CI/CD for IBM Cloud Private

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Overview of CI/CD

Continuous Integration

- The process of having developers integrate code into a single code repository.

Continuous Delivery

- The process of automatically building and testing new versions of software so that it is ready to be deployed to production. The process of deployment is manual.

Continuous Deployment

- The process of automatically building, testing, and deploying new versions of software into production as soon as it passes all tests.

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Tool stack for implementing CI/CD in IBM Cloud Private

Jenkins – Deployed in IBM Cloud Private as a helm release.

SCM – With Jenkins SCM integration we can be notified of new commits for different branches. (Jenkins has plugins for **AccuRev, CVS, Subversion, Git, Mercurial, Perforce, Clearcase** and **RTC)**

Docker – Container images are built and published to Docker registry.

Kubernetes – Jenkins will notify Kubernetes of a new image which will begin the deployment rolling update.

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Jenkins

- Open source, server-based tool that builds and tests software continuously
  - Enables continuous integration and continuous delivery
  - Extendable via a rich set of plugins
    - Large ecosystem of existing plugins to integrate with on-prem and cloud based DevOps tooling
      - e.g. SCM integration, Kubernetes, Docker, Gerrit etc

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Jenkins in IBM Cloud Private

After the deployment has been updated with the new image, Kubernetes will handle the rolling update of the new app pods.

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Jenkins in IBM Cloud Private

Before setting up Jenkins, a persistent volume and persistent volume claim needs to be created.

- Storage can be based on NFS, host path, GlusterFS, and vSphere

Jenkins master will create slave pods to handle incoming jobs

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Jenkins external to IBM Cloud Platform

If a build server already exists outside of IBM Cloud Private, it is still possible to integrate and deploy to a cluster within ICP.

This can be done by copying the kubectl configuration details from the ICP dashboard. For extended use, an ICP service account token should be created.

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CI/CD Pipelines for Microservices

Pipeline as Code

- Treat pipeline as another piece of code. Commit Jenkinsfile to repo
- Will now have multiple repos and each may have different build/deploy processes

Automation of CI/CD pipeline is almost necessary to ensure smooth deployments of microservices

Zero downtime deployment will be handled by Kubernetes as a rolling update. Updates can also be rolled back to a previous revision.

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CI/CD Pipelines for Microservices

With microservices, each service can be tested separately.

- **Unit tests** can be done during the build stage with Maven along with a **static code analysis**

After publishing the microservice to the image registry, **integration testing** with the other components can begin.

- The newly published microservice is then tested against the latest stable versions of other components.

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Additional topics

- Istio – Allows for ease of management and additional functionality of the service mesh.
- External notifications? Jenkins has plugins for sending notifications through many different applications including Slack
- How does your application handle failures of individual services? This blog covers how to architect your microservice application to handle outages.
- Martin Fowler's blog on microservices has more information on microservice architecture

Lab!

Reference links

- Sample Microservice application - https://github.com/djccarew/get-started-java-icp
- Microservice reference architecture documentation - https://www.ibm.com/cloud/garage/architectures/microservices/reference-architecture
- Microservice reference architecture application - https://github.com/ibm-cloud-architecture/refarch-cloudnative-kubernetes
- Pipeline as Code with Jenkins - https://jenkins.io/solutions/pipeline/

Further reading

- Azarny, Igor. “CI/CD for Containerized Microservices - DZone DevOps.” *Dzone.com*, 5 Oct. 2017, dzone.com/articles/cicd-for-containerised-microservices.
- IBM. “Set up a Jenkins Pipeline to Continuously Integrate and Deliver Kubernetes Deployments to an IBM Cloud Private Cluster.” *IBM Cognitive Advantage Reports*, IBM Corporation, www.ibm.com/cloud/garage/tutorials/cloud-private-jenkins-pipeline?
- IBM. “Use Jenkins in a Kubernetes Cluster to Continuously Integrate and Deliver on IBM Cloud Private.” *IBM Cognitive Advantage Reports*, IBM Corporation, www.ibm.com/cloud/garage/content/course/cloud-private-jenkins-devops/1