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The Smart Transportation using IOT and Intelligent Transport System in GPS Localization

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Abstract;- **Internet of things (IoT) a real world things or objects are connected each other to communicate anytime anywhere. Large numbers of real-world objects are connected to the internet that generated a large amount of data. The major objectives of the IOT is the creation of smart environments on transportation, home automation, education, agriculture in cities and villages. The IOT offers many number of solutions in transport sector like toll systems, traffic management, vehicle tracking, vehicle to vehicle communication, smart parking, accident prevention infrastructure monitoring The technology-driven mobile App are helping the customer to ease their daily need.**

I. INTRODUCTION

Using the interface of GPS Tracking system of the public transport system for e.g. every buses consisting GPS Tracking system will gives the information traffic control analyses center (TCAC) TCAC will give the information display LED board which is established at the bus stops.

In the Display board shows the bus route bus distance time schedule of arrival will be displayed on the Board which will be help full for the peo¬ples. People will get more facilities in the public transport system with more accuracy which will save timings and also the control in traffic system. Consider the problem of current transport system there is a lot of things to be happen in current situation in tolls and check post they just check the documents such as Driving License, RC book, Insurance documents and leave the vehicle. The documents submitted by the persons not aware either original or duplicate .In this case some people provide wrong documents for illegal transactions.

This project proposed to avoid the problem such as illegal transaction, vehicle theft. The vehicle entered in to the check post or toll gate the information's of vehicle will be checked from the system. Weight sensor is employed in this project for calculate the weight of the vehicle. Bio metric readers used for scan the thumb of driver and check the details of the person from data base of aadhaar API and verify the vehicle number for reference. These three details are stored on the system. If any details are wrong then the vehicle is not allowed to cross the check post. Every day the vehicle details of crossing the check post or toll gate will be stored in data storage. Cluster connectivity established with nearest toll gate, check post for communicate each other for share the details of crossed vehicles.

II. RELATED WORK

Connected public transport/Internet of things (IOT)Connected public transport provide seamless connectivity between different electronic systems such as infotainment, control systems, safety features and navigation features through internet within the car as well as with outside systems more known as Internet of Things (IOT) technology. In the near future, mobile or wearable devices would be communicating with the electronic systems of the car through the internet. This concept is known as V2X connectivity (Vehicle to Vehicle or V2V and Vehicle to Infrastructure or V2I). It would be imperative to design such systems with an inbuilt security for safety of user data throughout its access and processing. Connected public transport technology would encourage collaborations between manufacturers of electronic devices used in public transport, mobile devices, wearable devices, IT systems integrators as well as ISPs. The potential is huge and offers interesting possibilities as internet connected public transport are on a rise.

In existing system in India is a second largest road net work in the world 65% of fright more through roads it is a primary infrastructure Passenger information systems these systems provide a real time information to passengers using a public transport system. Usually the expected time of arrival (ETA) is displayed on electronic sign boards at the bus stands, MRT platforms or the Airports and Railway stations. Such systems also sometimes provide information on personal mobile devices for example in the aviation industry and Indian Railways. This reduces the uncertainty about ETA and eases the congestion at waiting areas. To avoid this problems using mart transportation using IOT. Some problems are illegal object transition, we can make proper utilization traffic system and accuracy in the timing schedules, over loaded vehicles, money laundering by official, duplicate vehicles documents. Can be provided IOT system.

III. PROPOSED ALGORITHM

Using the interface of GPS Tracking system of the public transport system for e.g. every buses consisting GPS Tracking system will gives the information traffic control analyses center (TCAC) TCAC will give the information display LED board which is established at the bus stops.
1.In the Display board shows the bus route bus distance time schedule of arrival will be displayed on the Board which will be help full for the peoples.
2.People will get more facilities in the public transport system with more accuracy which will save timings and also the control in traffic system.

