

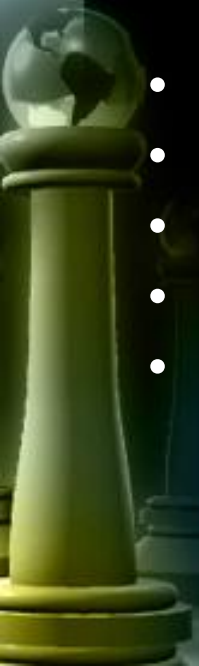
Evolution of Vehicle Connectivity Industry-wide

Richard Bishop, Bishop Consulting
VTTI NDS August 2012



The Connected Vehicle Space is Large and Growing

- Safety
 - Vehicle-vehicle communications
 - Vehicle-infrastructure communications
- Traveler Information
- Network Surveillance
- Security
 - Automatic Crash Notification
 - Stolen Vehicle Recovery
- Eco-Driving
- Energy Management (Electric and Hybrid Vehicles)
- Insurance -- Pay As You Drive
- Vehicle Diagnostics
- Infotainment



Connectivity in Vehicle Safety

- On-Board Sensors Dominate
- NHTSA's oft-quoted number
 - “80% of all crashes are potentially addressed by V2X”
 - About 4M out of 5M crashes
- On-board sensors are rapidly proliferating
 - Addressing about 4M out of 5M
 - Leaving about 1M crashes for V2X
- Cost
 - Radio's have a cost advantage currently (~\$50)
 - Sensor prices dropping steadily as volumes grow (~\$250 for radar-camera combination)

What's Available on a \$30,000 Car?

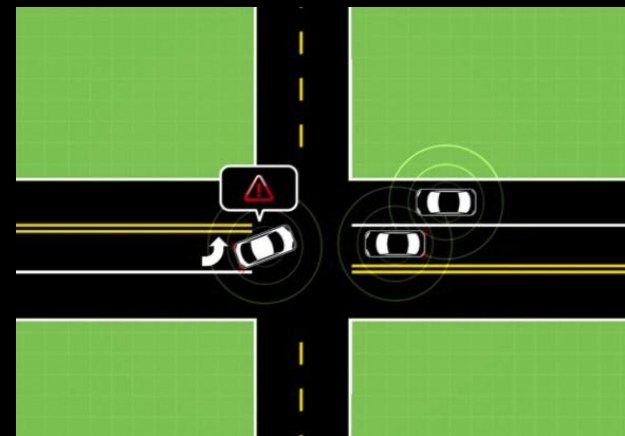
- Adaptive cruise control
- Forward Collision Mitigation w/Brake Support
 - Blind spot information system
 - Lane keeping aid
 - Driver alert
- Cross Traffic Alert



2013 Ford Focus

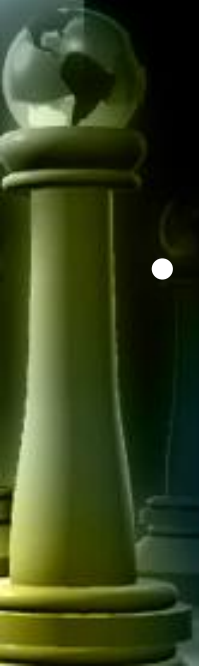
V2X for Safety: A Vital Role

- V2X “sees” where sensors are blind
 - around blind curve
 - several vehicles ahead (EEBL)
 - Do Not Pass warning
 - Intersection Movement Assist
 - Left Turn Assist
- Intersections
 - fewer crashes but more severe



Connectivity: Mobility and Environment

- V2X Connectivity Enables Key Functions
 - V2V: Cooperative Adaptive Cruise Control
 - Reduced headways, greater per-lane capacity
 - I2V: Dynamic Speed Management
 - Active management of vehicle speeds from Traffic Management Center to smooth traffic flow
 - Voluntary basis
- Apps included in FHWA mobility program



Major Projects and Players (1 of 2)

- Europe
 - Projects:
 - SIM-TD
 - DRIVE C2X
 - evaluating DSRC for safety and other applications
 - Car-2-Car Communications Consortium
 - EU OEMs and suppliers
 - privately funded
- Japan
 - Smartway deployment
 - over 1000 “ITS Spots” operating at 5.8 GHz
 - 700 MHz system may replace current 5.8 GHz DSRC approach



Major Projects and Players (2 of 2)

