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**Smart Mobility:
The Challenges for Tollway Operators**

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The Technological Evolution on Tollway Operation

Operation

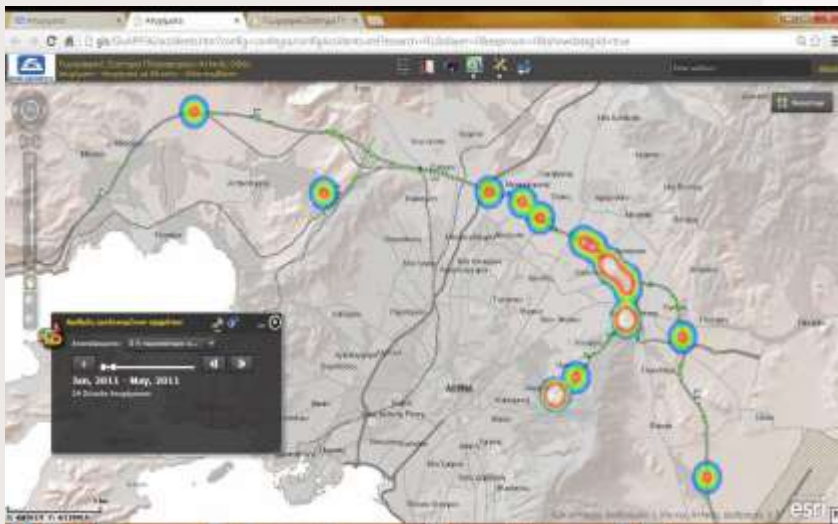
Traditional

- Surveillance
- Toll Collection
- Traffic Management
- Patrolling
- Equipment Control

Technological

- Monitoring, Automatic Incident Detection
- E-toll Collection
- Real Time Information
- Remote Enforcement
- Remote Control

Operation on Tollways



Towards Intelligent Transport Systems

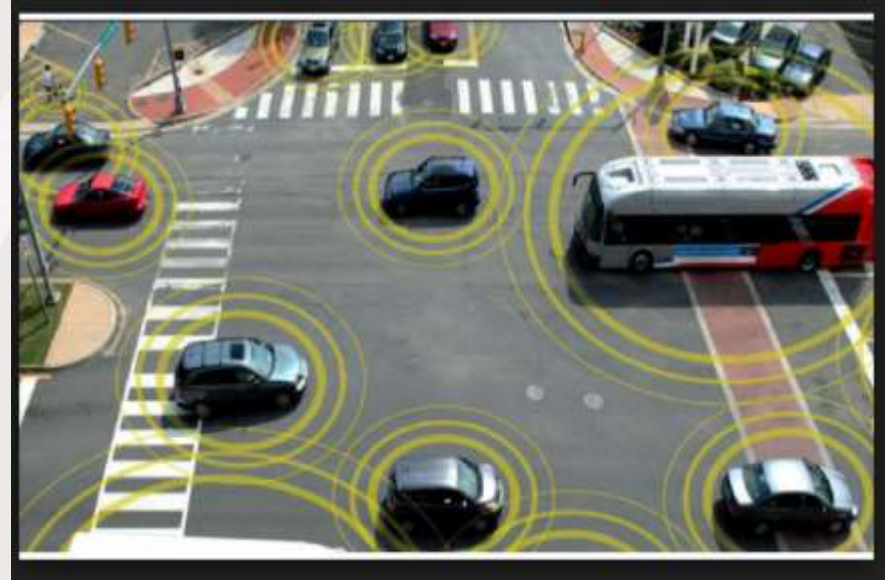
Intelligent Transport Systems (ITS) are vital to increase safety & tackle Europe's growing emission & congestion problems.

They can make transport:

- Safer**
- More efficient**
- More sustainable**

by applying and integrating information, communication technologies and cooperative technologies.

