Sustainability Internet of Things (IoT) implementation for Environmental Security Unit in Karang Tengah Hamlet Nogotirto Gamping Sleman

Nurhadi Wijaya [1], Sugeng Winardi[2], Kasmawaru[3], Putra Wanda[4], Agung Arif[5]

Informatics Department, Information System Department, Respati University Yogyakarta, Informatics Engineeing Dipanegara Makasar

[1]nurhadi@respati.ac.id
[2]sugeng@respati.ac.id
[3]kasmawaru@undipa.ac.id
[4]putra.wanda@respati.ac.id
[5]22220024@Respati.ac.id

Abstract— **Sustainability program for implementing the Internet of Things (IoT) for the Environmental Security Unit (Satkamling) in the RT 17 RW 11 Padukuhan Karang Tengah, Nogotirto, Gamping, Sleman area aims to improve security and operational efficiency through IoT technology. This program involves procurement and installation of IoT devices, data integration, as well as training and outreach to residents and Satkamling officers. The methods used include sensor selection, installation at strategic points, and integration with a central platform for data analysis. The expected results are a real-time monitoring system, emergency notifications, and increased public awareness about the benefits of IoT. This program also includes scientific publications as a main output. By implementing IoT, it is hoped that a safer and more efficient environment can be created in security management..**

Keywords— **Internet Of Things, Satkamling, Technology, Remote Control, Real-time, Security.**

I. INTRODUCTION

Internet of Things (IoT) is a revolutionary concept that connects physical devices, sensors and other objects to communicate with each other and exchange data over the internet network1. In recent years, IoT development has accelerated rapidly and opened up new opportunities for various industries. However, with this growth comes data security and reliability challenges that must be addressed.

In the RT 17 RW 11 Padukuhan Karang Tengah, Nogotirto, Gamping, Sleman area, the Environmental Security Unit (Satkamling) has a vital role in maintaining environmental security and order. However, challenges such as operational efficiency, inaccurate monitoring and response to emergency situations are still problems that need to be solved.

The sustainable program for implementing IoT for Satkamling aims to Improve Security: Use IoT technology to accurately monitor the environment and provide rapid response to emergency situations, Operational Efficiency: Automate routine tasks and reduce the workload of Satkamling officers, Increased Public Awareness: Educate citizens about the benefits and how to use IoT technology for security.

Urban and rural areas in Indonesia are often faced with complex security challenges, including the security of residential environments. One of the efforts that has been taken to improve security is by implementing Internet of Things technology in the Environmental Security Unit (Satkamling). In Padukuhan Karang Tengah, RT 17, RW 11, Nogotirto, Gamping, Sleman, last year through internal grant funds the implementation of IoT was implemented as an initial and preventive step to maintain environmental security.

There are still several problems that need to be addressed to ensure the sustainability of the Satkamling program. One of the problems that is the main focus is the lack of monitoring area coverage with IoT-based CCTV cameras, so that efficiency in monitoring and responding to developing security situations is felt to be still lacking. This can result in an increased risk of crime and security disturbances in the area.

Through this service, efforts will be made to identify, analyze and resolve the problems faced by RT 17, RW 11 Padukuhan Karang Tengah in the context of the sustainability of the IoT implementation program for Satkamling. In this way, it is hoped that it can increase the effectiveness and efficiency of the Satkamling program, as well as make a positive contribution to the security and comfort of the local community.

II. RELATED WORKS

The application of Internet of Things (IoT) technology in environmental security systems has become a widely researched topic in recent years. IoT enables the integration of various devices and sensors to monitor and manage security in real-time. In the context of environmental security, the use of

IoT can improve operational efficiency and response to emergency situations.

One relevant study is research by Liu et al. [1] which examines IoT-based security technology. This research highlights various challenges and opportunities in applying IoT for security, including issues of data security and system reliability. Liu et al. concluded that despite the challenges, the benefits offered by IoT in improving security are significant.

