Wireless Location Tracking
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Introduction

The Fourth Amendment in the U.S. Constitution states:

The right of the people to be secure in their persons, houses, papers, and effects, against unreasonable searches and seizures, shall not be violated, and no Warrants shall issue, but upon probable cause, supported by Oath or affirmation, and particularly describing the place to be searched, and the persons or things to be seized.

More often than not, the use of wireless location tracking has been utilized by law enforcement to track those suspected of criminal acts or those thought to be involved in criminal activities. Although law enforcement is able to receive a warrant from the Justice Department granting them the right to track wireless devices, advancements in mobile technology have opened the door to seemingly endless opportunities and threats concerning cell phone location tracking.

Cell phones no longer have to be in use in order to be traceable. Furthermore, cell phone users may not be aware that their location can be, and may be, tracked and recorded by cell phone providers or providers of location tracking services. Emerging technology is making wireless location tracking a more viable option, not only for law enforcement, but also for anyone interested in the capabilities. This new ability raises many concerns as to how much these capabilities are infringing on citizens’ rights to privacy. It is important to explore the uses of cell phone tracking technology, the advantages and disadvantages of the increase in technology, and the future implications that these services provide in order to ensure that users’ privacy can remain assured. If the location tracking services become unregulated, the government, tracking service companies, and those interested in various cell users’ location histories will have free reign over cell users’ privacy.
How Cell Phone Tracking Works

Wireless location tracking is a technology that enables a device, such as a cell phone, to be traced to its current location, as long as the phone is turned on. In order for cell users to have service that allows them to make phone calls, their phones must be able to connect to a cellular network of cell site base stations, such as Verizon Wireless, Cingular, Sprint, or any other service provider. These devices constantly search for the strongest signal emitted from base stations closest to that user and will connect to the nearest and strongest transmitting site. As the user moves around to various locations, the mobile device switches to various cell sites during calls or while waiting (idle), in order to ensure the phone has the strongest signal (Cell Phone Tracking). As this is being done, information is being stored on which mobile device is using certain cell sites. This allows cellular companies to see exactly where each cell phone user has been.

Cell phones can be tracked in two ways: (1) through triangulation and (2) through a Global Positioning System (GPS) chip that is embedded in users’ cell phones. For phones that are not GPS equipped, cell phone service providers can use triangulation, the pinpointing of a location through comparing of signal strength from at least three cell sites, in order to determine a general location of the mobile device. Other cell phones that are equipped with GPS chips can be located through satellite connections, thus allowing for a much more accurate location determination, usually within 10-50 meters (Budden).

At the end of 2005, the U.S. Federal Communications Commission (FCC) established a mandate requiring all cell phones to contain either GPS or some other ability to track the location of a cell phone call, so that the cell phone carriers can trace calls to a location within 100 meters or less (Frenzel). The idea behind these mandates is to ensure that the police can trace an emergency cell phone call. What started merely as a safety precaution has turned into a new cell phone craze, making wireless location tracking a part of everyday use.

Location Tracking Databases

New mobile device technologies ensure more accurate location tracking, whether from the addition of cell sites that gain a more accurate location through triangulation, or GPS equipped phones for even more accurate pinpointing. Essentially, through GPS tracking, satellite signals are continuously being sent, so the location and every move that a wireless device user makes could constantly be recorded (PittsburghChannel). Wireless service providers disclose that phone call histories are stored in databases; however, many are very reluctant to admit that they store location histories.

T-Mobile discloses in their Privacy Policy, that they may collect personal information, which includes: “calling information, and the services you use and how and where you use them” (T-Mobile). Other service providers are more discrete about the utilization of location history databases; however, all wireless companies store such data. Nathan Eagle, co-founder of the MIT/Harvard Center for Large-Scale Network Analysis, sat as an expert witness on an undisclosed court case in late 2006, dealing with information about possible locations of a cell phone retrieved from cellular tower IDs from various base stations. He
commented that, though the information had to be subpoenaed from Verizon as part of the litigation, it proves that these wireless service providers do have databases of location histories (Eagle).

