Introduction to Internet Applications

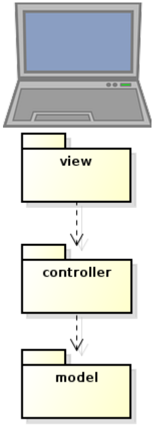
Internet Applications, ID1354

Contents

Section

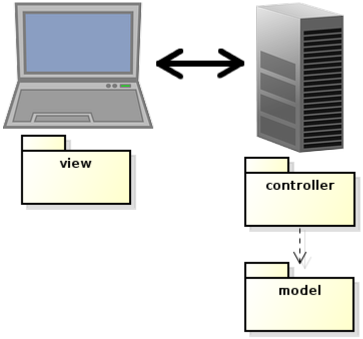
- Distributed Architectures
- HTTP and Other Protocols
- Tools
- User Interface Design

Local Application



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

Introducing a Server



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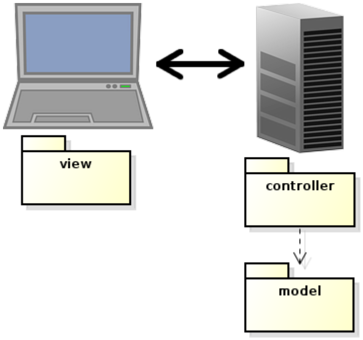

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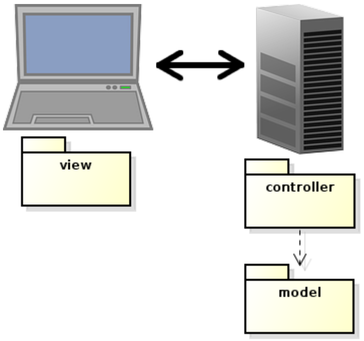

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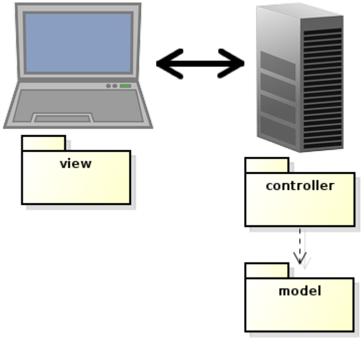

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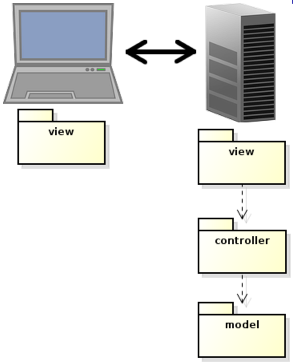
This architecture is not good, we also need layers for communication.

Server-Side Communication



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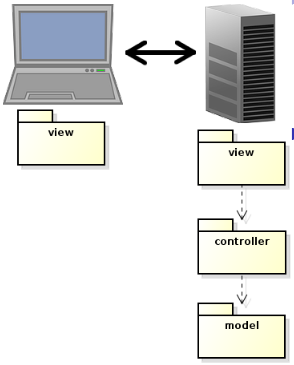

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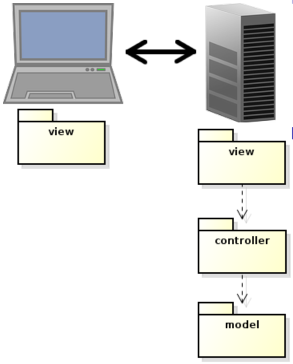

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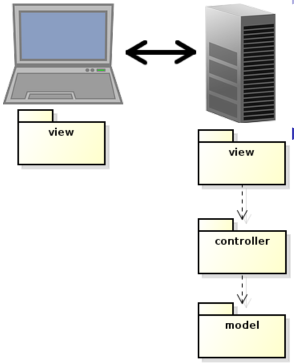

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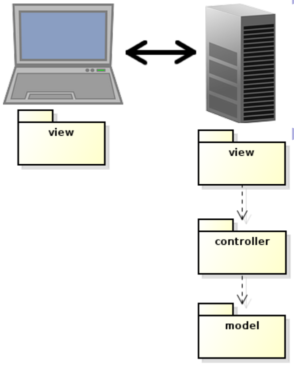

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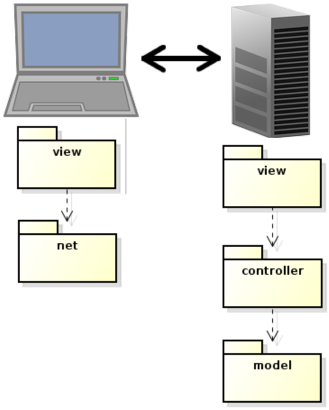
It might seem that we need yet a layer, for network handling. There is such a layer, but it is in the web server. We don't write it ourselves.

