Trends in Transportation:

The Future of GIS in Smart Transportation

Terry Bills

Current Trends in Transportation

Change and Disruption

- **Decline in Auto Ownership by Millennials**
- **New Means of Transport (Transportation Network Companies - TNCs)**
- **Growth (but also dissatisfaction) in Public Transport**
- **Increasing Congestion in Cities**

Smart Cities Challenge

Requires Solving our Transportation and Mobility Issues

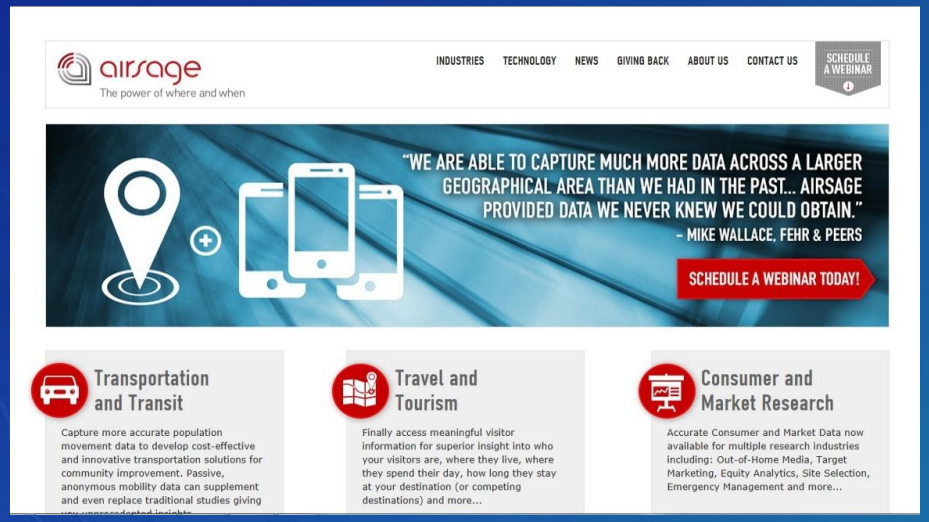
Opportunities in Transportation

To Address Change and Disruption

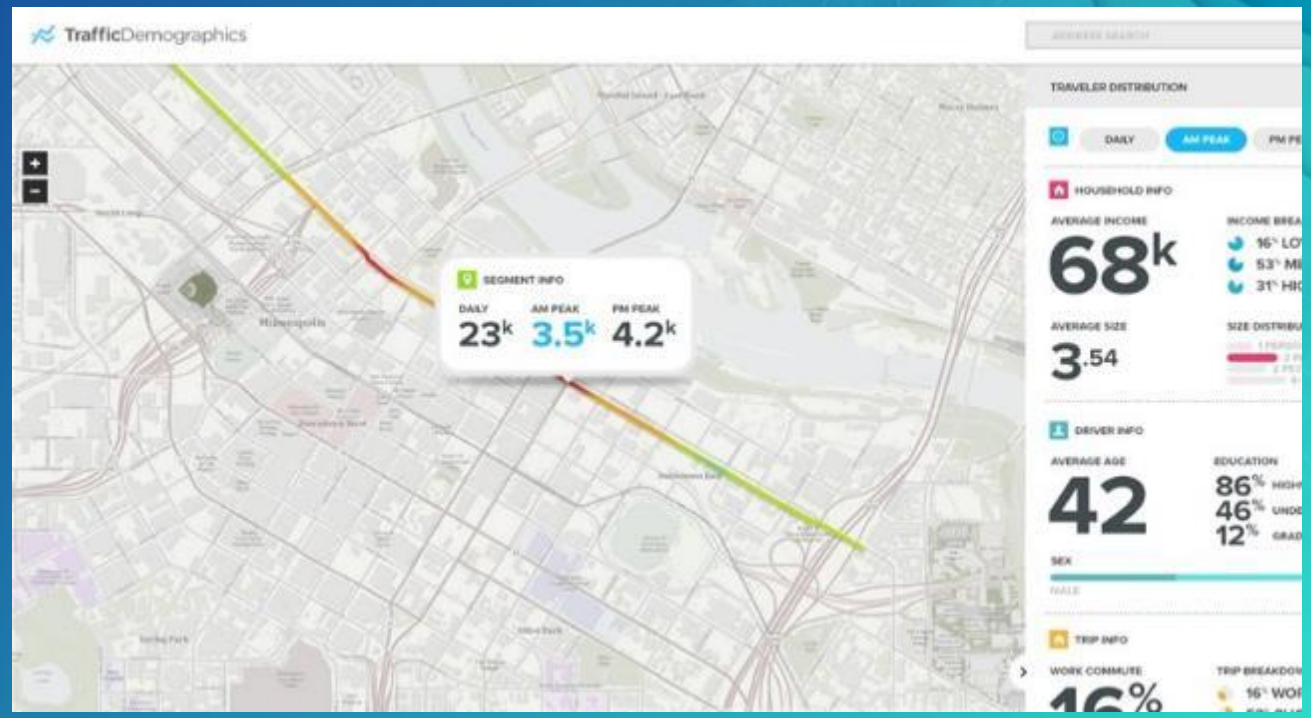
- **New Data Sources to Better Understand Mobility Patterns**
- **Big Data Analytics and Spatial Analysis**
- **Breaking Down the Silos**
- **“Smart Cities / Smart Transportation”**

