C.Akila

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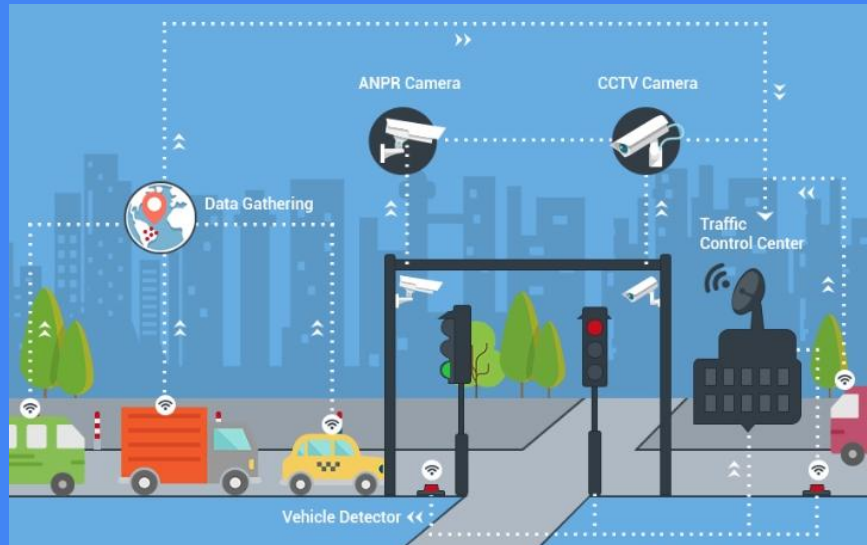
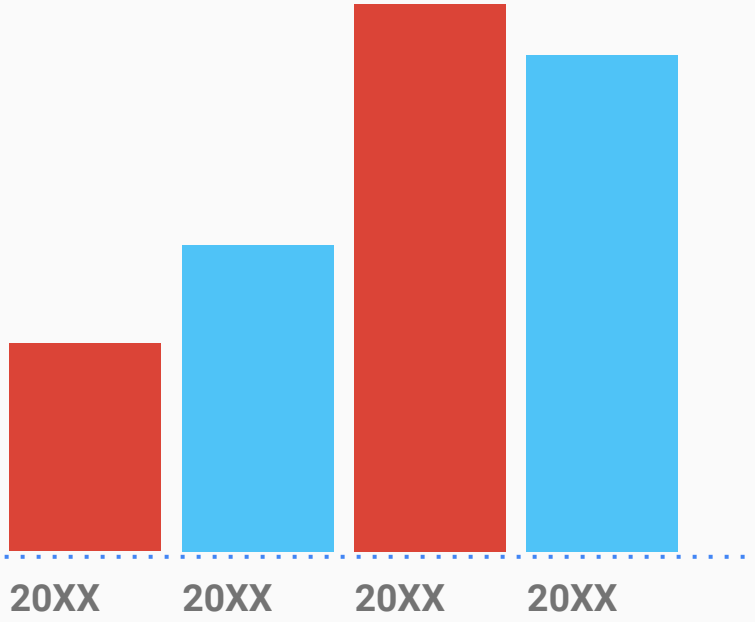


Project Name : Traffic Management

Objective

In this day & age, the conventional systems to manage urban mobility are proving incompetent. And there's a growing need for an efficient traffic management system. Cities big and small are in dire need of technology-led digital solutions to manage & monitor traffic. They can help regulate heavy traffic, road blockages at signals & congested networks.



Key contents

Key Contents

- Role of IoT in Smart City Traffic Management
- Advantages of a Smart Traffic Management System
- Functioning of Traffic Monitoring System Using IoT Capabilities
- Application of IoT in Traffic Management
- Key Features of a Smart Traffic Management System
- Implementation of a Smart Traffic Management System – Key Elements
- Rishabh's Role in IoT-based Smart Traffic Management

Role :

Role of IoT in Smart City Traffic Management

With cities worldwide experiencing ongoing population growth – it results in stressed municipal infrastructure. And the problem of traffic congestion across smart cities is continuously increasing. INRIX suggests that the average American driver lost 36 hours due to congestion, costing $564 in wasted time. This increasing growth in cities leads to the demand to meet sustainability goals while evaluating traffic management strategies.

It enables them to;

- Expand the capacity of city streets without having to build new roads.
- Optimize the traffic flow and keep the drivers safe. It would include cameras, sensors, and cellular technologies that automatically adjust traffic lights, expressway lanes, speed limits, and highway exit counters.
- Transmit accurate information about available parking spaces to citizens in real-time
- Collect data on congestion and improve traffic signaling to reduce blockages and optimize commute
- Locate incidents and report them to emergency rooms immediately with road sensors and video surveillance

Advantages of a Smart Traffic Management System

Cleaner, greener, safer, and more accessible roads are a few benefits of implementing IoT and intelligent technology.

