JavaScript Days 2019, Berlin

What's wrong with Single-Page Apps (and what to do about it)

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@stilkov

INNOQ

Annoying your app users in 10 easy steps

1.

Forbid the use of the back and forward buttons

2.

Send them to the home page when they hit "refresh" ...

3.

... or at least ensure the browser pops up a warning window

4.

Make sure they can't open a second browser window

5.

Let them see UI decoration and ads first, content last

6.
Make sure they can't bookmark or send a link

7.
Don't let Google index anything

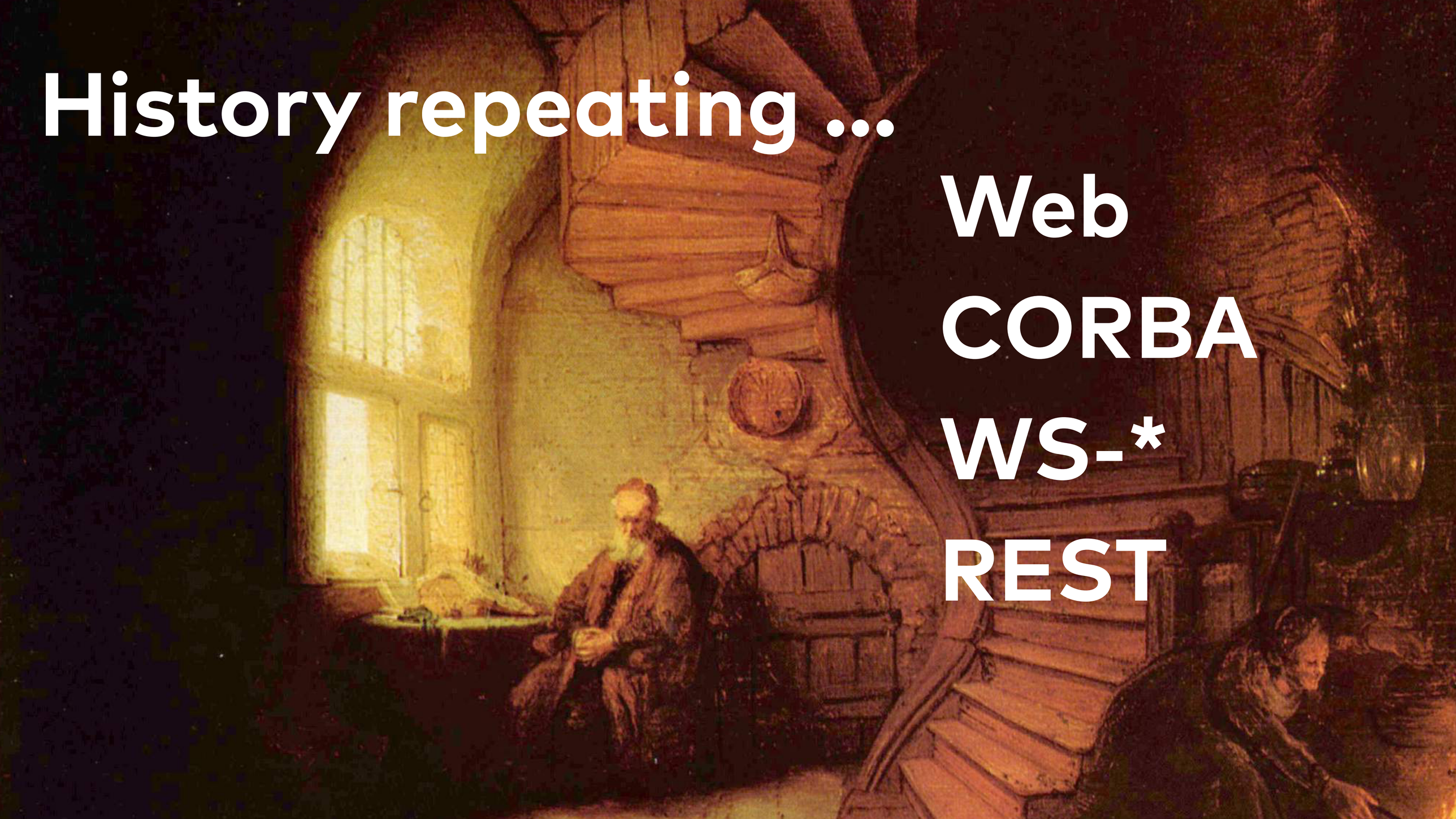
8.

Show users a picture of your app – it's surely better than nothing

9.

Disable assistive technologies. Who needs a screen reader, anyway?

10.
Ensure non-functioning JavaScript gives them a blank page


History repeating ...
Web
CORBA
WS-*
REST

What's the client side analogy?

“Web service”[1)]

- Uses HTTP as transport
- Ignores HTTP verbs
- Ignores URIs
- Exposes single “endpoint”
- Fails to embrace the Web

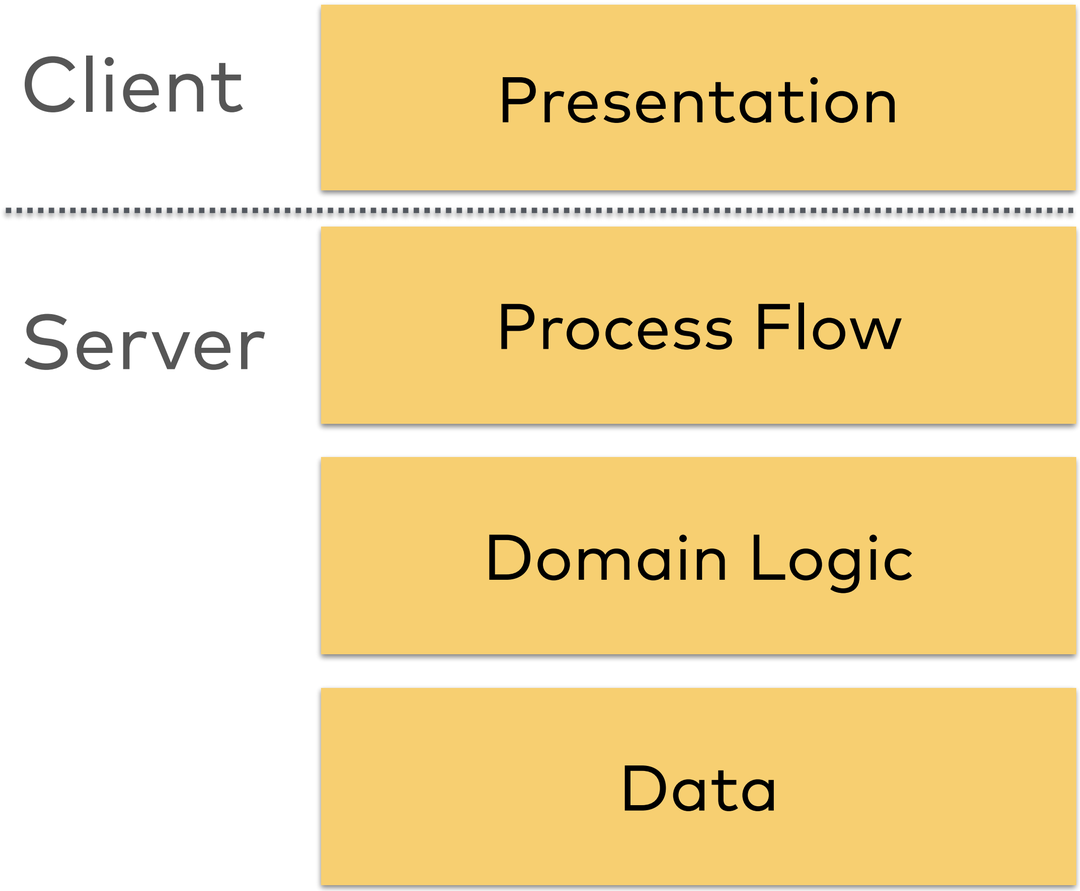
“Web app”[2)]

- Uses browser as runtime
- Ignores forward, back, refresh
- Does not support linking
- Exposes monolithic “app”
- Fails to embrace the browser

[1)] in the SOAP/WSDL sense

[2)] built as a careless SPA

The web-native way of distributing logic



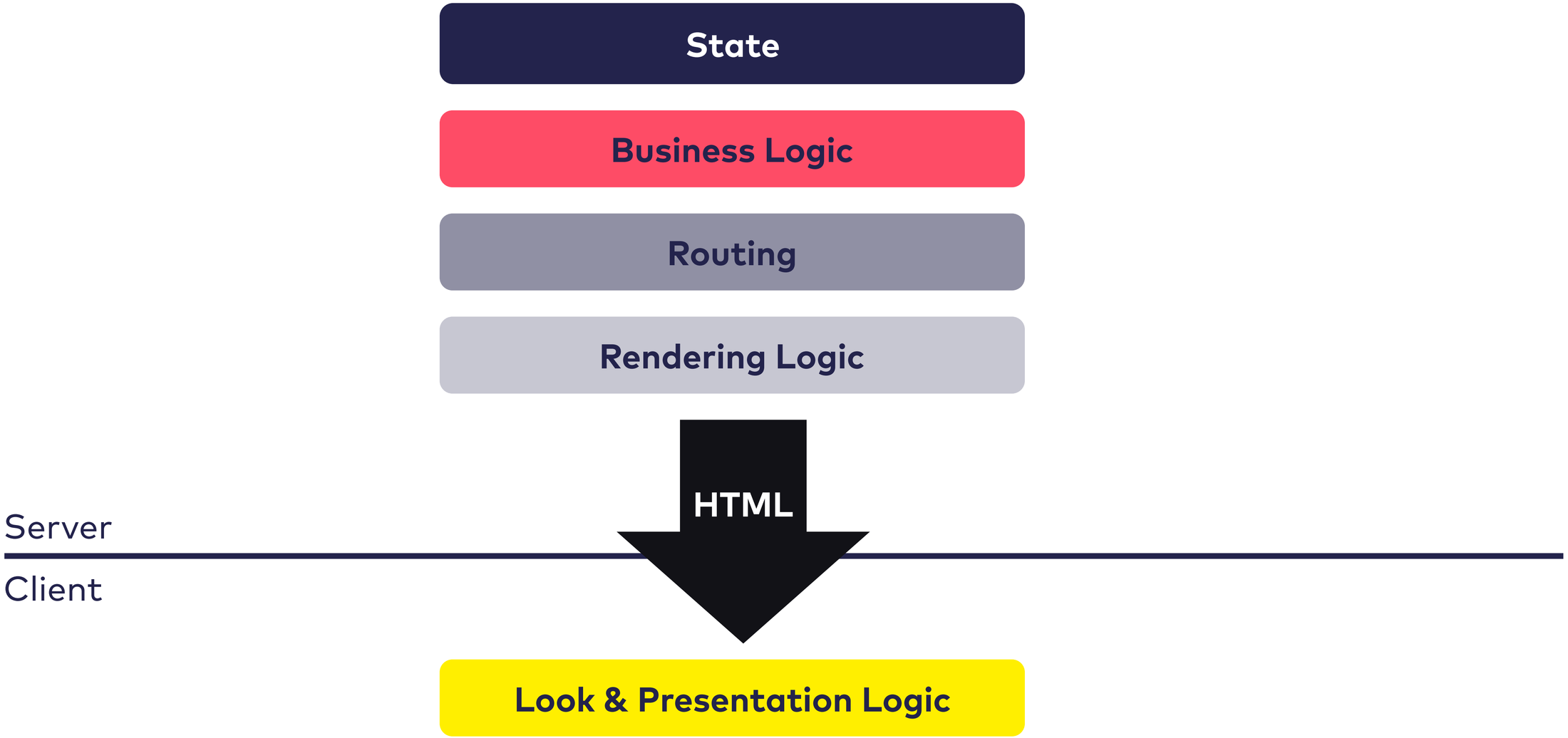
- Rendering, layout, styling on an unknown client
- Logic & state machine on server
- Client user-agent extensible via code on demand

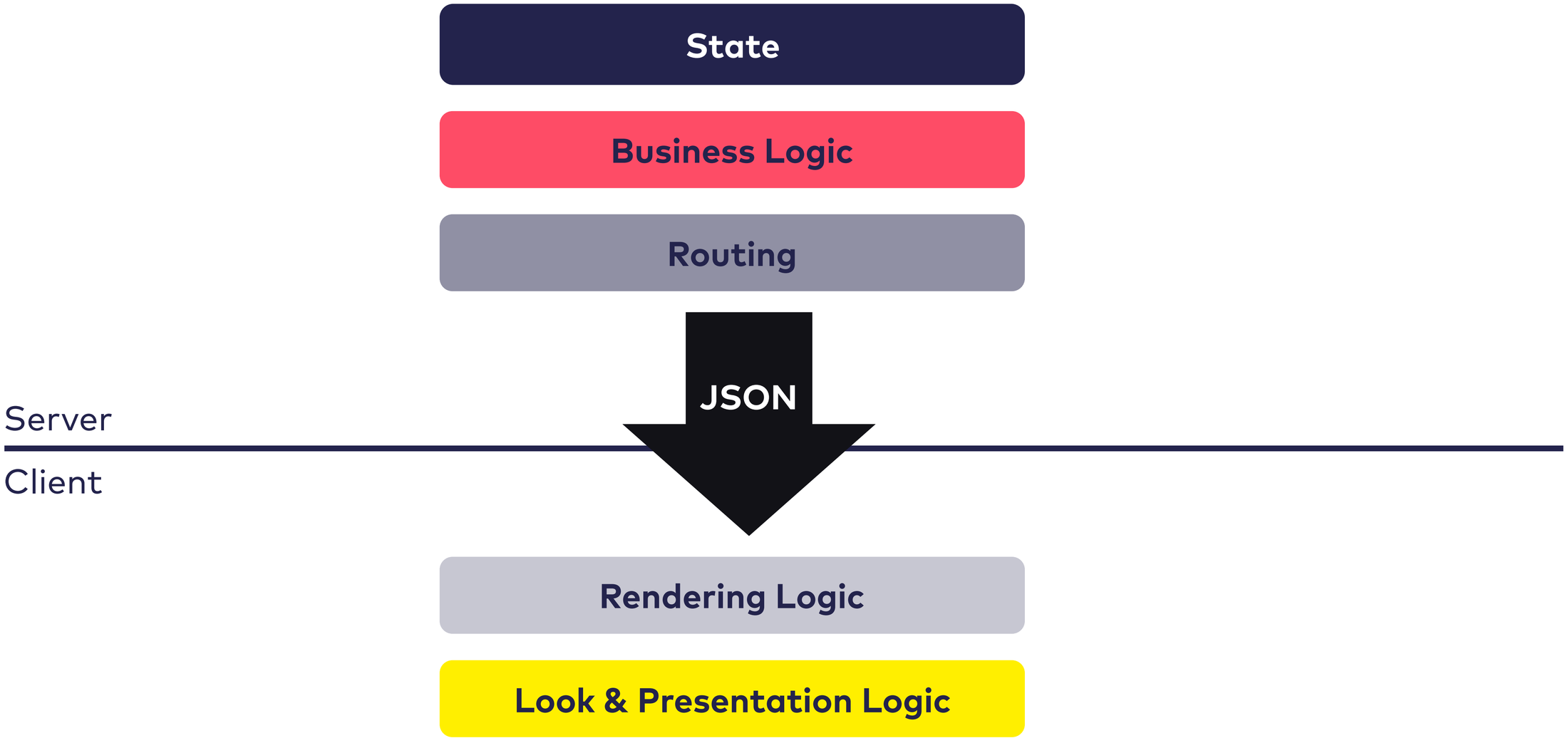
HTML & Hypermedia

- In REST, servers expose a hypermedia format
  - Option 1: Just invent your own JSON-based, incomplete clone
  - Option 2: Just use HTML
- Clients need to be RESTful, too
  - Option 1: Invent your own, JS-based, buggy, incomplete implementation
  - Option 2: Use the browser

A great REST hypermedia API is very similar to a simple, server-sided rendered web application

What does SPA even mean?


