SAN DIEGO I-15 TEST BED FOR INTEGRATED CORRIDOR MANAGEMENT

Rule 940: Methodology, Madness, and Measures Materialize

January 27th, 2015

8:30am – 12:00pm
Overview of SANDAG’s Regional Work

- Population growth
- Transportation
- Transit construction
- Habitat planning
- Housing
- Census

- Energy
- Economic prosperity
- Public safety
- Binational planning
- Shoreline preservation
- Interregional planning
Planning for Transportation Technology Adoption

- Multimodal Integration and Performance Based Management
- Traveler Information
- Arterial Management
- Freeway Management
- Transit Management
- Electronic Payment System
Utilize technology and partnerships
Manage corridor as system
Provide travelers decision quality information
Maximize corridor capacity
Experience Using Systems Engineering

- **Institutional Integration**: Coordination to collaboration between various agencies, modes, and jurisdictions that transcends institutional boundaries.
- **Operational Integration**: Joint operational objectives and strategies to manage and balance the total capacity and demand of the corridor.
- **Technical Integration**: Sharing and distribution of information and system operations control functions to support the analysis and immediate response.

http://www.its.dot.gov/icms/
## Strategic Assessment

<table>
<thead>
<tr>
<th>Level 1</th>
<th>Level 2</th>
<th>Level 3</th>
<th>Level 4</th>
<th>Level 5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Planning</strong></td>
<td>Functional Area Planning (single mode)</td>
<td>Project-based Planning (single mode)</td>
<td>Integrated agency-wide planning (single mode)</td>
<td>Integrated corridor-based multimodal planning</td>
</tr>
<tr>
<td><strong>Data Collection (vehicle tracking)</strong></td>
<td>Limited or Manual Input</td>
<td>Near real-time for major routes</td>
<td>Real-time for major routes using multiple inputs</td>
<td>System-wide Real-time data collection (single mode)</td>
</tr>
<tr>
<td><strong>Data Integration</strong></td>
<td>Limited</td>
<td>Networked</td>
<td>Common user interface</td>
<td>2-way system integration</td>
</tr>
<tr>
<td><strong>Network Operations</strong></td>
<td>Ad-Hoc, Single Mode</td>
<td>Centralized, Single Mode</td>
<td>Automated, Single Mode</td>
<td>Automated, Multimodal</td>
</tr>
<tr>
<td><strong>Incident Management</strong></td>
<td>Manual detection, response and recovery</td>
<td>Manual detection, coordinated response, manual recovery</td>
<td>Automated detection, coordinated response and manual recovery</td>
<td>Automated pre-planned multimodal recovery plans</td>
</tr>
<tr>
<td><strong>Analytics</strong></td>
<td>Ad-hoc analysis</td>
<td>Periodic, Systematic analysis</td>
<td>High-level analysis in near real-time</td>
<td>Detailed analysis in real-time</td>
</tr>
<tr>
<td><strong>Demand Management</strong></td>
<td>Individual static measures</td>
<td>Individual measures, with long term variability</td>
<td>Coordinated measures, with short term variability</td>
<td>Dynamic pricing</td>
</tr>
<tr>
<td><strong>Payment Methods</strong></td>
<td>Manual Cash Collection</td>
<td>Automatic Cash Machines</td>
<td>Electronic Payments</td>
<td>Multimodal integrated fare card</td>
</tr>
<tr>
<td><strong>User Information Services</strong></td>
<td>Static Information</td>
<td>Real-time information by mode</td>
<td>Multimodal Real-time trip planning</td>
<td>Location-based, on-journey multimodal information</td>
</tr>
<tr>
<td><strong>Performance Measurement</strong></td>
<td>Minimal</td>
<td>Defined metrics by mode</td>
<td>Limited multimodal metrics</td>
<td>System-wide multimodal system-wide metrics</td>
</tr>
</tbody>
</table>
Phase I: Concept Development
Phase II: Was it Feasible

- Overall, significant benefits
- Reduced travel time and improved travel time reliability are two largest expected benefits, followed by fuel consumption and emissions benefits.
- $13.7 million in user benefits per year
- 10-year life cycle total benefit of $115.9 million.
- Costs are estimated at $1.42 million per year. 10-year life-cycle cost at $12.0 million.
- Benefit/cost ratio over the 10 life cycle is 9.7:1.
Phase III: Design

A fierce hitter in Redskins' secondary: Jeris is one of club's leading tacklers.
Phase III: Design Confirmation

- Federal INCOSE consulting support consultant NOBLIS recommend IEEE 1028 Requirements Walkthrough be conducted.
- 1098 page *workbook*
- 5 day workshop
- Partner specific scheduling
Phase III: Re-Write....

- After “Requirements Walkthrough”
- 1007 consultant written requirements distill to 127 unique requirements
- Re-write takes 3 months
- Use Regional Architecture, and National Architecture to address NOBLIS comments
- Addition of “Performance Requirements” found to be most challenging for consultant to deliver
- New requirements require second walkthrough with stakeholders.
- Outcome:
  - Better definition
  - Expectations setting more robust
  - Test approach better understood
  - More easily phased for implementation
Phase III: Design DSS “Solution Clusters”

- Data Integration / Fusion Engine
- Business Rules Engine
- Corridor Visualization
- Real-Time Network Prediction Algorithm
- Response Plan Evaluation Engine
- Performance Data Warehouse
- Automation Workflow Engine
- Expert System
- Decision Support
Phase III: Delivery (with a twist)

Iteration Control Gates

- Iteration 1
  - Intelligent NETworks (iNET) ICM Configuration
  - New Data Hub Interfaces
  - TMDD v3.0 Conversion
  - Calibrated R/T Traffic Model
  - Response Plan Data Store Design
  - Iteration 2 Design

- Iteration 2
  - R/T Traffic Model w/ Response Plans
  - iNET Update for Response Plan Management
  - iNET update for Event Management
  - Iteration 3 Design

- Iteration 3
  - Predictive Modeling
  - iNET Update for Predictive Modeling
  - Integration of all DSS capabilities in all Subsystems

Iteration Deliverables

- Draft Iteration System Architecture Description
- Final Iteration System Design Document
- Iteration TRR
- Continuous Builds

Timeline: July 2011 – Jan 2012
Three Challenges

- **In-House**
  - Submissions from Regional Stakeholders can be ad-hoc & time dependent (in-house task at present)
  - Tools designed to “display” information, not produce *usable* artifacts (i.e. Statement of Work baseline)

- **Out-House**
  - Federal determination of “high risk” requirement to use full Systems Engineering methodology only made after a “risk” has triggered.

- **Under- House**
  - Federal documents or case studies where “SE+” or “SE-Lite” have been used. Difficulty getting *approval* to change “V” methodology.
Three Benefits

- Maintenance
  - Staff turnover happens
  - Corporate memory retained in document set. [now somebody just needs to read them again]

- Repeatability
  - From concept exploration to project execution.

- Choice
  - Reduced vendor “lock-in” risk
What can you do?

- Turn up the *volume* on the “Benefits”
- Certify (organization & individual)
- Get ready....V2I coming!