

Devops, A New Approach To Cloud Development & Testing

Dhaya Sindhu Battina

Sr. Data Engineer & Department of Information Technology

USA

Abstract The main purpose of this paper is to explore DevOps and its applications in Cloud development and testing. There's no denying it: DevOps and cloud go hand in hand. This trend will only continue since the bulk of cloud development projects now use DevOps. The advantages of utilizing DevOps with cloud applications are increasingly becoming evident. Competing well in the market necessitates a company's ability to supply services and applications at a rapid rate. To be effective, management procedures and tools need a model that is both swift and dependable. Because of this, we must automate the DevOps processes utilizing cloud and non-cloud DevOps automation technologies while designing cloud-native apps. The purpose of this article is to discuss how to migrate DevOps to the cloud and improve software development and operational agility. Likewise, this project will examine ways to expand such DevOps processes and automation to public and/or private clouds. If one is interested in learning more about how the emerging field of DevOps is changing the IT industry, read this paper. Understanding how DevOps and the Cloud work together to aid organizations in transforming themselves is the ultimate objective.

Keywords: DevOps, software testing, cloud development, automation tools

I. INTRODUCTION

A broad spectrum of occupational tasks involving predictable, repetitive tasks will be automated, according to analysts and observers. Intelligent Automation [1] is the use of AI in methods that can learn, adapt, and improve over time to automate jobs that were previously performed by a person. Advances in artificial intelligence and related subfields have made this new kind of automation possible. To automate cognitive processes, algorithms are being created. They also claim that the use of AI in mobile robots has increased the number of manual jobs that can be automated [1]. Knowledge and service labor often includes both cognitive and physical activities. A knowledge job is one in which the employee must use and create knowledge. It is intellectual, creative, and non-routine labor. A broad variety of professions, such as information and communication, consulting, pharmaceuticals, and teaching are all examples of knowledge-based employment. The process of utilizing one's resources (e.g., knowledge) for the benefit of someone (either oneself or another) is known as service labor. Retail, security, office cleaning, and knowledge-intensive occupations like consulting are all included in this category. Tasks requiring a high degree of cognitive flexibility and physical adaptation have traditionally been thought too tough to automate. This has changed lately. However, artificial intelligence (AI) has lately risen in breadth and capabilities, and this trend is expected to continue. To provide just a few examples, AI applications are expected to dramatically minimize the need for people in jobs such as translation (by 2024),

driving a truck (2027), retail (by 2031), and surgery (2053), all of which are forecast to be automated in the near future. As a result, advances in artificial intelligence will have significant impacts on the availability of knowledge and service jobs [2]. This influence on knowledge and service work distinguishes this transformation from past technological revolutions such as the industrialization of manufacturing labor in the nineteenth century or the use of transactional computers for administrative and services work in the late twentieth century. Organizations now have a new strategic opportunity to improve the corporate value as knowledge and service labor evolve [3]. Applied Intelligent Automation to middle-income cognitive employment might allow organizations to establish new commercial value prospects via recent breakthroughs in AI. Another option is for companies to replace high-skilled labor with new AI capital or to reassign high-skilled personnel to concentrate on more complicated, non-routine cognitive activities solely. The influence of AI on knowledge and service jobs is, however, a hotly debated topic. Because of this lack of agreement, new strategies for realizing commercial value via Intelligent Automation have limited coherence. The necessity for study into the newest breakthroughs in AI and their influence on the use of Intelligent Automation for commercial value is thus critical. Current academic knowledge is an excellent resource for gaining strategic views on Intelligent Automation [4]. Artificial intelligence (AI) has been studied extensively, with many studies adopting well-researched and scientifically solid approaches. There is a lack of unanimity on crucial discoveries and consequences since these contributions come from a diverse variety of academic fields and are based on divergent paradigms of study, theories, methodologies, and views. Reviewing the transformative implications of Intelligent Automation in areas that have been largely untouched by automation in comparison to other industries, such as manufacturing, this study concentrates on knowledge and service labor [4].

II. PROBLEM STATEMENT

The main problem that this paper will address is to explore how DevOps is changing cloud development, why it's changing, and, most importantly, how to adapt to the change. Financial challenges, the need for stronger and more flexible IT infrastructure resources, and management-related restrictions are all preventing cloud computing from reaching its full potential and becoming a world-beating technology. For businesses to expand, both cloud and DevOps technologies must arise and evolve together [5]. There will be delays in the adoption of DevOps technology for cloud systems if certain professionals or other specialists are not on board with incorporating it immediately into engineering. The paper will discuss how DevOps affects software development in general and cloud software development in particular.