- USA
 - USDOT Connected Vehicle Program
 - NHTSA: Safety Pilot Model Deployment
 - evaluating DSRC for safety applications
 - FHWA: I2V for safety and mobility
 - CAMP OEM Consortium
 - 80% publicly funded



OEMs: Current and Future Connectivity

- Telematics using Cellular Comms
 - integrated / phone tethering
 - infotainment, navigation, e-Call, etc etc
- Under discussion
 - signal phase and timing “in the cloud”
 - would support eco-driving
- DSRC for safety and other applications
 - USA:
 - hinges on NHTSA decision
 - 2013 start means equipment required ~2018
 - EU:
 - C2C-CC seeking synchronized deployment with road operators in ~2015
 - holds position that regulation should be avoided



Special Cases for Early Deployment?

- Taxi Fleets
- Truck Fleets
 - Cooperative ACC for reduction of fuel use
 - fleets with concentrated operations in specific corridors
 - using cellular wireless to “find” each other and couple up via DSRC
 - independent of regulation

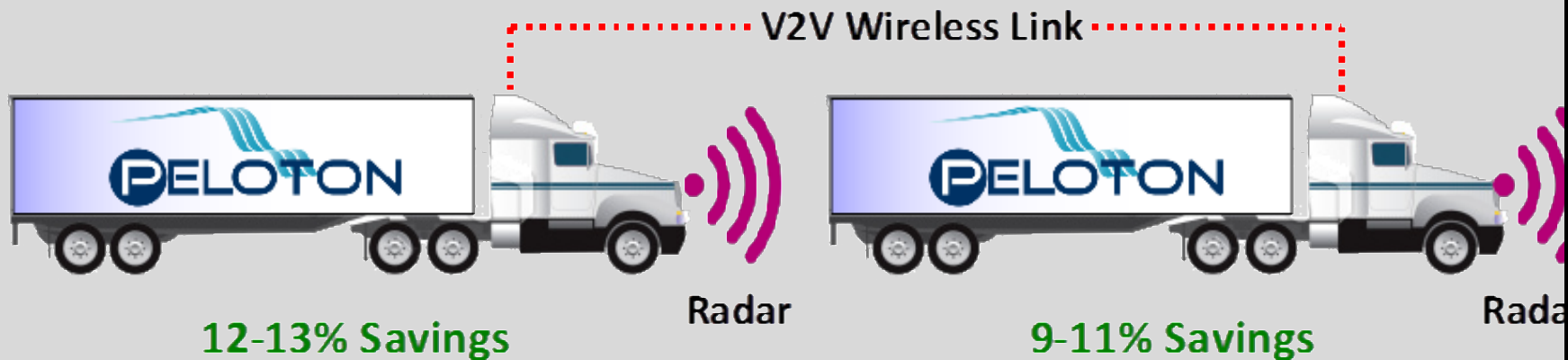


Peleton Aerolink



Saving the World Two Trucks at a Time

To significantly increase safety while reducing the cost of every mile traveled



Unknowns

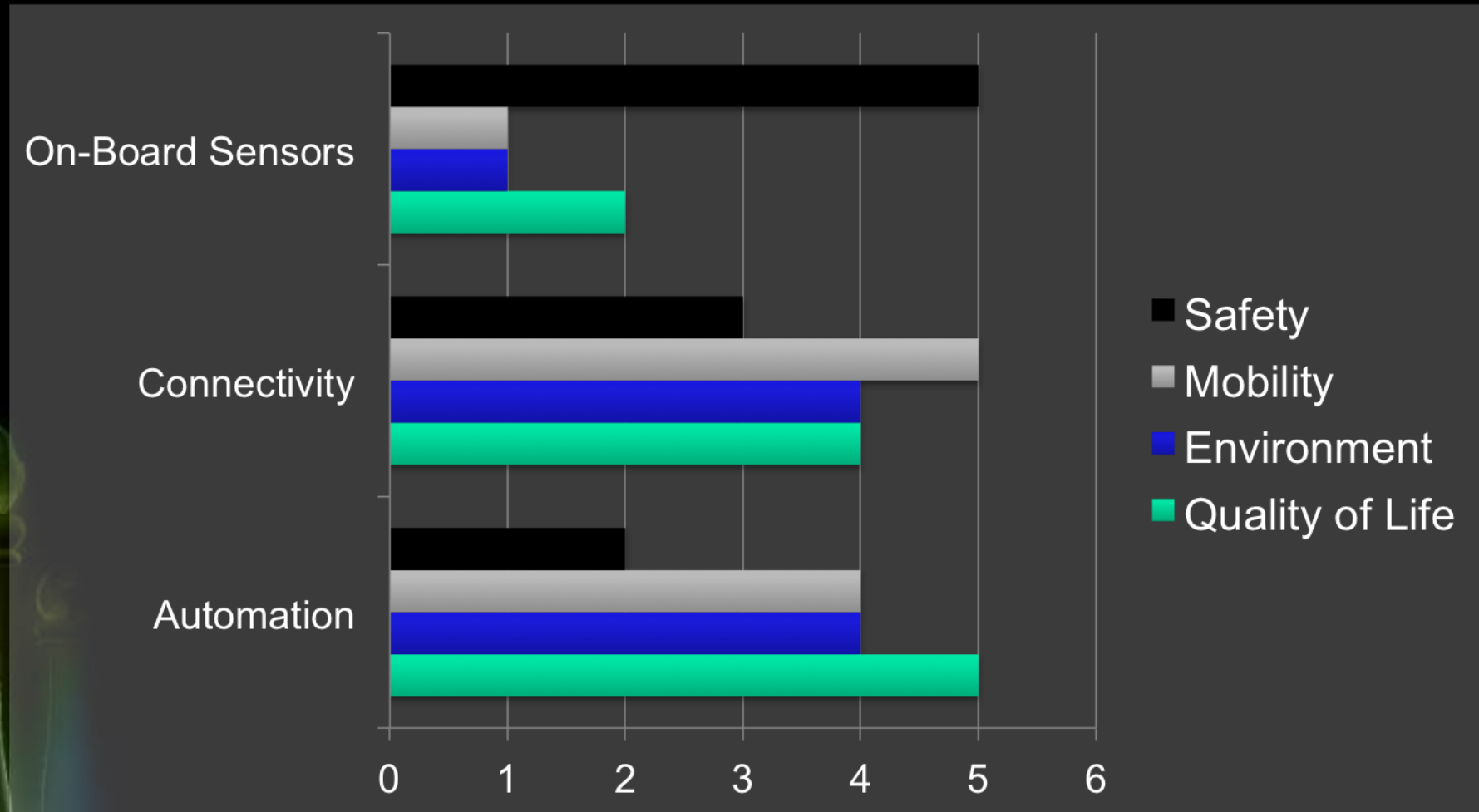
- NHTSA Regulatory Path
- Viability of Aftermarket DSRC Devices
 - vendor willingness to sell
 - customer willingness to buy
 - traditional retail outlets or new models?
- Europe
 - Aggressiveness of EU carmaker deployments
