

Assignment 4 - Introduction to Apache Zookeeper

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1a: Screenshot of Zookeeper Server having started.

```
pes1ug20cs588@pes1ug20cs588-VirtualBox:/opt/apache-zookeeper-3.8.0-bin$ bin/zkServer.sh start
/usr/bin/java
ZooKeeper JMX enabled by default
Using config: /opt/apache-zookeeper-3.8.0-bin/bin/../conf/zoo.cfg
Starting zookeeper ... STARTED
pes1ug20cs588@pes1ug20cs588-VirtualBox:/opt/apache-zookeeper-3.8.0-bin$
```

2a: Screenshot of Listing of the created ZNodes

```
[zk: localhost:2181(CONNECTED) 5] create -s /pes1ug20cs588_seq "a sequential node"
Created /pes1ug20cs588_seq0000000002
[zk: localhost:2181(CONNECTED) 6] create -e /pes1ug20cs588_eph "a ephemeral node"
Created /pes1ug20cs588_eph
[zk: localhost:2181(CONNECTED) 7] ls /
[pes1ug20cs588_eph, pes1ug20cs588_seq0000000002, zookeeper]
[zk: localhost:2181(CONNECTED) 8]
```

2b: Screenshot of Listing of the deleted ephemeral node

```
WATCHER::
WatchedEvent state:SyncConnected type:None path:null
[zk: localhost:2181(CONNECTED) 0] ls /
[pes1ug20cs588_seq0000000002, 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 /pes1ug20cs588_seq0000000002
a sequential node
cZxid = 0xb
ctime = Wed Mar 22 22:09:47 IST 2023
mZxid = 0xb
mtime = Wed Mar 22 22:09:47 IST 2023
pZxid = 0xb
cversion = 0
dataVersion = 0
aclVersion = 0
ephemeralOwner = 0x0
dataLength = 17
numChildren = 0
[zk: localhost:2181(CONNECTED) 2] □
```

2d: Screenshot of Listing of all the children nodes

```
[zk: localhost:2181(CONNECTED) 2] create /pesiug20cs588
Created /pesiug20cs588
[zk: localhost:2181(CONNECTED) 3] create /pesiug20cs588/Sahana "childnode"
Created /pesiug20cs588/Sahana
[zk: localhost:2181(CONNECTED) 4] create /pesiug20cs588/Rao "childnode"
Created /pesiug20cs588/Rao
[zk: localhost:2181(CONNECTED) 5] ls /pesiug20cs588
[Rao, Sahana]
[zk: localhost:2181(CONNECTED) 6]
```

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

```
pesiug20cs588@pesiug20cs588-VirtualBox: /opt/apache-zookeeper-3.8.0-bin
2023-03-22 22:19:17,884 [myid:] - WARN [main:o.a.z.s.ServerCnxnFactory@309] - maxCnxns is not configured, using default value 0.
2023-03-22 22:19:17,885 [myid:] - INFO [main:o.a.z.s.NIOServerCnxnFactory@652] - Configuring NIO connection handler with 10s sessionless connection timeout, 1 selector thread(s), 4 worker threads, and 6
4 kB direct buffers.
2023-03-22 22:19:17,886 [myid:] - INFO [main:o.a.z.s.NIOServerCnxnFactory@660] - binding to port 0.0.0.0/0.0.0.0:2181
2023-03-22 22:19:17,899 [myid:] - INFO [main:o.a.z.s.w.WatchManagerFactory@42] - Using org.apache.zookeeper.server.watch.WatchManager as watch manager
2023-03-22 22:19:17,900 [myid:] - INFO [main:o.a.z.s.w.WatchManagerFactory@42] - Using org.apache.zookeeper.server.watch.WatchManager as watch manager
2023-03-22 22:19:17,900 [myid:] - INFO [main:o.a.z.s.ZKDatabase@132] - zookeeper.snapshotSizeFactor = 0.33
2023-03-22 22:19:17,900 [myid:] - INFO [main:o.a.z.s.ZKDatabase@152] - zookeeper.commitLogCount=500
2023-03-22 22:19:17,909 [myid:] - INFO [main:o.a.z.s.p.SnapStream@61] - zookeeper.snapshot.compression.method = CHECKED
2023-03-22 22:19:17,909 [myid:] - INFO [main:o.a.z.s.p.SnapStream@61] - Reading snapshot /opt/apache-zookeeper-3.8.0-bin/data/version-2/snapshot.8
2023-03-22 22:19:17,911 [myid:] - INFO [main:o.a.z.s.DataTree@1705] - The digest in the snapshot has digest version of 2, with zxid as 0x8, and digest value as 6912398010
2023-03-22 22:19:17,936 [myid:] - INFO [main:o.a.z.s.ZKAuditProvider@42] - Zookeeper audit is disabled.
