

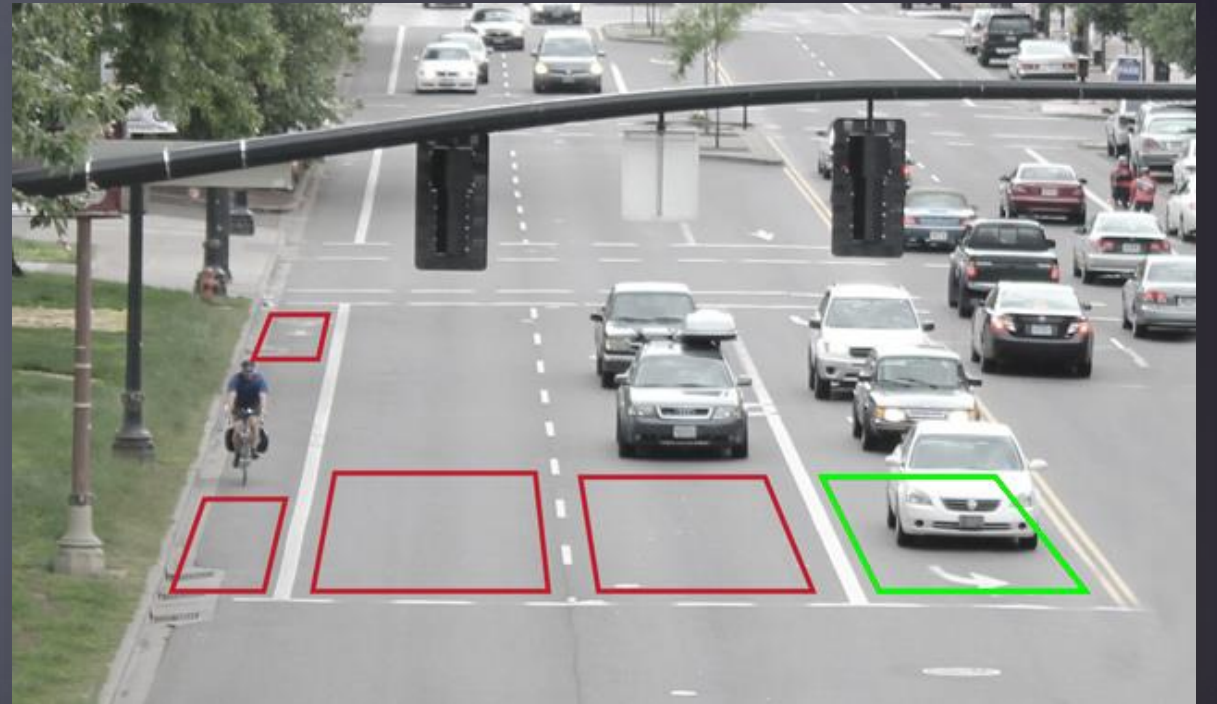


Trajectory-Based Adaptive Technology

CRAIG HINNERS, PE

SR. TECHNICAL SALES ENGINEER

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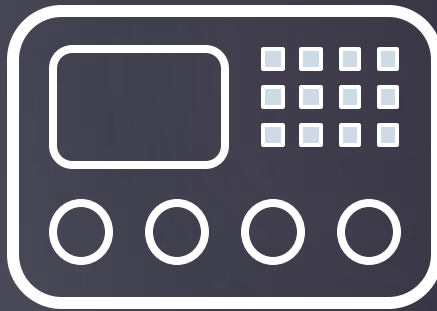


