Bangladesh Telecommunications Company Limited

BTCL

দেশ ও মানুষের সেবায়

Report on

DC Voltage Monitoring and Alert System

(DVMAS)

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Introduction:

At this moment ICT sector is growing at an enormous speed. In this sector server rooms, switch rooms and other sensitive infrastructure have very sensitive parts/equipment (such as air condition, battery, rectifier etc.) that have to be monitored every now and then. An important part of this monitoring is DC voltage monitoring of a battery set. Each of these sensitive infrastructures must operate at a certain voltage and even a small change in battery voltage during power outage can lead to a significant failure of daily operation. Often dedicated manpower is needed to monitor the DC voltage of battery set used in these infrastructures periodically. But it is not cost efficient and man monitoring cannot be errorless. So the best alternative is to implement an electronic device that can monitor the battery voltage level continuously and also can notify the concern persons at any time. Hence, online DC Voltage Monitoring and alert System is created.

What is Online DC Voltage Monitoring and Alert System:

Online DC Voltage Monitoring and Alert System is an embedded Internet of things (IoT) which is based on a programmable processor with dc voltage as input from a sensor and delivers the dc voltage as output to desired location via SMS or to a particular web portal.

The purpose of this embedded IOT system is to monitor dc voltage of battery set for server rooms, switch rooms and other voltage sensitive infrastructure. In telecom industry battery systems are used as backup power source to ensure reliability. Voltage fluctuations in batteries form a major challenge in telecommunication systems which may lead to damage of the valuable machinery, equipment and may create fire hazards which in turn lead to loss of revenue, customers, image and so on. These fluctuations mostly occur due to poor management and the lack of a battery voltage level monitoring system. Thus, as a cheap alternative, DVMAS monitors the voltage and alerts the concerned personnel, saves both times, money and sometimes avoids danger for damage and accidents.

Features of DVMAS:

1. The system can monitor voltage automatically in a regular interval (every minute in this module)
2. The system can send the data to an online server for the purpose of storage and display
3. The system can have options for displaying the voltage using various visualization tools like graphs, widgets, meters etc online so that voltage can be monitored from anywhere.
4. The system can send periodic updates of through SMS to concern personnel
5. The system can send critical voltage alert to concern personnel if a certain threshold for voltage is exceeded.

Components:

The system is built with the following components:
1. Arduino ESP8266
2. Potentiometer & Resistor
3. Battery (9V)
4. Barrel Connector
5. Access to Internet
6. SMS Gateway or GSM SIM Module

Operations and Block Diagram:

1. The Arduino reads voltage data every minute via analog pin.
2. The Arduino sends the voltage data to an online IOT server for online monitoring using a write API key.
3. The Arduino calculates average voltage of every 5 minutes and compares the average to a certain threshold.
4. If threshold is crossed, it sends a critical alert SMS
5. The Arduino waits for 30 minutes to see if voltage is above the threshold. If not, then it sends another alert and waits for another 30 minutes and so on.
6. The Arduino sends a regular updates in a predefined time 4 times a day. (at any desired time of the user)
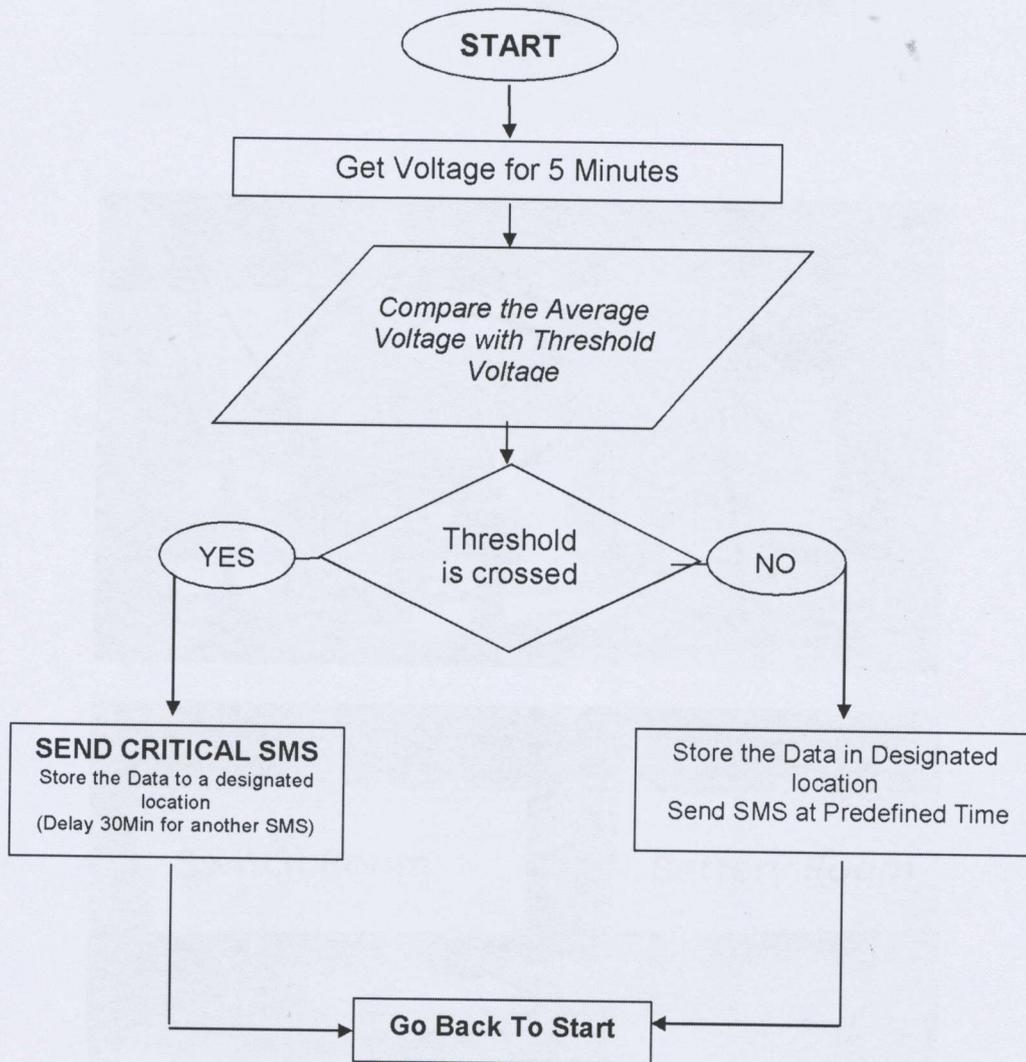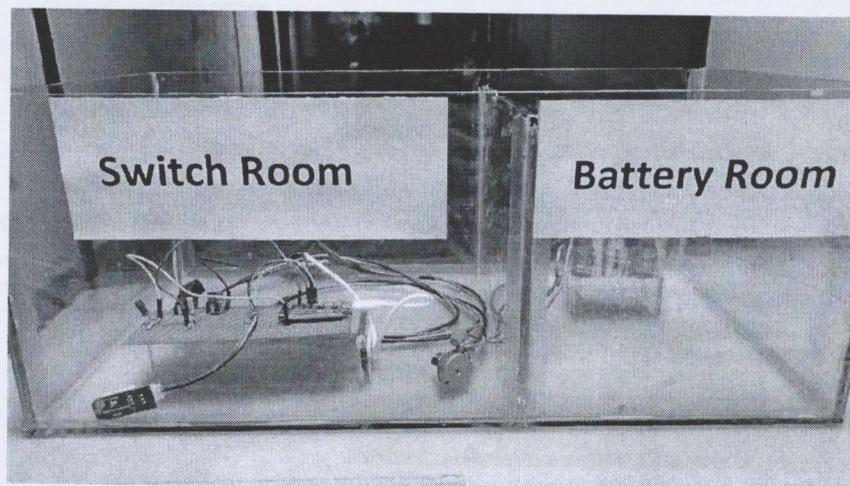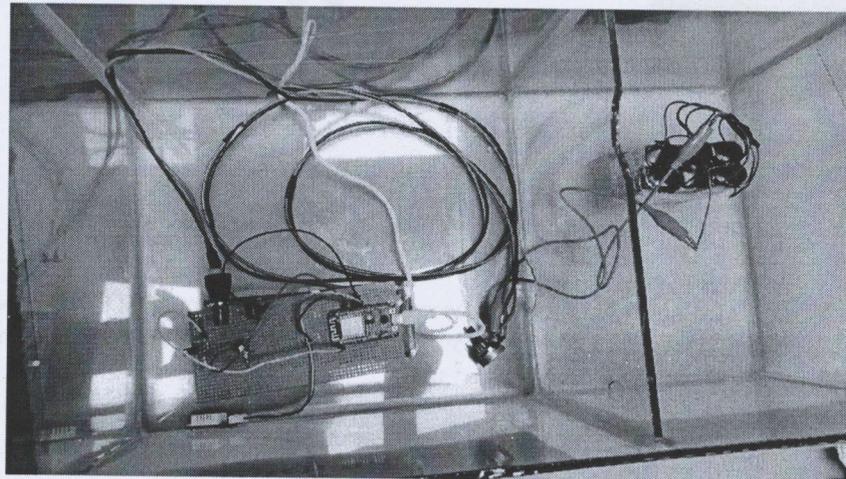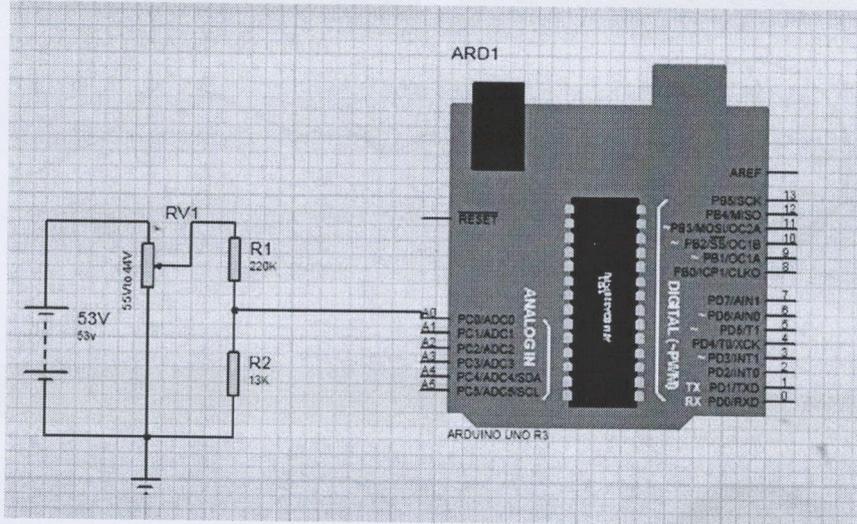
```
                    ╭──────────────╮
                    │    START     │
                    ╰──────────────╯
                            │
                            ▼
        ┌──────────────────────────────────────┐
        │      Get Voltage for 5 Minutes        │
        └──────────────────────────────────────┘
                            │
                            ▼
             ╱─────────────────────────╲
            ╱   Compare the Average      ╲
            ╲   Voltage with Threshold   ╱
             ╲        Voltage           ╱
              ╲───────────────────────╱
                            │
                            ▼
    ╭────────╮      ◇──────────────◇      ╭────────╮
    │  YES   │──────│   Threshold   │──────│  NO    │
    ╰────────╯      │  is crossed   │      ╰────────╯
                    ◇──────────────◇
         │                                      │
         ▼                                      ▼
┌──────────────────────┐          ┌──────────────────────────┐
│  SEND CRITICAL SMS   │          │ Store the Data in         │
│ Store the Data to a  │          │   Designated location     │
│ designated location  │          │ Send SMS at Predefined    │
│ (Delay 30Min for     │          │        Time               │
│  another SMS)        │          └──────────────────────────┘
└──────────────────────┘                       │
         │                                      │
         └──────────┐        ┌──────────────────┘
                    ▼        ▼
              ┌──────────────────────┐
              │   Go Back To Start   │
              └──────────────────────┘
```