2023-03-22 22:19:17,937 [myid:] - INFO [main:o.a.z.s.p.FileTxnSnapLog@372] - 13 txns loaded in 23 ms
2023-03-22 22:19:17,937 [myid:] - INFO [main:o.a.z.s.p.FileTxnSnapLog@372] - Snapshot loaded in 37 ms, highest zxid is 0x15, digest is 2247178770
2023-03-22 22:19:17,938 [myid:] - INFO [main:o.a.z.s.p.FileTxnSnapLog@479] - Snapshotting: 0x15 to /opt/apache-zookeeper-3.8.0-bin/data/version-2/snapshot.15
2023-03-22 22:19:17,939 [myid:] - INFO [main:o.a.z.s.ZooKeeperServer@547] - Snapshot taken in 1 ms
2023-03-22 22:19:17,940 [myid:] - INFO [main:o.a.z.s.RequestThrottler@75] - zookeeper.request.throttler.shutdownTimeout = 10000 ms
2023-03-22 22:19:17,950 [myid:] - INFO [ProcessThread(sid:0 cport:2181):o.a.z.s.PreRequestProcessor@138] - PreRequestProcessor (sid:0) started, reconfigEnabled=false
2023-03-22 22:19:17,971 [myid:] - INFO [main:o.a.z.s.ContainerManager@84] - Using checkIntervalMs=60000 maxPerMnute=10000 maxNeverUsedIntervalMs=0
2023-03-22 22:20:02,439 [myid:] - INFO [SynchThread:0:o.a.z.s.p.FileTxnLog@285] - Creating new log file: log.16

ad(localhost:2181):o.a.z.ClientCnxn$SendThread@1005] - Socket connection established, initiating session, client: /127.0.0.1:4196, server: localhost/127.0.0.1:2181
2023-03-22 22:20:03,549 [myid:localhost:2181] - INFO [main-SendThread(localhost:2181):o.a.z.ClientCnxn$SendThread@1444] - Session establishment complete on server localhost/127.0.0.1:2181, session id = 0x10000128fa30002, negotiated timeout = 30000
WATCHER::
WatchedEvent state:SyncConnected type:None path:null
[zk: localhost:2181(CONNECTED) 0] create /pesiug20cs588
Created /pesiug20cs588
[zk: localhost:2181(CONNECTED) 1] create -s -e /pesiug20cs588/candidate
Created /pesiug20cs588/candidate0000000000
[zk: localhost:2181(CONNECTED) 2] ls /
[pesiug20cs588, pesiug20cs588_seq0000000002, zookeeper]
[zk: localhost:2181(CONNECTED) 3] ls /
[pesiug20cs588, pesiug20cs588_seq0000000002, zookeeper]
[zk: localhost:2181(CONNECTED) 4] ls /pesiug20cs588
[candidate, candidate0000000000, candidate0000000001]
[zk: localhost:2181(CONNECTED) 5]

lg status: Will not attempt to authenticate using SASL (unknown error)
2181 support is enabled
2023-03-22 22:20:08,754 [myid:localhost:2181] - INFO [main-SendThread(localhost:2181):o.a.z.ClientCnxn$SendThread@1005] - Socket connection established, initiating session, client: /127.0.0.1:58884, server: localhost/127.0.0.1:2181
2023-03-22 22:20:08,807 [myid:localhost:2181] - INFO [main-SendThread(localhost:2181):o.a.z.ClientCnxn$SendThread@1444] - Session establishment complete on server localhost/127.0.0.1:2181, session id = 0x10000128fa30001, negotiated timeout = 30000
WATCHER::
WatchedEvent state:SyncConnected type:None path:null
[zk: localhost:2181(CONNECTED) 0] create -s -e /pesiug20cs588/candidate
Created /pesiug20cs588/candidate0000000001
[zk: localhost:2181(CONNECTED) 1] ls /
[pesiug20cs588, pesiug20cs588_seq0000000002, zookeeper]
[zk: localhost:2181(CONNECTED) 2] ls /pesiug20cs588
[candidate, candidate0000000000, candidate0000000001]
[zk: localhost:2181(CONNECTED) 3]

status: Will not attempt to authenticate using SASL (unknown error)
2023-03-22 22:20:02,413 [myid:localhost:2181] - INFO [main-SendThread(localhost:2181):o.a.z.ClientCnxn$SendThread@1005] - Socket connection established, initiating session, client: /127.0.0.1:40676, server: localhost/127.0.0.1:2181
Welcome to ZooKeeper!
