FIT 5137 Week 9 Lab Exercise

Part a

Breakout Room 1 - Q1

What are the main objectives of Databases?

What are the things the database management systems must do in order to achieve those objectives?

Store data persistently. CRUD.

Allows data to be accessed, locked and modified

Objective: store data and retrieve data.

Do: ➢ Store data persistently ➢ Maintain data consistency ➢ Ensure data availability

Breakout Room 1 - Q2

Describe a two-phase commit.

When there is a backup server, updates made to the primary server have to be made to the backup server. Hence, data is written to the disk in two phases: once to the primary server's disk and then to the backup server's disk.

Does it help ensure consistency or availability?

Both? Backups remain consistent, and availability if the primary goes down.

Because it is an atomic protocol, consistency is guaranteed.

Breakout Room 1 - Q3

What is CAP Theorem?

CAP is an abbreviation for Consistency, Availability and Partition tolerant.

- Consistency: Every read receives the most recent write or an error.
- Availability: Every request receives a (non-error) response, without the guarantee that it contains the most recent write.
- Partition tolerant: System continues to operate despite an arbitrary number of messages being dropped (or delayed) by the network between nodes.

Three kinds of guarantees for distributed systems(Usually cannot be realised in the meantime).

Breakout Room 1 - Q4

What do the C and A in the CAP theorem stand for?

Give an example of how designing for one of those properties can lead to difficulties in maintaining the other.

C - Consistency
A - Availability

When designing for consistency, all shards / copies must keep the same copy of data as each other. This makes writing data slow when a system is distributed over many servers, and over many copies.

This slowness conflicts with availability, as other users / clients must wait for earlier writes to be completed before their own write(s) can be handled. C > A

Likewise, if a system is available to edit all the time, it is impossible to have strict consistency. A > C

Breakout Room 1 - Q9

Describe monotonic write consistency.

Why is it so important?

A: Monotonic write consistency ensures executing multiple commands in the orders.

Ex: When you update balance into 1000, and update balance into 1200. System will modify balance into 1000 and then 1200.

Why: If you cannot guarantee the order of operations in the database, you would have to build features into your program to guarantee operations execute in the order you expect.

Breakout Room 2 - Q5

What does the BASE stand for?

Explain each principle of BASE

BASE stands for Non-Relational Database

Principle:

- Basically Available
- Soft state
- Eventual consistency

Breakout Room 2 - Q6

How does a BASE system differ from a traditional distributed database system?

BASE refers to a data consistency model in which data changes are not immediate but propagate slowly through the system until all replicas are eventually consistent.

Breakout Room 2 - Q7

The E in BASE stands for eventually consistent.   What does that mean?

Eventually consistent means that there may be times when the database is in an inconsistent state. The database will become consistent over time, but may not be consistent at any moment and especially not at transaction commit.

Breakout Room 2 - Q8

What are the types of eventual consistency?

- Causal consistency
- Read-your-writes consistency
- Session consistency
- Monotonic read consistency
- **Monotonic write consistency**