Inf2-SEPP 2021-22

Development tools

1 Introduction

This document describes the required tools that you will need to use for your Inf2-SEPP Coursework 3, as well as details for installing and configuring them on your local machines, and accessing them remotely from DICE (to be done only if you have no other alternative, see below).

2 The Required Tools for Inf2-SEPP

All of the software required for this course is pre-installed on the Informatics DICE[1] systems. However, we would strongly recommend that you prioritise installing the software locally on your machine, and you only use remote access to DICE as a fallback in case you have problems with the software on your system. This is because it is likely you will find using DICE remotely unacceptably slow.

2.1 Java

Inf2-SEPP uses the Java programming language, because of its excellent tool support, focus on an object-oriented approach and popularity in the industry. However, the course does not teach Java but rather relies on your experience with it from Inf1-OOP. Apart from the resources in this first year course, we have also provided some resources on Java under the Learn page of the course- Resources.

We use OpenJDK[2] which is a freely available implementation of the Java platform. You must use **JDK version 14**. You can check your default version as follows:

```
➔ java --version
openjdk 14.0.1 2020-04-14
OpenJDK Runtime Environment (build 14.0.1+14)
OpenJDK 64-Bit Server VM (build 14.0.1+14, mixed mode, sharing)
```

[1] http://computing.help.inf.ed.ac.uk/what-is-dice

[2] https://openjdk.java.net/

If you have previously installed a different version on your machine, you will need to be very careful to ensure that all references to the previous version are replaced with the new version.

In addition, section 5 shows how to lower your active JDK version to 14 in IntelliJ, provided that you have a higher version installed.

2.2 Gradle

We use Gradle to include a build file with the assignment templates which you can use to assemble all of the components required for the assignment. Moreover, we recommend that you use IntelliJ with Gradle.

Gradle is freely available from the Gradle[3] website for you to install on your own machine. You must use **Gradle version 6**.

```
➜ gradle --version
------------------------------------------------------------
Gradle 6.6
------------------------------------------------------------
Build time:   2020-08-10 22:06:19 UTC
Revision:     d119144684a0c301aea027b79857815659e431b9
Kotlin:       1.3.72
Groovy:       2.5.12
Ant:          Apache Ant(TM) version 1.10.8 compiled on May 10 2020
JVM:          14.0.1 (Oracle Corporation 14.0.1+14)
OS:           Mac OS X 10.15.6 x86_64
```

2.3 IntelliJ IDEA

It is quite possible to create Java programs with a simple editor and compile and run them from the command line (possibly using Gradle).

The alternative is to use an IDE (integrated development environment), which provides a graphical interface to an editor and file browser with specific support for code development.

This year, we have decided to use IntelliJ IDEA and we strongly recommend that you use this - it is a good environment with support for Gradle, and very popular amongst Java developers.

The "Community Edition" of IntelliJ is freely available from the JetBrains[4] website for you to install on your own machine. We recommend that you accept all of the default values when this is initially started- these can be changed later if necessary.

[3] `https://gradle.org/releases/`

[4] `https://www.jetbrains.com/idea/`

3 Installation and Configuration

The sections below provide advice on installing and configuring the required tools for this course. We will also be providing help for this during the labs in Weeks 8-9 of the course, and by using Piazza.

Important notes:

- We recommend that you install the software on your own machines, but also *make sure that you can run your software on some alternative system (e.g. DICE) as well, in case your own machine has a problem.* Failure of your own machine will not be taken into account when assessing your assignment submissions.
- Make sure that you have the appropriate versions of all of the tools installed. The recommended versions have been carefully chosen so that they work together. If you use different versions, your code may not compile with the supplied skeleton code, the documentation may not match, and you may get unpredictable errors.

Once you have installed and configured your tools, you can use this video for advice as to how you can use IntelliJ with Java and Gradle:

`https://www.youtube.com/watch?v=a5W-Kb7zWEc`

Please note that it is using an older version of IntelliJ, but it is very similar with the latest one.

