ITS Strategic Plan 2015-2019

Outline

- Strategic Planning Process
- ITS Strategic Plan Components and Hierarchy
- ITS Strategic Plan’s Framework
- Strategic Priorities, Vision, and Mission
- Strategic Themes
- ITS Technology Lifecycle and Operational Disciplines
- Program Categories
- Strategic and Operational Plan Elements

The Strategic Planning Process: Reflecting Stakeholder Input

WE HAVE HEARD YOU...

Over **700 stakeholders** representing states and localities from across the country participated in development of the 2015–2019 ITS Strategic Plan

AUTOMATION was a recurring topic of interest, being discussed by over

100

stakeholders

285 different organizations

contributed inputs to the ITS Strategic Plan 2015–2019

INTEROPERABILITY as an ITS program focus was raised over

200

times

connected
adoption
research
transition
performance
operational
new
systems
categories
questions
vehicle
development
technologies
transportation
deployment
data
include
Strategic
support
increase
process
priorities
areas
focus
use
Guide
safety
efficiency
mobility
associated
users
innovation
standards
information
various
international
JPO
interoperability
effective
groups
work
nation
testing
Detailed
stage
tracking
public
testing
benefits
responsibility
based
defined
themes
reflect
devices
disciplines
Potential
state
initial
integration
generation
outcomes
partners
input
figure
table
decision
Resources
Infrastructure
Knowledge
Individual
understanding
Improve
activities
actions
improve
private
impact
success
structure
Industry
Lifecycle
Establish
Environment
Related
Facilitate
Enterprise
Enterprising
Integrating
Integration
Multiple
Program
Research
Vehicle
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Support
Increase
Process
Strategic
Focus
Guide
Data
Deployment
Include
Priorities
Areas
Interoperability
Effective
Groups
Work
Nation
Testing
Public
Tracking
Detailed
Stage
Infrastructure
Knowledge
Individual
Understanding
Improve
Activities
Actions

ITS Strategic Plan Components and Hierarchy

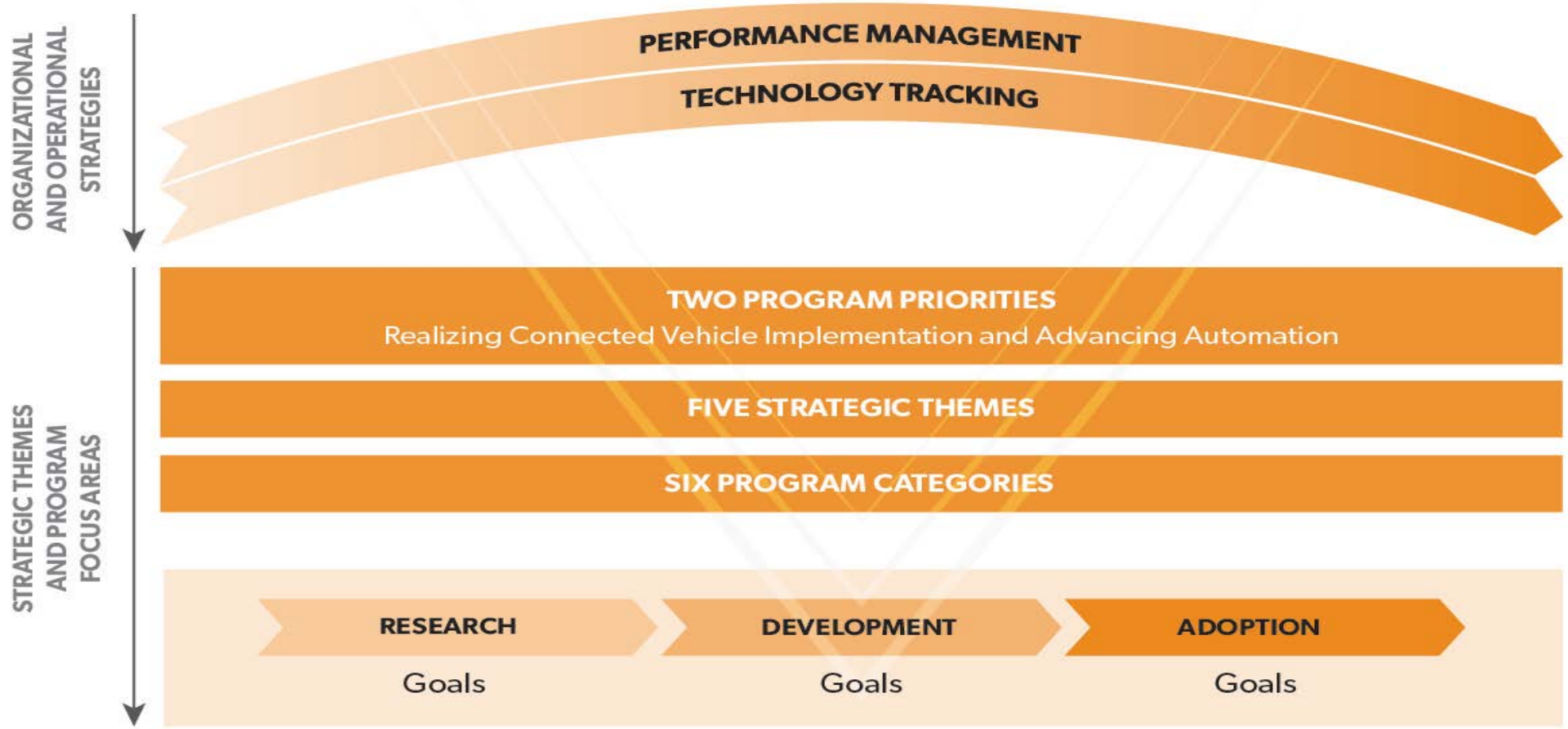
STRATEGIC PLAN

The purpose of the **ITS Strategic Plan** is to lay out the direction and goals of the ITS Program and to provide a framework around which the ITS JPO and other Department of Transportation agencies will conduct research, development, and adoption activities in order to achieve outcomes and goals of the overarching ITS Program. The Plan will be used to inform interested stakeholders about the activities and priorities of the *ITS Program*.

OPERATIONAL PLAN FOR JPO

The purpose of the **ITS JPO Operational Plan** is to provide a suite of program charters with resource allocations, milestones, responsibilities, and processes that the individual programs will develop. Working within the overarching structure and framework set forth in the Strategic Plan, the Operational Plan will allow the JPO to maintain its focus and momentum along the program categories defined in the Strategic Plan.

ITS Strategic Plan's Framework



Strategic Priorities

- Two Strategic Priorities reflect a sense of where the bulk of transportation research and innovation is heading. These priorities are not exclusive of other technologies or research areas.

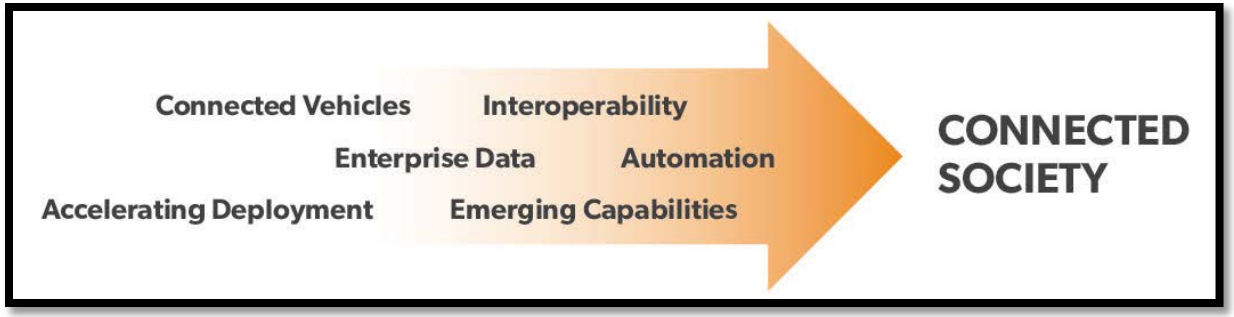
  - ***Realizing Connected Vehicle Implementation***
    - builds on the substantial progress made in recent years around design, testing, and planning for connected vehicles to be deployed across the nation.

  - ***Advancing Automation***
    - shapes the ITS Program around research, development, and adoption of automation related technologies as they emerge.

Vision and Mission

VISION

Transform the Way Society Moves



MISSION

Conduct research, development, and education activities to facilitate the adoption of information and communication technology to enable society to move more safely and efficiently.

Strategic Themes

- **Enable Safer Vehicles and Roadways** by developing better crash avoidance, performance measures, and other notification mechanisms, commercial motor vehicle safety considerations, infrastructure-based, and cooperative safety systems.

- **Enhance Mobility** by exploring methods and management strategies that increase system efficiency and improve individual mobility.

- **Limit Environmental Impacts** by better managing traffic flow, speeds, congestion, and using technology to address other vehicle and roadway operational practices.

- **Promote Innovation** by fostering technological advancement and innovation across the *ITS Program*, continuously pursuing a visionary/exploratory research agenda, and aligning the pace of technology development, adoption, and deployment to meet future transportation needs.

- **Support Transportation Connectivity** through the development of standards and systems architectures, and the application of advanced wireless technologies that enable communications among and between vehicles of all types, the infrastructure, and portable devices.

ITS Technology Lifecycle and Operational Disciplines

RESEARCH

The Research stage of the lifecycle starts with **idea generation**, includes **concept development**, and proceeds through all other research activities.

DEVELOPMENT

The Development stage of the lifecycle starts with **prototype development**, proceeds through **testing**, and includes **measures of effectiveness**.

ADOPTION

The Adoption stage of the lifecycle starts after testing is complete and technologies are ready for initial adoption. This stage includes **model deployments** and **measurements of initial adoption**.

PERFORMANCE MANAGEMENT

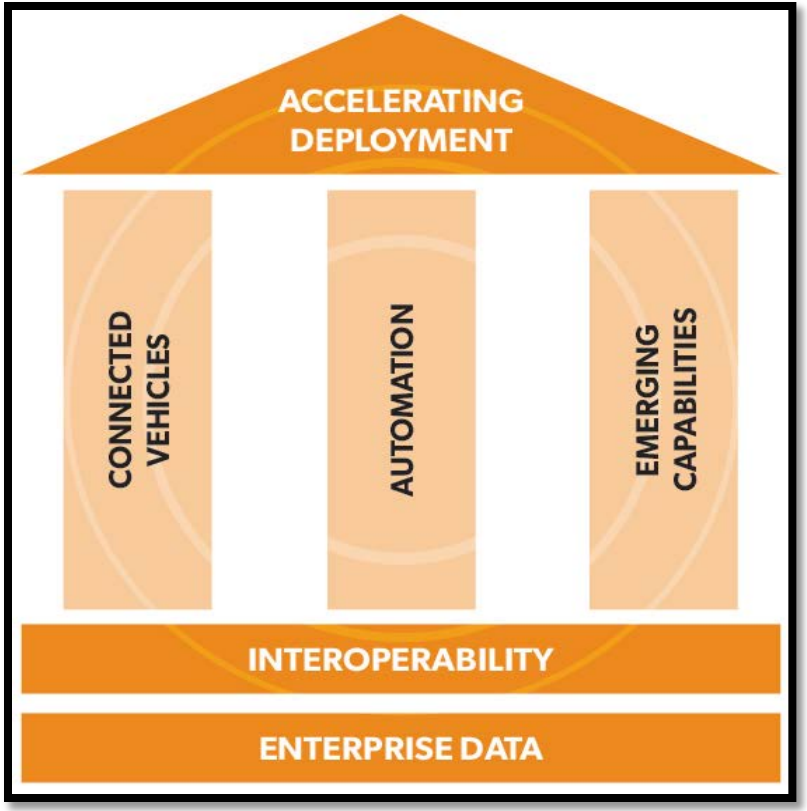
Performance management is the discipline of using metrics and defined outcomes to measure success of the ITS JPO, its programs and projects, and identify opportunities for improvement.

TECHNOLOGY TRACKING

Technology Tracking activities take place throughout the technology lifecycle to ensure goals, objectives, and performance indicators of all functions and activities are being used to make decisions and facilitate progress.

The Adoption Phase sets the stage for large scale **deployment**.

Program Categories



Program Categories

- **Connected Vehicles** program category will be primarily focused on adoption and eventual deployment of the system.

- **Automation research** will focus on topics related to automated road-vehicle systems and related technologies that transfer some amount of vehicle control from the driver to the vehicle.

