www.nhtsa.dot.gov
nhts☆
people saving people

Advanced Safety Research
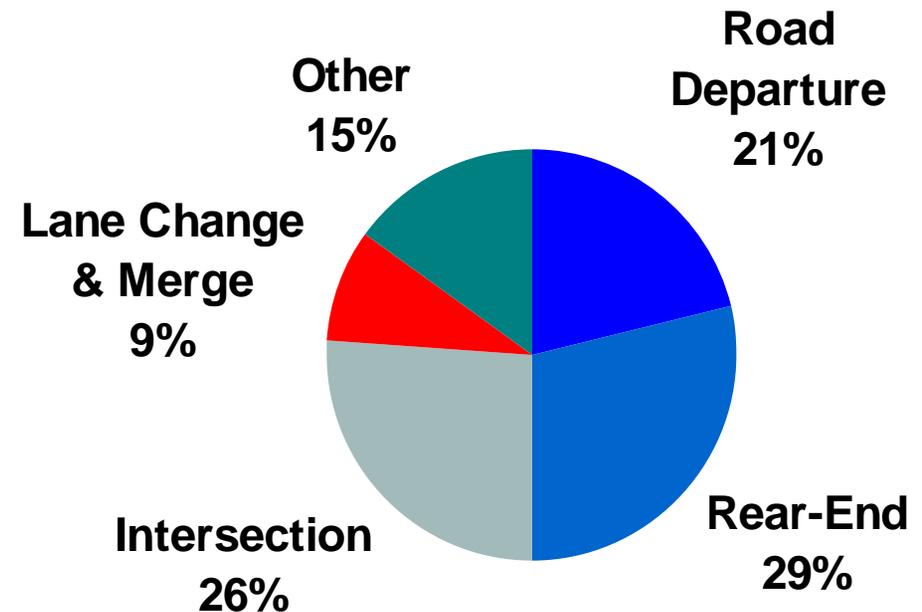## HATCHI-NHTSA Research Exchange

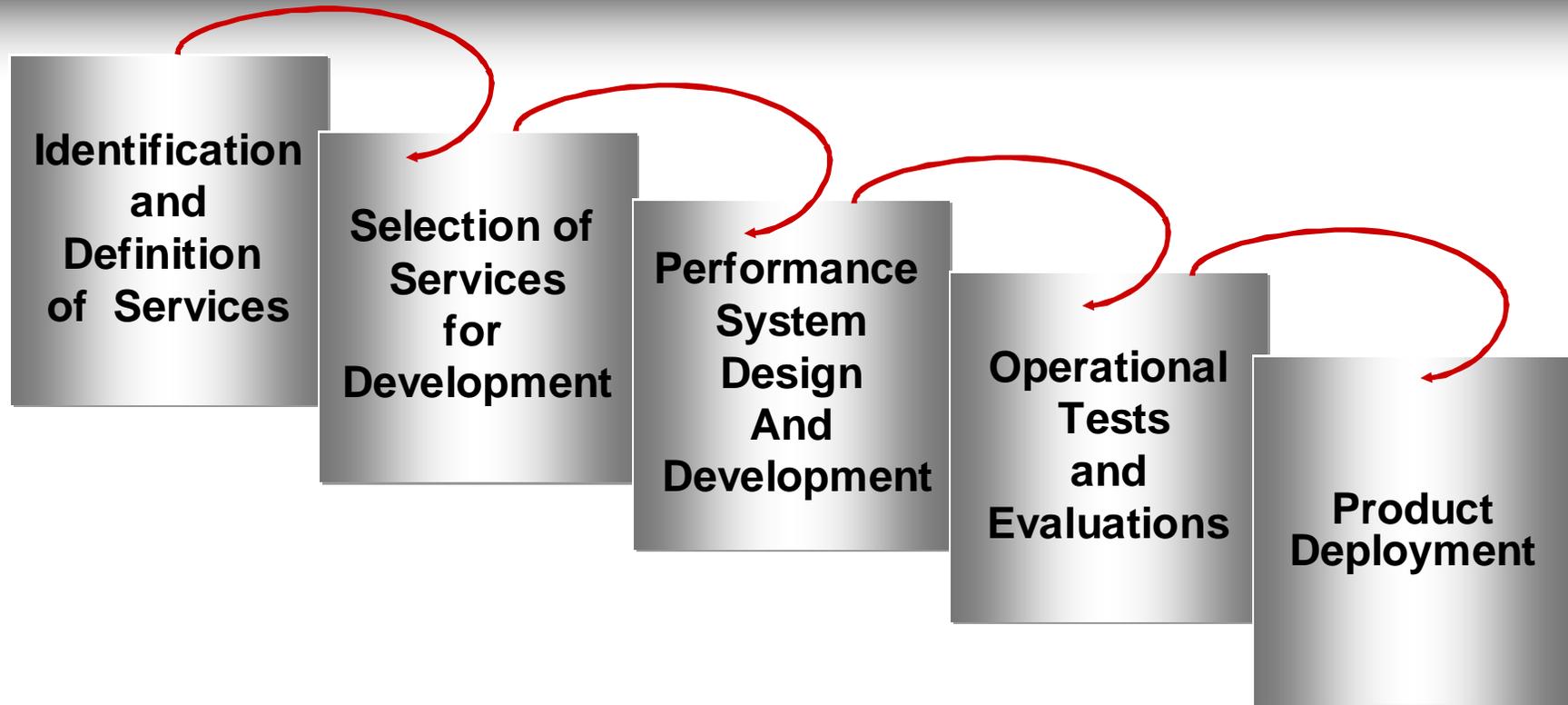Ray Resendes
Intelligent Technologies Research Division

