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Research paper

Design of Smart Identification Infrastructure for Presence System

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Abstract

The importance of attendance system is the processing speed of data collection, writing the presence data and summary of report. Currently Presence system takes a long time to record the user's presence. The problem occurs for several reasons, one of which is caused by the design of the network infrastructure. This problem can slow the process of collecting data on attendance system. In this research will be designed a prototype of network infrastructure as one of the alternative technologies for the presence system. This infrastructure will utilize the existing MAC Address on mobile devices used by the user to be able to use the system's presence. This network system can recognize all the MAC addresses connected to the access point (SSSID) as a unique identification for each user who is connected. the process of collecting MAC Address obtained by manipulating the outcome of the application Airodump-ng using the command shell programming. in the end the results obtained by using this infrastructure system can read 22 users at the same time in an average time of 2.2 minutes and the CPU and RAM usage from the server shows that the server load take 50% less each CPU from 4 CPU while RAM that being used is 7.2% from 100%. On Access Point device CPU and memory usage is low the value of 2% and 71% for its free RAM.

Keywords: *Infrastructure, MAC Address, Smart Identification, Attendance System*

1. Introduction

Automation of attendance management system is one important part of the academic system. The importance of this system, it has been proved empirically that that there is a significant correlation between the presence of students and their academic performances. The system consists of recording process and recapitulation report the presence of each user in the academic system. Manually record attendance system is considered inefficient and require more time to set the record and calculate the average attendance of each student. Technological improvements could help in the development of new systems to eliminate the disadvantages of classical methods and increase profits. This technology approach can be used in several ways, such as(Patel 2014):

- Fingerprint based Attendance System
- Iris Based Attendance System
- Face Recognition based Attendance System
- Mobile Based Attendance System
- RFID based Attendance System
- Bluetooth Based Attendance System
- Computerized Attendance System

Based on latest technology used in the previous environment, namely attendance recording system using RFID. We found some weaknesses in the system. One of the weaknesses of the system is the amount of time wasted during the student to tag RFID card on RFID Reader(Arulogun et al. 2013). Other weaknesses are the need of time synchronization of the data that has been read by the RFID reader to the main system, fig. 1.

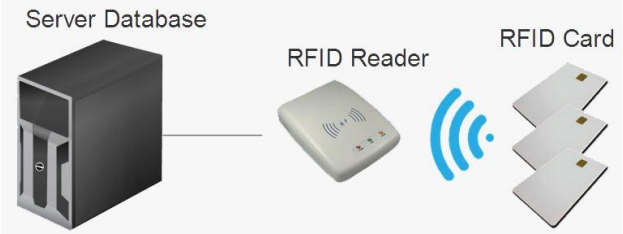


Fig 1: Attendance Sistem Using RFID

An improvement on the previous system was conducted by using a technological approach WIFI access as a tool to read the user's presence to identify the MAC address(Watanabe et al. 2013) connected to the SSID, named SMARTID (Smart Identification).

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Identification was defined as an object tagging is an enabling for many interesting ubiquitous computing (“ubicomp”) applications. By attaching small electronic tags to physical objects, these objects can be automatically identified and located when brought into the vicinity of a tag detection system. This paper use MAC address as unique identifier for SmartID system. It can readable by mobile devices (Jamil 2011) that connect to access point using wireless technology, this will provide of new concept for the system devices analysis, which in turn, catapulted the rise of automated analysis data. Infrastructure of Smart Identification as a supporting factor that make the overall system functioned and finally will be able to detect MAC address on smartphone as presence data.

Network Infrastructure(Mattam et al. 2012) are currently used consists of access points, mobile devices, and server as on fig. 2.