Client-Side Communication



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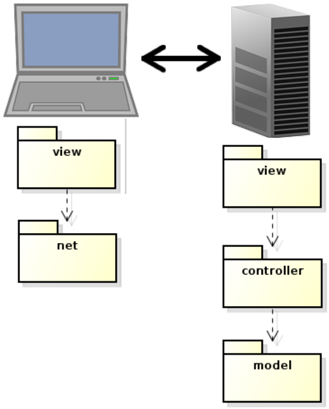

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- Actually, the browser handles most of the communication.
  - The small network code written by us is normally considered part of the client-side view, the net layer is omitted.

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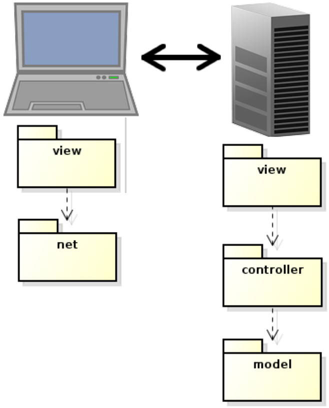

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- Actually, the browser handles most of the communication.
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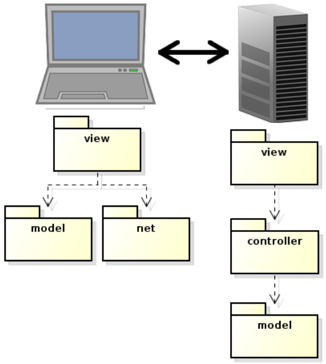
- This is a traditional web application.

The MVVM Pattern



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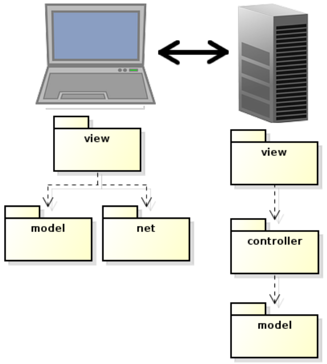

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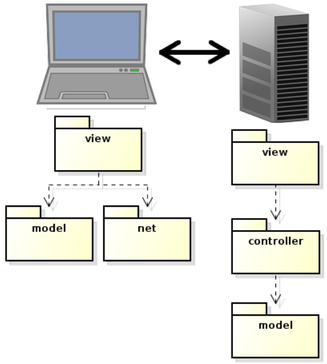

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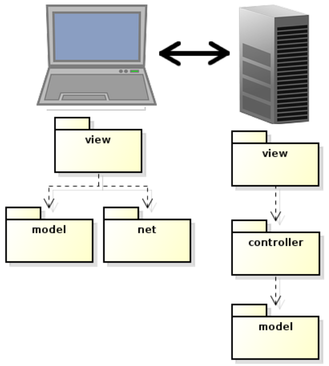

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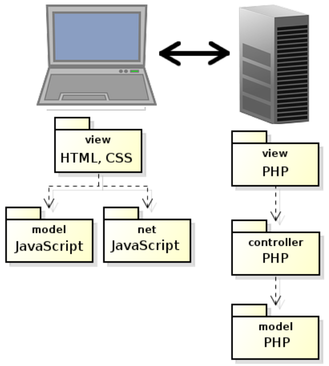
- This is referred to as the MVVM, model-view-viewmodel pattern.

