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Architecture Internet of Things Based on Cluster Housing Security System Using Fog Computing

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ABSTRACT

Internet of Things technology can help human work in information needs, utilize information, and provide information to the surrounding environment. One of the applications of IoT that helps humans with information gathering is control or monitoring activities that are controlled through commonly used devices. The use of IoT using the basis of the Fog Computing infrastructure provides a convenience to the function to control the use of electronic loads and security automation through remote control.

Key words: Cloud Computing, Fog Computing, Intenet of Things, Smarthome

1. INTRODUCTION

Safety is an important factor in the management of housing and buildings. Crimes that occur in the environment of houses and office buildings are increasing. Based on data obtained from the Central Statistics Agency (BPS) in 2010 there were 332,490 cases and increased in 2015 to 352,936 cases. The most common mode is theft. Continuous monitoring of buildings and residential areas is needed to avoid infiltration. Conventional monitoring conducted by security officers cannot meet the needs because of the vast area that needs to be monitored compared to the available personnel. The big of effort to reduce the blank spot area is proportional to the number of security officers.

The additional security method that is most widely applied is by installing a closed circuit television system, also known as CCTV. Although it can operate in realtime, conventional CCTV systems do not technically provide direct support in detecting intrusions, because this system requires the role of humans (security officers) to see the screen of the CCTV system continuously. This provides an opportunity for human error in preventing intrusion [1]. The application of highend building automation systems (BAS) to old buildings is very likely economically unreachable. Therefore we need a solution that can stand alone so that it can be applied to buildings without BAS. This solution is in the form of a motion detection / infiltration system that can work in realtime and is automatic and economically affordable.
In this study, the Internet of Things (IoT) approach with Fog Computing is used to develop the system. The Internet of Things (IoT) was first introduced by Asthon (2009) in 1999. IoT can be explained as a set of things connected to each other through the internet. Things here can be tags, sensors, humans etc. IoT functions to collect data and information from the physical environment (environment), these data will then be processed in order to understand its meaning The ability of IoT to communicate with each other makes IoT can be applied in all fields. According to Tan (2014), technology in IoT is divided into several layer architectures.

The first layer is the Perception layer, this layer functions to read and collect information from the physical environment (environment). Then, the data will be sent to the network layer. Finally the data will be used in the application layer. The Perception Layer is responsible for converting data into signals sent over the network so that it can be read by the application layer. For example, the use of barcodes by minimarkets. In the barcode there are data such as name, price and stock of goods. When information has been obtained, the network layer will be responsible for sending data from one host to another. There are various techniques used such as ZigBee, Wifi, 6LoWPAN etc. While the application layer functions to process information that has been obtained to be used according to their needs.

IoT devices have limited processing and storage capabilities, while the system in this study collects and analyzes sizable data. Thus, the solution for storing and processing collected data is to use cloud computing. IoT devices are responsible for sensing and actuation, while heavier processing tasks are carried out by cloud computing, which has more processing power and is able to collect all data. However, data centers in cloud computing face big problems in the amount of data that explodes, latency, data queues, and devices that are too far from the data center. So we need a system that allows the system not through and not directly to the data center to send

data with devices that are known to use fog computing. Therefore in this paper, discussing the Architecture of the Housing Cluster Security System based on the Internet of Things (IoT) with Fog Computing.

2. LITERATURE REVIEW

Internet of Things (IoT) has enabled various devices to connect to existing Internet networks and be remotely controlled as are other virtual information assets. Various potentials can be developed with this technology, but at the same time also bring new threats to the security of devices connected to the internet.

2.1 Internet of Things

IoT is a global infrastructure for the information society, which enables various devices, both physical and virtual, to be connected to one another. What is meant by things are physical objects or virtual world information that can be identified and integrated into a communication network.

