

2020-1-FR01-KA203-080184

Development of secure applications based on IoT

WP2.1

# Deliverable #1: First App with Quarkus List of tools' configuration at Grenoble INP - Esisar

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## 1. Introduction

In the EMNESS project, the objective is to update an existing lab at Grenoble INP – Esisar. This lab deals with the development of secured IoT applications teaching to Master 2 students. This lab is a part of a course named “IoT Applications”. The goal of this lab is, for the students, to develop (from scratch) a secured application collecting data from many devices. In the first version of the global architecture, the main technologies are JEE-oriented. To modernize this architecture, the JEE server is replaced by a modern Quarkus server for backend and a Vue.js web interface for frontend. These changes include an update of the development infrastructure available in the lab. The global infrastructure is illustrated by Figure 1.



Figure 1: Global infrastructure.

The Java development tools (Eclipse, Apache Maven, OpenJDK and Nexus Repository) are yet installed at Grenoble INP – Esisar but they require to be updated. For JavaScript development, it is a new installation and configuration for all tools (Node.js, npm and Visual Studio Code). A database PostgreSQL is also installed to persist data because previously data are only stored in memory database H2.

All the tools used in the global infrastructure are described in the following sections. For each tool, a brief description is done. For the updates, we give the old and the new versions installed while for the new software only the installed version is given. We also detail the configuration and the installation testing at Grenoble INP – Esisar.

## 2. Updates

In this section, we present the update realized for the different tools used to develop secured IoT applications. These tools are previously used at Grenoble INP – Esisar to develop Java applications, including IoT applications. An update of these different tools was required due to security concerns, to new features, to requirements from others tools...

### 2.1. Open JDK: Runtime Environment

“Open JDK (Open Java Development Kit) is a free and open-source implementation of the Java Platform, Standard Edition (Java SE)”<sup>1</sup>

Due to the prerequisites defined by Quarkus server and other tools, it required to update the Open JDK version from 8 to 11.

	Old version	New version
Version	Open JDK 8	Open JDK 11
Release Date	2019-03	2019-03
Download	<a href="https://download.java.net/java/GA/jmc8/03/binaries/jmc-8.2.1_linux-x64.tar.gz">https://download.java.net/java/GA/jmc8/03/binaries/jmc-8.2.1_linux-x64.tar.gz</a>	<a href="https://download.java.net/java/GA/jdk11/13/GPL/openjdk-11.0.1_linux-x64_bin.tar.gz">https://download.java.net/java/GA/jdk11/13/GPL/openjdk-11.0.1_linux-x64_bin.tar.gz</a>

Installing OpenJdk:

- Extract distribution archive in any directory: at Esisar in /usr/lib/jvm

Testing installation:

```
$ echo $JAVA_HOME
/usr/lib/jvm/java-1.11.0-openjdk-amd64
$ java -version
openjdk version "11.0.15" 2022-04-19
OpenJDK Runtime Environment (build 11.0.15+10-post-Debian-1deb11u1)
OpenJDK 64-Bit Server VM (build 11.0.15+10-post-Debian-1deb11u1, mixed
mode, sharing)
$ javac -version
javac 11.0.15
```

<sup>1</sup> <https://en.wikipedia.org/wiki/OpenJDK>

## 2.2. Apache Maven: Build automation tool

“Apache Maven is a build automation tool primarily for Java projects, but it can also be used to build and manage projects written in C#, Ruby, Scala and other languages.”<sup>2</sup> (Wikipedia)

Due to the prerequisites defined by Quarkus server, it required to update the Apache Maven version from 3.5.3 to 3.8.6.

	Old version	New version
Version	Apache Maven 3.5.3	Apache Maven 3.8.6
Release Date	2018-03-08	2022-06-06
Required Java Version	Java 7	Java 7
Download	<a href="https://archive.apache.org/dist/maven/maven-3/3.5.3/">https://archive.apache.org/dist/maven/maven-3/3.5.3/</a>	<a href="https://archive.apache.org/dist/maven/maven-3/3.8.6/">https://archive.apache.org/dist/maven/maven-3/3.8.6/</a>

Apache Maven website: <https://maven.apache.org/index.html>

Prerequisite for Apache Maven:

- Have a JDK installation on your system. Either set the JAVA\_HOME environment variable pointing to your JDK installation or have the java executable on your PATH.

