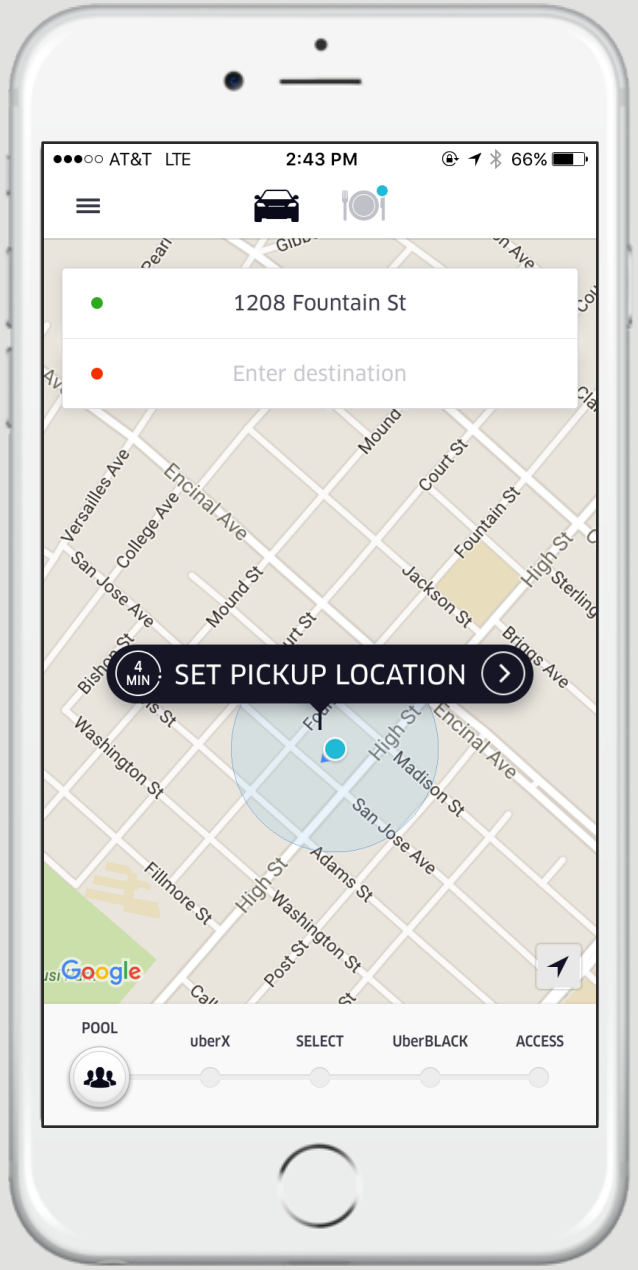
Location Data: Accuracy and Innovations

PlaceIQ MMA MOBILE MARKETING ASSOCIATION

July 25, 2016

What's Behind the Blue Dot?



THE MANY 'LOCATIONS'

