NANYANG TECHNOLOGICAL UNIVERSITY SINGAPORE

SkillsFuture Career Transition Program

Cloud Infrastructure Engineering - Containers, Load Balancing & Security

Nanyang Technological University
Skills Union

2022/2023

Containers

You are working in an insurance firm in Singapore. The technology stack consists of monolithic applications built in Java and deployed onto on-premise servers in your company's own data centre.

The senior management, of late, has been concerned with the company lagging behind competitors in upgrading the technology stack. They would like to migrate some of their operations to AWS cloud.

As such, your team has just recently hired a new senior manager tasked with revamping a part of the company's technology stack. This would represent a proof-of-concept that would set the tone for other teams to follow, should it be successful.

Containers

The first thing on your manager's agenda is to break down the monolithic application your team manages into microservices, so that it can be easily containerized using Docker and then deployed on to the cloud.

Many of your colleagues are unaware or unfamiliar with containerization technology. You, having attended NTU's SCTP course, have a good idea of containerization and how it can benefit the company.

As such, your manager has approached you and asked for your help in getting your team members on board with the idea. You are asked to do a short presentation/ demonstration of what containerization on the cloud would look like.

Containers

In your short 10 to 15-min sharing, you are asked to cover:

1. The basics of microservices
   a. What are microservices?
   b. How is it different from a monolithic application?
2. The basics of Docker
   a. What is Docker?
   b. What is it used for?
   c. How do we containerize microservices into Docker images for deployment on the cloud? [you may include any simple commands/ workflow diagrams too]
3. The benefits of Docker
   a. Why should we move towards containerization with Docker?
   b. How is containerization better than running monolithic applications?
4. The tools needed on AWS
   a. What tools should we use if we want to deploy containerized applications?

Containers

You may cover more concepts should you wish to as well, using the previous questions as a guideline for your demonstration.

Feel free to add in images, diagrams or workflows to provide visual learning aids to your team members.

You may refer to sites such as https://www.docker.com/ and https://www.tutorialspoint.com/docker/index.htm to aid your research.

Load Balancing

You are working in an e-commerce firm in Singapore. Your current technology stack includes containerized applications running on your on-premise data centre residing only in Singapore.

Recently, due to the pandemic, there has been a larger interest in your company's services overseas. As such, your company has expanded its operations beyond Singapore, covering 3 regions - North America, Europe, and Asia.

You have found that due to this huge increase in consumer usage across the globe, the application performance has started to deteriorate.

Load Balancing

Your team - the DevOps team - has been assigned to look into the issue. You proposed a 2-step approach; migrating some (or all) of your workloads to AWS cloud, and utilize a load balancer to distribute the traffic across as many instances of your application as possible.

Your team, however, are not too familiar with AWS cloud and seek your guidance is sharing more information on migrating to the cloud and planning the architecture of your existing application on the cloud.

Your manager has outlined that the company needs to focus on achieving better application performance for customers across the globe whilst maintaining low costs for the organization.

Load Balancing

In your short 10 to 15-min sharing, you are asked to cover:

1. The tools needed on AWS in relation to deploying your containerized applications
2. The basics of Cloud Load Balancing
    a. What is a load balancer?
    b. What are the key features of an AWS load balancer?
    c. What are the different types of load balancers available in AWS?
    d. Which type of load balancer should the organization use in this case?
3. The basics of auto-scaling
    a. What is auto-scaling?
    b. Why is auto-scaling needed?
    c. How can we implement auto-scaling?

Load Balancing

You may cover more concepts should you wish to as well, using the previous questions as a guideline for your demonstration.

Feel free to add in images, diagrams or workflows to provide visual learning aids to your team members.

You may refer to sites such as https://aws.amazon.com/elasticloadbalancing/ and https://aws.amazon.com/autoscaling/ to aid your research.

Cloud Security

You are working in a rising health-tech firm in Singapore and your company stores many sensitive client data. These data reside in your company's database and file servers, stored on AWS cloud.

Recently, your rival company has been reported to have had private client data hacked by attackers, resulting in a leakage of over 15,000 client data to unauthorized users. This has caused massive panic within your organization.

The compliance team has been called to review the company's security architecture and found that there are multiple gaps which need to be filled.

Cloud Security

Your team - the DevSecOps team - has been called to review the cloud blueprints again to ensure that they can achieve better data security of clients' data.

Your senior management team, however, are not too familiar with the latest AWS cloud security tools and seek your guidance is sharing more information on how they can ensure tighter security on the cloud.

You have outlined the need to consider imposing stricter IAM controls, firewall rules, encryption of data and use of additional AWS cloud security tools.

Cloud Security

In your short 10 to 15-min sharing, you are asked to cover:

1. The basics of IAM
    a. What is IAM?
    b. How can different users from different teams within the organization access internal data, both public and private?
    c. How can IAM help impose stricter controls to company's data?
2. The basics of Firewall Rules
    a. What is a firewall rule?
    b. How can a firewall rule help impose stricter controls to company's data?
    c. Can we also consider whitelisting/ blacklisting?
3. The cloud security tools to consider in AWS
    a. What tools can we utilize to help
        i. monitor and log unwanted attackers from accessing our data, & alerting relevant team members of such attacks
        ii. prevent attacks on our applications e.g. via DDoS, Malware etc.

Cloud Security

You may cover more concepts should you wish to as well, using the previous questions as a guideline for your demonstration.

Feel free to add in images, diagrams or workflows to provide visual learning aids to your team members.

You may refer to sites such as https://aws.amazon.com/products/security/ and https://aws.amazon.com/security/ to aid your research.