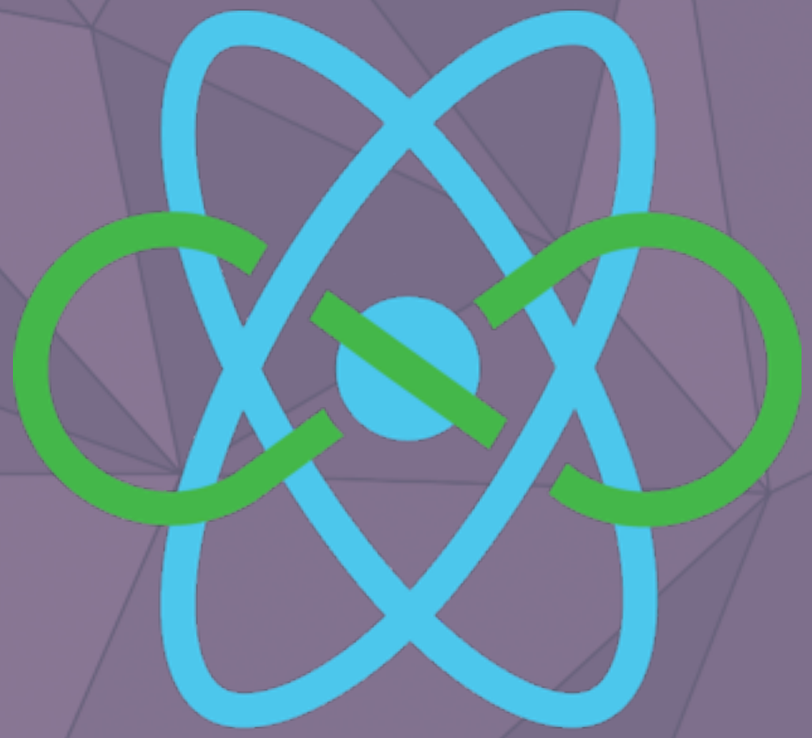

React and Flux

Building Applications with a Unidirectional Data Flow

React and Flux

Building Applications with a Unidirectional Data Flow

Bill Fisher
@fisherwebdev

React and Flux

https://speakerdeck.com/fisherwebdev/flux-applicative

http://facebook.github.io/flux/

http://facebook.github.io/react/

Bill Fisher
@fisherwebdev

#reactjs #fluxjs

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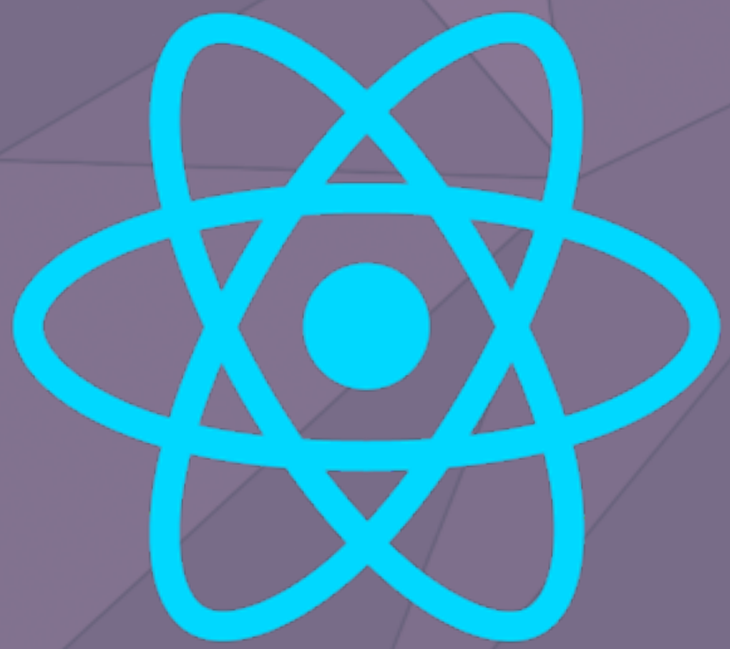

React and Flux

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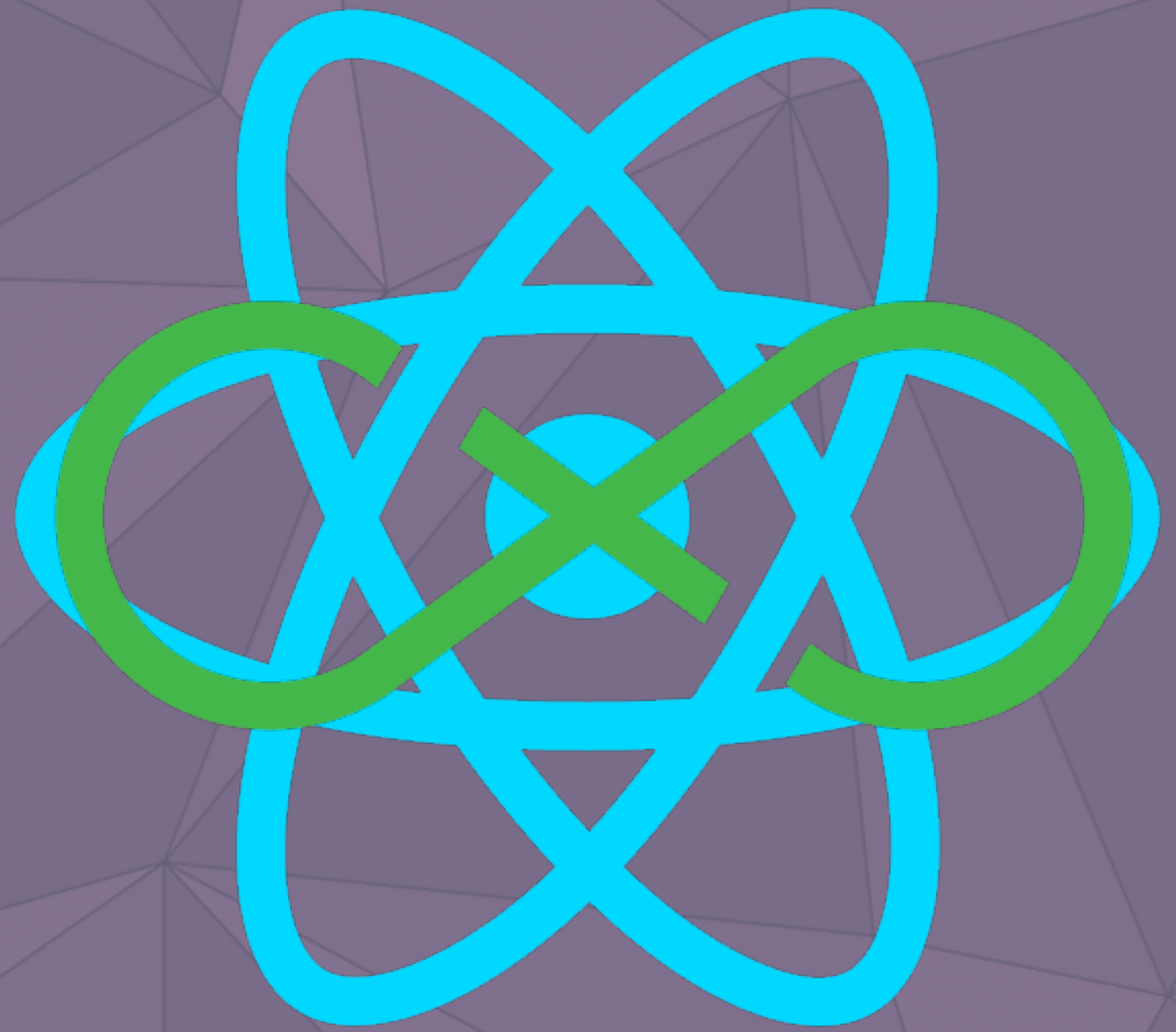

