

How Software bots can interact with DevOps

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1 Introduction

Software bot is not an entirely new technology and some of the software bots' history can trace back to 1988 [10]. Nowadays software bots are used intensively worldwide. For instance, there is a popular collaboration platform for software developers called Slack, and software bots are used on the platform by the name Slackbot. There are so many different kinds of software bots out there, but their common purpose would be to automate some manual tasks.

DevOps is an effective approach to software development that enables a faster and more efficient development cycle. Here, automation is a key in DevOps as well, thus there should be synergy between the DevOps and software bots. For instance, the cycle of DevOps consists of several stages and the tasks in those stages can be automated.

This essay explores some general information regarding DevOps, software bots, as well as other related topics. The goal of the essay is to reveal how Software bots can interact with DevOps beneficially, by investigating the relationship between them.

2 Background

2.1 Software bot

Bots are short for "Robots" and they can be used in physical robots as well as in software [9]. There are many types of software bots, but one of the bots people often see in their lives might be, for example, chatbots. Chatbots were in their earliest days described as programs that pass the Turing test and can fool humans into believing that they are interacting with real humans rather than a program. But nowadays the purpose of the use of bots is more focused on automating tedious tasks rather than imitating humans perfectly [8]. Software bots are used for automating tasks by running code [6], and today half of the entire internet traffic is estimated to be made by the automated tasks of bots e.g., customer services, simulation of human communication on social networks, helping companies search online for content and assisting with search engine optimization [11].

2.2 DevOps

DevOps is an integration of two different parts, namely development and operations by using automated development, deployment, and infrastructure monitoring [7]. The integration of the development and operations enables a faster delivery cycle. And not only that, the adoption of DevOps provides some other benefits, for example, improved collaboration, early bug detection, and fixing, and improved productivity [4]. However, the adoption of DevOps is not always successful. The factors that hinder DevOps adoption are due to human aspects such as lack of communication and resistance to change, and technical aspects such as the complexity of development and production environments [14].

2.3 Slack

Slack is a collaboration platform/messaging app that enables users to communicate quickly and efficiently in their team. Users can work in dedicated places called channels in which specific people and information is brought together. Everyone in the same channel can access the shared information and that helps the team to be organized and enables quick decision-making [20].

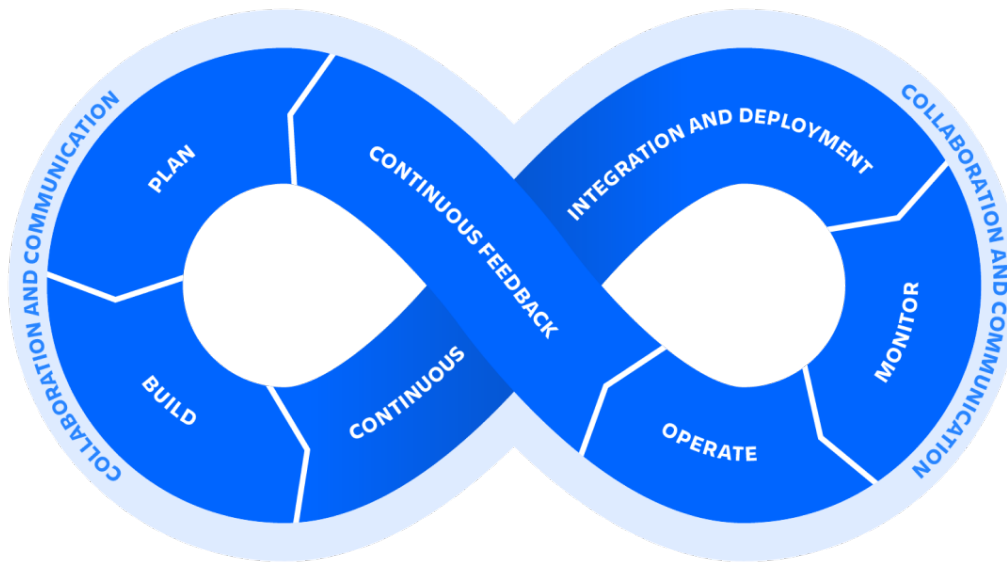


Figure 1: The DevOps lifecycle [2].

2.4 Slackbot

Slackbot is a software bot used in Slack and it can access the same range of APIs as the slack app can. The difference between the bot and the app is that the bot has more personality such as a name, and the users can interact with the bots. Bots can, for example, send DMs, being able to be mentioned by users, post messages, or upload files, and can be invited to channels [19].

3 Software bots in DevOps and ChatOps

3.1 Adaption of bots

Nowadays messaging platforms such as Slack and Facebook Messenger are widely adopted worldwide, and that is one of the causes that bots are rapidly becoming adapted as interfaces for software services in practice. Other causes are the advancement of natural-language processing and the widespread presence of big data, as well as machine-learning algorithms for analyzing data across many domains. Here bots are used as a convenient UI for interacting with those algorithms and data for the developers [12].

