



## Connected Vehicle Systems in Europe

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- European Deployment: Drive C2X / Score@F
- Applications & Infrastructure oriented services
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## Connected vehicles: concept & ideas

### Origins – Car 2 Car communications

- A direct radio link between vehicles
  - V2V applications
- Initiated for enhancing Road safety
- G5: A dedicated radio band
  - US (5,855 - 5,925 GHz)
  - EU 30MHz (5,875 – 5,905 GHz)
- Royalties free





## Connected vehicles: concept & ideas

### Origins - Car 2 Infrastructure Communication

A need for additional G5 hotspots

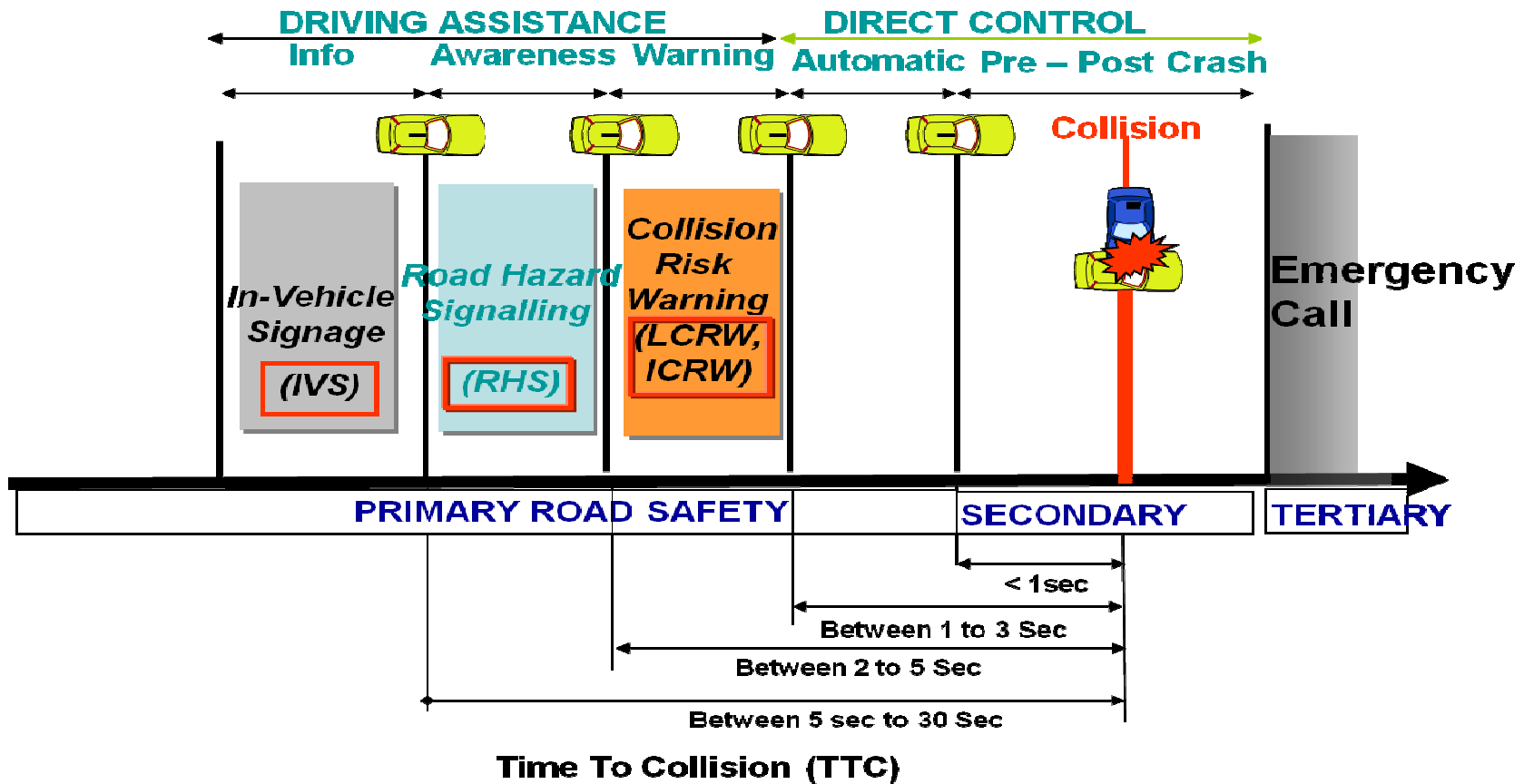
- For V2V applications:
  - To cover all potential accident places :
    - Mountain roads & curves
    - Critical places without huge traffic
    - Masking area (buildings, forest)
  - To prevent accident in case of road hazards
    - animals, pedestrian, non equipped vehicle...
- For new V2I applications and services using:
  - Free car information over the radio link
  - Free access to enhanced traffic data
  - Accuracy of the data (each car has its own radio transceiver and is clearly identify)



