Home Monitoring System Based on Cloud Computing Technology and Object Sensor

Chapter · January 2018

DOI: 10.1007/978-981-10-8471-3_96

3 authors:

Evizal Abdul Kadir
Universitas Islam Riau
98 PUBLICATIONS **537** CITATIONS
SEE PROFILE

Apri Siswanto
Universitas Islam Riau
24 PUBLICATIONS **63** CITATIONS
SEE PROFILE

Ari Yulian
Universitas Islam Riau
1 PUBLICATION **1** CITATION
SEE PROFILE

Home Monitoring System Based on Cloud Computing Technology and Object Sensor

Evizal Abdul Kadir, Apri Siswanto and Ari Yulian

Abstract High mobility of Indonesian residence is increasing by the time, especially for the people who live in urban areas. Most of housing and room are leave without any guidance and very risk to the theft and violation. In this research propose, a home monitoring system based on object sensor and cloud computing to keep the information before forward to owner. House monitoring system used cloud computing technology using Webcam motion detection used for the detection system and Raspberry Pi 3 as processor to store data as buffer before send to cloud, as well as webcam and motion movement. Every section for image storage media when image captured then store in google drive that can be call any time and also cloud computing and notification that is using email or push messaging. Results show that moving object can be detect while object under position up to 5 m, an alert send to owner for notification that something happen in the house. With this system will help residence more safe and reduce risk to leave house.

Keywords Cloud computing · Monitoring · Object sensor · Raspberry pi 3

1 Introduction

In today's modern era, the level of mobility of Indonesian society is increasing, especially for people who live in urban areas. The busy work of the day causes the interaction at home to be reduced. In addition to the many job matters, one of the cultures that are already inherent in Indonesian society is to return to their home-

E. A. Kadir (✉) · A. Siswanto · A. Yulian
Department of Information Technology, Faculty of Engineering,
Universitas Islam Riau, Jl. Kaharuddin Nasution No. 113, Pekanbaru
Riau 28284, Indonesia
e-mail: evizal@eng.uir.ac.id

R. Saian and M. A. Abbas (eds.), *Proceedings of the Second International Conference on the Future of ASEAN (ICoFA) 2017 – Volume 2*,
https://doi.org/10.1007/978-981-10-8471-3_96

town or commonly called "Mudik" during public holidays or during school holidays (Rido and Faldana 2014).

High population density in urban areas and job vacancies are getting less while the need for food and accommodation should remain fulfilled for the sake of survival. To meet the needs, sometimes humans take action outside the norms of humanity, committing criminal acts such as cases of theft that many occur lately. In addition to the factors of fulfillment of needs, other factors that make a person commit a crime that is because of the opportunity.

At the time of leaving the house in a state of empty and with the many cases of theft that occurred, would cause a fear for the owner of the house. The most common precautions used are with a security guard or a Closed Circuit Television (CCTV) camera installed in every corner of the room. Security officers who are expected to be the number one solution to home security or implementation cannot be said to be effective as most security guys sit in their posts alone, while the use of CCTV devices that can record and display real-time room conditions that are considered more effective cost but not least in the cost of installation and maintenance (Rido and Faldana 2014).

The other side, technological progress is increasing rapidly, so almost every individual already have gadgets, whether it be a smartphone or tablet. Internet technology is no less rapid, using the Internet Service Provider (ISP) and also provides a variety of package options at an affordable price and supported by Third Generation (3G) or even Fourth Generation (4G) networking technology, making internet access is getting faster in accessing streaming video content.

One of the Internet technologies that became the center of attention in recent years is cloud computing technology. Cloud computing is a combination of the use of computer technology (computing) in a network with Internet-based development (cloud) that has the function to run programs or applications through computers connected at the same time. Cloud computing technology makes the Internet a central server for managing data and user applications. Cloud computing also provides data storage capacity large enough, so users can store a lot of data on a large scale and can be reopened wherever and whenever.

