



Unit III Chapter 5

Introduction to Servlets

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5.1 Introduction

How do the pages you're reading in your favorite Web browser show up there? When you log into your favorite Web site, how does the Web site know that you're you? And how do Web retailers handle taking your order online? Those capabilities are possible because of code running on servers behind the scenes that interact with you in a Web session, access stored information throughout that process, and oftentimes present dynamic information in one or more Web pages.

The core of those capabilities is provided in the Java language world by *servlets*. The goal of this Unit is to introduce you to servlets. It describes what servlets are, how they work, how you can use them to create Web applications of any degree of sophistication you can imagine, and how you can use servlets most effectively as a professional programmer.

In the early days, web servers deliver *static* contents that are indifferent to users' requests. Java servlets are *server-side programs* (running inside a web server) that handle clients' requests and return a *customized or dynamic response* for each request. The dynamic response could be based on user's input (e.g., search, online shopping, online transaction) with data retrieved from databases or other applications, or time-sensitive data (such as news and stock prices).

Java servlets typically run on the **HTTP protocol**. HTTP is an *asymmetrical request-response protocol*. The client sends a *request message* to the server, and the server returns a *response message* as illustrated.

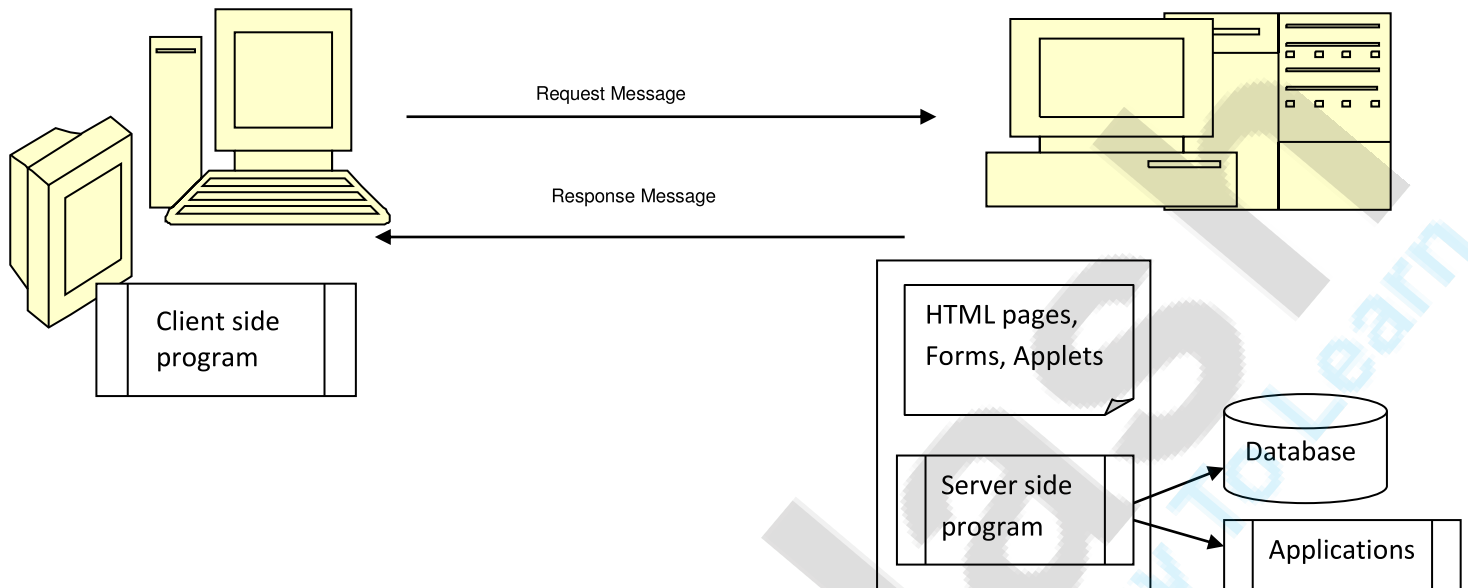




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In brief, HTTP is a request-response protocol. The client sends a request message to the server. The server, in turn, returns a response message. The messages consists of two parts: header (information about the message) and body (contents). Header provides information about the messages. The data in header is organized in name-value pairs.

