The Practical Side of Cell Phones as Traffic Probes

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Cell Probe Technology

- Part of general trend away from fixed sensors toward vehicle-based information
- Reflects frustration with high costs and slow pace of deployment for traditional sensors
- More than just ITS - a broad management and planning tool (see NCHRP report)
- Characteristics:
  - Low cost
  - full regional coverage
  - performance-based, and
  - self sufficient business model

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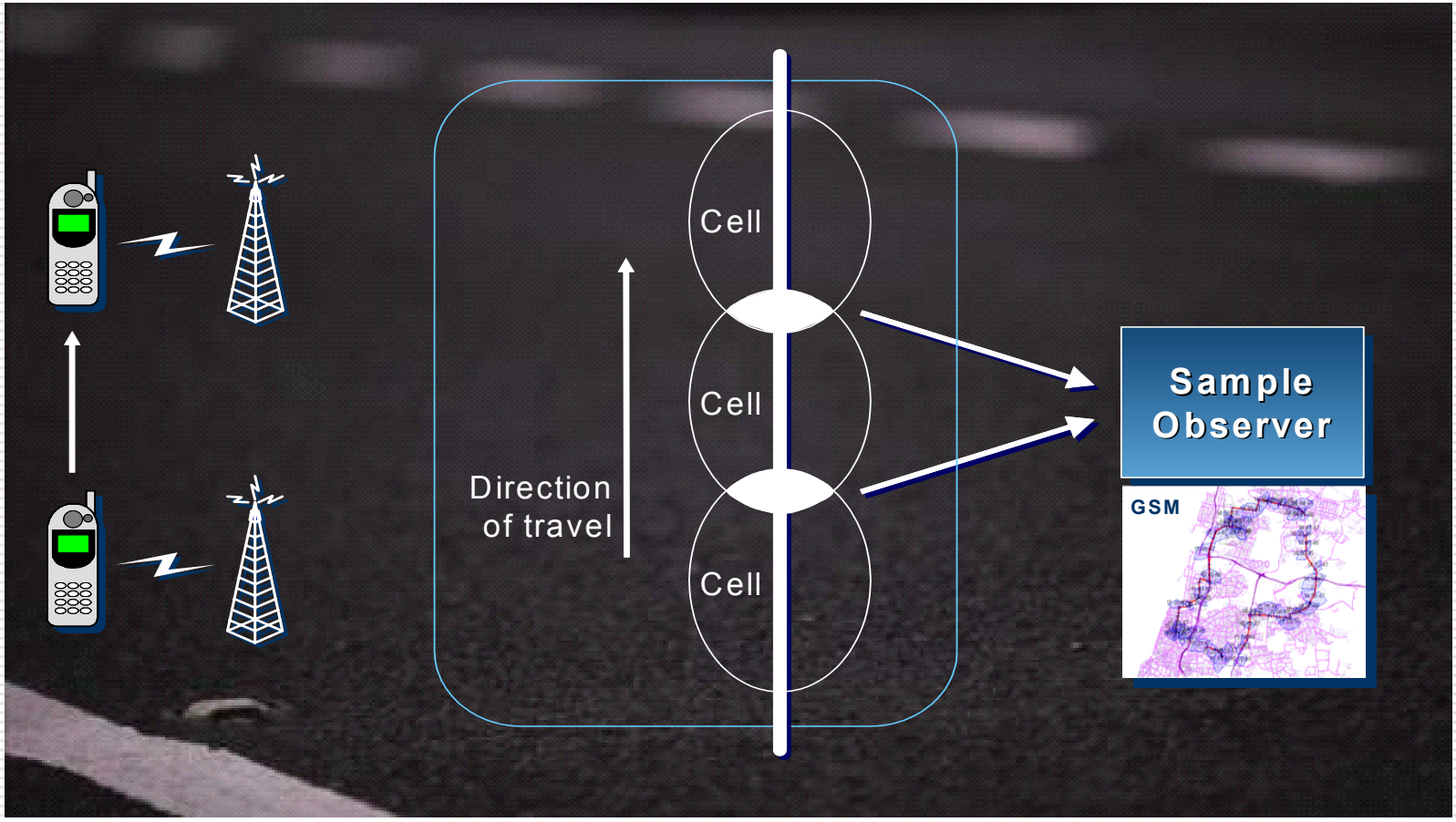
Cell Probe Technology

- Practical success requires more than cell phones
- Cell phone movement based on cell location and "hand-offs" from one cell to another
- Pattern recognition techniques filter out data from those not on the highway
- Then traffic algorithms generate travel times and speeds on roadway links
- Cell phones need to be turned on, but not necessarily in use
- Full regional systems in place in Baltimore, Antwerp, and Tel Aviv = 4,600 miles