Ray [2] also examined the application of IoT in smart homes, which includes security aspects. This research shows that IoT can be used to monitor activity in and around the home, providing real-time notifications to homeowners if suspicious activity occurs. Ray emphasized the importance of data security and privacy in IoT systems, as well as the need for strict security standards to protect users.

In a more specific context, research by Wijaya et al. [3] in Padukuhan Karang Tengah, Sleman, shows how IoT can be applied in environmental security systems. This research involves installing IoT-based sensors and cameras at various strategic points to monitor activities in the environment. The results show significant improvements in operational efficiency and response to emergency situations.

Additionally, research by Han et al. [4] studied the use of IoT in smart city security systems. This research shows that IoT can be used to monitor various aspects of city security, including traffic, fire and crime. Han et al. found that the integration of IoT in city security systems can improve coordination between various security agencies and speed up responses to emergency situations.

Another study by Ma et al.[5] highlights the importance of training and outreach in implementing IoT for security. Ma et al. found that the success of IoT implementation relies heavily on community understanding and involvement. Therefore, training and outreach on the use of IoT technology is very important to ensure that society can utilize this technology effectively.

Overall, various studies show that the application of IoT in environmental security systems has great potential to improve security and operational efficiency. However, challenges such as data security, system reliability, and community engagement need to be addressed to ensure successful implementation of this technology.

III. METHOD

The method for implementing sustainable implementation of the Internet of Things (IoT) for the Environmental Security Unit (Satkamling) in the RT 17, RW 11 Dusun Karang Tengah, Nogotirto Gamping Sleman, involves several important stages. First, a needs analysis is carried out to identify areas that require security improvements. This preliminary study involves collecting data from various sources, such as motion sensors and security cameras, to understand the current security conditions and determine the specific needs of the area. The collected data is then analyzed to identify crime patterns and vulnerable areas that require special attention.

IoT system design is carried out that is in accordance with the results of the needs analysis. The design of this system includes the selection of appropriate devices and sensors, as well as determining the optimal installation location. The hardware used includes a wireless IP (Internet Protocol) based monitoring camera, with a frequency of 2.4 GHz via WiFi transmission media. The installation location is selected based on previous crime data and community activity patterns, taking into account the signal quality and the range of the signal beam to the monitoring camera.

The system implementation phase involves installing and configuring IoT devices at predetermined locations. This process includes the installation of sensors and security cameras at strategic points such as entrances, exits, strategic roads and vulnerable areas. CCTV monitoring systems are integrated with cloud services to enable real-time data access from various locations. Cloud Computing technology is used to store and process data safely and efficiently, allowing Satkamling members to access data from anywhere and at any time using different devices. The sustainable design architecture for implementing Internet of Things (IoT) for environmental security units in the RT 17 Karang Tengah hamlet area can be shown in the following figure below.
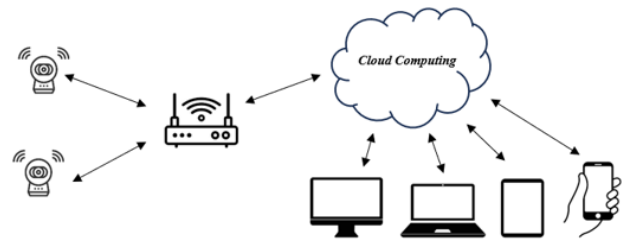

Fig. 1, Design architecture for implementing Internet of Things (IoT) for environmental security units in the RT 17 Karang Tengah hamlet

Figure above depicts a cloud computing architecture integrated with the Internet of Things (IoT). On the left side, there are three icons representing sensors or wireless devices in the form of CCTV IP, each sending a signal towards the router or hub in the middle. These devices connect wirelessly to a cloud labeled "Cloud Computing," which represents the internet or a remote server where data is processed and stored. From this cloud, there are connections leading to the four different computing devices on the right: desktop computers, monitors, laptops, and smartphones. Each of these devices receives data from the cloud.

