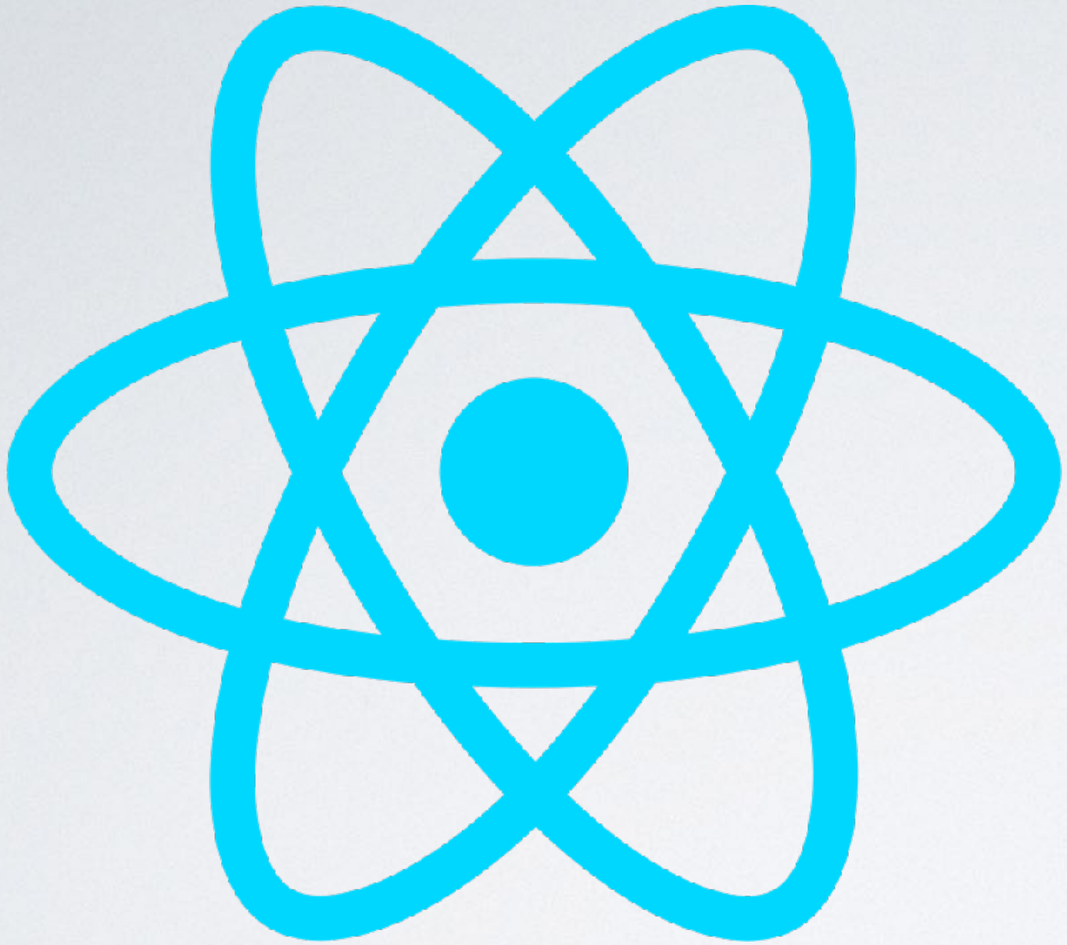

React & Redux

ABOUT ME

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- Freelancer: www.ivorycode.com
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- In-House Kurse & Coachings: Web-Technologien im Enterprise (UBS, Postfinance, Mobiliar, BIT, SBB ...)

JavaScript / Angular 2 / React
Schulungen & Coachings
Project-Setup & Proof-of-Concept:

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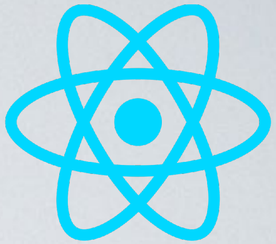
Agenda

- React: Introduction & Basic Concepts
- React Demo
- Redux: Introduction & Basic Concepts
- Redux Demo
- Opinionated Comparison with Angular

What is React?



React is a JavaScript library for building user interfaces.

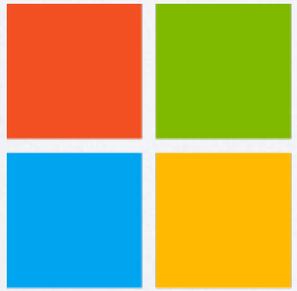
Created by Facebook in 2013.

The DOM is created programmatically.
JSX enables declarative DOM programming.
A virtual DOM abstracts the real DOM.
One-way data flow instead of two-way data binding.

https://facebook.github.io/react/

React is Very Popular

facebook / react	★ Star 75,060
vuejs / vue	★ Star 65,846
angular / angular	★ Star 27,553



amazon

Microsoft

JSX

```
class GreeterComponent extends React.Component {

    state = {time: new Date()};

    render() {
        const now = new Date();

        return (
            <div>
                <h1>{this.props.title}</h1>
                <p>{this.props.message}</p>
                <p>The current time is:</p>
                <p>{this.state.time.toLocaleString()}</p>
            </div>
        );
    }
}
```

- JSX is a XML-like syntax extension to ECMAScript which defines a for defining tree structures
- JSX can declare HTML in JavaScript
- JSX is not an embedded HTML template. It gets compiled to JavaScript statements which use the React API to manipulate the DOM.

Other frameworks supporting JSX: Vue.js, Cycle.js, Preact, Inferno …

https://facebook.github.io/jsx/

A React Component

properties

properties represent data
owned by someone else and
should not be changed

```
class HelloMessage extends React.Component{
  ...
  render() {
    return <div>
           Hello {this.props.props}
              + {this.state.name}
         </div>;
  }
};
```

state

components can be stateful

state is managed and changed
by the component itself

html

If properties or state change, the component is (re-)rendered

https://facebook.github.io/react/docs/reusable-components.html

A Stateless Functional Component

Stateless components can be written as plain JavaScript functions.

