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Md Manzurul Haque

SLACKBOT DESIGN AND DEVELOPMENT

– Case Company: Enkora Ltd



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Md Manzurul Haque

SLACKBOT DESIGN AND DEVELOPMENT

Communication is an essential key factor to succeed in any business, and it is highly recommended to have a secured, streamlined communication system for both internal and external communication. Due to the increase of digital innovation internet-based communication tools, such as Skype, Slack, GoToMeeting and similar tools, services now play an exclusive role in maintaining communication between team members. Because of digital innovation, above internet tools are quite convenient and suitable to use by SMEs as well as larger, organizations. In addition, Bots/Chatbots are becoming quite popular because organizations can use them to automate specific repetitive tasks within the set boundaries. They also enable a team to integrate custom functionality into the existing communication service such as Skype, Slack.

The primary objective of this study is to find out the chatbot automation capability in the Slack platform and develop a Slack chatbot to perform repetitive tasks in project development. The research and development of the SlackBot was conducted through close co-operation with the team members, CTO of the case company Enkora Ltd. To develop a prototype Bot program Nodejs was used as tech stack and the testing and some test cases were carried out in the Enkora Ltd. Slack communication channel. The results of this thesis showed that chatbots could be a useful tool for a wide range of tasks automation in project management lifecycle. This research also indicates other possible usage areas, though there are some limitations due to the technology not being advanced yet and the lack of the respective company and people's awareness of how to plan, develop, integrate and operate with Chatbots.

KEYWORDS: Digital Communication, Project Management, Slack, SlackBot, Chatbots, Bots, Automation, Development, Deployment

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LIST OF ABBREVIATIONS (OR) SYMBOLS

AI - Artificial Intelligence

AIML - Artificial Intelligence Markup Language

A.L.I.C.E - Artificial Linguistic Internet Computer Entity

API - Application Programming Interface

CTO - Chief Technology Officer

MIT - Massachusetts Institute of Technology

NLU - Natural Language Understanding

NLP - Natural Language Processing

PR - Public Relations

RTM – Real Time Messaging

1 INTRODUCTION

The introduction part of this research aims to provide an idea on this thesis and helps the reader to be familiar with the research content structure, to keep the content precise and clear presentation, introduction section divided into a few parts and briefly described below. The very first part of the chapter describes and explains the research background in detail, followed by the thesis objectives and research questions with possible limitations. After this, the next section includes the information of any viable solution development strategy required to complete this thesis which relevant for the case company Enkora Ltd. Following the above chapters at the end of the introduction section, the thesis structure chapter describes the detailed structure about the rest of the chapters of this thesis.

1.1 Research Background and Objectives

Communication is the doorway to any business whether it is external communication for the target customer base or between the internal departments of the company. Under external communication management policy, A proper and organized dialogue with customers is essential for businesses to grow and develop profitably and efficiently and, also can help a company gain to have clear statistics regarding the current situation on the market as well as the future competition. This impact occurs because customers tend to have a different point of view to a company, on the market and products or services presented. Customer communication is considered a significant part of any business development that helps to increase brand loyalty and make the business more attractive to clients (Oleksak 2005). In the real business scenario, almost any company needs to have both internal and external communication channel setup in an organized way to provide feedback to customer inquiries as swift as possible (Proactive Internal Peer 2016). Communication that takes place between the employees or team member of the company is defined as internal communication. Achieving internal communication is considered one of the most critical objectives in business – after all, due to going through an inefficient communication setup might decrease the employee's full potential. It not only engages the team together, but it enables them to discuss information, news, and opinions that might be of value to someone else within that business. Furthermore, internal communication can give the

team the chance to create new ideas and ways to improve the process of work, while allowing staff to have input in the decision-making can encourage loyalty. In a nutshell, getting internal communications right can create a positive work environment which has the potential to help a company reach its fullest potential. (Proactive Internal Peer 2016).

External communication describes the engagement between company employees and outside parties such as supplier, customers or other external parties involved in the company business line. External connection is also about the sharing of news about the company and its services with the public in an engaging way. It is very crucial for any business because it allows to gather feedback on its work and build its profile and, also enables to have new business ideas and open new opportunity (Proactive Internal Peer 2016).

In the recent few years, internal and external communications are merging in one another more and more, e.g., company newsletters also shared with staff and stakeholders. In internal communication management, product managers need to have constant communication with the developer, project managers and other internal support teams to provide a seamless product and service to valuable customers. Due to rapid digital innovations, most of external communication takes place via online communication tools like Skype, Zoom, Slack, Whatsapp, etc. (Proactive Internal Peer 2016).

This thesis was commissioned from the case company Enkora Ltd described in this thesis, a software and digital systems development agency that was founded at 2006 and successfully providing services to over 250 companies across Finland and, has several offices all around the world. The author was working at Enkora Ltd as a Software Developer. During this period, the company was in outstanding business growth, providing software services and digital systems to the clients and in this process in all the projects, internal teams were being managed through Slack, a team management software and manage multiple projects along with 25+ developers, testers and project managers with other managerial staffs. Since the development team had to maintain many projects for numerous clients with continuous development, testing, and release system, hence, there was a real need for this research to develop a chatbot for a Slack team communication tool that can help in this case. The study is also influenced by an increase in the typical case of chatbots and automation popularity.

The research carried out for Enkora Ltd is aimed to discover the extent to which bots can be a useful tool in the context of internal team communication and collaboration to manage the project better for rich productivity and reduce downtime due to deployment. The research was conducted after the company decided to use the Slack as a communication tool between the development, support and sales team since it has significant useful features for project collaboration and management also. The empirical part of the research consists of a discussion with the CTO of Enkora Ltd, Artem Goutsoul and with the active members of the internal team. The final expected outcome of the thesis is to find out useful integration of chatbot into the Slack platform to help the development team to enable the project development and deployment automation capability for software platform of the case company. Companies that are following the current trend of chatbots integration used as a communication and management helper tool will find the outcomes of the thesis insightful.

1.2 Research Questions and Limitations

The primary purpose of the thesis is to help the case company to collect a deep insight into the use of chatbot as a project deployment tool which will be used by the internal team members from the development team of the company. Along with it, another objective is to research to find out the other useful integration of chatbots into the current system to engage in a more intuitive way with the customers and create a seamless feedback channel for the customer support team. Additionally, the research aimed to:

- Investigate how team members can benefit from it,
- Find out what automation capabilities it can provide to the team especially in the project management, development, and deployment.

Currently, Enkora Ltd migrated to Slack tool from Hipchat for team collaboration and conference calls as well as one to one communication capability comparing to the other online communication tool. Previously Hipchat was good in providing team communication; however, it lacks several advances features corresponding to the Slack as the case company decided to use it, hence the need of conducting this research to make the process of the study more efficient the research question was carefully placed. The research question is used to describe the topic.

The main research question is:

How should businesses properly integrate a bot into Slack to use it as a deployment tool?

The sub-questions for the thesis are the following:

- What is the current solution and how the new solution is going to help?
- Who are the users and What kind of content do users want to see in the chatbot when communicating?
- For what purposes chatbots can be used?

As like other research, there are different limitations to consider as the topic is quite broad, the study is focused on bots integration in Slack. In this thesis, restrictions are also linked to the case company, as this research and development are for Enkora Ltd new team collaboration tool. Moreover, digital innovations are rocket--fast nowadays, so the results might appear outdated in a short period. To sum up, all the work carried out for this thesis is conducted for a specific company for a particular requirement to be added in the development environment and will be used for future development and research.

1.3 Thesis Structure

The theoretical framework is an integral part of this study as it organizes all key factors and forms in an easily analyzable manner. (Saunders 2009) This subchapter gives a short introduction to the topics used for the research process.

Chapter 2 describes the theoretical concept about chatbot/bots and Slack platform, and it also contains information on various uses of the above tools. The chapter finalized with the explanation of the latest trends in customer communication, including chatbots, which logically links it to Chapter 3. Chapter 3 presents all the necessary information about the concept of Slack, its features and uses in organizations.

Chapter 4 provides brief information about the case company, its product and the uses areas of the newly carried out study about developing SlackBot. Following this chapter, Chapters 5 covers the information on the development and integration process of the SlackBot.

