

Planning and Operations Data Integration:

State of the Art Tools

presented to

NATMEC 2010

presented by

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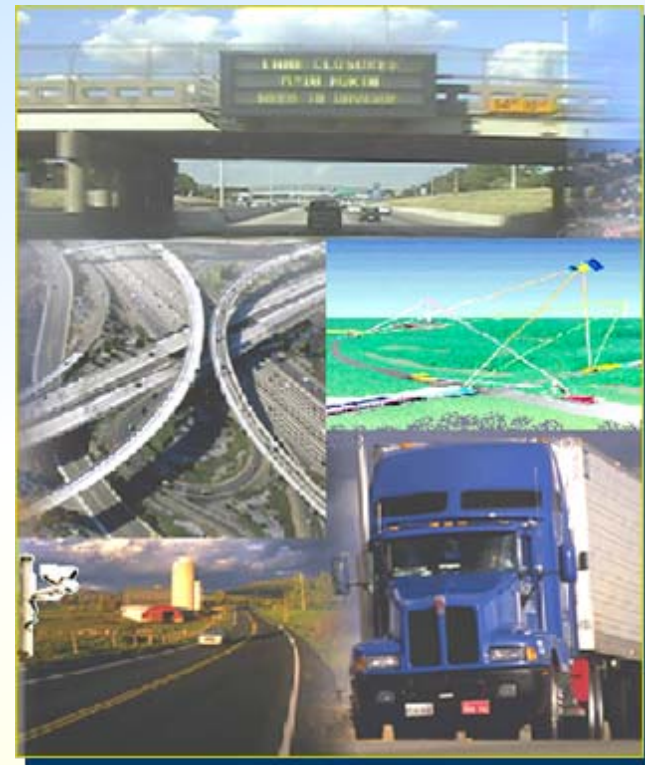
Outline

- **Planning and Operations Data Integration – What's New**
- **Examples of applications**
 - » **Integrated Corridor Management**
 - » **Transportation System Management and Operations (TSM&O)**
- **Examples of tools**
 - » **Analytic**
 - » **Integration and Display**



National Driving Factors

- **Congestion – Capacity investments are not cutting it**
- **Reliability**
- **Safety**
- **DOTs need to be accountable to the public**
- **Private sector**
- **Need for interagency corporation**
- **Federal policy**



What's New?

- **FHWA**
 - » **ICM, ATM, TSM&O, Planning for Operations**
 - » **Reauthorization**
 - » **HPMS, TMG Update**



Why Link Planning and Operations at State DOTs?

- **Roles and Benefits for Planning**
 - » Long range transportation plan
 - » State Transportation Improvement Plan (STIP)
 - » Corridor/regional/modal studies
 - » Congestion and Performance Modeling
 - » Utilize O&M data for planning purposes
 - » Include O&M strategies in planning process



Why Link Planning and Operations at State DOTs? cont.

● Benefits for Operations

- » Monitor and optimize operation and safety of the transportation system
 - Customer focused
 - Collect and utilize data to manage system
- » Shape the transportation plans for future to include O&M