Vehicle Technology Evolution

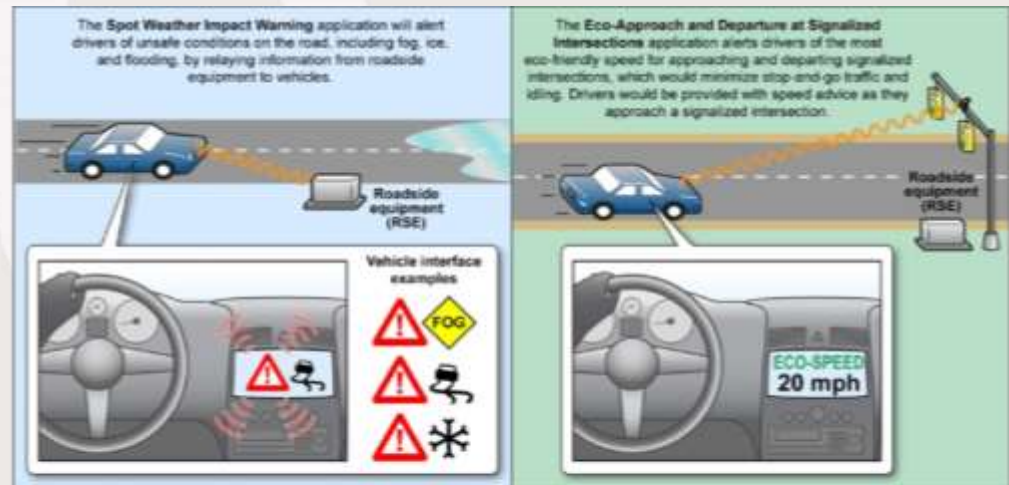


Cooperative System

Cooperative systems include two-way communication:

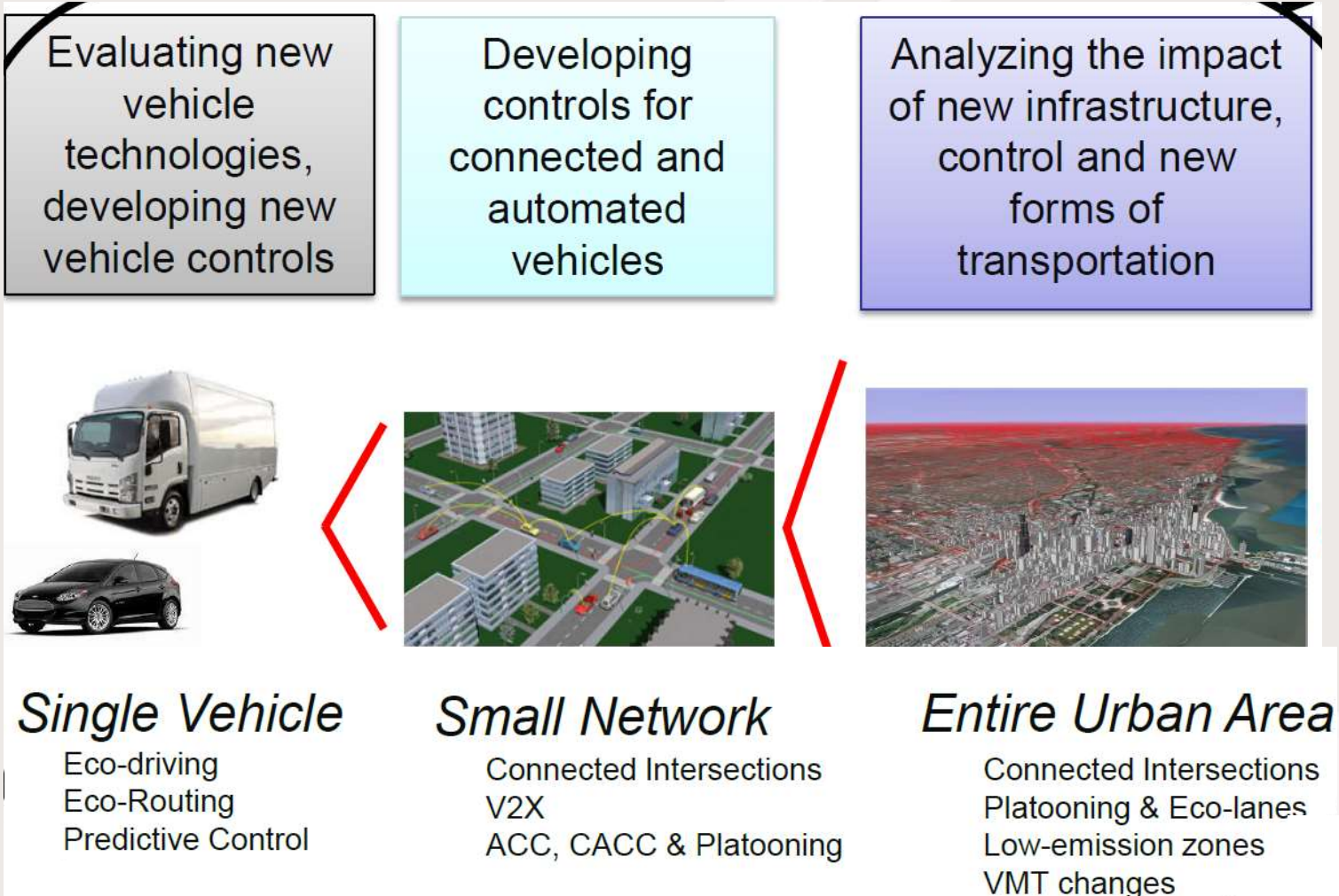
- a) between vehicles (V2V)
- b) between vehicles and infrastructures (V2I)

