AV Benefits Framework

Presentation for FOT-NET Workshop

Scott Smith, U.S. Department of Transportation

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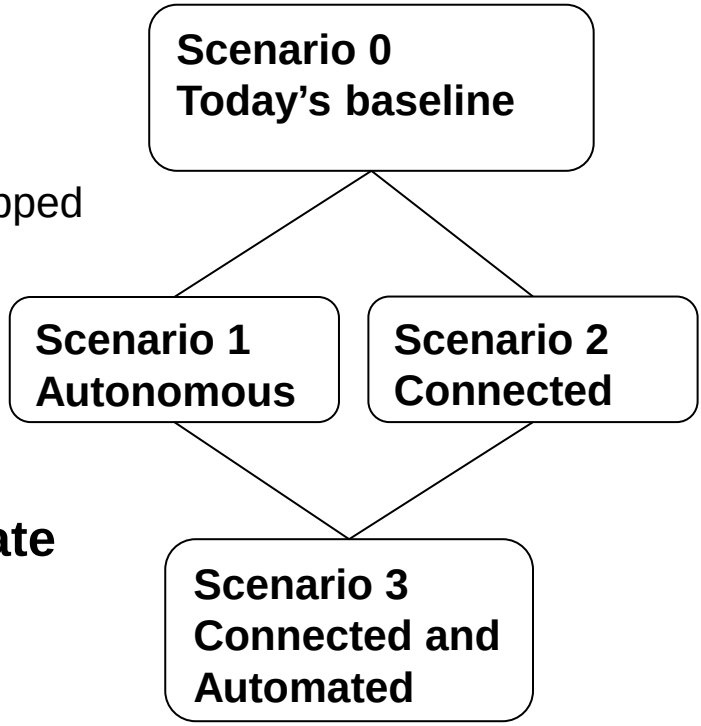
AV Multimodal Benefits Framework, Phase 1

- Develop a framework to estimate the potential safety, mobility, energy and environmental benefits (including dis-benefits) of technologies contributing to the automation of the nation's surface transportation system
- Objectives
  - Identify metrics
  - Develop a framework for quantifying impacts
  - Provide a high order assessment of the state of knowledge
  - Incorporate current research by other parties.
- Final phase 1 report, *Benefits Estimation Framework for Automated Vehicle Operations* (FHWA-JPO-16-229), is now available in the National Transportation Library (ntl.bts.gov)

This research is sponsored by the US DOT Intelligent Transportation Systems Joint Program Office.

