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Fetch API

Enabling the link to the server side

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Goal

- Loading data asynchronously
- Sending asynchronous HTTP requests
- Handling multiple requests
- Using alternative libraries

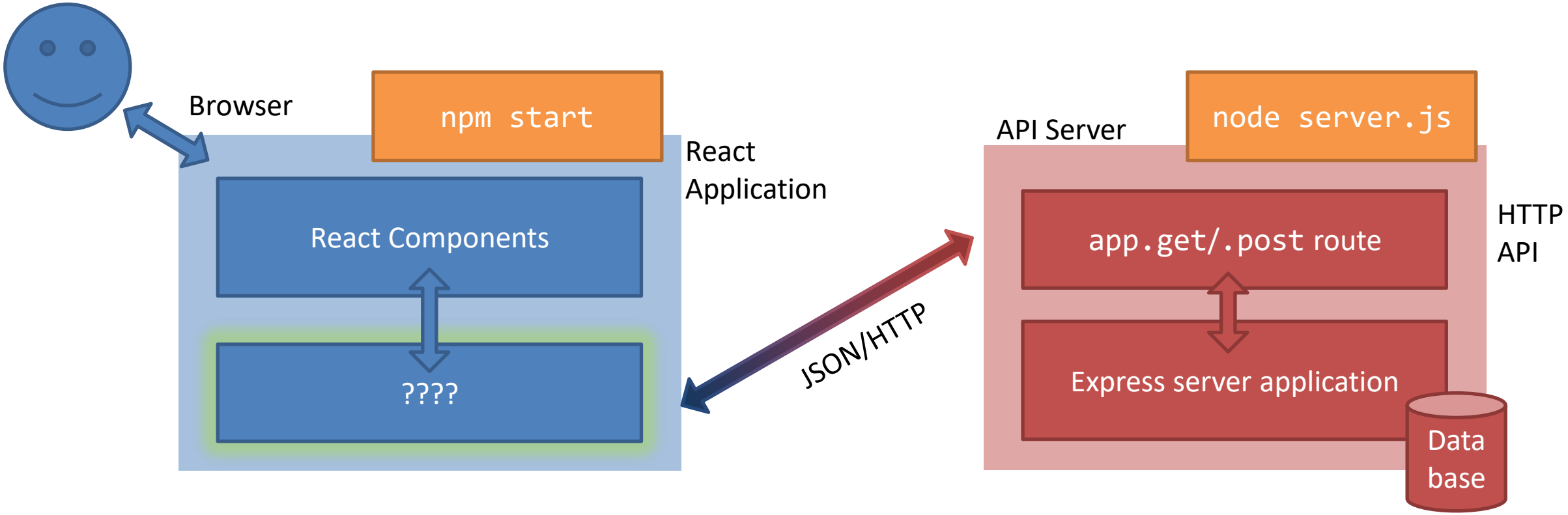
JavaScript: The Definitive Guide, 7th Edition
Chapter 11. Asynchronous JavaScript

Mozilla Developer Network:
Web technology for developers —
Web API — Fetch API
https://developer.mozilla.org/en-US/docs/Web/API/Fetch_API