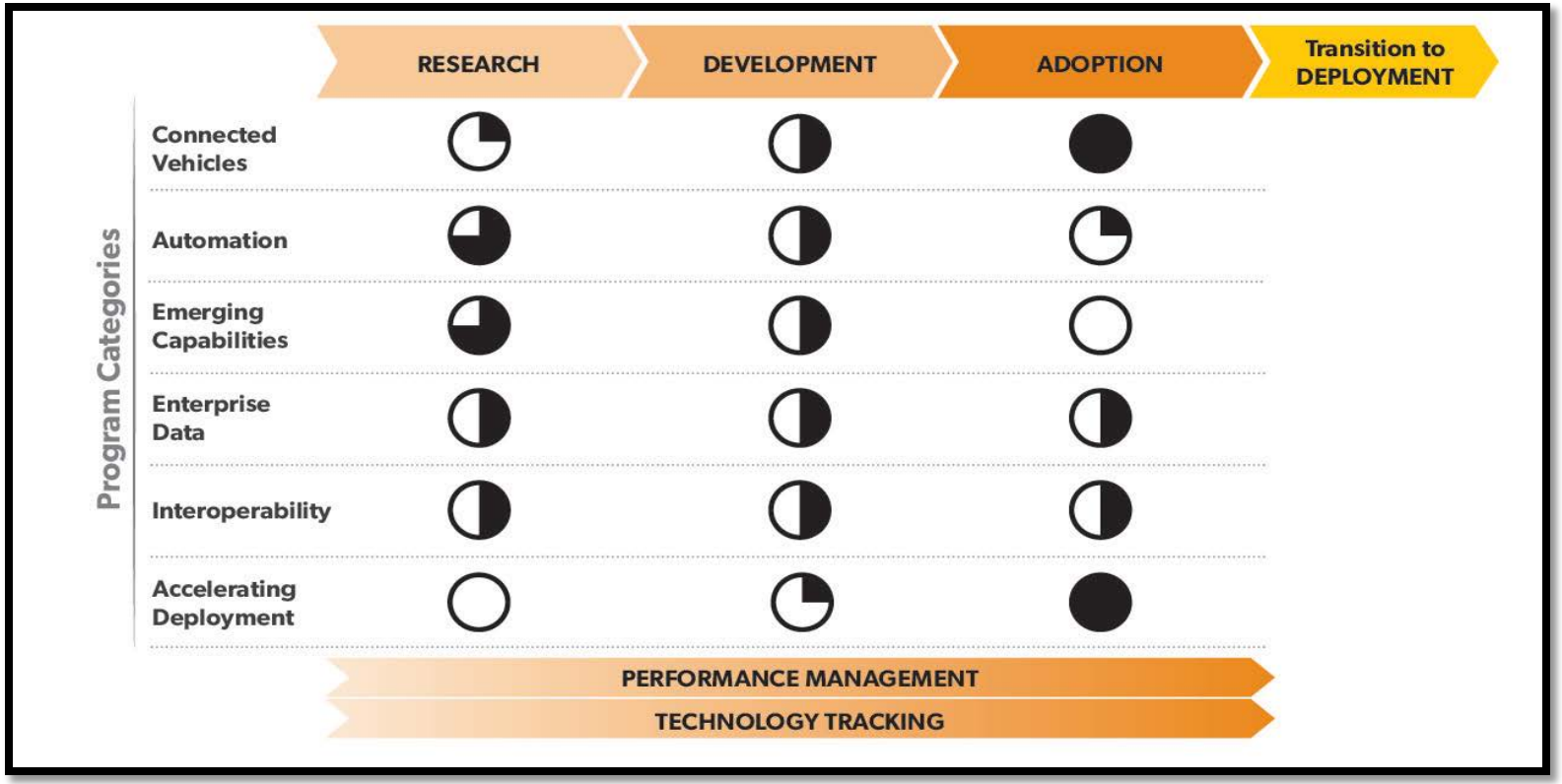
- **Emerging Capabilities** will focus on future generations of transportation systems.

- **Enterprise Data** programs will continue existing efforts in operational data capture from stationary sensors, mobile devices, and connected vehicles, and expand into research activities involving the development of mechanisms for housing, sharing, analyzing, transporting, and applying those data for improved safety and mobility across all modes of travel.

- **Interoperability** focuses on how to ensure effective connectivity among devices and systems.

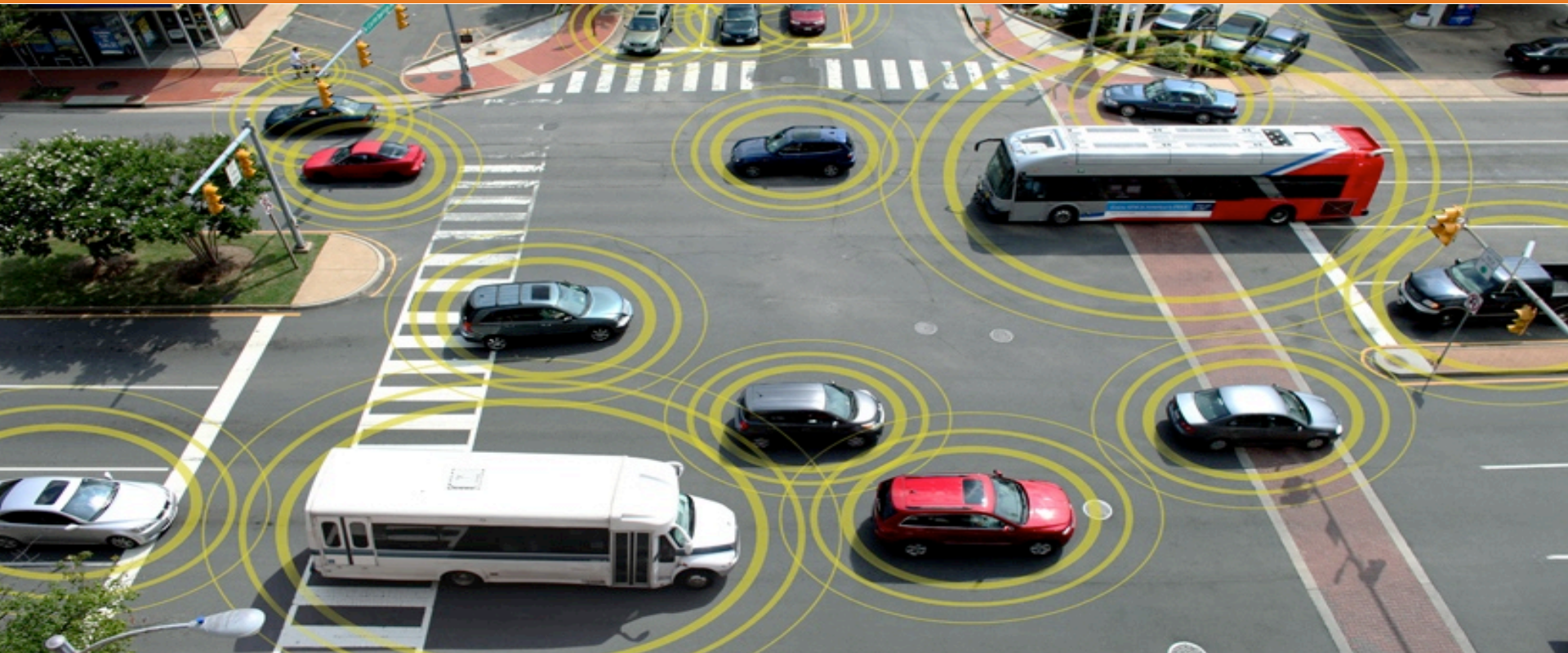
- **Accelerating Deployment** advances the work from adoption to wider scale deployment in coordination with several other DOT agencies.

Program Categories and Technology Lifestyle

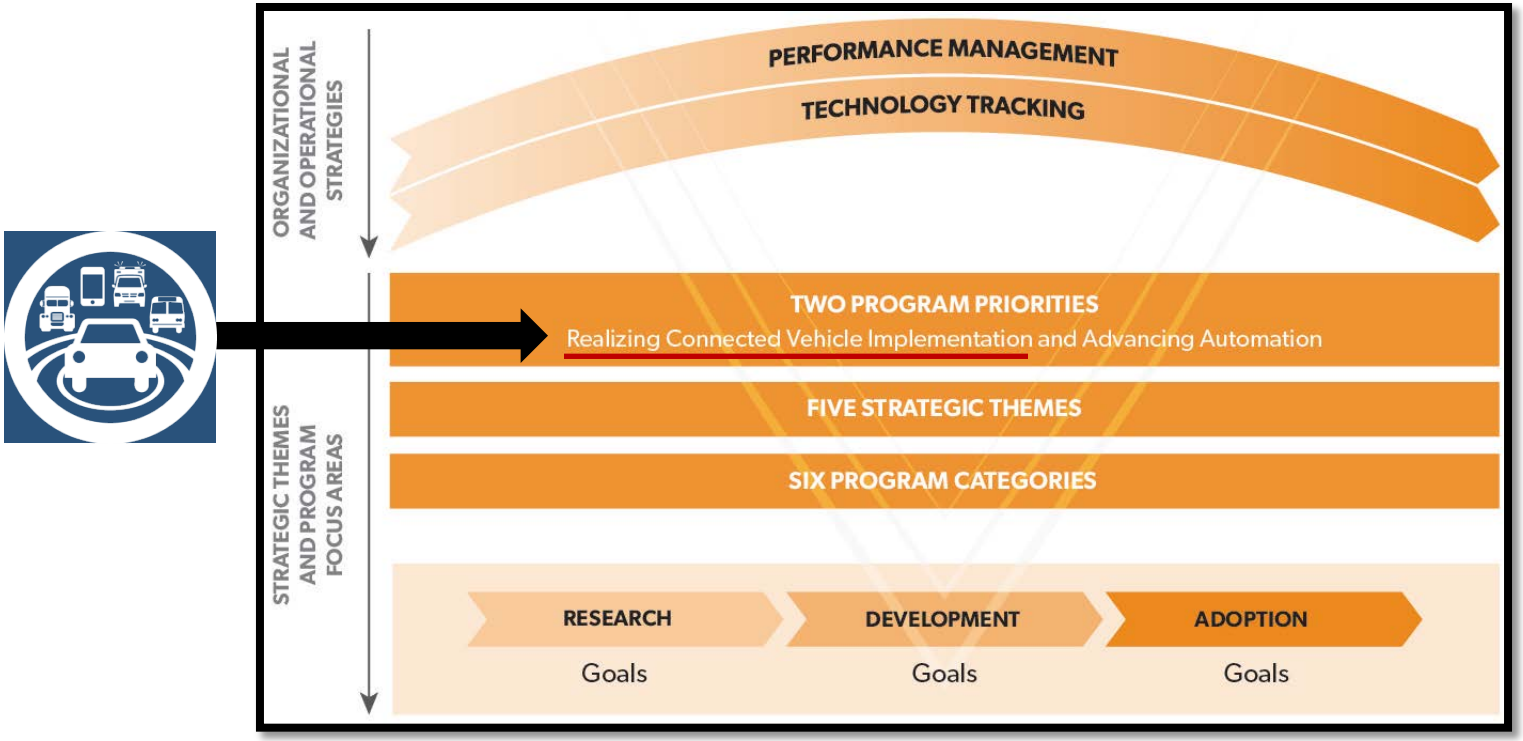


Kate Hartman

Connected Vehicles



ITS Strategic Plan's Framework



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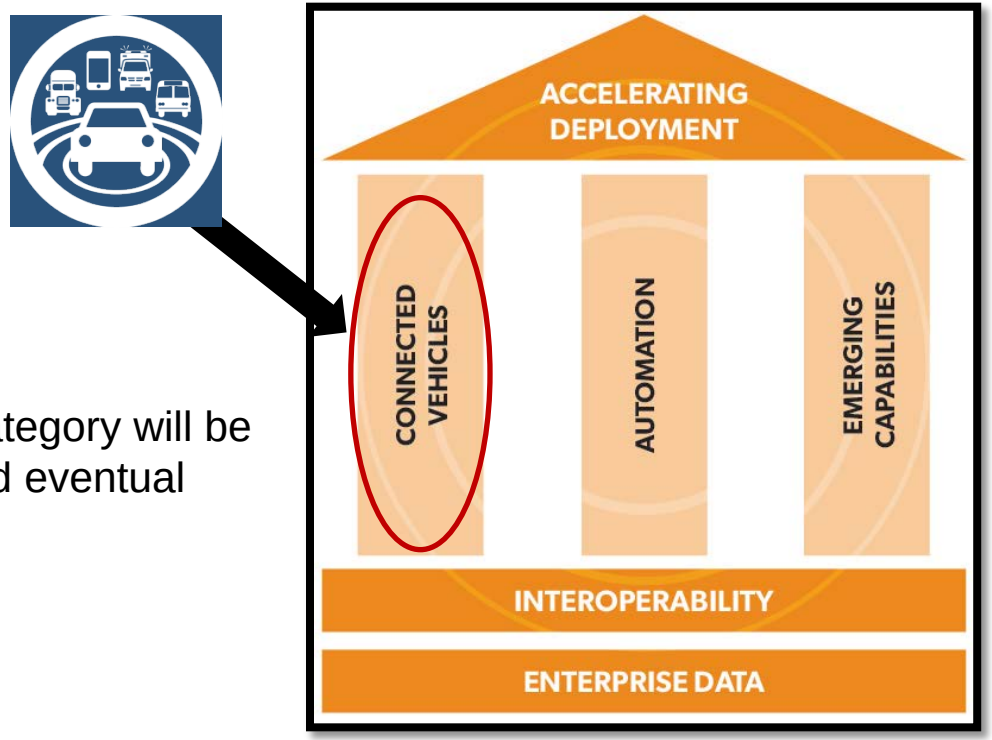