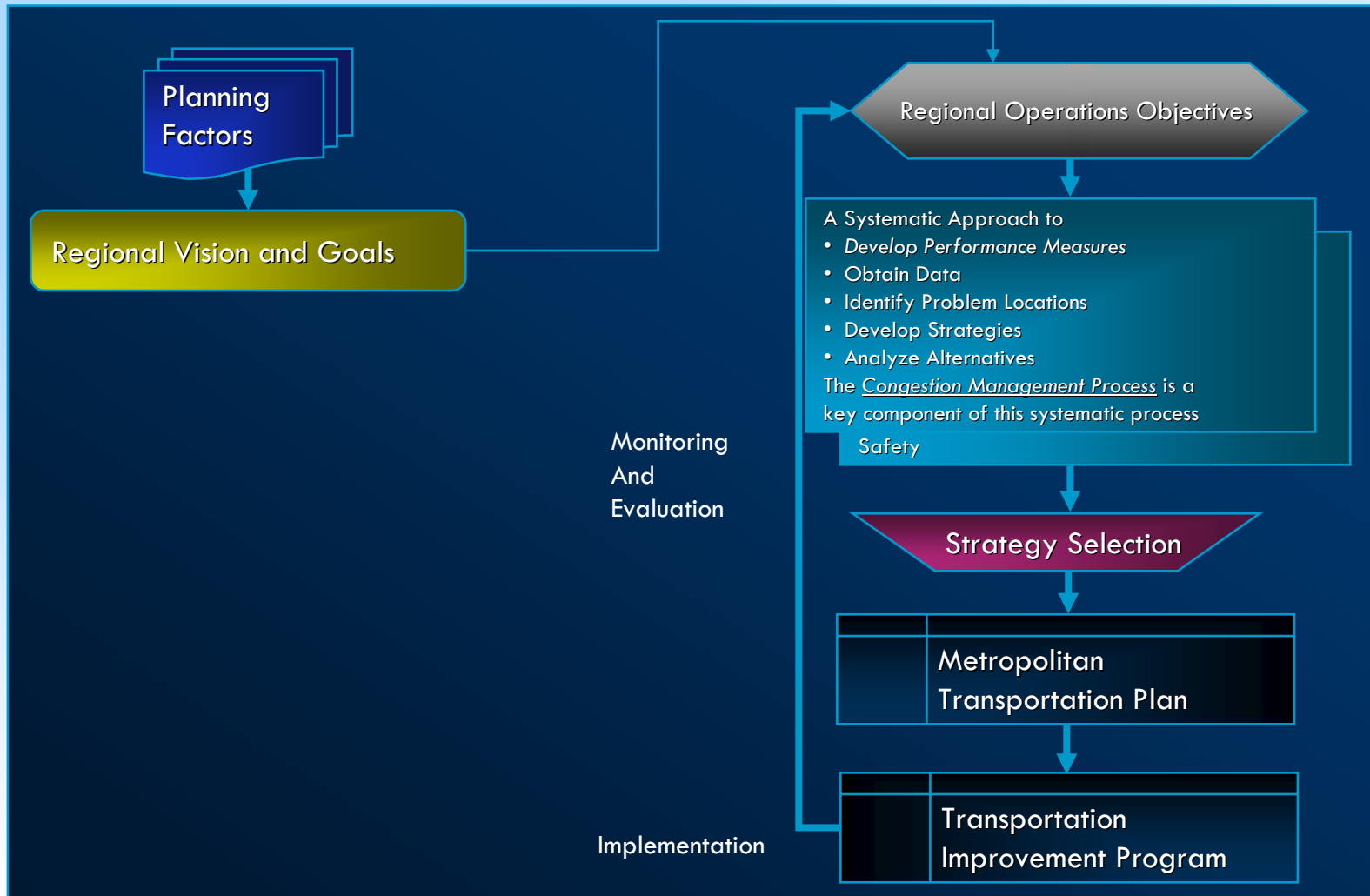
● Benefits for System Users

- » Improved ability to address short and long-term needs
- » Improved reliability
- » Improved emergency preparedness

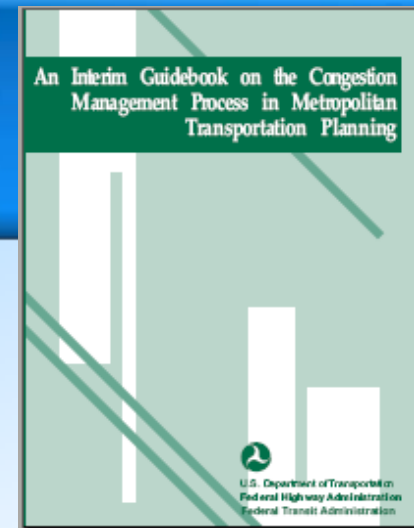
● IMPROVED SYSTEM PERFORMANCE



Framework for an Objectives-Driven, Performance-Based Approach



View the Guidebooks



- **FHWA Planning for Operations Web site**
 - » www.plan4operations.dot.gov
- **Guidebook on the Congestion Management Process in Metropolitan Transportation Planning**
 - » www.ops.fhwa.dot.gov/publications/cmpguidebook/cmpguidebook.pdf
- **Management and Operations in the Metropolitan Transportation Plan – A Guidebook for Creating an Objectives-Driven, Performance-Based Approach**
 - » www.ops.fhwa.dot.gov/publications/moguidebook/moguidebook.pdf

