Introduction to Internet Applications

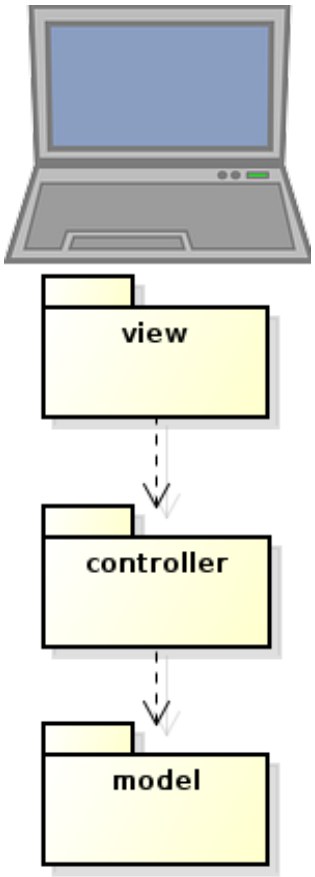
Internet Applications, ID1354

Contents

Section

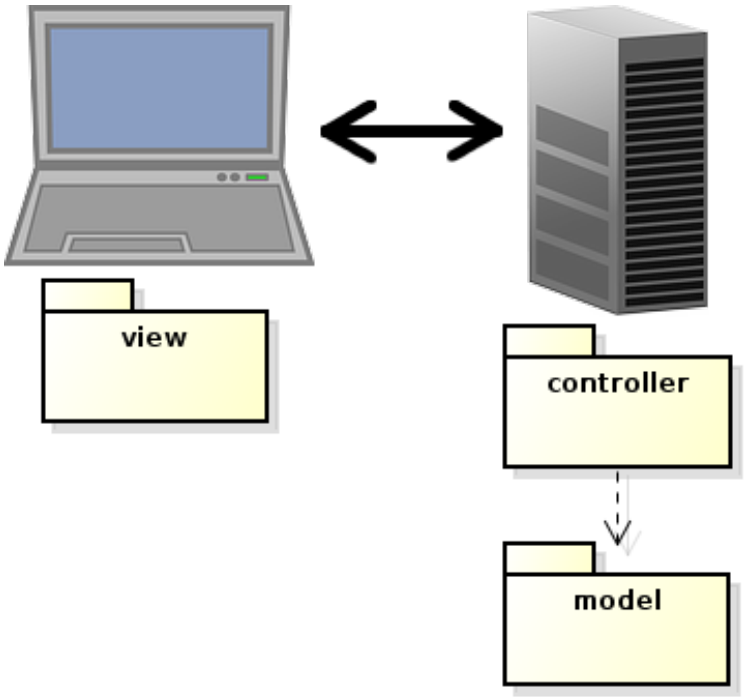
- Distributed Architectures
- HTTP and Other Protocols
- Tools
- User Interface Design

Local Application



- We are familiar with an architecture where the entire application resides on the same computer.

Introducing a Server



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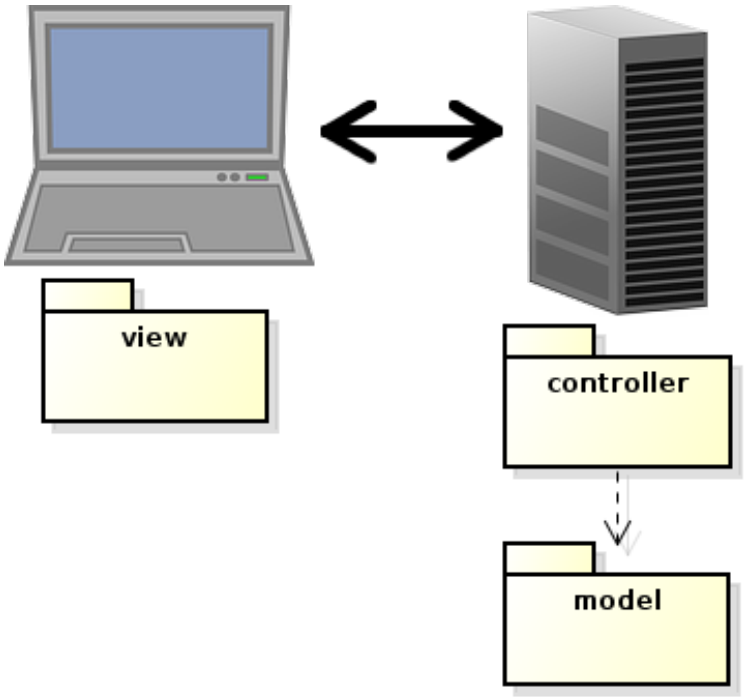

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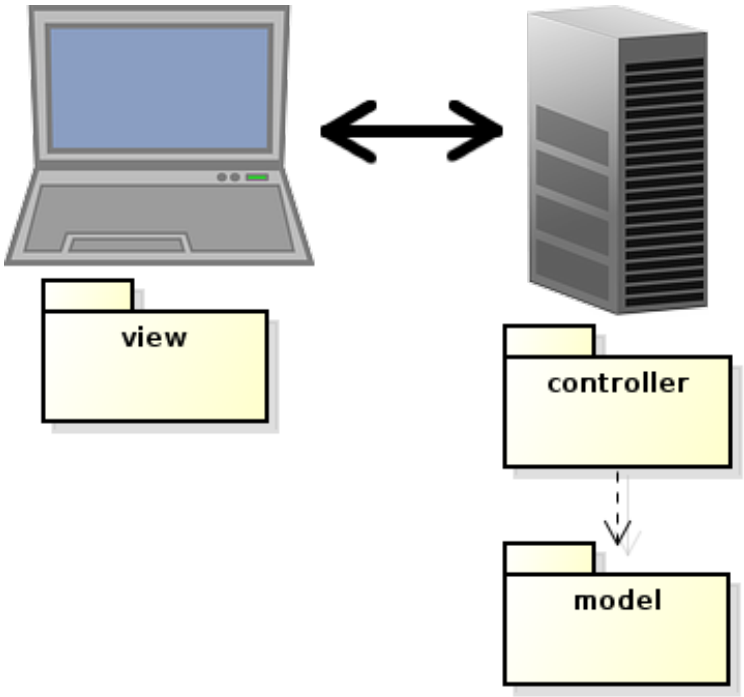

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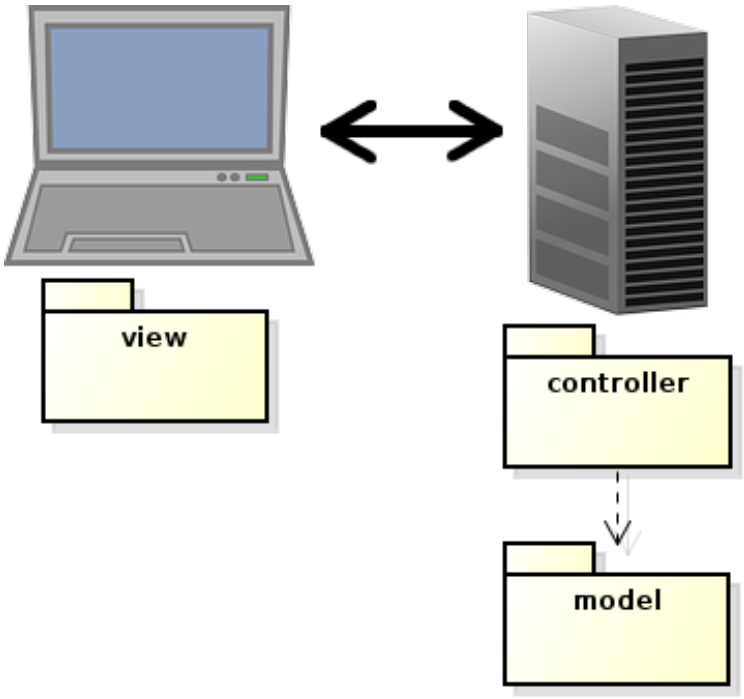

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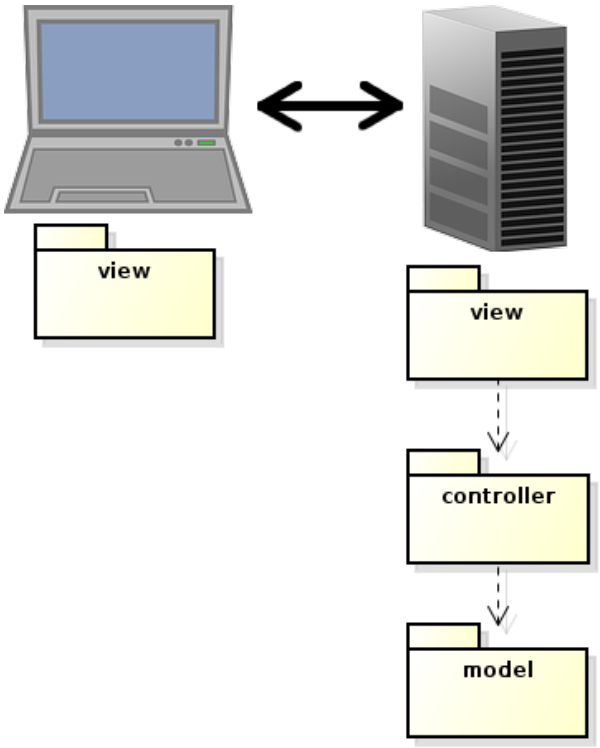
This architecture is not good, we also need layers for communication.

