

The impact of cloud technology on the automation of businesses

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Abstract—Studies reveal that 70% of our IT finance is used in maintaining the traditional IT System, while a mere 30% is utilized in enhancing its productivity, efficiency and innovation. This intensifies the need for a computer solution which provides technology designed for high performance, availability, greater reliability, rapid mass scalability, with a reduced cost, that facilitates higher growth and increased flexibility. With the immensely rapid rate at which the world is progressing, organizations find it exceedingly challenging to constantly maintain and advance the quality and efficiency of their businesses. Reliance on traditional IT models and man power results not only in a loss of quality but also an increase in the cost incurred. This project aims to increase the productivity of business, especially small scale businesses that can't afford expensive infrastructure, by automating jobs that can be carried out mechanically, but are currently being executed by humans due to the dearth of cheap technology that business can rely on. The objective of this project was to develop an inexpensive mobile application, which automatically monitors the attendance of the employees of an organization. To achieve this objective an openstack cloud server is deployed and an iBeacon is integrated with the server.

Keywords— *Cloud computing; iBeacon; openstack; Android application; automation*

I. INTRODUCTION

With the immensely rapid rate at which the world is progressing, organizations find it exceedingly challenging to constantly maintain and advance the quality and efficiency of their businesses. Reliance on traditional IT models and man power results not only in a loss of quality but also an increase in the cost incurred. Surveys, show that nearly 50 percent of an IT sector's funding is spent on traditional IT, and out of the remaining approximately 15 percent is subcontracted and 35 percent is expended on the cloud.[1] These statistics reveal that businesses are even now highly reliant on traditional IT. The need of the hour is to develop efficient yet inexpensive technology which will help businesses overcome the challenges of the traditional IT model and increase the productivity of the business. With the growth of the global market there is an exigent demand for high quality yet inexpensive services, which cannot be achieved by the traditional IT system.

Automation of business is the way to the future, and cloud computing is the key that will lead us down this path. The aim of this project is to integrate existing technology, cloud server and iBeacon, to develop a mobile application which will help automate the attendance taking process in organizations. The objective of the first part of the project was to set up a cloud server which will present the idea of cloud computing as a way to describe IT service offerings which are untethered from the need to own and maintain the infrastructure which supports them. The second part of the project was to develop an android based mobile application which helps automate the process of attendance taking. Automation not only helps reduce the cost incurred due to manual errors and inefficiency, but also enables transparency within an organization and improves the fidelity of the attendance system by leaving no room for the occurrence of corrupt practices such as fake attendance.[17] Moreover, the application also serves as a security check by identifying individuals who are not registered members of the company

II. APPLICATION

This section presents and describes The Android mobile application.

3.1 System Framework

Hardware Requirements

iBeacon: Bluetooth Low Energy Communication (BLE) can be divided into 2 channels—advertising and connection. [2] An iBeacon uses the advertising channel, which is a one way channel, to transmit data to an android application. [3]

Android phone: An Android phone with bluetooth version 4.0 or higher is required to establish a BLE connection with an iBeacon.

Software Requirements: Eclipse IDEv, openstack, PHPMyAdmin, android studio, adobe Photoshop

3.2 System implementation

An attendance taking app can be used for various purposes such as, attendance taking in schools and universities, fast identification of patients at hospitals, MICE (Meetings, incentives, conferences, and exhibitions)

applications etc. For the purpose of demonstration as an attendance taking app, as it will be used in a business organization to monitor its employees is described below. The attendance taking app is an android based app, that can be used by companies to monitor the staff attendance. The design can be divided into 3 categories (for 3 different types of users)–Staff, manager and administrator.

The application is so designed that each type of user has access to specific functions and interfaces, unique to a category

General staff: The general staff includes all individuals whose attendance is to be recorded.

Manager: Manager is the terms used to identify the person who utilizes the mobile application to record and scan the attendance information of the staff.

Administrator: Administrator refers to the person who oversees the entire system operation.

III. METHODOLOGY

A. Cloud server setup

This section gives a detailed explanation of the setup process Linux Server- using opensatck and DevStack.

Set up requirements: Ubuntu, openstack

Open Stack-Open stack is a free, open source cloud computing project developed to provide consumers an IaaS by means of a cloud.[4] [6] For this project openstack was chosen for deployment of the cloud server as openStack is a cloud software stack which runs on commodity hardware, thereby allowing users to adopt it into their existing technical framework, without any disruptions. [5]

Devsatck -DevStack is shell script that helps in installing the OpenStack components, a LAMP stack and CirrOS.[7]

Procedure [8][9]

Add stack user: create a user named ‘stack’ to use for installing DevStack. Add user sudo permissions and give stack full sudo privileges

- Install git: Install git and download Devstack. Logout and log back in as stack.

- Create a custom file: using the command “create /var/devstack/localrc“,configure networking, passwords, etc and create a file name localrc and save it in the DevStack root.

