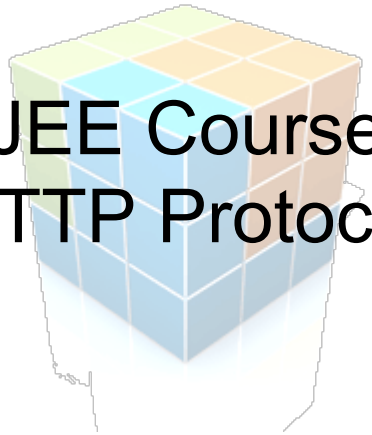


JEE Course
HTTP Protocol

Márcio Fuckner

marcio.fuckner@pucpr.br

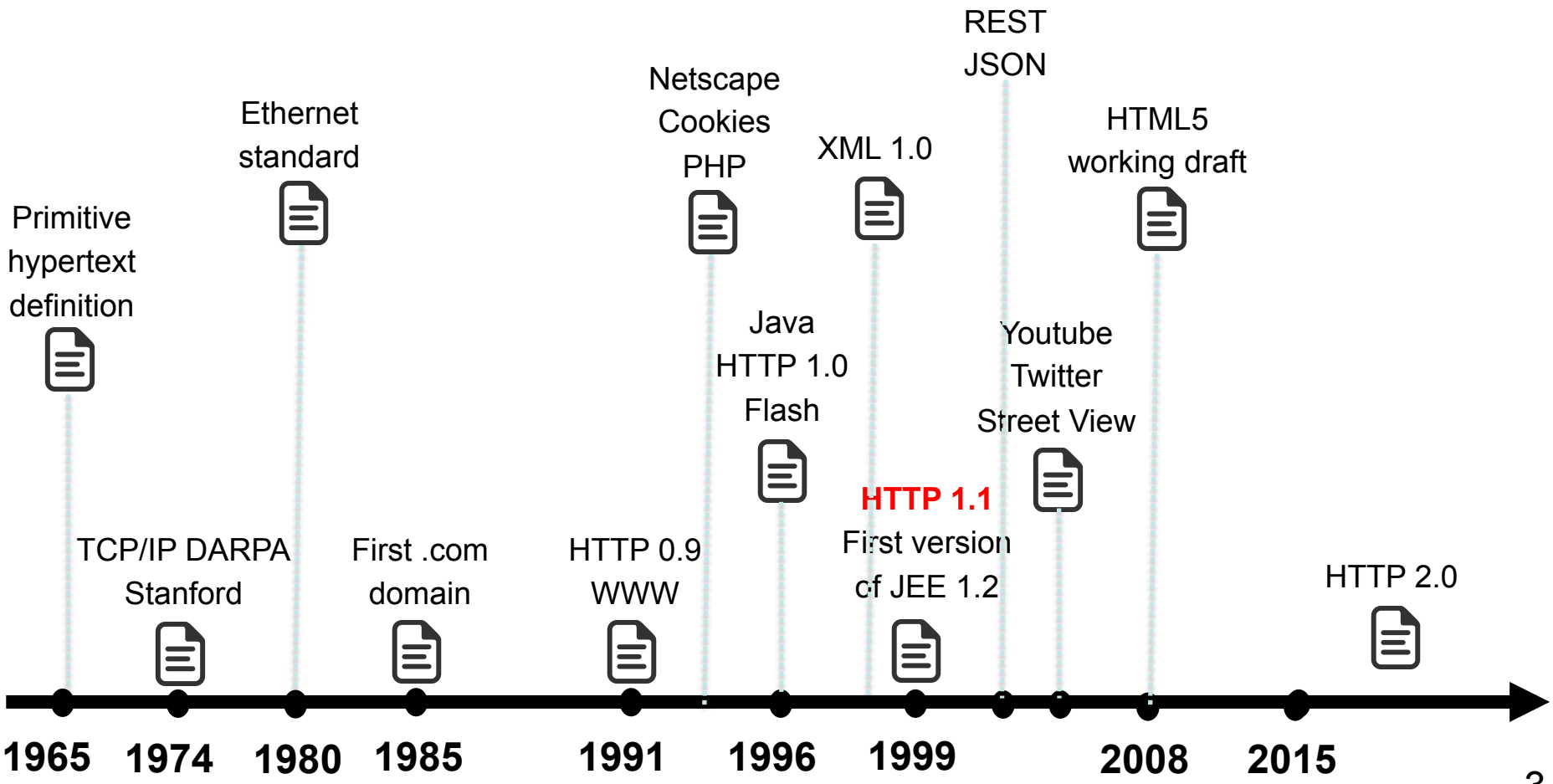
PUCPR - Pontifical Catholic University of Parana

