The CONNECTED VEHICLE and NEW JERSEY

A Strategic Opportunity
and Conceptual Reference for
NEW JERSEY to become
an
ECONOMIC INCUBATOR
for
Research and Deployment
for the “Connected Vehicle”
(Technologies and Services)
What is the CONNECTED VEHICLE initiative

- Connected Vehicle is a USDOT multimodal initiative to enable safe, interoperable, networked wireless communications among vehicles, the infrastructure, and travelers’ personal communications devices.

- USDOT and Industry research to date is more than $500M; deployment will begin while research continues over 20 years. Multi Billion $$$ initiatives

- USDOE, USDOD, USDHS investing in similar solutions. Multi billion in expenditures.

- It is the catalyst for a major component of the mobile (wireless) internet and expands to the Connected Driver and Connected Traveler initiatives
The PROPOSAL & OPPORTUNITY

- Establish a permanent economic incubator within the state to be a magnet for high tech jobs
- Support commercial applications that provide comfort and convenience to travelers (parking, insurance, weather....); also attract mobile information providers
- Become a national showcase for other states and industry service providers; include NEXT Generation of EZ-PASS (VMT)
- Organize a team of NJ companies & NJ transportation agencies to develop a Connected Vehicle ready environment within the state.
- Identify leading edge solutions to improve transportation safety, mobility, energy, and consumer concerns

- MOBILE CONTENT IS PROJECTED TO BE A $250 BILLION INDUSTRY
Connected Vehicle Function vs. Density

- Traffic Info
- Roadway Situational Awareness
- Safety Warnings
- Active Controls
- Traffic Management
- Crash Avoidance
- Automated Highway Segments

Timeline:
- 2010
- 2030+

Crashes:
- Crash Reduction (reduction from 2006 baseline)

VII Equipped Vehicles vs. Density

Legend:
- Red dashed line: Crashes
- Blue line: Traffic Management
- Green line: Automated Highway Segments

Connected Vehicle Function vs. Density
"Connected Vehicle" Use Cases

**Primary**
- Intersection Cooperation
- Lane/Road Departure
- Vehicle to Vehicle Cooperation

**Safety**
- Intersection Collision Warning
- Highway / Rail Collision Warning
- Road Condition Warning
- Approaching Emergency Vehicle Warning
- Emergency Vehicle Signal Preemption
- Vehicle-to-vehicle Road Feature Notification
- Work Zone Warning
- Highway Merge Assistant
- Signalized intersection violation warning (external)
- Traffic signal violation warning (in-vehicle)
- Stop sign movement assistance
- Stop sign violation warning
- In-vehicle highway signage
- Road condition warning
- Lane departure warning (electronic rumble strips)
- Curve speed warning / rollover warning
- Commercial vehicle electronic clearance
- Commercial vehicle safety data
- Approaching emergency vehicle warning
- Emergency vehicle ahead
- SOS services
- Crash data to Public Service Answering Point (PSAP)
- Post-crash warning

**Mobility**
- Traffic Advisories (routing, re-routing assistance)
- Navigation Assistance
- In-Vehicle Signage
- Weather Alert Notifications
- Signal Phasing (traffic flow optimization)
- Incident observation and mitigation
- Roadway incident assistance
- Cooperative Adaptive Cruise Control
- Hazardous material path enforcement
- Cargo Management
- Traveler Information
- Highway Infrastructure Planning
- Vehicle-Highway Automation System
- Approach Speed to Signal
- Speed Limits
- Vehicles as traffic probes
- Incident information to vehicles
- Travel time data to vehicles
- Electronic payment
- Enhanced route guidance and navigation
- Crash data to Transportation Operations Center (TOC)
- Origin and Destination (OD) data to TOC

**Consumer Services**
- Parking Location Assistance
- Parking Access
- Food Drive Through Payment
- Concierge Assistance
- Appointment Confirmation/Changes
- Download Data Files (MP3, etc...)
- Home Network Content

