HTTP Revisited

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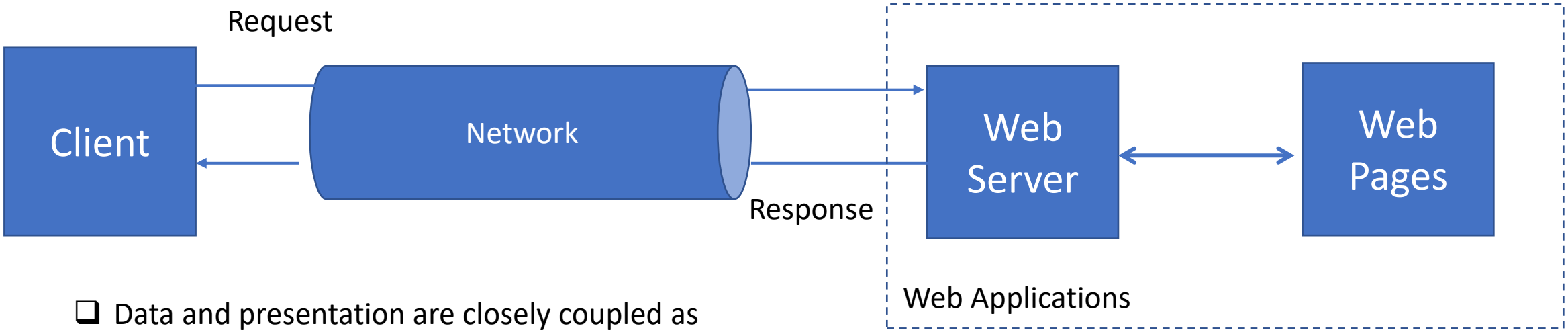
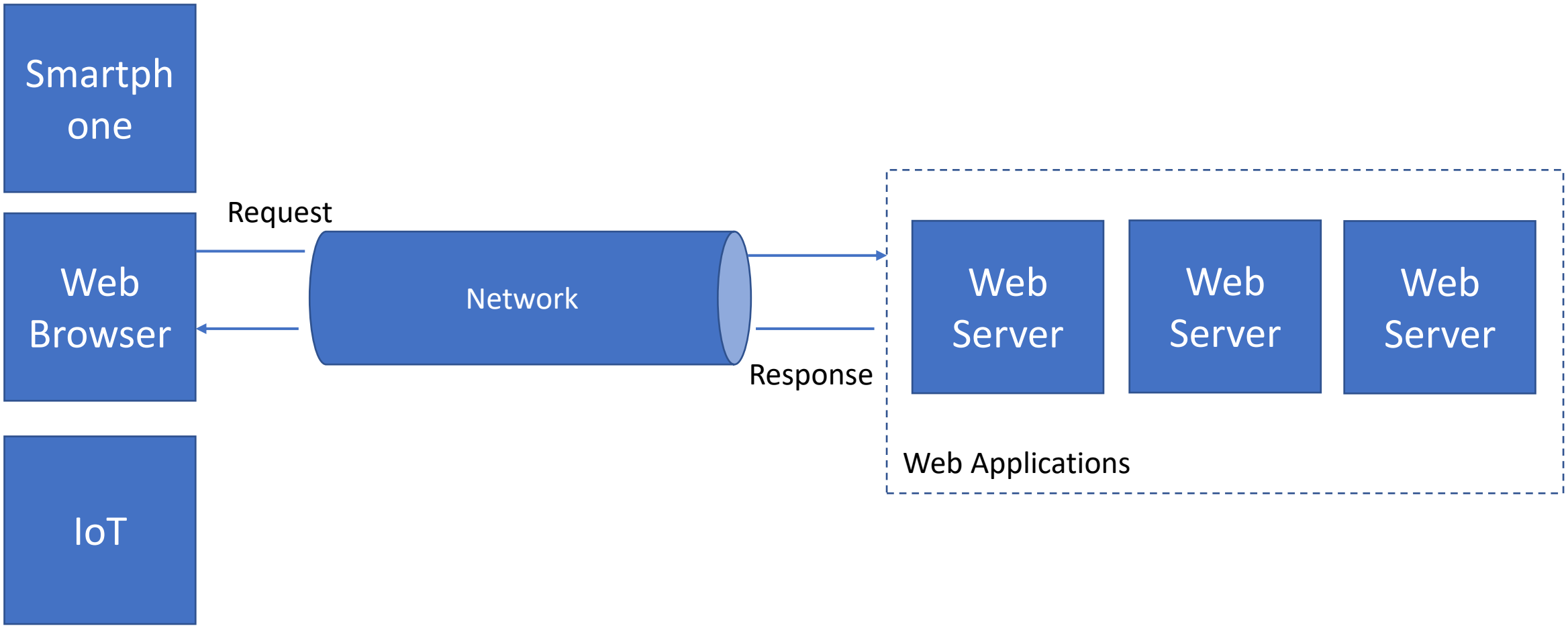
Web App Architecture-web 1.0



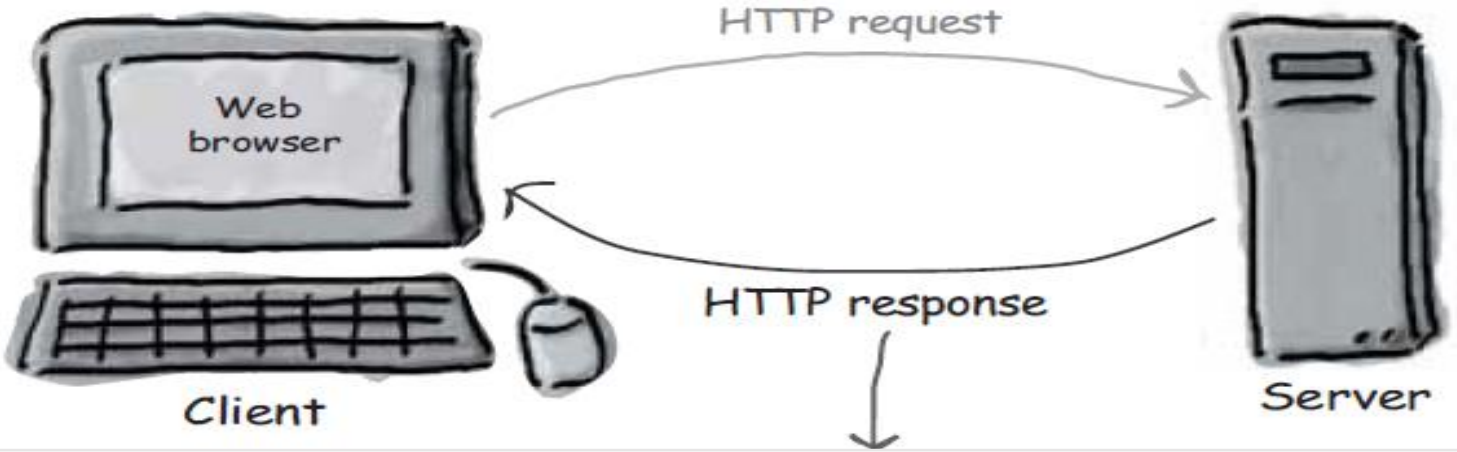
- Data and presentation are closely coupled as web pages are static