Cell Probe Technology



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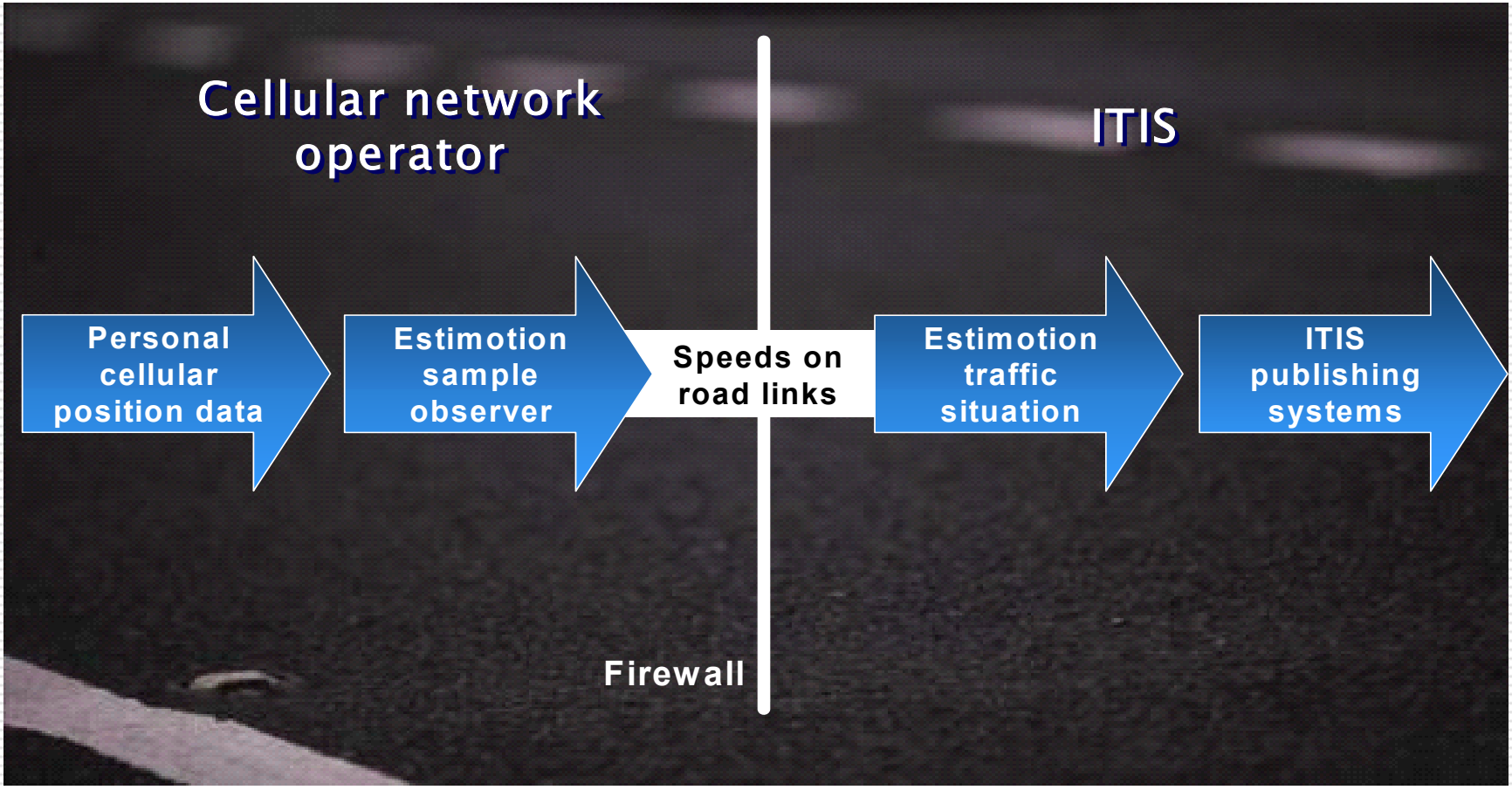
Cell Probe Privacy



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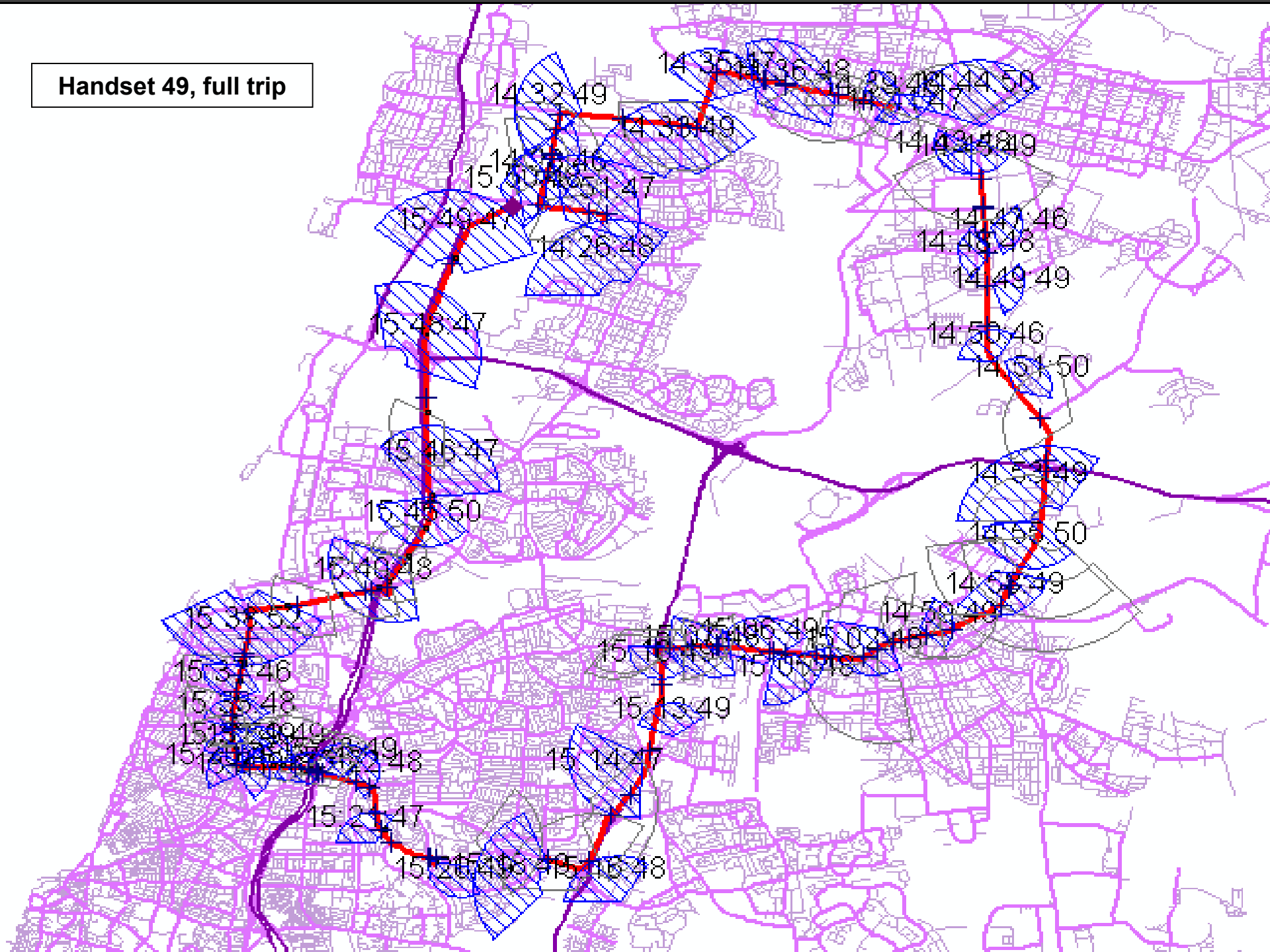
Handset 49, full trip

