Vue.js

Logistic

- Hours and Scheduling
- Lunch & breaks

Overview

- What is Vue.js
- The Vue instance
- Components
- Vue-CLI
- Directives
- Filters
- Routing
- Data fetching
- Plugins
- Typescript
- Vuex
- Testing
- Server Side rendering

What is Vue.js

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Introduction

Vue.js was created in February of 2014 by Evan You. It has been maintained by himself & his team ever since (not by any members of the GAFAM family).

Its 2.0 version was announced in April of 2016 & released in December of the same year.

The latest stable version of Vue.js is ***v2.6.11***.

Introduction

Vue.js is the 3rd most starred project on ***Github***.
Github is a web-based hosting service for version control using git & commonly used to host open-source software projects.

https://github.com

Installation

Vue.js can be installed on your computer via ***npm***. npm is a package manager for Node.js. All packages can be found on npmjs.org

You may also add the library to your project via a ***CDN*** link by adding it in the script tag.

Lab 1

Inspiration

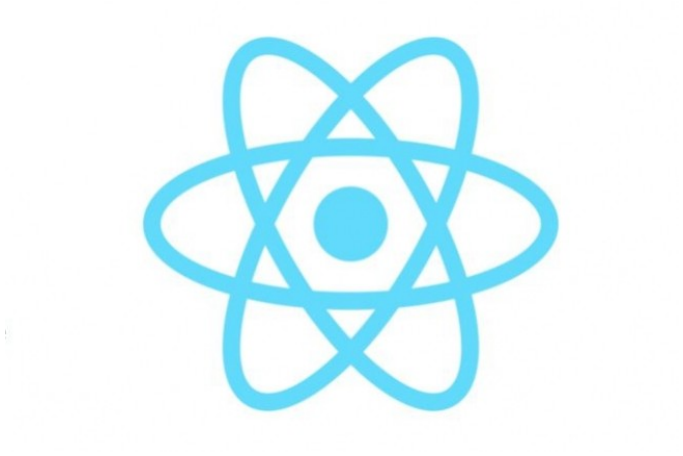
Vue.js is used to write sophisticated Single-Page Applications (SPA). It is also designed to be incrementally adoptable with other Javascript Libraries.

In fact, a lot of concepts used by Vue.js are directly inspired by other great libraries & frameworks such as ***AngularJS***, ***React*** or even ***jQuery***.

AngularJS shared concepts

- Syntax (v-if vs ng-if)
- Two-way binding
- Directives
- Watchers
- Filters

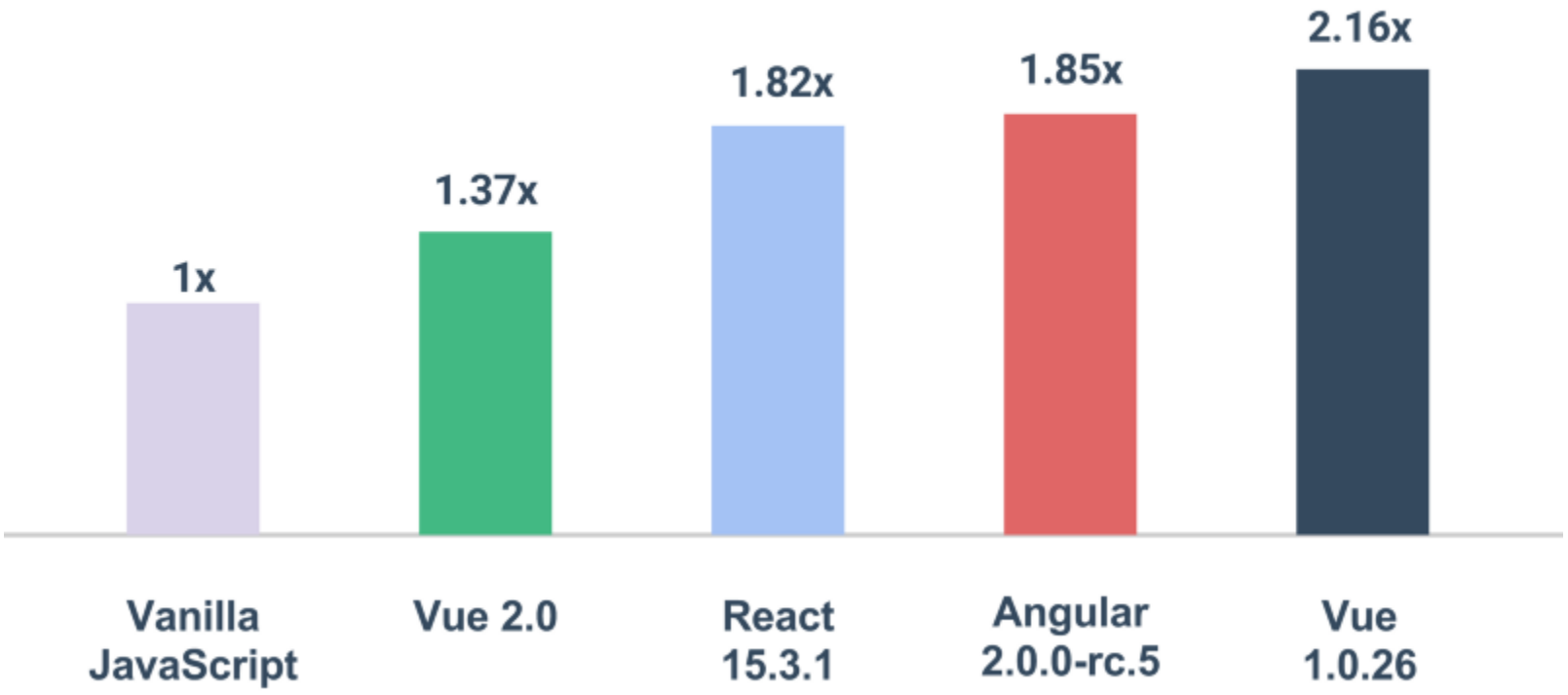
React shared concepts



- Virtual DOM
- Render Functions & JSX Support
- Focus on the View Layer

Benchmark

According to many benchmarks, Vue.js is currently faster than its most famous competitors.



The Vue instance

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Our first instance

A Vue application consists of a root Vue instance created using `new Vue`, optionally organized into a tree of nested, reusable components.
The Vue instance is declared using the Vue constructor function.

```
let vm = new Vue({
    // options here
})
```

Each instance is declared with an options object which can contain data, methods, elements to mount on or lifecycle callbacks.

Mount a DOM element

We use the **el** option to mount an instance to a DOM element.

```
<div id="app">
    <h1>Hello World!</h1>
</div>
```

```
let vm = new Vue({
    el: '#app',
})
```

We may also use the $mount() method instead of the el option on the Vue instance.

```
let vm = new Vue({
}).$mount('#app')
```

Data properties

- Each property found in the data object is 'proxified'
- Vue attaches setters & getters to each one of these properties
- All properties are accessible on the client side

```
<div id="app">
    <h1>{{message}}</h1>
</div>
```

```
let vm = new Vue({
    el: '#app',
    data: {
        message: 'Hello World!',
    },
})
```