Jline support is enabled
2023-03-22 22:20:02,482 [myid:localhost:2181] - INFO [main-SendThread(localhost:2181):o.a.z.ClientCnxn$SendThread@1444] - Session establishment complete on server localhost/127.0.0.1:2181, session id = 0x10000128fa30000, negotiated timeout = 30000
WATCHER::
WatchedEvent state:SyncConnected type:None path:null
[zk: localhost:2181(CONNECTED) 0] create /pesiug20cs588/candidate
Created /pesiug20cs588/candidate0000000001
[zk: localhost:2181(CONNECTED) 1] ls /
[pesiug20cs588, pesiug20cs588_seq0000000002, zookeeper]
[zk: localhost:2181(CONNECTED) 2] ls /pesiug20cs588
[candidate, candidate0000000000, candidate0000000001]
[zk: localhost:2181(CONNECTED) 3]
```

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

```
pesiug20cs588@pesiug20cs588-VirtualBox: /opt/apache-zookeeper-3.8.0-bin
2023-03-22 22:19:17,883 [myid:] - INFO [main:o.a.z.s.ServerCnxnFactory@109] - Using org.apache.zookeeper.server.NIOServerCnxnFactory as server connection factory
2023-03-22 22:19:17,884 [myid:] - WARN [main:o.a.z.s.ServerCnxnFactory@309] - maxCnxns is not configured, using default value 0
2023-03-22 22:19:17,885 [myid:] - INFO [main:o.a.z.s.NIOServerCnxnFactory@652] - Configuring NIO connection handler with 10s sessionless connection timeout, 1 selector thread(s), 4 worker threads, and 6
4 kB direct buffers.
2023-03-22 22:19:17,886 [myid:] - INFO [main:o.a.z.s.NIOServerCnxnFactory@660] - binding to port 0.0.0.0/0.0.0.0:2181
2023-03-22 22:19:17,899 [myid:] - INFO [main:o.a.z.s.w.WatchManagerFactory@42] - Using org.apache.zookeeper.server.watch.WatchManager as watch manager
2023-03-22 22:19:17,900 [myid:] - INFO [main:o.a.z.s.w.WatchManagerFactory@42] - Using org.apache.zookeeper.server.watch.WatchManager as watch manager
2023-03-22 22:19:17,900 [myid:] - INFO [main:o.a.z.s.ZKDatabase@132] - zookeeper.snapshotSizeFactor = 0.33
2023-03-22 22:19:17,900 [myid:] - INFO [main:o.a.z.s.ZKDatabase@152] - zookeeper.commitLogCount=500
2023-03-22 22:19:17,909 [myid:] - INFO [main:o.a.z.s.p.SnapStream@61] - zookeeper.snapshot.compression.method = CHECKED
2023-03-22 22:19:17,909 [myid:] - INFO [main:o.a.z.s.p.SnapStream@61] - Reading snapshot /opt/apache-zookeeper-3.8.0-bin/data/version-2/snapshot.8
2023-03-22 22:19:17,936 [myid:] - INFO [main:o.a.z.s.ZKAuditProvider@42] - Zookeeper audit is disabled.