Following the above chapters, Chapter 6 discusses the limitation and possible future improvement along with a final discussion and summary.

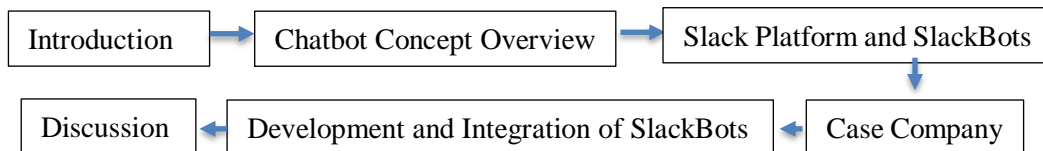


Figure 1. Thesis Structure.

2 CHATBOTS CONCEPT OVERVIEW

2.1 What are Chatbots

A chatbot is artificial intelligence software which can simulate a conversation (or a talk) with a person in natural language via messaging packages, websites, and cellular apps or via the cell phone. It permits a form of interplay between a human and a device the conversation, which happens thru messages or voice command. A chatbot is programmed to work independently from a human operator. It can answer questions formulated to it in verbal language and reply like an actual man or woman. A chatbot regularly described as one of the most superior and promising expressions of an interplay between people and machines. (Hosseini 2018)

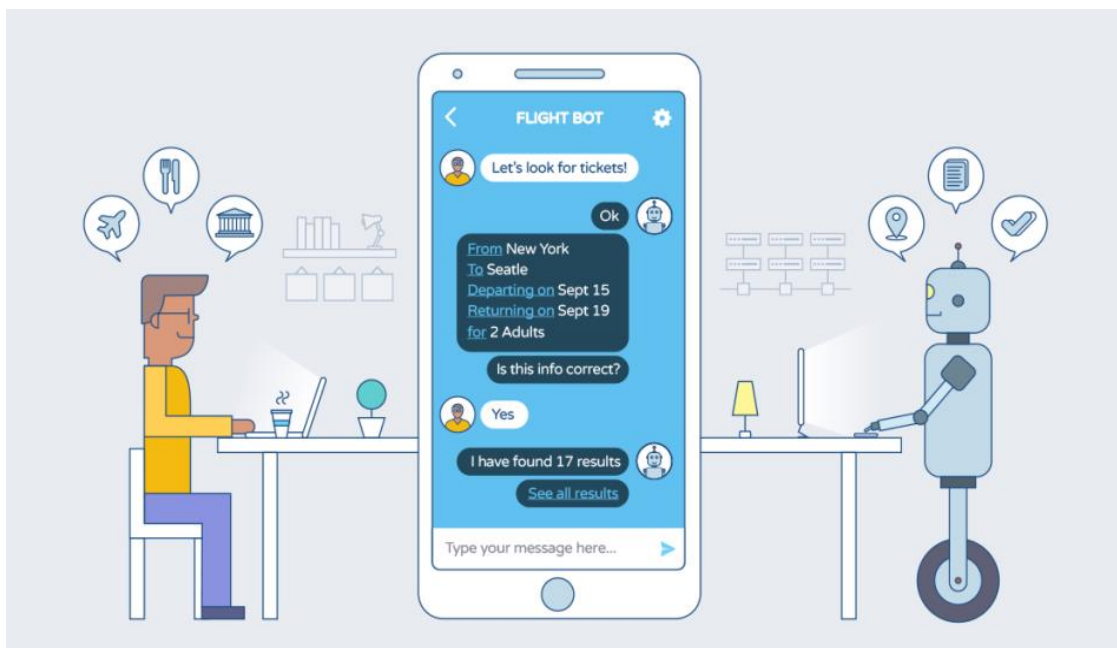


Figure 2. A sample Chatbots wireframe.

2.2 Architecture & Work Methods of Chatbots

Bots make use of sample matches to the organization the textual content, and it produces the precise response from the clients. "Artificial Intelligence Markup Language (AIML) is a popular-based version of those Patterns. For every sort of query,

an outstanding sample ought to be handy inside the database to give an affordable response. With some of the pattern combos, it makes a hierarchical structure.

Natural Language Understanding (NLU)

This NLU has three definite ideas as follows:

Entities: This represents a concept of chatbot. For instance, it may be a fee system for E-commerce chatbot.

Context: This means that, if it gets a response to a question it has been these days asked, it won't bear in mind the inquiry. So, the phases in the course of the verbal exchange of chat are one after the other saved.

Expectations: This is what a chatbot should satisfy when the consumer says sends an inquiry. Which may be equal for distinctive questions?

Natural Language Processing (NLP)

NLP is a technological process that permits computer systems to derive which means from person text inputs. In doing so, it tries to understand the intent of the data, as opposed to just the data approximately the motive itself. It is a form of artificial intelligence technology that goals to interpret, to understand, and understand person request within the shape of free language. (Elupula 2018.)

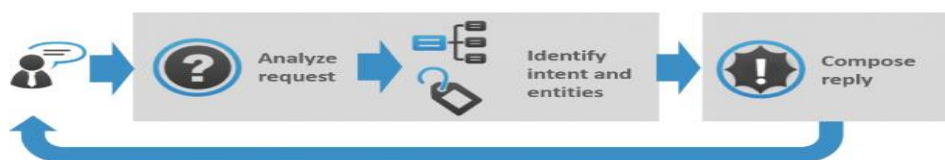


Figure 3. Behind the scenes functionality of a chatbot.

There are two individual responsibilities on the core of a chatbot:

User request analysis: That is the primary task that a chatbot plays. It analyzes the consumer's request to perceive the consumer reason and to extract relevant entities.

Returning the response

Once the user's rationale gets recognized, the chatbot ought to provide the most suitable reaction for the person's request. The answer may be:

- A customary and predefined textual content
- A textual content retrieved from an expertise base that carries specific solutions
- A contextualized piece of facts primarily based on records the person has supplied
- Events stored in business enterprise systems (Expert Systems 2018)

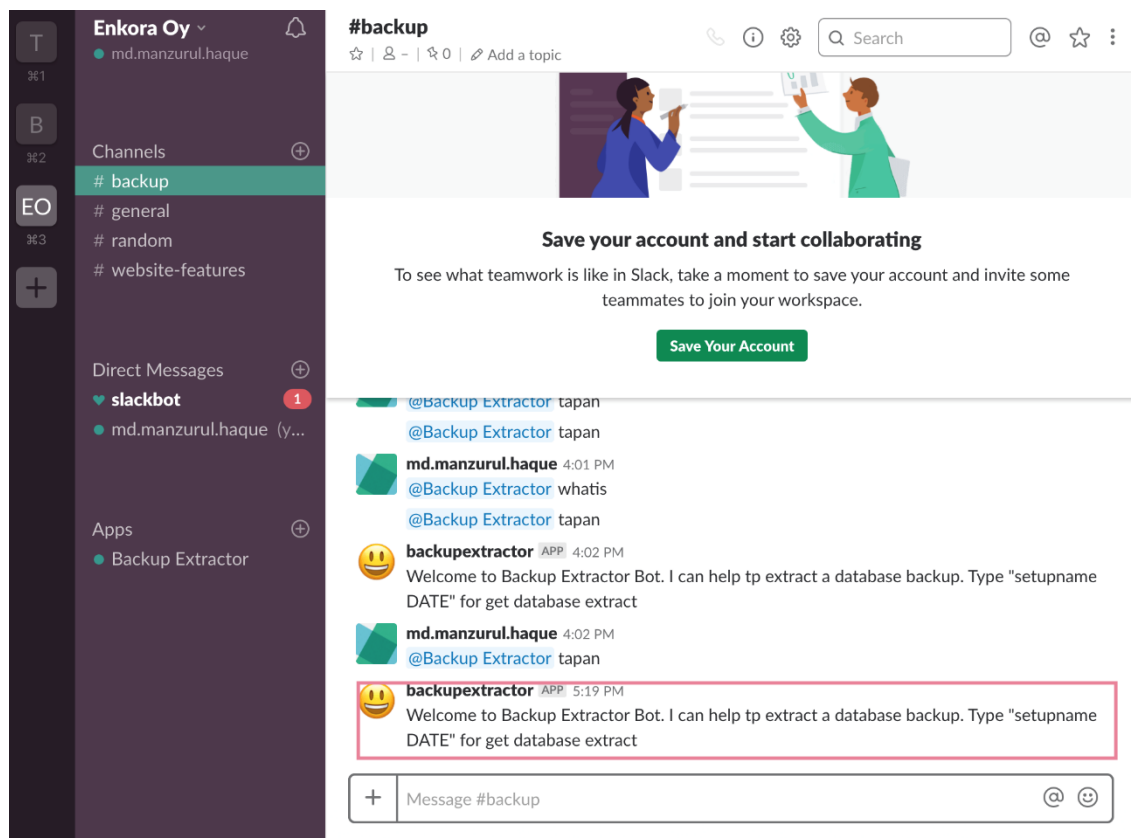


Figure 3. Bot returning a welcome message.