SMART TRANSPORTATION SYSTEM USING GPS LOCALIZATION:

A challenging issue in intelligent transportation systems (ITS) is to accurately locate moving vehicles in urban area. Considerable efforts have been made to improve the localization accuracy of standalone GPS receivers. However, through empirical study, found that the latitude and longitude values generated by GPS receivers fluctuate significantly because of the multipath effect in urban areas. The relative distances between neighboring vehicles with similar GPS signal data in terms of satellite sets and signal strength are much more stable in such a scenario. Cooperative localization algorithm, Networking -GPS, to improve the accuracy of location information for vehicular networks in urban area using commodity GPS receivers. First, atom redundantly rigid graphs of vehicles are constructed according to the similarity of neighboring GPS data. Based on real-time exchange of their individual GPS position coordinates, and then propose a novel system solution for achieving the same (relative positioning functionality) during persistent GPS outages. Based on survey results, also qualitatively assess various radio based ranging and relative positioning techniques, experimentally evaluate the received signal strength based ranging technique, and comment on their

SUITABILITY FOR OUR PROPOSED SOLUTION.

1) Vehicles in geographical proximity often share redundant information such as road and traffic conditions. Hence, in

2) Such as probe vehicle data, where the vehicles respond to requests received from the infrastructure, not all vehicles need to send replies.

3) As observed in, the mobility of vehicles is spatially restricted and spatially dependent. Hence, vehicles in geographical proximity can navigate as a group, with the same average velocity due to the spatial dependency, and with similar direction due to the spatial restrictions, over a period of time. The above observations, and propose to enable vehicles to form a group. In order to form a group, restrict the vehicles to be in a group if each group member can hear broadcasts of every other group member. Since vehicles in a group will move relative to each other, and on average have the same velocity, a group can be represented by a single vehicle that refer to as the group leader. it is sufficient if only the Traffic control (TC) communicates and gives the directions and guidelines to all the vehicles.

DIFFERENTIAL GLOBAL POSITIONING SYSTEM (DGPS)

Differential GPS (DGPS) consists of two receivers observing the same GPS satellites. One of these receivers is stationary and the other one is roving. The stationary receiver resides at a known location and obtains the pseudo range from the satellite signals, so it identifies a global error by comparing the measurements with its location. The stationary receiver transmits the global error correction to the roving receiver so that the roving one can correct its measurements. DGPS takes advantage of correlated errors by installing a GPS receiver in an already known fixed location. This GPS receiver can compute its position using the information from the satellites and compare the computed position with its already known physical location. The difference between these two positions can be broadcasted and all nearby GPS receivers can correct their computed positions based on the broadcasted differential information. This is why this technique is known as Differential GPS. A drawback of this technique is that fixed ground-based reference stations must be used to broadcast this differential information. On the other hand, DGPS can lead to a sub-meter precision,

HARDWARE & SOFTWARE INTERACTION.

Every public transport vehicle will be installed with GPRS/GPS device with SIM card inserted were the device continually sends information of vehicle path and

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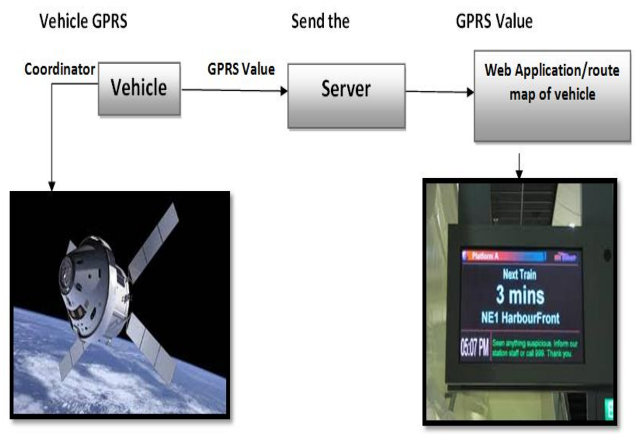
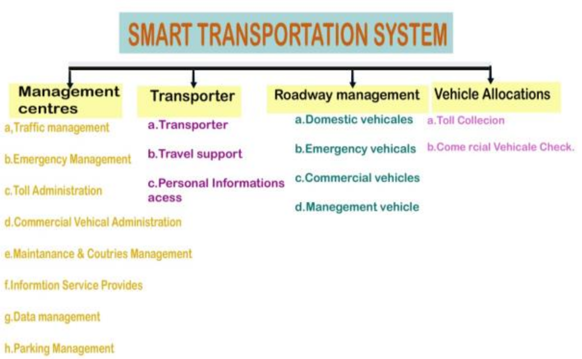
also shows the route map from Source to destination. Once the vehicle wheels are stopped the software which is installed in GPS/GPRS device picks signal and starts counting the waiting time as an when destination is reached

GPRS FLOW CHART





I. STS Taxonomy

The most commonly used classification of STS is based on the positioning of the system as given below.

