TELKOMNIKA, Vol.17, No.1, February 2019, pp.147~152
ISSN: 1693-6930, accredited First Grade by Kemenristekdikti, Decree No: 21/E/KPT/2018
DOI: 10.12928/TELKOMNIKA.v17i1.10245

The design of smart notification on android gadget for academic announcement

Agustina Heryati, Evi Yulianti, Faradillah, Dewi Sartika, Dhamayanti, Imelda Saluza, Ahmad Sanmorino*
Faculty of Computer Science, Universitas Indo Global Mandiri, Indonesia
*Corresponding author, e-mail: sanmorino@uigm.ac.id

Abstract

In this article, we try to design the architecture of a smart notification system using an Android gadget for academic notification in college. Academic notification in colleges now utilizes bulletin boards and online media such as websites or social media. The problem faced is the high cost and resources required to deliver the academic notification. Another problem is whether the information delivered can be right to the students who need it. We proposed the architecture of a smart notification system that can reduce the cost, and the information delivered can be right on target to the students in need.

Keywords: *academic, android, architecture, design, notification*

1. Introduction

Currently, academic information notifications in college are still using media boards, academic portals, and social media. The use of bulletin boards is still effective for small academic environments, such as in schools. With low cost, the academic information delivered can be directly accepted by the students, because the number of students in schools is still covered by the existence of bulletin boards that are usually placed near the school gate. So it can be seen and read easily by the student. But the effectiveness of bulletin boards in conveying information decreases with the increasing area and number of academic students. Other media used such as academic portals can cover a wider area, even unlimited as long as there is still an internet connection. Social media also has the same characteristics with the academic portal, but both academic portal and social media have a weakness that is not able to classify information based on the group of students who need the information. In other words, the information displayed is not necessarily required by all students or vice versa. The anticipation that can be done is to create several web pages or several groups of different social media. Grouping is formed based on the criteria of similarity of information required by the students in each group. But this is also less effective because the operator must manage some web pages or social media groups. Cause much time and cost needed to deliver academic information. The comparison of the performance of bulletin boards, academic portals and social media groups in conveying information, can be seen in Figure 1.

Based on the background we discussed earlier, we propose architecture of notification system that can overcome the limitations of bulletin boards, website portals, and social media. That can reach a large area and still can deliver academic information in accordance with the needs of students who receive it. Actually, the device used in the proposed architecture is already known and used by the public. The design of smart notification architecture that we proposed is believed to meet the needs of the college. Where the current trend in information notification is massive and can be done in a short time. The architecture that we propose also requires large bandwidth and high-speed Internet access. Thanks to the current technological developments, with 4G or even 4.5G internet connections, can meet the needs of data access speed by the notification system. For the operating system used on gadget device is not limited, but in this study, we use only Android OS, because Android OS has a very widely used market share. So for the operating system much more based on the needs and specifications of users.

For studies that utilize Android-based notifications have been done by several researchers with various goals and needs. Such as the use of notification systems for problems

Received June 7, 2018; Revised October 27, 2018; Accepted November 25, 2018

related to emergency warning [1-2], queuing-time notification systems that utilize data-sensing [3], personal activity monitoring [4] and personal security tracking [5]. Then there is also the use of notification systems in the health area [6-8], and those relating to moving objects [9-10]. This research is also related to the studies we have done before. In the previous study, we focused on the design of academic notification software. For this study, the focus of research lies in the design of academic notification system architecture. Some related research is the use of Android-based notification system to analyze wireless network services such as access speed and internet bandwidth [11]. Another very useful study is the use of an Android-based notification system to tell the safest and fastest route of the disaster area [12]. With so much research utilizing the Android-based notification system shows the current trend of technology usage. So we assess the research related to the use of notification system based on the Android gadget is still very relevant.

