REACT

The Marmite Framework

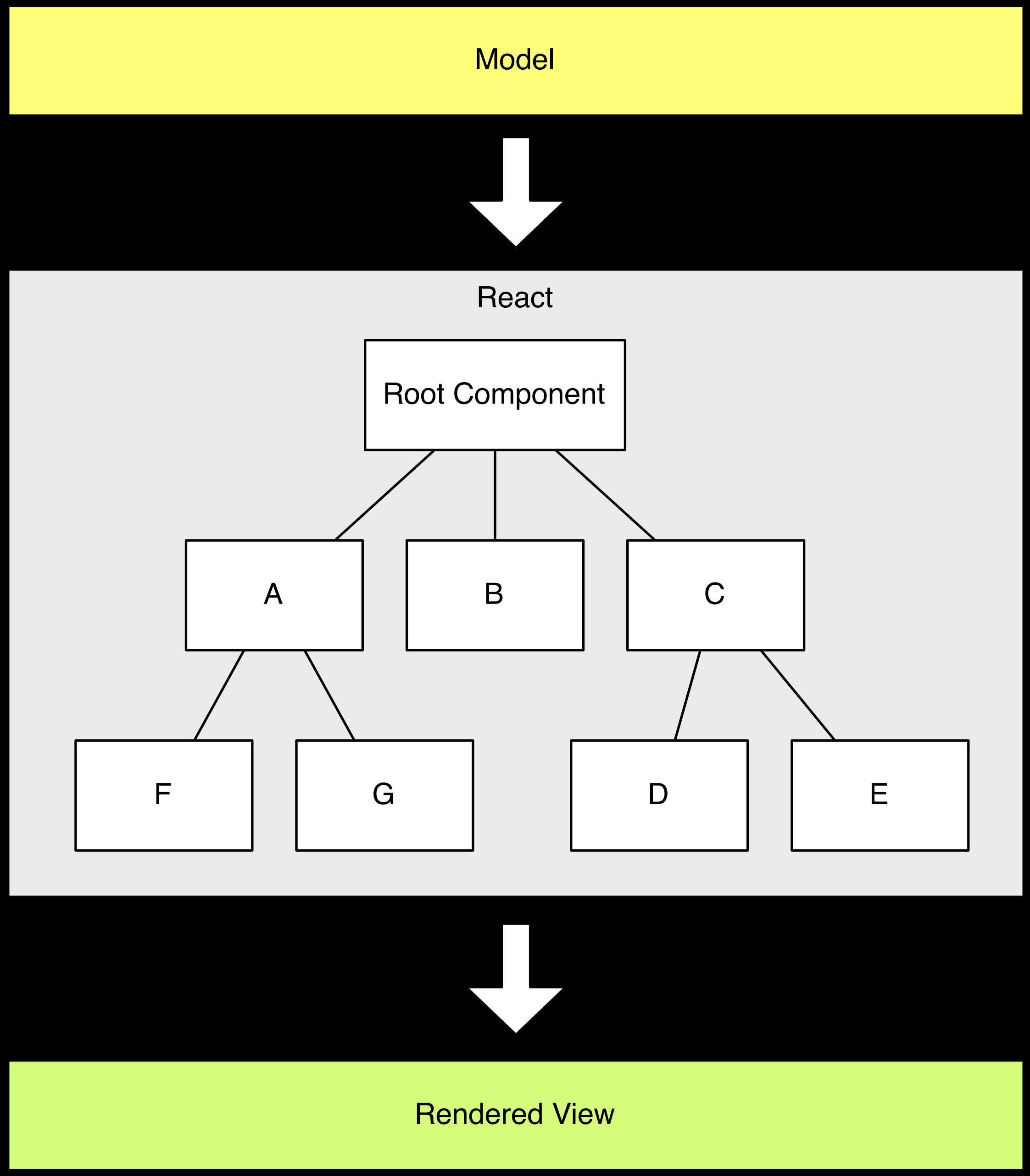
What is React?

- A library for building user interfaces
- Strictly concerns itself with the view
- Does not require a browser
- You need to bring your own pattern for managing data

Key Concepts

- One way binding
- Component based
- Virtual DOM

How does it work?