Where you actually are

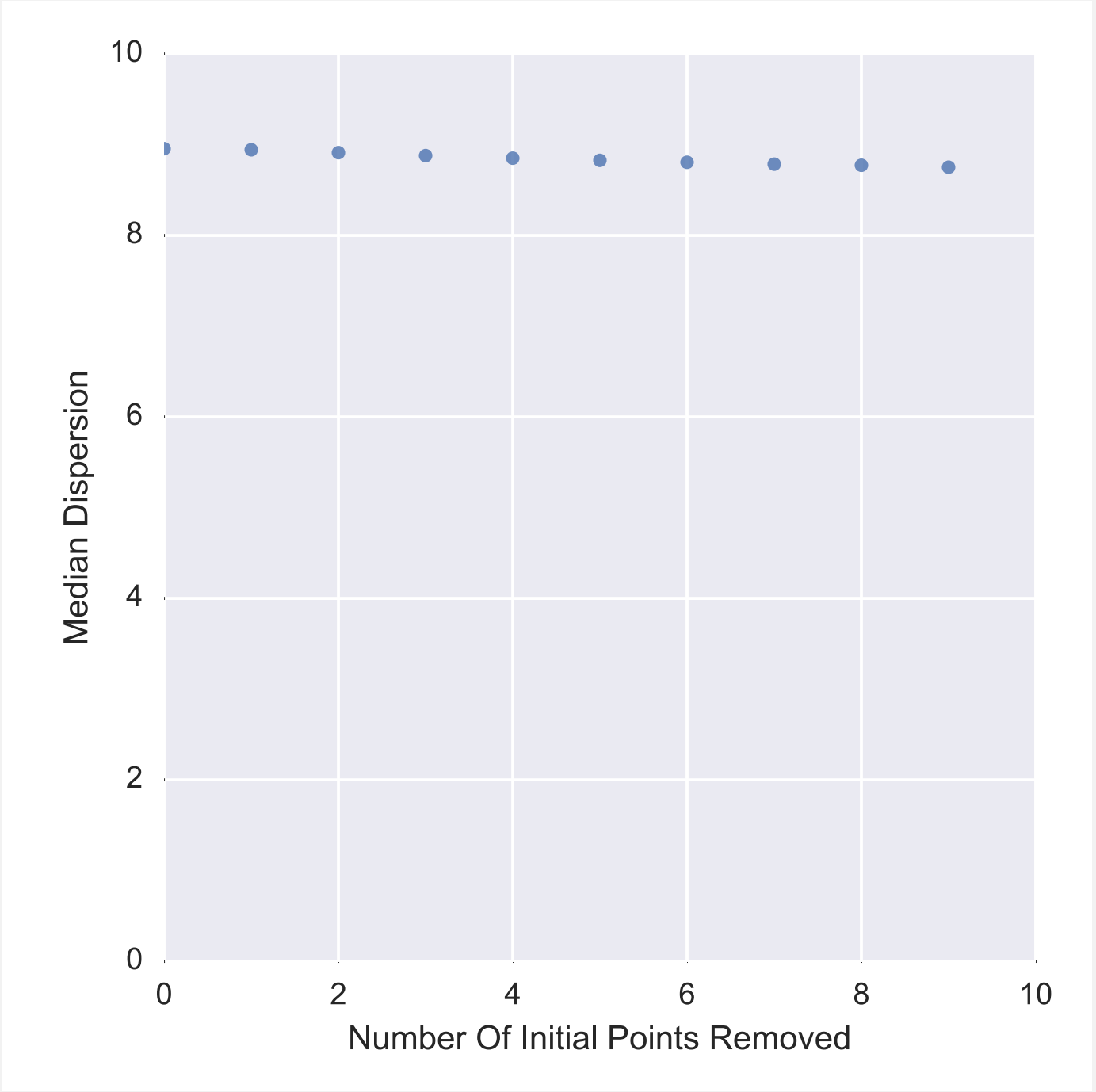
Where the map says you are

Where the phone thinks you are

What the application shows you

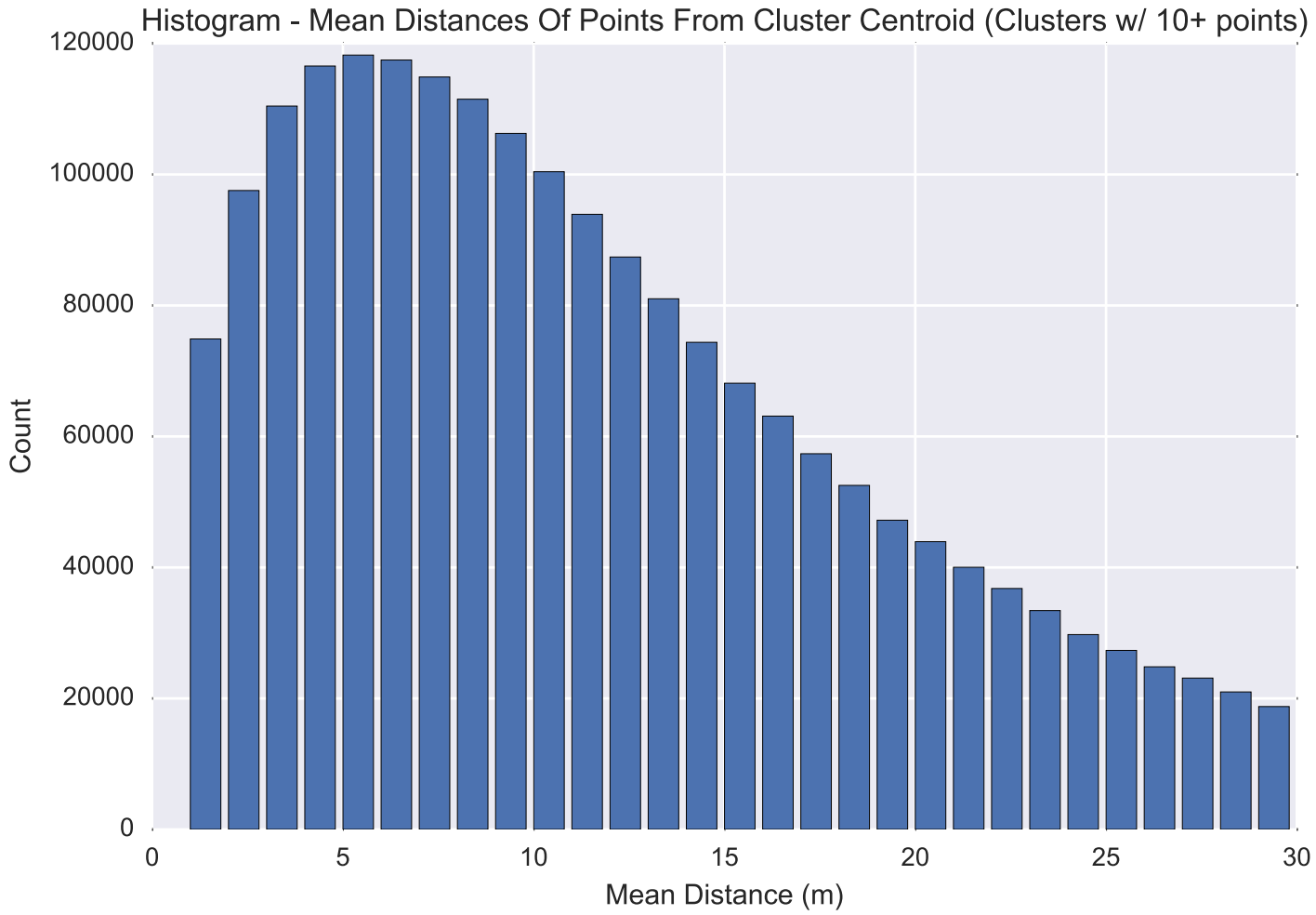
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Initial Locates Are Not Significantly Less Accurate

