# MEETING SUMMARY

## Meeting Details

August 6, 2018
1:00p-3:00p
Conference Call

## MEETING SUMMARY

### *Introductions*

The meeting was opened with a welcome to all those in attendance. A brief reorder of the agenda was presented to the attendees.

### *Information Sharing*

Amanda Good introduced four presenters, from various backgrounds, to share what they are doing day-to-day in relation to the (potential) impacts to NC. The presenters included:

- Joe Geigle, FHWA – USDOT Perspective
- Dennis Jernigan, NCTA – State of the State, NCTA/DOT
- Jeff Sural, NCDIT/NC Broadband – Communication Considerations Moving Forward
- Thomas Chase, ITRE – Current Research Focus Areas, both National and International

The FHWA, Broadband, and Research presentations are all available at the following link: www.ncav.org/committee. Additionally, NCTA has developed marketing materials regarding the activities performed and the partnerships formed with respect to their designation by USDOT as an Autonomous Vehicle Proving Ground. If anyone would like to receive this material, please reach out to Amanda Good.

### *Working Group Recap*

All working groups have concluded their initial kick off meetings. Currently each group is inquiring with their members to establish goals of the working groups. The working group members have until August 15th to provide feedback on potential goals to the champion, which will then be compiled and shared with the corresponding working group, other champions, and ultimately this committee.

## *Next Meeting Suggestions*

Amanda Good introduced a suggested layout for the next Committee meeting. It is recommended to have the next meeting in early December with a similar set up to the December 2017 Technology Day. Final dates and location(s) are being finalized and will be shared to the Committee for review and consideration. The suggested agenda is located on the last page.

The agenda considers staggered committee meetings to accommodate those participating in multiple working groups. An aggregated summary of the working group meetings will be presented during the full FAV Committee meeting.

## *Other Items*

The members were asked to provide any final words, the following was noted on the call for considerations.

- *Infrastructure isn't just roads and bridges, communications play a huge role and we would be remiss to not suggest something to the general assembly for more rural areas.*
- *Scenario Planning - what is the worst-case scenario? What is the best-case scenario? How do we use this now at the state level for MPOs? For example, the Uber model has caused a huge impact on VMT. We can move forward sooner rather than later on this item.*

## *Closing Remarks*

Thanks to the presenters. The attendees really enjoyed being able to see the materials and have the discussion without having to travel so much. This was a great way to utilize the technology across the state while sharing information.

# POTENTIAL AGENDA LAYOUT (*DECEMBER COMMITTEE MEETING)*

## DAY ONE – AM

1) Vehicles arrive on location for setup – *if anyone has a contact or recommended demonstration, please forward*

## DAY ONE – PM

2) Working Group Sessions – *sessions will be staggered to accommodate members participating in multiple working groups*

## DAY TWO – AM

3) Presentations/Demonstrations – *demonstrations will include multiple modes of transportation*

## DAY TWO – PM

4) FAV Committee Meeting – *correlating the previous day and the morning demonstration portion to the afternoon discussion*
   - Presentation/Discussion regarding three topic areas: Technology, Functionality, and Showcase
   - NHTSA presenting on 5 crashes
   - Aggregated summary of the working group sessions from the previous day – *highlight similarities as well as areas that connect the groups together*
   - Other recommendations?
5) Recap and Action Items
6) Next Meeting
7) Wrap-Up

# U.S. DOT and CAV

Facilitating a new era of transportation innovation and safety

Joe Geigle FHWA-NC

# USDOT Activities in Automation

| Event | Date |
| --- | --- |
| USDOT releases Automated Driving Systems (ADS) 2.0: A Vision for Safety | September 12, 2017 |
| Roundtable on Data for Automated Vehicle Safety | December 7, 2017 |
| Public Listening Summit on Automated Vehicle Policy | March 1, 2018 |
| Automated Vehicles 3.0 announced | Late Summer 2018 |
| Various Research | Ongoing |
| National Dialogue | Ongoing |
| Work Zone Data Exchange Project | Ongoing |
| V2X Mapping Stakeholder Input | Ongoing |

# U.S. DOT Automation Policy

- **Automated Driving Systems (ADS) 2.0**: A Vision for Safety (September 2017)
  - Clarifies Voluntary Safety Self-Assessment process
  - Emphasis on motor vehicle safety
- **2018 Update**
  - Multimodal, surface transportation
  - Broadens considerations to reflect multimodal responsibilities (e.g. operations)


More information on ADS 2.0 is available on the NHTSA website: https://www.nhtsa.gov/technology-innovation/automated-vehicles

# 2018 Requests for Comment and Information Related to Automation

- FHWA, FTA, FMCSA, NHTSA, FRA, PHMSA each released RFIs/RFCs in early 2018
- Nearly 4,000 comments submitted
- Topics included:
  - Technology availability
  - Mode-specific barriers to integration of automation
  - Mode-specific considerations






# Public Listening Summit on Automated Vehicle Policy

- Stakeholder Discussion
  - 117 participants
- Public Listening Session
  - 1,111 participants (in-person and livestream)
- Themes
  - Public safety and first responders
  - Disability and accessibility
  - Consumer and public education
  - Insurance and liability
  - Employment issues
  - Cybersecurity

# FHWA National Dialogue on Highway Automation

The Federal Highway Administration is initiating a national conversation with partners and stakeholders to better understand the implications of highway automation to facilitate innovation and inform the Agency's role in this area.

FHWA will use inputs from the National Dialogue to...

