




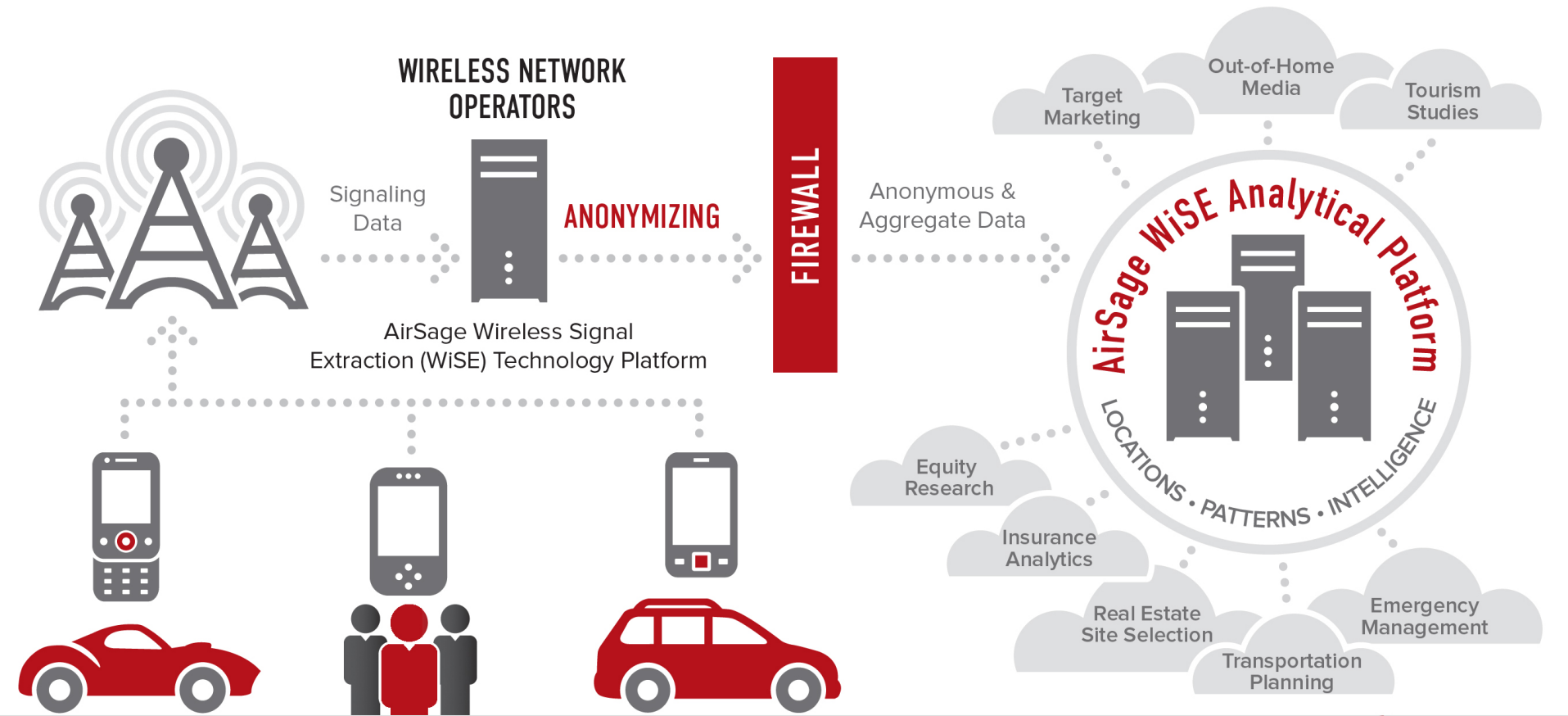
Innovations in Data Collection

The Power of Where and When

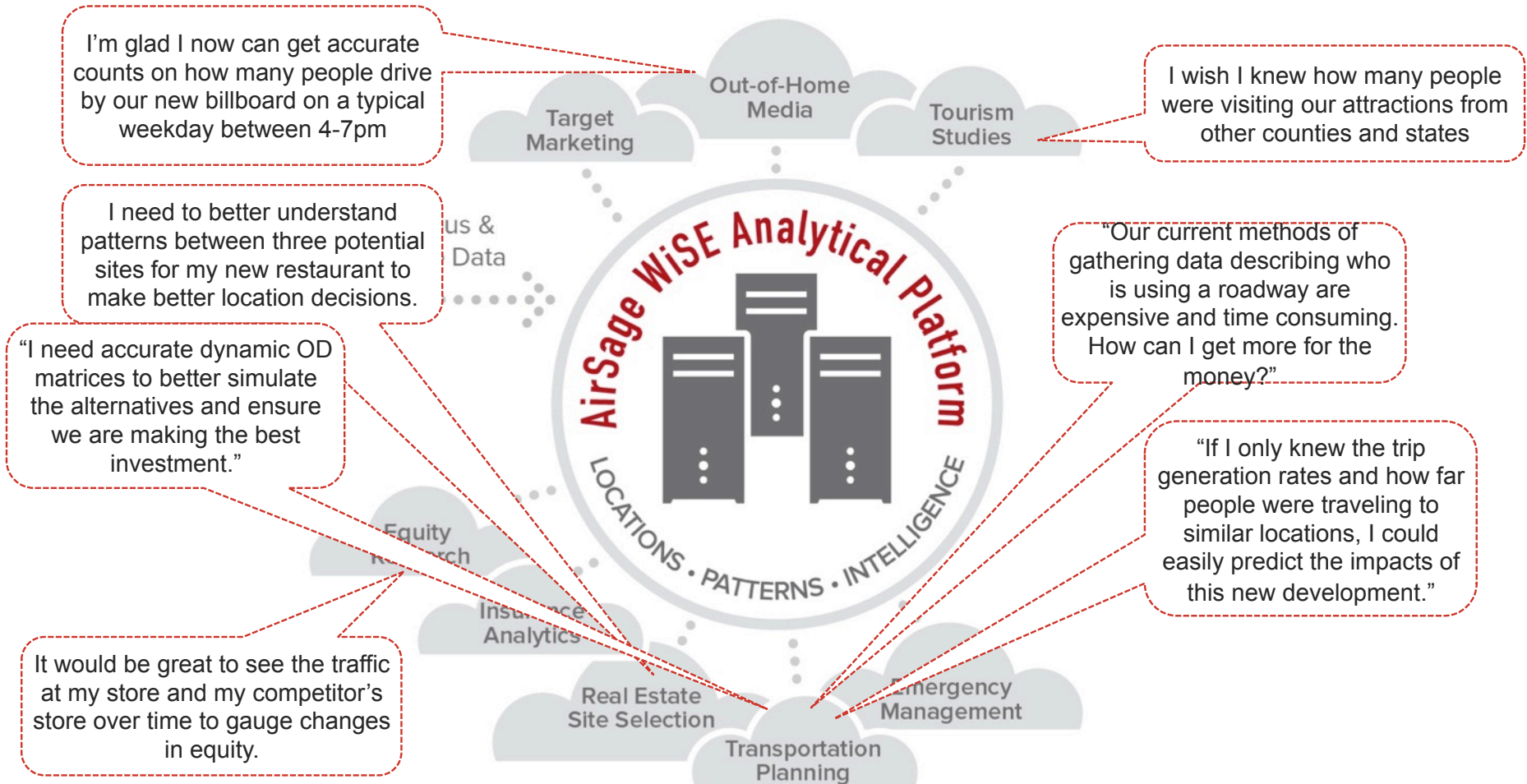
Company Overview

- 
- A hand is holding a black smartphone. The screen of the phone displays a white rectangular box containing a bulleted list. A finger is visible on the right side of the phone, near a blue circular button.
- Collect & analyze mobile signaling data
 - We “see” over:
 - 1/3 of the U.S. population
 - 100 million devices / day
 - each device average 100 times / day
 - **Anonymous** - Consumer privacy

