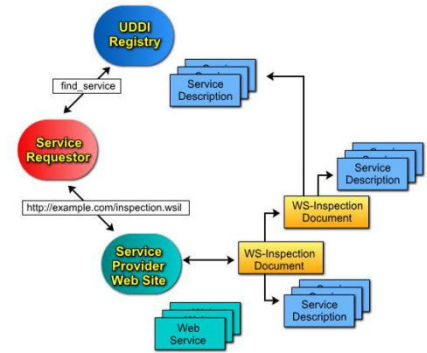


Web Application & Service

JSP 개발환경 구축



컴퓨터 과학과
김 희 열

Web Programming

- HTML

- 정적인 웹 페이지를 생성
- 동적인 정보(현재 시간 등)를 보여주는 웹 페이지를 어떻게 생성할까?

- Client-side coding

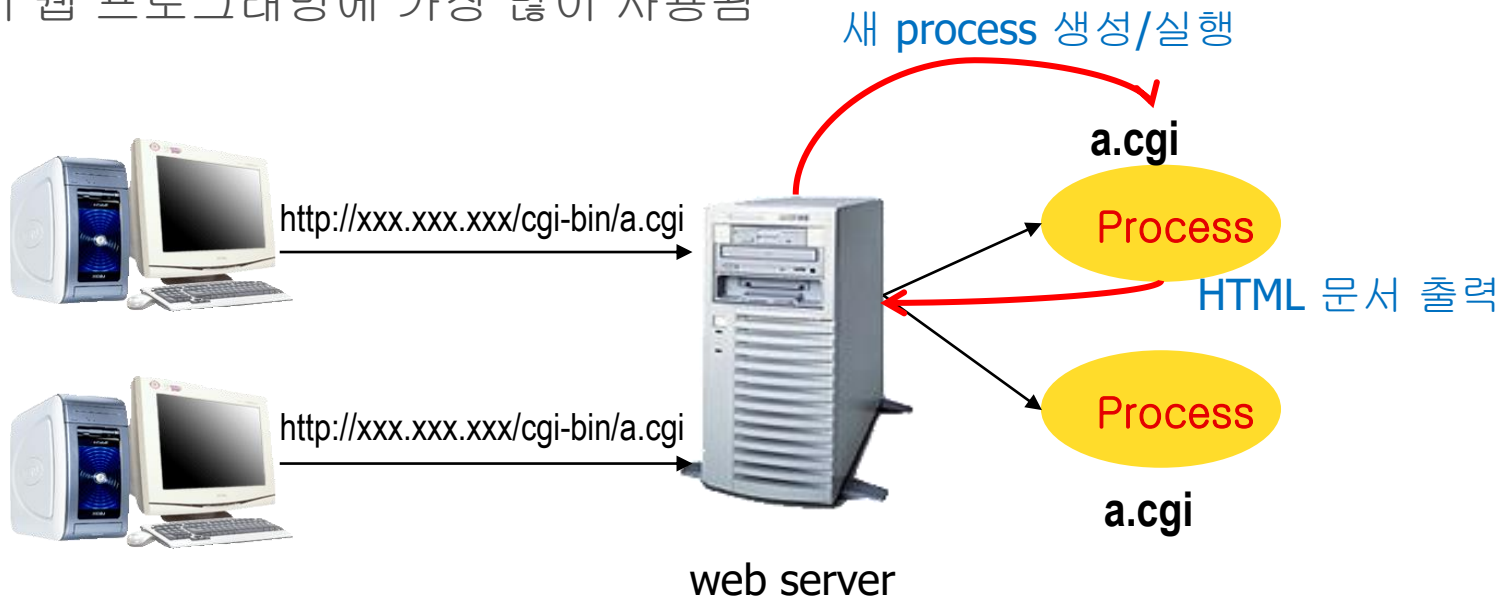
- 웹 브라우저에 의해 동작
- 서버의 개입을 줄여서 빠른 처리가 가능
 - Ex) 회원 가입 form의 데이터 validation
- JavaScript, MS Silverlight, Adobe AIR, ...

- Server-side coding

- 웹 서버에 의해 처리
- 코드의 실행을 통해 동적으로 웹 페이지를 생성
 - Ex) DB로부터 데이터를 가져와서 화면에 보여주는 웹 페이지 생성
- CGI, JSP, PHP, ASP, ...

Server-side Coding

- CGI
 - Common Gateway Interface
 - 초기 웹 프로그래밍에 가장 많이 사용됨



- 각각의 클라이언트 요청에 대해 개별 프로세스가 생성됨
- 시스템 리소스를 많이 사용함

Server-side Coding

- Servlet

```
public class CMemberTest extends HttpServlet {  
  
    public void doGet(HttpServletRequest request, HttpServletResponse response)  
        throws ServletException, IOException {  
  
        response.setContentType("text/html; charset=EUC_KR");  
        PrintWriter out = response.getWriter();  
        out.println("<HTML><HEAD><TITLE>로그인</TITLE></HEAD></HTML>");  
        out.println("<BODY><H2>Hello World : 헬로월드</H2>");  
        out.println("오늘의 날짜와 시간은 : "+new java.util.Date());  
        out.println("</BODY></HTML>");  
    }  
}
```

Server-side Coding

- Server-side scripting

- 웹 서버 내에서 동적인 웹 페이지가 생성됨

```
<%@ page contentType="text/html; charset=euc-kr" %>
<HTML>
    <HEAD><TITLE>Hello World</TITLE></HEAD>
    <BODY><H2>Hello World : 헬로월드</H2>
        오늘의 날짜와 시간은 : <%= new java.util.Date() %>
    </BODY>
</HTML>
```

- 장점

- 디자인과 데이터를 구분
- 코드 수정 및 관리가 쉬움

Server-side Coding

- Server-side scripting

- ASP

- Active Server Page
 - 주로 VBScript를 사용해서 동적 웹 페이지 생성

- PHP

- Professional Hypertext Preprocessor
 - 오픈소스 프로젝트
 - 다양한 OS와 환경에서 많이 사용됨

```
<html>
<head>
  <title>PHP Test</title>
</head>
<body>
  <?php echo '<p>Hello World</p>'; ?>
</body>
</html>
```

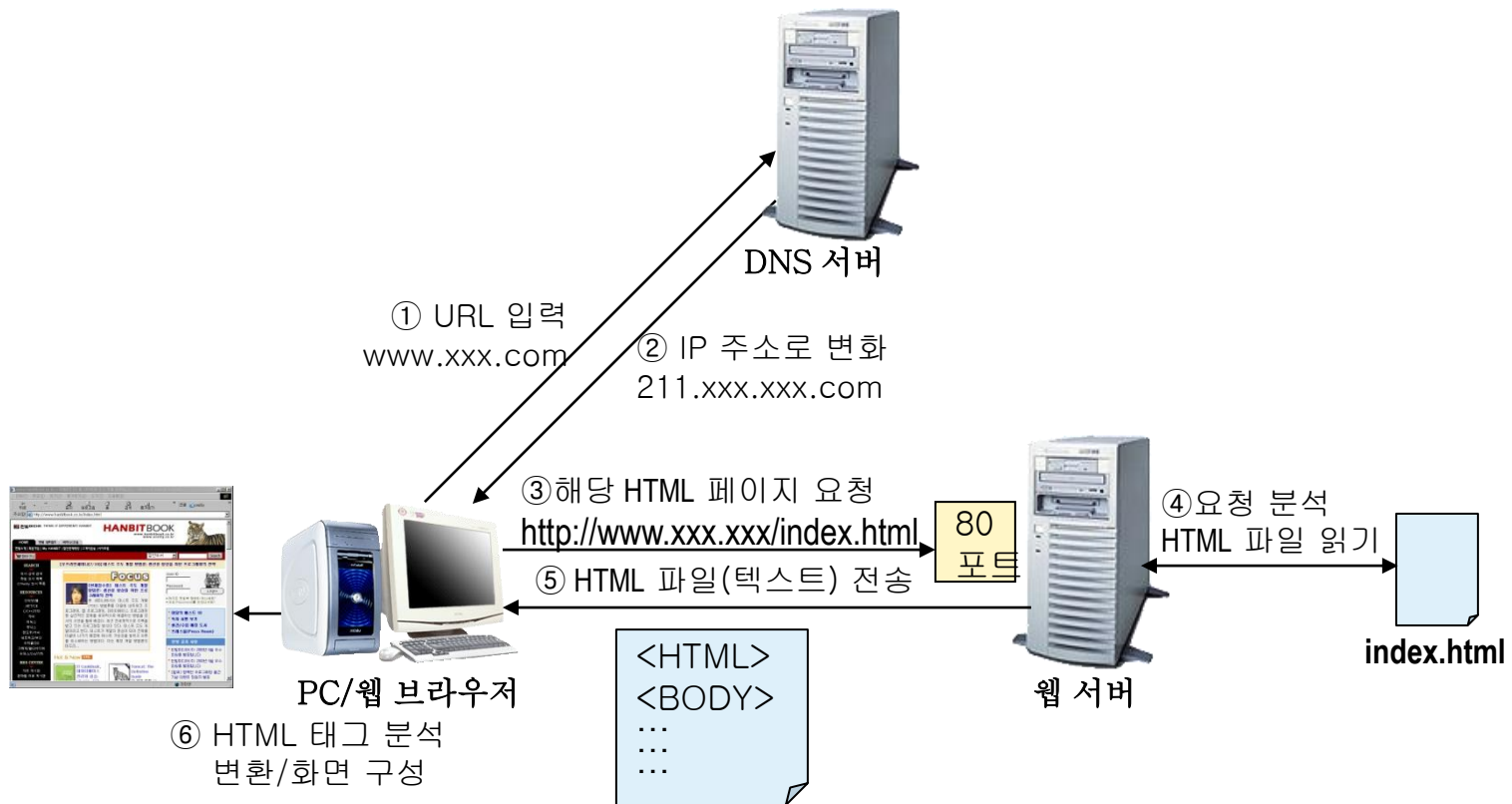
- JSP

- Java Server Page
 - Servlet과 연계되는 server-side script
 - 각 요청에 대해 별도의 process가 생기지 않고 thread기반으로 처리

```
<html>
<table>
  <tr><td>
    <%= toStringOrBlank( "expanded inline data " + 1 ) %>
  </td></tr>
</table>
```