State
Business Logic
Routing
Rendering Logic
HTML
Server
Client
Look & Presentation Logic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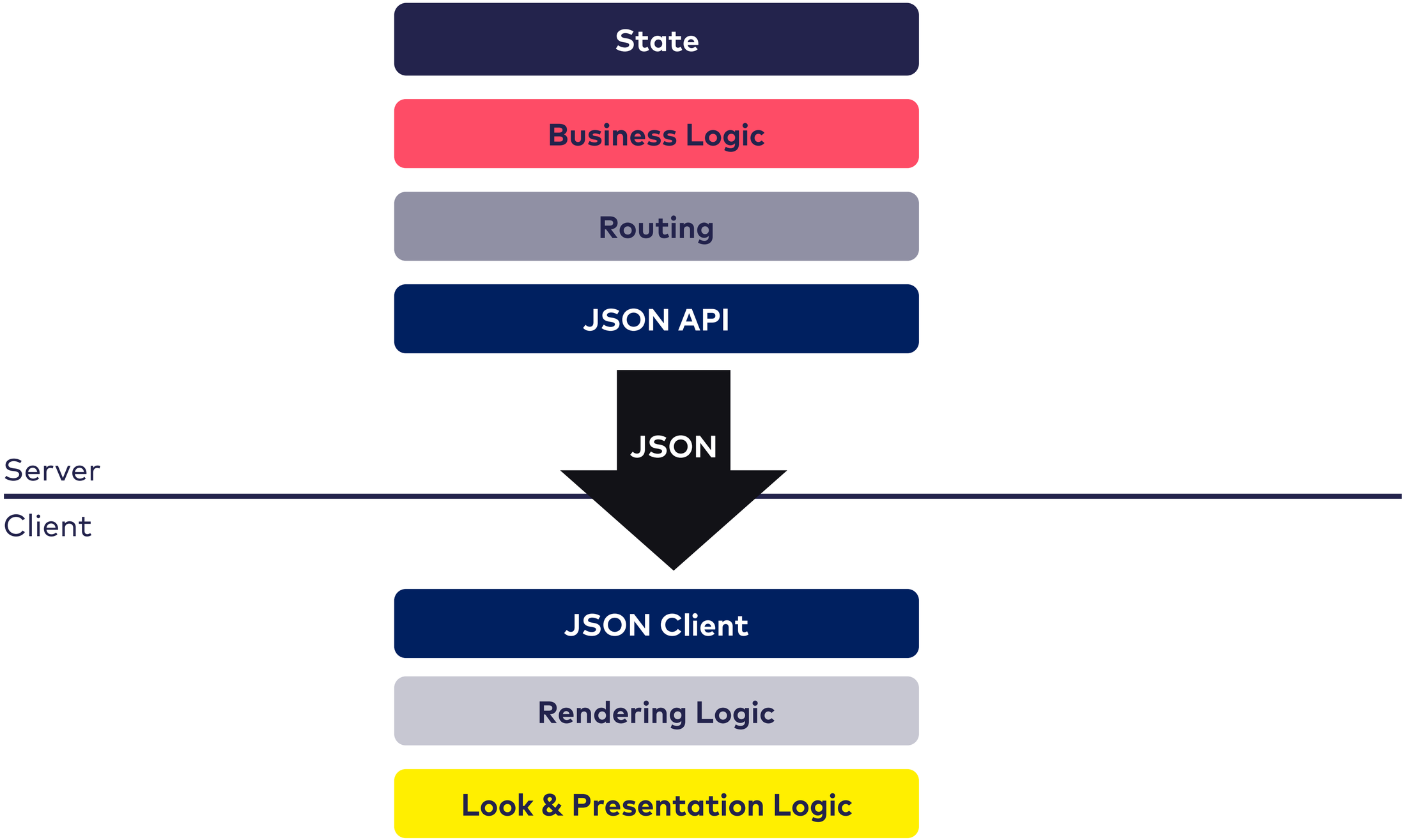
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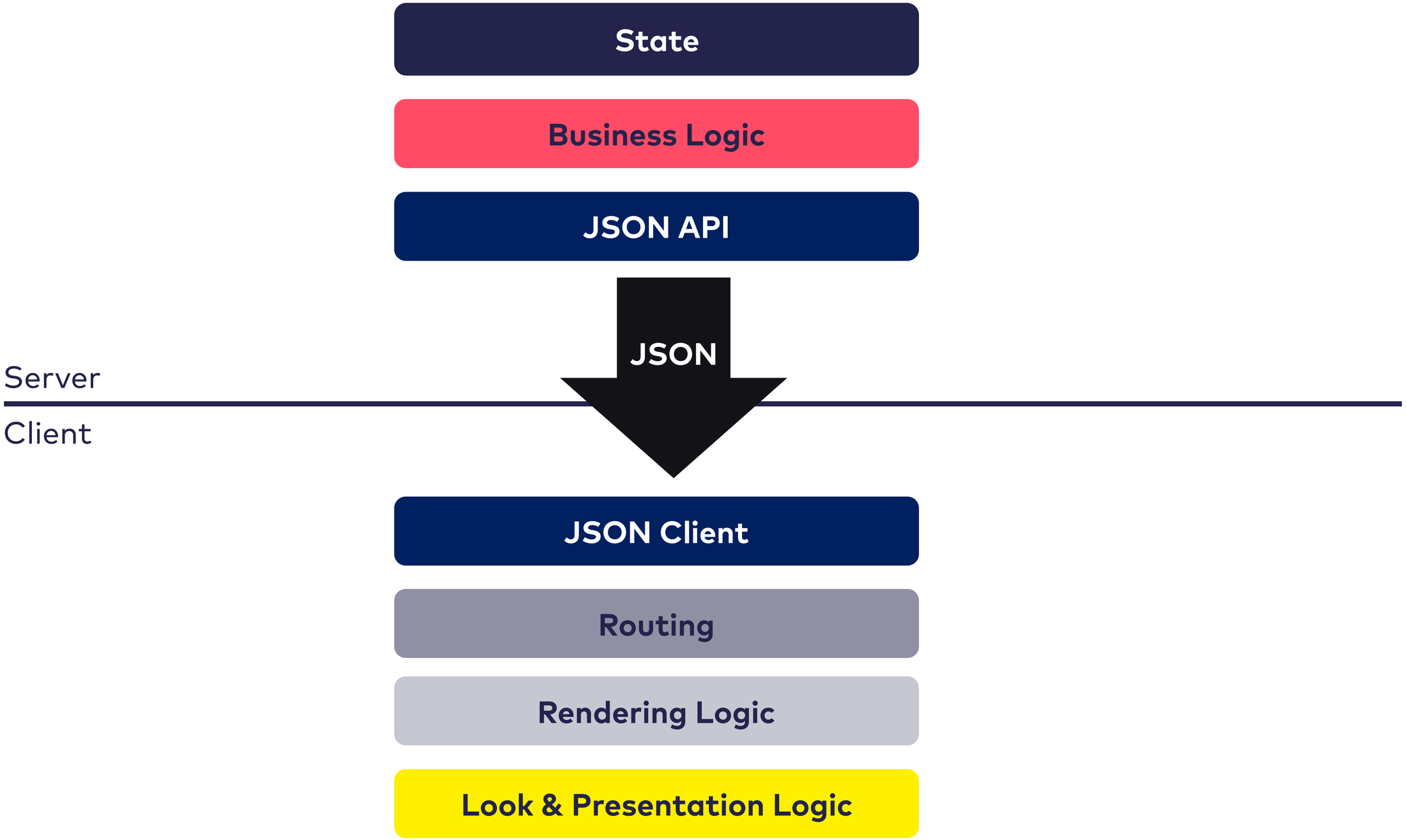
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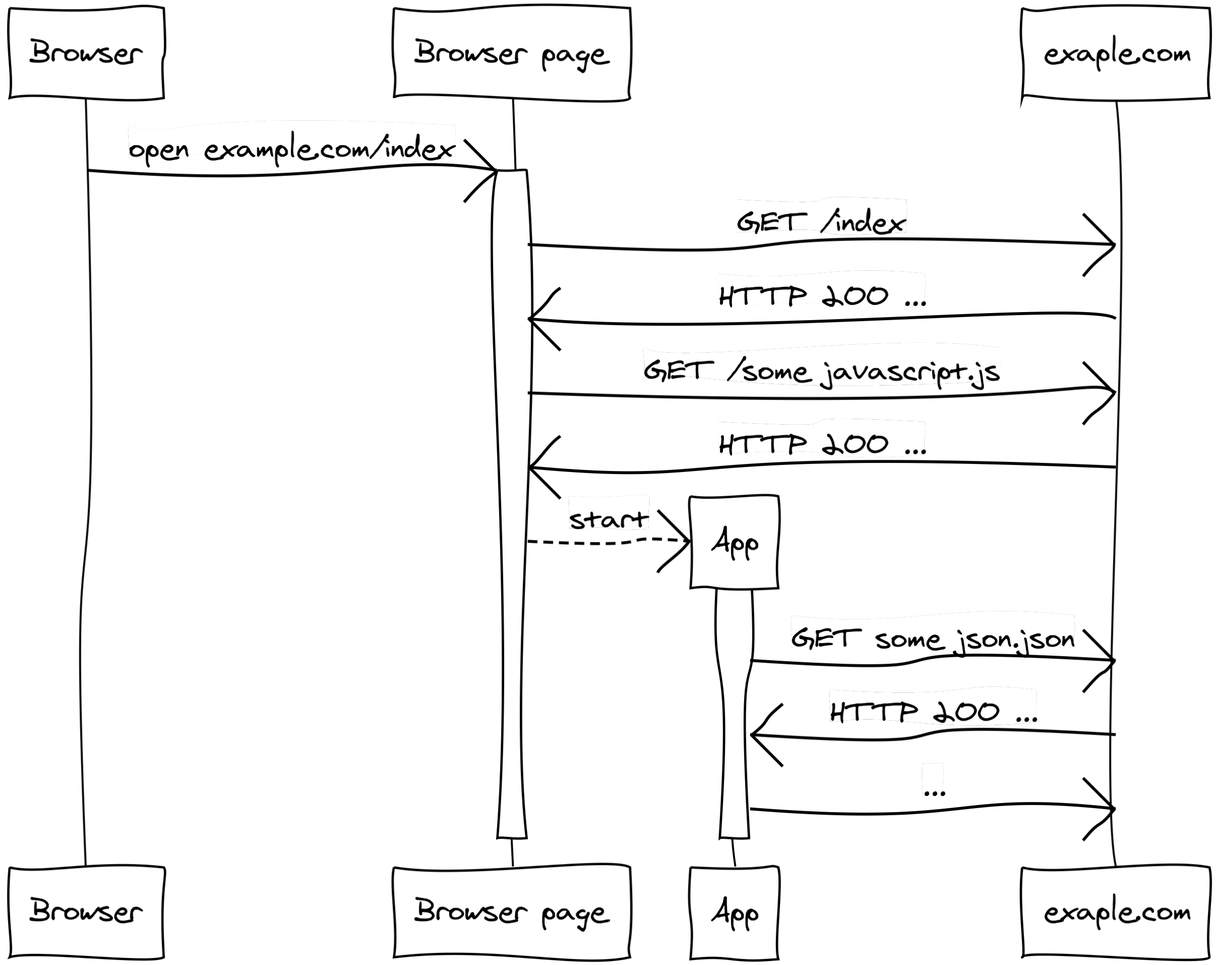
Look & Presentation Logic

Single Page Apps – Why Routing?



Bookmarks?

Deep links?

Reload?

Solution:
Store some app state in the URI!