March 1, 2006

The Big Picture

- **What are the biggest safety problems that are appropriate for DOT involvement and appear to be solvable?**

- **To what extent can advanced technologies address these problems?**

Other 15%

Lane Change & Merge 9%

Road Departure 21%

Intersection 26%

Rear-End 29%

Our Research Process

Rear-end Crash Prevention

- **Our goal:** Establish a definitive description of the problem, performance features of systems to address the problem, and the safety impact of these systems.

- **FOT of a state-of-the-art light vehicle rear-end crash warning system.**

- **Heavy truck FOT of a commercially available rear-end crash warning system**

Road-Departure Crash Prevention

- **Heavy Vehicle Roll Advisor and Control System FOT**

- **FOT of a state-of-the-art light vehicle road-departure crash warning system**

- **FOT of heavy vehicle lane-keeping system**

RDCW•FOT
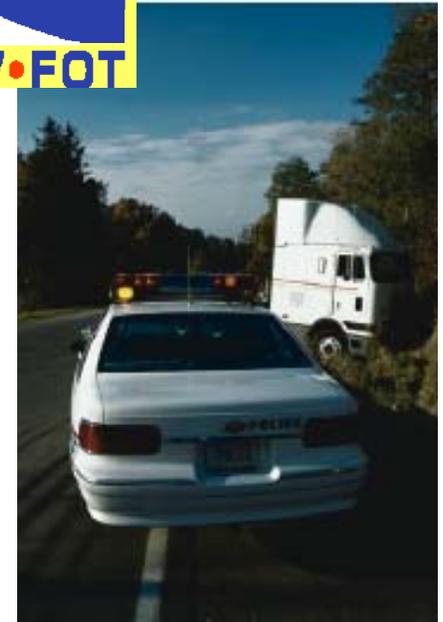
100-car Naturalistic Driving Study

- Goal:
  - **To collect data on driver behaviors and vehicle performance occurring prior to crashes and critical incidents**