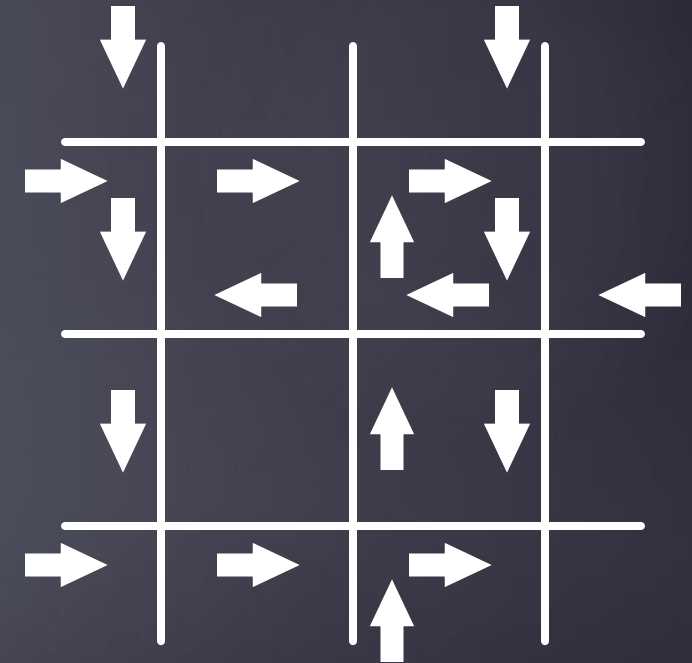
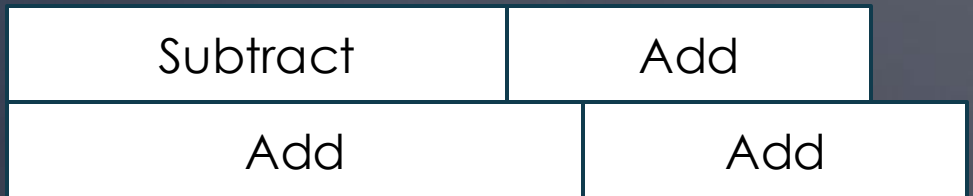
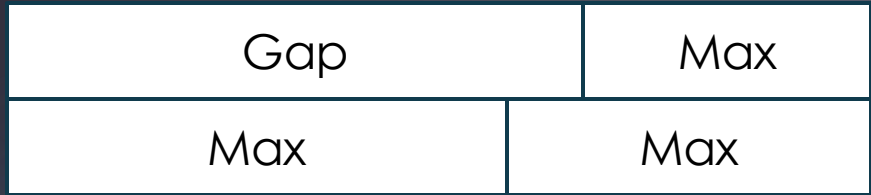
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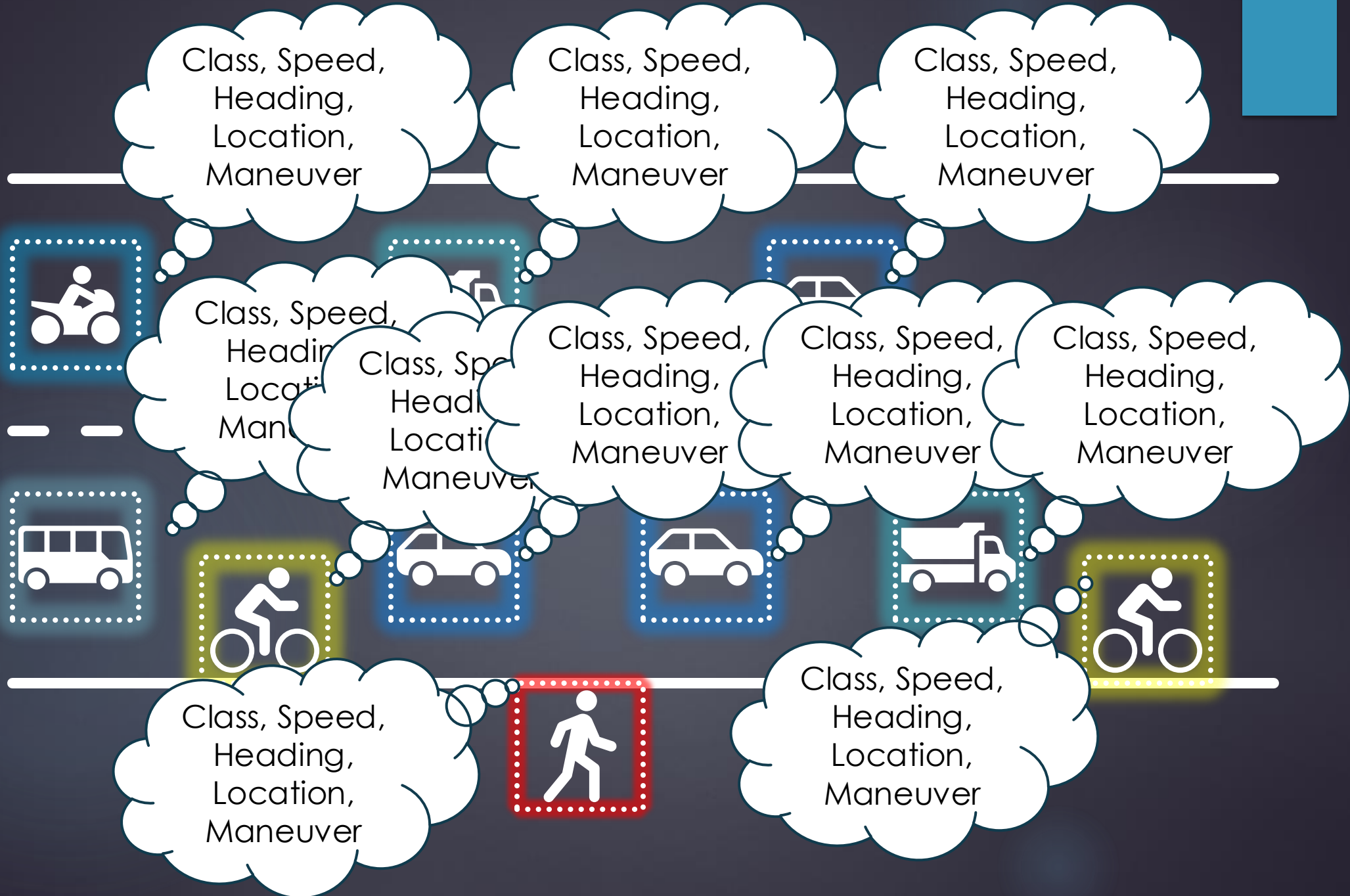
Det 2 = Off

