Journal of Artificial Intelligence and Engineering Applications

Website: https://ioinformatic.org/

15th February 2025. Vol. 4. No. 2; e-ISSN: 2808-4519

# Internet of Things Monitoring and Automation Simulation Design Using Cisco Packet on Smart Office

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**Abstract**

The development of Internet of Things (IoT) technology has brought significant changes across various sectors, including office management. The use of IoT enables the integration of smart devices to improve operational efficiency and comfort. This study aims to design a monitoring and automation simulation in the context of a smart office using Cisco Packet Tracer as a network simulation tool. The system design involves integrating various IoT devices, such as temperature sensors, humidity sensors, lighting, and electrical device controllers, which can be monitored and managed automatically through a web-based application. The results of this simulation are expected to provide insights into the application of IoT technology in efficient and controlled smart office management, as well as enhance the understanding of IoT devices and network implementation using Cisco Packet Tracer. This simulation is hoped to serve as a foundation for the development of more advanced and efficient smart office systems in the future.

***Keywords***: *Means Algorithm, Cluster, Library*

## 1. Introduction

Internet of Things (IoT) is a concept that refers to a network of physical devices that are connected together and can communicate via the internet. In an IoT system, these devices can collect, transmit, and exchange data automatically without human intervention. The goal of IoT is to create extensive connectivity between devices and enable efficient information exchange, generating greater benefits through monitoring, controlling, and analyzing data obtained from these devices [1]

Internet of Things is a concept where an object can have the ability to communicate via a network, such as the process of transferring data without any communication process carried out between humans (human to human) or between humans to system devices such as computers or controllers. With the existence of this Internet of Things technology, the work process of a system can be carried out more widely, the range is also wider, the process of data processing and data analysis of a system is also better [2]

## 2. Theoritical Basic

### 2.1. Simulation

Building a simulation model is about applying systems theories, principles, and approaches. As a software tool for studying and analyzing the characteristics of a system, it is important to develop a system model and simulated or symbolic features of its processes and operational procedures. By emulating real systems and associated activities, simulation results can be accepted and viewed as valid output data that helps reveal the operating characteristics of real systems. [3]

### 2.2. Smart Office

Smart Office is an application that combines technology and services to create comfort in the office environment, with the aim of increasing efficiency and security for owners and their employees. The smart office system can create a representative office environment, thereby improving the quality and effectiveness of employees in working. Smartoffice is a term where electronic devices work in the office and are controlled automatically via the internet.[4]

### 2.3. IoT (Internet of Things)

IoT is a concept that aims to extend the benefits of an always-on internet connection, allowing us to connect machines, devices, and other physical objects to networked sensors and actuators to collect data and manage their performance autonomously. In this way, machines can collaborate and operate based on new information obtained without human intervention [5]

### 2.4. Cloud Computing

Cloud Computing is an example of developments in information technology. Cloud computing changes the way information and communication technology is done from a client or server-based model to a cloud-based model. With cloud computing, users can access software services, media storage, infrastructure platforms, and technology applications through the internet network. This technology offers advantages by reducing the need for large investments in software, data applications, and hardware maintenance [6]

### 2.5. Cisco Packet Tracer

Packet Tracer is a network simulator from Cisco that is widely used for learning, training, and research in computer network simulation. Developed by Cisco Systems, this program is available free of charge to faculty, students, and graduates enrolled in the Cisco Networking Academy. The main goal of Packet Tracer is to provide students and educators with a tool that facilitates understanding of the working principles of computer networks and helps build skills in Cisco networking hardware. Cisco Packet Tracer is an application developed by the Cisco Company, aimed at simulating a running computer network.[7]

## 3. Analysis and Design

### 3.1. Research Framework

The research conducted by the author has a research framework which can be seen in fig 1 to make it easier for readers to understand the flow of the research conducted by the author.

