

# Infosys Makeathon 5.0 Phase 1



# Team and Use Case



- **USE CASE:**

Create a platform that promotes sustainable transportation options, such as intelligent traffic management, optimized public transportation systems, and real-time monitoring of vehicular emissions to reduce congestion, promote alternative modes of transport, and also, lower carbon footprints/emissions.

- **TEAM NAME: Virtuosos**

- **TEAM MEMBERS WITH COLLEGE DETAILS:**

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# Use Case



## □ CONTEXT-

- In today's modern transportation industry, the efficient movement of goods is of utmost importance. The weight of trucks and the proper monitoring of their loads play a crucial role in ensuring road safety, minimizing damage to infrastructure, and complying with legal regulations. To address these concerns, the integration of Internet of Things (IoT) devices has emerged as a groundbreaking solution.
- The Truck Weight and Monitoring IoT Device is a cutting-edge technology designed to accurately measure and monitor the weight of trucks and their cargo. It consists of various components, including sensors, connectivity modules, data processing units, and a cloud-based management system.
- Sensors, connectivity modules, data processing units, and a cloud-based management system are key components.
- Sensors are installed on the truck's chassis or suspension systems to measure weight distribution and overall load.
- Sensors use advanced technologies like strain gauges, load cells, or pressure sensors for precise real-time weight measurements.
- Data from sensors is wirelessly transmitted to the connectivity module.
- Data processing unit analyzes the weight measurements, calculates total weight, and assesses weight distribution patterns.
- Real-time alerts and notifications are generated for weight irregularities, facilitating proactive actions.

## □ Benefits:

- 1) Enhances road safety by preventing overloading and reducing accidents, increased braking distances, and infrastructure damage.
- 2) Enables timely intervention, reducing the risk of violations and penalties.
- 3) Optimizes operational efficiency by ensuring balanced loads, improving fuel economy, and extending vehicle lifespan.
- 4) IoT devices for truck weight and monitoring have revolutionized the transportation industry.
- 5) Provides real-time insights into truck weights and load distribution for safety, compliance, and operational efficiency.
- 6) Shapes the future of the trucking industry by preventing accidents, optimizing resources, and streamlining regulatory compliance.



# Business relevance -



The key business benefits associated with this technology:

- 1. Compliance with Legal Regulations:** Many jurisdictions have strict regulations regarding truck weights and load limits to ensure road safety and prevent damage to infrastructure. Implementing the IoT device enables businesses to comply with these regulations, avoiding penalties, fines, and potential legal consequences. By maintaining compliance, companies can protect their reputation and maintain a positive relationship with regulatory authorities.
- 2. Improved Fleet Efficiency:** Overloading trucks or uneven weight distribution can lead to increased fuel consumption, excess wear and tear on vehicles, and reduced overall efficiency. The IoT device provides real-time weight monitoring and load distribution analysis, allowing fleet managers to optimize the use of their resources. By ensuring balanced loads, companies can reduce fuel costs, enhance vehicle lifespan, and improve operational efficiency.
- 3. Enhanced Safety Measures:** Overloaded trucks pose a significant risk on the roads, as they have longer braking distances and increased chances of accidents. The IoT device's real-time monitoring and alerts help identify potential weight irregularities, such as overloading or imbalanced loads, allowing proactive measures to be taken. By prioritizing safety, businesses can minimize the risk of accidents, protect their drivers, and avoid potential liabilities.
- 4. Preventive Maintenance and Cost Savings:** The IoT device provides valuable data on truck weights and load patterns, enabling businesses to identify potential issues with vehicle performance or load management. By analyzing this data, companies can implement preventive maintenance measures, address potential problems in advance, and reduce costly breakdowns or repairs. Proactive maintenance not only improves operational efficiency but also helps in cost savings by avoiding unplanned downtime.

# Business solution



We will be building the sensor and IOT based device that will help in solving the problem of overloading of trucks to prevent frequent accidents. ***As soon as the sensor will detect the problem of overloading The device will not allow the truck to get start and move further at the warehouse itself, so that they can reduce of the weight and then can move .***

With advancements in IoT technology, the Truck Weight and Monitoring IoT Device offers a future-proof solution. It can be integrated with other IoT devices and systems for a comprehensive fleet management solution. The device's scalability and adaptability make it suitable for evolving business needs and technological advancements.

