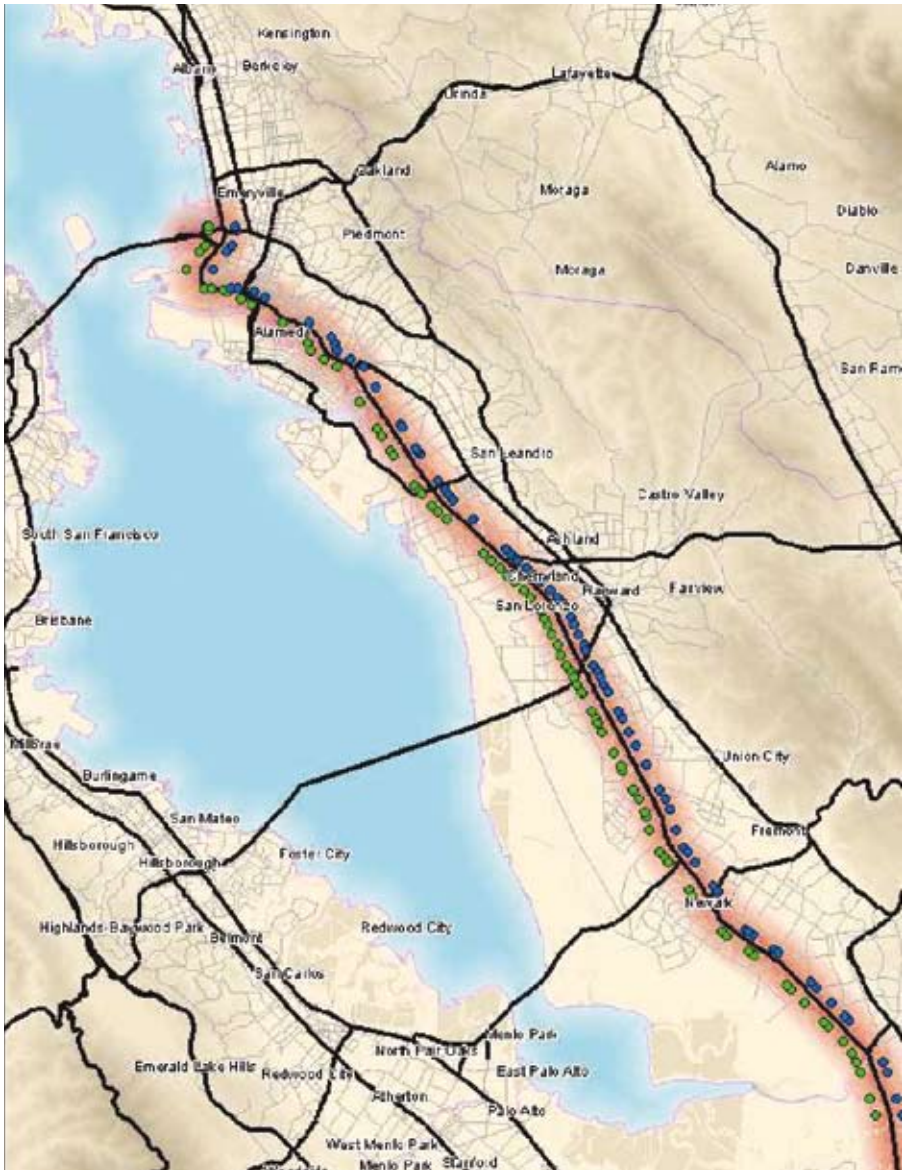
by Hamed Benouar

RELEASE THE PRESSURE

PERFORMANCE-BASED MANAGEMENT USING REAL-TIME TRAFFIC DATA

Transportation agencies are always on the hunt for solutions to their traffic congestion conundrums. In the field of detection, finding solutions that are cost-effective, reliable and maintenance-free causes just as many headaches



The I-880 corridor was one of the first comprehensive applications of corridor management

Transportation system management requires the collaboration and cooperation of the institutions that have jurisdiction over the system. Subdivided into corridors, transportation systems include freeways, arterials, local street and transit properties. Managing a corridor also requires the collaboration and cooperation of the agencies having jurisdiction over the corridor, such as transportation agencies, law enforcement agencies, and transit properties. Real-time transportation management is vital to making the best use of the transportation infrastructure in relation to meeting actual demand. Measuring the performance of the infrastructure and managing based on the real-time performance of the corridor is an important element of meeting the needs of the corridor agencies. Accurate, reliable and cost effective real-time traffic data collection is essential for such real-time performance-based corridor management.

