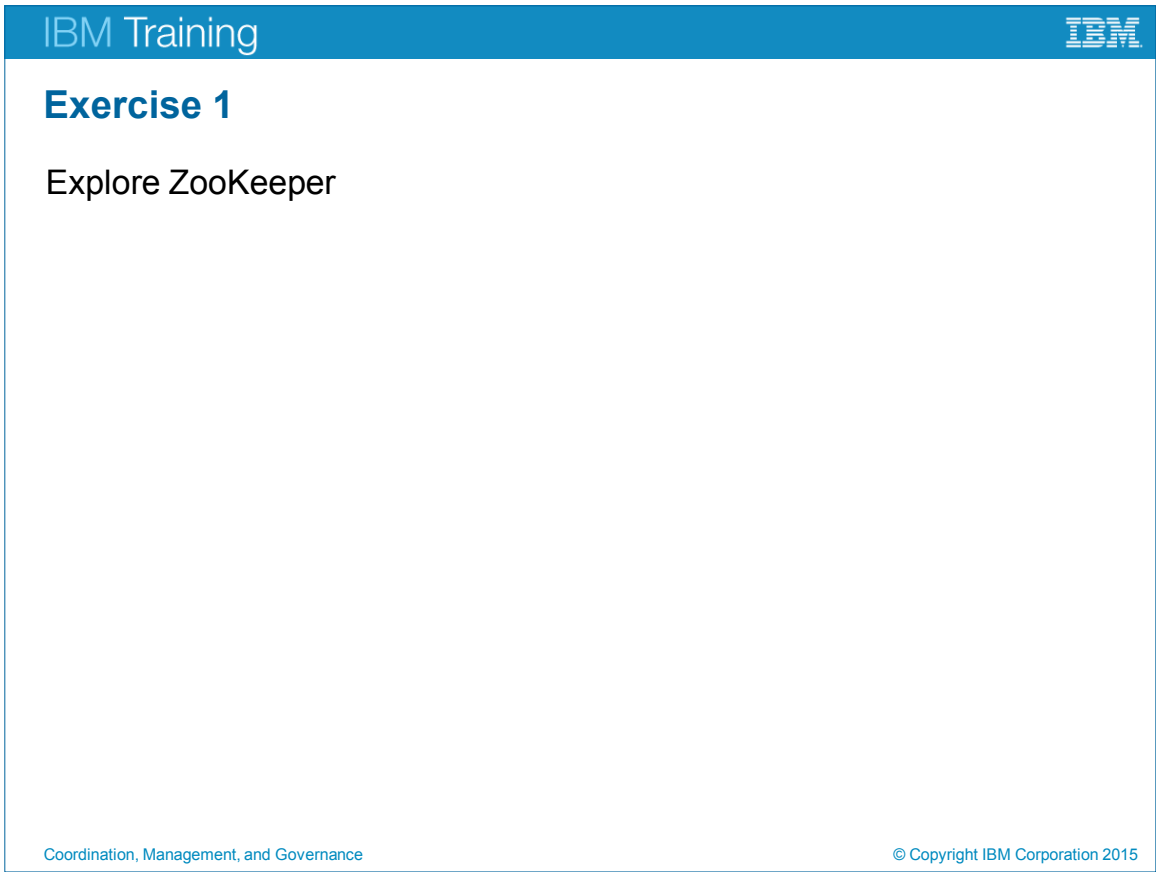


Exercise 1: Explore Zookeeper

Exercise 1: Explore ZooKeeper

Purpose:
You will connect to ZooKeeper and explore the ZooKeeper files.

Task 1. Connect to ZooKeeper and explore the ZooKeeper files.

