

Configure for Lab

Bok, Jong Soon

javaexpert@nate.com

<https://github.com/swacademy/Spring5>

Contents

- JDK 11.x Installation and Configuration
- Eclipse JEE Download and Configuration
- Maven 3.8.3 Configuration
- Maven Project in Eclipse
- Tomcat 10.0.12 Installation and Configuration
- STS 4.12.0.RELEASE Download and Configuration
- STS3 Add-On Installation
- Maven Project with STS
- Lombok 1.18.20 Library Installation



I. JDK 11.x

JDK 13.x Installation and Configuration

- JDK : <https://www.oracle.com/java/technologies/downloads/>
- Documentation : <https://docs.oracle.com/en/java/javase/11/>
- API : <https://docs.oracle.com/en/java/javase/11/docs/api/index.html>

JDK 1.8.x Installation and Configuration (Cont.)

- JAVA_HOME
- PATH

```
C:\Windows\system32\cmd.exe
Microsoft Windows [Version 10.0.19043.1237]
(c) Microsoft Corporation. All rights reserved.

C:\Users\instructor>set JAVA_HOME
JAVA_HOME=C:\Program Files\Java\jdk-11.0.12

C:\Users\instructor>set PATH
Path=C:\Program Files\Java\jdk-11.0.12\bin;C:\Program Files\Python39\Scripts;C:\Program
Files\Python39;C:\Windows\system32;C:\Windows;C:\Windows\System32\WBEM;C:\Windows\System
32\WindowsPowerShell\v1.0\;C:\Windows\System32\OpenSSH;C:\Program Files\MySQL\MySQL Serv
er 5.7\bin;C:\Program Files\Microsoft VS Code\bin;C:\Users\instructor\AppData\Local\Micro
soft\WindowsApps;C:\Program Files\Bandizip\;C:\Program Files\JetBrains\PyCharm Community
Edition 2021.2.1\bin;
PATHEXT=.COM;.EXE;.BAT;.CMD;.VBS;.VBE;.JS;.JSE;.WSF;.WSH;.MSC;.PY;.PYW
```

JDK 1.8.x Installation and Configuration (Cont.)

- javac & java -version

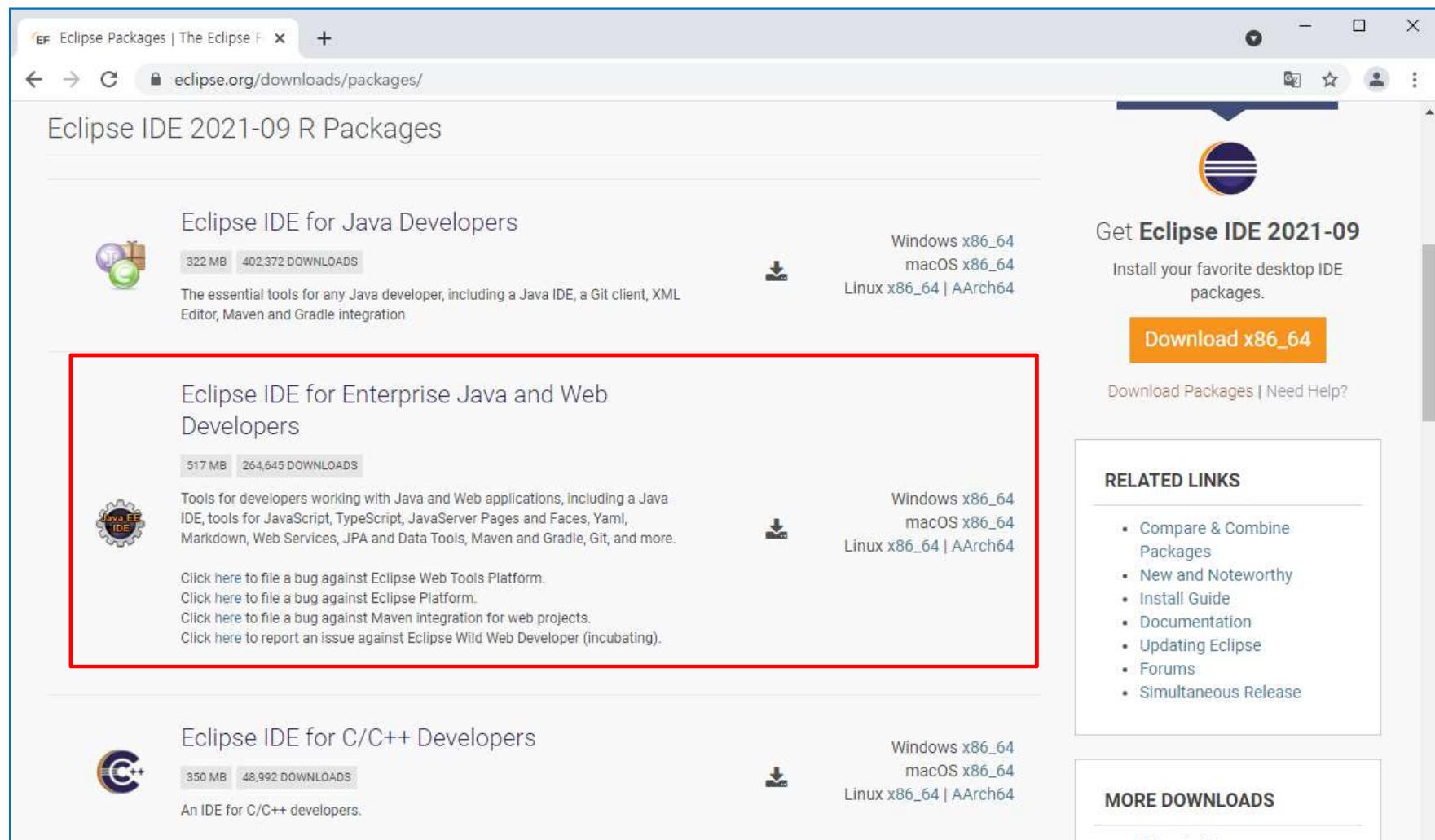
```
C:\Users\instructor>javac -version  
javac 11.0.12
```

```
C:\Users\instructor>java -version  
java version "11.0.12" 2021-07-20 LTS  
Java(TM) SE Runtime Environment 18.9 (build 11.0.12+8-LTS-237)  
Java HotSpot(TM) 64-Bit Server VM 18.9 (build 11.0.12+8-LTS-237, mixed mode)
```

II. Eclipse JEE



Eclipse JEE Download and Configuration



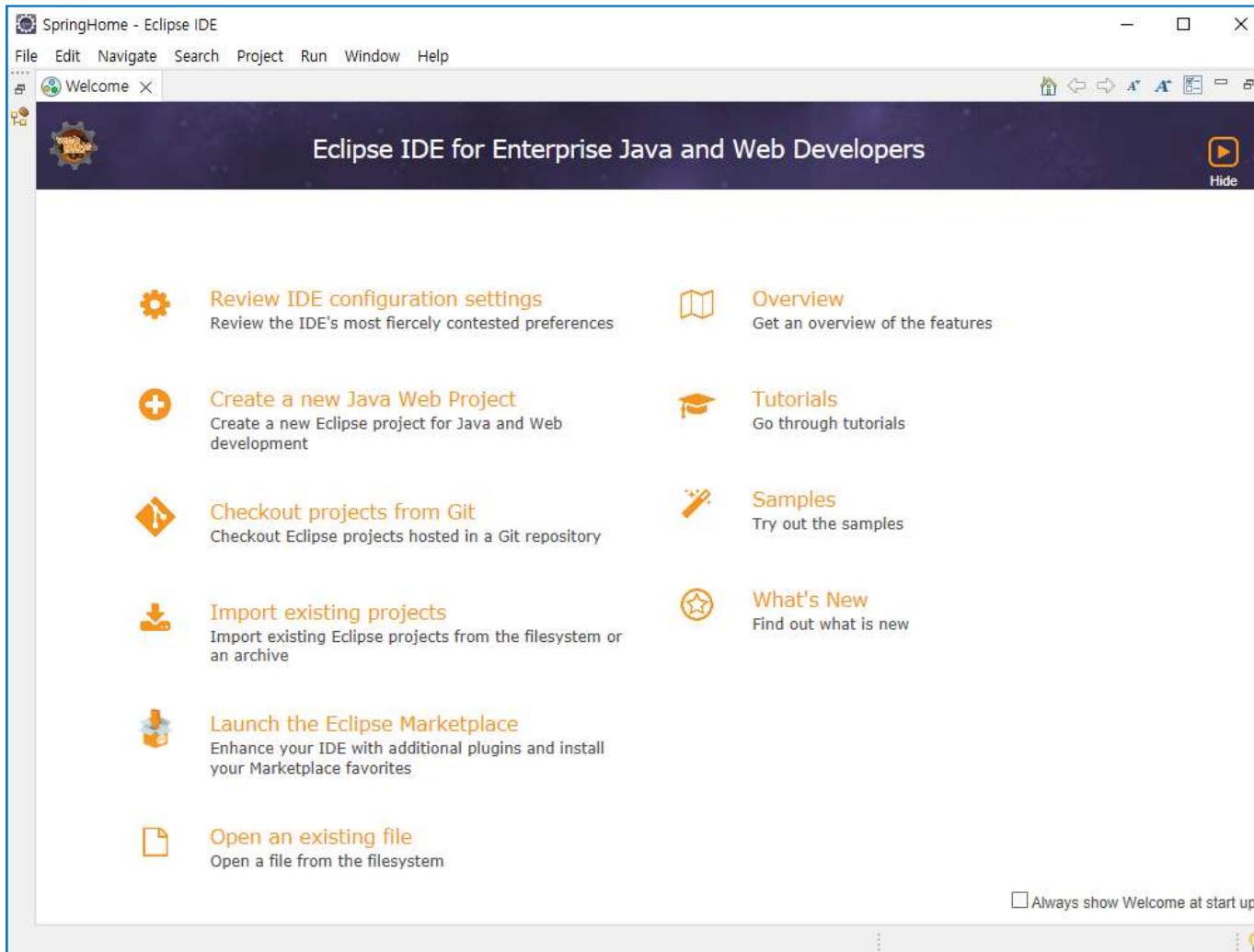
The screenshot shows the Eclipse Packages download page at eclipse.org/downloads/packages/. The page displays various Eclipse IDE packages:

- Eclipse IDE for Java Developers**: 322 MB, 402,372 DOWNLOADS. Description: The essential tools for any Java developer, including a Java IDE, a Git client, XML Editor, Maven and Gradle integration.
- Eclipse IDE for Enterprise Java and Web Developers**: 517 MB, 264,645 DOWNLOADS. Description: Tools for developers working with Java and Web applications, including a Java IDE, tools for JavaScript, TypeScript, JavaServer Pages and Faces, Yaml, Markdown, Web Services, JPA and Data Tools, Maven and Gradle, Git, and more. This section is highlighted with a red box.
- Eclipse IDE for C/C++ Developers**: 350 MB, 48,992 DOWNLOADS. Description: An IDE for C/C++ developers.

On the right side of the page, there is a sidebar with the following sections:

- Get Eclipse IDE 2021-09**: Install your favorite desktop IDE packages. Includes a **Download x86_64** button.
- RELATED LINKS**:
 - Compare & Combine Packages
 - New and Noteworthy
 - Install Guide
 - Documentation
 - Updating Eclipse
 - Forums
 - Simultaneous Release
- MORE DOWNLOADS**: A link to view more download options.

Eclipse JEE Download and Configuration (Cont.)



III. Maven 3.8.3



Maven 3.6.3 Configuration

- <http://maven.apache.org/>
- Refer to : <http://javacan.tistory.com/entry/MavenBasic>
- Download
 - <http://maven.apache.org/download.cgi>
 - Binary zip archive : apache-maven-3.8.3-bin.zip

Maven 3.6.3 Configuration (Cont.)

- M2_HOME(C:\ Program Files \ apache-maven-3.8.3) 설정
- PATH에 (%M2_HOME% \ bin) 추가

```
C:\Windows\system32\cmd.exe
Microsoft Windows [Version 10.0.19043.1237]
(c) Microsoft Corporation. All rights reserved.

C:\Users\instructor>set M2_HOME
M2_HOME=C:\Program Files\apache-maven-3.8.3

C:\Users\instructor>set PATH
Path=C:\Program Files\Java\jdk-11.0.12\bin;C:\Program Files\apache-maven-3.8.3\bin;C:\Program Files\Python39\Scripts\;C:\Program Files\Python39\;C:\Windows\system32;C:\Windows;C:\Windows\System32\WBem;C:\Windows\System32\WindowsPowerShell\v1.0\;C:\Windows\System32\OpenSSH\;C:\Program Files\MySQL\MySQL Server 5.7\bin;C:\Program Files\Microsoft VS Code\bin;C:\Users\instructor\AppData\Local\Microsoft\WindowsApps;C:\Program Files\Bandizip\;C:\Program Files\JetBrains\PyCharm Community Edition 2021.2.1\bin;
PATHEXT=.COM;.EXE;.BAT;.CMD;.VBS;.VBE;.JS;.JSE;.WSF;.WSH;.MSC;.PY;.PYW
```

Maven 3.6.x Configuration (Cont.)

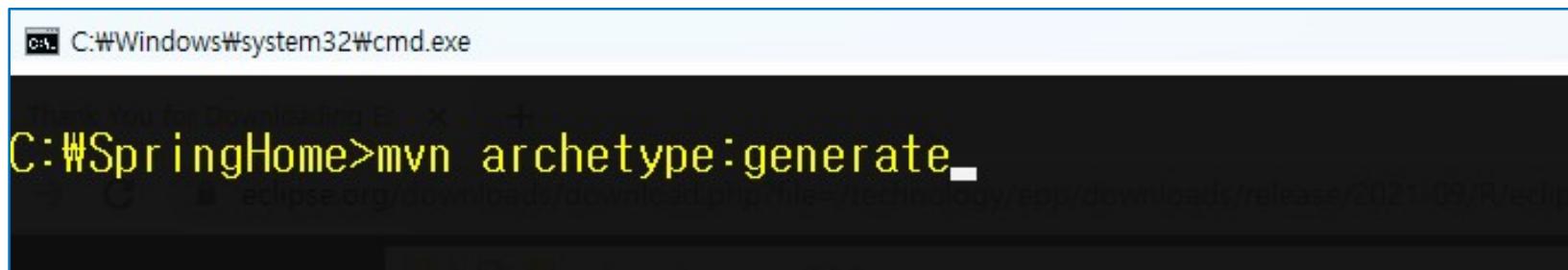
■ 설치 확인

\$ mvn -version

```
C:\Users\winstructor>mvn -version
Apache Maven 3.8.3 (ff8e977a158738155dc465c6a97ffaf31982d739)
Maven home: C:\Program Files\apache-maven-3.8.3
Java version: 11.0.12, vendor: Oracle Corporation, runtime: C:\Program Files\Java\jdk-11.0.12
Default locale: ko_KR, platform encoding: MS949
OS name: "windows 10", version: "10.0", arch: "amd64", family: "windows"
```

Maven Project

\$ mvn archetype:generate



A screenshot of a Windows command prompt window titled "cmd C:\Windows\system32\cmd.exe". The window shows the command "mvn archetype:generate" being typed at the prompt. The background of the window is dark, and the text is white or light-colored.

