Ejercicios Web

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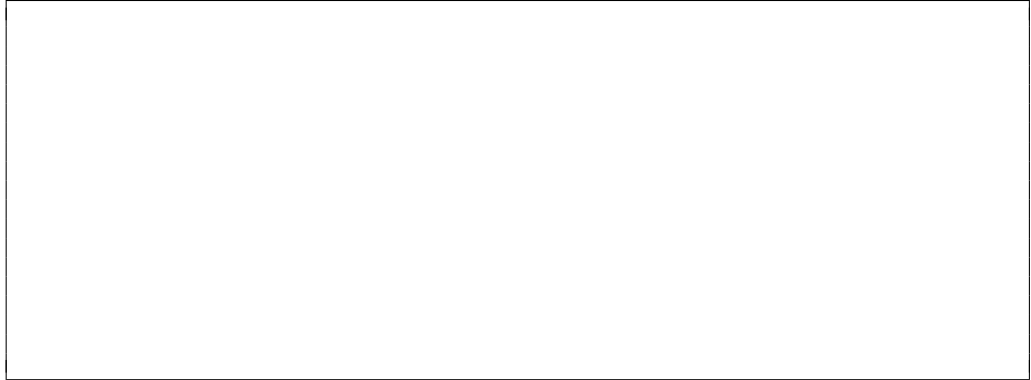# 1.   Basic problems

1. The content of an HTML file named `index.html` is shown below. The page is accessible at the URL `http://www.test.com/index.html`.

```
<html>
  <body>
      <p>This is a great web page</p>
      <img src="/res/aptel.png"/>
  </body>
</html>
```
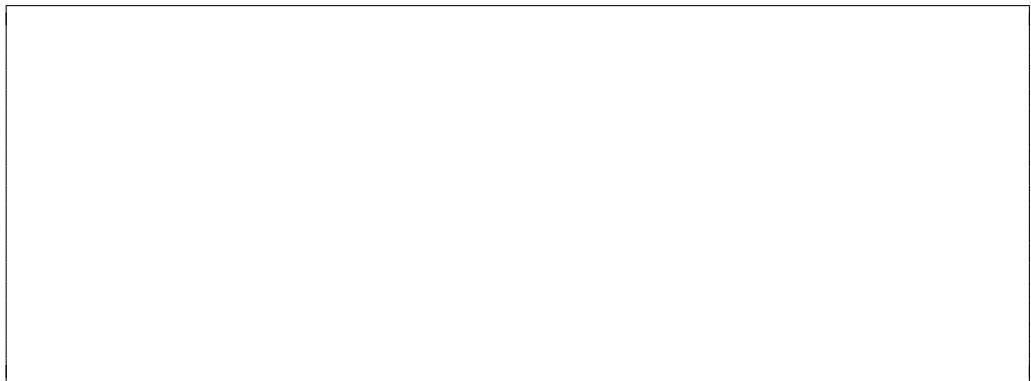
(a) If the user enters the URL `http://www.test.com/index.html` in their browser using HTTP 1.1,

I. How many connections will be opened? And in HTTP 1.0?

II. Write the requests that are made assuming the use of HTTP 1.1.

III. If the web server hosted another virtual host, for example, www.example.com, how would the server know which virtual host the requests are intended for?

IV. The website owner wants to offer a premium service for fast image uploads. Engineers have adjusted the TCP window size depending on whether the user is premium or regular. If the HTML page (including HTTP response headers) occupies one segment, and the image 271 segments (including HTTP headers), knowing that `ssthresh=48`, how many RTTs would it take to send the image for a premium user (`WIN=32`) and for a regular user (`WIN=16`)?

2. The figure 1 shows a network diagram in which a server supporting HTTP/1.1 and HTTP/2 provides a streaming application. Available resources for every phase of the streaming application are also shown and will be described later.

The way we use (phases) the streaming web is the following:

- (**Access**) The user downloads the main web page `index.html` and all its components and shows it.

