



May 2022,  
Course Java

# Servlet Container, Servlets, JSPs

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# Where to Find the Code?

Java Academy projects and examples are available  
@GitHub:

<https://github.com/iproduct/java-fundamentals-2022.git>



# Agenda for This Session

- ❖ Introduction
- ❖ HTTP Clients
- ❖ web.xml
- ❖ Servlets
- ❖ JSPs & Expression Language (EL)
- ❖ Tags (JSTL)

# World Wide Web (WWW) – Main Concepts

- The idea for **World Wide Web** is suggested by Tim Berners-Lee in 1989 in CERN.
- Documents in **World Wide Web**, called **web pages**, may contain *text, images, video, and other multimedia components*, and the connections between them are specified using *hyperlinks*.
- **Web Sites** include multiple connected *web pages* for a specific purpose
- They are **deployed** on a **Web Server** and are accessed using **Web Client** (*web browser – IE, Mozilla, Chrome*), using a protocol called: **Hypertext Transfer Protocol (HTTP)**

# HTTP Clients

- **HTTP Clients** allow to make HTTP requests to a **Web Server**:
- *Web browsers* – Mozilla, Chrome, Edge etc.
- *Generic HTTP clients* – Postman, Insomnia, etc.
- *Java HTTP Clients* – Apache HttpClient, new Java 17 standard `java.net.http.HttpClient`
- *Spring reactive HTTP client* – Web Client
- *Many more ...*



# Example: New Java 17 HttpClient

```
HttpClient client = HttpClient.newBuilder()
    .version(Version.HTTP_1_1)
    .followRedirects(Redirect.NORMAL)
    .connectTimeout(Duration.ofSeconds(20))
    .proxy(ProxySelector.of(new
InetSocketAddress("proxy.example.com", 80)))
    .authenticator(Authenticator.getDefault())
    .build();
HttpResponse<String> response = client.send(request,
BodyHandlers.ofString());
System.out.println(response.statusCode());
System.out.println(response.body());
```

# Example: New Java 17 HttpClient - Sync

```
HttpClient client = HttpClient.newBuilder()
    .version(Version.HTTP_1_1)
    .followRedirects(Redirect.NORMAL)
    .connectTimeout(Duration.ofSeconds(20))
    .proxy(ProxySelector.of(new
InetSocketAddress("proxy.example.com", 80)))
    .authenticator(Authenticator.getDefault())
    .build();
HttpResponse<String> response = client.send(request,
BodyHandlers.ofString());
System.out.println(response.statusCode());
System.out.println(response.body());
```

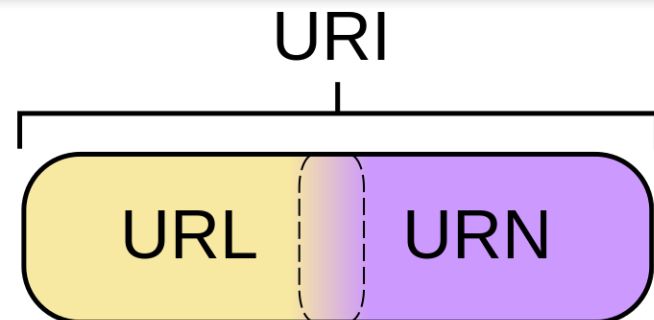
# Example: New Java 17 HttpClient - Async

```
HttpRequest request = HttpRequest.newBuilder()  
    .uri(URI.create("https://foo.com/"))  
    .timeout(Duration.ofMinutes(2))  
    .header("Content-Type", "application/json")  
    .POST(BodyPublishers.ofFile(Paths.get("file.json")))  
    .build();  
client.sendAsync(request, BodyHandlers.ofString())  
    .thenApply(HttpResponse::body)  
    .thenAccept(System.out::println);
```



# URLs, IP Addresses, and Ports

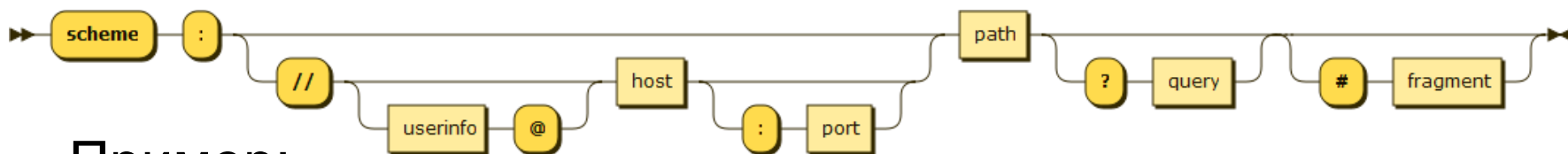
- Uniform Resource Identifier - URI:
  - Uniform Resource Locator – URL
  - Uniform Resource Name – URN



- Формат:

`scheme://domain:port/path?query_string#fragment_id`

Схеми: `http://`, `https://`, `file://`, `ftp://`. `news://`, `mailto:`, `telnet://`



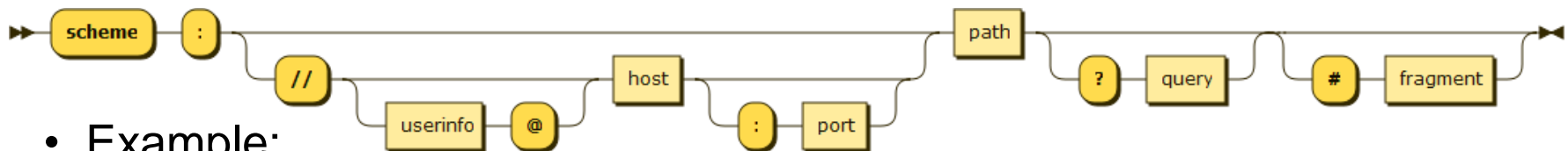
- Пример:

`http://en.wikipedia.org/wiki/Uniform_resource_locator#History`

# URL Structure (2)

- URLs pointing to **dynamic resources** (CGI scripts, Java Servlet / JSP, ASP, PHP, etc.) often include:
  - **?** list of request query parameters (query string) – e.g.:  
`?courseId=1211&role=student`
  - **#** fragment identifier – defines the fragment (part) of the resource we want to access, used by asynchronous javascript page loading (AJAX) applications to encode the local page state – e.g.  
`#view=fitb&nameddest=Chapter3`
- The whole syntax is:

`scheme://domain:port/path?query_string#fragment_id`



- Example:
- `http://en.wikipedia.org/wiki/Uniform_resource_locator#History`

# Types of Web Sites

- **Static Web sites** – show the same information for all visitors – can include hypertext, images, videos, navigation menus, etc.
- **Dynamic Web sites** – change and tune the content according to the specific visitor
  - **server-side** – use server technologies for dynamic web content (page) generation (data comes from DB)
  - **client-side** – use JavaScript and asynchronous data actualization



# Media Types. Multimedia

- **Text** – a linear sequence of character data
- **Graphics** – raster and vector images
- **Animation** – sequence of changing images (frames) with different frame-rates
- **Audio** – can be discretized analog signal (e.g. MP3) or just musical notes (MIDI)
- **Video** – different file formats, can be linear or interactive
- **3D Graphics / Animation** – using 3D modelling and rendering techniques to achieve realistic, real-world like visualization
- And more – haptic feedback, smells, ...
- **Multimedia** – combining different media types in a coherent and consistent way to achieve better/more realistic user experience

# Comparison between HTML and XML

- **HTML:**

```
<html>
<head>
<title>Page of John Smith</title>
</head>
<body>
<p>John Smith</p>
</body>
</html>
```

