

PRACTICAL 1:

POM.XML:

```
<?xml version="1.0" encoding="UTF-8"?>
<project xmlns="http://maven.apache.org/POM/4.0.0"
    xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
    xsi:schemaLocation="http://maven.apache.org/POM/4.0.0
http://maven.apache.org/xsd/maven-4.0.0.xsd">
    <modelVersion>4.0.0</modelVersion>

    <groupId>distributed.systems</groupId>
    <artifactId>leader.election</artifactId>
    <version>1.0-SNAPSHOT</version>

    <properties>
        <maven.compiler.source>17</maven.compiler.source>
        <maven.compiler.target>17</maven.compiler.target>
        <project.build.sourceEncoding>UTF-8</project.build.sourceEncoding>
    </properties>

    <build>
        <plugins>
            <plugin>
                <groupId>org.apache.maven.plugins</groupId>
                <artifactId>maven-compiler-plugin</artifactId>
                <version>3.11.0</version>
                <configuration>
                    <source>1.8</source>
                    <target>1.8</target>
                </configuration>
            </plugin>
        </plugins>
    </build>
    <dependencies>
        <dependency>
            <groupId>org.apache.zookeeper</groupId>
            <artifactId>zookeeper</artifactId>
            <version>3.8.3</version>
        </dependency>
        <dependency>
            <groupId>distributed.systems</groupId>
            <artifactId>leader.election</artifactId>
            <version>1.0-SNAPSHOT</version>
        </dependency>
    </dependencies>

```

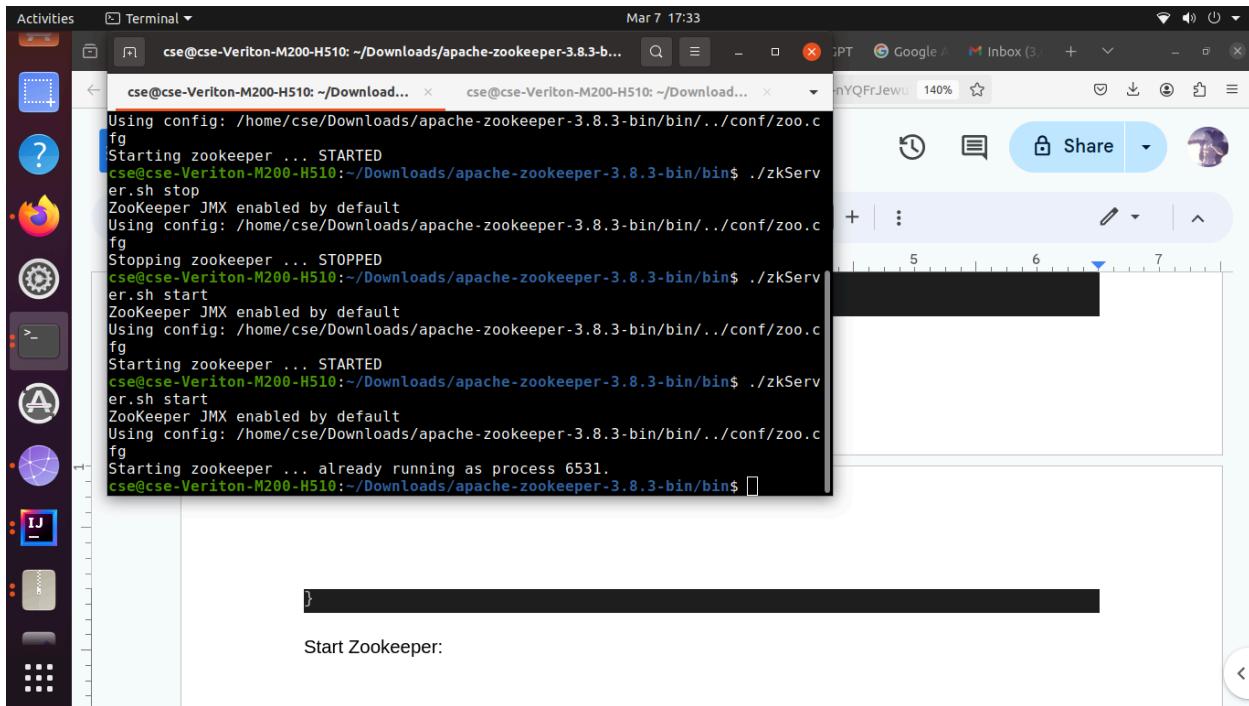


```
</project>
```

LeaderElection:

```
}
```

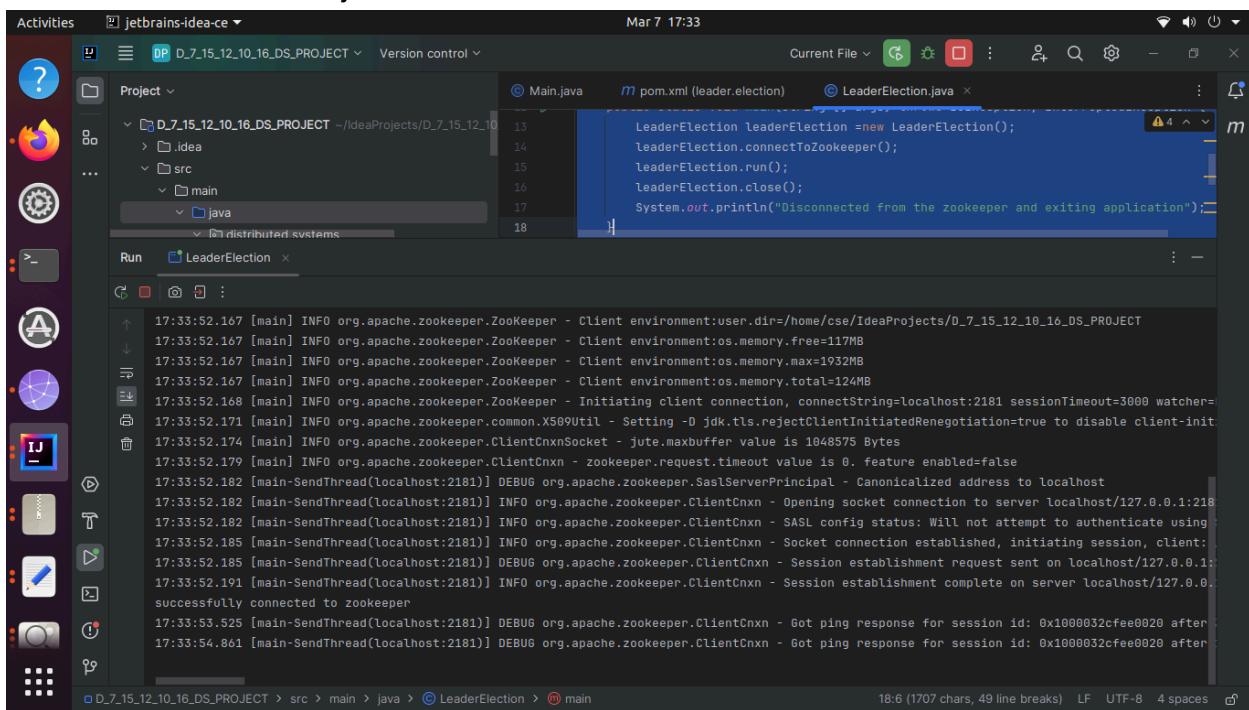
Start Zookeeper:



```
Activities Terminal Mar 7 17:33
cse@cse-Veriton-M200-H510: ~/Downloads/apache-zookeeper-3.8.3-bin... x cse@cse-Veriton-M200-H510: ~/Downloads... x nYQFrJewU 140% ☆
Using config: /home/cse/Downloads/apache-zookeeper-3.8.3-bin/bin/..conf/zoo.cfg
Starting zookeeper ... STARTED
cse@cse-Veriton-M200-H510:~/Downloads/apache-zookeeper-3.8.3-bin/bin$ ./zkServer.sh stop
ZooKeeper JMX enabled by default
Using config: /home/cse/Downloads/apache-zookeeper-3.8.3-bin/bin/..conf/zoo.cfg
Stopping zookeeper ... STOPPED
cse@cse-Veriton-M200-H510:~/Downloads/apache-zookeeper-3.8.3-bin/bin$ ./zkServer.sh start
ZooKeeper JMX enabled by default
Using config: /home/cse/Downloads/apache-zookeeper-3.8.3-bin/bin/..conf/zoo.cfg
Starting zookeeper ... STARTED
cse@cse-Veriton-M200-H510:~/Downloads/apache-zookeeper-3.8.3-bin/bin$ ./zkServer.sh start
ZooKeeper JMX enabled by default
Using config: /home/cse/Downloads/apache-zookeeper-3.8.3-bin/bin/..conf/zoo.cfg
Starting zookeeper ... already running as process 6531.
cse@cse-Veriton-M200-H510:~/Downloads/apache-zookeeper-3.8.3-bin/bin$ }
```

Start Zookeeper:

Then Run LeaderElection.java:



```
Activities jetbrains-idea-ce Mar 7 17:33
D_7.15_12_10_16_DS_PROJECT Version control Current File G O X
Project D_7.15_12_10_16_DS_PROJECT ~/deaProjects/D_7.15_12_10_16...
  > .idea
  > src
    > main
      > java
        > distributed-systems
          Main.java pom.xml (leader.election) LeaderElection.java
LeaderElection leaderElection =new LeaderElection();
leaderElection.connectToZookeeper();
leaderElection.run();
leaderElection.close();
System.out.println("Disconnected from the zookeeper and exiting application");
Run LeaderElection x
```

```
17:33:52.167 [main] INFO org.apache.zookeeper.ZooKeeper - Client environment:user.dir=/home/cse/IdeaProjects/D_7.15_12_10_16_DS_PROJECT
17:33:52.167 [main] INFO org.apache.zookeeper.ZooKeeper - Client environment:os.memory.free=117MB
17:33:52.167 [main] INFO org.apache.zookeeper.ZooKeeper - Client environment:os.memory.max=1932MB
17:33:52.167 [main] INFO org.apache.zookeeper.ZooKeeper - Client environment:os.memory.total=124MB
17:33:52.168 [main] INFO org.apache.zookeeper.ZooKeeper - Initiating client connection, connectString=localhost:2181 sessionTimeout=3000 watcher=
17:33:52.171 [main] INFO org.apache.zookeeper.common.X509Util - Setting -D jdk.tls.rejectClientInitiatedRenegotiation=true to disable client-init
17:33:52.174 [main] INFO org.apache.zookeeper.ClientCnxnSocket - jute.maxbuffer value is 1048575 Bytes
17:33:52.179 [main] INFO org.apache.zookeeper.ClientCnxn - zookeeper.request.timeout value is 0. feature enabled=false
17:33:52.182 [main-SendThreadlocalhost:2181] DEBUG org.apache.zookeeper.SaslServerPrincipal - Canonicalized address to localhost
17:33:52.182 [main-SendThreadlocalhost:2181] INFO org.apache.zookeeper.ClientCnxn - Opening socket connection to server localhost/127.0.0.1:218
17:33:52.182 [main-SendThreadlocalhost:2181] INFO org.apache.zookeeper.ClientCnxn - SASL config status: Will not attempt to authenticate using
17:33:52.185 [main-SendThreadlocalhost:2181] INFO org.apache.zookeeper.ClientCnxn - Socket connection established, initiating session, client:
17:33:52.185 [main-SendThreadlocalhost:2181] DEBUG org.apache.zookeeper.ClientCnxn - Session establishment request sent on localhost/127.0.0.1:
17:33:52.191 [main-SendThreadlocalhost:2181] INFO org.apache.zookeeper.ClientCnxn - Session establishment complete on server localhost/127.0.0.
successfully connected to zookeeper
17:33:53.525 [main-SendThreadlocalhost:2181] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x1000032cf0020 after
17:33:54.861 [main-SendThreadlocalhost:2181] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x1000032cf0020 after
```

Stop Zookeeper:

Activities Terminal Mar 7 17:34

```
cse@cse-Veriton-M200-H510: ~/Downloads/apache-zookeeper-3.8.3-bin$ ./zkServer.sh start
ZooKeeper JMX enabled by default
Using config: /home/cse/Downloads/apache-zookeeper-3.8.3-bin/bin/../conf/zoo.cfg
Starting zookeeper ... STARTED
cse@cse-Veriton-M200-H510: ~/Downloads/apache-zookeeper-3.8.3-bin/bin$ ./zkServer.sh start
ZooKeeper JMX enabled by default
Using config: /home/cse/Downloads/apache-zookeeper-3.8.3-bin/bin/../conf/zoo.cfg
Starting zookeeper ... already running as process 6531.
cse@cse-Veriton-M200-H510: ~/Downloads/apache-zookeeper-3.8.3-bin/bin$ ./zkServer.sh stop
ZooKeeper JMX enabled by default
Using config: /home/cse/Downloads/apache-zookeeper-3.8.3-bin/bin/../conf/zoo.cfg
Stopping zookeeper ... STOPPED
cse@cse-Veriton-M200-H510: ~/Downloads/apache-zookeeper-3.8.3-bin/bin$ 
```

Stop Zookeeper:

LeaderElection.java output after stopping zookeeper:

Activities jetbrains-idea-ce Mar 7 17:36

Project D_7_15_12_10_16_DS_PROJECT Version control

Main.java pom.xml (leader.election) LeaderElection.java

```
LeaderElection leaderElection = new LeaderElection();
leaderElection.connectToZookeeper();
leaderElection.run();
leaderElection.close();
System.out.println("Disconnected from the zookeeper and exiting application");
```

Run LeaderElection

```
at org.apache.zookeeper.ClientCnxn$SendThread.run(ClientCnxn.java:1317)
17:34:55.100 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxnSocketNIO - Ignoring exception during shutdown output
java.nio.channels.ClosedChannelException Create breakpoint : null
at java.base/sun.nio.ch.SocketChannelImpl.ensureOpen(SocketChannelImpl.java:195)
at java.base/sun.nio.ch.SocketChannelImpl.shutdownOutput(SocketChannelImpl.java:1113)
at java.base/sun.nio.ch.SocketAdaptor.shutdownOutput(SocketAdaptor.java:399)
at org.apache.zookeeper.ClientCnxnSocketNIO.cleanup(ClientCnxnSocketNIO.java:198)
at org.apache.zookeeper.ClientCnxn$SendThread.cleanup(ClientCnxn.java:1394)
at org.apache.zookeeper.ClientCnxn$SendThread.run(ClientCnxn.java:1317)
17:34:55.204 [main] DEBUG org.apache.zookeeper.ClientCnxn - Disconnecting client for session: 0x1000032cf0020
17:34:55.207 [main] INFO org.apache.zookeeper.ZooKeeper - Session: 0x1000032cf0020 closed
Disconnected from the zookeeper and exiting application
Disconnected from the Zookeeper
Disconnected from the server
17:34:55.207 [main-EventThread] INFO org.apache.zookeeper.ClientCnxn - EventThread shut down for session: 0x1000032cf0020
Process finished with exit code 0
```

D_7_15_12_10_16_DS_PROJECT > src > main > java > LeaderElection > main

PRACTICAL 2:

POM.XML:

```
<?xml version="1.0" encoding="UTF-8"?>
<project xmlns="http://maven.apache.org/POM/4.0.0"
    xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
    xsi:schemaLocation="http://maven.apache.org/POM/4.0.0
http://maven.apache.org/xsd/maven-4.0.0.xsd">
    <modelVersion>4.0.0</modelVersion>

    <groupId>distributed.systems</groupId>
    <artifactId>leader.election</artifactId>
    <version>1.0-SNAPSHOT</version>

    <properties>
        <maven.compiler.source>17</maven.compiler.source>
        <maven.compiler.target>17</maven.compiler.target>
        <project.build.sourceEncoding>UTF-8</project.build.sourceEncoding>
    </properties>

    <build>
        <plugins>
            <plugin>
                <groupId>org.apache.maven.plugins</groupId>
                <artifactId>maven-compiler-plugin</artifactId>
                <version>3.11.0</version>
                <configuration>
                    <source>1.8</source>
                    <target>1.8</target>
                </configuration>
            </plugin>
        </plugins>
    </build>
    <dependencies>
        <dependency>
            <groupId>org.apache.zookeeper</groupId>
            <artifactId>zookeeper</artifactId>
            <version>3.8.3</version>
        </dependency>
        <dependency>
            <groupId>distributed.systems</groupId>
            <artifactId>leader.election</artifactId>
            <version>1.0-SNAPSHOT</version>
        </dependency>
    </dependencies>

```



```
</project>
```

LeaderElection.java:

```
import org.apache.zookeeper.*;
import java.io.IOException;
import java.util.Collections;
import java.util.List;

public class LeaderElection implements Watcher {
    private static final String ZOOKEEPER_ADDRESS = "localhost:2181";
    private static final int SESSION_TIMEOUT = 3000;
    private static final String ELECTION_NAMESPACE = "/election";
    private ZooKeeper zooKeeper;
    private String currentZnodeName;

    public static void main(String[] args) throws IOException,
    InterruptedException, KeeperException {
        LeaderElection leaderElection = new LeaderElection();

        leaderElection.connectToZookeeper();
        leaderElection.volunteerForLeadership();
        leaderElection.electLeader();
        leaderElection.run();
        leaderElection.close();
        System.out.println("Disconnected from Zookeeper, exiting application");
    }

    public void volunteerForLeadership() throws KeeperException,
    InterruptedException {
        String znodePrefix = ELECTION_NAMESPACE + "/c_";
        String znodeFullPath = zooKeeper.create(znodePrefix, new byte[] {}, 
ZooDefs.Ids.OPEN_ACL_UNSAFE, CreateMode.EPHEMERAL_SEQUENTIAL);

        System.out.println("znode name " + znodeFullPath);
        this.currentZnodeName = znodeFullPath.replace("/election/", "");
    }

    public void electLeader() throws KeeperException, InterruptedException {
        List<String> children = zooKeeper.getChildren(ELECTION_NAMESPACE,
false);

        Collections.sort(children);
        String smallestChild = children.get(0);
```

```

        if (smallestChild.equals(currentZnodeName)) {
            System.out.println("I am the leader");
            return;
        }

        System.out.println("I am not the leader, " + smallestChild + " is the
leader");
    }

    public void connectToZookeeper() throws IOException {
        this.zooKeeper = new ZooKeeper(ZOOKEEPER_ADDRESS, SESSION_TIMEOUT,
this);
    }

    private void run() throws InterruptedException {
        synchronized (zooKeeper) {
            zooKeeper.wait();
        }
    }

    private void close() throws InterruptedException {
        this.zooKeeper.close();
    }

    @Override
    public void process(WatchedEvent event) {
        switch (event.getType()) {
            case None:
                if (event.getState() == Event.KeeperState.SyncConnected) {
                    System.out.println("Successfully connected to Zookeeper");
                } else {
                    synchronized (zooKeeper) {
                        System.out.println("Disconnected from Zookeeper event");
                        zooKeeper.notifyAll();
                    }
                }
        }
    }
}

