

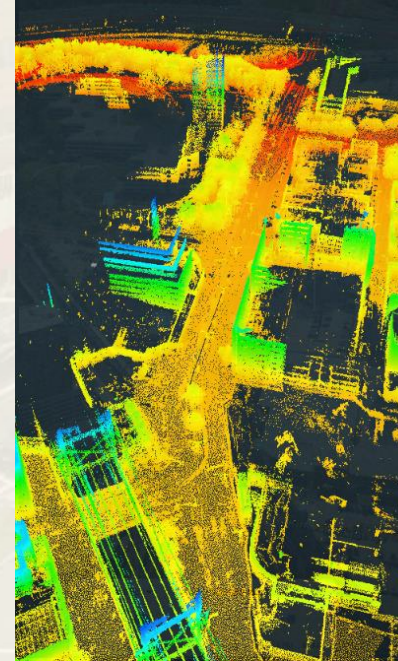


School of Engineering

Region 2 University Transportation Center Consortium  
led by Rutgers Center for Advanced Infrastructure  
and Transportation (CAIT)

## New Brunswick Innovation Hub (Smart Mobility Testing Ground)

October 29, 2020



(CAIT)



### Vehicle-to-Network (V2N)

Communications with backend systems establish automotive specific services like precise navigation maps and software updates, offer access to almost unlimited internet based applications.

### Global Navigation Satellite System (GNSS)

High accuracy positioning is essential for almost all V2X services.

### Vehicle-to-Infrastructure (V2I)

Road infrastructure e.g. traffic lights, road signs provides information for traffic and speed management. Specific infrastructure offers additional services like parking management and road toll collection.

### Vehicle-to-Pedestrian (V2P)

Message exchange between vehicles and vulnerable road users encompassing e.g. pedestrian, cyclist etc. holds the promise of reduced road fatalities and serious injuries.

### Vehicle-to-Vehicle (V2V)

Vehicles exchange messages to achieve cooperative awareness, to warn about road hazardous conditions and to improve driver assistance systems.

# The Future of Transportation



# Connected and Automated Vehicle Technology Development in the US

- Closed Testbeds
- Living Labs
- Urban Living Lab

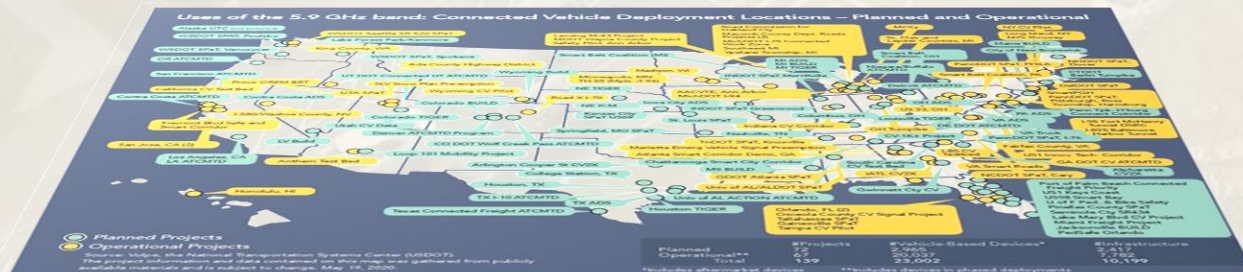


**New Brunswick Innovation Hub  
Smart Mobility Testing Ground (SMTG)**

**Connected and Automated Vehicle  
Testbeds (5 Sites)**



**Automated Vehicle Demonstration  
(10-15 Sites)**



**Connected Vehicle Deployment  
(139 Sites)**

# Connected and Automated Vehicle Technology Development in the US

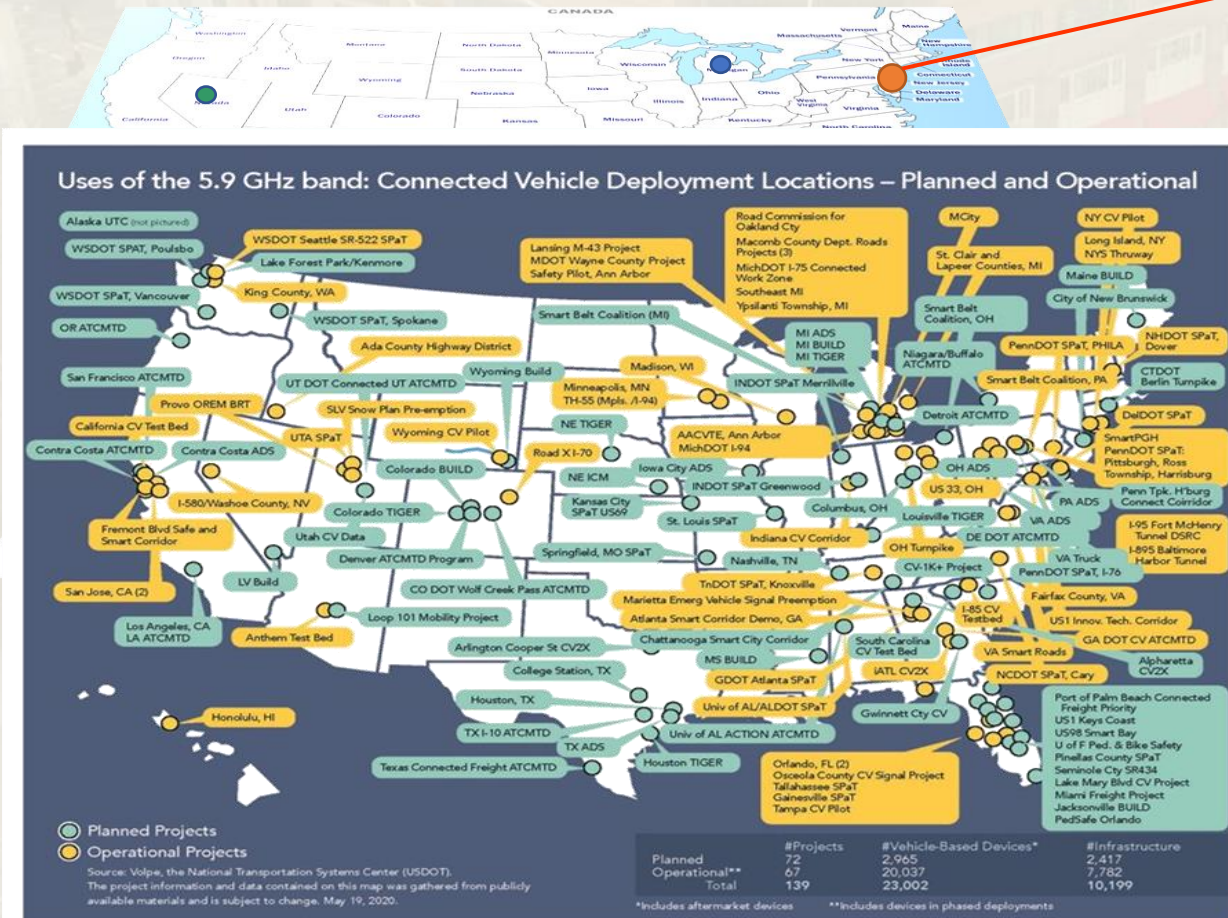
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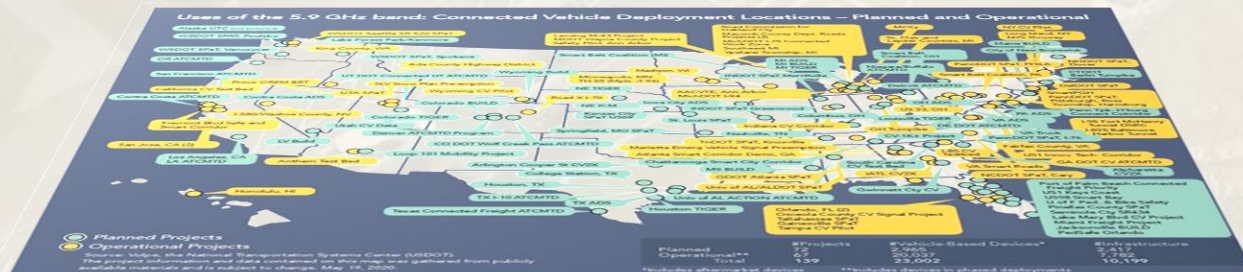