From some backgrounds above, it is necessary to build a system capable of monitoring a room that is easy to access on all gadget devices, cost-effective, and practical. This system uses a wireless device and Webcam as a medium of shooting or object as well as cloud computing as an online image storage media. It is hoped that with the technology of merging the two technologies, this system will become more practical and easy to access anywhere.

2 Literature Review

Research conducted by (Rido and Faldana 2014), entitled "Monitoring System Home Based on Cloud Computing Technology". The research discusses the making of home monitoring system using Webcam by integrating with cloud

computing technology as storage media. Differences with this research that will be located on the motion detection using Webcam, raspberry Pi and motioneye with notification to Email.

Another study is a room monitoring system, conducted by Setiawan (2013) entitled "The Design of a Room Monitoring System Using OpenWrt-based Webcams." The study discusses the creation of a room security system using the TP-LINK 3420 router with OpenWrt firmware. Features include Webcam to record the state of the room, soundcard as an alarm output and notification based on security level, i.e., security level as notification in the form of alarm, security level two notification in the form of alert and SMS, and security level three notification in the form of SMS and email to user. Differences with research that will be the author of the adoption of storage with cloud technology also use motion detection and notification.

Another study was a Web-based home observer, conducted by (Zul Ihsan and Widyawan 2013) entitled "Architecture of Web-Based Monitoring System Using IP Camera." The study discussed about making home monitoring system by using Internet network and also using IP Camera. This monitoring system requires an architectural design in accordance with the conditions of the home network in general. Also use four monitoring architecture conditions that can be applied in home internet user network.

3 Methodology

Cloud computing is a client-server model, where resources such as servers, storage, networks, and software can be used as a service that users can remotely access at any time. Users can enjoy the various services provided by the cloud computing provider, without requiring too much help from technicians or support from the provider. Figure 1 shows the illustration of the cloud computing diagram to be used.

Cloud computing is a combination of the use of computer technology (computing) in a network with Internet-based development (cloud) that has the function to run programs or applications through computers connected at the same time, but not all connected via the Internet using cloud computing. Cloud-based computer system technology is a technology that makes the Internet as a central server to manage data and user applications. This technology allows users to run programs without installation and allows users to access their personal data through computers with Internet access.

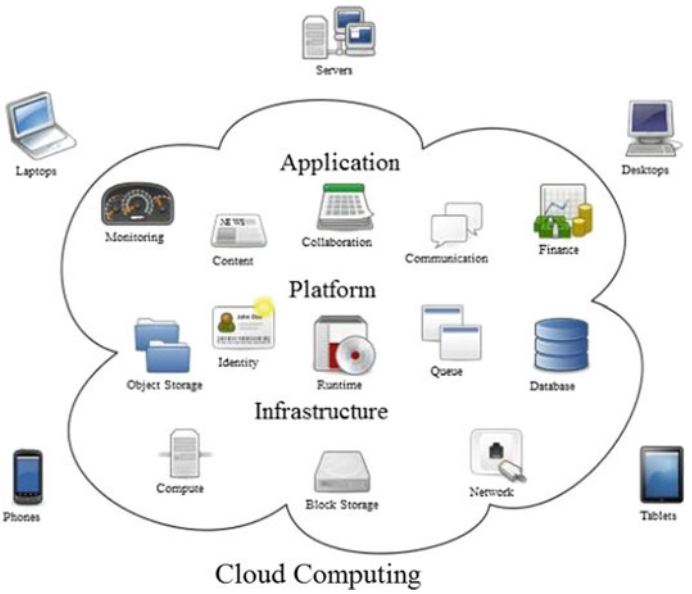

Fig. 1 Cloud computing illustration diagram

Raspberry Pi 3

Raspberry Pi 3 is a minicomputer board; the size of a credit card can be called single-board computer (SBC), and raspberry Pi 3 is already equipped with Wi-fi and Bluetooth. The specifications are as follows: Broadcom BCM2837 processor 64-bit quad-core 1.2 GHz, 1 GB RAM, MCM43438 Wi-Fi and low-energy Bluetooth, general purpose input/output (GPIO) 40 pins, 4 USB 2.0 ports, ethernet 10/100 Mbps, 4-pole stereo and video output ports, HDMI port, CSI camera port to connect to RPi camera, DSI display port to connect to RPi touch screen, microSD slot. For a minicomputer with limited hardware specifications, then for the operating system is also lightweight type. Figure 2 shows the Raspberry Pi3 board that will be used to process a moving object image.

