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The proposed ICM system components should be compatible with the Los Angeles Area Regional ITS Architecture elements to ensure that the ICM system components are interoperable among themselves, as well as with external applications. Los Angeles County developed a Regional ITS Architecture in 2004 which produced an integrated ITS and Strategic Deployment Plan for the Los Angeles County Area. The Regional ITS Architecture has not been updated since its development and, as a result, it does not include several components that are expected to be part of the I-210 Pilot ICM system. This document presents a Project ITS Architecture to represent the I-210 Pilot ICM system from the National ITS Architecture, version 7.1 perspective. It is recommended that this Project ITS Architecture be incorporated into the Los Angeles Regional ITS Architecture as part of its next update.

The following sections describe the different components of the I-210 Pilot ICM system project architecture.

# **Subsystem Diagram**

The overall subsystem diagram for the I-210 Pilot ICM is shown in Figure 1. The white rectangles indicate the subsystems that apply to one or more elements in the I-210 Pilot ICM system. The descriptions of the subsystems are in Appendix A.

Figure 1 – Subsystem Diagram showing the type of National ITS Architecture Entities included in the I-210 ICM system

C:\Users\adas\Desktop\I-210  ICM Project\3-14-2017\Sausage Diagram\Sausage.emf

The I-210 Pilot ICM system has the objective of improving overall traffic operations in the project corridor during significant incidents and events. The National ITS Architecture subsystems included in the architecture provide the services that the ICM system is expected to deliver in order to meet this goal.

# **Interconnect Diagram**

The I-210 Pilot ICM system Concept of Operations document shows a high-level system architecture diagram in Figure 11-4 on page 178. The National ITS Architecture representation of this high-level architecture is depicted in Figure 2.

The ICM system is connected to the elements associated with one of the following categories:

* Roadway
* Transit
* Emergency Management
* Information Service Provider
* Parking Operators
* Other Data Suppliers

Attached to each of the systems with which the ICM system has direct interfaces are additional elements (field devices) from which the ICM system is expected to receive information and/or provide control recommendations.

Communication between the I-210 Pilot ICM system and the other systems operated by the various stakeholders is expected to be implemented by using the existing Regional Integration of Intelligent Transportation Systems (RIITS) communication network. The agencies within the I-210 corridor that provide information to the RIITS system are the Los Angeles Metropolitan Transportation Authority (Metro), City of Los Angeles Department of Transportation, Caltrans Districts 7, 8 and 12, California Highway Patrol, Foothill Transit, Los Angeles County Department of Public Works, City of Pasadena, City of Arcadia, City of Alhambra, and the City of West Covina. In addition to functioning as communication network the RIITS also processes and distributes transportation-related data among the participating agencies. With respect to the ICM system, RIITS is modeled as a communication system as depicted in Figure 11-4 (page 178) of the I-210 Pilot ICM system Concept of Operations document. Since the National ITS Architecture does not model communication networks, RIITS is not physically represented as stand-alone subsystem in this diagram.

The planned interfaces, shown as dotted lines, between the ICM system and the systems to which it is directly connected, are automated interfaces. These automated interfaces will allow the ICM system to receive data from/send data to the field equipment through the centralized control system that directly controls the field equipment The centralized control systems that have direct interfaces with the I-210 ICM are the Caltrans ATMS, arterial ATMS (traffic control systems of City of Arcadia, City of Pasadena, and Los Angeles County), freeway ramp meter systems, and systems for changeable message signs (arterial and freeway).

Figure 2 – I-210 ICM System Interconnect Diagram

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# **Information Flow Diagram**

Defining the system interconnects as shown in Figure 2 permits the identification of anticipated information flows to perform the functions that will deliver the transportation services expected from the ICM system.

The ICM system is complex, requiring information flows between numerous systems as depicted in Figure 2, so the information flows using these interfaces cannot be shown in a single diagram. To view the information flows better, context flow diagrams as shown in Figures 3 through 21 were created. Each of these diagrams show the information flows using each interface between the ICM system and the systems directly connected to it. The diagrams also show the interfaces between the systems directly connected to the ICM system and the devices being controlled or with other systems that provide services to implement the ICM system. Integrating the information flows in Figures 3 through 21 creates the interconnect diagram shown in Figure 2.