- **ASSESS** National issues and priorities
- **DEVELOP** technical guidance, best practices and standards
- **SUPPORT** necessary research
- **ADAPT** programs and policies
- **CREATE** a National community or coalition

NATIONAL DIALOGUE ON HIGHWAY AUTOMATION

"Collaboration Corner" at Philadelphia National Dialogue event, June 26-27

# FHWA National Dialogue Schedule

| Month | Event | Location |
|---|---|---|
| June 7 | National Dialogue Launch Workshop | Detroit, MI |
| June 26-27 | National Workshop 1<br>Planning and Policy Considerations for Highway Automation | Philadelphia, PA |
| July 12 | Automated Vehicle Symposium<br>FMCSA-FHWA Truck Automation Listening Session | San Francisco, CA |
| August 1-2 | National Workshop 2<br>Digital Infrastructure and Data Considerations for Highway Automation | Seattle, WA |
| Early September | National Workshop 3<br>Freight Considerations for Highway Automation | Chicago, IL |
| October 24-25 | National Workshop 4<br>Operations Considerations for Highway Automation | Phoenix, AZ |
| Week of Nov. 12 | National Workshop 5<br>Infrastructure Design and Safety Considerations for Highway Automation | Austin, TX |

**Additional Information: https://ops.fhwa.dot.gov/automationdialogue/**

# FMCSA Listening Sessions/Open Meetings on Vehicle Automation

- **Public Listening Session on Automation Technologies: Held June 19 at University of Michigan**
  - Participants included representatives from industry, law enforcement, commercial motor vehicle operators, academia, and technology providers
- **FMCSA-FHWA Truck Automation Listening Session: Thursday, July 12 at 1:30, Grand Ballroom, Hilton Union Square**
- **Motor Carrier Safety Advisory Committee (MCSAC) Meeting: July 30-31 at USDOT Headquarters**
- **FMCSA Truck Automation Listening Session, August 24, 2018 at the Great American Trucking Show, Dallas, Texas**

# NHTSA Public Meetings and Listening Sessions

- **Public Meeting On Removing Regulatory Barriers For Vehicles With Automated Driving Systems March 2018**
- **Public Listening Session on Automated Driving Systems 2.0: A Vision for Safety November 2017**
- **Public Meeting on Automated Driving Systems: Voluntary Safety Self-Assessments October 2017**

# Research Approach and Highlights

Exploring how to ensure safe, accessible, and efficient integration of automation

# Consolidated Appropriations Act, 2018

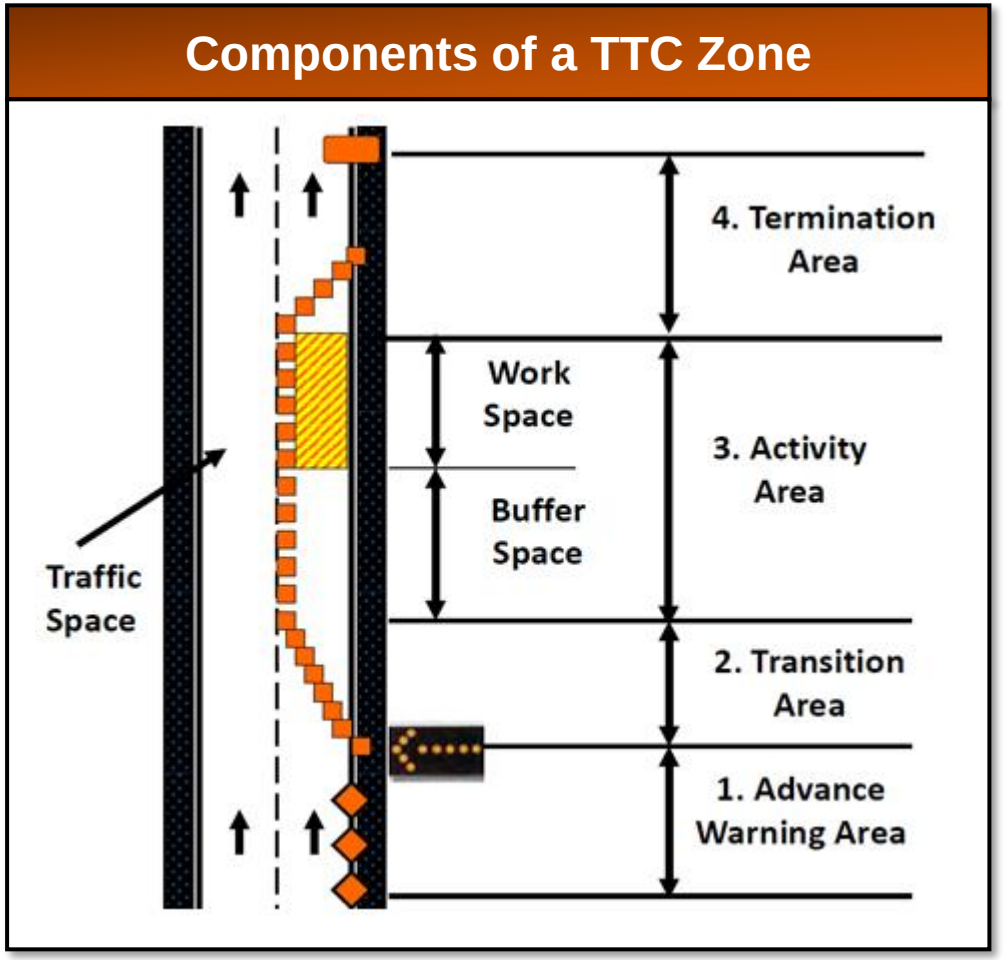
- Signed into law on March 23, 2018
- Funds highly automated vehicle research and development
- Reallocates a total of $100 million for automation activities, including:
  - Up to $38 million for direct research
  - Up to $60 million for demonstration grants
  - Up to $1.5 million for analysis of impacts on drivers and operators of commercial motor vehicles, in consultation with Department of Labor
- Additional funding for NHTSA and OST
- https://www.congress.gov/bill/115th-congress/house-bill/1625

# Data For Automated Vehicle Integration

Voluntary data exchanges to accelerate the safe integration of AVs

## WORK ZONE DATA EXCHANGE

- **Purpose**
  - Voluntary adoption of a basic work zone data spec
- **Outcomes within 6 months**
  - Active work zone data feed
  - Feed is used in a meaningful way
- **Big Picture Outcome**
  - Repeatable approach to harmonize local data



# Automated Low-Speed Shuttles

- **Monitor** development and deployment activity
- **Convene** working group of early deployer communities and other organizations interested in small, automated shuttles.
- **Document Emerging Findings** – including best practices, barriers, and lessons learned from early deployers and technology suppliers


Working Group Member Communities

# FHWA: Cooperative Automation Testing

**Cooperative Automated Vehicle Testing with VDOT and Transurban**

**Objective:** Investigate the combination of speed harmonization, vehicle platooning, and cooperative merging at an entrance ramp for a single-lane, managed facility with access limited to cooperative automated vehicles.

