

Assignment 4 - Introduction to Apache Zookeeper

Submitted by: Mahika Gupta

SRN: PES1UG20CS243

The following screenshots are to be submitted in a PDF file:

1a: Screenshot of Zookeeper Server having started.

```
(mahika@kali)-[/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
```

2a: Screenshot of Listing of the created ZNodes

```
WatchedEvent state:SyncConnected type:None path:null
[zk: localhost:2181(CONNECTED) 0] create -s /pes1ug20cs243_seq "a sequential node"
Created /pes1ug20cs243_seq0000000000
[zk: localhost:2181(CONNECTED) 1] create -e /pes1ug20cs243_eph "an ephemeral node"
Created /pes1ug20cs243_eph
[zk: localhost:2181(CONNECTED) 3] ls /
[pes1ug20cs243_eph, pes1ug20cs243_seq0000000000, zookeeper]
[zk: localhost:2181(CONNECTED) 4]
```

2b: Screenshot of Listing of the deleted ephemeral node

```
WatchedEvent state:SyncConnected type:None path:null
[zk: localhost:2181(CONNECTED) 0] ls /
[pes1ug20cs243_seq0000000000, zookeeper]
[zk: localhost:2181(CONNECTED) 1]
```

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

```
[zk: localhost:2181(CONNECTED) 13] set /peslug20cs243_seq0000000000 updated
[zk: localhost:2181(CONNECTED) 14] get -s /peslug20cs243_seq0000000000
updated
cZxid = 0x4
ctime = Fri Mar 24 06:24:34 EDT 2023
mZxid = 0xe
mtime = Fri Mar 24 10:29:02 EDT 2023
pZxid = 0x4
cversion = 0
dataVersion = 5
aclVersion = 0
ephemeralOwner = 0x0
dataLength = 7
numChildren = 0
[zk: localhost:2181(CONNECTED) 15]
```

2d: Screenshot of Listing of all the children nodes

```
node does not exist: /peslug20cs243/mahika
[zk: localhost:2181(CONNECTED) 18] create /peslug20cs243_seq0000000000/mahika firstch
ildnode
Created /peslug20cs243_seq0000000000/mahika
[zk: localhost:2181(CONNECTED) 19] create /peslug20cs243_seq0000000000/gupta secondch
ildnode
Created /peslug20cs243_seq0000000000/gupta
[zk: localhost:2181(CONNECTED) 20] ls /peslug20cs243_seq0000000000
[gupta, mahika]
[zk: localhost:2181(CONNECTED) 21]
```

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

```
File Edit View Help
mahika@kali: /opt/apache-zookeeper-3.8.0-bin

at org.apache.zookeeper.server.quorum.QuorumPeerMain.initializeAndRun(QuorumPeerMain.java:141)
at org.apache.zookeeper.server.quorum.QuorumPeerMain.main(QuorumPeerMain.java:91)
Caused by: java.io.IOException: Failed to bind to /0.0.0.0:8080
at org.eclipse.jetty.server.ServerConnector.openAcceptChannel(ServerConnector.java:349)
at org.eclipse.jetty.server.ServerConnector.open(ServerConnector.java:310)
at org.eclipse.jetty.server.AbstractNetworkConnector.doStart(AbstractNetworkConnector.java:80)
at org.eclipse.jetty.server.ServerConnector.doStart(ServerConnector.java:234)
at org.eclipse.jetty.util.component.AbstractLifecycle.start(AbstractLifecycle.java:73)
at org.eclipse.jetty.server.Server.doStart(Server.java:401)
at org.eclipse.jetty.util.component.AbstractLifecycle.start(AbstractLifecycle.java:73)
at org.apache.zookeeper.server.admin.JettyAdminServer.start(JettyAdminServer.java:185)
... 5 common frames omitted
Caused by: java.net.BindException: Address already in use
at java.base/sun.nio.ch.Net.bind0(Native Method)
at java.base/sun.nio.ch.Net.bind(Net.java:459)
at java.base/sun.nio.ch.Net.bind(Net.java:448)
at java.base/sun.nio.ch.ServerSocketChannelImpl.bind(ServerSocketChannelImpl.java:227)
at java.base/sun.nio.ch.ServerSocketAdaptor.bind(ServerSocketAdaptor.java:80)
at org.eclipse.jetty.server.ServerConnector.openAcceptChannel(ServerConnector.java:344)
... 12 common frames omitted
Unable to start AdminServer, exiting abnormally
2023-03-25 16:24:33,867 [myid:] - INFO [main:o.a.z.a.ZKAuditProvider@42] - ZooKeeper audit is disabled.
2023-03-25 16:24:33,868 [myid:] - ERROR [main:o.a.z.u.ServiceUtils@42] - Exiting JVM with code 4

mahika@kali:~/opt/apache-zookeeper-3.8.0-bin/bin$

Session establishment complete on server localhost/127.0.0.1:2181, session id = 0x10000381cd10005, negotiated timeout = 30000

WATCHER::

WatchedEvent state:SyncConnected type:None path:null
[zookeeper:2181(CONNECTED) 0] create /pesiug20cs243
pesiug20cs243
[zookeeper:2181(CONNECTED) 0] create /pesiug20cs243/candidate
[zookeeper:2181(CONNECTED) 1] create -s -e /pesiug20cs243/candidate
[zookeeper:2181(CONNECTED) 2] create -s -e /pesiug20cs243/candidate
[zookeeper:2181(CONNECTED) 3] ls /pesiug20cs243
[zookeeper:2181(CONNECTED) 4]

WatchedEvent state:SyncConnected type:None path:null
[zookeeper:2181(CONNECTED) 0] create /pesiug20cs243
Created /pesiug20cs243
[zookeeper:2181(CONNECTED) 1] create /pesiug20cs243/candidate
Node already exists: /pesiug20cs243/candidate
[zookeeper:2181(CONNECTED) 1] create -s -e /pesiug20cs243/candidate
[zookeeper:2181(CONNECTED) 1] create -s -e /pesiug20cs243/candidate
[zookeeper:2181(CONNECTED) 2] ls /pesiug20cs243
[zookeeper:2181(CONNECTED) 2] ls /pesiug20cs243
[zookeeper:2181(CONNECTED) 3] ls /pesiug20cs243
[zookeeper:2181(CONNECTED) 3] ls /pesiug20cs243
[zookeeper:2181(CONNECTED) 4]

WatchedEvent state:SyncConnected type:None path:null
[zookeeper:2181(CONNECTED) 0] create /pesiug20cs243/candidate
Node already exists: /pesiug20cs243/candidate
[zookeeper:2181(CONNECTED) 1] delete /pesiug20cs243/candidate
[zookeeper:2181(CONNECTED) 1] delete /pesiug20cs243/candidate
[zookeeper:2181(CONNECTED) 2] create -s -e /pesiug20cs243/candidate
[zookeeper:2181(CONNECTED) 2] create -s -e /pesiug20cs243/candidate
[zookeeper:2181(CONNECTED) 3] ls /pesiug20cs243
[zookeeper:2181(CONNECTED) 3] ls /pesiug20cs243
[zookeeper:2181(CONNECTED) 4]

[0] 0: bash$
```