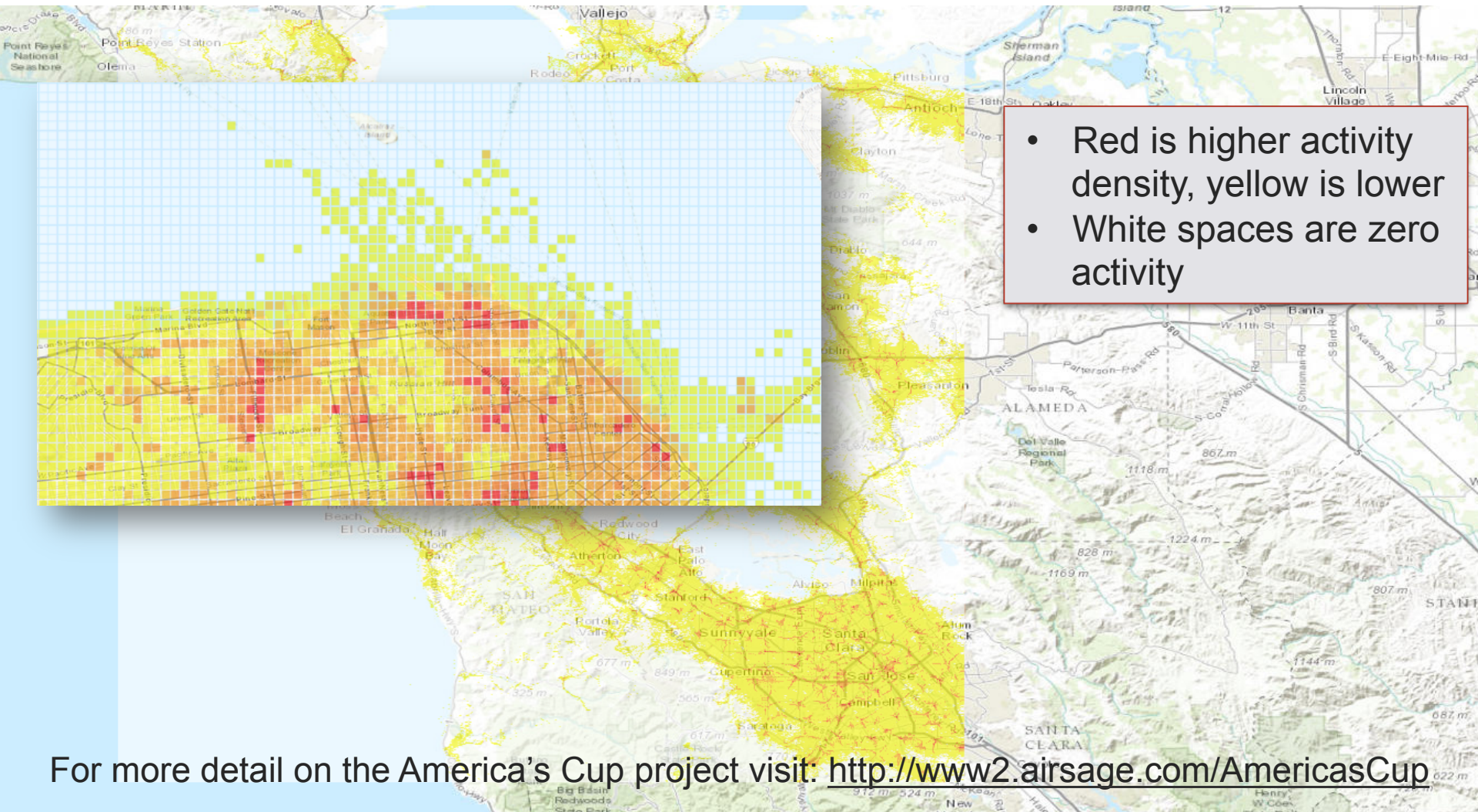
AirSage WiSE Platform



Practical Solutions

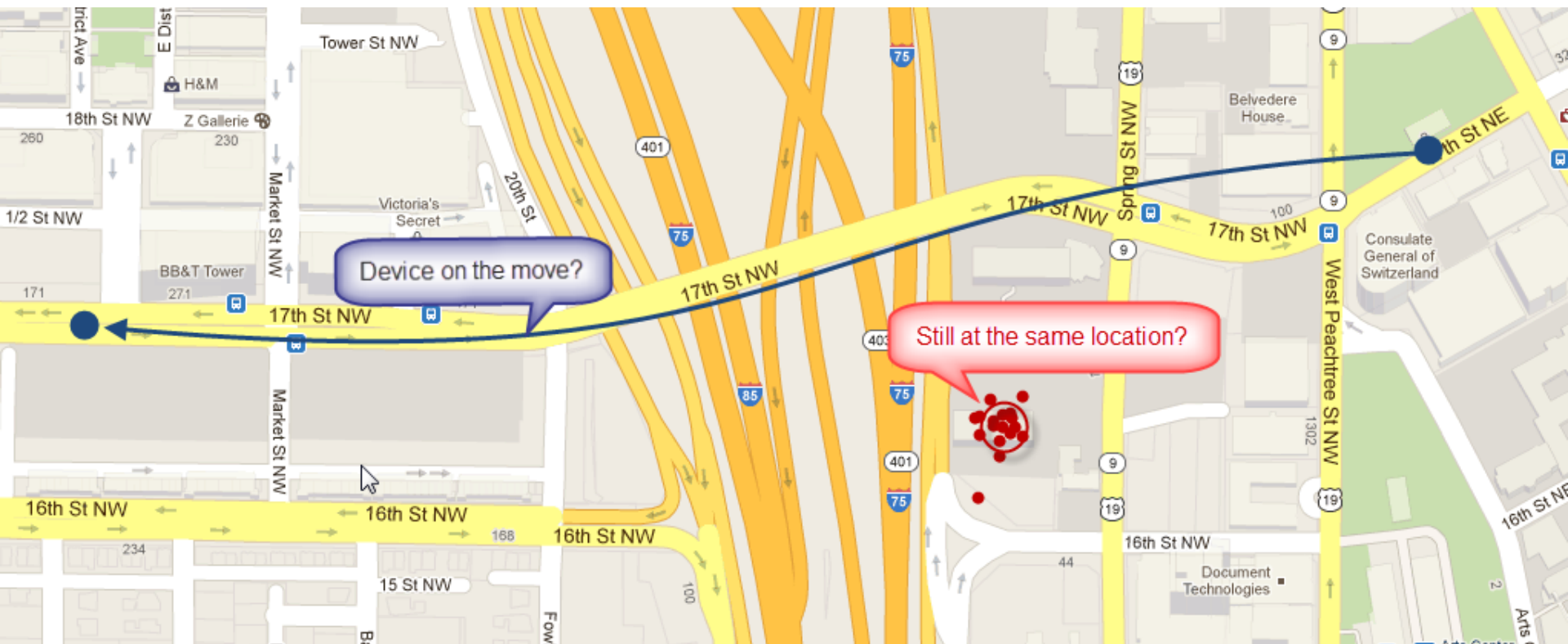


What do we do?

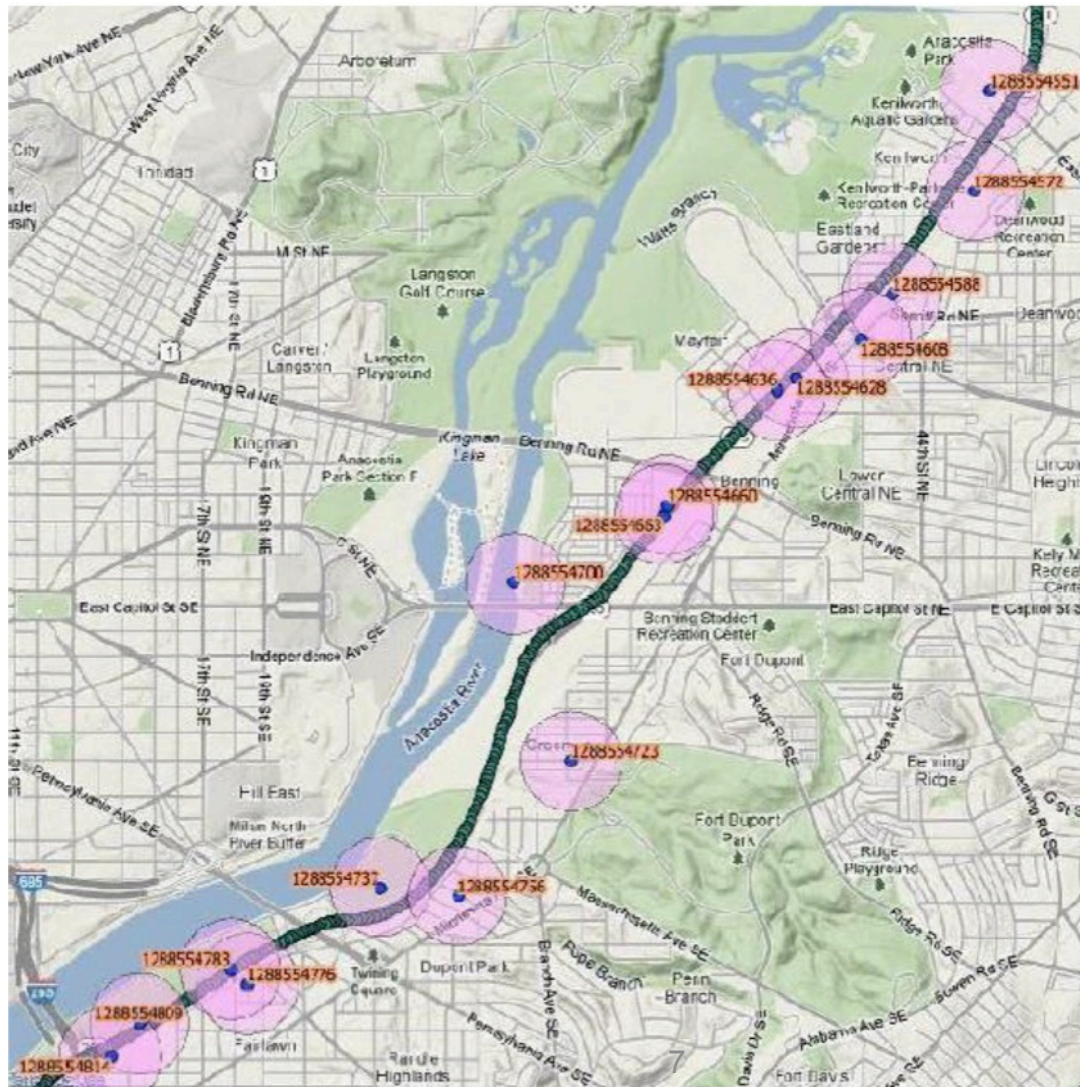


How do we do it?

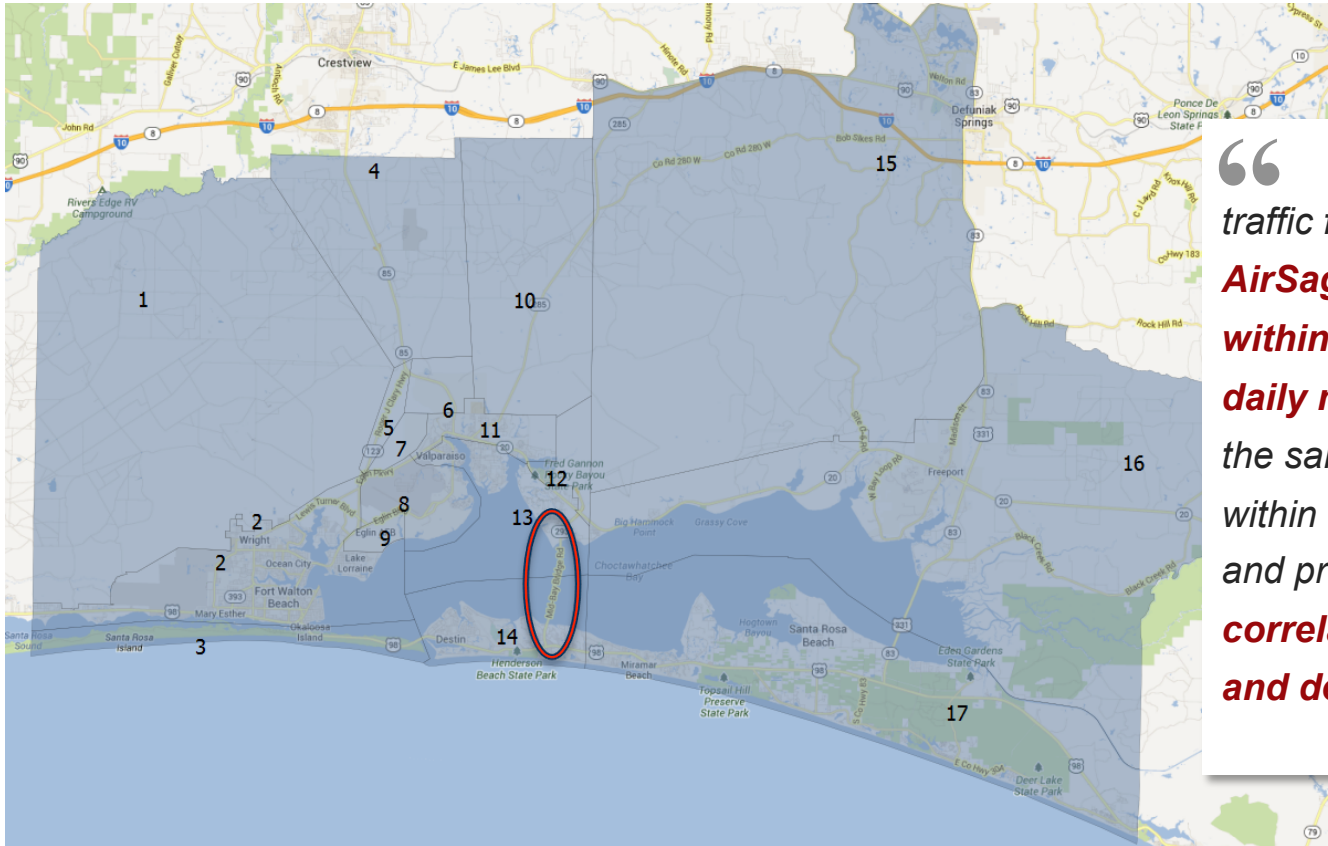
Each location is analyzed and compared to other locations.



AirSage Data Accuracy



Case Study: Niceville, Florida



“ The estimation of traffic flows using the **AirSage data compares within 3% of the average daily machine counts** for the same period. This is within range of counter error and provides **very good correlation with the origin and destination data.** ”

- Tom Hiles, HDR

Niceville, FL: Trip Characteristics

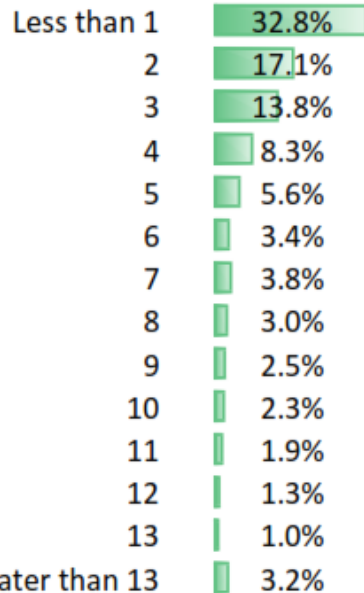
Niceville, FL -- Average Weekday Travel Data (Jan 15 - Feb 15, 2012)

Census 2010 Population: 130,575
 Average Daily Sampled Subscribers: 18,444
 Average # of Trips per Subscriber per Day: 4.00

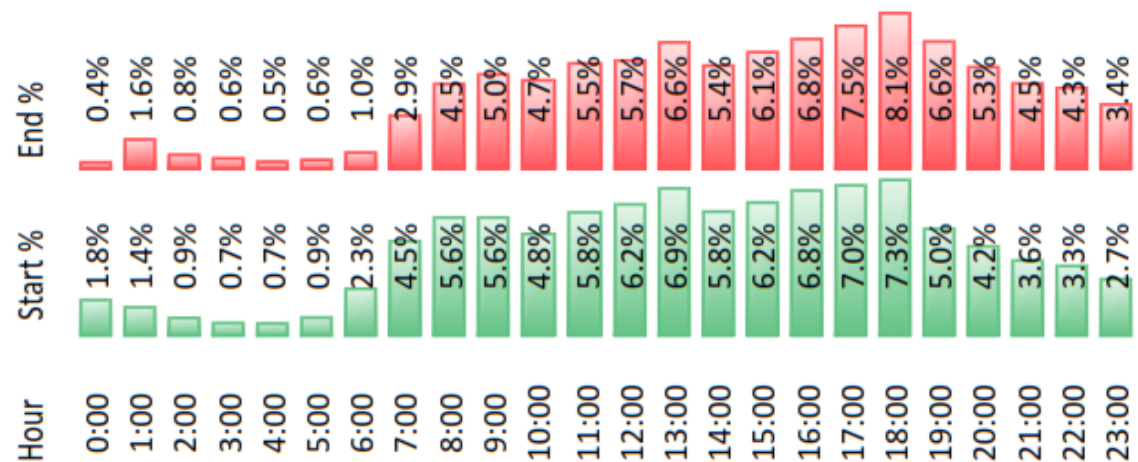
Proportion of Trips by Purpose (H-Home, W-Work, O-Other)

Trip Type	HW	WH	HO	OO	OH	WO	OW	WW	HH
Percent	3.9%	2.9%	21.2%	32.7%	20.4%	6.2%	5.2%	2.4%	5.2%

Trip Length Distribution (miles)



Time of Day Distribution (Hourly)



What can the data tell us?