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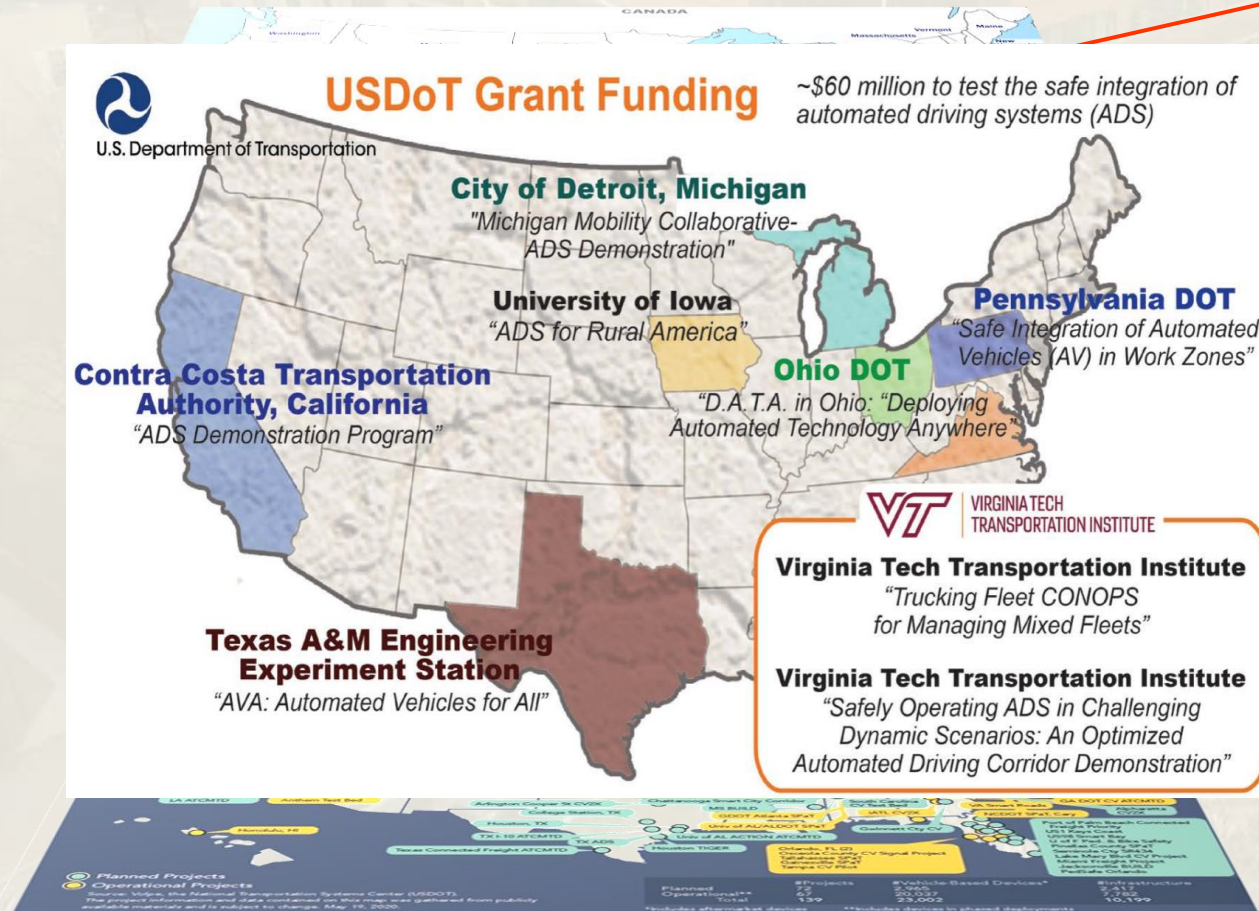
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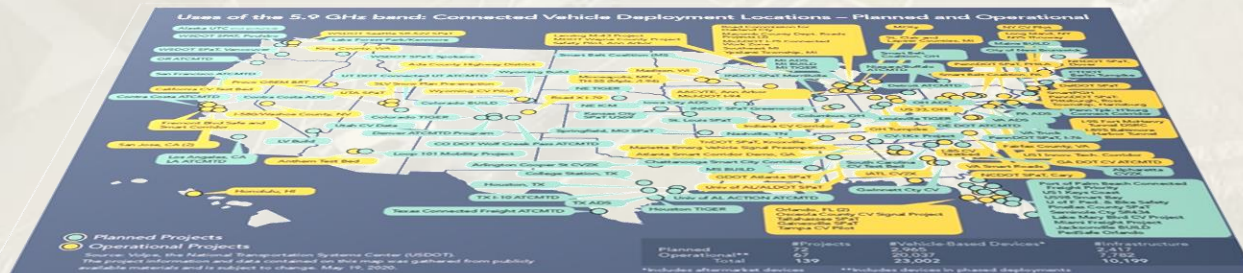