Installing Apache Maven:

- Extract distribution archive in any directory: at Esisar in /opt/Maven

Testing installation:

```
$ mvn -version
Apache Maven 3.8.4 (9b656c72d54e5bacbed989b64718c159fe39b537)
Maven home: /opt/Maven/Maven-3.8.4
Java version: 11.0.15, vendor: Debian, runtime: /usr/lib/jvm/java-11-openjdk-amd64
Default locale: fr_FR, platform encoding: UTF-8
OS name: "linux", version: "5.10.0-15-amd64", arch: "amd64", family: "unix"
```

<sup>2</sup> [https://en.wikipedia.org/wiki/Apache\\_Maven](https://en.wikipedia.org/wiki/Apache_Maven)

## 2.3. Sonatype Nexus Repository: Repository Management

“A repository manager is a dedicated server application designed to manage repositories of binary components. The usage of a repository manager is considered an essential best practice for any significant usage of Maven.”<sup>3</sup>

Due to security reasons, but also to benefit from new functionalities, it was required to update the nexus server.

	Old version	New version
Version	3.20	3.41
Release Date	2019-12-20	2022-08-27
Download	<a href="https://download.sonatype.com/nexus/3/nexus-3.20.0-04-unix.tar.gz">https://download.sonatype.com/nexus/3/nexus-3.20.0-04-unix.tar.gz</a>	<a href="https://download.sonatype.com/nexus/3/nexus-3.41.1-01-unix.tar.gz">https://download.sonatype.com/nexus/3/nexus-3.41.1-01-unix.tar.gz</a>

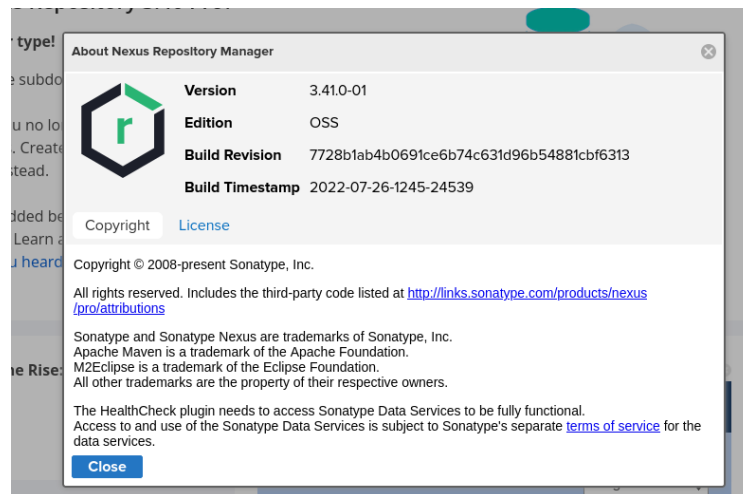


Figure 2: Screenshot of Nexus Repository Manager version at Grenoble INP - Esisar.

### Installation or upgrades:

According to the configuration: <https://help.sonatype.com/repomanager3/installation-and-upgrades>

### Configuration:

The Nexus Repository Manager is configured at Grenoble INP –Esisar with a set of remote repositories in order to work with Apache Maven, npm, Docker and Quarkus ( Figure 3).