New Data Sources

Leveraging Cellular Data for Travel Information



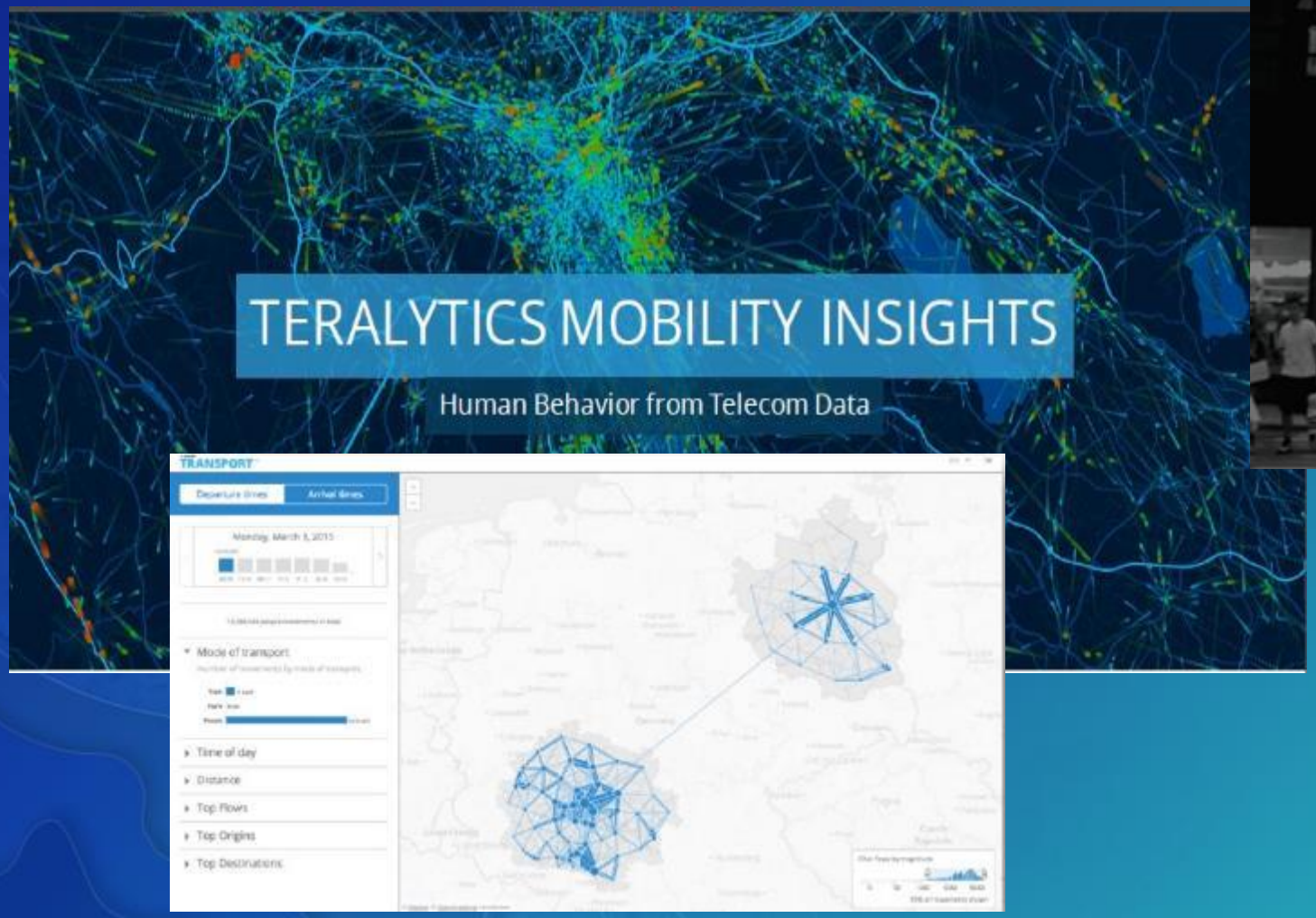
- **AirSage Cellular Tracking Data**

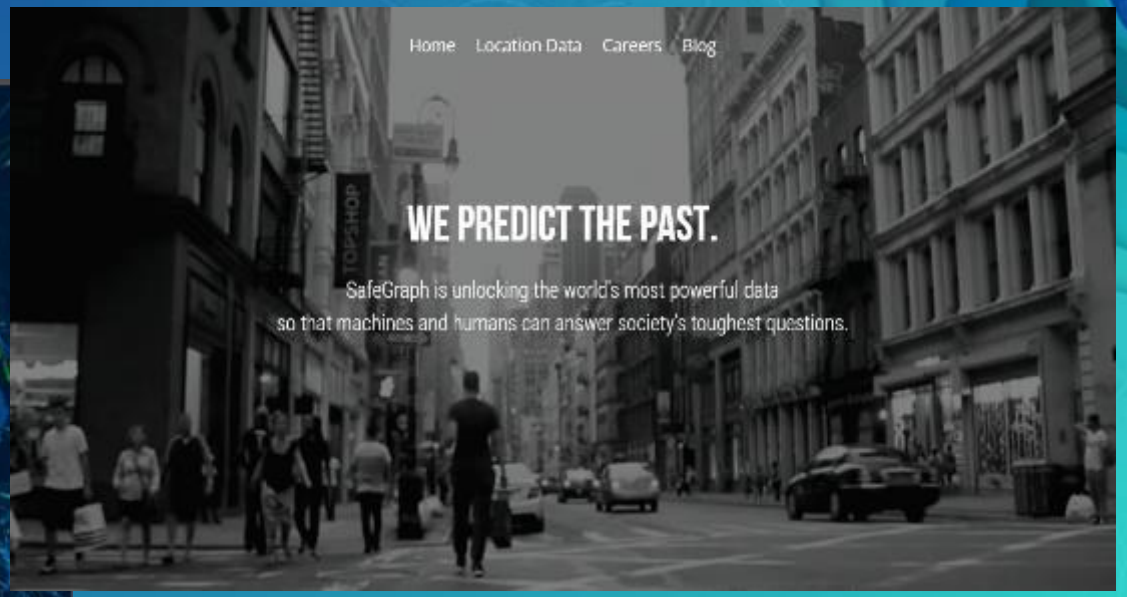


Citilabs Streetlytics Demographic data

New Data Sources

Leveraging Cellular Data for Travel Information





SafeGraph

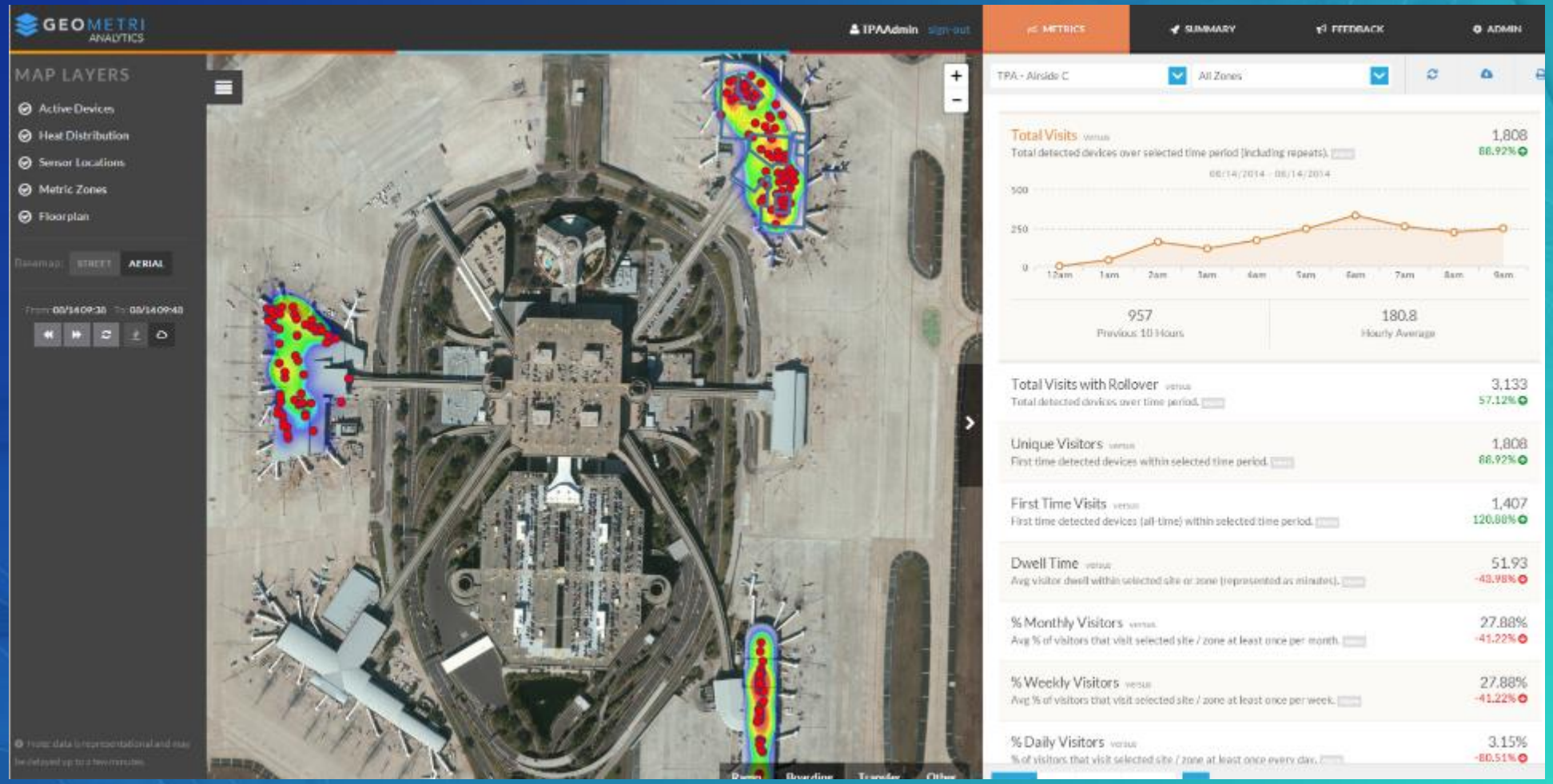
New Data Sources

Leveraging Cellular Data for Travel Information

- **Twitter Posts**
- **Indoor (Bus) Tracking with Wi-Fi and Bluetooth**
- ***"We are just beginning to understand how we can use the technology for understanding consumer behavior."***
- ***Josh Kavangh U of Washington***

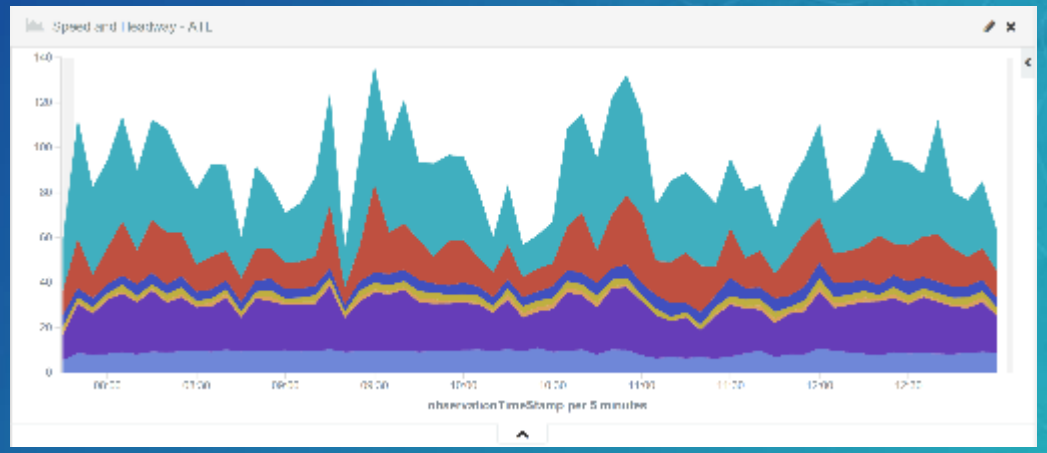
New Data Sources

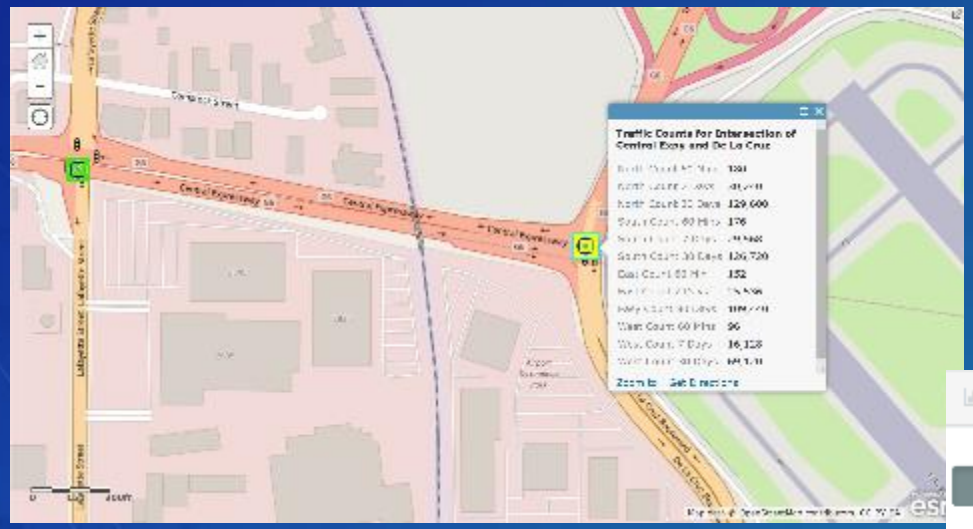
Leveraging Cellular Data for Travel Information



New Data Sources

Leveraging Traffic Cameras for Real Time Counts and Speed Data





4 Way Traffic Counts from Traffic Camera

Speed and Count - ATL

Table | Request | Response | Statistics

observationTimeStamp per 10 minutes	Count	Average speed
October 1st 2016, 03:30:00.000	73	10.247
October 1st 2016, 03:40:00.000	175	9.949
October 1st 2016, 03:50:00.000	194	9.985
October 1st 2016, 04:00:00.000	174	10.77
October 1st 2016, 04:10:00.000	203	9.872
October 1st 2016, 04:20:00.000	211	10.498
October 1st 2016, 04:30:00.000	220	11.373
October 1st 2016, 04:40:00.000	213	11.089
October 1st 2016, 04:50:00.000	277	10.838
October 1st 2016, 05:00:00.000	275	11.589

"MetroTech converted our traffic cameras into 24 x 7 count stations, providing us with enhanced traffic data. From this data, we were able to improve our signal timing, mitigating overall congestion."

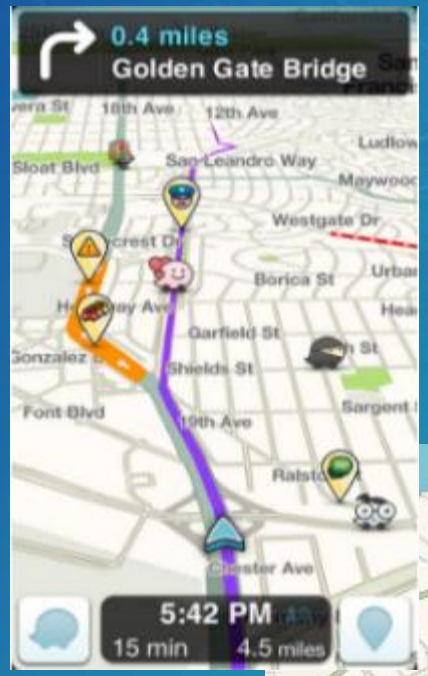
Ananth Prasad Senior Civil Engineer County of Santa Clara

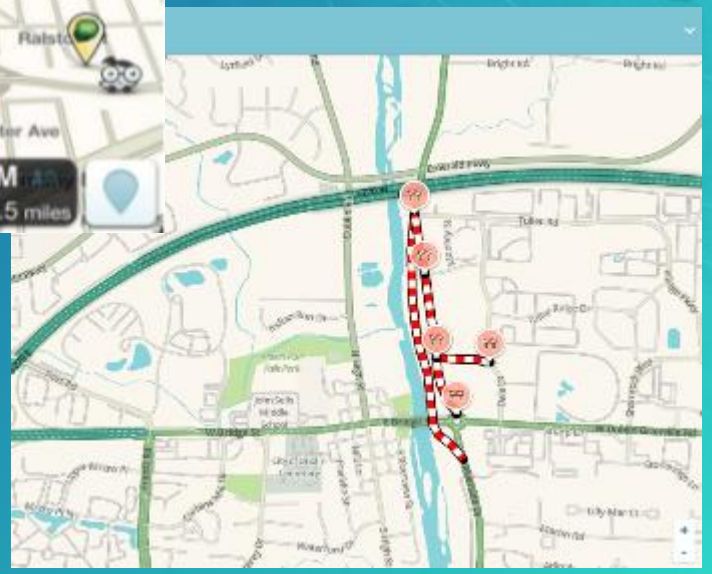
Metrotech

Leveraging Crowd Sourcing

Every Citizen is a Sensor

Waze Partnership





Understanding Big Data

- **Sensor Information and Big Data: generating massive amounts of data**
- **Three V's of Big Data: Volume, Velocity and Variety: the sheer amount, the speed, and the different types of data**
- **Magnifies the problem of understanding and context**