Baltimore MMTIS

- Provides first regional deployment of commercial-quality cellular traffic probes in North America
- Mutually profitable public-private partnership
  - Test commercial markets during project
  - Integrate with existing public data – including transit and E-911
  - Encourage public applications beyond traditional ITS
- Contract signed September 2004; data flow to Maryland DOT began April 2005

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Baltimore MMTIS – Private Firms

- Delcan-NET
  - Transportation and technology consultants
  - Fifty plus years in business
  - Profitable every year; staff = 500 plus
- ITIS Holdings
  - Leader in traffic probes; staff = 100
  - Commercial customers – 16 automobile firms, for-profit 511
  - Profitable!
  - Publicly traded on London exchange
- National cellular firms

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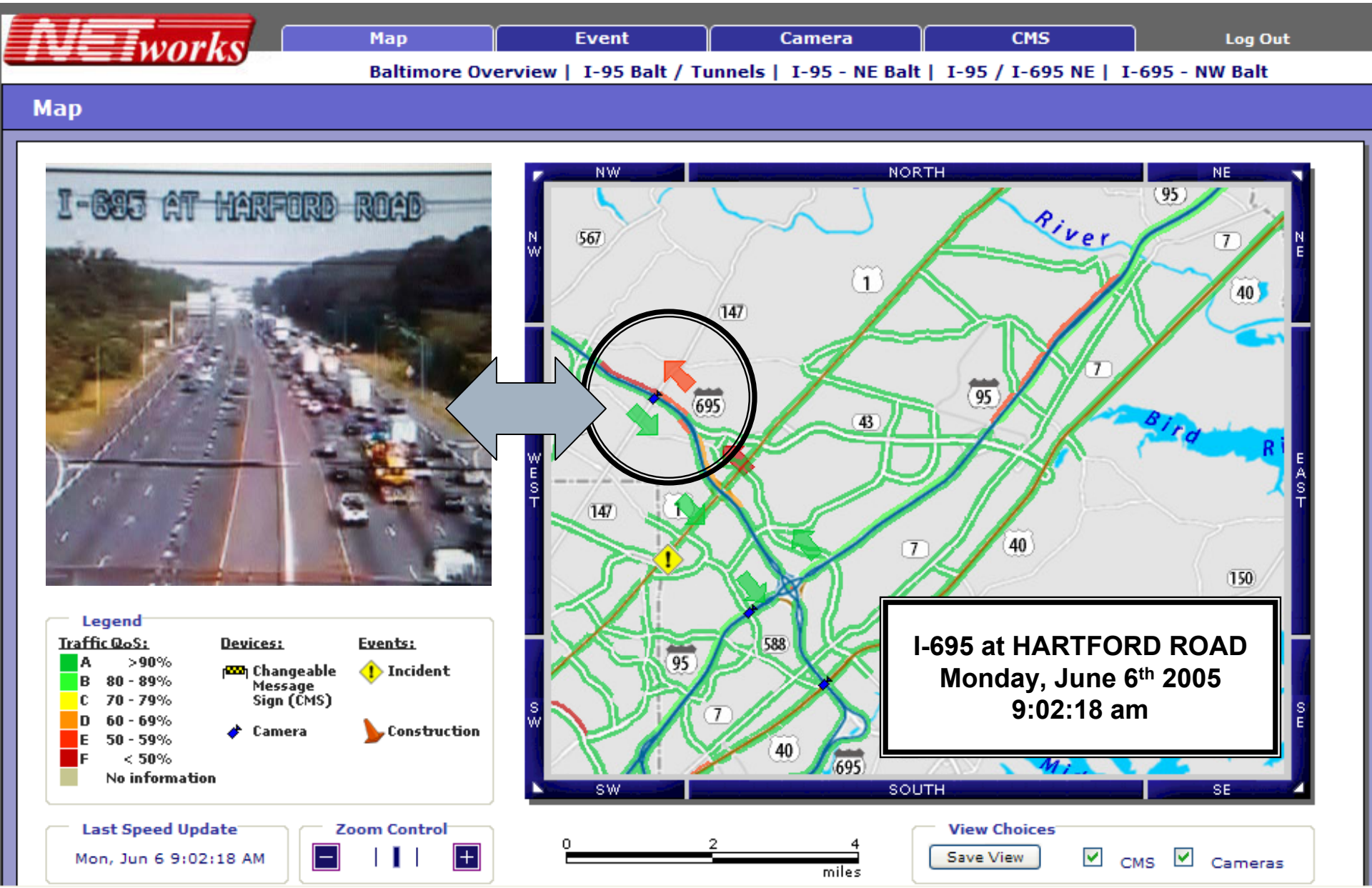
iTIS Holdings plc