Activity patterns can be examined over time to determine:

- Home-Based Work (HBW)
- Home-Based Other (HBO)
- Non-Home Based (NHB)
- Combinations of Home, Work, Other
 - HO, HW, HH, WH...
- Trips per Day by Type
- Trip Lengths by Type
- Time of Day Information
- Residence Class

“Generates **detailed traces** that can be used to construct **path histories with high fidelity** across long periods of time”*

* Research study by:

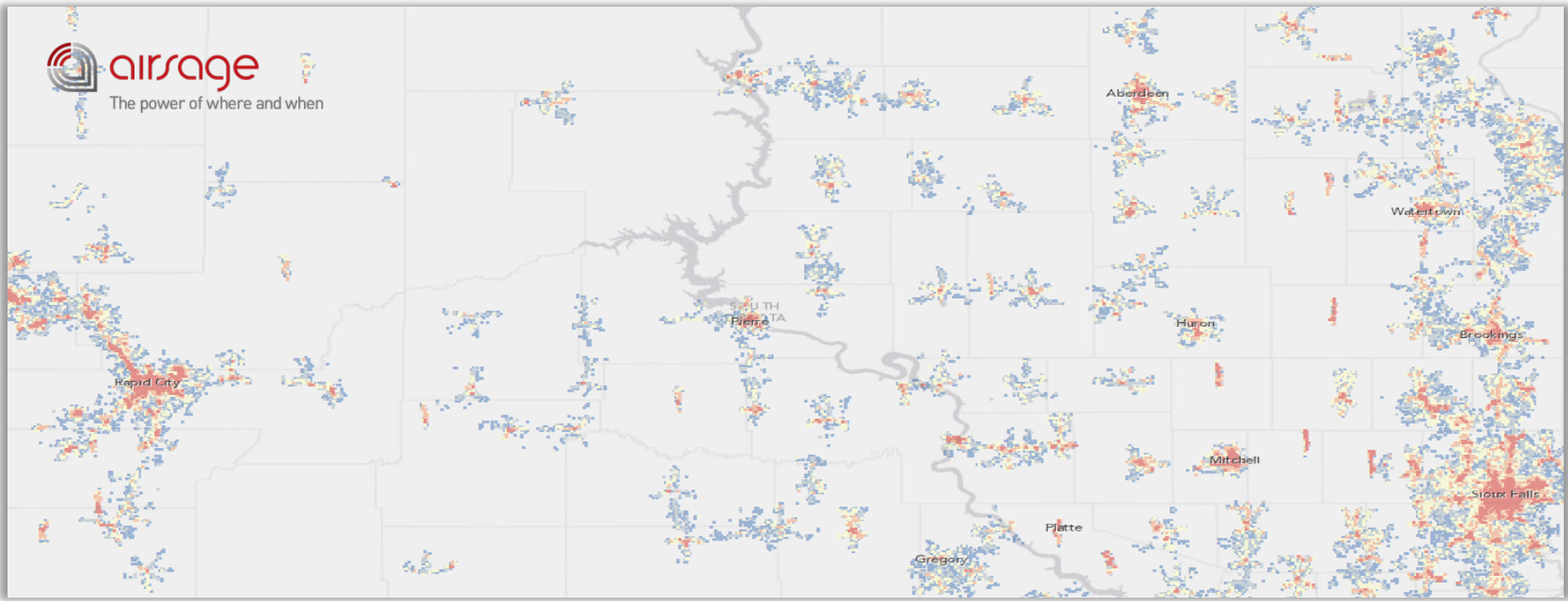
- IBM Dublin Research Laboratory
- Massachusetts Institute of Technology
- SENSEable City Laboratory

Resident Classes

2-Category Option	The mobile device...
Resident	Lives or works in the study area
Visitor	Does not live or work in the study area

6-Category Option	The mobile device...
Resident Worker	Lives and works are in the study area
Home Worker	Lives and works at the same location in the study area
Inbound Commuter	Works in the study area but lives outside of the study area
Outbound Commuter	Lives in the study area but works outside of the study area
Long-term Visitor	Is a non-resident present in the study area between 2 & 14 days
Short-term Visitor	Is a non-resident present in the study area less than 2 days

Wide Coverage



24th October 2012 -- South Dakota

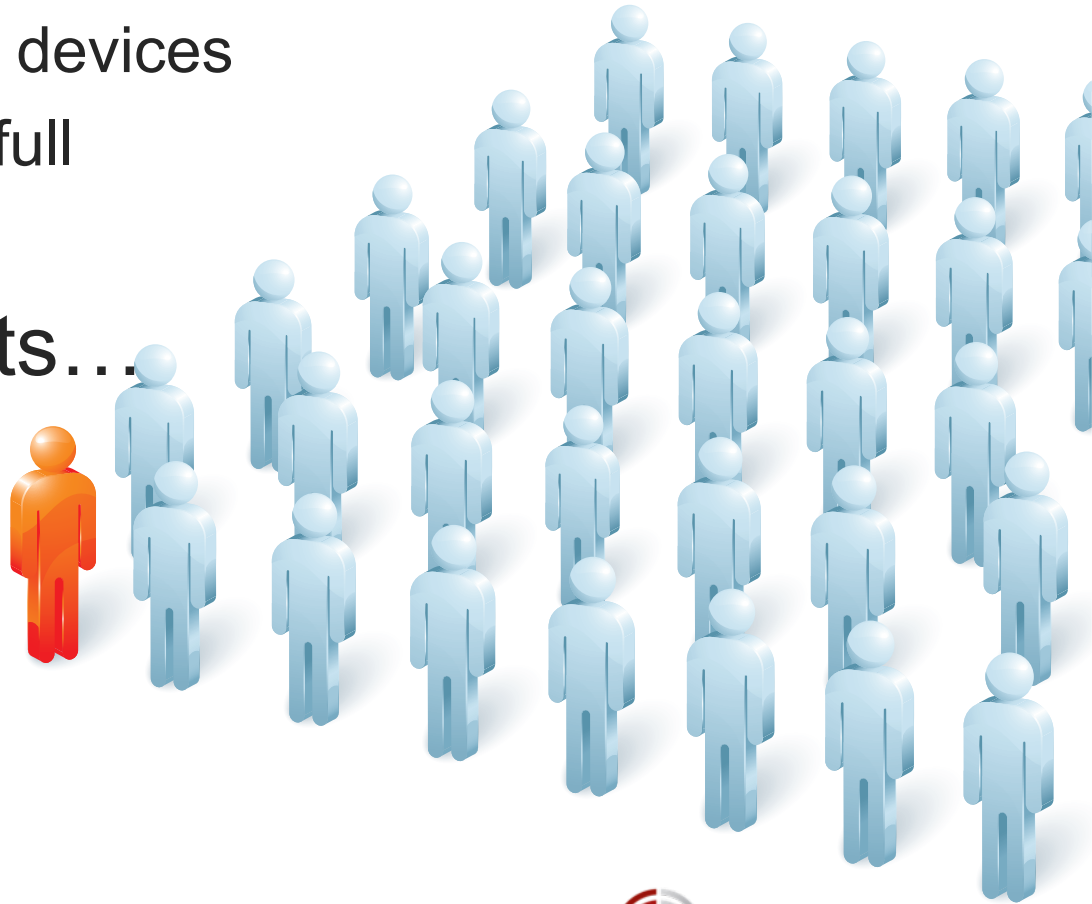
30 million sightings generated by more than 400,000 devices

Synthesized Resident Population of 808,000 people (Census 2011 Est.
824,000)

Synthesizing a Full Population

Leveraging Census data to expand
our sample of 100 million devices
accurately simulates the full
population of the U.S.

311 million residents...



Sample Bias?

- Inclusion of all mobile devices regardless of age, income
- Attach Census data to show HHI

Cell Phone and Smartphone Ownership

% of American adults within each group who own a cell phone and the % who own a smartphone

		Cell Phone	Smartphone
All adults (n=2,252)		91%	56%
a	Men (n=1,029)	93 ^b	59 ^b
b	Women (n=1,223)	88	53
Race/ethnicity			
a	White, Non-Hispanic (n=1,571)	90	53
b	Black, Non-Hispanic (n=252)	93	64 ^a
c	Hispanic (n=249)	88	60
Age			
a	18-29 (n=404)	97 ^{cd}	80 ^{bcd}
b	30-49 (n=577)	95 ^{cd}	67 ^{cd}
c	50-64 (n=641)	89 ^d	45 ^d
d	65+ (n=570)	76	18

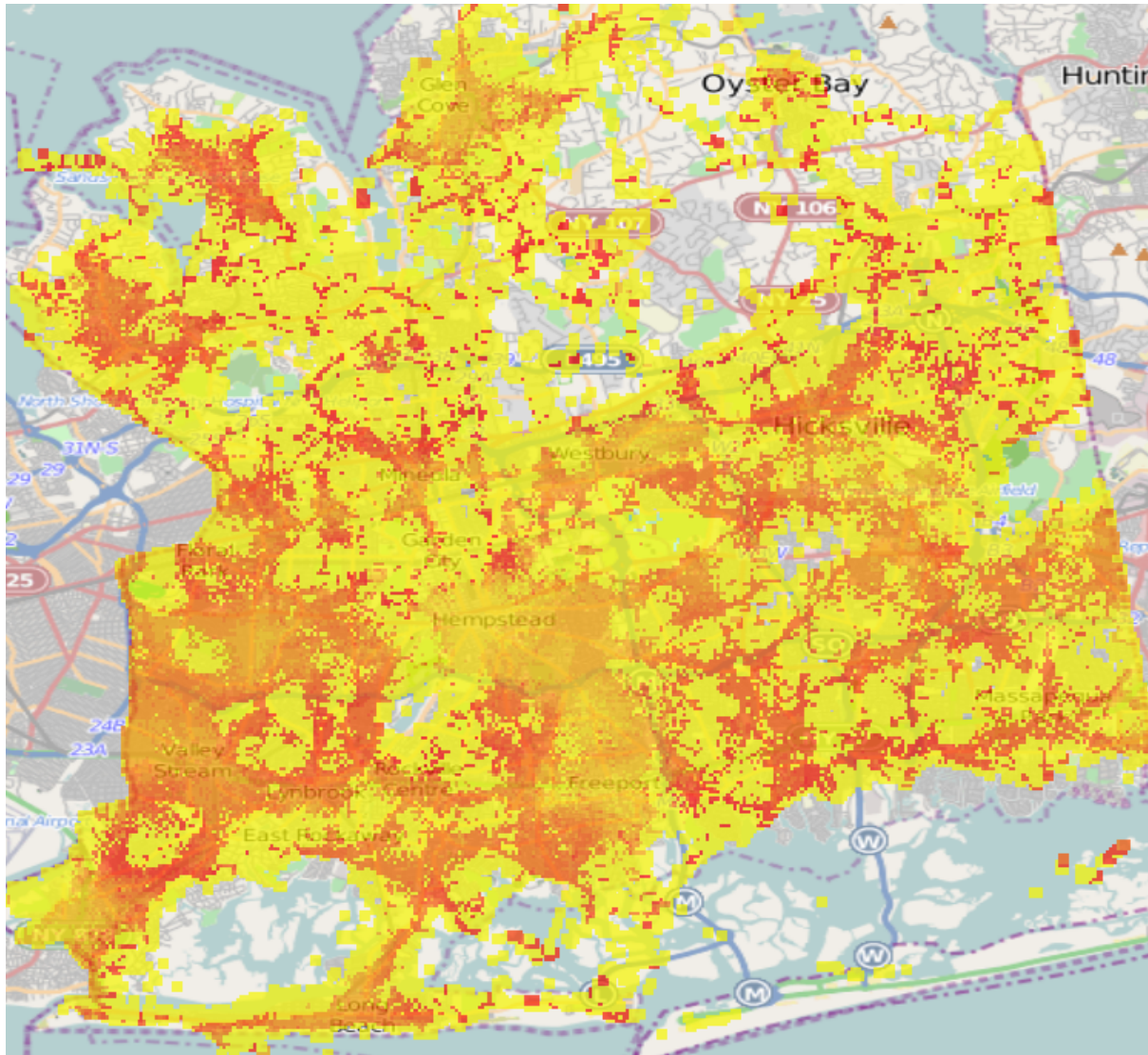
Education attainment			
a	No high school diploma (n=168)	83	36
b	High school grad (n=630)	88	46 ^a
c	Some College (n=588)	92 ^{ab}	60 ^{ab}
d	College + (n=834)	95 ^{abc}	70 ^{abc}
Household income			
a	Less than \$30,000/yr (n=580)	86	43
b	\$30,000-\$49,999 (n=374)	90 ^a	52 ^a
c	\$50,000-\$74,999 (n=298)	96 ^{ab}	61 ^a
d	\$75,000+ (n=582)	98 ^{ab}	78 ^{abc}
Urbanity			
a	Urban (n=763)	92 ^c	59 ^c
b	Suburban (n=1,037)	91 ^c	59 ^c
c	Rural (n=450)	85	40