Server-Side Communication



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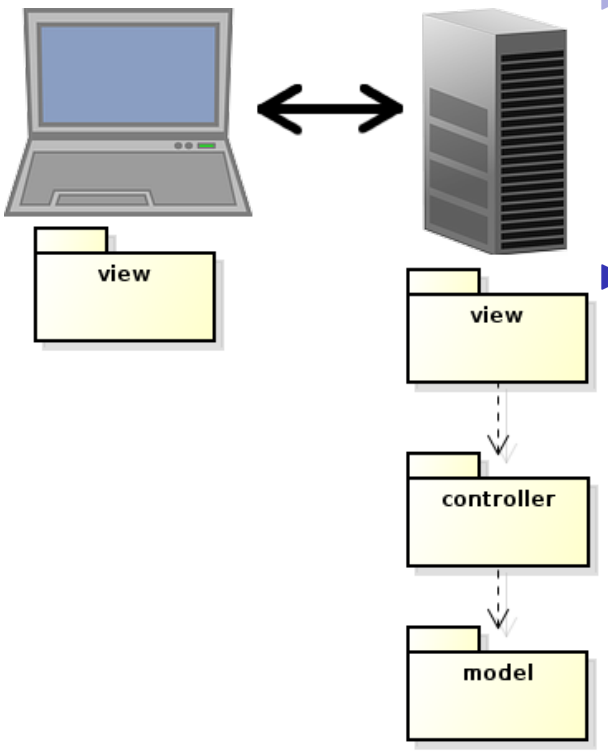

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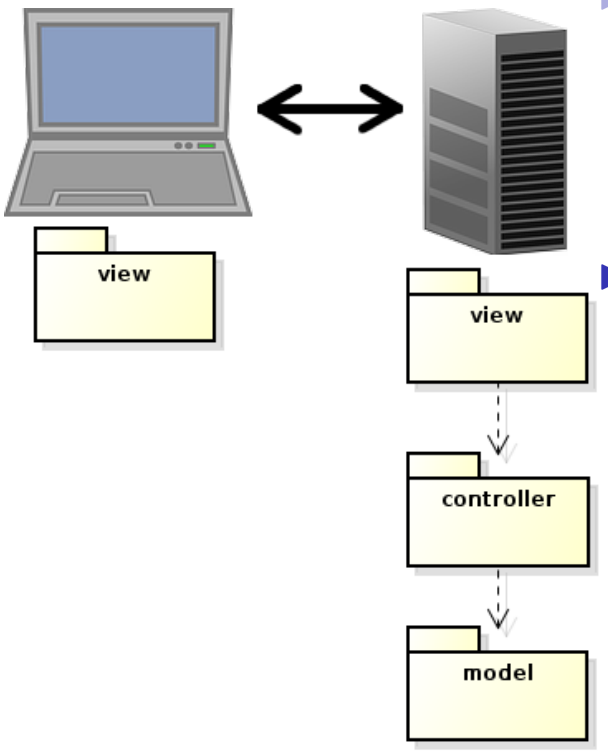

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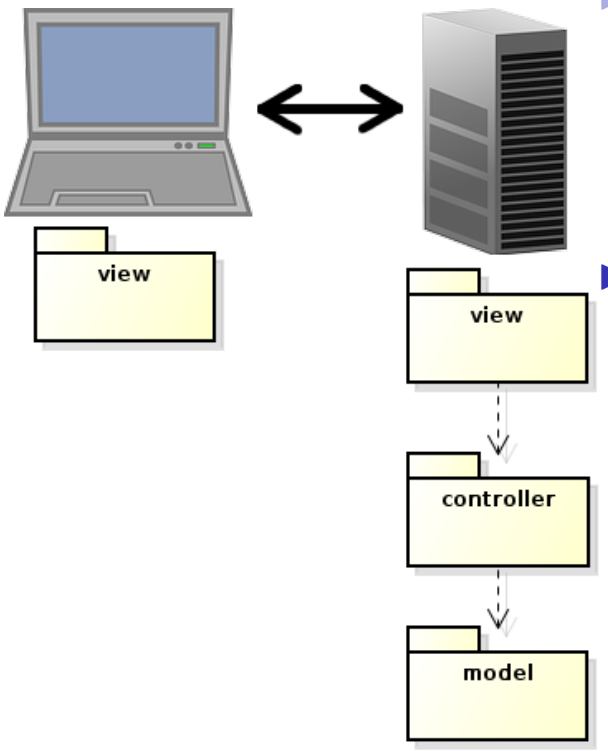

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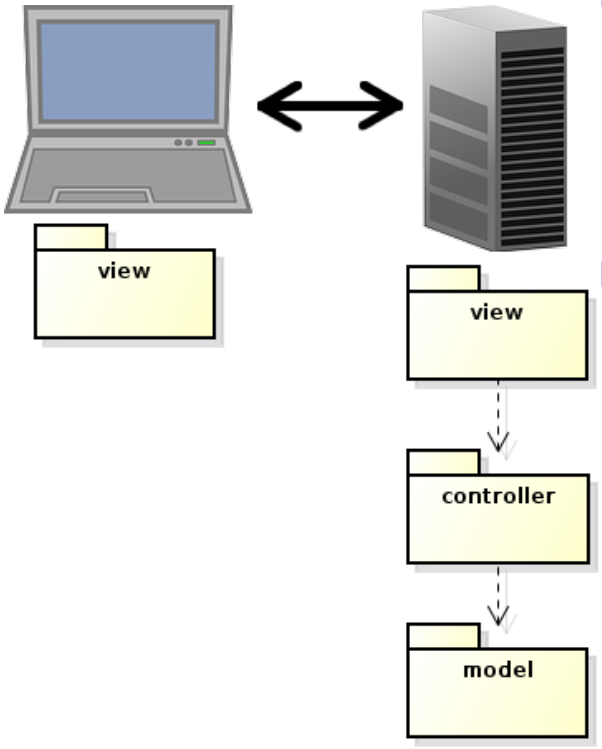

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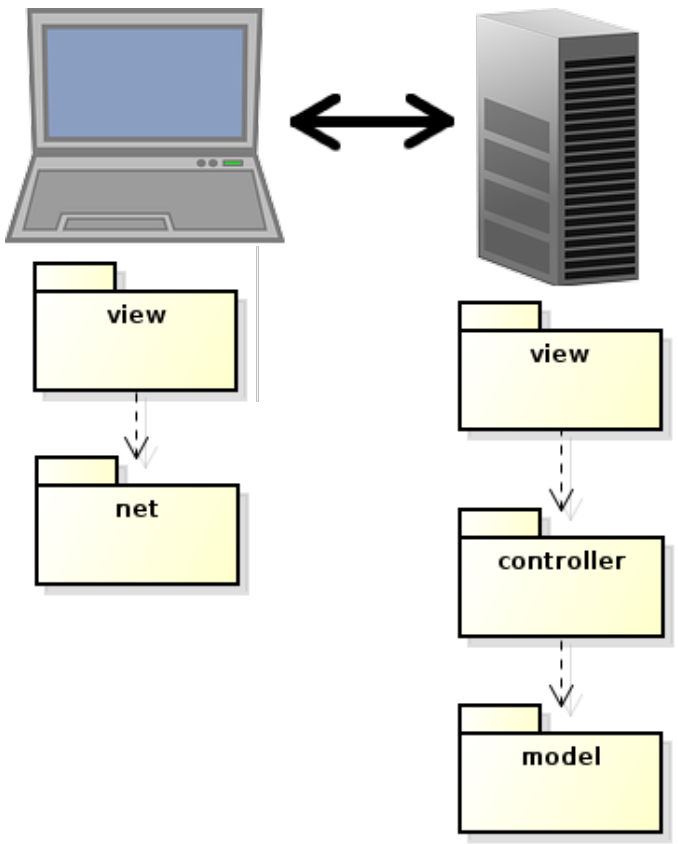
It might seem that we need yet a layer, for network handling. There is such a layer, but it is in the web server. We don't write it ourselves.

