# WEB SYSTEM ARCHITECTURE

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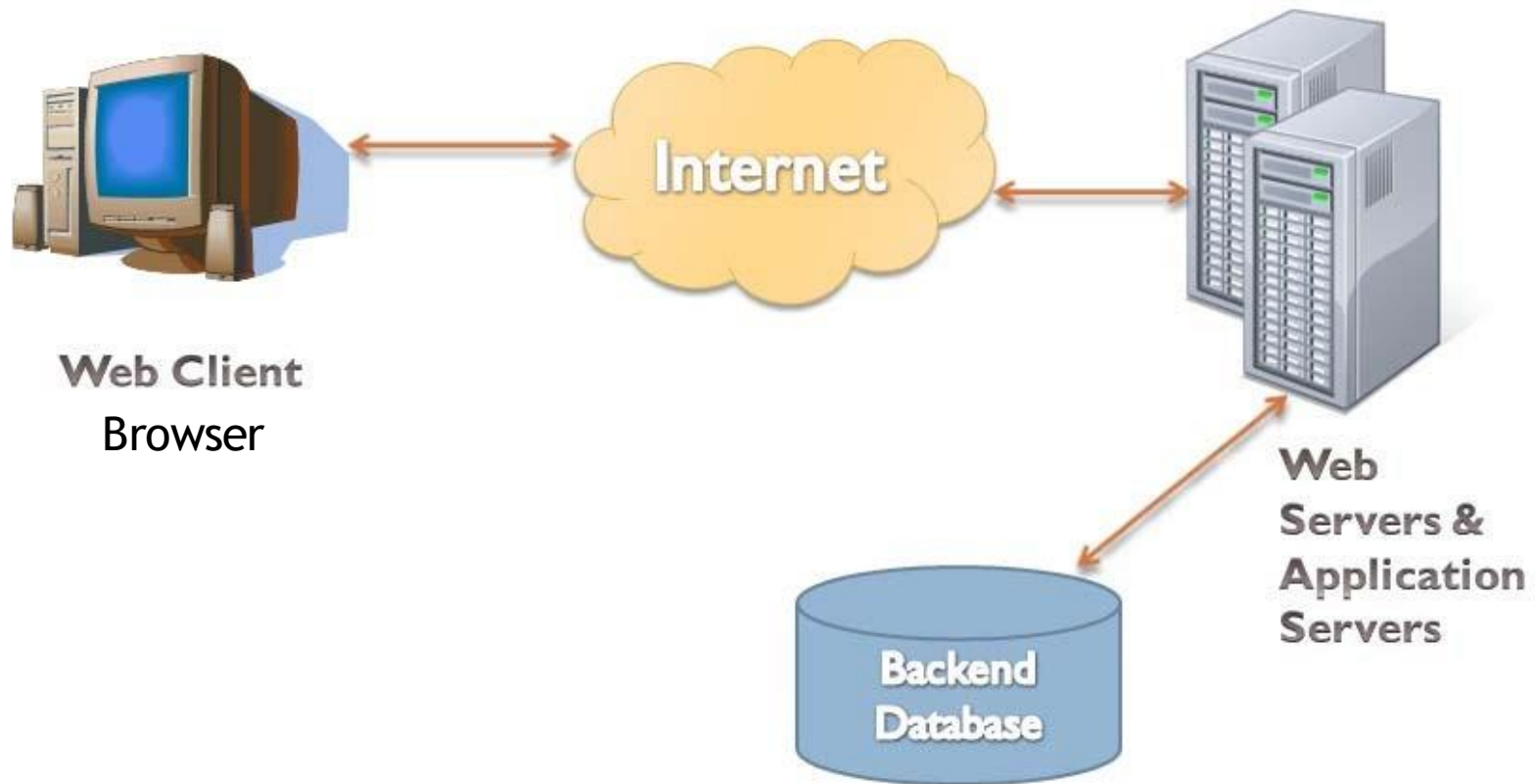


