Big Data and GIS

Visualization and Analysis Unleashed

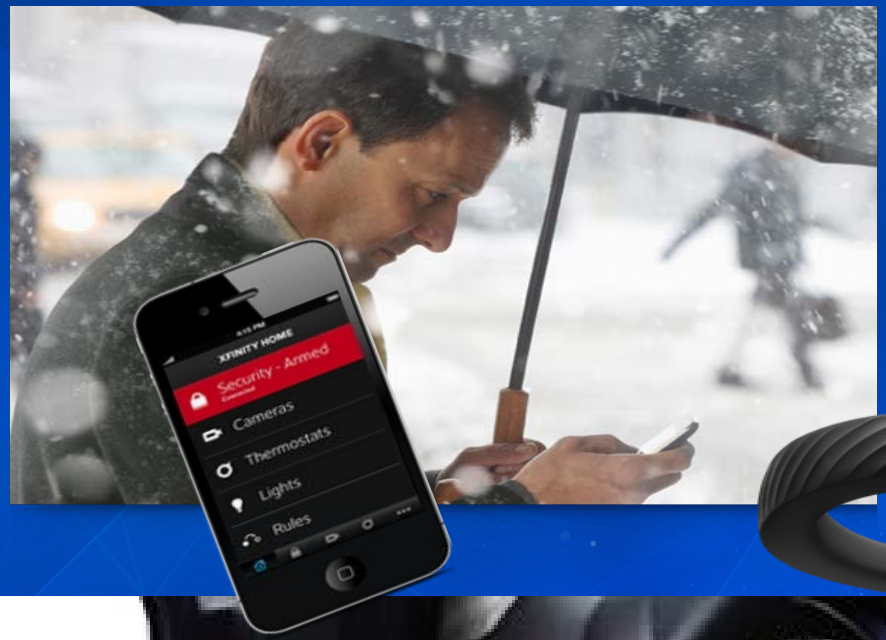
Big Data and GIS

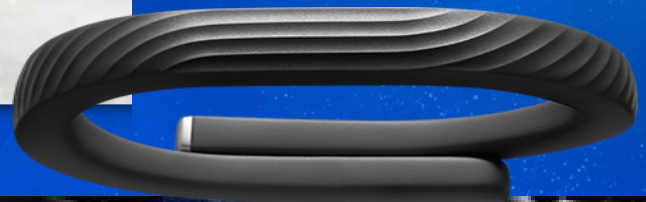
Visualization and Analysis Unleashed

We Are Increasingly Measuring Everything

And Making This Data Widely Available,

Smart – Connected Devices are Becoming Pervasive





Data is being Connected and Integrated

Into Everything We Do

By 2020 The Internet of All Things Will Emerge as a New Framework

50b
connected
devices

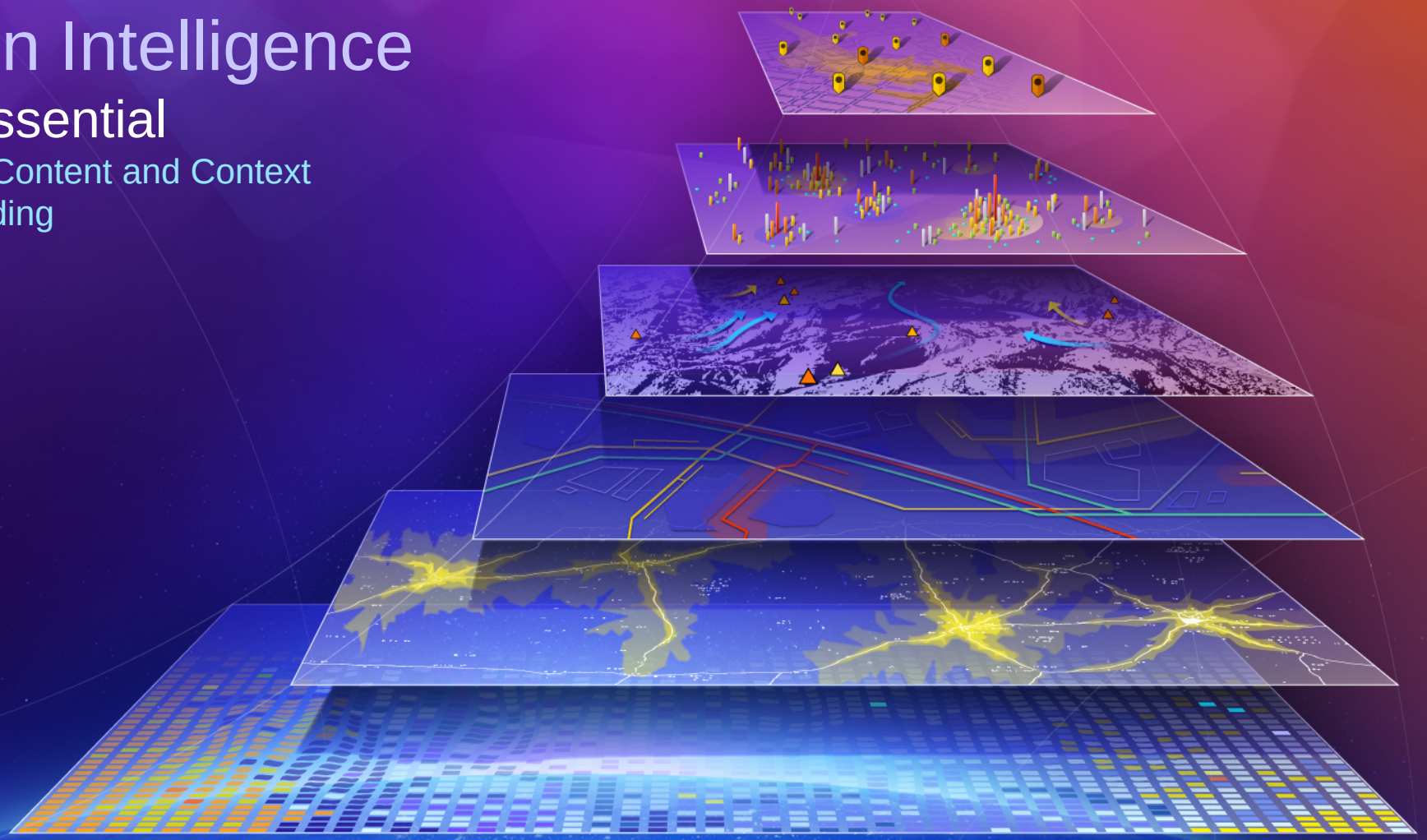
5
gadgets
per person

. . . . *Creating Very Large Real Time Data Sets About Everything. . .*
……Volume, Velocity and Variety