Wireless service providers are very discrete about their practices of storing mobile device users’ location histories; however, it is necessary to understand that it is occurring today. Mr. Eagle (2006) had no difficulties in getting information about his call log history from T-Mobile, yet he was unable to obtain location history. This brings up the issue about who owns mobile device users’ location history and what the benefits that this information provides for the cell phone companies or interested third party companies. New technology that allows for the real-time location of mobile device users raises new concerns about who may gain from such information and how much privacy users are forfeiting through the use of tracking technology. This growing technology begs the question of how far companies are willing to leverage location tracking as a competitive advantage. Is location tracking beneficial by ensuring the safety and well being of mobile users and by providing easy tracking and directions to friends and locations? Or is it detrimental to the users’ privacy and safety?

Benefits of Location Tracking Technologies

The original intention and benefit of location tracking was to improve the chances of saving a person in an emergency situation, by allowing law enforcement to pinpoint a distressed person’s cell phone call within 100 meters. As the technology evolved, and modern advancements allowed for more precise and real-time tracking, wireless service carriers took advantage of the opportunity to provide their customers with new capabilities to make life easier. Such capabilities include turn-by-turn directions and family, friend, and employee locators.

Law Enforcement Application

One way that the police utilize location tracking is through the new “Enhanced 911” (E911) technology. As stated earlier, the FCC has implemented regulations for all cell phone providers to be able to locate any cell phone within 100 meters. E911 seeks to “improve the effectiveness and reliability of wireless 911 service by providing police dispatchers with additional information on wireless 911 calls” (FCC). By using GPS tracking or Triangulation, dispatchers can accurately locate where the 911 call is coming from, for a more detailed dispatch to the police. Moreover, there are many other opportunities this technology provides for law enforcement, such as enabling the police to track and find kidnap victims. Using this technology will enable the police to “hone in on a specific location of that signal and know that there is a body connected to it. This may help save lives that way, where it will help rescuers get to their position quicker” (PittsburghChannel). Law enforcement can use this technology to help capture a criminal or even track down a missing child through cell phone Amber Alerts, which are public notices of missing children.

As Mr. Eagle previously pointed out, the police are able to subpoena location records for a certain mobile unit, and can now receive the real-time location of a user from the wireless service
company. This ability can help locate suspects and criminals attempting to evade the law. In 2002, local authorities near San Jose, California, traced a mailbox bomb suspect through triangulation once the suspect activated his cell phone (Wired News). The police were able to contact the cell phone service company to get the locations of the nearest cell towers in contact with the suspect’s phone and capture the man within an hour of doing so. The location tracking capabilities are being used by law enforcement to help save lives and serve criminals their justice.

There are other uses of this technology that the police can utilize to further help society, include Amber Alerts. These alerts give citizens information regarding a missing child, where he or she was seen last, and sometimes descriptions of the suspect’s car or physical features. Amber Alerts are usually posted on digital roadway signs on major highways so drivers can see this information as they are traveling in the area and can assist law enforcement agents in finding a suspect by providing any helpful information. With location tracking technology, Amber Alerts can be sent as text messages to all cell phones in the general area of the crime. As a result, Amber Alerts would be much more effective as they could reach citizens who are not traveling on a major roadway, which is a set back of the current method.

It is clear that these uses of the location tracking prove beneficial and demonstrate the possible effectiveness as a tool for the police. Other advantages of this technology include family locator plans to ensure the safety of children, or to provide a new tool for enhanced supervision.

**Family Tracking**

There are many desirable and attractive safety attributes for the use and implementation of location tracking services and GPS-enabled mobile phones. Sprint Nextel, Verizon Wireless, and Disney Mobile offer plans that permit parents to download the Family Locator application onto their phones, giving them the capability to locate up to four cell phones, whether or not they are GPS equipped (Hayhurst). Having the ability to do this would make many parents more comfortable with their children being away from home.

**Guardian Angel Technology** is similar software that further ensures the safety and knowledge of the whereabouts of family members. This technology has two parts: (1) the cell phone with the software loaded onto it and (2) the tracking website. Once the software has been installed on the child’s phone, the parents will be able to monitor and track the movements of their child through a secure website. This software will allow parents to constantly check their child's movements, as it is continually updated every seven seconds and can be accessed an unlimited number of times. This capability will allow parents to check the path a child has taken 30 days ago and monitor how fast they got there (MacMillan). Knowing that this information is available could prevent young kids from speeding, thus making them safer drivers.

