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Mayor



City and County of Denver

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U.S. Department of Transportation
1200 New Jersey Avenue, SE
Washington, DC 20590

RE: V2X Communications

To Whom It May Concern,

The City and County of Denver (the city) appreciates this opportunity to provide comment on the agency's connected vehicle (CV) policy. The questions posed by the request for comment are similar to questions being debated internally within the city and with our industry partners. As a recipient of the agency's advanced transportation and congestion management technologies deployment (ATCMTD) grant, the city is also heavily invested in testing and demonstrating the value of CV technology on behalf of our residents. Denver sought this grant opportunity because of the incredible potential we see in CV technologies to improve congestion and safety. While we recognize that dedicated short-range communications (DSRC) technologies have already been available for a number of years, only recent advances in the underlying software, security and privacy components have readied the technology for infrastructure owners to test. We would encourage policymakers to consider several factors that maximize public interests in the public ownership of data, infrastructure, and source code when it comes to connected vehicle technology.

Roadside Hardware

Denver does not have wireless radio expertise to answer the agency's technical questions evaluating the differences and compatibility of DSRC versus cellular CV (C-V2X) technologies. Overall, the city is agnostic on the wireless medium used to connect vehicles and infrastructure. The possible exception to this is how ownership of certain elements of critical infrastructure would be impacted by a transition to C-V2X. Currently, while implementing DSRC roadside units (RSUs), the city purchases and integrates the roadside radio directly into our traffic intersections. This model allows the public sector to own the technology stack and data that flows to and from vehicles and city infrastructure, run edge-level computing to achieve signal priority, probe vehicle data collection, send alerts directly to vehicles, and other use cases. The city has heard from industry representatives that C-V2X would also allow for the public sector to buy and utilize RSUs in the same way. However, it's unclear to the city how that model would be disrupted by cellular companies providing access to CV data. We believe ownership of safety-critical infrastructure by the public sector is critically important to the outcomes affecting our residents, with minimal dependence on other entities. Our concern with a C-V2X rollout is that it has the potential to 1) make public sector agencies dependent on wireless carriers for access to a communications medium that will only grow in importance to transportation operations; 2) create a strong potential for vendor-lock in, where the public sector would lose communications access to a significant portion of the vehicles on its roadway if a cellular provider ceased providing services to the municipality at a reasonable price; and 3) fragment where

transportation system decisions are made, with some logic running at the traffic intersection edge, some in a back-office or cloud environment, and some with wireless carriers.

For Denver, this raises several important questions. Would C-V2X equipped vehicles operate with an exclusive carrier (AT&T, Verizon, etc.) or communicate across carriers? Would a municipality be required to have contracts with all carriers to communicate critical information with vehicles in their network? What forces of competition can be introduced to ensure prices are competitive and reasonable? How can policymakers ensure that municipalities retain the option to buy roadside infrastructure outright to maintain the direct communications link with vehicles on its roadway?

Roadside Software

Related to the concerns about the hardware operating at traffic intersections is the software making this communications link valuable. Denver's Smart City program operates under the principle of "open by default," preferring an open source approach to software to the maximum extent practical. CV technologies offer the industry an opportunity to redefine how new solutions are introduced into a transportation system — avoiding duplication of effort and cost across municipalities and states implementing similar intelligent transportation system (ITS) technologies. Denver is partnered closely with the U.S. DOT Turner-Fairbank Highway Research team in developing open source platforms that allow all cities and states to build off a common code base to enable signal priority, preemption, pedestrian safety alerts, etc.

If the industry transitions to a C-V2X solution, Denver has several questions about what happens to the role of cellular providers and this software layer. Do cellular providers also become the solution provider and, in addition to the data connection with vehicles, also become the cloud platform that runs the applications and associated logic for CV applications? If this application layer is also transitioned from public ownership to provider ownership, Denver would be even more concerned about the risk of provider lock-in, a lack of support for open source solutions, and an inability to directly adjust the parameters of how that code operates with municipal traffic infrastructure. Public works and DOTs are subject to a strict set of safety and regulatory requirements from the USDOT and would be concerned about entrusting a significant aspect of the operations of that environment to a third party.

Networking Infrastructure

In Denver, and in other cities, the traffic infrastructure often operates on its own dedicated fiber network. If C-V2X is to be utilized, how should municipalities incorporate cellular connections into their traffic environment? Exposing that network to a cellular provider introduces a series of new concerns for municipal network operators and security teams. To the maximum extent possible, the city would aim to constrain network access points while keeping latency low for CV applications and retain edge-level control for signal system operations.

Conclusions

Some of the concerns and questions raised above are rooted in the unknowns associated with C-V2X. These concerns are not meant to imply that Denver is endorsing one technology over another, just that policymakers should factor in these concerns as the debate proceeds. The city recognizes the many potential benefits of a cellular solution, including a rapid expansion of coverage that wouldn't be possible utilizing DSRC RSUs alone or wouldn't be cost effective. Further, we also recognize that the data security and privacy concerns associated with CV could benefit from the cellular industry's long history of handling sensitive consumer data. Current bottlenecks to CV implementation, including the deployment of a mature security credential management system, could be rapidly accelerated by adding cellular providers to the marketplace with an incentive to invest. Current market forces associated with DSRC do not seem to be driving adoption at the rate USDOT and other agencies would like.

Appreciating these benefits, Denver hopes this letter provides additional considerations from a local municipal level. Our primary concerns with any CV implementation is the impact of who owns the data, infrastructure and source code associated with any technology. To the maximum extent possible, Denver would encourage policymakers to create guard rails that prevent any single private entity from controlling more than one of those elements in order to keep the public sector as the center of trust when residents are driving on public roads.

Respectfully,

A handwritten signature in black ink, appearing to read "M. Hancock", with a long horizontal line extending to the right.

Michael B. Hancock
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