

Introduction and Background

Traffic monitoring is a key function for traffic management centers (TMCs), which are generally responsible for high-order facilities such as freeways and limited access facilities. The cost of existing surveillance technology is extremely high because of the extensive infrastructure needs involved. These devices are effective when they are operational, but studies suggest high rates of failing sensors for large state-wide networks. Additionally, the geographic coverage of these systems is limited to those infrastructure requirements.

A new wave of probe-based technologies have been shown to be effective in identifying travel speed and, in some cases, origin-destination pairs. No traffic volume or density parameters have been observed in the existing literature for probe-based surveillance systems. In addition, state departments of transportation are unlikely to have the in-house staff or leverage over major mobile-device providers to build these projects in house. As equipment ages and necessitates replacement or overhauls, TMCs are faced with the option of purchasing this broad-coverage speed data from third-party vendors. This research project attempts to identify what technological or organizational barriers exist in the deployment of these systems.

Methodology

Literature Review: GPS-based traffic monitoring began to show up regularly in literature within the past decade; this will be used to identify the technical capabilities and limitations of modern devices and systems.

Semi Structured Interviews and Survey Development: A survey of TMC operators will be the primary data collection instrument for this study. To ensure a broad understanding of survey questions and format, a series of extended semi-structured interviews with 3-5 TMC operators will assist in the development of the survey.

Survey Deployment: The TMC Pooled-Fund Study, organized through the US Department of Transportation, is a group of active TMC operators that collaborate on research tasks. The survey will be distributed to this group of approximately 40 operators.

Analysis: The results from this survey and the literature review will be compiled and analyzed in the context of the original research questions.

Survey Question Highlights

TMC profiles

- **What are the existing technologies employed by the agencies who are answering?** Many agencies are expected to employ traditional ITS systems but those that are already innovating may be more likely to accept third-party data.
- **Do agencies make use of all data from their existing systems?** Traffic management may not require as much data as current systems provide, creating an opening for more lightweight traffic monitoring systems that only report vehicle speeds.

Existing risk assessment

- **Are certain physical elements of existing ITS systems vulnerable to outages?** Physical risks exist in all parts of ITS systems that can fail, including both power and communication lines that lead to field devices. Redundancy and self-sufficiency are measures that agencies sometimes take to mitigate this risk.
- **Are there critical elements of existing ITS systems that agencies do not manage or control?** Use of the public power grid means that a black-out is beyond the control of a DOT. What portions of the ITS system do TMCs already accept as the responsibility of some other entity?

Using third-party data

- **Are certain technologies more or less acceptable than others when operated by a third party?** TMCs and DOTs have long been the decision-makers on which technology to purchase for their own use. As third-party data use grows, is it important that agencies be as thoroughly aware of the kind of technology used to generate the data or is the final data product all that matters?
- **Do public agencies trust third-party data vendors? How important is transparency?** When the data product is the only thing an agency purchases, it has limited insight into how the data is developed. This black-box approach implies that agencies need to trust the technology, methodology and execution of a private entity.
- **Will third-party vendors be held to different standards than internal system data?** In terms of availability, accuracy and timeliness, agencies will decide whether or not third-party data will be held to different standards.
- **What are the long-term cost implications on the TMC business model?** Even though TMCs are not designed to be profitable ventures, their budgets are designed to build, maintain and operated large-scale information technology infrastructure. It is unclear how long-term data contracts will factor into existing budgets.

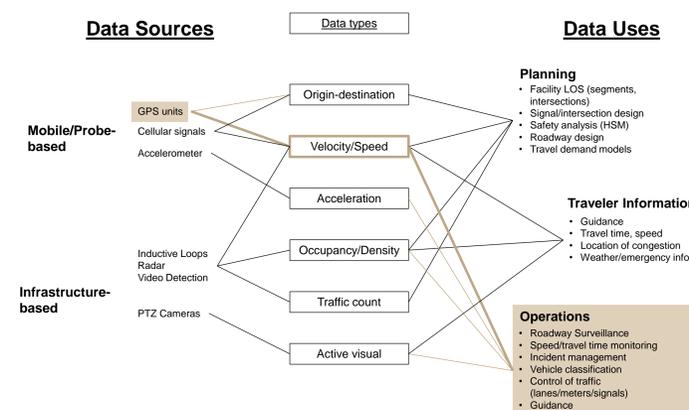
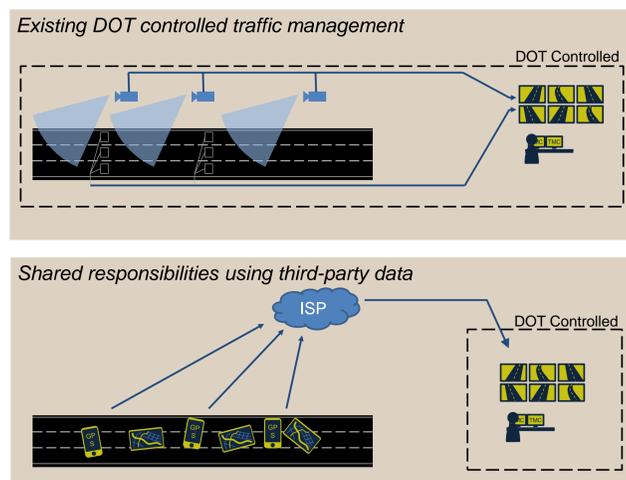
Understanding impediments to the use of third-party data

Organizational Barriers

The existing organization of most TMC's is predicated on their role as a central manager for the hardware and data of infrastructure-based traffic monitoring. Inductive loops, video cameras and other devices are all connected to communication and power networks that carry data to a TMC where it is translated into information for TMC operators who can then manage traffic with that information. With third-party data, DOTs will control far less of the traffic monitoring system. What are the risks involved and how might TMCs mitigate these risks when there are third-parties are increasingly responsible for critical elements of traffic monitoring?

Technical Barriers

Traditional traffic monitoring equipment has been developed to report speed, counts and occupancy for use by TMCs. Not all activities in planning, traveler information and operations, however, require that much data. GPS units are only able to report vehicle speed when there are sufficient probes available on a facility. Will TMC operators be able to perform their tasks without either vehicle count or occupancy data? Does traffic management itself require all the data that has been generated from devices or is some of the data redundant or unnecessary?



Preliminary Results

- Initial findings suggest that TMC operators are currently reluctant to trust third-parties with the responsibility of providing traffic monitoring data, largely because of the non-transparent nature of the data. The use of historic data to fill in where live data is unavailable is potentially useful for drivers but TMC operators find this practice misleading and un-useful for their purposes.
- There are many sources of uncertainty and risk that will affect TMC operators' likelihood to endorse a third-party GPS-based system including lack of documentation, limited understanding of technology, third-party operation and others that will emerge from ongoing study.
- TMC operators may be willing to accept technologies that produce speed measurements without traffic flow or volume data. The need for volume and flow information is largely related to performance measurement such as the Highway Performance Monitoring System. This is an important task but is not central to the function of TMCs, which focus on operations.
- TMC operators recognize the trade-off between accuracy and the cost of a system; they may be willing to accept a decrease in accuracy if the system costs are substantially less than the cost for maintaining or rehabilitating existing systems. This will be most apparent when a low sample of vehicles is available for speed calculation, decreasing confidence in the values.

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