

## A MOBILE ENTERPRISE SOLUTION (TRUE MONITOR)

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**ABSTRACT.** *In a gradually idealized, homogeneous and sanitized world, Security and confidentiality of organization's policies, practices, rules and procedure is becoming a major issue for any enterprise or association and there are also such a variety of criminal cases. So to maintain the security of organization's future projects and secret missions, to help to avoid criminal cases like child kidnapping, mobile snatching and etc. by monitoring geographical location and to monitor the children by their parents after tracking their daily activities along with its date and time, we proposed a mobile and web based monitoring system "A Mobile, Enterprise Solution (True Monitor)" which "ll run invisibly on target device to track all the activities including device information (Inc. Id, Name, Model, OS, OS Version, IMEI No., Carrier, Carrier No., IMSI No., Battery, Wi-Fi/GPRS/3G, Location Tracker Status, Microphone Detection, Status (Lock/Unlock), Last Login, IP Address, Primary Email ID), Contact Logs, Call logs (Incoming, Outgoing, Missed), Call Recordings, Call Duration, Text Message Logs (Inbox, Sent) with its source and destination mobile number, GPS Location, Instant Messages (Facebook, Whatsapp, Skype, Viber & etc.), Mailbox, Browser History, Multimedia files and Blocked Websites along with its date and time. This information would have sent to the server (monitored by administrator) with an alert notification to the administrator in the result of any activity which does from the user mobile with detailed information.*

**Keywords:** True Monitor; Confidentiality; Global Positioning System (GPS); Dalvik Virtual Machine (DVM); Java Development Kit (JDK); Tracking.

**1. Introduction.** A Mobile Enterprise Solution (True Monitor) system is developed with android operating system and web based. Currently android cell phones are everywhere extraordinarily, however in the event that we consider the zone, for example, Information Technology, Organizations, Instructive and Commercial, all the representative through cell phones accomplishes many actions even in working hour so the framework is developed to monitor the employees what action they are carrying out in official hour in the association.

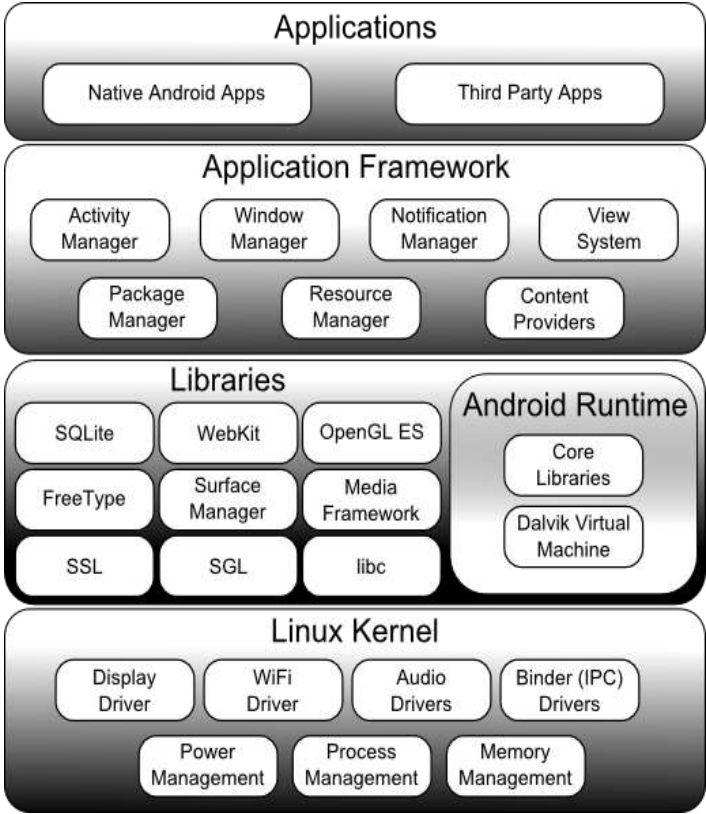
Our mobile monitoring framework "ll run undetectably on target device to track all the activities including Device information (Inc. Id, Name, Model, OS, OS Version, IMEI No., Carrier, Carrier No., IMSI No., Battery, Wi-Fi/GPRS/3G, Location Tracker Status, Microphone Detection, Status (Lock/Unlock), Last Login, IP Address, Primary Email ID), Contact Logs, Call logs (Incoming, Outgoing, Missed), Call Recordings, Call Duration, Text Message Logs (Inbox, Sent) with its source and destination mobile number, GPS Location, Instant Messages (Facebook, Whatsapp, Skype, Viber & etc.), Mailbox, Browser History, Multimedia files, Blocked Websites along with its date and time and much more detailed information, This would be observed and would directed to the web server and a notification will be conveyed to the overseer when the action will accomplished by any employee using his cell phone.