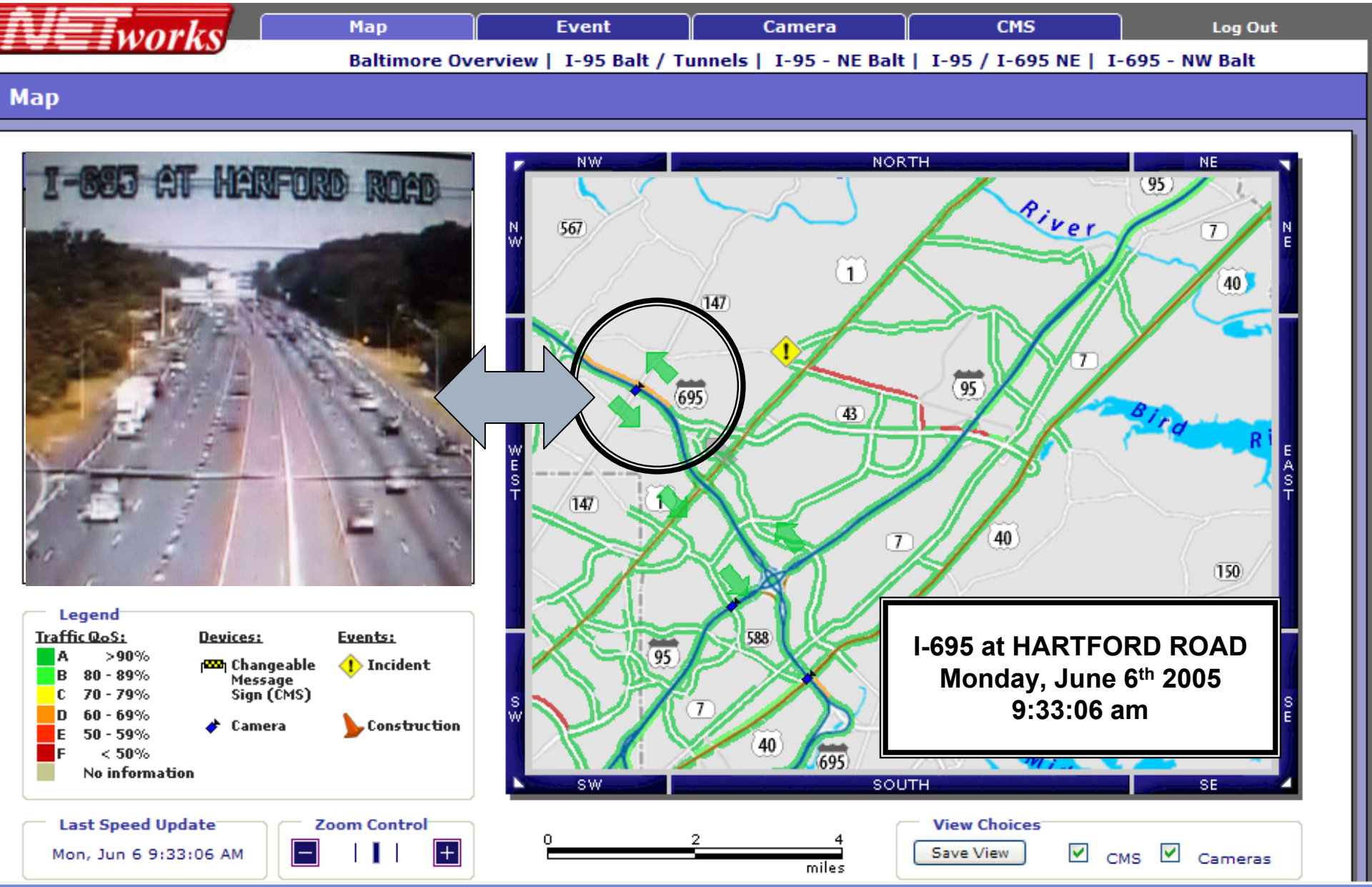
Our Customers

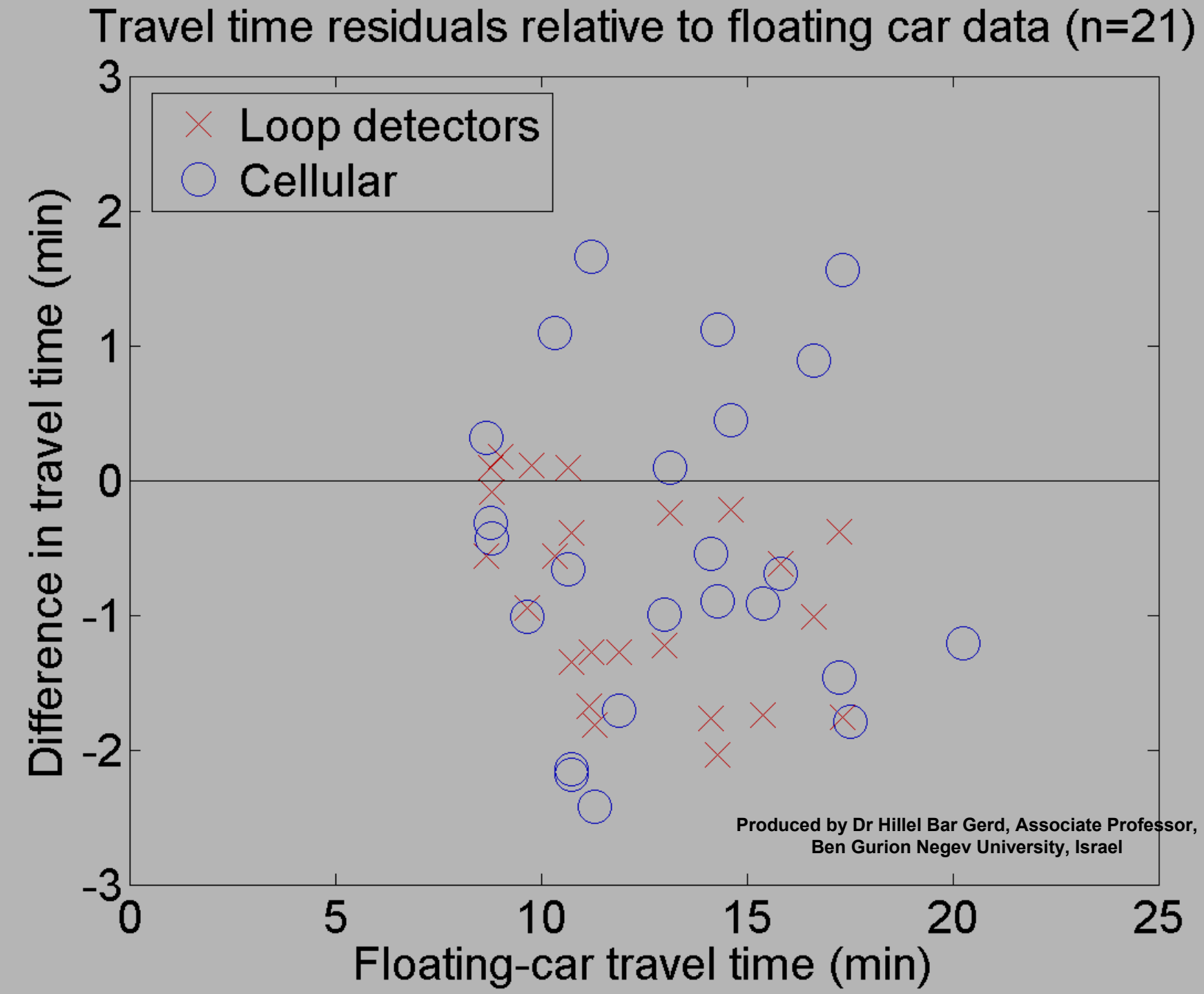
The AA
Bentley
BMW GB Ltd
Co Pilot
DaimlerChrysler
DfT
Ferrari
Ford GB Ltd
Hampshire C.Council
The Highways Agency
Kenwood
Land Rover
Lexus
Maserati
Mini
Navteq
Nissan
O2
Orange
Panasonic
Pioneer
Porsche
Renault
Route 66
Saab GB Ltd
The Scottish Executive
Siemens VDO
Subaru Europe
T-Mobile
Tele Atlas
Tom Tom
Toyota
Transport for London
Vauxhall
Vodafone
Volvo