<sup>3</sup> <https://maven.apache.org/repository-management.html#:~:text=A%20repository%20manager%20is%20a,any%20significant%20usage%20of%20Maven.>

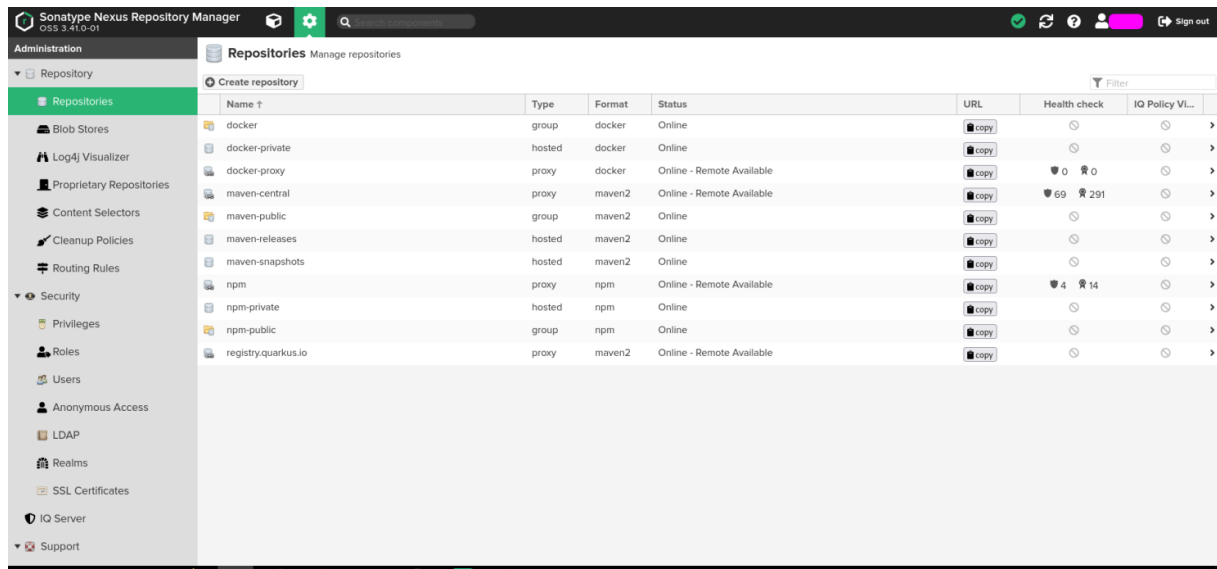


Figure 3: Repositories' configuration.

### Configuration of Apache Maven:

To use nexus repository manager with Apache Maven, it is required to configure Maven to check the repository manager instead of the default, built-in connection to the Central repository. To do this, we added a mirror configuration in the settings.xml file.

```

<mirrors>
<mirror>
<id>default</id>
<url>http://nexus.esisar.grenoble-inp.fr:8081/repository/maven-public/</url>
<mirrorOf>*</mirrorOf>
</mirror>
</mirrors>

```

Figure 4: Mirror configuration in settings.xml file.

## 2.4. Eclipse: Integrated Development Environment

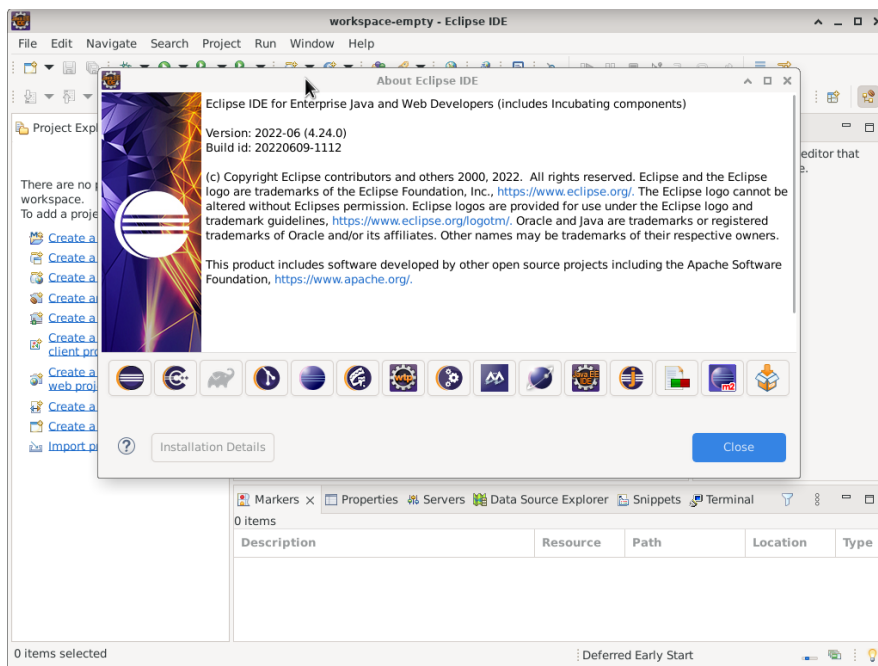
“Eclipse is an Integrated Development Environment (IDE) used in computer programming. It contains a base workspace and an extensible plug-in system for customizing the environment. It is the second-most-popular IDE for Java development, and, until 2016, was the most popular. Eclipse is written mostly in Java and its primary use is for developing Java applications, but it may also be used to develop applications in other programming languages.”<sup>4</sup>

