Signs with smart connectivity for better road safety

IBM PROJECT PPT

Team Id : PNT2022TMID18923

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Introduction

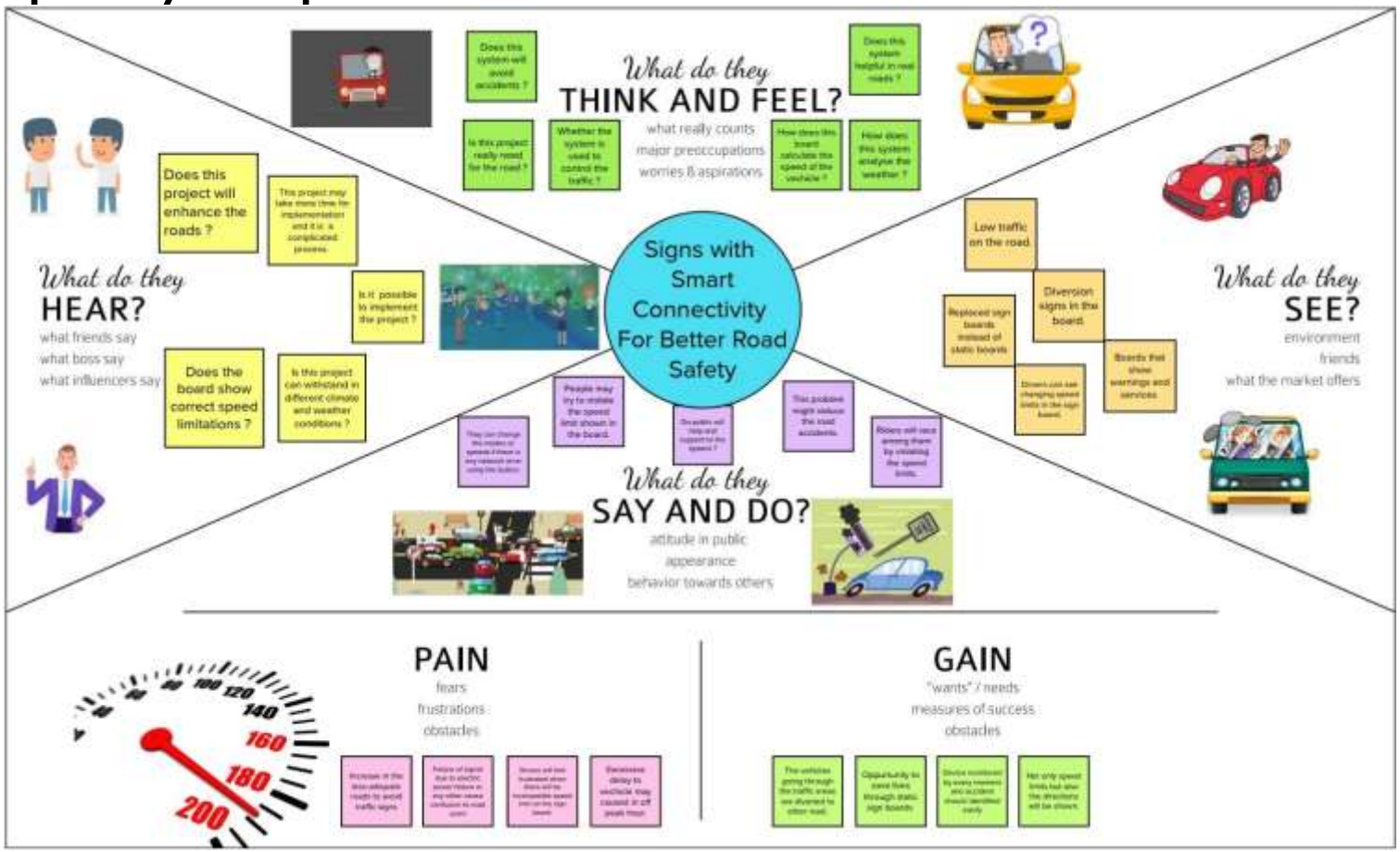
- To replace the static signboards, smart connected signboards are used.
- These smart connected sign boards get the speed limitations from a web app using weather API and update automatically.
- Based on the weather changes the speed may increase or decrease.
- Based on the traffic and fatal situations the diversion signs are displayed.
- Guide (Schools), Warning and Service (Hospitals, Restaurants) signs are also displayed accordingly.
- Different modes of operations can be selected with the help of buttons.
- Smart Traffic Management is a system to monitor and control traffic signals using sensors to regulate the flow of traffic and to avoid congestion for a smooth flow of traffic.
- Prioritizing traffic like ambulances, police etc. is also one application comes under smart traffic management.