Maven Project (Cont.)

```
C:\Windows\system32\cmd.exe - mvn archetype:generate
2971: remote -> ua.co.gravy.archetype:single-project-with-junit-and-slf4j (Create a single project with jUnit, Mockito and slf4j dependencies.)
2972: remote -> uk.ac.ebi.gxa:atlas-archetype (Archetype for generating a custom Atlas webapp)
2973: remote -> uk.ac.gate:gate-plugin-archetype (Maven archetype to create a new GATE plugin project.)
2974: remote -> uk.ac.gate:gate-pr-archetype (Maven archetype to create a new GATE plugin project including a sample PR class (an empty LanguageAnalyser).)
2975: remote -> uk.ac.nactem.argo:argo-analysis-engine-archetype (An archetype which contains a sample Argo (UIMA) Analysis Engine)
2976: remote -> uk.ac.nactem.argo:argo-reader-archetype (An archetype which contains a sample Argo (UIMA) Reader)
2977: remote -> uk.ac.rdg.resc:edal-ncwms-based-webapp (-)
2978: remote -> uk.co.markg.archetypes:java11-junit5 (An archetype for generate java 11 projects with junit 5.)
2979: remote -> uk.co.nemstix:basic-javaee7-archetype (A basic Java EE7 Maven archetype)
2980: remote -> uk.co.solong:angular-spring-archetype (So Long archetype for RESTful spring services with an AngularJS frontend. Includes debian deployment)
2981: remote -> us.fatehi:schemacrawler-archetype-maven-project (-)
2982: remote -> us.fatehi:schemacrawler-archetype-plugin-command (-)
2983: remote -> us.fatehi:schemacrawler-archetype-plugin-dbconnector (-)
2984: remote -> us.fatehi:schemacrawler-archetype-plugin-lint (-)
2985: remote -> ws.osiris:osiris-archetype (Maven Archetype for Osiris)
2986: remote -> xyz.luan.generator:xyz-gae-generator (-)
2987: remote -> xyz.luan.generator:xyz-generator (-)
2988: remote -> za.co.absa.hyperdrive:component-archetype (-)
2989: remote -> za.co.absa.hyperdrive:component-archetype_2.11 (-)
2990: remote -> za.co.absa.hyperdrive:component-archetype_2.12 (-)
Choose a number or apply filter (format: [groupId:]artifactId, case sensitive contains):
1826:
```

Maven Project (Cont.)

```
C:\Windows\system32\cmd.exe - mvn archetype:generate
2977: remote -> uk.ac.rdg.resc:edal-ncwms-based-webapp (-)
2978: remote -> uk.co.markg.archetypes:java11-junit5 (An archetype for generate java 11 p
rojects with junit 5.)
2979: remote -> uk.co.nemstix:basic-javaee7-archetype (A basic Java EE7 Maven archetype)
2980: remote -> uk.co.solong:angular-spring-archetype (So Long archetype for RESTful spri
ng services with an AngularJS frontend. Includes debian deployment)
2981: remote -> us.fatehi:schemacrawler-archetype-maven-project (-)
2982: remote -> us.fatehi:schemacrawler-archetype-plugin-command (-)
2983: remote -> us.fatehi:schemacrawler-archetype-plugin-dbconnector (-)
2984: remote -> us.fatehi:schemacrawler-archetype-plugin-lint (-)
2985: remote -> ws.osiris:osiris-archetype (Maven Archetype for Osiris)
2986: remote -> xyz.luan.generator:xyz-gae-generator (-)
2987: remote -> xyz.luan.generator:xyz-generator (-)
2988: remote -> za.co.absa.hyperdrive:component-archetype (-)
2989: remote -> za.co.absa.hyperdrive:component-archetype_2.11 (-)
2990: remote -> za.co.absa.hyperdrive:component-archetype_2.12 (-)
Choose a number or apply filter (format: [groupId:]artifactId, case sensitive contains):
1826:
Choose org.apache.maven.archetypes:maven-archetype-quickstart version:
1: 1.0-alpha-1
2: 1.0-alpha-2
3: 1.0-alpha-3
4: 1.0-alpha-4
5: 1.0
6: 1.1
7: 1.3
8: 1.4
Choose a number: 8: -
```

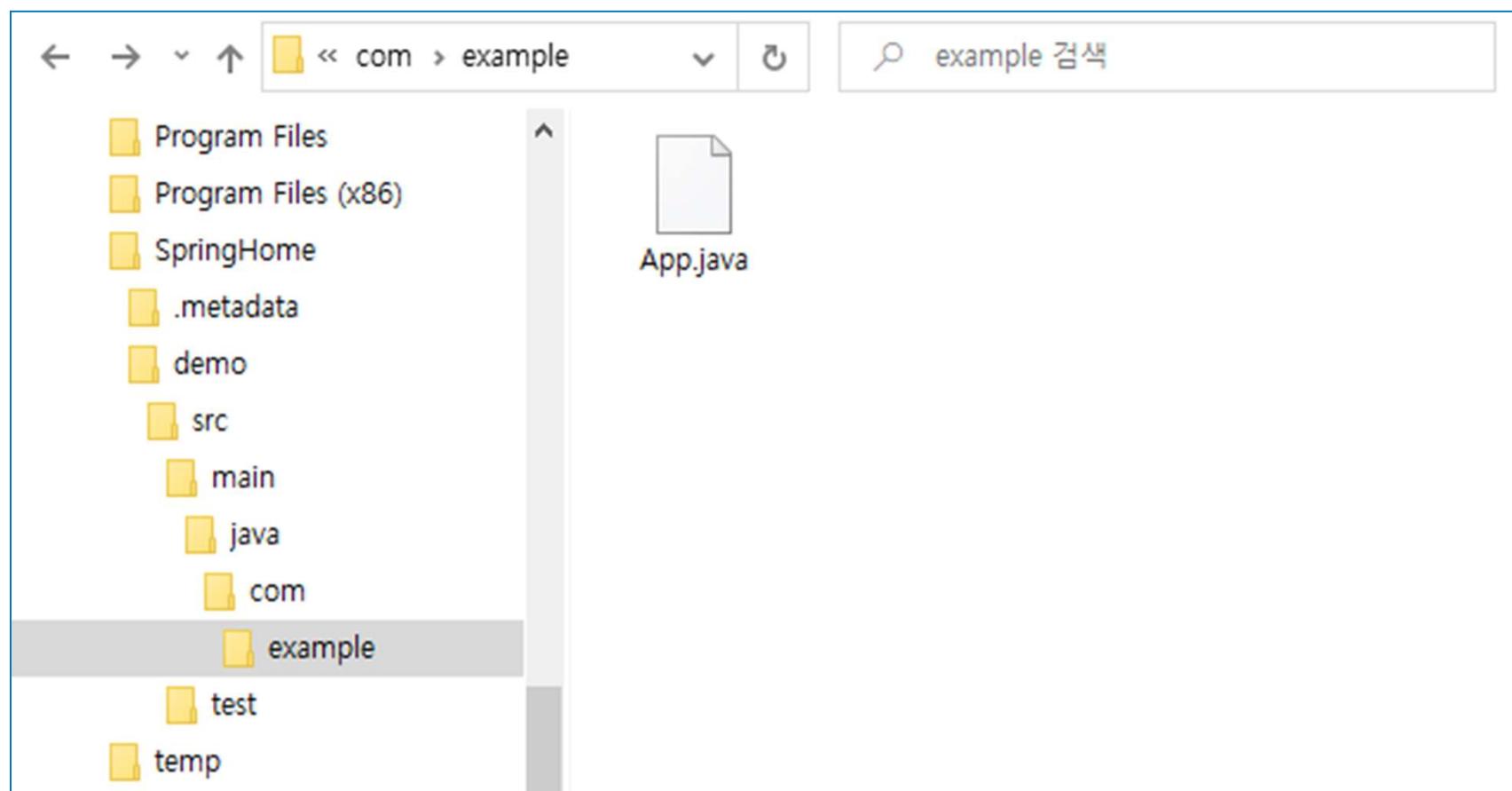
Maven Project (Cont.)

```
C:\Windows\system32\cmd.exe - mvn archetype:generate
2: 1.0-alpha-2
3: 1.0-alpha-3
4: 1.0-alpha-4
5: 1.0
6: 1.1
7: 1.3
8: 1.4
Choose a number: 8:
Downloading from central: https://repo.maven.apache.org/maven2/org/apache/maven/archetypes/maven-archetype-quickstart/1.4/maven-archetype-quickstart-1.4.pom
Downloaded from central: https://repo.maven.apache.org/maven2/org/apache/maven/archetypes/maven-archetype-quickstart/1.4/maven-archetype-quickstart-1.4.pom (1.6 kB at 4.3 kB/s)
Downloading from central: https://repo.maven.apache.org/maven2/org/apache/maven/archetypes/maven-archetype-bundles/1.4/maven-archetype-bundles-1.4.pom
Downloaded from central: https://repo.maven.apache.org/maven2/org/apache/maven/archetypes/maven-archetype-bundles/1.4/maven-archetype-bundles-1.4.pom (4.5 kB at 14 kB/s)
Downloading from central: https://repo.maven.apache.org/maven2/org/apache/maven/archetypes/maven-archetype-quickstart/1.4/maven-archetype-quickstart-1.4.jar
Downloaded from central: https://repo.maven.apache.org/maven2/org/apache/maven/archetypes/maven-archetype-quickstart/1.4/maven-archetype-quickstart-1.4.jar (7.1 kB at 24 kB/s)
Define value for property 'groupId': com.example
Define value for property 'artifactId': demo
Define value for property 'version' 1.0-SNAPSHOT: :
Define value for property 'package' com.example: :
Confirm properties configuration:
groupId: com.example
artifactId: demo
version: 1.0-SNAPSHOT
package: com.example
Y: :
```

Maven Project (Cont.)

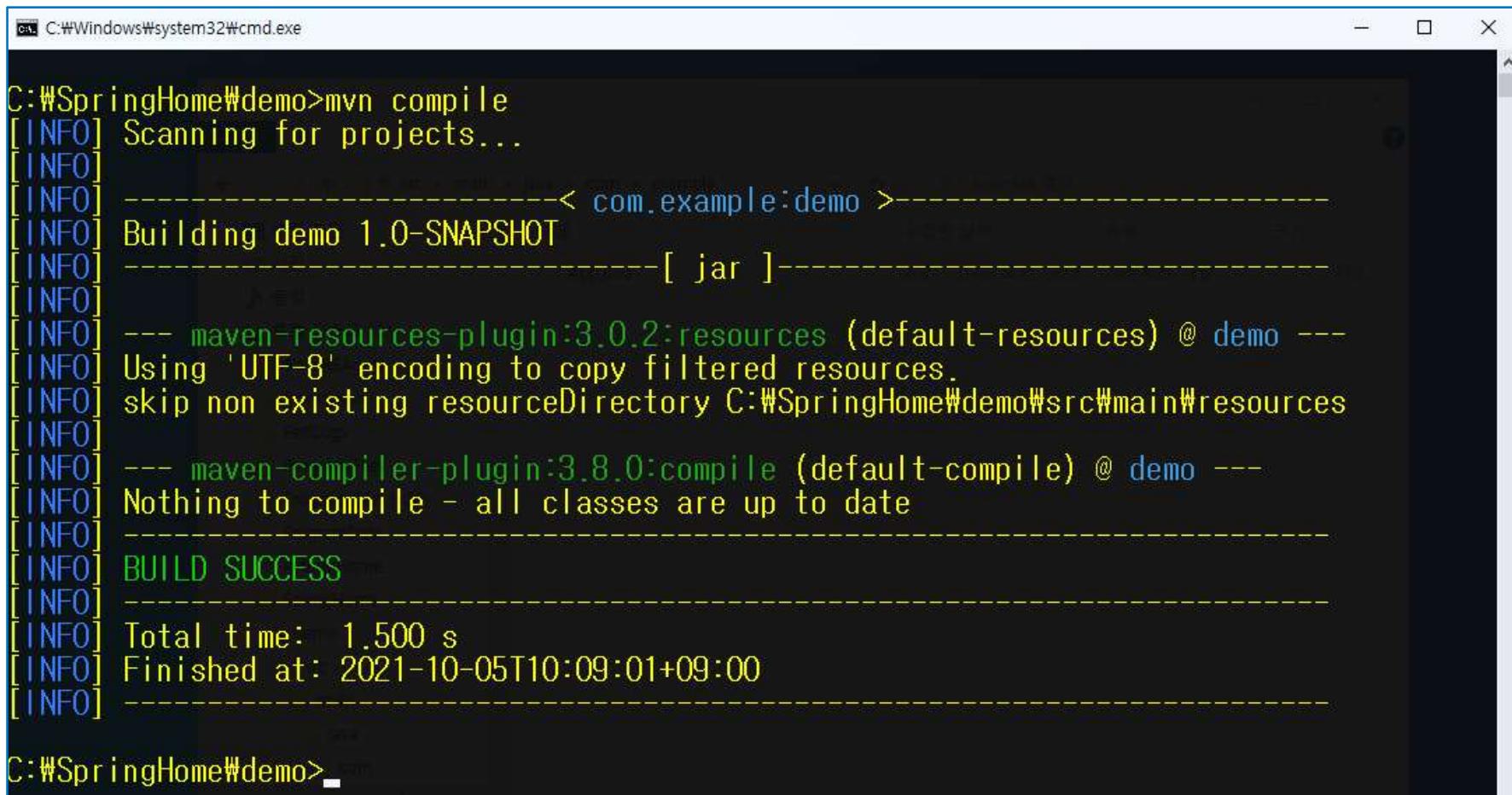
```
C:\Windows\system32\cmd.exe
Define value for property 'version' 1.0-SNAPSHOT: :
Define value for property 'package' com.example: :
Confirm properties configuration:
groupId: com.example
artifactId: demo
version: 1.0-SNAPSHOT
package: com.example
Y: :
[INFO] -----
[INFO] Using following parameters for creating project from Archetype: maven-archetype-quickstart:1.4
[INFO] -----
[INFO] Parameter: groupId, Value: com.example
[INFO] Parameter: artifactId, Value: demo
[INFO] Parameter: version, Value: 1.0-SNAPSHOT
[INFO] Parameter: package, Value: com.example
[INFO] Parameter: packageInPathFormat, Value: com/example
[INFO] Parameter: package, Value: com.example
[INFO] Parameter: groupId, Value: com.example
[INFO] Parameter: artifactId, Value: demo
[INFO] Parameter: version, Value: 1.0-SNAPSHOT
[INFO] Project created from Archetype in dir: C:\SpringHome\demo
[INFO] -----
[INFO] BUILD SUCCESS
[INFO] -----
[INFO] Total time: 05:00 min
[INFO] Finished at: 2021-10-05T10:05:46+09:00
[INFO] -----
```

Maven Project (Cont.)



Maven Project (Cont.)

\$ mvn compile



```
C:\#SpringHome\#demo>mvn compile
[INFO] Scanning for projects...
[INFO] [INFO] -----< com.example:demo >-----
[INFO] Building demo 1.0-SNAPSHOT
[INFO] [INFO] -----[ jar ]-----
[INFO] --- maven-resources-plugin:3.0.2:resources (default-resources) @ demo ---
[INFO] Using 'UTF-8' encoding to copy filtered resources.
[INFO] skip non existing resourceDirectory C:\#SpringHome\#demo\src\main\resources
[INFO] --- maven-compiler-plugin:3.8.0:compile (default-compile) @ demo ---
[INFO] Nothing to compile - all classes are up to date
[INFO] [INFO] -----BUILD SUCCESS-----
[INFO] Total time: 1.500 s
[INFO] Finished at: 2021-10-05T10:09:01+09:00
[INFO] [INFO] -----
```

C:\#SpringHome\#demo>

Maven Project (Cont.)

\$ mvn test

```
C:\Windows\system32\cmd.exe
C:\SpringHome\demo>mvn test
```

```
C:\Windows\system32\cmd.exe
surefire-junit4/2.22.1/surefire-junit4-2.22.1.jar
Downloaded from central: https://repo.maven.apache.org/maven2/org/apache/maven/surefire/s
urefire-junit4/2.22.1/surefire-junit4-2.22.1.jar (85 kB at 218 kB/s)
[INFO] -----
[INFO] T E S T S
[INFO] -----
[INFO] Running com.example.AppTest
[INFO] Tests run: 1, Failures: 0, Errors: 0, Skipped: 0, Time elapsed: 0.075 s - in com.e
xample.AppTest
[INFO] Results:
[INFO] Tests run: 1, Failures: 0, Errors: 0, Skipped: 0
[INFO] -----
[INFO] BUILD SUCCESS
[INFO] -----
[INFO] Total time: 19.156 s
[INFO] Finished at: 2021-10-05T10:10:48+09:00
[INFO] -----
```

C:\SpringHome\demo>

Maven Project (Cont.)

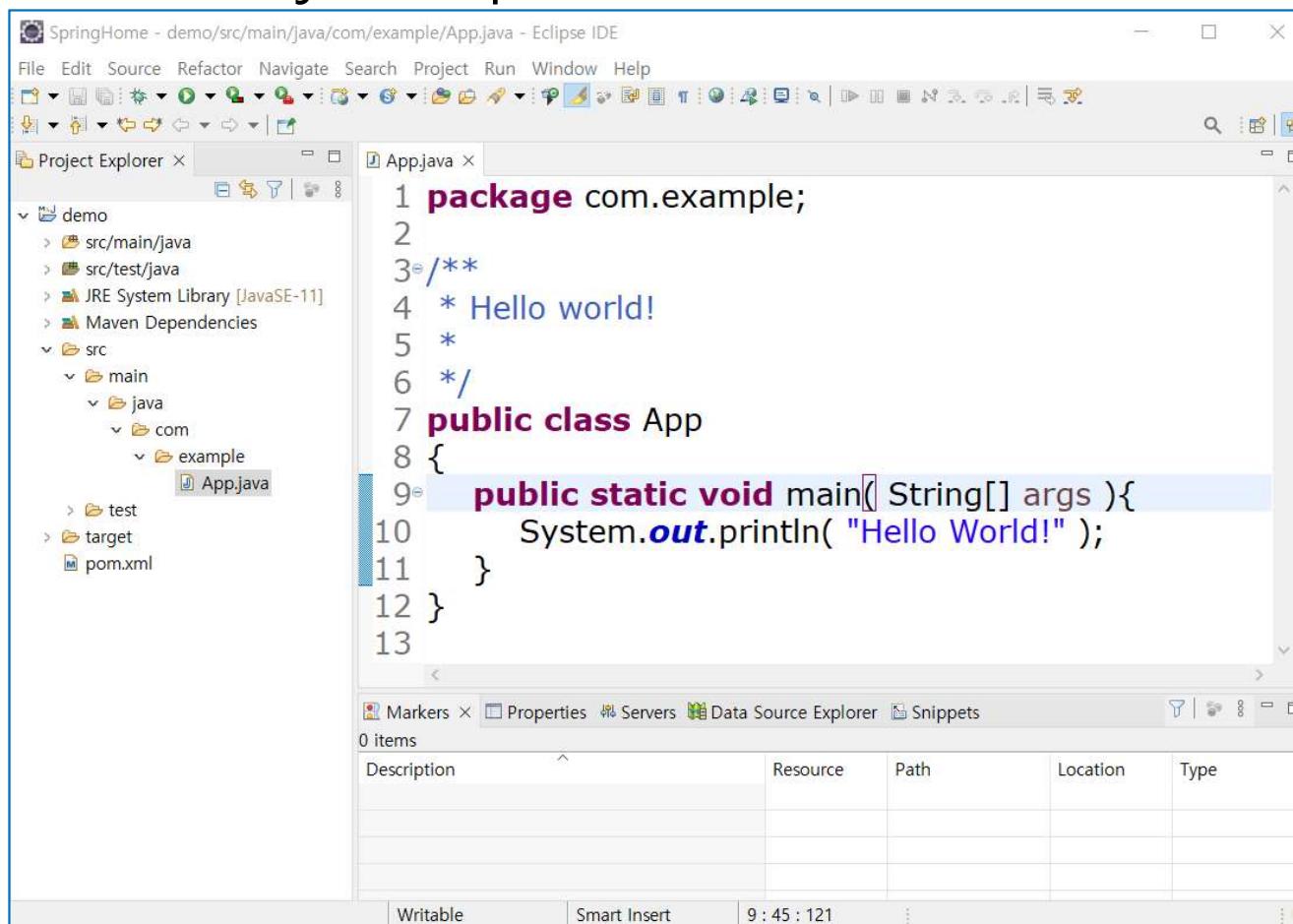
\$ mvn package

```
C:\Windows\system32\cmd.exe
C:\SpringHome\demo>mvn package
```

```
C:\Windows\system32\cmd.exe
Downloaded from central: https://repo.maven.apache.org/maven2/org/codehaus/plexus/plexus-archiver/3.4/plexus-archiver-3.4.jar (187 kB at 282 kB/s)
Downloading from central: https://repo.maven.apache.org/maven2/org/tukaani/xz/1.5/xz-1.5.jar
Downloaded from central: https://repo.maven.apache.org/maven2/org/apache/maven/maven-archiver/3.1.1/maven-archiver-3.1.1.jar (24 kB at 27 kB/s)
Downloaded from central: https://repo.maven.apache.org/maven2/org/codehaus/plexus/plexus-io/2.7.1/plexus-io-2.7.1.jar (86 kB at 86 kB/s)
Downloaded from central: https://repo.maven.apache.org/maven2/org/apache/maven/shared/maven-shared-utils/3.0.1/maven-shared-utils-3.0.1.jar (154 kB at 142 kB/s)
Downloaded from central: https://repo.maven.apache.org/maven2/org/tukaani/xz/1.5/xz-1.5.jar (100 kB at 86 kB/s)
Downloaded from central: https://repo.maven.apache.org/maven2/org/apache/commons/commons-compress/1.11/commons-compress-1.11.jar (426 kB at 258 kB/s)
[INFO] Building jar: C:\SpringHome\demo\target\demo-1.0-SNAPSHOT.jar
[INFO] -----
[INFO] BUILD SUCCESS
[INFO] -----
[INFO] Total time: 13.284 s
[INFO] Finished at: 2021-10-05T10:11:41+09:00
[INFO] -----
```

