# Full Glossary A–Z

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A reference guide to terms used in LoRa mesh networking, covering MeshCore, Meshtastic, hardware, radio concepts, and related protocols. Terms are listed alphabetically.

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# A

**ACK**
: Acknowledgment. A confirmation packet sent by the destination node to indicate that a message was successfully received. For direct messages, the acknowledgment confirms end-to-end receipt. For channel (broadcast) messages in Meshtastic, the checkmark only means another node was heard rebroadcasting the packet - not that any particular person received it. MeshCore provides delivery reports for direct messages.

**AGC (Automatic Gain Control)**
: A circuit in a radio receiver that automatically adjusts sensitivity based on incoming signal strength. AGC helps receive weak signals but can be desensitized when a very strong nearby transmitter is present - a concern in high-density node environments.

# B

**Bandwidth (BW)**
: The width of the radio frequency channel used for transmission - commonly 62.5 - 500 kHz in mesh use (Meshtastic's LongFast default is 250 kHz; MeshCore's recommended US preset uses 62.5 kHz). 125/250/500 kHz are the classic LoRaWAN values. Wider bandwidth increases the data rate but reduces effective range and noise resistance. Narrower bandwidth improves sensitivity but slows transmission.

**BLE (Bluetooth Low Energy)**
: The wireless standard used to connect a phone or computer to a LoRa mesh node for configuration and messaging. BLE consumes minimal power compared to classic Bluetooth and is built into most modern smartphones. Most mesh devices use BLE as the primary

interface to the companion app.

# C

**Chirp Spread Spectrum (CSS)**
: The modulation method used by LoRa. Data is encoded in frequency chirps - continuous sweeps up or down across the channel bandwidth. CSS is exceptionally resistant to narrowband noise and interference, enabling reception of signals well below the noise floor. This is the core technology that gives LoRa its long-range characteristics.

**Coding Rate (CR)**
: The forward error correction ratio applied to LoRa transmissions, expressed as 4/5, 4/6, 4/7, or 4/8. A higher coding rate (e.g., 4/8) adds more redundant bits per data bit, improving error correction and link reliability at the cost of increased airtime and reduced effective throughput. Most mesh presets use CR 4/5 for efficiency.

# D

**dBi**
: Decibels relative to an isotropic radiator. A measure of antenna gain. An isotropic antenna (theoretical, radiates equally in all directions) is 0 dBi. Real antennas focus energy in specific directions - a 5 dBi vertical antenna focuses more energy toward the horizon, increasing horizontal range at the expense of coverage directly above and below. Higher dBi is generally better for ground-level mesh communication but can cause issues if nodes are at very different elevations.

**dBm**
: Decibels relative to 1 milliwatt. The standard unit for transmit power in LoRa systems. Common values: 14 dBm = 25 mW, 20 dBm = 100 mW, 27 dBm = 500 mW, 30 dBm = 1 W. The FCC Part 15 limit for 915 MHz is 30 dBm conducted power (1 W) and 36 dBm EIRP (4 W including antenna gain).

**DFU (Device Firmware Update)**
: The firmware update mode used by nRF52-based devices (T-Echo, T114, RAK4631). Entered by double-tapping the reset button, which causes the device to appear as a USB mass storage drive. Firmware is updated by dragging a .uf2 file onto this virtual drive. No separate flashing tool required.

# E

**EIRP (Effective Isotropic Radiated Power)**

The total radiated power accounting for both transmitter output and antenna gain. EIRP = TX power + antenna gain (in dBm and dBi respectively). FCC Part 15 sets the EIRP limit for 915 MHz at 36 dBm (4 W). A 30 dBm transmitter with a 6 dBi antenna reaches exactly this limit.

**ESP32**

A popular microcontroller platform from Espressif Systems, used in many LoRa mesh devices including the Heltec V3, LILYGO T-Beam, and T-Deck. The ESP32 includes built-in Wi-Fi and Bluetooth. It consumes more power than nRF52-based platforms but is easier to develop for and generally less expensive. The ESP32-S3 variant is used in newer devices.

# F

**Flooding**

The routing method used by Meshtastic. Meshtastic uses *managed flooding*: when a node receives a message it rebroadcasts it, but it skips its own rebroadcast if it first hears another node relay the same packet. This continues until the hop limit is reached or all nodes have seen the packet. Since firmware 2.6, direct messages use learned next-hop routing instead of pure flooding. Flooding ensures high delivery reliability in sparse networks but creates significant channel congestion in dense networks. Contrast with *Path Discovery* (used by MeshCore).