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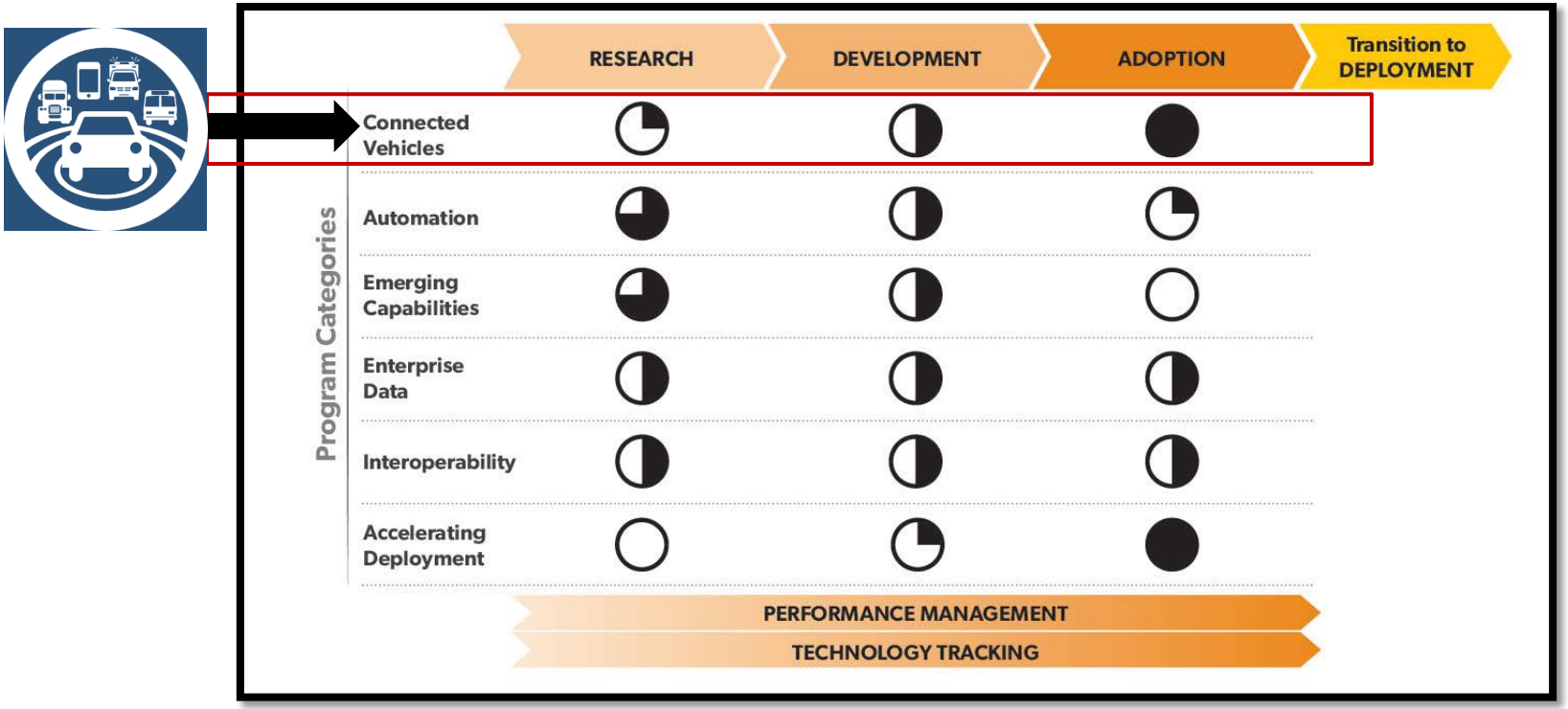
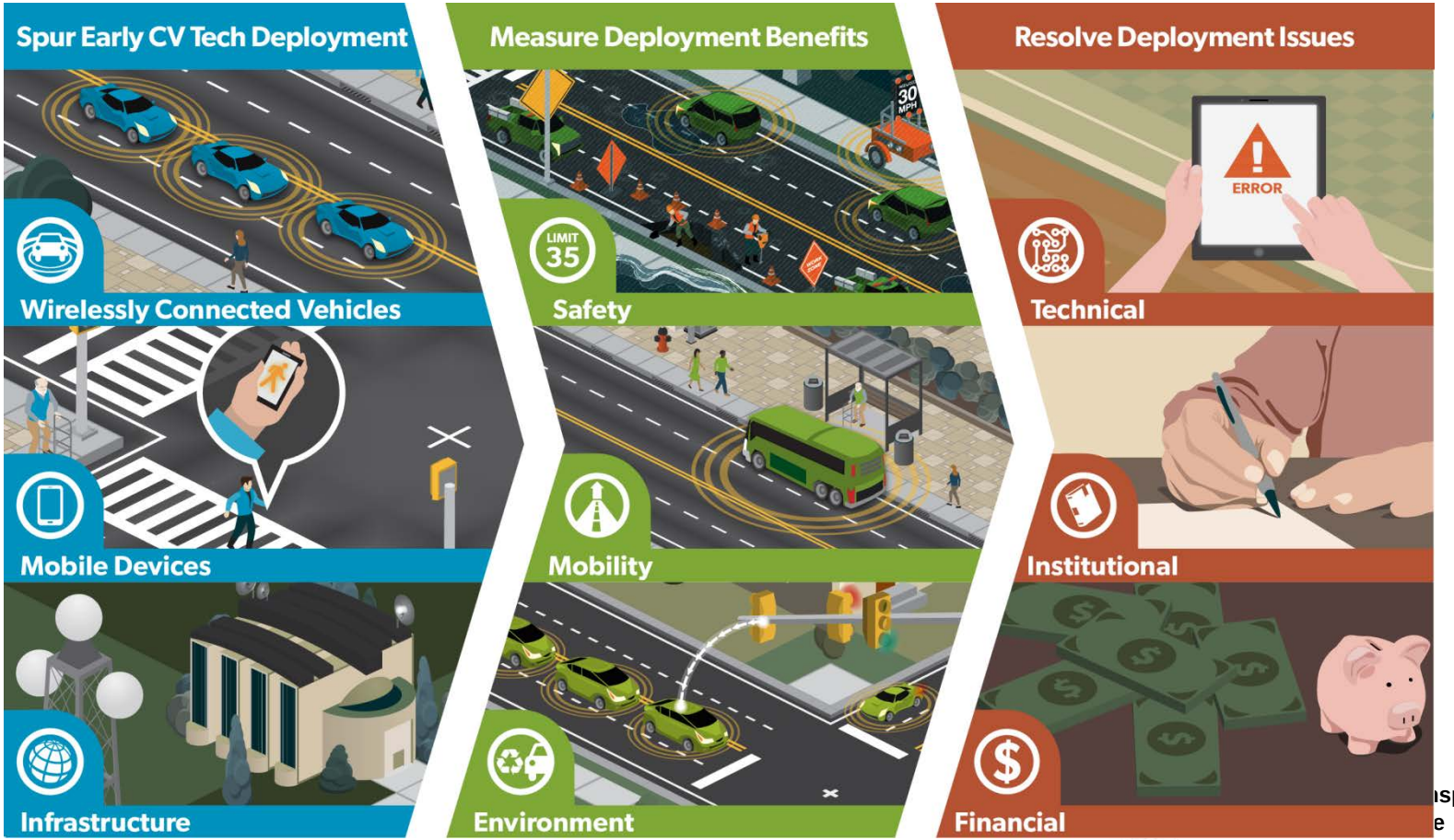
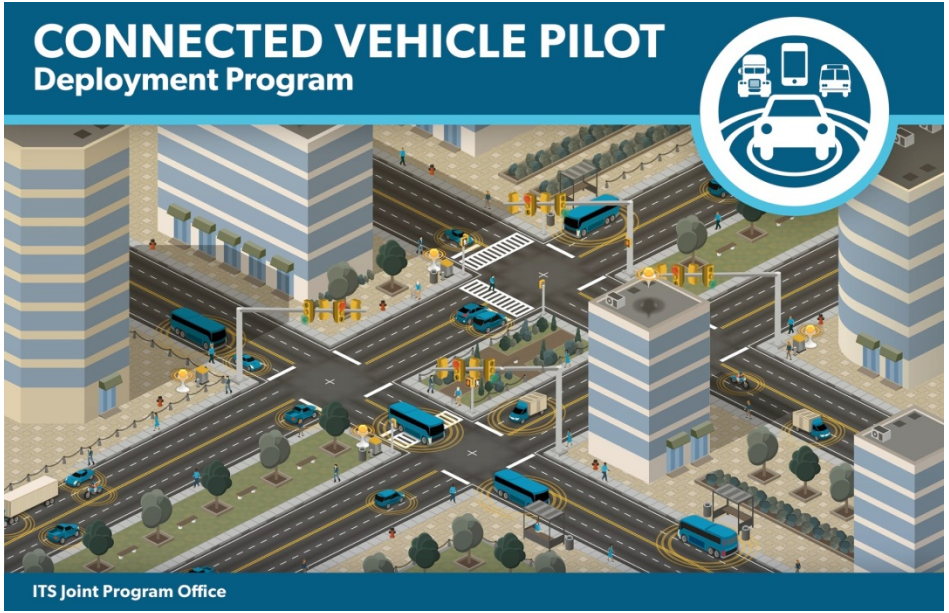
Program Categories and Technology Lifecycle



CV Pilot Deployment Program Goals



Organizing Principles



- Pilot deployments will be *needs-driven* and have measureable impact
- Successfully deployed technologies are expected to remain as *permanent operational elements*
- There will be *multiple pilot sites*
  - Each site will have different needs, focus and applications
- Each pilot deployment will feature *multiple applications* drawing on the products of USDOT and other connected vehicle research

Proposed Pilot Deployment Elements

- **Multiple** connected vehicle applications must be deployed together
- Pilot deployments should **leverage USDOT-sponsored research**
- Pilot deployments should include the **capture of data from multiple sources**
- At a minimum, **vehicles must represent one source of data**
- **Multiple forms of communications** technologies are desired
  - DSRC desired as one communication technology
  - Integrated or carry-in devices for connected vehicles capable of generating an SAE J2735 Basic Safety Message (BSM)
- Well-defined, focused, quantitative **performance measures**
- **Share pilot deployment data and lessons learned** while protecting privacy and intellectual property
- **Security and credentialing** management system

Connected Vehicle Applications

V2I Safety

- Red Light Violation Warning
- Curve Speed Warning
- Stop Sign Gap Assist
- Spot Weather Impact Warning
- Reduced Speed/Work Zone Warning
- Pedestrian in Signalized Crosswalk Warning (Transit)

V2V Safety

- Emergency Electronic Brake Lights (EEBL)
- Forward Collision Warning (FCW)
- Intersection Movement Assist (IMA)
- Left Turn Assist (LTA)
- Blind Spot/Lane Change Warning (BSW/LCW)
- Do Not Pass Warning (DNPW)
- Vehicle Turning Right in Front of Bus Warning (Transit)

Agency Data

- Probe-based Pavement Maintenance
- Probe-enabled Traffic Monitoring
- Vehicle Classification-based Traffic Studies
- CV-enabled Turning Movement & Intersection Analysis
- CV-enabled Origin-Destination Studies
- Work Zone Traveler Information

Environment

- Eco-Approach and Departure at Signalized Intersections
- Eco-Traffic Signal Timing
- Eco-Traffic Signal Priority
- Connected Eco-Driving
- Wireless Inductive/Resonance Charging
- Eco-Lanes Management
- Eco-Speed Harmonization
- Eco-Cooperative Adaptive Cruise Control
- Eco-Traveler Information
- Eco-Ramp Metering
- Low Emissions Zone Management
- AFV Charging / Fueling Information
- Eco-Smart Parking
- Dynamic Eco-Routing (light vehicle, transit, freight)
- Eco-ICM Decision Support System

Road Weather

- Motorist Advisories and Warnings (MAW)
- Enhanced MDSS
- Vehicle Data Translator (VDT)
- Weather Response Traffic Information (WxTINFO)

Mobility

- Advanced Traveler Information System
- Intelligent Traffic Signal System (I-SIG)
- Signal Priority (transit, freight)
- Mobile Accessible Pedestrian Signal System (PED-SIG)
- Emergency Vehicle Preemption (PREEMPT)
- Dynamic Speed Harmonization (SPD-HARM)
- Queue Warning (Q-WARN)
- Cooperative Adaptive Cruise Control (CACC)
- Incident Scene Pre-Arrival Staging Guidance for Emergency Responders (RESP-STG)
- Incident Scene Work Zone Alerts for Drivers and Workers (INC-ZONE)
- Emergency Communications and Evacuation (EVAC)
- Connection Protection (T-CONNECT)
- Dynamic Transit Operations (T-DISP)
- Dynamic Ridesharing (D-RIDE)
- Freight-Specific Dynamic Travel Planning and Performance
- Drayage Optimization

