Signs with smart connectivity for better road safety

1 Introduction:

Signal lights have an important safety function. They demonstrate declaration and a change in direction of the vehicle, and make the vehicle more visible to other road user when it is dark or during poor visibility. Indicator lights are amber in color and can be located at the front, the rear and sometimes at the side of the car or both the left and the right-hand sides .

1.1 Project Overview:

Road accidents are on the day by day and in countries like India automobiles are moved prevalent, many people die due to careless caused during indicator usage. Our project focused on turning on and off the indicator by getting appropriate instructions from the GPS connected map.

1.2 Purpose:

The main purpose of this system is:

To avoid the number of road accidents which occur due to improper usage of indicators.

To help people during busy hours and also during emergency situations.

2 Literature survey:

For our project we have analysed to many research paper related to our concept. The information obtained from the survey is given below.

2.1 Existing problem:

The existing problem is that in manual mode of indication, the rider usually forgot to use the indicator on the right time. Many times a bike indicators are used improperly which confuses the other road users. In the semi-automatic turn on/off bike indicator the problem occurs then the manualling of bike indicates will not be done even after the turning is completed.

2.2 References:

An IoT based Intelligent Transport and Road Safety System
P. Sharmila; J.M Nandhini; K. Anuratha; Soshya Joshi.

IoT Based Smart Road Safety and Vehicle Accident Prevention System for Mountain Roads

Kailas Shinde, Shivani Valhvankar.

2.2 Problem statement Definition:

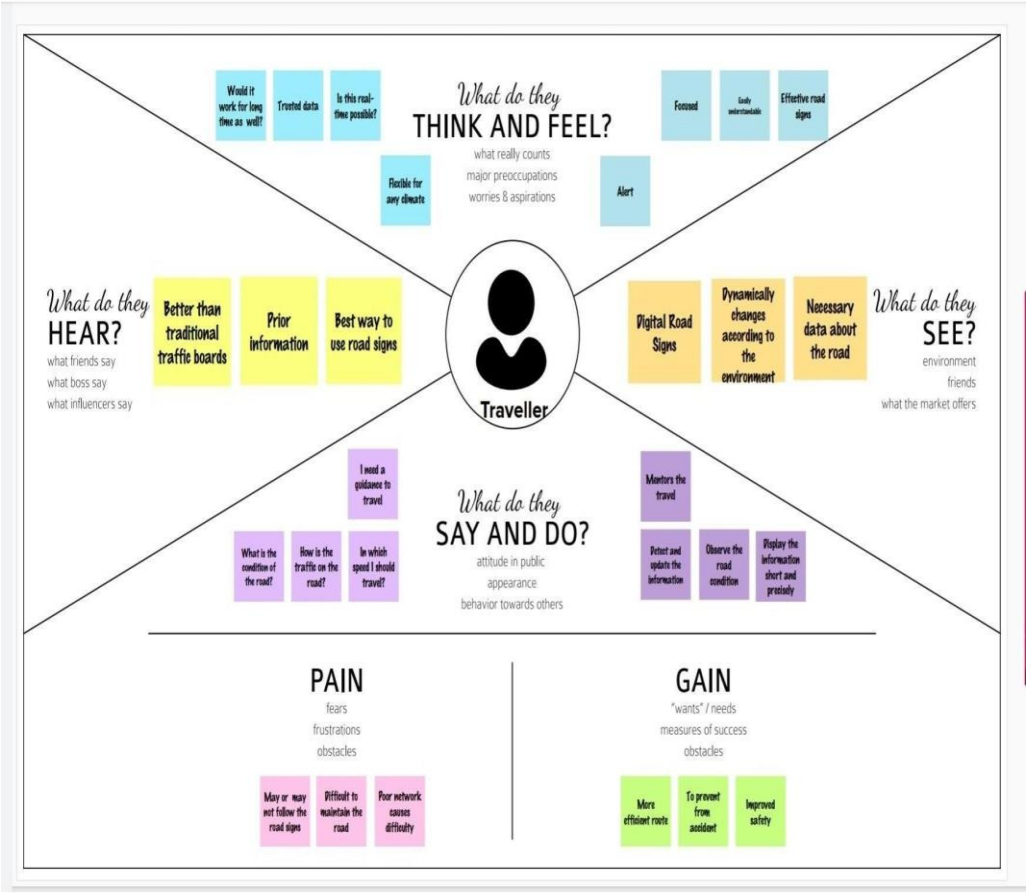
Nearly 15 million reported Traffic violation take place annually. These collision leads to collision by accident. Accidents may occurs when the driver doesn't have a proper knowledge on indicator allocation. This can also happen accidently to a great extend. So in order to increase our road safety and protect proper from severe accidents the above mentioned issue.