Location Intelligence

Will Be Essential

Providing the Content and Context
for Understanding



Big Data and GIS Applications

Are Already Emerging

- **Sensor Networks**

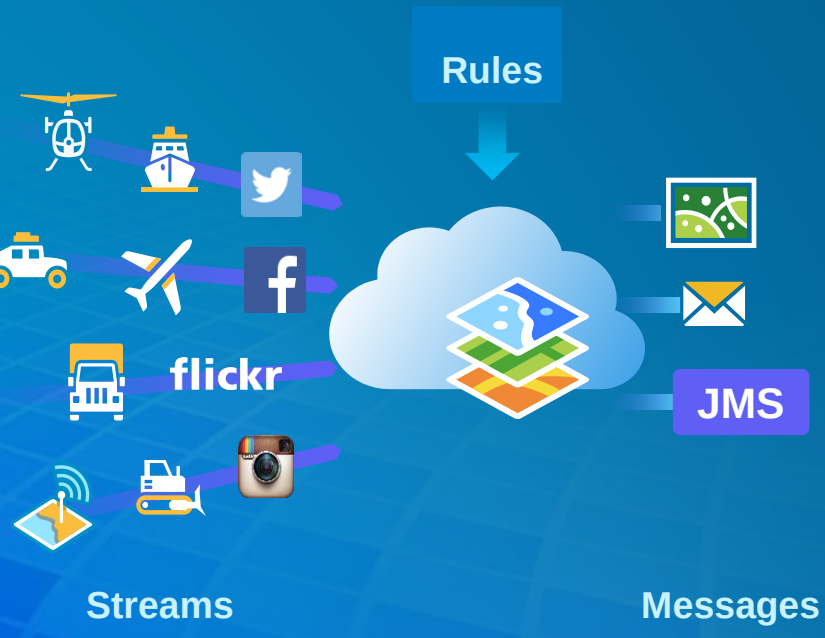
- **Software and Hardware Processing Environments**
  - **- Hadoop, Spark…., Cloud and Grid Computing….**
  - **- Supporting large amounts and types of data**

Powerful Applications and Systems

- *Supporting a Wide range of Transportation Systems*

Real Time GIS

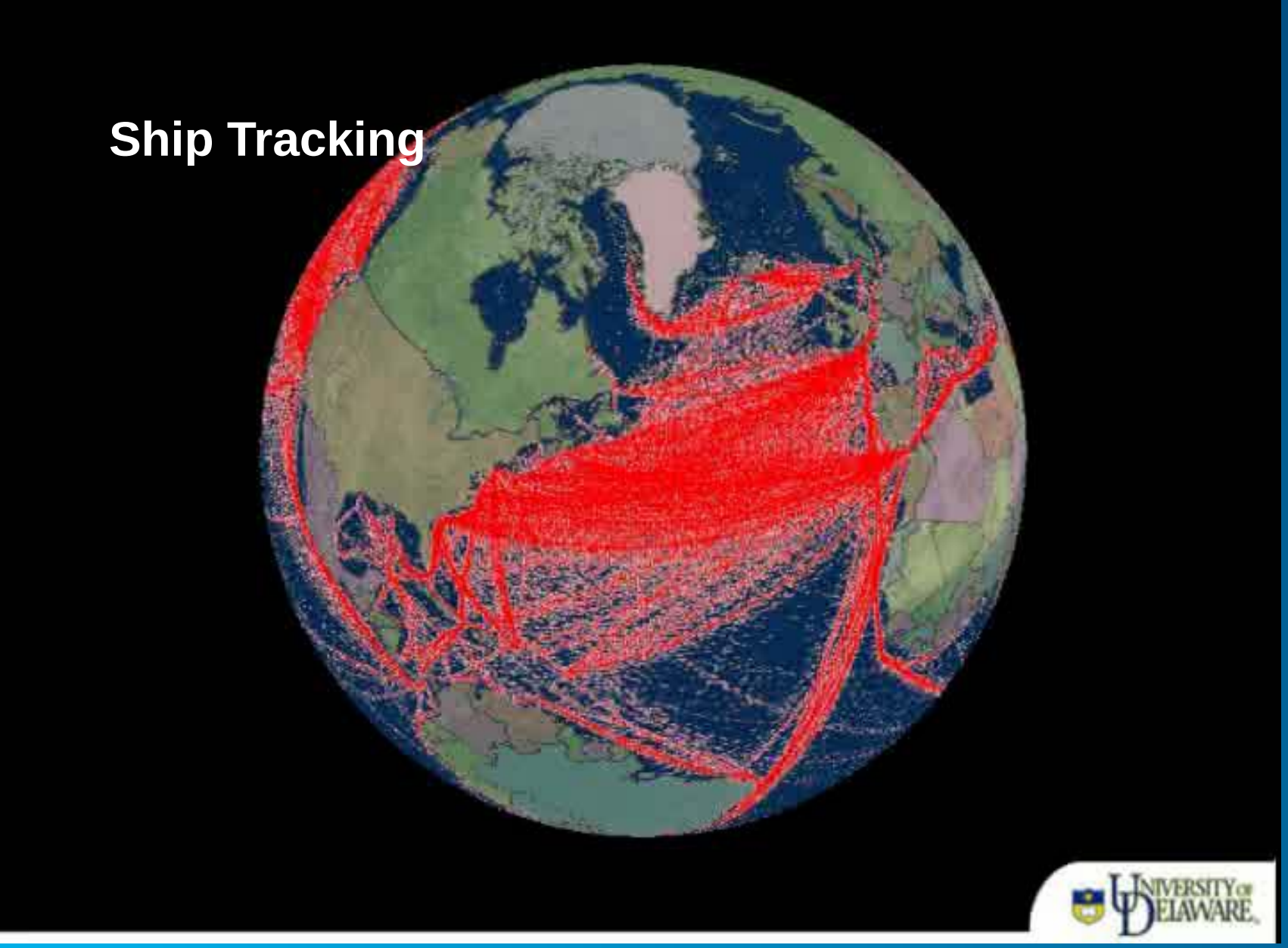
- Big Data
- Stream Processing
- Geo-Fencing