Each box shown in these diagrams includes two pieces of information. The box title (text in the blue-colored top portion of the box) represents the name of the stakeholder who owns, operates, controls and may maintain the system/equipment. The text in the body (white portion of the box) represents the system/equipment name that will provide the function and/or data required for implementing the ICM services. Between the boxes, the diagrams show information flows for three conditions; existing, planned and future. The existing information flow (solid blue) represents the data that is currently being communicated between the two systems/equipment. The planned information flows (dashed red) are not occurring now, but are planned to occur when the ICM system is deployed. The future flow (dotted green) represents the data that is not being planned for now, but that may be implemented in future. The sequence of the diagrams is in the order of relative importance in terms of implementing the ICM services, with those with a more significant role shown before the systems with a lesser role. The context flow diagram of a subsystem shows the information flows between the subsystem and other subsystems with which it has direct interfaces in the I-210 ICM system. As a subsystem can be a part of one or more service packages in which it performs function(s) to render the services required for the I-210 ICM system, the information flows of each context flow diagram can be from one or many service packages depending on how many service packages are implemented by the subsystem. For each context flow diagram, Table 1 identifies the service packages from which the flows of the diagram are selected, i.e. it shows the service packages in which the subsystem provides some function to implement the services.

While most of these high-level information flows in Figures 3 through 21 are defined in the National ITS Architecture v7.1, some are user-defined flows that better represent other specific ICM data flow requirements. In summary, each context flow diagram shows which systems/equipment are involved and what information sharing among them are required to implement the various applications necessary to deliver the ICM services.

Table – Mapping of the Subsystem Context Flow Diagram to the Service Packages

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Diagram Number** | **Service Package Name** | | | | | | | | | | | | | | | | | | | |
| **AD1 ITS Data Mart** | **APTS01 Transit Vehicle Tracking** | **APTS02 Transit Fixed-Route Operations** | **APTS03 Demand response Transit Operations** | **APTS07 Multi-modal Coordination** | **APTS09 Transit Signal Priority** | **APTS10 Transit Passenger Counting** | **ATIS01 Broadcast Traveler Information** | **ATMS01 Network Surveillance** | **ATMS02 Traffic Probe Surveillance** | **ATMS03 Traffic Signal Control** | **ATMS04 Traffic Metering** | **ATMS05 HOV Lane Management** | **ATMS06 Traffic Information Dissemination** | **ATMS07 Regional Traffic Management** | **ATMS08 Traffic Incident Management System** | **ATMS09 Transportation Decision Support and Demand Modeling** | **ATMS17 Regional Parking Management** | **ATMS21 Roadway Closure Management** | **EM01 Emergency Call-Taking and Dispatch** |
| 3 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 4 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 5 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 6 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 7 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 8 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 9 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 10 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 11 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 12 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 13 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 14 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 15 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 16 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 17 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 18 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 19 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 20 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 21 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

## Los Angeles Regional TMC

The Los Angeles Regional TMC (LARTMC) operates the traffic management equipment installed on the state-controlled roads within Los Angeles and Ventura counties. Traffic management equipment operated by the District in the I-210 corridor includes mainline, on-ramp, off-ramp and arterial traffic sensors; ramp and connector metering signals; changeable message signs; closed-circuit television cameras; and highway advisory radios. The TMC also operates and maintains traffic signals located at the intersections between freeway ramps and local arterials. The I-210 ICM receives the device data through the communication network. After utilizing this data in the I-210 Core ICM System, the ICM System provides suggested actions ( e.g. Traffic signal plan modification, ramp metering rate adjustment etc.) necessary to improve the traffic operations during incidents to the LARTMC through the communication network.

Figure – Los Angeles Regional TMC Context Flow Diagram

C:\Users\adas\Desktop\I-210  ICM Project\3-14-2017\Context Flow Diagram\FlowLosAngelesRegionalTMC(LARTMC).emf

## Los Angeles County TMC

Los Angeles County TMC is the nerve center of an integrated system of advanced technologies including computer software, hardware, traffic signals, CCTV cameras, Bluetooth reading devices, and arterial changeable message signs (CMS). From the Los Angeles County TMC, the County TMC operators monitor and control signalized intersections connected to the county traffic signal control system, access and manage video feeds from the CCTV cameras, track travel times through Bluetooth devices, and access traffic and signal timing data stored in the signal control system. Also, the signals of the City of Monrovia and City of Duarte are controlled from the LACTMC. After receiving this data from the LACTMC, the I-210 ICM system will utilize this in its decision support system algorithm and provide any suggested actions (e.g. traffic signal plan modification.) necessary to improve the traffic operations during incidents to the LACTMC.

