Industry 4.0 & Transport for Digital Infrastructure

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ICT changes Transport

Vehicle to Anything Connectivity (V2X)

Automotive World

- IVN-Sensor
  - X-by-Wire, MOST, ...
  - Multi media
  - Gyro Sens.
  - Distance Sens.
  - Wheel Sens.
  - Vehicle G/W

- IVN
  - CAN, LIN, Flexray, ...

IT World

- V2I
  - CDMA, DSRC, WLAN, ...

- V2V
  - VMC, WAVE, ...

- V2N
  - Bluetooth, USB, ...

RSU

Vehicle

Nomadic Device
ICT changes Transport

- Cooperative ITS (C-ITS) based on V2X : ISO/TC204
• Super Connectivity in Smart Cities
  – Connectivity between
    • Vehicles
    • Infrastructure
    • Drivers
    • Nomadic Devices
  – Communications
    • Citizen
    • City
    • Anywhere, anytime, ..
**ITS vs. Next Generation ITS**

**Intelligent Transport Systems (ITS) (1990s-2010s)**
- Information Collection & Provision
  - Vehicle Detection System (VDS)
  - Road Surveillance & Monitoring
  - Variable Message Signs (VMS)

**ITS for Next Generation (2020s-2040s)**
- Citizen and City Super Connectivity
- **Digital Infrastructure** by V2X
- Mobile & Nomadic Devices
- Smart Mobility in Smart Cities
Digital Infrastructure

- Intelligent & Sensor-based Infrastructure
  - V2X and Automotive Cloud Information & Management
  - Connected & Automated Driving, Mobility Integration, Smart Cities

Sources: USDOT, 2014
Technology convergence will revolutionize transportation, dramatically improving safety and mobility while reducing costs and environmental impacts.

Benefits
- Order of magnitude safety improvements
- Reduced congestion
- Reduced emissions and use of fossil fuels
- Improved access to jobs and services
- Reduced transportation costs for gov’t and users
- Improved accessibility and mobility

Sources: USDOT, 2015
## Level of Automated Driving & Digital Infrastructure

- **Vehicle Automation**
- **Digital Infrastructure by ITS for Next Generation**

<table>
<thead>
<tr>
<th>SAE</th>
<th>No Automation</th>
<th>Driver Assistance</th>
<th>Partial Automation</th>
<th>Conditional Automation</th>
<th>High Automation</th>
<th>Full Automation</th>
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<tbody>
<tr>
<td>NHTSA</td>
<td>No Automation</td>
<td>Function Specific Automation</td>
<td>Combined Function Automation</td>
<td>Limited Self-Driving Automation</td>
<td>Full Self-Driving Automation</td>
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Digital Infrastructure

• Automated ITS (A-ITS) for Level 4 & Smart Cities
  – Traffic Management & Control based on Big Data & AI

Infrastructure Data:
Signal Phase and Timing, Drive 35 mph, 50 Parking Spaces Available

Vehicle Data:
Managing Infrastructure and prioritizing HOV and fuel efficient vehicles

Transit Data:
Passenger and Vehicle information for real-time prioritization

Traveler Information:
Individual trip profiles, social media data, trip choice and shared data

Sources: AUVSI 2014, San Francisco
Thank you very much!

See you next year with

“Digital Infrastructure and Smart Cities”!

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