Introduction to React.js

SENG 4640
Software Engineering for Web Apps
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Review

- **JavaScript:** a general-purpose, easy-to-use programming language
- **DOM:** representation of structure of HTML page, which can be manipulated using JavaScript
- **jQuery:** library that simplifies accessing/using the DOM

What is React?

- JavaScript library for building user interfaces
- HTML page is composed of recyclable, interactive **'components'** that have a lifecycle during which the state of the component changes
- Highly efficient because of notion of **VirtualDOM**
- Created and maintained by Facebook
- Used in production by many well known companies

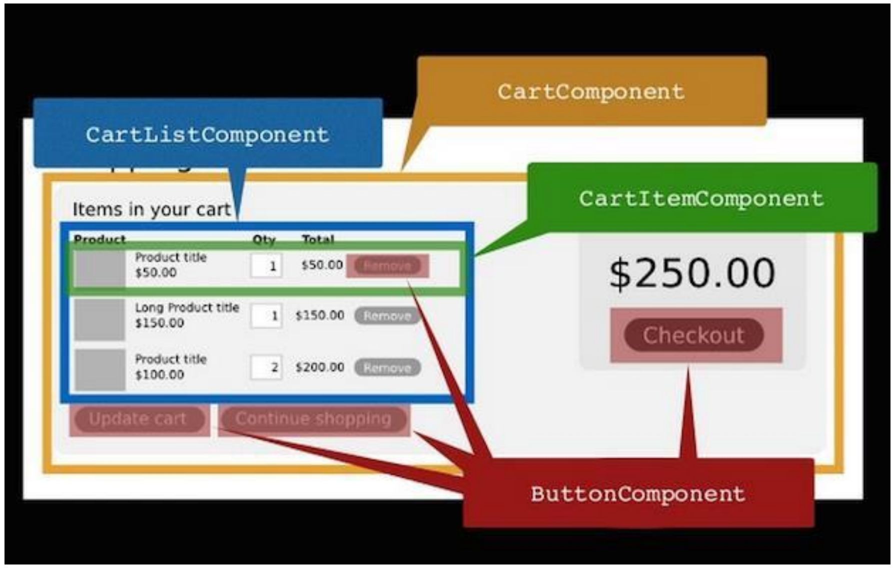
- Netflix
- WhatsApp, Instagram
- Atlassian (BitBucket, HipChat, Jira)
- Codecademy
- Airbnb
- Pinterest
- Dropbox
- PayPal
- Reddit
- Salesforce
- Squarespace
- New York Times
- Treehouse
- eBay
- Trulia
- Expedia
- Visa
- Wolfram Alpha

Why React?

- **Modularity:** organize code into reusable components that can work together
- **Lifecycle maintenance:** modifying component based on state; event listeners; simplified conditional rendering
- **JSX:** write HTML within JavaScript

Components

- Building blocks of React
- Make up the nodes included in the VirtualDOM
- Include and maintain a **state** that changes with events
- Each component maintains state independently
- Applications can be configured to respond to component level events



VirtualDOM

- Node tree that represents HTML elements, their attributes, and content as objects and properties
- **Selectively** renders and re-renders **subtrees** of nodes based on state changes
- Efficient because it does the least amount of DOM manipulation to update components
- Provides a layer of abstraction to the developer, providing simpler programming model and high performance

Normal DOM – How it Works

- When a node is updated, the browser updates (re-renders) **all** nodes

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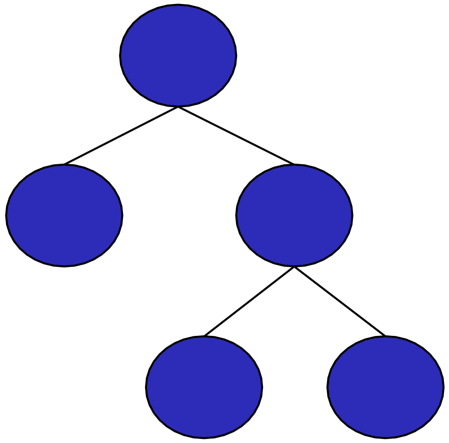

