MP2 REPORT

Marshaled Message Format: 1. Join: “join” 2. Leave: “update, leave, *VM_ID/IP/JOIN_TIMESTAMP*” 3. Heartbeat:“heartbeat”

Receive:

1. Heartbeat (endless): Update Contact List’s timestamp = receive time
2. Join info: ① If my Membership List doesn't include the new member: Update Membership List; Send its Join Info to my contacts ② If it is supposed to be my contact:Update my Contact List
3. Leave info: ① If my Membership List includes the leaving member: Update Membership List; Send its Leave Info to my contacts ② If it is my contact: Update my Contact List

Send:

1. Heartbeat (endless): Send heartbeat to my contacts every 0.4s
2. Join info: Send a joining request to introducer with my IP
3. Leave info: Send Leave info to my contacts

Update Info Rules: A VM’s contacts are its adjacent 4 id in the membership list. It will only send and receive messages from its contacts. So message cost is O(1).

Join Rules: There are 5 introducer (VM1-5) known by all VM. If a VM want to join the membership, it will send a join request to VM1. If it doesn’t receive a feedback in 0.5s, it will send a request to VM2(VM3/VM4/…by analogy). Introducer will send it a membership list and its unique index ID on the ring. The index would be the first available position on the ring.(Linear probing from 1 to 10.)

MP1’s Usage: Help conveniently fetch special information, like “join” or “failed”, from all machines’ log.

For 4 Machines:

1. Background bandwidth usage: (10 Bytes(heartbeat message size)/0.4s)*3=75Bps (every machine)

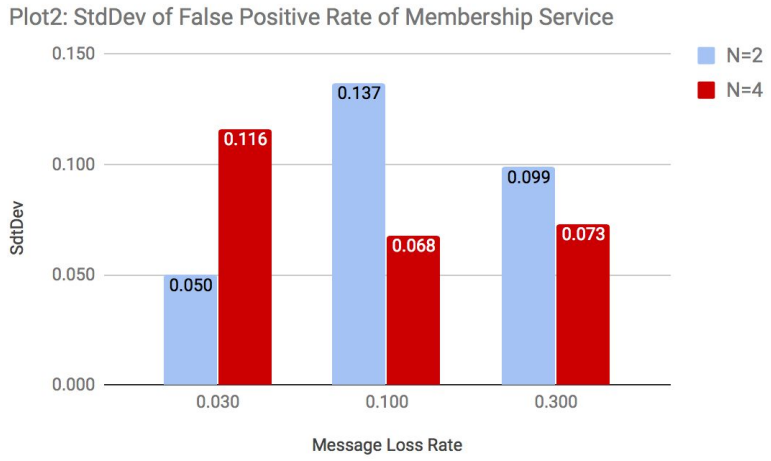
2. Expected bandwidth usage when 1 node: ① Join: For contact node: (125 Bytes(membership list)/0.5s = 250Bps); For other: 30B/0.5s = 60Bps ② Leave:30B/2s = 15Bps ③ Fail: 30B/2s=15Bps

False Positive Rate: Took 5 readings at all nodes.

False positive rate (FPR)= total failed times due to message loss / (total failed times due to server(daemon) crash + total failed times due to message loss)

Num of Nodes	N=2			N=4		
Message Loss Rate	0.030	0.100	0.300	0.030	0.100	0.300
	0.000	0.167	0.375	0.000	0.286	0.412
	0.091	0.286	0.286	0.091	0.286	0.444
False Positive Rate	0.091	0.000	0.545	0.091	0.231	0.500

	0.000	0.091	0.333	0.231	0.333	0.583
	0.000	0.333	0.412	0.286	0.412	0.412
Average (FPR)	0.036	0.175	0.390	0.140	0.309	0.470
StdDev (FPR)	0.050	0.137	0.099	0.116	0.068	0.073
Margin of Error (95%)	0.044	0.120	0.086	0.102	0.059	0.064
Confidence Interval	[-0.007,0.080]	[0.055,0.295]	[0.304,0.477]	[0.038,0.241]	[0.250,0.369]	[0.406,0.534]



As we can see in the plot1,

1. The higher the Message Loss rate is(MLR), the higher the FPR would be, just as expected. Because if there is no message received in this timeout limit, this node would be detected as down. And when MLR increases, there are more lost messages of one node in a specific period of time (timeout limit).
2. The FPRs of N=4 are always higher than N=2. Because when the number of nodes increases, there would be more message exchange in these whole system. So the number of lost massage increase. Hence the FPR increase.