Ship Tracking

Continuous Processing and Analysis

Ship Tracking

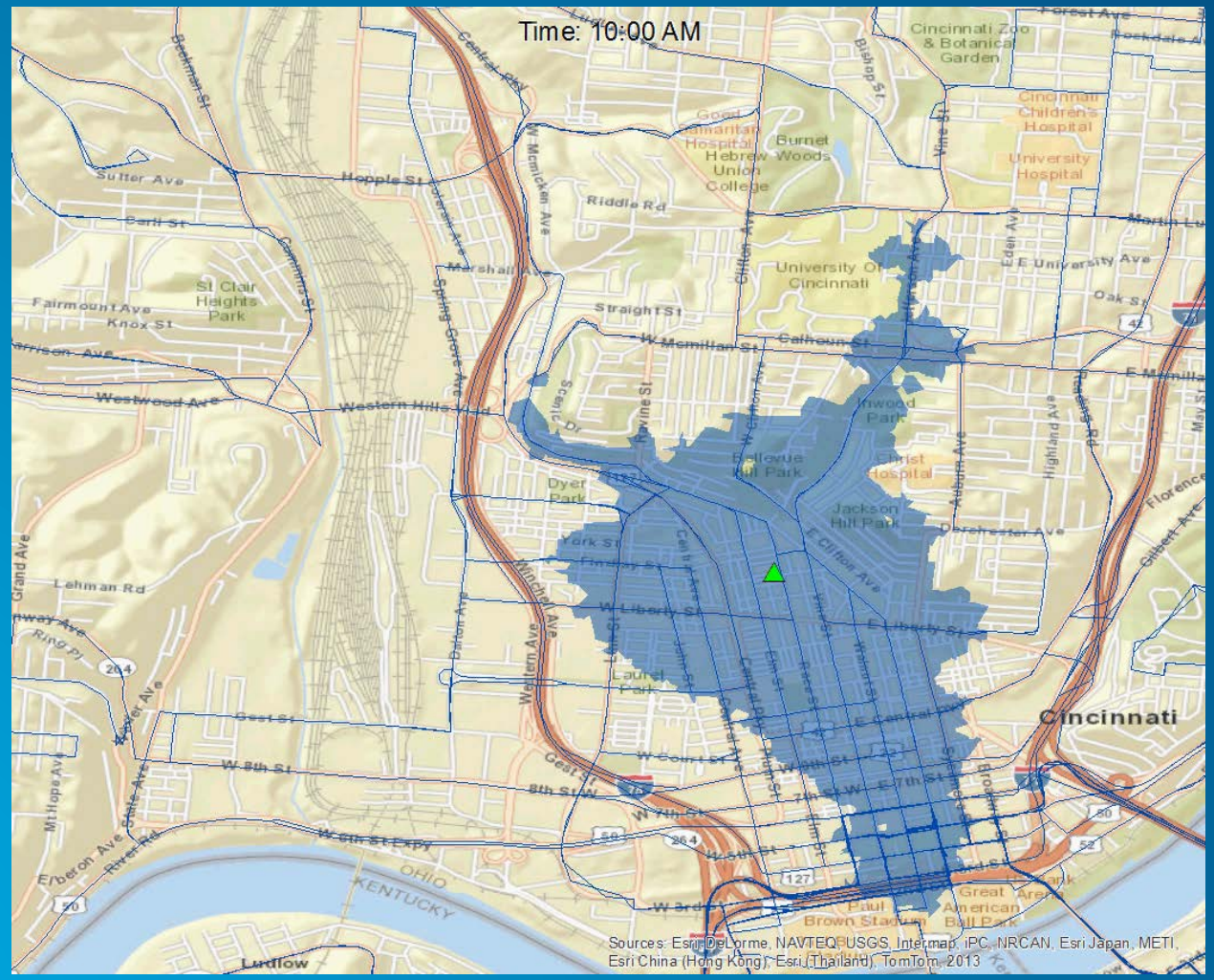


Containership
Tanker
Bulk Carrier
General Cargo
Refrigerated Cargo
Ro-Ro
Passenger

James J. Corbett,

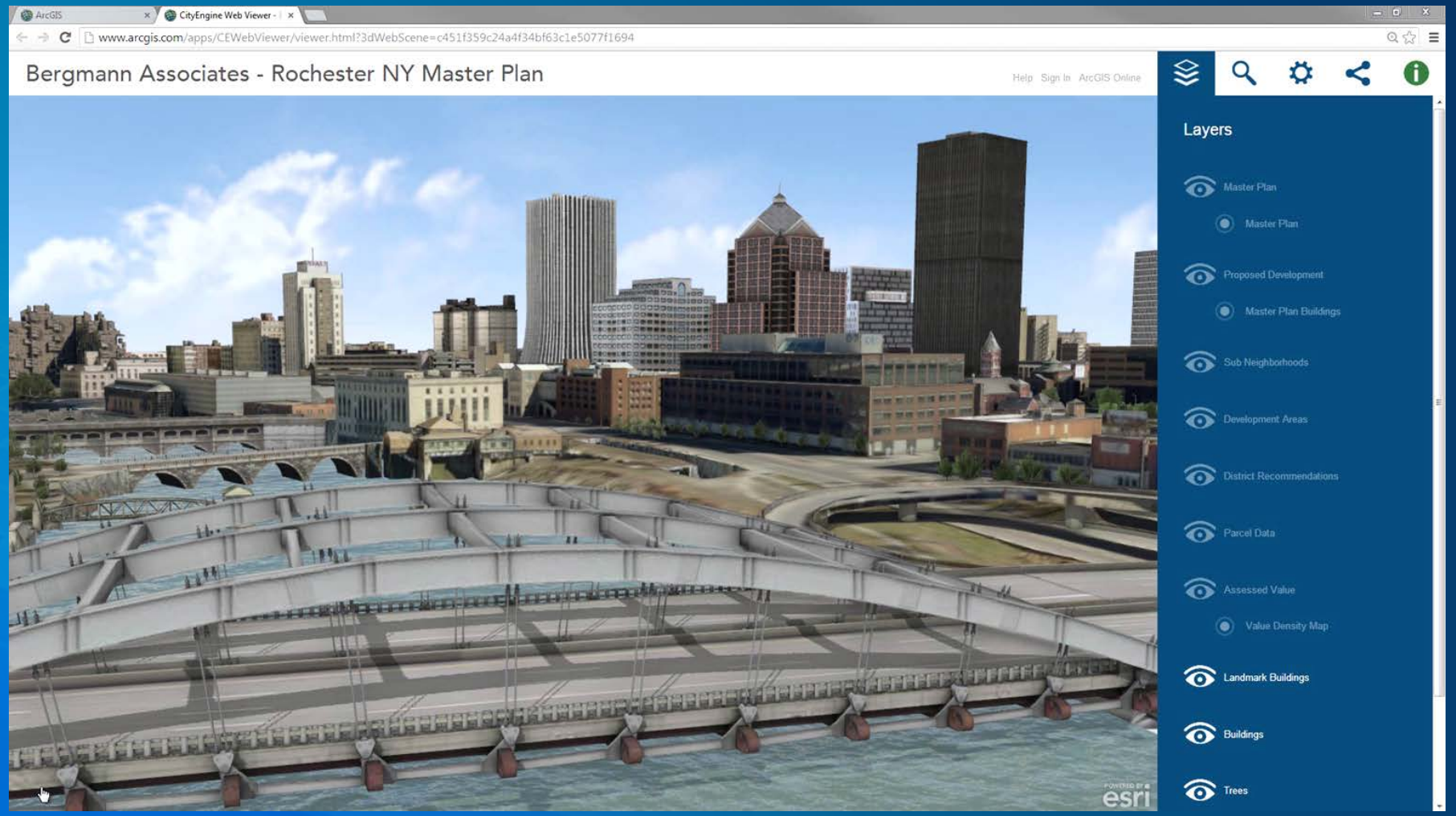
GIS Helps Us Understand Patterns and Relationships