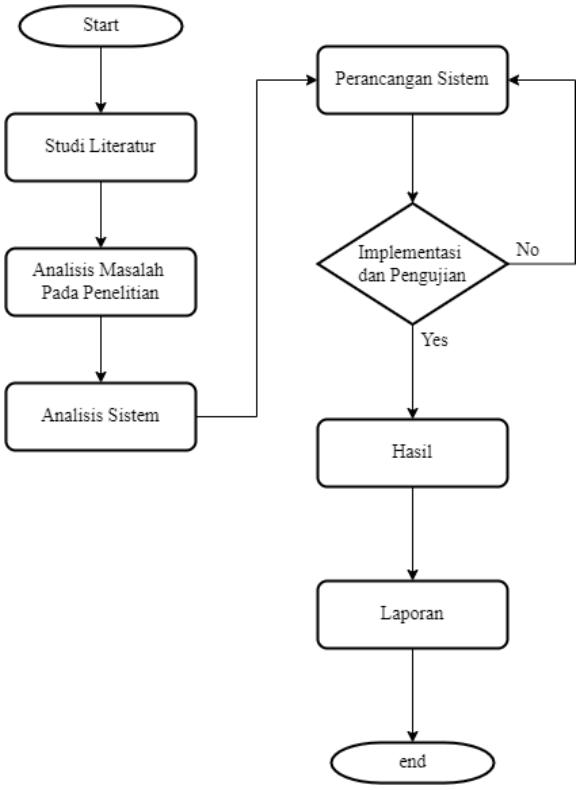


**Fig. 1:** Research Framework

Figure 3.1 is a flowchart of the research framework conducted by the author which begins with a start, then conducts a study of related research literature, then the process of analyzing problems that arise in the research being raised, after that the process of analyzing the system that will be created, then the system design process. The next step is implementation and testing in the form of options or choices where if the test does not run according to the author's wishes, the system design process is repeated. If the test is successful according to what the author wants, the next step is the process of making a report and ends with end.

### 3.2. Problem Analysis

The problem analysis process at the literature study stage has been carried out in the previous chapter, and the author concluded that the problems raised in the previous study can be further developed. The suitability between the author's problem background and the

information and data that have been collected is a strong basis for the implementation of research or research that is being carried out with the title "Design of Internet Of Things Monitoring and Automation Simulation Using Cisco Packet Tracer In Smart Office"

### 3.3. System Analysis

The concept of implementing Smart Office is to implement IoT-based office devices with the aim that the devices in the office can be controlled by the owner or employee from anywhere and at any time and are connected to an Office Gateway connected to an internet connection and these devices can also work automatically without any intervention from the owner or employee.

1. Smart Door

The author created the Smart Door concept using several IoT devices that will be used, namely RFID Reader, RFID Card, Alarm, MCU Board, and CCTV (Camera). MCU Board is used to program devices such as RFID Reader, RFID Card, Door, Alarm, and CCTV (Camera) so that they can work automatically. RFID Card as an entry access which will later be scanned by RFID Reader first on the room door as an entry access where a valid ID Card (already registered on the RFID Reader previously) can open the door automatically and the camera will turn on as a monitor. If the ID Card is not appropriate/invalid then the door will not open or entry access is denied, Alarm and CCTV (Camera) will turn on. In addition, later the owner or employee can monitor the IoT Smart Door devices in the room via a laptop remotely as long as the devices are connected to an internet connection.

2. Smart Fire Extinguisher

The author created a simulation concept of a Smart Fire Extinguisher in a room using several IoT devices such as Fire Sprinkler, Fire Monitor, Smoke Detector, MCU Board, and Siren. The MCU Board is used to program automatic fire extinguishing in a room where the Fire Sprinkler will be active to extinguish the fire if the Fire Monitor detects a fire in the room or if the Smoke Detector detects smoke at a certain level. The siren will be active as an alarm indicating a fire. In addition, later the owner or employees can monitor the IoT fire extinguishing devices in the room via a laptop remotely as long as the devices are connected to an internet connection.

The concept of Smart Office that the author will apply in this study includes: Smart Door, Smart Pantry Room, and Smart Fire Extinguisher. Apart from the concept of IoT devices that will be used in the simulation, a network topology is also needed that functions so that IoT devices can be connected to an internet connection so that they can be controlled and function together according to the program being built.

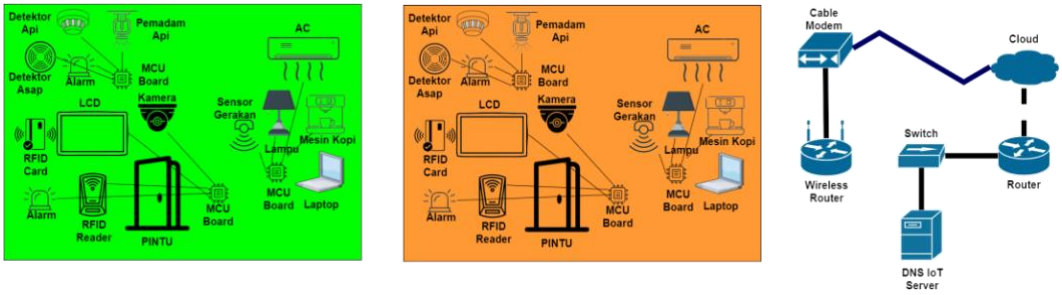


**Fig. 2:** Smart Office Simulation Concept

#### 3.3.1. Network Device Requirements Analysis

Based on Figure 2 above, the author uses several network devices used in network management in the simulation to be carried out, namely in table 1 below:

**Table. 1**: Network Devices List

| Network Devices | Series | Type | Amount |
|---|---|---|---|
| DNS IoT Server | Server-PT | Network Device | 1 |
| Switch | 2960-24TT | Network Device | 1 |
| Cloud | Cloud-PT | Network Device | 1 |
| Router | 2911 | Network Device | 1 |
| Cable Modem | Cable-Modem-PT | Network Device | 1 |
| Wireless Router | DLC-100 | Network Device | 1 |
| Laptop | Laptop-PT | Network Device | 2 |

### 3.4. System Design

System design is carried out as a planning for the system that will be built on the IoT-based Smart Office simulation concept including the configuration of the devices used in the study. Some of the system designs that will be built are: Network Topology, Smart Door, Smart Pantry Room, and Smart Fire Extinguisher.

#### 3.4.1. System Flowchart

The IoT system that has been designed will later make IoT devices work remotely or automatically. The flowchart of the system can be seen as follows:

1. Remote System

This remote system is designed to allow owners and employees to easily monitor and control IoT devices in the office from anywhere and at any time as long as the devices and users are connected to the internet. The flow of the IoT device Remote System can be seen in the following image:

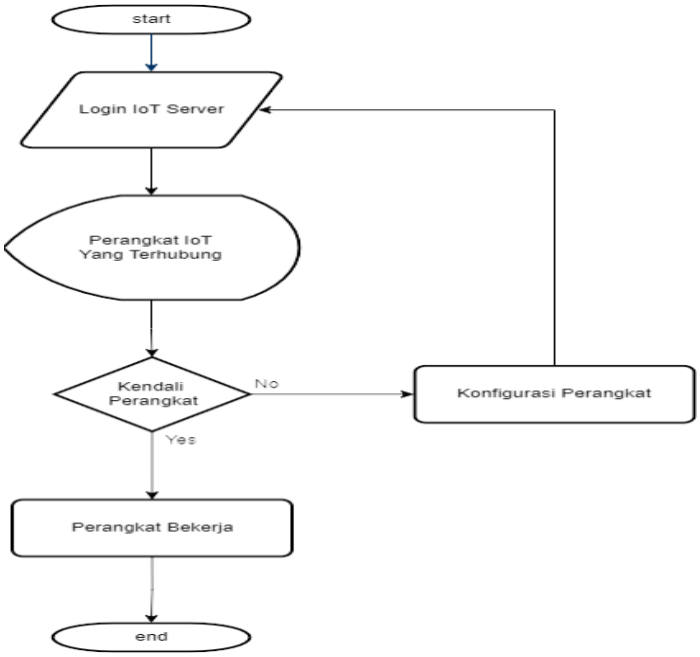


**Fig. 3:** IoT Device Remote System Flowchart

In Figure 3 above is a flowchart of the IoT device remote system that begins with start, then the owner or employee uses a device such as a laptop, the next process is to log in to the IoT DNS server by accessing the DNS or IP Address of the IoT DNS server that has been created and log in using the username and password that have been registered, after successfully logging in, the devices that have been connected to the IoT DNS server will appear, the next process is the condition where control of the IoT device cannot be carried out, then the device configuration process is carried out again and then re-login to the IoT DNS server if control of the IoT device can be carried out, then the next process is that the IoT devices can work and the process ends.

