Volatile Organic Compound Monitor

Requirements Details

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**Introduction**

This report contains a summary of requirements for the Volatile Organic Compound (VOC) monitor. These requirements describe the features and operations of the finished system. The requirements are divided into two main categories: Functional and Non Functional. Functional requirements describe the operations and tasks the system shall perform. Non Functional requirements describe how the system shall accomplish the functional requirements. The Functional and Non Functional requirements are divided into groups of related requirements.

**Functional Requirements**

The area of Functional requirements describes operations the system is intended to perform. Each requirement depicts a single behavior. Requirements are divided into groups based on relation. Each group of functional requirements illustrates a functional module that will be treated as a single task in development, testing and deployment.

Functional Requirements are prioritized as follows:

* H-A : High Priority, Architecture – These requirements are mandatory for architectural integrity of the system technical operation.
* H : High Priority – These requirements are part of system basic operation. Without these requirements, the system cannot be considered operational.
* M : Mid-Level Priority – These requirements are necessary for a final delivered system. The system will function without these operations; however, it may not be useful from and end user perspective.
* L : Low Level Priority – These requirements are items that may be added to the system if time allows

Functional Groups:

**User Communication**

The User Communication includes those requirements involved with the interaction between the end-user and VOC monitor. This communication system happens through a web application and emailing list. This is considered a secondary function of the system.

1. The system shall have an alert system.
   1. The system shall send alert to the user via e-mail list. M
   2. The system shall include symptom information within the e-mail. M
   3. The system shall include protection information within the e-mail. M
2. The system shall allow web application users to subscribe to e-mail alert system.
   1. The system shall allow users to add up to three zip codes to monitor with alert subscription. M

**VOC Representation**

The VOC Representation contains those requirements involved with the web application including aspects on what the web application will contain and how the web application is affected by the VOC data retrieval. This is considered part of the core system functionality and the primary purpose of the overall system operation.

1. The system shall display a toxic levels of VOC
   1. The system shall define toxic levels through a horizontal line on a parts-per-million

( PPM ) vs. time graph. HA

3.2 The system shall differentiate between VOC’s: HA

1. The system shall convey VOC data to end-user
   1. The system shall have one graph for all VOCs. HA
      1. The system shall have a VOC level in ppm vs. time graph. HA
      2. The system shall distinguish between VOCs via a drop down menu. HA
   2. The system shall provide VOC levels in a text format. H
   3. The system shall have a map displaying all VOC monitor locations. M
   4. The system shall provide symptom information for each VOC. M
   5. The system shall provide protection information for each VOC. M
2. The system shall update the web application after each retrieval from VOC monitor
   1. The system shall update the VOC level in PPM vs. time graph. M
   2. The system shall update VOC text files. H

**VOC Interaction**

The User Interaction contains those requirements involved with the direct interaction the VOC monitor. This is considered part of the core system functionality and necessary for the operation if the primary purpose of the overall system.

1. The system shall have PC initialize hand shake with XBEE. HA
2. The system shall send packets for monitor communication initialization. HA
3. The system shall enable point to point communication between monitors. M
4. The system shall have PC initialize termination hand shake with XBEE. HA
5. The system shall provide an option to download new or old VOC level data. M

10.1 The system shall be able to download the previous week’s VOC levels. H

10.2 The system shall be able to download the previous two weeks of VOC levels. M

11. The system shall notify user if VOC retrieval fails. M

12. The system shall notify user when VOC level retrieval is complete. M

**VOC Persistence**

The File System contains those requirements involved with the storage of VOC levels. This is considered part of the core system functionality and necessary for the operation if the primary purpose of the overall system. These functions encompass the secondary software of the system.

1. The system shall store individual VOC levels
   1. The system shall have date stamps for each VOC level retrieved. HA
   2. The system shall have time stamps for each VOC level retrieved. HA
   3. The system shall define each VOC monitor with a unique serial number. HA

13.4 The system shall retrieve VOC level every hour. HA

1. The system shall divide SD into two files: Old to hold VOC levels of last download and Current to hold incoming data. H
   1. The system shall delete Old file. H
   2. The system shall have PC download Current file. H
   3. The system shall transfer VOC level from Current to Old file. H
2. The system shall purge VOC data from SD card. H

**VOC Data Reduction**

The VOC Data Reduction contains those requirements involved with the interpretation and analysis of VOC levels. This is considered the core system functionality and the primary purpose of the overall system. These functions encompass the primary software of the system.

1. The system shall interpret VOC level
   1. The system shall define a toxic PPM VOC level for each VOC. HA
   2. The system shall convert VOC levels to PPM. HA
2. The system shall transfer VOC data (levels, time, date stamp, serial number) to SQL database. H

**Non Functional Requirements**

The area of Non Functional requirements describes the implementation areas of the system. Each requirement depicts a single rule for construction of the system. These requirements are not related to operational behavior. Requirements are divided into groups based on relation. Each group of Non Functional requirements will be single items that drive construction and platform details.

Non Functional Groups:

**Communication**

1. The system shall support Zigbee communication.
2. They system shall support XBEE communication.

**Platform**

1. The system shall be written in C++.
2. The system shall support a windows application.
3. The system shall have an SQL database.
4. The system shall have a Windows app.

**Monitor Hardware**

1. The system shall store VOC levels on an SD card.
2. The system shall store VOC levels on SD through an Arduino SD shield.
3. The system shall retrieve VOC levels through TGS2620 sensor.
4. The system shall communicate to a PC through an XBEE.
5. The system shall retrieve VOC levels from VOC sensors through an Arduino UNO R3.
6. The system shall retrieve VOC levels through a thumb drive.
7. The system shall burn in the sensor for one week prior to use.
8. The system shall expose VOC sensor outside containment.

**Web Application**

1. The system shall display each VOC level through a time-line graph.
2. NF The system shall make raw VOC level data accessible on web application.
3. The system shall provide protection and symptom information through web application.
4. The system shall export a map from Google maps.
5. The system shall have a map locating all VOC monitors through web application.
6. The system shall send alerts to users through an e-mail mailing list.

Physical Layer

1. The system shall protect VOC hardware with a hard plastic structure.

**Power Supply**

1. The system shall be powered with a solar panel.

32.1 The system shall store solar energy through Arudnio shield.