Network Programming

[CACS355]

BCA 6th Sem

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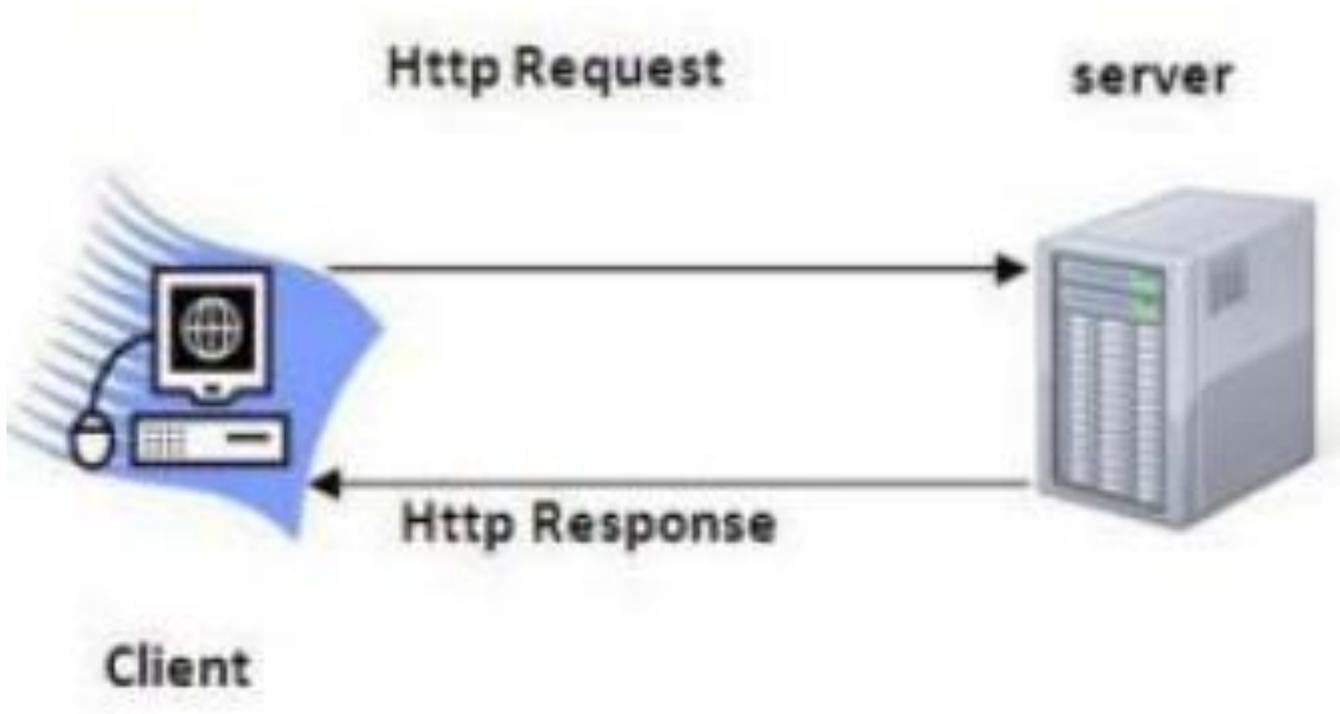
HTTP

The Hypertext Transfer Protocol (HTTP) is a standard that defines how a web client talks to a server and how data is transferred from the server back to the client.

HTTP is usually thought of as a means of transferring HTML files and the pictures embedded in them.



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The Protocol:

HTTP is the standard protocol for communication between web browsers and web servers.

- HTTP specifies how a client and server establish a connection,
- how the client requests data from the server,
- how the server responds to that request, and
- finally, how the connection is closed.

HTTP connections use the TCP/IP protocol for data transfer.

