Survey on Monitoring Victim Activities by Using Android Mobile Phone

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Abstract

Now a day the android mobile phone became used any time and everywhere in the world. Every person that have android mobile phone can perform much activities. The companies or organizations have more rules, policies and confidence information, so they need some way for monitoring every employee's activities on their mobile phone devices that working there, for detecting any misusing of the mobile phone at the working hours. At the other hand parents whose working for long time needed to know if their kids arrived safely or not to or from school and monitoring different internet activities for their kids. In this survey several researches have been presented for different monitoring systems of android mobile applications, and the most important techniques used for this type of the systems and also drawbacks and strong points of them.

Keyword: Android, Victim, GPS, Smart phone

المستخلص

اليوم اصبح هاتف الاندرويد يستخدم في كل زمان ومكان في العالم .كل شخص يملك هاتف الاندرويد يستطيع اداء الكثير من الفعاليات. الشركات والمنظمات لديها قواعد وسياسات ومعلومات سرية لذلك تحتاج الى طريقة محددة لمراقبة فعاليات الموظفين الذين يعملون هناك فيما اذا قاموا بسوء استخدام للهاتف خلال ساعات العمل . وكذلك الاباء الذين يعملون لفترات طويلة يحتاجون للاطمئنان على سلامة وصول ابنائهم من والى المدارس. في هذه الدرسة الاستقصائية تم جمع واستعراض عدة ابحاث لتوضيح انظمة مراقبة هواتف الاندرويد واهم التقنيات المستخدمة بهذا النوع من الانظمة مع بيان نقاط الضعف والقوة لها.

1. Introduction

Monitoring smart phone activities system is one of the very important systems because it helps the parents to track the locomotion of their Kids, and also managers when they wanted to monitor their employee's activities to protect the secret companies' information [1]. Some of these systems used SMS to send the data or location directly to other client without using internet, client can show this location by using Google map.

When a researcher designing other monitoring system they overcomes the drawbacks of some systems by increasing monitored activities and uses the algorithms which help them to improve the system performance such as K-mean algorithm to clustering the gathered data according to their features. On the other hand they protect the information by encryption methods such as DES and AES [2] and [8]. This monitoring system has been used by smart phone, and the smart phones have to be

supported by operating system. The operating systems which are currently available in market are Windows, Android, IOS but the most common operating system is Android. Android operating system is open source operating system called software stack which contains operating systems, middleware and key mobile applications. The Android OS is rely on the Linux Kernel and it's designed for touching screen mobile device such as tablet devices and smart phone devices. The source code of Android is released by Google under the "Apache License" which make developers able to modified freely and then distributed it to device manufacturers [6]. It released in Sept., 23, 2008 and then more upgrade was happening to android OS which enhanced the system performance by added many features and fixed bugs [7]. The Android software development kit (SDK) provides libraries which required interfacing, the hardware and making, deploying, an android, application. The applications are written in Java programming language, and run on the Dalvik virtual machine. Android uses a SQLite light weight database to store data [9]. Android OS have more advantages for instance openness and equality of application, no boarders among them and also fast and easy to devolve the application [10].

The architecture of Android consists of Libraries, android runtime, frame work of application and also Linux Kernel. Android support many kind of Network connectivity such as EDGE ,GSM, 3G, Wi-Fi, LTE etc. there are many kind of android monitoring

application some of them for monitoring user's health, monitoring the power that used in each computer device and monitoring smart phone activities and etc [11]. So this survey, will view a third type of monitoring systems.

2. Literature survey

Many researchers presented different systems that monitoring the mobile phone activities of the victim which either is child or employee, so the most important such like systems will be introduce in the following:

1. In 2015, Rohit N & et al. It's one of the systems that monitoring the child's location , meanwhile send this location to its parents with using some of technologies like Global Positioning System (GPS) which a resource of "navigation system" that provides information of location in terms of longitude and latitude and also use voice playback circuit to detect whether child is crying or not. And use Advance Risc Machine (ARM7) microcontroller which required low power in the child module. But it can't dedicate the location of victim when he was out of specific area it just send message when the victim cross the specific geographic area. The main findings of this research is keep the observation on their child even when they can't physically see them [1].

