New Roles in Transformational Technology

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CAVita

Giving life to transformational technology in transportation

Agenda

1) Transformational technology impacting mobility services, policy and research

   • Brought about by CAV and shared mobility (SM)

2) The new role of research

   • Deploy and learn

3) How do we get to CAV?
4) New roles for universities

A technological tipping point

- Connected vehicles and infrastructure (CV)
- Automated vehicles (AV)
- Surrounded by:
  - Shared Mobility (SM), Alt-Fuel Vehicles, Big Data, Cybersecurity, Internet-of-Things, Smart Cities
- Enabled by:
  - Sensors, software, cloud services, computation, robotics, artificial intelligence, consumer electronics

Century-old transportation system

- Drivers, vehicles and infrastructure
- Tremendous incremental progress
  - For example, crash rates continue to decline
- But not sustainable for another century
- New technologies cut right across the old silos
  - Safety, traffic efficiency, emissions, energy, economics
- The 21st Century mobility system is connected, automated, shared and electrified

the new role of research

High rate of change

- Conventional R&D model is linear: research, protoyping, testing, modification, deployment
- We now need rapid learning cycles based on large deployments
  - This has been the successful model of the auto industry
  - Commercially successful products require multiple cycles of deployment with increasingly large groups of users
- The same model applies to CAV; in addition it becomes a public-private activity, or set of activities
  - There is no rule book for "public-private learning cycles"
  - Current examples include pilots, demos, model deployments, field operational tests, challenges, etc

The process of deployment

- Model deployments (eg. Safety Pilot, Ann Arbor)
- Fake cities
  - Mcity
  - Willow Run (MI), RELLIS (Tx), GoMentum (CA)
- CV pilots
  - NYC, Tampa, Wyoming
- Public-private consortia
  - Safety Pilot, Mobility Transformation Center (MTC), American Center for Mobility (ACM), RELLIS (Tx), GoMentum, Virginia Automated Corridors, I70 Mountain Pilot
- Smart City Challenge
  - $50M prize
  - One winner out of 78 cities: Columbus
- Advanced Transportation and Congestion Management Technologies Deployment (ATCMTD) awards
- National Automated Vehicle Proving Grounds
  - Larson Institute PA
  - Texas AV Proving Grounds Partnership
  - Aberdeen MD
  - GoMentum Station CA
  - San Diego Assoc of Governments CA
  - Iowa City
  - University of Wisconsin-Madison
  - Central Florida AV Partners
  - North Carolina Turnpike Authority
  - American Center for Mobility (ACM) MI

