Introduction to Benchmark

Database Systems
DataLab, CS, NTHU
Spring, 2023

Outline

- VanillaBench Project
  - Introduction to VanillaBench
  - Setting Benchmark Configurations
  - Starting Up Server for Benchmarking
  - Running Benchmark Client
  - Assignment 2

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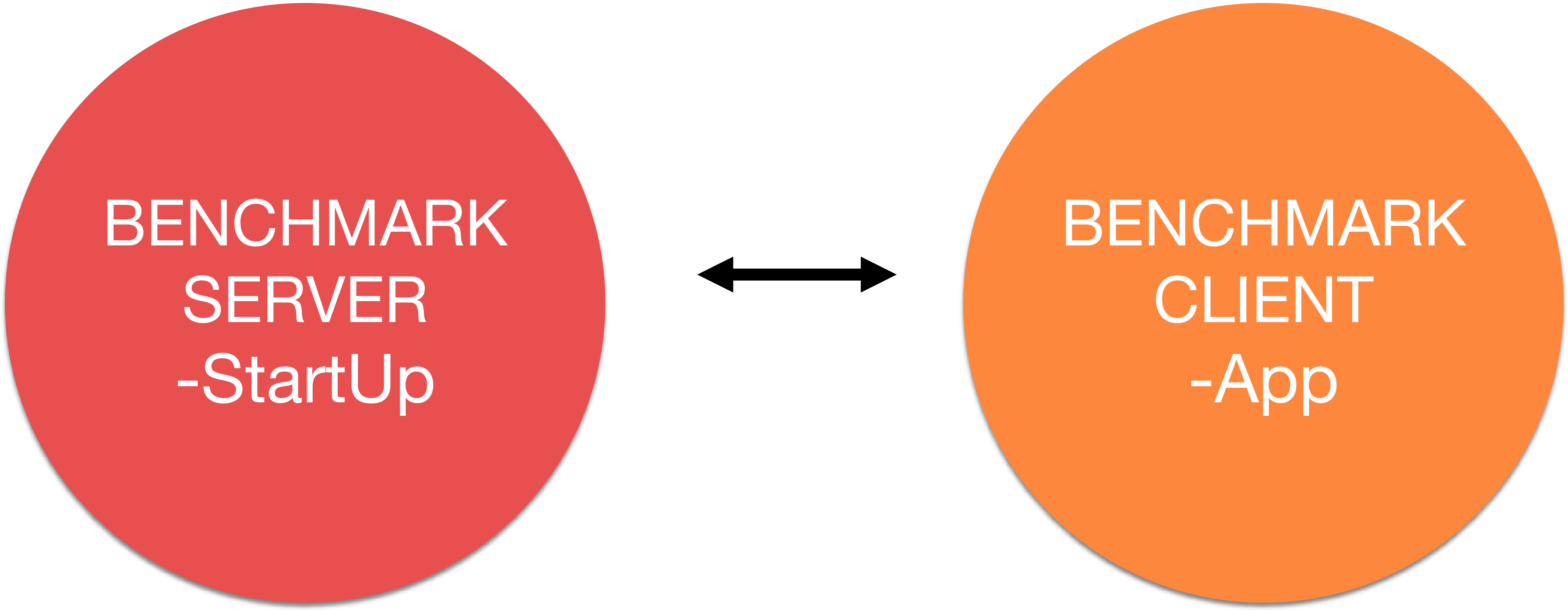
VanillaBench

- VanillaBench is a project designed for automatically benchmarking VanillaCore
- It contains several benchmark procedures
- It also has a lot of adjustable testing parameters

[Icon Source]

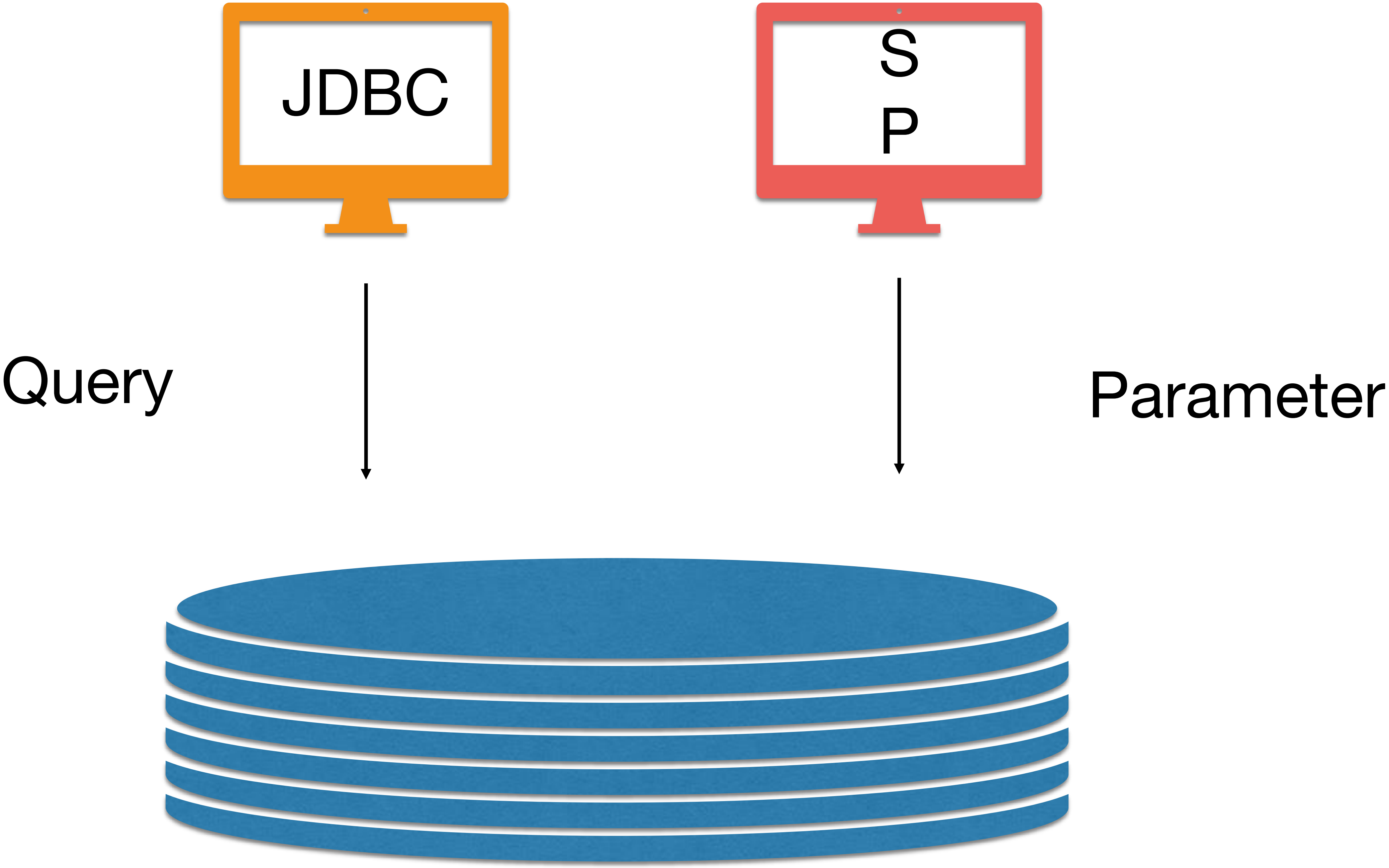
Two Main Methods



BENCHMARK SERVER
-StartUp

BENCHMARK CLIENT
-App

JDBC / SP ?



Create SP

```
-- Insert user
CREATE PROCEDURE insertuser(uname VARCHAR(50), ukarma INT)
LANGUAGE SQL
AS $$
        INSERT INTO users(name, karma) VALUES (uname, ukarma);
$$;

-- Insert post
CREATE PROCEDURE insertpost(uname VARCHAR(50), post TEXT)
LANGUAGE SQL
AS $$
        INSERT INTO posts(text, "authorId")
        VALUES (post, (SELECT id FROM users WHERE name = uname));
$$;
```

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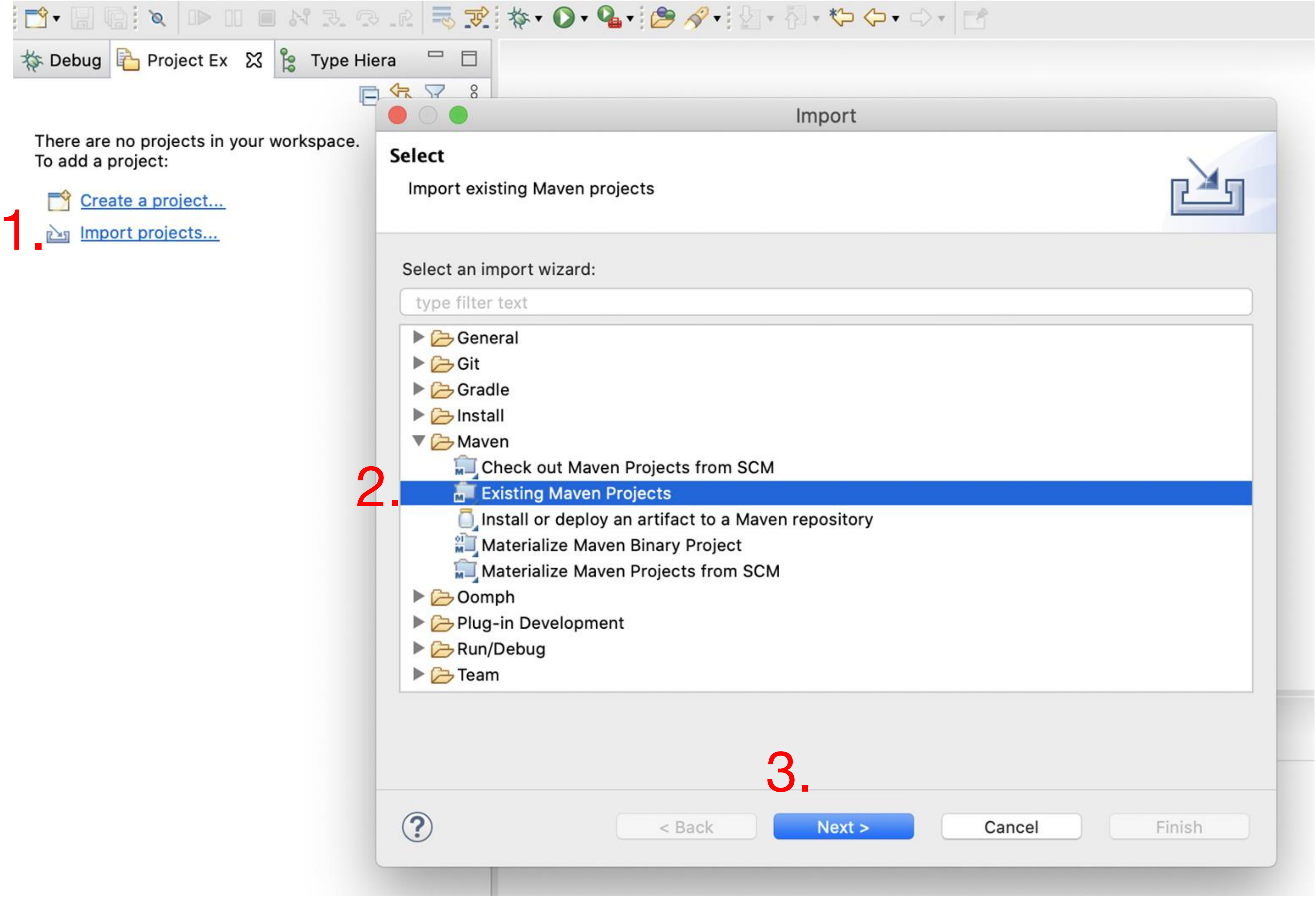
Clone the Project First

- The code of VanillaBench has been pushed to vanilladb repository
- All you need is to clone from the remote repository

```
> git clone
```

- You can clone from here:
    - https://shwu10.cs.nthu.edu.tw/courses/databases/2023-spring/db23-assignment-2

Import Project(1/3)



There are no projects in your workspace.
To add a project:

Create a project...

1. Import projects...

Import

Select

Import existing Maven projects

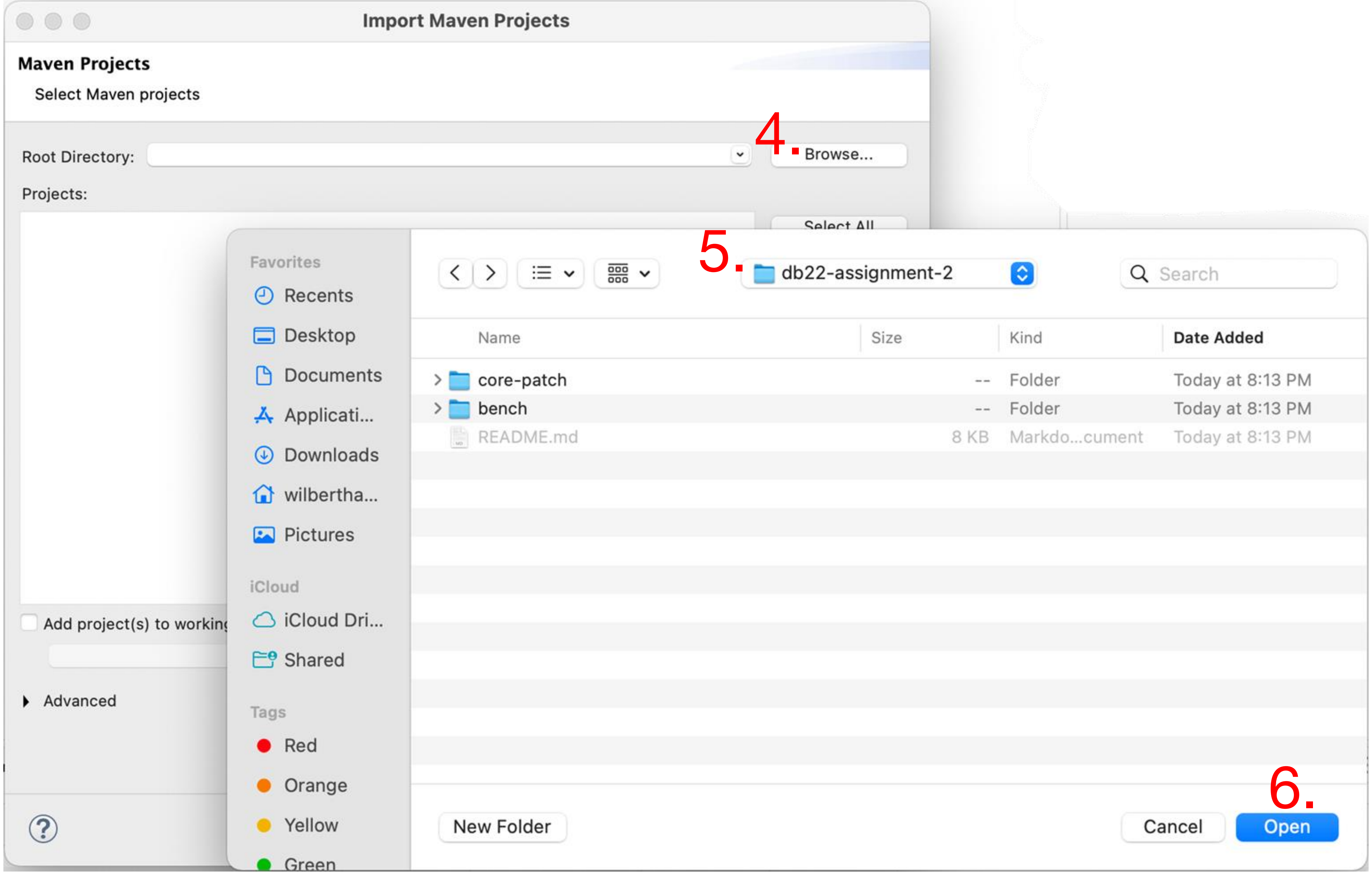
Select an import wizard:

type filter text

- General
- Git
- Gradle
- Install
- Maven
  - Check out Maven Projects from SCM
  - 2. Existing Maven Projects
  - Install or deploy an artifact to a Maven repository
  - Materialize Maven Binary Project
  - Materialize Maven Projects from SCM
- Oomph
- Plug-in Development
- Run/Debug
- Team