Framework Approach

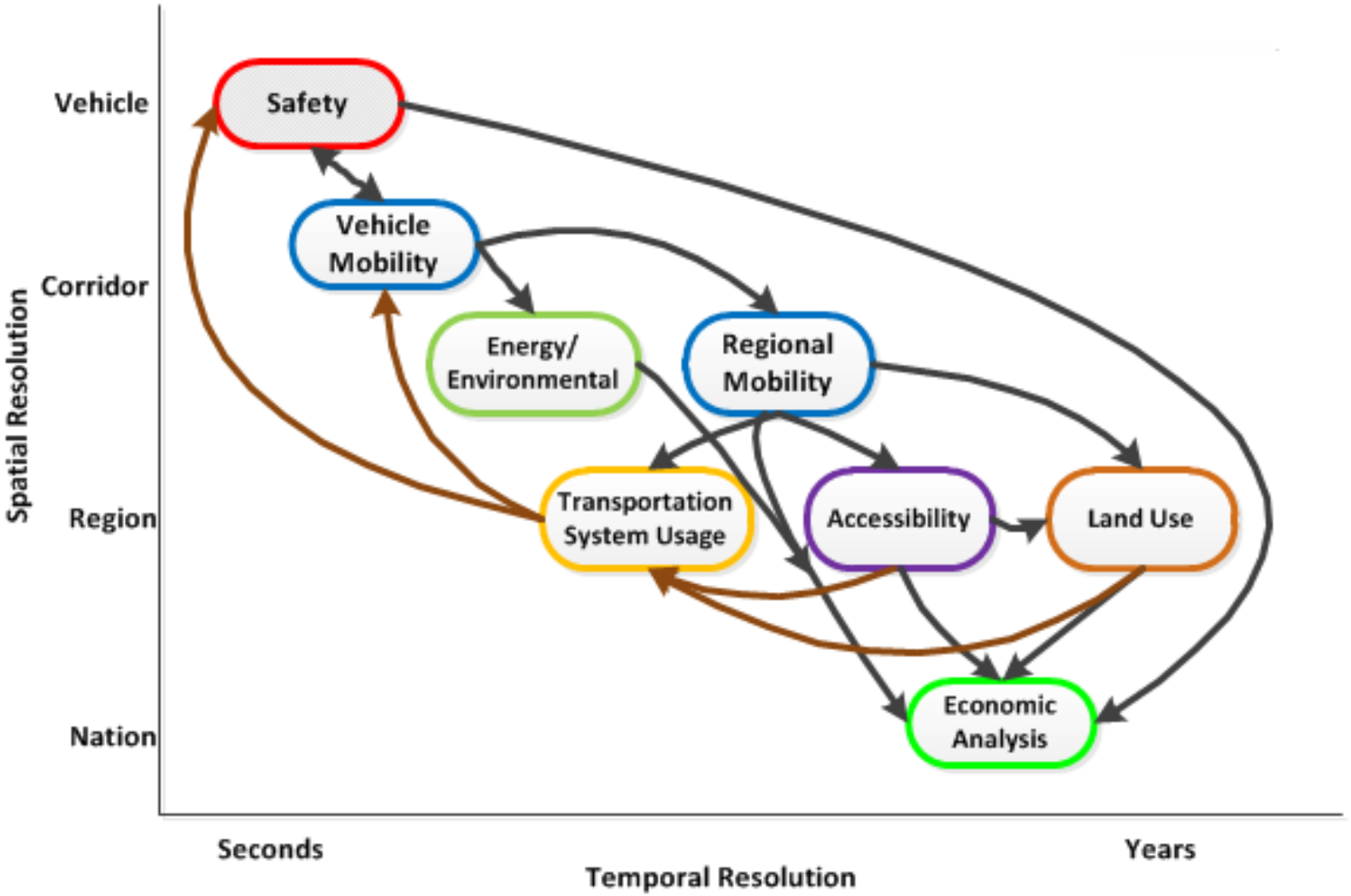
- **Divide and conquer**
  - Several models
  - Several levels of spatial and temporal resolution
  - Well-defined scenarios, for example,
    - Forward collision avoidance with lead vehicle stopped
    - Car following (lane capacity) on a freeway
- **Feedback loops are important**
- **Consistent methods for modeling the baseline and automation**
- **Use existing tools and methods as appropriate**
  - Safety Impact Methodology
  - Car-following and traffic microsimulation
  - Emissions / energy estimation (MOVES)
- **Flexibility to accommodate several visions of the future world (e.g., state of infrastructure, amount of ride sharing)**



Potential Impacts of Automation

- Immediate Impacts
  - Safety: Crash avoidance and severity reduction
  - Mobility: Closer car following, more efficient intersection performance, increased lane and intersection capacity
  - Energy / Environment: Lower tailpipe emissions and energy consumption
- Longer term impacts
  - Accessibility: More options for non-drivers
  - Land Use: More density, more sprawl
  - **Transportation System Usage: Induced travel**
  - **Public Health (new to the framework)**
- Economic benefits
  - Reduced crash and pollution costs
  - Increased productivity