2. In 2015, Yogini Shendkar& et al. In this research Its designed a system as android application for smart phone, it contain two

module one for children include GSM, GPS ,microcontroller, and other for parents which includes android mobile which use as receiver module and also it adds teacher module to connect with parents and also can tracking multiple children at the same time. The main findings system is provide facility to track browser activities and to block calls or messages from specified numbers. Meanwhile, all incoming and outgoing calls, texts and multimedia messages can be seen and interrupted by the parents [2].

3. In 2015, Nitin P. & et al. In this system, it's also tracking the location of victim in additional to monitor the activities such as SMS and incoming and out coming calls of the victims, all this information was sending to administrator and also to server to save it in a database, with using android smart phone which required take some permissions to access sensitive information like SMS and calls of a victim and also GPS resource in order to tracking. And also this system consists of an alert of location if any of user crosses the specified geographical area of the organization instantly an alert will be sent to the manager's mobile phone in the form of E-mail. This system is very useful because it help to increase effectiveness of the employees' work and keep security in organizations, or tracking the child. In this system they use permission system [3].

4. In 2015, Kalyani Bhagwat &et al. It's one of existing system the victim is tracking by using Bluetooth technology. In this

system the android application tracking the location of victim and alert message is send to mobile phone of an administrator. And also that make activities monitoring such as missed calls, incoming, outgoing calls and SMS to individual person is occur because it can't able to support connected of multiple user at the same time, adopts 2G communication network function between Android mobile terminal , so the administrator can't tracking current location of the victim [4].

5. In 2014, DeshpandeKomal N.& et al. Implemented system which enable a manager to monitor the smart phone activities of employees such as SMS, MMS, incoming call, outgoing call, web history, data usage and employees' locomotion by using some technologies such as 3G network like internet which considered more secure and faster than 2G network, used GPS for tracking, to make the system more secure and achieved aim of protecting confidential data of employees from unauthorized users and transmitting data in safely way they should used encryption algorithm like AES which is a symmetric block cipher, this means they used same key for encryption and decryption. Encryption is a process of converting the plaintext to cipher text that can't be recognizes by thread party by using some key and this cipher text can be reconverting to original plaintext by same key. So the use AES algorithm that make the system more reliable

than other systems. The structure of this algorithm is shown below [8].

6. In 2014, S Santosh Goud & et al. This research proposed the system which includes a child module and two receiver modules for getting the information about the missed child on periodical basis. The child module includes ARM7 microcontroller, GPS, Global system for mobile communication (GSM), Voice playback circuit and the receiver module includes Android mobile device in parent's hand and the other as monitoring database in control room of the school as a server. Furthermore, this system used clustering technology for managing groups of Android terminals those attached to children in school and this terminals used wireless LAN and Bluetooth in the communication between them in single cluster. The main findings of this research is the system can monitor the missed child location and send this information to school control room and also to parents. Not only information about the whereabouts of the child but also if the child is crying is send through text message to parents' Android mobile device [13].

7. In 2015, Mahesh Gavhane and et al. In this study the proposed system used android system that allow to the manager to monitor Employee's office cell phone. All incoming and outgoing calls, texts and multimedia messages can be seen and interrupted by the managers, who can also monitor where their

Employee are (through GPS) to get their location and set up alerts if their employee are going outside of approved geographical zones. Android mobile terminal is connected to high speed 3G network. The proposed system use of the cloud technology to store and retrieve various telephony information using SOAP protocol. And also use AES Encryption algorithm. The mobile device in the hand of the Employee should be an Android based device and the Managers may have any kind mobile devices, since they are going to receive alerts from the Employee in SMS format only. The main findings is used this system it is possible for the manager to track an employee in the organization and it is also possible for the manager to know all the incoming calls, outgoing calls and text messages sent by an unknown person to the employee [14].

8. In 2016, Gangurde Madhuri and et al. This study presented a system which implemented for tracking the daily activity of the users with their android mobiles. The information such as missed call, incoming call, outgoing call, call duration, incoming SMS, out-going SMS along with its date and time will be tracked and updated to the server this server will be monitored by the administrator. The server can receive the data from the software and can store the data in an efficient manner by using cloud. Server side refers to operations that are performed by the server in a client – server relationship in computer networking. And this

helps the manager to review the details and can know the performance of the employees in the organization. And monitoring PC of the employees to track their incoming and outgoing call log, web browsing history and their location during working hours. [14]

9.In 2013, Radhika Kinage and et al. This study proposed Personal Tracking Systems are the tracking devices specially built up for personal information. The person takes it with him and the information of where he is presently is provided. This application which tracks the mobiles location by GPS and if the location is outside the security zone that is the zones are divided into three priority regions. The priority regions are safe, risky and highly risky. So if the mobile's location coordinates are found breaching the priority zones, an alert message is sent every 10 or 15 minute to any number which is registered for receiving the alert message by using a mobile network. In additional the application would warn user in the form of a message with beep so that mobile user would also be well informed about risk associated with his/her movement. Te main findings of this application allowed specifying different safety zones and it's cost effective and does not require any additional device [15].