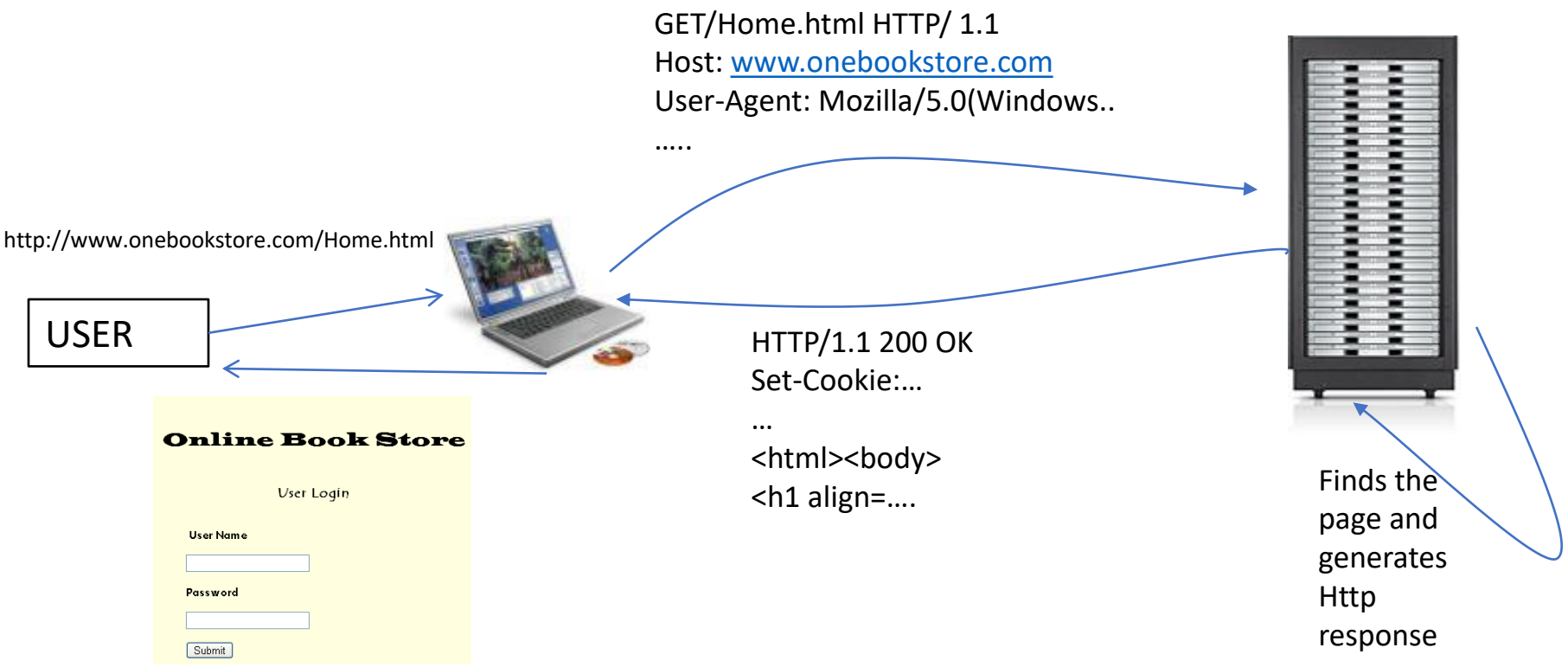

Smartph
one
Web
Browser
IoT
Request
Network
Response
Web
Server
Web
Server
Web
Server
Web Applications

Why HTTP

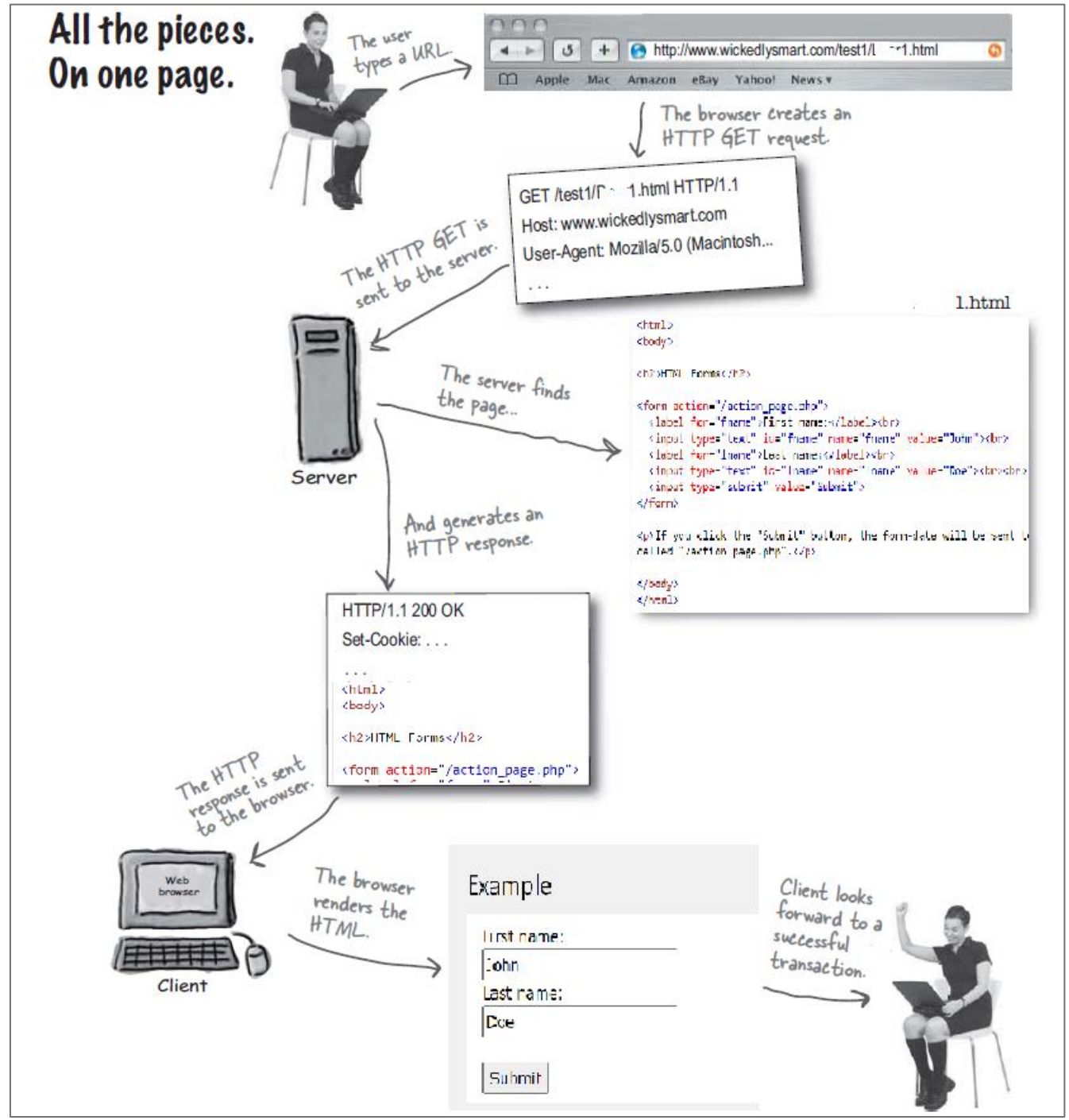
- It provides a uniform interface to access the resources and services from a web server or cloud
- Reuse infrastructure for ubiquity
  - Web is ubiquitous
- Reusing
  - application frameworks and libraries
  - Load balancing infrastructure for different applications including interacting with cloud
- Distribute requests throughout the servers