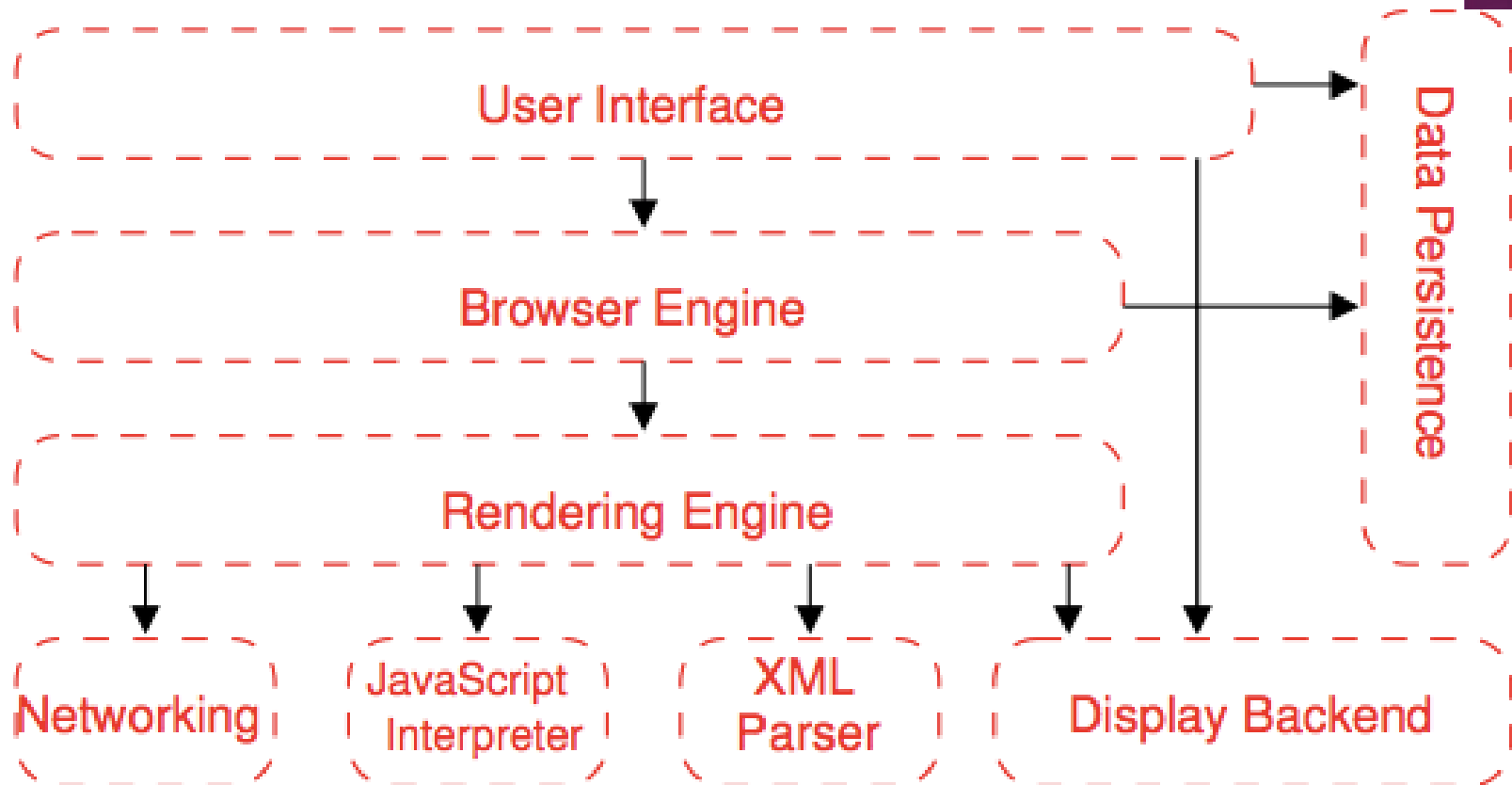Fig: Basic Components of a Web based system

☐ Types of web clients may vary depending on the application. *Fore.g.* –

   ☐ Web browsers (PC, mobile, text-only browsers, voice browsers)

   ☐ Chat browsers/interfaces

   ☐ **Software robots** *(no direct user contact)*

   ☐ **Software agents on the Web** *(initiated with user action)*

☐ <u>Basic tasks to be handled by a browser</u>

　☐ Reformat the URL entered as a valid HTTP request message.

　☐ Use DNS to convert the host name to the appropriate IP address.

　☐ Establish a TCP connection using the IP address of the specified web server.

　☐ Send the HTTP request over TCP connection and wait for the server's response.

　☐ Display document contained in the response. (e.g. direct display of plain text, rendering HTML pages etc.)

# WEB SYSTEM COMPONENTS (CONTD.) WEB CLIENTS

- Some important additional functionalities provided by modern browsers
  - Automatic URL completion (…data persistence)
  - Script Management
  - Event Handling
  - Management of form GUI
  - Secure Communication
  - Session/Cookie Management
  - Handling extension mechanisms

# EXTENSION MECHANISMS FOR THE WEB CLIENT

☐ Mechanisms that add additional capabilities to the browser, either automatically or by user intervention.

☐ Types -

a. MIME Types or Internet Media Types

b. Plug-ins

c. Add-ons

d. Scripts

e. Applets

f. Controls

# EXTENSION MECHANISMS FOR THE WEB CLIENT

a. MIME Types  or IM Types

☐ **Multipurpose Internet Mail Extensions/Internet media type**

  ☐ standard identifier used on the Web/Internet to indicate the type of data that a file contains.

  ☐ Common uses include :

    ☐ In web browsers - how to display or output files that are not in HTML format

    ☐ In search engines -  to classify data files on the web.

