



*UNITED STATES*  
**DEPARTMENT OF TRANSPORTATION**

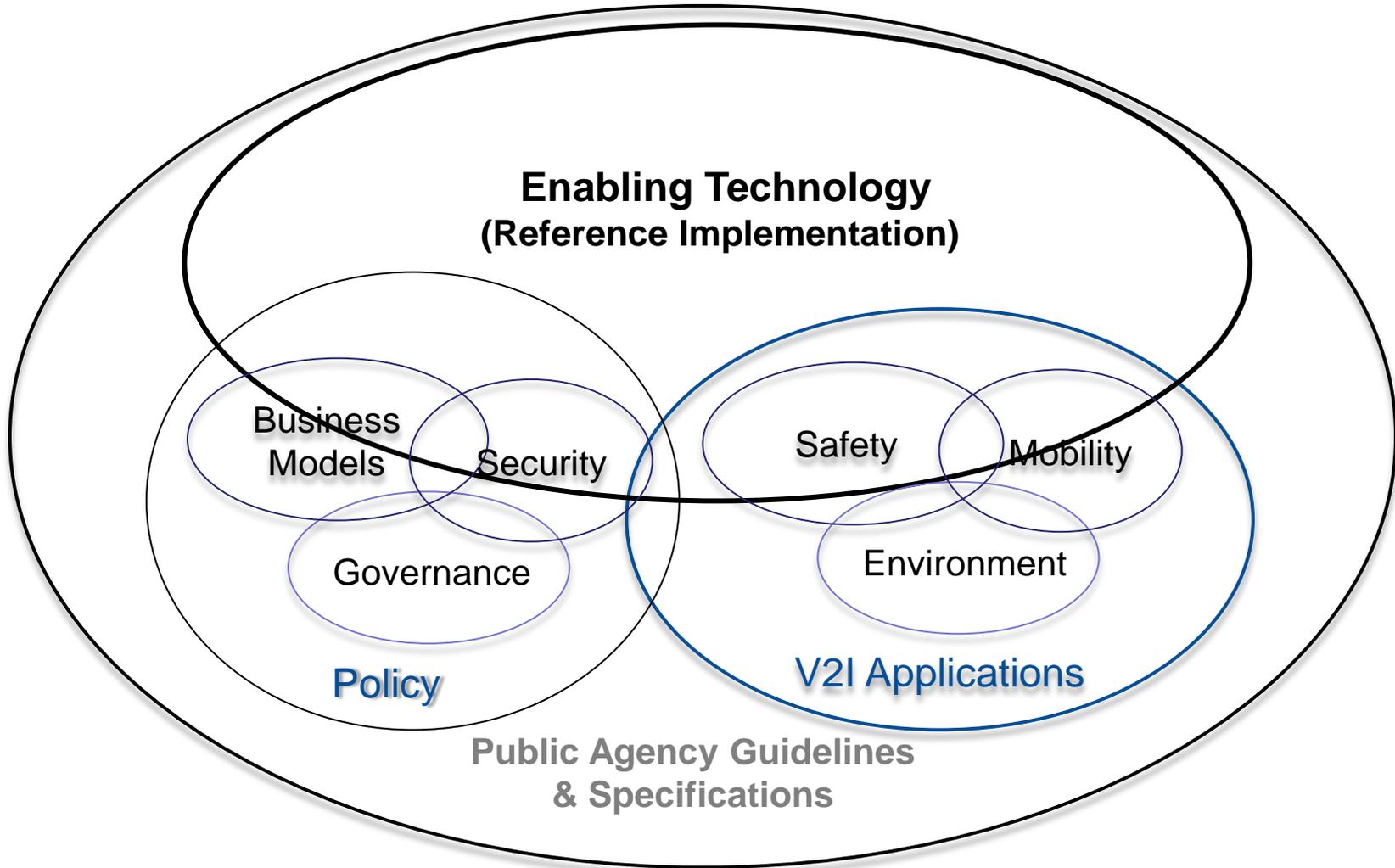
# **Vehicle-to-Infrastructure Communications: Enabling Technology**

**ITS America Annual Meeting SS28:  
V2V Safety Pilot and Model Deployment**  
Nashville, TN  
April 24, 2013

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# V2I Communications – Major Activities

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# V2I – Enabling Technologies

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Goal – Develop and integrate the infrastructure components necessary to provide the foundation for V2I deployment.

