CS 425 MP2 Report
GA6 - Saurabh Darekar(sdare1) & Ankit Chavan(auc3)

Design:

Our system design follows the core SWIM protocol, incorporating essential components for failure detection and membership management.

A Suspicion Mode flag is implemented to differentiate between normal SWIM and Suspicion variants of the program. Each node maintains a dynamic membership list, updated when nodes join or leave. The list ensures synchronized group membership across all nodes. We have developed a Failure Detector process that pings target nodes during each protocol period TTT. Based on the response, it generates either a suspect message if suspicion mode is on or a failure message if it is off. A dissemination component multicast these messages to other nodes. Additionally, there is a Ping Receiver component that listens for all incoming messages to the node and takes the appropriate action. Within this component, we have implemented a switch case to handle each type of message.

To achieve time-bounded strong completeness, we created a separate concurrent array that holds the member names. In the first iteration, the array shuffles all the values, then sequentially selects each element as a target to ping. Once the list is exhausted, it shuffles the array again and begins the next iteration. We have integrated our MP1 code into the project, which constantly listens on a different port. There is also a Command Line class that accepts input from the CLI. It supports the grep command and displays the output directly on the CLI.

1) **Join Workflow: -**
   When a new node sends an alive message to the introducer, the introducer adds it to the membership list and sends the member list back. The new node then updates its local list and joins the group.
2) **Basic SWIM Workflow: -**
   During each protocol period, the Failure Detector pings a node. If no ack is received, the node is marked as failed, and a failure message is multicast. The detector also listens for failure and alive messages from other nodes.
3) **Suspicion Workflow: -**
   In suspicion mode, if a node does not respond, it is marked as suspected, and a suspect message is multicast. If the node remains in the suspected state beyond Tsuspicion, it is marked as failed. If an alive or confirm(failed) message is received, the node is marked accordingly or removed.
4) **Switch-Case Workflow: -**
   A command is provided to switch protocol variants. The switch message is multicast, and all nodes update their flags and protocol period timing accordingly.

For Question 1 A and 2 C

We have set the protocol period for Basic Swim to be 3 seconds and for Suspicion to be 2.5 seconds, In each protocol period 1 message gets sent to the target. We checked the logs in a time frame of 10 secs at each machine and plotted the below graph. Then for Question 2 C we made the protocol period for Suspicion to 3 seconds so that the bandwidth taken by both variants becomes equivalent.
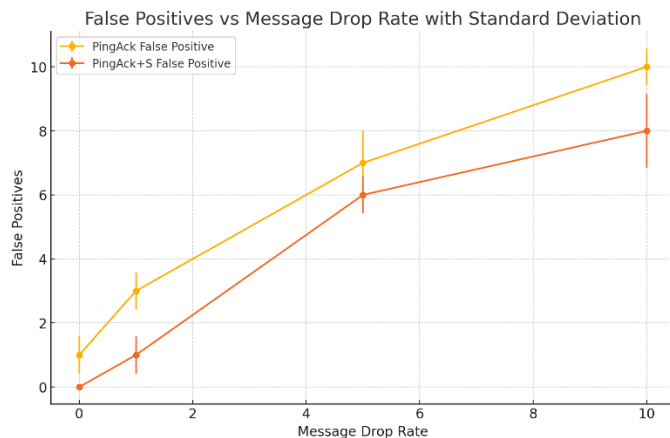
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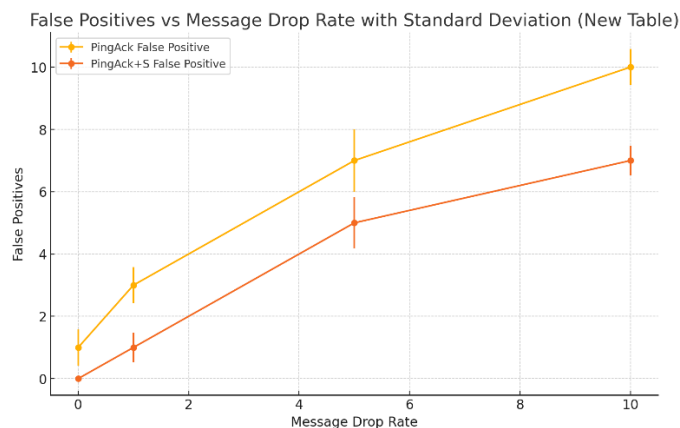# GA6 - Saurabh Darekar(sdare1) & Ankit Chavan(auc3)
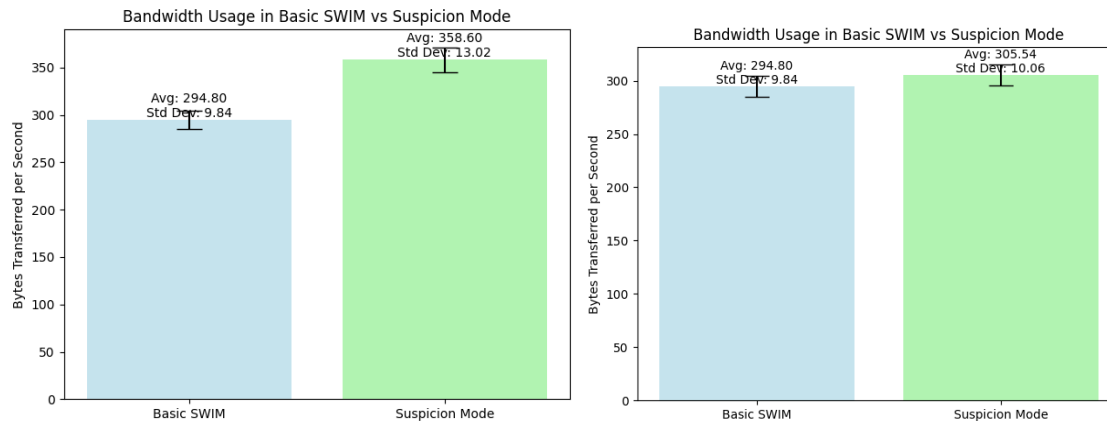
For Question 1 B and 2 B