- Install Openstack: pull OpenStack from Github to copy it into the current directory. cd to /var and run git, this places everything in “/var/devstack”. cd to devstack, and go through the scripts and files. To Set up DevStack change to /var/devstack and run “./stack.sh”. On successful completion the users, password and host ip address is displayed on the screen

- Login: Login in to the dashboard, at the ip address given, using the Admin username and password

- Set up security & access: on the ‘Project’ tab select the ‘Access & Security’ link. The user can either edit the default security group or add a new security group. Add the following rules: Port 8080(TCP) –HTTP port

 - Port 80(TCP)-HTTP port

 - Port 22(TCP)-SSH port

ICMP-1(Type), -1(Code)

- Create Keypair: public-key cryptography is used to secure the instance. Create and download a keypair. The user is required to provide the downloaded keypair for every log in process.

- Launch an instance: the user can now create an instance by selecting the “Instances” link under “Project” tab. Configure the instance and select the keypair

- Installation of a LAMP server: the user needs to install LAMP (*Linux, Apache, MySQL and PHP*), which is an open-source development platform that operates with Linux as its operating system, Apache as its Web server, MySQL as the RDBMS and PHP as the object-oriented scripting language.[10] The LAMP server allows deployment of both static as well as dynamic PHP applications that need to read and write data to a database.[11]

- Connecting to the instance: On successful setup of the instance, the user can connect to the instance over SSH [12][13].By using the PuTTY Secure Copy client (PSCP), a command-line tool employed to facilitate the transfer of files between a windows computer and a Linux instance, or the user can also connect to the instance using a GUI interface WinSCP, a file manager for windows, which enables users to upload or transfer files and folders from a remote computer using the SFTP, SCP, FTP, and FTPS protocols. By means of the WinSCP GUI interface, all that an user needs to do is to drag and drop a file from a Windows machine to the Linux instance.[13][12][14]

- Phpmyadmin & MYSQL: The user needs to set up aliases and allow access from external IPs. [13] Once access is granted the user can access phpmyadmin to create the necessary database and tables. The MYSQL database serves as the database of the cloud and the PHP commands coded in the mobile application communicate with the MYSQL database to execute the task required such as update ,create, read, write [15]

B. Database Modelling

The required tables are created and all the required information such as the employee name, employee id, iBeacon id, mobile device id (for this project the Gmail ID which is unique to a mobile device is taken as the mobile device id . This is done to avoid fake or proxy attendance) is stored in the database .

IV. APPLICATION DEVELOPMENT

This section presents and describes the Android mobile app

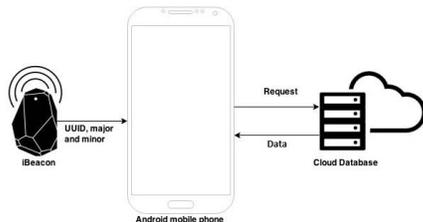
The first page of the application presents users with two options–to start the application or to open the iBeacon server. ‘Open the iBeacon server’ option gives permission to the application to monitor the advertising signals from the surrounding iBeacon devices and to upload data into the cloud server.

An iBeacon itself does not transmit the actual data, it only transmits its UUID, Major and Minor values to the mobile device. Once the details reach the mobile device, a request is sent to the cloud database and in response to the

request the database extracts the required data and sends the data along with the request details back to the mobile device. The implementation process requires connection to the internet. In case the users are not connected to Wi-Fi, and they don't need to refresh their attendance information, they can choose to close the iBeacon server as it may take up data and incur a cost to use this option.[16].

On selecting the Start App option, the user is directed to the login page, where the user is required to provide their username and password. This feature helps cut down man power and avoid long queues. Now on the employer's side the work load reduces to zero while on the employee's side he/she merely needs to make sure that he/she is within the range of the iBeacon. Automation of attendance registration also does away with any form of malpractice or bribery that is likely to occur. The application also acts a security check by ensuring only registered personnel are within the premise of the organization. Generally the iBeacon is located at the reception and if the employee's mobile phone lies within the range of the iBeacon, a new activity is unlocked and the attendance is registered.

Fig. 1. iBeacon model



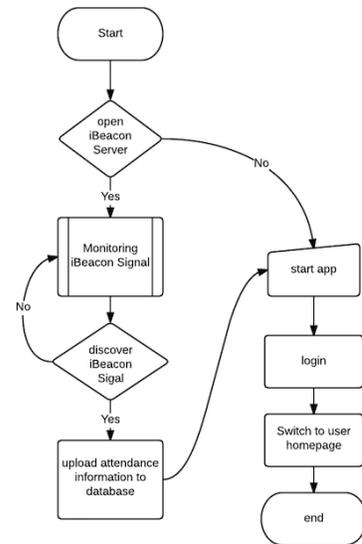
On turning on the Bluetooth and iBeacon Server, the device starts scanning for signals. A message notification stating “you are in the iBeacon region” or “sorry, you have exited the iBeacon region” appears on entering and exiting the office premises. When an user enters the iBeacon region and logs into his account, his attendance and time of arrival is automatically recorded and data is saved in the cloud database. Similarly, when the user exits the iBeacon Region, the time of his departure is also automatically recorded. All that the user needs to do is to turn on the devices Bluetooth and iBeacon server. The flow chart given below illustrates the process through the first and second page

A) Administrator

The administrator plays the most vital role in the project, as he/she oversees the operation of the entire system. The admin has control over the user's information and can add, delete and modify the users information.

