# Single Page App Day

## Brought to you by Chariot Solutions

# What are Single Page Applications?


2.1

# Single Page Application Division of Labor


- Rich user interface
- Client-side logic
- Hold state, cache data
- Make requests to server(s)

- Respond to client requests
- Handle business logic
- Generally stateless
- Provide security

# Three popular SPAs

- `Angular` - Google-created *Framework* that includes APIs for many chores
- `React` - A Component library written from the ground up for a single purpose, has many "friends"
- `VueJS` - A "better, simpler Angular?"

# Why an SPA?

- Rich front-end experience
  - Snappier responses
  - No full-page refreshes
  - Better indications of activity
- Full client application
  - Leverage browser computing power
  - Reduce server complexity
  - Have a true conversation with the server

# Mad SPA Skills...

# "Modern" JavaScript

- A moving target...
- `JavaScript` is actually officially ECMAScript
- `ECMAScript 2018` is the current version
- Most developers develop in `ECMAScript 2015` or higher and translate it to an older version

Say it: ECMAScript = ES = JavaScript


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# Babel - babeljs.io

`Babel` "transpiles" ECMAScript 2018 → ECMAScript 5 (which every browser interprets) or higher...

- Compiles down to ECMAScript 5
- Can compile to newer versions of ECMAScript

# Design and UI Skills

- User Experience Design
- HTML and Cascading Style Sheets

# JavaScript Skills

- Shed the jQuery knowledge, it’s obsolete
- JavaScript is NOT Java
- The event loop controls performance

# Key JavaScript Skills (this IS a JavaScript day…)


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# Prototypes ARE Inheritance Model

```
1  var prototype = {
2    sayHello: function() {
3       console.log(this.name);
4    }
5  };
6
7  var obj = Object.create(prototype);
8  obj.name = 'Ken';
9
10 console.log(obj.sayHello());
11
12 // output: 'Ken'
```

# Class definitions (i.e. constructor functions)

```
1  class Person {
2    constructor(first, last) {
3       this.first = first;
4       this.last = last;
5    }
6  }
```

Turns into...

```
1  function Person(first, last) {
2    this.first = first;
3    this.last = last;
4  }
```

Classes create constructor functions!

# Classes and Inheritance

```
1  class Customer extends Person {
2
3    constructor(first, last, orders) {
4      super(first, last);
5      this.orders = orders;
6    }
7
8    reportOrders() {
9      return `Customer ${this.first} ${this.las
10             has ${orders.length} orders`;
11   }
12 }
```

# The Customer Prototype

```
> Customer.prototype
< ▼Person {constructor: ƒ, reportOrders: ƒ}
    ▶constructor: class Customer
    ▶reportOrders: ƒ reportOrders()
    ▼__proto__:
      ▶constructor: class Person
      ▶sayIt: ƒ sayIt()
      ▶__proto__: Object
>
```

Figure 1. Prototypes are objects…

JavaScript is *function driven* and supports objects…

`this` is a mess…

# Without arrow functions

This will not work, will set **`window.customer`**

```
1  // bad
2  const customerWrapper = {
3    customer: [],
4    getCustomer: function(key) {
5      setTimeout(function() {
6        this.customer = { first: 'Ken', ...};
7      }, 4000);
8    }
9  }
```

# Arrow functions remember the **`this`** keyword from the outer function

Inherits "this" from the outer calling code, *not* the code that initiated it

```
1  const customerWrapper = {
2    customer: [],
3    getCustomer: function(key) {
4      setTimeout(() => {
5        this.customer = { first: 'Ken', ...};
6      }, 4000);
7    }
8  }
```

# Promises, async and await

```
1  function getLocation() {
2    return new Promise((resolve, reject) => {
3      try {
4        navigator.geolocation.watchPosition(
5          function (geoposition) {
6            navigator.geolocation.clearWatch(wa
7            resolve({ coords: geoposition.coord
8          }
9        );
10     catch (e) { reject(e); }
11   });
```

# Calling a function with a promise

Original way - use the **.then** callback

```
1  getLocation()
2  .then(
3    location => {
4      this.coords = location.coords;
5      this.error = undefined;
6    },
7    error => {
8      console.error(rejectPayload);
9      this.coords = undefined;
10     this.error = error;
11   };
12 )
```

# Newer way: Use **async** and **await**

```
1  class MyComponent {
2    async getLocation = () => {
3      const location = await this.getLocation();
4      this.coords = location.coords;
5    }
6  }
```

# Use `try` and `catch` to deal with errors

```
1  class MyComponent {
2    async getLocation = () => {
3      try {
4        const location = await this.getLocation
5        this.coords = location.coords;
6        this.error = undefined;
7      } catch (e) {
8        this.coords = undefined;
9        this.error = e.message;
10     }
11   }
12 }
```

