Division of Transportation

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January 16, 2019

Finch Fulton
Deputy Assistant Secretary for Transportation Policy
Office of the Secretary (OST)
U.S. Department of Transportation (DOT)
1200 New Jersey Avenue S.E.
Washington, DC 20590

Re: Comment Request for Docket No. DOT-OST-2018-0210

Dear Deputy Assistant Secretary for Transportation Policy Fulton:

We would like to thank the USDOT for opening the dialogue on the complex and technical issues that are inherent to the connected vehicle discussion. Traffic congestion impacts the quality of our daily lives – time spent frustrated in traffic backups means less time with our families. The Lake County Division of Transportation provides a safe and efficient transportation system within Lake County, Illinois.

In our opinion, connected vehicle technology should be going in the direction of "5G" or Cellular-V2X. Using Dedicated Short-Range Communications (DSRC) has a significant financial impact on larger agencies and multiple-agency collaboration like Lake County PASSAGE. Cellular-V2X has the potential to be used in conjunction with central traffic signal system software or Advanced Transportation Management Software (ATMS), in which Signal Phasing and Timing (SPaT) data can be sent to vehicles via "5G" for more accurate data sharing in real time.

We would like to raise our comments in the attached V2X Communications Comments document. If there are any questions or we can be of any assistance, please contact myself at jeffinger@lakecountyil.gov or (847) 377-7474.

Sincerely,

Justin R. Effinger, PE
Principal Engineer

Lake County Division of Transportation

V2X COMMUNICATIONS COMMENTS

Justin R. Effinger | Traffic Signal Engineer | January 16, 2019

Background of Lake County PASSAGE

Reducing traffic congestion in Lake County, IL has been a long-standing strategic goal of the Lake County Board as population in the county increased from approximately 179,000 in 1950 to over 700,000 today. Lake County leadership recognized that effectively addressing congestion meant not only adding new lanes to the highway system, but also finding innovative ways to make the existing roads work better. As an initiative of the County Board, the Lake County Division of Transportation (LCDOT) was awarded a federal Intelligent Transportation System (ITS) grant to invest in technology and build a Transportation Management Center (TMC).

Studies were conducted, plans were developed, and construction started that would begin connecting existing traffic signal systems together with new fiber optic cable, install a couple traffic monitoring cameras, and develop a way to communicate traveler information with motorists in Lake County through the newly created Intelligent Transportation System, Lake County PASSAGE (Program for Arterial Signal Synchronization and TrAvel GuidancE). The goal of the system was to make the highways in the County smarter and more efficient by synchronizing traffic signals, managing planned and unplanned incidents, and providing traveler information.

COMMUNICATION NETWORK AND TRAFFIC SIGNAL SYSTEM

Traffic signal and other roadway data is collected and returned to the TMC through the field communications network, including, a fiber optic network consisting of over 300 miles of fiber cable, licensed wireless radio communication, and cellular connections. The expansive communication network connects over 600 of the 740 state, county, and locally owned traffic signals in Lake County.

Using the traffic signal system, TMC operators and signal engineers observe traffic remotely to monitor conditions, see the current state of all signals in the system, and adjust signal timings in real time to help traffic adjust to road closures or unexpected congestion. The signal system has been set up to run traffic responsive programming (TRP) on certain corridors and run special timing programs Countywide on holidays when traffic is known to be different than typical traffic patterns.

The traffic signal system also provides real-time alerts and log data for various data sets. For example, when a traffic signal goes into flash or battery back-up, the system immediately notifies DOT staff of the alarm. The system will also email the appropriate traffic signal maintenance contractor that a traffic signal is in 4-way flash even outside of normal TMC operating hours.

"5G" or Cellular-V2X

In our opinion, connected vehicle technology should be going in the direction of "5G" or Cellular-V2X. It is assumed in this article that traffic signals will not go away in the future if there is an option for driver intervention in the vehicle. With the expansion of small cell sites already happening in areas like Lake County, telecommunication companies will start offering 5G coverage in years rather than decades in time. With the expected speed or bandwidth of up to 20 Gigabits per second (5G, 2019) and latency of 1 millisecond, there should be no issues in broadcasting vehicle position data along with FHWA approved V2I language to vehicles.

Using Dedicated Short-Range Communications (DSRC) has a significant financial impact on larger agencies and multiple-agency collaboration like Lake County PASSAGE. At an estimated cost of $15,000 to $50,000 per intersection (NOCOE, FAQ, 2019) to be retrofitted with DSRC, it would cost $11,100,000 to $37,000,000 to retrofit all traffic signals in Lake County. If there was no power source at an intersection (for example a highway curve or two-way stop sign controlled intersection), the dollar amount would be higher. For a large government agency with 3000 traffic signals, the cost would be $45,000,000 to $150,000,000. This wouldn't account for yearly maintenance costs, which would be hard to quantify until more units are implemented.

