



CRIMINAL DEFENSE – LOCATION DATA

Advanced Cell Site Analysis Using Per Call Measurement Data



Location data from cellular service provider records can be key evidence in a case. Cell provider records can show the cell site that was used to handle the call and the location of the cell site. Plotting the approximate location can be useful but cannot pinpoint the exact position. It can only show a general location because a cell site can have a range from approximately 1 to 30 miles. A cell site with a 30 mile range can cover an area of more than 2,800 square miles.

Another type of record kept by the cellular provider is called Per Call Measurement Data (PCMD) This data is more accurate, but the retention period is much less than typical call detail and cell site records, so early case assessment is critical. If the mobile device has location data enabled, there could be even more data that is more accurate than PCMD obtained from an examination of the device.

In this article we discuss how a mobile device works on a cellular network, the types of location data that can be obtained from the cellular service provider, and links to the latest subpoena guide and retention schedules for the major service providers.

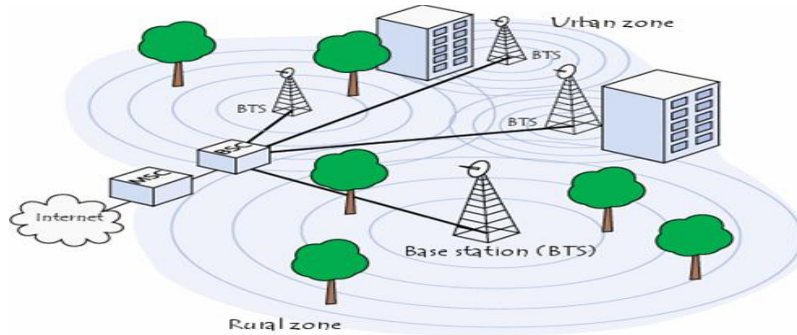
“Harness the power of knowledge.”

Digital evidence is time sensitive and needs to be assessed during the initial stages of every case. We have combined the latest available resources, standards and reference materials in our [Digital Evidence Toolbox](#) to help promote a reliable, repeatable process with an emphasis on early case assessment.



Cellular Network

The standard use of a mobile device for communication or data transfer requires that the device connect via radio frequency to the service provider's cellular network. As the user travels, the device can switch from one antenna (cell site) to another to maintain the radio signal as long as the device is in range of an available cell site.



In urban areas, the cell sites tend to be more numerous and closer together to handle the increased number of users and account for obstacles that block the radio signals. In rural zones they can be located farther apart and cover a greater area. A cell site can have a range from approximately 1 to 30 miles.



Cell sites can have one omnidirectional antenna that covers the entire area and/or 3 to 4 antennas that break down the coverage area into sectors. Most common are 3 sector cell sites with each antenna covering approximately 120° of the cell site. Each sector has a known direction called the azimuth as follows:





Call Detail Records

Service providers maintain records of calls for customer billing and for development of their cellular network referred to as call detail records (CDR). Besides the date, time, call duration, and parties involved, they also maintain the first cell site and last cell site used by the call. To obtain the call detail records and cell site information, the records request must specify Call Detail Records with Cell Site Data.

These call detail records can be useful to place a device user in a particular area, but cannot pinpoint the actual location at any given time. A mobile device does not always connect to the closest cell site. The closest site could be over-capacity with other users, having maintenance issues, or many other factors.

Historical CDR Issues

- Cell phones attempt to connect with the strongest and highest quality signal, not the closest.
- Is complex and hinges on a multitude of factors.
- Not listed in the call detail records.

For example, a user could initiate a call from his home, travel a distance and return to his residence while conducting the call. In this case, the CDR would likely identify the same cell site for the first and last used and it could appear that the user did not move during the time period the call was made.

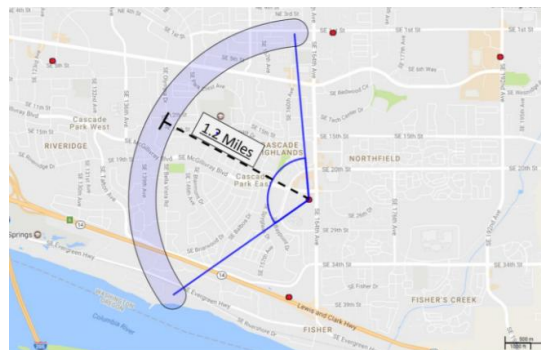
Per Call Measurement Data

Cellular service providers maintain ranging data for engineering and network optimization purposes through the normal course of business called Round Trip Delay (RTD), also referred to as Per Call Measurement Data (PCMD). PCMD is the measurement of the time required for the signal to travel from the cell site to the handset and then back to the cell site. PCMD provides an approximate distance of the mobile device from the cell site. This range can narrow the area within the cell site to provide a more accurate estimate of the user's location.

This type of data is non-technology specific and can be found in use by all of the major carriers in the United States. This data is also commonly referred as Round Trip Time (RTT).

Unlike the cell site and sector information obtained from call detail records, PCMD is captured not only for every phone call, but also for every text message and data event.

In some cases, service providers also provide an estimate of the approximate location of the device via latitude and longitude with a margin of error. The coordinates provided in these types of records are generated from a proprietary algorithm and are not intended to provide an exact location of a device. As a result, it is recommended that ranging data be manually mapped at the listed ranges within the provided sectors.





PCMD/RTT Record Retention

The retention periods for these types of records is relatively short and varies by the service provider. This is typically less than the call detail-cell site record retention. Requests to preserve these records with a letter of preservation should be made as soon as possible. See our Digital Evidence Toolbox for sample preservation letters and the most up to date subpoena guide and retention schedule.



AT&T has proprietary location data known as Network Event Location System (NELOS). The retention period for NELOS is 180 days.



Verizon refers to this data as Round Trip Time (RTT) or Round Trip Delay (RTD). Verizon only retains this data for 7 days. A preservation letter must be sent as soon as possible!



T-Mobile refers to these records as "TrueCall". When requesting this data you must ask for "TDOA or Timing Advanced Information". T-Mobile only retains these records for 90 days.



Sprint uses the term Per Call Measurement Data. The retention for voice calls is 90 days and 14 days for text message PCMD.

Service Provider Retention Schedule

Knowing what records are available and how long they are kept are critical in the practical application of using location data records from cellular service providers. I.R.I.S. LLC has recently published a new [Cell Phone Service Provider Retention Schedule](#) for the five major providers with a link to their subsidiaries and leased service providers.

Updated Cellular Subpoena Guide

I.R.I.S. LLC also recently published an updated [Cellular Telephone Provider Subpoena Guide](#) in our Digital Evidence Toolbox.

Use of Cell Site Records

Historical cell site records are not as accurate as GPS for location information. They can't be reliably used to pinpoint the location of a mobile device because of the way the technology works. However, these records can effectively provide a more general location data point based off which cell site tower was used to handle the call. And they could also help to validate data obtained from a forensic examination of a device.



For more information about the effective use and limitations of cell site records, see the IRIS Digital Evidence Toolbox: [Call Detail and Cell Site Analysis](#) drawer.

For more topics and information on digital evidence, see our toolbox at: <http://www.irisinvestigations.com/wordpress/iris-digital-evidence-toolbox/>




For more information on location evidence, call now and speak with a certified expert. I.R.I.S. LLC is available 24 hours in emergency cases.



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