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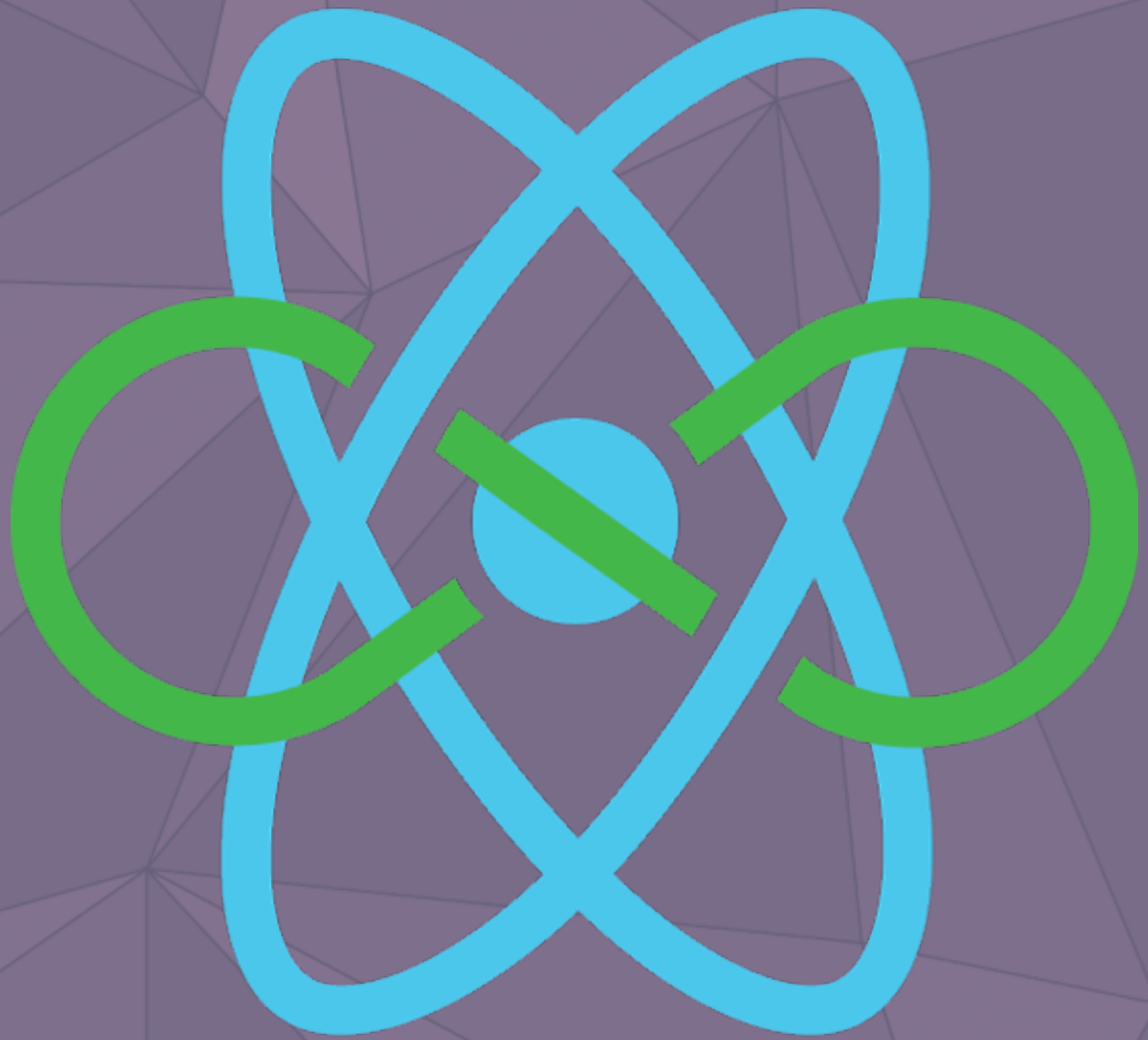

