ASYNCHRONOUS NETWORKING

Client-Server Model + AJAX

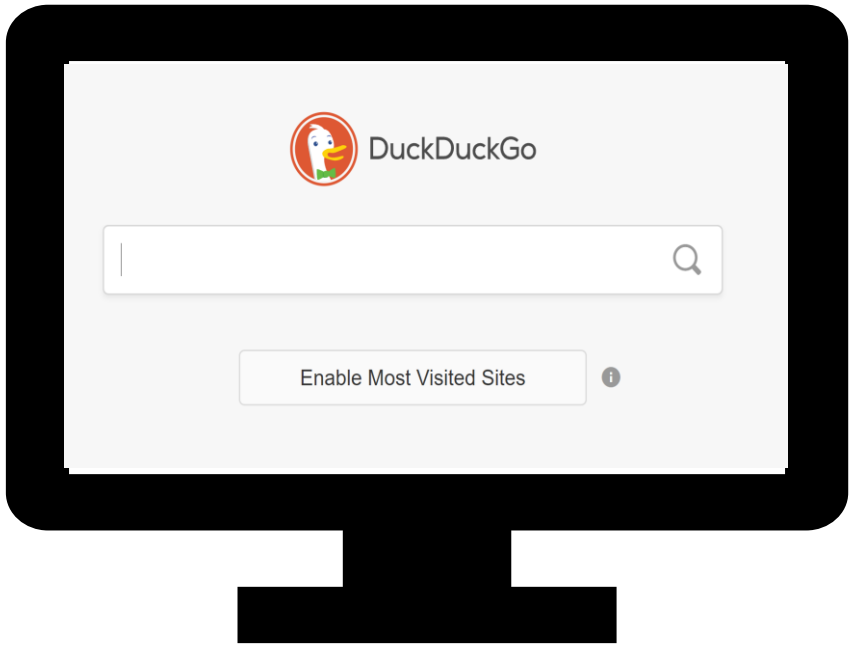
OVERVIEW

- Client-Server Model + AJAX
- Concurrency & JS
- Networking with `XMLHttpRequest()`
- Networking with Promises & `fetch()`
- Networking with `async/await & fetch()`

CLIENT-SERVER INTERACTION

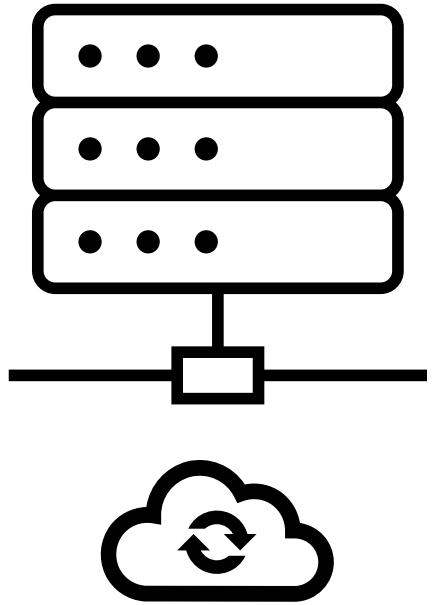
Client

Smart phones, laptops, etc.