Smart GIS Embeds Advanced Analytics and Visualization

Providing a System of Insight

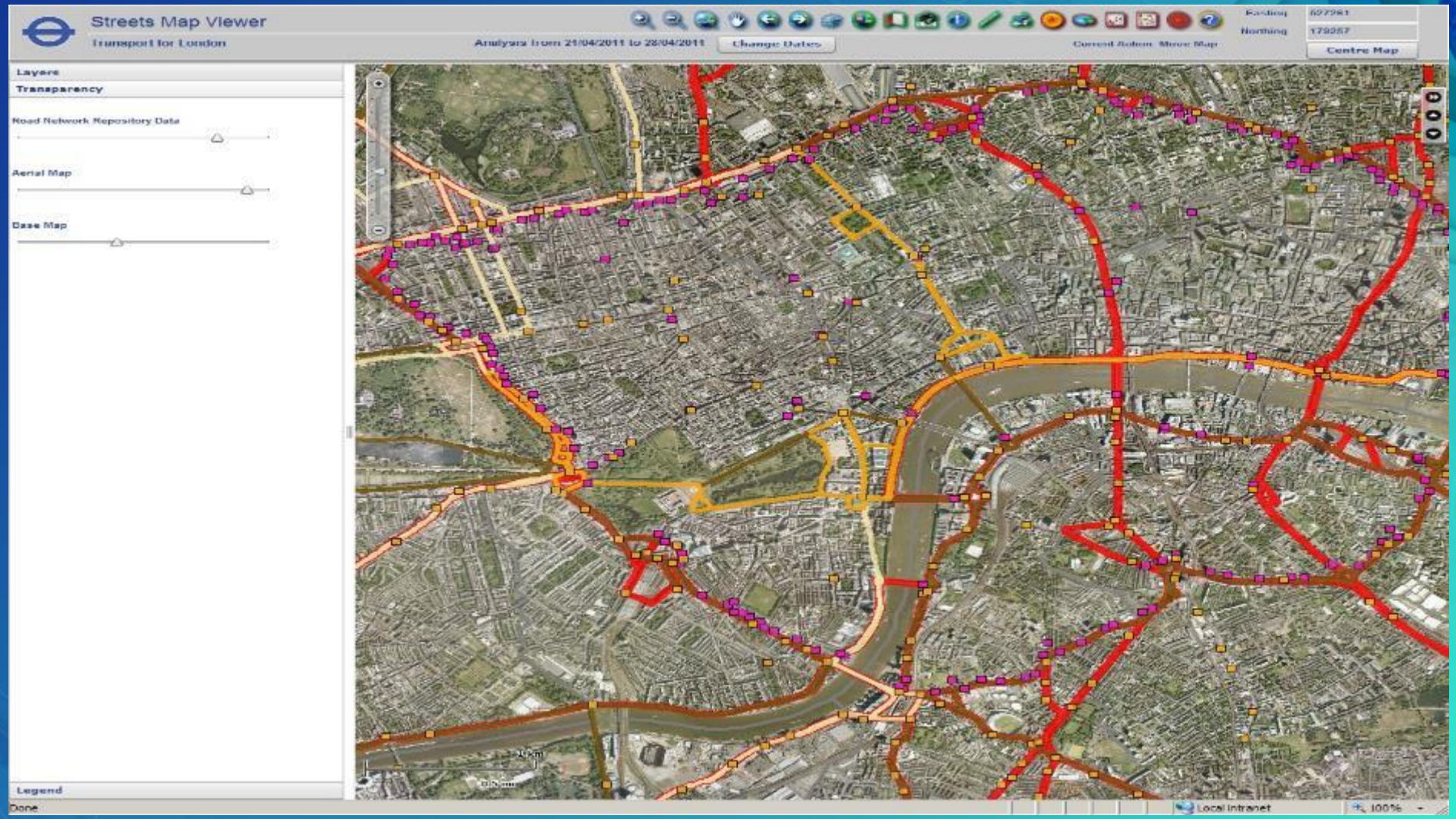
Real-Time

Integrating Sensor Networks and the IoT

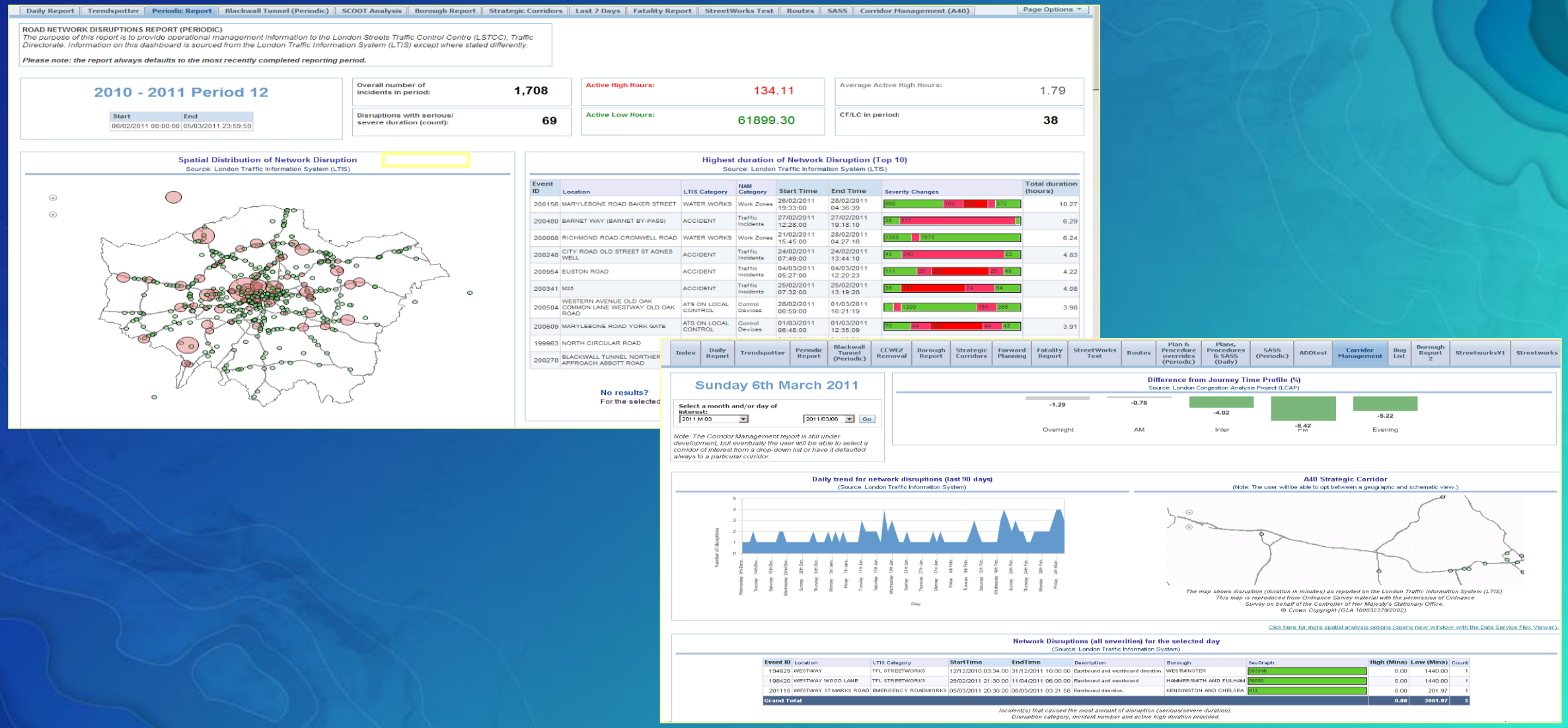
- High-Velocity Data Streams
- Monitoring and Alerting
- Dynamic and Big Data Analytics

Supporting Real-Time GIS Applications . . .
. . . Enabling Smarter Organizations

Big Data Analysis

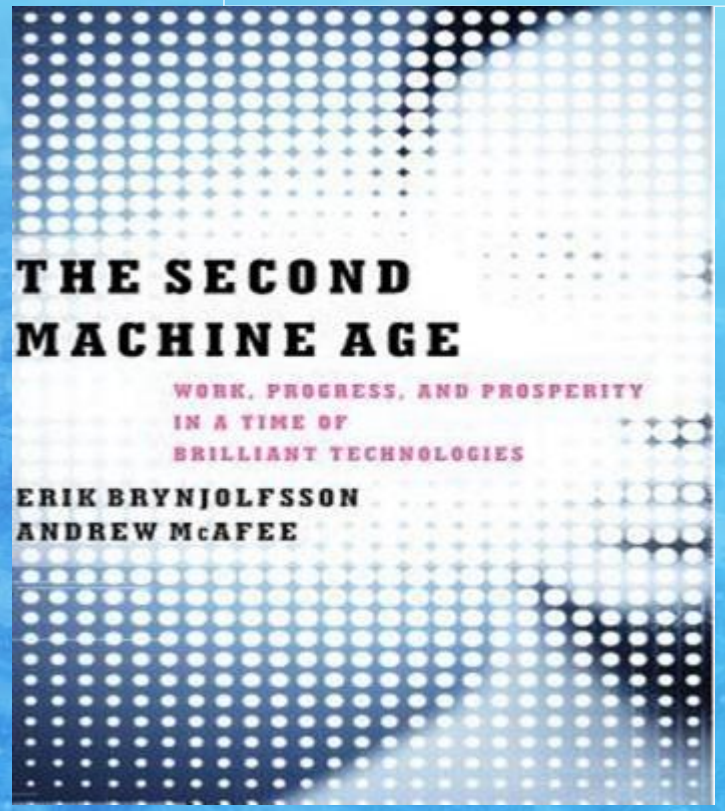


Big Data Analysis

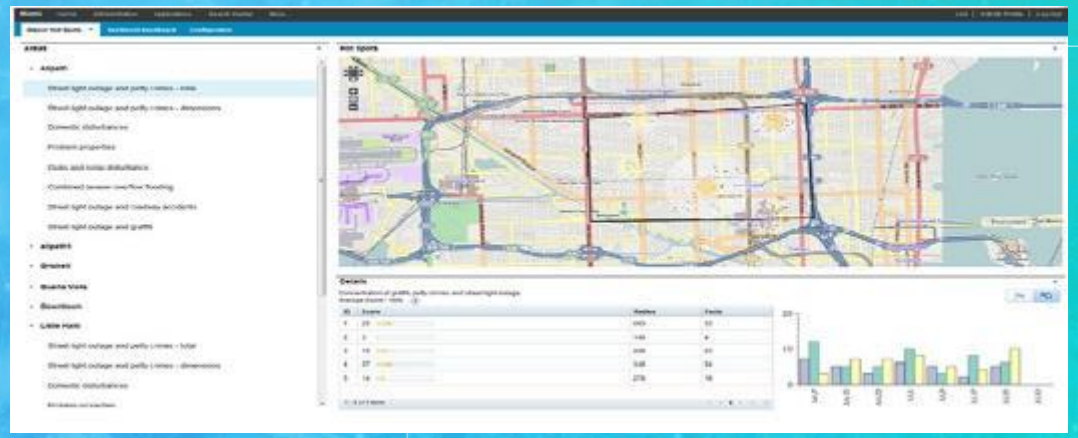


Big Data Trends

Leveraging GIS and Big Data Analysis



Adaptive Signal Control Systems
Connected Vehicle
Intelligent Operations Center



Everything is Driven by Location

Connected Vehicles

Car Insurance

Parking Fees and Management

Toll Collection Systems

Mobility

Transit Accessibility

Metropolitan Policy Program at BROOKINGS

METROPOLITAN INFRASTRUCTURE INITIATIVE SERIES AND METROPOLITAN OPPORTUNITY SERIES

Missed Opportunity:
Transit and Jobs in Metropolitan America

Adie Tomer, Elizabeth Kneebone, Robert Puentes, and Alan Berube

"As states and regions strive to put Americans back to work, policymakers should be careful not to sever the transportation lifelines between workers and jobs."

