

CLOUD COMPUTING

ASSIGNMENT – 4

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Section : G

TASK A: Installing Zookeeper

1a: Screenshot of Zookeeper Server having started.

```
sanmat@sanmat:/opt/apache-zookeeper-3.8.0-bin$ bin/zkServer.sh start
ZooKeeper JMX enabled by default
Using config: /opt/apache-zookeeper-3.8.0-bin/bin/../conf/zoo.cfg
Starting zookeeper ... STARTED
sanmat@sanmat:/opt/apache-zookeeper-3.8.0-bin$
```

TASK B: Getting Familiar with Zookeeper CLI

2a: Screenshot of Listing of the created ZNodes

```
WATCHER::
WatchedEvent state:SyncConnected type:None path:null
[zk: localhost:2181(CONNECTED) 0] create -s /PES1UG20CS385_seq "PES1UG20CS385"
Created /PES1UG20CS385_seq0000000000
[zk: localhost:2181(CONNECTED) 1] create -e /PES1UG20CS385_eph "PES1UG20CS385"
Created /PES1UG20CS385_eph
[zk: localhost:2181(CONNECTED) 2] ls /
[PES1UG20CS385_eph, PES1UG20CS385_seq0000000000, zookeeper]
[zk: localhost:2181(CONNECTED) 3]
```

2b: Screenshot of Listing of the deleted ephemeral node

```
WATCHER::
WatchedEvent state:SyncConnected type:None path:null
[zk: localhost:2181(CONNECTED) 0] ls /
[PES1UG20CS385_seq0000000000, zookeeper]
[zk: localhost:2181(CONNECTED) 1]
```

2c: Screenshot of Data and Metadata associated with the created sequential znode.

```
[zk: localhost:2181(CONNECTED) 1] get -s /PES1UG20CS385_seq0000000000
"PES1UG20CS385"
cZxid = 0xa
ctime = Tue Mar 21 13:38:56 IST 2023
mZxid = 0xa
mtime = Tue Mar 21 13:38:56 IST 2023
pZxid = 0xa
cversion = 0
dataVersion = 0
aclVersion = 0
ephemeralOwner = 0x0
dataLength = 19
numChildren = 0
[zk: localhost:2181(CONNECTED) 2]
```

2d: Screenshot of Listing of all the children nodes

```
[zk: localhost:2181(CONNECTED) 2] create /parent/path/subnode/path /data
Node does not exist: /parent/path/subnode/path
[zk: localhost:2181(CONNECTED) 3] create /parent
Created /parent
[zk: localhost:2181(CONNECTED) 4] create /parent/child "childnode"
Created /parent/child
[zk: localhost:2181(CONNECTED) 5] ls /parent
[child]
[zk: localhost:2181(CONNECTED) 6] █
```