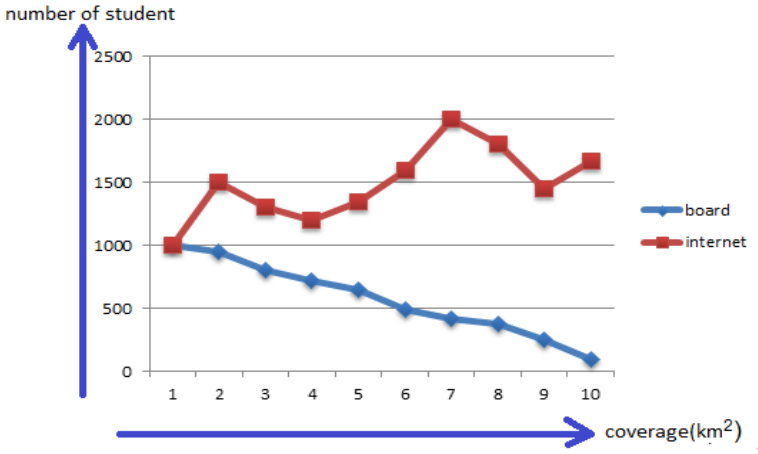

Figure 1. Current system performance in terms of coverage area and number of students

2. Research Method

In designing notification system architecture, we define the logical steps required to achieve the stated objectives. The steps needed to design the architecture of the academic notification system can be seen in Figure 2.

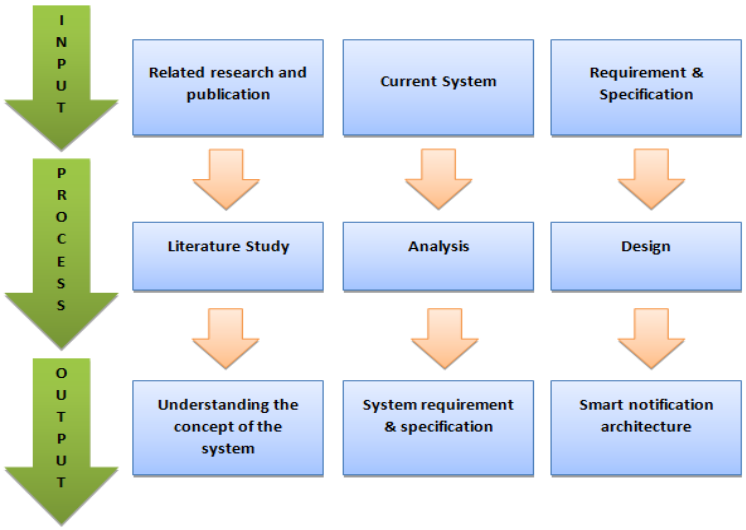

Figure 2. Research Mechanism

The initial phase of the research starts with finding and studying related research and publications that have been done by other researchers. By conducting a literature study, we gain an understanding of the condition of the research tool, the gap that can be an opportunity or get the weakness of the research that has been done before. Understanding of the current state becomes very important as the starting position of a research started. In order to gain understanding, excellence, weakness and research opportunities, a research mechanism is needed.

The analysis is a mechanism that must be done to gain an understanding of a condition or a system. The result of the analysis is in the form of requirement and specification of the architecture design notification system that will be developed. By looking at the requirements and specification system, researchers can begin to design the system architecture, starting from basic architecture to final architecture ready to use. The addition of features and maintenance process can be done continuously, in accordance with the needs of the system and end-users.

3. Proposed Design

The main problem faced by the service provider of academic information notification in college is whether the academic information sent can reach the students who need it or vice versa? The accuracy of the delivery of academic information to students who need it is strongly influenced by the media used by notification service providers in the college. To overcome these problems, while maintaining the coverage that can be covered which impact on the time and cost required, we try to make the basic architecture of academic notification system. To design the architecture of academic notification system requires an understanding of the device or the component of academic notification system architecture. The components of the basic architecture of academic notification system are as Table 1.

Table 1. Basic Architecture Components

Components	Function
App back-end	The back-end app is usually a database contained on a college server. Controlled and monitored by college admins and operators, can send and manage academic notification systems, have authorize to view, add or remove students.
Cloud (Internet)	An operator that provides service notification system, in accordance with the operating system used by the student. One of them is Firebase Cloud Messaging [13]. Receive a notification registration service and forward it to the back-end app.
Mobile Device Platform	The device used to broadcast academic notification.
Android Gadget	The device used to receive academic notification messages sent by the operator.

