SOFTWARE ARCHITECTURE

Escuela de Ingeniería Informática

Universidad de Oviedo

Lab 5

React
Building automation
Dependency management

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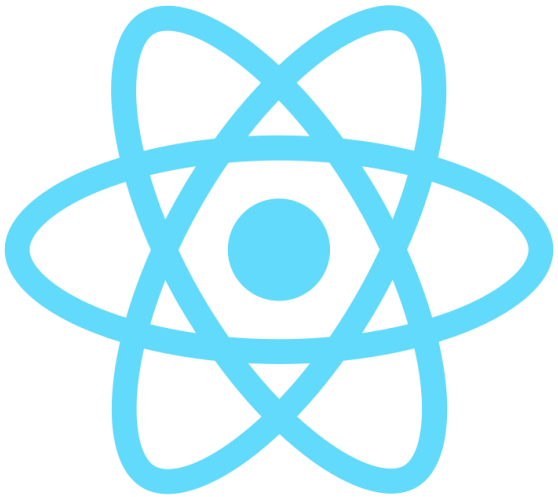
What is React.js?

React = JavaScript library for building user interfaces for the web as well as mobile applications

- Open source
- Created by Facebook (Meta)
- Based on components



Why React?

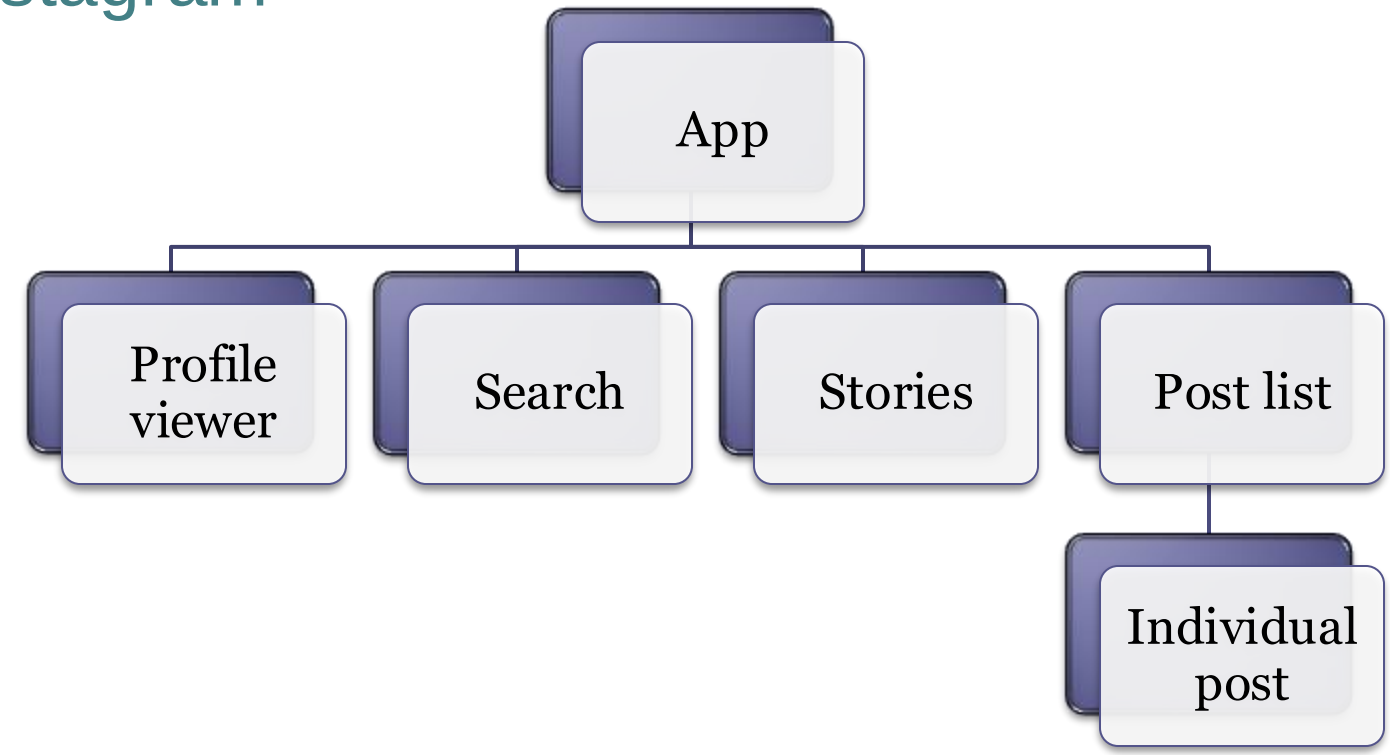
- Some reasons to use React:
  - Popularity
  - Simplicity and easy to learn
  - Reusable components
  - Native approach (React Native)
  - Lots of resources and tools for development
  - Testability