# Connected vehicles: concept & ideas

## Safety principles

- Different uses for different times



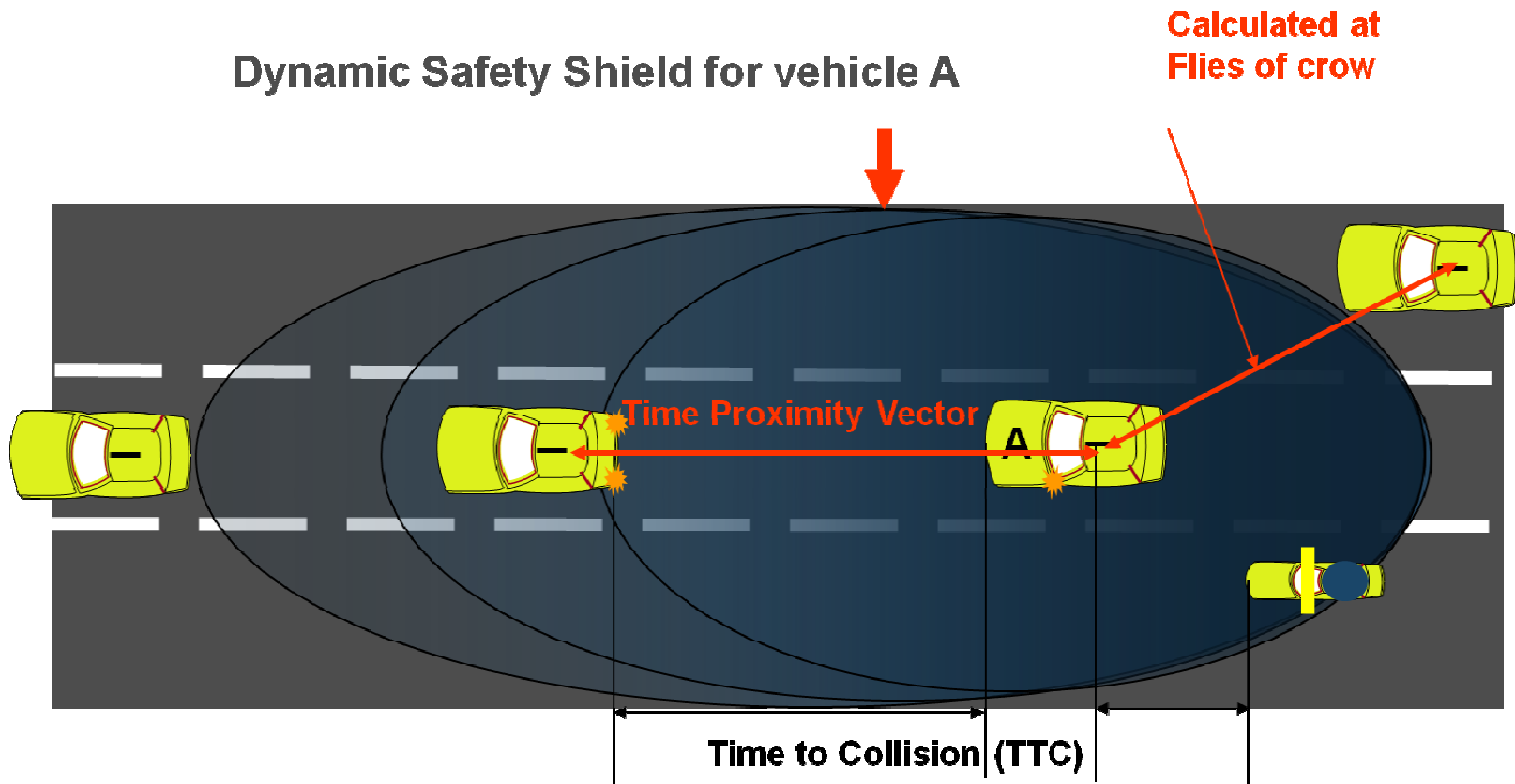


# Connected vehicles: concept & ideas

## Safety principles

- Vehicle virtual shield

### Dynamic Safety Shield for vehicle A



# European deployment

## European Standards

- ETSI
  - European Telecommunications Standards Institute
- CAM Message
  - Cooperative Awareness Message
  - Periodic position
  - Complete vehicle characteristics
  - 100 ms
- DENM Message
  - Decentralized Environmental Notification Message
  - Alarm message
  - Relayed by other cars