Homepage-On logging into the application as an administrator, the user is directed to the homepage interface. The homepage displays the user name, number of days worked and daily notes, three features that are common to the staff, manager and the administrator. Unique to the administrator's homepage are the tab bar items, located at the bottom of the screen such as the *adduser* and *addnote* option.

Fig. 2. Flowchart of the App's 1st & 2nd View



Note Management-The note management function is unique to the administrator and enables the administrator to type in the title and content of a note. By clicking the submit button the user can add the note to the list of notes displayed in the homepage. Details of the time are automatically added to the note when the user submits the note.

Registration-The second function unique to the administrator is Registration, which enables the administrator to manage the registration of the user account. The employees are of two categories—with and without BLE iOS device. The employees who don't have a BLE device are provided an iBeacon tag. The unique major and minor number of each tag is recorded at the time of registration.(and is used to identify the user). For employees who own an iOS, BLE device the following details are entered at the time of registration: *username, password, name, department, position and entry time*. Additionally a photo identity the user can be added to the registration form

B) General Staff

The general staff includes all individuals whose attendance is to be recorded

Homepage-The homepage of the staff is very similar to the homepage of the administrator except for the difference in the tab bar items.

Calendar-The *Calendar* class is unique to the staff. A calendar is displayed on the screen. The staff can select a particular day to check for details or to apply for leave. In order to apply for leave, users simply needs to click on the button called *ask for leave*.On selecting this option, the user is prompted to then fill in the reason for leave and once done the user can click on submit. The manager can view and reply to the request, sent by the staff, by logging into his own account. Once the manager responds to the request, the staff will be able to view the response from a change in their own status label. There are five types of status – Working, Approving, Approved, Unapproved and Blank(Staff is not working and hasn't entered the monitored region).The other labels on the calendar pager are *firstCon* & *lastCon*- first

and last time in that day the staff entered the monitored region, total time-the total time in that day the staff worked

C) Manager

The Manager needs to check the attendance information of the staff irrespective of the method used for registration (iBeacon or iOS) .

Homepage-The homepage of the manger is very similar to that of the staff, except for the tab bar items.

Examine-Displays the profile pictures of all the staff registered. A black & white image indicates that the staff is currently not present in the monitored region (not working) While, a color picture indicates that the staff is within the monitored region (working). This enables the manager to check the attendance efficiently. If the manager requires more details about a staff member he simply needs to click on the picture of the staff and the all the saved information, including the firstCon and lastCon, is displayed.

Manage-It displays the interface corresponding to the 'ask for leave' function in the section of staff. Here the manager can view the application submitted & make a decision.

Server Side Coding

An open stack cloud server is deployed using Devstack and on completion of the server setup an instance is created. A LAMP server, PHPMYADMIN and all the other necessary software are installed A database, containing the required tables, is created and the PHP files, containing instructions to Create, Read and Update the tables, are saved in the /var/www/html directory. The mobile application is then linked to the PHP files, thereby enabling it to access the database and to carry out the necessary operations.

V. CONCLUSION & FUTURE WORK

A combination of globalization and the rapid pace at which technology evolving, is creating a need for a solution which will improve the quality and productivity of businesses at a minimum cost, a need to develop superior models which can provide innovative services, thus facilitating the increase of IT capabilities and efficiency while simultaneously adding value to the organization [1]. Automation and cloud computing seem to go hand in hand in achieving such a solution, a solution which provides technology designed with high performance, availability, greater reliability, rapid mass scalability, and a reduced cost that facilitates higher growth and increased flexibility. The objective of the project was to set up an openstack cloud server, integrate this server to an iBeacon and to deploy an inexpensive mobile application, which automatically monitors the attendance of the employees of an organization. As demonstrated by the attendance taking mobile application, automation improves the efficiency of the attendance taking process and the cloud plays a vital role in this process of automation. With this App, the manger can easily monitor the attendance of his staff and the administrator can oversee the entire operation form anywhere at any time The application demonstrates how cloud computing can bring to reality the concept of a reliable, scalable, sustainable, fast and efficient platform.

With the world's advancement towards fibre optic transmission cables and 4th Generation Long Term Evolution networks, it is expected that the age of cloud-computing will soon render intensive client-side computing obsolete, dramatically reducing the prices of consumer IT and providing fast, secure and reliable mobile technology – from the heart of the cloud to the palm of the consumer, anywhere in the world. Applications like the attendance taking app, can be extended to other fields of society such as educational institutes for registration of student attendance, hospital for monitoring the incoming patients, etc. Expansion into these fields calls for an enhancement in security, for data protection and privacy. It is highly recommend in future research and development, to work on improving the security features of the cloud. Data protection and privacy is of high importance and currently, host based firewalls, host based intrusion detection/prevention, and encryption are employed to meet stringent compliance requirements [1]

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