Components

Pages are modelled using components

A component is a part of the user interface

Example: Instagram



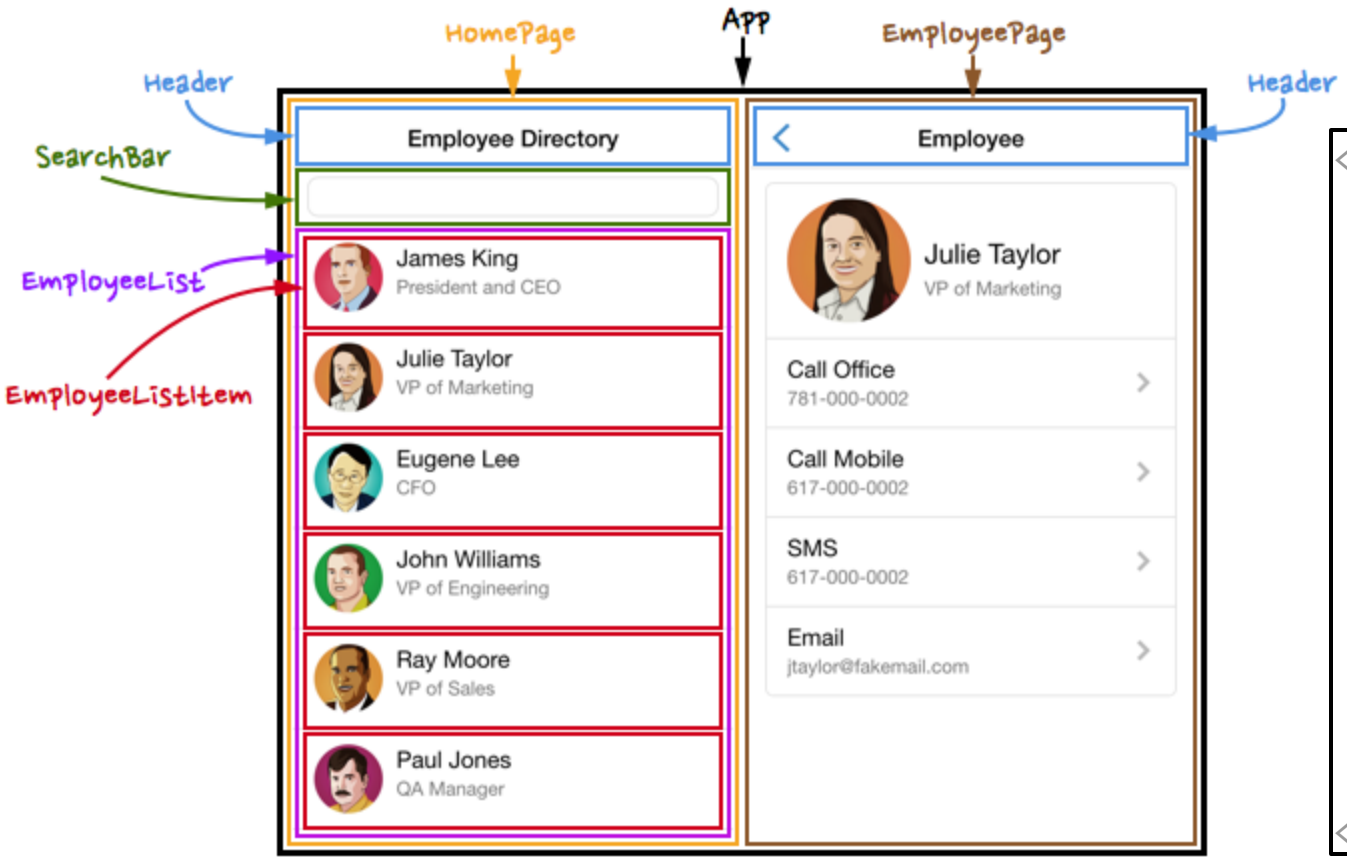
Components

A component can be implemented as a JavaScript function (Hook)

- It has a state
- And a `render` method that controls what is displayed in UI
- When the state changes, react updates the element and its child's in memory
- This element representation in memory is called Virtual DOM