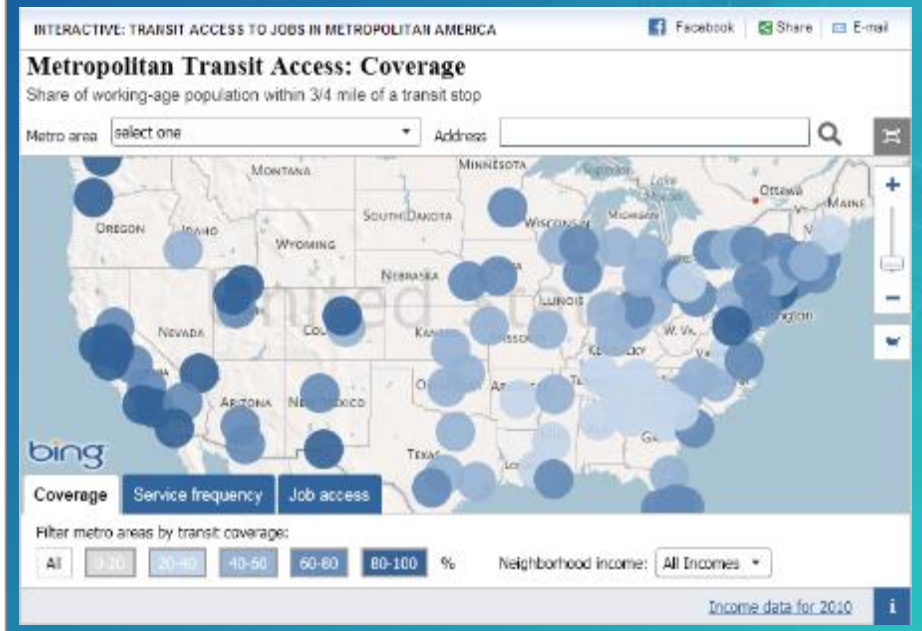
Findings

An analysis of data from 371 transit providers in the nation's 100 largest metropolitan areas reveals that:

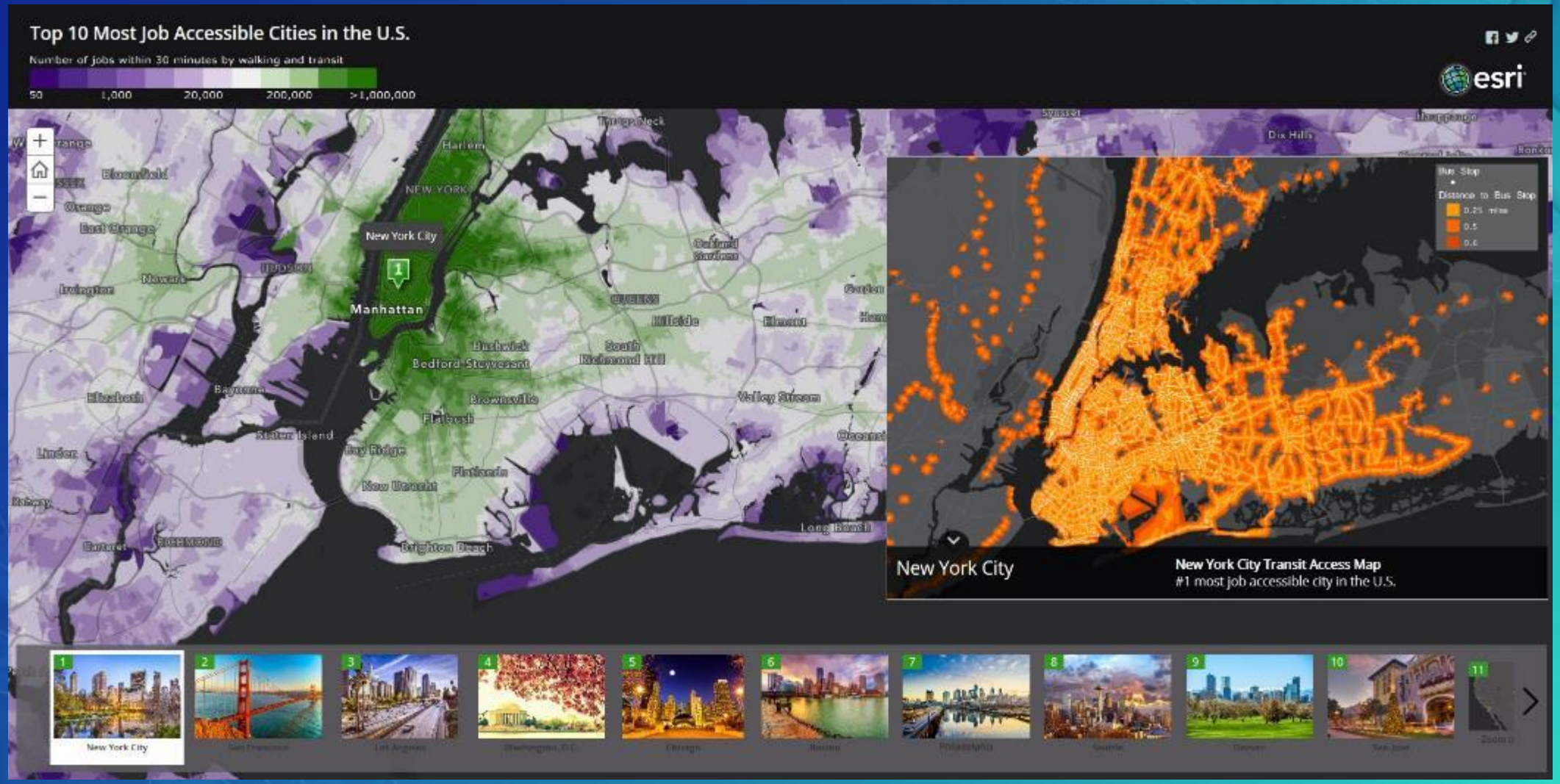
- **Nearly 70 percent of large metropolitan residents live in neighborhoods with access to transit service of some kind.** Transit coverage is highest in Western metro areas such as Honolulu and Los Angeles, and lowest in Southern metro areas such as Chattanooga and Greenville. Regardless of region, residents of cities and lower-income neighborhoods have better access to transit than residents of suburbs and middle/higher-income neighborhoods.
- **In neighborhoods covered by transit, morning rush hour service occurs about once every 10 minutes for the typical metropolitan commuter.** In less than one quarter of large metro areas (23), however, is this typical service frequency, or "headway," under 10 minutes. These include very large metro areas such as New York, Los Angeles, Houston, and Washington. Transit services city residents on average almost twice as frequently as suburban residents.
- **The typical metropolitan resident can reach about 30 percent of jobs in their metropolitan area via transit in 90 minutes.** Job access differs considerably across metro areas, from 60 percent in Honolulu to just 7 percent in Palm Bay, reflecting variable transit coverage levels and service frequencies, and variable levels of employment and population decentralization. Among very large metro areas, the share of jobs accessible via transit ranges from 37 percent in Washington and New York to 16 percent in Miami.
- **About one-quarter of jobs in low- and middle-skill industries are accessible via transit within 90 minutes for the typical metropolitan commuter, compared to one-third of jobs in high-skill industries.** This reflects the higher concentration of high-skill jobs in cities, which are uniformly better served by transit. It also points to potentially large accessibility problems for workers in growing low-income suburban communities, who on average can access only about 22 percent of metropolitan jobs in low- and middle-skill industries for which they may be most qualified.
- **Fifteen of the 20 metro areas that rank highest on a combined score of transit coverage and job access are in the West.** Top performers include metro areas with noted transit systems such as New York, Portland, San Francisco, and Washington, but also Salt Lake City, Tucson, Fresno, and Las Vegas. Conversely, 15 of the 20 metro areas that rank lowest are in the South.

These trends have three broad implications for leaders at the local, regional, state, and national levels. Transportation leaders should make access to jobs an explicit priority in their spending and service decisions, especially given the budget pressures they face. Metro leaders should coordinate strategies regarding land use, economic development, and housing with transit decisions in order to ensure that transit reaches more people and more jobs efficiently. And federal officials should collect and disseminate standardized transit data to enable public, private, and non-profit actors to make more informed decisions and ultimately maximize the benefits of transit for labor markets.

BROOKINGS | May 2011



Transit Accessibility



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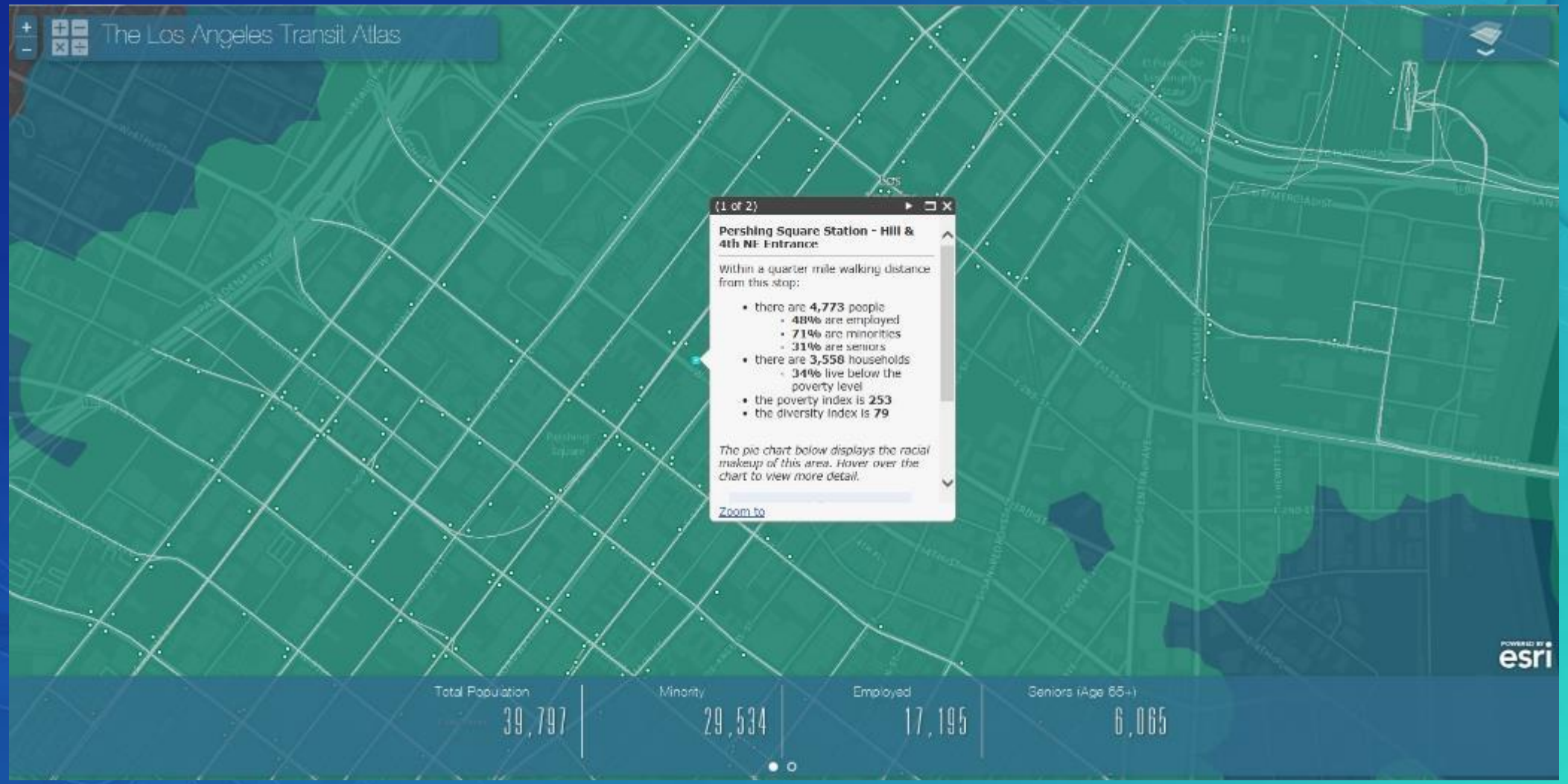

