



# International Journal of Innovative Research in Computer and Communication Engineering

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## Implementation of a Monitoring Application in Android

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**ABSTRACT:** With the increasing innovations and advancements in the field of technology, number of smartphones that are used every day is sky rocketing. From a daily wagger to employees in a multinational company, almost every person uses smartphones for various purposes to socialize, manage businesses, stay connected with the world and digitalize the life as much as possible. Many times, it is very important to monitor the activities performed on the device for multiple purposes such as feedback analysis for betterment of the services provided, surveillance in order to understand and predict any crimes so as to prevent them beforehand, monitor the usage and activities of children by parents etc. Android based smartphones share a large portion of smartphone devices used across the world. Hence, our application is based on Android OS which helps in storage of data from a device that is installed on and dump on an external server. This application tracks location, call logs, contacts, SMS, file manager, images, camera access of the device and provides control to an administrator on an external server. The data is then displayed through a PHP server on a webpage where it is categorized into various tabs thereby making it efficient for the administrator to access any details that are grabbed from the remote device this application is installed on.

**KEYWORDS:** Android application, security of mobile devices, acquiring data from the user, permissions bypassing in android, stealth mode in android.

### I. INTRODUCTION

The application once installed on an Android device, seeks permissions such as Access to Camera, find Accounts on Device, Read Contacts, Access approximate & precise Location (GPS), Record audio using microphone, read call logs, record phone identity (Number & IMEI), Reroute outgoing calls, read text messages, send and receive text messages, modify and delete contents from SD Card etc.

This project is targeted towards various organizations which provide Android Smartphones to their employees for work purposes so that they can monitor and track activities to prevent any misuse of the phones provided to the employees. [10] Police officers and crime investigators can use this application to grab and steal sensitive information from suspected criminals to gain evidences and maybe prevent any crimes that could possibly take place. Also, parents can keep an eye on children's activities over internet. The application will not be available for customer use to prevent misuse like attacks on privacy, intellectual property theft, and protect the rights of civilians and attempt to provide privacy to all the users. Thereby, this application will only be used Police authorities and certain organizations to whom licensing and privileges will be provided.

### II. MOTIVATION

Most of the organizations these days provide many resources to their employees in a hope that it will help the organization to grow and it will make the employees happy. One of such resource which the organization provides is a mobile device. But there have been cases of employees misusing the Android Smartphone provided to them. This misuse of the devices for any personal use can bring losses to the organization thereby defying the purpose of providing the smartphone. Hence it is necessary to monitor the devices with/without the employees knowing about it so that any necessary action can be taken against such employees. MackDroid aims at achieving this goal by providing an



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application which works in a stealth mode and collects and transfers the usage data such as call logs, messages, WhatsApp to the server which the respective employees can access anytime.

### III. PROBLEM DEFINITION

MackDroid is an android application which will collect all the information from the user's device as soon as it is installed properly with all the permissions granted by the user. This data will be stored on a remotely located server for monitoring and analysis of the activities performed on the device by the respective people from the organization who have to keep a watch on any misuse of company resources. Information Collected includes: Location History, Contacts, and Call logs, Text Messages, Photos, Video Files, Browser History and Emails. The permissions requests include permissions to access location history, Call records, network communication, SMS records, and notifications access etc. This information will be accessed only by the system administrator and the licensed authority that has the privilege to monitor the data collected from the device where the Android application is installed. The application will have two modes of installation namely stealth mode and without stealth mode. When the application is installed with Stealth mode, the targeted device will have no trace of the application installed. The processes will be run in multithreading system where multiple processes will function according to the task specified to it.

### IV. LITERATURE SURVEY

The existing systems propose that the application should work as a Trojan or a spy and acquire the permissions from the device. Some systems propose to store the data on a server, some propose to alert the administrator as soon as any activity is performed while some make use of an encrypted channel to transfer the data to the administrator.

Table IV.1. Comparison of existing systems and MackDroid

Sr. no.	Title	Description	Drawbacks
1	Android Rat	Android Rat works as Trojan. Acquires permissions at once. Collects data and sends it to a server.	Easily detectable by Antimalware.
2	Android Spy	Sends alerts of Calls, SMSes and Location to the administrator as and when the activity is performed.	Lot of redundancy of data.
3	Employee Monitoring System	This monitoring system collects and sends data to the manager through a secured 3g tunnel.	Visibility of application to the device user.
4	MackDroid	MackDroid collects and stores the information on a remotely located server, where the administrator can review the data.	Does not work if internet is not available.