3.1 Installing the Tools on Windows

Windows x64 zipped binaries for OpenJDK and Gradle are available from the respective websites (OpenJDK[5], Gradle[6]). Unzip these into directories without spaces in the name[7]. You will then need to add these directories to the system PATH variable[8]:

```
path-to-my-java-directory\jdk-14.0.2\bin
path-to-my-java-directory\gradle-6.6.1\bin
```

You can check the versions (as above) in a (new) PowerShell window.

IntelliJ IDEA has a Windows version available on its websites which can be installed in any directory.

[5] `https://jdk.java.net/archive/`

[6] `https://gradle.org/releases/`

[7] If you have spaces in the directory names, these will need quoting when you use the command line tools.

[8] see `https://www.java.com/en/download/help/path.html`

3.2 Installing the Tools on MacOS (Catalina)

The easiest way to install OpenJDK and Gradle on the Mac is to use the Brew package manager. If you don't already have brew installed, copy the command on the Brew website[9] and paste it into a terminal. You should then[10] ...

```
➜ brew tap
➜ brew homebrew/cask
➜ brew homebrew/cask-version
```

You can now install Gradle and OpenJDK:

```
➜ brew install gradle
➜ brew install java
```

You will probably want to set some environment variables to make these available by default:

```
➜ echo 'export PATH="/usr/local/opt/openjdk/bin:$PATH"' >> ~/.zshrc
➜ echo 'export CPPFLAGS="-I/usr/local/opt/openjdk/include"' >> ~/.zshrc
```

IntelliJ IDEA has a Mac package available on its website.

3.3 Installing the Tools on Linux

Installing the tools on Linux can be more complicated, and will depend on the specific version of Linux that you are using.

On Ubuntu and related Linux distributions, the appropriate version of OpenJDK can be installed with apt:

```
# Ensure your existing packages are already up-to-date
➜ sudo apt-get update && sudo apt-get upgrade
# Installing Java 14
➜ sudo apt install openjdk-14-jdk
```

Intellij IDEA can be installed relatively painlessly with Snappy:

```
➜ sudo snap install intellij-idea-community --classic
```

Gradle can be installed as follows ...

```
➜ wget https://services.gradle.org/distributions/gradle-6.6-bin.zip -P /tmp
➜ sudo unzip -d /opt/gradle /tmp/gradle-*.zip
```

You need to configure the PATH environment variable to include the new Gradle directory. Do so by creating a new profile in your preferred text editor:

```
➜ sudo nano /etc/profile.d/gradle.sh
```

Then add these lines, save and exit:

[9] https://brew.sh/

[10] https://gist.github.com/gwpantazes/50810d5635fc2e053ad117b39b597a14

```
➜ export GRADLE_HOME=/opt/gradle/gradle-6.6
➜ export PATH=${GRADLE_HOME}/bin:${PATH}
```

Make the script executable with chmod, then load the new environment variables with source:

```
➜ sudo chmod +x /etc/profile.d/gradle.sh
➜ source /etc/profile.d/gradle.sh
```

4 Using the Tools on DICE

All of the necessary software is installed on the Informatics DICE systems which can be accessed remotely via the XRDP Service[11]. Again, we recommend that you install the tools on your local machine and only use DICE as a fallback as it will likely be very slow.

No special configuration is required on the current version of DICE, and all of the tools can be launched from the command line: `java ...`, `gradle ...`.