Lifecycle hooks

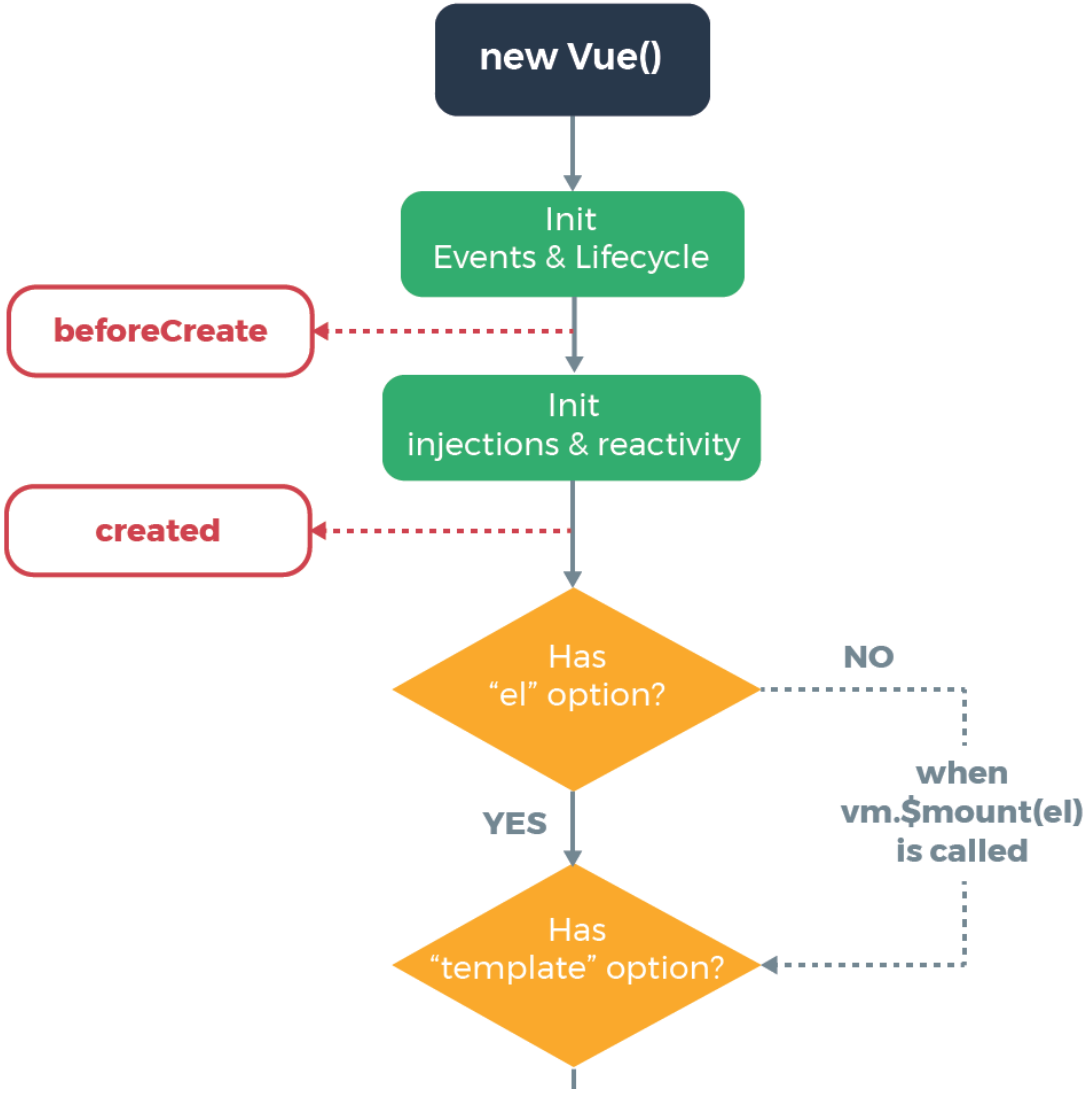
- Lifecycle hooks help us manage stages of a Vue instance's lifecycle.
- They allow us to execute code at a precise moment of our instance.

```
let vm = new Vue({
  el: '#app',
  data: {
    message: 'Hello World!'
  },
  beforeCreate: function() {
    console.log("I'm beforeCreate");
  },
  created: function() {
    console.log("I'm created");
  },
  beforeMount: function() {
    console.log("I'm beforeMount");
  },
  ...
```

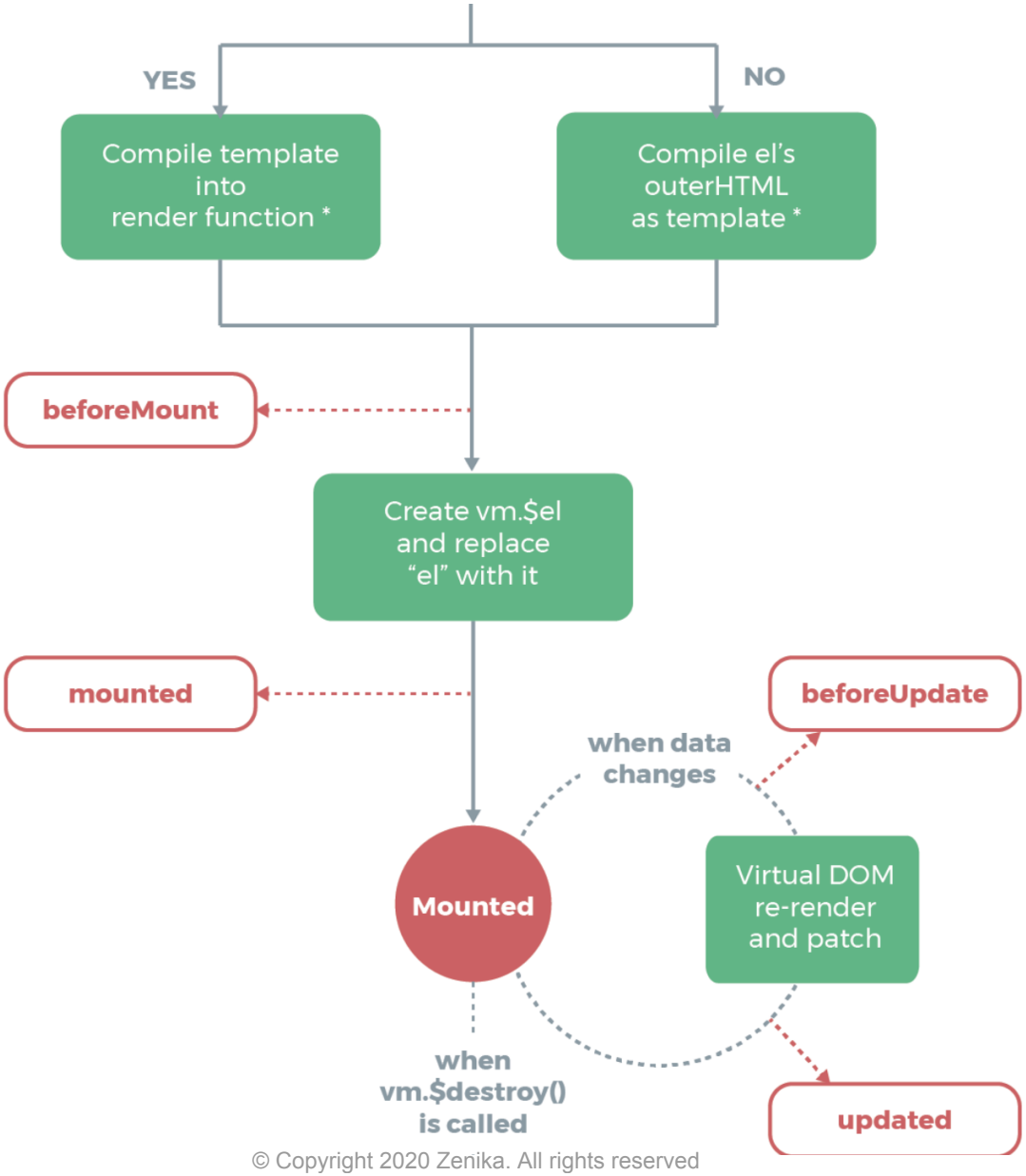
Lifecycle hooks 2

```
    ...
      mounted: function() {
          console.log("I'm mounted");
      },
      beforeDestroy: function() {
          console.log("I'm beforeDestroy");
      },
      destroyed: function() {
          console.log("I'm destroyed");
      },
});
```

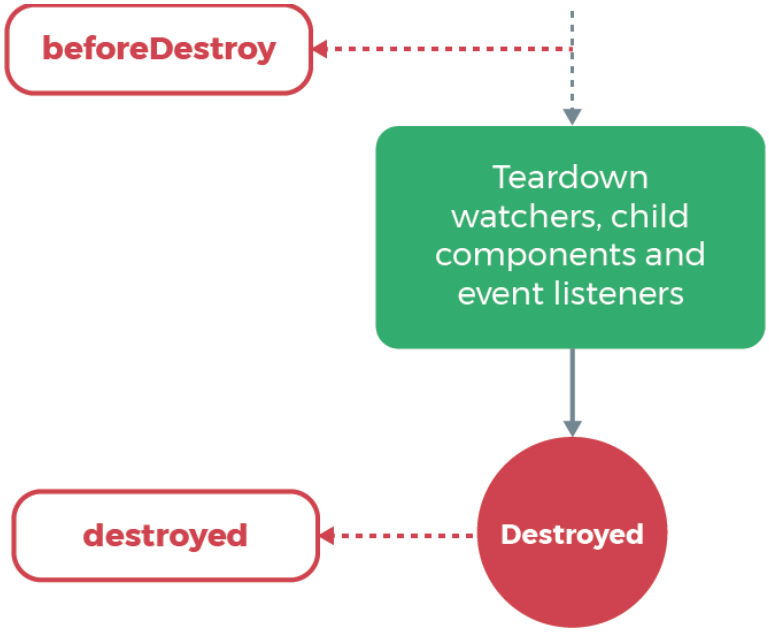
Lifecycle Diagram



Lifecycle Diagram part 2.



Lifecycle Diagram part 3.



Lab 2

Components

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Overview

- Components are custom HTML elements.
- They allow to encapsulate reusable code.
- Each component should have its own behavior.

