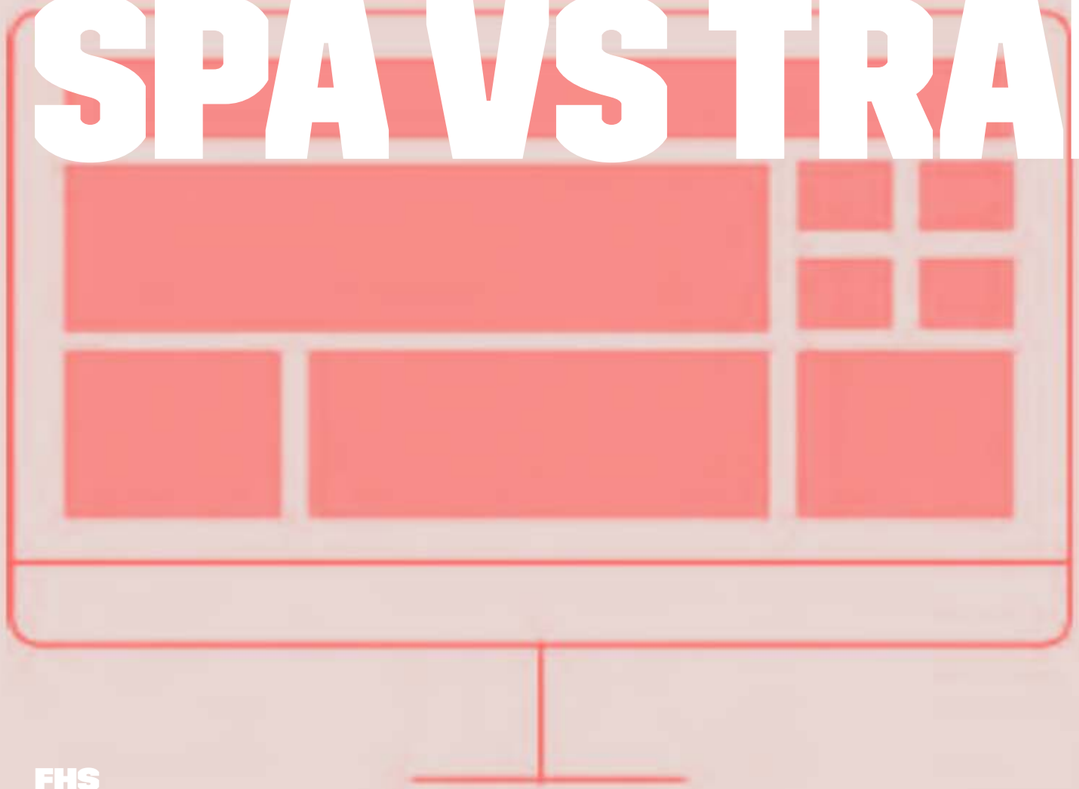
FRONTEND DEVELOPMENT

WINTERSEMESTER 2022

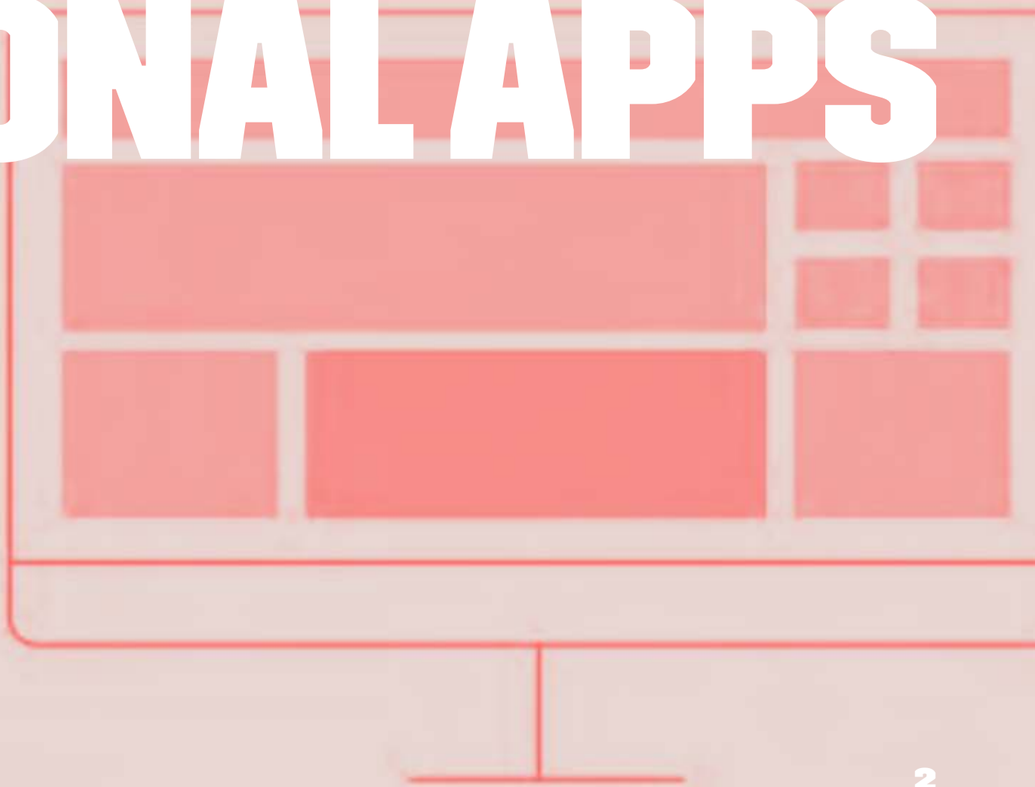
Traditional

Every request for new information gives you a new version of the whole page.



