

IntelliDriveSM

Vehicle to Infrastructure Connectivity for Safety Applications

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www.IntelliDriveUSA.org







- Focus of V2I Safety
- Detailed presentation of the roadmap activities
 O Highlight Key Objectives and Major Outcomes
- Prepare for later Breakout discussion







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- Carl K. Andersen, FHWA
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- Greater situational awareness Your vehicle can "see" nearby vehicles and knows roadway conditions you can't see
- Reduce or even eliminate crashes thru: Driver Advisories Driver Warnings
- Focus is DSRC 5.9 GHz and crash prevention
- Communication can be to or from vehicle, infrastructure, and/or nomadic/aftermarket devices
- All vehicle types and pedestrians will be considered

Safer Driving in the V2I Environment



Instrumented Roadside



Signal Phase and Timing





Equipped Vehicles Aftermarket or Retrofit Devices







- Intersections
- Speed Management
- Run-off road and lane departure
- Enforcement and Operational Safety for Commercial Vehicles and Transit





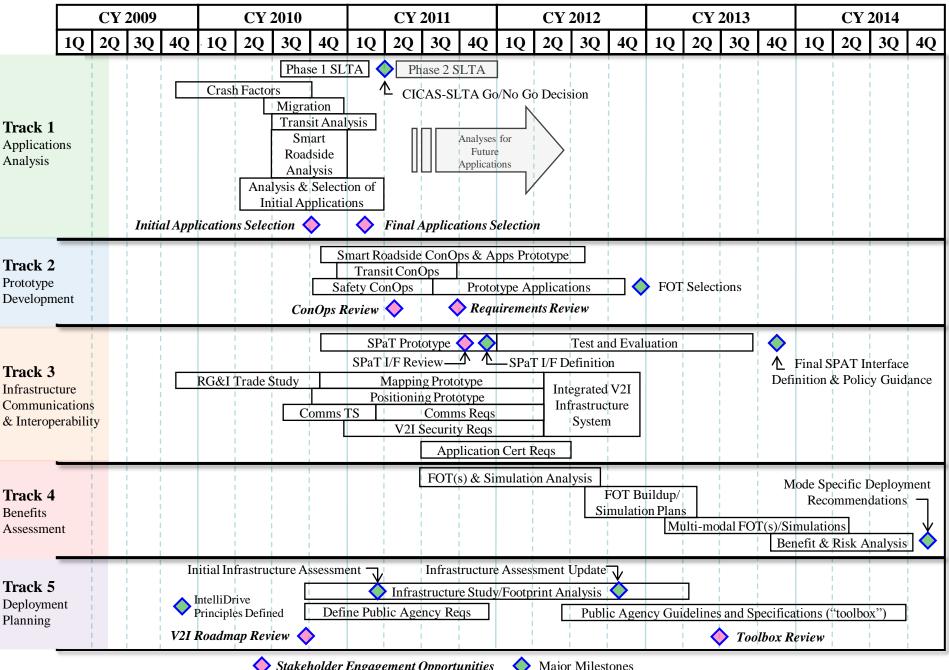


V2I Safety Research Plan

- Track 1 Applications Analysis Selection of Safety Applications (January 2011).
- Track 2 Prototype Development
 - Develop concept of operations, application requirements, and design, build and test applications.
- Track 3 Infrastructure Communications/Interoperability Test and evaluate SPaT, *issue SPaT Policy Guidance (2Q 2013)**. Test and evaluate Mapping and Positioning solutions. Test and Evaluate Communication Requirements.
- Track 4 Benefits Assessment
 - Perform FOTs based on selected safety applications. Analyze data for measuring safety benefits.
- Track 5 Deployment Planning (ongoing) Development of Public Agency Guidelines and a Toolbox for practitioners.

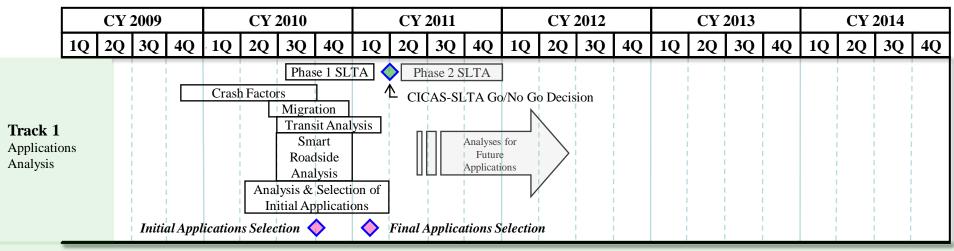






🔷 Stakeholder Engagement Opportunities

Major Milestones



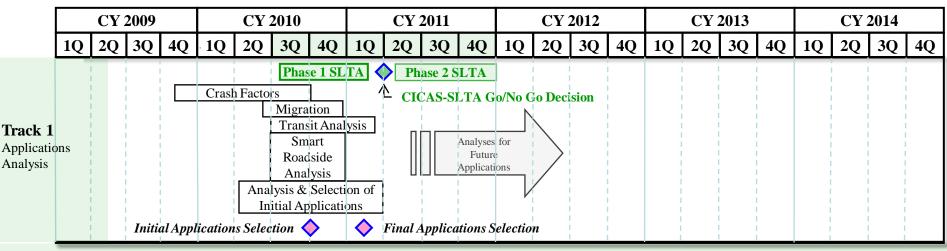
TRACK 1 – Applications Analyses

Key objective: Determine high value safety applications for initial V2I safety deployment.

