개발환경 구성, JSP 기본구조

524730 2022년 봄학기 3/2/2022 박경신

인터넷과 웹 서비스

□ 인터넷과 WWW(World Wide Web)

- 인터넷은 TCP/IP 기반의 네트워크가 전세계적으로 확대되어 하나로 연결된 '네트워크의 네트워크'
- WWW(World Wide Web)는 인터넷 기반의 서비스 중 하나

이름	프로토콜	포트	기능
WWW	http	80	웹 서비스
Email	SMTP/POP3/IMAP	25/110/114	이메일 서비스
FTP	ftp	21	파일 전송 서비스
telnet	telnet	23	원격 호스트 접속 서비스
DNS	DNS	83	도메인 이름 변환 서비스
News	NNTP	119	인터넷 뉴스 서비스

인터넷과 웹 서비스

□ HTTP (Hyper Text Transfer Protocol)

- Protocol이란 네트워크에 연결된 컴퓨터가 서로 통신(대화)하기 위한 규약
- HTTP는 www 서비스를 위한 프로토콜
- 웹 서버와 클라이언트는 HTTP를 이용해 통신
- URL (Uniform Resource Locator)
 - URL은 웹 어플리케이션에 요청을 구분하기 위한 용도로 사용됨
 - 예: http://www.google.com/search?hl=en&q=jsp&aq=f&oq=
 - □ 프로토콜: http
 - □ 호스트: www.google.com
 - □ 포트: 80 (http 프로토콜의 기본 포트)
 - □ 경로: /search
 - □ 쿼리문자열: hl=en&q=jsp&aq=f&oq=

웹 프로그래밍 기술

□ HTML과 웹 프로그래밍 기술

- HTML(HyperText Markup Language): www 서비스를 표현하기 위해 사용하는 언어
- HTML은 텍스트 파일로 정적인 정보만 처리 가능
- 동적인 컨텐츠 처리하기 위해 CGI(Common Gateway Interface), Fast CGI, PHP(Personal Home Page), ASP(Active Server Page), JSP(Java Server Page) 등의 기술이 사용

□ 클라이언트 스크립트

- Javascript가 대표적. 웹 브라우저가 스크립트 해석의 주체
- 웹 브라우저 핸들링은 가능하지만 서버 연동은 불가능

□ 서버 스크립트

- ASP.NET, PHP, Servlet, JSP 등. HTML과 스크립트 언어를 함께 사용할 수 있는 기술로 웹 서버에서 해석.
- 데이터베이스 연동 처리 등 다양한 구현이 가능
- 별도의 컴파일 과정없이 HTML 태그 수정 가능

서블릿과 JSP

- □ 자바를 만든 Sun에서 정한 웹 개발 표준
 - 서블릿(Servlet): 웹 어플리케이션을 구현하기 위해 작성하는 실행 코드

■ JSP(Java Server Page): 서블릿 기반의 서버 스크립트 기술

- □ JSP의 특징
 - 자바 기반 스크립트 언어: 자바의 기능을 그대로 사용 가능
 - HTTP에 대한 클라이언트의 요청 처리/응답
 - 웹 어플리케이션에서 결과 화면을 생성할 때 주로 사용
- □ JSP를 사용하는 이유
 - 자바 언어에 기반하여 플랫폼(리눅스, 윈도우 등)에 독립적
 - 자바 언어에 대한 깊은 이해 없이도 초기 학습 가능 스크립트 언어는 상대적으로 자바 언어보다 단순
 - 스프링(Spring)이나 스트러츠(Struts)와 같은 프레임워크와 완벽하게 연동

웹 컨테이너

□ 웹 컨테이너

- JSP, Servlet 실행 환경을 제공하며, WAS (Web Application Server)라고 함
- 웹 브라우저의 요청에 대한 응답을 웹 서버에 전달하는 기능을 제공하며 웹 응용 프로그램의 보안, 관리, 라이프 사이클관리 등의 서비스를 제공



□ 주요 웹 컨테이너

- 톰캣(Tomcat) : <u>http://tomcat.apache.org/</u>
- 제티(Jetty) : <u>http://www.mortbay.org/jetty/</u>

JSP Architecture

□ JSP(Java Server Pages) 웹 어플리케이션 구조



JSP 동작 원리



JSP Lifecycle

□ JSP 생명주기

- JSP Page Translation
- JSP Page Compilation
- Class Loading
- Initialization
- Execution
- Cleanup