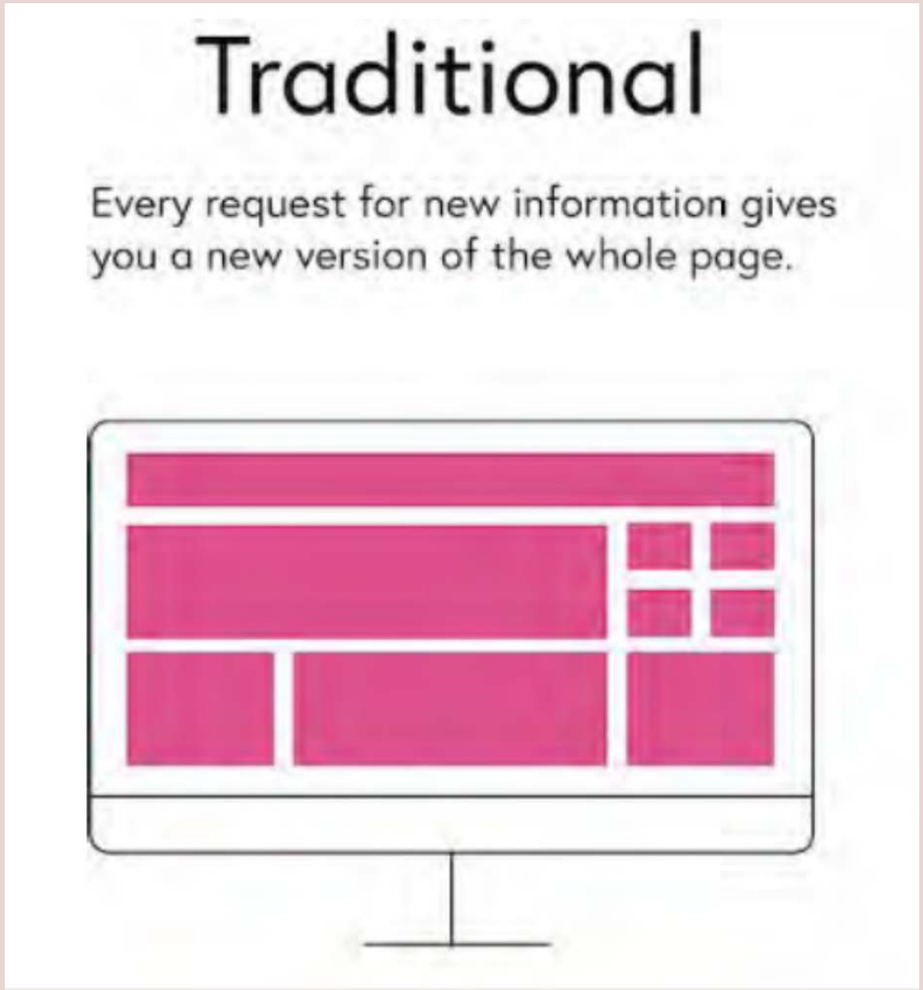
SPA

You request just the pieces you need.