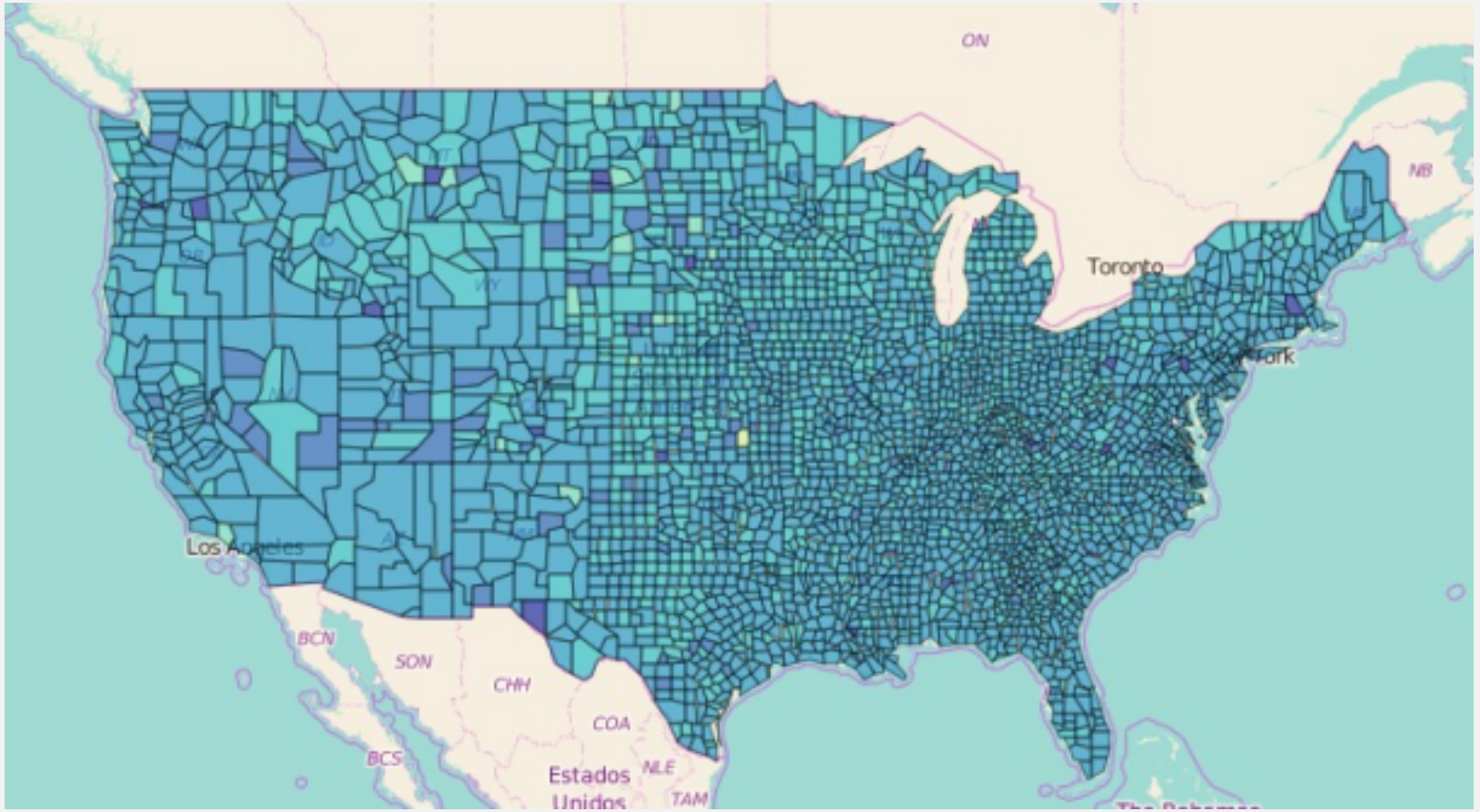


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Accuracy Varies Up To 30m



Accuracy Has Variance by Location



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How an App Figures Out Where You Are

1 App asks OS for location

Operating System

On iOS, the app uses the **Core Location** API.

