Interconnected Signal System

TM 4

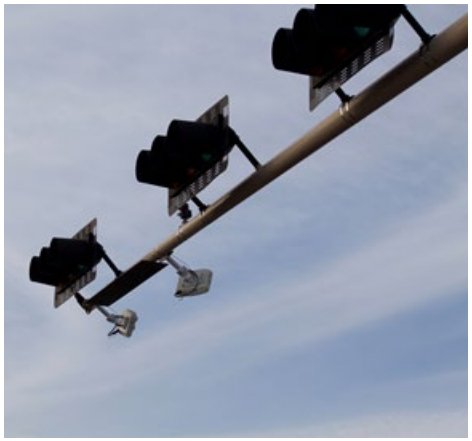

Photo: Courtesy of Natalie Villwock-Witte, WTI

Description: Interconnected signal systems are those which communicate with other signals or systems from controller cabinet to controller cabinet. If central communications are available, remote access from a rural Traffic Management or Operations Center (see #TM9) may be possible to allow for changing signal timings remotely. In small urban areas or towns, signals along a main route can be coordinated for optimal service. Finally, during special events (see #TM8), interconnected signal systems may obtain input regarding alternative traffic patterns during the special event to function optimally.

This approach can also be used in conjunction with adaptive signal control technologies (see #TM10) for additional efficiencies and benefits.

Rural Transportation Critical Needs

- ☑ Crash Countermeasures
- ☐ Emergency Services
- ☑ Operations & Maintenance
- ☐ Rural Transit & Mobility
- ☐ Surface Transportation & Weather
- ☐ Tourism & Travel Information
- ☑ Traffic Management

Issues Addressed

- ☑ Congestion and Delays
- ☑ Inefficient Signal Operations
- ☐ Parking Challenges
- ☐ Vehicle Detection
- ☐ Road Closures
- ☑ Travel Time
- ☐ Speed
- ☐ Alternate Routes
- ☐ Dynamic Traffic Control/Operations
- ☐ Special Event Management
- ☑ Inefficient Use of Road Network

Strategies Achieved

- ☐ Road User
- ☑ Road
- ☐ Vehicle
- ☐ Safety Culture
- ☑ Engineering
- ☐ Emergency Response
- ☐ Enforcement
- ☐ Education

Applicability	Partnerships	Key Components
•Interconnected signal systems are likely most applicable to small urban areas, where, for example, a department of transportation may be in control of the signal systems on the main state road running through town, while the locality may oversee some signals on a road parallel to the state road. Interconnecting all the signals can save residents and visitors time and enhance safety by reducing rear-end crashes that may be caused by motorists not paying attention to the signals. The interconnection of signal systems with current technology is relatively inexpensive.	•Applications benefit from collaboration among numerous agencies, which may include: •Departments of transportation (local, state, federal)	•Detectors •Controller cards •Communication

Examples of Implementation

- **Green Light-Go: Pennsylvania's Municipal Signal Partnership**

The Pennsylvania Department of Transportation has implemented "Green Light-Go: Pennsylvania's Municipal Signal Partnership," in order to support traffic signal retiming, traffic signal operation connections back to the traffic management center, controller upgrades, intelligent transportation system applications and other objectives.

- **Mountain View (SR-85) and Daybreak Parkway**

At an automated traffic signal performance measures workshop held in Salt Lake City, Utah in January of 2016, a presentation highlighted peer-to-peer communications between signal controllers for an intersection in South Jordan, UT.

Implementation Considerations (General)	Implementation Considerations (Pro)	Implementation Considerations (Con)
•The timing of signal systems should be monitored over time, as many factors may cause the traffic flow through a signalized intersection to change. By managing a signal, the highest level of service can be provided to the traveling public.	•Improved signal coordination. •Reduction in vehicle delay.	•Some signal controllers may still be "legacy" controllers (e.g. they are out-of-date technologically). Replacing these controllers and upgrading other electronic components could result in unexpected costs.

Opportunities for Future Expansion

- Vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I) technologies will allow vehicles to communicate directly with signal controllers; however, this will require significant upgrades in signal system technology across the United States.

Additional Resources

- NCHRP Report 812, *Signal Timing Manual – Second Edition,* found here: http://www.trb.org/OperationsTrafficManagement/Blurbs/173121.aspx
- *Evaluation of Integrated Platoon-Priority and Advance Warning Flasher System at High-Speed Intersections*, found here: https://journals.sagepub.com/doi/abs/10.3141/2128-13
- National Transportation Operations Coalition, *National Traffic Signal Report Card*, found here: https://transportationops.org/publications/2012-national-traffic-signal-report-card

Useful Tip

Optimizing signal timing is a low-cost approach to reducing congestion and vehicle emissions.

Cost Range

(Cost/financial information, where noted, is based on 2016 dollars (unless otherwise specified). Cost/financial information is estimated, and will vary based on size and scope of project, number of units, etc. In general, capital costs include initial purchase costs of hardware, software, and other required equipment. Maintenance and operations costs include staff time to operate, monitor and maintain systems; data collection; system upgrades; evaluation; etc.)

Capital Costs: The total capital costs for this tool are low (Less than $50,000) to medium ($50,000 to $100,000), depending on the number of signals under consideration. Upgrading signal equipment or installing new equipment can impact the potential costs of integrating signal systems; however, a proposed capital cost for such an upgrade is $38,000 per intersection[1]. Therefore, the advantage for smaller agencies is they typically have fewer signals to manage.

Operations Costs: The operations and maintenance costs for this tool are low (Less than $50,000). Annual operation and maintenance costs for an interconnected signal system were estimated to be $1,270 per intersection[2].

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