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Panel 5G and Verticals

The Connected and Automated Driving (CAD) Case

Xavier Costa Perez

NEC Laboratories Europe
Heidelberg, Germany

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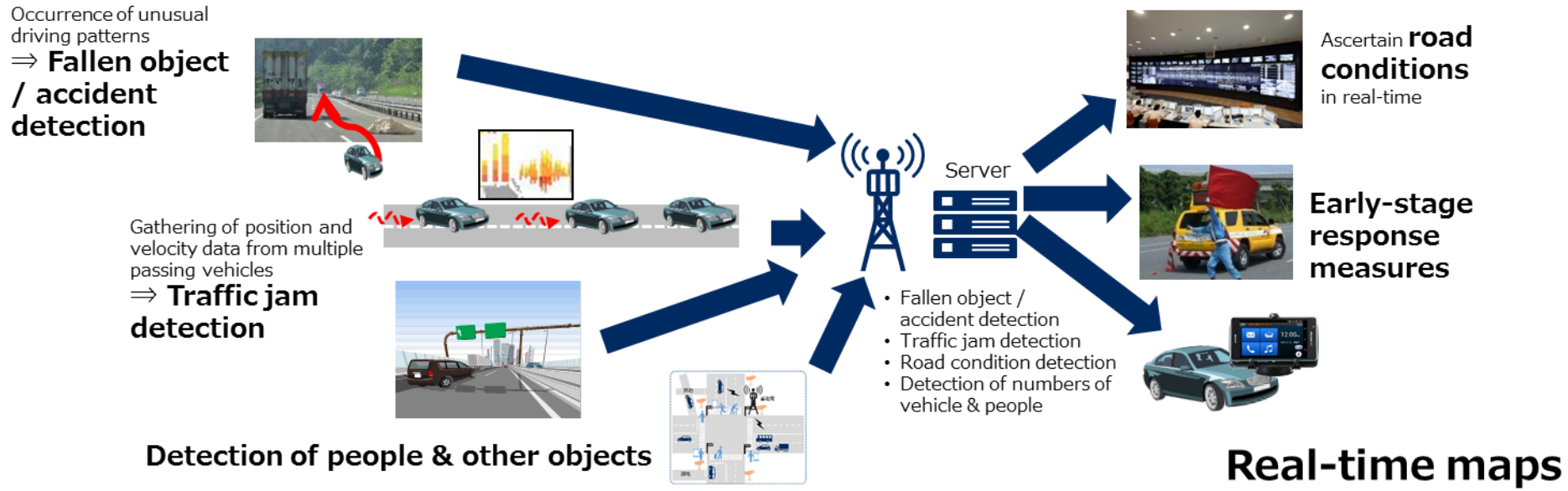
Why 5G for Connected and Automated Driving?

Social issues	• Need to reduce the number of traffic accidents, alleviate traffic jams, and implement efficient traffic systems • Need to dynamically ascertain changes in road conditions (e.g. fallen objects, accidents and traffic jams/congestion)
Solution	Real-time distribution of ITS data to widely disseminate road condition forecasts and offer greater safety and peace of mind when driving