After knowing and understanding the required components, we started to design the basic architecture of the academic notification system. So based on the design results obtained basic architecture as in Figure 3, basic architecture consists of back-end apps in the form of databases, mobile device platforms, the cloud or Internet, and Android-gadgets, such as smartphones, smart-glass, tablet pc, netbook or smartwatch.

The flow of academic notification services that contained in the basic architecture, first, students register academic notification service through gadget device to notification service provider (cloud). Notification service here is still general. Then, notification service providers forward it to the back-end server, for approval and added to the academic notification system database in the college. Student data storage is based on unique ID, which differentiates it from other students. After the storage process is complete, the back-end app continues to forward the service confirmation through the notification service provider. To send notification of confirmation and academic information, notification service providers use the Mobile Device Platform. Mobile Device Platform sends academic confirmation and notification messages to students. So if there are many students who do the registration at the same time, confirmation messages can be broadcast simultaneously. Students receive confirmation messages, to obtain academic information notification service.

Basic architecture can be used for system notification with a small number of gadget devices because the basic architecture has some limitations to accommodate a large number of gadget devices. Some conditions that must be fulfilled is the gadget device must be homogeneous, because if there are several different types of devices, then the notification

message delivery should be done in several times, and this is not effective. Need much time and effort just to send an academic notification message. Basic architecture design is needed as a first step to making better architecture, in other words, to make system integrated, we have to make smaller subsystem first [14]. To overcome the limitations of basic architecture, we try to propose better architectural designs by involving some additional components, as shown in Figure 4. On the one hand, the addition of components will add to the costs incurred, but efficient when used to broadcast academic notification messages.