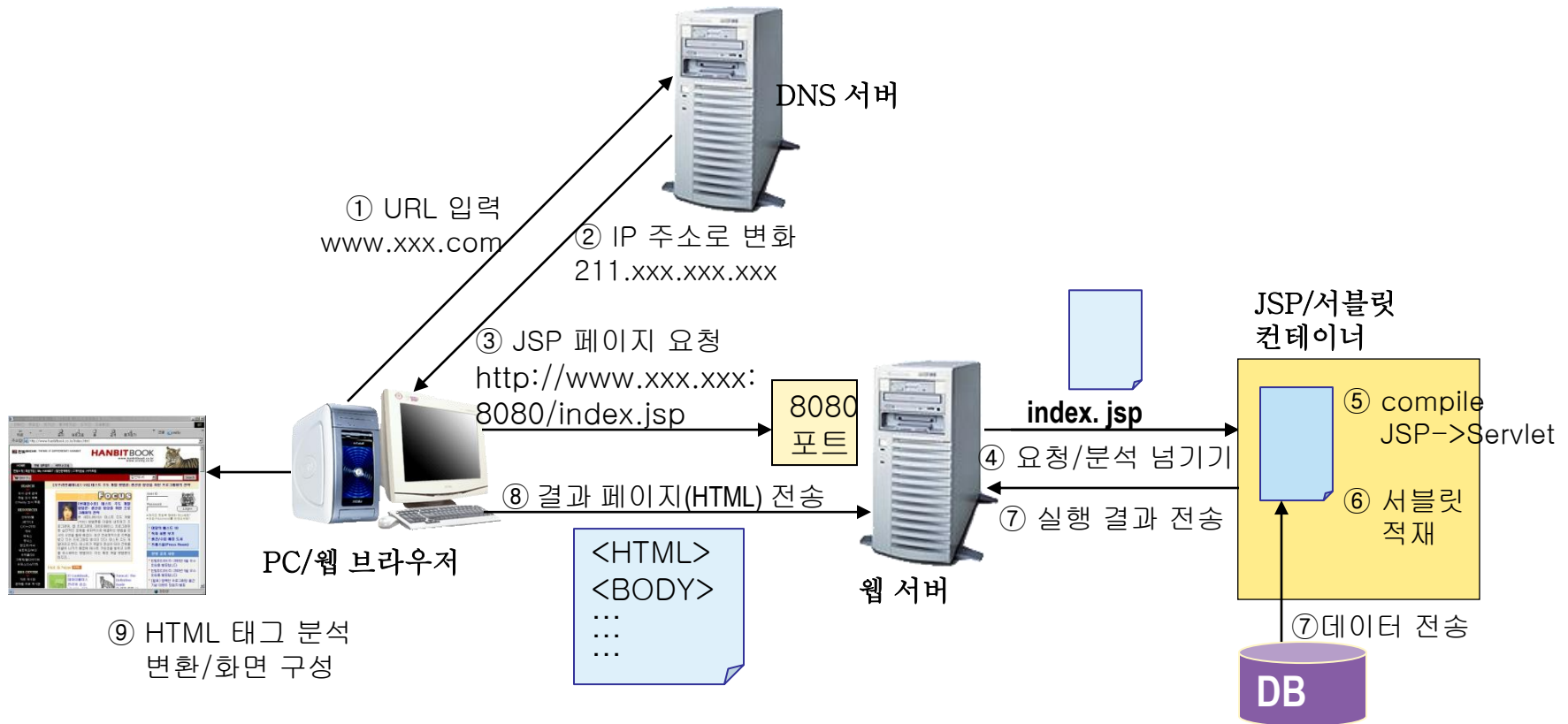
JSP 동작 방식

- 일반적인 웹 서버 동작 방식



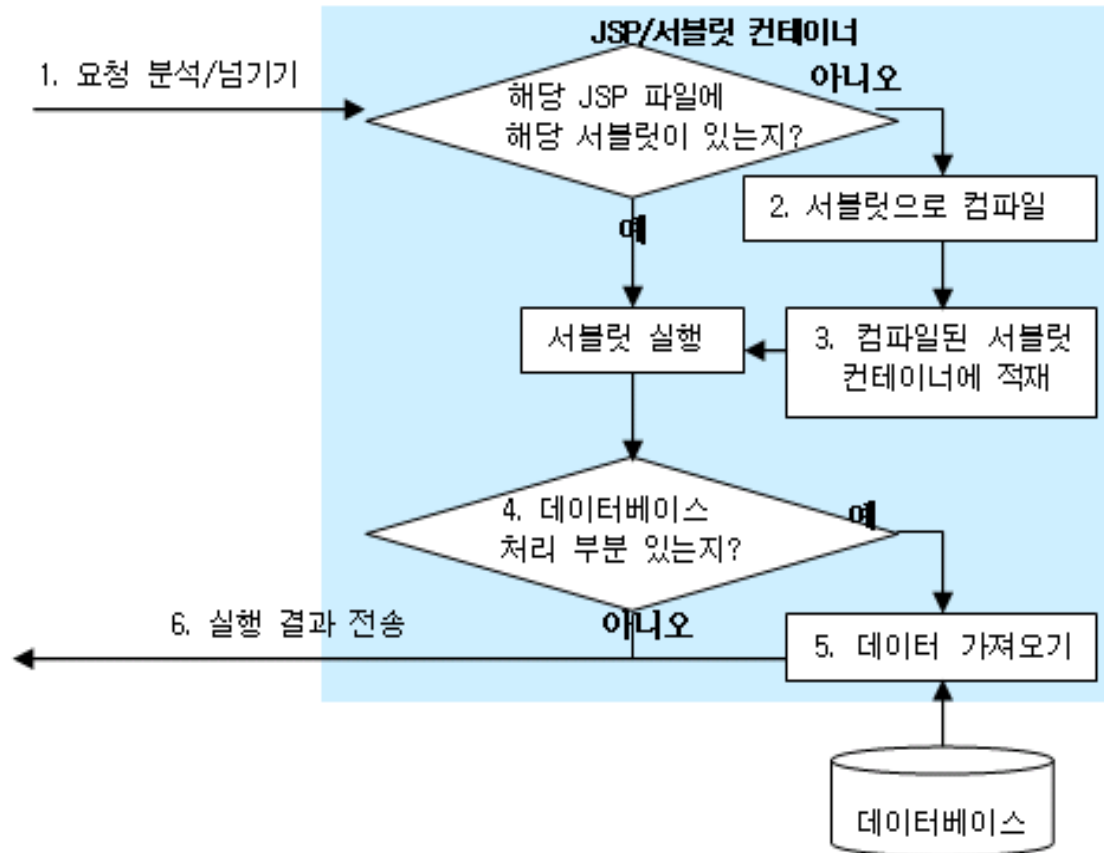
JSP 동작 방식

- JSP



JSP 동작 방식

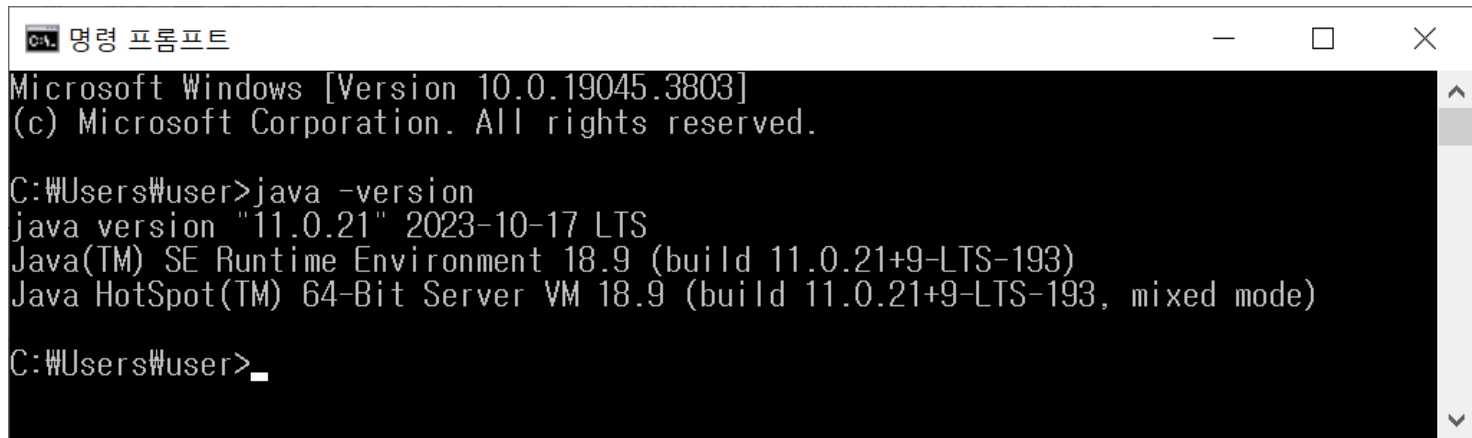
- JSP → Servlet



Java 개발환경 구축

- Java SE JDK 11 버전 설치

- <https://www.oracle.com/java/technologies/downloads/#java11-windows>



```
명령 프롬프트
Microsoft Windows [Version 10.0.19045.3803]
(c) Microsoft Corporation. All rights reserved.

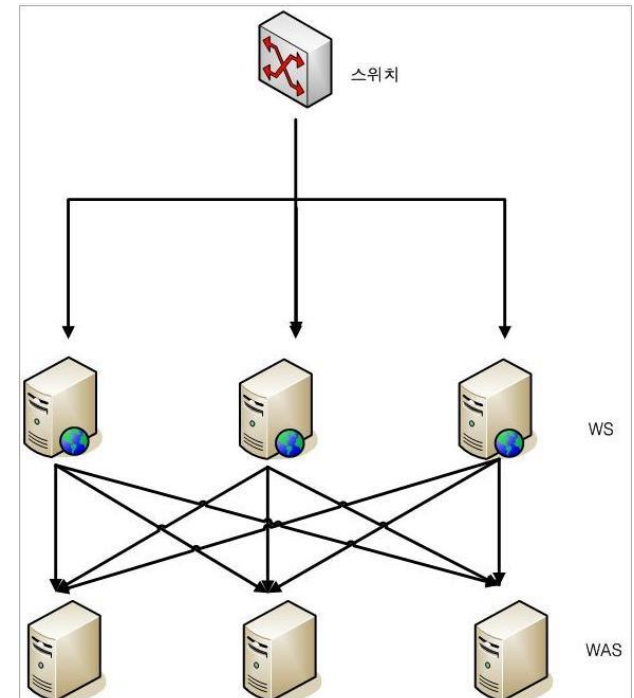
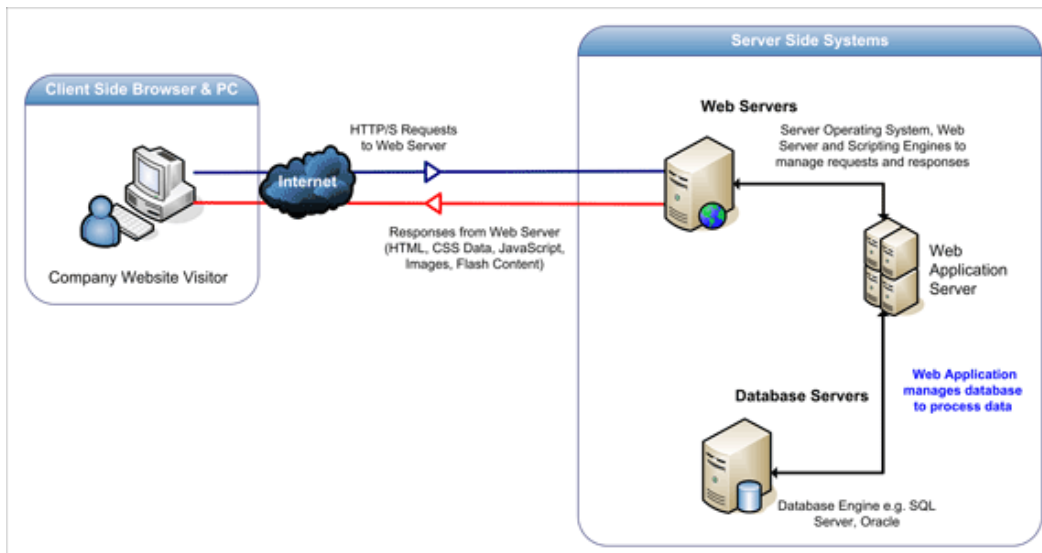
C:\Users\User>java -version
java version "11.0.21" 2023-10-17 LTS
Java(TM) SE Runtime Environment 18.9 (build 11.0.21+9-LTS-193)
Java HotSpot(TM) 64-Bit Server VM 18.9 (build 11.0.21+9-LTS-193, mixed mode)

C:\Users\User>_
```