RELLIS Campus at Texas A&M

The American Center for Mobility

With:
- DSRC,
- 4G LTE,
- 5G,
- Cyber,
- Cloud
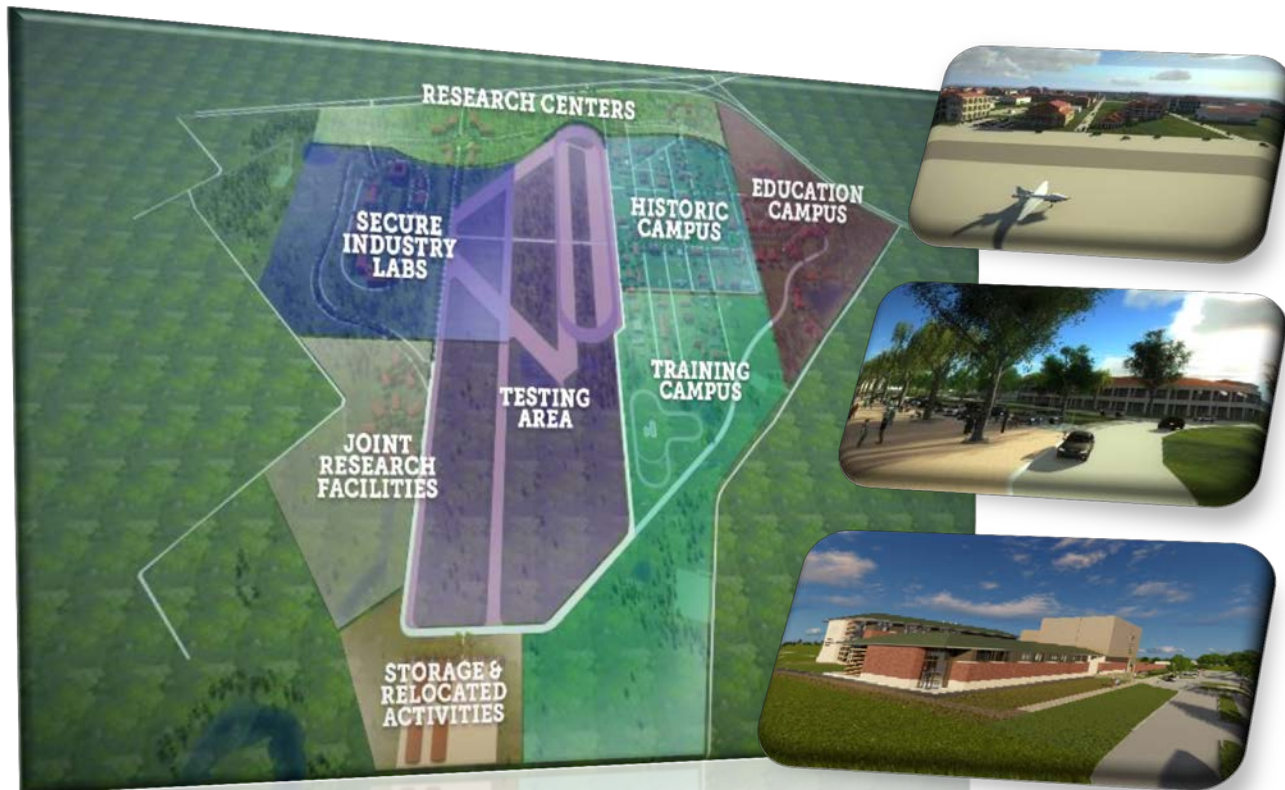
CV and AV are proceeding independently on parallel paths

CV support for AV will create "CAV"