HTTP and HTML




GET/Home.html HTTP/ 1.1
Host: www.onebookstore.com
User-Agent: Mozilla/5.0(Windows..
…..
http://www.onebookstore.com/Home.html
USER
HTTP/1.1 200 OK
Set-Cookie:…
…
<html><body>
<h1 align=….
Finds the page and generates Http response
Online Book Store
User Login
User Name
Password
Submit

HTTP Request Response

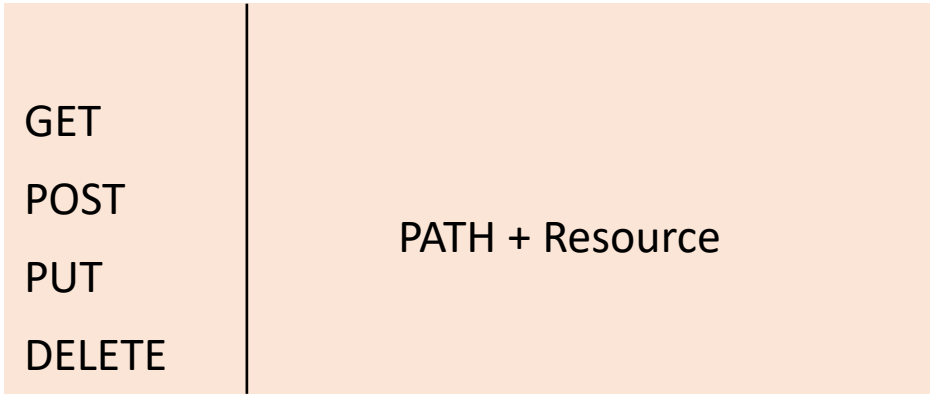


Http Request

- ***HTTP GET***
  - The total amount of characters in a GET is really limited (depending on the server)
  - The data you send with the GET is appended to the URL up in the browser bar, so whatever you send is exposed
  - Because of this, the user can bookmark a form submission if you use GET
- HTTP POST
  - The data is included in the request body
  - More data can be sent
  - General purpose sending of data

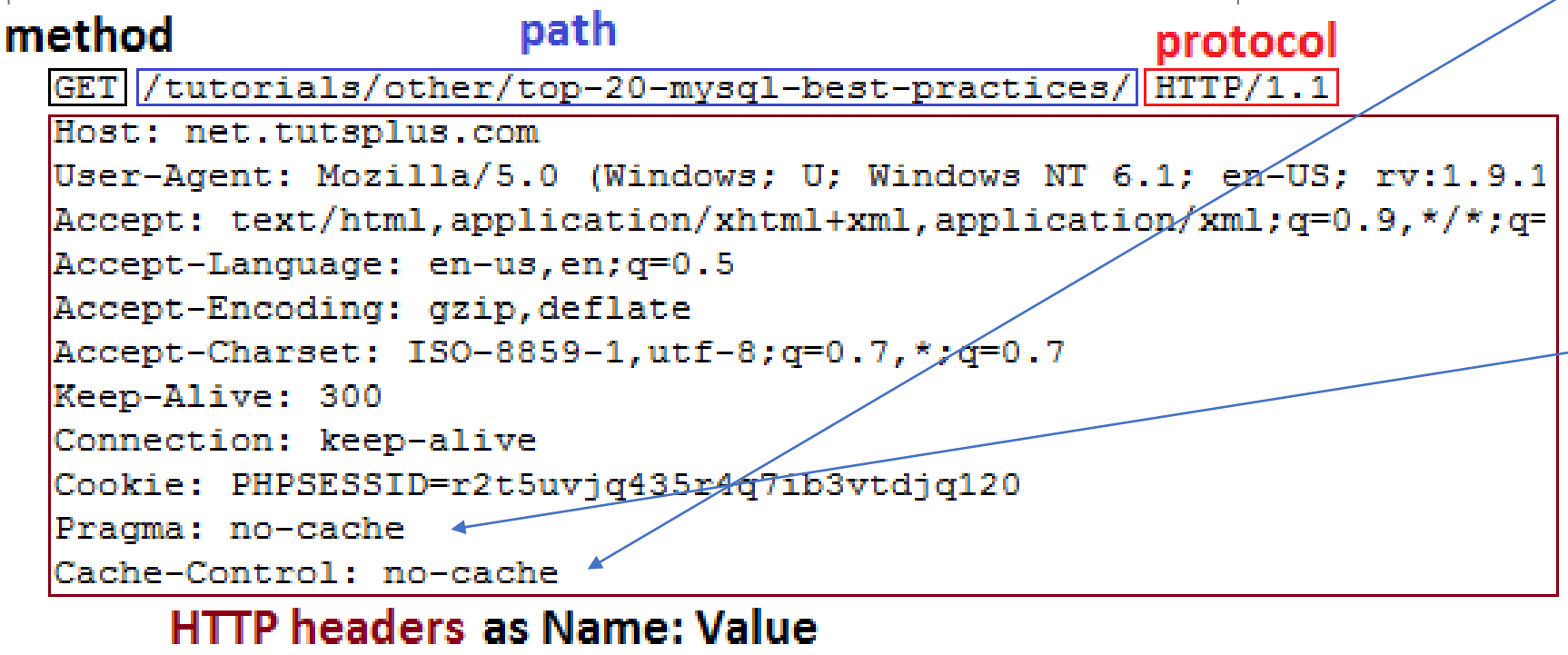
Http Methods

- Put
  - Data to be stored in the server
- Delete
  - Remove some information from the server