3. Next >

Import Project(2/3)



Import Maven Projects

Maven Projects

Select Maven projects

Root Directory:

4. Browse...

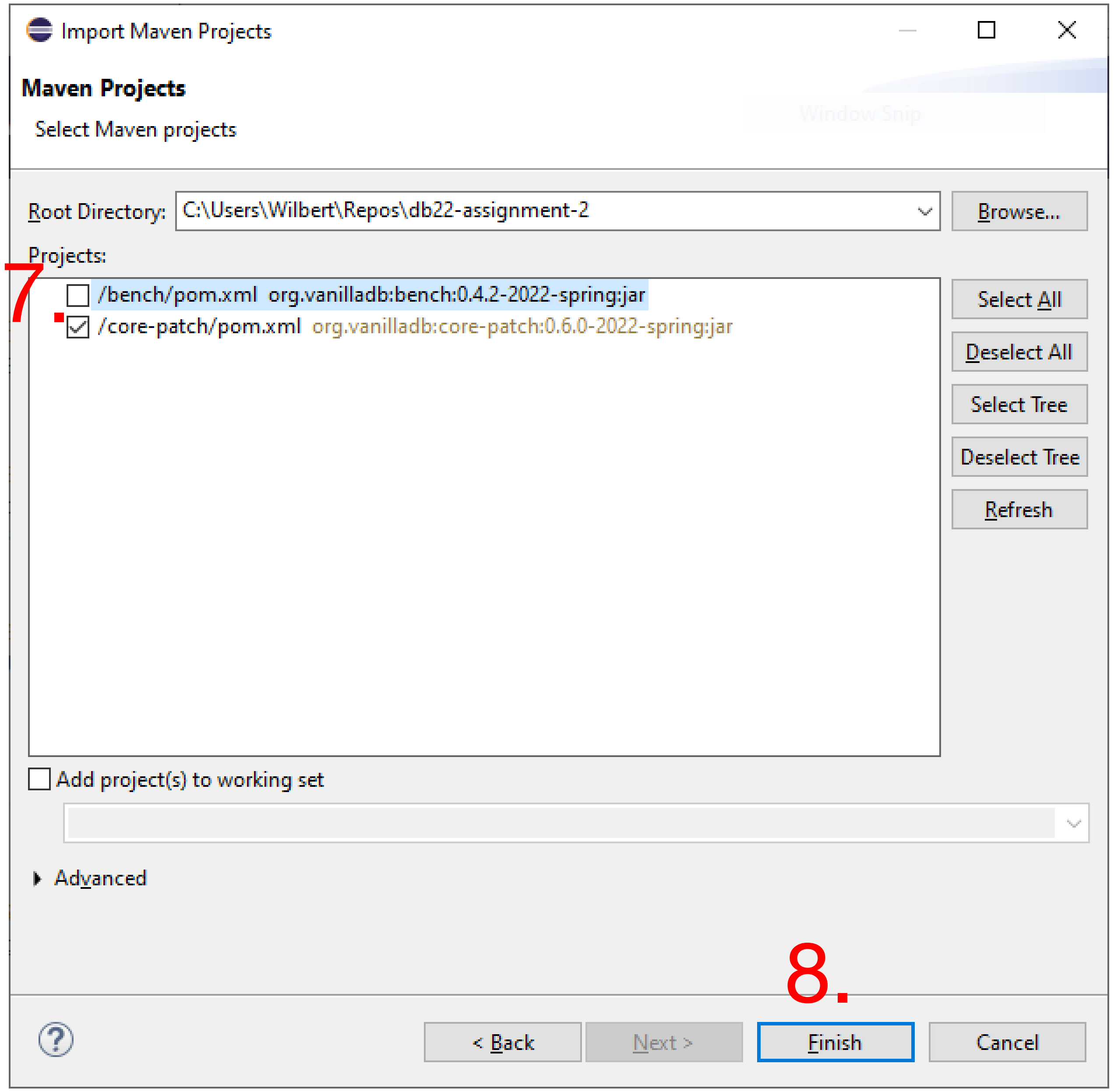
Projects:

5. db22-assignment-2

Name	Size	Kind	Date Added
core-patch	--	Folder	Today at 8:13 PM
bench	--	Folder	Today at 8:13 PM
README.md	8 KB	Markdo...cument	Today at 8:13 PM

6. Open

Import Project(3/3)



7.

Import Maven Projects

Maven Projects

Select Maven projects

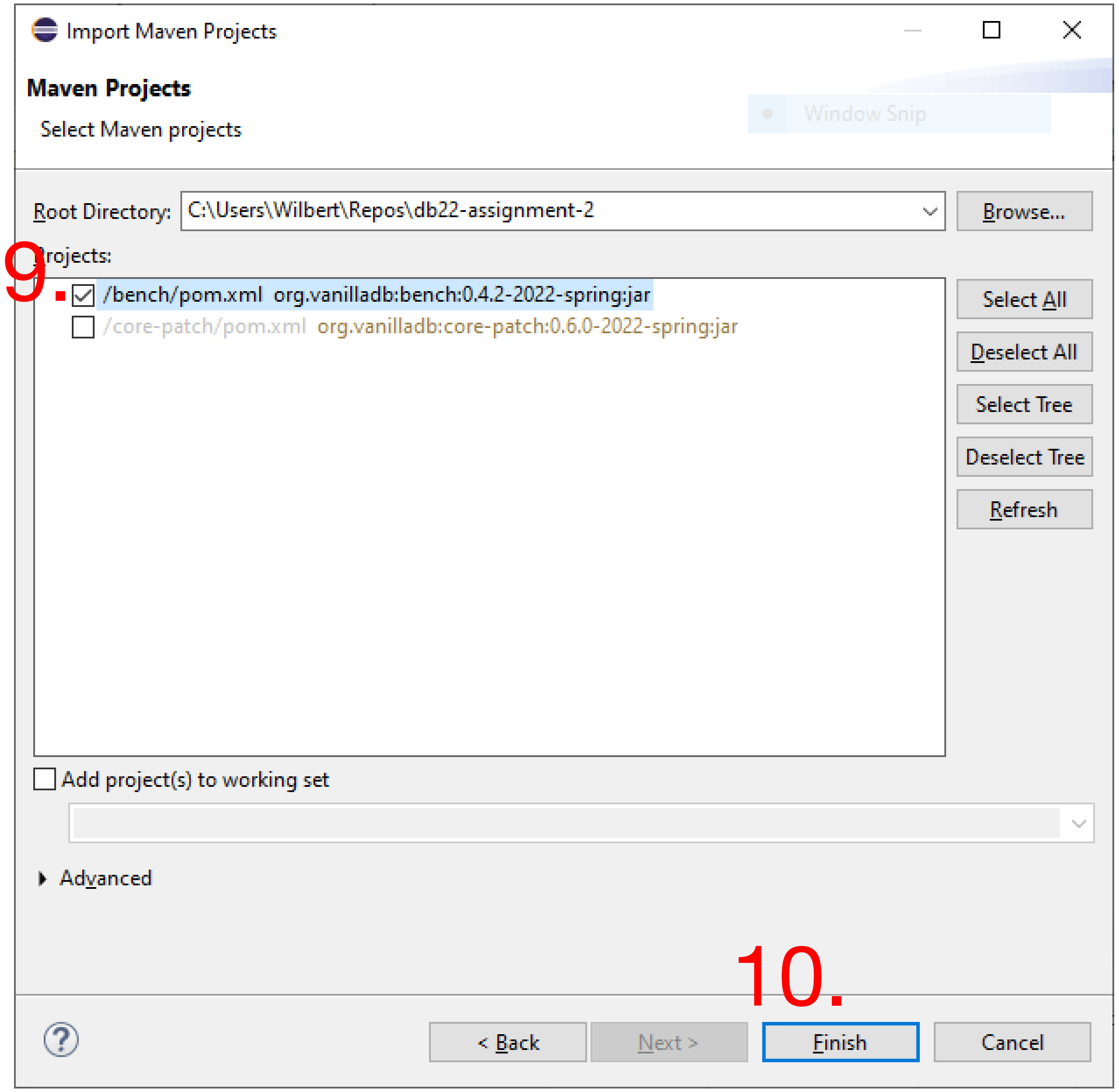
Root Directory: C:\Users\Wilbert\Repos\db22-assignment-2

Projects:

- □ /bench/pom.xml org.vanilladb:bench:0.4.2-2022-spring:jar
- ☑ /core-patch/pom.xml org.vanilladb:core-patch:0.6.0-2022-spring:jar

□ Add project(s) to working set

8.



9.

Import Maven Projects

Maven Projects

Select Maven projects

Root Directory: C:\Users\Wilbert\Repos\db22-assignment-2

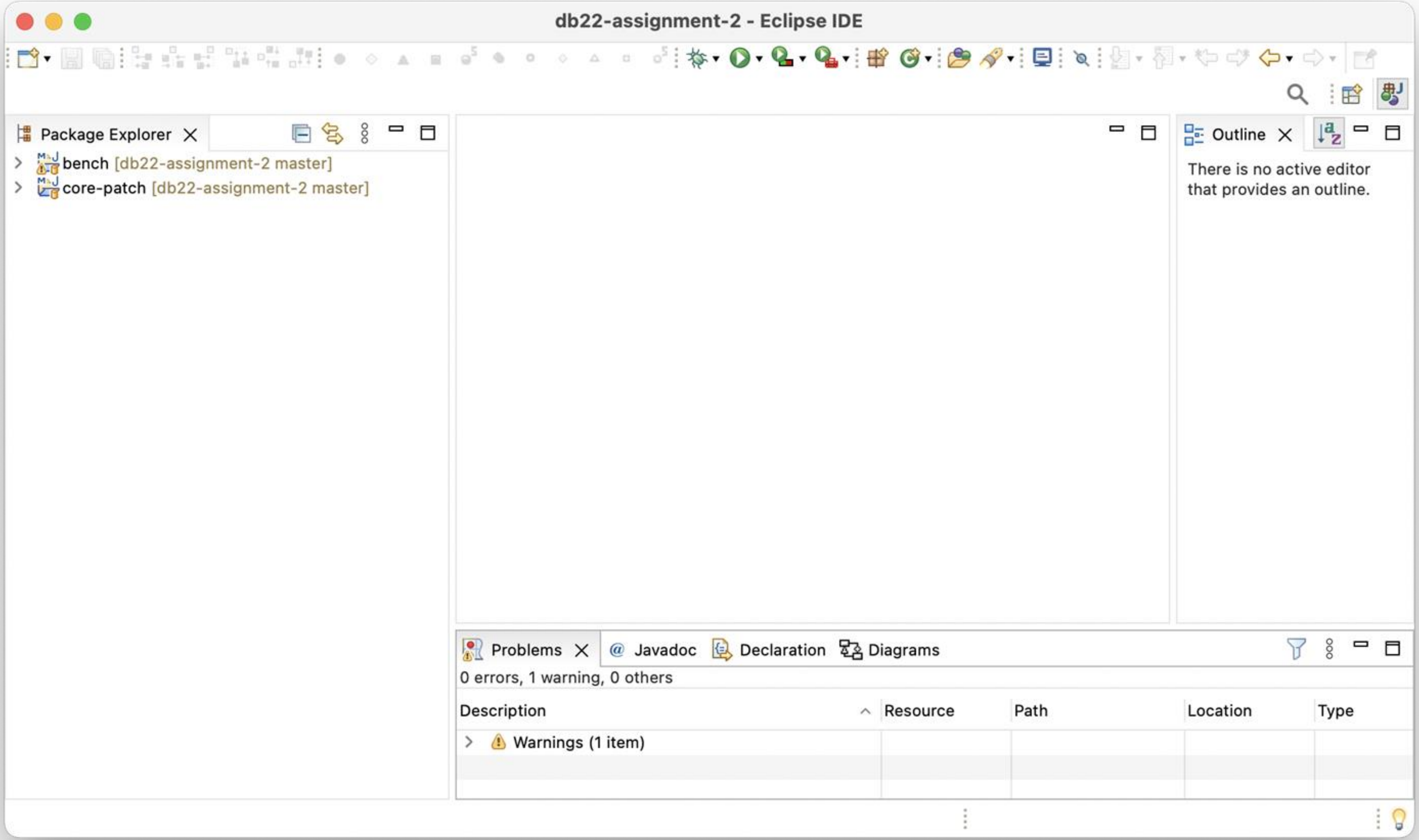
Projects:

- ☑ /bench/pom.xml org.vanilladb:bench:0.4.2-2022-spring:jar
- □ /core-patch/pom.xml org.vanilladb:core-patch:0.6.0-2022-spring:jar

□ Add project(s) to working set

10.

Finish Import Projects



db22-assignment-2 - Eclipse IDE

bench [db22-assignment-2 master]
core-patch [db22-assignment-2 master]

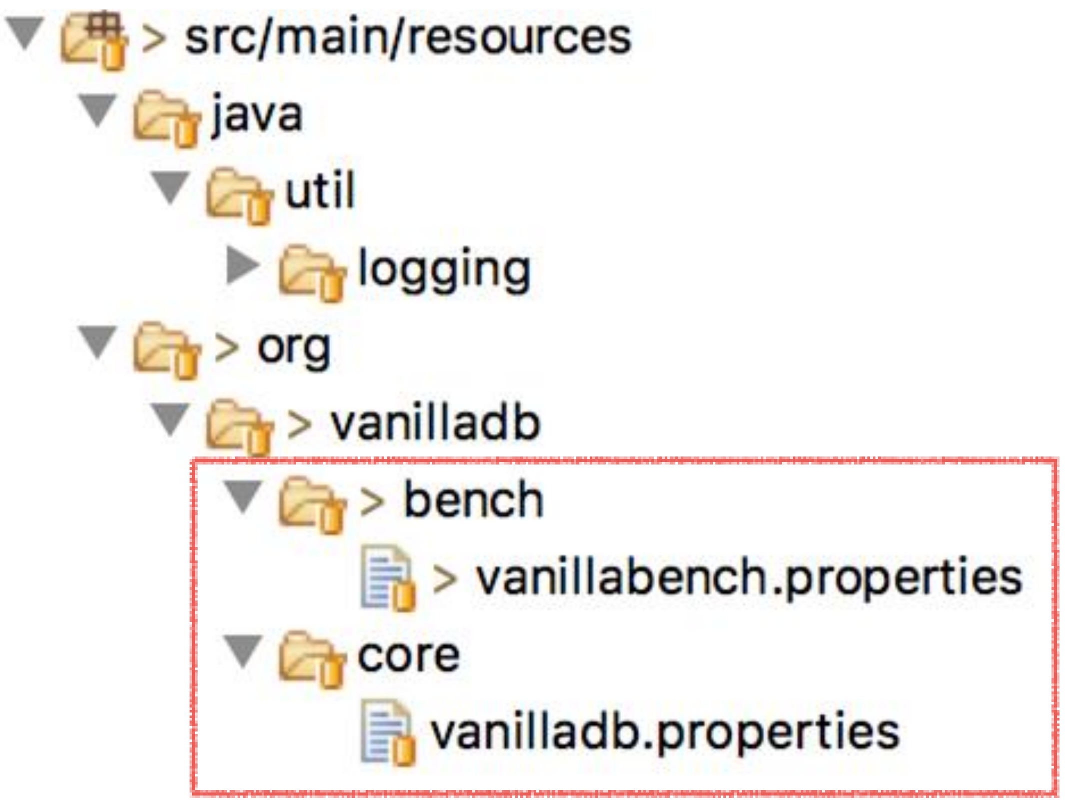
There is no active editor that provides an outline.