TASK B: Naive Leader Election with Zookeeper CLI - Understanding the Algorithm

3a: Screenshot of each of the clients listing all the znodes

```
sanmat@sanmat: /opt/apache-zookeeper-3.8.0-bin
2023-03-21 14:03:53,960 [myid:] - INFO [main:io.a.z.s.a.JettyAdminServer@196] - Started AdminServer on address 0.0.0.0, port 8080 and command URL /commands
2023-03-21 14:03:53,965 [myid:] - INFO [main:io.a.z.s.s.ServerCnxnFactory@109] - Using org.apache.zookeeper.server.NIOServerCnxnFactory as server connection factory
2023-03-21 14:03:53,967 [myid:] - WARN [main:io.a.z.s.s.ServerCnxnFactory@809] - maxCnxns is not configured, using default value 0.
2023-03-21 14:03:53,968 [myid:] - INFO [main:io.a.z.s.NIOServerCnxnFactory@652] - Configuring NIO connection handler with 10s sessionless connection timeout, 1 selector thread(s), 8 worker threads, and 6
4 kb direct buffers.
2023-03-21 14:03:53,969 [myid:] - INFO [main:io.a.z.s.NIOServerCnxnFactory@660] - binding to port 0.0.0.0/0.0.0.0:2181
2023-03-21 14:03:53,980 [myid:] - INFO [main:io.a.z.s.w.WatchManagerFactory@42] - Using org.apache.zookeeper.server.watch.WatchManager as watch manager
2023-03-21 14:03:53,980 [myid:] - INFO [main:io.a.z.s.w.WatchManagerFactory@42] - Using org.apache.zookeeper.server.watch.WatchManager as watch manager
2023-03-21 14:03:53,980 [myid:] - INFO [main:io.a.z.s.z.ZKDatabase@132] - zookeeper.snapshotSizeFactor = 0.33
2023-03-21 14:03:53,981 [myid:] - INFO [main:io.a.z.s.z.ZKDatabase@152] - zookeeper.commitlogCount=200
2023-03-21 14:03:53,984 [myid:] - INFO [main:io.a.z.s.p.p.SnapStream@61] - zookeeper.snapshot.compression.method = CHECKED
2023-03-21 14:03:53,984 [myid:] - INFO [main:io.a.z.s.p.p.SnapStream@85] - Reading snapshot /opt/apache-zookeeper-3.8.0-bin/data/version-2/snapshot.8
2023-03-21 14:03:53,989 [myid:] - INFO [main:io.a.z.s.p.DataTree@1705] - The digest in the snapshot has digest version of 2, with zxid as 0x8, and digest value as 1371985504
2023-03-21 14:03:54,002 [myid:] - INFO [main:io.a.z.s.a.ZKAuditProvider@42] - Zookeeper audit is disabled.
2023-03-21 14:03:54,005 [myid:] - INFO [main:io.a.z.s.p.FileTxnSnapLog@372] - 18 txns loaded in 9 ms
2023-03-21 14:03:54,005 [myid:] - INFO [main:io.a.z.s.z.ZKDatabase@289] - Snapshot loaded in 24 ms, highest zxid is 0x1a, digest is 15340426148
2023-03-21 14:03:54,006 [myid:] - INFO [main:io.a.z.s.p.FileTxnSnapLog@479] - Snapshotting: 0x1a to /opt/apache-zookeeper-3.8.0-bin/data/version-2/snapshot.1a
2023-03-21 14:03:54,007 [myid:] - INFO [main:io.a.z.s.ZookeeperServer@647] - Snapshot taken in 1 ms
2023-03-21 14:03:54,017 [myid:] - INFO [main:io.a.z.s.RequestThrottler@75] - zookeeper.request.throttler.shutdownTimeout = 10000 ms
2023-03-21 14:03:54,017 [myid:] - INFO [ProcessThread(sid:0 cport:2181):io.a.z.s.PreRequestProcessor@138] - PreRequestProcessor (sid:0) started, reconfigEnabled=false
2023-03-21 14:03:54,030 [myid:] - INFO [main:io.a.z.s.ContainerManager@84] - Using checkIntervalMs=60000 maxPerMinute=10000 maxNeverUsedIntervalMs=0
2023-03-21 14:03:53,488 [myid:] - INFO [SyncThread@0:io.a.z.s.p.FileTxnLog@285] - Creating new log file: log.1b

Welcome to ZooKeeper!
2023-03-21 14:06:34,981 [myid:localhost:2181] - INFO [main-SendThrea
d[localhost:2181]:io.a.z.ClientCnxnSendThread@1171] - Opening socke
t connection to server localhost/127.0.0.1:2181.
2023-03-21 14:06:34,981 [myid:localhost:2181] - INFO [main-SendThrea
d[localhost:2181]:io.a.z.ClientCnxnSendThread@1171] - SASL config st
atus: Will not attempt to authenticate using SASL (unknown error)
2023-03-21 14:06:34,986 [myid:localhost:2181] - INFO [main-SendThrea
d[localhost:2181]:io.a.z.ClientCnxnSendThread@1005] - Socket connecti
on established, initiating session, client: /127.0.0.1:42300, server:
localhost/127.0.0.1:2181
2023-03-21 14:06:34,995 [myid:localhost:2181] - INFO [main-SendThrea
d[localhost:2181]:io.a.z.ClientCnxnSendThread@1444] - Session establi
shment complete on server localhost/127.0.0.1:2181, session id = 0x10
9081afad0000, negotiated timeout = 30000
WATCHER::
WatchedEvent state:SyncConnected type:None path:null
line support is enabled
[zk: localhost:2181(CONNECTED) 0] ls /pesisug20cs385
[candidate0000000000, candidate0000000002]
[zk: localhost:2181(CONNECTED) 1]

2023-03-21 14:07:03,311 [myid:localhost:2181] - INFO [main-SendTh
read[localhost:2181]:io.a.z.ClientCnxnSendThread@1171] - Opening s
ocket connection to server localhost/127.0.0.1:2181.
2023-03-21 14:07:03,312 [myid:localhost:2181] - INFO [main-SendTh
read[localhost:2181]:io.a.z.ClientCnxnSendThread@1005] - Socket co
nnection established, initiating session, client: /127.0.0.1:44754
2023-03-21 14:07:03,312 [myid:localhost:2181] - INFO [main-SendTh
read[localhost:2181]:io.a.z.ClientCnxnSendThread@1171] - SASL confi
g status: Will not attempt to authenticate using SASL (unknown er
ror)
2023-03-21 14:07:03,327 [myid:localhost:2181] - INFO [main-SendTh
read[localhost:2181]:io.a.z.ClientCnxnSendThread@1005] - Socket co
nnection established, initiating session, client: /127.0.0.1:49436
2023-03-21 14:07:03,339 [myid:localhost:2181] - INFO [main-SendTh
read[localhost:2181]:io.a.z.ClientCnxnSendThread@1444] - Session e
stablishment complete on server localhost/127.0.0.1:2181, session
id = 0x100001afad0001, negotiated timeout = 30000
WATCHER::
WatchedEvent state:SyncConnected type:None path:null
[zk: localhost:2181(CONNECTED) 0] ls /pesisug20cs385
[zk: localhost:2181(CONNECTED) 1]

2023-03-21 14:07:31,225 [myid:localhost:2181] - INFO [main-SendTh
read[localhost:2181]:io.a.z.ClientCnxnSendThread@1444] - Session e
stablishment complete on server localhost/127.0.0.1:2181, session
id = 0x100001afad0002, negotiated timeout = 30000
WATCHER::
WatchedEvent state:SyncConnected type:None path:null
Created /pesisug20cs385/candidate0000000003
[zk: localhost:2181(CONNECTED) 2] ls /pesisug20cs385
[candidate0000000000, candidate0000000002, candidate0000000003]
[zk: localhost:2181(CONNECTED) 3] █
```