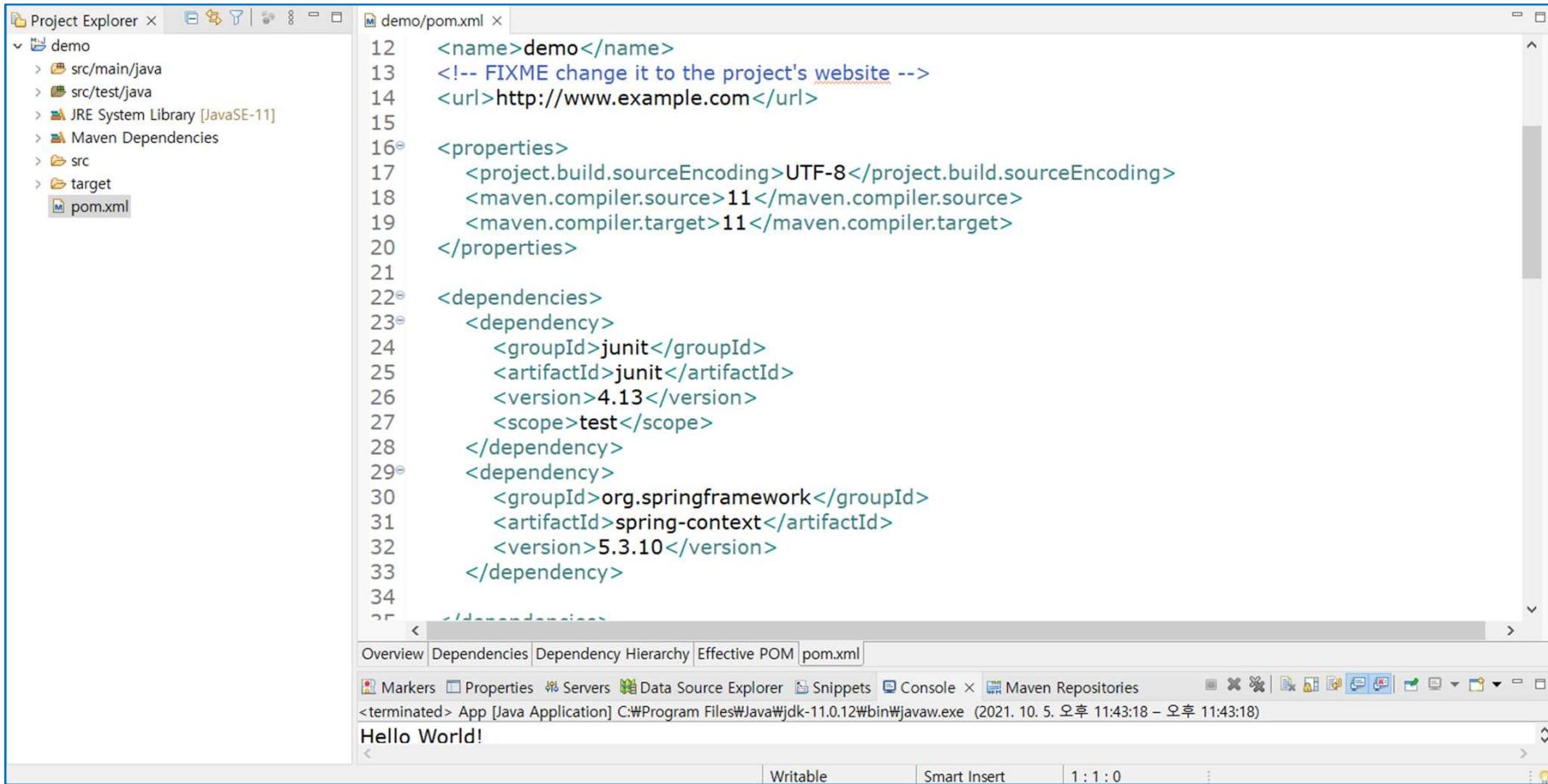
Maven Project (Cont.)

■ Eclipse에서 Maven Project Import 하기



Maven Project (Cont.)

■ Eclipse에서 Maven Project Import 하기

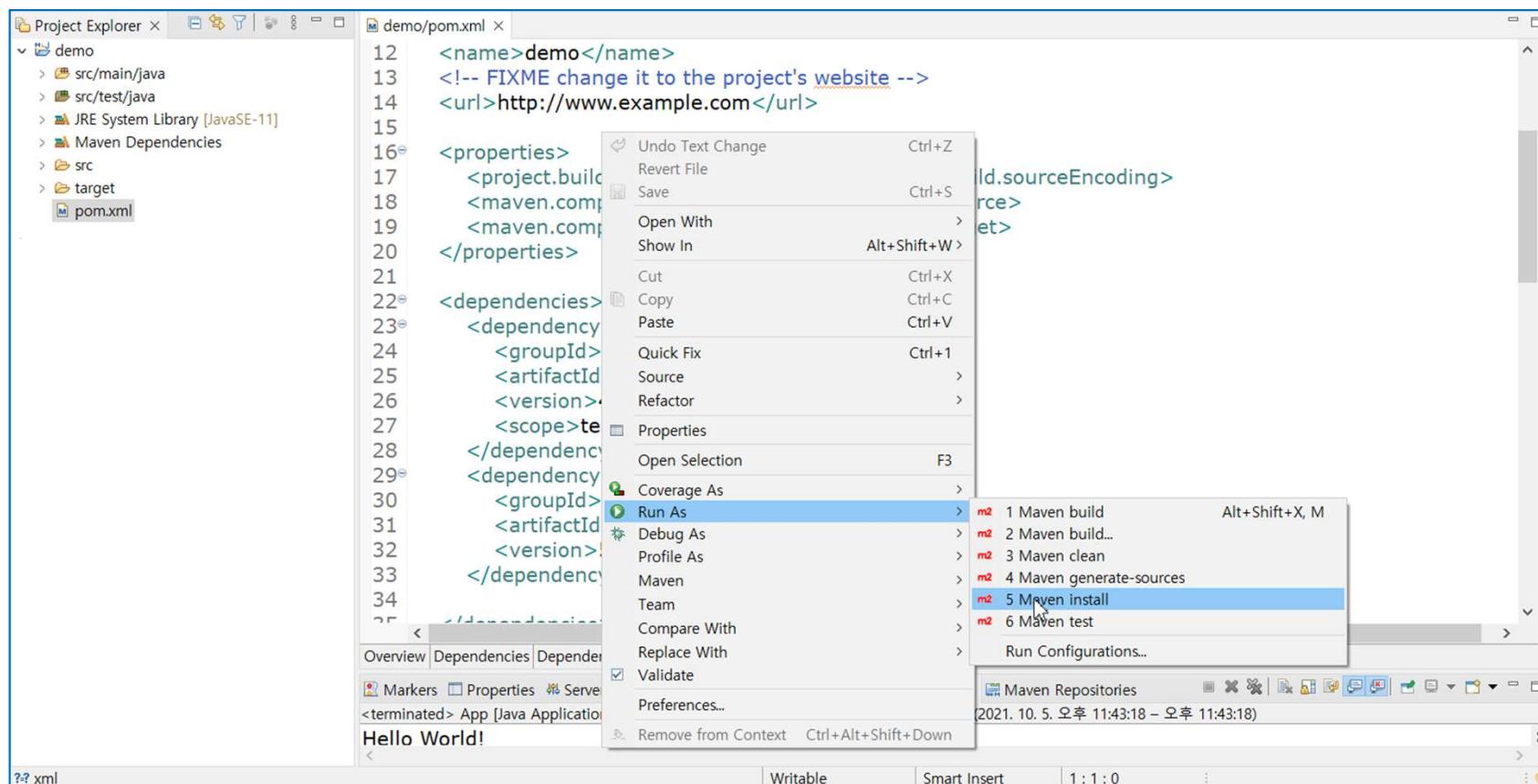


The screenshot shows the Eclipse IDE interface with a Maven project imported. The left side features the Project Explorer view, which lists a project named 'demo' containing 'src/main/java', 'src/test/java', 'JRE System Library [JavaSE-11]', 'Maven Dependencies', 'src', and 'target'. Inside 'target' is a file named 'pom.xml'. The right side of the interface is a code editor displaying the contents of the 'pom.xml' file. The code defines a project with name 'demo', website URL 'http://www.example.com', and various properties like build source encoding ('UTF-8'), compiler source and target versions ('11'), and dependencies for 'junit' and 'org.springframework'. Below the code editor, the tabs 'Overview', 'Dependencies', 'Dependency Hierarchy', and 'Effective POM' are visible, with 'pom.xml' being the active tab. At the bottom, the Eclipse toolbar and status bar are shown.

```
12  <name>demo</name>
13  <!-- FIXME change it to the project's website -->
14  <url>http://www.example.com</url>
15
16  <properties>
17      <project.build.sourceEncoding>UTF-8</project.build.sourceEncoding>
18      <maven.compiler.source>11</maven.compiler.source>
19      <maven.compiler.target>11</maven.compiler.target>
20  </properties>
21
22  <dependencies>
23      <dependency>
24          <groupId>junit</groupId>
25          <artifactId>junit</artifactId>
26          <version>4.13</version>
27          <scope>test</scope>
28      </dependency>
29      <dependency>
30          <groupId>org.springframework</groupId>
31          <artifactId>spring-context</artifactId>
32          <version>5.3.10</version>
33      </dependency>
34
35  </dependencies>
```

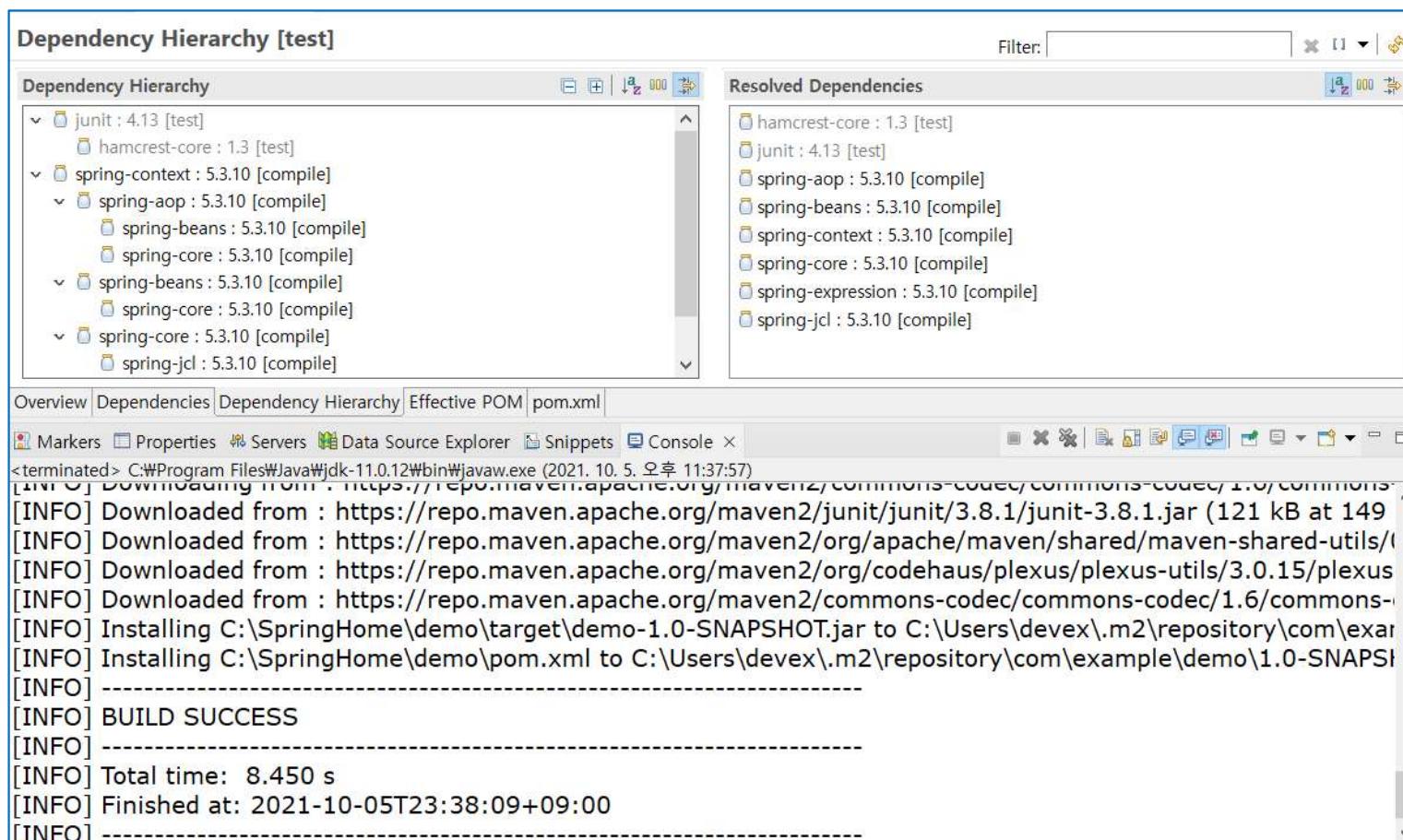
Maven Project (Cont.)

■ Eclipse에서 Maven Project Import 하기



Maven Project (Cont.)

