CS425 MP2 Report

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Design

We implemented failure detector based on the ping-ack style. Each node spawned four threads. The first was running a UDP server to receive the messages including joining or leaving request, and receiving ping and ack. The second was running a TCP server based on xmlrpc from Mp1 for the grep service and debugging. The third is sending ping to its neighbors. The fourth was responsible for the user command.

We constructed the machines using a ring structure. And each machine maintains a sorted and full membership list which is used to monitor the next three machines in the system ring by using PING->ACK messages. The project can scale to large N since each machine connects to the next three machines regardless of N. We used the fa18-cs425-g43-01.cs.illinois.edu as the introducer. For marshaling message, we used pickle module to serialize Python objects. We stored the message in a dictionary. Before sending through the UDP protocol, we used pickle.dumps to return the dictionary as a bytes object. While receiving the message through the UDP, we used pickle.loads to read the original dictionary from the bytes object. Mp1 is helpful, since we can do a distributed grep of the log file in any machine to find out the useful information.

Joining: When a node wants to join the group, it will send a "join" message to the introducer. Then the introducer will judge whether the node can join based on the introducer's state. On the one hand, if the introducer already joined the group, it will update its own membership list and then propagated the new list to other nodes in its membership list. And other nodes can update their membership list and appropriately change the nodes it is monitoring. On the other hand, if the introducer is down, no new node can join the group.

Leaving: When a node wants to leave voluntarily, it will send the leave message to other nodes in the member list, and stop sending its ping to its neighbors and also stop sending the ack to respond other nodes' ping.

Crashing: When a node crashed, it does not send ping to its monitors and it also does not send ack to respond the others' ping. The failure message is propagated throughout the ring to make sure the other nodes remove this node from their membership list. Once it wants to be part of the group, it has to send a new join request to the introducer and rejoins the group.

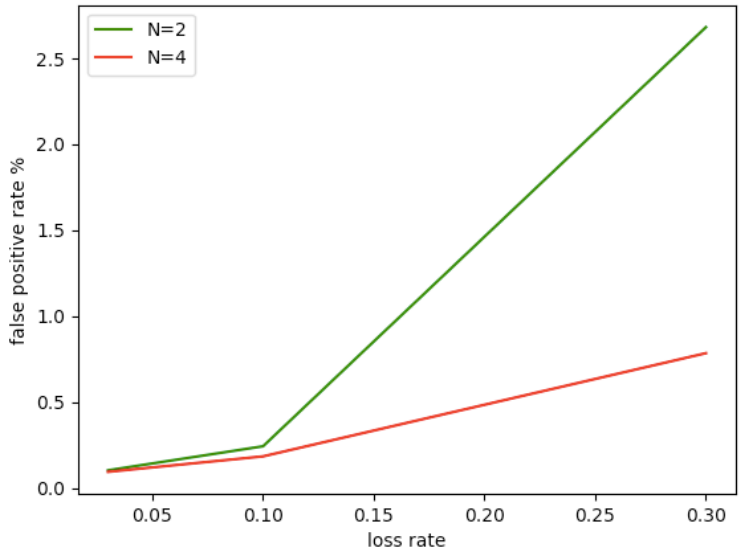
Measurements

(i) The background bandwidth usage for 4 machines is 142 Bps.

(ii) The average bandwidth usage when a node joins: 267Bps, leaves:192Bps, fails: 162Bps.

(iii) False positive rate.

	3%			10%			30%		
	avg	sd	conf	avg	sd	conf	avg	sd	conf
N=2	0.1026%	0.0743%	0.0691%	0.2426%	0.2074%	0.2001%	2.6824%	0.5389%	0.5093%
N=4	0.0938%	0.0442%	0.0323%	0.1838%	0.0954%	0.0821%	0.7846%	0.4988%	0.5149%



When the loss rate increases, the false positive rate also increases. As the plot showed above, when the false positive rate is very small that lower than 10%, it did not effect too much. However, when the loss rate is as high as 30%, the false positive rate will increase rapidly. Moreover, the false positive rate of N = 2 is higher than N = 4. Since in the N = 4 system, it sill has the other neighbors to support the propagation of information.