

# Running a Mesh Communications Exercise

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Exercises are the primary mechanism by which emergency communications groups validate their capabilities before they are needed in an actual incident. A well-designed mesh communications exercise will surface coverage gaps, equipment failures, procedural ambiguities, and operator skill deficiencies in a controlled environment where mistakes have no real-world consequences.

## HSEEP Framework Basics

The Homeland Security Exercise and Evaluation Program (HSEEP) provides a standardised methodology for designing, conducting, and evaluating exercises. Key HSEEP concepts relevant to mesh communications exercises include:

- **Exercise types:** Tabletop exercises (TTX) involve discussion of scenarios around a table with no equipment deployment; functional exercises (FE) are operations-based exercises that test functions and decision-making using a system of simulators and exercise injects, with no movement or actual "boots on the ground" field deployment of personnel (in a mesh context this typically means activating and operating equipment from fixed positions rather than deploying teams to the field); full-scale exercises deploy people and equipment to simulate an actual incident response. For mesh communications, starting with a TTX to validate procedures, then a functional exercise to validate equipment, is a recommended progression before attempting a full-scale exercise.
- **Objectives:** HSEEP requires that exercises have specific, measurable objectives tied to core capabilities. Frame objectives as things to *measure* rather than reliability levels to assume — for example, "measure what fraction of welfare-check messages originating from designated neighbourhood nodes reach the EOC within 10 minutes" (set the target from your own baseline data, and expect best-effort mesh delivery rates to vary widely with load and terrain rather than assuming a high fixed percentage), or "network operator can reconfigure channel settings within 5 minutes of a security compromise notification."

- **After-Action Report (AAR):** HSEEP-compliant exercises produce an AAR that documents exercise objectives, observed strengths, areas for improvement, and a corrective action plan with assigned owners and target completion dates.

## Designing a Realistic Scenario

Effective mesh communications exercises are anchored in plausible local hazard scenarios. Three scenarios that work well for most communities:

- **Extended power outage (3-7 days):** For this exercise, assume cellular towers are on generator backup and that local cell sites begin failing after roughly 24-48 hours — but treat this as a scenario assumption, not a fact: actual battery/generator endurance varies widely by carrier and site (often only a few hours on battery alone, longer with generators and refuelling). Internet is intermittent or unavailable. The exercise tests whether the mesh can carry welfare traffic and coordinate resource distribution without internet or cellular infrastructure.
- **Wildfire evacuation:** Multiple zones are under evacuation orders. Road closures and smoke limit travel. The exercise tests whether the mesh can relay evacuation status, shelter capacity, and resource requests between field teams, the EOC, and reception centres.
- **Earthquake with infrastructure damage:** Multiple buildings are damaged. A simulated percentage of nodes are offline (to represent destroyed or inaccessible nodes). The exercise tests whether the remaining nodes can keep traffic flowing around the gaps — note that Meshtastic reroutes via managed flood rebroadcast only where an alternate in-range node exists; it does not compute repaired routes like a routed network, so "self-healing" only works if another node is within RF range of the gap — and whether operators can identify and document coverage holes.

## Facilitator Guide Structure

A mesh communications exercise facilitator guide should include: exercise overview and objectives; scenario narrative with inject schedule (pre-scripted events delivered to players at designated times to drive exercise activity); expected player actions for each inject; evaluator guidance (what to observe, how to score); and facilitated hot wash guidance (structured discussion immediately after the exercise to capture initial observations before memory fades).

## Common After-Action Findings

Common issues anticipated in mesh communications exercises — based on general emergency-communications experience rather than a specific published study — include:

- **Coverage gaps in specific neighbourhoods:** Often correlate with terrain features (hills, valleys, dense tree canopy) not fully accounted for in the network design. Corrective

action typically involves adding a node on an elevated structure in the gap area.

- **Operators needing more training:** Operators who can turn on and send a message but have not practised configuration tasks can be expected to struggle when asked to change channels or assist a neighbour with an equipment problem. (The Level 1/2/3 operator tiering used elsewhere in this library is our own framework, not an external standard.)
  - **Procedural gaps:** Absence of documented check-in procedures (who checks in with whom, at what interval, using what format) leads to confusion about network status. Writing and distributing a one-page standard operating procedure for check-ins is a common corrective action.
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