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HTTP

The Protocol:

Each request and response has the same basic form:

1. A header line
2. An HTTP header
3. Containing metadata
4. A blank line
5. A message body

A response code :

- ✓100 to 199 always indicates an informational response
- ✓200 to 299 always indicates success
- ✓300 to 399 always indicates redirection
- ✓400 to 499 always indicates a client error
- ✓500 to 599 indicates a server error

A typical client request :

GET /index.html HTTP/1.1

User-Agent: Mozilla/5.0 (Macintosh; Intel Mac OS X 10.8; rv:20.0)
Gecko/20100101 Firefox/20.0

Host: en.wikipedia.org

Connection: keep-alive

Accept-Language: en-US,en;

Accept-Encoding: gzip, deflate

Accept: text/html,application/xhtml+xml,application/xml

A typical successful response :

HTTP/1.1 200 OK

Date: Sun, 21 Apr 2013 15:12:46 GMT

Server: Apache

Connection: close

Content-Type: text/html; charset=ISO-8859-1

Content-length: 115

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HTTP

Keep-Alive

HTTP 1.0 opens a new connection for each request.
This is a problematic for encrypted HTTPS connections using Secure Sockets Layer & Transport Layer Security.

In HTTP 1.1 and later, the server doesn't have to close the socket after it sends its response.

A client indicates that it's willing to reuse a socket by including a *Connection field in the* HTTP request header with the value *Keep-Alive:*

Connection: Keep-Alive

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HTTP

Keep-Alive

We can control Java's use of HTTP Keep-Alive with several system properties:

- http.keepAlive to "true or false" to enable/disable. Default enable.
- http.maxConnections to the number of sockets. The default is 5.
- http.keepAlive.remainingData to true, It is false by default.
- sun.net.http.errorstream.enableBuffering to true, It is false by default.
- sun.net.http.errorstream.bufferSize, The default is 4,096 bytes.
- sun.net.http.errorstream.timeout , It is 300 milliseconds by default.

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HTTP Methods

a. The Request Body

b. Cookies

c. CookieManager

d. CookieStore

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HTTP Methods

Communication with an HTTP server follows a request-response pattern: one stateless request followed by one stateless response.

Each HTTP request has two or three parts:

- Start line containing the HTTP method and a path to the resource.
- Header of name-value fields that provide meta-information.
- Request body containing a representation of a resource (POST and PUT only)

There are four main HTTP methods, operations that can be performed:

- GET
- POST
- PUT
- DELETE

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The Request Body

The representation of the resource is sent in the body of the request, after the header. That is, it sends these four items in order:

1. A starter line including the method, path and query string, and HTTP version
2. An HTTP header
3. A blank line
4. The body

For example, this POST request sends form data to a server:

```
POST /cgi-bin/register.pl HTTP 1.0
Date: Sun, 27 Apr 2013 12:32:36
Host: www.cafeaulait.org
Content-type: application/x-www-form-urlencoded
Content-length: 54
username=Elliotte+Harold&email=elharo%40ibiblio.org
```

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The Request Body

However, the HTTP header should include two fields that specify the nature of the body:

- A Content-length field that specifies how many bytes are in the body.
- A Content-type field that specifies the MIME media type of the bytes

For example, here's a PUT request that uploads an Atom document:

```
PUT /blog/software-development/the-power-of-pomodoros/ HTTP/1.1
Host: elharo.com
User-Agent: AtomMaker/1.0
Authorization: Basic ZGFmZnk6c2VjZXJldA==
Content-Type: application/atom+xml;type=entry
Content-Length: 322

<?xml version="1.0"?>
<entry xmlns="http://www.w3.org/2005/Atom">
<title>The Power of Pomodoros</title>
<id>urn:uuid:101a41a6-722b-4d9b-8afb-ccfb01d77499</id>
<updated>2013-02-22T19:40:52Z</updated>
<author><name>Elliotte Harold</name></author>
<content>I hadn't paid much attention to Pomodoro...</content>
</entry>
```

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Cookies

Many websites use small strings of text known as *cookies to store persistent client-side* state between connections.

Cookies are passed from server to client and back again in the HTTP headers of requests and responses.

Cookies are limited to nonwhitespace ASCII text, and may not contain commas or semicolons.
To set a cookie in a browser, the server includes a Set-Cookie header line in the HTTP header.