Eclipse is the tool used for all the Java development projects at Grenoble INP – Esisar, in particular the course “Development of secured IoT Applications”.

	Old version	New version
Version	Eclipse 2021-06 (4.20)	Eclipse 2022-06 (4.24)
Release Date	2021-06	2022-06
Download	<a href="https://www.eclipse.org/downloads/packages/release/2021-06/r">https://www.eclipse.org/downloads/packages/release/2021-06/r</a>	<a href="https://www.eclipse.org/downloads/packages/release/2022-06/r">https://www.eclipse.org/downloads/packages/release/2022-06/r</a>

### Installing Eclipse:

- Extract distribution archive in any directory: at Esisar in /opt/Eclipse

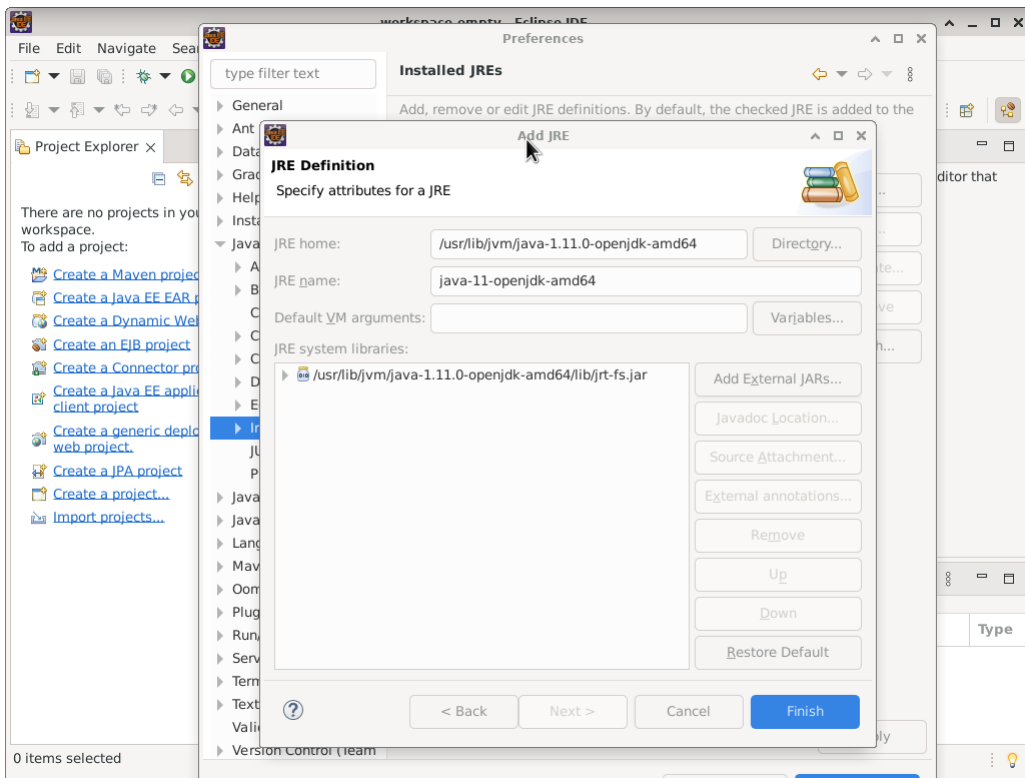


### Configuring Eclipse to use the OpenJDK:

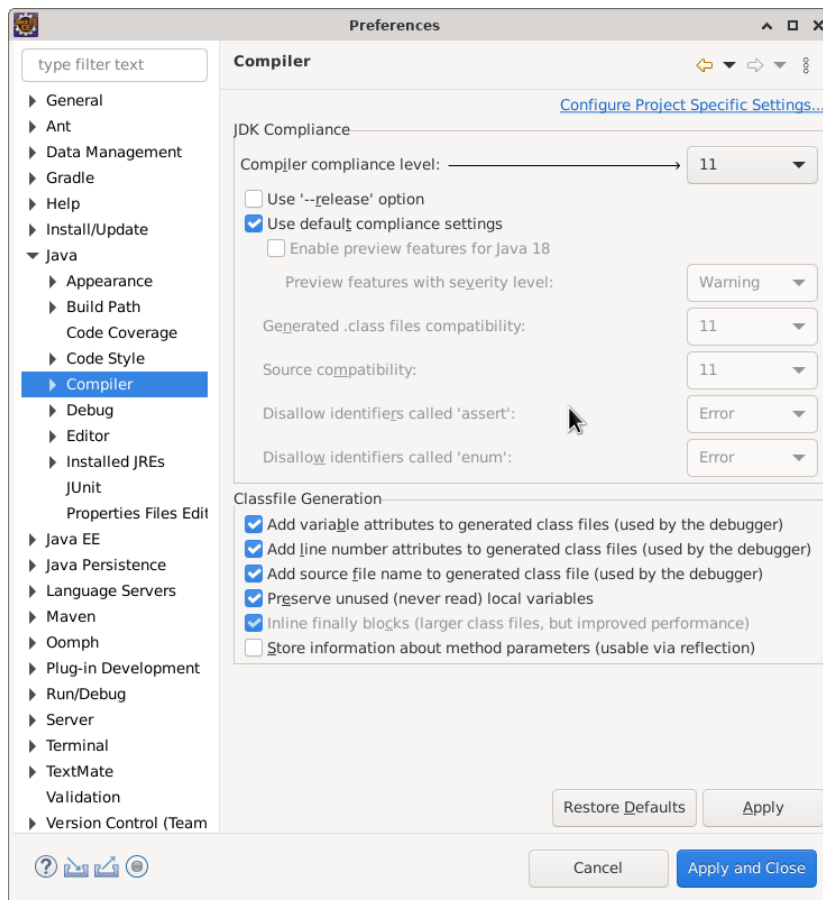
- In *Window > Preferences > Java > Installed JRE:*

<sup>4</sup> [https://en.wikipedia.org/wiki/Eclipse\\_\(software\)](https://en.wikipedia.org/wiki/Eclipse_(software))



