



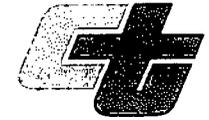
VII and SafeTrip-21 Activities in Michigan and California

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California Department of Transportation



Caltrans Improves Mobility Across California



Outline of the Presentation

- Michigan DOT Projects
- The VII California Program and Test Bed
- SafeTrip-21: Mobile Millennium
- SafeTrip-21: Networked Traveler

Current VII Research: MDOT and DUAP



- The Data Use, Analysis, and Processing (DUAP) program looks specifically at VII applications for DOTs
 - Incident detection
 - Travel advisories
 - Road and weather conditions
 - Winter maintenance
 - Asset management

MDOT Program: Status of the DUAP Project



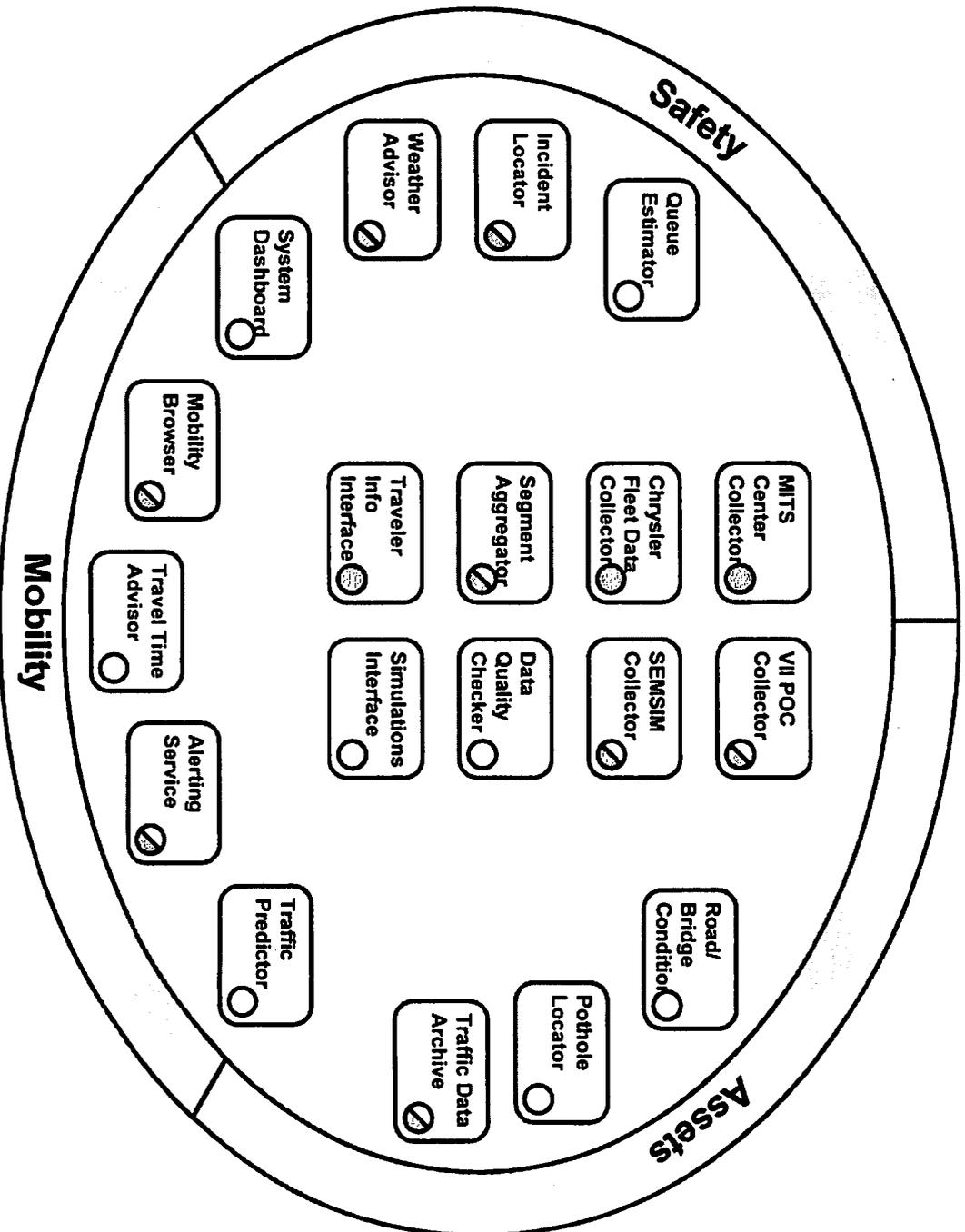
Purposes

- Evaluate the uses and benefits of VII data
 - Safety
 - Mobility
 - Asset management
- Support other ongoing VII activities
 - Technical development
 - Economic growth