Programming Languages



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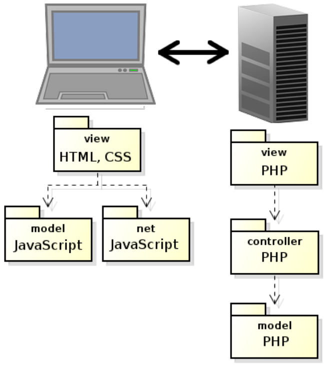
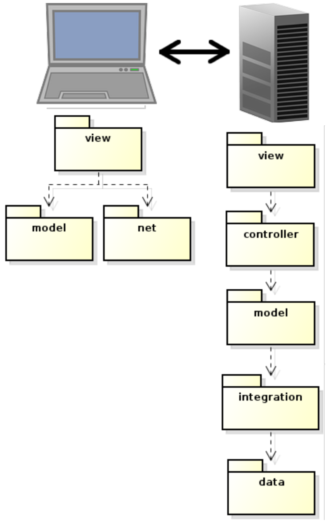


- This is the architecture we will normally use during the course.
- The view is programmed in HTML and CSS, client side behavior is programmed in JavaScript and the entire server side code is written in PHP.

Three-Tier Architecture



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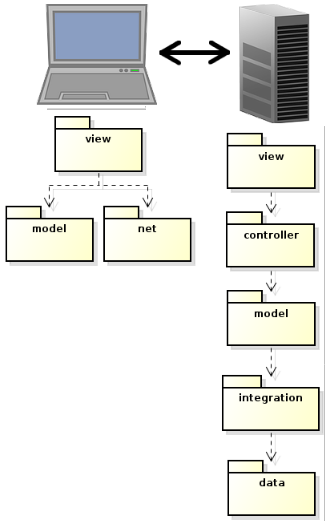

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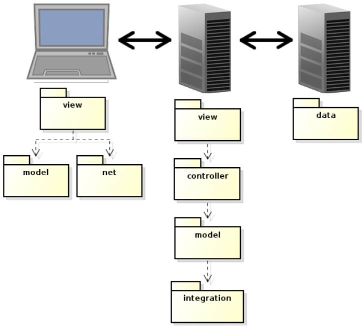
- We also introduce the integration layer, to handle the database calls.

Three-Tier Architecture (Cont'd)



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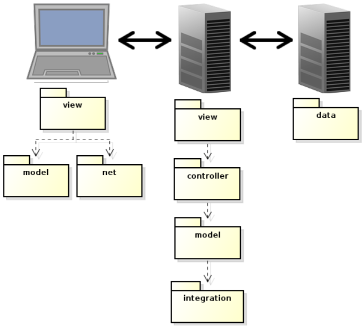
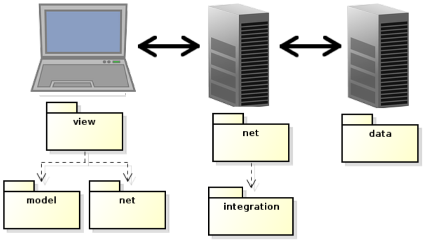


- In a bigger application, we would most likely place the database in a separate node.
- This is called three-tier architecture and is, since long time, the dominating architecture for web applications.

Event-Driven Architecture



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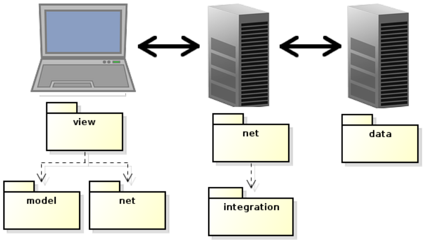

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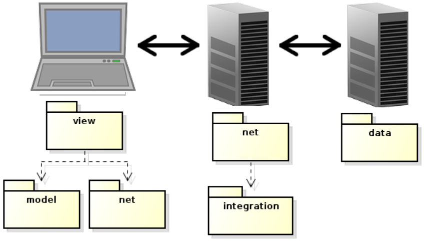

- In the latest year, there is a growing tendency to move business logic to the client, perhaps completely remove the server-side model.
- This is made possible with web sockets, which enable full duplex browser-server communication.
- The motive is to reduce communication latency. The browser informs the server about user actions, but does not wait for response before updating the view.

Section

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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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  - 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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  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.

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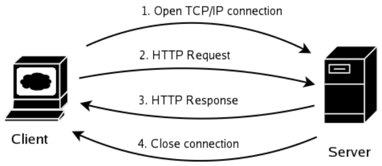
- HTTP is based on TCP, which means a TCP connection is established for each browser-server communication.

