Cloud Computing

1. Determine if cloud solution is appropriate

1.1 Explain advantages provided by cloud to stakeholders
   • Describe cloud infrastructure
   • Distinguish between IaaS, PaaS, and SaaS
   • Show how cloud allows building applications cheaper than with traditional models
   • Show how cloud allows building applications faster than with traditional models

1.2 Explain cost to stakeholders
   • Identify the use case (new development or transition of existing product or service)
   • Identify the resources that will be required to construct the service or product using cloud-hosted components (include compute, data, and network costs)
   • Identify support plan that will be required to meet performance, availability, scalability, and reliability (PASR) criteria
   • Consider factors that go into return on investment

1.3 Explain performance to stakeholders
   • Identify performance criteria
   • Consider what solutions meet the criteria
   • Assess cost and availability of technical expertise

1.4 Explain reliability to stakeholders
   • Identify reliability criteria, including network speeds
   • Consider what solutions meet the criteria
   • Understand service-level agreement (SLA) with cloud provider
   • Consider disaster-recovery and backup plans (including backup redundancy or replication factor)

1.5 Explain availability to stakeholders
   • Identify the use case (new development or transition of existing product or service)
   • Identify any upstream or downstream SLAs that will govern availability requirements
   • Establish availability metrics
   • Assess the SLA offered by the cloud-hosted solution

1.6 Explain scalability to stakeholders
   • Identify the use case (new development or transition of existing product or service)
   • Understand that rules can be set to adjust resources based on need

1.7 Recommend off-the-shelf (OTS) or custom solutions as needed
   • Identify the use case (new development or transition of existing product or service)
   • Evaluate if existing OTS offering meets performance, availability, scalability, and reliability needs
2. Developing cloud architecture

2.1 Choose between public, private, and hybrid cloud implementations
- Identify the security and privacy requirements for the solution (focusing on networking options that each provides)
- Consider limits imposed by tenancy in various cloud implementations

2.2 Draw an architectural diagram (show data flows)
- Break down the proposed solution into compute, data, and networking components
- Produce logical groupings for the components
- Mark data flows between components (including the protocol)
- Identify system and component boundaries (including responsibility model)

2.3 Define requirements
- Decide whether to virtualize server, network, storage, and desktop
- Be aware of design patterns like microservices and serverless
- Consider networking infrastructure, storage devices, memory, and end-user devices required

2.4 Identify how services communicate through application programming interfaces (APIs)
- Identifying services with which the application needs to integrate
- Interact using an API

2.5 Create virtual machines
- Determine the operating system for the virtual machines
- Choose the appropriate size for the virtual machines
- Decide on geographic setting for the virtual machines (latency, legal requirements)
- Configure options (e.g., time limitations, scaling, backups) for the virtual machines

2.6 Identify data storage requirements
- Distinguish between structured and unstructured data
- Determine amount of storage needed
- Consider location of storage
- Consider storage security

3. Implementing the cloud development life cycle

3.1 Create content in virtual environments
- Understand that a source-code management system needs to be set up
- Install and configure the prerequisite packages in the virtual environment
- Save changes and keep track of the codes in a source code management system (such as Github)
3.2 Perform testing
- Provide different test cases, test scenarios, and test scripts
- Run the tests and report the bugs iteratively

3.3 Structure the overall cloud-based solution
- Integrate systems and applications within the selected environment
- Integrate systems and applications with legacy systems
- Integrate systems and applications with third-party applications
- Distinguish between containers and virtual machines
- Know when to choose containers over virtual machines

3.4 Deploy application on server
- Decide on the strategy to deploy a new application, replacing a previous one
- Understand version control
- Identify cloud-hosted solutions to create code and data pipelines (e.g., cloud-native CI/CD offerings and workflow automation like GitHub Actions)
- Identify existing CI/CD practices

4. Managing cloud operations

4.1 Manage operational costs
- Understand usage-based pricing
- Scale up and scale down to meet demand cost-effectively

4.2 Develop business continuity and disaster recovery policy
- Identify potential risks and disaster scenarios
- Establish on-premise vs offsite backup strategy

4.3 Provide support to users
- Identify protection and security policies for external and internal users
- Provide application and hardware support for internal users
- Provide training tools for internal and external users

4.4 Monitoring cloud systems
- Log events
- Monitor hardware and software (e.g., interpret graphs and dashboards)
- Understand notifications or alerts for provisioning backup

5. Understanding cloud governance

5.1 Comply with privacy and regulatory requirements
- Identify relevant privacy requirements based on geographical and domain constraints (e.g. BIPA, HIPAA, PDP, FERPA, COPPA, GDPR, CCPA, etc.) as well as organization-specific policies
- Identify cloud-provider compliance for these privacy regulations
- Assess types of data managed within the environment
- Assess location and storage of data
- Be aware of NIST and ISO frameworks and standards
5.2 Comply with ethical guidelines
- Consider the impact of bias, lack of transparency, and lack of accountability
- Explain potential bias and transparency challenges with prebuilt services

5.3 Managing cloud security
- Understand options and concepts for identity verification and authentication, including digital identity and multifactor authentication
- Understand access policies and authorizations (e.g., options for access, vendor-provided roles vs. custom roles and permissions, and access hygiene, including least privilege access, removal of access when not needed, disabling accounts)
- Understand the importance of data security and encryption
- Understand options to protect against unauthorized access in cloud environments (including intrusion detection and prevention, firewalls)