



**FLORIDA DEPARTMENT OF TRANSPORTATION**

# **RESEARCH PEER EXCHANGE 2017**

**FINAL REPORT**

[Prepared and submitted in accordance  
with 23 CFR 420.207(6)(b)]

FDOT Research Center  
605 Suwannee Street, MS 30  
Tallahassee, Florida 32399  
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## Acknowledgments

The Florida Department of Transportation Research Center wishes to express its great appreciation to those who joined us for our 2017 Research Peer Exchange. The three days of presentations, interactions, and brainstorming provided valuable insight into state DOT research roadmaps in the contexts of national agenda/activity and emerging technologies – how a program can work to be aware, agile, and relevant in this environment. The following report records the many ideas that came out of the peer exchange, which will provide a solid basis for a plan of action. Names and contact information for the principal discussants is provided in Chapter VII of the report.



Pictured above:

- |             |                  |                      |                  |                        |                       |
|-------------|------------------|----------------------|------------------|------------------------|-----------------------|
| Ray<br>Derr | David<br>Kuehn   | Joe<br>Horton        | David<br>Sherman | Steve<br>Andrie        | David<br>Jared        |
|             |                  |                      | Mark<br>Norman   | Catherine<br>T. Lawson | Christopher<br>Poe    |
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## List of Acronyms

AASHTO	American Association of State Highway Transportation Officials
AV	Automated vehicle
AVAIL	Albany Visualization and Informatics Lab, an initiative in the Lewis Mumford Center at the University at Albany, State University of New York
Caltrans	California Department of Transportation
CV	Connected vehicle
DOT	Department of Transportation
DRISI	Division of Research, Innovation, and System Information, a division of Caltrans
EAR	Exploratory Advanced Research, an FHWA program
FDOT	Florida Department of Transportation
FHWA	Federal Highway Administration
GDOT	Georgia Department of Transportation
NCHRP	National Cooperative Highway Research Program
NDS	Naturalistic Driving Survey, a project of SHRP 2
RAC	Research Advisory Committee, an AASHTO committee
RFP	Request for Proposal
ROADS	Reliable Open Accurate Data Sharing, an FDOT project
SCOR	Standing Committee on Research, an AASHTO committee
SHRP 2	Second Strategic Research Highway Program, authorized in 2009
TPF	Transportation Pooled Funds, an FHWA mechanism for funding multistate research
TRB	Transportation Research Board
TSM&O	Transportation Systems Management & Operations
UAS	Unmanned aerial systems
UF	University of Florida
UFTI	University of Florida Transportation Institute

## I. Introduction – Welcome, Overview, and Objectives

The FDOT Research Program receives approximately \$14 million a year to support its annual research program, which includes pooled fund and cooperative research. Most research is performed by state universities. The Research Center’s website, <http://www.fdot.gov/research/>, includes final reports, summaries of final reports, *Research Showcase* magazine, and other information. The Technology Transfer (T2) program for the state is administered by the University of Florida.

23 CFR Part 420, Subpart B, contains four provisions that each state must meet to be eligible for Federal Highway Administration (FHWA) planning and research funds for its research, development, and technology transfer (RD&T) activities. One requirement is to conduct peer exchanges that consider for improvement the state’s RD&T management process or some aspect of the research program and to be willing to participate in peer exchanges held by other states’ programs. This report documents the Florida Department of Transportation’s peer exchange held on April 25–27, 2017, in partial fulfillment of these requirements.

Members of this Peer Exchange team included

- Steve Andrie – Transportation Research Board (TRB)
- Ray Derr – National Cooperative Highway Research Program (NCHRP)
- Darryll Dockstader – FDOT Research Center
- Dr. Lily Elefteriadou – University of Florida
- King Gee – American Association of State Highway Transportation Officials (AASHTO)
- Joe Horton – Caltrans
- David Jared – Georgia DOT
- David Kuehn – FHWA Exploratory Advanced Research (EAR) Program
- Dr. Catherine T. Lawson – University of Albany
- James Lou – IBM
- Mark Norman – TRB
- Dr. Christopher Poe – Texas A&M Transportation Institute
- David Sherman – FDOT Research Center
- Sue Sillick – Montana DOT



Other participants observing the exchange included

- April Blackburn – FDOT
- Tom Byron – FDOT
- Ed Hutchinson – FDOT
- John Krause – FDOT
- Aschkan Omidvar – University of Florida
- Teresa Parker – FHWA
- Raj V. Ponnaluri – FDOT
- Jeri Shell – University of Florida
- Brent Shore – FDOT
- Jessica VanDenBogaert – FDOT

Each of FDOT's peer exchanges has been substantially different in composition and theme. The first (1997) focused on overall research program management; the second (2002) on opportunities for enhancing the Research Center's relationships with FDOT project managers and universities; the third (2007) on strategic project visioning; and the fourth (2013) on implementation and performance measurement.

State DOT research programs are applied research programs, historically focused on materials and structures. In the last several years, the pace and nature of FDOT's research program have evolved. Increased emphasis on implementation and performance, along with accelerating technology cycles, have placed greater demands on the program to innovate, partner, monitor sometimes hard-to-find or mountainous amounts of relevant activity, and implement and measure outcomes. The theme of this fifth peer exchange was to discuss state DOT research roadmaps in the contexts of national agenda/activity and emerging technologies—to explore how a program can work to be aware, agile, and relevant in this environment.

The report follows the format of the panel and working sessions for the first two days of the exchange (the agenda is presented in appendix A). Three panel sessions were held on day one, focusing on national activity, university and industry activity, and state DOT activity, respectively. The afternoon working session focused on the concept of a transportation research roadmap. The goal of the first half of day two was to workshop and synthesize the ideas generated from a presentation on the FDOT ROADS (Reliable Open Accurate Data Sharing) initiative and its implications for research data needs and data creation. The afternoon of day two was devoted to emerging technologies, typified by, but not limited to, automated and connected vehicle issues, and, in the context of the previous sessions, with the goal of developing recommendations for program improvement. Exchange presentations may be found in appendices B and C.

## II. National, Industry and University, and State DOT Convergence

### 1. Participant Presentations on Respective Discourse Concerning Emerging Technologies

Participants delivered presentations discussing research roadmaps, strategic process, emerging technologies, and data. The presentations were delivered across three panel sessions moderated by Steve Andrie and Darryll Dockstader. The following is a list of presentation titles and descriptions in order of delivery. PowerPoint slides for each presentation appear in appendix C.

#### Panel 1 – The National Picture

Moderator – Steve Andrie

##### King Gee – AASHTO

###### ***Presentation title: “Strategic Research in Context”***

Although transportation infrastructure is often considered slow changing, the reality is that there are forces within the transportation sector, outside the transportation sector, within a state, and nationwide that are poised to transform traditional paradigms. Strategic research must anticipate and support an agency’s ability to manage and address those changes. The presentation briefly examined these forces and noted some success factors.

##### Ray Derr – NCHRP

###### ***Presentation title: “NCHRP’s Research Roadmap Experiences”***

Derr discussed NCHRP’s experience with roadmapping for their research efforts, including SHRP2, Connected Vehicles/Automated Vehicles, and Transformational Technologies.

##### David Kuehn – FHWA EAR

###### ***Presentation title: “A Map is to Research as Directions are to...”***

Kuehn discussed purposes, approaches, and uses of research roadmaps.



**Mark Norman – TRB*****Presentation title: “Transformational Technologies – Transforming Research”***

Norman discussed potential impacts of transformational technologies on our transportation goals, the range of prospective positive and negative outcomes, the role of research in leading us to positive outcomes, and how our approaches to research itself may have to change in an era of transformational technologies.

**Panel 2 – Universities and Industry**

Moderator – Steve Andrie

**Dr. Christopher Poe – Texas A&M Transportation Institute*****Presentation title: “Bridging the Gap to Deployment”***

Poe discussed the needs of, and approaches to, research and testing of automated and connected vehicle technologies. He highlighted work from both Texas and Florida on automated vehicle proving grounds and the importance of partnerships for pilots and early deployments.

**Dr. Catherine T. Lawson – University of Albany*****Presentation title: “The Road to the Future is Paved with Data”***

While transportation professionals have a long history of using data, new techniques and data sources are creating amazing opportunities and daunting challenges. New York State DOT has taken on the challenge by utilizing data science approaches to meet their data needs (e.g., use of NPMRDS to develop route-level tool suites). Universities have a key role in assisting transportation agencies in advancing their understanding of how best to navigate into the future.

**Dr. Lily Elefteriadou – University of Florida*****Presentation title: “Developing a Transportation Testbed in Gainesville, Florida: From Concept to Implementation”***

Elefteriadou provided background and motivation for the development of this testbed, along with the overall concept and plans for implementation. She also discussed ongoing research at UF on autonomous/connected vehicles. The presentation closed with thoughts on the essential elements for successful implementation.

**James Lou – IBM*****Presentation title: “Transforming Transportation Management with Cognitive ITS Infrastructure”***

### **Panel 3 – State DOTs**

Moderator – Darryll Dockstader

#### **David Jared – Georgia DOT**

***Presentation title: “Strategic Research at Georgia DOT”***

Jared provided an overview of GDOT’s entire research program, emphasizing development of research aligned with GDOT strategic goals and the structure supporting such development. Some limited discussion of research roadmaps was included.

#### **Joe Horton – Caltrans**

***Presentation title: “The Caltrans Research Process”***

The presentation discussed the research operations of the Caltrans Division of Research, Innovation, and System Information (DRISI). The presentation covered the mission of DRISI, its research services, governance, and research development. Special attention was given to the areas of research roadmaps, research prioritization, and the handling of emerging technologies.

#### **Sue Sillick – Montana DOT**

***Presentation title: “Research Roadmaps: Communication, Coordination, and Collaboration”***

The presentation focused on the MDT (Montana Department of Transportation) solicitation, prioritization and selection process as well as the coordination and collaboration needed to overcome barriers, making sure the right “players” are involved both nationally and at the state level. Additionally, tools and mechanisms were discussed.



### III. Concept of Transportation Research Roadmaps

Darryll Dockstader led an in-depth discussion on the concept of a transportation research roadmap, during which participants discussed opportunities and desired outcomes. Key points of this discussion included:

- Distinguishing between categories (below), which are thematic, and goals, which have direction and measurable purpose
  - Safety
  - Mobility
  - Tech transfer
  - Information
  - Equity
  - Sustainability
  - Economic development
- Determining the goals FDOT will pursue
- Ideas on collaboration including semiannual meetings to revisit transformational technologies issues
  - Meetings to consist of a group of 20-30
- Standing groups could be a challenge since it doesn't fit traditional models of procurement.
- Discussion on how big data is a complementing, vital component

## IV. Data and Research

April Blackburn, Chief of Transportation Technology at FDOT, delivered a presentation on the FDOT ROADS initiative which was developed to improve data reliability and simplify data sharing across FDOT, which is vital to decision-making.

The participants actively discussed issues raised within and by this presentation, including the following:

- Communicating throughout the data-gathering process is key to ensure consistent submission of data to allow FDOT to set up mechanisms to best share data among various users.
- Leveraging of expertise to reduce duplication and increase accuracy of data being collected
- Collaborating across multiple disciplines in an effort to understand data needs and develop software
- Exploring the initiative's three vital components:
  - Leveraging available research
  - Requesting additional research
  - Collaborating
- Engaging with industry

## **V. Emerging Technologies**

David Sherman, Research Performance Coordinator for the FDOT Research Center, delivered a presentation highlighting various test beds and initiatives ongoing in Florida.

Following this presentation, Dr. Raj Ponnaluri, State Arterial Management Systems Engineer with FDOT, led a discussion on Transportation Systems Management & Operations (TSM&O) emerging technologies within the Traffic Engineering & Operations Office.

These presentations stimulated a discussion among attendees demonstrating a consensus on the importance of having strong partnerships, including engagement with industry, university, and DOT teams. Collaboration is vital to gain objectivity as well as validation and replication.

## VI. Conclusions

This peer exchange benefited from a vibrant team that generated a great deal of mature consideration of the issues. The various perspectives of the state agency, federal, academic, and industry participants made for valuable discussion.

### 1. Participant Takeaways

#### Steve Andrie – TRB

##### No Brainers

1. Align research and field test program with Florida DOT goals and objectives.
2. Continue developing the ROADS data management program.

##### Ideas

3. Conduct research on “cognitive architecture” and data platforms as recommended by James Lou (IBM) and Catherine T. Lawson (University at Albany).
4. Hire or gain the capability of a data scientist to help structure DOT data.
5. Spend some time and money planning for ingesting and using data from research and field tests. This is a subset of number 4. Look at APIs, open source programming, and other new ways to connect data and users. The data platforms or at least a data framework for research needs to be established.
6. Explore the Capability Maturity Model for planning progress. See SHRP 2 R06 report. Andrie will supply a copy, and it is also available on the TRB website under data and resources (see below).
7. Develop a partnership strategy to capitalize on the test beds and proving grounds in Florida. Take advantage of Florida’s favorable laws on operating automated vehicles. Communicate this capability.
8. Set aside funding for selective implementation of research results. This may mean taking a project from the field test stage to demonstration.
9. Investigate “automated reporting” of results from Florida’s nine research universities, four test beds, and private AV deployment sites (e.g., Babcock Ranch). This can start with simple progress reports and move toward sharing data. Link to others who are (or should be) reporting on the

ten national proving grounds, Smart Cities winner and applicants, the National Connected Vehicle Test Bed, and TRB's forum on Preparing for Automated Vehicles.

**Capability Maturity Model** – This stepwise model can be combined with steps that need to be taken to achieve each level to form a matrix for future actions.

### **Levels of Maturity**

1. Initial – Disorganized; Work characterized by individual effort needs champions to progress.
2. Repeatable – Processes are documented and repeatable.
3. Defined – Organization has adopted the process and developed standards.
4. Managed – The organization monitors and controls.
5. Optimized – Constant improvement and feedback.

## **Ray Derr – NCHRP**

### **Takeaways for my work**

1. The system for ranking NCHRP problem statements has been embellished over the years but remains basically the same. Elements of the California Research Prioritization Methodology might be useful in reshaping it, particularly in better aligning the program with AASHTO's Strategic Plan.
2. The AASHTO Standing Committee on Research has asked AASHTO committees to develop research roadmaps. The examples provided during the peer exchange could be useful models.
3. Some of Derr's new projects touch upon the data science issues discussed, and he will be better equipped to incorporate them into the panel and scope of work. Derr thinks the Automated Traffic Signal Performance Measures website hosted by the Utah DOT (<http://udottraffic.utah.gov/atspm>) represents a good model for getting started on open data platforms that facilitate data analytics.

Florida DOT is interested in a broad range of emerging topics, from automated vehicles to bridge sensor systems. A critical need for any of these topics is to obtain a good understanding of what has been learned, either from other research efforts (public sector and private sector) and other deployment efforts. For some problems or issues identified by FDOT staff, a quick literature review would suffice, particularly if it identifies a viable solution. For others, identifying experts from other states and bringing them in for a workshop could be effective. FDOT may decide that some issues warrant a sustained research effort that would benefit from developing a research roadmap, and several examples were presented. For emerging technologies, the rapidly changing environment reduces the viability of a long term plan, and the DOT may be best served by shorter-term, more



agile approach. These efforts would benefit from input from a wide range of stakeholders beyond FDOT, including the private sector, academia, and local agencies.

For the testbed being developed through the University of Florida, a diverse oversight group would be useful in setting priorities for activities to be undertaken. Some of these should aim to replicate or validate similar efforts conducted at other facilities in the United States and internationally. Establishing ongoing communications channels with the other testbeds would be valuable in coordinating research efforts and disseminating information and results. The NCHRP has some projects getting underway that could help with these coordination efforts.

### **Dr. Lily Elefteriadou, University of Florida**

1. For the testbed it is important to schedule 6-month reviews with stakeholders (a “Transportation Innovation Forum”?). One of those could be scheduled in conjunction with the annual FAV conference. This review should discuss success stories/performance measurement, other developments around the country and internationally, tech transfer opportunities, decisions on new research, and industry partnerships.
2. The testbed plan should consider both a bottom down and a top up approach. It should consider the overall goals of FDOT (for example, Safety, Mobility, Information/Decision making, Sustainability (including maintenance needs), Equity, Tech transfer, Economic development), and also the availability of new technology and opportunities that can be pursued provided they meet one of the main goals.
3. Projects can be categorized into “families” and frequent meetings should be scheduled with the researchers and stakeholders of each such family to ensure coordination.
4. We should explore collaboration opportunities with the TTI testbed. One item discussed was specifically related to developing a joint RFI for industry.
5. Learned a lot about data analytics and visualization, and we are planning a workshop in early fall, to bring in researchers and practitioners that work in these areas to discuss different approaches and implementations for consideration in our data analytics work for the testbed.

### **King Gee – AASHTO**

#### **Key Ideas/“Take-Aways”**

- A “Strategic Road Map” seems a bit contradictory in that being strategic necessarily means one may not want the level of detail in it that a “route map” has to have to guide the way.

- 
- “Strategic” implies “direction” – even though the destination may be unclear today, it is still essential to have a general sense of the way forward, which will be clearer as the journey progresses.
  - Strategic goals need to be “goals” and not general topic areas, e.g., “safety” is a subject area, and a safety goal might be “reduce traffic fatalities.”
  - When thinking strategically in the evolving transportation space, we need to think of it as a system (systems thinking) by seeing the infrastructure, the vehicle, and the driver/passenger as a whole. Previously, decisions in one area were “silo-ed,” not affecting the other two.
    - The innovations and innovative thinking of academia and industry need to be leveraged and unleashed from traditional limits.
    - This new perspective will be challenging and may require that research contract agreements include provisions to pivot as new information and advances come to light.
    - The new transportation space will bring new business models with old and new partners where FDOT needs to consider its negotiating position strengths to get the best terms for itself and the citizens of Florida.
  - A key strategic consideration for FDOT is where it wants to be in, say, 30 years, and what role(s) it wants to be positioned for within Florida and nationally.
    - The illustrations provided by FDOT’s Transportation Technology initiative and the TSM&O strategic plan are great examples of proactive strategic direction taken by FDOT supported by specific and concrete actions,
    - Research can help answer the “where” and “roles” for FDOT and provide options for actions to support its journey forward,
  - Regarding the emerging areas of CVs and AVs and the UF testbed, FDOT should set some general direction and eventually define some specific functions and desired research answers to be served by the testbed for Florida’s aspirations.
    - Given the emerging nature of this space, a tremendous service would be provided by initiating a forum for testbed managers from around the country to meet periodically:
      - To share trends and progress seen at their respective testbeds
      - To identify areas for collaboration and coordination
      - To articulate and reach consensus on gaps that need to be filled with research
      - To present a single point of contact for peer institutions from abroad.

- Ultimately, a key premise should be that emerging technology and potentially transformative technology should be positioned to serve transportation goals and not merely be advanced because they are new and “shiny.”
  - Unintended consequences may occur, and research should identify the breadth of unintended consequences that may be unwanted and should note early signs of such consequences emerging so that policy steps may be taken to mitigate negative impacts.

## **Joe Horton – Caltrans**

### **Caltrans FL Peer Exchange Take-Aways**

1. Caltrans wants to improve the implementation and communication of research. The FDOT Research Coordinator position is an intriguing idea that we may incorporate into our business practices.
2. FHWA gave a presentation on research roadmaps that will help Caltrans refine our processes. Differentiating between a landscape roadmap that helps you decide where to go versus a route-style research roadmap that lays out the process to get to the results.
3. Learning about the FL testbeds was helpful. It provides opportunities to collaborate on CV/AV research.
4. Caltrans is interested in the FDOT IT Strategic Management Plan. We would like to learn from their experience and successes.
5. Learning about the changes to the AASHTO restructuring process was useful. We did not realize that the restructuring of RAC and SCOR will lead to a CEO-led Research and Innovation committee. This will change the current AASHTO RAC process. The various state DOTs need to comment on the reorganization so that the activities and research in the national arena continue to progress.
6. DOTs need to work more closely with industry on CV/AV issues. The IBM assertion that "cognitive" technology will be a key technology that will bring information together to the driver is one take-away that DOTs may find useful for industry.
7. Montana DOT developed a crosswalk that ties the old AASHTO structure to the new AASHTO structure, along with the assorted TRB committees. Caltrans is currently adjusting who will attend AASHTO as the main representatives for Caltrans. The crosswalk will provide vital information to ensure Caltrans has the right people participating in the most important AASHTO committees.

**Observations**

1. The FDOT plan to develop a test bed through the AID process is a great decision. This will help ensure that FDOT is involved with the development of CV/AV solutions so that DOTs are ready for the large scale use of CV/AV. More states need to join in this effort.
2. I applaud the effort by FDOT to develop new tools to assist in the planning and development of needed research to support their efforts in dealing with transformational technologies, such as CV/AV.

**David Jared – Georgia DOT****Top Three Take-Homes**

1. Research roadmaps can be subdivided into “landscape” maps (where to go) and “route” maps (how to get there). (FHWA)
2. Roadmaps may be incorporated into the existing GDOT research initiation process. (Caltrans)
3. For research on transformational technologies, consider parallel tasking, scenario planning, and open calls for ideas. (TRB)

**Day 1 Take-Homes**

1. AASHTO
  - a. State DOTs are 52 “laboratories” but are shifting from data collection/provision to data purchasing.
  - b. Policy research quality is often subpar.
2. TRB
  - a. Roadmap considerations: awareness, agility, relevance
3. State University of New York (Albany)
  - a. Data should be viewed as an “agile” asset.
  - b. Concept of a “data scientist” should be explored to guide data asset management.
  - c. Web-based dashboards should be considered for data dissemination.
4. IBM
  - a. Data should be considered as a “natural resource” for the 21<sup>st</sup> century.
  - b. Utilize private research findings to extent possible: they can save time.
5. Caltrans
  - a. Research ideas come bottom-up; guidance top-down (confirms current GDOT model).
6. University of Florida
  - a. Factors to consider in roadmaps: safety, mobility, providing information, technology transfer, economic development, equity, sustainability.

**Day 2 Take-Homes**

1. Florida DOT
  - a. Data governance shouldn't be viewed as scary but as expeditious.
  - b. Good data inventory can prevent unnecessary data purchases.
  - c. Identify relationship between GDOT-IT and Office of Transportation Data (how could they implement data governance policy?).
2. TRB
  - a. Review national concrete research roadmap; adaptable to other pavement research?
  - b. Consider more performance-based research, focused on outcomes rather than processes.

**David Kuehn – FHWA EAR**

1. From King Gee: We are entering a unique time in highway transportation research with raised public awareness and interest created by advances in vehicle automation.
2. On Roadmaps
  - a. It can be difficult obtaining and maintaining situational awareness in rapidly advancing areas of research. Many organizations are conducting scans. There is limited sharing of the scanning within or across organizations, which can result in unnecessary duplication. [This could be a good topic of discussion for RAC TKN or PM&Q or for TRB Conduct of Research Committee.]
  - b. State DOT and NCHRP research mostly focuses on discrete projects, not programs. Projects often are bottom-up with limited strategic focus.
  - c. Transportation Pooled Fund studies can provide a management scheme for research on a topic beyond the fixed period of performance and work scope of a project.
  - d. Agencies are seeking methods to increase flexibility in research procurement in response to rapidly changing environments.
3. Communication of Roadmaps
  - a. Some roadmaps are prospective, and others retrospective (describe a bundle of projects that came from the ground up). Both can aid in communication.
  - b. Communication can aid with cross-cutting issues, e.g., research on when to grout tendons involves structures, materials, and construction areas.
4. Regarding research program management, Caltrans conducts initial stage investigations that often result in identifying solutions developed by others, saving the need for what could be unnecessary duplication of research.
5. Data can be valuable assets resulting from research.
  - a. Research programs may benefit by considering data value, lifecycle, and possible re-uses earlier.



- b. It can be difficult to transition data or software developed under research into program tools and data analytics. Coordination with Acquisition and IT are necessary.
6. There is a benefit to strengthening the link between research and policy. Research road maps may not encompass the use of results for policy development or policy change.
7. There is increasing interest in moving research to pilot deployments in the area of connected and automated vehicles.
  - a. These activities engage local agencies and universities. There are test bed coalitions in Florida and Texas.
  - b. There are questions on how and when to engage industry. [State DOTs perhaps need information about an equivalent to a Cooperative Research and Development Agreement, which federal laboratories use; more information is located at <https://www.fhwa.dot.gov/research/tfhrc/labs/collaboration.cfm#>.]

## **Dr. Catherine T. Lawson, University at Albany**

### **Vision**

- Research catchment – Consider the concept of a “research catchment” rather than using the term research roadmap or research route map. A research catchment would suggest research could be informed by like-kind research activities that validate and/or compliment research efforts. FDOT should consider capturing data production flows using Application Programming Interfaces (APIs) that could to be accessed using a web-based platform designed to ensure agile access and analytics on the fly.

### **Approach**

- Coordinate test-beds locally, nationally, and internationally to allow for confirmation/validation of test-bed outputs and approaches and rapid identification of next steps (review literature review to identify elements already tested or underway).
- Expand science behind scenario planning to reflect experimental design structure.
- Develop clear direction for dealing with industry partners to make sure DOT research is benefiting equally with private sector.

## James Lou, IBM

- Public and private sectors, including academia, should work together on using latest technologies such as IoT, Cloud, Cognitive AI, and Analytics, for ITS deployment. Regular exchange is necessary to synch up on progress.
- A procurement process different from civil infrastructure projects are necessary for ITS and technology projects. The new process will allow technologies to be adopted more rapidly and bring faster benefits (e.g. congestion relief) to the travelling public.
- Research on a cognitive IT architecture for transportation is necessary in light of Big Data, connected vehicles, and Cloud computing. The IT platform includes Cloud infrastructure, Data Analytics, and Cognitive AI Machine Learning. The platform supports multiple ITS applications and serves as the basis for future innovation.

## Mark Norman – TRB

- Florida DOT, Texas, California, Montana, and Georgia, and other states are already pursuing innovative approaches to research
  - Florida DOT is already pursuing more than a dozen research projects on connected/automated vehicles.
  - California DOT has considerable experience with research roadmaps.
  - TxDOT Innovate Research Program (no RFPs or problem statements)
  - Georgia DOT annual implementation reports
  - Several states are establishing lead implementation manager positions.
- On the other hand, states are also facing some of the same barriers.
  - State RFPs for ITS projects still use technologies that are 10-15 years old. Most projects do not incorporate latest technologies such as Cloud, Big Data, IoT, and Cognitive Computing. The result is that outdated systems are designed and implemented which deliver reduced benefits to the traveling public. DOTs should consider adopting a suitable procurement method for ITS technology projects that differ from traditional civil infrastructure projects.
- Concept of a research roadmap
  - Needs to track with DOT's overall mission and goals
  - Idea of a dynamic/living research roadmap has value.
  - Standing group that meets at least on a regular basis could also have value.
  - Standing contracts for quick response answers could have value.
  - However, all of these would mean some change from the ways we have historically done business.
  - As in any change, support from top management would be key.

- Potential Impacts on our traditional research processes
  - Redefining our definition of a research “project”
  - Accomplish tasks in parallel rather than in series, and bring together at the end.
  - Consider need to rely more on scenario planning for some topics.
  - Focus RFPs on outcomes rather than processes.
  - Enhance agility/flexibility for researchers and staff.
  - Reduce administrative burdens.
  - Leverage demos and field tests.
  - Look to other sectors for good models.
- Florida DOT’s challenges in addressing research in transformation technologies are not unique.
- Other states are facing similar challenges and questions:
  - What are the issues in this area that can be addressed by research?
  - What research is already underway or planned by others?
  - How can state DOTs keep abreast of all that is happening?
  - What “niches” can/should individual states focus on as part of their own research programs?
  - What opportunities exist or should be created to enable states to collaborate on researching common issues and for “replicating” research results where desirable?
  - How might some of our traditional research processes need to change in this age of transformational technologies?
- Other state DOTs would benefit from a discussion of issues addressed during this peer exchange.
  - AASHTO RAC/TRB State Reps meeting(s) would be a good venue to expand this dialogue.