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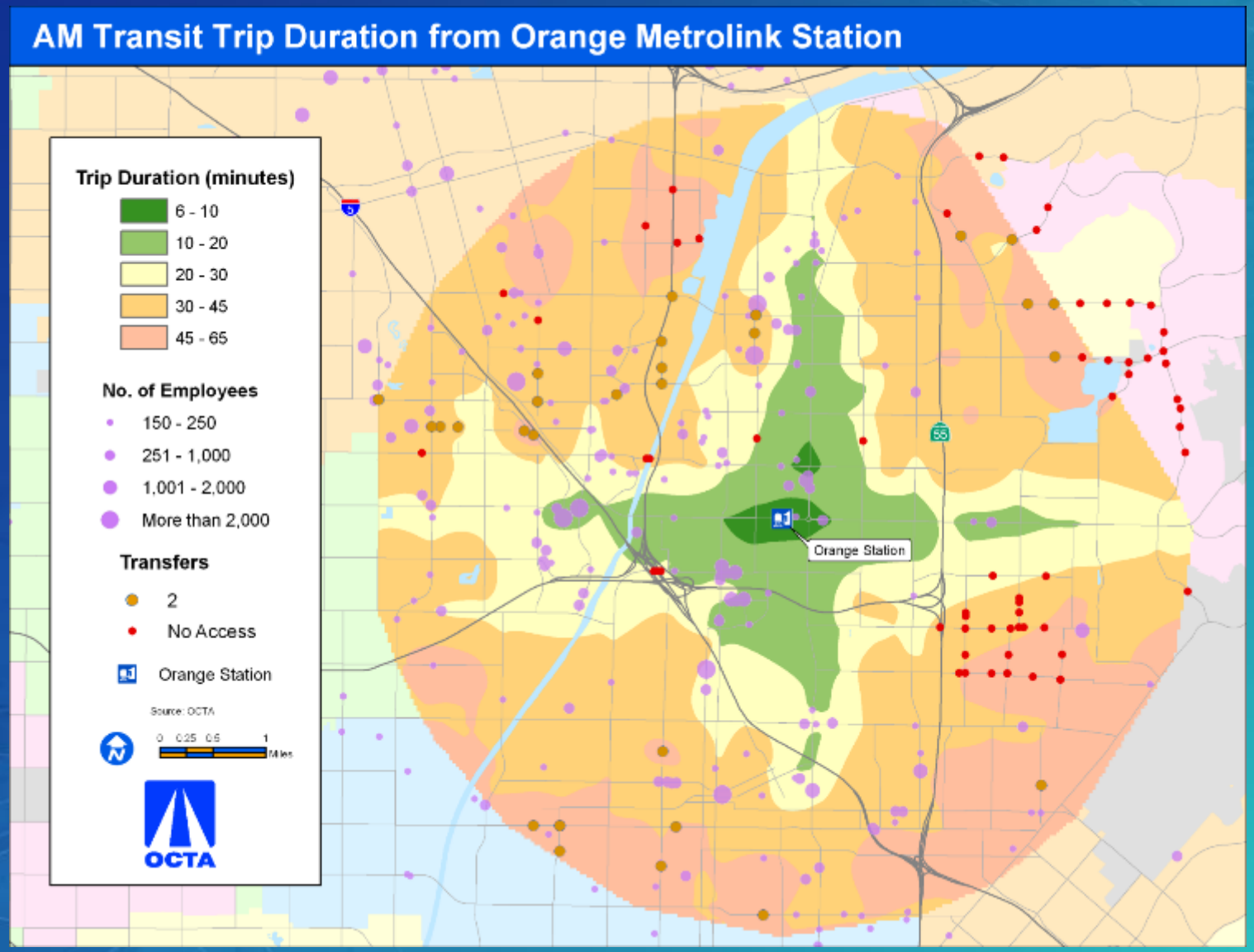
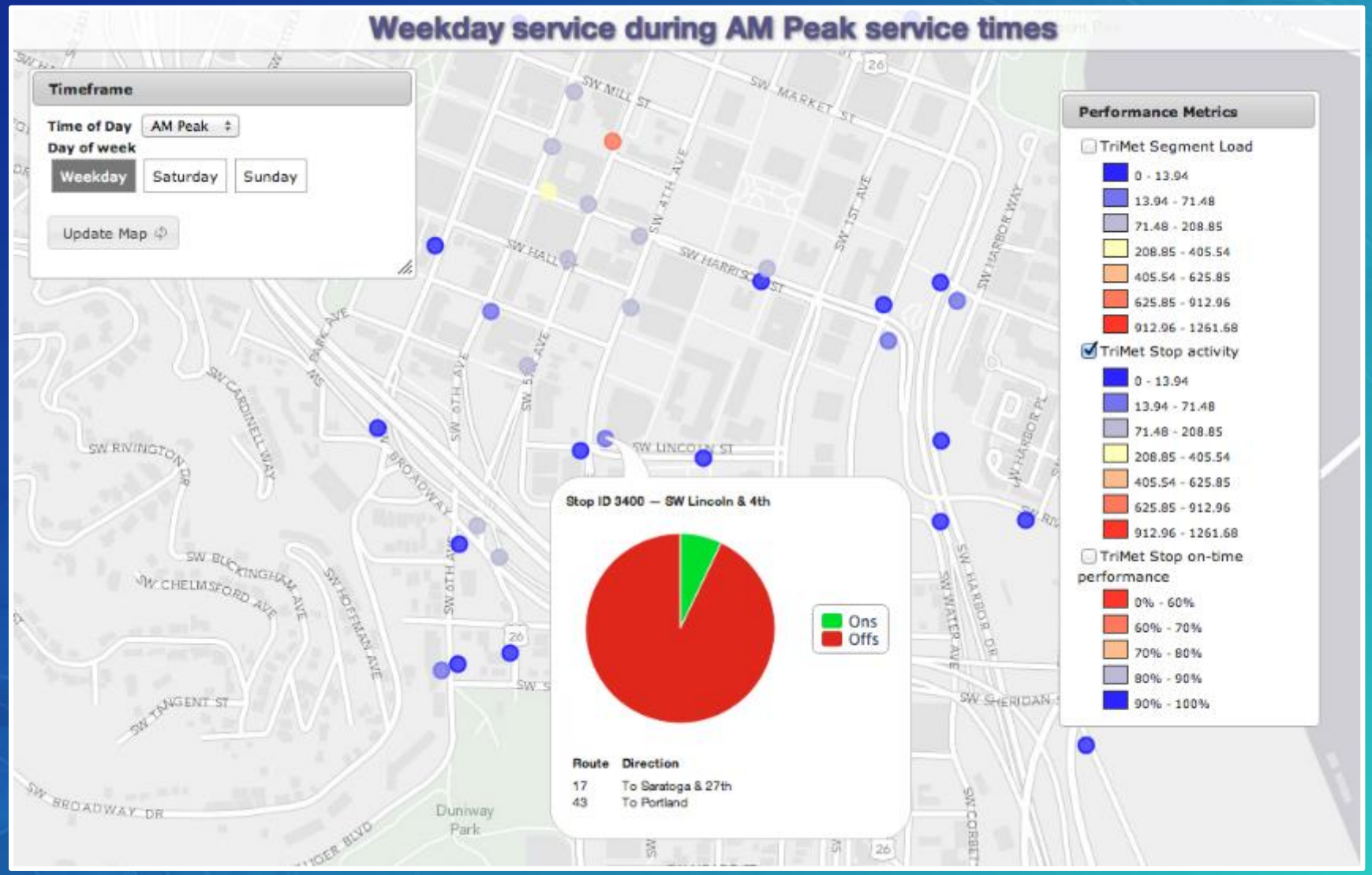


Performance Monitoring



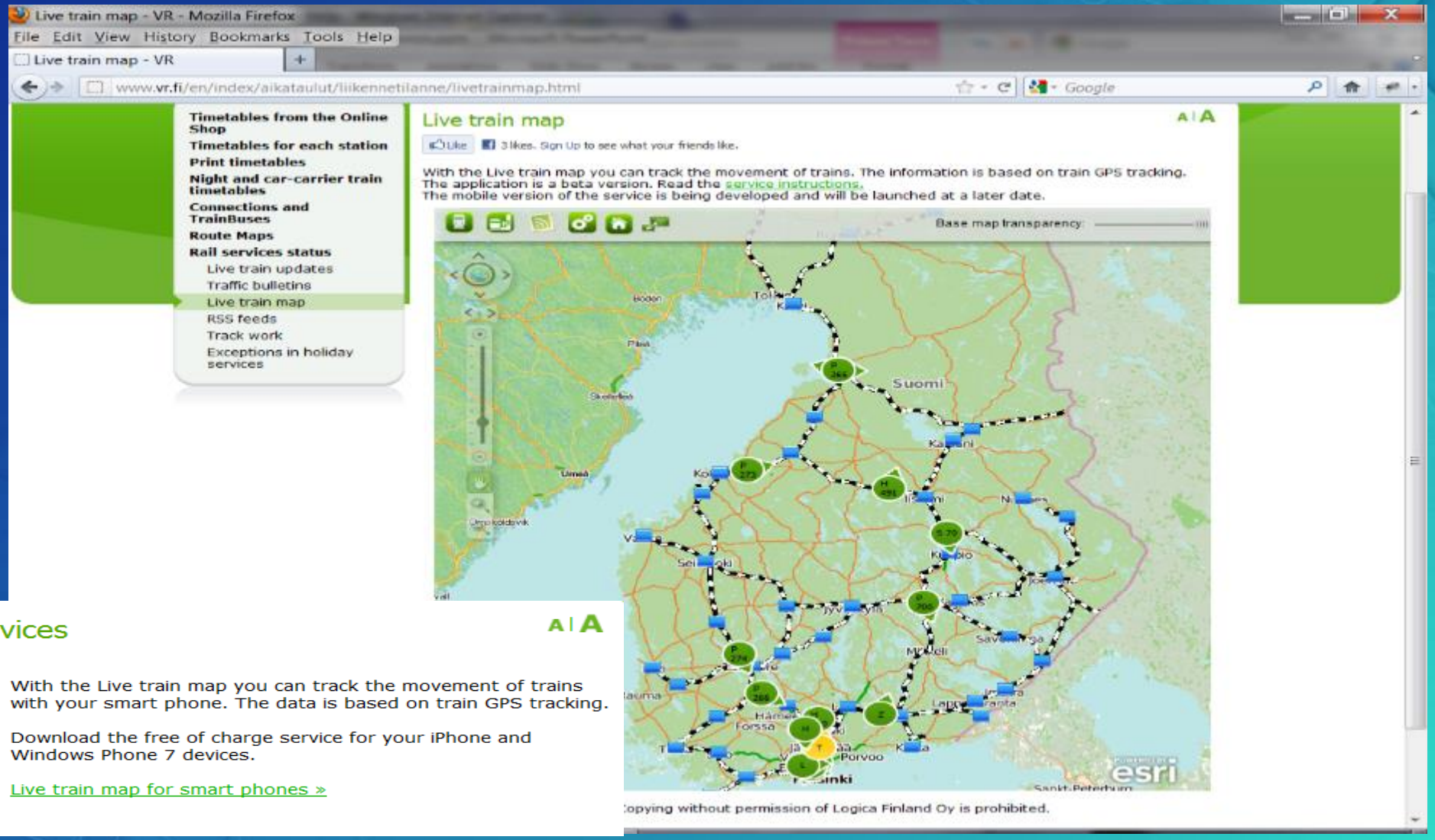
Real Time Performance Monitoring: Spain

Real Time Data: Madrid

Last Search
PLAZA CIBELES 1

Line	Destination	Next bus
N4	BARAJAS	9min >> +20 min
N1	SANCHINARRO	9min >> +20 min
N24	LAS TABLAS	9min >> +20 min
N22	BARRIO DEL PILAR	9min >> +20 min
N25	ALONSO MARTINEZ	+20 min+20 min
N26	ALONSO MARTINEZ	+20 min+20 min