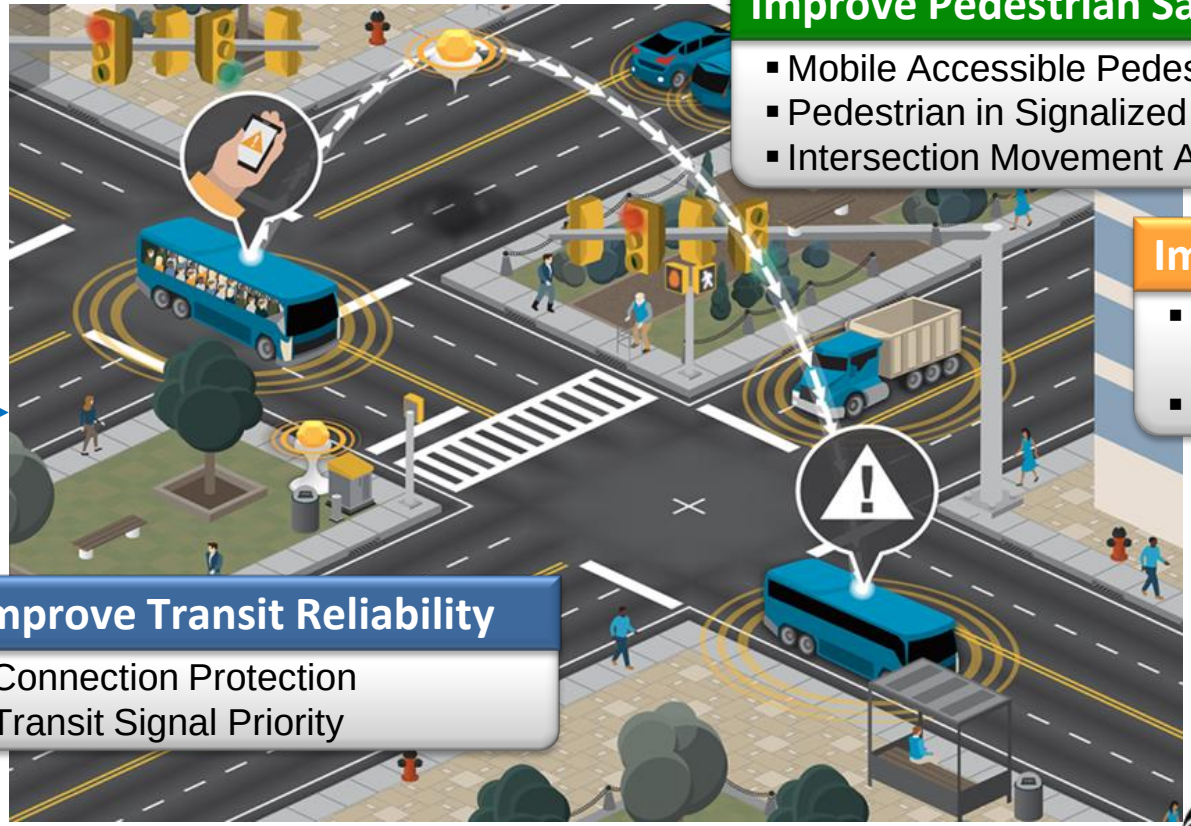
Smart Roadside

- Wireless Inspection
- Smart Truck Parking

Applications in various states of maturity

Many will be prototyped and documented by the end of 2014

Pilot Deployment Scenario 1: Sunnyside



Improve Pedestrian Safety

- Mobile Accessible Pedestrian Signal System
- Pedestrian in Signalized Crosswalk Warning
- Intersection Movement Assist

Improve Air Quality

- Eco-Approach and Departure at Signalized Intersections
- Eco-Traffic Signal Timing

•Improve Transit Reliability

- Connection Protection
- Transit Signal Priority

•Synergies among applications increase benefits and reduce costs

Pilot Deployment Schedule

Schedule Item	Date
Regional Pre-Deployment Workshop/Webinar Series	**Summer-Fall 2014**
Solicitation for Wave 1 Pilot Deployment Concepts	**Early 2015**
Wave 1 Pilot Deployments Award(s) Concept Development Phase (6-9 months) Design/Build/Test Phase (10-14 months) Operate and Maintain Phase (18 months)	**September 2015**
Solicitation for Wave 2 Pilot Deployment Concepts	**Early 2017**
Wave 2 Pilot Deployments Award(s) Concept Development Phase (6-9 months) Design/Build/Test Phase (10-14 months) Operate and Maintain Phase (18 months)	**September 2017**
Pilot Deployments Complete	**September 2020**

For More Information

www.its.dot.gov/pilots

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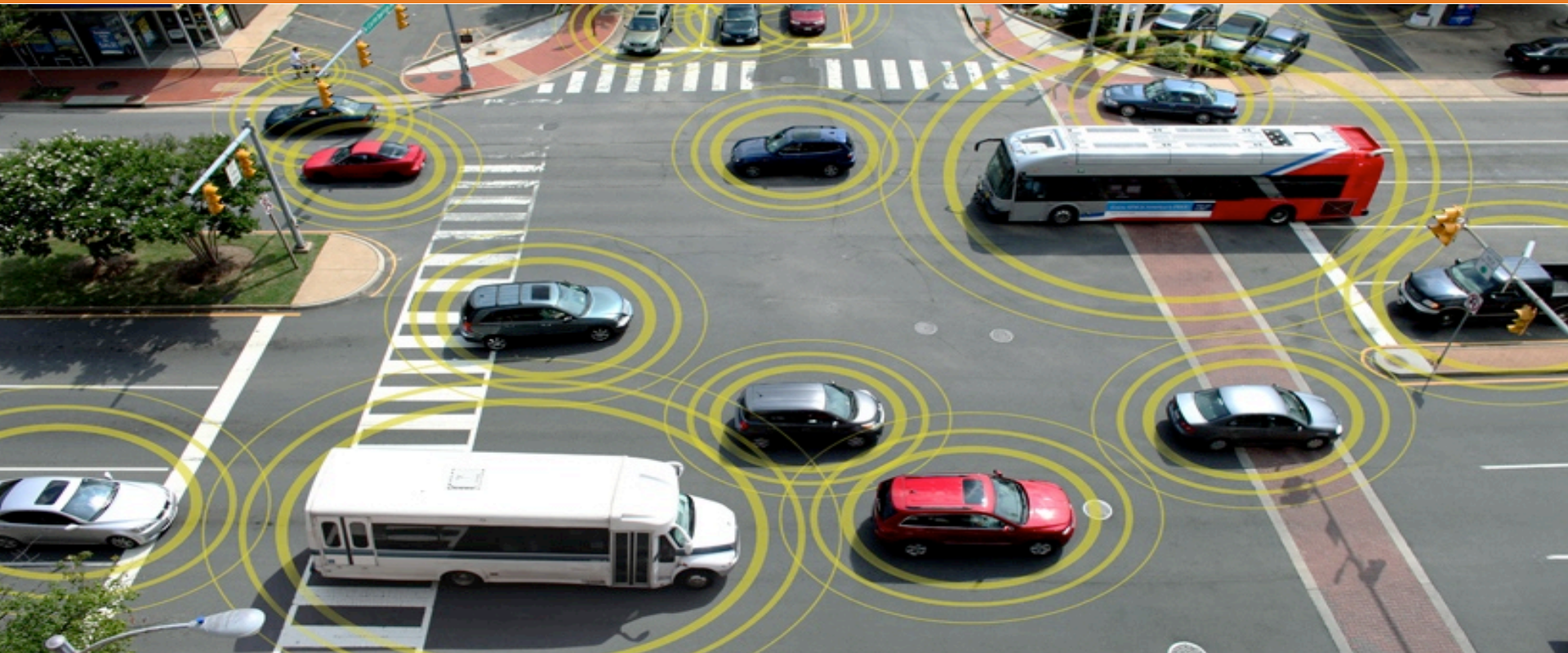
Automation Research



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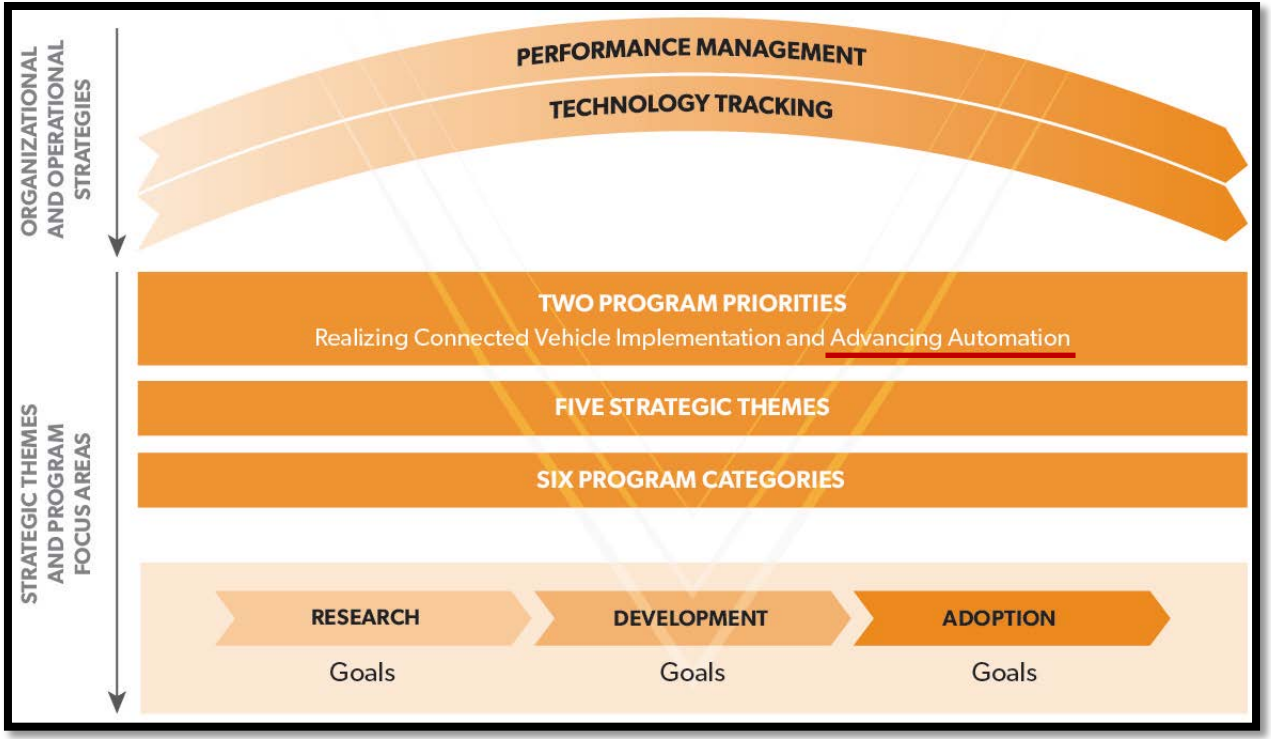

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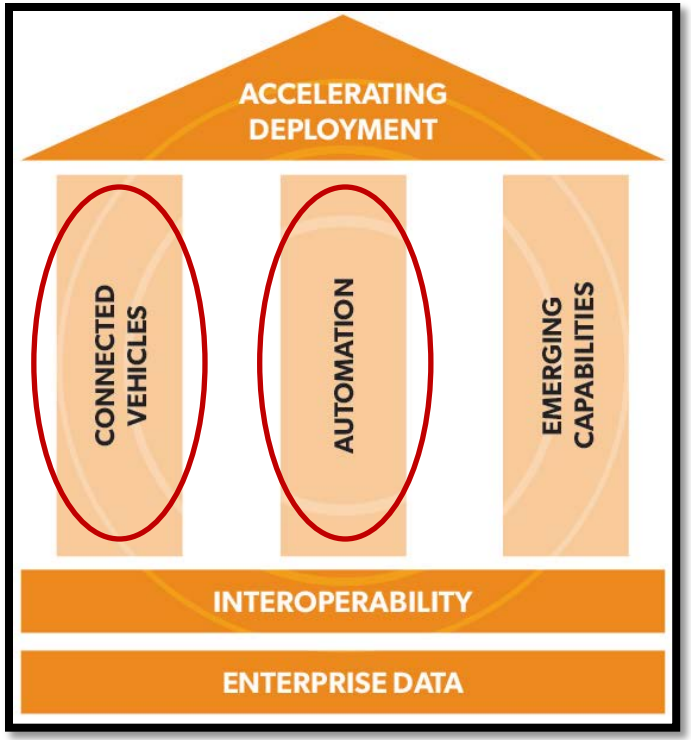

