MODAL QUESTIONS

1. Is there any difference between frontend and backend systems?
2. Describe the internal architecture of cloud computing.
3. What are the approaches of inter-process communication? Describe.
4. A big company like *X* company uses large-scale distributed systems across different data centers. What could be the security challenges cloud may face? Discuss.
5. You have a company and your company doesn't have a data recovery strategy. Is there any risk? Support your answer.
6. Why and when is it necessary that private and public cloud should work together? Describe this scenario.
7. Which methods can be used to provide data security in the cloud in a certain company?
8. Can virtualization help to reduce cost? Discuss your answer.
9. With one characteristic and one criterion to consider, describe cloud computing terminology.
10. Demonstrate the **5 Vs of data**.
11. Differentiate the two main types of hadoop architecture.
12. Describe the benefits of virtualization technology.

SOLUTIONS

1. Difference Between Frontend and Backend Systems The frontend refers to the user interface part of a system that interacts directly with users, such as web pages or apps. The backend comprises the server-side logic, databases, and services that process data, perform operations, and support frontend functions. Essentially, frontend is what users see, backend is how data is managed and processed behind the scenes .

2. Internal Architecture of Cloud Computing Cloud computing architecture typically includes three main layers:

Infrastructure Layer: Physical hardware like servers, storage devices, and networking equipment.

Platform Layer: Virtualization, operating systems, and middleware that provide a platform for deploying applications.

Application Layer: Software applications and services delivered over the cloud, accessible via internet. Cloud architecture supports scalability, resource pooling, and on-demand access .

3. Approaches of Inter-Process Communication (IPC) Common IPC methods include:

Message Passing: Processes communicate by sending messages (sockets, message queues).

Shared Memory: Multiple processes access the same memory space for fast data exchange.

Remote Procedure Calls (RPC): Processes invoke procedures on remote systems transparently. Choosing an approach depends on latency requirements, system architecture, and data consistency needs .

4. Security Challenges for Large-Scale Distributed Systems in the Cloud Challenges include:

Data breaches and unauthorized access due to vulnerable endpoints.

Data loss or corruption across multiple data centers.

Securing data in transit and at rest.

Ensuring compliance with regulations across different regions.

Managing identity and access controls heterogeneously. Effective security involves encryption, access management, regular audits, and deploying security frameworks .

5. Risks of No Data Recovery Strategy Without a recovery plan, a company risks:

Permanent data loss from hardware failure, cyberattacks, or disasters.

Operational downtime affecting business continuity.

Financial losses and damage to reputation. Implementing regular backups and disaster recovery plans mitigates these risks .

6. Private and Public Cloud Collaboration (Hybrid Cloud) Hybrid cloud combines private and public clouds to leverage the benefits of both. It's necessary when:

Sensitive data requires high security (private cloud) while less sensitive functions use public cloud.

Scalability is needed for peak loads.

Cost optimization through resource allocation flexibility. This allows enterprises to maintain control over critical data while enjoying cloud benefits .

7. Data Security Methods in Cloud Computing Methods include:

Data encryption during transmission and storage.

Identity and Access Management (IAM).

Multi-factor authentication (MFA).

Regular security audits and vulnerability testing.

Using secure APIs and network security measures like firewalls and VPNs .

8. Virtualization and Cost Reduction Virtualization consolidates multiple virtual machines on fewer physical servers, reducing hardware costs, power consumption, and space requirements. It also improves resource utilization and simplifies management, leading to significant cost savings .

9. Cloud Computing Terminology (Characteristic and Criterion)

Characteristic: Elasticity—ability to dynamically allocate resources based on demand.

Criterion: Pay-per-use—billing based on actual resource consumption. These ensure cost efficiency and scalability .

10. The 5 Vs of Data

Volume: The amount of data generated.

Velocity: Speed at which data is produced and processed.

Variety: Different types and sources of data.

Veracity: Data quality and accuracy.

Value: Insights and benefits derived from data. Proper management of these aspects is crucial in big data analytics .

11. Main Types of Hadoop Architecture

Single Node Hadoop: A standalone setup for development and testing.

Fully Distributed Hadoop: Multiple nodes working together in a cluster, suitable for production environments, handling large-scale data processing efficiently. Understanding the architecture ensures scalability and performance optimization .

12. Benefits of Virtualization Technology

Cost savings through hardware consolidation.

Improved resource utilization and flexibility.

Simplified disaster recovery and backup.

Faster deployment of applications/services.

Enhanced testing and development environments. Virtualization enables agile and efficient IT infrastructure management .