Source: Pew Internet Spring Tracking Survey, April 17 – May 19, 2013. N=2,252 adults ages 18+. Interviews were conducted in English and Spanish and on landline and cell phones. Margin of error is +/- 2.3 percentage points for results based on all adults.

Note: Columns marked with a superscript letter (^a) or another letter indicate a statistically significant difference between that row and the row designated by that superscript letter. Statistical significance is determined inside the specific section covering each demographic trait.

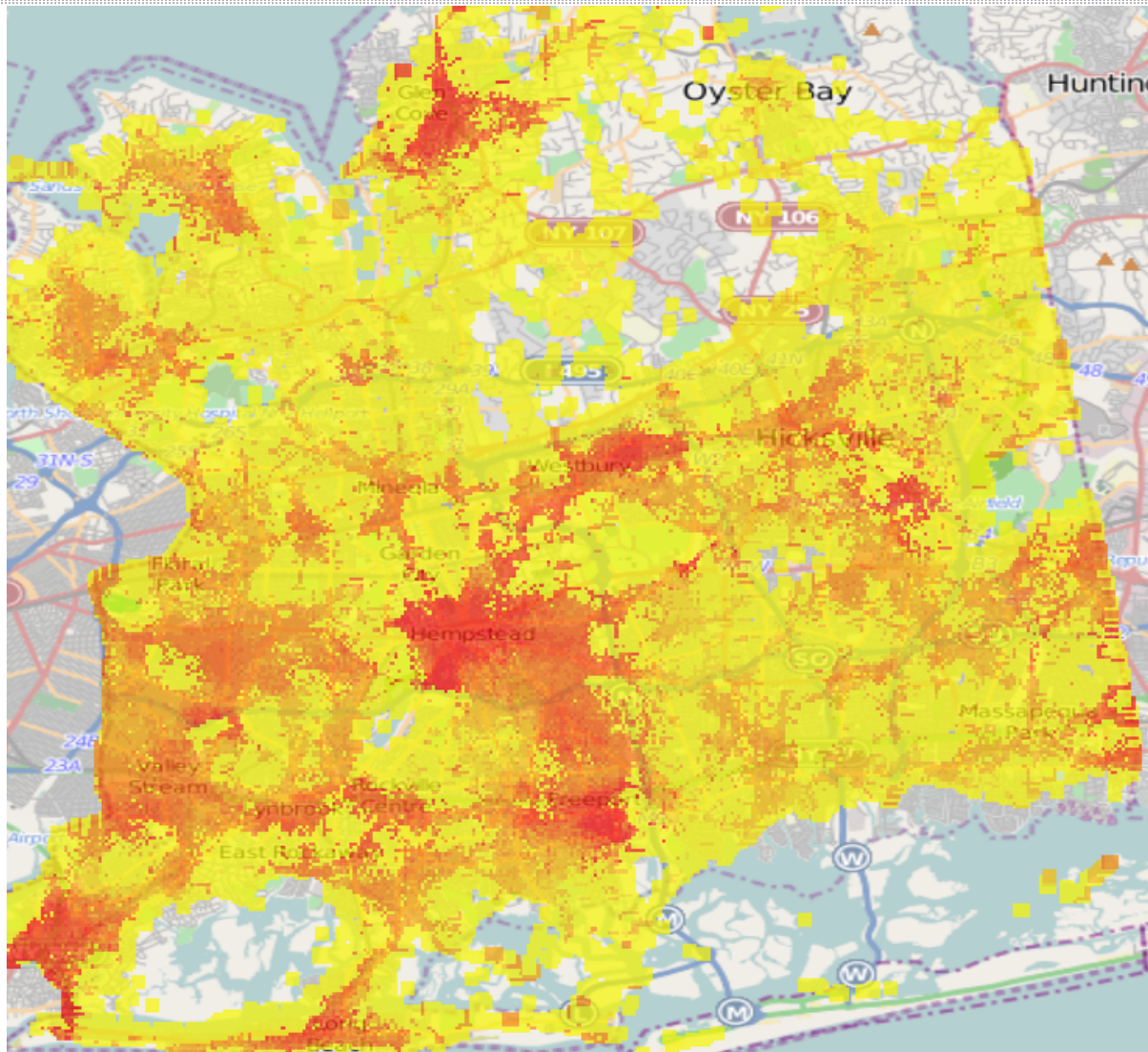


Case Study: Nassau County



Devices with
Income > \$100K

Case Study: Nassau County



Devices with
Income < \$35K

Population Analytics

4 Products

Actionable, Relevant Insights into...

Trip Matrix

The number of people and types of trips between two specific locations

Select Zone Analysis

The number of people and types of trips that go to, or come from, a specific location and where those trips began or ended

Arrivals and Departures

The number of people that go to, or come from, a specific location by time of day

Activity Density

The aggregation of all Activity Points with an activity duration of 5 or more minutes in a

Add-on Products

For Greater Analytics:

Home-Work Matrix

The number of people who live and work in specific locations

Home Location Report

The proportion of home locations (by zip code, county or state) for unique mobile devices included in a study

TRIP MATRIX

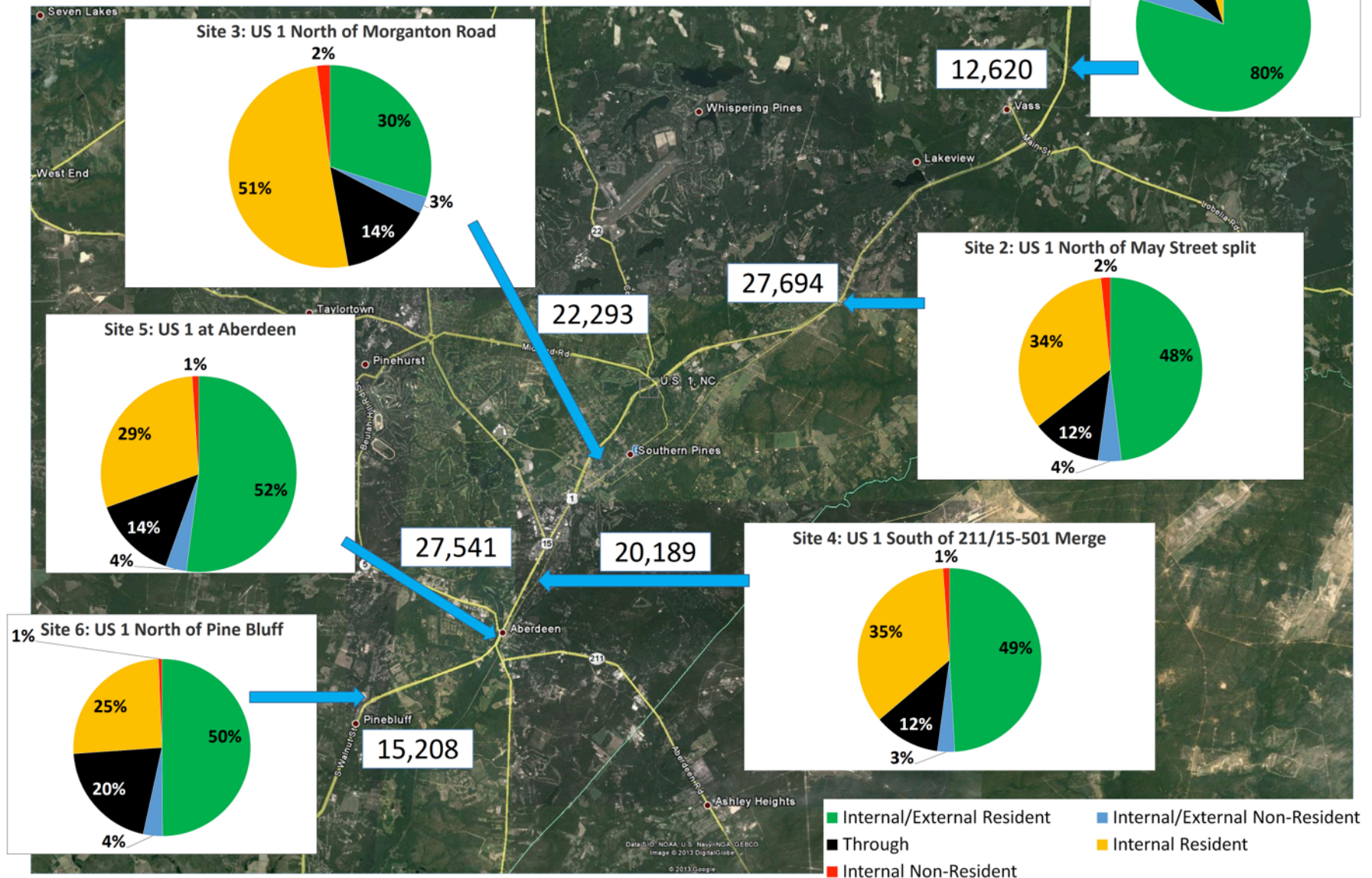
Case Study: Moore County, NC

- 1 month of data
(September 20 – October 18, 2012) consists of:
 - 8 weekend days*
 - 12 weekdays
- 11,590,819 total number of trips recorded
- 3,017,382 unique mobile devices seen at least once in focus study area

