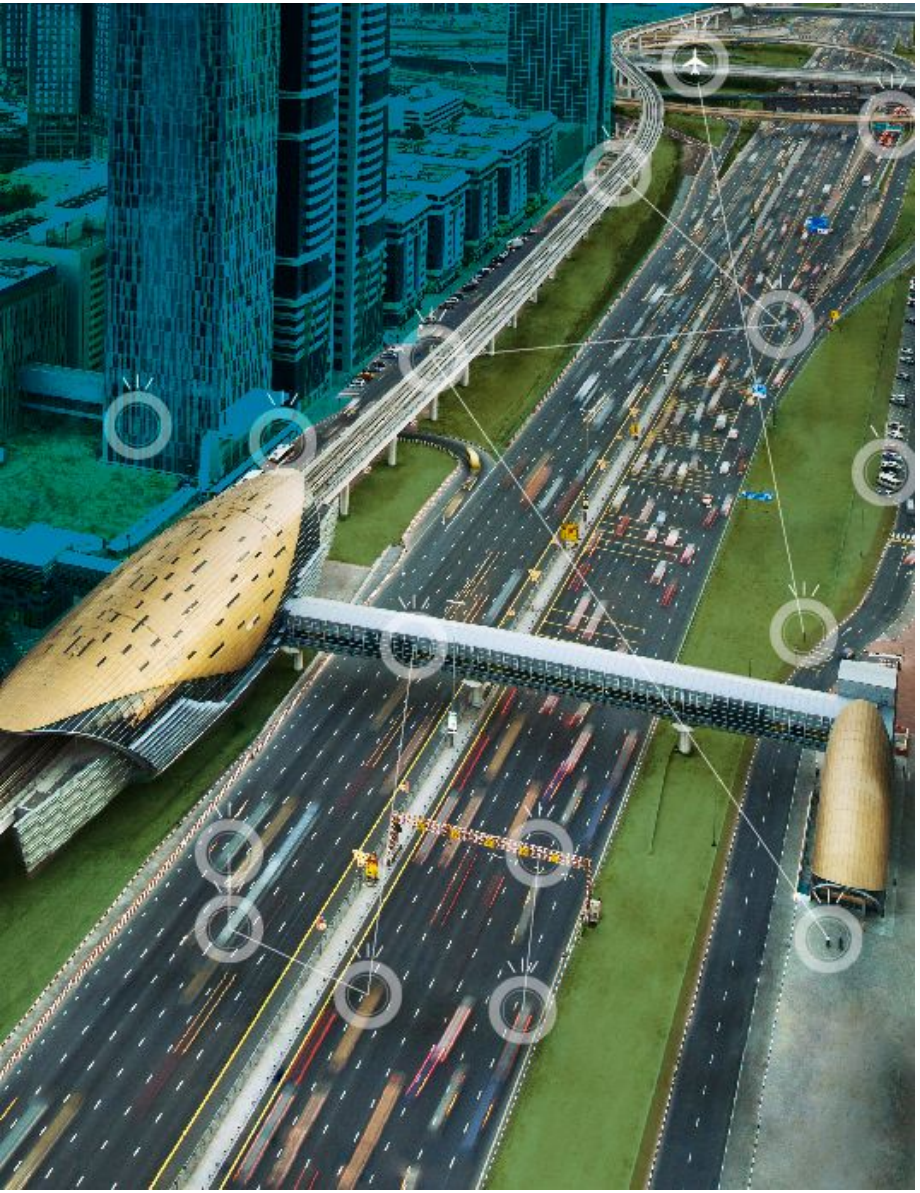

INTEGRATION OF AUTOMATION INTO THE TRANSPORTATION OPERATIONS ENVIRONMENT

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HNTB Corporation

FLORIDA AUTOMATED VEHICLES SUMMIT

November 22. 2019

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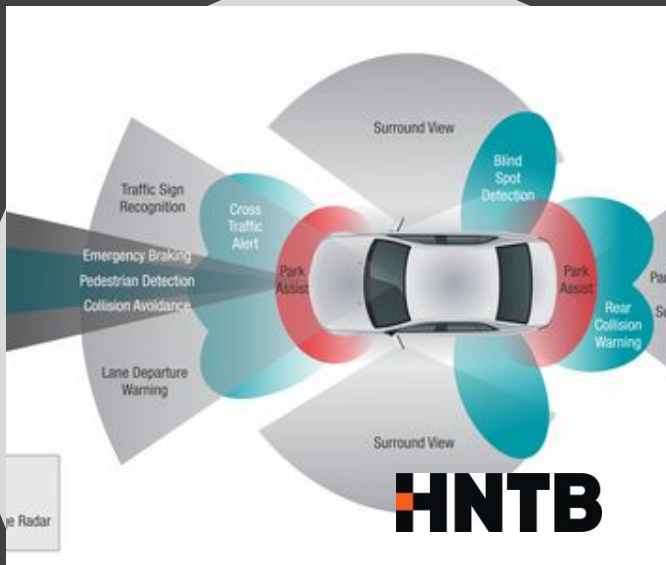
CHALLENGE

- Integration of emerging transportation technologies into the existing operations environment
  - Long transition period
  - Uncertainty regarding:
    - Regulation and policy
    - Technologies
    - Standards
    - Resource needs
    - Business models

TRANSFORMATION OF OPERATIONS

- Collaborative, proactive approach needed to support emerging mobility solutions