## European deployment

### European Standards

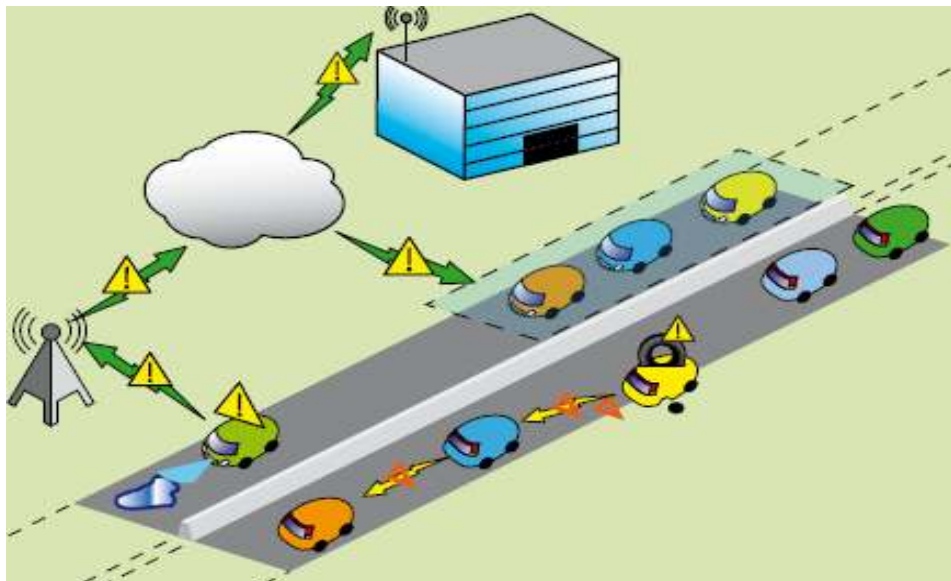
- Some Services messages:
  - SAM (Service Announcement Message)
    - Used to inform about the services available on a device
  - SPAT (Signal Phase And Timing Message)
    - Used to signal to cars the different timings on a traffic light
  - ESM (Embedded Signage Message)
    - Used to display a message to a driver
  - RIM (Recommended Itinerary Message)
    - Used to help the GPS device of the vehicle
  - POI Message (Point Of Interest)
    - Several Point of Interest (Park, Toll, Charging spots...)