This Figure illustrated the concept of integrating IoT and cloud computing. Wireless sensors can be IP CCTV smart devices that can collect data and send it for processing in the cloud. A central router represents how a local network can connect multiple devices to the internet. The wide range of computing devices means that cloud services can be accessed

by various types of hardware, from traditional computers to mobile phones.

The relevance of this figure lies in how this technology has become an essential part of modern life, such as storing videos or photos online so they can be accessed anywhere for data analysis without the need for expensive local hardware.

In the context of environmental security, this technology enables real-time monitoring and rapid response to emergency situations. Cloud-connected CCTV IP camera sensors can detect suspicious activity and send notifications to different devices, enabling fast and effective action. In addition, data stored in the cloud can be accessed at any time and from anywhere, providing flexibility and efficiency in security management shows the great potential of the integration of IoT and cloud computing in various aspects of life, including security, operational efficiency, and ease of data access.

Training methods for using tools in the continued application of the Internet of Things (IoT) for Environmental Security Units (Satkamling) are also very important to ensure that the technology applied can function optimally and sustainably. This training aims to provide Satkamling members and residents with an in-depth understanding of how to use IoT devices, as well as how to utilize the resulting data to improve environmental security.

First, this training helps Satkamling members understand how IoT devices work, such as motion sensors, IoT-based CCTV cameras, and mobile applications used for monitoring. With a good understanding, they can operate devices properly, identify technical problems, and perform routine maintenance. This is important to ensure that the device is always in optimal condition and can provide accurate data.

Second, this training also covers how to integrate data from various devices into a central monitoring system. Satkamling members will be taught how to access and analyze data in real-time via the cloud3 platform. This capability allows them to make quick and informed decisions in emergency situations, as well as identify suspicious patterns that may indicate a security threat.

Apart from that, this training also aims to improve coordination between Satkamling members. With a shared understanding of how to use IoT technology, they can work more effectively as a team. For example, they can share information in real-time via mobile applications, so that each member can know the latest situation in the field and respond quickly if an incident occurs.

Training also covers data security aspects. Satkamling members will be taught about the importance of maintaining the confidentiality of data collected by IoT devices. They will learn how to secure data from unauthorized access and how to properly manage data for analysis and reporting purposes.

Apart from Satkamling members, this training also involved local residents. Educating citizens about the benefits and how to use IoT technology for environmental safety is very important. With good understanding, residents can actively participate in maintaining the security of their environment. For example, they can report suspicious events via mobile applications or assist in IoT device maintenance.

Overall, training in the use of tools in the continued application of IoT for Satkamling is a crucial step to ensure that the technology applied can function well and provide maximum benefits. With proper training, Satkamling members and residents can work together to create a safer and more comfortable environment.

IV. CONCLUSIONS

This article explains continuation of the previous year's activities which successfully implemented IoT for environmental security units in areas entering the RT 17 area. This year, the scope of the IoT application area for Satkamling was expanded. The urgency of this program lies in the need to improve environmental security and operational efficiency of the Satkamling. By integrating sensors and smart devices, the program aims to detect potential threats and provide rapid response to emergency situations. Apart from that, this program also automates routine tasks such as monitoring and reporting, thereby reducing the workload of Satkamling officers. This program also aims to increase public awareness about the benefits and ways to use IoT technology for security.

The methods used in this program include procurement of IoT devices that suit regional needs, installation and configuration of sensors at strategic points, integration of data from sensors into a central platform for further analysis and action, as well as training and outreach to residents and Satkamling officers. The expected outcomes of this program include a monitoring system that can monitor movements and situations in the Satkamling area in real-time, automatic emergency notifications to officers and residents, increased operational efficiency, and increased citizen understanding of the benefits and use of IoT technology for security.