- Java SE (Standard Edition)
- Java EE (Enterprise Edition)
- Java ME (Micro Edition)
- JDK (Java Development Kit)
 - 자바 실행환경 및 개발자 도구를 포함
 - 컴파일러, 디버거, javadoc 등
 - JRE (Java Runtime Environment) 포함
 - Java Virtual Machine
 - core library

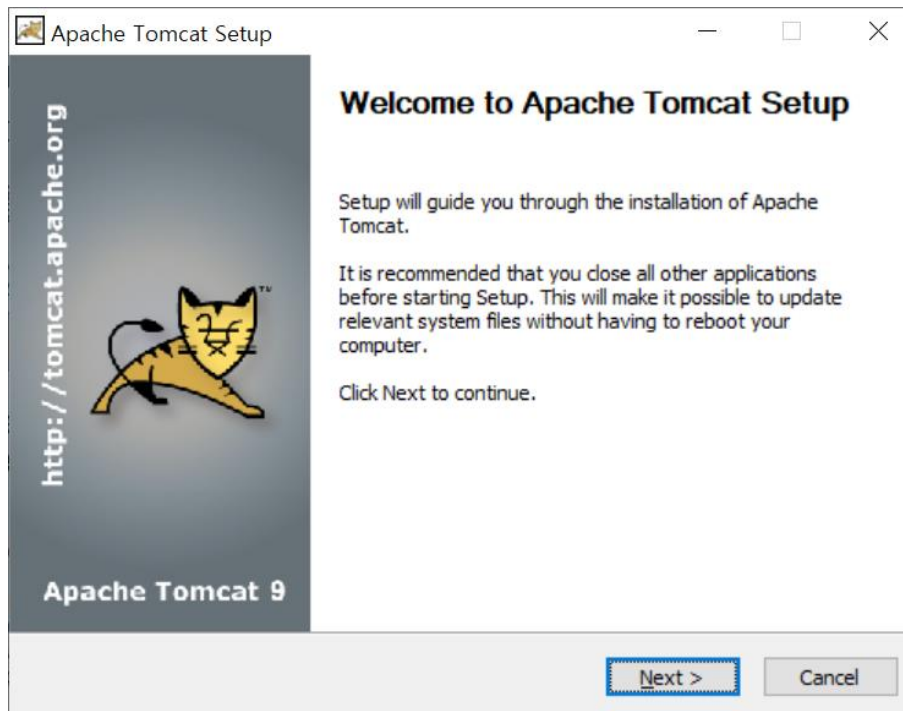
Apache Tomcat Server

- Web server vs. Web application server
 - Web server
 - 단순한 HTML 문서, image 등의 정적인 content 처리
 - 정적인 content 처리 속도가 빠른 대신 동적인 content를 처리하기 힘들
 - Web application server
 - DB서버와의 연동이나 비즈니스 로직의 처리를 담당하는 middleware
 - JSP/Servlet 등을 이용해 동적인 content 처리
 - 분산 환경에서의 transaction 처리가 용이



Apache Tomcat Server

- Apache Tomcat server
 - Apache software foundation에서 개발한 servlet container
 - Java servlet과 JSP 스펙을 구현
 - 기본적인 HTTP web server를 함께 포함하고 있음
 - <https://tomcat.apache.org/download-90.cgi> 에서 다운로드 후 설치



Apache Tomcat Server

Apache Tomcat Setup: Configuration Options

Configuration
Tomcat basic configuration.

Server Shutdown Port: 8005

HTTP/1.1 Connector Port: 8080

Windows Service Name: Tomcat9

Create shortcuts for all users: ☐

Tomcat Administrator Login (optional)

User Name: kgu

Password: ...

Roles: manager-gui

Nullsoft Install System v3.09

< Back Next > Cancel

Apache Tomcat Setup: Java Virtual Machine path selection

Java Virtual Machine
Java Virtual Machine path selection.

Please select the path of a Java 8 or later JRE installed on your system.