III. LITERATURE REVIEW

A. Development of cloud-based applications

Changes must be made at the beginning of the Cloud application development process. Modern DevOps technologies provides several benefits. Many businesses now use Cloud development platforms, but they must automate the agile process. The most effective method for achieving satisfactory outcomes is as follows:

- Define the development needs by examining current and prospective tasks.
- The return on investment (ROI) must be defined.
- Define the basic processes, which will evolve as a result of trial and error.
- Gain a thorough understanding of the target platform and establish a synergy between DevOps procedures, automation, and the platform itself.
- Define how cloud-based apps will work.

B. Examples of Cloud Development Platforms

- **Salesforce:** One of the top platforms is Salesforce Cloud Computing. CRM, ERP, sales, marketing, and other software are available. It offers a variety of cloud services, including sales, service, and marketing. And it aids in the service of clients from all over the globe [6].
- **Azure development platform from Microsoft:** The Azure development platform from Microsoft is used to create and build apps across a global network. This Cloud computing solution is compatible with a wide range of databases, tools, and frameworks [6].
- **Google's application engine:** The cloud application framework makes use of Google data center resources such as computers, virtual machines, and hard drives. It's an integrated storage system for live data that developers utilize.
- **Adobe Cloud development platform:** When it comes to providing Cloud services, Adobe has a number of solutions to choose from, including Adobe Creative Cloud, Adobe Experience Cloud, and Adobe Document Cloud. It gives customers access to tools, advertising solutions, campaign building solutions, and digital documentation solutions.

C. The Evolution of Cloud Development Platforms

The most intriguing aspect of DevOps is the flexibility it provides when it comes to automating and delivering applications and software systems. Previously, developers employed unconventional development techniques, but with the introduction of DevOps, the situation has changed dramatically [7]. The main objective is to enable developers to meet the demands of the company while also eliminating the delay that has plagued development for years. Let's look at the connections between DevOps and Cloud development platforms now:

1. Cloud computing's centralized structure offers a platform for DevOps automation's testing, deployment, and production. Previously, centralized development did not work well with a distributed corporate system. Many complicated challenges that distributed systems face may now be solved by employing a Cloud development platform.
2. Cloud-based DevOps automation is gaining traction. With continuous integration, many Cloud developers offer DevOps on their platforms. This lowers the cost of on-premise DevOps automation in the long run. This governance is now easy to manage and trouble-free for cloud developers [8].
3. Using DevOps in a Cloud development platform eliminates the need to account for leveraging resources. Utilization-based accounting is used in the

cloud to monitor resource usage per application. The cost of development resources may now be tracked much more easily [8,9]. One amusing reality is that DevOps is driving Cloud growth, not the other way around.



Fig i: DevOps Lifecycle

D. Why are cloud businesses using DevOps?

To what extent is DevOps making a difference to businesses and how are innovative approaches to Cloud development platforms being dictated? The dependence for quicker development and deployment is the easiest option. The reason for this is that DevOps is both easy and complicated. Despite the businesses' strong belief in DevOps, there is still a need for more resources to meet the business's present demands. This, however, cannot be accomplished just via the use of a DevOps system [10]. The development process is slowed by the high latency during the procurement of resources. As a result, Cloud development resources are required to expedite the whole process. DevOps is undoubtedly influencing new techniques, but it is useless without the Cloud. The reality is that both DevOps and Cloud have shown their worth in the industry and continue to be equally beneficial. However, with continuous and agile development, these businesses must expand the value of DevOps [10,11]. The adoption of DevOps is the only reason for Cloud development's success. Without the other, one technology is useless. DevOps must be deployed with thorough awareness, and the Cloud must be integrated with DevOps, as well as numerous choices based on DevOps tools and Cloud development platforms. DevOps is definitely on a mission to impose new ways to cloud development, as shown by the fact that cloud enterprise professionals exclusively use DevOps platforms for quicker deployment and scaling of their businesses. The key reason for this is because DevOps technology is simple and employs a sophisticated strategy for deploying software systems and tools, which speeds up the development process [11]. Even though these firms seem to have put a lot of confidence in DevOps technologies for quicker deployment, development, and production agility, there are hardware and other software-based resources that must be purchased, implemented, and controlled depending on the business's present requirements. This can't be managed by DevOps systems alone, which is why these businesses need cloud solutions to accept such massive yet required resources to speed up the app development and deployment process [11]. DevOps seems to mandate new techniques for cloud-based systems, but it is a harsh reality that it cannot be achieved without the support of cloud systems. Anyone interested in pursuing a career in DevOps or cloud development should take AWS DevOps certification courses to better prepare for the test and get the skills needed for the job [11].

