Utah Connected Webinar Series: Webinar #4 Questions & Answers

Early benefits have been realized from deployments of transit signal priority for buses, signal preemption for snow plows, and preemption for emergency vehicles. These cutting-edge deployments have made transit buses and snow plowing more efficient. The objective of this webinar was to detail the planning, execution, testing, and maintenance of the technology used in these applications, including a discussion of how the system interfaces with the signal controller, how we have measured benefits of the system, and a perspective on these benefits from the transit agency. Some of the key takeaways included:

- TSP can reduce transit travel time, increase reliability, improve the overall customer experience, and create a positive impact on air quality, ridership, equity, and safety.
- Transmitted messages of all types must have certificates, allowing for authenticity, authorization, and integrity.
- We are one of the first states in the US to have successfully deployed RTCM 3.2 using OBU/OBP, RSU, RTK Chipset, and DGNSS in connected vehicle environments.
- Post deployment system monitoring is critical, even if you've done it before!
- Consider more data sources to improve disruption identification.

Q1: How are the vehicles indicating if they want priority vs preemption? If they are not explicitly requesting this, how is this determined?

A1: The SRM message, if formed properly, and signed is the request for service from a vehicle to a signal controller system. The SRM indicates a vehicle role (and sometimes subrole) such as Transit, or DOT (Snowplow). It is up to the signal controller system to decide, based on the vehicle role what type of service to provide (priority vs. preemption). The vehicle itself cannot choose which service other than indicating its appropriate role.

Q2: What kind of central traffic signal system is UDOT using? is it Centracs? MaxTime? Are you using Yunex controllers?

A2: UDOT uses the MaxTime system with Econolite controllers (Cobalt and ASC/3) and Q-Free (Intelight) controllers. UDOT doesn't have any Yunex controllers.

Q3: You outlined the benefits of TSP from the point of view of buses, but did UDOT conduct a study on unintended consequences on the rest of the traffic (for example by inspecting split monitor reports before and after implementing TSP, and other performance metrics)? And, if so what was the output of it?

A3: An evaluation with that level of detail was not performed for Route 850. However, TSP was implemented on Route 217 a few years ago and the detailed analysis you asked about was performed. The following link will take you to the full report: https://rosap.ntl.bts.gov/view/dot/54889

Q4: How did you address TSP requests for near side vs far side bus stops?

A4: For near-side transit stops, we use CAN data from the J1939 network on the vehicle to determine when the vehicle is in a non-forward gear, and stop the SRM message from being broadcast as to not continue requesting priority when at a near-side stop. When at a far-side bus stop, the vehicle will not be in an approach lane, and therefore will not be requesting priority.

Q5: What if vehicle has start-stop system? Can this be ascertained from CAN data?

A5: The transit vehicles we are analyzing for this deployment do not employ start-stop systems, so that was not an issue that needed to be addressed.

Q6: What were the costs involved in managing the message security, roadside equipment at intersections, and in the buses?

A6: In the management of the system over the last eight years, we realized that it involves a couple of different groups, and we have not done a good job of capturing all of the efforts that are involved with managing and maintaining these systems; frankly, our system is not mature enough from a comprehensive standpoint. We are working hard to figure out the best way to manage our deployed network of hardware and software so that we can look to the future for an annualized cost. However, for security certificates, the nominal costs of having certificates on a roadside unit is about $60-70 per year per device, and onboard units are a little less than that. You need a contract with the certificate provider, and there are some other options you could get from a certificate provider like a dashboard and a portal, a monitor, a status of the certificates and all your devices, and there are extra annual costs with all of those. The insulations of the certificates on our individual devices have been sort of buried in with all the other integration items, so unfortunately, we don't have a good exact cost for these. I think what you could do, though, is think about what it costs to maintain a traffic signal system; this is a little more intense than that because of the nature of the software, so if you can quantify what your agency spends to manage and maintain traffic signal system, this will be a little higher than that per unit.

Q7: Do different cities in Utah all use CV technology for TSP or does UTA have to support different TSP technologies, e.g., cloud-based TSP using CAD/AVL on bus? Also, does CV OBU compete with CAD/AVL for J1939 port on bus?

A7: UTA's service area covers most of the northern Utah populated area, and they are the largest transit area in the state. There are a couple other areas down south and in Park City, but we are not aware of any other transit priority system in place in Utah today. There are cities that have AVL-based emergency vehicle preemption like fire trucks. Many of these are older. We don't have a handle on how many there are, and some of them are not operable today. We don't think that our OBU-based TSP system will interfere with an AVL TSP system at the signal cabinet, but we don't have a large base of knowledge to make that a fact. We just converted an older TSP technology, and we are in the process of converting it to V2X; that was the only other operable TSP system. Typically, the buses have multiple TSP systems running on them, but going forward, we will be building the systems into the baseline of the bus.