Getting Started

- This used to be tough but its recently been made easy:

```
npm install -g create-react-app
create-react-app hello-world
```

- Quick look at the output

ES6

- Many of these examples will include ES6
- Using a mixture of transpiling and polyfills Babel converts this to ES5 for broad compatibility in browsers
- We'll look at just enough to make sense of the examples

ES6 - Destructuring

- Uses to extract data from arrays or objects into distinct variables

```
var o = { x: 10, y: 20 }
var {x, y } = o
var {x: a }
console.log(x) // 10
console.log(y) // 20
console.log(a) // 10
```

ES6 - Class

- Classes in ES6 are just syntactic improvements over the existing prototype based inheritance

```
class Animal { }

class Dog extends Animal {
    constructor(name, age) {
        this.name = name
        this.age = age
    }
}

var myDog = new Dog(‘Tess’, 5)
```

ES6 - Modules

- Take elements of CommonJS (Node) modules and AMD (RequireJS) modules

```
export const myVariable = 5
export function dosomething() { … }
export default class MyClass { … }
```

Simple ToDo List Example

https://jsfiddle.net/jrandall/f7wn69ma/

Components

- A React application is constructed of a hierarchy of components
- Components often contain rendering code but don’t have to (and we’ll see some examples later)

Virtual DOM

- React uses the component model, properties and state to build a virtual DOM
- The virtual DOM is much faster to manipulate than the real DOM
- As components change (via properties or state) React updates its virtual DOM and uses this to calculate the most optimal way to update the real DOM

JSX

- JSX is not HTML
- It’s a shortcut for building the virtual DOM using Reacts DOM API
- It transpiles to JavaScript (usually via Babel)
- It can provoke interesting reactions!!