Server

Racks of machines in datacentres



CLIENT-SERVER INTERACTION

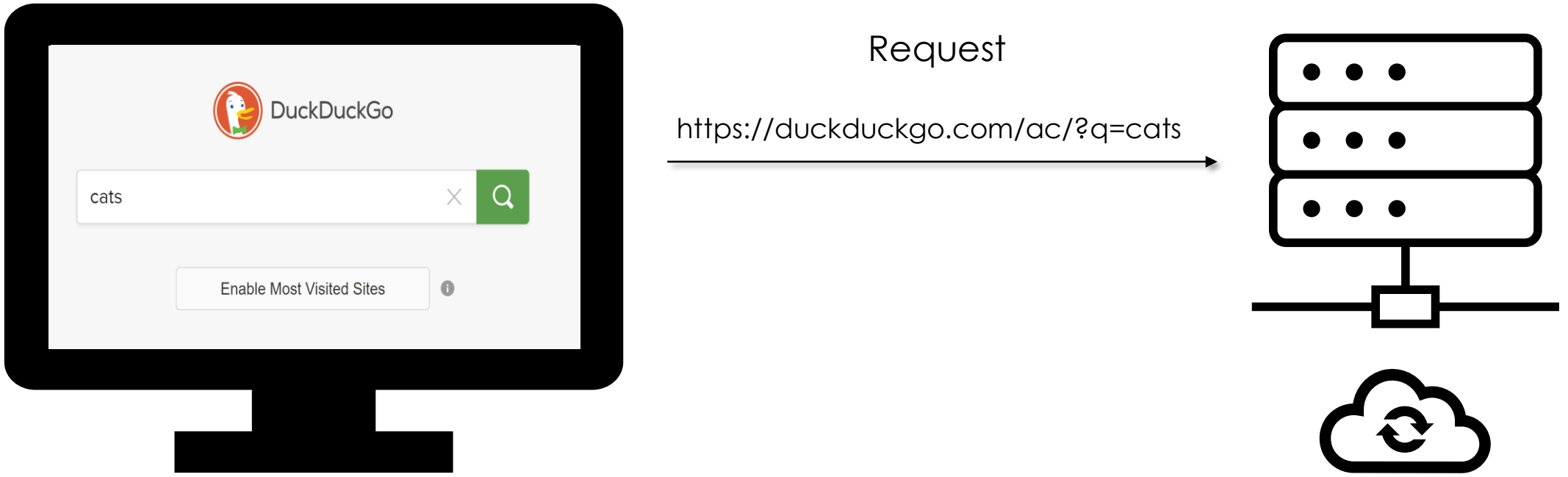
Client

Makes a request to a server

e.g. Search for websites that contain ‘cats’