Our first component

- We can use `Vue.component(tagName, options)` to register a component.

```
Vue.component('my-component', {
// options
})
let vm = new Vue({
  el: '#app',
})
```

tagName must be lowercase & contain hyphens

- We can then use it as a custom element in an instance's template.

```
<div id="app">
  <my-component></my-component>
</div>
```

Template

- To pass HTML as a template to our component, we can use the `template` option element.

```
Vue.component('my-component', {
   template: '<h1>My first component</h1>',
})
let vm = new Vue({
    el: '#app',
})
```

```
<div id="app">
    <my-component></my-component>
</div>
```

- The example above will render:

```
<div id="app">
    <h1>My first component</h1>
</div>
```

Data

- Unlike the Vue instance, a component's data option must return a function. This way, each component will have its ***own instance*** of its data and won't share it with other components.
- Data values can be used in a component's template.

```
Vue.component('my-title-component', {
 template: '<h1>{{message}}</h1>',
 data() {
      return {
          message: 'Hello World!'
      }
  },
})
```

Props

- Data can be passed down to child components using props.
- Props can be used inside templates.
- Props must be explicitly declared with the `props` option element.

```
Vue.component('child-component', {
  props: ['message'],
  template: '<span>{{ message }}</span>',
})
```

```
<child-component v-bind:message="foo"></child-component>
```

Methods

- Methods are functions of our component.
- They can only be used in the component's scope.
- They can be declared using the `methods` option element.

```
Vue.component('my-like-button', {
  template: '<button @click="addLike()">{{likes}}</button>',
  data() {
      return {
          likes: 0,
      }
  },
  methods: {
      addLike () {
          this.likes++;
      }
  },
})
```

Computed properties

- Computed properties are used to avoid complex expressions in templates.
- We can use them with the `computed` option element.

```
Vue.component('my-fullname', {
  template: '<span>{{fullName}}</span>',
  data() {
      return {
          firstName: 'John',
          lastName: 'Doe',
      }
  },
  computed: {
      fullName () {
          return `${this.firstName} ${this.lastName}`;
      },
  },
})
```

Note that a computed property will only re-evaluate when some of its dependencies have changed.

Watchers

- With **computed properties** we can handle most cases.
- But for some specific cases we can use **watchers**.
- Useful to change data depending on asynchronous or expensive operations.

Watchers

```
Vue.component('my-sample-form', {
    template: `
        <div>
            <input type="text" v-model="firstName"/>
            <span>{{ reversedFirstName }}</span>
        </div>
    `,
    data() {
        return {
            firstName: '',
            reversedFirstName: '',
        }
    },
    watcher: {
        firstName (value) {
            this.reversedFirstName = value.split('').reverse().join('');
        },
    },
})
```

Lab 3

Mixins

Mixins allow us to distribute functionalities across multiple components. When a component uses a mixin, all options in the mixin will be “mixed” into the component’s own options.

Quick example:

```
var myMixin = {
    created: function () {
        this.greeting()
    },
    methods: {
        greeting: function () {
            alert('Hello!')
        }
    },
}

var Component = Vue.extend({
    mixins: [myMixin],
})

var component = new Component() // -> "Hello!"
```

Mixins

Mixin hooks will always be called before the component's own hooks, but component options will take priority when there are conflicting keys in these objects.

```
var myMixin = {
    methods: {
        greeting: function () {
            console.log('Hello!')
        },
        conflicting: function () {
            console.log('Hello from mixin!')
        }
    },
}
var vm = Vue.component({
    mixins: [myMixin],
    methods: {
        conflicting: function () {
            console.log('Hello from component!')
        }
    },
})
vm.greeting() // -> "Hello!"
vm.conflicting() // -> "Hello from component!"
```

Slots

Slots allow us to access the component's children. It can contain any template code, including HTML.

```
<!-- HTML of Parent component -->
<my-dialog>
  <div>This is the Dialog Content</div>
</my-dialog>
```

```
<!-- HTML of child component my-dialog-->
<section class="dialog">
  <h1>This is a dialog title</h1>
  <div class="dialogContent">
    <slot></slot>
  </div>
</section>
```

It will produce:

```
<!-- HTML of child component my-dialog-->
<section class="dialog">
  <h1>This is a dialog title</h1>
  <div class="dialogContent">
    <div>This is the Dialog Content</div>
  </div>
</section>
```

Named slots

It's also possible to name slots :

```
<!-- HTML of Parent component -->
<my-dialog>
  <template v-slot:title>This is a dialog title</template>
  <template v-slot:body>This is the Dialog Content</template>
</my-dialog>
```

```
<!-- HTML of child component my-dialog-->
<section class="dialog">
  <h1>
    <slot name="title"></slot>
  </h1>
  <div class="dialogContent">
    <slot name="body"></slot>
  </div>
</section>
```

It will produce:

```
<!-- HTML of child component my-dialog-->
<section class="dialog">
  <h1>This is a dialog title</h1>
  <div class="dialogContent">
    <div>This is the Dialog Content</div>
```

Slots - default content

It's possible to specify a slot default content by simply put it in the `slot` element :

```
<slot>Default content</slot>
```

Render functions

Most of the time Vue templates can accomplish almost everything we need to build our HTML. Although, in cases where we base our component's creation on input or slot values we can use the **render function**.

- Components using the render function do not have a template tag or property.
- These components use a `render` function that receives a createElement argument (commonly aliased as h) and returns an element created with that function.

Render functions

Quick example :

```
<my-rendered-component :tag="span">Hello world!</my-rendered-component>
```

```
Vue.component('my-rendered-component', {
  render: function (createElement) {
    return createElement(
      this.tag, // tag attribute, 'span' in our example
      this.$slots.default // Array of children, 'Hello world!' in this case
    )
  },
  props: {
    tag: {
      type: String,
      required: true
    }
  }
})
```

... Will render

```
<span>Hello World!</span>
```

Render functions

`createElement()` receives as arguments `renderElement`: String | Object | Function, `definition`: Object and `children`: String | Array.

```
// @returns {VNode}
createElement(
    // {String | Object | Function}
    'div',
    // {Object}
    {
      'class': 'example'
    },
    // {String | Array}
    // Children VNodes, built using `createElement()`,
    // or simply using strings to get 'text VNodes'. Optional.
    [
        'Some text comes first.',
        createElement('h1', 'A headline'),
        createElement(MyComponent, {
            props: {
                someProp: 'foobar'
            }
        })
    ]
)
```

Render functions

Note that the render function does not have access to the Vue template features such as `v-if` or `v-for`. They must be implemented in plain Javascript.

For the `v-for` directive, it could be implemented like so:

```
render (h) {
  return h('ul', this.elements.map(element => h('li')));
}
```

Instead of

```
<template>
  <ul>
    <li v-for="element of elements">
    </li>
  </ul>
</template>
```

JSX

The syntax of the render function can be painful, especially when using it for multiple components. To make it easier, Babel has a plugin that allows us to use JSX with Vue.

Example :

```
export default {
  render (h) {
    return (
      <p>Hello World!.</p>
    )
  }
}
```

Vue-CLI

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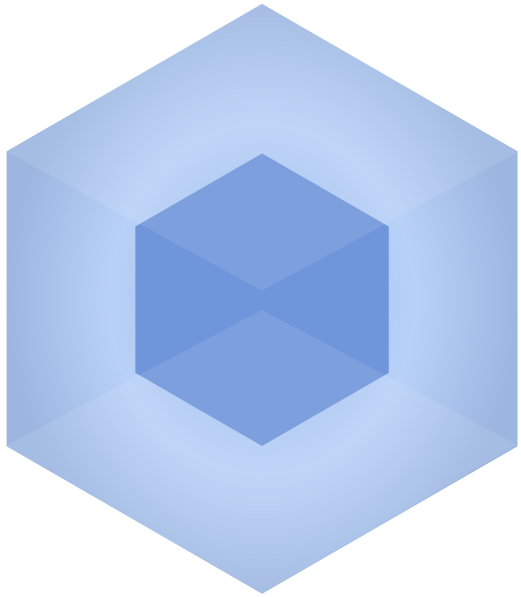
Webpack

- Browses all `import` from an endpoint.
- Bundles all exports into one file.
- Extensible with plugins / loaders.
- Offers devtools: HTTP server, live-reload, hot module replacement.
- vue-loader to combine it with Vue's single file components



Single file components

- File ending with `.vue` (e.g: `Card.vue`)
- Groups up all elements of a Vue component
  - template: `html` or `pug`
  - script: `javascript` or `typescript`
  - style: `css`, `sass`, `scss`, `stylus`
- Better readability
- Better developer experience

Single file components - example

SingleFileComponent.vue

src > SingleFileComponent.vue > {} "SingleFileComponent.vue"

```vue
<template>
  <h1>
    {{ title }}
  </h1>
</template>

<script>
export default {
  name: 'SingleFileComponent',
  data() {
    return {
      title: 'My awesome single file component',
    };
  },
};
</script>

<style>
  h1 {
    font-size: 1.5rem;
    margin-bottom: 1rem;
  }
</style>
```

Single file components - example

SingleFileComponent.advanced.vue

```
<template lang="pug">
  div
    h1 {{ title }}
</template>
<script lang="ts">
import Vue, { ComponentOptions } from 'vue'
export default {
  data () {
    return {
      title: 'My App'
    }
  }
} as ComponentOptions<Vue>
</script>
<style lang="stylus" scoped>
  h1
    font-size 2em
    margin-bottom 20px
</style>

```

Vue-CLI

Installation

```
$ npm i -g @vue/cli
```

The newly installed `vue` binary allows you to manage your vue projects via command line or a UI (using `vue ui`).