The major reference for Apache ZooKeeper can be found on the Apache ZooKeeper website:

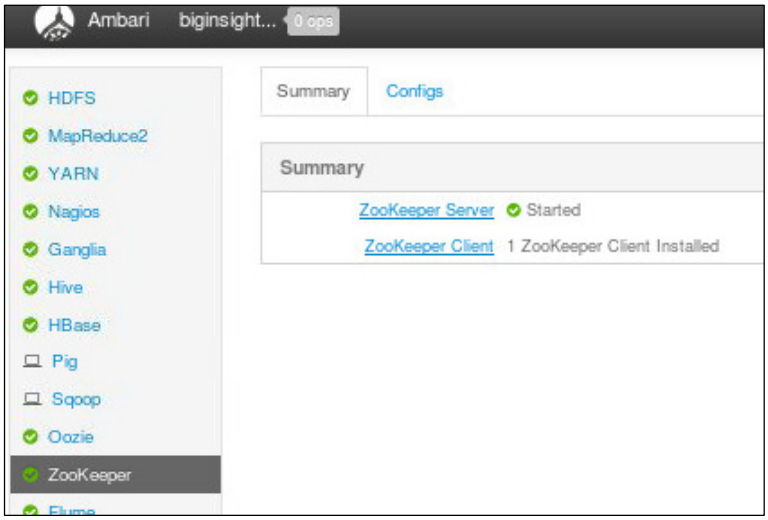
- http://zookeeper.apache.org
- http://zookeeper.apache.org/doc/trunk/ (Documentation)

Additional information can be found on the ZooKeeper wiki:

- https://cwiki.apache.org/confluence/display/ZOOKEEPER/Index
- https://cwiki.apache.org/confluence/display/ZOOKEEPER/Tutorial (Quick Tutorial)

A full course *Developing Distributed Applications Using ZooKeeper*, updated for BigInsights v4 and the Open Data Platform initiative is available on the BigDataUniversity.com (BDU) at bigdatauniversity.com/courses/course/view.php?id=547 .

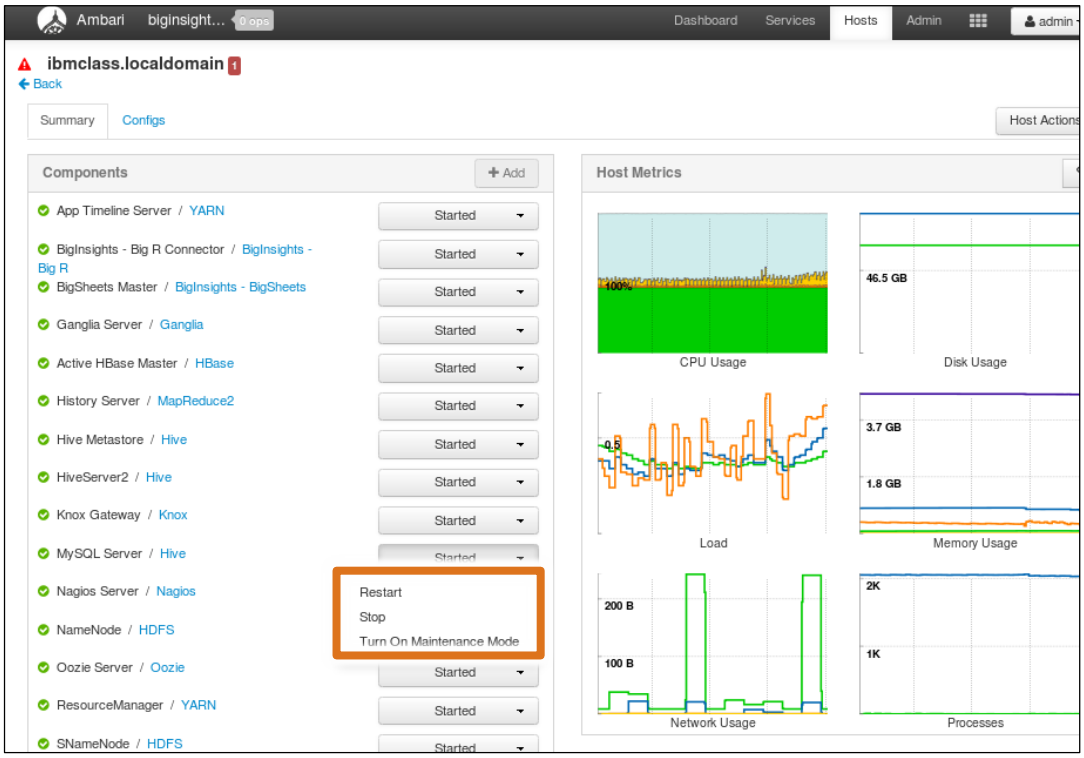
1. Connect to and login to your lab environment withuser **biadmin** and password **biadmin** credentials.
2. Launch **Firefox**, and then if necessary, navigate to the **Ambari** login page, **http://localhost:8080**, logging in as **admin/admin**.
3. Click **ZooKeeper** in the left pane to see the Summary information.