### **Teresa Parker – FHWA**

- Aligns with FAST-ACT and new future highway funding legislation
- Communication, collaboration, and coordination are extremely important for engaging the public and stakeholders early on in the initiation of potential research projects.
- Emerging Research Projects: Ask the right questions which will aid in reducing time/money.
- On-going feedback on what’s happening from a national/state/university/private sector/international perspective to not reinvent the wheel but to replicate the processes to fit what the state needs
- Possibility to leverage other funding sources for emerging research projects with others
- Data seems to be a big factor in how, what, where, and who can strategically utilize the data.
- Establish a network to keep open dialogue and communication with the peer exchange stakeholders from both past and present.

- Tap into other career discipline areas that you may not even think to consider when defining a purpose and need.

## **Dr. Christopher Poe, Texas A&M Transportation Institute**

### **Sue Sillick – Montana DOT**

- Investigate developing data plans for research projects.
- Incorporate data considerations upfront at the beginning of each project. Identify others who may be able to benefit from project data, and develop it in a manner to facilitate its use.
- Contact John Krause to learn about demonstration UAS projects.
- Remember governance is not scary; it helps us go fast.
- Share FDOT IT strategic plan presentation with MDT staff.
- Share AASHTO-TRB committee's crosswalk with Joe.
- Share Peer Exchange presentations and report with WTI.

## **2. Research Center Action Plan**

As a result of the in-depth discussion throughout the peer exchange, FDOT identified the following items that will be vetted and prioritized in coordination with executive leadership to identify top priorities for action. The list below comprises actions ongoing as well as items for future consideration and development. These will be managed through annual review and reporting.

### **Initial Action Plan Items**

- Consider potential additional project vetting across functional areas against identified key strategic criteria (Horton).
- Consider additional ways to create project cohorts or families.
- Consider potential for standing subject matter teams (cross-functional, potentially cross-sector, national). Formalize approach and possibly provide additional, e.g., consultant or university support to manage (Norman et al.).
- Consider potential for open RFI through UF for campus test bed to attract test bed users (Kuehn, Poe).
- Consider more effective monitoring of test bed areas vis-à-vis national groups (e.g., CV TPF).
- Consider how to expedite project data sharing (real- and near-real-time).

- 
- Guidance (top-down) and project (bottom-up) coordination sharing with leadership and functional areas
  - Annual implementation report
  - Revisit organizational process and language used in implementing potential changes.

#### **Future Action Plan Items to Be Considered and Developed**

- Consider process to effectively and actively manage whatever version of a “roadmap” is considered (Andrle).
- Consider development of key area/focus topics for open call for research ideas/projects (Kuehn).
- Consider how to craft a portfolio of case projects or partner for distributed replication projects at different test beds (Sillick).
- Six-month emerging technology coordination/information sharing meeting
- Topic scouting (maturation of technology) to share with functional areas/leadership to coordinate strategic goals and research portfolio
- Advisory committees in research project selection
- Consider how implementation of solutions can be leveraged to expedite process.
- Immersive research/research catchment – real-time awareness
- Staff assignments for monitoring current event issues in selected areas.
- Expand the science behind scenario planning for potential integration into research projects.
- Develop clear direction for working with industry partners to effectively leverage and understand respective benefits.



## VII. The FDOT Research Peer Exchange 2017 Team



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## Appendix A – FDOT 2017 Research Peer Exchange: Agenda

### Monday, April 24

—	Travel Day	
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### Tuesday, April 25 Morning Schedule – Auditorium

8:00 am	Introduction – State DOT Research Roadmaps in the Contexts of National Agenda/Activity and Emerging Technologies	Darryll Dockstader
8:30 am	Panel 1 – The National Picture <ul style="list-style-type: none"> <li>○ 8:30 King Gee, AASHTO</li> <li>○ 8:45 Ray Derr, NCHRP</li> <li>○ 9:00 David Kuehn, FHWA EAR</li> <li>○ 9:15 Mark Norman, TRB</li> <li>○ 9:30 Q&amp;A</li> </ul>	Moderator: Steve Andrie
9:45 am	Break	
10:00 am	Panel 2 – Universities and Industry <ul style="list-style-type: none"> <li>○ 10:00 Dr. Christopher Poe, Texas A&amp;M Transportation Institute</li> <li>○ 10:15 Dr. Catherine T. Lawson, University at Albany</li> <li>○ 10:30 Dr. Lily Elefteriadou, University of Florida</li> <li>○ 10:45 James Lou, IBM</li> <li>○ 11:00 Q&amp;A</li> </ul>	Moderator: Steve Andrie
11:15 am	Break	
11:30 am	Panel 3 – State DOTs <ul style="list-style-type: none"> <li>○ 11:30 David Jared, Georgia DOT</li> <li>○ 11:45 Joe Horton, Caltrans</li> <li>○ 12:00 Sue Sillick, Montana DOT</li> <li>○ 12:15 Q&amp;A</li> </ul>	Moderator: Darryll Dockstader
12:30 pm	Lunch	



**Afternoon Schedule – 336**

1:30 pm	Concept of a Research Roadmap	
2:30 pm	Tour of Cascades Park	
3:15 pm	Concept of a Research Roadmap – Discussion (continued)	
5:00 pm	Dinner	

**Wednesday, April 26**  
**Morning Schedule – 336**

8:00 am	Recap	
8:30 am	ROADS – FDOT’s Process – April Blackburn	
9:00 am	And What of Data and Research? <ul style="list-style-type: none"> <li>○ Data and Decision-making</li> <li>○ Data and Performance Analysis</li> <li>○ Data and Production</li> <li>○ Data Security</li> </ul>	
10:00 am	Break	
10:15 am	Data and Research, Research and Data (continued) – David Sherman, Raj Ponnaluri	
12:00 pm	Lunch	

**Afternoon Schedule – 336**

1:30 pm	Emerging Technologies <ul style="list-style-type: none"> <li>○ What do we mean by emerging technologies</li> <li>○ AV/CV Projects</li> <li>○ UF Campus Testbed</li> </ul>	
3:30 pm	Break	
3:45 pm	Emerging Technologies (continued)	
5:00 pm	Adjourn	

**Thursday, April 27**

8:00–11:00 am	Recap, report preparation, and wrap-up	
11:00 am - 12:00 pm	Report out to Brian Blanchard, FDOT Assistant Secretary	

## Appendix B – Opening Presentation

### Darryll Dockstader – Opening Presentation

Slide 1

**PEER EXCHANGE**

2017

**Darryll Dockstader**  
Florida Department of Transportation  
Research Center

Florida Department of Transportation

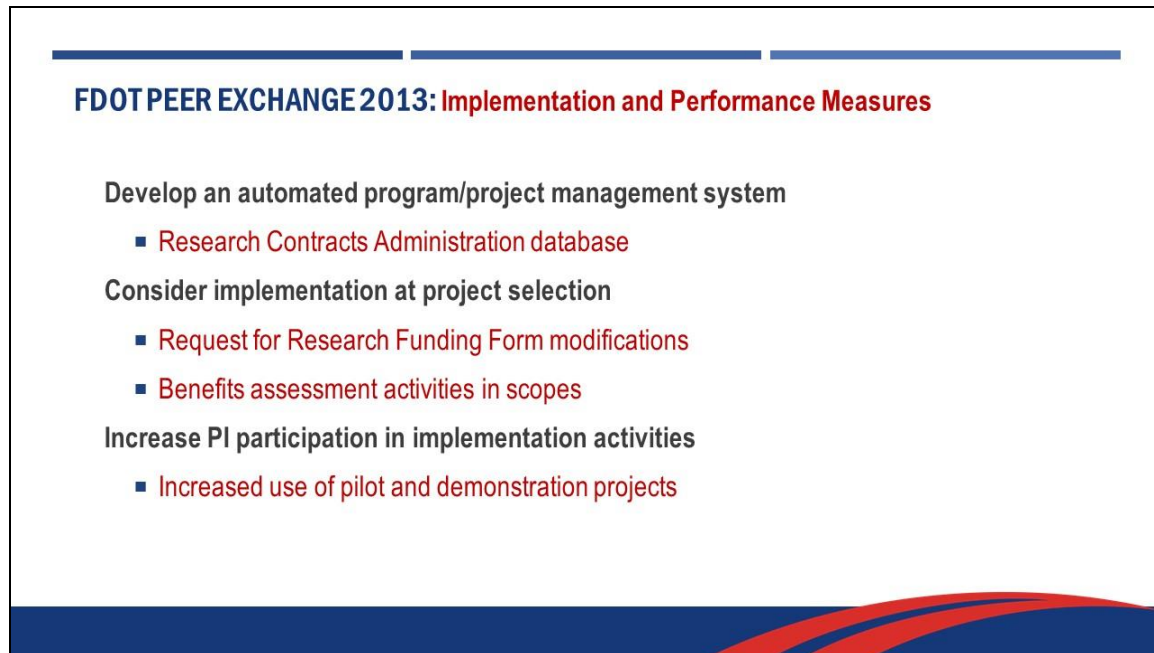
Slide 2

**WHAT IS A PEER EXCHANGE?**

- Examine and evaluate a state DOT research program or some aspect thereof with a collaborative team of peers, experts, and stakeholders
- Promote the exchange of vision, ideas, and best practices

Code of Federal Regulations

Required every 5 years  
by 23 CFR 420

**Dockstader, continued***Slide 3*

**FDOT PEER EXCHANGE 2013: Implementation and Performance Measures**

- Develop an automated program/project management system
  - Research Contracts Administration database
- Consider implementation at project selection
  - Request for Research Funding Form modifications
  - Benefits assessment activities in scopes
- Increase PI participation in implementation activities
  - Increased use of pilot and demonstration projects

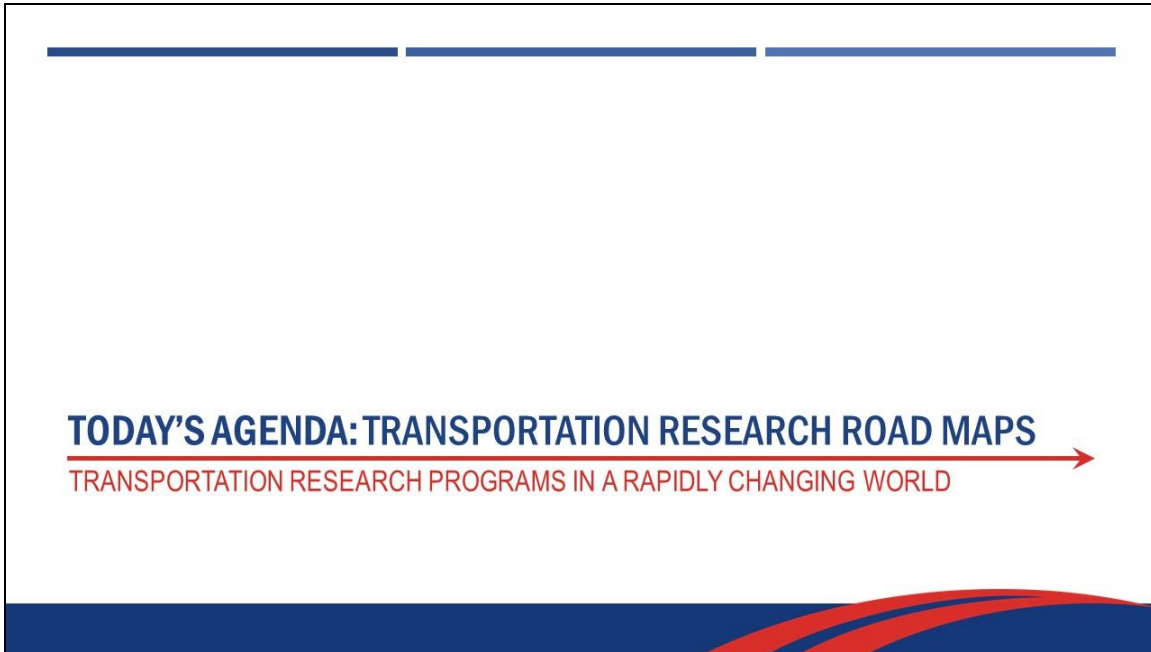
*Slide 4*

**FDOT PEER EXCHANGE 2013: Implementation and Performance Measures**

- Embrace credible qualitative measures in performance analysis
  - *Financial Achievability of Florida Department of Transportation Research Projects with Florida State University (BDK83-977-24 & BDV30-977-12)*
- Utilize research implementation assessment report as planning/process document
  - Implementing mid-project meeting
- Develop additional ways to communication research solutions
  - Developing expanded closeout meeting process

**Dockstader, continued**

Slide 5



Slide 6



**Dockstader, continued**

*Slide 7*

UF Test Bed

NDS Automated Processing

LiDAR

Drone Inspection Techniques

Advanced Signal Control Technologies

Skyway Bridge Monitoring

Solar Roadways

Fog Detection

*Slide 8*

**Utilize online transportation databases (TRID, RIP, etc.)**

- Required for new projects

**Participate on panels and committees**

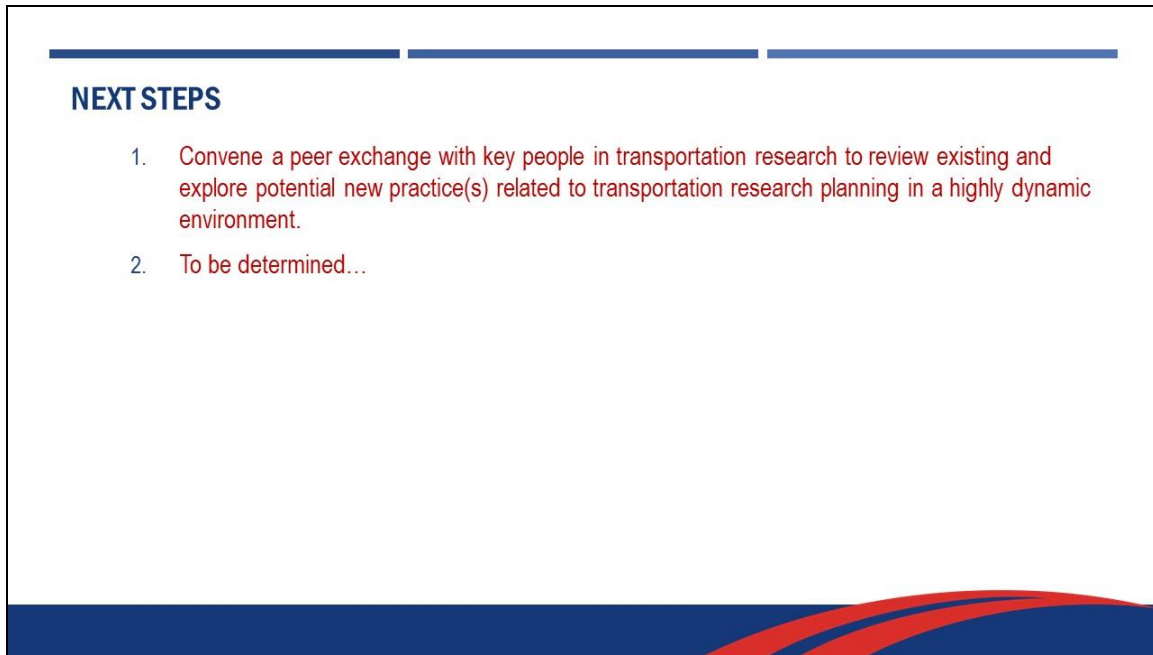
- Over 60 FDOT staff on 100+ TRB committees and CRP panels
- Active involvement on AASHTO and other committees

**Leverage and contribute to regional and national efforts**

- Pooled fund studies
- NCHRP 20-102

**Dockstader, concluded**

Slide 9



**NEXT STEPS**

1. Convene a peer exchange with key people in transportation research to review existing and explore potential new practice(s) related to transportation research planning in a highly dynamic environment.
2. To be determined...

## Appendix C – Panel Presentations

### King Gee – AASHTO

Slide 1




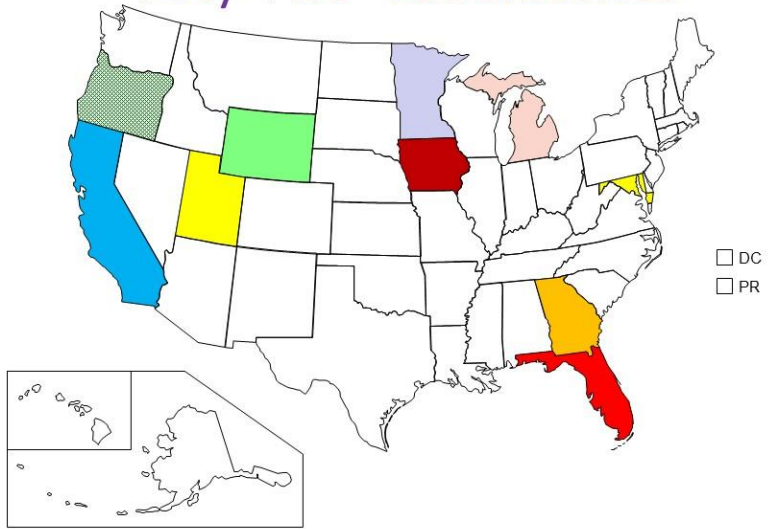
# Strategic Research in Context

Florida Department of Transportation Peer Exchange  
Tallahassee - April 25, 2017



Slide 2

## Fifty-Two “Laboratories”






**Gee, continued**

Slide 3

## State Level R&D Realities

- Strategic Focus Shifts
- Legacy Technical Strengths Change (or not)
- Funding Waxes & Wanes
- Larger Context: Transportation and Non-Transportation Sector Innovations Apace
  - Other States' Research
  - FHWA and NCHRP Research
  - Industry/Academia Research

→ Research, Borrow, Leverage, Collaborate



Slide 4

## National Transportation Scene

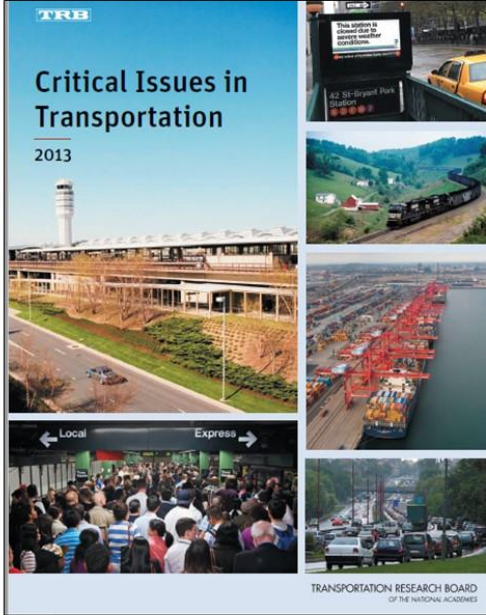
- Overarching Transitions:
  - Infrastructure Investments
  - Highway Safety Challenges
  - Performance-based Management
  - National Freight Policy
  - Innovation and Technology: Materials, Systems, Mobility
- Critical Issues – TRB (2013)
- Beyond Traffic – USDOT (2015)
- The Transforming Mobility Ecosystem – USDOE
- Foresight Series – NCHRP 750






**Gee, continued**

Slide 5



Critical Issues Nationwide:


- **System performance** is neither reliable nor resilient.
- **Safety** has improved, but avoidable losses are still significant.
- The impacts on **energy, climate,** and the **environment** are unsustainable.
- **Funding sources** for public infrastructure are inadequate
- **Innovation** lags — and R&D investment is low and declining.




Slide 6

## Critical Policy Choices

Framed by:



- Growing Population
- Changing Travel Patterns
- Growth of Freight
- Technological & Innovation Barriers
- Infrastructure Resiliency
- Aligning Decisions & Dollars



**Gee, continued**

Slide 7

**The Transforming Mobility Ecosystem:**  
Enabling an Energy-Efficient Future

U.S. DEPARTMENT OF  
**ENERGY**  
Energy Efficiency & Renewable Energy

### Energy Impacts of Connectivity & Automation - Driven By:

- Vehicle Powertrain Advancements
- Lighter Materials
- CV & AV Integration
- Big Data
- Faster Processing, Lower Costs

Slide 8

## NCHRP 20-24 Strategic Project

### FORESIGHT 750 SERIES

**SOCIO-DEMOGRAPHICS**

Model and envision the transportation impacts of shifting sociodemographics.

**SIX REPORTS AT-A-GLANCE**

**FREIGHT**

Explore and plan for the future of freight with a scenario planning toolkit.

**ENERGY & FUELS**

Identify and assess strategies for a variety of future energy scenarios.

**CLIMATE CHANGE**

How to prepare for extreme weather events.

**SUSTAINABILITY**

How to organize DOTs for a sustainable future.

**TECHNOLOGY**

Select the right technology investments at the right time.

Gee, continued


Slide 9

## NCHRP Foresight 750 Series

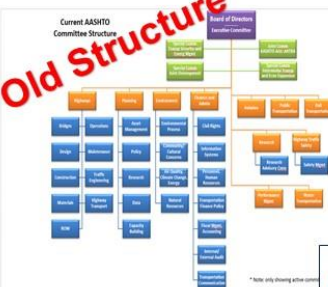
### SOME QUESTIONS WE FACE TODAY

7 cross cutting questions

1. Will DOTs work differently in the future?
2. Will the economy stay global?
3. What is resilient infrastructure and how much does it cost?
4. What if there is no more driving, but Vehicle Miles Traveled (VMT) still rises?
5. Where are the next boom towns?
6. Will cars fill up or plug in?
7. What's the relationship between more senior Americans and transportation?



Slide 10



Old Structure

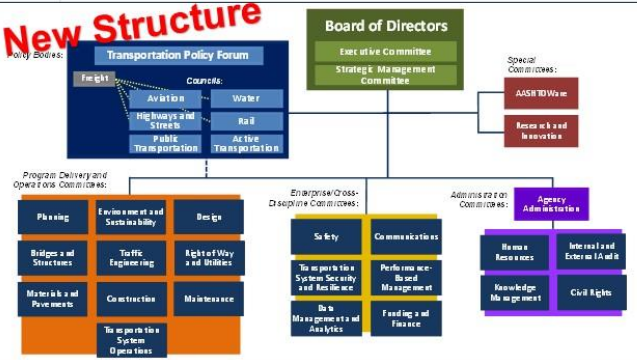
### AASHTO's Response to the Context

Shifts:


- Some Top Down Direction, too
- Enhanced Nimbleness
- Broaden Multimodal Perspective
- Larger Reach (decentralization of DOTs)
- Considering Private Sector Roles

New:

- Transp. Policy Forum
- Active Transportation C.
- Performance Based
- Knowledge Mgt.
- Data Mgt. & Analytics



New Structure



**Gee, continued***Slide 11*

## Observations on State DOT RD&D

### Program Shaping Factors

- Political
- Legacy (industry, hard, soft)
- Leadership (need, opportunity)

### Successful Realization: **Deployment**

- **Executive Leadership / Champions**
- **Needs Responsive / Needs Driven**
- **Focused Implementation Plans**

### Difficult Challenges

- **Balancing - Scarce Resources vs Areas of Need / Focus**
- **Aspired Roles & Competencies**

*Slide 12*

## Thank You

King W. Gee  
Director, Engineering and Technical Services  
AASHTO  
[kgee@ashto.org](mailto:kgee@ashto.org)





**Gee, concluded**

Slide 13

## AASHTO Strategic Plan



**Strategic Goals:**

- Provide value to members
- Provide innovative technical and professional services and products
- Be a leader in national transportation policy development
- Communicate the value of transportation



Slide 14

## Critical Role of AASHTO Committees and Volunteers


















**Ray Derr – NCHRP**

Slide 1

**NCHRP Experience with  
Research Roadmaps**

Ray Derr

  
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Slide 2

**Roadmaps of Note**

- Strategic Highway Research Program II
- Connected & Automated Vehicles
- AASHTO Standing Committee on Research Focus Areas
  - Multimodal Freight Transportation
  - Transportation and Public Health
  - Transformational Technologies

  
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**Derr, continued**

Slide 3

## SHRP 2

- Study for a Future Strategic Highway Research Program (Jun 1999—Jun 2001)
- Detailed Planning for Research on Providing a Highway System with Reliable Travel Times (NCHRP 20-58(03), Feb 2002—Sep 2003, \$250,000)
- Strategic Highway Research Program 2 (2006—2015)

  
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Slide 4

## SHRP 2 Observations

- Travel time reliability was a new topic with little work underway
- Research program was massive; the roadmap totaled \$80M
- Delays in funding slowed the program and forced changes

  
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**Derr, continued**

Slide 5

## Connected & Automated Vehicles

- Connected & Automated Vehicles Research Roadmap for AASHTO [NCHRP 20-24(98), Jun 2014—Jun 2015, \$85,000]
- Impacts of Connected Vehicles and Automated Vehicles on State and Local Transportation Agencies [NCHRP 20-102, Dec 2014—Current]
  - First project began Nov 2015

  
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Slide 6

## CAV Roadmap Features

- Planning
  - Roadmap and Execution requests were simultaneous
- Development
  - Experienced contractors identified over 100 issues
  - Panel met with contractor to consolidate and prioritize issues
  - 23 problem statements totaling \$15M
- Execution
  - Panel meets annually to decide on projects
  - Draws from roadmap and other sources
  - More roadmap maintenance needed

  
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**Derr, continued**

Slide 7

## Transformational Technologies

- Research Roadmap for Transformational Technologies (Other than CV/AV) [NCHRP 20-113, \$250k]
  - Support for TRB Symposium [\$130k]
- TRB Partners in Research Symposium: Transformational Technologies in Transportation [Oct 30-Nov 1, 2016]
- Three projects approved in Feb 2017 and Mar 2017



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Slide 8

## Transformational Tech. Features

- Planning
  - Symposium planning was extensive
  - Contractor identified participants and developed resources
- Symposium
  - Focused on how public policy objectives can be met through technology initiatives
  - Topical break-out groups to identify issues
  - Three themes
    - Private-sector, public-sector, and academia working together is vital
    - Planning horizons are very different
    - Processes need to change for public sector to keep pace
  - Three problem statements developed
- Execution
  - Process for dialogue still being developed



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**Derr, concluded**

Slide 9

In planning for battle, I have  
always found that plans are  
useless but planning is  
indispensable.

Dwight D. Eisenhower

  
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David Kuehn – FHWA EAR

Slide 1

EXPLORATORY ADVANCED RESEARCH



# A Map is to Research as Directions are to ...

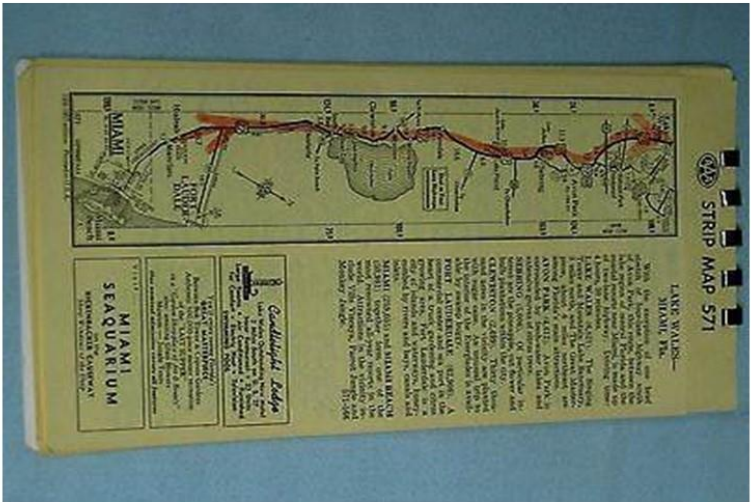
Presentation at the Florida DOT Peer Exchange  
April 24, 2017



US Department of Transportation  
Federal Highway Administration

Slide 2

# Do you Recognize This?



STRIP MAP 571

LAMP WALKER—  
MIAMI, FL.