IntelliJ IDEA interacts badly with the AFS filesystem[12] used in DICE. This can cause the Open Project dialog to hang. You can work around this by opening IntelliJ directly in the project directory:

```
➜ cd path-to-project-directory
➜ ideaIC .
```

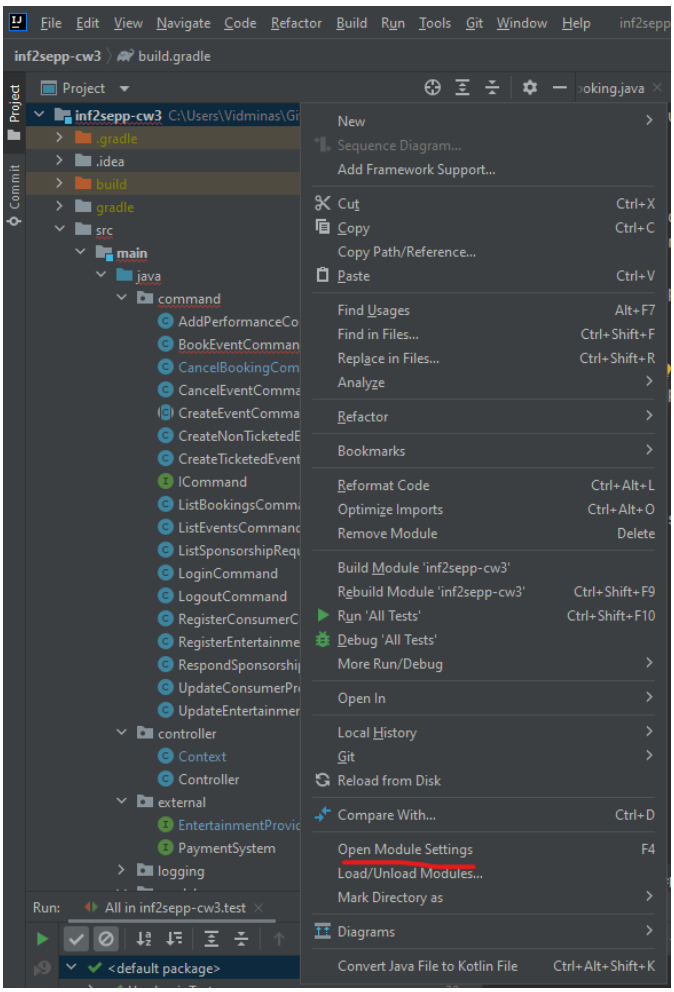
The "." on the second line is very important!

5 Lowering JDK version to 14 in IntelliJ

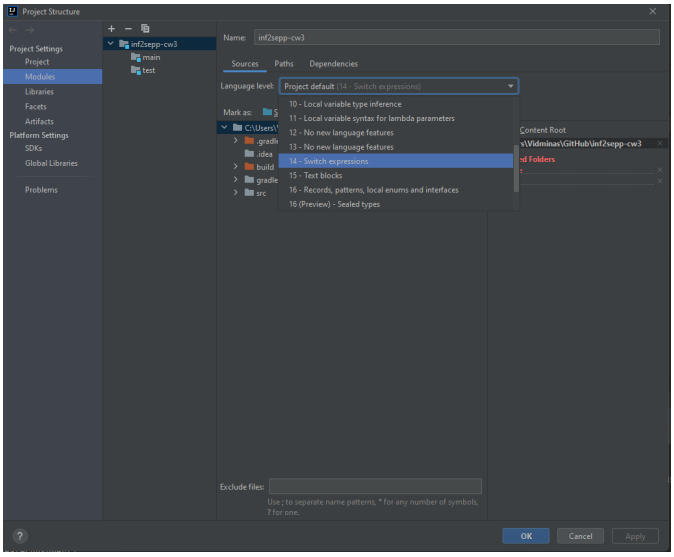
If you have a higher version of JDK than the required 14, there is a way to limit the functionality of your project in IntelliJ to that of version 14. See the screenshots and their captions provided on the next page.

[11] `http://computing.help.inf.ed.ac.uk/remote-desktop`

[12] see `https://intellij-support.jetbrains.com/hc/en-us/community/posts/206924155-Problems-with-afs-access`



Step 1: Right-click your project, and select "Open Module Settings."



Step 2: From the "Language Level" drop-down menu, select 14.