MARYLAND DOT CAMERAS SHOW ACCURACY OF TRAFFIC INFORMATION BEING CAPTURED USING CELL PROBES

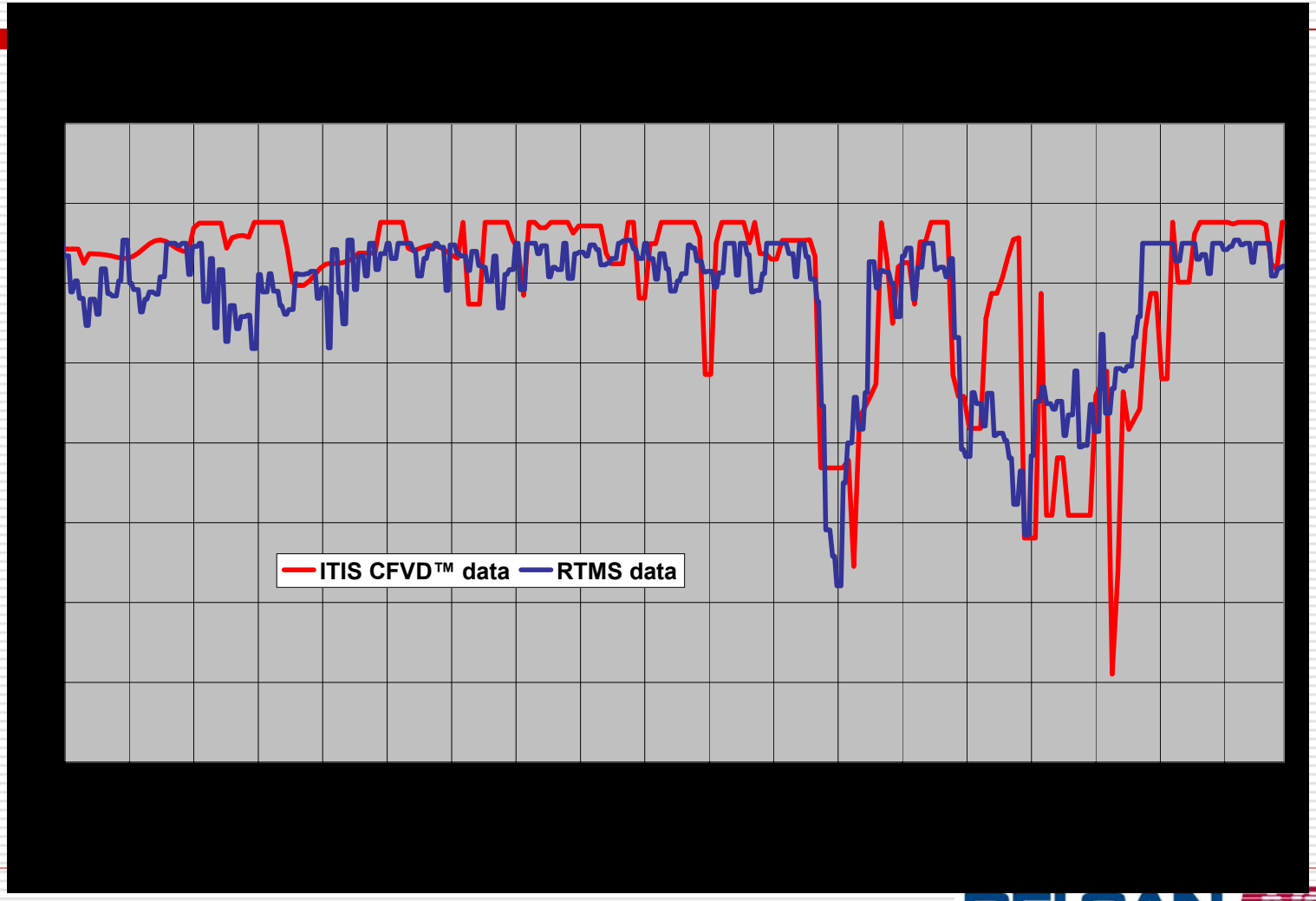


CELL PROBES ACCURATELY UPDATE TRAFFIC CONDITIONS AS CHANGES OCCUR




Travel time residuals relative to floating car data (n=21)
Loop detectors
Cellular
Difference in travel time (min)
Floating-car travel time (min)
3
2
1
0
-1
-2
-3
0
5
10
15
20
25
Produced by Dr Hillel Bar Gerd, Associate Professor,
Ben Gurion Negev University, Israel

Baltimore Comparison with RTMS Data



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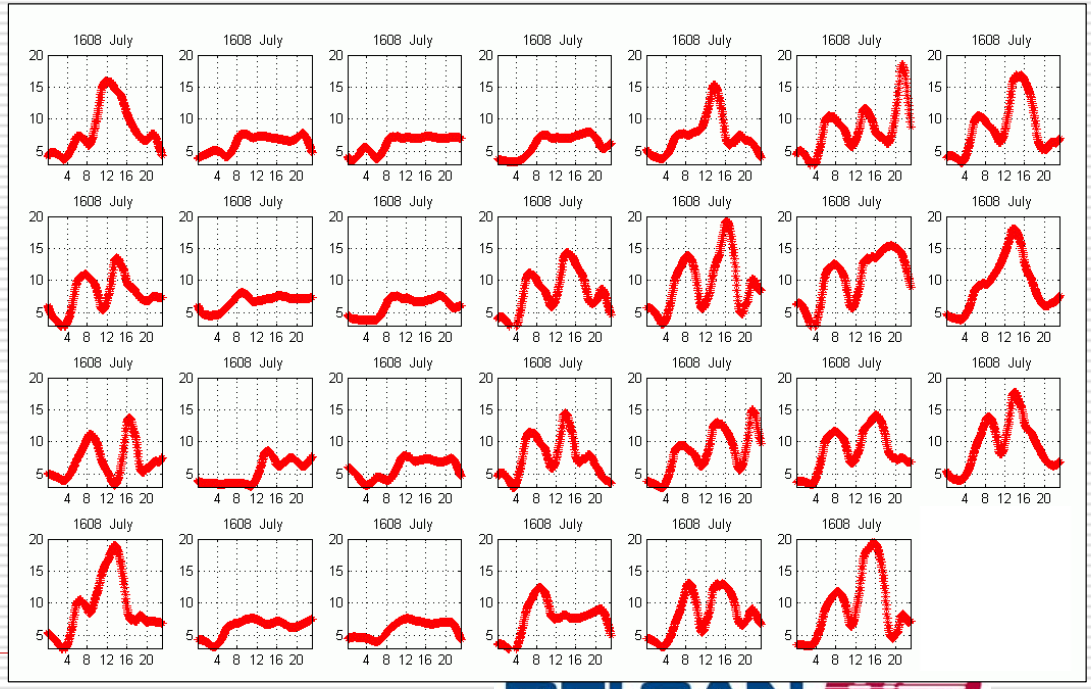
Performance data I-695 – July 2005