React **reacts** to changes

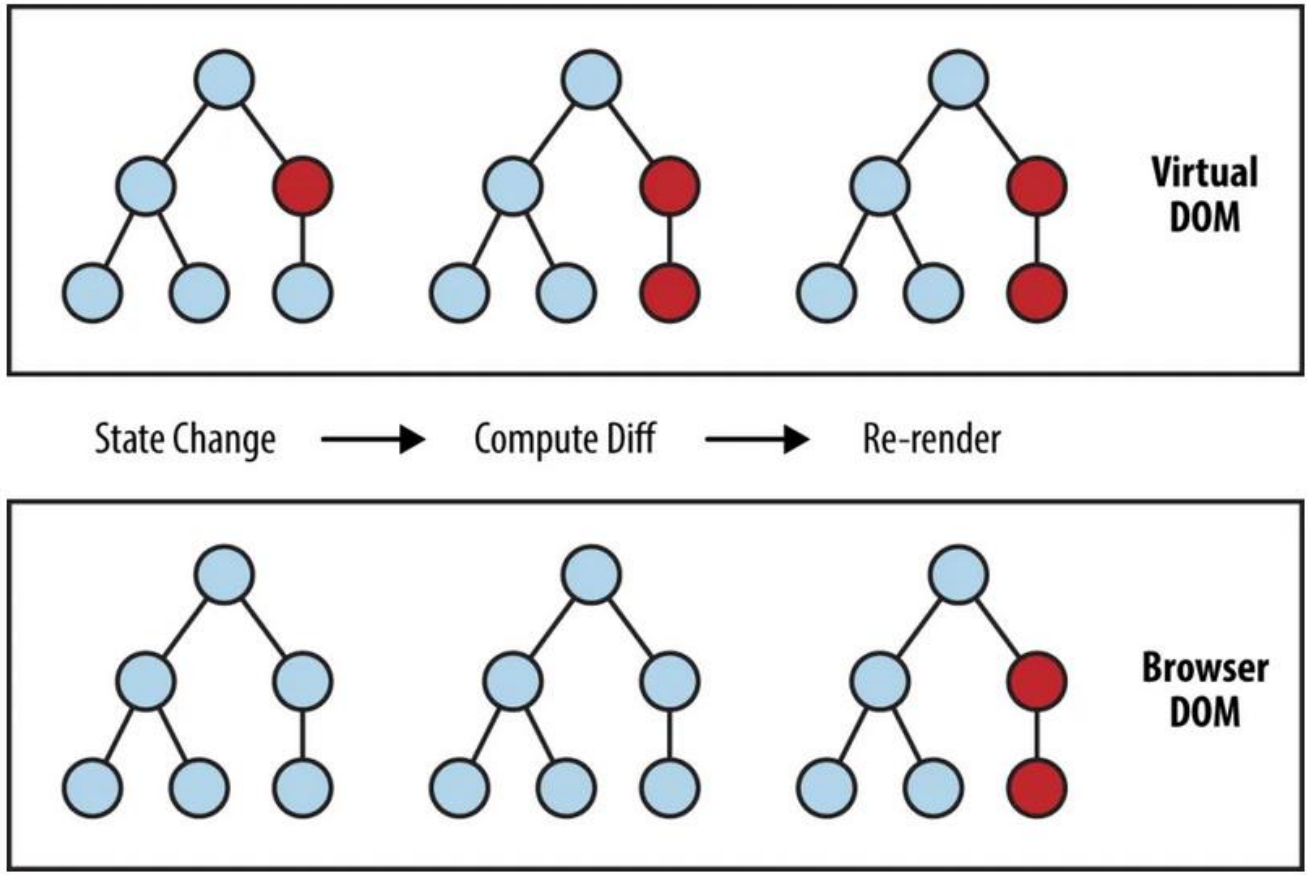
Example of components




```
<App>
  <HomePage>
    <Header />
    <SearchBar />
    <EmployeeList>
      <EmployeeListItem person="James King" />
      <EmployeeListItem person="Julie Taylor" />
      <EmployeeListItem person="Eugene Lee" />
      ...
    </EmployList>
  </HomePage>
  <EmployeePage>
    <Header />
    ...
  </EmployeePage>
</App>
```

Fuente: Client-side Web Development, https://info340.github.io

Virtual DOM



source: https://www.oreilly.com/library/view/learning-react-native/9781491929049/ch02.html

JSX (Javascript XML)

JSX is a syntax extension to Javascript

- Looks like HTML
- JSX files are compiled to Javascript

JSX

```
const element = (
  <h1 className="greeting">
    Hello, world!
  </h1>
);
```

Javascript

```
const element = React.createElement(
  'h1',
  {className: 'greeting'},
  'Hello, world!'
);
```