Real Time Transit Accessibility



GIS Helps Us Understand Patterns and Relationships

Web Visualization of Geodesign Proposals



Rochester NY Master Plan

Center-City Master Plan
3D was critical
Lots of civic engagement

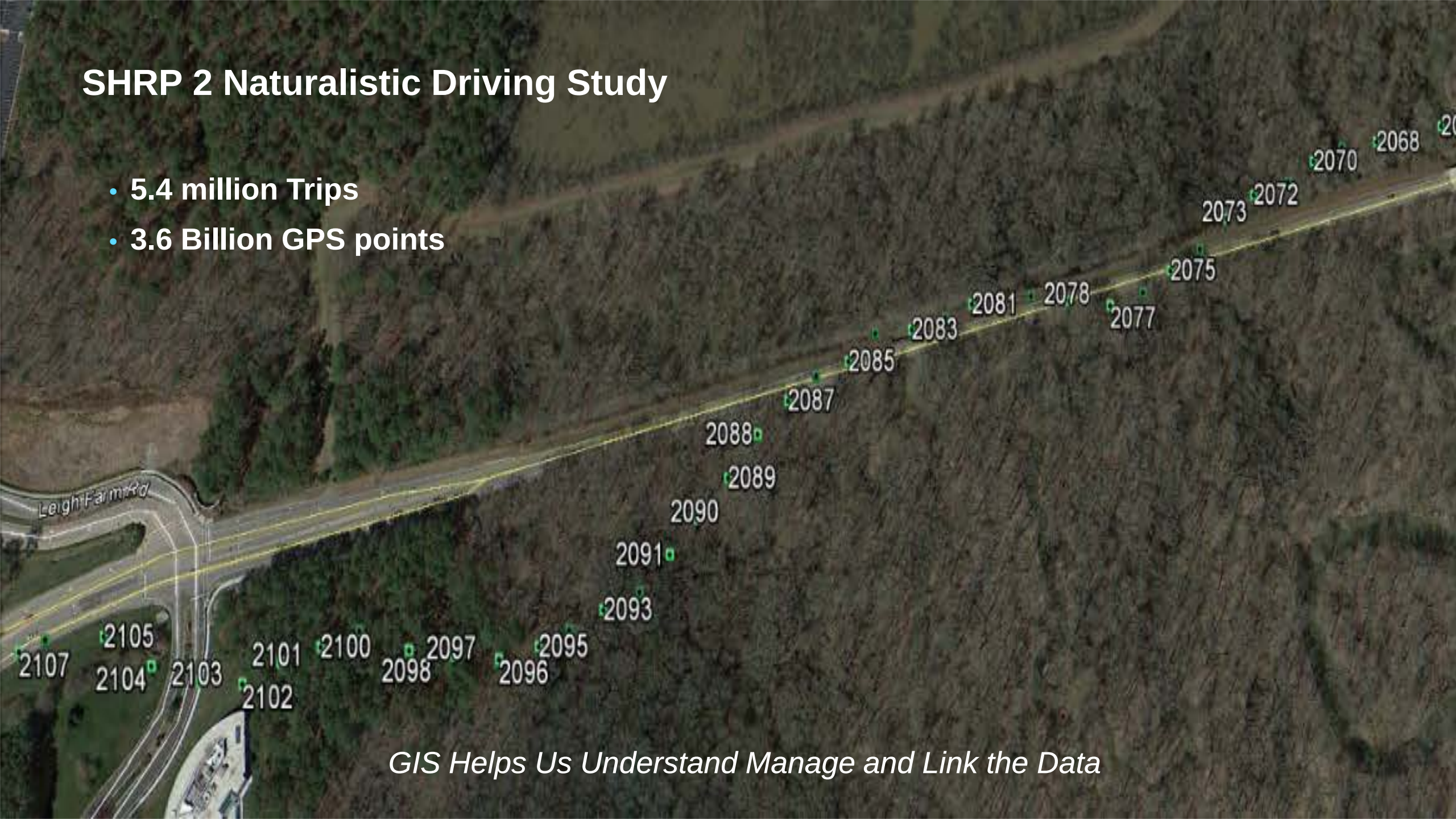
Smart System Concepts Are Emerging

. . . . Including Management of Transportation Networks

Source: IBM

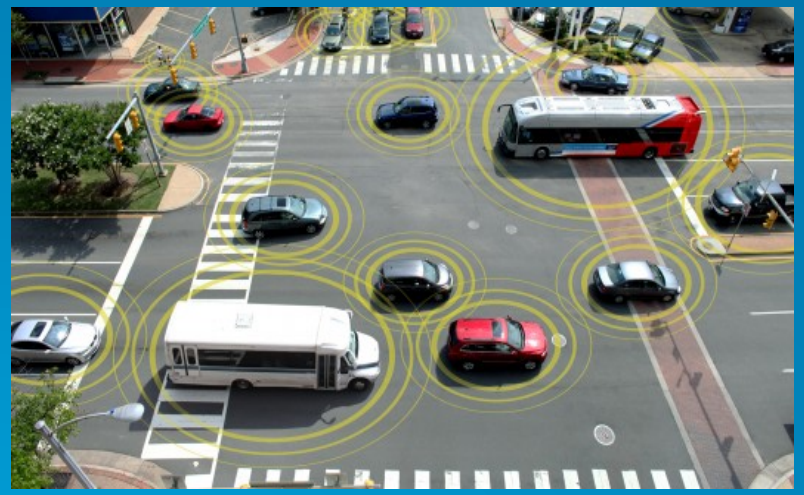
SHRP 2 Naturalistic Driving Study

- 5.4 million Trips
- 3.6 Billion GPS points



GIS Helps Us Understand Manage and Link the Data

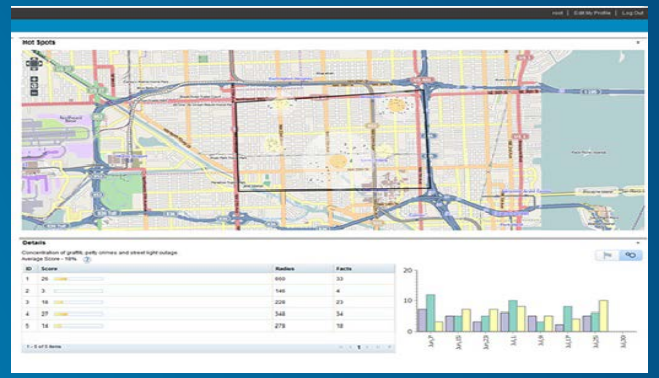
Big Data and GIS Are Driving Big Systems



Connected Vehicles

Car Insurance

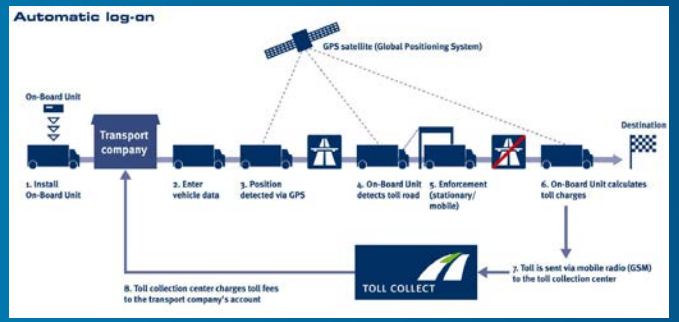
Adaptive Signal Control Systems



Intelligent
Operations Center

Parking Fees and
Management

Toll Collection Systems



big data collections

sensor networks

social media

spatial data

business systems

images / video

spreadsheets

analytics

web services

Cloud Computing Infrastructure Provides A New Platform
. . . for Big Data and GIS

