IJARSCT

ISSN (Online) 2581-9429

International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)

International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal

Impact Factor: 7.301

Volume 3, Issue 2, July 2023

Survey on Techniques to Effectively Test in DEVOPS with Latest Tooling

Kanchan Sambhaji Pathare

Student, Master of Computer Application

Late Bhausaheb Hiray S.S Trust's Hiray Institute of Computer Application, Mumbai, India

Abstract*: The purpose of this paper is to explore testing in DevOps. Now a days, many of the projects are using DevOps for development, testing, monitoring, production as well as automation. The main goal of DevOps is to establish a culture of collaboration and communication between development and operation teams, allowing for more efficient and effective development, testing, deployment and operation of software applications. Basically, DevOps is the union of people, process and products to enable continuous delivery of value to our end users. There are set of DevOps test practices as DevOps test culture, Continuous test strategy, end-to-end test infrastructures, DevOps test infrastructures, DevOps test frameworks, test creation, test acceleration, DevOps ready test tools, test analytics, micro services and containers. Database DevOps testing, DevOps security testing, continuous testing antipatterns, continuous test management, advanced continuous test topics.*

Keywords: DevOps, Testing, Bugs, Product, Software, Quality, Automation, Test

I. INTRODUCTION

DevOps name itself says a lot, it is a combination of "Development" and "Operation". DevOps is a collaboration between Development and IT Operation to make software production and Deployment in an automated & repeatable way, DevOps helps increase the organization's speed to deliver software applications and services. Apart from development and operation, the system of DevOps Testing provides other crucial aspects such as quality engineering and security. It improves cooperation and collaboration between teams. As a result, higher-quality items are produced. Automation testing is used in DevOps to significantly reduce the percentage of human interaction. This includes the verification of the product's overall functionality, the functionality test is carried on by the usage of automation frameworks along with DevOps testing tools. Simply, automation testing is useful to detect bugs, minimize the overall human error percentile, execute the test cases multiple times and automatically increase the overall reliability of the product as well.

1.1 Why DevOps Testing

Clients want work to be completed on time, or even before the time. Clients expect the final product to be flawless. It is a human likelihood to make mistakes while making any product at a faster pace. This is where the DevOps culture comes into play. With DevOps Testing, it is easy to divide the manual tasks and the automated tasks toreduce the workload and ensures that the work is carried on simultaneously. Thus, there is a good window of opportunity to perfect the product by fixing the bugs.

1.2 DevOps Testing Strategy

The quality of the DevOps testing has a great impact on any organization's success. Following are a few key points to make the best use of the DevOps Testing Strategy for organization's success:

- Identify all the test cases that need to be executed for a particular build.
- The Development and Quality Assurance teams need to identify all the areas that a particular build is affecting. They need to execute all the test cases related to the build.
- The execution of all tests should be important.
- Coverage tools and specialized code analysis need to be configured to ensure that all of the code is covered.
- Not requited to execute all regression test cases for a test pass.
- While the QA develops test scripts and executes automation tests on the builds, a standardised approach to testing new features is required. As

DOI: 10.48175/IJARSCT-12106

soon as the code is solid enough to be deployed in a production environment, this process should continue.

- All the deployments need to be automated. The environments required for testing need to be described
- Automation testing across different cross-platform environments should be run by QA with the help of automation techniques.
- Parallel execution of tests should be implemented to reduce the time-to-market.
- Each of the test scenarios should have an exit condition. When the results are returned to the chain, Production can make a more timely choice.

1.3 Types of testing in DevOps:

- **Chain Test:** The Chain Test helps confirm that all the apps on the chain are working well together. This is sometimes also called the Integration Test.
- **Component Test:** Big applications are built on different components and the Component Test tests all of them.
- **Functional Acceptance Test:** This test helps verify if the path of the app is working according to the functional requirements. The error and alternate paths need to be tested as well.
- **Integration Test:** It works similar to the Component Test but while the Component Test works on one component at a time, this can work on multiple components simultaneously.
- **Performance Stress Test:** This test checks if the system can handle the request on time by a set number of users, background workload, and transactions.
- **Production Acceptance Test:** This test verifies if the app can work fine in the target environment.
- **System Test:** This test verifies if the app can fulfill the requirements.
- **Unit Test:** This test examines a single small object.
- **User Acceptance Test**: This test helps figure out if the user can use the app and whether it's user-friendly, effortless, usable, etc.

