

**TRAFFIC CONTROL SYSTEMS AND ITS IN VEHICLES  
(COMMUNICATION AVOIDANCE AND DRIVER  
ASSISTANCE).**

by

**Engr. Remi Adewunmi (Ph.D)**

**Nigerian Institute of Transport Technology, NITT Zaria**

# APPLICATION OF ITS IN HIGHWAY INFRASTRUCTURE AND TRAFFIC MANAGEMENT

- **Introduction**
- **Paper Objectives**
- **Current situation of Highway Infrastructure, Health, Safety And Security.**
- **Traffic Problems**
- **What are Intelligent Transport System?**
- **The benefits of ITS deployment**
- **Sample Application Of Its In Highway Infrastructure And Traffic Management**

# INTRODUCTION

- Mega cities cannot fulfil their vision without providing new solutions for transportation within the cities and so needs intelligent transportation system (ITS) as a driving force to facilitate its initiatives that will help improve mobility and improve transport infrastructures.
- ITS is one of the fundamental structures smart cities are using to improve the lives of its citizens and achieving sustainability. It includes tracking high pedestrian areas, traffic patterns, metro stations and coordinating bus times. It also enhances interoperability, general awareness of situations and has capacity to share information swiftly.
- It also offers a comprehensive approach to risk management, putting emergency procedures and response capabilities in place, identifying dangers, including vandalism or violence, fare evasion, and medical emergencies.
- The Nigerian transport system is urgently in need of modern infrastructures such as ITS because it would continue to suffer both in direct and indirect investments opportunities, unless urgent steps are taken to address the status quo.

# INTRODUCTION contd.

- Smart city transport technology helps cities to function productively, while improving services for businesses and lives of its citizens. This technology has the ability to improve travel across traditional modes of transport, such as cars and buses, with immediate benefits for city dwellers and also enhances traffic safety such as dangerous weather conditions, heavy traffic, and unsafe speeds which can result in accidents and loss of lives.
- ITS help in traffic control such as permitting traffic lights to react to changing traffic patterns, instead of working on a fixed schedule in traffic.
- ITS helps parking management because conventional parking enforcement systems are not very effective and are costly. Smart parking violations systems also help scan parked vehicles and transmit information to the parking meter to document illegally parked vehicles and helps in acquiring traffic data, for instance electronic traffic counters can record the type and number of vehicles accessing a road or visiting a specific area of a city and can also measure peak traffic times, journey length and other data.

# PAPER OBJECTIVES

- To draw the attention of the participants to the need for the introduction of ITS into our Highway Infrastructure and Traffic Management Systems.
- To educate transport stakeholders on the urgent need to provide a seamless, safe and secure Highways for Nigeria

# CURRENT SITUATION OF HIGHWAY INFRASTRUCTURE, HEALTH, SAFETY AND SECURITY

- Daily commuting and freight within the country especially in mega cities like Lagos, Abuja, Kano and Port Harcourt is becoming more difficult and complex.
- 6:30am – 10:30am morning peak hours and 3:00pm – 7:30pm evening peak hours.
- The deplorable traffic situations in cities are caused by land use activities such as industrial, commercial, educational, public and semi-public, administrative, recreational land use patterns, and circulation/transportation land use and its resultant activities.
- Poor geographic location of cities coupled with inadequate and inefficient transport activities, the unruly behavior of drivers and rise in car ownership have all contributed to complicate the problems on our highways leading to inefficient traffic flow.
- This has resulted in the following predominant traffic situations