### Geonet

- Classical communication use connected IP (TCP)
- Geonet provide a key to allow mobility of the vehicle
- Architecture independent using GPS coordinates
  - A vehicle is addressed by its position
  - Vehicles can also relay a message until it reach its final destination





## European deployment

### Drive C2X

- European coordination for the C2C experimentations (FOT)
- Provide a common technical template
  - OS, Communication framework,
  - Tests tools
- Ensure interoperability
- Global tests
- 7 country
- 8 cars manufacturers
- 2011-2013





# European deployment

Drive C2X



DAIMLER



DELPHI  
Automotive Systems

HITACHI  
Inspire the Next

NEC

RENESAS



Fraunhofer  
FOKUS



Inria  
INVENTORS FOR THE DIGITAL WORLD



nevia )))  
technologies

nevia )))  
technologies

# European deployment

## Score@F : The French FOT



- Up to 5 national tests sites
- Consortium of different actors:
  - Cars Manufacturers
  - Road Operator and Infrastructure manufacturers

### Cars Manufacturers & OEMs



PSA PEUGEOT CITROËN



### Road Infrastructure



### Prospective



### Telecoms & Services



## European deployment

### Tests Sites

- Controlled roads (IFSTTAR)
- Suburban roads (Yvelines)
- Highways (A10 / Vinci network)
- Urban roads (Versailles)
- Mountains roads (Alps, Isere)
- 09/2011- 09/2013



### French Tests Sites

- Road side units
  - G5 Hotspots
  - HSPA link with external servers
  - Ethernet link
  - Rugged and full integration design (antennas)
- Vehicles
  - G5 Communication unit
  - Framework Application unit
  - Integrated HMI