The existing systems acquire the required permissions at once. This makes the systems susceptible to detection from antivirus. The existing systems show up in the application drawer of the device hence letting the user know about the application. This defies the main purpose of the application. The systems already in existence are readily available for use. This may lead to the unethical use of the application by criminals. [7]

MackDroid overcomes the drawbacks of existing solutions by providing the salient features such as permission distribution and management. For example, if the location has to be accessed, then only the permission for location access will be granted. MackDroid works in a stealth mode too. This feature helps to hide the application from the device users so that the authentic details of the activities can be collected. If anyone wants to use MackDroid, that person or an organization has to register and purchase a valid license. Using this license only, the application can be bought and installed on a particular device. [7]



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## V. METHODOLOGY USED

### A. *Android:*

Android is a mobile operating system developed by Google, based on the Linux kernel and designed primarily for touchscreen mobile devices. Android has the largest installing base of all operating systems of any kind. Android is an open-source OS. Android's default user interface is mainly based on direct manipulation using touch inputs that loosely correspond to real-world actions such as tapping, pinching or reverse pinching in order to manipulate on-screen objects. The response to the user input is designed to be immediate and provides fluid touch interface, often using the vibration capabilities of the device to provide full haptic feedback to the user. Android applications (apps) which extend the functionality of devices are written in Android Software Development (SDK) kit. The SDK includes a comprehensive set of development tools, including a debugger, software libraries, a handset emulator, documentation, samples and tutorials. Android APK will be developed for this application which will be linked to a database stored on a server where the data collected from the devices that have the Android APK installed will be stored and managed by the system administrator. [1]

### B. *PHP:*

PHP (Hypertext Pre-processor) is a server side scripting language designed primarily for web development. PHP code may be embedded into HTML code, or it can be used in combination with various web template systems, web content management systems and web frameworks. [12] PHP code is usually processed by PHP interpreter and is implemented as a module in the web server. PHP has been widely ported and can be deployed on most web servers on almost every operating system and platform, free of charge. [3]

### C. *PHP v/s HTML:*

HTML is a language used to describe to a browser how to display text and other objects in a browser window. It is not a programming language. HTML works on a client computer (the system on which the page is being viewed).[2]

PHP is a scripting language, and can be used to create web pages written in HTML. PHP runs on the server (the system from which the page comes), and is a full-fledged programming language. PHP is a server side scripting language and hence it executes on the server and only the output is downloaded on the client's computer. PHP can generate a lot more than HTML. It can do things like upload files, generate images (with the GD library), send email, write to your server's file system and execute code, among other things. PHP really comes in useful when you're working with a database. For example, you can store all of your user accounts in a database and when a member enters the correct username and password your PHP program/script will fetch the relevant user details from the database and display them in the user's browser. With html it's only really possible for everyone to see the same page, the page won't look different or display different information depending who's looking at it, everyone pretty much gets the same. PHP is a server-side scripting language for web development. After the PHP code is interpreted and executed, the web server sends resulting output to its client, usually in form of a part of the generated web page; for example, PHP code can generate a web page's HTML code, an image, or some other data. You can see the HTML design code of any webpage you want (For Google Chrome, just right click on web page and click on "View page source"). But, you cannot see the PHP code (PHP is a Server side language). [3]

## VI. SYSTEM DESIGN

### A. *Data Flow Diagram:*

A data flow diagram (DFD) is a graphical representation of the "flow" of data through an information system, modeling its process aspects. A DFD is often used as a preliminary step to create an overview of the system, which can later be elaborated. DFDs can also be used for the visualization of data processing (structured design). A DFD shows what kind of information will be input to and output from the system, where the data will come from and go to, and where the data will be stored. [6]