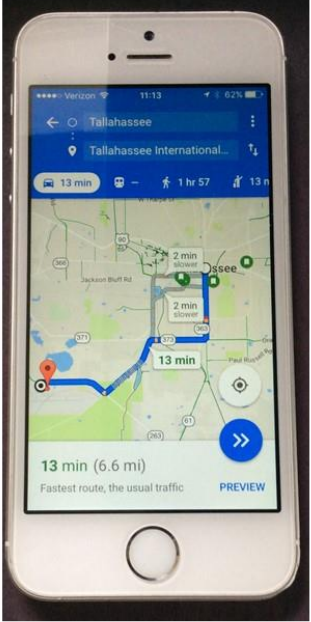
MIAMI SEAQUARIUM

April 25, 2017

2

**Kuehn, continued**

Slide 3



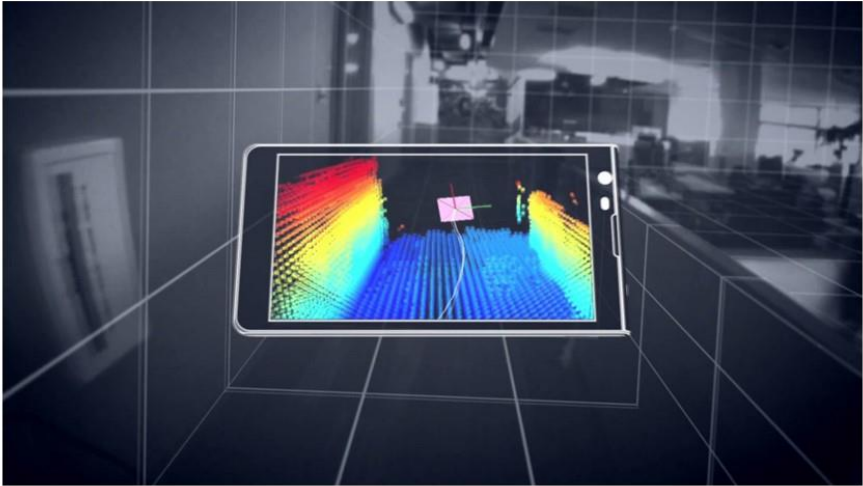
What about This?

April 25, 2017

3

Detailed description: This slide features a photograph of a white smartphone held vertically. The screen displays the Google Maps navigation interface for Tallahassee, Florida. The destination is 'Tallahassee International...'. The estimated travel time is 13 minutes. The map shows a blue route starting from a red location marker and ending at the airport. A 'PREVIEW' button is visible at the bottom right of the map area. The phone's status bar at the top shows the time as 11:13 and 62% battery. To the right of the phone, the text 'What about This?' is written in a large, black, sans-serif font. At the bottom left of the slide frame, the date 'April 25, 2017' is printed, and at the bottom right, the number '3' is printed.

Slide 4



Or This?

April 25, 2017

4

Detailed description: This slide features a photograph of a tablet computer held horizontally. The screen displays a colorful, abstract visualization that resembles a data visualization or a simulation. The colors transition from red at the top to blue at the bottom, with a central vertical line. The background of the photograph is a dark, grid-like pattern, possibly representing a virtual environment or a data space. To the right of the tablet, the text 'Or This?' is written in a large, black, sans-serif font. At the bottom left of the slide frame, the date 'April 25, 2017' is printed, and at the bottom right, the number '4' is printed.

Kuehn, continued

Slide 5

# What is a Roadmap?

- Types of Roadmaps
  - Landscape maps help you decide where to go
  - Route maps help get there



EXPLORATORY ADVANCED RESEARCH

US Department of Transportation  
Federal Highway Administration


April 25, 2017

5

Slide 6

# Topic Scouting

List of Exploratory Advanced Research (EAR) Program Scanning Topics and keywords	Broad or Cross-Cutting Topics	Highly Focused Topics (Pinpoints)	New Concepts	New Tools, Processes	Modeling, Simulation and Analysis Cluster	Sensors Cluster	Automation Cluster	Materials and design cluster	System health cluster	Network management and operations cluster	Safety Cluster	Environmental Stewardship Cluster	Large Network Cluster
Integrated Active Transportation Systems													
Intercity travel													
Maintenance, system													
Materials													
Mega-Region Travel Forecasting Models													
Motorevele Travel													
Multi-modal, (Rail-Volution)													
Nanoscale, Nanotechnology													
National Highway System, national network													
National Transportation Demand Model													
Navigation													
Net Zero Highways													
Pedestrians – Detection, Large Area, Low Cost													
Policy Discussion													
Right-of-way, public space													
Robotics and automation													
Self-monitoring systems													



EXPLORATORY ADVANCED RESEARCH

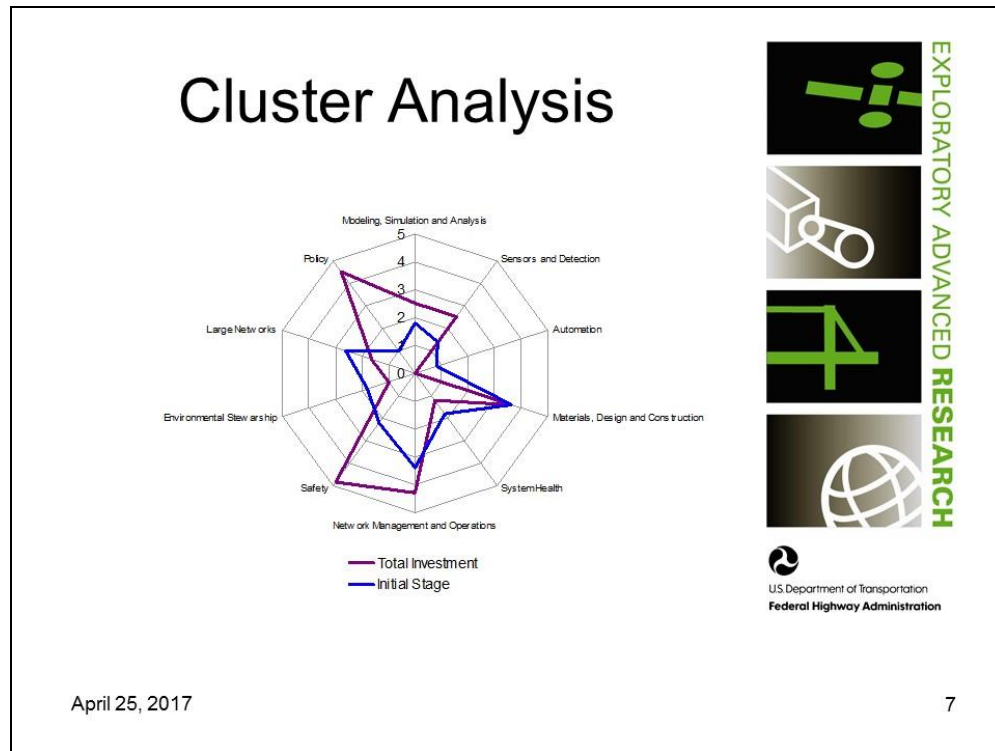
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Federal Highway Administration

April 25, 2017

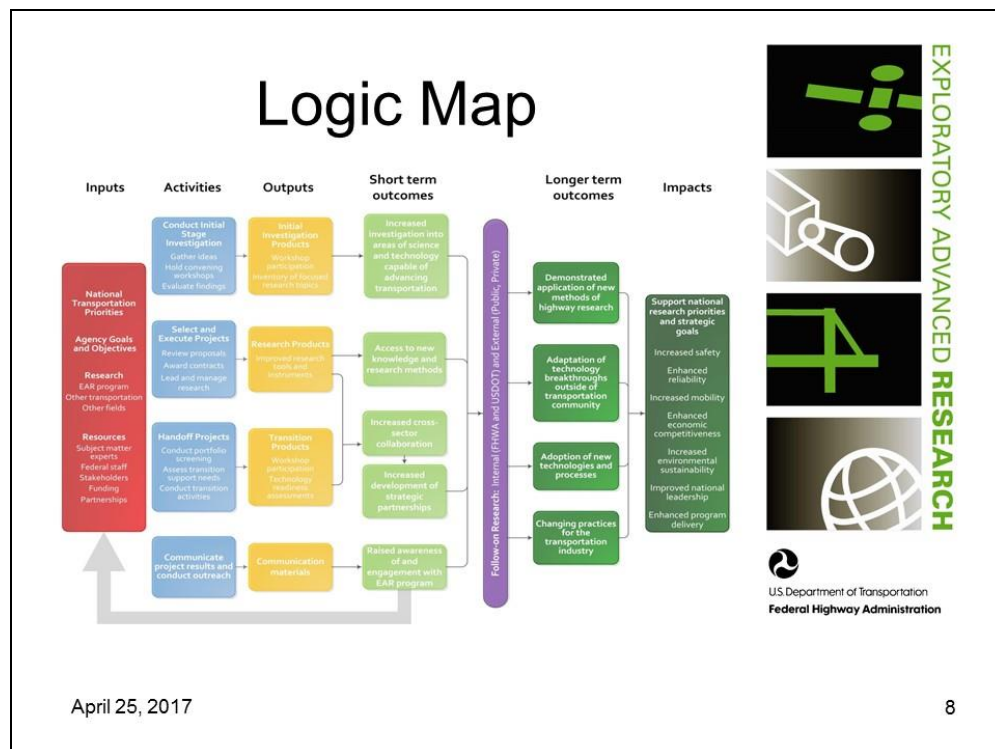
6

Kuehn, continued

Slide 7



Slide 8






**Kuehn, continued**


Slide 9

## Key Processes

- Focus on high-risk, high payoff research
- Merit review is used to enhance the quality of research processes and results
- Research stakeholders are involved throughout
- Commitment to successful project handoff

April 25, 2017




 U.S. Department of Transportation  
 Federal Highway Administration


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Slide 10

## Program Status

- 200+ Initial stage investigations
- Eight solicitations resulting in
  - 79 projects awarded; 27 ongoing
  - \$77M federal, \$28M match
- 9<sup>th</sup> Closed in October
  - Mobile Device Data
  - Experimental Economics
  - New Methods in Simulation

April 25, 2017




 U.S. Department of Transportation  
 Federal Highway Administration

10

**Kuehn, concluded**

Slide 11

## EAR Program Payoff

- Connecting with new partners
- Growing scientific capacity and pushing disciplinary frontiers
  - Building tools that accelerate discovery, allow for new measurements, concepts
- Pointing towards new technology, applications



EXPLORATORY ADVANCED RESEARCH



April 25, 2017

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Slide 12

## ...Technology Deployment

## Thank You

More information is located at  
[www.fhwa.dot.gov/advancedresearch](http://www.fhwa.dot.gov/advancedresearch)

David Kuehn  
 Program Manager  
 (202) 493-3414  
[david.kuehn@dot.gov](mailto:david.kuehn@dot.gov)



EXPLORATORY ADVANCED RESEARCH



April 25, 2017

12



**Mark Norman – TRB**

Slide 1

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**Transformational Technologies:  
Can Our Research Processes Keep Up?**

Slide 2

**TRB Dialogue: Can Our  
Research Processes  
Keep Up?**



- Continuing presentations/roundtable discussions
  - 2016 TRB Annual Meeting
  - AASHTO SCOR and RAC Annual Meetings
  - Automated Vehicle Symposium
- Building and sharing list of options for consideration




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**Norman, continued**



Slide 3




## Transformational Technologies Impacting Transportation



Connected/automated vehicles, shared vehicles, advanced versions of on-demand shared ride and micro-transit services, NextGen, unmanned aerial systems, 3D printing, cog in “internet-of-things” & “smart cities”


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## Why Are We Having This Dialogue?



- Private sector investing billions in R&D
- Research needed to inform public sector based on fact, rather than sensationalism or extremes
  - Facilitate ability of public sector to facilitate deployment in a manner & timeframe to achieve policy objectives
- Conventional public agency approaches to research may need to be re-examined
- Timeframes not compatible with transformational technologies



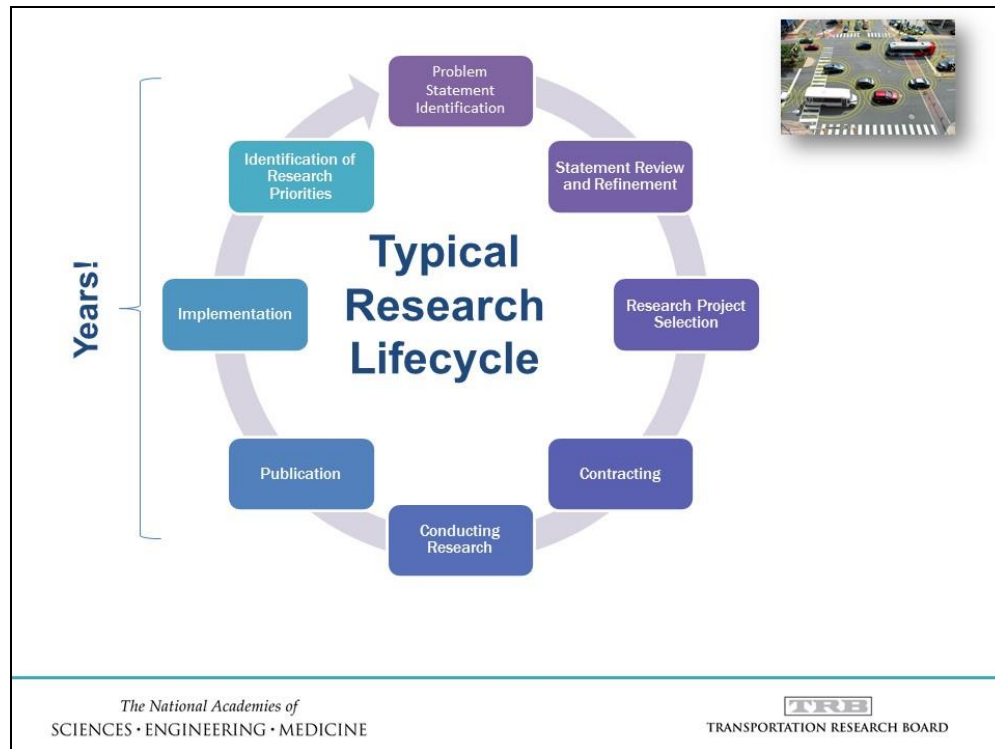
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**Norman, continued**

Slide 5



Slide 6

# Question 1

What are areas of great potential to move to a more timely & strategic research approach?

POTENTIAL


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**Norman, continued**

Slide 7

## Redefine Research “Project”



- Address research program areas as a continuum rather than as discrete individual projects
  - Program rather than by project focus
  - Continuity of R&D process
  - Interactive nature of R&D




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## Parallel Tasking



- Accomplish tasks in parallel rather than in series, & bring together at the end
  - Break research questions into smaller “chunks”
  - Rely on standing pool of peer reviewers/continuous peer reviews
  - Release interim results and/or “pre-publication” findings before final editing


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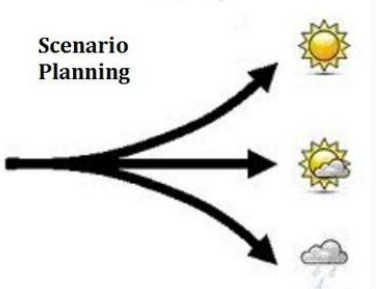
**Norman, continued**

Slide 9

## Looking Forward



- Use of Scenario Planning
  - Consider emerging needs




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## Question 2



What are some ways we can accomplish that transformation?



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**Norman, continued**

Slide 11


## Identify and Remove Obstacles



- What are the obstacles that will prevent or inhibit change?
- How do we remove or overcome these obstacles?




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## Create Impetus for Change



- Even clearly beneficial changes must overcome inertia
  - Change typically doesn't happen without strong impetus
- How do we create that?




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**Norman, continued**

Slide 13


## Getting Practical



- Build leadership support
- Pursue strategic level research
- Focus RFPs on outcomes rather than processes
- Enhance agility/flexibility for researchers and staff
- Reduce administrative burdens
- Other steps?




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Slide 14


## Leveraging Demos



- Take advantage of scheduled field tests/demonstrations




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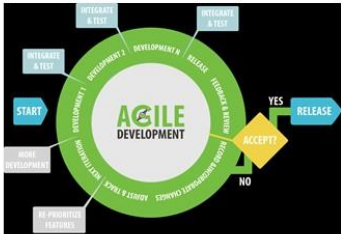

**Norman, continued**

Slide 15


## Question 3




- Are there models from other sectors that we should be looking at?

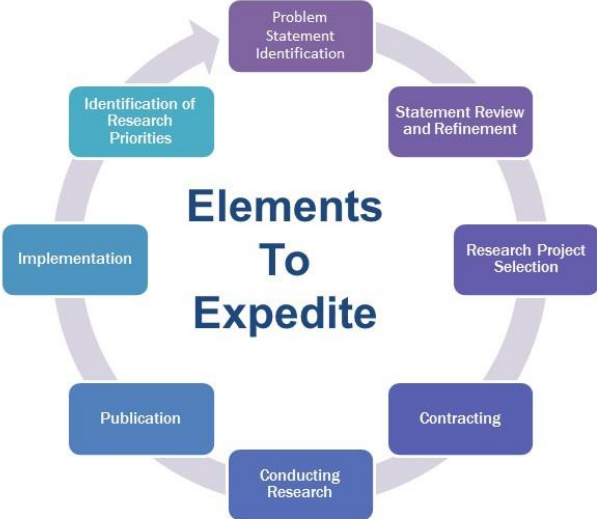
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### Elements To Expedite



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**Norman, continued**

Slide 17


## Potential Models



- Rapid response models (e.g., NSF)
- Continuous open call for proposals
- Prequalification of contractors
- RFQ vs. RFP
- IDIQ contracts
- “Design-build”




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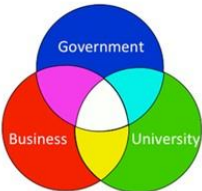
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Slide 18


## Potential Sources of Models



<ul style="list-style-type: none"> <li>• Public agencies</li> <li>• Private sector</li> <li>• Universities</li> <li>• National labs</li> </ul>	<ul style="list-style-type: none"> <li>• International</li> <li>• NSF</li> <li>• DARPA</li> <li>• Others?</li> </ul>
--	--



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**Norman, concluded**


Slide 19

## Next Steps


- Synthesize comments and feedback
- Review by TRB Conduct of Research committee
- Share results
  - Summary flyer
  - More in-depth report
  - Distribute/publicize
  - Present at webinars, sessions, etc.



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What do YOU think?

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**Dr. Christopher Poe – Texas A&M Transportation Institute**

Slide 1


# Bridging the Gap to Deployment

Presentation to the Florida DOT Peer Exchange Workshop – April 2017


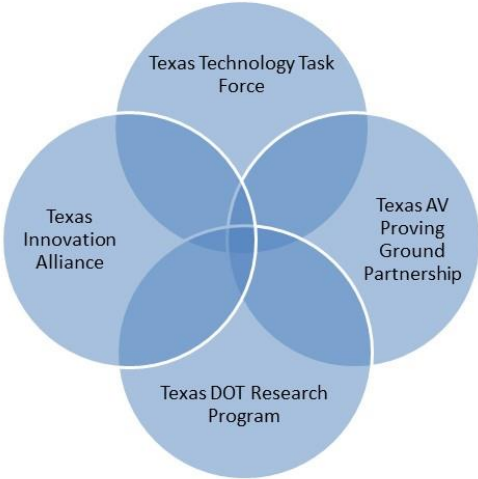
Christopher Poe, Ph.D., P.E.  
Assistant Director, Connected and Automated Transportation Strategy  
Texas A&M Transportation Institute



Slide 2



## Technology Leadership in Texas




Poe, continued

Slide 3




## Texas DOT Innovative Research Program

- No RFP / Problem Statements
- Let Universities propose transformative research to support TxDOT Goals
  - Encourage private sector partnership
- Example of Projects
  - Commercial Truck Platooning
  - Wrong-way Driving Detection and Mitigation
  - Transit/Pedestrian/Bicycle Testbed
  - High-speed Sensing of Infrastructure






Slide 4



## Working Test Bed: I-35

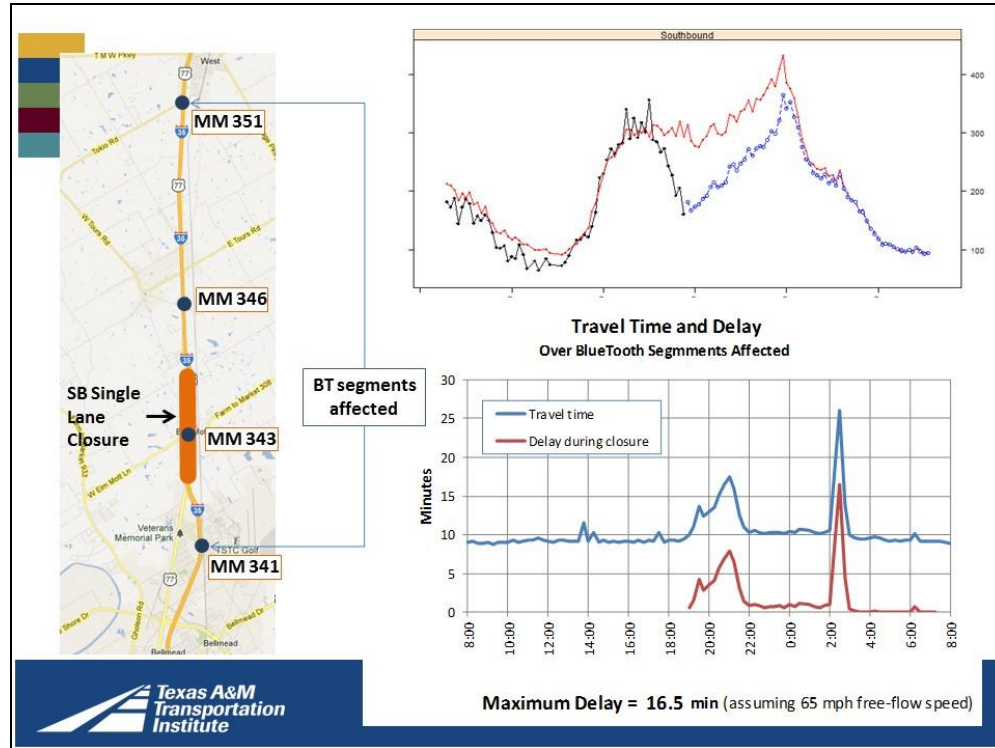
- Bluetooth travel time detection
  - 40 segments, 2-5 miles in length
  - ~20 additional segments AUS, SAN, DAL, FTW
- 19 Wavetronix radar detector sites
- 7 CCTV cameras sites
- 21 portable changeable message signs (PCMS)
  - ~10 per direction at approximate 10 mile spacing



Poe, continued


Slide 5



Slide 6

## TEXAS AUTOMATED VEHICLE PROVING GROUNDS PARTNERSHIP

Christopher Poe, Ph.D., P.E.  
Assistant Director, Connected and Automated Transportation Strategy  
Texas A&M Transportation Institute




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Poe, continued

Slide 7



## Texas AV Testing Needs


- Automated vehicles are here – and more are coming!
- How do the public agencies plan for:
  - AVs to help with safety and mobility needs
  - What is needed to safely accommodate AVs
  - Safe introduction of AVs into mixed traffic




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Slide 8




## National AV Proving Grounds

USDOT selected 10 sites out of 60+ proposals

1. City of Pittsburgh and the Thomas D. Larson Pennsylvania Transportation Institute
2. Texas AV Proving Grounds Partnership
3. U.S. Army Aberdeen Test Center
4. American Center for Mobility (ACM) at Willow Run
5. Contra Costa Transportation Authority (CCTA) & GoMentum Station
6. San Diego Association of Governments
7. Iowa City Area Development Group
8. University of Wisconsin-Madison
9. Central Florida Automated Vehicle Partners
10. North Carolina Turnpike Authority

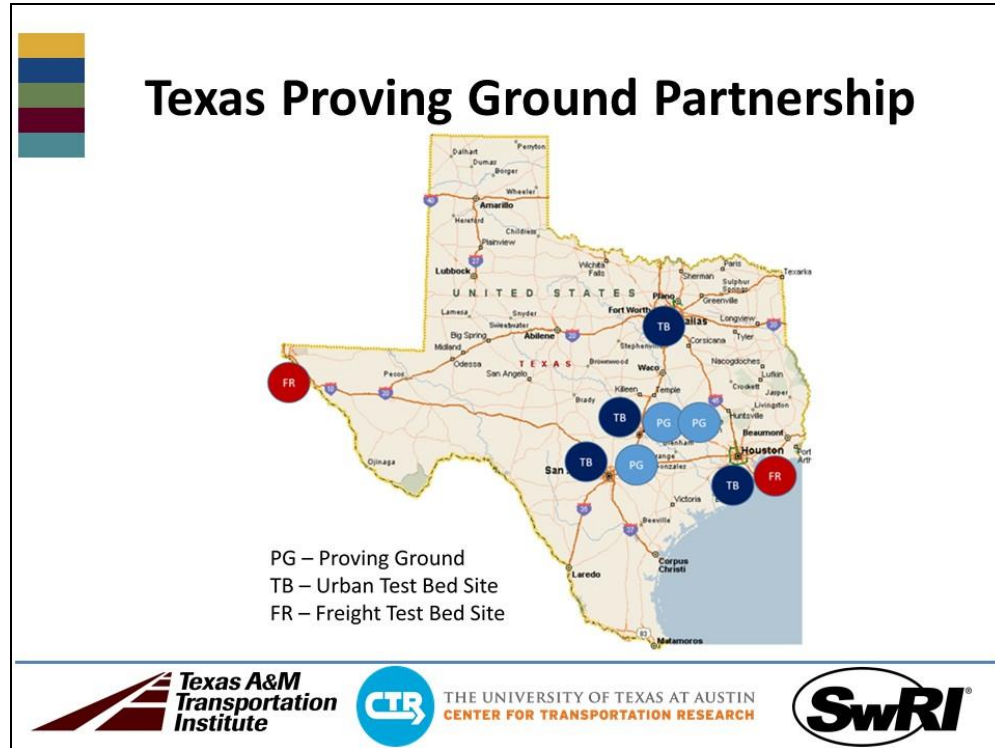



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Poe, continued

Slide 9



Slide 10

**Proving Ground Partners**


- Texas A&M, University of Texas, and Southwest Research Institute
- All are conducting AV research
- All have controlled proving grounds on their campuses

**Texas A&M Transportation Institute** **CTR** THE UNIVERSITY OF TEXAS AT AUSTIN CENTER FOR TRANSPORTATION RESEARCH **SwRI** 10




Poe, continued



Slide 11




## TTI/Texas A&M




- RELLIS Campus Proving Grounds
  - 2,000 acre campus
- Truck Platooning
- AV roadway infrastructure needs and V2I
- FAA UAV Center of Excellence
- Expertise in vehicle controls, robotics, cybersecurity, UAVs