**User Convenience Tracking**

Location tracking technologies are not used merely to keep tabs on children or to stop or prevent crime. Many other uses are intended to make life easier for mobile device users to communicate with others and
to get where they desire in an expeditious manner. For example, Verizon Wireless, Sprint Nextel, Boost Mobile, and Disney Mobile are all carriers of GPS enabled phones that allow users to sign up with various location tracking companies such as Loopt, Dodgeball, and Groundspeak’s Geocaching (Reardon 2006). These companies saw tremendous opportunities to take advantage of location tracking technologies to benefit their consumers. Through these service providers, users are able to share their location automatically, find events and places, as well as find and connect with their friends on a detailed map (Loopt).

The purpose of these services is to “offer a mix of social networking and so-called location-based services” (Reardon). These location tracking companies offer a service where you can see the precise position of your friends. This eliminates the need to call or text message specific buddies, because their whereabouts will be recorded on a map on their friend’s wireless device with the touch of a button. Not to mention, the users gain the ability to get directions to a specific site by using GPS to receive step-by-step directions to where other friends and locations are, saving time on asking for directions. This capability also eliminates the need to waste time calling someone if it is clear that they are not in a position to answer the call or meet up, such as sitting in a meeting or in class. The location tracking technology not only keeps family and friends in touch, but also allows for a company to ensure efficient utilization of time and employees to maximize resources, time, and profit.

**Employee Monitoring**

Small companies with mobile units, such as ambulances, can also benefit from the rapidly growing technologies in cell phone location tracking. Equipping employees with GPS-enabled mobile phones gives supervisors access to real-time data about their fleet, ensuring that employees are in appropriate locations and are efficiently managing their time (Hayhurst). Matt O’Connell, operations manager of Waste Connections Inc., a solid waste company, has benefited immensely from the distribution of GPS enabled cell phones to employees. Operations run much smoother and efficiently as 5,000 new homes are being reached in the same amount of time that it took one home to be reached in previous years. The tracking helps ensure that trucks are not overlapping in areas and are utilizing the most time-efficient routes to hit more houses in the same amount of time (Hayhurst).

Location tracking through GPS enabled phones requires no extra hardware for companies to place in trucks or at the home station. All that is needed is a computer to run the software, and employees to carry their phones with them throughout the day. As a result, companies can pull up real-time displays of what is going on outside of the company building, to ensure maximum efficiency to help increase revenues.

Not only can these capabilities be very valuable as safety measures to track children or to be used in case of emergencies, but they can also be used to help make the lives of these location tracking users much easier by connecting people and employees in ways that never thought possible a few years ago. However, as technology increases and these services expand, users of these services continually forfeit their privacy.
Disadvantages of Location Tracking Technologies

Location tracking technology has strayed far from its original roots, as it was first implemented for safety reasons. As just explored, there are many advantages to the use of wireless location tracking for police, everyday users, and employers. While technology advances, privacy issues are arising and creating a dilemma between how much privacy users of this technology are willing to sacrifice for the sake of protection and convenience. A common, everyday cell phone can now be used as a constant location chip attached to any user.

Law Enforcement Abuses

The use of wireless location tracking can put cell phone users’ minds at ease knowing that, in case of an emergency, they can use their E911 application on their phone to notify the police the location of an emergency issue. It has also been discovered that the police can track suspects of a crime in order to find and detain suspects. Such occasions are clear instances of when it is beneficial and acceptable for the police to use location-tracking technology, but it is hard to determine if law enforcement crosses the line of privacy rights when using the location tracking technology for other means. For example, if there was probable cause, or even if the government deemed it important, the police could subpoena a caller’s record of, not only who they were contacting, but also where they have been. This ability could be beneficial for anti-terrorism and other crime prevention efforts. Although these capabilities prove useful, it causes much uncertainty as to how much the police can and will use this technology.