Raspberry Pi 3 is a very flexible platform; there are many things that can be done with Raspberry Pi 3, i.e.:

1. Media Learning Programming
   Raspberry Pi already has interpreters and compilers from various programming languages such as Python, Java, and C++.
2. General Purpose Computing
   Raspberry Pi can be used as a computer as it connects to a monitor and adjusts its graphical display through a Web browser.
3. Media Center

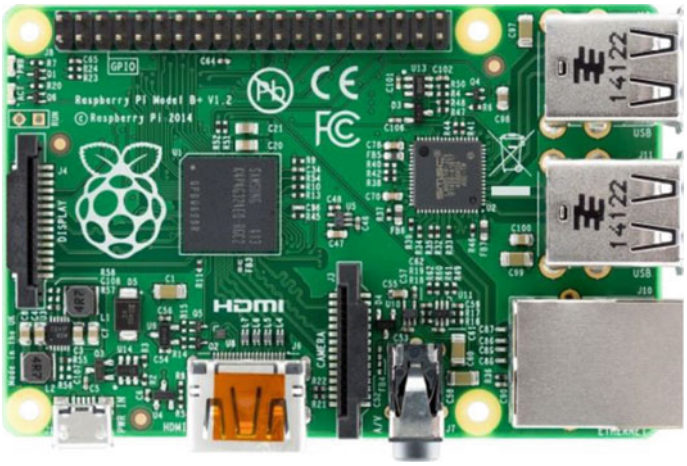

Fig. 2 Propose Raspberry Pi 3 Model B

Raspberry has an HDMI port and audio/video. Raspberry Pi can be easily connected to the monitor. This advantage is supported by the power of Raspberry Pi processor is enough to play full screen high definition video and also in Raspberry Pi itself already has XBMC (media player) that supports as a kind of media file format.

Motion Object Detector

Motioneye is a Web interface for the use of security cameras called motion for Raspberry Pi. Motioneye is a development of previous versions of motionpie to be compatible with several different versions of Raspberry Pi. Motioneye is created by Callin Crisan to develop the use of motion created by Kanneth Larvsen. Motioneye has Web interface with responsive design, user and security password, streaming MJPG, motion detection with JPEG and AVI file output, browsing and downloading media files via Web, and camera settings (Crisan 2014).

PYTHON Programming

Python is a dynamic object-oriented programming language; it can be used for a variety of software development. Python provides strong support for integration with other programming languages and other tools. And also, python can run on

many platforms or operating systems like Windows, Linux or platform, Mac OS X, OS/2, Amiga, and python have also been ported into Java virtual machine and .NET.

Python is distributed under Open Source Initiative (OSI) open source licenses, so python is free to use and also free to use, and there are some python features:

1. Python is powerful and fast
   Python users often use batteries included phrases to describe standard libraries. The library covers everything from non-syncing processing to compressed files. Python itself is a collection of very good modules and can handle practically every problem domain.
2. Python plays well with others
   Python can integrate with component object model (COM), .NET, and common object request broker architecture (CORBA) objects. If we use Java libraries, Jython is a Python implementation for Java Virtual Machine.
3. Python runs everywhere
   Python is available for many widely used operating systems, such as Windows, Unix or Linux, OS/2, Mac, Amiga, and many other operating systems. There is also a python version running on .NET, Java virtual machine.