Development

- Data being collected from probe vehicles
- Probe data merged with traditional detector data
- Algorithms being developed for both anonymized and known-source data
- Prototype map presentation developed

DUAP Status



Michigan VII Infrastructure

- Multiple Test Beds
 - Different geography
 - Different technologies
 - DSRC, Mesh, Wi-Fi, Cell, etc.
- Enhancing and expanding as needed
 - Partners have different needs
- Working on a comprehensive, Detroit-wide test and demonstration facility



Next Steps

- Additional data sources
 - Other VII test beds
 - Arterial/signal management systems
 - Public and private fleets
 - Specific test vehicles
- Integration with in-vehicle signage and messaging
- Demonstration of integration with agency operations

VII California Program Partners



- **Public Agencies**
 - California Department of Transportation (Caltrans)
 - Metropolitan Transportation Commission (MTC)
 - City/County Association of Governments of San Mateo County
- **Auto Industry**
 - Mercedes (formerly DaimlerChrysler) Research and Engineering Development, North America
 - Volkswagen of America, Electronics Research Lab
 - Toyota InfoTechnology Center, USA
 - BMW of North America
 - Nissan North America
- **Technical Consultants**
 - California PATH
 - Telvent Farradyne

VII California Test Bed Applications



- Traveler Information (using 511)
- Electronic Payment and Toll Collection
- Ramp Metering
- Cooperative Intersection Collision Avoidance Systems (CICAS)
- Curve Over-Speed Warning
- Auto Industry Applications, such as Customer Relations and Vehicle Diagnostics

VII Calif. Test Bed Infrastructure

- Access to 60 miles of Right-of-Way
 - Three, parallel, 20-mile long North/South routes: US 101; SR 82 (El Camino Real); and I-280
- 14 Road Side Equipment (RSE) sites are installed and operating, with approved FCC licenses
 - Mix of freeway / intersection locations
- 26 more RSE sites have been selected and surveyed
 - Installation of RSEs will continue through September 2008
- Backhaul: wired (T1 lines) and wireless (3G cellular; WiMAX, Municipal WiFi)
 - Communications technology choice is site dependent
- Back End Data Servers
 - “Service Delivery Node” located at the 511 TIC in Oakland
 - IP-based; additional servers can be located anywhere

VII California Test Bed

Southern
Peninsula,
San Francisco
Bay Area



Initial SafeTrip-21 Projects



- “Mobile Millennium”
 - Builds upon the success of the “Mobile Century” Experiment
 - Relies on a “Private Sector” business model
 - Public Sector becomes just another consumer of the traffic data
- “Networked Traveler”
 - A “Gateway” connects the consumer mobile device in the vehicle to roadside infrastructure
 - The Gateway enables new transit services too
 - Several transit agencies are very interested in these services
 - The Public Sector seeks to be the catalyst in triggering additional Private Sector development

Public-Private Partnership



- Public Partners
 - USDOT
 - Caltrans
 - Metropolitan Transportation Commission (MTC)
 - Santa Clara Valley Transportation Authority (VTA)
 - San Mateo County Transit District (SamTrans)
- Private Partners
 - Nokia
 - NAVTEQ
 - Nissan
- Academic Partners
 - California Center for Innovative Transportation (CCIT)
 - Partners for Advanced Transit and Highways (PATH)

