

Exercise 4

1 Perfect Failure Detector

- a) Assume that a bound Δ on message delay is known and holds always. Design a perfect failure detector $\mathcal{D} \in \mathcal{P}$.
- b) Assume that a bound Δ on message delay exists, but is not known to the protocol designer, and that the bound holds only after some “global stabilization time” t_Δ . Design an eventually perfect failure detector $\mathcal{D} \in \diamond\mathcal{P}$.

2 Non-Blocking Atomic Commit

The reduction of non-blocking atomic commit in Section 5.4 uses a perfect failure detector. Does it also work with an eventually perfect failure detector? Why or why not?

3 Efficient Causal Broadcast

Algorithm 5.17 for causal broadcast from FIFO broadcast suffers from impractically large messages, which grow in proportion to the number messages sent by a party. Provide a more efficient implementation directly using reliable broadcast. (Use a vector clock for causal ordering.)