Request line

- GET/com/Kolkata/Home.html HTTP/ 1.1
- Method
- <path+resource>

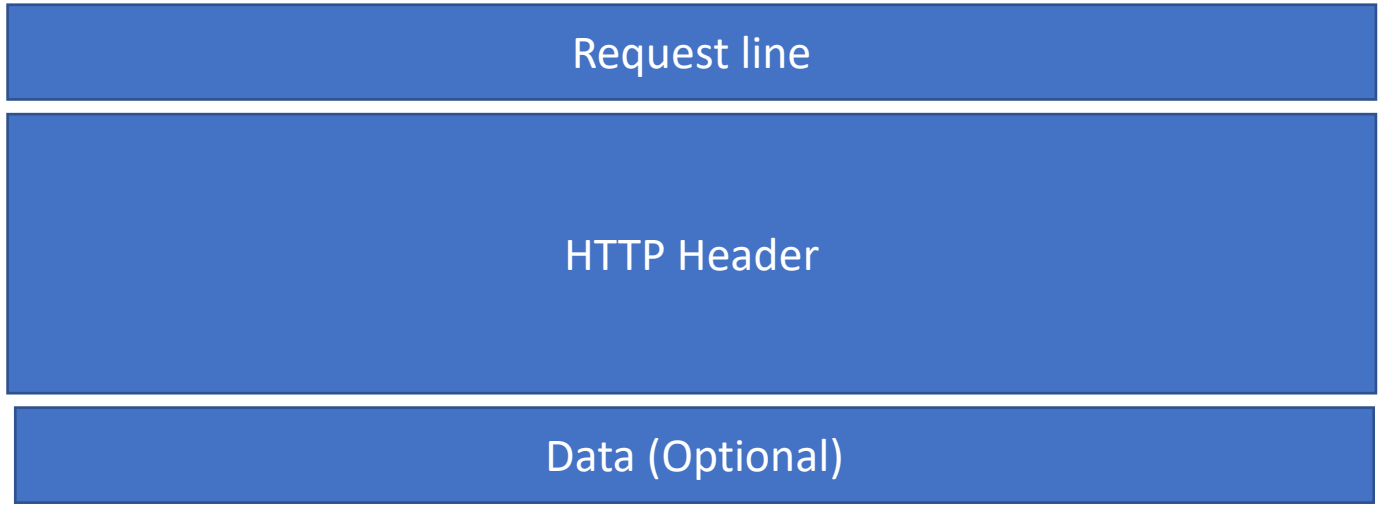


The response may be stored by *any* cache, even if the response is normally non-cacheable. However, the stored response MUST *always* go through validation with the origin server first before using it

The server MUST NOT use a cached copy when responding to such a request.

https://developer.mozilla.org/en-US/docs/Web/HTTP/Headers

HTTP Headers



- Headers are meta information but body of a HTTP message contains pure data
  - These are the extra information that the client is giving the server to help it complete that Request.
- If message body is sent without the header then the server may process the request
  - May not send the response in the expected format
- When body of a message is missing when it was required, the relevant information would not be processed

Uniform Resource Locator

https://wishnet.in/home/login.html

- The way resources are identified is called a URL
- `http://<host name>:<port number>/path/resource?key1=value1&key2=value2`
- Using the query parameters we can pass extra information about a specific aspect of a resource to the server
- URL encoding encodes any character that is not allowed in the query param spec
- For dynamically constructed URLs with data, it is better to encode all URLs as data may not follow the spec
- It is good to provide the correct file extension in the encoded URLs but not a requirement

Data Types

Image/jpg

Image/png

Text/plain

Text/html

Application/json

- The way data is stored in the server and the way it is sent in the body may differ
  - MIME type allows this adaptation
- There should be some way of interpreting the type of data sent in body
  - Image data
- MIME type is an identifier for a particular type or format information
- All of these different MIME types are identifiers for a well known format for the data in the body of either a request or a response.
  - Based on the MIME type the data will be processed
- MIME types are changed between client and server