They can help drivers to have a better control of their vehicle and hence have positive effects in terms of safety and traffic efficiency. Vehicles can also function as sensors reporting weather and road conditions including incidents, to be used for high-quality information services.



Source: United States Government Accountability Office Report to Congressional Requesters, Intelligent Transportation Systems (September 2015)

From the Vehicle Changes to the Infrastructure Reform

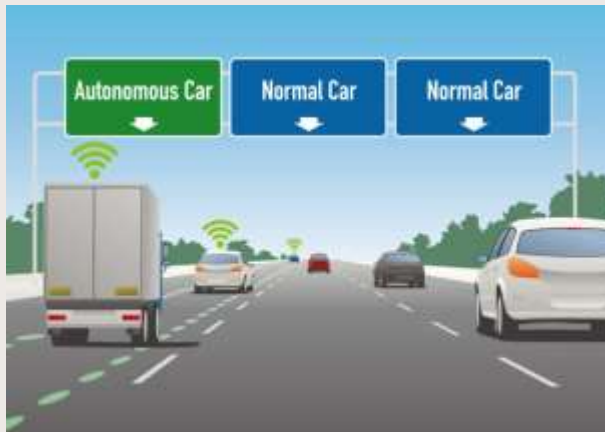


The New Role of the Tollways and Motorways

- The motorway network will supply the brain and the vehicles will plug into the network.
- Innovation has started primarily from the vehicle and changes and innovation on the motorway have to follow in order to fully unlock the potential of the new vehicles.
- Motorways and connected cars will have to cooperate.
- Information gathering and sharing will become as important as planning and constructing roads and bridges! Information will become infrastructure in the new highway operating system.

Operator Issues & Strategies

- Traffic management for mixed traffic
- Dedicated lanes for automated vehicles
- Improving lane markings for automated vehicles
- I2V Communications of toll information to connected vehicles
- Personalized dynamic traffic management to the driver
- Use of DSRC or cellular V2X for tolling



Tolling & Pricing

- **Tolling technologies are more adaptive to technology changes than infrastructure.**
- **Open Road Tolling is more convenient to new technologies than traditional tolling. There is no more need to pay at traditional toll booths!**
- **The more effective the pricing the more efficient the highway system.**
- **Intelligent cars will be able to identify the best routes of travel based on price, speed of travel and time of day. So the highway system can optimize capacity.**

The Role of Operator

- 1. Face the challenges in the transition period in terms of cost and effectiveness.**
- 2. Introduction of new technologies in customer service and tolling will help transition.**
- 3. Collaborate with other stakeholders and perform pilot demonstrations.**
- 4. Provide facilities for electric cars.**
- 5. Contribute to the new sense of integrated mobility.**

Challenges

- Interoperability of all systems
- Fraud and violations in the use of ITS – Hacking?
- Regional differences
- Security and privacy
- Human factors
- Technology factors
- Patrolling
- Penalties and fines

The World is Changing

- **ITS will play a crucial role in the Transport sector**
- **The combination of many applications and systems such as real time information, ADAS, electronic tolling e.t.c will lead to full automation**
- **When planning a transport network safety is the key priority**
- **The human factor should be minimized**
- **The infrastructure has to be preventive and forgiving**

Questions

- Is it better to invest in new infrastructure or in new technologies?
- Does it make sense to invest billions in new roads when you could double the capacity with new technologies ?
- Who is going to pay for the implementation of new technologies? The operator? The state? The users?
- How do infrastructure elements vary with different levels of automation?

Thank you!



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