- Approach:
  - **100 volunteers in N Virginia recruited from flyers and ads**
  - **Told them to 'Just Drive'**
  - **Equipped vehicles with extensive data collection system -unobtrusive, inconspicuous**
    - **Five video channels**
    - **Up to four radar sensors**
    - **Lane tracker**
    - **Vehicle kinematics, GPS, RF detectors…..**

- Overview of data collected:
  - **1 year, 43K hours, 2M miles**
  - **109 primary drivers, 241 total drivers, ages 18-73**

- Critical Events
  - **15 police reported crashes**
  - **67 non-police reported crashes**
  - **761 near-crashes**
 - **8295 critical incidents**

Preliminary Findings

- **Research questions include:**
  - **When do drivers engage in distracting tasks?**
  - **How does inattention influence safety risk?**
  - **What is the timing of driver braking and steering responses?**
  - **What crash countermeasures might be effective?**

- **About 80 Percent of all crashes and 65 Percent of near-crashes involved driver inattention within 3 seconds of conflict onset**

- **Most frequent secondary task preceding critical events was wireless device use, followed by passenger-related**

- **12 Percent of crashes and 10 percent of near crashes involved driver fatigue**

- **The rate of inattention-related events decreased with increasing driver age**

Final Report to be released this month

Where are we now?

- **Accelerating Deployment**

- **Integrated Systems**

- **Vehicle Safety Communications**

- **Intersection crash avoidance**
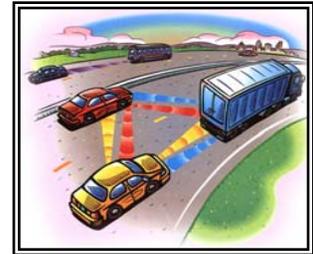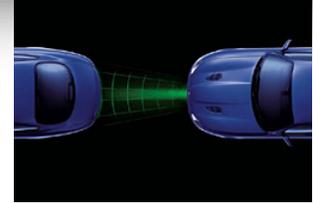
ACAT Program

- **Determine the potential safety impact of selected new and emerging technologies**

- **This information may be used to inform consumers about:**
  - What advanced safety features vehicles have that help them avoid a crash, reduce their severity when it occurs and protect the occupant?
  - In what situations do these systems work?
  - How effective are they in meeting the objectives?

- **Role of NHTSA in facilitating deployment**
  - Ensuring that there are suitable specifications for safety technologies
  - Developing test procedures to discriminate full system performance
  - Estimating safety benefits
  - Using consumer information for facilitating deployment
  - Addressing human/machine interface issues

Background

- **European Commission Intelligent Car Initiative**

- **Industry/supplier meetings over the last 2 years**

- **Public statements by NHTSA Regarding Advanced Technologies**

- **Program plan**

- **Request for information & expression of interest - July 2005**

Emerging Technologies

- **Electronic Stability Control**

- **Adaptive Cruise Control**

- **Night Vision Systems**

- **Curve Speed Warning**

- **Lane Departure Warning**

- **Alcohol Monitoring**

- **Brake Assist Systems**

- **Pre-crash sensing**
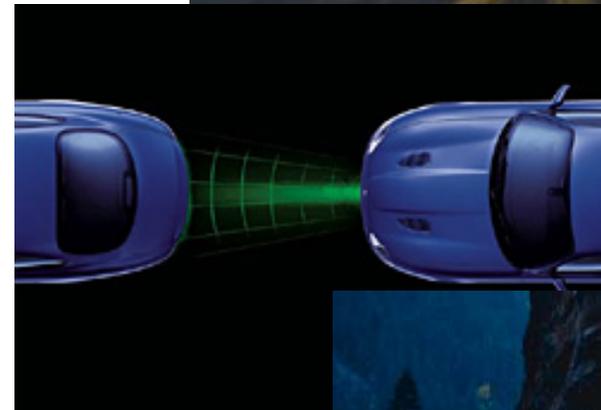
ACAT PROGRAM PLAN

- **Task 1 – Priority Candidates**

  Identify new or emerging technologies or systems

- **Task 2 – Safety Impact Methodology**

  Develop the methodology for credible estimate of safety impact.