A CI/CD pipeline consists of several stages, and bots can be implemented in them. The stages in CI/CD pipeline can be executed manually, but it is obvious that automation here will benefit tremendously. An example of what tool can be applied to phases in the DevOps cycle is listed below:

- Proactive planning – JIRA
- Requirements management – JIRA
- Continuous integration – Jenkins
- Continuous deployment – Ansible, Chef
- Continuous monitoring – Nagios, Grafana, Splunk
- Continuous feedback – JIRA [16]

As it can be seen in the example list above, by using bots in different combinations of tools they can cover a wide range of the phases in the DevOps cycle.

Tools	Description
Ansible	IT automation tool
Chef	CD Pipeline Automation Tool
Grafana	Observability tools
Jenkins	CI/CD automation software
Jira	Software development tool
Nagios	IT management system and IT monitoring software
Splunk	Platform for big data collection and analytics

Table 1: Brief description of the example tools used in DevOps cycle.

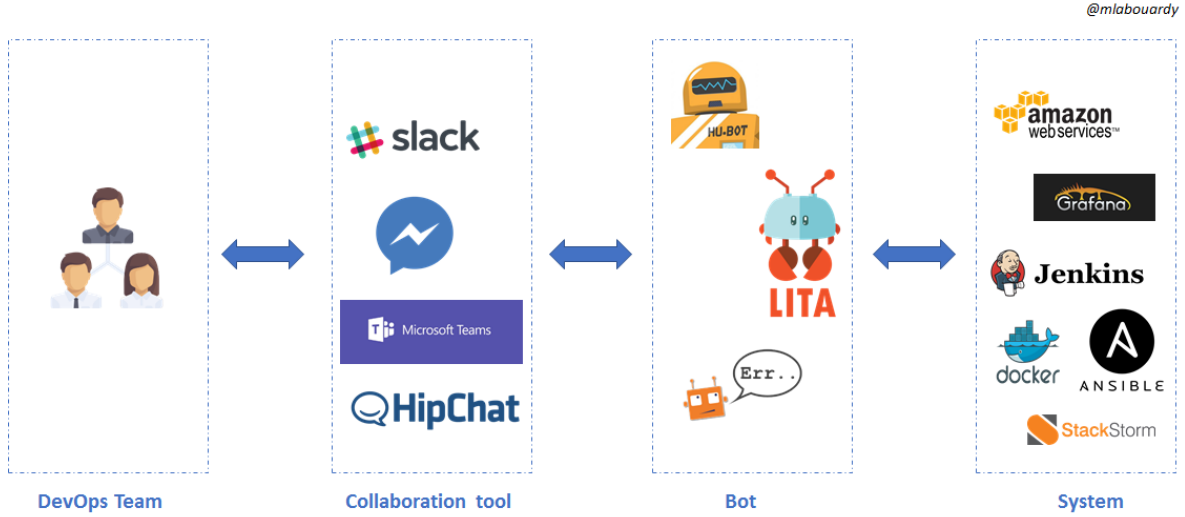


Figure 2: How different actors interact in DevOps and ChatOps [21]

3.2 ChatOps

There is a collaboration model called ChatOps. This model formulates a communication-driven environment, and it helps connect people, tools, processes, and automation and enables having a transparent workflow [3]. The term ChatOps was first created by GitHub to handle DevOps by using a bot called Hubot and other organizations also started to adopt ChatOps and DevOps [17].

ChatOps' fundamental components are Chat Application, Operational Tools, and Chatbots [17]. Among those, the most relevant components to this essay are Chat Application and Chatbots. Some popular chat applications would be Slack, Microsoft Teams, Google chat, and so on. And those applications are further going to be integrated with bots.

As one of the core components of ChatOps, chatbots act as a bridge between chat applications and operational tools (tools such as version control, knowledge management, incident management, change management, etc [17]). The bots refer to the information by exchanging messages through the chat application while integrating with the operational tool, and bots can also accept commands from chat applications and run them on operational tools [17]. Figure 2 illustrates the role of the bot as a bridge, and interactions between other actors as well.

4 Classification of bots

4.1 Bot types examples

The chatbot is mentioned as a type of software bot, and it was also mentioned that there are many other types too. Some web articles introduce different types of bots, but those types differ from author to author. For example, one website listed some types namely, Spider Bots, Scraper Bots, Spam Bots, Social Media Bots, Download Bots, Ticketing Bots, and Malicious and Non-Malicious Bot Activity [15],

and another website listed Chatbots, Crawlers, Transactional bots, Informational bots, Entertainment bots: Art bots, Game bots, and so on [5].