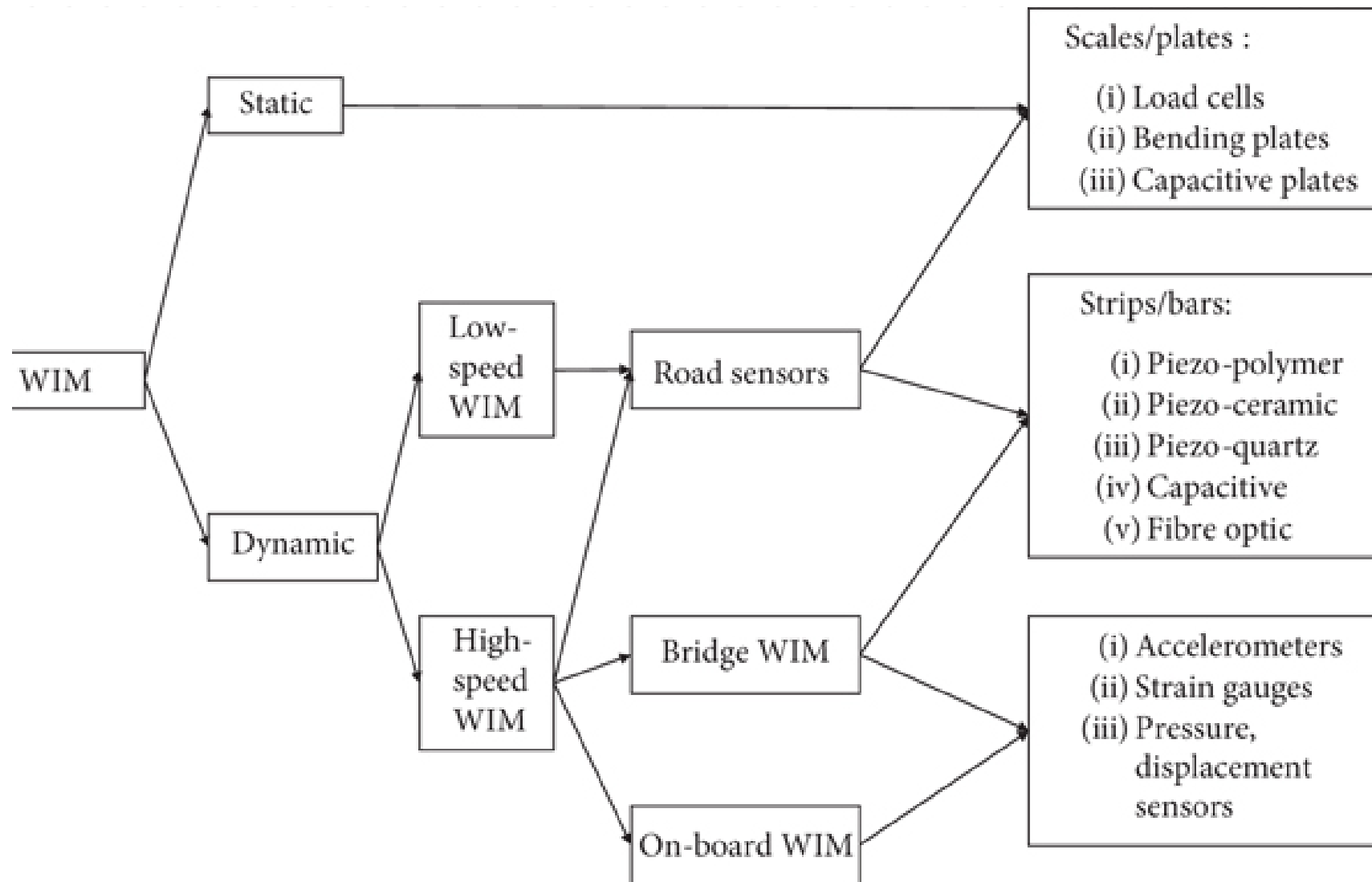
By implementing this cutting-edge technology, businesses can gain a competitive advantage in the transportation industry. They can demonstrate a commitment to safety, compliance, and operational efficiency, which can attract customers, reduce risks, and enhance their reputation in the market.

