Visualizing and Communicating Sensitive First Responder and Public Safety Data for Ops. & Planning
What is the CATT Lab

30 Full-Time Employees

5 Graduate Students

60+ Undergrad
Student Researchers
- Computer Science
- Mechanical Engineering
- Aerospace Engineering
- Computer Engineering
- Geography & GIS
- Telecommunications
- Electrical Engineering
- Art & Graphic Design
- Digital Entertainment
- English
- Archaeology
- Civil Engineering
**CATT Lab Transportation Data**

- **RITIS Today**
  - Traffic accidents: 20,000 records per day: 0.001 Gb/day
  - Traffic detectors: 35,000,000 records per day: 5 Gb/day
  - Probe vehicle data: 4,200,000,000 records per day: 550 Gb/day
  - CCTV, weather, radio, etc: NO, STA, TSK, EPT records per day: ??? Tb/day
  - V2X & Automation data: ?, ???, ???, ???, ??? records per day: ??? ?b/day
Our Challenge

• Our mission is to make ALL of this data
  • easily accessible,
  • usable, and
  • understandable
  to end users—whomever they may be...

It’s all about Story Telling
Why Visualization?

• **Visual bandwidth is enormous**
  • Human perceptual skills are remarkable
    • Trend, cluster, gap, outlier...
    • Color, size, shape, proximity...
  • Human image storage is fast and vast

Visualization is so effective and useful because it utilizes one of the channels to our brain that have the highest bandwidths: our eyes.

- Robert Kosara
Who is your audience?

- Engineers
- Planners
- Operators

Vs.

- Legislators
- Media
- Decision Makers
- Public
National System
Map View
Real-time and Historic Timeline of Incident Activity
Weather Alerts
Road Weather Data
Radio/Scanners
Sensor Data
CCTV Overlay
CCTV Personal Media Wall
Transit
Bus Stops & AVL
Virtual Weigh Stations
Evacuation Data
Traffic Control Points
Filtering of Evacuation Data
Routes
Who is affected?
Search within a radius
See Details of POI
Chat & File Sharing Functionality
Our Growing Suite of Empowering Visual Analytics

Incident Analysis

Congestion Analysis

Weather Analysis

Enabling Informed Decision Making
Congestion Reporting Examples

• System Performance Reporting
• Problem Identification
• Project Prioritization
• After Action Incident Review
• Before & After Studies
• Operations
• Travel Time Analysis
• Work Zone Monitoring
Winter Weather Worries

• Snowmageddon 2011. There’s been a request from the Governor’s office to produce some examples that depict how bad traffic was during the January 26th, 2011 snow storm compared to normal weekday traffic. What can you show in just a few minutes?
Statewide Reporting

• You’ve been asked to provide a monthly state-wide congestion report to the Secretary. This report only needs to cover the interstates, but it needs to highlight where the worst congestion occurred (top 10 locations) and some basic stats about the severity of the congestion at each of these locations. You also need to let the Secretary know if the congestion is about the same, better, or worse than the previous 2-weeks. What do you do?
### Bottleneck Ranking

<table>
<thead>
<tr>
<th>Location</th>
<th>Average duration</th>
<th>Average max length (miles)</th>
<th>Occurrences</th>
<th>Impact factor</th>
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<tr>
<td>1-495 CW @ 1-795/Exit 19</td>
<td>2 h 5 m</td>
<td>5.37</td>
<td>40</td>
<td>32.203</td>
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<td>I-270 N @ I-70/US-40</td>
<td>1 h 29 m</td>
<td>8.71</td>
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<td>6.77</td>
<td>43</td>
<td>29.964</td>
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In this time spiral, each trip around the circle represents one occurrence. The center represents March 1, 2013, and the outer edge represents April 1, 2013.

Maximum queue length: < 1 mile: Green, 1-2 miles: Yellow, 2-3 miles: Orange, 3-4 miles: Red, > 4 miles: Maroon

View video demos of these tools at www.vpp.ritis.org/suite/screencast
I just spend $200M, and all I got was this...

• You just spent $200M on a 6-month major road widening project along that corridor you (and everybody else) hate. Some commuters are now complaining that things haven’t improved---in fact, they claim things have gotten worse. You can see the headlines now: “$200M fattens road, shrinks commuter patience!”

• What can you produce to show the true impact of this recent investment (positive or negative).
Answer #1: better or worse?
## Public Consumption

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<th>12 PM</th>
<th>1 PM</th>
<th>2 PM</th>
<th>3 PM</th>
<th>4 PM</th>
<th>5 PM</th>
<th>6 PM</th>
<th>7 PM</th>
<th>8 PM</th>
<th>9 PM</th>
<th>10 PM</th>
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### Delay Cost:
- **Total:** $277,124.39
- **Per vehicle:** $35.54
- **Per person:** $29.93

### Hours of Delay:
- **Person-hours:** 8,788.94 hours
- **Vehicle-hours:** 7,401.21 hours
- **Per vehicle:** 0.95 hours

### Volume:
- **Passenger:** 5145 vph
- **Commercial:** 1715 vph

### Data Validity: 100.00%

*Click the table cell to see links to congestion scans*
Usage Statistics & Growth Plans

- 4000+ Website Users
- Hundreds of active feed subscribers (both public & private sector)
- 50% Transportation
- 50% “Other” – This is VERY Important!!!
- 25 State DOTs
- 300+ Agencies & Private Sector Providers
- Over 1-Trillion Records Downloaded in 6-months

Users Include:

- DOTs (Federal, State, and Local)
- Transit Providers
- Metropolitan Planning Organizations
- Emergency Management Agencies
- FEMA
- US Army, Air Force, Navy, Coast Guard
- NorthCom
- U.S. Secret Service
- U.S. Capitol & Park Police
- Fire & Rescue
- Law Enforcement (state & local)
- U.S. Joint Forces Headquarters
- NSA
- US Office of Personnel Management
- 3rd Party Trav Info Providers
- University Researchers
- Consultants working on projects for the DOTs
- Social Security
- Pentagon Force Protection
- Etc.
Thank you!

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  301.405.0722