**Commercial Services**
- Software Updates
- Remote Control
- Secure Access
- Just-In-Time Repair Notification
- Safety Recall Notification
- Remote Diagnostics
- Customer Relations Management
- Fleet Management

**Probe Applications**
- Pothole Detection
- GPS Data
- Traction Control
- ABS (Braking)
- Moisture
- Darkness
- Fog
- Wet Pavement
- Abrupt Stop
- Skidding
- Road Surface Conditions
- Airbag
- Wipers
- Headlights
- Fog Lights
- Ambient
- Air Temp
- Location
- Snow
- Ice

**CAMP Priorities**
- Cooperative Forward Collision Warning
- Emergency Electronic Brake Lights
- Pre-Crash Sensing
- Curve Speed (Rollover) Warning
- Left Turn Assistant
- Stop Sign Movement Assistance
- Traffic Signal Violation Warning
The Commercial Scope of the Connected Vehicle

- **Verticals**
  - Safety – the responsibility of the automakers
  - Mobility – the responsibility of the transportation agencies
  - Commercial Services – everything else

- **Communications Protocols**
  - Radio – Entertainment and Communications
  - Cellular – Diagnostics and Communications
  - Satellite – Location and Communications
  - WiFi – Information and Entertainment
  - DSRC – Safety Communications
  - Near Field, Bluetooth, Zigbee, etc.

- **Devices**
  - Embedded – built in to the car
  - Aftermarket – added after sale
  - Nomadic – carried in by driver/passenger
Early Incubator/Magnet Applications

Focus on existing commercial wireless services:

- Vehicles and mobile devices as data sources
- Expand to transit and freight
- Institutional, legal and technical issues
- Wireless and communication media combined to enable large-scale data capture
- Integration of diverse data sources
Vision: Travel experience is transparent; every trip on any mode utilizes dynamic content.

Rollout of connected vehicle is accelerated. Enhanced by centimeter accuracy maps and real-time content.

Every personal device is a two-way node on the transportation network.

Routing decisions take environmental factors into consideration for all travel.

Database is updated constantly in real-time.

Institutional issues resolved (Tort & Privacy).

Commercial services expand; Similar to economic stimulus driven by internet in the 90’s.

Content is free; content services are bundled into other products and services.

Personal navigation is 3-dimensional.

Content enables 250+ Billion Dollar industry.

CARS DRIVE PEOPLE
Lessons From The Internet

Build it and they will come...

- Internet was built to connect computers
- Few of the initial apps exist today
- Few (if any) of today’s apps were envisioned in the beginning
- Applications will continue to evolve
What Makes NJ Unique?

NJ’s Transportation Network

- Densest road network
- Multi-state transit systems
- Highest penetration of toll collection units → strong consumer acceptance
- Largest commuter population
- High volume freight corridor
- Highest Auto Insurance costs for consumers
- High Volume/High Congestion Cargo Port
What Makes a NJ Bid Unique?

New Jersey Team’s World Class Credentials

- Industry-leading wireless expertise
- Dynamic transportation data collection, processing and distribution
- Technology-savvy auto companies
- Leading edge technology adoption for vehicle wireless connectivity

Focus is on wireless collection & distribution of data. NJ can be the center of the universe in wireless for travel.
USDOT Connected Vehicle Opportunities

**Recent Announcements**

- Dynamic Mobility Data Demo project (pending) $20M
- DOT TIGER (Transportation Improvements to Generate Economic Recovery) $2B
- Smart Truck Parking (Due out early November) $1-5M each

**Interested Companies**

- Wireless data collectors and suppliers
- Mobile advertising to grow to $15B in 5 years
BENEFITS of SUCCESS: JOBS! JOBS! JOBS