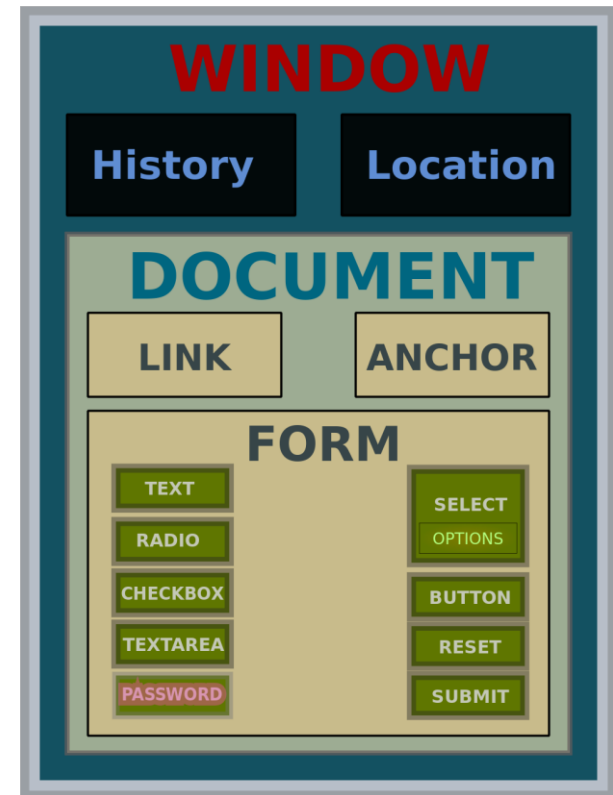
- **XML:**

```
<?xml version="1.0"
      encoding="UTF-8"?>
<name>
  <first>John</first>
  <last>Smith</last>
</name>
```



# Information hierarchies – Document Object Models (DOM)

- Comparison between XML and HTML – different purpose:
  - HTML – specific purpose (formatting and visualization)
  - XML – no specific purpose – different information structures
- HTML Document Object Model - DOM
- XML Document Object Model – DOM



# HTML Elements

- Tags, elements, attributes
- Document tree – types of nodes
- Element content – simple, mixed
- Document type – dictionary. HTML/XHTML/XML validation:
  - ***Document Type Definition (DTD), XML Schema***
- XML visualization in a web browser:
  - ***Cascading Style Sheets – CSS***
  - Interactivity – programming language ***JavaScript***  
***(EcmaScript)*** for execution of client side code in the browser

# Basics of (X)HTML (1)

- XML markup and content – markup is enclosed between **<** and **>** (tags) or between **&** and **;** (entities), everything other than that is **content**
- XML parser and user application – processes and analysis the markup and sends structured information to to user application
- Tags: **<div>**, **</div>**, **<div />**
- XML element – logical element in the XML document tree – simple or mixed content model:

**<div>**I am**<span>**George**</span>****</div>**

# Basics of (X)HTML (2)

- Attribute – key-value pair, included inside the tag:

```
<div id='15' style="color:red">
```

Learn HTML for a day

```
</div>
```

- HTML / XHTML декларации:

- **HTML5:** <!DOCTYPE html>
- **HTML 4.01:** <!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.01 Transitional//EN" "http://www.w3.org/TR/html4/loose.dtd">
- **XHTML 1.0:** <!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Transitional//EN" "http://www.w3.org/TR/xhtml1/DTD/xhtml1-transitional.dtd">

# Well Formatted HTML

- Root element of HTML Document should be **html**.
- HTML start with opening and end with a closing tag.
- Tags should be properly nested (nested) – e.g.:  
`<p><i>...Content...</i></p>`
- Attributes are inside the tag and always enclose their values in parenthesis.
- Tags and attributes are recommended to be in lowercase.
- Symbols `<`, `>`, `&`, `'`, `“` are changed to entities **entities**: **&lt;**, **&gt;**, **&amp;**, **&apos;**, **&quot;**;



# HTML 5 Base Template

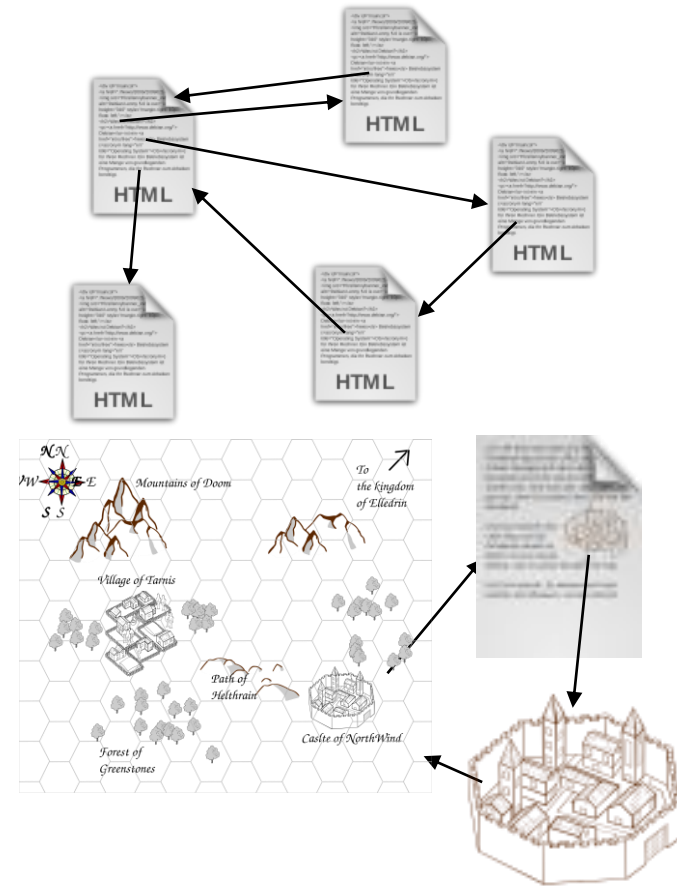
```
<!DOCTYPE html>
<html>
  <head>
    <title>Insert title here</title>
    <meta charset="UTF-8">
    <meta name="viewport"
      content="width=device-width, initial-scale=1.0">
    <style type="text/css">
      ... Example CSS ...
    </style>
  </head>
  <body>
    ... Example HTML ...
  </body>
</html>
```

# HTML 5 Extended Template

```
<!DOCTYPE html>
<html>
  <head>
    <title>Insert title here</title>
    <meta charset="UTF-8">
    ...
  </head>
  <body>
    <!-- Enable HTML 5 elements in IE 7+8 -->
    <!--[if lt IE 9]>
      <script src="dist/html5shiv.js"></script>
    <![endif]-->
    ... Example HTML ...
  </body>
</html>
```

# Hypertext & Hypermedia

- **Hypertext** is structured text that uses logical links (hyperlinks) between nodes containing text
- **HTTP** is the protocol to exchange or transfer hypertext
- **Hypermedia** - extension of the term hypertext, is a nonlinear medium of information which includes multimedia (text, graphics, audio, video, etc.) and hyperlinks of different media types (e.g. image or animation/video fragment can be linked to a detailed description).