0 errors, 1 warning, 0 others

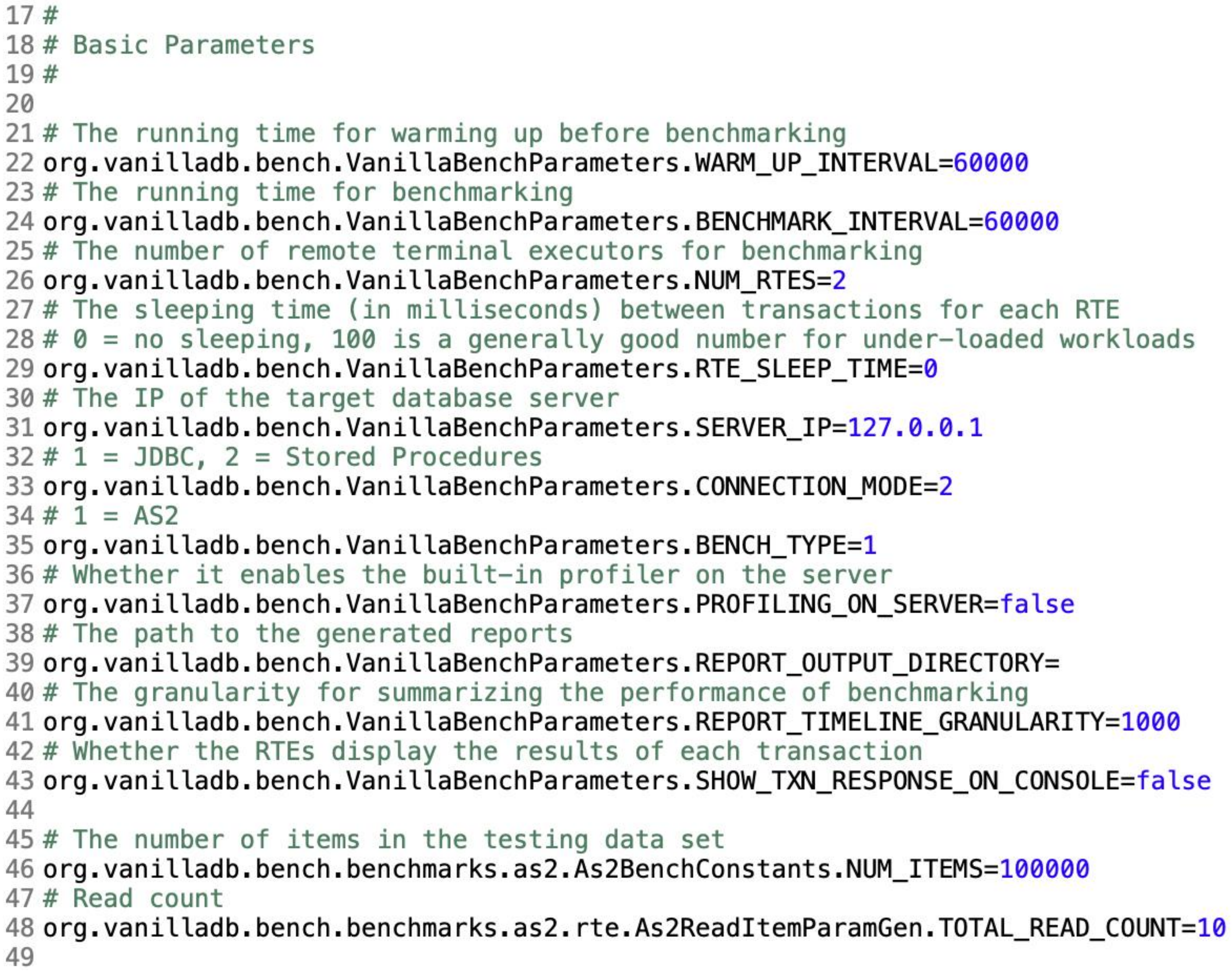
Description	Resource	Path	Location	Type
Warnings (1 item)				

Benchmark Setting

- Benchmark project also has its own set of properties files



```
▼ > src/main/resources
  ▼ java
    ▼ util
      ▶ logging
  ▼ > org
    ▼ > vanilladb
      ▼ > bench
          > vanillabench.properties
      ▼ core
          vanilladb.properties
```

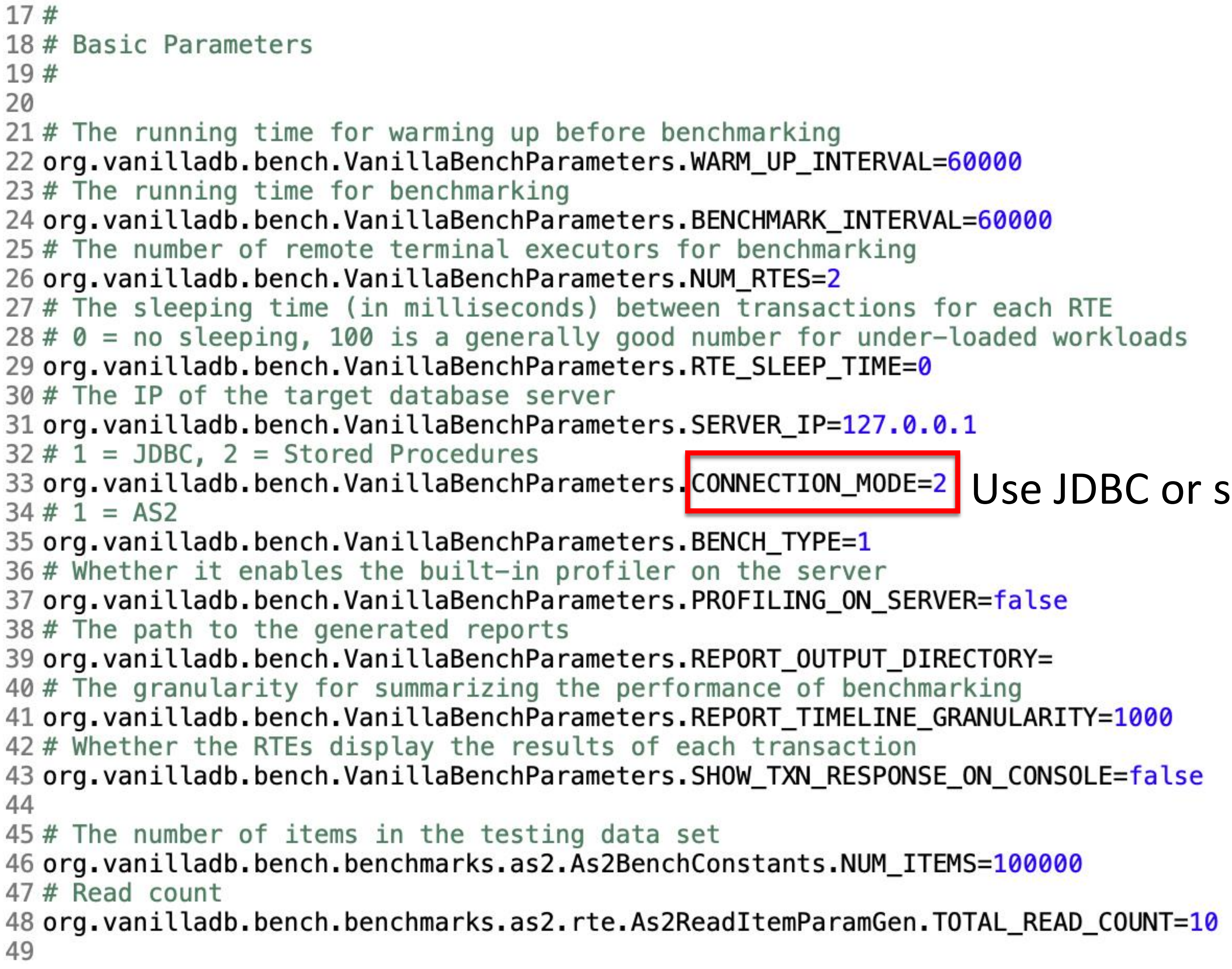


```
#
# Basic Parameters
#

# The running time for warming up before benchmarking
org.vanilladb.bench.VanillaBenchParameters.WARM_UP_INTERVAL=60000
# The running time for benchmarking
org.vanilladb.bench.VanillaBenchParameters.BENCHMARK_INTERVAL=60000
# The number of remote terminal executors for benchmarking
org.vanilladb.bench.VanillaBenchParameters.NUM_RTES=2
# The sleeping time (in milliseconds) between transactions for each RTE
# 0 = no sleeping, 100 is a generally good number for under-loaded workloads
org.vanilladb.bench.VanillaBenchParameters.RTE_SLEEP_TIME=0
# The IP of the target database server
org.vanilladb.bench.VanillaBenchParameters.SERVER_IP=127.0.0.1
# 1 = JDBC, 2 = Stored Procedures
org.vanilladb.bench.VanillaBenchParameters.CONNECTION_MODE=2
# 1 = AS2
org.vanilladb.bench.VanillaBenchParameters.BENCH_TYPE=1
# Whether it enables the built-in profiler on the server
org.vanilladb.bench.VanillaBenchParameters.PROFILING_ON_SERVER=false
# The path to the generated reports
org.vanilladb.bench.VanillaBenchParameters.REPORT_OUTPUT_DIRECTORY=
# The granularity for summarizing the performance of benchmarking
org.vanilladb.bench.VanillaBenchParameters.REPORT_TIMELINE_GRANULARITY=1000
# Whether the RTEs display the results of each transaction
org.vanilladb.bench.VanillaBenchParameters.SHOW_TXN_RESPONSE_ON_CONSOLE=false

# The number of items in the testing data set
org.vanilladb.bench.benchmarks.as2.As2BenchConstants.NUM_ITEMS=100000
# Read count
org.vanilladb.bench.benchmarks.as2.rte.As2ReadItemParamGen.TOTAL_READ_COUNT=10

```



```
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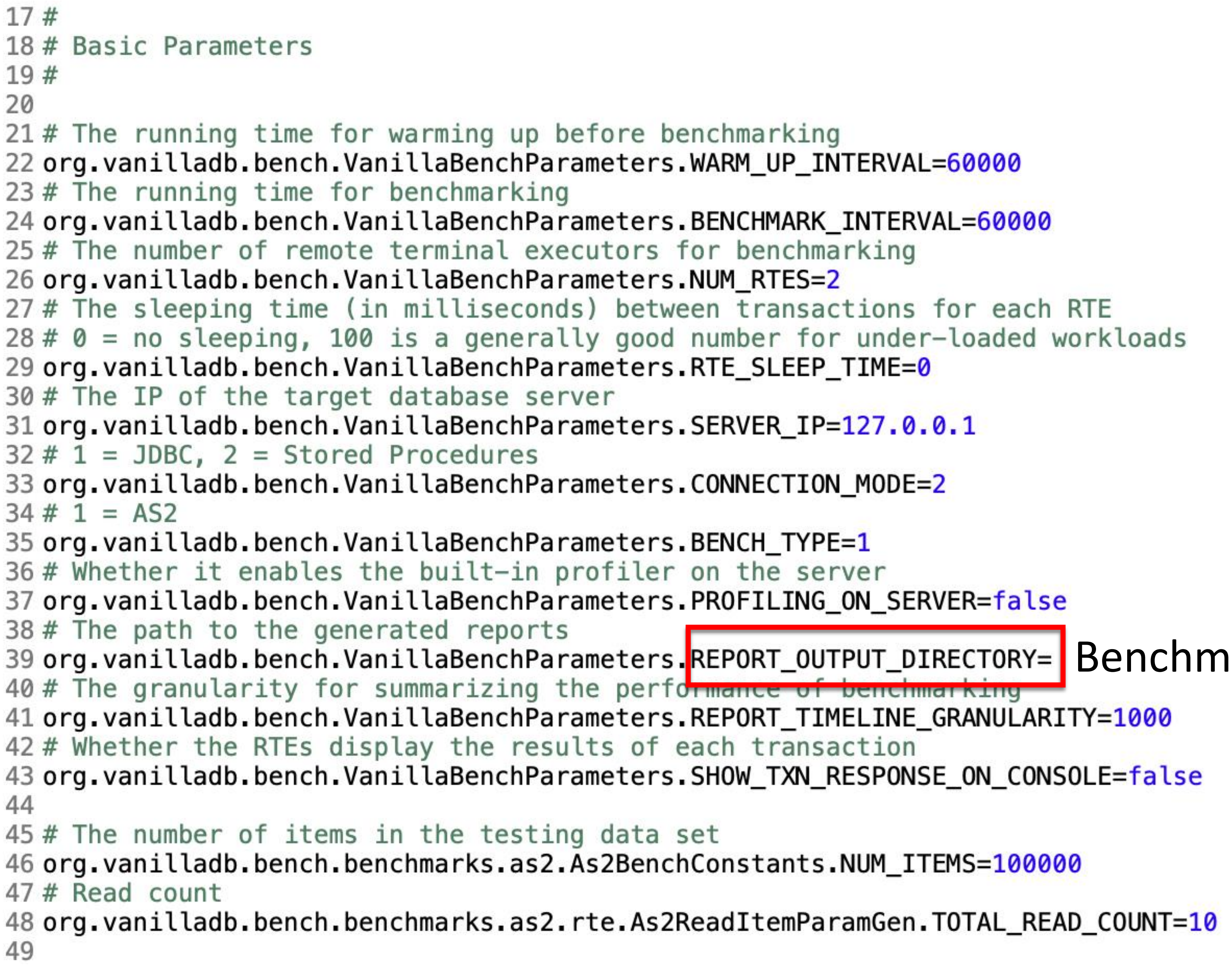
org.vanilladb.bench.VanillaBenchParameters.SHOW_TXN_RESPONSE_ON_CONSOLE=false

# The number of items in the testing data set
org.vanilladb.bench.benchmarks.as2.As2BenchConstants.NUM_ITEMS=100000
# Read count
org.vanilladb.bench.benchmarks.as2.rte.As2ReadItemParamGen.TOTAL_READ_COUNT=10
```

