Cloud Software Engineering

Rupashree Rangaiyengar
Indian Institute of Science
Bengaluru, India
rupashreeh@iisc.ac.in

ABSTRACT

Cloud is a distributed ecosystem and differs significantly from on-premise software development platform. Cloud application development is built upon a service-based architecture, application programming interface driven communications, container-based infrastructure and a bias for DevOps process such as continuous improvement, agile development, continuous delivery and collaborative development among developers, quality assurance teams, security professionals, IT operations and line-of-business stakeholders. Therefore, while building applications on the cloud there needs to be a novel attitude to requirements gathering, software design, development, deployment, debugging, maintenance and testing. The main objective of the workshop is to discuss how Cloud Software Engineering differs from traditional software engineering and the challenges that arise and create a community around the relevant work areas.

ACM Reference Format:
Rupashree Rangaiyengar. 2023. Cloud Software Engineering. In *16th Innovations in Software Engineering Conference (ISEC 2023), February 23–25, 2023, Allahabad, India.* ACM, New York, NY, USA, 2 pages. https://doi.org/10.1145/3578527.3581746

1 MOTIVATION AND AIM

While designing a cloud application, architects need to be aware of the infrastructure requirements and deployment strategies upfront. Traditional applications have a static infrastructure and data and services are scaled manually. Cloud-based applications, being automatic, can scale data independently. They are designed on Service Oriented Architecture principles and are compatible with dynamic frameworks. Traditional applications are made on three basic tiers known as database tier, presentation tier, and app logic tier and deployed on-premise. Cloud-based applications in addition to the above have other tiers all of which are containerised and deployed on the cloud. They work on theories of user interface and automation. Cloud-based applications have well-designed structures that ensure proper backup for all the data. When it comes to cost-effectivity, cloud-based applications lead the race as they are designed, keeping the software as a service orientation in mind, as server maintenance cost and the licensing costs can be avoided. Costliness is one of the main reasons why traditional applications are losing credibility over time. Cloud-based application development involves building decoupled microservices allowing easy collaboration, independent development and fast release cycles.

A traditional application is dependent on a specific OS, backing services, storage and hardware making OS migration risky. Cloud-based applications are independent and do not require patches or configurations. GDPR is not an issue during traditional software development because all data resides within the on premise data center , while it is a significant issue during cloud software engineering. Database consistency models are not a concern during traditional software development but it is a critical criteria in cloud software engineering. Migrating an existing monolith to a microservice in the cloud is a significant endeavour that many organizations are investing in.

As the cloud services in a company's ecosystem increase rapidly, it becomes extremely crucial to have robust incident detection and remediation capabilities. Enhanced integration , performance and security testing for the cloud is essential. A cloud deployment model is defined according to where the infrastructure for the deployment resides and who has control over that infrastructure and can be divided into public cloud, private cloud, community cloud, hybrid cloud and multi-cloud. Automating and orchestration of tasks on these different deployment models needs special thought.

There are certain issues that are unique to cloud software engineering. Cloud security challenges includes compromised credentials, mass sensitive data breaches, hacked interfaces and account hijacking. Governance and Compliance should also be factored in. Multi Cloud environments which could involve varied combinations of public - private cloud or public - public cloud increases application development complexity many fold. Migration , portability and inter- operability are some of the critical concerns that govern cloud architecting decisions. Cloud services need to provide stringent reliability and availability guarantees. Cloud software engineering challenges present great opportunities for growth and evolution for industry practitioners and novel research problems for academicians.

2 PROGRAM

The workshop program comprised of the following invited talks followed by open discussion towards the end.

2.1 Srishti Sofat , Senior Vice President Product Development , Oracle

Topic: Enterprise Software on the cloud – Oracle Unity on OCI.

Srishti will share her experience in building and scaling large scale consumer and enterprise cloud software products in Marketing Orchestration, Personalization, Mobile, Mar-Tech and customer intelligence to help a global set of customers.

ISEC 2023, February 23–25, 2023, Allahabad, India

ACM ISBN 979-8-4007-0064-4/23/02.
https://doi.org/10.1145/3578527.3581746

2.2 Ashish Puri, Vice President R&D , Flytxt

Topic: Flytxt's big data and AI platform on the cloud.

Abstract: Flytxt has built its SaaS big data and AI platform on the cloud leveraging the best breed IaaS services to rapidly onboard their customers to their cloud offering. Multi-tenanted SaaS design has lead to exciting learnings for Flytxt, that will be insightful learning for Cloud software engineering practitioners such as this audience:

- Cost savings and rapid account /client activation: Cloud computing eliminated the need for upfront capital expenses for hardware and reduces ongoing maintenance costs enabling rapid deployments and 1-3 months delays in hardware were reduced to almost instant activation.
- Scalability: Elastic deploy and autoscale deployment allows Flytxt to handle the workloads from running Map Reduce jobs on EMR, as needed Spot instances , AI on Sagemaker, in the most cost effective and with the highest performance.
- Improved security: Using advanced security measures - VPN , WAF , encryption of data at rest and data in transit, using Key Manager, Certificate Manager , Identity Managers, Access Management , Audit trails from IaaS vendors which have helped greatly in reducing the risk of data breaches and cyberattacks. Frequent validation of environment through Security Hub to keep the platform on par with latest security advisories.
- Enhanced reliability: With multiple availability zones and disaster recovery and backup systems, cloud infrastructure provides a more reliable and available computing environment handling resiliency concerns and also assures a good nights sleep to Flytxt DevOps.
- Increased agility: Cloud infrastructure enables us to quickly launch new products and services, as well as respond to changing business requirements. CI/CD pipeline with frequent and timely feature and bug fixes, allows us to meet the most demanding needs of our customers in the quickest and shortest possible time
- Automatic updates: Flytxt SaaS environment allows software updates to all customers , ensuring that users always have access to the latest features and security patches.

2.3 Padmanabha Venkatagiri. S , Konveyor , IBM Research

Title: Replatforming applications with Konveyor

Abstract: Konveyor community provides a suite of open-source tools for modernizing applications through replatforming and refactoring applications. In this talk, a general overview of Konveyor is provided with a specific focus on the replatforming framework. The details of the framework and the capabilities it offers towards automating the creation and transformation of DevOps artifacts of an application for deployment in a Cloud Native environment are discussed. More on the framework could learnt from the following website: https://move2kube.konveyor.io/

2.4 Gokul Rangababu, Kiran.R. Mahuli , Wells Fargo

Gokul and Kiran will be providing context for the electronic trading business, illustrate how clock sync challenges in distributed systems impacts them and how they addressed the issue.

3 ORGANISER

Rupashree Rangaiyengar is a PhD student at Programming Languages Lab, Department of Computer Science and Engineering, Indian Institute of Science , Bangalore. She graduated with a Masters of Engineering in Computer Science from Cornell University in 2010. Prior to starting PhD, she was a Software Architect with 13 years of experience working in companies like Walmart Labs, VMware, Jivox and Oracle. She has varied experience across all phases of software development life cycle and deep expertise in building scalable and distributed microservices .