BookKeeper Getting Started Guide

by

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1. Programming with BookKeeper

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- Closing a ledger.
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1.1. Instantiating BookKeeper.

The first step to use BookKeeper is to instantiate a BookKeeper object:

```
org.apache.bookkeeper.BookKeeper
```

There are three BookKeeper constructors:

```
public BookKeeper(String servers) throws KeeperException, IOException
```

where:
- `servers` is a comma-separated list of ZooKeeper servers.

```
public BookKeeper(ZooKeeper zk) throws InterruptedException, KeeperException
```

where:
- `zk` is a ZooKeeper object. This constructor is useful when the application also using ZooKeeper and wants to have a single instance of ZooKeeper.

```
public BookKeeper(ZooKeeper zk, ClientSocketChannelFactory channelFactory) throws InterruptedException, KeeperException
```

where:
- `zk` is a ZooKeeper object. This constructor is useful when the application also using ZooKeeper and wants to have a single instance of ZooKeeper.
- `channelFactory` is a netty channel object
  (`org.jboss.netty.channel.socket`).
1.2. Creating a ledger.

Before writing entries to BookKeeper, it is necessary to create a ledger. With the current BookKeeper API, it is possible to create a ledger both synchronously or asynchronously. The following methods belong to org.apache.bookkeeper.client.BookKeeper.

**Synchronous call:**

```java
public LedgerHandle createLedger(int ensSize, int qSize, DigestType type, byte passwd[]) throws KeeperException, InterruptedException, IOException, BKException
```

where:
- `ensSize` is the number of bookies (ensemble size);
- `qSize` is the write quorum size;
- `type` is the type of digest used with entries: either MAC or CRC32.
- `passwd` is a password that authorizes the client to write to the ledger being created.

All further operations on a ledger are invoked through the `LedgerHandle` object returned.

As a convenience, we provide a `createLedger` with default parameters (3,2,VERIFIABLE), and the only two input parameters it requires are a digest type and a password.

**Asynchronous call:**

```java
public void asyncCreateLedger(int ensSize, int qSize, DigestType type, byte passwd[], CreateCallback cb, Object ctx)
```

The parameters are the same of the synchronous version, with the exception of `cb` and `ctx`. `CreateCallback` is an interface in org.apache.bookkeeper.client.AsyncCallback, and a class implementing it has to implement a method called `createComplete` that has the following signature:

```java
void createComplete(int rc, LedgerHandle lh, Object ctx);
```

where:
- `rc` is a return code (please refer to org.apache.bookkeeper.client.BKException for a list);
- `lh` is a `LedgerHandle` object to manipulate a ledger;
• ctx is a control object for accountability purposes. It can be essentially any object the application is happy with.

The ctx object passed as a parameter to the call to create a ledger is the one same returned in the callback.

1.3. Adding entries to a ledger.

Once we have a ledger handle lh obtained through a call to create a ledger, we can start writing entries. As with creating ledgers, we can write both synchronously and asynchronously. The following methods belong to org.apache.bookkeeper.client.LedgerHandle.

Synchronous call:

public long addEntry(byte[] data) throws InterruptedException
where:
• data is a byte array;

A call to addEntry returns the status of the operation (please refer to org.apache.bookkeeper.client.BKDefs for a list);

Asynchronous call:

public void asyncAddEntry(byte[] data, AddCallback cb, Object ctx)

It also takes a byte array as the sequence of bytes to be stored as an entry. Additionally, it takes a callback object cb and a control object ctx. The callback object must implement the AddCallback interface in org.apache.bookkeeper.client.AsyncCallback, and a class implementing it has to implement a method called addComplete that has the following signature:

void addComplete(int rc, LedgerHandle lh, long entryId, Object ctx);

where:
• rc is a return code (please refer to org.apache.bookkeeper.client.BKDefs for a list);
• lh is a LedgerHandle object to manipulate a ledger;
• entryId is the identifier of entry associated with this request;
• ctx is control object used for accountability purposes. It can be any object the application is happy with.

1.4. Closing a ledger.

Once a client is done writing, it closes the ledger. The following methods belong to org.apache.bookkeeper.client.LedgerHandle.

**Synchronous close:**

```java
public void close() throws InterruptedException
```

It takes no input parameters.

**Asynchronous close:**

```java
public void asyncClose(CloseCallback cb, Object ctx) throws InterruptedException
```

It takes a callback object cb and a control object ctx. The callback object must implement the CloseCallback interface in org.apache.bookkeeper.client.AsyncCallback, and a class implementing it has to implement a method called closeComplete that has the following signature:

```java
void closeComplete(int rc, LedgerHandle lh, Object ctx)
```

where:

• rc is a return code (please refer to org.apache.bookkeeper.client.BKDefs for a list);
• lh is a LedgerHandle object to manipulate a ledger;
• ctx is control object used for accountability purposes.

1.5. Opening a ledger.

To read from a ledger, a client must open it first. The following methods belong to org.apache.bookkeeper.client.BookKeeper.

**Synchronous open:**

```java
public LedgerHandle openLedger(long lId, DigestType type, byte passwd[]) throws InterruptedException, BKException
```

• ledgerId is the ledger identifier;
• type is the type of digest used with entries: either MAC or CRC32.
• passwd is a password to access the ledger (used only in the case of VERIFIABLE ledgers);

Asynchronous open:

```java
public void asyncOpenLedger(long lId, DigestType type, byte passwd[], OpenCallback cb, Object ctx)
```

It also takes a a ledger identifier and a password. Additionally, it takes a callback object cb and a control object ctx. The callback object must implement the OpenCallback interface in org.apache.bookkeeper.client.AsyncCallback, and a class implementing it has to implement a method called openComplete that has the following signature:

```java
public void openComplete(int rc, LedgerHandle lh, Object ctx)
```

where:
• rc is a return code (please refer to org.apache.bookkeeper.client.BKDefs for a list);
• lh is a LedgerHandle object to manipulate a ledger;
• ctx is control object used for accountability purposes.

1.6. Reading from ledger

Read calls may request one or more consecutive entries. The following methods belong to org.apache.bookkeeper.client.LedgerHandle.

Synchronous read:

```java
public LedgerSequence readEntries(long firstEntry, long lastEntry) throws InterruptedException, BKException
```

• firstEntry is the identifier of the first entry in the sequence of entries to read;
• lastEntry is the identifier of the last entry in the sequence of entries to read.

Asynchronous read:

```java
public void asyncReadEntries(long firstEntry, long lastEntry, ReadCallback cb, Object ctx) throws BKException, InterruptedException
```
It also takes a first and a last entry identifiers. Additionally, it takes a callback object cb and a control object ctx. The callback object must implement the ReadCallback interface in org.apache.bookkeeper.client.AsyncCallback, and a class implementing it has to implement a method called readComplete that has the following signature:

```java
void readComplete(int rc, LedgerHandle lh, Enumeration<LedgerEntry> seq, Object ctx)
```

where:

- `rc` is a return code (please refer to org.apache.bookkeeper.client.BKDefs for a list);
- `lh` is a LedgerHandle object to manipulate a ledger;
- `seq` is a Enumeration<LedgerEntry> object to containing the list of entries requested;
- `ctx` is control object used for accountability purposes.