Figure 4 – Los Angeles County TMC Context Flow Diagram

C:\Users\adas\Desktop\I-210  ICM Project\3-14-2017\Context Flow Diagram\FlowLosAngelesCountyTMC(LACTMC).emf

## City of Pasadena TMC

City of Pasadena TMC is the nerve center of an integrated system of advanced technologies including computer software, hardware, traffic signals, CCTV cameras, Bluetooth reading devices, and changeable message signs (CMS). From the City of Pasadena TMC, the operators monitor and control signalized intersections connected to the City's centralized traffic control system, access and manage video feeds from the CCTV cameras, track travel times through Bluetooth devices, and access traffic and signal timing data stored in the traffic control system. After receiving this data from the City of Pasadena TMC, the I-210 ICM system will utilize this in its decision support system algorithm and provide any suggested actions (e.g. traffic signal plan modification)necessary to improve the traffic operations during incidents to the City of Pasadena TMC.

Figure 5 – City of Pasadena TMC Context Flow Diagram

C:\Users\adas\Desktop\I-210  ICM Project\3-21-2017\Context Flow Diagram\FlowCityofPasadenaTMC.emf

## City of Arcadia TMC

City of Arcadia TMC is an integrated system of advanced technologies including computer software, hardware, traffic signals, CCTV cameras, and Bluetooth reading devices. From the City of Arcadia TMC, the operators monitor and control signalized intersections connected to the City's centralized TranSuite traffic control system, access and manage video feeds from the CCTV cameras, track travel times through Bluetooth devices, and access traffic and signal timing data stored in the TranSuite traffic control system. After receiving this data from the City of Arcadia TMC, the I-210 ICM system will utilize this in its decision support system algorithm and provide any suggested actions (e.g. traffic signal plan modification.) necessary to improve the traffic operations during incidents to the City of Arcadia TMC.

Figure 6 – City of Arcadia TMC Context Flow Diagram

C:\Users\adas\Desktop\I-210  ICM Project\3-14-2017\Context Flow Diagram\FlowCityofArcadiaTMC.emf

## Southern California Go511

The Southern California Go511 service provides multi-modal traveler information through a 511 interactive voice response (IVR) system and the Go511.com web portal. Go511 provides traffic information for the Los Angeles, Orange, Riverside, San Bernardino, and Ventura counties. Upon receiving the existing travel condition data, the I-210 ICM system will analyze and process this data to generate value-added traveler information which will be sent back to the Go511 system for disseminating to the travelers.

Figure – Southern California Go511 Context Flow Diagram

C:\Users\adas\Desktop\I-210  ICM Project\3-14-2017\Context Flow Diagram\FlowSouthernCaliforniaGo511.emf

## Metro Transit Operations Center

The Los Angeles County Metropolitan Transportation Authority (Metro) is the state-chartered regional transportation planning agency and public transportation operating agency for the County of Los Angeles. As a transit system operator, Metro provides Metro Bus, Metro Liner and Metro rail transit services in the project corridor. Within the I-210 corridor, buses run primarily through the cities of Pasadena and Arcadia, as well as communities to the south and the west of these two cities. The Metro Transit Operation Center Automatic Vehicle Location/Computer Aided Dispatch (AVL/CAD) system operates the Metro Bus and Metro Liner transit systems. Upon receiving the transit operations data through the AVL/CAD system, the I-210 ICM system processes the data and provides suggested actions (request for increase/decrease in transit service, request for transit connection protection, transit signal priority requests etc.) to change the transit service during incidents to the AVL/CAD system. The AVL/CAD system may execute the ICM suggested operational changes to the transit service to respond to the incidents.

Figure – Metro Transit Operations Center Context Flow Diagram

C:\Users\adas\Desktop\I-210  ICM Project\3-14-2017\Context Flow Diagram\FlowMetroTransitOperationsCenter.emf

## Foothill Transit Operations Center

Foothill Transit provides fixed-route bus transit services in the San Gabriel and Pomona Valleys. Its 314-bus fleet provides bus service over an area of approximately 327 squares miles, carrying over 14 million passengers each year along 29 local and 6 express routes. Two of these routes are operated within the I-210 corridor. Upon receiving the transit operations data through the Automatic Vehicle Location/Computer Aided Dispatch (AVL/CAD) system, the I-210 ICM system processes the data and provides suggested actions (request for increase/decrease in transit service, request for transit connection protection, transit signal priority requests, etc.) to change the transit service during incidents to the AVL/CAD system. The AVL/CAD system may execute the ICM suggested operational changes to the transit service to respond to the incidents.