Vehicle Level

- ✓ GPS Travelling
- ✓ GPRS providing
- ✓ Free WIFI facility
- ✓ Speaker for announcement
- ✓ Cameras
- ✓ Sensors
- ✓ Led display board with map
- ✓ Smart pos machine which contains.
- ✓ Biometric and barcode machine

Technologies deployed within vehicles, including sensors, information processors and displays that provides information to the driver.

Infrastructure Level

Sensors on and by the side of roads collect important trafficdata. Tools of communication provide drivers with pertinent information to manage traffic better. These tools include roadside messages, GPS alerts and signals to direct traffic flow.

Cooperative Level

Communication between vehicles, and between infrastructure and vehicles involving a synergic combination of vehicle level and infrastructure level technologies.

The commonly adopted functional taxonomy of the STS is as follows

Advanced Traffic Management Systems (ATMS)

Integrates various sub-systems (such as CCTV, vehicle detection, communications, variable message systems, etc.) into a coherent single interface that provides real time data on traffic status and predicts traffic conditions for more efficient planning and operations. Dynamic traffic control systems, freeway operations management systems, incident response systems etc. respond in real time to changing conditions.

Advanced Traveler Information Systems (ATIS)

Provide to users of transportation systems, travel-related information to assist decision making on route choices, estimate travel times, and avoid congestion. This can be enabled by providing different information using various technologies such as:

- GPS enabled in-vehicle navigation systems
- Dynamic road message signs for real time communication of

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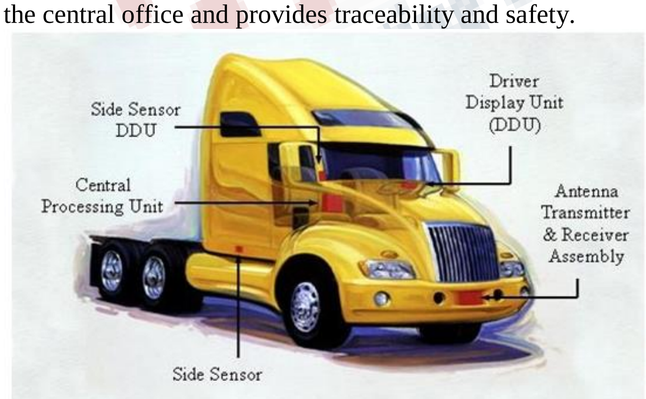
Examples of ATIS

Advanced Vehicle Control Systems (AVCS)
Information on traffic congestions, bottlenecks, accidents and alternate route information during road closures and maintenance Website to provide a colour-coded network map showing congestion levels on highway are tools and concepts that enhance the driver's control of the vehicle to make travel safer and more efficient. For example, in vehicle collision warning systems alert the driver to a possible imminent collision. In more advanced AVCS applications, the vehicle could automatically break or steer away from a collision, based on input from sensors on the vehicle. Both systems are autonomous to the vehicle and can provide substantial benefits by improving safety and reducing accident induced congestion. The installation of high tech gadgets and processors in vehicles allow incorporation of software applications and artificial intelligence systems that control internal operations, ubiquitous computing, and other programs designed to be integrated into a greater transportation system

Commercial Vehicle Operations (CVO)
Comprises an ensemble of satellite navigation system, a small computer and a digital radio, which can be used in commercial vehicles such as trucks, vans, and taxis. This system affords constant monitoring of truck operations by the central office and provides traceability and safety.