Literature Survey

- Analysis of crash data has suggested a link between roadside advertising signs and safety.
- Research suggests that crash risk increases by approximate 25–29% in the presence of digital roadside advertising signs compared to control areas.
- On the other hand, static roadside advertising signs have not been linked with differences in the crash count.
- However, this finding is contrary to previous research that suggests differences in crash counts exist in the presence of static roadside advertising.
- The quantity and quality of available evidence limit our conclusion.
- Fixed object, side swipe and rear end crashes are the most common types of crashes in the presence of roadside advertising signs.
- PROBLEM STATEMENT : This project will replace the static boards to smart signed boards that will change the speed limits according to the weather climate and show diversion messages if there are accidents in the road and alert messages if there is hospital, schools or any road works.

Ideation and proposed solution

Empathy map



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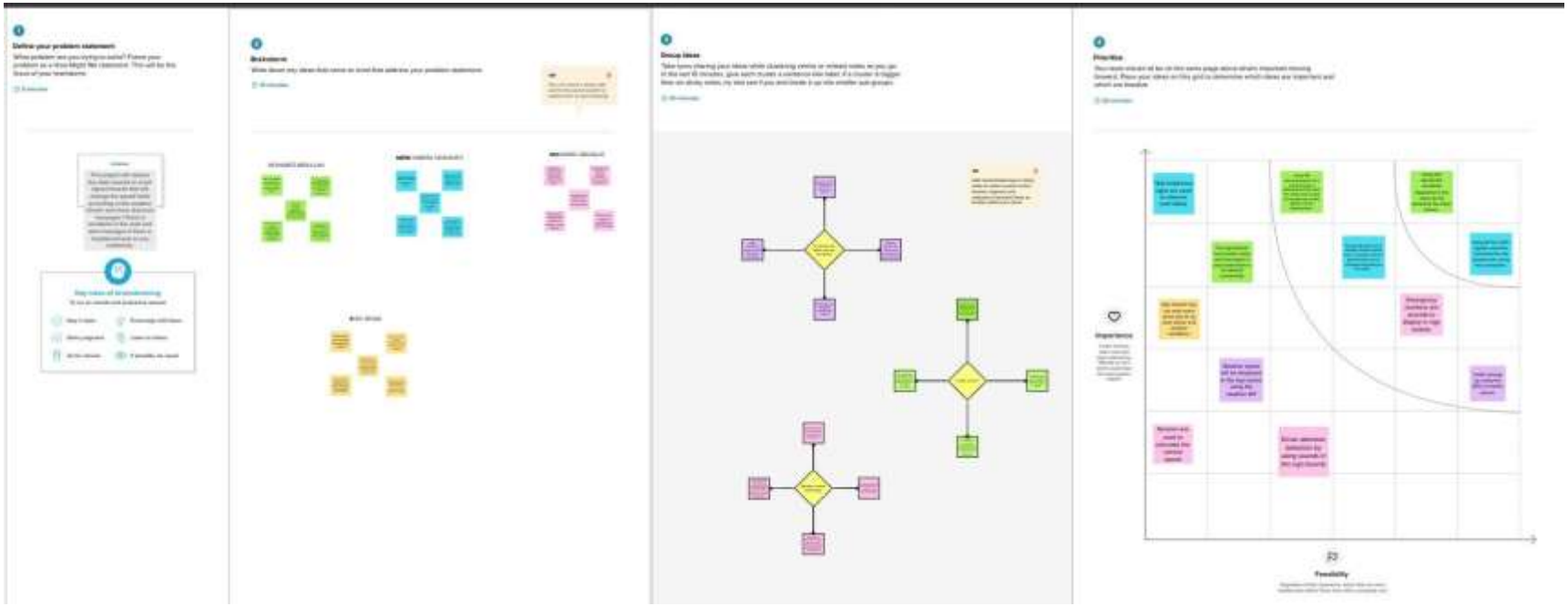
Ideation and brainstorming