Client-Side Communication



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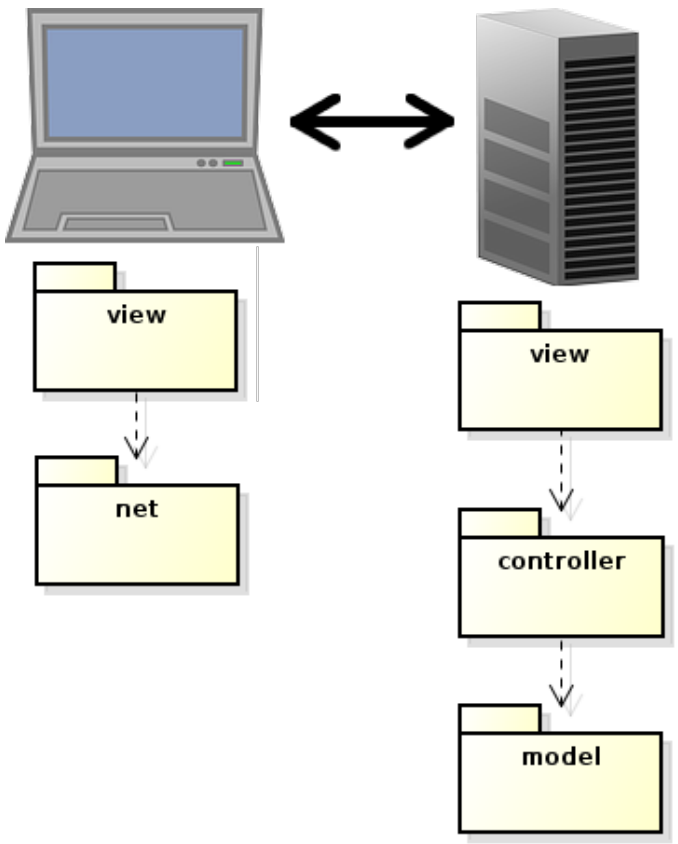

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- Actually, the browser handles most of the communication.
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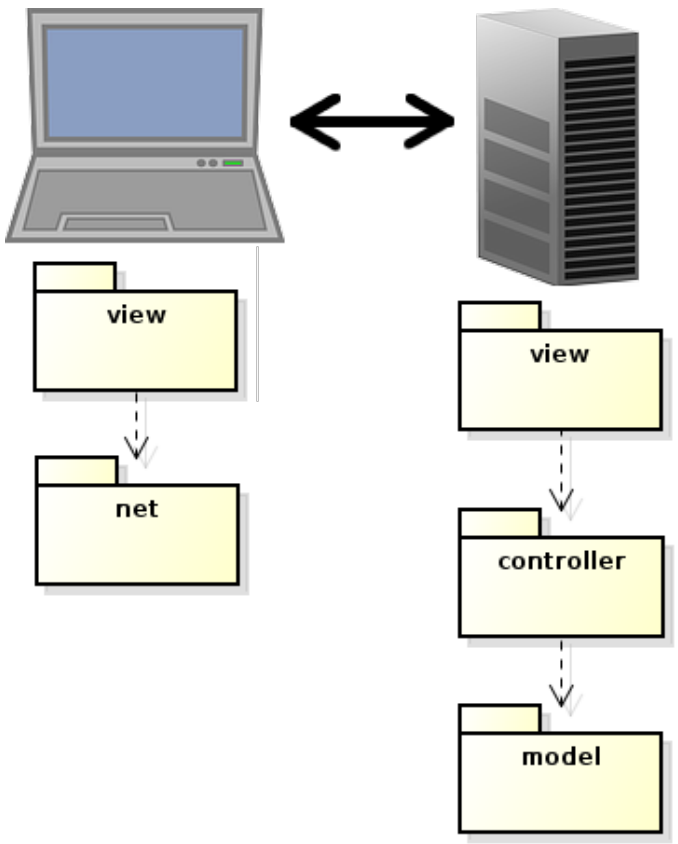

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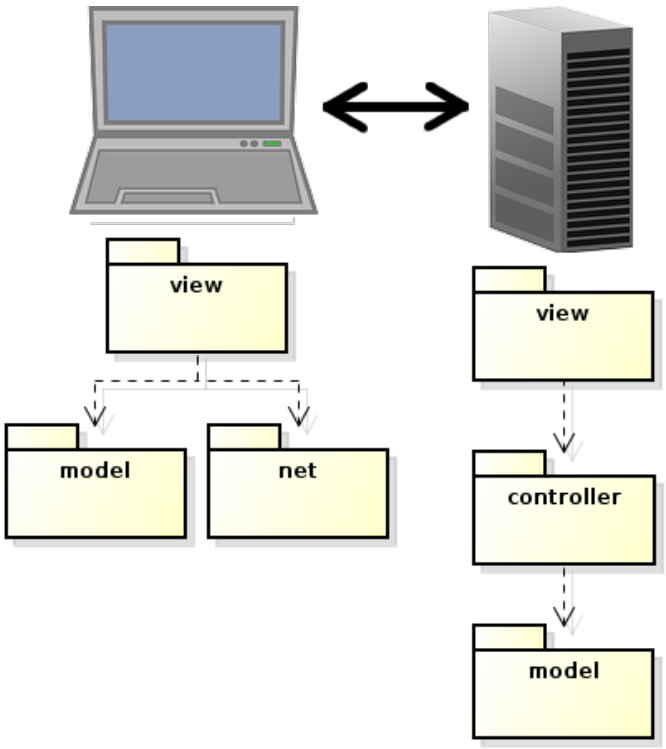
- This is a traditional web application.

The MVVM Pattern



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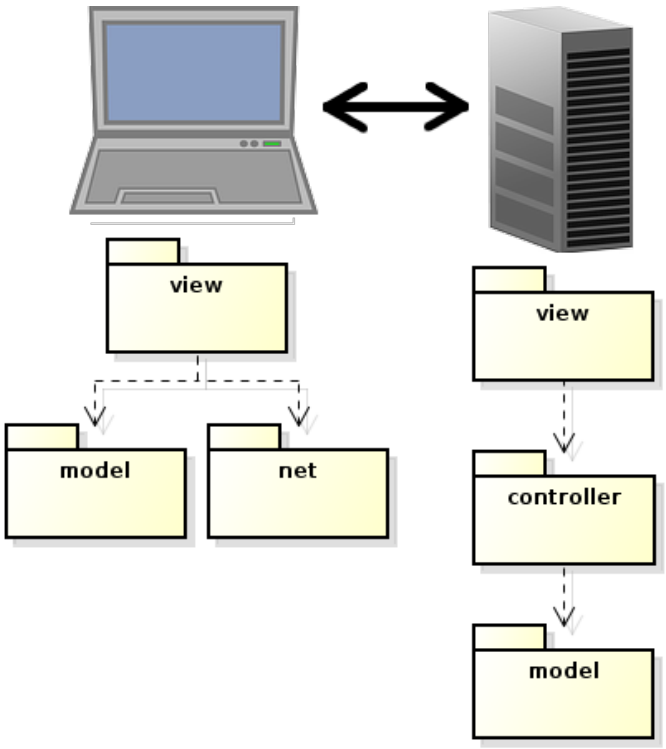

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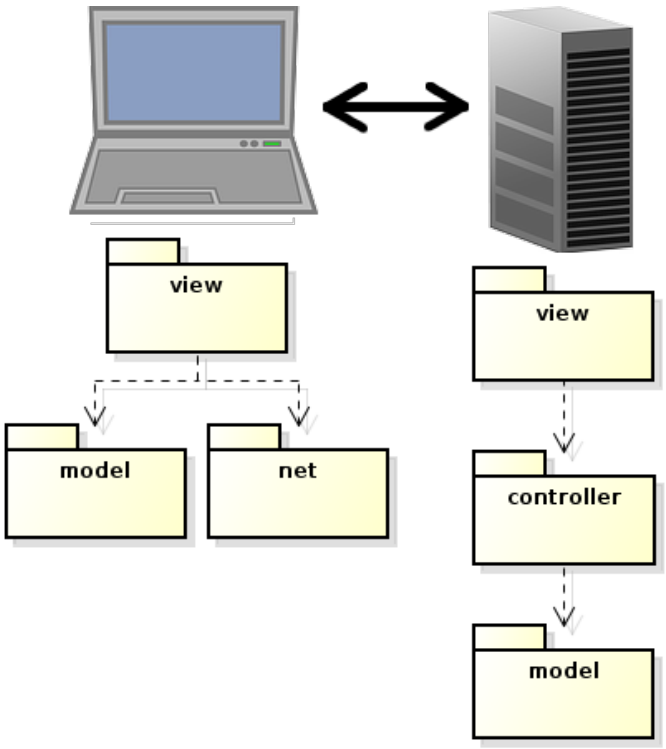