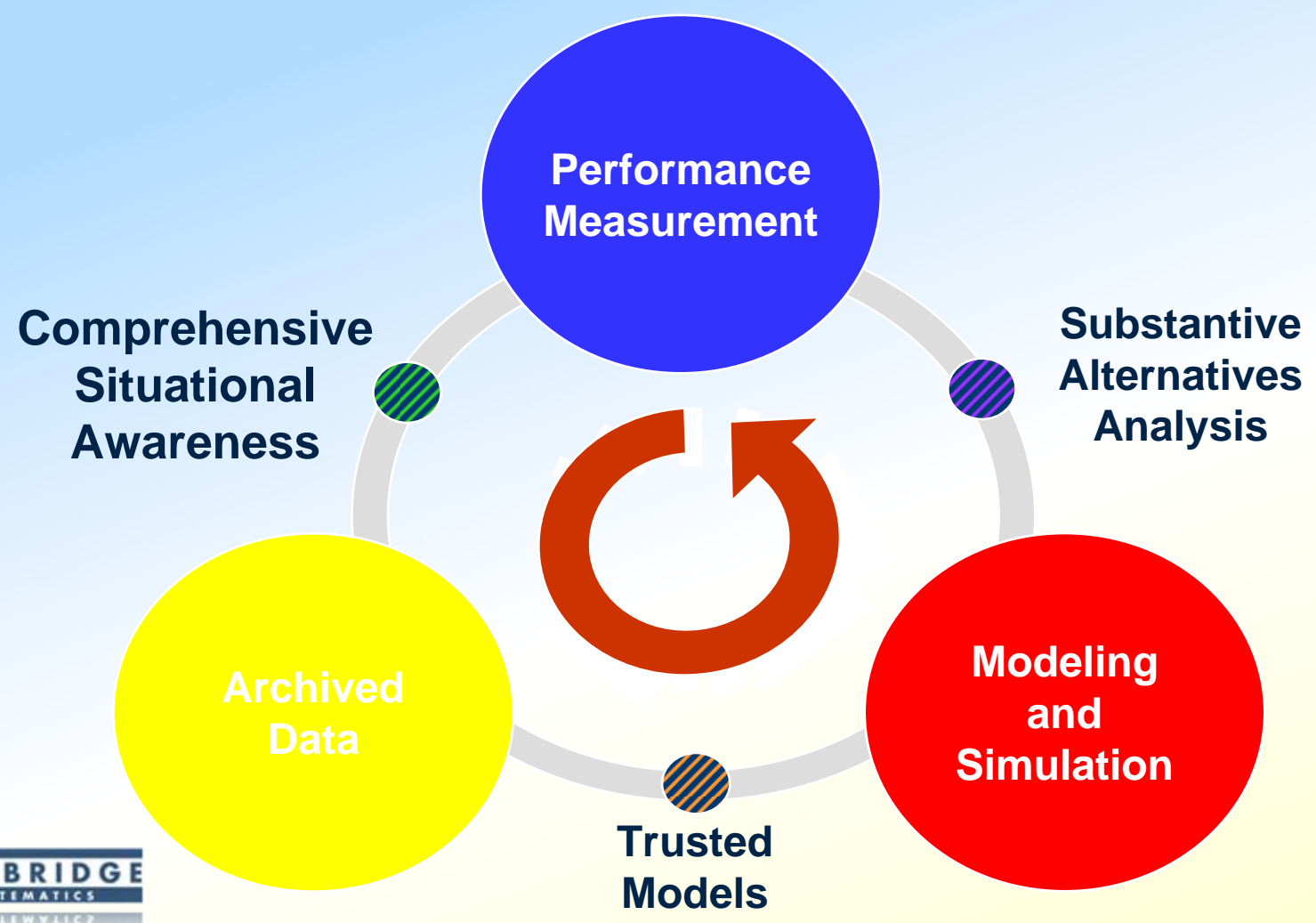


Integrated Corridor Management - Purpose

- **Invest in the right strategies**
 - » A predictive capability to help determine which combinations of strategies are likely to be most effective
- **Invest with confidence**
 - » Minimize conflicts or unintended consequences that would otherwise be unknowable before implementation
- **Improve the effectiveness/success of implementation**
 - » Help in building consensus among stakeholders
 - » Optimize implementation staging



ICM - A Process for Continuous Improvement



Major ICM Analysis Efforts in the U.S.

- **USDOT ICM Program**

- » Three Stage 2 AMS Sites (Minneapolis, San Diego, Dallas)

- **Caltrans CSMP**

- » Twenty major corridors in California

- » Sacramento, SF Bay Area, Los Angeles region, Monterey/Santa Cruz, Orange County, San Diego, some Valley locations

- **Atlanta GA**

- » Beltway and Radial Highways

- **New York**

- » Buffalo and Mid-town Manhattan



Transportation System Management and Operations

“Regional transportation systems management and operations (TSM&O) means an integrated program to optimize the performance of the existing infrastructure through implementation of multimodal, cross-jurisdictional systems, services, and projects. These systems, services, and projects are designed to preserve capacity and improve security, safety, and reliability of transportation systems.”

U.S. DOT Planning for Operations web site

http://plan4operations.dot.gov/reg_trans_sys.htm



TSM&O Focus Areas Include

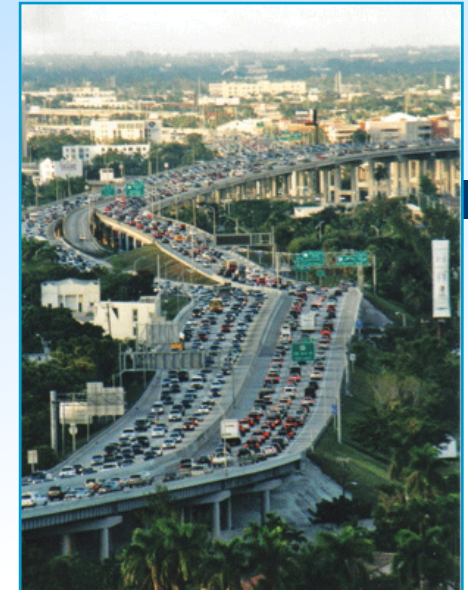
- Traffic incident management
- Traveler information systems (for roadways and transit)
- Regional traffic management centers
- Freeway management
- Regional traffic signal coordination
- Work zone traffic management
- Electronic payment
- Freight management