Figure – Foothill Transit Operations Center Context Flow Diagram

C:\Users\adas\Desktop\I-210  ICM Project\3-14-2017\Context Flow Diagram\FlowFoothillTransitOperationsCenter.emf

## Pasadena Transit Operations Center

The Automatic Vehicle Location/Computer Aided Dispatch (CAD/AVL) system in the Pasadena Transit Operations Center is utilized to control, operate and monitor the transit service provided by the Pasadena Transit system. The I-210 ICM system receives the transit operations data through the AVL/CAD system. Upon receiving the data, the I-210 ICM system processes it and provides suggested actions (request for increase/decrease in transit service, request for transit connection protection, transit signal priority requests, etc.) to change the transit service during incidents to the AVL/CAD system. The AVL/CAD system may execute the ICM suggested operational changes to the transit service to respond to the incidents.

Figure – Pasadena Transit Operations Center Context Flow Diagram

C:\Users\adas\Desktop\I-210  ICM Project\3-14-2017\Context Flow Diagram\FlowPasadenaTransitOperationsCenter.emf

## Metro link Transit Operations Center

The rail Automatic Vehicle Location/Computer Aided Dispatch (CAD/AVL) system in the Metrolink Transit Operations Center is utilized to control, operate, and monitor the rail commute transit service provided by the Metrolink Transit system. The I-210 ICM system receives the transit operations data through the AVL/CAD system. Upon receiving the data, the I-210 ICM system processes it and provides suggested actions (request for increase/decrease in transit service, request for transit connection protection, etc.) to change the transit service during incidents to the AVL/CAD system. The AVL/CAD system may execute the ICM suggested operational changes to the transit service to respond to the incidents.

Figure – Metro link Transit Operations Center Context Flow Diagram

C:\Users\adas\Desktop\I-210  ICM Project\3-14-2017\Context Flow Diagram\FlowMetrolinkTransitOperationsCenter.emf

## PeMS

The Freeway Performance Measurement System (PeMS) is a web-based tool that retrieves, processes, analyzes, and stores data collected by traffic monitoring systems as depicted in Figure 12. The traffic monitoring data sources include Caltrans' freeway mainline and ramp traffic detectors, Caltrans' Lane Closure System, Caltrans' freeway Changeable Message Signs (CMS), and incident reports from CHP CAD system.The I-210 ICM system retrieves this data from PeMS and utilizes the data in its decision support system algorithm.

Figure – PeMS Context Flow Diagram

C:\Users\adas\Desktop\I-210  ICM Project\3-14-2017\Context Flow Diagram\FlowCaltransFreewayPerformanceMeasurementSystem(PeMS).emf

## Caltrans Lane Closure Tracking System

Caltrans Lane Closure Tracking System is a statewide system that tracks lane closures (active and planned) for the next seven days from any given day. It allows Caltrans traffic managers to track lane, ramp, and road closures due to construction, maintenance, and encroachment permit activities. The I-210 ICM system retrieves this data from Caltrans Lane Closure Tracking System and utilizes the data in its decision support system algorithm.

Figure – Caltrans Lane Closure Tracking System Context Flow Diagram

C:\Users\adas\Desktop\I-210  ICM Project\3-14-2017\Context Flow Diagram\FlowCaltransLaneClosureTrackingSystem.emf

## CHP CAD System

California Highway Patrol (CHP)'s Computer-Aided Dispatch (CAD) system is a secure system used by the CHP to support dispatch and response functions. As it is often the point of first notification for an incident and provides regular updates as a situation progresses, this system often functions as one of the primary methods for disseminating incident information within Caltrans TMCs. The I-210 ICM system recieves the incident data from the CHP CAD system, processes the data and sends back any updated incident information and response plan to the CHP CAD system.

Figure – CHP CAD System Context Flow Diagram

C:\Users\adas\Desktop\I-210  ICM Project\3-14-2017\Context Flow Diagram\FlowCHPCADSystem.emf

## Local Law Enforcement Agency Center

Local Law Enforcement Agency Dispatch System is the Computer-Aided Dispatch (CAD) system utilized by the local law enforcement agencies to manage, dispatch, and to coordinate law enforcement personnel during incidents. I-210 ICM system has an interface with this system to receive and send incident and road network conditions data during an incident.

Figure – Local Law Enforcement Agency Center Context Flow Diagram

C:\Users\adas\Desktop\I-210  ICM Project\3-14-2017\Context Flow Diagram\FlowLocalLawEnforcementAgencyDispatchSystems.emf

## Metro Freeway Service Patrol (FSP)

The Metro Freeway Service Patrol (FSP) is a team of privately owned tow trucks that patrol designated routes on congested Los Angeles County freeways to provide help to stranded motorists and assist in clearing traffic accidents to keep traffic moving. The FSP provides the incident information to the I-210 ICM system.