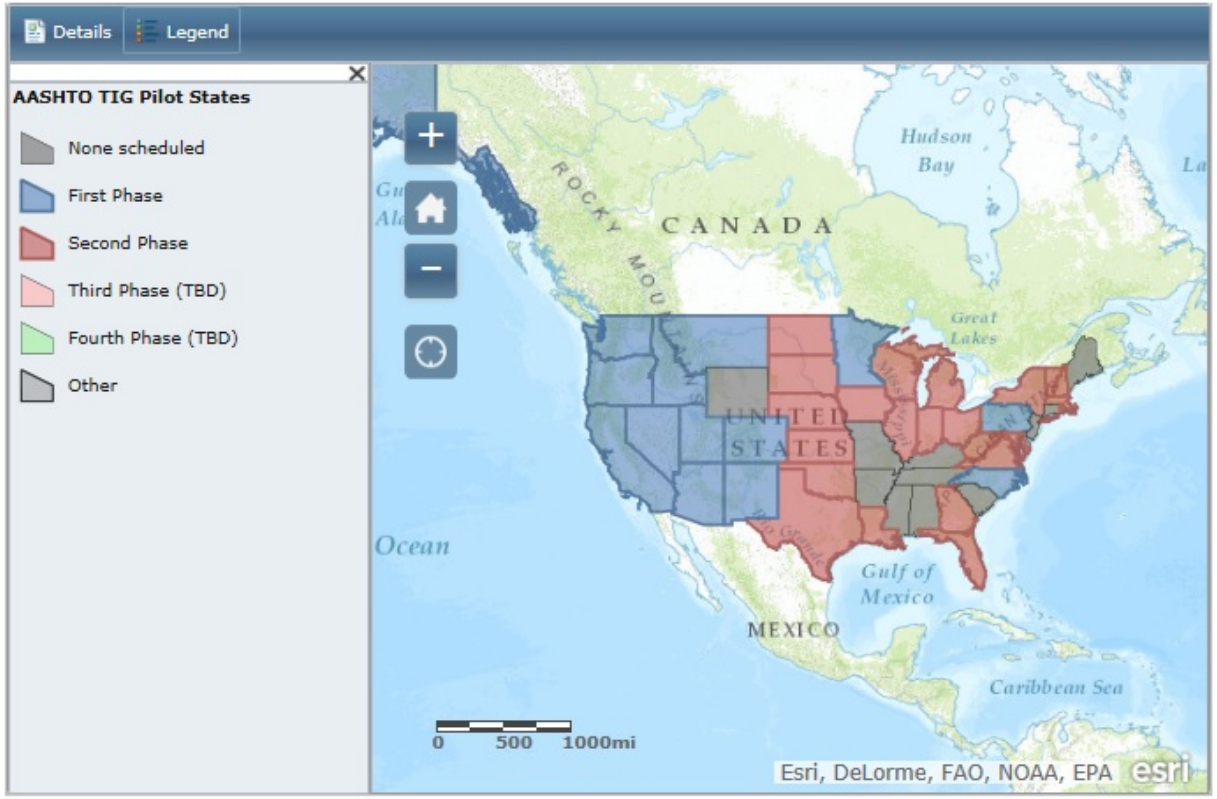
Uplan is a Leading Model

Leveraging the Web GIS Pattern in the Cloud

http://uplan.maps.arcgis.com/home/

The AASHTO Innovation Initiative

Putting Web GIS (modeled after UPlan) in every State



View Larger Map

AASHTO
THE VOICE OF TRANSPORTATION

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Web GIS

Is a New Architecture

Making Data Sharing
and Access Easier

Enabling a Flexible and Agile Approach

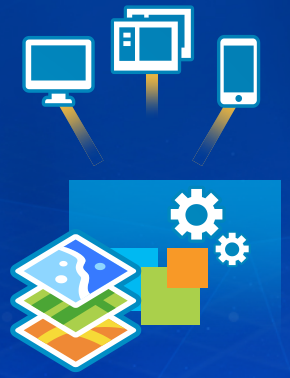
Web GIS Integrates All Types of Information

Organizing and Sharing Your Work

Both Internally and on the Open Web

Two Approaches For Big Data and GIS Integration

Adding Fundamental Geo-processing and Spatial Analytics



“Spatialized”
Big Data

Web GIS
Integration

Web GIS Integrates Contents Dynamically

Combining and
Analyzing Information

Visual Overlay

Mashup

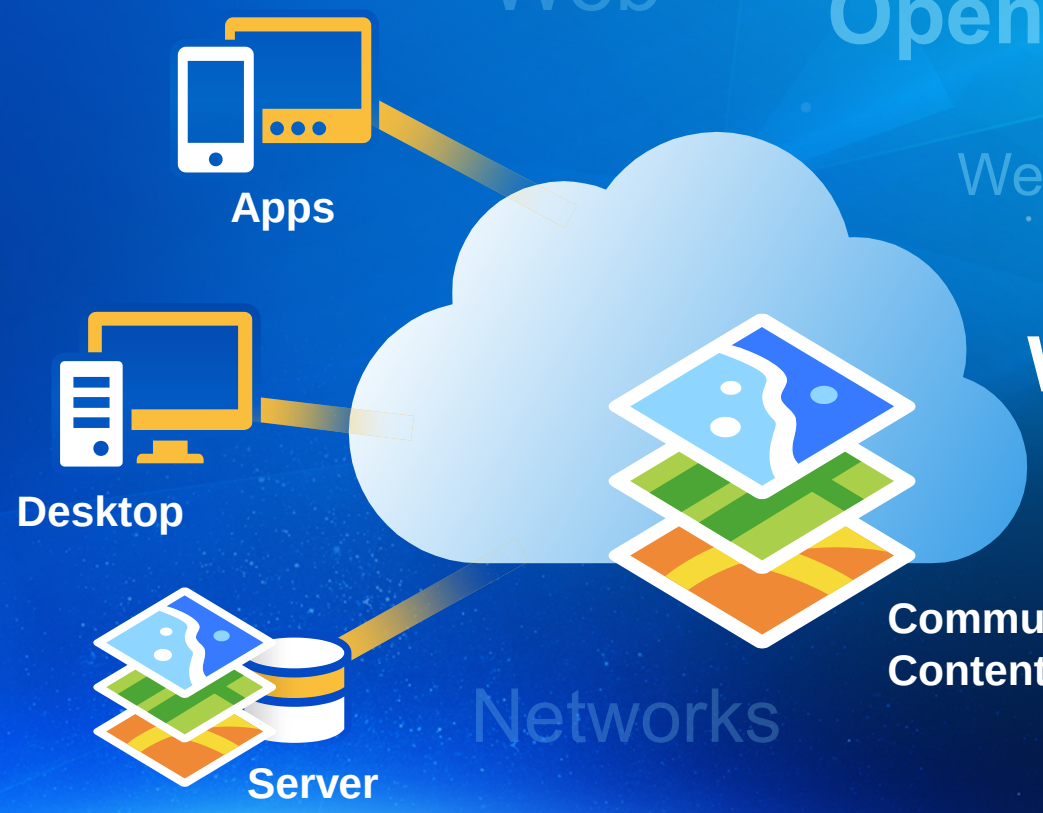
Spatial Analysis

Modeling

Helping to Discover and Understand Relationships . . .