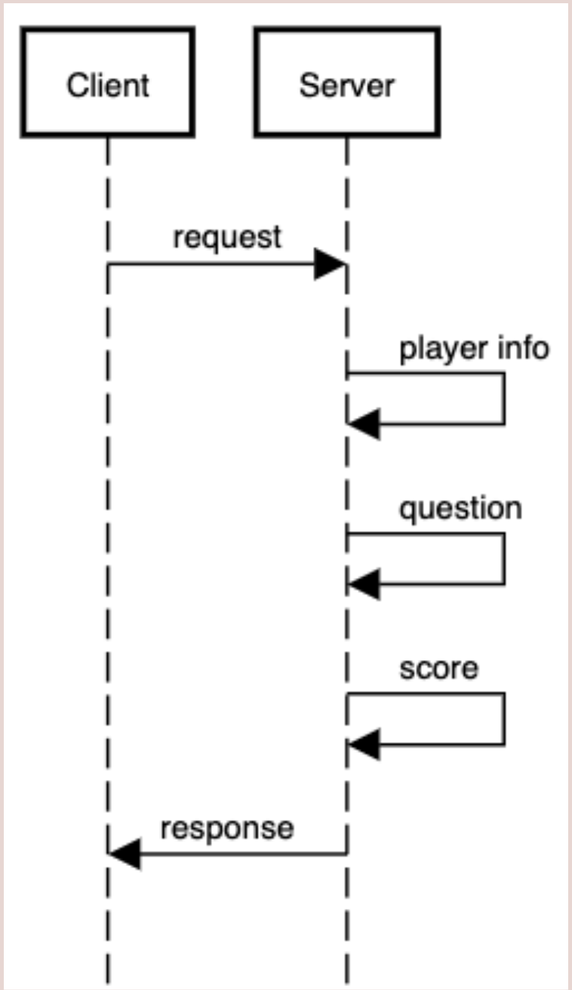


SPA VS TRADITIONAL APPS

TRADITIONAL WEB APPLICATIONS



TRADITIONAL WEB APPLICATIONS



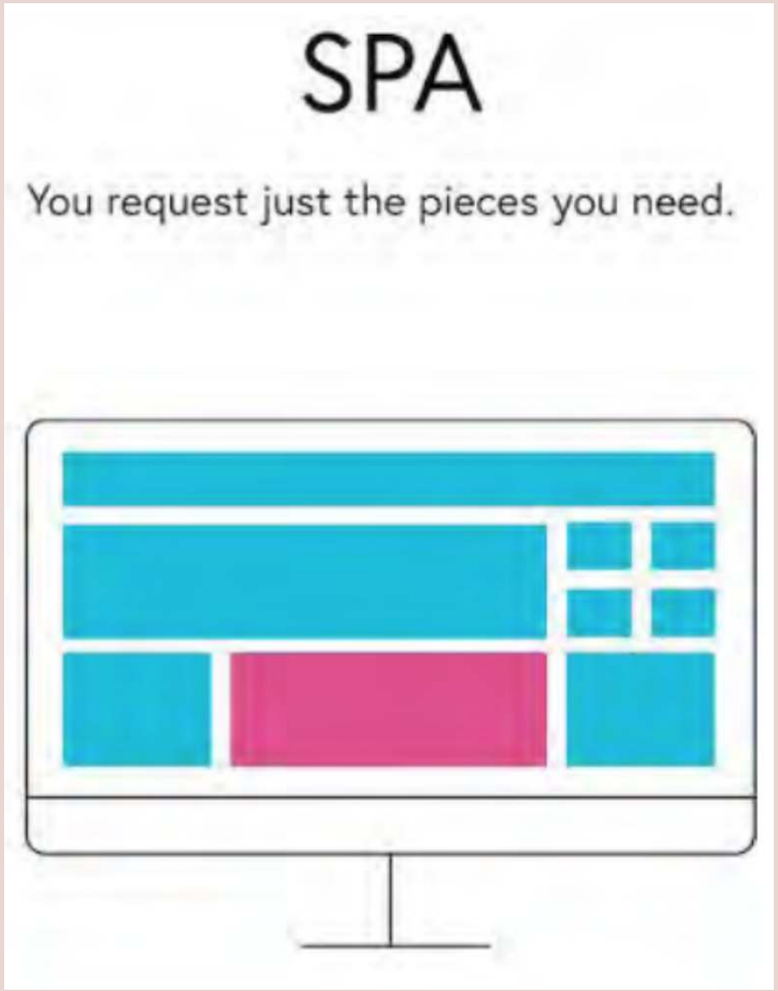
TRADITIONAL WEB APPLICATIONS

- client /quiz
- server gets request
  - fetches player info
  - fetches question
  - fetches score
- when all data fetched returns rendered HTML

TRADITIONAL WEB APPLICATIONS

» Video

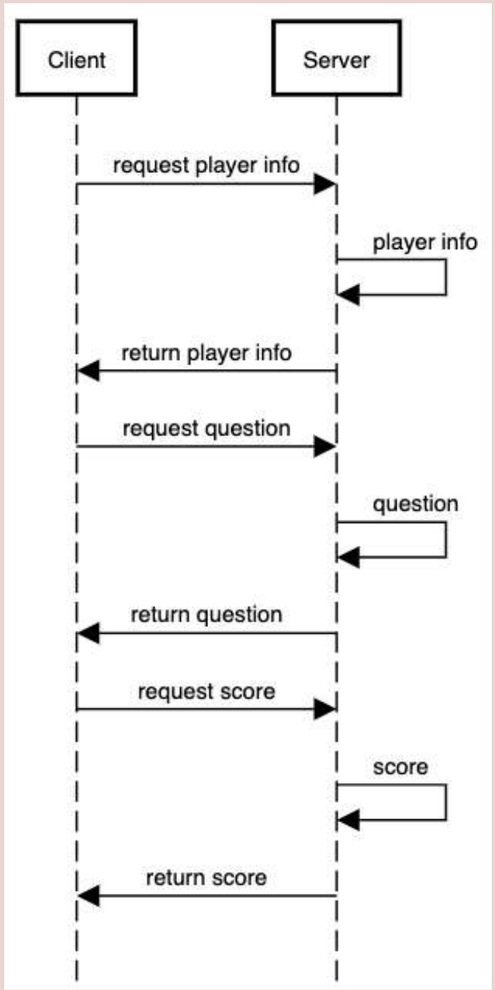
SINGLE PAGE APPLICATIONS



SINGLE PAGE APPLICATIONS

“A single-page application (SPA) is a web application or web site that fits on a single web page with the goal of providing a user experience similar to that of a desktop application.”

SINGLE PAGE APPLICATIONS



SINGLE PAGE APPLICATIONS

- client requests /quiz
- client requests in parallel
  - player-info
  - question
  - score
- when one of these requests return
  - client displays data immediately

SINGLE PAGE APPLICATIONS

» video

SINGLE PAGE APPLICATIONS
ADVANTAGES [2]

» No redundant Queries to Server

» Fast and Responsive Front-end Built

» Enhanced User Experiences

[2] https://www.bloomreach.com/en/blog/2018/07/what-is-a-single-page-application.html#whatssingle-page-application

SINGLE PAGE APPLICATIONS
NO REDUNDANT QUERIES [2]