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Model

Model

Model

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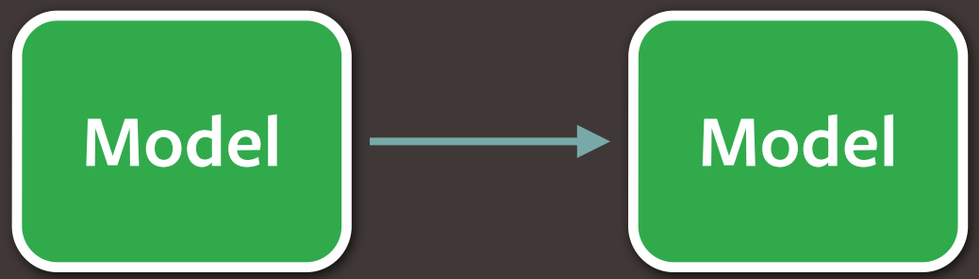
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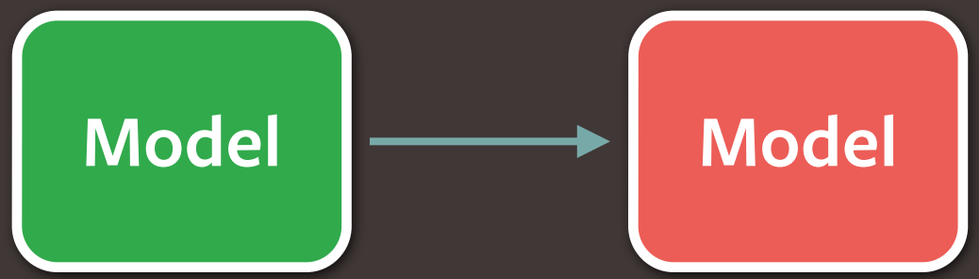
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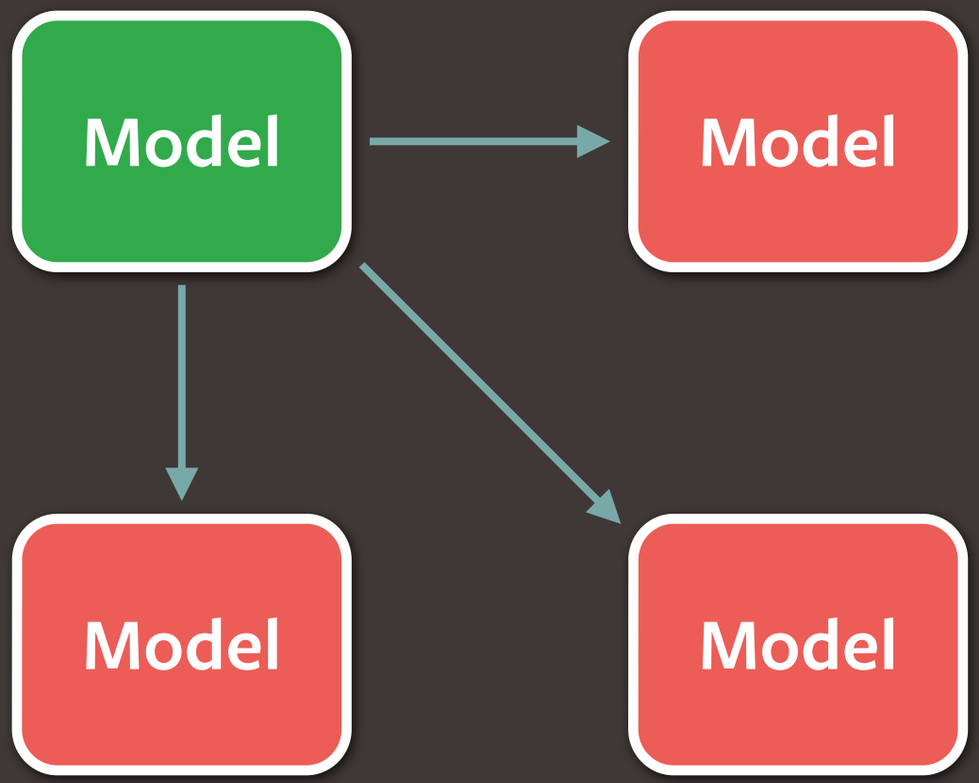
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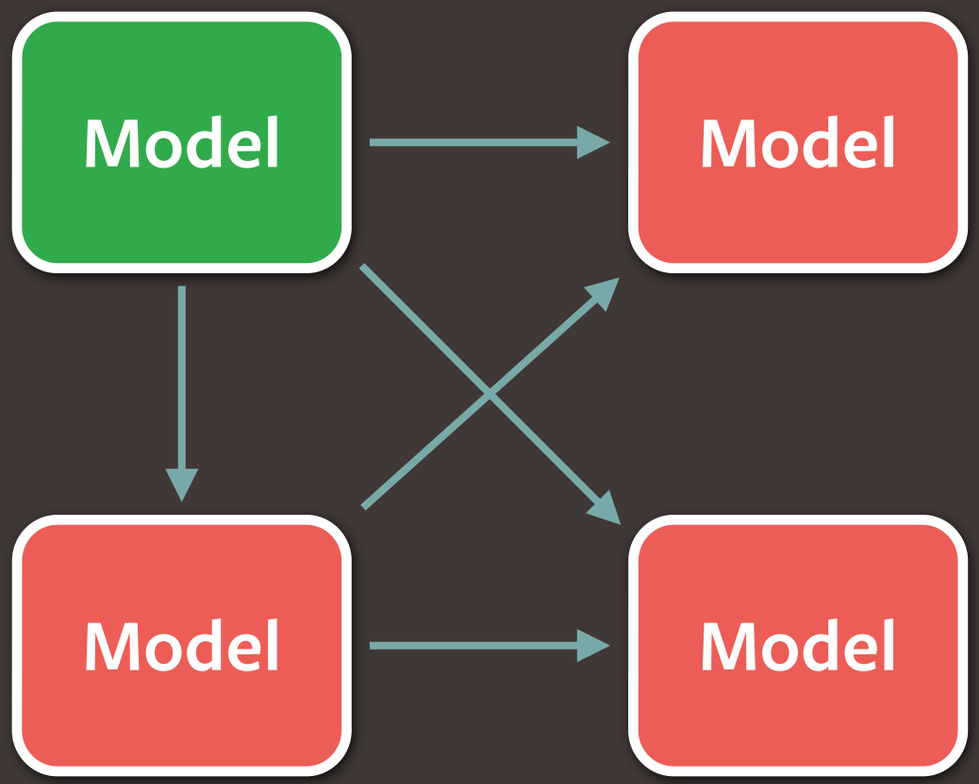
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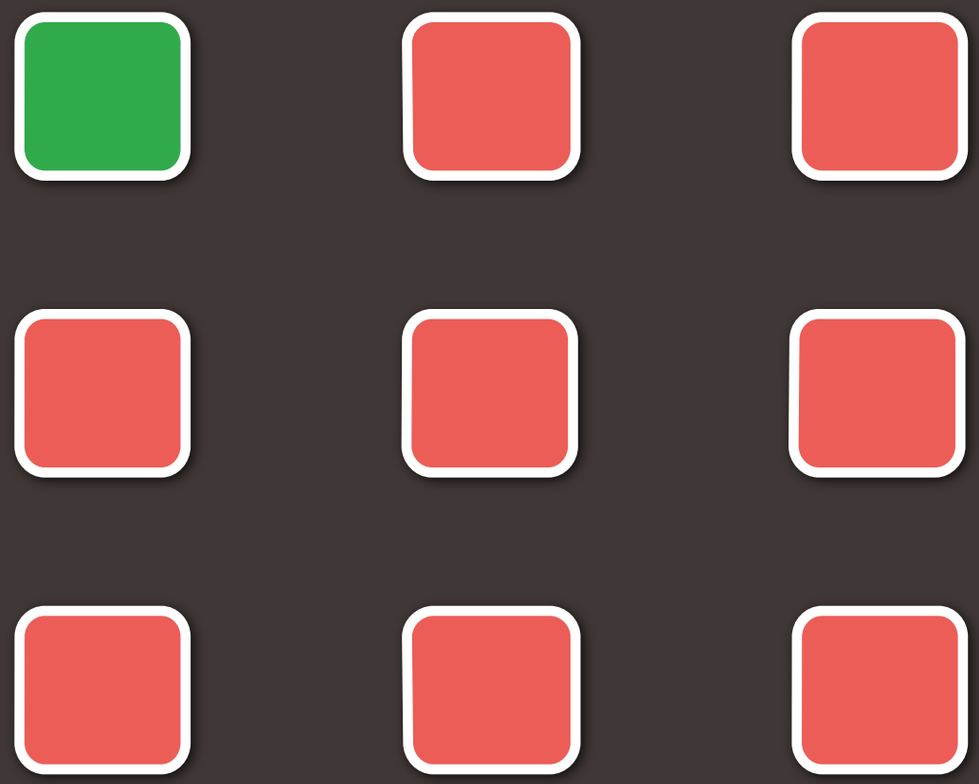
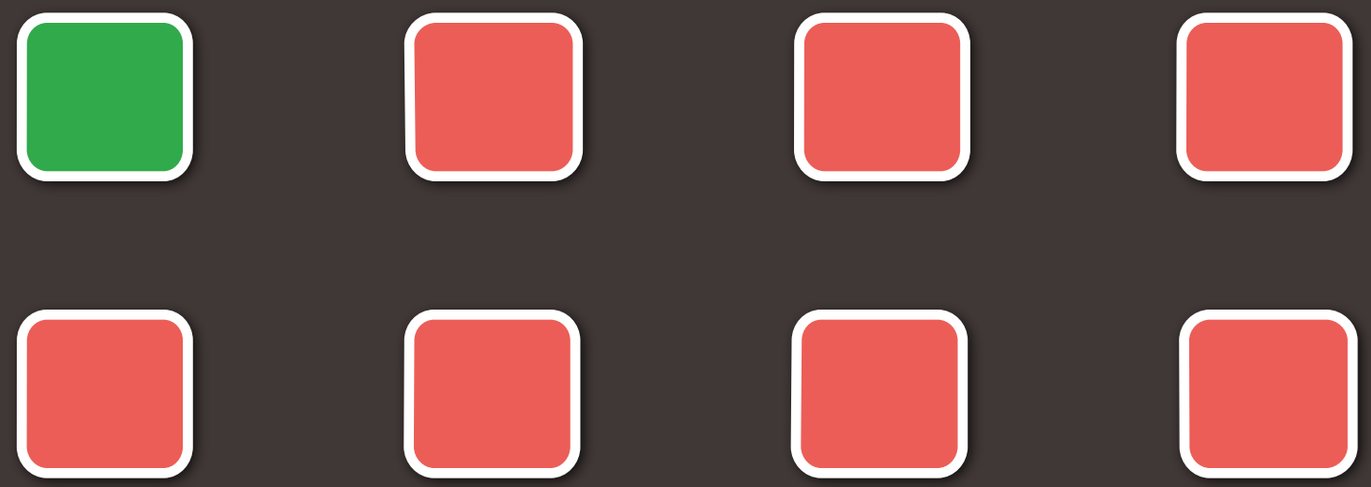
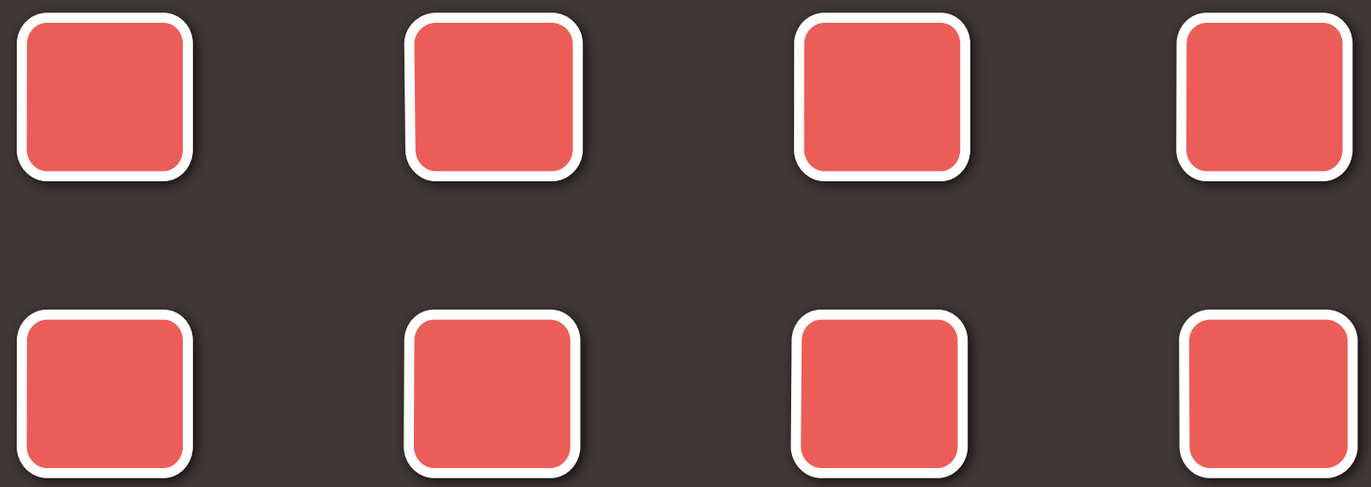
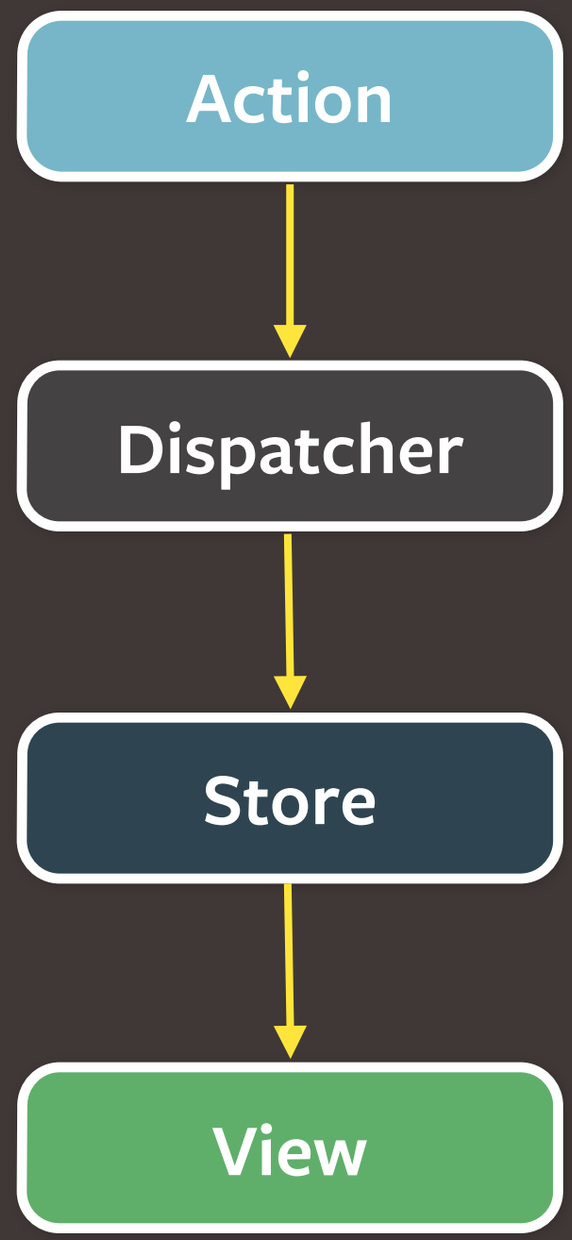