https://facebook.github.io/react/docs/reusable-components.html

The Virtual DOM

Components

App

Title

Content

input

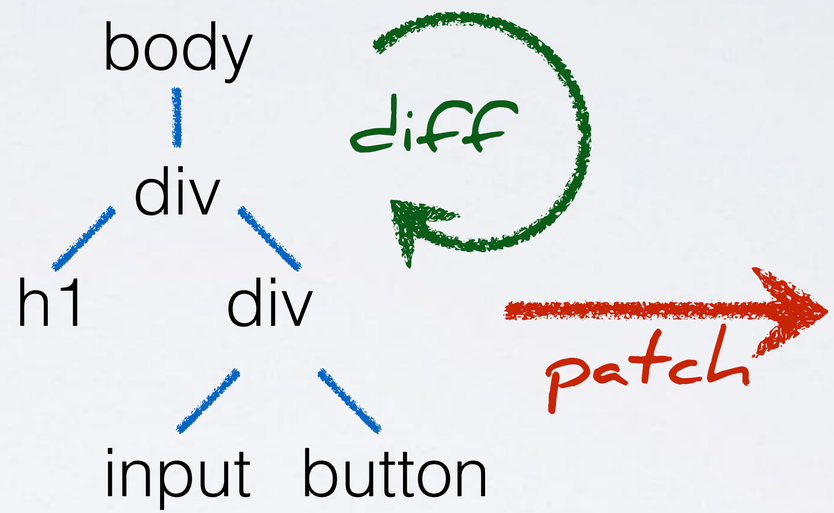
button

render

Dirty components are always rendered completely

Virtual DOM

In-Memory, implemented in JavaScript



Browser DOM

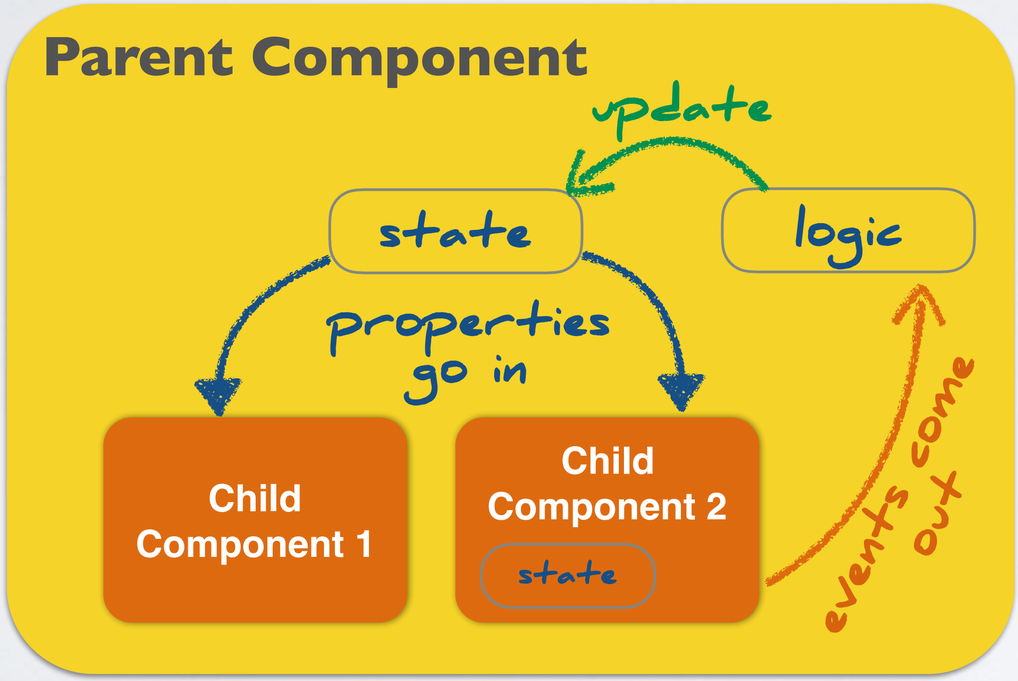
```
<body>
  <div>
    <h1></h1>
    <div>
      <input/>
      <button>
          </button>
    </div>
  </div>
</body>
```

Virtual DOM also enables server-side rendering.

Nested Components: Unidirectional Data-Flow

State should be explicitly owned by a component.

No 2-way databinding!



- A parent component passes state to children
- Children should not edit state of their parent
- Children "notify" parents (events, actions …)

React formalises *unidirectional data-flow* via properties and events.

Separation of Concerns

Separation of concerns is not equal to separation of file types!

Keep things together that change together.

You can split a component into a controller and a view:

```
import View from './View';

export class GiphySearch extends Component {
  … // controller logic & state
  render(){
     return <View data={...}
  }
}
```

GiphySearch.js

```
const View = ({data}) => (
  <div>
     {data.message}
  </div>
);
export default View;
```

View.js

https://codesandbox.io/s/NxqMqyxlD

https://medium.com/styled-components/component-folder-pattern-ee42df37ec68

Container vs. Presentation Components

Application should be decomposed in container- and presentation components:

Container	**Presentation**
Little to no markup	Mostly markup
Pass data and actions down	Receive data & actions via props
typically stateful / manage state	mostly stateless
	better reusability

aka: Smart- vs. Dumb Components

https://medium.com/@dan_abramov/smart-and-dumb-components-7ca2f9a7c7d0
https://medium.com/curated-by-versett/building-maintainable-angular-2-applications-5b9ec4b463a1
https://www.robinwieruch.de/learn-react-before-using-redux/

What is Redux?

Redux is a predictable state container for JavaScript apps.

Created in 2015 by Dan Abramov.

Redux itself is the implementation of a very simple concept.
There is a big ecosystem around Redux (middleware).

Redux is very small (~2KB).

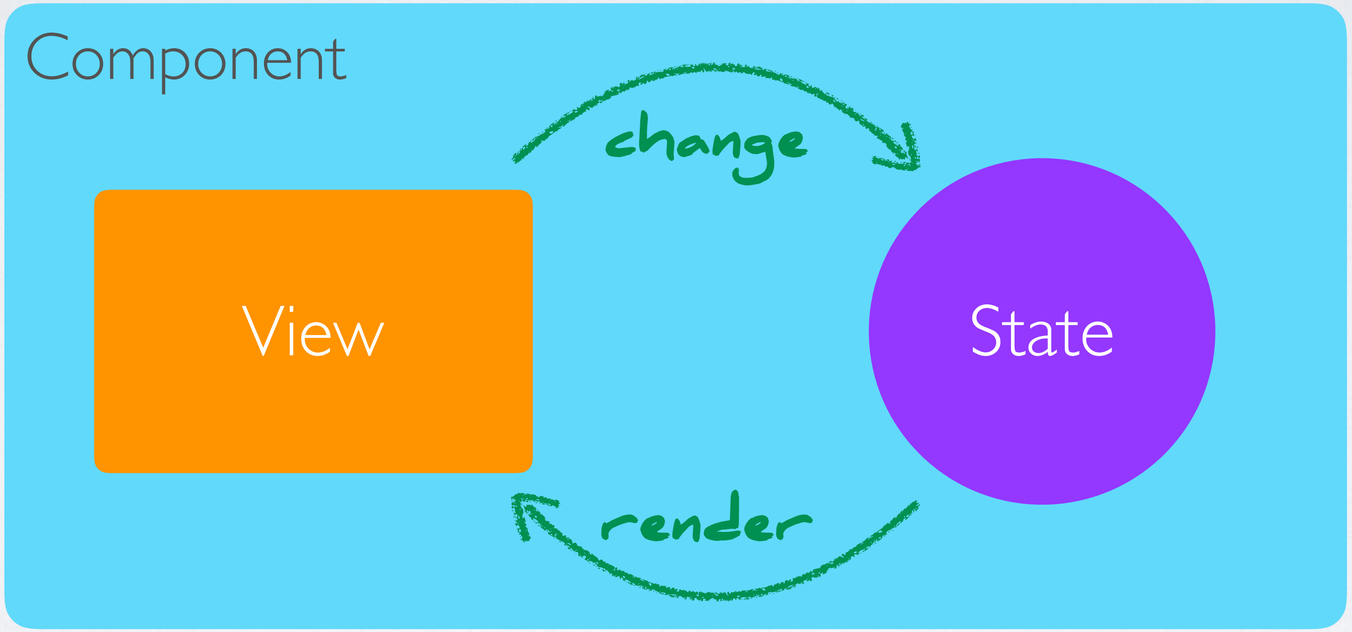
Redux is widely used in the React community. Technically it is not tied to React.

