**PREPARED STATEMENT OF MICHAEL AMAROSA**
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**Before the**

**COMMITTEE ON THE JUDICIARY**
**SUBCOMMITTEE ON THE CONSTITUION,**
**CIVIL RIGHTS AND CIVIL LIBERTIES**
**HOUSE OF REPRESENTATIVES**

**Electronic Communications Privacy Act**

**June 24, 2010**

Good morning Chairman Nadler, Ranking Member Sensenbrenner and Members of the Subcommittee. My name is Michael Amarosa and I am Senior Vice President of TruePosition, Inc. It is a privilege to appear as part of the Subcommittee's examination of the Electronic Communications Privacy Act and the state of technology since it was last amended.

My role today is to provide background and history addressing the technical elements of wireless location technology, in particular network based location technology. Wireless location capability is the core element of the Nation's emergency response 9-1-1 structure. Long before wireless technologies became prominent, the Congress, the Federal Communications Commission (FCC), State and local legislatures and regulators, telecommunications carriers, those who operate the Nation's 911 Centers and police, fire and emergency medical officers (EMS), embraced the critical need to locate the individual facing an emergency expeditiously. The faster help arrives, the more likely lives are saved.

The investment and work TruePosition and other technology companies, including the wireless carriers, have committed to locating individuals confronting an

emergency flow directly from this important public policy. Beyond emerging as an important factor in the quality of emergency response, location capability now contributes to preparedness and investigation responsibilities.

Expeditious and effective emergency response has been at the center of my professional career. I spent 24 years working in public safety. It was my honor to manage the largest 911 center in the Nation, that of the New York City Police Department (NYPD), as Deputy Commissioner for Technological and Systems Development. The NYPD sought to bring to public safety technologies that would speed police, firefighter and emergency medical service response to the citizen needing help. During my tenure at the NYPD, we undertook and completed major upgrades of the systems supporting 911 and the equipment and infrastructure needed to support NYPD's mission. This effort encompassed obtaining the necessary funding, determining and designing the system upgrades, and deploying the improvements. The experience reflects a microcosm of the ongoing and heightened national effort to bring modern technology to support emergency response, preparedness and investigation. Since leaving the NYPD, my role with TruePosition has given me opportunity to work with a range of agencies, large and small, urban, rural and suburban. There remains a critical need to bring modern technology to important government responsibilities.

My purpose here today is to provide insight to the technical characteristics of wireless location technology to assist your examination of the Electronic Communications Privacy Act. I present no stance with regard to what amendments to the law should be examined. In providing technology and services, TruePosition's foremost

principle is fidelity to the laws Congress enacts. Our presence here today seeks to contribute to this important precept.

**TruePosition, Inc.**

TruePosition, headquartered in Berwyn, Pennsylvania, is the leading provider of location determination and intelligence solutions for public safety and national security worldwide. TruePosition offers a portfolio of industry-leading location technologies, future-proof platform products, innovative applications, and comprehensive networking and systems services to enable the creation of carrier-grade location solutions for private enterprise and government agencies to protect citizens, combat crime, and save lives. TruePosition has offices in North America, the European Union and Asia. It is a subsidiary of Liberty Media Corporation. EmFinders, Inc. and Rosum Corporation are subsidiary entities of TruePosition.

**Enhanced 9-1-1 Location Requirements**

The first step toward speeding emergency response was recognizing the value of a universal emergency telephone number. The United States and Canada adopted the emergency services number 911 in 1968. In the wireline environment, telephone companies know the addresses of most landline phones. Providing that information to the dispatchers at the 911 call center so they could promptly direct emergency response to the location of the incident became a priority in the national 911 system.

Yet, if a person called from a wireless phone, the public safety agency had to rely on the caller to provide an accurate location of the emergency. The most often heard question asked by emergency communications personnel was “where is your emergency?” With wireless calls expanding, the challenge is maintaining the standard

established in the wireline environment. Of 300,000 calls made to 911 daily, over half are now from wireless phones, and approximately half of those – with the relative number rising – are made from indoor environments.