» client requests data which he needs

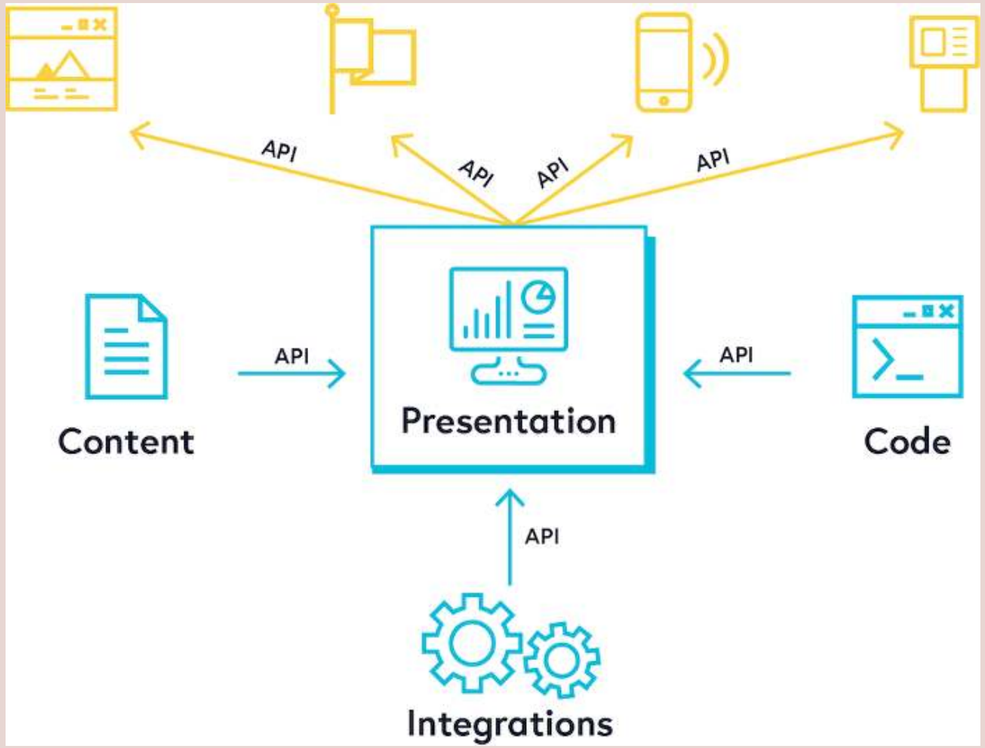
» no need for a full rerender of app

» removes unnecessary/expensive DB queries

[2] https://www.bloomreach.com/en/blog/2018/07/what-is-a-single-page-application.html#whatssingle-page-application

SINGLE PAGE APPLICATIONS FAST AND RESPONSIVE FRONT-END BUILT

SINGLE PAGE APPLICATIONS
FAST AND RESPONSIVE FRONT-END BUILT [2]



[2] https://www.bloomreach.com/en/blog/2018/07/what-is-a-single-page-application.html#whatssingle-page-application

SINGLE PAGE APPLICATIONS
FAST AND RESPONSIVE FRONT-END BUILT [2]

- many clients can be built with same backend
- one client could be composed of different backends
  - blog served from own backend
  - comments served from third party service (eg. facebook/disqus)

[2] https://www.bloomreach.com/en/blog/2018/07/what-is-a-single-page-application.html#whatssingle-page-application

SINGLE PAGE APPLICATIONS
ENHANCED USER EXPERIENCE

» no full page refresh required

» dynamic content loading possible

» faster page transitions

  » HTML/CSS already loaded

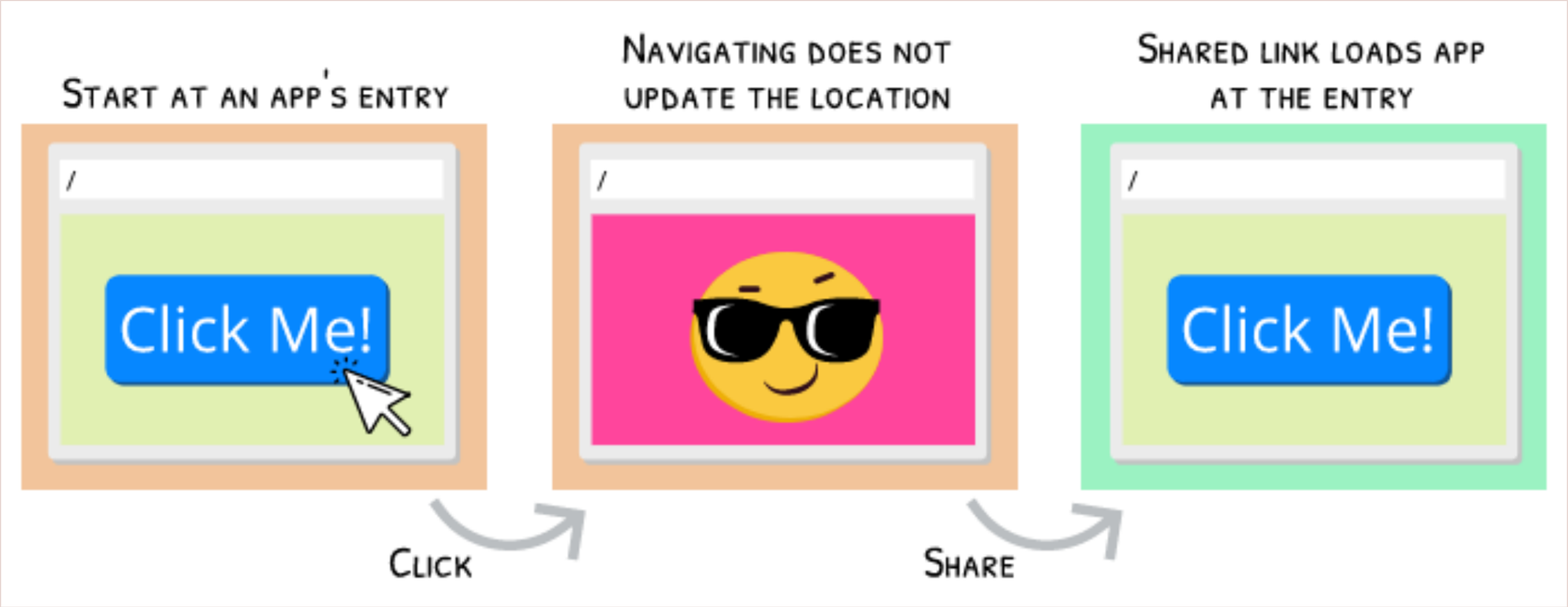

BUILDING AN SPA

BUILDING AN SPA

- An SPA consists of the following:
  - Data (see Async JS slides)
  - Routing
  - Templates