"Tangled wires, Freegeek, Portland, Oregon, USA" by Cory Doctorow, used under CC BY 2.0\


Action
Dispatcher
Store
View

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THE PLAN

Anatomy of a React + Flux Application

Actions & Action Creators

The Dispatcher

Stores + Testing

Views, Controller-views and React

Initialization, Interacting with a Web API, Immutable Data, Patterns & Anti-Patterns

```
js
├── actions
│   └── MessageActionCreators.js
├── AppBootstrap.js
├── AppConstants.js
├── AppDispatcher.js
├── stores
│   ├── MessageStore.js
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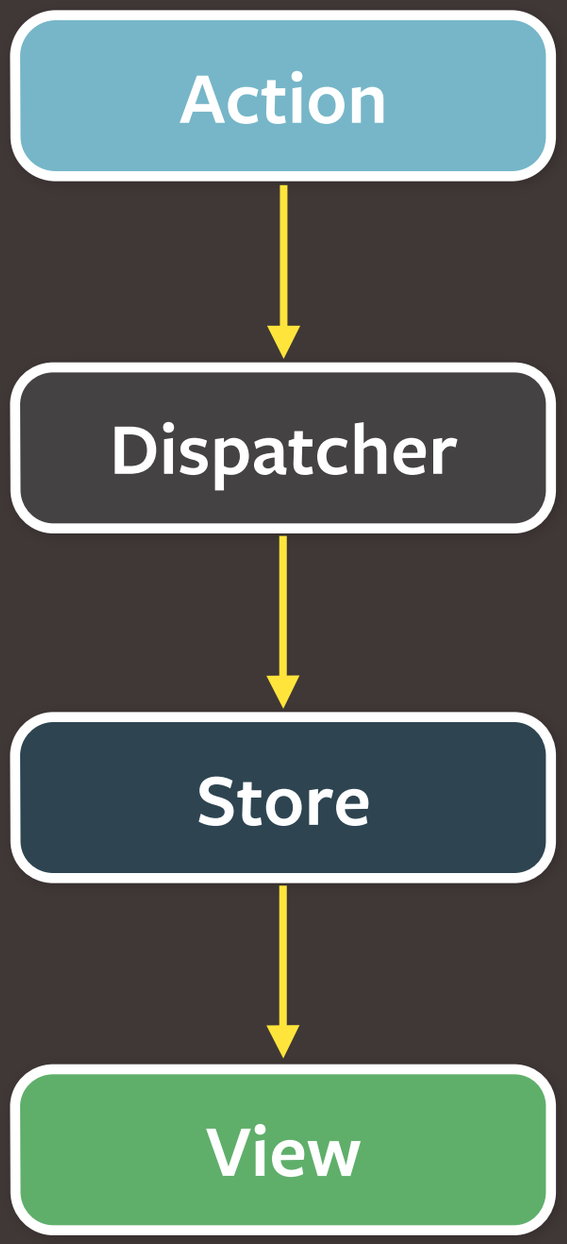


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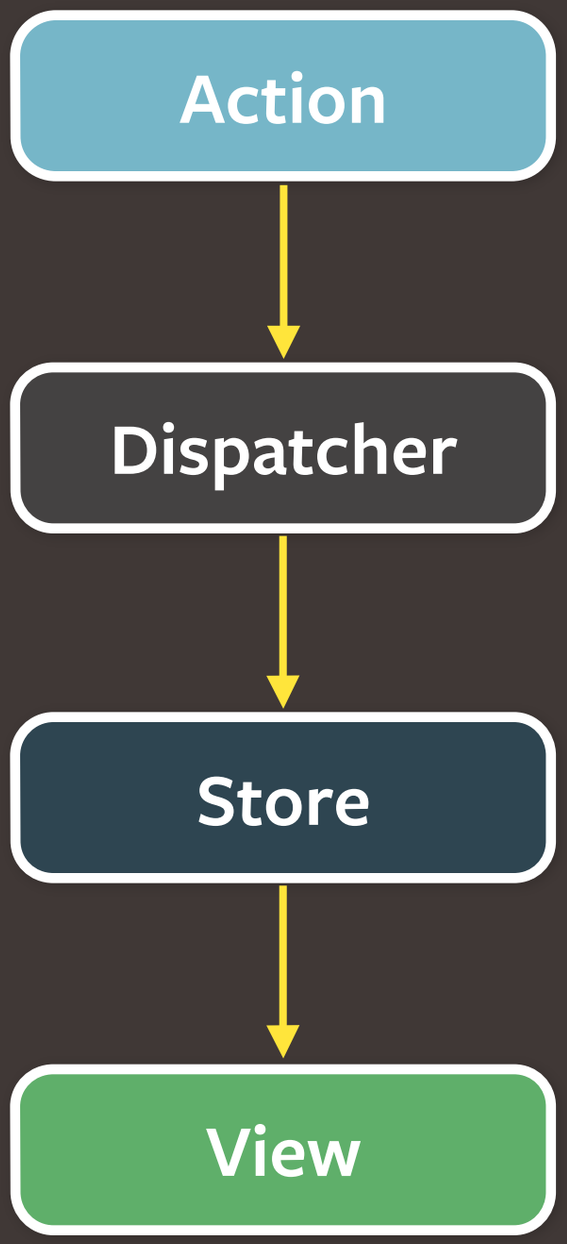


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```

ACTIONS & ACTION CREATORS


```
actions
└── MessageActionCreators.js
```

ACTIONS & ACTION CREATORS

Actions:

an object with a type property and new data

Action creators:

semantic methods that create actions

collected together in a module to become an API

```
// MessageActionCreators.js

var AppDispatcher = require('../AppDispatcher');
var AppConstants = require('../AppConstants');

var ActionTypes = Constants.ActionTypes;

module.exports = {

  createMessage: text => {
    AppDispatcher.dispatch({
      type: ActionTypes.MESSAGE_CREATE,
      text
    });
  }

};
```

```
createMessage: text => {
  AppDispatcher.dispatch({
    type: ActionTypes.MESSAGE_CREATE,
    text
  });
}
```

```
createMessage: text => {
  AppDispatcher.dispatch({
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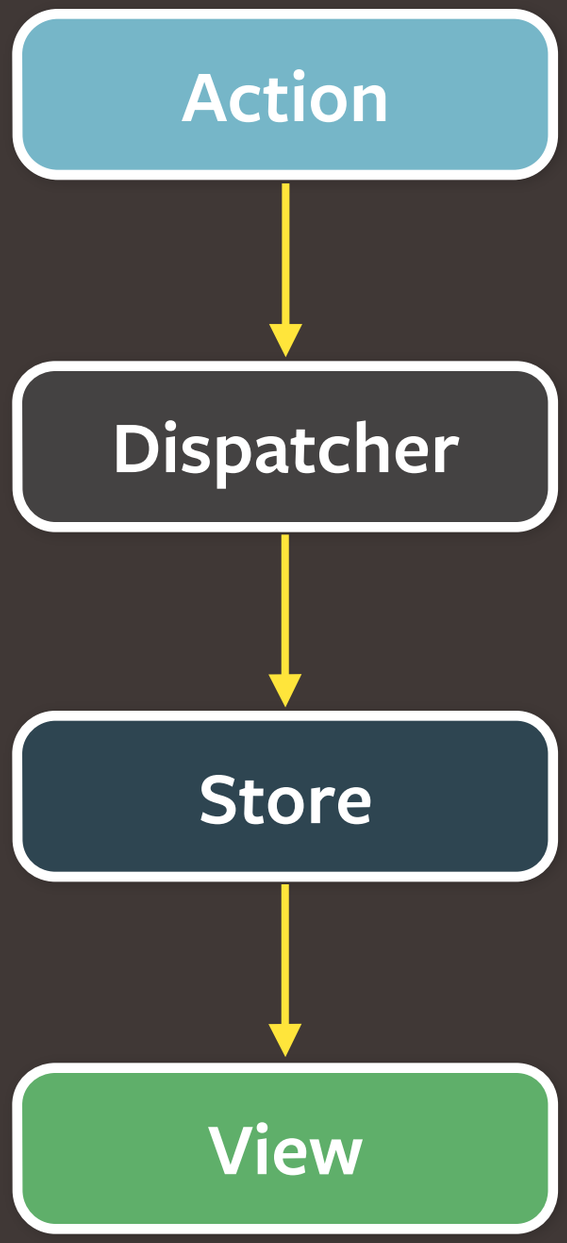