The observation would be completed by background services which are using on the handler’s cell phone. With registration apk file would installed and every single information related to user would be tracked for example, id, name, Email Id, Carrier number, Designation.

Administrator can get to the user area anytime through scope and longitude via detection. Framework acquires mindfulness working hours and expands the productivity in work and gives intelligent security to the business. This framework is useful for association as well as helpful for observing victimized area, observing understudies carrying out action through mobile phones with android operating system in lecture hall, parents can observe children acting pointless actions on their cell phones, furthermore area notification can get from their children and to maintain the security of information for secret services and security agencies.

The framework is Simple to actualize and add functions, ready to oversee numerous user effectively, Versatile for adaptability of client who is functioning in concern. Protected against doubtful individuals, Low cost. To satisfy the above requirements, the proposed new technology True Monitor framework embraces Data Connection/Wi-Fi correspondence capacity between Android portable terminals, and gathers user data utilizing Global Positioning System. Cell Phone applications moreover called portable applications is a term used to depict Internet applications which continue running on mobile phones. Android is a product stack usage for mobile phones that incorporates OS, middleware and key applications.

Android Smartphone portable application is stage, created by the Open Handset Alliance (OHA) drove by Google, Inc. This Android framework comprises of 4 layers: the Linux portion, local libraries, the virtual machine, and an application system. The Android SDK gives the apparatuses and APIs vital to start generating applications on the Android organize using the Java programming language [5] .



**Figure-1: Android Framework [2]**

Android relies on upon Linux adjustment 2.6 for focus structure organizations, for instance, security, memory association, handle association, framework stack, and driver display. The part goes about as a pondering layer between the hardware and the straggling leftovers of the product stack [5]. The library layer is interfaced

through Java. It is in this layer the Android specific libc (Bionic) is found. The surface boss handles the customer interface. The Android runtime layer holds the Dalvik Virtual Machine (DVM) and the middle libraries, (for instance, Java or IO).

An expansive bit of the functionalities open in Android are given by method for the inside libraries. Every Android application continues running in its own strategy, with its own instance of the Dalvik Virtual machine. Dalvik has been formed so that a device can run various VMs successfully. The Dalvik VM executes records in the Dalvik Executable association which is streamlined for immaterial memory foot formed impression. The VM is enroll based, and runs classes consolidated by a Java language compiler that have changed into the .dex group by the included "dx" instrument. The Dalvik VM relies on upon the Linux piece for major convenience, for instance, threading and low-level memory administration. Android utilizes SQLite which is a successful and lightweight social database engine available to all applications.

There are distinctive components open in the android and them generally spotlights on application framework engaging reuse and substitution of sections, Dalvik virtual machine overhauled for mobile phones. Consolidated program in light of the open source Web Kit engine. Enhanced illustrations controlled by a custom 2D representation library; 3D outline in perspective of the OpenGL ES 1.0 detail. SQLite for sorted out data stockpiling Media bolster for standard sound, video, and still picture plans. GSM Telephony. Bluetooth, 3G, and Wi-Fi, Camera and GPS.

Rich headway environment including a contraption emulator, devices for investigating, memory and execution profiling, and a module for the android studio or eclipsing. The key portion of our paper is Managers, to investigate all mobile actions of representatives through cellphones to know the loyalty and performance of client (Good-Loyal/Average/Bad).

**Literature Review:** R.Anand, G. Arun Kumar and S.Murthy proposed a 'Mitter - Bitter Monitoring System Using Android Smart-phone's' has communicated that Employee screening framework using android telephone is that application which allows the administrator to screen the worker's association mobile phone. The boss can see the incoming, missed and outgoing calls, messages, web history, and the area territory of the representative through GPS. The administrator can send the alarms to the representative if the specialist is going outside as far as possible. This application can be presented just on android telephones. Moreover, for Manager's advantage, the data is secured on concentrated server with the objective that boss can see the purposes of enthusiasm of the representative at whatever time. Thusly the administrator can without quite a bit of an extend track the worker and keeps the record in purpose of enthusiasm of the representative [9]

Luis C. M. Varandas, Binod Vaidya and Joel J. P. C. Rodrigues proposed a 'mTracker: A Mobile Tracking Application for Pervasive Environment' paper, the maker has concentrated on following of the android phone customer through GPS. Currently the cell phones or the portable digital displays (PDDs) are outfitted with the GPS which tracks the present territory of the customer. This paper depict the accompanying device i.e. mTracker which uses the region based organizations and overall structure for flexible. This application can send the cautions to the administrator if the representative is out of the topographical range [7].

