Java Applets, etc.

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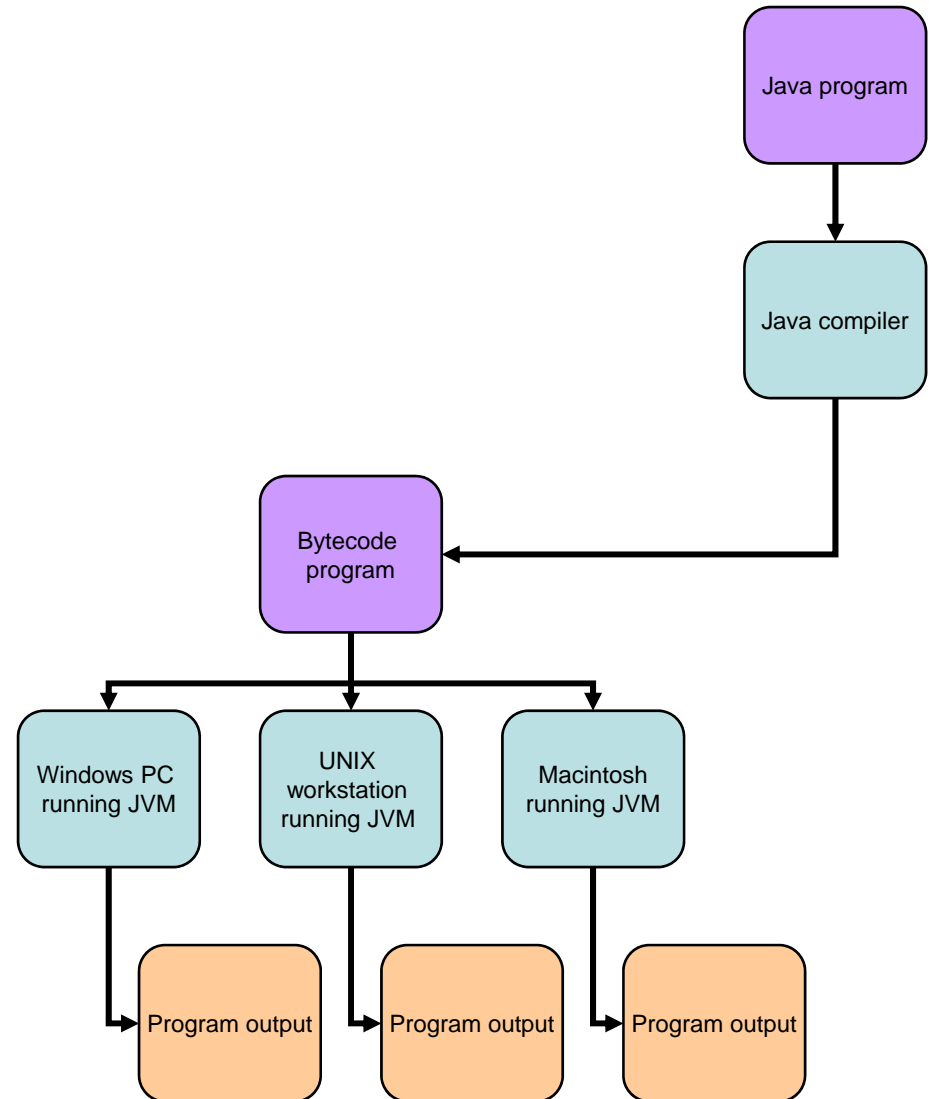# CGI (Common Gateway Interface)

CGI is a standard for handling forms' data.

Example: Interfacing a database.

- Write a script (program) to interface between a database and the Web. *Perl* has been used since the early days of the Web to write CGI scripts. It is known as one of "the three Ps" (along with *Python* and *PHP*), the most popular dynamic languages for writing Web applications (which now also include *Ruby*).
- Store the script in the cgi-bin directory under an URL.
- When retrieves a page located in cgi-bin the HTTP server executes the script.
- Put the script name in the ACTION parameter of the form.
- The browser invokes the operation specified in METHOD (usually POST)
- The script is started and presented with the form input data.
- After the database retrieval the script produce an HTML file, which is sent back to the browser.
- This mechanism can be used to include selected ads in the Web page depending on what the user is looking for.

Translation of Java Programs

A Java program is first *compiled* into a standard machine language called *Bytecode*. A software interpreter called the Java Virtual Machine (JVM) then takes the Bytecode program and executes it. Any machine that has a JVM can run the compiled Java program.

```
Java program
    ↓
Java compiler
    ↓
Bytecode program
    ↓
┌────────────┬─────────────┬──────────────┐
Windows PC    UNIX          Macintosh
running JVM    workstation   running JVM
               running JVM
    ↓             ↓             ↓
Program output  Program output  Program output
```

Java System for the Web

- A Java-to-bytecode compiler
- A browser that understands applets (<APPLET> tag)
- A bytecode interpreter

Java Applets

A Java *applet* is a Java program designed to be embedded into an HTML document, transferred over the Web, and executed in a browser.

```
<APPLET
  code="AssemblyLanguageApplet.class"
  width=350 height=200></APPLET>
```

Application of Applets

- Implementing highly interactive Web pages

- Running applications and using remote servers or databases

- Adding animation and sound to the Web page without spawning and external viewer

- No need of standard for the Web protocols (HTTP, FTP etc.)