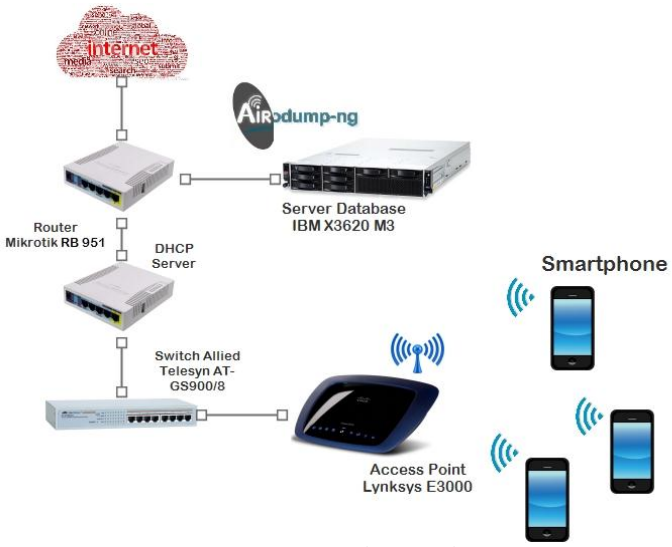


Fig 2: SMART Identification infrastructure

Other fact from analysis, Mobile Based Attendance System is more efficient in investment and better in performance than RFID. It is proven by execution time measurement and result of CBA(Ibnugraha et al. 2016). In investment, the main differences both of technologies are in infrastructure building and the use of attendance ID material. In performance, Mobile Based Attendance System is 3 times faster than RFID when it records attendance ID of students(Zulfikar et al. 2015)

This paper proposes a new model of network topology and infrastructure for Smart Identification with all requirements needed to improve the system performance and range process related detecting MAC address for presence data.

2. Method and Material

The SMARTID System works as well as on Fig. 3. Each step must be in accordance with the stages on existing methods, so that the results will refer to a final conclusion in this study.

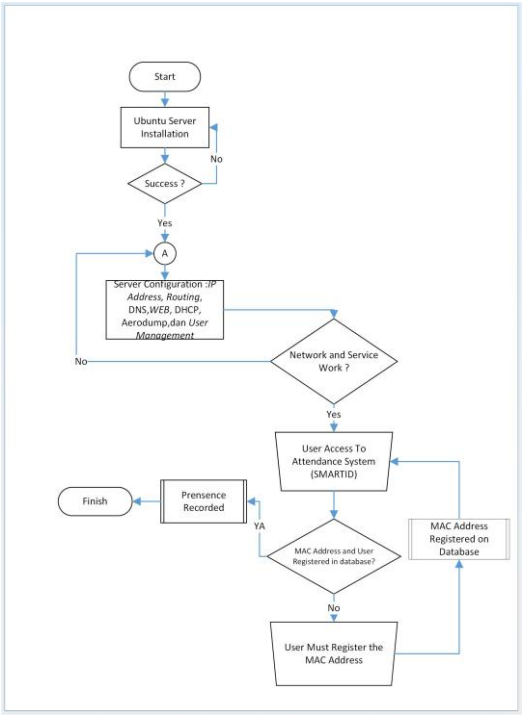


Fig 3: Method How SMARTID work on infrastructure

Hardware

Server device used was the IBM 3620 M3. This device serves as a data center on Smart Identification system.

Specifications of IBM Server 3620 M3:

1. Memory 1x4GB.
2. HDD 300GB 15K 3.5 "HS SAS.
3. Power Supply 460 watts.
4. Processor Intel Xeon Quad Core E5507 2.26GHz / 800MHz / 4MB.
5. Port 4x USB 2.0, 1 serial and video, 1 Parallel, and 2x RJ-45 port.
6. Slot 2 x8 PCIe Gen II slots and one x4 PCIe Gen II buried slot.

Switch Allied Telesyn AT-GS900 / 8 are used as traffic management and packet data transmitted as an interface for the router and access point.

specification of switches Allied Telesyn AT-GS 900/8:

1. Switching capacity 16Gbps.
2. Interface Connections 10/100 / 1000T RJ-45.
3. Throughput 11.9Mpps.
4. Power consumption max 5W
5. 8 port 10/100 / 1000T unmanaged switch

Router Mikrotik RB 951 series are used as a link between two or more Smart Identification network

Routerboard Mikrotik RB-951 has the following specifications:

1. Size of RAM 32 MB.
2. five 10/100 Ethernet ports.
3. Wireless standards 802.11b / g / n.
4. Supported input voltage 6 V - 31 V.
5. DBI Antenna gain 1.5.