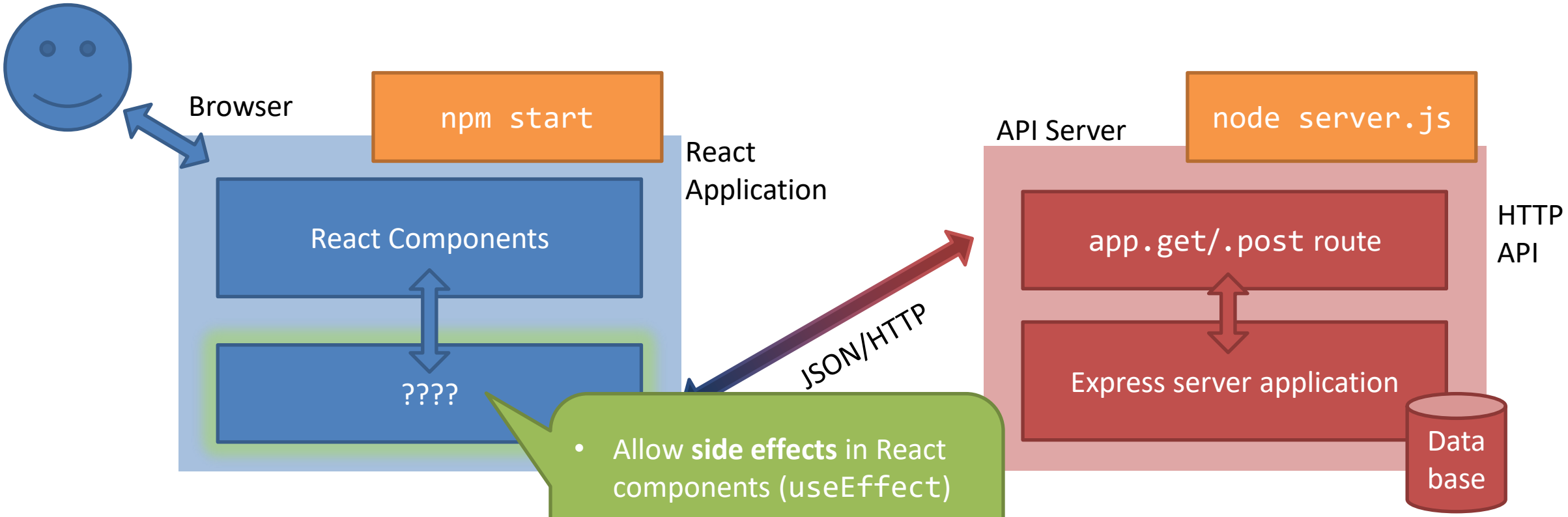
Fetch API

ASYNCHRONOUS JS REQUESTS

Asynchronous API Data Transfers



Asynchronous API Data Transfers



How to Exchange Data Asynchronously

- Make asynchronous HTTP requests using browser-provided Web API
- Use the Fetch API, i.e., **`fetch()`** method
  - Parameters: URL of the resource, object with request parameters (optional)
  - Default request type: GET
- Available in almost any context (e.g., from `window` object)
- Returns a **`Promise`** that will resolve once the load operation finishes
  - Resolves to the **`Response`** object, that allows to access the details of the HTTP transaction and the content
  - The promise is rejected only in case of network errors

https://developer.mozilla.org/en-US/docs/Web/API/Fetch_API

Example

- Just handle the promise (`.then` or `await`)

```
fetch('http://example.com/exams.json')
  .then((response) => {
    return response.json();
  })
  .then((data) => {
    console.log(data);
  })
```

```
const response = await
     fetch('http://example.com/exams.json');

const data = await response.json();

console.log(data);
```

`Response` Object

- The fulfilled Promise returns a `Response` object
- Main properties
  - `Response.ok` (boolean): HTTP successful (code 200-299)
  - `Response.status`, `Response.statusText`
  - `Response.headers`: collection of HTTP headers of the response
  - `Response.url`: final URL (potentially after HTTP redirects)
  - `Response.body`: a readable stream of the body content

https://developer.mozilla.org/en-US/docs/Web/API/Response

Accessing Response Headers

```
fetch('http://localhost/data.json')
  .then(response => {
    console.log(response.headers.get('Content-Type'));
    console.log(response.headers.get('Date'));

    console.log(response.status);
    console.log(response.statusText);
    console.log(response.type);
    console.log(response.url);
  }
```

```
application/html; charset=utf-8
Sat, 11 Apr 2020 13:41:04 GMT

404
Not Found
undefined
http://localhost/data.json
```

https://developers.google.com/web/updates/2015/03/introduction-to-fetch

Error Handling

- Promise is only rejected for non-HTTP errors (e.g., network connection error)
  - Any HTTP status value (200 OK, 404: Not found, 500: Internal server error, ...) returns a **fulfilled** Promise
- *Suggested* error handling approach:
  - Check `response.ok`: true for HTTP status 200-299
  - Check content type header (depends on the application needs)
  - Provide a `catch()` for other types of errors