Budget



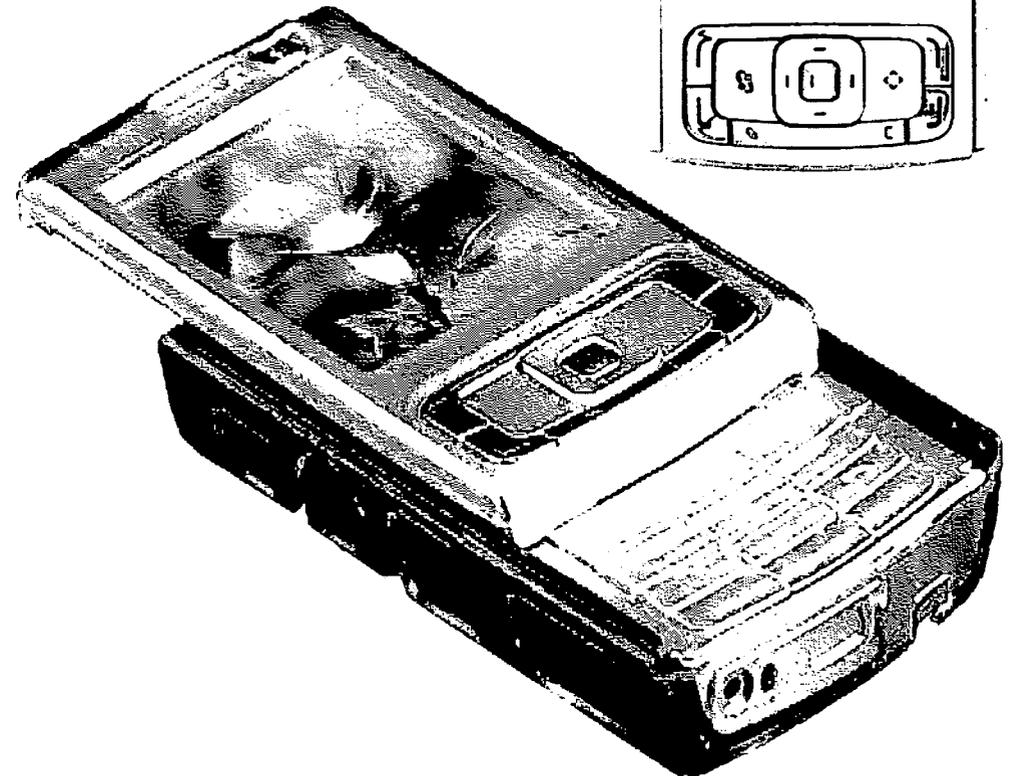
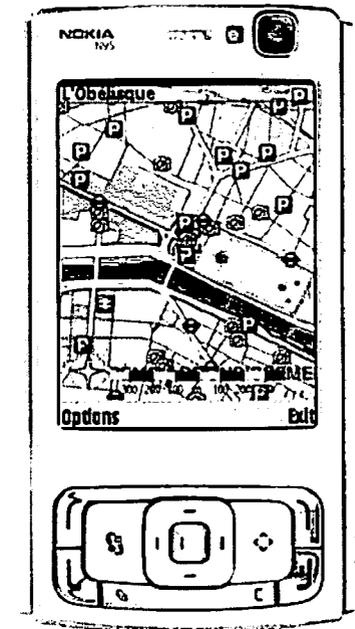
Total Project Budget: \$12.4 million

- Federal Share: \$2.9 million
- Caltrans Share: \$4.2 million
- Nokia Share: \$2.5 million
- NAVTEQ Share: \$2.0 million
- UC Berkeley Share: \$700 thousand
- Nissan Share: \$30 thousand

Convergence of multimedia, sensing and communication



- **N95 is a good example of the convergence of multimedia, sensing, and communication platforms**
 - GPS
 - MP3 and movie player
 - Multiple sensors (accelerometers, tiltmeter, light)
 - Radio, wireless, Bluetooth, various ports, infrared, etc.
 - 5 megapixel camera
- **Smart phones enable:**
 - Location based services
 - Situational awareness
 - Mobility tracking
- **Ubiquitous Sensing Platform (Nokia)**
 - 3 billion mobile devices by 2009
 - 1.5 million devices per day



