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Department of Computer Science and Engineering
Cloud Computing Assignment

Assignment 4 - Introduction to Apache Zookeeper

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Section : G

Assignment 4 - Introduction to Apache Zookeeper

1a: Screenshot of Zookeeper Server having started.

```
Last login: Thu Mar 23 09:42:49 on ttys000
(base) adityakhot@Adityas-MacBook-Air ~ % cd opt
(base) adityakhot@Adityas-MacBook-Air opt % ls
apache-zookeeper-3.8.0-bin
(base) adityakhot@Adityas-MacBook-Air opt % cd apache-zookeeper-3.8.0-bin
(base) adityakhot@Adityas-MacBook-Air apache-zookeeper-3.8.0-bin % bin/zkServer.sh start
/usr/bin/java
ZooKeeper JMX enabled by default
Using config: /Users/adityakhot/opt/apache-zookeeper-3.8.0-bin/bin/../conf/zoo.cfg
Starting zookeeper ... STARTED
(base) adityakhot@Adityas-MacBook-Air apache-zookeeper-3.8.0-bin %
```

```
(base) adityakhot@Adityas-MacBook-Air apache-zookeeper-3.8.0-bin % bin/zkCli.sh
/usr/bin/java
Connecting to localhost:2181
2023-03-23 09:53:08,869 [myid:] - INFO  [main:o.a.z.Environment@98] - Client environment:zookeeper.version=3.8.0-5a02a0
5edb59aee6ac762f7ea82e92a68eb9c0f, built on 2022-02-25 08:49 UTC
2023-03-23 09:53:08,870 [myid:] - INFO  [main:o.a.z.Environment@98] - Client environment:host.name=10.16.160.132
2023-03-23 09:53:08,870 [myid:] - INFO  [main:o.a.z.Environment@98] - Client environment:java.version=19.0.2
2023-03-23 09:53:08,870 [myid:] - INFO  [main:o.a.z.Environment@98] - Client environment:java.vendor=Oracle Corporation
2023-03-23 09:53:08,870 [myid:] - INFO  [main:o.a.z.Environment@98] - Client environment:java.home=/Users/adityakhot/Library/Java/JavaVirtualMachines/openjdk-19.0.2/Contents/Home
2023-03-23 09:53:08,870 [myid:] - INFO  [main:o.a.z.Environment@98] - Client environment:java.class.path=/Users/adityakhot/opt/apache-zookeeper-3.8.0-bin/bin/../zookeeper-server/target/classes:/Users/adityakhot/opt/apache-zookeeper-3.8.0-bin/bin/..../build/classes:/Users/adityakhot/opt/apache-zookeeper-3.8.0-bin/bin/..../zookeeper-server/target/lib/*.jar:/Users/adityakhot/opt/apache-zookeeper-3.8.0-bin/bin/..../lib/zookeeper-prometheus-metrics-3.8.0.jar:/Users/adityakhot/opt/apache-zookeeper-3.8.0-bin/bin/..../lib/zookeeper-jute-3.8.0.jar:/Users/adityakhot/opt/apache-zookeeper-3.8.0-bin/bin/..../lib/zookeeper-3.8.0.jar:/Users/adityakhot/opt/apache-zookeeper-3.8.0-bin/bin/..../lib/snappy-java-1.1.7.7.jar:/Users/adityakhot/opt/apache-zookeeper-3.8.0-bin/bin/..../lib/simpleclient_servlet-0.9.0.jar:/Users/adityakhot/opt/apache-zookeeper-3.8.0-bin/bin/..../lib/simpleclient_common_0.9.0.jar:/Users/adityakhot/opt/apache-zookeeper-3.8.0-bin/bin/..../lib/simpleclient-0.9.0.jar:/Users/adityakhot/opt/apache-zookeeper-3.8.0-bin/bin/..../lib/netty-transport-native-unix-common-4.1.7.3.Final.jar:/Users/adityakhot/opt/apache-zookeeper-3.8.0-bin/bin/..../lib/netty-transport-epoll-4.1.73.Final.jar:/Users/adityakhot/opt/apache-zookeeper-3.8.0-bin/bin/..../lib/netty-transport-classes-epoll-4.1.73.Final.jar:/Users/adityakhot/opt/apache-zookeeper-3.8.0-bin/bin/..../lib/netty-transport-4.1.73.Final.jar:/Users/adityakhot/opt/apache-zookeeper-3.8.0-bin/bin/..../lib/netty-tcnative-classes-2.0.48.Final.jar:/Users/adityakhot/opt/apache-zookeeper-3.8.0-bin/bin/..../lib/netty-tcnative-2.0.48.Final.jar:/Users/adityakhot/opt/apache-zookeeper-3.8.0-bin/bin/..../lib/netty-resolver-4.1.73.Final.jar:/Users/adityakhot/opt/apache-zookeeper-3.8.0-bin/bin/..../