

## Development and Deployment of Corridor Management Prototype (ATMS TESTBED PHASE III FINAL REPORT)

### Why was this Research Undertaken?

A central Advanced Transportation Management Information System (ATMIS) capability is a timely and efficient response to non-recurring congestion. The complexity of traffic in urban corridors requires substantial interaction between the various agencies that share responsibilities for corridor management. Coordinated response to congestion phenomena between these agencies avoids the implementation of responses that may be conflicting and therefore counter-productive.

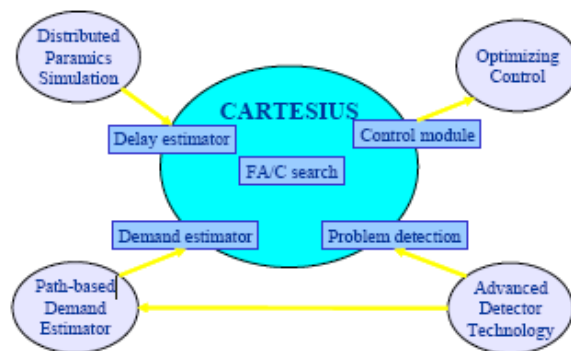
The problems of transportation management in urban areas are complicated by jurisdictional as well as operational problems. The spatial and administrative organization of transportation management agencies in metropolitan networks requires a coordinated solution effort that preserves the different levels of authority; guarantees privileged data control, and in general reflects the inherent distribution of the decision-making power. A coordinated response to congestion avoids the implementation of operational solutions that may otherwise conflict, and therefore be counterproductive.

### What was done?

The Testbed functionality in this broadly defined ATMIS application is centered on the real-time multi-agent incident management system CARTESIUS (Coordinated Adaptive Real-Time Expert System for Incident management in Urban Systems), deployed within the Testbed Real-time Integrated Control and Evaluation Prototype System (TRICEPS). CARTESIUS approaches this problem by employing advanced cooperation and conflict resolution methodologies for coordinated traffic management operations among multiple agents.

This system is at the cutting edge of the application of agent technology to traffic management and has been tested extensively using laboratory simulation with positive outcomes

reported across the scenarios evaluated. To date, however, it has not been deployed in the field.



**CARTESIUS Components**

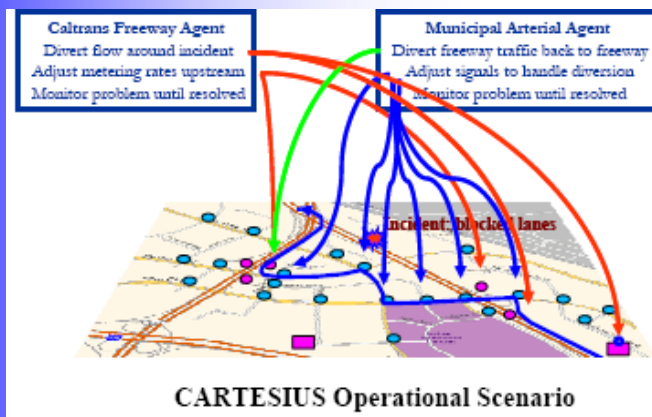
In an ongoing joint Testbed/PATH project, TRICEPS/CARTESIUS is in the process of being field tested in two evaluation modes. In the first mode, the system processes real-time data coming from sensors in the field and provides advisory management strategies and control actions for the consideration of Caltrans District and City of Irvine Traffic Management Center personnel.

The second evaluation mode involves developing CARTESIUS as a client under CTNET, and deploying the system in its real-time, interactive mode in the Testbed corridor. The deployment will utilize dynamic Origin/Destination (O/D) patterns and travel times derived from the vehicle re-identification research (REID), which is a separate ongoing PATH research effort, to assess alternative routing of vehicles through the corridor. Signal timing recommendations selected with the aid of TRICEPS/CARTESIUS will be implemented via the Cartesius/CTNET system that will be deployed by the Testbed along Alton Parkway; ramp meter settings will also be implemented based on enhancements to the

Caltrans District 12 Testbed intertie as part of the follow-on Testbed contract.

## What can be concluded from the Research?

The product of this work will be deployment of a multi-jurisdictional, multi-agent traffic management decision support system using an extensible implementation architecture. The deployment will utilize the products of current and prior Testbed research and evaluate their use in practical settings. The field deployment of TRICEPS/CARTESIUS will produce a functional multi-agent, multi-jurisdictional traffic management system for the real-world transportation corridor that is part of the Testbed. This system will coordinate management strategies between Caltrans D12 and the City of Irvine. The TRICEPS/CARTESIUS system is a mature research project utilizing agent technology to implement strategies that “coordinate freeway and arterial operations among multiple agencies.” The work conducted here will produce a pilot deployment of this system in a specific real-world setting. This will permit further evaluation of both the performance of the architecture as well as provide feedback on the practical usability of the system from the operators' perspectives.



## What do the Researchers recommend?

Because CARTESIUS will be deployed in the Irvine I-405 transportation corridor, it offers the potential to conduct study in the following important areas:

1. *Assessments of impacts of application of technologies:* The impact of TRICEPS and CARTESIUS on various non-recurrent

congestion scenarios in Irvine corridor will be assessed.

2. *Studies of institutional coordination issues:* The efficacy of CARTESIUS mediated inter-jurisdictional coordination of traffic management strategies between the City of Irvine and Caltrans D12 will be evaluated.
3. *Post-deployment evaluations of effectiveness:* While full evaluation of the deployment will likely require longer-term calibration of the system and subsequent monitoring, preliminary evaluation of its performance will be produced and used to feed further fine-tuning of the deployment.

## Implementation Strategies

Because of the safety, legal, and institutional issues involved with moving research into full deployment, we have included stages in the development that provide a middle ground between researchers and practitioners by establishing the ability to engage in TMC-in-the-simulation-loop experiments. We hope this will provide an important prototype for moving research into practice.

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