You can also install various plugins in already existing projects.

```
vue add [options] <plugin> [pluginOptions]
```

Scaffold new project

To create a new project, run:

```
vue create [options] <app-name>
```

Which will prompt you to use a default preset or build a custom one by selecting features such as:

- TypeScript
- PWA Support
- Router
- Vuex
- CSS Pre-processors
- Linter / Formatter
- Unit testing
- E2E Testing

Lab 4

Extend default configuration

The default configuration can be extended by adding a ***vue.config.js*** file at the project's root.

```
// vue.config.js
module.exports = {
  baseUrl: '/',
  outputDir: 'dist',
  lintOnSave: true,
  compiler: false,
  chainWebpack: (config) => {},
  configureWebpack: (config) => {},
  vueLoader: {},
  productionSourceMap: true,
  css: {},
  parallel: require('os').cpus().length > 1,
  dll: false,
  pwa: {},
  devServer: {},
  pluginOptions: {}
}
```

Extend default webpack configuration

vue-cli 4 hides your webpack configuration. Use the `vue inspect` command to display the configuration of the current project like so:

```
module: {
  noParse: /^(vue|vue-router|vuex|vuex-router-sync)$/,
  rules: [
    /* config.module.rule('vue') */
    {
      test: /\.vue$/,
      use: [
        /* config.module.rule('vue').use('cache-loader') */
        {
          loader: 'cache-loader',
          options: { ... }
        }
      ]
    }
  ]
}
```

Each comment is an example of how to overwrite specific configurations.

Plugins for `vue-cli 4`

Useful to keep the same configuration across different projects.

```
.
├── README.md
├── generator.js  # generator (optional)
├── prompts.js    # prompts file (optional)
├── index.js      # service plugin
└── package.json
```

- **service plugin**: save a specific webpack configuration
- **generator**: can modify `package.json` and add files
- **prompts file**: makes the plugin customizable at runtime

Preset

Vue CLI 4 provides a default preset. Although you can create a company preset to ensure that each new project will use the same dependencies.

```
{
  "useConfigFiles": true,
  "plugins": {
    "@vue/cli-plugin-babel": {},
    "@vue/cli-plugin-eslint": {
      "config": "airbnb",
      "lintOn": ["save", "commit"]
    },
    "homemade-plugin": {
      "auth": "onstart"
    }
  },
  "configs": {
    "eslintConfig": {
      "env": {
        "jest": true
      }
    }
  }
}
```

Directives

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Basics

v-directive = “js expression”

```
<span v-if="displayMessage"> Now you see me </span>
```

A directive allows Vue to add a side-effect to the DOM

- Starts with a v-
- The value is a Javascript expression

Arguments

`v-directive:arguments`

```
<img v-bind:src="logoUrl">
```

Pass arguments to the directive

- Denoted by a `:` after the directive's name

Modifiers

`v-directive.modifier`

```
<button v-on:click.prevent.stop="clickButtonCallback()">
```

Binds the directive to a certain way

- Denoted by a `.` after the directive's name

Conditional Rendering

v-if / v-else / v-else-if / v-show

- Built-in directives used to add or remove DOM element

```
<div v-if="test">Test</div>
```

```
<template v-if="test">
    <h1>Title</h1>
    <h2>Subtitle</h2>
</template>
```

```
<div v-if="done">done</div>
<div v-else-if="loading">loading...</div>
<div v-else>Nothing to display</div>
```

```
<dialog v-show="toast"></dialog>
```

v-if / v-else / v-else-if / v-show

- Data object

```
{
  display: false,
  userStatus: 'loggedOut'
}
```

- Template

```
<div class="alert" v-show="display">Alert displayed</div>
<template v-if="true">
    <h1>Title</h1>
    <h2>Subtitle</h2>
</template>
<button v-if="userStatus === 'loggedIn'">Logout</button>
<button v-else>Login</button>
```

What will it render ?

v-if / v-else / v-else-if / v-show

- rendered DOM:

```
<div class="alert" style="display: none;">Alert displayed</div>
<h1>Title</h1>
<h2>Subtitle</h2>
<button>Login</button>
```

List Rendering

v-for

- Built in directives used to render a list

```
v-for = “item in array”
```

```
v-for = “(item, index) in items”
```

```
v-for = “(value, key, index) in object”
```

Example:

```
<ul>
  <li v-for="route in routes">{{route.name}}</li>
</ul>
```

- To help Vue render each element correctly and faster, use the `:key` attribute with a **unique** identifier

```
<card v-for="element in menu" :key="element.id"></card>
```

v-for

- Data object

```
{
  users: [
    { id: 1, name: 'Evan You', username: '@yyx990803' },
    { id: 2, name: 'Edd Yerburgh', username: '@eddyerburgh' }
  ],
  auth: { type: 'jwt', exp: 1501585988266 }
}
```

- Template

```
<span v-for="n in 5">{{ n }}</span>
<template v-for="user in users" :key="user.id">
  <span>{{user.name}}</span>
  <span>{{user.username}}</span>
</template>
<div v-for="(key, value, index) in auth">{{index}}# {{key}}: {{value}}</div>
```

What will it render ?

v-for

- rendered DOM:

```
<span>1</span>
<span>2</span>
<span>3</span>
<span>4</span>
<span>5</span>

<span>Evan You</span>
<span>@yyx990803</span>
<span>Edd Yerburgh</span>
<span>@eddyerburgh</span>

<div>0# type: jwt</div>
<div>1# exp: 1501585988266</div>
```

Class and Style bindings

v-bind

- Built-in directive used to dynamically bind an HTML attribute to a JS expression

```
data () {
  return {
    dynamicId: 28
  }
}
```

```
<div v-bind:id="dynamicId"></div>
```

Render:

```
<div id="28"></div>
```

v-bind:class

Conditionally bind a CSS class to an element using `:class`

Using an object:

```
<div class="link" v-bind:class="{'active-link': isActive}"></div>
```

What will it render ?

Render:

- `isActive === true`

```
<div class="link active-link"></div>
```

- `isActive === false`

```
<div class="link"></div>
```

v-bind:class

Using an array:

```
<div class="alert" v-bind:class="[alertLevel, position]"></div>
```

```
data () {
    return {
      alertLevel: 'info',
      position: 'top'
    }
}
```

What will it render ?

Render:

```
<div class="alert info top"></div>
```

v-bind:style

Update CSS properties dynamically using `:style`

```
<div class="alert" v-bind:style="{'background-color': alertLevel}"></div>
```

```
data () {
    return {
      alertLevel: '#00FF00'
    }
}
```

What will it render ?

Render:

```
<div class="alert" style="background-color: #00FF00"></div>
```

Event Handling

v-on

Built-in directive used to listen to DOM or component events

```
<element v-on:eventName="codeToRunOnEvent"></element>
```

Example:

```
<button v-on:click="alert('login')">Login</button>
```

v-on - Event Modifiers

- `.stop`: event.stopPropagation()
- `.prevent`: event.preventDefault()
- `.capture`: uses capture mode when adding the event listener
- `.self`: only from the first component (ignored for nested component)
- `.once`: the event is captured only once

```
<a href="" v-on:click.stop.prevent.capture.self.once="alert('link')">Link</a>
```

v-on - Key modifier

- `.enter`: captures "Enter" key
- `.tab`: captures "Tab" key
- `.delete`: captures both “Delete” and “Backspace” keys
- `.esc`: captures "Escape" key
- `.space`: captures "Space" key
- `.up`: captures "Arrow up" key
- `.down`: captures "Arrow down" key
- `.left`: captures "Arrow left" key
- `.right`: captures "Arrow right" key
- `.<keyCode>`: captures the given key code

Shorthands

v-bind

- `v-bind:attr` can be shortened into `:attr`
- The following

```
<a v-bind:id="user.id" v-bind:href="user.loginUrl" v-bind:class="{'active-
link': isActive}">Link</a>
```

- Is the same as

```
<a :id="user.id" :href="user.loginUrl" :class="{'active-link':
isActive}">Link</a>
```

v-on

- `v-on:event` can be shortened into `@event`
- The following

```
<input v-on:keyup.13="login()" v-on:click="focus()"></input>
```

- Is the same as

```
<input @keyup.13="login()" @click="focus()"></input>
```

Custom events

Custom events

Its possible to emit and listen custom events

In the child :

```
{
  ...
  methods: {
    validate() {
      this.$emit('my-event')
    }
  }
}
```

In the parent :

```
<child v-on:my-event="myFunction"></child>
```

or:

```
<child @my-event="myFunction"></child>
```

Custom events - with payload

In the child :

```
{
  ...
  methods: {
    validate() {
      this.$emit('my-event', { data: 'some data' })
    }
  }
}
```

In the parent :

```
<child @my-event="myFunction"></child>
```

```
{
  ...
  methods: {
    myFunction(payload) {
      // payload === { data: 'some data' }
    }
  }
}
```

Naming custom events

Unlike components and props, event names will never be used as variable or property names in JavaScript, so there's no reason to use `camelCase` or `PascalCase`

Additionally, `v-on` event listeners inside DOM templates will be automatically transformed to lowercase (due to HTML's case-insensitivity), so `v-on:myEvent` would become `v-on:myevent` – making `myEvent` impossible to listen to.