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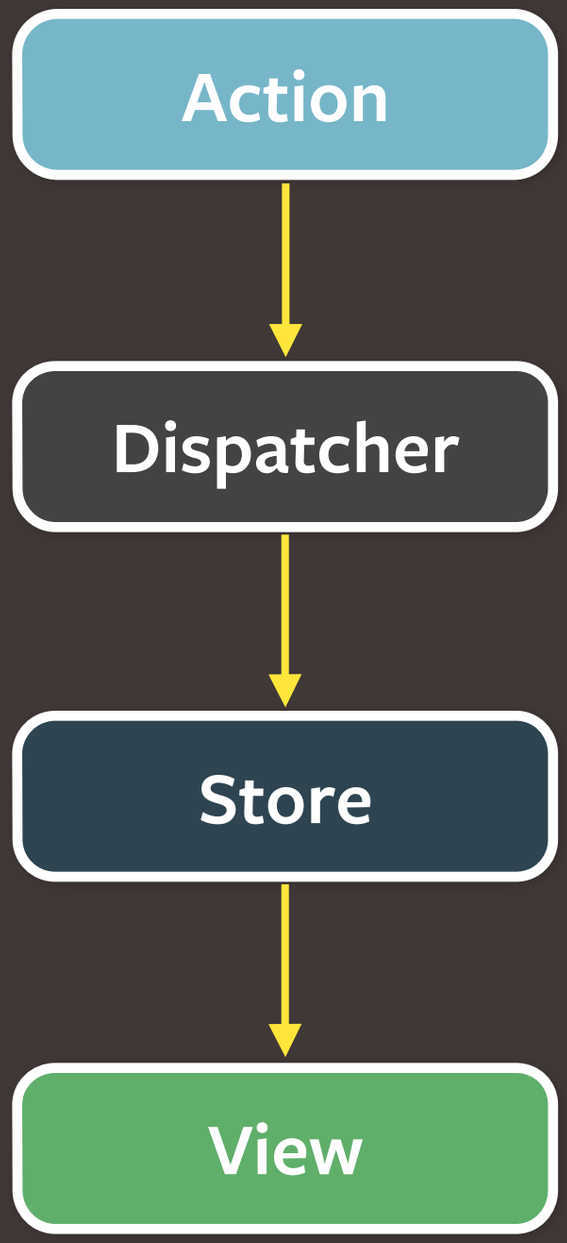


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```

THE DISPATCHER

Dispatcher

AppDispatcher.js

THE DISPATCHER

Essentially a registry of callbacks

To dispatch, it invokes all the callbacks with a payload

Flux dispatcher is a singleton; payload is an action

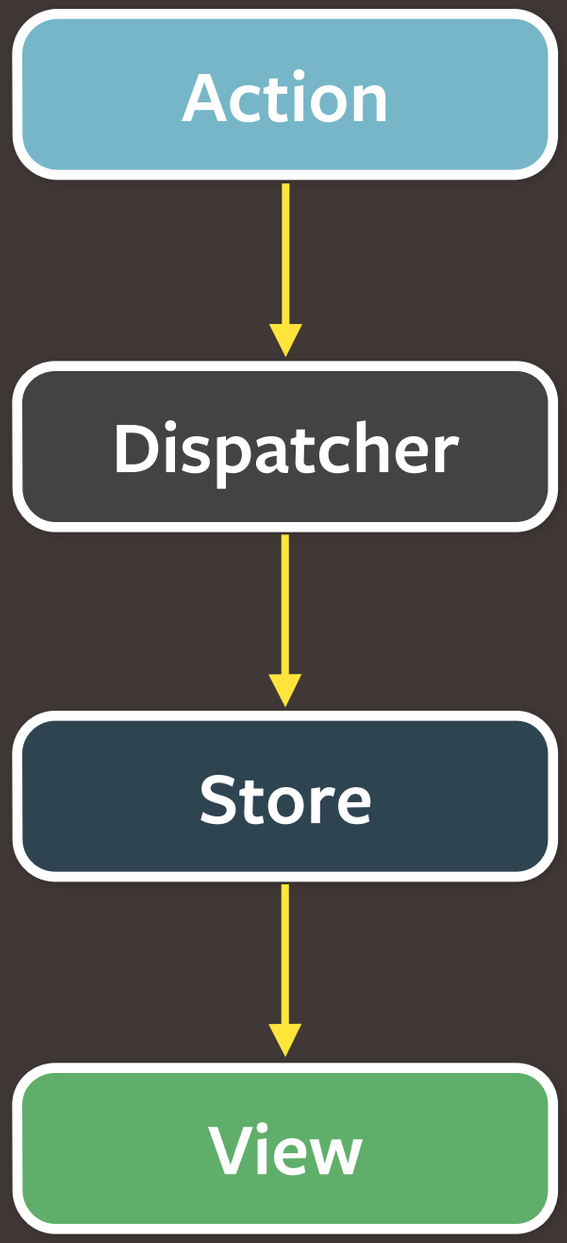
Primary API: `dispatch()`, `register()`, `waitFor()`

Base class is available through npm or Bower.

```
// AppDispatcher.js

var Dispatcher = require('Flux.Dispatcher');

// export singleton
module.exports = new Dispatcher();
```

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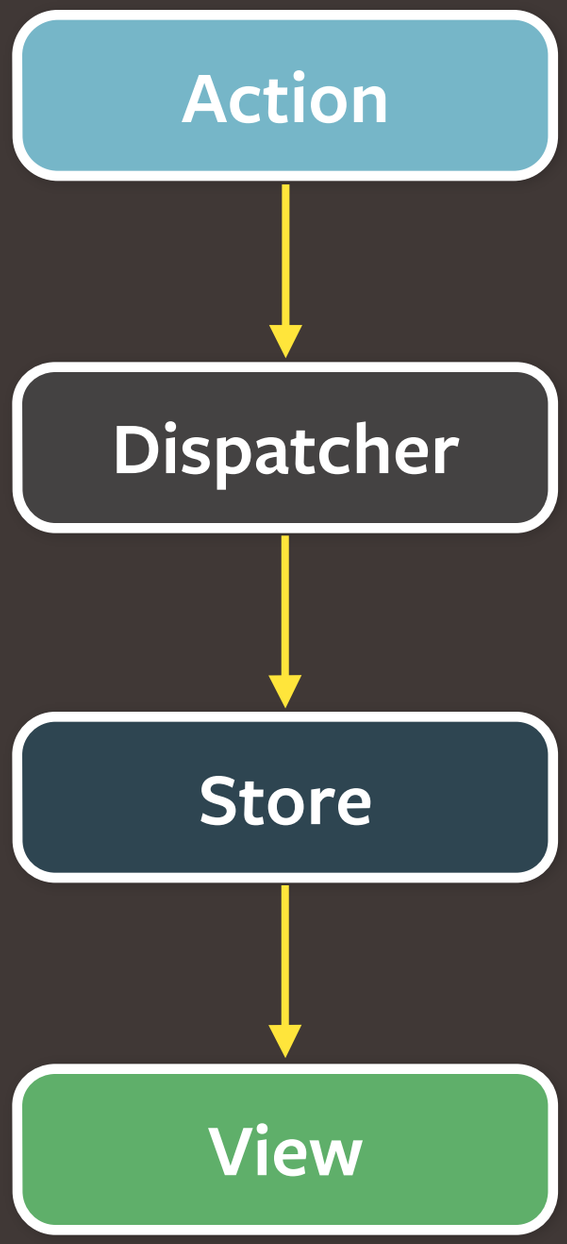


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```

STORES

Store

```
stores
├── MessageStore.js
└── __tests__
    └── MessageStore-test.js
```