Redux can be used with Angular. For Angular there is also ngrx, which is an alterative implementation of the same concept.
(https://github.com/angular-redux/ng-redux and https://github.com/ngrx)

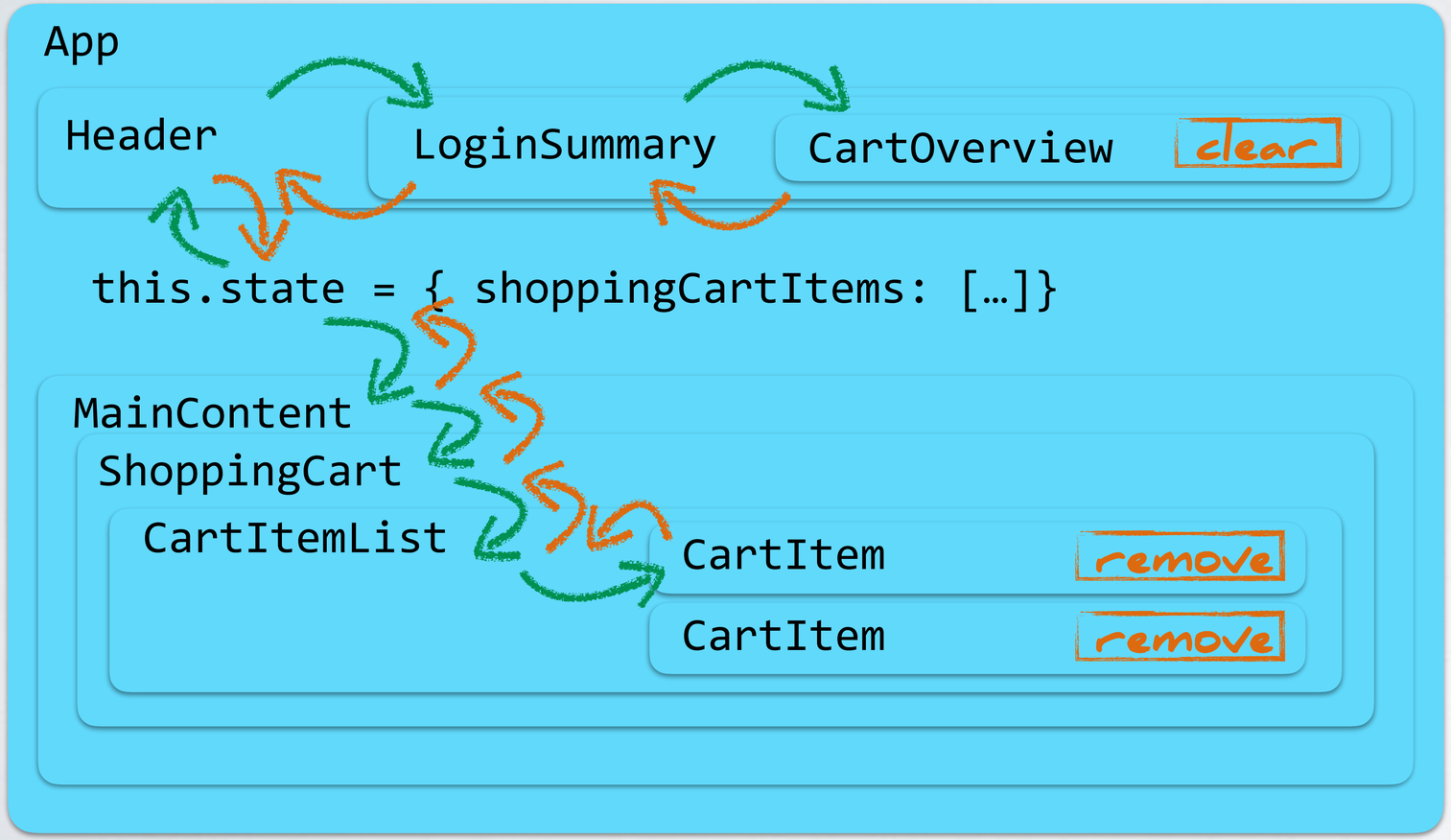
http://redux.js.org/

A single component

Managing state in a component is simple:



State Management

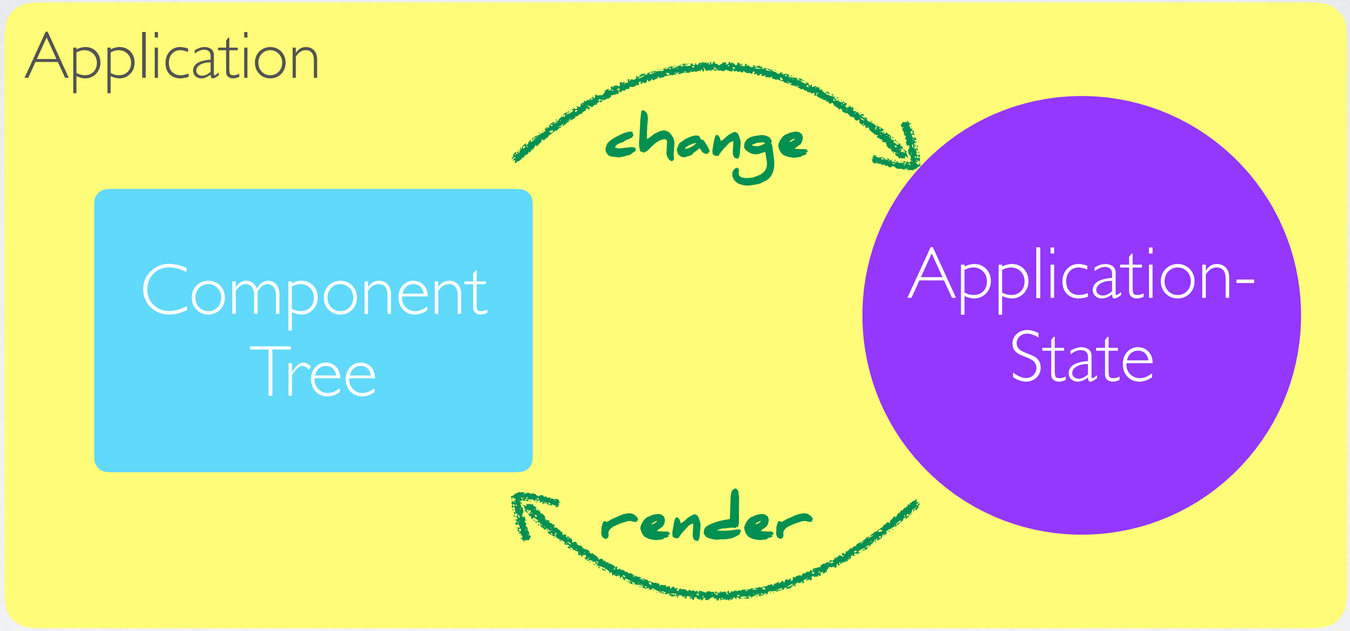


Challenges when managing state in a component tree:

- Multiple components may depend on the same piece of state.
- Different components may need to mutate the same piece of state.