```

Server:

LeaderElection.java:

CASE 1:

The screenshot shows the IntelliJ IDEA interface with the project 'D_7_15_12_10_16_DS_PROJECT' open. The 'LeaderElection.java' file is selected in the editor. The code contains a method that prints a message if it's not the leader. The run output window shows the application's log output, which includes the connection to ZooKeeper and the message 'I am not the leader'.

```
17:43:40.086 [main] INFO org.apache.zookeeper.ClientEnvironment - Client environment:os.memory.total=124MB
17:43:40.087 [main] INFO org.apache.zookeeper.ZooKeeper - Initiating client connection, connectString=localhost:2181 sessionTimeout=3000 watcher=
17:43:40.092 [main] INFO org.apache.zookeeper.common.X509Util - Setting -D jdk.tls.rejectClientInitiatedRenegotiation=true to disable client-init
17:43:40.095 [main] INFO org.apache.zookeeper.ClientCnxnSocket - jute.maxbuffer value is 1048575 Bytes
17:43:40.099 [main] INFO org.apache.zookeeper.ClientCnxn - zookeeper.request.timeout value is 0. feature.enabled=false
17:43:40.102 [main-SendThread[localhost:2181]] DEBUG org.apache.zookeeper.SaslServerPrincipal - Canonicalized address to localhost
17:43:40.102 [main-SendThread[localhost:2181]] INFO org.apache.zookeeper.ClientCnxn - Opening socket connection to server localhost/127.0.0.1:218
17:43:40.102 [main-SendThread[localhost:2181]] INFO org.apache.zookeeper.ClientCnxn - SASL config status: Will not attempt to authenticate using:
17:43:40.104 [main-SendThread[localhost:2181]] INFO org.apache.zookeeper.ClientCnxn - Socket connection established, initiating session, client:
17:43:40.105 [main-SendThread[localhost:2181]] DEBUG org.apache.zookeeper.ClientCnxn - Session establishment request sent on localhost/127.0.0.1:
17:43:40.117 [main-SendThread[localhost:2181]] INFO org.apache.zookeeper.ClientCnxn - Session establishment complete on server localhost/127.0.0.1:
Successfully connected to Zookeeper
17:43:40.124 [main-SendThread[localhost:2181]] DEBUG org.apache.zookeeper.ClientCnxn - Reading reply session id: 0x10000bc3fe00002, packet:: cli
znode name /election/c_0000000033
17:43:40.129 [main-SendThread[localhost:2181]] DEBUG org.apache.zookeeper.ClientCnxn - Reading reply session id: 0x10000bc3fe00002, packet:: cli
I am the leader
17:43:41.465 [main-SendThread[localhost:2181]] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x10000bc3fe00002 after:
17:43:42.801 [main-SendThread[localhost:2181]] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x10000bc3fe00002 after:
17:43:44.135 [main-SendThread[localhost:2181]] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x10000bc3fe00002 after:
17:43:45.470 [main-SendThread[localhost:2181]] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x10000bc3fe00002 after:
17:43:45.470 [main-SendThread[localhost:2181]] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x10000bc3fe00002 after:
17:43:45.470 [main-SendThread[localhost:2181]] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x10000bc3fe00002 after:
```

CASE 2:

The screenshot shows a terminal window on a Linux system (cse@cse-Veriton-M200-H510) running the Apache ZooKeeper 3.8.3 binary. The logs show the client connecting to 'localhost:2181', establishing a session, and creating a node '/election'. It also shows a 'WATCHER:' event for the creation of the '/election' node.

```
cse@cse-Veriton-M200-H510: ~/Downloads/apache-zookeeper-3.8.3-bin/bin Mar 07 17:42:39,197 [myid:] - INFO [main:o.a.z.Environment@98] - Client environment:os.memory.total=124MB
2024-03-07 17:42:39,198 [myid:] - INFO [main:o.a.z.ZooKeeper@637] - Initiating client connection, connectString=localhost:2181 sessionTimeout=30000 watcher=org.apache.zookeeper.ZooKeeperMainsMyWatcher@7a9273a8
2024-03-07 17:42:39,200 [myid:] - INFO [main:o.a.z.c.X509Util@78] - Setting -D jdk.tls.rejectClientInitiatedRenegotiation=true to disable client-initiated TLS renegotiation
2024-03-07 17:42:39,203 [myid:] - INFO [main:o.a.z.ClientCnxnSocket@239] - jute.maxbuffer value is 1048575 Bytes
2024-03-07 17:42:39,207 [myid:] - INFO [main:o.a.z.ClientCnxn@1741] - zookeeper.request.timeout value is 0. feature.enabled=false
Welcome to ZooKeeper!
2024-03-07 17:42:39,210 [myid:localhost:2181] - INFO [main-SendThread(localhost:2181):o.a.z.ClientCnxn$SendThread@1177] - Opening socket connection to server localhost/127.0.0.1:2181.
2024-03-07 17:42:39,210 [myid:localhost:2181] - INFO [main-SendThread(localhost:2181):o.a.z.ClientCnxn$SendThread@1179] - SASL config status: Will not attempt to authenticate using SASL (unknown error)
2024-03-07 17:42:39,213 [myid:localhost:2181] - INFO [main-SendThread(localhost:2181):o.a.z.ClientCnxn$SendThread@1011] - Socket connection established, initiating session, client: /127.0.0.1:46538, server: localhost/127.0.0.1:2181
JLine support is enabled
2024-03-07 17:42:39,220 [myid:localhost:2181] - INFO [main-SendThread(localhost:2181):o.a.z.ClientCnxn$SendThread@1452] - Session establishment complete on server localhost/127.0.0.1:2181, session id = 0x10000bc3fe00001, negotiated timeout = 30000
WATCHER:
WatchedEvent state:SyncConnected type:None path:null
[zk: localhost:2181(CONNECTED) 0] create /election
Node already exists: /election
[zk: localhost:2181(CONNECTED) 1] ls /election
[000001]
[zk: localhost:2181(CONNECTED) 2] delete /election/000001
[zk: localhost:2181(CONNECTED) 3] ls /election
[]
[zk: localhost:2181(CONNECTED) 4] ls /election/001
Node does not exist: /election/001
[zk: localhost:2181(CONNECTED) 5] create /election/001
Created /election/001
[zk: localhost:2181(CONNECTED) 6] 
```

Activities jetbrains-idea-ce ▾

D_7_15_12_10_16_DS_PROJECT Version control ▾

Project D_7_15_12_10_16_DS_PROJECT ~/ideaProjects/D_7_15_12_10_16_DS_PROJECT

Main.java pom.xml (leader.election) LeaderElection.java

Run LeaderElection

```

17:48:13.670 [main] INFO org.apache.zookeeper - Client environment.us.memory.total=124416
17:48:13.671 [main] INFO org.apache.zookeeper.ZooKeeper - Initiating client connection, connectString=localhost:2181 sessionTimeout=3000 watcher=
17:48:13.674 [main] INFO org.apache.zookeeper.common.X509Util - Setting -D jdk.tls.rejectClientInitiatedRenegotiation=true to disable client-init
17:48:13.676 [main] INFO org.apache.zookeeper.ClientCnxnSocket - jute.maxbuffer value is 1048575 Bytes
17:48:13.681 [main] INFO org.apache.zookeeper.ClientCnxn - zookeeper.request.timeout value is 0. feature.enabled=false
17:48:13.683 [main-SendThread[localhost:2181]] DEBUG org.apache.zookeeper.SaslServerPrincipal - Canonicalized address to localhost
17:48:13.684 [main-SendThread[localhost:2181]] INFO org.apache.zookeeper.ClientCnxn - Opening socket connection to server localhost/127.0.0.1:218
17:48:13.684 [main-SendThread[localhost:2181]] INFO org.apache.zookeeper.ClientCnxn - SASL config status: Will not attempt to authenticate using
17:48:13.686 [main-SendThread[localhost:2181]] INFO org.apache.zookeeper.ClientCnxn - Socket connection established, initiating session, client:
17:48:13.686 [main-SendThread[localhost:2181]] DEBUG org.apache.zookeeper.ClientCnxn - Session establishment request sent on localhost/127.0.0.1:
17:48:13.692 [main-SendThread[localhost:2181]] INFO org.apache.zookeeper.ClientCnxn - Session establishment complete on server localhost/127.0.0.1:218
Successfully connected to Zookeeper
17:48:13.697 [main-SendThread[localhost:2181]] DEBUG org.apache.zookeeper.ClientCnxn - Reading reply session id: 0x10000bc3fe00003, packet:: cli
znode name /election/c_0000000035
17:48:13.700 [main-SendThread[localhost:2181]] DEBUG org.apache.zookeeper.ClientCnxn - Reading reply session id: 0x10000bc3fe00003, packet:: cli
I am not the leader, 001 is the leader
17:48:15.035 [main-SendThread[localhost:2181]] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x10000bc3fe00003 after
17:48:16.371 [main-SendThread[localhost:2181]] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x10000bc3fe00003 after
17:48:17.707 [main-SendThread[localhost:2181]] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x10000bc3fe00003 after