Advanced Public Transportation Systems (APTS)
Applies state-of-art transportation management and information technologies to public transit systems to enhance efficiency of operation and improve safety. It includes real-time passenger information systems, automatic vehicle location systems, bus arrival notification systems, and systems providing priority of passage to buses at signalized intersections (transit signal priority).


Digital announcement of transit arrival

Advanced Rural Transportation Systems (ARTS)
provide information about remote road and other transportation systems. Examples include automated road and weather conditions reporting and directional information. This type of information is valuable to

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motorists travelling to remote or rural areas. This has been widely implemented in the United States and will be a valuable asset to countries like India, where rural areas are widely distributed.

IV. COMPONENTS OF STS

A Traffic Management Centre (TMC) is the hub of transport administration, where data is collected, and analyzed and combined with other operational and control concepts to manage the complex transportation network. It is the focal point for communicating transportation-related information to the media and the motoring public, a place where agencies can coordinate their responses to transportation situations and conditions. Typically, several agencies share the administration of transport infrastructure, through a network of traffic operation canters. There is, often, a localized distribution of data and information and the canters adopt different criteria to achieve the goals of traffic management. This inter-dependent autonomy in operations and decision-making is essential because of the heterogeneity of demand and performance characteristics of interacting subsystems.
Schematic of the workings of a TMC

The effective functioning of the TMC, and hence the efficiency of the STS, depend critically on the following components:

•Automated data acquisition
•Fast data communication to traffic management centers
•Accurate analysis of data at the management centers
•Reliable information to public/traveler

A. Data Acquisition

Rapid, exhaustive and accurate data acquisition and communication is critical for real-time monitoring and strategic planning. A good data acquisition-management-communication system combines tested hardware and efficient software that can collect reliable data on which to base further STS activities. The different STS hardware/equipment commonly used include sensors, cameras, automatic vehicle identifiers (AVI), GPS based automatic vehicle locators (AVL), and servers that can store huge amounts of data for meaningful interpretation. A few of the state-of-art, critical components are described below.

• Sensors
Sensors and detectors have been used for highway traffic counts, surveillance, and control for the last 50 years. Early sensors relied on visuals (e.g. optical detectors), sound (acoustic detectors), and vehicle weight induced pressure/vibration (seismic/piezoelectric sensors) on the road surface. Advances in detector technology now enable use of a variety of detectors such as magnetic detectors (based on geomagnetism), infrared, ultrasonic, radar, and these detectors measure the change in magnetic/seismic / optical/acoustic fields caused by the passage of vehicles and calculate traffic parameters based on these measurements. The three main types of vehicle detectors used in current practice are inductive loop detectors magnetic detectors, and magnetometer a video image processor (VIP) system typically consists of one or more cameras, a microprocessor based computer for digitizing and processing the imagery, and software for interpreting the images and converting them into traffic flow data.

Cameras to monitor Traffic

A.Automatic Vehicle Identifiers (AVI) and Automatic Vehicle Locators (AVL)

The AVI system uses a combination of AVI readers, AVI tags or transponders in the vehicles, and a central computer system. AVI readers/antennas are located on roadside or overhead structures or as a part of an electronic toll collection booth The antennas emit radio frequency signals within a capture range across one or more freeway lanes. When a probe vehicle enters the antenna's capture range, Wireless Communications Systems dedicated to Intelligent Transport Systems and Road Transport and Traffic Telemetric provide network connectivity to vehicles. Continuous Air interface Long and Medium range (CALM) provides continuous communications between a vehicle and the roadside using a variety of communication media, including cellular, 5 GHz, 63 GHz and infra-red links.

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GPS Unit in car

• GPS

The Global Positioning System (GPS) is a worldwide satellite navigation system that provides a fast, flexible, and relatively inexpensive data to determine a vehicles position and velocity in real time. GPS is a US owned space-based system of twenty four satellites providing 24x7 monitoring of the earth. The 24 satellites are distributed uniformly in six orbital planes, at an altitude of approximately 20,200 km such that at ast four satellites are visible at any time and from any point on the earth's surface. GPS positioning is based loosely on three-dimensional positioning of manmade landmarks/"stars" using trilateration related techniques. GPS employs two fundamental observables for positioning and navigation, to produce reliable traffic information from the GPS data, it is of significance to meet the sample size requirements and follow an appropriate field procedure.