Components defined with Hooks

Hooks introduced in version 16, replace classes by functions

- In the following example, we use the `useState` hook to handle the name changes in the app
- Once the button is clicked, the state is changed, the virtual DOM updated, and the page is automatically refreshed

```
const App = () => {
    const [name, setName] = useState('World');
    return (
        <div className="App">
            <h1>Hello, {name}!</h1>
            <button onClick={() => setName('James')}>
                Click me to change the name
            </button>
        </div>
);}
```

Additional documentation

Exercises about React state (in Spanish)

- Ej1 Create a counter
- Ej2 Complex states(objects)
- Ej3 Different handlers()
- Ej4 Adding elements to an array
- Ej5 Change a component's behaviour (background color)

Additional documentation

Exercises rendering in React

- Ej1 Array rendering
- Ej2 Refactoring
- Ej3 Adding elements to the array
- Ej4 Adding elements from a form

Additional documentation

Asynchronous programming

- Ej1 Fetch() -> Do an API request
- Ej2 useEffect()
- Ej3 Conditional rendering
- Ej4 One Refactoring
- Ej5 Requests using axios library

Additional documentation

Exercises using Typescript + React

- Ej1 Counter with typescript
- Ej2 2nd exercise
- Ej3 Example of an interface

Additional documentation

More links

- Course Bootcamp Fullstack
- First Node.js conference by Ryan Dahl
- Vite (https://vitejs.dev/)

Software builders

- Tasks
  - Compilation
    - From source code to binary code
  - Packaging
    - Dependency management and integration
    - Also called linking
  - Test execution
  - Deployment
  - Documentation creation / *release notes*

Building automation

Automatize building tasks

Objectives:

- Avoid errors (minimize "*bad buildings*")
- Eliminate redundant and repetive tasks
- Manage complexity
- Improve the product quality
- Store a building and release history
- Continuous integration
- Save time and money

Automation tools

- Makefile (C)
- Ant (Java)
- Maven (Java)
- Npm (Node.js)
- SBT (Scala, JVM languages)
- Gradle (Groovy, JVM languages)
- rake (Ruby)
- cargo (Rust)
- etc.

npm

Node.js **P**ackage **M**anager

- Initially created by Isaac Schlueter
- Later became Npm inc.

3 things:

1. Website (https://www.npmjs.com/)
   - User and organization management
2. Software registry
   - Public/private packages
3. CLI application
   - Dependency and task management
   - Configuration file: package.json

npm configuration: package.json

- Configuration file: package.json
  - npm init creates a simple skeleton
- Fields:

```
{
 "name":                 "...mandatory...",
 "version":              "...mandatory...",
 "description":          "...optional...",
 "keywords":             "...",
 "repository":           {... },
 "author":               "...",
 "license":              "...",
 "bugs":                 {...},
 "homepage":             "http://. . .",
 "main":                 "index.js",
 "devDependencies":      { ... },
 "dependencies":         { ... }
 "scripts":              { "test": " ... " },
 "bin":                  {...},
}
```

Note: Yeoman provides fully featured scaffolding

npm packages

Registry: http://npmjs.org

Installing packages:

2 options:

Local

```
npm install <packageName> --save (--save-dev)
```

Store the dependency in the `package.json`

Only for development

Downloads `<packageName>` contents to `node_modules` folder

Global

```
npm install -g <packageName>
```

npm dependencies

- Dependency management
  - Local packages are cached at `node_modules` folder
  - Access to modules through: `require('...')`
- Global packages (installed with --global option)
  - Saved in /usr/local/npm (Linux OS)
- Scoped packages marked by @
- Referencing a module inside our project

```
var uc = require('upper-case');
```

npm commands and scripts

npm contains lots of commands

- `start` -> node service.js
- `test` -> jest
- `ls` lists installed packages
- ...

Custom scripts:

- `run <name>`

More complex tasks in NodeJs

- Gulp, Grunt

https://docs.npmjs.com/cli-documentation/

npm packages

- Dependencies: Stored in package.json
- Package: Identified by name and version
- Rule for names:
  - Less than or equal to 214 characters.
  - Can't start with a dot or an underscore.
  - New packages must not have uppercase letters in the name.
  - The name ends up being part of a URL, an argument on the command line, and a folder name. Therefore, the name can't contain any non-URL-safe characters.