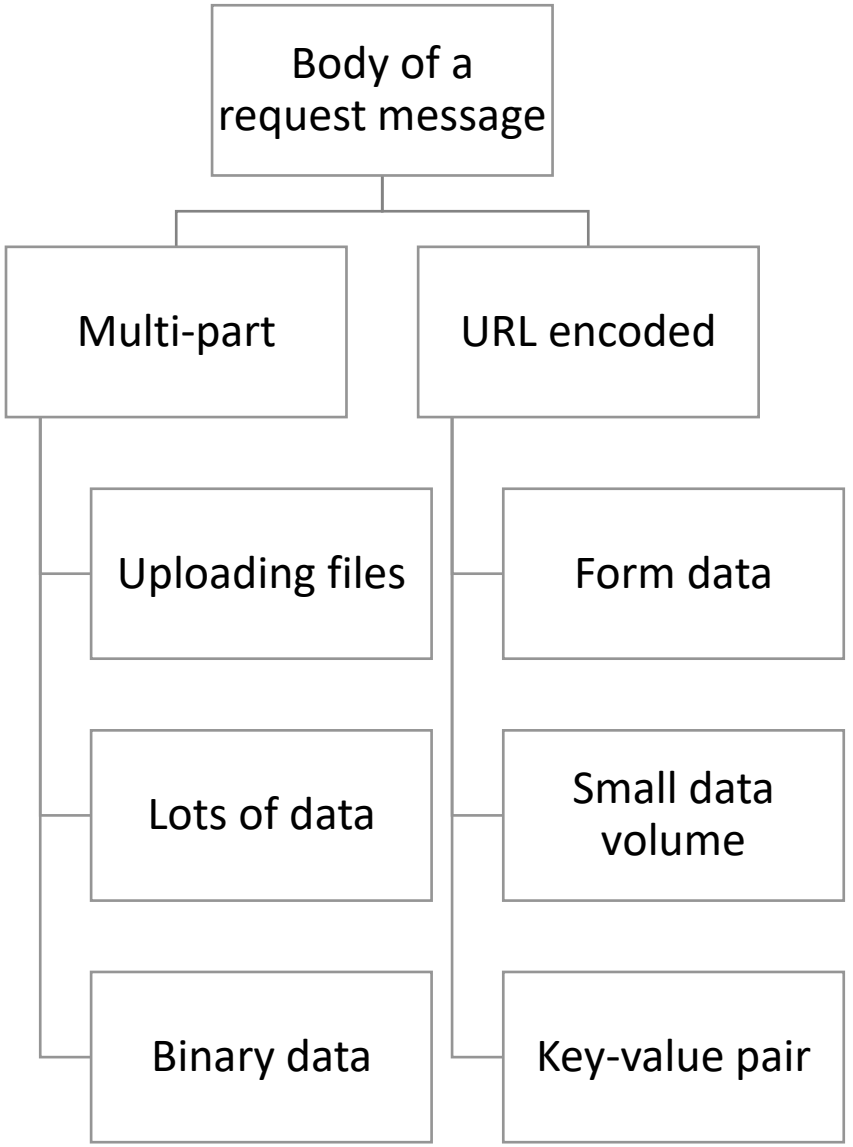
Content-Type: multipart/form-data

```
<form action="/" method="post" enctype="multipart/form-data">
   <input type="text" name="description" value="some text">
   <input type="file" name="myFile">
   <button type="submit">Submit</button>
</form>
```

```
POST /foo HTTP/1.1
Content-Length: 68137
Content-Type: multipart/form-data; boundary=---------------------------974767299852498929531610575

-----------------------------974767299852498929531610575
Content-Disposition: form-data; name="description"

some text
-----------------------------974767299852498929531610575
Content-Disposition: form-data; name="myFile"; filename="foo.txt"
Content-Type: text/plain

(content of the uploaded file foo.txt)
-----------------------------974767299852498929531610575--
```

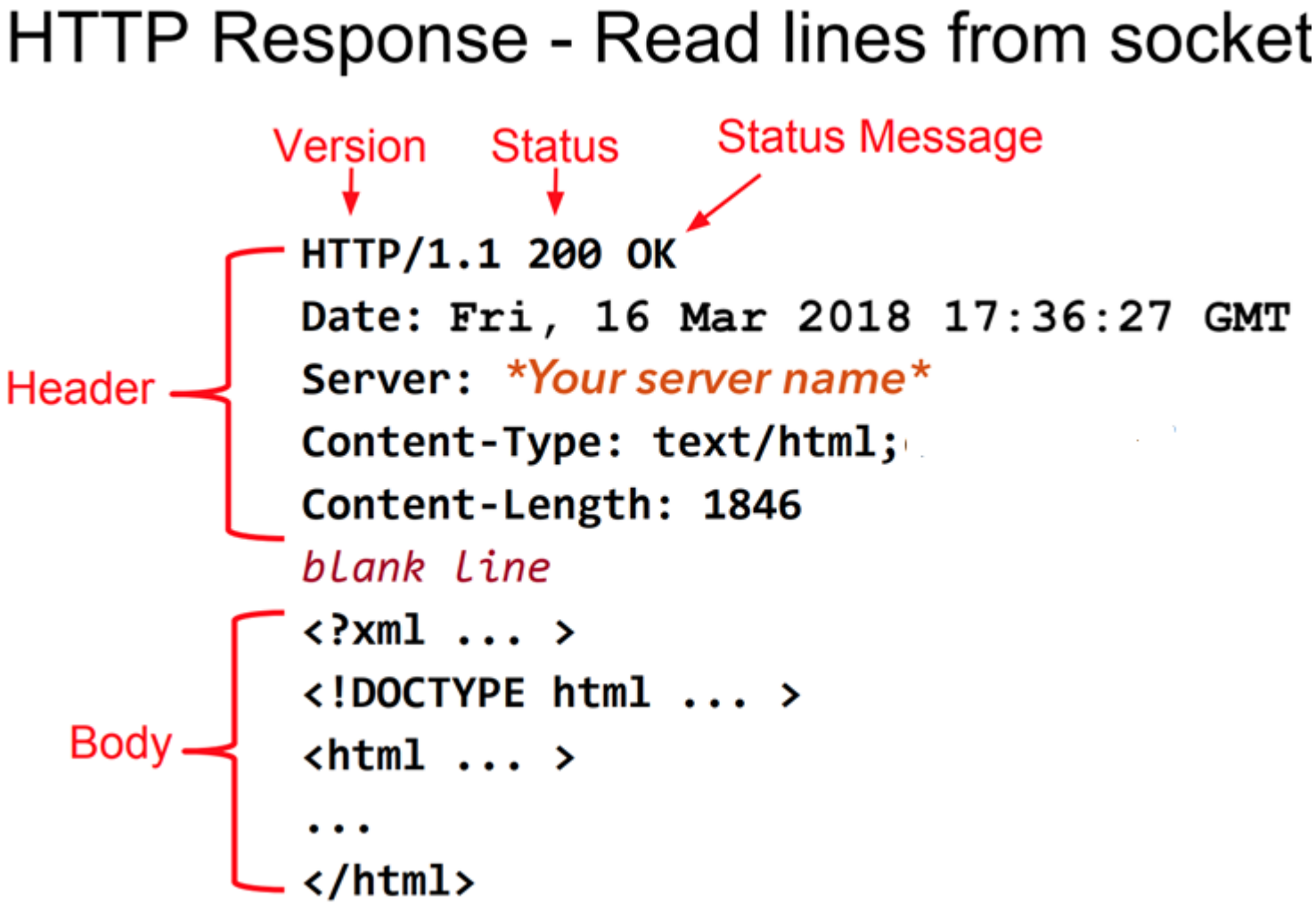
Request Body Encoding

- These are written as content types



HTTP Response

- We cant be present at the sever to check what has happened
- 1XX
- 2XX
- 3XX
- 4XX
- 5XX



Response Codes

- 1XX- informal continuing process
- 2XX- successful
  - 200 means the client can assume that the server has successfully handled the request
- 3XX-redirection
  - Resend the request as the requested resource may have been moved
- 4XX- client error
  - Requested resource not found
  - Problem in request formatting
- 5XX-server error
  - The response body may contain the detailing of the error
- Depending on the response code and the MIME type, the body of the response is processed