IoT allows objects to be sensed and controlled remotely through existing network infrastructure. This provides an opportunity for direct integration of physical objects into computer-based systems. Each object can be uniquely identified through an embedded computer system (embedded computing system) and is able to interoperate in the existing Internet infrastructure. [4] - [6]

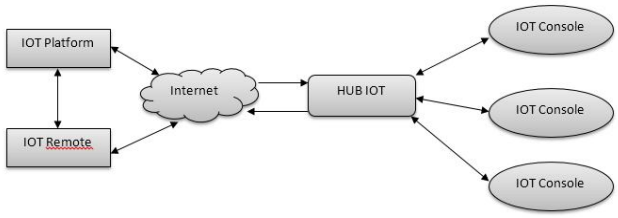

Figure 1: *Internet of Things Ecosystem*

2.2 Smart Home IOT Architecture

IOT architecture on smarthome can be simply described into 2 parts, namely the Application section which consists of services, Data Anaytics and Infrastructure consisting of Communications and hardware. Smarthome IOT architectural drawings are simply depicted in Figure 2

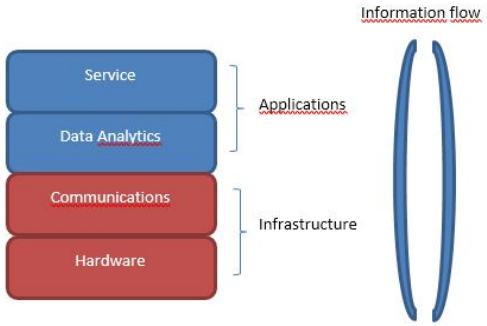

Figure 2: IOT Smart Home Architecture

At the hardware layer consists of sensors, actuators, chips, and radios. The function of this element is as a means of direct interaction with the environment with other hardware elements. The communication layer can be called connectivity at this layer. The communication layer functions as a liaison between hardware components so that information can be channeled at each layer between the hardware components. The communication layer can be Ethernet, WiFi, Cellular, and WLAN.

At the data analytics layer, it plays a role in receiving data from the communication layer that is stored, analyzed, and processed. In the data analytics layer, it can play a role in the big data role. The analytics data layer functions as a data collection and extracts information from the data set to become information with the desired results. At the service layer, it is the layer as a decision-making tool with intelligence created. This service layer function can display information on the monitor screen or can control the aquator.

Figure 3: IoT Smart Home

2.3 Fog Computing

Based on Burwood's research, CISCO created fog computing that allows software applications to work on the edge of network devices rather than at the center of a data network. Fog data service can make operators in the service section to make policies that can monitor and take action from data obtained through the IoT environment. The service is on the IOX platform, users can integrate policies that have been adapted to their application. Fog computing-based IoT system consists of three layers, namely the device layer, the fog layer, and the cloud layer.

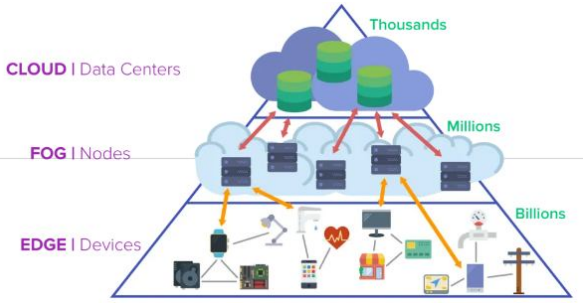

Figure 4: Basic Model Fog Computing

3. METODE PENELITIAN

Method This research was conducted in the form of an IoT-based smart home design using fog computing architecture for clusters in cluster X settlements in Serpong BSD, South Tangerang. In the research there is a diagram research and manufacturing desan smart home.

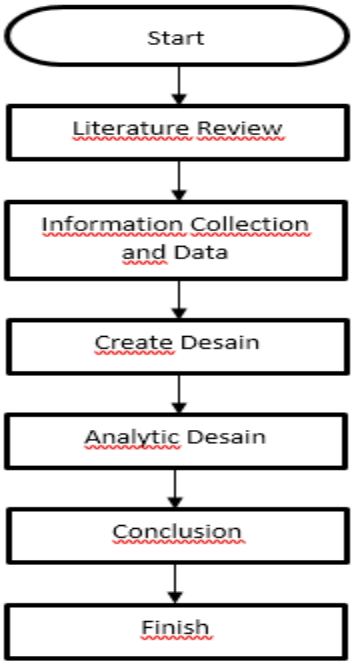

Figure 5: Research Flow Chart

4. RESULTS OF DESIGN AND DISCUSSION

Based on literature studies and information gathering. Architectural Design of an Internet-based Residential Cluster of Things (IoT) Security System with Fog Computing will be discussed as follows.