E. The DevOps-cloud Development

DevOps, or continuous and continuous development and operation of software/applications, is now possible in

the cloud environment. The bulk of cloud development programs, software, and apps use DevOps. The newest trend in software development and testing is cloud projects that use DevOps services [12]. They reduce development, testing, implementation, and operational expenses by reducing the time-to-delivery of application development to satisfy the needs of business units.

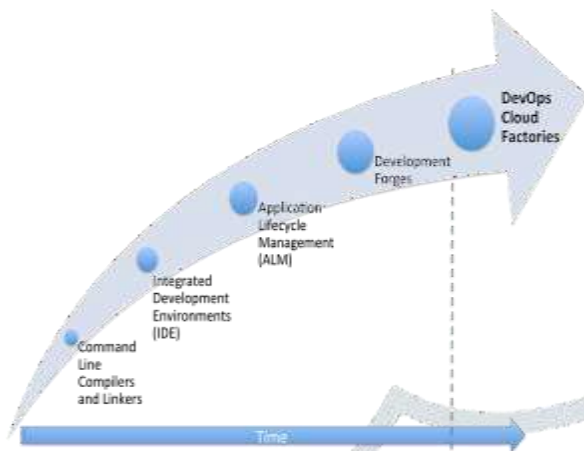


Fig ii: The DevOps-cloud Development

F. What Is DevOps and How Is It Changing the Game?

At its core, DevOps is the automation of agile methods. The idea is that developers will be able to react to the organization's demands in real-time. DevOps may help to remove long-standing lag in software development. Cloud computing's centralized architecture provides a consistent and centralized environment for DevOps automation training, deployment, and development. DevOps automation is moving to the cloud [12]. According to a recent Gartner poll, high-performing companies had 200 times more deployments and 2555 times quicker-lead times than low-performing companies. In addition, high-performing firms have 24 times quicker recovery times and a 3 times lower change failure rate than low-performing organizations. This emphasizes the need of adopting DevOps to remain competitive. Most public and private cloud infrastructures, as well as continuous integration and continuous development technologies, enable DevOps. Their tight connection may save the expenses of on-site DevOps automation technology while also providing a solid DevOps process with centralized administration and control. Many developers who start the process discover that governance keeps them safe, and it's simpler to do this from a single location than attempting to bring departments under control [13]. The requirement to account for leveraged resources is reduced with cloud-based DevOps. Clouds employ consumption-based accounting, which tracks resource utilization by application, developer, user data, and so on. This service is usually not available in traditional systems. When using cloud-based resources, it's much easier to keep track of development costs and adjustments as required.

While organizations recognize the need for speed and the advantages of DevOps, the whole process necessitates a cultural transformation in the organization's operating paradigm. Finding a DevOps Managed Services provider that specializes in assisting firms in adopting agile development frameworks is the proven or quickest way to make that move [13]. A business evaluation and knowledge of the development lifecycle are usually the first steps, followed by a thorough overview of best practices and process adjustments.

G. A Cloud-Based Development Methodology

While designing cloud applications, the shift should begin at the software engineering stage, not at the C-level [13,14]. All those in charge of the process should be aware of the advantages of creating cloud applications using contemporary DevOps technologies. Many who aren't on board are likely to stymie progress and fail to react appropriately to the inevitable problems that will develop. Even though business software shops are quick to choose a cloud platform, DevOps and public and private cloud solutions may expand at a rapid pace.

Development and operations teams will be integrated through DevOps to eliminate the delays that have existed for years in software development and to automate the agile development approach. Businesses nowadays are concerned with speed, efficiency, and getting the most value for the money [14]. As a result of these key influences, we're seeing a shift in how cloud development is done.

1. Speed:

With DevOps, organizations are more inclined to create and deploy on Cloud because it provides a common platform for development, testing, and production. Removes the distribution headaches that come with an on-premises installation. But that's not all. Most cloud suppliers offer platform services that are completely integrated with DevOps tools so that IT development teams can produce new products and features at the speed necessary to remain competitive [15].