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Slide 12



## UT-Austin / CTR



- Proving Grounds: Streets and parking lots; J.J. Pickle Campus
- Highway, intersection, rural road safety
- V2X sensing/communication
- Vehicle and non-motorized user interactions
- Expertise in travel behavior, GPS and wireless sensing, cybersecurity, policy and regulation




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Poe, continued

Slide 13



## Southwest Research Institute

- 1,200 acre on- and off-road testing facilities
- Over 20 fully automated vehicle platforms developed (from golf carts to class 8 trucks) for government and commercial clients
- Deploying CAV since 2008
- Specialties include: localization, perception, cybersecurity, connected automation, UAVs



On-Road



Off-Road






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Slide 14




## Urban Test Site Partners

- City of Austin,
- Central Texas Regional Mobility Authority,
- Capital METRO, Capital Area MPO,
- City of Bryan,
- City of College Station,
- Brazos Valley Council of Governments,
- City of Corpus Christi
- Corpus Christi MPO,
- Houston METRO,
- City of Houston,
- Harris County,
- Port of Houston,
- Houston-Galveston Area Council,
- Texas Medical Center,
- University of Houston,
- City of Arlington,
- City of Dallas,
- City of Fort Worth,
- City of Grand Prairie,
- North Central Texas Council of Govts,
- Tarrant County,
- Denton County Transit Authority,
- University of Texas at Arlington,
- City of San Antonio,
- VIA Transit,
- Alamo Area MPO,
- Joint Base San Antonio,
- City of El Paso,
- County of El Paso,
- Camino Real Regional Mobility Authority,
- El Paso MPO,
- Texas Department of Transportation





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**Poe, continued**

Slide 15




## Strengths of Texas AV Partnership

- Proving Grounds open for business
  - On-road and off-road environments
- Match research expertise and proving grounds to testing needs
- Partnerships are in place for pilots/demos
- Diverse set of urban test sites
  - High-speed freeway/managed lanes
  - Arterial streets with transit
  - Low Speed Urban
  - Campus environments
  - Border crossings



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Slide 16



## For More Information

- Christopher Poe, Texas A&M Transportation Institute, [cpoe@tamu.edu](mailto:cpoe@tamu.edu)
- Chandra Bhat, University of Texas, [bhat@mail.utexas.edu](mailto:bhat@mail.utexas.edu)
- Michael Brown, Southwest Research Institute, [Michael.brown@swri.org](mailto:Michael.brown@swri.org)




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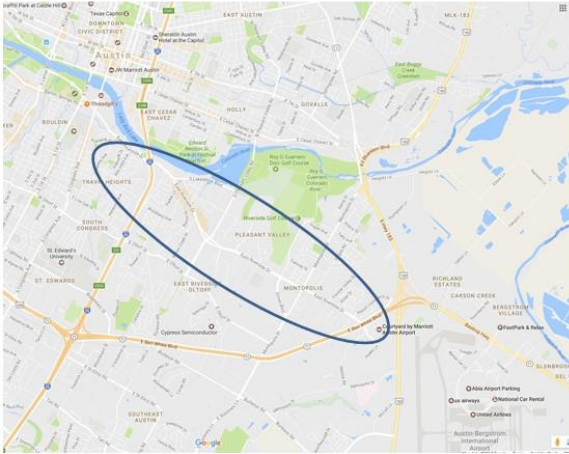
Poe, continued



Slide 17




## Austin

- Riverside Drive
  - Connects to CBD
  - Low-speed arterial
  - Transit/ped/bike
- Austin-Bergstrom Airport



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Slide 18



## Dallas-Fort Worth-Arlington

- I-30 Freeway / managed lanes between Dallas and Fort Worth
- Arlington arterials connecting to I-30
- UT Arlington Campus







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Poe, continued



Slide 19





# Houston


Potential tests include:

- Safety: autonomous braking
- Capacity: bus platooning
- First/last mile Connection: automated shuttle


Texas Medical Center	METRO HOV Lanes	Energy Corridor	Universities
<ul style="list-style-type: none"> <li>• 1,345 acres</li> <li>• 106,000 employees</li> <li>• 50,000 students</li> <li>• METRO bus and</li> </ul> 	<ul style="list-style-type: none"> <li>• METRO owned and operated</li> <li>• 100 miles HOV/HOT</li> <li>• I-45</li> <li>• US 59 North</li> <li>• I-45 South</li> <li>• US 59 South</li> <li>• US 290</li> </ul>	<ul style="list-style-type: none"> <li>• Third largest employment center</li> <li>• 91,000 employees</li> <li>• Multimodal options</li> </ul> 	<ul style="list-style-type: none"> <li>• University of Houston</li> <li>• Rice University</li> <li>• Texas Southern University</li> </ul>

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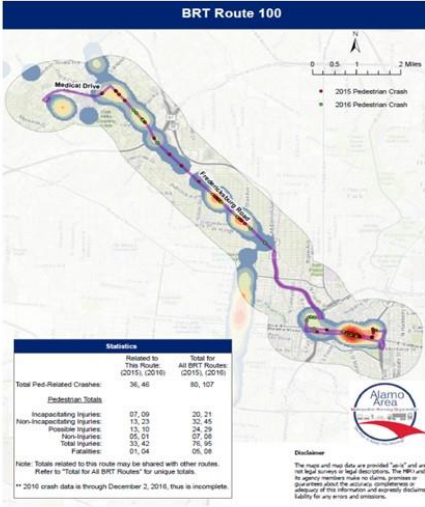


Slide 20





# San Antonio

- Fredericksburg Road
  - Arterial street
  - Bus Rapid Transit Route




Statistics	
Related to This Route (2015, 2016)	Total for All BRT Routes (2015, 2016)
Total Ped-Related Crashes:	36, 46 / 80, 107
<b>Pedestrian Totals</b>	
Incapacitating injuries:	07, 09 / 20, 21
Non-incapacitating injuries:	13, 23 / 32, 45
Possible injuries:	13, 10 / 24, 29
Non-injuries:	05, 01 / 07, 06
Total injuries:	33, 42 / 76, 96
Fatalities:	01, 04 / 05, 08

Note: Totals related to this route may be shared with other routes.  
 Refer to "Total for All BRT Routes" for unique totals.  
 \*\* 2016 crash data is through December 2, 2016, thus is incomplete.





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**Poe, concluded**



Slide 21




## El Paso

- AV technologies for freight and passenger border crossings
- Model for other border crossings in Texas and U.S.



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Slide 22



## Upcoming Events

- Energy Thought Summit – AV Demonstration
  - Austin, Texas, March 27, 2017
- DIA – Igniting a Smart Texas Revolution
  - Dallas, April 20-21, 2017
- Texas A&M Transportation Technology Conference
  - College Station, May 4/5, 2017
- Data Code-a-thon
  - Austin, July 18/19<sup>th</sup>
- 2<sup>nd</sup> Smart State Alliance Summit
  - October, 2017




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**Dr. Kate Lawson – University at Albany**

Slide 1

## Road to the Future is Paved with Data



**Dr. Catherine T. Lawson**  
**University at Albany/AVAIL**  
**Peer Exchange/Tallahassee, FL**

5/25-5/27, 2017

Slide 2

## Traditional Approach: Data used for decision-making



**Lawson, continued***Slide 3*

## **Data as a Resource**

- **Traditional data sources exist in separate environments (e.g., counts program).**
- **No data integration capabilities with legacy software and data formats.**
- **Limited access across agency operations.**
- **Constant challenges to meet reporting requirements.**
- **Workforce turnover and retirements.**

*Slide 4*

## **Data as an “Agile Asset”**

- **New sources of data now challenge existing practices:**
    - **The National Performance Management Research Dataset (NPMRDS)**
    - **Connected Vehicle (CV) data**
    - **Bridge sensor data**
- ..... and so much more!**

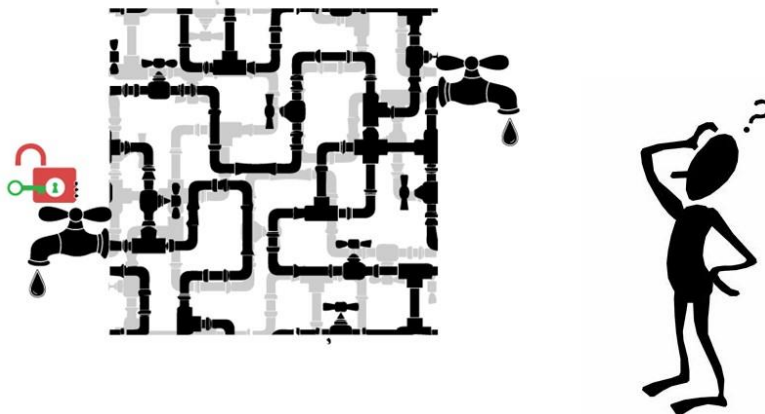
**Lawson, continued***Slide 5*

## **New York State DOT: Taking on the challenge**

- **Data delivery strategies**
- **Analytics options**
- **Organizational approach**
- **Relationship to workforce needs**
- **Internal/External dissemination**
- **Maintainability and investment longevity**

*Slide 6*

## **Thinking like a Data Scientist**

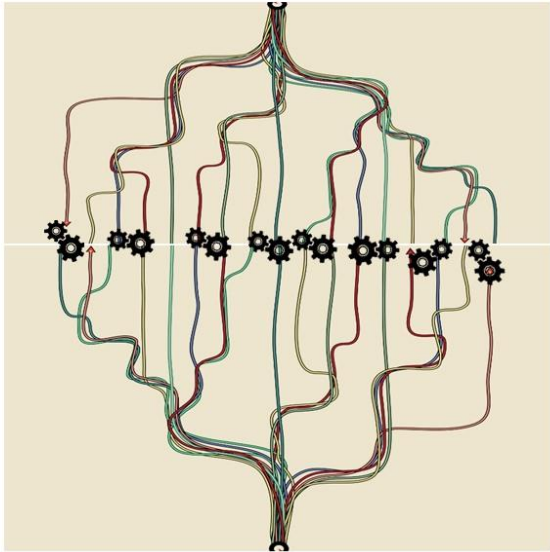
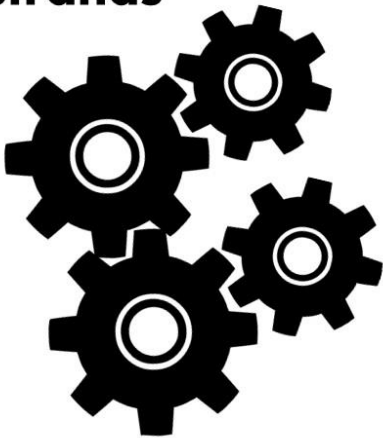


**Application Programming Interfaces (APIs)**

Lawson, continued

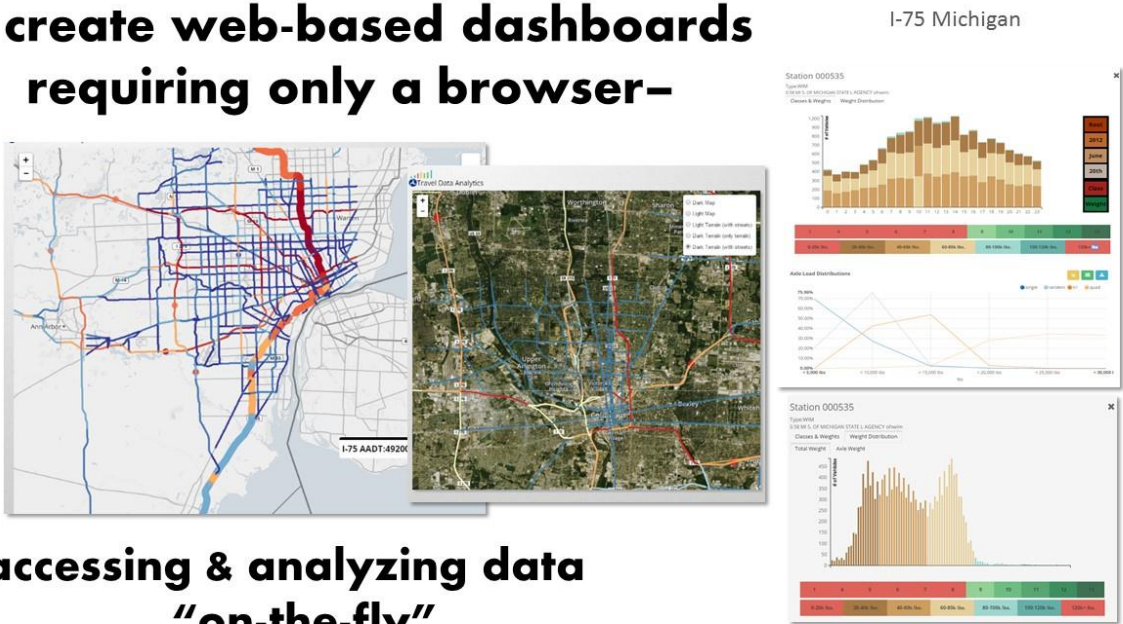
Slide 7

**Data Scientists  
reweave data  
strands --**



Slide 8

**To create web-based dashboards  
requiring only a browser--**



**accessing & analyzing data  
"on-the-fly"**

**FHWA Pooled Fund Study**



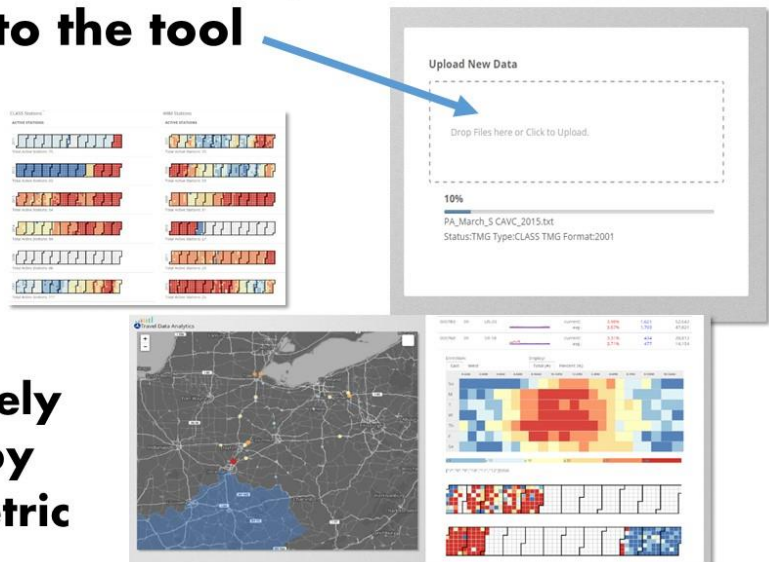
**Lawson, continued**

Slide 9

**Where data can be easily “dragged and dropped” into the tool**

**Checked for completeness**

**And interactively interrogated by location or metric**

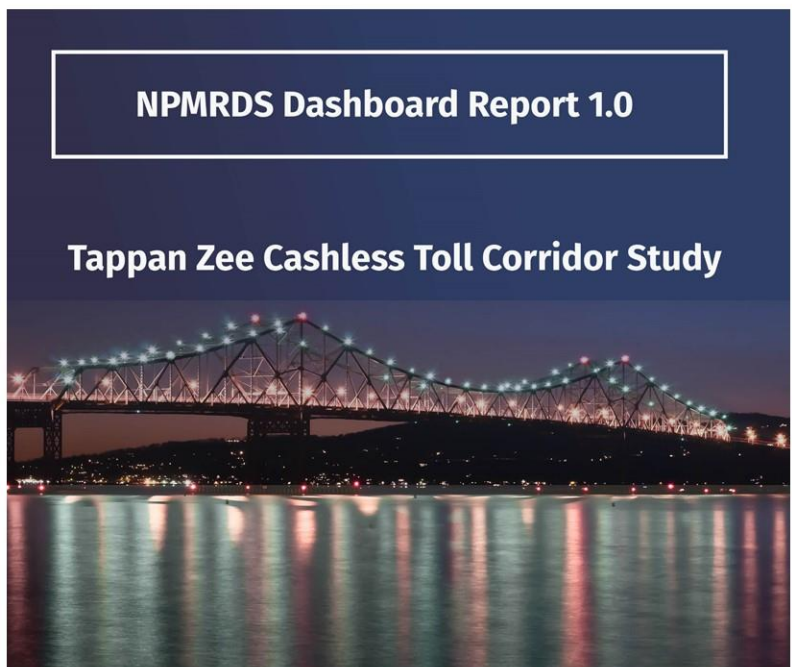


The screenshot displays a user interface for data management and analysis. At the top right, there is a section titled 'Upload New Data' with a dashed rectangular box for dropping files and a 'Click to Upload' button. Below this, a progress bar shows 10% completion, and the file name 'PA\_March\_S\_CAVC\_2015.txt' is listed with its status as 'Status:TMG Type:CLASS TMG Format:2001'. The main area of the interface is filled with various data visualizations: a grid of colored horizontal bars on the left, a map of a geographic area with a red location marker in the center, and a heatmap on the right showing a concentration of red and yellow colors. Below the heatmap are several small grid-like charts.

Slide 10

**NPMRDS Dashboard Report 1.0**

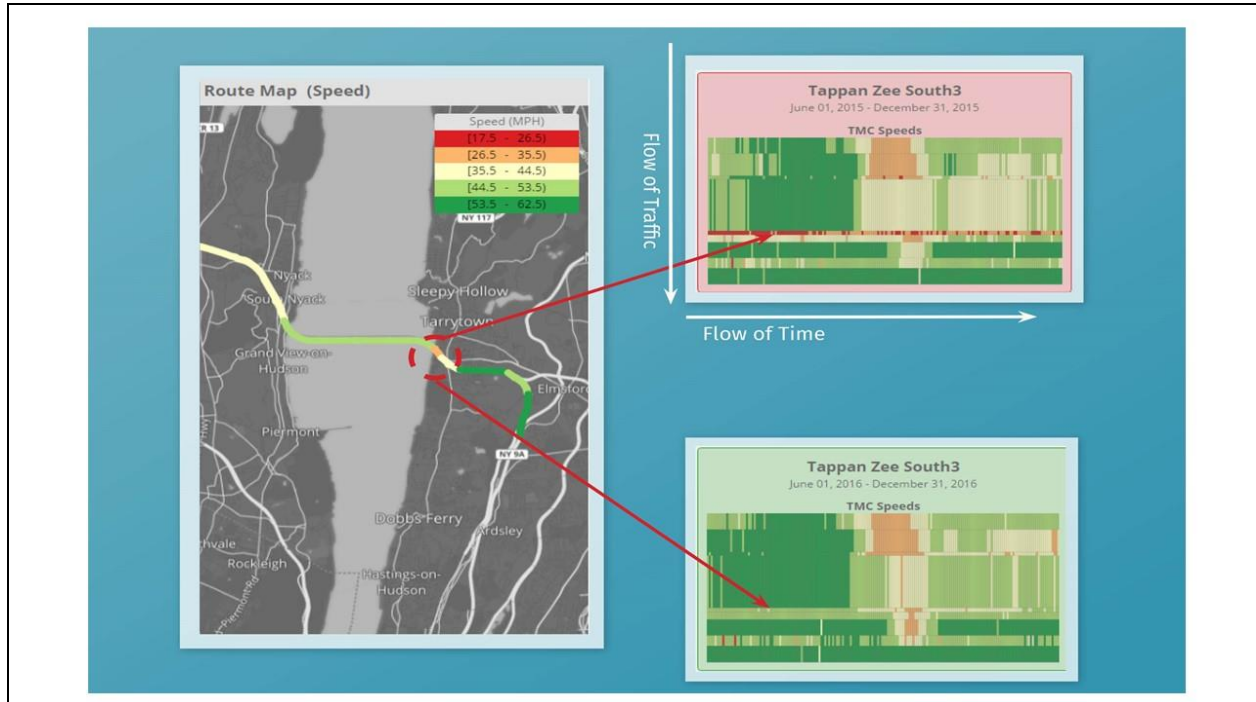
**Tappan Zee Cashless Toll Corridor Study**



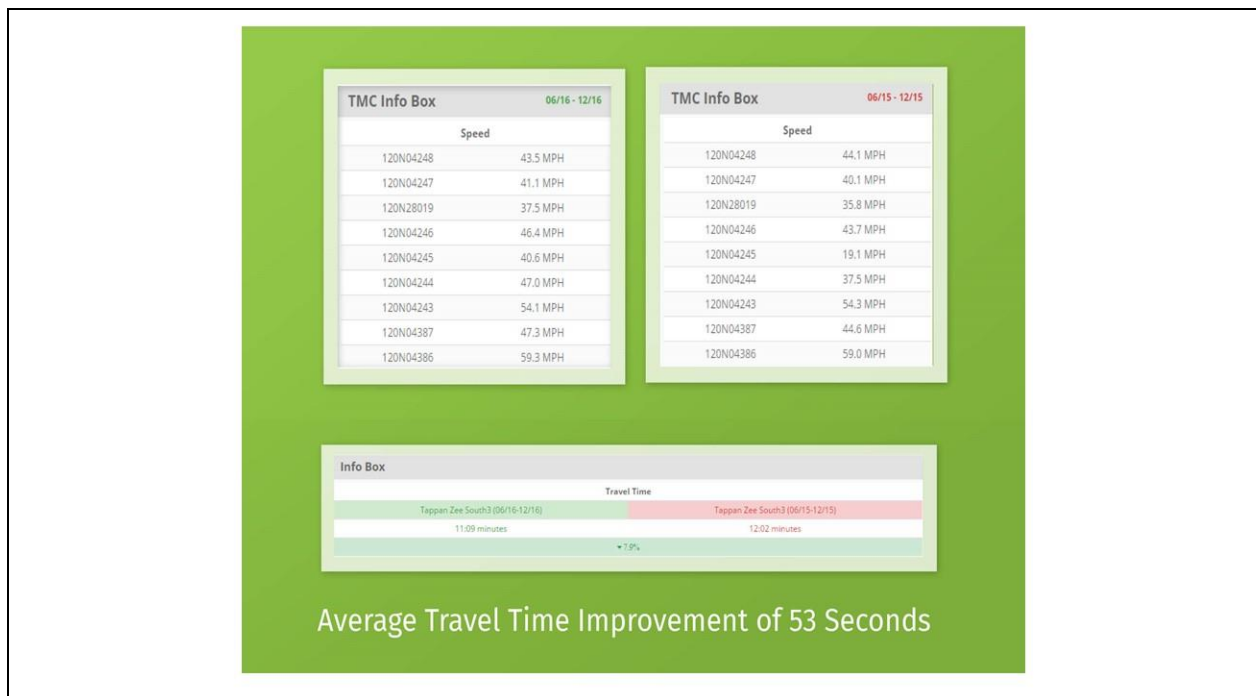
The cover image features a dark blue background with a white-bordered box at the top containing the text 'NPMRDS Dashboard Report 1.0'. Below this, the title 'Tappan Zee Cashless Toll Corridor Study' is written in white. The bottom half of the image shows a night-time photograph of the Tappan Zee Bridge, illuminated with lights that reflect on the water below.

Lawson, continued

Slide 11



Slide 12





**Lawson, continued**

Slide 13



**This data is as good as gold!!!!!!**

Slide 14

## **The Way Forward**

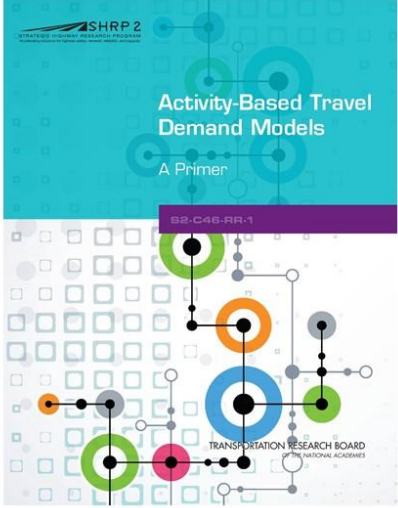
- **Strategic Approach to Data**
  - **Platform Options (e.g., APIs, tools)**
- **Intra-agency Integration**
- **Multi-agency Integration**
- **Regional Integration**
- **Micro- to Mega-scale Geographies**
- **Day Forward Trajectory –**

***Think about your data needs for tomorrow -  
TODAY!***

Lawson, concluded

Slide 15

## ***Recommended Reading***



**Check out Chapter 6 for guidance:**

- **Lack of Institutional Knowledge**
- **Staff Resources**
- **Consultant Assistance**
- **Interagency Coordination**

Slide 16

## ***And.....***

- **Produce University-level teaching materials in parallel with practice trajectory.**
- **Aim training at new hires, in addition to internal staff.**
- **Sponsor “exploration gardens” within Universities as data-oriented test-beds to conduct methodological evaluations.**
- **Consider Open Source and Open Data to accelerate progress.**

**Dr. Lily Elefteriadou – University of Florida**

Slide 1

**UF** Transportation Institute  
UNIVERSITY of FLORIDA

**DEVELOPING A TRANSPORTATION TESTBED IN GAINESVILLE, FLORIDA: FROM CONCEPT TO IMPLEMENTATION**

A Collaboration of UF, Florida Department of Transportation (FDOT), and the City of Gainesville

Lily Elefteriadou  
Director, UFTI

April 25, 2017



1

Slide 2

**UF** Transportation Institute

**Presentation Outline**

- Background
- GNV/UF Testbed - FDOT –funded Project
- Some Research Examples
- Timeline
- Discussion



2

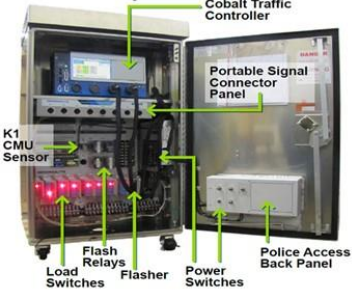
**Elefteriadou, continued**


Slide 3

UF
Transportation Institute

## Background

- Vehicles with various levels of autonomy and connectivity in the near future
- Communication technologies in transportation
- Other new technologies (for example, sensors and data analytics)





3



Slide 4

UF
Transportation Institute

## Testbed Concept

- UF, FDOT, CoG partnership
- Strong relevant research groups at UF
- Aligns well with UF strategic plan

- **FDOT-Funded Project:** Develop a plan for an advanced transportation technologies testbed at UF/City of Gainesville

4



**Elefteriadou, continued**

Slide 5

UF Transportation Institute

## FDOT Project Objectives

1. Literature and State-of-the-art Review
  - Published literature and reports
  - Other testbeds
  - Industry
2. Assist FDOT with Peer Exchange
  - Roadmap of a state research program in the context of emerging technologies
3. Develop a Roadmap
  - Implementation and operation of the testbed
  - Industry engagement


5

Slide 6

UF Transportation Institute

## Testbed Initiatives in Florida

- Florida’s Connected Vehicle Test Bed – Orlando  
 ITS World Congress Roadside Unit Deployment
- Tampa-Hillsborough Expressway Authority (THEA)  
 Connected Vehicle Pilot Deployment Program
- Advanced Driver Assistant Systems (ADAS)- District 7
- AV/CV/ITS Freight Applications (Perishable-goods delivery)- Miami
- Central Florida Automated Vehicle Partners - Florida  
 USDOT Automated Vehicle Proving Grounds
- Transportation Testbed in Gainesville – University of Florida  
 FDOT, UF AND COG



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**Elefteriadou, continued**

Slide 7

UF Transportation Institute

## Testbed Initiatives in the U.S. (1)



### Connected Vehicle Test Bed Initiatives

- MCDOT Test Bed for SMARTDrive - Arizona (Anthem)
- Connected Vehicle Test Bed - California (Palo Alto)
- Southeast Michigan Test Bed – Michigan (Oakland County)
- Inform CVII NYSDOT LIE Test Bed - New York (Long Island)
- New York World Congress VII Test Bed – New York
- Minnesota Connected Vehicle Pilot Deployment Project - Minnesota
- Turner-Fairbank Highway Research Center - Virginia (McLean)
- The Northern Virginia Connected Vehicle Test – Virginia (VCC)
- Denver E-470 Test / Denver Test Bed - Colorado

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Slide 8

UF Transportation Institute

## Testbed Initiatives in the U.S. (2)

### USDOT Automated Vehicle Proving Grounds

- Thomas D. Larson Transportation Institute (Pittsburgh) - Pennsylvania
- Texas AV Proving Grounds Partnership - Texas
- U.S. Army Aberdeen Test Center - Maryland
- American Center for Mobility (ACM) Willow Run, Ypsilanti - Michigan
- CCTA and GoMentum Station - California
- San Diego Association of Governments (Chula Vista) - California
- Iowa City Area Development Group - Iowa
- University of Wisconsin-Madison - Wisconsin
- Central Florida Automated Vehicle Partners - Florida
- North Carolina Turnpike Authority – North Carolina



8



**Elefteriadou, continued**


Slide 9

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### *Testbed Initiatives in the U.S. (3)*


**Connected Vehicle Pilot Deployment Program**

- City of Tampa – Florida
- New York City – New York
- Interstate Corridors - Wyoming



**International Efforts**

- Automotive Research and Testing Center (ARTC) – Taiwan
- Driving Implementation and Evaluation of C2X Communication Technology (Drive C2x) - Italy and EU
- AstaZero Proving Ground – Gothenburg, Sweden
- National Intelligent Connected Vehicle testing Demonstration base – Singapore
- Cetran – NTU, Singapore
- ...