# Multipurpose Internet Mail Extensions (MIME)

- Different types of media are represented using different text/binary encoding formats – for example:
  - Text -> plain, html, xml ...
  - Image (Graphics) -> gif, png, jpeg, svg ...
  - Audio & Video -> mp3, ogg, webm ...
- **Multipurpose Internet Mail Extensions (MIME)** allows the client to recognize how to handle/present the particular multimedia asset/node:

Media Type      Media SubType (format)

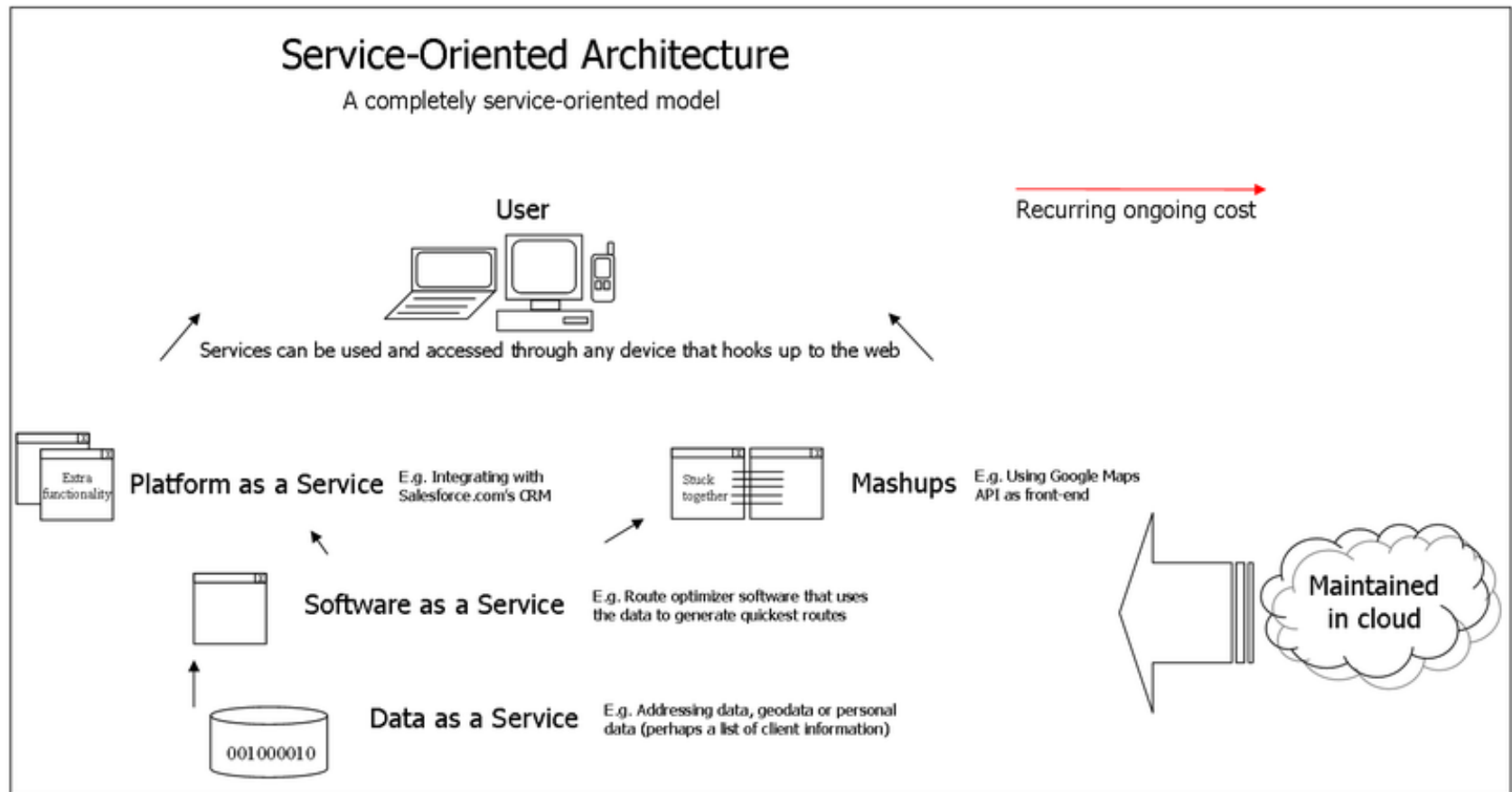
Ex.: Content-Type: text/plain
- More examples for standard MIME types: [https://developer.mozilla.org/en-US/docs/Web/HTTP/Basics\\_of\\_HTTP/MIME\\_types](https://developer.mozilla.org/en-US/docs/Web/HTTP/Basics_of_HTTP/MIME_types)
- Vendor specific media (MIME) types: application/vnd.\*+json/xml

# REST Architectural Properties

- According to **Dr. Roy Fielding** [Architectural Styles and the Design of Network-based Software Architectures, 2000]:
  - Performance
  - Scalability
  - Reliability
  - Simplicity
  - Extensibility
  - Dynamic evolvability
  - Customizability
  - Configurability
  - Visibility
- All of them should be present in a desired Web Architecture and REST architectural style tries to preserve them by consistently applying several **architectural constraints**



# Service Oriented Architecture (SOA). Mashups



# Representational State Transfer (REST) [1]

- REpresentational State Transfer (REST) is an architecture for accessing distributed hypermedia web-services
- The resources are identified by URIs and are accessed and manipulated using an HTTP interface base methods (GET, POST, PUT, DELETE, OPTIONS, HEAD, PATCH)
- Information is exchanged using representations of these resources
- Lightweight alternative to SOAP+WSDL -> HTTP + Any representation format (e.g. JavaScript™ Object Notation – JSON)

# Representational State Transfer (REST) [2]

- Identification of resources – URIs
- Representation of resources – e.g. HTML, XML, JSON, etc.
- Manipulation of resources through these representations
- Self-descriptive messages - Internet media type (**MIME type**) provides enough information to describe how to process the message. Responses also explicitly indicate their **cacheability**.
- Hypermedia as the engine of application state (aka **HATEOAS**)
- Application contracts are expressed as **media types** and [semantic] link relations (**rel** attribute - RFC5988, "Web Linking")

[Source: [http://en.wikipedia.org/wiki/Representational\\_state\\_transfer](http://en.wikipedia.org/wiki/Representational_state_transfer)]

# Hypermedia As The Engine Of Application State (HATEOAS) – New Link Header (RFC 5988) Example

Content-Length →1656

Content-Type →application/json

```
Link →<http://localhost:8080/polling/resources/polls/629>;  
rel="prev"; type="application/json"; title="Previous poll",  
<http://localhost:8080/polling/resources/polls/632>;  
rel="next"; type="application/json"; title="Next poll",  
<http://localhost:8080/polling/resources/polls>;  
rel="collection"; type="application/json"; title="Polls  
collection", <http://localhost:8080/polling/resources/polls>;  
rel="collection up"; type="application/json"; title="Self  
link", <http://localhost:8080/polling/resources/polls/630>;  
rel="self"
```

# Simple Example: URLs + HTTP Methods

Uniform Resource Locator (URL)	GET	PUT	POST	DELETE
Collection, such as <a href="http://api.example.com/comments/">http://api.example.com/comments/</a>	List the URIs and perhaps other details of the collection's members.	Replace the entire collection with another collection.	Create a new entry in the collection. The new entry's URI is assigned automatically and is usually returned by the operation.	Delete the entire collection.
Element, such as <a href="http://api.example.com/comments/11">http://api.example.com/comments/11</a>	Retrieve a representation of the addressed member of the collection, expressed in an appropriate Internet media type.	Replace the addressed member of the collection, or if it does not exist, create it.	Not generally used. Treat the addressed member as a collection in its own right and create a new entry in it.	Delete the addressed member of the collection.