STORES

Each store is a singleton

The locus of control within the application

Manages application state for a logical domain

Private variables hold the application data

Numerous collections or values can be held in a store

STORES

Register a callback with the dispatcher

Callback is the only way data gets into the store

No setters, only getters: a universe unto itself

Emits an event when state has changed

```
// MessageStore.js

var _dispatchToken;
var _messages = {};

class MessageStore extends EventEmitter {

  constructor() {
    super();
    _dispatchToken = AppDispatcher.register(action => {

      switch(action.type) {

        case ActionTypes.MESSAGE_CREATE:
          var message = {
            id: Date.now(),
            text: action.text
          }
          _messages[message.id] = message;
          this.emit('change');
          break;

        case ActionTypes.MESSAGE_DELETE:
          delete _messages[action.messageID];
          this.emit('change');
          break;

        default:
          // no op
      }

    });
  }

  getDispatchToken() {
    return _dispatchToken;
  }

  getMessages() {
    return _messages;
  }

}

module.exports = new MessageStore();
```

```
_dispatchToken = AppDispatcher.register(action => {

  switch(action.type) {

    case ActionTypes.MESSAGE_CREATE:
      var message = {
        id: Date.now(),
        text: action.text
      }
      _messages[message.id] = message;
      this.emit('change');
      break;

    case ActionTypes.MESSAGE_DELETE:
      delete _messages[action.messageID];
      this.emit('change');
      break;

    default:
      // no op
  }

});
```

TESTING STORES WITH JEST

Stores have no setters — how to test is not obvious

Jest is Facebook's auto-mocking test framework

Built on top of Jasmine

http://facebook.github.io/jest/

```
callback = AppDispatcher.register.mock.calls[0][0];
```

```
jest.dontMock('MessageStore');

var AppConstants = require('AppConstants');

var ActionTypes = AppConstants.ActionTypes;

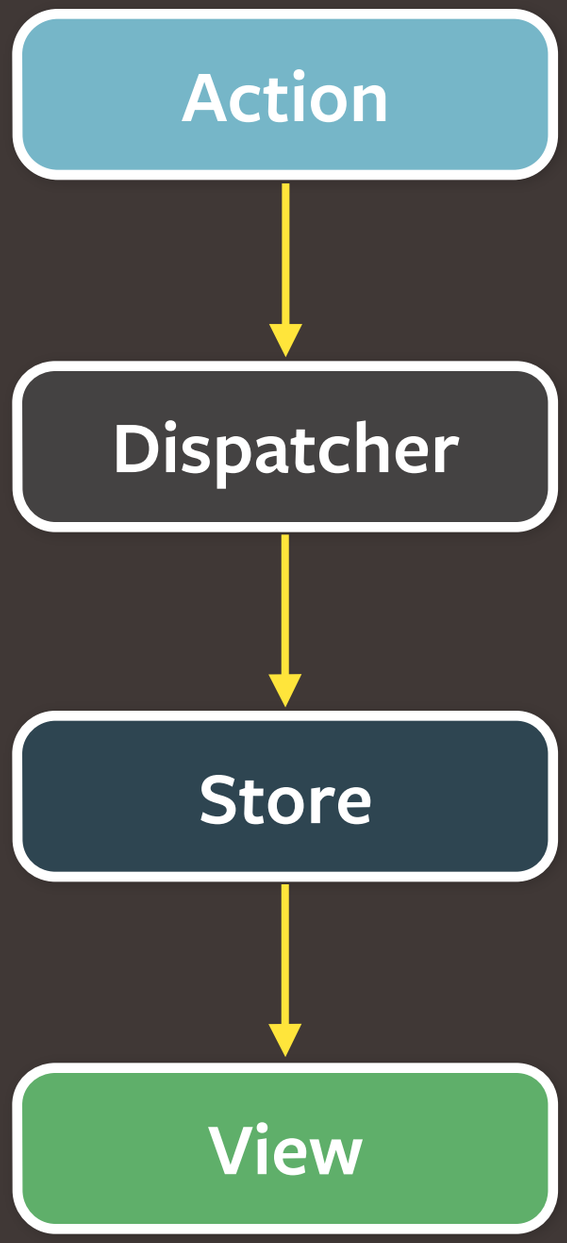
describe('MessageStore', function() {

  var callback;

  beforeEach(function() {
    AppDispatcher = require('AppDispatcher');
    MessageStore = require('MessageStore');
    callback = AppDispatcher.register.mock.calls[0][0];
  });

  it('can create messages', function() {
    callback({
      type: ActionTypes.MESSAGE_CREATE,
      text: 'test'
    });
    var messages = MessageStore.getMessages();
    var firstKey = Objects.keys(messages)[0];
    expect(MessageStore.getMessages()[firstKey].text).toBe('test');
  });

});
```

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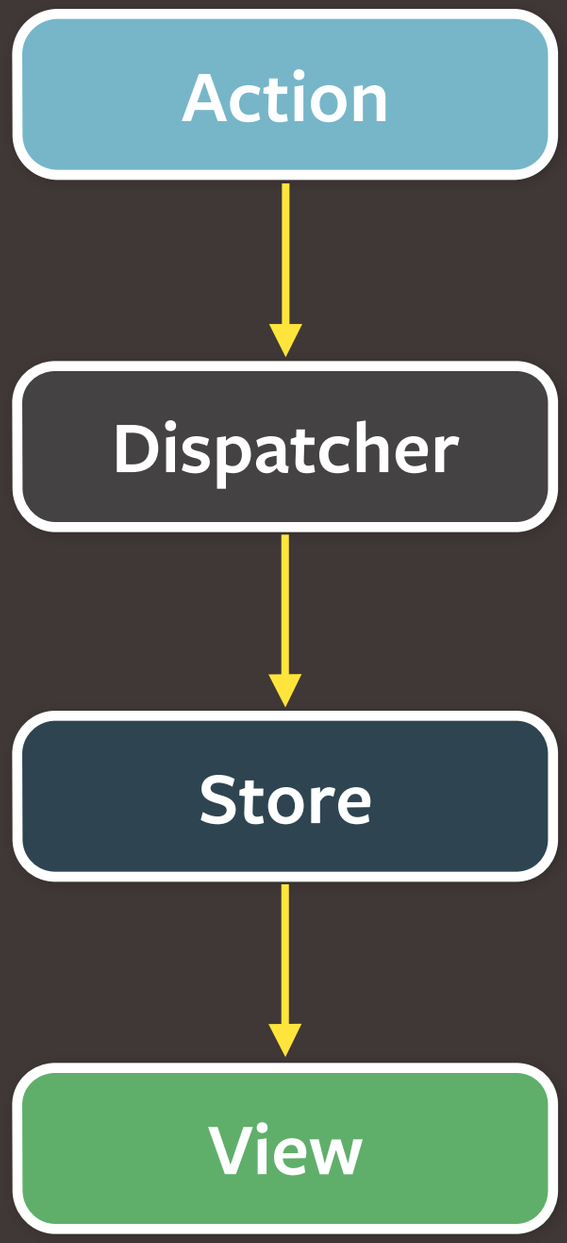


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```

VIEWS & CONTROLLER VIEWS

View

```
views
├── MessageControllerView.react.js
└── MessageListItem.react.js
```