Det 3 = On

Det 4 = Off





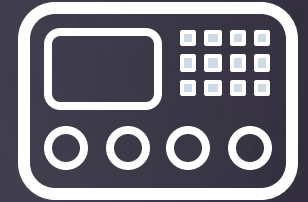


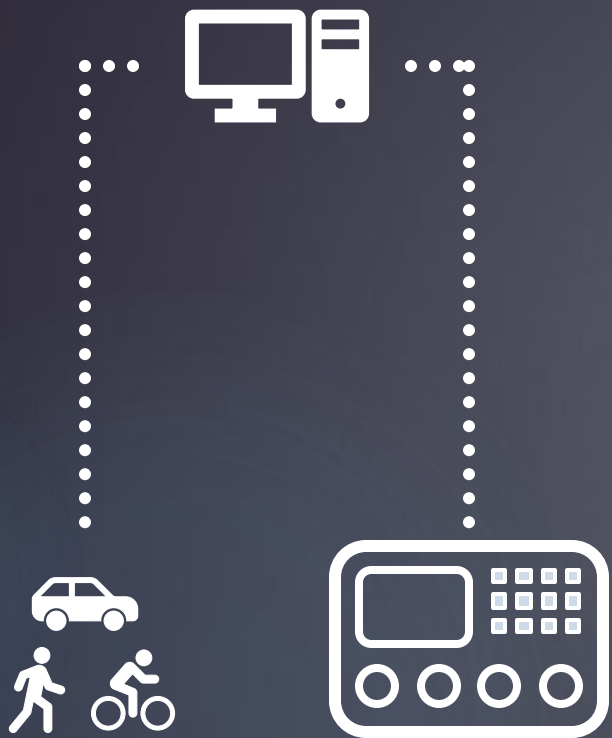


Object Data



Zone Data

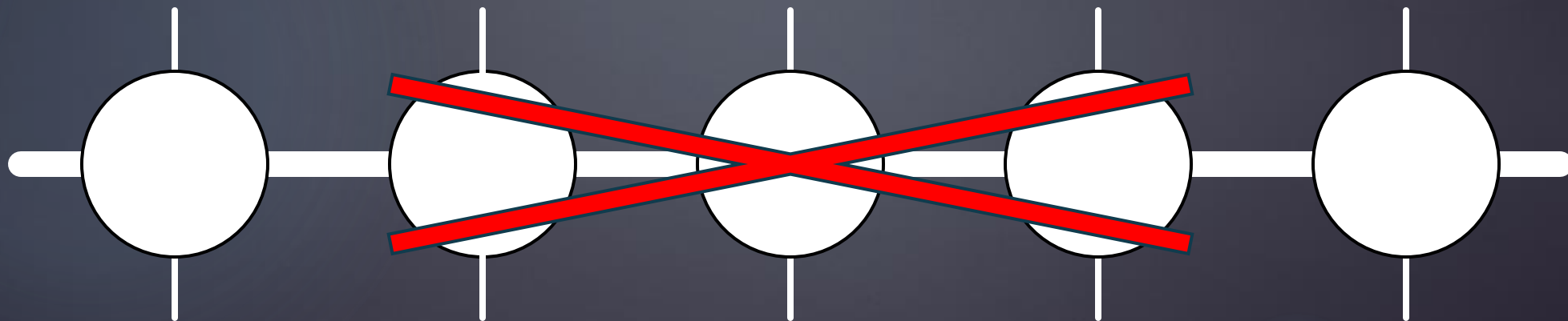
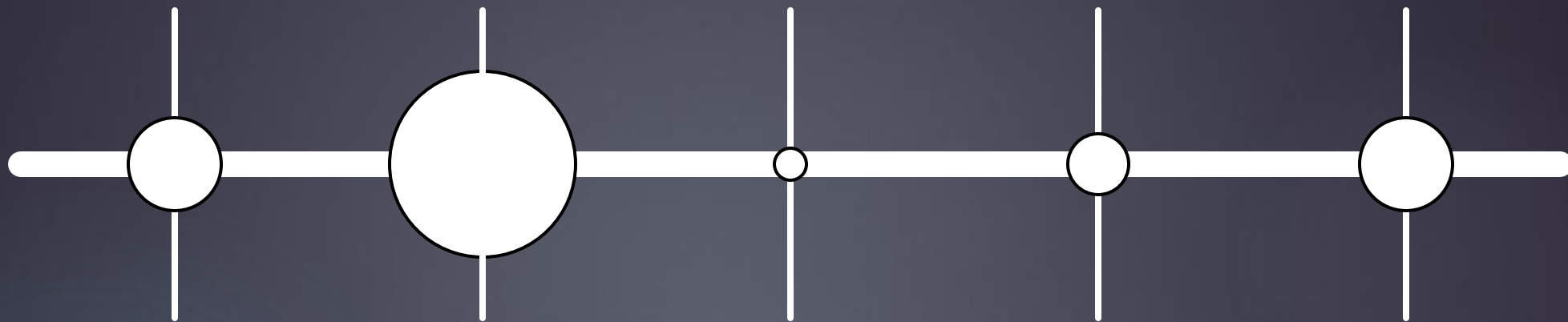