The Request-Response Cycle



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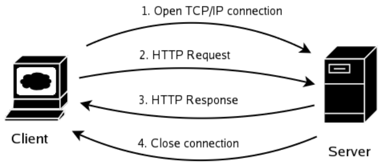

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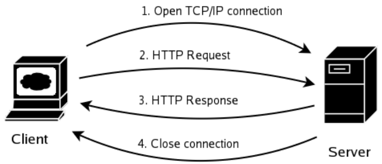

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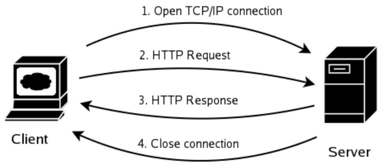

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3. The server sends a response to the client. Also the response consists of HTTP headers, and data if the response required data.
4. The server closes the TCP connection.

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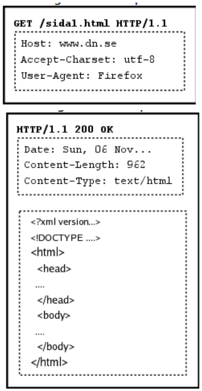
- If a request has a cookie with a session identifier, it identifies the user. If there is no such cookie, the user does not have a running session.
- On the server, the session id can be associated with any amount of data related to the user with that session. This is called conversational state.

HTTP Message Format



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GET /sida1.html HTTP/1.1
Host: www.dn.se
Accept-Charset: utf-8
User-Agent: Firefox
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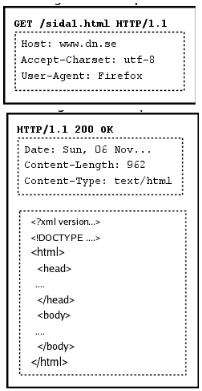

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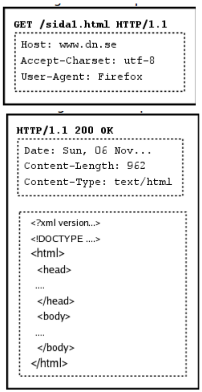

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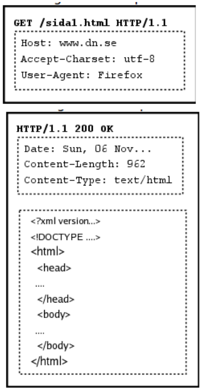
- The request start-line consists of HTTP method (se left), URL path and HTTP version, e.g., **`GET /page1.html HTTP/1.1`**
- The response start-line consists of HTTP version, status code and reason, e.g., **`HTTP/1.1 200 OK`**

HTTP Message Format



```
GET /sida1.html HTTP/1.1
Host: www.dn.se
Accept-Charset: utf-8
User-Agent: Firefox
```

```
HTTP/1.1 200 OK
Date: Sun, 06 Nov...
Content-Length: 962
Content-Type: text/html

<?xml version...>
<!DOCTYPE ....>
<html>
  <head>
  ....
  </head>
  <body>
  ....
  </body>
</html>
```

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

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

Safe and Idempotent Methods

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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.

When to Use GET

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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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  - The data shall not appear in the URL. Note that this is not a matter of security, data is sent in clear text also when using **`POST`**.

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- When using the **`GET`** method, parameters are appended to the URL as a query string, **`http://some.domain/some/path?city=stockholm&country=sweden`**
- When using the **`POST`** method, parameters are included in the message body.

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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.

Web Browsers

- It is important to test the web application with all different browsers that shall be able to display it.

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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.

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- The most commonly used web server is apache, `https://httpd.apache.org/`
- Other common web servers are nginx, **`http://wiki.nginx.org/Main`** and Microsoft IIS.

Web Servers (Cont'd)

- You need to install a web server on your laptop. All labs will be reported on your own laptop, there is no web server in ICT school where you can run all the labs.

Web Servers (Cont'd)

- You need to install a web server on your laptop. All labs will be reported on your own laptop, there is no web server in ICT school where you can run all the labs.
- It might take time to get the web server running. You are advised to start installing the web server now.