## Technical Solution



The truck overloading device is designed to address the issue of overweight vehicles, which can pose significant risks to road infrastructure and public safety. By combining MEMS sensors, load sensors, and pressure sensors, the device can accurately measure the load and pressure exerted on the truck. It actively prevents the vehicle from starting if it detects an overload or abnormal pressure, ensuring compliance with weight regulations.

# Flow Diagram





# Truck Overloading Device with MEMS Sensor, Load Sensor, and Pressure Sensor for Vehicle Start Prevention

Start

Acquire data from MEMS sensors, load sensors, and pressure sensors

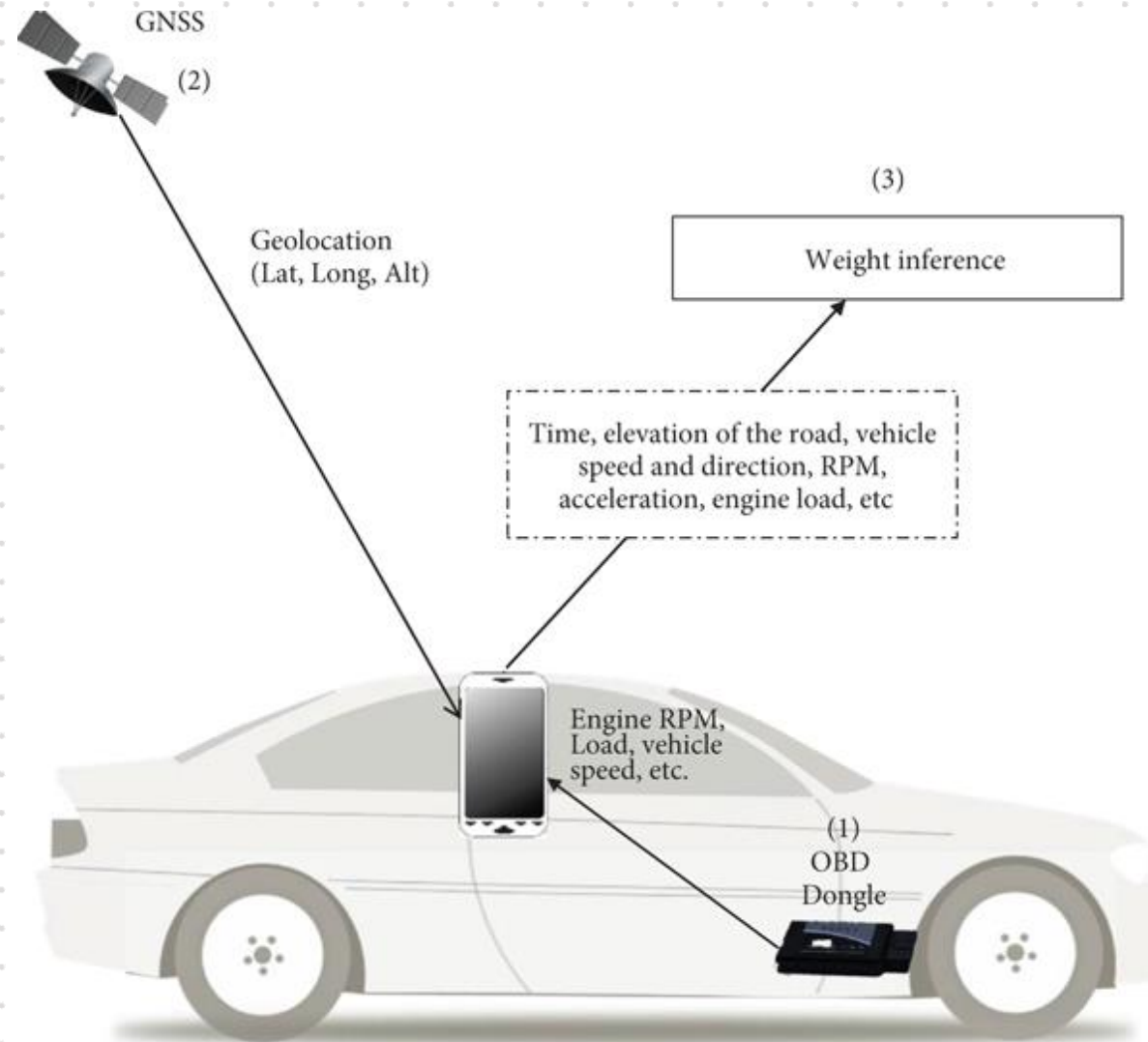
Process acquired sensor data

Is the load within permissible limits?

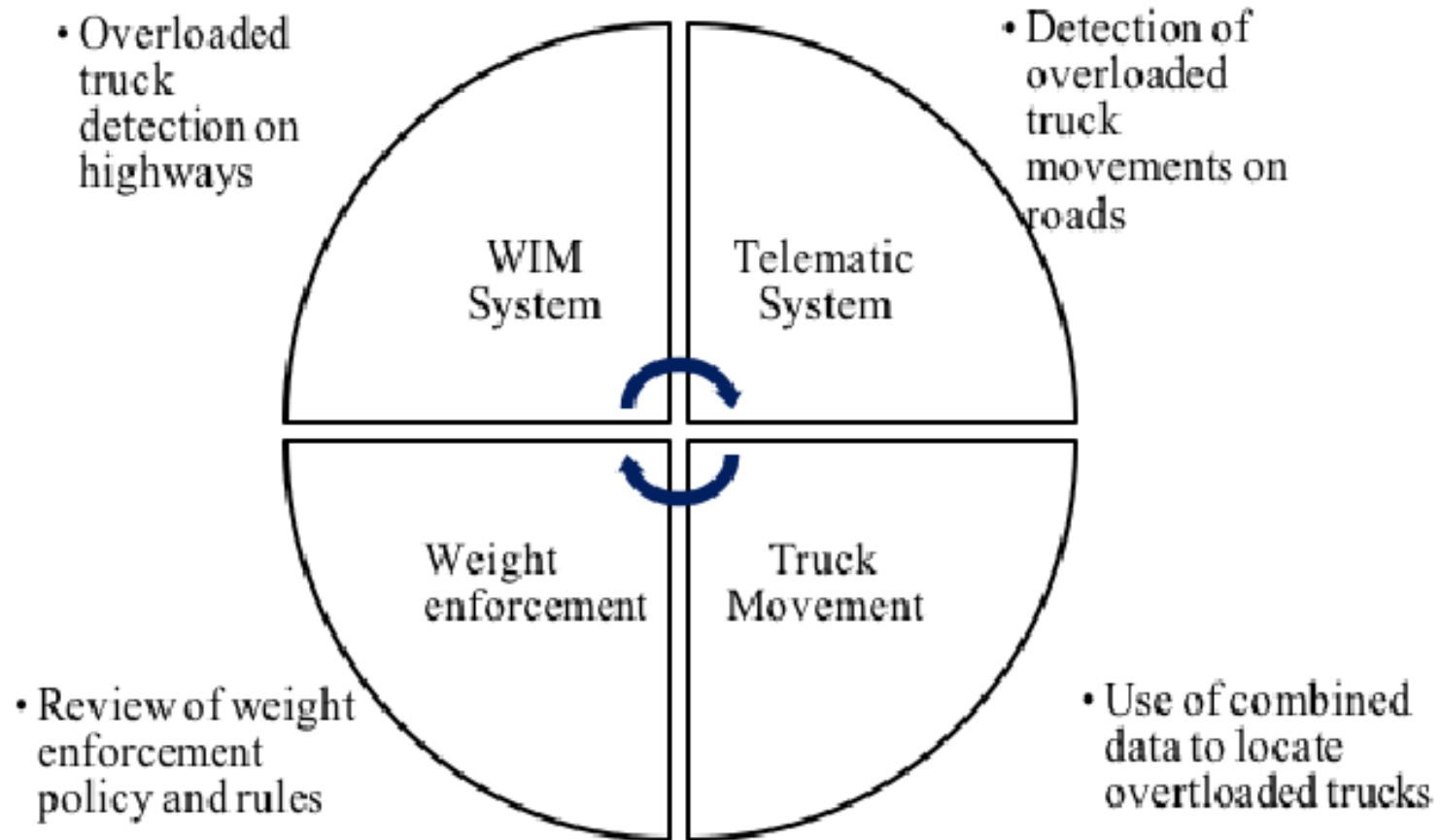
- |
- |-- No -- Prevent vehicle start
- |
- |-- Yes -- Is the pressure within safe range?
- |
- |-- No -- Prevent vehicle start
- |
- |-- Yes -- Allow vehicle start