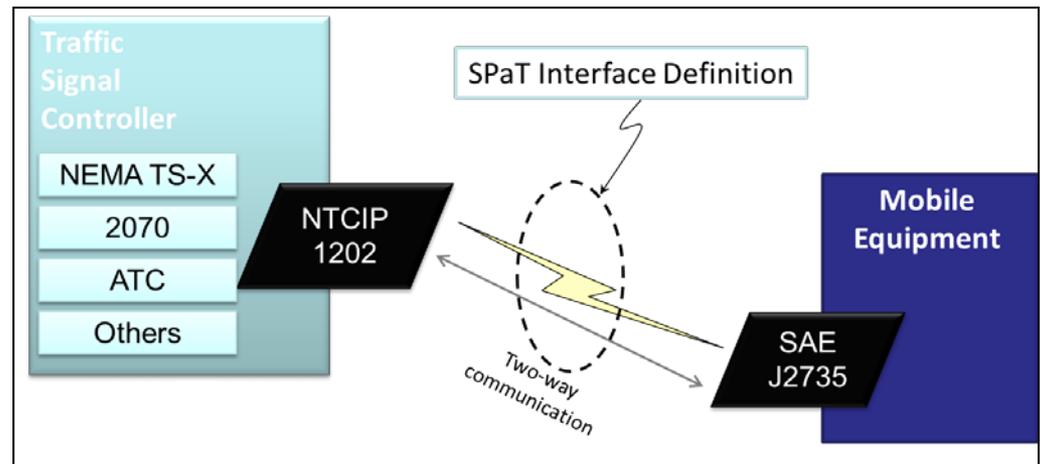
- Signal Phase and Timing (SPaT)
- Mapping
- Positioning
- Communications
- Roadside Equipment (RSE) Device
- Integrated Prototype



# Signal Phase and Timing (SPaT)

Goal: Develop an interface between signal controllers and RSE device to enable 2-way data exchange between vehicles and controllers

- SPaT Data
- Geometric intersection description (GID)
- Signal request messages
- Position correction message
- Standards to promote interoperability



# Signal Phase and Timing (SPaT)

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## ■ Current Activities

- Interface tested in the Connected Vehicle Highway Testbed (CVHT) at the Turner Fairbank Highway Research Center (TFHRC)
- Interface Testing at Safety Pilot - 12 intersections equipped
  - Transit application using SPaT data
  - SPaT data logged to facilitate future application development

## ■ Planned Near-term Steps

- Lessons learned from Safety Pilot and other studies, and industry comment, will be used to refine the SPaT message
- Deploy SPaT Prototype in Affiliated Test Beds to support field testing of Multi-Modal Intelligent Traffic Signal System (MMITSS)



# Mapping

Goal: Collect relevant roadway geometry and attributes data and broadcast it for use in V2I applications.

- Current Activities
  - Initial research proved concept of generating and broadcasting maps for V2I applications
  - LIDAR with 360 optical are promising technologies for developing the initial map; other technologies promising for map updates
- Planned Near-term Steps
  - Evaluate lessons learned from Safety Pilot related to infrastructure and communications
  - Identifying or developing map standards



# Positioning

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Goal: Ascertain which current or near-term positioning technologies can meet requirements of V2I applications

*Positioning and mapping are closely related.*

- Current Activities
  - Unit testing of technologies ongoing at CVHT
  - GPS combined with IMU provide the best of all positioning solutions
- Planned Near-term Steps
  - Complete development of positioning correction messages
  - Additional research at CVHT to integrate positioning technologies within the connected vehicle environment



# Communications

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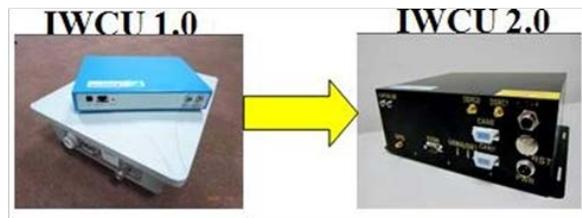
Goal: To test multiple communication technologies for potential use in V2I applications

- Current Activities
  - Develop test plans to assess the most promising technologies
    - DSRC
    - Cellular 4G/LTE
  - Monitoring ongoing NTIA study
- Planned Near-term Steps
  - Continue to investigate DSRC bandwidth issues (e.g., data transfer frequency, packet drops) using lessons learned from Safety Pilot
  - Test the technologies in a laboratory field test at CVHT in mid 2013



# Roadside Equipment (RSE) Device

Goal: Foster the development of RSE device that meets the requirements of the connected vehicle program



IWCU:ITRI WAVE/DSRC Communication Unit

- Current Activities
  - 5 vendors participated in prototyping
  - Continue to refine design based on Safety Pilot results (RSE v3)
- Planned Near-term Steps
  - Revision to latest RSE device spec
    - Workshops and direct communications with a variety of stakeholders
  - Identify the full range of requirements for deployed RSE device



# Integrated V2I Prototype

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Goal: Develop a comprehensive solution to connected vehicle infrastructure needs

- Incorporate all parts of Track 1 to work seamlessly to enable V2I applications
- Integration and testing of a complete infrastructure system
  - Data flows
  - Information exchange
  - Standards
- Planned Near-term Steps
  - Contract for development of the Integrated V2I Prototype



# For More Information.....

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