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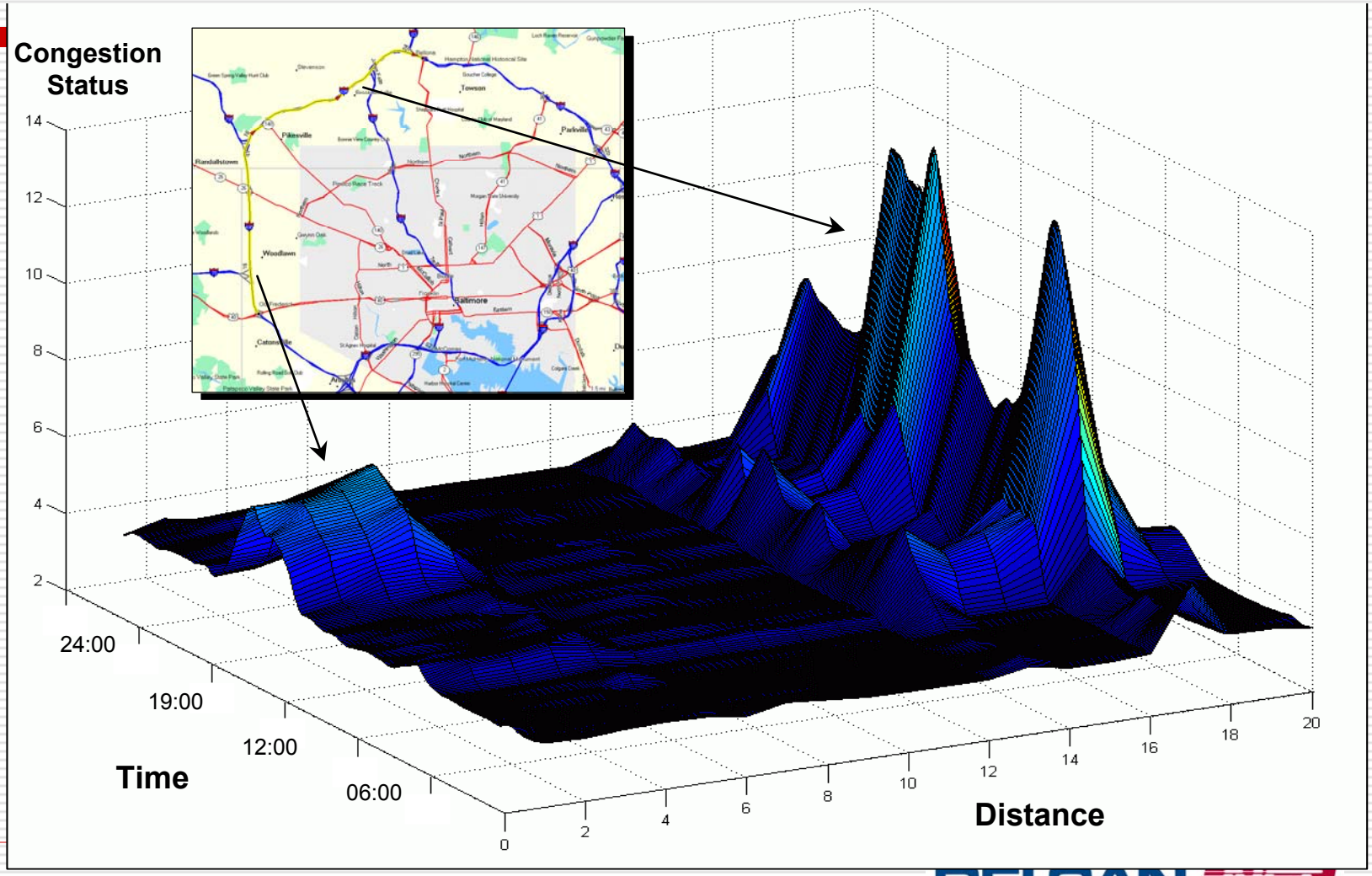
Baltimore I-695 Weekday Patterns



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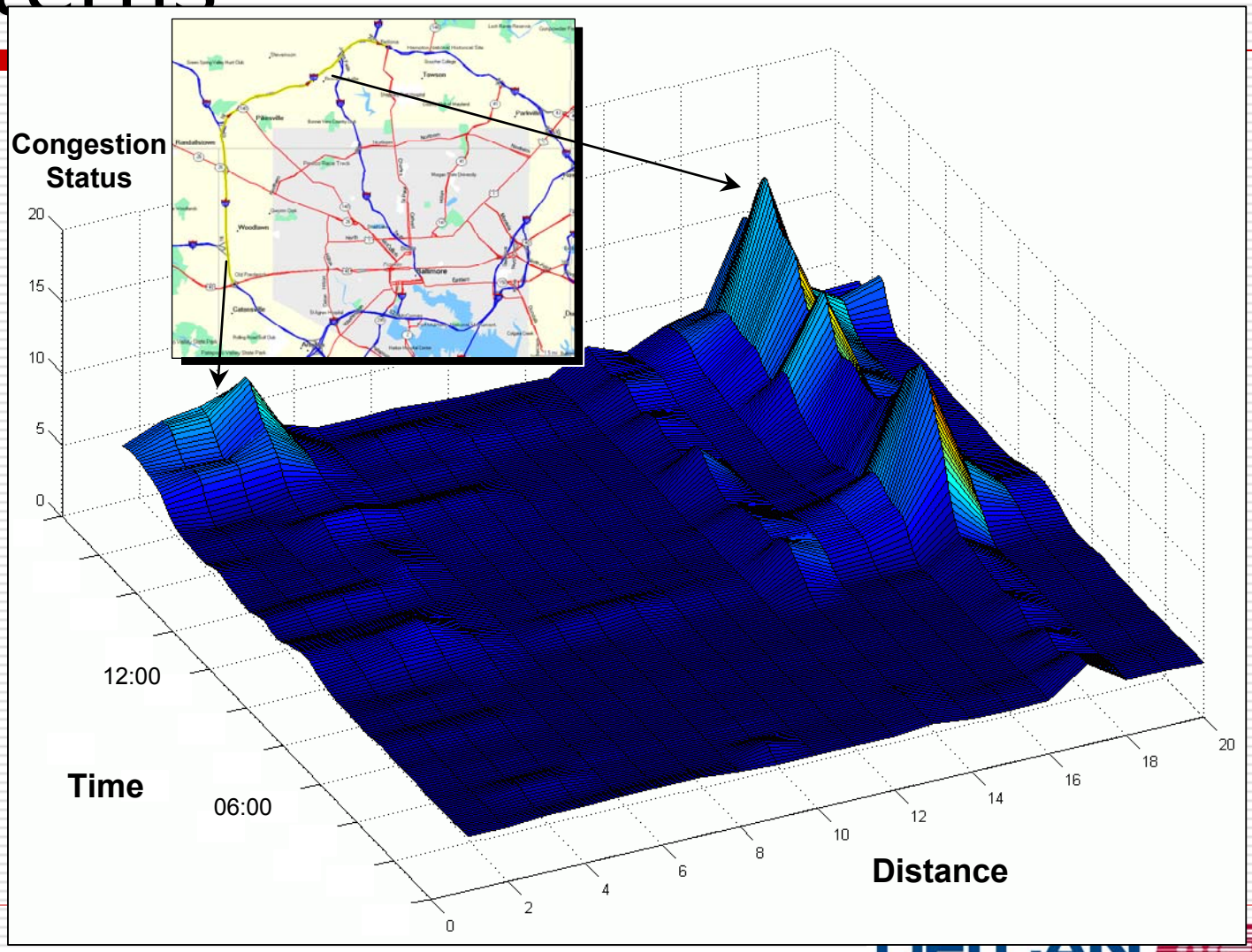
Baltimore I-695 Saturday Patterns