> *For these reasons, we recommend you always use `kebab-case` for event names.*

Form Input Bindings

Naive implementation

- Using `v-bind` and `v-on`

```
<input type="text" :value="text" @input="text = $event.target.value">
```

👍 Works well with input text or custom component

👎 **Limited when using radio, select or multi-checkbox**

v-model

- Built-in directive used to provide "two-way" data bindings

Text

```
<input type="text" v-model="text">
```

Checkboxes

```
<input type="checkbox" v-model="selected">
```

Multi-line text

```
<textarea v-model="multiLine"></textarea>
```

v-model

Multi checkbox

```
data () {
  return {
    selection: ['red', 'blue']
  }
}
```

```
<input type="checkbox" v-model="selection" value="red">
<input type="checkbox" v-model="selection" value="blue">
<input type="checkbox" v-model="selection" value="green">
```

Radio

```
<input type="radio" v-model="gender" value="M">
<input type="radio" v-model="gender" value="F">
```

v-model

Select

```
<select v-model="phoneType">
  <option disabled value="">Pick one</option>
  <option>android</option>
  <option>iOS</option>
  <option>windows phone</option>
</select>
```

v-model - Modifiers

- `.lazy`: update model on `change` event instead of `input`
- `.number`: typecaste into `Number`
- `.trim`: auto trim the value

```
<input type="text" v-model.trim.number.lazy="firstName">
```

Lab 5

Custom directive

Vue.directive

```
<div v-my-directive></div>
```

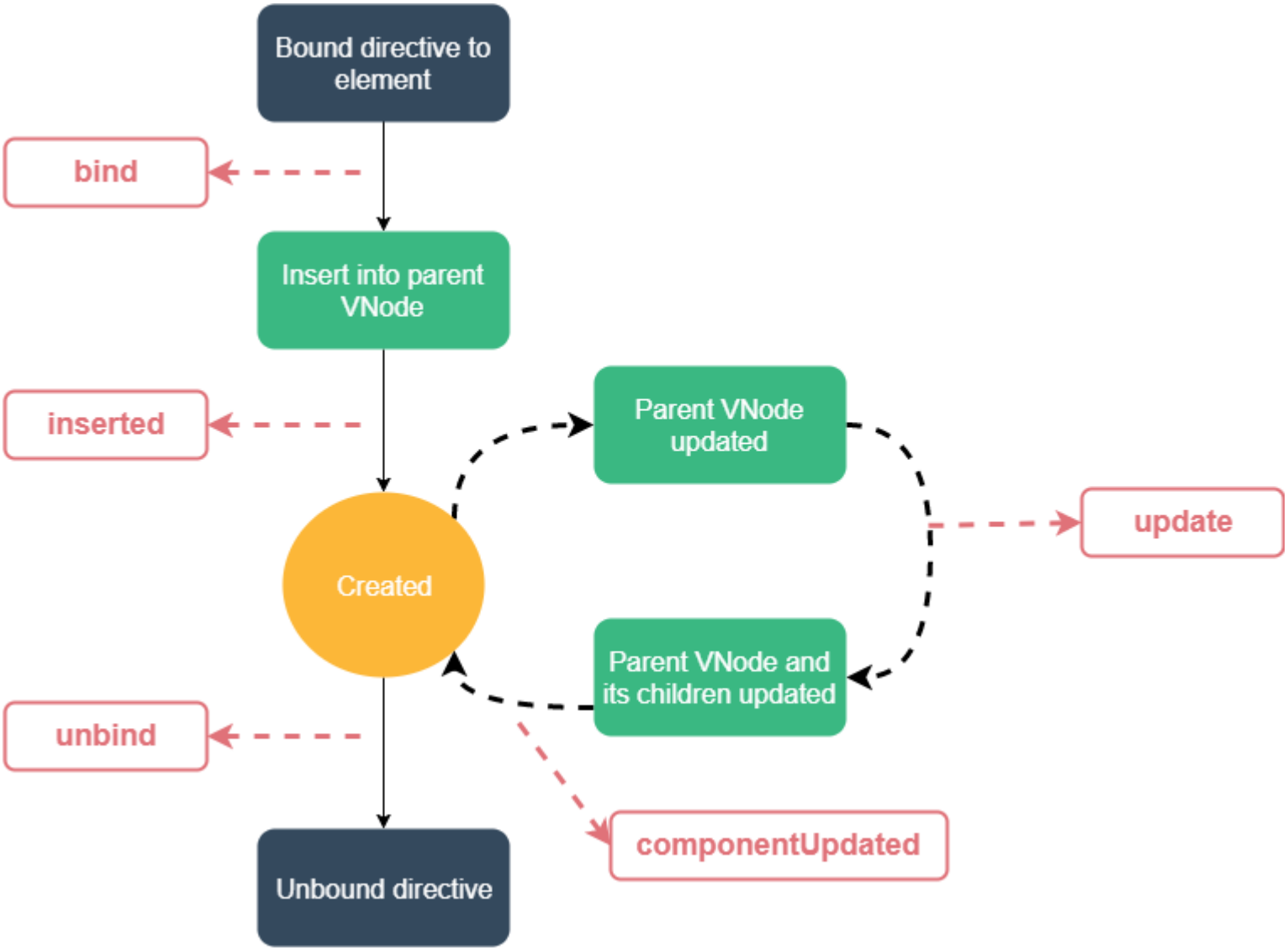
- Register it globally

```
Vue.directive('my-directive', {
  ...
})
```

- Register it locally

```
export default {
  name: 'myComponent',
  directives: {
    myDirective: {
      // ...
    }
  }
}
```

Directive Hooks



Directive Hooks Arguments

- `el`: The element the directive is bound to. This can be used to directly manipulate the DOM.
- `binding`: An object containing the following properties:
  - `name`: The name of the directive, without the v- prefix.
  - `value`: The value passed to the directive.
  - `oldValue`: The previous value, only available in update and componentUpdated. It is available whether or not the value has changed.
  - `expression`: The expression of the binding as a string.
  - `arg`: The argument passed to the directive, if any.
  - `modifiers`: An object containing modifiers, if any.

Directive Hooks Arguments

- `vnode`: The virtual node produced by Vue's compiler.
- `oldVnode`: The previous virtual node, only available in update and componentUpdated.

Function shorthand

- Often times you'll want the same behavior on `bind` and `update`, but won't care for other hooks.
- Vue provides a shorthand notation for this

```
Vue.directive('my-directive', (el, binding) => {
  ...
})
```

Lab 5

Filters

Overview

- What is Vue.js
- The Vue instance
- Components
- Vue-CLI
- Directives
- *Filters*
- Routing
- Data fetching
- Plugins
- Typescript
- Vuex
- Testing
- Server Side rendering

Use a filter

- Function used to apply common text formatting
- Only available in **mustache interpolations** and **v-bind expression**

```
<p>{{ text | myFilter }}</p>

<div :id="id | myFilter">
```

- Can be chained

```
<p>{{ text | myFilter1 | myFilter2 | myFilter3 }}</p>
```

- Can have arguments

```
<p>{{ text | myFilter(arg1, arg2) }}</p>
```

Write a filter

- Register it globally

```
Vue.filter('myFilter', (value, arg1, arg2) => {
  // Format the value
  return valueFormatted
})
```

- Register it locally

```
export default {
  name: 'myComponent',
  filters: {
    myFilter(value, arg1, arg2) {
      // Format the value
      return valueFormatted
    }
  }
}
```

Lab 6

Routing

Overview

- What is Vue.js
- The Vue instance
- Components
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- Filters
- *Routing*
- Data fetching
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Routing

Vue has an official router plugin called ***vue-router***. We can add and use it by two ways:

- Import library via CDN
- Installing it via npm.

Basic routing

Example :

```
const Foo = { template: '<div>foo</div>' }
const Bar = { template: '<div>bar</div>' }

const routes = [
    { path: '/foo', component: Foo },
    { path: '/bar', component: Bar }
]

const router = new VueRouter({
    routes
})

Vue.use(VueRouter)

const app = new Vue({
    router
}).$mount('#app')
```

Basic routing

Example :

```
<div id="app">
    <h1>Hello App!</h1>

    <div>
        <router-link to="/foo">Go to Foo</router-link>
        <router-link to="/bar">Go to Bar</router-link>
    </div>

    <router-view></router-view>
</div>
```

Basic routing

In this example we can notice few things :

- We define template for each routes we gonna use (Foo & Bar).
- We associate routes to each components.
- We create the router instance and pass the 'routes' option.
- We inject the router in our root instance.
- We use ***router-link*** component and we provide it a link as a prop.
- Then ***router-view*** render the component that match with our current route.

Dynamic Route Matching

We may want to share a component for many users or products. We need to have a core path that can fit with our different IDs that represent our users or products. To do so we can use a dynamic segment in the path.

Example :

```
const User = {
    template: '<div>User</div>'
}
const router = new VueRouter({
    routes: [
        {
            path: '/user/:id',
            component: User
        }
    ]
})
```

By doing this, we will be able to navigate to ***'user/1337'*** or ***'user/42'*** but to use the same User component.

