Exercise 3

1 Perfect Failure Detector

Assume that a bound Δ on message delay is known and that all local processing after delivering a point-to-point message takes at most Φ time. Algorithm 2.5 [CGR11, p. 51] implements a *perfect failure detector* with request/reply messages.

1. Design an alternative implementation that uses only unidirectional messages (that is, only periodic heartbeats from every process to all others instead of request/reply pairs between every pair of processes).

2. Discuss your algorithm in relation to Algorithm 2.5.

2 FIFO Broadcast from FIFO Links

An implementation of FIFO-order reliable broadcast is found in Algorithm 3.12 [CGR11]. It is implemented on top of a reliable broadcast primitive.

Consider a different implementation, without underlying reliable broadcast. Assume that the point-to-point links between all servers are FIFO, that is, messages are delivered by the link *per process* in the order they were sent. (See [CGR11] Exercises 2.2–2.3 and their solutions, for details and an implementation.)

Does the simple "Eager Reliable Broadcast" algorithm (Algorithm 3.3) on top of FIFO point-to-point links implement FIFO-order reliable broadcast? Justify your answer.