End

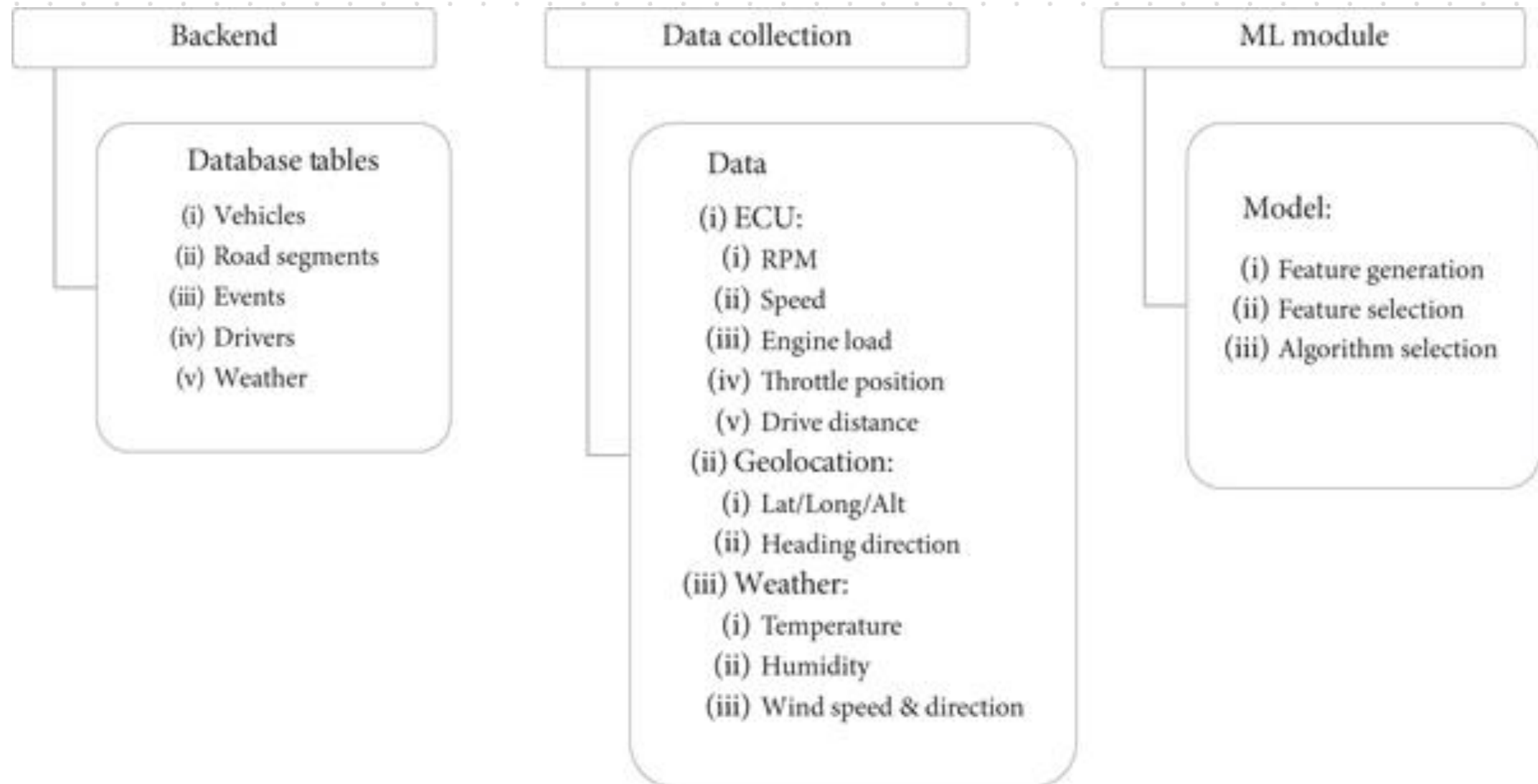
# Architecture



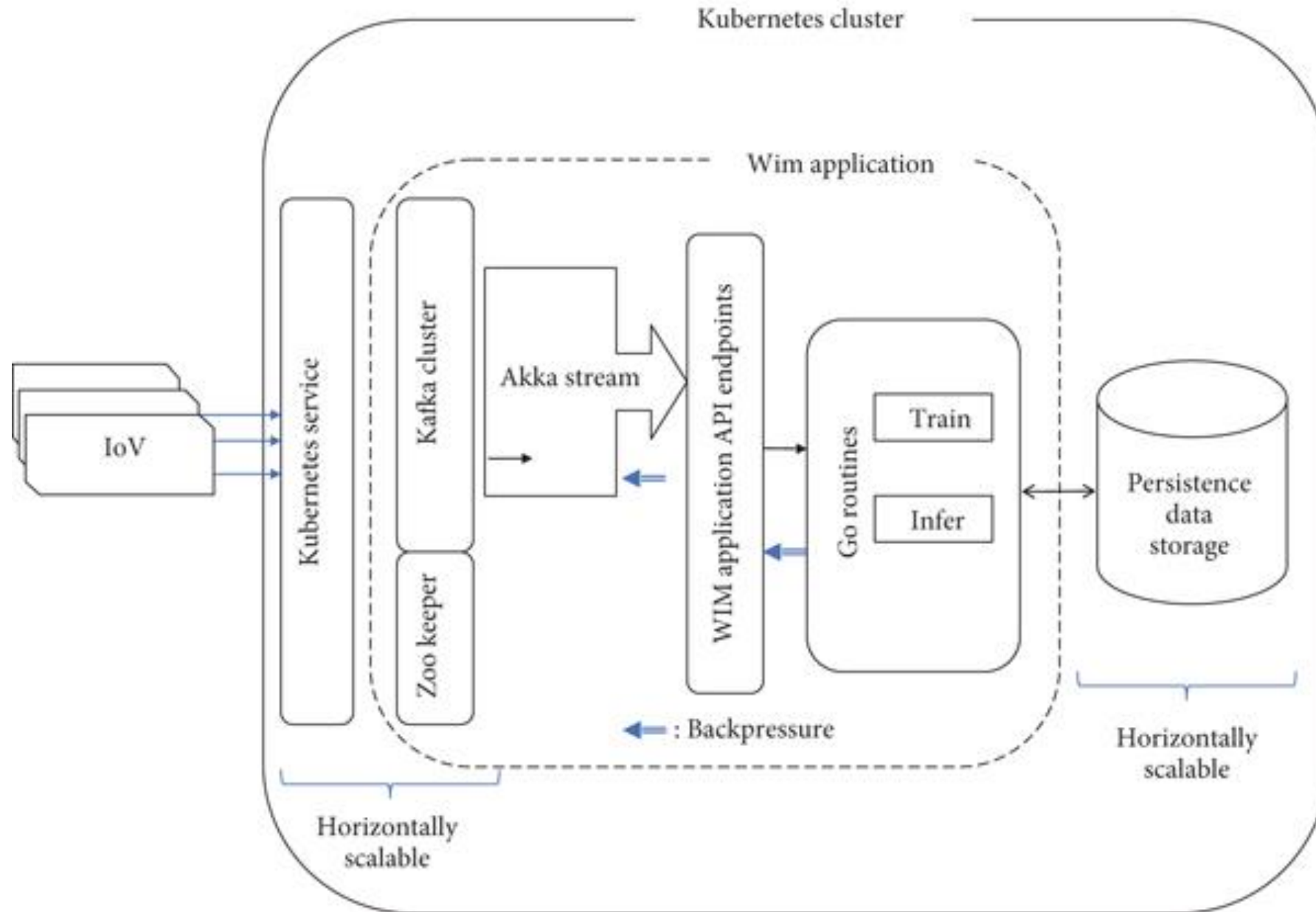
# Diagram



# Deployment



# Deployment Model





# How did you arrive this solution?

The primary reason for suggesting the implementation of this solution is the increasing number of accidents and instances of instability that are being encountered while driving. This issue is of utmost importance and needs to be addressed immediately in order to ensure the safety of drivers, passengers, and other individuals who use the roadways.

The proposed solution involves the installation of a system that detects overloading of trucks and prevents them from starting their ignition. By adopting this solution, we hope to minimize the risks associated with driving and promote a safer driving experience for all.

## Any other relevant components to explain your solution better

1. **Real-time Data Acquisition:** Collect real-time data from various sources, such as weighbridges, sensors, or IoT devices installed in trucks.
2. **Integration with Weighing Systems:** Integrate the model with weighing systems to automate the process of capturing truck weights.
3. **Threshold Setting:** Determine appropriate thresholds for identifying overloaded trucks based on regulatory guidelines, safety standards, or specific requirements of your organization.
4. **Alarm and Alert Mechanisms:** Notify relevant stakeholders when a truck is detected as overloaded.