Relying on the caller to provide the location for directing emergency response is fraught with risk. The delay associated with determining where the individual is stifles and often precludes determining even what the emergency is. The standard of emergency dispatch is to provide the most effective resources in the most expeditious way possible; time is unforgiving. Those calling for emergency services are unsettled and distressed even in familiar surroundings. The trauma of an event delays response or misdirects it and the error is not inconsequential. Police, fire, EMS and other emergency service agencies have documented where accident victims lost their lives because emergency responders did not know the location of the caller.

It is this background- location capability being a fundamental element of speeding emergency response- that led the FCC to mandate wireless operators to provide public safety agencies with location information in the event of an emergency. The requirement, known as Enhanced 9-1-1 (E 9-1-1) dictates that wireless calls to the emergency 911 number must be located and the location sent to the nearest or most appropriate emergency call center and only to the call center.

The FCC specified the accuracy required for locations on a statistical basis and provided a timeline for deployment. It left the choice of technology to meet the mandate's requirements up to the wireless carriers. An initial deadline of year end 2005 for national deployment of the E 9-1-1 wireless location system was met by major carriers. Those carriers unable to meet the accuracy standard were required to seek a

waiver of the FCC rules. Currently, the FCC is examining various changes to the system to improve location accuracy and effectiveness of the E 9-1-1 system.

The commitment to emergency response and deployment of wireless location is attributed to several factors. Congress consistently emphasized the importance of E 9-1-1 and the FCC pursued the goal with focus. Police, fire, EMS and other emergency response agencies and their associations advocated the importance of defined requirements and reliable performance. Just as important is the private investment by wireless carriers in their networks and the public investment by state and local government in individual 911 centers.

TruePosition's very existence evolves from wireless location technology. We made substantial commitments of resources, prior to any mandate, to develop technologies able to provide the location of persons using mobile phones to call for help. The effort has required understanding and respecting wireless carriers and their network as well as their customers and public safety agencies. We value our work with the public safety community and with carriers, both large and small, to bring about pervasive E 9-1-1.

TruePosition continues to commit significant resources to provide location technology to the ever-evolving generations of mobile devices. With carriers now promoting wireless broadband services, it is crucial that citizens and public safety officials can continue to rely on location technology. As manufacturers, service providers, software and application developers and ancillary equipment sources move to shape the standards and protocols of the future, location technology must be at the forefront.

## Wireless Location Technologies

Currently two location geolocation technologies are capable of addressing the FCC's location accuracy requirements and are installed nation-wide. US CDMA carriers use a handset based technique known as Global Positioning System (GPS/AGPS). US GSM carriers use a network based technique known as Uplink-Time-Difference of Arrival (U-TDOA). Both approaches possess a fall back geolocation technique as well in the event the primary one cannot determine the location of the handset.

Both of these methods involve determining the location of a point in a coordinate system by measuring the distances from the point of unknown location to three or more points of known location. GPS uses space-based satellites; U-TDOA uses radios located at cell sites on the ground. Graphically, in two dimensions, the location of the unknown point can be visualized as the common intersection of three circles whose centers are at the location of the known points and whose radii are the measured distances. Radiolocation uses the properties of radio waves to measure the distances from the unknown point to the known points. The specific property utilized is the velocity of radio wave propagation. Radio waves propagate, i.e. travel, at a constant velocity. Therefore, the distance between two points can be determined by measuring the time it takes a radio wave to travel between the two points and multiplying by the velocity of propagation of radio waves to derive the distance.

GPS uses this property of radio wave propagation to permit the determination of the location of a GPS receiver, the cell phone/handset. The GPS is comprised of at least 24 satellites constantly orbiting the earth in six low earth orbits. Each satellite possesses a very accurate time clock that is synchronized with the time clocks in all of the other GPS

satellites. Each satellite transmits at least one civilian signal with its own unique signature, i.e. code, with its time of transmission and location of the satellite embedded into it. GPS receivers on the surface of the earth with an unobstructed or minimally-obstructed view to a number of GPS satellites receive the transmissions from them and note the time of reception with respect to their local clock. Typically, at least four GPS satellites uniformly distributed about the sky must be received to accurately solve for the latitude, longitude, elevation and time offset between the GPS receiver's local clock and the GPS satellites' clocks.

