Quiz 5: Failure Models

Due Jun 19 at 11:59pm **Points** 100 **Questions** 4
Available Jun 10 at 8am - Jun 19 at 11:59pm 10 days **Time Limit** 60 Minutes

This quiz was locked Jun 19 at 11:59pm.

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	41 minutes	46.25 out of 100

Score for this quiz: **46.25** out of 100
Submitted Jun 18 at 3:14pm
This attempt took 41 minutes.

Question 1

20 / 20 pts

1. What is the difference between crash and fail-stop failures?
2. What is the difference between Heisenbugs and Bohrbugs?

Your Answer:

1. A crash is when a server has a failure and stops responding. It cannot be detected. A fail-stop failure can be detected by other servers (system supported).

2. Heisenbugs are a result of poor algorithms, broken pointers, conditions (programming errors), that can change/alter when trying to study/troubleshoot. Bohrbugs are set and easily detectable errors/problems.

Question 2

15 / 20 pts

What are the three differences in the assumptions made by the synchronous and asynchronous models of networks?

Your Answer:

1. Binding on message delivery time
2. Bindings on clock drift
3. Bindings on computing time

Bounds. What of them?

Question 3

0 / 30 pts

The gossip-based failure detector described in the notes takes O(N log N) time to distribute a process' list of heartbeat timestamps to all other processes, where N is the number of processes.

1. Why do gossip protocols normally take O(log N) time, instead of constant time for example, to broadcast a message to all N processes?
2. Why does the gossip-based failure detector take O(N log N) time instead of O(log N) time to broadcast a process' heartbeat timestamps to all other processes?
3. What is the motivation for choosing slow dissemination of failure detection results in these detectors?

Your Answer:

1. Gossip protocols take O(log N) growth time because the nodes have to be rechecked to see if they missed the message and the Fibonacci Number has a O(log N) time complexity.

2. The gossip-based failure detector takes O(N log N) time because it has to iterate through the gossip protocol nodes and the message has to be constant.

3. Mitigation between speed vs completeness and accuracy. The slower dissemination of failure detection will result in high correctness.

(1) O(log N): each node only gossips to a single peer (or a constant number of peers) in each round. Because of exponential infection rate, every node is "infected" in O(log N). (2) Failure detector: O(N log N) because it must gossip O(N) heartbeat (3) Slow dissemination: constant amount of work on each round, hence scalable

Question 4

11.25 / 30 pts

Suppose we have N servers in a system, and up to F failures. What is the lower bound for N, in terms of F, in each of the following failure scenarios? Also give an actual number for the minimum value of N in the event of up to two failures (F=2). For both answers in each, state "Impossible" if no amount of servers can achieve the agreement necessary.

1. Consensus in an asynchronous system [Impossible] . N= [Impossible] .
2. Consensus with an eventually weak failure detector in an asynchronous system [Impossible] . N= [Impossible] .
3. Byzantine agreement in a synchronous system [4] . N= [7] .
4. Byzantine agreement in a synchronous system with digital signatures [4] . N= [10] .

Answer 1:

Correct!

Impossible

Answer 2:

Correct!

Impossible

Answer 3:

ou Answered

Impossible

orrect Answer

2F+1

Answer 4:

ou Answered

Impossible

orrect Answer

5

Answer 5:

ou Answered

4

orrect Answer

3F+1

Answer 6:

Correct!

7

Answer 7:

ou Answered

4

orrect Answer

F+2

Answer 8:

ou Answered

10

orrect Answer

4

Quiz Score: **46.25** out of 100