Unit 10 Seminar - DR Solutions Design and Review

Part A

1. Vendor Lock-In Issues

Vendor lock-in is a significant concern in cloud environments when organisations face difficulties switching providers due to proprietary technologies, contractual limitations, or operational dependencies (Opara-Martins et al., 2014; Morrow et al., 2021).

Main Issues Identified:

- **Proprietary APIs and Formats:** Vendors use unique APIs or data structures that complicate migration and interoperability (Opara-Martins et al., 2014).
- **Data Portability Challenges:** Exporting data to other vendors often requires custom integrations, making the process time-consuming and expensive (Morrow et al., 2021).
- **Dependence on Vendor-Specific Ecosystems:** Reliance on a vendor's ecosystem may reduce flexibility in adopting alternative solutions (Opara-Martins et al., 2014).

Mitigation Strategies:

- **Standards-Based Solutions:** Utilise open-standard technologies such as OpenStack or Kubernetes, enabling easier migration between platforms (Opara-Martins et al., 2014).
- **Multi-Cloud Strategies:** Distribute workloads across multiple providers to reduce reliance on a single vendor (Morrow et al., 2021).
- **Contractual Safeguards:** Negotiate agreements that ensure data export in a standard format (Morrow et al., 2021).
- **Use of Containers:** Employ containerisation (e.g., Docker) to enhance application portability across cloud environments (Opara-Martins et al., 2014).

2. Security Concerns in the Modern Cloud

Modern cloud environments introduce numerous security risks that require mitigation to maintain data integrity, confidentiality, and compliance. Key concerns include data breaches, misconfigurations,

insider threats, and regulatory compliance challenges (Opara-Martins et al., 2014; Morrow et al., 2021).

Main Concerns:

- **Data Breaches:** Cloud environments consolidate sensitive data, making them attractive targets for cyberattacks (Morrow et al., 2021).
- **Insider Threats:** Unauthorised access by malicious or negligent personnel poses risks (Opara-Martins et al., 2014).
- **Misconfigurations:** Incorrect setups of cloud services can unintentionally expose sensitive data (Morrow et al., 2021).
- **Compliance Issues:** Adhering to regulations such as GDPR and HIPAA can be complex in shared infrastructure environments (Morrow et al., 2021).

Mitigation Strategies:

- **Encryption:** Encrypt data at rest and in transit to prevent unauthorized access (Opara-Martins et al., 2014).
- **Access Control Policies:** Implement robust IAM policies, including multi-factor authentication (MFA) and the principle of least privilege (Morrow et al., 2021).
- **Cloud Security Posture Management (CSPM):** Use automated tools to identify and resolve configuration vulnerabilities (Morrow et al., 2021).
- **Continuous Monitoring:** Conduct regular audits and monitor for security anomalies to ensure compliance (Opara-Martins et al., 2014).

Part B

High-Level DR Solution Diagrams

1. RPO= 1 hr; RTO= 8 hrs; HA Required

Design Overview:

- This solution uses a primary-secondary cloud architecture with automated failover for disaster recovery.
- **Description:** This scenario requires a highly resilient solution with minimal data loss and rapid recovery.
- **Diagram:**

- **Data Replication:** Asynchronous replication to a geographically separate secondary site ensures data is up to date within the specified RPO (Opara-Martins et al., 2014).
- **Active-Passive Cluster:** Utilize an active-passive cluster configuration with real-time replication between the primary and secondary sites.
- **Components:** Primary site with production servers, secondary site with standby servers, high-speed replication technology (e.g., synchronous replication) using services such as AWS EBS or Azure Site Recovery, network connectivity with low latency and high bandwidth.
- **Failover Mechanism:** Automated failover mechanism to quickly switch to the secondary site in case of a disaster at the primary site.

2. RPO= 24 hrs; RTO = 72 hrs; HA Not Required

Design Overview:

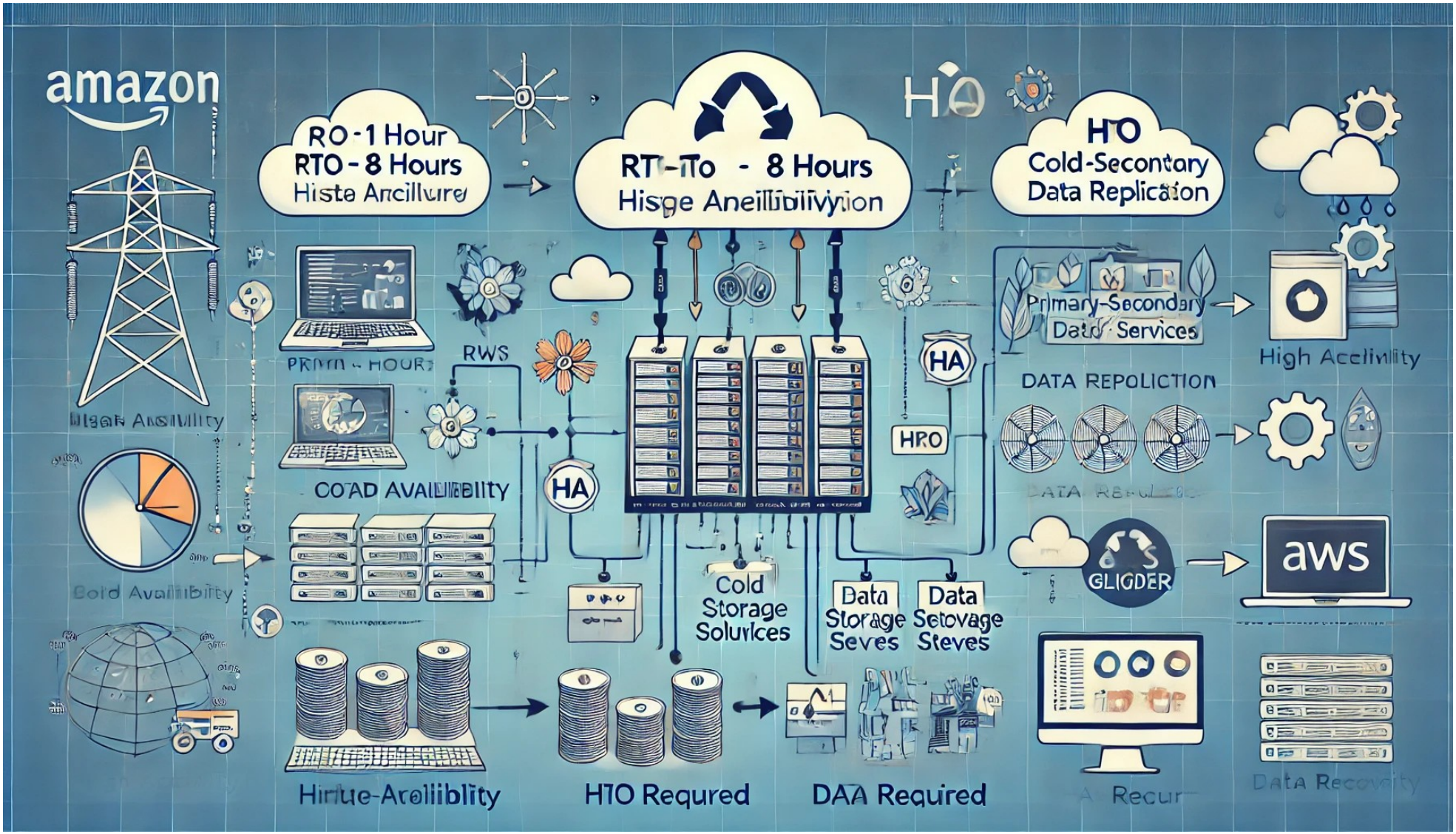
- Focus on a backup-oriented approach to store data in cost-efficient solutions like AWS Glacier or Azure Backup.
- **Diagram:**
  - **Backup and Recovery:** Backups are taken daily to ensure the RPO is met, with manual recovery planned for the RTO window (Morrow et al., 2021).
  - **Components:**
    - Full and incremental backups.
    - Manual recovery orchestration using documented procedures.
    - Cold storage to minimise costs.
  - **Recovery Process:** In case of a disaster, restore data and applications from backups at the off-site location.

3. RPO= 5 mins; RTO= 1 hr; HA Required

- **Description:** This scenario requires a highly available solution with minimal data loss and rapid recovery, similar to scenario 1 but with more stringent RPO requirements.

- An active-active multi-region setup ensures zero downtime with synchronous replication between two active regions (Opara-Martins et al., 2014).
- Real-time monitoring and automated failover ensure rapid recovery within the specified RTO.

- **Diagram:**
  - **Active-Active Cluster:** Utilise an active-active cluster configuration with synchronous replication and load balancing between primary and secondary sites.
  - **Components:**
    - Global load balancers (e.g., AWS Global Accelerator).
    - Real-time replication tools like Amazon Aurora Global Database.
    - Continuous monitoring and automated failback processes.
  - **Failover Mechanism:** Automated failover mechanism to seamlessly switch traffic to the secondary site in case of an outage at the primary site.


amazon
RO-1 Hour
RTO - 8 Hours
RT-To - 8 Hours
HTO
Cold-Secondary
Data Replication
Primary-Secondary
Data Services
High Acclimity
DATA REPOLICTION
RWS
HA
HPO
COAD AVAILIBBILITY
Cold
Storage
Solurices
Data
Storage
Seves
Data
Setovage
Steves
GLIGDER
aws
Hirtue-Aroliiblity
HTO Requred
DAA Requried
Recur
Data Recovity

References

Morrow, T., Prakash, S., and Johnson, L. (2021) Modern Cloud Computing: Concepts and Practices. Oxford University Press.

Opara-Martins, J., Sahandi, R., and Tian, F. (2014) ‘Critical Analysis of Vendor Lock-in and Its Impact on Cloud Computing Migration: A Business Perspective,’ Journal of Cloud Computing Advances, 3(1), pp. 35-42.