Java CLI JDK command line

CONCEPTS

Source becomes bytecode with javac, bytecode runs on the JVM with java. Tools like jar, jshell and jcmd all ship in the JDK.

Main.java source
↓ javac
Main.class bytecode
↓ jar
app.jar archive
↓ java -jar
JVM running app

Class path separator is : on Linux and macOS, ; on Windows.

A JRE-only install has java but no javac, jar or jshell: install a JDK.

RUN

java -version
Print version and exit

java *<File>*.java [args]
Compile in memory and run

java -cp *<path> <MainClass>* [args]
Run a class

java -jar *<file.jar>* [args]
Run a JAR's main class

java -Dkey=value ...
Set a system property

java -ea ...
Enable assertions

java -m *<module>*/*<MainClass>*
Run a module

CLASS PATH & MODULES

-cp "lib/*:out"
Add all JARs in lib, plus out

--module-path *<dir>* **/ -p** *<dir>*
Where application modules live

--add-opens *<mod>*/*<pkg>*=ALL-UNNAMED
Open a package to reflection

MEMORY & JVM FLAGS

-Xmx*<size>*
Maximum heap

-Xms*<size>*
Initial heap

-Xss*<size>*
Thread stack size

-XX:MaxRAMPercentage=*<n>*
Heap as share of RAM

-XX:+HeapDumpOnOutOfMemoryError
Write a heap dump on OOM

-XX:HeapDumpPath=*<file>*
Where the dump goes

-verbose:gc
Log garbage collections

COMPILE (JAVAC)

javac *<File>*.java
Compile one file

javac -d *<dir> <files>*
Put class files in dir

javac -cp *<path> <files>*
Compile against libraries

javac --release *<n> <files>*
Target a Java version

javac -Xlint:all *<files>*
Enable all warnings

PACKAGE (JAR)

jar --create --file *<f.jar>* **-C** *<dir>* **.**
Pack a directory

jar --create --file *<f.jar>* **--main-class** *<Class>* **-C** *<dir>* **.**
Runnable JAR

jar -tf *<f.jar>*
List contents

jar -xf *<f.jar>* [*<entry>*]
Extract all or one entry

JSHELL

jshell
Start the REPL

jshell --class-path *<path>*
Start with libraries

JSHELL (cont.)

/vars
Show variables

DIAGNOSE

jcmd
List running JVMs

jps -l
PIDs with main class or JAR

jcmd *<pid>* **Thread.print**
Thread dump

jcmd *<pid>* **GC.heap_info**
Heap usage summary

jcmd *<pid>* **GC.class_histogram**
Objects per class

jcmd *<pid>* **GC.heap_dump** *<file>*
Write a heap dump

jcmd *<pid>* **JFR.start duration=60s filename=***<f.jfr>*
Record a flight recording

ENVIRONMENT

JAVA_HOME
JDK install directory

JAVA_TOOL_OPTIONS
Options for every JVM

RECIPES

Build and run a small app

```
javac -d out $(find src -name
'*.java')
jar --create --file app.jar --
main-class com.example.Main -C
out .
java -jar app.jar
```

Run with libraries

```
javac -cp "lib/*" -d out src/
Main.java
java -cp "out:lib/*" Main
```

Diagnose a stuck app

```
jps -l
jcmd <pid> Thread.print -l >
threads.txt
jcmd <pid> GC.heap_info
```

Capture memory failures

```
java -Xmx512m \
  -XX:+HeapDumpOnOutOfMemoryError
\
  -XX:HeapDumpPath=/tmp/heap.hprof
\
  -jar app.jar
```