

# 행정업무 자동화 챗봇 개발 및 성능 향상에 관한 연구

---

Yoonkyo Jung

Assistant Professor

Dept. of Computer Science, Republic of Korea Air Force Academy

# Contents

---

- Introduction
- Chatbot Development
- Performance Improvement
- Conclusion

# Introduction

---

# Motivation

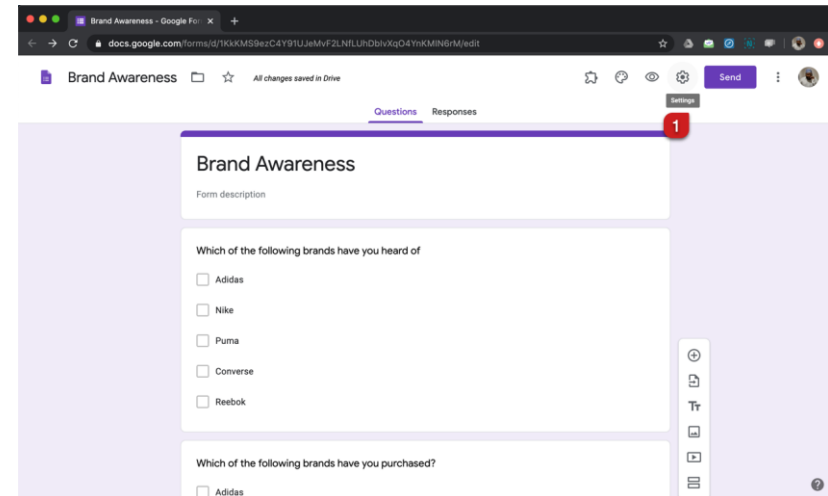
- Many office workers spend a lot of time performing repetitive office tasks
  - They perform the tasks in efficient ways
  - e.g. choosing T-shirt size color, group bus, vote...



	A	B	C	D	E	F
1	이름	사이즈	이니셜	학번		
2	김민지	XS	minji.K	15		
3	배수진	XS	Sujin.B	15		
4	박다연	XS	B.Dayeon	15		XS 85: 3명
5	이미연	S	L.miyeon	15		S 90: 2명
6	김찬수	S	Chansu.K	14		M 95: 1명
7	박보미	M	bomi.B	14		L 100: 2명
8	차민수	L	Minsu.C	15		
9	금만기	L	K.Manki	15		총 8명

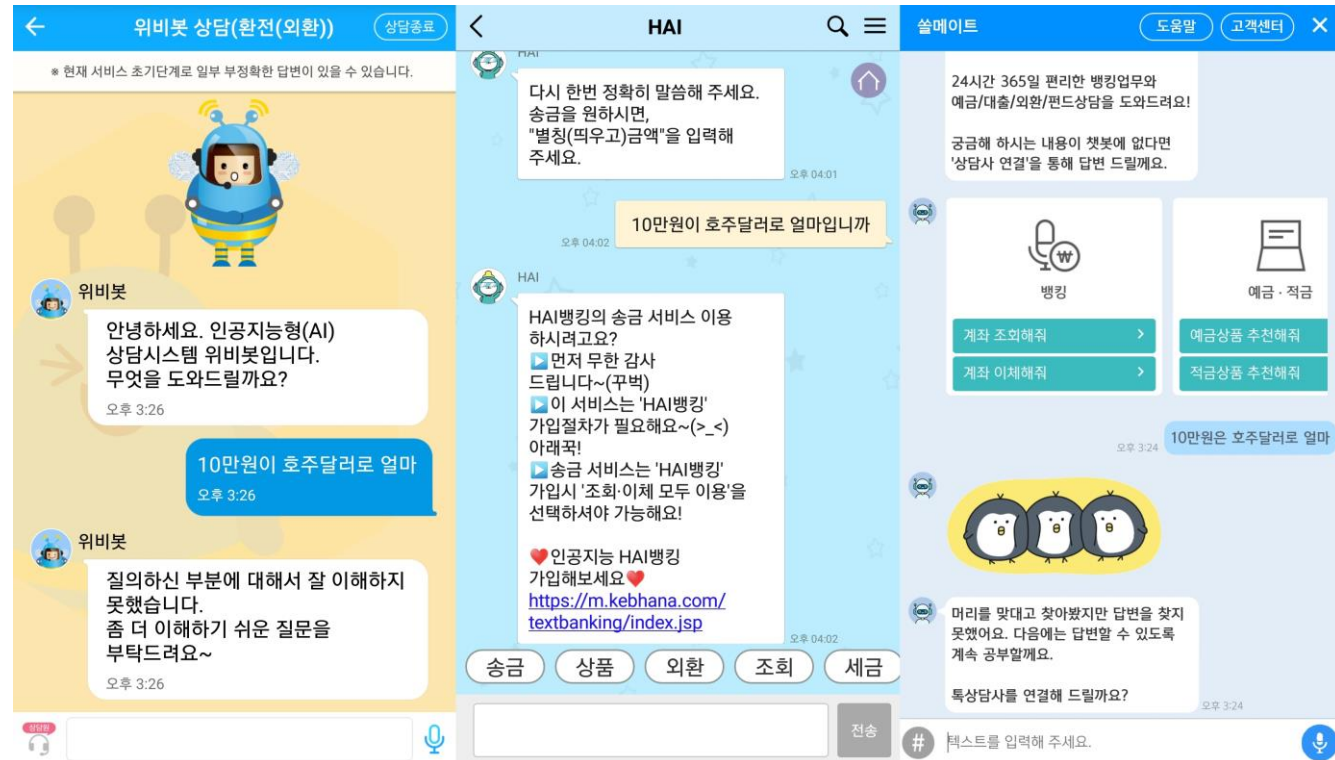
# Existing Solutions

- Online bulletin board
  - It cannot guarantee user privacy
- Google form
  - The survey data saved to the external database
- Kakaotalk Survey
  - It cannot guarantee user privacy
  - Anonymous survey has many limits



# Chatbot System

- Chatbot simulates human-like conversations with users via text messages



# Chatbot System

---

- We develop user-friendly chatbot system for handling repetitive tasks
  - Kakaotalk
  - Kakao i Open Builder
- We operate the system in the real workplace and improved performance