1.4 Advantage of DevOps:

It can fulfil business requirement and can remove human error from the project lifecycle if created more responsive development environment, DevOps enables organizations to:

- Reduce the implementation time of new services from months to minutes.
- Increase productivity of business and IT teams.
- Save costs on maintenance and upgrades.
- Standardize processes for easy replication and faster delivery.
- Improve quality, reliability and reusability of all system components.
- Increase the rate of success for digitalization strategies and transformation projects.
- Ensure that money invested in cloud infrastructure, analytics and data management are not wasted.

1.5 Future of DevOps

- As we move to more automation there is higher chance of automating problems too. So DevOps shall ensure the security of the product being developed in production and in testing environment.
- If AI and MI is applied to DevOps pipelines it can help us to build and automate in much better and closer insights a controls.
- Since, everything is on internet thus automation of companies need to done thus it have a wide market for companies automation done through DevOps.
- DevOps methodology can be used in the new emerging, Container Technology.
- DevOps can provide a lot of applications Platform as a Service namely configuration management, continuous security and containerization.
- Its plays a significant role in the integration of all services that are hosted on different platforms.
- Whether it a developer job or operational job both are tedious process, so DevOps can act as a coding automation instrumentation i.e. the infrastructure as a code methodology and CD/CI pipelines will help to reduce the time gap.

DOI: 10.48175/IJARSCT-12106

II. LATEST TOOLING FOR EFFECTIVE TESTING TECHNIQUES

- Shift-left Testing: Involves testing earlier in the development cycle, thereby preventing defects from entering the system.
- Continuous integration (CI) and Continuous testing (CT): Enable team collaboration to deliver higher quality software faster.
- Test Driven Development [TDD]: Effective technique for improving code quality while reducing defects and failures.
- Behavior Driven Development [BDD]: Focus on developing code based on desired outcomes.
- Risk Based Testing: To prioritize testing errors based on potential risks.
- Exploratory Testing: It is an unscripted approach to testing that encourages testers to think outside the box and uncover new issues.

By incorporating the latest testing tooling into DevOps processes. We can streamline the testing process and improve efficiency. Implementing automation, continuous integration and deployment testing ensures maximum QA deliver Quality code faster.

2.1 SELENIUM

It enables faster and more accurate testing of web application, including regression testing and functional testing.The most widely used automated testing tool is **Selenium**. It is one of the top DevOps automated testing solutions, specifically developed to handle browser automation testing. It support for concurrent test execution decreases test execution time. When compared to other testing tools, Selenium requires far fewer resources. This testing tool's test cases can be run on any operating system. It is compatible with common programming languages such as Java, Python, C#, Perl, PHP, and JavaScript.

2.2 JMETER

Apache **JMeter** is a free and open source load testing software. It is intended to assess the performance of websites. This load testing tool is suitable for usage in the DevOps process.This load testing tool saves its test plans in XML format, allowing users to construct them with a text editor. This can be used to do automated and functional application testing.

2.3 JENKINS

A CI/CD server called **Jenkins** can automatically run tests every time a new code is pushed into the repository by the developer. CI can detect bugs early in the process. Jenkins is a build automation tool for Java. Nowadays, it has become a platform where we can build, automate and deploy any software project.

2.4 DOCKER

Containerization tool that is widely used in DevOps for building and deploying applications. It helps in streamlining the testing process by creating a separate environment for each application, allowing multiple versions to run simultaneously and reducing the risk of errors. **Docker** is a technology package for DevOps. It enables DevOps teams to create, deploy, and run distributed applications. Users can use this tool to assemble apps from components and collaborate on them. This open source platform is used to manage an app's containers as a single group.