The most famous chatbot

There are various search engines like Google for bots, including Chatbottle, Botlist, as an instance, supporting developers to inform customers about the release of new talkbots. They feature more than three and a half of thousand bots for Facebook Messenger, Slack, Skype, and Kik. Through the chatbot search engines like Google

and Yahoo, you could locate software in every category, e.g., the satisfactory chatbot for Facebook Messenger is Poncho.



Figure 5. Chatbottle chatbot logo.



Figure 6. Botlist chatbot logo.

2.3 History and Business Uses

The idea of creating a system (chatbot) that had human-like thought methods have been around for hundreds of years. Scientists, philosophers, or even sculptors were curious about the concept of a humanistic automaton. Author Samuel Butler first wrote the idea of a mechanical cognizance in his 1872 technology fiction novel, Erewhon. Despite the interest and fascination on the subject, it turned into no longer until 1966 while any form of artificial intelligence took shape: ELIZA.

The Humble Beginnings of Chatbot History

One of the first bots in Chatbot history which name was Eliza chatbot developed by MIT professor Joseph Weizenbaum in Nineteen Sixties (Wikipedia). Eliza chatbot took the form of a psychotherapist who answered to the user with enquires from set of predefined answers. This recursive form of discussion become designed to illustrate the superficiality of human-gadget conversation.

The evolution of the chatbot

While the chatbots of today are hastily becoming a regular thing of the customer support revel in, it is essential to keep in mind that they are continually evolving. According to Dylana Valverde it's all started at 1950. (Valverde 2018)

1950: In 1950, Alan Turing published "Computer Machinery and Intelligence." Despite that, the standards used in ELIZA laid a foundation for the systems of chatbots, including key phrases, precise phrases, and preprogrammed responses.

1966: Eager laptop scientist and contemporaries of Turing attempted to pass his take a look at ELIZA, created in 1966 by Joseph Weizenbaum, changed into one of the first chatbots.

1972: Kenneth Colby got here out with PARRY, a chatbot that might simulate someone with paranoid schizophrenia. In a check given to psychiatrists, handiest 48% have been capable of becoming aware of the difference among PARRY and a real person.

1995: A famous online bot turned into A.L.I.C.E., a language-processing bot. Although she turned into not able to skip the Turing Test, she did get hold of many different rewards for being the most superior bot of her time.

2001: That is, till Smarterchild came out. In many approaches, it turned into the precursor to Apple's Siri and Samsung's S Voice.

2010-2015: Over the following decade or so, bots have become very famous amongst huge tech groups, beginning within Siri (2010), Google Now (2012), Alexa (2015), and Cortana in (2015). These bots can respond to voice commands, play music, and carry out internet searches, amongst other tasks.

Present: Amazon desires to enhance Alexa through making her a clever socialbot which can have conversations with every person, and about something.

Key Uses in Business area

Due to digitalization effects the business heavily, the uses of chatbot are coming into different kinds of uses. According to the Maruti TechLab findings below areas can be more digitalized when business decides to use bots in everyday business operation. (Maruti TechLab 2017)

Availability: Chatbots may be operational and prepared to interact with their defined target organization 24 hours a day, 365 days a year.

Chatbots are fantastic equipment to manner a massive quantity of requests: If a selected organization gets many requests, it isn't always vital to increase the template or group capacity for receiving queries.

It allows corporations to realize higher and apprehend their customers:

Companies can get actual insight into what they're costumers decide upon, and consequently offer stepped forward offers and answers to their customers.

Low protection charges: Chatbots allow companies to shop cash and are easy to configure to fulfill particular desires and easy to maintain also.

Customer Service Improvement through Analytics and Data series: Chatbots can file data, traits, and metrics to reveal interactions and adjust their procedures and responses thus ultimately.

Platform Agnostic: Chatbots permit to be built in extraordinary structures and are clean to evolve and integrate to whatever commercial enterprise as additionally they allow for unique installations.

Time-saving: A very common and superb instance of how Chatbots can assist agencies to save time is when it comes to how they could help businesses via answering their customer's FAQ.

2.4 Bots in the future

With an increasing number of groups, the use of API's to combine chatbots inside their more full surroundings of communications, there now exists a demand for bots that interact across platforms. Now have the possibility to offer customers the choice in their favored messaging channel, e.G., Facebook Messenger, WhatsApp, voice, chat or messaging. Chatbots have revolutionized the ways agencies engage with their customers, and we're handiest at the very starting. (Botanalytics Blog 2018)

3 SLACK PLATFORM AND SLACKBOTS

Slack is a collaboration hub where the decent human beings and the adequate information came together in organized, searchable channels and considered as a top-notch resource for small corporations, groups, freelancers, or just man or woman designers looking to network in the fields of design, development. Slack is a group collaboration tool for messaging. (Slack Official Documentation 2017)

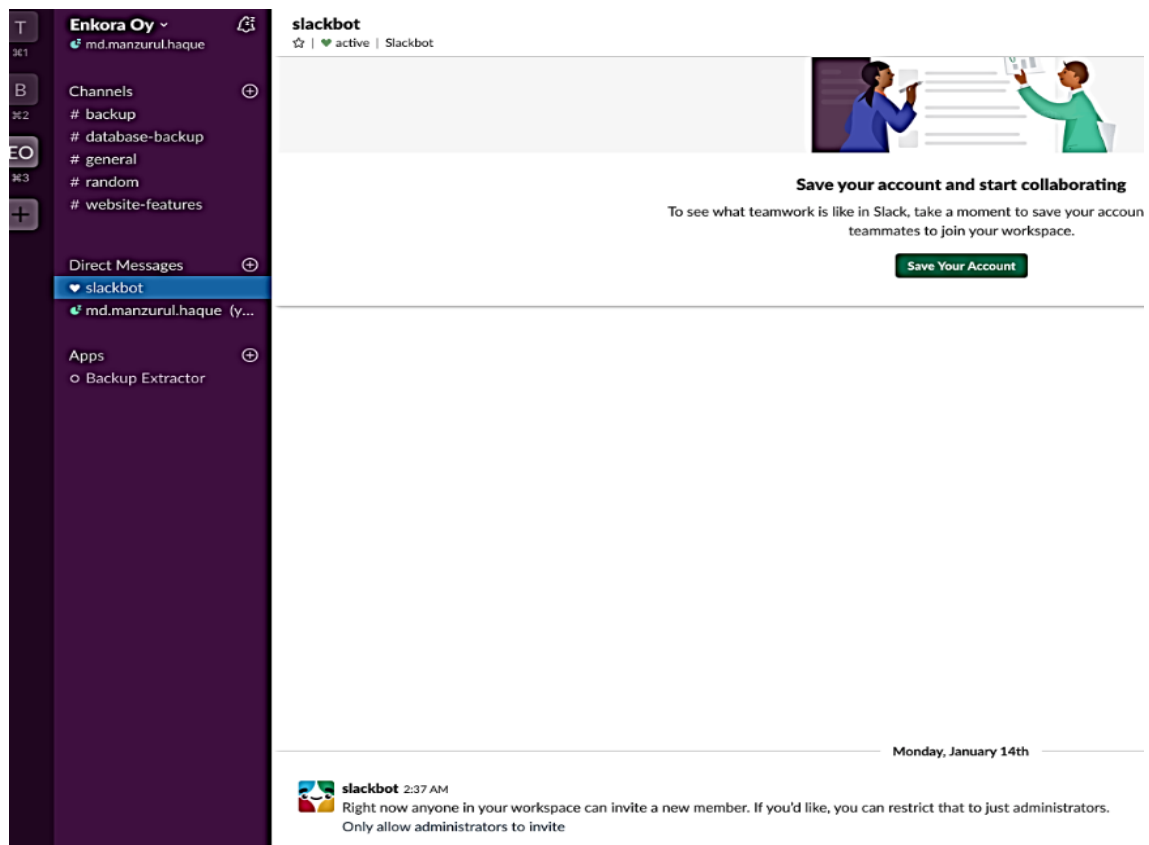


Figure 7. Slack Interface (Slack.com 2018).