# Chatbot Development

---



# System Design

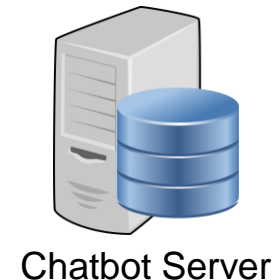
- Chatbot System Design



# Chatbot Development

---

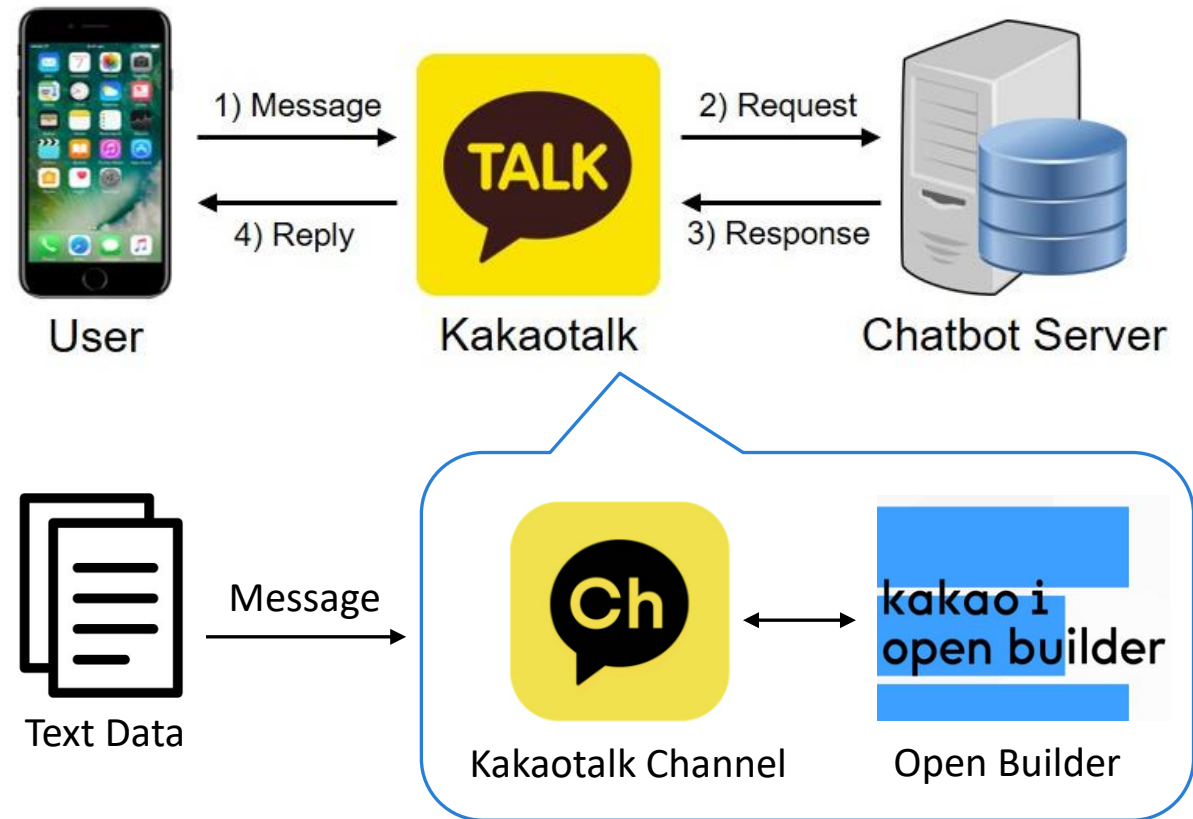
- Kakao i Open Builder provides only chatbot service
  - We make chatbot server for managing data



- We aimed to improve request time and total request per second(TPS) when many users simultaneously use the service
  - if the server does not respond within the time, it is considered no response to the request
- We operate the initial chatbot system in the real workplace
  - About 800 users, 6 months