■ Eclipse에서 Maven Project Import 하기



IV. Maven Project In Eclipse



Maven Project in Eclipse

The screenshot shows the Eclipse IDE interface with a Maven project open. The left pane is the Project Explorer, displaying the project structure:

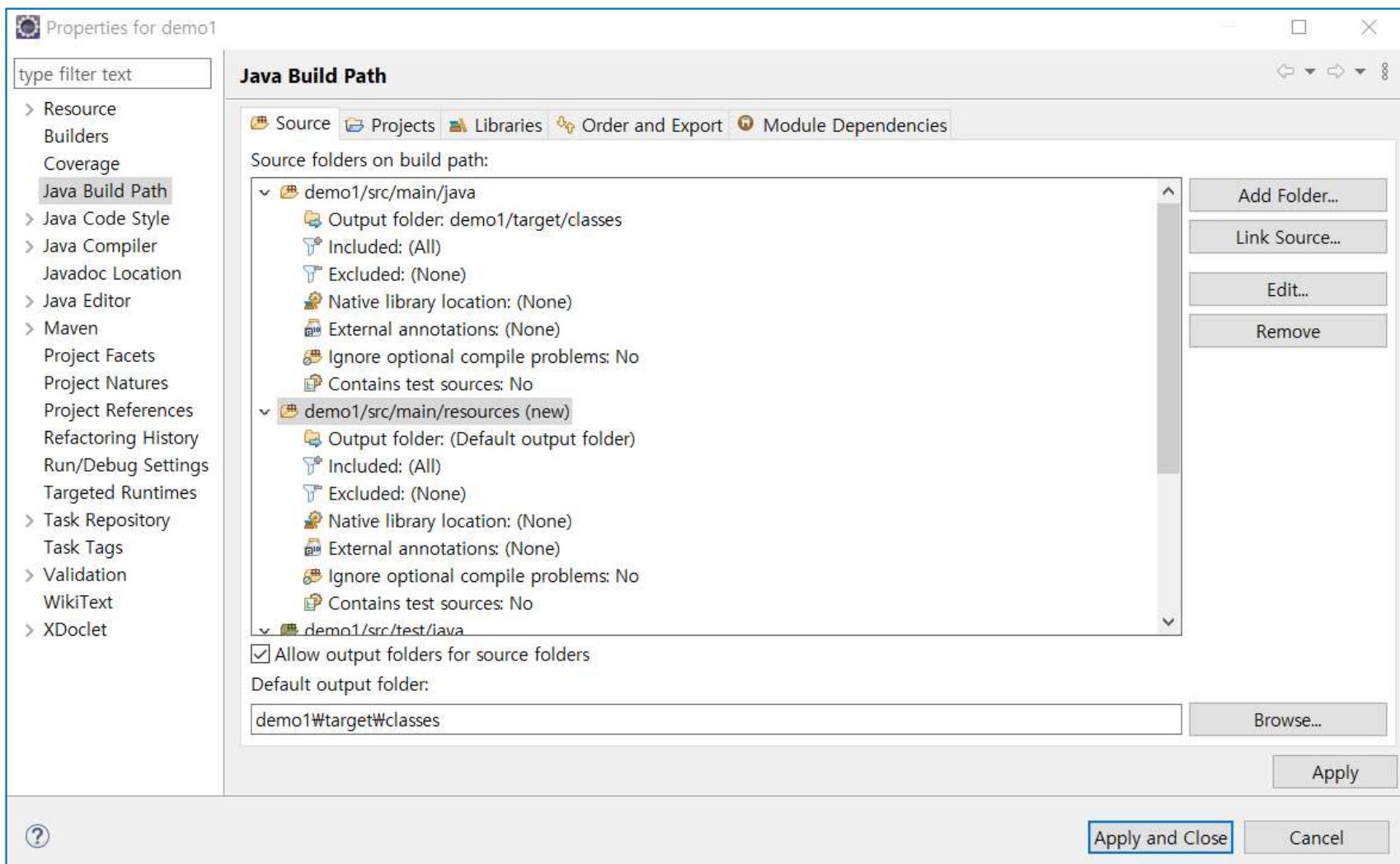
- demo
- demo1
 - src/main/java
 - com.example.demo1
 - Greeter.java
 - src/test/java
 - JRE System Library [jdk-11.0.12]
 - Maven Dependencies
 - src
 - target
- pom.xml

The right pane is the code editor for Greeter.java, showing the following Java code:

```
1 package com.example.demo1;
2
3 public class Greeter {
4     private String format;
5
6     public String greet(String guest) {
7         return String.format(this.format, guest);
8     }
9
10    public void setFormat(String format) {
11        this.format = format;
12    }
13 }
14
```

The line `this.format = format;` is highlighted with a light blue background, indicating it is selected or being edited.

Maven Project in Eclipse



Maven Project in Eclipse (Cont.)

The screenshot shows the Eclipse IDE interface with a Maven project named "demo1". The Project Explorer view on the left displays the project structure, including a Java class "Greeter.java" and an XML configuration file "applicationContext.xml". The "applicationContext.xml" file is open in the main editor area, showing the following Spring XML configuration:

```
<?xml version="1.0" encoding="UTF-8"?>
<beans xmlns="http://www.springframework.org/schema/beans"
       xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
       xsi:schemaLocation="http://www.springframework.org/schema/beans
                           http://www.springframework.org/schema/beans/spring-beans.xsd">
    <bean id="greeter" class="com.example.demo1.Greeter">
        <property name="format" value="%s, Hello, World!" />
    </bean>
</beans>
```

The "Console" view at the bottom shows the application's output: "Hello World!".

Maven Project in Eclipse (Cont.)

The screenshot shows the Eclipse IDE interface with a Maven project named "demo" open. The Project Explorer view on the left displays the project structure, including a "demo1" module containing Java source code and resources. The central editor area shows the content of the `pom.xml` file, which defines properties like source encoding and compiler versions, and lists dependencies for JUnit and Spring Context.

```
15<properties>
16    <project.build.sourceEncoding>UTF-8</project.build.sourceEncoding>
17    <maven.compiler.source>11</maven.compiler.source>
18    <maven.compiler.target>11</maven.compiler.target>
19</properties>
20<dependencies>
21    <dependency>
22        <groupId>junit</groupId>
23        <artifactId>junit</artifactId>
24        <version>4.13</version>
25        <scope>test</scope>
26    </dependency>
27    <!-- https://mvnrepository.com/artifact/org.springframework/spring-context -->
28    <dependency>
29        <groupId>org.springframework</groupId>
30        <artifactId>spring-context</artifactId>
31        <version>5.3.10</version>
32    </dependency>
33</dependencies>
```

The Eclipse interface includes tabs for Overview, Dependencies, Dependency Hierarchy, Effective POM, and pom.xml at the bottom of the editor. The status bar at the bottom shows the application is terminated and provides file navigation information.

Maven Project in Eclipse (Cont.)

The screenshot shows the Eclipse IDE interface with a Maven project named "demo1". The Project Explorer view on the left displays the project structure, including a "src/main/java" folder containing "com.example.demo1" package with "Greeter.java" and "Main.java" files, and a "src/main/resources" folder with "applicationContext.xml". The Main.java file is open in the editor, showing Java code that uses Spring's GenericXmlApplicationContext to load a configuration file and get a bean named "greeter". The code is as follows:

```
1 package com.example.demo1;
2
3 import org.springframework.context.support.GenericXmlApplicationContext;
4
5 public class Main {
6     public static void main(String[] args) {
7         GenericXmlApplicationContext ctx = new
8             GenericXmlApplicationContext("classpath:applicationContext.xml");
9         Greeter g = ctx.getBean("greeter", Greeter.class);
10        String msg = g.greet("Spring");
11        System.out.println(msg);
12        ctx.close();
13    }
14 }
```

The Eclipse interface includes tabs for "Greeter.java", "applicationContext.xml", "demo1/pom.xml", and "Main.java". Below the editor, the Console view shows the output of the application running: "Spring, Hello, World!". The status bar at the bottom indicates the code is "Writable" and was last saved at "12 : 21 : 415".



V. Tomcat 10.0.12



Tomcat Installation

- <http://tomcat.apache.org/>

The screenshot shows the Apache Tomcat® Welcome page. At the top left is the iconic yellow and black striped cat logo. To its right is the text "Apache Tomcat®". On the right side of the header are two logos: one for "SUPPORT APACHE" featuring a feather, and another for "THE APACHE SOFTWARE FOUNDATION" with the word "APACHE" in large letters. Below the header is a search bar with a "GO" button. To the left of the search bar is a banner for "APACHECON 2021" with the text "September 21-23 www.apachecon.com" and a "Save the date!" link. A sidebar on the left contains links for "Apache Tomcat" (Home, Taglibs, Maven Plugin), "Download" (Which version?, Tomcat 10, Tomcat 9, Tomcat 8, Tomcat Migration Tool for Jakarta EE, Tomcat Connectors), and "Apache Tomcat" (Jakarta Servlet, Jakarta Server Pages, Jakarta Expression Language, Jakarta WebSocket, Jakarta Annotations, Jakarta Authentication). The main content area has a heading "Apache Tomcat" and a paragraph about the software being an open source implementation of various Jakarta specifications. It also mentions the Jakarta EE platform and the Apache license. There is a note about the evolution of Java EE to Jakarta EE. The page ends with a "PoweredBy" link and a "Tomcat 9.0.54 Released" announcement.

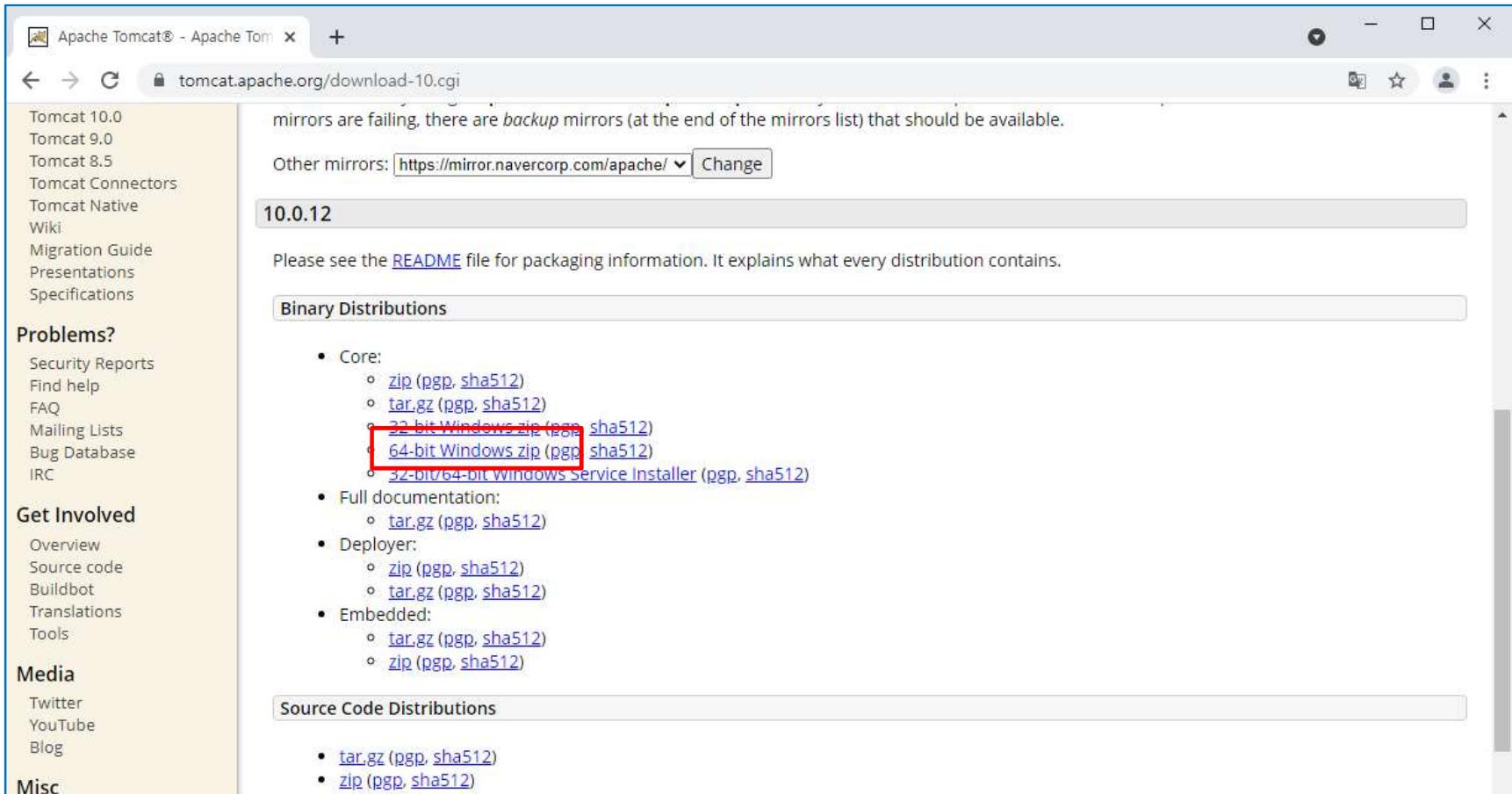
Tomcat Installation (Cont.)

- <http://tomcat.apache.org/whichversion.html>

Servlet Spec	JSP Spec	EL Spec	WebSocket Spec	Authentication (JASIC) Spec	Apache Tomcat Version	Latest Released Version	Supported Java Versions
6.0	3.1	5.0	TBD	TBD	10.1.x	10.1.0-M6 (alpha)	11 and later
5.0	3.0	4.0	2.0	2.0	10.0.x	10.0.12	8 and later
4.0	2.3	3.0	1.1	1.1	9.0.x	9.0.54	8 and later
3.1	2.3	3.0	1.1	1.1	8.5.x	8.5.71	7 and later
3.1	2.3	3.0	1.1	N/A	8.0.x (superseded)	8.0.53 (superseded)	7 and later
3.0	2.2	2.2	1.1	N/A	7.0.x (archived)	7.0.109 (archived)	6 and later (7 and later for WebSocket)
2.5	2.1	2.1	N/A	N/A	6.0.x (archived)	6.0.53 (archived)	5 and later
2.4	2.0	N/A	N/A	N/A	5.5.x (archived)	5.5.36 (archived)	1.4 and later
2.3	1.2	N/A	N/A	N/A	4.1.x (archived)	4.1.40 (archived)	1.3 and later
2.2	1.1	N/A	N/A	N/A	3.3.x (archived)	3.3.2 (archived)	1.1 and later

Tomcat Installation (Cont.)

- <https://tomcat.apache.org/download-10.cgi>



The screenshot shows a web browser window with the URL <https://tomcat.apache.org/download-10.cgi> in the address bar. The page content is as follows:

mirrors are failing, there are *backup* mirrors (at the end of the mirrors list) that should be available.

Other mirrors: <https://mirror.navercorp.com/apache/> ▾ Change

10.0.12

Please see the [README](#) file for packaging information. It explains what every distribution contains.

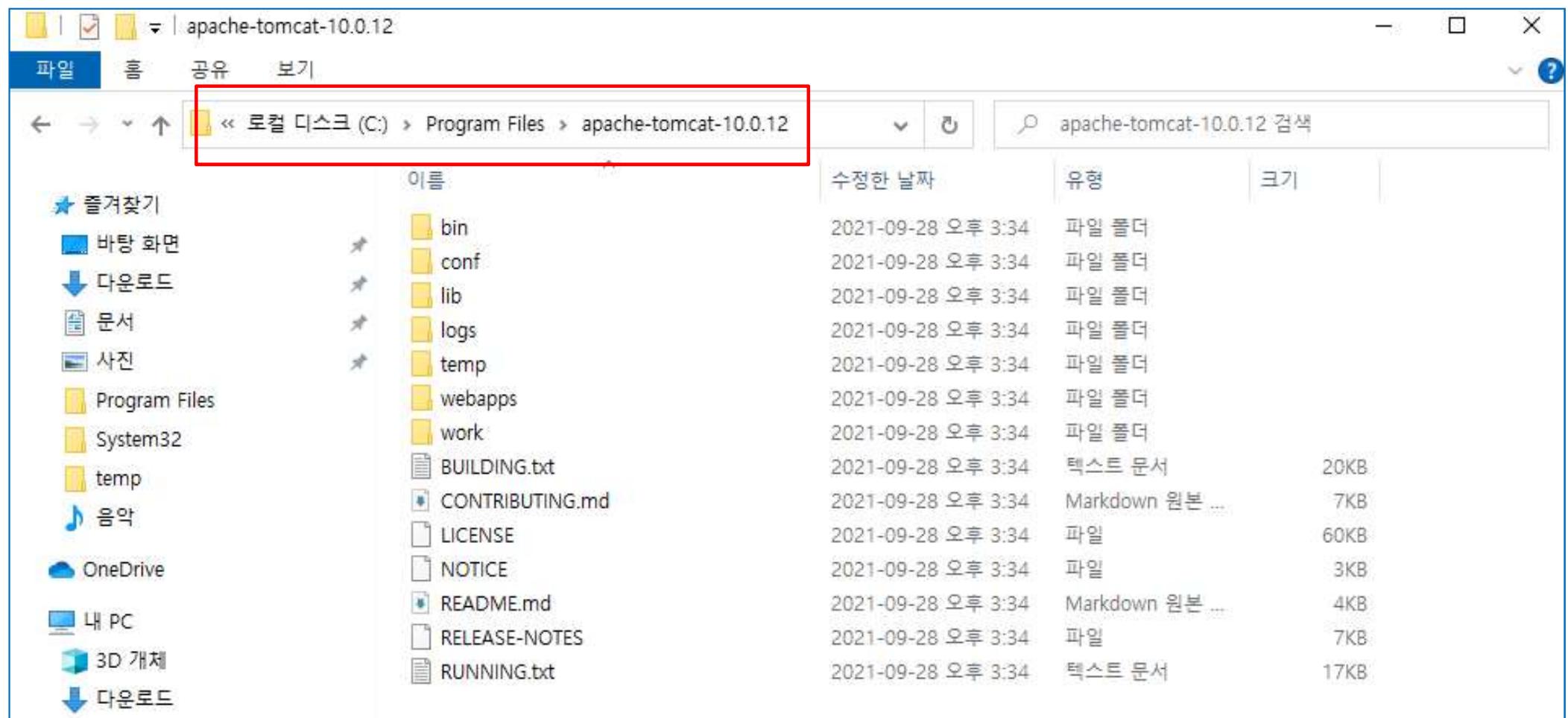
Binary Distributions

- Core:
 - [zip \(pgp, sha512\)](#)
 - [tar.gz \(pgp, sha512\)](#)
 - [32-bit Windows zip \(pgp, sha512\)](#)
 - [64-bit Windows zip \(pgp, sha512\)](#)
 - [32-bit/64-bit windows Service Installer \(pgp, sha512\)](#)
- Full documentation:
 - [tar.gz \(pgp, sha512\)](#)
- Deployer:
 - [zip \(pgp, sha512\)](#)
 - [tar.gz \(pgp, sha512\)](#)
- Embedded:
 - [tar.gz \(pgp, sha512\)](#)
 - [zip \(pgp, sha512\)](#)