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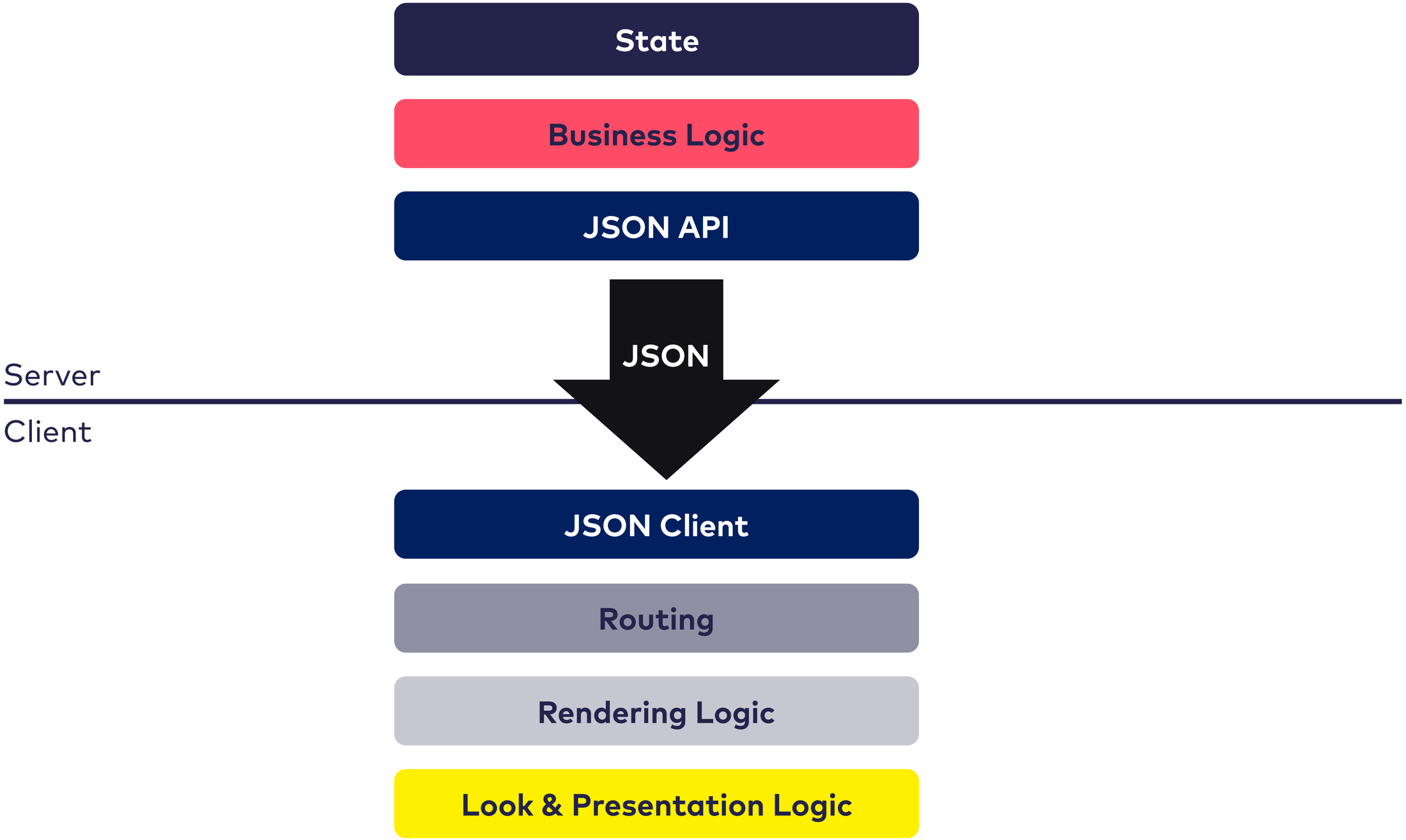
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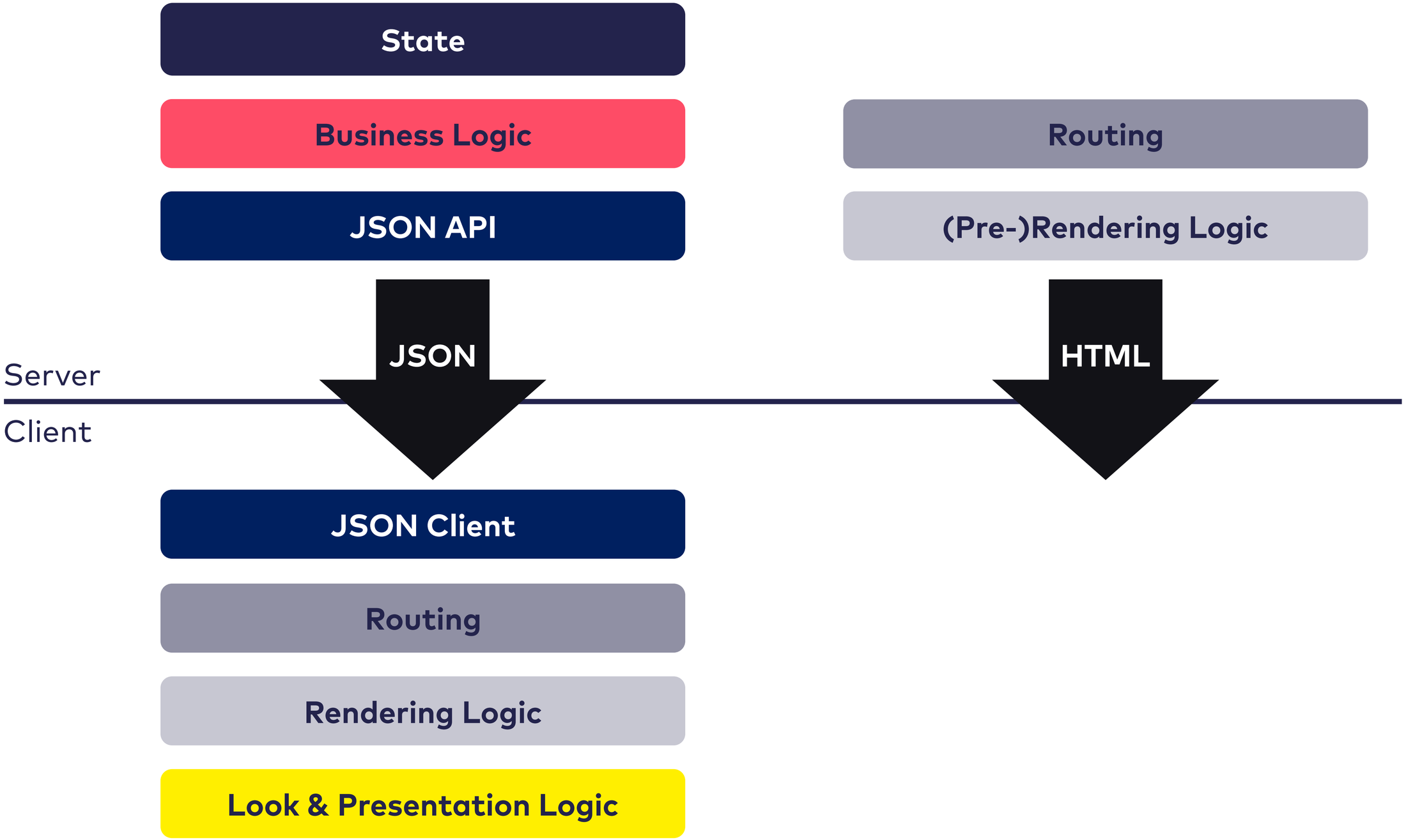
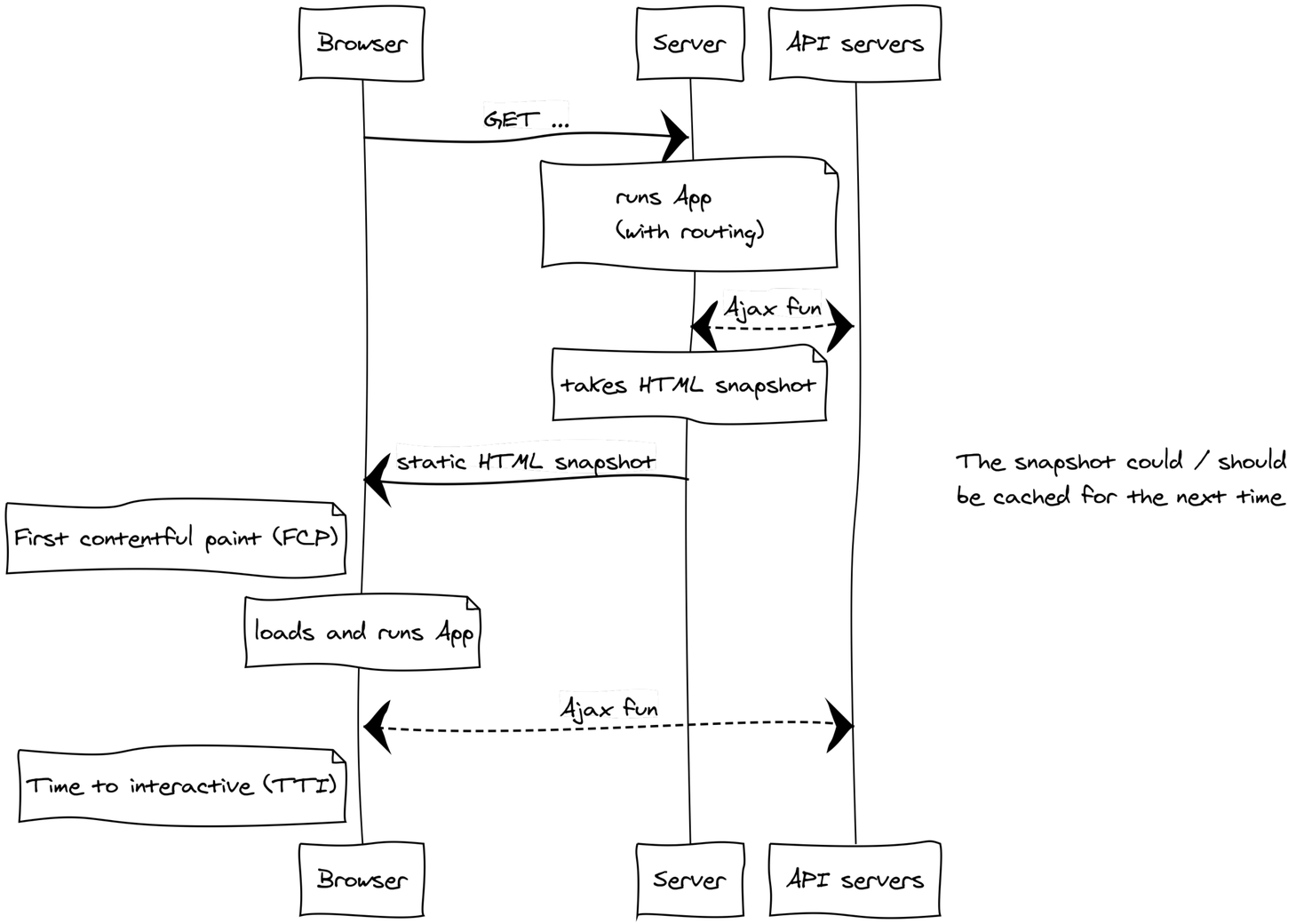

State
Business Logic
JSON API
JSON
Server
Client
JSON Client
Routing
Rendering Logic
Look & Presentation Logic
Routing
(Pre-)Rendering Logic
HTML

Prerendering



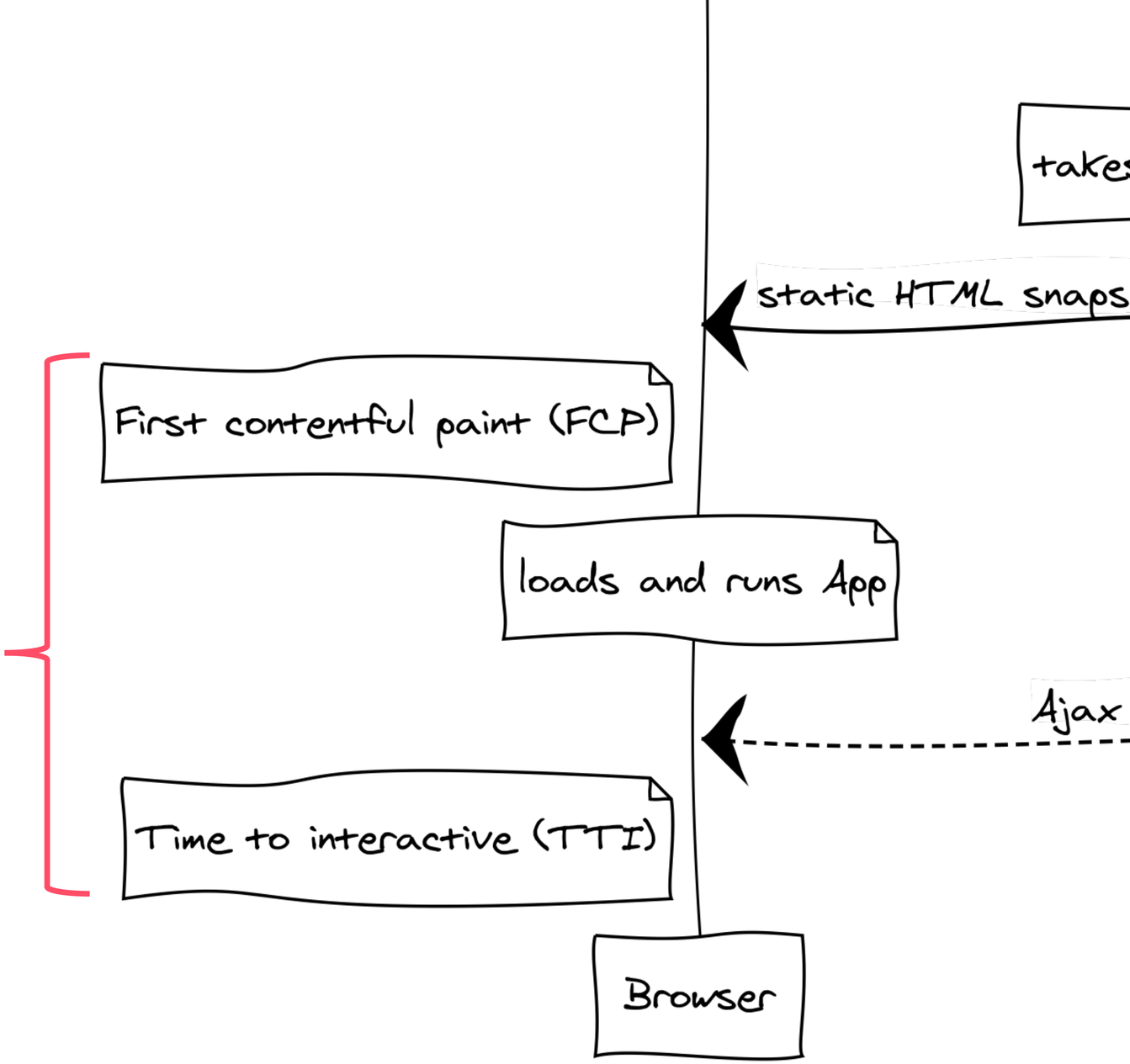
The snapshot could / should be cached for the next time