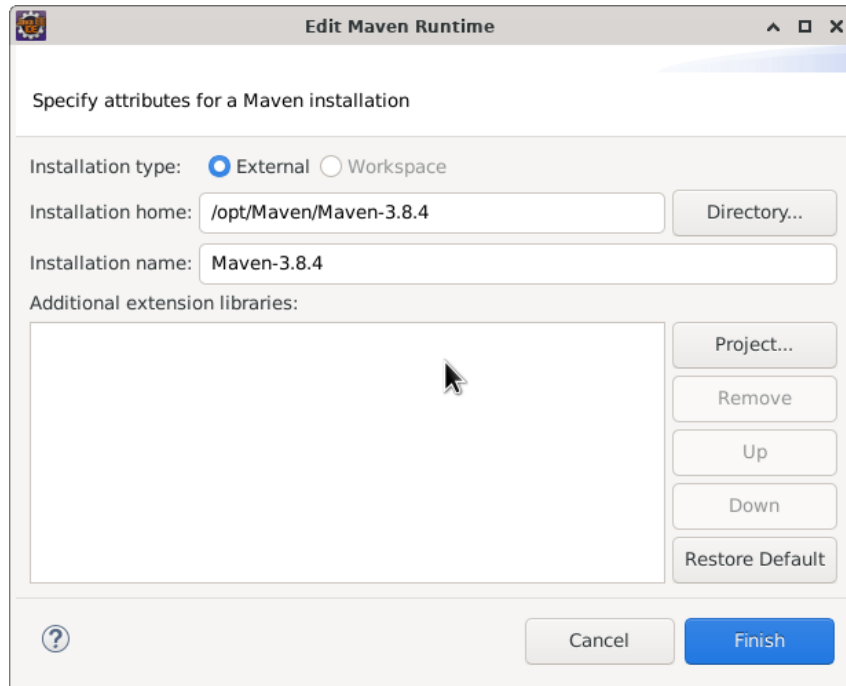


- In *Window > Preferences > Java > Compiler*:

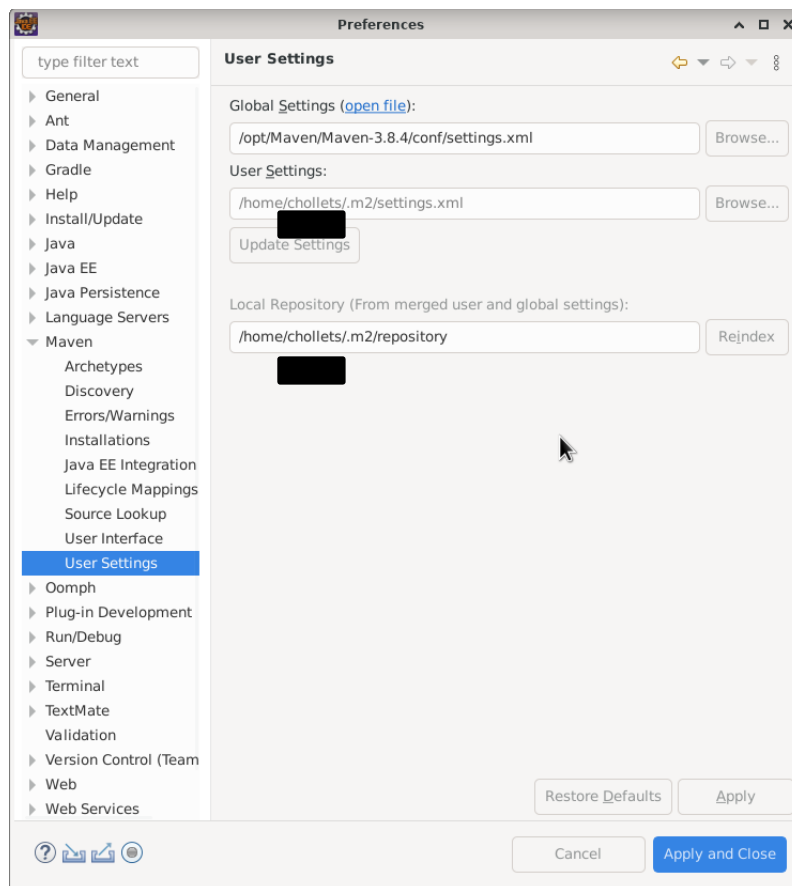


## Configuring Eclipse with Apache Maven:

- In *Window > Preferences > Maven > Installations:*



- In *Window > Preferences > Maven > User Settings:*



### 3. New software

#### 3.1. Node.js: Runtime environment

“Node.js is an open-source, cross-platform, back-end JavaScript runtime environment that runs on a JavaScript Engine (i.e. V8 engine) and executes JavaScript code outside a web browser, which was designed to build scalable network applications.”<sup>5</sup>

	New version
Version	12.22.5
Release Date	2021-08-11
Download	<a href="https://nodejs.org/en/download/releases/">https://nodejs.org/en/download/releases/</a>