Web GIS Creates

.....an Interconnected Platform



Web

Open

Web Services

Faster Computing

Cloud

Devices

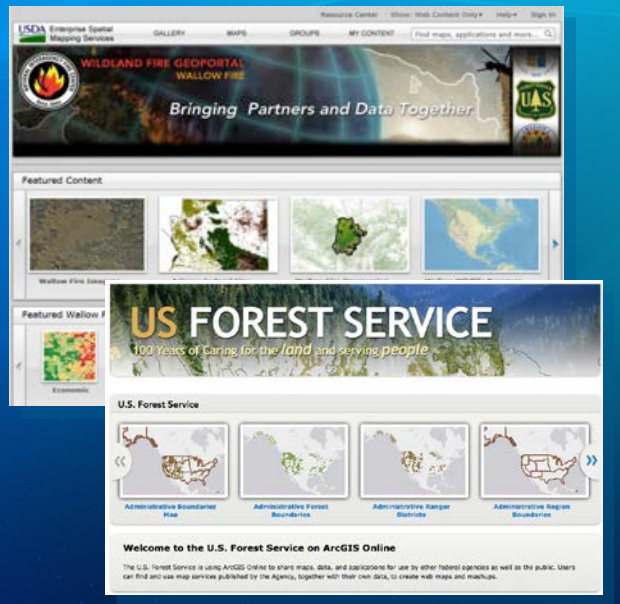
Networks

Bringing Together Data, Technology, and People . . .

. . . Creating a Framework for Solving Complex Problems

Web GIS Integrates Organizations and People

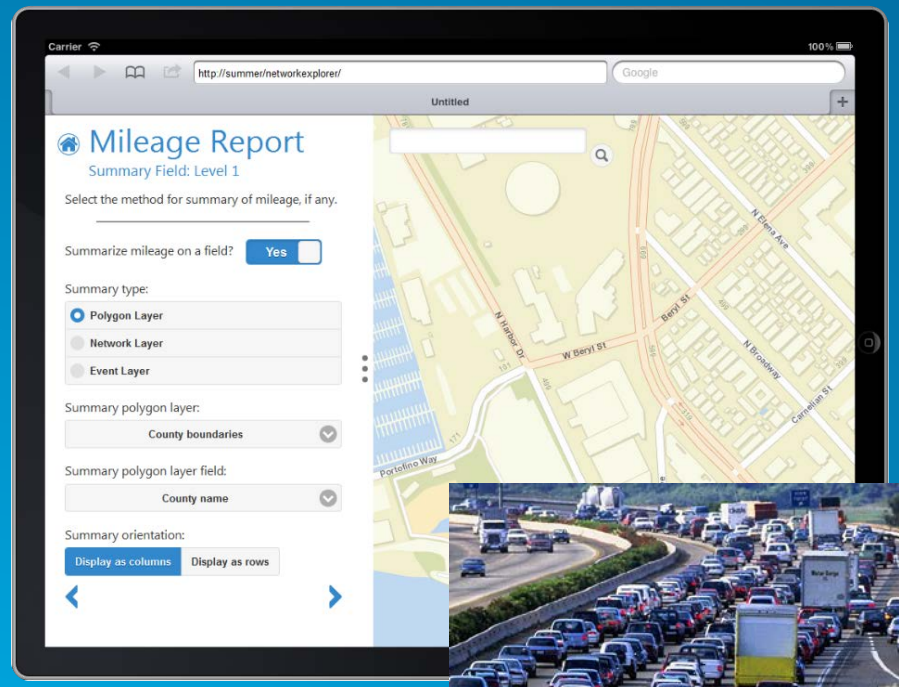
Breaking Down the Barriers



Creating New Relationships

Sharing Information . . .
. . . Supporting Collaborative Approaches

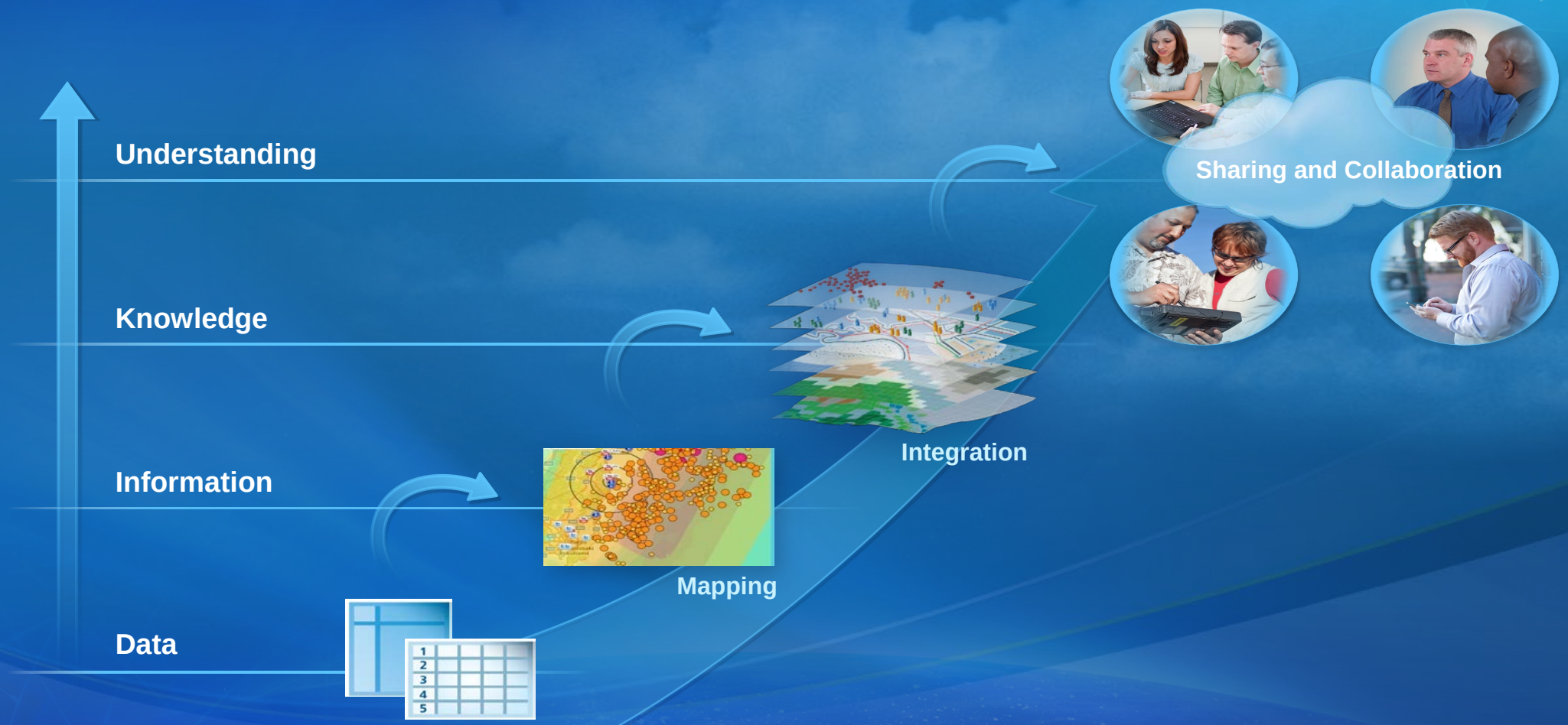
Two Final Examples



HPMS

State DOT “Data Lake”

Geospatial Systems Are Helping Us Understand



. . . Helping Us Make Better Decisions

esri
Understanding our world.

