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2021

# Components and State

## The Foundations of React

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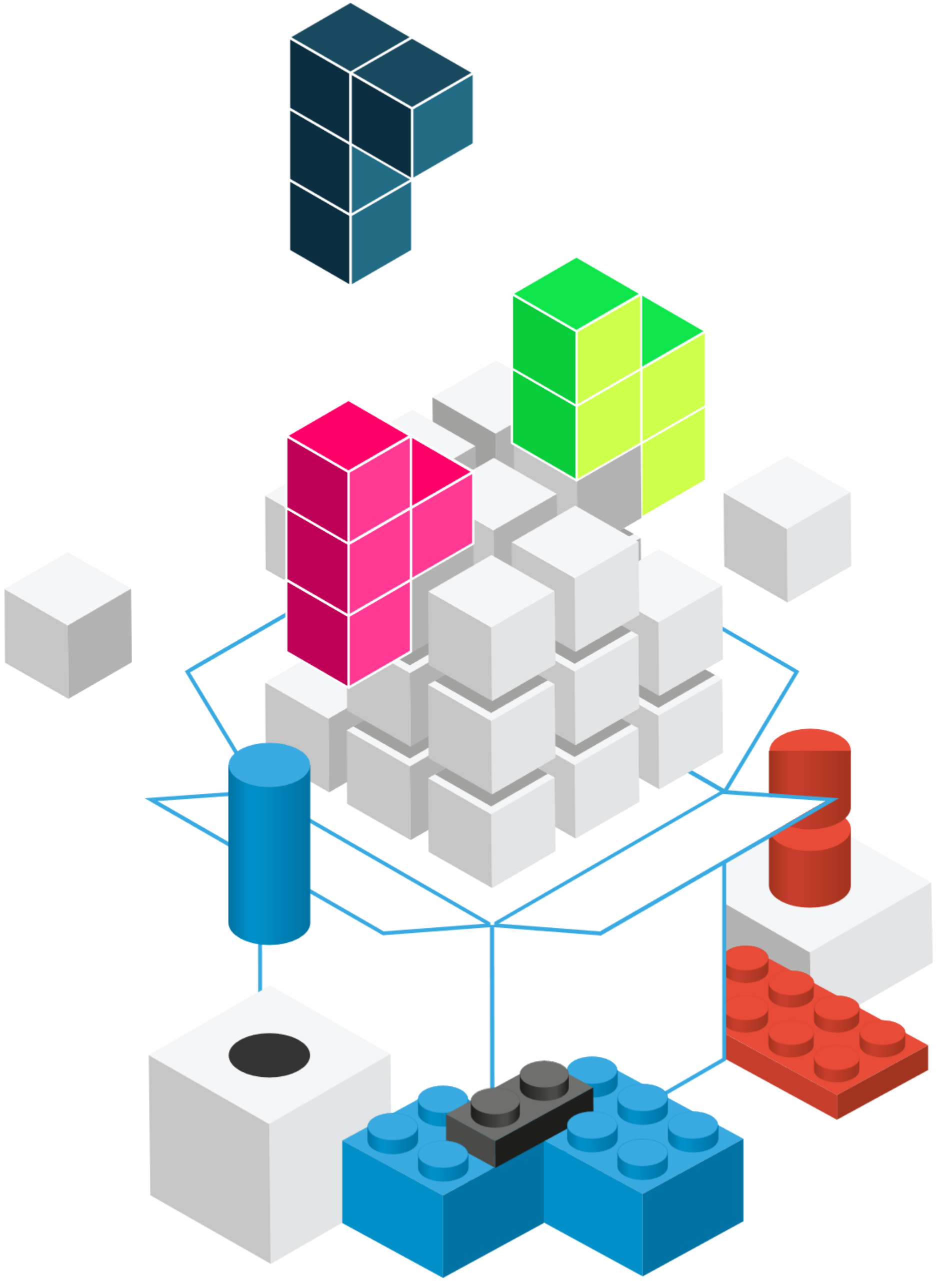


# Outline

- React Components
  - Props and State
- React design process
  - Top-down information flow

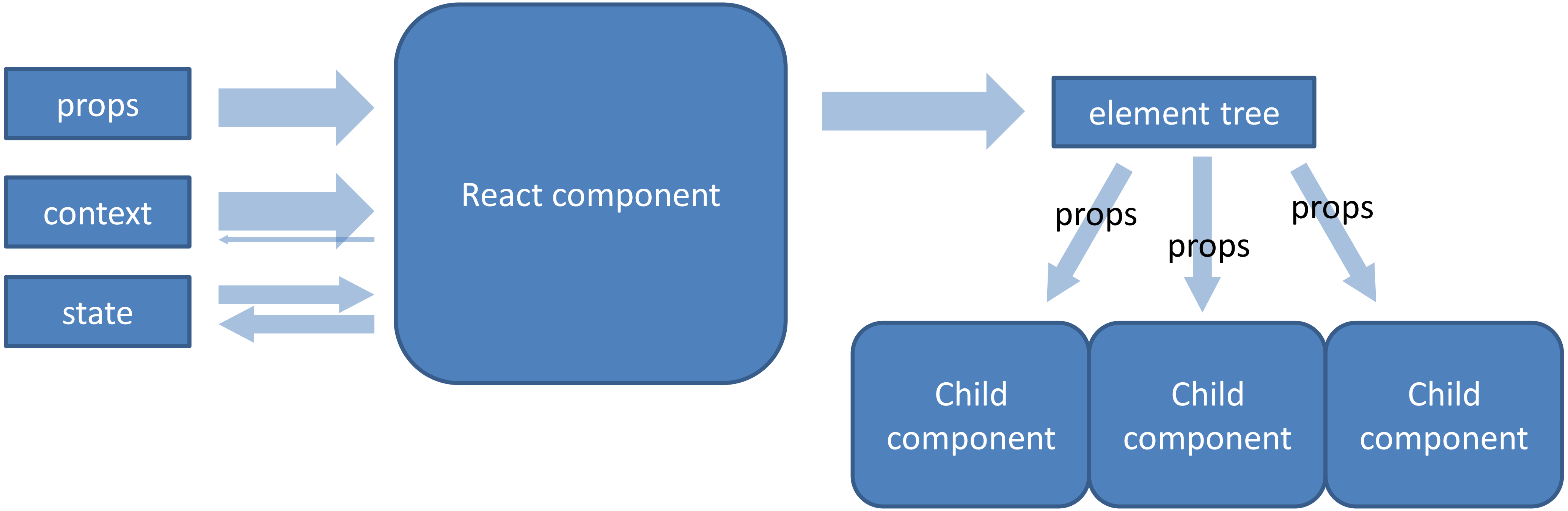
https://reactjs.org/docs/react-component.html

