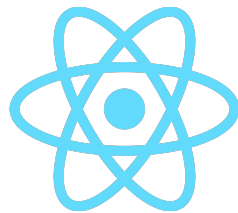Orbital 2023
Mission Control
Web Development: React (Part 1)

Ravern

About Me

- Y1 NUS Computer Science

- Coreteam member at

- Experience with React through internship, freelance work

What We Aim to Cover

Part 1

- What is React and JSX

- React components

- Managing state in React

- Build Rocket to-do app 🚀

- Deploy to Vercel
  i.e. see your app live!

Part 2

- Adding 3rd-party libraries

- Styling the app

- Adding Supabase
  - Sign up and login
  - Persistence (i.e. save your data to a database in the cloud)

Setting Expectations

- This is a 2-hour workshop

- This workshop aims to equip you with the very fundamentals of React through building a basic web app

- There is a lot more to depth to web dev than will be covered

- We will focus on key concepts and aim to get something working 💪

Workshop Format

- I explain React concepts

- I livecode using the aforementioned concept

- You will be given some time to read/understand the code and for Q&A

- Repeat

We will be using CodeSandbox, links can be found here
https://docs.google.com/document/d/1kgnNxX7GRxaV_KuJRs4FdxBstmpLzIgnjGo6HI4Dfds/edit#

Final Product (For Today)

https://rocket-todos.vercel.app

Rocket To-Dos

Hi there, how may I address you?

Set name

You are all done!

Add new task

Add

Awwwww there are no tasks yet...

Here is an interesting fact

There are more than 500 million domestic cats in the world, with approximately 40 recognized breeds.

Refresh

Live Q&A

https://app.sli.do/event/9wUhkJ5cXxsvQMzano8dFh/live/questions

Event Code: **#3352 698**

Maximum of 100 participants (free plan; I'm poor) so only visit the site to upvote or post new questions.

During live Q&As I'll display the questions on screen.

Accompanying Document

https://docs.google.com/document/d/1kgnNxX7GRxaV_KuJRs4FdxBstmpLzIgnjGo6Hl4Dfds/edit#
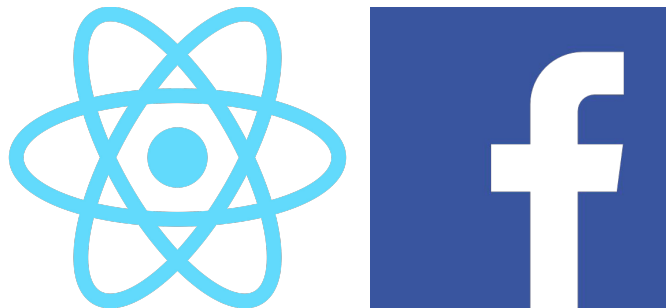
Contains more resources and relevant links.

What is React?

React

- Open source JavaScript library used for building interactive webpages

- Created in 2011 by Facebook engineer Jordan Walke

- Currently maintained by Facebook

Building Interactive Webpages

- Facebook

- Instagram Web

- AirBnB

- Uber

- Netflix

- Straits Times

- NUSMods

- Source Academy

How Does React Work?