It helps with the following:

- Reducing traffic jams and accidents on the streets
- Ensuring immediate clearance for emergency vehicles
- Facilitating safer and shorter commute times
- Reducing congestion & energy consumption at intersections

Functioning of Traffic Monitoring System Using IoT Capabilities

This intelligent system comprises several components, including wireless sensors, RFID tags, and BLE beacons installed at the traffic signals to monitor the movement of vehicles. A real-time data analytics tool connects the Geographic Information System (GIS-enabled) digital roadmap with control rooms for real-time traffic monitoring.

Application of IoT in Traffic Management

City governments can improve their operations & infrastructure by placing IoT sensors and tracking devices on roads and highways for recording, analyzing, and sharing data in real-time.


IOT USE CASES FOR SMART CITIES
Smart Emergency Assistance
Emergency Assistance
Handling Long Commutes
Traffic Lights and IoT Control Systems
Smart Parking
POLICE

An intelligent traffic monitoring system using IoT capabilities has so many factors & use cases, including;

- **Traffic Lights and IoT Control Systems**: Smart traffic signals may look like a typical stoplight, yet they utilize an array of sensors to monitor real-time traffic. Usually, the goal is to help cars reduce the amount of time spent idle. And IoT technology enables the various signals to communicate with each other. This is while adapting to changing traffic conditions in real time. The outcome is less time spent in traffic jams and even reduced carbon emissions.
- **Parking Enabled through IoT**: Smart meters and mobile apps make on-street parking spaces easily accessible with instant notifications. Drivers receive alerts whenever a parking spot is available to reserve it instantly. The app gives easy directions to the parking spot with a convenient online payment option.
- **Emergency Assistance through IoT**: A traffic monitoring system using IoT technology enables emergency responders to speed up the care mechanism in case of accidents late at night or in isolated locations. The sensors on the road detect any accident, and the problem is immediately reported to the traffic management system. This request is passed on to relevant authorities to take corrective action. Emergency response personnel would include medical technicians, police officers, and fire departments for enhanced responsiveness and timely intervention.

- **Commute Assistance:** With every vehicle acting as an IoT sensor, a dedicated app can make suggestions, determine optimal routes & provide advance notice of accidents or traffic jams. Further, it can even suggest the best time to leave. It is all because of a robust algorithm that helps reduce driving time with intelligent traffic lights.

Key Features of a Smart Traffic Management System

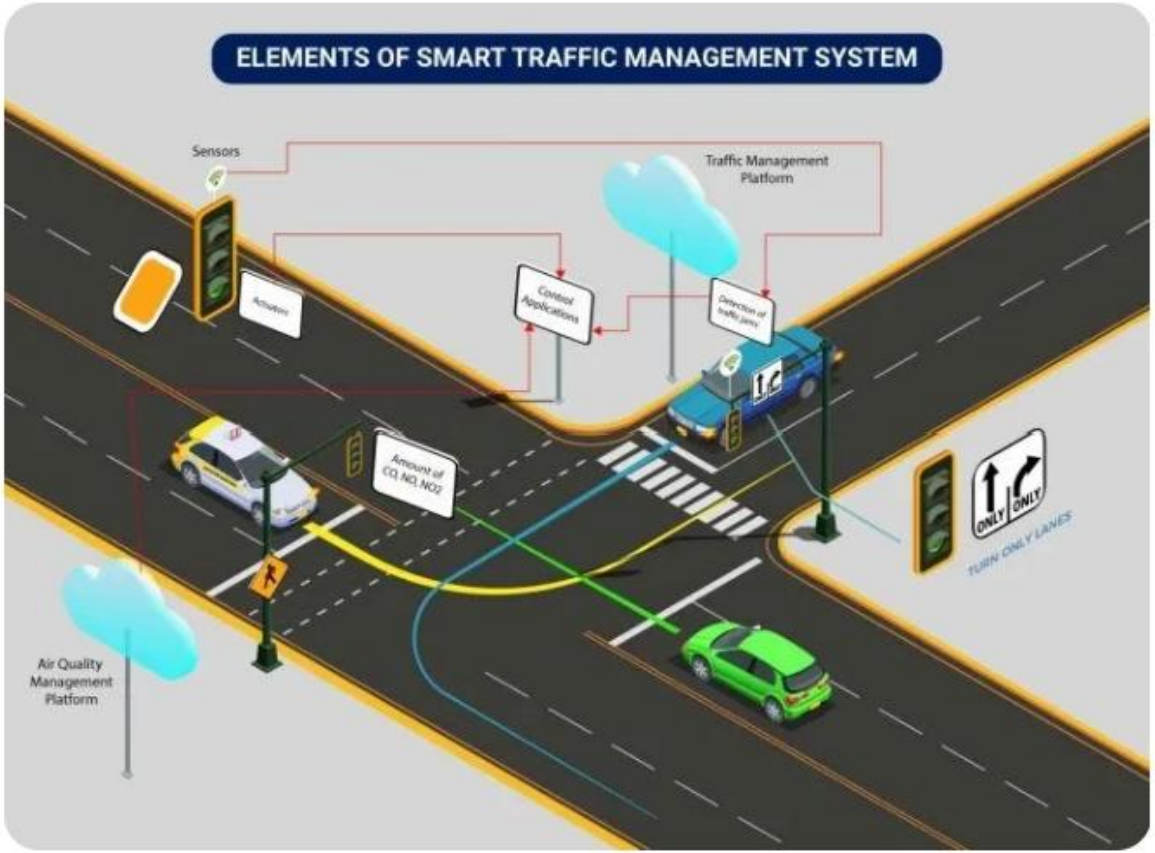
The key features are listed below depending on the city's size and the scope of the governmental policies. It can be integrated into an intelligent traffic management system. They include:

- **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.
- **Digital Payments:** Commercial traffic management systems enable quick and convenient electronic transactions in real time while ensuring financial data safety.

Implementation of a Smart Traffic Management System – Key Elements

Whether municipalities want to improve their traffic management approach, expand public services, or upgrade existing infrastructure – it all starts with a smart city solution!


ELEMENTS OF SMART TRAFFIC MANAGEMENT SYSTEM
Sensors
Traffic Management Platform
Actuators
Control Applications
Detection of traffic jams
Amount of CO, NO, NO2
ONLY
ONLY
TURN ONLY LANES
Air Quality Management Platform

Here's an implementation plan for building a scalable traffic control system using IoT capabilities:

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

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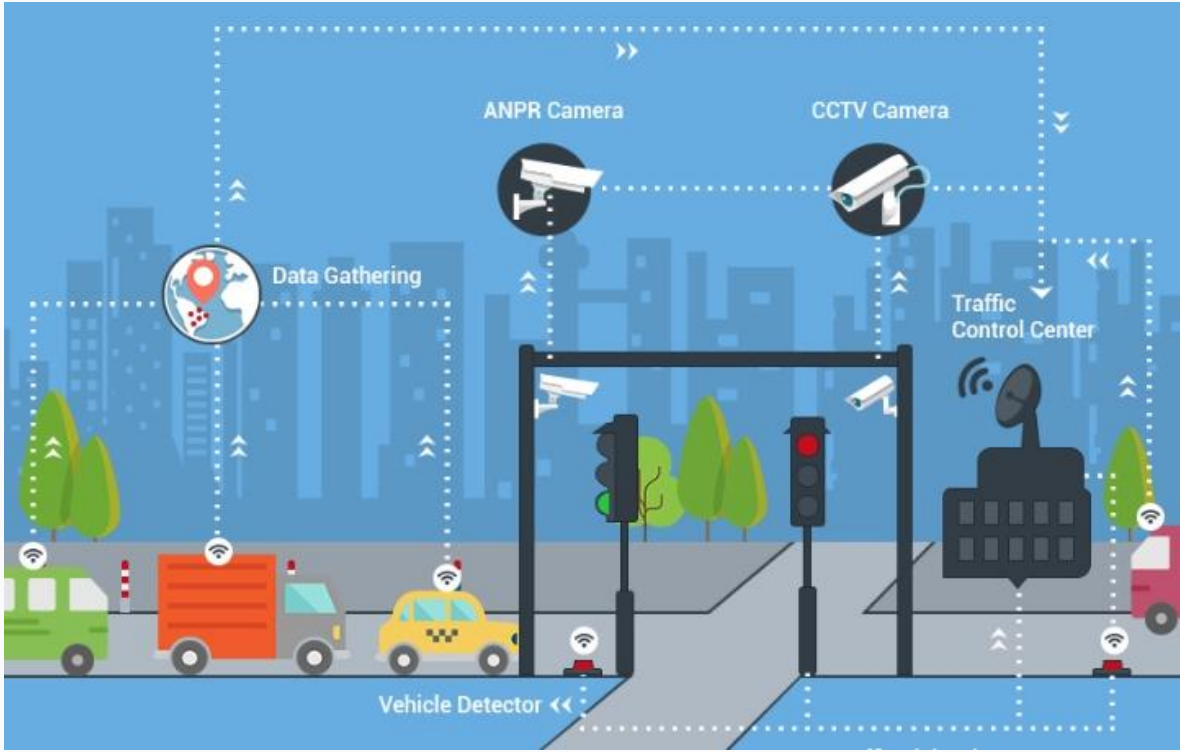
- **ML algorithms** to analyze traffic patterns & trends from historical data – stored in the data warehouse. The identified trends are then used to build predictive models for control apps. These apps modify the average vehicle speed to avoid congestion.
- **Rules** to enable actuators to automate the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



Thank you