- (**Configuration**) The user configures the video he wants to stream and authenticates by sending data (using JSON format with mime type application/json). For example, suppose he selects the video with identifier 123, using audio and subtitles in Spanish (from Spain) (suppose this piece of data always occupies 88 bytes) and has the following structure:

```
{"user":"usuario","password":"password",
"videoid":"123","audio":"ES-ES","subs":"ES-ES"}
```
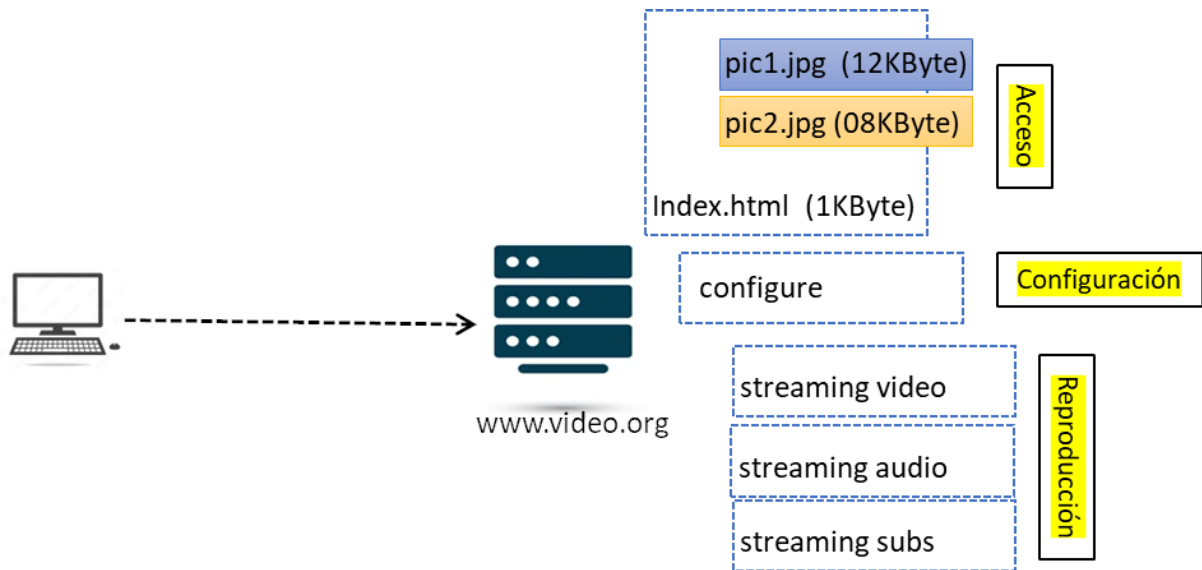
Figura 1: Network diagram - HTTP

- (**Play**) The user makes a request to the already configured streaming resources to start the video play.

Answer the following questions:

(a) During the access phase, you should observe there is a HTML page in the url `http://www.video.org/index.html` that shows two files `pic1.jpg` and `pic2.jpg` that can be found in the same server and path.
I) Write down the HTTP/1.1 requests that the client should make to obtain the page and the necessary resources (pictures) for its rendering and write down the server response for the web page index.html (you can signal the presence of body using <body>).
II) How many TCP connections will be needed in this case? why?

(b) For the configuration phase, the client should deliver a JSON (88 bytes long) as indicated previously in the problem statement, to the URL `http://www.video.org/configure`. If the configuration is correct, it will obtain a response (in JSON format with mime type `application/json` and 15 bytes long) `{"result":"ok"}`. For the following questions, indicate the presence of a body with the <body> placeholder when it is necessary.
I) Write down the request(s) in HTTP/1.1 that the client should make to deliver the configuration information to the server.
II) Write down the response (assuming the configuration is correct)

(c) For the play phase, the client should access simultaneously to three different resources (video, audio and subtitles) during the time it takes the video playback.
I) Reason the differences in connections and bandwidth utilisation using HTTP/1.1 or HTTP/2 for the playback.
II) What characteristics of HTTP/2 could be used to access the three resources

simultaneously?

(d) If, after the access and configuration phase performed with HTTP/1.1, the client considers more appropriate using HTTP/2...
I) would it be possible to change to HTTP/2?
II) will be necessary to open a new TCP connection?
III) In case the response to question a) is positive, what will be necessary to do to change to HTTP/2 (describe the requests and responses)?

(e) Suppose the client is using HTTP/2 during the playback phase. Suppose it decides to use three HTTP/2 streams, one per resource, that are:

- `http://www.video.org/streaming_video` for video transmission
- `http://www.video.org/streaming_audio` for audio transmission
- `http://www.video.org/streaming_subs` for subtitle transmission

The connection uses a MTU of 1500. The client announces a window (WIN) of 140 segments. The client establishes priorities for the streams so that the 60 % of the information delivered is for video, 30 % for audio and 10 % for subtitles.

Consider the connection has a congestion window equals or more the WIN in the instant the playback starts and the time used to deliver all the segments of a window and receive their corresponding ACKs is 10ms. The application is configured in a way it is necessary to wait for all the previous segments to be acknowledged before sending the segments of a new window and the application always send the entire window.

If the video requires a bandwidth at application level of 10 MBytes per second or bigger, Can the client play the video?