Testing Plans

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# LoRa Testing Plans

## Unit testing

1. Test that messages can be transmitted from Field Station to Service Station.
2. Test that messages can be transmitted from Service Station to Field Station.
3. Measure frequency of messaging between Field Station and Service Station.
4. Test that messages transmitted from Field Station to Service Station trigger an acknowledgement from Service Station to Field Station.
5. Test that messages transmitted from Service Station to Field Station trigger an acknowledgement from Field Station to Service Station.

## Component testing

1. Test that when Service Station is disconnected, Field Station RPi continues to send same message until Service Station reconnects. (Ensure the Field Station does not discard data & message until it has received an acknowledgement from the Service Station).
2. Test that when Field Station is disconnected, Service Station RPi continues to send same message until Field Station reconnects. (Ensure the Service Station does not discard data & message until it has received an acknowledgement from the Field Station).

## Integration testing

1. RPi hardware watchdog + LoRa integration test: shutdown Field Station RPi and re-establish LoRa connection. Verify that messages and acknowledgements can be sent in both directions.
2. RPi hardware watchdog + LoRa integration test: shutdown Service Station RPi and re-establish LoRa connection. Verify that messages and acknowledgements can be sent in both directions.

## Acceptance tests

1. LoRa Transmission Acceptance test (T\_LoRa\_1): Transmission test at 150m and 200m between RPIs. Measure data loss (number of reissued ACKs for the same data packet), overall time to transmit 1K, 2K, 4K, 8k, 16k, 32k of data. *(source: Dr. Cenek)*
2. LoRa Transmission Acceptance test (T\_LoRa\_SS2): Repeat T\_LoRa\_1 in heavy rain record the same outcomes. Quantify 3 different scenarios of 'heavy rain'. *(source: Dr. Cenek)*

# RPi Watchdog Testing

## Unit Testing

1. Test that watchdog observes when the RPi shuts down due to an error.
2. Test rebooting functionality after a reboot due to the RPi shutting down due to a fault. Test the RPi restarts after executing a fork bomb on RPi. Repeat for Field Station and Service Station.
3. Test that watchdog periodically restarts the RPi.

## Component Testing

1. Test that RPi restarts python scripts after rebooting.
   1. Shutdown of RPi caused by RPi error (use fork bomb). Repeat for Field Station and Service Station.
   2. Shutdown of RPi due to periodic restart (intentional restart). Repeat for Field Station and Service Station.

## Integration Testing

1. Complete all integration tests as specified in the LoRa Testing section.
2. LoRa + watchdog integration: verify that Service Station RPi periodically reboots the RPi system and reestablishes LoRa connection afterwards. Test that messages and acknowledgements can be sent in both directions.
3. LoRa + watchdog integration: verify that Field Station RPi periodically reboots the RPi system and reestablishes LoRa connection afterwards. Test that messages and acknowledgements can be sent in both directions.

## Acceptance Tests

1. Error shutdown acceptance test: test to ensure that when the Service Station is shut down due to a system error, when the Service Station reconnects the system functions properly. Issue fork bomb to kill Service Station.
   1. Requires that the Field Station does not drop any data or messages.
   2. LoRa must reconnect and begin reissuing messages.
2. Error shutdown acceptance test: test to ensure that when the Field Station is shut down due to a system error, when the Field Station reconnects the system functions properly. Issue fork bomb to kill Field Station.
   1. Requires that the Service Station does not drop any data or messages.
   2. LoRa must reconnect and begin reissuing messages.
3. Period restart acceptance test: verify that when the Service Station periodically restarts, LoRa connection is reestablished and messages continue to be issued. Measure number of messages that are dropped by the Field Station.
4. Period restart acceptance test: verify that when the Field Station periodically restarts, LoRa connection is reestablished and messages continue to be issued. Measure number messages that are dropped by the Service Station.

# SSH Setup Testing

Test that we can set up the RPi’s with and without access to WiFi to simulate real installation conditions:

1. Test with WiFi connection.
2. Test without WiFi connection.