment) and ECDH encryption for direct messages. Distinct from and incompatible with Meshtastic.

Meshtastic

An open-source peer-to-peer LoRa mesh networking project using flood-based routing. The most widely deployed LoRa mesh protocol globally.

MPPT (Maximum Power Point Tracking)

A charge controller technique that continuously adjusts load to extract maximum power from a solar panel. MPPT typically harvests 10-30% more energy from the same panel than a PWM controller (vendor data; the exact gain depends on conditions), which matters most for small panel/battery systems.

NodeInfo

Meshtastic packet type that broadcasts a node's name, hardware type, and short name. Sent periodically and when the node first joins the network. Creates entries in other nodes' contact databases.

nRF52840

A Nordic Semiconductor microcontroller with integrated Bluetooth 5 and low-power design. Used in RAK4631, T-Echo, and T114 LoRa boards. Draws substantially less power than ESP32-based boards (sleep behavior and the radio dominate the difference), making it preferred for battery-powered deployments.

PSK (Pre-Shared Key)

A cryptographic key shared among all members of a group before communication begins. Meshtastic channels use PSKs for AES-256-CTR channel encryption (the PSK itself may be 128- or 256-bit). All nodes on a channel must have the same PSK to decrypt messages.

R-Z

RAK4631
: A WisBlock LoRa module based on nRF52840 and SX1262 radio. One of the most popular nRF52840-based boards for MeshCore and Meshtastic deployments, valued for its low power consumption and external antenna support.

Room server
: A MeshCore node running room-server firmware that acts as a shared message board (BBS): it stores posts and forwards them to clients when they connect, enabling asynchronous delivery. It does not require internet connectivity.

RSSI (Received Signal Strength Indicator)
: Measured in dBm (negative values). The power level of a received radio signal. More negative = weaker signal. LoRa can decode signals as weak as -120 to -148 dBm depending on Spreading Factor.

SNR (Signal-to-Noise Ratio)
: The ratio of signal power to noise floor, measured in dB. LoRa can decode at negative SNR values (down to about -20 dB), which is why it achieves such long range despite low signal strength.

Spreading Factor (SF)
: A LoRa parameter, typically 7-12 (newer SX126x radios support 5-12). Higher SF = longer range, more airtime, lower data rate. Each step roughly doubles airtime. SF12 has roughly 30x more airtime than SF7 (at the same bandwidth) but much greater sensitivity.

T-Beam
: A popular ESP32-based LoRa development board by TTGO/LilyGO featuring an integrated GPS module and 18650 battery holder. The antenna connector varies by version (SMA on classic v1.x boards, U.FL on the T-Beam Supreme/S3-Core). Available in 915 MHz (US) and 868 MHz (EU) variants.

T-Echo
: A nRF52840-based LoRa device by LilyGO with an e-ink display, integrated GPS, and excellent battery life. Recommended for portable/handheld Meshtastic use.

UART
: Universal Asynchronous Receiver-Transmitter. A serial communication interface. Used to connect GPS modules, serial sensors, and external hardware to LoRa boards.

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