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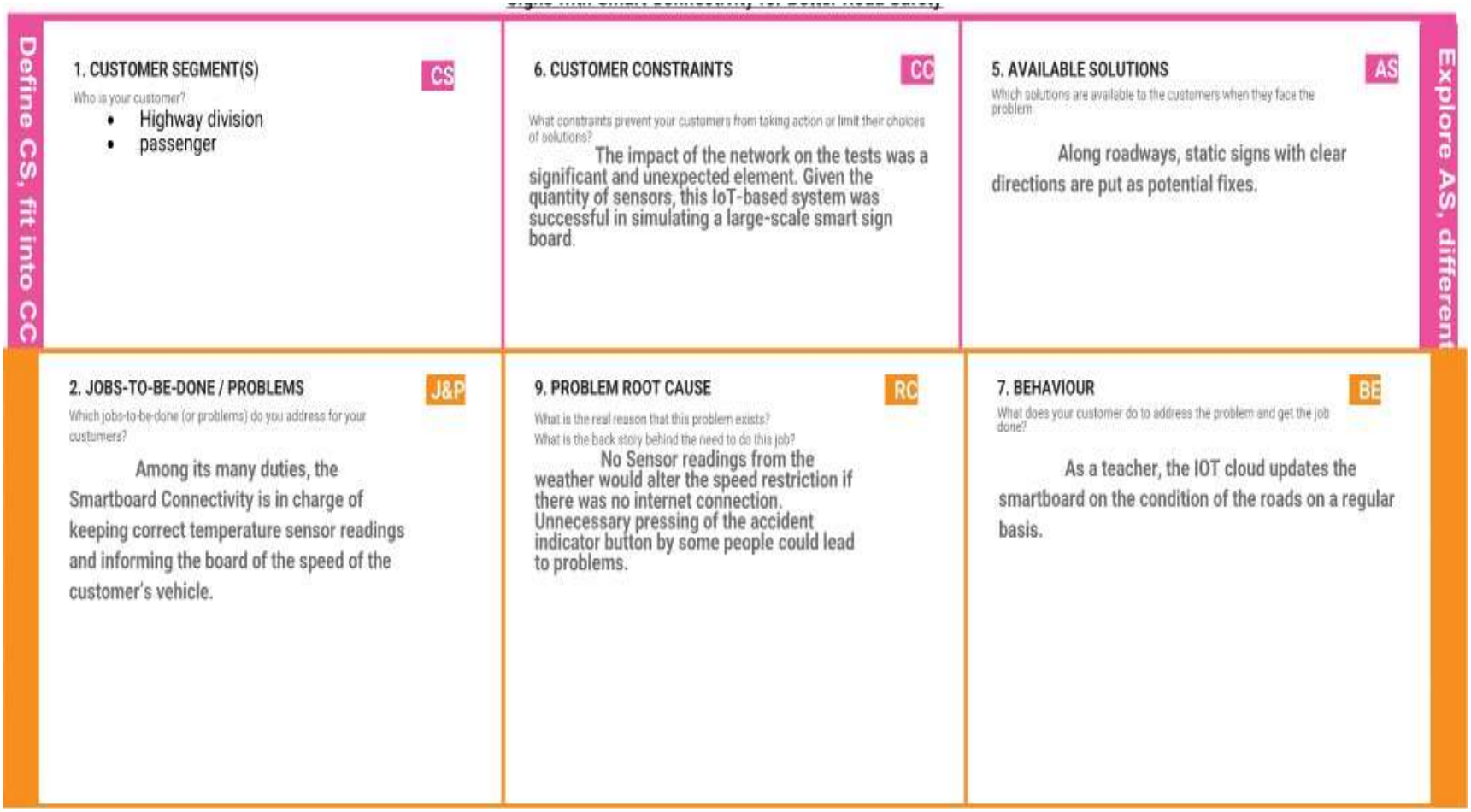
Problem solution fit



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3. TRIGGERS

TR

What triggers customers to act?

. Poor weather conditions prevail. The vehicle should be moving at threshold speed. The sensor value should be shown on the smart board to alert the customer.

10. YOUR SOLUTION

SL

We employ smart linked sign boards as an alternative to static signboards. With the help of a web app and weather API, these intelligent connected sign boards automatically update with the current speed limits. The speed may rise or fall in response to variations in the weather. The display of diversion signs are determined by traffic and potentially fatal situations. As appropriate, there are also signs that read "Guide (Schools), Warning, and Service" (Hospitals, Restaurants). Using buttons, it is possible to choose from a variety of operating modes.

8. CHANNELS of BEHAVIOUR

CH

8.1 ONLINE

What kind of actions do customers take online?

The departments can receive direct emails or messages from customers. (Officers on nearby patrol).

8.2 OFFLINE

What kind of actions do customers take offline?

Following directions is one of the main tasks for the traveler, but they can utilize the smartboard signs to check the state of the road from wherever they are.