ROUTING

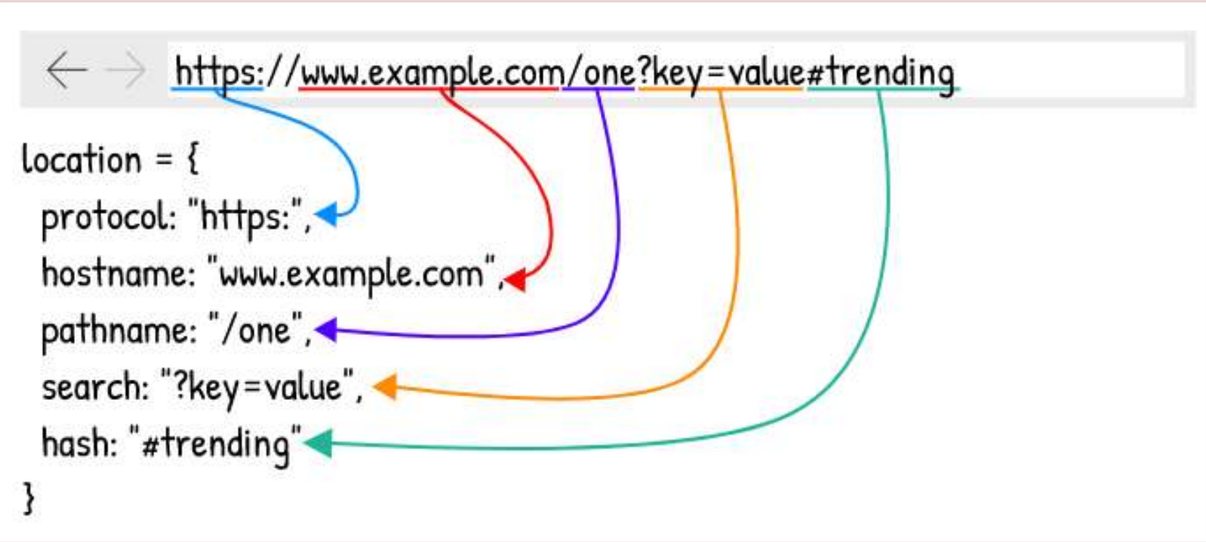
"A location-based SPA render can immediately render the desired content [1]"



[1] https://blog.pshrmn.com/how-single-page-applications-work/

ROUTING
LOCATION

“The window.location properties map directly from the URL [1]”



[1] https://blog.pshrmn.com/how-single-page-applications-work/

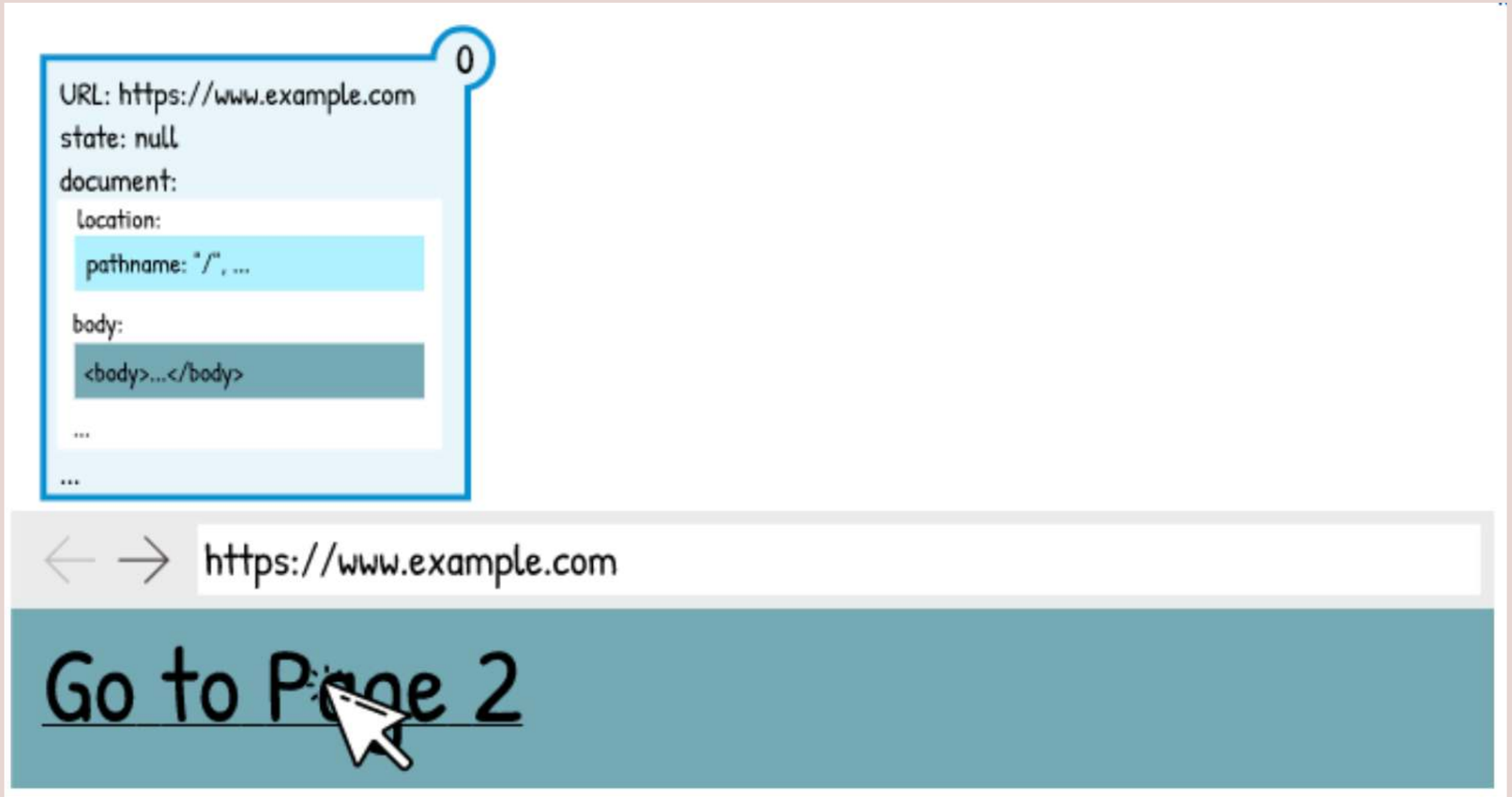
ROUTING
LOCATION

```
window.location // returns information about the current location

// {
//   "ancestorOrigins": {},
//   "href": "https://www.fh-salzburg.ac.at/studium/dmk/multimediatechnology-bachelor",
//   "origin": "https://www.fh-salzburg.ac.at",
//   "protocol": "https:",
//   "host": "www.fh-salzburg.ac.at",
//   "hostname": "www.fh-salzburg.ac.at",
//   "port": "",
//   "pathname": "/studium/dmk/multimediatechnology-bachelor",
//   "search": "",
//   "hash": ""
// }
```