Major outputs: A set of applications that will be further developed in Track 2.

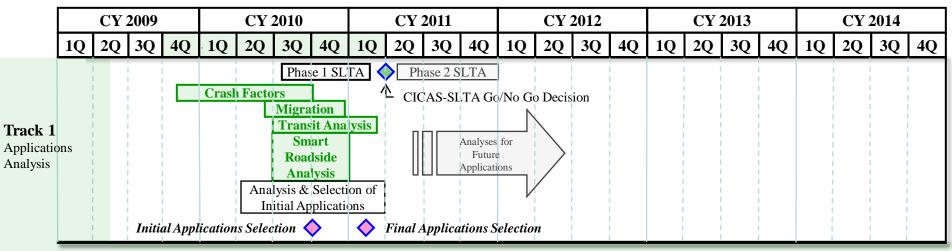
Items to be covered:

- Status of CICAS-SLTA
- Multimodal Applications Analyses
- Selection of Safety V2I Applications



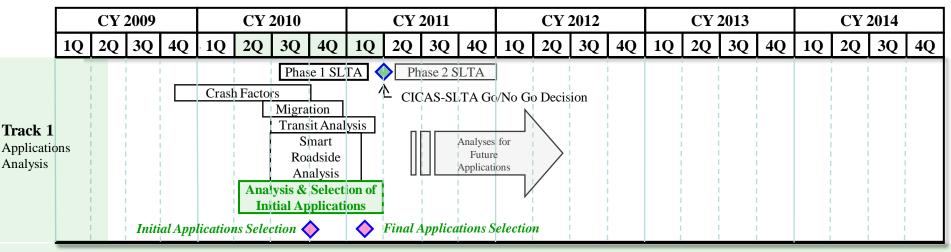
<u>Cooperative Intersection Collision Avoidance System – Signalized Left Turn</u> <u>Assist (CICAS-SLTA)</u>:

- Investigate how to warn drivers when it is unsafe to make a left turn on a permissive green at signalized intersections.
 - \circ Phase 1 Warning algorithm
 - \circ \diamond Go/No Go Decision Is algorithm effective & reliable?
 - \circ Phase 2 Develop prototype & determine feasibility for implementation.



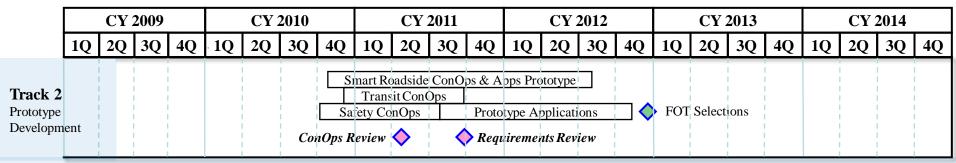
Multimodal Applications Analyses:

- Crash Factors Study What crash types can V2I reduce or mitigate?
- Migration Study What do we have that can be moved to V2I?
- Transit Analysis What about transit issues?
- Smart Roadside Analysis What is the status of the Smart Roadside Infrastructure for Commercial Vehicle Operations?



Analysis and Selection of Applications:

- An iterative process among the US DOT and Stakeholders.
 - Formula to be developed by FHWA
- Stakeholder Engagement Opportunity Selection of V2I safety applications that show the most promise of having a positive cost/benefit ratio for deployment.



TRACK 2 – Prototype Development

<u>Key objective</u>: Develop and validate prototypes of high value cooperative safety applications that will be field tested in Track 4.

<u>Major outputs</u>: Prototype applications ready for integration with infrastructure components and the vehicle components.

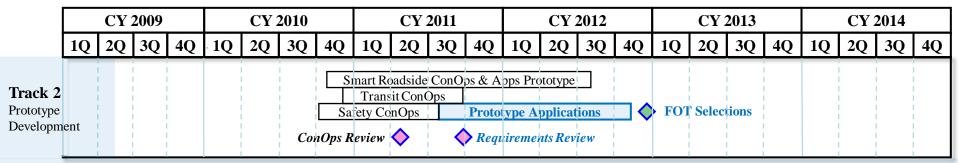
Items to be covered:

- Multimodal Concepts of Operations
- Development of Prototype Applications

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Concept of Operations:

- Develop Smart Roadside and Transit Concepts of Operations.
- Develop Safety Concept of Operations.
- Stakeholder Engagement Opportunity Review of Initial Safety Concept of Operations.



Development of Prototype Safety Applications:

- Stakeholder Engagement Opportunity Prototype Applications Requirements Review and Input
- Selection of Applications for Field Operational Tests

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TRACK 3 – Infrastructure Communications & Interoperability

<u>Key objective</u>: Provide the critical technology underpinnings that allow safety applications to be deployed nationally.