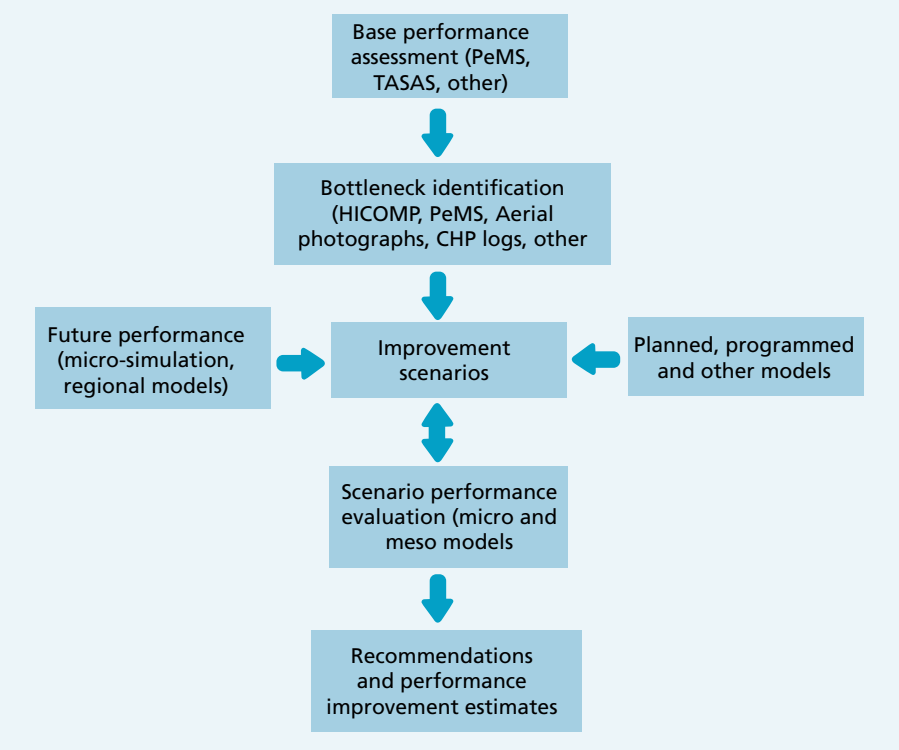
WHY CORRIDOR MANAGEMENT?

Traffic congestion continues to have a negative impact on people and the economy. In the USA, the top three most congested cities are Los Angeles, New York and Chicago. It is no surprise that those three cities are not only the most populated cities in the USA, but also major national financial centers. But congestion comes with economic growth, which is inevitable, and eliminating it is a very difficult task. Transportation agencies cannot keep up with increased demand through infrastructure expansion alone. Building additional facilities when physically possible takes a long time given environmental and funding constraints. Congestion should at least be managed to a level that is acceptable to commuters and the economy.

There are two types of congestion: recurring congestion due to excess demand

and the lack of adequate infrastructure to meet the demand; and non-recurring congestion resulting from incidents and more predictable but not recurring special events, such as sports games, and construction and maintenance activities. In all cases, agencies could achieve more with the use of new technologies to improve efficiency and make better use of existing infrastructure, and to plan and respond better to non-recurring congestion. In all cases, accurate real-time data is key to better corridor and overall transportation system management. In the case of recurring congestion, real-time traffic data can make use of ramp meters a lot more efficiently in managing demand on the freeway. Knowledge of real-time performance of arterials, such as travel time, could provide opportunities for balancing the system on a corridor basis by sharing capacity between freeways and arterials. Providing real-time accurate information to the motorist will encourage better use of existing infrastructure, as informed motorists will go to the least congested routes, thereby helping to balance the system and fulfilling the role of 'ultimate transportation manager'.