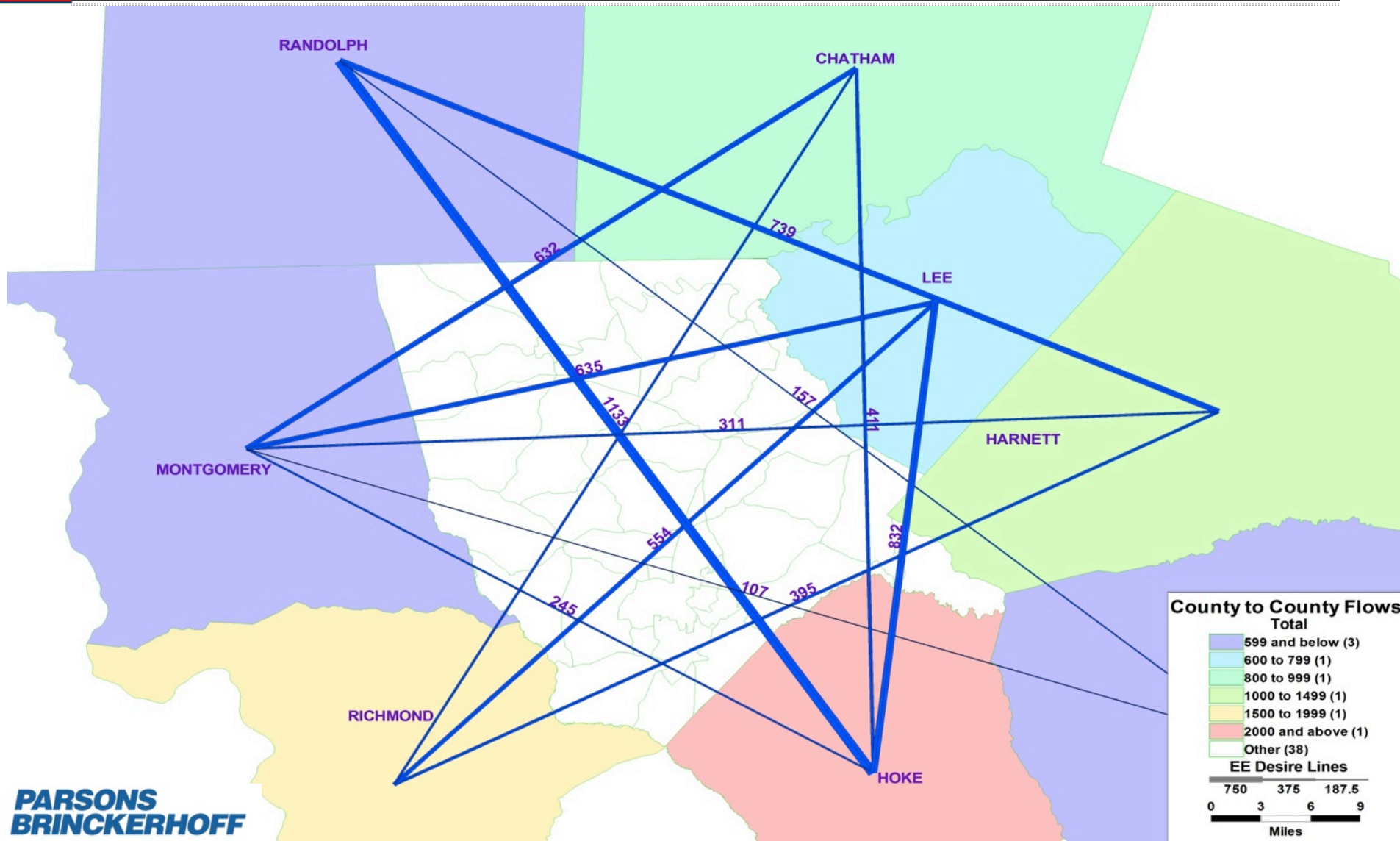


* Weekend data is only used to help determine the home and work locations of the devices. This data was not used in developing the OD matrices used in the analysis described for Moore County

US 1 in Moore County OD Flows By Trip Type Using AirSage Data



County to County Flows (Through Trips)



Assigning AirSage Matrices

*“The biggest difference noted is for rural facilities...the TRM (Triangle Regional Model) and AirSage are quite different... **AirSage data actually matches the traffic counts for these rural facilities better than the TRM.**”*

Leta Huntsinger, PhD, P.E.

Parsons Brinckerhoff Systems Analysis Group

*“Reconciliation of Regional Travel Model and
Passive Device Tracking Data”*

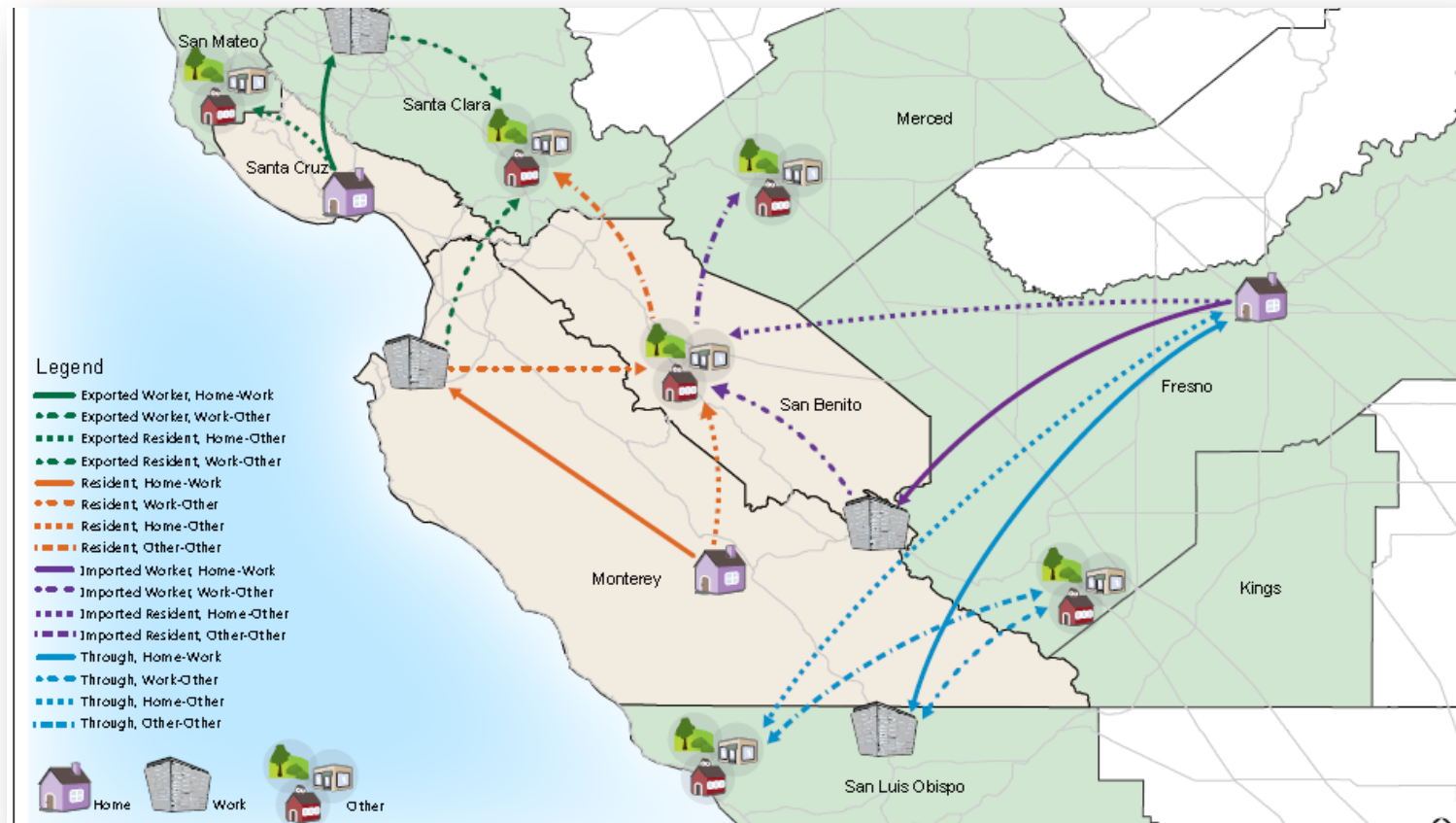


airsage

The power of where and when

SELECT ZONE ANALYSIS

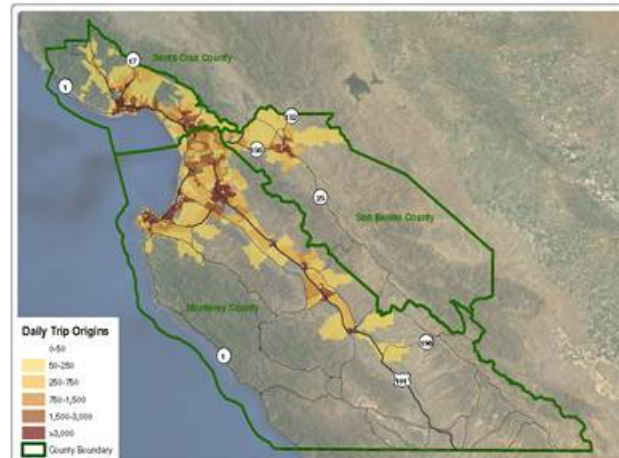
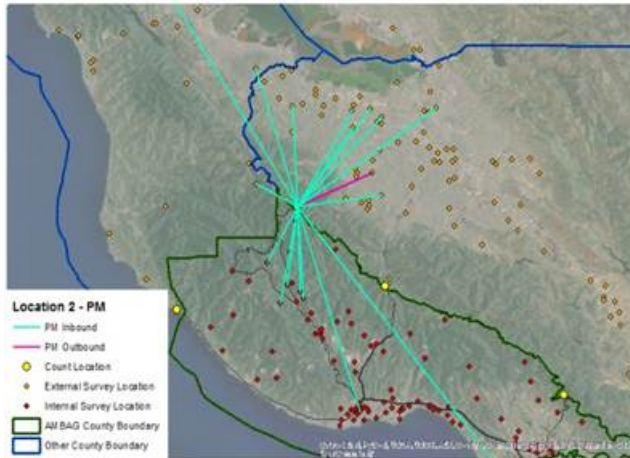
Case Study: Monterey Bay, CA



The accuracy and additional data collected with the new license plate video technology alone increases the value of the survey. The ability to also collect cell phone data over 30 days and combine with Census data to infer the household demographics has great potential but has not yet been done. Combining both approaches on the same study is very exciting. We are looking forward to the advances the project can bring to data collection, travel modeling, and transportation planning.

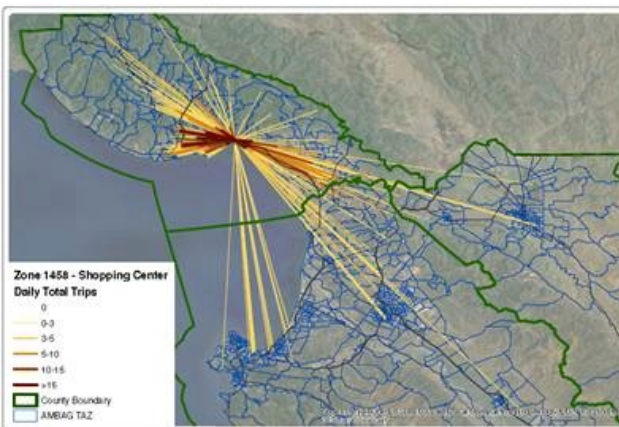
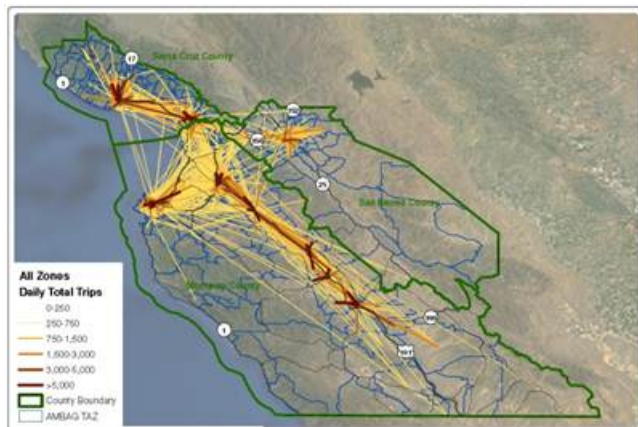
- Anais Schenk, Planner and AMBAG Project Manager

Case Study: Monterey Bay, CA



Data collected – 10 regional external gateways for control total

- Over 24-hrs, 165,000 vehicles observed
- 83,000 unique license plate numbers
- Addresses obtained from DMV
- 5,300 license plate surveys mailed for more detailed travel characteristics
- Compared to American Community Survey for missing demographics



To supplement & complement, AirSage cellular data was used:

Provided info on all trip types occurring within the AMBAG region including:

- Local resident
- Visitor
- Inter-regional trips

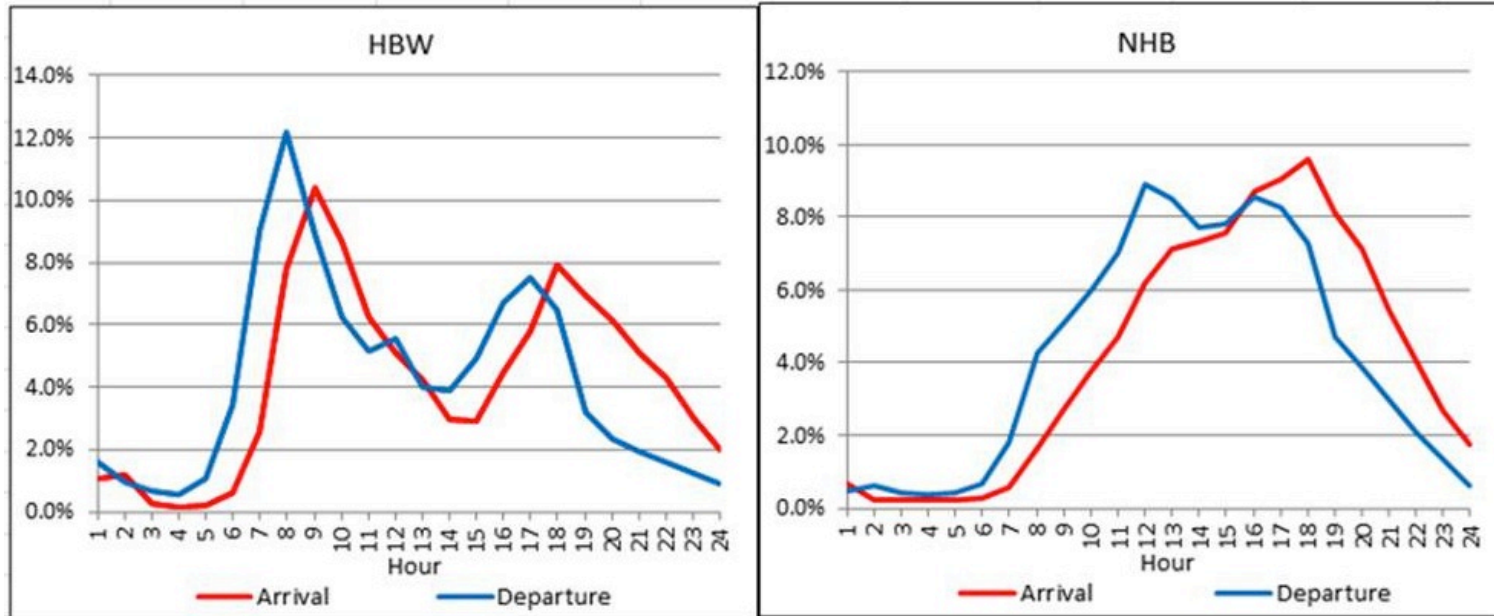
Data also stratified by 9 different trip purposes

<http://asap.fehrandpeers.com/projects/monterey-bay-origin-and-destination-study/>

ARRIVALS & DEPARTURES

Arrivals & Departures

The data below represents the Cincinnati, OH region (March 2013). More information about the Ohio-Kentucky-Indiana Regional Council of Governments Travel Demand Model Update can be found on AirSage.com under /News/Success Stories.



"The AirSage data helps validate findings, which is very valuable. If we mess up and the model says it should take 2 lanes and it really needed 4, the cost of getting it wrong could be 10-20 years of people sitting in traffic."

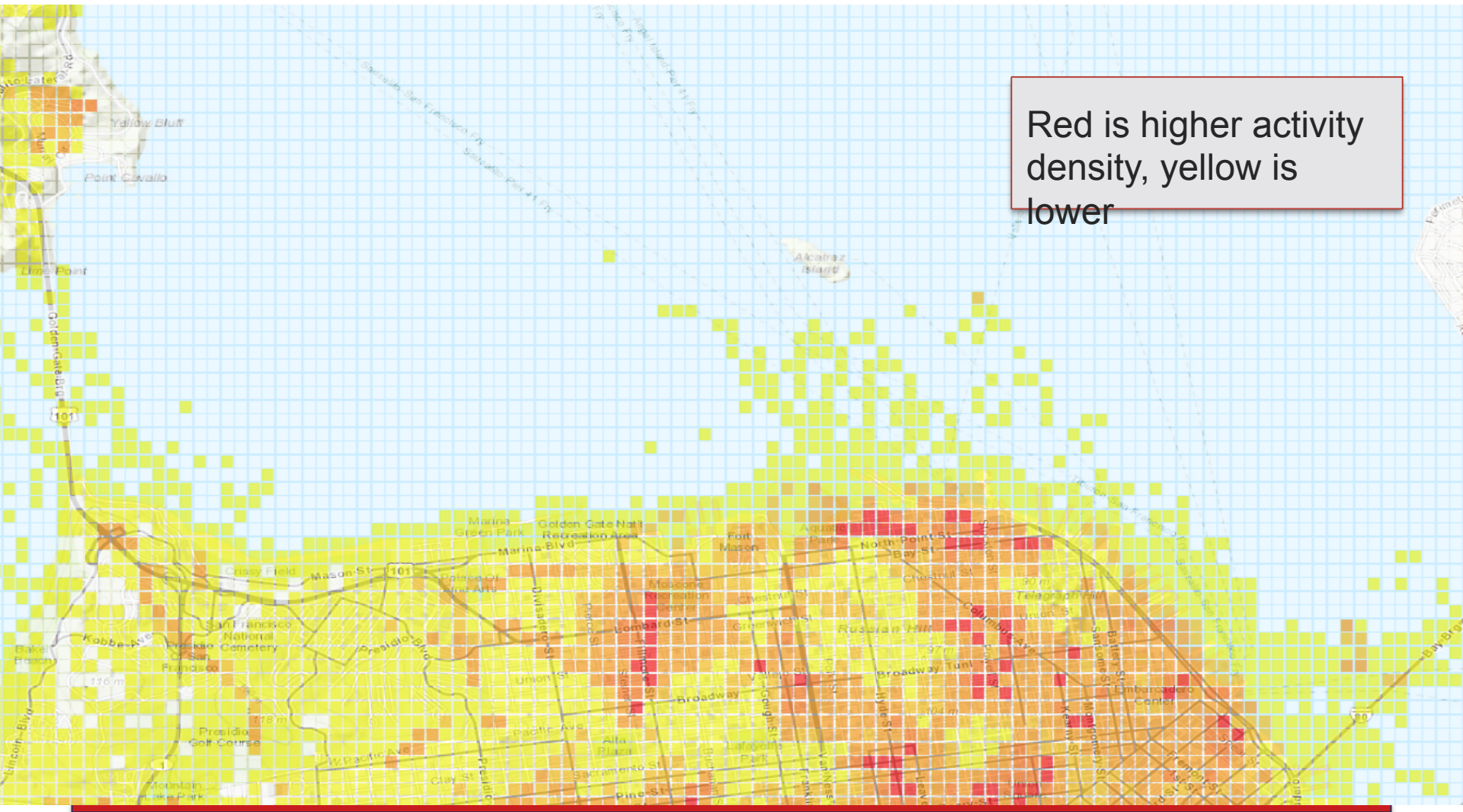
- Andrew Rohne, Transportation Modeling Manager and Project Leader for OKI