Use JDBC or stored procedures



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```

Benchmark report path

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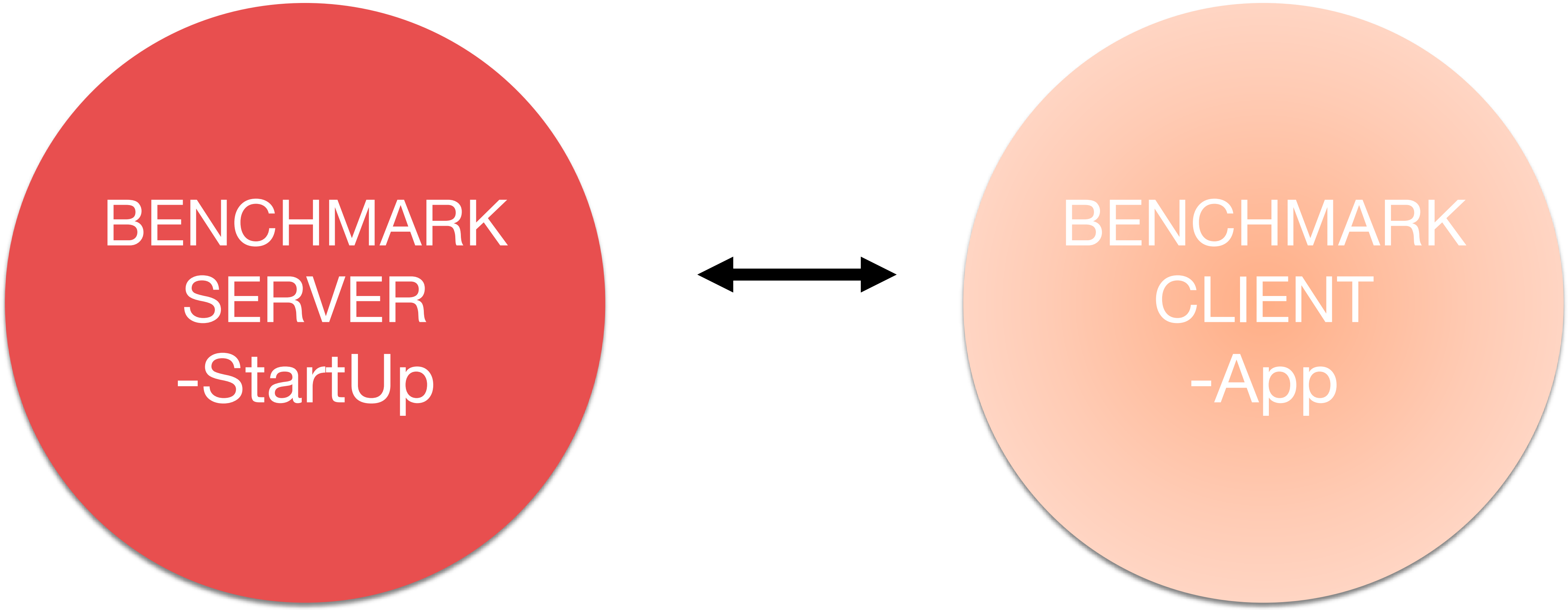
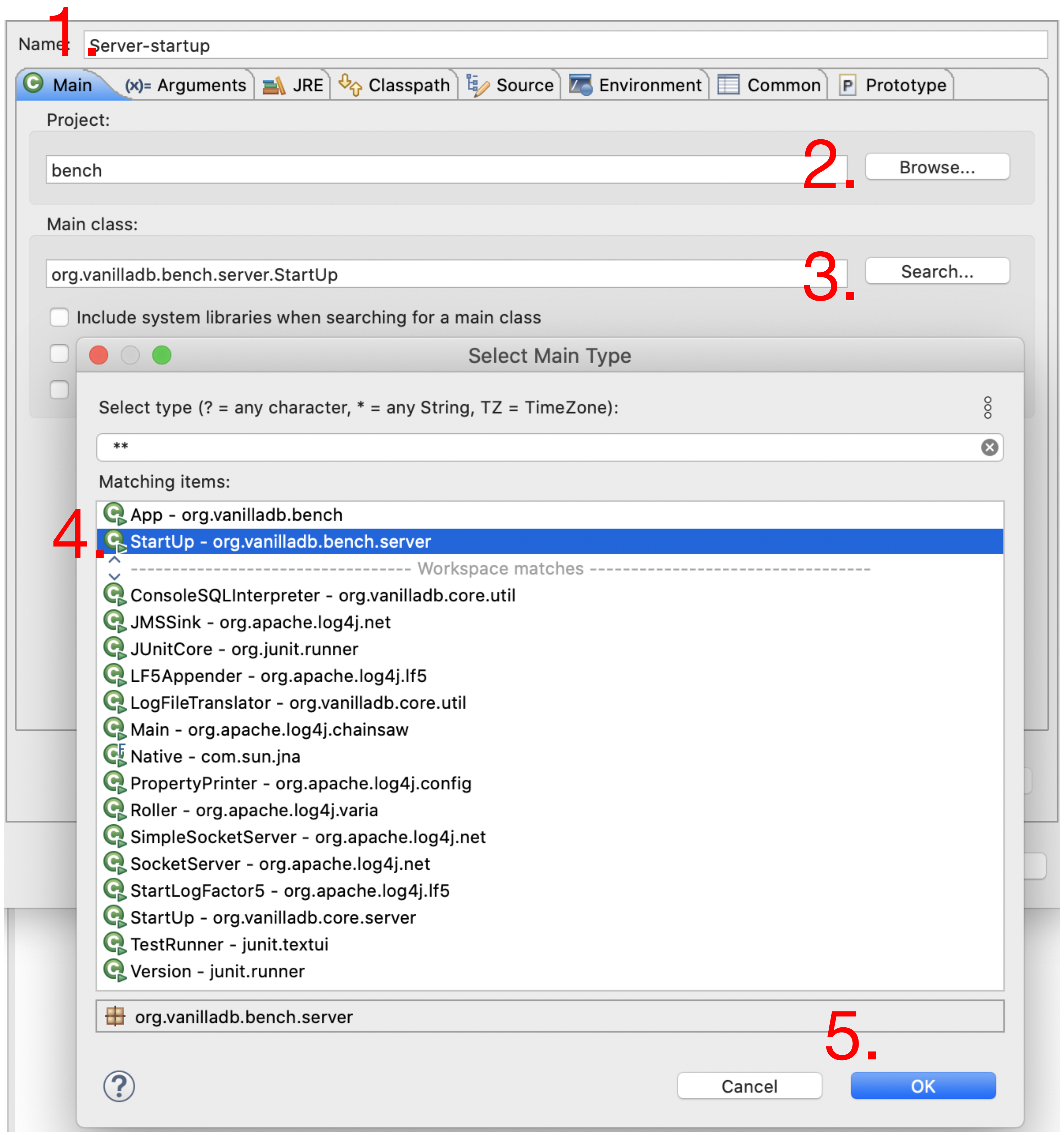
Two Main Methods



Starting Up Server (1/2)

- To benchmark a VanillaDB server, you need to start up the server in another entry point



1. Name: Server-startup

Project:

2. bench

Main class:

3. org.vanilladb.bench.server.StartUp

□ Include system libraries when searching for a main class

Select Main Type

Select type (? = any character, * = any String, TZ = TimeZone):

```
**
```

Matching items:

```
App - org.vanilladb.bench
StartUp - org.vanilladb.bench.server
------------------------------- Workspace matches -------------------------------
ConsoleSQLInterpreter - org.vanilladb.core.util
JMSSink - org.apache.log4j.net
JUnitCore - org.junit.runner
LF5Appender - org.apache.log4j.lf5
LogFileTranslator - org.vanilladb.core.util
Main - org.apache.log4j.chainsaw
Native - com.sun.jna
PropertyPrinter - org.apache.log4j.config
Roller - org.apache.log4j.varia
SimpleSocketServer - org.apache.log4j.net
SocketServer - org.apache.log4j.net
StartLogFactor5 - org.apache.log4j.lf5
StartUp - org.vanilladb.core.server
TestRunner - junit.textui
Version - junit.runner
```

org.vanilladb.bench.server

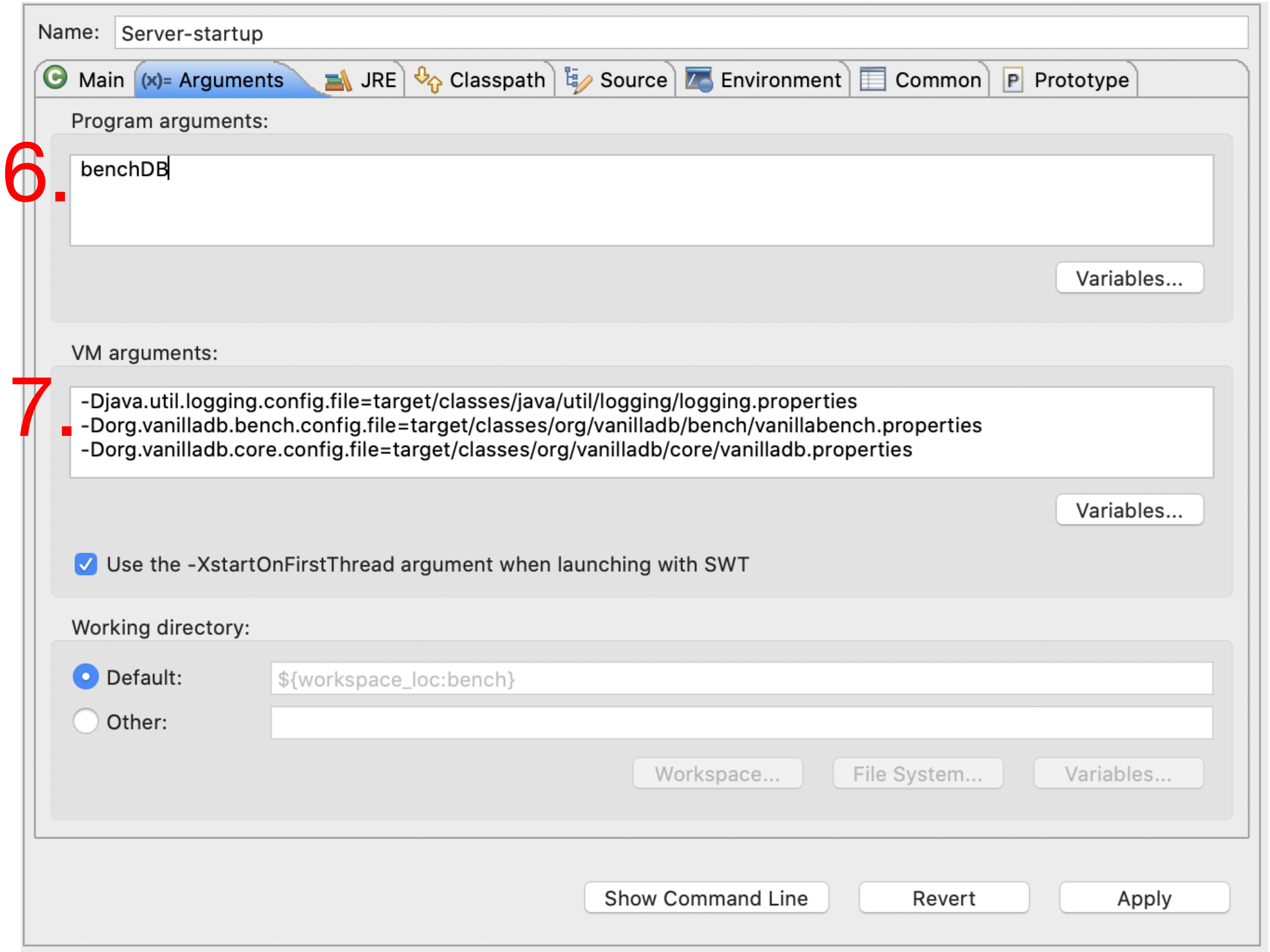
4. StartUp - org.vanilladb.bench.server

5. OK

Starting Up Server (2/2)

- Add the Database Directory Name

- You also need to add one more VM argument for benchmarking.



Name: Server-startup

Program arguments:

6. benchDB

VM arguments:

7.
```
-Djava.util.logging.config.file=target/classes/java/util/logging/logging.properties
-Dorg.vanilladb.bench.config.file=target/classes/org/vanilladb/bench/vanillabench.properties
-Dorg.vanilladb.core.config.file=target/classes/org/vanilladb/core/vanilladb.properties
```

☑ Use the -XstartOnFirstThread argument when launching with SWT

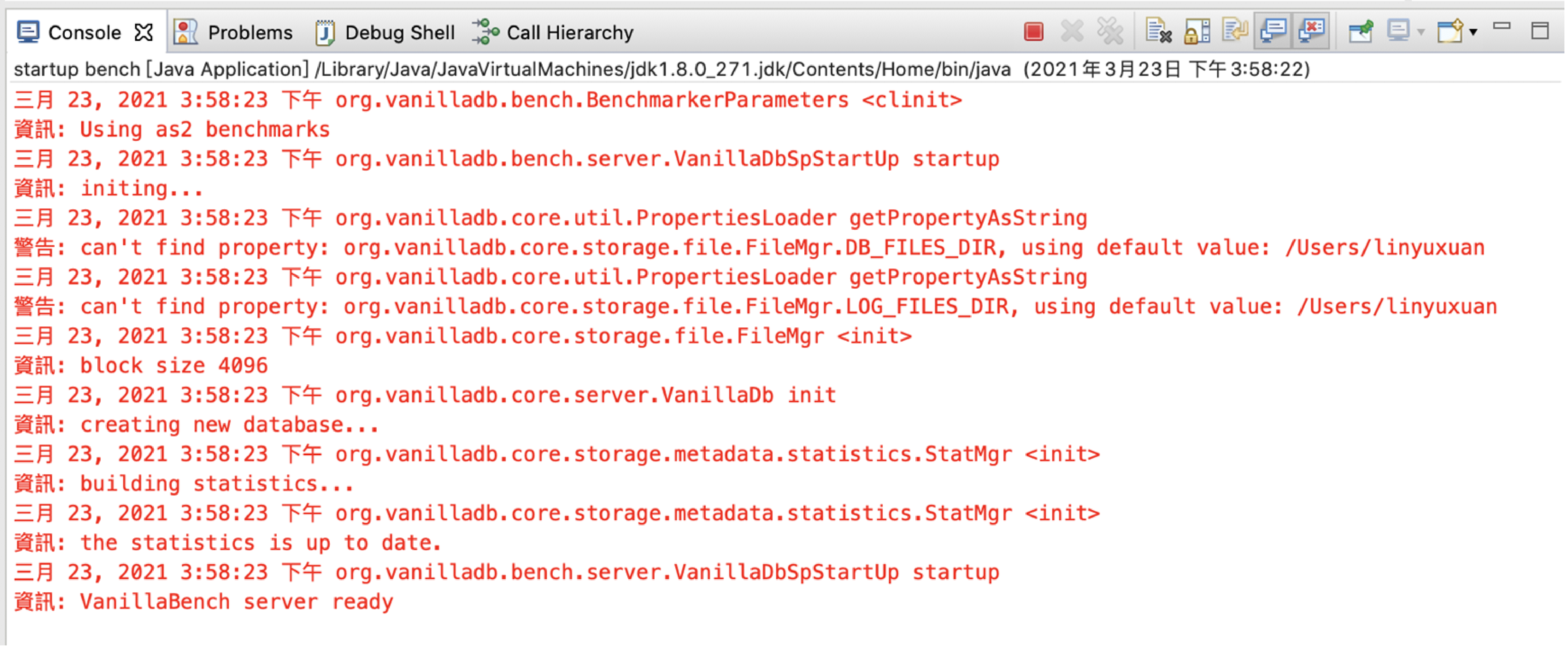
Working directory:

● Default: ${workspace_loc:bench}

○ Other:

You can copy those arguments from here.

