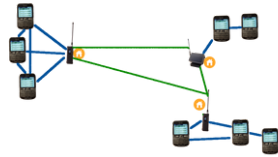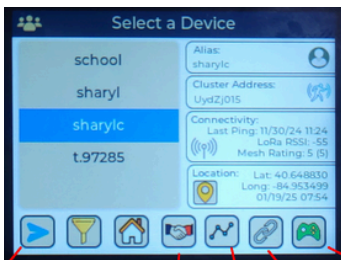# Clusters



Clusters are (by design) private, closed, and secure. There is a fixed number of devices (although read-only nodes can be added infinitely). Clusters maintain a shared and evolving state.

# Channels



Channels are open to anyone possessing the channel ID, frequency passwords, and encryption passwords. Channels can be secure, if you keep the passwords secure.

## Sending / Receiving Messages

**Clusters:**
- Smart path planning for direct messages
- Decentralized mesh cache helps deliver packets
- Direct Messages & Broadcasts
- Direct message delivery confirmation
- Broadcast confirmation of acceptance/rebroadcast
- Broadcasts can optionally be displayed on nodes



**Channels:**
- Decentralized mesh cache helps deliver packets
- All messages are broadcasts to the channel
- Broadcast confirmation of acceptance/rebroadcast
- Broadcasts can optionally be displayed on nodes
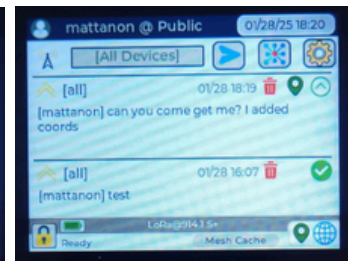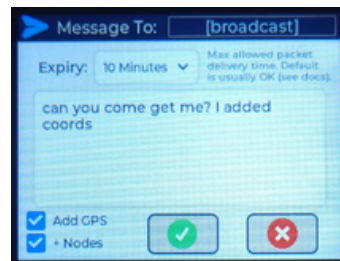


## Location Awareness & Sharing

**Clusters:**
- Cluster-wide awareness of locations and connectivity
- Location is always being securely shared/propagated through cluster-wide "pings"
- View current or last-known location, speed, and heading of any device in your cluster - even those out of range

**Channels:**
- Location can optionally be sent along with any broadcast
- The location marker (if sent) remains with that broadcast message as it carries forward to other devices
- View current or last-known location, speed, and heading included in any broadcast

## Security

**Clusters:**
- New devices must be onboarded by the root device, where they are assigned a cluster address
- Direct messages are asymmetrically encrypted
- Broadcasts are symmetrically encrypted
- All transmissions are digitally signed

**Channels:**
- Channel ID/creds can be manually entered into a communicator, or "pushed" from another communicator.
- Channel info must be pushed from communicators to nodes
- Broadcasts are symmetrically encrypted
- All transmissions are digitally signed using channel keys

## Limitations

**Clusters:**
- New devices must be physically close enough to the root device in order to be onboarded, since keys are never viewable and devices must have a unique address in a cluster
- Max of 90 communicators and nodes
- Unlimited read-only nodes
- DM delivery attempts can continue for up to 24 hours
- Broadcast messages can continue to propagate for up to 2 hours

**Channels:**
- Unlimited communicators and nodes
- DM delivery attempts can continue for up to 24 hours
- Broadcast messages can continue to propagate for up to 2 hours
- Your cluster's security is only as good as the weakest link in those who have/know the cluster credentials
- There is no neighbors screen