Challenges for an Enterprise to Deploy Devops in Multi-Cloud Environment

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Abstract : *In software industry, the primary factor contributing to the success of an enterprise is software delivery. The latest software development paradigm/platform, DevOps helps an organization to stay ahead in competition in the industry as well as provide continuous delivery and integration platform for software development and operations. To leverage the potential of DevOps platform, a challenge is to deploy it properly for multiple targets. In this paper, an effort is made to survey various technical challenges an enterprise has to deal and their probable solutions. Besides this, the paper discusses most effective best practices for DevOps in hybrid cloud environments, along with research scope in Software engineering with DevOps platform in multi-cloud environment.*

Keywords: *DevOps, Multi-Cloud, Agile, Security, Continuous Integration, Performance, QoS , Deployment*

Introduction

Couple of decades ago, The IT industry was viewing Enterprise IT and Development as two separate departments. The Engineering and software development departments are concerned with design and development of projects/products, where as the Enterprise IT department addresses value stability and continuity. This partitioned approach started posing issues, when the development team adopted state-of-the-art development processes like agile/scrum. The issues were slower integration, poor configuration management , and coping up with changing source code etc[10]. The solution to theses problems is deployment of DevOps. DevOps is a state-of-the-art practice that is basically an amalgamation of software development processes and operations, with collaborative efforts to out-perform in deploying and delivering software projects/applications[1].

DevOps strives to break the barrier between developers and operations staff of an organization, in order to reduce the time and friction persisting between them, for deploying newer versions of software. Due this the enterprises are able to compete and provide Quality of Service(Qos)[6].

As agile and scrum are the iterative development processes, they require, IT divisions to respond quickly to the demands of the development. These newer software processes normally demand scalable and flexible infrastructure on shorter notices[2]. The latter part can incorporated by adopting a cloud services from cloud-vendors[2]. Thus DevOps and Cloud are almost becoming head and tail of a coin, without one and the other, they can not provide best performance for an Enterprise.

II. Devops under the umbrella of Cloud

With the inception of DevOps in software engineering there is a change in the traditional development life cycle and cloud development/computing as well. When DevOps are linked to Cloud computing, the developers of an Enterprise as a whole en-cash following listed features[8].

- The cloud computing paradigm provides a centralized platform for DevOps in regard to a standard and centralized platform for development, testing, configuration, deployment and production[4].
- As DevOps are driving most of the cloud computing industry, various cloud service providers up-hold DevOps, systematically on their platforms, like continuous integration and continuous development tools[4].
- The cohesive coupling between DevOps and cloud computing lowers the cost associated with on-premises DevOps automations technology[7].
- Under the Umbrella of DevOps, the Cloud's most important service, Software-as-Service, de-partitions the function and operation, which is projected as unified solution to the customer[5].
- DevOps with Cloud computing encourages the adoption of agile methodology of Software development which has drastically contributed in development with respect to time/speed , as with the same flexibility as

business. In a nut shell it can be said DevOps enables operations to move at the same speed and with same flexibility as development.

• Moreover, the Cloud Management software automatically keeps account of resources used etc[5].
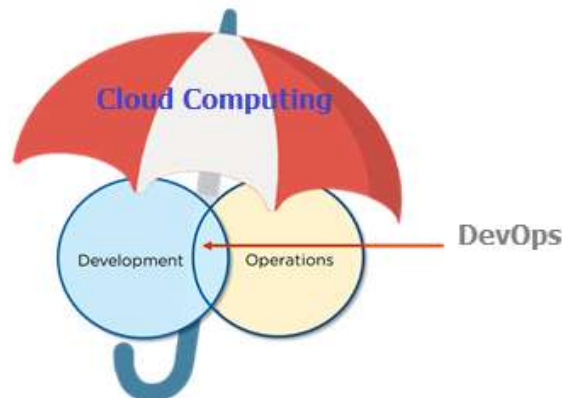

Fig. 1 DevOps under the Umbrella of Cloud

As per the present scenario in IT industry cloud and DevOps will continue to prove their collective value for an Organization/Enterprise. The amalgamation of Cloud and DevOps is not a easy decision for an Enterprise, but take many aspects in to account[3]. DevOps need to be understood and implemented, where as Cloud Computing need to be adopted around DevOps and thus many of the decisions should be taken jointly Cloud management teams and Development people[9]. It is evident from the above discussion that, DevOps will not have any value without cloud and Cloud has lesser appreciation value without DevOps and The principle of continuous improvement is key to agile, cloud and DevOps.

III. The Journey Of Devops With Multiple Clouds

In the preceding discussion, it is been emphasized that Cloud computing and DevOps are interdependent, to leverage their potentials to provide best QoS to an Enterprise. Due continuous changes and advancements in technologies, and to beat one another in competitive enterprise world, IT enterprises are going for options with multiple clouds for their organizations[4]. Earlier DevOps deployments were in single cloud, hence there were no major issues and challenges for the DevOps team and Cloud team. But with adoption DevOps deployment in multi-cloud environments, a new set of challenges and issues are faced by the enterprises. An Enterprise may be using multiple clouds for different needs, say it is using AWS cloud for computing and for storage IBM etc[7]. Thus thers would be need of switching of operations from one cloud to the other. In this scenario, due to varying business policies from cloud vendors, the development and operations may not work properly and gives rise to delays in end-to-end services. Fig-2 shows DevOps with Multiple Clouds. In this section an effort has been made to discuss the issues with probable solutions.

The IT industry/Software industry has revolutionized the Software Engineering field with the advent of agile/scrum methodology for development and Cloud computing for platform/Software/Infrastructure-as-Service[10]. The agile methodology has enforced a mechanism of Dev-Ops with which, the enterprise can continuously develop(Git), continuously integrate(Jenkins), continuously monitor(Nagios/Puppet/Ganglia) and continuously deploy (Docker/ Kubernetes). These tools must be using/sharing various resources(storage/computing/bandwidth etc) available from different cloud service vendors. If the applications/processes need to be shifted from on cloud to the other for some QoS purpose, then there would an array of issues need to be addressed and find solutions for it.

- The primary issue of concern is reliable deployment of distributed code to public, private and hybrid clouds, It must also deploy it properly to globally reputed cloud service providers such as Google, AWS etc[7].
- The Cloud management team and DevOps team must ensure the aligning of the processes and tools of DevOps automation with the existing operational platform[7].
- Both team must thoroughly study and realize the details concerning the target clouds which include their run-time environments, native features, and popular practice of data and coding etc.
- The DevOps tool development team must anticipate the expected target cloud requirement and accordingly it must be designed and developed.
- Another important parameter to be addressed is Security in deploying DevOps in multi cloud environment. As cloud to cloud the security policy changes, it must be systematically incorporated so that security is not compromised. An alerting Intrusion detection system should be used to secure the multiple cloud environment[8].
- One more major Issue is resource governance . Normally this is most often neglected on both sides, i.e DevOps side as well as Cloud side. A clear service and resource governance policy must be incorporated to provide optimal usage and consumption of resources. An Enterprise must ensure the availability service and resource directory that helps track , secure and manage services and resource.

IV. Conclusion

It is evident from the above discussion that DevOps is the rise of agile methodology and dynamic IT operations. DevOps coupled with Cloud computing technology can provide better solutions with good QoS parameters. DevOps blended with multiple cloud environments outperform in regard to continuous development, integration, monitoring and deployment of solutions to customers. But due to heterogeneity in Cloud architectures and implementations, there are some potential issues, if not resolved scrupulously it would backfire on the performance. So This paper discussed some important issues and challenges and their brief probable solutions.

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