2.5 POSTMAN

Faster feedback on code changes and reduce the time taken for testing. Implementing these techniques can improve the overall quality of DevOps lifecycle. Postman is a standalone software testing API (Application Programming Interface) platform to build, test, design, modify, and document APIs. It is a simple Graphic User Interface for sending and viewing HTTP requests and responses. This tool has the ability to make various types of HTTP requests like GET, POST, PUT, PATCH.

2.6 APPIUM

Maximize quality assurance with **Appium**, an open-source tool that enables automation of mobile applications. AI-powered testing enables faster and better defect identification, with testing scripts that are easy to create and maintain.. One of the greatest testing tools available for DevOps, it enables users to test different native, mobile, online, and hybrid apps. Additionally, it aids in the automated testing of emulators and simulators. In the DevOps process, it is employed actively.

2.7 JIRA

A lot of organizations use **Jira** to manage test cases. With the help of this development and testing teams can work together. Zephyr for Jira is a tool that is used for creating, executing, tracking and reporting test uses.

DOI: 10.48175/IJARSCT-12106

2.8 PUPPET/CHEF

Tools like Puppet or chef enable users to avoid snowflake servers in their delivery/deployment environment. We can use **Manifests in Puppet or Recipes in Chef**, to explain the configuration of the elements of a server. This helps in configuring and specifying environments in a completely automatable format.

2.9 TEST SIGMA

Tests are defined and automated using simple language, and **Testsigma** offers end-to-end evaluations for web and mobile applications as well as APIs.

2.10 BAMBOO

Continuous integration (CI) platform from Atlassian that comes in self-hosted and cloud configurations. Unlike other CI tools, it offers a drag-and-drop interface to easily configure development workflows and orchestrate tests at each stage.

2.11 SOAPUI

It is an API testing tool for **SOAP and REST** that runs on multiple platforms. It is a popular DevOps testing tool for performing functional and load testing on APIs.

2.12 TESTPROJECT

Test automation framework for web and mobile environments. It supports Android, iOS, and all major web browsers. Test cases can be written in TestProject's SDK tool or recorded in the browser, and all cases can be shared with other team members. **TestProject** offers integrations with other open-source automation frameworks like Selenium and Appium.

2.13 TEST COMPLETE

UI testing tool that offers wide-ranging capabilities for desktop, web, and mobile applications. It is built on an AI-powered object recognition engine that you can use to define tests either with or without custom scripts.

2.14 SIMPLE TEST

It is a popular unit testing tools and apply these features to PHP applications. Its features include mock objects for less resource-intensive testing and an internal web browser to simulate user interactions on a web application such as signing up for a newsletter through a form.

2.15 TYPE MOCK

It offers coverage reports to identify code not covered by existing test cases, suggestions for new test cases, real-time review of newly written code to highlight lack of coverage, and additional insights into potential vulnerabilities in your code.

2.16 APP VERIFY

It is a continuous testing solution that covers the entire DevOps lifecycle. This includes functional testing and performance testing capabilities as well as application monitoring and robotic process automation. It allows you to create UX test cases by simply acting as a user in the app, and the tool then converts these actions into scripts.

2.17 LEAP WORK

An automation platform designed to make test automation easy for non-coders by providing a visual dashboard that requires no scripting language. The tool allows users to build tests through flowcharts with built-in automation. **Leap work** can run tests across web applications, local machines, virtual machines.

III. LITERATURE REVIEW

[1] In the **Factors Driving Testing in DevOps Setting- A Systematic Literature Survey**Jayasri Angara, Srinivas Prasad and GuttaSridevi stated that continuous software delivery, which seizes market opportunities and shortens feedback times, gave rise to DevOps. However, the QA and Testing operations are being significantly impacted by the new DevOps procedures. The goal of the current study is to comprehend the many motivating variables that drive testing in the DevOps environment and makes an effort to identify the important administrative, cultural, and technological aspects of testing in a DevOps environment. It is clear that the majority of DevOps testing publications were released after 2011 and increased after 2014. This phenomena demonstrates the beginning of the advancement of research in this area. We found that automation of test cases is highly related to DevOps in testing. Its advanced stage is attributed to model driven frameworks that automatically generate test cases. More than 50% of review articles have made this a point to emphasise.