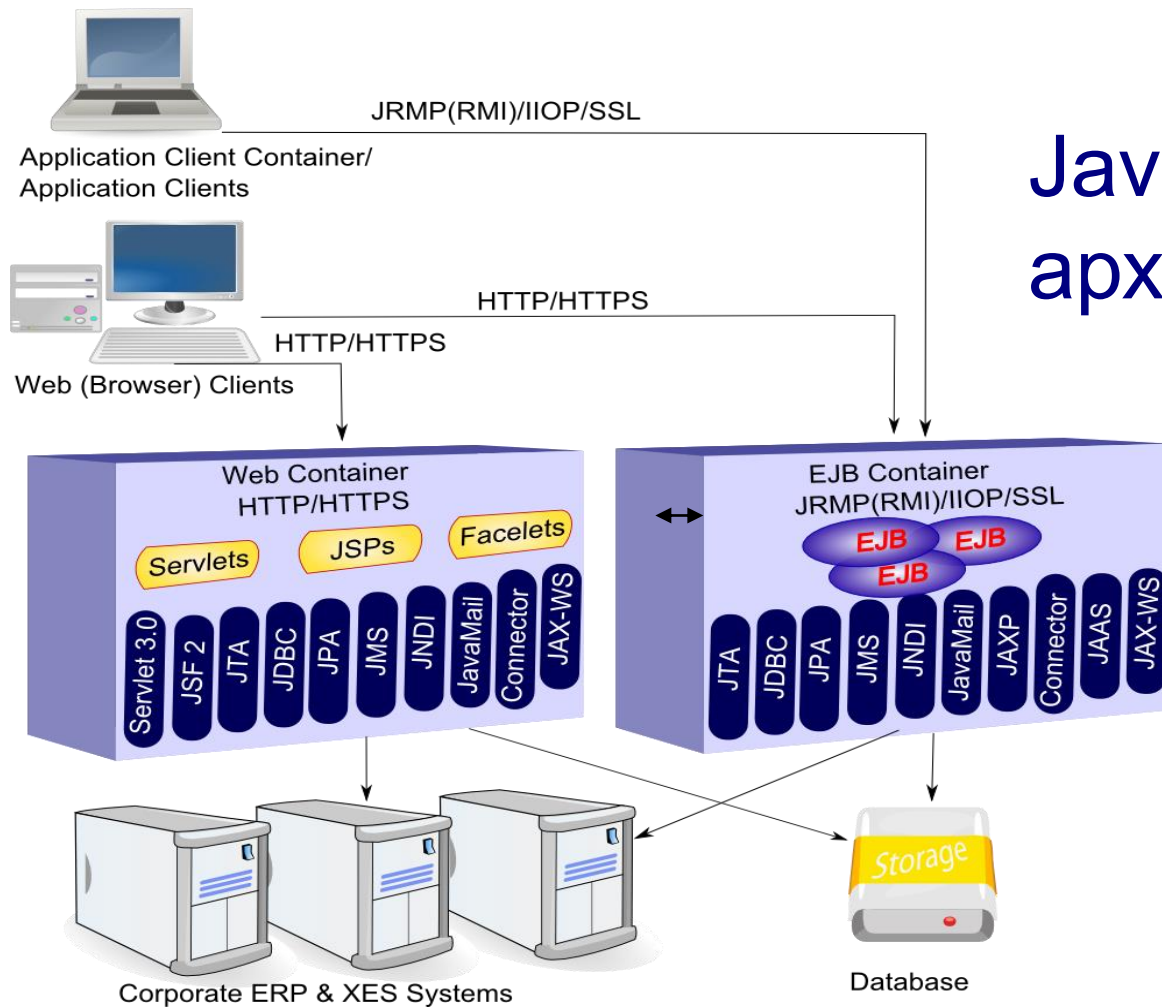


# Java™ Platform, Enterprise Edition 8

- **Java™ Platform Enterprise Edition** е спецификация разработена от Oracle® (Sun) заедно с партньори като BEA Systems, Borland, E.piphany, Hewlett-Packard, IBM, Inria, Novell, Red Hat, SAP, Sybase, Apache и др. за да улесни създаването на надеждни, конфигурируеми, мащабируеми, лесно опериращи помежду си и платформено-независими сървърни приложения и компоненти на езика Java™.
- Базирана е върху **Java™ SE**
- Вече част от **Jakarta (Eclipse Foundation)** -> **Jakarta EE 9**

# Java™ Platform, Enterprise Edition

- Java™ EE дефинира:
  - Програмни модели за разработка на приложения и програмни интерфейси (API) за създаване на разпределени, многокомпонентни приложения, тяхното пакетиране и инсталиране
  - Множество от готови интегрирани услуги и APIs намаляващи времето за разработка, сложността на приложенията и подобряващи тяхната производителност
  - Обща логическа архитектура интегрираща различни компоненти и контейнери за компоненти



# Java™ EE архитектура

# Java™ EE 6/7 Архитектура (1)

- Основни компоненти в Java™ EE архитектурата:
  - Базирана върху Java™ SE
  - Java™ EE компоненти
    - Web Components – Servlets, JSPs, Facelets, Web Services (SOAP, REST)
    - EJB™ Componentenets – Session EJBs, Persistence Entities, Message Driven EJBs
  - Java™ EE среда за изпълнение
    - Сървъри
    - Контейнери – Web и EJB контейнери
    - Application Client контейнери

# ОСНОВНИ API В Java™ EE

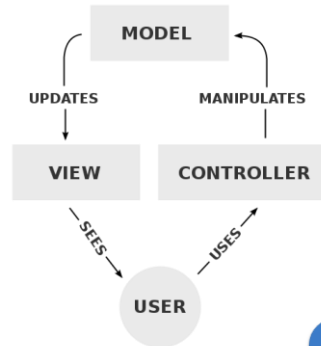
[https://en.wikipedia.org/wiki/Java\\_EE\\_version\\_history#Java\\_EE\\_7](https://en.wikipedia.org/wiki/Java_EE_version_history#Java_EE_7) .28June 12.2C 2013.29

1

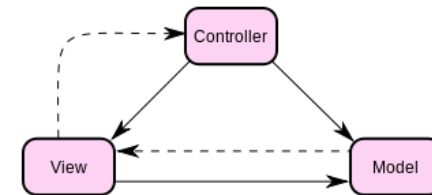
- javax.ejb.\* - EJB
- javax.enterprise.inject.\* - CDI
- javax.enterprise.context.\* - CDI
- javax.jms.\* - JMS
- **javax.servlet.\* - Servlet API, JSP, JSTL, Expression Language (EL)**
- javax.faces.\* - JSF, Facelets, Components
- javax.mail – Java Mail
- javax.persistence – JPA
- javax.transaction – JTA
- javax.validation – Validation API
- javax.xml.stream - StAX
- javax.resource.\* - Java EE Connector Architecture
- javax.jws - JAX-WS
- javax.ws.rs - JAX-RS (RESTful Services)

# MVC Comes in Different Flavors - II

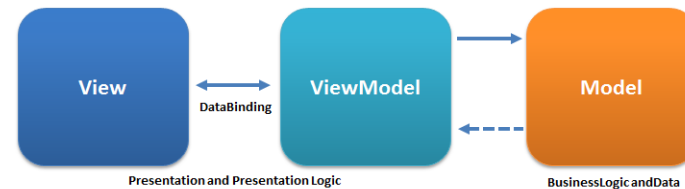
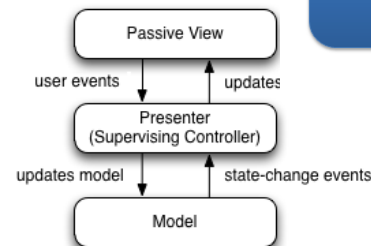
- MVC