TSM&O

A Paradigm Shift

- TSM&O is an *organizational shift* from transportation system outputs (lane miles resurfaced) to *mobility* (time reliability), that *maximize the efficiency* of the system
- TSM&O is a fundamental change in the way we solve the urban transportation problem



Purpose of the TSM&O Program - Florida

- **Active Arterial Management**
- **Incident Management**
- **Performance Measurement**



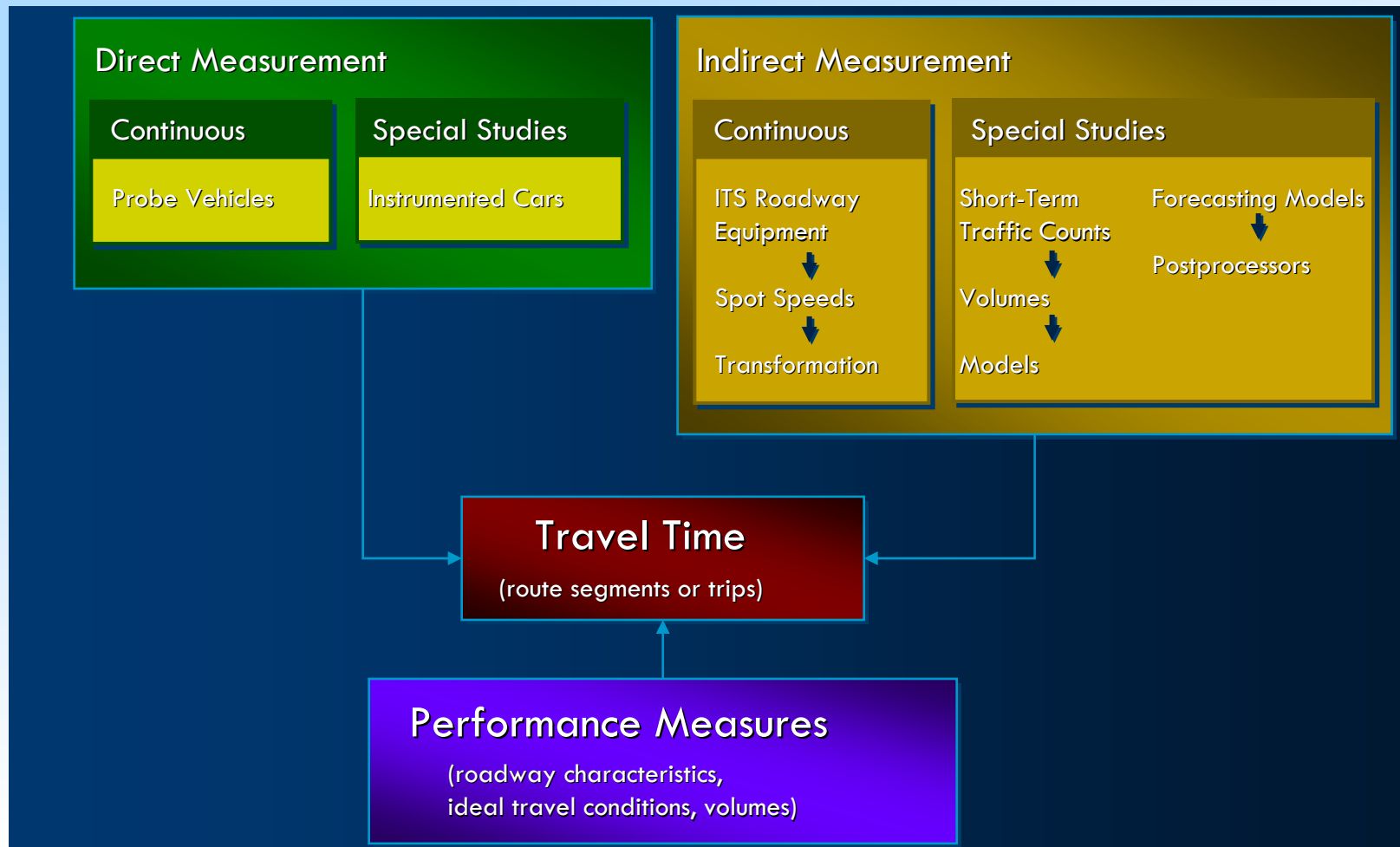
Initial Deployment Concept



Traffic Management Center

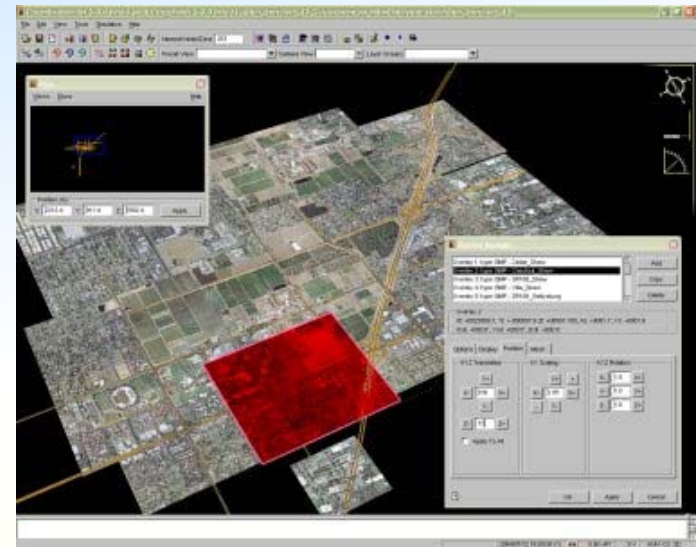


Travel Time Data Collection



Planning for Operations - Current Methods and Tools

- A. Sketch-planning tools
- B. Travel demand models
- C. Analytical/deterministic tools (HCM-based)
- D. Traffic signal optimization tools
- E. Simulation models
 - Macroscopic
 - Mesoscopic
 - Microscopic
- F. Archived operations data
- G. ...Plus many hybrid approaches



Planning for Operations - Current Methods

A. Sketch Planning Tools

- Provide quick order of magnitude estimates with minimal input data in support of preliminary screening assessments

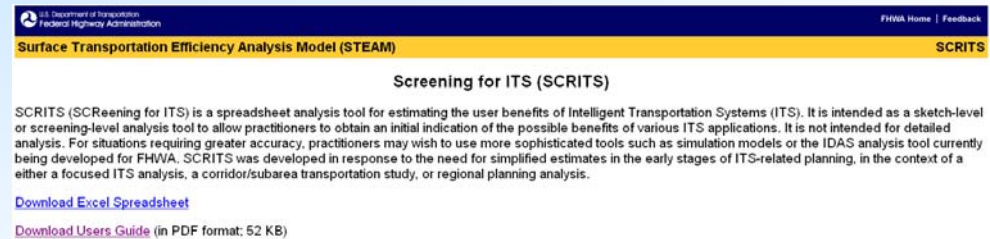
- Examples

- » Sketch

- SCRITS