```

D_7_15_12_10_16_DS_PROJECT > src > main > java > LeaderElection > electLeader

52:10 (2745 chars, 90 line breaks) LF UTF-8 4 spaces

CASE 3:

Activities Terminal ▾

cse@cse-Veriton-M200-H510: ~/Downloads/apache-zookeeper-3.8.3-bin/bin Mar 7 17:49

sessionTimeout=30000 watcher=org.apache.zookeeper.ZooKeeperMain\$MyWatcher@7a9273a8

2024-03-07 17:42:39.200 [myid:] - INFO [main:o.a.z.c.X509Util@78] - Setting -D jdk.tls.rejectClientInitiatedRenegotiation=true to disable client-initiated TLS renegotiation

2024-03-07 17:42:39.203 [myid:] - INFO [main:o.a.z.ClientCnxnSocket@239] - jute.maxbuffer value is 1048575 Bytes

2024-03-07 17:42:39.207 [myid:] - INFO [main:o.a.z.ClientCnxn@1741] - zookeeper.request.timeout value is 0. feature.enabled=false

Welcome to ZooKeeper!

2024-03-07 17:42:39.210 [myid:localhost:2181] - INFO [main-SendThread(localhost:2181):o.a.z.ClientCnxn\$SendThread@1177] - Opened socket connection to server localhost/127.0.0.1:2181

2024-03-07 17:42:39.210 [myid:localhost:2181] - INFO [main-SendThread(localhost:2181):o.a.z.ClientCnxn\$SendThread@1179] - SASL config status: Will not attempt to authenticate using SASL (unknown error)

2024-03-07 17:42:39.213 [myid:localhost:2181] - INFO [main-SendThread(localhost:2181):o.a.z.ClientCnxn\$SendThread@1011] - Socket connection established, initiating session, client: /127.0.0.1:46538, server: localhost/127.0.0.1:2181

JLine support is enabled

2024-03-07 17:42:39.220 [myid:localhost:2181] - INFO [main-SendThread(localhost:2181):o.a.z.ClientCnxn\$SendThread@1452] - Session establishment complete on server localhost/127.0.0.1:2181, session id = 0x10000bc3fe00001, negotiated timeout = 30000

WATCHER::

WatchedEvent state:SyncConnected type:None path:null

[zk: localhost:2181(CONNECTED) 0] create /election

Node already exists: /election

[zk: localhost:2181(CONNECTED) 1] ls /election

[0000001]

[zk: localhost:2181(CONNECTED) 2] delete /election/000001

[zk: localhost:2181(CONNECTED) 3] ls /election

[]

[zk: localhost:2181(CONNECTED) 4] ls /election/001

Node does not exist: /election/001

[zk: localhost:2181(CONNECTED) 5] create /election/001

Created /election/001

[zk: localhost:2181(CONNECTED) 6] create /election/0001

Created /election/0001

[zk: localhost:2181(CONNECTED) 7]

Activities jetbrains-idea-ce ▾

D_7_15_12_10_16_DS_PROJECT Version control ▾

Project D_7_15_12_10_16_DS_PROJECT ~/ideaProjects/D_7_15_12_10_16_DS_PROJECT

Main.java pom.xml (leader.election) LeaderElection.java

Run LeaderElection

```

17:49:36.097 [main] INFO org.apache.zookeeper - Client environment.us.memory.total=124416
17:49:36.098 [main] INFO org.apache.zookeeper.ZooKeeper - Initiating client connection, connectString=localhost:2181 sessionTimeout=3000 watcher=
17:49:36.101 [main] INFO org.apache.zookeeper.common.X509Util - Setting -Djdk.tls.rejectClientInitiatedRenegotiation=true to disable client-init
17:49:36.104 [main] INFO org.apache.zookeeper.ClientCnxnSocket - jute.maxbuffer value is 1048575 Bytes
17:49:36.108 [main] INFO org.apache.zookeeper.ClientCnxn - zookeeper.request.timeout value is 0. feature.enabled=false
17:49:36.111 [main-SendThread[localhost:2181]] DEBUG org.apache.zookeeper.SaslServerPrincipal - Canonicalized address to localhost
17:49:36.111 [main-SendThread[localhost:2181]] INFO org.apache.zookeeper.ClientCnxn - Opening socket connection to server localhost/127.0.0.1:218
17:49:36.111 [main-SendThread[localhost:2181]] INFO org.apache.zookeeper.ClientCnxn - SASL config status: Will not attempt to authenticate using
17:49:36.113 [main-SendThread[localhost:2181]] INFO org.apache.zookeeper.ClientCnxn - Socket connection established, initiating session, client:
17:49:36.114 [main-SendThread[localhost:2181]] DEBUG org.apache.zookeeper.ClientCnxn - Session establishment request sent on localhost/127.0.0.1:
17:49:36.120 [main-SendThread[localhost:2181]] INFO org.apache.zookeeper.ClientCnxn - Session establishment complete on server localhost/127.0.0.0
Successfully connected to Zookeeper
17:49:36.125 [main-SendThread[localhost:2181]] DEBUG org.apache.zookeeper.ClientCnxn - Reading reply session id: 0x10000bc3fe00004, packet:: cli
znode name /election/c_0000000037
17:49:36.128 [main-SendThread[localhost:2181]] DEBUG org.apache.zookeeper.ClientCnxn - Reading reply session id: 0x10000bc3fe00004, packet:: cli
I am not the leader, 0001 is the leader
17:49:37.464 [main-SendThread[localhost:2181]] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x10000bc3fe00004 after
17:49:38.797 [main-SendThread[localhost:2181]] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x10000bc3fe00004 after
17:49:40.133 [main-SendThread[localhost:2181]] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x10000bc3fe00004 after

```

D_7_15_12_10_16_DS_PROJECT > src > main > java > LeaderElection > electLeader

52:10 (2745 chars, 90 line breaks) LF UTF-8 4 spaces

CASE 4:

Activities Terminal ▾

cse@cse-Veriton-M200-H510: ~/Downloads/apache-zookeeper-3.8.3-bin/bin

```

to disable client-initiated TLS renegotiation
2024-03-07 17:42:39.203 [myid:] - INFO  [main:o.a.z.ClientCnxnSocket@239] - jute.maxbuffer value is 1048575 Bytes
2024-03-07 17:42:39.207 [myid:] - INFO  [main:o.a.z.ClientCnxn@1741] - zookeeper.request.timeout value is 0. feature.enabled=false
Welcome to ZooKeeper!
2024-03-07 17:42:39.210 [myid:localhost:2181] - INFO  [main-SendThread(localhost:2181):o.a.z.ClientCnxn$SendThread@1177] - Openi
ng socket connection to server localhost/127.0.0.1:2181,
2024-03-07 17:42:39.210 [myid:localhost:2181] - INFO  [main-SendThread(localhost:2181):o.a.z.ClientCnxn$SendThread@1179] - SASL
config status: Will not attempt to authenticate using SASL (unknown error)
2024-03-07 17:42:39.213 [myid:localhost:2181] - INFO  [main-SendThread(localhost:2181):o.a.z.ClientCnxn$SendThread@1011] - Socke
t connection established, initiating session, client: /127.0.0.1:46538, server: localhost/127.0.0.1:2181
JLine support is enabled
2024-03-07 17:42:39.220 [myid:localhost:2181] - INFO  [main-SendThread(localhost:2181):o.a.z.ClientCnxn$SendThread@1452] - Sessi
on establishment complete on server localhost/127.0.0.1:2181, session id = 0x10000bc3fe00001, negotiated timeout = 30000
WATCHER::

WatchedEvent state:SyncConnected type:None path:null
[zk: localhost:2181(CONNECTED) 0] create /election
Node already exists: /election
[zk: localhost:2181(CONNECTED) 1] ls /election
[0000001]
[zk: localhost:2181(CONNECTED) 2] delete /election/000001
[zk: localhost:2181(CONNECTED) 3] ls /election
[]
[zk: localhost:2181(CONNECTED) 4] ls /election/001
Node does not exist: /election/001
[zk: localhost:2181(CONNECTED) 5] create /election/001
Created /election/001
[zk: localhost:2181(CONNECTED) 6] create /election/0001
Created /election/0001
[zk: localhost:2181(CONNECTED) 7] create /election/00000001
Created /election/00000001
[zk: localhost:2181(CONNECTED) 8] 