5.2 Need for dynamic content

Shortly after the Web began to be used for delivering services, service providers recognized the need for dynamic content. Applets, one of the earliest attempts toward this goal, focused on using the client platform to deliver dynamic user experiences. At the same time, developers also investigated using the server platform for the same purpose.

Initially, **Common Gateway Interface** (CGI) server-side scripts were the main technology used to generate dynamic content. Although widely used, CGI scripting technology had many shortcomings, including platform dependence and lack of scalability. To address these limitations, Java Servlet technology was created as a portable way to provide dynamic, user-oriented content.

There are many (competing) server-side technologies available: Java-based (servlet, JSP, JSF, Struts, Spring, Hibernate), ASP, PHP, CGI Script, and many others.



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Java servlet is the *foundation* of the Java server-side technology, JSP (JavaServer Pages), JSF (JavaServer Faces), Struts, Spring, Hibernate, and others, are extensions of the servlet technology.

Dynamic content means user will ask for particular details in database upon that server will process user request and response appropriately by handing user required data from database.

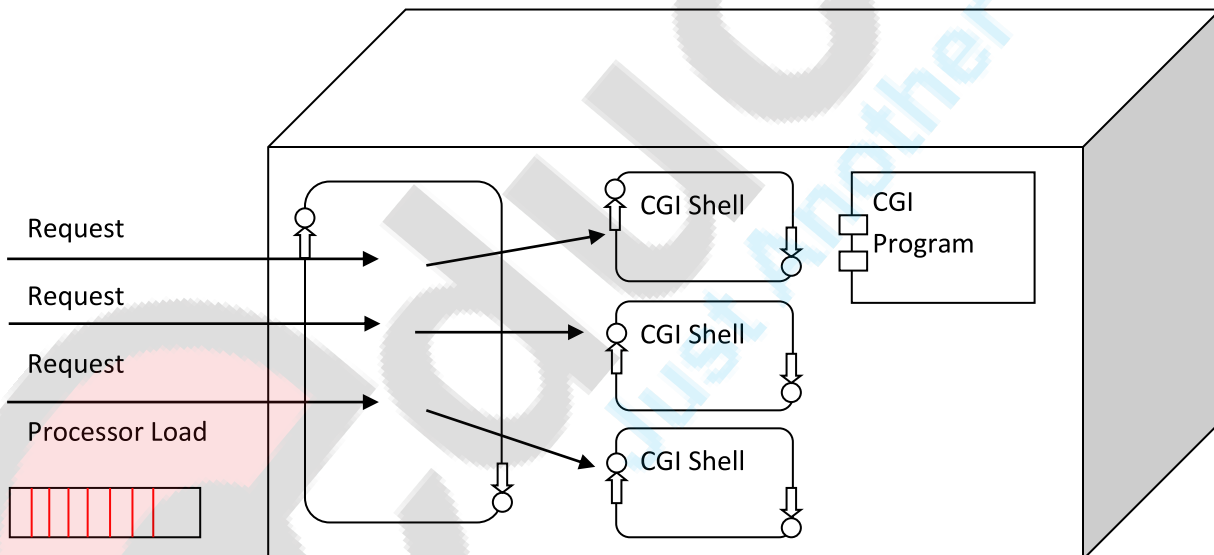
Eg. Online Banking Systems, Online Reservation System.

During those days only way to provide dynamic content was using CGI (Common Gateway Interface).

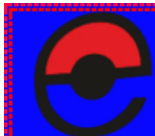
5.2.1 CGI

Using CGI we could accept user input, process it and give relevant result back to user.

All traditional web technologies provide support to CGI. **PERL** is one of the significant CGI supportive language.