Through ambiguities of the Patriot Act and due to lack of regulation of location history databases and tracking, law enforcement agencies can have free access to such information from wireless service providers. Robin Gross, an attorney of the Electronic Frontier Foundation (EFF), a nonprofit group that works to protect fundamental rights regarding technology, notes that it is “inappropriate to be tracking people under some kind of assumption that they might do something illegal . . . it is ripe for abuse by law enforcement and by government” (Wired News). Law enforcement is not the only entity that abuses the wireless location tracking history as friends, family, and employers also take advantage of these capabilities and manipulate the intended use of this tracking.

User Abuse

New technology, allowing for constantly updated GPS positions of cell phone users, can be as disadvantageous as it is useful for family members, friends, and employees. A once convenient way to ensure the safety of family members can turn into a trust issue and unnecessary surveillance. Children will have the inclination to turn off their cell phones or leave them at home in order to ensure that their parents are not tracking their every move. As a result, the wireless location tracking ends up being counterproductive, leaving children with no ability to make a call in the case of a real emergency.

The same issues occur with friends and employee/employer relations. A Boost Mobile user, for example, may not want to allow their network friends to locate them through the Loopt wireless location
tracking service and constantly know their whereabouts. Although the application allows for users to disable their tracking, friends, such as boyfriends and girlfriends may become suspicious if the program is turned off. Furthermore, under Loopt’s privacy notice, they disclose: “This location tracking may occur even when the loopt application is not actively running on your mobile device” (Loopt), which means that a user may have a false sense of privacy when disabling the application on his or her phone.

Employers who are utilizing this tool to improve workplace efficiency can certainly abuse the GPS cell phone tracking capabilities, resulting in a decline in employee morale, as the employees feel their privacy rights being infringed upon. The most important objective for an employee is to ensure that they accomplish the tasks required by their job. As long as this is being done, there should be no reason for employers to use a “Big Brother” approach and track every move. By doing this, employees feel like they are being micromanaged and may be uncomfortable knowing that their employer is constantly watching, thus resulting in decreased productivity. Additionally, employees cannot opt to turn off their cell phones because they may be fired for doing so.

There are many promising features for the use of this technology, but the tracking ability also raises many questions as to how far and how much the capabilities will be used and abused by police, service providers, and anyone concerned with such information about product users. It is important to explore what the future has in store for the growing wireless tracking capabilities.
What is in Store for Wireless Tracking Technology?

As wireless tracking technology expands to provide consumers with the newest and most accurate capabilities and as more people begin to utilize this technology, a lot of information is being collected that can be extremely useful to various people and third party companies.

Unwanted Trackers

As Loopt’s privacy notices informs users: “Your real-time location information is subject to abuse, misuse, and over-monitoring by others” (Loopt). The data kept by cell phone companies and wireless tracking service providers is not as secure and private as many users of such services believe. Clearly, this can cause safety and protection concerns. As spyware exponentially increases in today’s cyber world, people are gaining access to, once believed, secure web sites. Wireless location tracking technology allows for cell phones to be monitored on a service provider’s web site. A person with malicious intentions can gain access to a database and constantly track specific individuals, with the intent to stalk, rob, or kidnap. Robin Gross of EFF warned, “cell phone tracking could be used to follow the movements of political dissenters or politicians and other people in power” (Wired News), not only for criminal uses.

Safety and privacy concerns are a looming issue for users, especially for politicians or top business executives whose tracking can provide insight on future deals that a campaign or company may undertake. For example, someone could have tracked the CEO of Sprint and the CEO of Nextel for months before the announcement of their merger. Anyone with common sense could see they were meeting frequently, thus giving rise to suspicion that a possible business deal could be underway that could increase the stocks of these two companies. This type of information can thus be financially advantageous.

Mobile Phone Advertising

Another way of gaining financials advantage via mobile tracking is by using cell phones as the newest accurate advertising medium. Wireless location tracking makes real time locations a highly sought-after advertising advantage for retail companies trying to reach customers in new and innovative ways. Wireless service companies have an enormous opportunity to sell wireless location information to other parties that want to advertise based on location of a mobile device user. The cell phone could become the biggest and most successful advertising medium since television (Halper) – “the ultimate, targeted, personal marketing machine” (Halper). Advertisers desire to utilize the demographic and location data of cell phone carrier users in order to mold campaigns aimed at specific age, gender, income, and lifestyle segments (Halper). Essentially, wireless companies will sell the sensitive information and capabilities for commercial use and profit to these companies.