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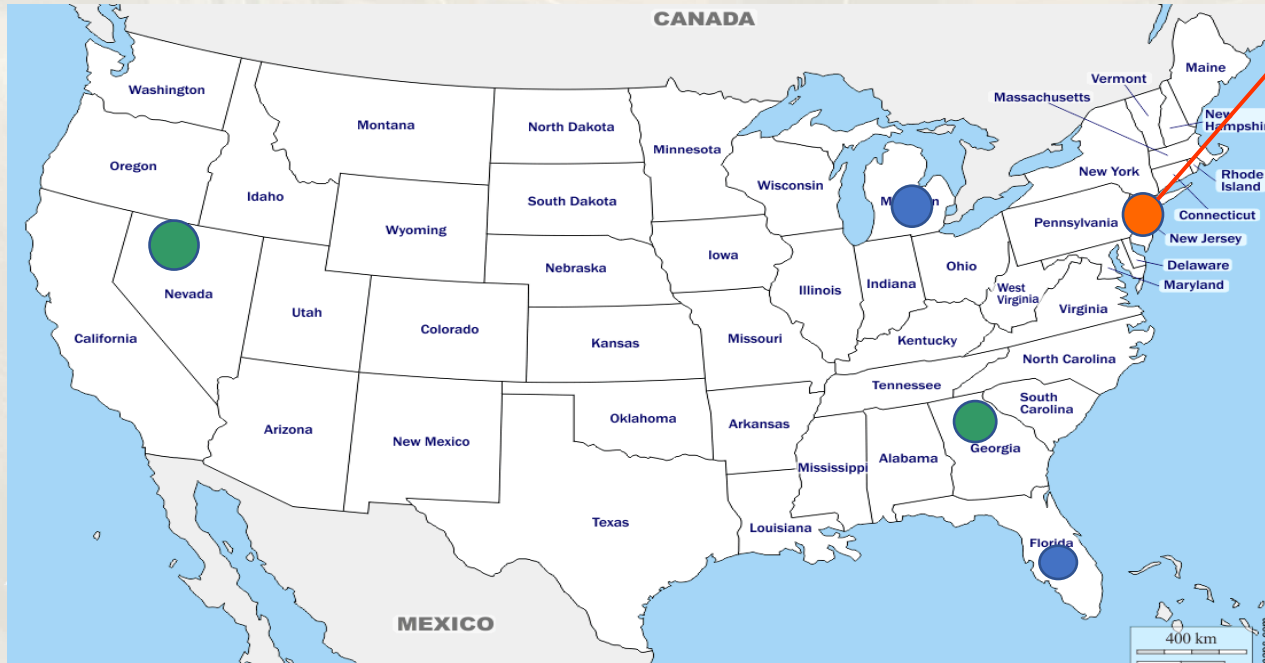
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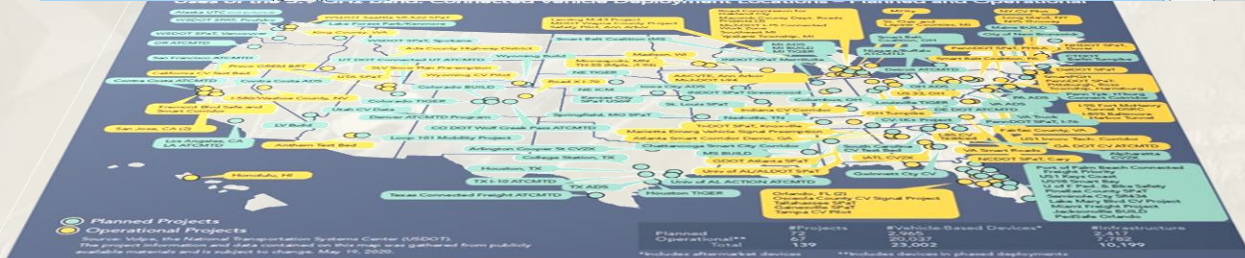


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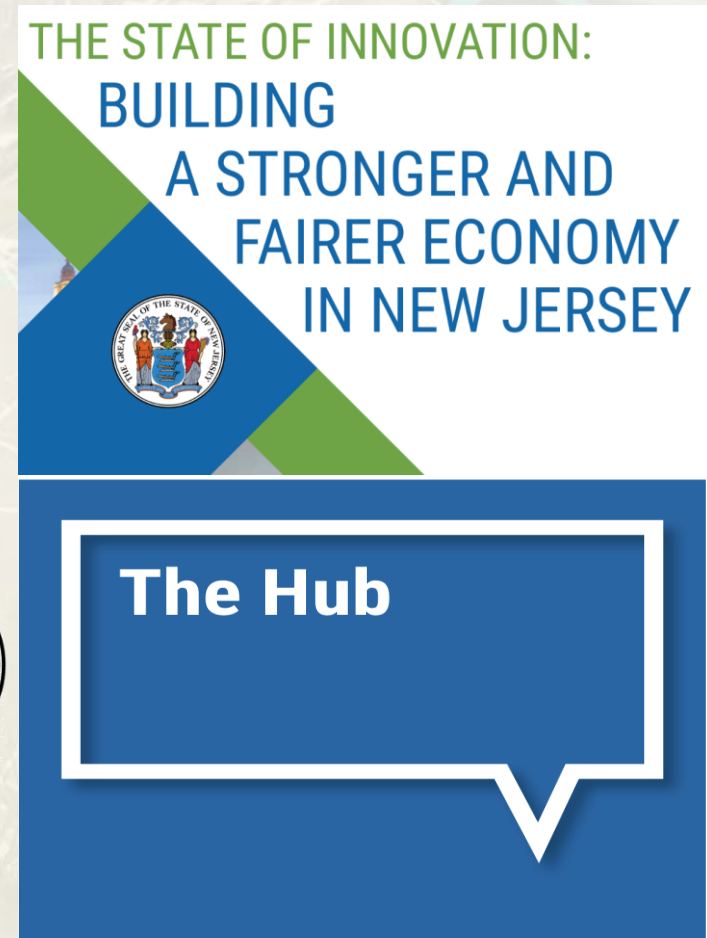
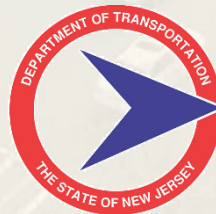




