



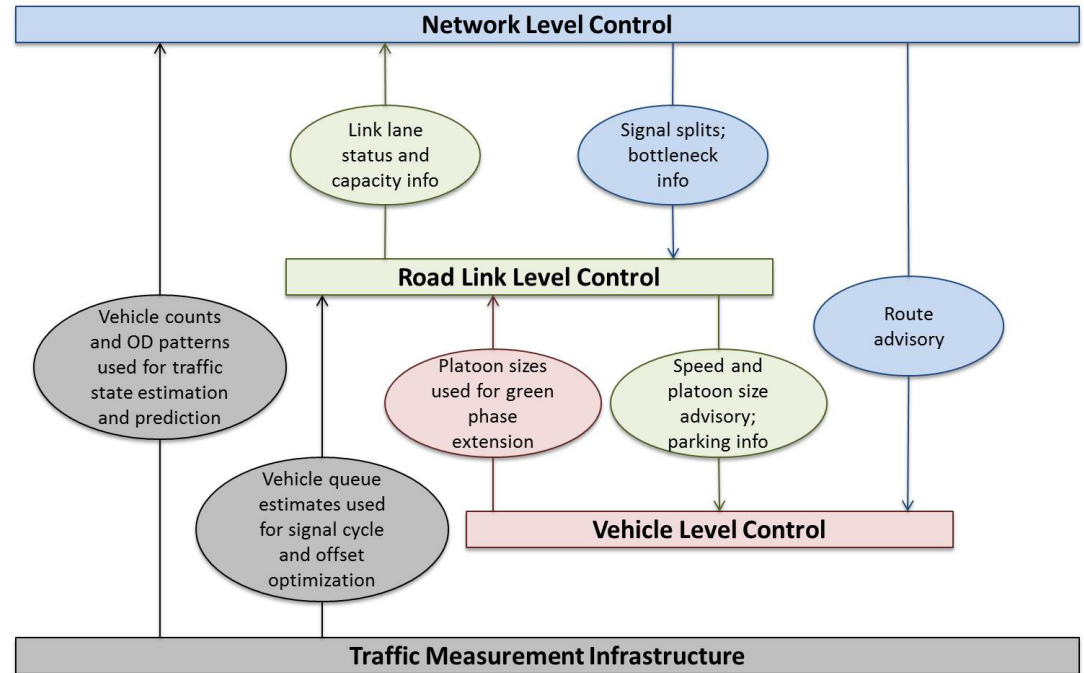
# Traffic Operating System for Smart Cities

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# Project description

**Goal:** Develop a *traffic operating system (TOS)* with 3 levels of feedback control:

- 1. Network Level Control:** demand management with information dissemination
- 2. Road Link Level Control:** signal timing, lane allocation, speed advisory
- 3. Vehicle Level Control:** V2X, platoons, speed/lane adjustment



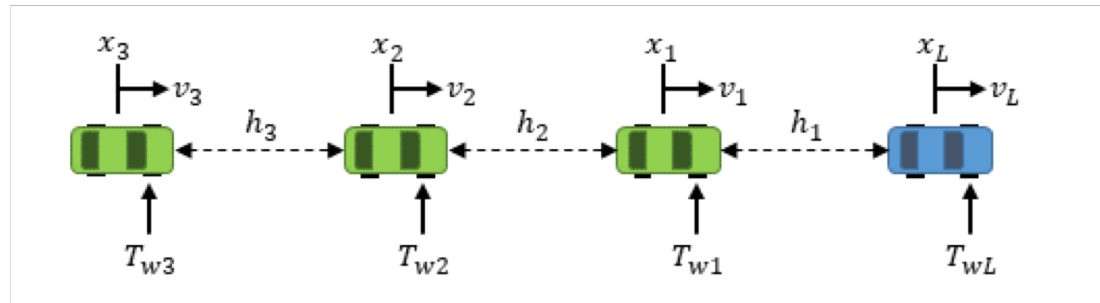
This project takes a holistic, cross-layer approach to:

- Minimize congestion by increasing traffic throughput
- Enhance safety with connected vehicle technology
- Minimize environmental impact through fuel economy and lower emissions

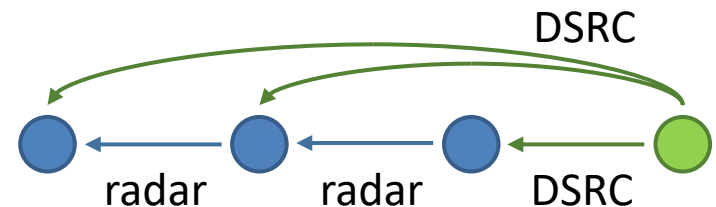
# TTP demo: platoons at intersections

- Dramatically increase intersection capacity (at least x2) by maintaining small space gap during acceleration from rest at green light
- Demonstration in real traffic in Arcadia, CA
- Study throughput/safety/comfort tradeoffs prior to experiments
- MPC controller to manage the tradeoffs
- Vehicles with camera, radar, GPS, and CACC enabled with DSRC

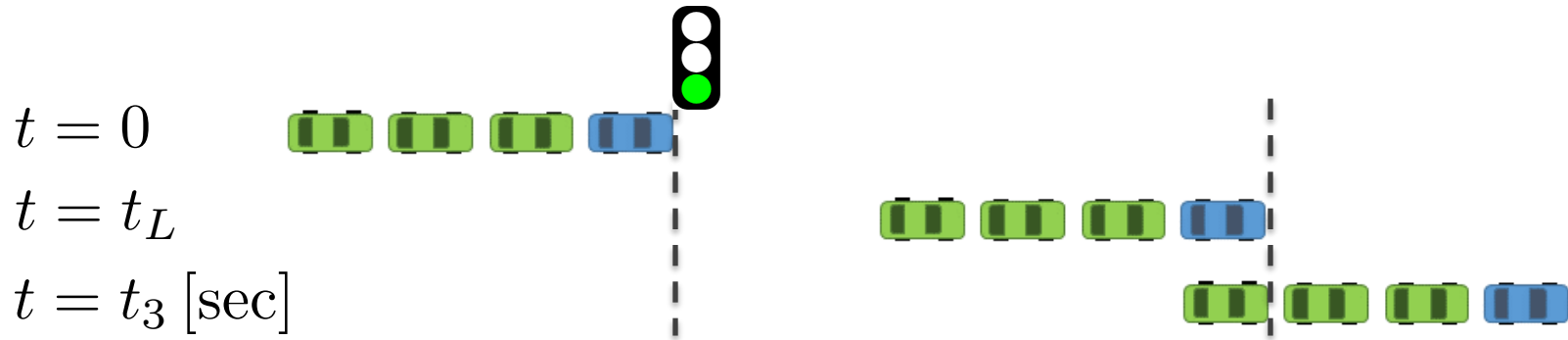
- 1 leader, 3 follower vehicles:



- *V2V communication:*
  - Predecessor following + leader topology
  - Position, acceleration, planned velocity shared
  - Delays modeled, accounted for by controller



# TTP demo: platoons at intersections



**Performance metric:** throughput  $\approx 3600 \frac{3}{t_3 - t_L}$  [vph]

## Why this TTP effort is timely:

- Platooning promises great benefits in urban traffic
- Demonstrate how existing technology can be leveraged for congestion relief
- Technical challenges in real traffic situations and urban environments
- Mobility goals announced by the USDOT ITS Joint Program Office (2015):  
*Connected vehicle technology can “identify, develop, and deploy applications that leverage the full potential of connected vehicles, travelers, and infrastructure to enhance current operational practices and transform future surface transportation systems management.”*