

Web Development using Java, JSP, and Web Services

Web Technologies

Today

Web Technologies

Internet

WWW

Protocols

TCP/IP

HTTP

Apache

Next Time

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Web Technologies

Lecture #3 2008

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Web Technologies

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Internet

WWW

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Apache

Next Time

- 1 Web Technologies
 - Internet
 - WWW
- 2 Protocols
 - TCP/IP
 - HTTP
- 3 Apache

Web Development using Java, JSP, and Web Services

Web Technologies

Today

Web Technologies

Internet

WWW

Protocols

TCP/IP

HTTP

Apache

Next Time

Web Technologies

- Markup & presentation (HTML, XHTML, CSS etc)
- Data storage & access (JDBC, XML etc)
- Network & application protocols (TCP/IP, HTTP etc)
- Programming & scripting languages (Java, JSP etc)

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Web Technologies

Today

Web Technologies

Internet

WWW

Protocols

TCP/IP

HTTP

Apache

Next Time

Internet

- Heterogenous network of networks
- More than 1 billion users
- Handles the web, e-mail, file transfers, instant messaging, telecommunication etc

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Web Technologies

Today

Web Technologies

Internet

WWW

Protocols

TCP/IP

HTTP

Apache

Next Time

Internet

- Internet Protocol (IP)
- Packet-oriented
- Uses IP-addresses (130.239.8.60)

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Web Technologies

Today

Web Technologies

Internet

WWW

Protocols

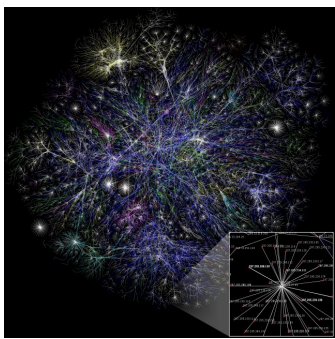
TCP/IP

HTTP

Apache

Next Time

Internet



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Web Technologies

Today

Web Technologies Internet **WWW**

Protocols TCP/IP HTTP

Apache

Next Time

World Wide Web (WWW)

- Web clients and servers
- More than 1 billion web pages on
- More than 100 million sites
- More than 170 million TLDs (May 2008)
- HTML, graphics, and components
- Transferred via HTTP (over TCP/IP)

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Today

Web Technologies Internet **WWW**

Protocols TCP/IP HTTP

Apache

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Hypertext Markup Language (HTML)

- Text-based
- Content + Markup
- Interpreted and visualized by browsers
- Constitutes a small part of the resulting network traffic

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Today

Web Technologies Internet **WWW**

Protocols TCP/IP HTTP

Apache

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Extensible Hypertext Markup Language (XHTML)

- XML version of HTML
- Well-formed XML document
- Can be parsed by any XML tool
- Treated by browsers as a new version of HTML

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Today

Web Technologies Internet **WWW**

Protocols TCP/IP HTTP

Apache

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Uniform Resource Locator (URL)

<http://www.cs.umu.se:80/kurser/5DV076/SOM-07/index.html>

Contains

- Protocol (http)
- Address (www.cs.umu.se)
- Port (80)
- Path (/kurser/5DV076/SOM-07/index.html)

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Today

Web Technologies Internet **WWW**

Protocols TCP/IP HTTP

Apache

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Universally Unique Identifier (UUID)

20269f4c-9111-4778-8f78-249fea2b2e6e

- Generated from MAC-addresses, timestamps, and random numbers
- Unique to a very high probability
- Used as unique filenames, database ids etc

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Today

Web Technologies Internet **WWW**

Protocols TCP/IP HTTP

Apache

Next Time

Web Client

- Requests resources via HTTP
- Interprets and presents the data retrieved
- Can be anything that requests data via HTTP
- Usually a web browser
- Uses URLs to reference resources

Web Server

- Serves resources via HTTP
- Can be anything that serves data via HTTP
- Usually a dedicated server software
- May contain several pieces of software working together
- One server may serve several sites (and vice versa)
- Large sites often clustered for performance

Domain Name System (DNS)

- A network of DNS servers
- Resolves IP-addresses
- www.umu.se = 130.239.8.60
- 130.239.8.60 = www.umu.se

Proxy

Acts as an intermediary between clients and servers

A web proxy can, e.g.,

- Enforce access control
- Block, filter or alter information
- Cache information
- Anonymize traffic
- Perform network address translation

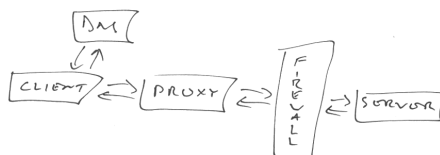
Firewall

Regulates traffic between networks

A firewall can, e.g.,

- Enforce access control
- Block, filter or alter connections
- Perform network address translation
- Be stateless, stateful or application-aware