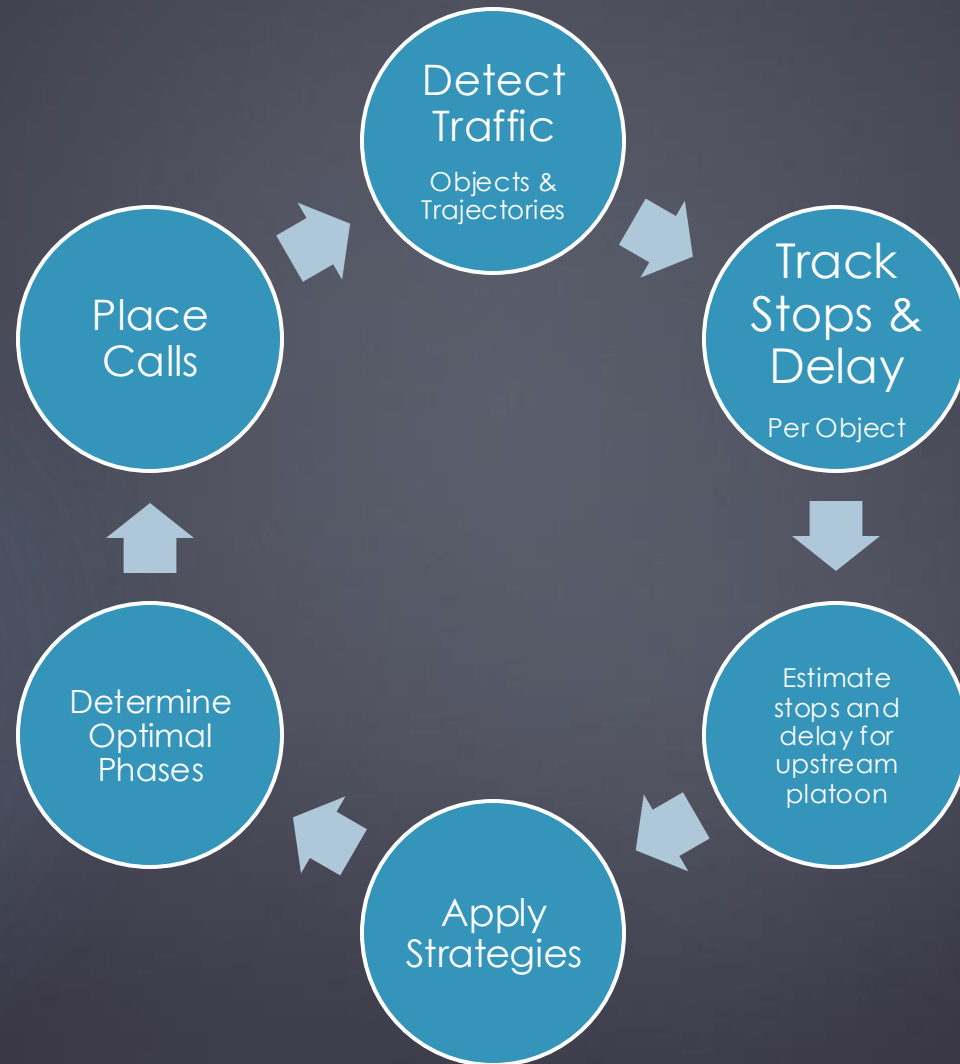
Centralized



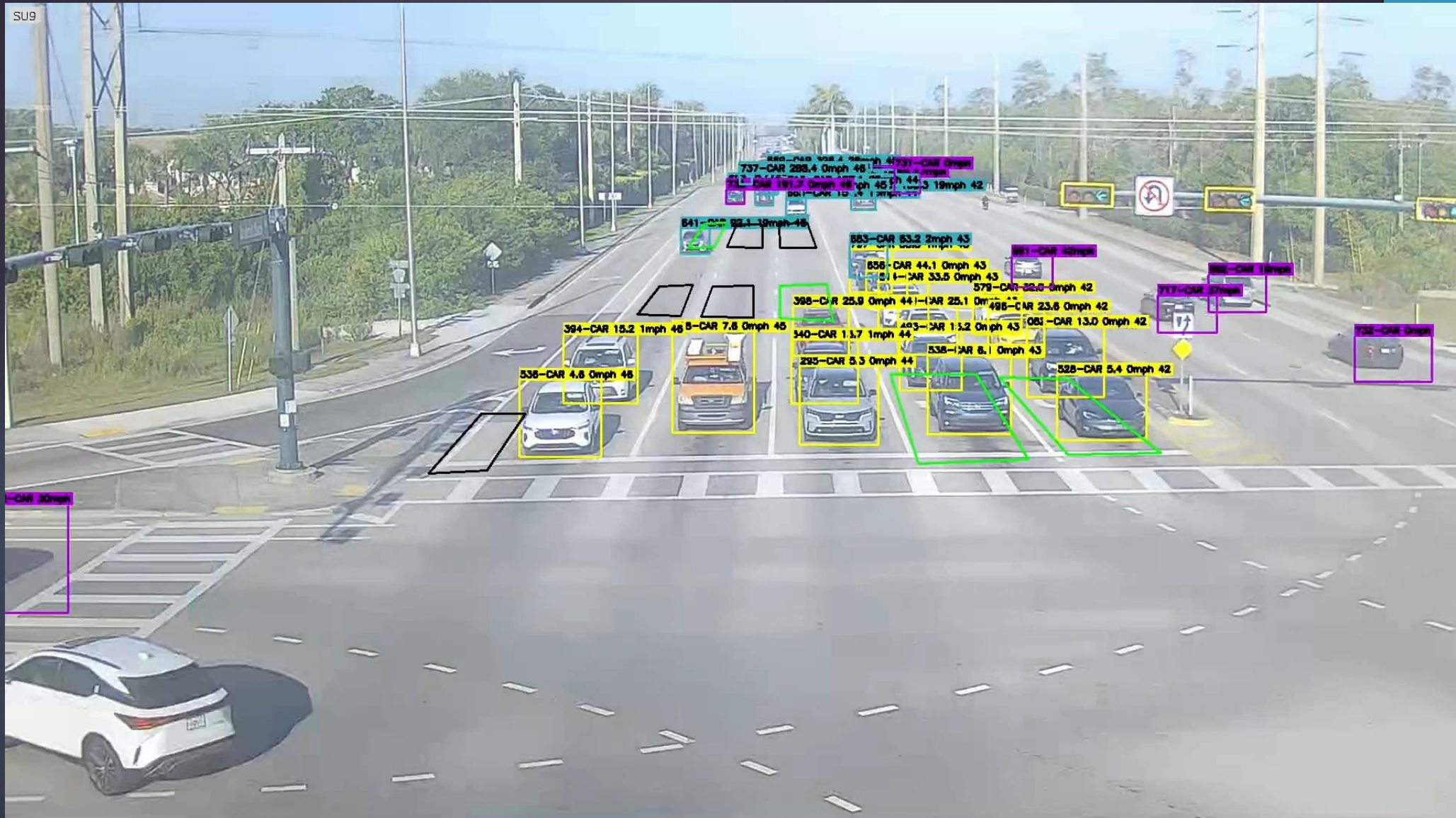
Distributed



Trajectory-Based ASCT Algorithm



SU9



536-CAR 4.6 0mph 48

394-CAR 15.2 1mph 48

5-CAR 7.6 0mph 48

340-CAR 1.17 1mph 44

295-CAR 5.3 0mph 44

398-CAR 25.9 0mph 44

403-CAR 1.12 0mph 43

538-CAR 6.1 0mph 43

528-CAR 5.4 0mph 42

496-CAR 23.6 0mph 42