Application with State Container

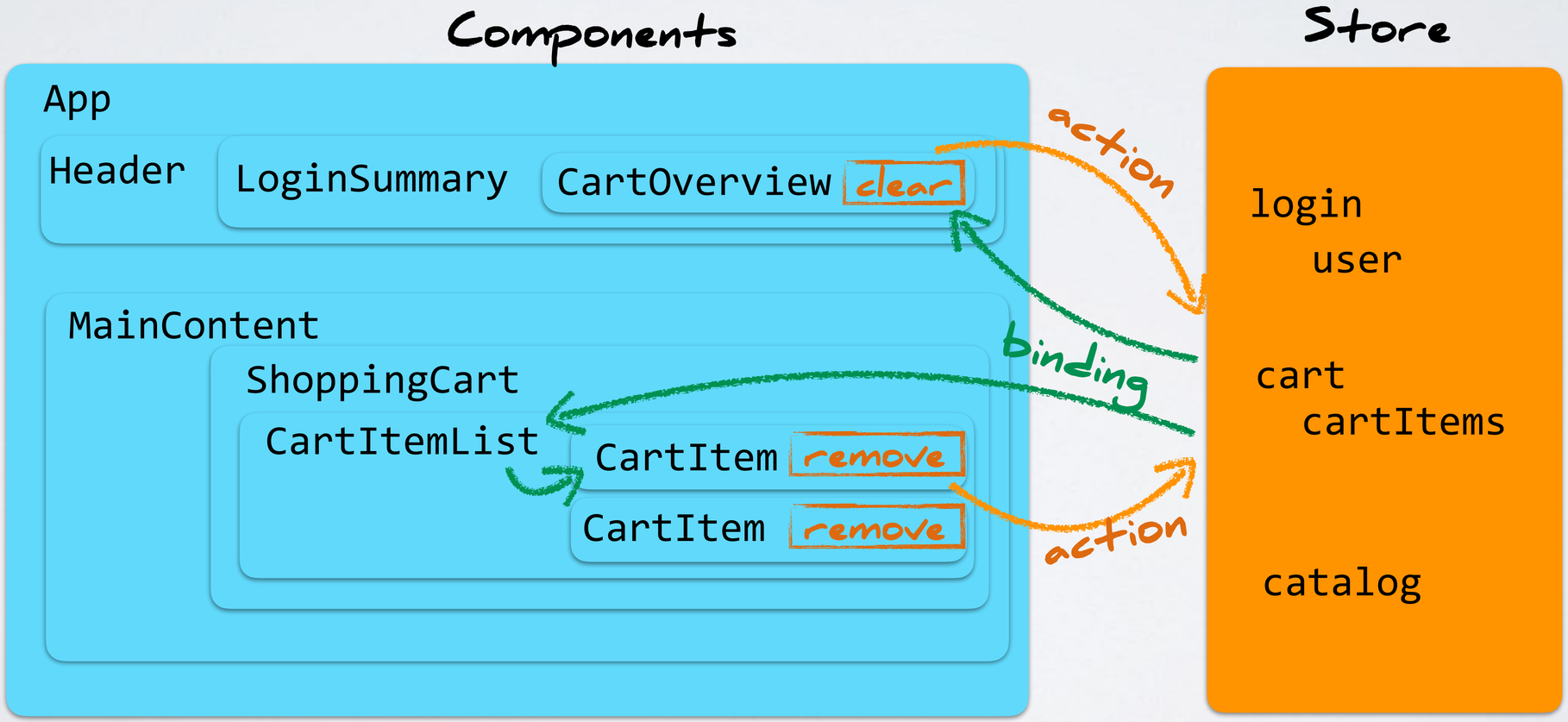
A state container extracts the shared state out of the components, and manages it in a global singleton.



The component tree becomes a big "view", and any component can access the state or trigger actions, no matter where they are in the tree!

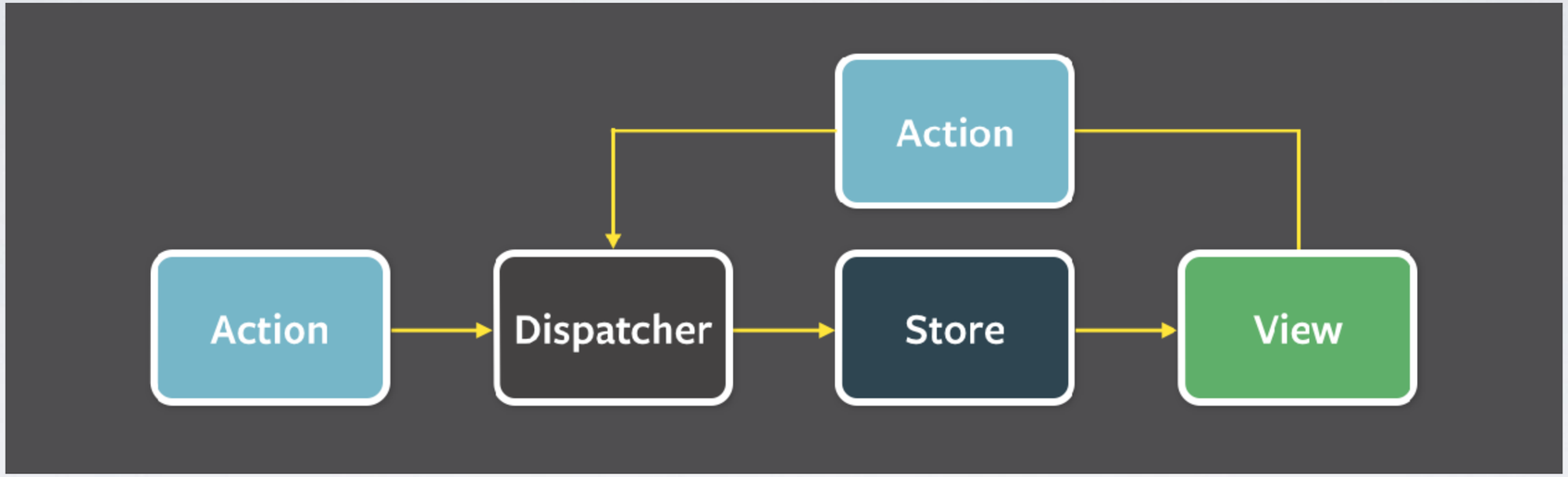
Managing State with a State Container

State can be managed outside the components.
Components are bound to state.