```

The screenshot shows the IntelliJ IDEA interface with the project 'D_7_15_12_10_16_DS_PROJECT' open. The 'LeaderElection.java' file is the active editor, displaying Java code for a ZooKeeper leader election. The terminal below shows the application's log output, indicating it has connected to a ZooKeeper server at localhost:2181 and is attempting to become the leader. The code uses the Apache ZooKeeper API to handle session establishment and leadership.

```
17:51:09.049 [main] INFO org.apache.zookeeper.ZooKeeper - Client environment:os.memory.total=1952MB
17:51:09.050 [main] INFO org.apache.zookeeper.ZooKeeper - Client environment:os.memory.total=124MB
17:51:09.053 [main] INFO org.apache.zookeeper.common.X509Util - Initiating client connection, connectString=localhost:2181 sessionTimeout=3000 watcher=
17:51:09.056 [main] INFO org.apache.zookeeper.ClientCnxnSocket - jute.maxbuffer value is 1048575 Bytes
17:51:09.060 [main] INFO org.apache.zookeeper.ClientCnxn - zookeeper.request.timeout value is 0. feature.enabled=false
17:51:09.063 [main-SendThread[localhost:2181]] DEBUG org.apache.zookeeper.SaslServerPrincipal - Canonicalized address to localhost
17:51:09.064 [main-SendThread[localhost:2181]] INFO org.apache.zookeeper.ClientCnxn - Opening socket connection to server localhost/127.0.0.1:2181
17:51:09.064 [main-SendThread[localhost:2181]] INFO org.apache.zookeeper.ClientCnxn - SASL config status: Will not attempt to authenticate using
17:51:09.067 [main-SendThread[localhost:2181]] INFO org.apache.zookeeper.ClientCnxn - Socket connection established, initiating session, client:
17:51:09.067 [main-SendThread[localhost:2181]] DEBUG org.apache.zookeeper.ClientCnxn - Session establishment request sent on localhost/127.0.0.1:2181
17:51:09.073 [main-SendThread[localhost:2181]] INFO org.apache.zookeeper.ClientCnxn - Session establishment complete on server localhost/127.0.0.1:2181
Successfully connected to Zookeeper
17:51:09.078 [main-SendThread[localhost:2181]] DEBUG org.apache.zookeeper.ClientCnxn - Reading reply session id: 0x10000bc3fe00005, packet:: client
znode name /election/c_000000039
17:51:09.081 [main-SendThread[localhost:2181]] DEBUG org.apache.zookeeper.ClientCnxn - Reading reply session id: 0x10000bc3fe00005, packet:: client
I am not the leader, 000000001 is the leader
17:51:10.417 [main-SendThread[localhost:2181]] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x10000bc3fe00005 after
17:51:11.751 [main-SendThread[localhost:2181]] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x10000bc3fe00005 after
```

Leader re-election:

LeaderElection.java:

```
import org.apache.zookeeper.*;
import org.apache.zookeeper.data.Stat;

import java.io.IOException;
import java.util.Collections;
import java.util.List;

public class LeaderElection implements Watcher {
    private static final String ZOOKEEPER_ADDRESS = "localhost:2181";
    private static final int SESSION_TIMEOUT = 3000;
    private static final String ELECTION_NAMESPACE = "/election";
    private ZooKeeper zooKeeper;
    private String currentZnodeName;

    public static void main(String[] args) throws IOException,
    InterruptedException, KeeperException {
        LeaderElection leaderElection = new LeaderElection();

        leaderElection.connectToZookeeper();
        leaderElection.volunteerForLeadership();
        leaderElection.reelectLeader();
        leaderElection.run();
        leaderElection.close();
        System.out.println("Disconnected from Zookeeper, exiting application");
    }
}
```

```

    }

    public void volunteerForLeadership() throws KeeperException,
InterruptedException {
    String znodePrefix = ELECTION_NAMESPACE + "/c_";
    String znodeFullPath = zooKeeper.create(znodePrefix, new byte[] {}, ZooDefs.Ids.OPEN_ACL_UNSAFE, CreateMode.EPHEMERAL_SEQUENTIAL);

    System.out.println("znode name " + znodeFullPath);
    this.currentZnodeName = znodeFullPath.replace(ELECTION_NAMESPACE + "/", "");
}

public void reelectLeader() throws KeeperException, InterruptedException {
    Stat predecessorStat = null;
    String predecessorZnodeName = "";
    while (predecessorStat == null) {
        List<String> children = zooKeeper.getChildren(ELECTION_NAMESPACE, false);

        Collections.sort(children);
        String smallestChild = children.get(0);

        if (smallestChild.equals(currentZnodeName)) {
            System.out.println("I am the leader");
            return;
        } else {
            System.out.println("I am not the leader");
            int predecessorIndex = Collections.binarySearch(children, currentZnodeName) - 1;
            predecessorZnodeName = children.get(predecessorIndex);
            predecessorStat = zooKeeper.exists(ELECTION_NAMESPACE + "/" + predecessorZnodeName, this);
        }
    }

    System.out.println("Watching znode " + predecessorZnodeName);
    System.out.println();
}

public void connectToZookeeper() throws IOException {
    this.zooKeeper = new ZooKeeper(ZOOKEEPER_ADDRESS, SESSION_TIMEOUT, this);
}

public void run() throws InterruptedException {
    synchronized (zooKeeper) {
        zooKeeper.wait();
    }
}

```

```

    }

    public void close() throws InterruptedException {
        zooKeeper.close();
    }

    @Override
    public void process(WatchedEvent event) {
        switch (event.getType()) {
            case None:
                if (event.getState() == Event.KeeperState.SyncConnected) {
                    System.out.println("Successfully connected to Zookeeper");
                } else {
                    synchronized (zooKeeper) {
                        System.out.println("Disconnected from Zookeeper event");
                        zooKeeper.notifyAll();
                    }
                }
                break;
            case NodeDeleted:
                try {
                    reelectLeader();
                } catch (InterruptedException e) {
                } catch (KeeperException e) {
                }
        }
    }
}
}

```

The screenshot shows a terminal window with two tabs open, both titled "cse@cse-Veriton-M200-H510: ~/Downloads/apache-zookeeper-3.8.3-bin/bin". The terminal output displays ZooKeeper logs from March 7, 2024, at 17:42:39. The logs show the client connecting to localhost:2181, attempting to authenticate using SASL, and establishing a session with session id 0x10000bc3fe00001. The session timeout is set to 30000.

Below the terminal, there is a graphical interface titled "WATCHER:" which lists the following sequence of events:

- [zk: localhost:2181(CONNECTED) 0] create /election
- Node already exists: /election
- [zk: localhost:2181(CONNECTED) 1] ls /election
- [0000001]
- [zk: localhost:2181(CONNECTED) 2] delete /election/0000001
- [zk: localhost:2181(CONNECTED) 3] ls /election
- []
- [zk: localhost:2181(CONNECTED) 4] ls /election/001
- Node does not exist: /election/001
- [zk: localhost:2181(CONNECTED) 5] create /election/001
- Created /election/001
- [zk: localhost:2181(CONNECTED) 6] create /election/00001
- Created /election/00001
- [zk: localhost:2181(CONNECTED) 7] create /election/000000001
- Created /election/000000001
- [zk: localhost:2181(CONNECTED) 8] ls /election
- [000000001, 0001, 001, c_0000000039]
- [zk: localhost:2181(CONNECTED) 9] []

Activities jetbrains-idea-ce ▾

DP D_7_15_12_10_16_DS_PROJECT Version control ▾

Project ▾

D_7_15_12_10_16_DS_PROJECT ~/ideaProjects/D_7_15_12_10_16_DS_PROJECT

src

main

java

distributed.systems

Main

Main.java pom.xml (leader.election) LeaderElection.java

Run LeaderElection

Mar 7 17:56

```
17:56:13.130 [main-SendThread(localhost:2181)] INFO org.apache.zookeeper.ClientCnxn - Socket connection established, initiating session, client: /127.0.0.1:53032-127.0.0.1:2181
17:56:13.130 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Session establishment request sent on localhost/127.0.0.1:53032
17:56:13.136 [main-SendThread(localhost:2181)] INFO org.apache.zookeeper.ClientCnxn - Session establishment complete on server localhost/127.0.0.1:2181
Successfully connected to Zookeeper
17:56:13.142 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Reading reply session id: 0x10000bc3fe00006, packet:: client
znode name /election/c_0000000004
17:56:13.145 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Reading reply session id: 0x10000bc3fe00006, packet:: client
I am not the leader
17:56:13.149 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Reading reply session id: 0x10000bc3fe00006, packet:: client
Watching znode c_0000000039

17:56:14.483 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x10000bc3fe00006 after 17:56:13.130 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x10000bc3fe00006 after 17:56:13.136 [main-SendThread(localhost:2181)] INFO org.apache.zookeeper.ClientCnxn - Session establishment complete on server localhost/127.0.0.1:2181
17:56:16.439 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got notification session id: 0x10000bc3fe00006
17:56:16.442 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got WatchedEvent state:SyncConnected type:NodeDeleted path
17:56:16.447 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Reading reply session id: 0x10000bc3fe00006, packet:: client
I am not the leader
17:56:16.450 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Reading reply session id: 0x10000bc3fe00006, packet:: client
17:56:16.453 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Reading reply session id: 0x10000bc3fe00006, packet:: client
c_0000000039
```