Framework Elements

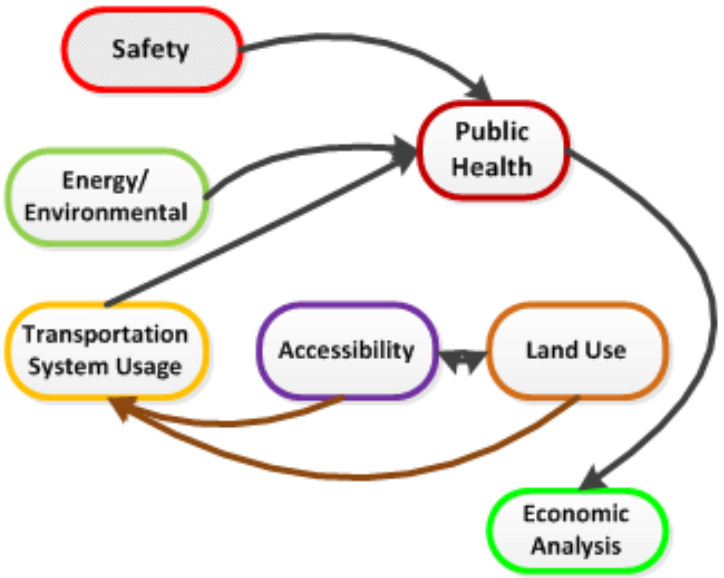


Public Health

Public health is the science of protecting and improving the health of families and communities through promotion of healthy lifestyles, research for disease and injury prevention and detection and control of infectious diseases. – U.S CDC

Elements of automation that affect public health

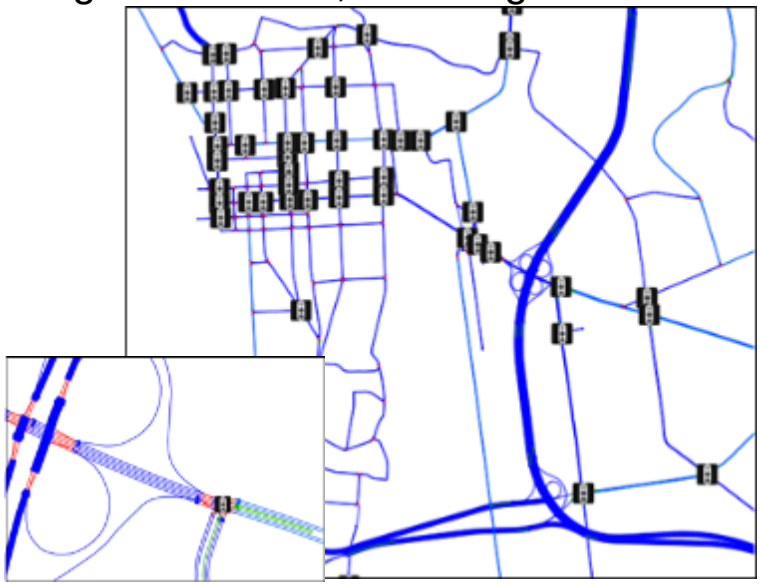
- Safety: vehicle occupants and non-occupants
- Effect of automation on active transportation (walking, bicycling)
- Air pollution
- Access to opportunities for healthy lifestyles
  - Equity concern for low income populations
  - Access to medical care, healthy food, employment, education, and recreation