lib/netty-handler-4.1.73.Final.jar:/Users/adityakhot/opt/apache-zookeeper-3.8.0-bin/bin/..../lib/netty-common-4.1.73.Final.jar:/Users/adityakhot/opt/apache-zookeeper-3.8.0-bin/bin/..../lib/netty-buffer-4.1.73.Final.jar:/Users/adityakhot/opt/apache-zookeeper-3.8.0-bin/bin/..../lib/metrics-core-4.1.12.1.jar:/Users/adityakhot/opt/apache-zookeeper-3.8.0-bin/bin/..../lib/logback-classic-1.2.10.jar:/Users/adityakhot/opt/apache-zookeeper-3.8.0-bin/bin/..../lib/jline-2.14.6.jar:/Users/adityakhot/opt/apache-zookeeper-3.8.0-bin/bin/..../lib/jetty-util-ajax-9.4.43.v20210629.jar:/Users/adityakhot/opt/apache-zookeeper-3.8.0-bin/bin/..../lib/jetty-util-9.4.43.v20210629.jar:/Users/adityakhot/opt/apache-zookeeper-3.8.0-bin/bin/..../lib/je
```

```

-/opt/apache-zookeeper-3.8.0-bin - java - bash bin/zkCli.sh
2023-03-23 09:53:08,870 [myid:] - INFO  [main:o.a.z.Environment@98] - Client environment:os.name=Mac OS X
2023-03-23 09:53:08,870 [myid:] - INFO  [main:o.a.z.Environment@98] - Client environment:os.arch=aarch64
2023-03-23 09:53:08,870 [myid:] - INFO  [main:o.a.z.Environment@98] - Client environment:os.version=13.2.1
2023-03-23 09:53:08,870 [myid:] - INFO  [main:o.a.z.Environment@98] - Client environment:user.name=adityakhot
2023-03-23 09:53:08,870 [myid:] - INFO  [main:o.a.z.Environment@98] - Client environment:user.home=/Users/adityakhot
2023-03-23 09:53:08,870 [myid:] - INFO  [main:o.a.z.Environment@98] - Client environment:user.dir=/Users/adityakhot/opt/apache-zookeeper-3.8.0-bin
2023-03-23 09:53:08,870 [myid:] - INFO  [main:o.a.z.Environment@98] - Client environment:os.memory.free=120MB
2023-03-23 09:53:08,870 [myid:] - INFO  [main:o.a.z.Environment@98] - Client environment:os.memory.max=256MB
2023-03-23 09:53:08,871 [myid:] - INFO  [main:o.a.z.Environment@98] - Client environment:os.memory.total=130MB
2023-03-23 09:53:08,871 [myid:] - INFO  [main:o.a.z.ZooKeeper@637] - Initiating client connection, connectString=localhost:2181 sessionTimeout=30000 watcher=org.apache.zookeeper.ZooKeeperMain$MyWatcher@371a67ec
2023-03-23 09:53:08,874 [myid:] - INFO  [main:o.a.z.c.X509Util@77] - Setting -D jdk.tls.rejectClientInitiatedRenegotiation=true to disable client-initiated TLS renegotiation
2023-03-23 09:53:08,877 [myid:] - INFO  [main:o.a.z.ClientCnxnSocket@239] - jute.maxbuffer value is 1048575 Bytes
2023-03-23 09:53:08,880 [myid:] - INFO  [main:o.a.z.ClientCnxn@1732] - zookeeper.request.timeout value is 0. feature enabled=false
Welcome to ZooKeeper!
2023-03-23 09:53:08,882 [myid:localhost:2181] - INFO  [main-SendThread(localhost:2181):o.a.z.ClientCnxn$SendThread@1171] - Opening socket connection to server localhost/[0:0:0:0:0:0:1]:2181.
2023-03-23 09:53:08,882 [myid:localhost:2181] - INFO  [main-SendThread(localhost:2181):o.a.z.ClientCnxn$SendThread@1173] - SASL config status: Will not attempt to authenticate using SASL (unknown error)
2023-03-23 09:53:08,886 [myid:localhost:2181] - INFO  [main-SendThread(localhost:2181):o.a.z.ClientCnxn$SendThread@1005] - Socket connection established, initiating session, client: /[0:0:0:0:0:0:1]:63364, server: localhost/[0:0:0:0:0:0:1]:2181
JLine support is enabled
2023-03-23 09:53:08,903 [myid:localhost:2181] - INFO  [main-SendThread(localhost:2181):o.a.z.ClientCnxn$SendThread@1444] - Session establishment complete on server localhost/[0:0:0:0:0:0:1]:2181, session id = 0x10003367a8b0000, negotiated timeout = 30000
WATCHER::

WatchedEvent state:SyncConnected type:None path:null
[zk: localhost:2181(CONNECTED) 0]