10. In 2014, Sonal Kasliwal and et al. This study is proposed system which used AES algorithm for security purpose, K-mean algorithm to determining the behavior of the Employees, 3G

network and GPS technology. This system consist of Employee App, Central Server and Manager App. The Employee App should be run continuously in the android mobile phones of the employees in the company. The Manager app provides the details of Employees to the Manager through the mail. The database is stored in the central server which is accessible only to the Manager. This main findings of this system to monitor the employee's SMS history, incoming calls, outgoing calls, employee Locations, data usage, web browser history and unauthorized call history in order to It helps to avoid the wastage and thus help to increase the company's output [16].

3. Android

Android operating system is the most widely used operating system in 2012 and 2013. This is a software platform and operating system for mobile devices which is based on Linux kernel and is developed by Google but later on by Open Handset Alliance (OHA). Its native language is Java which is the officially supported language [17].

Android operating system is designed for low powered devices, with integrated hardware like cameras, Wi-Fi, Bluetooth, a touch screen, and GPS. Android supports applications to use hardware features through abstraction and provides environment for applications [18].

Android provides open source operating system; users and developers can get source code but only under the rules

and conditions. Whenever the user wants to install any application, firstly its description as well as a list of permission requests is provided with an opportunity for review before its installation or cancel the installation if he or she finds that the permissions are too many or objectionable [19].

Some of the features of Android OS are: Messaging, Web browser, Multi-touch, Video calling, Multi-tasking and etc. Some of the best Android smart phones are: Samsung Galaxy Note 3, Moto X, Google Nexus 7 etc. Google, Sony and Samsung are coming up with smart watches like Samsung Galaxy which are going to revolutionize the smart phone industry [17].

3.1 Architecture of Android Operating System

Unlike other mobile operating systems such as Windows Phone or iOS, Android applications are written in Java and run in a Dalvik VM (Virtual Machine). This virtual machine is a core component, because all Android applications and the application framework are executed by it. [21]

Android operating system is divided into four layers: the kernel layer, libraries and runtime layer, applications framework layer, and applications layer. Android kernel is a modified version of Linux 2.6 kernel, which is updated from time to time with different versions of Android. The libraries provide support for graphics, media capabilities, and data storage. Android

runtime, embedded in libraries layer, contains the Dalvik virtual machine to power the applications. As a replacement of Dalvik, Android introduced its new Android Run Time (ART) with a head-of-time (AOT) compilation, which improves performance. All applications use the applications framework API for accessing the lowest level of the architecture [18]. The following figure is showing the architecture.