    ☐ In email clients - to identify attachment files.

# EXTENSION MECHANISMS FOR THE WEB CLIENT

a. MIME Types or IM Types (contd.)

☐ Each document is tagged with a *type* to identify what kind of resourse it is.

   ☐ Format – *class/subclass*

   ☐ E.g. *text/html, image/gif, application/pdf, audio/mp3* etc.

# EXTENSION MECHANISMS FOR THE WEB CLIENT

## a. MIME Types or IM Types (contd.)

| file type | MIME type |
|-----------|-----------|
| avi | video/x-msvideo |
| bmp | image/bmp |
| css | text/css |
| doc | application/msword |
| dtd | application/xml-dtd |
| dvi | application/x-dvi |
| gif | image/gif |
| html | text/html |
| ico | image/x-icon |
| midi | audio/midi |
| mov | video/quicktime |
| mp3 | audio/mpeg |
| mpeg | video/mpeg |
| pdf | application/pdf |

Complete List maintained by **Internet Assigned Numbers Authority (IANA)**

http://www.iana.org/assignments/media-types/media-types.xhtml

# EXTENSION MECHANISMS FOR THE WEB CLIENT (CONTD.)

## b. Plug-ins

☐ Allow adding new capabilities for handling third party software in the browser itself rather than launching a separate application.

☐ Applications provide plug-ins to –

   ☐ support easy adding of new features to browsers.

   ☐ enable third-party developers to provide abilities to handle their formats in the native browser.

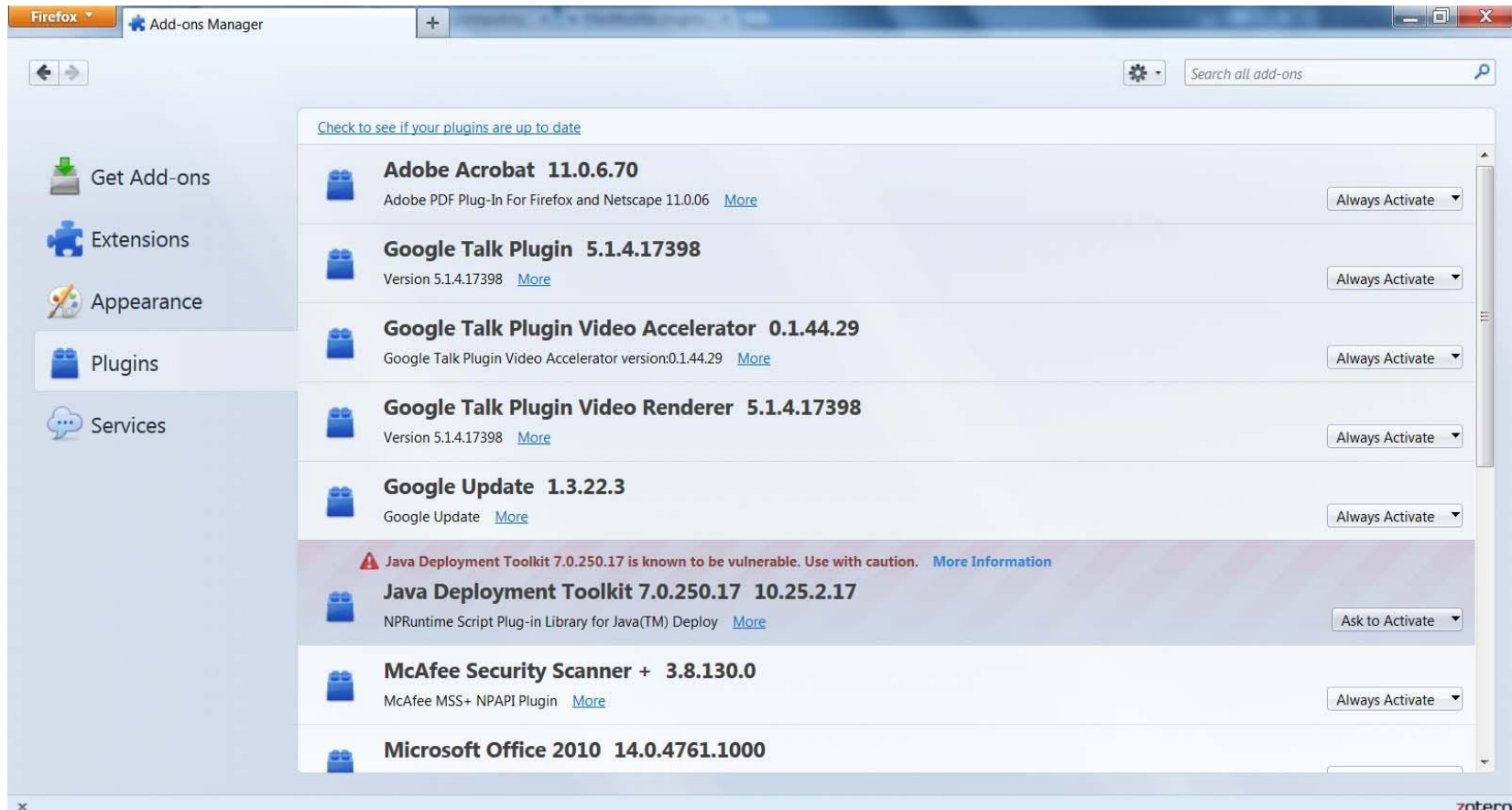   ☐ separate source code from an application because of incompatible software licenses.