npm semantic versioning

- Version of the package: Semantic versioning
  - Must be parseable by node-semver
- Ranges: Comparators which specify versions that satisfy the range
  - For example, the comparator >=1.2.7 would match the versions 1.2.7, 1.2.8, 2.5.3, and 1.3.9, but not the versions 1.2.6 or 1.1.0.
  - More at https://docs.npmjs.com/misc/semver

npm package.json fields

Reference: https://docs.npmjs.com/files/package.json

Fields:

- description
- keywords
- homepage: URL to Project homepage
- bugs: URL of project's issue tracker and/or the email address to which issues should be reported
- people fields: author, contributors.
  - The "author" is one person. "contributors" is an array of people. A "person" is an object with a "name" field and optionally "url" and "email"

npm package.json fields

- files: An array of file patterns that describes the entries to be included when your package is installed as a dependency
- file patterns follow a similar syntax to .gitignore, but reversed:
  - Including a file, directory, or glob pattern (*, **/*, and such) will make it so that file is included in the tarball when it's packed.
  - Omitting the field will make it default to ["*"], which means it will include all files.

npm files included

- Certain files are always included, regardless of settings:
  - package.json
  - README
  - CHANGES / CHANGELOG / HISTORY
  - LICENSE / LICENCE
  - NOTICE
  - The file in the “main” field

npm package.json fields

- main: module ID that is the primary entry point to your program
  - This should be a module ID relative to the root of your package folder.
  - For most modules, it makes the most sense to have a main script and often not much else.
- browser: If the module is meant to be used client-side the browser field should be used instead of the main field.
  - This is helpful to hint users that it might rely on primitives that aren't available in Node.js modules (eg a window).

npm package.json fields

- repository: the place where the code lives.

```
"repository": {
  "type" : "git",
  "url" : "https://github.com/npm/cli.git"
}

"repository": {
  "type" : "svn",
  "url" : "https://v8.googlecode.com/svn/trunk/"
}
```

npm package.json fields

- config: Used to set configuration parameters used in package scripts that persist across upgrades.

```
{
  "name" : "foo" ,
  "config" : { "port" : "8080" }
}
```

npm package.json fields

- dependencies: Dependencies are specified in a simple object that maps a package name to a version range.
  - The version range is a string which has one or more space-separated descriptors.
  - Version ranges based on semantic versioning:
    - See https://docs.npmjs.com/misc/semver

npm package.json fields

- devDependencies: Dependencies required to delevop the application such as unit tests.
- URL dependencies:
  - You may specify a tarball URL in place of a version range.
  - This tarball will be downloaded and installed locally to your package at install time.

```
<protocol>://[<user>[:<password>]@]<hostname>[:<port>][:][/]<path>[#<commit-ish> | #semver:<semver>]
```

npm

- GIT URLs: Following form:

```
<protocol>://[<user>[:<password>]@]<hostname>[:<port>][:][/]<path>[#<commit-ish>|#semver:<semver>]
```

- Example

```
git+ssh://git@github.com:npm/cli.git#v1.0.27
git+ssh://git@github.com:npm/cli#semver:^5.0
git+https://isaacs@github.com/npm/cli.git
git://github.com/npm/cli.git#v1.0.27
```

Task Execution : Grup and Gulp

Execute JavaScript tasks:

- Compress images
- Package modules (webpack)
- Minimize js and css files
- Run tests
- Transcompile – babel.js

These tasks can be directly run with npm scripts or with Gulp and/or Grunt

Task Execution : Grup y Gulp

- Grup:
  - Module fs
  - Installation:

```
npm install -g grunt
npm install -g grunt-cli
```

  - package.json configuration

```
{  "name": “ASW",
   "version": "0.1.0",
   "devDependencies": {
      "grunt-contrib-jshint": "~0.10.0",
      "grunt-contrib-nodeunit": "~0.4.1",
      "grunt-contrib-uglify": "~0.5.0"
   }
}
```

- Gulp:
  - Module stream
  - Installation:

```
npm install --save-dev gulp
npm install -g gulp-cli
```

  - gulpfile.js configuration

```
function defaultTask(cb) {
 // tasks
 cb();
}
exports.default = defaultTask
```

Examples

Wrapper

```
module.exports = function(grunt) {
   // CONFIGURE GRUNT
   grunt.initConfig({
(pkg.name)
      pkg: grunt.file.readJSON('package.json'),
    });
   grunt.loadNpmTasks('grunt-contrib-uglify');
   grunt.registerTask('default', ['uglify']);
};
```

Wrapper

```
gulp.task('jpgs', function()
{ return gulp.src('src/images/*.jpg')
.pipe(imagemin({ progressive: true }))
.pipe(gulp.dest('optimized_images')); });
```

End