5.2.2 What are the Advantage of Servlets Over "Traditional" CGI?



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Java servlets are more efficient, easier to use, more powerful, more portable, and cheaper than traditional CGI and than many alternative CGI-like technologies. (More importantly, servlet developers get paid more than Perl programmers .

- **Efficient**

With traditional CGI, a new process is started for each HTTP request.

With CGI, if number of clients increase it takes more time for sending response.

If the CGI program does a relatively fast operation, the overhead of starting the process can dominate the execution time. With servlets, the Java Virtual Machine stays up, and each request is handled by a lightweight Java thread, not a heavyweight operating system process. Similarly, in traditional CGI, if there are N simultaneous request to the same CGI program, then the code for the CGI program is loaded into memory N times. With servlets, however, there are N threads but only a single copy of the servlet class. Servlets also have more alternatives than do regular CGI programs for optimizations such as caching previous computations, keeping database connections open, and the like.

- **Convenient**

you already know Java. Why learn Perl too? Besides the convenience of being able to use a familiar language, servlets have an extensive infrastructure for automatically parsing and decoding HTML form data, reading and setting HTTP headers, handling cookies, tracking sessions, and many other such utilities.

- **Powerful**

Java servlets let you easily do several things that are difficult or impossible with regular CGI. For one thing, servlets can talk directly to the Web server (regular CGI programs can't). This simplifies operations that need to look up images and other data stored in standard places. Servlets can also share data among each other, making useful things like database connection pools easy to implement. They can also maintain information from request to request, simplifying things like session tracking and caching of previous computations.

- **Portable**

Servlets are written in Java and follow a well-standardized API. Consequently, servlets written for, say I-Planet Enterprise Server can run virtually unchanged on Apache, Microsoft IIS, or WebStar. Servlets are supported directly or via a plugin on almost every major Web server.



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- **Inexpensive**

There are a number of free or very inexpensive Web servers available that are good for "personal" use or low-volume Web sites. However, with the major exception of Apache, which is free, most commercial-quality Web servers are relatively expensive. Nevertheless, once you have a Web server, no matter the cost of that server, adding servlet support to it (if it doesn't come preconfigured to support servlets) is generally free or cheap.

There were alternative programmings languages emerge to CGI some of them were

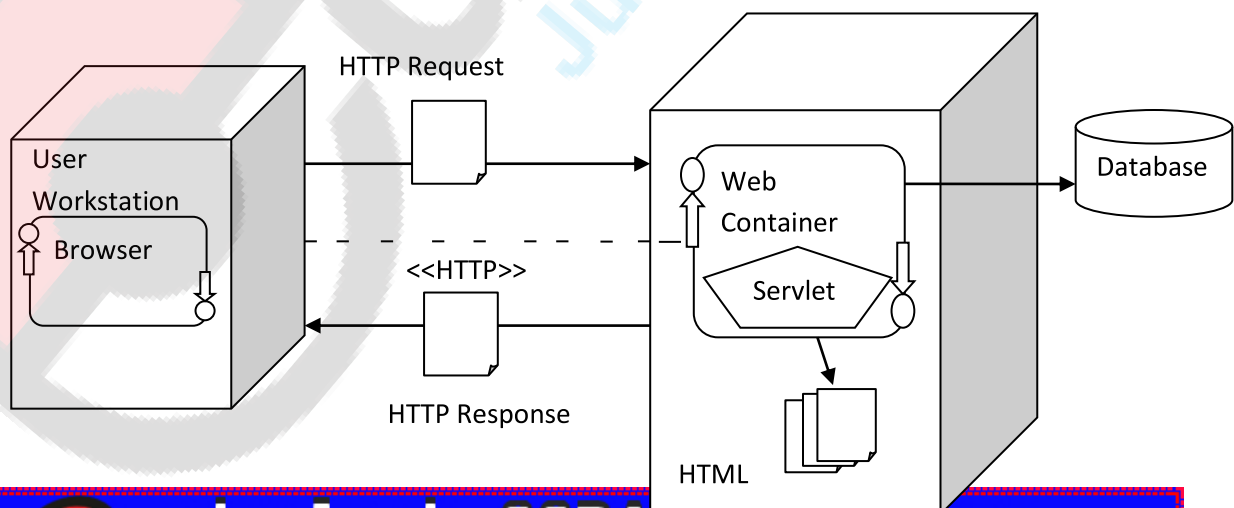
- FastCGI
- mod_perl
- NSAPI
- ISAPI
- Java Servlets.

