Testing Document for PowerCloud

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1 Test Plan

1.1 Firmware

We're using Manual Testing to test the firmware due to the fact that the firmware has to be compiled using the Particle Cloud.

However, in due course, we intend to find a workaround in order to test the firmware using a testing framework.

The following features of the firmware are tested:

- Store to EEPROM using a struct.
- Store to EEPROM using raw values.
- Retrieve from EEPROM.
- Check EEPROM for data.
- MQTT connect, which establishes a reliable connection to the server.
- MQTT publish, which publishes JSON to the server.

1.2 Application Server

We're using **JUnit** to test the major features of our application server. Detailed descriptions of these features are as follows:

- Concurrent MQTT Client Connections.
- Validate Data from Client.
- Store data to Firebase.

2 Test Design

The tests were implemented as follows for each of the components of the entire system.

2.1 Test Procedure Description

2.1.1 Firmware

Store to EEPROM using a struct.

1. Create the appropriate structure.
2. Attempt to store said structure.
3. Create an empty struct.
4. Attempt to store an empty struct.
5. Retrieve structs from EEPROM and verify that they are correct.

Store to EEPROM using raw values.

1. Declare raw values which need to be stored.
2. Attempt to store these accpetable values.
3. Retrieve data from EEPROM and verify that it is correct.

Retrieve from EEPROM.

1. Create multiple struct objects.
2. Store these struct objects to EEPROM.
3. Attempt to retreive stored objects.
4. Verify that the objects are correct.
5. Clear Memory.
6. Attempt to retrieve objects again.

Check EEPROM for data.

1. Calculate how many struct objects can be stored in EEPROM.
2. Create enough struct objects to fill EEPROM to capacity.
3. Call appropriate function to determine if the EEPROM is full.
4. Create half the capacity of struct objects.
5. Store these struct objects to EEPROM.
6. Call appropriate function to determine if the EEPROM is full.

MQTT connect, which establishes a reliable connection to the server.

1. Provide incorrect host IP.
2. Attempt to connect.
3. Proivde correct host IP.
4. Attempt to connect.

MQTT publish, which publishes JSON to the server.

1. Ensure connection to server is established.
2. Publish well-formed JSON.
3. Publish malformed JSON.
4. Ensure ACK packets are received on both occasions.

2.1.2 Application Server

Concurrent MQTT Client Connections.

1. Connect to server using Particle Photon.
2. Connect to server using MQTT Lens plugin.
3. Publish messages to server from photon and plugin concurrently.
4. Evaluate Firebase to ensure data is stored correctly.

Validate Data from Client.

1. Once a message has been received from a client.
2. Extract payload from message.
3. Parse JSON String into JSON object.
4. Catch exception if necessary.
5. Ensure JSON Object is accessible.

Store data to Firebase.

1. Receive a continuous stream of messages from MQTT Clients.
2. Attempt to store all messages to firebase.
3. Verify that all messages are present.
4. Receive a continuous stream of messages with a 10 second delay.
5. Attempt to store messages to Firebase.
6. Verify that all messages are present.

3 Test Execution

3.1 Test Incident Report

3.1.1 Firmware

The following incidents occured during firmware testing. Namely during: **Testing the connect and publish:**

1. Particle Photon disconnects from WIFI after concurrent publish events.
2. Particle Photon does not continue publishing after disconnecting.

Testing the EEPROM No incidents occured with regards to testing the EEPROM.

3.1.2 Application Server

The following incidents occured during application server testing. Namely during: **Storing to Firebase**

1. When receiving continous messages from clients, some messages are not stored to Firebase.

3.2 Test Log

3.2.1 Application Server

```
-------------------------------------------------------
 T E S T S
-------------------------------------------------------
Running powerCloudTests.TestSuite
Tests run: 6, Failures: 0, Errors: 0, Skipped: 0, Time elapsed: 0.169 sec

Results :

Tests run: 6, Failures: 0, Errors: 0, Skipped: 0

[INFO] ------------------------------------------------------------------------
[INFO] BUILD SUCCESS
[INFO] ------------------------------------------------------------------------
[INFO] Total time: 17.844s
[INFO] Finished at: Fri Jul 29 19:24:03 CAT 2016
[INFO] Final Memory: 22M/123M
[INFO] ------------------------------------------------------------------------
```

4 Test Summary Report

4.1 Firmware

The current state of the Firmware is as follows.
The following tests need to be implemented and assessed:

- Attempt to publish a message without establishing a reliable connection to the server.
- Attempt to overflow variables.
- Attempt store incorrect datatypes.
- Test if EEPROM clears once full.
- Check data persists after device loses power.
- Criteria which would cause the device to disconnect or reboot.

4.2 Application Server

The current state of the Application Server is as follows.
The following tests need to be implemented and assessed:

- Test whether messages received from clients contain the correct data.
- Attempt to store malformed JSON to Firebase.
- Test store methods using parameterized test.
- Test *checkMonth()* with parameterized tests.
- Test *validateID()* using parameterized tests.
- Test appropriate exceptions which are included within the exceptions package.

As a whole, the system functions as expected using expected parameters. The next round of testing will be to ensure that the system functions correctly under unexpected conditions.