HTML

Provides the structure
and semantics of a
webpage

HTML

HTML Page Structure

```
<!DOCTYPE html>                          ← Tells version of HTML
<html>                    ←              HTML Root Element

<head>            ←                      Used to contain  page HTML metadata
  <title>Page Title</title>      ←       Title of HTML page
</head>

<body>        ←                          Hold content of HTML
  <h2>Heading Content</h2>    ←          HTML headling tag
  <p>Paragraph Content</p>   ←           HTML paragraph tag
</body>

</html>
```
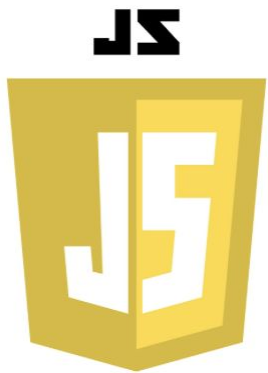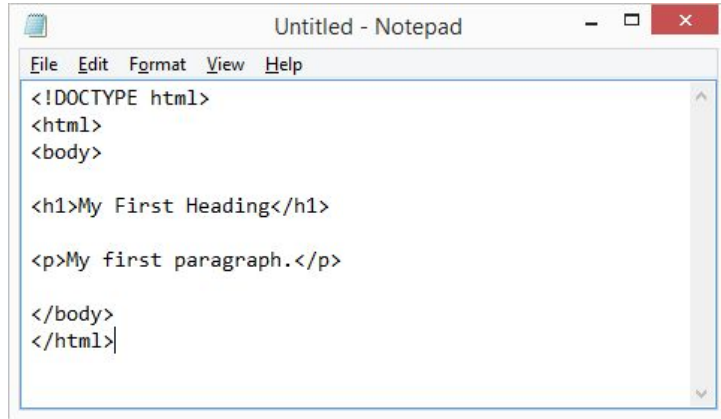
CSS

Adds styling to a webpage

JavaScript

Adds interactivity and
logic into websites

```javascript
15
16  const LOCALE = globalThis.navigator.language
17
18  const div = document.body.appendChild(document.createElement('div'))
19  const list = div.appendChild(document.createElement('ol'))
20
21  const dayNames = new Map()
22
23  for (let i = 0; i < 7; ++i) {
24      const d = Temporal.PlainDate.from({
25          year: Temporal.Now.plainDateISO().year,
26          month: 1,
27          day: i + 1,
28      })
29
30      dayNames.set(d.dayOfWeek, d.toLocaleString(LOCALE, { weekday: 'long' }))
31  }
32  |
33  for (const num of [...dayNames.keys()].sort((a, b) ⇒ a - b)) {
34      list.appendChild(Object.assign(
35          document.createElement('li'),
36          { textContent: dayNames.get(num) },
37      ))
38  }
39
```

Document Object Model (DOM)

Plain text file
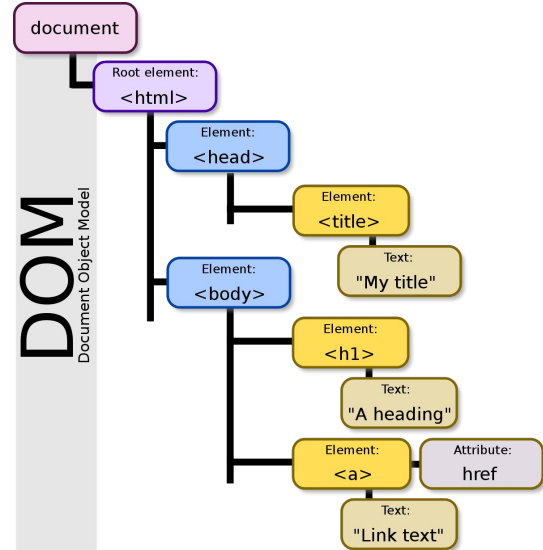
Tree Structure

Document Object Model (DOM)

DOM — Document Object Model

document

Root element: <html>

Element: <head>

Element: <title>

Text: "My title"

Element: <body>

Element: <h1>

Text: "A heading"

Element: <a>

Attribute: href

Text: "Link text"
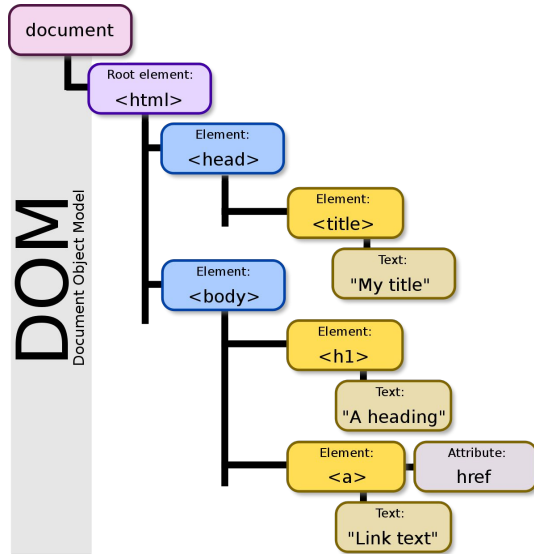
Converted by browser to