Flux Architecture

Formalization of unidirectional data-flow.

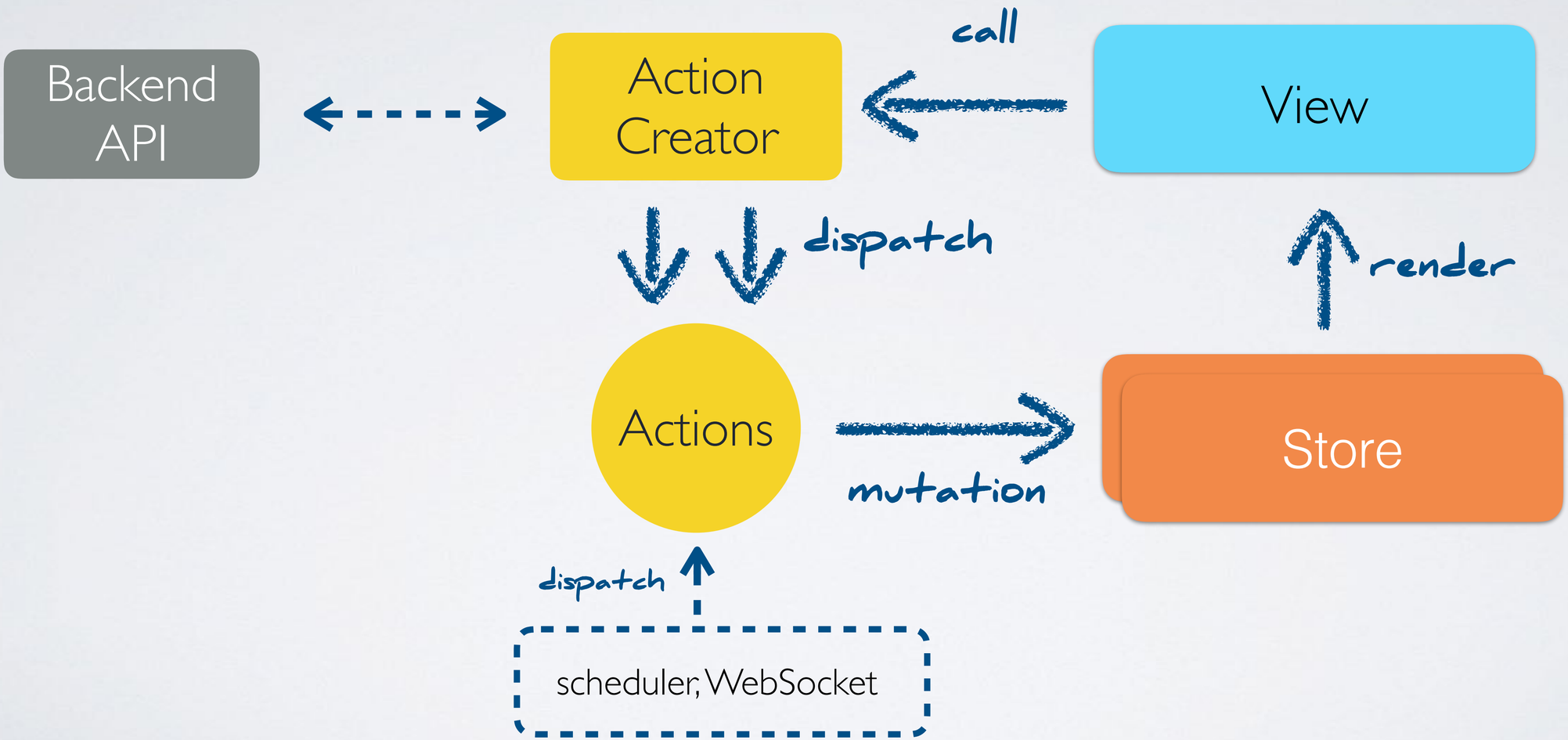


- Stores hold state that can be used from several views.
- Only actions can modify store states. Stores have no setters.
- Stores subscribe to actions and notify views if their state changed.
- Views trigger the rendering if a store changed.
- Actions are fire-and-forget.