ESIGELEC – Graduate School of Engineering

Content

- Brief history
- Main concepts
- Request and response messages
- Status codes
- Headers
- MIME

Timeline of HTTP and related technologies

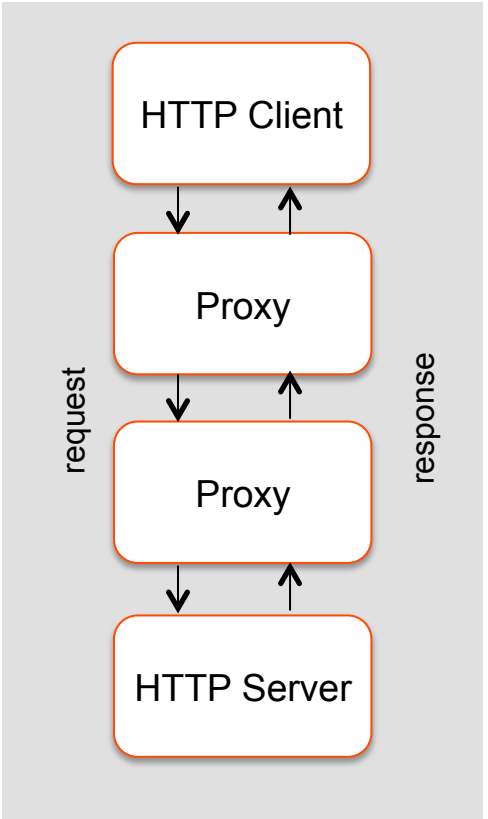


HTTP features (1 of 2)

- According to Bernes-Lee, the world wide web has three key elements
  - A **markup language** to represent the information
  - A **common notation** to access resources
  - A **transport protocol**
- We have several markup languages. The most popular are **HTML**, XML and their variations.
- The conventional notation is called **URI** (*Uniform Resource Identifier*), popularly also known as URL (*Uniform Resource Locator).*
- **HTTP** is the transport protocol

HTTP features (2 of 2)

- HTTP is a **TCP/IP based** communication protocol used to deliver data on the web
- Described in the RFC 2616
- Request and response paradigm
- Stateless protocol



Uniform Resource Locator (1 of 3)

- Uniform Resource Locators (URLs) are strings used to find a resource.
- General notation:

protocol://**host**[:**port**]/**path**[;**parameters**][?**query**][#**anchor**]

  - **protocol**: Name of the protocol (Ex.: HTTP, HTTPS, e FTP). The name precedes the sequence “://”;
  - **host**: IP address or hostname;
  - **port**: Optional. Indicates what port is used to connect the server. If the port is omitted, then the standard port is used. For example, the default port for the HTTP protocol is 80;
  - **path**: absolute path of the resource. In general, some HTTP servers allow the creation of aliases, which does not mean that the resource is navigable in the server file system.

Uniform Resource Locator (2 of 3)

- Uniform Resource Locators (URLs) are strings used to find a resource.
- General notation:

  protocol://**host**[:**port**]/**path**[;**parameters**][?**query**][#**anchor**]

  - **parameters**: Optional. Commonly used for session tracking.
  - **query**: Optional. A list of parameters (key=value pairs), separated by the ampersand (&) character
  - **anchor**: Optional. Determines a specific part of the document (like a bookmark)

Uniform Resource Locator (3 of 3)

