

MESHTASTIC



Powered

MESHTASTIC INTRODUCTION

Definition of a “Mesh” and a “Node”

- Grid-independent, de-centralized, low-speed data network made up of connected “nodes” (devices)

Hardware & Software

- Meshtastic node acts as a modem tethered via Bluetooth to phone, tablet, computer. Some standalones exist.
- Nodes are very small and energy efficient

Operates on 33cm ISM Band

- 902-928mhz (Often referred to as “915” as the center channel)
- LoRa (Long Range) physical communication layer
- Signal penetrates some obstacles like buildings and foliage but is weakened significantly
- LOS is ideal but not 100% essential

No License Required!

- As long as as transmitting under IW ERP (+30dBm)
- Licensed Mode exists, but has some caveat(s)
 - Can only function with other Licensed Mode nodes

Common Use-Cases

- Camping/Outdoors (micro-mesh)
- Rural/Ag applications (soil readings, livestock tracking, intrusion detection)
- Large off-grid festivals/events (Burning Man, etc)
- Emergency Communications
- Large Area mesh networks (such as MSPMesh or St Cloud Mesh)

HARDWARE & SOFTWARE BASICS

Types of nodes

- On-Person (phone-tethered or standalone)
- Mobile
- Infrastructure/HQ
- Special-purpose
- Environmental sensors
- Motion sensors/PAX counters
- GPS Trackers
- Drones
- Raspberry Pi & other Linux (meshtasticd)
 - BBS's (is this the plural of BBS?)
 - Bridging/combining meshes
 - Other custom applications

Meshtastic Firmware

- Firmware flashing your node
 - Flasher Website (flasher.meshtastic.org)
 - OTA (careful!)
 - CLI tools
- Versioning & device compatibility concerns
 - Host device limitations
 - Mesh compatibility/EOL considerations
- Client Software/Apps
 - Mobile App for Android and iOS
 - Browser-based Web Client (via node or cloud)
 - CLI
 - Specialty clients/interfaces

SETUP / CONFIG BASICS

- Preset (“Chirp”) must match (example, Long Range Fast – “LongFast”)
- Frequency slot (or exact frequency override) must match
- Primary Channel must match name and key to propagate node data/telemetry
- Device Roles
 - Client_Mute or Client for nearly all nodes
 - “Repeaters” and “Routers” - tricky but important distinctions and caveats about device roles:
 - Client mode repeats mesh traffic without being labeled a “Repeater”
 - Repeater mode is rarely if ever used, likely will be EOL’d by Meshtastic eventually
 - Router mode is used extremely sparingly, generally 1-2 for every 100 known nodes
 - Both modes require extremely advantageous LOS compared to standard nodes
 - Poorly placed Routers/Repeaters severely harm mesh performance
 - Meshes do not require a Repeater or Router at all

SIMPLE MESH DEMONSTRATIONS

- Device-to-device DM
- Public chat rooms
- Private chat rooms
 - Chat Room sharing via QR code or URL

EXPECTATION VS REALITY

- Useable range is not what you've been told
 - RX is nearly effortless in most cases on established meshes
 - TX is not. Large urban meshes generally require multiple "levels" of nodes to propagate traffic fully
 - Setting up a new mesh or joining an existing mesh
 - Involvement level varies from one or two devices to "problems".
 - Topography/LOS is king, height is better than wattage
 - Channel name/order is important for extended mesh capabilities
 - Experimentation is constant - one is none, two is one, and ten is inevitable.
- Most people buy before they try. The learning curve is steep, and the first thing you buy is rarely sufficient.
 - Beware of false/misleading specs on antennas and batteries
 - There is no such thing as a 10dBi, 17cm whip antenna.
 - There is no such thing as an 18650 that holds 4,000+ mAh
 - Mesh devices share common hardware with crypto miner market – buyer beware!
 - Also beware of un-vetted sellers (Amazon, AliExp, eBay, FB Marketplace, etc) especially when first starting
 - Sellers often mislabel or mistake similar looking antennas for similar performing ones.
 - Very low initial investment for simple mesh functionality
 - Frustration or "island/bowl" issues

ADDITIONAL FEATURES

- Encryption
- Range/Bandwidth customization
 - Data rate and frequency bandwidth varies from 0.18kbps to 25kbps
 - Effective range varies based on “Spread Factor” or Preset (“Chirp”).
 - Long Fast default
 - Chirp/frequency adjustment upon bandwidth saturation/congestion
 - Example: This conference moving to Short Turbo to accommodate many nodes in a small area
- GPS location sharing
 - Configurable to your level of privacy/obfuscation
 - Not required for mesh functionality
- ATAK integration
- IOT/Home Automation

DIY/OPEN SOURCE/COMMUNITY

- Official Software and Firmware is open-source
 - github.com/meshtastic
- Many nodes are created from scratch using PCBs and 3D Prints
- Large meshes necessitate extensive teamwork and coordination
- Several vendors/providers/communities create mesh-centric mesh-helping software & services
 - MeshSense (meshsense.affirmatech.com)
 - MeshPlanner (meshplanner.com)
 - HeyWhatsThat (heywhatsthat.com)
 - TC2 BBS (github.com/TheCommsChannel/TC2-BBS-mesh)
 - Meshtastic Site Planner (github.com/meshtastic/meshtastic-site-planner)

FUTURE CONSIDERATIONS & EDUCATION

- Meshtastic has peer and near-peer competition
 - MeshCore
 - Reticulum
 - BearTooth (commercial, higher wattage)
- Immature/young tech -- Information changes quickly!
 - Firmware updates happen on an unscheduled, uneven duration
 - Official documentation & “legacy” online info sources often do not change as quickly
 - Dynamic, “live” online help (e.g. Discord) has proven to be extremely useful in helping new users learn.
 - YouTube and other video-based content ages out very quickly to become inaccurate or irrelevant

THANK YOU!

Visit us at mspmesh.org

800 helpful, friendly users on our Discord and growing!

At least 600 nodes on the MSP Mesh

Current East/West distance to communicate: 175mi