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Slide 10

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### *University Driven Testbed Initiatives in North America*

- **CMU:** Township and Pittsburgh Test Bed – Pennsylvania
- **OSU:** SMOOTH – Ohio
- **UM:** M-City - Michigan
- **UM:** AACVTE - Michigan
- **Texas A&M:** Connected Vehicle Test Bed at the Riverside Campus – Texas
- **U Alberta and UBC:** ACTIVE-AURORA - Canada
- **VT:** Virginia International Raceway Test Bed - Virginia
- **VT:** Smart Road Connected-Vehicle Test Bed – Virginia
- **UF:** Transportation Testbed in Gainesville - Florida

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**Elefteriadou, continued**

Slide 11

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## Testbed-related Plans and Activities

- Data analytics platform
- Autonomous shuttle - pilot
- Sensor development
- Pedestrian, bicycle safety
- Connectivity
- Industry participation (IBM, Lyft, etc.)
- Workshop planned for May 3 on DSRC



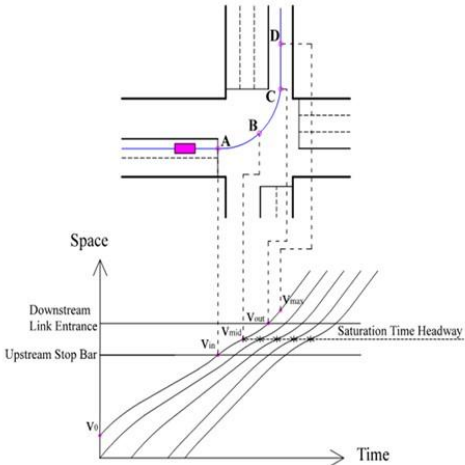

11

Slide 12

UF Transportation Institute

## Examples:

- Traffic management by optimizing AV trajectories
- Most important at bottlenecks (intersections, on-ramps, etc.)
- Optimization methods used to increase throughput and reduce delay



12

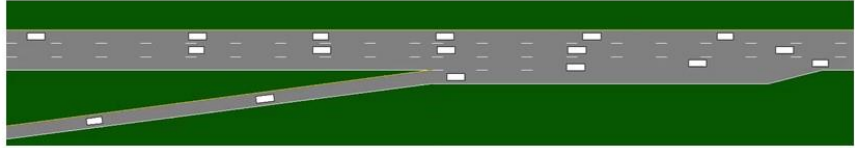
Elefteriadou, continued

Slide 13

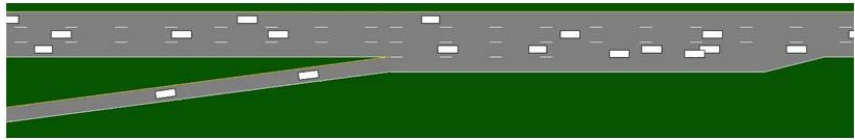
**UF** Transportation Institute

## Examples: Optimizing AV movement for freeways

**Autonomous Vehicles**



**Conventional Vehicles**



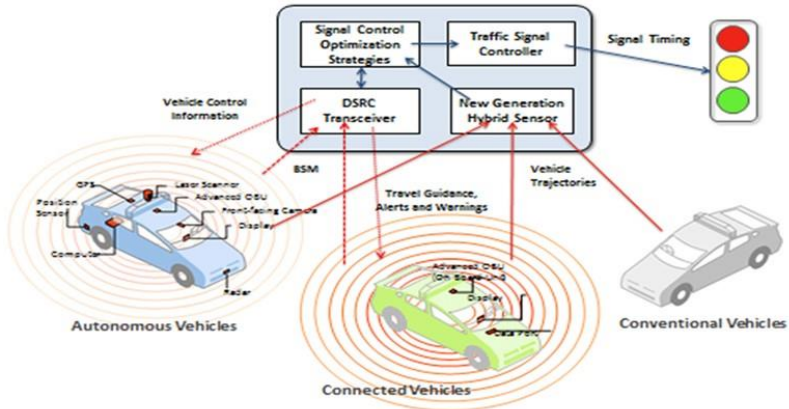
13

Slide 14

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## Examples: CPS: TTP Option: Synergy: Traffic Signal Control with Connected and Autonomous Vehicles in the Traffic Stream (NSF Award # 1446813)

Intelligent Intersection Control System



The diagram illustrates the Intelligent Intersection Control System. At the top, a central box contains 'Signal Control Optimization Strategies' and 'Traffic Signal Controller', which are linked to 'Signal Timing' (represented by a traffic light icon). Below this, 'DSRC Transceiver' and 'New Generation Hybrid Sensor' are connected to the central system. The system interacts with three types of vehicles: 'Autonomous Vehicles' (equipped with GPS, Laser Scanner, Advanced CPU, Proximity Camera, Display, Computer, and Radar), 'Connected Vehicles' (equipped with Advanced CPU, GPS, Display, and Position), and 'Conventional Vehicles'. Bidirectional communication is shown between the vehicles and the central system, with labels for 'Vehicle Control Information', 'BSM' (Basic Safety Message), 'Travel Guidance, Alerts and Warnings', and 'Vehicle Trajectories'.

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**Elefteriadou, continued**

Slide 15

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**Examples:**  
*Optimizing Traffic Signal Control AV and CV (NSF/FDOT)*

- Optimization algorithm completed with many simplifying assumptions
- Initial testing in Gainesville and TERL in Tallahassee
- DSRC communication established
- Working on fusion of radar/video/DSRC
- Planning closed course testing at the FDOT/TERL this spring.





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Slide 16

**UF** Transportation Institute

**Examples:**  
*New Driving Simulator*

- At Oak Hammock /Smart House
- Can simulate autonomous vehicles
- Can evaluate human subject reaction to, and use of various technologies and designs

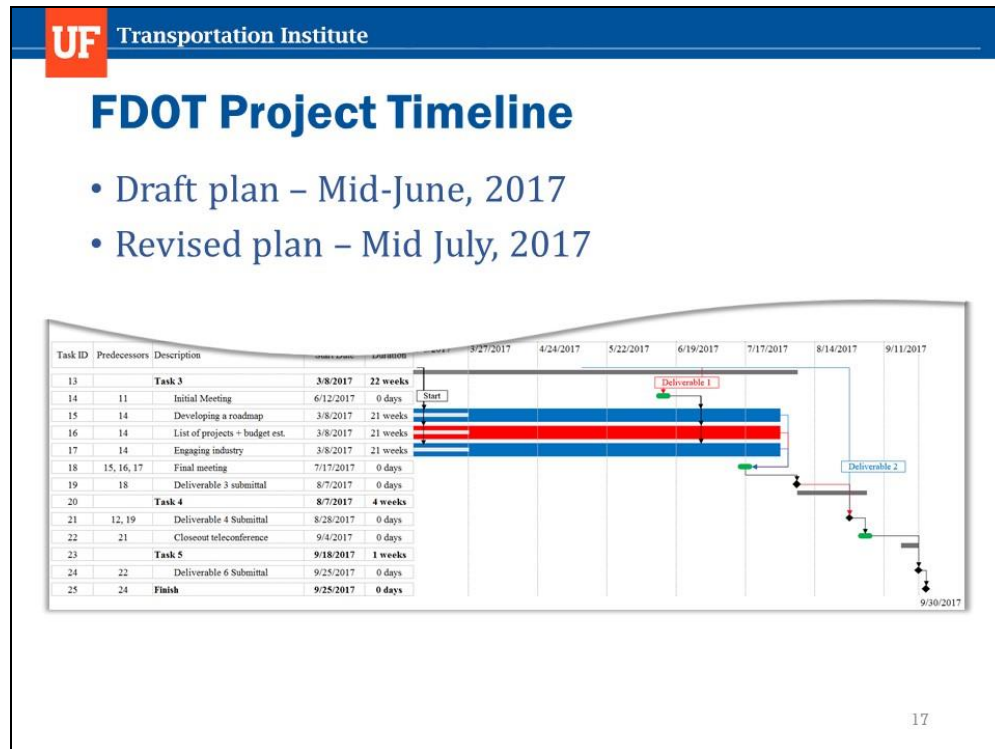



16



**Elefteriadou, continued**

Slide 17

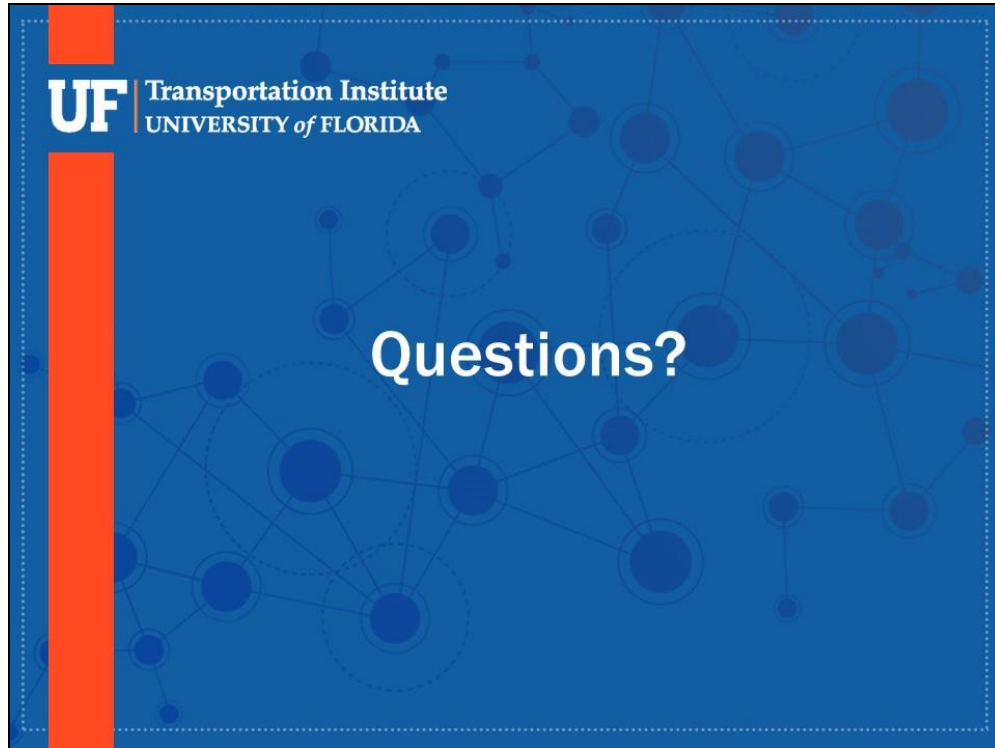


Slide 18

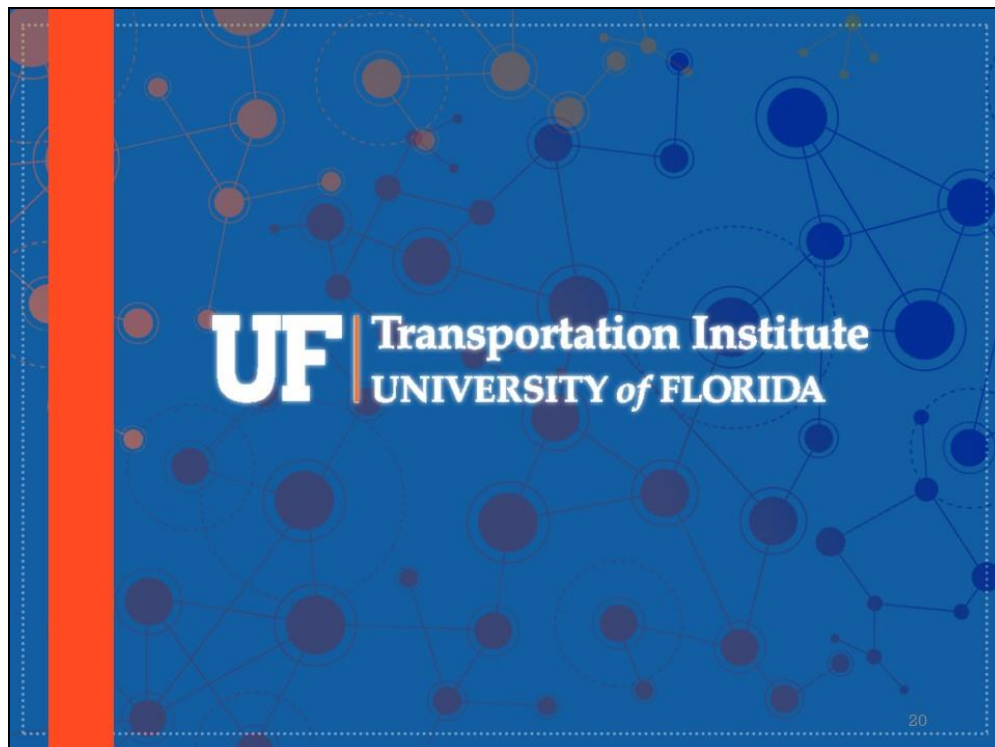


**Elefteriadou, concluded**

Slide 19



Slide 20





**James Lou – IBM**

Slide 1

Transforming Transportation Management with Cognitive ITS Infrastructure

IBM

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Slide 2

**Cognitive Transportation**

**From smarter to cognitive**

Smarter	Cognitive
<ul style="list-style-type: none"> <li>▪ Addresses predefined problems</li> </ul>	<ul style="list-style-type: none"> <li>▪ Addresses ambiguous problems</li> </ul>
<ul style="list-style-type: none"> <li>▪ Provides accurate and definitive answers</li> </ul>	<ul style="list-style-type: none"> <li>▪ Provides answers with a margin of error and learns</li> </ul>
<ul style="list-style-type: none"> <li>▪ Handles structured and unstructured information with known semantics</li> </ul>	<ul style="list-style-type: none"> <li>▪ Handles unstructured information without explicitly knowing semantics</li> </ul>
<ul style="list-style-type: none"> <li>▪ Interacts in formal digital means (e.g. commands, screens) with human users</li> </ul>	<ul style="list-style-type: none"> <li>▪ Interacts in natural language with human users</li> </ul>

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**Lou, continued**

Slide 3

**Cognitive Transportation**

**Cognitive Changes the Game...**

**UNDERSTAND**

**REASON**

**LEARN**

**INTERACT**

...taking smart transportation to a new level

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Slide 4

**Cognitive Transportation**

**Watson IoT is the new catalyst for Cognitive Transportation**

- ✓ Rapidly and securely connect devices
- ✓ Optimize operations and services
- ✓ Enable new business models
- ✓ Engage with citizens and stakeholders in new ways

The diagram illustrates the architecture of IBM Watson IoT Solutions. At the top, a row of icons represents various IoT applications: a truck, a car, a building, a car, an airplane, and a smartphone. Below this is the 'IBM Watson IoT Solutions' layer, which includes 'Operations' (with a central Watson logo), 'Services Development', and 'Connected Devices and Services'. The 'Operations' layer is further divided into 'Asset Performance', 'Facilities Mgmt', 'Health & Social Services', and 'Work Mgmt'. Below this is the 'IBM Watson IoT Platform' layer, which includes icons for a cloud, a database, a lock, a globe, and another cloud. At the bottom, various connected devices are shown: 'Networks' (a tower), 'Vehicles' (a car), 'Buildings' (a house), 'Environment' (a globe), and 'People' (a group of people). Arrows indicate the flow of data and services between these layers and devices.

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**Lou, continued**

Slide 5

Enterprise innovation is realized by integrating new technologies with existing core systems

**Systems of insight**  
Advanced analytics and cognitive computing systems that harness big data enabling competitive advantage for organizations

**Systems of engagement**  
Leverage mobile and social to transform relationships with customers, employees & citizens

**Systems of record**  
The traditional core systems such as accounting applications and product systems that record key internal data

**Pervasive Security Intelligence**  
A dynamic approach to threat reduction through a life cycle of prevention, detection and response

Cloud enables leaders to take a systematic approach to integrate these capabilities to drive enterprise innovation

Slide 6

**New Cognitive ITS Architecture**


- Existing IT architecture does not include the data platform
- Use cognitive platform for innovation (system of engagement) and as a data shock absorber
- Platform includes Cloud, Data, and Cognitive layers

Lou, continued

Slide 7

Cognitive Transportation

### Key Solution Components




- ✓ Tailored to individual client needs
- ✓ Easy, secure access to IoT platform
- ✓ Cognitive analytics
- ✓ Priced as OPEX rather than CAPEX
- ✓ Scalable and flexible
- ✓ Open for citizen/stakeholder developers
- ✓ Based on open standards

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Slide 8

### Watson IoT for Smart Transportation Management

Sensors, vehicles and 3rd-party sensor/device networks



IBM Watson IoT Platform




Weather

Mapping & Geofencing

Transportation specific data services

3<sup>rd</sup> party IoT platforms

Analytics & Applications



Intelligent Transportation Solutions

8

**Lou, continued**

*Slide 9*

Olli is a revolutionary concept for urban mobility solutions



- Olli is a self-driving, electric-powered mini-bus requiring no in-vehicle attendant to control him
- Olli is more than a vehicle, it will be an ecosystem as they will all be interconnected
- Olli is cognitive and passengers communicate with him through natural language
- Olli will have personality, he will know you and understand you
- Olli can transport people, cargo, deliver food and be extended to many applications


<http://meetolli.auto>

*Slide 10*

A NEW ERA FOR BUSINESS


## Cognitive brings it all together

Cognitive systems **understand, reason and learn:**




**Understand**

The ability to understand structured and unstructured data, text-based or sensory in context and meaning, at astonishing speed and volume.



**Reason**

The ability to form hypotheses, make considered arguments and prioritize recommendations to help humans make better decisions.



**Learn**

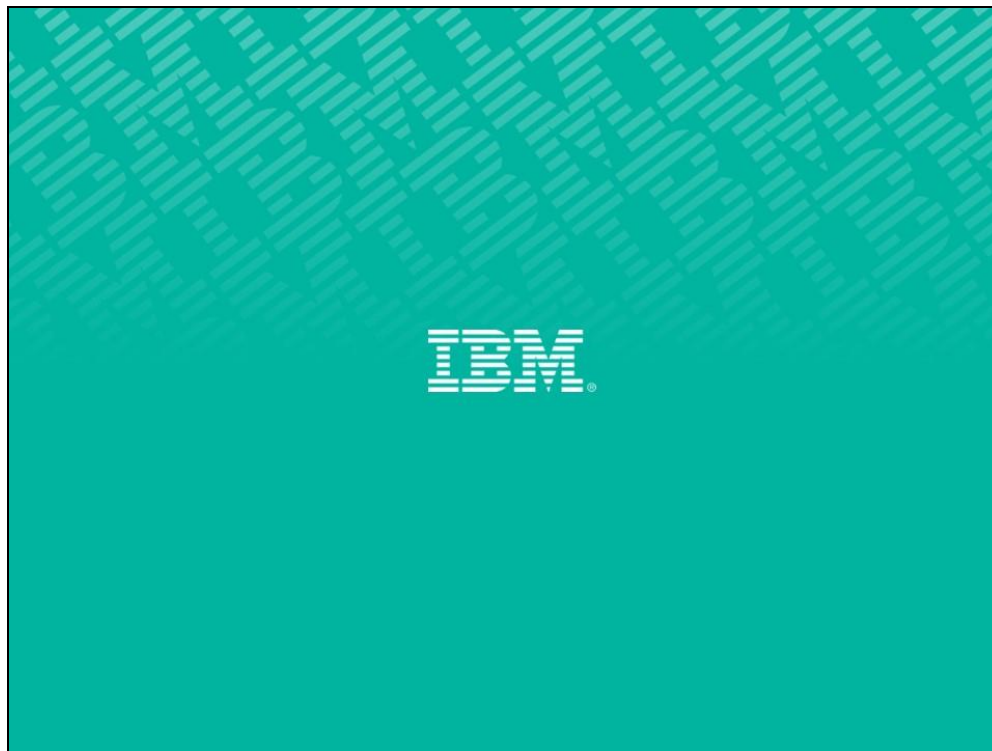
Ingest and accumulate data and insight from every interaction continuously. Trained, not programmed, by experts to enhance, scale and accelerate their expertise.

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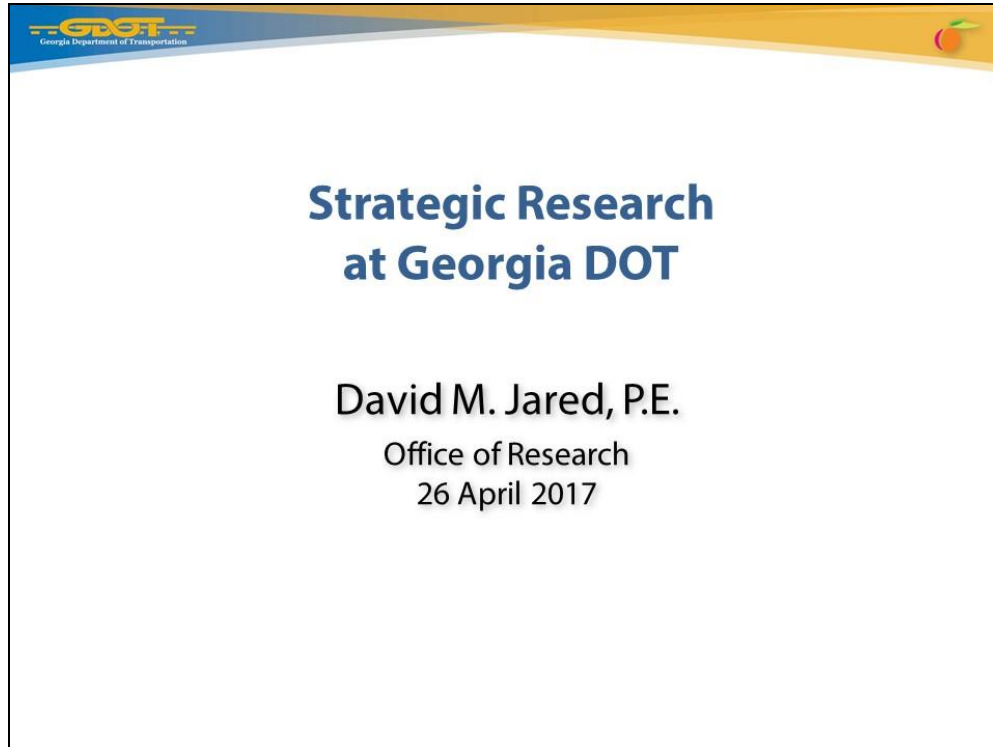
**Lou, concluded**

*Slide 11*



**David Jared – Georgia Department of Transportation**

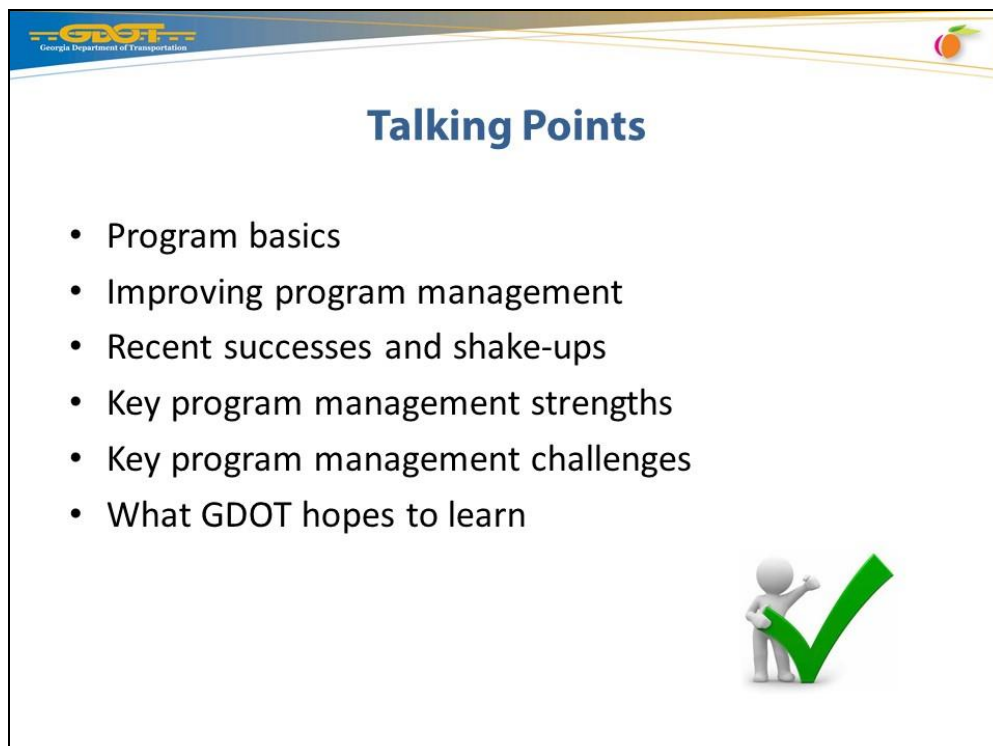
Slide 1



**Strategic Research  
at Georgia DOT**


David M. Jared, P.E.  
Office of Research  
26 April 2017

Slide 2



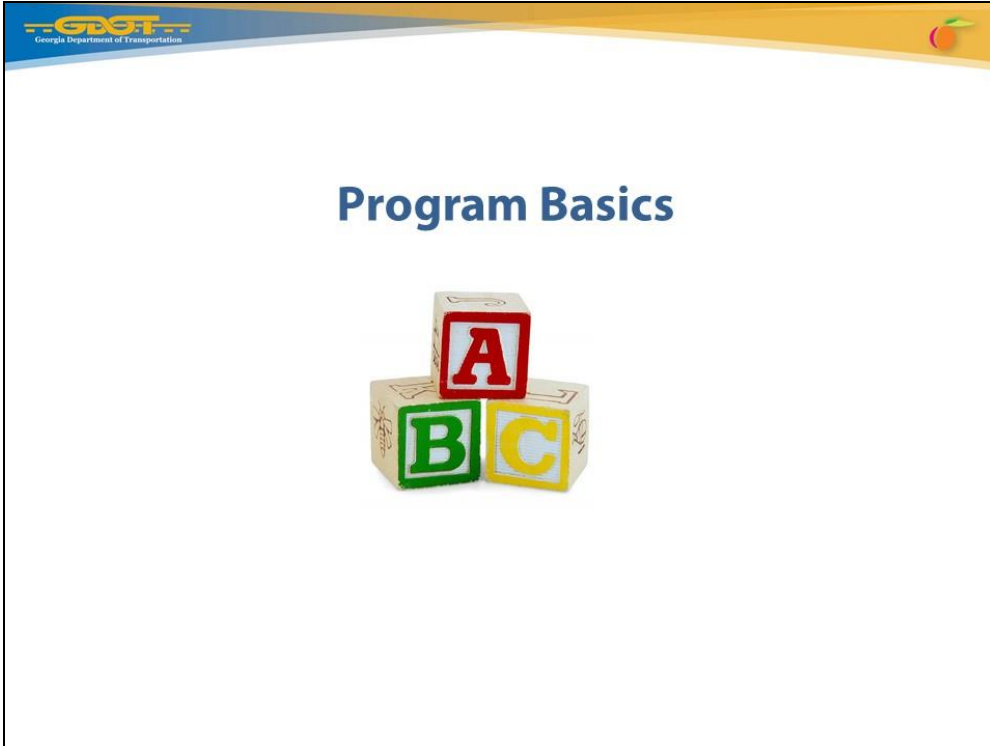
**Talking Points**

- Program basics
- Improving program management
- Recent successes and shake-ups
- Key program management strengths
- Key program management challenges
- What GDOT hopes to learn




**Jared, continued**

Slide 3

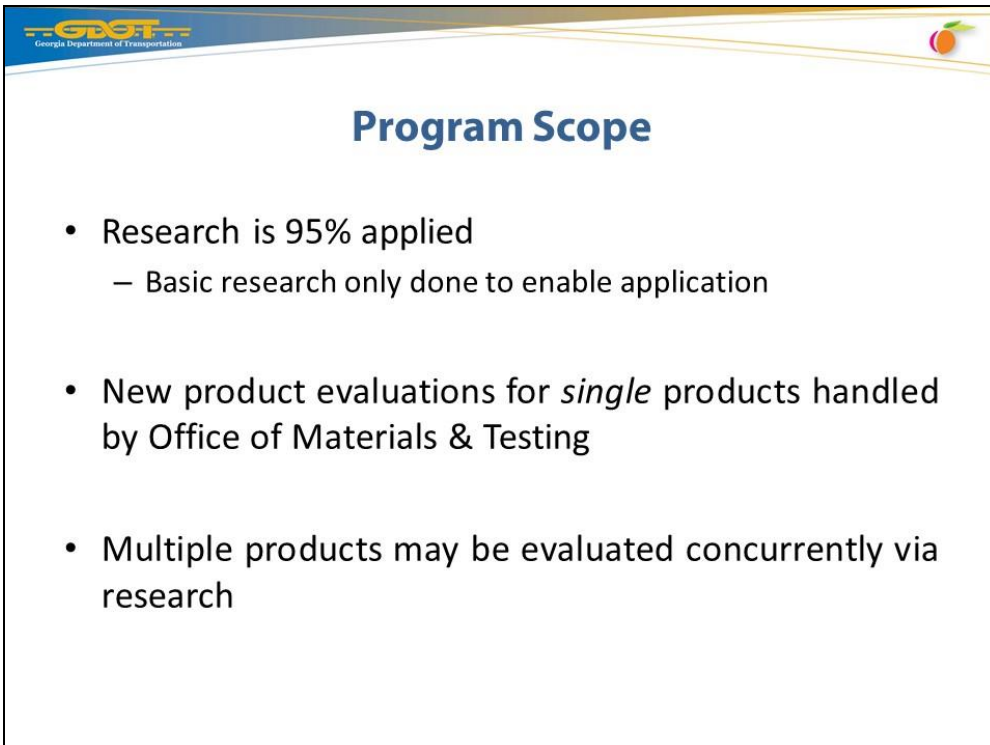


Slide 3 features a blue header with the GDOT logo and the text "Georgia Department of Transportation". A small orange and green logo is in the top right corner. The main content area is white and contains the title "Program Basics" in blue. Below the title is an illustration of three wooden blocks: a red block with the letter 'A' on top, and two blocks below it, one green with 'B' and one yellow with 'C'.