3.1 Features of Slack

Slack has a number of features and some of the features has customization capability to include custom functionality. In Slack All team can communicate in one place through slack. It quickly has become overwhelming to preserve the sequence of email threads a mile deep, conversations, textual content messages, and other places wherein we were speaking with every different. Slack integrates automated equipment right into a single

area, allowing you to spend less time with iterative, decrease-fee tasks and more significant time targeted on product improvement and design. Discover outages and insects quicker with the aid of coordinating responses in real time. Connecting the reporting tools to Slack helps screen problems as they arrive in, locate resolutions to beyond bugs, and gather the right human beings to clear up incidents. Engineering groups use Slack to collaborate on projects and get them out the door. Channels and integrations dispose of friction between groups and functions. Slack makes dead simple to locate that link that a person published three weeks in the past that you only now need to have a examine. Not most useful is the quest exquisite rapid and pleasant. However, it's also filterable. (Slack Official Documentation 2017.)

By integrating Google Drive (or Dropbox) with slack, report sharing with colleagues turns into manner more comfortable. By clearly pasting the Google Drive link to your Slack chat, you'll get a preview of the file – rather than a simple link. Being capable of proportion and take a look at code snippets across our group in an instant is a superb function of Slack that shouldn't move unmentioned. Slack is committed to supporting our users understand the rights and obligations under the General Data Protection. It provides Data encryption in transit and at rest, SCIM provisioning, custom message retention, Support for Data Loss Prevention, Enterprise Mobility Management and e-Discovery. (Slack Official Documentation 2017)

3.2 Organizational usage of Slack

The default channels covered with Slack are #preferred and #random for organizing teams and agencies. These are available to all and sundry within your employer. Beyond these, you can create additional public channels in addition to personal agencies. (Peters 2017.) Before we get began, it is proper to consider that you have selections round the way to start a communication in Slack. You can send an immediate message to solely one person, create direct collection messages with up to nine humans, create a private channel, or create a public channel. When a channel's problem remembers, or membership grows drastically, institution discussions may also begin overlapping, and topics may grow to be harder to observe. Shared channels are the latest addition to slack that let you bridge your Slack workspace with that of some other agencies, like your employer, a vendor, or a contract consultant. Slack incorporates with all of the apps your

company is probably already the use of, such as Google Drive, Jira, Zoom, Salesforce, and InVision. Team individuals can add operating substances and remark at once within Slack, as an alternative to having to log in to software.

Slack helps to retrieve the content material. After the occasion is over, it can archive the channel's content material; however, it always remains searchable. This may be as easy as importing a PDF of the crew's yearly desires to their crew channel, or it can be greater state-of-the-art with a dedicated aid channel. Transparency in team communications is undoubtedly an excellent option, but there are instances while you need to speak something privately between the contributors of your crew. (Slack Official Documentation 2017.) Slack has cell apps available too. Anyone works at home often must run errands throughout the day and be able to hold up with all work communications has helped merely to round out the day and preserve within the loop on the obligations one needs to observe. (Peters 2017.)

Slack gives an opportunity to receiving updates. Working on a ramification of net tasks, you probably manage your duties with a mission management tool – like Trello or Blossom. Slack integrates nicely with the one's assignment control tools. By integrating those offerings with Slack ensure to stay on top of what's happening during your improvement process in internal Slack channel (Peters 2017). Many dispensed improvement teams rely on Slack. By integrating your overall performance monitoring service (e.G., New Relic) with Slack. If you're the usage of a customer support tool like Help Scout, Intercom, Zendesk, or Desk.Com, there's some excellent information. Connect Slack along with your current customer support device and be notified on any new help request from your customers. Slack also provides data security and protection services. Configure single sign-on, allow users to exchange their email cope with or display call, Enable necessary-aspect authentication. It provides custom message retention, support for data Loss prevention, enterprise mobility management, and e-Discovery. (Haughey 2018.)

3.3 What is Slack Bot

The slack bot is Slack's integrated self-carrier help gadget. The Slackbot is continually inclined to assist, whether it's via direct message or in a channel together with your teammates. (Slack Official Documentation 2018.)

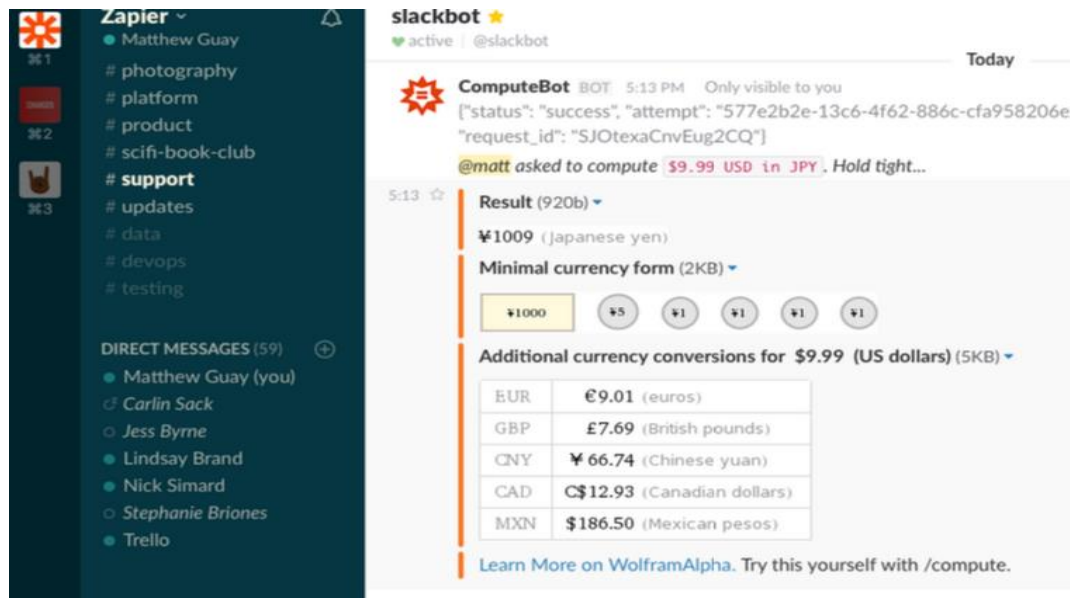


Figure 8. An example chatbot in Slack.

Here are some reasons for that would involve using Slack bot:

- To find solutions to your questions about Slack.
- To add custom designed automated responses.
- To get entry to non-public reminders and obligations. (Brandall 2017)

Real Life Uses of Slack Bot

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3.4 Chatbot Trends and Awareness

The chatbot surroundings are fast increasing regardless of the tremendously strong environment that currently exists. Deployment channels including messaging apps, cloud networks, SMS, and email clients are in which chatbots stay and engage with customers. Its trends and awareness are rising on the following branch of below. With the usage of AI chatbots, the availability of extensive data may also be predicted to thoroughly revolutionize the way in which corporations interact with their clients seeing that each communication may be assessed to spur commercial enterprise increase and better client engagement competencies. Companies that applied the conversational platforms for functions of advertising had been in a service to get rid of the client paperwork conventionally used for conversations. Chatbots are proving to be reliable within the attempt of gaining customer insights. They will diversely be used to collect client insights subsequently improving the advertising tiers and interplay with customers. It is handiest a count number of times to chatbots will flow from the early adopter degree to turning into vital for corporations. 2018 is the 12 months while AI usage goes mainstream, and chatbots could be a part of the package deal.