- MVVM



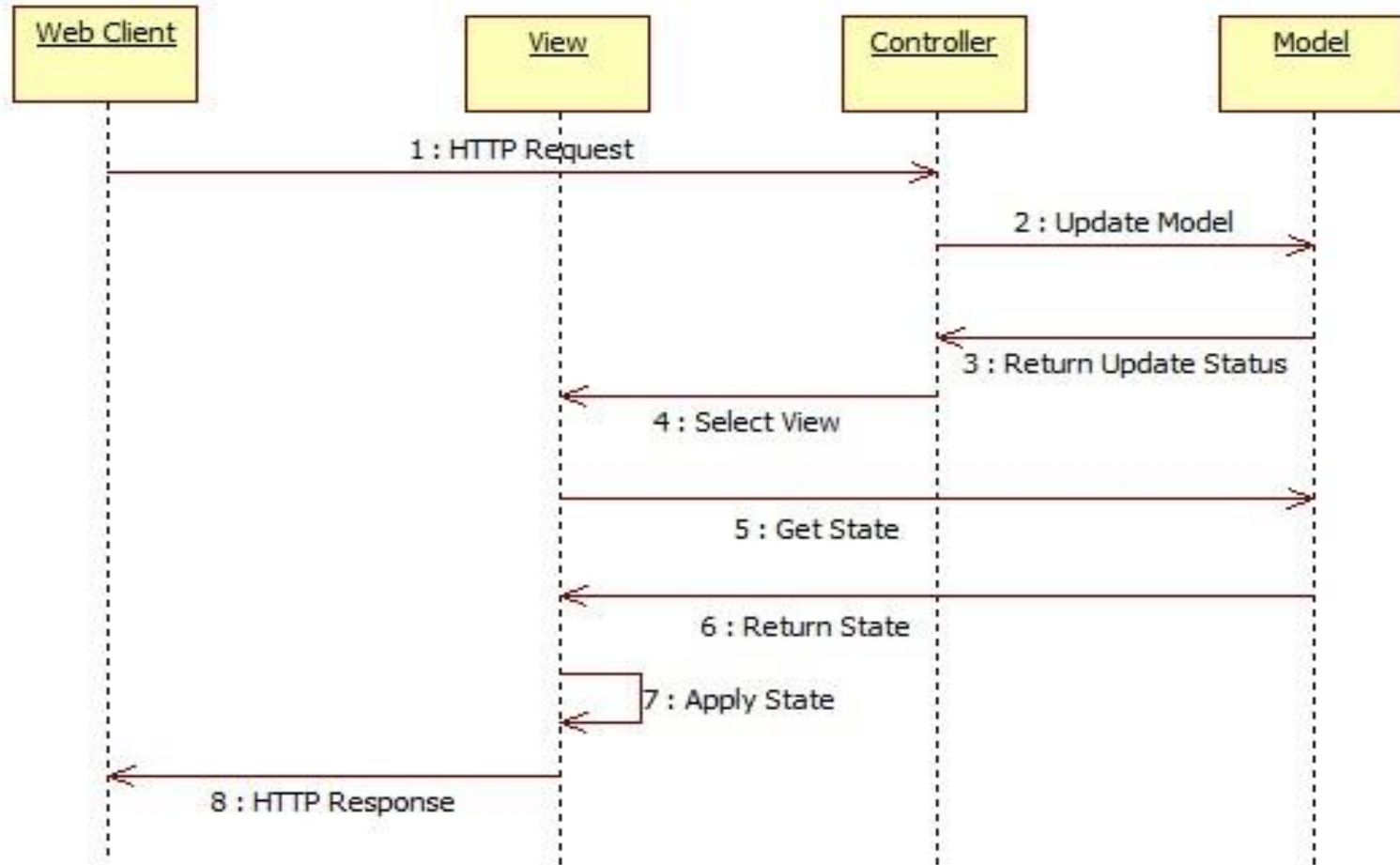
- MVP



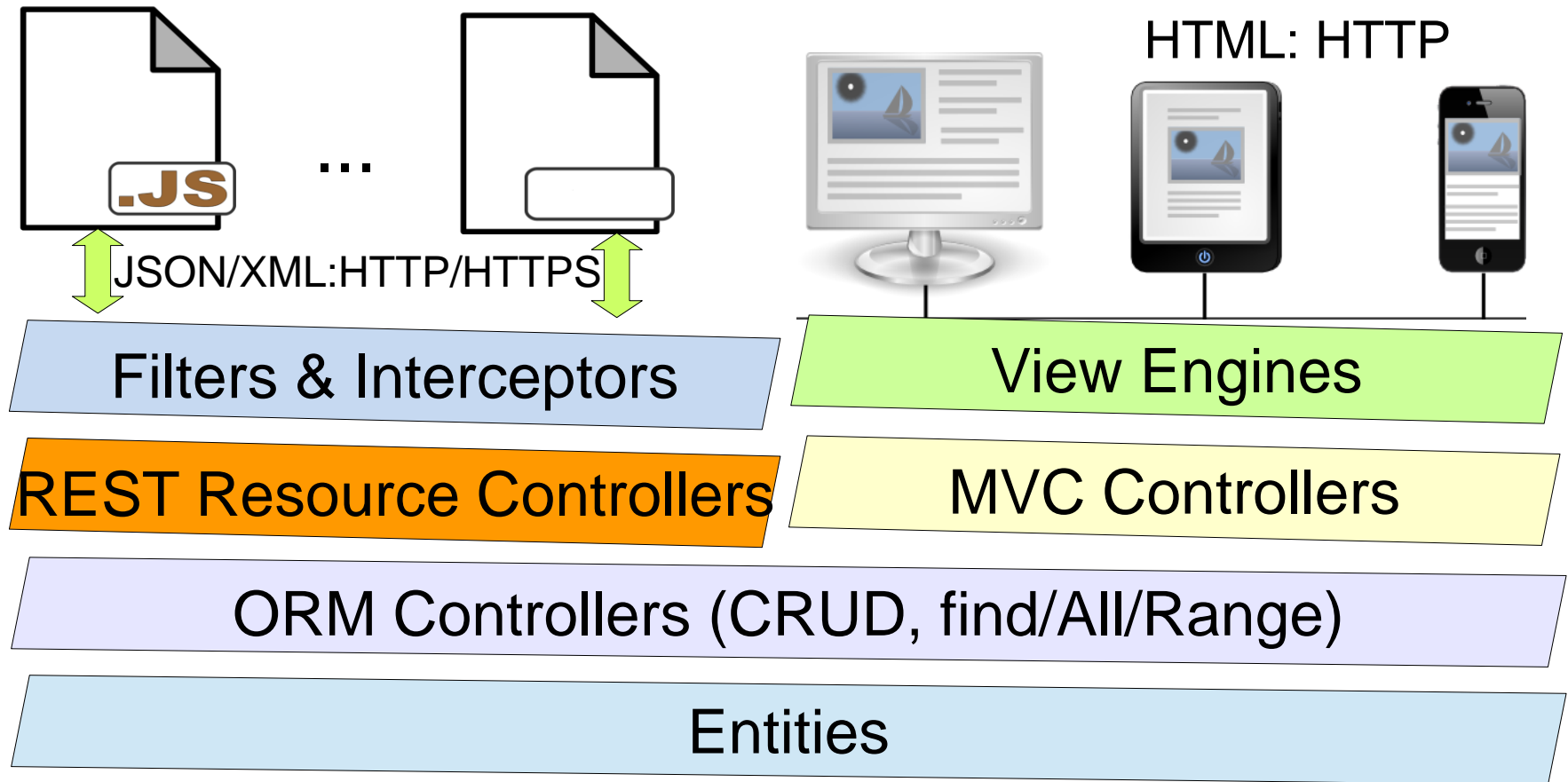
Sources:[https://en.wikipedia.org/wiki/Model\\_View\\_ViewModel#/media/File:MVVMPattern.png](https://en.wikipedia.org/wiki/Model_View_ViewModel#/media/File:MVVMPattern.png),  
[https://en.wikipedia.org/wiki/Model%E2%80%93view%E2%80%93presenter#/media/File:Model\\_View\\_Presenter\\_GUI\\_Design\\_Pattern.png](https://en.wikipedia.org/wiki/Model%E2%80%93view%E2%80%93presenter#/media/File:Model_View_Presenter_GUI_Design_Pattern.png)  
License: CC BY-SA 3.0, Authors:Ugaya40, Daniel.Cardenas