Dynamic Route Matching

The ***:id*** parameter of our route is exposed in every component in every component. We can access to it easily by using ***this.$route.params***.

```
const User = {
    template: `
        <div>
            User {{$route.params.id}}
        </div>
    `
}

const router = new VueRouter({
    routes: [
        {
            path: '/user/:id',
            component: User
        }
    ]
})
```

Dynamic Route Matching

Many parameters can be passed to our routes. They will be all accessible in ***$route.params***, defined by their name.

```
const User = {
    template: `
        <div>
            My name is {{$route.params.firstname}} {{$route.params.lastname}}
        </div>
    `
}

const router = new VueRouter({
    routes: [
        {
            path: '/user/:firstname/:lastname',
            component: User
        }
    ]
})
```

Params Changes

Note that when a routes render the same component, the same component instance will be reused, so lifecycle hooks of the component will not be called again.

To trigger params changes, we can use the `beforeRouteUpdate` guard (>= 2.2)

```
const User = {
    beforeRouteUpdate (to, from, next) {
        // Do something
    }
}
```

Best practices for props

We saw that our props are accessible in ***$route.params***. But this syntax can be hard to understand when many props are passed. A better way to do is to use ***props*** option.

```
const User = {
    props: ['id'],
    template: '<div>User {{ id }}</div>',
}
const router = new VueRouter({
    routes: [
        {
            path: '/user/:id',
            component: User,
            props: true
        }
    ]
})
```

As we can see, ***id*** is now directly passed as prop to our component.

Named routes

Every routes can have a name in addition of their paths. To do so we just need to precise it in the route declaration.

```
const router = new VueRouter({
    routes: [
        {
            path: '/user',
            name: 'user',
            component: User
        }
    ]
})
```

```
<router-link :to="{ name: 'user' }">
    User
</router-link>
```

Named routes

- Named routes can be very useful when we want to pass props directly from our HTML.

```
const router = new VueRouter({
    routes: [
        {
            path: '/user/:userId',
            name: 'user',
            component: User
        }
    ]
})
```

```
<router-link :to="{ name: 'user', params: { userId: 42 }}">
    User
</router-link>
```

Named views

Named views can be used when we want to render many views at the same time. For that we just need to pass a parameter to router-view called ***name***.

Example :

```
<router-view></router-view>
<router-view name="sidebar"></router-view>
<router-view name="navbar"></router-view>
```

```
const router = new VueRouter({
    routes: [
        {
            path: '/',
            components: {
                default: Main,
                sidebar: Sidebar,
                navbar: Navbar,
            }
        }
    ]
})
```

A router-view without a name will be given default.

Programmatic Navigation

Inside of a Vue instance, you have access to the router instance as $router.

- We can use $router to navigate :

```
this.$router.push({ name: 'user', params: { userId: 42 }})
```

same as

```
<router-link :to="{ name: 'user', params: { userId: 42 }}" />
```

- To replace our current history entry.

```
this.$router.replace(...)
```

same as

```
<router-link :to="..." replace />
```

- Or to go forwards or go backwards in the history stack.

```
this.$router.go(-1)
```

Redirect

Vue router allow us to redirect path, for example redirect from '/foo' to '/bar'

```
const router = new VueRouter({
  routes: [
    {
      path: '/foo',
      redirect: '/bar'
    }
  ]
})
```

We can also use a function instead of passing a hard coded path :

```
const router = new VueRouter({
  routes: [
    {
      path: '/foo',
      redirect: to => {
        // Code here
      }
    }
  ]
})
```

Alias

An alias can be used when we want to apply the same logic to some routes.

For example if we want to share the component Main to both paths `/` and `/home` we will use an alias.

Example :

```
const router = new VueRouter({
  routes: [
    {
      path: '/',
      component: Home,
      alias: '/home'
    }
  ]
})
```

Lazy-loading Routes

When application starts to grown, application bundle does too. A good solution to gain performance is to load on demand when the route is accessed.

Here is a basic example of how we can process to do so :

```
import Main from './routes/Main'

const routes = [
  {
    path: '/main',
    component: Main
  },
  {
    path: '/other',
    component: () => import('./routes/LazyLoadedPage')
  }
]
```

Thanks to `() => import('...')` our file LazyLoadedPage will be loaded only when visiting.

Lab 7

Data Fetching

Overview

- What is Vue.js
- The Vue instance
- Components
- Vue-CLI
- Directives
- Filters
- Routing
- *Data fetching*
- Plugins
- Typescript
- Vuex
- Testing
- Server Side rendering

Data fetching

Most of the time we want to fetch data from a remote source or consume an API in our applications.

At first, vue-resource was used to answer this need but since the creator of Vuejs (Evan You) has announced that the Vue.js team is retiring vue-resource, Axios is recommanded.

Axios

Axios is one of the most popular HTTP client libraries, it uses promises by default and runs on both the client and the server (so we can combine with async/await). In addition, it is universal, supports cancellation, and has TypeScript definitions.

Installation :

```
$ npm install axios --save
```

Fetching Data

Here is a basic example of how we can get some data from an url :

```
new Vue({
    el: '#app',
    methods: {
        getData: function() {
            axios.get('http://www.example.com/data')
            .then(function(response) {
                console.log(response.data);
            })
            .catch(function(error) {
                console.log(error);
            });
        }
    }
})
```

POST data

Example :

```
new Vue({
    el: '#app',
    methods: {
        getData: function() {
            axios.post('http://www.example.com/data', {
                body: 'toto',
            })
            .then(function(response) {
                console.log(response.data);
            })
            .catch(function(error) {
                console.log(error);
            });
        }
    }
})
```

Create a base instance

Axios allows us to create a base instance to make it easier to configure. We need attributes such as base url or headers.

Example :

```
const HTTP = axios.create({
  baseURL: 'http://www.example.com',
  headers: {
    Authorization: 'authorized token'
  }
})

...
getData: function() {
    HTTP.get('data')
    .then(function(response) {
        console.log(response.data);
    })
    .catch(function(error) {
        console.log(error);
    });
}
...
```

Lab 8

Plugins

Overview

- What is Vue.js
- The Vue instance
- Components
- Vue-CLI
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- Filters
- Routing
- Data fetching
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- Server Side rendering

Why plugins ?

- Add global methods or properties (**vue-router**)
- Register global directives, components, filters... (**vuetify**)
- Enrich components behavior with global mixins (**vuex**)
- Add methods to the Vue instance (**this.$store**, **this.$route**)
- Add an external library with custom API (**vue-router**)

Using a plugin

- Just call `Vue.use`

```
import myPlugin from './path/to/myPlugin'

Vue.use(myPlugin, { myPluginOption: true })
```

- `Vue.use` automatically prevent multiple initialization

```
import myPlugin from './path/to/myPlugin'
Vue.use(myPlugin, { config: 1 })
Vue.use(myPlugin, { config: 2 })
Vue.use(myPlugin, { config: 3 })

// myPlugin is initialized with {config: 1}
```

- awesome-vue, the list of Vue plugins

Writing a plugin

- export an object with `install` function

```
export default {

  install (Vue, options) {
    // Add anything you want via Vue instance in params
  }

}
```

Writing a plugin

- You can add VueJS components, filters, directives

```
export default {

  install (Vue, options) {
    Vue.directive('my-directive', { /* ... */ })
    Vue.component('my-component', { /* ... */ })
    Vue.filter('my-filter', () => { /* ... */})
  }

}
```

Writing a plugin

- You can add global method or property

```
export default {

  install (Vue, options) {
    Vue.myGlobalMethod = function () {/* ... */}
    Vue.myGlobalObject = {}
  }

}
```

Writing a plugin

- You can add an instance method
- We usually prefix method with a $

```
export default {

  install (Vue, options) {
    Vue.prototype.$myMethod = function (arg) { return arg * 2; }
  }

}
```

- You can now use $myMethod in each components

```
export default {
  name: 'my-component',
  data() {
    return {
      toto: this.$myMethod(21)
    }
  }
}
```

Lab 9 - Bonus

Typescript

Overview

- What is Vue.js
- The Vue instance
- Components
- Vue-CLI
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- Filters
- Routing
- Data fetching
- Plugins
- *Typescript*
- Vuex
- Testing
- Server Side rendering

Introduction

- Language created by **Anders Hejlsberg** in 2012
- Open source project maintained by **Microsoft**
- Inspired by **JavaScript**, **Java** et **C#**
- Alternatives : CoffeeScript, Dart, Haxe or Flow

Functionalities

TypeScript is a language for application-scale JavaScript development. It's a typed superset of JavaScript that compiles to plain JavaScript. It allow to write components as classes using properties, decorators and using data types.

- **ES2015+**
- Typing
- Generics
- Classes / Interfaces / Inheritance
- Modular development
- configuration files
- Mixins
- Decorator

Installation

With **vue-cli 4** it's easier to play with TypeScript. During the creation process you can add TypeScript plugin when prompt asks you.

Or use the `add` command:

```
vue add typescript
```

This generates base files as `App.vue` with TypeScript configuration and completes webpack configuration to work with TS:

```
config.rule('ts')
config.rule('ts').use('ts-loader')
config.rule('ts').use('babel-loader') (when used alongside @vue/cli-plugin-babel)
config.rule('ts').use('cache-loader')
config.plugin('fork-ts-checker')
```

Declaring component with Typescript

As we can see, we now use the ***@Component*** decorator from ***vue-property-decorator*** to declare our component. It transforms the class into a format that Vue can understand during the compilation process.

```
import { Component, Vue } from 'vue-property-decorator';

@Component
export default class MyUser extends Vue {
  fullName: any
}
```

Also, our data properties are no longer declared in a ***data*** option but directly in our component, followed by property type.

