

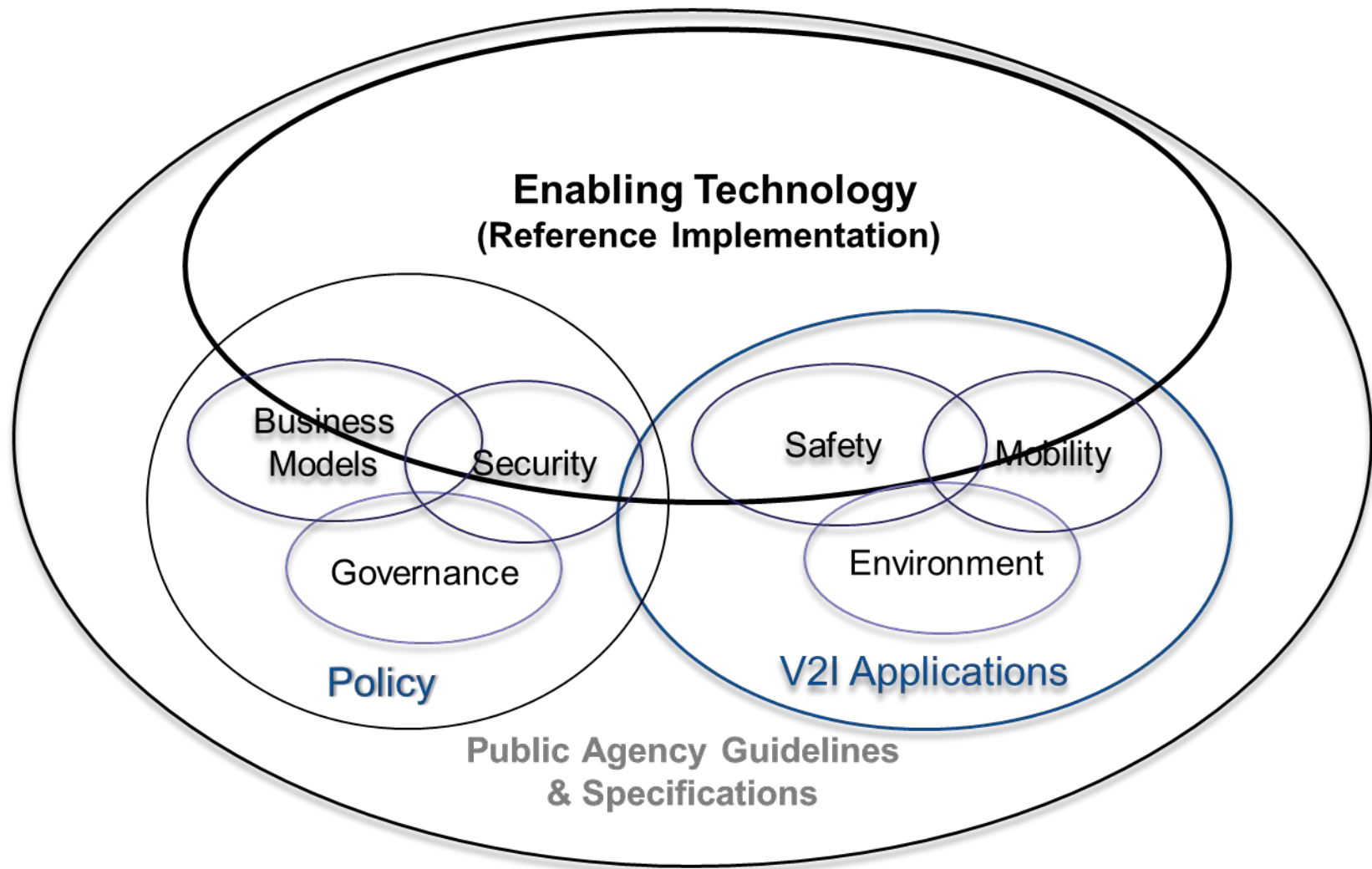
FHWA Office of Operations  
Research and Development