ACTIVITY DENSITY

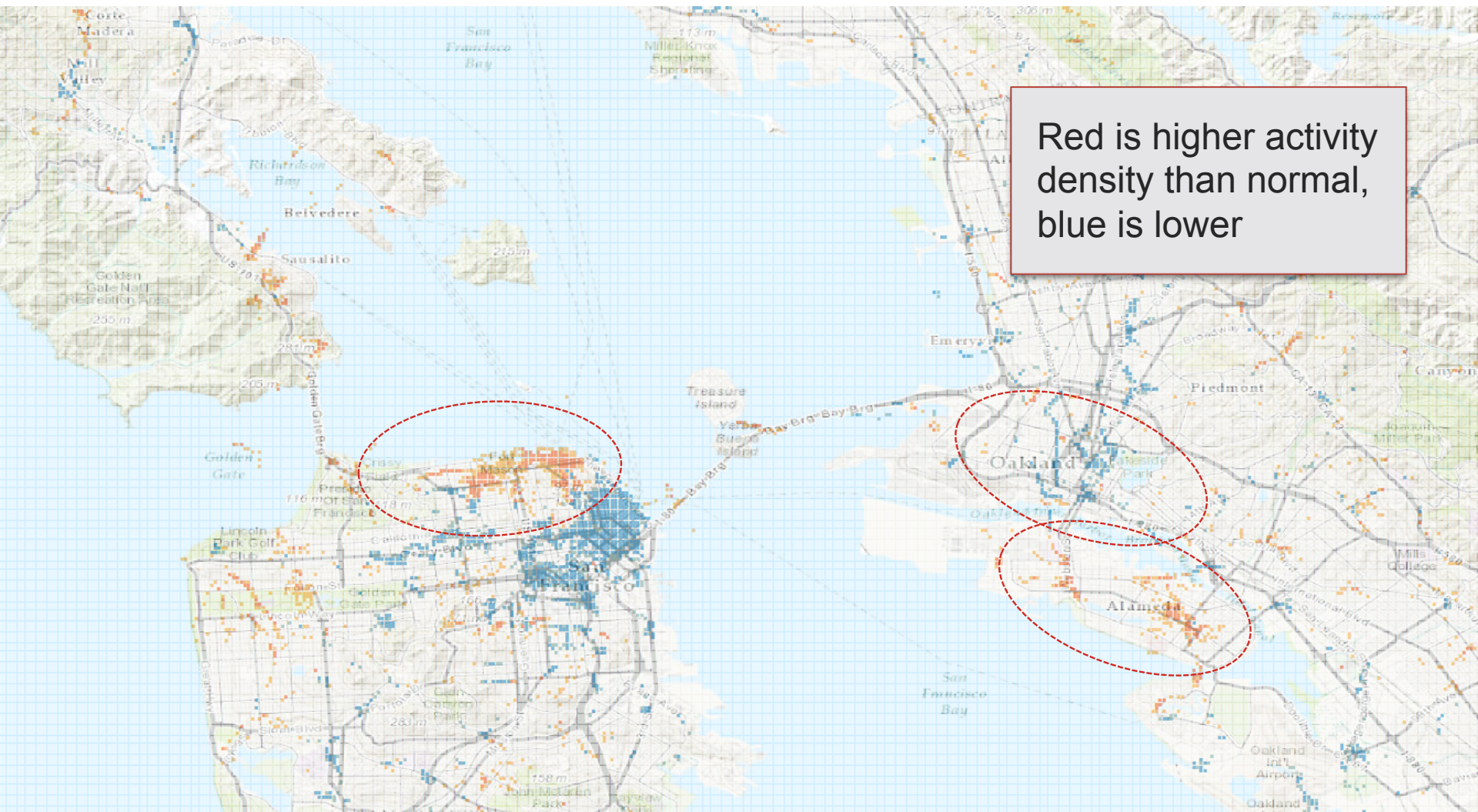
Case Study: America's Cup



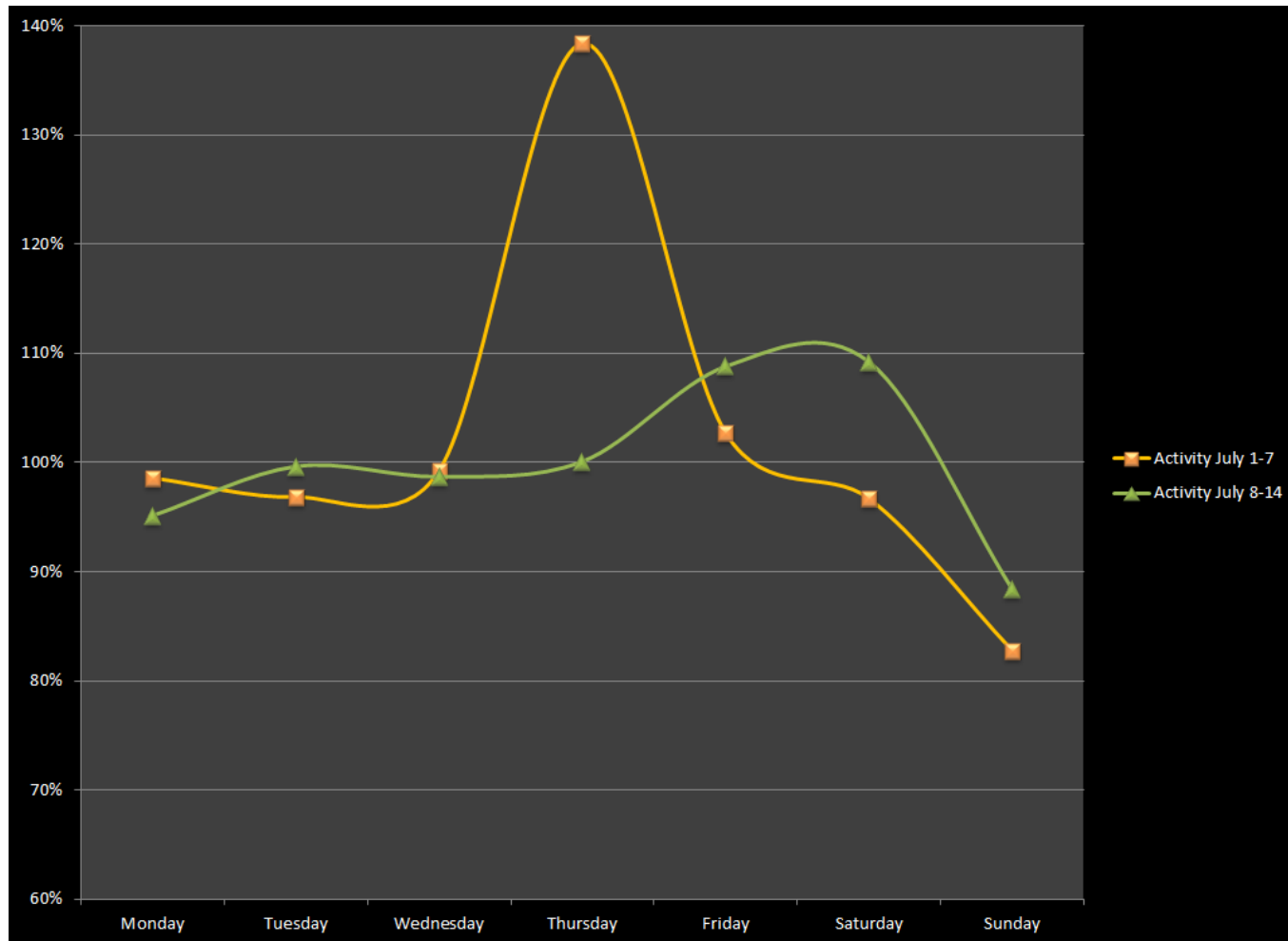
July 4 – Amer. Cup Activity



July 4 – City Difference

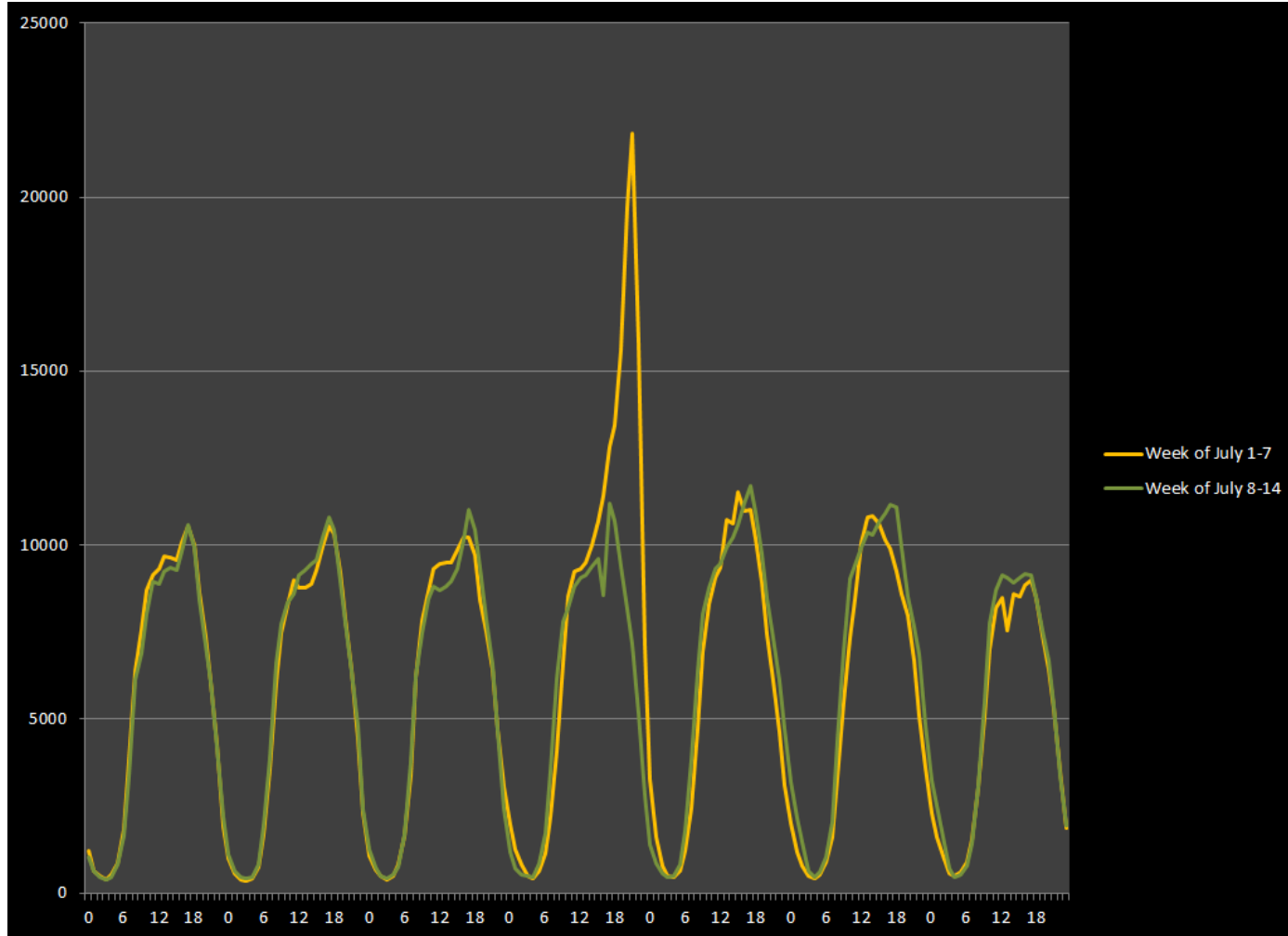


Waterfront, normal versus 4th



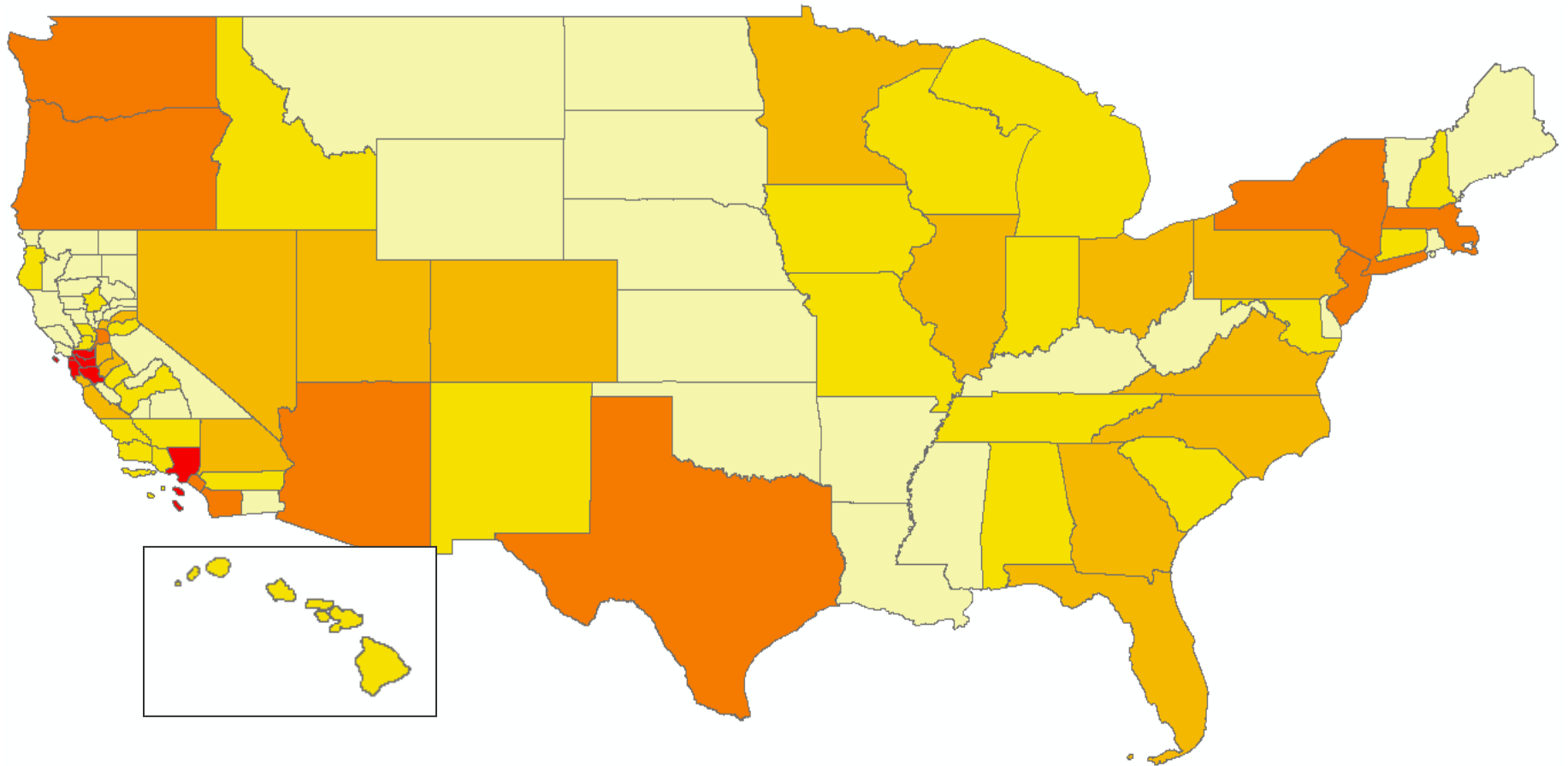
Waterfront Hourly Activity Profiles

normal versus 4th

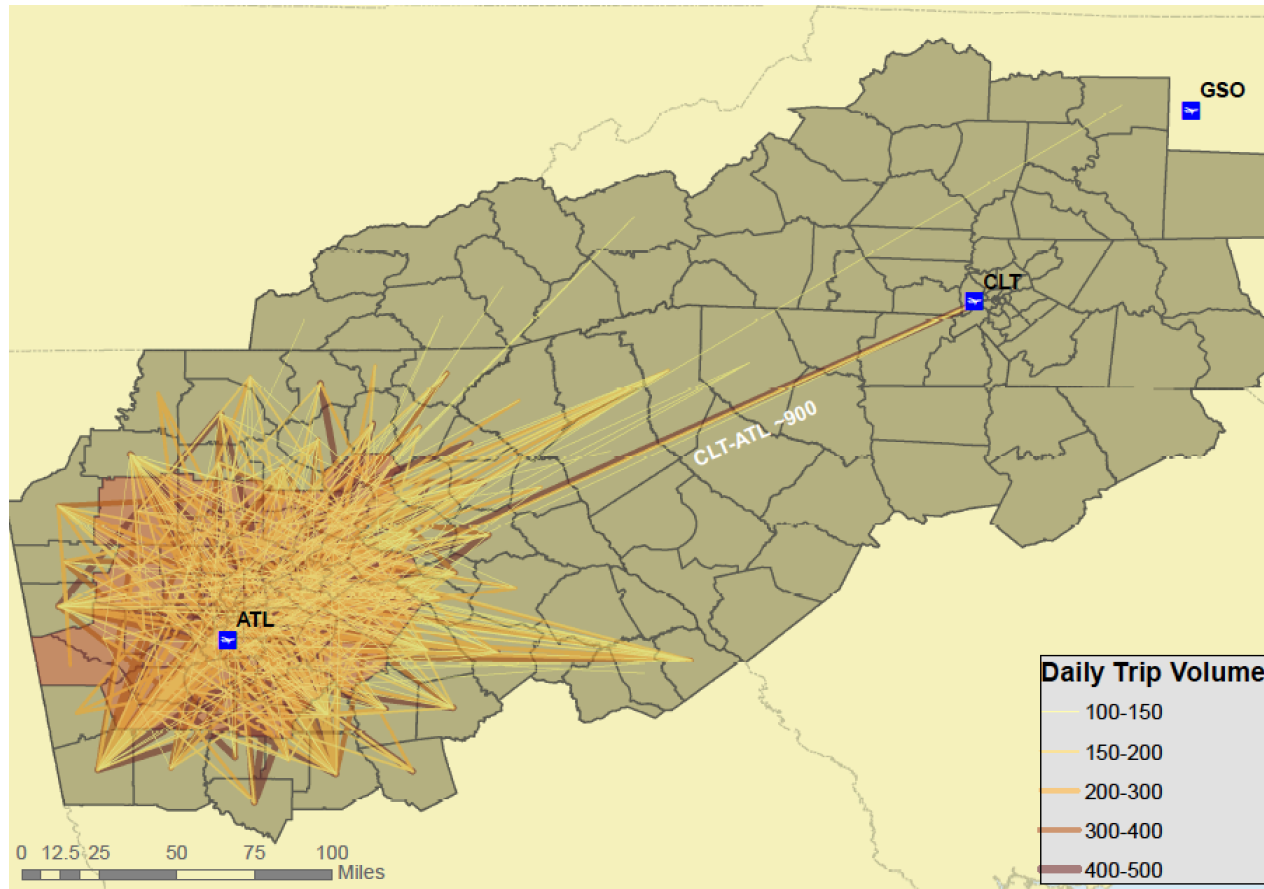


Example: America's Cup 2013

Visitor Home Locations

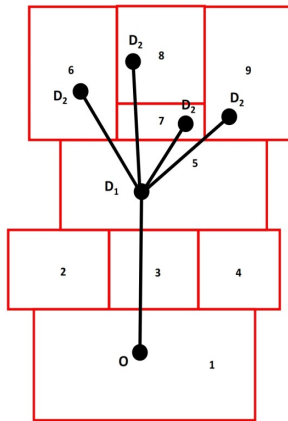


Long Distance Trips



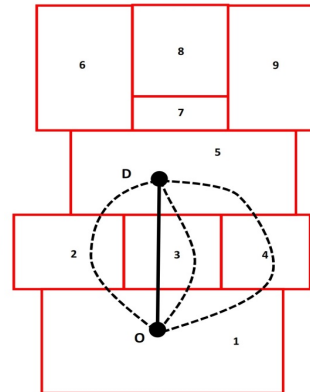
Super and Sub Matrices

Super Matrix



- Super Matrix is a breakdown of trips that were made after a completed trip leg.
- EXAMPLE: For the Zone 1 to Zone 5 trip leg, the count or % of subsequent trips. The subsequent trips have an origin D_1 and new destination D_2 .

Sub Matrix



- Submatrix is a breakdown of trips that were made through any new zones between the origin and destination.
- EXAMPLE: For the Zone 1 to Zone 5 trip leg, the count or % of trips that pass through intermediate Zones 2, 3, and 4.

Sample Deliverable

Origin_Zone	Destination_Zone	Start_Date	End_Date	Aggregation	Time of Day	Counts	Zone_1	Zone_2	Zone_15	Zone_16
5	15	20121015	20121127	TotWD	H0:H24	200	6%	6%	6%	6%	6%	6%
7	8	20121015	20121127	TotWD	H0:H24	800	6%	6%	6%	6%	6%	6%
6	3	20121015	20121127	TotWD	H0:H24	900	6%	6%	6%	6%	6%	6%
5	2	20121015	20121127	TotWD	H0:H24	1000	6%	6%	6%	6%	6%	6%
4	1	20121015	20121127	TotWD	H0:H24	1100	6%	6%	6%	6%	6%	6%
5	4	20121015	20121127	TotWD	H0:H24	300	6%	6%	6%	6%	6%	6%
8	5	20121015	20121127	TotWD	H0:H24	300	6%	6%	6%	6%	6%	6%
9	6	20121015	20121127	TotWD	H0:H24	500	6%	6%	6%	6%	6%	6%
9	7	20121015	20121127	TotWD	H0:H24	700	6%	6%	6%	6%	6%	6%
15	2	20121015	20121127	TotWD	H0:H24	300	6%	6%	6%	6%	6%	6%

Sample of Data Format

	A	B	C	D	E	F	G	H	I	
1	Origin_Zone	Destination_Zone	Start_Date	End_Date	Aggregation	Subscriber_Zone	Purpose	Time_of_Day	Count	
2	94	37	20130702	20130731	WD	Visitor	OO	H00:H24	5.08	
3	420	343	20130702	20130731	WD	Resident	HW	H00:H24	1.49	
4	548	33	20130702	20130731	WD	Resident	WO	H00:H24	5.01	
5	68	164	20130702	20130731	WD	Resident	OO	H00:H24	4.96	
6	256	400	20130702	20130731	WD	Resident	HO	H00:H24	5.97	
7	498	62	20130702	20130731	WD	Resident	HW	H00:H24	4.37	
8	1	176	20130702	20130731	WD	Resident	OH	H00:H24	4.71	
9	54	33	20130702	20130731	WD	Resident	OO	H00:H24	18.54	
10	255	311	20130702	20130731	WD	Resident	HO	H00:H24	1.65	
11	543	85	20130702	20130731	WD	Resident	HO	H00:H24	1.19	
12	268	62	20130702	20130731	WD	Resident	OH	H00:H24	25	
13	110	425	20130702	20130731	WD	Resident	WH	H00:H24	0.41	
14	1005	249	20130702	20130731	WD	Resident	WH	H00:H24	2.63	
15	1003	3	20130702	20130731	WD	Visitor	HO	H00:H24	4.36	
16	221	102	20130702	20130731	WD	Resident	HO	H00:H24	1.82	
17	12	45	20130702	20130731	WD	Resident	HH	H00:H24	2.97	
18	290	286	20130702	20130731	WD	Visitor	OO	H00:H24	2.59	
19	400	593	20130702	20130731	WD	Visitor	OO	H00:H24	0.46	
20	122	160	20130702	20130731	WD	Resident	HO	H00:H24	1.26	

Summary

- AirSage data is...
 - **Faster:** Validate traditional methods, or replace altogether
 - **Easier:** Massive sample size using population synthesis
 - **Better:** Reduced sample bias; extremely wide coverage area
 - **Cheaper:** Reduced study resources



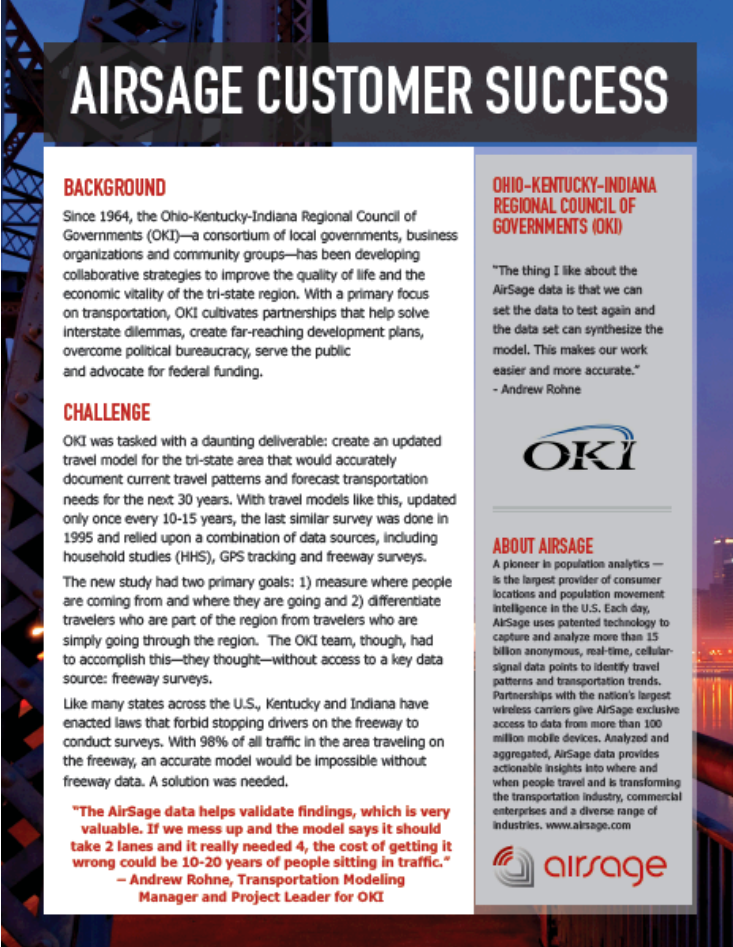
AirSage data reduced a typical NuStats data collection team of 20-60 analysts to a handful of data analysts and GIS specialists.

Data Validation

OKI Success Story

“ When I have to use travel surveys, which are done the same as they have been for the last 40-50 years, we don’t always know if the data is right. But if we can tap into another source, like mobility data, then we agree that the results are more than likely accurate.”

- Andrew Rohne



AIRPAGE CUSTOMER SUCCESS

BACKGROUND

