Connected Corridors

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Agenda

- **Connected Corridors:**
- **Related projects:**
  - PCARI;
  - ERC;
  - SOPALE; and
  - NCHRP.
- **Industry:**
  - INRIX;
  - NOKIA;
  - TOM TOM; and
  - Bitcarrier.
What is Connected Corridors?

• A collaborative effort to research, develop, and test a framework for future corridor traffic operations in California and beyond;

• Funded by California Department of Transportation;

• $20M for Phase 1 to 2016;

• Main aim - to address and fundamentally change the way the State of California manages its transportation challenges for years to come.
Faculty Leadership

- Alex Bayen
- Michael Cassidy
- Roberto Horowitz
- Adib Kanafani
- Alex Skabardonis
- Pravin Varaiya
- Joan Walker

Collaborators

- Mike Hansen
- Robert Cervero
- Elizabeth Deakin
Aims

• Enable existing transportation infrastructure and vehicles to work together in a highly coordinated manner;

• Deliver improved corridor performance (safety and mobility);

• Improve accountability;

• Evolve Caltrans to Real-Time operations and management; and

• Enhance regional, local and private sector partnerships
• California is a leader in traffic congestion;

• In 2009 for example, Californians lost:
  – nearly 80 million hours because of congestion;
  – equal to $400 million in additional fuel costs; and $3.5 million lost in wages and salaries *per day*.

• 2010 to 2060 = 37,309,382 to 52,693,583

• In the past we built our way out of congestion; we can’t in future:
  – Costs are too high;
  – Land is too valuable; and
  – Livability is too important.
Mobile Millennium - An early instantiation of participatory sensing

- Consortium: NSF, US DOT, Caltrans, Nokia, NAVTEQ, + 10 others
- Initially, 5000 downloads of the FIRST Nokia traffic app worldwide
- Today: gathers about 60 million data points / day from dozen of sources (smartphones, taxis, fleets, static sensors, public feeds)
- Provides real-time nowcast (soon forecast) of highway and arterial traffic, provide routing and data fusion tools.
Example: 0.5% of Mobile Millennium data (one day)
Freeway Performance Measurement System (PeMS)

- Real-time Archive Data Management System;
- Collects detailed traffic data in real-time;
- Processes these values in real-time, performing:
  - Diagnostics
  - Imputation for missing values
  - Speed calculations
  - Aggregations over space and time
  - Many analysis functions
- Reports

Over 30,000 sensors
All data on-line (1998-)
• Tools to analyze and design:
  a) Major traffic corridor operational improvements:
     • ramp metering; incident management; traveler routing and diversion; toll and commuter lane (HOT) management; arterial signaling control; demand management; pricing; etc.
  b) Major traffic corridor infrastructure improvements:
     • Additional lanes, extend ramps capacity, add HOT
  c) Quickly estimate the benefits of such actions
Accomplishments - Research

**Probe & Hybrid Data** - can inform decisions; 'data fusion' improves accuracy and coverage; 'big data' can locate the severity and extent of traffic jams in real-time.

**Incentives** – work to reduce congestion by changing behavior

**Connected Commuting** - real-time information; commuter sentiment analysis tools; & happiness

Transportation system management and traffic control

Demand management

Social network tools
Accomplishments - Operations

- Core organization defined and staffed
- Pilot corridor selected
- Concept of Operations in development
- Industry and government partnerships in development
The next big thing in California: ICM

- BART Express Lanes
- HOT/HOV control
- Local Arterial Traffic Signals
- Parking
- CMS
- Ramp Metering
- Smartphone enabled reroute
- Express Lanes HOT/HOV control
- BART
- Local Arterial Traffic Signals
Integrated Corridor Management

State Strategy
- Performance measurement;
- Active traffic management;
- Organizational change;
- New contracting requirements; and
- Cooperation between state, regional and city agencies.

Methodology – Freeways, Arterials, Mass Transit
- Organization, System Eng, Policies, MOUs;
- Other ICM projects;
- Industry – Delcan, Schneider, TSS, Navteq, Google, INRIX etc; and
- Local Agencies.

New concepts & technologies
- Data Fusion;
- Rapid Estimation, Prediction and Control ;
- Demand Management through social networking; and
- Decision Support Technology (DSS) through Machine Learning.

California Pilot
- Full Pilot - a template for all major corridors in California.

ICM California – 50 major corridors
- True Collaborative Commuting in California – People, Infrastructure and Vehicles
Hybrid Data

Collection and Quality Control → Fusion (Multiple sources – Various data) → Models

- Traffic Operation
- Planning
- Traveler Information
- Safety
Connected Corridors - Strategy

Key questions:
- Who will manage the system?
- Who will make money?
- Who will regulate?
Related Projects

• Philippines – California Advanced Research Institutes – approximately $4M – Mobile Millennium Manila;
• NSF Engineering Research Center pre-proposal submitted July 30th – consortium led by SUNY, Buffalo – Reinventing the Transportation System;
• NASA - Simultaneous Optimization of Passenger Airside and Landside Environments (SOPALE);
• NCHRP:
  – Planning for Transportation System Management and Operations" for inclusion in the Transportation Research Board Proposal Request NCHRP 20-07 (Task 345); and
  – 08-95 B-07 Using Cell Phone Data to Improve Travel Demand Models.
Simultaneous Optimization of Passenger Airside and Landside Environments (SOPALE)

0.5% of Mobile Millennium data (one day)