Software Server

Ubuntu Server 14.04 Operating System will be used as a server for DNS services, Web Server and identification of MAC Address.

Application

Fig. 5 shows Auto System Airodump-ngsyntax Application shell to run the application Airodump-ng(Soewito 2014) as identifiers MAC address with the script as follows.

```
#!/bin/bash
echo "------------------------------------------------------"
echo "        AUTO SYSTEM OF SMART IDENTIFICATION          "
echo "------------------------------------------------------"
sleep 0.5
echo "======================================================"
echo "             Smart Identification                     "
echo "======================================================"
sleep 0.5
echo "running to system"
airmon-ng start wlan0
sleep 0.5
airodump-ng -w filemac --bssid C0:C1:C0:CD:9A:BA wlan0mon
```

Fig 4: Output Identifier Mac Address

3. Result and Discussion

Based on Fig. 2 network infrastructure consists of access point, mobile devices, and server. The current network topology especially access point directly connected to server and these models can provoke security problem also the server load will increase gradually.

Access time of 22 users when using a smartphone with SSID generate an average time of 2.2 minutes faster than the previous system which is 8.33 minutes, Fig. 6.

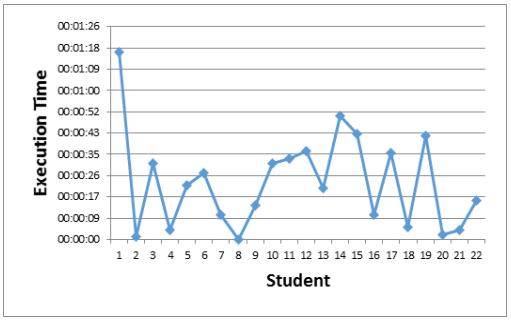


Fig 5: Average time of SMARTID Access

Fig. 6 shown the CPU and RAM usage from the server. System Smart Identification can be operating without any constraints and the server load take 50% less each CPU from 4 CPU while RAM that being used is 7.2% from 100%.

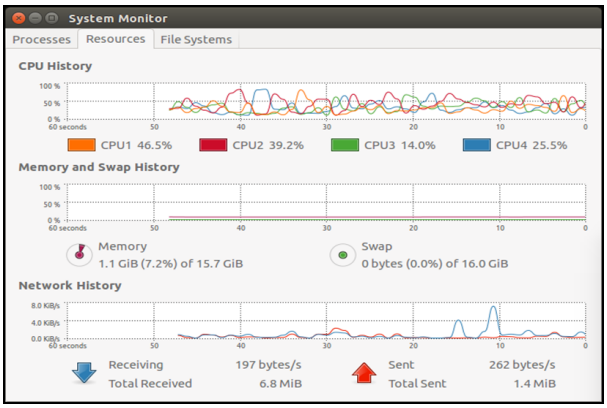


Fig 6: RAM and CPU Server usage

Fig.7 shown the CPU and memory access point usage is low the value of 2% and 71% for its free RAM.

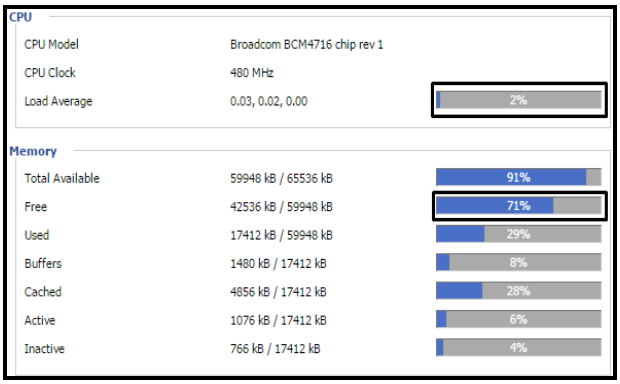


Fig 7: RAM and CPU Acces Point usage

This paper explain about how the infrastructure works to scanning MAC address mobile device and finally presence data can be recorded on Smart Identification server. Client must be connected to the access point using mobile devices, after that Airodump-ng as a server application will be automatically detecting client who connected on that access point especially Ethernet address on these mobile devices. MAC address that have been registered on server will showing detail time and date of presence data from mobile devices which connected to the access point and it will be saved on the server. Fig. 8 shows that MAC address on mobile device is connected to the system and can be used it for presence data.



