Summary of Integrated Corridor Management (ICM) Development Efforts
- United States -
## Summary of ICM Efforts

<table>
<thead>
<tr>
<th>Corridor</th>
<th>Corridor Type</th>
<th>Lead Agencies</th>
<th>Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>I-15 Diego</td>
<td>Suburban</td>
<td>SANDAG</td>
<td>• ConOps and System Requirements developed in 2008</td>
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<td>• Simulation evaluation in 2009-2010</td>
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<td>• System launched in spring 2013</td>
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<td>• Currently in evaluation phase</td>
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<tr>
<td>US-75 Dallas</td>
<td>Suburban/urban</td>
<td>DART</td>
<td>• ConOps and System Requirements developed in 2008</td>
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<tr>
<td>I-80 Bay Area</td>
<td>Suburban/urban</td>
<td>MTC / Caltrans</td>
<td>• ConOps developed in 2010</td>
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<td></td>
<td>• Project groundbreaking in October 2012</td>
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<td>• Project expected to be completed summer 2015</td>
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<tr>
<td>I-95 / I-395</td>
<td>Rural, Suburban &amp; Urban</td>
<td>Virginia DOT</td>
<td>• ConOps development initiated in 2012</td>
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<tr>
<td>Virginia</td>
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<td></td>
<td>• Currently developing deployment plan &amp; partnerships</td>
</tr>
<tr>
<td>I-394 Minneapolis</td>
<td>Suburban/urban</td>
<td>Minnesota DOT</td>
<td>• ConOps and System Requirements developed in 2008</td>
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<td>• No apparent activity since 2009</td>
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<td>I-270 Maryland</td>
<td>Suburban</td>
<td>Maryland DOT</td>
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I-15 San Diego
Corridor

- 21-mile section of I-15 corridor north of San Diego
  - I-15 freeway
    - General-purpose traffic lanes
    - Barrier-separated 4-lane managed lane system with moveable barrier
    - Dynamic toll pricing on managed lanes
  - Parallel arterials
    - Center City Parkway (Escondido)
    - Pomerado Road (Poway/San Diego)
    - Black Mountain Road/Kearny Villa Road (San Diego)
  - Transit services
    - MTS bus network
    - NCTD bus network
    - NCTD Sprinter Commuter Rail
ICM Elements

- **Real-time monitoring systems**
  - **Freeway**
    - Traffic detection stations (PeMS)
    - Ramp metering rates
  - **Arterials**
    - Traffic detection stations (Sensys)
    - Traffic signal status monitoring
  - **Transit operations**
    - Connection to Automatic Vehicle Location (AVL) system
  - **Weather**
ICM Elements

- **Freeway operations**
  - Traffic-responsive on-ramp metering
  - I-15 HOT Managed Lane System
    - Northbound/southbound lane configuration
    - Toll-free access policy

- **Arterial operations**
  - Traffic-responsive signal control
  - Arterial/freeway ramp traffic signal coordination

- **Transit operations**
  - Vehicle rerouting around incidents
  - Service increase in response to event/incidents
ICM Elements

- **Traveler information**
  - Integrated, multi-modal traveler information service
  - Comparative travel times along alternate routes
  - Real-time park-and-ride availability
  - 511 mobile applications
  - Changeable message signs along I-15
  - Trailblazer signs along arterials
Decision Support System

- Development of response plans in response to observed congestion and/or identified events/incidents
- Response plans developed online using a rule-based decision process relying on sets of predetermined potential actions
- Evaluation of developed candidate response plans using simulation
- Control recommendations to system operators
Decision Support System

- **Role of simulation**
  - Evaluation of current network conditions
  - Projection of network operations over next 15, 30, 45 and 60 minutes
    - Do nothing scenario
    - 6 to 12 alternate response plans

- **Simulation using Aimsun Online**
  - Microscopic simulation model considering the behavior of individual vehicles
US-75 Dallas
Corridor

- 20-mile section of US-75 corridor northeast of downtown Dallas
  - US-75 freeway
    - General-purpose lanes
    - HOV lanes north of I-635
  - Parallel arterials
    - Freeway frontage roads
    - Greenville Avenue
    - Coit Road
  - Transit services
    - DART Bus Network
    - DART Light Rail
ICM Elements

- **System monitoring**
  - Bluetooth sensors along freeway and two diversion routes (40 locations, every 1-2 miles)
  - Parking availability at 5 park-and-ride lots
  - Light rail train location and passenger count
  - Weather monitoring

- **Data sharing**
  - Implementation of regional information exchange network (SmartNET)
ICM Elements

- **Freeway operations**
  - Predefined diversion plans to local arterials and/or light-rail service in response to incidents
  - Management of HOV access restrictions during incidents

- **Arterial operations**
  - New signal timing plans for Greenville Avenue
  - Event-specific signal timing plans
  - Responsive traffic signal control
ICM Elements