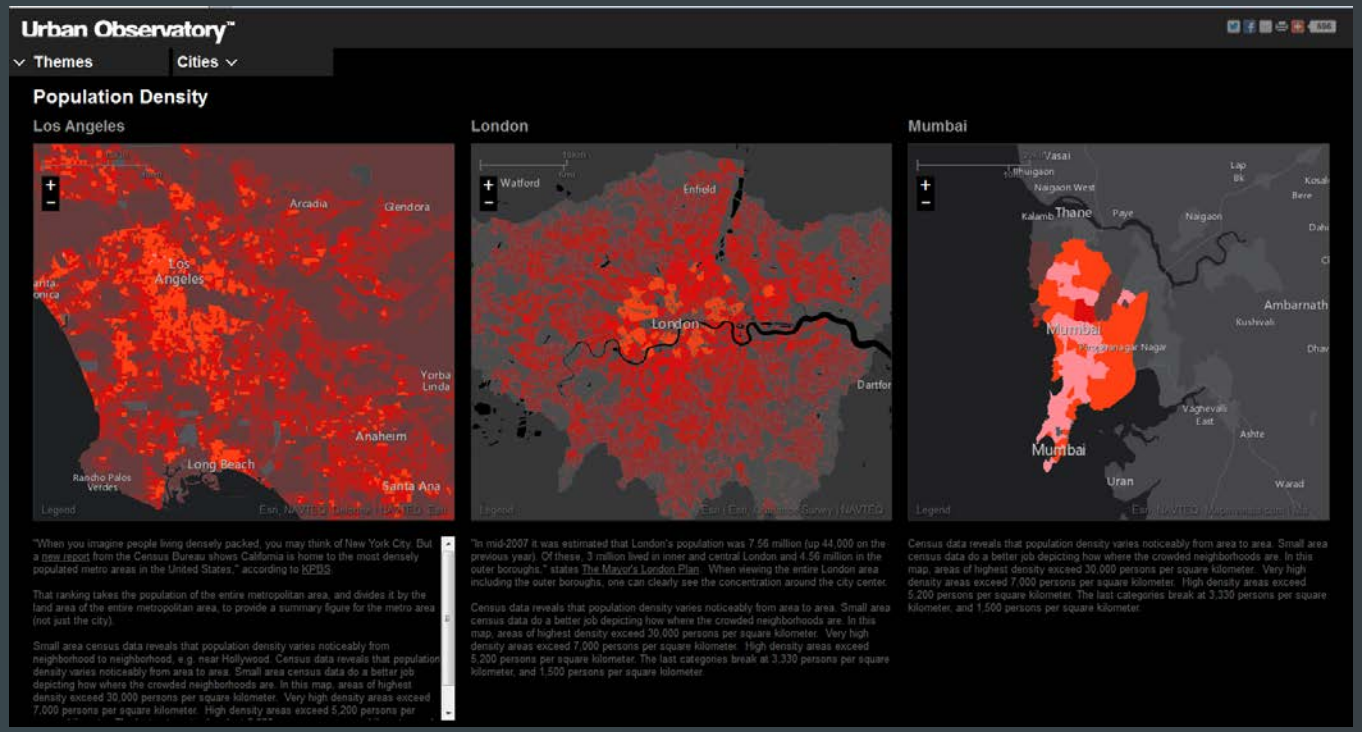
Urban Observatory

Urban Observatory

Urban Footprint

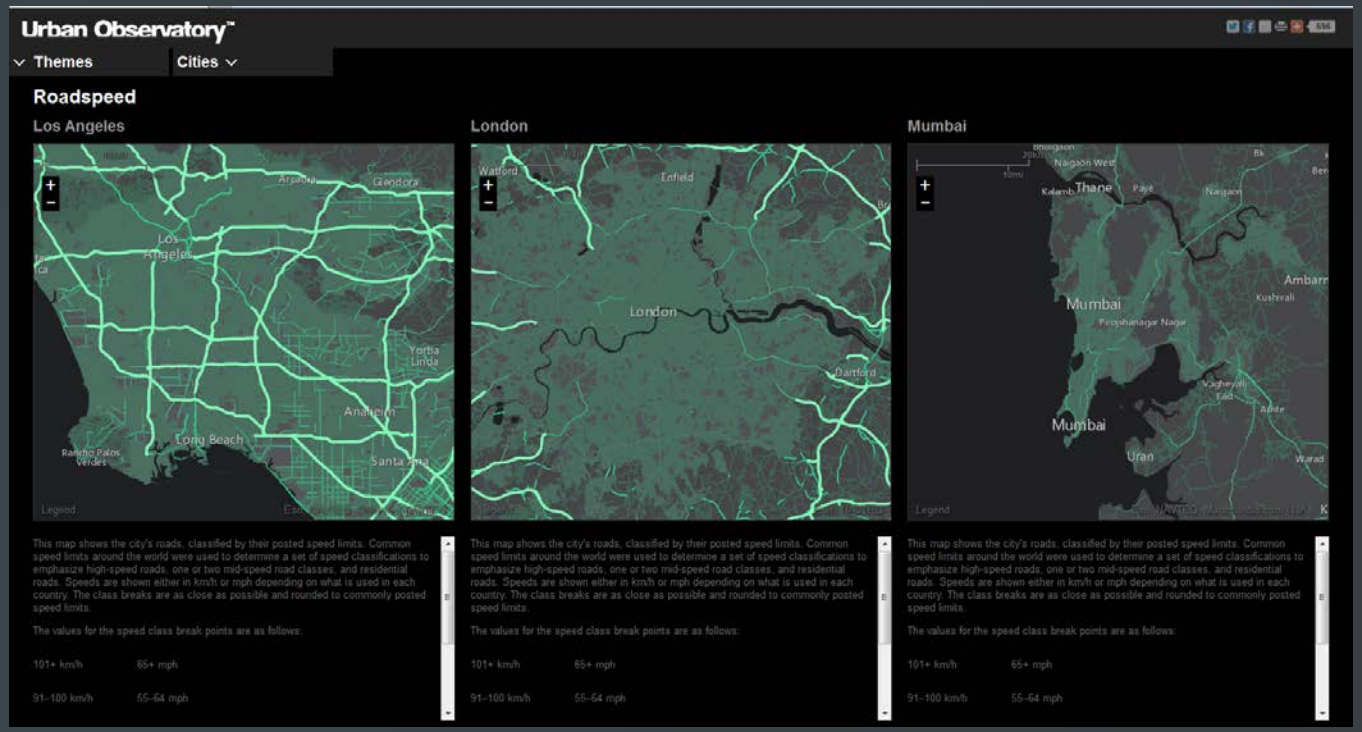
Urban Observatory

Population Density