Overall, the sustainable program for implementing IoT for Satkamling in the RT 17 RW 11 Padukuhan Karang Tengah, Nogotirto, Gamping, Sleman area, can increase the effectiveness and efficiency of the Satkamling program, as well as make a positive contribution to the security and comfort of the local community environment. This program can also become a model for the application of IoT technology in environmental protection in other regions.

REFERENCES.

[1]   Liu, H., Zhang, Y., & Li, Q. (2019). *IoT-based intelligent security monitoring and early warning system for smart community.* In

Proceedings of the 2019 International Conference on Electrical Engineering and Information Communication Technology (ICEEICT) (pp. 1-5)10. IEEE.

[2] P. P. Ray, "Internet of things for smart homes: Technologies, security, and challenges," *Journal of Ambient Intelligence and Humanized Computing*, vol. 8, no. 1, pp. 153-164, 2017

[3] Wijaya, et al., "IoT in environmental security systems: A case study in Padukuhan Karang Tengah, Sleman" *Journal Dharma Bhakti*, Vol 7, no.1, February, pp 8-15, 2023 .

[4] Han, X. Yang, S. Liu, Z. and X. Ma, "Internet of things (IoT)-based security technologies: A survey," *Sensors*, vol. 19, no. 9, p. 1965, 2019

[5] X. Ma, Y. Zhang, and Q. Li, "Community involvement in IoT-based security systems," *Journal of Community Technology*, vol. 12, no. 3, pp. 45-58, 2021.

[6] H. C. Lai and W. W. Wu, "Application of IoT technology in smart security system for smart home," *Journal of Information Processing Systems*, vol. 16, no. 5, pp. 1161-1176, 2020

[7] A. Al-Fuqaha, M. Guizani, M. Mohammadi, M. Aledhari, and M. Ayyash, "Internet of things: A survey on enabling technologies, protocols, and applications," *IEEE Communications Surveys & Tutorials*, vol. 17, no. 4, pp. 2347-2376, 2015

[8] I. Arif, A. M. Salim, T. Basaruddin, and A. B. Rachmat, "Implementation of IoT technology in the smart home environment for security and energy saving," *Journal of Physics: Conference Series*, vol. 1464, no. 1, p. 012010, 2020.

[9] J. Shanthini and S. Saravanan, "A review on IoT based smart security systems for smart homes," *International Journal of Innovative Technology and Exploring Engineering*, vol. 10, no. 8, pp. 1852-1857, 2021

[10] M. M. Rathore, A. Ahmad, A. Paul, and S. Rho, "Urban sensing: A review of recent trends and applications," *IEEE Communications Surveys & Tutorials*, vol. 18, no. 1, pp. 712-735, 2016

[11] J. Wan, Y. Cai, and K. Zhou, "Towards smart neighborhood via sensing technologies," *IEEE Communications Magazine*, vol. 53, no. 6, pp. 52-58, 2015

[12] M. Abdulaziz, A. Alghamdi, and N. Albukhary, "Internet of things (IoT) security issues and challenges: A review," in *Proceedings of the 3rd International Conference on Computer and Information Sciences (ICCIS)*, 2019, pp. 1-6.

[13] M. Bagheri and S. Zeadally, "Securing the internet of things," *Computer*, vol. 50, no. 6, pp. 38-46, 2017

[14] J. Gubbi, R. Buyya, S. Marusic, and M. Palaniswami, "Internet of things (IoT): A vision, architectural elements, and future directions," *Future Generation Computer Systems*, vol. 29, no. 7, pp. 1645-1660, 2013

[15] A. Kumar and P. Kumar, "Smart home security: An IoT-based approach," in *Proceedings of the 2019 5th International Conference on Computing Communication and Automation (ICCCA)*, 2019, pp. 1-5

[16] M. A. Razzaque, M. Milojevic-Jevric, A. Palade, and S. Clarke, "Middleware for internet of things: A survey," *IEEE Internet of Things Journal*, vol. 3, no. 1, pp. 70-95, 2016.