- HTTP request (user name, PWD)
- HTTP Response (Inbox)
- HTTP request (mail id)
- HTTP response

Cookies

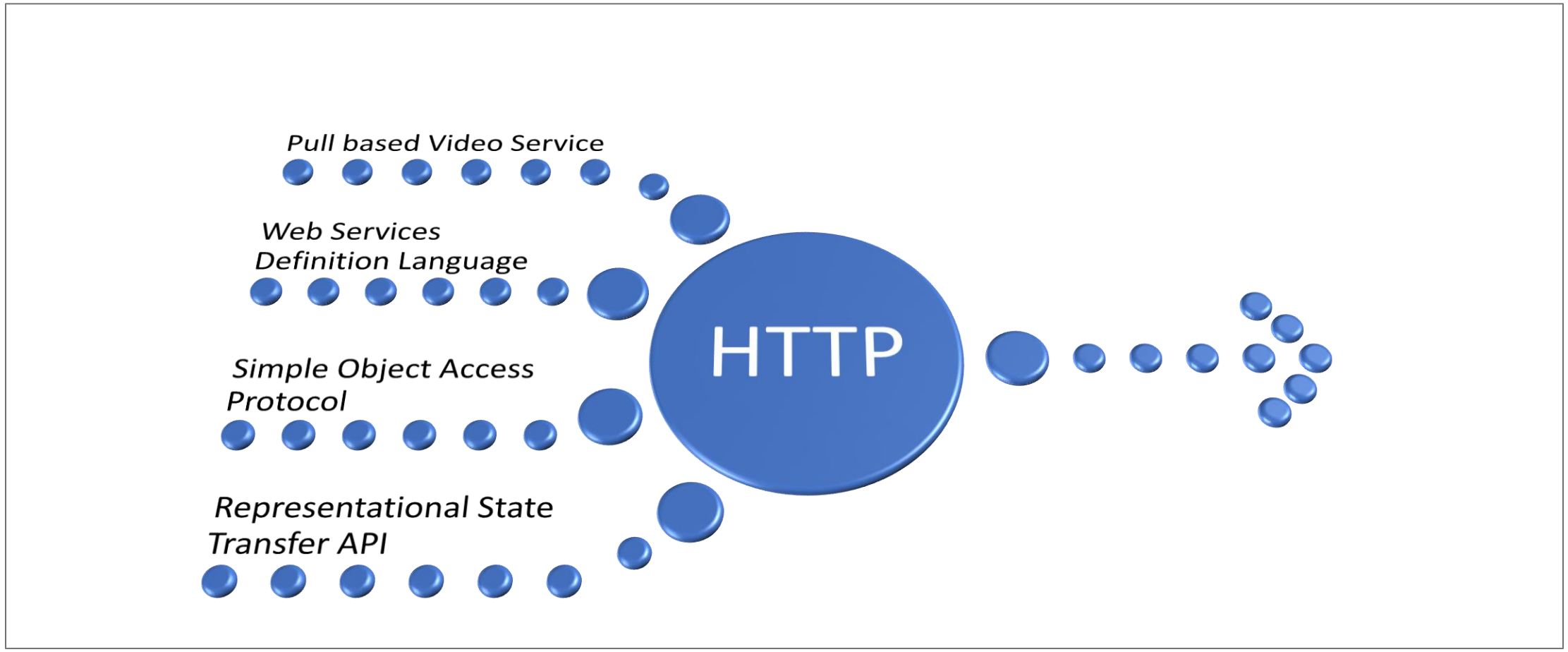
- They are very small limited pieces of data, that the server sends back to the client
- Goes through response header
- Size of the cookie has to be small
- Date/lifetime
- Encryption while sending the cookie
  - client only sends this cookie back to the server if a secure link, or an HTTPS communication protocol is being used

Protocol Layering

REST/WSDL/protocol to interact with a cloud object
HTTP
TCP/IP

- Specifying rules for interaction and exchange of messages
- formatting of those messages
- If a nice interface is designed for the protocol then other protocols could even be layered on top of this protocol
- So HTTP is just a protocol layer among many in the application
- Existing protocols on HTTP describe how you take messages or services and describe them using HTTP-based interactions
    - **Microsoft Smooth Streaming**

Services on top of HTTP



Other protocols

- How to interface HTTP through that protocol
- How to encode parameters in the body or URL
- Web services and REST are methodologies for building on top of HTTP that describes very specific formats and principles for building things on HTTP
- Most applications support REST like services or webservices like properties
- Building in some object which can live in the cloud or some service which can live in the cloud and can receive information and be interacted with over HTTP

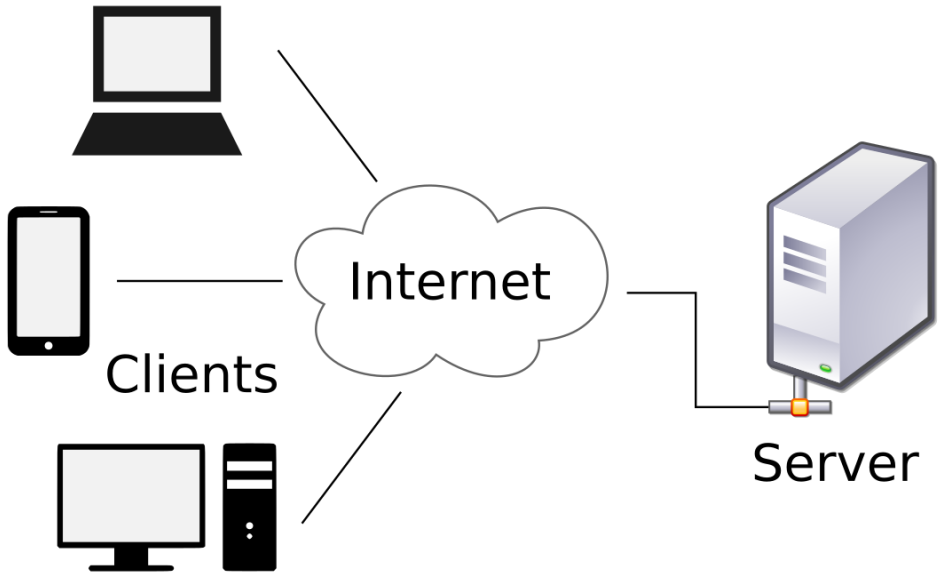
GET	https://www.coursera.org/learn/cloud-services-java-spring-framework/lecture/HBmkG/protocol-layering-http-design-methodologies
POST	
PUT	
DELETE	

