HTTPS, HTTP, HTTP/2

1. In the following you can find the content of an HTTP Request. Answer to the following questions, indicating where (e.g., in which field) in the HTTP Request you can find the answer:

```
GET /martignon/index.html HTTP/1.1
Host: cs.unibg.it
User Agent: Mozilla/5.0 (Macintosh; U; PPC Mac OS X; en) AppleWebKit/124
(KHTML, like Gecko) Safari/125
Accept: ext/xml, application/xml, application/xhtml+xml, text/html;q=0.9,
text/plain;q=0.8, image/png,*,*;q=0.5
Accept-Language: it
Keep-Alive: 300
Connection: keep-alive
```

a) What is the requested URL?

Within the GET method, the requested URL is stated: /martignon/index.html

b) Which version of HTTP is used?

After the URL, we see the HTTP version, which is HTTP/1.1

c) Does the browser ask for a persistent or a non-persistent connection?

Persistent, as found on the last line that says Conenction: keep-alive. A persistent connection allows a single TCP connection to send and receive multiple requests rather than opening a new connec tion each time.

d) What is, in your opinion, the utility in indicating the type (and version) of browser used by the client in the HTTP Request?

There are several possible uses of User Agent in an HTTP request. My first thoughts are it's useful if developers want to end up providing different HTML to different browsers. It's also helpful if a specific browser has a bug that the developer wants to address in their code. Maybe, some browsers have a specific feature that developers want to use in their web application and not all browsers yet support it, so you want to tailor your user experience to the browser being used.

2. An HTTP client sends the following message:

```
GET http://cs.unibg.it /index.html HTTP/1.1
User-agent: Mozilla/4.0
Accept: text/html, image/gif, image/jpeg
If-modified-since: 27 Feb 2017 08:10:00
```

a) Write down two feasible responses of the HTTP server (only the status line)

The status of `102 Processing` is given when the server has received the request, but it's still processing it and no response is yet available. If the request was successfully processed, there's the response of `200 OK`. Because the request used the GET method, this response would mean the resources have been fetched and transmitted in the message body.

b) Assuming that the message is sent through a Proxy, specify the behavior of the Proxy itself.

A Proxy server is like a middle man between clients and their destinations. They can be used to improve security, functionality, or privacy depending on the client's needs/desires. A Proxy server has its own IP address and when you send a request on your computer, it's sent to the Proxy first. The Proxy server makes the request on behalf of your computer, receives a response, and then feeds the response back to your computer. Proxy servers can make changes to your data and still get the information you expected to see. For example,

Proxies can change your IP address so web servers don't have your location, they can encrypt your data so its unreadable when in transit, or they can block access to certain web pages based on your IP address.

DNS & Domain Names

1. What is an Internet Standard, and which document defines the DNS protocol?

   An Internet Standard is a rule for how to use the Internet that promotes a consistent use of the Internet worldwide. These standards are approved by the Internet Engineering Task Force. The Internet protocol suite (TCP/IP) is a set of computer protocols used in the Internet, and it contains the DNS protocol.

2. Which design strategies enable the DNS to scale?

   The DNS in hierarchical in nature, allowing it to scale. Starting with the root of ".", domains are broken into levels. Top Level Domains (TLDs) are domains such as .com, .org, and .us. There's also a geographic hierarchy to domains.

3. Demonstrate the interaction of the resolver library with the DNS servers.

   a. Using nslookup, manually replay all name-server requests emitted by the resolver library and its primary name server when searching for an A record for the name unknown.tu-dresden.de.

      When I tried `nslookup unknown.tu-dresden.de`, I got the message: server can't find unknown.tu-dresden.de: NXDOMAIN. However, nslookup tu-dresden.de yielded results. Both attempts are shown in the screenshot.

   b. Did one of the DNS answers come from a name server's cache? If yes: How would the request-answer sequence have differed if all the participating name server's caches would have been empty?

      The domain unknown.tu-dresden.de does not exist, so none of the requests were from the name's server cache, as it doesn't exist. Rather than a name server's cache, nslookup tried using the root servers to see if the domain existed.

4. Besides translating names to IP addresses, which other information is stored in DNS?

   Mail transfer agents use DNS to find the best mail server to deliver email. The DNS is also used for efficient storage and distribution of IP addresses of blacklisted email hosts.

5. Try looking up a well-known address: type www.microsoft.com. Notice that the query returns several IP addresses (Microsoft load-balances Web traffic by using multiple servers in the same DNS record).

6. Try looking up a nonexistent host: type www.fubijar.com. Notice that your server complains that it can't find the address. This is normal behavior.

7. Change the server to a nonexistent host (try making up a private IP address that you know isn't a DNS server on your network, like 10.10.10.10). Do this by typing server ipAddress. Nslookup will try to turn the IP address into a hostname. Eventually it will display a message telling you that the new default server is using the IP address you specified.

8. Try doing another lookup of a known DNS name. Type www.microsoft.com. Notice that nslookup is contacting the server you specified and that the lookup times out after a few seconds.