Server

Waiting for requests



CLIENT-SERVER INTERACTION

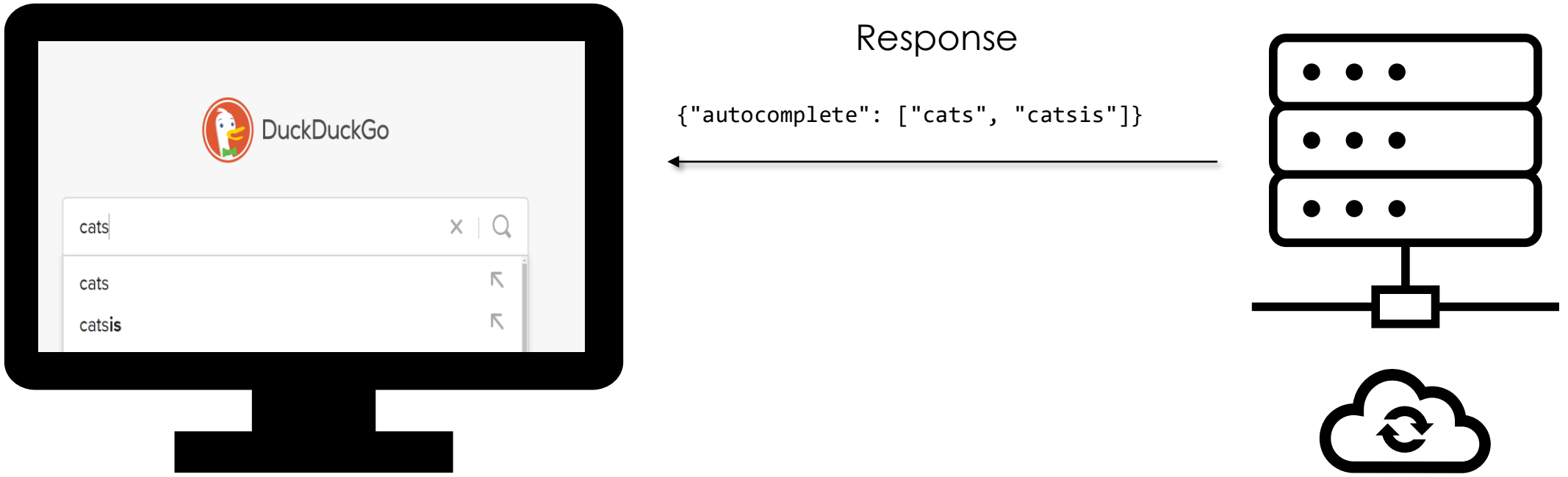
Client

Receives payload as a server response

Renders the HTML & CSS, executes the JS

Server

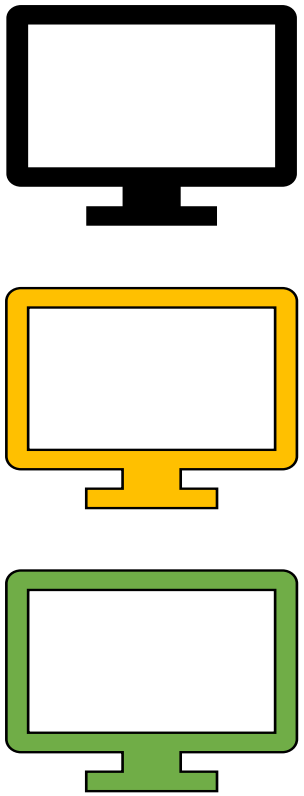
Validates arguments, executes API, returns data