Example: Error Handling

```
fetch(url)
  .then(response => {
    if (!response.ok) { throw Error(response.statusText) }
    let type = response.headers.get('Content-Type');
    if (type !== 'application/json') {
        //then() returns a rejected promise if something is thrown
        throw new TypeError(`Expected JSON, got ${type}`)
    }
    return response;
  })
  .then(response => {
  //...
  })
  .catch(err => console.log(err))  // either the throw value or other errors
```

Fetch Options

- `const fetchResponsePromise = fetch(resource [, init])`
- Main properties of (optional) `init` object
  - `method`
  - `headers` (an object with a property per each header)
  - `body`
  - `mode` (cors, no-cors, same-origin)
  - `credentials` (omit, same-origin, include), to send cookies with the request
  - `signal`: an AbortSignal object instance to communicate with the fetch request

https://developer.mozilla.org/en-US/docs/Web/API/WindowOrWorkerGlobalScope/fetch

Example: POST with JSON content

```
let objectToSend = {'title': 'Do homework' , 'urgent': true, 'private': false,
'sharedWithIds': [3, 24, 58] };

fetch(url, {
    method: 'POST',
    headers: {
      'Content-Type': 'application/json',
    },
    body: JSON.stringify(objectToSend),  // Conversion in JSON format
  })
  .catch(function (error) {
    console.log('Failed to store data on server: ', error);
  });
```

Reading The Response Body

- Can use (**only once**) one of the following methods
  - …then the body is "**consumed**"
- These methods **also return a Promise**, which returns the response body…
  - `response.text()`: as plain text (string)
  - `response.json()`: as a JS object, by parsing the body as JSON
  - `response.formData()`: as a FormData object
  - `response.blob()`: as Blob (binary data with type)
  - `response.arrayBuffer()`: as ArrayBuffer (low-level representation of binary data)
- `response.body` is a ReadableStreaming object to read it chunk-by-chunk

https://javascript.info/fetch

Sequential Fetches

- Easy with `async`: no need to nest another fetch in `.then()` method

```
const getFirstUserData = async () => {
  const response = await fetch('/users.json'); // get users list
  const users = await response.json(); // parse JSON

  const user = users[0]; // pick first user

  const userResponse = await fetch(`/users/${user.name}`); // get user data
  const userData = await user.json(); // parse JSON

  return userData;
}
```

Parallel Fetches

- Multiple fetches in parallel: use `Promise.all()`

```
// array of URLs
const urls = [url1, url2];

// Convert to an array of Promises
const promises = urls.map(url => fetch(url) );
// Wait only for the fetch Promise

// Run all promises in parallel, wait for all
Promise.all(promises)
  .then(results => { // process according to the order needed by the app
       for (const res of results) res.text().then( t => console.log(t) );
  })
  .catch(e => console.error(e))
```

Basic Fetch vs. Other Libraries

- Most common alternative library: **Axios**
  - Does polyfill for older browsers
  - Has an easier way to cancel a request
  - Has a way to set a response **timeout** (not supported by fetch, which needs a `setTimeout()` to call the `AbortController.abort()` method)
  - Easier support for progress bar via Axios Progress Bar module (fetch requires quite some code around a `ReadableStream` object)
  - Performs automatic JSON conversion
  - Provides an easier way to separate responses of parallel requests
  - Works well also in Node.js (fetch is not included by default)

https://flaviocopes.com/axios/
https://blog.logrocket.com/axios-or-fetch-api/

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