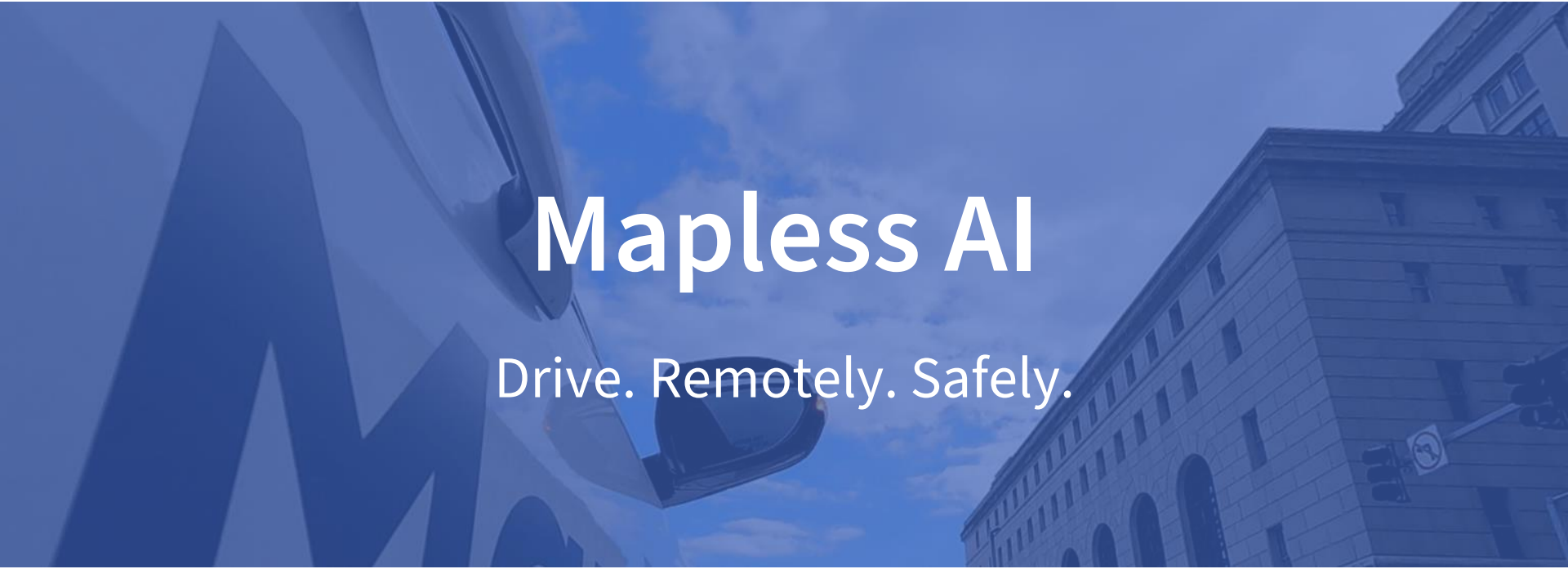
Future Networked Car Symposium

FNC2025

SESSION 2:

Challenges in Achieving Effective Vehicle Remote Driving



Leadership Team

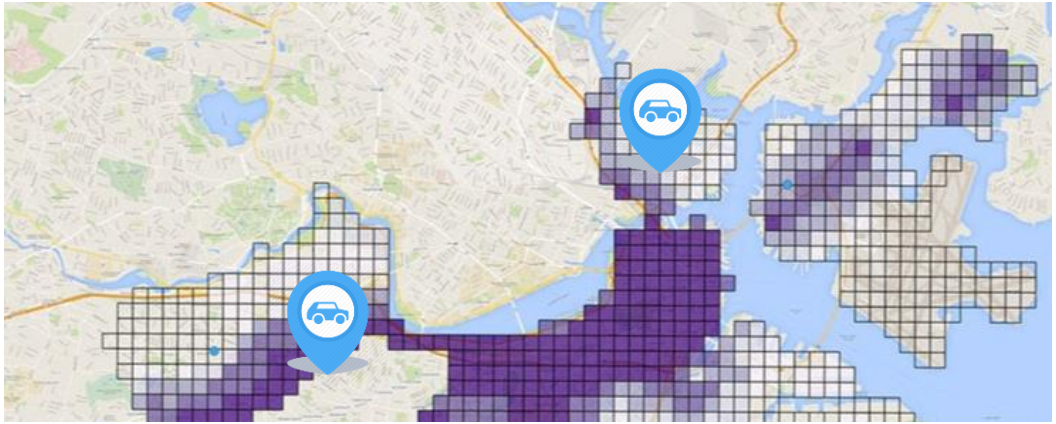
Philipp Robbel, PhD
CEO and Co-Founder

- Director of Engineering at nuTonomy – led safety and simulation teams (acquired in 2017)
- Head of Safety at Aptiv Autonomous Mobility
- Engineering at Bosch (L4 Highway Pilot)
- PhD in Robotics, MIT

Jeffrey Kane Johnson, PhD
CTO and Co-Founder

- Technical expert in Autonomous Vehicle systems
- Built AV navigation at Bosch, Apple, and Uber
- Principal Investigator in NSF award for vehicle safety system
- Computer Science PhD, Indiana University

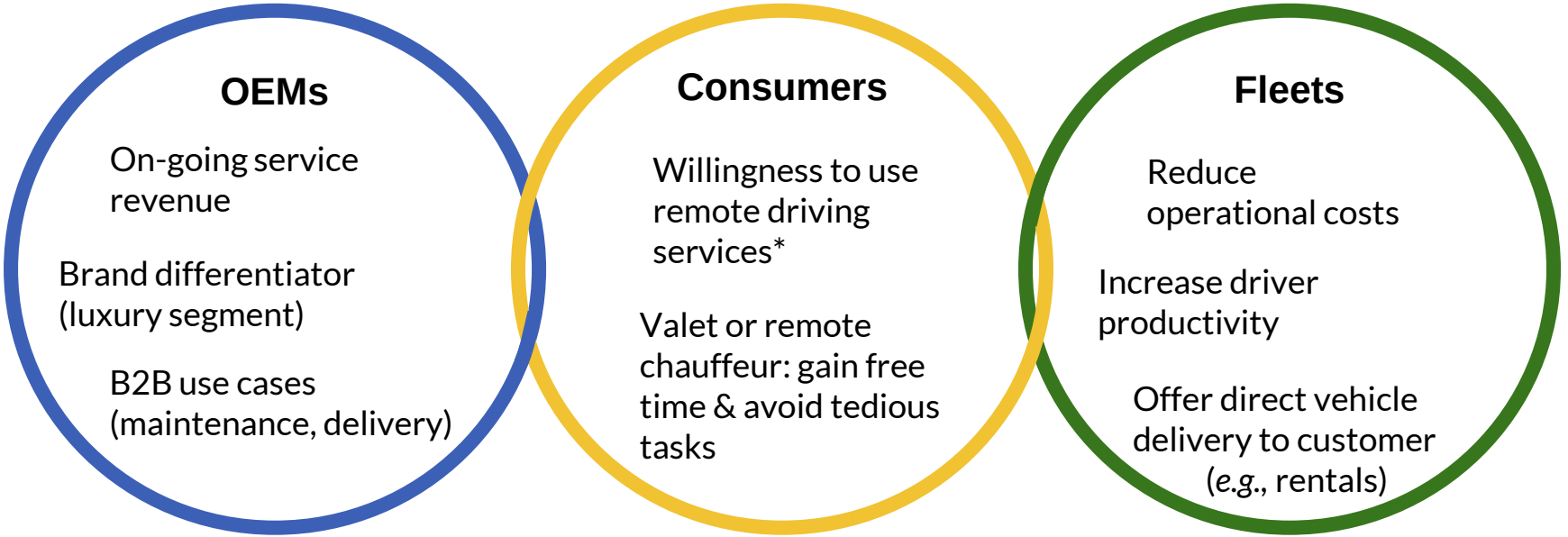
Vehicle Movement is Critical for Fleet Operations



Fleet side:
Keep driver productivity high
Rebalance fleet effectively

Customer-facing side:
Meet needs for vehicle availability
Enable new revenue streams from use cases like vehicle delivery on demand

Benefits to Remote Driving



** McKinsey & Co, "Remote-driving services: The next disruption in mobility innovation?" (Jan 3, 2025)*

Mapless AI: Full Stack for Public Road Operation

- Optimized install targeting fleet partners
- Trained remote driver staff
- Targeted to automotive standards
- Safe motion at all times – independent of network

Ensuring Safe Motion during Remote Driving

Full Safety concept for remote driving

- Supports remote driving or AV stack
- Automotive-grade
- ADAS-level pricing

Redundant Sensors

- Cameras and LIDAR—processed locally on vehicle
- Forward sensor cleaning

Low-latency perception and control contingency layer is required for mitigating safety hazards during Teleoperation.