On Android, the app uses the **android.location** API.



2 OS gets location from device

Cellular Antenna	*Avg. Accuracy: 2,000 m*	
WIFI Antenna	*Avg. Accuracy:* ***424 m***	
GPS Antenna	*Avg. Accuracy: 23 m*	

3 OS passes best available location

Location Response

- (Lat, Long)
- Accuracy

Ad Request

- (Lat, Long)
- UDID

Ad Exchange

4 App passes location to ad exchange

Location Analytics Platform



Key Processes

- Identify and filter spam
- Verify places and map in high detail
- Understand the surrounding context
- Unify a single device's many hashed IDs

5 Location analytics platform matches to place or audience

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Factors Affecting Device Location

RADIO SIGNAL



Satellite



Mobile Tower



WiFi

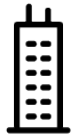
INTERFERENCE



Solar



Atmosphere

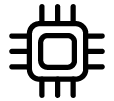


Structure

HARDWARE



Antennae



Chip Power



Recency and Capabilities

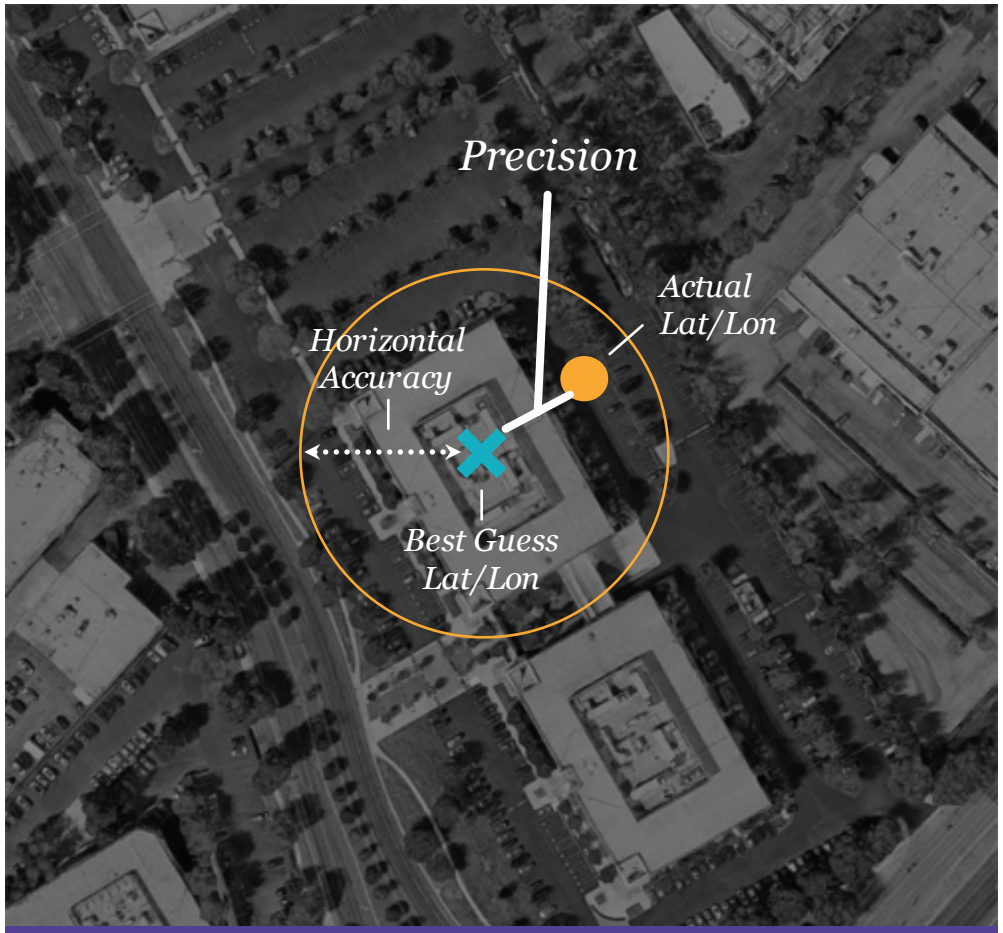
SOFTWARE



- WiFi on/off
- GPS on/off
- GPS augmentation (e.g. WAAS)
- OS location services
- Location SDIS
- Application logic
  - Time to locate
  - Caching location
  - Accuracy requested