Mobile Millennium



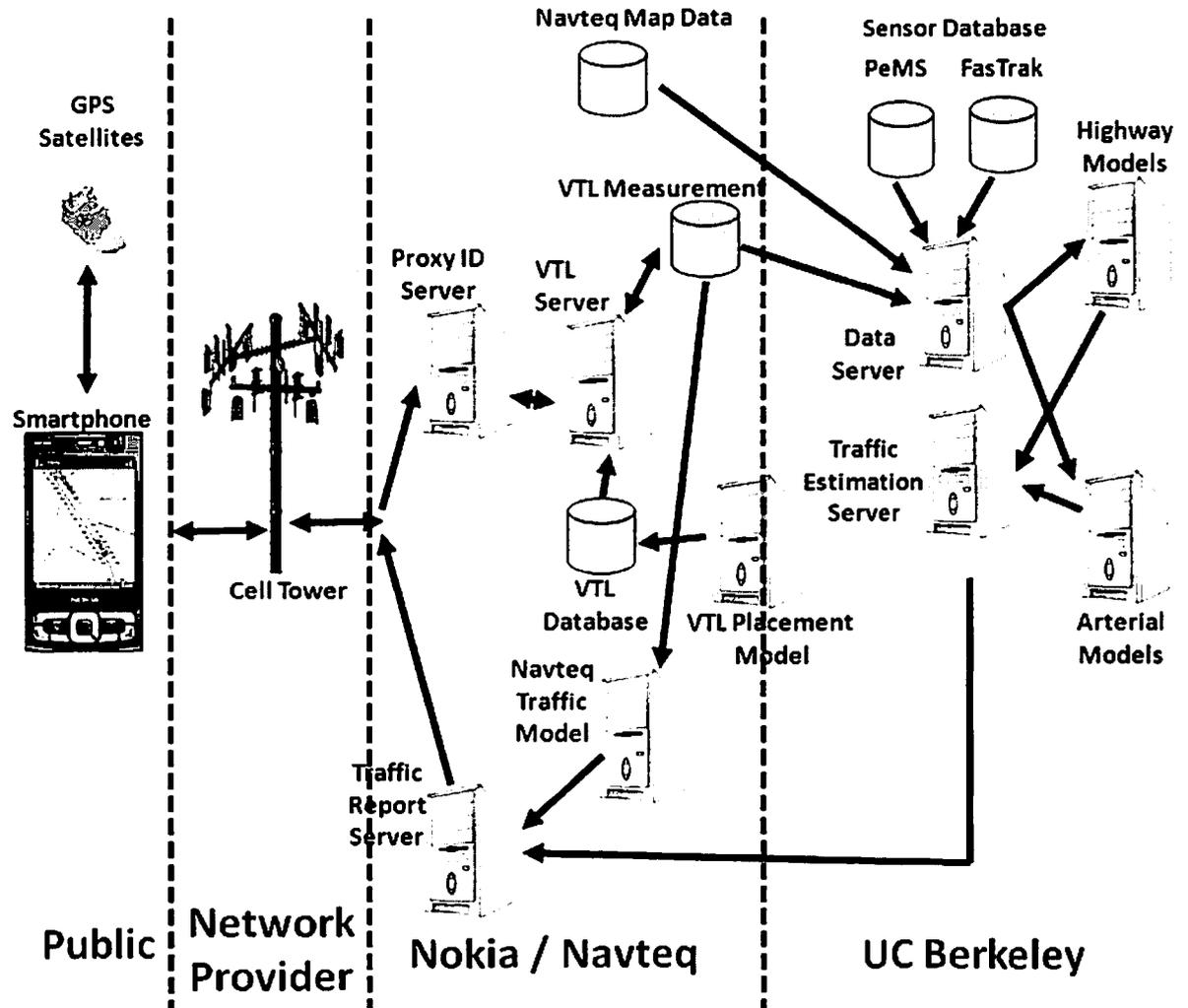
- **Project Description**
 - For a six-month period, equip thousands of cars on a roadway network, including arterials
 - Participating drivers agree to share position and speed data
 - Collect unprecedented traffic data, covering 500+ miles of freeway and arterials
 - Demonstrate the added value of this traffic data on freeways, and especially on arterials that are not currently monitored
 - Drivers receive real-time traveler information through a map application on their phone
 - Demonstrate privacy protection
 - Mobile Millennium is the precursor to a real, mainstream product
- **SafeTrip-21 Demos**
 - ITS World Congress: Live broadcast of Mobile Millennium capabilities, and [tentative] subset of Mobile Millennium technology directly showcased for New York arterial network.

