React

Virtual DOM

vs

Real DOM

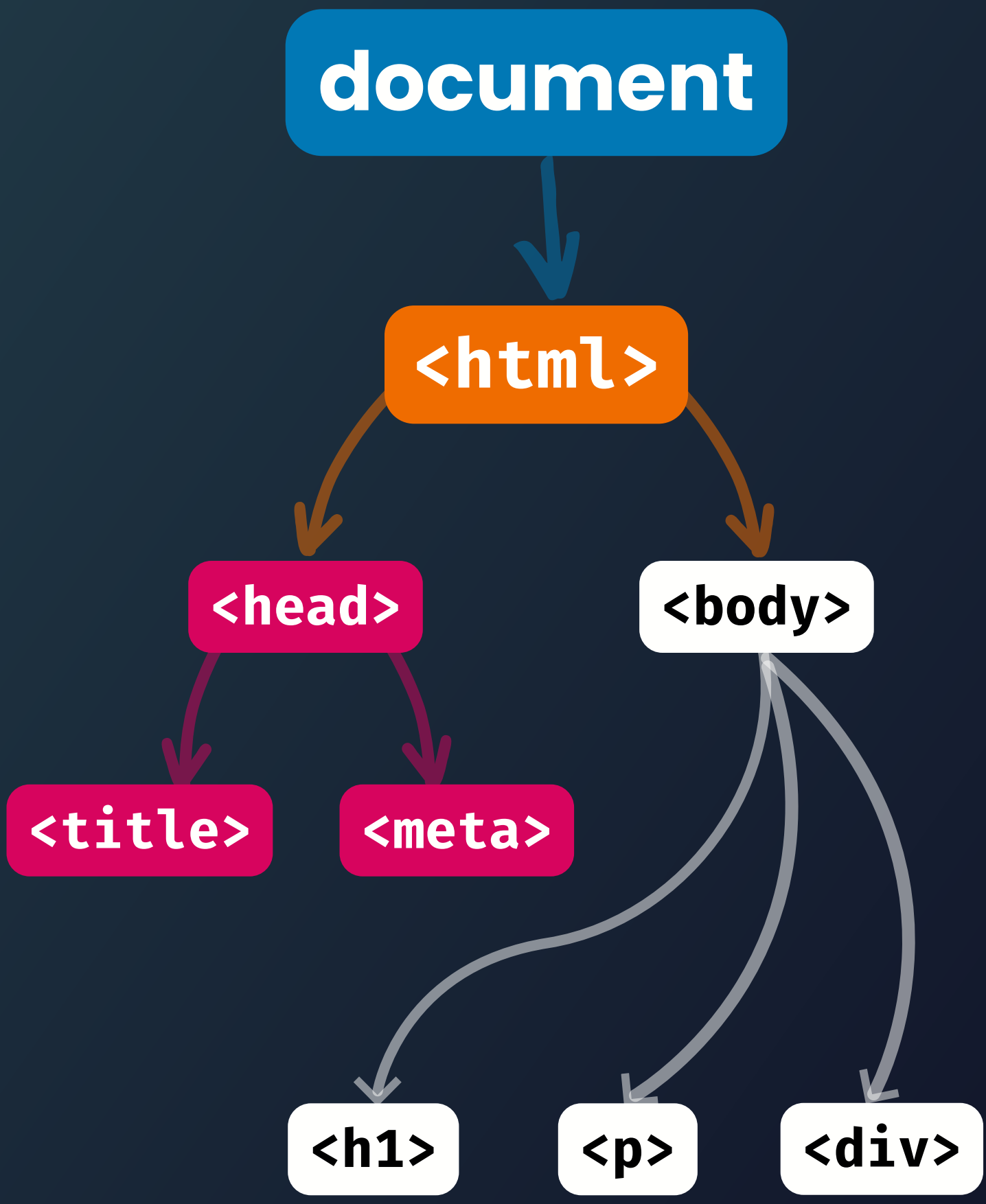
like and share

What is DOM?

The DOM is an abstraction of a page's HTML structure. It takes HTML elements and wraps them in an object with a tree-structure — maintaining the parent/child relationships of those nested HTML elements. This provides an API that allows us to traverse nodes (HTML elements) and manipulate them in a number of ways — such as adding nodes, removing nodes, editing a node's content, etc.

Real DOM

DOM: An HTML Structure



The Problem with DOM

```
let fruits = ['Apple', 'Orange', 'Banana']
```

Lets say we want to update here from Orange to Lemon. Then we need to create a new array.

```
let fruits = ['Apple', 'Lemon', 'Banana']
```

In an efficient way we can just traverse to the fruits[1] and update only this element.

Now it's common to have a thousands node in a single SPA. So repainting the whole page for each change is very-very expensive.

Ideally, we'd like to only re-render items that receive updates, leaving the rest of the items as-is.

The Methods of update

Dirty Checking (slow)

In AngularJS 1.x, data changes were checked by recursively traversing every node at fixed intervals, which was inefficient as it required examining all nodes even if their data was up-to-date.

Observable (fast)

Components are responsible for listening to when an update takes place. Since the data is saved on the state, components can simply listen to events on the state and if there is an update, it can re-render to the UI. React uses it.

Virtual DOM

The Virtual DOM is a light-weight abstraction of the DOM.

You can think of it as a copy of the DOM, that can be updated without affecting the actual DOM.

It has all the same properties as the real DOM object, but doesn't have the ability to write to the screen like the real DOM.

The virtual DOM gains it's speed and efficiency from the fact that it's lightweight.

A new virtual DOM is created after every re-render.

Under the hood

Reconciliation is a process to compare and keep in sync the two files (Real and Virtual DOM). Diffing algorithm is a technique of reconciliation which is used by React.

Is Shadow DOM same as the Virtual DOM?

No, they are different. The Shadow DOM is a browser technology designed primarily for scoping variables and CSS in web components. The virtual DOM is a concept implemented by libraries in JavaScript on top of browser APIs.

Update Process in React

On the first load, ReactDOM.render() will create the Virtual DOM tree and real DOM tree.

As React works on Observable patterns, when any event(like key press, left click, api response, etc.) occurred, Virtual DOM tree nodes are notified for props change, If the properties used in that node are updated, the node is updated else left as it is.

React compares Virtual DOM with real DOM and updates real DOM. This process is called Reconciliation. React uses Diffing algorithm technique of Reconciliation.

Updated real DOM is repainted on browser.

Additional Info

Virtual DOM is pure JS file and light weight, So capturing any update in Virtual DOM is much faster than directly updating on Real DOM.

React takes a few milliseconds before reconciliation. This allows react to bundle few processes. This increases efficiency and avoids unnecessary reprocessing. Because of this delay we should not rely on `state` just after `setState()`.

React does shallow comparison of props value. We need to handle deep comparison separately, immutable is the most common way to handle it.

Want explanation on
- Reconciliation and Diffing Algorithm?
- Use of keys in lists in React?

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