Path to CV

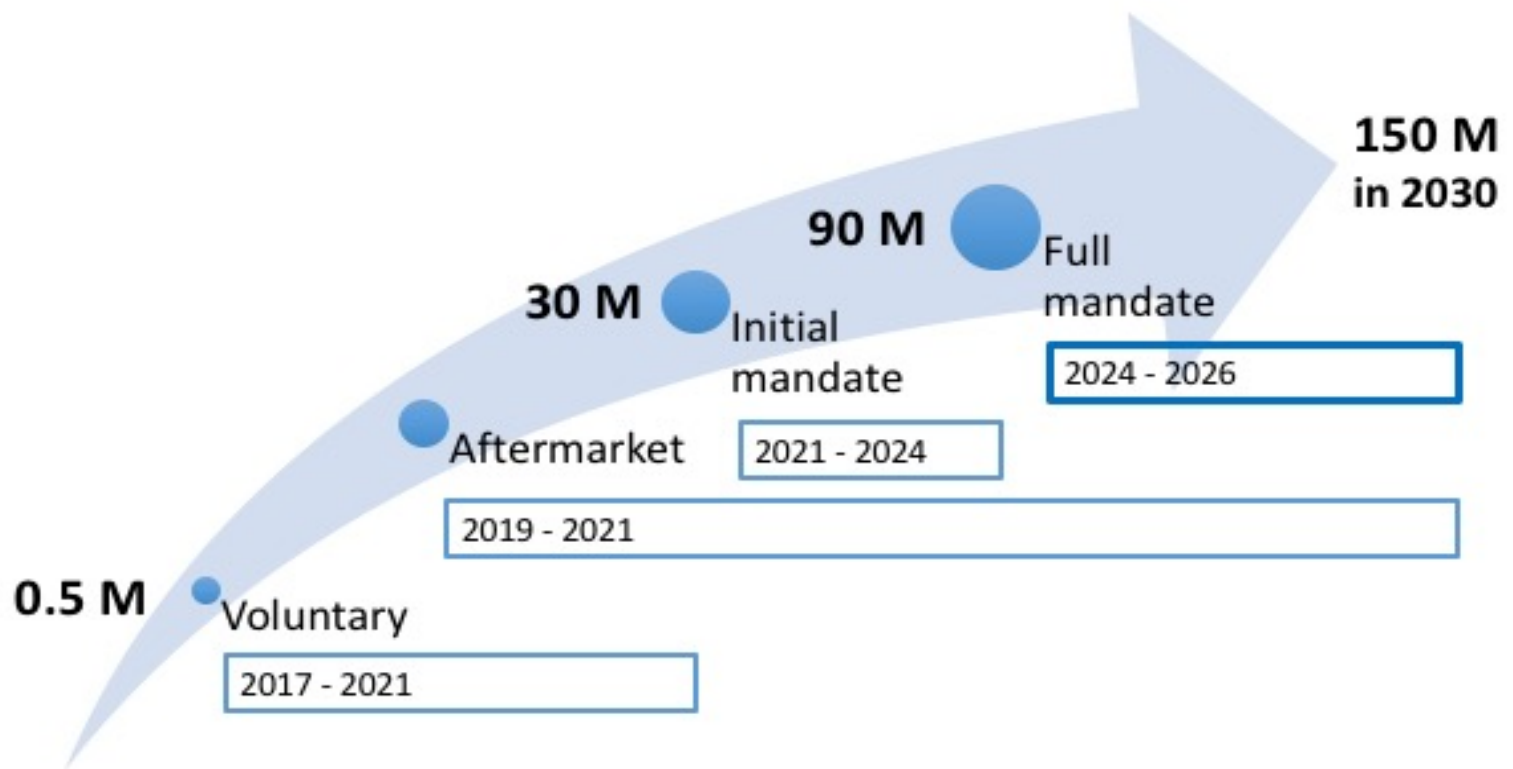## Connected Vehicles

- Voluntary fitment of V2V and I2V by OEMs
- Aftermarket fitment
- Introduction of V2V rule
- Significant penetration by 2025