**Executing the Vehicle-to-Infrastructure  
Research Program: Enabling Technology**

September 25, 2013

Deborah Curtis

# V2I Communications – Major Activities



# V2I – Enabling Technologies

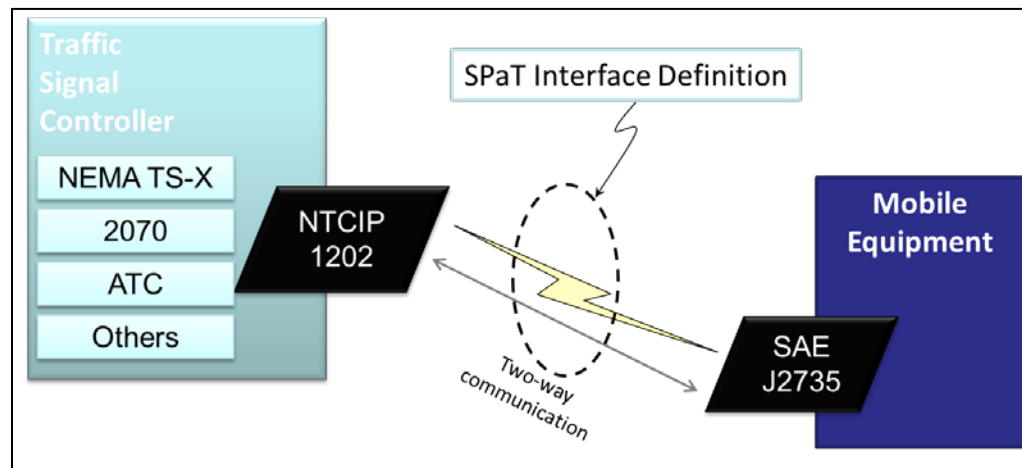
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- Goal – Develop and integrate the infrastructure components necessary to provide the foundation for V2I deployment
  - Signal Phase and Timing (SPaT)
  - Mapping
  - Positioning
  - Communications
  - Roadside Equipment (RSE) Device
  - Integrated V2I Prototype



# Signal Phase and Timing (SPaT) & Related Messages

- 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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- Past and current activities
  - Interface testing at Safety Pilot
    - 6 intersections equipped and 6 pending equipment installation
    - Transit application using SPaT data
    - SPaT data logged to facilitate future application development
  - Lessons learned from Safety Pilot and other studies, and industry comment, will be used to refine the SPaT message
- Planned near-term steps
  - Deploy SPaT Prototype in Affiliated Test Beds to support field testing of Multi-Modal Intelligent traffic Signal System (MMITSS)
  - Compile lessons learned related to SPaT from research & development at Turner-Fairbank Highway Research Center (TFHRC) and Safety Pilot Model deployment



# Mapping

- Goal – Collect relevant roadway geometry and attributes data and broadcast it for use in V2I applications
  - Supporting activities
    - Initial research proved concept of generating and broadcasting maps for V2I applications
    - LIDAR and 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
  - Work with ITS Standards Program to identify gaps in standards and actions going forward, and harmonize with international standards effort



# Positioning

- Goal – Ascertain which current or near-term positioning technologies can meet requirements of V2I applications
  - Current activities
    - Unit testing of technologies ongoing at Connected Vehicle Highway Testbed (CVHT) located at TFHRC
    - 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 integrated positioning technologies within the connected vehicle environment



**Positioning and mapping are closely related**



U.S. Department of Transportation  
Research and Innovative Technology Administration  
ITS Joint Program Office

# Communications

- Goal – To test multiple communication technologies for potential use in V2I applications
  - Current activities
    - Develop test plans to assess the most promising technologies
      - 5.9 GHz 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 fall 2013



# Roadside Equipment (RSE) Device

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- Goal – Foster the development of RSE device that meets the requirements of the connected vehicle program
  - Past and current activities
    - Hosted stakeholder workshop on August 8, 2013
    - Conducting weekly teleconferences
  - Planned near-term steps
    - Revision to latest RSE device specification
      - Conduct workshops and direct communications with a variety of stakeholders
      - Identify the full range of requirements for deployed RSE device
      - Rewrite current specification and develop test plan based on specification rewrite



# Integrated V2I Prototype

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- Goal – Develop a comprehensive prototype 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
  - Current activities
    - Awarded contract to Battelle on 9/9/2013 for development of the Integrated V2I Prototype



# For More Information

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