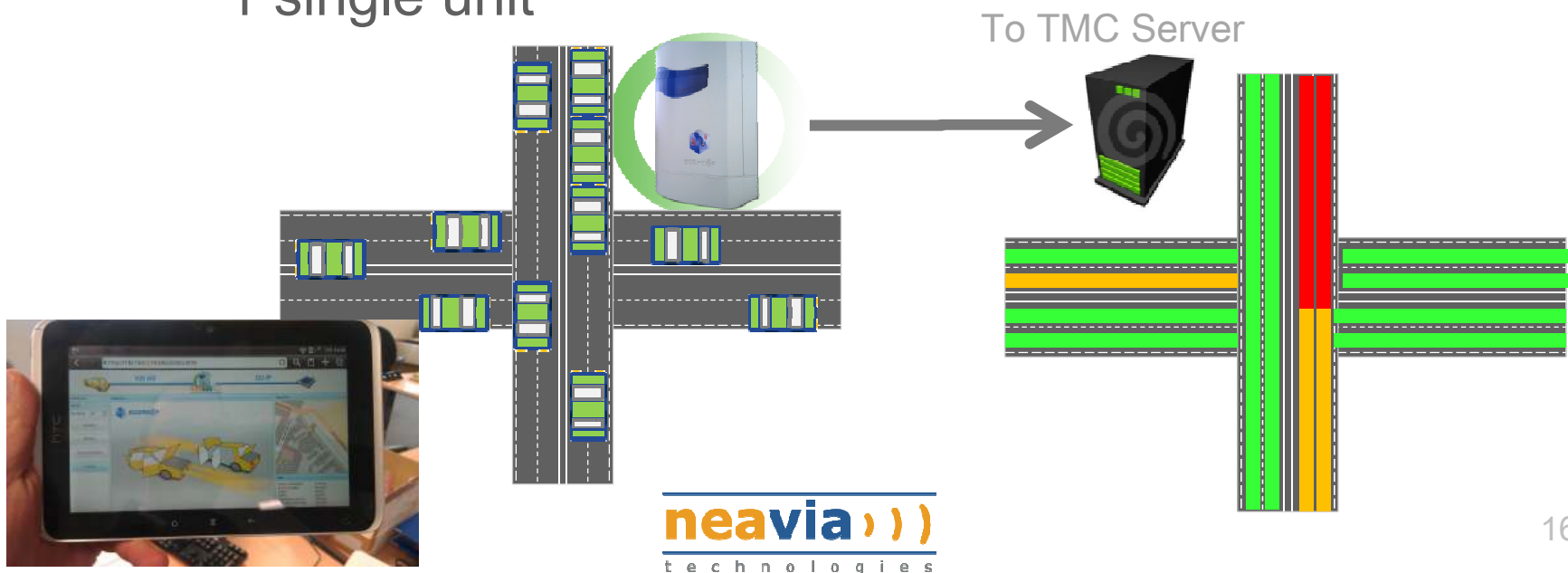


### C2C Uses cases

- Uses cases using a direct link from vehicle to another
- Traffic jam ahead
- Wrong way driver
- Contextual speed limits
- Collision warning
- Roadwork warning

### Traffic Data Collection

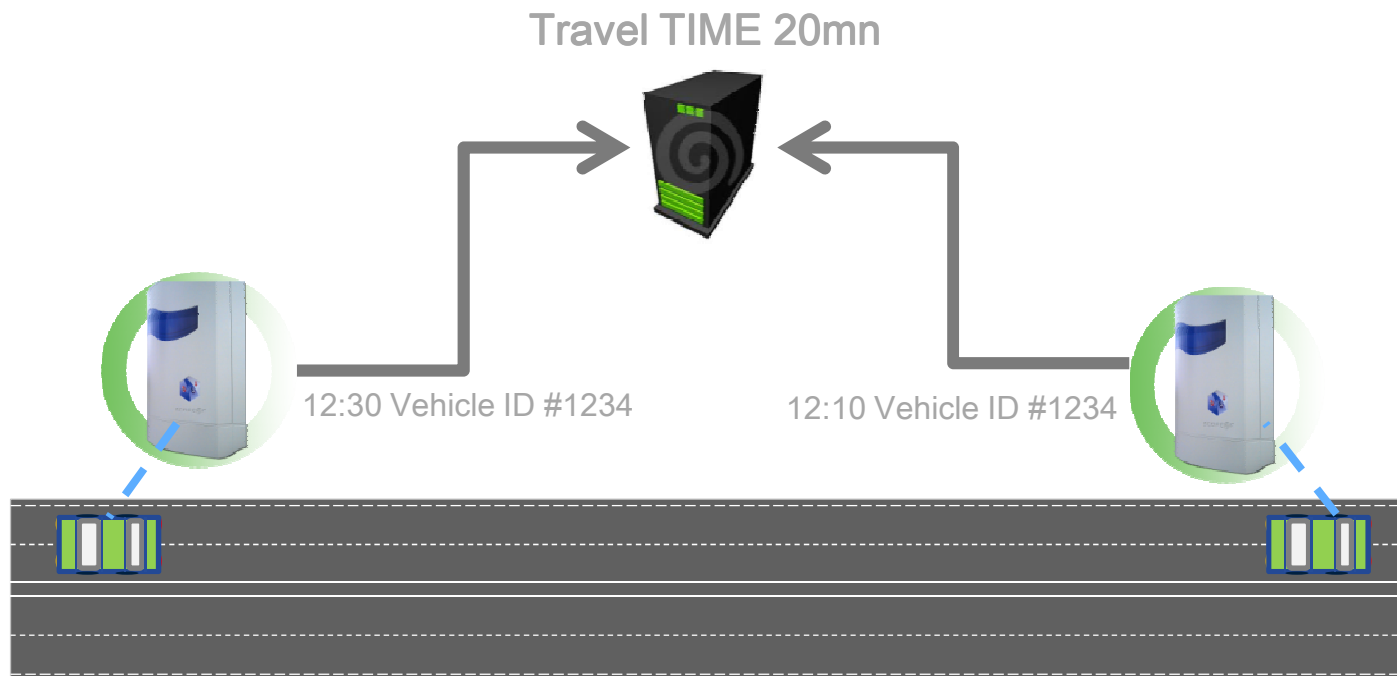
- Use V2V message to provide accurate traffic data
  - (counting, speed, classification, occupancy...)
- Send to TMC the vehicles alarms
- Enhanced information
  - Passengers, Weather indication, Road conditions (ice...)
- Using car hopping, several areas of analysis with only 1 single unit