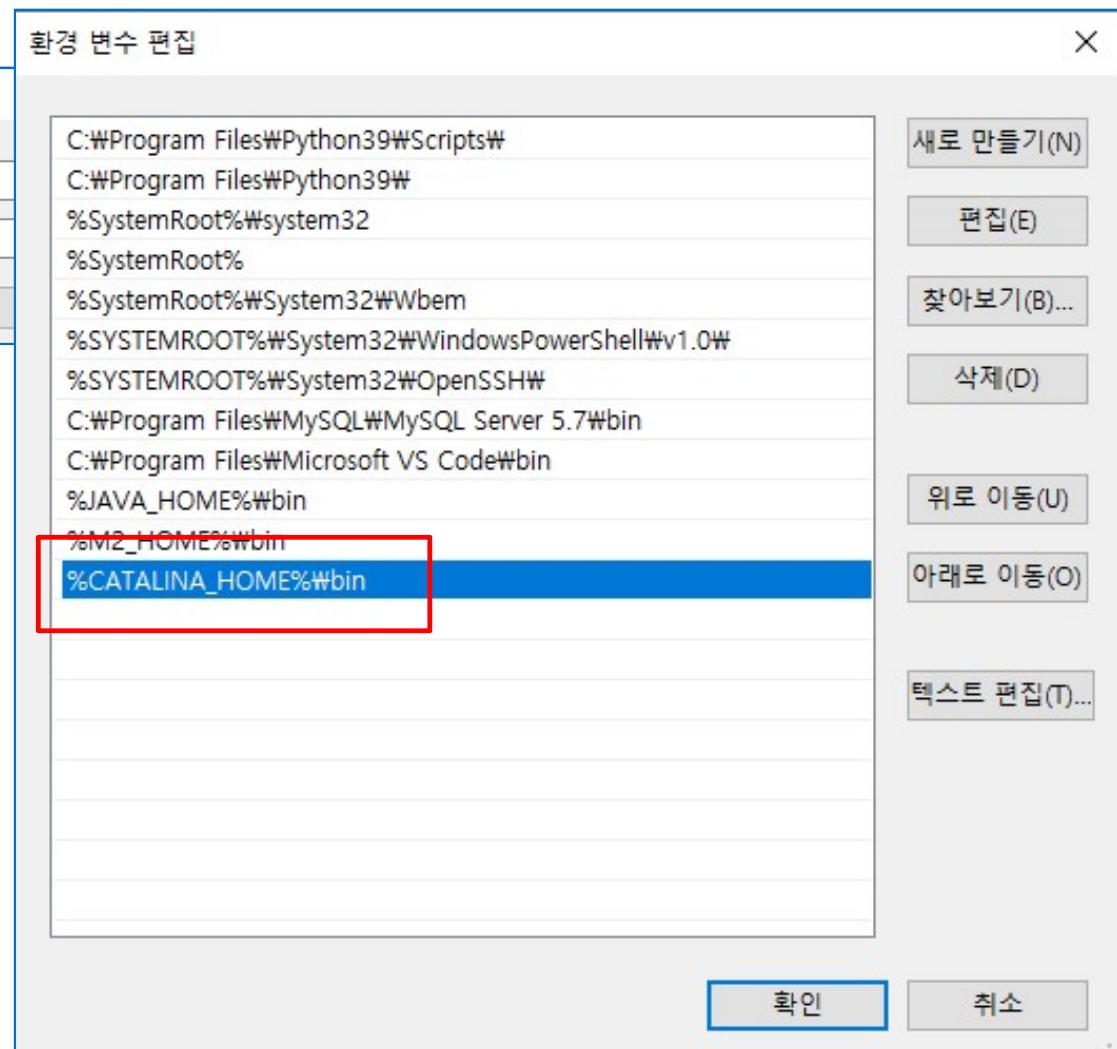
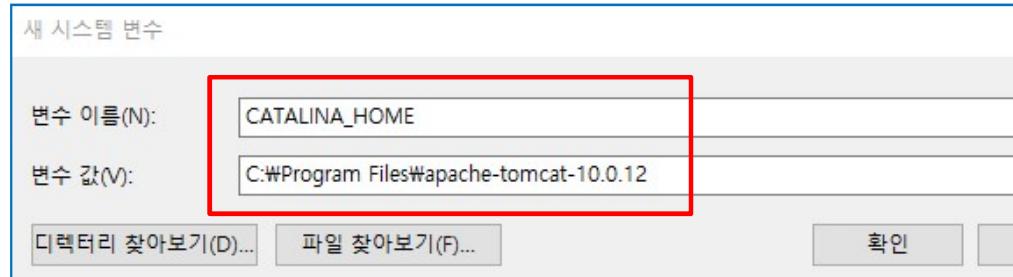
Source Code Distributions

- [tar.gz \(pgp, sha512\)](#)
- [zip \(pgp, sha512\)](#)

Tomcat Installation (Cont.)



Tomcat Installation (Cont.)



Tomcat Installation (Cont.)

```
C:\Windows\system32\cmd.exe
Microsoft Windows [Version 10.0.19043.1237]
(c) Microsoft Corporation. All rights reserved.

C:\Users\instructor>set CATALINA_HOME
CATALINA_HOME=C:\Program Files\Apache-tomcat-10.0.12
```

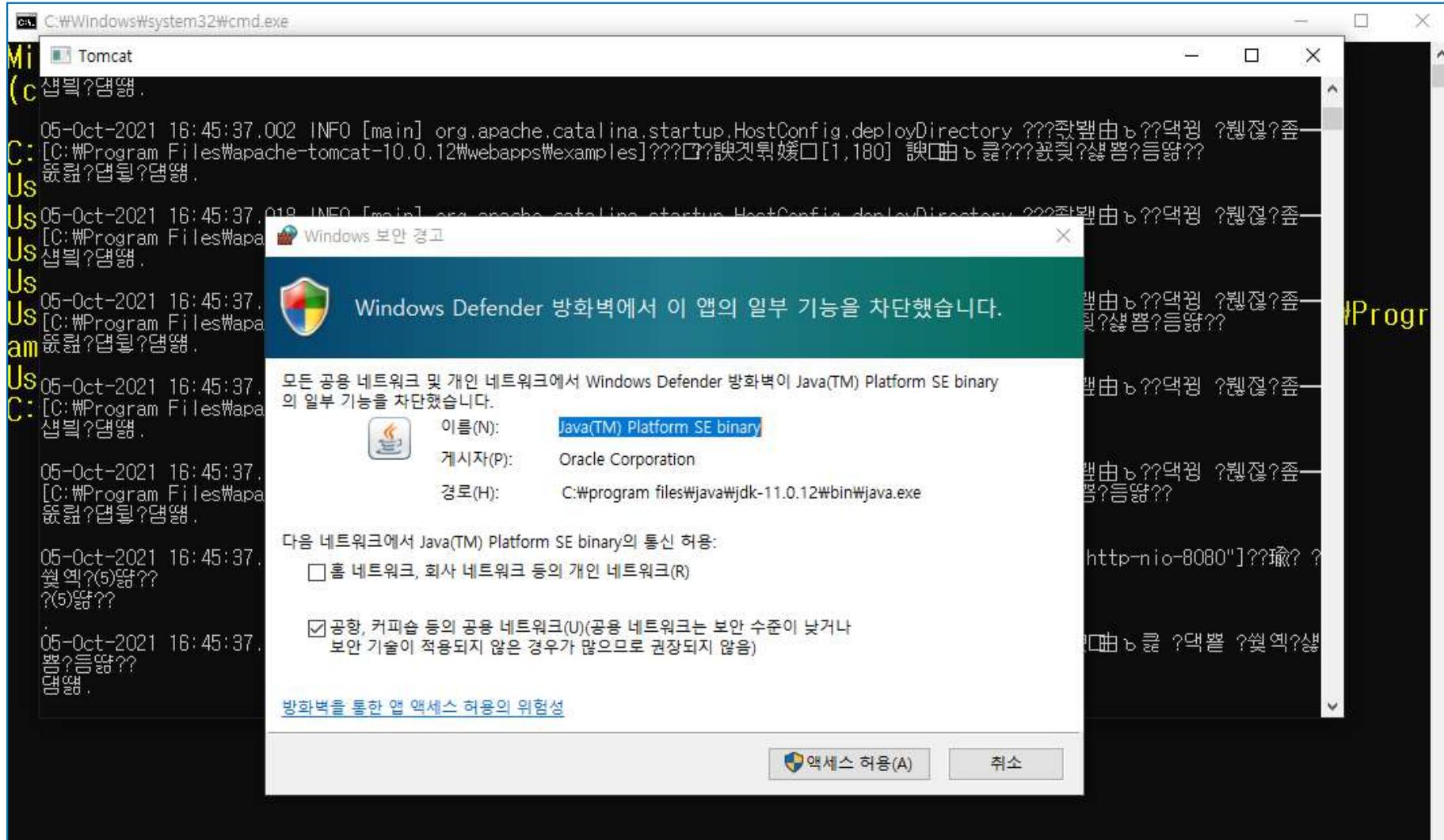
```
C:\Users\devex>set PATH
Path=C:\Program Files\Java\jdk-11.0.12\bin;C:\Program Files\Python39\Scripts\;C:\Program Files\Python39\;C:\Program Files (x86)\NAT Service;C:\app\devex\product\18.0.0\dbhomeXE\bin;C:\WINDOWS\System32;C:\WINDOWS;C:\WINDOWS\System32\Wbem;C:\WINDOWS\System32\WindowsPowerShell\v1.0\;C:\WINDOWS\System32\OpenSSH\;C:\Program Files\Apache-maven-3.8.3\bin;C:\Program Files (x86)\PuTTY\;C:\ProgramData\chocolatey\bin;C:\Program Files\MongoDB\Server\4.2\bin;C:\Program Files\Git\cmd;C:\Program Files\Apache24\bin;C:\Program Files\Microsoft VS Code\bin;C:\Program Files (x86)\NetSarang\Xshell 7\;C:\Program Files\Docker\resources\bin;C:\ProgramData\DockerDesktop\version-bin;C:\Program Files\MySQL\MySQL Server 5.7\bin;C:\Program Files\Apache-tomcat-10.0.12\bin;C:\Users\devex\AppData\Local\Microsoft\WindowsApps;C:\Program Files\Bandizip\;C:\Program Files\heroku\bin
PATHEXT=.COM;.EXE;.BAT;.CMD;.VBS;.VBE;.JS;.JSE;.WSF;.WSH;.MSC;.PY;.PYW
```

Tomcat Configuration

```
C:\Windows\system32\cmd.exe
Microsoft Windows [Version 10.0.19043.1237]
(c) Microsoft Corporation. All rights reserved.

C:\Users\instructor>startup.bat
Using CATALINA_BASE:      "C:\Program Files\Apache-tomcat-10.0.12"
Using CATALINA_HOME:      "C:\Program Files\Apache-tomcat-10.0.12"
Using CATALINA_TMPDIR:    "C:\Program Files\Apache-tomcat-10.0.12\temp"
Using JRE_HOME:           "C:\Program Files\Java\jdk-17"
Using CLASSPATH:          "C:\Program Files\Apache-tomcat-10.0.12\bin\bootstrap.jar;C:\Program Files\Apache-tomcat-10.0.12\bin\tomcat-juli.jar"
Using CATALINA_OPTS:      ""
C:\Users\instructor>
```

Tomcat Configuration



Tomcat Configuration (Cont.)

The screenshot shows the Apache Tomcat 10.0.12 homepage. The browser title bar reads "Apache Tomcat/10.0.12". The address bar shows "localhost:8080". The page header includes links for Home, Documentation, Configuration, Examples, Wiki, and Mailing Lists, along with a "Find Help" button. The main title is "Apache Tomcat/10.0.12". A green banner at the top says "If you're seeing this, you've successfully installed Tomcat. Congratulations!" Below it is a cartoon cat icon and a list of recommended reading: Security Considerations How-To, Manager Application How-To, and Clustering/Session Replication How-To. To the right are buttons for Server Status, Manager App, and Host Manager. The "Developer Quick Start" section includes links for Tomcat Setup, First Web Application, Realms & AAA, JDBC DataSources, Examples, Servlet Specifications, and Tomcat Versions. The "Managing Tomcat" section discusses manager webapp access and provides links for Release Notes, Changelog, Migration Guide, and Security Notices. The "Documentation" section links to Tomcat 10.0 Documentation, Configuration, and Wiki, and lists RUNNING.txt and JavaDocs. The "Getting Help" section links to FAQ and Mailing Lists, listing tomcat-announce, tomcat-users, taglibs-user, and tomcat-dev.

If you're seeing this, you've successfully installed Tomcat. Congratulations!

Recommended Reading:

- [Security Considerations How-To](#)
- [Manager Application How-To](#)
- [Clustering/Session Replication How-To](#)

Developer Quick Start

Tomcat Setup Realms & AAA Examples Servlet Specifications
First Web Application JDBC DataSources Tomcat Versions

Managing Tomcat

For security, access to the [manager webapp](#) is restricted. Users are defined in: `$CATALINA_HOME/conf/tomcat-users.xml`

In Tomcat 10.0 access to the manager application is split between different users. [Read more...](#)

[Release Notes](#)

[Changelog](#)

[Migration Guide](#)

[Security Notices](#)

Documentation

[Tomcat 10.0 Documentation](#)

[Tomcat 10.0 Configuration](#)

[Tomcat Wiki](#)

Find additional important configuration information in: `$CATALINA_HOME/RUNNING.txt`

Developers may be interested in:

- [Tomcat 10.0 Bug Database](#)
- [Tomcat 10.0 JavaDocs](#)
- [Tomcat 10.0 Git Repository at GitHub](#)

Getting Help

FAQ and Mailing Lists

The following mailing lists are available:

- tomcat-announce**
Important announcements, releases, security vulnerability notifications. (Low volume).
- tomcat-users**
User support and discussion
- taglibs-user**
User support and discussion for [Apache Taglibs](#)
- tomcat-dev**
Development mailing list, including commit messages

Tomcat Configuration (Cont.)

■ %CATALINA_HOME%/conf/tomcat-users.xml

```
22  <!--
23 By default, no user is included in the "manager-gui" role required
24 to operate the "/manager/html" web application. If you wish to use this app,
25 you must define such a user - the username and password are arbitrary.
26
27  Built-in Tomcat manager roles:
28     - manager-gui - allows access to the HTML GUI and the status pages
29     - manager-script - allows access to the HTTP API and the status pages
30     - manager-jmx - allows access to the JMX proxy and the status pages
31     - manager-status - allows access to the status pages only
32
33 The users below are wrapped in a comment and are therefore ignored. If you
34 wish to configure one or more of these users for use with the manager web
35 application, do not forget to remove the <!... ...> that surrounds them. You
36 will also need to set the passwords to something appropriate.
37 -->
38     <user username="admin" password="tomcatadmin" roles="admin-gui,manager-gui"/>
39  <!--
40     <user username="admin" password="" roles="manager-gui"/>
41     <user username="robot" password="" roles="manager-script"/>
42 -->
43  <!--
44 The sample user and role entries below are intended for use with the
45 examples web application. They are wrapped in a comment and thus are ignored
46 when reading this file. If you wish to configure these users for use with the
47 examples web application, do not forget to remove the <!... ...> that surrounds
48 them. You will also need to set the passwords to something appropriate.
49 -->
```

Tomcat Configuration (Cont.)

- %CATALINA_HOME%/webapps/homecontext.xml 생성

```
<Context path="" docBase="C:/SpringHome" debug="0" reloadable="true"  
crossContext="true" privileged="true" />
```

Tomcat Configuration (Cont.)

- %CATALINA_HOME%/webapps/ROOT/WEB-INF 복사
- C:/SpringHome 하위에 붙여넣기
- C:/SpringHome/WEB-INF/web.xml 수정

```
1 <?xml version="1.0" encoding="UTF-8"?>
2 <web-app xmlns="https://jakarta.ee/xml/ns/jakartaee"
3   xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
4   xsi:schemaLocation="https://jakarta.ee/xml/ns/jakartaee
5     https://jakarta.ee/xml/ns/jakartaee/web-app_5_0.xsd"
6   version="5.0"
7   metadata-complete="true">
8
9   <display-name>Welcome to Spring Homepage</display-name>
>10 </web-app>|
```

Tomcat Configuration (Cont.)

■ C:/SpringHome/index.html 생성

```
1 <!DOCTYPE html>
2 <html lang="en">
3   <head>
4     <meta charset="utf-8">
5     <title>Welcome to Spring Homepage</title>
6   </head>
7   <body>
8     <div>
9       <span style="font-size:30pt;color:blue">Welcome to Spring 5</span>
10    </div>
11  </body>
12 </html>
```

Tomcat Configuration (Cont.)

- [Tomcat Web Application Manager]에서 / 경로 [배치된 것을 제거]

The screenshot shows the Apache Tomcat Web Application Manager interface at `localhost:8080/manager/html`. The page title is "Tomcat 웹 애플리케이션 매니저". A message box at the top left says "메시지: OK". Below it is a navigation bar with tabs: "매니저", "애플리케이션들의 목록을 표시", "HTML 매니저 도움말", "매니저 도움말", and "서버 상태". The main content area is titled "애플리케이션들" and lists the following applications:

경로	버전	표시 이름	실행 중	세션들	명령들
/	지정 안됨	Welcome to Tomcat.	true	0	<button>시작</button> <button>중지</button> <button>다시 로드</button> <button>배치된 것을 제거</button>
/docs	지정 안됨	Tomcat Documentation	true	0	<button>시작</button> <button>중지</button> <button>다시 로드</button> <button>배치된 것을 제거</button>
/examples	지정 안됨	Servlet and JSP Examples	true	0	<button>시작</button> <button>중지</button> <button>다시 로드</button> <button>배치된 것을 제거</button>
/host-manager	지정 안됨	Tomcat Host Manager Application	true	0	<button>시작</button> <button>중지</button> <button>다시 로드</button> <button>배치된 것을 제거</button>
/manager	지정 안됨	Tomcat Manager Application	true	1	<button>시작</button> <button>중지</button> <button>다시 로드</button> <button>배치된 것을 제거</button>

A red box highlights the "배치된 것을 제거" (Remove) button for the root application (/). Below the table, there is a note: "세션들을 만료시키기 idle 값 > 30 분".