Most of these had relatively better performance and scalability support.

However, it was the Java Servlet Technology which actually replaced CGI almost entirely.

Sun introduced Servlets (A highly efficient CGI program written in java) as a way to have thin, dynamic web clients.

5.3 java servlet technology





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A Servlet is server-side program which services http requests and return results as http response.

In other word Servlet is an non visual applet which runs on server, it has similar lifecycle as of applet.

Servlet is module written using java that runs in server applications to answer client requests.

Servlets are most commonly used with http hence also known as http Servlets.

Servlets are supported by virtually all web servers and web browsers.

Servlets executes all requests in a form of threads of single process, hence increase performance.

Servlets can easily share resources unlike CGI.

Servlets can be easily ported along platforms which supports java, this is because Servlets run inside JVM. hence they are platform independent.

When request dynamic contents from web server, user request is handed to Servlets for processing upon that Servlets give relevant response in form of web page only.

Most Java servlets that you'll encounter as a professional programmer are designed to respond to HTTP requests in the context of a Web application. As such, the HTTP-specific classes in the javax.servlet and javax.servlet.http packages are the ones you'll care about.

When you create a Java servlet, you typically subclass HttpServlet. This class has methods that give you access to the request and response wrappers you can use to handle requests and create responses.

The HTTP protocol isn't Java-specific, of course. It is simply a specification that defines what service requests and responses have to look like. The Java servlet classes wrap those low-level constructs in Java classes with convenience methods that make them easier to deal with in a Java language context. When



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a user issues a request via a URL, the Java servlet classes convert it to an `HttpServletRequest` and send it to the target pointed to by the URL, as defined in configuration files for the particular servlet container you're using.

When the server side has done its work, the Java Runtime Environment packages the results in an `HttpServletResponse` and then sends a raw HTTP response back to the client that made the request. When you're interacting with a Web app, you usually make multiple requests and get multiple responses. All of them are within the context of a *session*, which Java language wraps in an `HttpSession` object. You can access this object when you process requests, and add stuff to it when you create responses. It provides some cross-request context.

A *container*, like Tomcat, manages the runtime environment for servlets. You can configure the container to customize the way in which the J2EE server functions, and you *must* configure it to expose your servlets to the world. As we'll see, through various configuration files in the container, you provide a bridge from a URL (entered by a user in a browser) to the server-side components that handle the request that you want the URL to translate into.

5.3.1 Servlets and Web Servers.

- When user request for dynamic contents from web server, even though web server has access to database it cannot produce web pages.
- Here Servlets come into middle and generate dynamic web pages upon user requests.

5.3.2 Servlet and Clients.

- It's not necessary that application from client side should be written in java to get Servlets response.
- Hence application written in any programming language can consume Servlets outputs.

5.3.3 Servlet Container

Servlet container is popularly known as Servlet Engine which provides execution environment for Servlets and manages Servlets lifecycle from creation to destroy phase.

5.4 Why servlet?



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- Servlets are loaded into memory once and they can run from memory thereafter.
- Servlets are spawned as thread.
- Servlets are powerful object Oriented abstraction for HTTP.
- Servlets are portable across multiple web servers and platforms.
- Servlets are simple in design and implement.
- Servlet tightly integrated with web servers.
- Servlets efficiently services client request.
- Servlets run within JVM which is why they are secure.
- Servlets obey the rule of standard API.
- Servlets processes request and returns HTML.
- Servlets are good replacement to CGI due to their robustness and scalability.
- Servlets supported by various server.
- Since they reside in server they provide good code security.



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