# B. PLUG-INS (CONTD.)

- Features -
  - Must be manually installed by user before new data type can be used.
  - Browser plug-ins can modify the behavior of the browser. (e.g. adding new toolbar commands, menu items etc.)

- For e.g. Quicktime player, Adobe Reader, Macromedia Flash etc.
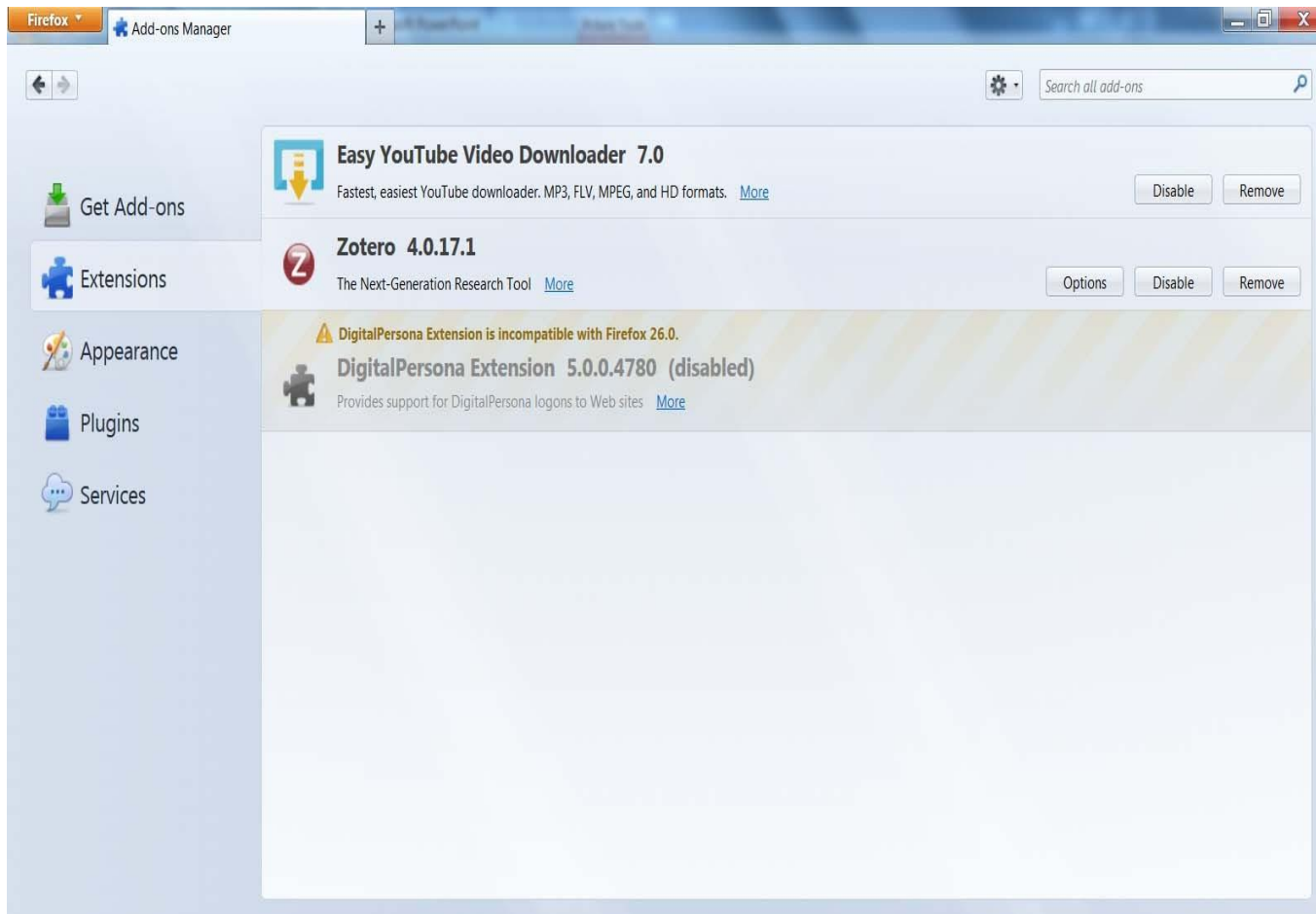
# CLIENT

## B. PLUG-INS (CONTD.)

## c. Add-ons

☐ used to refer to features that enhance an application.