## Program Basics



Slide 4



Slide 4 features a blue header with the GDOT logo and the text "Georgia Department of Transportation". A small orange and green logo is in the top right corner. The main content area is white and contains the title "Program Scope" in blue. Below the title is a bulleted list of three items.

## Program Scope

- Research is 95% applied
  - Basic research only done to enable application
- New product evaluations for *single* products handled by Office of Materials & Testing
- Multiple products may be evaluated concurrently via research

Jared, continued

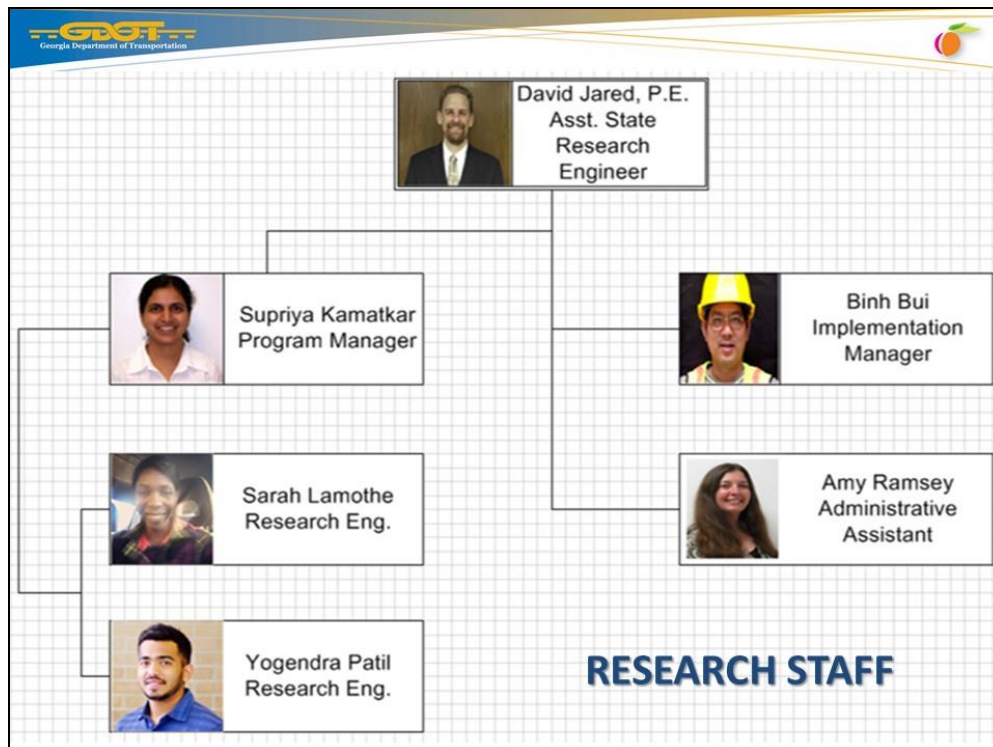
Slide 5



Slide 5 features the GDOT logo in the top left and a small graphic in the top right. The title "Program Scope (Cont.)" is centered in blue. Below the title is a bulleted list of four items.



- Manage contract research (59 core program projects)
- Manage GDOT’s national research activities
- Direct in-house research and conduct special studies
- Manage GDOT Library

Slide 6




**Jared, continued**

Slide 7






## Research Funding

- Primarily (but not exclusively) SP&R
- Other types
  - Preliminary engineering
  - Construction
  - Maintenance
  - Safety (Office of Traffic Operations)
  - Other agencies (USGS, GDNR)
- National programs (including LTAP)

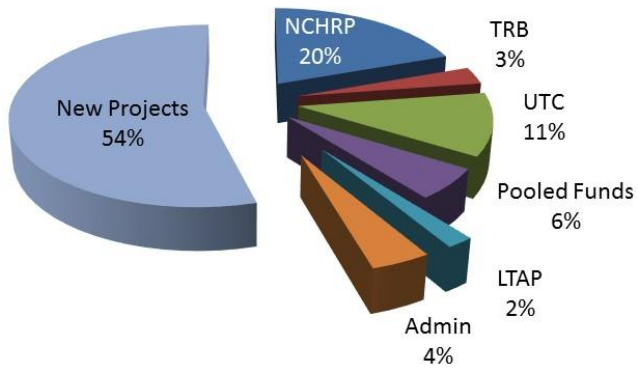


Slide 8

## Typical Research Funding Allocations

Federal Dollars Only



Category	Percentage
New Projects	54%
NCHRP	20%
UTC	11%
Pooled Funds	6%
Admin	4%
TRB	3%
LTAP	2%



Jared, continued

Slide 9

**What is Strategic Research?**

- Research aligned with GDOT strategic goals
- GDOT strategic goals
  - Making GDOT a better place to work will make GDOT a place that works better
  - Taking care of what we have in most efficient way possible
  - Planning and constructing best mobility-focused projects, on schedule
  - Making safety investment and improvements where traveling public most at risk



Slide 10

**Research Technical Advisory Groups**

The diagram features a central blue circle divided into four quadrants, each representing an RTAG. Yellow circular arrows in the center indicate a clockwise flow between the groups. Each quadrant is connected to a text box describing its primary focus:

- Policy/Workforce RTAG**: Making GDOT a better place to work will make GDOT place that works better
- Asset Management RTAG**: Taking care of what we have in most efficient way possible
- Mobility RTAG**: Planning and constructing best mobility-focused projects we can, on schedule
- Safety RTAG**: Making safety investments and improvements where traveling public most at risk

**Jared, continued**

Slide 11

**RTAG Responsibilities**

- Develop research need statements
- Technical oversight of active research projects
- Assist with implementation of active and completed research
  - Technical/Implementation Manager
- Meet at least twice a year

Slide 12

**Methods of Performing Research**

National Cooperative Highway Research Program (NCHRP)	
National issue	Long Term/ selected yearly
↓	
Transportation Pooled Fund (TPF) Program	
Regional issue	Long Term/other States needed
↓	
Georgia Transportation Institute-University Transportation Center	
Based on researchers expertise	Availability of researcher
↓	
Outside solicitation	
In accordance with FAR 35.007	

**Jared, continued**

Slide 13

Slide 13 features a header with the GDOT logo (Georgia Department of Transportation) and a small graphic of an orange. The main title is "Research Advisory Committee (RAC)". Below the title is a bulleted list of membership and roles.

- Membership
  - Chief Engineer (Chair)
  - Director of Organizational Performance Mgt. (Vice-Chair)
  - 10 division directors
  - Asst. State Research Engineer (Secretary)
  - FHWA Division Office Liaison (Advisory)
  
- Roles
  - Guidance and direction for OR and RTAG's
  - Approve research needs recommended by RTAG's
  - Review annual implementation report

Slide 14

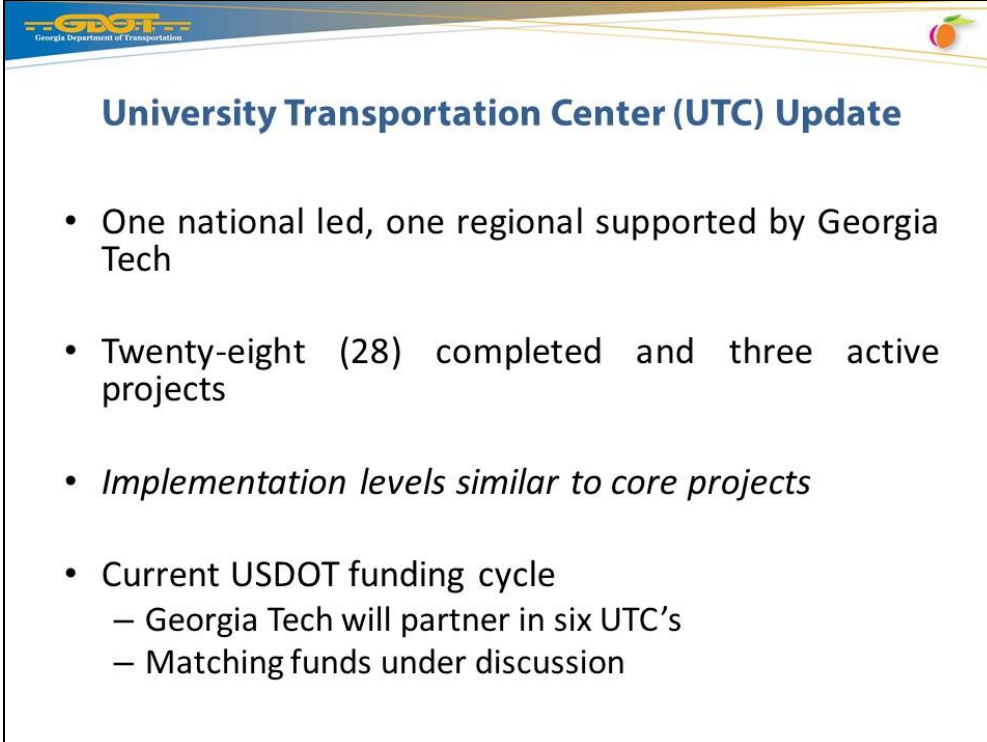
Slide 14 features a header with the GDOT logo (Georgia Department of Transportation) and a small graphic of an orange. The main title is "Georgia Transportation Institute". Below the title is a bulleted list of information and a map of Georgia with university logos.

- GDOT's primary research partner
  
- Consortium of state universities engaged in transportation research
  
- Members: 11 (3 HBCU's)
  
- Promotes education and workforce development

A map of the state of Georgia is shown on the right side of the slide. Overlaid on the map are logos for several universities: Southern Polytechnic Institute, Georgia State University, Georgia Tech, Mercer University, Georgia Southern University, and Albany State University. The University of Georgia logo is also present in the upper right corner of the map area.

**Jared, continued**

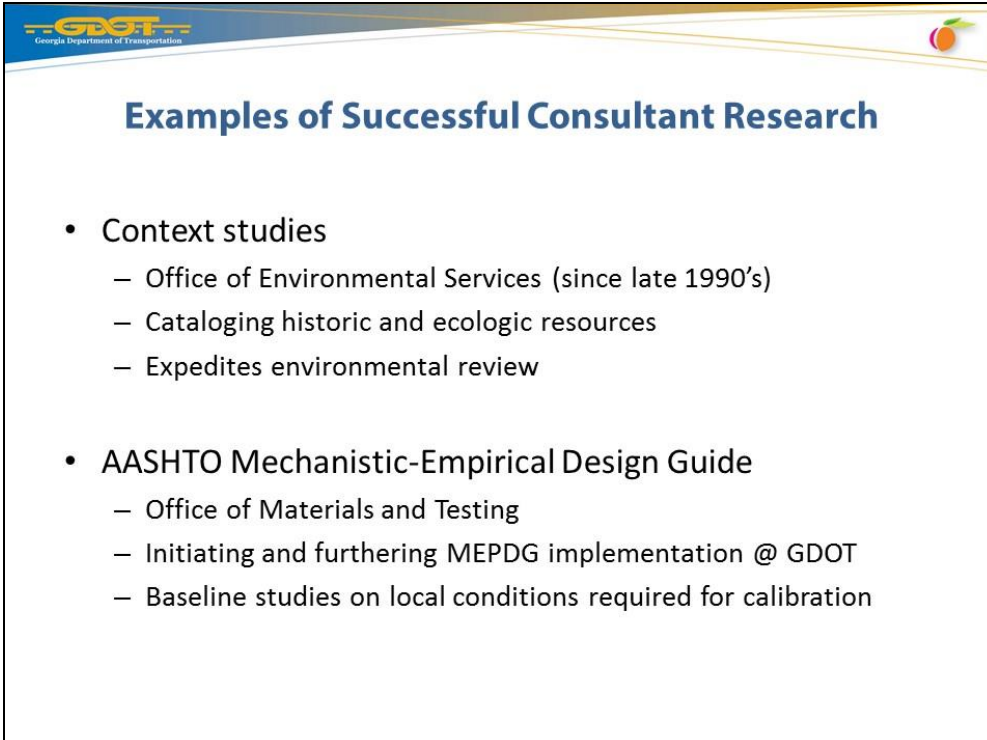
## Slide 15



**University Transportation Center (UTC) Update**

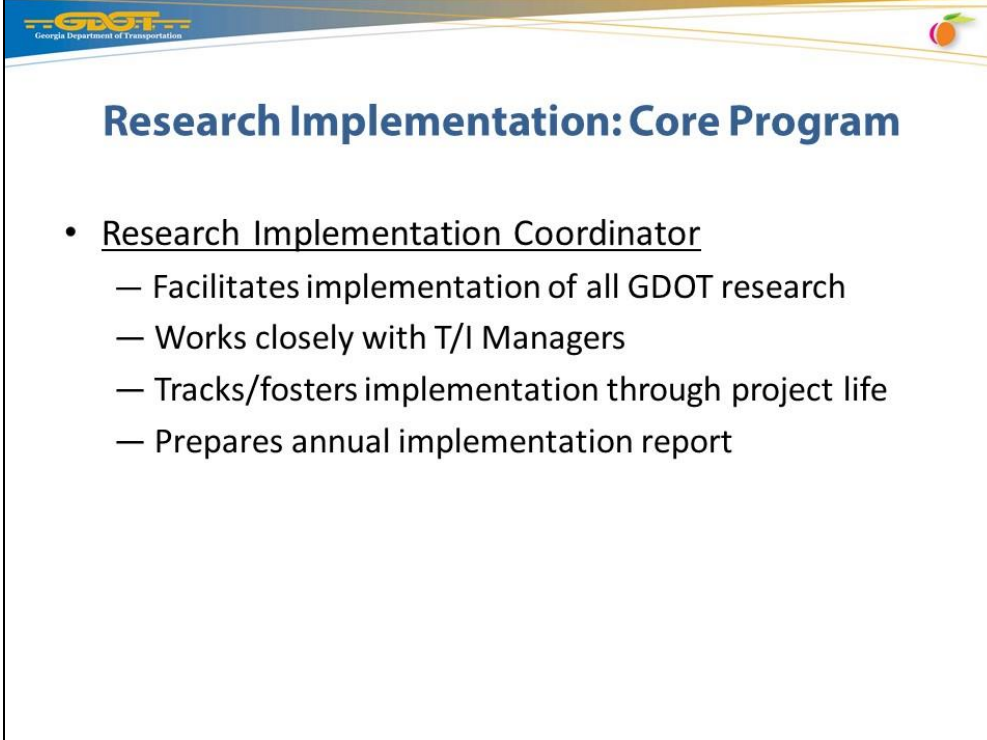
- One national led, one regional supported by Georgia Tech
- Twenty-eight (28) completed and three active projects
- *Implementation levels similar to core projects*
- Current USDOT funding cycle
  - Georgia Tech will partner in six UTC's
  - Matching funds under discussion

## Slide 16



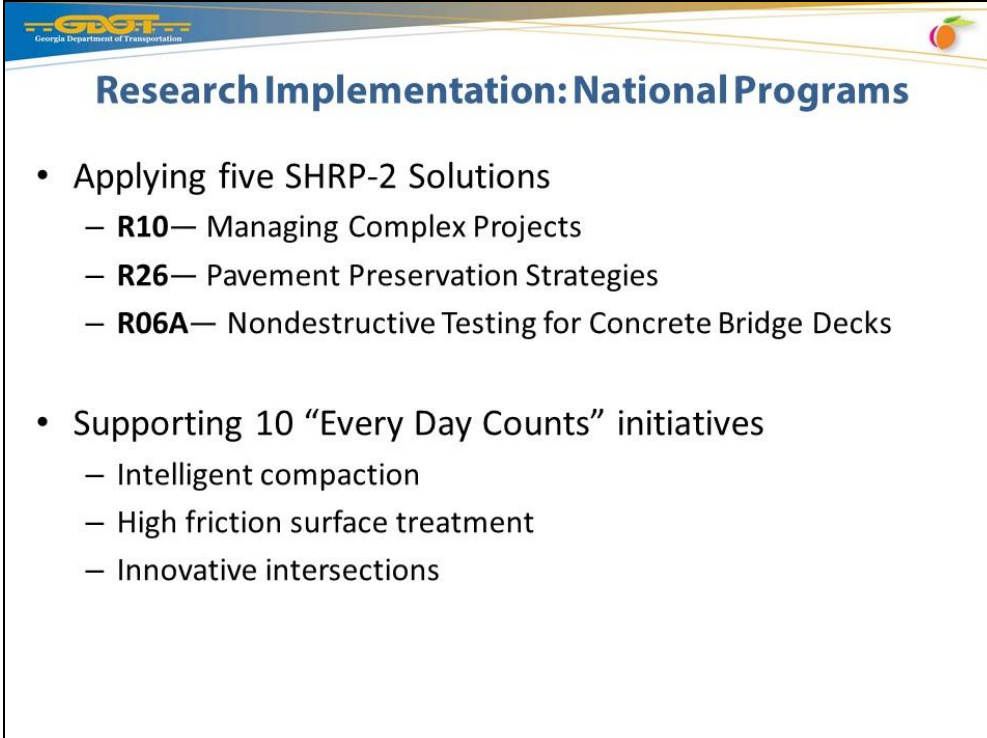
**Examples of Successful Consultant Research**

- Context studies
  - Office of Environmental Services (since late 1990's)
  - Cataloging historic and ecologic resources
  - Expedites environmental review
- AASHTO Mechanistic-Empirical Design Guide
  - Office of Materials and Testing
  - Initiating and furthering MEPDG implementation @ GDOT
  - Baseline studies on local conditions required for calibration

**Jared, continued***Slide 17*

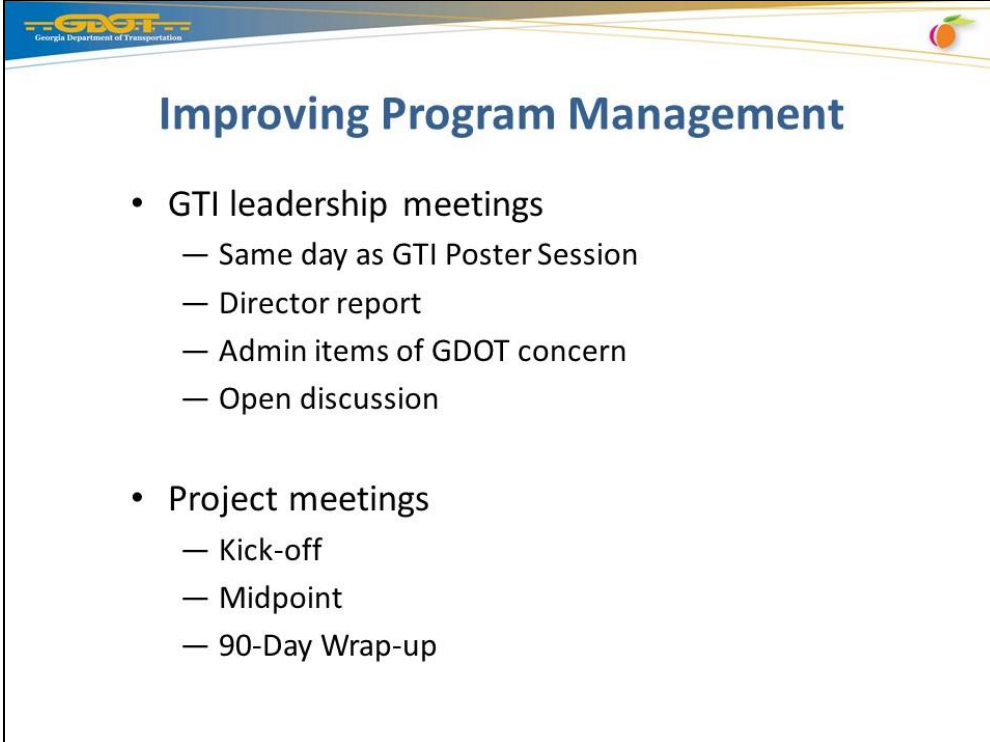
**Research Implementation: Core Program**

- Research Implementation Coordinator
  - Facilitates implementation of all GDOT research
  - Works closely with T/I Managers
  - Tracks/fosters implementation through project life
  - Prepares annual implementation report

*Slide 18*

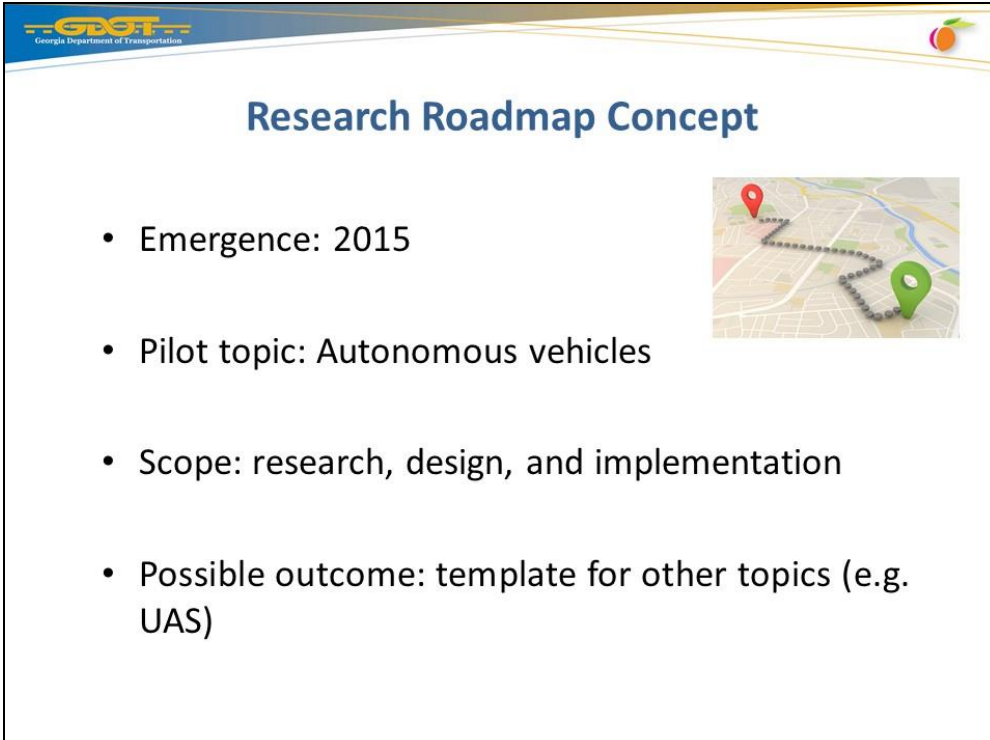
**Research Implementation: National Programs**

- Applying five SHRP-2 Solutions
  - **R10**— Managing Complex Projects
  - **R26**— Pavement Preservation Strategies
  - **R06A**— Nondestructive Testing for Concrete Bridge Decks
- Supporting 10 “Every Day Counts” initiatives
  - Intelligent compaction
  - High friction surface treatment
  - Innovative intersections


**Jared, continued***Slide 19*

## Improving Program Management

- GTI leadership meetings
  - Same day as GTI Poster Session
  - Director report
  - Admin items of GDOT concern
  - Open discussion
- Project meetings
  - Kick-off
  - Midpoint
  - 90-Day Wrap-up