Server Messages



startup bench [Java Application] /Library/Java/JavaVirtualMachines/jdk1.8.0_271.jdk/Contents/Home/bin/java (2021年3月23日 下午3:58:22)

```
三月 23, 2021 3:58:23 下午 org.vanilladb.bench.BenchmarkerParameters <clinit>
資訊: Using as2 benchmarks
三月 23, 2021 3:58:23 下午 org.vanilladb.bench.server.VanillaDbSpStartUp startup
資訊: initing...
三月 23, 2021 3:58:23 下午 org.vanilladb.core.util.PropertiesLoader getPropertyAsString
警告: can't find property: org.vanilladb.core.storage.file.FileMgr.DB_FILES_DIR, using default value: /Users/linyuxuan
三月 23, 2021 3:58:23 下午 org.vanilladb.core.util.PropertiesLoader getPropertyAsString
警告: can't find property: org.vanilladb.core.storage.file.FileMgr.LOG_FILES_DIR, using default value: /Users/linyuxuan
三月 23, 2021 3:58:23 下午 org.vanilladb.core.storage.file.FileMgr <init>
資訊: block size 4096
三月 23, 2021 3:58:23 下午 org.vanilladb.core.server.VanillaDb init
資訊: creating new database...
三月 23, 2021 3:58:23 下午 org.vanilladb.core.storage.metadata.statistics.StatMgr <init>
資訊: building statistics...
三月 23, 2021 3:58:23 下午 org.vanilladb.core.storage.metadata.statistics.StatMgr <init>
資訊: the statistics is up to date.
三月 23, 2021 3:58:23 下午 org.vanilladb.bench.server.VanillaDbSpStartUp startup
資訊: VanillaBench server ready
```

You should see similar messages
if nothing is wrong.

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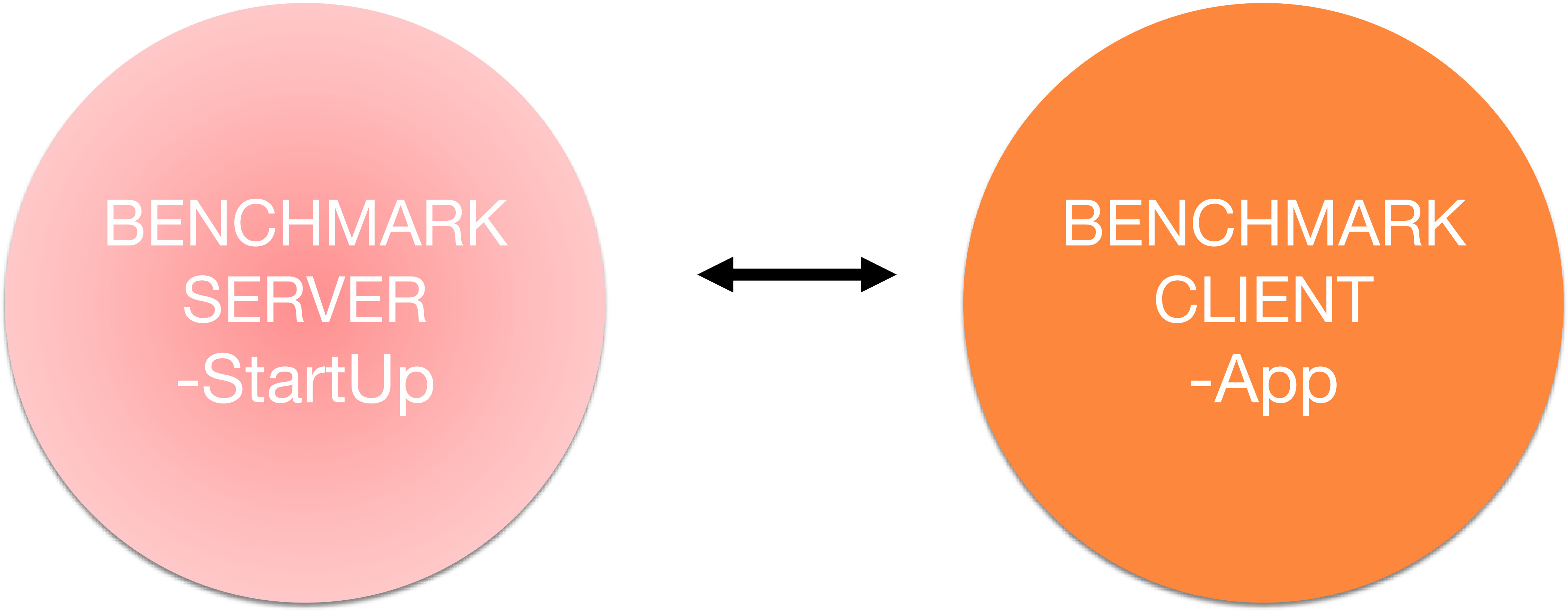
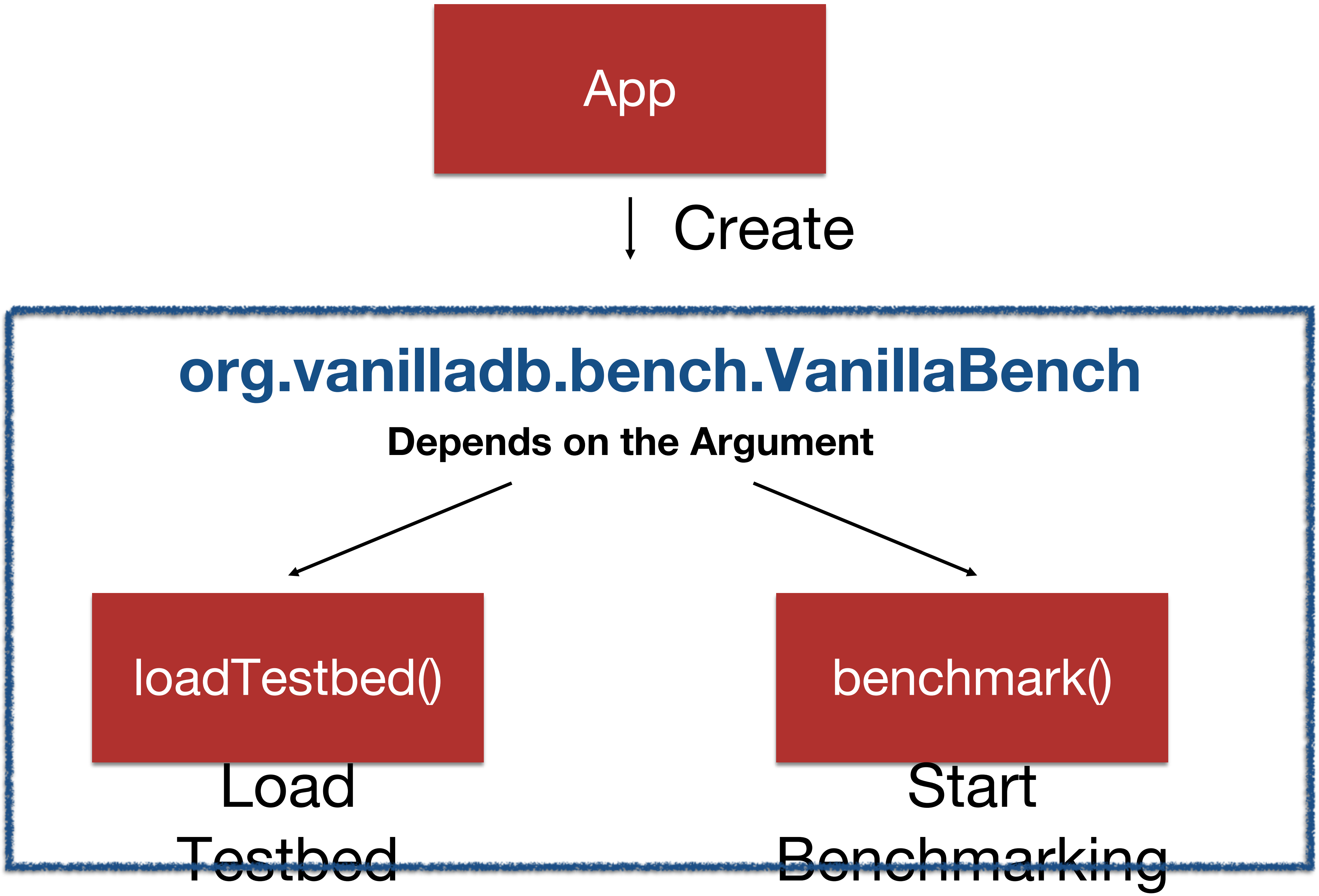
Two Main Methods



BENCHMARK
SERVER
-StartUp

BENCHMARK
CLIENT
-App

The Workflow of A Client



App

Create

org.vanilladb.bench.VanillaBench

Depends on the Argument

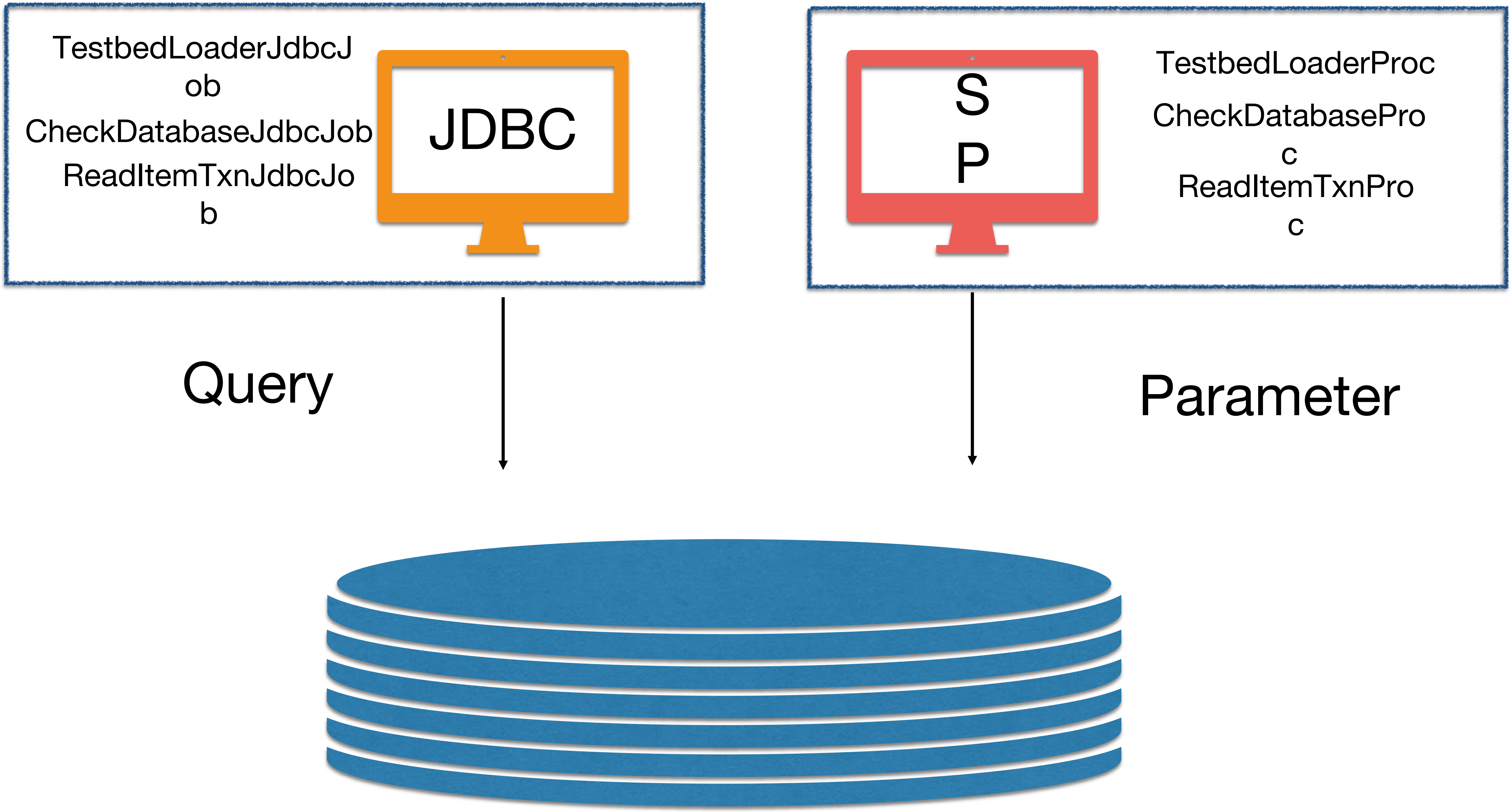
loadTestbed()

benchmark()

Load Testbed

Start Benchmarking

JDBC / SP ?