One of the most important developments this year can be automating information series from chatbots and facilitating its analysis. This era will permit users and machines to have interaction more evidently. Therefore, businesses are pouring cash into the improvement of technologies like AI to help computers get a better understanding of the human language and user requests. As humans are using greater messaging apps, these messaging apps make it smooth for manufacturers to create durable courting with the focused target market and to get excellent conversions. The first-rate part of the Chatbot is it can combine more than one apps into one. Chatbot automates commercial enterprise tasks and boosts purchaser revel (Suthar 2018). This year, we noticed enterprise giants like Google and Amazon pushing the “clever audio system” market. For instance, as Geekwire reviews, Amazon has already offered more significant than 20 million Echo devices. Furthermore, there are over 20 thousand talents on the Alexa Store in the interim (Mool 2017).

4 CASE COMPANY

This chapter describes the case company Enkora Ltd and its wide range of services to provide a clear picture of the research purpose to the reader related to SlackBot development. Due to the nature of the information, this chapter has explained into a few parts. In the first chapter, an introduction to the company is given, followed that next chapter describes the company platform and leading products and services. In the next subchapter team collaboration and challenges, the team faces are discussed which continued in the following subchapter with Slack collaboration tool integration and automation details. This subchapter finalizes the discussion with Slack integration information on to develop the SlackBot to help the internal team.

4.1 Introduction

Enkora Ltd is a Helsinki--based software and service development agency, founded in 2006, the company official website is, <https://www.enkora.fi>. Enkora develops and maintains software services and digital embedded systems for various companies across few countries. The mission of Enkora is to provide reservations system along with next-generation secured embedded devices with other reporting services and also provide maintenance support. While being active for twelve years, Enkora has three offices all around the world – the headquarters office is in Kalasatama, Helsinki, Finland, while other offices located in Spain and Estonia.

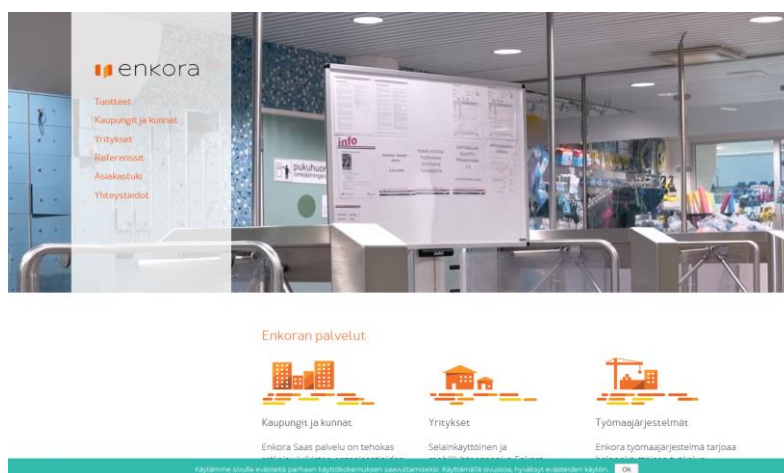


Figure 9. Enkora official website.

4.2 Company Platform and Services

Enkora Ltd has a very dynamic platform with microservice architecture to provide reservation system related services to client companies both in private and public sector. Enkora also produces digital gates and locks with embedded systems and has been providing these services for a decade. Enkora Ltd has been a leading company in providing software and digital services in the resource reservation system category and continued to expand its services with more features and products ideas.



Figure 10. Enkora Services/Products.

4.3 Team Collaboration and challenges

Enkora has several teams to operate its services to the end users, and groups categorized into three central departments.

- Sales/Corporate Management Team - Manages external relationship with the client companies.
- QA Team - Provide customer support and involves in quality assurance and testing of the features.

- Development team - Responsible for developing new features, implement new service requests and maintain the project development and deployment strategies and operations.

There are numerous challenges in team collaboration since there are other offices and team members are in constant communication to provide support to the end users and clients. To solve this project, Enkora uses a premium project management system integrated with Slack collaboration tool and git version management to keep track of the project development and versioning the codebase. Due to providing services to many clients, team members are often very busy and has to roam into multiple project features from multiple clients which needs a structured development procedure to prevent the project being extremely complex because of continuous development and deployment. In this area, there was a need for this research to develop a tool to help the team to perform the repetitive tasks with more flexibility, testable and secure.

4.4 Slack Integration and Automation

As earliest it is discussed that Enkora Ltd uses Slack as a communication tool and to do that there were several reasons. Slack has some very organized uses for team management with calling and other features described in the earlier sections. Slack also have effortless customization capability to develop and integrate programs, which is called as SlackBot to incorporate into the Slack UI for assisting the team members within a set of rules set by the program. SlackBot can carry out many actions as we define and can help in automation which we will see in the later chapter from the developed programmed along with development details, screenshot and testing result.

5 DEVELOPMENT AND INTEGRATION OF SLACKBOT

This chapter explains the steps and actions need to perform to develop and integrate a chatbot into Slack Platform. In order to present the development process, this chapter has been divided into a few subsections wherein the first subsection feature requirements describe the core features functionality of the SlackBot. In the platform selection subsection included the selection programming platform to develop the SlackBot which continued in development and testing subsection with the development phase related details. The outcome of the development phase, a working SlackBot, it's the performance and evaluation were included in the last subsection in this chapter.

5.1 Feature Requirements

In Slack, a bot is controlled program via a bot user token that can access one or more of Slack's APIs to do some specific set of tasks or even more smarter tasks feed through machine learning and AI (Slack Help Center 2018).

It is entirely possible to design a Slack Bot with many advanced functionalities. Hence it is crucial to decide on the requirements carefully along with since the aim of this thesis was to develop a Bot program within the existing slack channel to help the team members of Enkora Ltd to make the deployment process of the project more manageable. Because of certain limitations in development, testing and scope of the bot program these following features are considered as the main features in the case study Bot program with a customization capability with more features in the future.

Main features:

- Extract Database backup. E.g. `/backupextractor tapanila 02-01-2019`
- List of commits to deploy. Enable command to check the latest updates from the code repository to check which are ready to deploy. E.g., `/deploy list`
- Enable simple command from Slack App to initiate the deployment process. E.g. `/deploy project-name`

5.2 Development and Testing

A Slack Bot development does not depend on in any specific programming languages rather it can be achieved in programming languages. Based on the requirements obtained through discussion with CTO of the case company Enkora Ltd, bot program tech stack would be Nodejs framework. To develop a bot, there are some prerequisites defined within the Slack platform since every Slack bot works with the Slack API platform and uses RTM protocol to maintain the communication. A bot is similar to a regular Slack app which can access the same range of APIs and perform all of the intended things that a Slack App can perform. During the development and lunch of a bot for any Slack App means that app has a face, a name, and identity, and encouraging users to have a conversation. In this chapter, these steps are explained briefly with the necessary screenshot to develop Slack bot and demonstrate its workflow in general.

The first step of developing a Slack bot is to create a Slack App and configure the App settings and install the app in the company Slack workspace. In the next step is creating a Bot user to interact with the Slack app within the set channel and at the end to develop the bot program to communicate with the conversation style functionality to perform specific tasks in the server. These steps are explained below briefly.

Creating Slack App

In the first step, for the case company Enkora Ltd, the app name was 'EnkoraBot.'