### Travel time estimation

- Use vehicle Ids
- Send to a TMC software a cloud of timestamp+Ids
- The module compute the Travel Time



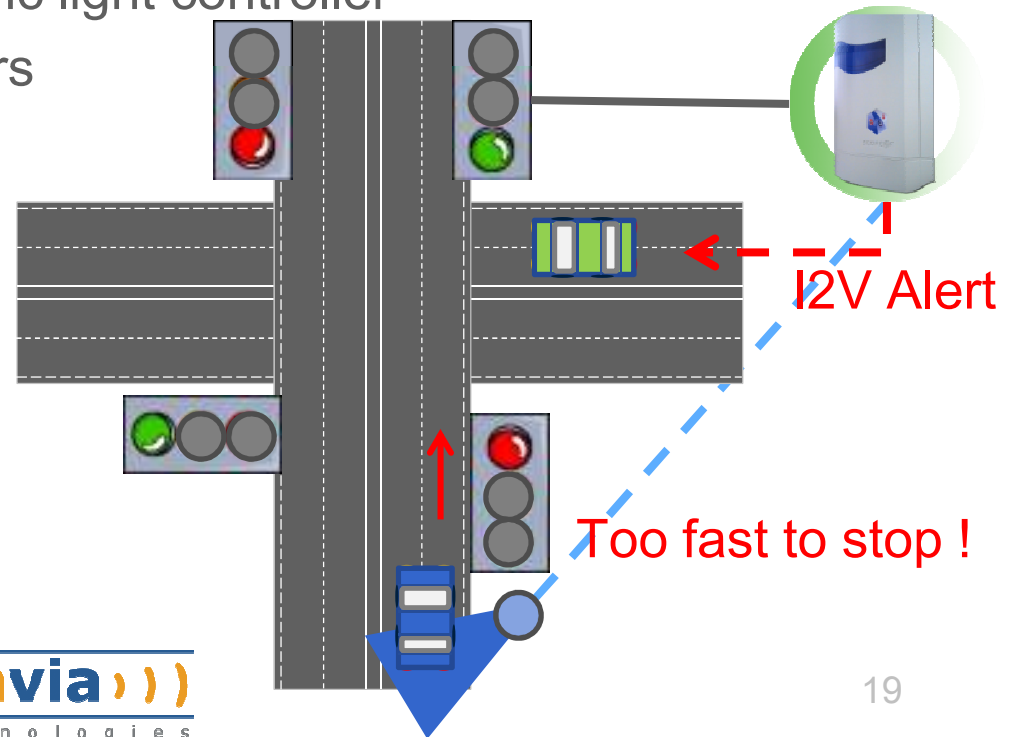
## Services broadcasting

- Road side units connect to mobility servers
- Broadcast:
  - Park indications
  - Toll information
  - Urban entrances



## Signal Violation

- Deployment assistance through classical sensors connected to the Road Side Unit
- Direct benefit for equipped vehicle
- Signal violation for fixed or dynamic signals
  - Connected to the traffic light controller
  - Interface radio sensors
  - Send I2V alarms





## Conclusion

- A revolution in progress
  - First step for a global deployment / technical validation
  - Project Pilot (similar to Safety pilot in the US) starting in 2013/2014
  - European project for a mandatory deployment in all cars
  - First inline production 2017/2018
- Turn over
  - More than 10 years to replace the fleet to the next generation one
  - The Road Side Units will help the transient situation and will provide benefits from the first car equipped
  - A great opportunity for new applications and business



# Thank you

04/07/2012



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