TruePosition's U-TDOA is a network-based technology that relies on multilateration and uses equipment installed in the mobile operator's network. Because it is network-based, U-TDOA can pinpoint the location of any mobile phone – current or future, in any environment. It allows the system to:

- Locate all mobile phones and devices, regardless of age or air interface - even those that are not GPS-enabled
- Locate so-called "gray market" mobile phones and devices – that is, those phones and devices not sold by carriers or their authorized dealers that GPS cannot locate
- Locate roaming mobile phones and devices that may not be interoperable with carriers' GPS systems
- Locate mobile phones and devices in any environment (indoors, in-vehicle, urban, suburban, rural, etc.)
- Locate mobile phones and devices with very high accuracy (typically under 50 meters) and reliability

Like GPS, U-TDOA is also a time based geolocation technique in that it measures the time of travel of radio waves. Specifically, the difference in the time it takes the radio wave to travel from the handset to Location Measurement Units (LMUs)

located at the base/transmitting facilities of the wireless carrier is the information utilized for UTDOA geolocation. The radio wave it measures is the same signal the handset uses for signaling and communications on the network. It measures the time of travel to multiple auxiliary receivers collocated with the base stations. These auxiliary receivers, the LMUs, are very accurately time-synchronized to each other and at any given moment, a handset may be communication with upwards of 30 LMUs. A minimum of three LMUs must receive the handset's signal to uniquely determine the location of it. Reception of the handset by more than 3 LMUs also enhances the accuracy of the location estimated. TruePosition has deployed over 100,000 LMUs.

U-TDOA system determines a wireless phone's geographical location by collecting and processing the RF signals transmitted by the phone. When a signal is transmitted -- when a phone call is placed -- the system gathers information about the signal from nearby mobile base stations. The data are transmitted to a processor that analyzes the information and computes the position of the caller by using TruePosition's patented Time Difference of Arrival (TDOA) algorithms**.** For a 911 call, the system then determines the location of the call and delivers the information so that the appropriate 911 center can dispatch assistance.

Unlike GPS, U-TDOA provides accurate and reliable geolocation of handsets even when they are indoors. This occurs for two reasons. First, the distances between the transmitter, i.e. the handset, and receiver, i.e. the LMU, is much less than with GPS, which relies upon satellite signals, so there is much less loss due to spherical spreading of the propagating radio wave. Second, and more significant, the power output of handsets can be varied and are controlled by the wireless network and dynamically adjusted many

times per second to assure reliable communications. Thus, when the loss between the transmitter and receiver increases because of attenuation by building materials, the wireless network commands the handset to increase it output power to compensate for this additional attenuation in order to achieve reliable communications. Thus, if a handset can communicate with its wireless network from indoors then U-TDOA can reliably and accurately geolocate it.

Differences between GPS and U-TDOA are important. U-TDOA is challenged in extreme rural areas, where there are long distances between carrier base stations. When satellite visibility is seriously blocked – such as in urban canyons or the insides of buildings – the GPS system is not able to produce a location. GPS cannot reliably and accurately provide caller location originating in many common buildings. In addition, unlike with U-TDOA, GPS devices can be deactivated – that is, the ability to locate them disabled – by the user.

**Expanded Use of Location Technology**

Location technology has evolved to serve beyond locating 911 calls. There are now expanded applications serving both the private and public sector. A network technology using television broadcast signals has been developed.[1] There are applications to locate lost persons and to safeguard and secure property whether it is in

[1] Rosum location technology is based on time difference of arrival where a device makes timing measurements of broadcast television signals. This technology is particularly applicable to urban and indoor scenarios, because TV signals are broadcast at a very high power level to enable them to penetrate buildings. These signals are also wide band 6 MHz bandwidth, which also facilitates accurate timing measurements. The technology requires that the TV broadcast signals be synchronized, or that a monitoring network be deployed across the coverage area to create timing calibration information of the TV signals. The technology also requires that a TV band antenna and tuner be included in the wireless device to make these timing measurements and requires that the TV broadcast antenna locations surround the devices to be located. Rosum technology has not yet been deployed in mass market.

storage or in transit.[2] It has emerged as an element of confronting and eliminating what corrections officials state is a growing challenge of illicit cell phones in prison. Jamming alone is neither effective nor risk free in eliminating illicit cell phone use in correctional institutions. Effective prevention can evolve by implementing network location and other wireless technologies. Location technology's importance in supporting law enforcement and national security missions is also recognized.