B. Communication Tools

The efficiency of the STS system depends not only on the collection and analysis of traffic-related data, but also on quick and reliable communication, both data from field to TMC and information derived using the data and models from TMC to the public. This involves communication between data collection centres to TMC and travel and traffic related announcements to vehicles through onboard unSTS and to the travelers through media like VMS, web pages, SMS etc.

C. Data Analysis

Data analysis includes data cleaning, fusion, and analysis. The data from the sensors and other collection devices that are transmitted to the TMC must be checked. Inconsistent data must be weeded out and clean data has to be retained. Further, data from different devices may need to be combined or fused for further analysis. The cleaned and fused traffic data will be analyzed to estimate and forecast traffic states. These traffic state estimation methods will be used to provide suitable information to users.

D. Traveler Information

Travel advisory system facilities are used for relaying transportation-related information to the motoring public. These include: Variable Message Signs, Highway Advisory Radio, Internet, Short Messaging Services, automated cell phone messaging, public radio announcement, television broadcast and other modern media tools. Such systems can provide real-time information on travel times, travel speeds, delays, accidents, route closures and detours, and work zone conditions, among others.

State-of-Art Traffic Control Centre

The system will be capable of conducting hundreds of complicated tasks simultaneously. Some of the tasks that will be handled are:

- Advising motorists ahead of a traffic jam to alter routes

- Diverting traffic safely and with least inconvenience, away from accident induced blocked lanes
- Automatic moderation of speed limSTS during incidents or congestions.
- Implementation of pre approved and tested plans jointly with Police Department and
- Establishing easy and rapid approach to accident locations and hospitals during incidents.
- Prioritising signals to support traffic incidents and civil defence vehicles
- Handling equipment to guarantee reaching injured drivers and passengers as soon as possible.
- Automating traffic management plans to reduce congestion during special events.

Relevant traffic related information is provided to the drivers through LED-based Dynamic Message Signs "DMS" that are located upstream of decision points. State-of-the-art graphical information with concise English and Arabic text are designed. In a joint venture by Transport Canada, Tran slink and IBI group, three bus rapid transit (BRT) services have been developed in Canada: the 99 B-Line along Broadway, the 97 B-Line linking Coquitlam, Port Moody and Burnaby to the Millennium Sky Train line, and the 98 B-Line linking Richmond, the Airport and downtown Vancouver. The 98 B-Line is the first BRT service that incorporates the following state-of-art STS technologies:

Transit Management: The system incorporates Automatic Vehicle Location (AVL) and schedule adherence monitoring, supported by voice and data communications to the Surrey. Transit Centre (STC) intended to optimize TransLinks efficiency in managing the 98 B-Line fleet of buses, as well as buses on other routes.

•Traffic signal priority (TSP): The system allows buses to receive priority at traffic signals when running behind schedule, reducing the number of stops at intersections, as well as the amount of delay experienced at traffic signals, improving trip time reliability, while also contributing to reduced operating costs.
•Real-time Passenger Information: The system provides "next bus" arrival time information to customers at the 98 B-Line stations, updated in real time based on vehicle locations and schedule adherence – thus increasing passenger convenience and accessibility to the system.

• Automated Voice and Digital Next Stop: On board the buses, automated voice and digital displays provide "next stop" announcements to on board passengers.

The STS office of the Ontario Ministry of Transportation is implementing an STS deployment analysis system known as IDAS, a computerized benefit/cost model that estimates the impacts of alternative STS-based transportation solutions in urban, freeway and intercity situations.
A Canada-wide university research network, led jointly by the University of Toronto STS Centre and Testbed, and the University of Montreal Centre for Research in Transport, has Europe and US partners. A few successful projects by the network are given below.