Real Time Data: Finland



VR mobile services

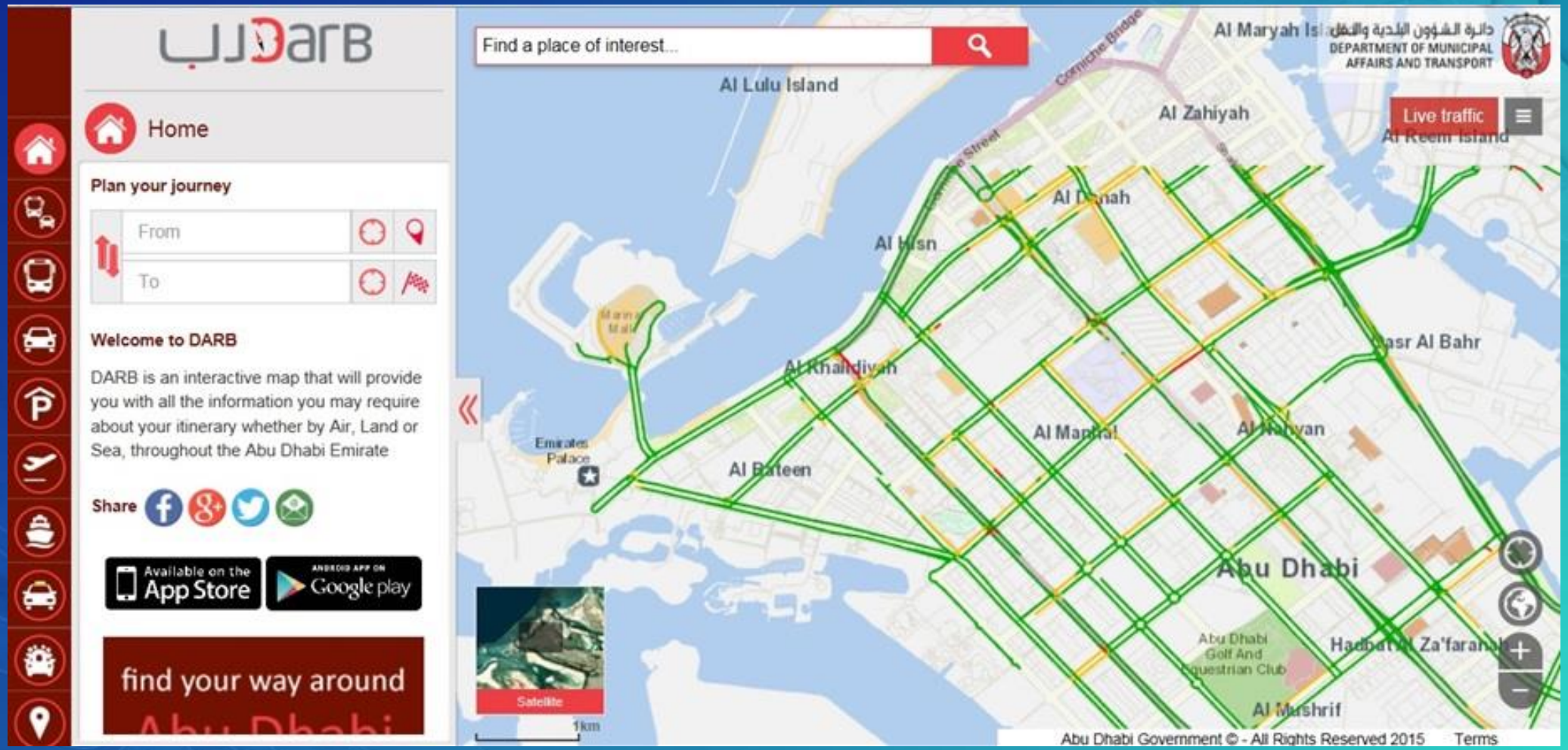
Live train map

With the Live train map you can track the movement of trains with your smart phone. The data is based on train GPS tracking.

Download the free of charge service for your iPhone and Windows Phone 7 devices.

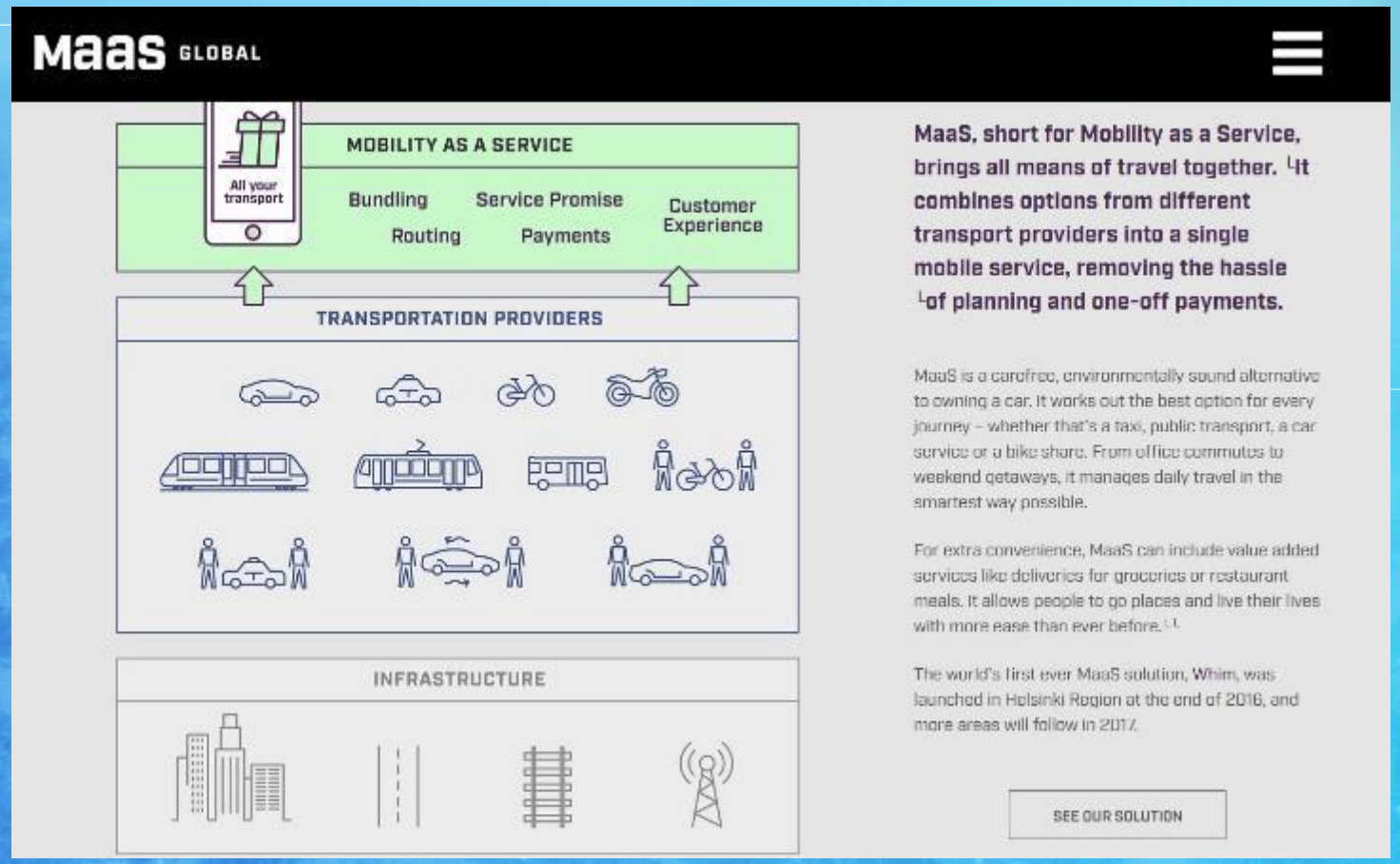
Live train map for smart phones »

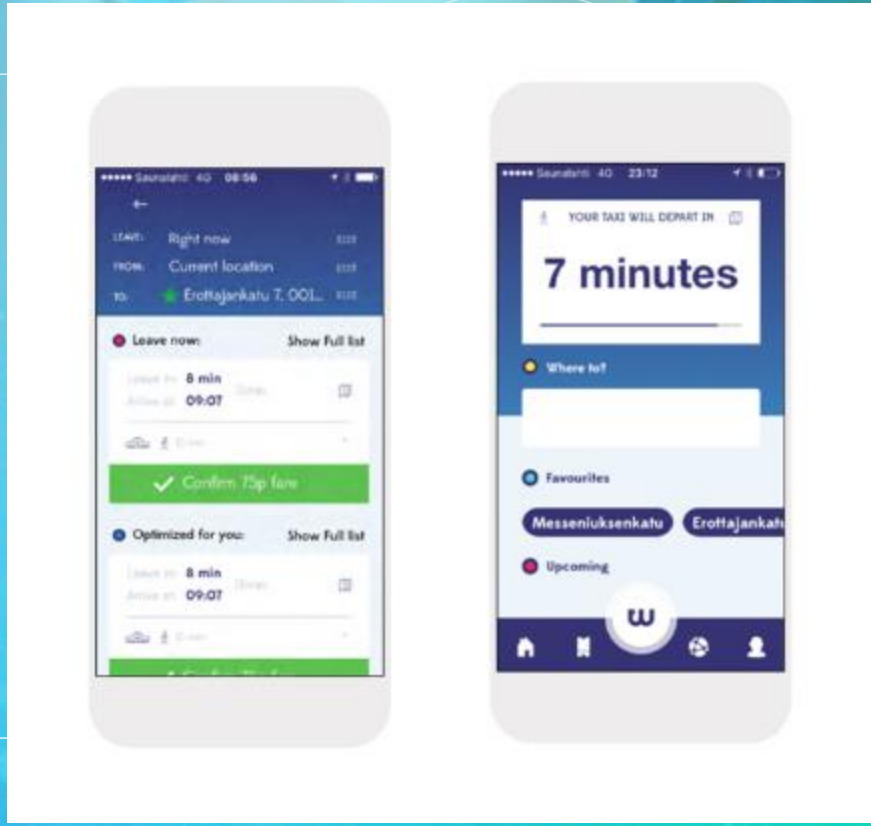
Real Time Data: Abu Dhabi



Mobility as a Service (MAAS)