CLIENT-SERVER REALITY

Webapp Client**s**

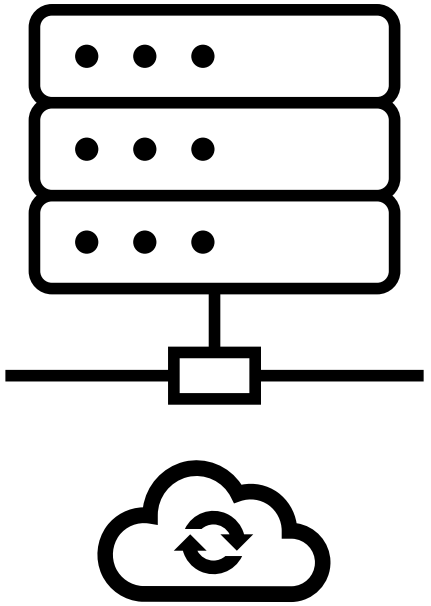
Server



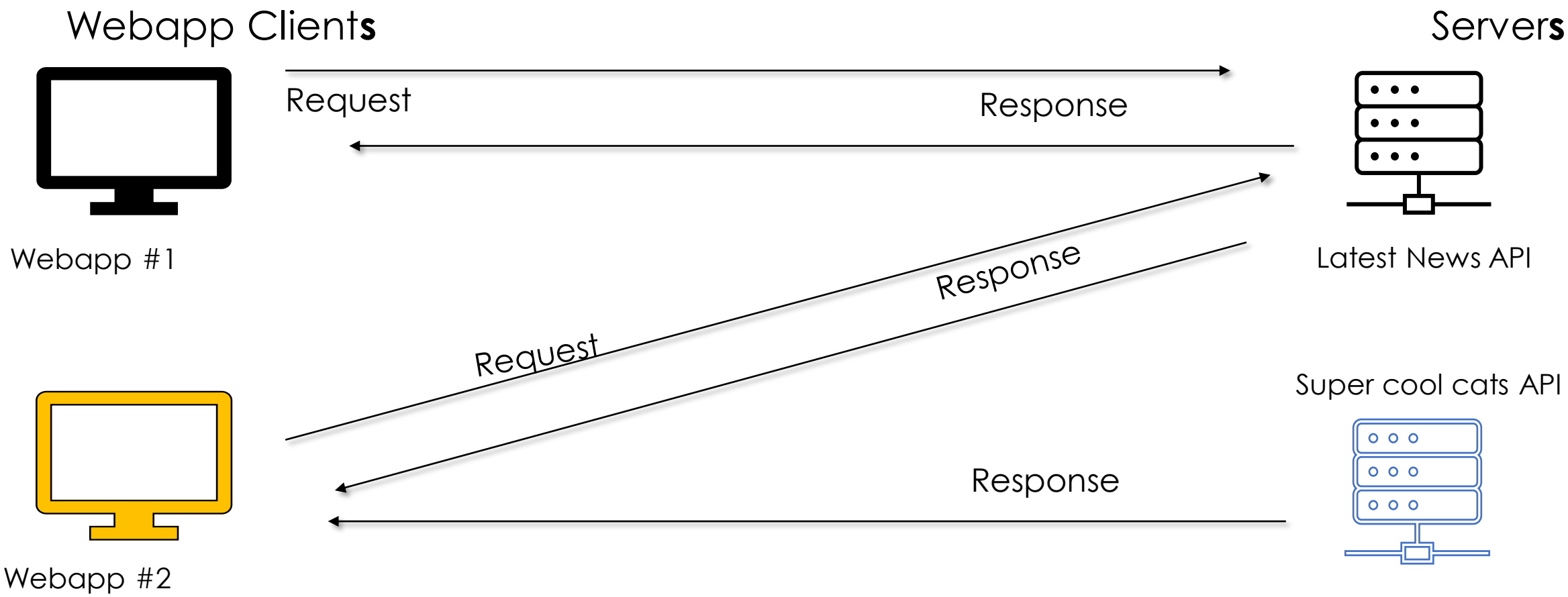
Response

Response

Response



CLIENT-SERVER REALITY²



LATENCY & THROUGHPUT: THE PROBLEM

Client-side

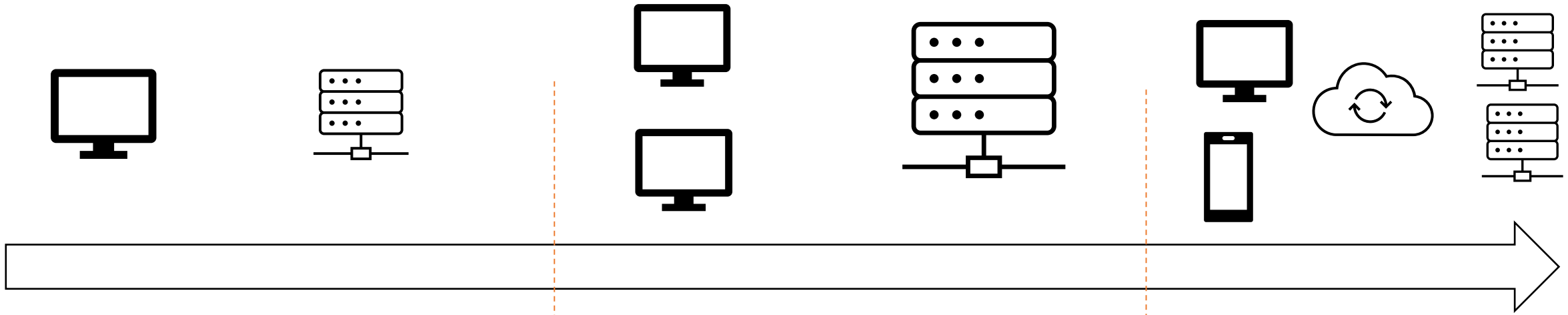
- Interactivity + responsiveness = low **latency** is most important
- Page loads ideally fast + once
- Losing your place in a page due to reload is bad UX

Server-side

- Need to handle at least thousands of requests
- Resources (time, power, # of servers) are expensive
- Maximising **throughput** is most important

EVOLUTION OF THE CLIENT-SERVER

A BRIEF HISTORY



1990s & early 2000s

- Clients = majority desktop web browsers
- On-site servers
- Era of "static webpages" i.e. **server-side rendering (SSR)**
- Scale by upgrading server

Mid-2000s – Early 2010s

- Majority of clients still desktop browsers
- JS adding much more interactivity client-side
- Still scale server vertically

~2010s – Present

- iPhone ushers in the smart phone era
- Clients now IoT and mobile
- Almost all rendering is client-side
- Cloud server-hosting is dominant
- Scale servers horizontally

LATENCY & THROUGHPUT: SOLUTIONS?