881-CAR 42mph

858-CAR 44.1 0mph 43

579-CAR 32.0 0mph 42

853-CAR 63.2 2mph 43

841-CAR 92.1 10mph 48

737-CAR 289.4 0mph 46

732-CAR 181.7 0mph 48

801-CAR 19.3 19mph 42

881-CAR 18mph

717-CAR 27mph

732-CAR 0mph

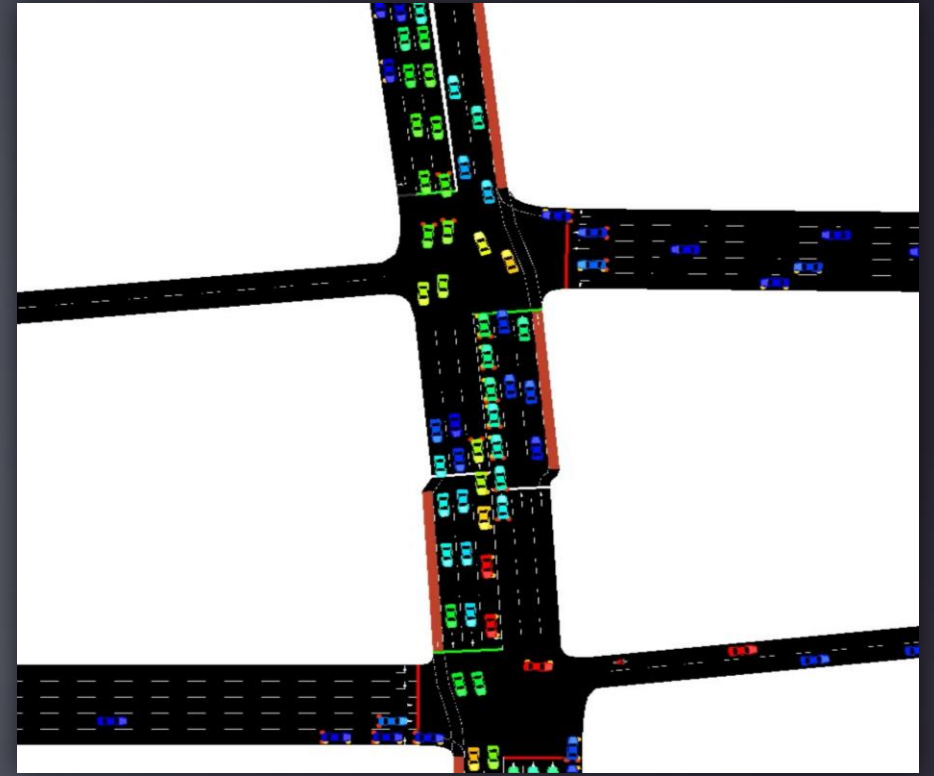
536-CAR 4.6 0mph 48

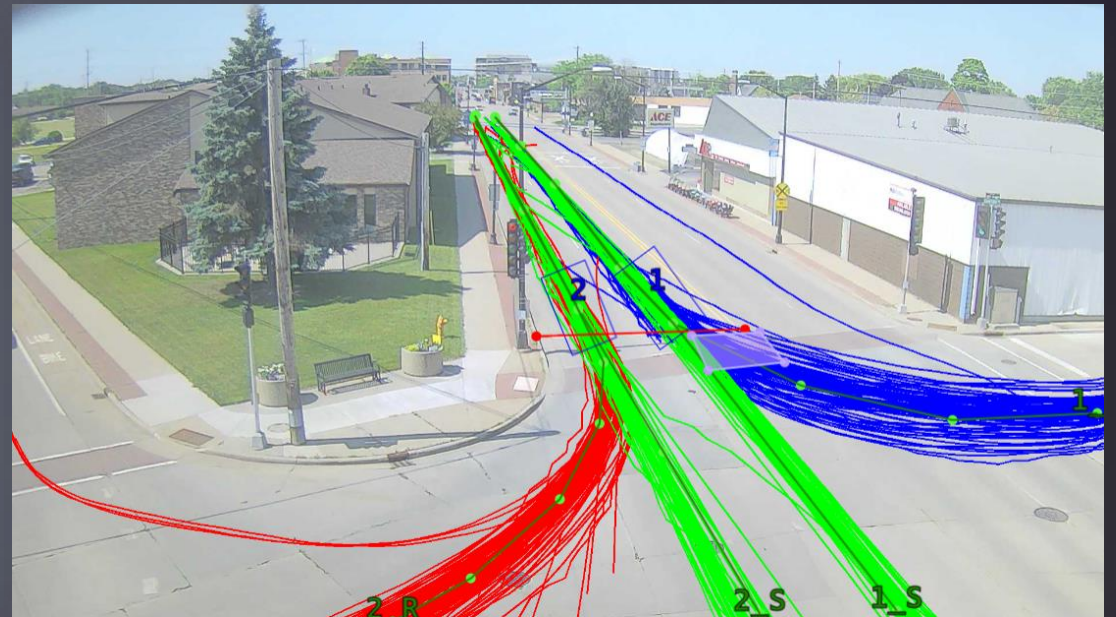
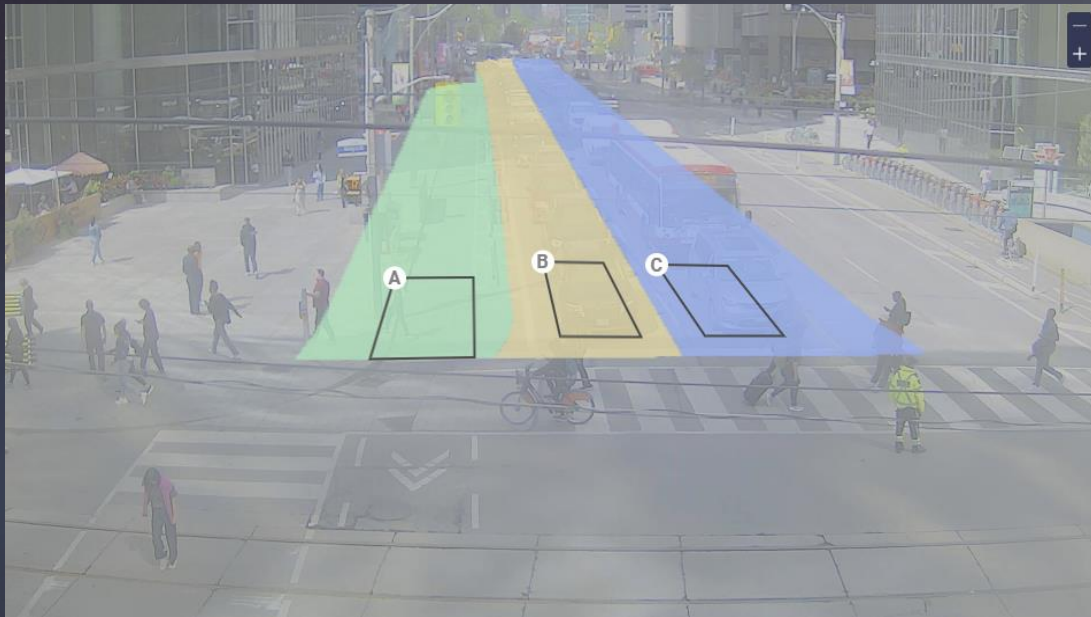
Strategies