Tomcat Configuration (Cont.)

- [Tomcat Web Application Manager]에서 / Path deploy

- Context Path : /

- XML Configuration file path :

C:\Program Files\apache-tomcat-10.0.12\webapps\homecontext.xml

1

The screenshot shows the '배치' (Deployment) page of the Tomcat Web Application Manager. The XML configuration file path field, which contains the value '2webapps\homecontext.xml', is highlighted with a red box. The page includes fields for Context Path (set to '/'), Deployment Descriptor (set to '버전 (병렬 배치용)'), XML Configuration File Path (highlighted), and WAR or Directory Path.

컨텍스트 경로:	/
버전 (병렬 배치용):	
XML 설정 파일 경로:	2webapps\homecontext.xml
WAR 또는 디렉토리 경로:	

배치

Tomcat Configuration (Cont.)

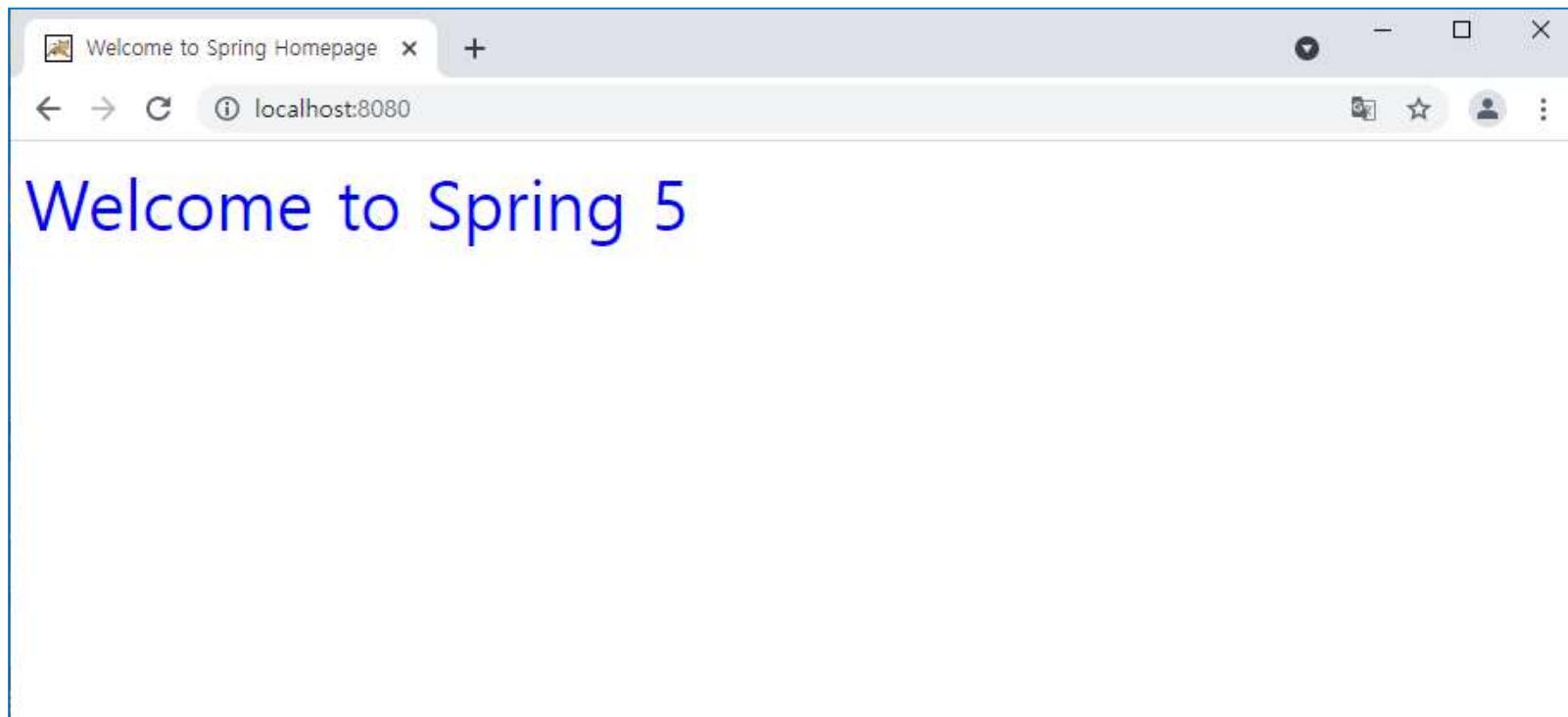
- [Tomcat Web Application Manager]에서 / Path deploy

The screenshot shows the Tomcat Web Application Manager interface at `localhost:8080/manager/html/deploy?org.apache.catalina.filters.CSRF_NONCE=4E96CD5DBEF63BFF4B708539E781F5CF`. The main content area displays the message "OK - 컨텍스트 경로 [/]에 애플리케이션을 배치했습니다." (OK - Context path [/] application deployed). Below this, the "Applications" section lists several applications:

경로	버전	표시 이름	실행 중	세션들	명령들
/	지정 안됨	Welcome to Spring Homepage	true	0	시작 중지 다시 로드 배치된 것을 제거 세션들을 만료시키기 idle 값 ≥ 30 분
/examples	지정 안됨	Servlet and JSP Examples	true	0	시작 중지 다시 로드 배치된 것을 제거 세션들을 만료시키기 idle 값 ≥ 30 분
/host-manager	지정 안됨	Tomcat Host Manager Application	true	0	시작 중지 다시 로드 배치된 것을 제거 세션들을 만료시키기 idle 값 ≥ 30 분
/manager	지정 안됨	Tomcat Manager Application	true	1	시작 중지 다시 로드 배치된 것을 제거 세션들을 만료시키기 idle 값 ≥ 30 분

The first application row is highlighted with a red box, and its command buttons are also highlighted with a red box.

Tomcat Configuration (Cont.)

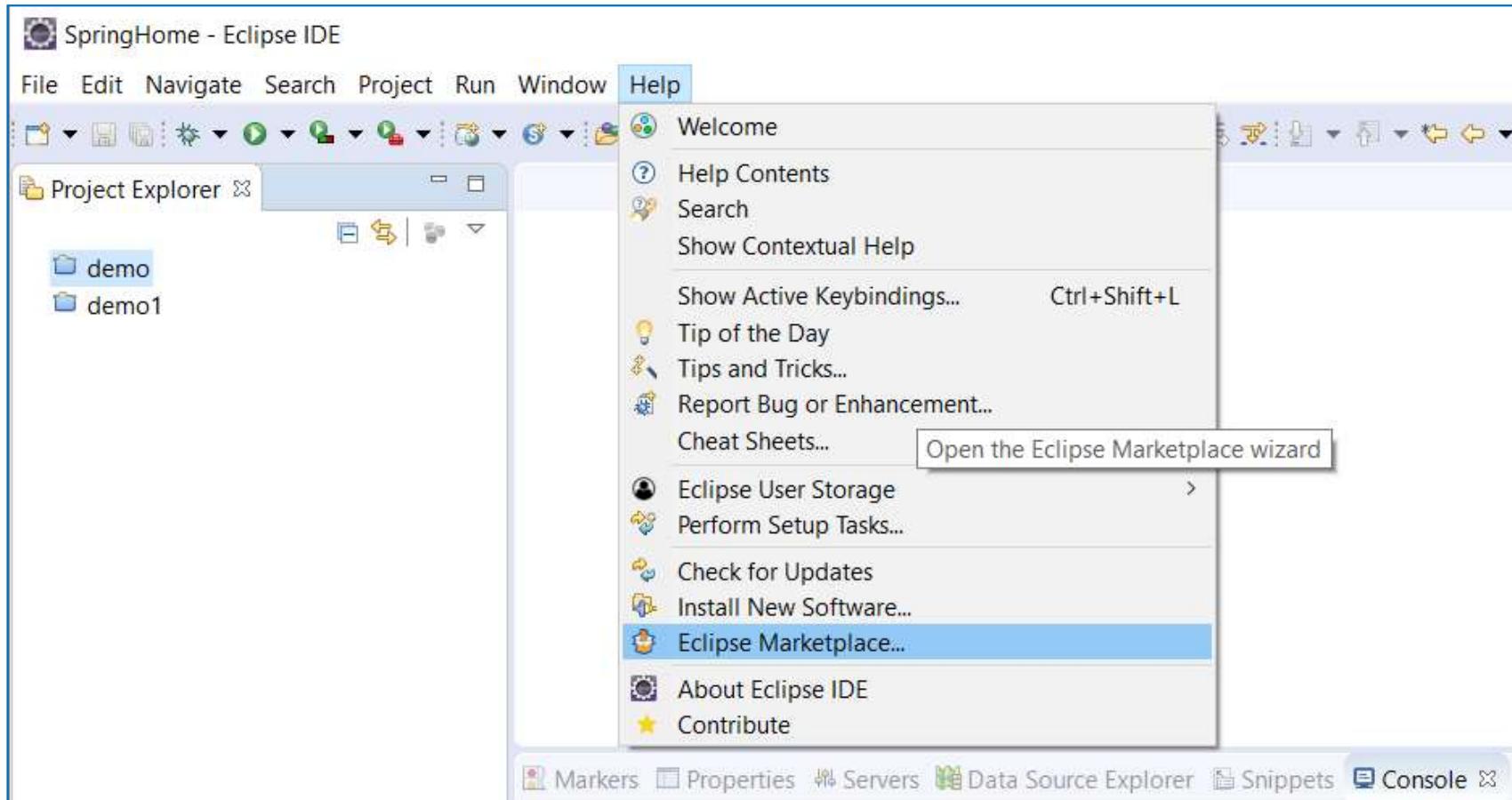




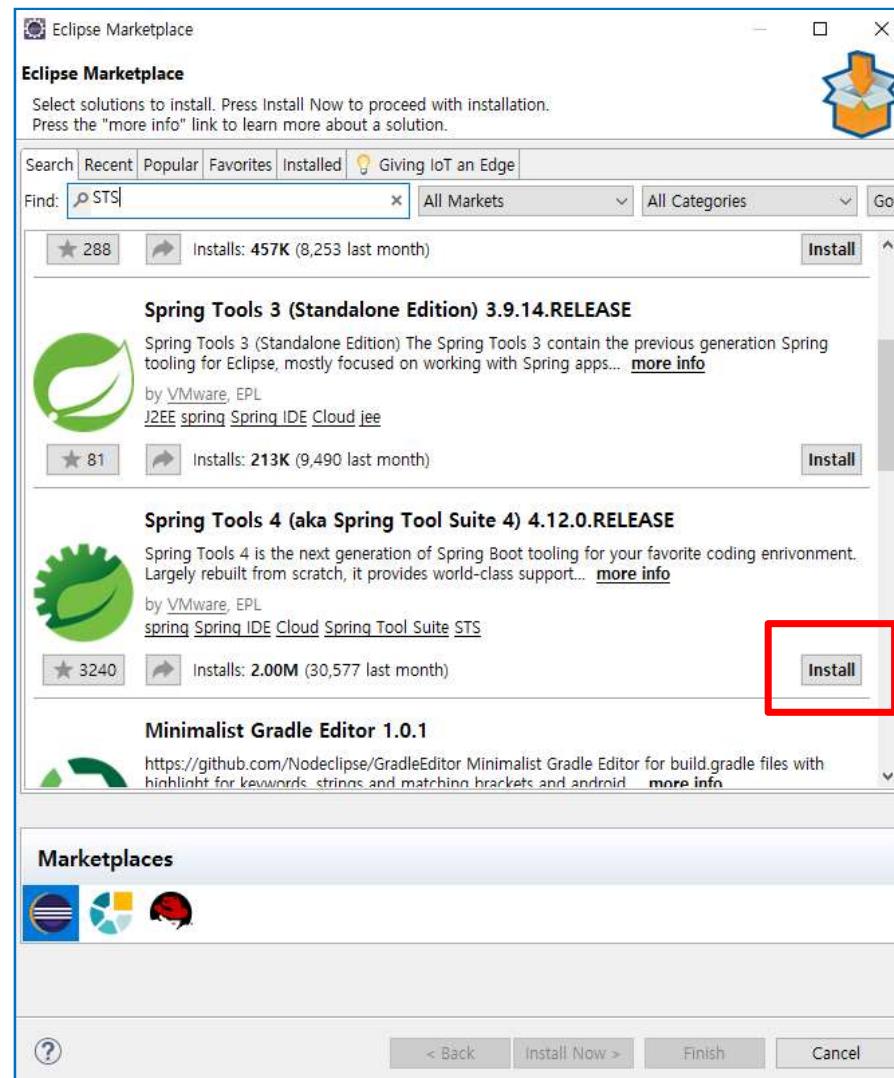
VI. STS 4.12.0.RELEASE



STS Downloads

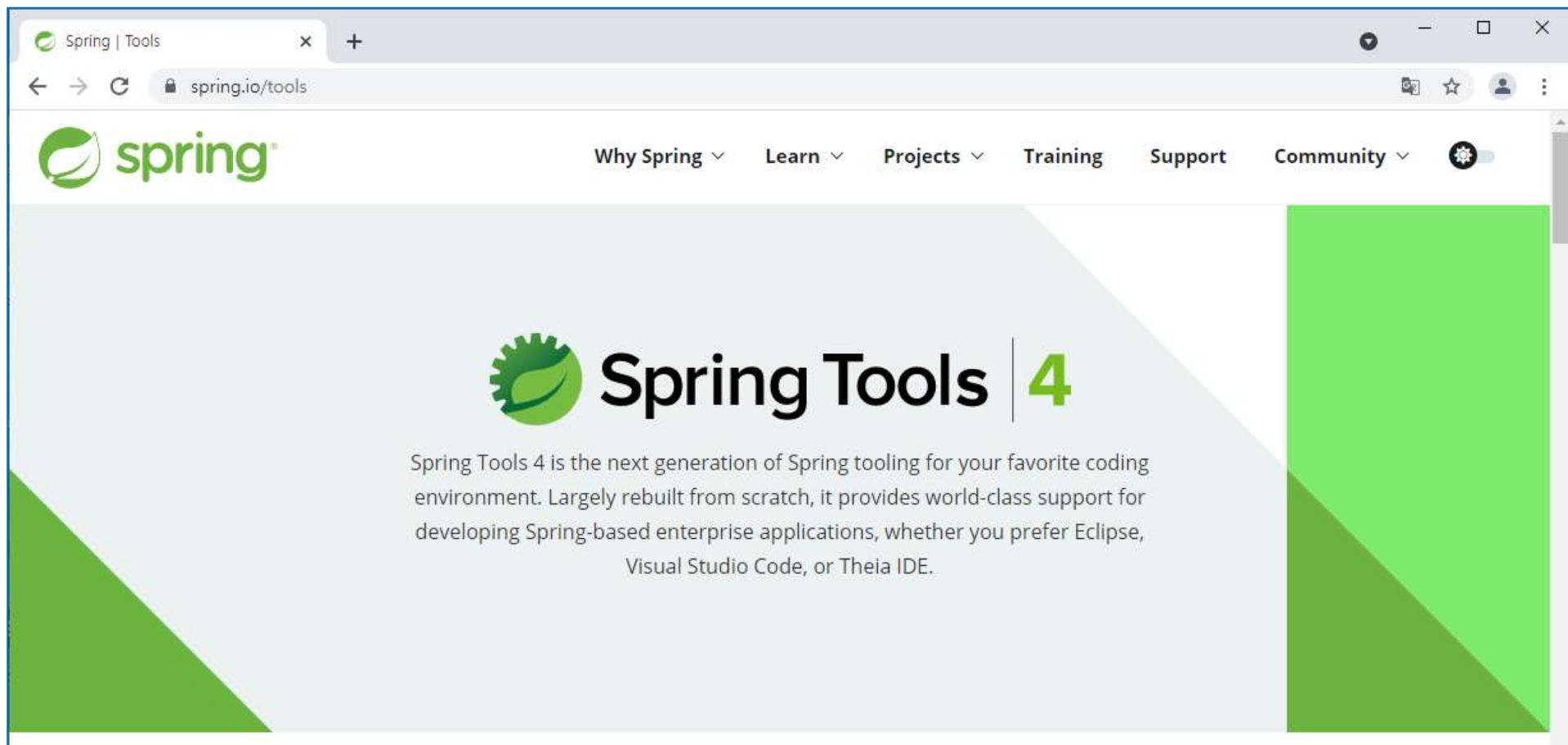


STS Downloads (Cont.)



STS Downloads (Cont.)