VIEWS & CONTROLLER VIEWS

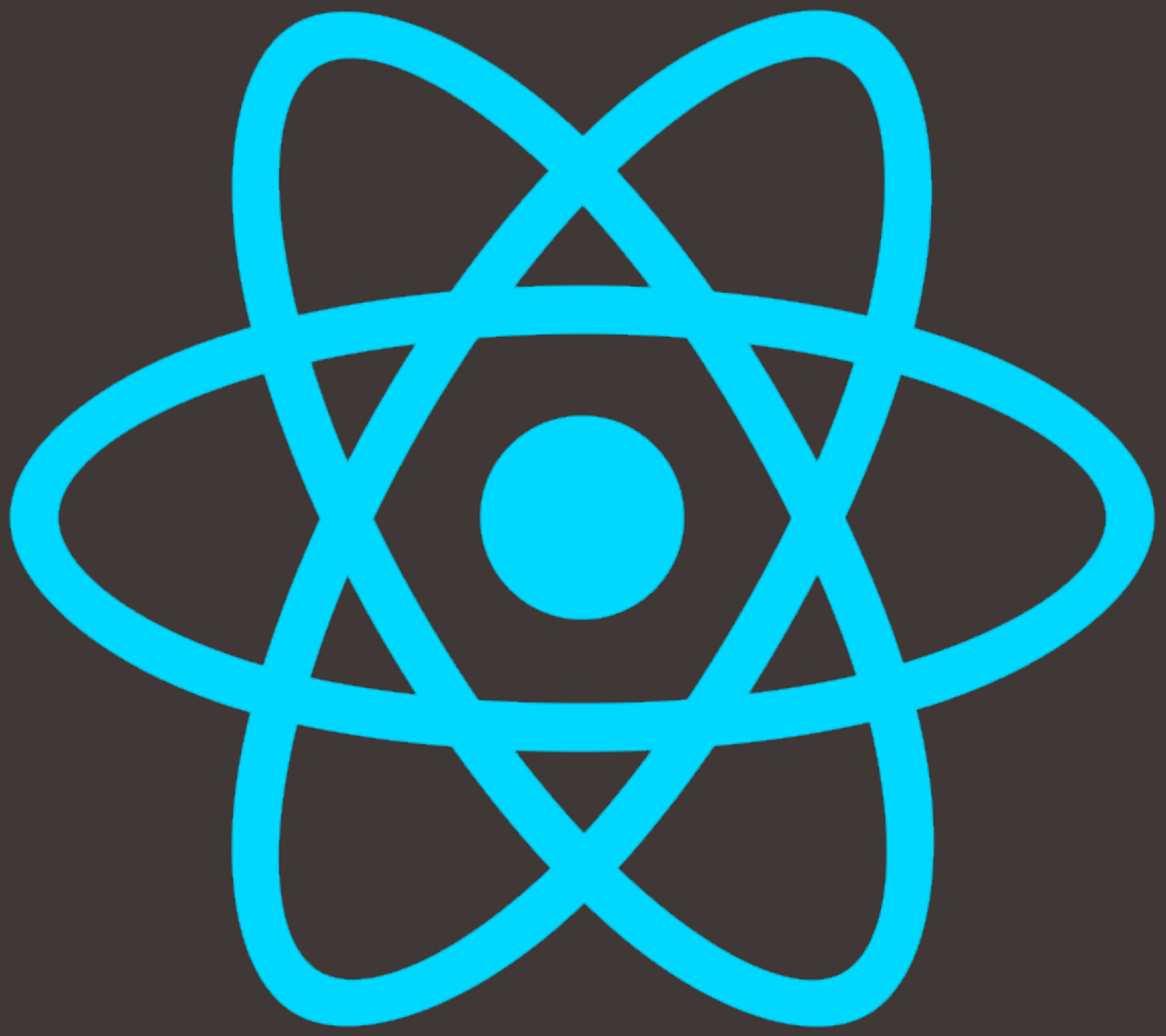
Tree of React components

Controller views are near the root, listen for change events

On change, controller views query stores for new data

With new data, they re-render themselves & children

REACT



REACT AND THE DOM

Component-based system for managing DOM updates

Uses a “Virtual DOM”: data structure and algorithm

Updates the DOM as efficiently as possible

Huge performance boost

Bonus: we can stop thinking about managing the DOM

REACT'S PARADIGM

Based on Functional-Reactive principles

Unidirectional data flow

Composability

Predictable, Reliable, Testable

Declarative: what the UI should look like, given props

USING REACT

Data is provided through props

Rendering is a function of `this.props` and `this.state`

“Re-render” (or not) on every state change

Keep components as stateless as possible

Component lifecycle and update cycle methods

Lifecycle:
Mounting and Unmounting

getDefaultProps()

getInitialState()

componentWillMount()

render()

---------- DOM Mutations Complete ----------

componentDidMount()

---

componentWillUnmount()

Update:
New Props or State

componentWillReceiveProps()*

shouldComponentUpdate()

componentWillUpdate()

render()

componentDidUpdate()

**Called only with new props*

Lifecycle: Mounting and Unmounting	Update: New Props or State
getDefaultProps()	componentWillReceiveProps()*
getInitialState()	shouldComponentUpdate()
componentWillMount()	componentWillUpdate()
render()	render()
---------- DOM Mutations Complete ----------	
componentDidMount()	componentDidUpdate()
----------	
componentWillUnmount()	

**Called only with new props*

```
// MessagesControllerView.react.js

var React = require('react');

var MessagesControllerView = React.createClass({

  render: function() {
    // TODO
  }

});

module.exports = MessagesControllerView;
```

```
// MessagesControllerView.react.js

var MessagesControllerView = React.createClass({

  render: function() {
    // TODO
  }

});
```

```
// MessagesControllerView.react.js

var MessagesControllerView = React.createClass({

  componentDidMount: function() {
    MessageStore.on('change', this._onChange);
  },

  componentWillUnmount: function() {
    MessageStore.removeListener('change', this._onChange);
  },

  render: function() {
    // TODO
  }

});
```

```
// MessagesControllerView.react.js

var MessagesControllerView = React.createClass({

  getInitialState: function() {
    return { messages: MessageStore.getMessages() };
  },

  componentDidMount: function() {
    MessageStore.on('change', this._onChange);
  },

  componentWillUnmount: function() {
    MessageStore.removeListener('change', this._onChange);
  },

  render: function() {
    // TODO
  },

  _onChange: function() {
    this.setState({ messages: MessageStore.getMessages() });
  }

});
```

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var MessagesControllerView = React.createClass({

  getInitialState: function() {
    return { messages: MessageStore.getMessages() };
  },

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    MessageStore.on('change', this._onChange);
  },

  componentWillUnmount: function() {
    MessageStore.removeListener('change', this._onChange);
  },

  render: function() {
    // TODO
  },

  _onChange: function() {
    this.setState({ messages: MessageStore.getMessages() });
  }

});
```

```
render: function() {
  // TODO
},
```

```
render: function() {
  return (
    <ul>
    </ul>
  );
},
```

```
render: function() {
  var messageListItems = [];
  return (
    <ul>
      {messageListItems}
    </ul>
  );
},
```

```
render: function() {
  var messageListItems = this.state.messages.map(message => {
    return (
      <MessageListItem
        key={message.id}
        messageID={message.id}
        text={message.text}
      />
    );
  });
  return (
    <ul>
      {messageListItems}
    </ul>
  );
},
```

```
// MessageListItem.react.js

var React = require('react');

var MessageListItem = React.createClass({

  propTypes = {
    messageID: React.PropTypes.number.isRequired,
    text: React.PropTypes.string.isRequired
  },

  render: function() {
    return (
      <li>
        {this.props.text}
      </li>
    );
  }

});

module.exports = MessageListItem;
```

```
// MessageListItem.react.js

var MessageActionCreators = require('MessageActionCreators');
var React = require('react');

var MessageListItem = React.createClass({

  propTypes = {
    messageID: React.PropTypes.number.isRequired,
    text: React.PropTypes.string.isRequired
  },

  render: function() {
    return (
      <li onClick={this._onClick}>
        {this.props.text}
      </li>
    );
  },

  _onClick: function() {
    MessageActionCreators.deleteMessage(this.props.messageID);
  }

});