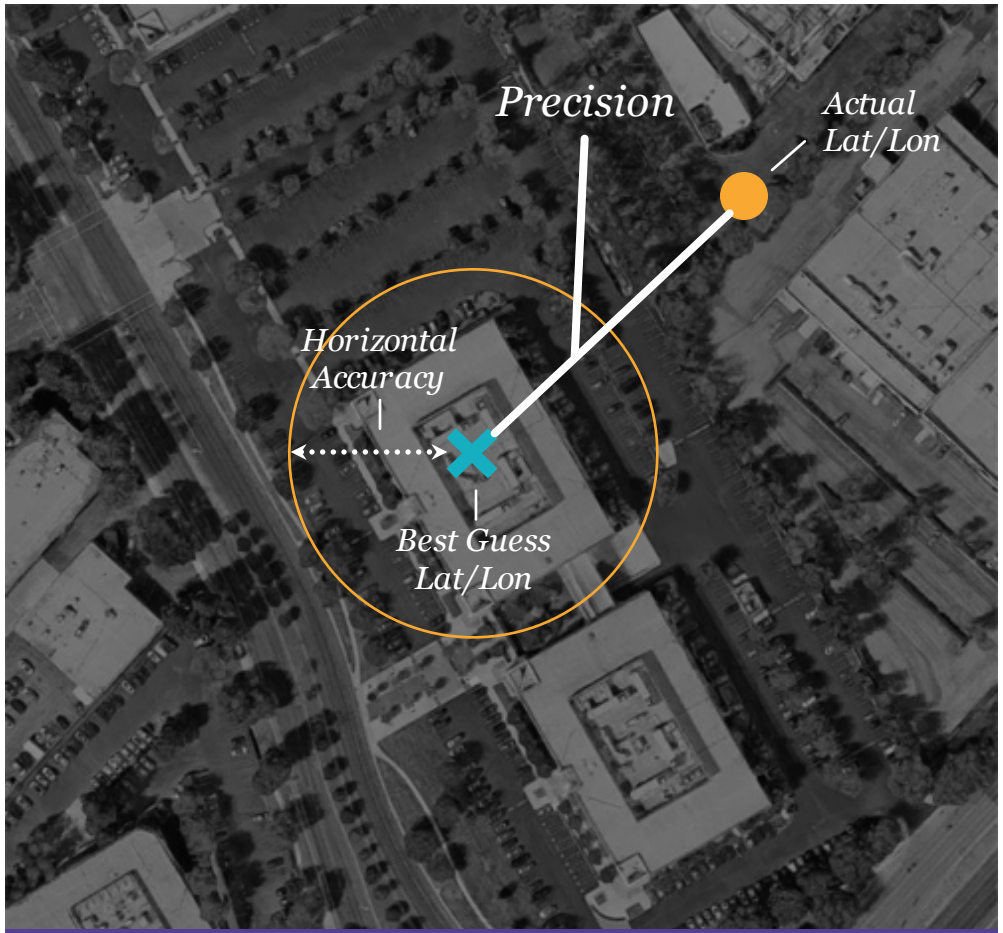
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As a Result, Sometimes the Blue Dot Fails



IDEAL CIRCUMSTANCES

Device Lat/Lon Inaccurate
Horizontal Accuracy Accurate



NON-IDEAL CIRCUMSTANCES

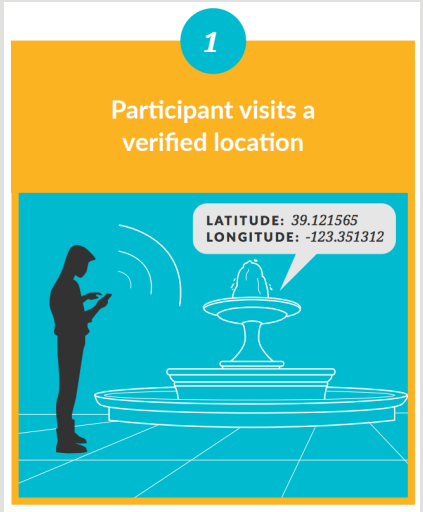
Device Lat/Long Inaccurate
Horizontal Accuracy Inaccurate

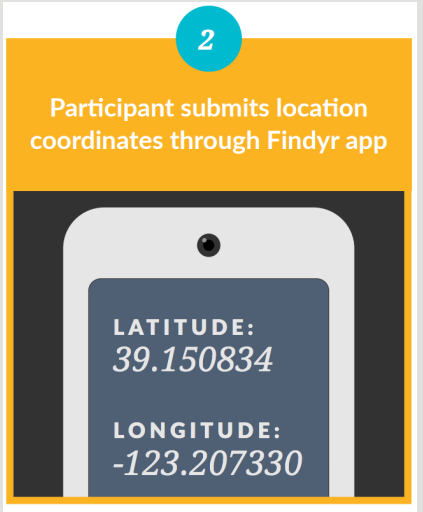
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So How Do We Test Smartphone Accuracy?