# Web MVC Interactions Sequence Diagram



# N-Tier Architectures



# Apache Tomcat v9 Web Server

- Поддържа Servlet 4.0 API
- Стартиране/ спиране: **bin\startup.bat** или **bin\catalina.bat** start (Windows) (\*.sh – Unix, Linux)
- Директорийна структура:
  - **bin** - изпълними файлове и стартиращи/стоп скриптове
  - **conf** - конфигурационни файлове
  - **lib** - библиотеки и класове
  - **logs** - Log и Output файлове
  - **webapps** – уеб приложения зареждани автоматично
  - **work** – временни работни директории за уеб прилож.
  - **temp** -използва се от JVM съхранение на temp файлове

# Структура на Java™ веб приложение (WAR)

- **Web Archive (WAR) root – /**

- index.html, other.htm, ... – стандартни HTML страници
- index.jsp, other.jsp, ... – JavaServer™ Pages (JSP) страници
- js / myscript.js, ... – директория съдържаща JavaScript ресурси
- css / main.css, ... – директория съдържаща CSS ресурси
- images / logo.png, ... – директория с граф. изображения, снимки
- **WEB-INF**
  - web.xml – конфигурационен файл за конкретната инсталация на веб приложението (**deployment descriptor**)
  - glassfish-web.xml – опционален конфигурационен файл с настройки специфични за конкретния веб сървър
  - **lib** – директория, включва .jar библиотеки с java класове
  - **classes** – директория, включва компилираните java класове

# Дескриптор на разпространение web.xml

```
<?xml version="1.0" encoding="UTF-8"?>
<web-app version="2.5" xmlns="http://java.sun.com/xml/ns/javaee"
  xsi:schemaLocation="http://xmlns.jcp.org/xml/ns/javaee
  http://xmlns.jcp.org/xml/ns/javaee/web-app_4_0.xsd"
  id="WebApp_ID" version="4.0">
  <servlet>
    <servlet-name>DispatcherServlet</servlet-name>
    <servlet-class>invoicing.DispatcherServlet</servlet-class>
  </servlet>
  <servlet-mapping>
    <servlet-name>DispatcherServlet</servlet-name>
    <url-pattern>/DispatcherServlet</url-pattern>
  </servlet-mapping>
```

# Дескриптор на распространение web.xml (2)

```
<session-config>
  <session-timeout>
    30
  </session-timeout>
</session-config>
<welcome-file-list>
  <welcome-file>index.jsp</welcome-file>
</welcome-file-list>
</web-app>
```



# Структура на дескриптора на разпространение web.xml

- **icon**
- **display-name**
- **description**
- **distributable**
- **context-param**
- **filter**
- **filter-mapping**
- **listener**
- **servlet**
- **servlet-mapping**
- **session-config**
- **mime-mapping**
- **welcome-file-list**
- **error-page**
- **taglib**
- **resource-env-ref**
- **resource-ref**
- **security-constraint**
- **login-config**
- **security-role**
- **env-entry**
- **ejb-ref**
- **ejb-local-ref**

# Сървърна поддръжка

- Java™ EE 6 сървъри:
  - GlassFish/Payara (<https://payara.gitbooks.io/payara-server/content/>)
  - RedHat's JBoss/WildFly (<https://wildfly.org/>)
  - Apache TomEE (<https://tomee.apache.org/>)
  - Oracle's WebLogic
  - IBM's WebSphere
  - SAP Netweaver
  - Resin, JOnAS, JEUS, . . .
- Олекотени уеб сървъри:
  - Apache Tomcat, Jetty, Undertow и много други

# Жизнен цикъл на сървлета

- Зареждане на класа на сървлета от веб контейнера
- Уеб контейнерът създава инстанция на класа
- Инициализира инстанцията на сървлета като извиква метода **init()**
- Извиква **service()** метода за всяка заявка подавайки **request** и **response** обекти като аргументи
- Преди да деактивира (премахне) сървлета контейнера извиква неговия метод **destroy()**

# Основна структура на сървлети (1)

- Основни методи на класа HttpServlet:
  - doGet – за HTTP GET заявки
  - doPost – за HTTP POST заявки
  - doPut – за HTTP PUT заявки
  - delete – за HTTP DELETE заявки
  - init and destroy – за управление на ресурсите
  - getServletInfo – дава информация за сървлета
  - service – получава всички HTTP заявки и играе ролята на диспечер – **не трябва да се предефинира директно**

## Основна структура на сървлети (2)

- Основни методи на класа `GenericServlet`:
  - `getInitParameter`, `getInitParameterNames` – дават възможност за декларативно конфигуриране
  - `getServletConfig` – връща обект от тип `ServletConfig`, който съдържа информация предавана от уеб контейнера на сървлета
  - `getServletContext` – връща обект от тип `ServletContext` дефиниращ множество методи, които сървлетът използва за да комуникира с контейнера
    - например да получи MIME типа на файл, да диспечеризира заявки или да пише в log файл

# Клас HttpServlet – методи: doGet, doPost

```
response.setContentType("text/html");

PrintWriter out = response.getWriter();

out.println(docType + "<HTML>\n" +
    "<HEAD><TITLE>Hello</TITLE></HEAD>\n" +
    "<BODY BGCOLOR=\"#FDF5E6\">\n" +
    "<H1>Hello</H1>\n" +      "</BODY></HTML>");
```



# Инсталиране на сървлети

- Инсталиране и конфигуриране на сървлет и JSP™ софтуер
- Динамична регистрация на сървлети – анотации `@WebServlet` и `@WebInitParam`.
- Уеб компоненти и WAR архиви
- Структура на дескриптора на разпространението (deployment descriptor) – web.xml

# Пример за сървлет с използване на @WebServlet и @WebInitParam анотации (1)

```
@WebServlet(urlPatterns = "/HelloWorld",
    initParams = {
        @WebInitParam(name="bgcolor", value="yellow"),
        @WebInitParam(name="message", value="Hello from Servlet 3.0")
    })
public class HelloWorld extends HttpServlet {
    private String bgcolor;
    private String message;

    public void init() throws ServletException {
        bgcolor = getInitParameter("bgcolor");
        bgcolor = (bgcolor != null) ? bgcolor: "white";
        message = getInitParameter("message");
        message = (message != null) ? message: "Hello";
    }
}
```

# Пример за сървлет с използване на @WebServlet и @WebInitParam анотации (2)

```
protected void doGet(HttpServletRequest request,
HttpServletRequest response) throws ServletException,
IOException {
    response.setContentType("text/html");
    PrintWriter out = response.getWriter();
    out.println("<html>");
    out.println("<head>");
    out.println("<title>Hello World!</title>");
    out.println("</head>");
    out.println("<body bgcolor='" + bgcolor + "'>");
    out.println("<h1>" + message + "</h1>");
    out.println("</body>");
    out.println("</html>");
}
}
```