4 Result and Discussion

In home monitoring systems based on cloud computing technology using a webcam with motion detection that after implementation, will be tested against the system. System testing is a process to verify that all elements of the system have been integrated and functioning correctly. Home-based monitoring system cloud computing technology uses a Webcam with motion detection is built and designed based on user roles, which will use this system can to perform monitoring or monitoring from a distance by looking at the capture results of cloud computing. Home monitoring system can be accessed by using Web browser (Fig. 3).

Main view form of the display is generated from the camera that will be displayed on the Web. Figure 4 shows the implementation of the main display form process.

```
sudo wget goo.gl/hRdgZP
```

```
mv hRdgZP motioneye
```

```
sh motioneye
```

Fig. 3 Script instruction of motion program

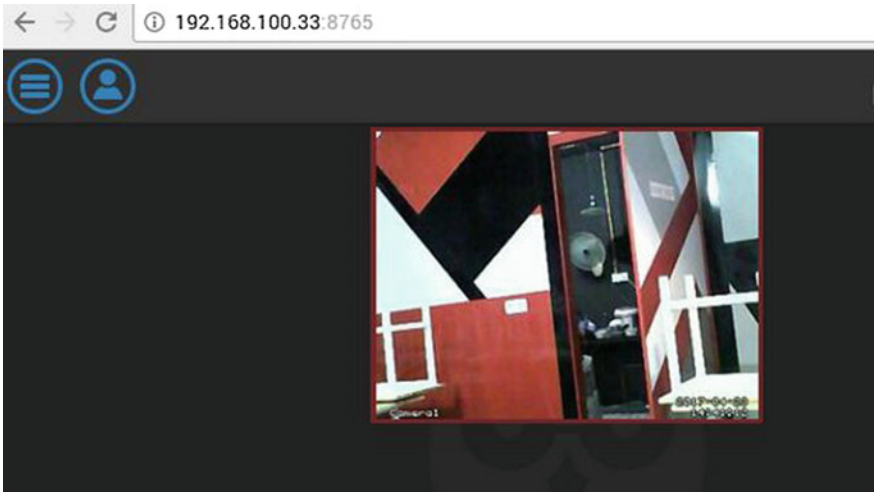

Fig. 4 Form tampilan utama

Capture report form in motion is used to do temporary storage in the report in motion, and there is a feature to download images and can be delete images. Figure 5 shows the implementation of the capture report form process in motion.

The capture report form on google drive is used to capture storage of movements and store the capture in google drive by online. Figure 6 shows the implementation of the capture report form process in google drive.

Once the system has been successfully established, the system will be tested. Testing is required to ensure the system is running as expected. One way of testing is by using black box testing. This test focuses on the functions that exist in the

