**Step-1:** Capture signals frompump using freedom IoT hardware (microcontroller) and store them in form of Bytes with address and data streams. Take starting point as address bytes 1111 and store them temporarily as shown below.

|  |  |
| --- | --- |
| **Address** | **1111 2222 3333 4444 5555 6666 1111 2222 3333 4444 5555 6666** |
| **Data** | **2199 2299 2399 2199 2299 2399 2199 2299 2399 2199 2299 2399** |

**Step-2:** Find greatest value of address stream and calculate no. of grades = greatest value/2.

**Step-3:**

If no. grades =1 then compare each data byte Dn with Dn-32.

If no. grades =2 then compare each data byte Dn with Dn-64.

If no. grades =3 then compare each data byte Dn with Dn-96.

If no. grades =4 then compare each data byte Dn with Dn-128.

If no. grades =5 then compare each data byte Dn with Dn-160.

If no. grades =6 then compare each data byte Dn with Dn-192.

**Step-4:**

In step-3 if Dn =Dn-X. then state there is no error and store Data bytes as price values with Date and time. And stop

In step-3 if Dn=! Dn-X then there is error so move to step-5

**Step-5:**

Take Address bytes 1111 as starting point and compare data as followed

|  |  |  |  |
| --- | --- | --- | --- |
| **Address Bytes** | **Data Bytes** | **Data Bytes-(X/2)** | **Data Bytes-X** |
| 1 1 1 1 | 2 1 9 9 | 15 15 15 15 | 2 1 9 9 |
| 2 2 2 2 | 2 2 9 9 | 15 15 15 15 | 2 2 9 9 |
| 3 3 3 3 | 2 3 9 9 | 15 15 15 15 | 2 3 9 9 |
| 4 4 4 4 | 2 1 9 9 | 15 15 15 15 | 15 15 4 4 |
| 5 5 5 5 | 2 2 9 9 | 15 15 15 15 | 2 2 9 9 |
| 6 6 6 6 | 2 3 9 9 | 15 15 15 15 | 2 3 9 9 |

15 represents blank so ignore them. And compare Data bytes and Data bytes-X with previous stored price value. So we know Data bytes are exactly same as price values so Data bytes-X have different values other than price values they are 15 15 4 4 at address 4444.

Print error code 15 15 4 4 on Grade 4 (4 4 4 4)

**Step-6:** push the error code with pump and grade data to the cloud using AWS IoT

**At Pump Hardware**

**Start**

Read signals from GPIO’s

And store them in Bytes

With address, data

Find greatest value of Address

Stream and calculate no. of

Grades= greatest value/2

YES If NO

If no. of grades =1 Dn= Dn - 32

Step-5

YES

NO Step-4

YES If NO

If no. of grades =2 Dn=Dn - 64

Step-5

YES

NO Step-4

YES If NO

If no. of grades =3 Dn=Dn - 96

Step-5

YES

NO Step-4

YES If NO

If no. of grades =4 Dn=Dn - 128

Step-5

YES

NO Step-4

YES If NO

If no. of grades =5 Dn=Dn - 160

Step-5

YES

NO Step-4

YES If NO

If no. of grades =6 Dn=Dn - 192

Step-5

YES

NO

Step-4

**STOP**

**Step-4**

If Dn=Dn-X (X –factor depends on no. of grades),

Store price (data) values with address and date& time

**Step-5**

Compare Data bytes, Databytes-X/2 and Data bytes-X with previous stored price values. While ignoring 15 as 15 represent blank. Print the value which do not match with price values as error code with respective Grade address and date & real-time

Push the data into Cloud using (AWS IoT)

**Stop**