**Findings:** Completed 21 runs with 5 FHWA test vehicles that confirm earlier simulation results that throughput can realistically be increased by more than 50 percent with greater stability and reliability

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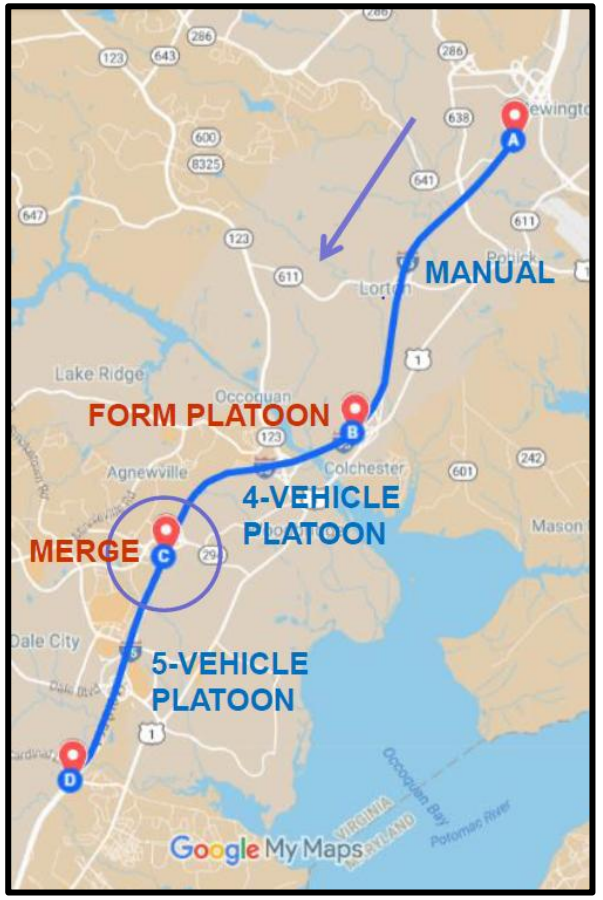
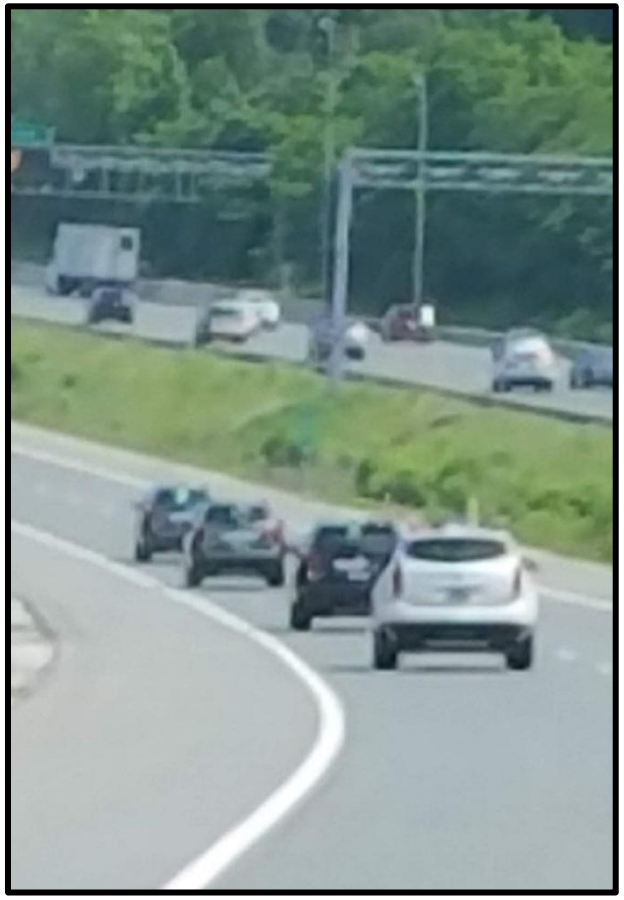


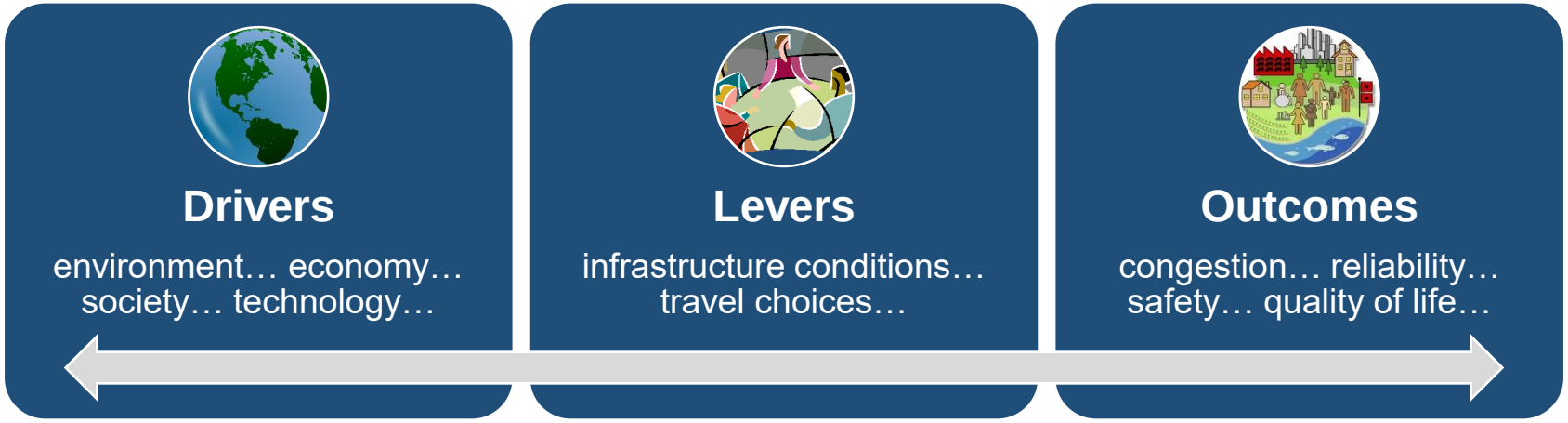
*Google Maps Image of the Sites for the Cooperative Automated Vehicle Testing*