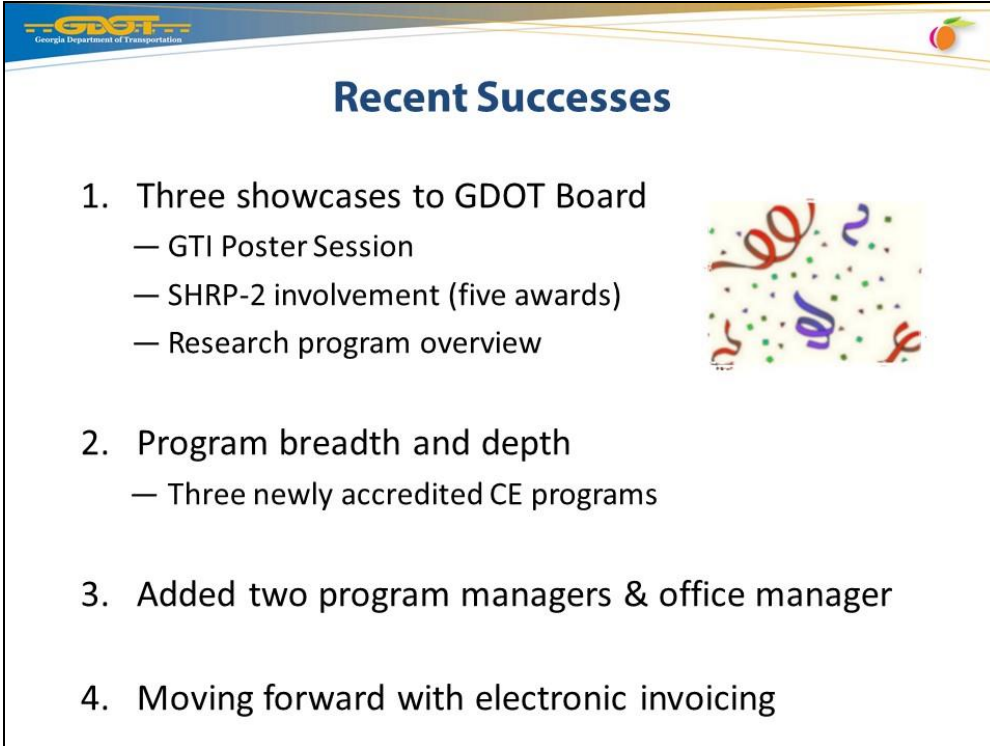
*Slide 20*

## Research Roadmap Concept



- Emergence: 2015
- Pilot topic: Autonomous vehicles
- Scope: research, design, and implementation
- Possible outcome: template for other topics (e.g. UAS)

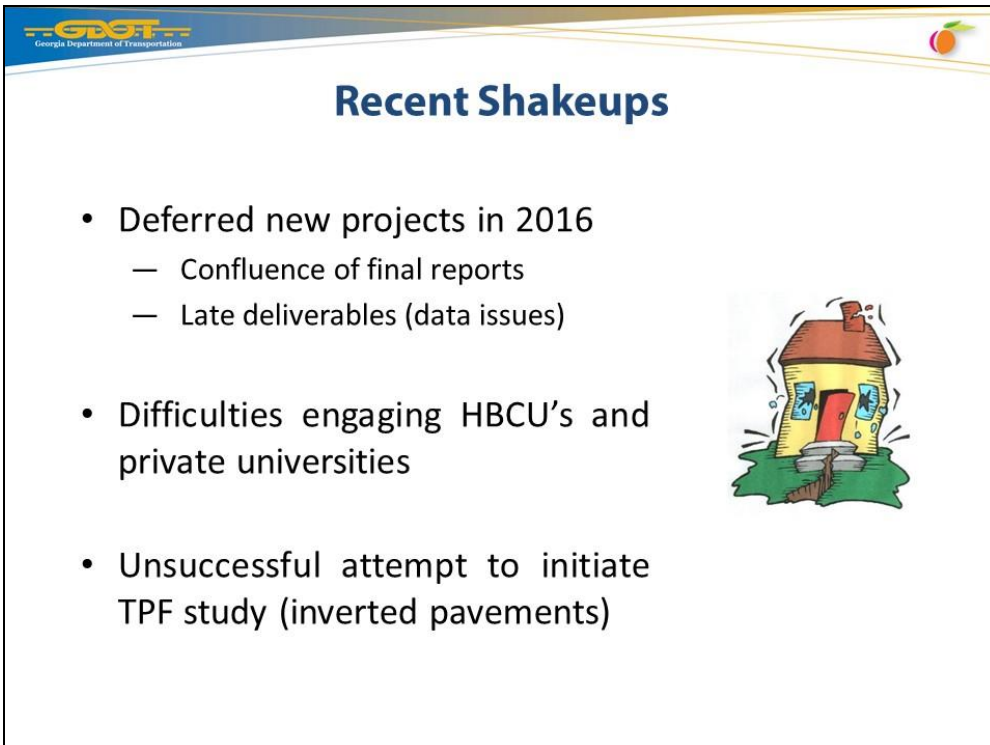


**Jared, continued***Slide 21*

Slide 21 features a blue header with the GDOT logo and the text "Georgia Department of Transportation". The main title is "Recent Successes" in blue. The content is a numbered list of four items, with a celebratory confetti graphic to the right of the first item.

### Recent Successes

1. Three showcases to GDOT Board
  - GTI Poster Session
  - SHRP-2 involvement (five awards)
  - Research program overview
2. Program breadth and depth
  - Three newly accredited CE programs
3. Added two program managers & office manager
4. Moving forward with electronic invoicing

*Slide 22*

Slide 22 features a blue header with the GDOT logo and the text "Georgia Department of Transportation". The main title is "Recent Shakeups" in blue. The content is a bulleted list of three items, with a cartoon illustration of a house being shaken by a hammer to the right of the first two items.

### Recent Shakeups

- Deferred new projects in 2016
  - Confluence of final reports
  - Late deliverables (data issues)
- Difficulties engaging HBCU's and private universities
- Unsuccessful attempt to initiate TPF study (inverted pavements)



**Jared, continued***Slide 23*

## Key Program Management Strengths


1. Strong agency-wide support
2. Experienced leadership
3. Breadth of academic partners
4. Robust budget
5. Implementation focus and strategy

*Slide 24*

## Key Program Management Challenges

1. Work-staff balance
2. Timeliness/quality of deliverables
3. New civil engineering programs
4. Old civil engineering programs
5. UTC workload and administration



<http://www.photo-dictionary.com>

**Jared, concluded**

Slide 25

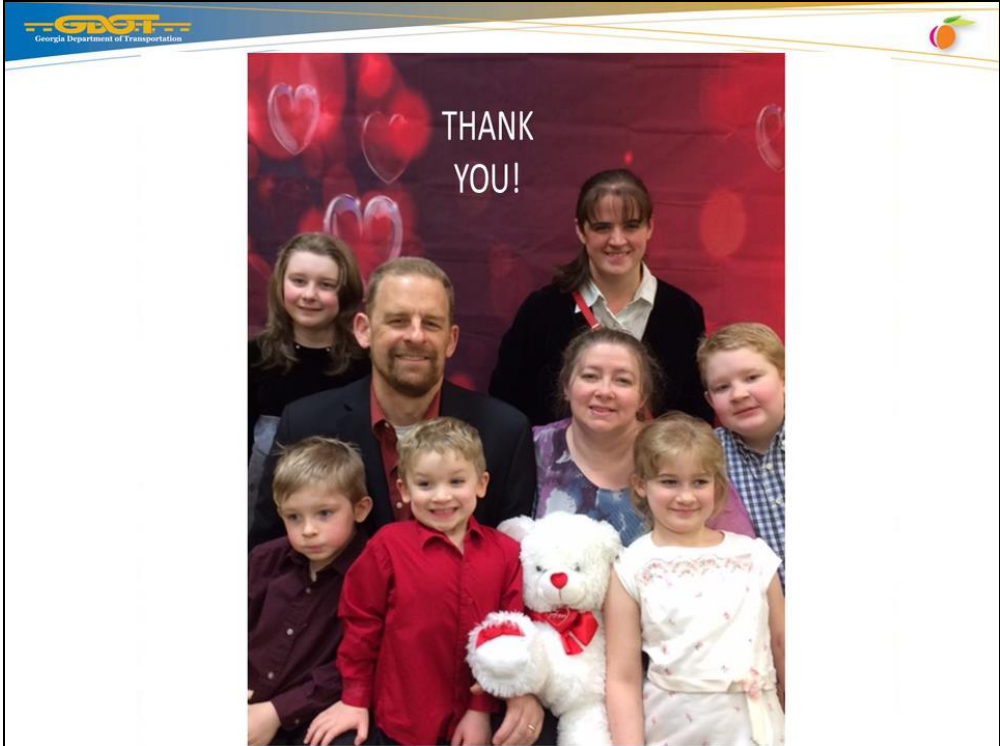


Slide 25 features a blue header with the GDOT logo (Georgia Department of Transportation) on the left and a small orange and green icon on the right. The main title is "What GDOT Hopes to Learn" in bold blue text. Below the title is a numbered list of five items. To the right of the list is a cartoon illustration of a man's head with a surprised expression, his hand raised near his ear as if listening.

### What GDOT Hopes to Learn

1. Program/project management tools
2. Research roadmap concepts
3. Roadmap success(es)
4. Ways to overcome data challenges
5. Innovative staffing options

Slide 26



Slide 26 features a blue header with the GDOT logo (Georgia Department of Transportation) on the left and a small orange and green icon on the right. The main content is a photograph of a group of seven people (three adults and four children) smiling. A white teddy bear is in the foreground. The background of the photo is red with white hearts. The text "THANK YOU!" is overlaid in white capital letters on the upper part of the photo.

THANK YOU!

**Joe Horton – California Department of Transportation**

Slide 1



The Caltrans Research Process

**Joe Horton, Chief**  
 Office of Safety Implementation and Cooperative Research  
 Caltrans Division of Research, Innovation  
 and System Information  
 April 2017



Slide 2



Division of Research, Innovation and System Information (DRISI)



- DRISI Purpose and Services
- Research Program
  - Research Services
  - Governance and Development
  - Research Roadmaps
  - Research Prioritization
  - Emerging Technologies

**Horton, continued**

Slide 3



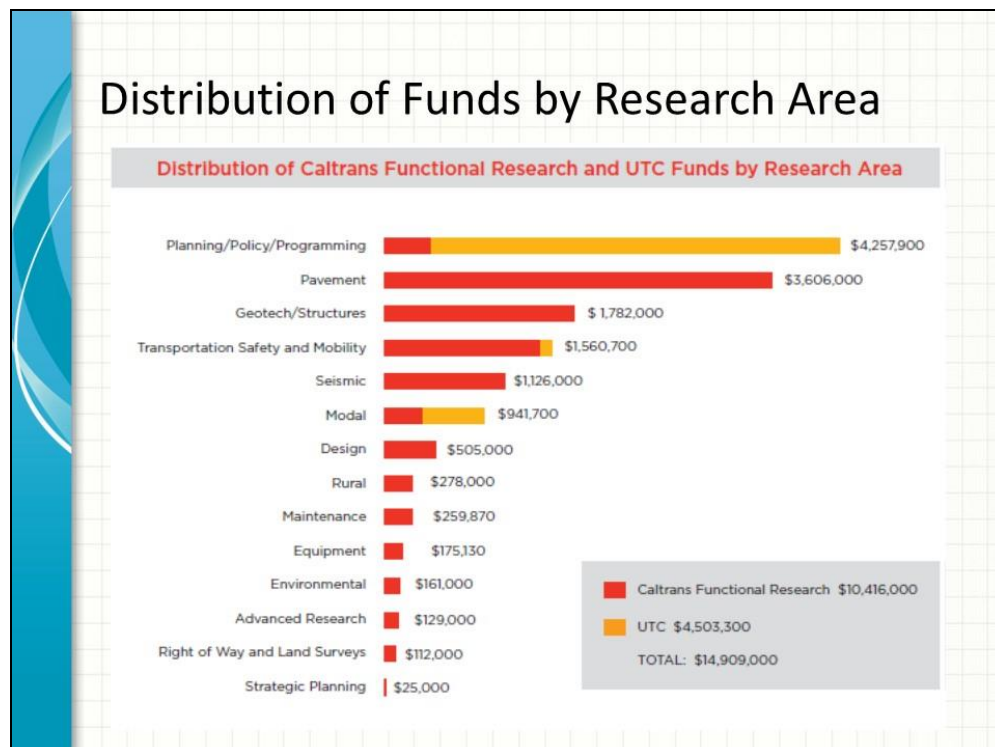
“We provide a safe, sustainable, integrated and efficient transportation system to enhance California’s economy and livability.”



Provide solutions and knowledge that improve California’s transportation system

- Research
- Information and Data Services


Slide 4





Horton, continued


Slide 5



## Research Services

<p><b>Conduct preliminary investigations and best practice research</b></p>	<p><b>Support the innovation needs of Caltrans practitioners</b> <i>(Emerging Technologies)</i></p>
<p><b>Deliver research products</b></p> <ul style="list-style-type: none"> <li>• From the idea stage to implementable product</li> </ul>	<p><b>Serve as national engagement liaisons</b></p> <ul style="list-style-type: none"> <li>• Transportation Research Board, Cooperative Research Programs, US DOT, etc.</li> </ul>

Slide 6



## Research Program Governance

Membership	Function
<p><b>Executive Board</b></p>	<p>Director Chief Deputy Director Deputy Directors District Directors</p> <ul style="list-style-type: none"> <li>• Set Caltrans strategic research direction</li> <li>• Help ensure implementation of research products</li> </ul>
<p><b>Research and Deployment Advisory Committee (RDAC)</b></p>	<p>Division Chiefs, Deputy District Directors</p> <ul style="list-style-type: none"> <li>• Recommend research priorities and funding allocation among research programs</li> <li>• Actively sponsor deployment of research products</li> </ul>
<p><b>Program Steering Committee (PSC)</b></p>	<p>Division Chiefs of contributing Divisions; District representatives and external partners, as appropriate to the program category</p> <ul style="list-style-type: none"> <li>• Adopt roadmaps for multi-year integrated research program</li> <li>• Develop program-level research priorities</li> <li>• Support deployment of research products</li> </ul>
<p><b>Technical Advisory Panel (TAP)</b></p>	<p>Technical experts from Divisions, Districts, DRISI, and external partners</p> <ul style="list-style-type: none"> <li>• Suggest, review, and rank problems and Preliminary Investigation requests</li> <li>• Identify deployment opportunities</li> </ul>



**Horton, continued***Slide 7*

## Research Development

- Caltrans does research to support Caltrans Programs
  - Research is customer Focused
  - Research Tasks are tied to the goals of Caltrans and the user Divisions
- Supported by Research Centers
  - UC Berkeley (PATH and PEER)
  - UC David (AHMCT and UCPRC)
  - Caltrans supports the Centers to provide researchers who are familiar with Caltrans processes.

*Slide 8*

## Research Roadmaps

- Each PSC develops a Research Roadmap
  - Adopt roadmaps for multi-year integrated research program
  - Develop program-level research priorities
- Each roadmap varies by Research Complexity
  - Pavement uses an extensive roadmap since research results tend to build on previous research
  - Maintenance roadmaps tend to be shorter term evaluations of new equipment or potential business practice changes
  - See examples

**Horton, continued***Slide 9*

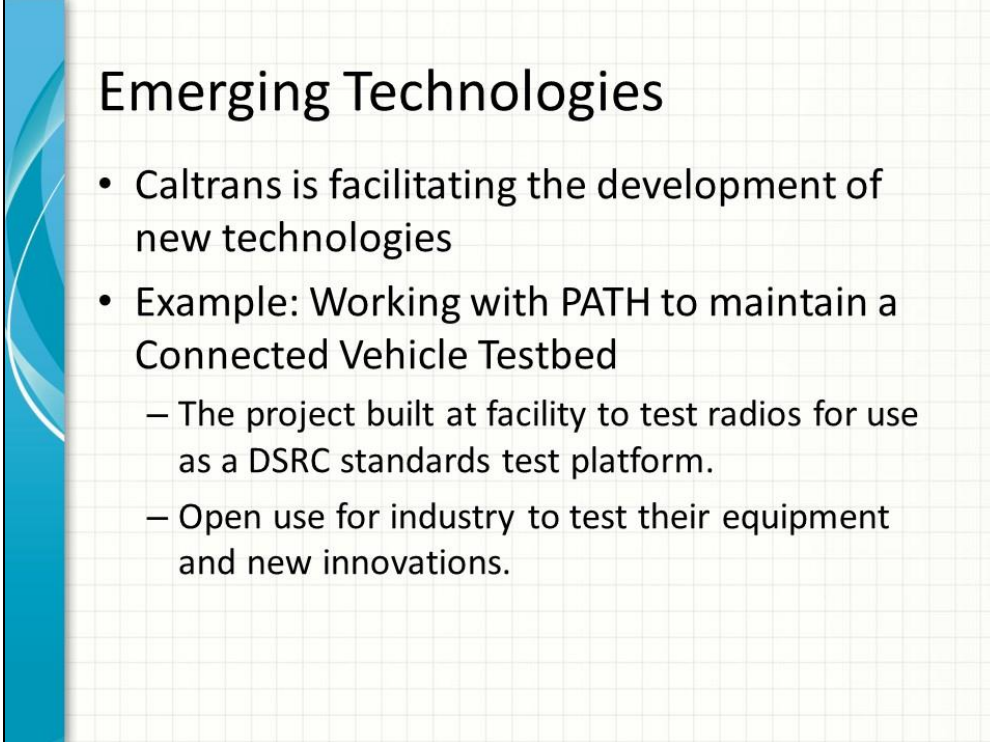
## Research Prioritization

- The Caltrans Executive Board tasked DRISI to prioritize research based on our Strategic Plan.
- This year, DRISI developed a methodology to evaluate the new research requests called the Research Prioritization Methodology (RPM)
  - Designed to evaluate the merit of new research based on its potential to help Caltrans achieve its five strategic goals.
  - Scoring is based on the usefulness of the proposed research meeting the twelve fundamental objectives corresponding to the five Caltrans strategic goals.
- Caltrans held a Peer Exchange this year to get comments on the RPM
- Process is ongoing (See Examples)

*Slide 10*

## Emerging Technologies

- Caltrans is finding that research is not keeping up with emerging technologies
  - Divisions want to incorporate new technology into their business practices
  - Instead of starting research tasks, DRISI has started to use tech transfer concepts to showcase new technology to our customers
- **Example: Automated Vehicle Location (AVL) Technology**
  - Caltrans hosted a workshop in October 2016
  - Brought experts from across the US and Canada to share their accomplishments with Caltrans Equipment and Maintenance Staff
  - Caltrans staff now adopting the lessons learned into Caltrans business practices
- **Side Benefit:** These events lead to the development of future research needs where there are gaps in available technology

**Horton, concluded***Slide 11*A presentation slide with a light blue grid background and a decorative blue wave graphic on the left side. The title "Emerging Technologies" is in a large, bold, black font. Below the title is a bulleted list of three items. The first item is "Caltrans is facilitating the development of new technologies". The second item is "Example: Working with PATH to maintain a Connected Vehicle Testbed", which has two sub-bullets: "– The project built at facility to test radios for use as a DSRC standards test platform." and "– Open use for industry to test their equipment and new innovations.".

## Emerging Technologies

- Caltrans is facilitating the development of new technologies
- Example: Working with PATH to maintain a Connected Vehicle Testbed
  - The project built at facility to test radios for use as a DSRC standards test platform.
  - Open use for industry to test their equipment and new innovations.

*Slide 12*A presentation slide with a light blue grid background and a decorative blue wave graphic on the left side. The text "Thank You!" is centered in a large, bold, blue font. Below it is a horizontal line, followed by the URL "http://www.dot.ca.gov/hq/research/" in a smaller black font. In the bottom right corner is the Caltrans logo, which consists of a stylized blue "CT" above the word "Caltrans" in a smaller font.

## Thank You!

<http://www.dot.ca.gov/hq/research/>



**Sue Sillick – Montana Department of Transportation**

Slide 1

**Research Roadmaps:  
Communication, Coordination, and  
Collaboration**

Florida DOT Peer Exchange

Sue Sillick  
MDT

April 25, 2017

**RESEARCH PROGRAMS**

**MONTANA MDT DEPARTMENT OF TRANSPORTATION**

Slide 2

**Montana Department of Transportation**

- ★ **Mission:**
  - ★ Serve the public by providing a transportation system and services that emphasize quality, safety, cost effectiveness, economic vitality and sensitivity to the environment.
- ★ **Biennial Goals**
- ★ **TranPlanMT**
  - ★ In Development
  - ★ Provide some strategic direction for MDT

**RESEARCH PROGRAMS**

**MONTANA MDT DEPARTMENT OF TRANSPORTATION**



**Sillick, continued**

Slide 3

## MDT Research

- ★ TranPlanMT: May provide some strategic direction for Research
- ★ New Solicitation, Prioritization, and Selection Process
  - ★ Impetus: Change in funding of projects
  - ★ Defined Terms & What Research is not
  - ★ Defined Research Project Categories
    - ★ Administration High Priority
    - ★ Partnering Projects (e.g., TPFs and AASHTO TSPs)
    - ★ Small Projects
    - ★ Standard Projects




**RESEARCH PROGRAMS**




Slide 4

## Solicitation, Prioritization, and Selection Process

- ★ Stage 1: Research Idea Form (March)
- ★ Stage 2: Research Topic Statement form (April)
  - ★ Field for Priority Focus Area(s), but...None Selected Yet
  - ★ Feasibility, Probability of Success, & Risk
  - ★ Urgency, Importance, & Expected Benefits/Pay-Off
  - ★ Implementability



**RESEARCH PROGRAMS**






**Sillick, continued**

Slide 5

**Solicitation, Prioritization, and Selection Process**

- ★ Partnering Project Funding Request, Annual Evaluation, & Close-Out Evaluation Forms
- ★ Champion Presentations to RRC (May)
- ★ Individual Projects Funded/Set Asides (Small Projects & Partnering Projects ) Determined (June)
- ★ Technical Panels Formed
  - ★ Develop Scope
  - ★ Recommend Proposals for Funding
  - ★ Oversee Projects




Slide 6

**Roadmaps and Communication, Coordination, & Collaboration (CCC)**





**Sillick, continued**

Slide 7

**Roadmaps and Communication,  
Coordination, & Collaboration (CCC)**

- ★ Barriers
  - ★ Decentralized Funding
  - ★ Focus on “me”
  - ★ Different Visions & Priorities
  - ★ Time Investment
  - ★ Lack of comfort/training on process
  - ★ Research is not their day job
  - ★ Reactive/Lack of Strategic Thinking




Slide 8

**Roadmaps and Communication,  
Coordination, & Collaboration (CCC)**

- ★ Players
  - ★ AASHTO Committees
  - ★ Associations
  - ★ Federal, State & Local
  - ★ TRB Committees
  - ★ Universities/CUTC




**Sillick, continued**

Slide 9

## Roadmaps and Communication, Coordination, & Collaboration (CCC)

- ★ Tools
  - ★ RIP & TRID: Over 300 records on Research Roadmaps
  - ★ RPPM: Setting the Research Agenda  
[rppm.transportation.org](http://rppm.transportation.org)
    - ★ Strategic Research Documents
    - ★ Unfunded & Partially Funded Research Needs
  - ★ TRB RNS




**RESEARCH PROGRAMS**

Slide 10

## Roadmaps and Communication, Coordination, & Collaboration (CCC)

- ★ Mechanisms
  - ★ AASHTO-TRB Committee Connections
    - ★ AASHTO & TRB CRCC Making Connections
  - ★ AASHTO Committee Meetings
  - ★ TRB Committees via CRC/C
  - ★ TRB Sections & Groups
  - ★ TRB Annual Meeting Workshops/Sessions
  - ★ CUTC Meetings




**RESEARCH PROGRAMS**

**Sillick, continued**

Slide 11

## Roadmaps and Communication, Coordination, & Collaboration (CCC)

- ★ Mechanisms
  - ★ Examples/Case Studies
    - ★ Concrete Pavement Research Roadmap
    - ★ SHRP/SHRP 2
    - ★ Individual States
    - ★ International
- ★ Funding
  - ★ TPFs
  - ★ CRPs
  - ★ Congress



**RESEARCH PROGRAMS**



Slide 12

## Roadmaps and Communication, Coordination, & Collaboration (CCC)

Can we move forward?  
How do we move forward?



**RESEARCH PROGRAMS**



**Sillick, concluded**

Slide 13

**Thank you!**

**Contact**  
Sue Sillick  
ssillick@mt.gov  
406.444.7693

**RESEARCH PROGRAMS**

MONTANA  
**MDT**  
DEPARTMENT OF TRANSPORTATION



## April Blackburn – Florida Department of Transportation

Slide 1

**FDOT ROADS**  
RELIABLE, ORGANIZED, ACCURATE DATA SHARING

**Florida Department of TRANSPORTATION**

# Research Peer Exchange

The goal of the ROADS Initiative is to improve data reliability and simplify data sharing across FDOT to have readily available and accurate data to make informed decisions.

April 26, 2017

Slide 2

## Information Technology Strategic Plan

**FDOT Mission**  
The Department will provide a safe transportation system that ensures the mobility of people and goods, enhances economic prosperity and preserves the quality of our environment and communities.

**Information Technology Strategic Initiatives**

<b>Enterprise Information Technology Governance</b>	<b>Enterprise Information Management</b>	<b>Uniform Information Technology Standards</b>
<b>Establish effective governance to develop, maintain and protect FDOT's information assets</b>	<b>Improve decision making with an enterprise view of all information</b>	<b>Assess, develop, deploy, and support all technology using consistent standards and methodologies</b>
<b>Key Tasks</b>	<b>Key Tasks</b>	<b>Key Tasks</b>
<ul style="list-style-type: none"> <li>Develop a program charter defining roles, responsibilities and decision authorities</li> <li>Inventory existing governance tools and methods</li> <li>Identify gaps in needed governance methods and tools</li> <li>Align resources to implement governance structure</li> <li>Provide support for enterprise governance implementation / Communicate to ensure interested parties are informed and heard</li> <li>Engage in continuous process improvement</li> </ul>	<ul style="list-style-type: none"> <li>Develop a program charter defining roles, responsibilities and decision authorities</li> <li>Inventory existing information assets and sources</li> <li>Identify met and unmet information needs</li> <li>Recommend information architecture framework</li> <li>Develop policies, procedures and information architecture framework implementation plan</li> <li>Execute implementation plan</li> <li>Provide program management, communications, and change management support</li> </ul>	<ul style="list-style-type: none"> <li>Develop a program charter defining roles, responsibilities and decision authorities</li> <li>Inventory existing IT standards and protocols (i.e., formal and informal standards)</li> <li>Determine additional and enhanced IT standards needed by the Department</li> <li>Collaborate across the enterprise to develop, enhance, and formalized IT standards</li> <li>Communicate and implement new standards</li> <li>Develop and implement process to ensure standards remain current</li> </ul>

**Support Strategic Initiatives through effective Communications Program, Organizational Change Management, and Project Management.**

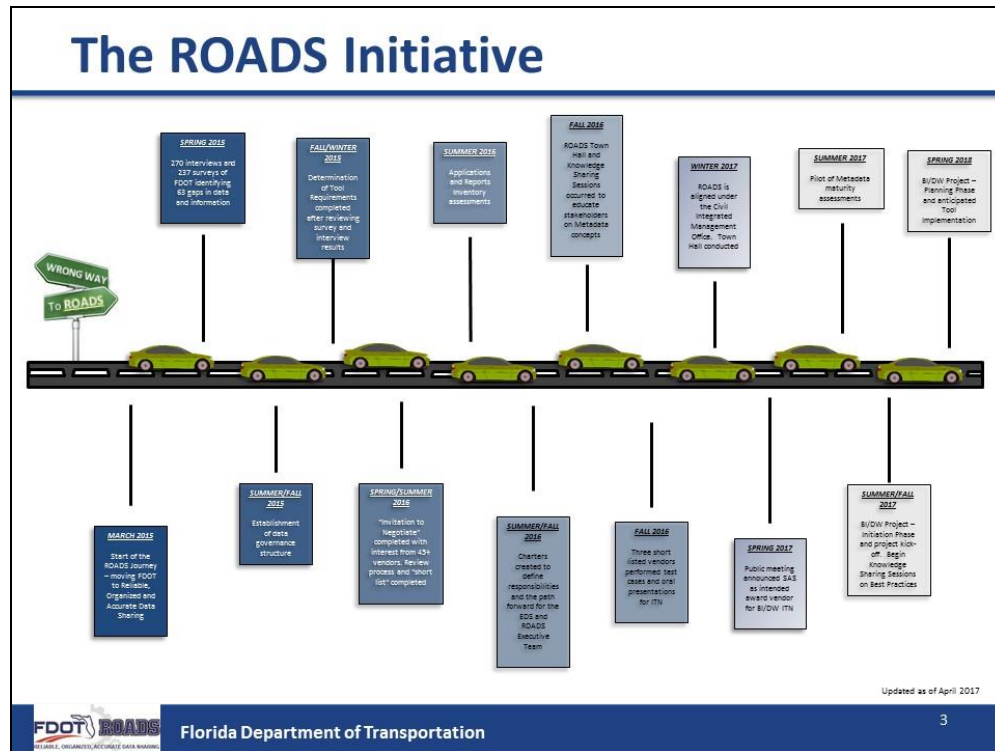
**IT Improvement Initiatives**  
Continue to identify and implement critical OIT initiatives such as mobile technology standards development, systems and enterprise architecture definition and documentation, and enterprise infrastructure documentation.