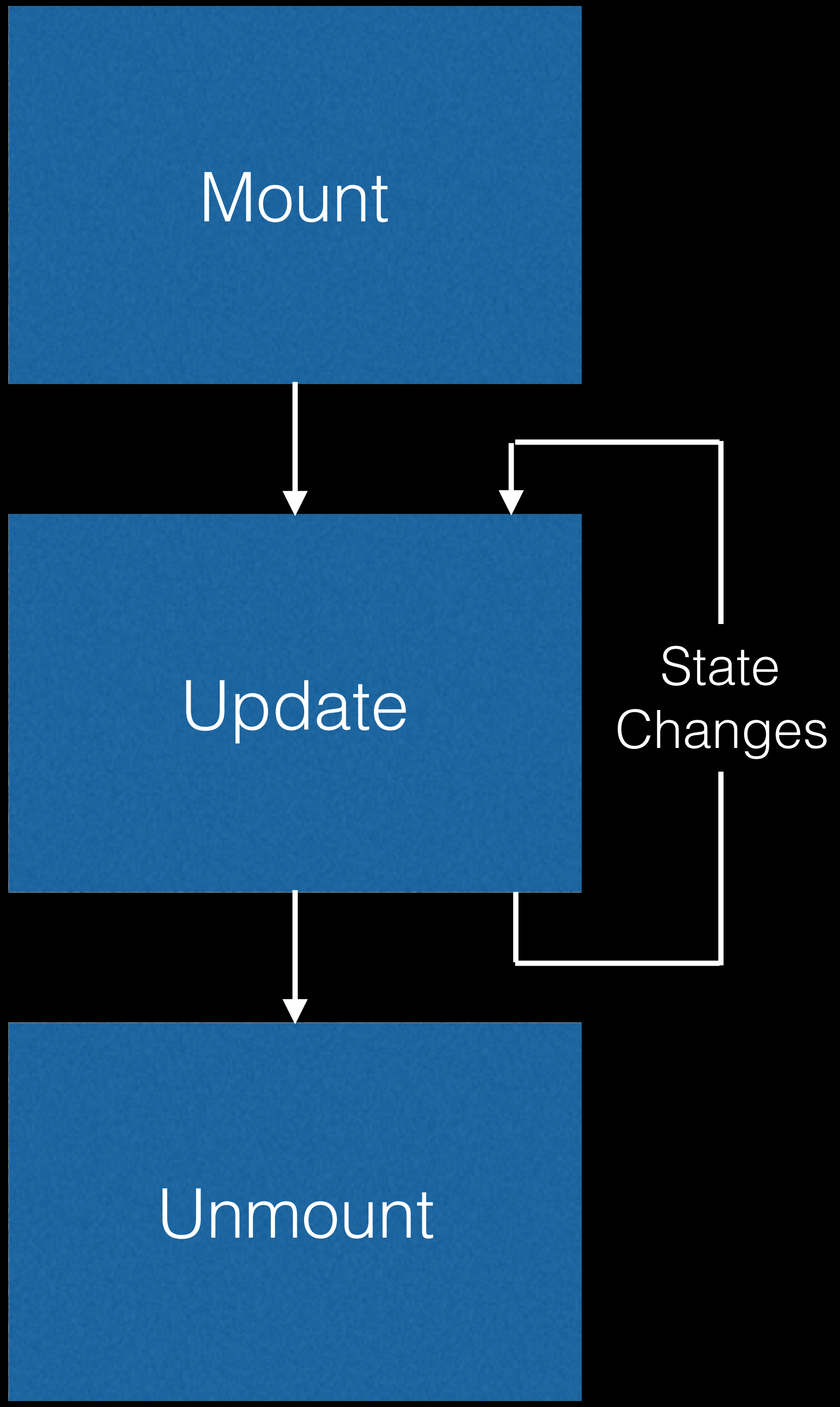
Philosophical thoughts on JSX

- It just flips traditional templating on its head
- Rather than learn a templating DSL with “code” inside HTML JSX takes the other view - keep things in JavaScript
- Over time I’ve found myself scratching my head less over the JSX approach than I have over Angular 1’s template language

State and Properties

- Properties (props) are immutable and used to share state between components
  - Data and callbacks are passed down
  - Components use the callbacks to communicate change back up the component tree
- State is mutable and scoped within a component
- You should strive to make your components stateless and either compute the “state” from properties in render() or use the container pattern to pre-shape the properties

Component Lifecycle



componentWillMount()
componentDidMount()

componentWillReceiveProps()
shouldComponentUpdate()
componentWillUpdate()
render()

componentWillUnmount()

Immutability and JavaScript

- JavaScript itself has no inbuilt support for immutable data
- You can use the Immutable library to add support
  - http://facebook.github.io/immutable-js/
  - Implements immutable versions of many common data structures
  - Works well with ES6 and TypeScript, transpiles to ES3

Moving on from ToDo

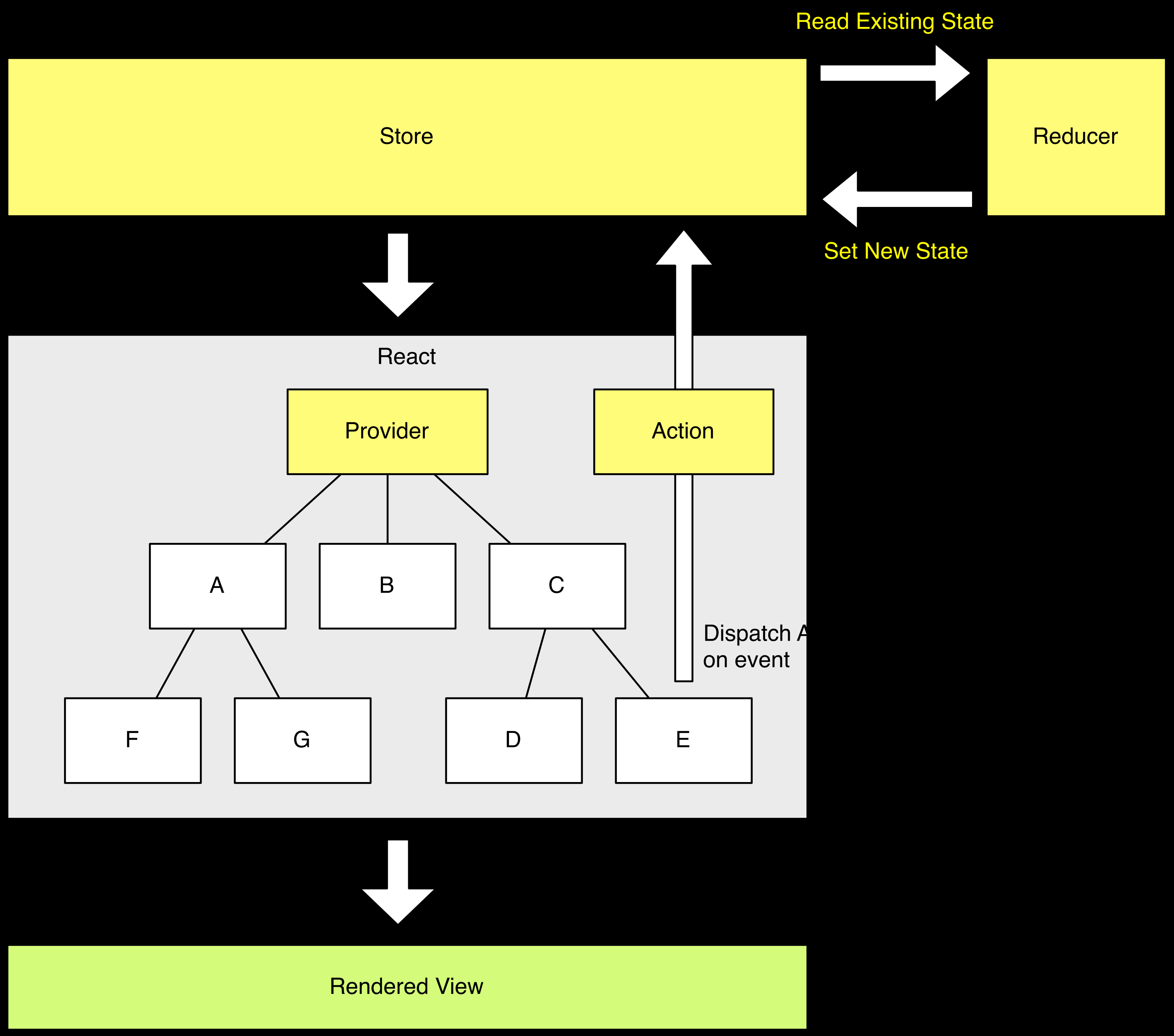
- The ToDo example was simple but we’re quickly going to hit problems with those patterns:
  - Data / state management was complex
  - Everything was in one file
  - It’s not clear how to test it

