mobile location accuracy

data sources
why accuracy matters

Rapid adoption has made smartphones and tablets culturally ubiquitous. 85% of people feel that their mobile devices are a central part of their everyday lives.¹ This technology trend has logically led to an explosion of mobile advertising. To create highly targeted and engaging mobile campaigns, advertisers are combining knowledge of users’ current, past or future locations with demographics, social behavior and visitation patterns.²

Today, over 75% of marketers are already using real-time, mobile location-based marketing techniques.³ By 2019, the location-based services market is projected to exceed $43 billion.⁴ Mobile location information is more important now than it has ever been to the marketing world, and it is vital that the accuracy of that information be properly understood.

the challenge

Mobile location accuracy is still an emerging technology. Complex data and contradictory market claims have created confusion amongst clients and the industry at large.

A recent study found that of the mobile ad impressions that include latitude-longitude data, fewer than 34% were correct to within 100 meters of a user.⁵ Do these results constitute location accuracy?

The unfortunate truth is, there are no industry standards for the definition of accurate location.⁶ As a result, the burden is on clients to determine which claims are true.

YP™ believes that there is nothing more valuable than an informed customer. Companies can only make informed marketing decisions when they are working with factual information.
Several mobile advertising providers state that they arrive at accurate user positioning, correct to within only a few feet. They refer to using different combinations of the following sources to arrive at their results:

- Global Positioning System (GPS)
- Assisted Global Positioning System (A-GPS)
- Wi-Fi Hotspot
- Wi-Fi Triangulation
- Bluetooth (BT)
- Indoor Positioning System (IPS)
- Cell-Tower Triangulation
- IP Address
- City Centroid
- Zip Code Centroid
reality check

Whatever the claims, no providers are actually deploying any of these technologies. In fact, all any company can do is make use of the location information relayed by the operating system (OS) of a user’s mobile phone. Both iOS and Android™ devices have onboard sensors collecting data. They actively share selections of that data with third parties, without disclosing any user’s personally identifiable information (PII). **So ultimately, all companies are using the exact same collection technologies.**

The real differentiator can be found in how, or even if, different providers filter the information provided by a mobile phone’s operating system. The greatest quantity of location information comes from the least qualified sources. Far too often, providers use most or all of the data. This allows them to sing the praises of their high quality location information while ignoring their far greater amount of low quality data.

At YP we have been working with mobile location data since before the first iPhone was released. We apply a combination of patented location analytics algorithms and machine learning techniques to separate out and use only the most accurate location information – even though it is the least available. We specifically look for only the data provided by A-GPS and Wi-Fi, as that has been proven to be the most accurate and reliable.
A-GPS
Under optimal conditions, Assisted Global Positioning System technology provides the highest accuracy among location sources commonly available on mobile devices. A study of A-GPS accuracy on mobile phones found that the median error ranges from 5 to 8.5 meters, depending on the device type.\(^7\)

Because of the space and power constraints, the GPS antenna and chipsets are not as effective on a phone as in a standalone GPS device, which has a median accuracy between 2 and 3 meters.\(^7\) On the other hand, because of the “assist” that A-GPS receives from its cellular network connection, it has greatly reduced “time to first fix” compared to standalone devices.

While A-GPS works very well in wide open spaces with direct line-of-sight to the sky, its accuracy suffers in “urban canyons.” It is usually either impossible or it takes a very long time to get a location fix indoors and in crowded urban areas.

Bluetooth and Indoor Positioning Systems can provide highly accurate indoor positioning, but very few spaces have been instrumented with these technologies and they are not available at scale.
Wi-Fi

With an abundance of Wi-Fi access points in urban areas, Wi-Fi positioning has become quite effective and fills a real need. In an independent study of Wi-Fi position accuracy, the median position accuracies ranged from 43 to 92 meters, depending on the area of the study. These numbers were generated in 2011 and we expect that they have gradually been improving, both as more data is collected and as the positioning methods improve.

This approach is based on a Wi-Fi “fingerprint,” which is simply a list of all the Wi-Fi access points that are visible to a device and their corresponding signal strengths. In a calibration phase, Wi-Fi fingerprints and their corresponding GPS locations are recorded around locations planned for Wi-Fi positioning. Over time, a library of these fingerprints builds up.

When a Wi-Fi device needs to be geographically located, the new Wi-Fi fingerprint is aligned with the closest matching fingerprints in the library to derive an estimate of location. In practice, Android devices send their Wi-Fi fingerprints to a Google™ server, which sends back a predicted location, while iOS devices send their requests to an Apple® server.
In many ways, the science of working with mobile location data is still in its infancy. Highly technical terminology and false assumptions have fostered several areas of confusion.

**Precision**
Some companies highlight the impressive degree of precision for their location information as a key differentiator. In reality, accuracy is what really matters with location data. Accuracy is the degree to which a measurement conforms to the correct value, and precision is the refinement of that measurement. When working with location data, if the reported location has poor accuracy, extra digits of precision are useless.

**Ad Exchanges**
Whether true or not, ad exchanges have a reputation for having an abundance of low quality data. Many advertisers have decided that because of this they can only look to first party ad networks for high quality location information. In reality, with proper filtering technology applied, data from exchanges can be just as accurate as any from ad networks.

**Privacy**
There is a popular myth that more consumers are choosing to turn off location services and disable GPS and Wi-Fi location sharing out of privacy concerns. In reality, 76% of people believe that location sharing provides more meaningful content.\(^9\) Recent studies have found that over 70% of smartphone and tablet users are more likely to click on an ad that is “locally relevant to me.”\(^10\)
Accurate location data influences audience targeting, which greatly impacts mobile campaign results. While there are many potential sources of data, they are not equal. The most accurate location targeting available at scale has a median range between 5 and 8.5 meters.

With the potential value of mobile location campaigns being so high, an advertiser cannot afford to take assertions of accuracy at face value. There’s a need to look beyond words and instead evaluate a company’s approach to working with location data and their commitment to scientific rigor.

At the end of the day, good science means great campaigns.

1. 2014 Mobile Behavior Report | ExactTarget Marketing Cloud | February 2014
2. Location Terminology Guide | MMA | September 2013
5. Location Score Index: Mobile Advertising’s Guide to Location Accuracy | Thinknear | May 2014
6. Mobile Location Data Accuracy Panel | MMA | August 6, 2014
7. Positional Accuracy of Assisted GPS Data from High-Sensitivity GPS-enabled Mobile Phones | Paul A. Zandbergen and Sean J. Barbeau | The Journal of Navigation, Vol. 64, No. 3 | July 2011
8. Comparison of WiFi Positioning on Two Mobile Devices | Paul A. Zandbergen | Journal of Location Based Services, Vol. 6, No. 1 | March 2012
10. Mobile Location Use Cases and Case Studies | IAB | March 2014
about mobile labs

The mission of Mobile Labs is to use a science-based approach to solve mobile advertising challenges, and to create mobile ad products that accelerate commerce between businesses and their consumers. Our data scientists and engineers continually push the limits of our information and technology, redefining what it means to optimize mobile campaigns.

Every month, YP Mobile Labs processes 25 billion ad bid requests and updates 150 million user profiles. Only location data that is validated through our scientific process is used for audience targeting. This provides some of the most accurate location data in the industry for scaled campaigns that routinely deliver results above client expectations.

about yp

YP is the largest local ad platform in the United States, connecting businesses with local consumers when they’re ready to buy. We’ve been powering advertising solutions for more than 100 years, but how we do it has evolved. Today, through mobile, search and display, YP delivers local audiences on a national scale.