- **Traveler information**
  - First multimodal 511 system in Texas
  - Real-time transit vehicle information
    - Vehicle location
    - Next stop arrival time
    - Available capacity
  - Parking availability information on CMS signs and 511 systems
    - 5 park-and-ride lots along the LRT red line
  - Links to social media (Facebook, Twitter)
  - Exploration of sponsorship options
SmartFusion/SmartNet Systems

- **SmartNET**
  - Regional information exchange network

- **SmartFusion**
  - Data Fusion Engine
  - Receives and publishes data to the regional center-to-center and other external systems
  - Feeds data to the 511 Systems and Decision Support System
**Decision Support System**

- Rule-based system designed to capture existing operational knowledge
- Uses travel time and speeds on diversion routes to select a recommended plan
- Evaluates trade-offs between alternate plans
- Sends recommendation to partner agencies for approval / implementation
Decision Support System

- **Roles of simulation**
  - Evaluation of current network state
  - Prediction of network operations over the next 30 minutes
    - Do nothing scenario
    - Recommended control plan(s)

- **Simulation using the DIRECT model**
  - Mesoscopic dynamic traffic assignment model developed at Southern Methodist University
  - Model capable of capturing interactions between travel demand, network capacity and mode shifts under various control strategies
I-80 Bay Area
Corridor

- 20-miles section of I-80 from Bay Bridge to Carquinez Bridge

- Transportation networks
  - I-80 freeway
    - General-purpose traffic lanes
    - HOV lanes
  - Parallel arterial
    - San Pablo Avenue
  - Transit services
    - AC Transit bus network
    - BART subway network
ICM Elements

- Freeway operations
  - Adaptive ramp metering
    - Coordinated ramp meters
    - Maximum queue detection
    - Meter bypass for HOV vehicles
  - Lane use management system
    - Ability to close lanes ahead of incidents
  - Variable advisory speed signs
    - Provision of speed recommendations ahead of incidents and congestion areas
  - Additional CCTV cameras
ICM Elements

- **Arterial operations**
  - Traffic signal system upgrade
  - Enhanced traffic detection along San Pablo Avenue
  - Signal synchronization/optimization
  - Implementation of traffic signal flush plan to improve capacity during major incidents/events
  - Trailblazer signs to help guide traffic naturally rerouting through San Pablo during incidents
  - Traffic signal preemption for first responders

- **Transit operations**
  - Transit signal priority at signalized intersections
  - Transit signal priority at HOV freeways on-ramps
ICM Elements

- **Traveler information**
  - Displaying of traffic and transit information on freeway dynamic display boards showing
  - Trailblazer signs along arterials to help traffic go back to the freeway
  - Highway advisory radio
  - Integration with Bay Area 511 system and East Bay SMART Corridors
  - Directions to transit facilities
  - Real-time parking availability (future element)
I-95/I-395 Virginia
Corridor

- 52-mile section of I-95/I-395 between Spotsylvania and 14th Street Bridge near Washington DC
  - I-95/I-395 freeway
    - General purpose traffic lanes
    - Reversible two-lane HOV facility in middle of freeway north of Dumfries (northern half of corridor)
  - Parallel arterials
    - US-1 convenient alternate south of Woodridge
  - Transit services
    - Commuter rail along entire corridor
    - Various bus services
  - Park-and-ride
    - 40,771 spaces within corridor
  - Ridesharing services
    - Carpools / Vanpools
    - 6400 daily “slugs” (2008)
    - Real-time ridesharing pilot
ICM Elements

- **Freeway operations**
  - Hard shoulder running
  - Ramp queue warning
  - Speed restrictions
  - Traffic-responsive ramp metering, some with HOV bypass

- **Arterial operations**
  - Traffic signal upgrades
  - Adaptive signal control
    - Freeway alternate routes
    - Routes connecting I-95 to park-and-ride lots

- **Transit operations**
  - Transit signal priority along express buses (future phase)
ICM Elements

- **Traveler information**
  - Integrated, multi-modal single information gateway
  - Real-time park-and-ride space availability information on freeways and approach routes
  - Comparative travel times for travel on freeway, arterials, transit
  - Personalized multi-modal real-time trip planning
  - Mobile applications
  - Information kiosks
Planned as a future system element

Expected to use of simulation to assess the performance of alternate strategies
System Deployment Strategy

ICM Infrastructure
- Arterial Enhanced Signal Operations
- Freeway Active Traffic Management

ICM Traveler Information
- Personalized Multi-Modal Real-Time Trip Planning

ICM Decision Support
- Modeling and Decision Support

Phase 2-3
- Multi-Modal and Parking Information Systems
- Expanded Multi-Modal & Parking Information for 511
- Performance Management

Early Start
- Integrated Single Info Gateway (including kiosks)

Existing Traffic Data
- Existing Transit Data