3 Ideation & Proposed Solution:

The ideation and proposed solution is given below:

3.1 Empathy Map Canvas:

An empathy map is a simple, easy-to-digest visual that captures knowledge about a user's behaviours and attitudes. It is a useful tool to helps teams better understand their users. Creating an effective solution requires understanding the true problem and the person who is experiencing it. The exercise of creating the map helps participants consider things from the user's perspective along with his or her goals and challenges.



3.2 Ideation & Brainstorming:

Brainstorming provides a free and open environment that encourages everyone within a team to participate in the creative thinking process that leads to problem solving. Prioritizing volume over value, out-of-the-box ideas are welcome and built upon, and all participants are encouraged to collaborate, helping each other develop a rich amount of creative solutions. Use this template in your own brainstorming sessions so your team can unleash their imagination and start shaping concepts even if you're not sitting in the same room.

3.3 Problem solution fit:

In this part of the project various questions asked about the project are answered. The questions are asked about the customer segments, problem to be solved, triggers, customer constraints, problem root cause, our proposed solution, available solution, behaviou, channels of behaviour, emotions of customer before & after the implementation of idea. After answering the above questions, the solution becomes more clear.

4 Requirements Analysis:

The various functional and non-functional requirements of the project are discussed below:

4.1 Functional Requirements :

The various functional requirements of the proposed solution:

User Visibility: Sign Boards should be made of bright coloured LEDs capable of attracting driver's attention Not too distracting to cause accidents.

User Understanding: Should display information through means like images/illustrations with text so that the user can understand the signs correctly.

User Convenience: Display should be big enough to display all the signs correctly so that it is visible event of faraway drivers.

4.2 Non-Functional Requirements:

Following are the non-functional requirements of the proposed solution:

Usability: Should be able to dynamically update with respect to time.

Security: Should be secure enough that only the intended messages are displayed in the display.

Reliability: Should convey the traffic information correctly.

Performance: Display should update dynamically whenever the weather or traffic values are updated.

Availability: Should be on service 24/7.

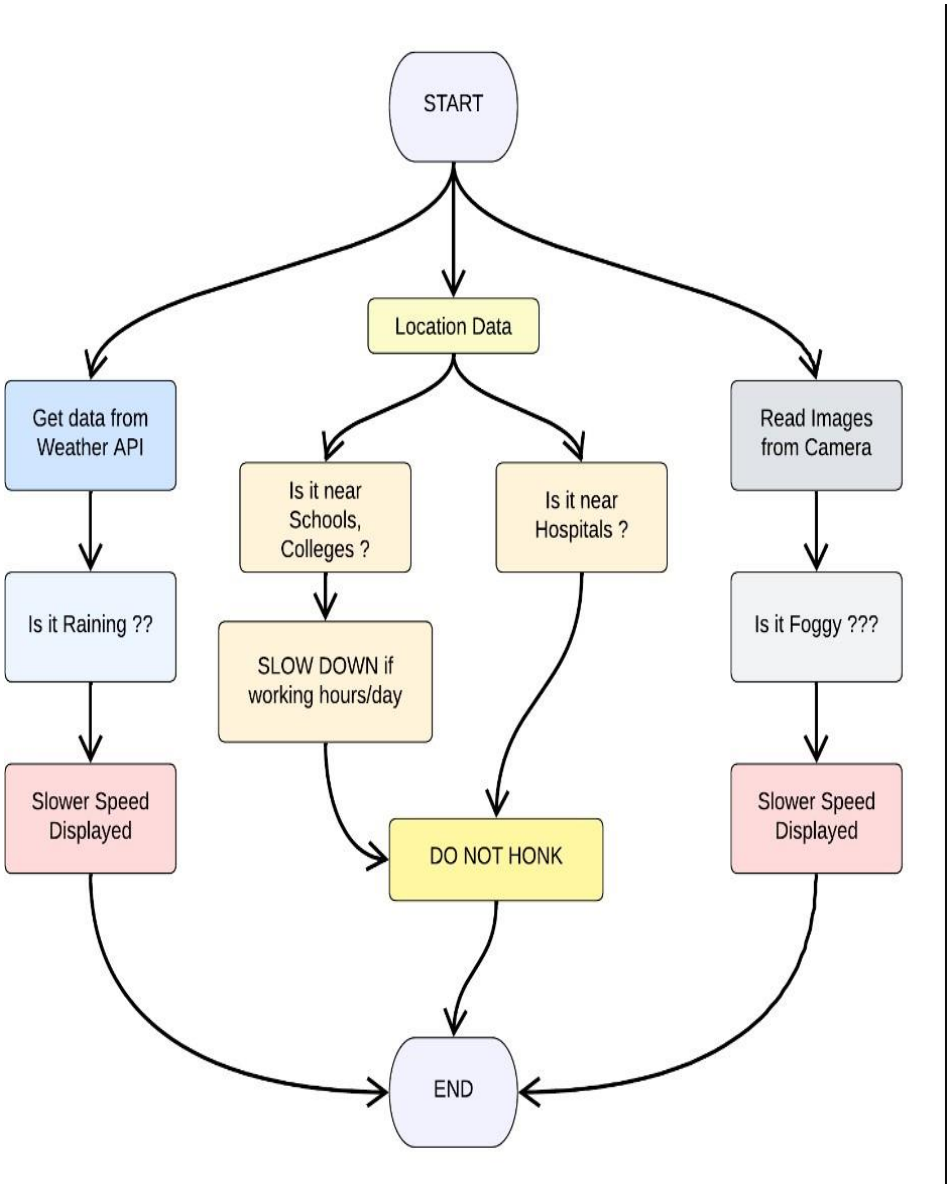
Scalability: Should be modular and hence able to scale on servers horizontally.