# FHWA: Scenario Planning for Connected and Automated Vehicles

**Purpose**: To equip agencies with information and tools to consider the uncertainties of CV/AV deployment

- Created scenarios of potential CV/AV deployment
- Conducted workshops to refine test scenarios
- Assessed overarching scenario impacts and implications

**Outputs:** Practitioner guidance/guidebook, qualitative assessment of impacts and policy implications arising from future described in scenarios




**Scenario Building Blocks**

# Research in Other USDOT Agencies

- FMCSA: Development of Baseline Safety Performance Measures for Automated CMVs
- FMCSA: Sensor Guidelines for Automated CMV Applications
- FRA: Automated Vehicles at Highway-Rail Grade Crossings
- FTA: Strategic Transit Automation Research Plan
- MARAD/FMCSA: Feasibility Study: Low-Speed Automated Truck Queue at Ports and Warehouses

# Research in Other USDOT Agencies

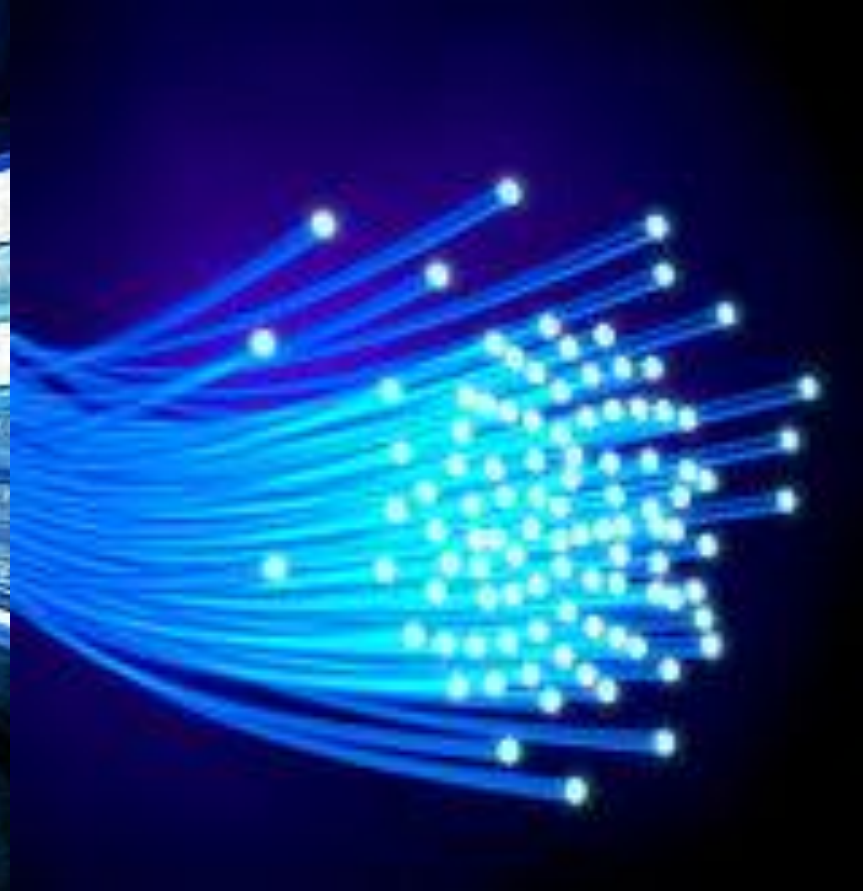
- NHTSA: Driving Automation Communication of Intent with Shared Road Users
- NHTSA: FMVSS Considerations for Vehicles with Automated Driving Systems
- PHMSA: Carriage of Hazardous Materials by Automated Vehicles

transportation.gov/av

# FAV Committee

Jeff Sural
*Director*
*Broadband Infrastructure Office*

*August 3, 2018*



# What *is* Broadband?

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| | Streaming & Other functions | |
|---|---|---|
| | Sending Email | 0.08 Mbps |
| | Social Media | 0.03 Mbps |
| | Skype with Friends | 0.30 Mbps |
| | Music | 2.00 Mbps |
| | Video on Smart TV | 4.00 Mbps |
| | Hi-Def Movie on Smart TV (6-7 GB/hour) | 5.30 Mbps |
| | Playing online game | 10+ Mbps |
| | Netflix 4k movie | 25 Mbps |
| | FCC recommendation per household: email, web surfing, basic streaming video plus one high-demand application: streaming HD, video conferencing, OR online gaming | 6 to 15 Mbps |

| iTunes Downloads | | 24 Mbps | 15 Mbps | 10 Mbps | 8 Mbps | 2 Mbps |
|---|---|---|---|---|---|---|
| **4-minute song** | 4 MB | 1 second | 2 seconds | 3 seconds | 4 seconds | 16 seconds |
| **5-minute video** | 30 MB | 10 seconds | 16 seconds | 25 seconds | 30s | 2m |

NC DIT Broadband Infrastructure Office

# Vision

Every North Carolinian should be able to access affordable high-speed internet anywhere, at any time.