# TRAFFIC PROBLEMS

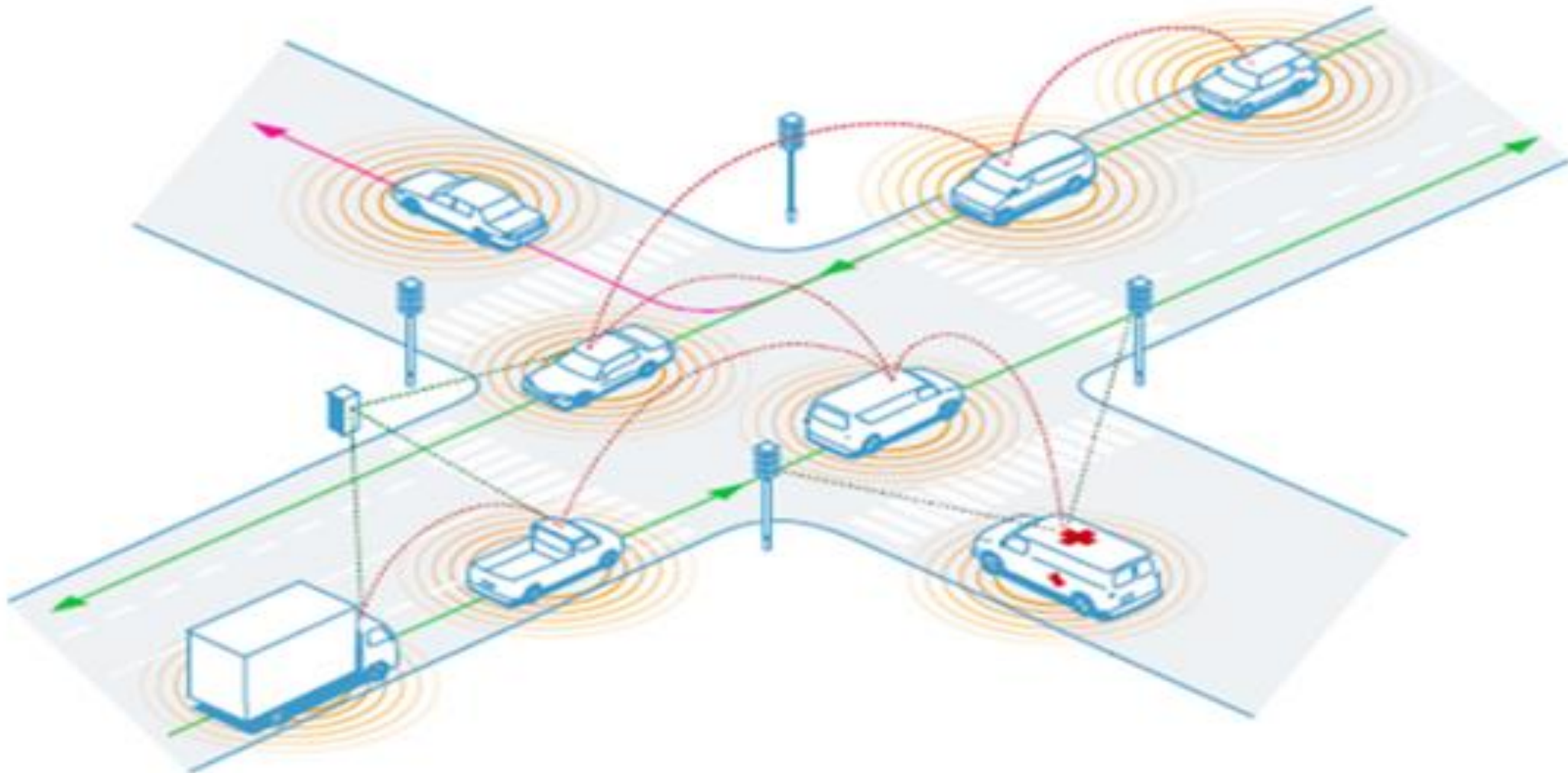
- Traffic congestion and Delay
  - Inadequate public transportation facilities causing inconvenience to public
  - Shortage of man power
  - Increased air and noise pollution due to increase in number of vehicles
  - Acute parking problems in urban areas
  - Non-cooperation from public for any new system or changes
  - High accident rates due to uncontrolled speed of vehicles and lack of discipline.
  - Absence of effective monitoring and prevention of traffic violation
- 
- A major approach at solving these problems is through the adoption of the **Intelligent Transport System (ITS)**

# WHAT ARE INTELLIGENT TRANSPORT SYSTEMS?

- Intelligent Transport Systems or ITS refers to a set of Information and Communication Technology (ICT) based solutions, applications and services that are applied in all areas of transport in order to achieve, safer, more reliable and efficient transport journeys thereby supporting sustainable economic growth and prosperity.
- When properly implemented, ITS solutions have been proven to be a useful tool in supporting the delivery of policy objectives such as casualty reduction, crime reduction, traffic congestion and carbon emission reduction.
- Others include increasing accessibility, informing travelers, integrated transport and efficient management of transport infrastructure and assets are all being supported by ITS implementations.



# Cooperative Intelligent Transport Systems



# Cooperative Intelligence Infrastructure Systems

- **Infrastructure to vehicle**

- Intelligent speed adaptation (ISA) - advisory
- Dynamic speed warning
- Local information(bridge, school, pedestrian etc.