Coast View (BC) enhances management of hazardous materials and dangerous goods to improve transport safety.
Video Traffic Management and Traveler Information (Edmonton, Alberta) deploys CCTV to provide information for traffic and incident management, and traveler information images via TV and a website.
Traffic Signal Priority for Buses and Automatic Vehicle Tracking System (Calgary, Alberta) focuses on bus priority at traffic signals, and collection and analysis of data for validating and adjusting transit schedules.
Reduce Single Occupant Vehicle Travel in Region of Waterloo (Regional Municipality of Waterloo, Ontario) is a pioneering public-private partnership aimed at implementing, monitoring and evaluating the effectiveness of employer based transportation demand management.
STS for School Bus Drivers (Quebec and New Brunswick) is using STS to detect children around school buses and warn drivers. The Confederation Bridge (Prince Edward Island-New Brunswick) has introduced ETC transponders identical to those used elsewhere in the Atlantic Provinces to facilitate interoperability.

INDIA
The STS program in India is aimed at ensuring safe, affordable, quick, comfortable, reliable and sustainable access for the growing urban and rural population to jobs, education, recreation and such other needs. A few STS applications have been introduced in India in metropolitan cities like New Delhi, Pune, Bangalore, Chennai etc. focusing on stand-alone deployments of area- wide signal control, parking information, advanced public transportation, toll collection etc. However, all of these are small scale pilot studies limited to major cities and are

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in the beginning stage of deployment. Thus, at present, there are no exhaustive fully developed STS applications with traffic management centers in India.

A brief description of some of the existing applications of STS is given below:

Trial of advanced Traffic Management System (Tamil Nadu, Sep 2009) This involved a trial run of the fully automated Traffic Regulatory Management System (TRMS), involving usage of surveillance cameras in the city of Chennai. This project involved installing sophisticated cameras, wireless towers and poles, under the Rs. 3-crore-State government- funded project. Automatic Number Plate Reader (ANPR) cameras were installed in 28 out of 42 vantage points in the city, while „Pan Tilt Zoom" (PTZ) cameras were deployed in 10 out of 12 busy junctions identified. The traffic police also plan to install 40 CCTV cameras at various junctions. This is to warn motorists who blatantly violate rules and monitor traffic on arterial roads during peak hours.

Automated Traffic Control (ATC)

ATC has been setup in many cities in India including Delhi, Pune, and Mumbai etc.

Mumbai:

The Area Traffic Control Project of the Mumbai Traffic Control Branch focused on synchronising major junction and was implemented through the Mumbai Metropolitan Region Development Authority (MMRDA) and Municipal Corporation of Greater Mumbai (MCGM) with financial aid from World Bank. Modern gadgets such as Speed Check Guns and Multi Radar C comprising Smart Cameras, Radar sensor, Screen, Manual control unit, Flash generator, Flash light, Power Box and Tripod were used in this project.

Chennai:

The Chennai traffic police set up the cities first Automatic Traffic Control (ATC) system at 26 major traffic signals around the new secretariat complex. The system monitors and regulates traffic without any manual intervention and helps police regulate VIP routes. The ATC is designed to be capable of changing signal duration in accordance with the volume of the traffic by analyzing the number of vehicles at three adjoining junctions and synchronising the signals. Manual intervention if required is

designed to be performed from the control room. A VIP movement can be managed by creating a green corridor by automatically synchronising the signals along the VIP route.

ATIS

The objective is to inform road-users of latest traffic updates and better management of traffic. SMS, internet and radio have been employed for updates. The update protocols in a few Indian cities are as follows

a.Bangalore and Hyderabad.

• Internet (June 2008)

This project provides a platform for the public to check the real time traffic situation at important junctions and arterial roads, through the net. Real time images of traffic at busy junctions are available. It covers 40 busy traffic junctions and the information's are updated every 15 seconds.