Figure – Metro Freeway Service Patrol (FSP) Context Flow Diagram

C:\Users\adas\Desktop\I-210  ICM Project\3-14-2017\Context Flow Diagram\FlowMetroFreewayServicePatrol(FSP).emf

## Park and Ride Management Center

The Park and Ride Management System will be implemented by Metro for operating the Park and Ride facilities along the Metro Gold line and elsewhere in the I-210 corridor. Also, this element will manage the Park and Ride facilities that will be operated by Caltrans and LA County within the project corridor. The I-210 ICM will receive the status of parking facilities (parking availability, parking rate, etc.) data from the Park and Ride Management System. Upon receiving the data, the ICM system will use it in its decision support system algorithm and will send any request to change parking status data (parking price adjustment request, etc.) to the Park and Ride Management System as a response to an incident.

Figure 17 – Park and Ride Management Center Context Flow Diagram

C:\Users\adas\Desktop\I-210  ICM Project\3-14-2017\Context Flow Diagram\FlowParkandRideManagementSystem.emf

## Parking Management System

In addition to the Metro Park and Management Center, Parking Management Systems may be implemented in the project corridor by other parking operators in the future. The parking status data from these systems will be utilized by the I-210 ICM decision support system algorithm to provide the recommend course of actions in response to an incident.

Figure – Parking Management System Context Flow Diagram

C:\Users\adas\Desktop\I-210  ICM Project\3-14-2017\Context Flow Diagram\FlowParkingManagementSystem.emf

## Probe Vehicle

A probe vehicle will be tracked and utilized as a probe data provider to the I-210 ICM system.

Figure – Probe Vehicle Context Flow Diagram

C:\Users\adas\Desktop\I-210  ICM Project\3-14-2017\Context Flow Diagram\FlowProbeVehicle.emf

## Blue Commute System

Blue Commute is a traveler information application that provides real-time traffic reports via phone and internet on computers, laptops, smartphones, and tablet devices to the travelers. Information includes congestion on freeways and arterials, speed and travel times, incident notices and construction events, messages displayed on changeable message signs, and video feeds from Caltrans CCTV cameras. Blue Commute provides this information to the I-210 ICM system and disseminates the incident, road network and other transportation related data received from the ICM system to its subscribers.

Figure – Blue Commute System Context Flow Diagram

C:\Users\adas\Desktop\I-210  ICM Project\3-14-2017\Context Flow Diagram\FlowBlueCommute.emf

## Traveler Information Services

The Traveler Information Services is a third-party application which provides travel information and trip suggestion to travelers, both before they start a trip and while traveling. Examples of such applications are Google Map Navigation, Apple Navigation, Waze, Telenav Scout and Garmin Viago. Through the interface with this system, the I-210 ICM system will receive the travel time data from this system, and will send back the value-added travel time data to this system for disseminating to the travelers.

Figure – Traveler Information Services Context Flow Diagram

C:\Users\adas\Desktop\I-210  ICM Project\3-14-2017\Context Flow Diagram\FlowTravelerInformationServices.emf

APPENDIX A – SUBSYSTEM DESCRIPTION

This section describes every surface transportation inventory element for the I-210 ICM Project ITS Architecture. A transportation element can be either a center, vehicle, traveler or field equipment. In order to reduce the complexity of the architecture, some transportation elements with like functionality have been grouped together (e.g., Local Law Enforcement Agency Dispatch Systems element provides public safety dispatch in the I-210 ICM project corridor that are not covered by the CHP CAD System). The description of each element provides an overview of what it does with the data it receives in order to generate other data. The elements are sequenced in accordance with the alphabetical order of their names.