```

```

(base) adityakhot@Adityas-MacBook-Air apache-zookeeper-3.8.0-bin % bin/zkServer.sh stop
/usr/bin/java
ZooKeeper JMX enabled by default
Using config: /Users/adityakhot/opt/apache-zookeeper-3.8.0-bin/bin/../conf/zoo.cfg
Stopping zookeeper ... STOPPED
(base) adityakhot@Adityas-MacBook-Air apache-zookeeper-3.8.0-bin %

```

2a: Screenshot of Listing of the created ZNodes

```

ss -tmeast -o0000
WATCHER::

WatchedEvent state:SyncConnected type:None path:null
[zk: localhost:2181(CONNECTED) 0] create -s /pes2ug20cs414_seq "a sequential node"
Created /pes2ug20cs414_seq0000000000
[zk: localhost:2181(CONNECTED) 1] create -e /pes2ug20cs414_seq "a sequential node"
Created /pes2ug20cs414_seq
[zk: localhost:2181(CONNECTED) 2] ls /
[pes2ug20cs414_seq, pes2ug20cs414_seq0000000000, zookeeper]
[zk: localhost:2181(CONNECTED) 3] quit

WATCHER::

WatchedEvent state:Closed type:None path:null
2023-03-23 10:05:25,808 [myid:] - INFO  [main:o.a.z.ZooKeeper@1232] - Session: 0x100033b780e0000 closed
2023-03-23 10:05:25,808 [myid:] - INFO  [main-EventThread:o.a.z.ClientCnxn$EventThread@568] - EventThread shut down for session: 0x100033b780e0000
2023-03-23 10:05:25,810 [myid:] - ERROR [main:o.a.z.u.ServiceUtils@42] - Exiting JVM with code 0
(base) adityakhot@Adityas-MacBook-Air apache-zookeeper-3.8.0-bin %

