CS425 MP2 Group35 Zhengliang Zhu (zz40) Mingren Feng (mingren3)

Design:

Our swim-style group membership maintainer mainly consists of a swim-style failure detector and a UDP server.

SWIM detector:

SWIM detector uses ping-ack for detection, but without indirect ack. Each node monitors five neighbor nodes - two predecessors and three successors in a circular ring topology. Protocol time for ping-ack is set to 0.4 seconds. Within every protocol period, the node pings one of its four monitored node, and uses a determined order to decide which neighbor to ping which ensures a time-bounded completeness (ping in a determined sequential order within each protocol period).

We use piggyback in acks to disseminate the failure or leave messages. When a node couldn't receive an ack for its ping message at the end of a protocol period, it will mark that monitored node as fail and store this information (the failure node id and the localtime when the node fails). Whenever a node receives a ping message from whichever node, it sends all the piggyback messages it stores for the last 2 seconds back along with its ack message. Since it takes at most two rounds for a failure message to the farthest node, all nodes will be informed of a failure within 6 seconds. Since there are at most three simultaneous failure, so our system can keep fault-tolerant in the MP2 setting and fulfill the time requirement.

UDP server:

UDP server handles all UDP packets and their responses. All messages all marshaled into JSON format for sending and receiving.

MP1 is very useful for debugging MP2 since we can know the current states about the system, and can track the origin for bug from them.

Bandwidth:

We use nload, a console application which monitors network traffic and bandwidth usage in real time, for measurement. The background bandwidth when no

join/fail/leave is 274.6bps, which is slightly larger than our theory value. Average bandwidth for join is about 576bps, for leave is about 247bps, for fails is 436bps.

We take 5 tests for each case. The average and standard deviation is shown as follows.

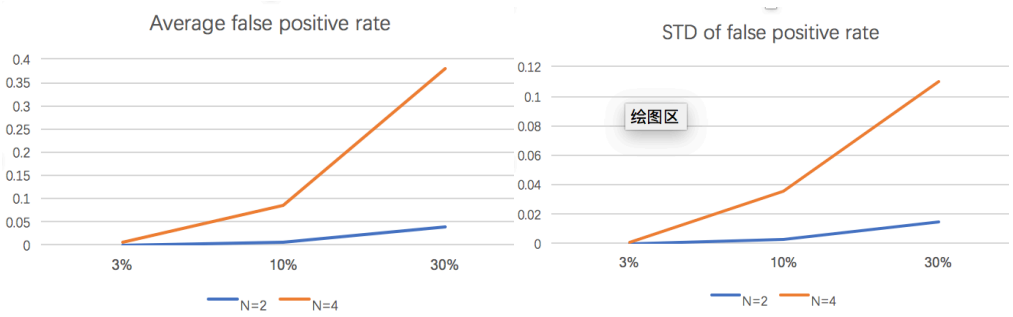
(u, S)	3%	10%	30%
N=2	0 ± 0	0.0066 ± 0.0028	0.04 ± 0.015
N=4	0.005 ± 0.001	0.085 ± 0.036	0.38 ± 0.11

Table.1 Average and standard deviation

The confidence interval is shown as follows.

CI	3%	10%	30%
N=2	N/A	(0.0039,0.0084)	(0.023,0.048)
N=4	$(0.004, 0.006)$	$(0.05, 0.104)$	(0.3,0.45)

Table.2 CI



Overall, the larger N and larger package loss rate would lead to a larger average false positive rate as well as larger standard deviation. Consequently, the confidence interval would have larger ranges with larger N and larger package loss rate.