4.2 Characterization of bots

Are there any better ways to characterize those bots depending on their features? Lebeuf et al. proposed three ways of characterizing bots and provided some examples. The first way is to do that through the bots' interaction model. For example, some bots interact with users through specific commands in a command-line interface and the other bots might parse natural language through text or speech [12].

And the second way is using the bots' intelligence according to three aspects namely, Adaption, Reasoning, and Autonomy. Some bots are aware of context and can change and adapt their way of interacting with users. Such bots can be characterized using this Adaption aspect. And in the Reasoning aspect, how the bots reason their activities are considered. For example, whether they are just following simple logic rules or some advanced AI techniques are used in them. And finally, the Autonomy aspect is about how much freedom the bots have for their behavior. Some bots might require some user input for their behavior, other bots might be completely autonomous, or somewhere in between [12].

And the third way of the bots' characterization is according to their purposes. Lebeuf et al. listed 5 different types of bots, namely Generalist bots, Transactional bots, Informational bots, Productivity bots, and Collaboration bots. An example of Generalist bots is Siri which is used for supporting users with a wide range of tasks. Transactional bots are used for automated transactions and Informational bots are bots that gather information for example stocks or weather. Productivity bots are used for improving the productivity of a person or team by automating tedious tasks. And collaboration bots are used for helping with communication, coordination, and collaboration [12].

5 Building a Slackbot

5.1 What Slackbots can do

It is impossible to list all the things Slackbots can do, but I will introduce some of the useful features in this section. One of the things a Slackbot can do is an automated reply. This is the easiest function by which Slackbot detects specific phrases and replies automatically to them. This feature can be for instance used for answering frequently asked questions or something essential but easily forgotten, and users do not need to carefully watch for the phrases in question on channels. Building this replay bot is easily done on Slack's settings page, but the bot's functionality is limited to replying with the same user-specified phrases. One of the ways to add more customizability to this bot is using a tool called Zapier. Zapier is a tool that connects users' work apps and enables automated tasks [13]. By using a tool called Formatter in Zapier, users can, for instance, format their text, calculate values, choose random values from a list, and so on [13].

The combination of Slackbot and Zapier also makes it easier to create a Notification bot. For example, if a user wants to receive a notification on Slack when a new task is added to other collaboration tools such as Trello, Slackbot can receive and show the notification through Zapier [13].

One of the most powerful and advanced bots in Slack would be the Slash command bot. Slash commands are the commands which invoke the app by typing commands in the message box [1]. Slash command bots require more configuration than Reply and Notification bots, but they can do a wide variety of things, for example, searching for a person's contact information such as email address and phone number.

Another useful thing a Slackbot can do is make the channel messages more interactive by for example adding buttons or menus to the messages as interactive components [18]. Using these buttons and menus, users can easily send their choice/thought by just clicking the button or selecting the option from the menu. Those interactive components help quick and clear decision-making in a team.

5.2 Benefits of using Slackbots in DevOps

In the previous subsection, some of the Slackbots' functionalities were introduced. So how can those functionalities be beneficial in DevOps? Slackbots' benefits can be boiled down to saving time and

effort in teams by automating small tasks. For instance, it was mentioned that the Reply bots can automatically answer the specific phrases. Answering questions manually could be a tedious and time-consuming task, and waiting for a reply can take some time and can hinder the other tasks while waiting. It is difficult to cover all the possible cases with the Reply bots, but it would most likely ease the issues with the time-consuming manual reply which could disturb the sound development cycle in DevOps.

Notification/Reminder bot would reduce human errors, and members of development teams would be able to focus on the main tasks. Missing important events, issues, etc can easily happen without any notification system or reminder and it can lead to serious problems. The configuration for those bots is relatively easy, and would effectively prevent such problems.

Collaboration and speed are some of the key benefits of DevOps. The usage of Slackbots can boost these benefits. As previously mentioned, bots can add interactive components to the messages in channels and that would make the quality of communications better and help faster decision making. This will lead to better collaboration and help the fast product release, as well as maintain the product's good quality in DevOps.

6 Conclusion

In this essay, an overview of the software bots, DevOps, as well as related topics were presented, and further, the relation between the software bots and DevOps was investigated. One of the strengths of the software bots would be that they are applicable to a wide range of areas. In the case of DevOps, the software bots can work in the stages of the DevOps cycle e.g., automating integration and deployment tasks, and by doing that they affect DevOps directly. Another example of how software bots can interact with DevOps is, through the collaboration model of ChatOps. Here, chatbots play a significant role that bridge between collaboration tools and DevOps tools and supporting the DevOps team for information retrieval, improved collaboration, as well as command execution on the DevOps tools.

The use cases of software bots for improving DevOps presented in this essay are not exhaustive, still, they are fundamental, and will benefit DevOps teams in most cases.

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