Node.js website: <https://nodejs.org/en/>

Testing installation:

```
$ node -v  
v12.22.5
```

#### 3.2. npm: Build automation tool

“npm (originally short for Node Package Manager)[4] is a package manager for the JavaScript programming language maintained by npm, Inc. npm is the default package manager for the JavaScript runtime environment Node.js. It consists of a command line client, also called npm, and an online database of public and paid-for private packages, called the npm registry. The registry is accessed via the client, and the available packages can be browsed and searched via the npm website. The package manager and the registry are managed by npm, Inc.”<sup>6</sup>

	New version
Version	7.5.2
Release Date	2022-02-02
Download	<a href="https://nodejs.org/download/release/v15.8.0/">https://nodejs.org/download/release/v15.8.0/</a>

npm website: <https://www.npmjs.com/>

Testing installation:

```
$ npm -v  
7.5.2
```

<sup>5</sup> <https://en.wikipedia.org/wiki/Node.js>

<sup>6</sup> [https://en.wikipedia.org/wiki/Npm\\_\(software\)](https://en.wikipedia.org/wiki/Npm_(software))

### 3.3. Sonatype Nexus Repository: Repository Management

npm registries were added in Sonatype Nexus Repository. Figure 3 is a screenshot of the Sonatype Nexus Repository configuration for Grenoble INP – Esisar. This configuration is similar to the Apache Maven configuration.

#### Configuration of npm:

To use nexus repository manager with npm, it is required to configure npm to check the repository manager instead of the default, built-in connection to the Central repository. To do this, we added configuration in the file `/etc/nprmc`:

```
registry = http://nexus.esisar.grenoble-inp.fr:8081/repository/npm/
```

And also in the file `/etc/bash.bashrc`:

```
export no_proxy=nexus.esisar.grenoble-inp.fr
```

### 3.4. Visual Studio Code: Integrated Development Environment

“Visual Studio Code, also commonly referred to as VS Code, is a source-code editor made by Microsoft for Windows, Linux and macOS. Features include support for debugging, syntax highlighting, intelligent code completion, snippets, code refactoring, and embedded Git. Users can change the theme, keyboard shortcuts, preferences, and install extensions that add additional functionality.”<sup>7</sup>

	New version
Version	1.65.0
Release Date	2022-02
Download	<a href="https://code.visualstudio.com/updates/v1_65">https://code.visualstudio.com/updates/v1_65</a>