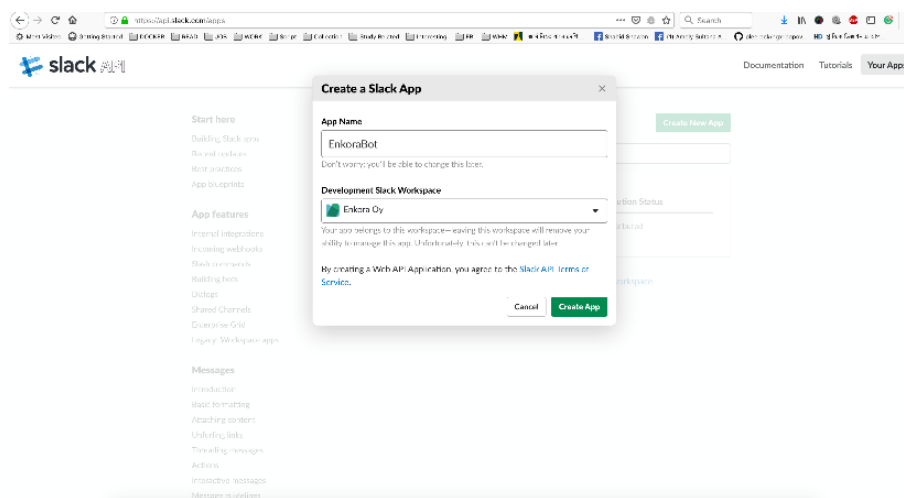


Figure 11: Create Slack App.

Creating Bot user

It is necessary to develop a bot user to use the Slack app as a Bot. To create a bot user, it needs a 'display name' and a 'Default username.' There is another option 'Always Show My Bot as Online' which allows controlling the Bot online visibility within the Slack App. In this research, for the case company, the bot was named 'Backup Extractor' with a username 'backupextractor.' (SlackBot features 2017). Figure 12 shows the process of creating a Bot user.

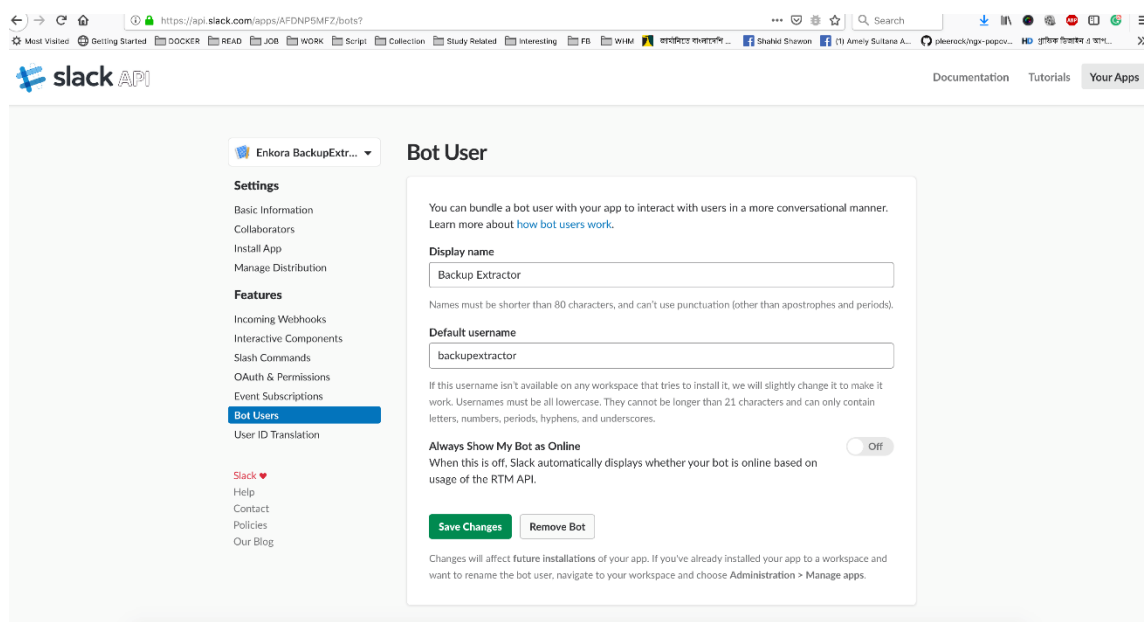


Figure 12: Create a Bot user.

Installing the bot to a workspace

In this step, the configured app needs to be installed in Slack workspace to generate OAuth token for the bot user to send and receive a message through Slack channel. After installing the app into a workspace, it will create an OAuth token which we will use later when we code the bot program. (SlackBot features 2017).

Figure 13 shows how to install the app into Slack workspace.

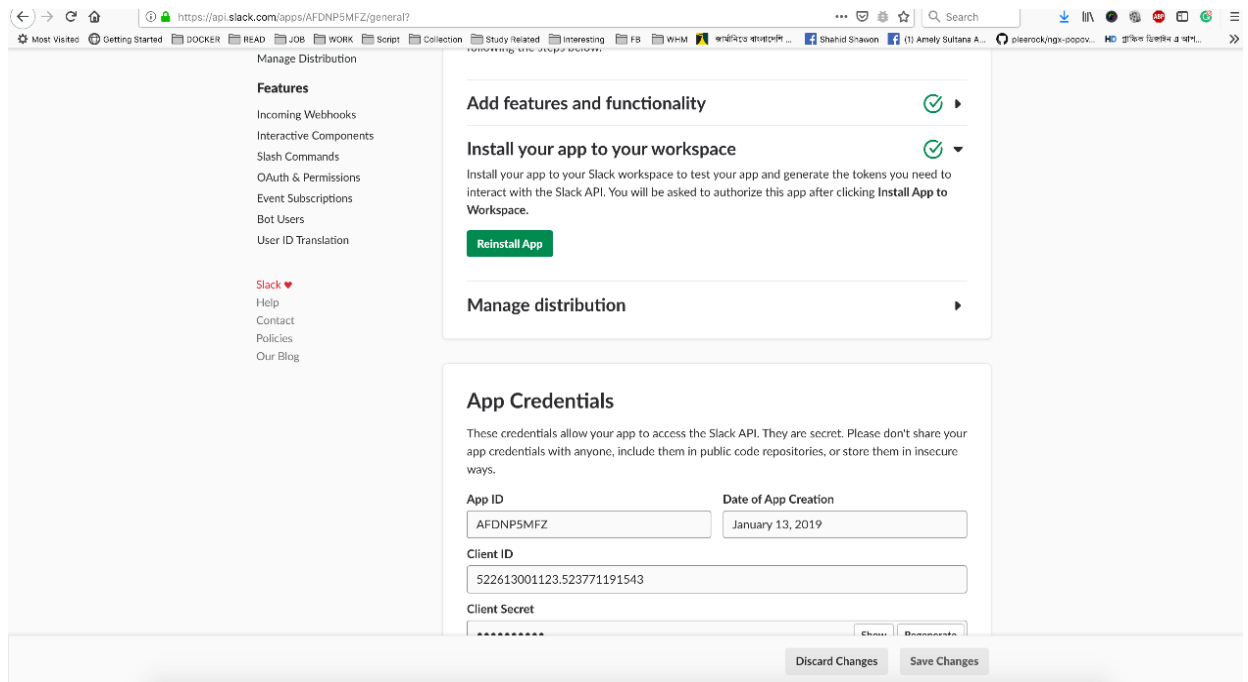


Figure 13. Installing app into Slack workspace.