4. EMOTIONS: BEFORE / AFTER

EM

How do customers feel when they face a problem or a job and afterwards?

Clients will feel better after selecting an operation mode with the use of smartboard connectivity, and they will then follow the instructions on the smartboard.

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Requirement analysis

FR-I

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

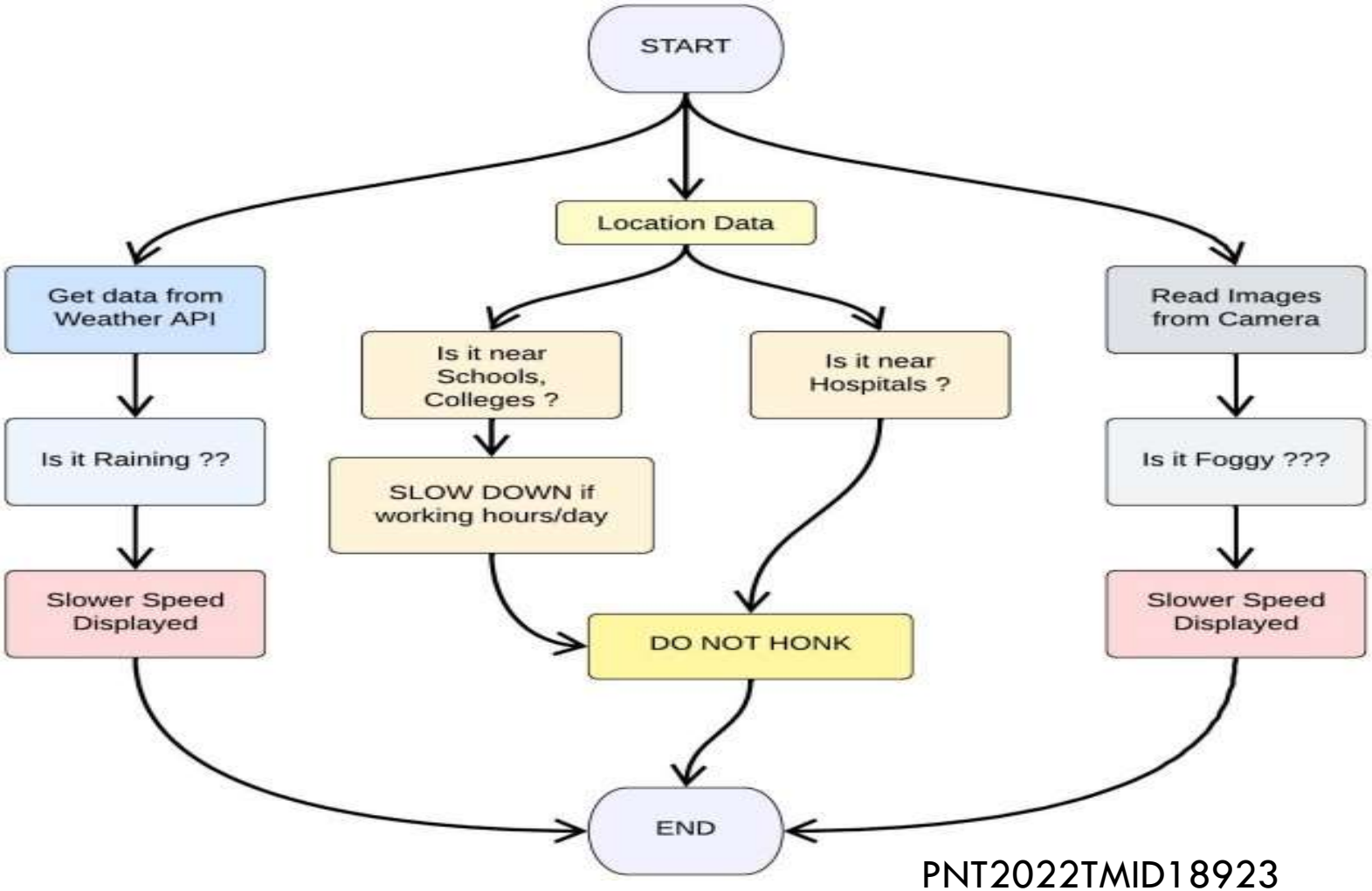
FR-2

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

FR-3

- User Convenience
- Display should be big enough to display all the signs correctly so that it is visible even to far away drivers