More over half of the papers were about cloud computing, virtualization, and DevOps testing simulation methodologies. More than 16 review articles mentioned factors including agility, scale, metric-driven processes, decrease of complexity, and cost. DevOps requires

DOI: 10.48175/IJARSCT-12106

alternative metrics to improve collaboration and communication among system stakeholders. The face of an organization's culture and human resource mindset is DevOps testing. However, we discovered that academic scientific literature has not consistently examined DevOps testing. Academic journals did not contain any real-world case studies involving DevOps testing frameworks. It encourages conducting further action research in this field.

In DevOps, the traditional separated QA / Testing capabilities may face difficulties and have a restricted role to play.

[2]SaimaRafi, MuhammadAzeemAkbar, SajjadMahmood, AhmedAlsanad, Abdulrahman Alothaimtry to get attention on **DevOps best test practices** in their paper. They stated due to the requirement for an automated process that delivers feedback at various methods of continuous development and operations pipeline, testing is a challenging phase in the DevOps process. Due to a lack of knowledge about testing best practises for the DevOps paradigm, software organisations encounter numerous difficulties throughout the testing phase. The goal of this study is to rank the best DevOps testing practises, which will make it easier to choose testing methods during the DevOps process. Using the 15 DevOps testing techniques covered in Hornbeek's study, we expanded on his work to conduct this research.

In the paper they conclude CALMS (Culture, automation, Lean, Measurement and Share) criteria are used to rank DevOps best practises using a prioritization-based taxonomy. The DevOps test practises that would help practitioners better manage testing activities during the DevOps process were prioritised using the ISM (This is an interactive learning approach in which we can structure directly and indirectly related factors into a holistic model)and fuzzy TOPSIS (This approach is one of the MCDM methods for ranking. It supports both qualitative and quantitative studies. TOPSIS approach makes best and quick decision to our real life-problems.) They will conduct a guidelines-based model for automation in testing and perform case study analysis to verify the authenticity of our proposed model from industrial experts. Furthermore, they will create a maturity model that could assist software engineers to revise their existing capabilities of testing.

[3] In the **Testing in DevOps** publication Frank Faberstates that testing was and will continue to be an integral element of the process to ensure the quality of the service. To ensure that testing truly focuses on the quality of the service supplied, DevOps adjustments are required. In this publication he covered the points are DevOps, Testing in DevOps, automation is. At the end he concluded due to team is responsible for a service from start to finish, quality standards for both development and operations must be considered as well as we want automate everything whatever we can in DevOps.

IV. METHODOLOGY

To address the research objective of this paper need to investigate and evaluate the data. So, here approach in DevOps Testing was informed such as collect the data, analyse it and then final result.In Online **Google Survey** method I prepare some set of questions that responded through the various people.To examine the role of testing in DevOps I have designed and executed online questionnaire survey. The responses were gathered from geographically distributed individuals who has a required knowledge about the DevOps.

The questionnaire was designed using Google Forms tool (**docs.google.com**/forms).

In questionnaire I set few questions those are as follows:

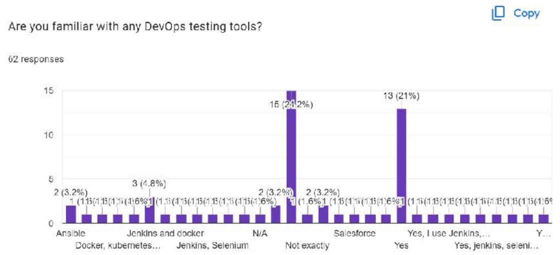
- Do you aware of DevOps?
- Does DevOps will impact QA testing?
- Do you agree DevOps improves speed and stability of Software Development and Deployment as well as it maximizes efficiency with Automation?
- Why DevOps important in testing?
- Are you familiar with any DevOps testing tools?
- As well as I discussed with my colleagues and friends regarding DevOps testing and its tools, use, etc.