- Understanding nuances of ADS behavior for safe transportation system operations
- Understanding ADS use cases to create an integrated environment for automated driving



EARLY BUSINESS CASES

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AUTOMATED VEHICLE BUSINESS CASES

- Ride-hailing and fleets of shared use vehicles
- First and last mile opportunities
- Residential, CBD and campus circulation
- Truck automation and platooning
- Package and food delivery
- Dedicated lanes for AVs
- Highway maintenance and construction operations

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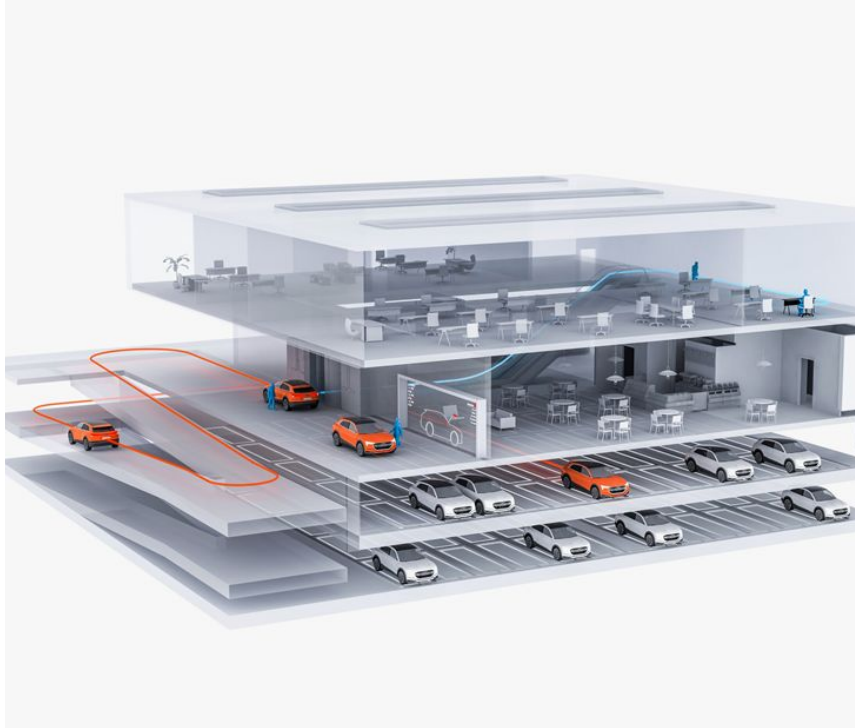
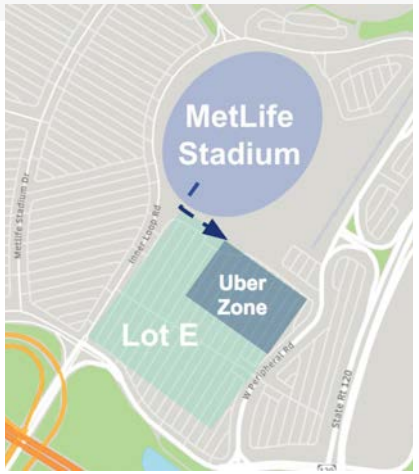
Ride-Hailing Services

