

The Future of Transit Signal Priority (TSP) Architecture

From the perspective of the following DKS employee-owners:



ADRIAN PEARMINE



KASEY DELUCIA

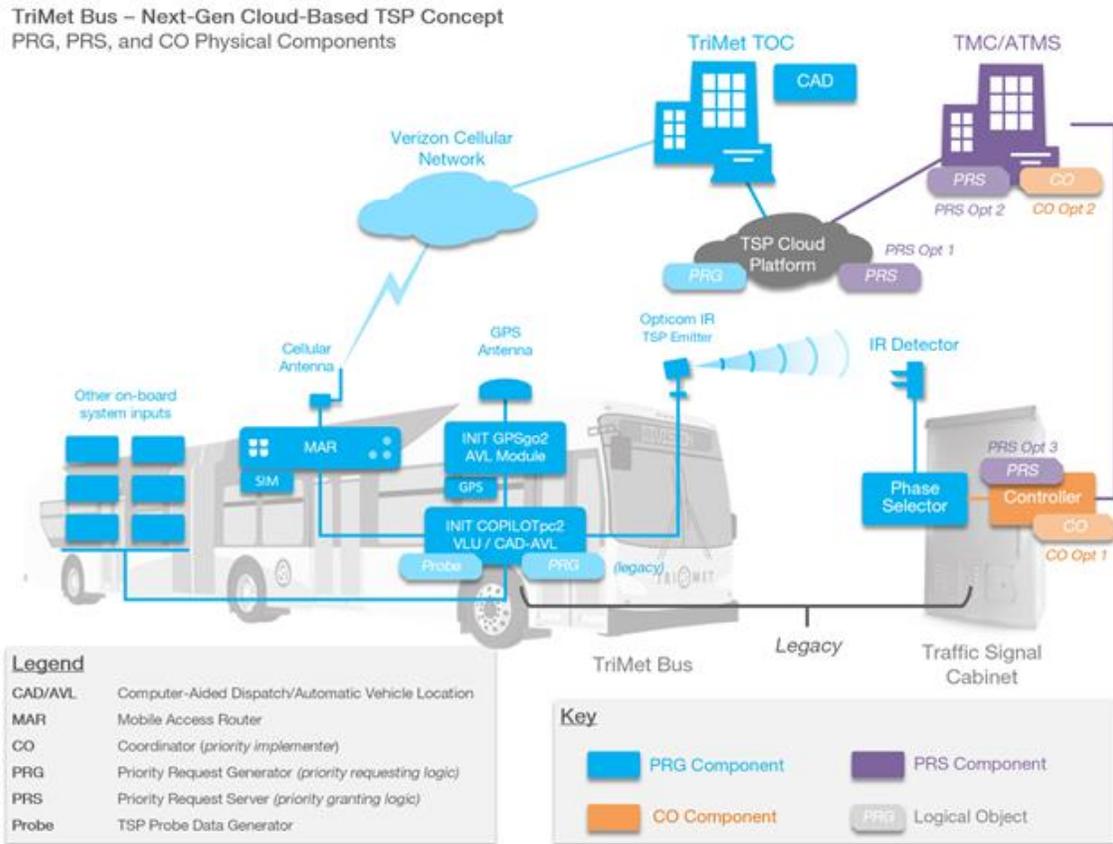
As traffic congestion is anticipated to increase three-fold over the next 25 years in Portland, Oregon, TriMet is in the process of expanding its transit service to meet the rising demand for increased ridership. A major part of meeting this demand includes TriMet working with its regional traffic agency partners on a broad program of improvements under the Enhance Transit Corridor (ETC) initiative. A key enabling technology of the ETC program involves TriMet and partners implementing a regional, next generation Transit Signal Priority (TSP) system.

TSP systems prioritize bus travel, getting riders to their destination faster, and improving on-time performance. This involves a transit vehicle requesting signal priority and the signal system choosing to grant, or not grant, priority to the bus by extending the green time or truncating the red time. The goal is to reduce travel time so riders can get to their destination faster, and more importantly, to improve schedule reliability and on-time performance. This system reliability is critical to increasing ridership and customer satisfaction with the service.

TriMet's Next Generation Transit Signal Priority (Next-Gen TSP) project started out as a concept and technology recommendation for upgrading TSP along SE Division Street in Portland. During the planning phase of the [Division Transit](#) project, the idea of implementing a new architecture (using the cellular network, the mobile access router, and the TSP in the cloud) to give traffic signals priority to reduce delays at key intersections was imagined.

The Next-Gen TSP concept is illustrated in Figure 1 and is created around a cloud-based central TSP system that consolidates and performs the primary priority request functions at the TSP Cloud. The legacy infrared (IR) TSP system will still be included for signals that are not available on the new system.

This Next-Gen architecture represents a fundamental architecture shift away from the existing distributed architecture or “vehicle-centric model”, where priority determination logic and communications to traffic signals are done by components residing on-vehicle, and all logic determining if and how a TSP request is served resides at the signal cabinet. The new system will move most of this logic to the cloud.



TriMet’s Next-Gen TSP will be the first of its kind to be implemented on the west coast while other cities such as Seattle, Santa Monica, and Los Angeles are looking towards adopting this architecture. When considering the cost of expanding the current City of Portland-only TSP system to the entire Portland Metro area, the new architecture will save TriMet a significant amount of money, because the design doesn’t require field infrastructure to be installed at the intersection.

The uniqueness of this project is that the vehicle to center approach is an emerging technology that will “future proof” TriMet and partner agency investment. This new architecture will be used to set the stage for future connected vehicles where buses and the central system can communicate with the intersection, providing the data to make smarter decisions on how to prioritize traffic. This architecture enables the transit system to be part of a more holistic

connected vehicle future where pedestrians, bicyclists, buses, fire trucks, light rail, and streetcars can talk to the intersection to receive priority. This future connected vehicle environment will allow the partner agencies to determine who or what gets the priority to move first.

As transportation technology continues to expand, next generation TSP solutions are becoming more available with enhanced functionality resulting in greater communications between street transit and traffic signals.

DKS Associates served as the lead transportation engineering firm for TriMet, Santa Monica, and LA Metro's Next Generation TSP Plans. DKS is also leading the design, procurement, and implementation of TriMet's Next-Gen TSP system, expected to go live in late 2021.