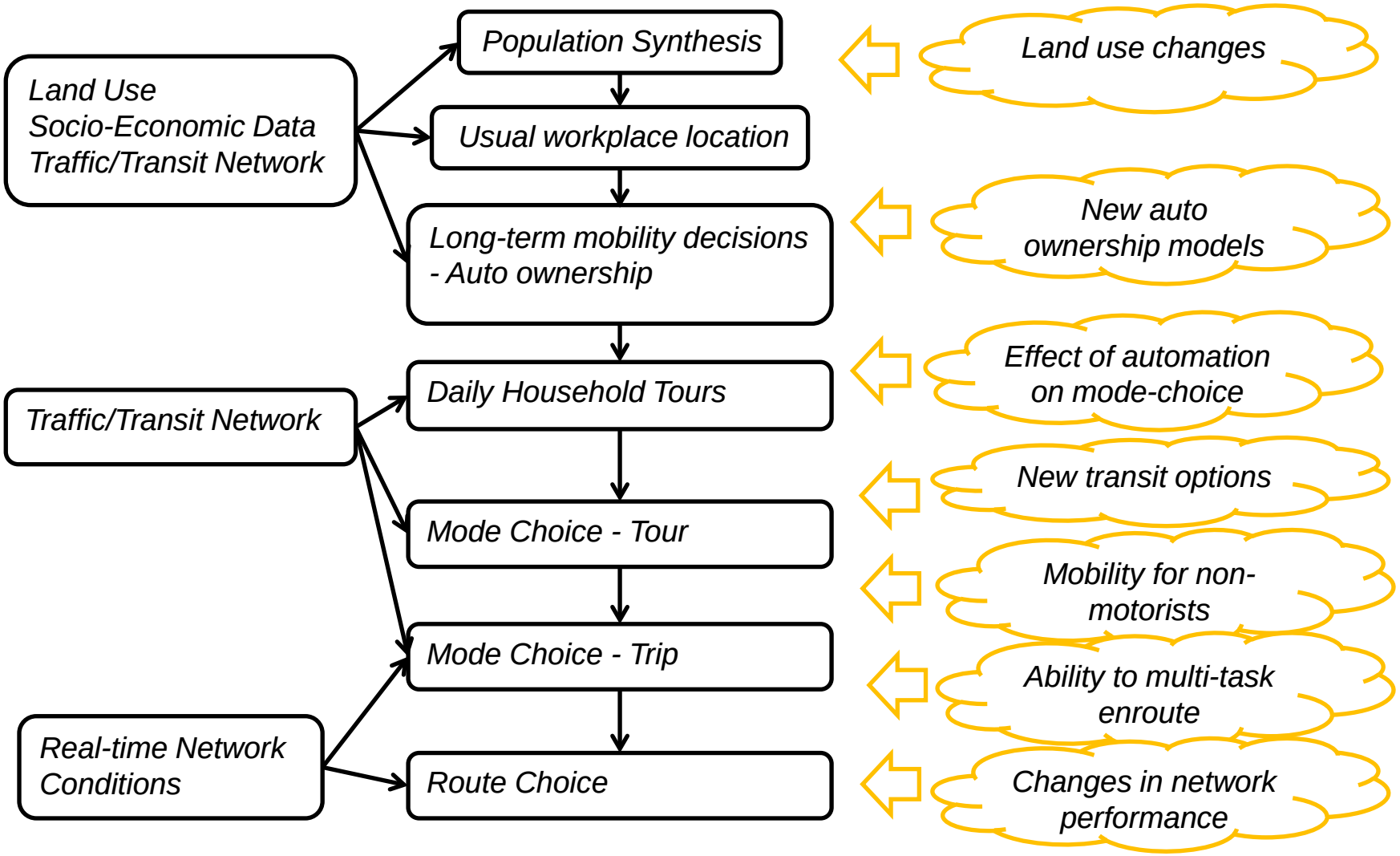
Transportation System Usage

- Metrics
  - Total trips, travel distance and time
  - Average trip duration, speed
  - Mode split: e.g. drive, bus, walk, bike
  - Various congestion indices
- Data needed
  - Road and intersection performance
    - < 100% AV market penetration
  - Network configuration
    - Existing roads and traffic controls
    - New managed lanes
    - ITS Infrastructure
  - Demand for travel
    - Passenger
    - Freight
- Data sources
  - Existing regional models
    - Supply and demand
  - Results from detailed AV modeling

- Challenges
  - Many possible future scenarios
    - The “baseline” is not current vehicles
    - Levels of automation
    - Market penetration
    - User response: vehicle and trip sharing
  - Connecting to existing regional models
- Approach
  - Assess suitability of existing state-of-art regional models, including land use