You will see more information about the ZooKeeper Server.

4. Click **ZooKeeper Server** in the **Summary** pane.

   This will bring up a detailed list of individual services where from the individual drop-downs you are able to Start, Stop, Restart, Turn on Maintenance Mode.



5. In the **Components** list, beside ZooKeeper, expand the drop down and click **Start** (if stopped) or **Restart** (if currently running).
6. Click **OK** to confirm, and after the background operation is complete, click **OK** to close the Background Operations Running window.
7. Minimize the Ambari Web Console browser (Firefox).

Task 2. Investigate the ZooKeeper environment.

You will now use a terminal window to navigate to the ZooKeeper home directory on the Linux file system and investigate the directories and files that you will find there.

1. To open a terminal window, right-click your desktop, and then click **Open in Terminal**.
2. Execute the following commands to change directory in the Linux file system to where you will find details of the **ZooKeeper Client**, and list the files that you find there:

```
cd /usr/iop/current/zookeeper-client
pwd
ls -l
```

```
[biadmin@ibmclass Desktop]$ cd /usr/iop/current/zookeeper-client
[biadmin@ibmclass zookeeper-client]$ pwd
/usr/iop/current/zookeeper-client
[biadmin@ibmclass zookeeper-client]$ ls -l
total 1328
drwxr-xr-x. 2 root root    4096 Apr 15 12:43 bin
lrwxrwxrwx. 1 root root      19 Apr 15 12:43 conf -> /etc/zookeeper/conf
drwxr-xr-x. 3 root root    4096 Apr 15 12:43 contrib
drwxr-xr-x. 6 root root    4096 Apr 15 12:43 doc
drwxr-xr-x. 2 root root    4096 Apr 15 12:43 lib
drwxr-xr-x. 3 root root    4096 Apr 15 12:43 man
-rw-r--r--. 1 root root 1337298 Mar 28 00:31 zookeeper-3.4.6_IBM_1.jar
lrwxrwxrwx. 1 root root      25 Apr 15 12:43 zookeeper.jar -> zookeeper-
3.4.6_IBM_1.jar
[biadmin@ibmclass zookeeper-client]$
```

Note the names of the various directories. These follow, in general, Linux directory naming conventions:

- **bin**: Executables to start/stop/interact with ZooKeeper
- **conf**: ZooKeeper and log configuration files
- **contrib:** Utilities to help integrate ZooKeeper into other systems: rest, fuse, perl, and python libraries.
- **docs:** ZooKeeper documentation