JSP 개발 환경 셋팅

- □ JDK 설치 : 자바 개발 도구
 - 환경변수 JAVA_HOME 설정
- □ 웹컨테이너 설치 : 톰캣, 제티 등
 - 환경변수 CATALINA_HOME 설정 (톰캣 설치 디렉토리)
- □ IDE 설치 : 이클립스 등
 - elipse-workspace 이클립스 작업 디렉토리 설정

JDK 설치

Java SE Development Kit (OpenJDK17.0.2) Download https://jdk.java.net/17/



JDK 설치

□ 경로 설정하기	7	Edit System Variable				×
— -j → ↑ ⊆ + Control Pa	anel > All Control Panel Item	Variable name:	JAVA_HOME			
File Edit View Tools Help Control Panel Home	View basic informa	Variable value:	C:\Program Files\Java\jdl	k-17.0.2		
 Pevice Manager Remote settings Suctors protocion 	Windows edition Windows 10 Pro	Browse Directory	Browse File		OK Ca	ancel
System protection Advanced system settings	© 2015 Microsoft Corr	ooration. Air rights reserved.		VV	HUOWST	
System Properties	Processor:	Intel(R) Core(TM) i5-3550 CPU	@ 3.30GHz 3.70 GHz	Edit environment variable		^
You must be logged on as an Administrator to make most of these changes.	System type:	64-bit Operating System, x64-b	ased processor	C:\Python\Python35-32\Scripts\ C:\Python\Python35-32\	^	New
Performance Visual effects, processor scheduling, memory usage, and virtual memory	nistrator		C:\ProgramData\Oracle\Java\javapath C:\Program Files (x86)\Wizvera\Delfino C:\Program Files\NVIDIA GPU Computing Tr C:\Program Eles\NVIDIA GPU Computing Tr	C:\Program Data\Oracle\Java\javapath C:\Program Files (x80)\Wizvera\Delfino C:\Program Files\NVIDIA GPU Computing Toolkit\CUDA\v6.0\bin C:\Program Files\NVIDIA GPU Computing Toolkit\CUDA\v6.0\bin Brows	Edit Browse	
User Profiles Desktop settings related to your sign-in Settings	Value %USERPROFILE%\AppData %USERPROFILE%\AppData	\Local\Temp \Local\Temp	C:\Windows\System32 C:\WinDOWS C:\WINDOWS\SySTEM32\WBEM C:\WINDOWS\SYSTEM32\WINDOWSPOWERSHELL\V1.0\ C:\Program Files (x86)\OpenSceneGraph\bin	Delete Move Up		
Startup and Recovery				C:\Program Files (x86)\OpenSceneGraph\3rc C:\Program Files (x86)\Windows Kits\8.1\Wi	PartyBin Idows Performance To	Move Down
System startup, system tailure, and debugging intormation				%JAVA_HOME%\bin		Edit text
Environment Variables	System variables Variable	Value	New Edit De	C:\Users\ice\.dnx\bin C:\Program Files\Microsoft DNX\Dnvm\ C:\WINDOWS\system32 C:\WINDOWS		
OK Cancel Apply	NVTOOLSEXT_PATH OS OSG_FILE_PATH	C:\Program Files\NVIDIA C Windows_NT C:\Program Files (x86)\Ope	orporation\NvToolsExt\ enSceneGraph\Data		ОК	Cancel
	Path	C:\Python\Python35-32\S	ripts\:C:\Python\Python35-32\;C:\Pro	ogr		-
	PCL ROOT	C:\Program Files (x86)\PCI	1.6.0	~		
See also Security and Maintenance			New Edit Do	ncel		

JDK 설치

□ 설치된 자바 버전 확인

 \times Command Prompt — Microsoft Windows [Version 10.0.19041.1165] (c) Microsoft Corporation. All rights reserved. C:₩Users₩park>javac -version javac 17.0.2 C:₩Users₩park>

Tomcat 설치하기

■ **Tomcat9** (apache-tomcat-9.0.58.exe) https://tomcat.apache.org/download-90.cgi 다운로드



Get Involved

a tar ga (non sha512)