Fig 8: Mobile Device MAC Address

Fig. 9 showing how Airodump-ng works. Airodump-ng will be scanning and detecting all client who connected to the access point also shows about detail of mobile devices such as MAC address from these mobile devices.

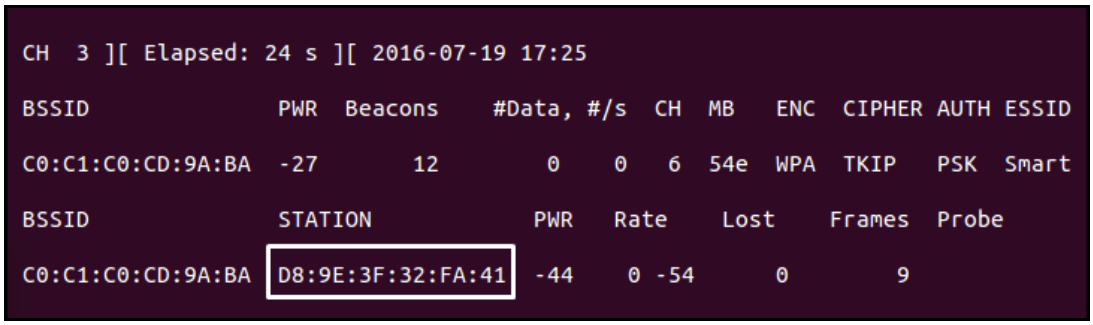


Fig 9: Airodump-ng Scanning MAC Address

MAC address from the mobile device are matched from Airodump-ng scanning and detecting, next step is MAC address that shown in Airodump-ng will be checked in the server database whether the MAC address already registered or not registered. While for MAC address already registered will be showing on web page Smart Identification based time and date the client connected to the access point. After all these process data will be saved as presence.

Fig. 10 shown client who successfully connected to the system and recorded as presence the system can be operate without any constraints and it is indicates that infrastructure that built up successfully operate the major function from Smart Identification specifically detect MAC address as presence data.

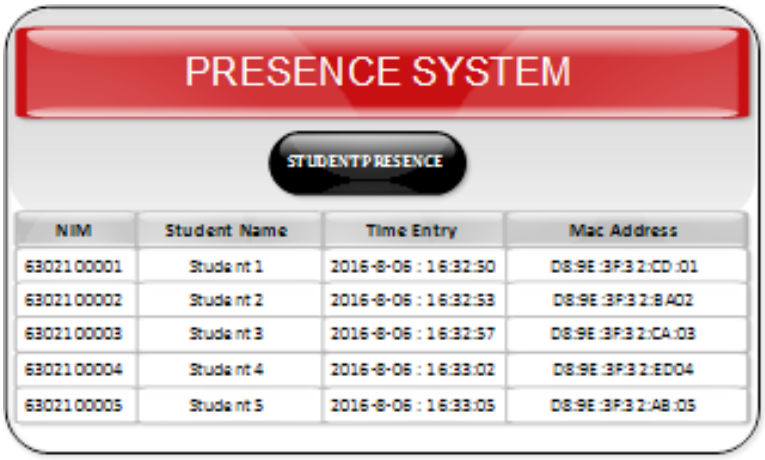


Fig 10: The Data of SMARTID

4. Conclusion

Presence system are used to show attendance of students and record it, especially in campus environment. The result of these research are:

1. Access time of 40 users when using a smartphone with SSID generate an average time of 2.2 minutes faster than the previous system which is 8.33 minutes

2.The CPU and RAM usage from the server shows that the server load take 50% less each CPU from 4 CPU while RAM that being used is 7.2% from 100%. On Access Point device CPU and memory usage is low the value of 2% and 71% for its free RAM.

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