D_7_15_12_10_16_DS_PROJECT > src > main > java > LeaderElection

94:2 LF UTF-8 4 spaces

Activities Terminal ▾

cse@cse-Veriton-M200-H510: ~/Downloads/apache-zookeeper-3.8.3-bin/bin

Mar 7 17:57

```
se
Welcome to ZooKeeper!
2024-03-07 17:42:39,210 [myid:localhost:2181] - INFO  [main-SendThread(localhost:2181):o.a.z.ClientCnxn$SendThread@1177] - Opening socket connection to server localhost/127.0.0.1:2181.
2024-03-07 17:42:39,210 [myid:localhost:2181] - DEBUG [main-SendThread(localhost:2181):o.a.z.ClientCnxn$SendThread@1179] - SASL config status: Will not attempt to authenticate using SASL (unknown error)
2024-03-07 17:42:39,213 [myid:localhost:2181] - INFO  [main-SendThread(localhost:2181):o.a.z.ClientCnxn$SendThread@1011] - Socket connection established, initiating session, client: /127.0.0.1:46538, server: localhost/127.0.0.1:2181
JLine support is enabled
2024-03-07 17:42:39,220 [myid:localhost:2181] - INFO  [main-SendThread(localhost:2181):o.a.z.ClientCnxn$SendThread@1452] - Session establishment complete on server localhost/127.0.0.1:2181, session id = 0x10000bc3fe00001, negotiated timeout = 30000

WATCHER::
```

WatchedEvent state:SyncConnected type:None path:null

```
[zk: localhost:2181(CONNECTED) 0] create /election
Node already exists: /election
[zk: localhost:2181(CONNECTED) 1] ls /election
[000001]
[zk: localhost:2181(CONNECTED) 2] delete /election/000001
[zk: localhost:2181(CONNECTED) 3] ls /election
[]
[zk: localhost:2181(CONNECTED) 4] ls /election/001
Node does not exist: /election/001
[zk: localhost:2181(CONNECTED) 5] create /election/001
Created /election/001
[zk: localhost:2181(CONNECTED) 6] create /election/0001
Created /election/0001
[zk: localhost:2181(CONNECTED) 7] create /election/000000001
Created /election/000000001
[zk: localhost:2181(CONNECTED) 8] ls /election
[00000001, 0001, 001, c_0000000039]
[zk: localhost:2181(CONNECTED) 9] delete /election/001
[zk: localhost:2181(CONNECTED) 10] []
```

Activities jetbrains-idea-ce ▾

Mar 7 17:57

D_7_15_12_10_16_DS_PROJECT Version control

Project D_7_15_12_10_16_DS_PROJECT ~/ideaProjects/D_7_15_12_10_16_DS_PROJECT

Main.java pom.xml (leader.election) LeaderElection.java

Run LeaderElection

```

17:57:00.504 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x10000bc3fe00006 after : 17:57:01.838 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x10000bc3fe00006 after : 17:57:03.173 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x10000bc3fe00006 after : 17:57:04.509 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x10000bc3fe00006 after : 17:57:04.744 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got notification session id: 0x10000bc3fe00006 17:57:04.745 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got WatchedEvent state:SyncConnected type:NodeDeleted path I am not the leader 17:57:04.750 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Reading reply session id: 0x10000bc3fe00006, packet:: clientWatching znode 0001

17:57:06.085 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x10000bc3fe00006 after : 17:57:07.421 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x10000bc3fe00006 after : 17:57:08.756 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x10000bc3fe00006 after : 17:57:10.091 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x10000bc3fe00006 after : 17:57:11.425 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x10000bc3fe00006 after : 17:57:12.761 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x10000bc3fe00006 after : 17:57:14.005 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x10000bc3fe00006 after :

```

D_7_15_12_10_16_DS_PROJECT > src > main > java > LeaderElection

94:2 LF UTF-8 4 spaces

Activities Terminal ▾

Mar 7 17:57

cse@cse-Veriton-M200-H510: ~/Downloads/apache-zookeeper-3.8.3-bin/bin

```

Welcome to ZooKeeper!
2024-03-07 17:42:39,210 [myid:localhost:2181] - INFO  [main-SendThread(localhost:2181):o.a.z.ClientCnxn$SendThread@1177] - Opened socket connection to server localhost/127.0.0.1:2181.
2024-03-07 17:42:39,210 [myid:localhost:2181] - INFO  [main-SendThread(localhost:2181):o.a.z.ClientCnxn$SendThread@1179] - SASL config status: Will not attempt to authenticate using SASL (unknown error)
2024-03-07 17:42:39,213 [myid:localhost:2181] - INFO  [main-SendThread(localhost:2181):o.a.z.ClientCnxn$SendThread@1011] - Socket connection established, initiating session, client: /127.0.0.1:46538, server: localhost/127.0.0.1:2181
JLine support is enabled
2024-03-07 17:42:39,220 [myid:localhost:2181] - INFO  [main-SendThread(localhost:2181):o.a.z.ClientCnxn$SendThread@1452] - Session on establishment complete on server localhost/127.0.0.1:2181, session id = 0x10000bc3fe00001, negotiated timeout = 30000

WATCHER:

WatchedEvent state:SyncConnected type:None path:null
[zk: localhost:2181(CONNECTED) 0] create /election
Node already exists: /election
[zk: localhost:2181(CONNECTED) 1] ls /election
[00000001]
[zk: localhost:2181(CONNECTED) 2] delete /election/00000001
[zk: localhost:2181(CONNECTED) 3] ls /election
[]
[zk: localhost:2181(CONNECTED) 4] ls /election/0001
Node does not exist: /election/0001
[zk: localhost:2181(CONNECTED) 5] create /election/0001
Created /election/0001
[zk: localhost:2181(CONNECTED) 6] create /election/00001
Created /election/00001
[zk: localhost:2181(CONNECTED) 7] create /election/000000001
Created /election/000000001
[zk: localhost:2181(CONNECTED) 8] ls /election
[00000001, 0001, 001, c 0000000039]
[zk: localhost:2181(CONNECTED) 9] delete /election/0001
[zk: localhost:2181(CONNECTED) 10] delete /election/00001
[zk: localhost:2181(CONNECTED) 11] 

```

Activities jetbrains-idea-ce ▾

DP D_7_15_12_10_16_DS_PROJECT Version control ▾

Project D_7_15_12_10_16_DS_PROJECT ~/ideaProjects/D_7_15_12_10_16_DS_PROJECT

Main.java pom.xml (leader.election) LeaderElection.java

Run LeaderElection

```
17:57:27.441 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x10000bc3fe00006 after 17:57:28.777 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x10000bc3fe00006 after 17:57:28.894 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got notification session id: 0x10000bc3fe00006 17:57:28.894 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got WatchedEvent state:SyncConnected type:NodeDeleted path I am not the leader 17:57:28.899 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Reading reply session id: 0x10000bc3fe00006, packet:: clientWatching znode 000000001 17:57:30.235 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x10000bc3fe00006 after 17:57:31.570 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x10000bc3fe00006 after 17:57:32.905 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x10000bc3fe00006 after 17:57:34.240 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x10000bc3fe00006 after 17:57:35.576 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x10000bc3fe00006 after 17:57:36.911 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x10000bc3fe00006 after 17:57:38.245 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x10000bc3fe00006 after
```

D_7_15_12_10_16_DS_PROJECT > src > main > java > LeaderElection

Activities jetbrains-idea-ce ▾

DP D_7_15_12_10_16_DS_PROJECT Version control ▾

Project D_7_15_12_10_16_DS_PROJECT ~/ideaProjects/D_7_15_12_10_16_DS_PROJECT

Main.java pom.xml (leader.election) LeaderElection.java

Run LeaderElection

```
17:57:46.254 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x10000bc3fe00006 after 17:57:47.589 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x10000bc3fe00006 after 17:57:48.925 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x10000bc3fe00006 after 17:57:50.259 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x10000bc3fe00006 after 17:57:51.594 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x10000bc3fe00006 after 17:57:52.930 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x10000bc3fe00006 after 17:57:54.265 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x10000bc3fe00006 after 17:57:55.599 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x10000bc3fe00006 after 17:57:55.613 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got notification session id: 0x10000bc3fe00006 17:57:55.614 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got WatchedEvent state:SyncConnected type:NodeDeleted path I am the leader 17:57:55.616 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Reading reply session id: 0x10000bc3fe00006, packet:: clientWatching znode 000000001 17:57:56.952 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x10000bc3fe00006 after 17:57:58.285 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x10000bc3fe00006 after 17:57:59.620 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x10000bc3fe00006 after 17:58:00.954 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x10000bc3fe00006 after
```