| **Sub-system Name** | **Description** |
| --- | --- |
| Blue Commute | Blue Commute is a traveler information application that provides real-time traffic reports via phone and internet on computers, laptops, smartphones, and tablet devices to the travelers. Information includes congestion on freeways and arterial, speed and travel times, incident notices and construction events, messages displayed on changeable message signs and video feeds from Caltrans CCTV cameras. Blue Commute provides this information to the I-210 ICM system and disseminate the incident, road network and other transportation related data received from the ICM system to its subscribers. |
| Caltrans Field Equipment | These devices are located along the roadside and the freeway ramp connectors and are controlled by operators in the Los Angeles Regional TMC (LARTMC) which aids them in monitoring and managing traffic conditions. The field equipment that aids operators in performing their functions are: Freeway Detectors, Cameras, Highway Advisory Radio (HAR), and Arterial Signals. |
| Caltrans Changeable Message Signs (CMS) | The CMS are installed along the I-210 and other relevant freeways included in the I-210 project corridor and are operated and controlled by operators in the LARTMC. |
| Caltrans Ramp Meters | The ramp meters are installed on the I-210 on-ramps and on the connectors to other freeway in the project corridor. The ramp meters are controlled by operators in the LARTMC to adjust the rates at which vehicles are allowed to enter the I-210 freeway at on-ramps and at other connectors. |
| Caltrans Freeway Performance Measurement System(PeMS) | The Freeway Performance Measurement System (PeMS) is a web-based tool that retrieves, processes, analyzes and stores data collected by traffic monitoring systems. The traffic monitoring data sources include Caltrans' freeway mainlines and ramps traffic detectors, Caltrans' Lane Closure System, Caltrans' freeway Changeable Message Signs (CMS), and incident reports from CHP CAD system. The I-210 ICM system retrieves this data from PeMS and utilizes the data in its decision support system algorithm. |
| Caltrans Lane Closure Tracking System | Caltrans Lane Closure Tracking System is a statewide system that tracks lane closures (active and planned) for the next seven days from any given day. It allows Caltrans traffic managers to track lane, ramp, and road closures due to construction, maintenance, and encroachment permit activities. The I-210 ICM system retrieves this data from Caltrans Lane Closure Tracking System and utilizes the data in its decision support system algorithm. |
| CHP CAD System | California Highway Patrol (CHP)'s Computer-Aided Dispatch (CAD) system is a secure system used by the CHP to support dispatch and incident response functions. As it is often the point of first notification for an incident and provides regular updates as a situation progresses, this system often functions as one of the primary methods for disseminating incident information within Caltrans TMCs. |
| CHP Vehicles | This element represents California Highway Patrol (CHP) vehicles used by CHP personnel for travelling to the incident location. CHP vehicle is capable of communicating with the centralized CHP CAD system for responding to the incident appropriately. |
| City of Arcadia TMC | City of Arcadia TMC is the nerve center of an integrated system of advanced technologies including computer software, hardware, traffic signals, CCTV cameras, and Bluetooth reading devices. From the City of Arcadia TMC, the operators monitor and control signalized intersections connected to the City's centralized TranSuite traffic control system, access and manage video feeds from the CCTV cameras, track travel times through Bluetooth devices, and access traffic and signal timing data stored in the TranSuite traffic control system. After receiving this data from the City of Arcadia TMC, the I-210 ICM system will utilize this in its decision support system algorithm and provide any suggested actions (e.g. traffic signal plan modification.) necessary to improve the traffic operations during incidents to the City of Arcadia TMC. |
| City of Arcadia Field Equipment | These devices are located along the roadside and are controlled by operators in the City of Arcadia TMC which aids them in monitoring and managing traffic conditions. The field equipment that aids operators in performing their functions are: Close Circuit Television (CCTV), traffic signals, vehicle detectors, and Bluetooth devices. The I-210 ICM system received the data from this field device through the City of Arcadia TMC and send any suggested operational commands that may be executed to operate the field devices to the City of Arcadia TMC. |
| City of Arcadia Changeable Message Signs(CMS) | The City of Arcadia CMSs are installed along the arterials included in the I-210 project that are owned and maintained by the City. The CMSs are used to direct traffic along the best routes to bypass an incident on freeway. |
| City of Arcadia Travel Time Measuring Field Equipment | This element represents the Bluetooth reading devices installed in the City of Arcadia to track travel times between key intersections. The I-210 ICM system receives the data through the City of Arcadia TMC and utilizes it in its decision support system algorithm. |
| City of Monrovia and Duarte Traffic Signals | This element represents the signals of the City of Monrovia and the City of Duarte that are operated by the Los Angeles County TMC signal control software. The I-210 ICM system receives the signal data through the Los Angeles County TMC and send any suggested operational commands that may be executed to operate these signals to the Los Angeles County TMC. |