# Дескриптор на распространение web.xml

```
<?xml version="1.0" encoding="UTF-8"?>
```

```
<web-app version="2.5" xmlns="http://java.sun.com/xml/ns/javaee"  
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"  
xsi:schemaLocation="http://java.sun.com/xml/ns/javaee  
http://java.sun.com/xml/ns/javaee/web-app_2_5.xsd">
```

```
<servlet>
```

```
<servlet-name>DispatcherServlet</servlet-name>
```

```
<servlet-class>invoicing.DispatcherServlet</servlet-class>
```

```
</servlet>
```

```
<servlet-mapping>
```

```
<servlet-name>DispatcherServlet</servlet-name>
```

```
<url-pattern>/DispatcherServlet</url-pattern>
```

```
</servlet-mapping>
```

# Дескриптор на распространение web.xml (2)

```
<session-config>
  <session-timeout>
    30
  </session-timeout>
</session-config>
<welcome-file-list>
  <welcome-file>index.jsp</welcome-file>
</welcome-file-list>
</web-app>
```

# Структура на дескриптора на разпространение web.xml

- icon
- display-name
- description
- distributable
- **context-param**
- filter
- filter-mapping
- listener
- **servlet**
- **servlet-mapping**
- **session-config**
- mime-mapping
- **welcome-file-list**
- **error-page**
- taglib
- resource-env-ref
- resource-ref
- security-constraint
- login-config
- security-role
- env-entry
- ejb-ref
- ejb-local-ref



# Обработка на параметри на форми с помощта на сървлети.

- Методи на **javax.servlet.ServletRequest** за обработка на параметри на форми:
  - **getParameter(String name)** – връща стойността на параметър с даденото име във формата като низ (String)
  - **getParameterValues(java.lang.String name)** – връща всички стойности на параметъра като масив от низове
  - **getParameterNames()** - връща **java.util.Enumeration<String>** с имената на всички параметри във формата
  - **getParameterMap()** - връща асоциативен списък (**java.util.Map<String, String[]>**) с всички имена и стойности на параметри във формата

# Отстраняване на грешки (debugging) на сървлети

Методи за откриване и отстраняване на грешки в сървлети:

- **System.out.println()** и **javax.servlet.GenericServlet.log()** – отпечатване на междинни резултати за диагностика на работата на сървлета в **log** файла на сървъра
- Използване на инструментите за отстраняване на грешки (**Debugger tools**) на интегрираната среда за разработка (**IDE**) – например **Eclipse** и **NetBeans** предлагат такива
- Използване на **Firebug** и други подобни инструменти за инспекция на **HTML** и **JavaScript** кода, който се визуализира и изпълнява вътре в уеб браузъра, както и за преглед на съдържанието на **HTTP** заявките и отговорите от сървъра
- Използване на **отделни класове** за отделните задачи

# Java™: Заглавни части на HTTP заявки

- Методи на класа `HttpServletRequest` за достъп до заглавните части:
  - `getCookies()`
  - `getAuthType()`
  - `getRemoteUser()`
  - `getContentLength()`
  - `getContentType()`
  - `getDateHeader()`
  - `getIntHeader()`
  - `getHeaderNames()`
  - `getHeader()`
  - `getHeaders()`

# Java™: Заглавни части на HTTP заявки

- Основни параметри на HTTP заявката:
  - **getMethod()**
  - **getRequestURI()**
  - **getQueryString()**
  - **getProtocol()**

# Заглавни части на HTTP заявки

- В **HTTP 1.0** всички заглавни части са опционални
- В **HTTP 1.1** са опционални всички заглавни части без **Host**
- Необходимо е винаги да се проверява дали съответната заглавна част е различна от **null**



# Request Header Example

host	localhost:8080
user-agent	Mozilla/5.0 (Windows NT 6.1; WOW64; rv:21.0) Gecko/20100101 Firefox/21.0
accept	text/html,application/xhtml+xml,application/xml;q=0.9,*/*;q=0.8
accept-language	en,bg;q=0.7,en-us;q=0.3
accept-encoding	gzip, deflate
dnt	1
referer	http://localhost:8080/examples/servlets/index.html
connection	keep-alive





# Структура на заявка

**GET** /context/Servlet HTTP/1.1

**Host:** *Client\_Host\_Name*

*Header2: Header2\_Data*

...

*HeaderN: HeaderN\_Data*

*<Празен ред>*

**POST** /context/Servlet HTTP/1.1

**Host:** *Client\_Host\_Name*

*Header2: Header2\_Data*

...

*HeaderN: HeaderN\_Data*

*<Празен ред>*

*POST\_Data*

# Структура на отговор на заявка

**HTTP/1.1 200 OK**

**Content-Type: text/html**

*Header2: Header2\_Data*

...

*HeaderN: HeaderN\_Data*

*<Празен ред>*

**<!DOCTYPE**

*Document\_Type*

*\_Definition>*

**<html>**

**<head>**

**<title>...</title>**

**</head>**

**<body>**

...

**</body>**

**</html>**

# Структура на отговор на заявка

**HTTP/1.1 200 OK**

**Content-Type: application/json**

*Header2: Header2\_Data*

...

*HeaderN: HeaderN\_Data*

<Празен ред>

```
[{ "id":1,  
  "name":"Novelties in Java EE 7 ...",  
  "description":"The presentation is ...",  
  "created":"2014-05-10T12:37:59",  
  "modified":"2014-05-10T13:50:02",  
},  
{ "id":2,  
  "name":"Mobile Apps with HTML5 ...",  
  "description":"Building Mobile ...",  
  "created":"2014-05-10T12:40:01",  
  "modified":"2014-05-10T12:40:01",  
}]
```

# Заглавни части на HTTP заявка - RFC2616

- **Accept**
- **Accept-Charset**
- **Accept-Encoding**
- **Accept-Language**
- **Authorization**
- **Connection**
- **Content-Length**
- **Cookie**
- **Host**
- **If-Modified-Since**
- **If-Unmodified-Since**
- **Referer**
- **User-Agent**

# Статус кодове на отговор на заявка

- **100 Continue**
- **101 Switching Protocols**
- **200 OK**
- **201 Created**
- **202 Accepted**
- **203 Non-Authoritative Information**
- **204 No Content**
- **205 Reset Content**
- **301 Moved Permanently**
- **302 Found**
- **303 See Other**
- **304 Not Modified**
- **307 Temporary Redirect**
- **400 Bad Request**
- **401 Unauthorized**
- **403 Forbidden**
- **404 Not Found**

# Статус кодове на отговор на заявка

- **405 Method Not Allowed**
- **415 Unsupported Media Type**
- **417 Expectation Failed**
- **500 Internal Server Error**
- **501 Not Implemented**
- **503 Service Unavailable**
- **505 HTTP Version Not Supported**



# Java™: Методи за установяване на заглавни части на HTTP отговори

- **setHeader(String headerName, String headerValue)**
- **setDateHeader(String header, long milliseconds)**
- **setIntHeader(String header, int headerValue)**
- **setContentType(String mimeType)**
- **setContentLength(int length)**
- **addCookie(Cookie c)**
- **sendRedirect(String address)**

# Заглавни части на HTTP отговори

- **Allow**
- **Cache-Control**
- **Pragma**
- **Connection**
- **Content-Disposition**
- **Content-Encoding**
- **Content-Language**
- **Content-Length**
- **Content-Type**
- **Expires**
- **Last-Modified**
- **Location**
- **Refresh**
- **Retry-After**
- **Set-Cookie**
- **WWW-Authenticate**