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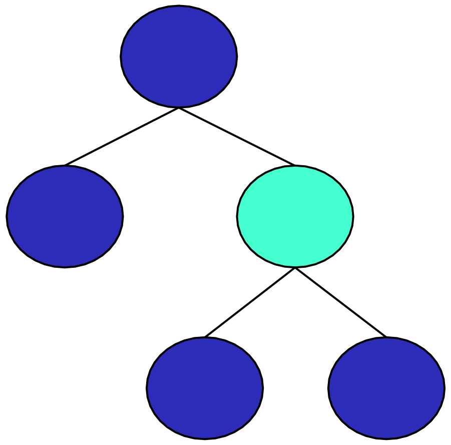

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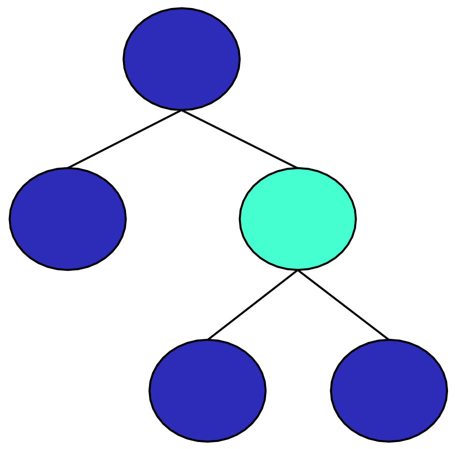

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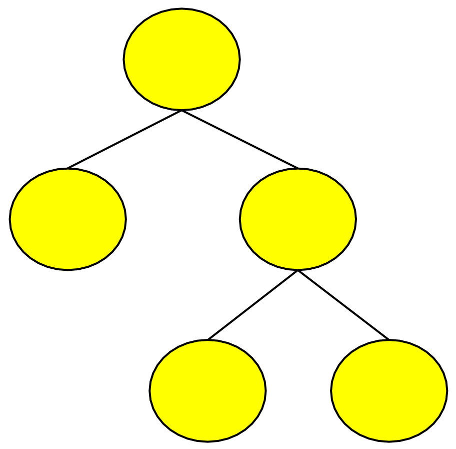

*Re-render **all** nodes to reflect the change*

VirtualDOM – How it Works

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    - **‘diff’** to determine which nodes within DOM have changed
    - **‘reconciliation’** to update the nodes that are affected

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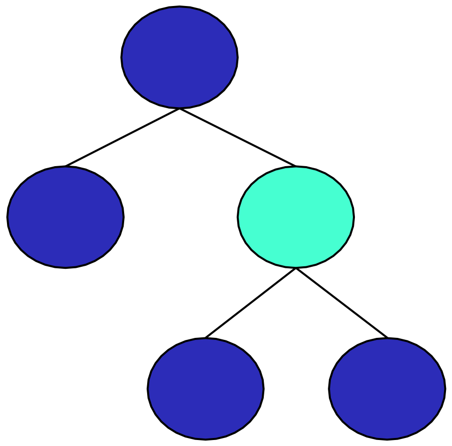

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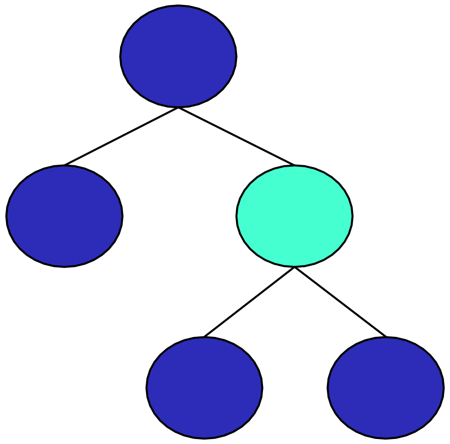