# New Brunswick Innovation Hub

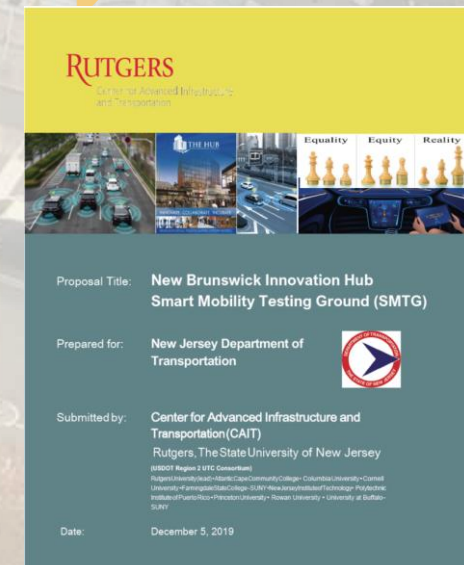
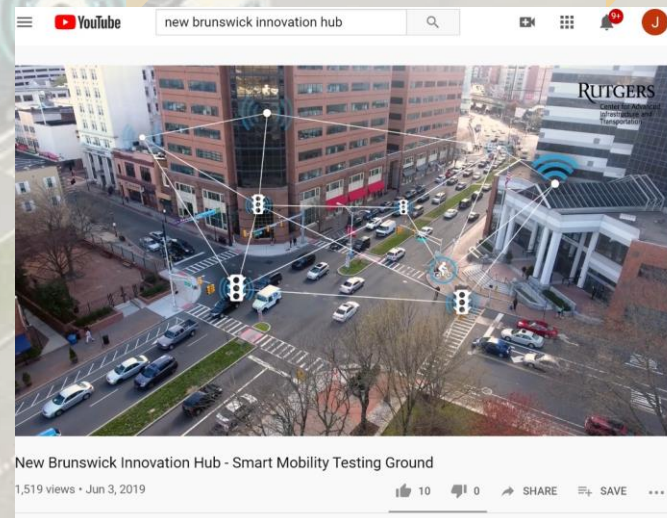
## - Smart Mobility Testing Ground (*The Living Lab*)

Governor Murphy's vision on creating “**The Innovation Hub**” to transform New Brunswick to state’s home for research and start-up incubation





# New Brunswick Innovation Hub Smart Mobility Testing Ground - Timeline

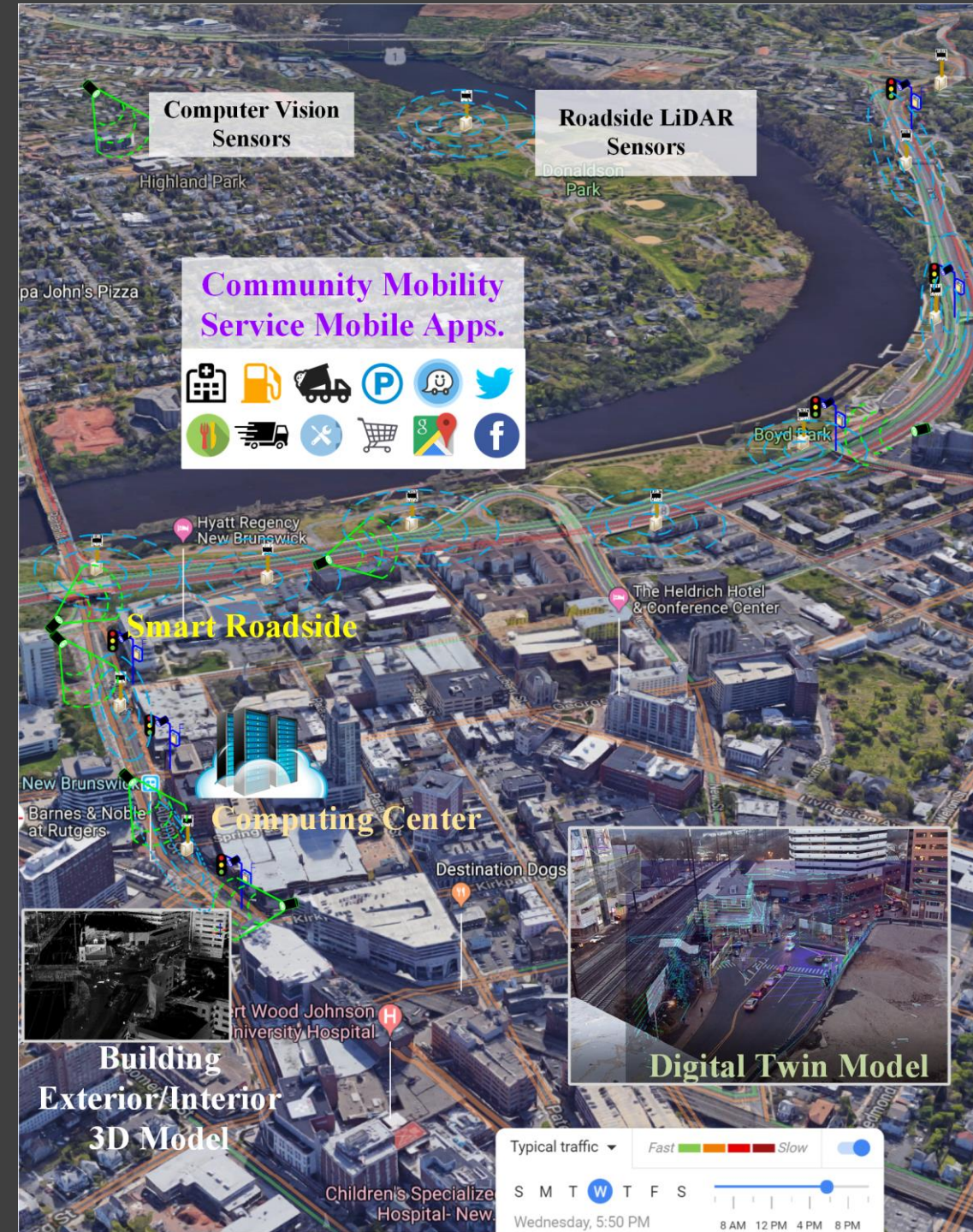




# Proposed Smart Mobility Testing Ground (SMTG)

## Concepts:

- **Self-Driving-Grade Roadside** Sensing and Computing Infrastructure
- Industrial-Grade **Smart Mobility Data Hub**
- **Mobility Technology Breeding Ground** for State, Middlesex County, and the City of New Brunswick
- V2X Smartphone-based **Community Mobility Applications**