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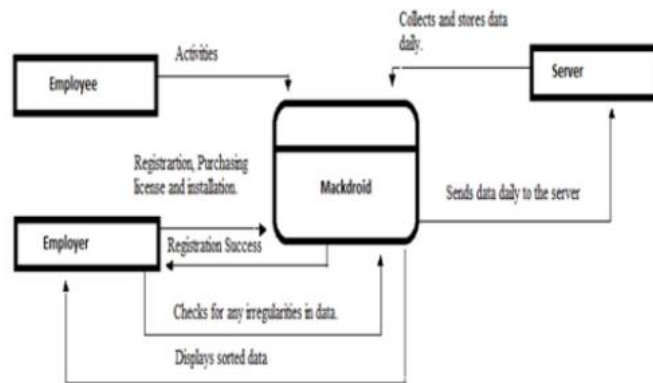


Figure VI.1. Data Flow Diagram

## B. Activity Diagram:

Activity diagram is basically a flow chart to represent the flow from one activity to another activity. The activity can be described as an operation of the system. So the control flow is drawn from one operation to another. [5]

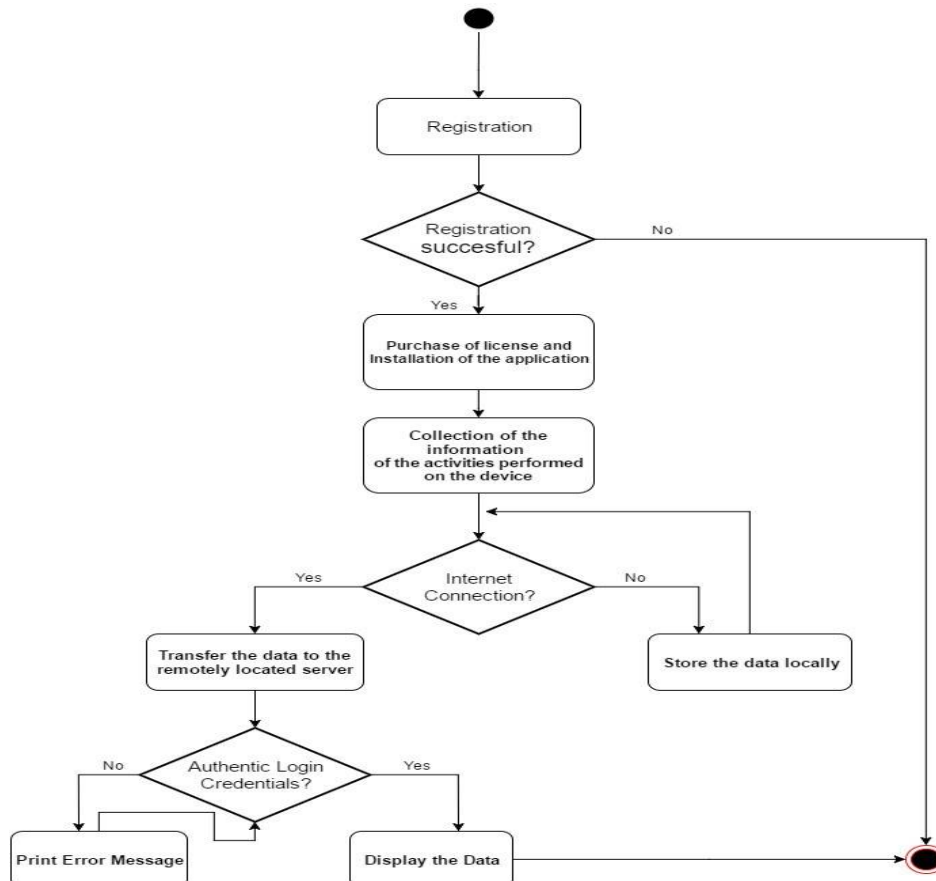


Figure VI.2. Activity Diagram



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## VII. IMPLEMENTATION

The system application is developed using Eclipse for Android to write and build the .APK file which will be installed on the device that needs to be monitored. It is configured with the web hosting server where the data will be stored. The web panel of the administrator is designed using HTML, CSS, JavaScript and PHP. PHP based webpage uses MySQL to manage the database and run queries in order to classify and sort the data that is grabbed from the targeted device.

MackDroid's android application package is named under "Android Security" which enables the administrator to run the application on the user's device without latter having any knowledge of device getting monitored. The web panel provides the tools and command options to the administrator to run and execute the various actions on the device. It also allows the administrator to monitor and filter the data using search feature for call logs, contacts, and SMS. Therefore, the database queries are linked to web panel in order to provide flexibility and convenience to the administrator to locate the required information as quickly as possible.