☐ Types – *extensions*, *themes* and *skins*.

☐ *An extension add-on* tailors the *core* features of an application by adding an optional module.

☐ *Theme or skin add-on* tailors the *outer* layers of an application to personalize functionality.

# C. ADD-ON (CONTD.)

## d. Scripts

☐ Executable scripts can be embedded in web pages.

   ☐ run when encountered on a page or when specified events occur.

   ☐ written in languages like JavaScript, VBScript, ActionScript etc, and are executed by an interpreter in the browser when page is displayed.

☐ Scripts can modify page display and increase interactivity of the page, but have limited power. (for security reasons)
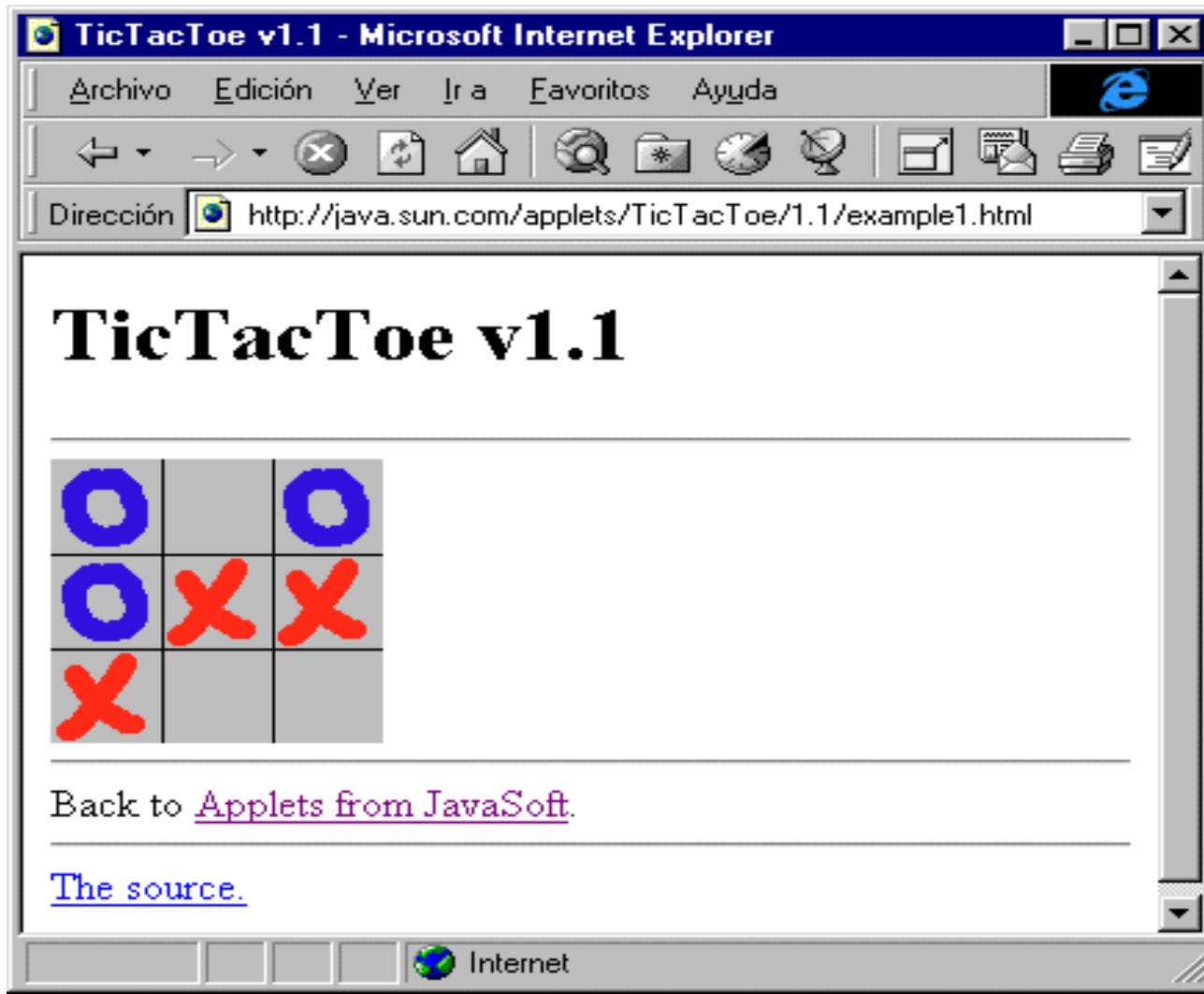
# EXTENSION MECHANISMS FOR THE WEB CLIENT (CONTD.)

## e. Applets

- Java applets are downloaded on demand from a server.
  - Used to create animation effects and other interactive behavior in the browser.
  - Are executed in the Java Virtual Machine supplied by the browser, thus limiting its effect on the system.