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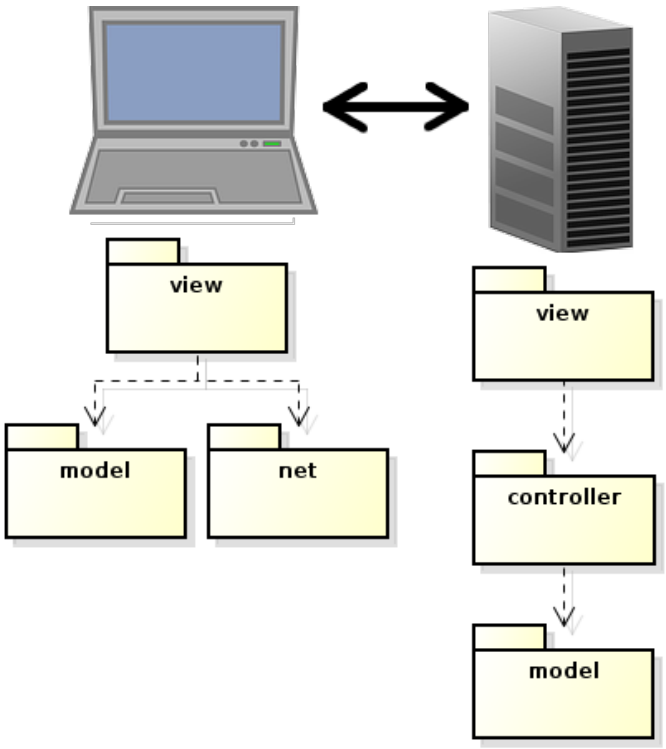

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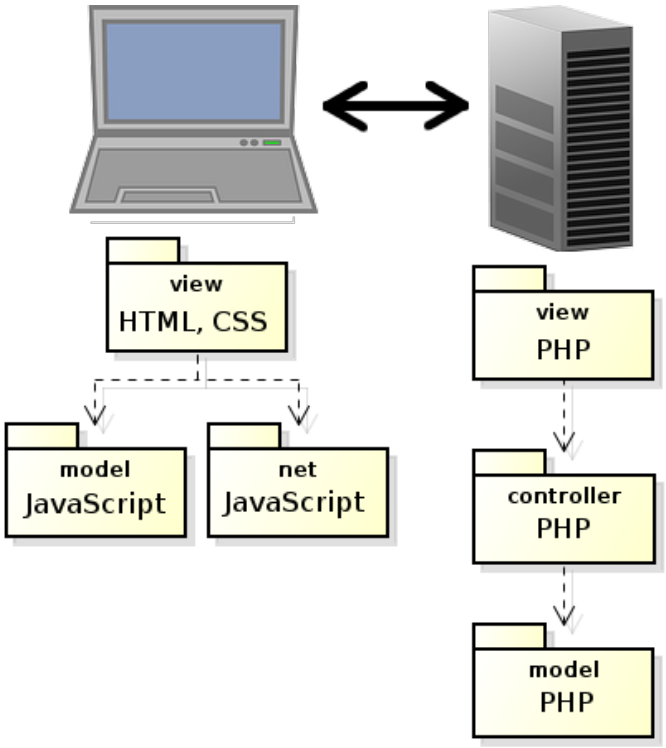
- This is referred to as the MVVM, model-view-viewmodel pattern.

Programming Languages



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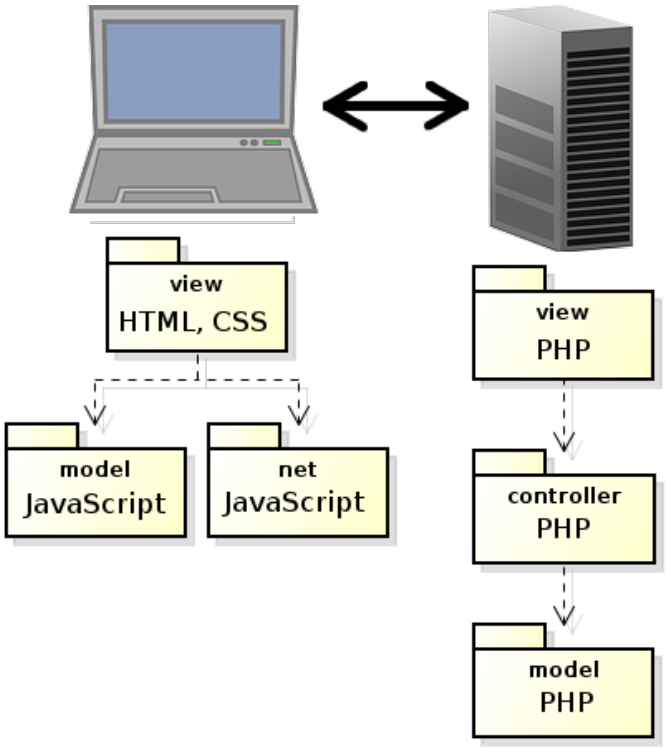

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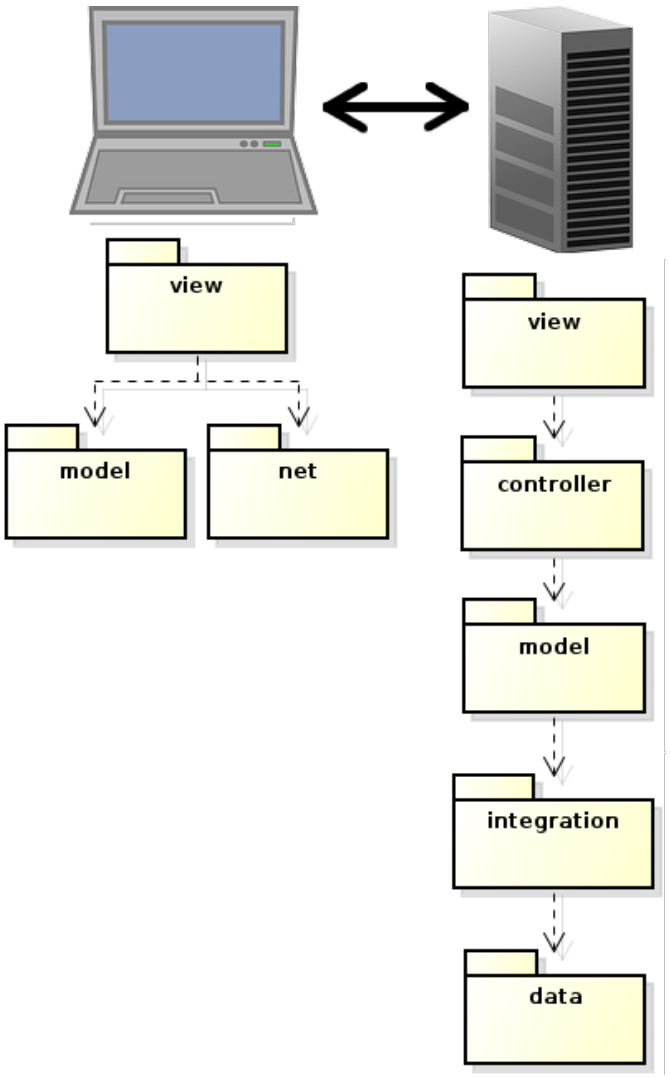
- The view is programmed in HTML and CSS, client side behavior is programmed in JavaScript and the entire server side code is written in PHP.

Three-Tier Architecture



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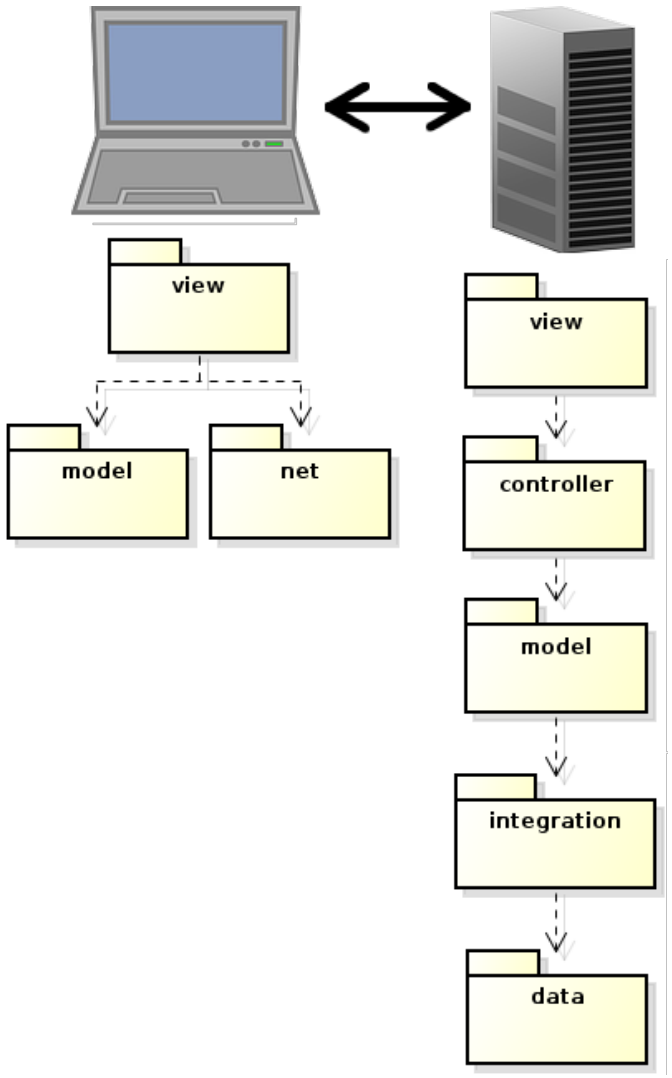