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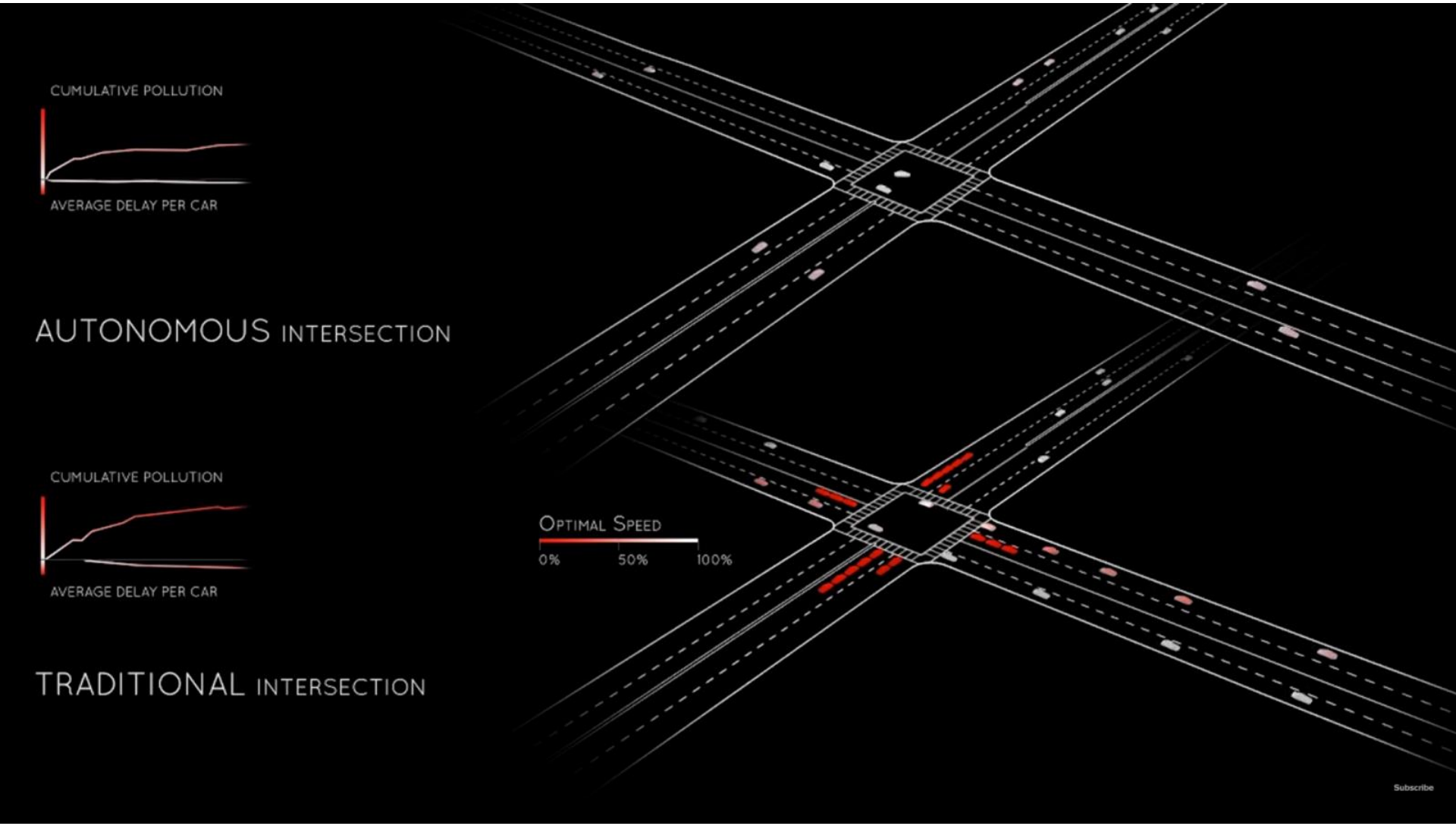
Why 5G for Connected and Automated Driving?

The death of traffic lights?



https://www.youtube.com/watch?v=kh7X-UKm9kw

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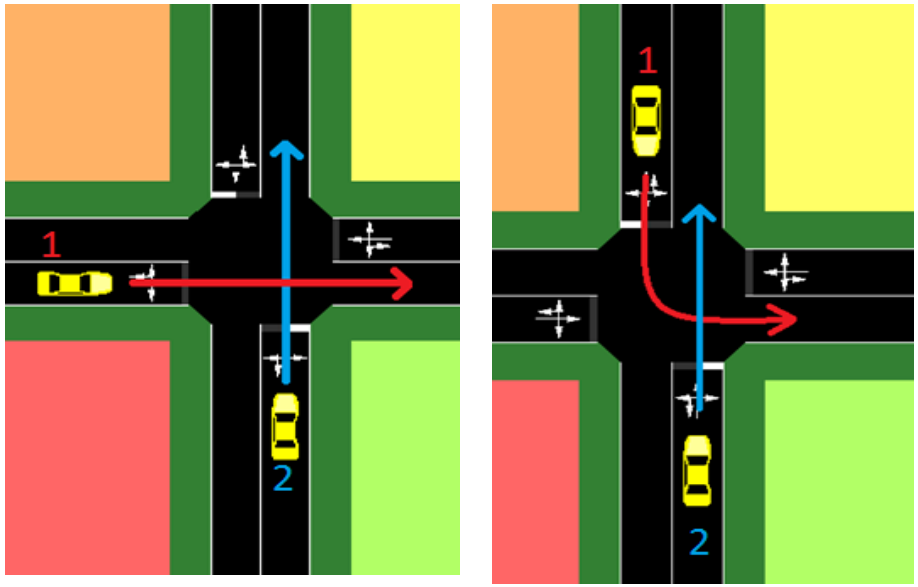
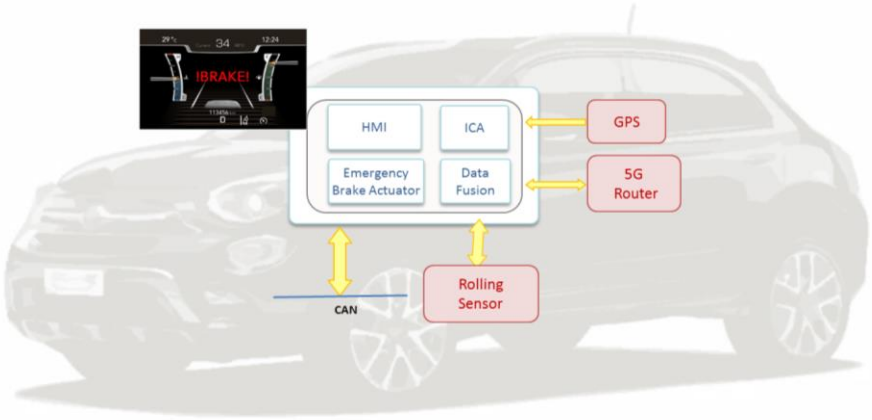
V2V vs V2X