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

The screenshot shows a terminal window with the title 'mahika@kali: /opt/apache-zookeeper-3.8.0-bin'. The top part displays a stack trace for a 'java.io.IOException: Failed to bind to /0.0.0.0:8080' and a 'java.net.BindException: Address already in use' error. Below the logs, a table displays 'WATCHER::' events. The table has three columns showing event details for different sessions and paths.

<p> pZxid = 0x1e cversion = 0 dataVersion = 0 aclVersion = 0 ephemeralOwner = 0x10000381cd10004 dataLength = 0 numChildren = 0 [zk: localhost:2181(CONNECTED) 5] quit </p> <p>WATCHER::</p> <p> WatchedEvent state:Closed type:None path:null 2023-03-25 16:54:46,213 [myid:] - INFO [main:o.a.z.ZooKeeper@1232] - Session: 0x10000381cd10005 closed 2023-03-25 16:54:46,213 [myid:] - INFO [main-EventThread:o.a.z.ClientCnxn\$EventThread@568] - EventThread shut down for session: 0x10000381cd10005 2023-03-25 16:54:46,217 [myid:] - ERROR [main:o.a.z.u.ServiceUtils@42] - Exiting JVM with code 0 </p>	<p> pZxid = 0x1d cversion = 0 dataVersion = 0 aclVersion = 0 ephemeralOwner = 0x10000381cd10003 dataLength = 0 numChildren = 0 [zk: localhost:2181(CONNECTED) 4] quit </p> <p>WATCHER::</p> <p> WatchedEvent state:Closed type:None path:null 2023-03-25 16:54:51,874 [myid:] - INFO [main-EventThread:o.a.z.ClientCnxn\$EventThread@568] - EventThread shut down for session: 0x10000381cd10004 2023-03-25 16:54:51,874 [myid:] - INFO [main:o.a.z.ZooKeeper@1232] - Session: 0x10000381cd10004 closed 2023-03-25 16:54:51,880 [myid:] - ERROR [main:o.a.z.u.ServiceUtils@42] - Exiting JVM with code 0 </p>	<p> 3/candidate000000003 Node does not exist: /peslug20cs243/candidate000000003 [zk: localhost:2181(CONNECTED) 6] get -s -w /peslug20cs243/candidate000000003 null cZxid = 0x1f ctime = Sat Mar 25 16:42:04 EDT 2023 mZxid = 0x1f mtime = Sat Mar 25 16:42:04 EDT 2023 pZxid = 0x1f cversion = 0 dataVersion = 0 aclVersion = 0 ephemeralOwner = 0x10000381cd10005 dataLength = 0 numChildren = 0 [zk: localhost:2181(CONNECTED) 7] WATCHER:: </p> <p> WatchedEvent state:SyncConnected type:NodeDeleted path:/peslug20cs243/candidate000000003 </p>
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The terminal prompt is '(mahika@kali)-[/opt/apache-zookeeper-3.8.0-bin/bin]' and the status bar shows '0) 0:zsh*' and 'kali 16:55 25-Mar-23'.