NC DIT Broadband Infrastructure Office

# The Broadband Infrastructure Office

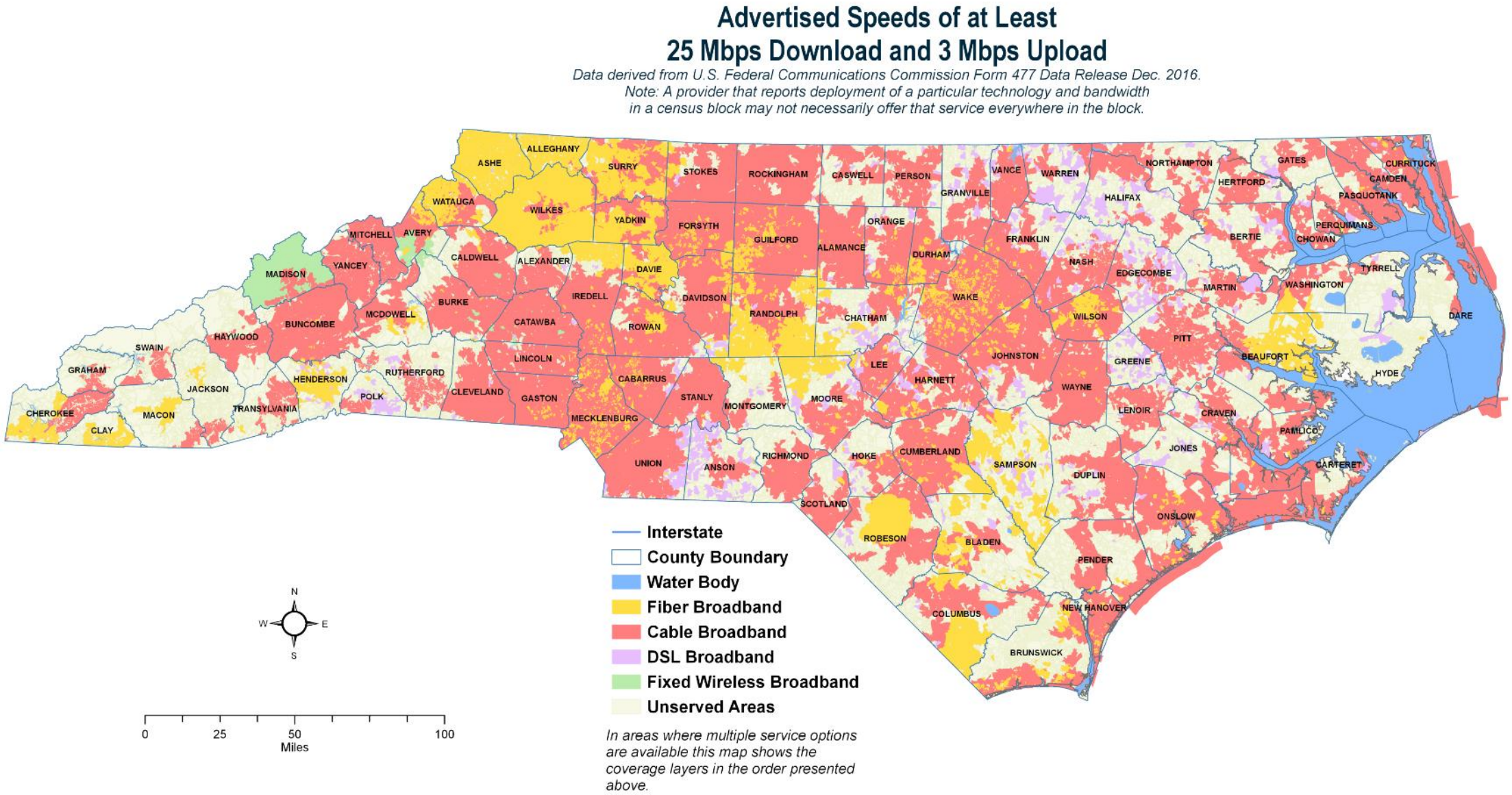
- Community
- Policy
- Programs and Tools