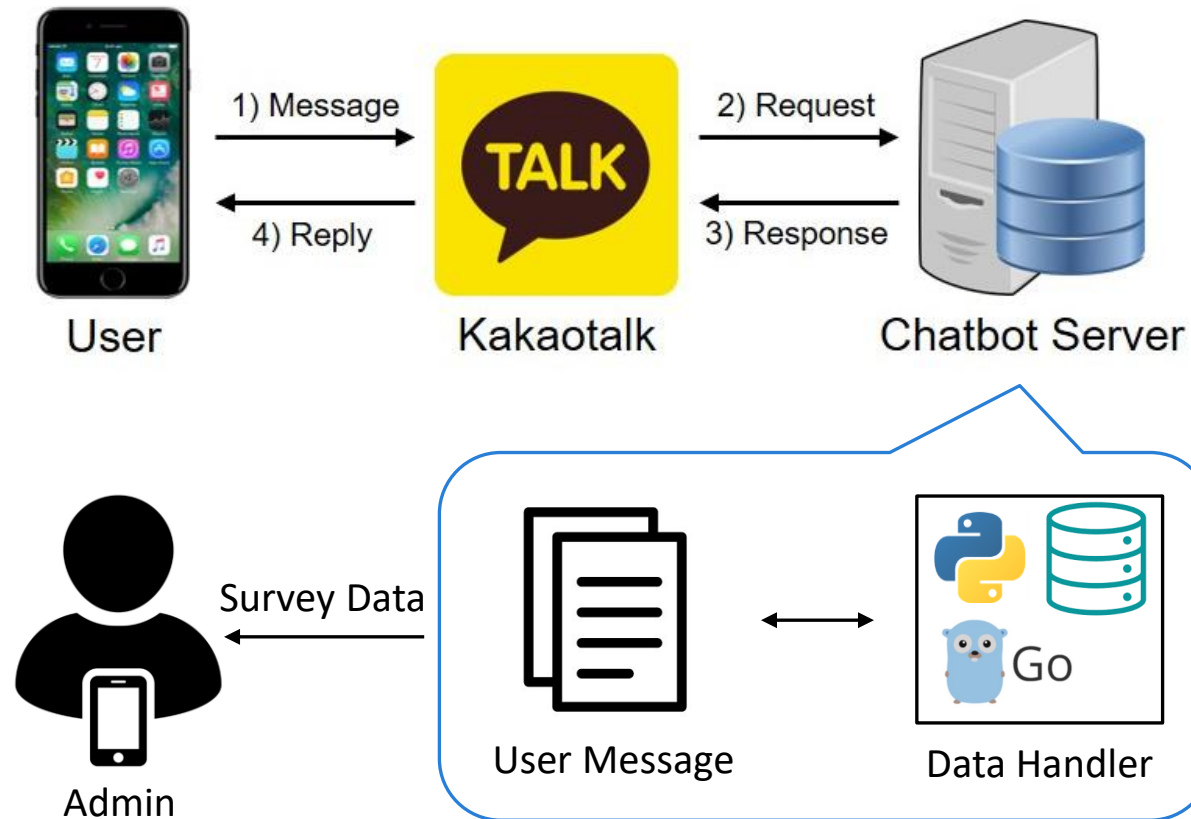
# System Design

- Kakaotalk



# System Design

- Chatbot Server



# Requirement

---

- Function Requirement

Index	Requirement
1	Chatbot has to identify user's name and authority.
2	Users have to be allowed to participate, check and cancel survey.
3	Administrator has to be allowed to make, check and delete survey.
4	Administrator has to be allowed to download csv file that contains results of survey.

# Requirement

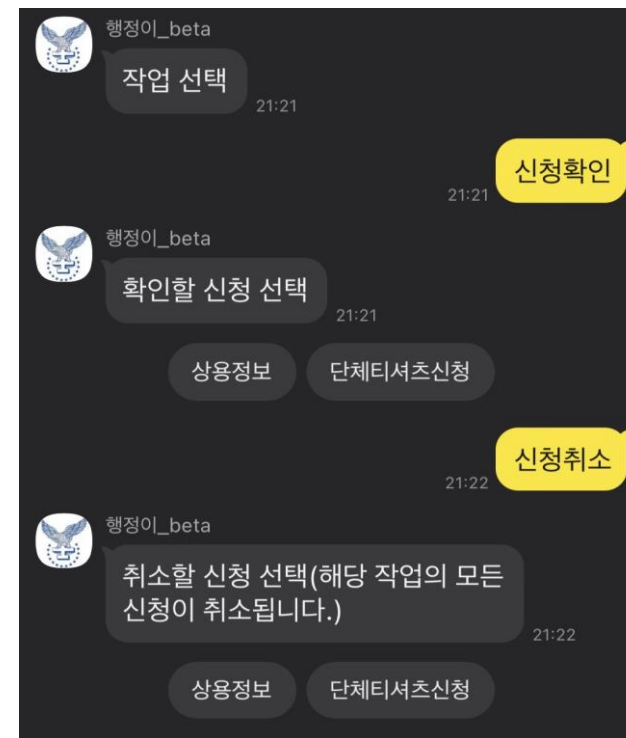
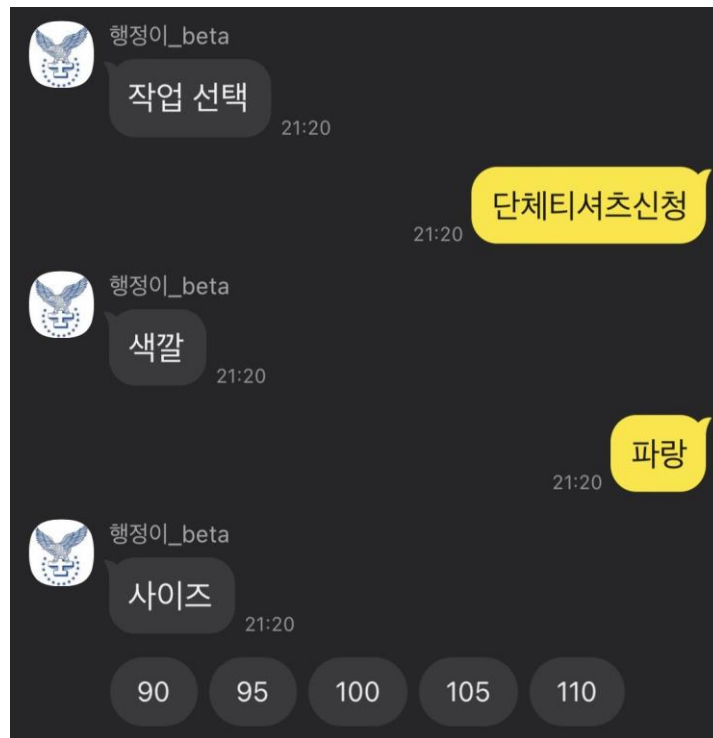
---

- Performance Requirement

Index	Requirement
1	Chatbot has to reply all request at least 100 per second.
2	Chatbot has to reply all request at least in 1 second under situation of 100 concurrent users.