Architecture for global traffic monitoring

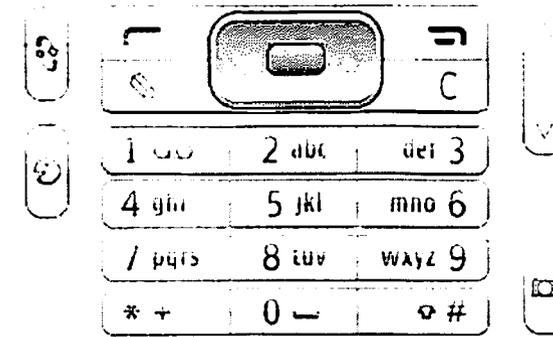
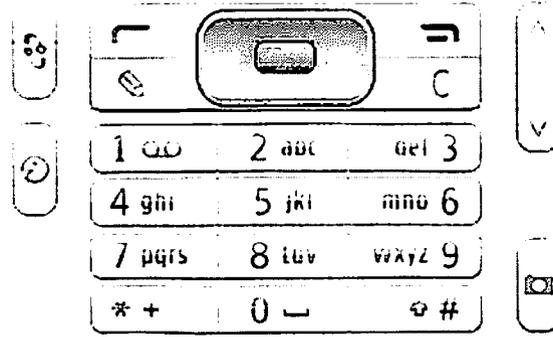
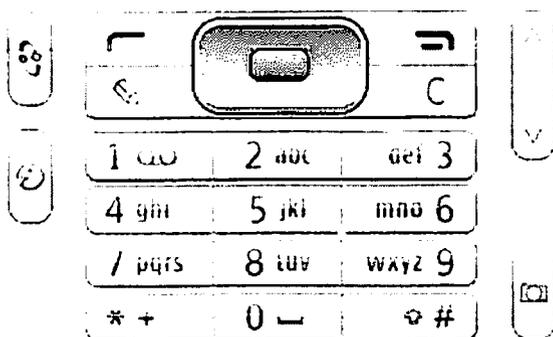
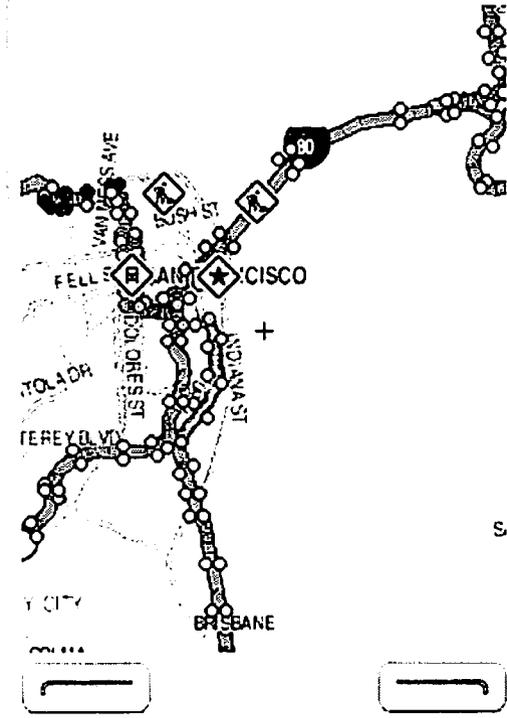
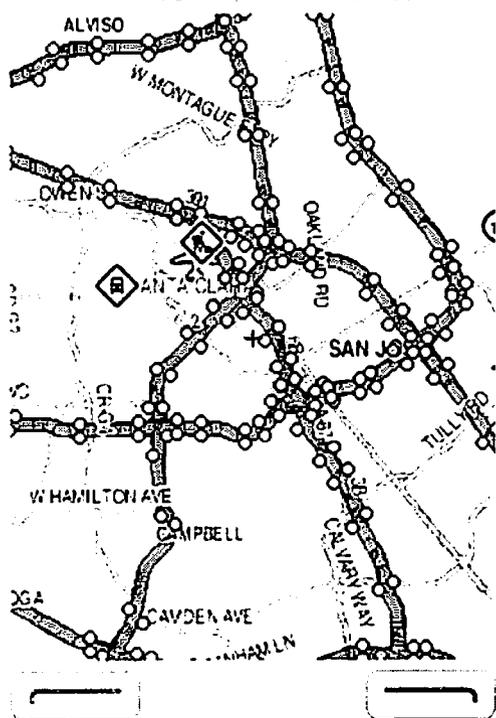


- **Architecture for global traffic monitoring**

- Public (phones)
- Network provider
- Nokia / Navteq
 - Data collection
 - Traffic.com
 - Historical data
 - Maps
- UC Berkeley
 - Highway traffic models
 - Arterial traffic models
 - Travel time, congestion, weather, accidents...



Software client on the phone



<http://traffic.berkeley.edu>

- **Mobile Millennium website**
 - Presentation of the project
 - Background material
 - Videos (previous experiments)
 - Media report (more than 100 entries)
 - CBS, NBC, ABC, CNET, BBC...
 - NPR, KGBO
 - Chicago Tribune, LA Times, San Francisco Chronicle, San Jose Mercury News.
 - More than 100 web outlets.
 - Team, milestones, contact
- **Upcoming**
 - Live data feed
 - Software upload

Mobile Millennium
Using cell phones as mobile traffic sensors

The project News Contact us Partners

What is the Mobile Millennium project?

Announcements
Cutting-Edge Wireless Traffic Technology Wins Support from Feds II

Would you like to volunteer?