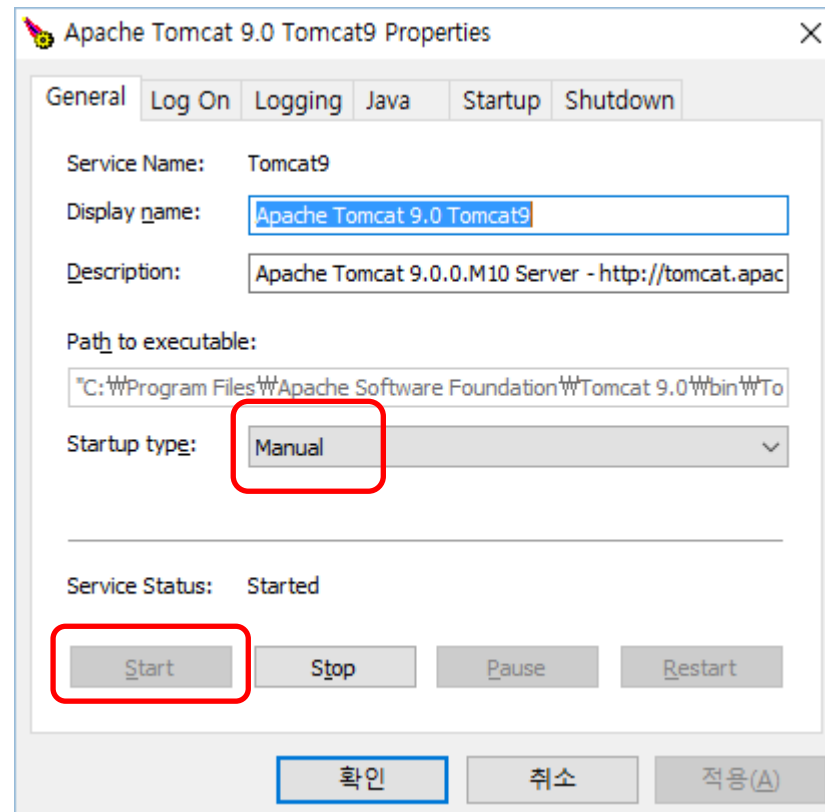
C:\Program Files\Java\jdk-11

Nullsoft Install System v3.09

< Back Next > Cancel

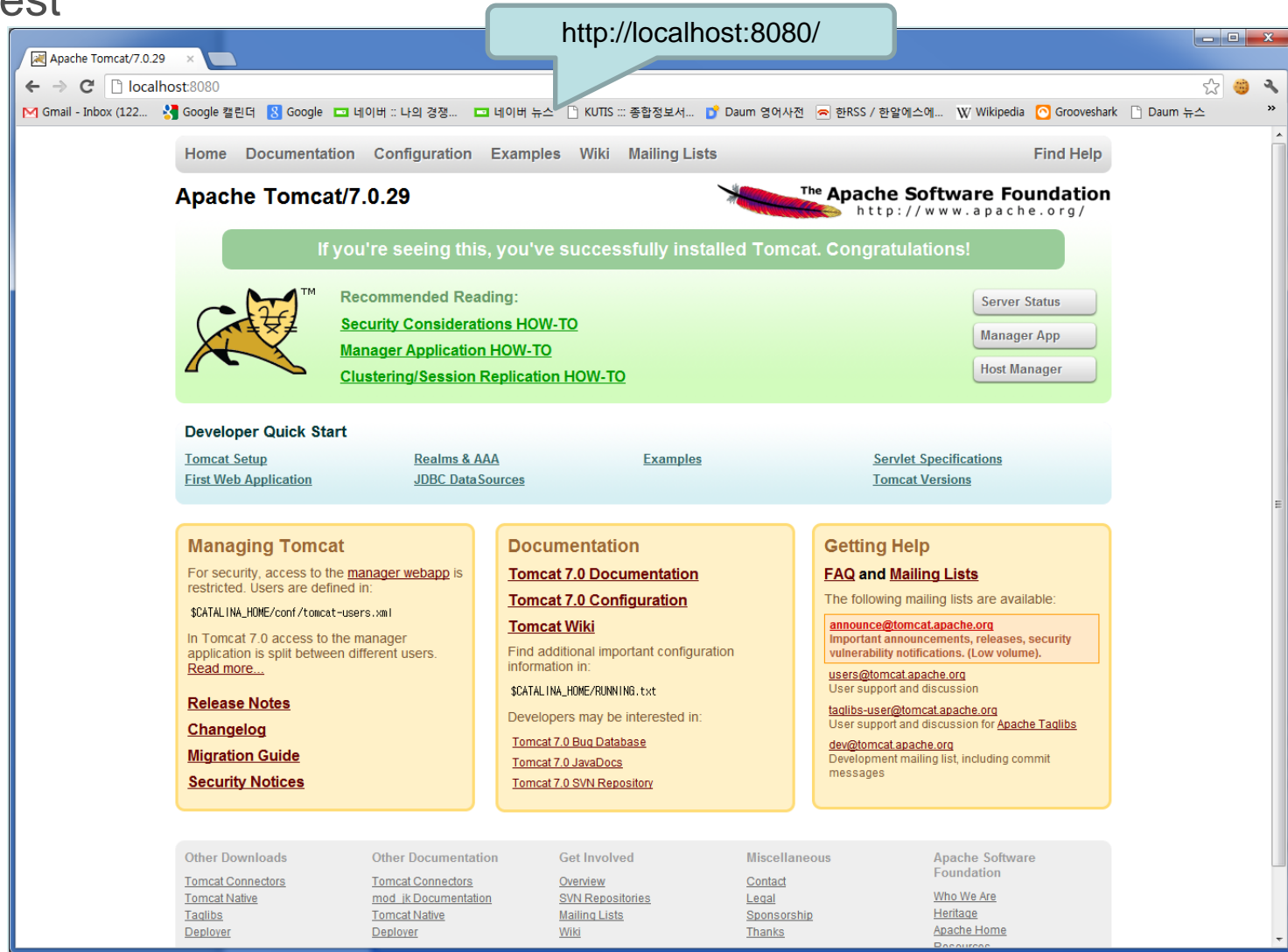
Apache Tomcat Server

- Run
 - Monitor Tomcat



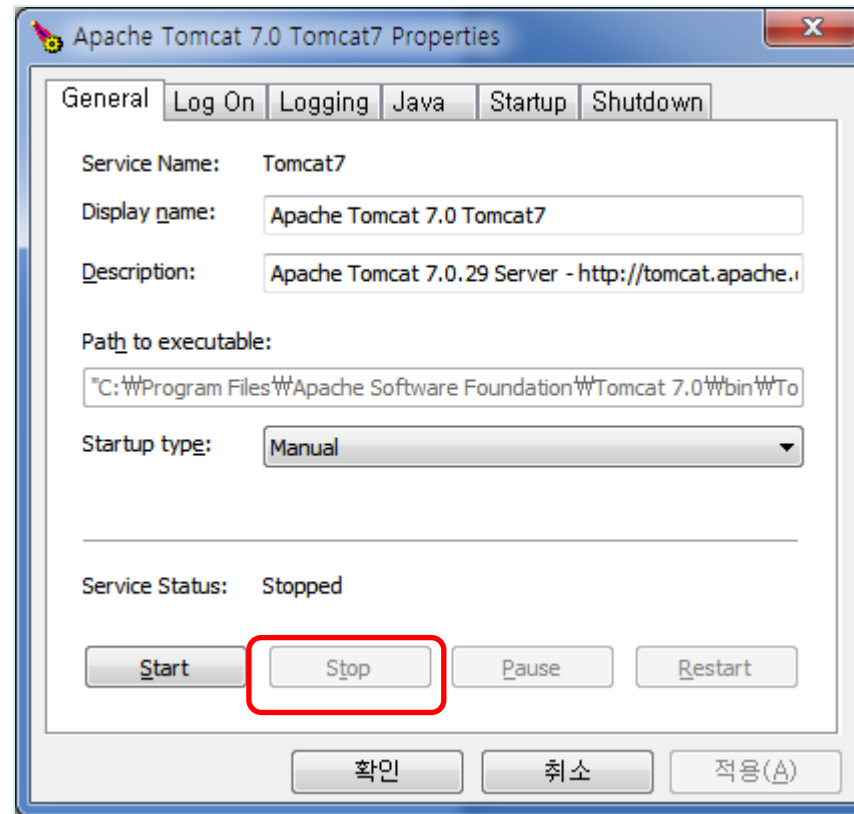
Apache Tomcat Server

- Test



Apache Tomcat Server

- Shutdown



Java 개발환경 구축

- Eclipse 설치
 - 통합 개발환경
- Eclipse WTP(Web Tools Platform) 플러그인 설치
 - Java를 이용해 web application을 개발할 때 유용한 툴 제공
 - 소스 에디터, wizard와 실행/테스트를 위한 API등을 포함
- **Eclipse IDE for Enterprise Java and Web Developers**
에 포함되어 있음

Java 개발환경 구축

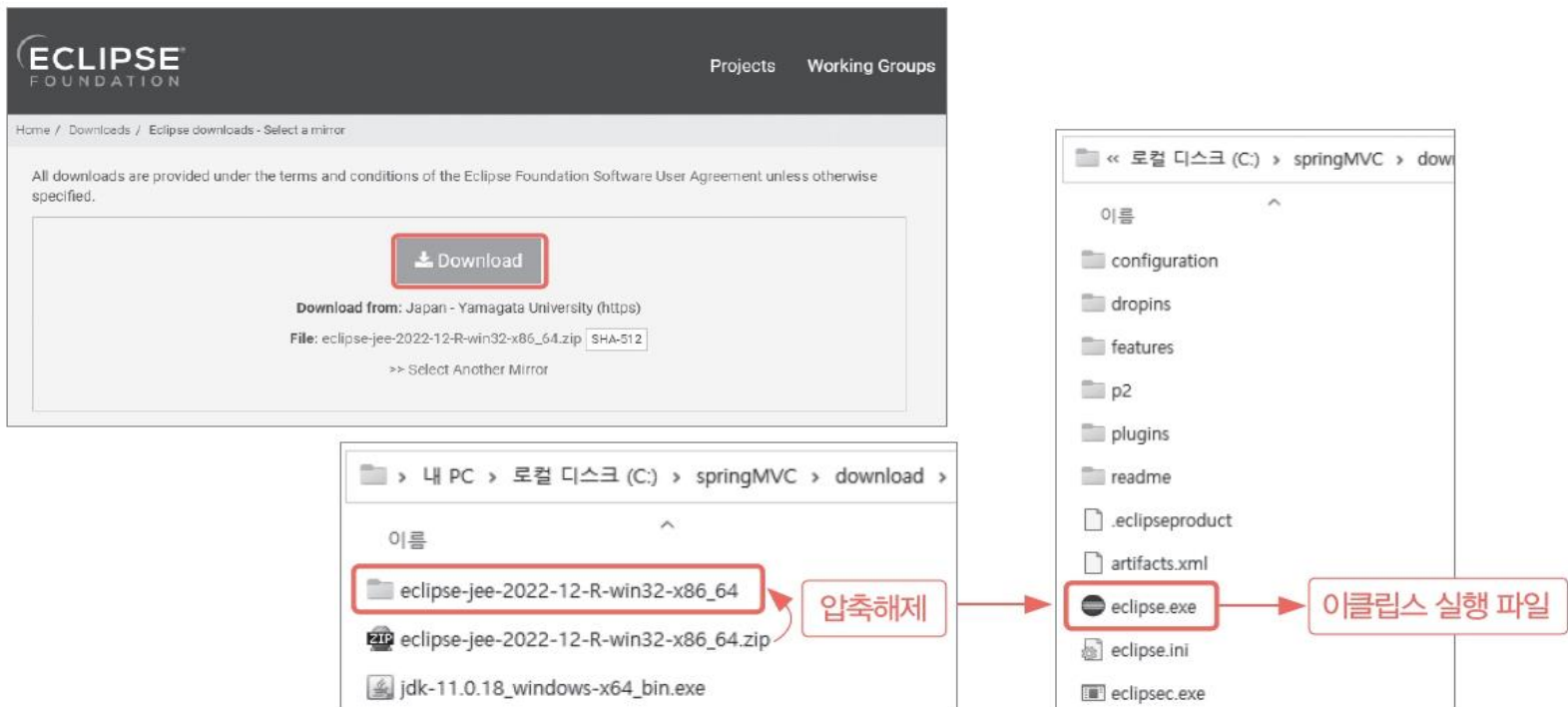
- <https://eclipseide.org>
- 2022-12 R Packages의 'Eclipse IDE for Enterprise Java and Web Developers'를 선택하고, 'Windows x86_64'를 클릭하여 다운로드

The screenshot shows the Eclipse IDE website with the following elements:

- Top Navigation:** Eclipse Foundation logo, Projects, Working Groups, Members, More, and a Download button (highlighted with a red box and a red circle with the number 1).
- Main Content:** "The Community for Open Innovation and Collaboration" banner.
- Eclipse IDE 2022-12 R Packages Section:**
 - Eclipse IDE for Java Developers:** 302 MB, 531,199 DOWNLOADS. Description: "The essential tools for any Java developer, including a Java IDE, a Git client, XML Editor, Maven and Gradle integration." Download links: Windows x86_64, macOS x86_64 | AAarch64, Linux x86_64 | AAarch64.
 - Eclipse IDE for Enterprise Java and Web Developers:** 516 MB, 377,975 DOWNLOADS. Description: "Tools for developers working with Java and Web applications, including a Java IDE, tools for JavaScript, TypeScript, JSP and Faces, YAML, Markdown, Web Services, JPA and Data Tools, Maven and Gradle, Git, and more." Download links: Windows x86_64 (highlighted with a red box), macOS x86_64 | AAarch64, Linux x86_64 | AAarch64.
- Right Side Panel:** "The Eclipse Installer 2022-12 R now includes a JRE for macOS, Windows and Linux." "Get Eclipse IDE 2022-12" section with a "Download x86_64" button and a "Download Packages" button (highlighted with a red box and a red circle with the number 2).

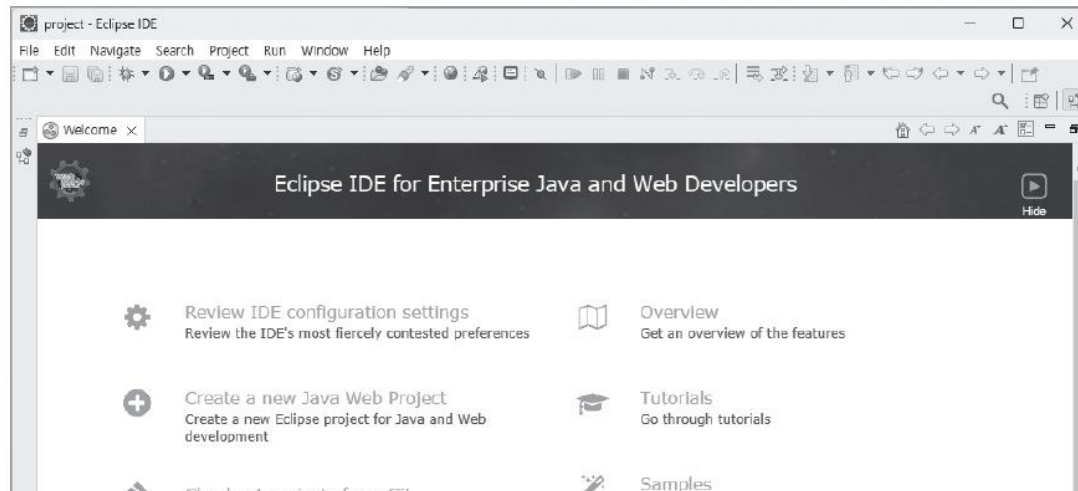
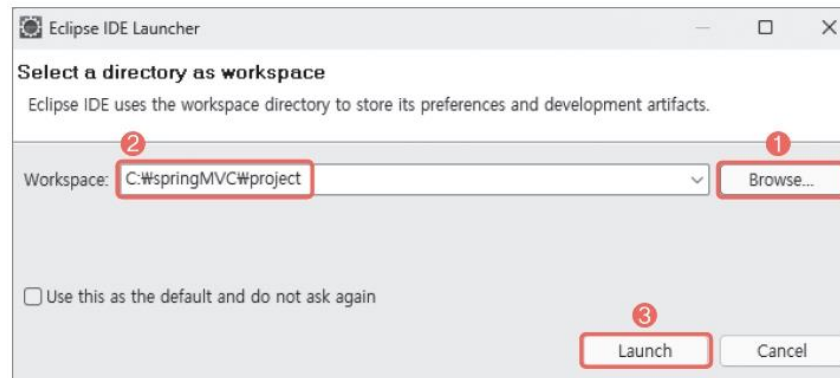
Java 개발환경 구축