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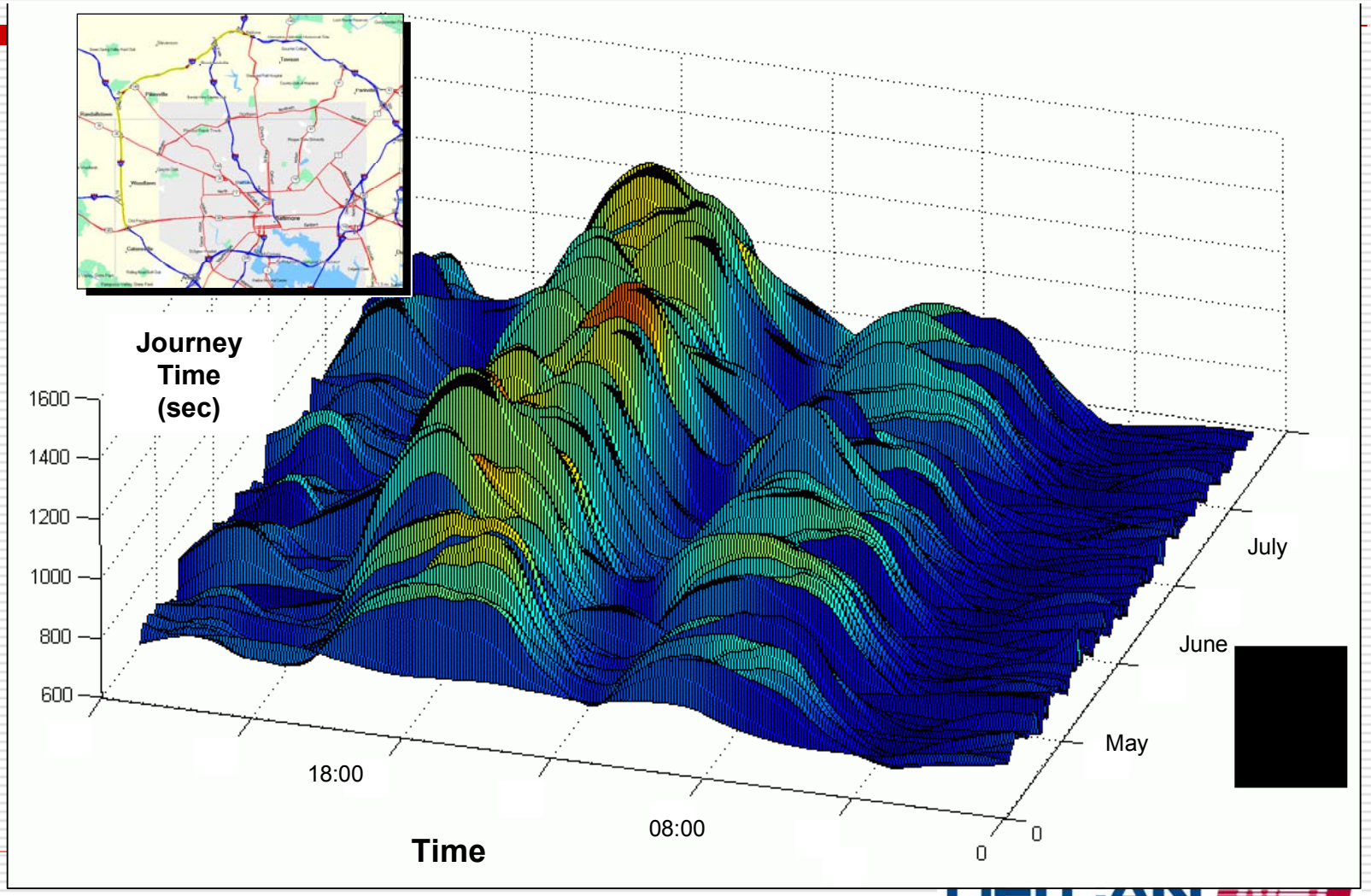
Baltimore I-695 Route Travel Time



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Applications

- General Planning and Management
  - Regional congestion management
  - Archived data supports system analysis, ”average day” information, long-range planning
  - Integrated regional or corridor management
  - Plan for “extreme” or special events
  - Homeland security applications – no-notice evacuations
  - Rapid evaluation of alternatives
  - Work zone management
  - Rural planning and operations
  - Traffic volume estimates -- future

Applications (2)

- Performance Measurement
  - System performance in near real time
  - Reliability measures – critical from user's perspective (travel time index, planning time index, etc.)
  - Performance-based systems – information for operators, users, and the public
  - Congestion management – support for HOT lanes and other finance alternatives
  - Economic value from partnerships with business – the DOT a part of just in time delivery

Applications (3)

- Travel Demand and Air Quality Modeling
  - Today – Validate travel demand and Mobile6 models
  - Tomorrow – origin/destination data
  - Tomorrow – New model development: activity-based and beyond
- Safety
  - Analysis and prediction
  - Targeted deployment of safety personnel
- Communication
  - Public participation – real data on congestion
  - Near real-time data – web, PDA, 511
  - Premium 511 service

Applications (4)

- Freight Operations
  - Web- or cell-based distribution of roadway information
  - Individual dynamic routing recommendations based on congestion
  - Travel time prediction to improve asset utilization
- Freight Analytics
  - Strategic analysis of freight movement for congestion mitigation
  - Origin/destination data to examine flows and set priorities
  - Support for cost/benefit and alternatives analysis