Implementation of Attendance System Using Raspberry Pi

A P Sujana, A Y Prastyawan
Department Computer Engineering, Faculty of Engineering and Computer Science, Universitas Komputer Indonesia
Email: aprianti.putri.sujana@email.unikom.ac.id

Abstract. This research used Raspberry Pi as a server. Raspberry Pi is used as a web server that is information about attendance. This server is built as a web server that contains an information system service. Each device has a MAC address that by default is unique, depending on the vendor that provides it. With the MAC Address, this server makes use of every MAC Address user that is connected to the network as a presence on this local network. Raspberry Pi as this server identifies the MAC Address user that is connected to this network, becoming an information that is processed as a form of attendance. Information system services in displaying users connected to the network. In a network, each user uses a different device. This research aims to further help in detecting lecturers presence. The result is by utilizing the MAC Address that is owned by each lecturer, it is able to identify the presence of the lecturer.

1. Introduction
In this advanced age there are many developing applications created to facilitate human activities, one of them is information systems in digital form[1]. Information systems like this are very much needed in places that are often used by many people, one of them is campus. Information about the presence of lecturers in the room is a matter of driving behaviour back and forth and peeking into the lecturer room by students which causes inconvenience to other lecturers who are in the lecturer room. Beside disturbing, this behaviour is also resulted ineffective time and energy that have been used by students to ascertain the existence of the lecturer sought[2].

Hence based on these problems, an information system that can inform the presence of lecturers in his room will be designed [3], when a mobile device belonging to a lecturer who has a mac address connected to the network in this system will display information about whether or not the lecturer is supported by a monitor[4]. Designing a lecturer attendance information system that can be used for campus areas so that it can inform students about the attendance status of lecturers using the Raspberry Pi mini PC[5]. Raspberry Pi itself is a computer that is very small and has a function that can be used for various projects and research, one of which supports a project for making information systems at lower prices and lower power consumption compared to using a normal computer[6].

In this research an information system for the presence of Raspberry Pi-based lecturers will be built that can provide information on the presence of lecturers in his room. The hope is that this information system can give a sense of certainty to students who want to know the presence of the lecturers they are looking for whether there is a room or not.
2. Method

2.1 Raspberry Pi
Raspberry Pi is a mini mainboard computer that is SoC (System on chip) where there is a combination of components and functions of computers and electronics into a single chip or can also be called embedded systems[7]. The SoC allows users to use GPIO (General Purpose Input / Output) for electronic purposes such as conducting radio signal transmission from the mainboard SoC that can be controlled through certain applications running on an operating system (OS) that are used. Supported by the support of the ARM type processor makes the mainboard SoC very economical, cheap and space-saving.

2.2 Computer Network
Computer network is a system consisting of a combination or set of devices (often called nodes) that are connected to each other through a communication channel. A node can be a computer, printer, or other device capable of sending and/or receiving data sent by other nodes on the network[8]. Based on the coverage of the geographical area, computer networks are grouped into three parts, namely:

1. Local Area Network (LAN)
   Local Area Network (LAN) is a set of devices that are connected in an adjacent geographical area. For example, a network in a building or class that is quite close. LAN networks are usually used by personal computers and workstations in companies.

2. Metropolitan Area Network (MAN)
   Metropolitan Area Network (MAN) is a LAN network that is larger in size and usually uses the same technology as LAN. MAN is usually able to support data and sound, can even be associated with cable TV networks.

3. Wide Area Network (WAN)
   Wide Area Network (WAN) is a computer network that covers a very large and wide geographical area. Examples such as networks between countries to between continents. The technology used is X.25 or Frame Relay.

2.3 Mac Address
Mac Address (Media Access Control Address) is a network address that is implemented in the data-link layer in the seven layers of the OSI model, which represents a particular node in the network. In an Ethernet-based network, Mac Address is a unique address that has a 48-bit length (6 bytes) that identifies a computer, an interface in a router, or other nodes in the network. MAC Address is also often referred to as an Ethernet address, physical address, or hardware address[9]. Addressing the MAC address is assigned to a network card (network interface card / NIC) that is used to connect the computer concerned to the network. MAC addresses generally cannot be changed because they have been entered into ROM. This is an example of a Mac Address D0-DF-9A-D1-12-87.