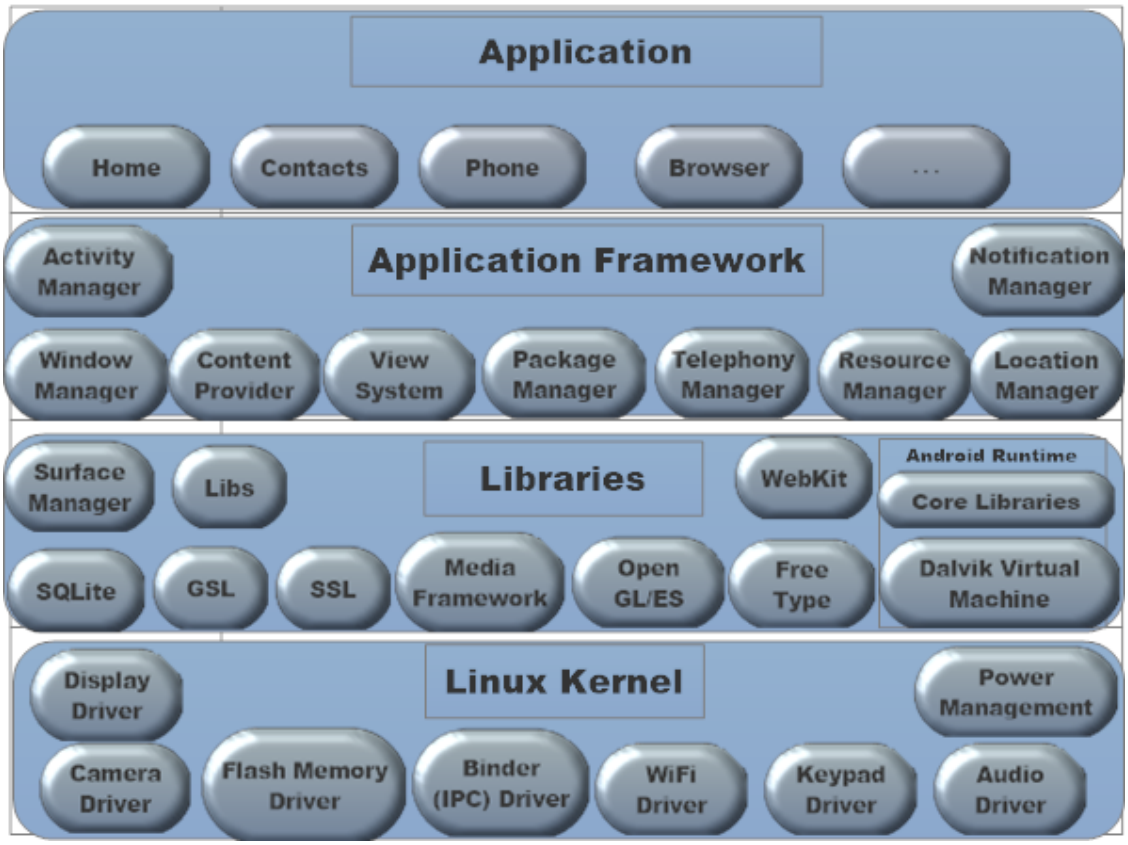

Figure (1.1): Architecture of android operating system [18].

1. Application Layer: The application component of the Android operating system is the closest to the end user. This is where the Contacts, Phone, Messaging, and Angry Birds apps live. As

a developer, your finished product will execute in this space by using the API libraries and the Dalvik VM .this includes a core application package, such as Email Client,
Web Browser etc.

2. Application Framework Layer: This layer is developed specifically for allowing developers full access to the core application framework used by the API. It consists of a range of services and system structure which include Active Manager, Windows Manager, View system, Contents Provider, Package Manager, Resource Manage, and so on.

3. Libraries and Android Run-time Layer: This layer is mainly associated with the process running. The core library provides most of the features of Java programming language. Additionally, each program of Android has a separate Dalvik's Java virtual machine environment.

4. The fourth layer – Linux kernel: Kernel of Android is Linux 2.6 core which, Similar to a desktop computer running Linux, the Android kernel will take care of power and memory management, device drivers, process management, networking, and security [20].

3.2 Android Permission

Android's permission system is intended to inform users about the risks of installing applications. When a user installs an application, he or she has the opportunity to review the

application's permission requests and cancel the installation if the permissions are excessive or objectionable. We examine whether the Android permission system is effective at warning users [20].

In addition, the purpose of permission is to protect the privacy of an Android user. Android application need to request permission to gain confidential information of user such as access to SMS or contact, as well as access to feature of system such as internet and camera. Depending on the feature, the system could be approved the permission automatically or might ask the user to grant the request.

If the application puts normal permissions in its manifest file that is permissions that don't cause any risk to the user's data or the operation of device, the system grants permissions application automatically. If application puts dangerous permissions in its manifest file that permissions that might potentially cause risk to users information or to operation of device, such as the SEND_SMS permission, the user must agree to grant those permissions. So the following permissions are collected between normal and dangerous permissions [12].

1. android. permission.INTERNET.
2. android.,permission.SEND_SMS.
3. android".permission.ACCESS_NETWORK_STATE.
4. android.permission.CALL_PHONE.

5. android.permission.ACCESS_COARSE_LOCATION.
6. android.permission.ACCESS_FINE-LOCATION.
7. android.permission.READ_PHONE_STATE.
8. android.permission.RECEIVE_BOOT_COMPLETED.
9. android.permission.RECEIVE_SMS.
10. android.permission.READ_CONTACTS.
11. android.permission.READ_SMS.
12. android.permission.WRITE_SMS [3].