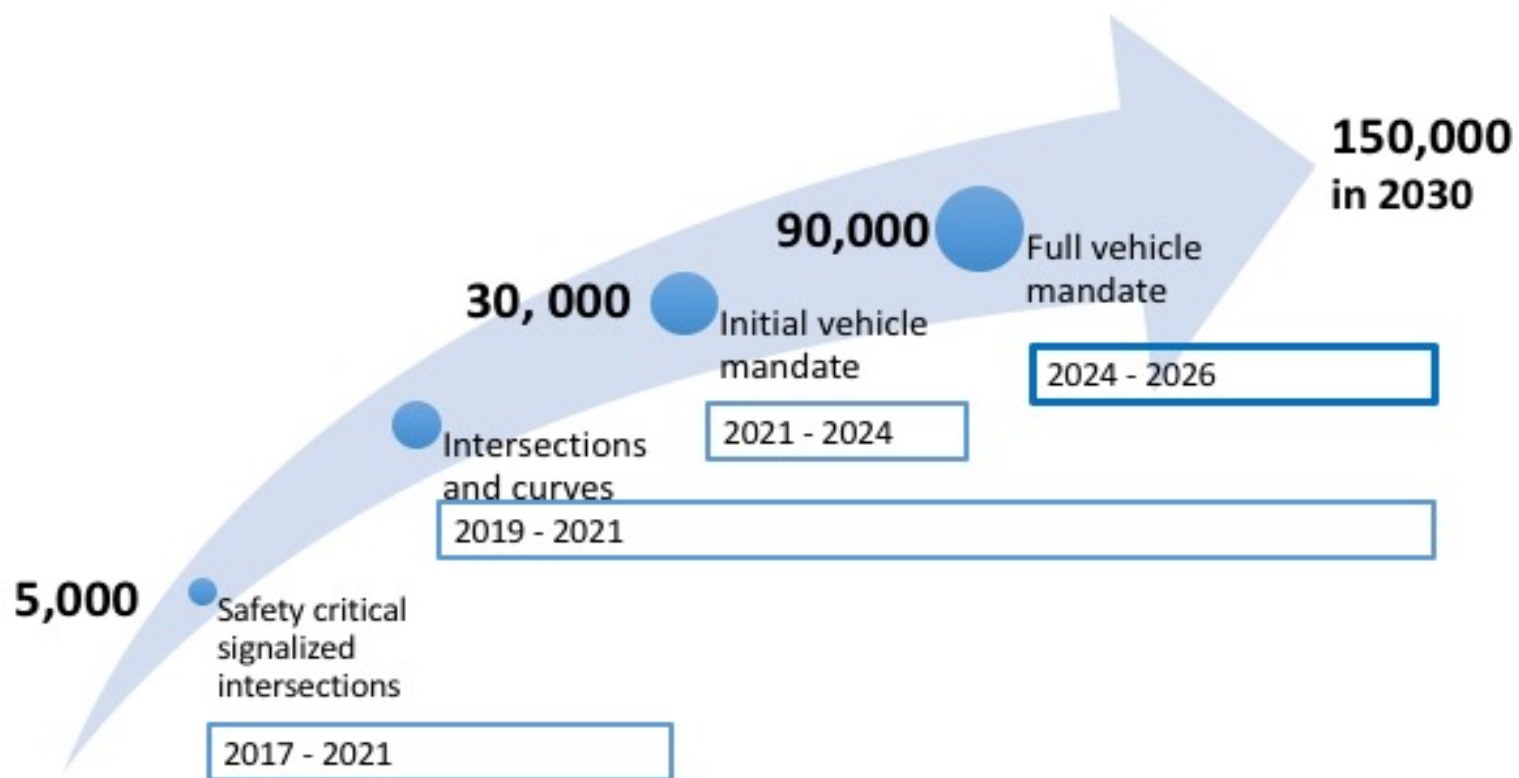## Connected Infrastructure

- V2I guidance from FHWA
- V2X pilots (NYC, Tampa, Wyoming)
- Actions by State DOT's, MPOs and cities
- Significant penetration of signalized intersections by 2025

Connected Vehicles

150 M
in 2030

90 M
Full
mandate
2024 - 2026

30 M
Initial
mandate
2021 - 2024

Aftermarket
2019 - 2021

0.5 M
Voluntary
2017 - 2021

Roadside Equipment (RSEs)

150,000 in 2030

90,000 — Full vehicle mandate — 2024 - 2026

30, 000 — Initial vehicle mandate — 2021 - 2024

Intersections and curves — 2019 - 2021

5,000 — Safety critical signalized intersections — 2017 - 2021

Path to AV

Automated Features

- Voluntary fitment of automated features by OEMs
- Fitment of automated features under NHTSA agreements
- Significant penetration by 2025

Highly Automated Vehicles (HAVs)

- Rules of the road at state level
- NHTSA issuing AV interpretations of FMVSS
- NHTSA guidance for HAVs
- HAV performance & security standards
- Smart cities deployments
- On-demand fleets in precincts and cities
- Readiness for on-demand mobility services by 2025

Continuing issues for AV

- Occasional engagement of human driver
- Liability
- Cybersecurity & privacy
- Compliance with federal motor vehicle standards

