



california center for innovative transportation

UNIVERSITY OF CALIFORNIA, BERKELEY

November 10, 2008



institute of transportation studies
ITS



NOKIA
Connecting People

NAVTEQ

SafeTrip-21
Innovation for a Nation on the Move

iTRIS
Center for Information Technology
Research in the Interest of Society

Objectives at a glance:

Build and launch a new cell-phone-based traffic monitoring system.

Announce free downloadable traffic information software for the public.

Teach the public about how the system works, including the software interface and state-of-the-art privacy protections.

Collecting Traffic Data from Mobile Probes

The potential of cell phones to operate as traffic data collection devices has been considered by the Intelligent Transportation Systems (ITS) community for several years.

Government agencies currently deploy networks of infrastructure-based traffic sensors that are expensive to install and maintain. Leveraging the existing infrastructure of commercial cellular networks could drastically cut the ongoing costs of

traffic monitoring and expand coverage to thousands of miles of highways and urban arterials for which sensors are not currently a viable option. On February 8, 2008, Nokia and the University of California, Berkeley demonstrated the reconstruction of traffic on highways using cell phones by running an experiment, nicknamed *Mobile Century* for its 100 cars traveling in 10-mile loops on I-880 for 8 hours, which amounted to

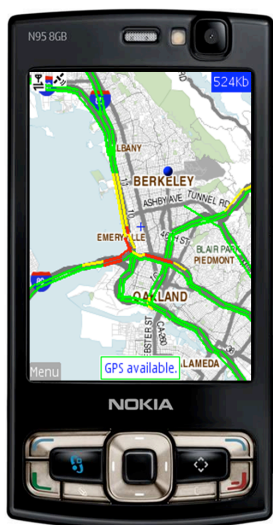
2% of traffic. During the experiment, GPS-equipped Nokia N95 phones sent traffic information in a privacy-protecting system capable of broadcasting traffic information in real time on the internet. The successful experiment, funded by the California Department of Transportation (Caltrans), led to the development of a pilot system, called *Mobile Millennium*, to make this technology available to the public.

What is Mobile Millennium?

The project is a partnership between Nokia, NAVTEQ, and UC Berkeley, based at the California Center for Innovative Transportation (CCIT) and supported by the U.S. and California Departments of Transportation through the SafeTrip-21 initiative. Researchers have constructed an unprecedented traffic monitoring system capable of fusing GPS data from cell phones with data from existing traffic sensors. The research and develop-

ment phase of this project was dubbed *Mobile Millennium* for the potential thousands of Early Adopters who will participate in the pilot deployment, launching November 10, 2008 and running for approximately six months. *Mobile Millennium* will cover not only highways, but also the arterial network, where there is currently almost no sensing infrastructure. The software will work on Nokia and non-Nokia phones, and the public will be able to download it

free of charge. It will gather data in a privacy-preserving environment, relying on *Virtual Trip Lines* technology, a data-sampling paradigm that anonymizes the GPS-based position information and aggregates it into a single data stream. The aggregated data is then encrypted and sent to a computer system, which blends it with other sources of traffic data and broadcasts this real-time, data-rich information back to the phones and to the internet through a user-friendly interface.





Pilot traffic software will be launched November 10, 2008. It will be free to the public at <http://traffic.berkeley.edu>.

Which phones work?

On November 10, only Nokia and non-Nokia mobile phones and devices that support Java applications and use GSM carriers (AT&T and T-Mobile) are compatible. Unlimited data plans are recommended.

New phones and plans will be added regularly. A phone list on the website will be regularly updated with additions.

Launching the System

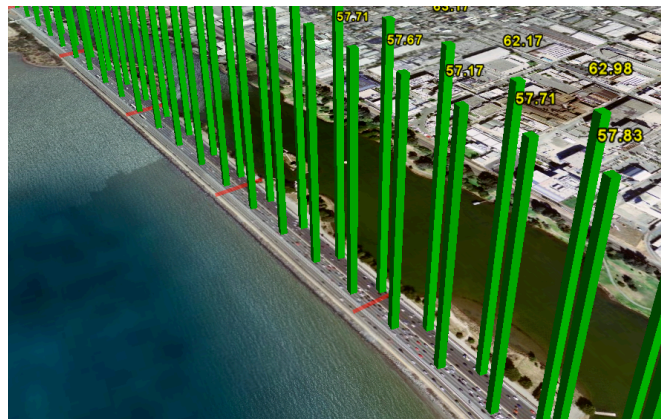
The launch of Mobile Millennium, including free software for the public, will be announced at a special preview event at UC Berkeley on November 10. Leaders from transportation, government, and academia will present information about the technology and how it works to an audience of invited Early Adopters, the media, and live webcast viewers. Following this brief presentation, guests will be invited to download the software and drive off as the

first mobile probes in the system. The free download will become available to the general public just before midnight on launch day. It will focus on users with compatible smart phones who drive between the Bay Area and the Lake Tahoe ski area, though all Bay Area residents with smart phones or internet access will be able to receive traffic information that includes probe data. The first phase of the system launch will include traffic data for

highways. Information on arterial routes will be introduced as more and more users come online and sufficient probe data becomes available. By April 2009, researchers expect to reach the estimated pilot system capacity of 10,000 users. The system's breakthrough arterial coverage capabilities will be demonstrated live in New York City on November 18, 2008, at the 15th World Congress on Intelligent Transportation Systems.

Getting the Word Out

- The launch event will be webcast live by the Center for Information Technology Research in the Interest of Society (CITRIS) at 8:30 am on <mms://media.citris.berkeley.edu/webcast>.
- The webcast will be posted online as an informational guide for the public.
- The media will be invited to preview the software.
- The public can get phone compatibility and other project information at <http://traffic.berkeley.edu>.



A Google Earth rendering of collected GPS data. Virtual trip lines measuring speed upon crossing of the vehicles are shown in red.

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Live webcast at 8:30am Nov. 10 at <mms://media.citris.berkeley.edu/webcast>