Section

Web Development Tools

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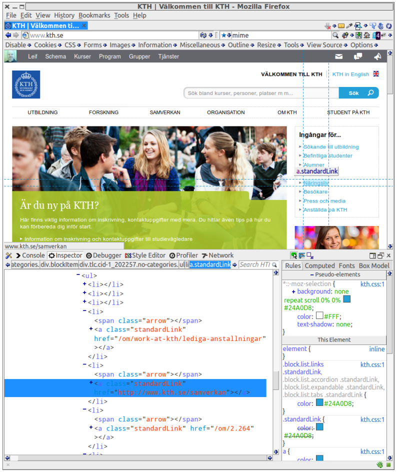
- You are strongly advised to start using some of the following tools, they will help you a lot.

Browser Web Console


KTH | Välkommen till KTH - Mozilla Firefox
File Edit View History Bookmarks Tools Help
www.kth.se
Console Inspector Debugger Style Editor Profiler Network
ategories. div.blockItem div.tlc.cid-1_202257.no-categories. ul li a.standardLink
Rules Computed Fonts Box Model

```
- <ul>
  + <li></li>
  + <li></li>
  + <li></li>
  - <li>
      <span class="arrow"></span>
    + <a class="standardLink"
      href="/om/work-at-kth/lediga-anstallningar"
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*::-moz-selection {                         kth.css:1
    + background: none
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element {                                   inline
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.block.list.links                           kth.css:1
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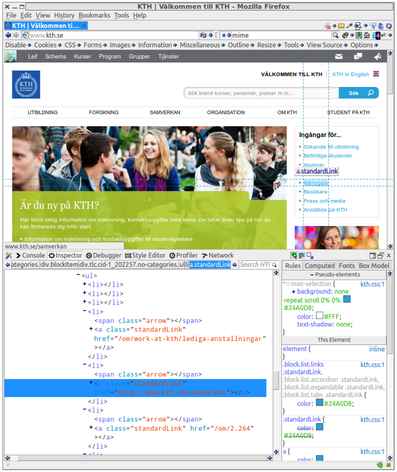
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Leif Schema Kurser Program Grupper Tjänster
VÄLKOMMEN TILL KTH
KTH in English
Sök bland kurser, personer, platser m m...
Sök
UTBILDNING FORSKNING SAMVERKAN ORGANISATION OM KTH STUDENT PÅ KTH
Ingångar för...
Sökande till utbildning
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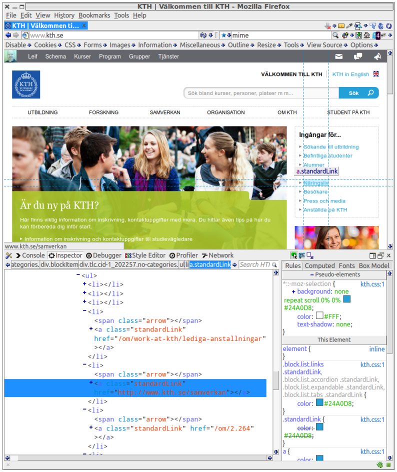
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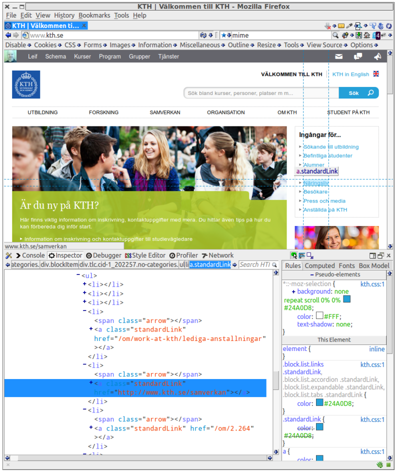
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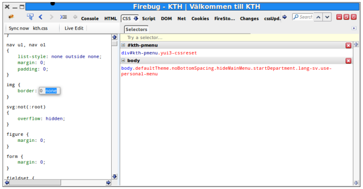
- It enables you to run JavaScript expressions in the web page.
- It also lets you choose elements from the web page and have their HTML and CSS displayed.

Browser (Cont'd)

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

Firebug


Firebug - KTH | Välkommen till KTH
Console HTML CSS Script DOM Net Cookies FireSto... Changes cssUpd.
Search
Sync now kth.css
Live Edit
Selectors
Try a selector...