• SMS(October 2009)

To keep commuters informed about traffic congestion and bottlenecks in real time, Bangalore Traffic Police have made arrangements to send SMS. The facility is available free of cost to all those who register for it. Everyday two SMS will be sent during morning and evening peak hours to the subscribers, indicating congestion points and bottle necks. In addition, reasons and alternatives will also be communicated. Additional messages will be sent whenever there are man-made disruptions in traffic like agitations, serious accidents etc.

b. Chennai

• FM radios

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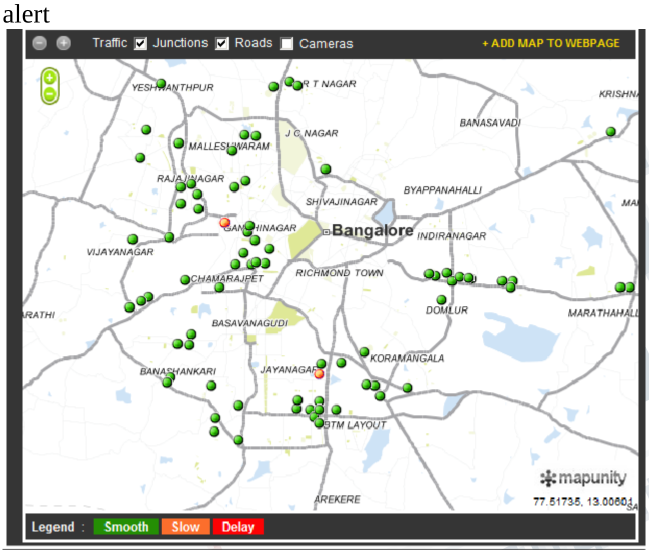
Traffic updates are being provided on FM radio to convey critical information such as obstruction and road damage due to rain.

c. Delhi

• The Traffic People (April 2009)

The Traffic People provides real time traffic updates to residents in the Delhi – NCR region. It gives time-to-time information on traffic situations through websites. Latest information on traffic jams, processions or rallies resulting in slow vehicular movement and on any sort of diversion can be obtained from the website. As of now it provides updates only during peak hours during mornings and evenings, but will expand coverage as need arises. They also share traffic updates with radio channels that makes it possible to reach a broader audience. An SMS alert



Real-time Traffic information available online

Advanced Public Transportation System APTS

One application implemented in APTS area is GPS vehicle tracking system in public transport buses (Bangalore, Chennai, Indore) to monitor vehicle routing and frequency so that passengers do not have to wait long hours for a bus. The objective is to provide Global Positioning System based passenger information system to help passengers utilize their waiting time at bus stops more efficiently as well as to reduce the uncertainty and associated frustrations. Display boards with high quality light emitting diode in wide-view angle are provided at bus stops so that passengers can read the information. It displays the number and destination of the approaching bus, expected time of arrival, and messages of public interest.

Electronic display at the Metropolitan Bus Stand in

Chennai Bus Rapid Transport (BRT)

Bus Rapid Transit (BRT) systems are viable alternatives to traditional light rail public transport. Instead of a train or metro rail, BRT systems use buses to ply a dedicated lane that runs lengthwise along the centre of the road. At specific locations, passengers can embark or disembark at conveniently located stations, which often feature ticket booths, turnstiles, and automatic doors. Studies have shown that a BRT is not only cheaper to build, but is also profitable for bus owners to operate and relatively inexpensive for commuters to use. The cities selected for implementing BRT include Ahmedabad, Pune, Rajkot, Bhopal, Indore, Visakhapatnam, Vijayawada and Jaipur.

a. pune (Dec 2006)

The city of Pune was the first to experiment with a Bus Rapid Transit system. The project consists of 13 kms of bus lanes along the Pune Sastra Road using air conditioned, low floor Volvo B7RLE buses. The project has achieved success to certain extent. The funding for the project came from the Government of India under the Jawaharlal Nehru National Urban Renewal Mission

V. CONCLUSIONS

The smart public transport system with IOT is very much of need in current scenario .Utilsing the technology in public transport system will develop the growth in all sectors of nation as well as life style of common man Adopting this system will leads save the timings of common people as well as growth in business level This project can be adopted for the smart cities which is developing by the government of India.

The system we have developed is open for all sorts of Enhancements like information chart regarding every

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hour to be used for what. All the up gradation is welcomed.
Finally we hope and trust that the work done by us for "Smart Transportation System

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