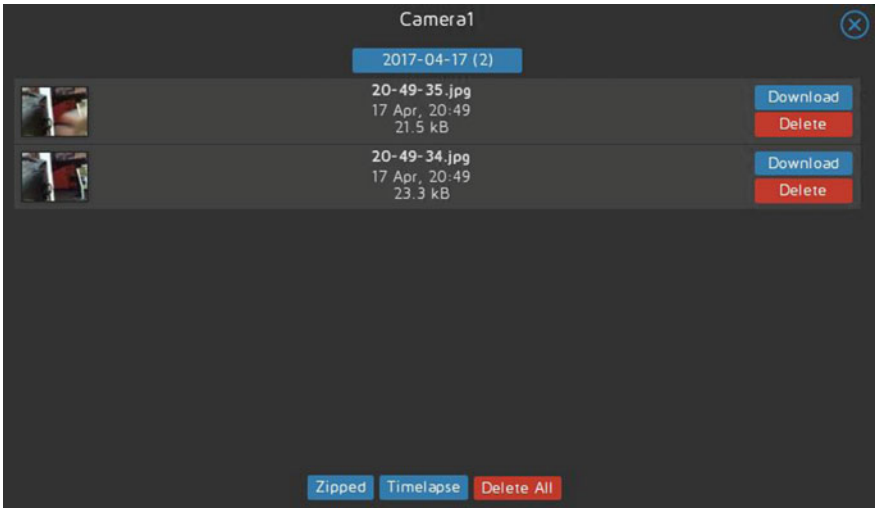

Fig. 5 Report form based on motion sensor captured

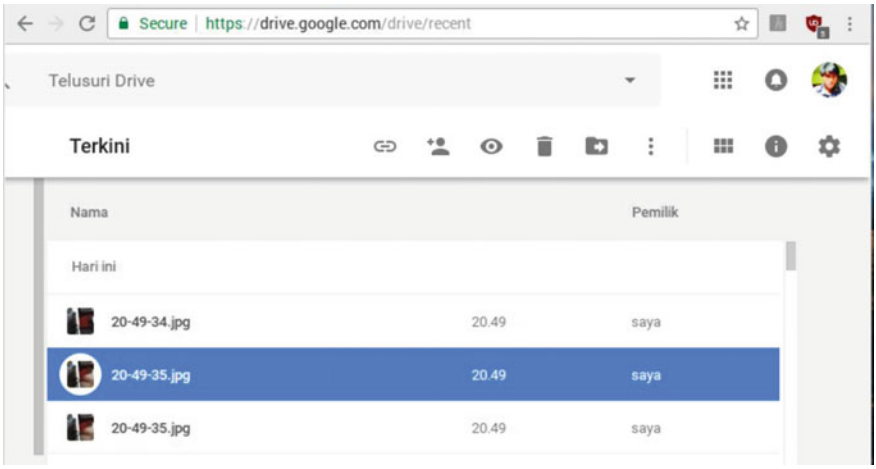

Fig. 6 Report form based on captured in google drive

program without having to know how the function is made whether in accordance with the expected results. If the expected results match the test results, this means the system corresponds to a predetermined goal. If not in accordance with the expected, then the system will be reviewed and performed repairs in accordance with existing errors. Here is an analysis of the results of black box testing. Table 1 shows that the results of capture distance movement and affects the success of the process of capture processing.

Table 1 Motion object based on capture in camera

No	Distance (m)	Captured moving object	Results
1	0.6		Terdeteksi Pergerakan
2	1		Terdeteksi Pergerakan
3	2		Terdeteksi Pergerakan
4	3		Terdeteksi Pergerakan
5	4		Terdeteksi Pergerakan
6	5		Terdeteksi Pergerakan

5 Conclusion

Based on the analysis and discussion of home-based monitoring system of cloud computing technology using Webcam with motion detection, then with this home monitoring system can help users or house owners to know the circumstances in the room by looking at capture from google drive. With this system can help provide solutions in home security and homeowners feel comfortable when leaving home because there is already a webcam that has been installed in the room if there is automatic movement of capture and will be uploaded to google drive.

Acknowledgements This work is partially supported by Universitas Islam Riau; the authors also gratefully acknowledge the helpful comments and suggestions of the reviewers, which have improved the presentation.

References

Crisan, C. (2014). http://www.howtoembed.com/projects/raspberry-pi/95-motioneye-with-raspberry- pi. diakses 14 Januari 2017.

Rido, A., Faldana, R. (2014). Sistem Monitoring Rumah Berbasis Teknologi Cloud Computing. *SESINDO 2014*.

Setiawan, A. (2013). Rancang Bangun Sistem Monitoring Ruangan Menggunakan Webcam Berbasis Openwrt (Doctoral dissertation, UIN SUNAN KALIJAGA).

Sofana, I. (2012). *Cloud Computing Teori dan Praktik (Open Nebula, VMware, dan Amazon AWS)*. Bandung: Informatika.

Zul Ihsan, M., & Widyawan, W. (2013). Arsitektur Sistem Pemantau Rumah Bebasis Web dengan Mengunakan IP Camera, Reserchgate.