Cellular-V2X has the potential to be used in conjunction with central traffic signal system software or Advanced Transportation Management Software (ATMS), in which Signal Phasing and Timing (SPaT) data can be sent to vehicles via "5G" for more accurate data sharing in real time. Our opinion would be working with third parties using the flow chart below (Figure 1):
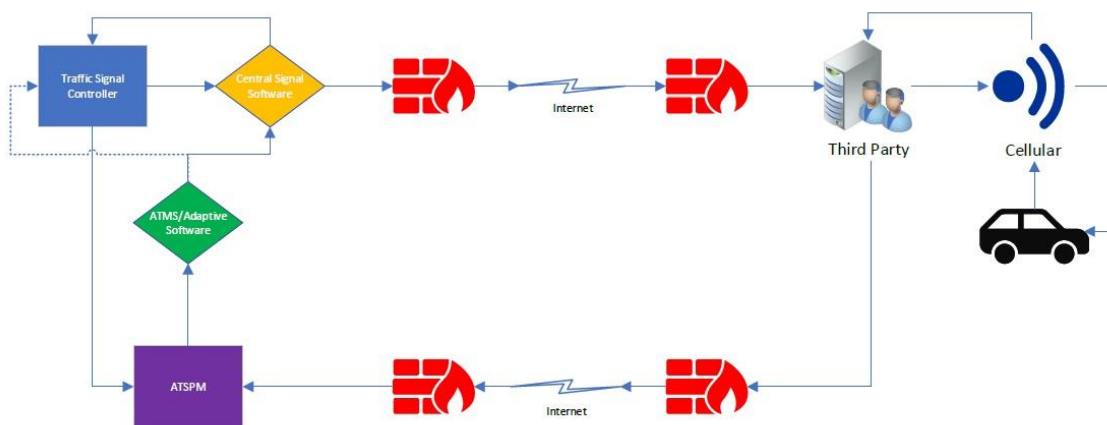

Figure 1: Connected Vehicle Flow Chart (ATSPM: Automated Traffic Signal Performance Measures)

The goal for the third party (which can be a car manufacturer, data analytic company, engineering consulting firm, etc.) is to take in the data from a government agency like Lake County and the Global Positioning System (GPS) information from the vehicles driving. The SPaT information can be turned into FHWA approved V2I language and broadcasted to the vehicle, and the GPS information can be shared with a central software at a TMC for the government agency, where the information can be analyzed to make the traffic signals operate in a more efficient manner.

More and more agencies are getting ATMS or central traffic signal system software, which would make technological add-ons more economically efficient rather than added equipment at each traffic signal. The GPS position information can also be used for safety purposes like speed management of sharp curves. Lake County has GPS locations of all traffic signs that can be used for safety messages (or automated reduction in speed of autonomous vehicles), which could be feasible through advanced research initiatives.

There is a need to address privacy information in conjunction with this effort. Vehicle position data is most important to traffic engineering professionals, as we can get speed profiles of vehicles as they travel through an entire corridor to determine and engineer solutions to areas of increased delay. With this information also comes abuse and requests for the information for malicious purposes. It would be critical to determine and standardize what information can be released to the public and what information should remain private. The goal is not to create programs to penalize drivers, but to create a mechanism to better the traffic conditions for the entire public.

Traffic Signal Research in Cellular-V2X

According to the 2012 National Traffic Signal Report Card (NOCOE, 2012 National Traffic Signal Report Card, 2019), traffic signals in the United States have an overall grade of D+. The introduction of adaptive traffic signals is innovative and helps with traffic signal timing, but the introduction of "5G" or Cellular-V2X provides the potential for a paradigm shift in the way traffic signals operate. We can move away from vehicle detection at each individual traffic signal and instead get vehicle platoon information and turn traffic signals green through various algorithms. Research with universities is critical in determining how the vehicle position information will turn into lower vehicle delay, and how we can leverage previous research in creating the most efficient algorithms depending on different agencies goals and objectives.

If "5G" or Cellular-V2X is standardized in the industry, it could create no-cost data sharing partnerships with universities to conduct the research in a low-cost and timely manner. When autonomous vehicles come into the industry as a viable car purchasing option, it creates the potential for traffic signals to communicate to the vehicles to slow

them down to make green light indications more efficient and preventing as much vehicle stops as possible. Being able to group vehicles prior to a traffic signal will allow green time at a traffic signal to be more efficient.

References

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