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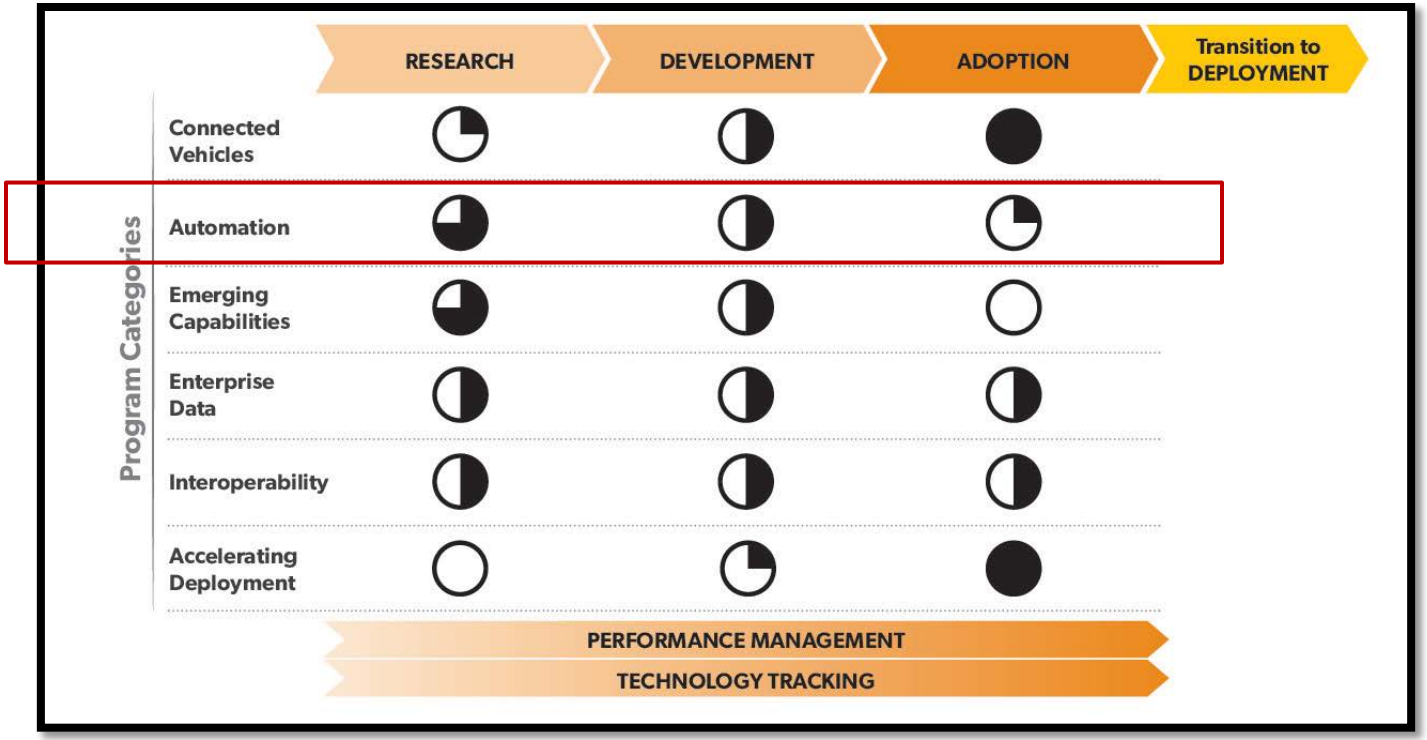
Program Categories and Technology Lifecycle



Automation – U.S. DOT Role

- Facilitate development and deployment of automated transportation systems that enhance safety, mobility, and sustainability
- Identify benefit opportunities in automated vehicle technology
- Invest in research areas that further industry investments and support realization of benefit opportunities
- Establish Federal Motor Vehicle Safety Standards (NHTSA) by level of automation

Proposed Vision for Automation Program

The U.S. DOT automation program will position industry and public agencies for the wide-scale deployment of partially automated vehicle systems that improve safety, mobility and reduce environmental impacts by the end of the decade.

Proposed Automation Program Goals

1. Develop estimates of the potential benefits and disbenefits of automated vehicles
2. Evaluate and promote enabling technologies
3. Develop prototype applications
4. Identify needed standards and appropriate methods for development
5. Identify technical, policy, institutional, and regulatory barriers to deployment and possible solutions
6. Generate design guidelines for automated vehicles
7. Collaborate with a broad range of public and private stakeholders

Planned Automation Program Framework

- Human-in-the-loop (HITL) Connected Driving Assistance
  - *Develop, test, and demonstrate HITL applications*
  - *Examples include: CACC, Platooning, Merge/Weave Assist, Speed Harmonization, and AERIS Eco-Approach/Departure*

L1

- Conditional Automation Safety Assurance
  - *Foundation research into systems that automate all control functions under certain conditions for limited amounts of time*
  - *Research areas include: human factors, control system reliability, testing procedures, and cybersecurity*

L2 / L3

- Limited Driverless Vehicle Operations
  - *Exploratory research into first-mile/last-mile prototypes*
  - *Develop concepts and test/evaluate emerging prototypes*

L4

Modal Research Areas

NHTSA

- Human Factors
- Electronic Control Systems
- System Performance
- Testing and Evaluation
- Cybersecurity

FHWA

- Enabling Technologies
- Application Testing and Evaluation
- Application Human Factors
- Infrastructure Policy

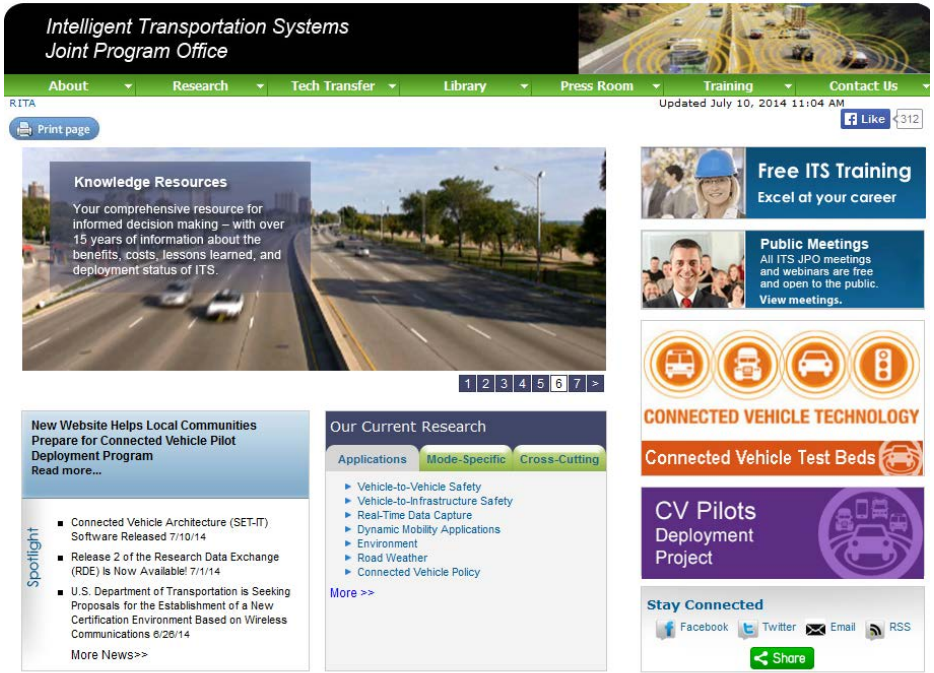
FTA

- Enabling Technologies
- Transit Application Testing and Evaluation

ITS JPO

- Benefits Estimation
- General Policy
- Standards
- Program Planning / Outreach

For More Information



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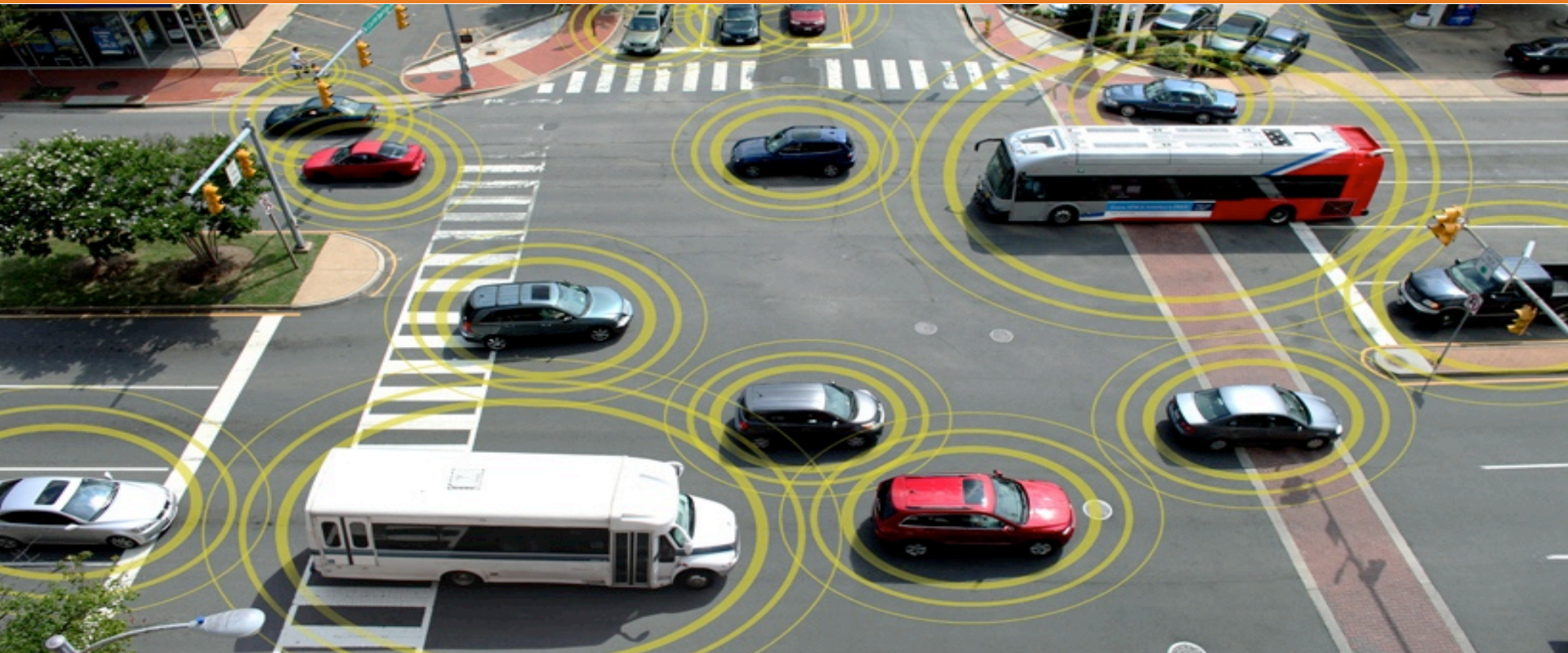
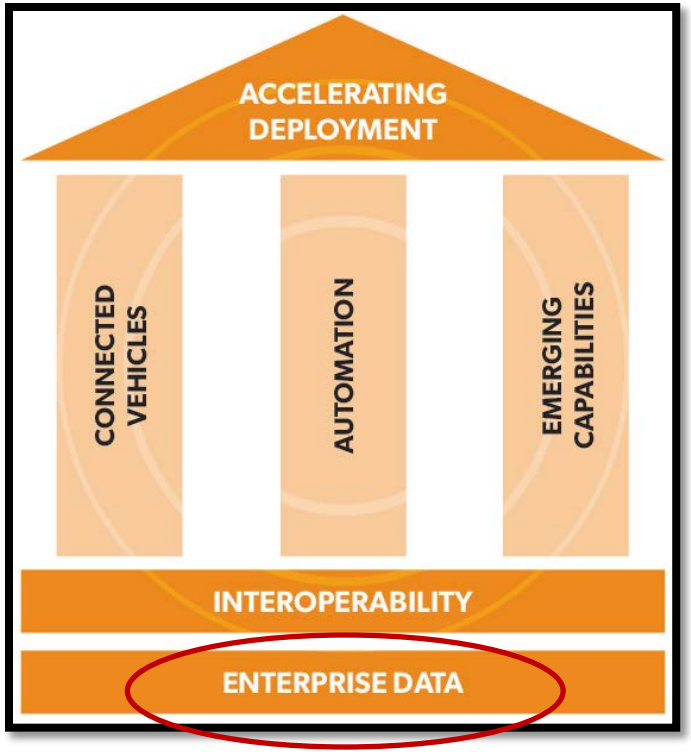
Enterprise Data