5 Project Design

This section concerns with the design of flow diagrams, solution and technical architectures and user stories.

5.1 Data Flow Diagrams :

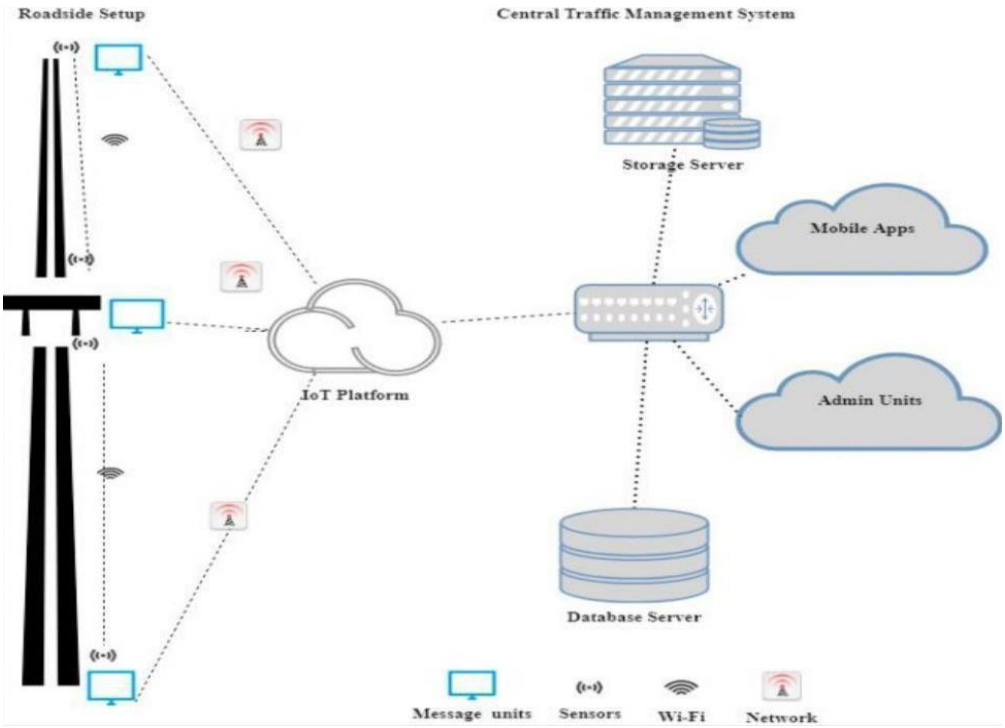
A Data Flow Diagram (DFD) is a traditional visual representation of the information flows within a system. A neat and clear DFD can depict the right amount of the system requirement graphically. It shows how data enters and leaves the system, what changes the information, and where data is stored.