REST or REST like Services

- URL Addressing scheme
- /video — All videos list
- /video/1 — Specific video using an identifier
- /video/1/duration — Duration of a video or specific part of the video

- GET-retrieve data
- PUT-create or replace
- POST-To add a new video and get back its URL identifier
- DELETE-remove resources at the server side

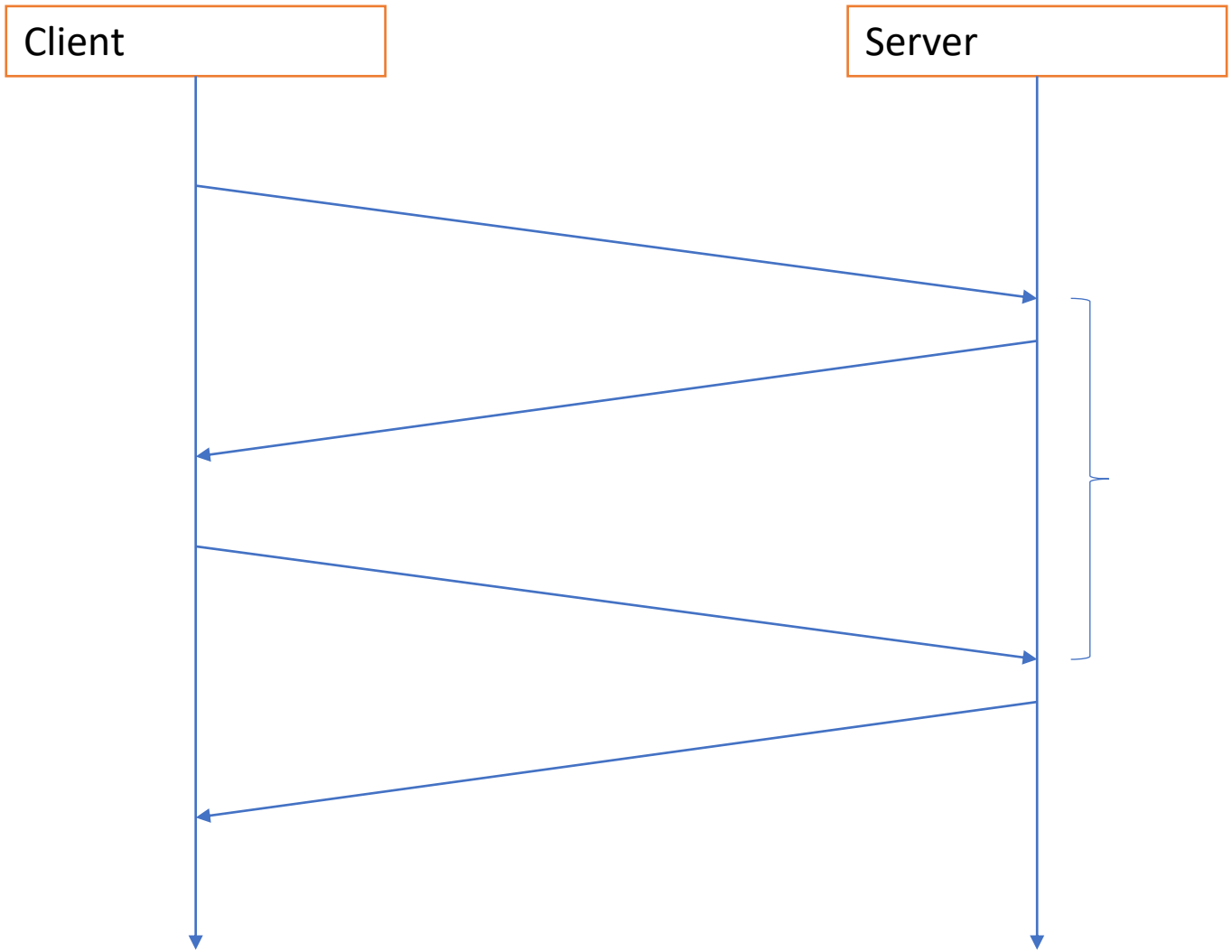
HTTP is client driven



- If client 2 updates important data that client 1 just pulled in, unless client 1 makes a second request for an update the server cannot notify client 1
- Server is not able to push data as and when needed

Pushing Data

- Manual- User may click on “refresh” when (s)he has decided to pull the data
- Every time the window is opened data is pulled from the server
- Periodic update
  - Overhead on the server processes as it needs to process the request even when no update is to be notified
  - Polling
  - Exponential backoff