Neha S. Mankar, Sweeti M. Shambharkar and Asst. Prof. Priti P. Dafale proposed an employee monitoring system using android smartphones. This system is valuable for the executives to screen out their employees through cell phones. This application is use to kept up sincerity between overseeing group and representative, keep up logs of call and messages, keep up territory of customer for track customer for there working achievements, online attendance system, plan emergency security using sending cautioning to companions and security group [1].

Mori, Y. Kojima, H. Kohno, E., noue, S. Ohta, T, Kakuda, Y, Ito implemented "A Self-Adaptive kids monitoring framework in view of mobile Ad Hoc Networks comprising of android portable terminals which concentrate on children observing structure is extensively used everywhere all through the world to ensure guardians that their zones are shielded from suspicious exercises and their children are happy in school environment without crying. The proposed system incorporates monitoring the kid's drive to and from school [4].

Nitin P. Jagtap, Kanchan A. Patil, Shaziya Sayyed Shakil, Nitin S. Ingle implemented the system "Mobile activity monitoring system using android spy" to observe the day by day activity like call history (incoming,

outgoing, missed) and message history (inbox, sent) of users on their android mobile devices with date and time [6].

Atsushi Ito, Yoshiaki Kakuda, Tomoyuki Ohta and Shinji Inoue, proposed the implementation of "New security arrangement framework for children on school routes utilizing mobile ad hoc networks" which built up another wellbeing safety supportive network for kids on school routes by utilizing a mobile ad hoc network assembled from cell phones with the Bluetooth work [3].

**2. Existing System.** Before we propose a tremendous system another framework is present to monitor The employees or users called as existing system or framework. In that framwork to locate the exact position of the user tags are fixed in diverse location. The correspondence medium to associate Android cell phones Bluetooth and remote LAN is utilized. The position will be monitored with in a range and report will be sent to overseer side through Bluetooth. Mobile actions, for example, call history i.e. missed call, incoming call, outgoing call and message history i.e. inbox and sent messages, web browser history, data usage of devices and unapproved call list is monitored through Bluetooth and wireless LAN [8].

**2.1. Drawbacks of Existing System.** There are many flaws and drawbacks in existing system which are highlighted in the given below statement as follows,

- User's position is tracked by altering labels in various area and for the connectivity with android smart phones Bluetooth and remote LAN is used.
  - Monitoring is done for a very smaller distance and relatively slow.
  - No security.
  - Network for communication is not reliable and much more complex.
- Text Message history is monitored in existing system but the biggest flaw in this module is
  - Number didn't find in message logs (inbox, sent).
  - Just message body exist.
  - No authorization.
  - No accuracy

Then how we came to know that from and to where information or confidential data is being leak?
- No Proper Device information is tracked to manage and to authenticate more than one user's.
- Can't restrict or block someone's calls or messages.
- Browser history is tracked in existing system but
  - Didn't mention the frequency of visited websites.
  - Didn't mention either website is bookmarked or not.
- Due to Bluetooth and wireless LAN medium
  - Can't track multiple users at single time.
  - If connection loss during data transfer then data will be loss.
  - No proper check and balance to transfer data.
  - Slow speed.
  - No reliability.
  - Data managing issues in large organizations or in large no. of users.

**3. Proposed Solution.** A Mobile enterprise solution (True Monitor) is proposed to achieve main objectives. The issues which are happened in the present-day system that are overcome in proposed framework. This framework is an improved version of existing system where all the drawbacks and flaws are handled and resolved in a good manner. This solution is an android and web based system where user application is in android platform and administrator side or admin panel which will be called as a server is a web based. In proposed system we have executed some utility by using mobile phone with android operating system for supervisor to manage the endeavor worker to avoid the misuse of their office cellphone.

Proposed mobile monitoring framework will run invisibly on marked device to track all the activities including Device information (Inc. Id, Name, Model, OS, OS Version, IMEI No., Carrier, Carrier No., IMSI No., Battery, Wi-Fi/GPRS/3G, Location Tracker Status, Microphone Detection, Status (Lock/Unlock), Last Login, IP Address, Primary Email ID), Contact Logs, Call logs (Incoming, Outgoing, Missed), Call

Recordings, Call Duration, Text Message Logs (Inbox, Sent) with its source and destination mobile number, GPS Location, Instant Messages (Facebook, Whatsapp, Skype, Viber & etc.), Mailbox, Browser History, Multimedia files, Blocked Websites along with its date and time and much more detailed information, also the overseer can get notification of what sort of message is exchanging and getting from the device. overseer can keep an eye on user with GPS Location tracker and microphone detection feature, where the representative is precisely whether he is accessible in his department or other division or whether he is doing converse with different people in working hours?, or he is playing out some unlawful exercises such discharging the private data? This data will be sent to the server and this server will be observed by the director.