Since the inception of the USDOT led to new ITS initiatives, many agencies have been embarking on the use of new technology to improve the efficiency of their transportation systems. However, many find it very difficult to deploy technology due to lack of funding and a trained workforce to operate and maintain the new systems. In addition to the slow adoption of new technologies, many institutional issues come in the way of integrated corridor management and corridor mobility improvements. The San Francisco-Oakland Bay area in California, for example, includes more than seven million people, nine counties, more than 100 cities and more than 25 independent transit properties. Integrated corridor management in such an area needs the participation and cooperation of more than a dozen agencies having independent jurisdiction over part of the corridor – either a freeway, local streets, or a transit bus or train. Data collection and sharing is at best a challenge. However, many of these agencies have come to the conclusion that cooperation and collaboration improves overall transportation system management. The USDOT is sponsoring the Integrated Corridor Management (ICM) effort and California has been a leader over the past decade in improving corridor mobility through an integrated planning and operations effort 'Practicing the Pyramid'.



The chart shows the processes taken during the development of Corridor Management Plans (CMPs)

THE BEST PRACTICES

California is a leader in the concept of using data to monitor and manage the system. Such concepts were articulated in reports to the legislature in the late-1990s and received USDOT awards. Practicing the Pyramid is a concept led by the California DOT (Caltrans) Division of Traffic Operations in collaboration with the Division of Planning. Such concepts and vision helped put a transportation measure on the 2006 ballot for California voters to pass. In November 2006, voters approved Proposition 1B that provided nearly US$20 billion for transportation improvements, of which around US$4.5 billion was for corridor mobility improvements. Recognizing the need for good data collection as a basis for monitoring the system, measuring system performance as well measuring the benefits of new improvements, Caltrans allocated funding up front to fill detection gaps throughout the most congested corridors that were slated for improvement under the Corridor Mobility Improvement Account (CMIA). With approval by the California Transportation Commission (CTC), Caltrans manages the CMIA program and funded the new detection through its State Highway Operations and Preservation Program (SHOPP).

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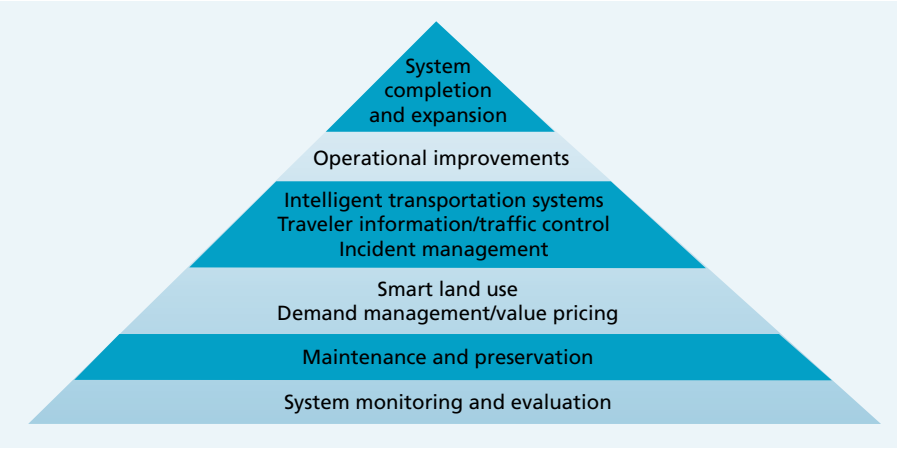
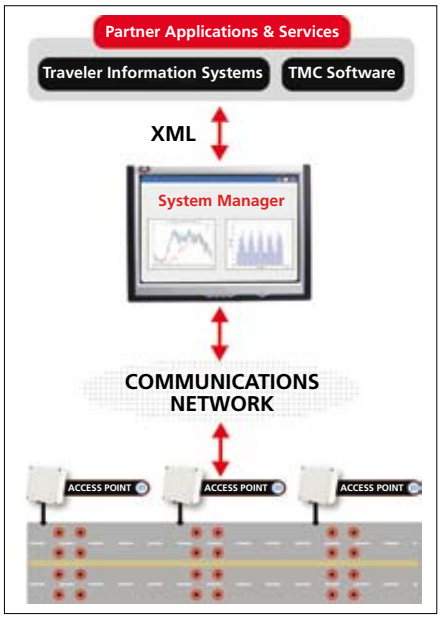


Measuring the system from planning through operations maintenance to improvement



The above shows an integrated traffic data system's components

The I-880 Corridor was one of the first comprehensive applications of corridor management. It included both the application of new technology and simulation and the participation and institutional cooperation of all the agencies that have jurisdiction over the corridor.