- User experience may be affected as download time can be significantly higher than that of scripts.

# E. APPLETS (CONTD.)

# EXTENSION MECHANISMS FOR THE WEB CLIENT (CONTD.)

f. Controls

☐ Are software modules that are automatically downloaded and installed when a webpage containing them is encountered.

☐ On future references, it is automatically activated without having to be downloaded again.

☐ Contain compiled code that can make changes to your machine.

# EXTENSION MECHANISMS FOR THE WEB CLIENT (CONTD.)

## f. Controls

- Features -
  - Controls have full system control, hence user needs to allow only trusted providers.
    - Each control is digitally signed by its authoring organization. (Code Signing)

- Disadvantage:
  - If user decides not to install the control, then user experience with website may be disrupted.
    - E.g. Flickr Photo Uploader, software download controls, IE, MS-Office.

# WEB SERVERS

☐ <u>Basic functionality of a web server</u>:

   ☐ Accept HTTP requests from web clients and return an appropriate resource (if available) in the HTTP response.

   ☐ Functionalities provided –

      ☐ Communicating with TCP.

      ☐ Handling multiple incoming requests and their corresponding responses.

      ☐ Identifying resource location based on request URL.

      ☐ Session Management.

# WEB SERVER ARCHITECTURE
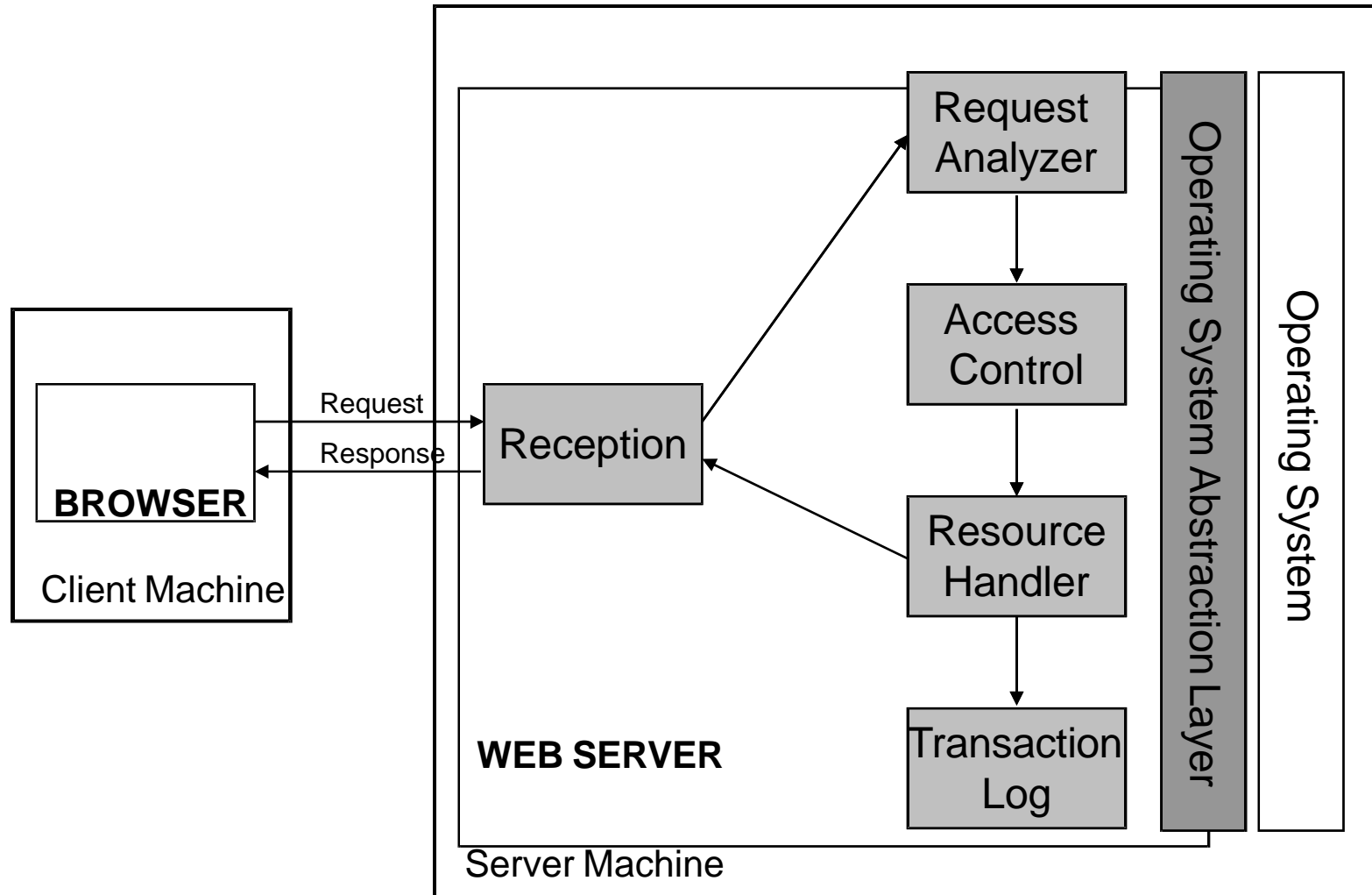
# WEB SERVERS

- *HTTPd* web server was the very first web server implementation. (developed by NCSA)
  - HTTPd became the starting point for the free, open source Apache Server (April 1995)