# H

**Hop**

A single relay from one LoRa node to the next. Each time a message is forwarded by a relay node, it consumes one hop from the message's hop budget. A message that travels from Node A to Node B to Node C has made two hops.

**Hop Limit**

The maximum number of relay hops a message is permitted to make before being discarded. Prevents messages from circulating indefinitely. Meshtastic's default hop limit is 3 (configurable up to 7). MeshCore supports hop limits up to 64, enabling coverage across very large geographic areas through chains of repeaters.

# I

**ISM Band (Industrial, Scientific, and Medical)**

Radio frequency bands reserved internationally for industrial, scientific, and medical use, available license-free for compliant devices. In the United States, LoRa mesh devices operate in the 902 - 928 MHz ISM band. Operation under FCC Part 15 rules in this band requires no

amateur radio license.

# L

**LiFePO4 (Lithium Iron Phosphate)**
: A battery chemistry strongly preferred for outdoor and cold-weather LoRa deployments. LiFePO4 tolerates heat and physical abuse far better than LiPo and lasts many more cycles, but both chemistries lose capacity in deep cold and must not be charged below freezing. LiFePO4 has a longer cycle life (2,000 - 5,000+ cycles vs. 300 - 500 for LiPo), and is far more resistant to thermal runaway (onset ~270°C vs ~150-210°C for LiPo/NMC), though not immune - still use a proper BMS and fusing. Note: usable capacity drops sharply below freezing (manufacturers typically rate discharge only to about -20°C), so size winter battery banks with significant headroom. Critical: do not charge any lithium chemistry, including LiFePO4, below 0°C (32°F) - sub-freezing charging causes lithium plating, which permanently damages the cell and can create internal shorts. For winter solar deployments use a BMS or charge controller with low-temperature charge cutoff, or a self-heating/insulated battery.

**LiPo (Lithium Polymer)**
: A common rechargeable battery chemistry used in many consumer electronics and LoRa devices. Energy-dense and lightweight, but sensitive to temperature extremes, overcharge, and physical damage. Not recommended for unattended outdoor deployments in climates with large temperature swings. See *LiFePO4* for a safer outdoor alternative.

**LNA (Low Noise Amplifier)**
: An amplifier placed before the receiver input to boost weak incoming signals while adding minimal noise. Some base station and repeater nodes include an LNA to improve receive sensitivity. Important consideration: an LNA improves reception of distant signals but can be overloaded by very strong nearby transmitters.

**LoRa (Long Range)**
: A proprietary wireless modulation technology developed by Semtech Corporation, using Chirp Spread Spectrum (CSS). LoRa defines the physical radio layer - how bits are transmitted over the air. It is the radio technology underlying both MeshCore and Meshtastic, as well as LoRaWAN. See also: *Chirp Spread Spectrum*, *LoRaWAN*.

**LoRaWAN**
: A centralized network architecture built on top of LoRa radio, designed by the LoRa Alliance for IoT (Internet of Things) deployments. LoRaWAN uses a star topology: devices communicate with gateways that connect to internet servers. It requires internet infrastructure and is **not the same as LoRa mesh networking**. MeshCore and Meshtastic do not use LoRaWAN. See the "LoRa vs LoRaWAN" page for a full comparison.

# M

**Mesh**

A network topology where every node can communicate directly with neighboring nodes and relay messages for other nodes. No central hub or server is required. Mesh networks are inherently redundant - if one node fails, messages can route around it through other paths. Both MeshCore and Meshtastic implement mesh topologies.

**MeshCore**

A LoRa mesh networking protocol and firmware developed as an alternative to Meshtastic. MeshCore uses path-discovery routing rather than flooding, making it more efficient in dense networks. It includes features such as Room Servers for store-and-forward messaging and support for large hop limits. MeshCore and Meshtastic are not cross-compatible. See the MeshCore vs Meshtastic comparison page.

**Meshtastic**

An open-source LoRa mesh networking project with a large global user base. Meshtastic uses managed flooding: relay nodes rebroadcast a message unless they already heard another node relay it; since firmware 2.6 direct messages use learned next-hop routing. It has extensive hardware support and a large, active community. Meshtastic and MeshCore are not cross-compatible. See the MeshCore vs Meshtastic comparison page.

**MQTT (Message Queuing Telemetry Transport)**

A lightweight publish/subscribe messaging protocol used to bridge Meshtastic nodes to internet services. Nodes with internet connectivity (via Wi-Fi) can publish mesh traffic to an MQTT broker, enabling out-of-area message delivery and integration with dashboards and mapping services. MQTT bridging is optional and requires infrastructure - the core mesh operates without it.

