Intelligent Transportation Systems on Highways
The term intelligent transport systems (ITS) refers to efforts to add information and communications technology to transport infrastructure and vehicles in an effort 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.
Intelligent transport technologies

- Wireless communications
- Computational technologies
- Floating car data/floating cellular data
- Sensing technologies
- Inductive loop detection
- Video vehicle detection
Intelligent transport applications on Highways

- Electronic toll collection
- High occupancy toll lanes
- Emergency vehicle notification systems
- Cordon zones with congestion pricing
- Automatic road enforcement
- Variable speed limits
- Collision avoidance systems
- Dynamic Traffic Light Sequence
1. Electronic toll collection

- Electronic toll collection (ETC), an adaptation of military "identification friend or foe" technology, aims to eliminate the delay on toll roads by collecting tolls electronically.
- It is thus a technological implementation of a road pricing concept.
- It determines whether the cars passing are enrolled in the program, alerts enforcers for those that are not, and electronically debits the accounts of registered car owners without requiring them to stop.
Electronic Road Pricing Gantry at North Bridge Road, Singapore

Transponders like this one electronically debit the accounts of registered cars without their stopping
2. High occupancy toll lanes

- High occupancy toll lanes (HOT lanes) is a road pricing scheme that gives motorists in single-occupant vehicles access to high-occupancy vehicle lanes (or "HOV lanes").

FasTrak High-occupancy toll (HOT) lanes at Express Lanes, at Orange County, California.
3. Emergency vehicle notification systems

- The in-vehicle eCall is an emergency call generated either manually by the vehicle occupants or automatically via activation of in-vehicle sensors after an accident.
- Sends information about the incident, including time, precise location, the direction the vehicle was traveling, and vehicle identification.
4. Intelligent speed adaptation

- Intelligent Speed Adaptation (ISA), also known as Intelligent Speed Assistance, is a system that constantly monitors vehicle speed and the local speed limit on a road and implements an action when the vehicle is detected to be exceeding the speed limit.

- This can be done through an advisory system, where the driver is warned, or through an intervention system where the driving systems of the vehicle are controlled automatically to reduce the vehicle’s speed.
Intelligent speed adaptation

Digital Speed Limit Map of Greater London (all 33 Boroughs)
5. Automatic road enforcement

Automatic speed enforcement gantry or "Lombada Eletrônica" with ground sensors at Brasilia, D.F.
Automatic road enforcement

• Speed cameras that identify vehicles traveling over the legal speed limit.
• Red light cameras that detect vehicles that cross a stop line.
• Bus lane cameras that identify vehicles traveling in lanes reserved for buses.
• Level crossing cameras that identify vehicles crossing railways at grade illegally.
• Double white line cameras that identify vehicles crossing these lines.
• Turn cameras at intersections where specific turns are prohibited on red.
**Variable speed limits**

- Officials can adjust the speed limit according to weather, traffic conditions, and construction.
- More typically, variable speed limits are used on remote stretches of highway in the United States in areas with extreme changes driving conditions.
Dynamic Traffic Light Sequence

- Intelligent RFID traffic control has been developed for dynamic traffic light sequence. It has circumvented or avoided the problems that usually arise with systems such as those, which use image processing and beam interruption techniques.
6. Vehicular ad-hoc network

- A Vehicular Ad-Hoc Network, or VANET, is a technology that uses moving cars as nodes in a network to create a mobile network. VANET turns every participating car into a wireless router or node, allowing cars approximately 100 to 300 metres of each other to connect and, in turn, create a network with a wide range.
Vehicular ad-hoc network

- As cars fall out of the signal range and drop out of the network, other cars can join in, connecting vehicles to one another so that a mobile Internet is created.

- It is estimated that the first systems that will integrate this technology are police and fire vehicles to communicate with each other for safety purposes.
Cooperative systems on the road

- The definition of cooperative systems in road traffic is according to the European Commission

"Road operators, infrastructure, vehicles, their drivers and other road users will cooperate to deliver the most efficient, safe, secure and comfortable journey. The vehicle-vehicle and vehicle-infrastructure co-operative systems will contribute to these objectives beyond the improvements achievable with stand-alone systems."
7. **Cooperative systems on the road**

- Communication cooperation on the road includes car-to-car, car-to-infrastructure, and vice versa.
- Data available from vehicles is acquired and transmitted to a server for central fusion and processing. This data can be used to detect events such as rain (wiper activity) and congestion (frequent braking activities).
- The server processes a driving recommendation dedicated to a single or a specific group of drivers and transmits it wirelessly to vehicles. The goal of cooperative systems is to use and plan communication and sensor infrastructure in order to increase road safety.
ITS World Congress

- The World Congress and Exhibition on Intelligent Transport Systems is an annual event, which rotates between Europe, the Americas and the Asia-Pacific region.

- The 18th ITS World Congress will be held in Orlando, FL, USA from 16–20, October 2011 with the theme

  'Keeping the Economy Moving'.