module.exports = MessageListItem;
```

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var MessageActionCreators = require('MessageActionCreators');
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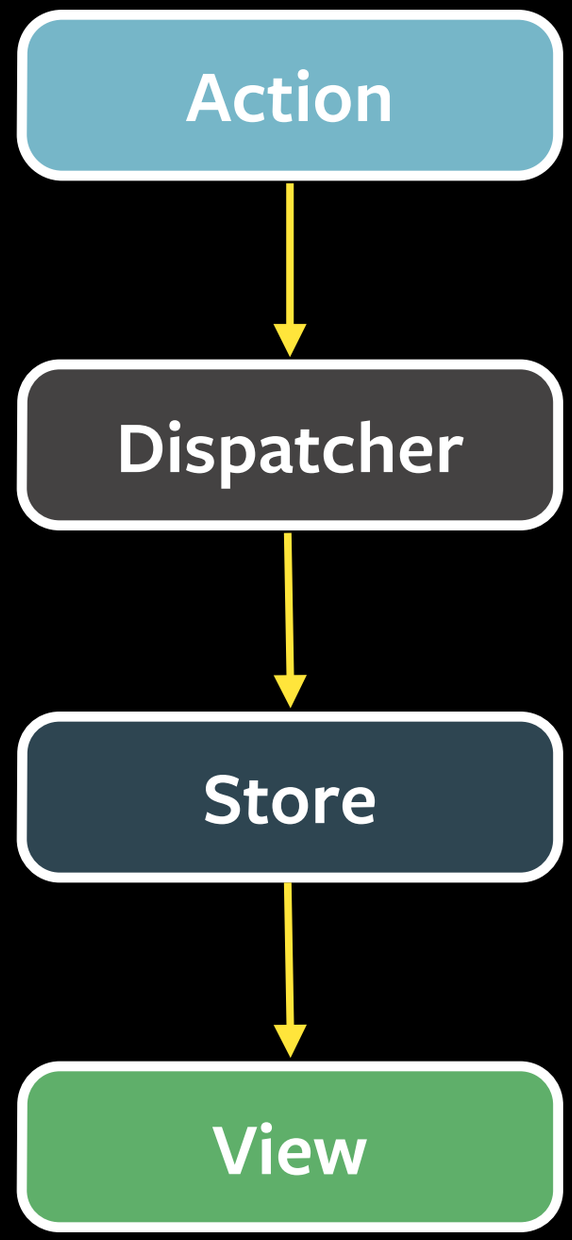
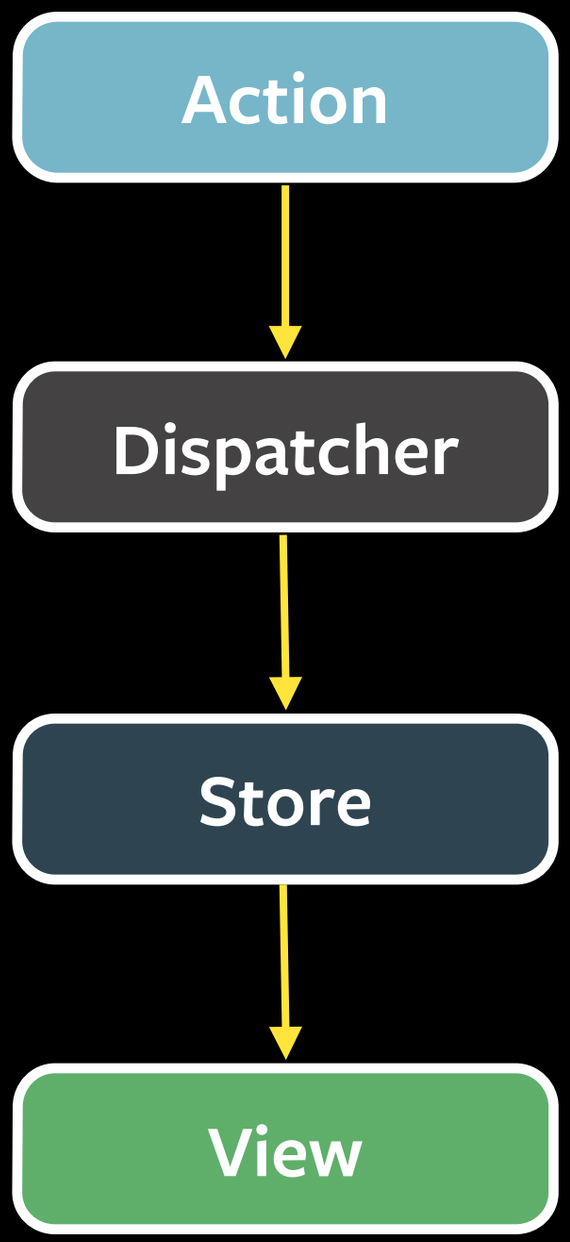
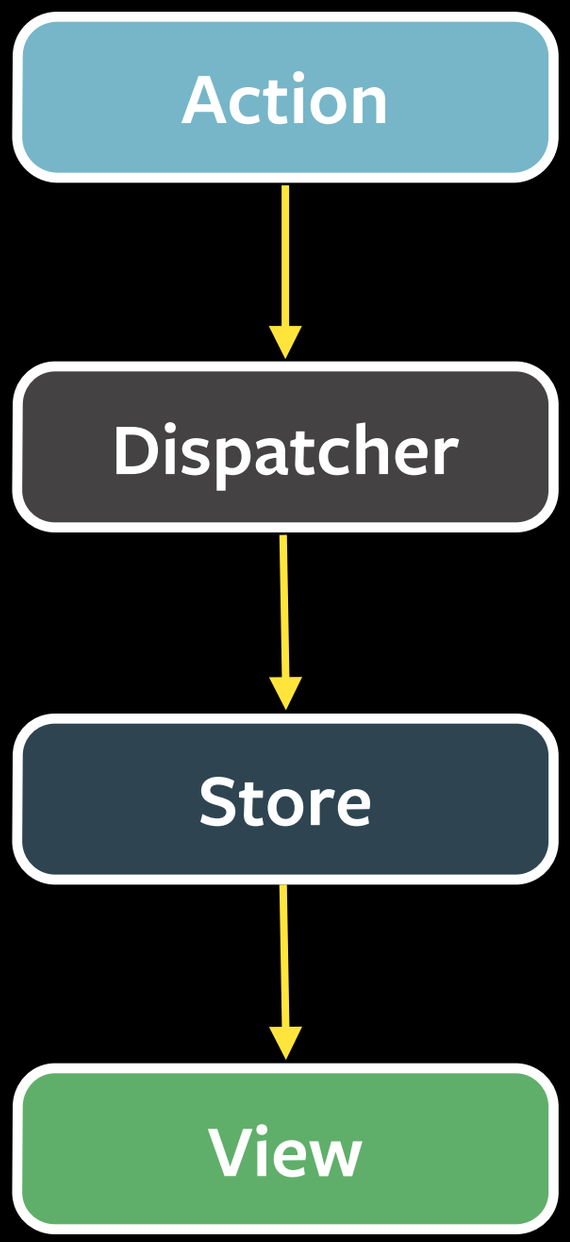

Action
Dispatcher
Store
View




```
deleteMessage: messageID => {
  AppDispatcher.dispatch({
    type: ActionTypes.MESSAGE_DELETE,
    messageID
  });
}
```




```
deleteMessage: messageID => {
  AppDispatcher.dispatch({
    type: ActionTypes.MESSAGE_DELETE,
    messageID
  });
}
```

```
case ActionTypes.MESSAGE_DELETE:
  delete _messages[action.messageID];
  this.emit('change');
  break;
```

INITIALIZATION OF THE APP

Usually done in a bootstrap module

Initializes stores with an action

Renders the topmost React component

```
// AppBootstrap.js

var AppConstants = require('AppConstants');
var AppDispatcher = require('AppDispatcher');
var AppRoot = require('AppRoot.react');
var React = require('React');

require('FriendStore');
require('LoggingStore');
require('MessageStore');

module.exports = (initialData, elem) => {
  AppDispatcher.dispatch({
    type: AppConstants.ActionTypes.INITIALIZE,
    initialData
  });
  React.render(<AppRoot />, elem);
};
```

CALLING A WEB API

Use a WebAPIUtils module to encapsulate XHR work.

Start requests directly in the Action Creators, or in the stores.

Important: create a new action on success/error.

Data must *enter* the system through an action.

IMMUTABLE DATA

Boost performance in React's `shouldComponentUpdate()`

React.addons.PureRenderMixin

immutable-js: http://facebook.github.io/immutable-js/

Lifecycle:
Mounting and Unmounting

getDefaultProps()

getInitialState()

componentWillMount()

render()

---------- DOM Mutations Complete ----------

componentDidMount()

---

componentWillUnmount()

Update:
New Props or State

componentWillReceiveProps()*

shouldComponentUpdate()

componentWillUpdate()

render()

componentDidUpdate()

**Called only with new props*

MORE FLUX PATTERNS

LoggingStore

Error handling with client ID / dirty bit

Error handling with actions queue

Resolving dependencies in the Controller-view

ANTI-PATTERNS FOR REACT+FLUX

Getters in `render()`

Public setters in stores & the setter mindset trap

Application state/logic in React components

Props in `getInitialState()`

Dataflow Programming

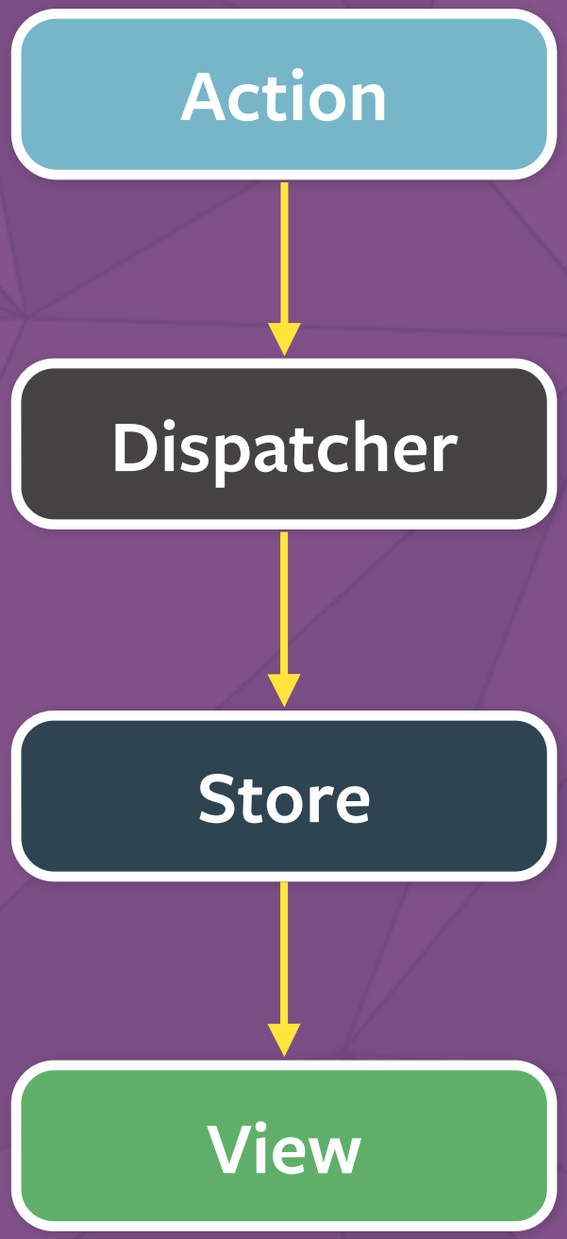
CQRS

Reactive

FLUX

MVC

Functional and FRP



FLUX TOTALLY WORKS

THANK YOU!