The communication would have done with the connectivity of Data Connection / Wi-Fi, So the administrator can be Track the user at a rapid and due to the fast system there should be not any hinder in the system. This proposed framework is exceptionally secured and solid when contrasted with the current framework for the reason that of the fast 3G systems furthermore gave web administration security to this application. All such observing may be possible through this proposed framework.

**3.1. Methodology of Proposed Solution.** The proposed framework makes use of the android portable application to screen their worker actions and subsequently expanding the accomplishment. The proposed solution is Client-Server based and the incremental model methodology is used to implement this system because we may check step by step the progress and efficiency of this system. In the event that the client gets any calls, messages or carry out any action then it will obviously save to the SQLite database of the mobile phone and will update the database of the server. At the point when there is no web association is open in client's Smartphone, all subtle elements would be saved to the SQLite database and later the particulars will send by the framework to the server database at the time network connection is available.

The proposed framework will screen user's present position and in addition the past position using GPS. This framework is truly successful and quicker than the ordinary framework. Because of the usage of 3G system the information is recovered and put away in the server at a rapid. Issues relevant to data managing in large no. of users, data loss during transfer, security, reliability, speed are resolved in this proposed solution True Monitor with the usage of modern technology as PHP5 Code-Igniter Framework, AJAX, JASON Parsing techniques. With the help of the encryption calculations the data is sent to the mobile terminal to extremely securely.

**3.2. Advantages of Proposed Solution.** A portion of the upsides of proposed arrangement are as per the following;

- User tracking is done with any network which is connected, Data Connection / Wi-Fi or else.
- A proposed system is user interactive.
- This system is proper authenticated, secure, reliable and with long distance transfer capability.
- There will be no data loss during data transfer.
- In this system all drawbacks and flaws are resolved.
- Modern techniques are used to manage speed and space issues in large no. of users, i.e. PHP5 Code-Igniter framework, JSON Parsing.

**3.3. System Specification of Proposed Solution.** The advancements which are utilized to actualize the proposed framework are as per the following;

- **Front End**
  - Android Studio Platform, Java SDK.
  - Web Portal Requirements (Adobe Dreamweaver, Notepad ++ or any editor, HTML5, CSS3, JQUERY, JavaScript and Bootstrap).
- **Back End**
  - SQLite Server (database), MYSQLi, Web Server.
- **Server End**

- PHP5 Code-Igniter Framework.
- JSON Parsing Technique.
- AJAX.

**4. Implementation.** This framework is implemented by applying Android working framework we can as well check it on emulator in investigating mode in which Android SDK gives virtual cell phone emulator which will continues running on PC [3] .

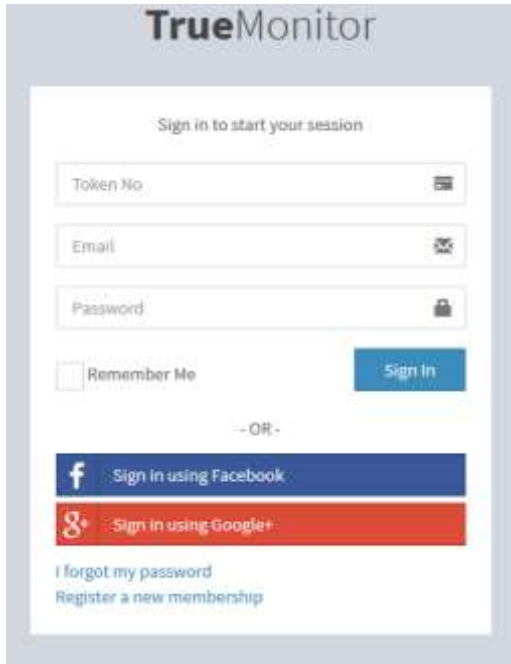
We finished a True Monitor which will continue running in backend bundle in users mobile to run the application in backend and to screen every information about Call, SMS, Location and other activity. We need to give a few permissions in AndroidManifest.xml which will fuse into android studio at the time of making True Monitor. To track and send information about client's activity in mobile to the centralized server we need to run these permissions.