3. Execute the following commands to set your environmental variable ZOOKEEPER_HOME to the current directory (as you may need it again in this window), change directory to the **bin** subdirectory, and start the **ZooKeeper Client Command Line Interface** (CLI):

```
export ZOOKEEPER_HOME=`pwd`
cd bin
./zkCli.sh
```

```
[biadmin@ibmclass zookeeper-client]$ export ZOOKEEPER_HOME=`pwd`
[biadmin@ibmclass zookeeper-client]$ cd bin
 [biadmin@ibmclass bin]$ ./zkCli.sh
Connecting to localhost:2181
2015-06-06 16:22:47,926 - INFO  [main:Environment@100] - Client
environment:zookeeper.version=3.4.6-IBM_1--1, built on 03/28/2015 04:29 GMT
2015-06-06 16:22:47,929 - INFO  [main:Environment@100] - Client
environment:host.name=ibmclass.localdomain
2015-06-06 16:22:47,929 - INFO  [main:Environment@100] - Client
environment:java.version=1.7.0_75
2015-06-06 16:22:47,933 - INFO  [main:Environment@100] - Client
environment:java.vendor=Oracle Corporation
2015-06-06 16:22:47,934 - INFO  [main:Environment@100] - Client
environment:java.home=/usr/lib/jvm/java-1.7.0-openjdk-1.7.0.75.x86_64/jre
2015-06-06 16:22:47,934 - INFO  [main:Environment@100] - Client
environment:java.class.path=/usr/iop/current/zookeeper-
client/bin/../build/classes:/usr/iop/current/zookeeper-
client/bin/../build/lib/*.jar:/usr/iop/current/zookeeper-client/bin/../lib/slf4j-
log4j12-1.6.1.jar:/usr/iop/current/zookeeper-client/bin/../lib/slf4j-api-
1.6.1.jar:/usr/iop/current/zookeeper-client/bin/../lib/netty-
3.7.0.Final.jar:/usr/iop/current/zookeeper-client/bin/../lib/log4j-
1.2.17.jar:/usr/iop/current/zookeeper-client/bin/../lib/jline-
0.9.94.jar:/usr/iop/current/zookeeper-client/bin/../zookeeper-
3.4.6_IBM_1.jar:/usr/iop/current/zookeeper-
client/bin/../src/java/lib/*.jar:/usr/iop/current/zookeeper-
client/bin/../conf::/usr/share/zookeeper/*
2015-06-06 16:22:47,934 - INFO  [main:Environment@100] - Client
environment:java.library.path=/usr/java/packages/lib/amd64:/usr/lib64:/lib64:/lib:/us
r/lib
2015-06-06 16:22:47,934 - INFO  [main:Environment@100] - Client
environment:java.io.tmpdir=/tmp
2015-06-06 16:22:47,934 - INFO  [main:Environment@100] - Client
environment:java.compiler=<NA>
2015-06-06 16:22:47,934 - INFO  [main:Environment@100] - Client
environment:os.name=Linux
2015-06-06 16:22:47,934 - INFO  [main:Environment@100] - Client
environment:os.arch=amd64
2015-06-06 16:22:47,934 - INFO  [main:Environment@100] - Client
environment:os.version=2.6.32-504.el6.x86_64
2015-06-06 16:22:47,935 - INFO  [main:Environment@100] - Client
environment:user.name=biadmin
2015-06-06 16:22:47,935 - INFO  [main:Environment@100] - Client
environment:user.home=/home/biadmin
2015-06-06 16:22:47,935 - INFO  [main:Environment@100] - Client
environment:user.dir=/usr/iop/4.0.0.0/zookeeper/bin
2015-06-06 16:22:47,937 - INFO  [main:ZooKeeper@438] - Initiating client connection,
connectString=localhost:2181 sessionTimeout=30000
watcher=org.apache.zookeeper.ZooKeeperMain$MyWatcher@53187f60
Welcome to ZooKeeper!
2015-06-06 16:22:48,115 - INFO  [main-
SendThread(localhost.localdomain:2181):ClientCnxn$SendThread@975] - Opening socket
connection to server localhost.localdomain/127.0.0.1:2181. Will not attempt to
authenticate using SASL (unknown error)
JLine support is enabled
```

```
2015-06-06 16:22:48,150 - INFO  [main-
SendThread(localhost.localdomain:2181):ClientCnxn$SendThread@852] - Socket connection
established to localhost.localdomain/127.0.0.1:2181, initiating session
[zk: localhost:2181(CONNECTING) 0] 2015-06-06 16:22:48,200 - INFO  [main-
SendThread(localhost.localdomain:2181):ClientCnxn$SendThread@1235] - Session
establishment complete on server localhost.localdomain/127.0.0.1:2181, sessionid =
0x14dcaa8f2000000, negotiated timeout = 30000

WATCHER::

WatchedEvent state:SyncConnected type:None path:null

[zk: localhost:2181(CONNECTED) 0]
```

You will probably have to press **Enter** to get this last line as your ongoing prompt.