TestbedLoaderJdbcJob

CheckDatabaseJdbcJob

ReadItemTxnJdbcJob

JDBC

Query

SP

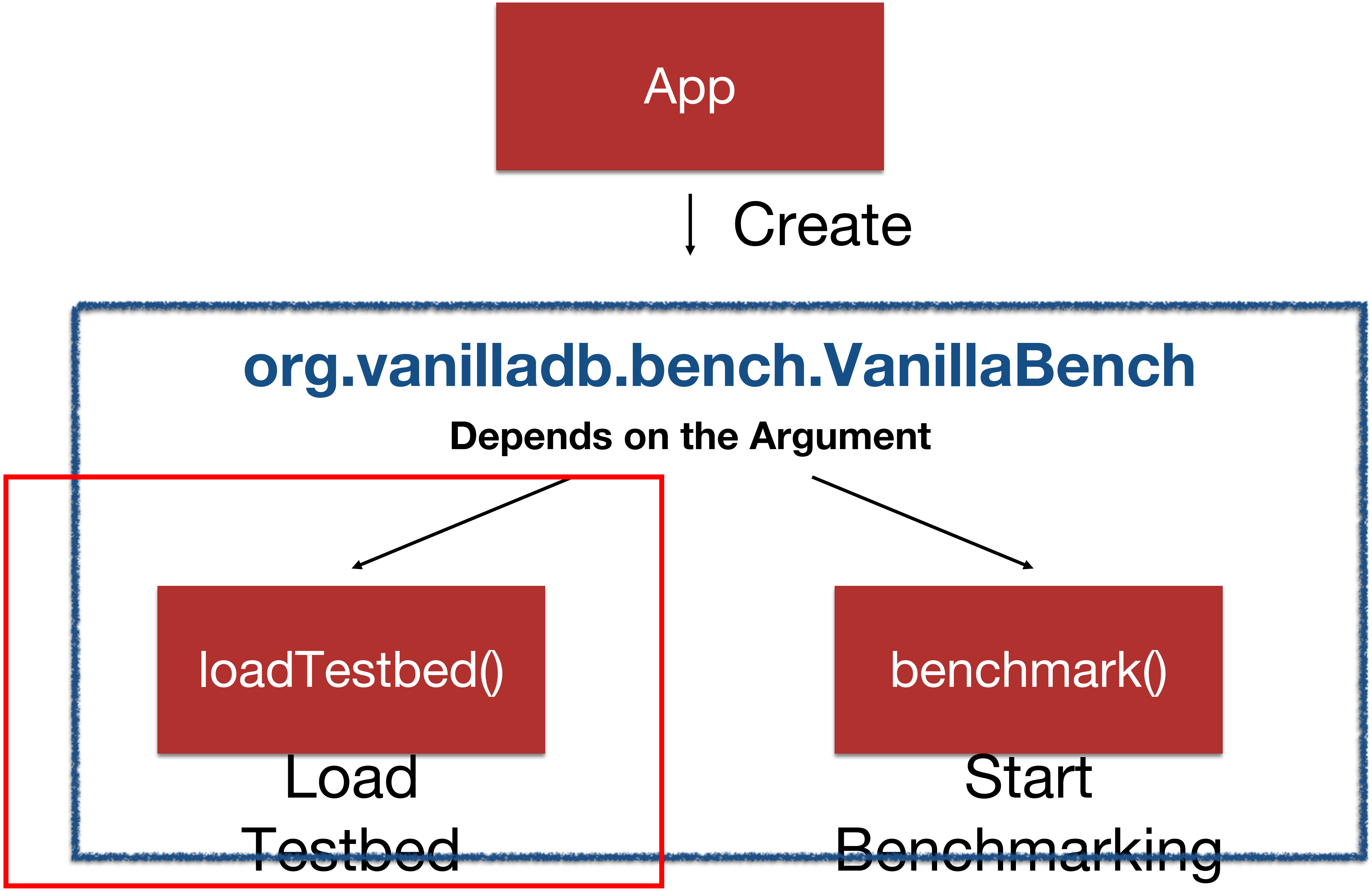
TestbedLoaderProc

CheckDatabaseProc

ReadItemTxnProc

Parameter

The Workflow of A Client



App

Create

org.vanilladb.bench.VanillaBench

Depends on the Argument

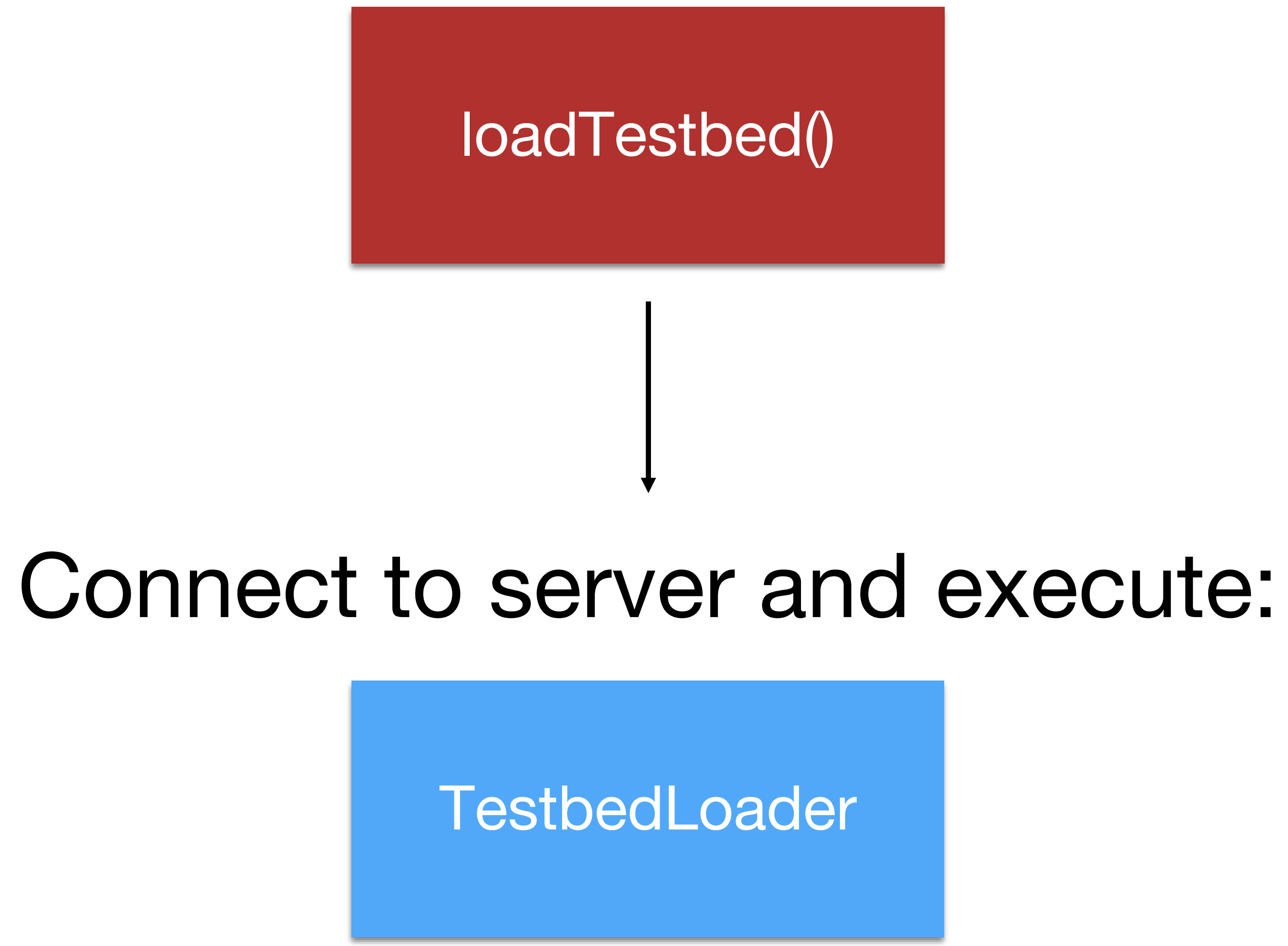
loadTestbed()

Load Testbed

benchmark()

Start Benchmarking

Loading Testbed



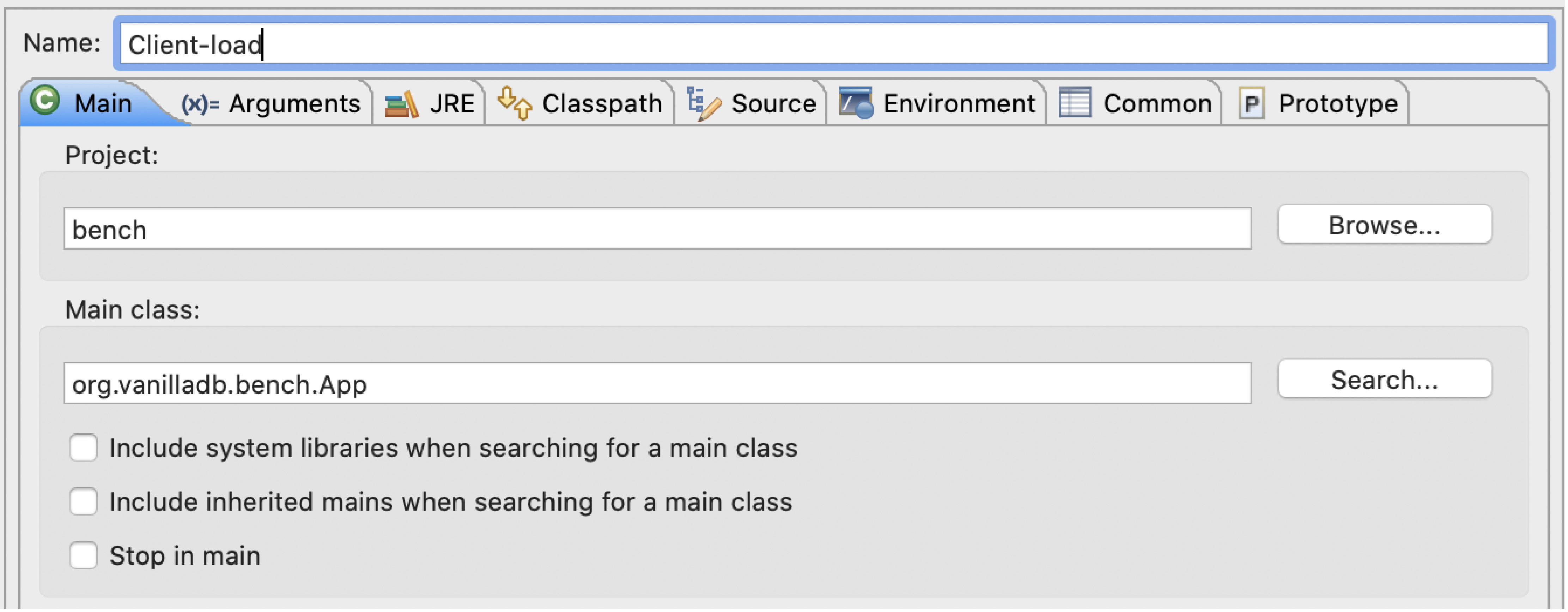
loadTestbed()

Connect to server and execute:

TestbedLoader

Running Client

- To run clients, create a run configuration for it



Name: Client-load

Project:

bench

Main class:

org.vanilladb.bench.App

□ Include system libraries when searching for a main class

□ Include inherited mains when searching for a main class

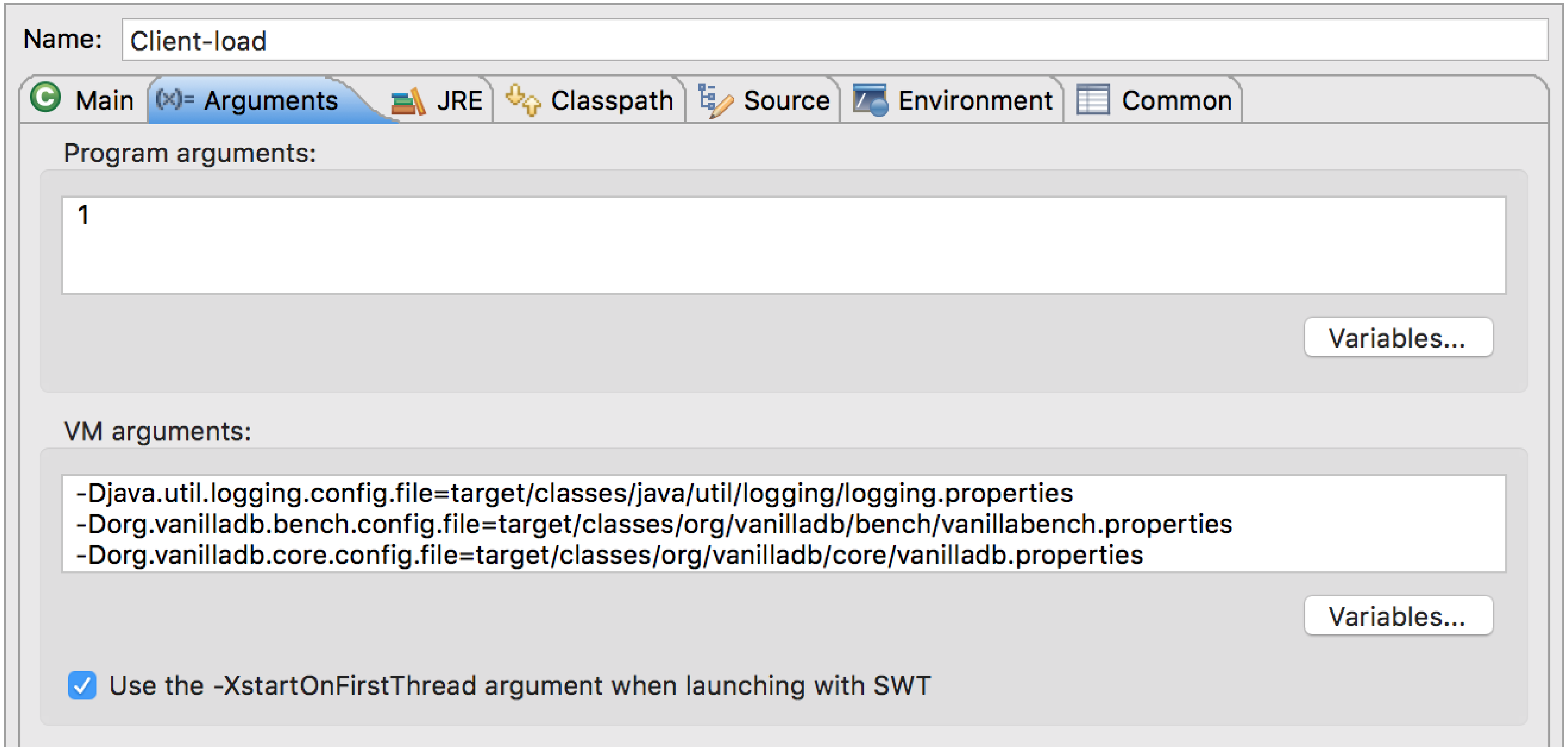
□ Stop in main

Arguments

- We also need to set some arguments
- Program Arguments
  - [Action]
    - 1 : Load Test-Bed
    - 2 : Launch Benchmark
- VM Arguments

```
-Djava.util.logging.config.file=target/classes/java/util/logging/logging.properties
-Dorg.vanilladb.bench.config.file=target/classes/org/vanilladb/bench/vanillabench.properties
-Dorg.vanilladb.core.config.file=target/classes/org/vanilladb/core/vanilladb.properties
```

Loading Testbed



Name: Client-load

Program arguments:

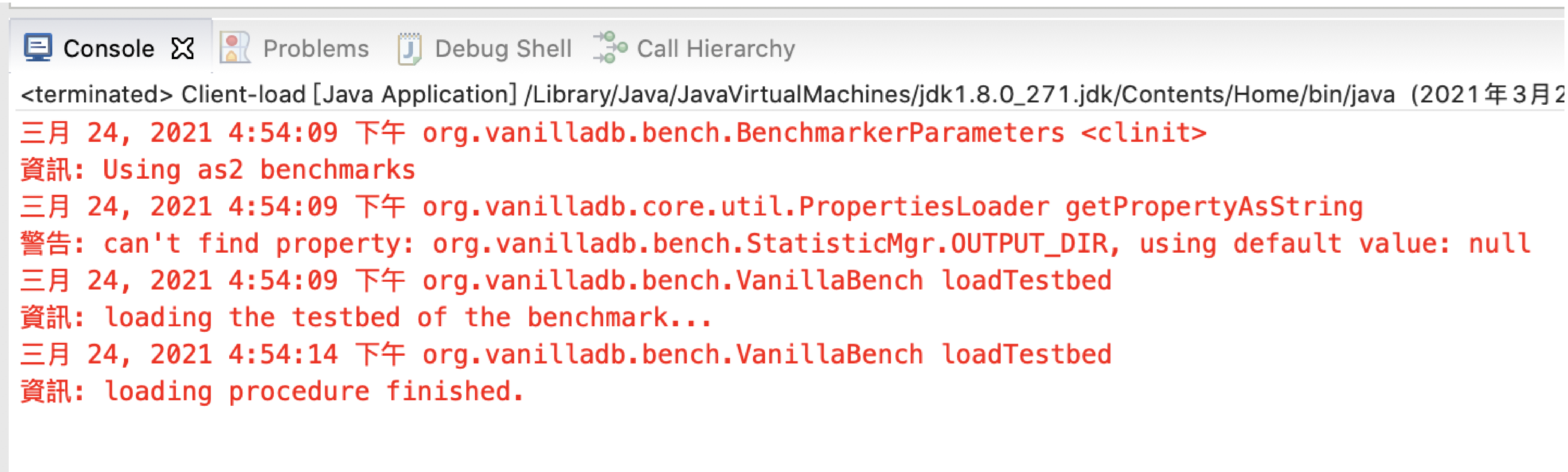
```
1
```

VM arguments:

```
-Djava.util.logging.config.file=target/classes/java/util/logging/logging.properties
-Dorg.vanilladb.bench.config.file=target/classes/org/vanilladb/bench/vanillabench.properties
-Dorg.vanilladb.core.config.file=target/classes/org/vanilladb/core/vanilladb.properties
```

