Arterial Performance Measurement System with Wireless Magnetic Sensors

Steve Kimble
Sensys Networks
Wireless Sensor Network Solutions
ITS-NY
June 9, 2011
Arterials carry half the traffic – but there’s an operational void

- Arterials vs. freeways and transit system
- 1 or 2-day volume study for managing non-recurring delay?

What’s the operational goal and how do we know when we reach it?

- Budgets - need the educated in “educated decision”
- How much good are we providing public? (now?!)  
- Current emphasis: historical & qualitative measures at peak
- 5-10% all traffic delay is due to improper signal timing

Arterial travel time - a true challenge

- Flow is interrupted by signals
- Spot speeds/density/mid-block not meeting the challenge
- New technologies arrive – but side issues

Bottom line – “where’s the data?”
ATTS – How it fits together
How it fits together
ATTS - Hardware

- Wireless Sensor
- Access Point
- Repeater
- SNAPS Server
- Re-identification Server
ATTS – How it fits together
Arterial Performance Measurements

- Arterial Travel Time uses a patented technology called magnetic re-identification to provide arterial performance measures and travel times along signalized corridors – all done anonymously with no privacy invasion or tracking of specific vehicles.

- System provides vehicle counts, vehicle speeds and arterial occupancy

- Approximately 65% match rate for typical application (1.5 to 2 miles)
What measures do you get?

The output of Arterial Travel Time System provides:

- Complete distribution of travel times
- Median Travel Time (sec)
- 80<sup>th</sup> percentile Travel Time (sec)
- 90<sup>th</sup> percentile Travel Time (sec)
- Vehicles in segment (number)
- Counts & Speed
- Level of Service
The “new” Arterial Performance Measures

Recurring Traffic management and operations
- True real-time operations
- Quantifying success and failures in real-time
- Can we use travel time to feed adaptive?

Non-recurring congestion management
- Detecting and managing incidents / emergencies
- Real-time, active traffic/modal re-routing (ICM)
- Giving travelers an informed choice with ATIS

Other: Planning / Maintenance / Engineering / Management
- Defining needs – educated decisions!
- Resources to focus engineering beyond peak times
- RIP: qualitative historical demand models, delay and LOS . .TBD?
- Break up the HCM delay into real-time measurements
- Quantitative and easy reporting to decision-makers
Added Benefit - Sensys ATTS Solution

Data Accuracy + Quality
  • 65% to 80% vs. 5% match = accurate data + MORE data
  • True travel time distribution
  • Timely – no need for historical data; any vehicle = data

Privacy / Policy Friendly
  • Not dependent on unique ID traceable personal info

Security
  • Proprietary protocol – hacker safe

Availability
  • Data safely processed at server and accessed via XML
  • You own the data

“Future-Proof”
  • Not dependent on technology from outside markets

Multi-functional Investment
  • Same hardware as loop replacement signal actuation, advanced/adaptive detection, count/speed stations
From One Intersection—To an Entire Region

Flexible, dependable, low-cost universal platform for all detection applications
Larger Installations

Transforming Transportation with Wireless Sensor Networks
Integrated Corridor Management

Wireless sensor networks provided accurate, real-time data for efficient load balancing between major arterials and freeway during extensive roadway re-construction, improving alternate route diversions and preventing extended closures along I-15 in Provo, Utah.
Real-time travel times during major freeway construction rerouting

Problem:
Freeway construction required extensive traffic rerouting between Provo and Lehi.

Solution:
Sensys Networks’ Arterial Travel Time, deployed along three major arterial routes provided:
- Volume
- Occupancy
- Real-time travel times for 14 VMS
- Travel time distribution
- Level of Service
- Vehicles in segment (queue detection)

Benefit:
24 Arterial Travel Time stations deployed in record time (>2 weeks) mitigated significant congestion and kept traffic moving smoothly throughout the region.
Dynamic Trail Blaze Sign with Directional Arterial Travel Time
Integrated Corridor Management & Traffic Light Synchronization

Wireless sensor networks provide accurate, real-time performance measures, arterial travel time, and traffic light synchronization optimization for federally funded Integrated Corridor Management project along San Diego-area I-15 corridor.
Problem:
Primary artery between Los Angeles and San Diego (with reversible HOT lanes), carries near constant heavy traffic.

Solution:
Sensys Networks’ integrated solution provided accurate performance measures including:
- Volume
- Occupancy
- Real-time travel times for VMS, 511
- Travel time distribution
- Level of Service
- Vehicles in segment (queue detection)

Benefit:
Enhanced corridor management across the shared network provided accurate data for traveler information and decision support systems for optimized regional mobility.
MoDOT Arterial Performance Measures

• Phase 1 installed and running: April 2011

• 5 main arterials
  – Route 67 North from I-70 to Route 367 ~12 miles
  – Route 67 Central from I-70 to Manchester Rd ~ 10 miles
  – Route 67 South from Big Bend Rd to I-255 ~ 8 miles
  – Route 141 from I-64 to I-55 ~ 20 miles
  – Old Route 94 from I-70 to I-64 ~ 11 miles

• Total coverage with initial installation > 60 miles of key arterials

• Equipment used for Travel Time along these arterials:
  – 67 Access Points
  – 901 Wireless Sensors