- Federal funding creates technology environment for Hitech jobs
- Federal funding establishes R&D and live test environment
- Accelerates next generation commuter connectivity
- Attracts companies for developing & testing and deploying next generation technologies & applications in this $ multi-B market:
  - DOT
  - DOE
  - DOD
  - DHS
- Positions NJ for additional “Connected Corridor” deployments (VMT)
NEXT STEPS…Assumes there is Interest

- Formally establish a PPP team to work on strategy document
- Organize workshop with State & NJ commercial partners
- Consider potential of “NextGen E-ZPass” as part of strategy (VMT?)
- Engage NJ Congressional offices in NJ and DC

This is a unique and timely opportunity to jump start NJ’s position as the Intelligent Transportation Corridor for future Federal and industry “Connected Vehicle” programs.
APPENDIX

Background on Connected Vehicle Initiatives
Rapid Evolution of Applications

Location Based Services
- Roadside Assistance
- Emergency Medical
- Off-Board POI look-up

Navigation
- Autonomous
- Turn by Turn Voice
- Guidance
- On-Board POI Look Up
- Map Display

ADAS
- Auto Collision Notification
- Proximity Location
- Adapt. Cruise Control
- Headlight Aiming
- Curve Preview Warn.
- Transmission Control
- Fuel Management

Hybrid
- Traffic
- Voice Recognition
- Real time map updates
- Supplemental Data

Off-Board
- Full Voice
- Fleet Management

Increasingly sophisticated applications
Some Continuums to Increase Content Value

Cruise control

Adaptive cruise control

Location-aware cruise control (curve ahead, going too fast)

Environment-aware cruise control (automatic braking)
“Green Benefits” - Research Finds Significant Fuel Savings With Maps

- **Everyday Navigation**
  (NAVTEQ Fuel Study 2009)
  - 8-15% Savings

- **Eco-Routing**
  (Magneti Marelli/NAVTEQ: joint testing 2008)
  - 5-10% Savings

- **Eco-Driving**
  (U.S. Department of Energy, 2009)
  - 5-15% Savings

- **Predictive Cruise Control**
  (Swedish Linköping, 2005)
  (Virginia Tech / NAVTEQ: joint study, 2009)
  - 2-5% Savings

- **Hybrid Powertrain Control**
  (Sentience / Ricardo U.K. study, 2009)
  - 5-24% Savings
Consumers are Enthusiastic About Fuel Economy

NAVTEQ Consumer Research Study Fall, 2007

US Data

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<td>77%</td>
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How important do you think these features will be to you when you consider a package of safety features for your vehicle? (% of respondents who responded “Would strongly influence” or “Would have some influence”)
Maps Required by Expanding List of Applications

- Navigation
- Pay-As-You-Drive Insurance
- Driver Assistance
- Road User Charging/VMT
- Active Safety
- Traffic Probe
- Fuel Economy
- Congestion Pricing
- Telematics/E-Call
Evolution to Autonomous Vehicles

- Connected
  - Mobile Communications
  - Instant Asset Tracking
  - Real Time Traffic Info
  - Electronic Tolling

- Coordinated
  - Coordinated Routing
  - Optimized Traffic Flow

- Cooperative
  - Cooperative Collision Avoidance
  - Transit-aware Signal Preemption

- Autonomous Vehicles

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The proposed Advanced Vehicle Technology Act reauthorizes the Department of Energy’s Vehicle Technologies Program, which has been operating without Congressional authorization for a number of years.

Through this program, the Department of Energy will partner with the light duty automobile, and medium and heavy duty commercial truck manufacturers and suppliers to conduct research that will help us develop the next generation of fuel efficient cars and trucks.

The goals of the Advanced Vehicle Technology Act are to improve the fuel efficiency of the U.S. fleet, reduce our dependence on imported oil, support domestic research and development, demonstration, commercialization, and manufacturing of advanced vehicle technologies, allow for greater consumer choice of technologies and fuels, and strengthen partnerships between the public and private sector.

The bill places a significant focus on the research and development programs for vehicle communications.