



Java Servlets

- Basic concepts
- Simple examples
- Java Server Pages basics

WWW programming – <http://www.cs.uta.fi/wo>



Servlet basics

- Servlets are the Java technology for serving HTTP requests.
- They are particularly used for serving HTTP requests, but they can be used as a basis for serving other requests, too.
- Basic servlet functionalities implemented by the basic HTTP servlet classes have the features for accessing HTTP request data and managing cookies and sessions.
- Typically some other technology is used for user interface or representation part.
 - Basic servlets are not that handy for representation matters.

WWW programming – <http://www.cs.uta.fi/wo>



Servlet info

- Servlets are fairly popular – there are lots of tutorials etc., see e.g. The J2EE 1.4 Tutorial, <http://java.sun.com/j2ee/1.4/docs/tutorial/doc/index.html>
 - Chapter 11 is about Servlets
- Because of different versions etc. all documentation do not agree on all details
- Servlets are initialized (at this moment you may want to initialize some data common etc.)
- Servlets serve the Service requests
- Finally, servlets are finalized.
 - The J2EE tutorial example keeps up data about service requests and only runs down the servlet when there are no active requests.

WWW programming – <http://www.cs.uta.fi/wo>



Important java stuff

- `javax.servlet.Servlet`
 - Interface defining methods that all servlets implement
- `javax.servlet.GenericServlet`
 - An abstract class for all Servlets
- `javax.servlet.HttpServlet`
 - An abstract class for servlets serving HTTP requests.
 - Most importantly, a `HttpServlet` needs to implement the `doPost()` and `doGet()` methods, which are called when a post or get request is received.
 - This is the basis for getting started with the implementation `http` servlets.

WWW programming – <http://www.cs.uta.fi/wo>



Jakarta tomcat

- Servlet specification is a standard.
- To execute servlets, one needs software to implement a standard.
- Jakarta tomcat of the Apache project is one implementation.
- For us, it is much easier and much more practical to study servlets using some environment to execute them.
- However, there are some rules of the implementation that we must study a bit and then follow.
- Jakarta tomcat has its documentation in the Internet
- Tomcat website: <http://tomcat.apache.org/>

WWW programming – <http://www.cs.uta.fi/wo>



Tomcat – getting started

- Tomcat is java software
 - Basic installation is easy
- Tomcat port (the port that tomcat listens) can be configured, by default it is 8080
- Apache installation can be made to direct certain URLs to Tomcat
 - For this, Apache installation needs a little addition.
 - To configure all this may be a little bit complicated.
- Once tomcat is up and running, you may build and install applications.
- <http://tomcat.apache.org/tomcat-5.5-doc/appdev/index.html> contains developer documentation.

WWW programming – <http://www.cs.uta.fi/wo>





Tomcat installation directory structure

University of Tampere, CS Department
Jyrki Nummenmaa

- We follow the standard / default application directory structure.
- Follows the "sample" application, which is a tomcat example.
- Let's study the example.
- However, this is a ready-made application.
- We do not need to build it, we can just deploy it!

WWW programming – <http://www.cs.uta.fi/wo>



Tomcat source directory structure

University of Tampere, CS Department
Jyrki Nummenmaa

- Configured in build.xml
- Application root: build.xml
 - Configures the application properties and how to build/install/remove it.
- src subdirectory: application sources
- web subdirectory: web contents (web documentroot)
 - html files, jsp files (more on these later), WEB-INF subdirectory contains web configuration (see examples)
- build subdirectory: This is where deployment will build the application (the contents are not supplied by the developer, the installation will normally create these files). Again, see examples.

WWW programming – <http://www.cs.uta.fi/wo>



Tomcat application installation (deployment)

University of Tampere, CS Department
Jyrki Nummenmaa

- There are many ways, we shall now start with just one:
 - Using the Tomcat manager
 - For this, use a war file (a jar file with a name ending in .war).
- Using the tomcat web manager, you can upload the war file.
 - There is password authentication here and you need a Tomcat username/password with rights to install applications.
 - Upload the file with managers html interface.
 - Tomcat will unpack the war file and install the application as it is configured in the configuration files.
- ant installation using the xml file that specifies the installation
 - build.xml specifies the ant operations. See the example file.
 - Ant is in a sense similar to the Make facility on Linux.