The study has been completed by the University of California Center for Innovative Transportation (CCIT) in collaboration with the System Metrics Group (SMG). The development of Corridor Management Plans (CMPs) had to include the collaboration and sharing of data from all agencies. The institutional work was just as demanding, if not more than the technological work. Data availability and accuracy was a major encountered problem, as it was hard to establish baselines and to validate the microsimulations. Three steps were followed by the group: first bring all agencies together, establish the charter and find out what data was available; then develop a data needs and acquisition plan; before finally performing system evaluation and scenario development and evaluation.

The process shown on the previous page was followed. The study concluded that reasonable data would allow corridor assessment and delay in more detail so that the impact of improvements can be evaluated. There are clear benefits to what good data can reveal as far as corridor performance is concerned.

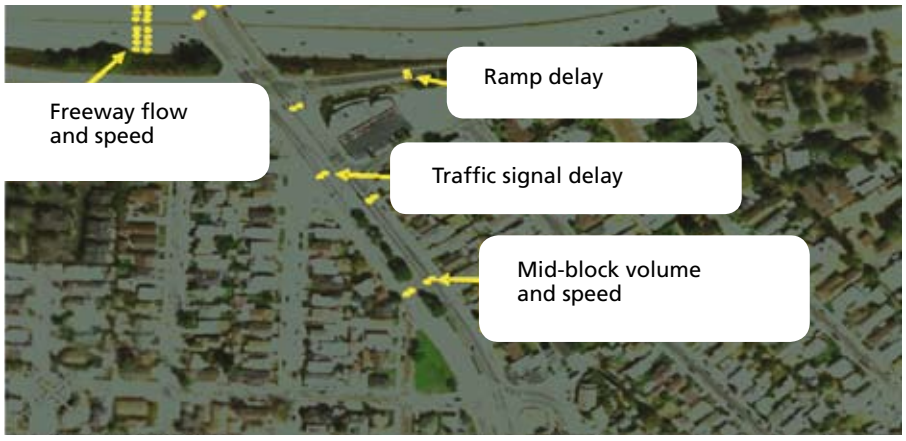
For planning and cost benefit evaluation purposes, average vehicle hours of delay can be estimated before improvements are completed. The afterstudy using the data can therefore show benefits of the investments.

I-80 CORRIDOR MOBILITY IMPROVEMENT

Another corridor that has been identified as a major one for improvement is the I-80. One of the most congested in the state of California, I-80 runs from the Carquinez Bridge to the Oakland-San Francisco Bridge. The Alameda County Congestion Management Agency (ACCMA) has the lead in implementing the I-80 corridor mobility improvements. The I-80 ICM vision is shared by all of the agencies along the corridor, and will enhance the current Transportation Management System by using a State of the Practice solution to build an integrated, balanced, responsive and equitable system to monitor and maintain optimum traffic flow along the network to improve the safety and mobility for all users.

This corridor received more than US$80 million in Proposition 1B funds for improvements both on the freeway and arterials. Along this corridor, there is no physical room for roadway expansion so the managed lane concept will be employed to get more efficiency out of the existing infrastructure.

The key to effective corridor management and reducing congestion on arteries and freeways is accurate data. The only way to receive accurate data from these congested arteries is to use a dependable, accurate and cost-effective vehicle detection system. The key word used here is dependable. Metropolitan areas need to consider their Dependability Index when choosing a vehicle detection system. Suppliers of such systems tout their accuracy, but a more appropriate question to ask is how often they are available. A large number of technologies used in vehicle detection are either broken or in 'recall' most of the time. Cities need to consider a technology's dependability before implementing a detection system.