- Environments:
  - Introduction in geofenced areas of cities
  - Entertainment and sports venues
  - Transit stations, mobility hubs and airports
- Impacts:
  - Curb management needs – Dynamic “Flex Zones”
  - Changes in parking needs
    - Parking structure design considerations
    - Repurpose parking for automated vehicle staging, queuing and charging
  - Buy rides, not cars
    - Fleet ownership changes
    - Garaging and residential home design considerations





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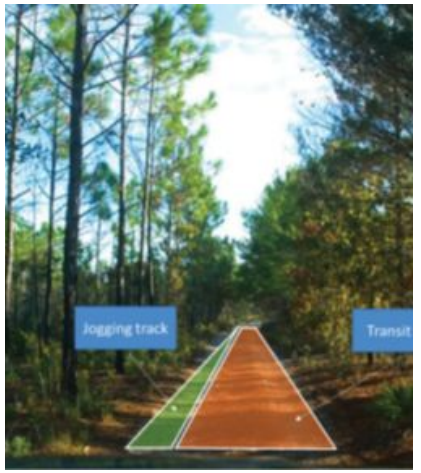
First and Last Mile Services

- Environments
  - Deliver residents / workers to and from mobility hub, transit station or parking
  - Residential communities
  - Resorts / beaches / parks
  - Airports and event venues
  - Commercial / business parks
- Impacts:
  - Remote parking facilities
  - Reduced congestion in sensitive areas
  - Greater accessibility
  - Curb management solutions
  - Intermodal connectivity



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Circulators

- Environments:
  - Campus, Airport and CBD Circulation
  - Planned Community Circulators
- Examples:
  - University of Michigan
  - Jacksonville Ultimate Urban Circulator
  - Columbus, OH
  - Babcock Ranch, FL
  - Treasure Island, San Francisco
- Impacts:
  - Reduced congestion
  - Walkable communities
  - Greater accessibility

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Automated Goods Movement

- Environments:
  - Intermodal connectivity at ports and airports
  - Assembly and distribution centers - Docking solutions and building design
  - Long-haul trucking efficiencies on Interstates
  - Local delivery
    - Land vehicles
    - Unmanned aerial vehicles
- Impacts:
  - Improved safety, traffic flow and efficiency
  - Better fuel efficiency from platooning
  - More efficient inventory handling = reduced space needs

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Truck Platooning

- Impacts:
  - Less wheel wander = pavement wear pattern and rutting
  - Less time for pavement slabs to recover
  - Dedicated lanes for truck platoons on highways
  - Bridge weight limits

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TRANSITIONING ON OUR HIGHWAYS

- Transition period will be challenging for operations
- Managed lanes in a new context
- Should we separate automated vehicles from others to generate the most benefits?
- At what penetration rate should we dedicate a lane?
- Incrementally increase the number of special lanes as the fleet turns over?

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LIFECYCLE CONSIDERATIONS FOR OPERATIONS

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PHASES OF THE OPERATIONS LIFE-CYCLE

SCALED DEPLOYMENT

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FLORIDA'S STRONG POLICY & PLANNING FOUNDATION

SUNTRAX AUTOMATED VEHICLE PROVING GROUNDS

- ADS test case validation
- Infrastructure test case development and validation
- Opportunity for collaboration among government, business and research communities
- Opportunity to design and test infrastructure and operations modifications for ADS