<u>Major outputs</u>: Integrated V2I Infrastructure System needed for exchange of useful data and information.

Items to be covered:

- Definition of SPaT Interface and Policy Guidance
- Infrastructure Systems Interoperability and Communications
- Integrated V2I Infrastructure System (Reference Implementation)
- **Applications Certification Requirements**

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Definition of SPaT Interface and Policy Guidance:

- Develop SPaT Prototype
 - Stakeholder Engagement Opportunity Review initial concept for SPaT Interface
 - ◆ Initial definition of SPaT Interface
- Test and Evaluation of SPaT Prototype
 - ◆ Final SPaT Interface Definition & Policy Guidance

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Infrastructure Systems Interoperability and Communications:

- Roadway Geometry and Inventory (RG&I) Trade Study.
- Geometric Roadway Map (Mapping) Prototype.
- Positioning Prototype.
- Communications Trade Study.
- Communications Requirements.
- V2I Security Requirements.

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Integrated V2I Infrastructure System (Reference Implementation):

- Integration of system requirements.
 - Consolidate outputs from SPaT, positioning, mapping, communications and security.
 - Produce format to enable applications.
 - Serve as "reference implementation."

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Applications Certification Requirements:

- Ensure applications meet requirements of IntelliDriveSM Program.
- A systems approach to certification of applications.
- This is NOT an equipment certification process. •

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TRACK 4 – Benefits Assessments

Key objective: Conduct field operational tests and simulations.

<u>Major outputs</u>: Reports covering cost-benefit analyses and the associated potential risks for deployment of V2I safety applications.

Items to be covered:

- Prototype Application Evaluations
- Benefit & Risk Analyses

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Prototype Applications Evaluations:

- Field Operational Tests (FOT) & Simulation Analysis.
- Field Operational Tests (FOT) & Simulation Planning and Build-up.
- Conduct Multi-modal Field Operational Tests (FOT) & Simulations.

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Benefit & Risk Analyses:

- Benefit & Risk Analysis.
 - \circ Develop an understanding of costs and risks.
 - Identify potential unintended consequences of an application.
 - Create framework for deployment recommendations.
- • Mode Specific Deployment Recommendations.

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TRACK 5 – Deployment Planning

Key objective: Develop tools and guidelines that will aid practitioners in making sound decisions on how to plan, deploy, operate, and maintain V2I systems.

Major outputs: Public Agency Guidelines and Specifications ("Toolbox")

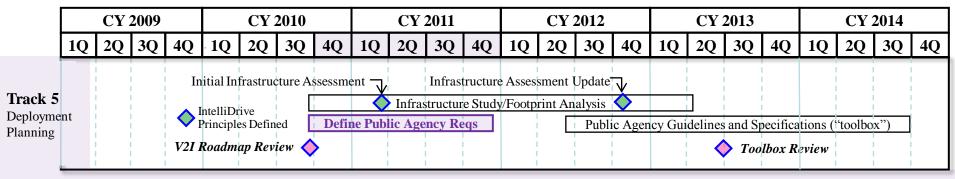
Items to be covered:

- Infrastructure Study / Footprint Analysis
- Definition of Public Agency Requirements
- Development of Public Agency Guidelines and Specifications Toolbox

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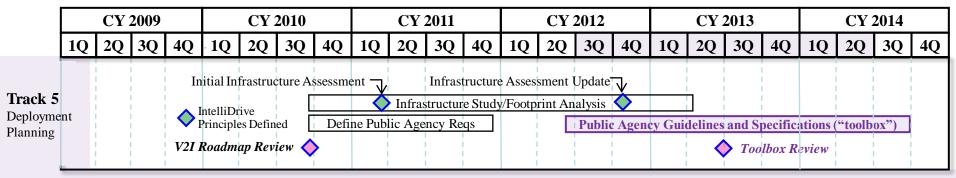
Infrastructure Study / Footprint Analysis:

- Iterative study that will assess the infrastructure requirements to enable successful deployment of IntelliDriveSM safety applications.
- **♦** Major Milestone Initial Infrastructure Assessment
- • Major Milestone Infrastructure Assessment Update



Define Public Agency Requirements:

- Determine what practitioners need to make an IntelliDriveSM deployment decision.
- Define the requirements that satisfy those needs.



Public Agency Guidelines and Specifications:

- Produce a "Toolbox" consisting of planning guides; operations and maintenance processes and procedures; and manuals and installation guides for implementation of V2I.
- Stakeholder Engagement Opportunity Review and feedback on proposed "Toolbox."

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Important Items:

- IntelliDriveSM Principles Defined: Completed in 4th Quarter 2009. <u>http://www.intellidriveusa.org/documents/2009/05/PrinciplesFlier.pdf</u>
- Stakeholder Engagement Opportunity Review of Draft V2I Roadmap.

July 22, 2010 Breakout Session.

---PLEASE ATTEND----



Breakout Questions

- 1. Are the research activities adequate to achieve our objective in each track?
- 2. Do you foresee any technical issues that may pose a challenge in order to get the work done?
- 3. Do you foresee any policy issues that may pose a challenge in order to get the work done?