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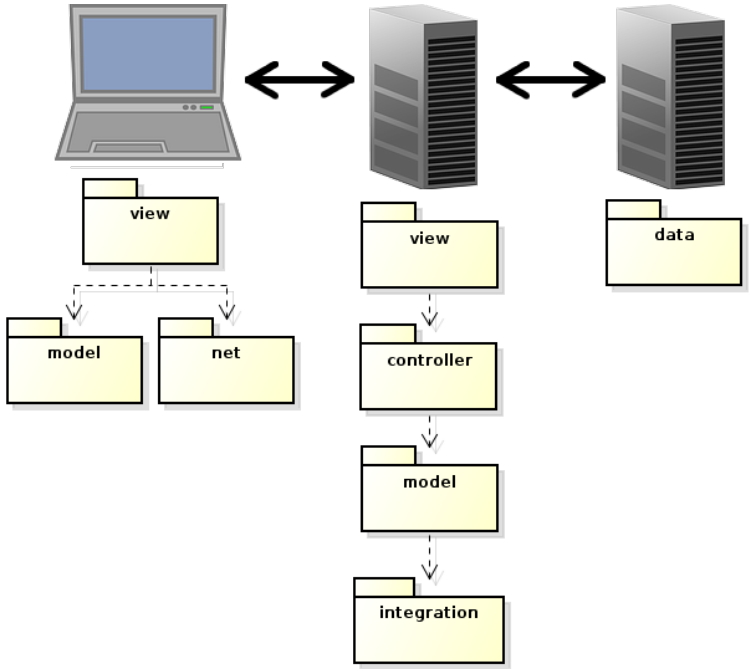
- We also introduce the integration layer, to handle the database calls.

Three-Tier Architecture (Cont'd)



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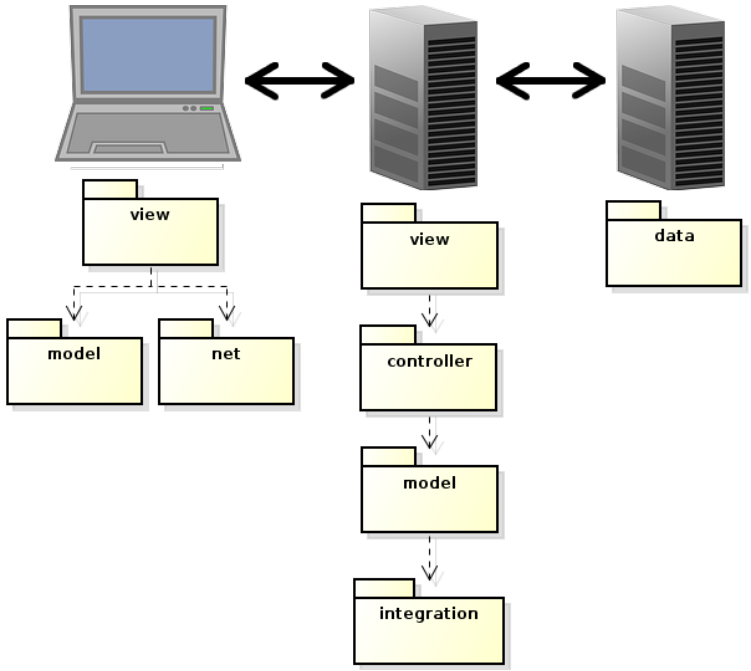
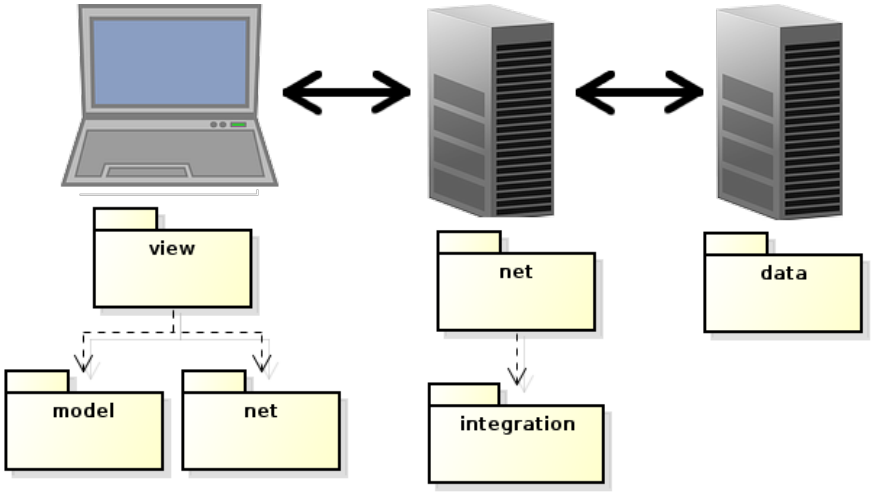


- In a bigger application, we would most likely place the database in a separate node.
- This is called three-tier architecture and is, since long time, the dominating architecture for web applications.

Event-Driven Architecture



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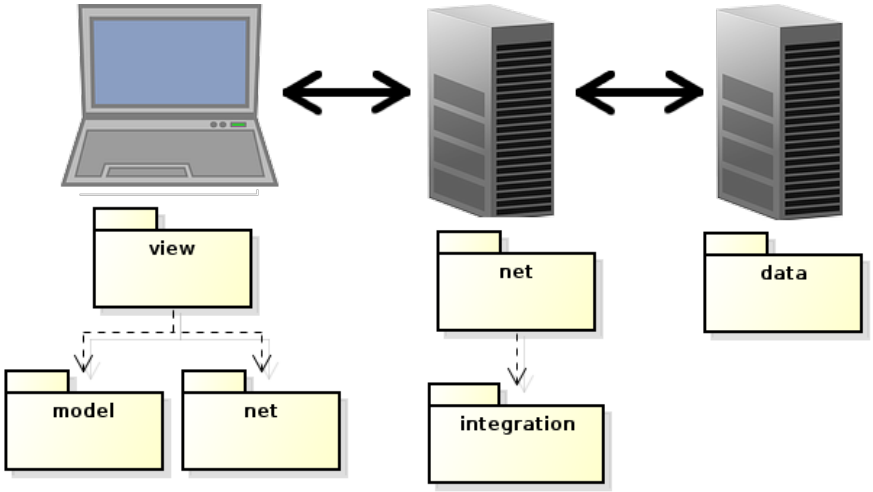

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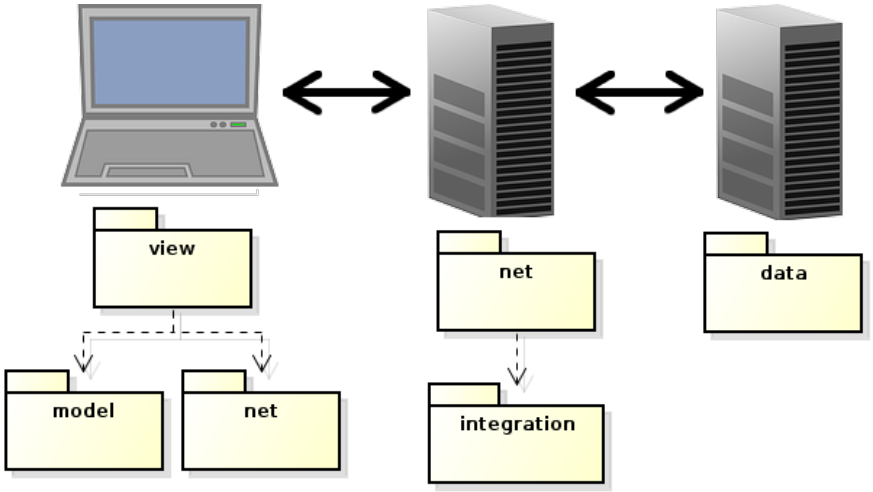

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- This is made possible with web sockets, which enable full duplex browser-server communication.
- The motive is to reduce communication latency. The browser informs the server about user actions, but does not wait for response before updating the view.

Section

- Distributed Architectures
- HTTP and Other Protocols
- Tools
- User Interface Design

The IP Protocol

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- A node dedicated to retransmitting packets across subnet borders is called a router.

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- Some addresses, like 192.168.X.X are dedicated to private networks and can be used freely. Such an address is not transmitted on the public internet. Instead, it is translated to a public address by a router.

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  - Delivered packets have the same content as sent packets.
  - There are no lost packets.

The TCP Protocol (Cont'd)

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- TCP handles ports, which makes it possible to have multiple connections with the same IP address open simultaneously. A port is identified by a number. An endpoint of a TCP connection has an IP address and a port number.

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  - The address **`www.ict.kth.se`** consists of the subdomain **`www`**, which is part of the subdomain **`ict`**, which is part of **`kth`**, which is part of **`se`**, which is part of the root, **`.`**

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  3. A port number (optional). The default HTTP port number is 80. **`http://www.kth.se:8080`**
  4. A path, which identifies the resource's location on the server. **`http://www.kth.se:8080/abc/index.html`**

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- A Uniform Resource Identifier, URI is either a URL or URN.