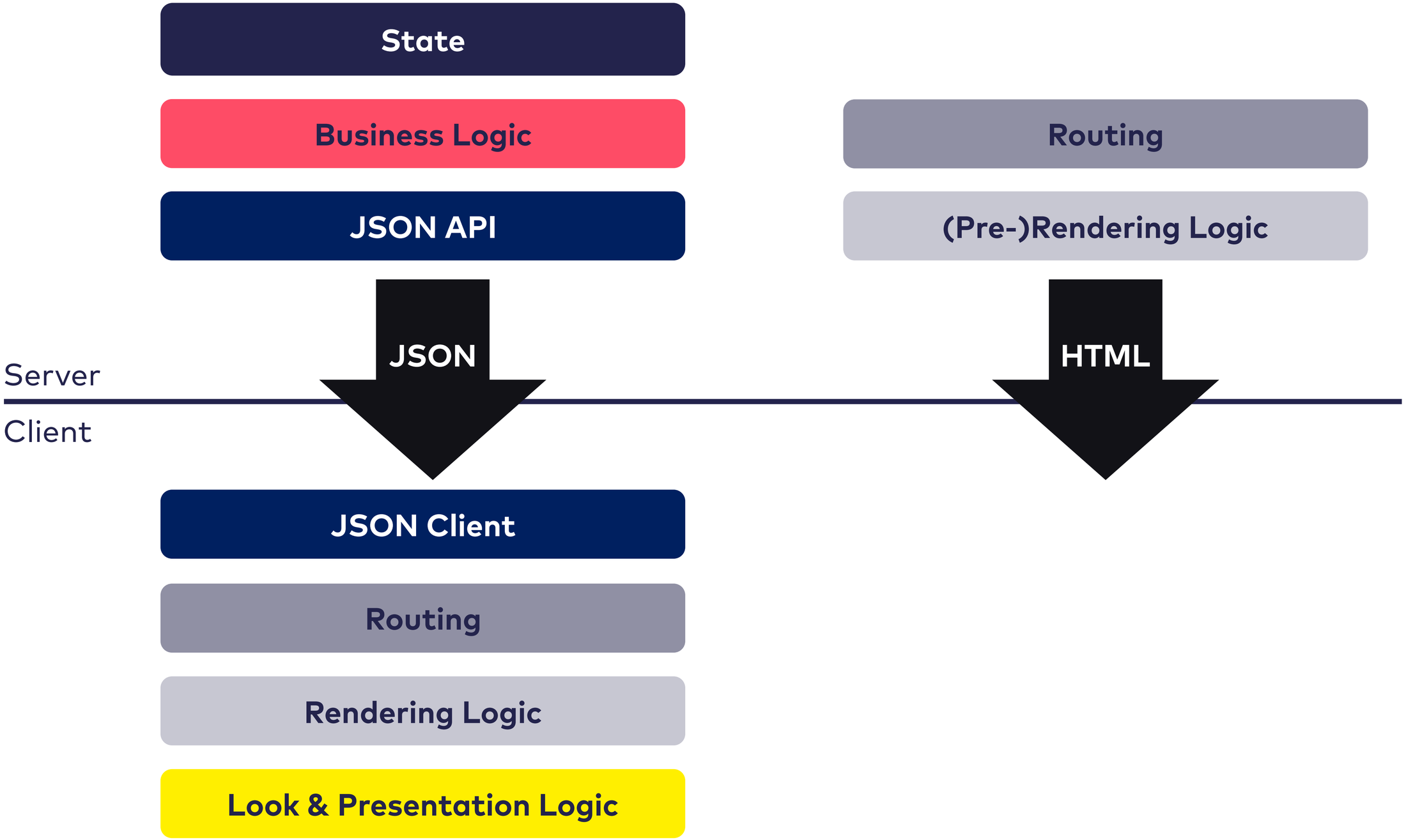
Hydration

How to simulate readiness?

What about Events (Clicks etc)?

How to match server-side HTML to client-side DOM?

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JSON
Server
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JSON Client
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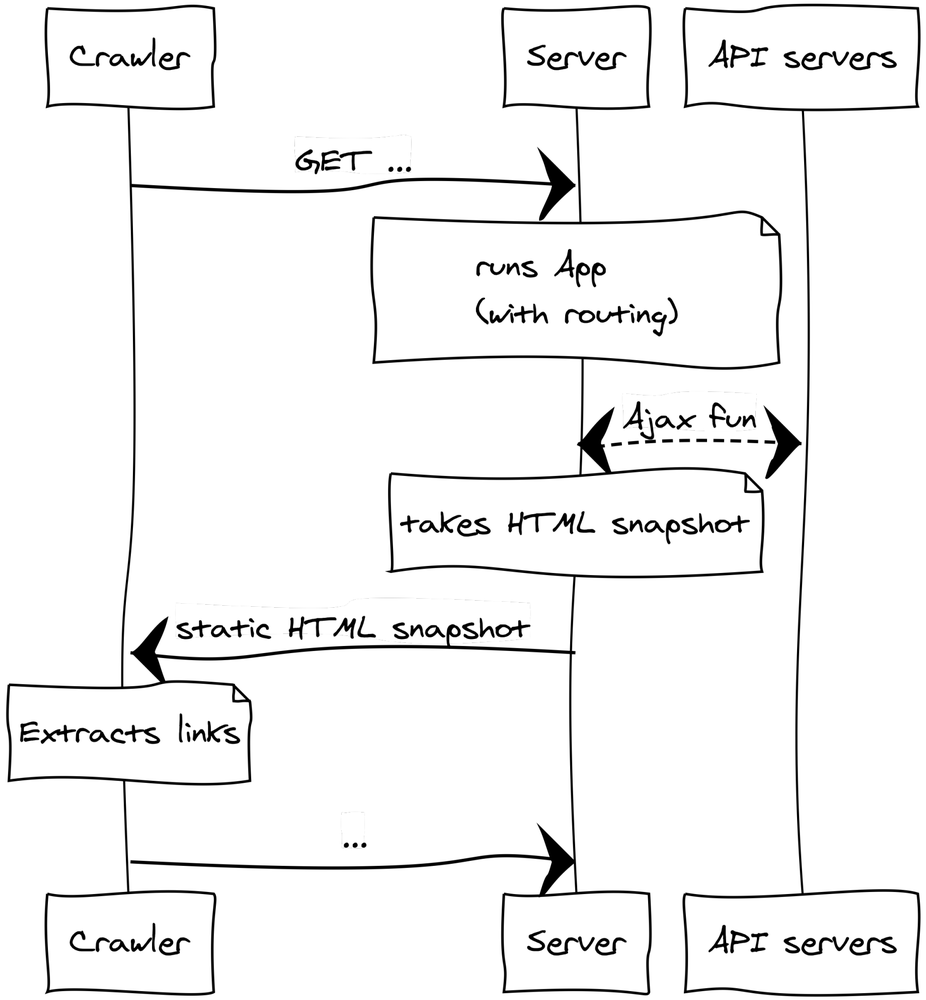
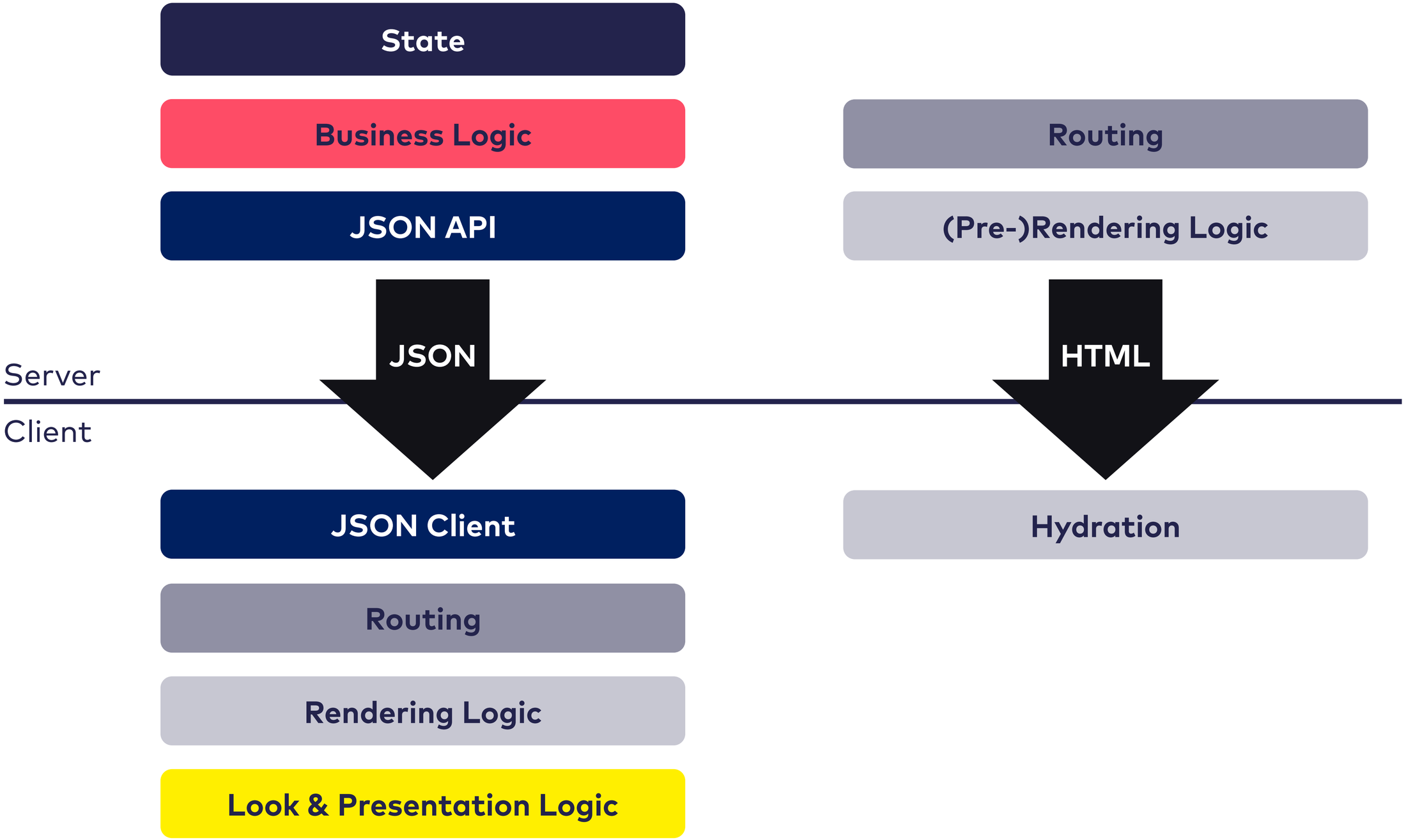
Rendering Logic
Look & Presentation Logic
Routing
(Pre-)Rendering Logic
HTML

Special case: Searchability

No Hydration needed

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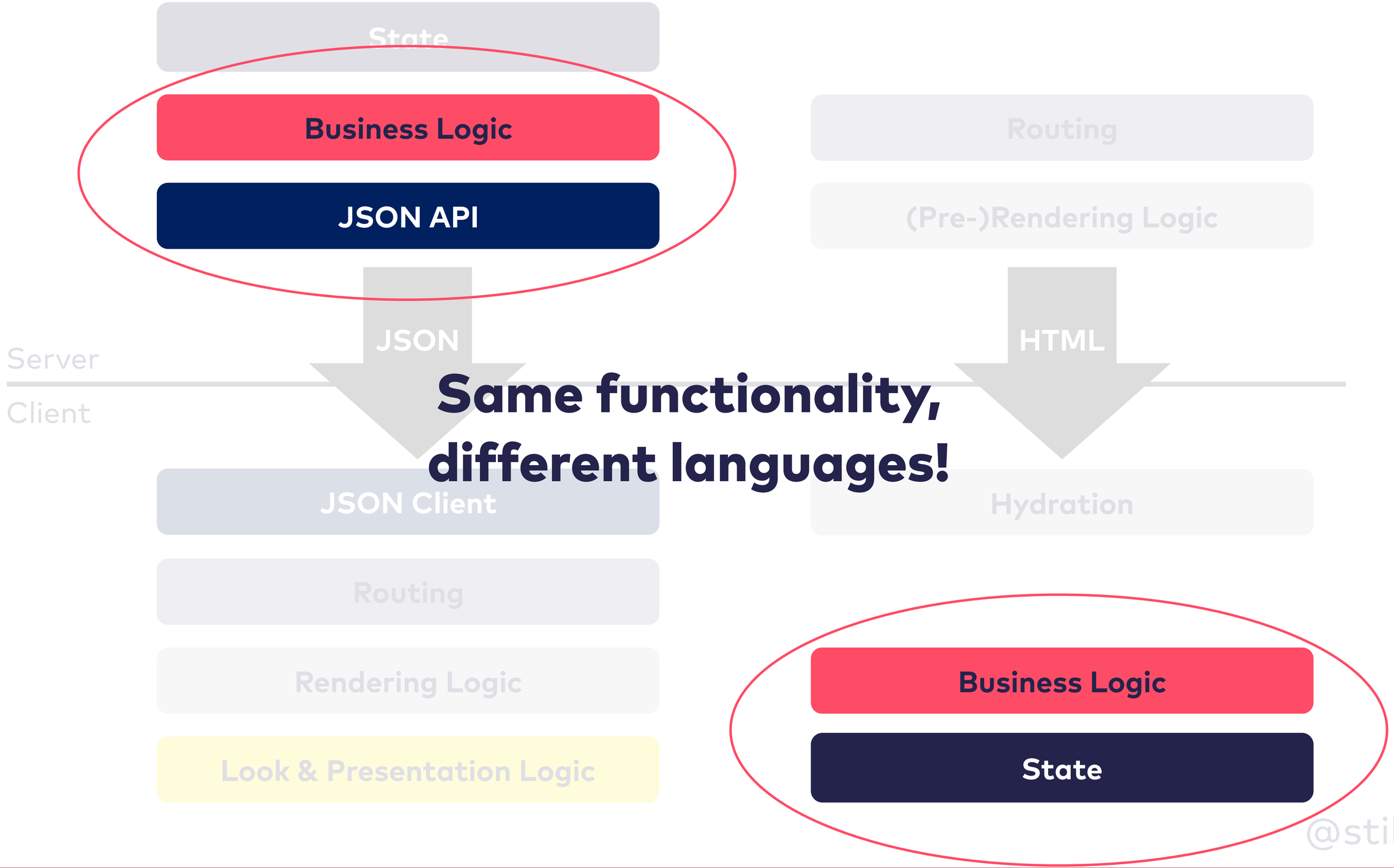
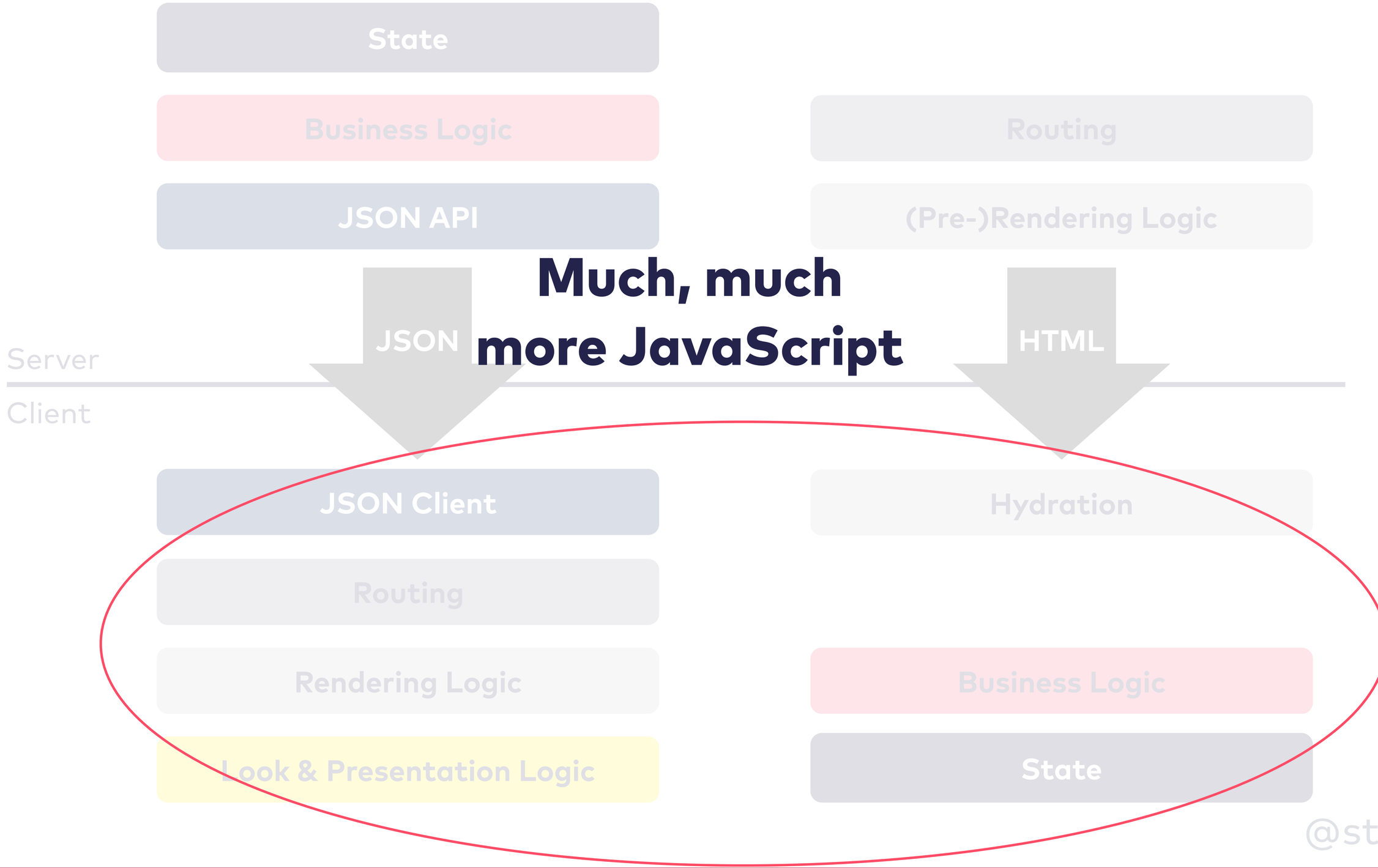
HTML
Hydration



