ETH

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**Distributed
Computing**

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Distributed Systems Part II
Exercise Sheet 8

1 Consistency Models

In the following, you are given several pairs of consistency models. For each pair, decide, whether one of the models implies the other one ($m_1 \rightarrow m_2$ means m_1 implies m_2, and similarly $m_1 \leftarrow m_2$ means m_2 implies m_1). x means neither m_1 implies m_2 nor m_2 implies m_1. Give a short explanation for each answer.

   a) Sequential Consistency, Causal Consistency

   b) Causal Consistency, Linearizability

   c) Lineariziability, Read-your-Writes Consistency

   d) Read-your-Writes Consistency, Causal Consistency

2 Library

In the following, we consider a library as a special kind of a storage system. Let's consider the following scenario: Barbara has borrowed a book on distributed systems a while ago. Now she returns the book at the library's front desk. Afterwards, she wants to borrow another book about motivating students using chocolate. Therefore, she checks the library's index. Thereby, she notices that the book she has just returned is still asssigned to her and not yet available. Afterwards she decides to buy some chocolate for the next exercise lesson at the library's cafeteria, and then rechecks the index. Now the book about distributed systems is listed again.

   a) Which of the consistencies listed below are violated assuming there were no other clients in the library except Barbara?

   b) Which of the consistencies listed below are (for sure) violated when above assumption does not hold (i.e. other clients might have borrowed and returned an arbitrary number of books while Barbara was in the library)?

   c) Draw the timeline of the scenario given by subtask a) and identify all the causal relationships between the operations!

Consistencies to consider:

   • Linearizability

   • Sequential Consistency

   • Monotonic Read Consistency

   • Read-your-Writes Consistency

   • Causal Consistency