5. **Reporting and Analytics:** Generate periodic reports on truck overloading incidents, trends, and patterns.
6. **Integration with Fleet Management Systems:** Integrate the truck overload system with existing fleet management systems or transportation management systems (TMS).
7. **Predictive Maintenance:** Predict maintenance requirements for trucks.
8. **Regulatory Compliance:** Ensure that the solution complies with relevant regulations, safety standards, and legal requirements.

# Technology Stack



## Hardware:

- Arduino board (e.g., Arduino Uno, Arduino Mega)
- Load sensor (e.g., strain gauge-based load cell)
- Pressure sensor (e.g., piezoresistive sensor, capacitive sensor)
- HX711 amplifier module (for load sensor)
- Breadboard and jumper wires
- Resistors (if required)
- Power supply (based on sensor and Arduino requirements)

## Software:

- Arduino IDE: The official integrated development environment (IDE) for programming Arduino boards. It provides a user-friendly interface for writing and uploading code to the Arduino board.

## Libraries:

- HX711 Library: The HX711 library is used to interface the load sensor with the Arduino via the HX711 amplifier module. This library simplifies the reading and calibration of load sensor values.

**Sensor-Specific Libraries:** Depending on the type and model of your pressure sensor, you may need to install specific libraries provided by the sensor manufacturer. These libraries often include functions to communicate with the sensor and retrieve pressure readings.

## Communication Protocols:

**Analog-to-Digital Conversion:** The HX711 module converts the analog output from the load sensor to a digital signal that can be read by the Arduino. The communication between the HX711 module and the Arduino is typically done using two digital pins (DT and SCK).

**Digital Communication:** If your pressure sensor communicates digitally (e.g., I2C, SPI), you will need to utilize the corresponding communication protocol. The Arduino has built-in I2C and SPI capabilities, and you can use relevant libraries to interface with the pressure sensor.

**Data Processing and Display:Arduino Code:** You will need to write code in the Arduino programming language (based on C/C++) to read data from the sensors, perform necessary calculations or conversions, and control any required actions based on the sensor values. This code will run on the Arduino board.

**Serial Communication:** The Arduino IDE provides a Serial Monitor tool that allows you to display sensor readings, debug information, or any other relevant data. You can use the Serial library to send sensor data to the Serial Monitor for visualization or further processing on a connected computer.

# References



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Thank You