- <Download> 버튼을 클릭하여 eclipse-jee-2022-12-R-win32-x86_64.zip 파일 다운로드하기
 - 다운로드 위치: C:\springMVC\download
- 다운로드한 이클립스는 압축파일로, 압축 해제하여 이클립스 실행 파일(eclipse.exe)을 더블클릭해서 이클립스를 실행하기



Java 개발환경 구축

- Workspace 설정
 - Run eclipse



Java 개발환경 구축

- 이클립스의 자바 버전(JDK) 설정하기
 - 자바 JDK11과 이클립스 2022-12-R을 설치했음
 - 그런데 이클립스 2022-12-R에는 자바의 최신 버전인 17이 내장되어 있기 때문에 이클립스의 자바 버전을 JDK17이 아닌 JDK11로 변경해야 함

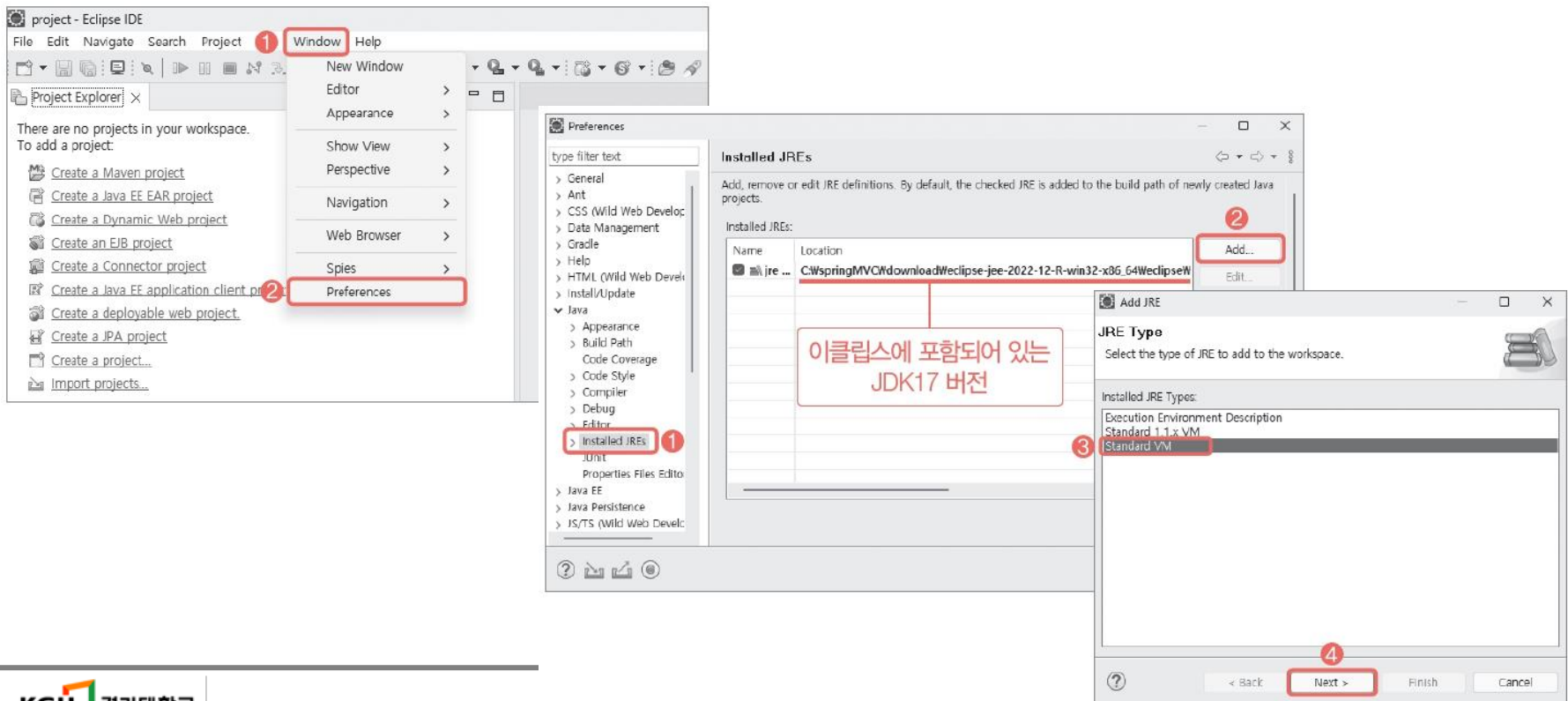
<여기서 잠깐!> 이클립스에서 자바를 JDK11로 변경하지 않고 최신 버전(JDK17)을 사용하면 안 되나요?

이 책에서는 JDK11 환경에서 모든 실습을 진행합니다. 따라서 JDK17을 사용하다가 실습이 막히면 학습에 어려움이 있을 수 있습니다. 또한 실무에서 이클립스의 자바 버전을 변경해야 하는 경우가 종종 발생하기도 합니다. 그런 경우를 대비해서 자바 버전을 변경하는 방법에 대해서 이번 기회에 알아두면 좋을 것입니다.

Java 개발환경 구축

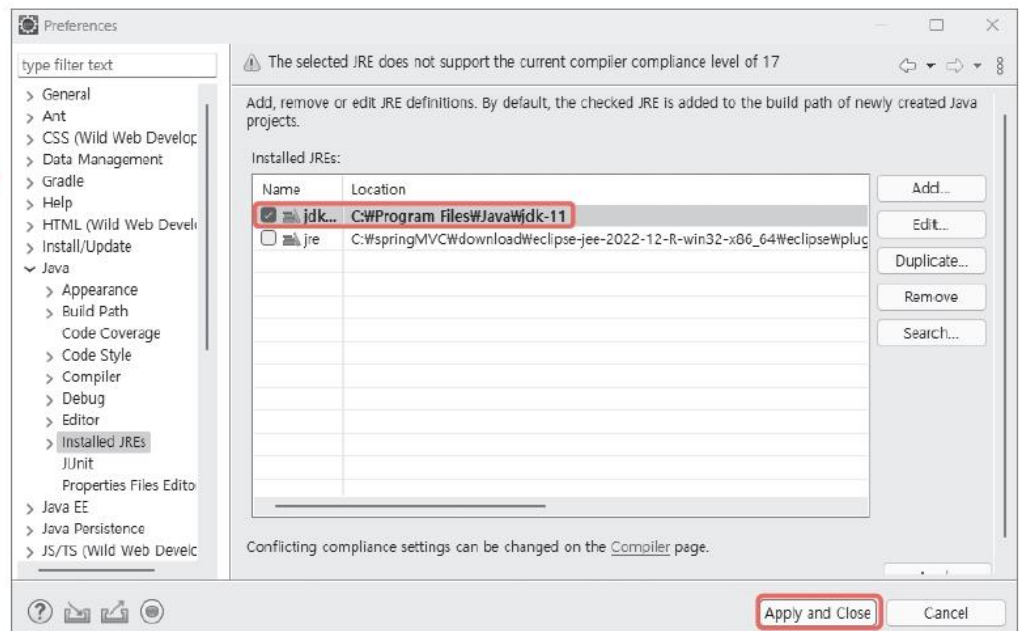
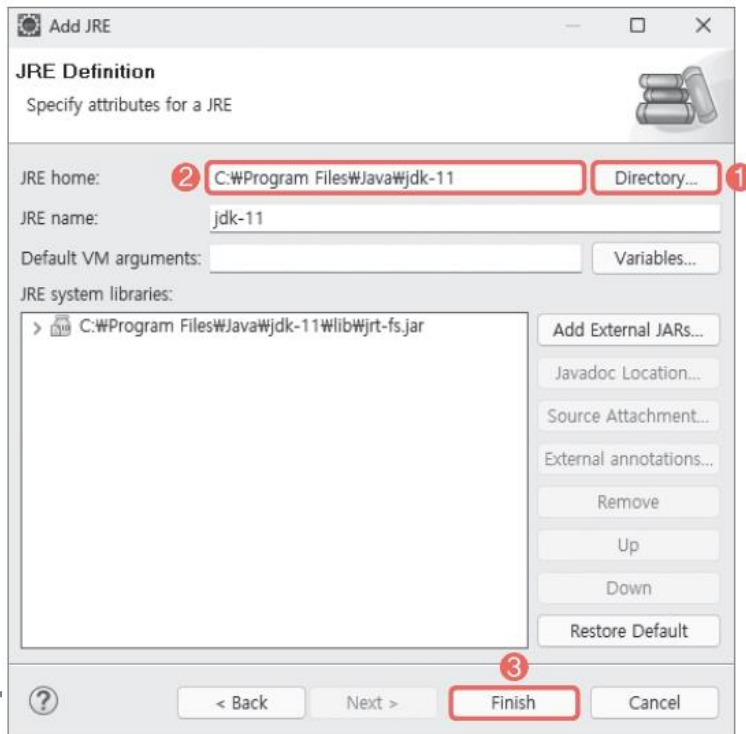
- 이클립스의 자바 버전(JDK) 설정하기

- 1. 이클립스 상단 메뉴에서 [Window]-[Preferences]를 선택
- 2. [Preferences] 창 왼쪽 메뉴에서 [Java]-[Installed JREs]를 클릭해 이클립스에 기본적으로 포함되어 있는 JDK17의 경로를 확인하기
 - <Add...>를 클릭하고, [Add JRE] 창에서 Standard VM을 선택한 후 <Next> 클릭



