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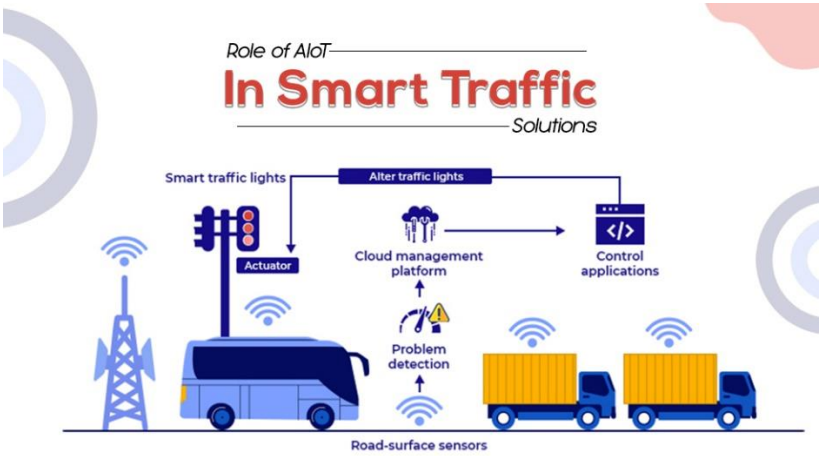
PROJECT DEFINITION:

The project involves using IoT devices and data analytics to monitor traffic flow and congestion in real-time, providing commuters with access to this information through a public platform or mobile apps. The objective is to help commuters make informed decisions about their routes and alleviate traffic congestion. This project includes defining objectives, designing the IoT traffic monitoring system, developing the traffic information platform, and integrating them using IoT technology and Python.



DESIGN THINKING:

Follow the below processes to achieve a best Traffic Management System**.**

1. Project Objectives: Define objectives such as real-time traffic monitoring, congestion detection, route optimization, and improved commuting experience.
2. IoT Sensor Design: Plan the deployment of IoT devices (sensors) to monitor traffic flow and congestion.
3. Real-Time Transit Information Platform: Design a web-based platform and mobile apps to display real-time traffic information to the public.

4. Integration Approach: Design a web-based platform and mobile apps to display real-time traffic information to the public.

1. PROJECT OBJECTIVES:

The objectives of this policy are: a. The establishment of appropriate traffic flow and access into and through the Town of Cottesloe, which maximises road safety and local amenity. The establishment of a procedure from which necessary traffic management works are undertaken in a cost effective and equitable manner.

- **Traffic Jam Detection:** With cloud connectivity, sensors, and CCTV cameras tracking intersections 24×7, technicians can remotely monitor all the streets in real-time from the city's traffic control room.

- **Connected Vehicles:** A smart traffic system using IoT technology can connect with roadside tracking devices to enable direct communication between intelligent vehicles & intersections.

- **Modular Control:** Real-time detection of congestion triggers dynamic adjustments in the systems meant for controlling traffic lights, express lanes, and entry alarms.

- **Emergency Navigation:** A system with edge data processing & programmatic alerting capabilities can alert response units (police, ambulance & tow trucks) in case of a car crash or collision. It reduces the crucial time an injured driver or passenger remains unattended.

- **Road Safety Analytics:** Systems with pattern detection capabilities can immediately flag high cruising speeds and reckless driver or inappropriate pedestrian behavior.

2. IOT SENSOR DESIGN:

A basic architecture that serves as a launchpad for feature enhancements and service upgrades will integrate the following components:

- **Sensors** for collecting data and sending it to a centralized cloud platform.

- **Actuators** for physical devices to make necessary adjustments like – restricting the water supply in pipelines with leakages or dimming & brightening streetlights based on weather conditions.

- **Field gateways** to collect & compress data before moving it to a cloud platform.

- **Cloud gateways** enable secure data transfer between field gateways & the cloud storage of the traffic management system.

- **A data lake** to store the raw, unstructured information before it is cleansed, processed, transformed & moved to a data warehouse for extracting actionable insights.

- **Data warehouse** stores contextual information about connected objects and devices installed with sensors and actuators.