We introduced artificial drop at ping receiver in our code. Below are the graphs for 2 questions on calculating false positives vs percent of messages dropped at a receiver.
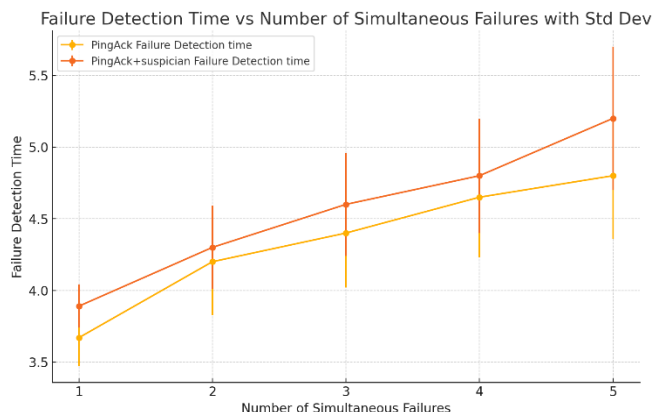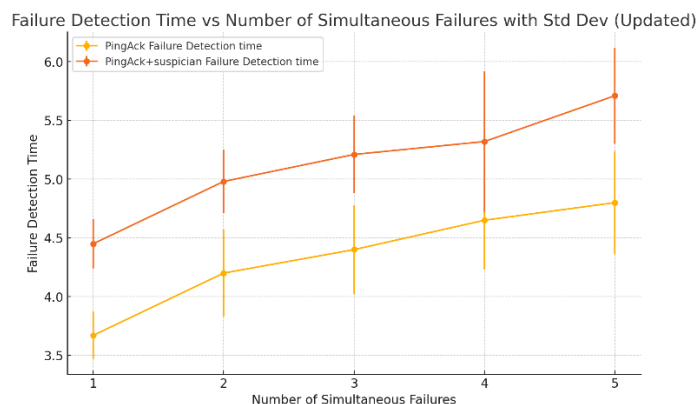

1B

2B

For Question 1 C and 2 A

1C

2A

Here we calculated the avg time against a function of no. of failures. In graph 2A we found that our average Failure Detection Time increased across all values by 0.5sec as we increase our protocol period by 0.5sec.