

***Bus Rapid Transit Signal Priority
Operational Concept***

The Bus Rapid Transit Signal Priority project initiated by the Kansas City Area Transportation Authority (KCATA) and the City of Kansas City, Missouri (KCMO) will utilize technology to improve transit service. The initial phase of the project will affect only the Bus Rapid Transit project along the Main Street corridor in Kansas City, Missouri. Through modification of normal signal operations at the local traffic controller, the signal priority system will allow properly equipped Bus Rapid Transit (BRT) vehicles to maintain a high level of schedule adherence by reducing the amount of intersection delay normally experienced by transit vehicles.

The system employed in the BRT Signal Priority project involves two elements, the BRT vehicle equipped with Siemens Mobile Data Terminal (MDT) automatic vehicle location (AVL) technology and the local traffic control device at the intersection. The MDT monitors vehicle location data to determine the schedule performance of the vehicle. This information is reported to the Metro Dispatch Center. Based on this data, the Metro Dispatch Center may send a set of instructions for the driver to improve schedule performance. Should the level of schedule performance decline to a level below a predetermined amount, the MDT will locally generate a request for priority through an emitter to the upcoming traffic control device. The MDT will continue to request priority from the traffic control devices the vehicle encounters along its route until the level of schedule deviation returns to a more acceptable level. The MDT will report the instances of a priority request to the Metro Dispatch Center.

The decision to accept or reject a request for priority lies with the local traffic control device. After receiving a request for priority from the BRT vehicle, the individual traffic controllers will evaluate the request based on the overall traffic conditions present and a set of predetermined rules governing transit signal priority. The traffic control device will report instances of priority requests and the action taken in response to those requests to the appropriate traffic signal control system.

Though center-to-center communication is not required for the operation of transit signal priority under this system, the opportunity exists for the involvement of both the traffic signal systems of KCMO and Operation Greenlight, a regional project to coordinate arterial traffic signals across jurisdictional boundaries, and the Metro Dispatch Center. The reports from the local traffic control devices will be shared with the Metro Dispatch Center by the signal systems, and compared to the information reported to the Metro Dispatch Center by the MDT. This exchange of information could then be used to permit cooperative performance monitoring, evaluation, and adjustment of the predetermined conditions for the granting of a priority request.