Same functionality, different languages!


State
Business Logic
JSON API
Routing
(Pre-)Rendering Logic
JSON
HTML
Much, much more JavaScript
Server
Client
JSON Client
Routing
Rendering Logic
Look & Presentation Logic
Hydration
Business Logic
State

All your users are non-JS while they're downloading your JS

Did the HTTP request for the JavaScript complete?

Does the corporate firewall block JavaScript?

Does their browser support the JavaScript you've written?

Do your users get the JavaScript?

If they're on a train and their net connection goes away before your JavaScript loads, then there's no JavaScript.

Does their ISP or mobile operator interfere with downloaded JavaScript?

Everyone has JavaScript, right?

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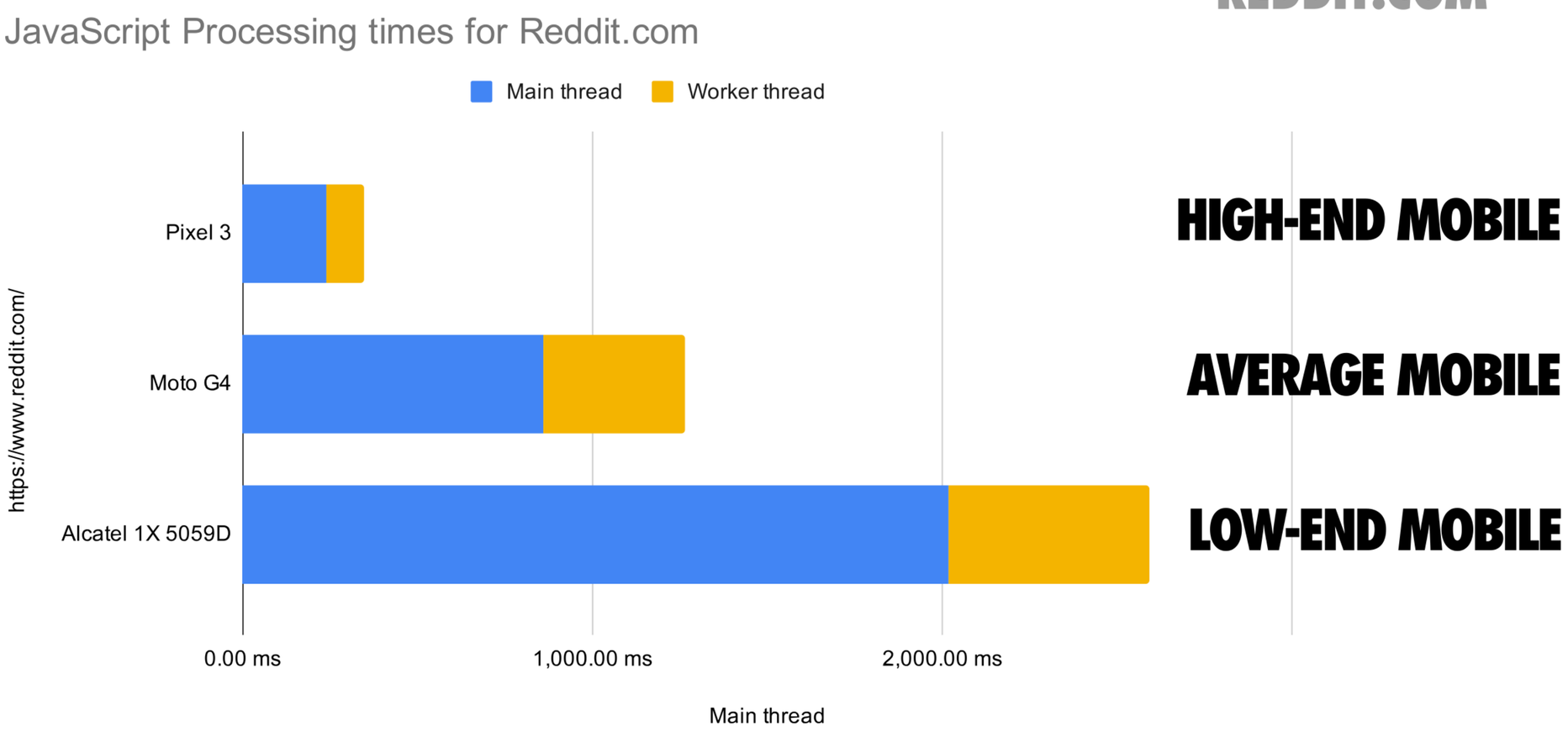
COST OF JAVASCRIPT

REDDIT.COM



The cost of JavaScript in 2019

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What's the alternative?

ROCA: Resource-oriented Client Architecture

http://roca-style.org

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ROCA

RESTful Server-side HTML (SSR)

Client-side (self contained) JavaScript components

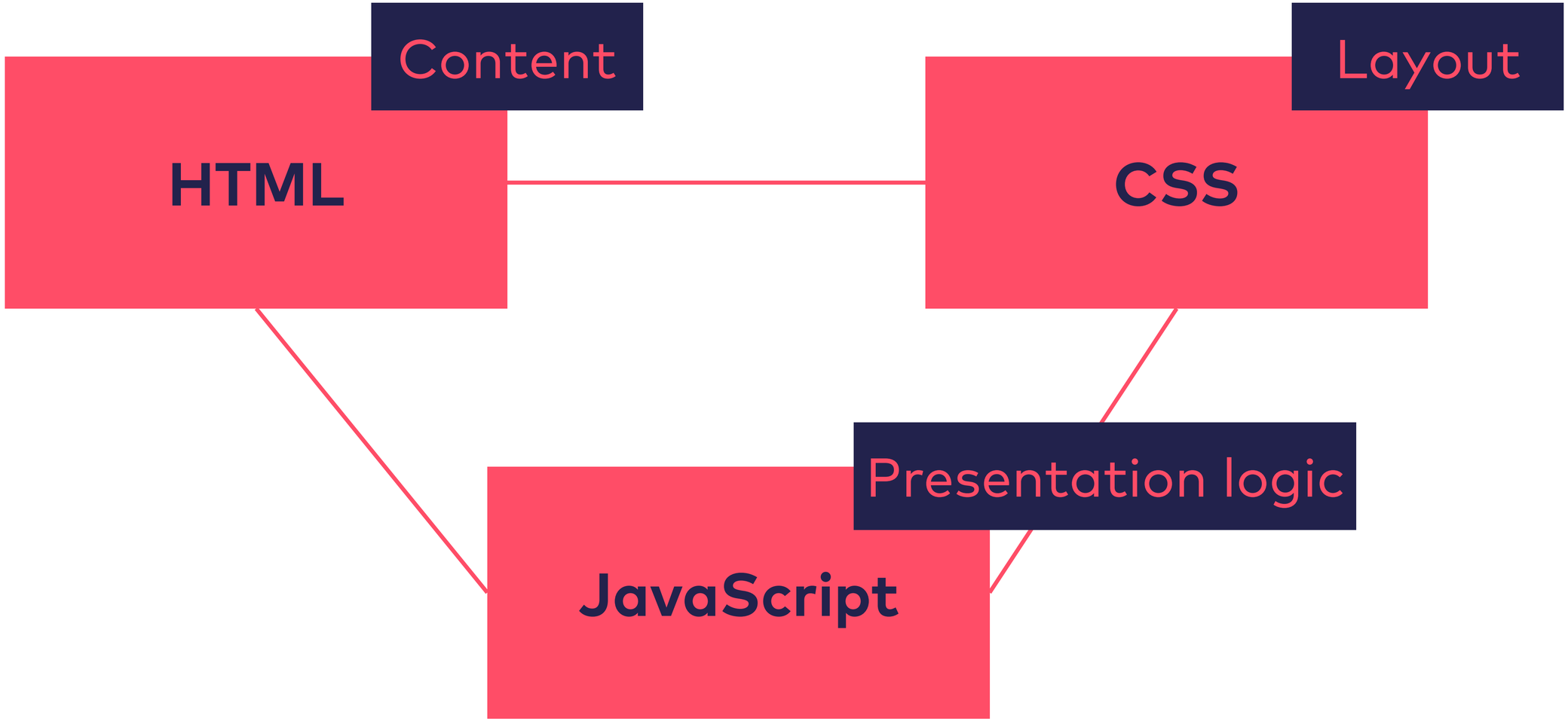
Application logic only on server

+

No duplicated logic on client

=

No application logic on client!



Client Side Logic is generic Presentation logic only. It enhances HTML

Progressive Enhancement

A web page needs to work without graphical elements, CSS and JS

This ensures our page will even work under unfavorable circumstances

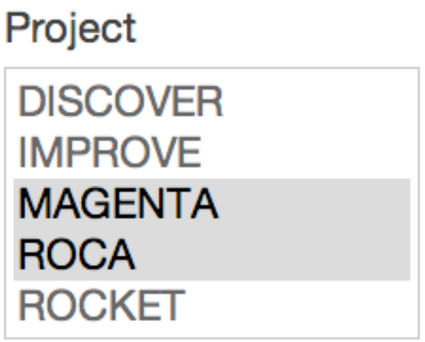
We also lay the foundation for accessibility

Does **not** mean that everything needs to work without CSS and JavaScript

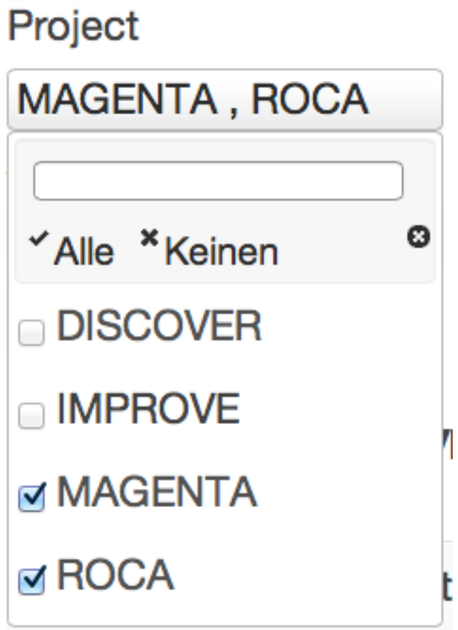
It means that the fundamental functionality of our web page relies on HTML only

Every thing that goes beyond that is seen as an enhancement

```
<div class="filter-column">
   <label for="project">Project</label>
   <select class="multiselect" id="project"
           name="project" size="5" multiple>
     <option>DISCOVER</option>
     <option>IMPROVE</option>
     <option >MAGENTA</option>
     <option>ROCA</option>
     <option>ROCKET</option>
   </select>
</div>
```