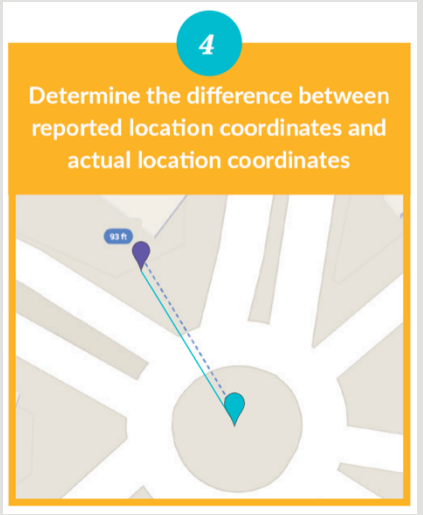
METHOD #1:

Assess Known Locations









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So How Do We Test Smartphone Accuracy?

Findyr Study Findings

93
Feet

Average accuracy of smartphones in marketing use cases

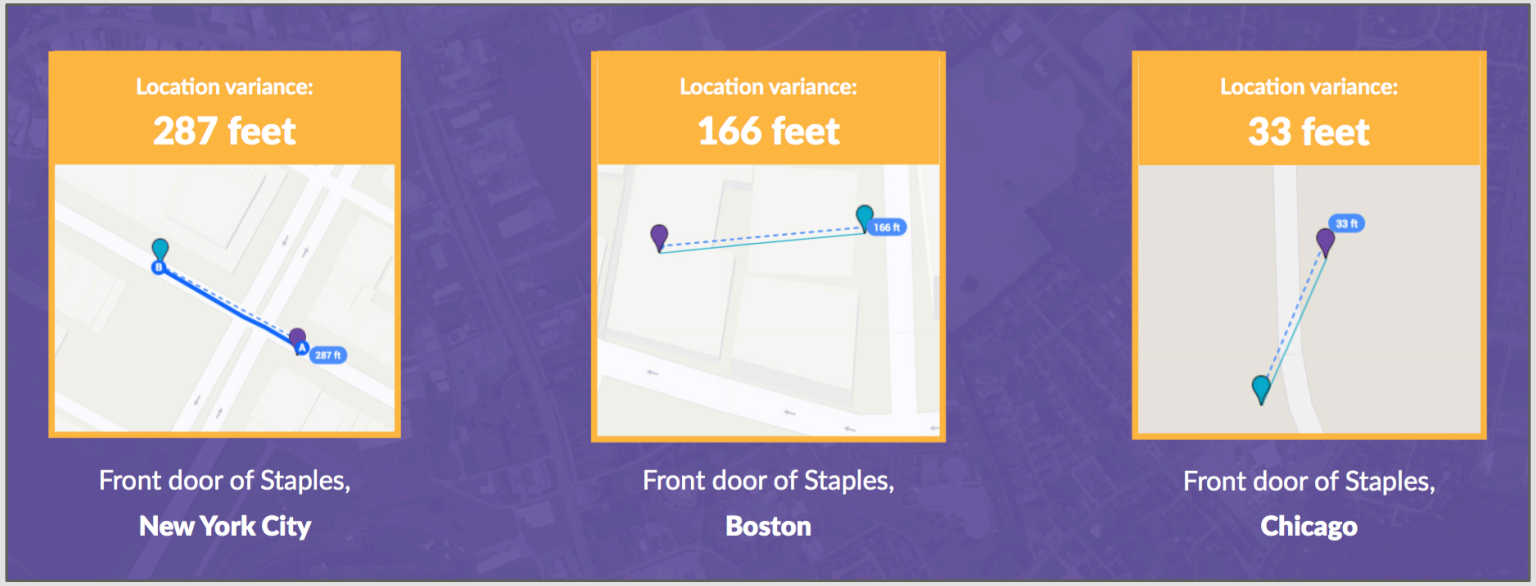


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So How Do We Test Smartphone Accuracy?

Findyr Study Findings

- Differences between cities based on density. The densest (New York) impaired GPS while the least dense studied (Austin) impaired wifi coverage.
- Slight variance among devices, occasional variance among software



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So How Do We Test Smartphone Accuracy?