Program Categories



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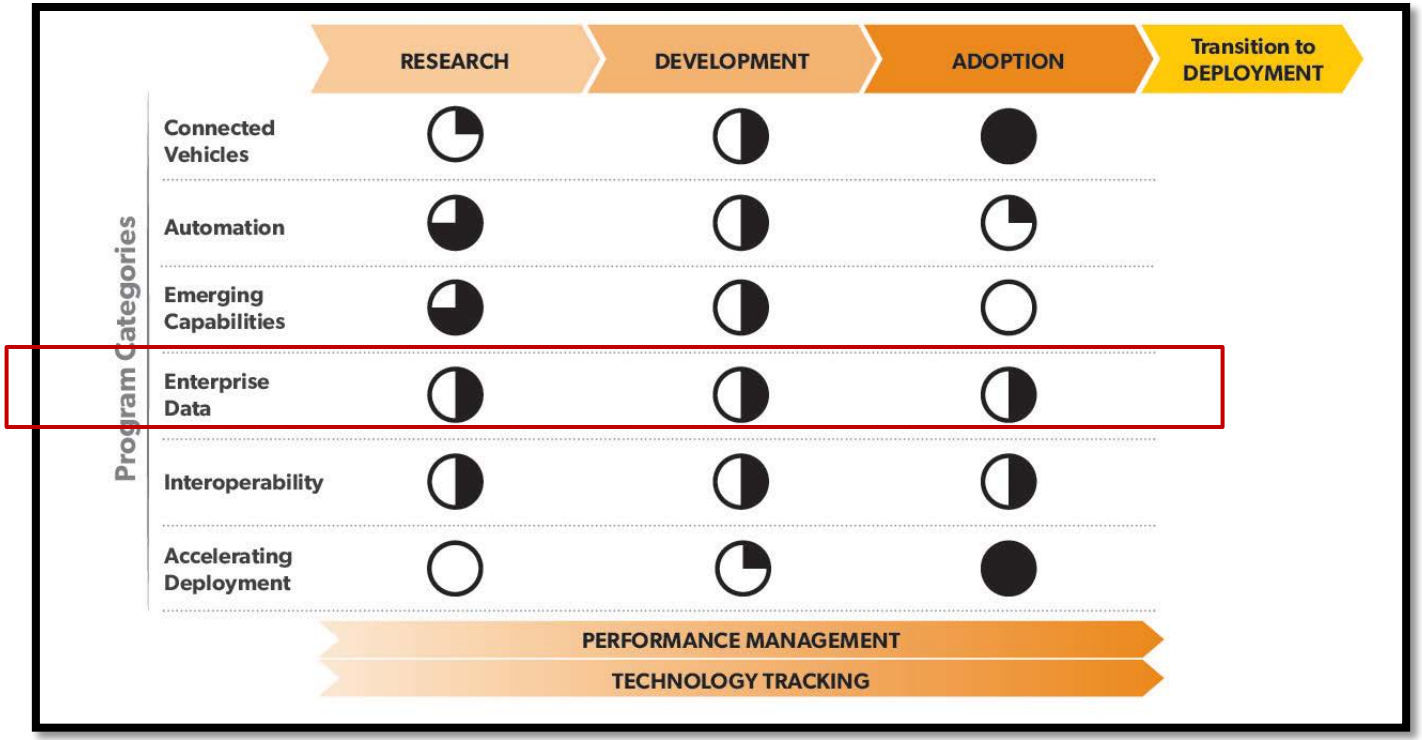
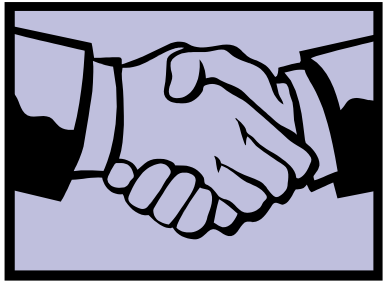


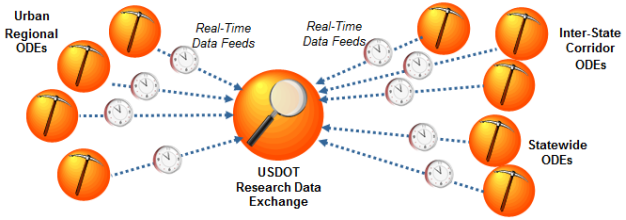
CDS Builds on Data Capture & Management Program

Research Data Exchange

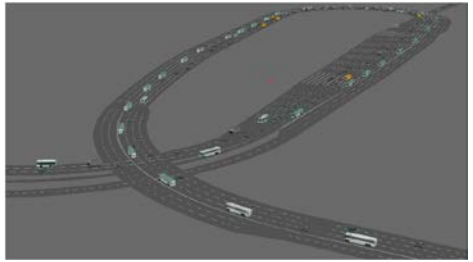
Big Data Analytics Study



U.S. / Europe / Japan Probe Message Coordination



Prototype Operational Data Environment



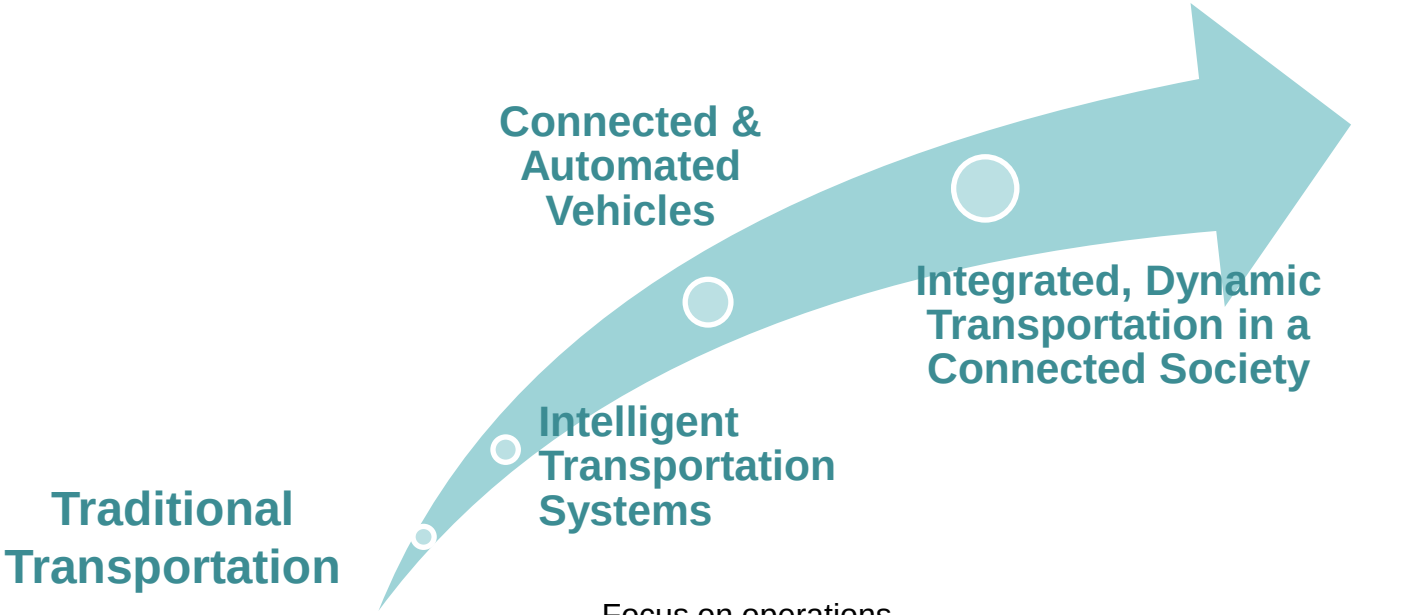
Basic Safety Message Emulator

CDS Responds to DCM Stakeholder Feedback

- **Contending with massive data volume**
  - "Serious questions remain about whether the infrastructure necessary to support…(Connected Vehicle) data transfer will exist to handle the amount of data generated by connected vehicles."*
- **Agency capability to utilize big data**
  - "There is a huge need for increased technical competency in the public sector."
  - "The DCM program should focus future research in a way that catalyzes private sector development of tools and techniques for…analyzing, and distributing data."
  - "…the DCM team may want to incorporate crowd-sourced or social networking data…Using social media data could add significant value to the data currently collected."

* All quotes are from the draft summary of the March 27, 2014 DCM Program Workshop

CDS Aligns with Evolution of Transportation



Low ——— Focus on operations
Volume & diversity of data
Diversity of operational objectives
Coordination among modes, jurisdictions and sectors
Speed and complexity of decision-making
Private sector provision of mobility services ———→ High

Proposed Vision for Connected Data Systems

Operationalize scalable data management and delivery methods exploiting the potential of high-volume multi-source data to enhance current operational practices and transform future surface transportation systems management.

CDS Contributes Toward a Connected Society

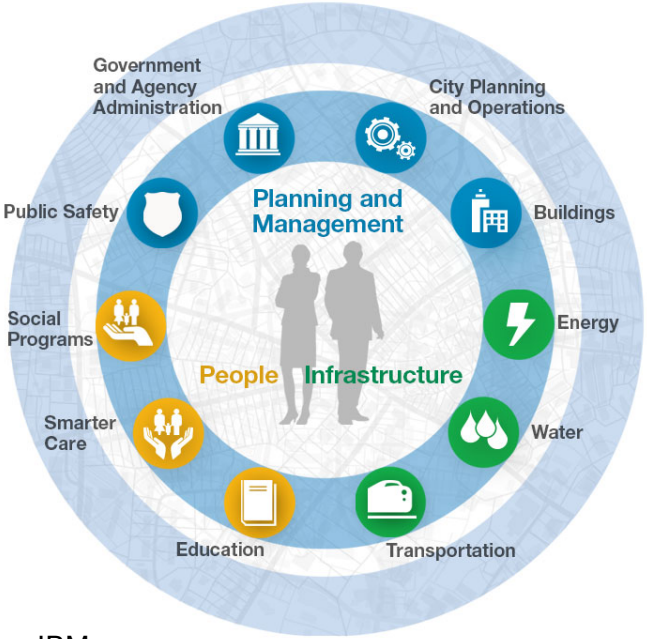


Image: IBM

- **Connected City** = a system of interconnected systems that communicate with and leverage each other to provide synergistic benefits.
  - Use collective **"intelligent infrastructure"** to sense what's around them and/or their own status to provide rich situational awareness
  - Utilize **new analytical processes**
  - Engage the connected citizen, allowing and encouraging **fully informed personal mobility** and other choices
  - Utilize solutions across **all transportation modes**, including transit, bicycle, electric vehicles and shared mobility services.

How Connected Cities Differ from Traditional Cities

Characteristics of Connected Cities	Enabled Capabilities
Use collective “intelligent infrastructure” to sense what’s around them and/or their own status	Provides operators rich situational awareness and basis for making more timely, effective and coordinated tactical and strategic decisions
Utilize new analytical processes	Engage the connected citizen, allowing and encouraging fully informed personal mobility and other choices
Connected vehicles and connected travelers send and receive information	Cities have far greater opportunities for responsive and efficient mobility solutions
Utilize solutions across all transportation modes, including transit, bicycle, electric vehicles and shared mobility services.	Provide for sustainable mobility

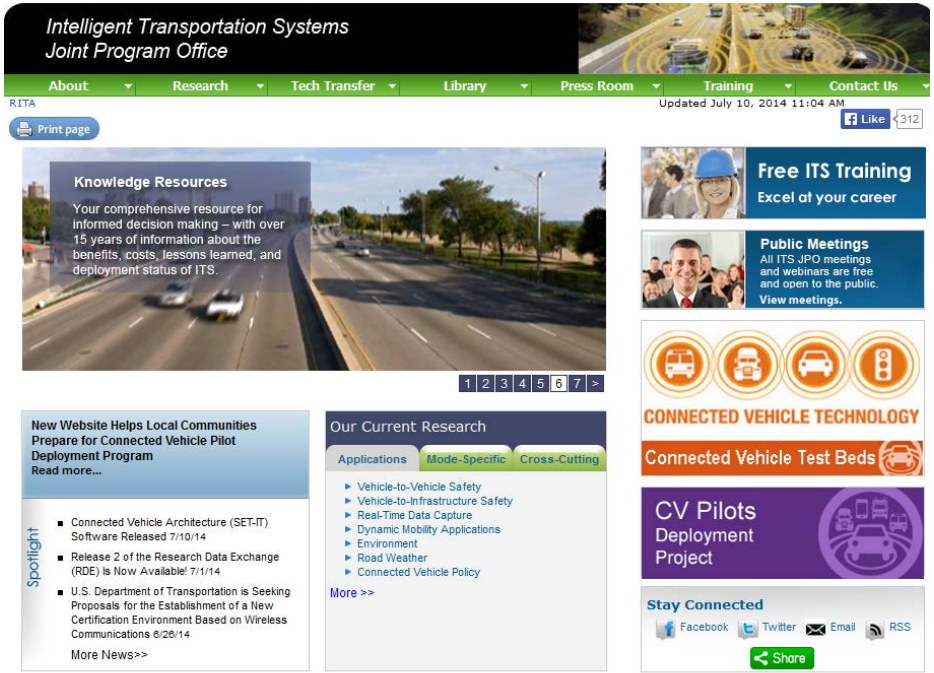
Example Research Questions

- How can ***big data tools and techniques*** be applied within real-world transportation system management strategies such as Integrated Corridor Management (ICM) and Active Transportation and Demand Management (ATDM)?
- How can data from travelers and citizens and other ***new sources*** be integrated to provide valuable data and information for transportation operations?
- How can the ***volume of data*** from connected vehicles and travelers be made manageable without sacrificing value?