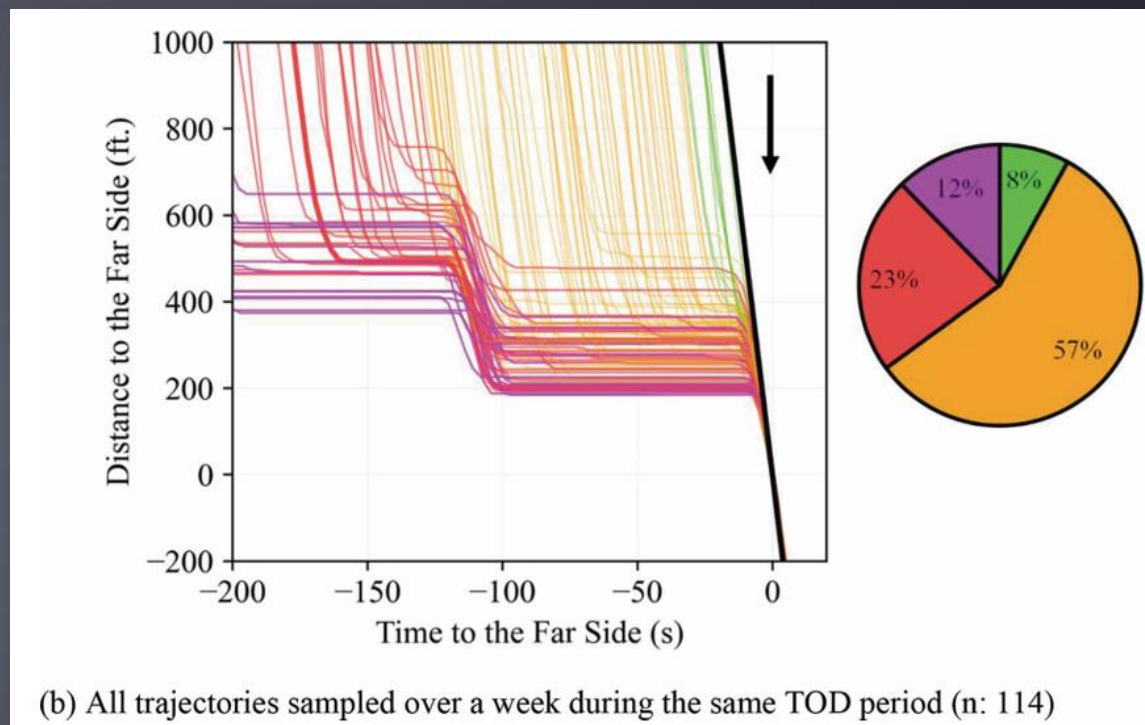
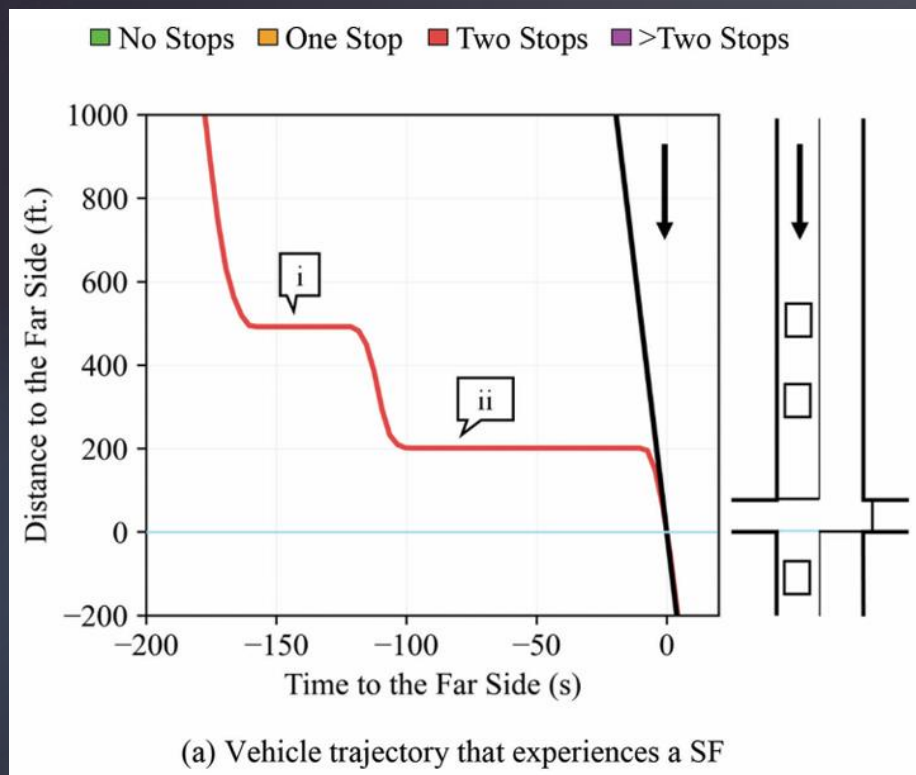
- ▶ Minimize delay
- ▶ Arterial progression
- ▶ Maximize throughput
- ▶ Crossing coordination
- ▶ Manage queues from oversaturation
- ▶ Clear queues on freeway off-ramps
- ▶ Multi-modal prioritization (ped, bike, transit, freight, etc.)

Trajectory-Based ASCT Advantages

- ▶ Pre-deployment before/after simulations
 - ▶ Seeded with trajectory data
 - ▶ Software in the loop
- ▶ Real-time per-object awareness
 - ▶ Queue depths
 - ▶ Split failures
 - ▶ Oversaturation (spillback)
 - ▶ Trajectory-based turning movement counts
- ▶ Measurable outcomes
 - ▶ Trajectory-based MOEs
- ▶ V2X ready







Beach County Preserve

Delnor-Wiggins Pass State Pk

Naples Park

The Ritz-Carlton, Naples

41

NORTH NAPLES

Pelican Marsh

WILLOUGHBY ACRES

The Ritz-Carlton Naples, Tiburón
Top rated

Island Walk

Heritage Bay



Vineyards Community Park

URBAN ESTATES

Pelican Bay

Vineyards

Physicians Regl - Pine Ridge

Clam Pass Park

PARK SHORE

Golden Gate



Live traffic

Fast Slow



Real-World Experience

Vanderbilt Beach Road, Collier County, FL

- ▶ 80,000 ADT
- ▶ Residential & commercial land use
- ▶ Local & through trips
- ▶ Seasonal & event variability
- ▶ Recently retimed
 - ▶ Nearly 20 TBC patterns
 - ▶ 6 different schedules
- ▶ Cycle failures
- ▶ Oversaturation