- No national roadmap to HAV deployment
- Too many questions, inhibiting collaboration
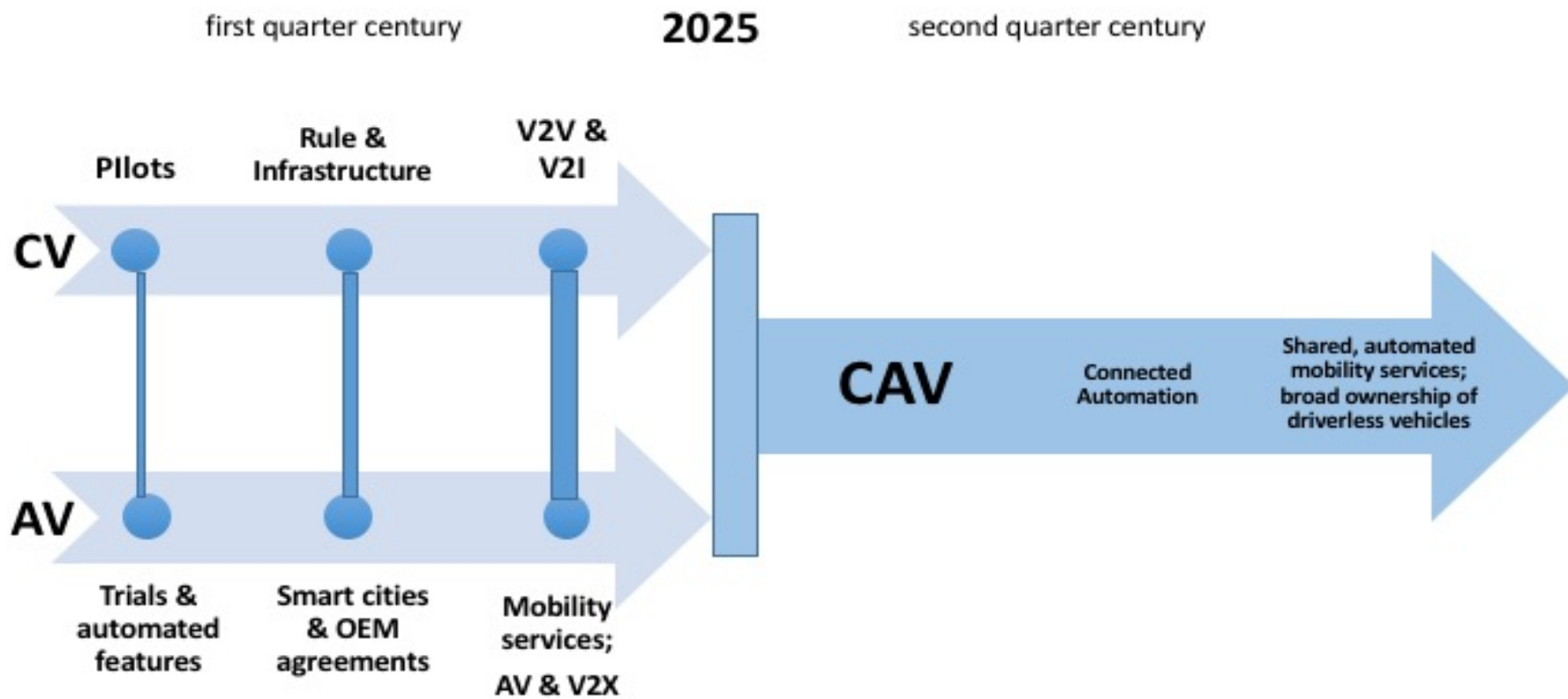
New roles for universities

- Independent convenor and holder of datasets
  - HAV requires sharing of data within privacy and competitive constraints
- "Sleeves rolled up" research model
  - Research based on deployment
  - Rapid learning cycles with real users on public roads
  - Accelerated process: redirection, immersion, rapid-fire products
- Working with agencies at all levels
  - History with state DOTs (but not other state agencies)
  - Federal funding – "at source" model
  - No history with regional and local agencies
    - City as a "platform"
    - Impacts of Smart Cities programs
- Assisting economic development of states, regions, counties
  - "Non-scientific" stance