- **Task 3 – Objective Tests**

  Develop objective tests that connect system performance to safety impact

- **Task 4 – Performance Testing**

- **Task 5 – Analysis and Reporting**

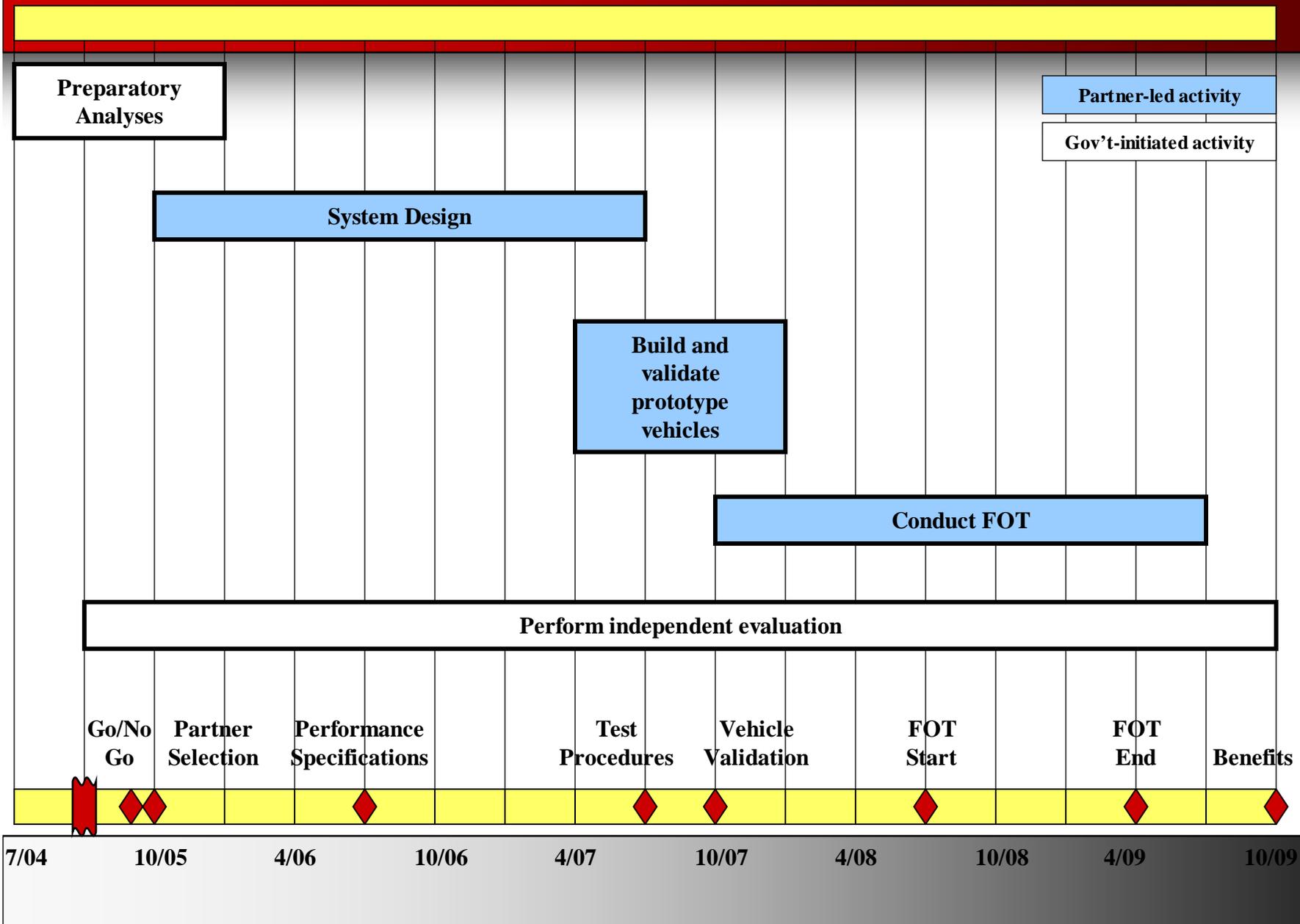 Implement the methodology to estimate safety impact.