Passing props

For passing props, we will use again the ***vue-property-decorator*** by calling ***@Prop*** decorator.

```
import { Component, Prop, Vue } from 'vue-property-decorator'

@Component
export default class MyUser extends Vue {
    @Prop({default: 'John Doe'}) // We set a default value for our prop
    fullName: string
}
```

Component method

Component methods are no longer declared in ***methods*** element option but directly in the component as data.

```
import { Component, Vue } from 'vue-property-decorator'

@Component
export default class MyUser extends Vue {
    logIn () {
        alert('Logged')
    }
}
```

Computed Properties

Computed properties are written as getters and setters in the class.

```
import { Component, Vue } from 'vue-property-decorator'

@Component
export default class MyUser extends Vue {
    get myComputedExample() {
        return console.log('Computed getter example')
    },

    set myComputedExample(value) {
        return console.log('Computed setter example')
    }
}
```

Watchers

Watchers from ***vue-property-decorator*** have the same behaviour as Vue vanilla version but the syntax is more clear.

```
import { Component, Vue, Watch } from 'vue-property-decorator'

@Component
export default class MyUser extends Vue {
    fullName: string

    @Watch('fullName') // We trigger here the data we want to watch
    onPropertyChanged(value: string, oldValue: string) {
        console.log(value, oldValue)
    }
}
```

Create custom decorator

vue-class-component allow us to create custom decorator. For that we just need to import ***createDecorator()*** and declare our new custom decorator.

```
import { createDecorator } from 'vue-class-component'

export const ReverseTab = createDecorator((options, key) => {
  options.computed[key] = options.computed[key].reverse()
})
```

```
import { ReverseTab } from './decorators'

@Component
class MyUser extends Vue {
    myTab = [1, 2, 3]

    @ReverseTab
    get myTab () {
        return this.myTab
    }
}
```

Adding Custom Hooks

Component.registerHooks allows us to register such hooks as :

```
import { Component, Vue } from 'vue-class-component'

Component.registerHooks([
    'beforeRouteEnter',
    'beforeRouteLeave'
])
```

```
import { Component, Vue } from 'vue-class-component'

@Component
class MyUser extends Vue {
  beforeRouteEnter () {
    console.log('beforeRouteEnter')
  }

  beforeRouteLeave () {
    console.log('beforeRouteLeave')
  }
}
```

Note that you have to register the hooks before component definition.

Lab 10 - Bonus

Vuex

Overview

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Vuex - Intro

Vuex is a state management pattern + library for Vue.js applications and inspired by ***Flux***, ***Redux*** and ***The Elm Architecture***. It serves as a centralized store for all the components in an application.

The basic idea behind that is that passing props for deeply nested components can be painful and hard to maintain, so why not extract shared state out of the components, and manage it in a global singleton?

Installation

Vuex need to be installed in your app with npm.

```
$ npm install vuex --save
```

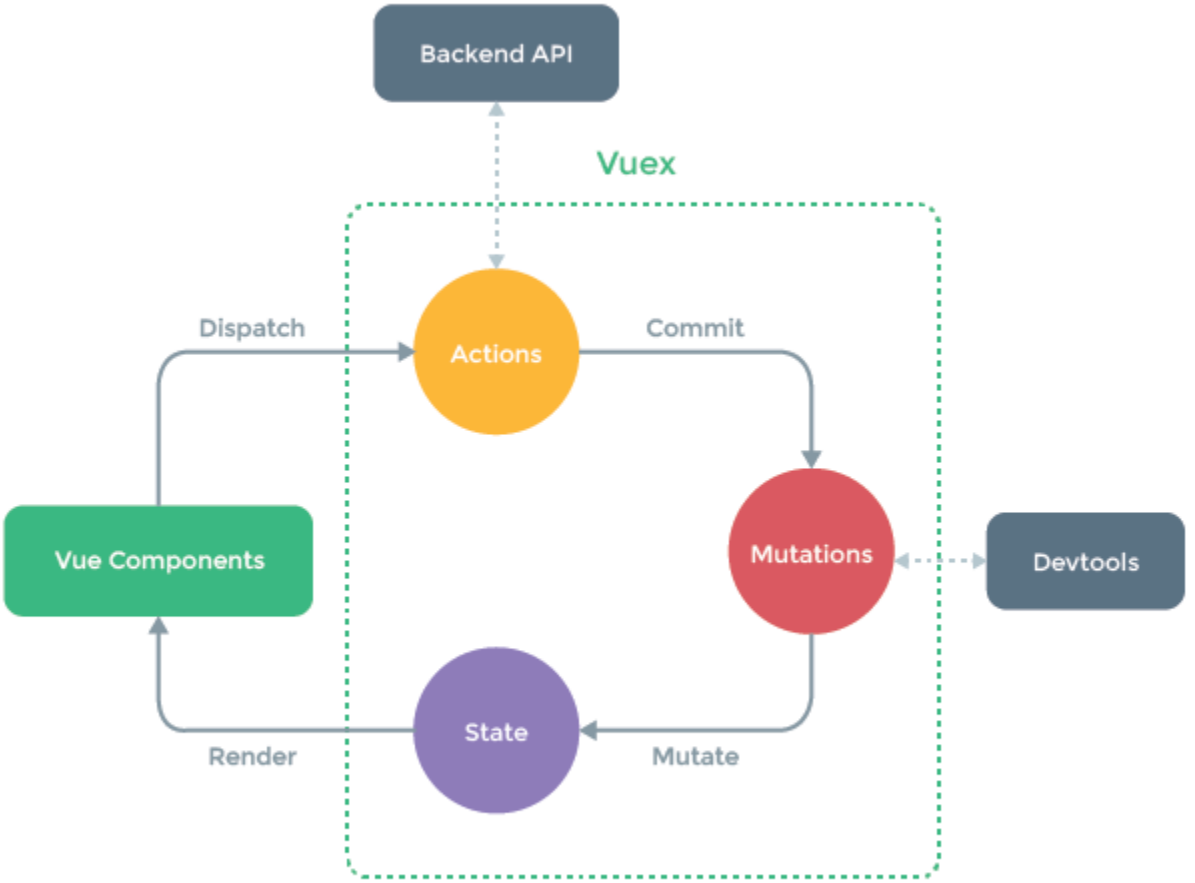
Make sure to enable Vuex in your app by using :

```
import Vue from 'vue';
import Vuex from 'vuex';
import App from 'App.vue';

Vue.use(Vuex);

new Vue({
    el: '#app',
    render: h => h(App)
});
```

State management with Vuex



Creating a store

A store is a container that will hold your application state. It cannot be accessed or modified directly in order to ensure a consistent state.

```
// store.js
const store = new Vuex.Store({
    state: {
        count: 0
    }
})

// app.js
import Vue from 'vue';
import Vuex from 'vuex';
import App from 'App.vue';
import { store } from './store.js'; // importation of our store

Vue.use(Vuex);

new Vue({
    store, // passing our store as option
    el: '#app',
    render: h => h(App)
});
```

Store injection

Injecting our store into the root Vue instance will automatically into every other component in our app.
We will be able to access to our store by simply using ***this.$store***

Example :

```
console.log(this.$store.state.count) // -> 0
```

Getters

Sometimes we may need to compute derived state based on store state. For that we will use a concept of Vuex.store that is called ***Getters***. Getters can be saw as 'computed properties for store'.

In our example we will ask to our store to return a list of todos where done is equal true :

```
const store = new Vuex.Store({
    state: {
        todos: [
            { id: 1, done: true },
            { id: 2, done: false },
        ]
    },
    getters: {
        doneTodos: state => {
            return state.todos.filter(todo => todo.done)
        }
    },
})

store.getters.doneTodos // -> [{id: 1, done: true }]
```

Getters

Getters will also receive other getters as the 2nd argument.

Example :

```
getters: {
    doneTodosCount: (state, getters) => {
        return getters.doneTodos.length
    }
}

store.getters.doneTodosCount // -> 1
```

Also you can pass arguments to getters by returning a function :

```
getters: {
    getTodoById: (state, getters) => (id) => {
        return state.todos.find(todo => todo.id === id)
    }
}

store.getters.getTodoById(2) // -> { id: 2, done: false }
```

Mutations

Direct modification of state in Vuex is done by calling a function called a mutation. Vuex mutations are very similar to events.
A mutation is passed the current state and an optional payload.

Example :

```
const store = new Vuex.Store({
    state: {
        count: 0
    },
    mutations: {
        increment (state, n) {
            state.count += n
        }
    }
})

store.commit('increment', 10) // -> count = count + 10
```

Note that mutations must be synchronous and shouldn't return a value. It ensure state is not dependent on the sequence.

Actions

Actions are similar to mutations but instead of mutating the state, actions commit mutations. They can contain arbitrary asynchronous operations.

We need to pass the entire state context as parameter to access getters and commit mutations. Multiple mutations are allowed inside an action.

