

## UEEN3113 / 3413 Server Configuration and Management

1. A company is currently using a single server, configured with multiple services, for its business operation. As the company is growing rapidly, a single server won't not be sufficient and efficient for various business operations. Thus, you are assigned to design a new architecture of server and network implementation based on the following information.

- The company needs to process and produce a lot of documents. All versions of a document must be kept for references and accessible from all branches in various regions.
- Email is an important communication channel between company and clients as documents can be attached in an email. The company will not send or receive documents through fax.
- Information of employees, clients and projects must be kept.

- a. Propose three types of servers that are suitable to be implemented.

**File server, email server, database server.**

- b. There are a few new branches will be located in areas with slower internet connection speed. Suggest the type of client to be used in those branches with appropriate reasons.

**Fat client.**

**Fat client will perform most of the processing, thus the client requires only minimal data to be transferred from or to the server.**

- c. Explain how the 3-tier architecture being beneficial to the company.

**Since different services / components are handled by different servers / machines, the overall performance will be improved.**

**The business logic is centralised, which can be easily updated as the company grows continuously.**

**Since each server / machine serves for only a single purpose, the security configuration can be tailored based on the functionality to enhance the security level of that particular server / machine.**

2. There are 3 disks, namely D1, D2 and D3, configured as RAID 4, where D3 is the parity disk.

- a. Suppose that a strip in D2 is updated. Explain how the new parity bit can be calculated. Show the relevant steps in your explanation.

**To calculate parity bit:  $D3 = D1 \oplus D2$**

**New parity bit:  $D3' = D1 \oplus D2'$**

**$D3' = D1 \oplus D2' \oplus D2 \oplus D2$**

**Reordering the terms:  $D3' = D1 \oplus D2 \oplus D2 \oplus D2'$**

**Replace first 2 terms:  $D3' = D3 \oplus D2 \oplus D2'$**

**To calculate new parity bit, old user strip and old parity strip need to be read in, and then updated.**

- b. Explain a possible performance issue in RAID 4.

**Every parity calculation requires 2 reads and 2 writes, and every write involves parity disk, the parity disk can become a bottleneck.**

3. Calculate the parity bit for the following stripes in RAID 3.

a. Disk 1: 10101, Disk 2: 01110, Disk 3: 10001

**01010**

b. Disk 1: 010111, Disk 2: 111101, Disk 3: 101110, Disk 4: 101010

**101110**

4. RAID 6 is able to regenerate data even 2 data disks failed. Explain how this feature is achieved in RAID 6.

**RAID 6 uses 2 different parity calculations and stores the parity in separate blocks on different disks.**

5. A company is planning to open a few more branches in various regions. Explain how client-server model can be beneficial to the company.

**Centralised DBMS enable all branches update the database and retrieve the latest data anytime. Able to generate report based on latest data is important in helping management making decision.**

**Centralised server makes the administration and troubleshooting easier, better data protection and restoration as the administrator requires to focus on a single server.**

**It is easier the increase the performance of operation and processing by upgrading or updating the server's software or hardware without involving the clients in all branches.**

6. You decided to implement RAID-10 because of its high performance, however, it will increase the cost as more disks are required. Explain the concept and operation of RAID-10 to the management in order to gain support to implement it.

**RAID-10 is a combination of RAID 0 and RAID 1 where RAID 1 is nested in RAID 0.**

**Data are stripped across all disks (RAID 0), where strips on different disks can be access simultaneously. This will increase disk access performance.**

**As a backup of data, each disk in RAID 0 has a mirror disk which contains duplicated data (RAID 1).**