- Quickzone
- Turbo Architecture
- Cal B/C
- Simple spreadsheets

- » Hybrid

- IDAS



The screenshot shows the website for the Surface Transportation Efficiency Analysis Model (STEAM) and the Screening for ITS (SCRITS) tool. The header includes the FHWA logo and navigation links. The main content area is titled "Screening for ITS (SCRITS)" and contains a descriptive paragraph about the tool's purpose as a sketch-level analysis tool. Below the text are two links: "Download Excel Spreadsheet" and "Download Users Guide (in PDF format: 52 KB)".



Sketch Planning Tools

Advantages

- **Low cost**
- **Fast analysis times**
- **Limited data requirements**
- **View of the “big picture”**

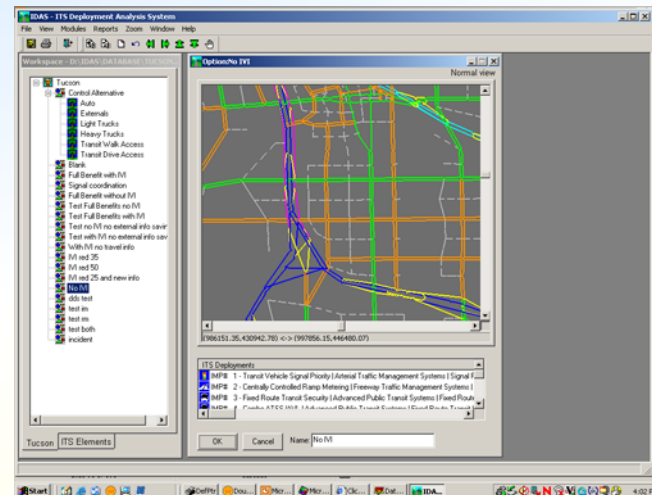
Challenges

- **Limited in scope, robustness, and presentation capabilities**



Travel Demand Models

- Estimate the regional traffic impact of changes in travel demand or system capacity
- Examples:
 - » Regional Demand / Metropolitan Planning Organization Models
 - » IDAS



Travel Demand Models

Advantages

- **Validated models available for most metro areas**
- **Evaluation of the regional impacts**
- **Consistent with current planning practices**