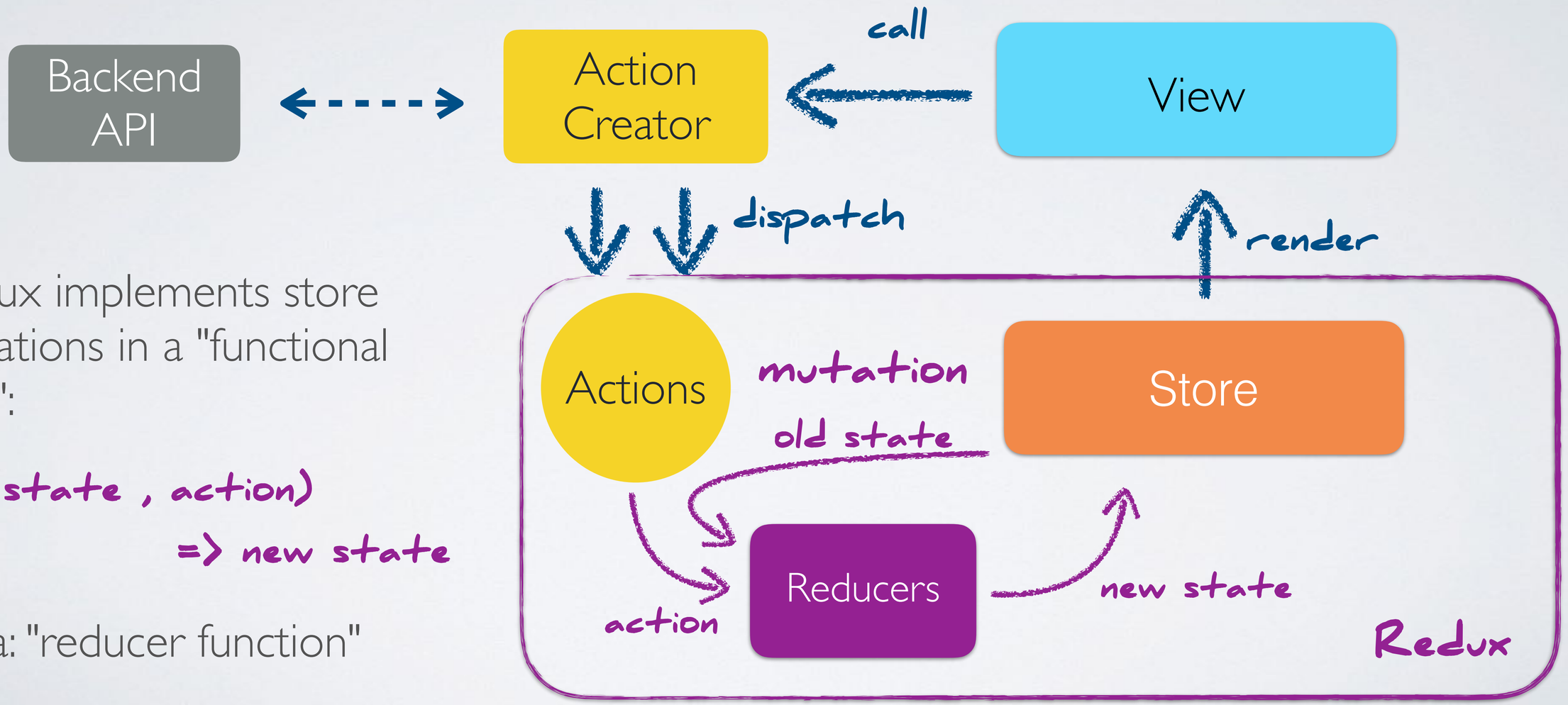
Introduced by Facebook in 2014

https://facebook.github.io/flux/docs/overview.html

Flux Architecture



Redux Architecture



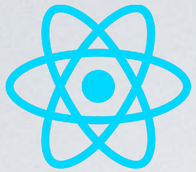
Redux implements store mutations in a "functional way":

(old state , action)
=> new state

aka: "reducer function"

React vs. Angular
(personal opinion)

Framework vs. Library



React and Angular have different scopes:

UI-Library

- UI-Components
- Unidirectional DataFlow Architecture

Complete SPA Framework

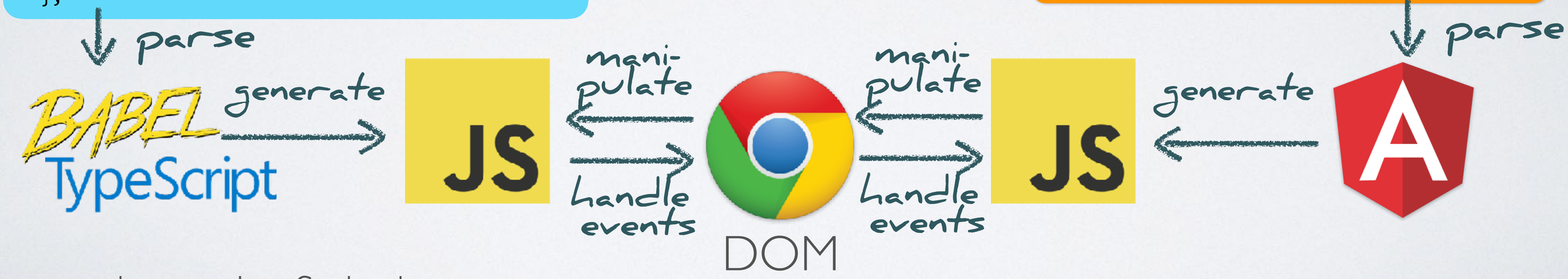
- UI-Components
- Unidirectional DataFlow Architecture
- Routing
- Backend-Access
- Architecture:
  - Services
  - Dependency-Injection
  - Modularization

The UI is rendered with JS

In Angular and in React the DOM is built with imperative JavaScript that is loaded into the browser.

```
class HelloMessage extends React.Component{
  ...
  render() {
    return <div>
           Hello {this.props.props}
              + {this.state.name}
         </div>;
  }
};
```

```
<ul class="todo-list" >
    <li *ngFor="let todo of todos">
        {{todo.title}}
        <button class="remove-button"
           (click)="removeToDo(todo)">
            x
        </button>
    </li>
</ul>
```



React enhances JavaScript in order to declare the UI

Angular enhances HTML with a new language

It's just JavaScript: Rendering

- Leverage the full power of JavaScript, no need for a new syntax.
  Bonus: build-time syntax checkin of your templates
- JavaScript is much more versatile than HTML.
  Trying to fit imperative constructs into a declarative language is cumbersome (does anybody remeber Ant?)
- Angular templating/directives feel clumsy …

```
render(){
  let message;
  if (this.props.loading) message = <p>Loading...</p>;
  else message = <div>this.state.message</div>;
  return message;
}
```

if-else in React

```
<p *ngIf="loading; else notLoading">
  Loading...
</p>
<ng-template #notLoading>
  <div>{{message}}</div>
</ng-template>
```

if-else added in Angular 4

Angular Templating: a new Language

```
<div [ngSwitch]="conditionExpression">
<ng-template [ngSwitchCase]="case1Exp">...</ng-template>
<ng-template ngSwitchCase="case2LiteralString">...</ng-template>
<ng-template ngSwitchDefault>...</ng-template>
</div>
```

```
<button (click)="do($event)">
```

```
<my-cmp [(title)]="name">
```

```
<input [(ngModel)]="userName">
```

```
<div *ngIf="things.car; let car">
  Nice {{ car }}!
</div>
```

```
<div [style.width.px]="mySize">
```

```
<div [ngClass]="{'active': isActive, 'disabled': isDisabled}">
```

```
<li*ngFor="let contact of contacts | async; let o = odd; let e = even;">
...
</li>
```

```
<ng-template ngFor let-contact [ngForOf]="contacts | async"> ... </ng-template>
```

It's just JavaScript: Dependencies

- Dependencies can be statically analyzed in JavaScript
- No additional module concept that 'magically' provides components

```
import MyComponent from './MyComponent';
...
<MyComponent
      data={currentValue}
      onSelect={handleSelect} />
```

```
<my-component
   [data]="currentValue"
   (onSelect)="handleSelect($target)" />
```

```
@Component(
  selector: 'my-component',
  ...
)
class MyComponent {...}
```

```
import {MyComponent} from './MyComponent';
...
@NgModule({
 declarations: [
   MyComponent
 ]
 ...
})
export class AppModule {}
```

Declarative all the Way!