- **Vehicle to vehicle**

- Emergency breaking
- Road condition warning
- Incident warning

- **Vehicle to infrastructure**

- Bus/emergency vehicle priority at junctions
- Vehicle tracking
- eCall (emergency location of vehicles)
- Wrong way driving
- Road condition and road damage reporting

# Further Definitions

- Addition of **information and communication technology (ict)** to **transport infrastructure** and **vehicles to manage** factors that typically are at odds with each other, such as vehicles, loads and routes to improve safety and reduce vehicle wear, transportation times and fuel consumption [Wikipedia]
- The application of **advanced technologies** to surface transportation problems, including traffic and transportation management (public and private), travel demand management, electronic payment, commercial vehicle operations, emergency services management, advanced vehicle control and safety systems [[www.answers.com](http://www.answers.com)]

# The Potential Value of ITS

- The Intelligent Transport Systems offer a valid and cost-efficient way of supporting the management and operations of transport services.
- According to Dr. Dave Tindall of TRL (UK) working in collaborations with ERTICO.
  - **Road Capacity:** an increase in effective capacity of up-to 20% without new construction has been demonstrated
  - **Saving Travel Time:** an estimated total of one year over an average lifetime
  - **Demand Management:** congestion charging can reduce traffic by 20%
  - **Health:** significant reduction in vehicle CO2 emission.
  - **Safety:** major reductions in road casualties (pedestrians and motorists)

### Running Ways

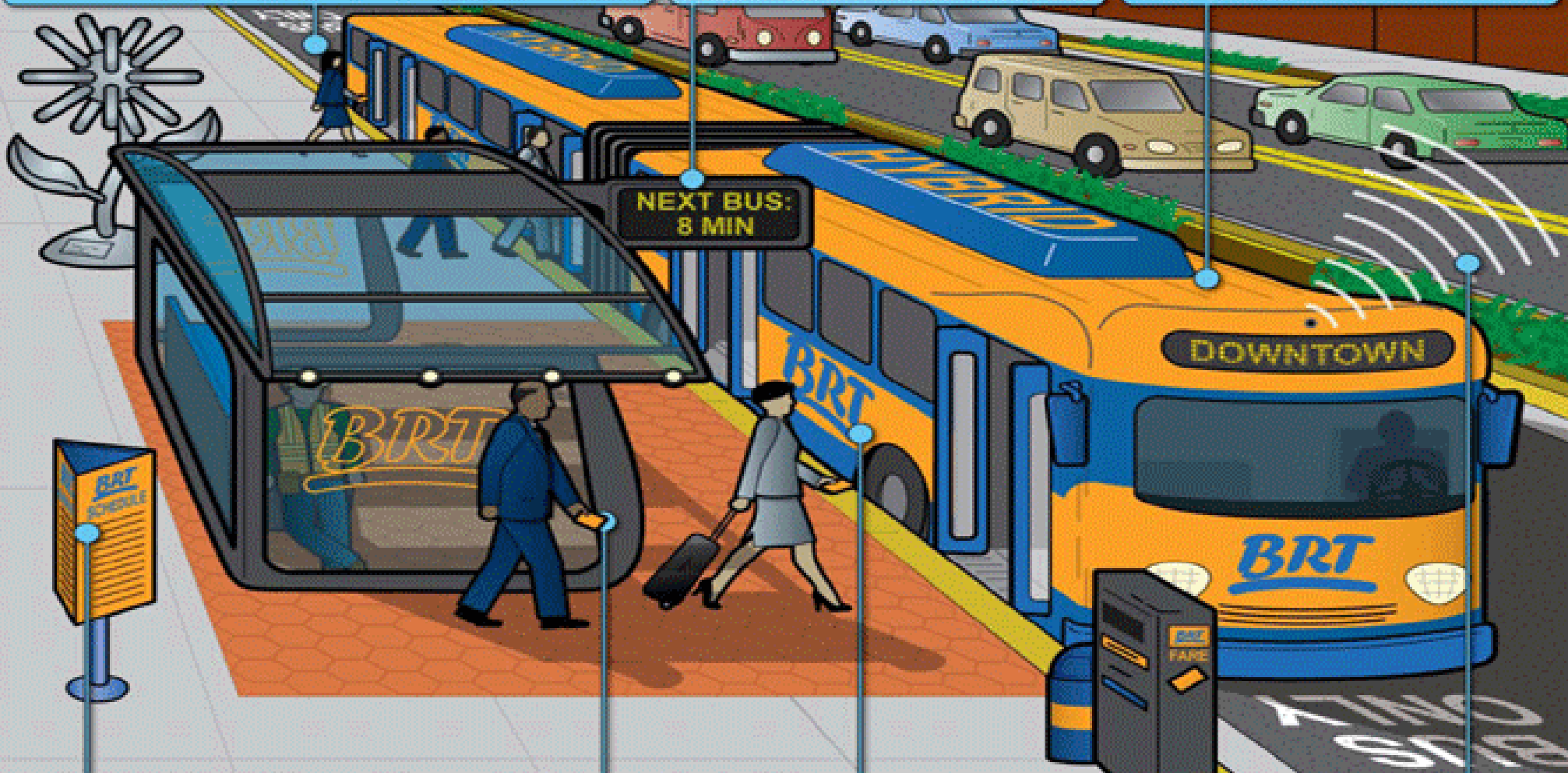
Running ways—lanes in which BRT vehicles operate—are improved to help decrease travel time, increase predictability, and increase a sense of permanence. Examples of improvements include: vehicles using dedicated lanes or guideways; semi-dedicated lanes (including high occupancy vehicle (HOV) or high occupancy toll (HOT) lanes).