**Law Enforcement and National Security**

Today, the global environment must confront dangers that are all too real. Wireless technology has revolutionized communication — creating a level of convenience and connectivity never seen before. Unfortunately, this revolution also has a dark side, as criminals and terrorists continuously use wireless technology to coordinate their activities. High accuracy location technologies, those able to meet mission critical requirements, are a crucial element in the preparedness, investigation and response to these dangers.

Terrorists and criminals need modern communications. They use wireless communications extensively to recruit, train, plan and prosecute their crimes and atrocities. They also depend on these communications for all other aspects of their lives. To avoid possible detection, they use multiple anonymous pay-as-you go mobile phones and swap SIM cards and handsets. While wireless technology has revolutionized

[2] TruePosition's EmFinders,™ is a technology company dedicated to the rapid location and recovery of wandering or missing adults and children that uses existing U-TDOA network based cellular telephone location technology. The EmFinders EmSeeQ is a small, affordable, watch-like wireless device without buttons or a screen and is under the secure and remote control of the EmFinders operations center. It is worn by individuals with medical impairments like Autism, Down syndrome or Alzheimer's disease. The device can only be activated at the request of a caregiver who has reported the individual missing to the police. A call from the EmFinders device is a pre-screened 911 call.

communication, it also provides tangible assistance to those assaulting the lives, property and values of citizens. Terrorists also use this technology to initiate attacks such as detonating improvised explosive devices (IEDs).

As events demonstrate, these incidents are a serious test to the social and economic stability of all nations. In the Madrid bombings, terrorists attacked the morning commuter trains, killing 191 people and wounding over 1,800 people. Mobile phones were used to detonate the IEDs. In Lahore, 12 terrorists attacked the Sri Lankan cricket team, killing 6 policemen and wounding 7 players. Mobile phones were used to organize and execute the attack. In Mumbai, 10 terrorists attacked two hotels, killing 164 people and wounding over 300 people. Mobile phones were used to receive orders from their leaders and coordinate the attack.

Properly implemented to protect the rights and expectations of the innocent citizen, wireless location technology has emerged as a critical implement in the preparedness and investigation responsibilities of national security and law enforcement agencies. Location technology provides the ability to detect and locate criminal and terrorists' activity in real time.

TruePosition's U-TDOA technology delivers two key requirements of mission critical location-high accuracy and high reliability. It can provide information relating to the details of the criminal conduct and be an important tool in preventing tragedy. It can present an additional dimension to the comprehensive information picture that intelligence and law enforcement officials need. While it can be implemented passively on existing networks, it is not possible without core location accuracy standards in place.

Described discretely, TruePosition location security solutions allow for automatic notifications based on desired criteria, such as the geographic zone of activity, specific communications patterns or particular users. Unlike GPS, it does not demand a special handset or device, and cannot be disabled by the user. U-TDOA technology allows for locating multiple devices in real time with high accuracy. The information obtained can be viewed in a map-based graphic format, also in real time. It includes alerting capability with regard to specific geographic areas and users. It is transparent to the device user and the network and embraces high standards to gain access and control to the capability.

The technology provides analysis capability of historic location and calling activity information. It can compile current activities, mobile events and interactions with other devices. By compartmenting information, it allows government agencies to pool resources and provide safe shared and secure access to definitive information relating to the size, detail, location and activity of illegal conduct.

Location technology has emerged as an important instrument in discerning details of criminal activity and to provide insight addressing the expanse of the conduct. It promotes the ability to analyze dangers and risks on a continuous real time basis.

## Conclusion

TruePosition continues to work closely with large and small public safety agencies and the dedicated associations and individuals that represent them, to best integrate accurate location into the 911 communications centers. We also work closely with wireless carriers in their significant cooperative effort toward the goal of universal

E 9-1-1 deployment. With heightened national security and law enforcement demands, we work with these agencies in carrying out their critical mission requirements. TruePosition values and safeguards these important responsibilities.

This completes my statement. TruePosition appreciates very much the opportunity to appear before the Subcommittee and stands ready to provide further information today or in the future.