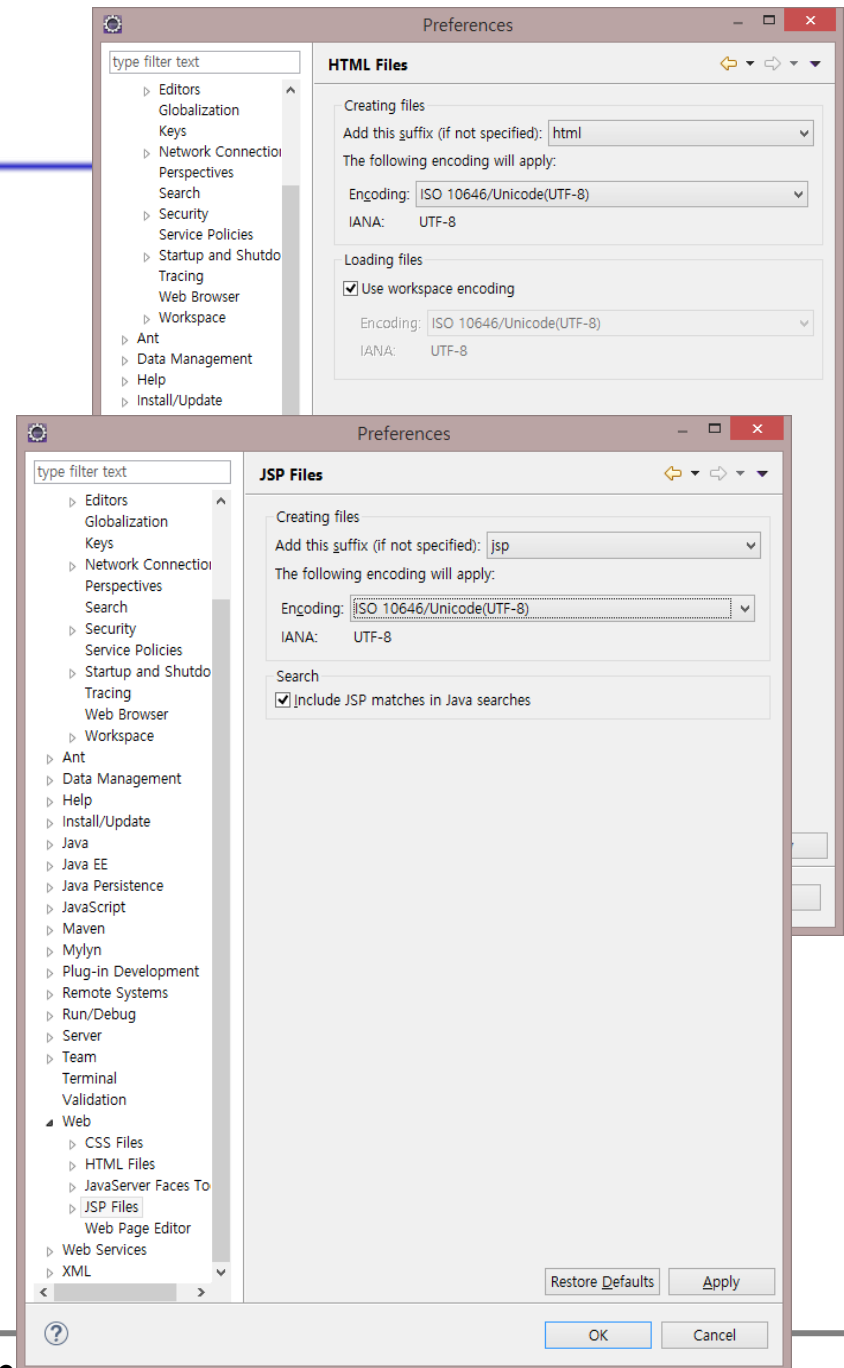
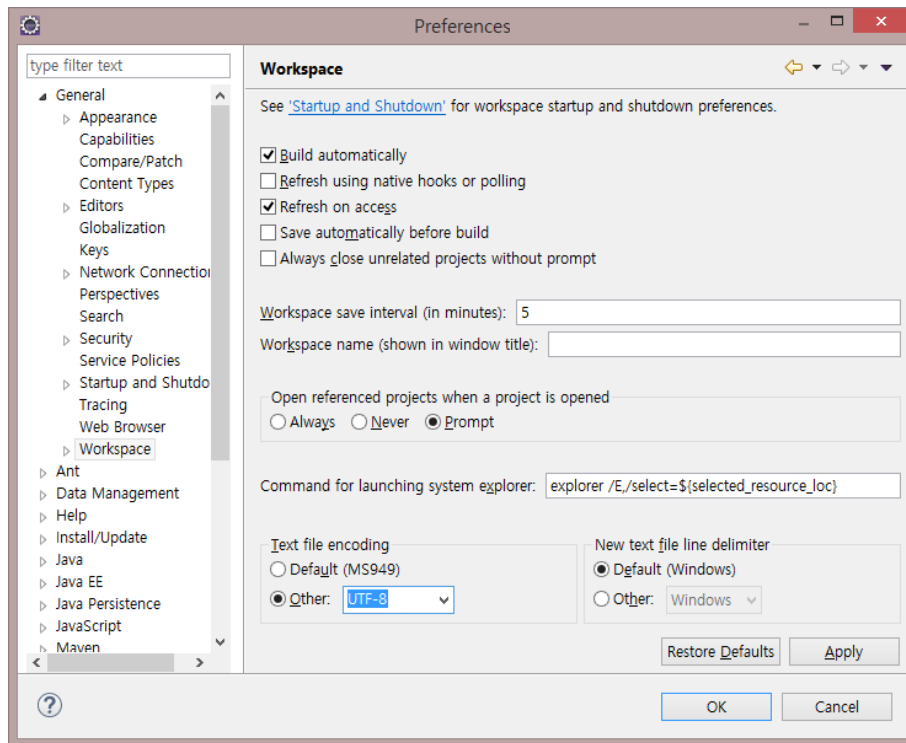
Java 개발환경 구축

- 이클립스의 자바 버전(JDK) 설정하기
 - 3. [JRE Definition] 창에서 <Directory>를 클릭하여 JRE home을 앞에서 설치한 JDK11 경로 설정하고 <Finish> 클릭
 - JDK11 경로: C:\Program Files\Java\jdk-11.0.14
 - 4. 추가된 jdk-11의 체크박스에 체크하여 default로 설정하고, <Apply and Close>를 클릭해서 설정 종료



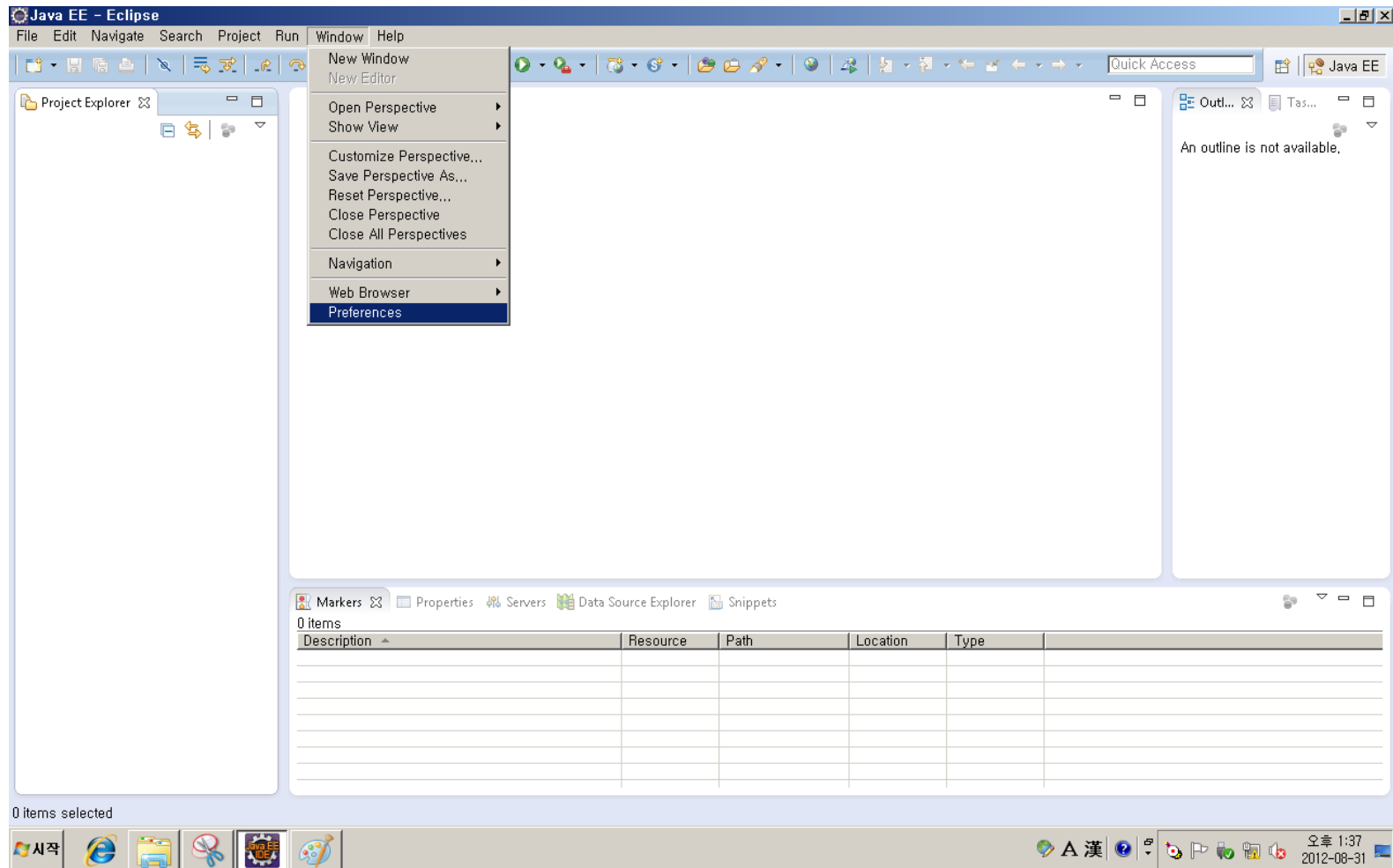
Java 개발환경 구축

- 한글 인코딩 설정
 - EUC-KR, UTF-8 등의 인코딩 방식
 - 최근에는 UTF-8을 기본으로 사용

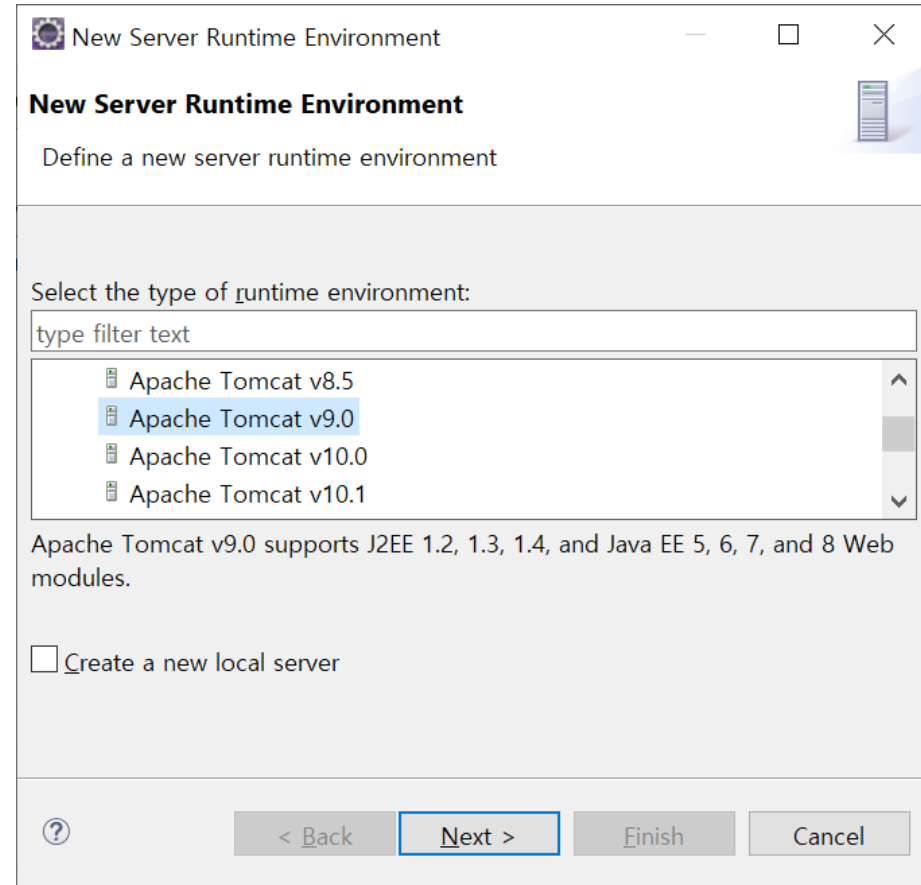


Java 개발환경 구축

- Tomcat 서버 설정



- Tomcat 서버 설정



Java 개발환경 구축

- Tomcat 서버 설정

New Server Runtime Environment

Tomcat Server
Specify the installation directory

Name:
Apache Tomcat v8.5

Tomcat installation directory:
C:\Program Files\Apache Software Foundation\Tomcat 8.5 **Browse...**
Download and Install...