Proposed Data CDS Program Research Tracks

1. **Develop/Foster Big Data Analytics and Visualization Methods**
   - Data discovery, data integration, data exploitation
2. **New Data Sources and Partnerships Field Test(s)**
   - Crowdsourced data from travelers and data for and from emerging mobility service providers/partners
3. **Conduct a Dynamic Interrogative Data Capture (DIDC) Field Test**
   - Dynamic optimization of how much data to keep and transmit
4. **Develop and Deploy a Connected Data Operational System (CDOS)**
   - Data collector / integrator / distributor to pave the way for deployment

For More Information



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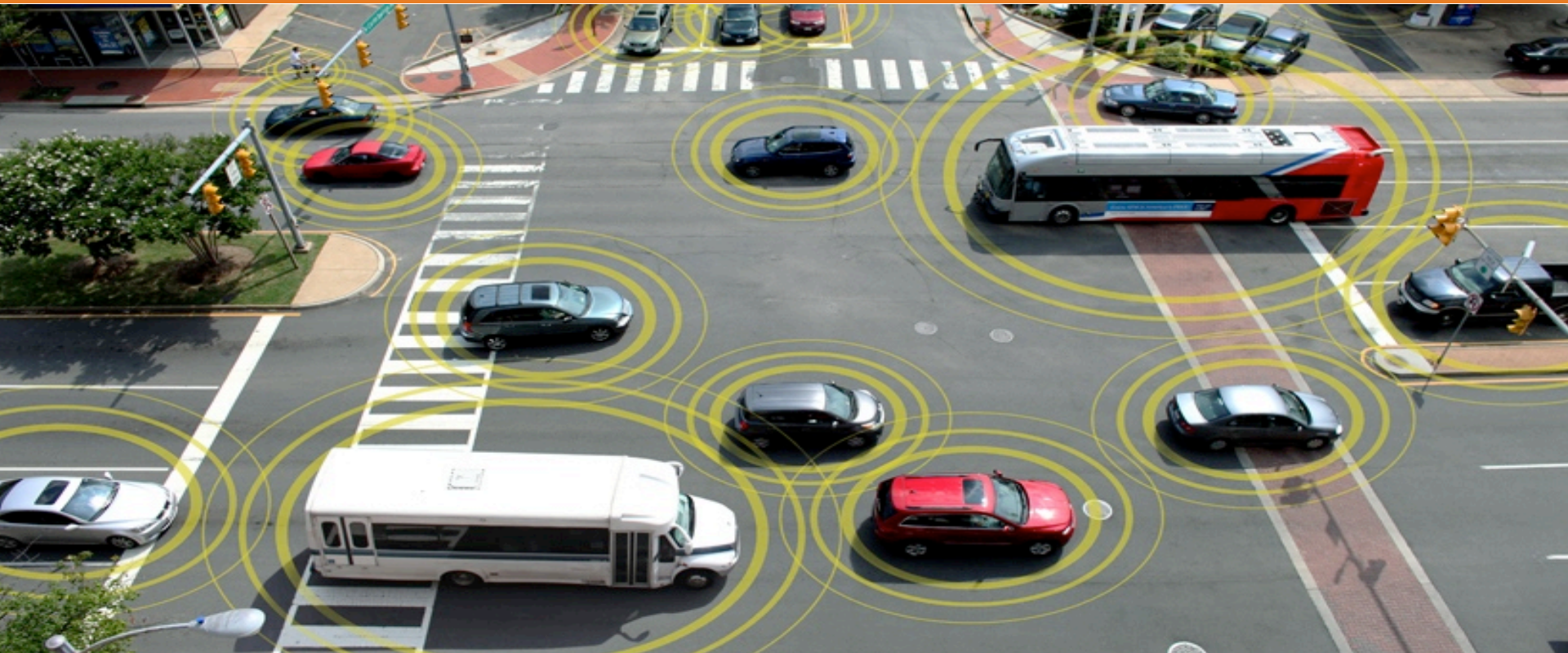
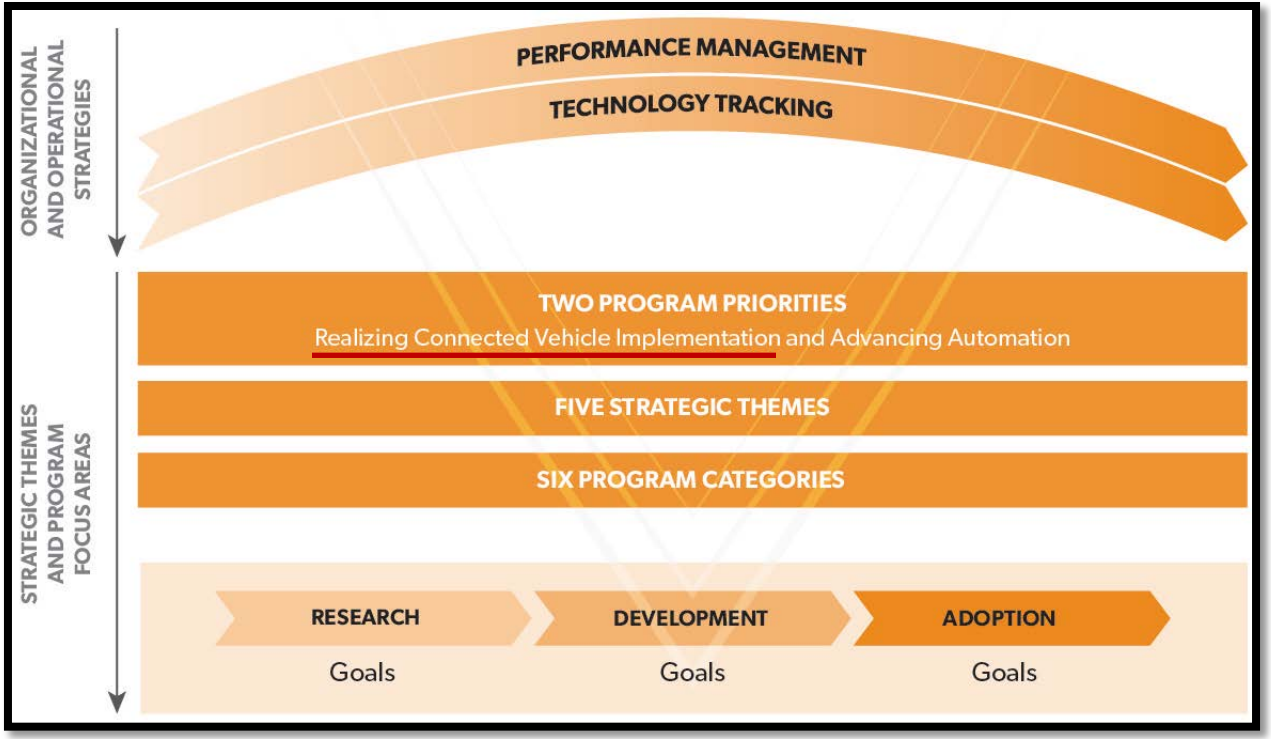
Emerging Capabilities



ITS Strategic Plan's Framework

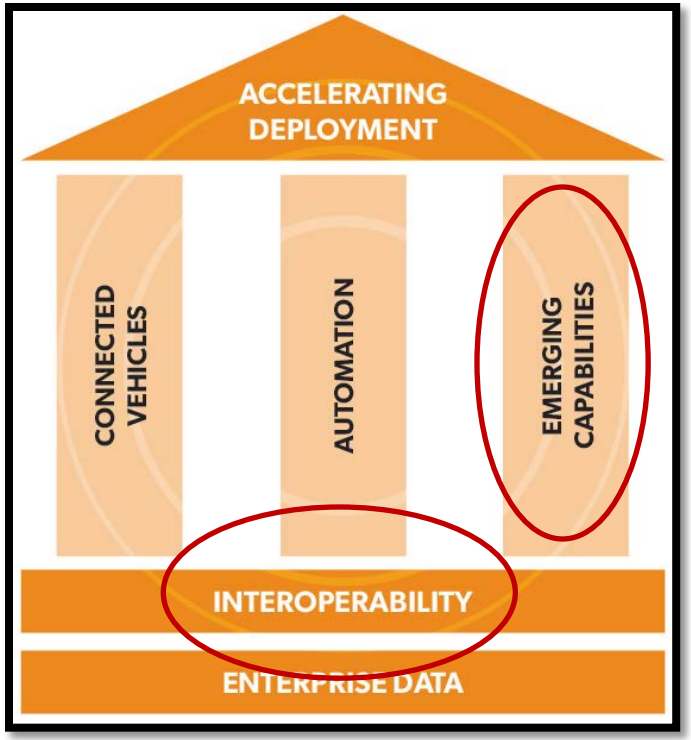


Strategic Priorities

- Two Strategic Priorities reflect a sense of where the bulk of transportation research and innovation is heading. These priorities are not exclusive of other technologies or research areas.

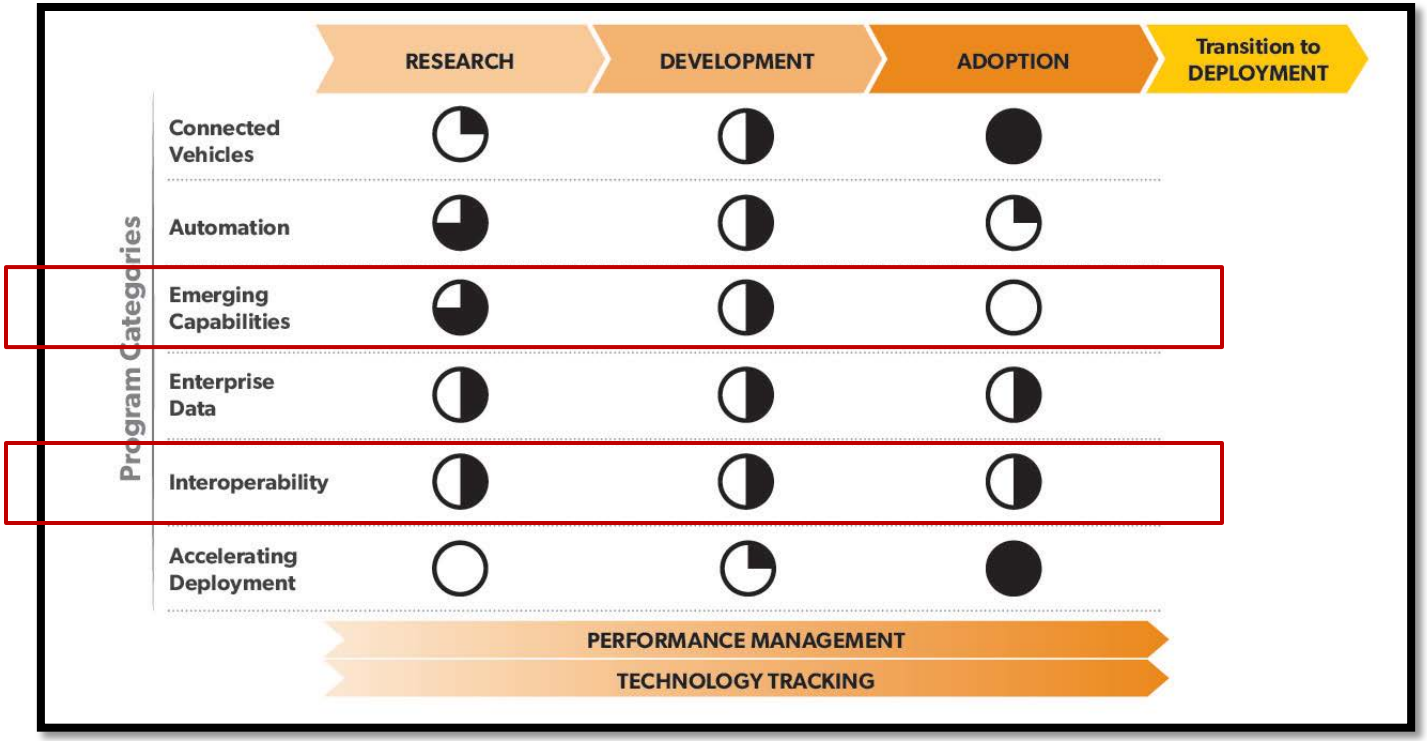
- ***Realizing Connected Vehicle Implementation***
  - builds on the substantial progress made in recent years around design, testing, and planning for connected vehicles to be deployed across the nation.
- ***Advancing Automation***
  - shapes the ITS Program around research, development, and adoption of automation related technologies as they emerge.

Program Categories



- **Connected Vehicles** program category will be primarily focused on adoption and eventual deployment of the system.
- **Interoperability research** will focus on topics related to establishing common ways of documenting implementations and common ways of approaching implementations.
- **Emerging Technologies** will focus on identifying existing technologies in other industry areas that might be brought into the Connected Vehicle program to speed adoption.