5.2 **Solution & Technical Architecture:**

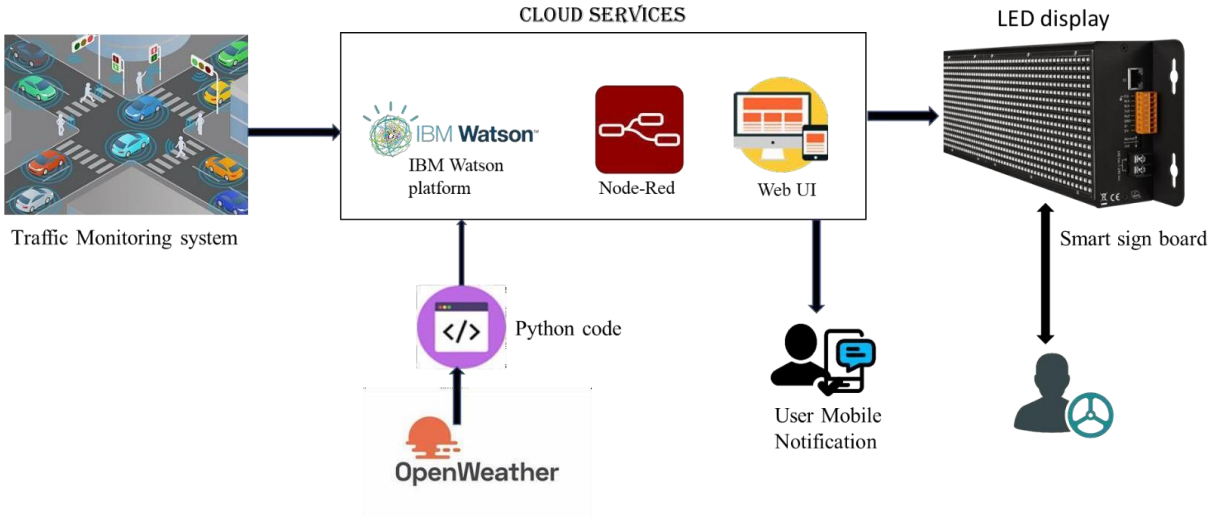
Solution architecture is a complex process – with many sub-processes – that bridges the gap between business problems and technology solutions. Its goals are to:

- Find the best tech solution to solve existing business problems.
- Describe the structure, characteristics, behaviour, and other aspects of the software to project stakeholders.
- Define features, development phases, and solution requirements.
- Provide specifications according to which the solution is defined, managed, and delivered



Technical Architecture:

- In Technical Architecture IOT device act as the hardware device which sends the message to the user using cloud services.
- In cloud services it contains some interfaces such as:
    - IBM Watson IOT Platform
    - Node-Red
    - Web UI



In this above diagram it shows the process of technical architecture. That it shows that the IOT device will send the data to the cloud services and the IBM Watson IOT platform will receive the data and it passes to the node red and then it is received by the web UI after it is received by the user. Python code (random data) is stored in cloudant DB. And object storage is will store the process from IOT device.

5.3 User Stories:

6 Project planning &Scheduling:

This section contains the project planning and the schedules for various tasks.

6.1 Sprint Planning & Estimation:

Sprint 1:

- As a user, I can register for the application by entering my email, password, and confirming my password.
- As a user can login using the email and password.
- Create the IBM Cloud services which are being used in this project.
- Configure the IBM Cloud services which are being used in completing this project.

Sprint 2:

- IBM Watson IoT platform acts as the mediator to connect the web application to IoT devices, so create the IBM Watson IoT platform.
- In order to connect the IoT device to the IBM cloud, create a device in the IBM Watson IoT platform and get the device credentials.
- Configure the connection security and create API keys that are used in the Node-RED service for accessing the IBM IoT Platform.

Sprint 3:

- To create a web application create a Node-RED service.
- Launch the cloudant DB and create a database to store the image URL.

Sprint 4:

- Create a cloud object storage service, create a bucket to store the images, and configure the bucket settings.
- Develop a python script.
- Develop a python script to publish random sensor data such as temperature, moisture, soil and humidity to the IBM IoT platform.

6.2 Sprint Delivery Schedule:

The sprint delivery schedule is shown below :

Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed (as on Planned End Date)	Sprint Release Date (Actual)
Sprint-1	20	6 Days	24 Oct 2022	29 Oct 2022	20	29 Oct 2022
Sprint-2	20	6 Days	31 Oct 2022	05 Nov 2022	20	05 Nov 2022
Sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022	20	12 Nov 2022
Sprint-4	20	6 Days	14 Nov 2022	19 Nov 2022	20	19 Nov 2022

Burn-Down Chart:

A burn down chart is a graphical representation of work left to do versus time. It is often used in agile software development methodologies such as Scrum. However, burn down charts can be applied to any project containing measurable progress over time.

6.3 Reports from JIRA:

Advantages & Disadvantages:

Advantages:

1)Automatic turn on/off by using GPS.

2)Will turn on even at rush hours.

3) Power will be received form the battery.

Disadvantages:

- Continuous and stable internet connection will be needed for proper working of system.

- Technical failure may take place.
- The bike indicators are controlled before 100 m

7 Conclusion:

In this proposed scheme an automatic turn on/off indicator is developed, with the help of connected global positioning system. Moreover, it help to reduce accidents to a great extend.Thus it would really help people during rush hours and also provide a great help during emergency situations. Future projects can be made on this topic by connecting brakes and the level of fuel identification.