Middleware Development to Connect Telegram Messenger and Instant Messenger for the Elderly

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Abstract. For the elderly, instant messengers can be a media for them to interact with other people so that they don’t feel lonely. However, the elderly often find it difficult to interact with big instant messengers such as LINE, Whatsapp and Telegram, which is why an instant messenger designed specifically for the elderly is needed. Unfortunately, there are several limitations in which the messages can only be exchanged within the same instant messenger. To tackle this problem, a middleware that will be used to connect this instant messaging for the elderly with Telegram messenger. The middleware is developed with API and Webhook method. Other than that, Telegram bot is used so that messages can be sent out from Telegram. Through the testing done, the middleware developed has successfully sent out messages from Telegram to the instant messenger for elderly and vice versa.

1. Introduction
There are many things that change as people grow older [1]. For the elderly, one of the changes that happened is how they aren’t able to interact with other people as much as they used to, which may result in loneliness. Studies have concluded that social isolation is often associated with an increased risk of death [2]. This shows the importance of social interaction for the elderly. The availability of instant messaging applications may help the isolated elders interact with other people by exchanging messages, either with their family or other people. However, due to their physical and cognitive limitations, the elders often find it hard to interact with common instant messengers such as Whatsapp, LINE, and Telegram, which is why an instant messenger designed specifically for the elders is needed. Unfortunately, users can only exchange messages within the same instant messenger [3]. This limitation is a huge factor on why bigger instant messengers are more appealing to the users [4]. The younger generation would prefer to use popular messengers such as LINE, Whatsapp or Telegram. This will limit the users’ interaction only to those who are using the same instant messenger.

Based on the problems explained above, a solution is needed to create an instant messenger that is not only easy to use, especially for the elders, but can also be used to connect with users who are using different instant messengers. The writers proposed a solution by creating a middleware which is able to connect the messaging application the writers specifically develop for the elderly with various other instant messengers. This study is a part of a bigger study where the best interface for the elders and middleware to connect the instant messenger made for the elders to other instant messengers will be developed too. However, this paper will focus only on the development of middleware to connect the
developed instant messenger for the elders and Telegram and dummy interface is used. The middleware is developed with API and Webhook method. Other than that, Telegram bot is used so that messages can be sent out from Telegram. Through the testing done, the middleware developed has successfully sent out messages from Telegram to the instant messenger for elderly and vice versa.

2. Related Work

Prior to the system development, the authors conducted a review to the research with focus on API or webhook. On one research [5] a mobile instant messenger with Microsoft Translator, an automatic translator is made. API is used on the instant messenger to integrate messages on Microsoft Translator. On another research [6] Dropbox API is used as a tool to exchange messages between two databases. The author stated that by using Dropbox API, Public IP is no longer needed in order to exchange data between databases. The next research [7] explains the use of LINE bot to exchange messages between Telegram and XMPP. Webhook and API are used to send messages between chat bots. However the test result shows several system problems. The test result shows that the system has weaknesses that it is very possible that message delivery failures occur because of large amounts of requests, and large database growth can quickly result in full storage space. The same method is also used in this study [8], which uses Telegram bot to share campus information. Researchers stated that webhook is able to give zero latency in handling many requests at the same time. Another study [9] compares long polling and webhook methods on Telegram bot. This study found that the webhook method performs three times better than the long polling method. Another study [10] also compares long polling and webhook method performance, focusing on their speed and character length of the messages. The test result shows that webhook requires shorter time than long polling, and shorter message results in shorter response time. Based on these previous studies, this study will focus on using API and webhook to connect Telegram and the instant messenger for elderly. API is used on the Telegram side, while webhook is used on Telegram bot as an intermediary. Furthermore, in order to handle the problem found [7], data removal on the database will be done periodically.

3. Design System

3.1. Design System
Figure 1 illustrates the system’s design. Middleware acts as an intermediary between the instant messenger which sends messages from Telegram to the instant messenger for elderly and vice versa. Webhook method is used on the Telegram Bot to forward messages to the middleware and from the middleware to the instant messenger for elderly while API is used to forward messages from the instant messenger for elderly to the Telegram bot.

3.2. API Design
The API created for this study is designed for three different types of client, Telegram Bot Admin, Telegram Bot User, and instant messenger for elderly. Telegram Bot Admin’s API Client is used to set connection between the corresponding Telegram account and the middleware. Telegram Bot User’s API Client is used to send out messages to the instant messenger for elderly, instant messenger for elderly’s API Client is used to send out messages to Telegram Bot User. The API created on the middleware functions as an intermediary between the Telegram with the instant messenger for elderly is listed below.

| Metode   | URI                                      | Keterangan                                                                 |
|----------|------------------------------------------|-----------------------------------------------------------------------------|
| POST     | /TelegramBotAdmin                        | Webhook for Telegram Bot Admin’s client                                    |
| POST     | /TelegramBotUser/<token>                 | Webhook for Telegram Bot Admin’s client                                    |
| GET      | /<token>/sendMessage                     | API Client for instant messenger for elderly, used to forward messages to Telegram |
| GET      | /<token>/getTelegramUserInfo             | API Client for instant messenger for elderly, used to retrieve information from corresponding Telegram account |

3.3. Telegram Bot Commands Design
Commands that are used in this study are specifically designed for two types of client, Telegram Bot Admin, and Telegram Bot User. The commands designed are listed below.

| Bot                  | Command | Fungsi                                                                 |
|----------------------|---------|------------------------------------------------------------------------|
| Telegram Bot Admin   | /help   | To provide information about the bot’s functions and how to use them.  |
| Telegram Bot Admin   | /addBot | To register a Telegram account so that the middleware can be used, by adding the bot’s token created before. Telegram Bot will then be added as Telegram Bot User Client |
| Telegram Bot User    | /help   | To provide information about bot’s functions and how to use them       |
| Telegram Bot User    | /getOTP | To generate OTP that will be used to set connection between corresponding Telegram account and instant messenger for elderly |
| Telegram Bot User    | /getKontak | To show the corresponding account from the connected instant messenger for elderly. |
| Telegram Bot User    | /setGroupAs | To create a bot to forward messages from corresponding instant messenger for elderly’s account. |
3.4. Database Design
The database used in the middleware to connect Telegram and the instant messenger for elderly is made using MySQL.