# Обектни обхвати (Scopes)

- **Web context** – клас: **javax.servlet.ServletContext**, съдържа уеб компоненти достъпни за цялото приложение
- **Session** – клас: **javax.servlet.http.HttpSession**, съдържа уеб компоненти достъпни в рамките на потребителската сесия
- **Request** – клас: **javax.servlet.ServletRequest**, съдържа уеб компоненти достъпни в рамките на HTTP заявката
- **Page** – клас: **javax.servlet.jsp.JspContext**, съдържа обекти достъпни в рамките на JSP страницата

# Конструиране на HttpServletResponse чрез вграждане на ресурси

- Създаване на обект от тип **RequestDispatcher**:
- `RequestDispatcher dispatcher = getServletContext().`
- `getRequestDispatcher("/datatable");`
- Включване на маркъп генериран от друг веб ресурс в отговора (HttpServletResponse) – **include**:
- `if (dispatcher != null) dispatcher.include(request, response);`
- Цялостно делегиране генерирането на отговор на друг веб ресурс – **forward**:
- `if (dispatcher != null) dispatcher.forward(request, response);`

# Новости в JDBC™ 4.1 (Java 7): try-with-resources

java.sql.Connection, java.sql.Statement и java.sql.ResultSet  
имплементируют интерфейса **AutoCloseable**:

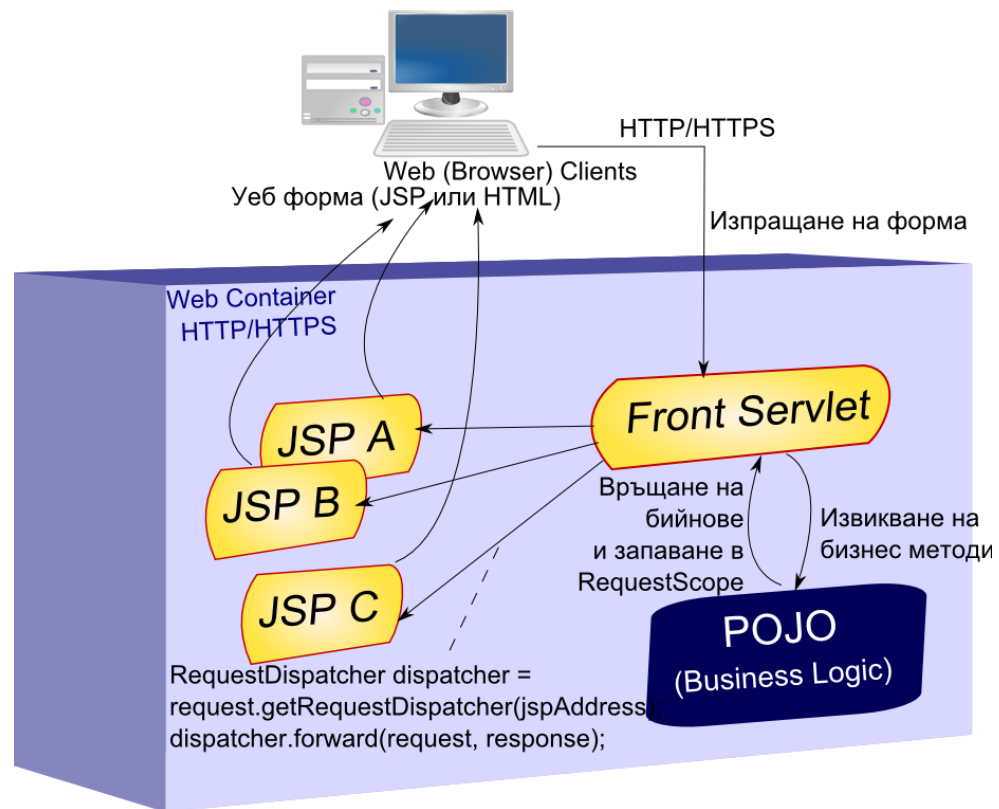
```
Class.forName("com.mysql.jdbc.Driver");           //Load MySQL DB driver
try (Connection c = DriverManager.getConnection(dbUrl, user, password);
    Statement s = c.createStatement() ) {
    c.setAutoCommit(false);
    int records = s.executeUpdate("INSERT INTO product " //Insert new product
        + "VALUES ('CP-00002', 'Lenovo', " + "790.0, 'br', 'Laptop')");
    System.out.println("Successfully inserted " + records + " records.");
    records = s.executeUpdate("UPDATE product " //Update product price
        + "SET price=470, description='Classic laptop' "
        + "WHERE code='CP-00001'");
    System.out.println("Successfully updated " + records + " records.");
    c.commit();                                     //Finish transaction
}
```

# Трислойна архитектура: презентация, бизнес логика и данни: Model -View-Controller-MVC design pattern, Model 2

Servlet (Controller) + JSPs (Views) + POJOs (Model)

## Предимства на MVC:

- Разделяне на труда между уеб дизайнери и програмисти на Java™
- Възможност за независима промяна на презентационната логика и визуалното представяне на данните
- По-лесна поддръжка, модификация и разширяване
- Улеснена навигация





# Литература и интернет ресурси

- JSR 342: Java™ Platform, Enterprise Edition 7 (Java EE 7) Specification – <https://www.jcp.org/en/jsr/detail?id=342>
- Java EE 7 Tutorial – <https://docs.oracle.com/javaee/7/tutorial/>
- GlassFish Application Server – <http://glassfish.java.net/>
- Introducing the Java EE 6 Platform – <http://java.sun.com/developer/technicalArticles/JavaEE/JavaEE6Overview.html>
- Java Platform, Enterprise Edition във Wikipedia – [http://en.wikipedia.org/wiki/Java\\_Platform,\\_Enterprise\\_Edition](http://en.wikipedia.org/wiki/Java_Platform,_Enterprise_Edition)
- Java EE 5 Tutorial – <http://java.sun.com/javaee/5/docs/tutorial/doc/>

# Литература и интернет ресурси

- JSR 244: Java™ Platform, Enterprise Edition 5 (Java EE 5) Specification – <http://jcp.org/en/jsr/detail?id=244>
- Java EE 5 Tutorial – <http://java.sun.com/javaee/5/docs/tutorial/doc/>
- Hall, M., Brown, L., Core Servlets and JavaServer Pages – <http://pdf.coreservlets.com/>
- Страница за JavaServer Pages на уеб сайта на Oracle® – <http://www.oracle.com/technetwork/java/javaee/jsp/index.html>
- JavaServer Pages в Wikipedia – [http://en.wikipedia.org/wiki/JavaServer\\_Pages](http://en.wikipedia.org/wiki/JavaServer_Pages)
- Ръководство за JavaServer Pages – <http://www.jsptut.com/>
- JavaWorld: Understanding JavaServer Pages Model 2 architecture – <http://www.javaworld.com/javaworld/jw-12-1999/jw-12-ssj-jspmvc.html>

# Литература и интернет ресурси

- JavaServer Pages (JSP) Syntax Reference –  
<http://java.sun.com/products/jsp/syntax/2.0/syntaxref20.html>
- JSP Simple Tags Explained by Andy Grant  
<http://articles.sitepoint.com/article/jsp-2-simple-tags>
- JavaServer Pages Standard Tag Library 1.1 Tag Reference –  
<http://java.sun.com/products/jsp/jstl/1.1/docs/tlddocs/index.html>
- Java EE 5 Tutorial –  
<http://java.sun.com/javaee/5/docs/tutorial/doc/>

# Thank's for Your Attention!



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