Tree Structure
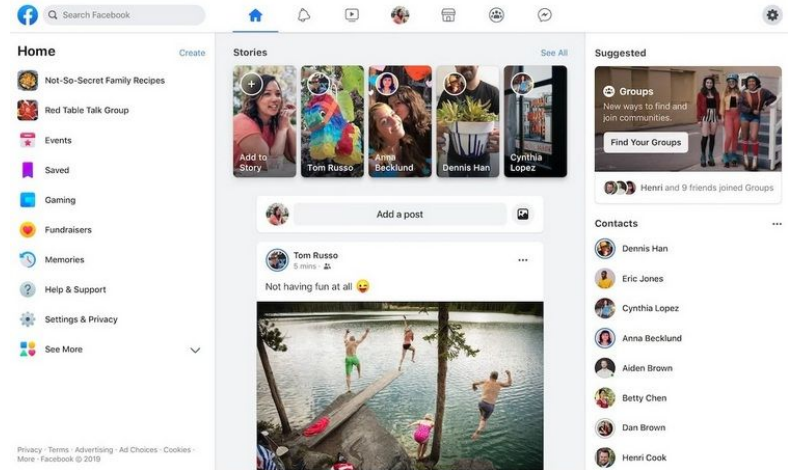
What you see

Without React (Traditional Web Apps)

Without React (Traditional Web Apps)