Previous experiment success: Mobile Century

Video: Nokia Traffic Watch

EIT NAVTEQ NOKIA Berkeley Engineering

Networked Traveler



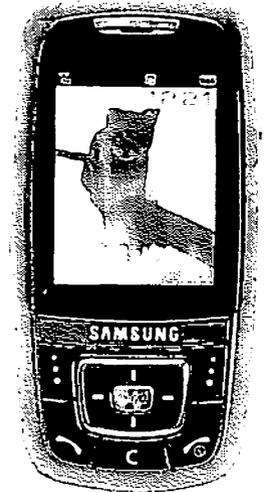
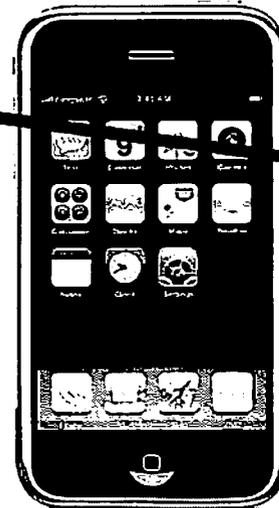
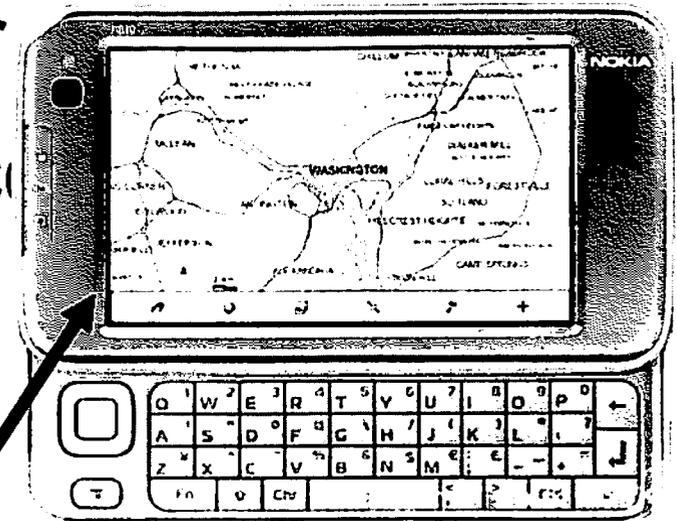
- **Provide real-time traveler information for safety, multi-modal mobility, parking, etc.**
- **Services can be easily downloaded from a web site into a “smart” mobile device**
- **Gateway uses multiple communications modes, such as cell phone network, Wi-Fi, and DSRC, to connect the traveler to the information**
- **Independent of vehicle type**
- **Uses existing VII California Test Bed**

Multi-Network Multi-Device

I want some safety alerts.
Hmm... I want a lot of
transit connection
information, too.



Browser based



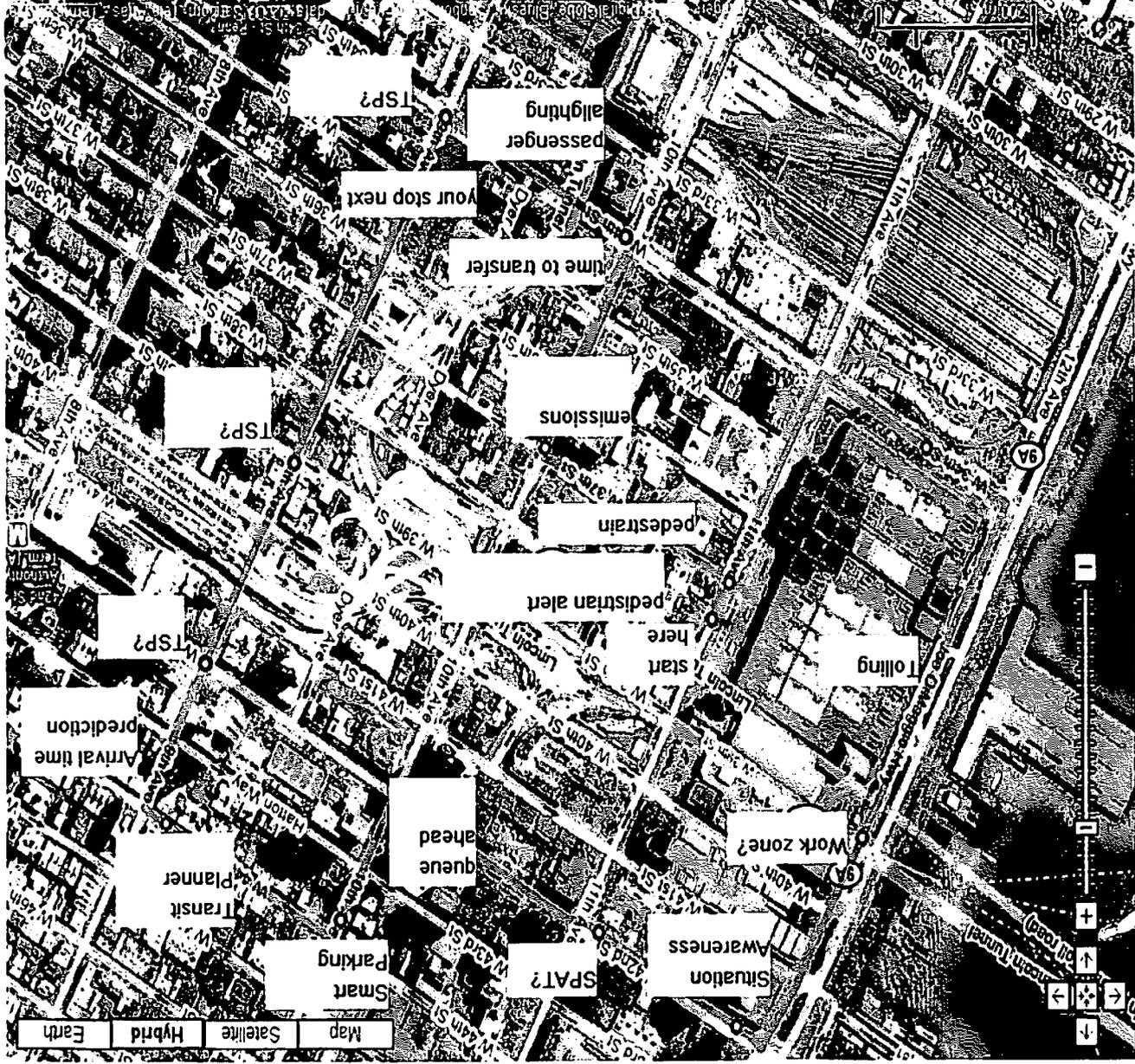
www.connected-traveler.org/tellmeaboutmytrip
www.connected-traveler.org/tellmeabouttheroad
www.connected-traveler.org/watchoutforme