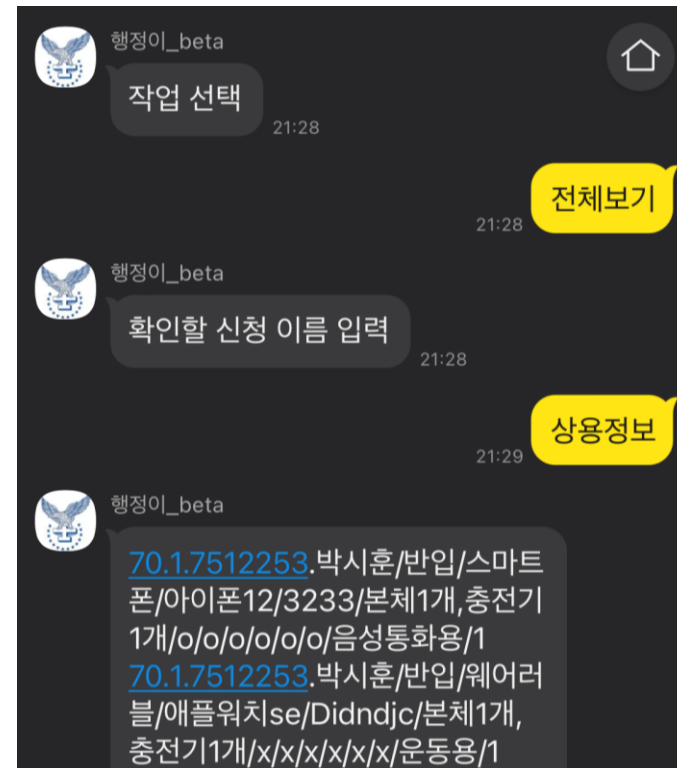
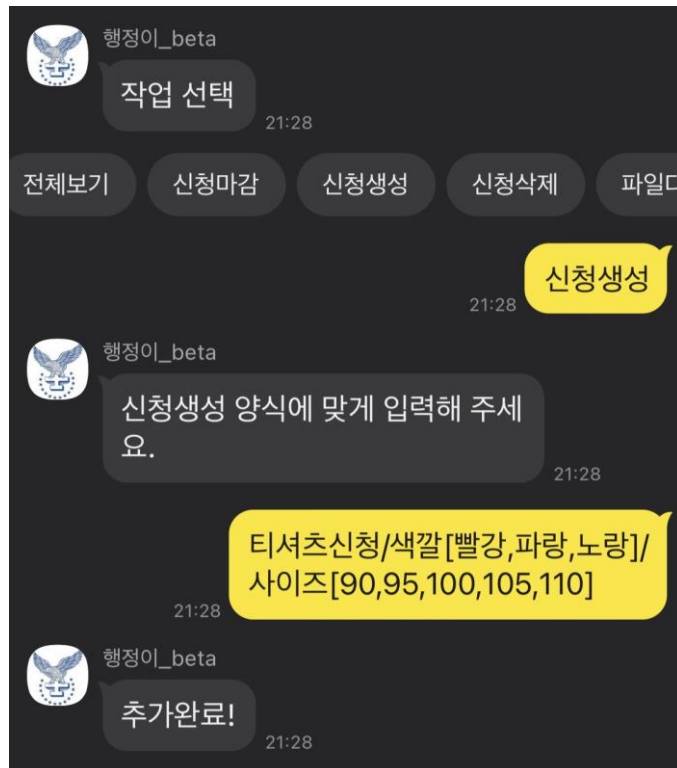
# Chatbot Function

- Users can participate, check and cancel survey



# Chatbot Function

- Administrator can make, check and delete survey
  - Administrator has to be allowed to download csv file that contains results of survey





# Request Message (Json)

```
"userRequest": {
  "block": {
    "id": "<블록 id>",
    "name": "<블록 이름>"
  },
  "user": {
    "id": "<사용자 botUserKey>",
    "type": "botUserKey",
    "properties": {
      "botUserKey": "<사용자 botUserKey>",
    }
  },
  "utterance": "<사용자 발화>",
  "params": {
    "surface": "BuilderBotTest",
    "ignoreMe": "true"
  },
  "lang": "kr",
  "timezone": "Asia/Seoul"
},
"contexts": []
```

```
{
  "version": "2.0",
  "template": {
    "outputs": [
      {
        "simpleText": {
          "text": "간단한 텍스트 요소입니다."
        }
      }
    ]
  }
}

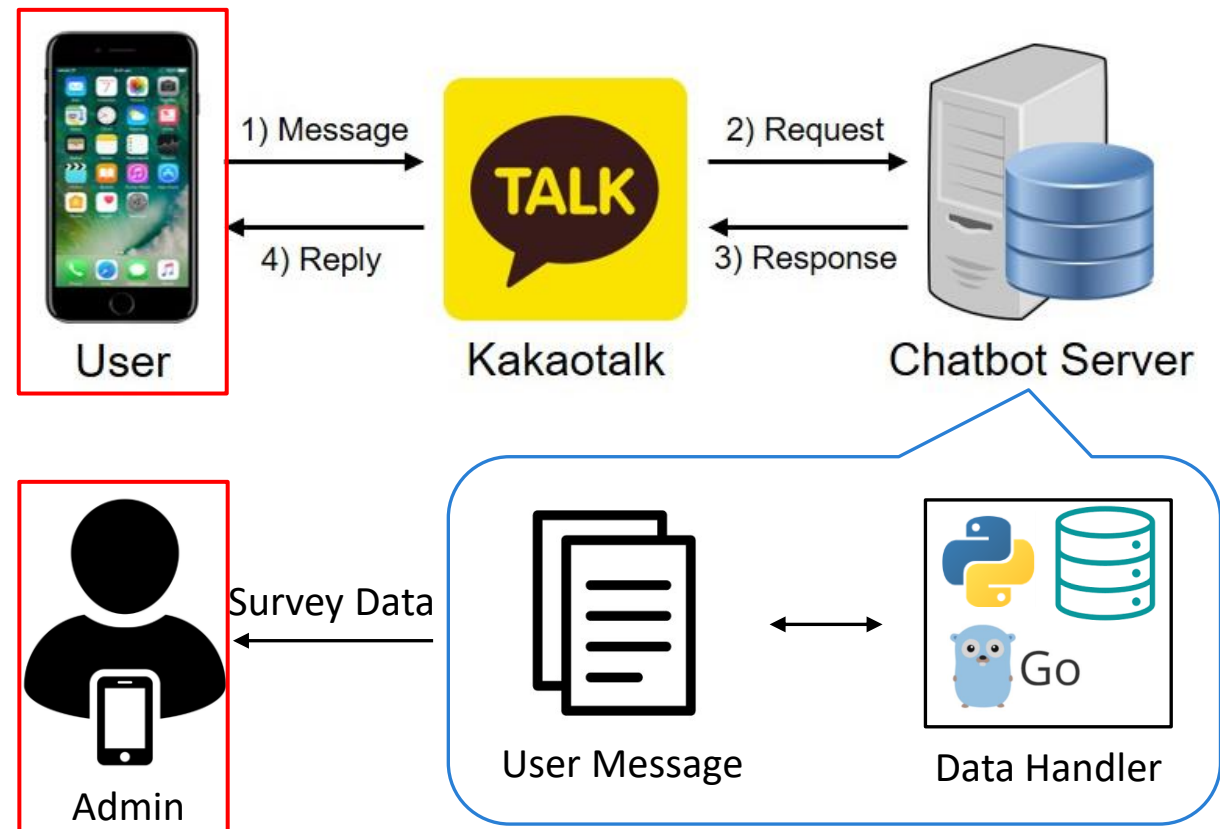
{
  "version": "2.0",
  "template": {
    "outputs": [
      {
        "simpleImage": {
          "imageUrl": "http://k.kakaocdn.net/dn/
          "altText": "보물상자입니다"
        }
      }
    ]
  }
}
```