NC DIT Broadband Infrastructure Office

# Broadband Availability Challenges

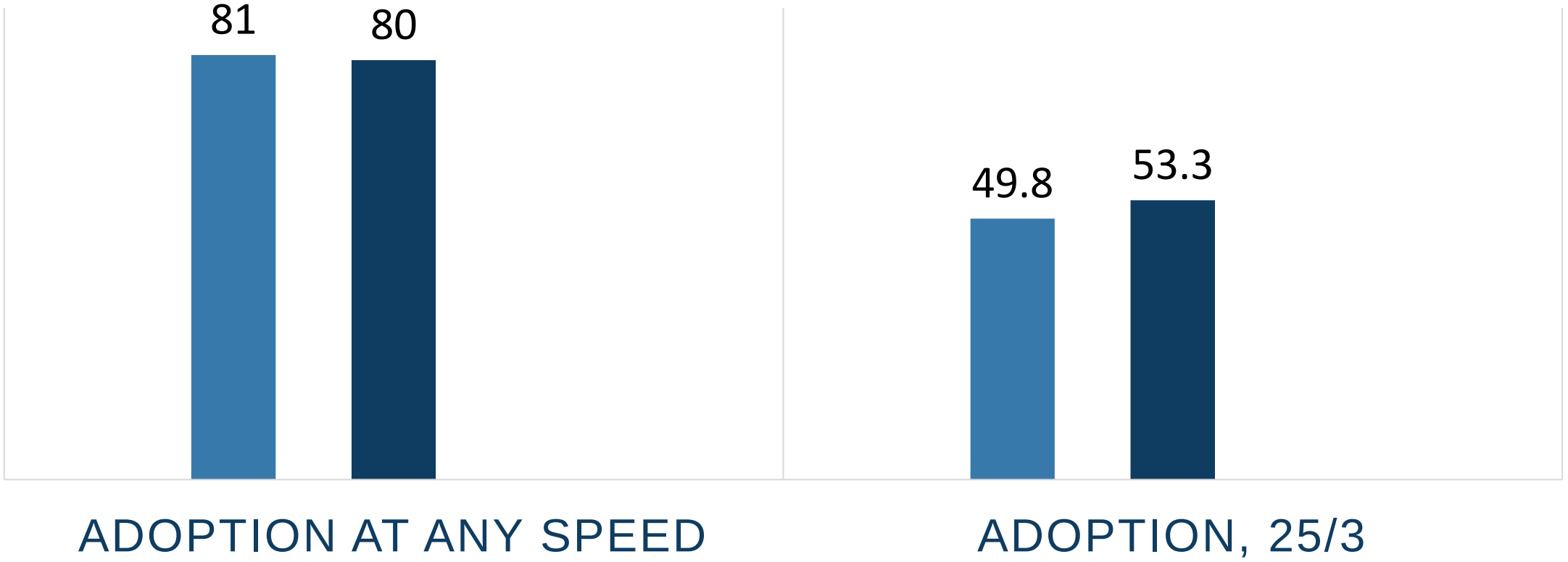

NC DIT Broadband Infrastructure Office

# Broadband Service Inventory

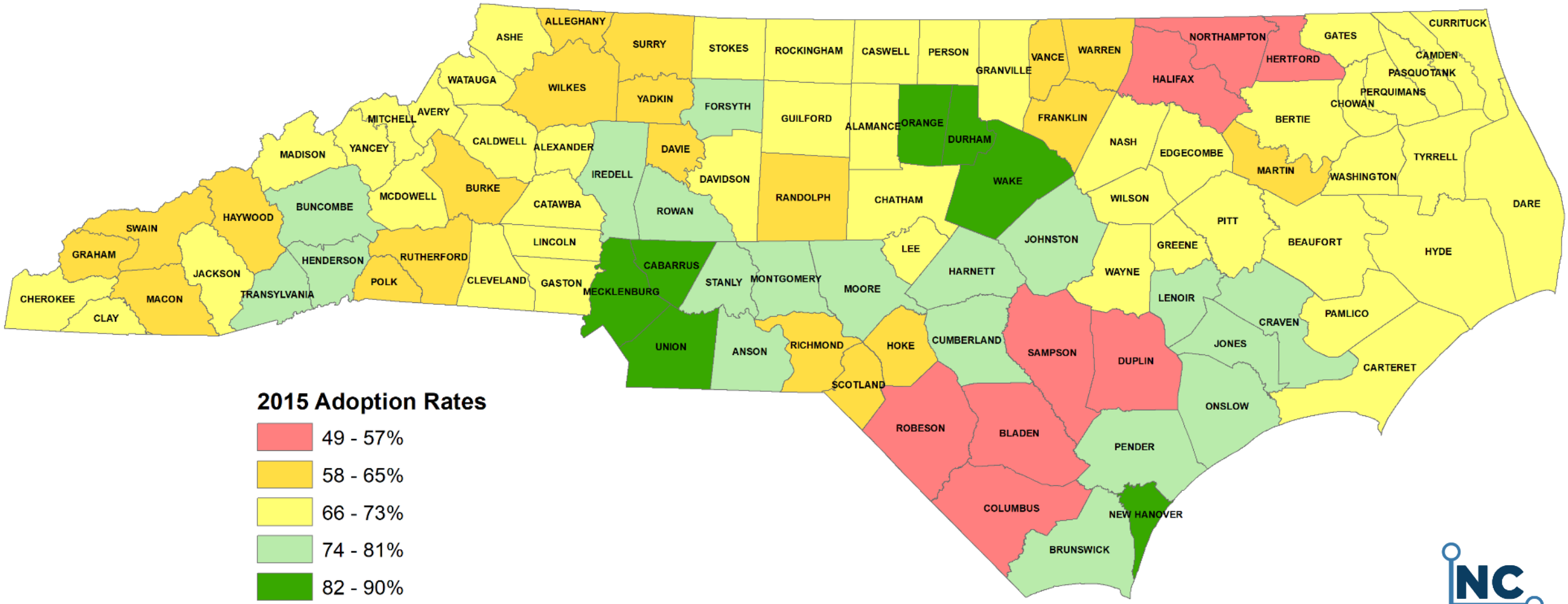



NC DIT Broadband Infrastructure Office

# 2016 Broadband Adoption Rates



# 2015 Broadband Adoption Rates

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# GREAT Grant Program

- Growing Rural Economies with Access to Technology (GREAT)
- New Program
- Tier One Counties
- Areas with less than 10/1 Mbps
- Eligible Applicants are Broadband Providers

To expedite terrestrial deployment of broadband, by encouraging partnerships and competition between private broadband providers and cooperatives…and lease of State and local-government owned properties or facilities