SunTrax Toll and CAV Test Facility, Lakeland FL

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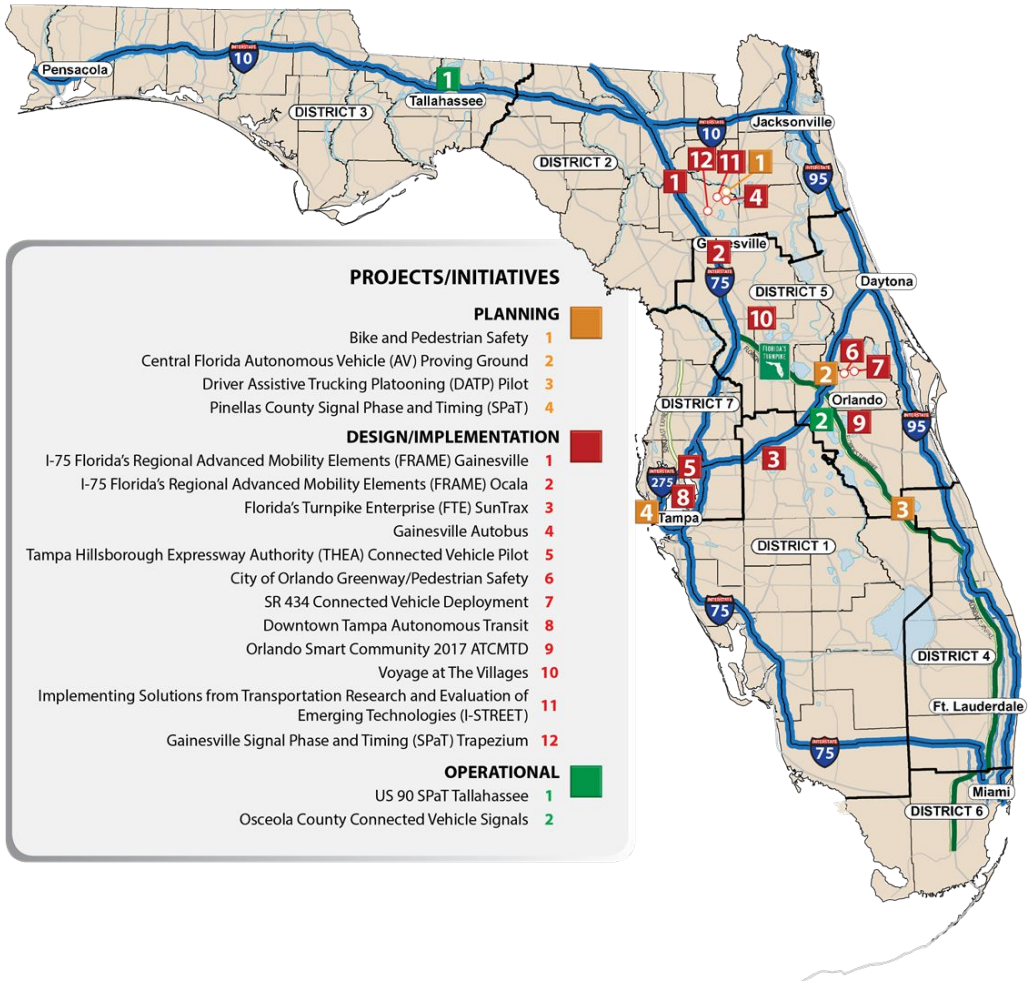
FLORIDA AT THE FOREFRONT OF IMPLEMENTATION



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WHERE ARE OPERATIONS HEADED

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WHAT LIES AHEAD?

- Automation impacts on operations?
- More VMT or less?
- Less parking?
- Private versus fleet ownership models?
- Impacts on transit?
- Climate impacts?
- Quality of life?
- Urban form?

