Requirements and tests

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| Reference Number | Requirement | Test | Pass/Fail Criteria |
| 1-SW\* | An offline web server for the UI | Connect a Wi-Fi capable device to the node and render the UI using a modern (Chrome, Safari, etc.) browser. | UI is rendered and readable. |
| 2-SW | Users must be able to send LoRa packets using the web interface from one device to another | Send a message using the UI to another user | The sent message is shown on the other device's UI |
| 3-SW | Chats on UI must have a user name or device identifier and a timestamp of when the message was sent | Send chat messages from multiple devices over the UI | The UI renders chat history with usernames in chronological order according to message timestamp |
| 4-SW | Each repeater node must monitor battery voltage and disconnect when dropping below the low voltage threshold | Supply voltage to the node with a variable power supply and document which voltages result in disconnect and reconnect. The node voltage monitor will be compared to that of the power supply and measured with an external meter. | The reported battery voltage is accurate within 3%. The load disconnects when the battery voltage drops below the low voltage threshold and turns back on when the battery charges above threshold voltage. |
| 5-SW | There must be a packet collision avoidance protocol implemented that deals with the hidden-node problem | Transmit a LoRa packet from two devices to a single receiver at the same time without a connection between the two senders to coordinate between them | Neither message is lost, or corrupted, and they are displayed in the UI in the correct order based on their timestamp |
| 6-HW\*\* | Design and order a PCB | PCB is designed in a manner that takes all component datasheet recommendations in to account. Traces are sized appropriately to power requirements specified in power audit. This will be tested by a different group member than the one who designed it. | If the PCB design passes external feedback of additional group member and Justin Curran or other member of the Capstone committee it may be ordered. |
| 7-HW | Must have a bespoke enclosure.  Should be protected against rain and moisture ingress | T1 – The enclosure passes inspection from professors.  T2 – Cable glands have been IPX4 tested (provide protection from splashes of water ie. rain) | All materials have IPX4 or greater certification from reputable lab |
| 8-HW | Solar charge controller and voltage regulator effectively provide the required 3.3V to the hardware. | Test a wide range of input voltages using a variable power supply and measure the output with a multimeter. | The hardware receives a stable 3.3V +/- 0.1V out across the range of test voltages. |
| 9-HW | Battery bank and solar panels must be sized to estimated loads | Chosen panel wattages and battery Ah meet or exceed node requirements as calculated by our power audit (datasheet specifications, duty cycle, solar insolation modeling) | All ordered materials meet or exceed calculated power audit. As a “pass” may look different for each node due to its geographic location, this will be determined for each individual node. |
| 10-HW | Antennas MUST be well matched to the driving Hardware | SWR/Impedance testing of antenna and source using VNA (may require tuning to meet these requirements) | Source impedance is matched to antenna so that VSWR < 2 and return loss < -10 dB |
| 11-HW | Incorporate an accessible user button at access points for users to initiate system operation | Test that the web-app is not accessible until the operation button is pressed to wake the microcontroller | web-app will not be available until the user button has been pressed and time out after a specified time |

\*Reference number containing SW denotes a Software requirement

\*\*Reference number containing HW denotes a Hardware requirement