NC DIT Broadband Infrastructure Office

# Connect with us!

NCBroadband.gov

@BroadbandIO

Broadband@NC.Gov

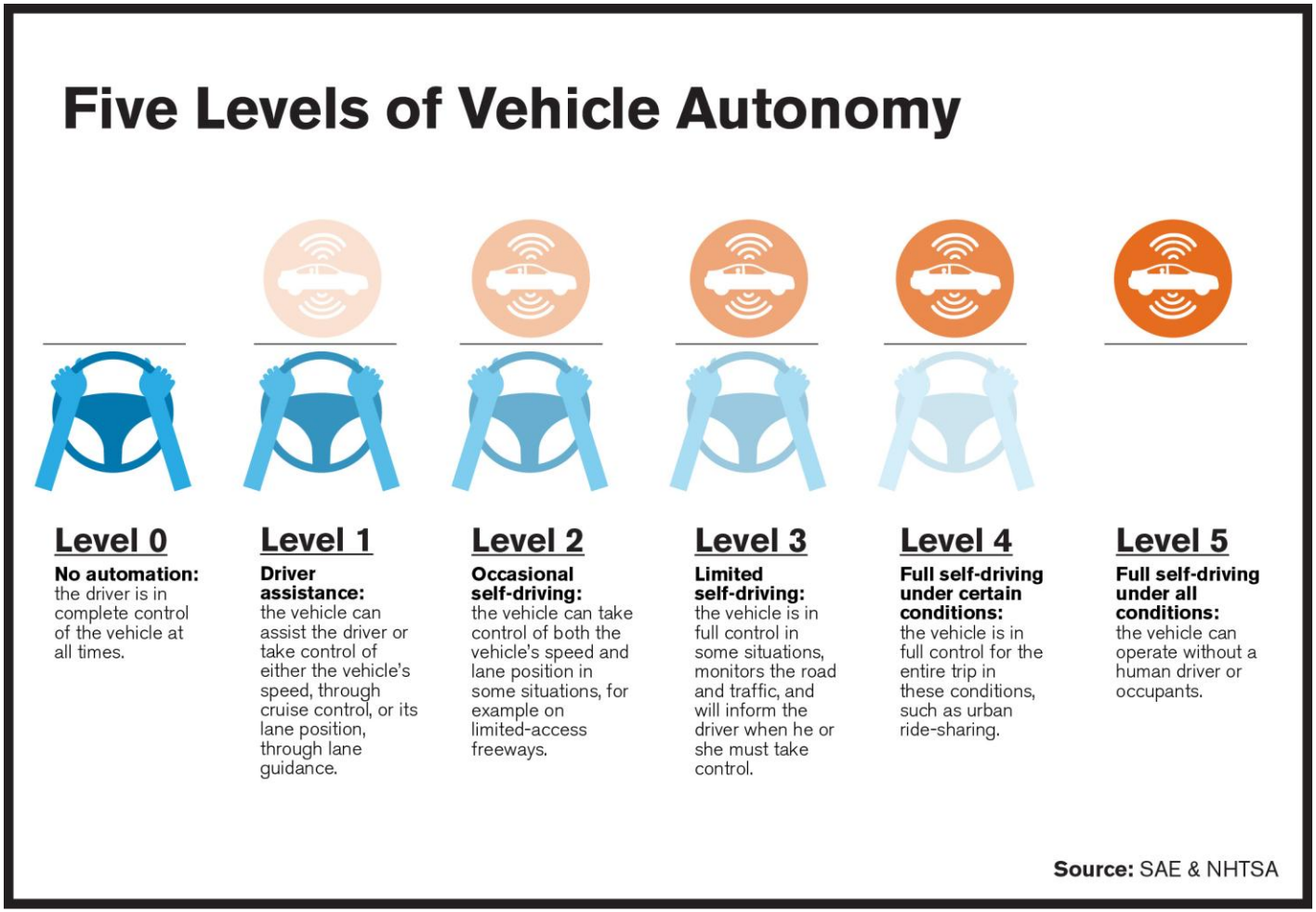
NC STATE UNIVERSITY

# Fully Automated Vehicle Research Update

*Thomas Chase*

ITRE
Institute for Transportation Research and Education

# Automated Vehicles (AV)



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# Automated Vehicles (AV)

| SAE level | Name | Narrative Definition | Execution of Steering and Acceleration/ Deceleration | *Monitoring* of Driving Environment | Fallback Performance of *Dynamic Driving Task* | System Capability *(Driving Modes)* |
|---|---|---|---|---|---|---|
| ***Human driver* monitors the driving environment** | | | | | | |
| 0 | **No Automation** | the full-time performance by the *human driver* of all aspects of the *dynamic driving task*, even when enhanced by warning or intervention systems | Human driver | Human driver | Human driver | n/a |
| 1 | **Driver Assistance** | the *driving mode*-specific execution by a driver assistance system of either steering or acceleration/deceleration using information about the driving environment and with the expectation that the *human driver* perform all remaining aspects of the *dynamic driving task* | Human driver and system | Human driver | Human driver | Some driving modes |
| 2 | **Partial Automation** | the *driving mode*-specific execution by one or more driver assistance systems of both steering and acceleration/ deceleration using information about the driving environment and with the expectation that the *human driver* perform all remaining aspects of the *dynamic driving task* | **System** | Human driver | Human driver | Some driving modes |
| ***Automated driving system* ("system") monitors the driving environment** | | | | | | |
| 3 | **Conditional Automation** | the *driving mode*-specific performance by an *automated driving system* of all aspects of the dynamic driving task with the expectation that the *human driver* will respond appropriately to a *request to intervene* | System | **System** | Human driver | Some driving modes |
| 4 | **High Automation** | the *driving mode*-specific performance by an automated driving system of all aspects of the *dynamic driving task*, even if a *human driver* does not respond appropriately to a *request to intervene* | System | System | **System** | Some driving modes |
| 5 | **Full Automation** | the full-time performance by an *automated driving system* of all aspects of the *dynamic driving task* under all roadway and environmental conditions that can be managed by a *human driver* | System | System | System | **All driving modes** |



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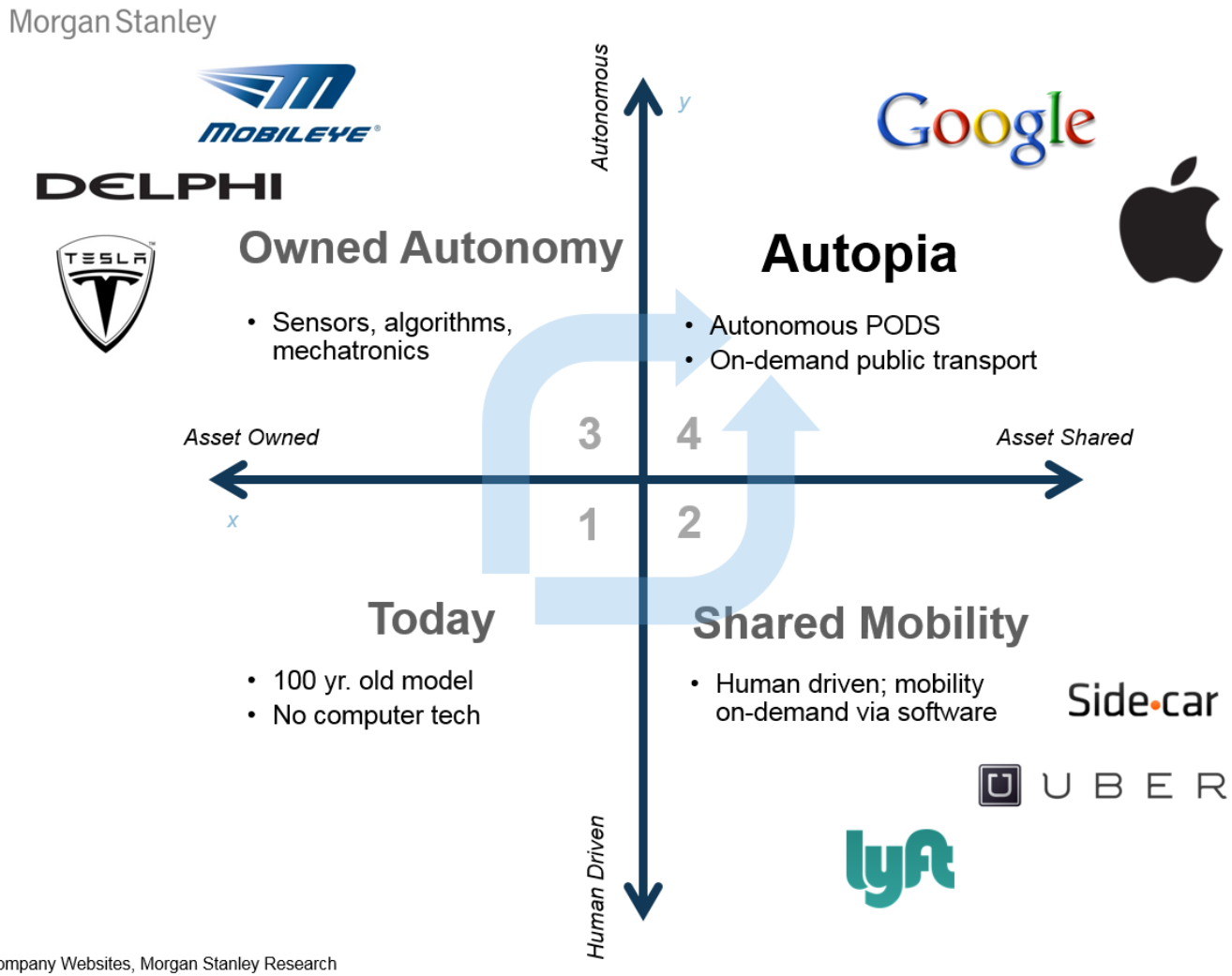
# Shared Autonomy