```

2b: Screenshot of Listing of the deleted ephemeral node

```

apache-zookeeper-3.8.0-bin - java - bash bin/zkCli.sh - 143x40
~/opt/apache-zookeeper-3.8.0-bin - java - bash bin/zkCli.sh

2023-03-25 20:28:49,528 [myid:] - INFO  [main:o.a.z.Environment@98] - Client environment:java.library.path=/Users/adityakhot/Library/Java/Extensions:/Library/Java/Extensions:/Network/Library/Java/Extensions:/System/Library/Java/Extensions:/usr/lib/java:.
2023-03-25 20:28:49,528 [myid:] - INFO  [main:o.a.z.Environment@98] - Client environment:java.io.tmpdir=/var/folders/gt/1bg5zmds7h56lckmmmgq4gl0000gn/T/
2023-03-25 20:28:49,528 [myid:] - INFO  [main:o.a.z.Environment@98] - Client environment:java.compiler=<NA>
2023-03-25 20:28:49,528 [myid:] - INFO  [main:o.a.z.Environment@98] - Client environment:os.name=Mac OS X
2023-03-25 20:28:49,528 [myid:] - INFO  [main:o.a.z.Environment@98] - Client environment:os.arch=aarch64
2023-03-25 20:28:49,528 [myid:] - INFO  [main:o.a.z.Environment@98] - Client environment:os.version=13.2.1
2023-03-25 20:28:49,528 [myid:] - INFO  [main:o.a.z.Environment@98] - Client environment:user.name=adityakhot
2023-03-25 20:28:49,528 [myid:] - INFO  [main:o.a.z.Environment@98] - Client environment:user.home=/Users/adityakhot
2023-03-25 20:28:49,528 [myid:] - INFO  [main:o.a.z.Environment@98] - Client environment:user.dir=/Users/adityakhot/opt/apache-zookeeper-3.8.0-bin

2023-03-25 20:28:49,528 [myid:] - INFO  [main:o.a.z.Environment@98] - Client environment:os.memory.free=120MB
2023-03-25 20:28:49,528 [myid:] - INFO  [main:o.a.z.Environment@98] - Client environment:os.memory.max=256MB
2023-03-25 20:28:49,528 [myid:] - INFO  [main:o.a.z.Environment@98] - Client environment:os.memory.total=130MB
2023-03-25 20:28:49,529 [myid:] - INFO  [main:o.a.z.ZooKeeper@637] - Initiating client connection, connectString=localhost:2181 sessionTimeout=30000 watcher=org.apache.zookeeper.ZooKeeperMain$MyWatcher@262b2c86
2023-03-25 20:28:49,531 [myid:] - INFO  [main:o.a.z.c.X509Util@77] - Setting -D jdk.tls.rejectClientInitiatedRenegotiation=true to disable client-initiated TLS renegotiation
2023-03-25 20:28:49,534 [myid:] - INFO  [main:o.a.z.ClientCnxnSocket@239] - jute.maxbuffer value is 1048575 Bytes
2023-03-25 20:28:49,536 [myid:] - INFO  [main:o.a.z.ClientCnxn@1732] - zookeeper.request.timeout value is 0. feature.enabled=false
Welcome to ZooKeeper!
2023-03-25 20:28:49,538 [myid:localhost:2181] - INFO  [main-SendThread(localhost:2181):o.a.z.ClientCnxn$SendThread@1171] - Opening socket connection to server localhost/127.0.0.1:2181.
2023-03-25 20:28:49,538 [myid:localhost:2181] - INFO  [main-SendThread(localhost:2181):o.a.z.ClientCnxn$SendThread@1173] - SASL config status: Will not attempt to authenticate using SASL (unknown error)
2023-03-25 20:28:49,542 [myid:localhost:2181] - INFO  [main-SendThread(localhost:2181):o.a.z.ClientCnxn$SendThread@1005] - Socket connection established, initiating session, client: /127.0.0.1:61037, server: localhost/127.0.0.1:2181
JLine support is enabled
2023-03-25 20:28:49,554 [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 = 0x100062f5cbc0000, negotiated timeout = 30000

WATCHER::

WatchedEvent state:SyncConnected type:None path:null
[zk: localhost:2181(CONNECTED) 0] ls /
[pes2ug20cs414_seq0000000000, pes2ug20cs414_seq0000000002, your_pes2ug20cs414_seq0000000004, zookeeper]
[zk: localhost:2181(CONNECTED) 1] set /path /data
Node does not exist: /path