4. Technologies and Algorithms of monitoring system

Many of the systems mentioned have used various technologies such as GPS and various types of networks to meet the requirements of the work, so a table was made showing the strengths and weaknesses of many of the techniques used in the monitoring systems Let us know the best.

Table (1): Strengths and weaknesses of some techniques

No.	Technologies	Type	Strengths	weaknesses
1	GPS	Hardware	1. It's the module to provide coordinates which is (longitude and latitude). 2. Speed on ground, exact	GPS data loss rates can reach 92% due to signal leakage

			time for these readings. 3. its wearable	
2	Bluetooth	Hardware	1. Bluetooth is a wireless network. 2. Bluetooth is enable the communicatio n between the devices like portable computers, cellular telephones, personal digital assistants (PDAs), and a variety of other devices. 3. It is using low-power. 4. It can share voice and data. 5. it's inexpensive.	1. It make the communication limited in specific area. 2. It slow unreliable in communication network. 3. It's allow for monitoring system to monitor only one person.

3	3G network	Software	1. It's can connect the devices without using a cable. 2. It Extremely fast to transmit a data among the devices. 3. It can share text, voice and video. 4. It's good for data intensive applications.	The mobile phone signal may be reduced due to factors of being too far from a cell tower that let to slow mobile internet, Internet timeouts and Increased battery usage
4	Android SDK	Software	1. The Android SDK has all the important tools you need to create an app. 2. The SDK contains an emulator that emulates all the functionality of a real Android device.	In progress of SDK tools some features is removed and others is added.

5	MySql	Software	1. MySQL works fine in most small or medium application with small and medium size of data.	1. MySQL would degrade when the data grows. 2. MySQL don't support auto sharing.
6	ARM7 controller	Hardware	ARM7 needs low power for its functioning.	The clock speeds are rising in spite of using low power.
7	GSM (Global System for Mobile Communications)	Software	1. advanced features such as short messaging, 2. Easy to use over air activation. 3. Its international roaming capability in over 100 countries. 4. it have improved battery life.	The communication of this system is unreliable.

The mentioned technologies have strengths and weaknesses that reflect positively or negatively on the performance level of the surveillance systems as the use of

Bluetooth technology makes the system able to monitor only one person at a time, unlike the 3G network such as (Wi-Fi and hotspot) which allows for monitoring more than one person simultaneously [3].

In addition, GSM technology is a global System for Mobile Communications which used in monitoring system to send and receive a message from child module to parent mobile [1]. Security algorithms used in GSM e.g. A3, A5, and A8 are all undisclosed algorithms. But researchers have proved that these algorithms cannot guarantee 100% security [32].

In addition to the use of algorithms such as the cryptographic algorithm such as AES and artificial intelligence algorithm such as K-Mean algorithm which making the systems more efficient and add features according to the system requirements.

4.1 K-mean Algorithm

Some system used this algorithm which used for clustering which process of organizing the objects into groups who's similar in features. A cluster is a collection of objects which are similar among them and are dissimilar to the objects belonging to other clusters. "Unlike classification" which objects are allocated to predefined classes; clustering doesn't have any "predefined classes.

Given a set "of observations (x1,"x2,...., xn), where each observation is a d-dimensional real vector, k-means

clustering aims to partition the n observations into k sets ($k \leq n$) $S = \{S1, S2, \ldots, Sk\}$ so as to minimize the within-cluster sum of squares (WCSS): [5]

$$\arg\min S = \sum_{i=1}^{k} \sum_{xj \in si} \left| |Xj - \mu_i| \right|^2 \quad \ldots\ldots\ldots\ldots\ldots\ldots [5]$$

5. Conclusion

In this survey, it has been mentioned many researches which explain several systems who monitoring the activities of victim and its study the development of these researches which used many technologies, some of these researches used GPS technologies to tracking the location of user that required to register to google API key to gain the location of the user. And other need to monitor more other activities, so they need more safely connection to send these data to administrator, and also some of them need to intelligent way to cluster the data to group, So they use K-mean algorithm, as well as using the encryption algorithms to implement goal of data security like integrity, confidentiality, authentication. Meanwhile became able to monitoring multiple victims at the same time. Thereby the systems preference should not be one on other because each system that meets the requirements of a particular research title, but it remains the use of techniques and algorithms that strengthen the systems technically and research, But it can be said that the techniques used may affect the.

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