Networked Traveler Services

Will be demonstrated in NYC

- **Tell me about my trip**
 - *Trip Planner (cell phone with Internet connectivity; multimodal services)*
 - *Dynamic Route Advisory*
- **Tell me about the road**
 - *Traffic Signal Countdown (as a safety and information enabler)*
 - *Public Signage – Situational Awareness*
 - *Pedestrian Assistant (location and other apps)*
- **Watch out for me!**
 - *Heartbeat/watch out for me (confederate driver near the bus; situational awareness, left/right?)*
 - *Pedestrian Assistant (safety apps)*
- **System Operator / Agency Applications**
 - *Transit Signal Priority (LCD on bus with signal phase countdown)*
 - *Dynamic Passenger Information (On-board display, arrival countdown, and bus station, arrival time)*

Marker	Latitude	Longitude	Distance
	40 -58020	-4.000330	0
11th Ave	40 -56450	-4.003580	439
12th Ave RT-9A	40 -60040	-4.002580	507
W 42nd St	40 -61-60	-4.000680	289
W 42nd St	40 -60890	-3.998580	202
W 42nd St	40 -59-30	-3.995-10	2-6
10th Ave	40 -60-60	-3.994660	166
W 44th St	40 -598-0	-3.992020	265
9th Ave	40 -58410	-3.992620	200
9th Ave	40 -565-1	-3.9939-1	234
9th Ave	40 -53420	-3.996280	402
W 34th St	40 -54530	-3.999010	266
10th Ave	40 -56440	-3.99-800	249
W 37th St	40 -57690	-4.000580	2-9