D_7_15_12_10_16_DS_PROJECT > src > main > java > LeaderElection

The screenshot shows the IntelliJ IDEA interface. The code editor displays three files: Main.java, pom.xml (leader.election), and LeaderElection.java. The terminal window below shows the output of the application's execution, indicating it has successfully connected to Zookeeper and identified itself as the leader.

```
17:59:03.904 [main] INFO org.apache.zookeeper.common.X509Util - Setting -D jdk.tls.rejectClientInitiatedRenegotiation=true to disable client-initiated renegotiations
17:59:03.907 [main] INFO org.apache.zookeeper.ClientCnxnSocket - jute.maxbuffer value is 1048575 Bytes
17:59:03.914 [main] INFO org.apache.zookeeper.ClientCnxn - zookeeper.request.timeout value is 0. feature.enabled=false
17:59:03.917 [main-SendThread[localhost:2181]] DEBUG org.apache.zookeeper.SaslServerPrincipal - Canonicalized address to localhost
17:59:03.917 [main-SendThread[localhost:2181]] INFO org.apache.zookeeper.ClientCnxn - Opening socket connection to server localhost/127.0.0.1:2181
17:59:03.920 [main-SendThread[localhost:2181]] INFO org.apache.zookeeper.ClientCnxn - SASL config status: Will not attempt to authenticate using
17:59:03.921 [main-SendThread[localhost:2181]] DEBUG org.apache.zookeeper.ClientCnxn - Socket connection established, initiating session, client: /127.0.0.1:52712-127.0.0.1:2181
17:59:03.926 [main-SendThread[localhost:2181]] INFO org.apache.zookeeper.ClientCnxn - Session establishment request sent on localhost/127.0.0.1:2181
17:59:03.926 [main-SendThread[localhost:2181]] DEBUG org.apache.zookeeper.ClientCnxn - Session establishment complete on server localhost/127.0.0.1:2181
Successfully connected to Zookeeper
17:59:03.932 [main-SendThread[localhost:2181]] DEBUG org.apache.zookeeper.ClientCnxn - Reading reply session id: 0x10000bc3fe000007, packet:: client
17:59:03.935 [main-SendThread[localhost:2181]] DEBUG org.apache.zookeeper.ClientCnxn - Reading reply session id: 0x10000bc3fe000007, packet:: client
I am the leader
17:59:05.271 [main-SendThread[localhost:2181]] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x10000bc3fe000007 after
17:59:06.607 [main-SendThread[localhost:2181]] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x10000bc3fe000007 after
```

The terminal window shows a session with the Apache Zookeeper command-line interface (CLI). It connects to the local host at port 2181, establishes a session, and creates a new node named '/election' under the '/' path. The session ID is 0x10000bc3fe000001, and the negotiated timeout is 30000 milliseconds.

```
cse@cse-Veriton-M200-H510: ~/Downloads/apache-zookeeper-3.8.3-bin/bin> ./zkCli.sh
[zk: localhost:2181(CONNECTED) 0] create /election
Node already exists: /election
[zk: localhost:2181(CONNECTED) 1] ls /election
[00000001]
[zk: localhost:2181(CONNECTED) 2] delete /election/00000001
[zk: localhost:2181(CONNECTED) 3] ls /election
[]
[zk: localhost:2181(CONNECTED) 4] ls /election/0001
Node does not exist: /election/0001
[zk: localhost:2181(CONNECTED) 5] create /election/0001
Created /election/0001
[zk: localhost:2181(CONNECTED) 6] create /election/00001
Created /election/00001
[zk: localhost:2181(CONNECTED) 7] create /election/000000001
Created /election/000000001
[zk: localhost:2181(CONNECTED) 8] ls /election
[0000000001, 0001, 0001, c_0000000039]
[zk: localhost:2181(CONNECTED) 9] delete /election/0001
[zk: localhost:2181(CONNECTED) 10] delete /election/000000001
[zk: localhost:2181(CONNECTED) 11] delete /election/000000001
[zk: localhost:2181(CONNECTED) 12] ls /election
[c_0000000040]
[zk: localhost:2181(CONNECTED) 13] delete /election/c_0000000040
[zk: localhost:2181(CONNECTED) 14] ls /election
[]
[zk: localhost:2181(CONNECTED) 15]
```

Watchersdemo code:

```
import org.apache.zookeeper.KeeperException;
import org.apache.zookeeper.WatchedEvent;
import org.apache.zookeeper.Watcher;
import org.apache.zookeeper.ZooKeeper;
import org.apache.zookeeper.data.Stat;
```

```
import java.io.IOException;
import java.util.List;

public class WatchersDemo implements Watcher {
    private static final String ZOOKEEPER_ADDRESS = "localhost:2181";
    private static final int SESSION_TIMEOUT = 3000;
    private static final String TARGET_ZNODE = "/target_znode";
    private ZooKeeper zooKeeper;

    public static void main(String[] args) throws InterruptedException,
    IOException, KeeperException {
        WatchersDemo watchersDemo = new WatchersDemo();
        watchersDemo.connectToZookeeper();
        watchersDemo.watchTargetZnode();
        watchersDemo.run();
        watchersDemo.close();
    }

    public void connectToZookeeper() throws IOException {
        this.zooKeeper = new ZooKeeper(ZOOKEEPER_ADDRESS, SESSION_TIMEOUT,
this);
    }

    public void run() throws InterruptedException {
        synchronized (zooKeeper) {
            zooKeeper.wait();
        }
    }

    public void close() throws InterruptedException {
        zooKeeper.close();
    }

    public void watchTargetZnode() throws KeeperException, InterruptedException
{
        Stat stat = zooKeeper.exists(TARGET_ZNODE, this);
        if (stat == null) {
            return;
        }

        byte[] data = zooKeeper.getData(TARGET_ZNODE, this, stat);
        List<String> children = zooKeeper.getChildren(TARGET_ZNODE, this);

        System.out.println("Data : " + new String(data) + ", children : " +
children);
    }

    @Override
```

```
public void process(WatchedEvent event) {
    switch (event.getType()) {
        case None:
            if (event.getState() == Event.KeeperState.SyncConnected) {
                System.out.println("Successfully connected to Zookeeper");
            } else {
                synchronized (zooKeeper) {
                    System.out.println("Disconnected from Zookeeper event");
                    zooKeeper.notifyAll();
                }
            }
            break;
        case NodeDeleted:
            System.out.println(TARGET_ZNODE + " was deleted");
            break;
        case NodeCreated:
            System.out.println(TARGET_ZNODE + " was created");
            break;
        case NodeDataChanged:
            System.out.println(TARGET_ZNODE + " data changed");
            break;
        case NodeChildrenChanged:
            System.out.println(TARGET_ZNODE + " children changed");
            break;
    }

    try {
        watchTargetZnode();
    } catch (KeeperException e) {
    } catch (InterruptedException e) {
    }
}
}
```

Activities jetbrains-idea-ce ▾ Mar 7 16:16

D4_37_HarshDiwase Version control

Project Main.java LeaderElection.java WatchersDemo.java pom.xml (leader.election)

Run WatchersDemo

```
16:15:02.968 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x1000032cf00013 after 16:15:04.303 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x1000032cf00013 after 16:15:05.639 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x1000032cf00013 after 16:15:06.974 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x1000032cf00013 after 16:15:07.031 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got notification session id: 0x1000032cf00013 16:15:07.033 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got WatchedEvent state:SyncConnected type:NodeChildrenChanged /target_znode children changed 16:15:07.037 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Reading reply session id: 0x1000032cf00013, packet:: client 16:15:07.038 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Reading reply session id: 0x1000032cf00013, packet:: client 16:15:07.039 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Reading reply session id: 0x1000032cf00013, packet:: client Data : abc, children : [child_node] 16:15:08.375 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x1000032cf00013 after 16:15:09.710 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x1000032cf00013 after 16:15:11.045 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x1000032cf00013 after 16:15:12.380 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x1000032cf00013 after 16:15:13.715 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x1000032cf00013 after 16:15:15.050 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x1000032cf00013 after 16:15:16.385 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x1000032cf00013 after 16:15:17.719 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x1000032cf00013 after 16:15:19.054 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x1000032cf00013 after 16:15:20.389 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x1000032cf00013 after
```

Activities jetbrains-idea-ce ▾ Mar 7 16:19

D4_37_HarshDiwase Version control

Project Main.java LeaderElection.java WatchersDemo.java pom.xml (leader.election)

Run WatchersDemo

```
16:19:31.331 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x1000032cf00013 after 16:19:32.665 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x1000032cf00013 after 16:19:34.000 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x1000032cf00013 after 16:19:35.335 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x1000032cf00013 after 16:19:36.669 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x1000032cf00013 after 16:19:38.004 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x1000032cf00013 after 16:19:38.576 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got notification session id: 0x1000032cf00013 16:19:38.577 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got WatchedEvent state:SyncConnected type:NodeDataChanged /target_znode data changed 16:19:38.578 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Reading reply session id: 0x1000032cf00013, packet:: client 16:19:38.582 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Reading reply session id: 0x1000032cf00013, packet:: client 16:19:38.585 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Reading reply session id: 0x1000032cf00013, packet:: client Data : Node Created, children : [child_node] 16:19:39.919 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x1000032cf00013 after 16:19:41.253 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x1000032cf00013 after 16:19:42.587 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x1000032cf00013 after 16:19:43.922 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x1000032cf00013 after 16:19:45.256 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x1000032cf00013 after 16:19:46.590 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x1000032cf00013 after
```