3b: Screenshot of the Watched Event and the Zookeeper Server logs.

```
sanmat@sanmat: /opt/apache-zookeeper-3.8.0-bin
2023-03-21 14:03:53,960 [myid:] - INFO [main:io.a.z.s.a.JettyAdminServer@196] - Started AdminServer on address 0.0.0.0, port 8888 and command URL /commands
2023-03-21 14:03:53,965 [myid:] - INFO [main:io.a.z.s.s.ServerCnxnFactory@169] - Using org.apache.zookeeper.server.NIOServerCnxnFactory as server connection factory
2023-03-21 14:03:53,967 [myid:] - WARN [main:io.a.z.s.s.ServerCnxnFactory@309] - maxCnxns is not configured, using default value 0
2023-03-21 14:03:53,968 [myid:] - INFO [main:io.a.z.s.NIOServerCnxnFactory@652] - Configuring NIO connection handler with 10s sessionless connection timeout, 1 selector thread(s), 8 worker threads, and 6
4 KB direct buffers.
2023-03-21 14:03:53,969 [myid:] - INFO [main:io.a.z.s.NIOServerCnxnFactory@660] - binding to port 0.0.0.0/0.0.0.0:2181
2023-03-21 14:03:53,980 [myid:] - INFO [main:io.a.z.s.w.WatchManagerFactory@42] - Using org.apache.zookeeper.server.watch.WatchManager as watch manager
2023-03-21 14:03:53,980 [myid:] - INFO [main:io.a.z.s.w.WatchManagerFactory@42] - Using org.apache.zookeeper.server.watch.WatchManager as watch manager
2023-03-21 14:03:53,981 [myid:] - INFO [main:io.a.z.s.ZKDatabase@132] - zookeeper.snapshotSizeFactor = 0.33
2023-03-21 14:03:53,981 [myid:] - INFO [main:io.a.z.s.ZKDatabase@152] - zookeeper.commitLogCount=500
2023-03-21 14:03:53,984 [myid:] - INFO [main:io.a.z.s.p.SnapStream@61] - zookeeper.snapshot.compression.method = CHECKED
2023-03-21 14:03:53,984 [myid:] - INFO [main:io.a.z.s.p.Filesnap@85] - Reading snapshot /opt/apache-zookeeper-3.8.0-bin/data/version-2/snapshot.0
2023-03-21 14:03:53,989 [myid:] - INFO [main:io.a.z.s.ZKDatabase@289] - Snapshot loaded in 24 ms, highest zxid is 0x1a, digest is 1371985504
2023-03-21 14:03:54,002 [myid:] - INFO [main:io.a.z.s.p.FileTxnSnapLog@42] - Zookeeper audit is disabled.
2023-03-21 14:03:54,005 [myid:] - INFO [main:io.a.z.s.p.FileTxnSnapLog@372] - 18 txns loaded in 9 ms
2023-03-21 14:03:54,005 [myid:] - INFO [main:io.a.z.s.ZKDatabase@289] - Snapshot loaded in 24 ms, highest zxid is 0x1a, digest is 1371985504
2023-03-21 14:03:54,006 [myid:] - INFO [main:io.a.z.s.p.FileTxnSnapLog@42] - Snapshotting: 0x1a to /opt/apache-zookeeper-3.8.0-bin/data/version-2/snapshot.1a
2023-03-21 14:03:54,007 [myid:] - INFO [main:io.a.z.s.ZookeeperServer@547] - Snapshot taken in 1 ms
2023-03-21 14:03:54,017 [myid:] - INFO [main:io.a.z.s.RequestThrottler@75] - zookeeper.request_throttler.shutdownTimeout = 10000 ms
2023-03-21 14:03:54,017 [myid:] - INFO [ProcessThread(sld:0 port:2181):io.a.z.s.PreRequestProcessor@138] - PreRequestProcessor (sld:0) started, reconfigEnabled=false
2023-03-21 14:03:54,036 [myid:] - INFO [main:io.a.z.s.ContainerManager@84] - Using checkIntervalMs=60000 maxPerMinute=10000 maxNeverUsedIntervalMs=6
2023-03-21 14:05:33,488 [myid:] - INFO [SyncThread:0:io.a.z.s.p.FileTxnLog@285] - Creating new log file: log.1b

d(localhost:2181):o.a.z.ClientCnxn$SendThread@1286] - An exception was thrown while closing send thread for session 0x100001afa6d0000.
org.apache.zookeeper.ClientCnxn$EndOfStreamException: Unable to read additional data from server sessionid 0x100001afa6d0000, likely server has closed socket
    at org.apache.zookeeper.ClientCnxnSocketNIO.doIO(ClientCnxnSocketNIO.java:77)
    at org.apache.zookeeper.ClientCnxnSocketNIO.doTransport(ClientCnxnSocketNIO.java:350)
    at org.apache.zookeeper.ClientCnxn$SendThread.run(ClientCnxn.java:1282)

WATCHER::
WatchedEvent state:Closed type:None path:null
2023-03-21 14:15:33,036 [myid:] - INFO [main:io.a.z.ZooKeeper@1232] - Session: 0x100001afa6d0000 closed
2023-03-21 14:15:33,036 [myid:] - INFO [main-EventThread:io.a.z.ClientCnxn$EventThread@568] - EventThread shut down for session: 0x100001afa6d0000
2023-03-21 14:15:33,038 [myid:] - ERROR [main:io.a.z.u.ServiceUtils@42] - sanmat@sanmat:/opt/apache-zookeeper-3.8.0-bin$

[zk: localhost:2181(CONNECTED) 0] ls /pesiug20cs385
[]
[zk: localhost:2181(CONNECTED) 1] create -s -e /pesiug20cs385/candidate
Created /pesiug20cs385/candidate0000000003
[zk: localhost:2181(CONNECTED) 2] ls /pesiug20cs385
[candidate0000000003]
[zk: localhost:2181(CONNECTED) 3] get -s -w /pesiug20cs385/candidate0000000003
null
cZxid = 0x22
ctime = Tue Mar 21 14:08:04 IST 2023
mZxid = 0x22
mtime = Tue Mar 21 14:08:04 IST 2023
pZxid = 0x22
cversion = 0
dataVersion = 0
aclVersion = 0
ephemeralOwner = 0x100001afa6d0000
dataLength = 0
numChildren = 0
[zk: localhost:2181(CONNECTED) 4]
```

