CS 578
Programming Assignment - 4.2

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Design:

This is the design for the creation of a fault-tolerant system using zookeeper for the coordination and cassandra for the storage.
It attempts to implement checkpointing, fault tolerance, and recovery after failure.

MyDBFaultTolerantServerZK.java :

Data outline:
- Client requests in /requests
- Server registers it address in /servers

Init:
- Create keyspace.
- Create grade and checkpoint tables.
- Load the last node from the checkpoint.

Architecture:

- Server: It is the key-value store. With zookeeper, it manages the clients. The leader will take in all the writes and connect to others, followers.
- Client: Sends the operations like GET etc.
- Zookeeper: It is the coordination service. It will keep a track of the current leader.

Leader Election used:
- Each server creates a node under servers which is created in the folder.
- Once numbers are given, the server with the lowest number becomes the leader.
- If a leader has failed, then the succeeding server becomes the leader after everyone is notified.

In case of Failure:
- Crash Recovery:
    - Server that recover reads from the stored /request
    - Compares the requests with it last znode
    - Covers up the missing operations

Checkpoint
- After operation, the last node is saved. Ensure constant overhead.

Concurrency:

- All servers accept clients paralleling like threading.
- A leader change will call for some reconfiguration as only the leader can perform writes.

Failing Tests:

- Total Tests:
    - test31_GracefulExecutionSingleRequest
    - test32_GracefulExecutionMultipleRequestsSingleServer
    - test33_GracefulExecutionMultipleRequestsToMultipleServers
    - test34_SingleServerCrash
    - test35_TwoServerCrash
    - test36_OneServerRecoveryMultipleRequests
    - test37_TwoServerRecoveryMultipleRequests
    - test38_EntireStateMatchCheck
    - test39_InstantaneousMassacreAndRevivalTest
    - test40_SerialKillAndRecover
    - test41_CheckpointRecoveryTest

- All the cases have passed

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 succeeded
.test49_DropTables  succeeded
.test99_closeSessionAndServers  succeeded

Time: 162.442

OK (13 tests)
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Corrected failures:
- Failed Zookeeper locally: Initially there was some compatibility issue with the Mac and ZK
- Servers using wrong ports: Some servers were not connecting to correct ports and so clients were failing, and it indicated that connection refused.
- Restart test often failed due to empty grade table