2. Automatic System

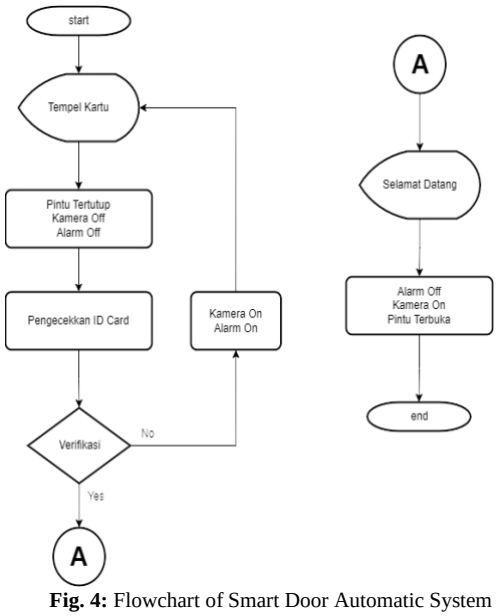


**Fig. 4:** Flowchart of Smart Door Automatic System

In figure 4 the Smart Door automatic system begins with a start, the LCD displays the text "Paste Card", checking the ID Card on the RFID Reader if the user wants to enter the room. If the ID Card is Valid, the RFID Reader LED will light up green and the door will open and the camera will turn on. If the ID Card is Invalid, the RFID Reader LED will light up red, the alarm and camera will turn on and the door will not open, the user must repeat the ID Card scan process.

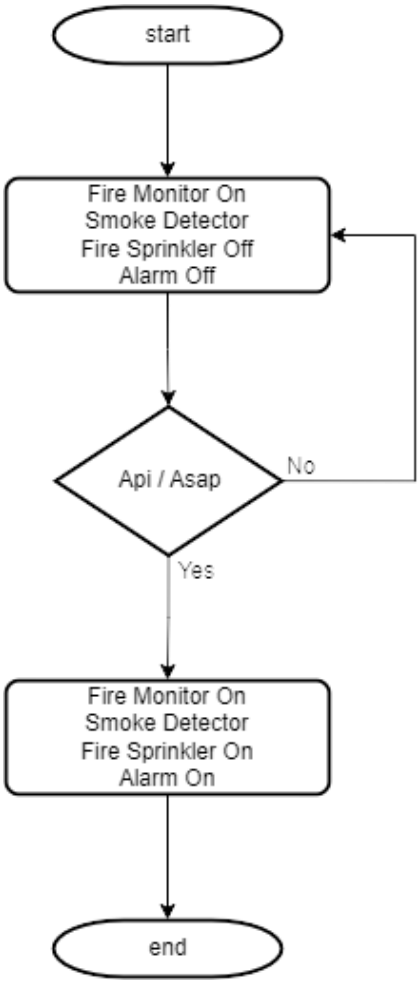


**Fig. 5:** Flowchart of Smart Fire Extinguisher Automatic System

### 3.5. Network Topology

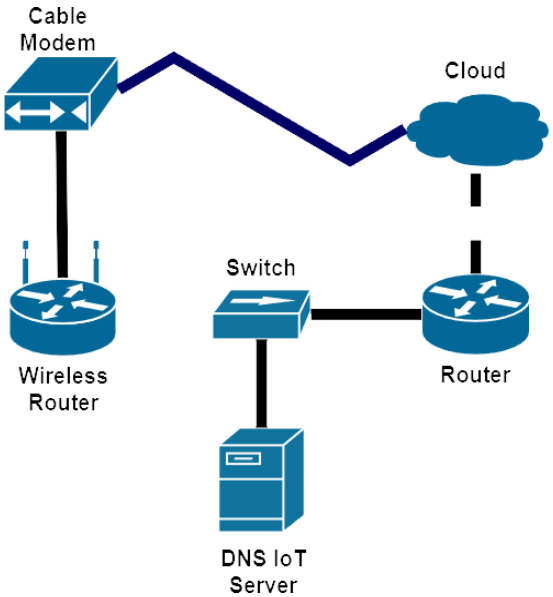


**Fig. 6:** Network Topology

Based on figure 6 above, the network topology built consists of 1 server (DNS IoT Server) connected to 1 switch, 1 router, 1 cloud, 1 cable modem and 1 wireless router.

# 4. Result and Discussion

## 4.1. System Simulation Concept Display

In the previous chapter, the author carried out system analysis and design to determine the concepts that will be built in research regarding Smart Office simulation, as shown in Figure 1 previously. The following is a display of the Smart Office simulation concept using the Cisco Packet Tracer 7.3 simulator, which can be seen in Figure 8 below.

