



# LinuxWorld Informatics Pvt. Ltd.

CIN: U72900RJ2012PTC039171

Ref : LWIPL-JPR-2020-1122

Date: 04<sup>th</sup> July, 2020

## TO WHOMSOEVER IT MAY CONCERN

This is to certify that the project work and report entitled **“Complete Infrastructure Setup & Application - Metrics Monitoring With Alerts, Notifications & Actions”** undergone during the **“DevOps Assembly Lines - The Future of Automation”** training embodies the original work of **Mr. Vedant Shrivastava** from **Kalinga Institute of Industrial Technology** (B.Tech – Computer Science and Communication Engineering) at **LinuxWorld Informatics Pvt Ltd.**

The duration of the project undergone as mentioned above, under the mentorship of Mr. Vimal Daga, Technical Head was from **15<sup>th</sup> April, 2020 to 30<sup>th</sup> Jun, 2020.**

### Gist About the Project :

In an organization the initial steps that are required to setup an application server is:

- A robust, highly available & fault tolerant infrastructure
- Deploying the application codes
- Monitoring & alert system which keeps a track of metrics and reports to the admin
- Proper actions (manual/automatic) based on the alerts

As a first step, he has written an **Ansible Playbook** that sets up a **Kubernetes Multi-node Cluster** on **AWS Cloud**, consisting of 1 Master Node and 2 Worker Nodes (scalable). Using Jenkins, a CI/CD Tool, as soon as the Application Developer commits any changes in the code on the **GitHub Master branch**, it triggers the **Jenkins Assembly Pipeline code**

- Jenkin pulls the application code
- Creates a Docker image with the updated code
- Updates the Deployment file of Kubernetes
- Launches the Deployment pods & External Service



+91 9829105960



lwindia.com  
training@lwindia.com



Plot No. 5, Krishna Tower, Next to Triveni Nagar Flyover,  
Gopalpura Bypass, Jaipur, Rajasthan - 302015



# LinuxWorld Informatics Pvt. Ltd.

CIN: U72900RJ2012PTC039171

Ref : LWIPL-JPR-2020-1122

Date: 04<sup>th</sup> July, 2020

- Ansible Playbook adds the worker nodes to the Load Balancer created
- Prometheus pulls the metrics of entire Kubernetes environment
- Grafana keeps on monitoring the **Memory Usage of the Pods** and alerts the admin about any excessive usage by notifying via e-mail
- Simultaneously Jenkins scales the pods as the load varies

## Technologies Used :

❖ **Terraform** : This tool is used on AWS Cloud to create Policies & IAM Roles to grant access to Kubernetes so that it can use the EC2 instances as nodes. A VPC is created with a special tag "kubernetes.io/cluster/kubernetes" that is mandatory for a Kubernetes Cluster environment. Since here the roles have been created using AWS API, Instance Profiles need to be created separately. The instance profile is used while launching EC2 Instances.

❖ **Ansible** : Initially, the Ansible Playbook is used to launch 3 AWS EC2 Instances which are later configured as Kubernetes Master & Worker nodes using the Ansible Roles for better code management. The setup has a strong security group with no useless ports open. This Configuration Management tool is used to setup the Kubernetes Multi-node Cluster from scratch. The software & tools it installs are kubectl, kubeadm & kubelet. Flannel is used to create the virtual overlay network. Jinja syntax is used in the playbooks to make them dynamic.

❖ **AWS-Cloud** : The project is entirely setup on AWS Cloud to utilize its power of computation. AWS Services – EC2 Instance, Security Groups, VPC, Routing Tables, Load Balancers, etc. are used.

AWS-CLI is installed as a command line utility tool to support Terraform & Ansible. The details about the AWS Profile, Access key & Secret key are specified using the AWS-CLI.

❖ **Kubernetes** : Kubernetes is a container-orchestration system that is the backbone of our setup as it helps in easy deployment, scaling & management. A multi-node cluster means that there are multiple Worker nodes working under a single Master node.



+91 9829105960



lwindia.com  
training@lwindia.com



Plot No. 5, Krishna Tower, Next to Triveni Nagar Flyover,  
Gopalpura Bypass, Jaipur, Rajasthan - 302015  
Regards



# LinuxWorld Informatics Pvt. Ltd.

CIN: U72900RJ2012PTC039171

Ref : LWIPL-JPR-2020-1122

Date: 04<sup>th</sup> July, 2020

- ❖ **Helm** : Helm Chart is used to install the Prometheus Application on the Kubernetes setup.
- ❖ **Prometheus**: It is used to collect the metrics of the pods on which our application is running. The metrics collected is related to the CPU & Memory Consumption which lets us decide when to scale the pods.
- ❖ **Grafana**: It is a visualization tool used to make real time graphs on the metrics obtained from various data sources. Grafana fetches the Prometheus metrics and constructs graphs based on them. An alert related to the memory usage of the pods has been setup based on our observation of the metric. As soon as the metric exceeds the set limit, it triggers a notification. An SMTP Server is setup in the grafana.ini file which will send the e-mail to the admin as soon as the alert notifies.
- ❖ **Jenkins**: An Assembly Pipeline Code has been created which consists of the entire process from creating the Docker Image to deploying the Kubernetes Pods and monitoring them to keep the infrastructure highly available.
- ❖ **Docker**: It plays an important role in the Kubernetes pods. The developer creates the Dockerfile for the Docker image which is used to launch the pods. Docker images are used because they are fast, secure & reliable



+91 9829105960



lwindia.com  
training@lwindia.com



Plot No. 5, Krishna Tower, Next to Triveni Nagar Flyover,  
Gopalpura Bypass, Jaipur, Rajasthan - 302015



# LinuxWorld Informatics Pvt. Ltd.

CIN: U72900RJ2012PTC039171

Ref : LWIPL-JPR-2020-1122

Date: 04<sup>th</sup> July, 2020

## Conclusion :

He studied the internals of AWS EKS in depth and successfully created a similar setup from scratch which is reliable, robust, secure, & highly available. The setup uses Ansible for Configuration Management, Terraform for Provisioning, Kubernetes for container orchestration and Jenkins for CI/CD – fulfilling the methodologies of the DevOps culture to bridge the Silos between Developers and Operations Team and keeping a check on the customer satisfaction at the same time.

## Future Scope :

More & more parts of the infrastructure can be converted to a code – Infrastructure-as-a-Code (IaC), so that the developer can easily come up with quality code files with reduced complexities. This will make the deployment of the application faster, error-free & manageable. The code files give the luxury to reuse the code whenever some urgent need arises. Reusability makes the next update just a click away!

We wish him all the success for his future

Regards

LinuxWorld Informatics Pvt Ltd

Mr. Vimal Daga – Technical Head



+91 9829105960



lwindia.com  
training@lwindia.com



Plot No. 5, Krishna Tower, Next to Triveni Nagar Flyover,  
Gopalpura Bypass, Jaipur, Rajasthan - 302015