4. Type **`help`** to get a list of available commands for the ZK CLI.

```
zk: localhost:2181(CONNECTED) 0] help
ZooKeeper -server host:port cmd args
   connect host:port
   get path [watch]
   ls path [watch]
   set path data [version]
   rmr path
   delquota [-n|-b] path
   quit
   printwatches on|off
   create [-s] [-e] path data acl
   stat path [watch]
   close
   ls2 path [watch]
   history
   listquota path
   setAcl path acl
   getAcl path
   sync path
   redo cmdno
   addauth scheme auth
   delete path [version]
   setquota -n|-b val path
[zk: localhost:2181(CONNECTED) 1]
```

5. Type **`ls \`** in the ZooKeeper CLI prompt.

   This tells ZK to list the ZNodes at the top level of the ZooKeeper node hierarchy. For this we need a slash ("/") after the ls command:

```
[zk: localhost:2181(CONNECTED) 1] ls /
[hiveserver2, hbase-unsecure, zookeeper]
[zk: localhost:2181(CONNECTED) 2]
```

   ZooKeeper returns [hiveserver2, hbase-unsecure, zookeeper*]*. (your results may be slightly different). This means there are three ZNodes at the top of the node hierarchy. The second node listed is used by hbase.

   Notice that each interaction in this session with the ZK CLI is numbered: 1, 2, and so on.

6. To see the subnodes of the hbase node, type **`ls /hbase-unsecure`**.

```
[zk: localhost:2181(CONNECTED) 2] ls /hbase-unsecure
[meta-region-server, rolllog-proc, backup-masters, table, draining, region-in-
transition, table-lock, running, master, namespace, hbaseid, online-snapshot,
replication, splitWAL, recovering-regions, rs]
[zk: localhost:2181(CONNECTED) 3]
```

7. Type **`get /hbase-unsecure`** to view the data and metadata stored in any of the nodes.

   You should look at the hbase node:

```
[zk: localhost:2181(CONNECTED) 3] get /hbase-unsecure

cZxid = 0xb
ctime = Wed Apr 15 12:12:39 GMT-05:00 2015
mZxid = 0xb
mtime = Wed Apr 15 12:12:39 GMT-05:00 2015
pZxid = 0x723
cversion = 72
dataVersion = 0
aclVersion = 0
ephemeralOwner = 0x0
dataLength = 0
numChildren = 16
[zk: localhost:2181(CONNECTED) 4]
```

   The meaning of the data / metadata fields for this response is shown in this table:

Field / Data	Description
Blank line	(Optional) line of text that is actual data stored in this ZNode
cZxid = 0xb	The zxid (ZooKeeper Transaction Id) of the change that caused this znode to be created
ctime = Wed Apr 15 12:12:39 GMT-05:00 2015	The time when this znode was created
mZxid = 0xb	The zxid of the change that last modified this znode
mtime = Wed Apr 15 12:12:39 GMT-05:00 2015	The time when this znode was last modified.
pZxid = 0x723	The zxid of the change that last modified children of this znode.
cversion = 72	The number of changes to the children of this znode.
dataVersion = 0	The number of changes to the data of this znode.
aclVersion = 0	The number of changes to the ACL of this znode.
ephemeralOwner = 0x0	The session id of the owner of this znode if the znode is an ephemeral node. If it is not an ephemeral node, it will be zero
dataLength = 0	The length of the data field of this znode (zero in this case, since blank)
numChildren = 16	The number of children of this znode.

There are a number of other commands that can be applied against this ZNode and other ZNodes of the ZooKeeper Server. For further details check the documentation.

Extra exercises are available in the BDU course *Developing Distributed Applications Using ZooKeeper and excellent documentation can be found on http://zookeeper.apache.ord.*

8. Close all open windows.

Results:
You connected to ZooKeeper and explored the ZooKeeper files.