![Entity Relationship Diagram (ERD)](image)

**Figure 2.** Entity Relationship Diagram (ERD)

4. Result and Discussion
Before the middleware can be used to exchange messages between Telegram and the instant messenger for elderly, both accounts should be added as contacts first. On the Telegram side, the group chatting feature will be used to replace contact, as illustrated in Figure 4. There are three groups on Telegram that represent three accounts on the instant messenger for elderly. The usage of group as contact is done with the intention that the saving of more than one contact through the instant messenger for elderly on Telegram is possible. Every dedicated group will consist of only two members, the Telegram account and the Telegram bot. The Telegram bot will show messages from the corresponding account, and receives messages to then be forwarded by the middleware. After the contact has been made successfully, message exchange can be done between Telegram and the instant messenger for elderly. Figure 5 shows Telegram group modeling steps to become contacts on the instant messenger for elderly.

![Illustration of group usage as contact replacement](image)

**Figure 3.** Illustration of group usage as contact replacement

Simple testing is done to measure the text messages exchanged between the two instant messengers. This test is done to make sure that the developed system runs well, by making sure that the messages sent have the same length as the messages received. The test result is presented on table 3. Information
obtained from Telegram bot API documentation that the maximum character length that Telegram can store is 4096 characters. If the length exceeds 4096 characters, the rest of the characters will be sent on the next message. However, messages sent from the instant messenger for elderly cannot be forwarded to Telegram if the length of the character is more than 4096 characters.

| Telegram | Instant Messenger For Elderly |
|----------|-------------------------------|
| START    |                               |
| Type /get@bot command on the Telegram bot | Adding contact by scanning the QR Code |
| Telegram bot sends a QR Code | Contact is added to the modified sharing application’s database |
| Create a new group |                               |
| Add the Telegram bot as a member in the group |                               |
| Type /setGroupAs command on the group |                               |
| Telegram bot sends list of contacts that can be added |                               |
| Chose one contact |                               |
| Telegram bot invites group to the corresponding account |                               |
| END       |                               |

**Figure 4. Add Contact Flowchart**

5. **Summary**
The middleware has successfully sent out simple messages on different instant messenger with a maximum number of characters that can be sent in one message is 4096 characters. However, currently the middleware can only send out text messages. By using the webhook method and flexible API, sending messages other than text messages is very possible, and will be done in future works. Other than that, message storing features will be developed, so that unsent messages can be saved on the middleware’s database, and to avoid the problems found on this study [7], messages that have been delivered successfully will be deleted.
Figure 5. Message exchange from Telegram

Figure 6. Message exchange from instant messenger for elderly

Table 3. Test Result

| Character Length | From Telegram Bot | From instant messenger for elderly |
|------------------|-------------------|-------------------------------------|
| 100 v            | v                 | v                                   |
| 500 v            | v                 | v                                   |
| 1000 v           | v                 | v                                   |
| 2000 v           | v                 | v                                   |
| 3000 v           | v                 | v                                   |
| 4096 v           | v                 | v                                   |
| 4097 x           | x                 | x                                   |

References

[1] Restyandito, Zebua J A and Nugraha K A 2019 Perancangan ikon pada aplikasi kesehatan untuk lansia berbasis mobile Jurnal Teknologi Informasi dan Ilmu Komputer (JTIIK) vol 6 no 6 pp 637–44

[2] Perissinotto C M, Cenzer I S and Covinsky K E 2012 Loneliness in older persons a predictor of functional decline and death Arch. Intern. Med. vol 172 no 14 pp 1078–83

[3] Restyandito, Kurniawan E and Widagdo T M 2019 Mobile application menu design for elderly in indonesia with cognitive consideration J. of Phys.: Conf. Ser. 1196 012058

References
[4] Essays 2018 How Did Whatsapp Become Popular? Retrieved on November 2018 from https://www.ukessays.com/essays/technology/whatsapp-user-growth-8352.php?vref=1

[5] Musyafi F and Afrianto I 2015 Membangun aplikasi chatting dengan penerjemah otomatis berbasis mobile Jurnal Ilmiah Komputer Dan Informatika vol 4 no 2 pp 79–84

[6] Hanafi A, Sukarsa M and Wiranatha A K A C 2017 Pertukaran data antar database dengan menggunakan teknologi API LONTAR KOMPUTE vol 8 no 1 pp 22–30

[7] Sukarsa I M and Buana P W 2019 LINE Messenger as a transport layer to distribute messages to partner instant messaging Int. J. of Modern Education and Computer Sci. vol 11 no 3 pp 1–9

[8] Setiaji H and Paputungan I V 2018 Design of telegram bots for campus information sharing Conf. Ser.: Mater. Sci. Eng. 325 012005

[9] Kavats E A and Kostenko A A 2019 Analysis of connection methods of telegram robots with server part System Technologies vol 3 no 122 pp 19–24

[10] Soeroso H, Arfianto A Z, Mayangsari N E and Taali M 2017 Penggunaan bot telegram sebagai announcement system pada intansi pendidikan Seminar MASTER vol 1 p 2