JRE:
Workbench default JRE **Installed JREs...**

< Back **Next >** **Finish** **Cancel**

Preferences

type filter text

- > Java Persistence
- > JS/TS (Wild Web Devel
- > Language Servers
- > Maven
- > Oomph
- > Plug-in Development
- > Run/Debug
- ▼ **Server**
 - Audio
 - Launching
 - Overlays
 - Profilers
 - Runtime Environment**
- > Terminal
- > TextMate
- > Validation
- > Version Control (Team)
- ▼ **Web**
 - > Client-side JavaScript
 - > CSS Files
 - > HTML Files
 - JavaScript
 - > JavaServer Faces To
 - > JSP Files

Server Runtime Environments
Add, remove, or edit server runtime environments.
Server runtime environments:

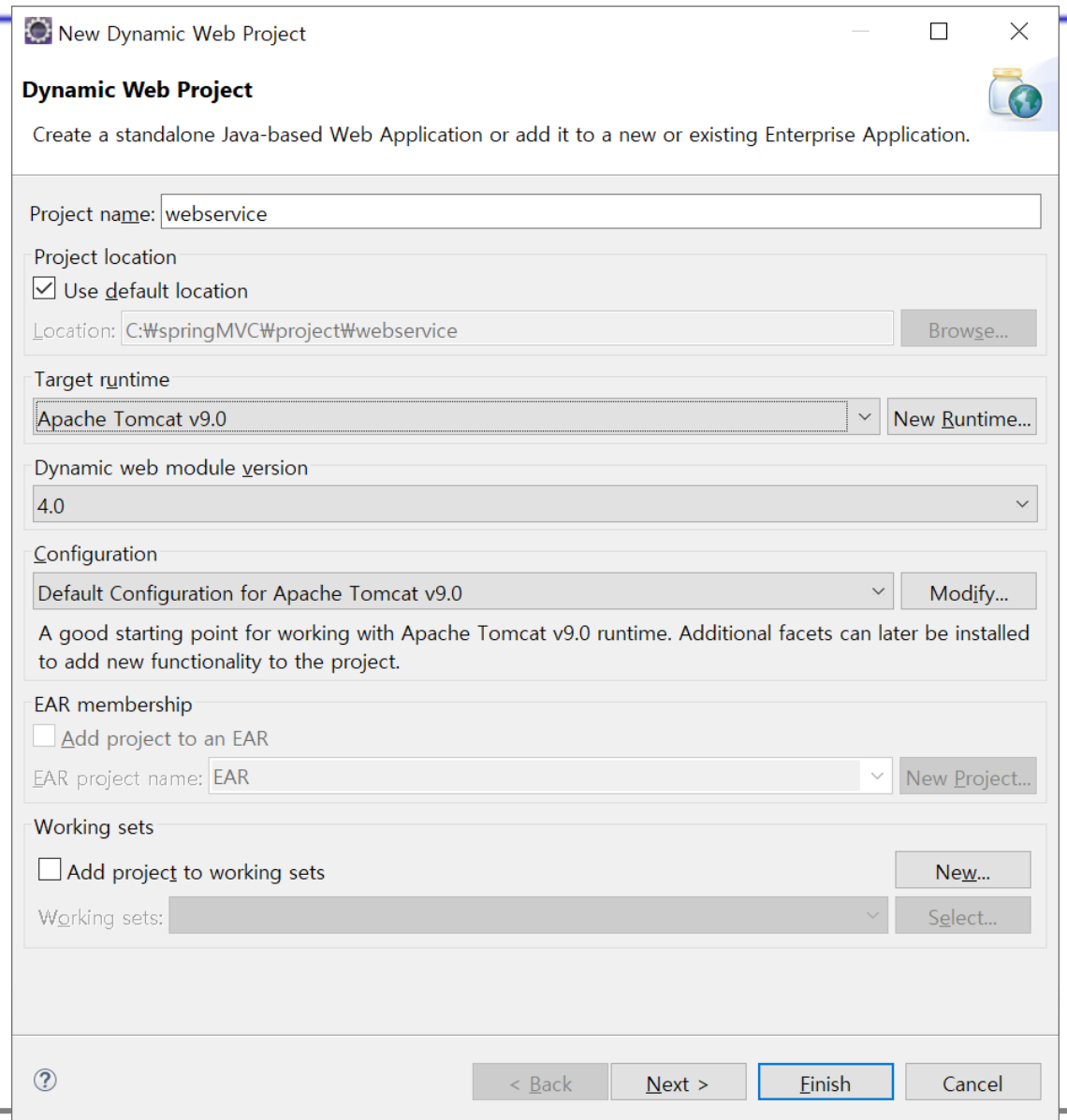
Name	Type
Apache Tomcat v9.0	Apache Tomcat v9.0

Add...
Edit...
Remove
Search...
Columns...

Apply and Close **Cancel**

Hello World

- Eclipse 프로젝트 생성
 - File > New > Dynamic Web Project



The screenshot shows the 'New Dynamic Web Project' dialog box in Eclipse. The title bar reads 'New Dynamic Web Project'. Below the title bar, the text 'Dynamic Web Project' is displayed, followed by the instruction: 'Create a standalone Java-based Web Application or add it to a new or existing Enterprise Application.' The dialog is divided into several sections: 'Project name:' with a text field containing 'webservice'; 'Project location' with a checked 'Use default location' checkbox and a 'Location:' text field showing 'C:\springMVC\project\webservice' and a 'Browse...' button; 'Target runtime' with a dropdown menu showing 'Apache Tomcat v9.0' and a 'New Runtime...' button; 'Dynamic web module version' with a dropdown menu showing '4.0'; 'Configuration' with a dropdown menu showing 'Default Configuration for Apache Tomcat v9.0' and a 'Modify...' button, followed by a descriptive paragraph; 'EAR membership' with an unchecked 'Add project to an EAR' checkbox, an 'EAR project name:' text field showing 'EAR', and a 'New Project...' button; and 'Working sets' with an unchecked 'Add project to working sets' checkbox, a 'Working sets:' text field, and a 'Select...' button. At the bottom, there is a '?' icon, a '< Back' button, a 'Next >' button, a highlighted 'Finish' button, and a 'Cancel' button.

New Dynamic Web Project

Dynamic Web Project
Create a standalone Java-based Web Application or add it to a new or existing Enterprise Application.

Project name: webservice

Project location
☒ Use default location
Location: C:\springMVC\project\webservice Browse...

Target runtime
Apache Tomcat v9.0 New Runtime...

Dynamic web module version
4.0

Configuration
Default Configuration for Apache Tomcat v9.0 Modify...
A good starting point for working with Apache Tomcat v9.0 runtime. Additional facets can later be installed to add new functionality to the project.

EAR membership
☐ Add project to an EAR
EAR project name: EAR New Project...

Working sets
☐ Add project to working sets New...
Working sets: Select...

? < Back Next > Finish Cancel

Hello World

항목	설명
Context Root	URL 상의 메인 접속 경로를 설정 옆의 경우 브라우저를 통한 접속 경로는 http://localhost:8080/webservice 각 웹 애플리케이션은 하나의 컨텍스트로 관리되며 동일 컨텍스트 내에서만 세션과 같이 공용정보가 공유
Content Directory	jsp, HTML, 그림파일 등 콘텐츠가 위치할 디렉토리를 설정
Java Source Directory	jsp 와 연동해서 사용할 자바 소스의 위치

New Dynamic Web Project

Web Module

Configure web module settings.

