ID2203-2021 Exam Prep

Exercise 1

Does the following statement satisfy the synchronous-computation assumption?

On my server, no request ever takes more than 1 week to be processed.

Yes! Known constant bound: 1 week

Exercise 2

In a fail-stop model, mark the following properties as safety or liveness.

1. every process that crashes is eventually detected

2. no process is detected before it crashes

3. no two processes decide differently

4. no two correct processes decide differently

5. every correct process decides before t time units

6. if some correct process decides then every correct process decides.

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Exercise 3

Why do we need partial synchrony in Paxos? Which property of Uniform Consensus cannot be achieved if Paxos is used in an asynchronous model?

Uniform Consensus Properties:

(1) Termination: Every correct process eventually decides on some value

(2) Validity: If a process decides v, then v was proposed by some process

(3) Integrity: No Process decides twice

(4) Uniform agreement: No two processes decide differently

Termination

The system does not know if a process has failed or if it is just slow. May happen that proposers race each other forever!

Exercise 4

Can we devise a uniform reliable broadcast algorithm with an eventually perfect failure detector but without assuming a majority of correct processes?

No, we cannot. The uniform agreement property may be violated if values are lost during a partition. (majority of acks) Uniform Agreement: For any msg m, if a process delivers m, then every current process delivers m

Exercise 5a

Suppose an algorithm **A** implements a distributed programming abstraction **M** using a failure detector **D** that is assumed to be eventually perfect. Can **A** violate a safety property of **M** if **D** is not eventually perfect, for example, when **D** permanently outputs the empty set?

No, because if that were possible, A would already violate the same property if D were eventually perfect.

E --------x

Safety is false for an

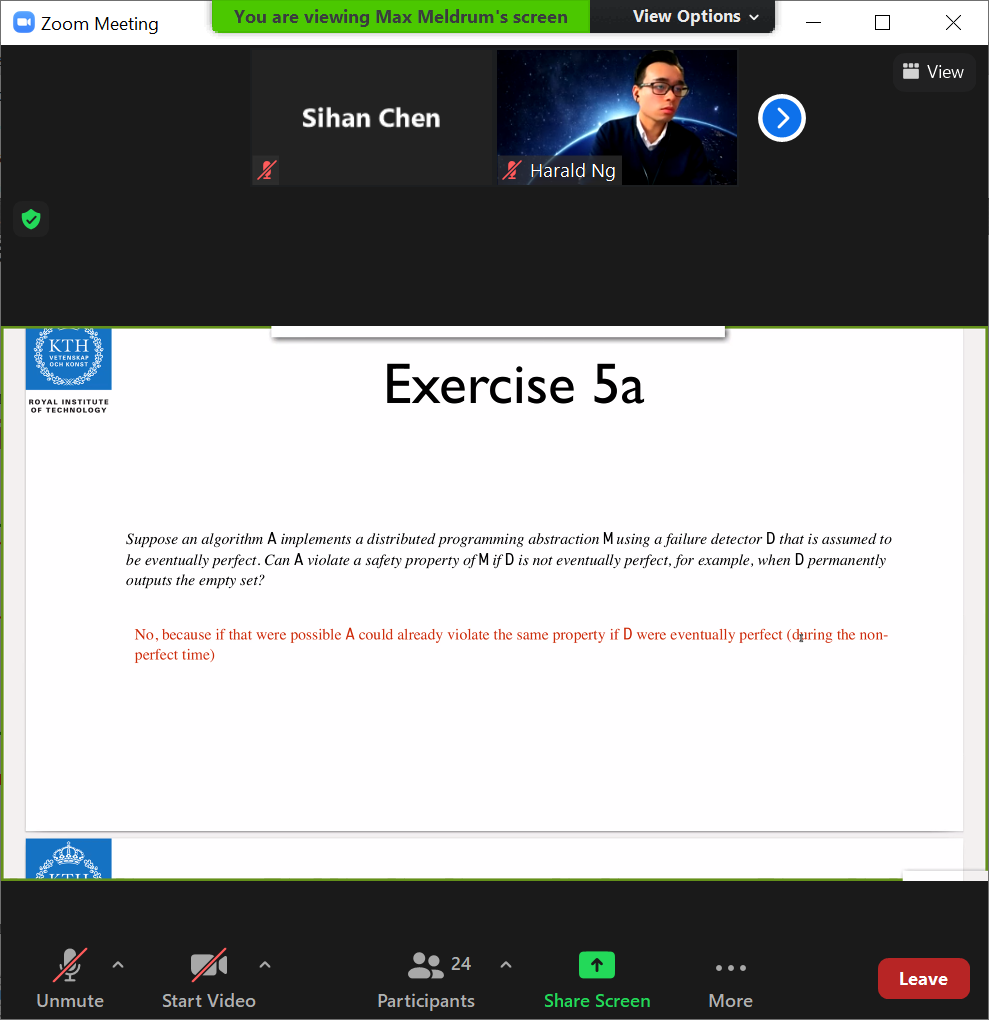
execution E if there exists

a prefix such that all

extensions are false

E’--------t-----🡪 after t run as normal

实际上只有Perfect Failure Detector有safety性质（strong accuracy）epfd只有eventual strong accuracy

Exercise 5b

Now, what about a liveness property?

Yes

