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CONNECTED VEHICLE APPLICATIONS: MOBILITY



Connected vehicle mobility applications are commonly referred to as dynamic mobility applications (DMAs). DMAs seek to fully leverage frequently collected and rapidly disseminated multi-source data gathered from connected travelers, vehicles, and infrastructure. DMAs increase efficiency and improve individual mobility, while reducing environmental impacts and safety risks. DMAs are organized within “bundles.” Many of the applications in these bundles rely on connected vehicle support systems.

This resource includes a brief description as well as a cross reference of materials for each connected vehicle mobility application and support system. The end of this document provides detailed reference material information.

Multimodal Intelligent Traffic Signal System (MMITSS)^{1, 2, 3, 4}

Emergency Vehicle Preemption: Provides signal preemption to emergency vehicles and accommodates multiple emergency requests.

Freight Signal Priority: Provides traffic signal priority for freight and commercial vehicles traveling in a signalized network.

Intelligent Traffic Signal System: An overarching system optimization application that accommodates signal priority, preemption, and pedestrian movements.

Mobile Accessible Pedestrian Signal System: Allows a visually impaired pedestrian’s smart phone to place an automated call to a traffic signal so the signal can then issue audio cues to help the pedestrian safely navigate the crosswalk.

Transit Signal Priority: Provides signal priority to transit vehicles at intersections and along arterial corridors.

Intelligent Network Flow Optimization (INFLO)^{5, 6, 7, 8, 9, 10, 11, 12}

Cooperative Adaptive Cruise Control: Dynamically adjusts and coordinates cruise control speeds among platooning vehicles to improve traffic flow stability and increase throughput.

Dynamic Speed Harmonization: Recommends target speeds in response to congestion, incidents, and road conditions to maximize throughput and reduce crashes.

Queue Warning: Provides timely warnings about existing and impending queues to drivers.

Response, Emergency Staging and Communications, Uniform Management, and Evacuation (R.E.S.C.U.M.E.)^{13, 14, 15, 16, 17}

Advanced Automatic Crash Notification Relay: Allows vehicles that have been in a crash or other distress situation to automatically transmit an emergency message.

Emergency Communications and Evacuation: Addresses needs of evacuees with and without special needs and provides real-time evacuation instructions and routing guidance that accounts for current road and traffic conditions.

Incident Scene Pre-Arrival Staging Guidance for Emergency Responders: Provides emergency responders with situational awareness and the ability to coordinate upon dispatch, including issuing additional information about the scene of an incident, providing real-time navigation instructions, and using GPS to track all responder vehicles.

Incident Scene Work Zone Alerts for Drivers and Workers: Warns on-scene workers of vehicles with trajectories or speeds that pose a high risk to their safety. It also warns drivers passing an incident zone if they need to slow down, stop, or change lanes.

Traveler Information^{18, 19, 20}

EnableATIS (Advanced Traveler Information System 2.0):

Collects, aggregates, and disseminates a wide range of transportation information, including traffic, transit, road weather, work zone, and connected vehicle-related data.

Smart Parking: Provides users with real-time parking location, availability, type, and price, resulting in reduced parking search times and emissions.

Integrated Dynamic Transit Operations (IDTO)^{21, 22, 23, 24, 25, 26, 27}

Dynamic Transit Operations: Allows travelers to request trips and obtain itineraries for multiple transportation services (public transportation modes, private transportation services, shared-ride, walking, and biking) using a handheld mobile device or personal computer.

Dynamic Ridesharing: Matches riders and drivers through a combination of dynamic ridesharing technology, personal mobile devices, and voice-activated, on-board equipment.

Transit Connection Protection: Enables coordination between public transportation providers and travelers to improve the probability of successful transit transfers.

Other Transit Applications^{28, 29}

Integrated Multi-Modal Electronic Payment:

Provides electronic payment capabilities for toll systems, parking systems, and other areas.

Intermittent Bus Lanes: Enhances transit operations mobility by providing dedicated bus lanes during peak demand times. It communicates a change in lane status to drivers through roadside message signs and in-vehicle signage.

Route ID for the Visually Impaired: Provides appropriate bus and route information to visually impaired travelers via portable audio devices.

Smart Park and Ride System: Provides real-time park and ride capacity information to travelers by monitoring the occupancy of parking spaces.

Transit Stop Request: Allows travelers to request connection protection anytime during a trip. Connection protection allows a traveler to make a successful transfer from one vehicle to another. The application uses real time data to examine the arrival status of a transit vehicle and transmits a hold message to another vehicle or other mode of transportation (e.g., rail).

Freight Advanced Traveler Information Systems (FRATIS)^{30, 31, 32, 33, 34, 35, 36, 37}

Drayage Optimization: Optimizes truck/load movements between freight facilities, balancing early and late arrivals.

Freight-Specific Dynamic Travel Planning and Performance: Enhances traveler information systems to address freight-specific needs by providing information such as road closures, work zones, route restrictions, and wait times at ports.

Commercial Vehicle Applications

Border Management System: Provides international border registration, pre-processing, and border inspection capabilities via electronic communications between border agencies, fleet management agencies, commercial vehicles, freight containers, and border inspection services.³

Container Security: Uses container-to-infrastructure communications to allow security and public safety agencies to examine a container's contents and check the container's information against manifest information previously obtained through other clearance activities.³⁹

Container/Chassis Operating Data: Allows the commercial vehicle driver and fleet operator to monitor the operating status of their containers or chassis, including temperature, humidity, and battery levels.³⁹

Smart Roadside Initiative: Performs a wireless roadside inspection of commercial vehicles' identification, speed, driver's log, weight, and dimensions.^{39, 40, 41, 42, 43, 44, 45, 46, 47}

Support Systems

Open System Application Data Protocol: Enables stakeholders to collaborate and share insights, methods, and source codes on a set of research projects sponsored by the U.S. Department of Transportation's DMA program.⁴⁸

Research Data Exchange (RDE): Provides a variety of data-related services that support the development, testing, and demonstration of multi-modal transportation mobility applications being pursued under the DMA program and other connected vehicle activities.⁴⁹

Vehicle Data Translator: Incorporates vehicle-based measurements of the road and surrounding atmosphere with other weather data sources.⁵⁰

Weather Data Exchange: As a weather-specific adjunct to RDE, provides weather data-related services that support the development, testing, and demonstration of multi-modal transportation mobility applications being pursued under the DMA program and connected vehicle research activities.⁵¹

Reference Materials

MMITSS

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