Tomcat 설치하기

	톰캣	설치하기	및	설치	후	환경변수	설정
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Apache Tomcat Setup: Configuration O	ptions - 🗆 X	💌 Apache Tomcat Setup: Java Virtual Machine path selection —	
Configuration Tomcat basic configuration.		Java Virtual Machine Java Virtual Machine path selection.	
Server Shutdown Port HTTP/1.1 Connector Port	8005 8085	Please select the path of a Java 8 or later JRE installed on your system.	
Windows Service Name Create shortcuts for all users	Tomcat9	ב:₩Program Files₩Java₩jdk-17.0.2	
Tomcat Administrator Login User Name (optional) Password Roles	manager-gui		
Nullsoft Install System v3.04	< Back Next > Cancel	Nullsoft Install System v3.08 	Cancel

Edit System Variable		×				
Variable name:	ariable name: CATALINA_HOME					
Variable value:	Variable value: C:\Program Files\Apache Software Foundation\Tomcat 9.0					
Browse Directory	Browse File OK	Cancel				

Tomcat 실행

■ 톰캣 설치 디렉토리 C:\#Program Files\#Apache Software Foundation\#Tomcat 9.0\#conf\#server.xml

📕 server.xml - Notep	pad2 — 🗆	×						
File Edit View Se	File Edit View Settings ?							
re	quests are received							
63	and responses are returned. Documentation at :							
64	Java HTTP Connector: /docs/config/http.html							
65	Java AJP Connector: /docs/config/aip.htm]							
66	APR (HTTP/AJP) Connector: /docs/apr.htm]							
67	Define a non-SSI/TLS HTTP/1 1 Connector on port 8080							
68								
60								
69	<pre><connector port="8085" protocol="HITP/1.1</pre"></connector></pre>							
70	connectionTimeout="20000"							
71	redirectPort="8443" />							
72	A "Connector" using the shared thread pool							
73	</td <td></td>							
74	<connector <="" executor="tomcatThreadPool" th=""><th></th></connector>							
75	port="8080" protocol="HTTP/1.1"							
76	connectionTimeout="20000"							
77	redirectPort="8443" />							
78	>							
79	Define an SSL/TLS HTTP/1.1 Connector on port 8443</th <th></th>							
Ln 69 : 172 Col 15 Sel	19 7.57 KB UTF-8 CR+LF INS XML Document	1 - *						

Tomcat 실행

■ 톰캣 실행하기 http://localhost:8085/



자바 IDE 소개와 설치

- □ 자바 IDE (Integrated Development Environment)
 - 통합 개발 환경
 - 편집, 컴파일, 디버깅을 한번에 할 수 있는 통합된 개발 환경
- □ 이클립스(Eclipse)
 - 자바 응용 프로그램 개발을 위한 통합 개발 환경
 - IBM에 의해 개발된 오픈 소스 프로젝트
 - <u>http://www.eclipse.org/downloads/</u> 에서 다운로드
- □ 넷빈즈(Netbeans)
 - <u>https://netbeans.org/</u>
- IntelliJ Idea
 - <u>http://www.jetbrains.com/idea/download/</u>

■ 이클립스 IDE 2021-12 (eclipse-inst-jre-win64.exe) <u>https://www.eclipse.org/downloads/</u> 다운로드

ren Eclipse Downloads The Eclipse X +		$\sim - \Box \times$
← → C ▲ Not secure eclipse.org/downloads/		* DOMATE ×
	Projects Worki	eclipseinstaller by Comph Image: Comphission of the second seco
Download Eclipse Technology		Contemporation Contem
that is right for you		Eclipse IDE for Enterprise Java and Web Developers Tools for developers working with Java and Web applications, including a Java IDE, tools for JavaScript, TypeScript, JavaServer Pages and Faces, Yaml,
Eclipse IDE Tools	OpenJI	CE Eclipse IDE for C/C++ Developers An IDE for C/C++ developers.
	те	Constant Con
Get Eclipse IDE 2021-12 Install your favorite desktop IDE packages.	The Eclipse Temurin™ pr certified OpenJDK runtime use across th	Eclipse IDE for PHP Developers The essential tools for any PHP developer, including PHP language support, Git client, Mylyn and editors for JavaScript, TypeScript, HTML, CSS and XML. Click here to
Download x86_64 Download Packages (Need Help?	Dowr Le	Eclipse IDE for Eclipse Committers Package suited for development of Eclipse itself at Eclipse.org; based on the Eclipse Platform addies PDF. Cite Machine the Elipse and development of the test set of the set of the test set of the