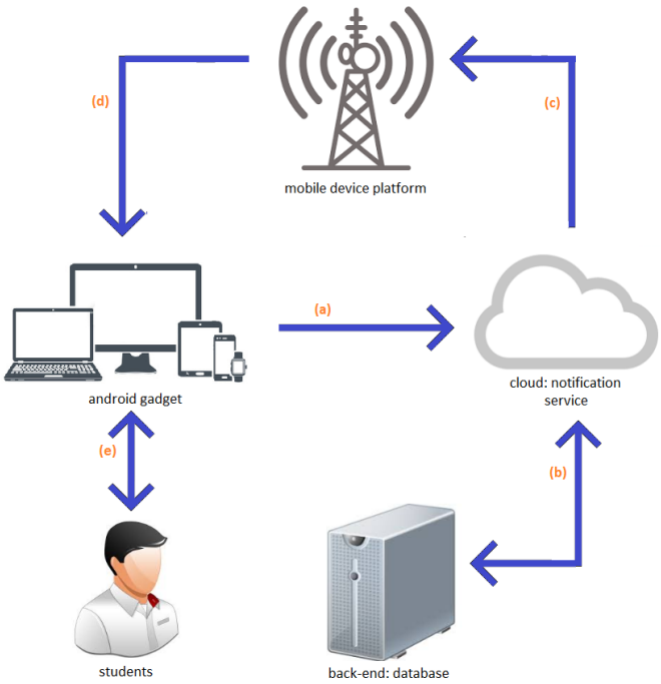

Figure 3. Basic architecture

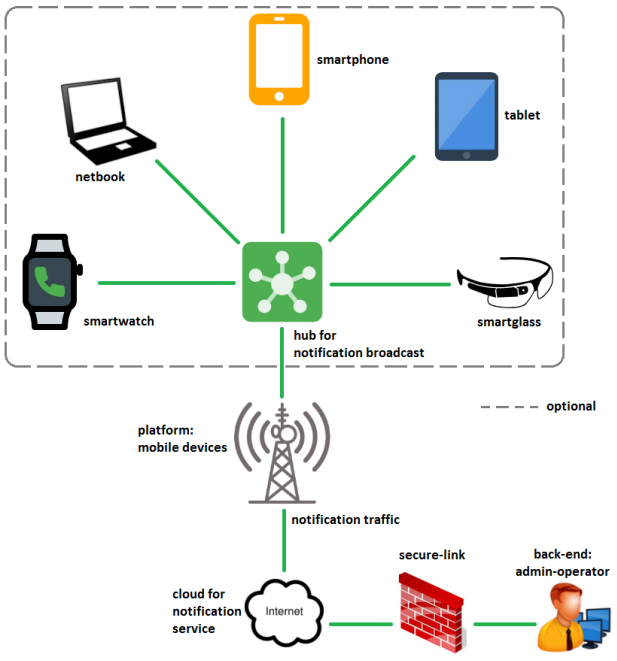

Figure 4. The advanced architecture

There are additional components in the advanced architecture design, with the following functions as shown in Table 2. However, the presence of hubs and connected gadget devices can be optional, depending on the needs and conditions in the college. For a college with a very large number of students, then the use of hubs will be very helpful. But for colleges that have few students with homogeneous gadget devices, the use of hubs can be waste. As more and more devices are connected, the greater the operational costs required for maintenance.

Table 2. Advanced Architecture Components

Components	Function
Secure-link	Secure-Link ensures data traffic contain legitimate information. Not from a third party who spreads hoaxes, advertisements, or spam. Because the Internet is a realm where there is always a gap for criminal action, therefore secure-links must always be active. Secure-link may be a firewall or other security methods that can detect non-legitimate information, as we did in our previous research [15].
Hub	When the operating system of connected devices does not come from a single vendor it needs a hub as a medium that can translate notification messages from mobile platforms. So notification messages can be recognized by various connected devices. Because usually in a college, the students use gadget devices from various vendors. Without a hub, it takes one mobile platform for one type of gadget device, if there are 5 types of gadget devices, then it takes 5 different types of mobile platforms, and this becomes ineffective. The existence of hubs in advanced architecture can overcome the limitations of existing mobile platform devices.

4. Results and Discussion

Next, we perform a simple calculation simulation to find out the proposed architectural design performance, the result is as shown in Figure 5.

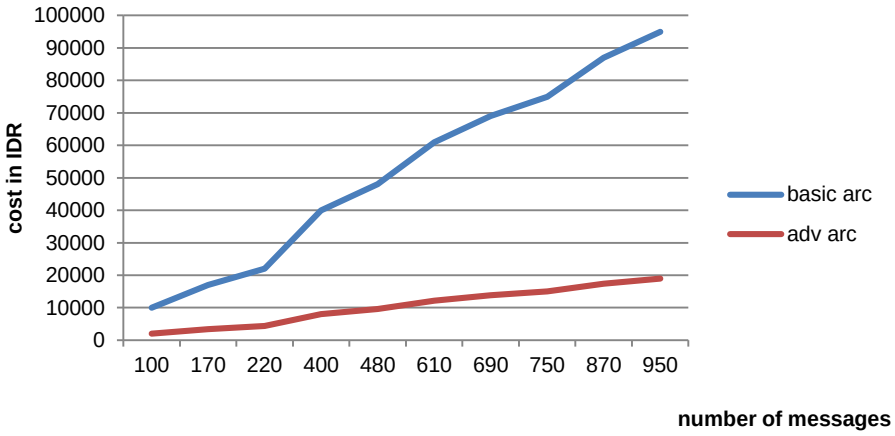

Figure 5. 10-fold calculating

We simulate the performance of the notification system architecture based on the cost required to perform a single broadcast for a notification message. The calculation is done as much as 10-*fold* for the relevant result, by choosing the value of each variable at random. Variables used in the calculation are the number of gadget, number of messages, and cost per message. The calculation results show the total cost required to perform a one-time delivery of academic notification messages on advanced architecture more efficient than basic architecture. As the number of gadget with different types of gadgets increases, the proposed architecture can still reduce the costs required to broadcast the academic notification message.

We use values for variables that are randomly selected for each test. As in the first to 10th simulation, with the increase in the notification message sent to student accompanied by soaring cost per message, the design that we submit can still maintain the total cost at the minimum level. As in the 3rd simulation with 220 messages, the cost needed to broadcast is less than ten thousand IDR. Another example in the 8th simulation the same thing happened, with 750 message submissions, the architecture that we proposed can still reduce the cost as low as possible. On the contrary, basic architecture has greater complexity. This can be seen from the

4th to 10th simulations, there is a surge in costs incurred for sending academic messages. Whereas in the initial conditions of the simulation, the difference in costs not too far. But along with the increasing number of messages sent, the greater the difference in the costs incurred.