Actors



Protocols

Specifies how information is exchanged in networks

- In which order
- In what format
- Transport level and application level protocols
- Built in protocol stacks

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Web Technologies

Today

Web Technologies
Internet
WWW

Protocols
TCP/IP
HTTP

Apache

Next Time

TCP/IP

- Packet-switched transport protocols
- Transport: Internet Protocol (IP)
- Reliable: Transmission Control Protocol (TCP)
- Unreliable: User Datagram Protocol (UDP)

- Each computer has (at least one) IP-address
- IP-addresses are resolved using DNS-systems
- Packets are routed from sender to receiver
- Packets can be lost, delayed or arrive in any order

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Web Technologies

Today

Web Technologies
Internet
WWW

Protocols
TCP/IP
HTTP

Apache

Next Time

Hypertext Transfer Protocol (HTTP)

- Text-based
- Application-level protocol (mostly used over TCP)
- Client-driven (requests and responses)
- Stateless (sessions are stored in cookies or rewritten URLs)
- Can handle text as well as binary data (encoded as text)

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Web Technologies

Today

Web Technologies
Internet
WWW

Protocols
TCP/IP
HTTP

Apache

Next Time

HTTP Request

- Request line (method + URI + protocol)
- Headers (request information)
- Body (optional)

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Web Technologies

Today

Web Technologies
Internet
WWW

Protocols
TCP/IP
HTTP

Apache

Next Time

HTTP GET Request Example

```
GET /kurser/5DV076/SOM-07/test.html HTTP/1.1
Host: www.cs.umu.se
```

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Web Technologies

Today

Web Technologies
Internet
WWW

Protocols
TCP/IP
HTTP

Apache

Next Time

HTTP Response

- Status line (protocol + status code + reason phrase)
- Headers (response information)
- Body (response data)

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Web Technologies

Today

Web Technologies
Internet
WWW

Protocols
TCP/IP
HTTP

Apache

Next Time

HTTP Response Example

```
HTTP/1.1 200 OK
Date: Tue, 15 May 2007 14:25:27 GMT
Server: Apache/2.0.54 (Unix)
Accept-Ranges: bytes
Content-Length: 50
Keep-Alive: timeout=15, max=100
Connection: Keep-Alive
Content-Type: text/html; charset=ISO-8859-1
```

```
<html>
<head>
</head>
<body>
test
</body>
</html>
```

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HTTP Request Methods

- **HEAD** - simulate a get request
- **GET** - retrieve resource
- **POST** - submit data to resource
- **PUT** - upload resource
- **DELETE** - delete resource
- **TRACE** - echo request
- **OPTIONS** - query server for supported methods
- **CONNECT** - create TCP/IP tunnel

HTTP HEAD Request

- Used to retrieve meta-information (headers)
- Simulates GET request
- No body (data) in response

HTTP GET Request

- Used to retrieve resources from web servers
- Parameters stored in query string (limited size)
- Default method for data retrieval

HTTP POST Request

- Used to submit (form) data to resources
- Data stored in request body
- Default method for data storage

HTTP PUT Request

- Used to upload resources
- Data stored (encoded) in request body

HTTP Response Status Codes

Directs client behavior

- 100-199 - informational
- 200-299 - request successful
- 300-399 - resource unavailable / moved
- 400-499 - client-side error
- 500-599 - server-side error

Apache

- Apache Software Foundation
- Non-profit organization developing open-source software
- <http://www.apache.org/>

Apache HTTP Server

- A (patchy) web server
- Arrived early and helped shape the web
- Runs 50% of the world's web sites (May 2008)
- Serves HTTP and HTTPS requests
- Runs CGI-scripts for dynamic content
- Can host modules for PHP, JSP, ASP etc

Apache Tomcat

- Servlet & JSP container with built-in web server
- Can run standalone or as a module in Apache
- Serves HTTP and HTTPS requests
- Requests may have been forwarded from HTTPD Server
- Contains configuration and management tools

Apache Axis2

- Web Service framework
- Refactorization of Axis
- Contains tools for generating language bindings and interfaces
- Includes a Web Service hosting environment
- Can run as a module / web application in Tomcat

Apache Ant

- A build tool for software development
- "Make for Java"
- Used to automate build, deployment and clean-up

Apache Derby

- A Pure-Java relational database management system
- Can be embedded into Java programs
- No configuration required
- No management clients provided
- Databases accessible through JDBC