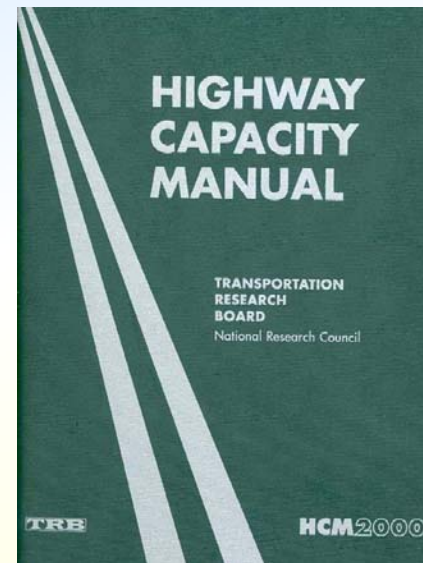
Challenges

- **Limited ability to analyze operational strategies**
- **High initial development costs**



Analytical/Deterministic Tools

- Analyze the performance (capacity, density, speed, delay, and queuing) for small segments of the transportation system based on Highway Capacity Manual (HCM) methods



Analytical/Deterministic Tools

Advantages

- **Quickly predict impacts for an isolated area**
- **Widely accepted**

Challenges

- **Limited ability to analyze broader network impacts**
- **Limited performance measures**



Traffic Signal Optimization Tools

- Analyze delay and identify optimum signal phasing and timing plans for isolated intersections or small signal systems
- Examples:
 - » PASSER
 - » TRANSYT-7F
 - » Synchro



Traffic Signal Optimization Tools

Advantages

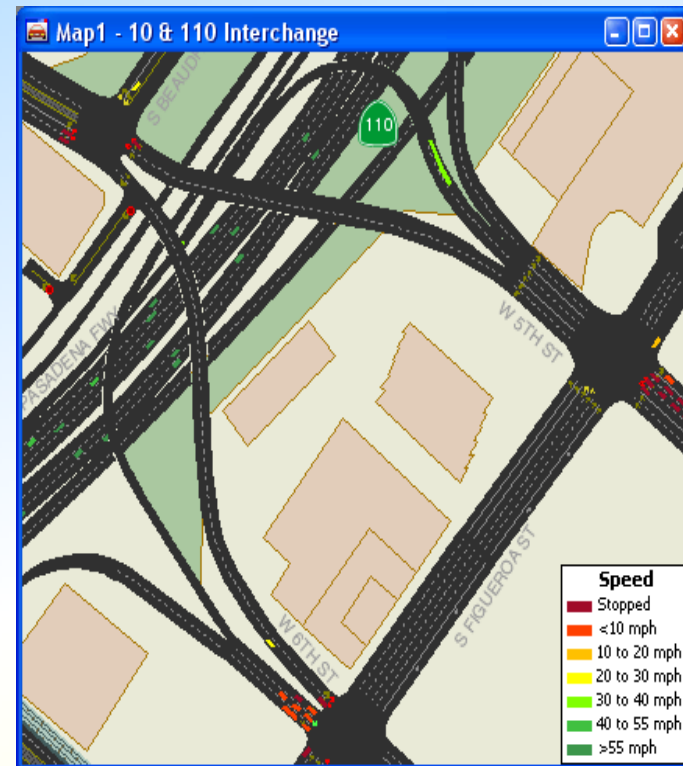
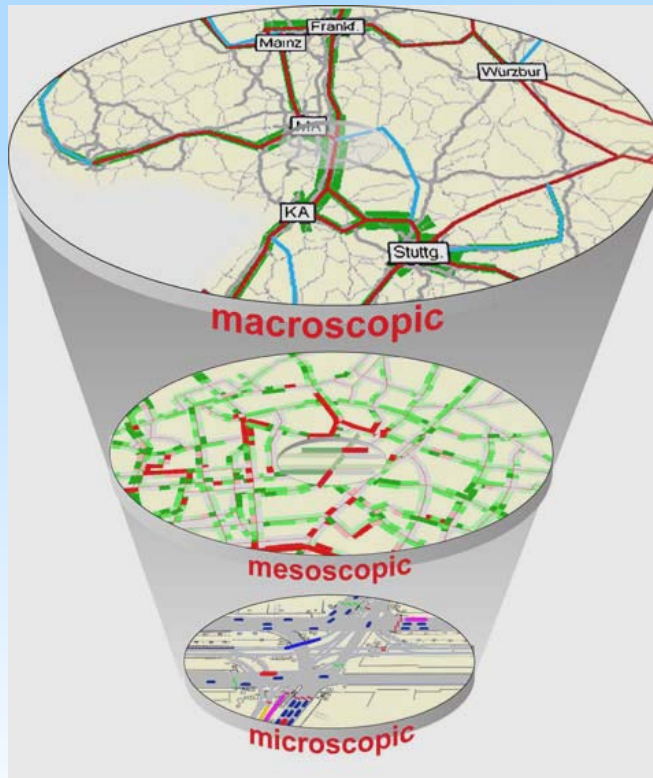
- **Effective tool for testing plans prior to field implementation**
- **Proven operational benefits**