4. Conclusion

Based on the simulation testing that has been done, the system notification architecture proposed can meet the needs of sending notification messages in massive number with low cost. By maintaining the originality of notification messages sent and can serve several different types of gadget devices. We realize that to be able to implement the architecture that has been proposed still requires more in-depth research. Because several external factors that have influence, have not been used in this study.

Acknowledgment

This work is supported by the Ministry of Research, Technology and Higher Education of the Republic of Indonesia.

References

[1] Ghazal M, Ali S, Halabi M A, Ali N, Khalil Y A. *Smart mobile-based emergency management and notification system*. 2016 IEEE 4th International Conference on Future Internet of Things and Cloud Workshops (FiCloudW). 2016: 282-287.
[2] Wibisono W, Arifin D N, Pratomo B A, Ahmad T, Royyana M I. *Fall detection and notification system using tri-axial accelerometer and gyroscope sensors of a smartphone*. 2013 Conference on Technologies and Applications of Artificial Intelligence. 2013: 382-385.
[3] Wang Y, Wang J, Zhang X. *QTime: a queuing-time notification system based on participatory sensing data*. Proceedings of the 37th Annual Computer Software and Applications Conference. 2013: 770-777.
[4] Oh H, Jalali L, Jain R. *An intelligent notification system using context from real-time personal activity monitoring*. 2015 IEEE International Conference on Multimedia and Expo (ICME). Turin. 2015.
[5] Ronald A, Yesmaya V, Danaparamita M. Personal Security tracking based on Android and Web Application. *TELKOMNIKA Telecommunication Computing Electronics and Control*, 2018; 16(2).
[6] Panjaitan S D, Fratama N, Hartoyo A, Kurnianto R. Telemonitoring Temperature and Humidity at Bio-energy Process using Smart Phones. *TELKOMNIKA Telecommunication Computing Electronics and Control*. 2016; 14(2): 762-771.
[7] Riadi I, Winiarti S, Yuliansyah H. *Development and evaluation of android based notification system to determine patient's medicine for pharmaceutical clinic*. 2017 4th International Conference on Electrical Engineering, Computer Science and Informatics (EECSI). Yogyakarta. 2017.
[8] Islam M, et al.. *Android based heart rate monitoring and automatic notification system*. 2017 IEEE Region 10 Humanitarian Technology Conference (R10-HTC). Dhaka. 2017.
[9] Hussin M A M, Zaini N. *Android-Based motorcycle safety notification system*. 2017 IEEE Conference on Systems, Process and Control (ICSPC). Malacca. 2017.
[10] Rokhman N, Saifuddin L. *Location and time based reminder system on Android mobile device*. 2016 2nd International Conference on Science in Information Technology (ICSITech). Balikpapan. 2016.
[11] Ji Z, Ganchev I, O'Droma M, Zhao Q. *A Push-Notification Service for Use in the UCWW*. International Conference on Cyber-Enabled Distributed Computing and Knowledge Discovery (CyberC). 2014: 318-322.
[12] Sikder Md F, Halder S, Hasan T, Uddin Md J, Baowaly M K. *Smart disaster notification system*. Advances in Electrical Engineering (ICAEE), 2017 4th International Conference. Dhaka. 2017.
[13] Shukla A, Hedaoo D, Chandak M B, Prakashe V, Raipurkar A. *A novel approach: Cloud-based real-time electronic notice board.* 2017 International Conference on Smart Technologies for Smart Nation (SmartTechCon). Bangalore. 2017.
[14] Sanmorino A, Isabella. *The design a system of retention and control on broiler farms based on the flow of data*. 2017 4th International Conference on Electrical Engineering, Computer Science and Informatics (EECSI). Yogyakarta. 2017.
[15] Sanmorino A, Gustriansyah R. An alternative solution to handle ddos attacks. *Journal of Theoretical and Applied Information Technology*. 2018; 96(3).