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

```

mahika@kali: /opt/apache-zookeeper-3.8.0-bin
File Actions Edit View Help
at org.apache.zookeeper.server.quorum.QuorumPeerMain.initializeAndRun(QuorumPeerMain.java:141)
at org.apache.zookeeper.server.quorum.QuorumPeerMain.main(QuorumPeerMain.java:91)
Caused by: java.io.IOException: Failed to bind to /0.0.0.0:8080
at org.eclipse.jetty.server.ServerConnector.openAcceptChannel(ServerConnector.java:349)
at org.eclipse.jetty.server.ServerConnector.open(ServerConnector.java:310)
at org.eclipse.jetty.server.AbstractNetworkConnector.doStart(AbstractNetworkConnector.java:80)
at org.eclipse.jetty.server.ServerConnector.doStart(ServerConnector.java:234)
at org.eclipse.jetty.util.component.AbstractLifecycle.start(AbstractLifecycle.java:73)
at org.eclipse.jetty.server.Server.doStart(Server.java:401)
at org.eclipse.jetty.util.component.AbstractLifecycle.start(AbstractLifecycle.java:73)
at org.apache.zookeeper.server.admin.JettyAdminServer.start(JettyAdminServer.java:185)
... 5 common frames omitted
Caused by: java.net.BindException: Address already in use
at java.base/sun.nio.ch.Net.bind0(Native Method)
at java.base/sun.nio.ch.Net.bind(Net.java:459)
at java.base/sun.nio.ch.Net.bind(Net.java:448)
at java.base/sun.nio.ch.ServerSocketChannelImpl.bind(ServerSocketChannelImpl.java:227)
at java.base/sun.nio.ch.ServerSocketAdaptor.bind(ServerSocketAdaptor.java:80)
at org.eclipse.jetty.server.ServerConnector.openAcceptChannel(ServerConnector.java:344)
... 12 common frames omitted
Unable to start AdminServer, exiting abnormally
2023-03-25 16:24:33,867 [myid:] - INFO [main:o.a.z.a.ZKAuditProvider@42] - ZooKeeper audit is disabled.
2023-03-25 16:24:33,868 [myid:] - ERROR [main:o.a.z.u.ServiceUtils@42] - Exiting JVM with code 4

(mahika@kali) - /opt/apache-zookeeper-3.8.0-bin/bin

ASL (unknown error)
JLine support is enabled
2023-03-25 16:58:50,280 [myid:localhost:2181] - INFO [main-S
endThread(localhost:2181):o.a.z.ClientCnxn$SendThread@1005] -
Socket connection established, initiating session, client: /
0:0:0:0:0:0:1:33986, server: localhost/0:0:0:0:0:0:1:2181
2023-03-25 16:58:50,299 [myid:localhost:2181] - INFO [main-S
endThread(localhost:2181):o.a.z.ClientCnxn$SendThread@1444] -
Session establishment complete on server localhost/0:0:0:0:
0:0:1:2181, session id = 0x10000381cd10006, negotiated timeo
ut = 30000
WATCHER::
WatchedEvent state:SyncConnected type:None path:null
[zk: localhost:2181(CONNECTED) 0] create -s -e /peslug20cs243
peslug20cs243 peslug20cs243_seq0000000000
[zk: localhost:2181(CONNECTED) 0] create -s -e /peslug20cs243
/candidate
Created /peslug20cs243/candidate0000000000
[zk: localhost:2181(CONNECTED) 1]

pZxid = 0x1d
cversion = 0
dataVersion = 0
aclVersion = 0
ephemeralOwner = 0x10000381cd10003
dataLength = 0
numChildren = 0
[zk: localhost:2181(CONNECTED) 4] quit
WATCHER::
WatchedEvent state:Closed type:None path:null
2023-03-25 16:54:51,874 [myid:] - INFO [main-EventThrea
d:o.a.z.ClientCnxn$EventThread@568] - EventThread shut d
own for session: 0x10000381cd10004
2023-03-25 16:54:51,874 [myid:] - INFO [main:o.a.z.Zook
eeper@1232] - Session: 0x10000381cd10004 closed
2023-03-25 16:54:51,880 [myid:] - ERROR [main:o.a.z.u.Se
rviceUtils@42] - Exiting JVM with code 0
3/candidate0000000003
Node does not exist: /peslug20cs243/candidate0000000003
[zk: localhost:2181(CONNECTED) 6] get -s -w /peslug20cs24
3/candidate0000000003
null
cZxid = 0x1f
ctime = Sat Mar 25 16:42:04 EDT 2023
mZxid = 0x1f
mtime = Sat Mar 25 16:42:04 EDT 2023
pZxid = 0x1f
cversion = 0
dataVersion = 0
aclVersion = 0
ephemeralOwner = 0x10000381cd10005
dataLength = 0
numChildren = 0
[zk: localhost:2181(CONNECTED) 7]
WATCHER::
WatchedEvent state:SyncConnected type:NodeDeleted path:/p
eslug20cs243/candidate0000000003

(mahika@kali) - /opt/apache-zookeeper-3.8.0-bin/bin
$
kali 16:59 25-Mar-23

```