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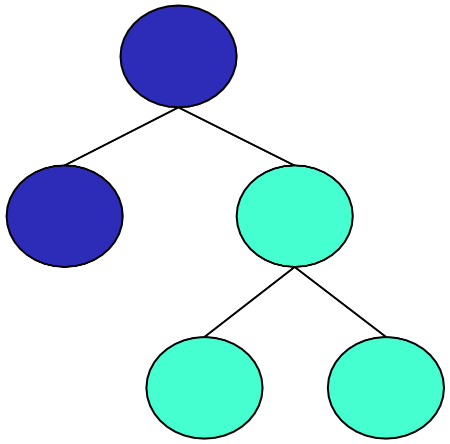

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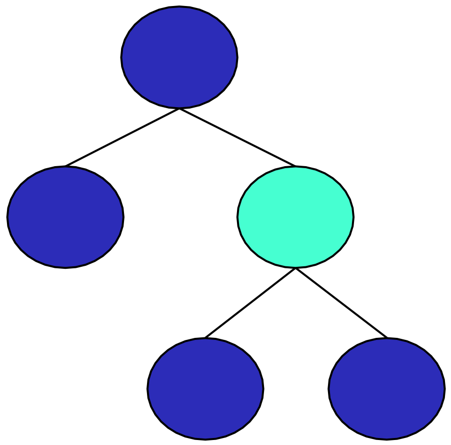

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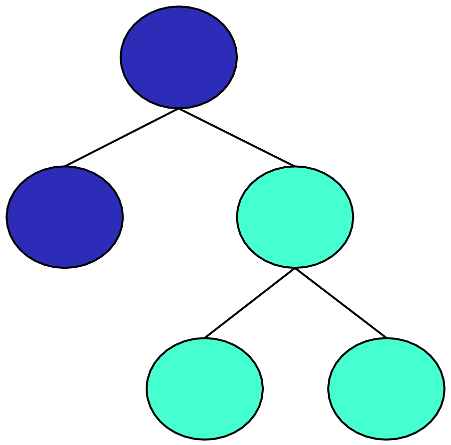

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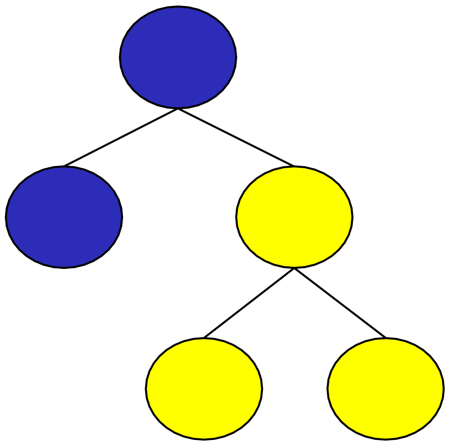

*Re-render **ONLY** the nodes that were affected by change*

Developing with React

1. Within the page's HTML, allocate a position on the page in which the desired React component will be rendered, e.g. a `div`

2. Create a React component in JavaScript
   - Establish an initial state
   - Define any events that could change the component's state over its lifecycle
   - Define the function to render the HTML

3. Drop the component into position allocated in Step 1

Getting Started

- Create a **`div`** in the HTML to represent the location where the React component will be placed
- Write JavaScript code to create and display component in **`div`**

```
<!DOCTYPE html>
<html>
  <head>
      <title>ReactJS Example</title>
      <script src="react.js"></script>
      <script src="react-dom.js"></script>
  </head>
  <body>
      <div id="container"></div>
      <script type="text/babel">
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            <!-- or add online libraries -->
<script src="https://unpkg.com/react@18/umd/react.development.js" crossorigin></script>
<script src="https://unpkg.com/react-dom@18/umd/react-dom.development.js" crossorigin></script>
<script src="https://unpkg.com/@babel/standalone/babel.min.js"></script>
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JSX

- JSX – JavaScript XML Syntax Transform
- Allows user to write HTML-like tags within JavaScript
- Converts text (HTML) to React code

Rendering Elements using JSX

```
<body>
   <div id="container"></div>
   <script type='text/babel'>

     ReactDOM.createRoot
     (document.getElementById("container")).
     render(<h1>Hello React!</h1>);

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Looking Ahead

- Defining React components
- Reacting to user events
- Interaction between React components
- Developing large applications with React