Since 1964, the Ohio-Kentucky-Indiana Regional Council of Governments (OKI)—a consortium of local governments, business organizations and community groups—has been developing collaborative strategies to improve the quality of life and the economic vitality of the tri-state region. With a primary focus on transportation, OKI cultivates partnerships that help solve interstate dilemmas, create far-reaching development plans, overcome political bureaucracy, serve the public and advocate for federal funding.

CHALLENGE

OKI was tasked with a daunting deliverable: create an updated travel model for the tri-state area that would accurately document current travel patterns and forecast transportation needs for the next 30 years. With travel models like this, updated only once every 10-15 years, the last similar survey was done in 1995 and relied upon a combination of data sources, including household studies (HHS), GPS tracking and freeway surveys.

The new study had two primary goals: 1) measure where people are coming from and where they are going and 2) differentiate travelers who are part of the region from travelers who are simply going through the region. The OKI team, though, had to accomplish this—they thought—without access to a key data source: freeway surveys.

Like many states across the U.S., Kentucky and Indiana have enacted laws that forbid stopping drivers on the freeway to conduct surveys. With 98% of all traffic in the area traveling on the freeway, an accurate model would be impossible without freeway data. A solution was needed.


“The AirSage data helps validate findings, which is very valuable. If we mess up and the model says it should take 2 lanes and it really needed 4, the cost of getting it wrong could be 10-20 years of people sitting in traffic.”

— Andrew Rohne, Transportation Modeling Manager and Project Leader for OKI

OHIO-KENTUCKY-INDIANA REGIONAL COUNCIL OF GOVERNMENTS (OKI)


“The thing I like about the AirSage data is that we can set the data to test again and the data set can synthesize the model. This makes our work easier and more accurate.”

- Andrew Rohne



ABOUT AIRPAGE

A pioneer in population analytics — is the largest provider of consumer locations and population movement intelligence in the U.S. Each day, AirSage uses patented technology to capture and analyze more than 15 billion anonymous, real-time, cellular-signal data points to identify travel patterns and transportation trends. Partnerships with the nation's largest wireless carriers give AirSage exclusive access to data from more than 100 million mobile devices. Analyzed and aggregated, AirSage data provides actionable insights into where and when people travel and is transforming the transportation industry, commercial enterprises and a diverse range of industries. www.airsage.com



IBM and MIT Research

- Research Concludes AirSage Data
 - Allows for **lower collection cost**, a **larger sample size**, **higher update frequency**, and a **broader spatial and temporal coverage**
 - Generates **detailed traces** that can be used to construct **path histories with high fidelity** across long periods of time
 - Produces audience measurements that are **more credible than current static measurements**, thus providing **rich information to support transportation planning and operation**

Notable Awards / Mentions

Gartner

- Gartner, Inc., the world's leading information technology research and advisory company, has named AirSage as **one of four Solution Vendors to Watch**

Inc.

- Inc. magazine named AirSage as **one of the nation's fastest-growing private companies** on its seventh annual Inc. 500|5000 list, ranking AirSage No. 2039

**BUSINESS
INSIDER**

- Business Insider listed AirSage as **one of the Google-like companies doing interesting things with Big Data**

Fierce 15
FierceWireless

- Fierce Wireless designated AirSage as **one of the top fifteen privately-held wireless companies to keep an eye on in 2013**



airsage

The power of where and when

615.815.4744

dfisher@airsage.com

www.airsage.com

Twitter - @airsage

LinkedIn - <http://www.linkedin.com/company/airsage>