- Some examples of URL:

  http://www.google.com.br/search?hl=en&q=Web+Technology&aq=f&oq=

  - Protocol: HTTP
  - Host: www.google.com.br
  - Port: Omitted (80)
  - Path: /search
  - Query: hl=en&q=Web+Technology&aq=f&oq=

  ftp://ftp.pucpr.br:21/FreeBSD

  - Protocol: ftp
  - Host: ftp.pucpr.br
  - Port: 21
  - Path: /FreeBSD

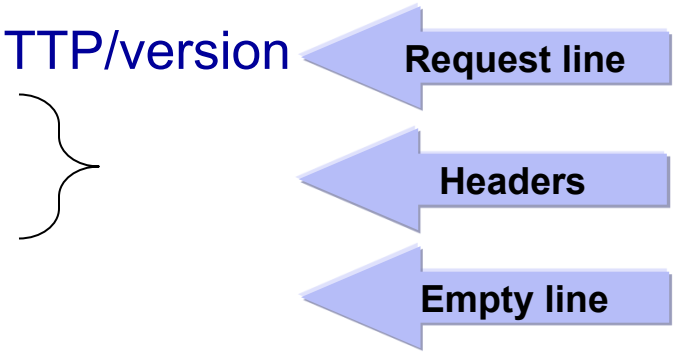
HTTP request

- When we open the browser and type a URL, the browser connects to the specified host and sends an HTTP request message

- An HTTP request have the following format:

Method path+parameters+query+anchor HTTP/version
Name-of-the-header-1: value-1
Name-of-the-header-n: value-n

[optional body]



HTTP methods

- There are several HTTP request methods available
  - get: used to retrieve information
  - post: posting a message, providing blocks of data
  - put: Add a resource
  - delete: Remove a resource
  - trace: Use for testing and diagnose purposes
  - options: request for information
  - connect: For use with a proxy

Hint: During the beginning of the 2000's, GET and POST were the most used HTTP methods. With the adoption of lightweight web services following the REST specification, other methods such as PUT and DELETE have gained more attention

GET method example

- When we click on a link or when we type a URL in the browser, it creates an HTTP request message using GET
- GET sends request data using the "?" character to mark the beginning of the requests and "&" to delimit multiple parameters

- Example:
- When typing the following URL into your browser:
  - http://www.google.com and enter the search value ”ESIGELEC", the browser will send the following request line:

- GET /?gws_rd=ssl#q=esigelec&safe=off HTTP/1.1

POST method example

- HTML forms submitted using the post method produce an HTTP message the query part of the body of the HTTP message.
- Remember that all HTTP messages are allowed to have a body!
- Example:

```
POST /q HTTP/1.1
Host: fun.yahoo.com
User-Agent: Mozilla/5.0 (Macintosh; …
Content-Type: application/x-www-form-urlencoded
Content-Length: 27

search=restaurants&count=10
```

request line

headers

body

HTTP response

- General format

  HTTP/version status code message

  Header-1: valor-1

  Header-2: valor-n

  [optional body]

Status Codes

- Range of status codes
  - 1xx Information (used for proxy chaining)
  - 2xx Success
  - 3xx Redirection
  - 4xx Client error
  - 5xx Server error

Headers (1 of 2)

- Headers are used to send additional information (to the server or the client)
- Used to improve the HTTP communication (connection optimization, cache, content-types, session tracking)
- A set of predefined headers is available. But you are free to create your own set of headers

Headers (2 of 2)

General headers

Date: Sun, 01 Mar 2015 11:05:48 GMT

Connection: Close

Request headers

User-Agent: Mozilla/5.0 …

Authorization: Basic [cred.]

Accept-Language: en-us,en;q=0.5

Response headers

Location: www.haschanged.com

www-Authenticate: Basic realm="XFiles"

Server: Apache/2.4.12

Entity Headers

Last-Modified: Sun, 01 Mar 2015 …

Content-Type: application/pdf

Content-Length: 250

Content-Type Header

- How to parse the body content? What is the format?
- HTTP has used the ideas applied to e-mail messages.
- An email message may have a body in pure textual format or HTML and several attachments
- The MIME standard (*Multipurpose Internet Mail Extension*) used for e-mail purposes is also used for HTTP messages
- Format: type/subtype

  Examples: text/html, text/plain, application/json, text/xml

  See: IANA media types: at http://www.iana.org/assignments/media-types/media-types.xhtml

Further reading

- RFC 2616 (*Hypertext Transfer Protocol – HTTP/1.1*)
  http://www.ietf.org/rfc/rfc2616.txt
- RFC 1738 (*Uniform Resource Locators*)
  http://www.w3.org/Addressing/rfc1738.txt
- IANA media types
  http://www.iana.org/assignments/media-types/media-types.xhtml
- RFC 2045 (*Multipurpose Internet Mail Extensions*)
  http://www.ietf.org/rfc/rfc2045.txt