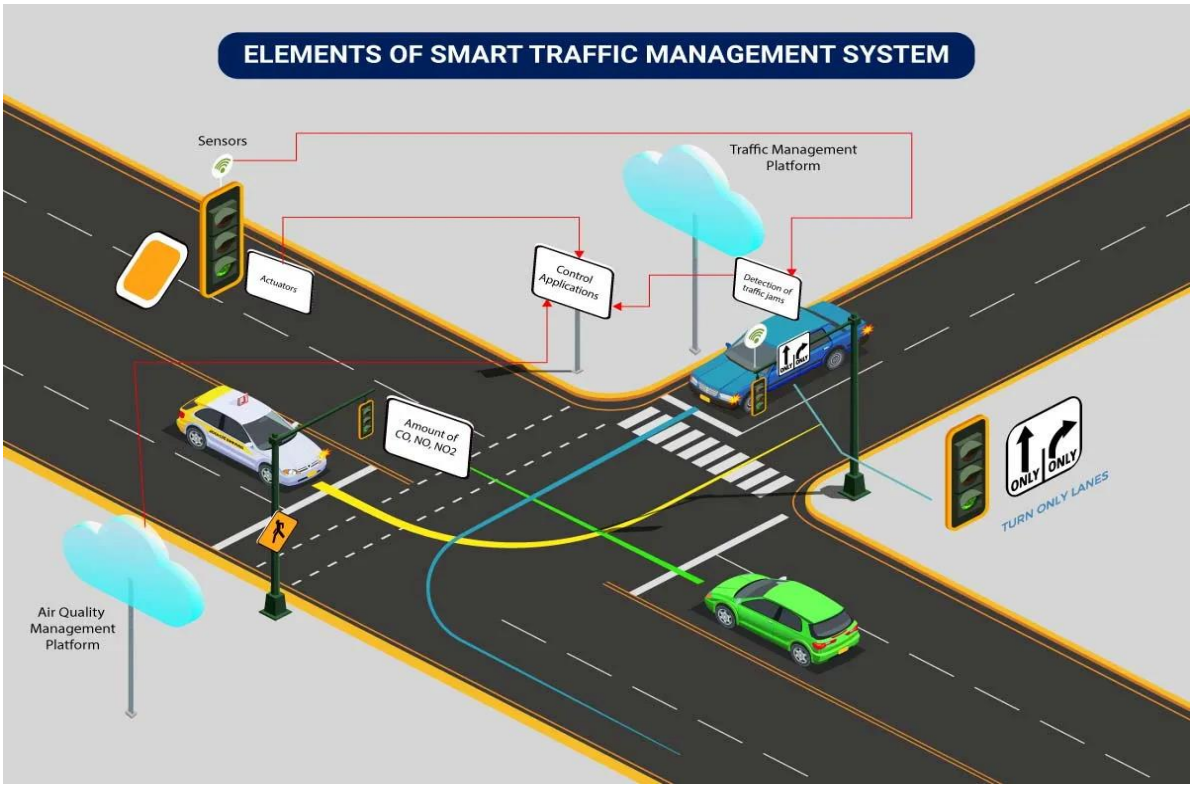
- **Data analytics** for analyzing the data from streetlight sensors on a centralized dashboard to adjust the intensity of lights.

- **ML algorithms** to analyze traffic patterns & trends from historical data stored in the data warehouse. The identified trends are then used to build predictive models for control apps. These apps modify the average vehicle speed to avoid congestion.

- **Rules** to enable actuators to automate the functioning & control of smart city objects and devices. These rules are manually defined to tell actuators what needs to be done to solve a specific problem.

- **User applications** that allow citizens to receive instant notifications in case of traffic jams and congested routes. Desktop user apps for control rooms send commands to actuators for altering traffic signals. It helps to relieve congestion and optimize routes.

- **Cross-solution integrations** with traffic lights or streetlight management systems. Control apps apply ML models or predefined rules to prompt appropriate output action if the air quality is poor.



3. REAL-TIME TRANSIT INFORMATION PLATFORM:

User Interface

- The design and layout of every form will be very clear and very interactive to the administrator.
- When the administrator open the software, the welcome window will appear.
- From each and every window the user can easily go to any desired window so that there will be an absolute and relative linking and admin can monitor and track the process easily.
- There should be proper coordination between the different modules and that should also be maintained at the front end in terms of look and feel to the DA.
- The admin will be able to check out the logs anytime for identification of errors or lags in the system.

Software Interface

- An external firewall can be attached to the application in order to prevent unauthorized access to the system. Also, a user authentication- Login system should be there to identify the System administrator.

Communication Interfaces

- Even the system administrator need not act as an interface. His/her only work would be to initiate the process. Afterwards, the management system takes over and it won't stop unless stopped by an external force or system breakdown. Initiation would start from:
- Add the chosen traffic CCTVs whose recording is to be done. Analyze those videos and the format configuration for recording should be AVI format.
- Calculate timing information and give it to the signal systems.

4. INTEGRATION APPROACH:

PIACON (Polyop-timal Integrated/ Intelligent Adaptive CONtrol) traffic control method for urban areas meet the most of needs of modern real traffic decision making and control processes.

- P: - very flexible multi-criteria based real-time recognizable system preferences
- I: - adequate representation of traffic-controlled processes in the presence of uncertainties, randomness, incomplete a'priori information and knowledge about the control problem.
- A /AI: - using computer intelligence tools (e.g. ANN, GA, FL, RS) integrated with monitoring/surveillance layers, detection and AVL+I systems, integrated heterogeneous data and knowledge sources to generate in real-time intelligent and adaptive decision and control actions.
- CON-R: - network robust traffic control in the wide spectrum of traffic situations, traffic modes with guarantee of compatibility with advanced ITS systems.