Client-side

- Leave presentation strictly to the frontend
- Initial page load contains minimal necessary data
- Fetch data **asynchronously** as needed ("lazy-loading")

Server-side

- Scale to handling millions of requests per second by **asynchronous** event processing
- Whilst waiting for I/O, serve another request => never idle
- Increase load-balancing by adding more servers

DEFINING AJAX

Asynchronous

Javascript

And

XML*

- AJAX = set of techniques to create asynchronous webapps.
- Not any one particular technology
- Allows offline apps, smooth UI/UX, modular frontend & backend

*JSON is used more nowadays rather than XML. So, Ajaj?

Doesn't quite roll off the tongue as well.

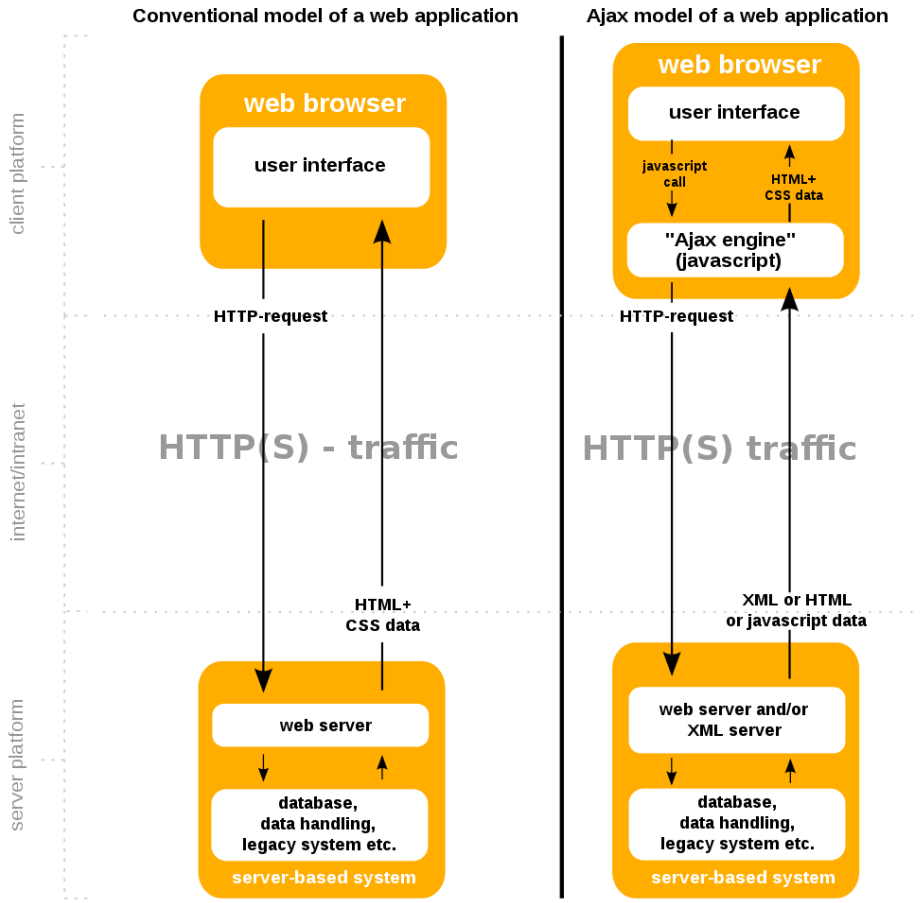


Image Credit: [Wikipedia]

SUMMARY

- Today:
  - Client-Server Model
  - AJAX

- Coming Up Next:
  - Concurrency & JS