이클립스 설치 디렉토리 설정하기



□ 이클립스 작업 디렉토리 설정하기

Eclipse IDE Launcher	×
Select a directory as workspace	
Eclipse IDE uses the workspace directory to store its preference	es and development artifacts.
Workspace: C:\Users\park\eclipse-workspace\aj22	∽ Browse
Use this as the default and do not ask again	
	Launch Cancel

□ 이클립스에 서버 실행 환경 설정하기

 Window - Preference - Server - Runtime Environments - Add -Tomcat v9.0

🔘 New Se	erver Runtime Environment			Preferences					\times
New Serv	ver Runtime Environment			type filter text	Server Runtime Envir	onments		⇔ ▼ ⊂	⇒ ▼ 8
Denne a r				 Java EE Java Persistence 	Add, remove, or edit serv	er runtime environments.			
Select the t	type of runtime environment:			Language Serv	Server runtime environme	ents:			
type filter	text pache Tomcat v8.5	^]	> Maven	Name	Туре		Add.	
B A	pache Tomcat v9.0			> Mylyn - > Oomph	Apache Tomcat v9.0	Apache Tomcat v9.0		Edit	
🔓 G	New Server Runtime Environment	—	×	> Plug-in Develo				Remov	ve
Apache 10	Tomcat Server Specify the installation directory			 Run/Debug Server 				Search	h
Create a	Name			Audio				Column	 DC
	Apache Tomcat v9.0]		Launching				Column	.15
	Tomcat installation directory:	Browse	2	Profilers			_		
?	apache-tomcat-9.0.55	5 Download an	d Install	Runtime Er			_		
	JRE:			> Terminal	C:/Program Files/Apache	Software Foundation/Tor	 ncat 9.(0	
	jdk-17.0.2 ~	Installed J	REs	? ` 4 0	-, -, -, -, -, -, -, -, -, -, -, -, -, -	Apply and Close]	Cancel	
	? < Back Next > Finish	Can	cel	_					

□ 이클립스에 서버 확인하기

Tomcat v9.0 Server a	at localhost ×				- 8			
Overview								
General Information	1		Publishing					
Specify the host name	e and other common settings.		+ Timeouts	+ Timeouts				
Server name:	Tomcat v9.0 Server at localhost							
Host name:	localhost		Modify the server ports					
Runtime Environmer	nt: Apache Tomcat v9.0	~		De et Niver have				
Configuration path:	/Servers/Tomcat v9.0 Server at localhost-conf	i Browse	Fort Name	8005				
Open launch configu	uration		ඦHTTP/1.1	8085				
Server Locations			1 million					
Specify the server pat with no modules pres	th (i.e. catalina.base) and deploy path. Server must sent to make changes.	be published	MIME Mappings					
O Use custom locat Server path:	tion (does not modify Tomcat installation) adata\.plugins\org.eclipse.wst.server.core\tmp0	Browse						
Set deploy path to t Deploy path: wtpw	the default value (currently set) webapps	Browse						
• Server Options								
Enter settings for the	server.							
Serve modules w	vithout publishing							
Publish module c	contexts to separate XML files							
Modules auto rel	load by default							
Enable security	ebug logging (not supported by this Tomcat versi	on)						
Overview Modules								
Markers Propertie	es 🏶 Servers × 🏙 Data Source Explorer 🖺 Snippe er at localhost (Stopped, Republish)	ets		日 林 🔾	ø = @ :			

JSP 프로그램 작성

□ 이클립스 프로젝트 생성 File->New->Dynamic Web Project -> Project Name: HelloJSP

Ô	eclipse-workspace2 - Eclipse IDE				New Dynamic Web Project	-	×		
File	Edit Navigate Search Project Run Window New Alt+Shift+N >	Help	Maven Project		Dynamic Web Project Create a standalone Java-based Web Application or add it to a new or existing Enterprise	Application.			
	Open File Open Projects from File System Recent Files > Close Ctrl+W Close All Ctrl+Shift+W Save Ctrl+S		 Maven Project Enterprise Application Project Dynamic Web Project EJB Project Connector Project Application Client Project Static Web Project 		Project name HelloJSP Project location Image: Comparison of the second seco				
ίως), dh_	Save As Save All Ctrl+Shift+S Revert		Project Servlet Session Bean (EJB 3.x)		Dynamic web module version 4.0 Configuration Default Configuration for Apache Tomcat v9.0				
	Move Rename F2 Refresh F5 Convert Line Delimiters To > Print Ctrl+P	F2 F5 rs To Ctrl+P Ctrl+P Alt+Enter	F2 F5 F5 Ctrl+P F5 F5 F5 F0lder File F2 F5 F2 F0lder F2 F5 F0lder F2 F2 F5 F2 F0lder	Message-Driven Bean (EJB 3.x) Web Service Folder File	Message-Driven Bean (EJB 3.x) Web Service Folder File		A good starting point for working with Apache Tomcat v9.0 runtime. Additional facets car to add new functionality to the project. EAR membership Add project to an EAR EAR project name: EAR	later be insta	istalled
21	Import Export Properties Alt+Enter		Ctrl+N	Working sets Add project to working sets Working sets:	New Select.				
	Switch Workspace > Restart Exit				? < Back Next > Finish	Cance	el		