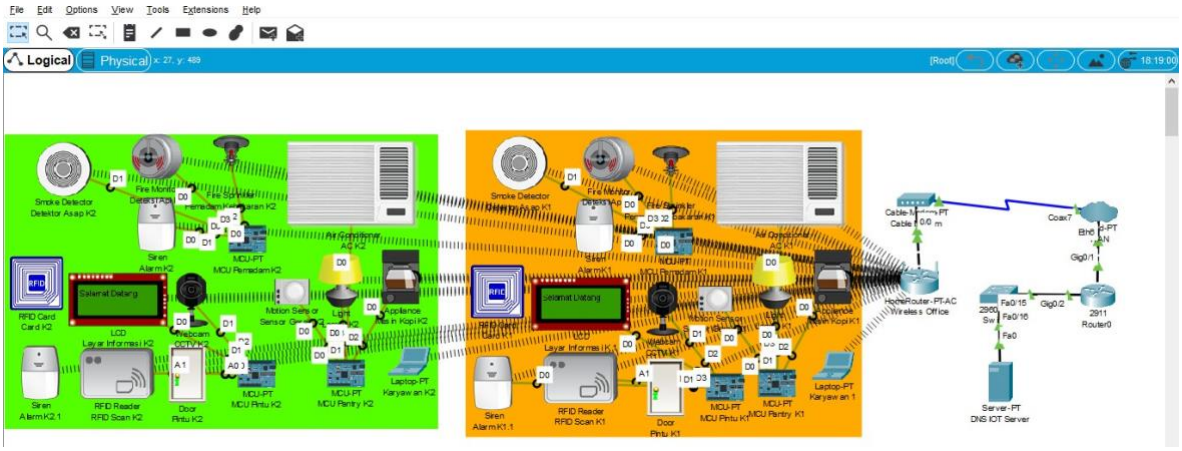

**Fig. 7:** Smart Office Simulation View

In figure 7 above is a simulation display of Smart Office carried out by the author in the research presented. The IoT device concept built includes: Smart Door, Smart Pantry Room, and Smart Fire Extinguisher. Apart from the concept of IoT devices, there is also a network topology which functions so that IoT devices can be connected to an internet connection so that they can be controlled and function with each other according to the program that was built**.**

## 4.2. System Test

The system trial carried out in the research carried out by the author is how the system works which was explained in the previous chapter regarding System Flowcharts, namely Remote Systems and Automatic Systems

1. Automatic System

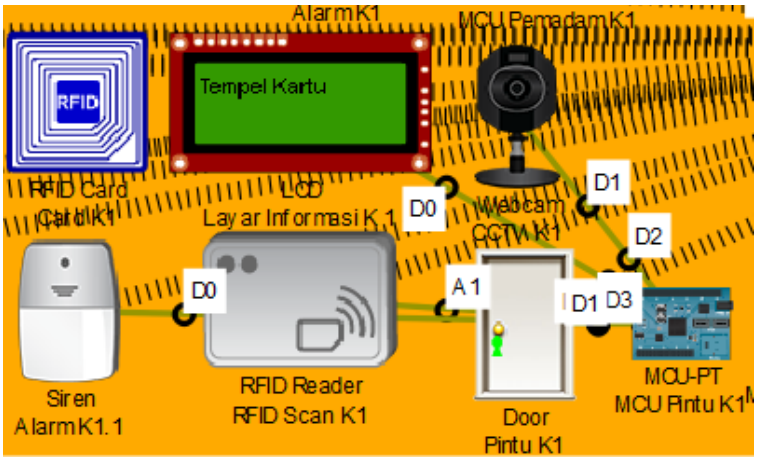


**Fig. 8:** Smart Door Default Condition

The image above is an implementation of the Smart Door concept applied to the Smart Office. Figure 8 above shows the device used in its initial or default condition according to the program that has been designed on the MCU Board.

# 5. Conclusion

Based on the stages of research carried out including problem background, problem formulation, problem limitations, research objectives, research benefits and research methods and design:

1. The Cisco Packet Tracer 7.3 application used can help in carrying out simulations on IoT devices because the required devices are available, therefore research on Smart Office security simulation and design can be carried out and the resulting output is in accordance with what the author desires.
2. The Smart Door concept was successful according to the design that had been built using several IoT devices used, namely RFID Reader, RFID Card, Alarm, MCU Board, and CCTV (Camera). MCU Board is used to program devices such as RFID Readers, RFID Cards, Doors, Alarms, and CCTV (Cameras) so that they can work automatically. The RFID Card as entry access will then be scanned by the RFID Reader first on the room door as entry access where a valid ID Card (which has been registered on the RFID Reader previously) can open the door automatically and the camera will turn on as a temporary monitor. If the ID Card does not match/is invalid then the door will not open or entry is denied, the Alarm and CCTV (Camera) will turn on. Apart from that, owners and employees will also be able to monitor IoT Smart Door devices in the room remotely via laptop as long as the devices are connected to an internet connection.

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