2023-03-22 22:19:17,937 [myid:] - INFO [main:o.a.z.s.p.FileTxnSnapLog@372] - 13 txns loaded in 23 ms
2023-03-22 22:19:17,937 [myid:] - INFO [main:o.a.z.s.p.FileTxnSnapLog@372] - Snapshot loaded in 37 ms, highest zxid is 0x15, digest is 2247178770
2023-03-22 22:19:17,938 [myid:] - INFO [main:o.a.z.s.p.FileTxnSnapLog@479] - Snapshotting: 0x15 to /opt/apache-zookeeper-3.8.0-bin/data/version-2/snapshot.15
2023-03-22 22:19:17,939 [myid:] - INFO [main:o.a.z.s.ZooKeeperServer@547] - Snapshot taken in 1 ms
2023-03-22 22:19:17,940 [myid:] - INFO [main:o.a.z.s.RequestThrottler@75] - zookeeper.request.throttler.shutdownTimeout = 10000 ms
2023-03-22 22:19:17,950 [myid:] - INFO [ProcessThread(sid:0 cport:2181):o.a.z.s.PreRequestProcessor@138] - PreRequestProcessor (sid:0) started, reconfigEnabled=false
2023-03-22 22:19:17,971 [myid:] - INFO [main:o.a.z.s.ContainerManager@84] - Using checkIntervalMs=60000 maxPerMnute=10000 maxNeverUsedIntervalMs=0
2023-03-22 22:20:02,439 [myid:] - INFO [SynchThread:0:o.a.z.s.p.FileTxnLog@285] - Creating new log file: log.16

org.apache.zookeeper.ClientCnxn$EndOfStreamException: Unable to read additional data from server sessionid 0x10000128fa30002, likely server has closed socket
    at org.apache.zookeeper.ClientCnxn$SocketNIO.doIO(ClientCnxn$SocketNIO.java:77)
    at org.apache.zookeeper.ClientCnxn$SocketNIO.doTransport(ClientCnxn$SocketNIO.java:1282)
    at org.apache.zookeeper.ClientCnxn$SendThread.run(ClientCnxn$SendThread.java:1282)
WATCHER::
WatchedEvent state:Closed type:None path:null
2023-03-22 22:32:16,397 [myid:] - INFO [main-EventThread:0:a.z.ClientCnxn$EventThread@568] - EventThread shut down for session: 0x10000128fa30002
2023-03-22 22:32:16,397 [myid:] - INFO [main:o.a.z.ZooKeeper@1232] - Session: 0x10000128fa30002 closed
2023-03-22 22:32:16,406 [myid:] - ERROR [main:o.a.z.u.ServiceUtils@4] - pesiug20cs588@pesiug20cs588-VirtualBox: /opt/apache-zookeeper-3.8.0-bin
0$
0:bash*

org.apache.zookeeper.ClientCnxn$EndOfStreamException: Unable to read additional data from server sessionid 0x10000128fa30001, likely server has closed socket
    at org.apache.zookeeper.ClientCnxn$SocketNIO.doIO(ClientCnxn$SocketNIO.java:77)
    at org.apache.zookeeper.ClientCnxn$SocketNIO.doTransport(ClientCnxn$SocketNIO.java:1282)
    at org.apache.zookeeper.ClientCnxn$SendThread.run(ClientCnxn$SendThread.java:1282)
WATCHER::
WatchedEvent state:Closed type:None path:null
2023-03-22 22:32:43,157 [myid:] - INFO [main:org.apache.zookeeper@1232] - Session: 0x10000128fa30001 closed
2023-03-22 22:32:43,158 [myid:] - INFO [main-EventThread:0:a.z.ClientCnxn$EventThread@568] - EventThread shut down for session: 0x10000128fa30001
2023-03-22 22:32:43,160 [myid:] - ERROR [main:o.a.z.u.ServiceUtils@4] - pesiug20cs588@pesiug20cs588-VirtualBox: /opt/apache-zookeeper-3.8.0-bin
0$
0:bash*

[pesiug20cs588, pesiug20cs588_seq0000000002, zookeeper]
[candidate, candidate0000000000, candidate0000000001]
[zk: localhost:2181(CONNECTED) 3] get -s -w /pesiug20cs588/candidate0000000001
null
cZxid = 0x1b
ctime = Wed Mar 22 22:23:24 IST 2023
mZxid = 0x1b
mtime = Wed Mar 22 22:23:24 IST 2023
pZxid = 0x1b
cversion = 0
dataVersion = 0
aclVersion = 0
ephemeralOwner = 0x10000128fa30001
dataLength = 0
numChildren = 0
[zk: localhost:2181(CONNECTED) 4]
WATCHER::
WatchedEvent state:SyncConnected type:NodeDeleted path:/pesiug20cs588/candidate0000000001
```

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

```
pesiug20cs588@pesiug20cs588-VirtualBox: /opt/apache-zookeeper-3.8.0-bin

2023-03-22 22:19:17,883 [myid:] - INFO [main:o.a.z.s.ServerCnxnFactory@169] - Using org.apache.zookeeper.server.NIOServerCnxnFactory as server connection factory
2023-03-22 22:19:17,884 [myid:] - WARN [main:o.a.z.s.ServerCnxnFactory@309] - maxCnxns is not configured, using default value 0.