METHOD #2:

Don't Use a Smartphone



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Factors Affecting Device Location

RADIO SIGNAL



Satellite



Mobile Tower



WiFi

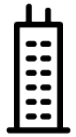
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Solar



Atmosphere

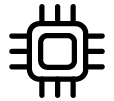


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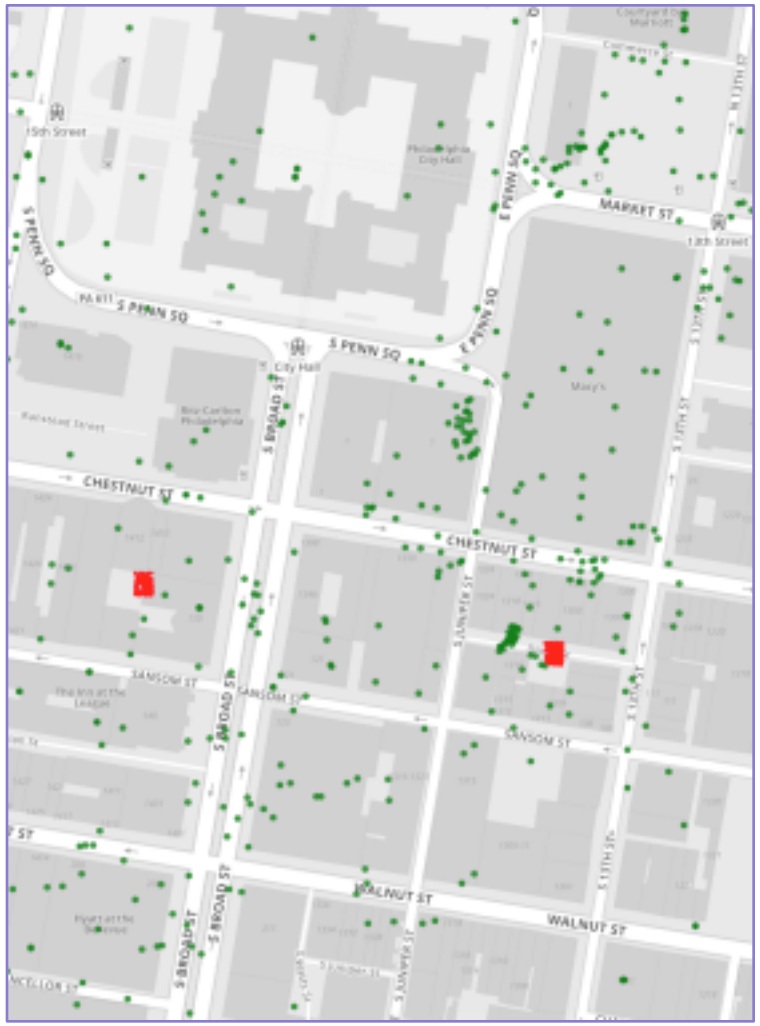
SOFTWARE



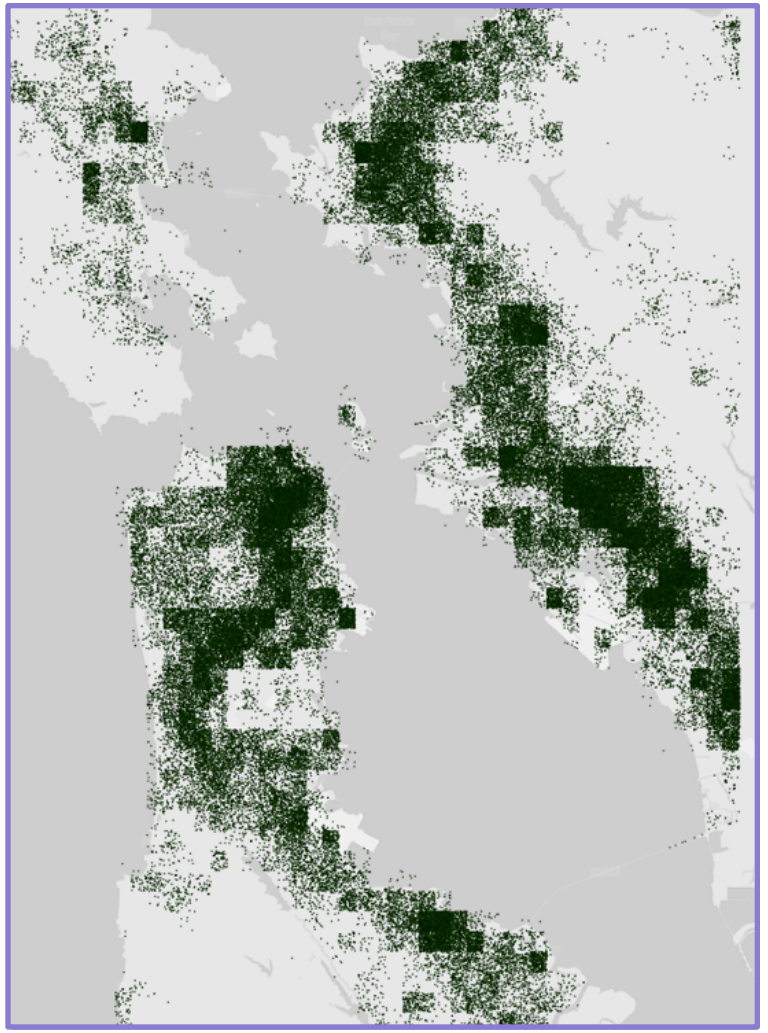
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Examples of Location Data Errors & Fraud

