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CALTRANS DIVISION OF RESEARCH, INNOVATION AND SYSTEM INFORMATION

TRANSFORMING IDEAS INTO SOLUTIONS

Research Results

Management of Multiple Integrated Corridor Management (ICM) Corridors

Formulate recommendations for strategies to enable multiple integrated corridor managements to work together.

Transportation Safety and Mobility

APRIL 2023

Project Title:
Integrated Corridor Management – Connected and Automated Vehicles (CAV)

Task Number: 3706

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WHAT WAS THE NEED?

The California Department of Transportation (Caltrans) is reorganizing to better support integrated corridor management (ICM) in the state. Corridor managers will serve as experts for individual corridors, responsible for overseeing corridor operations, coordinating with partner agencies, and improving collaborative, multi-agency planning. The Connected Corridors Pilot project aims to deploy an ICM system along the I-210 to mitigate incident-related congestion. While it makes sense to manage freeways, arterials, and transit in a coordinated way within a corridor, it is less clear how multiple corridors interact with each other, and how incidents and response plans along one corridor might impact a nearby corridor.

The success of future ICM projects depends on understanding how multiple corridors interact with each other, and how incidents and response plans deployed along one corridor may impact a nearby parallel corridor. Extension of decision support to cover multiple corridors is the next step in the evolution of ICM. Early identification of interoperability and compatibility challenges for multiple corridors is a necessary condition to avoid wasteful pitfalls and to hasten the realization of the true potential of future ICM projects. Reducing unintended consequences and costs of future ICM projects is the motivation for this research. This task aims to understand how to coordinate management of multiple corridors

WHAT WAS OUR GOAL?

Our goal was to understand what kinds of effects can be expected when multiple corridors interact with each other, and how incidents and response plans along one corridor may impact

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a nearby parallel corridor. Ultimately, having successive ICMs that together support each other's objectives will assist the public by allowing travelers to make informed decisions about route choice, thus reducing the inconvenience to highway system users.

WHAT DID WE DO?

Through a series case studies, this project investigated aspects of multi-corridor rerouting, and provided examples of coupled freeways that support each other's operations. Examples were taken primarily from 2019 and a range of freeways across California but with focus on: (1) I-210, I-10, and SR-60 (seen below in Image 1) in the Los Angeles area, and; (2) I-5, SR-91, SR-57, and SR-55 in the Orange County Triangle. Using data from PeMS, INRIX (example of INREX data seen below in Image 2), and Streetlight, it is shown that large incidents on one freeway can cause measurable changes and traffic congestion on the coupled freeways. Response plans that are able to increase capacity near and around the incident may result in benefits on the coupled freeways.

WHAT WAS THE OUTCOME?

The recommended structure for organizing ICMs is a scalable structure that could implement multiple response plans to manage multiple incidents on the road network at the scale of a region. Seen below in Image 3, is an example of a schematic of four ICM regions showing the boundaries of control for situational awareness. This indicates how establishing the areas of control can assist with managing multiple incidents from an ICM standpoint and a better collaboration from multiple jurisdictions among those ICMs for handling the incidents. A vision to achieve effective multi-jurisdictional collaboration for traffic management involves several key ingredients:

- **Commitment**
  - Acceptance that this is a long-term goal that will require decades of consistent effort
  - Recognition that legacy, variety, and lack of standardization of infrastructure are serious barriers
- **Standards**
  - It is crucial to establish modern standards for exchange of traffic management data
  - Standards must specify data semantics
  - Vendors must be included in the standards generation and maintenance process
- **Data**
  - More complete, more representative, and more integrated data is needed for planning and for real-time situational awareness
  - Further studies of emerging data sources are needed
  - To improve the fidelity of traffic studies to determine cost/benefits of large scale traffic management strategies
  - To build fast predictive models to enhance decision support for real-time traffic management
- **Incremental steps**
  - When standards are in place, Advanced Traffic Management Systems (ATMS) and local Traffic Management Center (TMC) systems can be updated or replaced to implement them
  - With consistent effort over time, the barriers to data exchange will be reduced

WHAT IS THE BENEFIT?

Three structures for organizing ICMs were discussed. An example with joint scorecards was used to illustrate how a data-driven decision process could enable two ICMs to work together to determine two response plans that could be deployed while respecting constraints on available resources.

This effort is crucial for Caltrans to push the envelope of what is possible with ICM, to demonstrate the ability to evolve with changing technologies, and to pioneer new possibilities in large-scale traffic management. Cutting-edge solutions adopted in California can become a

model of organizational excellence and copied across the United States and around the world. Efficiently run traffic systems support economic activity through reduced travel times, better access to parking, on-time freight delivery, and improved parking. Insofar as ICM supports economic activity by improving transportation system performance, this research enables these benefits to be expanded to cover multiple, interacting corridors. Better traffic management decisions will translate to better environmental outcomes, and improved livability.

LEARN MORE

The final report is posted to this website when available:
https://dot.ca.gov/programs/research-innovation-system-information/research-final-reports

UC Berkeley Direct Report link
https://escholarship.org/uc/item/7bm1r1k8

IMAGES

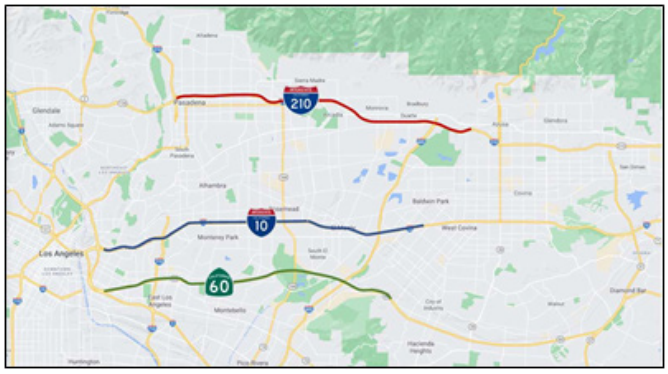

Image 1: Freeway Sections Considered

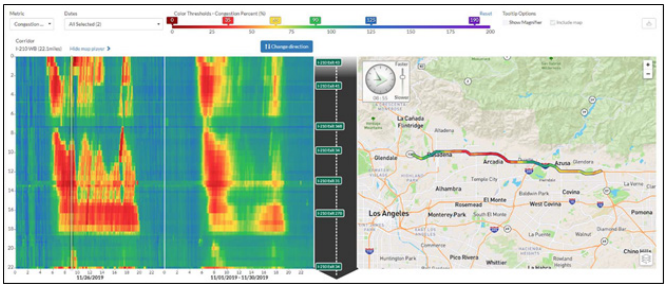

Image 2: INRIX Congestion Profile Example

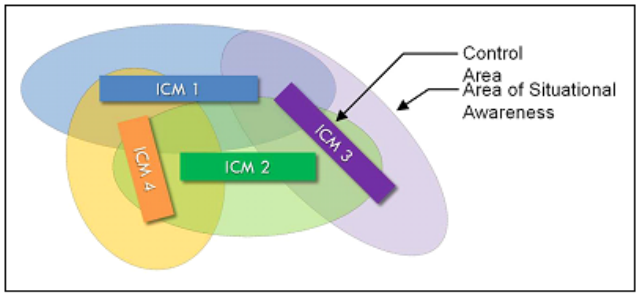

Image 3: Schematic representation of four ICM regions, control situational awareness boundaries