Example :

```
const store = new Vuex.Store({
    ...
    actions: {
        increment (context) {
            context.commit('increment')
        }
    }
})

store.dispatch('increment')
```

Actions

Note that if we want to use async / await we can use something like this :

```
// assuming `getData()` and `getOtherData()` return Promises

actions: {
    async actionA ({ commit }) {
        commit('gotData', await getData())
    },
    async actionB ({ dispatch, commit }) {
        await dispatch('actionA') // wait for `actionA` to finish
        commit('gotOtherData', await getOtherData())
    },
}
```

Modules

Vuex allows us to divide our store into modules. Each module can contain its own state, mutations, actions, getters.

```
const moduleA = {
  state: { ... },
  mutations: { ... },
  actions: { ... },
  getters: { ... }
}
const moduleB = {
  state: { ... },
  mutations: { ... },
  actions: { ... }
}
const store = new Vuex.Store({
  modules: {
    a: moduleA,
    b: moduleB
  }
})

store.state.a // -> `moduleA`'s state
store.state.b // -> `moduleB`'s state
```

Modules

If you want your modules to be reusable, you can mark it as namespaced. When the module is registered, all of its getters, actions and mutations will be automatically namespaced based on the path the module is registered at.

Example :

```
const store = new Vuex.Store({
    modules: {
        account: {
            namespaced: true,
            state: { ... },
            getters: {
                isAdmin () { ... } // -> getters['account/isAdmin']
            },
            actions: {
                login () { ... } // -> dispatch('account/login')
            },
            mutations: {
                login () { ... } // -> commit('account/login')
            },
        }
    }
})
```

Lab 11

Testing

Overview

- What is Vue.js
- The Vue instance
- Components
- Vue-CLI
- Directives
- Filters
- Routing
- Data fetching
- Plugins
- Typescript
- Vuex
- *Testing*
- Server Side rendering

Test runner

- You must use...**any runner you like**
- Official recommandation

➔ Works with webpack and browserify

- Alternative thanks to jsdom

⚠ When you use .vue files, you should use jest-vue-preprocessor

Test framework

- Jasmine

- Mocha / Chai

- Jest

Testing Vue

Test the instance

```
import Vue from 'vue'
import MyComponent from 'path/to/MyComponent.vue'

describe('MyComponent', () => {
  it('should have a default title', () => {
    const vm = new Vue(MyComponent).$mount()
    expect(vm.title).toBe('awesome title')
  })

  it('should render the title', () => {
    const vm = new Vue(MyComponent).$mount()
    expect(vm.$el.outerHTML).toBe('<h1>awesome title</h1>')
  })
})
```

Component testing

`Vue.extend` to pass custom props

```
import Vue from 'vue'
import MyComponent from 'path/to/MyComponent.vue'

describe('MyComponent', () => {
  it('should use the props title', () => {
    const Ctor = Vue.extend(MyComponent)
    const vm = new Ctor({
      propsData: { title: 'my custom title'}
    }).$mount()
    expect(vm.title).toBe('my custom title')
  })
})
```

Async updates

`Vue.nextTick` to trigger DOM update

```
import Vue from 'vue'
import MyComponent from 'path/to/MyComponent.vue'

describe('MyComponent', () => {
  it('should update the title', done => {
    const vm = new Vue(MyComponent).$mount()
    vm.title = 'next title'
    expect(vm.$el.textContent).toBe('default title')
    Vue.nextTick(() => {
      expect(vm.$el.textContent).toBe('next title')
      done()
    })
  })
})
```

Vue testing tools

vue-test-util

- Testing tools for Vue
- Check the Documentation

```
import { mount } from '@vue/test-utils'
import MyComponent from 'path/to/MyComponent.vue'

describe('MyComponent', () => {
  it('should use the props title', () => {
    const wrapper = mount(MyComponent, {
      propsData: { title: 'my custom title'}
    })
    expect(wrapper.vm.title).toBe('my custom title')
  })

  it('should render the title', () => {
    const wrapper = mount(MyComponent)
    expect(wrapper.html()).toBe('<h1>awesome title</h1>')
    expect(wrapper.first('h1').text()).toBe('awesome title')
  })
})
```

vue-test-util

- Mock instance methods

```
import { mount } from '@vue/test-utils'
import MyComponent from 'path/to/MyComponent.vue'

describe('MyComponent', () => {
  it('should mock router', () => {
    const $route = {path: 'http://www.example-path.com'}
    const wrapper = mount(MyComponent, {
        globals: {
          $route
        }
    })
    expect(wrapper.vm.$route.path).toEqual($route.path);
  })
})
```

vue-test-util

- Shallow render

```
import { shallowMount } from '@vue/test-utils'
import MyParentComponent from 'path/to/MyParentComponent.vue'
import MyChildComponent from 'path/to/MyChildComponent.vue'

describe('MyComponent', () => {
  it('should render only my component', () => {
    const wrapper = shallowMount(MyParentComponent)
    expect(wrapper.contains(MyChildComponent)).toBe(true)
  })
})
```

Lab 12

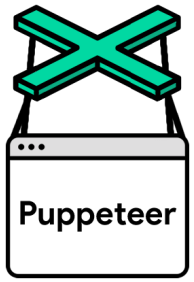
Going deeper

End to end

- Works fully with Vue
- Nightwatch

- Cypress

- Puppeteer



Server Side Rendering

Overview

- What is Vue.js
- The Vue instance
- Components
- Vue-CLI
- Directives
- Filters
- Routing
- Data fetching
- Plugins
- Typescript
- Vuex
- Testing
- *Server Side rendering*

Server side rendering vs Client side rendering

Initially, web frameworks had views rendered at the server. Whenever you want to see a new web page, your browser makes a request to the server and it returns the HTML content needed.

But today front end frameworks introduced the fact that content is rendered directly in the browser using JavaScript.
The main benefit is that the browser will not make another request to the server when you want to load more content. It will reload only the part we want to.

Disadvantage of using client-side-rendering is that can be bad for SEO.
Several search engines are unable to crawl well the content.
Another point is that the initial load can be slow. Browser will first ask to the server the HTML content and then our javascript app content that contains all our application.

Building a server side rendering with Express

We will use ***vue-server-renderer*** and ***express*** to build a server side rendering application.

```
$ npm install express vue-server-renderer --save
```

Rendering a vue instance

```
const Vue = require('vue')
const server = require('express')()
const renderer = require('vue-server-renderer').createRenderer()

server.get('*', (req, res) => {
    const app = new Vue({
        data: {
          url: req.url
        },
        template: '<div>The visited URL is: {{ url }}</div>'
    })
renderer.renderToString(app, (err, html) => {
    res.end('
        <html lang="en">
            <head><title>Hello World!</title></head>
            <body>${html}</body>
        </html>
    ')
  ...

server.listen(8080)
```

Using a template page

Let's go ahead by using an HTML template file instead of writing it in our javascript code.

index.template.html

```
<html lang="en">
  <head><title>Hello world!</title></head>
  <body>
    <!--vue-ssr-outlet-->
  </body>
</html>
```

main.js

```
const renderer = createRenderer({
  template: require('fs').readFileSync('./index.template.html', 'utf-8')
})
renderer.renderToString(app, (err, html) => {
  console.log(html)
})
```

vue-ssr-outlet is where your app's markup will be injected, it's similar to the ***el*** option of instance.

Nuxt

Nuxt is an other alternative to avoid client side rendering. Nuxt is a framework built on top of the Vue.js Instead Nuxt offers server side rendering or static file rendering to boost the performance of your web application.

Nuxt - Directory Structure

- `assets`: un-compiled assets such as Less, Sass or JavaScript
- `Components`: Vue.js Components. Nuxt.js doesn't supercharge the data method on these components
- `Layout`: Application Layouts
- `Middleware`: custom functions that can be run before rendering either a page or a group of pages (layouts)
- `Pages`: Application Views and Routes.
- `Plugins`: Javascript plugins that you want to run before instantiating the root Vue.js Application.
- `Static`: static files served on /
- `Store`: Vuex store files

Nuxt - Routing

```
pages/
--| user/
-----| index.vue
-----| _id.vue
--| index.vue
```

will generate

```
router: {
  routes: [
    {
      name: 'index',
      path: '/',
      component: 'pages/index.vue'
    },
    {
      name: 'user',
      path: '/user',
      component: 'pages/user/index.vue'
    },
    {
      name: 'user',
      path: '/user/:id',
      component: 'pages/user/id.vue'
    }
```

Nuxt - Template Layout

Nuxt add the following properties and hook to each page components :

- `asyncData`: equivalent to the data attribute, it can be asynchronous and receives the context as argument.
- `fetch`: Used to fill the store of vuex before rendering the page, it's like the data method except it doesn't set the component data.
- `head`: Set specific Meta Tags for the current page.
- `layout`: Specify a layout defined in the layouts directory.
- `transition`: Set a specific transition for the page.
- `scrollToTop`: Specify if you want the page to scroll to the top before rendering the page, it's used for nested routes. It set to `false` by default
- `validate`: Validator function for dynamic routes.
- `middleware`: Set a middleware for this page, the middleware will be called before rendering the page.

Nuxt - Vuex

Inside `store/index.js` classic store.

Each `store/myModule.js` create a namespaced module.

Lab 13 - Bonus