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Project 2

Building a CI/CD Pipeline for a Tech Company

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1. Business Challenge/Requirement

XYZ technologies is a leading online repository for downloading online courses. XYZ plans to have its repository managed such that it can have admin login and User Login modules. In the first phase team has created the user login module and has moved it to production. There is a team of developers who are working on source code creation and add it to source code management tool - git repository. When the entire source code of application is coded team has used Maven to build the source code. Once a successful build is created, it is deployed to test server for QE resources to start testing and log issues which they have found. If any bugs are detected, developers are notified with the help of a feedback loop. If no bug is encountered, then the code is deployed to pre-prod and eventually to production server for release. Upon analysis of this process, Management has identified the following flaws:

1. Entire source code of application is build and then deployed to test server for testing.
2. It takes lot of time for developer to get the test results
3. Accumulation of bugs
4. Consumes a lot of time to debug as entire source code needs to be checked
5. Underutilization of resources as developers are idle until QE give bugs and QE is idle until entire source code is developed
6. Software to market time is more
7. Feedback mechanism was not robust

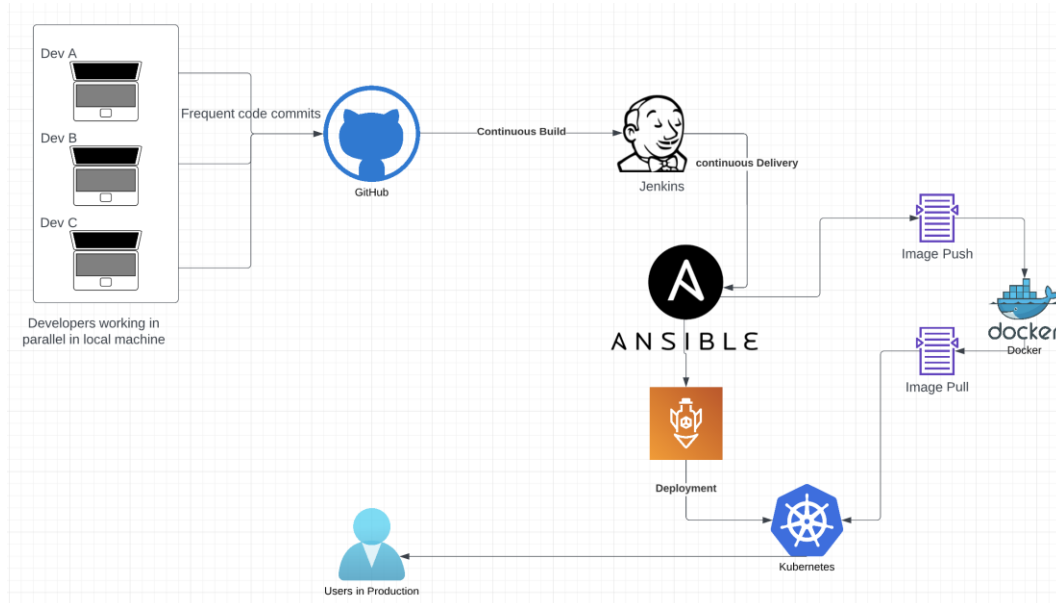
In the second phase, XYZ must create the modules such that the admin can view/add/delete Users. Further company wants to expand their repository to add more courses, add content based on most seen topic courses. Eventually, down the line company plans to provide course recommendations based on various user factors to provide good learning experience to the users. In order to achieve the company goals, Management has decided to leverage DevOps model and overcome above mentioned challenges.

2. The Goal of the Project

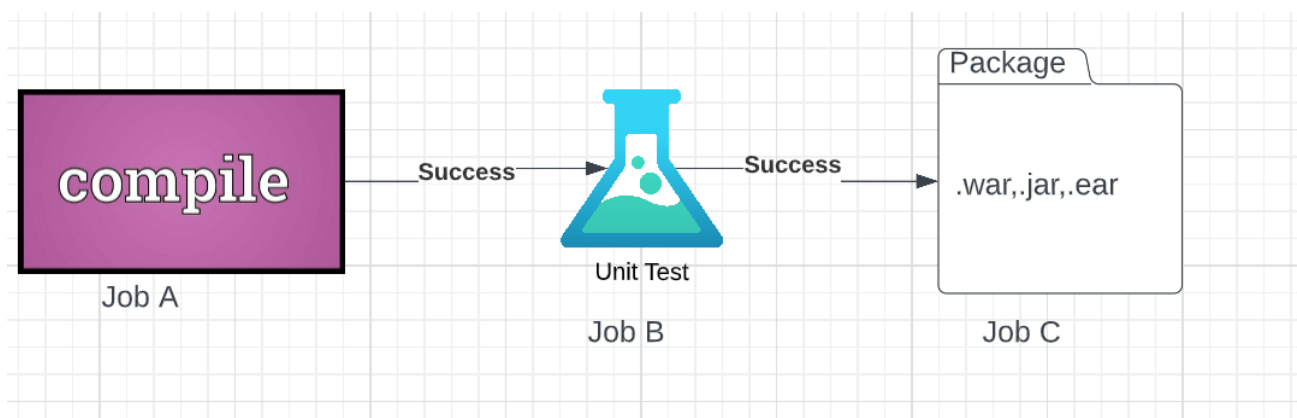
Below are some of the high-level goals of this project:

- Develop a continuous integration pipeline in Jenkins to compile, test and package the code
- CI/CD pipeline to resolve business challenges by XYZ technologies.
- Real-time understanding and hands-on with Git, Jenkins, Ansible, Docker, Kubernetes, and AWS Devops services

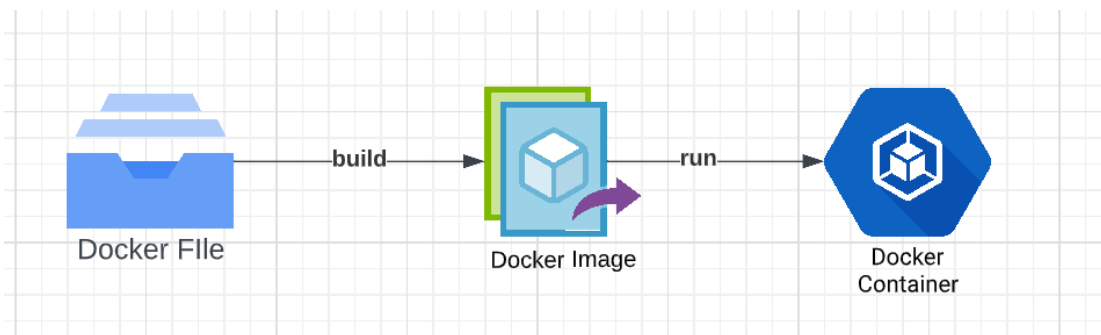
3. Data Flow Architecture/Process Flow



Continuous integration pipeline:



Docker



4. Data Explanation and Schema:

Sample Java project has been shared for usage. It is a maven project and has src and test folders created into it. It has a POM.xml file which lists all needed dependencies to execute this project.

5. Problem Statements/Tasks

We need to develop a CICD pipeline to automate the software development, testing, package, deploy reducing the time to market of app and ensuring good quality service is experienced by end users. In this project we need to

1. Push the code to our github repository
2. Create a continuous integration pipeline using Jenkins to compile, test and package the code present in git hub
3. Write docker file to push the war file to tomcat server
4. Integrate docker with Ansible and write playbook
5. Deploy artifacts to Kubernetes cluster
6. Monitor resources using Prometheus

6. Pre-requisites:

Verify following software is installed in the working machine

1. Java
2. Maven
3. Git
4. Jenkins
5. Docker
6. Ansible
7. Kubernetes

7. Approach to Solve:

Task 1: Clone the project from git hub link shared in resources to your local machine. Build the code using maven commands.

Task 2: Setup git repository and push the source code. Login to Jenkins

1. create 3 jobs
 - One for compiling source code
 - Second for testing source code
 - Third for packing the code
2. Setup CI/CD pipeline to execute the jobs created in step1
3. Setup master-slave node to distribute the tasks in pipeline

Task 3: Write a Docket file Create an Image and container on docker host. Integrate docker host with Jenkins. Create CI/CD job on Jenkins to build and deploy on a container

1. Enhance the package job created in step 1 of task 2 to create a docker image
2. In the docker image add code to move the war file to tomcat server and build the image

Task 4: Integrate Docker host with Ansible. Write ansible playbook to create Image and create continuer. Integrate Ansible with Jenkins. Deploy ansible playbook. CI/CD job to build code on ansible and deploy it on docker container

a. Deploy Artifacts on Kubernetes

- a. Write pod, service, and deployment manifest file
- b. Integrate Kubernetes with ansible
- c. Ansible playbook to create deployment and service

Task 5: Using Prometheus monitor the resources like CPU utilization: Total Usage, Usage per core, usage breakdown, Memory, Network on the instance by providing the end points in local host. Install node exporter and add URL to target in Prometheus

8. Considerations/Assumptions

Resources Needed:

- An AWS account
- A github account
- MobaXterm / Putty
- Git Bash setup
- Source Code

9. Deliverables

- Create a detailed solution document with screenshot for each task.
- Please submit the complete code developed by you.
- Please submit all the snapshots.

10. Business Benefits

After the solution is built, the business will have the below operational benefits:

- Automate the process of delivery
- Able to achieve dynamic iterations
- Constant integration and delivery
- Technical scalability
- Early error detection
- Transparency in process and org structure
- Reduced production bugs
- Improved customer experience
- Better collaboration between teams
- Improved time to market

11. How to submit the project

You can even upload all the scripts/files/code into your GitHub repository and share your repository with us.

Also share the detailed solution document containing step wise screenshot of tasks.

12. Marks Allocation

- Creation of CI pipeline in Jenkins [20 Marks]
- Creation of Docker file and integration with Ansible [35 Marks]
- Deploy artifacts to Kubernetes [35 Marks]
- Creation of Prometheus to monitor node [10 Marks]

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