In React rendering can only be triggered by changing the state:

```
class Modal extends React.Component {
  render() {
    // Render nothing if the "show" prop is false
    if(!this.props.show) {
      return null;
    }
    ...
}
```

```
class App extends Component {
  state = { isOpen: false };
  toggleModal = () => {
    this.setState({isOpen: !this.state.isOpen});
  }
  render() {
    return (
        <Modal show={this.state.isOpen} />
    );
  }
}
```

https://daveceddia.com/open-modal-in-react/

Angular mixes declarative and imperative rendering:

```
export class HomeComponent implements OnInit {
    private bodyText: string;

    constructor(private modalService: ModalService) {}

    ngOnInit() {
        this.bodyText = 'Mesage 1';
    }
    openModal(id: string){
        this.modalService.open(id);
    }
}
```

http://plnkr.co/edit/gPCTvV?p=preview

```
export class DashboardComponent {
  @ViewChild("mixedChart") mixedChart: UIChart;
  ...
  onDataUpdated(){
    this.mixedChart.refresh();
  }
}
```

https://github.com/glenasmith/pluralsight-primeng

API Surface

- React has very few but powerful primitives
- The API is simple and consistent
- Angular has a huge API, and the APIs are often overlapping or inconsistent
- Angular introduces complexity with doubtful benefits

Properties and Events

The Browser:

```
<input value="Test" onclick="alertHandler()">
```

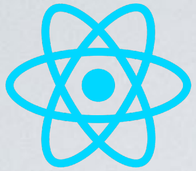
React:

```
<input value={currentVal} onClick={alertHandler}">
```

Angular:

```
<input [value]="currentVal" (click)="alertHandler()">
```

Custom Components



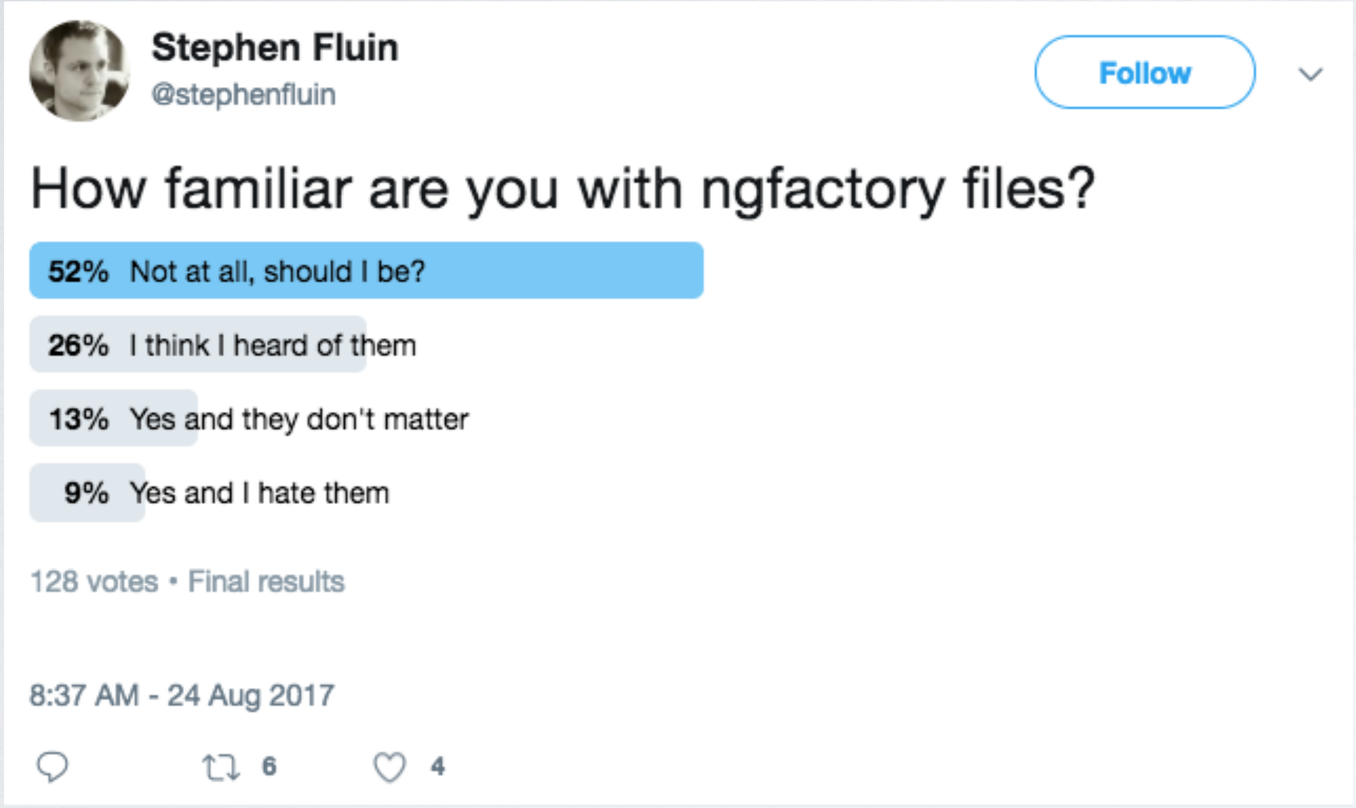
```
import MyComponent from './MyComponent';
...
<MyComponent
      data={currentValue}
      onSelect={handleSelect} />
```

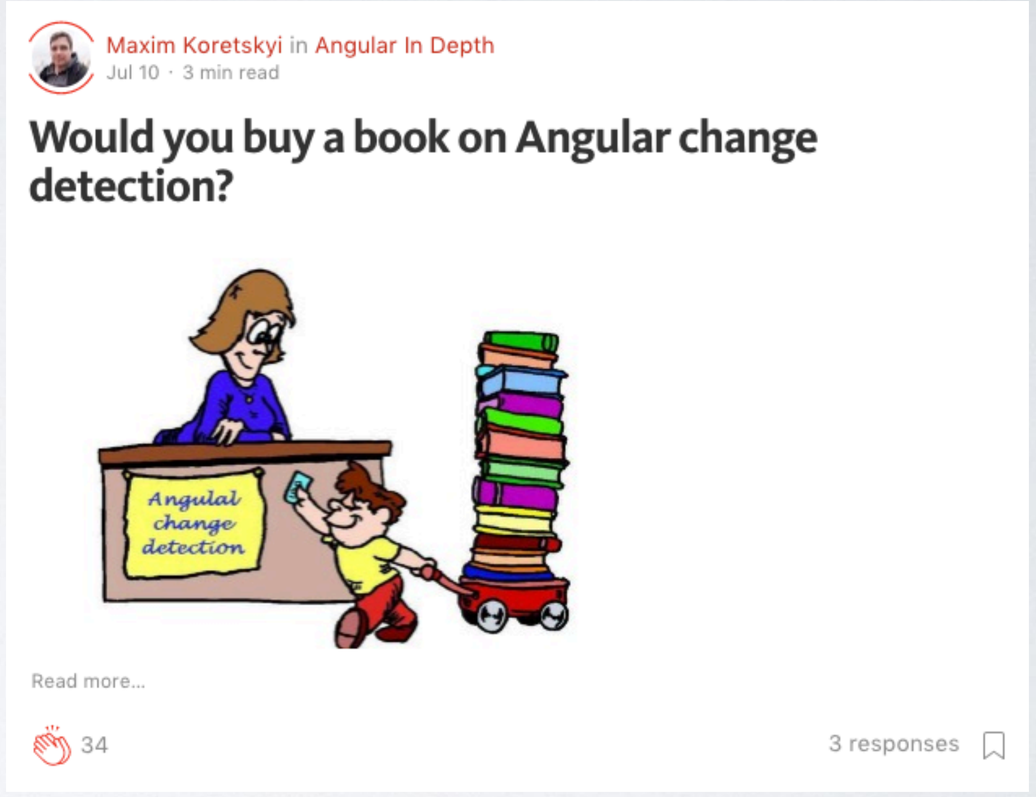
```
class MyComponent extends React.Component {
   ...
   trigger = () => {
      ...
      if (this.props.data != newVal){
        this.props.onSelect(newVal);
      }
   }
}
```

```
<my-component
      [data]="currentValue"
      (onSelect)="handleSelect($target)" />
```

```
@Component(
  selector: 'my-component',
  ...
)
class MyComponent
   @Input() data;
   @Output() onSelect = new EventEmitter();
   ...
   trigger(){
      ...
      if (this.data != newVal){
        this.onSelect.emit(newVal);
      }
   }
}
```