- android.permission.INTERNET
- android.permission.ACCESS\_WIFI\_STATE
- android.permission.ACCESS\_NETWORK\_STATE
- android.permission.CHANGE\_WIFI\_STATE
- android.permission.ACCESS\_COARSE\_LOCATION
- android.permission.ACCESS\_FINE\_LOCATION
- android.permission.AUTHENTICATE\_ACCOUNTS
- android.permission.GET\_ACCOUNTS
- android.permission.READ\_PHONE\_STATE
- android.permission.PROCESS\_OUTGOING\_CALLS
- android.permission.READ\_CALL\_LOG
- android.permission.READ\_OWNER\_DATA
- android.permission.MANAGE\_ACCOUNTS
- android.permission.USE\_CREDENTIALS
- android.permission.READ\_CONTACTS
- android.permission.WRITE\_CONTACTS
- android.permission.WRITE\_EXTERNAL\_STORAGE
- android.permission.READ\_EXTERNAL\_STORAGE
- android.hardware.telephony
- android.permission.READ\_SMS
- android.permission.WRITE\_SMS
- android.permission.SEND\_SMS
- android.permission.RECEIVE\_SMS
- android.permission.RECEIVE\_MMS
- android.permission.RECEIVE\_BOOT\_COMPLETED [6]

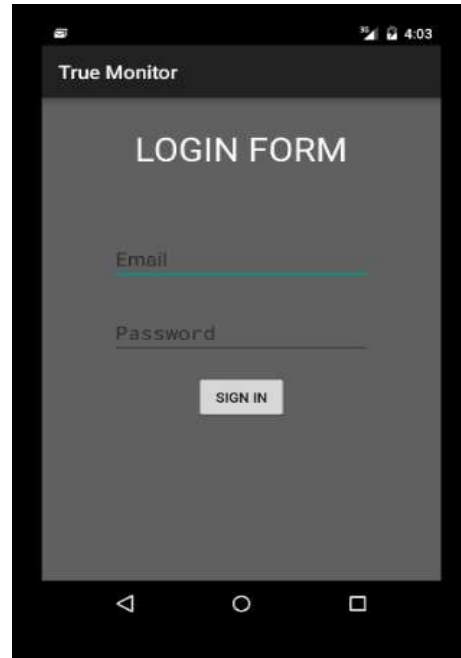
After that we have to register the Google's API key for getting the zone of user through GPS. Administrator can see every action which are performed by user like making a call, sms, or trying to cheat with organization, contact addition, or browse something. Administrator also have the authorities to block or restrict someone's call, sms, contact or any website to user's mobile. All information against activities which are performed will save in mobile local database as such mobile device connects to any network all information across activities will sent to admin panel database through JSON technique and with encryption algorithms to make secure the information.

**5. Results and Discussions.** After performing accomplishment of this system we found some results after doing testing on user's android mobile device and administrator web based admin panel which fulfills our targeted objectives, prerequisites also, parameters. We introduced our True Monitor System in one android portable device which runs android 4.4 least and perform some actions on device like made a call or sms, receive a call or sms, addition in contacts, or internet browsing or visited some block websites, when all these activities are performed in cell phone then parallel notification was sent to the administrator with a authenticated and detailed information of happened activity.

Some of the screen shots of Implementation phase are as follows;