# Performance Improvement

---

# Experiment

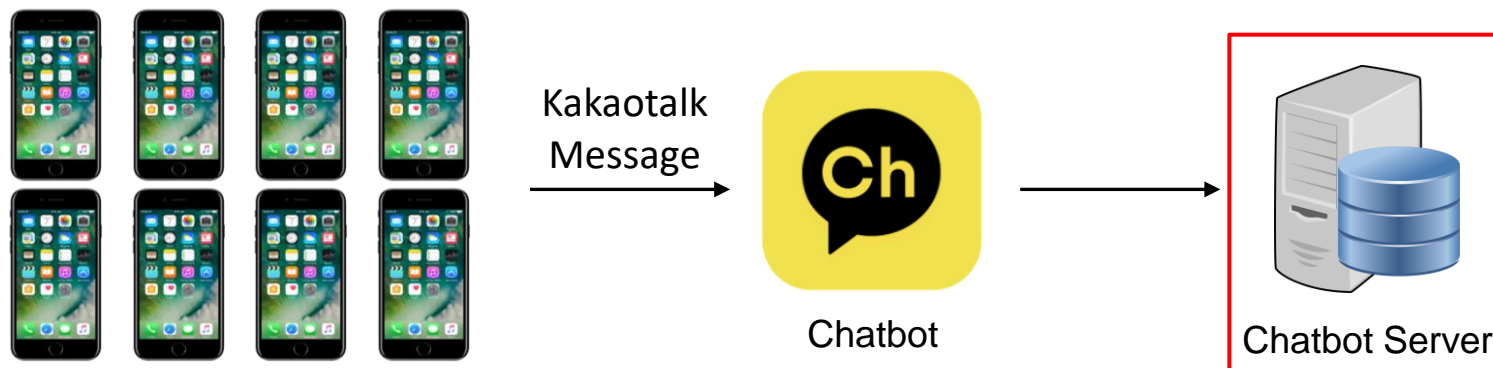
- We used the initial chatbot system in the real workplace
  - About 800 users, 6 months
- We monitored potential issue while using the chatbot system
  - User complaint
  - Admin complaint



# Issues

---

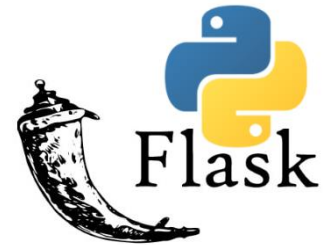
- Chatbot has error when users input incorrect message(empty text, form error)
  - We solved this problem by adding the function to check the user's response first
- Chatbot Server stop due to overload when concurrent users increased
  - We improve it by analyzing the cause of server performance degradation



# Performance Development

---

- Code migration
  - Python3 & Flask vs Golang & net/http



- Database design
  - Excel vs SQLite3

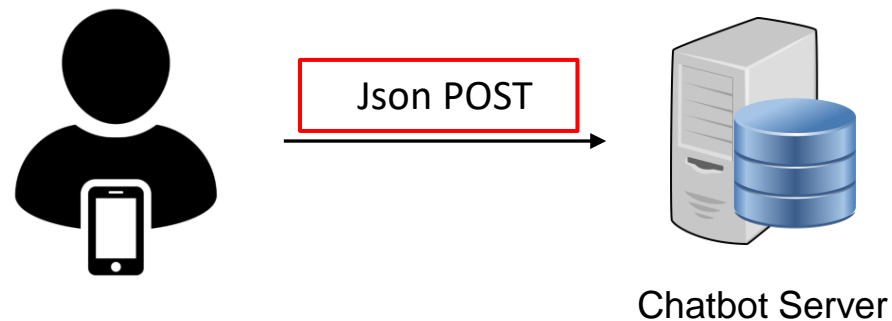


- Load Balancing

# Performance Analysis

---

- We measured response time and total request per second(TPS), repeatedly sending Json POSTs in the same form as request format to the backend server
  - We used Python Locust, open source load testing tool