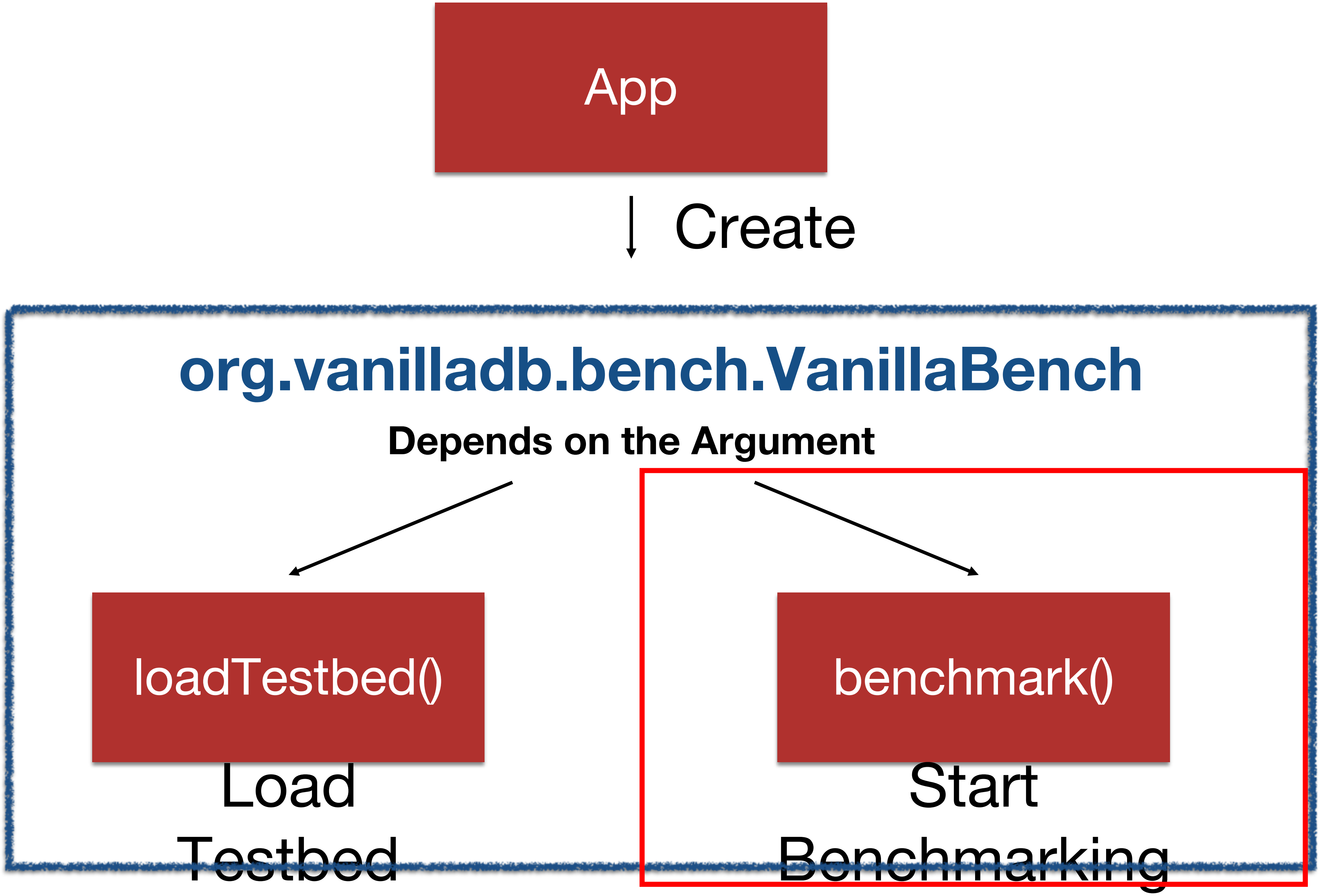
☑ Use the -XstartOnFirstThread argument when launching with SWT

Client Messages



```
<terminated> Client-load [Java Application] /Library/Java/JavaVirtualMachines/jdk1.8.0_271.jdk/Contents/Home/bin/java (2021年3月2
三月 24, 2021 4:54:09 下午 org.vanilladb.bench.BenchmarkerParameters <clinit>
資訊: Using as2 benchmarks
三月 24, 2021 4:54:09 下午 org.vanilladb.core.util.PropertiesLoader getPropertyAsString
警告: can't find property: org.vanilladb.bench.StatisticMgr.OUTPUT_DIR, using default value: null
三月 24, 2021 4:54:09 下午 org.vanilladb.bench.VanillaBench loadTestbed
資訊: loading the testbed of the benchmark...
三月 24, 2021 4:54:14 下午 org.vanilladb.bench.VanillaBench loadTestbed
資訊: loading procedure finished.
```

The Workflow of A Client



App

Create

org.vanilladb.bench.VanillaBench

Depends on the Argument

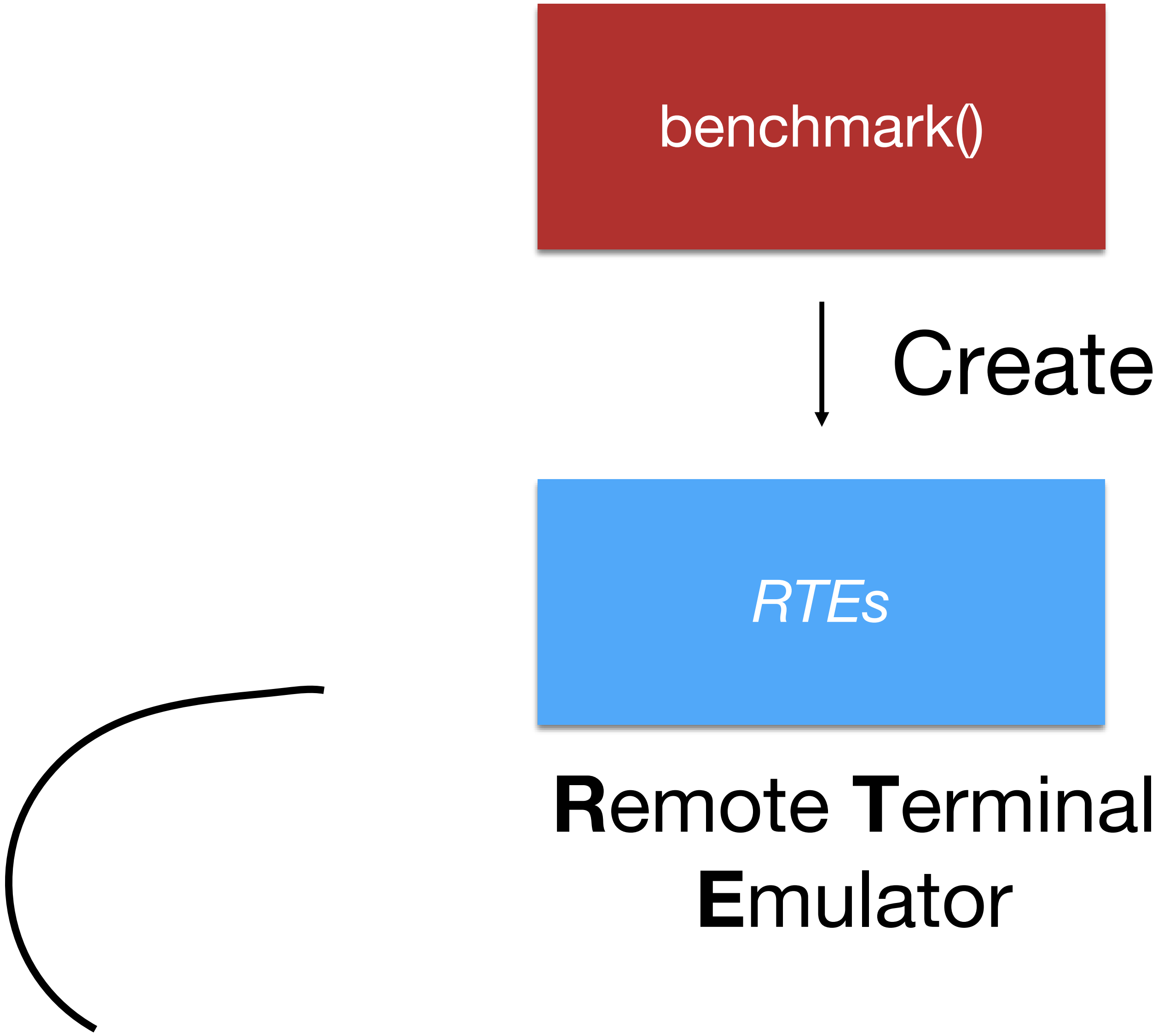
loadTestbed()

Load Testbed

benchmark()

Start Benchmarking

Starting Benchmark



benchmark()