- When you click on a link on a webpage

    a. Send a new HTTP request to your server
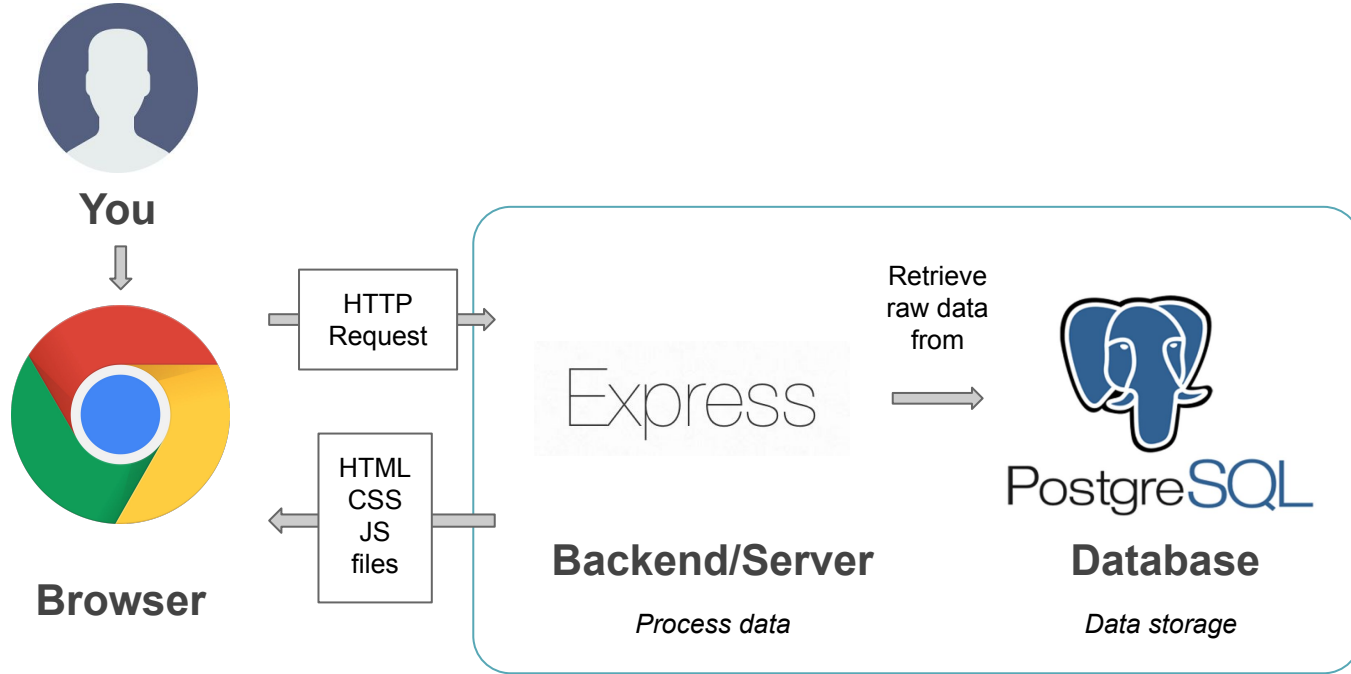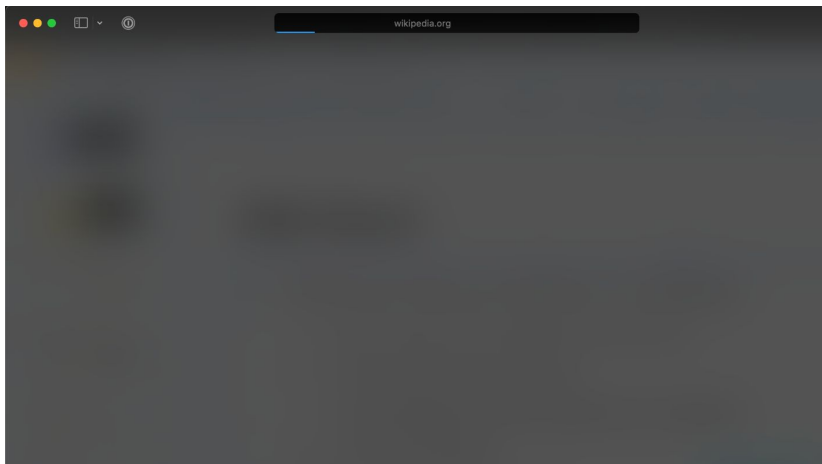
    b. Server sends a **new HTML file** even if some parts of the page look the same

    c. Your browser blanks out as it loads the new file

    d. New file displayed!