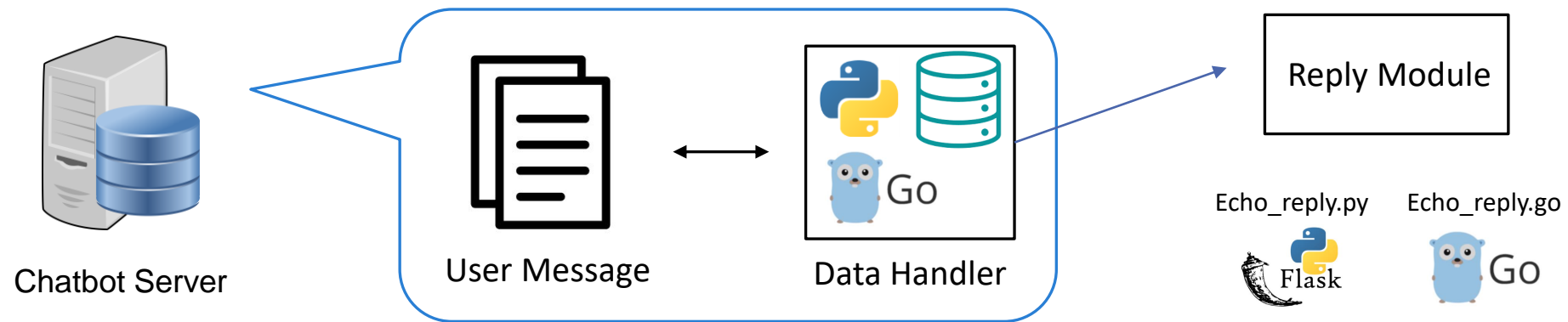


# Python Locust



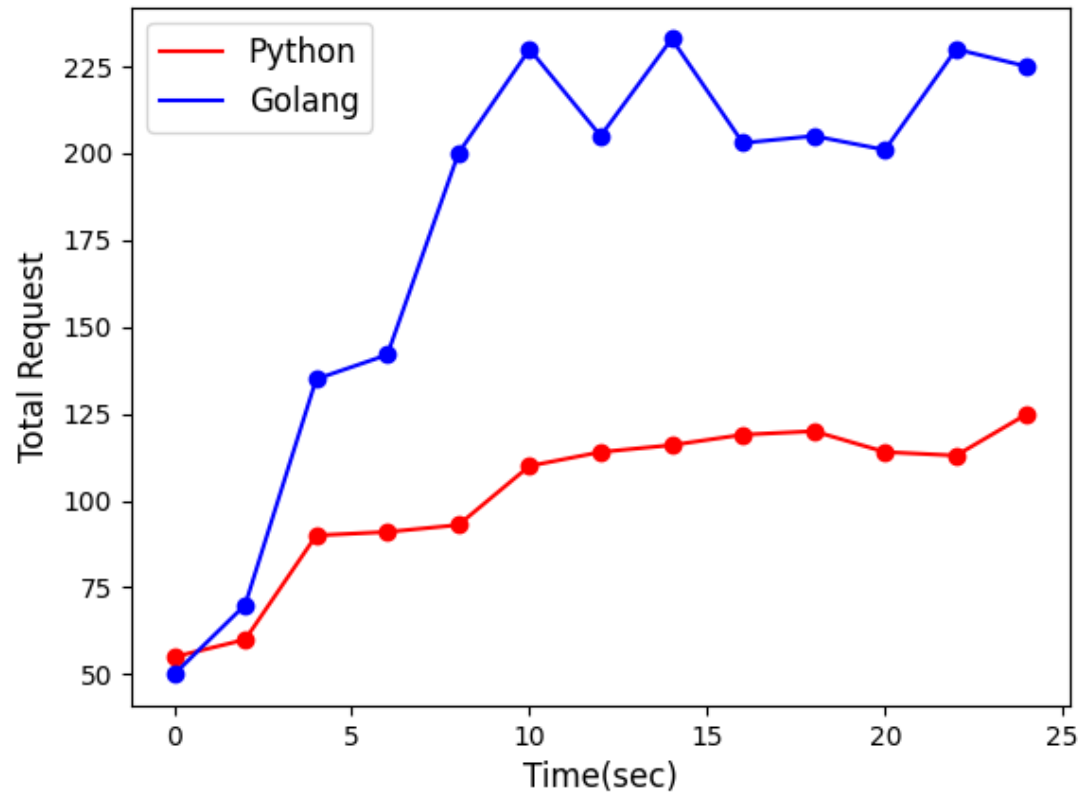
# Result: Code Migration

- Python3 & Flask vs Golang & net/http

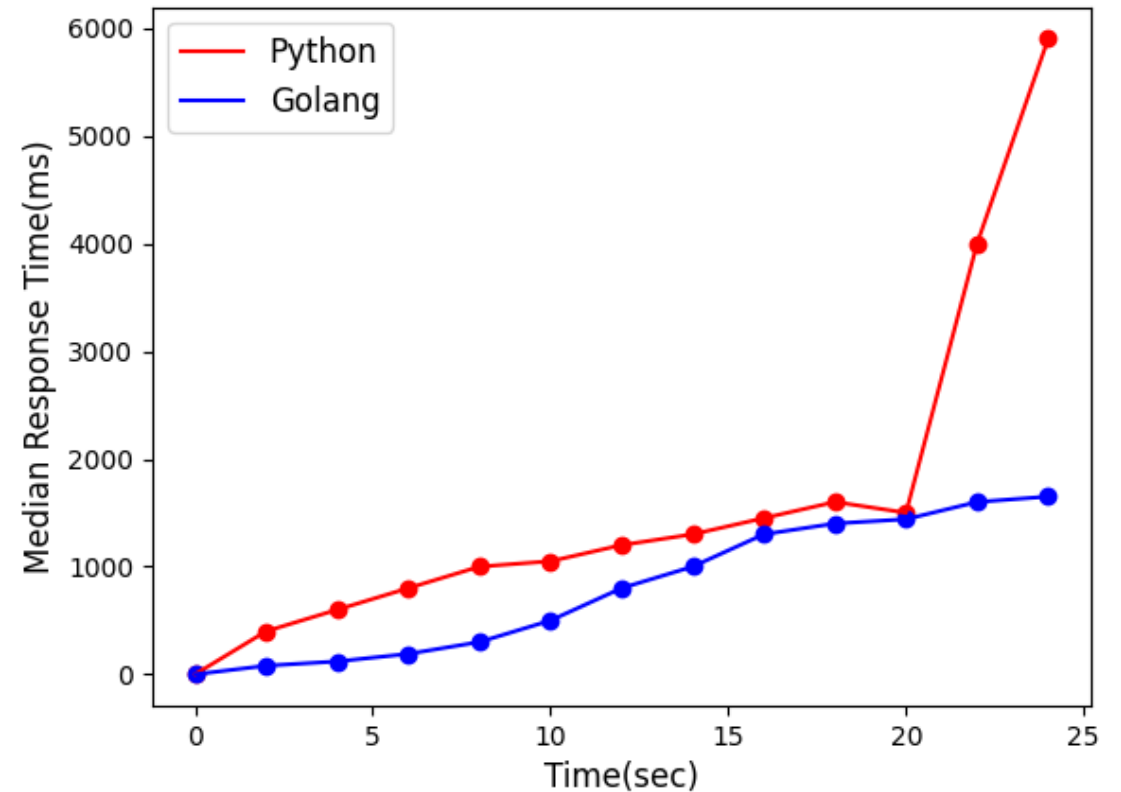




# Result: Code Migration



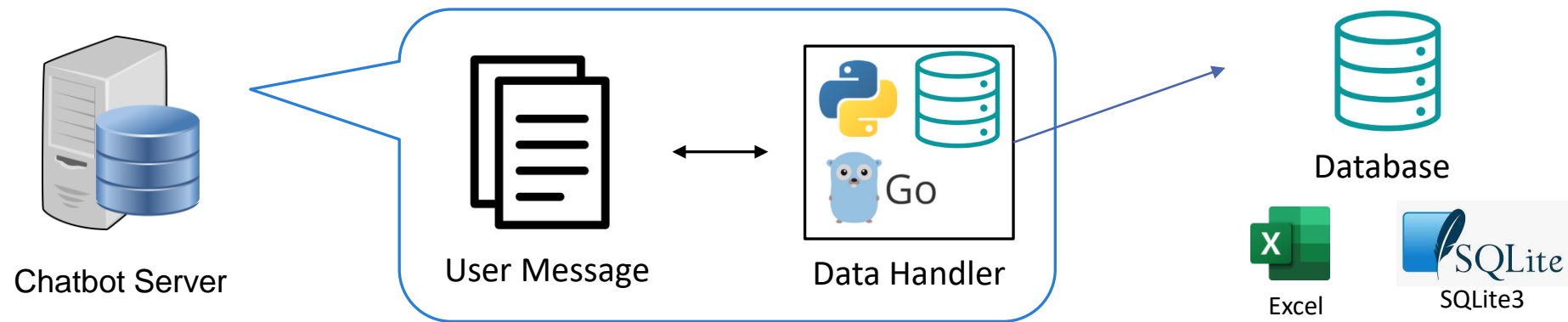
(a) Total Request per Second



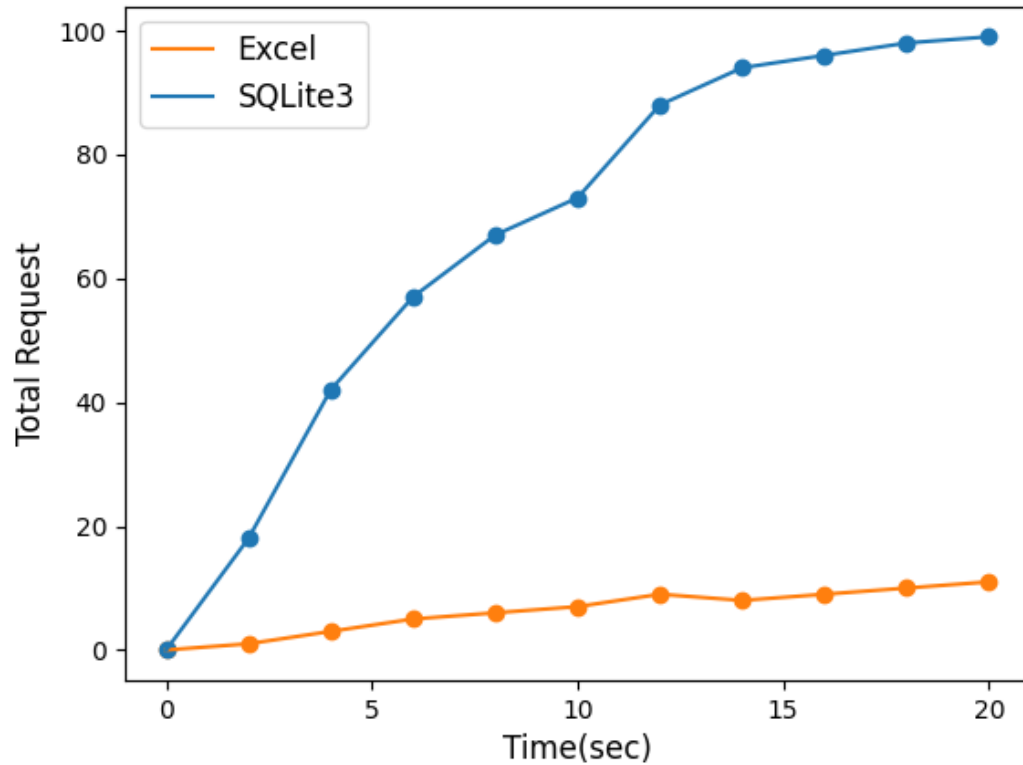
(b) Response Times

# Result: Database Design

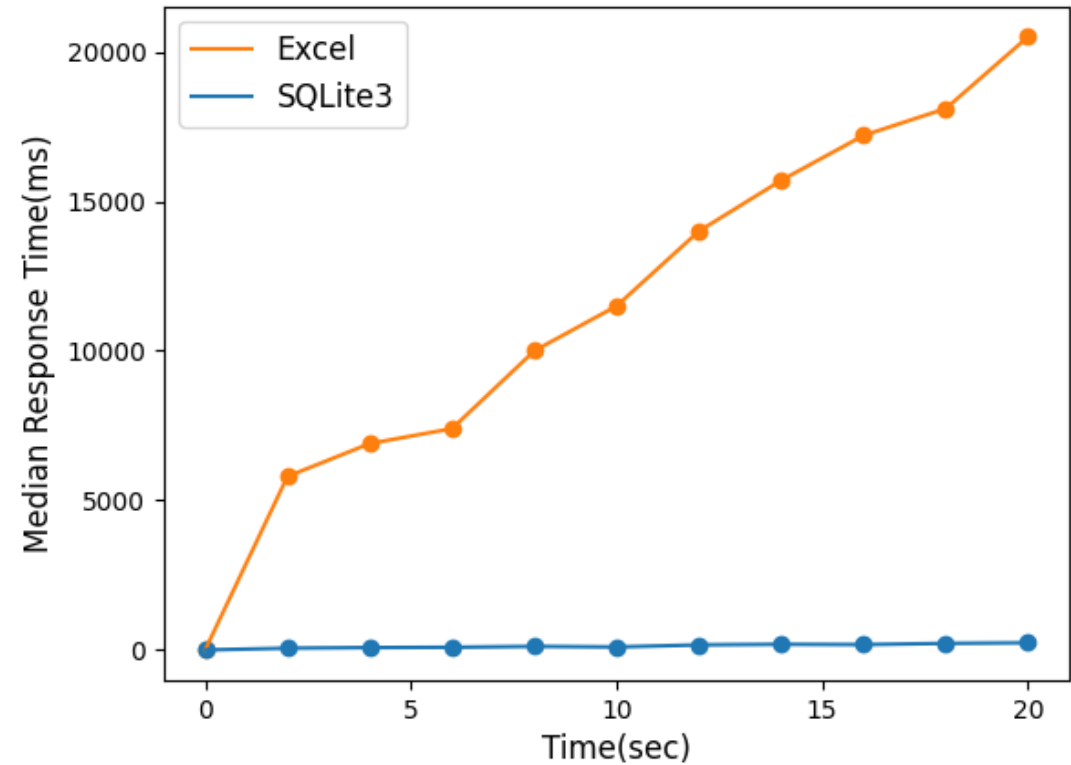
- Excel vs SQLite3



# Result: Database Design

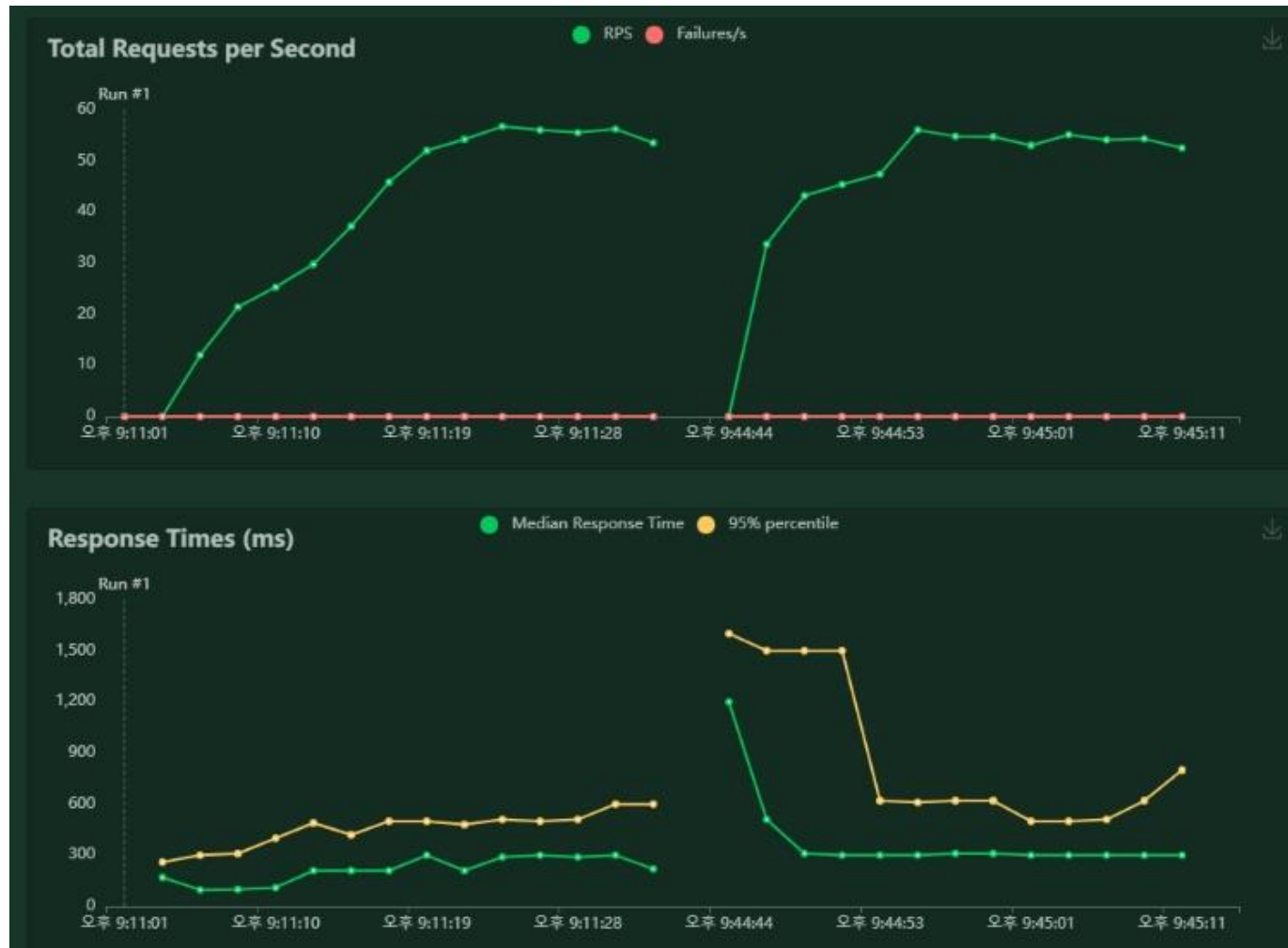


(a) Total Request per Second



(b) Response Times

# Result: Load Balancing



# Conclusion

---

# Conclusion

---

- The chatbot system meets all the function and performance requirement

Index	Function Requirement
1	Chatbot has to identify user's name and authority.
2	Users have to be allowed to participate, check and cancel survey.
3	Administrator has to be allowed to make, check and delete survey.
4	Administrator has to be allowed to download csv file that contains results of survey.

Index	Performance Requirement
1	Chatbot has to reply all request at least 100 per second.
2	Chatbot has to reply all request at least in 1 second under situation of 100 concurrent users.

# Conclusion

---

- We developed user-friendly chatbot system and used in real workplace
  - We improved chatbot performance by code migration and database design
- This system can be easily used in small groups or clubs
  - Administrator can build chatbot system if the chatbot server is prepared



# Thanks

---



# Q&A

---

# Appendix : Simple

```
{
  "version": "2.0",
  "template": {
    "outputs": [
      {
        "simpleText": {
          "text": "간단한 텍스트 요소입니다."
        }
      }
    ]
  }
}
```

```
{
  "version": "2.0",
  "template": {
    "outputs": [
      {
        "simpleImage": {
          "imageUrl": "http://k.kakaocdn.net/dn/",
          "altText": "보물상자입니다"
        }
      }
    ]
  }
}
```