Creating the Bot Program

As earlier we mentioned that for this case study Nodejs is used as tech-stack to develop the bot program. All the code is available in Git repository to access for the case company. Here is some screenshot of the coding and testing workflow of the application. The below figure shows the coding needed to run a prototype bot program.

```

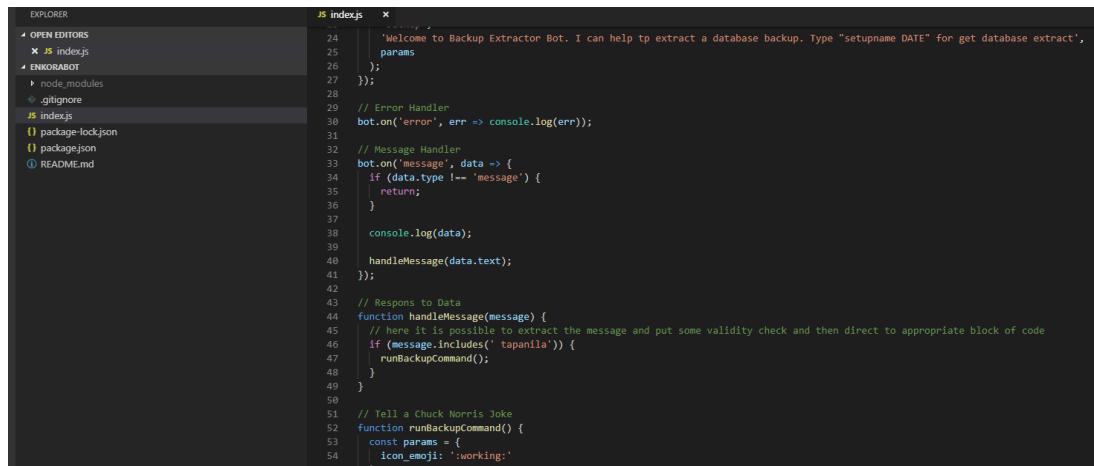
EXPLORER
  OPEN EDITORS
  JS index.js
  ENKORABOT
    node_modules
    .gitignore
  JS index.js
  package-lock.json
  package.json
  README.md

JS index.js
1  You 11 minutes ago | author (You)
2  const SlackBot = require('slackbots');
3  const axios = require('axios');
4  var exec = require('child_process').exec;
5  function execute(command, callback){
6    |   exec(command, function(error, stdout, stderr){ callback(stdout); });
7  };
8  const bot = new SlackBot({
9    token: '', // You, 14 hours ago • Server command execute
10   name: 'backupextractor'
11 });
12
13 const allowedUsers = [];
14 const allowedChannels = [];
15
16 // Start Handler
17 bot.on('start', () => {
18   const params = {
19     icon_emoji: ':smiley:'
20   };
21
22   bot.postMessageToChannel(
23     'backup',
24     'Welcome to Backup Extractor Bot. I can help tp extract a database backup. Type "setuptime DATE" for get database extract',
25     params
26   );
27 });
28
29 // Error Handler
30 bot.on('error', err => console.log(err));
31

```

Figure 14: Bot Program index.js.

Figure 15 holds the rest of the bot program with many comments to understand and customize the bot functionality.



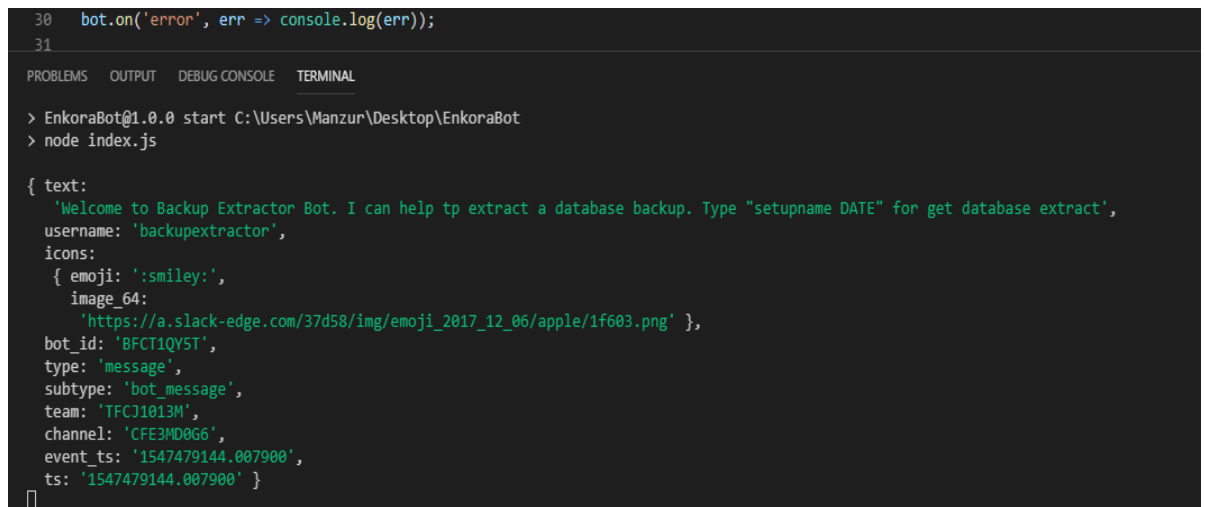
```

24 // console.log('Welcome to Backup Extractor Bot. I can help tp extract a database backup. Type "setupname DATE" for get database extract',
25 // params
26 // );
27 // });
28
29 // Error Handler
30 bot.on('error', err => console.log(err));
31
32 // Message Handler
33 bot.on('message', data => {
34   if (data.type !== 'message') {
35     return;
36   }
37
38   console.log(data);
39
40   handleMessage(data.text);
41 });
42
43 // Respos to Data
44 function handleMessage(message) {
45   // here it is possible to extract the message and put some validity check and then direct to appropriate block of code
46   if (message.includes('tapanila')) {
47     runBackupCommand();
48   }
49 }
50
51 // Tell a Chuck Norris Joke
52 function runBackupCommand() {
53   const params = {
54     icon_emoji: 'working:'

```

Figure 15: Bot Program index.js.

This figure shows the sample console output when a bot first time connects to Slack platform and gets appropriate response from Slack server.



```

30 bot.on('error', err => console.log(err));
31
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL
> EnkoraBot@1.0.0 start C:\Users\Manzur\Desktop\EnkoraBot
> node index.js

{ text:
  'Welcome to Backup Extractor Bot. I can help tp extract a database backup. Type "setupname DATE" for get database extract',
  username: 'backupextractor',
  icons:
    { emoji: ':smiley:',
      image_64:
        'https://a.slack-edge.com/37d58/img/emoji_2017_12_06/apple/1f603.png' },
  bot_id: 'BFCT1QYST',
  type: 'message',
  subtype: 'bot_message',
  team: 'TFCJ1013M',
  channel: 'CFE3MD066',
  event_ts: '1547479144.007900',
  ts: '1547479144.007900' }

```

Figure 16: Bot Program running and communicating with Slack App.

In the first run bot program posts a message in slack channels to notify users that this program is ready to accept command or message and perform the task in server accordingly. On wrong command text Bot is showing help text to write command accurately. Figure 17 shows an example for this case.

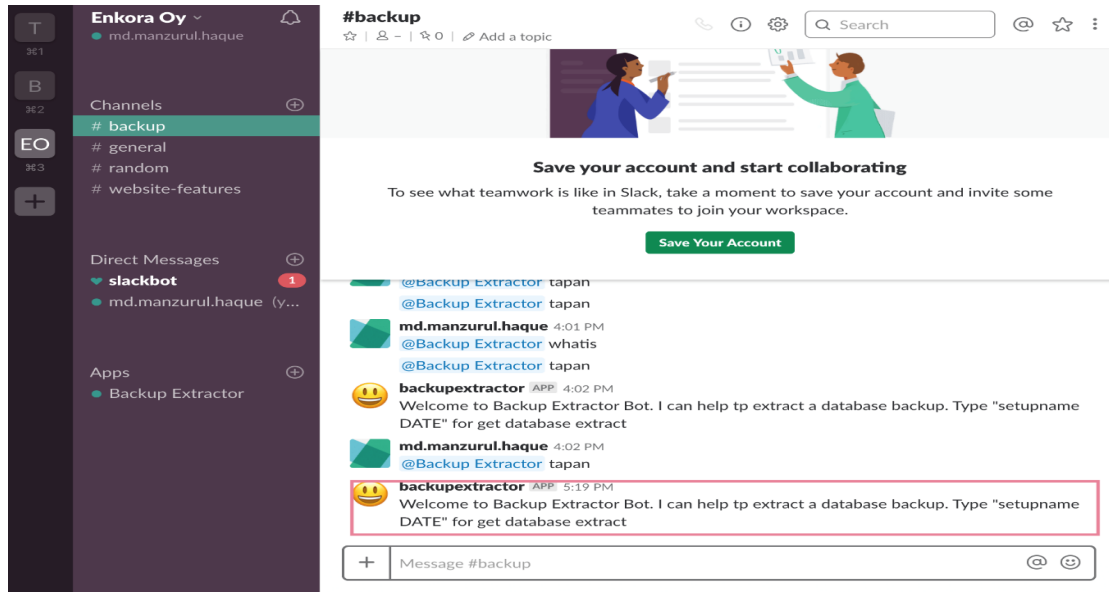


Figure 17. Bot Program first run with notification in the existing channel.