 - Degree of road operator deployments
- State DOT investments in V2I
 - FHWA funding
 - State-level priorities / capabilities
 - Pace?





BRINGING IT ALL TOGETHER

Mapping to Transportation Objectives



Crystal Ball

- 2020
 - Basic crash avoidance on almost all new cars
 - V2X mandated on all new cars (USA)
 - Starting 2018?
 - V2I public sector deployment: modest
 - Will the V2V schedule create urgency for public sector?
 - Aftermarket Safety Devices available; modest uptake
 - C-ACC on some heavy trucks
 - Low Speed Automation (traffic jam assist) broadly commercially available
- 2030
 - Major reductions in crash rates
 - V2I public sector deployment: most dangerous intersections
 - C-ACC and other V2X functions increasing lane capacity
 - Highway Speed Automation available commercially

Who will lead? Who will get in the way? Who will care?

- Collision Avoidance

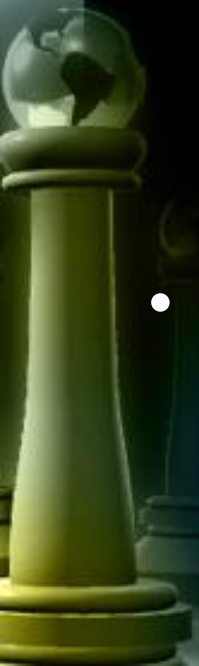
- Market driven competitive pressures
- Government mandates plus NCAP

- Connectivity

- Customer expects connectivity and will get it
- Market driven competitive pressures (EU)
- Government mandates (USA)
- Will the public sector do its part for V2I?
- Will aftermarket / retrofits really happen? How?

- Automation

- Market driven competitive pressures / User Pull
- Momentum enhanced by government investment



Thank You

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