- e.g. Wikipedia

With React
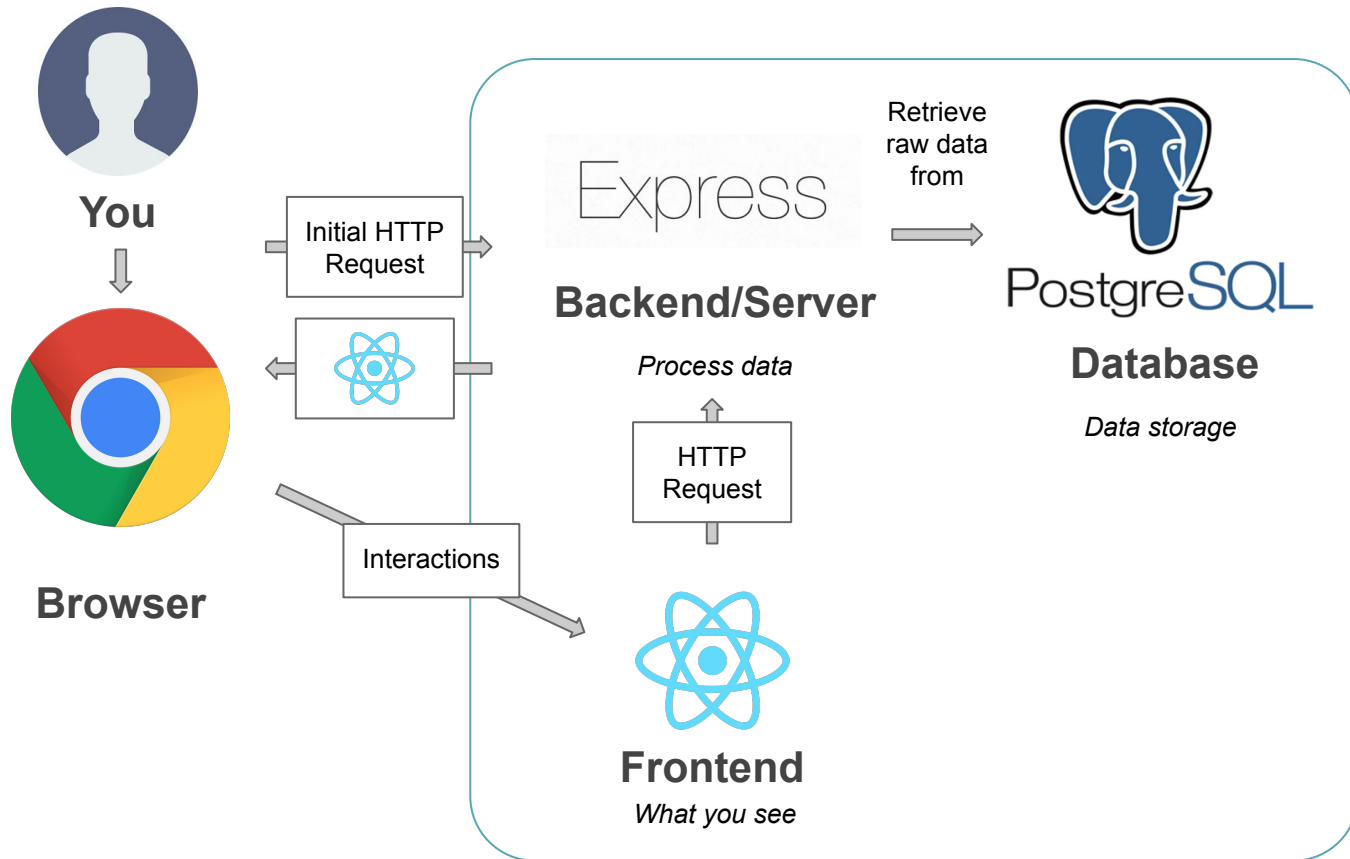
With React

- When you click on a button on a webpage

    a.   Send a new HTTP request to your server

    b.   Server sends back raw data

    c.   React **figures out what needs to be changed**

    d.   Only modifies the DOM with what needs to be changed

- Therefore, no ugly reloading of the entire page

- This concept is known as the Single Page Application (SPA)

- React is a SPA framework

How React Figures Out What Changed

- React maintains a **Virtual DOM** in between your code and the DOM
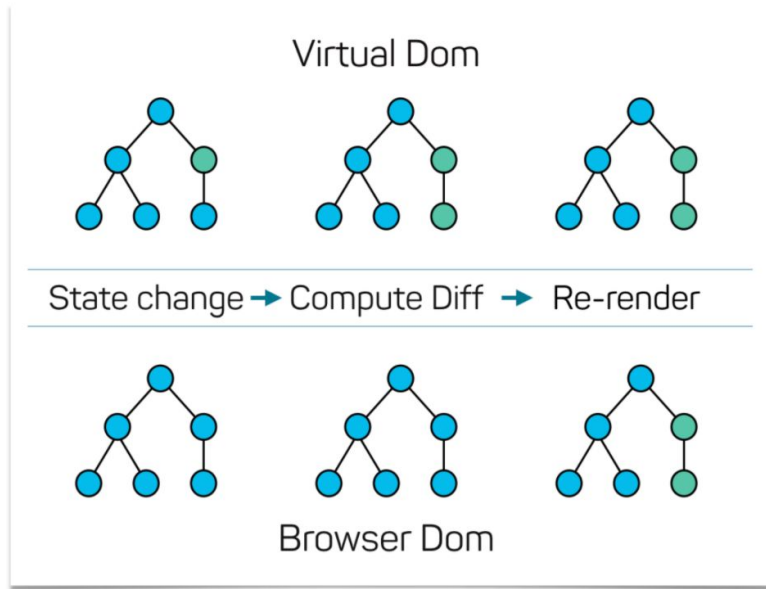
Why Use React?