# SMTG Roadside Unit Deployment and “Living Lab”

## Technologies

## SMTG Living Lab

High-Resolution Sensing

DSRC/5G Communication

Edge/Cloud Computing

3D Modeling and Digital Twin

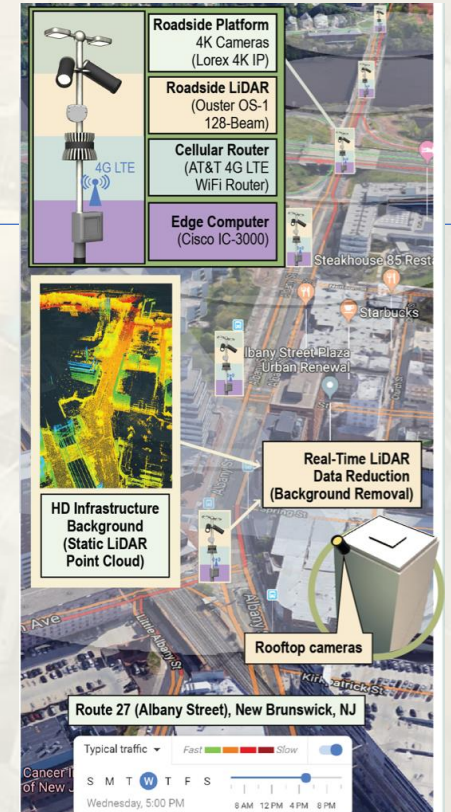
Smartphone and Apps.

Support **Self-Driving** and Smart Mobility Industry

Enable **Data sharing** among all Road Users

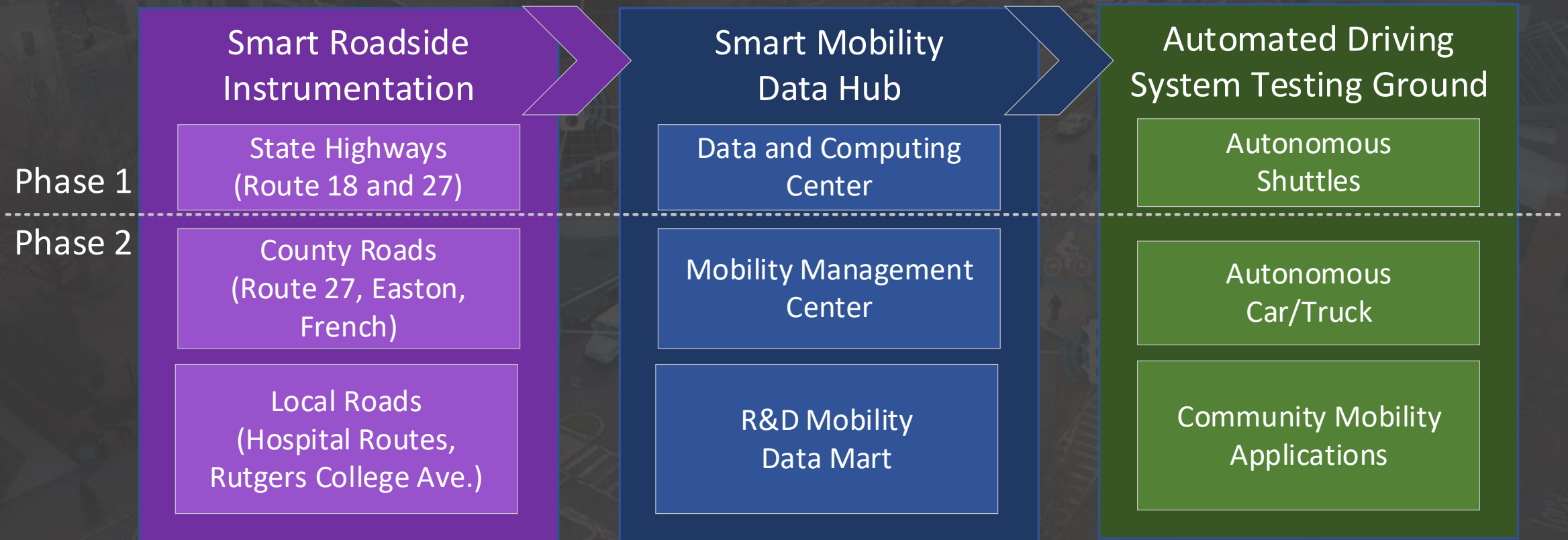
Create **Data Hub** for public, private, and academic R&D