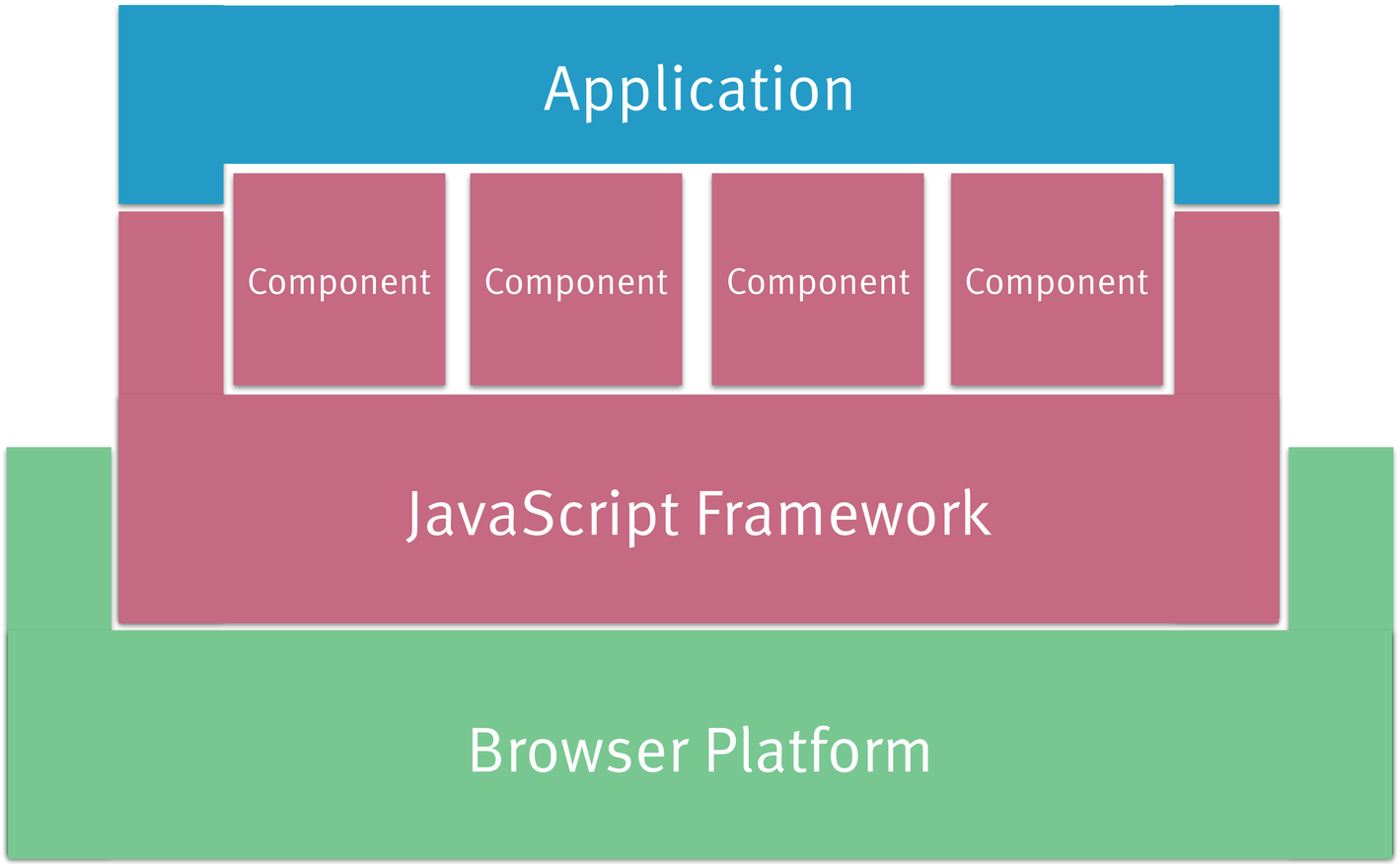

```
$('.multiselect', context).each(function() {
        $(this).multiselect({
                selectedList: 2,
                checkAllText: "Alle",
                uncheckAllText: "Keinen"
        }).multiselectfilter({label:"",
                              width:"200px"});
});
```

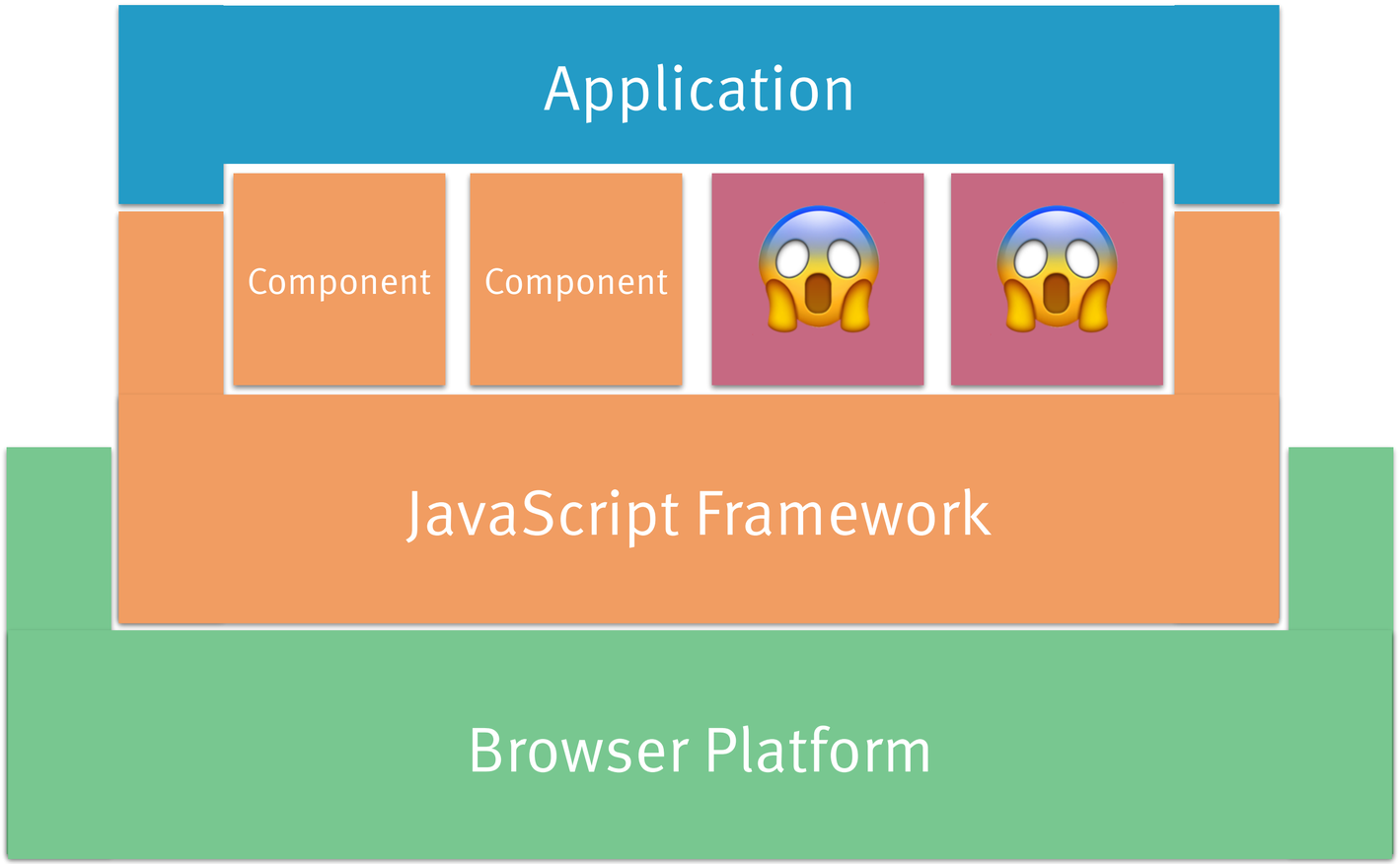


http://roca-airways.herokuapp.com

http://rocair.herokuapp.com

Components


Application
Component
Component
Component
Component
JavaScript Framework
Browser Platform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Component
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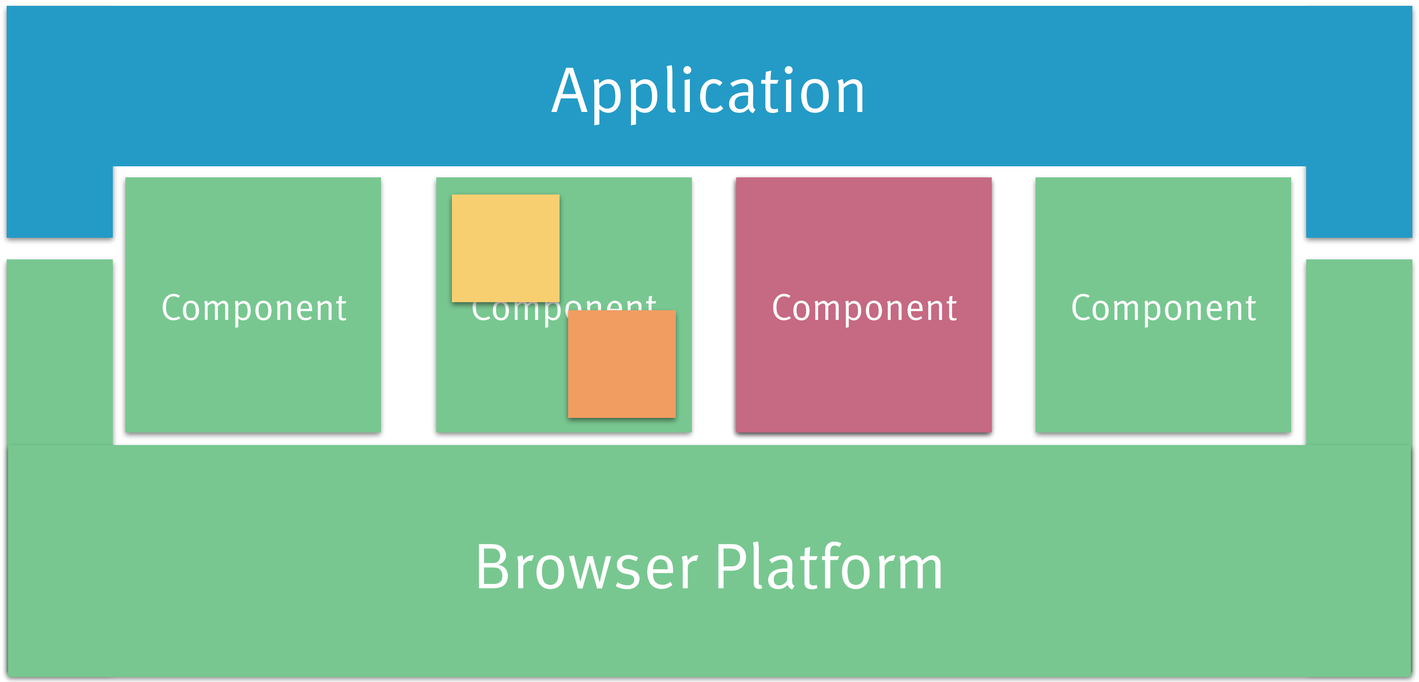
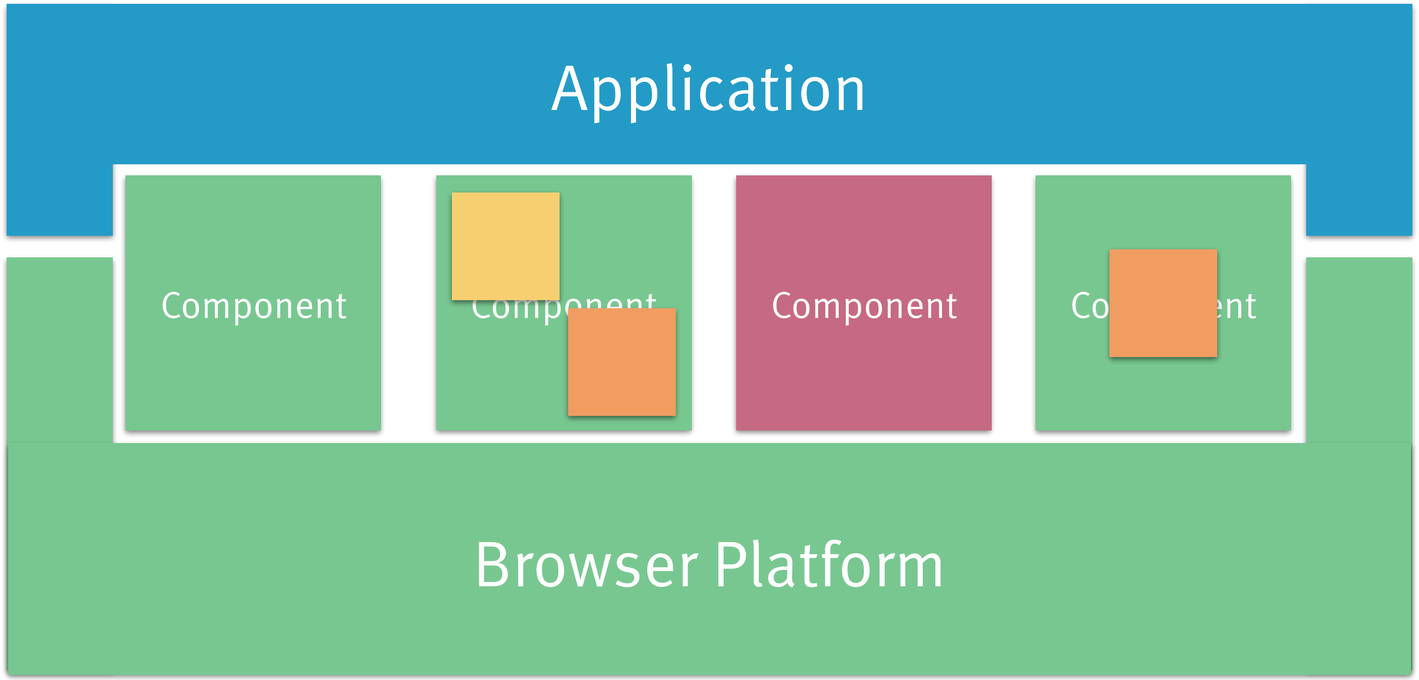
Browser Platform