Complexity & Leaking Abstraction





Unfortunate Design Decisions in Angular
(again: personal opinion)

Template Compilation

JSX is not supported in the browser.
A compiler (babel or typescript) is used at build time to generate JavaScript.
JavaScript is delivered to the browser.
Simple!

The official way to program Angular is to use TypeScript.
TypeScript is not supported in the browser.
A compiler must be used at build time to generate JavaScript.
But we don't compile templates at build-time … no no!
We ship the Angular compiler (70% of the Angular code) to the browser.
We also ship templates as strings to the browser.
Then we compile templates to JavaScript inside the browser.
Let's give it a fancy name: JIT Mode.

Template Compilation … continued!

Nothing more to say!

Ok, maybe there is a better way (we always had that in mind anyways …).
Let's compile at build time (ok, we are doing that already with TS anyway).
Let's give it a fancy name: AOT mode.

Hmm … let's make that the default in Angular 5.

Oh … but we don't support the full JavaScript syntax in AOT mode … sorry!

https://github.com/rangle/angular-2-aot-sandbox

Google: Consider replacing the function with a reference to an exported function

Change Detection

The goal of Angular change detection is to make devlopment simple:
You change some JavaScript object and Angular updates the UI.
Magic!

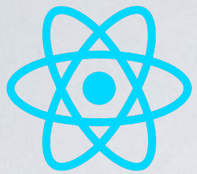
In reality the abstraction is leaking and there are many reasons why developers must start to care about change detection.

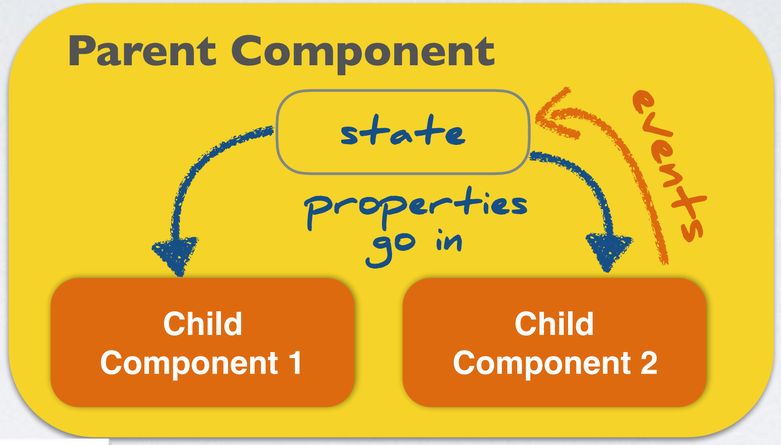
The concepts for change detection are very complex and a constant source for confusion:

`ngDoCheck, ngOnChanges, ChangeDetectionStrategy.OnPush, AppRef.tick(), NgZone.run(), ChangeDetectorRef.detach(), ChangeDetectorRef.markForCheck()`

https://github.com/danielwiehl/edu-angular-change-detection

Routing & Unidirectional DataFlow





A route is just a component!

```
<Route exact path="/" render={(props) => (
    <Child1
        message={this.state.message1}
        notify={this.alert}
        {...props}
/>
)}/>

<Route path="/child2" render={(props) => (
    <Child2
        message={this.state.message2}
        notify={this.alert}
        {...props}/>
)}/>
```

render function in parent

Routing brakes the component architecture

```
const appRoutes: Routes = [
  { path: '/', component: Child1 },
  { path: 'child2', component: Child2 },
]
```

static route configuration

```
<h1>Prent</h1>
...
<router-outlet></router-outlet>
```

parent template

no way for Parent to Pass properties or handle events

Toolchain is not used internally at Google

- Google did not use TypeScript until beginning of this year
- Google is not using angular-cli
- Google is not using webpack and @ngtools

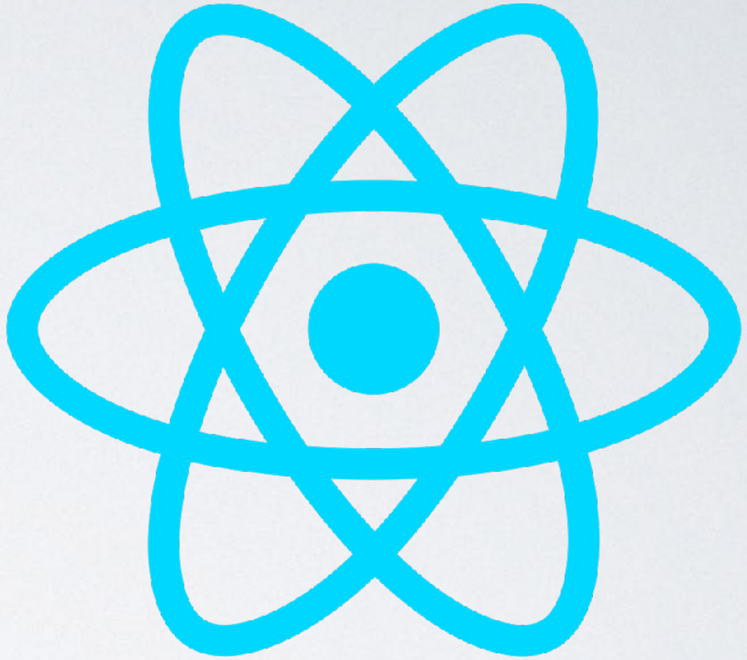
> and it would be a dream to no longer have to worry about the build process at all.

That's definitely where we'd like to be. At the moment, we're heavily reliant on third parties (webpack et al), and it's tricky as internally at Google we have an entirely different infrastructure for build, so we're grateful for this kind of feedback as it lets us know where we're falling short.

https://www.reddit.com/r/Angular2/comments/58y5d9/my_angular2_production_build_nightmare_as_a/

Either way ….

… have fun with Angular …



… or have a look at React!

Fragen?

https://github.com/jbandi/sbb-dev-day-2017

JavaScript / Angular / React
Schulungen & Coachings,
Project-Setup & Proof-of-Concept:

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