Project design



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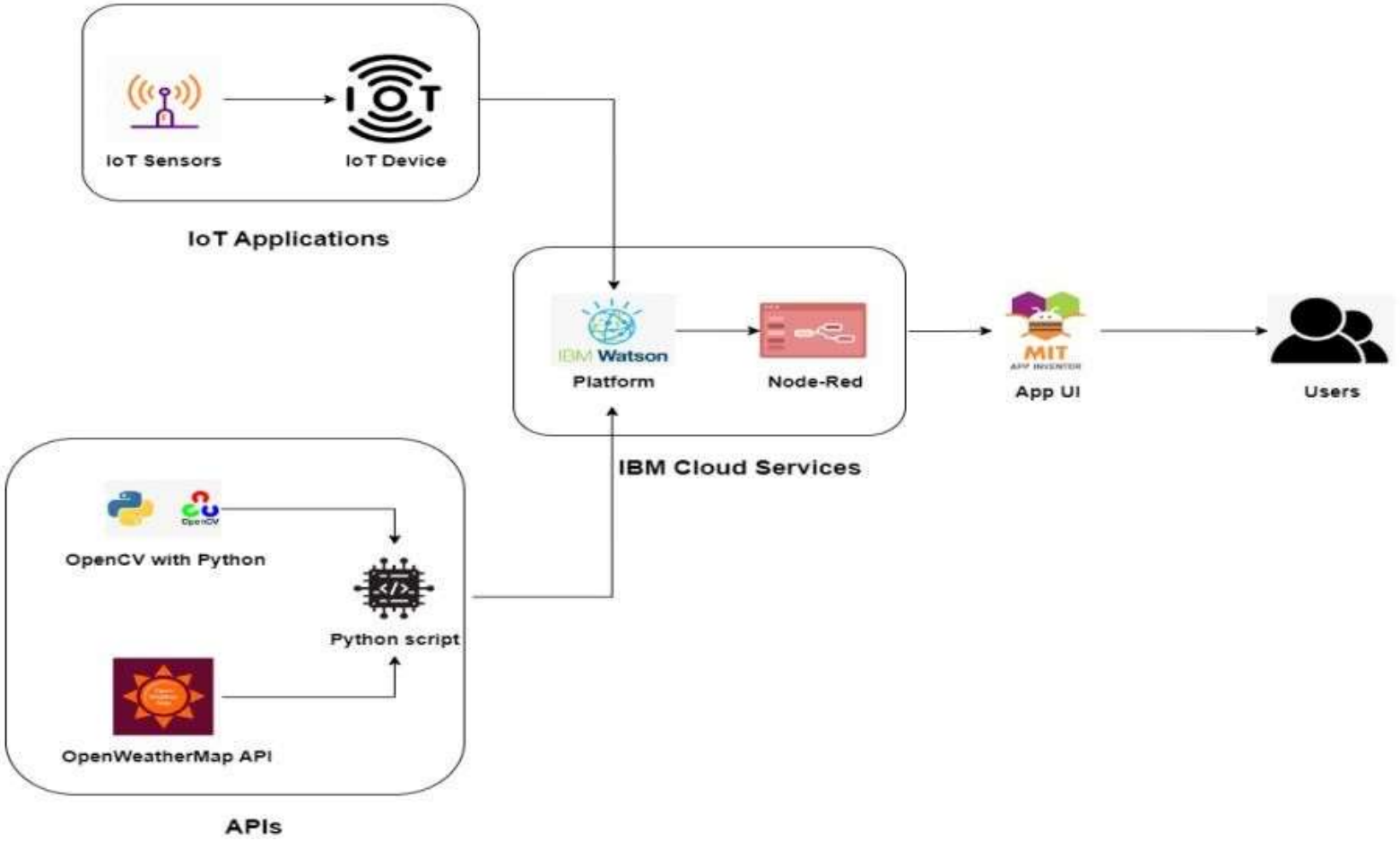
Solution and technical architecture