Cellular bonding < 6Ghz

- Redundant 4G/5G Sub-6 channels
- Link management: load balancing, FEC

Safety System

- Redundant safety (2x brake)
- Backup power
- Fully-driverless operation

Deployments

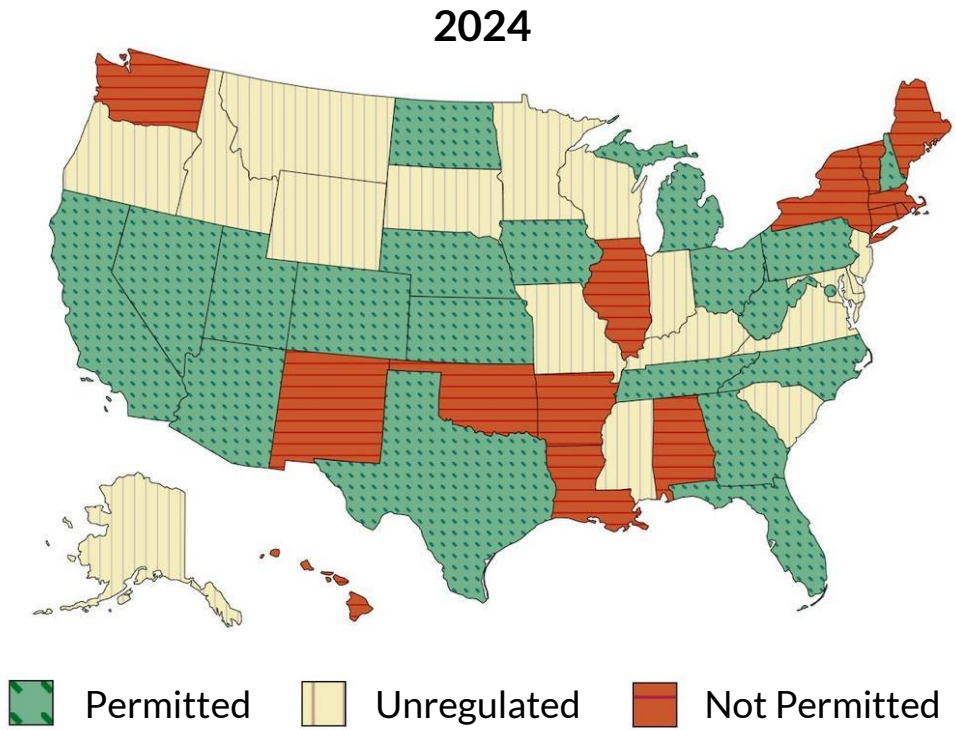
Areas of Operation

Mapless operation:

- Pittsburgh, PIT airport, Harrisburg, PA
- Detroit, MI
- Tampa, FL
- Massachusetts

Use cases:

- Carshare
- Fleet Ops
- Vehicle manufacturing



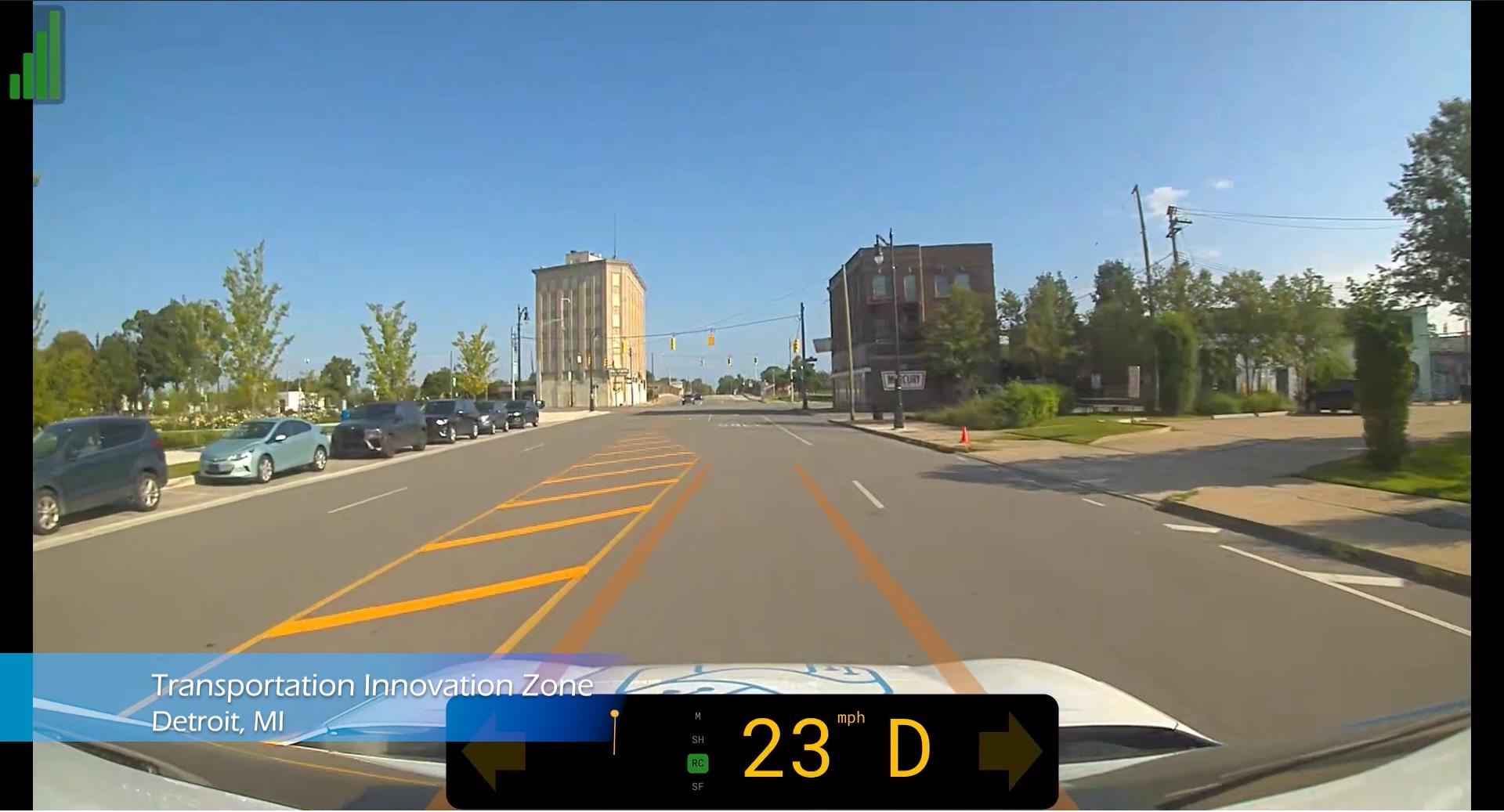
Corktown Carshare

Corktown Carshare is available in the Detroit Corktown area since Feb, 2025

Remote driving unlocks *virtual parking spots* and return to charging hub.

Corktown Carshare

Vehicles are controlled from control center in Pittsburgh, PA.



#ConnectedCar
Discussion Topics

Topics of Interest @ Mapless

- **Application layer tooling**
  - Effects of package drop / latency / jitter *)
  - Fault injection testing
- **Operator longitudinal motion perception**
  - HUD overlays, sound
- ***Reaction* to link degradation**
  - Corrective measures (bandwidth adjustment)
- ***Prediction* of link performance**
  - Offline: mapping
  - Online: RB allocation
- **Safety system**
  - Conservative, safe actions in times of degraded performance

**) Not just a teleoperation issue! Cf. NHTSA AV STEP comments (2025)*

Move Vehicles Without Moving People

VIP invites for rides in Detroit, Pittsburgh, or Boston: vip@mapless.ai