```
nav ul, nav ol
{
    list-style: none outside none;
    margin: 0;
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}

img {
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#kth-pmenu
div#kth-pmenu.yui3-cssreset
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body.defaultTheme.noBottomSpacing.hideMainMenu.startDepartment.lang-sv.use-
personal-menu
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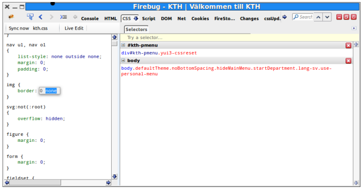

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- In addition to console features, you can for example debug JavaScript, mark HTML elements, edit CSS and log network traffic.

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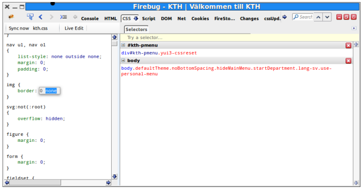

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{
    overflow: hidden;
}

figure {
    margin: 0;
}

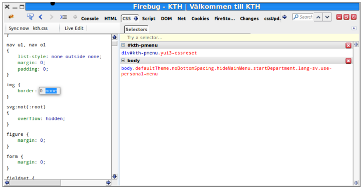
form {
    margin: 0;
}

fieldset {
```

```
#kth-pmenu
div#kth-pmenu.yui3-cssreset
body
body.defaultTheme.noBottomSpacing.hideMainMenu.startDepartment.lang-sv.use-
personal-menu
```

- Firebug is a powerful plug-in to Firefox.
- In addition to console features, you can for example debug JavaScript, mark HTML elements, edit CSS and log network traffic.
- There are also many plug-ins to Firebug.

Firebug


Firebug - KTH | Välkommen till KTH
Console HTML CSS Script DOM Net Cookies FireSto... Changes cssUpd.
Search
Sync now kth.css
Live Edit
Selectors
Try a selector...

```
nav ul, nav ol
{
    list-style: none outside none;
    margin: 0;
    padding: 0;
}

img {
    border: 0 none
}

svg:not(:root)
{
    overflow: hidden;
}

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    margin: 0;
}

form {
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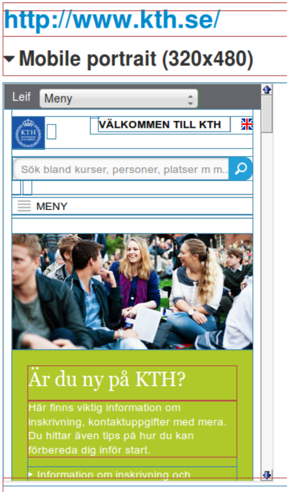
- There is a cross-browser version of Firebug, written in JavaScript, that offers a subset of the functionality for most other browsers.

Web Developer


http://www.kth.se/
Mobile portrait (320x480)
Leif
Meny
VÄLKOMMEN TILL KTH
Sök bland kurser, personer, platser m m..
MENY
Är du ny på KTH?
Här finns viktig information om inskrivning, kontaktuppgifter med mera. Du hittar även tips på hur du kan förbereda dig inför start.
Information om inskrivning och

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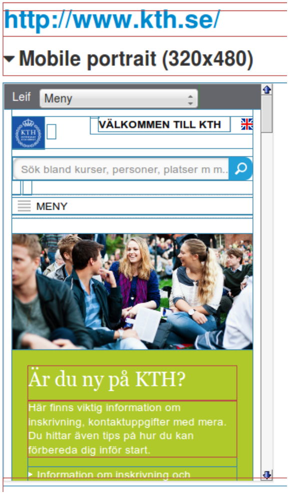
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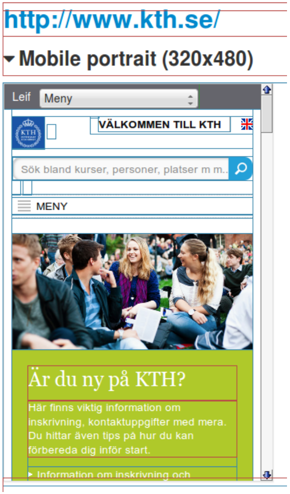
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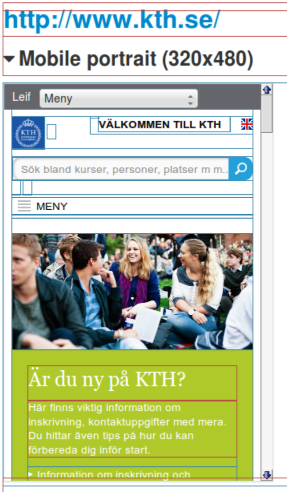
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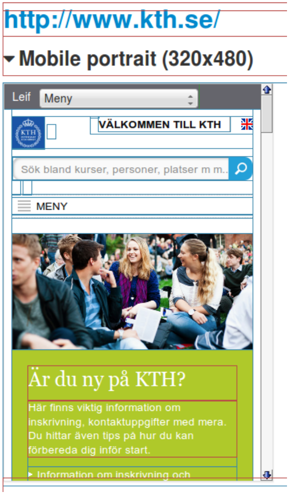

