

Protocols Performance Comparison

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Intro

I used two programs to compare the performance between mirror and parallel protocols. The first one is red-black grid computing from our programming project 1. The other one is a test case written by myself. Both programs ran on 8 nodes (4 primary nodes and 4 replicas) on the 9th floor. I will show the results of both and briefly explain the reasons.

Red-black Test

Red-black test ran on a grid of size 8080 for 30 iterations. It contains 4 sub-tests: 1) *all nodes are alive* during the execution; 2) *2 primary nodes were killed* in the mid of the execution; 3) *2 replica nodes were killed* in the mid of the execution; 4) *a primary node and a replica node were killed* in the mid of the execution. The results are shown in the Figure 1.

Each sub-test ran for 10 times independently. The execution time is measured in seconds. We see that for *All nodes alive* scenario, the parallel protocol performs slightly better than the mirror protocol, this is because the overhead of synchronization between senders and their replicas for parallel protocol is not as significant as the overhead of sending/receiving redundant messages in mirror protocol. In the other three scenarios where two nodes were killed, they show similar performance because as nodes were killed, parallel degrades to mirror.

My Test

My test contains two loops. In the first loop, each node sends messages to all other nodes and wait to receive the same message from all other nodes. In the second loop, each node wait to receive messages on `MPI_ANY_SOURCE`, while all other nodes send messages to this node. All the messages are of the size of 8MB. The program first ran the loops while all nodes were alive, then killed a primary node and ran the loops again, then kill a replica node and ran the loops for the last time. The result is shown in Figure 2.

We see that in this case, the parallel protocol shows a significant performance advantage against the mirror protocol. It is because the message size (8MB) here is relative large, thus the overhead of redundant messages became the dominant factor in deciding the performance.

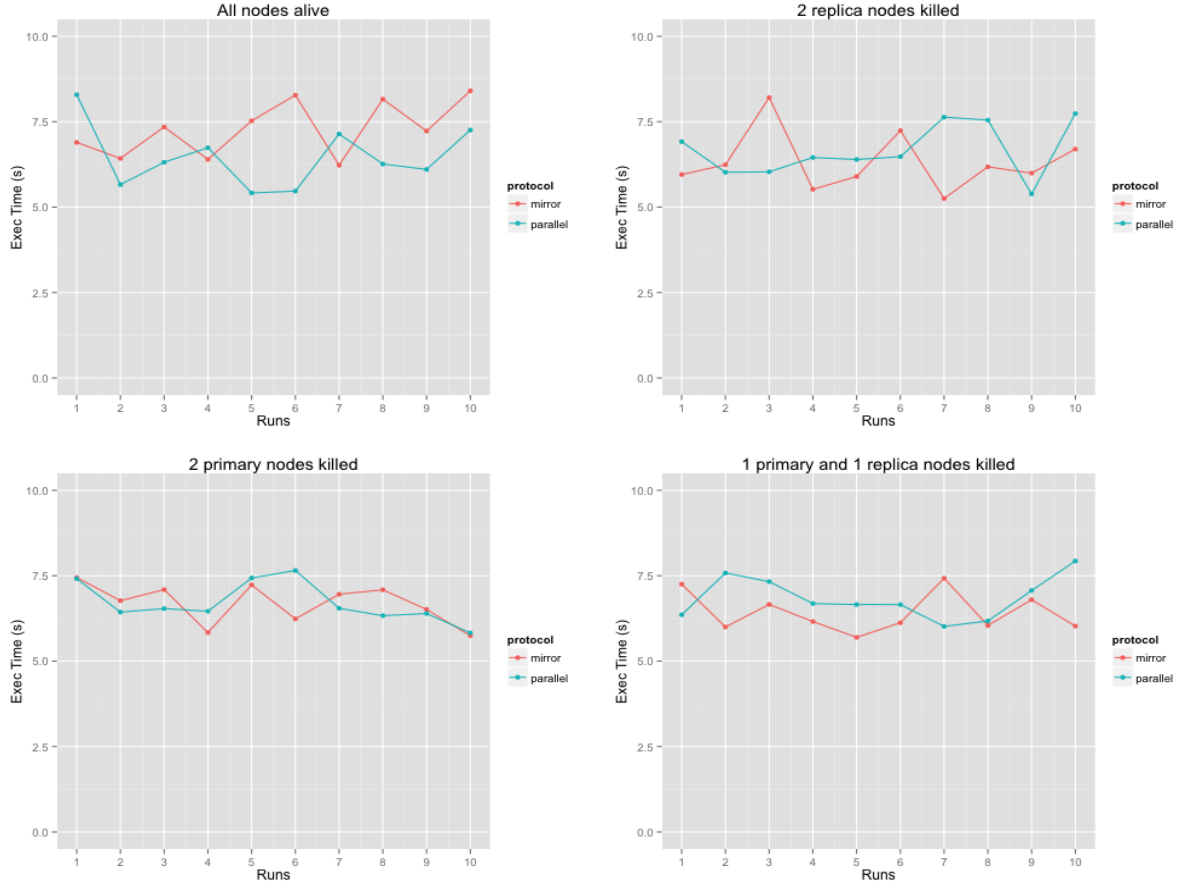


Figure 1: Protocol performance comparison against red-black grid computing

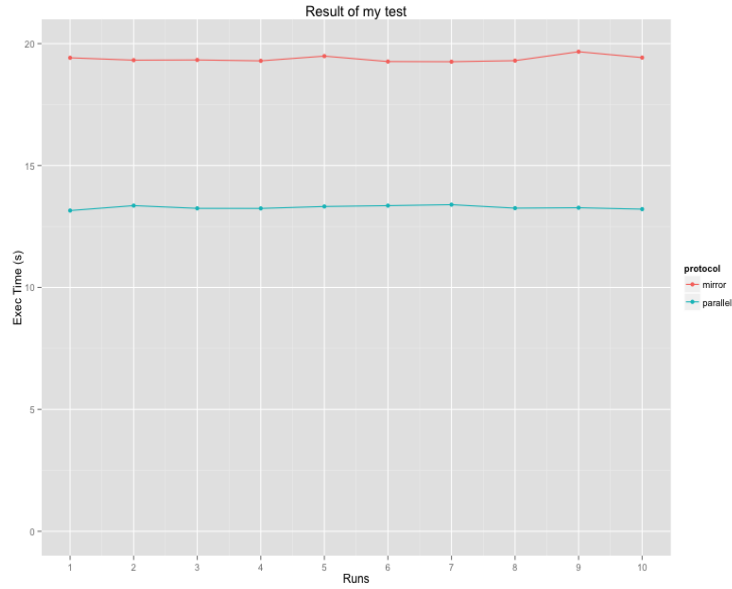


Figure 2: Protocol performance comparison against my test