HTTP

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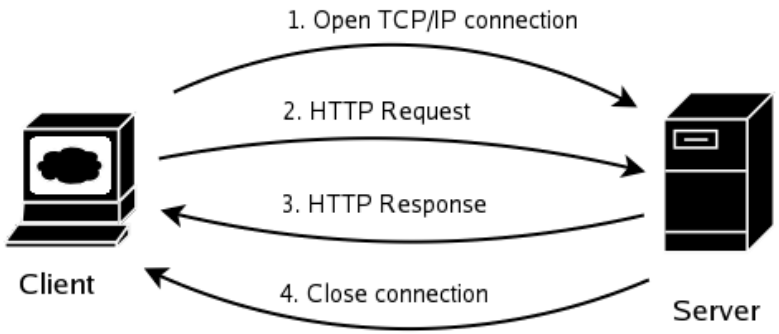
- HTTP is based on TCP, which means a TCP connection is established for each browser-server communication.

The Request-Response Cycle



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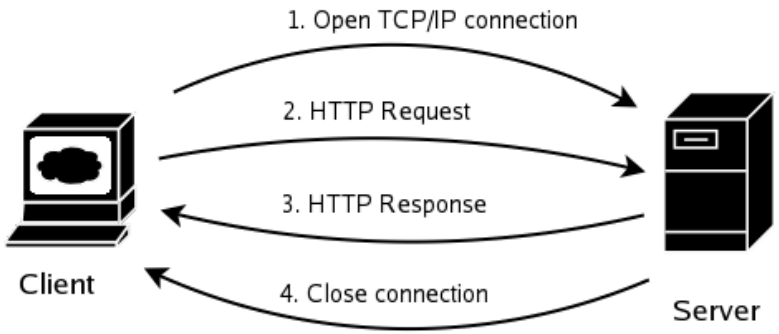

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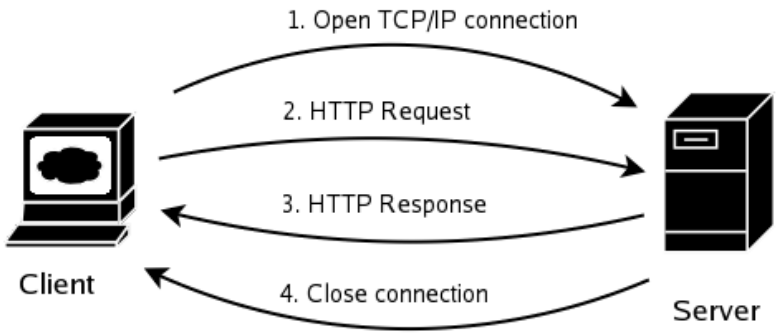

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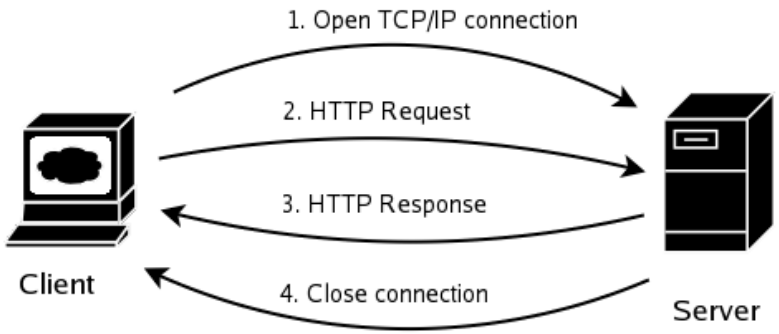

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3. The server sends a response to the client. Also the response consists of HTTP headers, and data if the response required data.
4. The server closes the TCP connection.

The Request-Response Cycle (Cont'd)

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- HTTP is stateless. Neither server nor browser remembers anything about previous request-response cycles. Session handling must be added in server-side code.
- To establish a TCP connection is expensive. Therefore, TCP connections might be kept alive and reused for multiple request-response cycles. This is specified with the **`keep-alive`** HTTP header, se below.

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- Cookies can be used to store the user's settings, for example display language.

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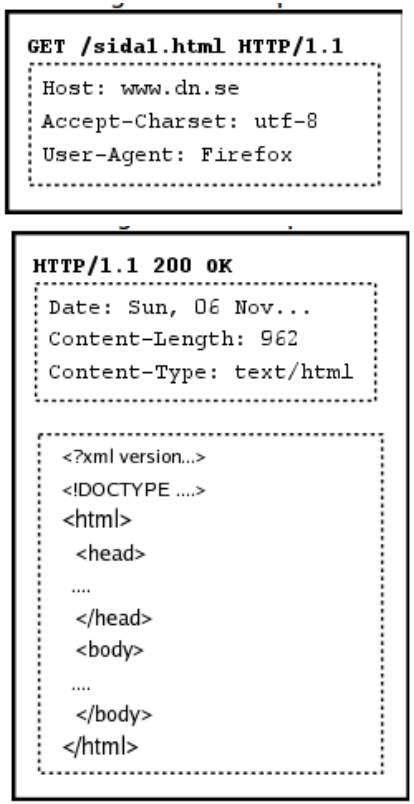
- If a request has a cookie with a session identifier, it identifies the user. If there is no such cookie, the user does not have a running session.
- On the server, the session id can be associated with any amount of data related to the user with that session. This is called conversational state.

HTTP Message Format

- A HTTP message has start-line, headers and body.



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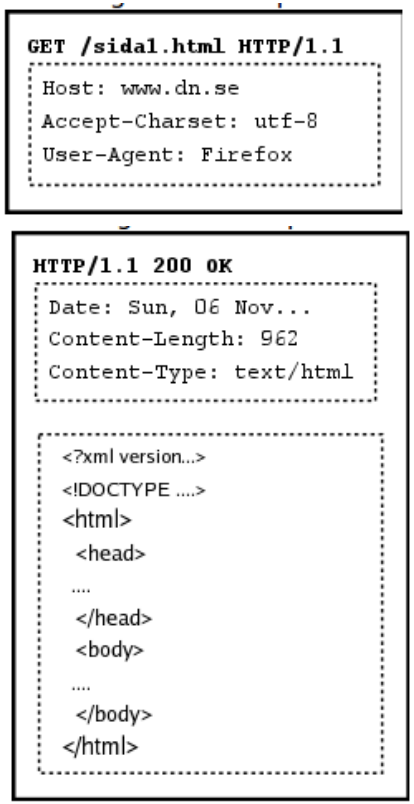

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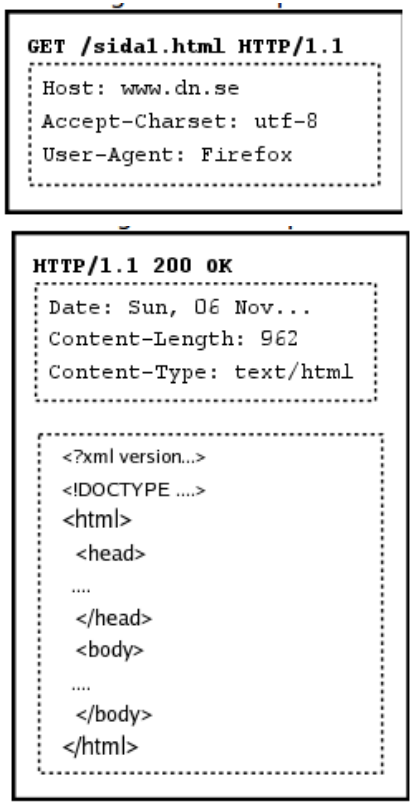

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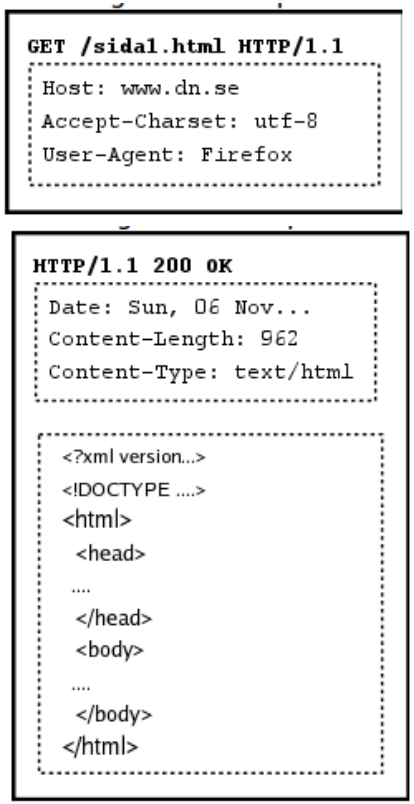

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- Sample request (top) and response (bottom) messages are depicted to the left.

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  - 5xx Server error, for example **500**, Internal Server Error

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- **`GET`** and **`POST`** are the most common methods and the only ones we will use in this course.

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- **GET**, **HEAD**, **PUT**, **DELETE**, **OPTIONS** and **TRACE** are idempotent methods, which means the same request can be sent multiple times without any side-effects on the server.
- **POST** is not idempotent. If you submit the same purchase order multiple times in a web shop you will probably by multiple items. The purchase is typically a **POST** request.