# Higher order functions in JavaScript

- Functions that
  - Take other functions as input arguments
  - Return other functions as results

# Sample higher-order functions

map - transform an object or array

```
let items = [1, 2, 3, 4, 5];
items.map(item => item * item);
// result: 1, 4, 9, 16, 25
```

reduce - produce a single output from a collection

```
let items = [1, 2, 3, 4, 5];
items.reduce((accum, item) => accum + item, 0;
// result: 15
```

chain two higher-order functions

```
let items = [1, 2, 3, 4, 5];
items.map(item => item * item)
     .reduce((i,v) => v+i,0);
// 55
```

# Observables

- A future ECMAScript feature candidate
- Currently implemented by `RxJS`
- Similar to promises, but
  - Observables provide a stream of events
  - Provide message delivery, error, and complete callbacks

# Simple Observable Examples

Observable events "from" a collection

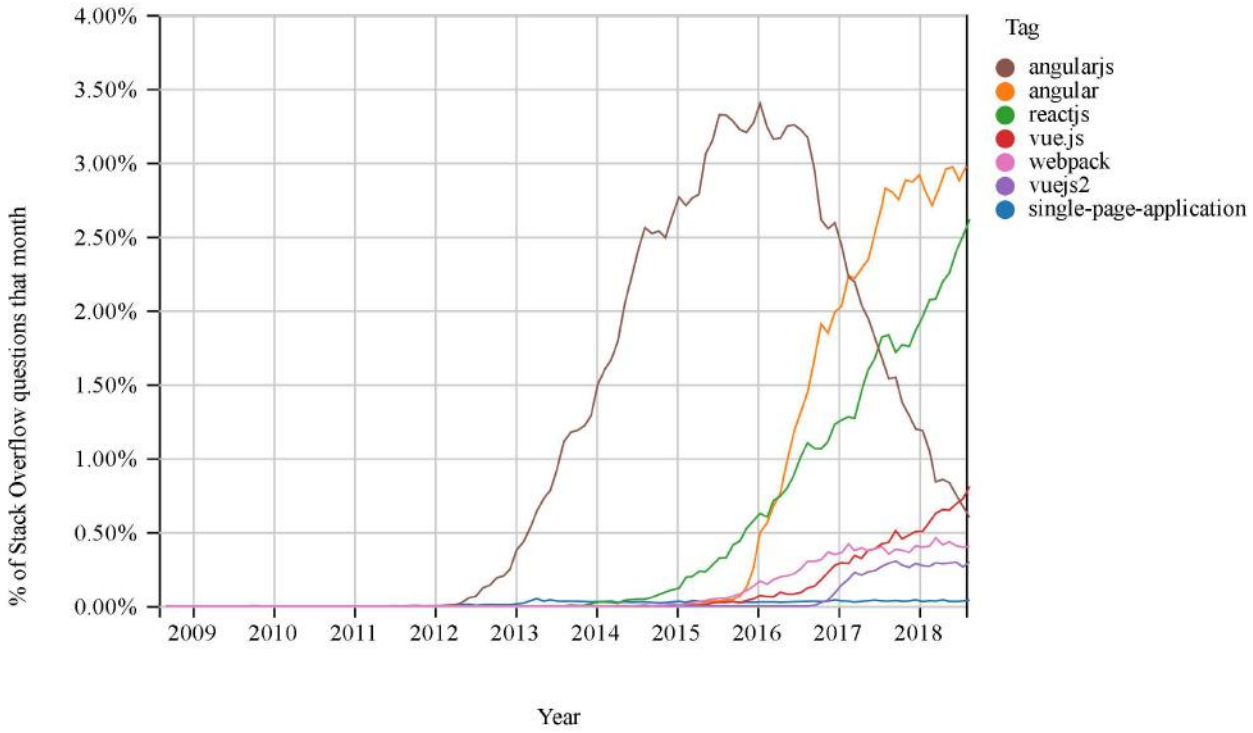
```
1  import {from} from 'rxjs';
2
3  .from([1, 2, 3, 4, 5])
4  .subscribe( x => { console.log(x); });
```

Observable events from mouse movement

```
1  import {fromEvent} from 'rxjs';
2
3  fromEvent(document, 'mousemove')
4  .subcribe(event =>
5      console.log(event.clientX, event.clientY))
```

Lots of interesting visualizations a http://rxmarbles.com

# The Growth of SPA

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# Rest of Day : Agenda (lunch provided!)

- Pete Fleming talks about User Experience
- Rich Freedman on Angular
- James Kent and Matt Gilbride on React
- Ken Rimple (me) on Vue
- Jeff Labonski on NodeJS and JavaScript on the server
- Ken Rimple (me) on Spring Boot
- Jeff Labonski on Continuous Integration
- Panel discussion