

Seattle DOT Multimodal Technology Improvements Leveraging Adaptive Traffic Signal Control

There is a need for technologies to better manage multimodal demands in the City, but these capabilities are not currently available in the marketplace. Rather than waiting for technology to meet the City's demands, SDOT will be developing and piloting solutions in the next few years, with a focus on the UW area, where SDOT received an FHWA grant focused on advanced technologies. And, SDOT has already implemented a powerful and flexible adaptive traffic signal control software platform that enables these innovations.

Pedestrian Surge Management

Today, traffic signals provide a fixed time response to pedestrian detection received via the pedestrian push button based on the time needed to cross. SDOT sees a need to change that to support pedestrian surges from rail stations, event venues and other locations where large volumes of pedestrians are crossing at signals. The Pedestrian Surge Management system pilot will include:

- Passive pedestrian detection – no need to push the button
- Pedestrian counting and input of that count to the traffic signal to change the pedestrian crossing time to support a surge.
- Integration of this functionality with the adaptive traffic signal software to help rebalance traffic signal timing when pedestrian surges are detected and responded to.

This is a first of its kind approach in the US where traffic signal operations respond to both vehicle and pedestrian volume-based demand.

Green Wave for Emergency Vehicles

Today, fire trucks and fire department ambulances are slowed in their approach to hospitals when there is traffic congestion. Current technologies provide a "fire lane green" signal for approaching emergency responders, but this is only partly effective if there is nowhere for vehicles to go to clear the path.

The Green Wave system will get inputs from the Seattle Fire Department Computer-Aided Dispatch (CAD) system indicating an emergency vehicle is on its way to the emergency room. This information will be combined with real-time congestion information. If needed traffic signal timing will be modified at signals downstream of congestion to clear the congested area before the emergency vehicle approaches. The adaptive signal control system will provide a quick recovery from the Green Wave disruption.

GiveMeGreen Bicycle Detection and Traffic Signal Response

SDOT wants to treat all modes in a balanced manner, and the GiveMeGreen app will enable cyclists to be detected at equipped traffic signals just like cars. The GiveMeGreen system is a mobile application that cyclists can load on their phones. It will detect bicycles approaching traffic signals and place a call to the signal. The adaptive software will be modified so that the signals can respond to bike calls just like they do to vehicle calls. The app will provide the cyclist with confirmation that the signal received their call.

NexGen Transit Signal Priority (TSP)

SDOT will be improving transit operations in the city by implementing NexGen TSP. Today, TSP responds to transit on an individual intersection/isolated basis, with transit location approaching an intersection as the input. TSP is meant to improve schedule adherence during congested conditions. However, when congestion is present, today's TSP:

- Causes significant side street delay
- Causes signals to fall out of coordination, adding delay to all modes including upstream transit
- Perpetuates a cycle of added delay as continual calls for TSP are made

Last, the system in place today cannot broker intersecting TSP requests, such as will be common on the future BRT network.

NexGen TSP will be designed to support transit performance using a systemwide approach to balancing multimodal operations. Rather than changing the timing at a single signal, NexGenTSP, will change signal timing in the network. It will use an algorithm that combines several factors including:

- transit schedule and headway adherence
- the number of passengers on the bus
- network congestion
- operations of all transit on the network

The algorithm connects to the adaptive traffic signal control system to produce signal timing that aligns with transit performance goals.