Redux

Redux

- It bills itself as a predictable state container for JavaScript applications
- It's a simplified implementation of the Flux pattern
- It's not tightly coupled to React and you can use it with other frameworks (Angular 2 for example)
- It does however work very well with React

How does it work?



The 3 Redux Principles

- It’s a single source of truth for your whole application
- State is read only
- Changes are made with pure functions called reducers

Redux ToDo List Example

https://github.com/reactjs/redux/tree/master/examples/todos

Store

- The store holds the state for the application
- Allows state to be retrieved through getState()
- Facilitates changes to state through the dispatch of actions
- Allows for listeners to be registered

State in Redux

- Should be thought of as a serializable model
- Don’t form none-hierarchical links between objects but use references (IDs etc.)
- If you can take state from a service or storage and place it directly in the store thats a good rule of thumb

Actions

- Simple payloads of data
- Should contain a type property
- Actions are created by action creators: functions that return an action. Though with middleware not always

Reducers

- Reducers are pure functions that take the existing state and an action and return the new state: *(existingState,action) => newState*
- State is immutable so the reducer must base the new state on a copy of the existing state (more on this later) - it cannot change the existing state
- Because deep copying is expensive its common to reuse objects that haven’t changed in the new state tree

Container Components

- Container components are used to connect UI components to the state tree
- Structure data and behaviour to presentation components
- Leave presentation components to concentrate purely on presentation and have no dependencies on the rest of the application

Returning New State

- When dealing with complex models this can get difficult
- Object.assign is a common option but that can lead to quite complex code as you balance copying with reusing existing objects
- There is an add-on package for React that helps with this

update()

- Get it from npm:
  npm install react-addons-update —save

- Uses a Mongo like syntax for updating state

- Example: ToDo sample reworked to use update

Redux Middleware

- Middleware is run after an action is dispatched and before it reaches a router
- Within middleware you have access to the dispatch() and getState() methods of the store
- Can be used to observe to wrap around the action and reduce process or get involved with it

Tools, Testing and Building

Tools

(and a more complicated example)

- React Developer Tools
- Redux Developer Tools

Testing

- Using React and Redux leads to a clean separation of concerns and a structure that lends itself to testing
- Jest is the Facebook framework for testing React applications
- Jest mocks dependencies by default. You can set application wide exclusions and per test exclusions.

Testing Redux

- Most of your testing will be focussed on reducers
- As they are pure functions they are simple to test
    - Construct pre-state
    - Execute reducer
    - Run expectations against returned state
- Quick example!

Testing React Components

- When testing presentational components you’re normally interested in verifying that given state x output y is rendered and doesn’t change
- You could verify this using the virtual DOM
- However Jest includes a “snapshot” feature to save you a lot of typing
- Example!

Deploy to Azure with VSTS

- VSTS includes everything you need to build and deploy React apps
- Example!

Thanks

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- Slides and sample code will be online in the next few days