Integrated . . combining or coordinating separate agencies so as to provide a harmonious, interrelated “whole” . . .

Corridor . . a travel shed of trips anchored by one or more highway, arterial, or rail line

Management . . the coordination of jointly managing all the travel therein in order to achieve defined objectives
Traditional Agency “Stovepipe” Responsibilities

- **Auto**
  - Autonomous response to incidents on ‘their’ facilities...
  - Traveler information is limited to their own agency’s facility...

- **Rail**
  - There is “facility” response, but not necessarily “corridor” response...

- **Bus**
  - They are slowly reactive to intervene in others’ incidents

- **Parking**
  - Roads

- **Ridership**
  - Commute routes

- **Supply**
Integrated Management

- Auto
- Rail
- Bus
- Parking

Resource – shared management of travel shed

- Mode choice.
- Mode shift.
- Proactivity.
- Communication.
- Pre-determined interventions.

Travel efficiency

Traveler information
511
Apps
Ability to make trip choices among entire corridor
10 Attributes of a Successful ICM Site

1. **Significant** Congestion and Unreliability?
   - The most critical – and most obvious – attribute is . . . need.

2. **Infrastructure Available?**
   - Parallel arterials, transit routes, mode hubs, alternatives to the clogged freeway.

3. **Multimodal Capabilities?**
   - Bus, rail, transit, freeway, incident, must be able to communicate with each other.

4. **Is there a Centralized Data Hub?**
   - A TMC center makes it easier to organize and analyze the data dump.

5. **Are there Successful Regional Procurement Practices?**
   - Needed: ITS experts who understand expertise requirements.

6. **Is Transit readily available?**
   - Bus routes? BRT? HOV lanes? Commuter rail? All of these can relieve a clogged hwy.

7. **Are current systems Optimized?**
   - Validate that roads cannot be improved by physical or operational means except ICM.

8. **Is there Public Engagement?**
   - A dedication to transparent and real-time public information and access.

9. **Is there Open-mindedness for Change?**
   - Educating the public to accept mode and route changes is paramount.

10. **Is there Institutional Support?**
    - A strong ICM Champion, strong leadership, a clear vision, and robust participation are vital to laying the foundation for success. This includes ConOps, Systems Engineering Plans (SEMPs) and such.
What is a “DSS”?

A computer-based information system that supports business or organizational decision-making activities, typically resulting in ranking, sorting, or choosing from among alternatives.

- A **communication-driven DSS** supports more than one person working on a shared task. (meetings, webs, client servers, instant messaging)
- A **data-driven DSS** emphasizes access to and manipulation of a data library. (Medical diagnosis; executive dashboards, i.e., visual presentations of performance metrics and efficiencies)
- A **document-driven DSS** manages, retrieves, and manipulates unstructured information in a variety of electronic formats. (Research)
- A **knowledge-driven DSS** provides problem solving expertise stored as decision trees, facts, rules, or procedures. (electrical grid allocation, resource allocation, banking, trucking and product delivery efficiencies)
- A **model-driven DSS** emphasizes access to and manipulation of a statistical, financial, optimization, or simulation model. Model-driven DSS use data and parameters provided by users to assist decision makers in modeling a situation. (“what if” scenarios”, military planning, scheduling)
What are “Business Rules”? 

Business rules are predefined and agreed-upon organizational and inter-agency permissions, constraints, or criteria that bind the participating agencies and affect the DSS solutions.

• They may or may not be the Concept of Operations (ConOps), Systems Requirements, or other documents.
• They may be only loosely be known, and rarely documented to an extreme degree.
• They have been described as “ephemeral” aids (temporary; literally “one use” or purpose; seasonal) that often only serve one user or user group, then expire or disband.
Business Rules can be thought of as a Chess Board

- The chess board constitutes the geographical constraints of play.
- The chess pieces (moving parts) are the managers, operators, and agencies, each having its own unique capability, i.e., pawns, bishops, knights, rooks, Queen, King.
- The game rules are the “business rules” by which everyone agrees to play/operate.
- The DSS is the innumerable strategies that exist, i.e., evaluating, “looking ahead”, reacting to loss or challenge, etc.
ICM Grantee Site Commonalities

- Motivated by recurring congestion, but “atypical” congestion is the real driver
- Concerned about effects of non-recurring freeway congestion on arterials – better freeway/arterial coordination
- Need multi-agency, multi-modal, coordinated response
- Need integrated management and operations
- Proactive, integrated traffic management strategies
- Traveler information pre- and en route
“Integrated” . . .

**Institutional Integration**
Coordination to collaboration between various agencies and jurisdictions that transcends institutional boundaries. *(MoA’s, Working agreements)*

**Operational Integration**
Multi-agency and cross-network operational strategies to manage the total capacity and demand of the corridor. *(Signals, routes, proactive actions, responses)*

**Technical Integration**
Sharing and distribution of information, and system operations and control functions to support the immediate analysis and response. *(Shared data, cross-approvals for actions, complementary response assistance)*

*Source: FHWA “Integrated Corridor Management” presentation*
Project Planning & Management

• Understand the scope and develop ConOps using systems engineering and design

• Prioritize high value/likelihood strategies

• Focus on data needs, collection, & sharing

• Plan $$ and time for systems and software

• Mainstream performance measures into the ConOps

• Plan resources/time for new operating processes

• Plan funding for the future
Institutional & Organizational

• Need an agency champion + people champions
• Develop a shared vision / cross-jurisdictional mindset
• Understand capabilities and limitations
• Establish formal agreements/partnerships
• Engage stakeholders early and sustain
• Celebrate “wins”
• Expect “communication breakdowns”
Technical & Operational

- Develop realistic multi-modal response plans
- Implement “your” decision support system (DSS)
- Understand operational scenarios and activation thresholds
- Evaluate reality of being able to run the scenarios
- Improve alternate route infrastructure and operations
- Be prepared to “Test and Adjust”
Additional Lessons Learned

• Partnerships are critical, it is ideal when operational trust already exists from prior traffic management teams and incident management teams
• Building on existing institutional arrangements was key to building consensus
• Need to build on existing agreements, business rules, and MOU’s
• Need to build trust with public on the accuracy and reliability of information
Additional Lessons Learned (continuation)

• With multiple agencies working together, the collaborative aspect of the projects has been one of the biggest successes
• Identify several stakeholder “champions” in multiple agencies and enable them to “own” corresponding elements of the ICM program
• Keep stakeholders engaged and communicate with them regularly regarding the ICM process and progress
• Empower stakeholders to shape and guide the process, and furnish substantive inputs
Additional Lessons Learned (continuation)

• A surprising amount of data exists within agencies that could be of value and thus relayed to partner agencies
• Operational opportunities exist within and between agencies with collaborative operation
• Adherence to the System Engineering requirements is very important to ensuring a methodical approach to delivery of multiple ICM project elements
ICM Moving Forward

• **Before ICM...**
  • Pre-existing systems—freeway, arterial, transit
  • Robust infrastructure—communications, detection, and standard operating procedures
  • Real-time data and functioning model—to determine the extent of the problems in the corridor

• **During ICM...**
  • Champion required
  • Funding required
  • Processes are paramount. Continue to Expand capabilities.
  • Maintain continuous coordination
  • Focus on *corridor-wide* objectives