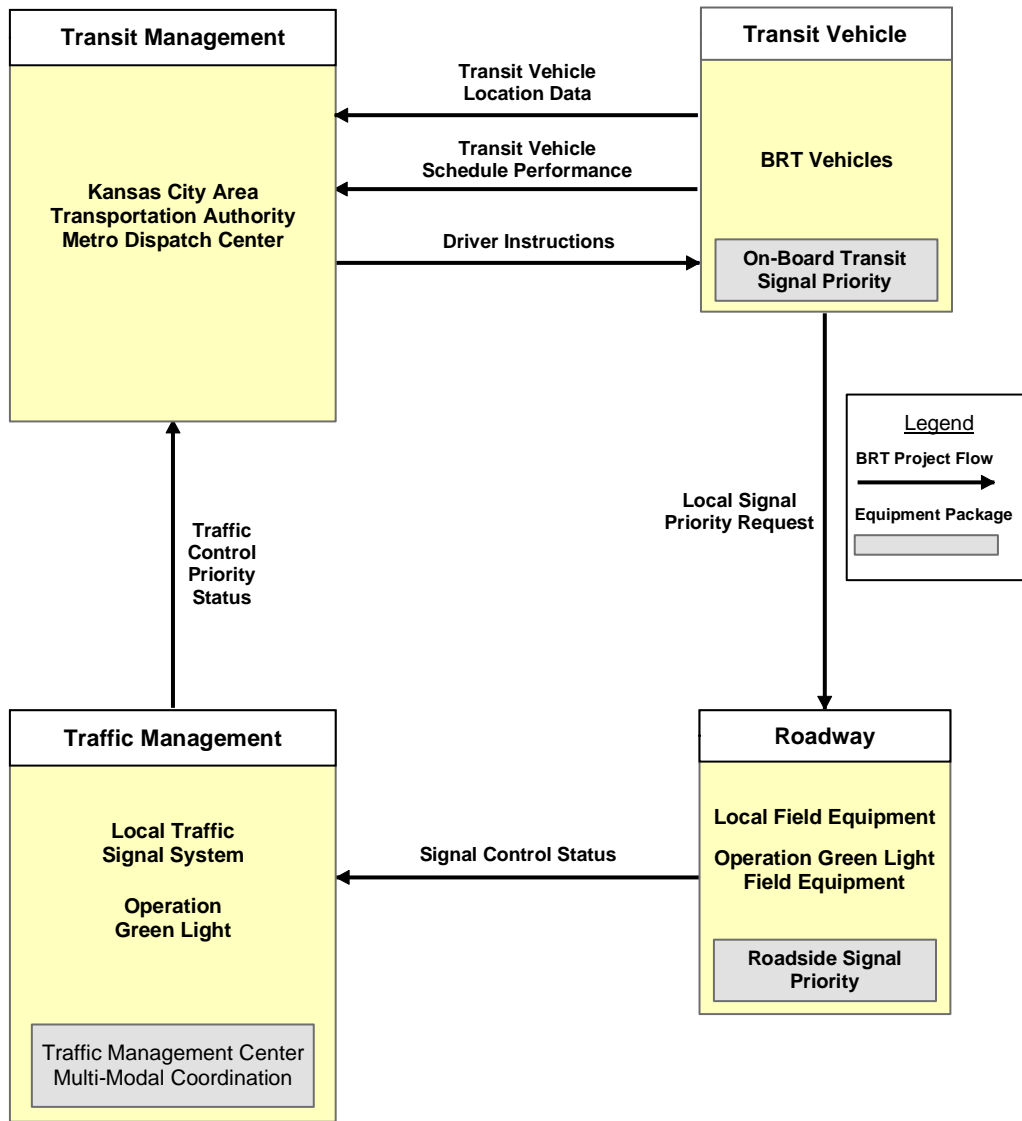
Future Considerations

In the future, the application of transit signal priority may be expanded to a wider, network level scale. No decision has been made with regard to the type of priority system to be employed at this time. Although the type of signal priority system has not been determined, the selected system will employ the Siemens MDT automatic vehicle location technology used in the Bus Rapid Transit project.

An expansion of the local intersection approach would utilize the MDT in the same manner as the Bus Rapid Transit project providing ease of implementation but requiring a more significant investment in equipment. This approach would require the installation of emitters on all vehicles and receivers at all intersections where priority is desired.

Under the center-to-center approach, the MDT would notify the Metro Dispatch Center immediately when a predetermined level of schedule deviation has been exceeded. The Metro Dispatch Center would then request priority for those vehicles directly from the traffic signal control system, which would then issue a the appropriate direction the local traffic control device. The center-to-center approach represents a more complex system and requires a heavier investment in communications, but offers the ability to provide transit signal priority on a corridor level basis rather than strictly intersection by intersection. Additionally, the use of vehicle based emitters and receivers at local controllers would not be required.

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This diagram of the operational concept for the Bus Rapid Transit Signal Priority project utilizes the following elements from the National ITS Architecture:

Market Packages

Multi-Modal Coordination (APTS 7)

This market package establishes two-way communications between multiple transit and traffic agencies to improve service coordination. Multi-modal coordination between transit agencies can increase traveler convenience at transfer points and also improve operating efficiency. Coordination between traffic and transit management is intended to improve on-time performance of the transit system to the extent that this can be accommodated without degrading overall performance of the traffic network. More limited local coordination between the transit vehicle and the individual intersection for signal priority is also supported by this package.

Equipment Packages

On-Board Signal Priority

This Equipment package provides the capability for transit vehicles to request signal priority through short-range communication directly with traffic control equipment at the roadside.

Roadside Signal Priority

This Equipment package shall provide the capability to receive vehicle signal priority requests and control roadside signals accordingly.

Traffic Management Center Multi-Modal Coordination

This Equipment package provides traffic signal priority for transit vehicles. Two options are provided including a wide-area option based on center-to-center communications between the Traffic Management and Transit Management Subsystems and a localized option based on direct communications between the transit vehicle and the individual intersection.

Roles and Responsibilities –Bus Rapid Transit Signal Priority

ITS Element	Agency	Role/Responsibility
BRT Vehicles	Kansas City Area Transportation Authority	Determine vehicle location and schedule performance Send vehicle location and schedule performance data to the Metro Dispatch Center When appropriate (based on schedule performance), issue a request for signal priority to traffic signal field equipment at the intersection the vehicle is approaching. Receive driver instructions from the Metro Dispatch Center
Metro Dispatch Center	Kansas City Area Transportation Authority	Receive vehicle location and schedule performance data from BRT Vehicles Issue driver instructions to BRT Vehicles Receive status of signal priority requests made by BRT Vehicles
Traffic Signal Control Field Equipment	Kansas City, MO Operation Greenlight	Receive request from BRT Vehicles for signal priority and execute alternative traffic signal control cycle timings when request meets predetermined conditions Advise the Signal Control System of the request and the action taken
Traffic Signal Control System	Kansas City, MO Operation Greenlight	Advise the Metro Dispatch Center of the status of signal priority requests Receive traffic signal control status data from Traffic Signal Control Field Equipment