3c: Screenshot of the old leader coming back and having a new sequence number.

```
d(localhost:2181):o.a.z.ClientCnxn$SendThread@1173] - SASL config status: Will not attempt to authenticate using SASL (unknown error)
JLine support is enabled
2023-03-21 14:19:30,087 [myid:localhost:2181] - INFO [main-SendThread(localhost:2181):o.a.z.ClientCnxn$SendThread@1005] - Socket connection established, initiating session, client: /127.0.0.1:46732, server: localhost/127.0.0.1:2181
2023-03-21 14:19:30,101 [myid:localhost:2181] - INFO [main-SendThread(localhost:2181):o.a.z.ClientCnxn$SendThread@1444] - Session establishment complete on server localhost/127.0.0.1:2181, session id = 0x100001afa6d0003, negotiated timeout = 30000

WATCHER::

WatchedEvent state:SyncConnected type:None path:null
[zk: localhost:2181(CONNECTED) 0] ls /pesiug20cs385
[candidate0000000003]
[zk: localhost:2181(CONNECTED) 1] create -s -e /pesiug20cs385/candidate
Created /pesiug20cs385/candidate0000000006
[zk: localhost:2181(CONNECTED) 2] ls /pesiug20cs385
[candidate0000000003, candidate0000000006]
[zk: localhost:2181(CONNECTED) 3]
```