```

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

```

apache-zookeeper-3.8.0-bin - java - bash bin/zkCli.sh - 143x40
~/opt/apache-zookeeper-3.8.0-bin - java - bash bin/zkCli.sh

2023-03-25 20:28:49,554 [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 = 0x100062f5cbc0000, negotiated timeout = 30000

WATCHER::

WatchedEvent state:SyncConnected type:None path:null
[zk: localhost:2181(CONNECTED) 0] ls /
[pes2ug20cs414_seq0000000000, pes2ug20cs414_seq0000000002, your_pes2ug20cs414_seq0000000004, zookeeper]
[zk: localhost:2181(CONNECTED) 1] set /path /data
Node does not exist: /path
[zk: localhost:2181(CONNECTED) 2] set /pes2ug20cs414 "data"
Node does not exist: /pes2ug20cs414
[zk: localhost:2181(CONNECTED) 3] set /pes2ug20cs414"data"
set [-s] [-v version] path data
[zk: localhost:2181(CONNECTED) 4] delete pes2ug20cs414_seq0000000002
Path must start with / character
[zk: localhost:2181(CONNECTED) 5] delete /pes2ug20cs414_seq0000000002
[zk: localhost:2181(CONNECTED) 6] delete /pes2ug20cs414_seq0000000004
Node does not exist: /pes2ug20cs414_seq0000000004
[zk: localhost:2181(CONNECTED) 7] delete /your_pes2ug20cs414_seq0000000004
[zk: localhost:2181(CONNECTED) 8] set /pes2ug20cs414_seq0000000000 "updated"
[zk: localhost:2181(CONNECTED) 9] get -s /pes2ug20cs414_seq0000000000
updated
cZxid = 0x4
ctime = Thu Mar 23 10:05:02 IST 2023
mZxid = 0x19
mtime = Sat Mar 25 22:51:36 IST 2023
pZxid = 0x4
version = 0
dataVersion = 1
aclVersion = 0
ephemeralOwner = 0x0
dataLength = 7
numChildren = 0
[zk: localhost:2181(CONNECTED) 10]

```

2d: Screenshot of Listing of all the children nodes

```
[zk: localhost:2181(CONNECTED) 2] set /pes2ug20cs414 "data"
Node does not exist: /pes2ug20cs414
[zk: localhost:2181(CONNECTED) 3] set /pes2ug20cs414"data"
set [-s] [-v version] path data
[zk: localhost:2181(CONNECTED) 4] delete pes2ug20cs414_seq0000000002
Path must start with / character
[zk: localhost:2181(CONNECTED) 5] delete /pes2ug20cs414_seq0000000002
[zk: localhost:2181(CONNECTED) 6] delete /pes2ug20cs414_seq0000000004
Node does not exist: /pes2ug20cs414_seq0000000004
[zk: localhost:2181(CONNECTED) 7] delete /your_pes2ug20cs414_seq0000000004
[zk: localhost:2181(CONNECTED) 8] set /pes2ug20cs414_seq0000000000 "updated"
[zk: localhost:2181(CONNECTED) 9] get -s /pes2ug20cs414_seq0000000000
updated
cZxid = 0x4
ctime = Thu Mar 23 10:05:02 IST 2023
mZxid = 0x19
mtime = Sat Mar 25 22:51:36 IST 2023
pZxid = 0x4
cversion = 0
dataVersion = 1
aclVersion = 0
ephemeralOwner = 0x0
dataLength = 7
numChildren = 0
[zk: localhost:2181(CONNECTED) 10] create /pes2ug20cs414/aditya "child node 1"
Node does not exist: /pes2ug20cs414/aditya
[zk: localhost:2181(CONNECTED) 11] create /pes2ug20cs414
Created /pes2ug20cs414
[zk: localhost:2181(CONNECTED) 12] create /pes2ug20cs414/aditya "child node 1"
Created /pes2ug20cs414/aditya
[zk: localhost:2181(CONNECTED) 13] create /pes2ug20cs414/khot "child node 2"
Created /pes2ug20cs414/khot
[zk: localhost:2181(CONNECTED) 14] ls /pes2ug20cs414
[aditya, khot]
[zk: localhost:2181(CONNECTED) 15] ]
```

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

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

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