- Microsoft's Internet Information Server (IIS) offers all the features of Apache.
  - IIS runs only on Windows systems, while Apache supports Windows, Unix and Mac Systems.

- Others – nginx, GWS
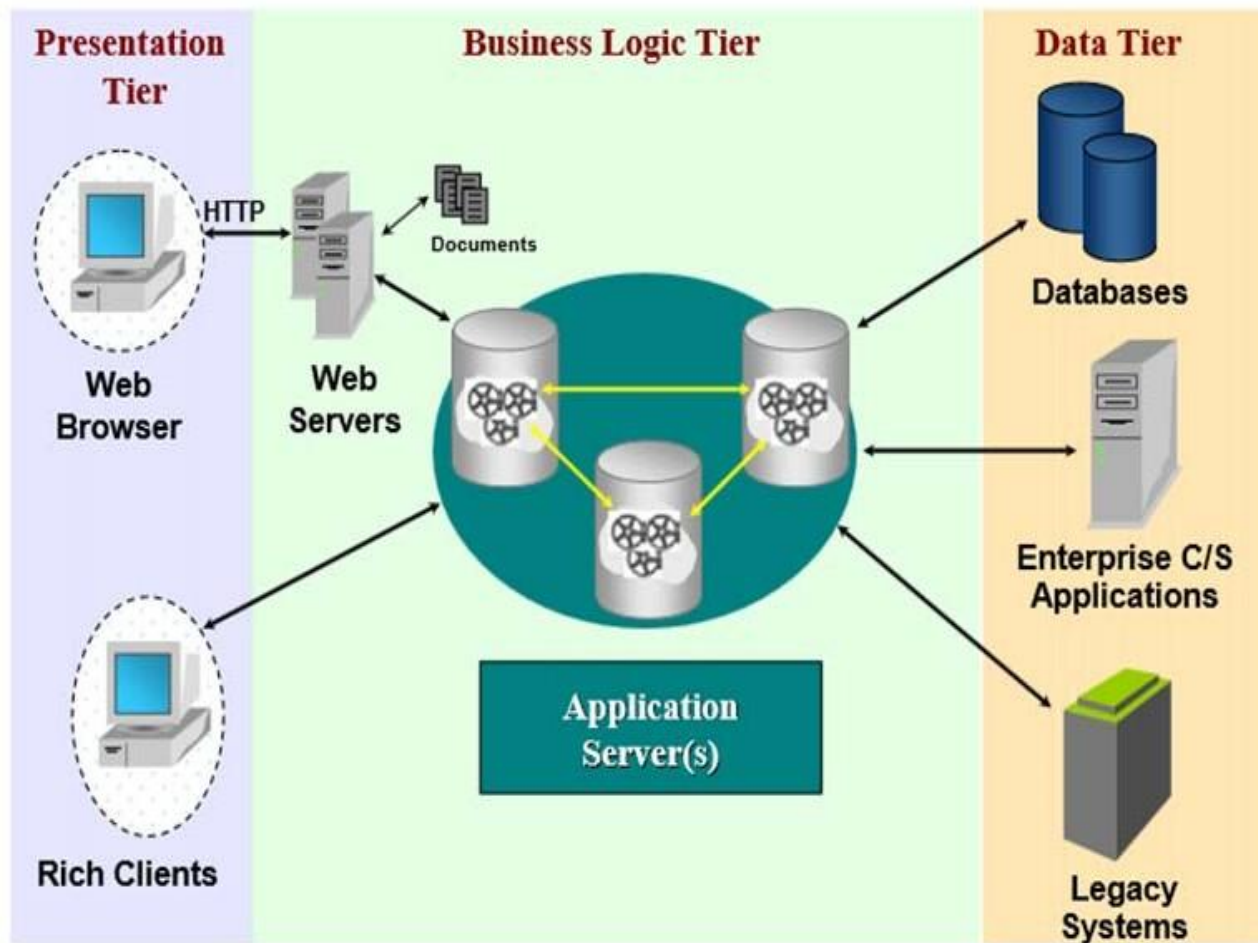
# APPLICATION SERVERS

☐ Application Servers are middleware for Web Applications.

  ☐ Used for connecting remote clients with applications over Internet and effectively integrating applications.

☐ provides middleware logic - for e.g. for transactions, security, data persistence, heterogeneous clients for complex Web Systems.