Hence, the whole system is integrated using three main components namely,

- 1) Android Application
- 2) Web Panel
- 3) Database

### A. *Android Application:*

The android application is installed in the user's device which is supposed to be monitored. The data is grabbed by the application which seeks various permissions from the device. The Android Application is named as "Android Security" such that it is not easily detectable by the owner of the device when the application is installed in the stealth mode. This application is not visible in the application drawer of the device.

### B. *Web Panel:*

The web panel of the application includes the admin panel of the system who is able to access all the data which is grabbed from the device. Web panel includes a web interface developed using HTML, CSS, JavaScript & PHP. The web panel further provides buttons necessary to execute various commands on the device in real time.

The devices that have the android application installed are listed on the page. Clicking on device navigates the admin to the dashboard where various components of the data can be viewed. There is separate box for various data such as Contacts, Messages, Call Logs, Images, File Manager, Location, Call Recordings, Microphone Recordings, and Camera Snap etc.

While the dashboard provides all the data categorized into various fields, it also provides updates on new data that is captured from the device every time the device is synced. Hence, for all new entries into the data, admin has the notification in the dashboard thereby resulting into convenient tracking & monitoring of data even though there is no continuous surveillance. The data entries can be sorted according to date, name, time, type, and call duration etc.

## VIII. TESTING

Testing comprises of 6 different types namely Unit testing, Integration testing, System testing, Functional testing, Software performance testing, Usability testing. [9]

In unit testing, the software's individual source codes, set of one or more modules, usage procedures, testing cases, methods invocation etc. are tested independently. This method helps to understand and debug the inaccuracies and errors in the system and conveniently helps to locate and identify the problems. [8]

Integration testing is the phase in software testing in which individual software modules are combined and tested as a group. It occurs after unit testing and before validation testing. Integration testing takes as its input modules that have been unit tested, groups them in larger aggregates, applies tests defined in an integration test plan to those aggregates, and delivers as its output the integrated system ready for system testing.[4]



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System testing of software or hardware is testing conducted on a complete, integrated system to evaluate the system's compliance with its specified requirements. System testing falls within the scope of black box testing, and as such, should require no knowledge of the inner design of the code or logic. System testing completely verifies if the product is ready for use or not. [4]

Functional testing is a very essential method of testing where all the functions that are specified in the system requirements and functional requirements are tested. Various test cases are used to check whether all the functions are able to provide output for each case. [8]

Performance testing is generally executed to determine how a system or sub-system performs in terms of responsiveness and stability under a particular workload. It can also serve to investigate measure, validate or verify other quality attributes of the system, such as scalability, reliability and resource usage. [11]

Usability testing is performed to check whether the user interface of the system is easy and convenient to use. The simplicity and navigation of the web application should be easy to understand for any administrator. [4]

Table VIII.1. Test Results of various functions

List of Functions	Result
Login credentials on Web Panel verified	Pass
Device detected on the panel	Pass
Building and Installing the APK	Pass
Test Real-time features to check connection	Pass
Data flow of the system application	Pass
All Functionalities	Pass
Performance when installed on 10 devices	Pass
Large amount of data stored on server	Pass
Scope for more functions	Yes
Internet seamlessness check	Improvement Required

## IX. LIMITATIONS

- MackDroid will be unable to work properly if the device is not connected to the internet.
- While collecting the information of the device, MackDroid is unable to get the phone number.

## X. CONCLUSION AND FUTURE WORK

The need for an authentic mobile based monitoring device led us to develop MackDroid. This application will prove to be of tremendous help to many organizations in both private and public sectors. MackDroid can be further improved



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as an application where the security of the servers must be enhanced to prevent any penetrations and intrusions. Also, binding of application is important to prevent any security applications to detect this process.

Future work can be done in the following areas:

Stealth mode can run even on the rooted device and integrating more real time functionalities like:

- Screenshot Feature: The administrator will be able to take screenshots of the device in real time and view it on the web panel through remote access.
- File Manager Options: The administrator will have the privilege to execute file operations on the files contained in the device. The options include copy, move, rename, zip and download.
- Key logger: This feature will be designed to grab each and every keystroke made using virtual keyboards. A text file containing these keystrokes will be created and uploaded on the server.
- Live chat: Administrator should be able to send a message to the device to which the user can reply immediately thereby helping the user from any unwanted scenarios.

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