Activities jetbrains-idea-ce ▾

D4_37_HarshDiwase Version control

Project D4_37_HarshDiwase

Main.java LeaderElection.java WatchersDemo.java pom.xml (leader.election)

Run WatchersDemo

```
16:21:58.713 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x1000032cf0013 after 16:22:00.048 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x1000032cf0013 after 16:22:01.383 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x1000032cf0013 after 16:22:02.718 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x1000032cf0013 after 16:22:04.052 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x1000032cf0013 after 16:22:05.387 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x1000032cf0013 after 16:22:06.722 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x1000032cf0013 after 16:22:08.057 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x1000032cf0013 after 16:22:09.023 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got notification session id: 0x1000032cf0013 16:22:09.024 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got WatchedEvent state:SyncConnected type:NodeChildrenChanged /target_znode children changed 16:22:09.025 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Reading reply session id: 0x1000032cf0013, packet:: client 16:22:09.028 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Reading reply session id: 0x1000032cf0013, packet:: client 16:22:09.030 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Reading reply session id: 0x1000032cf0013, packet:: client Data : Node Created, children : [] 16:22:10.365 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x1000032cf0013 after 16:22:11.700 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x1000032cf0013 after 16:22:13.035 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x1000032cf0013 after 16:22:14.370 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x1000032cf0013 after 16:22:15.705 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x1000032cf0013 after 16:22:17.039 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x1000032cf0013 after 16:22:18.374 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x1000032cf0013 after 16:22:19.709 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x1000032cf0013 after 16:22:21.044 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x1000032cf0013 after 16:22:22.378 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x1000032cf0013 after 16:22:23.713 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x1000032cf0013 after 16:22:24.345 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got notification session id: 0x1000032cf0013 16:22:24.345 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got WatchedEvent state:SyncConnected type:NodeDeleted path /target_znode was deleted 16:22:25.682 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x1000032cf0013 after 16:22:27.017 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x1000032cf0013 after
```

D4_37_HarshDiwase > src > main > java > WatchersDemo > TARGET_ZNODE

15:33 LF UTF-8 4 spaces

Activities jetbrains-idea-ce ▾

D4_37_HarshDiwase Version control

Project D4_37_HarshDiwase

Main.java LeaderElection.java WatchersDemo.java pom.xml (leader.election)

Run WatchersDemo

```
16:22:09.030 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Reading reply session id: 0x1000032cf0013, packet:: client 16:22:11.700 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x1000032cf0013 after 16:22:13.035 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x1000032cf0013 after 16:22:14.370 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x1000032cf0013 after 16:22:15.705 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x1000032cf0013 after 16:22:17.039 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x1000032cf0013 after 16:22:18.374 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x1000032cf0013 after 16:22:19.709 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x1000032cf0013 after 16:22:21.044 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x1000032cf0013 after 16:22:22.378 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x1000032cf0013 after 16:22:23.713 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x1000032cf0013 after 16:22:24.345 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got notification session id: 0x1000032cf0013 16:22:24.345 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Reading reply session id: 0x1000032cf0013, packet:: client 16:22:25.682 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x1000032cf0013 after 16:22:27.017 [main-SendThread(localhost:2181)] DEBUG org.apache.zookeeper.ClientCnxn - Got ping response for session id: 0x1000032cf0013 after
```

D4_37_HarshDiwase > src > main > java > WatchersDemo > TARGET_ZNODE

15:33 LF UTF-8 4 spaces

```

cse@cse-Veriton-M200-H510: ~/Downloads/apache-zookeeper-3.8.3-bin... cse@cse-Veriton-M200-H510: ~/Downloads...
[zk: localhost:2181(CONNECTED) 34] create /target_znode "some test data"
Created /target_znode
[zk: localhost:2181(CONNECTED) 35] set /target_znode "updated data"
[zk: localhost:2181(CONNECTED) 36] delete /target_znode
[zk: localhost:2181(CONNECTED) 37] create /target_znode
Created /target_znode
[zk: localhost:2181(CONNECTED) 38] ls /
[a, election, election1, target_znode, zookeeper]
[zk: localhost:2181(CONNECTED) 39] ls /
[a, election, election1, target_znode, zookeeper]
[zk: localhost:2181(CONNECTED) 40] delete /target_znode
[zk: localhost:2181(CONNECTED) 41] create /target_znode "abc"
Created /target_znode
[zk: localhost:2181(CONNECTED) 42] create /target_znode/child_node
Created /target_znode/child_node
[zk: localhost:2181(CONNECTED) 43] set /target_znode/child_node "child updated"
[zk: localhost:2181(CONNECTED) 44] set /target_znode "Node Created"
[zk: localhost:2181(CONNECTED) 45] delete /target_znode
Node not empty: /target_znode
[zk: localhost:2181(CONNECTED) 46] delete /target_znode/child_node
[zk: localhost:2181(CONNECTED) 47] delete /target_znode
[zk: localhost:2181(CONNECTED) 48] []

```

```

cse@cse-Veriton-M200-H510: ~/Downloads/apache-zookeeper-3.8.3-bin... cse@cse-Veriton-M200-H510: ~/Downloads...
Created /target_znode
[zk: localhost:2181(CONNECTED) 23] delete /target_znode
Node does not exist: /target_znode
[zk: localhost:2181(CONNECTED) 24] delete /target_znode
[zk: localhost:2181(CONNECTED) 25] create /target_znode "some test data"
Created /target_znode
[zk: localhost:2181(CONNECTED) 26] set /target_znode "updated data"
[zk: localhost:2181(CONNECTED) 27] set /target_znode "some new data"
[zk: localhost:2181(CONNECTED) 28] ls /
[a, election, election1, target_znode, zookeeper]
[zk: localhost:2181(CONNECTED) 29] ls /target_znode
[]
[zk: localhost:2181(CONNECTED) 30] delete /target_znode
[zk: localhost:2181(CONNECTED) 31] ls /
[a, election, election1, zookeeper]
[zk: localhost:2181(CONNECTED) 32] create /target_znode
Created /target_znode
[zk: localhost:2181(CONNECTED) 33] delete /target_znode
[zk: localhost:2181(CONNECTED) 34] create /target_znode "some test data"
Created /target_znode
[zk: localhost:2181(CONNECTED) 35] set /target_znode "updated data"
[zk: localhost:2181(CONNECTED) 36] delete /target_znode
[zk: localhost:2181(CONNECTED) 37] create /target_znode

```

PRACTICAL 3:

Client.java:

```

import java.rmi.*;
import java.util.Scanner;

```

```
public class Client{
    public static void main(String[] args){
        Scanner sc = new Scanner(System.in);

        try{
            String serverURL = "rmi://localhost/Server";
            ServerIntf serverIntf = (ServerIntf) Naming.lookup(serverURL);

            System.out.print("Enter First Number: ");
            double num1 = sc.nextDouble();

            System.out.print("Enter Second Number: ");
            double num2 = sc.nextDouble();

            System.out.println("First Number Is: " + num1);
            System.out.println("Second Number Is: " + num2);

            System.out.println("----- Results -----");
            System.out.println("Addition Is: " +serverIntf.Addition(num1,
num2));
            System.out.println("Subtraction Is: "
+serverIntf.Subtraction(num1, num2));
            System.out.println("Multiplication Is: "
+serverIntf.Multiplication(num1, num2));
            System.out.println("Division Is: " +serverIntf.Division(num1,
num2));

        }catch(Exception e){
            System.out.println("Exception Occurred At Client!" +
e.getMessage());
        }
    }
}
```

Server.java:

```
import java.rmi.*;  
  
public class Server{  
  
    public static void main(String[] args){  
  
        try{  
            ServerImpl serverImpl = new ServerImpl();  
            Naming.rebind("Server", serverImpl);  
  
            System.out.println("Server Started....");  
  
        }catch(Exception e){  
            System.out.println("Exception Occurred At Server! " +  
e.getMessage());  
        }  
    }  
  
}
```

ServerImpl.java:

```
import java.rmi.*;  
import java.rmi.server.*;  
  
public class ServerImpl extends UnicastRemoteObject  
implements ServerIntf {  
  
    public ServerImpl() throws RemoteException{  
    }  
  
    public double Addition(double num1, double num2) throws  
RemoteException{  
        return num1 + num2;  
    }
```

```

    }

    public double Subtraction(double num1, double num2) throws
RemoteException{
    return num1 - num2;
}

    public double Multiplication(double num1, double num2) throws
RemoteException{
    return num1 * num2;
}

    public double Division(double num1, double num2) throws
RemoteException{
    if(num2 != 0){
        return num1/num2;
    }
    else{
        System.out.println("Cannot Divide A Number By Zero!");
    }
    return num1/num2;
}

}
}

```

ServerIntf.java:

```

import java.rmi.*;

interface ServerIntf extends Remote{
    // Syntax for method declaration: accessSpecifier returnType
method_name(arguments...){ return value}
}

```

```
    public double Addition(double num1, double num2) throws
RemoteException;
    public double Subtraction(double num1, double num2) throws
RemoteException;
    public double Multiplication(double num1, double num2) throws
RemoteException;
    public double Division(double num1, double num2) throws
RemoteException;
}
```