Application
Component
Component
Component
Component
Browser Platform

<audio src="meow.mp4" controls>



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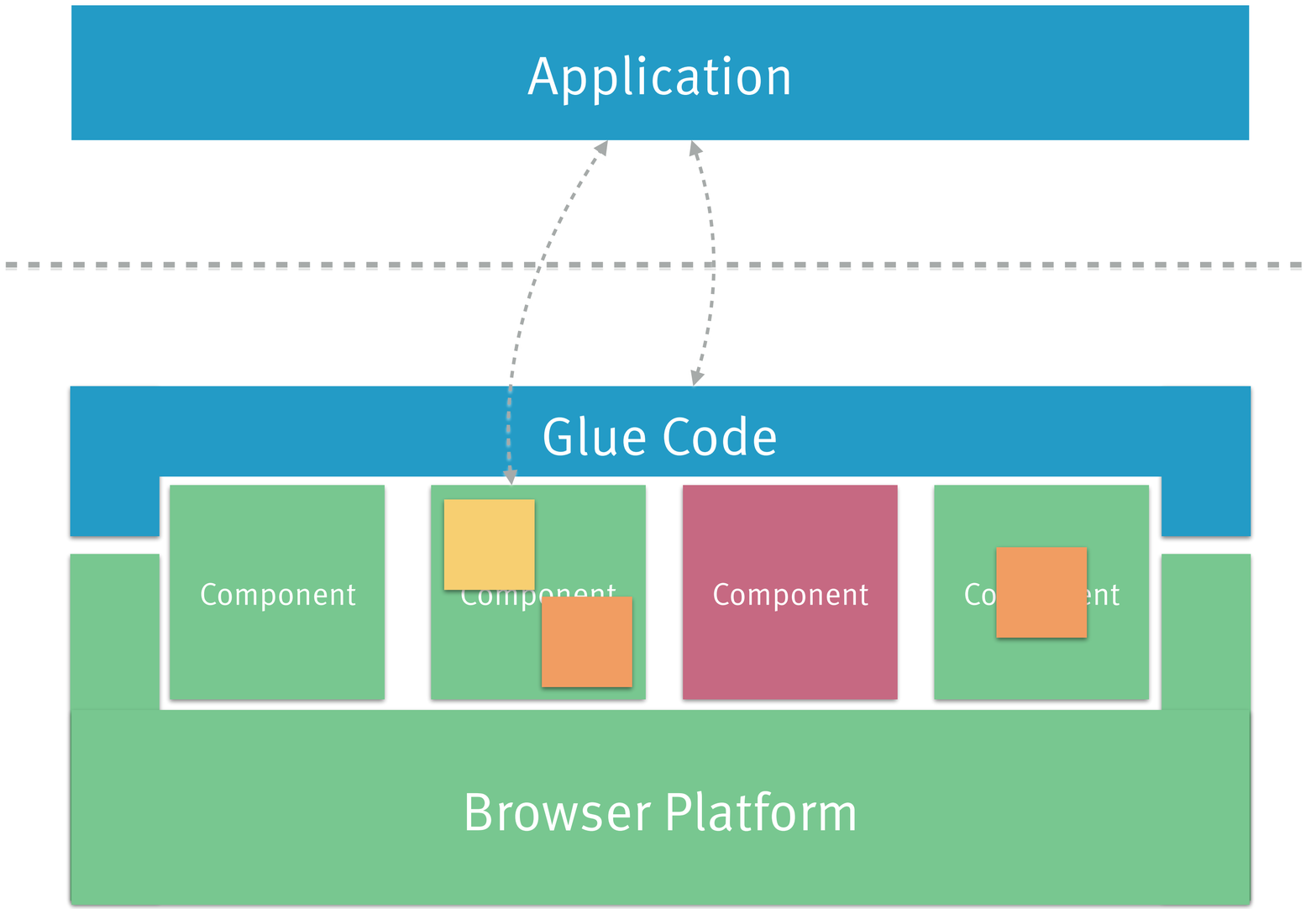
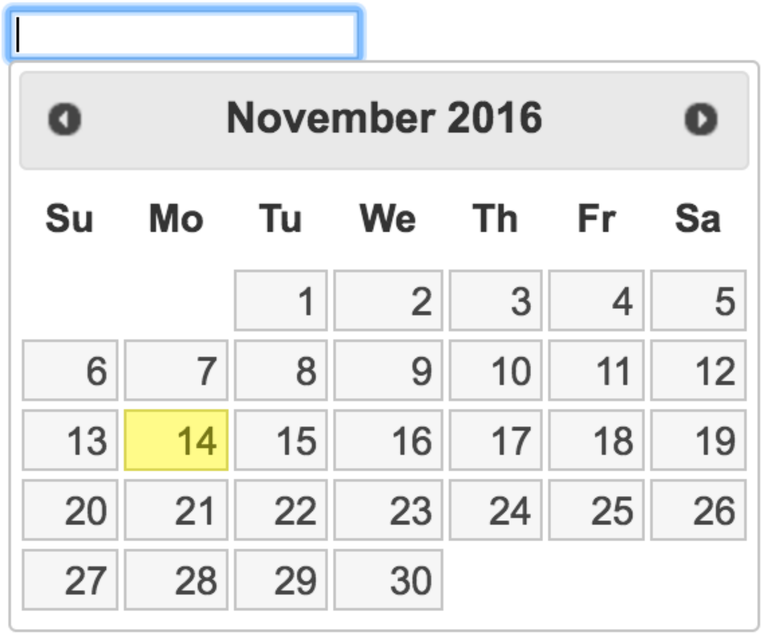

Application
Glue Code
Component
Component
Component
Browser Platform

```
<input type="text" class="date">
```

```
$("input.date").datepicker();
```



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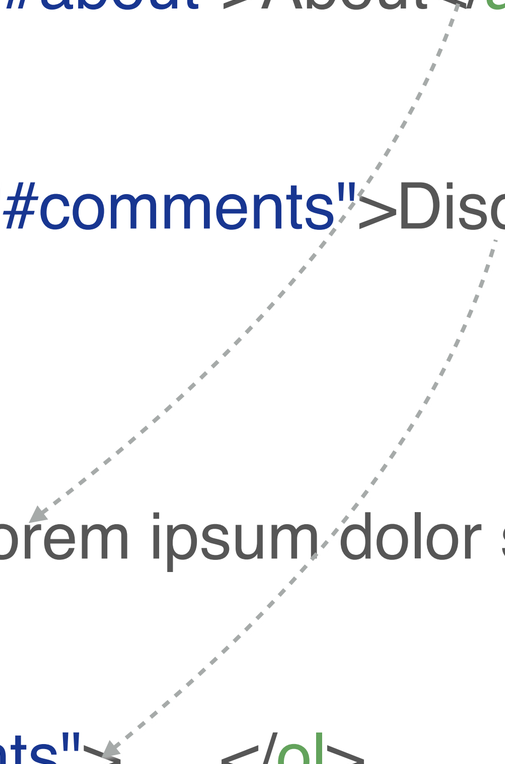
```
<div class="tabs">
    <ul>
        <li> <a href="#about">About</a>
        ...
        <li> <a href="#comments">Discussion</a>
    </ul>

    <p id="about">lorem ipsum dolor sit amet</p>
    ...
    <ol id="comments"> … </ol>
</div>
```

```
$(".tabs").tabs();
```



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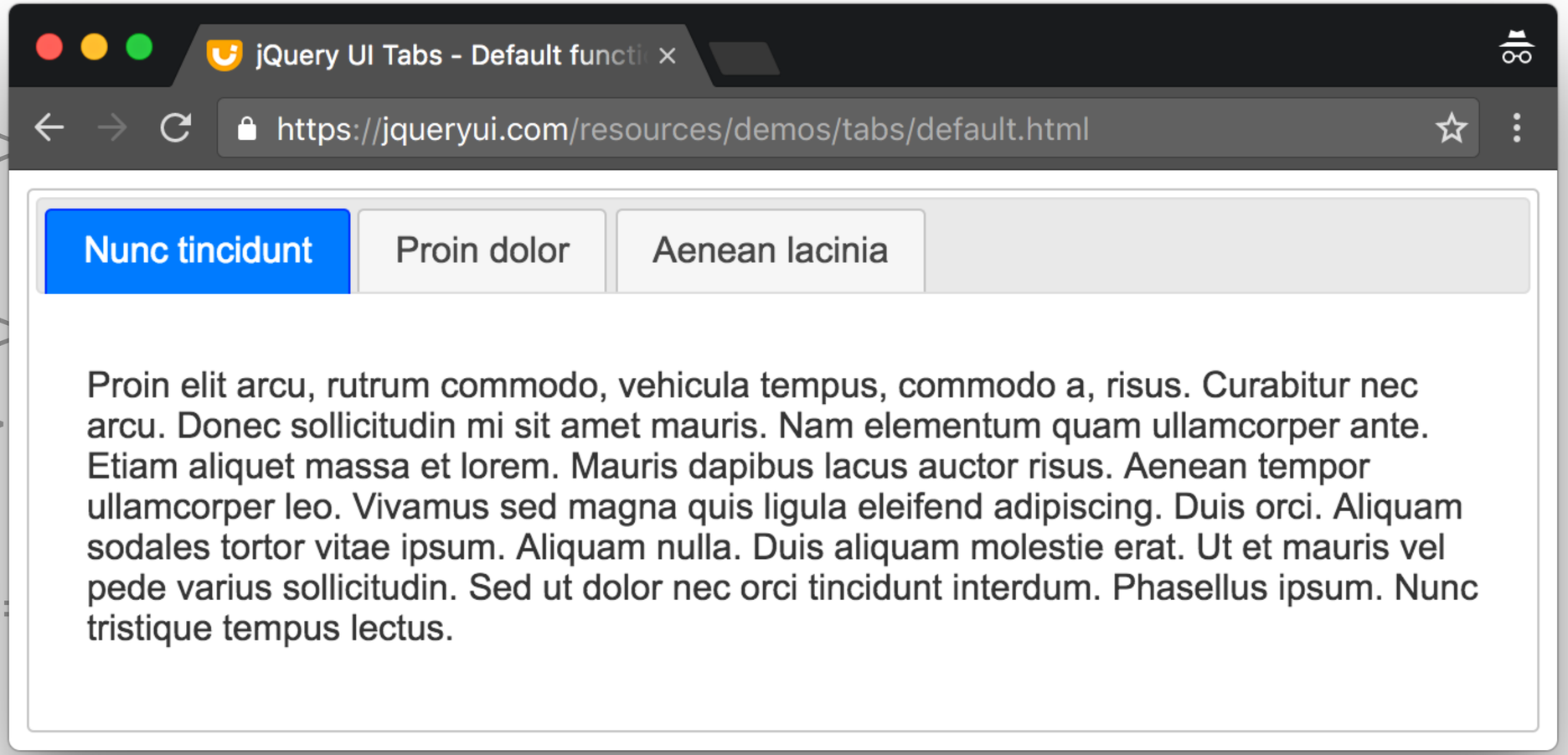
```
<div class="tabs">
    <ul>
        <li>
        ...
        <li>
    </ul>

    <p id=
    ...
    <ol id="comments"> ... </ol>
</div>
```

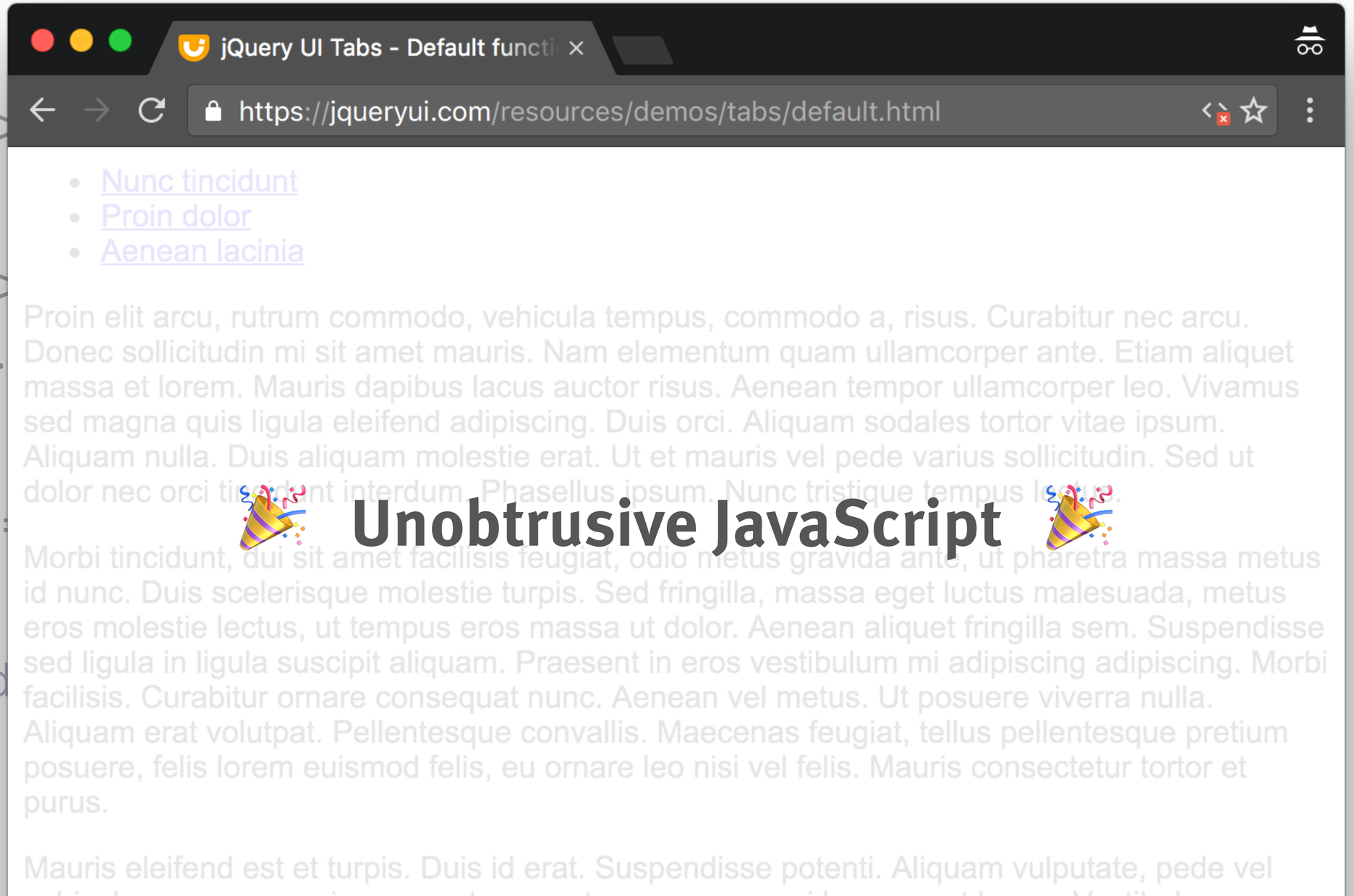
```
$(".tabs").tabs();
```



```
<div class="tabs">
    <ul>
        <li
        ...
        <li
    </ul>

    <p id=
    ...
    <ol id
</div>
```

```
$(".tabs").tabs();
```