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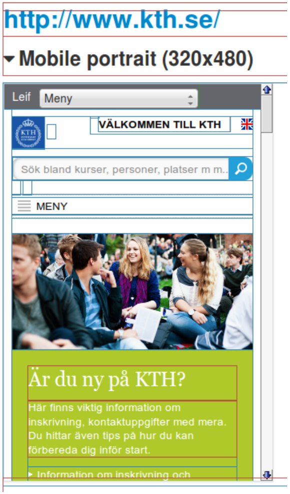
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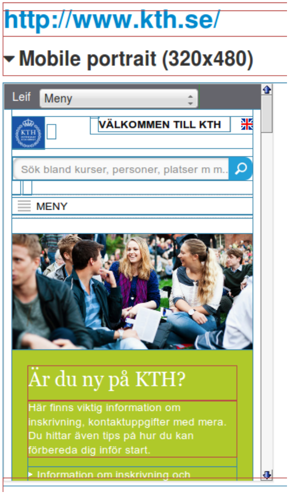
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  - Validate HTML and CSS.
- Web Developer has been ported to Chrome.

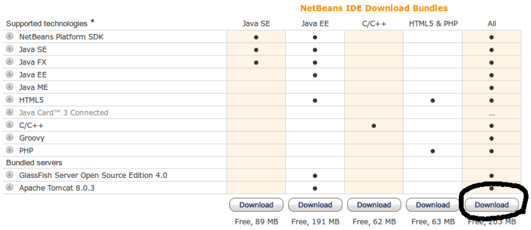
Validators

- There are online validators for both HTML and CSS. Links can be found on the course web site.

Validators

- There are online validators for both HTML and CSS. Links can be found on the course web site.
- Remember to always validate your HTML and CSS code.

NetBeans

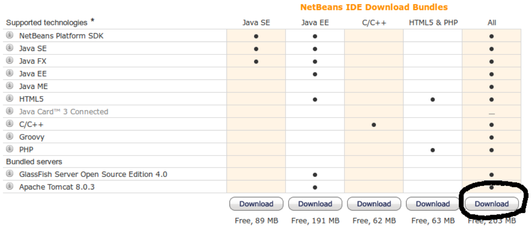


NetBeans IDE Download Bundles

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

- There are many different IDEs for web development, all have their pros and cons.

NetBeans



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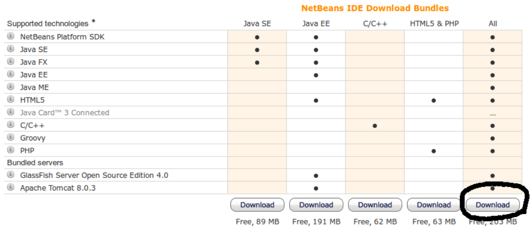

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- There are many different IDEs for web development, all have their pros and cons.
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- Most important is that actually you use an IDE, do not program in a text editor unless you are really sure it is what you prefer.

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Section

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  - Other lists linked from the latter.
- Here follows the 10 usability heuristics mentioned above.

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2. Use words, phrases and concepts familiar to the user, rather than system-oriented terms.
3. Implement undo and redo.
4. Follow platform conventions, users should not have to wonder whether different words, situations, or actions mean the same thing.

J. Nielsen's UI Design Principles

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7. Use accelerators to speed up interaction for expert users.
8. Remove irrelevant information.

J. Nielsen's UI Design Principles

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J. Nielsen’s UI Design Principles

9. Error messages should be expressed in plain language, precisely indicate the problem, and suggest a solution.
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.