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  - You want to be able to write the entire request, including data, in the browser. This is useful when debugging.

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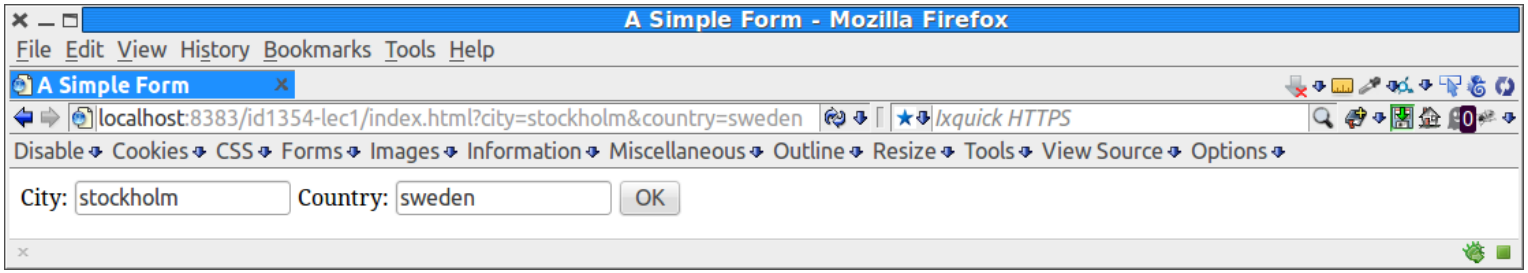
- A typical example is when the user has entered data in a HTML form.



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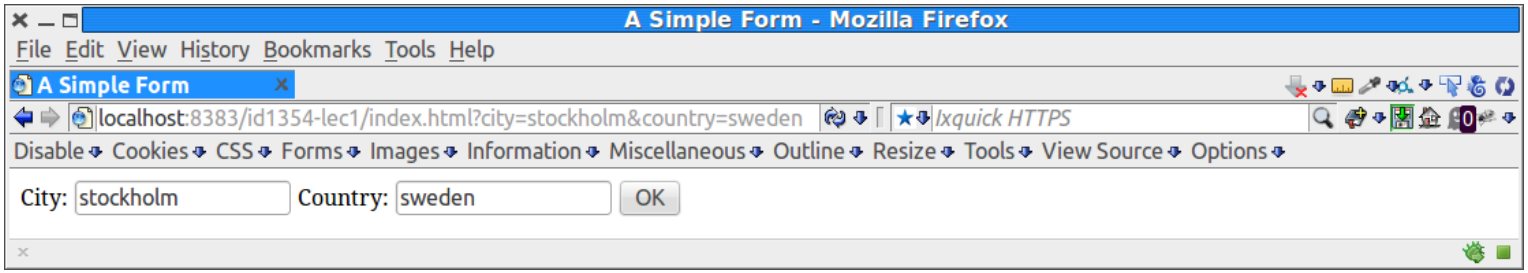

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Content-Length	Message body length in bytes.
Content-Type	Media Type (see below) of response.

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- Some media types are:

text/html	HTML markup
text/plain	Plain text
image/png	A png image
video/ogg	A ogg video.

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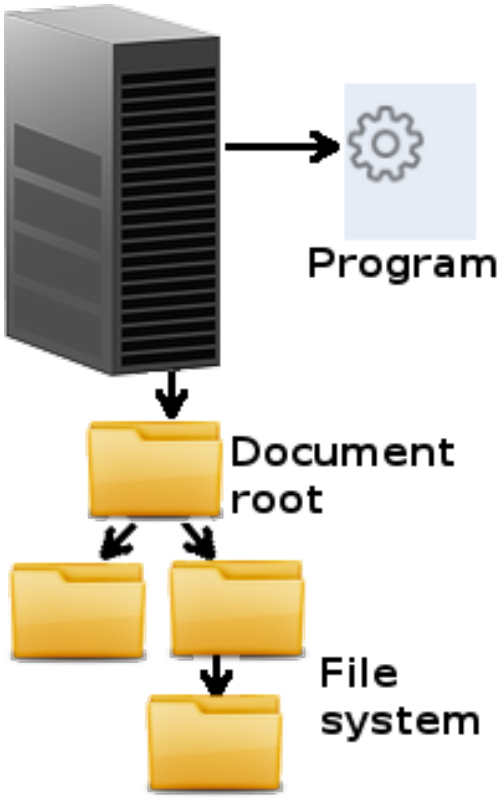
- It is important to test the web application with all different browsers that shall be able to display it.
- Browsers behave differently, and you should expect that some break specifications.

Web Servers



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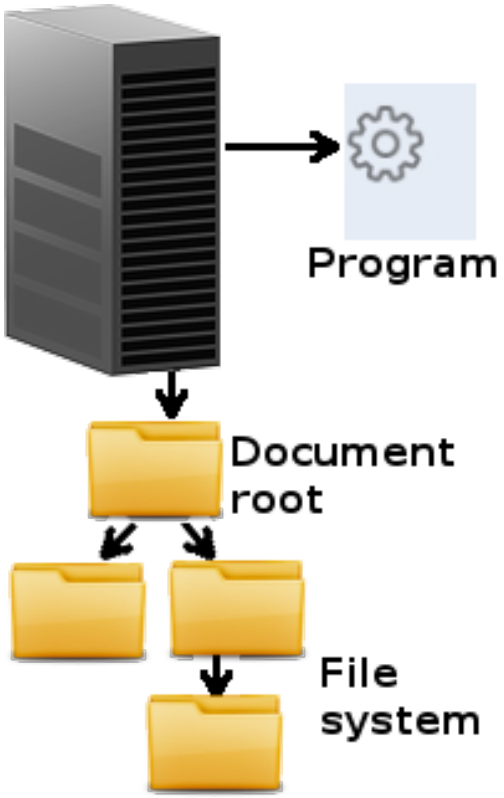

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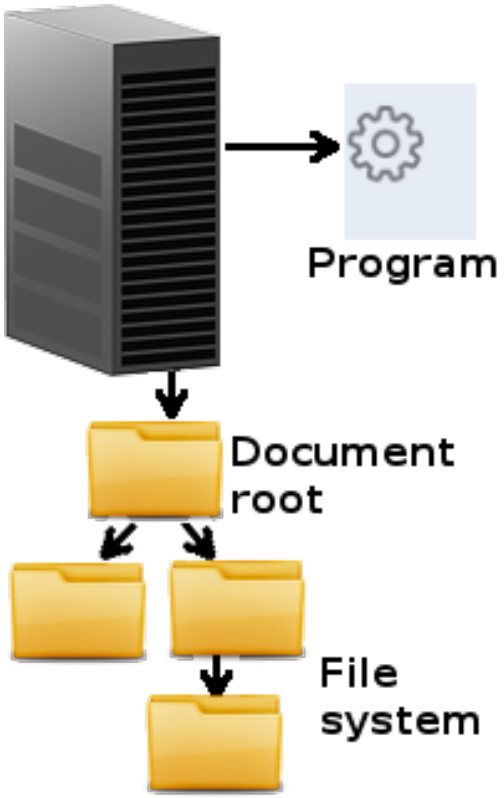

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- Other common web servers are nginx, `http://wiki.nginx.org/Main`

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- It might take time to get the web server running. You are advised to start installing the web server now.

Section

- Distributed Architectures
- HTTP and Other Protocols
- Tools
- User Interface Design

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- You are strongly advised to start using some of the following tools, they will help you a lot.

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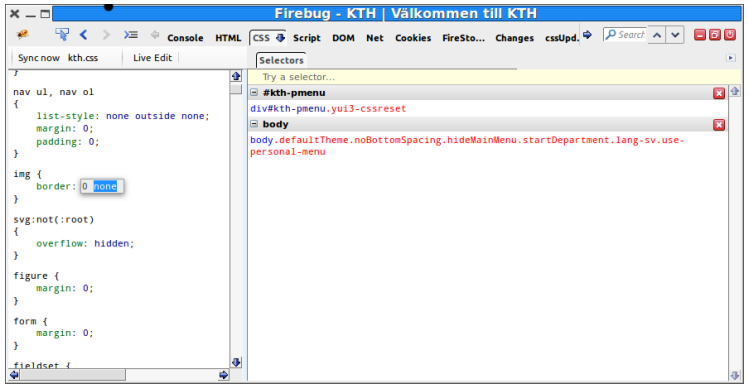
Browser Web Console (Cont'd)

- The console is opened with **`Ctrl-Shift-K`** in Firefox and **`Ctrl-Shift-J`** in Chrome.