WWW programming – <http://www.cs.uta.fi/wo>



Java Server Pages (JSP)

University of Tampere, CS Department
Jyrki Nummenmaa

- Presentation technology standard
- Provide a way to specify presentation part separately (and also this way the servlet does not need to print all web content.
- Tomcat supports Java Server Pages
- Typically Java Server Pages and servlets are combined with yet another technology to build the whole application (more on this later...)
- JSP commands are embedded into HTML (like Smarty)
- <http://java.sun.com/products/jsp/syntax/2.0/syntaxref20.html> has a reference guide.
- <http://java.sun.com/j2ee/1.4/docs/tutorial/doc/index.html> covers also JSP

WWW programming – <http://www.cs.uta.fi/wo>



JSP basics

University of Tampere, CS Department
Jyrki Nummenmaa

- The servlet engine processes the required JSP pages and combines it with the application it is running.
- Where does the JSP content come from?
 - It could be static or not needing any external input (like a date)
 - It could come from the request (get the data from the request)
 - It could come from the application through a bean interface
 - Setters and getters are required.
- See examples contained in Tomcat!

WWW programming – <http://www.cs.uta.fi/wo>



JSP and database

University of Tampere, CS Department
Jyrki Nummenmaa

- The servlet WO_webapp_examples includes some further JSP examples.
 - Most of them just explain formatting or such things.
- The Events example is maybe a little bit more interesting, as it accesses the database to get an event listing.
 - Notice that there is now quite a bit of Java code embedded into the JSP page
 - You may also notice, how the view level and model level implementations are mixed.
 - In a bigger application, this might cause problems later on.

WWW programming – <http://www.cs.uta.fi/wo>





Servlet applications

University of Tampere, CS Department
Jyrki Nummenmaa

- Servlets alone are a clumsy technology to build applications.
- They are good for executing more complicated operations.
- To display content, a JSP-based technology is better.
- Also, there are many competing technologies built on top of servlets and JSP for application developments.
- These technologies typically try to further split further the model and view parts of the application.
- The course does not cover these technologies. Examples:
 - Struts (An Apache project)
 - Velocity (An Apache project)
 - Shale (An Apache project)
 - JavaServer Faces (From Sun)

WWW programming – <http://www.cs.uta.fi/wo>



Servlet application elements

University of Tampere, CS Department
Jyrki Nummenmaa

- A Servlet application may contain e.g. following components:
 - web subdirectory
 - Normal web content: css and html files
 - JSP pages
 - web/WEB-INF
 - web.xml defines application servlet structure
 - lib subdirectory
 - Contains libraries (like the postgres driver in our case) needed by our software
 - src subdirectory
 - Contains source code and may contain parameter files accessed by the source code at src root (this will be the class subdirectory root in the build subdirectory)

WWW programming – <http://www.cs.uta.fi/wo>



build/WEB-INF

University of Tampere, CS Department
Jyrki Nummenmaa

- When ant builds and deploys the application, it will build it in the build subdirectory.
 - The build/WEB-INF contains the following
 - WEB-INF/lib is copied from lib
 - WEB-INF/classes is compiled from src
 - Notice that if you place e.g. resource files for Java programs into src they will be copied into WEB-INF/classes
 - Similarly the contents of web/WEB-INF will be copied to build/WEB-INF

WWW programming – <http://www.cs.uta.fi/wo>



Servlets and JSP

University of Tampere, CS Department
Jyrki Nummenmaa

- Servlets are good for computations
- JSPs are good for presentation
- They may be combined by re-directing the request
- The servlet example, which adds a link to the link table, does exactly that
 - The servlet reads the request data
 - It adds the new link to the database
 - Then it passes on the processing (withing the same request lifetime) to a JSP page, which shows the links.

WWW programming – <http://www.cs.uta.fi/wo>



Re-directing requests

University of Tampere, CS Department
Jyrki Nummenmaa

- If you define request-level variables, they can be used to carry on information within one request processing
 - E.g you may collect information from database and put it in a variable (e.g of type Vector) in the request, then pass on the request and the following servlet or JSP page will get the information.
- This way, it is possible to preprocess the requests
- You may, e.g. validate first and the either re-direct to an error page or a page, which performs the required action.
- See servlet examples.

WWW programming – <http://www.cs.uta.fi/wo>



Data from servlets to JSP pages

University of Tampere, CS Department
Jyrki Nummenmaa

- Servlets can assign data to attribute variables for JPS pages.
 - Attributes are named variables, typically objects having required setters and getters.
- If the JSP pages accesses the database directly, it combines the view and the model parts.
- Instead, the servlet may
 1. Create a variable
 2. Put it into the session as an attribute
 3. Forward the processing to a suitable JSP page
 - See example code from the alternative Add Link implementation.
 - A Vector of Link objects is passed on to the JSP page.
 - The JSP page uses JSTL tags to iterate and output.

WWW programming – <http://www.cs.uta.fi/wo>