Don't Use It

- If you don't need lots of interactivity within your app

- If you need to build quickly and you're more familiar with traditional web apps

- If you don't want to have lots of fun!

Benefits of React

- Fast - no ugly blanking out of web pages, only change what's needed)

- Intuitive - declarative style; tell React what you need, let it handle the rest

- Widely used - tons and tons of resources out there on learning React

Let's Begin!

Exercises

https://docs.google.com/document/d/1kgnNxX7GR
xaV_KuJRs4FdxBstmpLzIgnjGo6Hl4Dfds/edit#

- The final output of each exercise should be
  the next exercise (e.g. Exercise 0's outcome
  is Exercise 1)

Exercise 0

https://codesandbox.io/s/orbital-react-2023-exercise-0-gux86g

- HTML Refresher

- Build the skeleton of Rocket to-do list app

Rocket To-Dos

Welcome back, Alice!

It is so nice to have you back on the app :)

Add new task

[_____] [Add]

Task list

No.	Task	Completed?
1	Wash the dishes	☐
2	Buy more toilet paper	☑
3	Collect the mail	☑

Exercise 1

https://codesandbox.io/s/orbital-react-2023-exercise-1-xy1foq

- Basic state in React

- Interaction between JavaScript and JSX (e.g. rendering dynamic values)

Rendering and Re-rendering

state
{ name: "Alice" }

render →

Welcome back, Alice!

It is so nice to have you back on the app :)

[Change name]

↓ state change

state
{ name: "Bob" }

re-render →

Welcome back, Bob !

It is so nice to have you back on the app :)

[Change name]

Exercise 2

https://codesandbox.io/s/orbital-react-2023-exercise-2-k4r3k6

- Introduce the idea of the "component tree"

- Organize our code into multiple concise files rather than one convoluted, gigantic file

Rocket To-Dos

Welcome back, Alice!

It is so nice to have you back on the app :)

Change name

Add new task

| | Add |

Task list

No.	Task	Completed?
1	Wash the dishes	☐
2	Buy more toilet paper	☑
3	Collect the mail	☑

Exercise 3

https://codesandbox.io/s/orbital-react-2023-exercise-3-l3vtfz

- Introduce passing of React props into other components

- Rendering of array data to React elements (i.e. `key` prop)

Rocket To-Dos

Welcome back, Alice!

It is so nice to have you back on the app :)

Change name

Add new task

[   ] Add

Task list

No.	Task	Completed?
1	Wash the dishes	☐
2	Buy more toilet paper	☑
3	Collect the mail	☑

Exercise 4

https://codesandbox.io/s/orbital-react-20
23-exercise-4-mskufy

- Introduce events in React (e.g. click)

- JavaScript "..." or "spread" operator

- Preventing browser default behaviour using `preventDefault`

Exercise 5

- Conditional rendering

- Reiterate what the declarative paradigm and how it applies to React

Rocket To-Dos

Hi there, how may I address you?

Set name

Add new task

Add

Awwwww there are no tasks yet...

Exercise 6

- Introduce callbacks and passing them as props

- Destructuring of JavaScript objects

- Immutable paradigm in React

Rocket To-Dos

Hi there, how may I address you?

Set name

Add new task

[ ] Add

Awwwww there are no tasks yet...