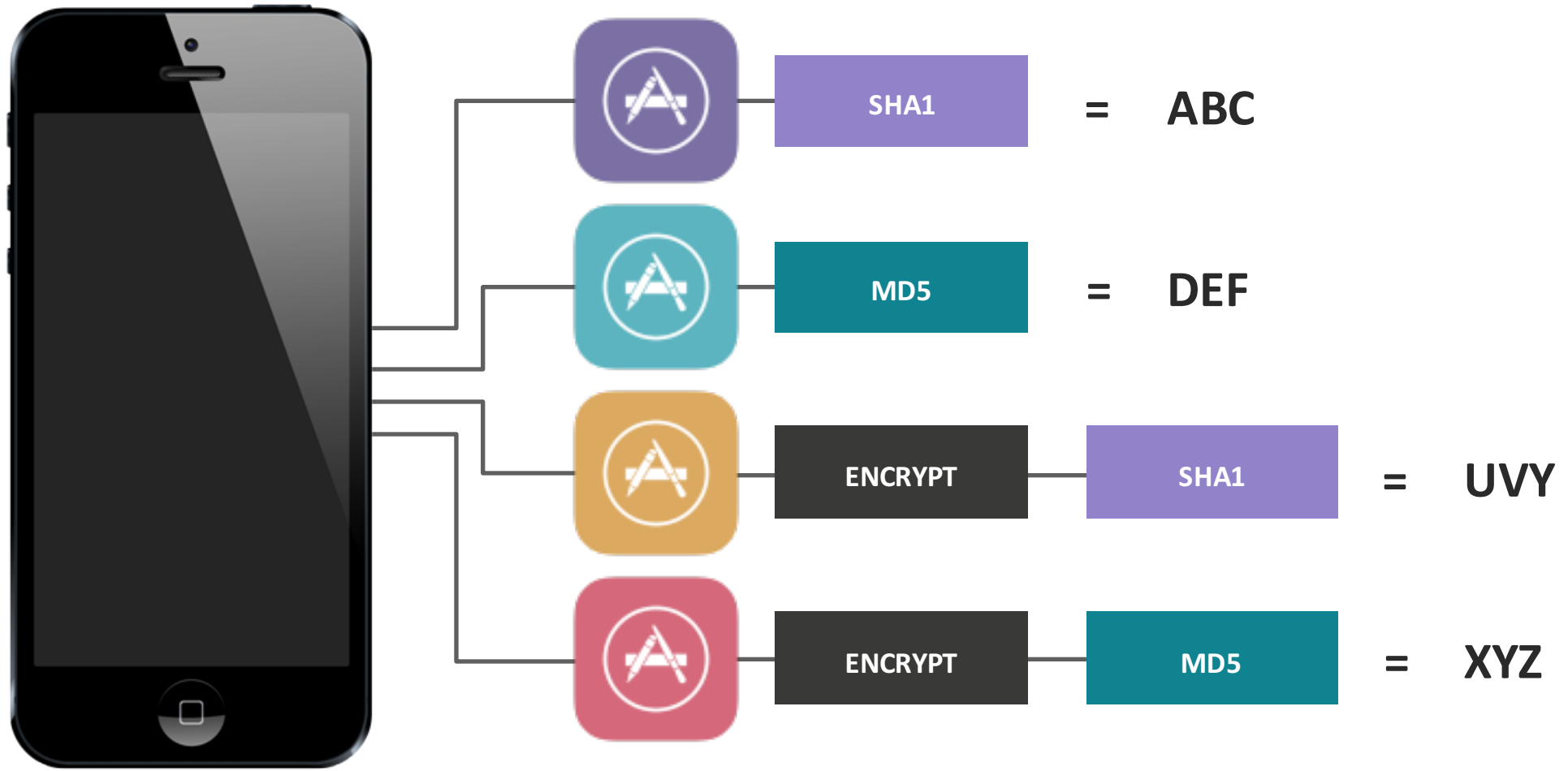






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A Device Has Many Identifiers from Many Apps & Networks



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TO RECAP

Assessing Location Data Quality

1. Devices derive their location using complex processes
2. These processes can be affected by many internal and external conditions
3. Accuracy does not always equal precision
4. Testing device accuracy requires professionals or professional tools
5. Humans – maliciously or accidentally – color raw location data