For example, this HTTP header sets the cookie “cart” to the value “ATVPDKIKX0DER”:

```
HTTP/1.1 200 OK
Content-type: text/html
Set-Cookie: cart=ATVPDKIKX0DER
```

If a browser makes a second request to the same server, it will send the cookie back in a Cookie line in the HTTP request header like so:

```
GET /index.html HTTP/1.1
Host: www.example.org
Cookie: cart=ATVPDKIKX0DER
Accept: text/html
```

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Content-type: text/html
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```
GET /index.html HTTP/1.1
Host: www.example.org
Cookie: cart=ATVPDKIKX0DER
Accept: text/html
```

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Cookies

In addition to a simple name=value pair, cookies can have several attributes that control their scope including:

- expiration date,
- path,
- domain,
- port,
- version, and
- security options

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Cookies

For example, this request sets a user cookie for the entire *foo.example.com domain:*

Set-Cookie: user=elharo;Domain=.foo.example.com

Set-Cookie: user=elharo; Path=/restricted

Set-Cookie: user=elharo;Path=/restricted;Domain=.example.com

Cookie: user=elharo; Path=/restricted;Domain=.foo.example.com

Set-Cookie: user=elharo; expires=Wed, 21-Dec-2015 15:23:00 GMT

Set-Cookie: user="elharo"; Max-Age=3600

Set-Cookie: key=etrogl7*;Domain=.foo.example.com; secure

Set-Cookie: key=etrogl7*;Domain=.foo.example.com; secure; httponly

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CookieManager

Java 5 includes an abstract java.net.CookieHandler class that defines an API for storing and retrieving cookies.

Java 6 fleshes this out by adding a concrete java.net.CookieManager subclass of CookieHandler can be use.

Before Java will store and return cookies, you need to enable it:

```
CookieManager manager = new CookieManager();
CookieHandler.setDefault(manager);
```

Three policies are predefined:

- CookiePolicy.ACCEPT_ALL All: cookies allowed
- CookiePolicy.ACCEPT_NONE: No cookies allowed
- CookiePolicy.ACCEPT_ORIGINAL_SERVER: Only first party cookies allowed

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CookieManager

Example 6-1. A cookie policy that blocks all .gov cookies but allows others

```
import java.net.*;
public class NoGovernmentCookies implements CookiePolicy {
@Override
public boolean shouldAccept(URI uri, HttpCookie cookie) {
if (uri.getAuthority().toLowerCase().endsWith(".gov")
|| cookie.getDomain().toLowerCase().endsWith(".gov")) {
return false;
}
return true;
}
}
```

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CookieStore

We can retrieve the store in which the CookieManager saves its cookies with the getCookieStore() method:

```
CookieStore store = manager.getCookieStore();
```

The CookieStore class allows you to add, remove, and list cookies so you can control the cookies that are sent outside the normal flow of HTTP requests and responses:

```
public void add(URI uri, HttpCookie cookie)
public List<HttpCookie> get(URI uri)
public List<HttpCookie> getCookies()
public List<URI> getURIs()
public boolean remove(URI uri, HttpCookie cookie)
public boolean removeAll()
```

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```
public class CookiesManager {
     public static void main(String[] args) {
        CookieManager cm = new CookieManager();
        CookieStore cs = cm.getCookieStore();
            //createing cookies and URI
        HttpCookie c1 = new HttpCookie("user1", "1");
        HttpCookie c2 = new HttpCookie("user2", "2");
        HttpCookie c3 = new HttpCookie("user3", "3");

        URI uri1 = URI.create("http://spm.com.np");
        URI uri2 = URI.create("http://spm1.com.np");
            // Add cookies into cookiestore
            cs.add(uri1, c1);
            cs.add(uri2, c2);
            cs.add(null, c3);
            //read stored cookies
     List cl = cs.getCookies();
     System.out.println("cookies lst store" + cl + "\n");
            //remove cookiestore of uri
            cs.remove(uri1,c1);
            List cr = cs.getCookies();
            System.out.println("remaining CS" +   cr + "\n");
            // remove all cookies
            cs.removeAll();
            List empty = cs.getCookies();
            System.out.println("remove all cs" +  empty);

     }
}
```