Exercise 7

https://codesandbox.io/s/orbital-react-2023-exercise-7-de758o

- Sharing state between sibling components in the component tree

- "Lifting state" in order to do the above

Lifting of state

Exercise 8

[https://codesandbox.io/s/orbital-react-20](https://codesandbox.io/s/orbital-react-2023-exercise-8-59x8wy)
[23-exercise-8-59x8wy](https://codesandbox.io/s/orbital-react-2023-exercise-8-59x8wy)

- Introduce the `useEffect` hook

- Introduce JavaScript `Promise`

- Make API call to Cat Fact of the Day

    - https://catfact.ninja/fact

Rocket To-Dos

Hi there, how may I address you?

Set name

You are all done!

Add new task

[   ] Add

Awwwww there are no tasks yet...

Here is an interesting fact

Not every cat gets \high\" from catnip. Whether or not a cat responds to it depends upon a recessive gene: no gene"

Refresh

Exercise 9

- Introduce native browser APIs (i.e. `localStorage`)

- Serializing and deserializing JavaScript objects

Exercise 10

https://codesandbox.io/s/orbital-react-2023-exercise-10-b6ziof

- Final product!

- We can deploy to Vercel through CodeSandbox
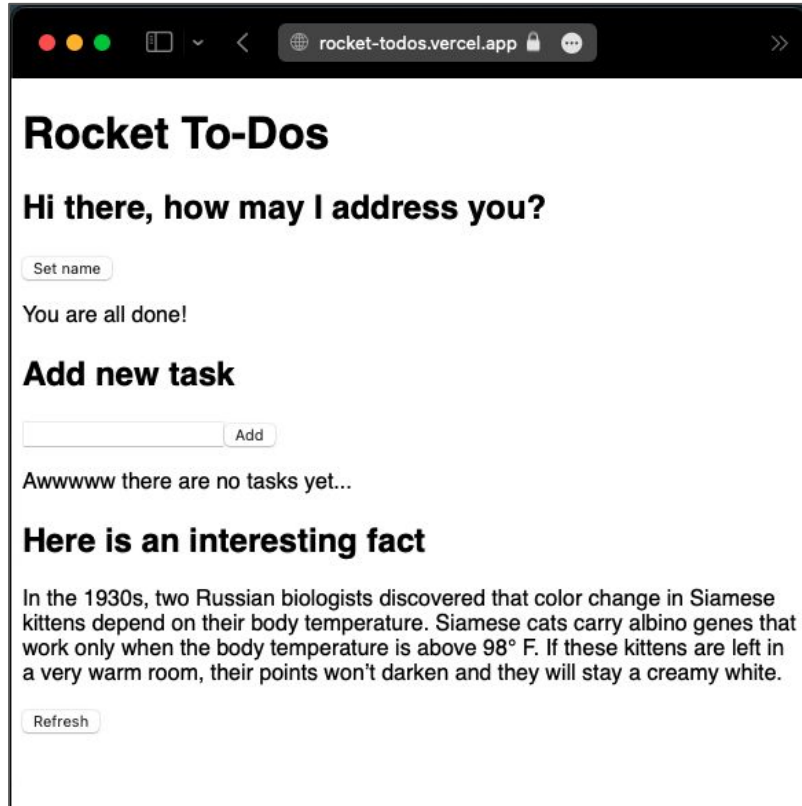
Summary

Final Product (For Today)

https://rocket-todos.vercel.app

Rocket To-Dos

Hi there, how may I address you?

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Refresh

Recap

- **Components** are the building blocks of React

- **Props** refers to data passed from a parent to child component

- **State** refers to data stored within the component

- When props or state has changed, the component is **re-rendered**

- If state needs to be shared across components, store it in the common ancestor's state, i.e. **Lifting state**

- **Do not modify state directly;** instead make a copy of the existing state, modify it and then set the new modified copied state

Aside: React DevTools

- Browser extension to view and interact with the virtual DOM of a React application

- Available in

  - Chrome:

    https://chrome.google.com/webstore/detail/react-developer-tools/fmkadmapgofado
    pljbjfkapdkoienihi?hl=en

  - Firefox:

    https://addons.mozilla.org/en-US/firefox/addon/react-devtools/

Q&A

See You Next Week!