Challenges

- **Limited to intersection Performance Measures**
- **No Freeway/Highway Capabilities**



Traffic Simulation Models



Traffic Simulation Models

- **Macroscopic**

- » Simulation of flow, speed and density made on a segment by segment basis

- **Mesoscopic**

- » Dynamic estimation of individual vehicles based on average segment speeds

- **Microscopic**

- » Simulates detailed movement of individual vehicles throughout the network



Traffic Simulation Models

Advantages

- Detailed results, particularly microsimulation
- Dynamic analysis of incidents and real time diversion patterns
- Visual presentation opportunities

Challenges

- Demanding data and computing requirements, particularly microsimulation
- Resource requirements may limit network size and number of analysis scenarios
- Calibration can be time consuming



For More Information:

www.ops.fhwa.dot.gov/trafficanalysisitools/

The screenshot shows a Microsoft Internet Explorer browser window displaying the FHWA Traffic Analysis Tools website. The browser's address bar shows the URL <http://www.ops.fhwa.dot.gov/trafficanalysisitools/index.htm>. The website header includes the U.S. Department of Transportation Federal Highway Administration logo and navigation links for "FHWA Home" and "Feedback". The main content area features a banner image of a busy highway with the text "OFFICE OF OPERATIONS 21ST CENTURY OPERATIONS USING 21ST CENTURY TECHNOLOGIES". Below the banner, there is a search box for "Search Operations:" and a "Go" button. A left sidebar contains a navigation menu with links such as "Traffic Analysis Tools Home", "About the Program", "Traffic Analysis Tools Team", "Types of Traffic Analysis Tools", "FAQs", "FHWA Products", "Traffic Analysis Toolbox", "Next-Generation Simulation (NGSIM)", "Dynamic Traffic Assignment (DTA)", "Corridor Simulation (CORSIM/TSIS)", "ITS Deployment Analysis System (IDAS)", and "Resources". The main content area is titled "Traffic Analysis Tools" and contains a paragraph defining the term, a paragraph about the program's purpose, and a section titled "Selection of the Proper Tool" with a detailed paragraph. To the right of the main text is an "Announcements" box with a link to "Announcing the Completion of Volumes I, II & III of the Traffic Analysis Toolbox" and an image of a green toolbox containing various documents and charts. At the bottom of the page, a small icon indicates that the Adobe Acrobat Reader is required to view PDFs.



AVID – CDOT Traffic Digital Dashboard

- Seamlessly integrates traffic data from a number of systems currently maintained by CDOT - TRADAS, TRANSYS, GIS, SAP, etc - into a single tool
- Allows traffic data to be analyzed and visualized using both standard components – Maps, Charts, Tables, News – and custom components – Short-Duration Counts, Bike/Pedestrian, FHWA
- Simplifies dissemination of data both within CDOT and to external traffic agencies
- Based on Business Process diagrams



Operational Areas

- **Functionality is contained within 10 operational areas:**

- 1. Automated Traffic Recorders**
- 2. Federal Highways**
- 3. Bike/Pedestrian**
- 4. Planning**
- 5. Region**
- 6. Route**
- 7. Short Duration Counts**
- 8. Traffic**
- 9. Traffic Data Committee**
- 10. Weigh-in-Motion**



Automated Traffic Recorders (ATR)

- View all ATRs to provide an overall view (i.e., percentage of functioning ATRs) and the ability to drill down to a particular ATR to review specific counts or status history

The screenshot displays the CDOT Traffic Digital Dashboard interface. The main content area is divided into several sections:

- Details:** A table showing information for Site ID 000107, including Name (I-70 E/O Mt Vernon Country Club Rd, Genessee), Type (ACL), Status (green dot), Route / Milepoint (070A / 253.53), and County (Jefferson).
- Location:** A map showing the location of the ATR on I-70 near Denver, Colorado, with various landmarks and road numbers visible.
- Status History:** A table listing recent status changes:

Date	Status	Description
19-Nov-09	Green dot	Piezo #2 replaced and tested
26-Sep-09	Blue dot	Piezo #2 is out. Change to Loop
10-May-07	Green dot	ACL Installed
- Annual Daily Traffic:** A line graph showing traffic volume over a period of time, with a peak in the middle of the year.
- Documents:** A table for managing documents related to the ATR, with columns for Name, Type, and Comments.