2023-03-22 22:19:17,885 [myid:] - INFO [main:o.a.z.s.NIOServerCnxnFactory@652] - Configuring NIO connection handler with 10s sessionless connection timeout, 1 selector thread(s), 4 worker threads, and 6
4 kB direct buffers.
2023-03-22 22:19:17,886 [myid:] - INFO [main:o.a.z.s.NIOServerCnxnFactory@660] - binding to port 0.0.0.0/0.0.0.0:2181
2023-03-22 22:19:17,899 [myid:] - INFO [main:o.a.z.s.w.WatchManagerFactory@42] - Using org.apache.zookeeper.server.watch.WatchManager as watch manager
2023-03-22 22:19:17,900 [myid:] - INFO [main:o.a.z.s.w.WatchManagerFactory@42] - Using org.apache.zookeeper.server.watch.WatchManager as watch manager
2023-03-22 22:19:17,900 [myid:] - INFO [main:o.a.z.s.ZKDatabase@132] - zookeeper.snapshotSizeFactor = 0.33
2023-03-22 22:19:17,900 [myid:] - INFO [main:o.a.z.s.ZKDatabase@152] - zookeeper.commitLogCount=500
2023-03-22 22:19:17,909 [myid:] - INFO [main:o.a.z.s.p.SnapStream@61] - zookeeper.snapshot.compression.method = CHECKED
2023-03-22 22:19:17,909 [myid:] - INFO [main:o.a.z.s.p.FileSnap@85] - Reading snapshot /opt/apache-zookeeper-3.8.0-bin/data/version-2/snapshot.8
2023-03-22 22:19:17,911 [myid:] - INFO [main:o.a.z.s.DataTree@1705] - The digest in the snapshot has digest version of 2, with zxid as 0x8, and digest value as 6912398010
2023-03-22 22:19:17,930 [myid:] - INFO [main:o.a.z.a.ZKAuditProvider@42] - ZooKeeper audit is disabled.
2023-03-22 22:19:17,937 [myid:] - INFO [main:o.a.z.s.p.FileTxnSnapLog@372] - 13 txns loaded in 23 ms
2023-03-22 22:19:17,937 [myid:] - INFO [main:o.a.z.s.ZKDatabase@289] - Snapshot loaded in 37 ms, highest zxid is 0x15, digest is 2247178770
2023-03-22 22:19:17,938 [myid:] - INFO [main:o.a.z.s.p.FileTxnSnapLog@479] - Snapshotting: 0x15 to /opt/apache-zookeeper-3.8.0-bin/data/version-2/snapshot.15
2023-03-22 22:19:17,939 [myid:] - INFO [main:o.a.z.s.ZooKeeperServer@547] - Snapshot taken in 1 ms
2023-03-22 22:19:17,949 [myid:] - INFO [main:o.a.z.s.RequestThrottler@75] - zookeeper.request_throttler.shutdownTimeout = 10000 ns
2023-03-22 22:19:17,950 [myid:] - INFO [ProcessThread(sId:0 cPort:2181):o.a.z.s.PreRequestProcessor@138] - PreRequestProcessor (cId:0) started, reconfgEnabled=false
2023-03-22 22:19:17,971 [myid:] - INFO [main:o.a.z.s.ContainerManager@884] - Using checkIntervalMs=60000 maxPerMinute=10000 maxNeverUsedIntervalMs=0
2023-03-22 22:20:02,439 [myid:] - INFO [SyncThread:0:o.a.z.s.p.FileTxnLog@285] - Creating new log file: log.16

2023-03-22 22:34:01,514 [myid:localhost:2181] - INFO [main-SendThre
ad(localhost:2181):o.a.z.ClientCnxn$SendThread@1171] - Opening socke
t connection to server localhost/127.0.0.1:2181.