Company Websites, Morgan Stanley Research

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# Automation Across Modes




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# Private FAV Research and Development- Passenger Cars

**Start-up**

- Lyft
- Tesla
- Uber
- Waymo

**Manufacturers**

- Audi
- Ford
- GM
- Toyota



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# Research Focus Areas

**Enabling Technologies**

**Safety Assurance**

**Transportation System Performance**

**Testing and Evaluation**

**Policy and Planning**



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# Current USDOT Research

**Enabling Technologies**

• Enabling Technologies: Future Forecast

• Assessment and Guidance for Digital Infrastructure

**Safety Assurance**

• Functional Safety of Automated Lane Centering Controls

• Cybersecurity Requirements for Automated Vehicles

• Driver Acceptance of Automated Vehicle Systems

• Human Factors Evaluation of Combined Function Automation Concepts

**Transportation System Performance**

• Automated Speed Harmonization Prototyping and Testing

• Simulation for Research on Automated Longitudinal Vehicle Control

• High Performance Vehicle Streams Simulation

• Partial Automation for Truck Platooning

• Lane Changing/Merge Foundational Research

**Testing and Evaluation**

• Development of Functional Descriptions, Safety Principles, and Test Methods for emerging system concepts in automated vehicles

• Transportation System Benefit Study of Highly Automated Vehicles

**Policy and Planning**

• Standards Program Planning for Automated Vehicles

• Automation Policy Foundational Research

# National Research Highlights

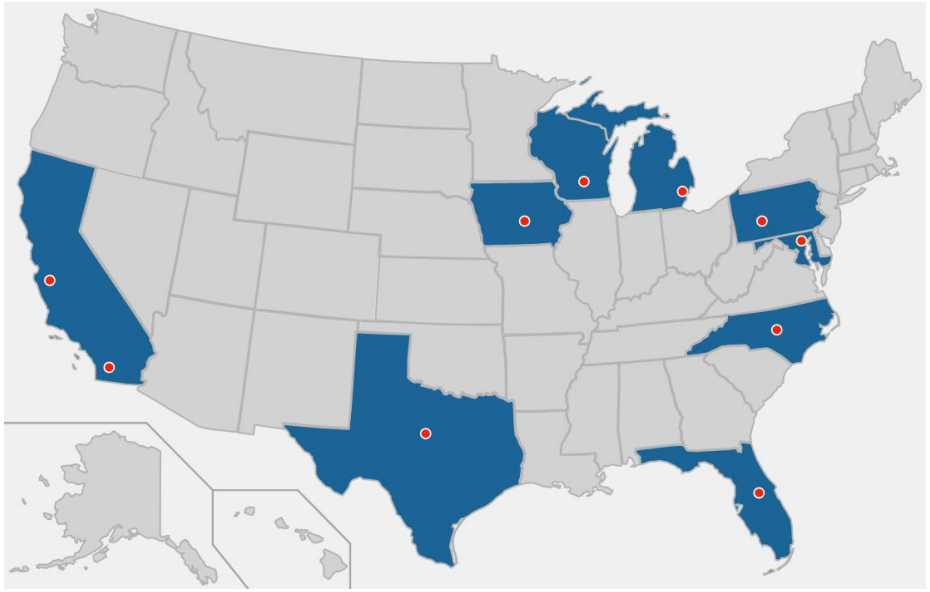
- NCHRP 20-102 Impacts of Connected Vehicles and Automated Vehicles on State and Local Transportation Agencies
  - Advancing Automated and Connected Vehicles: Policy and Planning Actions for State and Local Transportation Agencies
  - Impacts of Regulations and Policies on CV and AV Technology Introduction in Transit Operations
  - Challenges to CV and AV Application in Truck Freight Operations
  - Implications of Automation for Motor Vehicle Codes

# National Research Highlights

- NCHRP Legal Research Digest 69: A Look at the Legal Environment for Driverless Vehicles
- NCHRP 17-91 [Anticipated] Assessing the Impacts of Connected, Automated and Autonomous Vehicles on the Future of Transportation Safety
- NCHRP 14-42 [Anticipated] Determining State DOT Maintenance Program Implications of Connected and Automated Vehicles
- NCHRP 20-24(116) [Anticipated] Guidance on Roles and Responsibilities in Operation of Automated Vehicles

# Field Research and Testing


- USDOT AV Proving Grounds





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# International FAV Efforts

EU: INFRAMIX

- Road INFRAstructure ready for MIXed vehicle flows)

www.inframix.eu

EU: CoEXist

- Four European cities to explore “AV readiness”
- Connecting CAV control logic + sensor simulator + traffic simulator

China : The ‘Apollo’ project → open source




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# North Carolina AV Research

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FREEDM SYSTEMS CENTER

Duke UNIVERSITY

HAL
Humans and Autonomy Lab

THE UNIVERSITY of NORTH CAROLINA at CHAPEL HILL

THE UNIVERSITY OF NORTH CAROLINA
HIGHWAY SAFETY RESEARCH CENTER

Collaborative Sciences Center for ROAD SAFETY

NORTH CAROLINA A&T STATE UNIVERSITY

ACCESS Laboratory

UNC CHARLOTTE

CAMMSE

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# Thank You

Thomas Chase
rtchase@ncsu.edu
(919) 515-8625

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