Figure: Block Diagram of the DVMAS

Circuit Diagram and DVMAS System Assembly:
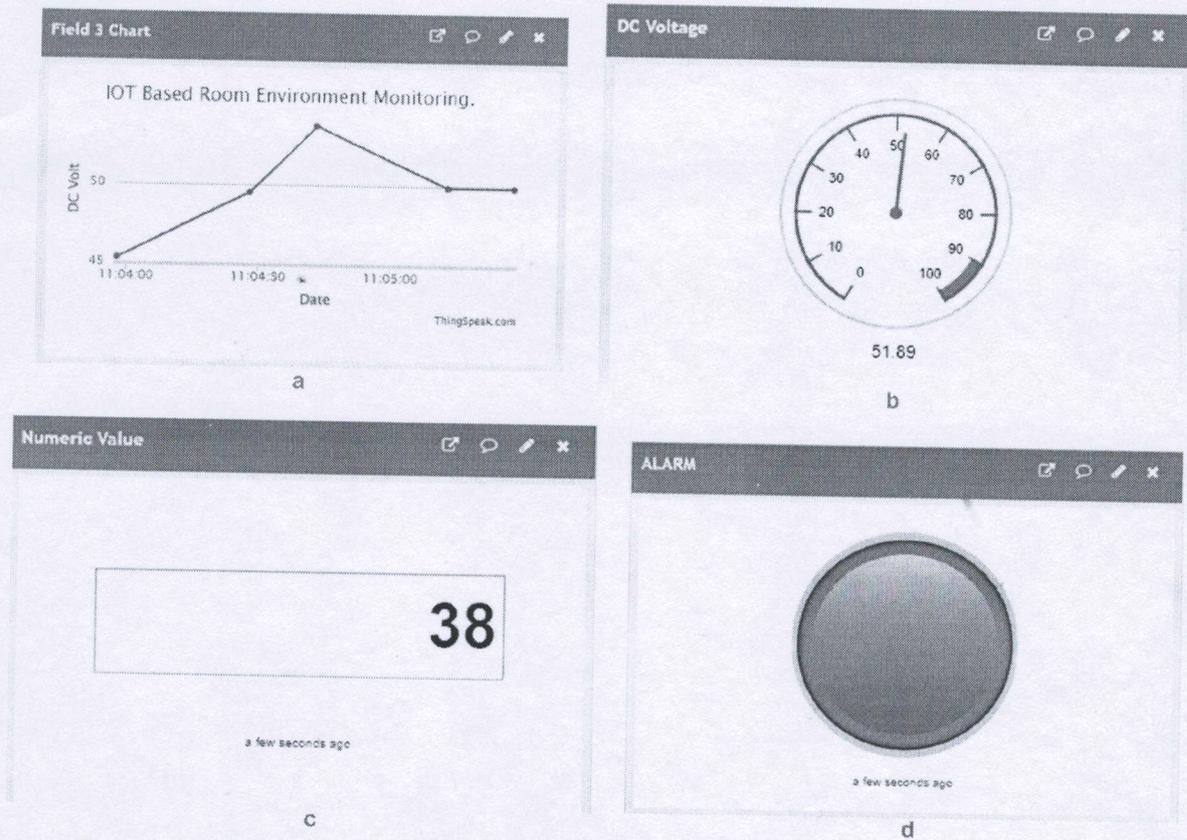
Output in Web:

a

b

c

d

Figure: DVMAS OVER INTERNET (a) Graphical Representation of Voltage with time; (b) Continuous Voltage Meter with Critical(Marked RED); (c)Numerical Display of Voltage; (d) Critical Voltage Alert Light;
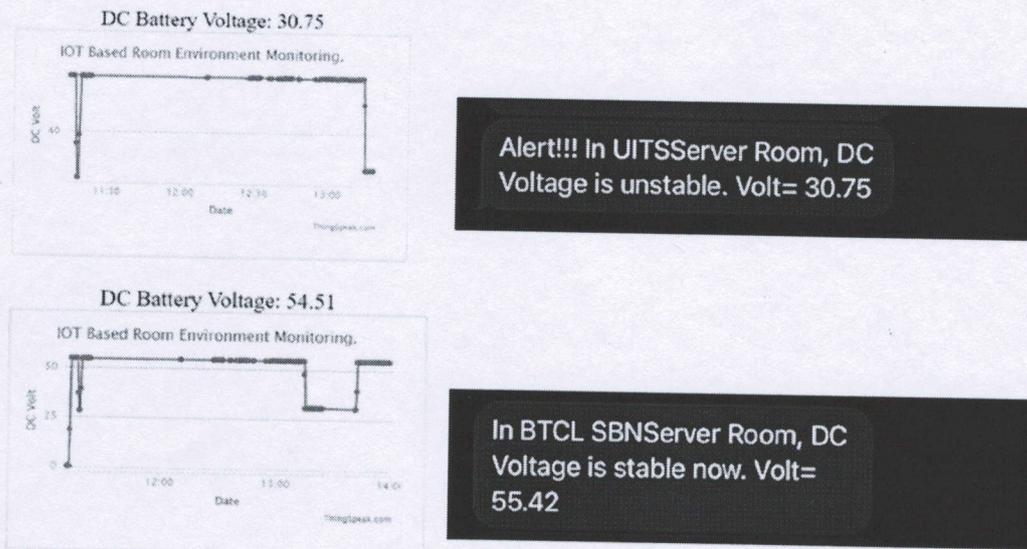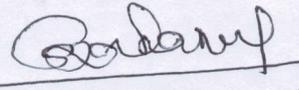
SMS Notification:

DC Battery Voltage: 30.75

Alert!!! In UITSServer Room, DC Voltage is unstable. Volt= 30.75

DC Battery Voltage: 54.51

In BTCL SBNServer Room, DC Voltage is stable now. Volt= 55.42

Figure: Regular Voltage Notification of DVMAS via SMS

Conclusion:

DVMAS is a simple but very effective way of monitoring battery voltage. The developed system can be used in accessing battery information remotely while allowing real-time continuous monitoring of battery usage. The proposed battery voltage-level monitoring system contributes to the elimination of battery hazards in telecommunication systems. Therefore, the proposed battery voltage level monitoring system can be adopted by telecommunication system for the reduction of voltage fluctuation risks.

14.03.2022

(এ. কে.এম.গোলাম বাহারুল)
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