### Stations

Stations or shelters provide additional rider amenities and differentiate BRT from standard bus service. Amenities can include, among other things, weather-proofing, safety improvements, public art and landscaping.

### Vehicles

Stylized vehicles run on alternative fuels or hybrid technology for a cleaner and quieter trip. BRT vehicles are also often designed to carry more riders and improve boarding with multiple boarding doors or low floors.



### Improved Service

BRT systems provide service for riders that is faster, more reliable, and more frequent than standard bus service.

### Fare Collection

Pre-paid or electronic passes can increase the convenience and speed of fare collection decreasing boarding times and providing travel time savings.

### Branding

Distinguishes BRT from standard bus service by marketing the BRT as a separate service, or unique branding of stations or vehicles.

### Intelligent Transportation Systems (ITS)

Improves service reliability by providing priority for BRT vehicles at intersections or extending a green light.

# What do we want from our transport systems?

- More information
  - To help us plan our journey
  - To help us avoid congestion and incidents –dynamic journey planning
- More choice
  - To choose modes of transport
- Modal integration
- Safety
- Health and Environment

# What do Road Operators Want?

- **More information..... and quickly**
  - Where is congestion?
  - Where are the incidents?
  - Where is the obstruction as a result of road damage?
  - Where can the efficiency of the network be improved?
  - Where can we improve the safety of the network?
  - Where can we save money in operating the network?
- **Provide road users with up-to-date and accurate information?**

## What will we be happy to pay for?

- Anything which saves us time and/or money
  - As individuals or as commercial organizations
  - Timely journey planning
  - An advantage over the others

## What do we tend not to want to pay for?

- Safety features
- Privacy
- Environmentally friendly features
- Charges for road use.



# How ITS works?

- Traffic Management Centre (TMC) is the vital unit of ITS. It is mainly a technical system administered by the transportation authority. Here all data is collected and analyzed for further operations and control management of the traffic in real time or information about local transportation vehicle.
- Well-organized and proficient operations of Traffic Management Centre depends on automatized data collection with precise location information than analysis of that data to generate accurate information and then transmitting it back to travelers.
- Data collection: Strategic planning needs precise, extensive and prompt data collection with real-time observation.
- Data Transmission: Rapid and real-time information communication is the Key to proficiency in ITS implementation
- Data Analysis: The data that has been collected and received at TMC is processed further in various steps
- Traveler Information: Travel Advisory Systems (TAS) is used to inform transportation updates to the traveling user

# Specific examples of ITS application areas include:

- **Floating Car Data/ Floating cellular Data :** ‘Floating Car’ or ‘Probe’ Data collection is a set of relatively low cost methods for obtaining travel time and speed data for vehicles travelling along streets, highways, motorways (freeways), and other Transport routes.
- **Vehicle Re-Identification:** Vehicle re-identification requires sets of detectors mounted along the road. In this technique, a unique serial number for a device in the vehicle is detected at one location then detected again (re-identified) further down the road.
- **Urban Traffic Control (UTC):** UTC provides road users with benefits such as reduced number of stops, reduced travel times and significant fuel savings
- **Sydney Co-ordinated Adaptive Traffic System (SCATS):** This is the most advanced and widely used fully adaptive Urban Traffic Control System in the market today. It uses real traffic adaptive approach to urban traffic control by measuring current traffic conditions and adjusting cycle lengths, splits and offsets, its real time response to changing traffic conditions ensures the most appropriate traffic signal phasing to safely direct traffic through intersections
- **Emergency Vehicle Preemption System:** Allows traffic lights’ normal operations to be preempted to provide safe passage to emergency vehicles at an intersection. Normally on standby mode, the system triggers priority phase once it receives an emitted signal from emergency vehicles equipped with a preemption emitter. It provides immediate green light or right of way on intersections.

# CONCLUSION

- The potential of ITS technologies in enhancing the efficiency of transportation sector in Nigeria is very promising based on the experience of other countries.
- A national strategic ITS plan for Nigeria is needed for effective development and deployment.
- Some of the ITS technologies can be applied to achieve an efficient transportation system.
- It is our prayer to plan and establish an ITS driven transport management system for the nation.

**THANK YOU**