Program Categories and Technology Lifecycle



Interoperability – U.S. DOT Role

- Facilitate development and deployment of an architecture for connected vehicle systems as part of the Internet of Things
- Develop a common graphical language for documenting connected intelligent transportation systems
- Create common data exchange processes and tools to implement them to assist practitioners
- Provide tools, training, and resources to promote system understanding and assist common, interoperable deployments

Proposed Vision for Interoperability

Graphical Language

⇩

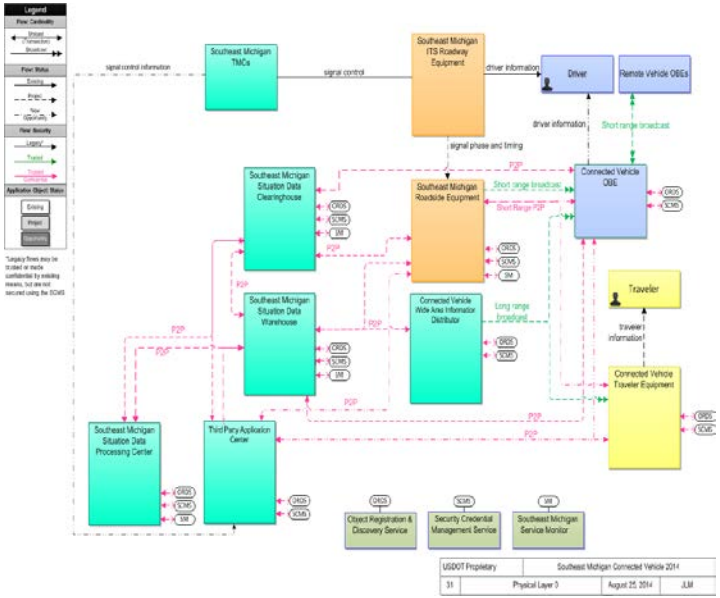
Designs and Tools

⇩

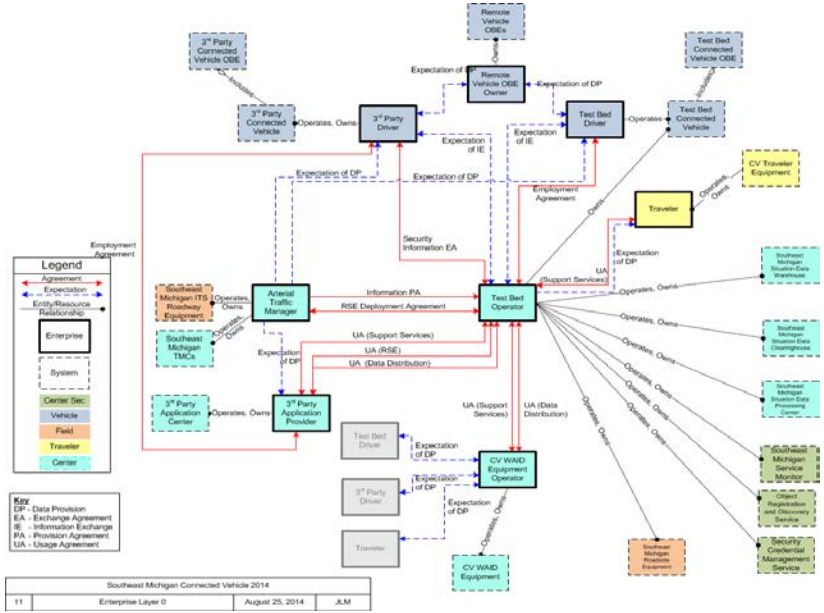
Training, Resources

Common Architecture, Graphical Language

Things

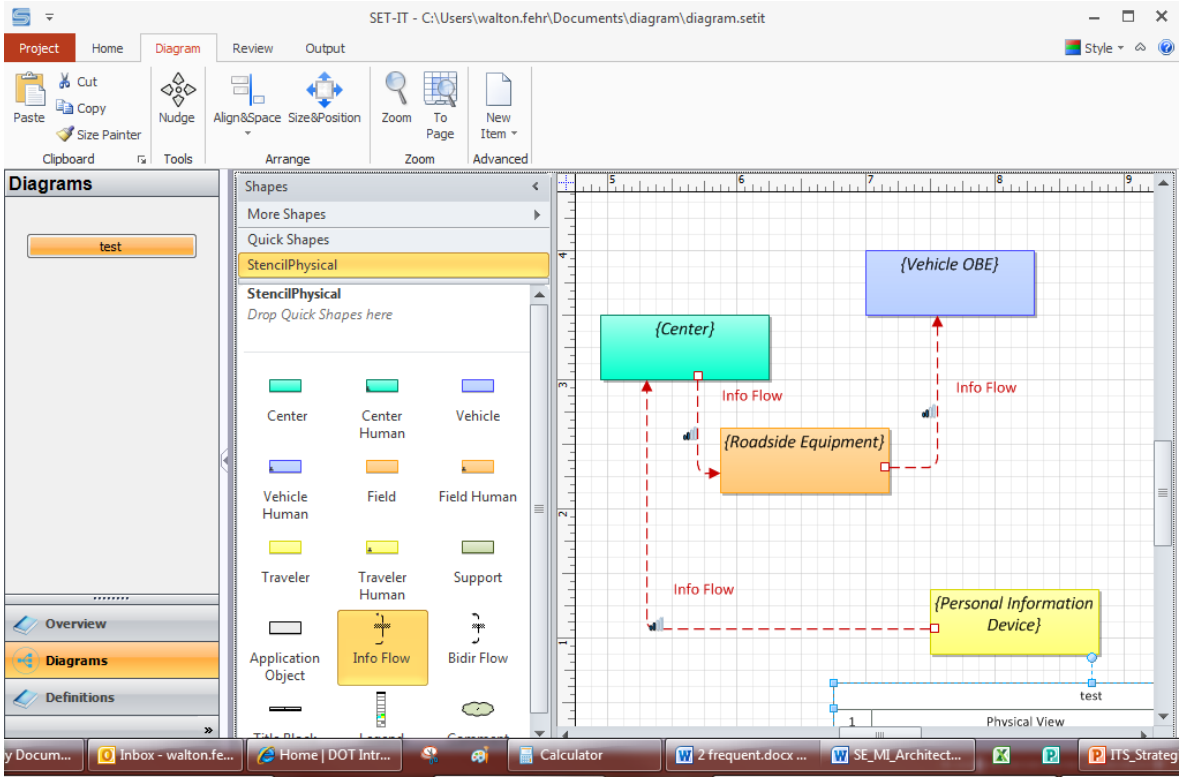


People



Design, Tools

- Architecture
- Concept of Operation
- Design Elements
  - Objects
  - Information Flows



ITS Professional Capacity Building Program Resources

- Online learning:
  - ITS Standards – 36 modules
  - ITS Transit Standards – coming soon
  - New eLearning Courses from Consortium for ITS Education (CITE):
    - Telecommunications and Networking Fundamentals
    - Network Design and Deployment Considerations for ITS Managers
  - Professional Certificate programs:
    - ITS Project Management
    - Traffic Engineering and Operations
    - ITS Systems
    - Road Weather Management

- Problem-based learning:
  - ePrimer
  - ITS Case Studies
    - Adaptive Signal Control
    - National Architecture
- Talking Transportation Technology Webinar program, with searchable T3 archive
- In-person workshops at ITS America state chapter meetings
  - Connected Vehicle 101
  - ICM, Procurement, Improving Safety

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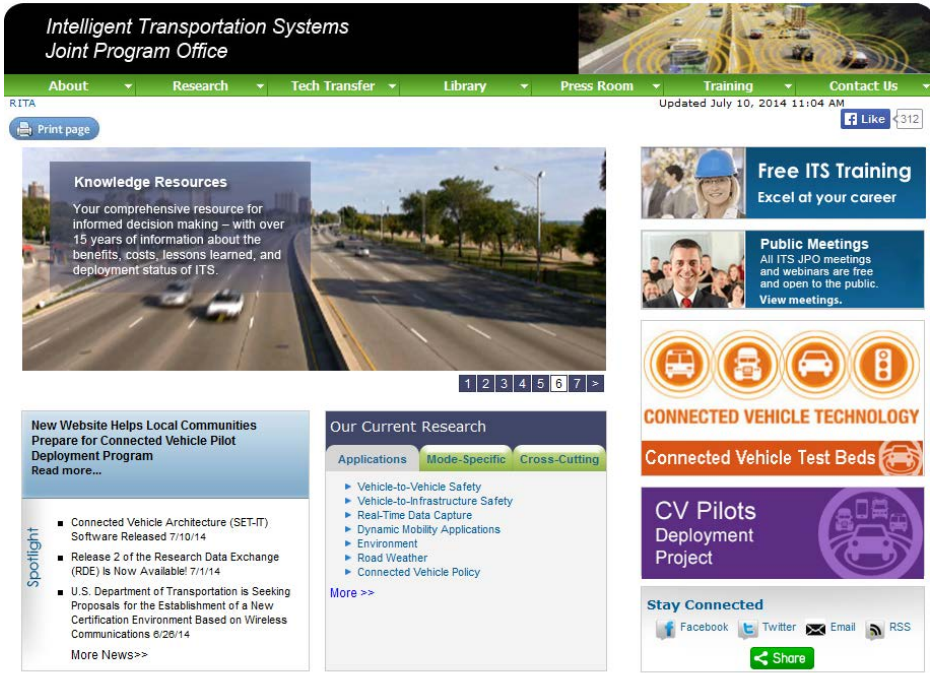
For More Information



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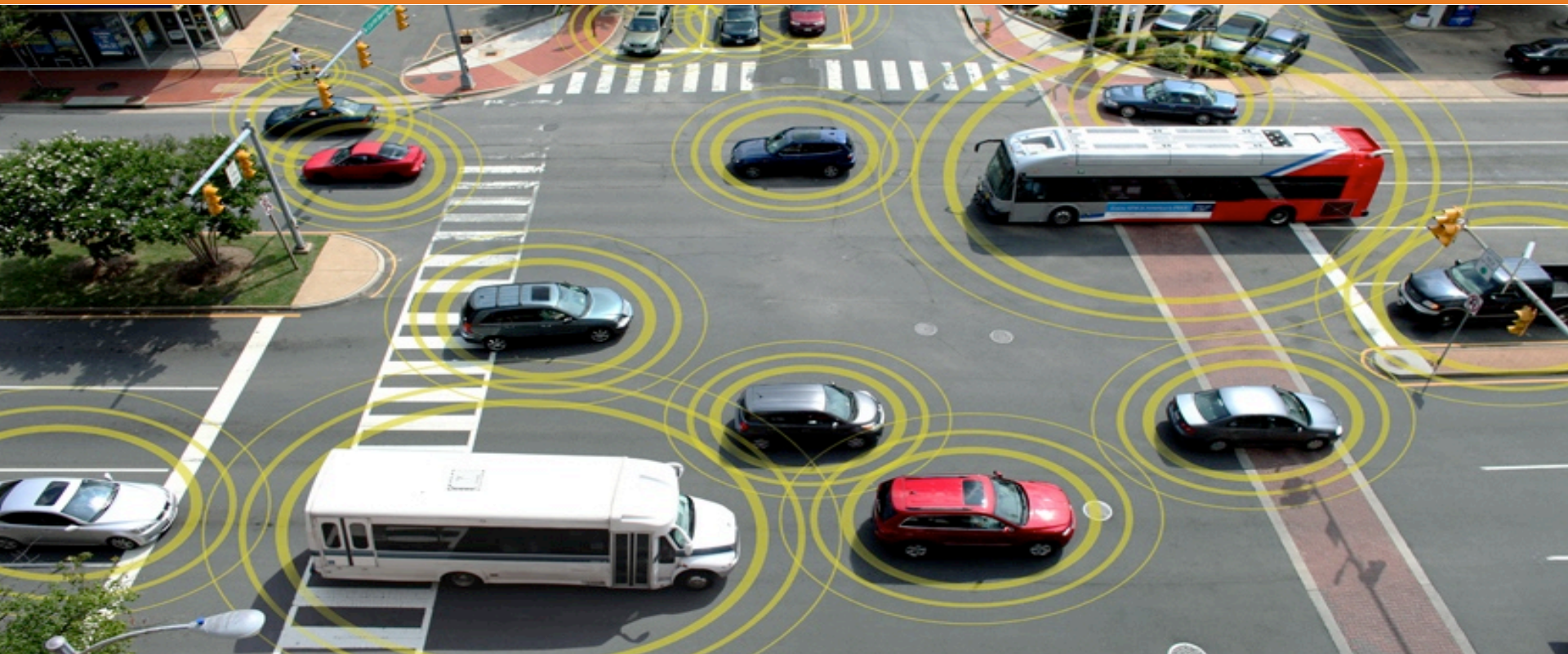
Connected Vehicles | Enterprise Data | Emerging Capabilities | Automation Research