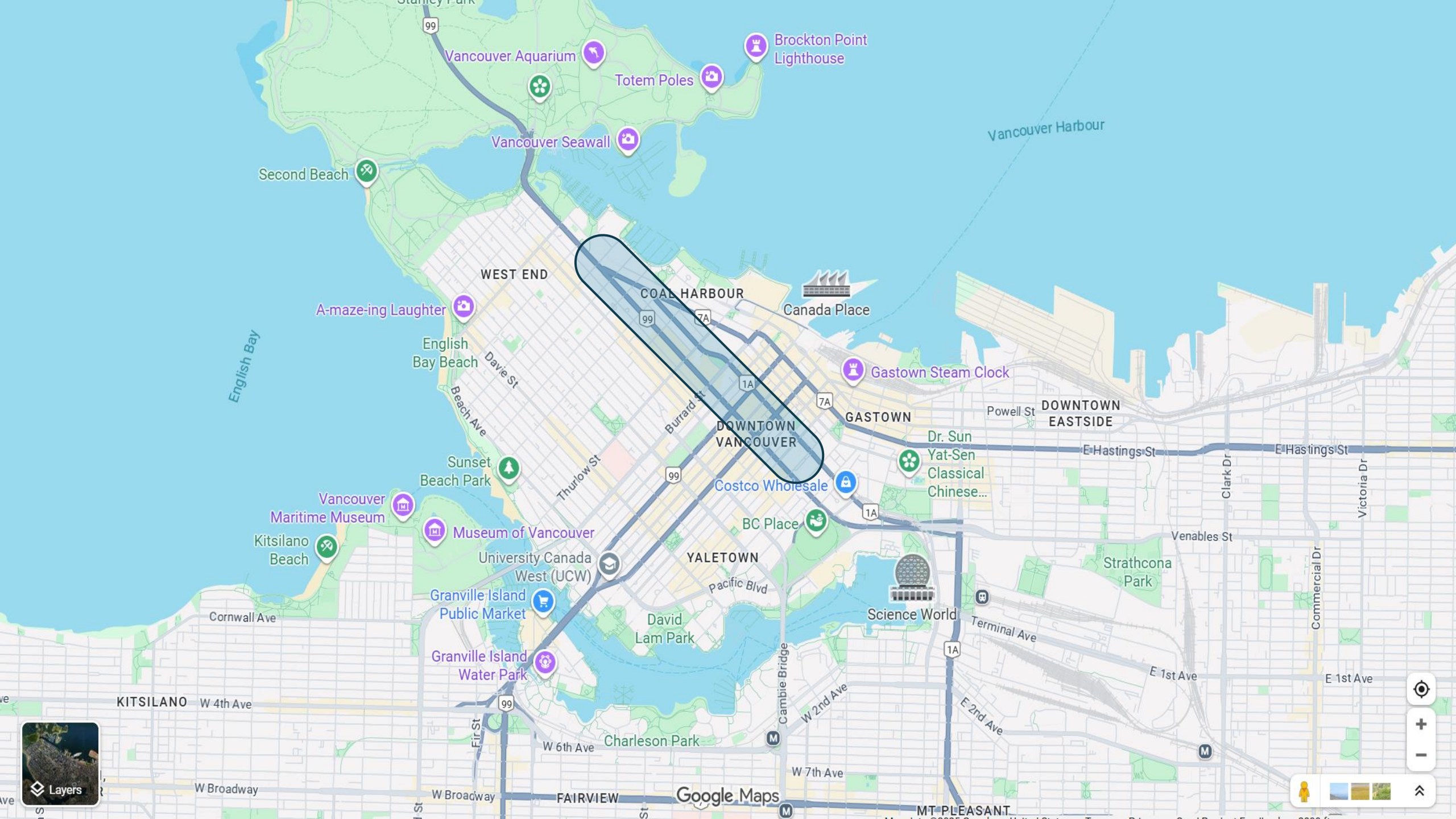
Live traffic Fast Slow

Golden Gate

Real-World Experience

Vanderbilt Beach Road, Collier County, FL

- ▶ Simulation values $\pm 5\%$ of actual
- ▶ 22% overall delay reduction
 - ▶ -27% AM peak
 - ▶ -30% PM peak
- ▶ Not entirely at the expense of minor movements
- ▶ Decrease periods of oversaturation
- ▶ Don't have to use common cycle length to ensure progression
- ▶ However, travel times recently trending back up