# N

**nRF52**

A microcontroller platform from Nordic Semiconductor, used in lower-power LoRa mesh devices including the LILYGO T-Echo, T114, and RAK4631. The nRF52 does not have Wi-Fi, which reduces power consumption significantly compared to ESP32-based devices. nRF52 devices typically offer better battery life but have fewer connectivity options. Firmware updates use DFU mode (double-tap reset).

# O

**OTA (Over-The-Air)**

Firmware update delivered wirelessly, without connecting a USB cable. Some LoRa mesh devices support OTA updates via Bluetooth or Wi-Fi. OTA capability depends on the specific device and firmware version.

# P

**Path Discovery**
: The routing method used by MeshCore. When a message needs to reach a destination, the network is initially flooded to discover a route. Once a path is found, subsequent messages to the same destination use the learned path directly, rather than flooding the entire network each time. This results in significantly less channel congestion than flooding in dense networks. Contrast with *Flooding* (used by Meshtastic).

**PSK (Pre-Shared Key)**
: An encryption key distributed to all nodes that should be able to communicate on a given channel. Both MeshCore and Meshtastic use PSK-based encryption. All devices on the same channel must have the same PSK to send and receive messages. The default channel typically uses a publicly known default key (effectively no privacy); private channels use a custom PSK.

# R

**Repeater**
: A node dedicated to relaying messages rather than originating them. Repeaters are typically placed at elevation (hilltops, rooftops, towers) to maximize coverage area. In MeshCore, "Repeater" is a specific firmware variant optimized for this role. In Meshtastic, the Router or Repeater role serves the same purpose. Repeater nodes should have continuous power (solar or mains).

**Room Server**
: A MeshCore-specific node type that functions as a store-and-forward bulletin board on the mesh. A Room Server retains recent messages and delivers them to nodes that connect later - similar in concept to a message board. This is particularly useful for networks where not all nodes are online simultaneously. Room Servers are a MeshCore feature and do not exist in standard Meshtastic.

**RP-SMA (Reverse-Polarity SMA)**
: A variant of the SMA RF connector where the center pin gender is reversed: the RP-SMA female connector has a center pin (male contact), while RP-SMA male has a socket. LoRa mesh devices most commonly use standard SMA (e.g., many LILYGO and Heltec boards), but some use RP-SMA - check your specific device before buying antennas. When purchasing antennas or adapters, verify whether RP-SMA or standard SMA is required - they look nearly identical but are not interchangeable.

# S

**Scope**

In MeshCore, the geographic or group region within which a message is intended to propagate. Scopes allow large networks to partition traffic so that local messages stay local and do not flood the entire regional network.

**SF (Spreading Factor)**

A LoRa parameter that controls how many chips encode each symbol (2^SF chips per symbol; each symbol carries SF bits), commonly SF7 (fastest, shortest range) to SF12 (slowest, longest range) in mesh presets - SF5 and SF6 also exist on newer radios. Higher spreading factors increase range and noise resistance exponentially but also increase time-on-air, battery consumption, and reduce channel capacity. Each step up in SF roughly doubles airtime and adds about 2.5 dB of link budget (about 30% more line-of-sight range).

**SMA (SubMiniature version A)**

A standard RF coaxial connector used widely in LoRa devices, antennas, and RF equipment. The standard SMA has a center pin on the male connector. Note the distinction between SMA and RP-SMA - they are not interchangeable. See *RP-SMA*.

**SWR (Standing Wave Ratio)**

A measure of impedance matching between the transmitter and antenna. A perfect match is 1:1; real antennas have some mismatch. SWR <1.5:1 is excellent; SWR <2:1 is acceptable; SWR >3:1 indicates a poor match and may cause reduced range and potential damage to the transmitter over time. Caused by wrong antenna type, damaged cable, or improper installation.

# T

**TX Power (Transmit Power)**

The power output of the radio transmitter, measured in dBm. Higher TX power increases range up to the regulatory limit but also increases battery consumption. Most LoRa mesh devices allow TX power adjustment in firmware settings. The FCC Part 15 limit for 915 MHz is 30 dBm (1 W) conducted power. Operating at 27 dBm (500 mW) rather than 30 dBm reduces battery consumption while sacrificing 3 dB of link budget (roughly 25-30% of line-of-sight range).

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*Terms added or updated as the community identifies gaps. If a term is missing, please raise it in the community Discord.*

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