**Figure-2: Administrator Login (Web)**



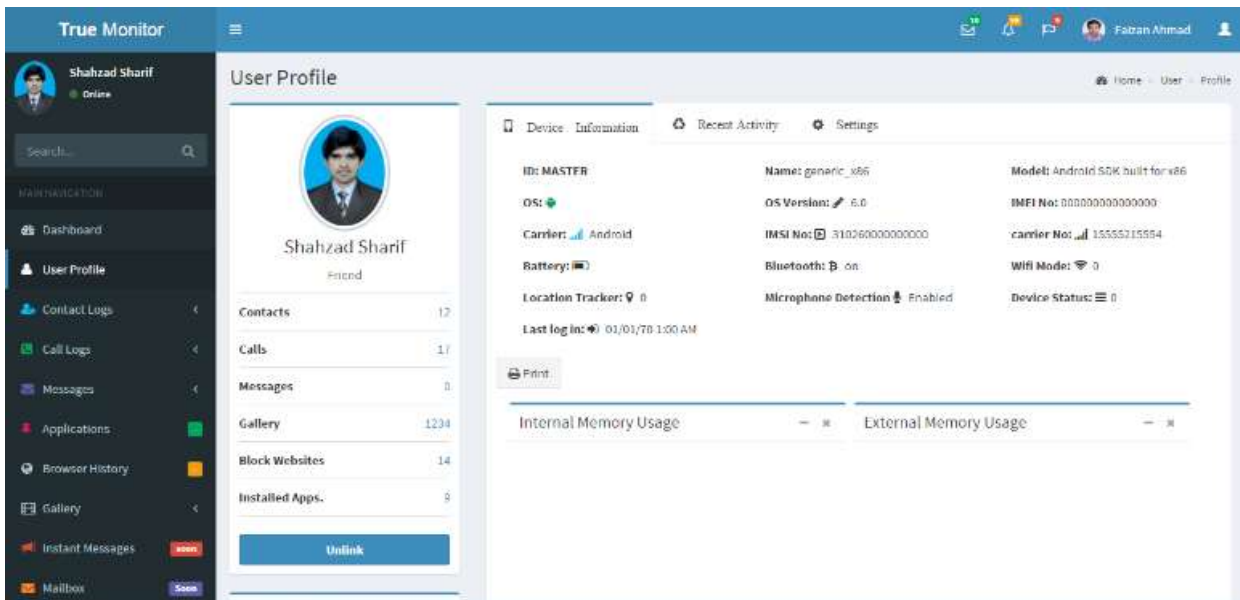
**Figure-3: User Login (Android)**

**Figure-2** and **Figure-3** are the screenshots of Administrator Login (Web Panel) and User Login (Android).



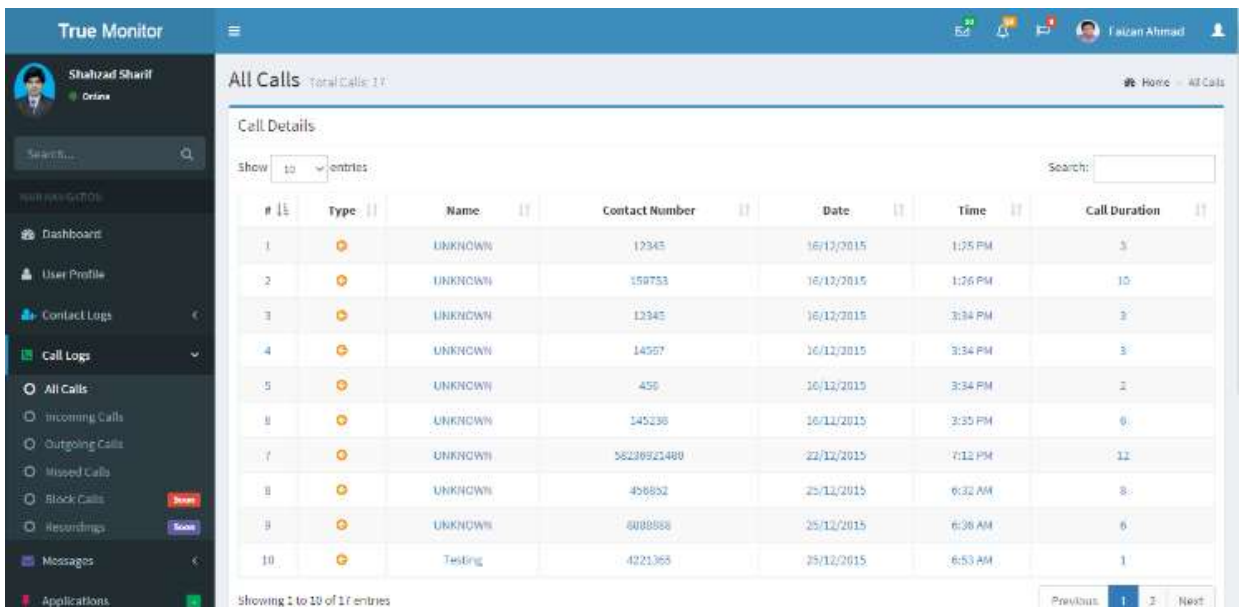
**Figure-4: Dashboard (Web)**

**Figure-4:** is the screenshot of Administrator dashboard on web panel, where administrator can move to any specific area of user's profile and can see every information on main screen.



**Figure-5: User's Profile**

**Figure-5:** is the screenshot of User's profile on administrator web panel where administrator can view all the information of respective user after selection.



**Figure-6: User's Call Logs**

**Figure-6:** is the screenshot of selected User's Call Logs on administrator web panel where administrator can view detailed information of user's Call Records.