V. RESULT

In result or output of questionnaire and discussion I observedthat most of agreed that DevOps is impacting to testing and it improves speed and stability of software development and deployment as well as it maximizes efficiency with Automation.

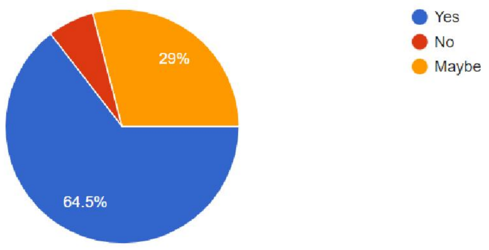
In google survey I received responses from 62 folks who are working in different organization on various role. From them some are software developers, testers, engineers, analyst, and consultant. Many of them aware with DevOps testing tools such as Jenkins, Selenium, Ansible, Postman, Jira, Docker.

DOI: 10.48175/IJARSCT-12106



As per them DevOps important in testing due it makes testing a shared responsibility of the entire team, while test automation enables developers to ship code changes quickly with high confidence in quality. It helps for continuous integration between deployment of code and testing different environments.

In the below pie-chart it clearly shows the Many of the people are agree that DevOps is impacting in QA testing.



Nowadays testing is becoming automated and by the help of using DevOps in testing it will help to testers and developers to develop and test the software's efficiently and within a time being.

VI. CONCLUSION

The DevOps methodology will boom production if applied correctly, it enhances the business performance of application and allows the end user to directly contribute to the application development process. It eliminates all most all conflicts that the development, testing and operation staff used to have while developing the project. DevOps is all about providing a path for faster time to market of new software features and achieving better stability. Right now, there is no chance it is going to be replace rather will witness it to be a top option for developing dynamic applications that constantly evolve to meet new challenges. I've quickly outlined DevOps here, along with how and why it has replaced earlier techniques. Initially, the QA team would hold off on public release until the product was perfected. The product's launch would be postponed by several days as a result. In some cases, the delay could go for several months. There would be no more delays thanks to the concurrent creation of the product by numerous teams. A good DevOps test automation tool promotes more efficient teamwork, lower costs, and shorter release cycles. The quality and status of the applications in the DevOps pipeline are also made visible. Deployment is, however, becoming increasingly automated as a result of the expansion of DevOps testing. Maximizing Quality Assurancerequires effectively testing in DevOps with latest tooling. Techniques such as automation testing, continuous integration, and deployment can be used to improve efficiency and reduce errors. With the use of tools such as Docker, containerization can help streamline the testing process and improve the reliability of DevOps pipeline.

BIBLOGRAPHY/REFERENCES

[1] A Review Paper on DevOps Methodology - Ijcrt.org

[2]https://www.researchgate.net/publication

[3] Selenium Simplified (Alan Richardson)

[4]https://intellipaat.com/blog/devops-testing-tutorial/#no1

[5]https://www.guru99.com/devops-testing-tools.html

[6]StephenRoddewighttps://blog.hubspot.com/website/devops-testing-tools

[7] Jayasri Angara1*, Srinivas Prasad2 and Gutta Sridevi1 1 K. L. University, Vijayawada - 522502 ,Andhra Pradesh, India;angara.jayasri@gmjail.com,sridevi.gutta2012@gmail.com 2GMR Institution of Technology (A), Rajam - 532127, Andhra Pradesh, India. "The Factors Driving Testing in DevOps Setting- A Systematic Literature Survey" Indian Journal of Science and Technology,Vol9(48),DOI:10.17485/ijst/2016/v9i48/103784,December 2016.

[8]SaimaRafi, MuhammadAzeemAkbar, SajjadMahmood, AhmedAlsanad, Abdulrahman AlothaimDeanship of Scientific Research, King Saud University "Selection of DevOps best test practices: A hybrid approach using ISM and fuzzy TOPSIS analysis" Journal of Software: Evolution and ProcessVolume 34Issue 501 May 2022https://doi.org/10.1002/smr.2448

[9] Frank Faber "Testing in DevOps" https://www.researchgate.net/publication/337400749_Testing_in_DevOps.