Integrated Vehicle-Based Safety Systems

- **Goal:** To work with industry to accelerate introduction of integrated vehicle-based safety systems into the U.S. vehicle fleet.

- Addresses 3 Crash Types:
  - Rear End
  - Road Departure
  - Lane Change

Rear-end, run-off-road, and lane change crash countermeasure systems could prevent over 48% or 1,836,000 target crashes.

Program Timeline

Preparatory Analyses

Partner-led activity

Gov't-initiated activity

System Design

Build and validate prototype vehicles

Conduct FOT

Perform independent evaluation

Go/No Go	Partner Selection	Performance Specifications	Test Procedures	Vehicle Validation	FOT Start	FOT End	Benefits

| 7/04	10/05	4/06	10/06	4/07	10/07	4/08	10/08	4/09	10/09

IVBSS Outreach Activities

- Meeting with Industry **planned for April 20-21, 2006 in Detroit**

- Information sharing/coordination with **EU PReVent** program through ITSWC

- Future meetings with Industry covering **performance specs, objective tests, and early program results** planned for 2007-08

Cooperative Intersection Collision Avoidance System (CICAS-V)

- Focus on preventing <u>violations</u> at intersections with traffic signals and stop signs to prevent crashes associated with violations

- Preliminary work was done under IVI

- Partners are CAMP and VTTI

- Four year program including Field Operational Test

- Critical Human Factors issues of warning timing and presentation to be addressed

Vehicle Infrastructure Integration

Connecting Vehicles and Infrastructure
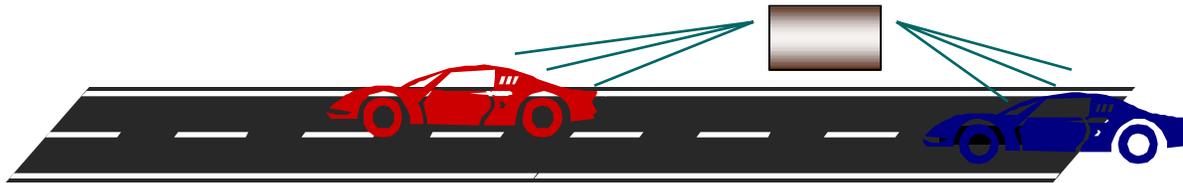
Creating a "nationwide enabling communication infrastructure"

"Day 1" Applications

- Signal Violation Warning
- Stop Sign Violation Warning
- Curve Speed Warning
- Electronic Brake Lights
- Advance Warning Information
- In Vehicle Signing

- Winter Maintenance
- Probe Mapping
- Ramp Metering
- Signal Timing & Adjust
- Corridor Management
- Traveler Information
- Electronic Payment
- Local Weather