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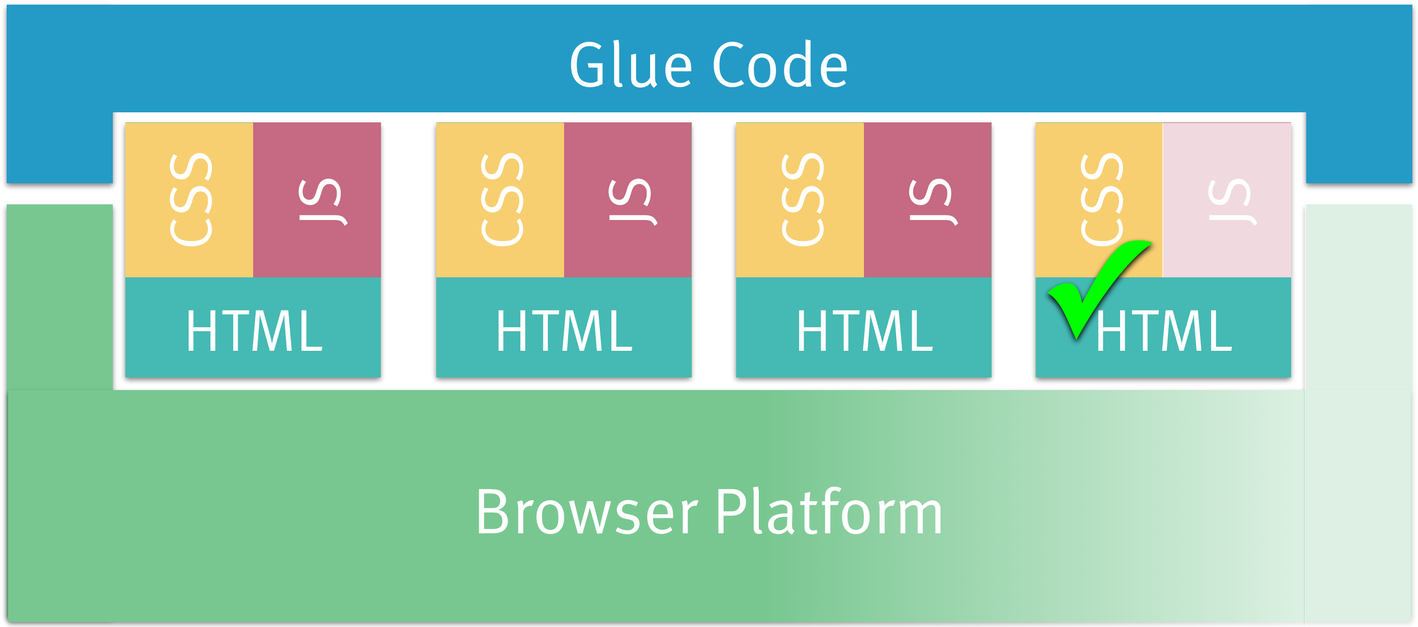
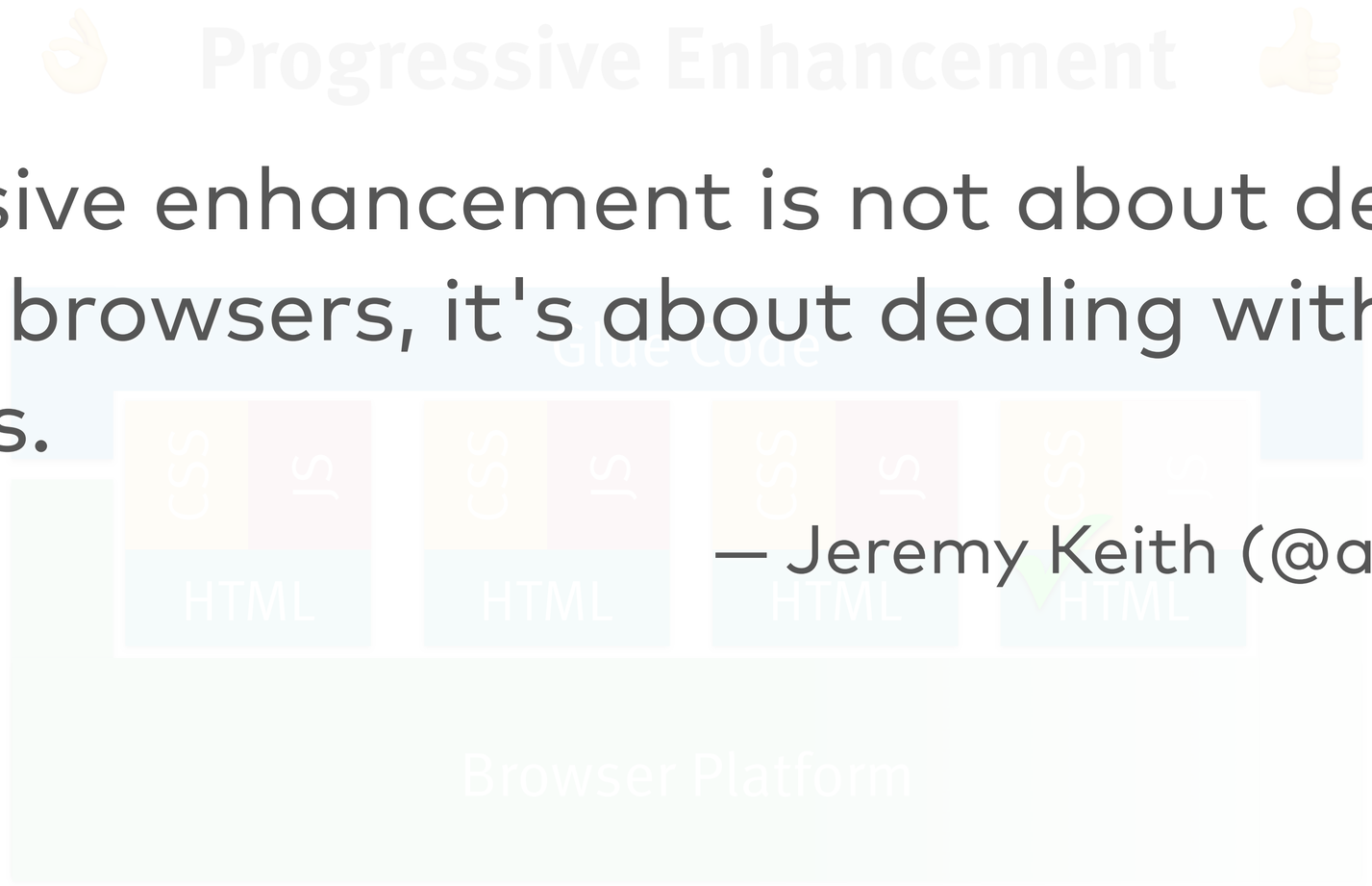
👌 Progressive Enhancement 👍





Progressive enhancement is not about dealing with old browsers, it's about dealing with new browsers.

— Jeremy Keith (@adactio)

```
<div class="tabs">
    <ul>
        <li> <a href="#about">About</a>
        ...
        <li> <a href="#comments">Discussion</a>
    </ul>


    <p id="about">lorem ipsum dolor sit amet</p>
    ...
    <ol id="comments"> … </ol>
</div>
```

```
$(".tabs").tabs();
```

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```
<tab-nav>
    <ul>
        <li> <a href="#about">About</a>
        ...
        <li> <a href="#comments">Discussion</a>
    </ul>
</tab-nav>

    <p id="about">lorem ipsum dolor sit amet</p>
    ...
    <ol id="comments"> … </ol>
```

```
$(".tabs").tabs();
```

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<tab-nav>
    <ul>
        <li> <a href="#about">About</a>
        ...
        <li> <a href="#comments">Discussion</a>
    </ul>
</tab-nav>
<tab-contents>
    <p id="about">lorem ipsum dolor sit amet</p>
    ...
    <ol id="comments"> … </ol>
</tab-contents>
```

```
$(".tabs").tabs();
```

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</tab-nav>
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```
$(".tabs").tabs();
```

Custom Elements

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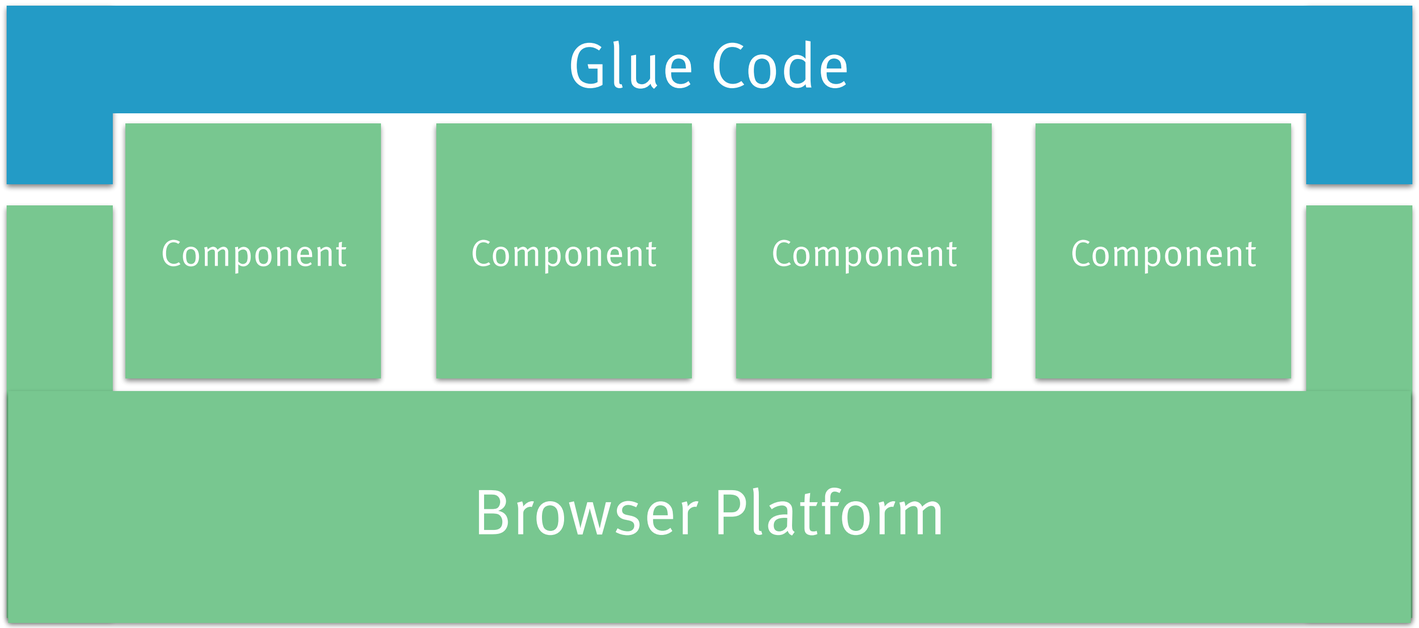

Glue Code
Component
Component
Component
Component
Browser Platform

Why the hate?

General benefits

Classic, server-side rendered web applications are much simpler, use less bandwidth, scale better, are more resilient, and a good match for most user needs

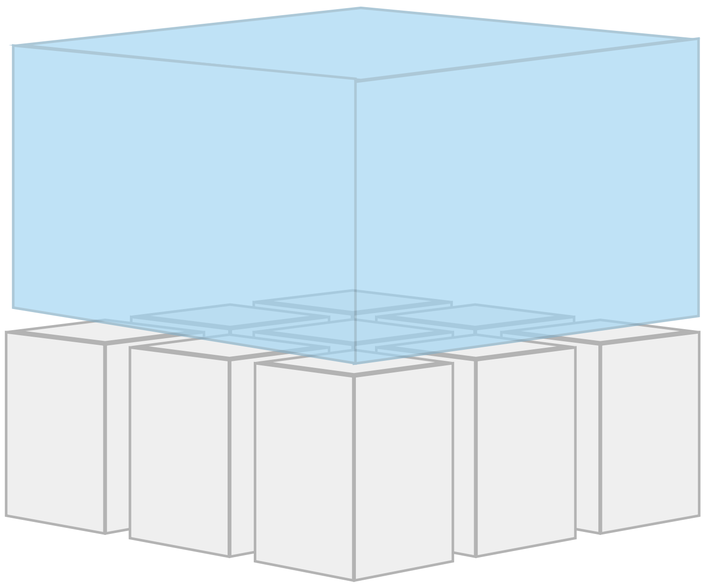
Many single-page apps are built carelessly and improve developer experience (if at all) at the cost of decreased usability and architectural complexity

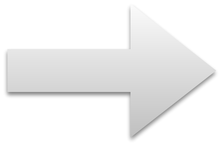
Large-scale benefits

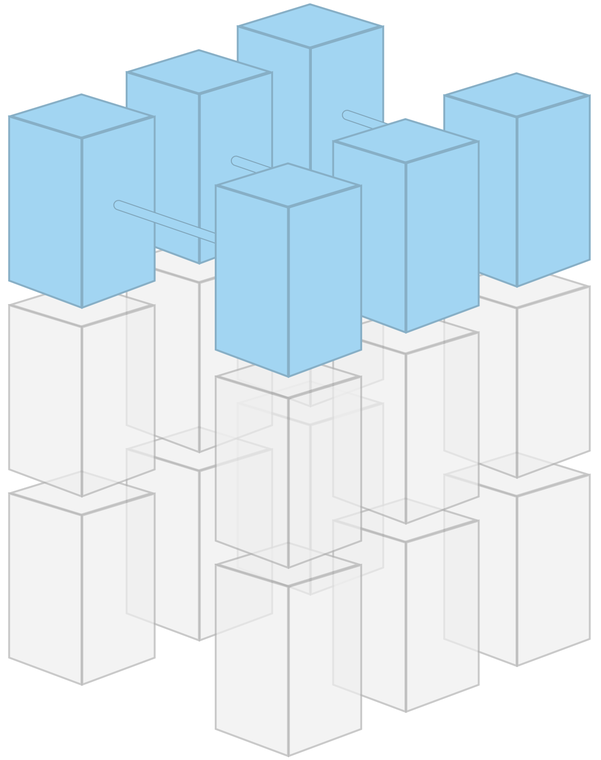
Why choose a monolith if you don't have to?

Any sufficiently complicated JavaScript client application contains an ad hoc, informally-specified, bug-ridden, slow implementation of half a browser.

(Me, with apologies to Phillip Greenspun)







In-page

JavaScript method calls

Shared abstractions & frameworks

Common language runtime

HTML 5 JS platform

Cross-page

Links & redirects

Micro-architecture

HTTP

Standard Browser

Sometimes, JS-centric applications/SPAs are the right choice, but very rarely for every part of your system

If you're a fan of single page apps, at least build more than one

- Don't reinvent browser integration features
- Accept some inefficiency
- Trade-off for framework independence
- Avoid modularity à la Java EE, OSGi etc.

Use your favorite SPA framework – when it's appropriate. Stick to basic, simpler stuff, when it's sufficient – likely, most of the time.

That's all I have.
Thanks for listening!

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