  ☐ The goal is to provide an environment for hosting all kinds of application logic:

  ☐ Can be used for EAI as well as Web-based integration.

# BASIC WEB APPLICATIONS
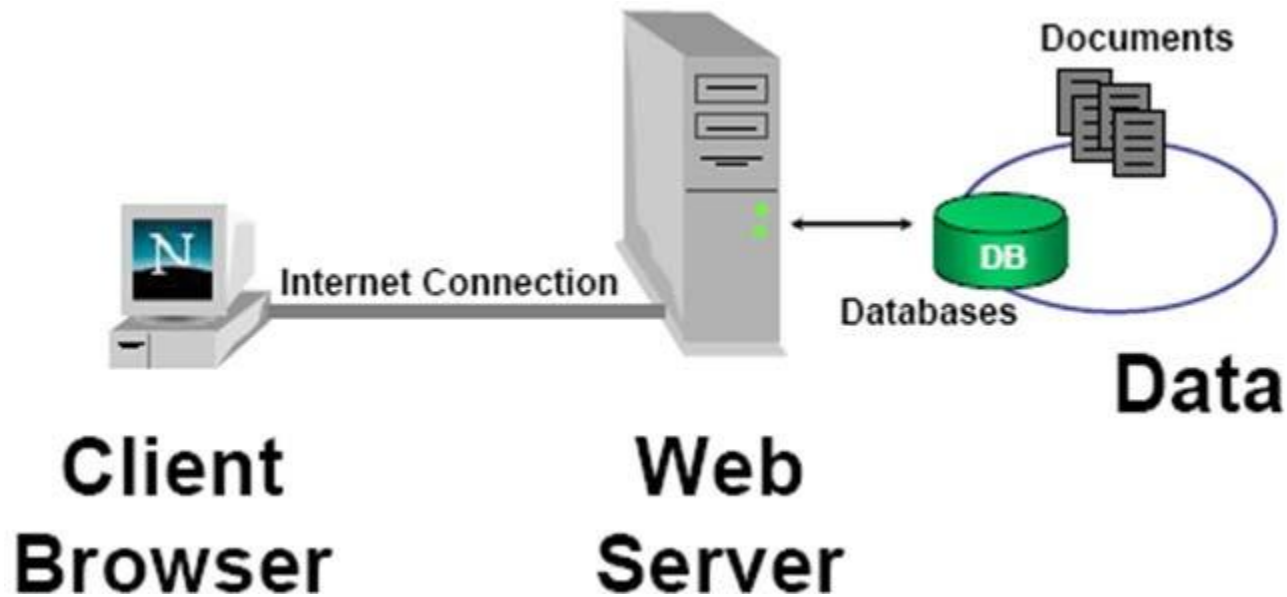
# ENTERPRISE WEB APPLICATIONS

## APPLICATION SERVER(S) AS WEB MIDDLEWARE

# APPLICATION SERVER SUPPORT FOR PRESENTATION LAYER

- provides extensive support for client-side interaction. Atypical app server can support -
  - Web browsers
  - Applications and Devices
  - Chat clients
  - Mobile clients
  - E-mail programs
  - Web services clients
- Presentation logic support includes
  - Multi-device content delivery
  - Servlets, JSPs, XML support, etc.
  - Personalization logic

# APPLICATION SERVER FUNCTIONS

☐ Flexibility and Scalability

   ☐ infrastructure for all types of e-business activities.

☐ Universal Business Server

   ☐ Provides a dynamic, Web-enabled environment - scales applications, balances loads, manages transactions.

☐ XML Server

   ☐ Provides the ability to dynamically exchange/modify XML documents externally, or internally as per user request.

# APPLICATION SERVER FUNCTIONS (CONTD.)

☐ Universal Listener Framework

  ☐ Monitors server ports to identify the presence and protocol of an incoming message.

☐ Application Manager

  ☐ Agent-based management component providing real-time performance and status information.

☐ Security Console

  ☐ User, group and role-based access control to every system level.

# APPLICATION SERVER FUNCTIONS (CONTD.)

- Fault-Tolerance
  - Customer-Facing Fault Tolerance
  - Ensuring that software/hardware system failures or upgrades don't adversely affect users.

- Fast Fail-over
  - Speed-up application recovery

- State Management
  - Storing State information (session, user activities) ………

**Backend System**

☐ Supports the service system by fulfilling the user's request.

☐ In many cases, this is a Database Management System.

**Internet**

☐ The communication platform for web server and web client.

☐ Web client and web server are not connected directly, hence use a protocol (HTTP) to communicate with each other.

# MORE READING...

☐ History of the Internet: by Gregory Gromov —

  ☐ http://www.netvalley.com/cgi-bin/intval/net_history.pl


☐ Architecture of the World Wide Web   (W3C)
  https://www.w3.org/TR/webarch/