VII

Driver

End User

Vehicle Data

Driver interface

Vehicle #2

Subscriber Applications

On Board Equipment

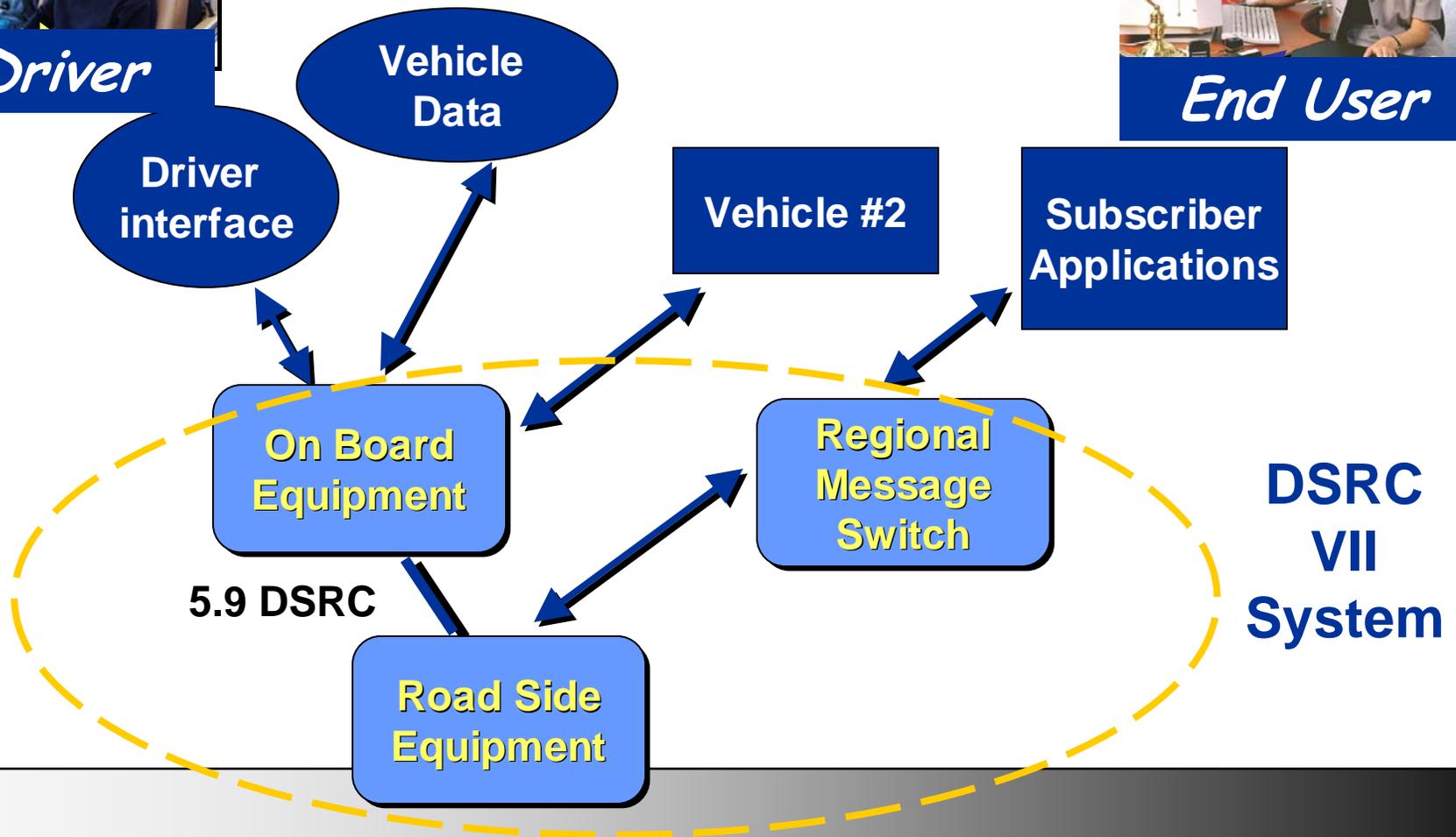Regional Message Switch

5.9 DSRC

Road Side Equipment

DSRC VII System

VII Design Initiated

- **VII Consortium (Auto OEMs)**
  - Design In-Vehicle Equipment & Applications (non-safety)

- **CAMP (Auto OEMs)**
  - Safety Applications

- **Booz Allen Hamilton**
  - System Integrator & Network Development

Proof of Concept Test

- **Begins end of 06**

- **Testing in a controlled Environment**

- **Integration of applications – vehicle – Infrastructure**

  - Location – suburban Detroit

- **FOT -- TBD**

Questions?

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