The chart shows an integrated data system for all traffic data needs

"WVDS can offer the missing link (accurate data) as a single platform for all corridor detection needs, including freeways, arterials and intersection actuation and control"

THE MISSING LINK

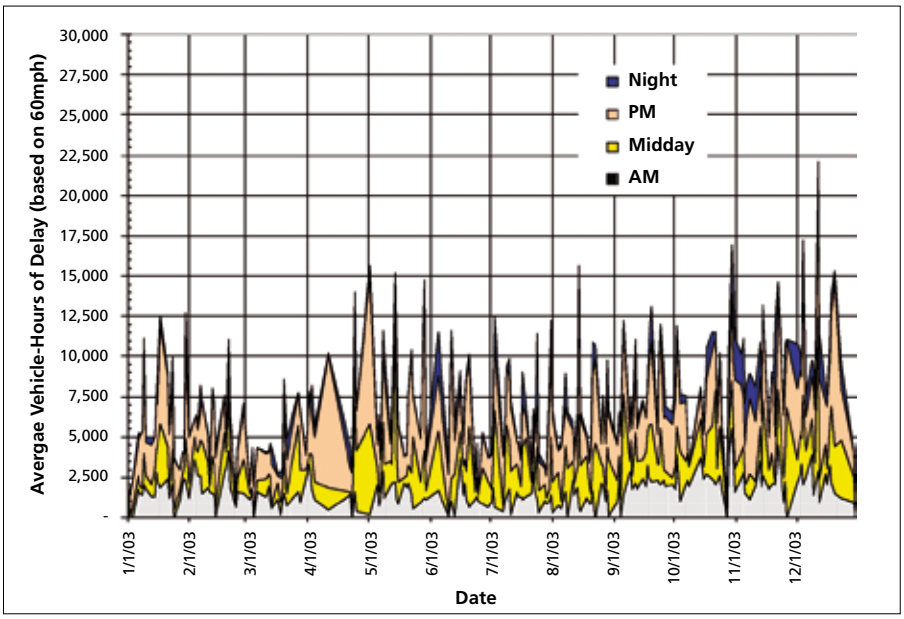
Inductive loop detectors have been used for the past 50 years for most traffic data collection, including traffic control at intersections and traffic count applications on the freeway and arterials. Many technologies that are perceived to be less intrusive and more cost effective have been introduced over the years to replace loop detectors. The most successful technologies introduced more than a decade ago include video detection, which is used mainly for traffic signal control, and side-fire microwave radar systems for freeway count stations. Today, loop detectors are still used in more than 70% of the applications as a result of their accuracy and because of the problems that both video and radar have had in their implementation over the past decade. Although both video and radar detection systems have evolved and improved over the years, they are still plagued with high maintenance and accuracy problems in all weather and traffic conditions. Advanced detection and system detection and any type of midblock detection continues to be dominated by loop detectors as both video and radar detection systems are not suitable due to obstacles, such as power requirements, occlusion and pole-mounting requirements.

Recent developments in wireless vehicle detection systems (WVDS) provide a good alternative to loops detectors as a single detection platform for vehicle detection in all applications. Wireless sensors are

especially cost effective for midblock vehicle detection applications, including advanced detection and system detection. Wireless detectors can be placed up to 1,000m from the intersection and can provide vehicle detection with accuracy comparable to loops, yet without the expensive and disruptive trenching that is required for installation of loops, conduit and wires. In addition, WVDS can be installed at a fraction of the cost of loops, enabling adaptive signal control, which was, until now, cost prohibitive. WVDS provides agencies that continue to use loop detectors today an excellent, less intrusive, as well as accurate and more reliable solution at a fraction of the lifecycle cost.

In addition, WVDS provides a flexible IP-based solution that can be integrated with existing controllers and detection system to fill the gap and provide the needed detection that is necessary to perform real-time performance-based corridor management and improvement. In areas where no detection is available, WVDS can offer the missing link (accurate data) as a single platform for all corridor detection needs, including freeways, arterials and intersection actuation and control.

Affordable vehicle detection systems with ease of installation and low maintenance/ lifecycle costs is vital to real-time performance-based corridor management. The accurate data is needed in support of freeway and arterial travel-time information systems, alternate routing, local and system level performance measures, adaptive and traffic responsive signal control, ramp metering and freeway management. Moreover, accurate, flexible detector technology is the foundation for effective Integrated Corridor Congestion management. ■



Most traffic delays are random in nature and change on a daily basis. Accurate, real-time data from a dependable vehicle detection system is key to reducing congestion and effective traffic management

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