A. IOT-Based Cluster Gate

The entrance or gate of the cluster is the main way to enter the housing cluster, this is a very important concern for the security of the housing cluster, when a vehicle or someone enters the housing cluster, what becomes a concern is whether the vehicle or person is a resident of a residential or guest cluster that is want to visit the occupants. The technological capability proposed at the gate cluster is the gate's ability to detect whether the car or someone is a cluster occupant by capturing the car plate to be identified or using an identifier that emits RFID so that the gate will automatically open, the data at the gate is sent to the database through fog and can be accessed by the cluster manager so they can know the condition of the housing cluster whether the occupants are at home or not.

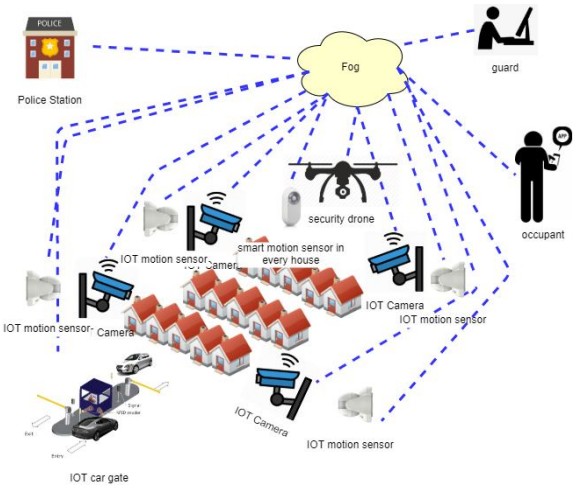

Figure 5: Architectural Design IoT security Cluster

B. IOT- Based Closed Circuit Televison (CCTV)

CCTV is a tool that is needed to get a vision of the environmental conditions of the housing cluster so that it will be installed in every corner of the housing cluster to get an overview of the current housing conditions. Conventional CCTV systems do not technically provide direct support in detecting intrusions, because this system requires the role of humans (security officers) to view the screen of the CCTV system continuously. This provides an opportunity for human error in preventing intrusion [1]. By using IOT-based CCTV surveillance can be done anywhere so that both cluster managers or cluster dwellers can jointly monitor the condition of the cluster as well as on some IOT-based CCTV that is equipped with motion sensors.

C. IOT-Based Outdoor Motion Sensor

To support cluster security, early detection of intrusion from the unexpected side is required if the official entrance has been given security, security must be prepared from the unexpected side, such as on the outside of the housing cluster wall where there is still the possibility of intruders to enter the cluster environment. Therefore a motion sensor is needed on the outer side of the housing cluster, this will be able to provide information directly to the manager if there are activities that try to enter the housing cluster through the cluster border. IOT-based motion sensors will send data so that it can be monitored by cluster managers anywhere at any time and can quickly respond to it.

D. IOT-Based Indoor Motion Sensors

Motion sensor in the room serves to provide information that the house has activity inside it, this is needed if it turns out that what is known to the cluster manager that the occupant of the house is out of the house turns out there is activity inside the house, motion sensor in the house can provide information so that the cluster manager can quickly investigate the house.

E. Security Drone

At present the drone is one of the foremost forms of supervision. With drones you can get further vision than CCTV. Security drones can be something that can be applied to the security of residential clusters, can be a form of rapid response from the examination of suspicious activity detected through motion sensors both indoors and outdoors. With routine security drone patrols can increase the sense of security of the occupants of the cluster and put pressure on those who will carry out activities not desirable to the housing cluster.

Housing developers are currently developing residential areas or housing complexes using a cluster system, this can usually be a marker of the different types of houses contained in each cluster. One area or housing complex can contain a variety of housing clusters, so it can be that the security management of each cluster can be different with each cluster area. Fog computing makes it possible to divide the tasks carried out by cloud computing into the form of many fog nodes, so as to reduce the burden on the cloud and speed up the process of exchanging and sending data from these IoT sensors.

5. CONCLUSION

At this time the housing cluster requires a better security system, using technology and integrated. The Internet of Things was chosen by using fog computing to reduce latency, facilitate communication between the device center with remote sensors, and avoid data queues that occur at cloud The future of research can be developed by adding a control system or parameter algorithm used in each IoT instrument and its management application

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