**FDOT** Florida Department of Transportation

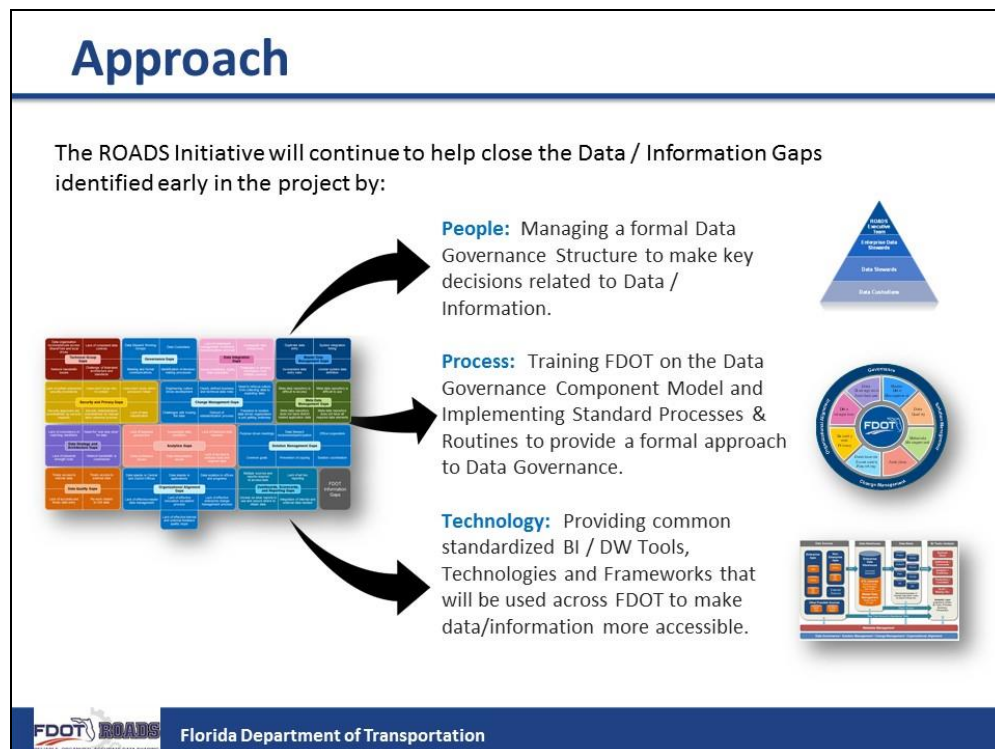
2

Blackburn, continued

Slide 3

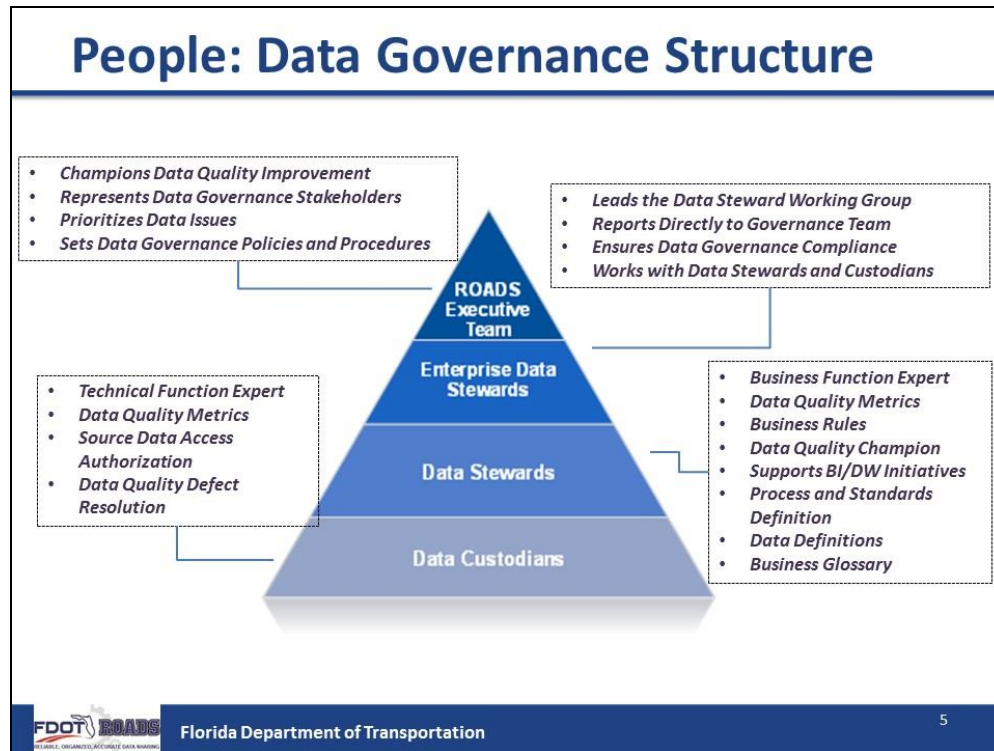


Slide 4

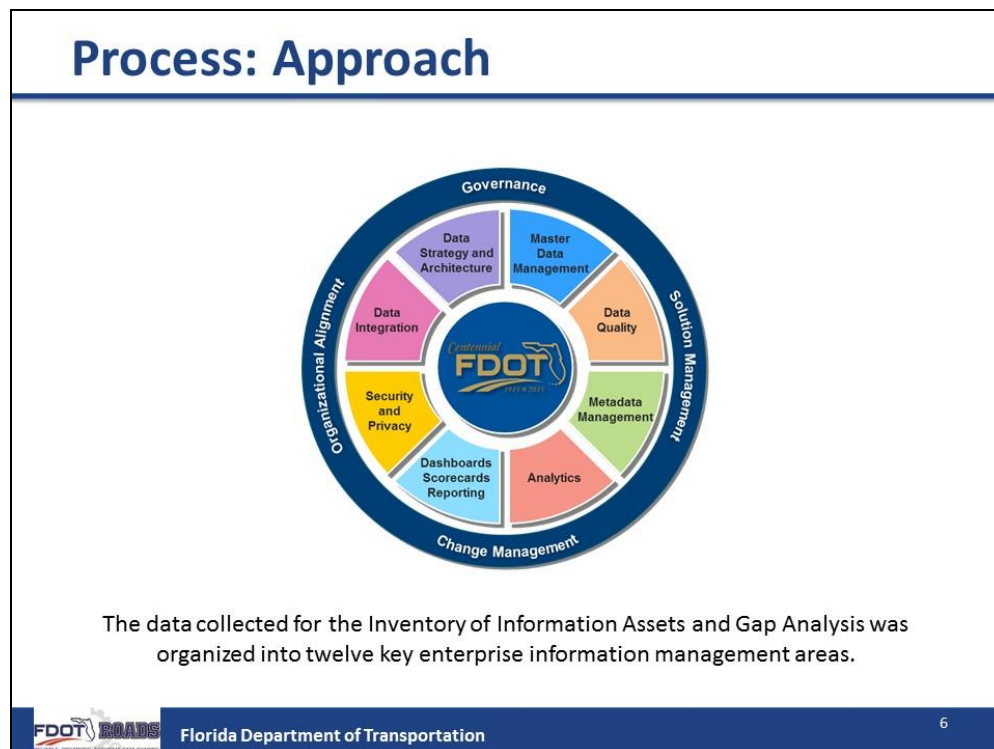


**Blackburn, continued**

Slide 5



Slide 6




**Blackburn, continued**


Slide 7

## Technology: Tools

- Our intended awarded vendor who will be our strategic partner for implementing tools to support our ROADS Efforts is SAS.



- The tool set includes:
  - Metadata Management
  - Extract, Transform & Load tools
  - Data Quality tools
  - Reporting tools
- We are working on the final contract now and plan to start the implementation of the project July 2017



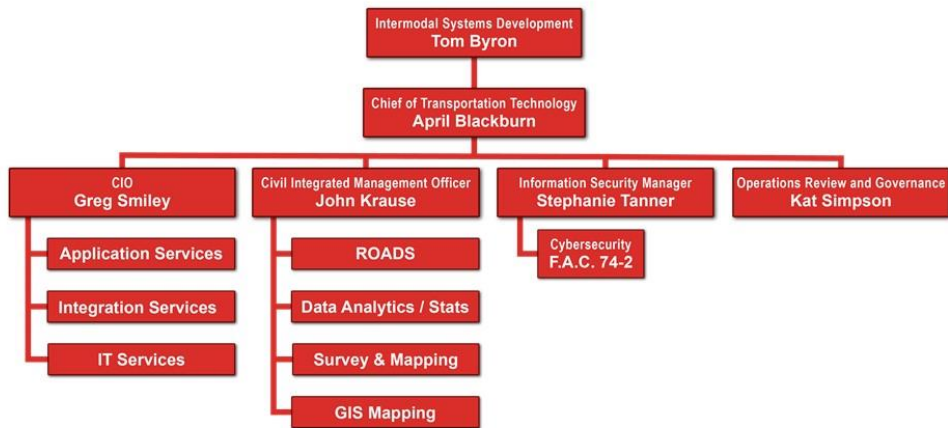
Florida Department of Transportation

7

Slide 8


## Transportation Technology Office

### TRANSPORTATION TECHNOLOGY OFFICE



```

graph TD
    A[Intermodal Systems Development  
Tom Byron] --> B[Chief of Transportation Technology  
April Blackburn]
    B --> C[CIO  
Greg Smiley]
    B --> D[Civil Integrated Management Officer  
John Krause]
    B --> E[Information Security Manager  
Stephanie Tanner]
    B --> F[Operations Review and Governance  
Kat Simpson]
    C --> C1[Application Services]
    C --> C2[Integration Services]
    C --> C3[IT Services]
    D --> D1[ROADS]
    D --> D2[Data Analytics / Stats]
    D --> D3[Survey & Mapping]
    D --> D4[GIS Mapping]
    E --> E1[Cybersecurity  
F.A.C. 74-2]
    
```




Florida Department of Transportation

8


**Blackburn, concluded**

Slide 9

**Thank You**



April Blackburn – [April.Blackburn@dot.state.fl.us](mailto:April.Blackburn@dot.state.fl.us)  
John Krause – [John.Krause@dot.state.fl.us](mailto:John.Krause@dot.state.fl.us)

 Florida Department of Transportation 9



## David Sherman – Florida Department of Transportation

Slide 1

**PEER EXCHANGE**

2017

**David Sherman**  
Florida Department of Transportation  
Research Center

Florida Department of Transportation

Slide 2

State University Partners
Test Beds
Driverless Shuttles
Other Emerging Technology Projects
UPS Drone Delivery
Florida Automated Vehicles Initiative
Jacksonville Transit Authority
Hillsborough Area Regional Transit
University of North Florida
University of South Florida

**Sherman, concluded**

Slide 3



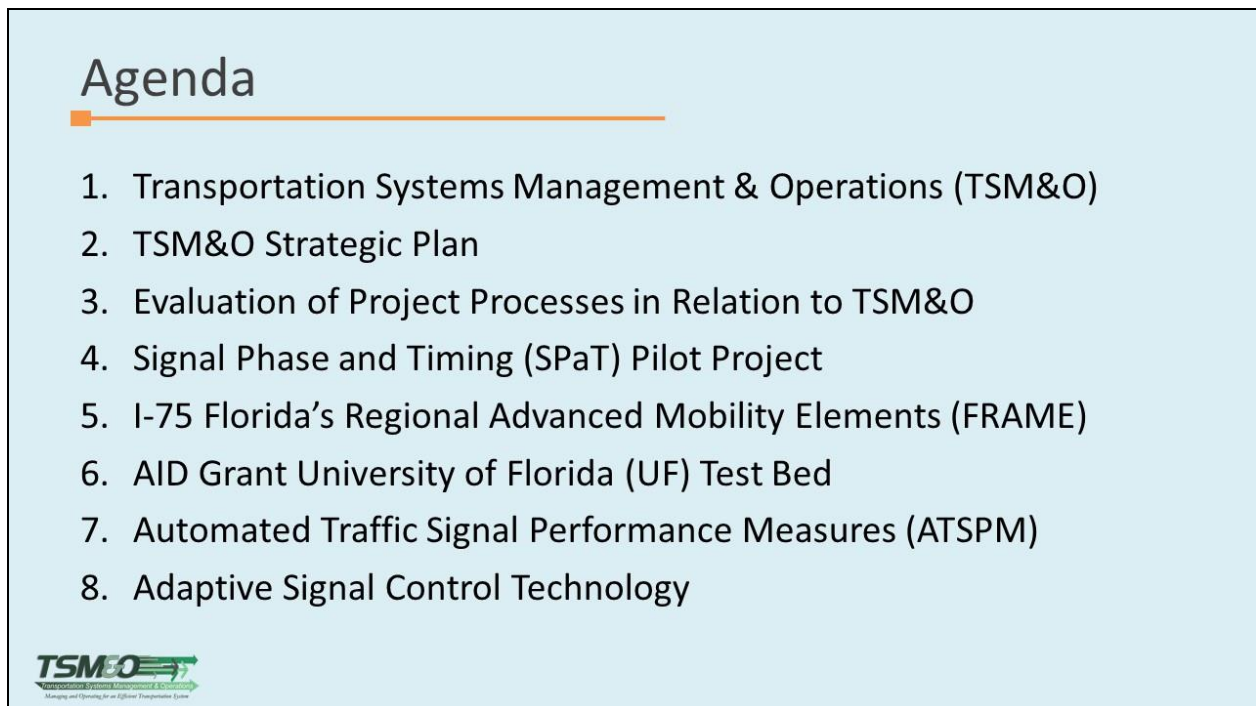
## Raj Ponnaluri – Florida Department of Transportation

### Slide 1



Slide 1 is a presentation slide with a light blue background. In the top left corner is the FDOT logo, and in the top right corner is the TSM&O logo with the tagline "Managing and Operating for an Efficient Transportation System". Below the logos, the text reads "April 26, 2017" and "FDOT Peer Exchange". A horizontal orange line is positioned above the main title, "TSM&O Emerging Technologies". Below the title, the text "Transportation Systems Management & Operations (TSM&O)" and "Traffic Engineering & Operations Office" is displayed. At the bottom of the slide, there is a collage of four images: a highway with a toll sign, a traffic light intersection, a person working at a computer workstation with multiple monitors, and an aerial view of a large transportation facility.

### Slide 2



Slide 2 is a presentation slide with a light blue background. The word "Agenda" is written in a large font at the top left, with a horizontal orange line below it. Below the line is a numbered list of eight items. At the bottom left corner, there is a small TSM&O logo with the tagline "Managing and Operating for an Efficient Transportation System".

1. Transportation Systems Management & Operations (TSM&O)
2. TSM&O Strategic Plan
3. Evaluation of Project Processes in Relation to TSM&O
4. Signal Phase and Timing (SPaT) Pilot Project
5. I-75 Florida's Regional Advanced Mobility Elements (FRAME)
6. AID Grant University of Florida (UF) Test Bed
7. Automated Traffic Signal Performance Measures (ATSPM)
8. Adaptive Signal Control Technology

**Ponnaluri, continued**

Slide 3

## Transportation Systems Management & Operations (TSM&O)

---

- TSM&O is the **application of technology and communications to improve the management, operations, safety and efficiency** of transportation systems.
- TSM&O involves **coordination with various stakeholders** ranging from all FDOT Offices to Local Metropolitan Planning Organizations and **cuts across all modes of transportation.**
- This program **develops and applies transportation management and operations solutions** that generally do not require major structural alterations of existing or planned roadways.



Slide 4

## Strategic Plan

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Executive Summary

- I. Strategic Plan Development and Background
- II. Challenges and Opportunities
- III. TSM&O Snapshot – Where We Are Today
- IV. TSM&O Mainstreaming
- V. Vision, Mission, and Goals
- VI. Roadmap to Achieving TSM&O Goals
- VII. TSM&O Resources
- VIII. Next Steps and Action Plans








**Ponnaluri, continued**

Slide 5

## Strategic Plan – TSM&O Goals

- **Outcome-based performance measures**
  1. **Mobility** – travel time reliability, throughput, delay, and roadway clearance times
  2. **Safety** – secondary crashes
  3. **System maintenance** – availability and uptime
- **Path to target setting**
  - ✓ **Year 1 and 2:** Collect data and establish baselines
  - ✓ **Year 2:** Set targets for routes and/or critical segments
  - ✓ **Year 3 and beyond:** Set Performance Enhancement Goals (PEG) to reach targets



Slide 6

## Evaluation of Project Processes in Relation to TSM&O

Contract Number: BDV34 TWO 977-07

Research Perspective

	<p><i>Principal Investigator:</i></p>	<p><i>Dr. Tobias Sando, P.E., PTOE</i> <i>University of North Florida</i></p>
	<p><i>Co-Principal Investigator:</i></p>	<p><i>Dr. Priyanka Alluri, P.E.</i> <i>Florida International University</i></p>
	<p><i>Project Manager:</i></p>	<p><i>Dr. Raj Ponnaluri, P.E., PTOE</i> <i>FDOT</i></p>
	<p><i>Co-Project Manager:</i></p>	<p><i>Melissa Ackert, P.E.</i> <i>FDOT</i></p>
	<p><i>Consultant:</i></p>	<p><i>Larry Hagen, P.E., PTOE</i> <i>Hagen Consulting Services, LLC</i></p>





**Ponnaluri, continued***Slide 7*

## Objectives BDV34 TWO 977-07

- **Comprehensive review of TSM&O incorporation in the existing project development process:** planning, design, construction, and operations
  - Florida
  - Nationwide
- **Revise the state-of-practice** to better accommodate TSM&O components
- Explore the potential of using various project development processes such as the Agile **Framework** in lieu of conventional methods
- **Develop procurement framework** for TSM&O projects

*Slide 8*

## Expected Outcomes BDV34 TWO 977-07

- **Synthesis of best practices** from in- and out-of-state agencies
- Recommendations aimed at revising the current process in order to **better accommodate TSM&O at various stages of project development**



**Ponnaluri, continued**

Slide 9

## TSM&O Innovation

- Arterial Management
  - Advanced traffic signal performance measures – part of FHWA’s Every Day Counts Program
  - Advanced signal control technology – pilot projects underway; before/after studies in progress
  - FHWA workshops planned – on Business Processes and Traffic Signal Action Plans
- Connected Vehicles
  - Signal Phase and Timing (SPaT) pilot project
  - I-75 Florida’s Regional Advanced Mobility Elements (FRAME) project
  - University of Florida Test Bed

Slide 10

## Signal Phase and Timing (SPaT) Pilot Project


- AASHTO Challenge
- 22 signalized intersections along US 90 (Mahan Drive) in Tallahassee
- FDOT and City of Tallahassee Partnership
  - City to install
- Pre-deployment testing at the Traffic Engineering Research Laboratory (TERL)
- RFP is advertised

**Ponnaluri, continued**


Slide 11


## Signal Phase and Timing (SPaT) Pilot Project

- Field testing using in-vehicle equipment




On-Board Units





Road Side Units (RSU)



Slide 12

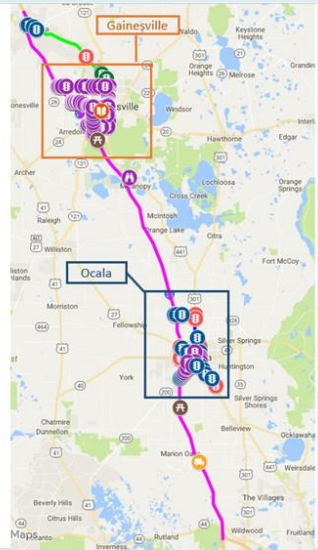
## I-75 Florida's Regional Advanced Mobility Elements (FRAME)


- Project limit: I-75 and US 441/US 301 from Wildwood to Alachua
- Deploy Integrated Corridor Management (ICM) using connected vehicle technologies
- Roadside Units (RSUs) at every mile on I-75 for incident management (in project limits)
- RSUs at signals on detour routes for signal phasing and timing, pedestrian safety, freight and transit priority
- Automated Traffic Signal Performance Measure (ATSPM) in both Gainesville and Ocala for Active Arterial Management (AAM)
- Test using On-Board Units (OBUs) and other testing tools
- D2 and D5 programmed this project

### Overall Map

Legend

- 📍 Traffic Signal
- 🚶 Traffic Signal with Pedestrian Crossings
- 🚇 Traffic Signal on Transit Route
- 🚶 Traffic Signal on Transit Route with Pedestrian Crossings
- 🚂 Railroad Crossing
- 🚗 Mid-block Crossing
- 🚗 Mid-block Crossing on Transit Route
- ⚖ Weigh-in-motion
- 🏠 Rest Areas
- 🎓 University of Florida
- 🏞 Paynes Prairie
- 🟢 Detour Corridor
- 🟡 I-75 with RSUs at every mile
- 🟠 Detour Corridor need Fiber Optic Deployment








**Ponnaluri, continued**


Slide 13

## AID Grant - University of Florida Test Bed

- FDOT applied for 2017 Accelerated Innovation Deployment (AID) grant application in April
- University of Florida (UF) and City of Gainesville connected vehicle pilot project on
  - 13 traffic signals around UF campus
  - 7 midblock crossings
- To test
  - Passive pedestrian/bicyclist detection at all locations via detection technologies
  - Real-time notification to transit, motorists, and pedestrians/bicyclists
  - SPaT data broadcasting w/active pedestrian/bicyclist detection via roadside units



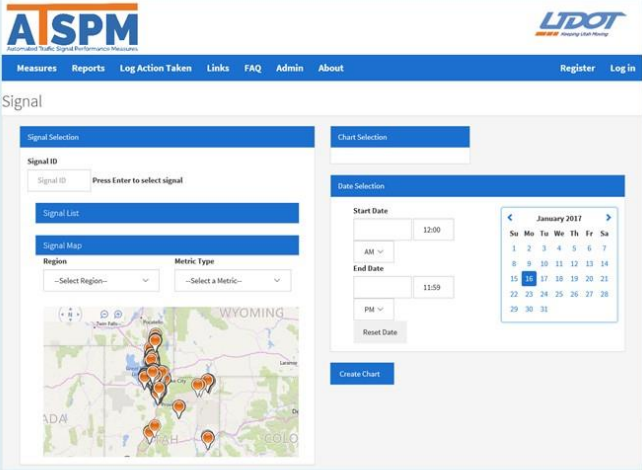




Legend: ● Traffic Signals ● Mid-Block Crossing (no signal) — Project Corridors



Slide 14

## Automated Traffic Signal Performance Measures (ATSPM)

- Federal Highway Administration’s (FHWA’s) Every Day Counts (EDC) program includes ATSPM
- Seminole County
  - Deployed and tested Purdue signal performance measures
- City of Tampa
  - Under active deployment
- Central Office
  - Provide resources for installation
  - Not promoting any one technology; but provide knowledge transfer

**Ponnaluri, continued**

Slide 15

## FDOT Traffic Signal Performance Measures (TSPM) Study

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- Final report published in 2/28/2017
- Report highlights
  - Benefits of TSPM
  - Challenges of TSPM
- Benefits
  - Enhanced system intelligence and remote signal monitoring
  - Travel time savings and reduction in delays
  - Public safety
  - Maintenance cost efficiencies
  - Additional verification of signal performance
  - Public information
  - Low-cost implementation



TRAFFIC SIGNAL PERFORMANCE  
MEASURES  
FINAL REPORT




Slide 16


## Adaptive Signal Control Technology

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- Advanced systems automatically adapt to changing traffic demands
- More responsive to unexpected incidents such as weather and traffic crashes
- More responsive to unscheduled events such as holiday traffic



Traffic Signal Controller - cabinet and hardware



Traffic Signal





**Ponnaluri, continued**

Slide 17

## Adaptive Signal Control Technology

- Deploying pilot projects
- Before and after assessments by University of Florida
- Does not work everywhere
  - Low effectiveness on fully saturated corridors during peak periods
- Additional deployments planned on Strategic Intermodal System corridors

**Legend**

- Traffic Signal State Road
- Adaptive Signal Control Technology
  - InSync
  - Synchro Green
  - Centracas
  - Opac
  - SCATS
  - Florida Districts

Last Updated: 10/04/2016

Slide 18

## STREET Challenge

- **STREET Vision:** To draw from the Department’s vision and TSM&O Strategic Plan of pursuing innovation and deploying emerging technologies which focus on transportation safety and mobility.
- **STREET Mission:** To conceptualize, accelerate deployment, and evaluate emerging TSM&O technologies.
- **Work Plan / Objectives:**
  - Identify regional needs and pilot locations
  - Identify deployment-ready connected vehicle and/or emerging technologies (CVET) consistent with the STREET vision
  - Develop potential use cases and develop cost estimates
  - Prepare a Request for Information (RFI) package to solicit CVET service providers and vendors

**Ponnaluri, continued**

## Slide 19

## Work Plan

- **Wok Plan / Objectives:**
- Choose about 3 to 4 technologies for implementation, deployment, testing and evaluation
- Identify regions for deployment and seek matching funds from federal, state, and local agencies, if feasible from a process and time-perspective
- Select vendors and implement the technologies in the selected regions
- Deploy
- Field test and evaluate the implemented technologies
- Conduct before and after studies to gauge the benefits and deployment challenges
- Prepare documentation as *lessons learned* effort



## Slide 20

## Potential CVET Applications

- Bike-Ped detection and/or safety including priority phasing for pedestrians (Ped-Sig)
- Pedestrian Alert Systems – alert vehicles when pedestrians are in a crosswalk (Ped-X)
- Forward Collision Warning (FCW) to warn drivers of an impending collision
- Intelligent Traffic Signal (I-SIG) for optimizing traffic flows though signal timing adjustments
- Vehicle Data for Traffic Operations (VDTO) – use Automated Traffic Signal Performance Measures
- Signal Phase and Timing (SPaT) deployment enhancements
- Basic Safety and Info messages for vehicle to infrastructure (V2I) support to industry
- Use of Unmanned Aerial System (UAS) in Traffic Engineering
- Grade Crossing Notification System (GCNS) at highway-rail grade crossings
- Traffic Signal Central System Software (CSS)
- Data Analytics and Decision Support Systems (DSS)



**Ponnaluri, concluded**

Slide 21