- <https://spring.io/tools>



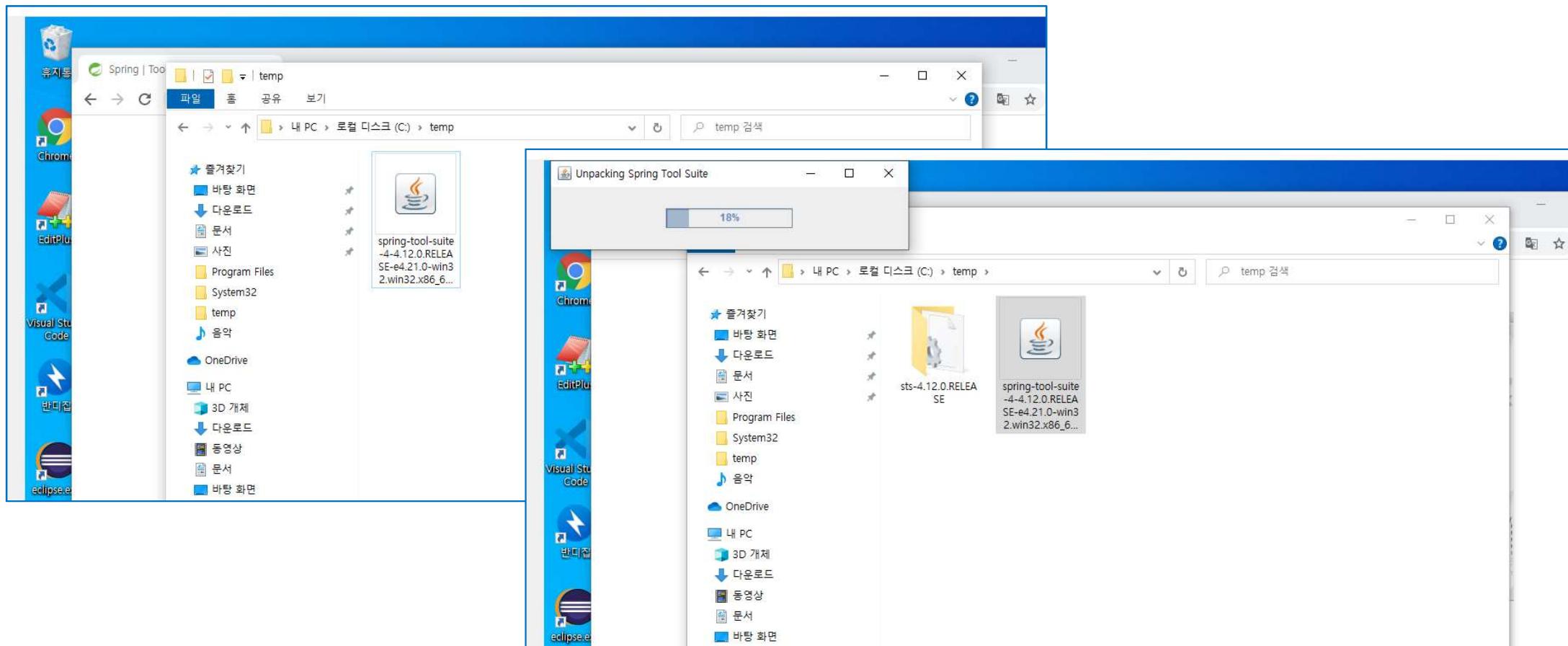
STS Downloads (Cont.)

- <https://spring.io/tools>

The screenshot shows the Spring Tools 4 for Eclipse download page. On the left, there's a large title "Spring Tools 4 for Eclipse" with the subtitle "The all-new Spring Tool Suite 4. Free. Open source." Below the title are three download links: "4.12.0 - LINUX X86_64", "4.12.0 - MACOS X86_64", and "4.12.0 - WINDOWS X86_64". On the right side of the page, the Spring Tool Suite 4 interface is displayed. It features a central code editor with Java code for a "GreetingController" class, surrounded by various Eclipse-based toolbars and panes like "Package Explorer", "Outline", "Problems", and "Console". A status bar at the bottom indicates "Windows Smart Insert 11:1".

STS Downloads (Cont.)

- Double-click to unzip



STS Configuration

The screenshot shows a Windows File Explorer window with the title bar 'sts-4.12.0.RELEASE'. The left sidebar contains various icons for quick access, including '즐겨찾기', '바탕 화면', '다운로드', '문서', '사진', 'Program Files', 'System32', 'temp', '음악', 'OneDrive', '내 PC', '3D 가체', and '다운로드'. The main pane displays the contents of the 'sts-4.12.0.RELEASE' directory, which includes subfolders like 'configuration', 'dropins', 'features', 'META-INF', 'p2', 'plugins', and 'readme', along with files such as '.eclipseproduct', 'artifacts.xml', 'eclipsec.exe', 'license.txt', 'open-source-licenses.txt', 'SpringToolSuite4.exe', and 'SpringToolSuite4.ini'. The file 'SpringToolSuite4.ini' is currently selected.

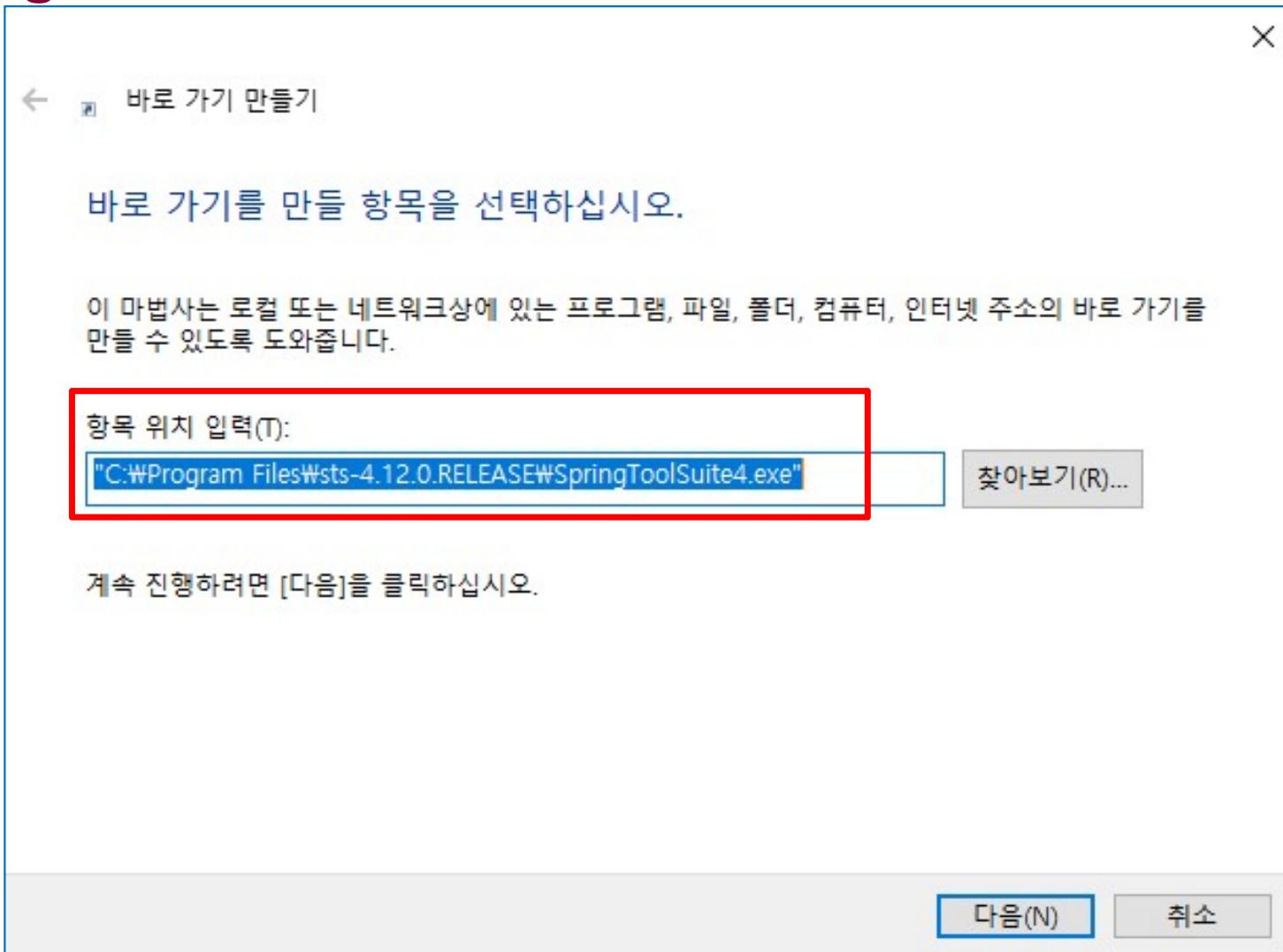
이름	수정한 날짜	유형	크기
configuration	2021-10-05 오후 3:18	파일 폴더	
dropins	2021-10-05 오후 3:18	파일 폴더	
features	2021-10-05 오후 3:18	파일 폴더	
META-INF	2021-10-05 오후 3:18	파일 폴더	
p2	2021-10-05 오후 3:18	파일 폴더	
plugins	2021-10-05 오후 3:18	파일 폴더	
readme	2021-10-05 오후 3:18	파일 폴더	
.eclipseproduct	2021-10-05 오후 3:18	ECLIPSEPRODUCT...	1KB
artifacts.xml	2021-10-05 오후 3:18	XML 문서	158KB
eclipsec.exe	2021-10-05 오후 3:18	응용 프로그램	231KB
license.txt	2021-10-05 오후 3:18	텍스트 문서	12KB
open-source-licenses.txt	2021-10-05 오후 3:18	텍스트 문서	832KB
SpringToolSuite4.exe	2021-10-05 오후 3:18	응용 프로그램	517KB
SpringToolSuite4.ini	2021-10-05 오후 3:26	구성 설정	1KB

STS Configuration

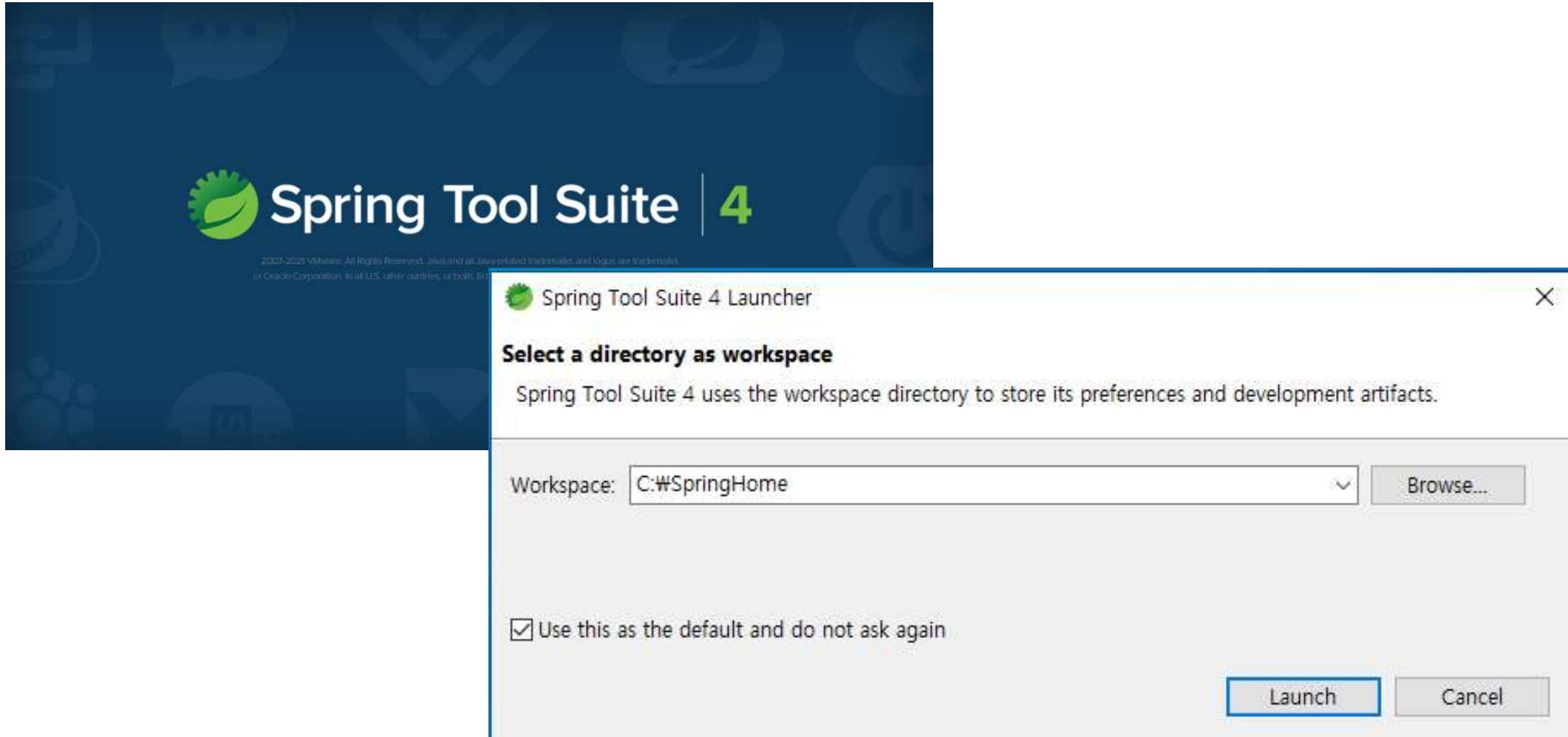
```
*SpringToolSuite4.ini - Windows 메모장
파일(F) 편집(E) 서식(O) 보기(V) 도움말(H)

-startup
plugins/org.eclipse.equinox.launcher_1.6.300.v20210813-1054.jar
--launcher.library
plugins/org.eclipse.equinox.launcher.win32.win32.x86_64_1.2.300.v20210828-0802
-product
org.springframework.boot.ide.branding.sts4
--launcher.defaultAction
openFile
-vm
C:/Program Files/Java/jdk-11.0.12/bin/javaw.exe
plugins/org.eclipse.justj.openjdk.hotspot.jre.full.win32.x86_64_16.0.2.v20210721-1149/jre/bin
-vmargs
-Dosgi.requiredJavaVersion=11
-Dosgi.dataAreaRequiresExplicitInit=true
-Xms256m
-Xmx2048m
--illegal-access=permit
--add-modules=ALL-SYSTEM
```