Build the **Test Platforms** for new Smart Mobility Applications

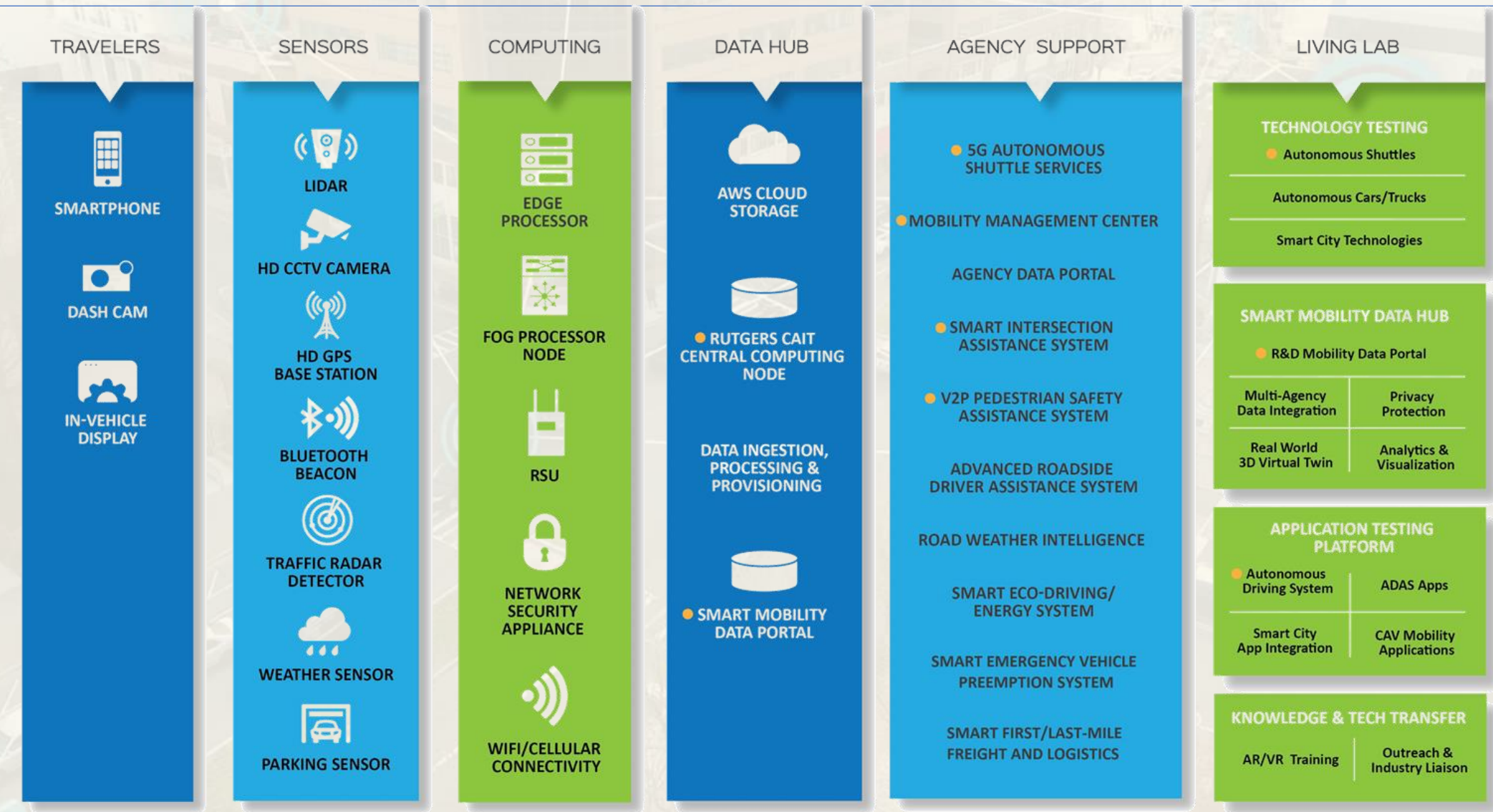




# SMTG Project Phases and Deliverables



# SMTG System Architecture





# SMTG Deployment and Phase Plan

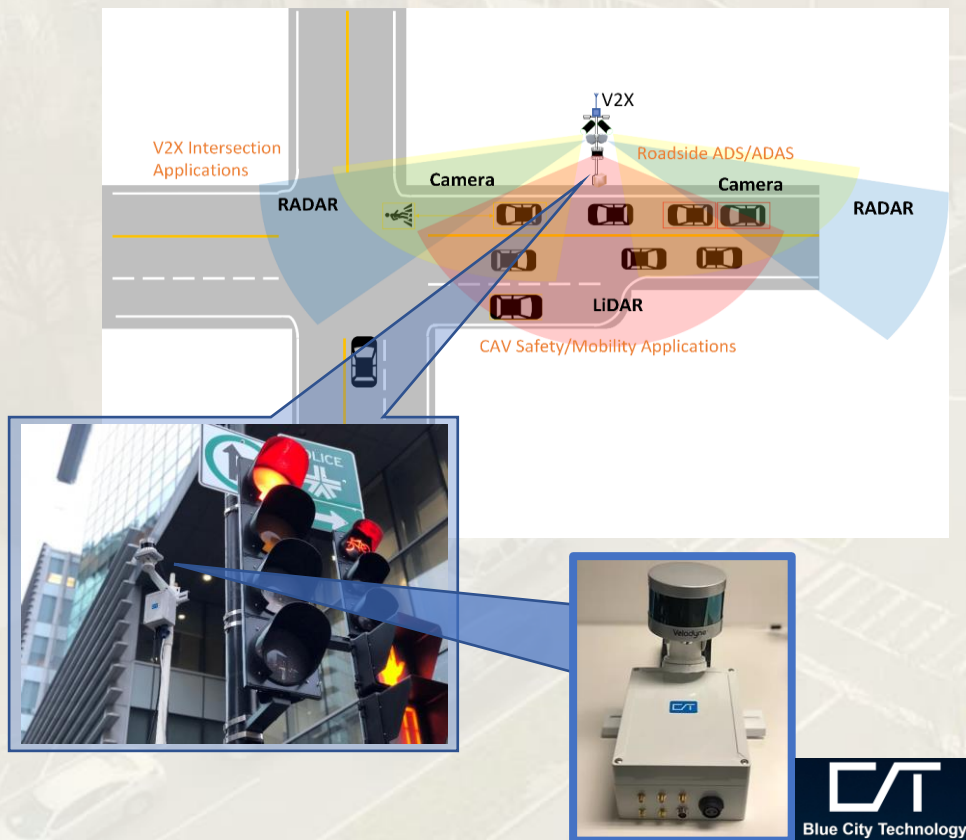
## - Total Mileage: 5 Miles



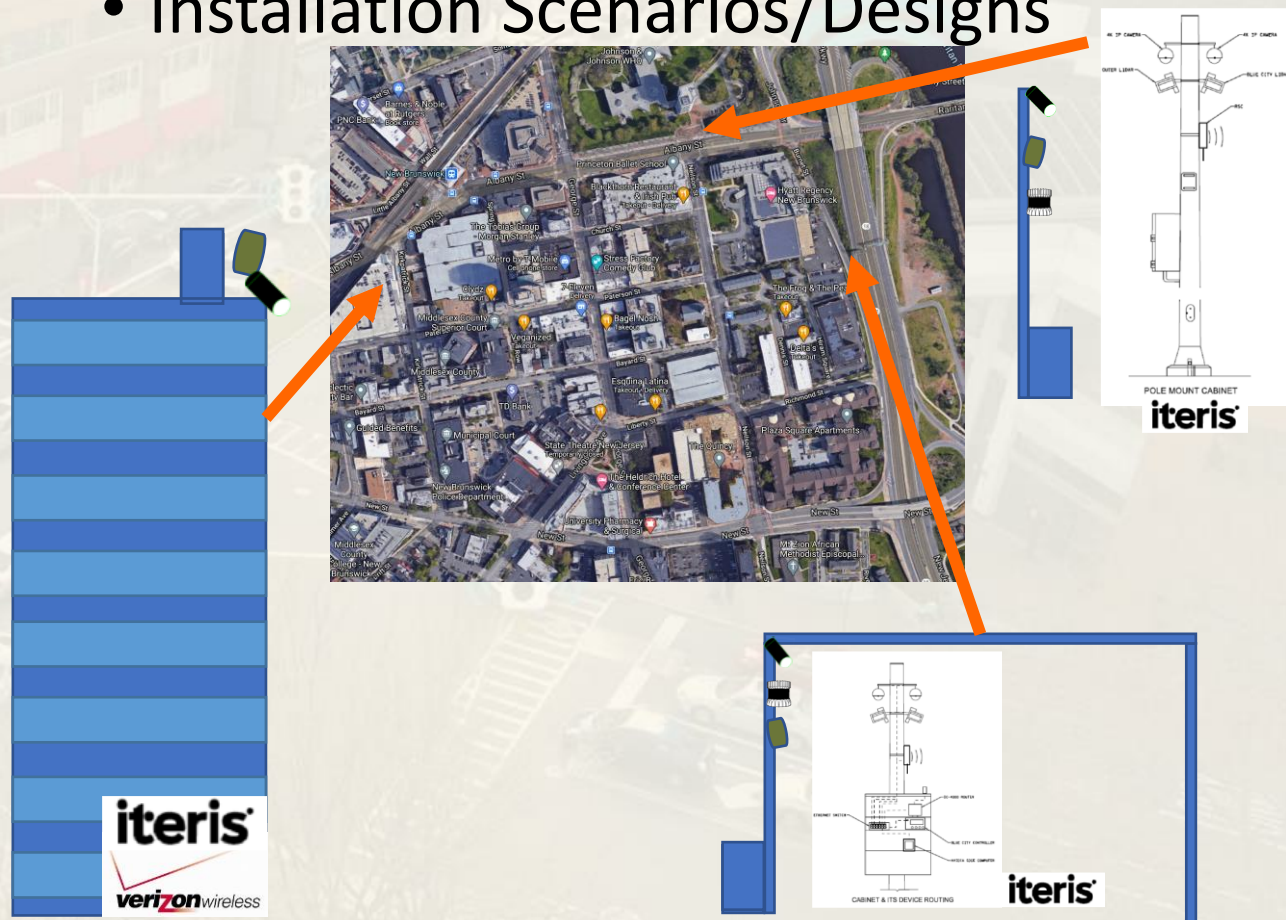


