Final Project

Cloud Computing

Assigned by: Dr. Hafiz Tayyab Javed

Topics: Live VM Migration and Monitoring of health statistics using Configured Dashboard

Instructions to be read Carefully

1. Marks of every logic will be awarded in case of understanding and practical implementation of this Project.
2. It is an individual Task. For this project, any group consist of 1-1 member (Minimum or Maximum).
3. Project should be done on any cloud platform.
4. Submit the document file with the screenshots of input/output with the code snipping
5. Plagiarism is strictly prohibited; assignment will be marked zero if plagiarized.
6. Late Submission is simply not Allowed.
7. Marks will be uploaded after conducted Viva Exams.
8. Evaluated out of 400 Marks.
9. Viva Rubrics will be shared with you soon.

Live VM migration and health statistics using cloud services.

This assignment is focused on utilizing cloud computing technology. You are tasked with creating a **Linux** virtual machine (VM) instance on any of the following cloud platforms: **Amazon, Microsoft Azure, Google Cloud Platform (GCP), Oracle Cloud, IBM Cloud or Digital Ocean** (or any other cloud platform)

Create a Cloud based project: Create a cloud-based project where minimum requirement **(carefully understand)** is to use ALL CORE CLOUD SERVICES (Compute, Networking, Security/IAM, Storage (block + object), Databases). If all core services are not used, the project will not be considered resulting in ZERO marks. Proper and full usage of each service usage will give you 20 marks **(20x5=50 marks).** Your project should also have a non-cloud module like a mobile app or web application which uses cloud services.

Key Requirements: of this project, is to simulate live migration of virtual machines (VMs) in an **OpenStack private cloud** environment while monitoring VM health parameters (like CPU usage, memory, disk I/O)

using **Prometheus + Grafana**. The dashboard will display real-time health data, and students will analyze how migration affects performance and availability.

Technologies to be used:

1. **Cloud Platform**: **Microsoft Azure, Google Cloud Platform (GCP), Oracle Cloud, IBM Cloud or Digital Ocean** (or any other cloud platform) including Amazon Cloud Services.
2. **Monitoring**: Prometheus Node Exporter, cAdvisor (optional), Grafana
3. **VM Management**: Horizon dashboard
4. **Scripting/Automation**: Bash or Python (for migration scripts, health checks)
5. **Optional**: Anomaly detection (e.g., high CPU triggers migration)

Learning Outcomes:

1. Understand how live VM migration works in cloud platforms.
2. Learn to collect and visualize VM health metrics.
3. Explore the impact of migration on VM performance.
4. Hands-on with monitoring and dashboard tools.

Project Workflow (175 Marks)

1. **Setup Environment:**
    - Deploy OpenStack using DevStack on cloud VM.
    - Launch 3+ compute nodes for migration purposes (1 Master Node save all the log on master and Two Slave machines minimum).
2. **Deploy Monitoring Stack:**
    - Install Prometheus and Grafana.
    - Install Node Exporter on VMs to collect metrics.
    - Configure Prometheus to scrape metrics.
3. **Implement VM Migration:**
    - Launch a VM and simulate workload (e.g., stress-ng).
    - Initiate live migration using OpenStack CLI.

- Monitor the VM's CPU/RAM/network before, during, and after migration.

4. **Integrate with Dashboard:**
    - Create Grafana dashboards showing real-time stats.
    - Highlight VM migrations and correlate with performance metrics.
5. **(Optional Advanced)**:
    - Trigger automatic migration if VM health degrades (CPU > threshold).
    - Integrate with webhook/alert from Prometheus.

Extra Guidelines:

a. If you are opting for cloud project, you need to submit a good report with the architecture of your solution and describe each component (why you used it, how you created and access it, etc.) with clear screenshots.

b. Make a demo video and share link of the video in your report.

c. You are recommended to use AWS services but using Azure and Google Cloud is also allowed.

d. **Submission must be done on or before due date.**

e. Project demo, viva will be conducted in the first three days of final exams but any student who wants to appear before exam may allowed.

f. ZERO marks in the project will be awarded if demo is missed.

Cloud Certification(75 Marks): Cloud Certifications from industry are very helpful in finding relevant jobs. You are expected to pass the certification exam to get full marks in the project.

- AWS Certified Cloud Practitioner Certification | AWS Certification | AWS (amazon.com)
- **Submission:** You can share your certification exam result (badge) through **Credly**.
- If you fail the test, better to submit your marks so that you may get some credit. For example, someone failing the exam by small margin will also get some credits.
- Submission deadline for the certification is **4 days before the final exam**, however, you must **submit a declaration on due date** that you have opted for cloud certification which will be submitted later.

- It is advised to book your exam date in advance and take the exam as early as possible because if everyone will try to book in the last four days then you might not get time slot.

Submission Guidelines:

The final submission should be in the form of a PDF report, detailing each step taken during the process. The report should be named following the convention f21xxxx_P_CloudComputing.pdf and should not be zipped.

For **30 marks**, you must write a complete blog on your own website or Medium and post a showcase of the blog on LinkedIn. The link to the blog post and LinkedIn post should be included in the PDF report.

Note:

Ensure to shut down all the services utilized in the project once you have finished it to prevent losing the credit and incurring charges on your card.

Project	
Use of all core cloud computing services + Well Documented	20*5=100
Use of each extra AWS service (VPC peering, Load Balancer, Cloud Watch, Lambda, KMS, Cost and Billing, S3 Glacier with data lifecycle policy, Autoscaling, CloudTrail, Resilience using multiple availability zones)	10*5 = 50
Certification	
Pass certification exam	75
Failed certification exam	Percentage of marks scored
Complete configuration of Project workflow	175

Improve your learning by taking a deep dive in this project.

Good Luck!