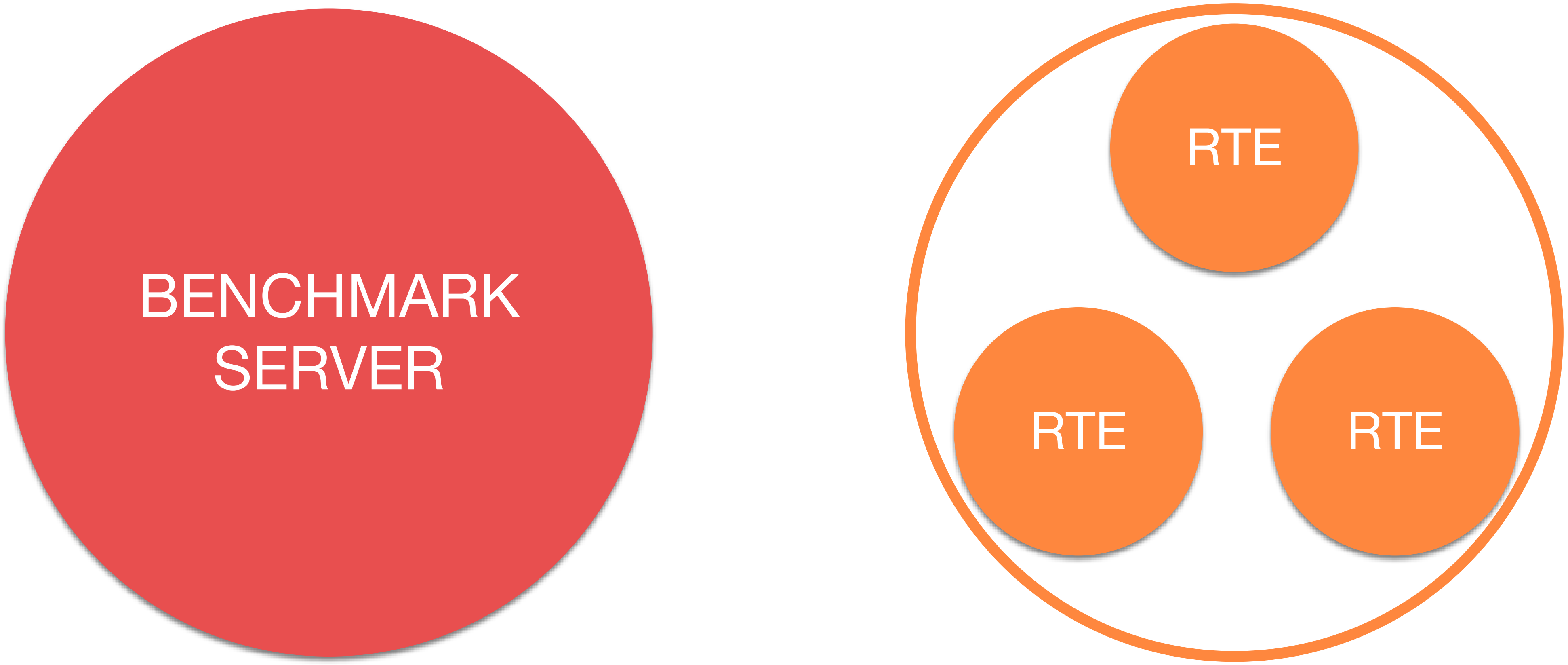
Create

RTEs

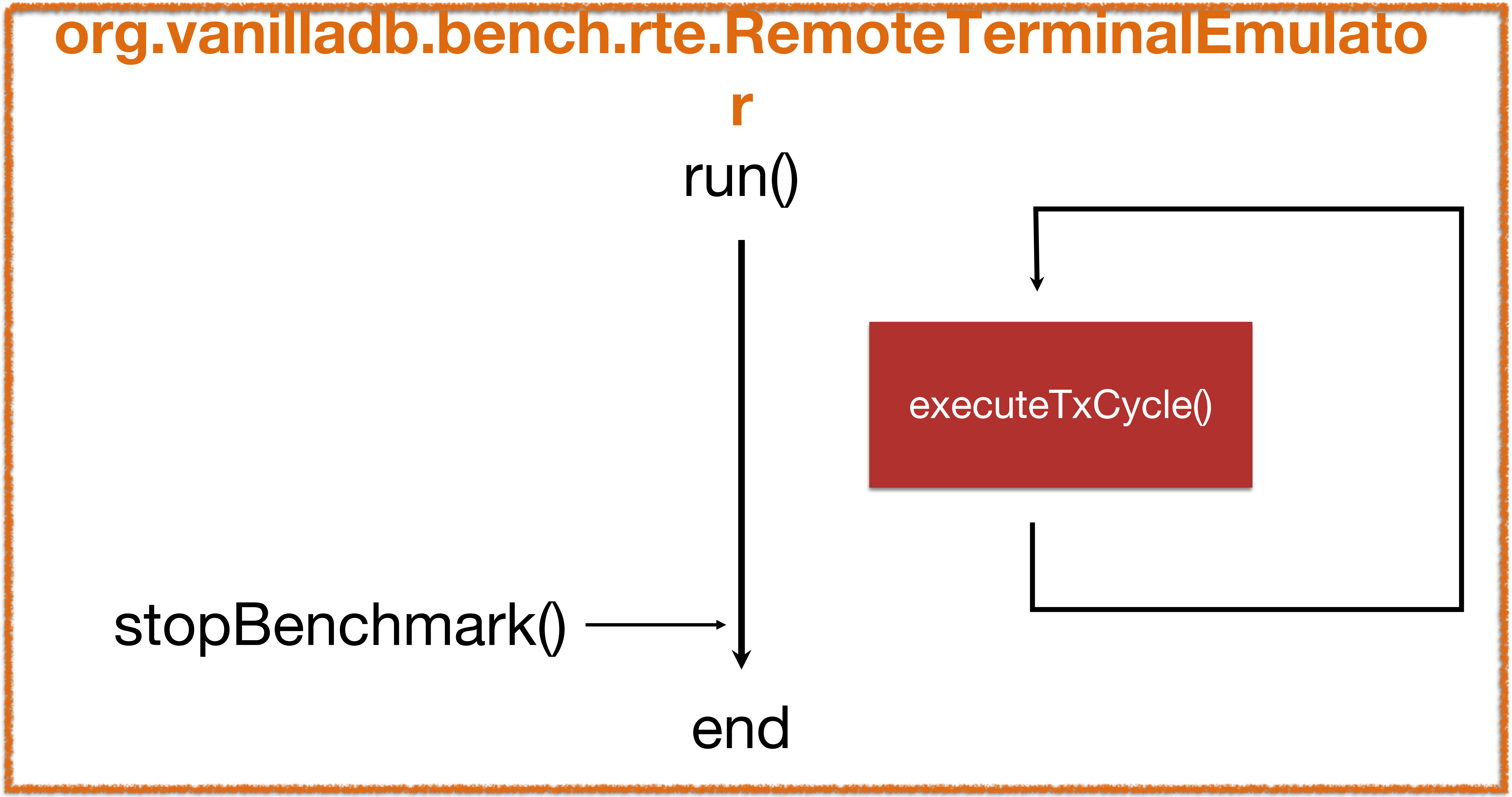
Remote **T**erminal **E**mulator

Emulates a remote terminal,
executing a sequence of transactions

Server & Client



RTE’s Life Cycle



org.vanilladb.bench.rte.RemoteTerminalEmulator

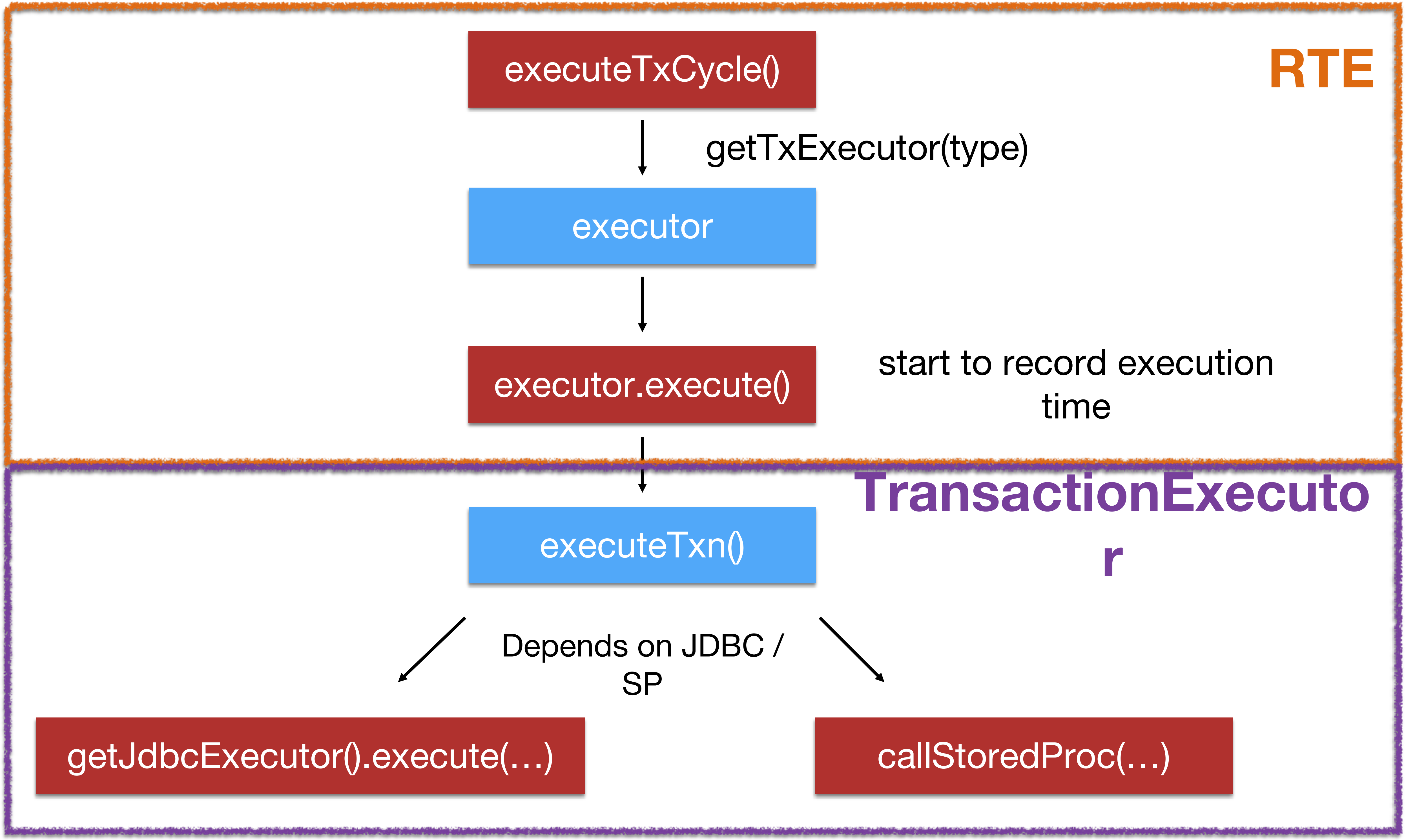
run()

executeTxCycle()

stopBenchmark()

end

Executing a Tx



RTE

executeTxCycle()

getTxExecutor(type)

executor

executor.execute()

start to record execution time

TransactionExecutor

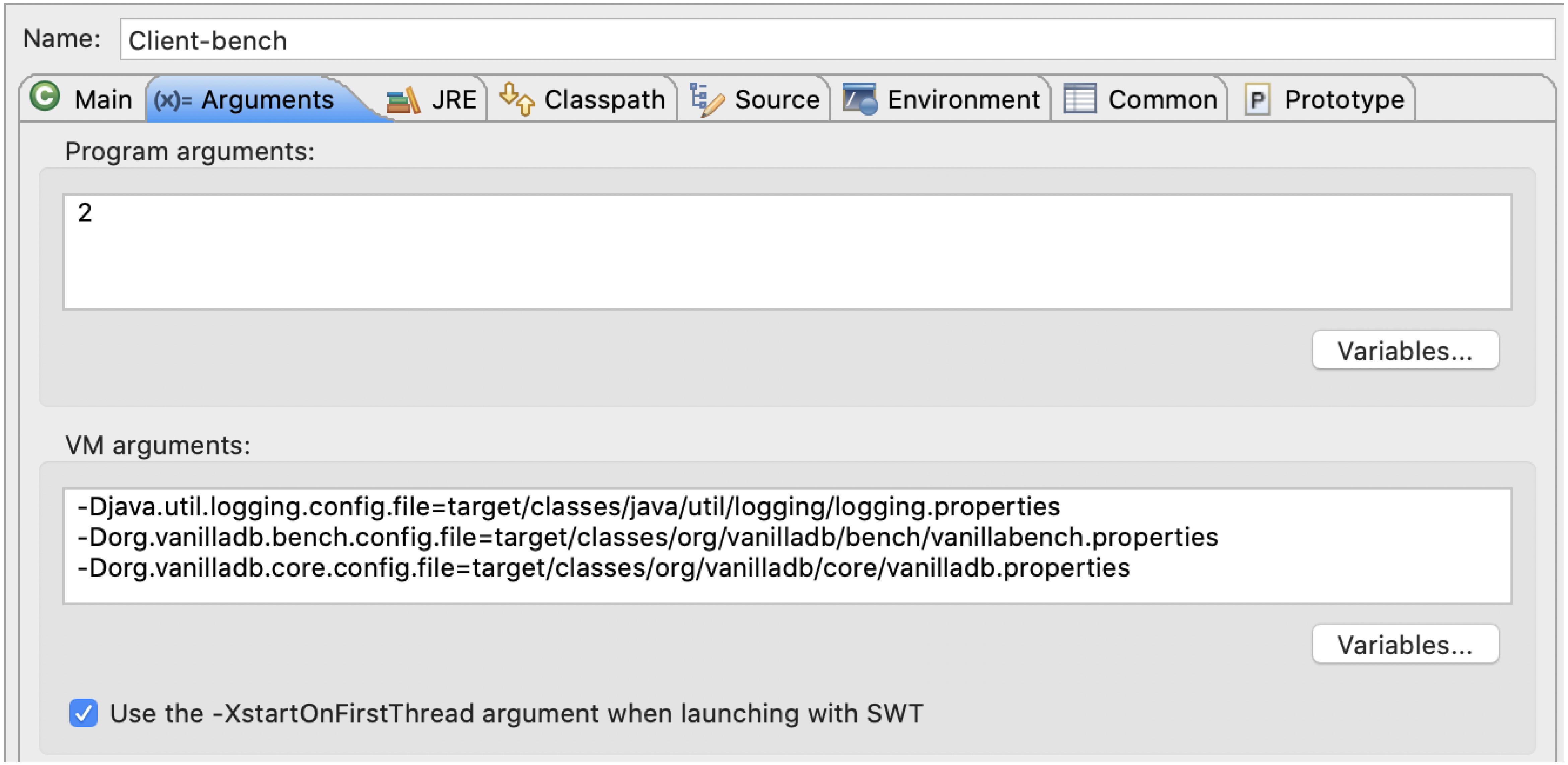
executeTxn()

Depends on JDBC / SP

getJdbcExecutor().execute(…)

callStoredProc(…)

Benchmarking



Name: Client-bench

Program arguments:

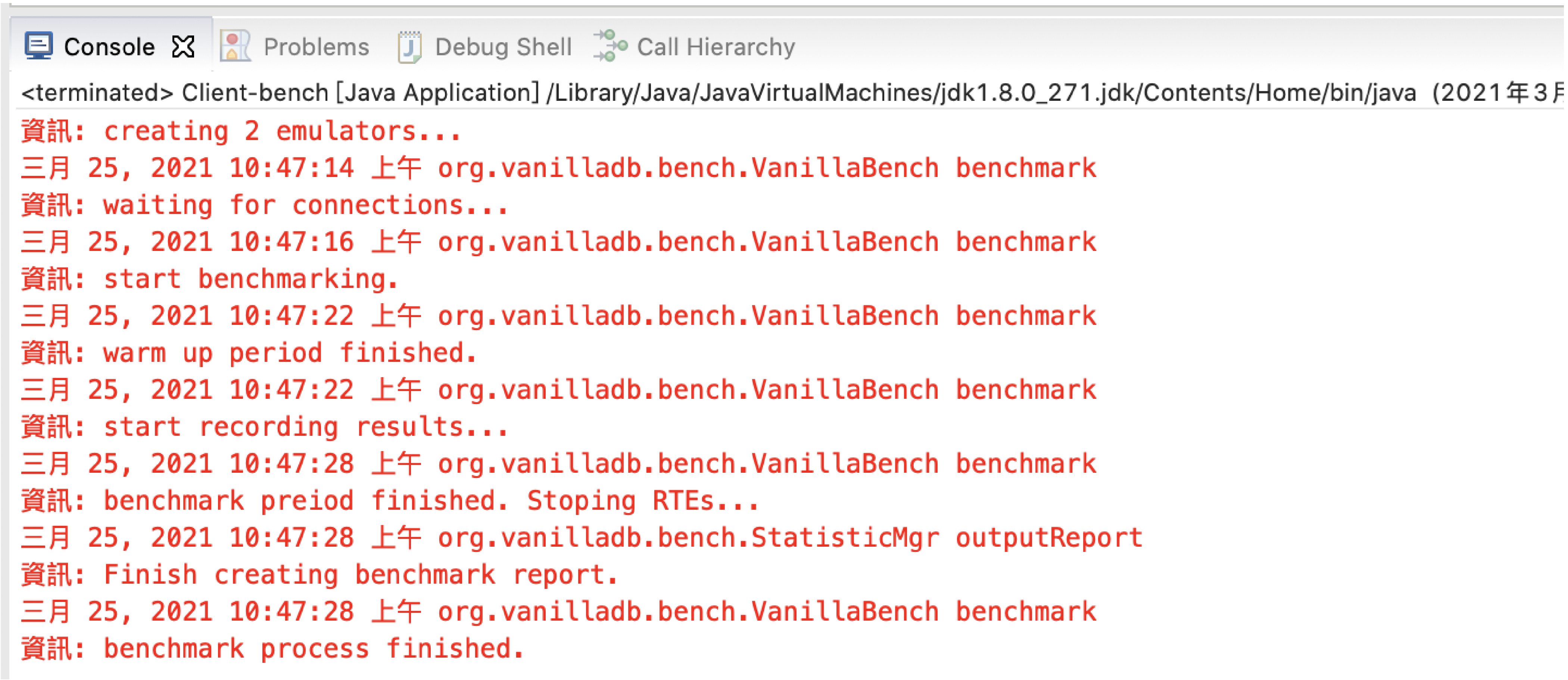
```
2
```

VM arguments:

```
-Djava.util.logging.config.file=target/classes/java/util/logging/logging.properties
-Dorg.vanilladb.bench.config.file=target/classes/org/vanilladb/bench/vanillabench.properties
-Dorg.vanilladb.core.config.file=target/classes/org/vanilladb/core/vanilladb.properties
```

☑ Use the -XstartOnFirstThread argument when launching with SWT

Client Messages



```
<terminated> Client-bench [Java Application] /Library/Java/JavaVirtualMachines/jdk1.8.0_271.jdk/Contents/Home/bin/java  (2021年3月
資訊: creating 2 emulators...
三月 25, 2021 10:47:14 上午 org.vanilladb.bench.VanillaBench benchmark
資訊: waiting for connections...
三月 25, 2021 10:47:16 上午 org.vanilladb.bench.VanillaBench benchmark
資訊: start benchmarking.
三月 25, 2021 10:47:22 上午 org.vanilladb.bench.VanillaBench benchmark
資訊: warm up period finished.
三月 25, 2021 10:47:22 上午 org.vanilladb.bench.VanillaBench benchmark
資訊: start recording results...
三月 25, 2021 10:47:28 上午 org.vanilladb.bench.VanillaBench benchmark
資訊: benchmark preiod finished. Stoping RTEs...
三月 25, 2021 10:47:28 上午 org.vanilladb.bench.StatisticMgr outputReport
資訊: Finish creating benchmark report.
三月 25, 2021 10:47:28 上午 org.vanilladb.bench.VanillaBench benchmark
資訊: benchmark process finished.
```

Assignment 2

Q&A

- If you have any problem, you could check here first
  - https://shwu10.cs.nthu.edu.tw/courses/databases/2023-spring/faq
- If your problem is very unique, feel free to send us an email