Intersection Collision Avoidance

Performance Improvement Benchmarking Efforts

- V2V Time-to-Brake vs
- V2X Time-to-Brake





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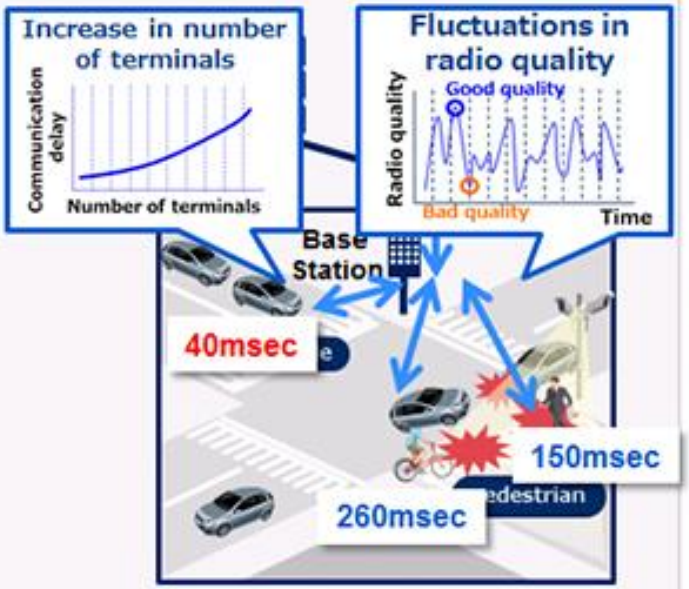
Prioritizing Connected and Autonomous Driving Traffic

Adaptive Network Traffic Control Technology

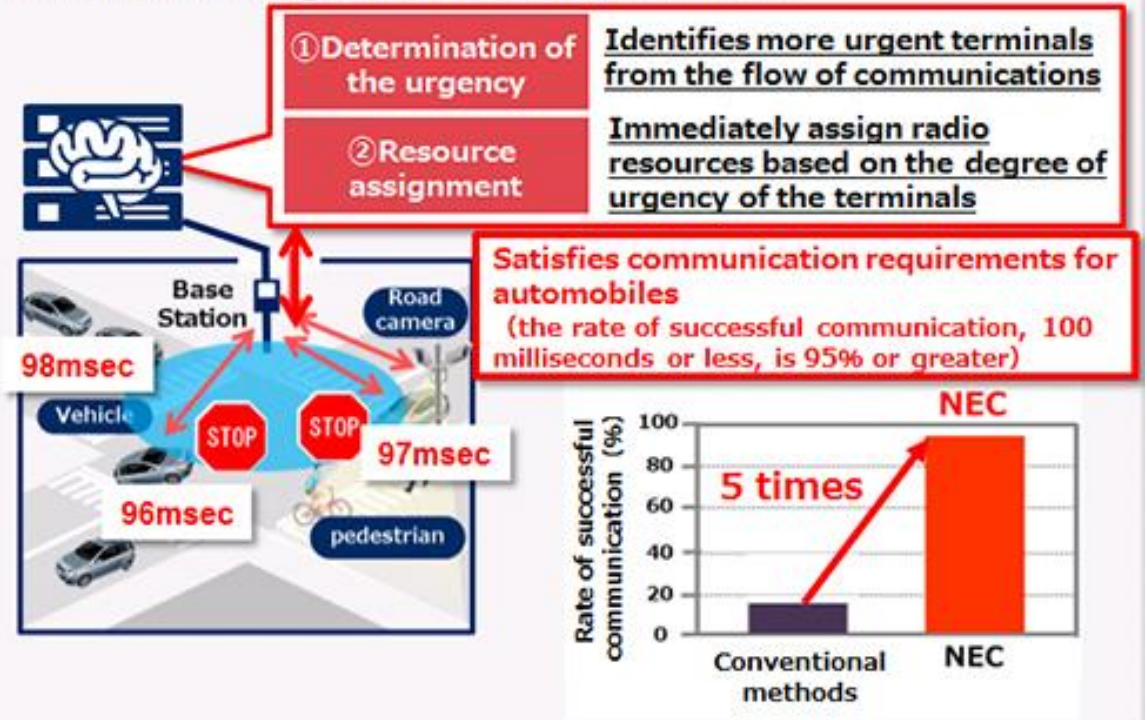
Before

The rising number of communication terminals and fluctuations in radio quality make it impossible to suppress fluctuations in communication delays