2023-03-22 22:34:01,515 [myid:localhost:2181] - INFO [main-SendThre
ad(localhost:2181):o.a.z.ClientCnxn$SendThread@1173] - SASL config s
tatus: Will not attempt to authenticate using SASL (unknown error)
2023-03-22 22:34:01,531 [myid:localhost:2181] - INFO [main-SendThre
ad(localhost:2181):o.a.z.ClientCnxn$SendThread@1005] - Socket connec
tion established, initiating session, client: /127.0.0.1:34016, serv
er: localhost/127.0.0.1:2181
2023-03-22 22:34:01,568 [myid:localhost:2181] - INFO [main-SendThre
ad(localhost:2181):o.a.z.ClientCnxn$SendThread@1444] - Session estab
lishment complete on server localhost/127.0.0.1:2181, session id = 0
x10000128fa30003, negotiated timeout = 30000
WATCHER::
WatchedEvent state:SyncConnected type:None path:null
[zk: localhost:2181(CONNECTED) 0] create -s -e /pesiug20cs588/candid
te
Created /pesiug20cs588/candidate0000000003
[zk: localhost:2181(CONNECTED) 1]

org.apache.zookeeper.ClientCnxn$EndOfStreamException: Unable to re
ad additional data from server sessionId 0x10000128fa30001, likely
server has closed socket
    at org.apache.zookeeper.ClientCnxnSocketNIO.doIO(ClientCnx
nSocketNIO.java:77)
    at org.apache.zookeeper.ClientCnxnSocketNIO.doTransport(Cl
ientCnxnSocketNIO.java:350)
    at org.apache.zookeeper.ClientCnxn$SendThread.run(ClientCn
xn.java:1282)
WATCHER::
WatchedEvent state:Closed type:None path:null
2023-03-22 22:32:43,157 [myid:] - INFO [main:o.a.z.ZooKeeper@1232
] - Session: 0x10000128fa30001 closed
2023-03-22 22:32:43,158 [myid:] - INFO [main-EventThread:o.a.z.Cl
ientCnxn$SendThread@508] - EventThread shut down for session: 0x1
0000128fa30001
2023-03-22 22:32:43,160 [myid:] - ERROR [main:o.a.z.u.ServiceUtil
s@4pesiug20cs588@pesiug20cs588-Vlirt
pesiug20cs588@pesiug20cs588-VirtualBox:/opt/apache-zookeeper-3.8p
e
ualBox:/opt/apache-zookeeper-3.8lBox:/opt/apache-zookeeper-3.8.0-b
.o-bin$ S
[zk: localhost:2181(CONNECTED) 2] ls /pesiug20cs588
[candidate, candidate0000000000, candidate0000000001]
[zk: localhost:2181(CONNECTED) 3] get -s -w /pesiug20cs588/candidat
e0000000001
null
cZxid = 0x1b
ctime = Wed Mar 22 22:23:24 IST 2023
mZxid = 0x1b
mtime = Wed Mar 22 22:23:24 IST 2023
pZxid = 0x1b
cversion = 0
dataVersion = 0
aclVersion = 0
ephemeralOwner = 0x10000128fa30001
dataLength = 0
numChildren = 0
[zk: localhost:2181(CONNECTED) 4]
WATCHER::
WatchedEvent state:SyncConnected type:NodeDeleted path:/pesiug20cs5
88/candidate0000000001

0] 0:~bash*
"pesiug20cs588-Virtual" 22:34 22-Mar-23
```