Change and Disruption





Mobility as a Service

Breaking Down The Silos

Breaking Down the Silos

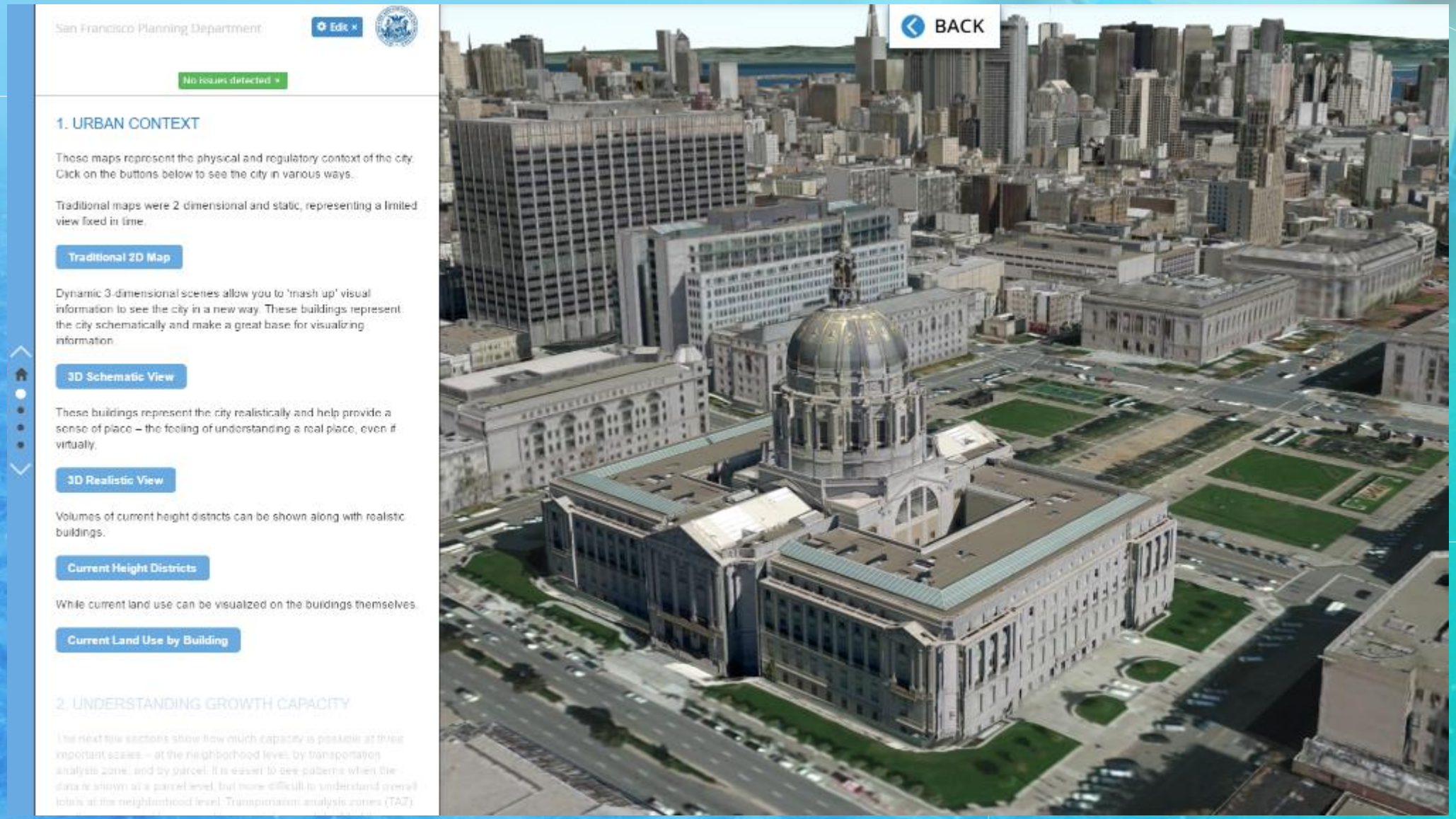
UBER

lyft

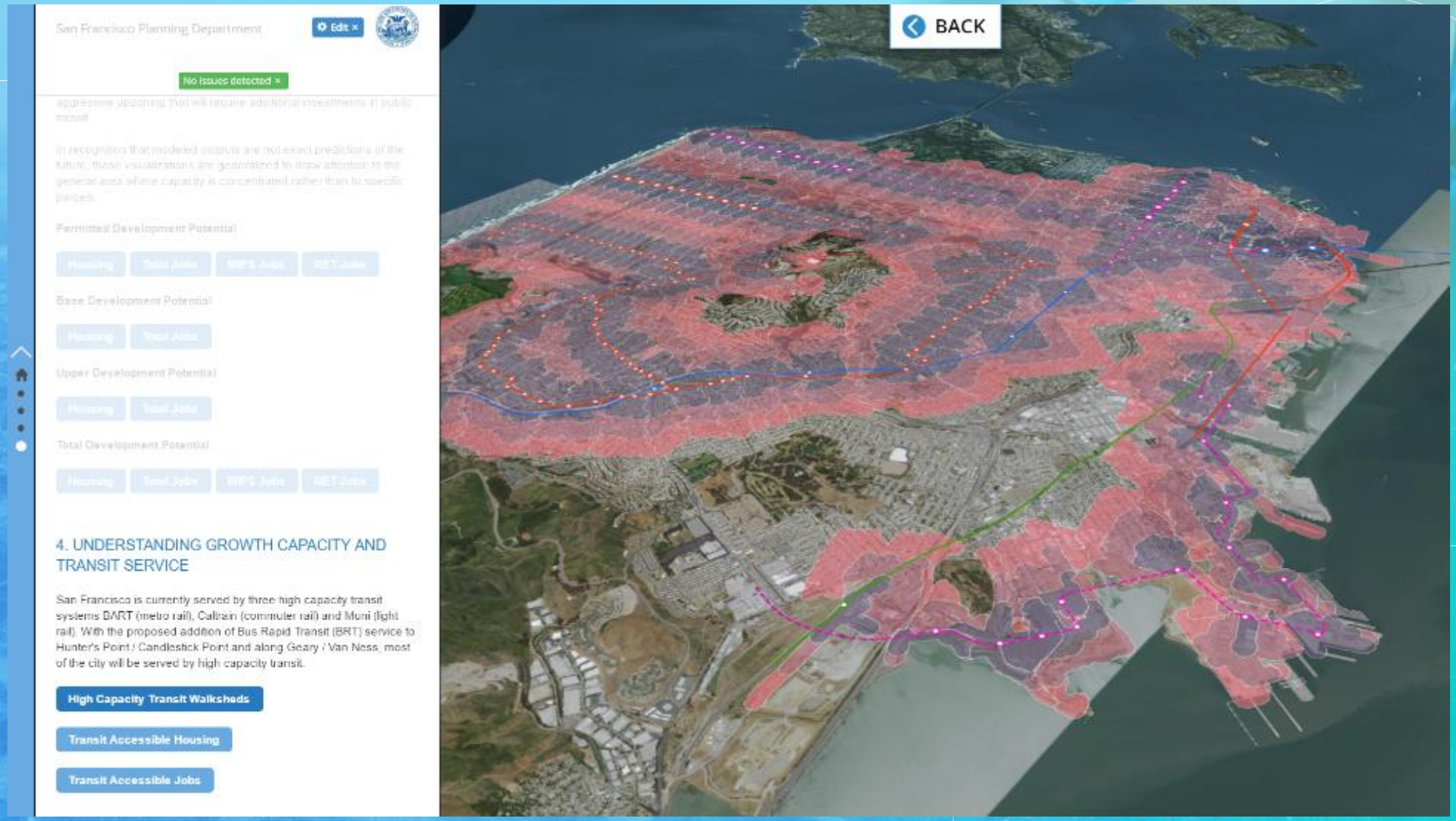
Breaking Down the Silos

Breaking Down the Silos

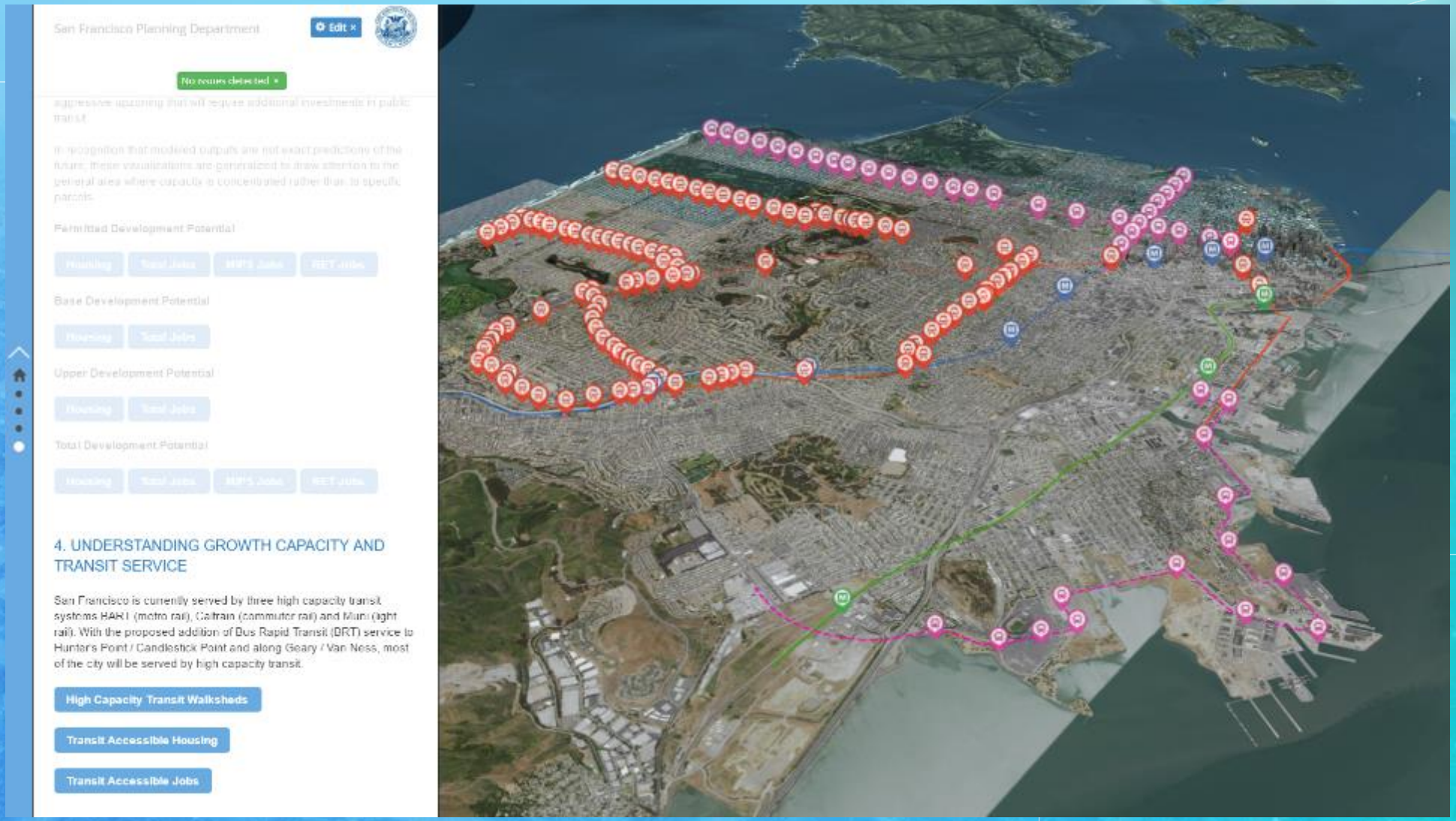
GIS for Smart Cities: San Francisco



San Francisco: Transit Accessibility



San Francisco: Designing High Capacity Public Transit



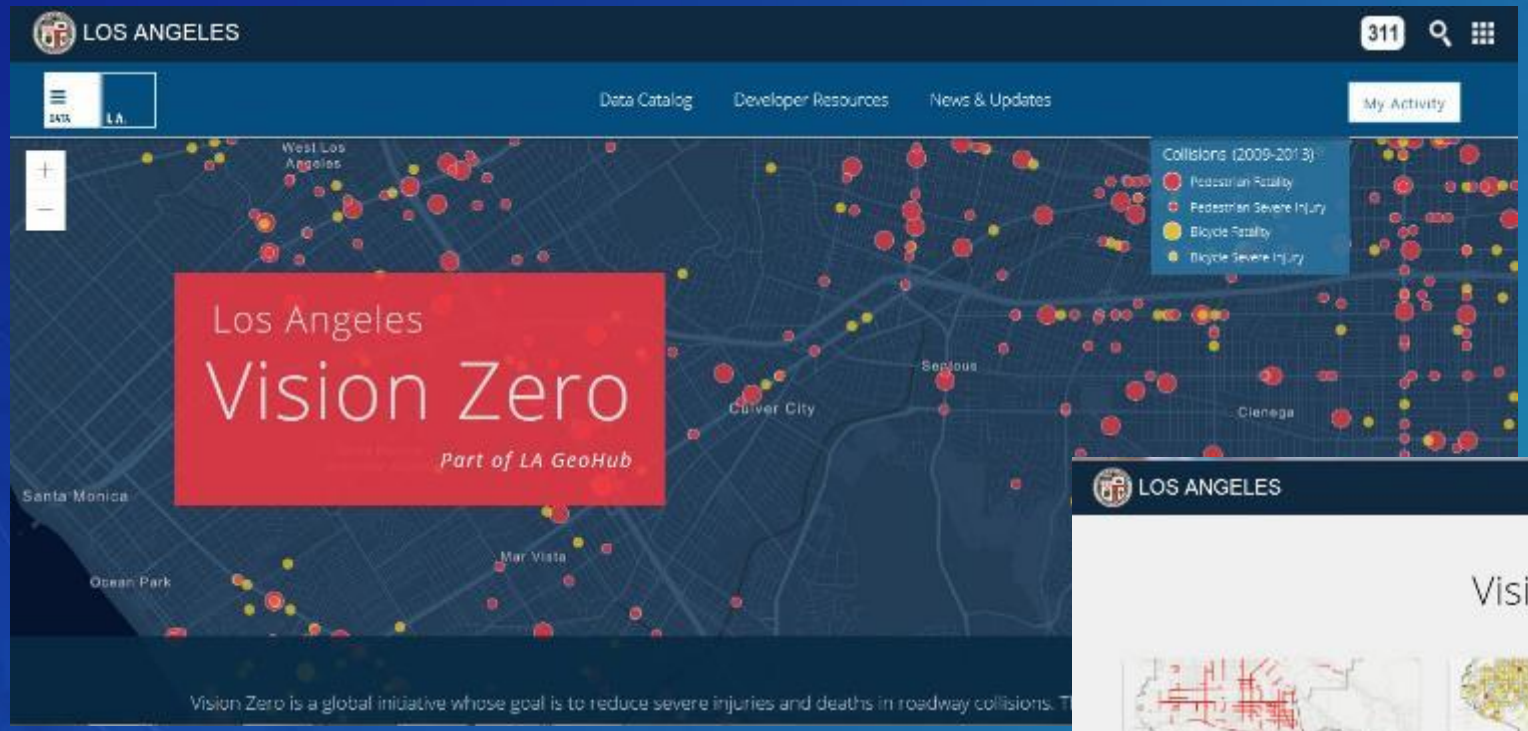
City of Los Angeles

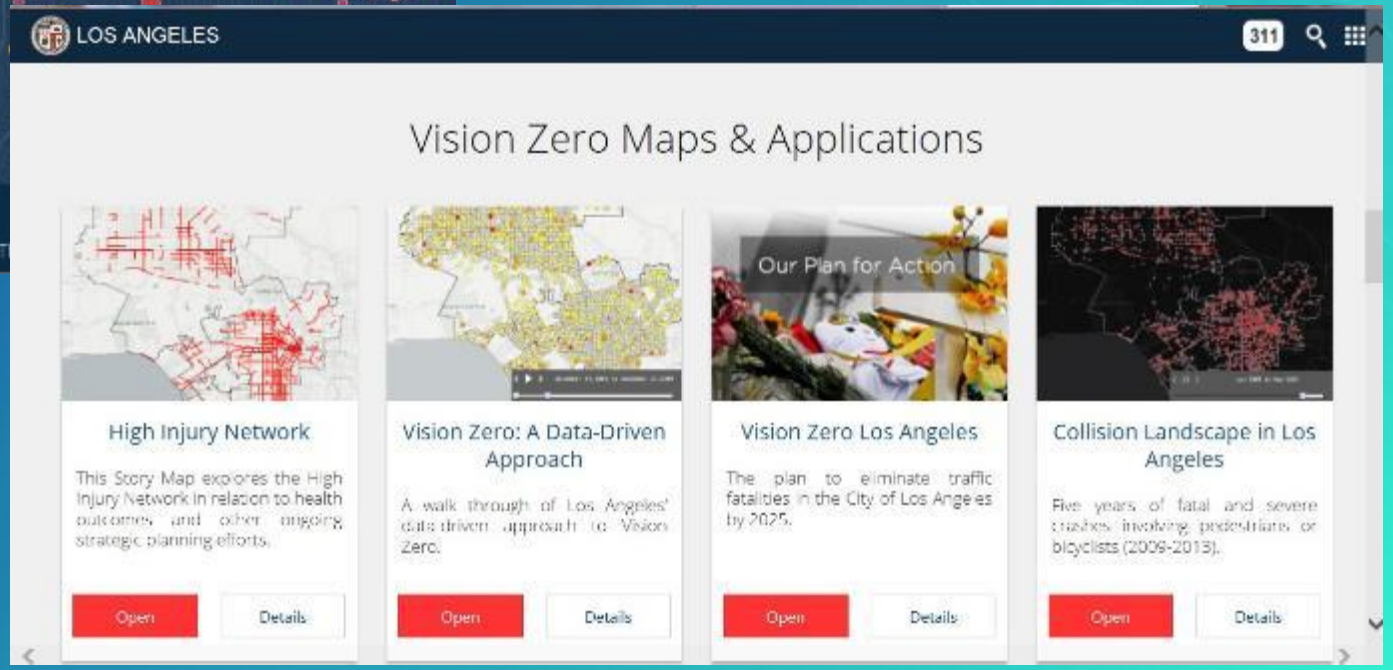
Is Already Implementing a Community GIS

Solutions Cross Departments