After

Fluctuations in communication delays are suppressed with the identification of more urgent terminals and with the immediate assignment of radio resources



PR: https://www.nec.com/en/press/201802/global_20180205_02.html

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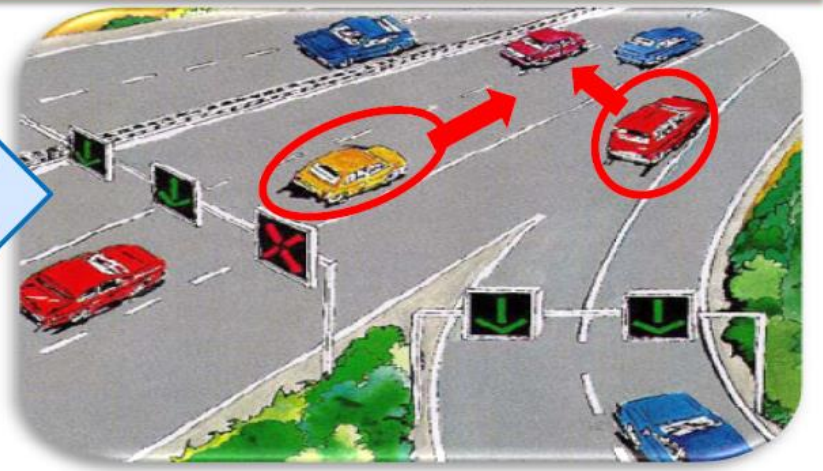
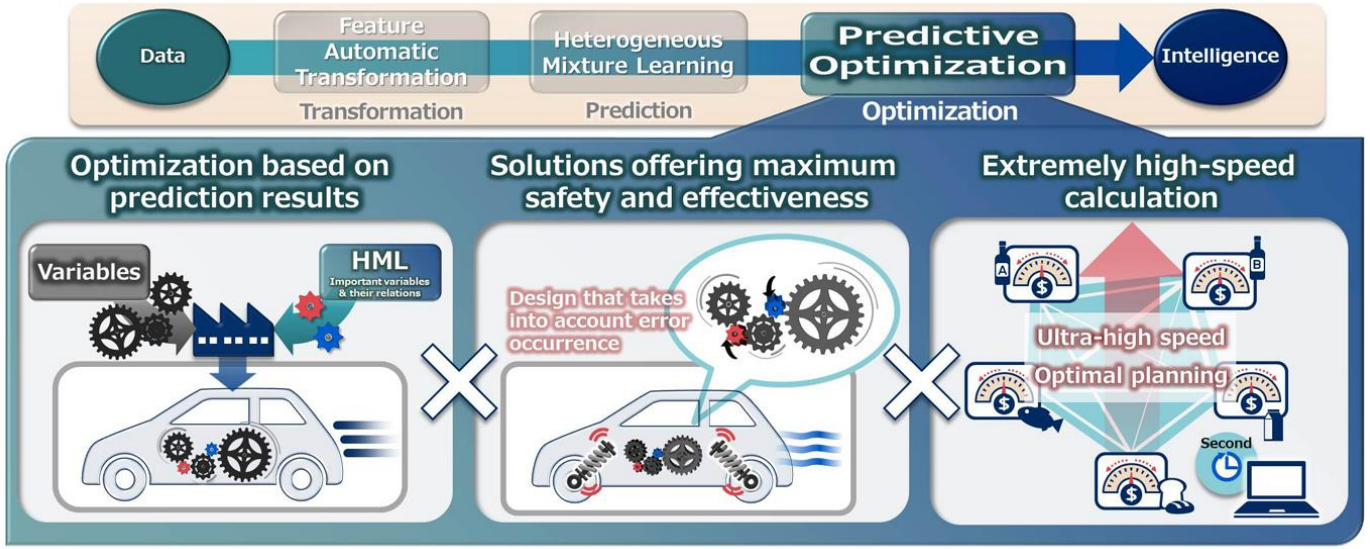
Predicting the Future – Above 2 seconds

Show driver where danger is and how severe in non-intrusive way.

Combination of map information with sensor data provides intelligent analysis





PR: https://www.denso.com/global/en/news/news-releases/2016/20161226-g01/

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Connected Driving – Remote Construction

- **5 Cameras**
  - 2 4K cameras
  - 1 2K omnidirectional
  - 2 2K overhead cameras
- **Images transmitted to the remote operations room by**
  - Massive-element active antenna system
  - Beamforming
  - 28 GHz Band

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