JSP 프로그램 작성

□ 프로젝트에 hello.jsp 소스 코드 추가

Hereite	0.		-						
4.0	New	>	Ľ	Project					
	Go Into		19	File					
	Show In	Alt+Shift+W >	3	Folder					
E	Сору	Ctrl+C		SQL File					
E	Copy Qualified Name		œ	Annotation	120				
G	Paste	Ctrl+V	G	Class	New JSP File				
x	Delete	Delete	C	Enum	JSP				
2	Remove from Context	Ctrl+Alt+Shift+Down	C	Interface	Create a new ISD file				
	Build Path	>	髩	Package	Create a new JSP me.				
	Refactor	Alt+Shift+T >	€°	Source Folder					
	Import	>	-	Dynamic Web Project	Enter or select the parent folder:				
	Export	>	B	Enterprise Application Project	HelloJSP/src/main/webapp				
1	Refresh	F5		JavaScript Source File					
-	Close Project		0		e settings				
	Close Unrelated Projects			HTML File	build				
	Chantin Damaka Cashanaa dama		2	JSP File	Y 🕞 STC				
0	Show in Remote Systems view	v in Kemote Systems view	🗯 Filter	👻 😓 main					
	Run Ac		G	Listener	🗁 java				
the	Debug As	5	G	Servlet	✓ i≥ webapp				
W.	Profile As	3		Example	MEIA-INF				
	Restore from Local History		P	Other Ctrl+N	VEB-INF				
	Java EE Tools	>	Г		File name hellojsp				
	Team	ć.			Advanced SS				
	Compare With	>			Auvaliced >>				
	Configure	\$							
	Source	>			() < Back Next > Finish Cancel				
	Validate								
	Properties	Alt+Enter							

→
SHelloISP

□ 톰캣 서버에 등록하여 실행

■ hello.jsp - 우클릭 - Run on Server

a IrAX-WS Web Services b IRE system Ubary [IwaSE-17] b IRE system Ubary [IwaSE-17] b IRE system Deary [IwaSE-17] b IRE system Deary [IwaSE-17] b Iray [IwaS	3 clOC(TYPE html) 3~chead> 5~chead> 6 cmeta charset="EUC-KR"> 7 ctitesInsert title here8 c/head> 10 dtody> 10 felody> 11 HELIOI 12 dtody> 13 c/head>	itley	Run On Server Run On Server Select which server to use	×	Run On Server Add and Remove HelloJSP is required and cannot be remo	oved from the server
> >> META-INF >>> WEB-INF						
⊴ hello, New ⊯ Servers Show In Open Open With Show in Iocal	> Alt+Shift+W > F3 2 Terminal		How do you want to select the server? © Choose an existing server		Move resources to the right to configure the Available:	em on the server Configured:
Copy Copy Qualified Copy Qualified D Paste Copy Content Reprove from	Ctrl+C d Name Ctrl+V Delete Context Ctrl+Alt+Shift+Dawn		O Manually define a new server Select the server that you want to use: type filter text			Adda a
Mark as Landr Build Path Move Rename	nark Ctri+Alt+Shirt+Up x F2		Server	State		= Kemove
telloipo - HelioSPV while telloipo - HelioSPV	PS > 2 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	1 1 Ran on Server Altu Shift X, R Run Configurations	Tomcat v9.0 Server at localhost	<u>Ea</u> Stopped		Add All >> = Temose All
			Apache Tomcat v9.0 supports J2EE 1.2, 1.3, 1.4, and Java EE 5, 6, 7, and 8 We modules.	b Columns	(2) < Back	Hest Finish Cancel
			? < Back Next > Finish	Cancel		

□ 실행결과 확인하기

Insert title here x +								-		×
C ରି 🛈 localhost:8085/HelloJSP/hello.jsp	G	R	to	8	ß	∑≡	Ē		-	•••
HELLO!										