| City of Pasadena TMC | City of Pasadena TMC is the nerve center of an integrated system of advanced technologies including computer software, hardware, traffic signals, CCTV cameras, and Bluetooth reading devices. From the City of Pasadena TMC, the operators monitor and control signalized intersections connected to the City's centralized traffic control system, access and manage video feeds from the CCTV cameras, track travel times through Bluetooth devices, and access traffic and signal timing data stored in the traffic control system. After receiving this data from the City of Pasadena TMC, the I-210 ICM system will utilize this in its decision support system algorithm and provide suggested actions (e.g. traffic signal plan modification) necessary to improve the traffic operations during incidents to the City of Pasadena TMC. |
| City of Pasadena Field Equipment | These devices are typically located along the roadside and are controlled by operators in the City of Pasadena TMC which aids them in monitoring and managing traffic conditions. The field equipment that aids operators in performing their functions are: Close Circuit Television (CCTV), traffic signals, vehicle detectors, and Bluetooth devices. The I-210 ICM system receives the data from these field devices through the City of Pasadena TMC and send any suggested operational commands that may be executed to operate the field devices to the City of Pasadena TMC. |
| City of Pasadena Changeable Message Signs (CMS) | The City of Pasadena CMSs are installed along the arterials included in the I-210 project that are owned and maintained by the City. The CMSs are used to direct traffic along the best routes to bypass an incident on freeway |
| City of Pasadena Travel Time Measuring Field Equipment | This element represents the Bluetooth reading devices installed in the City of Pasadena to track travel times between key intersections. The I-210 ICM system receives the data through the City of Pasadena TMC and utilizes it in its decision support system algorithm. |
| Foothill Transit Operations Center | Foothill Transit provides fixed-route bus transit services in the San Gabriel and Pomona Valleys. Its 314-bus fleet provides bus service over an area of approximately 327 squares miles, carrying over 14 million passengers each year along 29 local and 6 express routes. Two of these routes are operated within the I-210 corridor. Upon receiving the transit operations data through the AVL/CAD system, the I-210 ICM system processes the data and provides any suggestion (request for increase/decrease in transit service, request for transit connection protection, transit signal priority requests, etc.) to improve the traffic operations during incidents to the AVL/CAD system. |
| Foothill Transit Vehicles | Transit vehicles owned by the Foothill Transit. |
| I-210 Pilot ICM System | The I-210 Pilot ICM system will improve the traffic operations through coordinated operation of freeway on-ramp meters, freeway-to-freeway connector meters, arterial traffic signal control systems, transit systems, parking systems and traveler information systems during incidents along the I-210 Pilot ICM project corridor. The project corridor consists of the I-210 from the Arroyo Boulevard interchange in Pasadena (Exit 22B) to the I-605 interchange in Duarte (Exit 36), sections of the SR-134 and I-605 freeways, several key surrounding arterials, and several transit systems serving the corridor. |
| Local Law Enforcement Agency Dispatch Systems | This element represents the Computer-Aided Dispatch (CAD) system utilized by the local law enforcement agencies to manage dispatch and to coordinate with law enforcement personnel during incidents. I-210 ICM system has an interface with this system to receive and send incident and road network conditions data during an incident. |
| Local Law Enforcement Agency Vehicles | These are the vehicles that are operated by the local law enforcement agencies. |
| Los Angeles County TMC (LACTMC) | Los Angeles County TMC is the nerve center of an integrated system of advanced technologies including computer software, hardware, traffic signals, CCTV cameras, Bluetooth reading devices and arterial changeable message signs (CMS). From the Los Angeles County TMC, the County TMC operators monitor and control signalized intersections connected to the county traffic signal control system, access and manage video feeds from the CCTV cameras, track travel times through Bluetooth devices, and access traffic and signal timing data stored in the signal control system. Also, the signals of the City of Monrovia and City of Duarte are controlled from the LACTMC. After receiving this data from the LACTMC, the I-210 ICM system will utilize this in its decision support system algorithm and provide any suggested actions (e.g. traffic signal plan modification) necessary to improve the traffic operations during incidents to the LACTMC. |
| Los Angeles County Field Equipment | These devices are typically located along the roadside and are controlled by operators in the Los Angeles County TMC which aids them in monitoring and managing traffic conditions. The field equipment that aids operators in performing their functions are: Close Circuit Television (CCTV), traffic signals, vehicle detectors and Bluetooth devices. The I-210 ICM system received the data from these field devices through the LACTMC and send any suggested operational commands that may executed to operate the field devices to the LACTMC. |
| Los Angeles County Changeable Message Signs (CMS) | Los Angeles County CMSs are installed along the arterials included in the I-210 project that are owned and maintained by the County. The CMSs are used to direct traffic along the best routes to bypass an incident on freeway. |
| Los Angeles County Travel Time Measuring Field Devices | This element represents the Bluetooth reading devices installed in the Los Angeles County roadway to track travel times between key intersections. The I-210 ICM system receives the data through the Los Angeles County TMC and utilizes it in its decision support system algorithm. |