**All Messages** Total Messages: 132

Message Details

Show 10 entries

Type	Read/Unread	From/To	Messages	Date	Time
📄	★	456	122222	10/12/2015	3:56 AM
📄	★	456	1111222	10/12/2015	4:00 AM
📄	★	1233-333	Hello	09/12/2015	8:32 AM
📄	★	03330104261	Kaise ho	09/12/2015	9:27 AM
📄	★	456	Sub	10/12/2015	2:34 AM
📄	★	456	122222	10/12/2015	3:56 AM
📄	★	456	1111222	10/12/2015	4:00 AM
📄	★	1233-333	Hello	09/12/2015	8:32 AM
📄	★	03330104261	Kaise ho	09/12/2015	9:27 AM
📄	★	456	Sub	10/12/2015	2:34 AM

Showing 101 to 110 of 132 entries

**Figure-7: User’s Text Messages**

**Figure-7:** is the screenshot of selected User’s Text Message Logs on administrator web panel where administrator can view detailed information of user’s Text Message Records.

**All Contacts** Total Contacts: 12

All Contacts

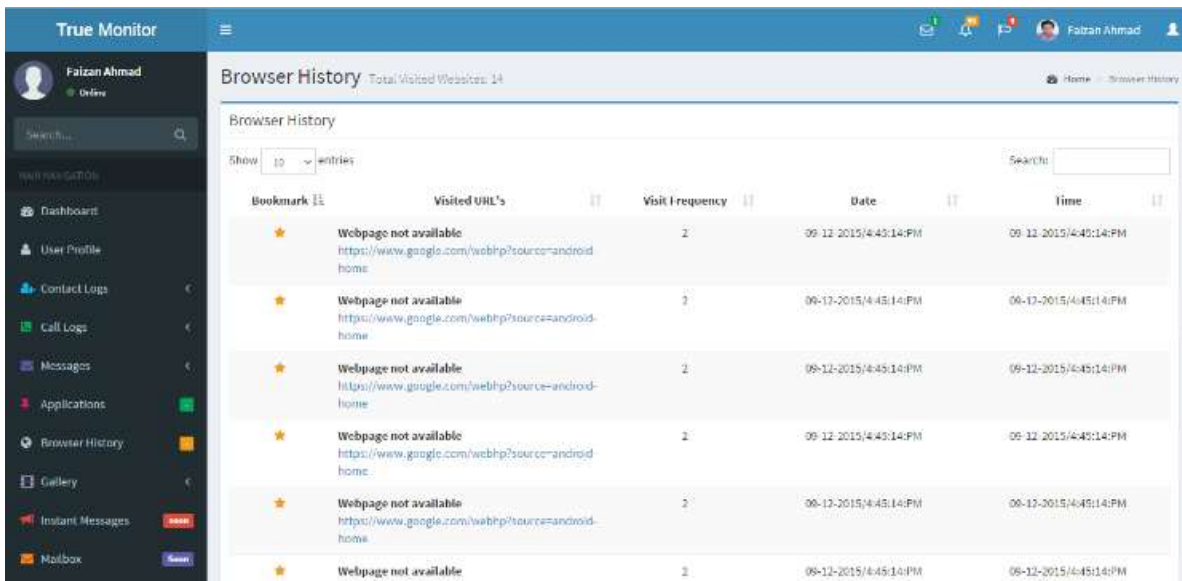
Show 10 entries

Contact ID	Contact Name	Contact Number	Status Block/Unblock
1	1	03330104261	★
2	2	1234-55	★
3	3	344-555	★
4	4	1234-56	★
5	5	990-559	★
6	6	03334504007	★
7	7	422 1365	★
8	8	03338184261	★
9	9	888-8888	★
10	Kamran	033 444	★