# Roadside Unit Design Concepts

- LiDAR/Video and Edge Computing Units

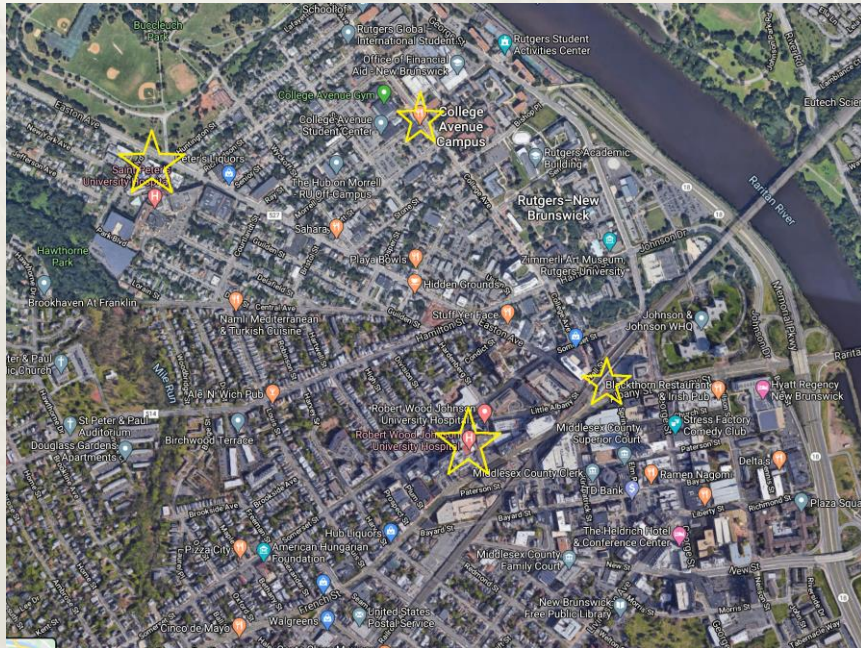


- Installation Scenarios/Designs





# Proposed SMTG ADS Technology Demonstration Project



Key Service Locations:

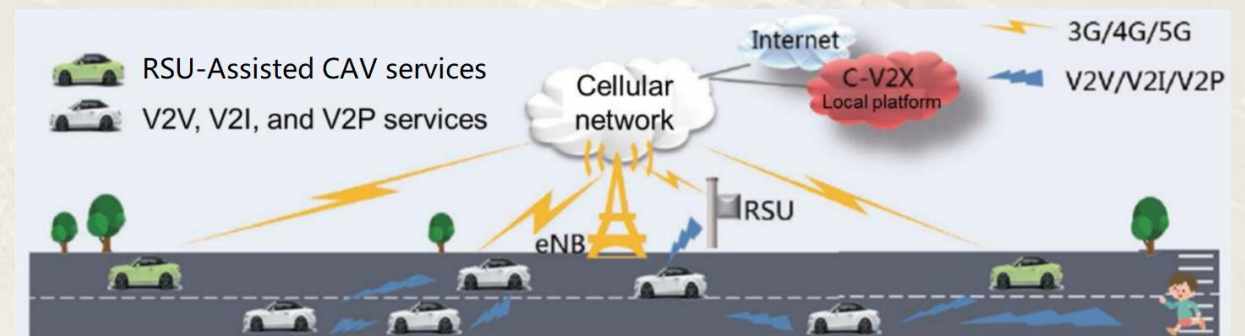
1. Innovation Hub
2. RWJ Hospital
3. St. Peter's Hospital
4. Rutgers University Campus