| Los Angeles Regional TMC (LARTMC) | Los Angeles Regional TMC (LARTMC) is the nerve center of an integrated system of advanced technologies including computer software, hardware, mainline, on-ramp, and off-ramp and arterial traffic sensors, traffic signals, freeway detectors, ramp and connector meters, CCTV cameras, Bluetooth reading devices and freeway changeable message signs (CMS), highway advisory radios (HARs). From the LARTMC, the operators monitor and control signalized intersections connected to the centralized traffic control system, access and manage video feeds from the CCTV cameras, access to the data stored in the lane closure system and access traffic and signal timing data stored in the traffic control system. After receiving this data from the LARTMC, the I-210 ICM system will utilize this in its decision support system algorithm and provide suggested action (traffic signal plan modification, ramp metering rate adjustment, .) necessary to improve the traffic operations during incidents to the LARTMC. |
| Metro Freeway Service Patrol (FSP) | The Metro Freeway Service Patrol (FSP) is a team of privately owned tow trucks that patrol designated routes on congested Los Angeles County freeways to provide help to stranded motorists and assist in clearing traffic accidents to keep traffic moving. The FSP provides the incident information to the I-210 ICM system. |
| Metro Freeway Service Patrol Vehicles | This element represents the vehicles utilized by the FSP team to respond to any traffic accidents on Los Angeles County freeways. |
| Metro Transit Operations Center | The Los Angeles County Metropolitan Transportation Authority (Metro) is the state-chartered regional transportation planning agency and public transportation operating agency for the County of Los Angeles. As a transit system operator, the Metro operates the third largest transit system in terms of annual ridership in USA. The transit system consists of Metro Bus, Metro Liner and Metro rail. Within the I-210 corridor, buses run primarily through the cities of Pasadena and Arcadia, as well as communities to the south and the west of these two cities. This element represents the AVL/CAD system resided in the operations center utilized to operate the Metro Bus and Metro Liner transit systems. Upon receiving the transit operations data through the AVL/CAD system, the I-210 ICM system process the data and provides any suggestion (request for increase/decrease in transit service, request for transit connection protection, transit signal priority requests, etc.) to improve the traffic operations during incidents to the AVL/CAD system. |
| Metro Transit Rail | This element represents the metro rail transit vehicles. |
| Metro Transit Vehicles | Transit vehicles (bus) owned and operated by Metro. |
| Metrolink Transit Operations Center | The Rail CAD/AVL system to control, operate and monitor the seven commuter rail services provided by the Metrolink. |
| Metrolink Transit Rail | This element represents the Metrolink transit vehicles. |
| Mobile Traveler Information Applications | Navigation applications for mobile devices utilized by travelers to receive travel time data from the I-210 ICM system. |
| Park and Ride Management System | This element represents the Park and Ride Management System that will be implemented by Metro for operating the Park-and-ride facilities along the Metro Gold line and elsewhere in the I-210 corridor. Also, this element will manage the Park and Ride facilities that will be operated by Caltrans and LA County within the project corridor. |
| Parking Management System | This element represents the Parking Management System that may be implemented in the project corridor in future. The parking status data from this system will be utilized by the I-210 ICM decision support system algorithm to provide the recommend courses of actions in response to an incident. |
| Parking Operator | Operators who will operate the Parking Management System. |
| Pasadena Transit Operations Center | The CAD/AVL system of the Pasadena Transit to control, operate and monitor the transit service provided by the Pasadena Transit system. |
| Pasadena Transit Vehicles | Transit vehicles owned and operated by Pasadena Transit. |
| Probe Vehicle | Represents the vehicle that will be tracked and utilized as a probe data provider to the I-210 ICM system. |
| Regional Integration of Intelligent Transportation Systems (RIITS) | Communication network developed by Metro to enable real-time information exchange among freeway, traffic, transit, and emergency service agencies. The I-210 ICM system retrieves the data circulated within the RIITS network, and sends control commands to specific devices through the network. |
| Road Weather Data Provider | This element represents weather platform that obtains environmental conditions information from sensors along the roadways included in the project corridor. The I-210 ICM system will receive and analyze this data and send back the value-added weather data to the platform for disseminating to the traveler. |
| Southern California Go511 | The Southern California Go511 service provides multi-modal traveler information through a 511 interactive voice response (IVR) system and the Go511.com web portal. Go511 provides traffic information for the Los Angeles, Orange, Riverside, San Bernardino and Ventura counties. After receiving the existing travel condition data, the I-210 ICM system will analyze and processed this data to generate value-added traveler information which will be sent back to the Go511 system for disseminating to the travelers. |
| Traveler Information Services | This element represents the third-party application which provides travel information and trip suggestion to travelers. Examples of such applications are Google Map Navigation, Apple Navigation, Waze, Telenav Scout and Garmin Viago. Through the interface with this system, the I-210 ICM system will receive the travel time data from this system, and will send back the value-added travel time data for disseminating to the travelers. |