AV Effects on Transportation System Usage



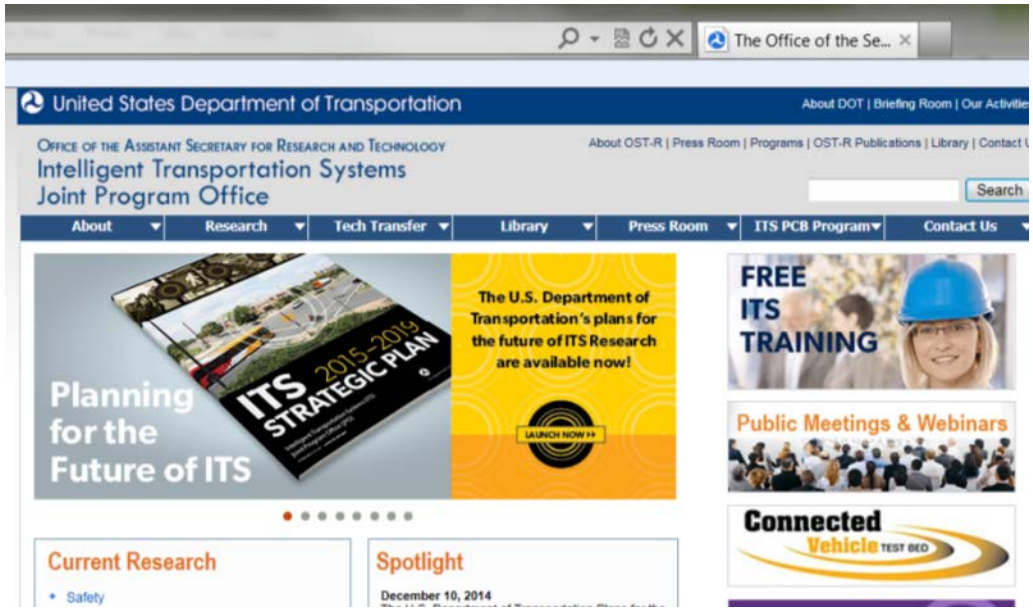
Framework: Lessons Learned thus Far

- Substantial interest in the framework
- Need for a clearinghouse on research, to facilitate sharing
  - What data are collected?
  - What methods (models) are used?
  - What results are reported?
- Understand the big picture, to ensure the right data are collected
  - For example, a mobility project may affect safety and vice versa

Plans for 2016-2017

- Identify data sources and automation applications for initial modeling
- Examine linkages between micro and regional mobility models
- Develop AV impact models
  - Start with Safety, Mobility and Environment
  - Continue to other areas
- Coordinate with U.S. and international evaluation efforts

For More Information



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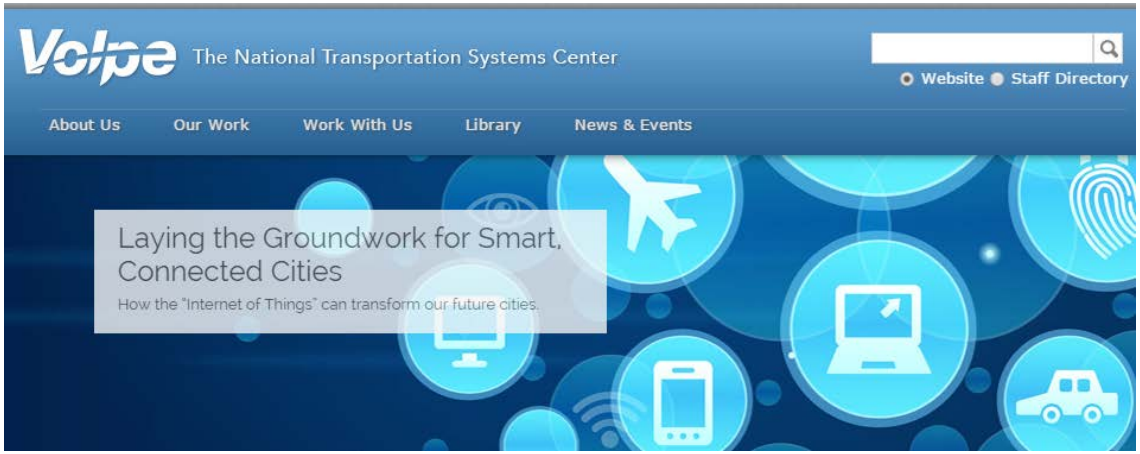
Kevin Dopart
US DOT / ITS JPO
Kevin.Dopart@dot.gov



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Scott Smith
US DOT / Volpe
Scott.Smith@dot.gov