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User stories

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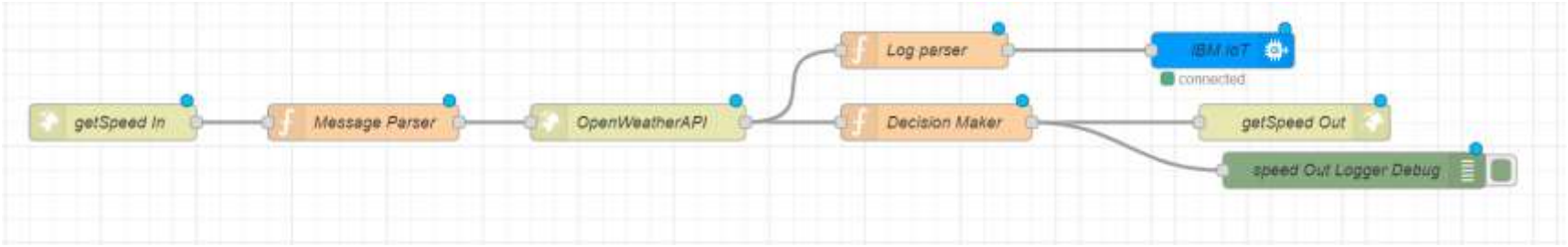
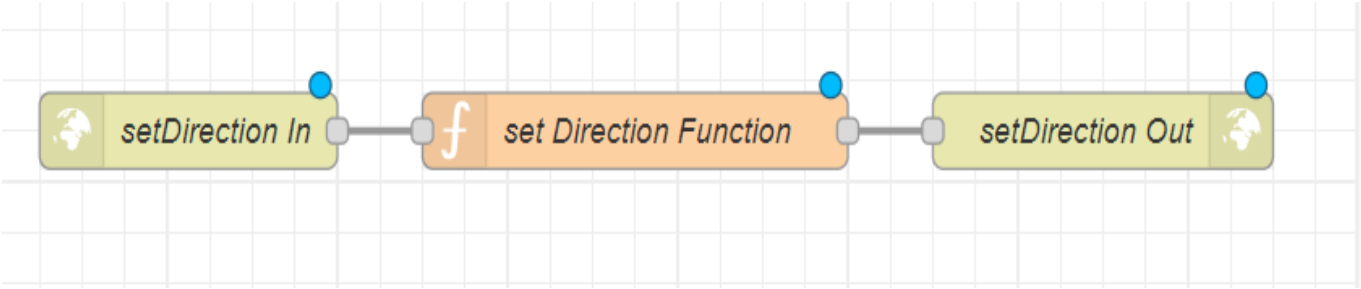
Coding and solutioning





- This part of Node RED flow accepts an http GET end point at **"/get Speed"** from which the location, uid, hospital/school zone info are passed.
- Message parser sets the required APIKEY for **Open Weather API**
- for the next block.
- This data is then passed onto Decision Maker which makes all the decisions regarding the message to be output at the display and sends it as a http response.
- This data is displayed at the microcontroller. Thus, a lot of battery is saved due to lesser processing time.
- This part of Node RED flow accepts an **http GET** end point at **"/setDirection"** from which the uid and direction information are passed by the respective authorities**. Set Direction** Function block adds the direction information to the database and returns the same as an http response. This data is sent to the microcontroller along with the **"/getSpeed"** path and the microcontroller displays it.

Testing

- **Test Cases**

TEST CASE 1

- Clear weather - Usual Speed Limit.

TEST CASE 2

- Foggy Weather - Reduced Speed Limit.

TEST CASE 3

- Rainy Weather - Further Reduced Speed Limit.

TEST CASE 4

- School/Hospital Zone - Do not Honk sign is displayed.

User Acceptance Testing

- Dynamic speed & diversion variations based on the weather and traffic helps user to avoid traffic and have a safe journey home.
- The users would welcome this idea to be implemented everywhere.

Performance Metrics

- Based on the IBM pack we chose, the performance of the website varies. Built upon NodeJS, a light and high performance engine, Node RED is capable of handling up to 10,000 requests per second.
- Moreover, since the system is horizontally scalable, an even higher demand of customers can be served.

ADVANTAGES

- Lower battery consumption since processing is done mostly by Node RED servers in the cloud.
- Cheaper and low requirement micro controllers can be used since processing requirements are reduced.
- Longer lasting systems.
- Dynamic Sign updating.
- School/Hospital Zone alerts

DISADAVNTAGES

- The size of the display determines the requirement of the micro controller
- Dependent on Open Weather Map API and hence the speed reduction is same for a large area in the scale of cities.

Future scope

- Introduction of intelligent road sign groups in real life scenarios could have great impact on increasing the driving safety by providing the end-user (car driver) with the most accurate information regarding the current road and traffic conditions. Even displaying the information of a suggested driving speed and road surface condition (temperature, icy, wet or dry surface) could result in smoother traffic flows and, what is more important, in increasing a driver's awareness of the road situation.

Conclusion

- Our project is capable of serving as a replacement for static signs for a comparatively lower cost and can be implemented in the very near future.
- This will help reduce a lot of accidents and maintain a more peaceful traffic atmosphere in the country.