2.4 ARP
ARP is a protocol in the TCP/IP Protocol Suite responsible for resolving IP addresses into the Media Access Control (MAC Address) address. ARP is used to translate IP addresses into MAC address links and hide these addresses from the above layers. This protocol maps IP addresses by MAC address. In general, the ARP module is broadcast to a network that contains an IP address. If the machine recognizes the IP address in the ARP Request, then returns the ARP reply to the machine asking to the MAC address[10].

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the IP address in the ARP Request, then it will return ARP replies to the machine asking to the MAC address.

2.5 Block Diagram
In this step determine what needs must be met in this research[11]. In Figure 1 is an overview of system design (see Figure 1).

![Figure 1. Block Diagram](image)

2.6 Hardware Specification
This section explains the hardware requirements to build a Raspberry Pi-based lecturer attendance information system, Table 1 below is a list of system hardware used.

| No | Hardware                        | Quantity |
|----|---------------------------------|----------|
| 1  | Raspberry Pi 3 Model B RAM 1GB  | 1        |
| 2  | Micro SD 16GB                   | 1        |
| 3  | Wireless Router Huawei HG8245A | 1        |
| 4  | Monitor Dell E2016HV            | 1        |

3. Results and Discussion
Testing of this research is carried out on each part, such as on hardware and software in the form of this system interface. The test results are as follows:

3.1 Hardware
The following is hardware testing[12], testing is done using one laptop and two smartphones that connect to the router on this system (see Figure 2).
Figure 2. Ping Test for Connected Devices

Figure 2 shows the device connected to the router. The device identified by the router is a device that has registered the previous MAC Address on the information system that has been built.

Figure 3. Device Testing Not Connected
Figure 3 shows a device that is not connected to the router. The device that is identified as not connected to the router is a device that has not registered the previous MAC Address or the device on the information system that has been built.

![Figure 4. Testing Getting Mac Address](image)

Figure 4 shows a list of MAC Addresses that are connected to the router. This MAC Address is the one that has been registered and is currently connected to the router.

3.2 Interface Testing
Following is the testing of the interface using the Epiphany web browser in full screen mode. The interface page consists of the main page on Figure 5, login page on Figure 6, lecturer data page on Figure 7, lecturer data input form page on Figure 8, page see mac address and edit / update lecturer data on Figure 9 and the last main page with attendance lecturers (see Figures 5-10).

![Figure 5. Display of Web System Main Page](image)
Figure 5 shows the main page on this system. This main page consists of lecturer attendance status. If it shows a red sign, the lecturer is in the room. If the green sign means the lecturer is in the room or there is no device connected to the router.

![Figure 6. Login Page](Image)

Figure 6 shows the login page as an administrator to enter the data needed for this information system.

![Figure 7. Data Lecturers](Image)

Figure 7 shows the lecturer data edit page. Only administrators can enter this page.
Figure 8 shows the input page for the MAC Address of each lecturer. Administrators who can enter on this page.

Figure 9 shows web page display of update data for each lecturer.
Figure 10 shows the main page on this system. This main page consists of lecturer attendance status. If it shows a red sign, the lecturer is in the room. If the green sign means the lecturer is in the room or there is no device connected to the router.

The discussion in this study is that the Raspberry Pi can be used as a web server that stores information systems that display the presence of lecturers in the room. This presence is identified from the device connected to the router that is available. What is identified is the MAC Address of the device that is owned by each lecturer. This device can be a notebook, smartphone, or devices that have a MAC Address[13].

4. Conclusion
From the result of testing that has been done, the conclusions that be taken are follows, this system has been built can provide information about the whereabouts of lecturers in his room through web pages using a local network, using a Raspberry Pi Router and Mini PC. The ability of this system to detect Mac Address depends on the maximum speed of the Router, the author conducted experiments on two routers with speeds of 150mbps and 300mbps and the result is a router with 300mbps faster in getting a Mac Address connected to it compared to a 150mbps router.

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