## Autonomous Shuttle Service Testing



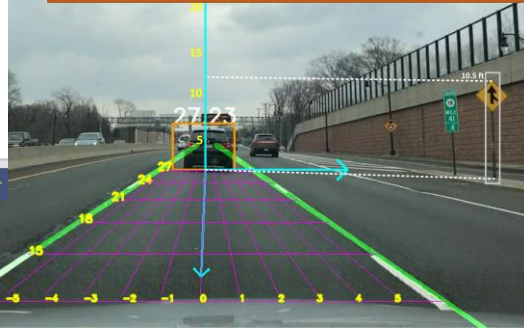
## Connected Automated Vehicles



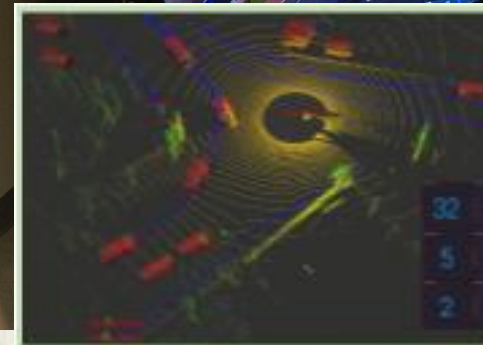


# Mobility Data Hub and Digital Twin Model

SmartMobi Community  
Mobility Application



Full-Digital Sibling of the Corridor



270-degree Visualization Lab



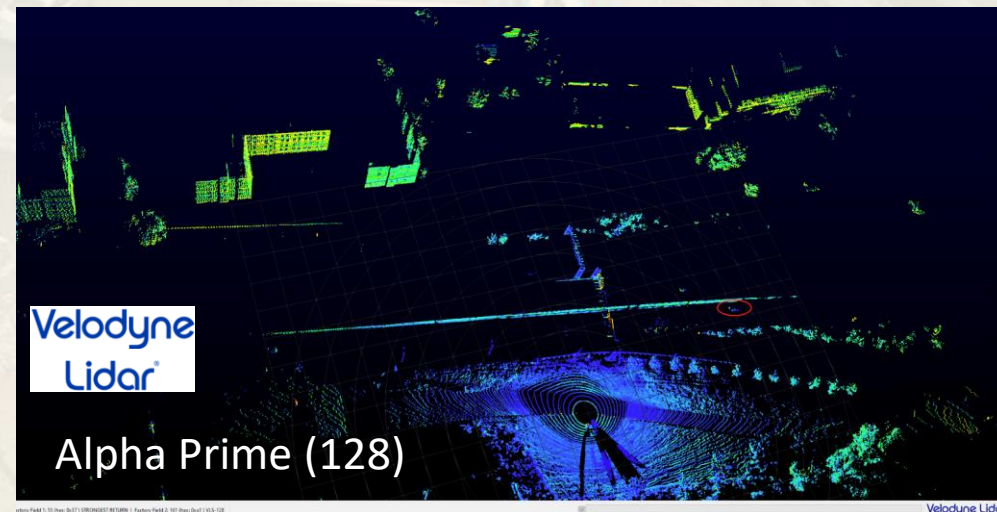
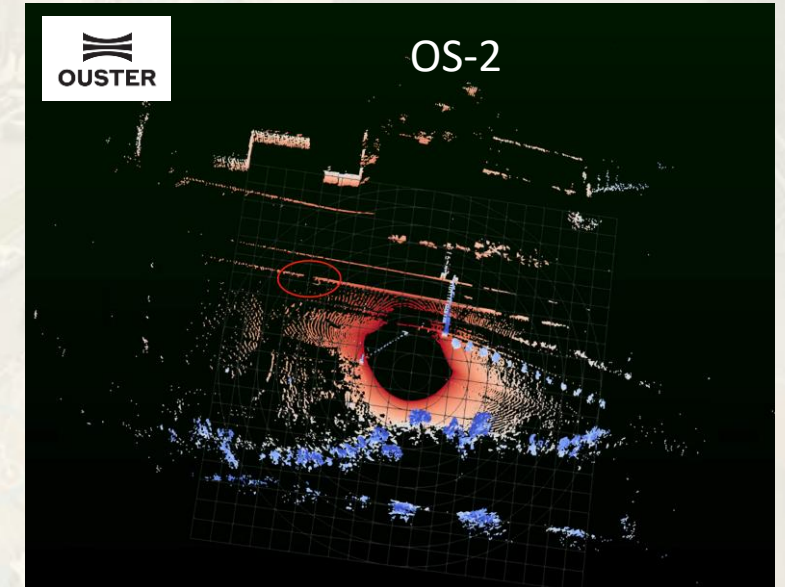
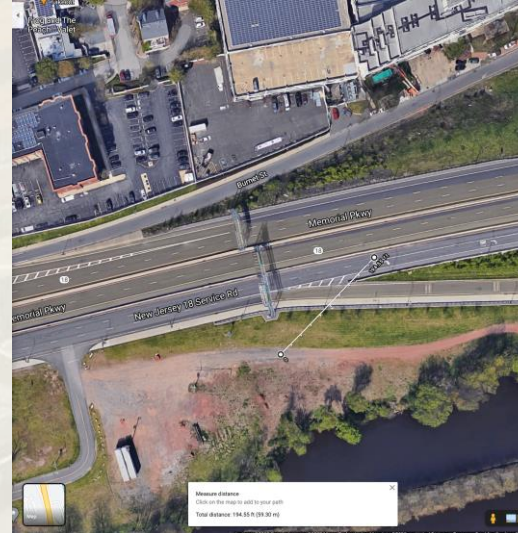
# LiDAR Sensor Tests and Site Planning

## Sensor Coverage Comparison

- Velodyne
  - VLP-32c:
    - 310 ft (Tracking\*)
  - Alpha Prime (128):
    - 380ft (Reconstruction\*\*)
    - 485-525ft (Tracking)
- Ouster
  - OS-1-64:
    - 120 ft (Reconstruction)
    - 285 ft (Tracking)
  - OS-2:
    - 150-230 ft (Reconstruction)
    - 225-290 ft (Tracking)

\* Tracking: >1-2 scanning rings

\*\* Reconstruction: >5 scanning rings





# SMTG Project Team and Partnership

- Public Sectors



- Private Sectors



- Academic/R&D Partners



# Engaging New Jersey Academic Communities

- Rutgers:
  - School of Engineering (CAIT)
    - **Peter Jin (PI), Ali Maher, Mohsen Jafari**
  - Voorhees Transportation Center –
    - **John Carnegie**
  - WINLAB
- ITS Resource Center at NJIT
- Steven Institute of Technology
- Rowan University
- The College of NJ (TCNJ)
- Princeton University
- Columbia University
- M-City: University of Michigan-Ann Arbor
- SunTrax: Florida International University
- Carnegie Mellon University





# New Brunswick Innovation Hub Smart Mobility Testing Ground

## Regional Impact

- **Position Middlesex County as a national leader** in ushering in the next generation of transportation
- Demonstrate leading edge technology applications to improve transportation **reliability and safety** and provide new **mobility** solutions
- Grow **jobs**, attract **investment** and build an **ecosystem of entrepreneurship** around advanced autonomous vehicles in the County



# New Brunswick Innovation Hub Smart Mobility Testing Ground

## State Impact

- Economy: Governor Murphy's vision on creating the hub to **promote innovative economy**.
- Workforce Development: Attract and retain **high-tech talents** to build careers in NJ.
- Transportation: Breeding ground of **transferrable smart mobility solutions** to state and nation.

These earnings and activity will generate **significant local and state tax revenues**.

**High Quality Jobs:** Average annual pay for Middlesex County workers in scientific research and development services is \$147,000, **more than 2x the average** private wage of \$65,000. - *U.S. Bureau of Labor Statistics (2018)*

**Spillover Effect:** For every \$1.00 of production in scientific research and development services in the county, **\$1.90 of activity is generated** in the local economy. - *IMPLAN (2015)*

## The Hub

THE STATE OF INNOVATION:  
BUILDING  
A STRONGER AND  
FAIRER ECONOMY  
IN NEW JERSEY

New Brunswick, Middlesex County and New Jersey will also benefit from **innovative technologies** that increase efficiency and productivity and reduce costs.



# Thank you!