BROWSER SESSION

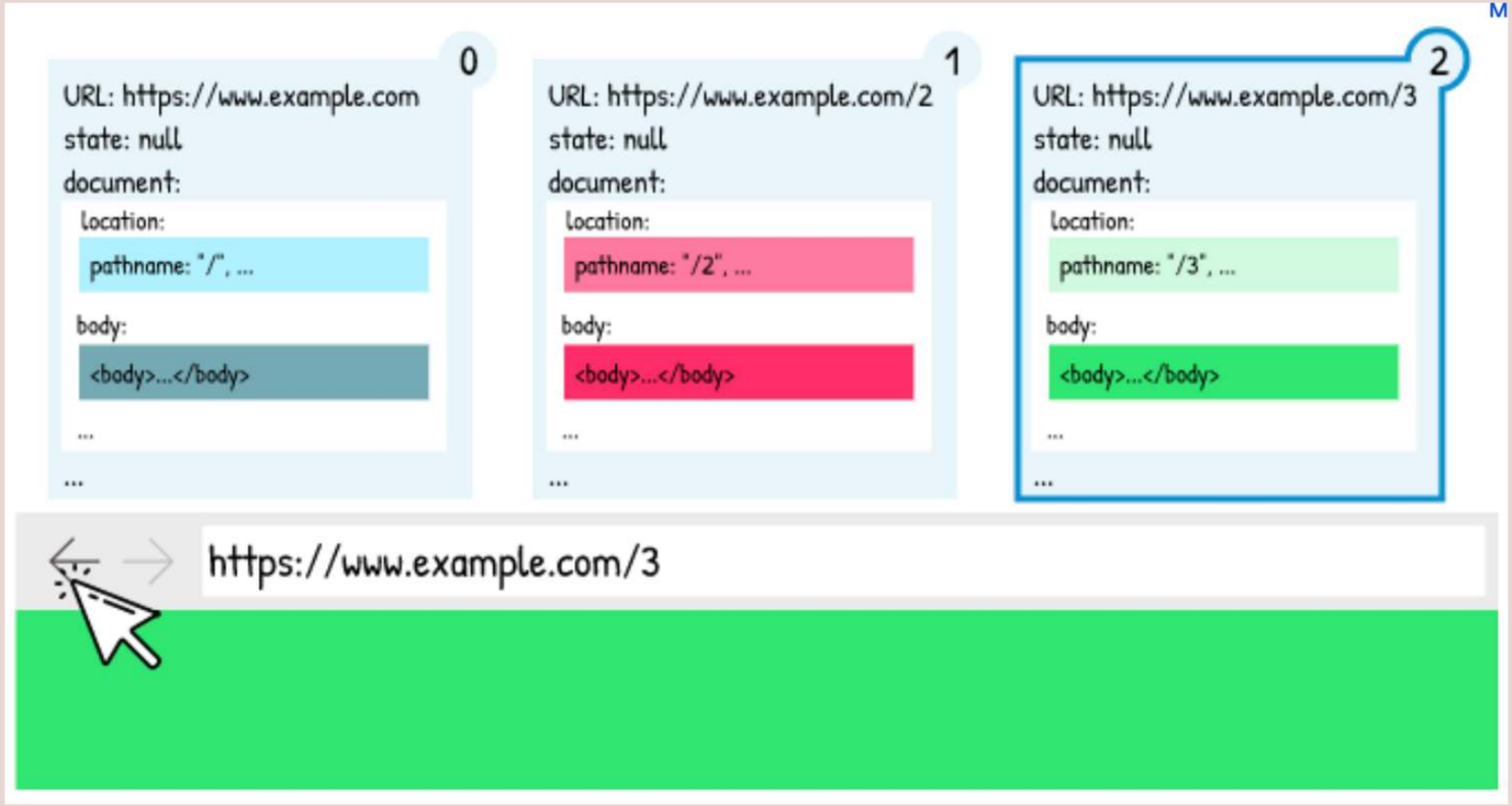
BROWSER SESSION
LINKS



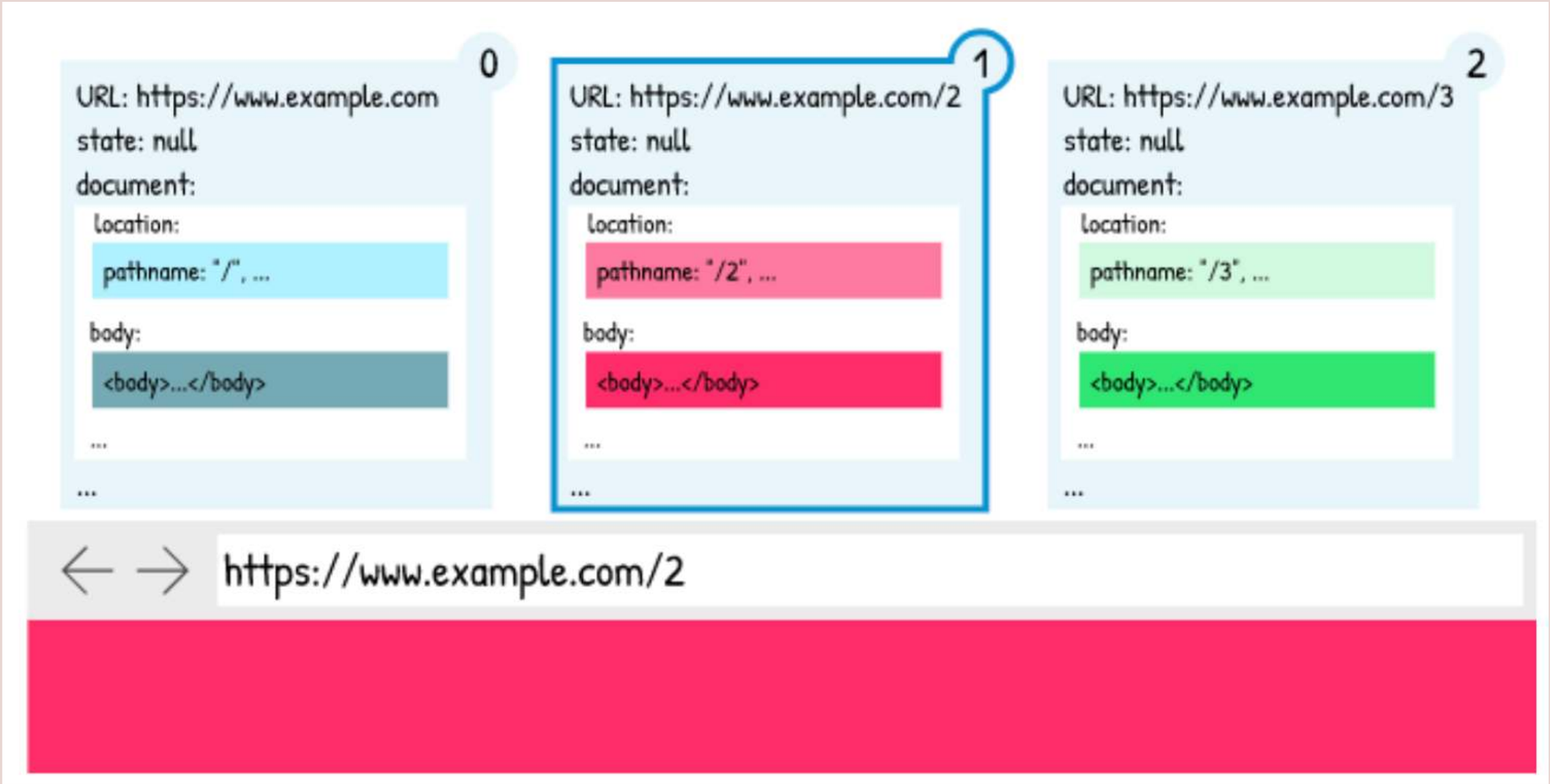
BROWSER SESSION
LINKS

BROWSER SESSION
LINKS

BROWSER SESSION
BACK BUTTON

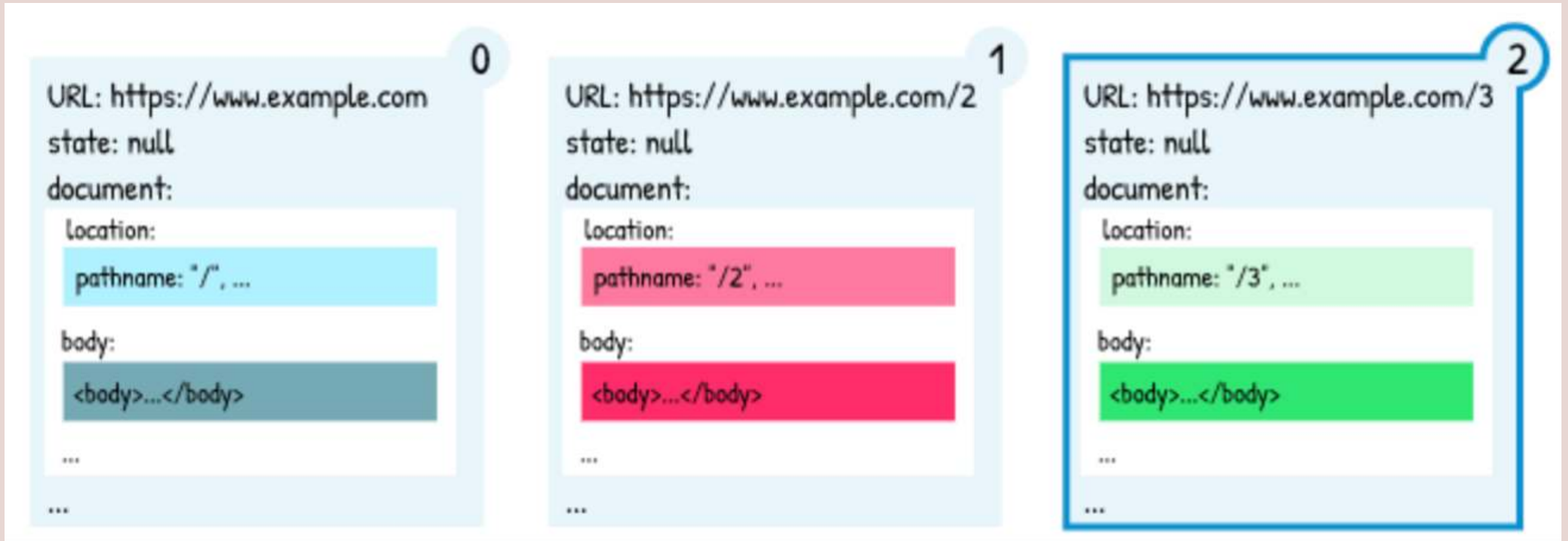


BROWSER SESSION
BACK BUTTON



ROUTING
LOCATION

“Each browser tab has a “browsing context”. The browsing context maintains a “session history”, which is essentially an array of location entries.”