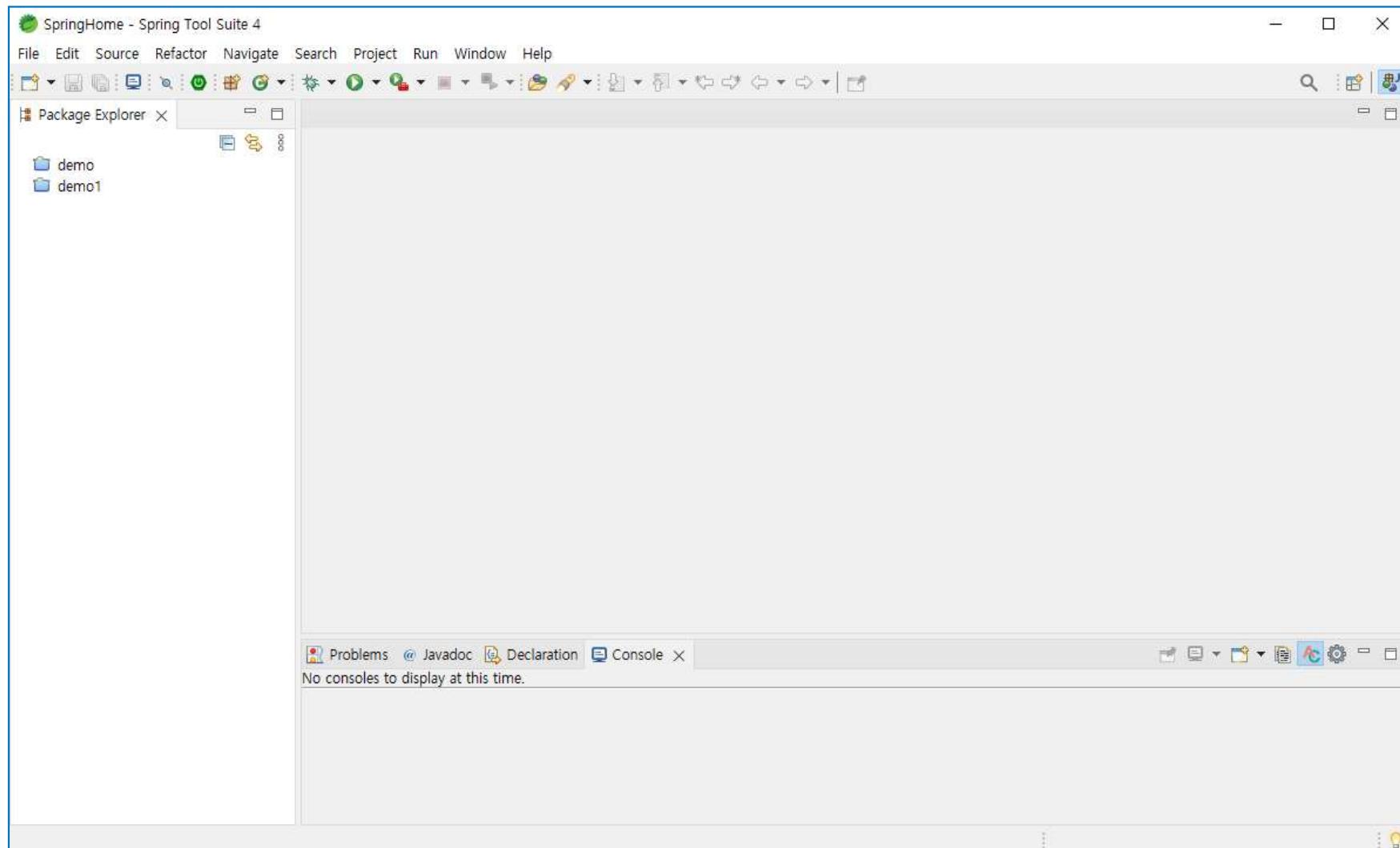
STS Configuration



STS Configuration

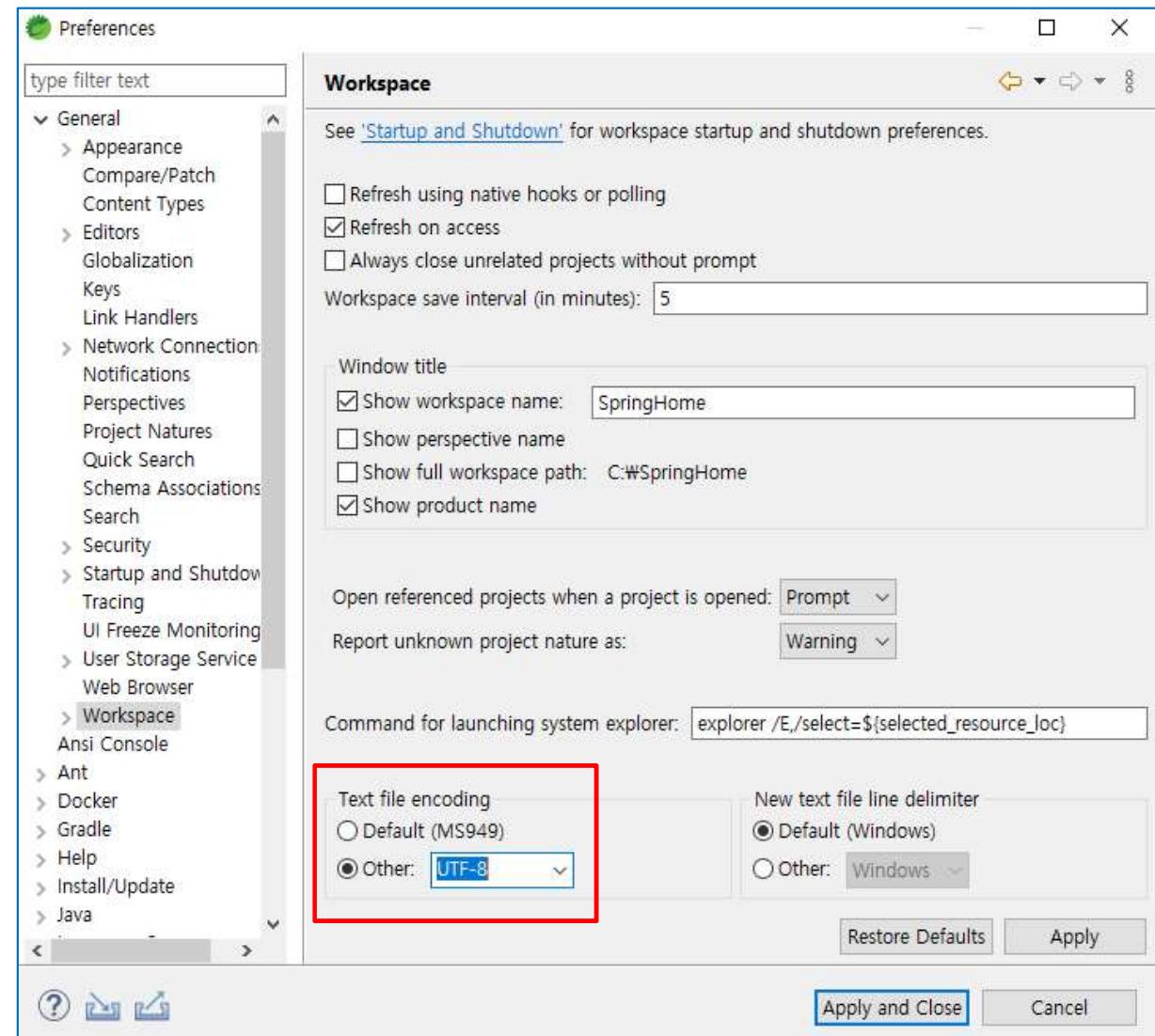


STS Configuration (Cont.)



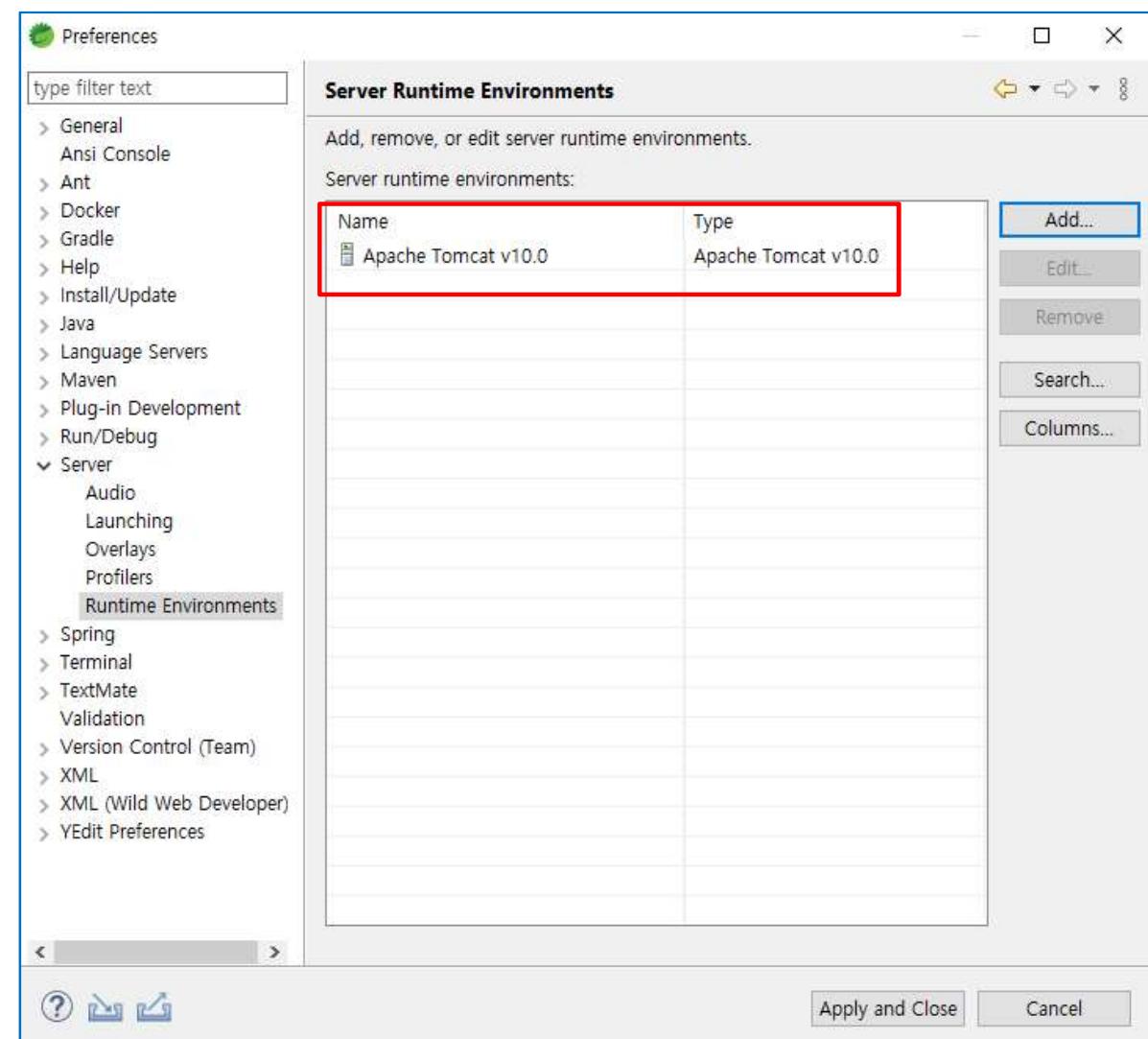
STS Configuration (Cont.)

■ Workspace의 UTF-8 설정하기



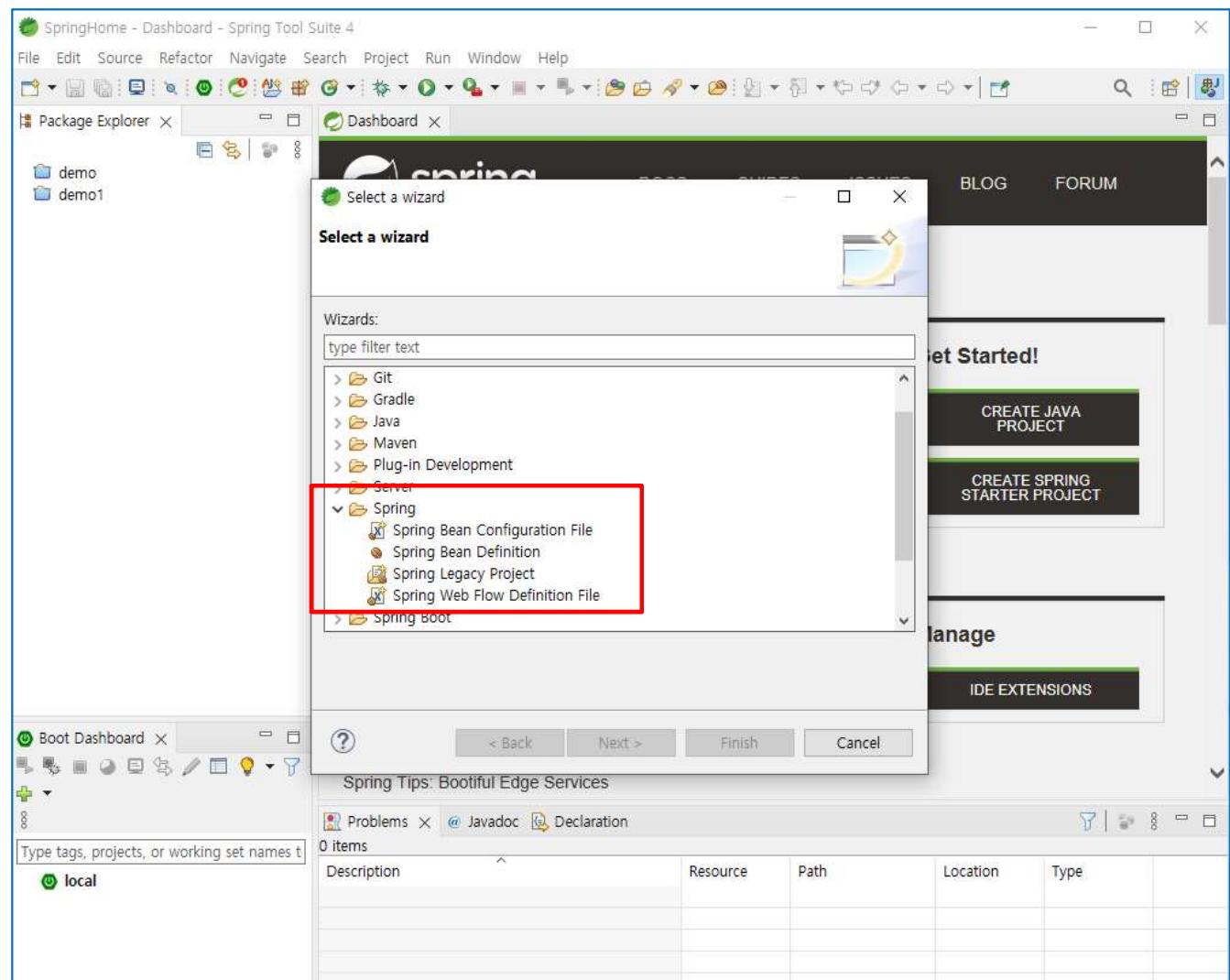
STS Configuration (Cont.)

■ STS4에 Tomcat 등록하기



STS Configuration (Cont.)

■ STS4에 STS3 Add-On Installation



VIII. Maven Project with STS



IX. Lombok v1.18.20



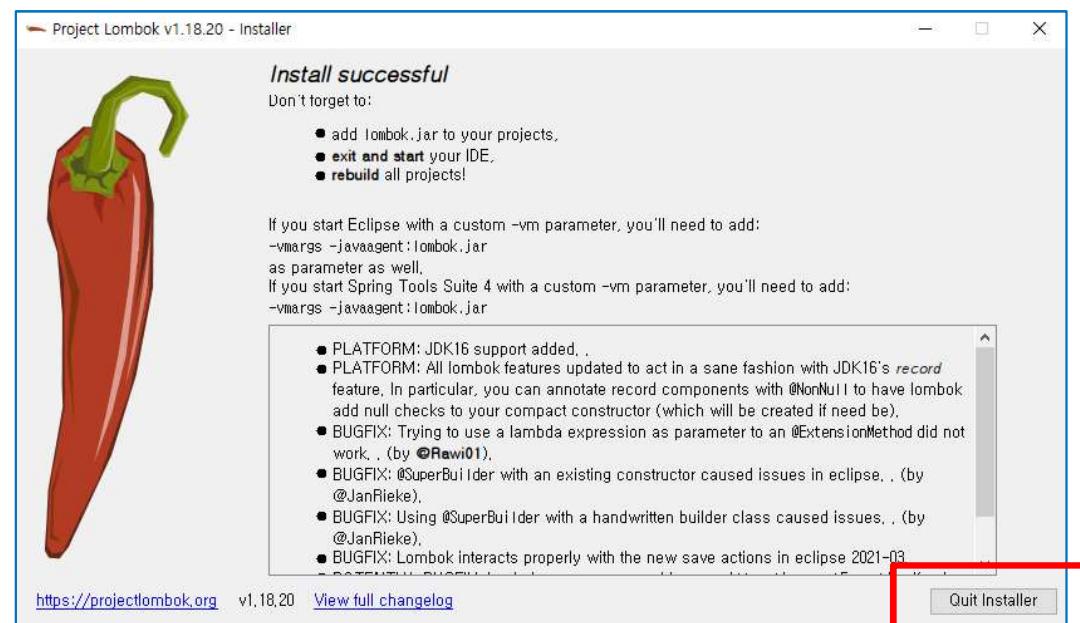
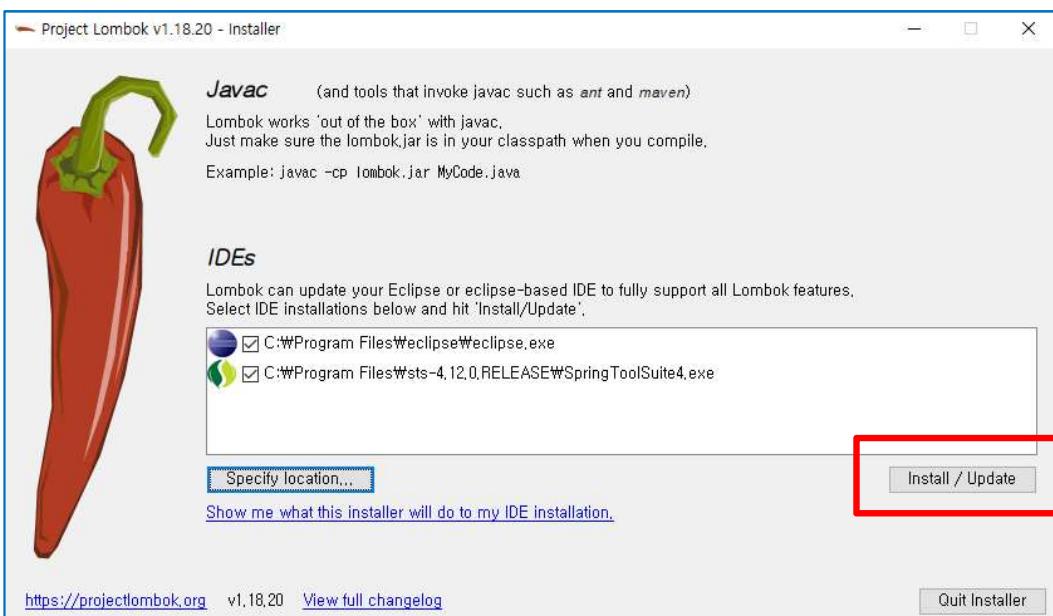
Lombok Download

The screenshot shows two browser windows side-by-side, both displaying the Project Lombok website (projectlombok.org).
The left window shows the main Project Lombok page. It features a large "Project Lombok" logo at the top, followed by a brief description: "Project Lombok is a java library that automatically plugs into your editor and build tools, spicing up your java." Below this is a button labeled "Get Lombok". A grey bar contains the text "Click to watch a 4 minute demo to learn more." and a link "Show me a text and images based explanation and tutorial instead!". Further down, it says "Project Lombok is powered by:" and lists several projects, with a button "I want to support Project Lombok too!".
The right window shows the "Download" page. The URL in the address bar is projectlombok.org/download. It features a prominent red "Download 1.18.20" button with a download icon. Below it are links for "changelog" and "older versions". At the bottom of the page, there is a note: "Feeling adventurous? Download the latest [snapshot](#) release." A footer at the very bottom contains links for "credits" and "Copyright © 2009-2021 The Project Lombok Authors, licensed under the [MIT license](#)".

Lombok Installation

선택 C:\Windows\system32\cmd.exe

```
C:\temp>java -jar lombok.jar
```



Lombok Installation