Visual Studio Code website: <https://code.visualstudio.com/>

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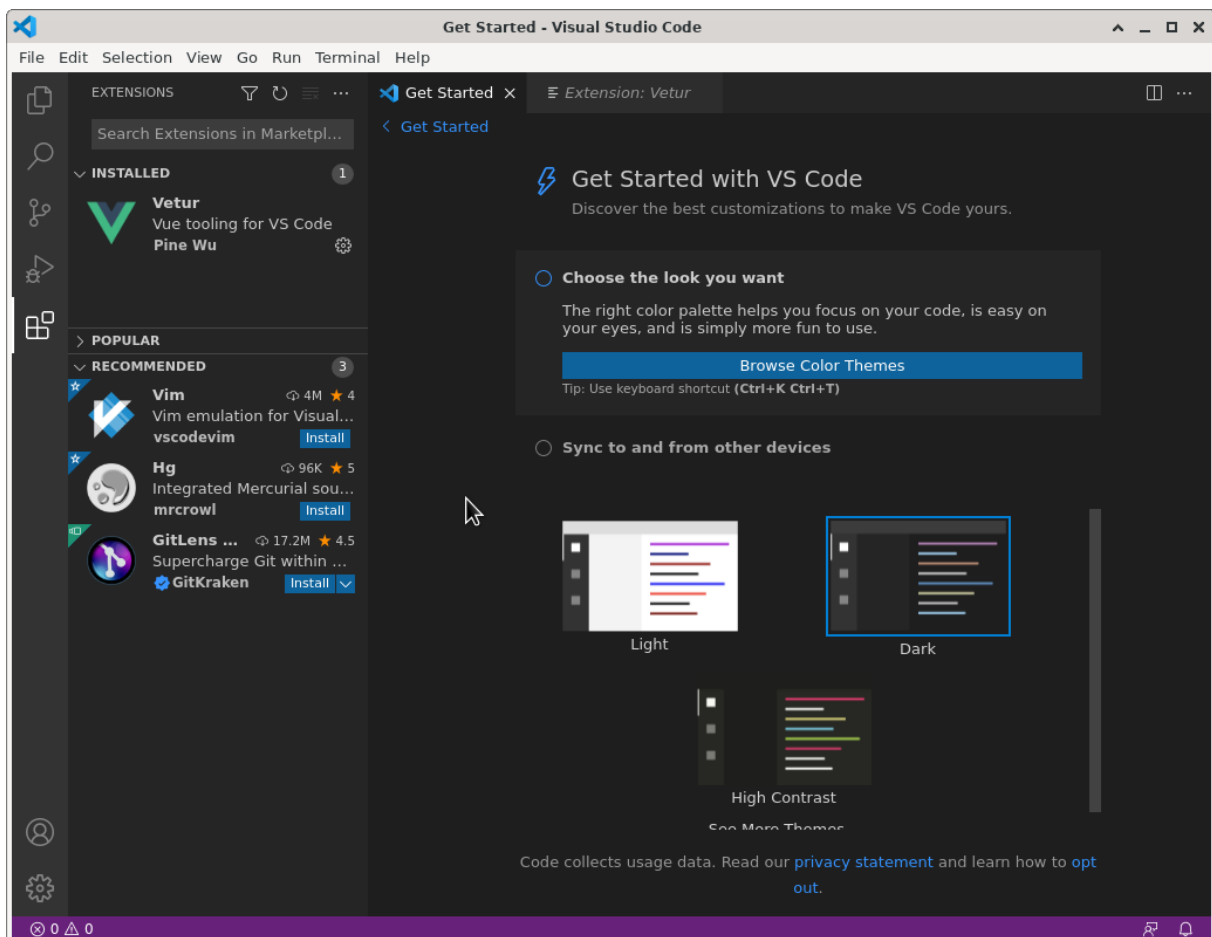
<sup>7</sup> [https://en.wikipedia.org/wiki/Visual\\_Studio\\_Code](https://en.wikipedia.org/wiki/Visual_Studio_Code)

**Visual Studio Code**  
**Visual Studio Code**

Version: 1.65.0  
Commit: b5205cc8eb4fbaa726835538cd82372cc0222d43  
Date: 2022-03-02T11:12:36.248Z (6 mos ago)  
Electron: 13.5.2  
Chromium: 91.0.4472.164  
Node.js: 14.16.0  
V8: 9.1.269.39-electron.0  
OS: Linux x64 5.10.0-15-amd64

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At Grenoble INP – Esisar, we added the Vetur plugin to facilitate the development of Vue.js code. Vetur plugin is an extension for Visual Studio Code available from the Visual Studio marketplace: <https://marketplace.visualstudio.com/items?itemName=octref.vetur>



### 3.5. PostgreSQL: relational database

“PostgreSQL also known as Postgres, is a free and open-source relational database management system (RDBMS) emphasizing extensibility and SQL compliance. It was originally named POSTGRES, referring to its origins as a successor to the Ingres database developed at the University of California, Berkeley. In 1996, the project was renamed to PostgreSQL to reflect its support for SQL. After a review in 2007, the development team decided to keep the name PostgreSQL and the alias Postgres.”<sup>8</sup>

	New version
Version	13.7
Release Date	2022-05-09
Download	<a href="https://www.postgresql.org/ftp/source/v13.7/">https://www.postgresql.org/ftp/source/v13.7/</a>

PostgreSQL website: <https://www.postgresql.org/>

Server URL at Grenoble INP – Esisar : <http://postgres.esisar.grenoble-inp.fr>

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<sup>8</sup> <https://en.wikipedia.org/wiki/PostgreSQL>