2. Efficacy:

DevOps, in conjunction with Cloud, enables automation, which is another word for efficacy, making it the most efficient way to develop software. As a platform for continuous integration and development, the cloud provides the scalability required for sophisticated application development, testing, and deployments. It also allows for template-based distribution [15]. Cloud also enables centralized governance, security, and monitoring, all of which contribute to a 20 percent increase in overall efficiency during implementation.

3. Cost-efficient:

DevOps solutions are now widely available as SaaS from major cloud service providers. This eliminates the need for large upfront investments in hardware and software setup, as well as ongoing administration fees and the costs of supporting systems such as resource management, monitoring, and security tools [15]. In comparison to traditional on-premise deployments, cloud providers' one-click deployment options for auto-scaling containers and dynamically scalable databases deliver higher ROI [15].

H. DevOps-enabled Cloud app development: how should it be approached?

There is no such thing as a DevOps tool or technology. For an organization to be DevOps ready, the entire organization must be on board with the process, not just a few teams or individuals. So that development teams can build the features and capabilities that customers want, DevOps necessitates involvement from business teams as well. To sum it up, DevOps enables a complete organization to rapidly create products that customers love and appreciate. Scale effectiveness and cost savings are made possible with the help of the Cloud [15].

IV. FUTURE IN THE U.S

The future of DevOps in cloud development in the United States is increasingly synonymous with the future of business; there are some DevOps future trends we can look forward to seeing in terms of DevOps development in the United States. Without DevOps systems, cloud computing's future cannot be defined or visualized, with the latter guiding the path to complete victory. Because an organization is more likely to fail and become incompetent if it lacks the agility and speed necessary to match the unmatched demands of users and stakeholders [16]. Metrics that are appropriate for the organization's policy must be established, and standards for the working environment must be implemented using DevOps and cloud-based server systems. Automation is used in some form or another by virtually every IT company. According to a Business Wire survey, 61% of US companies heavily rely on automation [17]. Autonomy has become increasingly important for companies as they realize the advantages of DevOps from development to deployment and management.

V. ECONOMIC BENEFITS IN THE UNITED STATES

DevOps for cloud development will benefit the United States economically in a variety of ways. In the last few years, hybrid and multi-cloud strategies have been the cornerstones of business expansion and success [18]. These approaches give companies the freedom and flexibility to host apps however they see fit, depending on the needs of the business. An IT operating model known as AgileOps was developed for digital organizations by using agile concepts to create more agile working methods. Simply put, companies that implement DevOps practices do more. DevOps enterprises may produce with optimum speed, functionality, and creativity with a single team made up of cross-functional people working together. There is now a 41.44 percent share of the worldwide DevOps market that is held by the United States. Employees can assist automobile manufacturers by using DevOps to find any production scaling concerns. The shift to a continuous testing standard by United Airlines saved the company about \$500,000 in total. It has also been able to raise its code coverage by 85% with the help of DevOps [18]. Considering that over 30% of IT organizations already use machine learning and artificial intelligence, the adoption of AIOps will continue to grow as organizations seek to improve efficiency and automate critical DevOps tasks to free up IT operators' time to focus on higher-value business activities.

VI. CONCLUSION

This research looked at exploring the application of DevOps in cloud development and testing. To summarize, cloud computing and DevOps couldn't be further apart on any spectrum, as evidenced by this research. Whereas DevOps is an operational philosophy, IT breakthroughs such as the widespread use of the Internet have sparked the rise of the former. DevOps and cloud computing are a marriage made in heaven when deployed together, notwithstanding their differences. Global corporations are already embracing DevOps as a way to improve their business processes. Most operations are progressively being stored on away servers – the cloud servers – for the sake of simplicity and economics. As a result, the idea is now more well known. There are numerous advantages to using cloud-based DevOps, and as time passes, fresh ones will emerge. When it comes to hardware, DevOps cloud computing minimizes downtime by running activities on the cloud continuously. Developers can create stateless

applications that boost availability and failover capability while also serving as a driving force behind client satisfaction levels. The capacity to accomplish DevOps automation is the most critical characteristic of a hybrid approach. It's now possible to automate on an unprecedented scale because of the cloud computing model's centralized structure and the availability of a common and unified platform for testing, deployment, and production.

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