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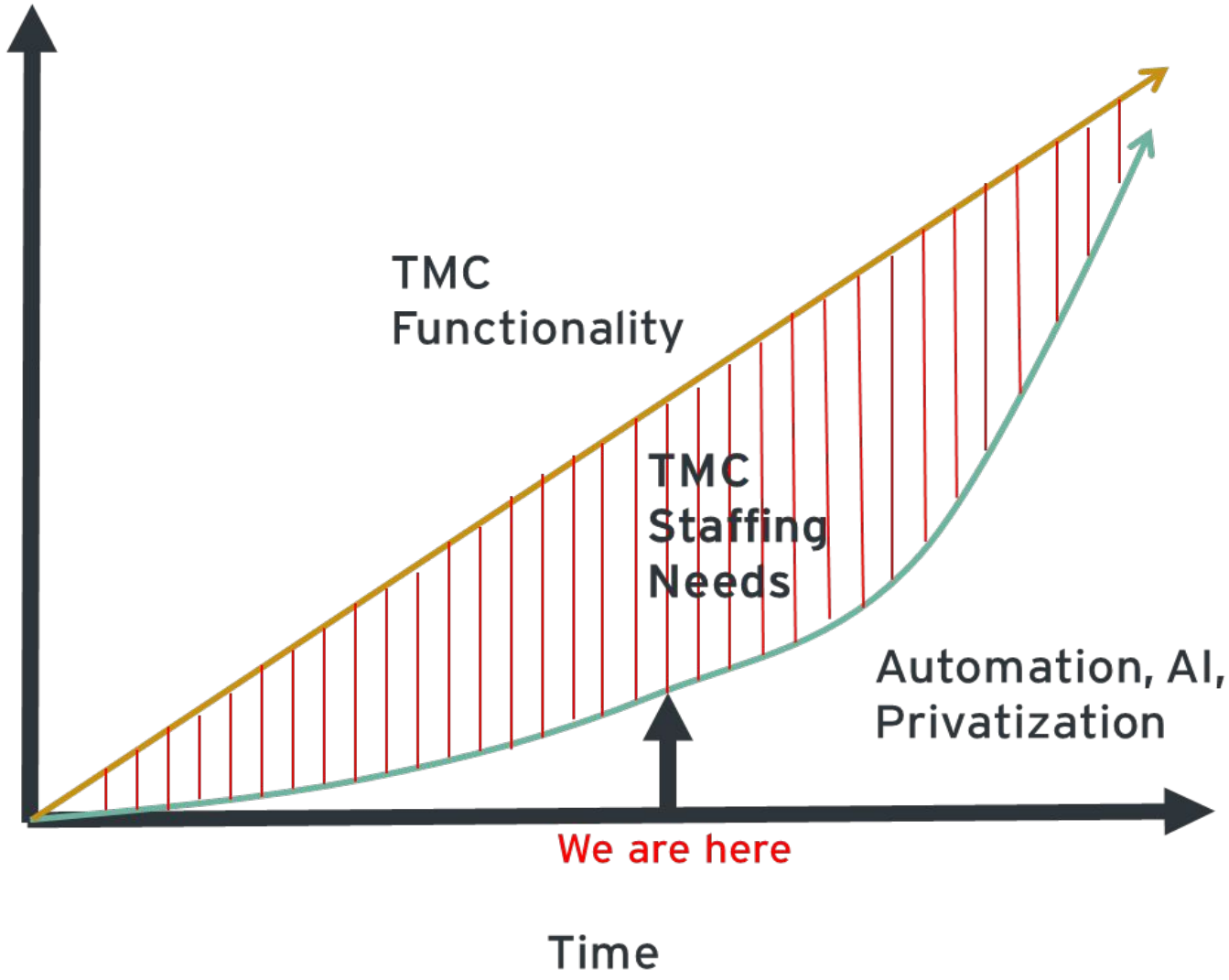
IMPACTS ON TRANSPORTATION MANAGEMENT CENTERS

- Automation and AI will transform operations
- Functionality of TMCs will change over time
- Staffing needs will change



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INFRASTRUCTURE IMPACTS

- The “Automated Highway”
  - Integrating automation into design and operations
  - MUTCD changes
  - Automated payment solutions
  - If “cars don’t crash” -
    - Traffic signalization impacts
    - Signage
    - Lane management solutions