BROWSER HISTORY

The History API has three core functions:

» pushState()

» replaceState()

» go()

BROWSER HISTORY
PUSHSTATE

```
// history.pushState(<state>, <title>, <url>)

history.pushState({}, 'page 1', '/page1')
// `pushState` adds a new entry to the history
// current history object ['/page1']

history.pushState({}, 'page 2', '/page2')
// current history object ['/page1', '/page2']
//                                  ^^^^^^^
// adds /page2 to the history
```

BROWSER HISTORY
HISTORY.PROTOTYPE.REPLACESTATE

```
// history.replaceState(<state>, <title>, <url>)

history.pushState({}, 'page 1', '/page1')
// current history object ['/page1']

history.replaceState({}, 'page 2', '/page2')
// current history object ['/page2']
//                          ^^^^^^^
// replaces /page1 with /page2
```

BROWSER HISTORY
HISTORY.PROTOTYPE.BACK

```
history.pushState({}, 'page 1', '/page1')
// current history object ['/page1']

history.pushState({}, 'page 2', '/page2')
// current history object ['/page1', '/page2']

history.back()
// history ['/page1', '/page2']
//                ^^^^^^^
```

BROWSER HISTORY EXERCISE

» Go to any webpage (e.g. medium.com) and navigate around

» Then open the console and type history or window.history

» Type history.go(-1) or history.back()

BROWSER HISTORY EXERCISE

- Push a new state: history.pushState({ name: 'FHS' } , '', '/user')
  - Check the bar on top and see how it changes the path
  - Check the history object again with history
- Replace the current state with replaceState(), see how the length of the history doesn't change
- Check the history state with history.state

BROWSER HISTORY EXERCISE

» Assign window.location = "/someroute" in comparison and look at the window.location


ROUTING IN SPA

LINKS & NAVIGATION

- Classic Website
  - Click on a link
  - Browser send request
  - Presents document

LINKS & NAVIGATION

- Single Page Application
  - Click on a link
  - Browser might do something (e.g. fetch data)
  - A certain area or complete page gets replaced within the current document

SINGLE PAGE APPLICATIONS
ROUTING

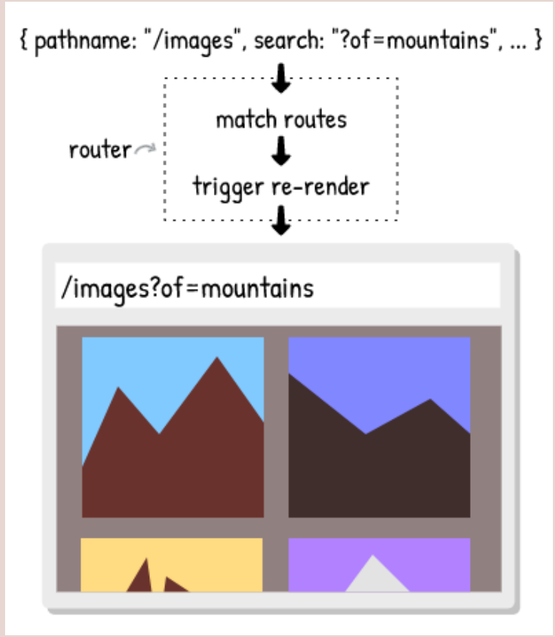
» Single-page application generally rely on a router.

» Routers are made up of routes, which describe the location that they should match.

```
const routes = [
 { path: '/' },
 { path: '/about' }, // static
 { path: '/album/:id' } // dynamic
 //              ^^^^
 // dynamic part
];
```

SINGLE PAGE APPLICATIONS
ROUTE MATCHING

» The application renders based on the route that matches the location



NAVIGATING IN SPAS
LINK HANDLING

- add click handler to link
  - call event.preventDefault()
  - removes native behavior
- call history.pushState / history.replaceState

NAVIGATING IN SPAS
LINK HANDLING

```
const link = document.querySelector('#my-link')

link.addEventListener('click', (evt) => {
// ^^^^^^^^^^^^^^^^^^^^^^^^^^^^
// attach event listener on click

    evt.preventDefault()
    // removes default behaviour (no navigation will take place)

    history.pushState(null, "My new page", evt.target.href)
    // navigate to URL from link
})
```

NAVIGATING IN SPAS
ATTACH TO ALL LINKS

```
const allLinks = document.querySelectorAll('a')
//                ^^^^^^^^^^^^^^^^^^^^^^^^^^^^^
// find all links in the document

Array.from(allLinks).forEach((link) => {
// ^^^^^^^^^^^^^^^^^
// convert NodeList to Array

  link.addEventListener('click', (evt) => {
    evt.preventDefault() // remove default behaviour from link
    history.pushState(null, "My new page", evt.target.href)
  })
})
```

NAVIGATING IN SPAS
READING THE CURRENT URL

```
const url = new URL(window.location);
//                  ^^^^^^^^^^^^^^^^
// reads the current URL as string

url.host // "website.com"
url.hostname // "website.com"
url.href // "https://website.com/homepage"
url.origin // "https://website.com"
url.pathname // "/homepage"
url.protocol // "https:"
```

NAVIGATING IN SPAS
RENDER SOME CONTENT

```
const onRouteChange = () => {
  const pathname = new URL(window.location).pathname;
  const domElement = document.querySelector('#content')
  //    ^^^^^^^^^
  // the element to render our content

  if (pathname === '/test1') {
    domElement.innerHTML = 'test1'
  } else if (pathname === '/test2') {
    domElement.innerHTML = 'test1'
  } else {
    domElement.innerHTML = 'not found =('
  }
}
```

FULL EXAMPLE

» https://gist.github.com/webpapaya/
f97f430b7c4f2c894f68644d2cd5ced5

HOMEWORK

» see wiki

FEEDBACK

» Questions: tmayrhofer.lba@fh-salzburg.ac.at

» Feedback Link