Firebug



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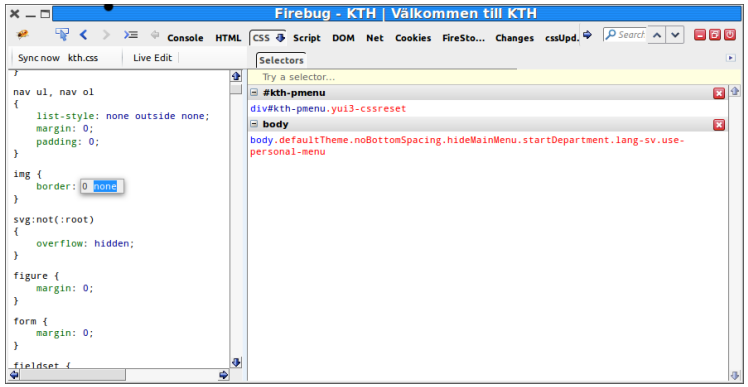

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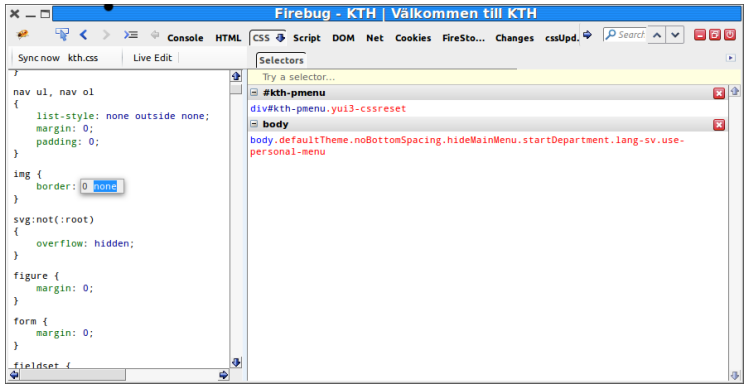

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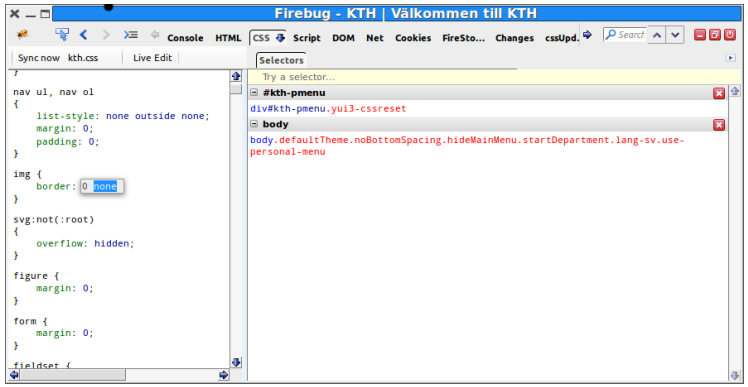

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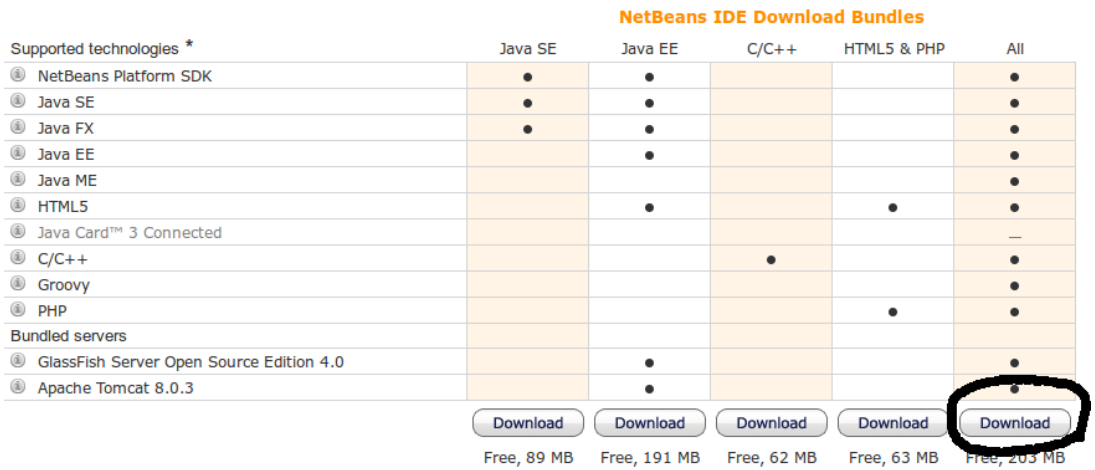
NetBeans



NetBeans IDE Download Bundles

Supported technologies *	Java SE	Java EE	C/C++	HTML5 & PHP	All
NetBeans Platform SDK	•	•			•
Java SE	•	•			•
Java FX	•	•			•
Java EE		•			•
Java ME					•
HTML5		•		•	•
Java Card™ 3 Connected					–
C/C++			•		•
Groovy					•
PHP				•	•
Bundled servers					
GlassFish Server Open Source Edition 4.0		•			•
Apache Tomcat 8.0.3		•			•
	Download	Download	Download	Download	Download
	Free, 89 MB	Free, 191 MB	Free, 62 MB	Free, 63 MB	Free, 203 MB

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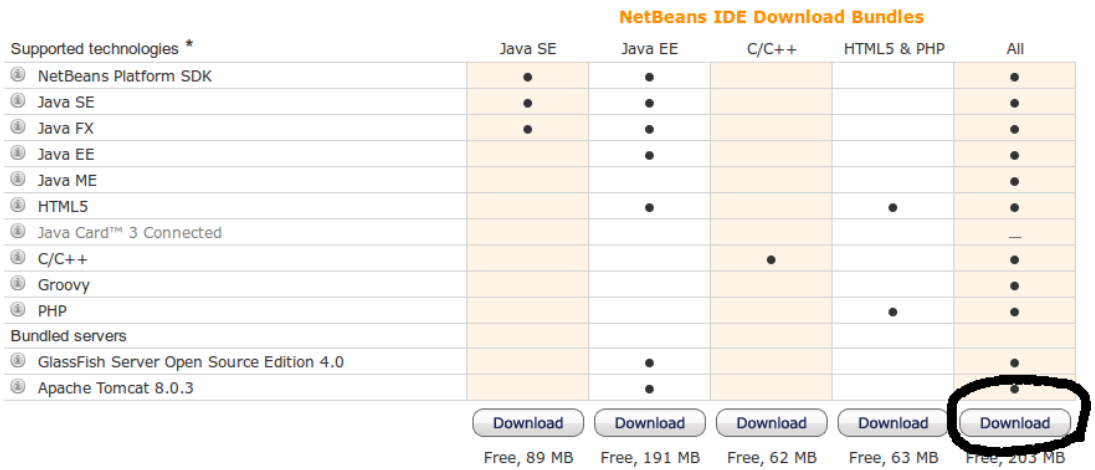

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Java SE	•	•			•
Java FX	•	•			•
Java EE		•			•
Java ME					•
HTML5		•		•	•
Java Card™ 3 Connected					–
C/C++			•		•
Groovy					•
PHP				•	•
Bundled servers					
GlassFish Server Open Source Edition 4.0		•			•
Apache Tomcat 8.0.3		•			•
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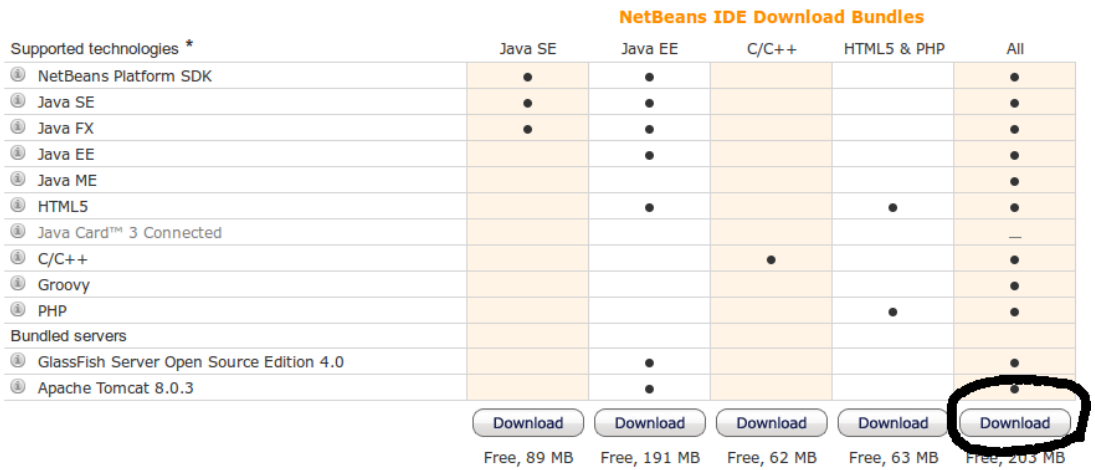

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Java ME					•
HTML5		•		•	•
Java Card™ 3 Connected					–
C/C++			•		•
Groovy					•
PHP				•	•
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- Here follows the 10 usability heuristics mentioned above.

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4. Follow platform conventions, users should not have to wonder whether different words, situations, or actions mean the same thing.

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10. If necessary, provide help and documentation. The help should be easy to search, focused on the user's task, and list concrete steps to be carried out.