□ 'Starting Tomcat v9.0 Server at localhost' has encountered a problem 에러가 발생 시

Problem Occurred —	ı ×								
'Starting Tomcat v9.0 Server at localhost' has encountered a problem.									
Port 8009 required by Tomcat v9.0 Server at localhost is already in use. The server may already be running in			n ie and other common settings.		Publishing				
another process, or a system process may be	using the		Torncat v9.0 Server at localhost						
port. To start this server you will need to stop the other			localhost		Modify the server ports.				
process or change the port number(s).		mer	ment: Apache Tomcat v9.0 Port Name	Port Name	Port Number				
		the		ie Browse	Comcat admin port	8005			
		lig	uration		GHTTP/1.1	8085			
OK << D	etails	ns							
		pat	th (i.e. catalina.base) and deploy path. Server must	be published					
Port 8009 required by Tomcat v9.0 Server at localhost is	already	ce tr	netadata (does not modify Tomcat installation) allation (takes control of Tomcat installation)						
in use. The server may already be running in another pr	ocess,	ocat	tion (does not modify Tomcat installation)						
or a system process may be using the port. To start this	server	net	tadata\.plugins\org.eclipse.wst.server.core\tmp0	Browse					
you will need to stop the other process or change the port		(2.)	We default value (currently set)						
number(s).			webapps	Browse					
		1 00							
		the	server.						
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■ Errors running builder 'Java Builder' on project 'HelloJSP'. Provider "jar" not found 에러가 발생 시

Eclipse 설치 디렉토리의 eclipse.ini 파일 수정

🖾 Multiple problen	ns have –	\Box \times	File Edit Format View Help
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톰캣에 JSP 프로젝트 배포하기

1. JSP 프로젝트를 war 파일로 Export

- File->Export->Select Web WAR file
- 2. war 파일을 톰캣의 웹루트(webapps)에 저장
- 3. http://localhost:8085/HelloJSP/hello.jsp 접속

Export	— 🗆 X	📕 🛛 🔁 📮 webapps		
WAR Export Export Web project to the local file system.		File Home Share View Image: Share View Image: Share View Image: Share Image: Share V	Move Copy Delete Rename New Cold	lew item * asy access * Properties History
Web project: HelloJSP Destination: C:\Program Files\Apache Software Foundation\Tomcat 9.0\w	 Browse 	Clipboard	Organize Nev	v Open Select ✓ ひ 𝒫 Search webapps
Target runtime ✓ Optimize for a specific server runtime Apache Tomcat v9.0 Export source files Overwrite existing file	Name docs manager ROOT HelloJSP.war	Type Size File folder File folder File folder WAR File 1 KB		
? < Back Next > Fin	Insert title	here × +	5/HelloJSP/hello.jsp	
	HELLO	!		

동적 웹 프로젝트 구조

□ Dynamic Web Project 디렉토리 구조

- 🖌 🐸 HelloJSP
 - > Deployment Descriptor: HelloJSP
 - > A JAX-WS Web Services
 - > A JRE System Library [JavaSE-17]
 - > B src/main/java
 - Server Runtime [Apache Tomcat v9.0]
 - › 🗁 build
 - 🗙 🗁 src
 - 👻 🗁 main
 - 🗁 java
 - 👻 🗁 webapp
 - > Description Meta-INF
 - > >> WEB-INF
 - 🗈 hello.jsp

Lab0

- □ HelloJSP 프로그램을 작성한다.
 - OpenJDK 설치 (**JDK17.0.2**)
 - WAS 설치 (Apache Tomcat9 apache-tomcat-9.0.58.exe)
 - IDE 설치 (Eclipse Jee 2021-12 (eclipse-inst-win64.exe))
 - 환경설정
 - 이클립스를 사용한 JSP 프로그램 작성
- □ Lab0 프로젝트와 배포 파일을 전체적으로 묶어서 보고서(1~2장)와 함께 Lab0_학번_이름.zip 압축한 후 elearning에 과제 제출한다.
- □ 보고서에 실행결과 화면을 캡쳐하여 첨부한다.