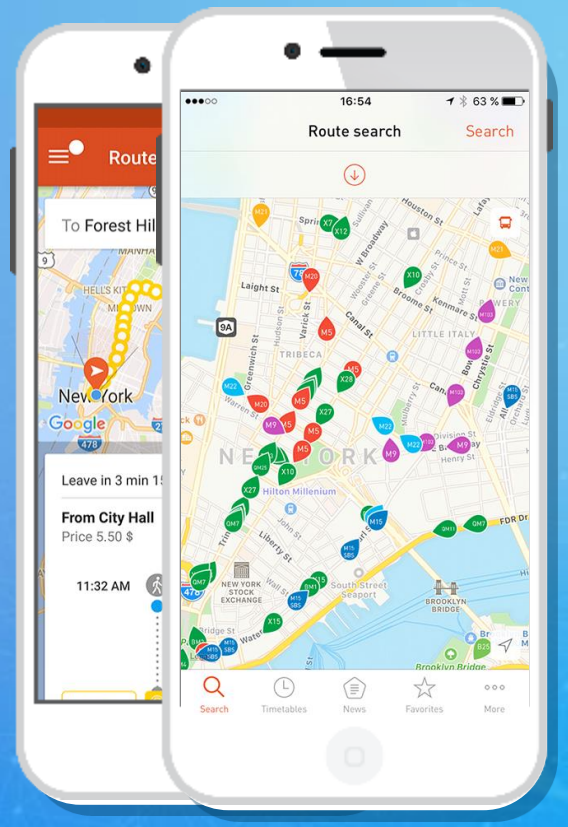
Expanding Their GIS to Support Everyone

Smart Cities



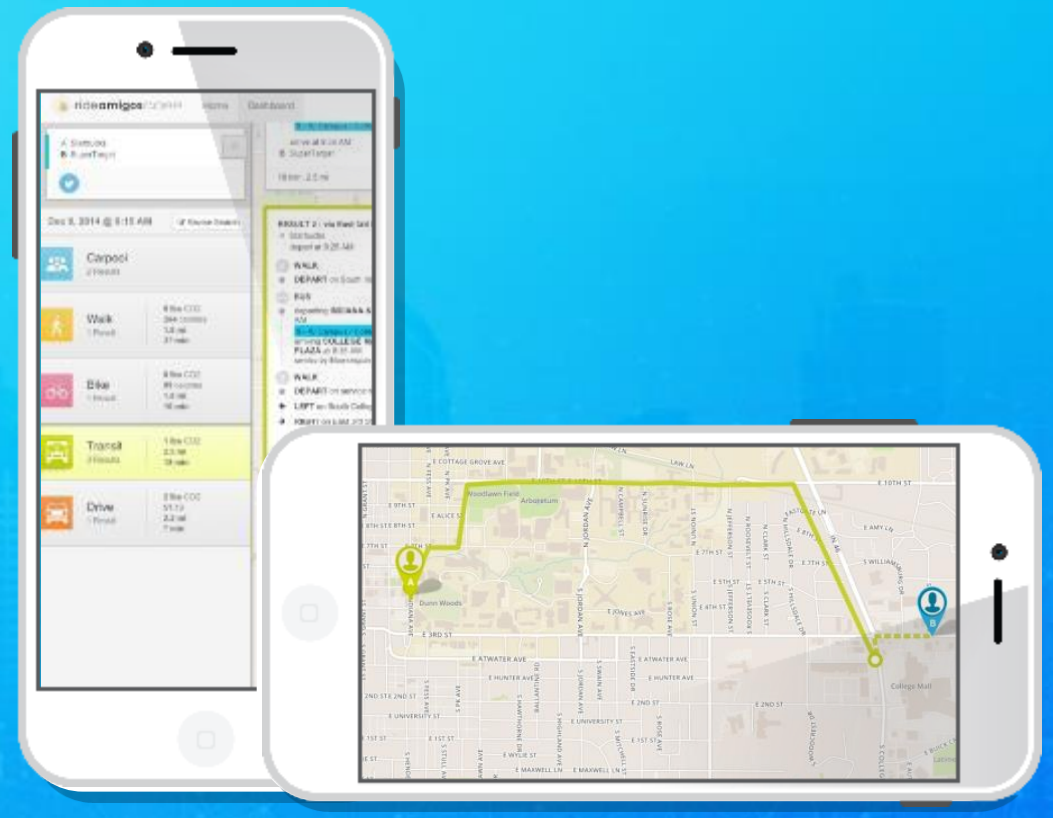


Open Data – Mobility Options



TRAFI

GoLA
Find your way in LA



rideamigos CORP.

Smart GIS Enables New Types of Collaboration

Connecting Individuals, Organizations and Communities

Individuals

Breaking Down Barriers

Organizations

Web GIS

Sharing Geographic Knowledge

Networks of Organizations

. . . Creating a Nervous System for Our Planet

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THE SCIENCE OF WHERE