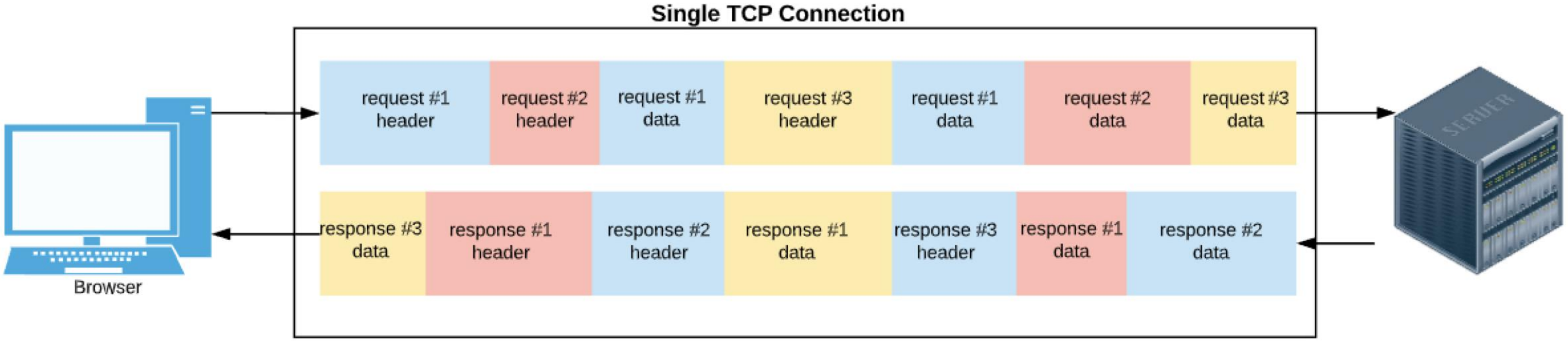


Periodic Update

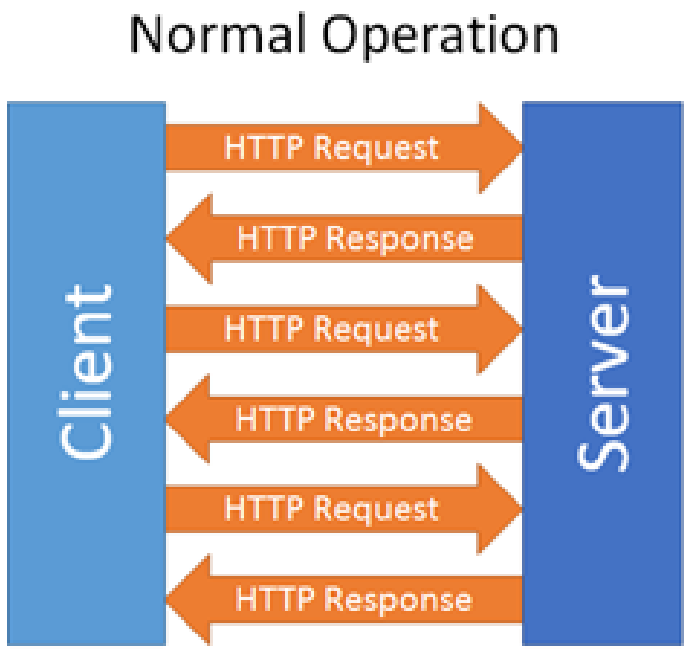
https://dzone.com/articles/thoughts-on-server-sent-events-http2-and-envoy-1

Server Data Push

- Server Sent Event (SSE)-an API for managing and parsing events from long-running HTTP connections
- HTTP 2.0
  - In addition to the response to the original request, the server can push additional resources to the client



WebSockets



- communication protocol which features bi-directional, full-duplex communication over a persistent TCP connection
- Any party can push data anytime
- Single TCP connection for full duplex traffic
- Message transfer on websockets does not require all parts of HTTP to be sent (header, URL, content type, body etc.)
- Simply send binary messages or some other format back and forth in a server
- By default, port 80 is used
- Port 443 is used for connection tunneled over the TLS

Web Socket HTTP compatibility

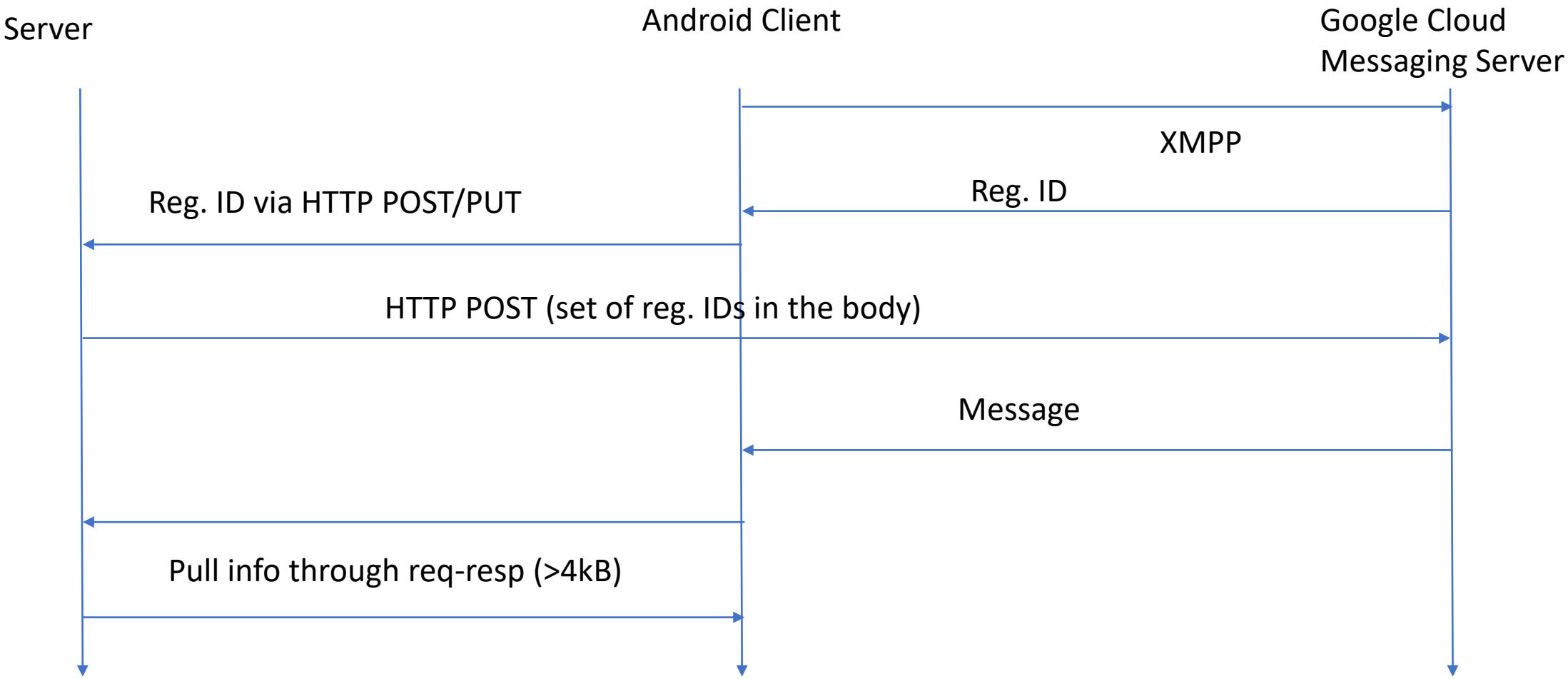
Web Socket Advantages

- Stateful connection
- Message overhead of polling is less than web socket
- STOMP- Simple Text Oriented Messaging Protocol

Web Socket

- Web sockets enable a server to push data only if the client is connected
- How to handle intermittent internet connections
  - Event mechanisms and notifications should be designed to detect disconnection and reconnection
  - Periodically reconnect/ or getting an event from Android
- Web sockets are heavy weight difficult to synchronize with more clients
- Keeping an open connection can have substantial resource impact
- For shared hosting servers, web socket is not a scalable option
- http responses can be cached by browser or by proxies
  - There is no such built-in mechanism for requests sent via webSockets

Push Notification



Push to Sync Model

- GCM handles the disconnection and reconnection issues through Android Cloud libraries
- Server sends an event pushed to the client that results in a pull by the client from the server
- Better than polling as the client now knows when to pull information
- Both message size and privacy issues dictate the exact design of the push notification
- Advantages
  - No need to push out large amount of information
  - The user can control the data dissemination and security over that dissemination of data