Showing 1 to 10 of 12 entries

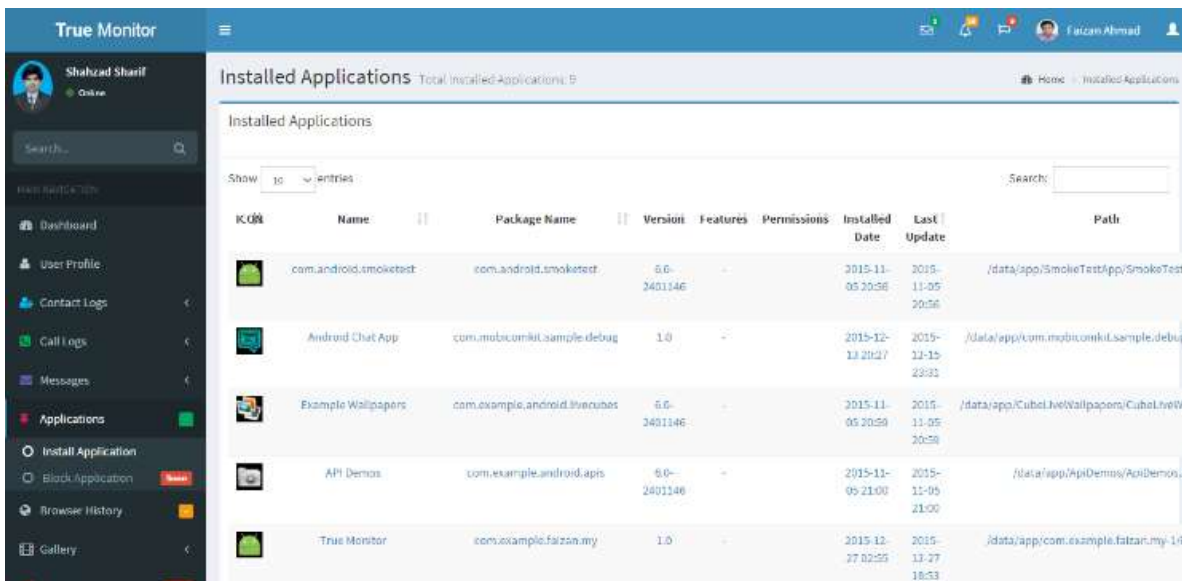
**Figure-8: User’s Contact Logs**

**Figure-8:** is the screenshot of selected User’s Contact Logs on administrator web panel where administrator can view detailed information of user’s contacts.



**Figure-9: User's Browser History**

**Figure-9:** is the screenshot of selected User's Browser history on administrator web panel where administrator can view detailed information of user's Web browser records.



**Figure-10: User's Installed Apps.**

**Figure-10:** is the screenshot of selected User's Installed Applications on administrator web panel where administrator can view detailed information of user's Installed apps.

**6. Conclusion.** A Mobile Enterprise Solution (True Monitor) is executed for Android cell phones. The key target of this framework is to screen out the representative or client, what activities they are completing with their mobile phones for security reason. This information will send to the administrator through the backend services which are running in the system to screen out all the information against any activity. With this framework overseer can see any activity and all detail information against this activity as well which is

performed by users or employees on their android mobile devices. It will enhance the execution of association adequately. It additionally uses working hour successfully. This framework keeps up the security of any employee base association or enterprise. It is exceptionally helpful framework for any organization, enterprise, security services or government agencies to monitor their employees or any suspect person whether they are releasing the private information or privacy of any secret mission as well as very beneficial to help to avoid criminal cases i.e. child kidnapping, street crimes like mobile snatching with location monitoring feature and also has a huge impact on a good upbringing of the society because with this system parents can monitor their children by tracking their daily mobile activities with detailed information. It is socially acceptable, feasible and beneficial.

## REFERENCES

- [1] Dafale, N. N. (2015). Monitoring Employee's Smartphone Using Android Applications. Proceedings of 20th IRF International Conference. Chennai, India: IRF International Conference.
- [2] Dhamaka, T. (2016). Theme your android phone with layers. Tech Dhamaka. Retrieved september 22, 2016, from <http://www.techdhamaka.com/2016/05/theming-android-part-5.html>.
- [3] Ito, A. &. (2011, January). New safety support system for children on school routes using mobile ad hoc networks. IEICE Transactions on Communications, E94-B(1), 18-29.
- [4] Mori, Y. K. (2011). A self-configurable new generation children tracking system based on mobile ad hoc networks consisting of Android mobile terminals. 10th International Symposium on Autonomous Decentralized Systems (ISADS) (pp. 339-342). IEEE.
- [5] Neha S. Mankar, S. M. (2015, March). A Review On Employee Monitoring Application Using Android Smartphone's. International Journal For Research In Emerging Science And Technology, 2(1), 19-23.
- [6] Nitin P. Jagtap, K. A. (2015, February). Mobile Activity Monitoring System Using Android Spy. International Journal of Advanced Research in Computer and Communication Engineering, 4(2), 158-162.
- [7] Luis C. M. Varandas, B. V. (2010). mTracker: A Mobile Tracking Application for Pervasive Environment. 2010 IEEE 24th International Conference on Advanced Information Networking and Applications Workshops. IEEE. doi: 10.1109/WAINA.2010.164.
- [8] Y.K.Patil, M. H. (2016, September). Survey on Employee Monitoring System Using Mobile Application. International Journal of Innovative Research in Computer and Communication Engineering, 4(9), 16858-16862. doi: DOI: 10.15680/IJIRCCE.2016. 0409157.
- [9] R. Anand, G. A. (2012). Mitter — Bitter monitoring system using Android smartphone's. International Conference of Computing, Communication and Applications (ICCCA). IEEE. doi:10.1109/ICCCA.2012.6179176.