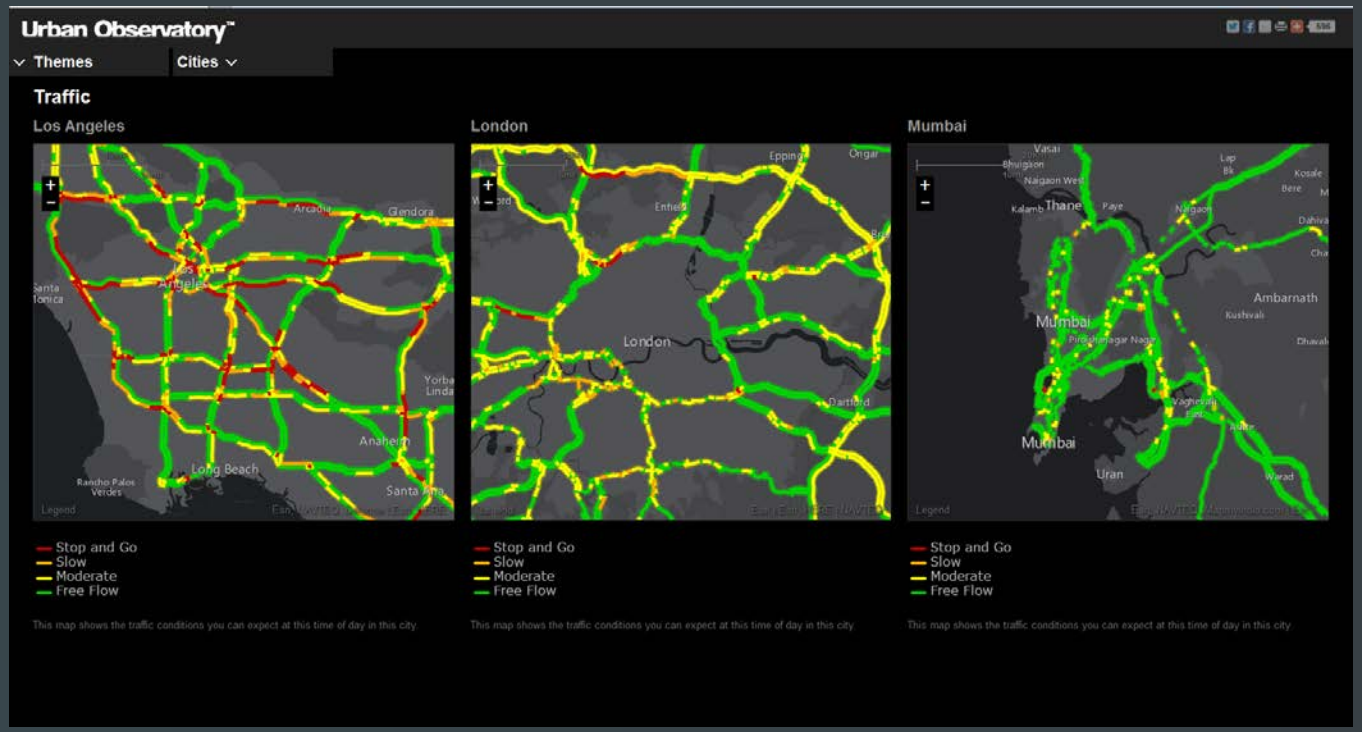
Urban Observatory

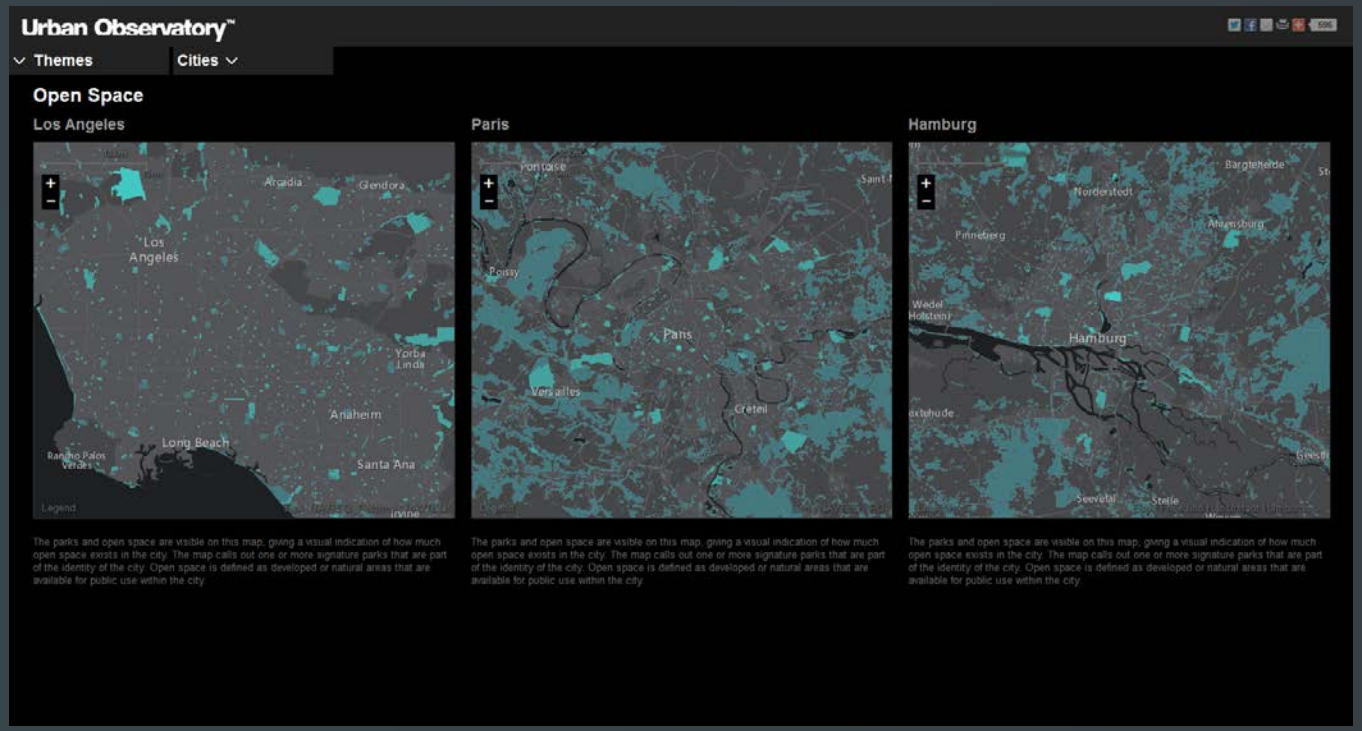
Road Speed



Urban Observatory

Real Time Traffic



Urban Observatory

Open Space