Layers



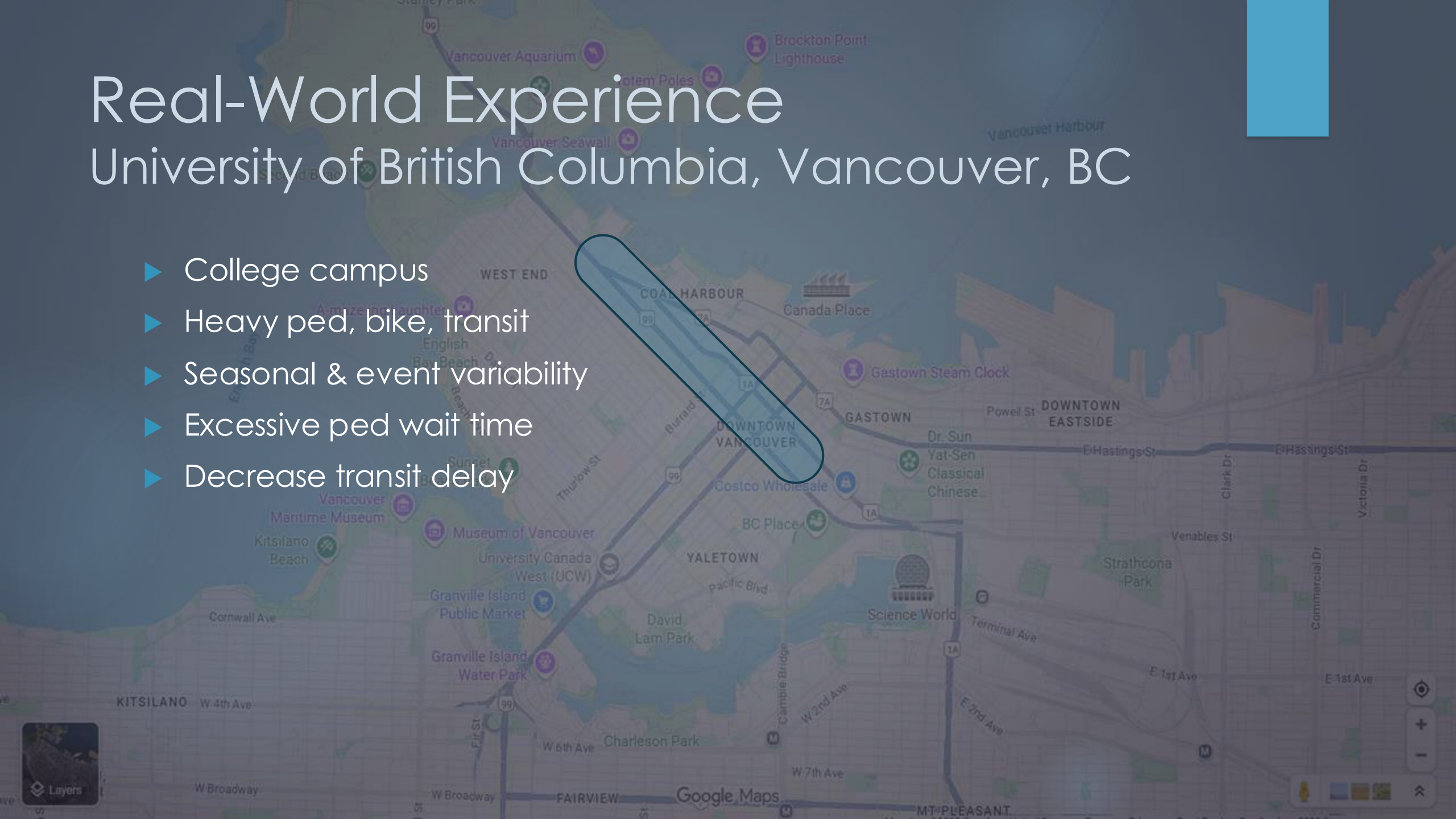
Google Maps



Real-World Experience

University of British Columbia, Vancouver, BC

- ▶ College campus
- ▶ Heavy ped, bike, transit
- ▶ Seasonal & event variability
- ▶ Excessive ped wait time
- ▶ Decrease transit delay



SU8 09-19-22 02:28:32.1 UTC

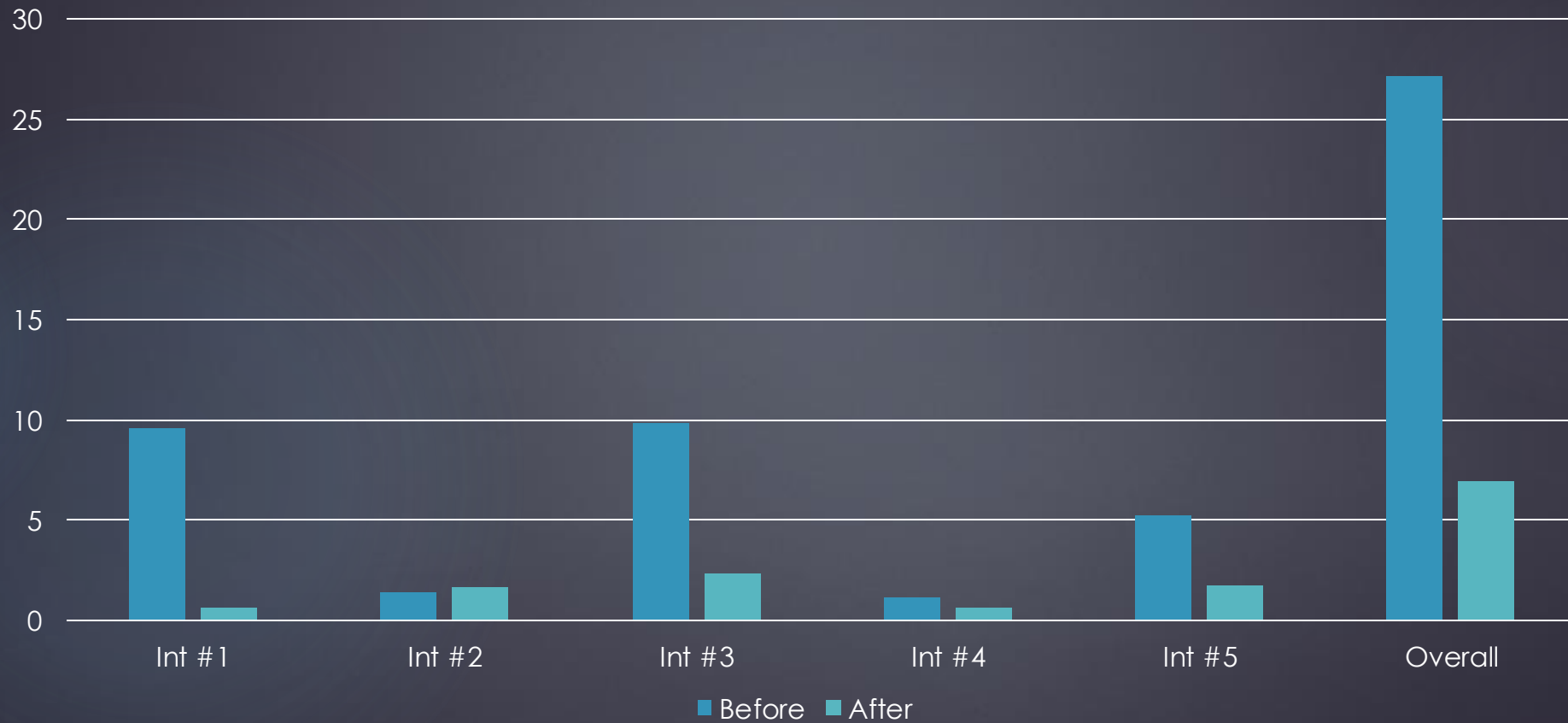


Real-World Experience

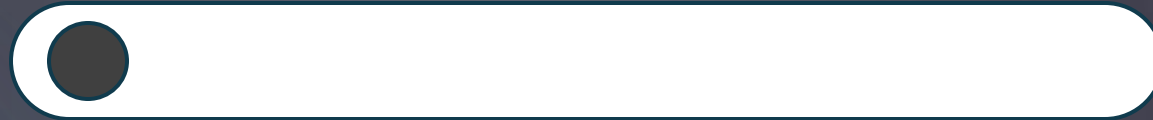
University of British Columbia, Vancouver, BC

- ▶ Shorter cycle lengths
- ▶ 40% ped delay reduction
- ▶ 7% vehicle delay reduction
- ▶ Improved transit reliability?
- ▶ Improve ped safety?

Red Light Running Before/After



Theoretical
Mathematical
Perfection



Real-World
Human
Perception





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