Context root: webservice

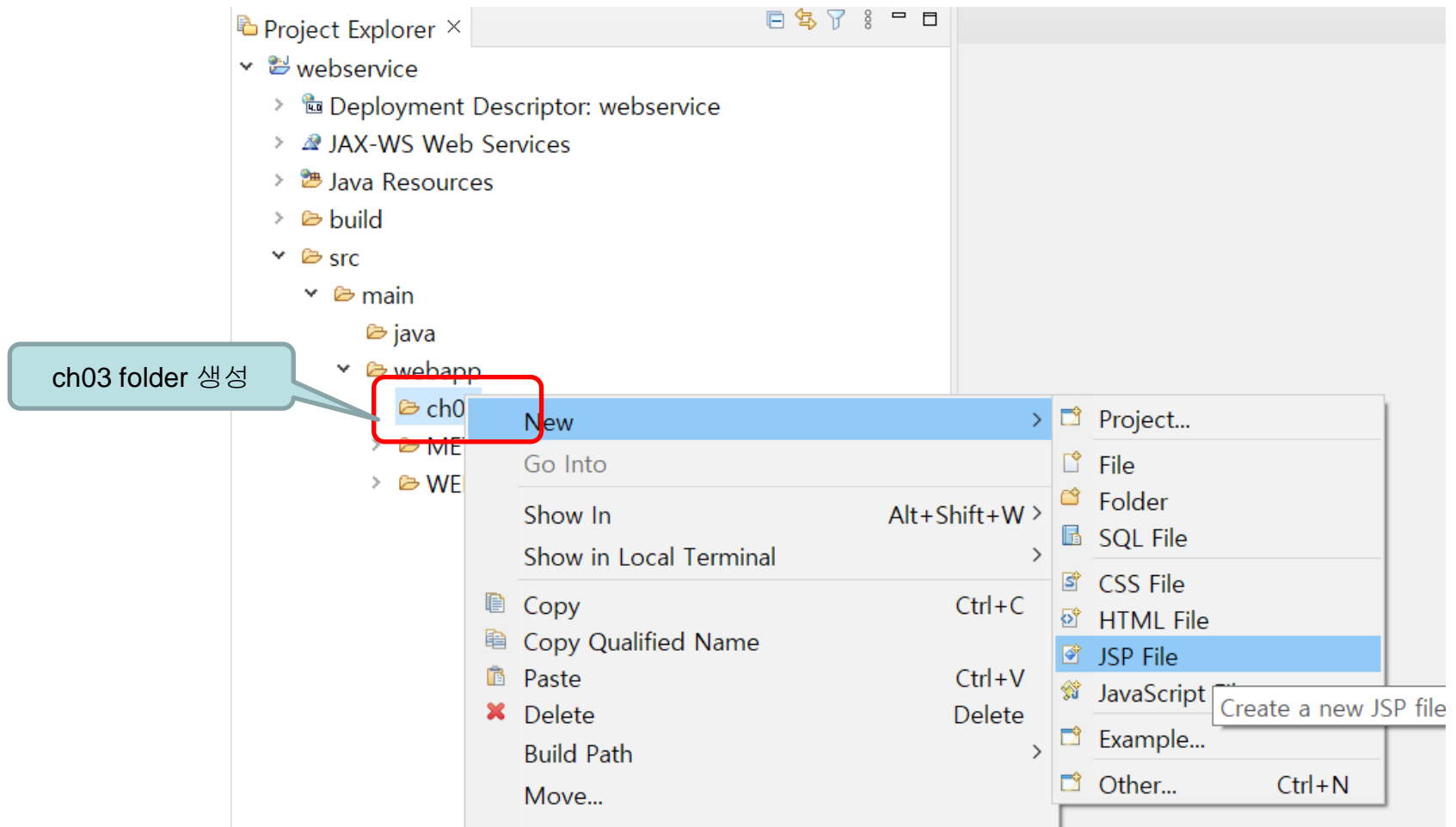
Content directory: src/main/webapp

☒ Generate web.xml deployment descriptor

? < Back Next > Finish Cancel

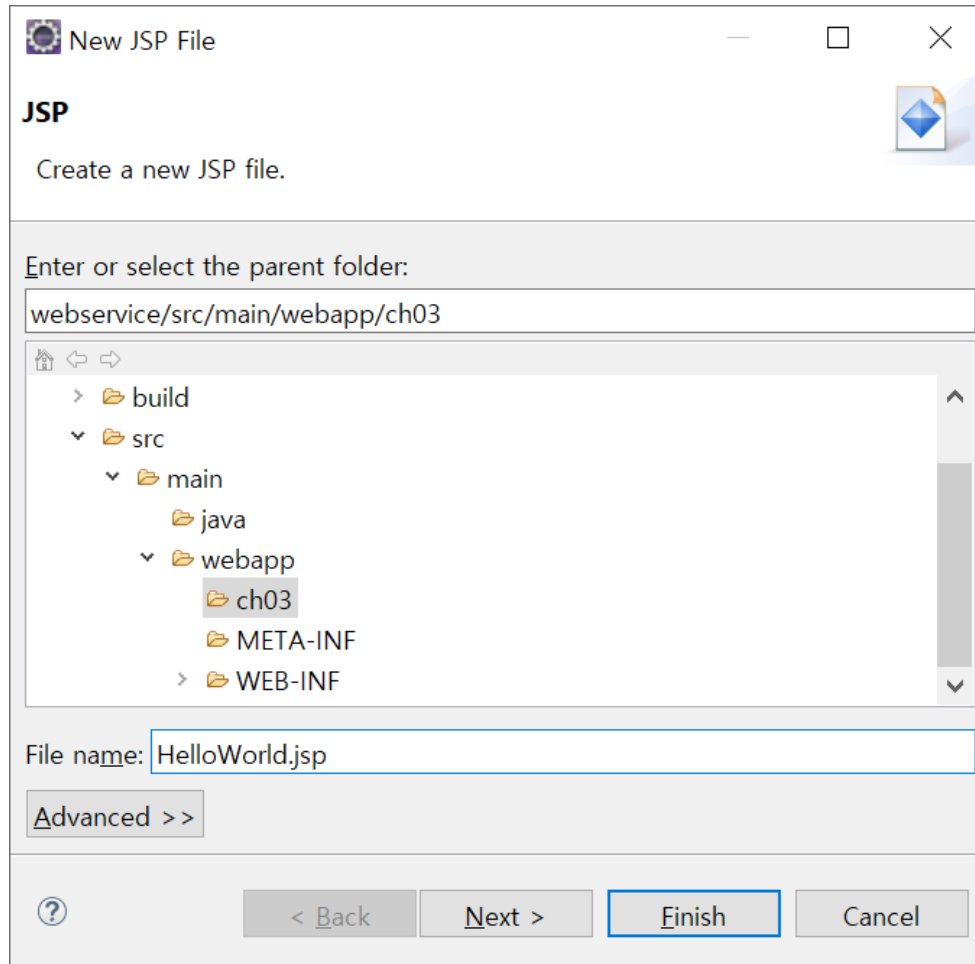
Hello World

- HelloWorld.jsp 생성



Hello World

- HelloWorld.jsp 생성



Hello World

- HelloWorld.jsp 작성

```
HelloWorld.jsp ×
1  <%@ page language="java" contentType="text/html; charset=UTF-8"
2      pageEncoding="UTF-8"%>
3  <!DOCTYPE html>
4  <html>
5  <head>
6  <meta charset="UTF-8">
7  <title>Insert title here</title>
8  </head>
9  <body>
10     <h2>Hello world</h2>
11     <hr>
12     현재 날짜와 시간은 <%= new java.util.Date() %>
13 </body>
14 </html>
```


Hello World

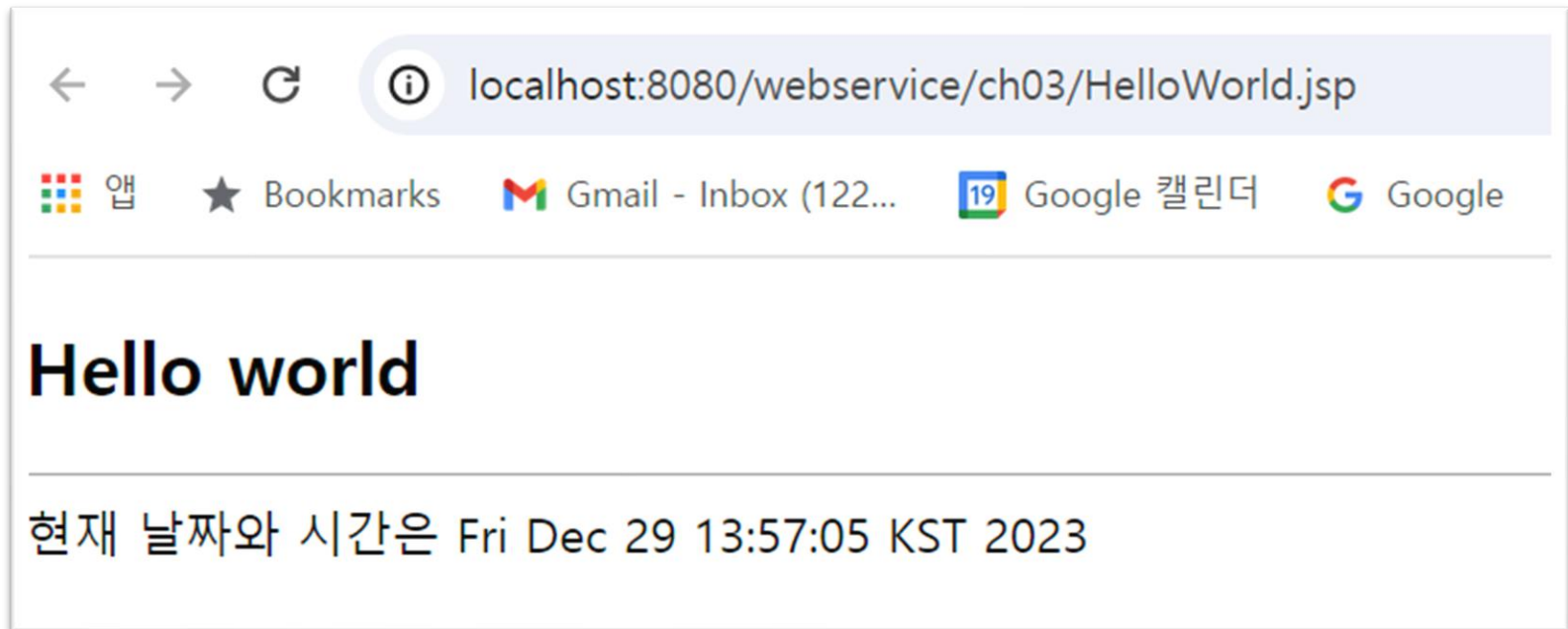
● Tomcat 서버 설정

The screenshot shows the Eclipse IDE interface. On the left, the Project Explorer displays a project structure with 'ch03' selected. A context menu is open over 'ch03', with 'Run As' highlighted. The main editor shows 'HelloWorld.jsp' with the following code:

```
1 <%@ page language="java"
2   pageEncoding="UTF-8"%>
3 <!DOCTYPE html>
4 <html>
5 <head>
6 <meta charset="UTF-8">
7 <title>Insert title here</title>
8 </head>
9 <body>
10 <div class="container">
11 <div class="row">
12 <div class="col">
13   현재 날짜와 시간은: <%=
14   </div>
15 </div>
16 </body>
</html>
```

On the right, the 'Run On Server' dialog is open. It prompts the user to 'Select which server to use'. The 'Manually define a new server' option is selected. Below, a list of server types is shown, with 'Tomcat v9.0 Server' selected. The 'Server's host name' is set to 'localhost', the 'Server name' is 'Tomcat v9.0 Server at localhost', and the 'Server runtime environment' is 'Apache Tomcat v9.0'. The 'Always use this server when running this project' checkbox is unchecked. The 'Finish' button is highlighted.

Hello World



Hello World

- 생성된 servlet 확인

- workspace\.metadata\.plugins\org.eclipse.wst.server.core\tmp0\work\Catalina\localhost\webservice\org\apache\jsp\ch03\HelloWorld_jsp.java

⋮

```
out.write("\n");
out.write("<!DOCTYPE html PUBLIC "-//W3C//DTD HTML 4.01 Transitional//EN" "http://www.w3.org/TR/html4/loose.dtd">\n");
out.write("<html>\n");
out.write("<head>\n");
out.write("<meta http-equiv='Content-Type' content='text/html; charset=EUC-KR'>\n");
out.write("<title>Insert title here</title>\n");
out.write("</head>\n");
out.write("<body>\n");
out.write("<center>\n");
out.write("<H2>HelloWorld</H2>\n");
out.write("<HR>\n");
out.write("현재 날짜와 시간은 : ");
out.print(new java.util.Date() );
out.write("\n");
out.write("</center>\n");
out.write("</body>\n");
out.write("</html>");
```

⋮

JSP Lifecycle

