Inside Engine Area:

- Engine Hours
- Oil Quality
- Temperature
- Fuel Consumption
- Battery

Suspension Area:

- Tire pressure Sensor
- Vibration, accelerometer
- Brake Condition, thermal sensor

GPS:

- Road Conditions
- Weather Conditions

IoT Flow Chart

Engine Devices

Suspension Sensors

GPS

Edge Devices:

NVDIA JETSON XAVIER

Pre-process Images using CNN, lower dimensionality of images, convert to arrays

Conduct ML models for predictive maintenance

Data Broker

Embedding Exist on Edge Device

5G Network

Google/AWS Cloud

User

1. Engine Monitoring

- ECU Data Capture: The truck's Engine Control Unit (ECU) continuously records critical engine parameters, including engine temperature, ambient temperature, oil condition, and other diagnostics.
- Data Extraction Module: A specialized device must be connected to the ECU to extract only the relevant data required for this dataset.
- Communication to Edge Device: The extracted data is then transmitted to the edge device using Bluetooth or a low-bandwidth protocol (e.g., LoRa, Zigbee, or CAN bus integration) for efficient data relay.

2. Suspension System Monitoring

- Accelerometer Sensor: This sensor captures vibrations, shocks, and movement along three axes (X, Y, Z) to detect potential issues with the suspension system, such as misalignments, excessive wear, or road impact severity.
- Thermal Sensor: The thermal sensor monitors heat distribution in the braking system to detect potential overheating, which may indicate mechanical failures, brake mis adjustments, or misuse.

3. Cabin and Geospatial Monitoring

- GPS Sensor: Installed within the truck's cabin, the GPS system tracks real-time geospatial coordinates to provide precise location tracking.
- Traffic & Environmental Data: The GPS module can also integrate external data sources to monitor traffic congestion, weather conditions, and road hazards.
- Edge Processing: To minimize data overload, the edge device preprocesses GPS and environmental data, extracting only the most relevant insights before transmitting them to the user for real-time decision-making.