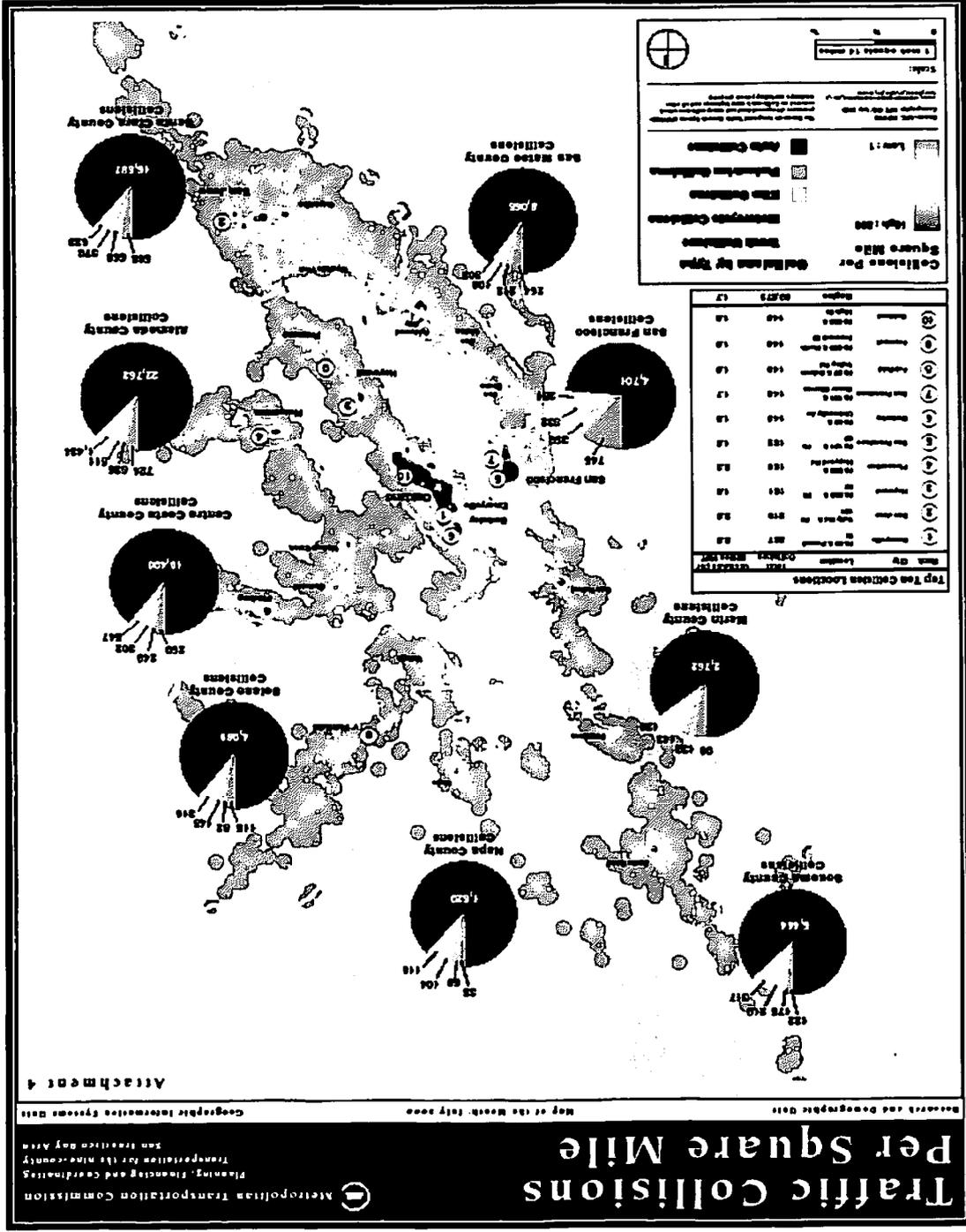




Traveler

Next Year:

Field Test and
Evaluation of
Safety
(Situational
Awareness)
and Mobility in
Applications in
the San
Francisco Bay
Area

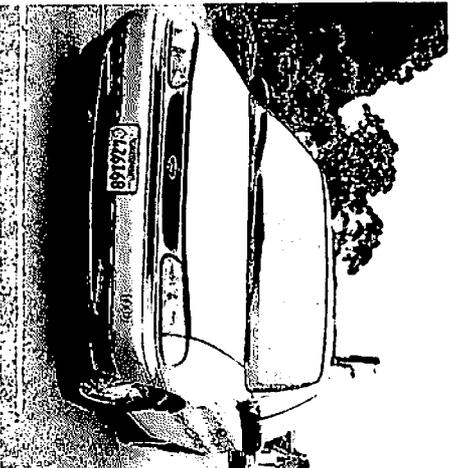
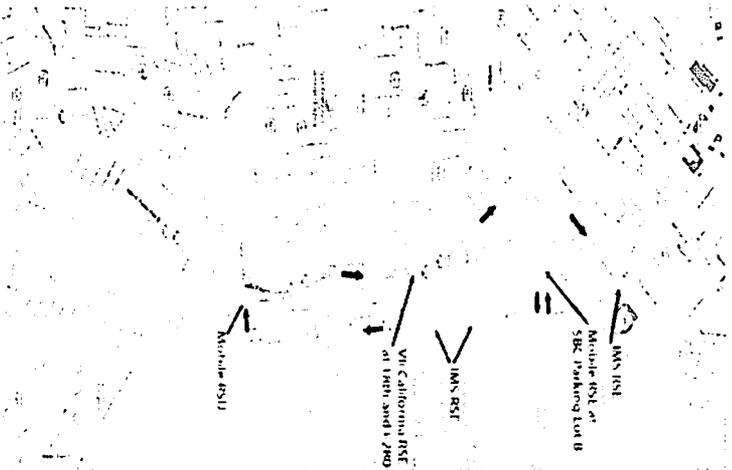




Thank You!

Please refer to:

viicalifornia.org



Caltrans Improves Mobility Across California

Multi-Network Gateway



- Gateway has Wi-Fi and DSRC radio interfaces
- Also has Bluetooth interface to cell phones