“Market research firm Informa forecasts an $11.4 billion mobile advertising market by 2011, up from an expected $1.5 billion this year” (Halper). As more companies begin to tap this advertising opportunity,
consumers’ locations and data will become widely available to third party companies, which might be perceived as an infringement on consumer privacy. Retailers are gaining the technology to receive information about which cell phones are close to their store or product. The retailer could then send a text message to these cell phones with a coupon trying to lure them into their store. Tom Daly, Coca Cola’s manager of global interactive marketing, views mobile advertising messages as a way of “getting intertwined with the life of the consumer,” as Coke can send an alert to drive a consumer to the nearest location where Coke is available (Halper). In the future, consumers could be bombarded by advertisements from various retail stores attempting to offer coupons to solicit business. Currently in London, a small start up company called iProx is focusing on supplying location-based services (LBS) infrastructure to wireless providers (Picard). Companies like iProx, and others, are working hard to make the text message coupon services a common and effective means of advertising.

There are many positive and negative aspects to the increasing ability of using mobile devices as an advertising medium. Positive aspects associated with this future technology will be the ability to have the latest information on store products, along with receiving coupons on a shopping trip. Customers will not have to walk up and down a mall to find out the best price because the ability to compare text message alerts would let them know who has the best deal. However, this creates a whole new form of “spam” as consumers may get annoyed of receiving countless text message alerts on products. Without regulation, consumers will be at the mercy of their cell phone service providers and advertisers sending them numerous cell phone messages.

Public Knowledge and Concern

The research done on the topic of wireless tracking technology was supplemented by a survey conducted to find out what information about this technology was known by general cell phone users as well as find out sentiment about the implications of the technology. The surveys were completed by 68 students at the University of Colorado at Boulder, ranging from 18 to 24 years of age, by handing the surveys out in freshman level to senior level classes.

The analysis of the information provided staggering and eye-opening results. 78% of all individuals surveyed were unaware that any cell phone that was turned on could be traced within 100 meters. This information demonstrates the lack of knowledge about wireless tracking capabilities and proves that the original intended purpose of emergency tracking is not even known by general consumers. 88% of the Sprint-Nextel & Verizon Wireless customers were unaware that their phones were GPS equipped and nearly everyone (93%) responded that they did not think or did not know that their location histories were stored. After learning that location histories were stored, 67% of the respondents believe that this technology is an invasion of their privacy, and 91% of those surveyed said that they did not want their location histories stored. This information implies that the respondents do not feel that there is a need for such histories to be recorded or known by anyone but themselves. Finally, 62% would not want to receive advertisements from companies/retailers. As marketing executives
learn about the tremendous opportunities presented by mobile advertising, it is important for them to weigh the consumer perceived invasion of privacy of such practices before too much money is invested in a campaign that could prove to be disastrous.

Conclusion

Rising technology makes wireless location-tracking easier and more precise. Often times, concerning technology, users of products fear how much their privacy and identity is being protected. Location tracking definitely opens a lot of windows of opportunity for product users’ privacy to be compromised. The advantages and disadvantages of the increasing technology in wireless location tracking must be weighed in, determining how much consumers are willing to compromise their privacy in order to gain safety and convenience. All of this will depend on how far wireless device users are willing to let their providers store and release location information because there are no formal restrictions on how this data can be used (PittsburghChannel). It may be that consumers will be at the mercy of their cell service providers to allow consumers to agree or disagree to the dissemination of wireless location information to other parties. Otherwise, the only solution may be for consumers to opt to leave their cell phone behind before traveling to a destination; however, in this day in age, it is nearly impossible for people to survive without their cell phone in their pocket or purse.

Works Cited

Budden, R. “Mobile technology takes on new direction: Location-based services can provide detailed maps and track friends at the touch of a button.” Financial Times. December 02, 2003, p 7.