After writing simple command via message window, server operation executed. Figure 18 shows a sample expected output when a user writes a valid command to get response.

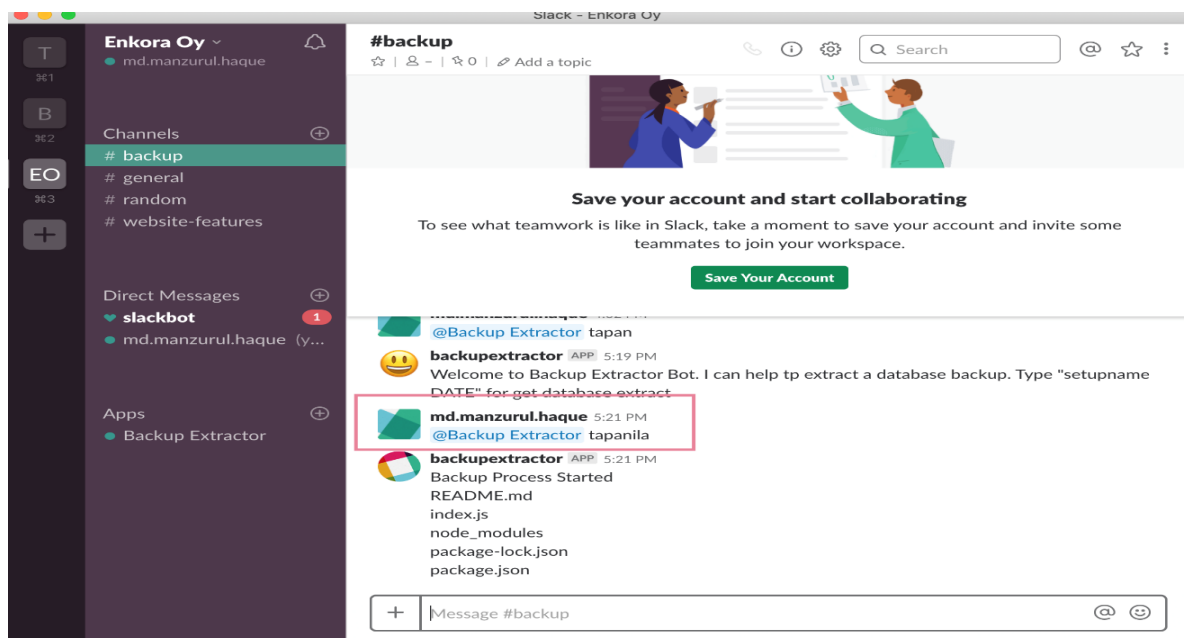


Figure 18. Bot Program running and getting response from Slack App.

5.3 Bot Security

A bot program is hosted in the server, and perform many critical tasks through conversation via Slack App. As a result, it is highly necessary to implement security implications. Since Slackbot works within the Slack platform and Slack app already achieved standard security by issuing OAuth token when Bots are communicating with the Slack App through command or message. In this research for the case company, there is some additional security has been implemented which will ensure the Bot program perform with security implications.

- **Filtering Channels:** Slack app communicates with the bot program through OAuth token and with the message data user sent to the Bot. It is possible to filter the channel from the posted data. A Typical postdata format from Slack to Bot program looks like below. From the posted data it is possible to filter out the actions based on the allowed channel etc.

```
{type: 'message', user: 'UFBUU7SBS', text: '<@UFCM44F34> tapanila',
client_msg_id: '8736f00b-c806-41f5-a9df-00d98b5c7645', team: 'TFCJ1013M',
channel: 'CFEV8QJET', event_ts: '1547551241.001200', ts:
'1547551241.001200'}
```

Figure 19 shows a response message to user when a user tries to run a command from a wrong channel which is not permitted to run that operation.

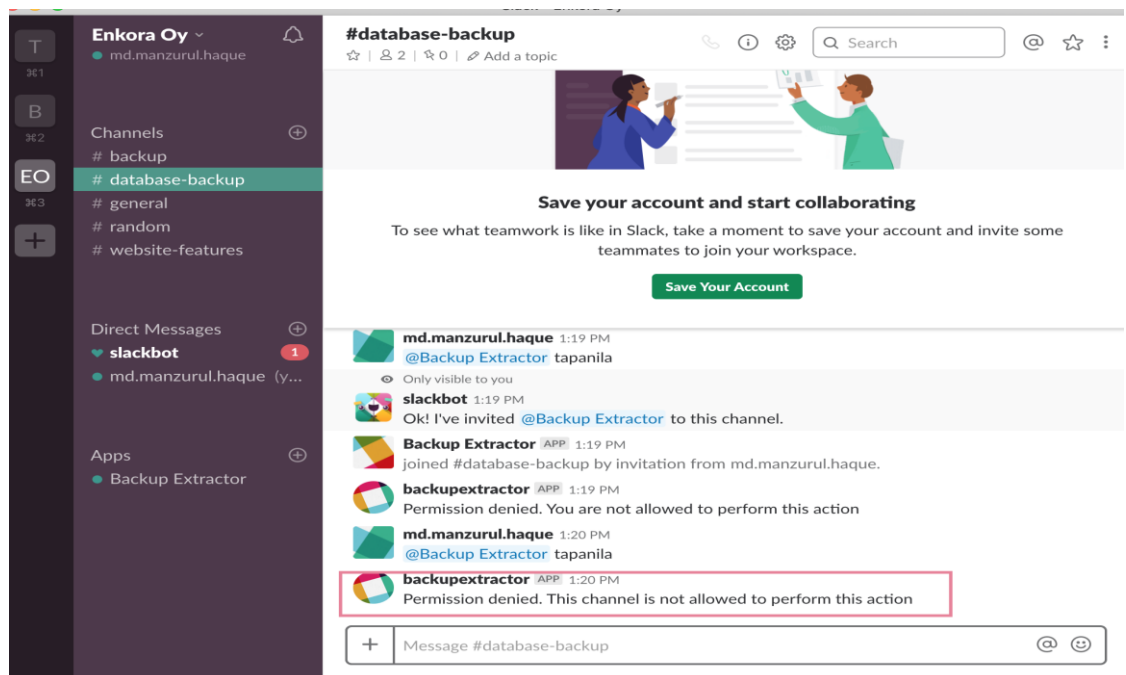


Figure 19. Error message shown from the wrong channel.

- **Filtering users and teams:** From the above data format, it is possible to implement more complex user and team's validation on the server side in Bot program which can ensure high security and also possible to show notification of an error in response.

5.4 Limitations

This research was carried out for a specific company as a case study to find out the potential of Slack bots in the development and company internal communication process. Hence the analysis was carried out through discussion with team members in the development team and CTO in the case company to find a best possible method of using Slack Bots to improve the development and deployment process smoother. Since this research conducted for a specific case company which might not be suitable for all companies in general.

6 CONCLUSIONS

This research aimed to find out the possible efficient methods of using bots in Slack app to facilitate the case company development team and other teams to manage some of the critical tasks efficiently. The result of the thesis is a developed Bot program which performs some essential functions in the case company server with a possibility to extend for other more complex functionality.

In the introduction, the research background and topic were explained briefly, and the research questions and limitations were introduced along with the thesis structure to provide the reader with a better understanding of the thesis content in later parts. In the next chapter, bots and chatbots were explained briefly and also how they could be implemented in a business case for the case company. In the following chapter, the Slack platform and the planned integration of the bot's program into Slack was explained.

The case company was also explained briefly and also the purpose, use case of Bot program needs, how teams can and will use the program was described in detail. In the next chapter the actual development and testing phase of Bot, the program was explained with the necessary screenshots to understand the functionality. In the end, security of Bots and limitations was discussed with a conclusion.

As was mentioned above, the research presented the benefits of using the latest trending software system like Bots. Since this is relatively a new technology and still it is expanding the usage areas, there is much scope for further research with Bots.

Overall, with the technology progressing and increasingly rising, chatbots can be a great topic of further research, changing the traditional communicational and purchasing patterns. This thesis gives an insight into setting up a different approach to help the teams within the case company.

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