Security Issues

- Problem: running a program on the client's machine (possible crash, collecting private information, consuming resources)

- Solutions:
  - First barrier: strong typed language - array bounds checking, no pointers (thus no memory access)
  - Second barrier: bytecode verifier
  - Third barrier: class loader (loading first system classes before looking for user classes)
  - Fourth barrier: security measures built in the classes, e.g. file access class (asking user if the applet needs file access).

JSP Scriptlets

A *Java Server Page*, or *JSP*, is a Web page that has JSP *scriptlets* embedded in them.

<H1><% out.println("A HUGE HEADER"); %></H1>

Unlike applets, the JSPs are executed on the server side. They help dynamically define the content of a Web page **before** it is shipped to the client.

XML

The *Extensible Markup Language*, or *XML*, allows the author to define his or her own set of tags.

XML is a *metalanguage*, i.e., a language used to define other languages.

The *Standard Generalized Markup Language (SGML)* was used to define HTML. XML is a simplified version of SGML.

XSL

The *Extensible Stylesheet Language* (or *XSL*) can be used to transform an XML document into other formats
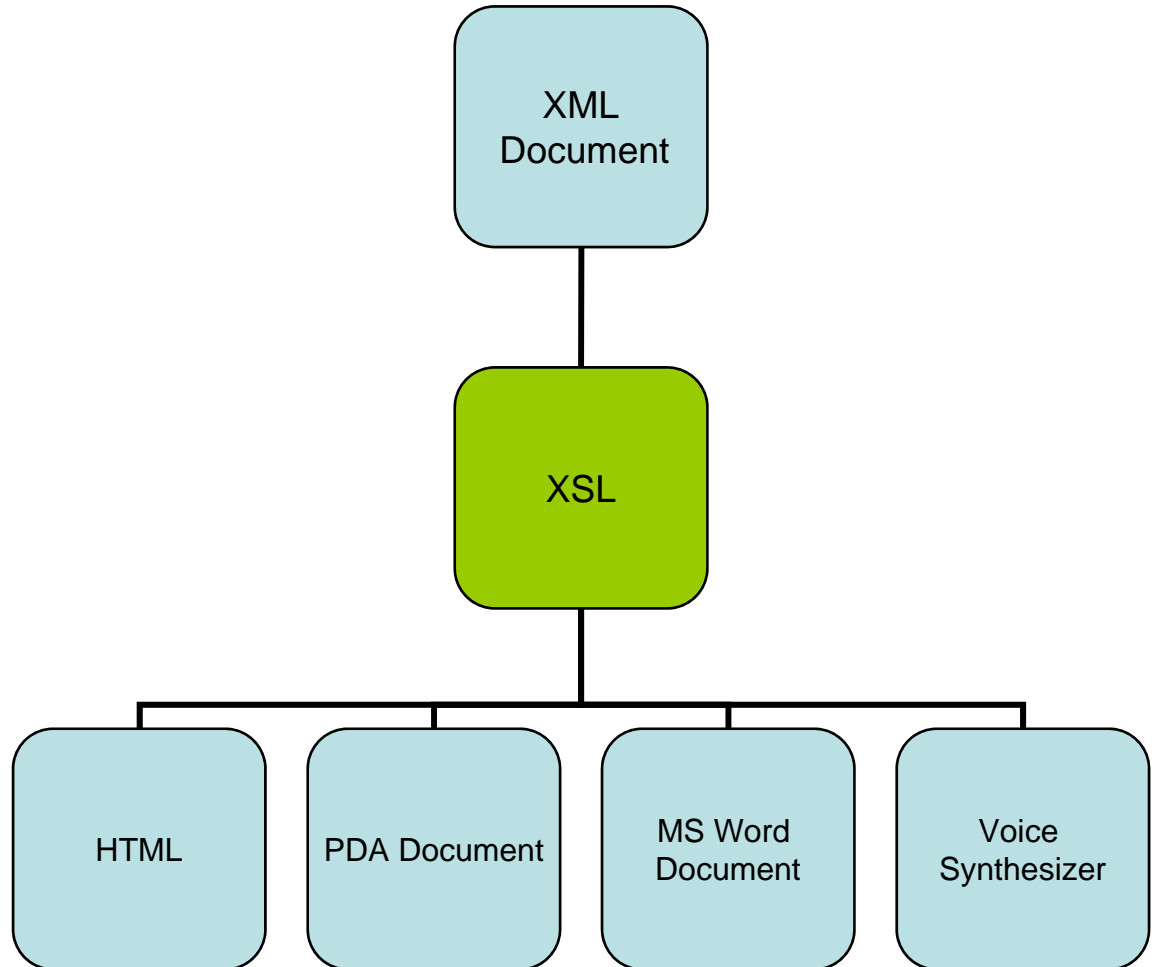
Cascading Style Sheets (CSS)

- *Cascading Style Sheets (CSS)* is a stylesheet language used to describe the presentation of a document written in a markup language. Its most common application is to style web pages written in HTML and XHTML, but the language can be applied to any kind of XML document. Internet Explorer 5.0 for the Macintosh, shipped in March of 2000, was the first browser to have full (better than 99 percent) CSS1 support.