Federal Highway

- Aid the validation and assembly of the monthly data package to be submitted to FHWA as well as providing access to historical submissions and FHWA reports

The screenshot shows the CDOT Traffic Digital Dashboard web application. The browser address bar displays <http://www.dot.state.co.us/traffic/dashboard>. The dashboard is titled "AVID: Analyze-Visualize-Integrate-Disseminate" and is logged in as John Smith on 13th November 2009. The navigation menu includes Home, ATR, FHWA, Bike/Ped, Planning, Region, Route, Short Duration, TDC, Traffic, WIM, and Messages. The main content area is divided into several sections:

- TVT Reports:** A table showing monthly data for 2009. The columns are Date, Submitted, Not Subm., Accepted, Rejected, and Vehide Miles. Each row includes links for Card, PDF, and XLS.
- Traffic Monitoring System:** A table listing monitoring sites with columns for SiteID, Location, Status, and Submit. The sites include SH 470 NW/O SH85, Santa Fe; SH 36 SE/O SH 170, Superior; SH 285 SE/O Indian Wells; SH I-25 N/O El Huerta View; I-70 NE/O SH 131 Wolcott; SH 50 SE/O SH 141, Whitewa; SH I-25 S/O SH 34 Loveland; SH I-25 S/O Santa Fe Trail; and SH I-25 S/O SH 7 Broomfield.
- CDOT Traffic Analysis Business Process:** A placeholder for a business process diagram.
- Accepted by Month:** A bar chart showing the percentage of accepted reports by month from October 2008 to September 2009.

The bottom of the dashboard features a "Submit" button and a system tray with "My Computer" and "100%" zoom level.



Route

- View all of the ATRs along a given route, and to view traffic statistics derived from the counts (i.e., AADT) for the route

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The "Details" section for Route ID 070A shows the following information:

- Route ID: 070A
- Name: I-70
- Description: {Description of Route}
- Functional Class: Interstate

The "Location" section features a map of Colorado with a purple line representing the route from Grand Junction to Denver. The "Traffic Counts Stations" table lists the following data:

SiteID	Ref Pt	Location
103032	202.35	I-70 SW/O SH 9, Blue River Pl...
000106	205.42	I-70 NE/O SH 9, Blue River Pk...
103034	216.19	I-70 W/O Woodward St, Silver...
103035	225.72	I-70 S/O 15 th St, Georgetown
103036	227.91	I-70 N/O 15 th St, Georgetown

The "Annual Average Daily Traffic" section contains a line graph showing traffic volume over time.



Short Duration Counts

- Aid in the scheduling, collection and validation of Short Duration Counts, and authorize the release of payment for those counts

The screenshot displays the CDOT Traffic Digital Dashboard interface. At the top, it shows the user is logged in as John Smith on 13 November 2009. The dashboard includes navigation tabs for Home, ATR, FHWA, Bike/Ped, Planning, Region, Route, Short Duration, TDC, Traffic, WIM, and Messages. The 'Short Duration' tab is active, showing a search filter for 'Smith Engineering' and a date range from '14-Nov-2009' to 'Today'. A central table displays a list of counts for Station 100450, with columns for Date, Type, Hours, ADT, % Change, Roadway, Negative Dir., Positive Dir., and Status. A map below the table shows the location of the counts in the Adams area, with markers for various stations. To the right, there is a 'CDOT Traffic Analysis Business Process' flowchart and an 'Invoice' list. At the bottom right, a 'Summary' bar chart shows the distribution of counts across different categories.

Date	Type	Hours	ADT	% Change	Roadway	Negative Dir.	Positive Dir.	Status
12-Nov-2009	Short	24	23,393	19.5%	23,550	11,460	12,090	●
11-Aug-2008	Short	24	18,839	-19.0%	23,536	11,176	12,360	●
18-Jun-2007	Short	48	22,424	-1.2%	53,865	25,916	27,949	●
1-Jan-2006	Short		22,700	9.7%				●
1-Jan-2005	Short		20,500	27.3%				●
1-Jan-2004	Short		14,900					●
12-May-2003	Short	24						●



CDOT Traffic Digital Dashboard

File Edit View Favorites Tools Help

http://www.dot.state.co.us/traffic/dashboard

Logged in as John Smith [Help](#)
 13th November 2009 [Configure](#)

Home ATR FHWA Bike/Ped Planning Region Route Short Duration TDC Traffic WIM Messages

Search

Details

Location ID	56
Name	Holly Street Bridge @ Cherry Creek, Denver, CO
Description	

Location

Pedestrian Counts

Documents

Name	Type	Comments
Project Location	PDF	Location description fro
Photo	JPG	Completed Bridge

[Add](#) [Edit](#) [Delete](#)

Data Transfer

Site ID: 107436

File: C:\Counts\SR12.xls

Format: Excel

[Upload](#)

AVID Development

- **CDOT and Cambridge Systematics are about to embark on a phased approach to the implementation of AVID**
- **The initial phase which will focus on the ATR, Short Duration Counts and Traffic Data Committee operational areas**
- **Expected to be deployed in early 2011**