Source: University of Texas

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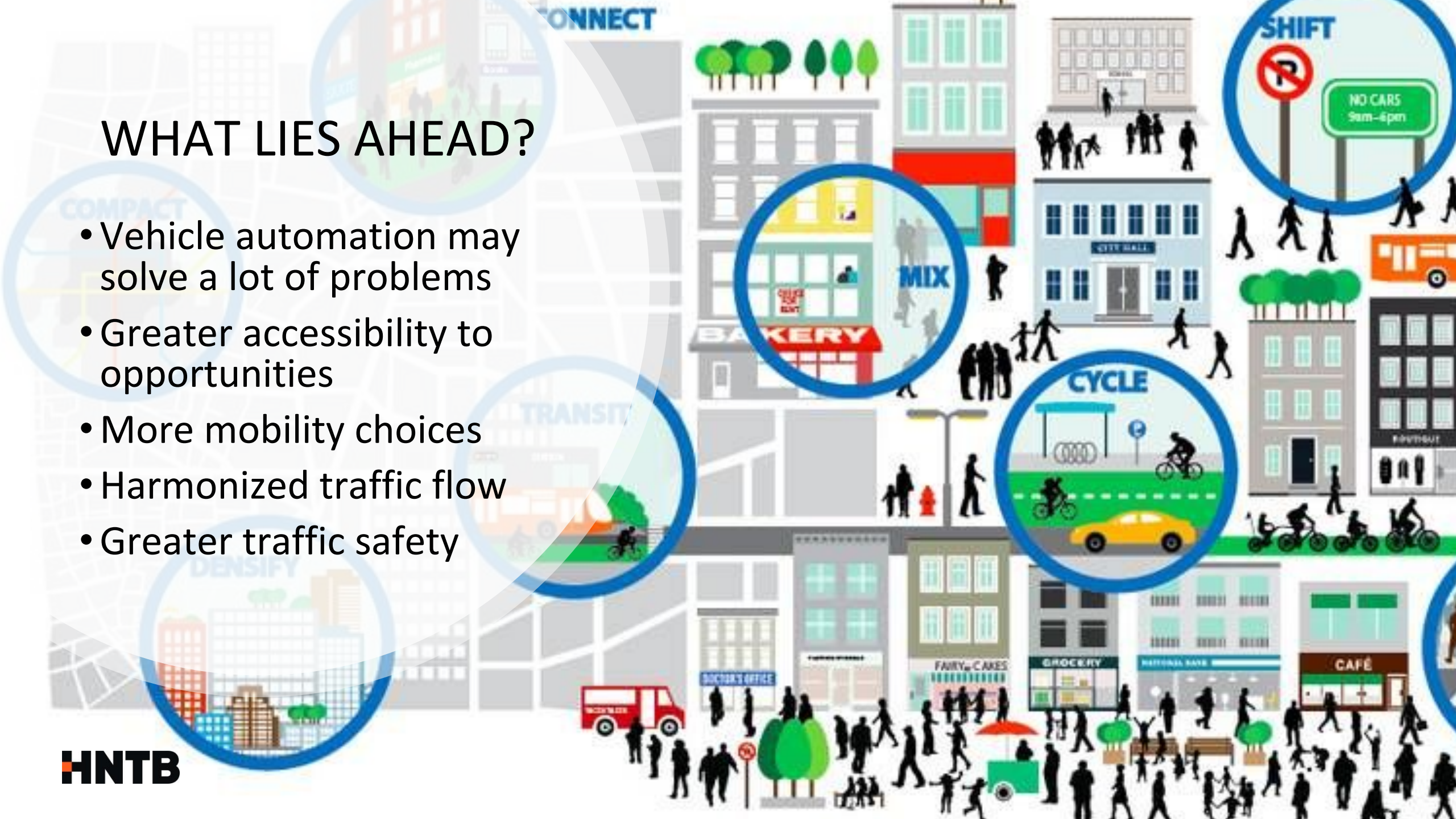
WHAT LIES AHEAD?

- Vehicle automation may solve a lot of problems
- Greater accessibility to opportunities
- More mobility choices
- Harmonized traffic flow
- Greater traffic safety



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WHAT LIES AHEAD?

- On the other hand…
- Vehicle automation may promote longer commutes
  - Work, sleep, eat on your ride
- Impacts:
  - Urban sprawl
  - Large lot developments and rural transformation
  - Property value decreases in urban core
  - Decentralization of housing and jobs to exurban areas
  - Additional strain on infrastructure

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WHAT LIES AHEAD?

- "Nomadization"
  - Untethered to place
  - Work, sleep, eat and live in your automated vehicle
  - Highways as homesteads
  - Strip cities / "sprawl on steroids"

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GAME CHANGER

- Automated, Connected, Electric and Shared Vehicles
  - Collaboration is required
  - Impacts on operations, urban form and land use, transportation system design, intermodal coordination, parking, green space
- Future Can’t be Left to Chance

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