Full Stack React, Chapter “Advanced Component Configuration with props, state, and children”

React Handbook, Chapters “Props” and “State”

# COMPONENTS: PROPS AND STATE

# Props, State, Context



# Props, State, Context

- **Props** are immutable pieces of data that are passed into child components from parents
- **State** is where a component holds data, locally
  - When state changes, usually the component needs to be re-rendered
  - State is *private* to the component and is *mutable* from inside the component, only
- **Context** is a sort of “global” and “implicit” props, that are automatically passed to all interested components

# Passing Props

- In JSX, every attribute is converted to a prop
  - `<Header headerText='Hello'/>`
  - `props.headerText` will contain the string `"hello"`
- `props` is the argument of the Component Function and collects all passed props
  - They are all read-only
- May be any JS object, or other React elements
  - `<UserError level={3}/>`
  - `<ResultsTable displayData={latestResults}/>`

# State

- An object containing local data, private to a component, that may be mutated by the component itself
- To define a state variable, use the `useState` hook

# State Example

```
function WelcomeButton(props) {
  let [english, setEnglish] =
    useState(true) ;

  return (<button>
      {english ? 'Hello' : 'Ciao'}
    </button>) ;
}
```

- Call `useState` with the *initial version* of an object describing the component state
- Inside the component, you may refer the state variable to customize the result according to the current state
- Never n-e-v-e-r modify the state variable directly
  - Always use the set*Variable* function

# State Modifications

- **All** modifications to the state must be requested through set*Variable*(*newValue*)
- It will apply the modification asynchronously (not immediately)

- New Value as a function
  - `(old_state) => updated_state`
  - Must return a **new** state value
  - Must **not** mutate the passed-in state

# Calling State Changes

- State changes are usually determined by asynchronous events
  - DOM event handlers
  - Server responses (e.g., API calls)
- The event handler is a function that in turn calls set*Variable*

```
function WelcomeButton(props) {
  let [english, setEnglish] =
    useState(true) ;

    const toggleLanguage = () => {
      setEnglish( e => !e ) ;
    }

  return (<button onClick={toggleLanguage}>
      {english ? 'Hello' : 'Ciao'}
    </button>);
}
```

# Calling State Changes

- State changes are usually determined by asynchronous events
  - DOM event handlers
  - Server responses (e.g., API calls)
- The event handler is a function that in turn calls set*Variable*
  - Often implemented as an arrow function

```
function WelcomeButton(props) {
  let [english, setEnglish] =
    useState(true) ;

  return (<button
    onClick={()=>setEnglish((eng)=>(!eng))}>
      {english ? 'Hello' : 'Ciao'}
    </button>);
}
```

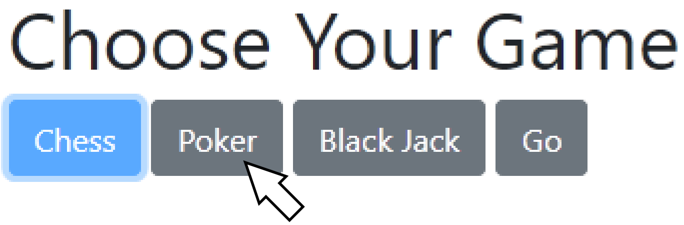
# Function or Object in setVariable?

- If the logic for computing the next state depends on the current state, **always** use a function
- ✗ `setCounter(counter+1)`
  - `counter` is evaluated when `setCounter` **is called**
  - The new state will be assigned later, asynchronously
  - In case many asynchronous requests are made, some update may rely on out-of-date information
- ✓ `setCounter((cnt)=>(cnt+1))`
  - The arrow function will be evaluated when the async call is made, with an up-to-date value of `cnt`: guaranteed to have the latest value

https://medium.com/@wisecobbler/using-a-function-in-setstate-instead-of-an-object-1f5cfd6e55d1

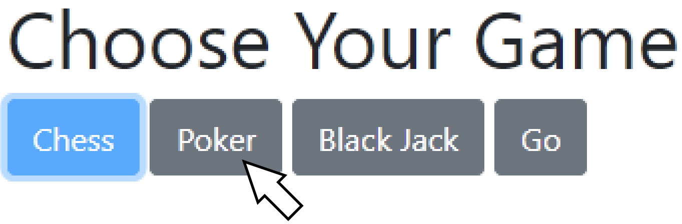
# Can Children Mutate Parent’s State?

- Each button may be selected or not, but only one may be selected at a time
- The information about what button is selected may not be in the button
- It is a state of a container component for “button group”

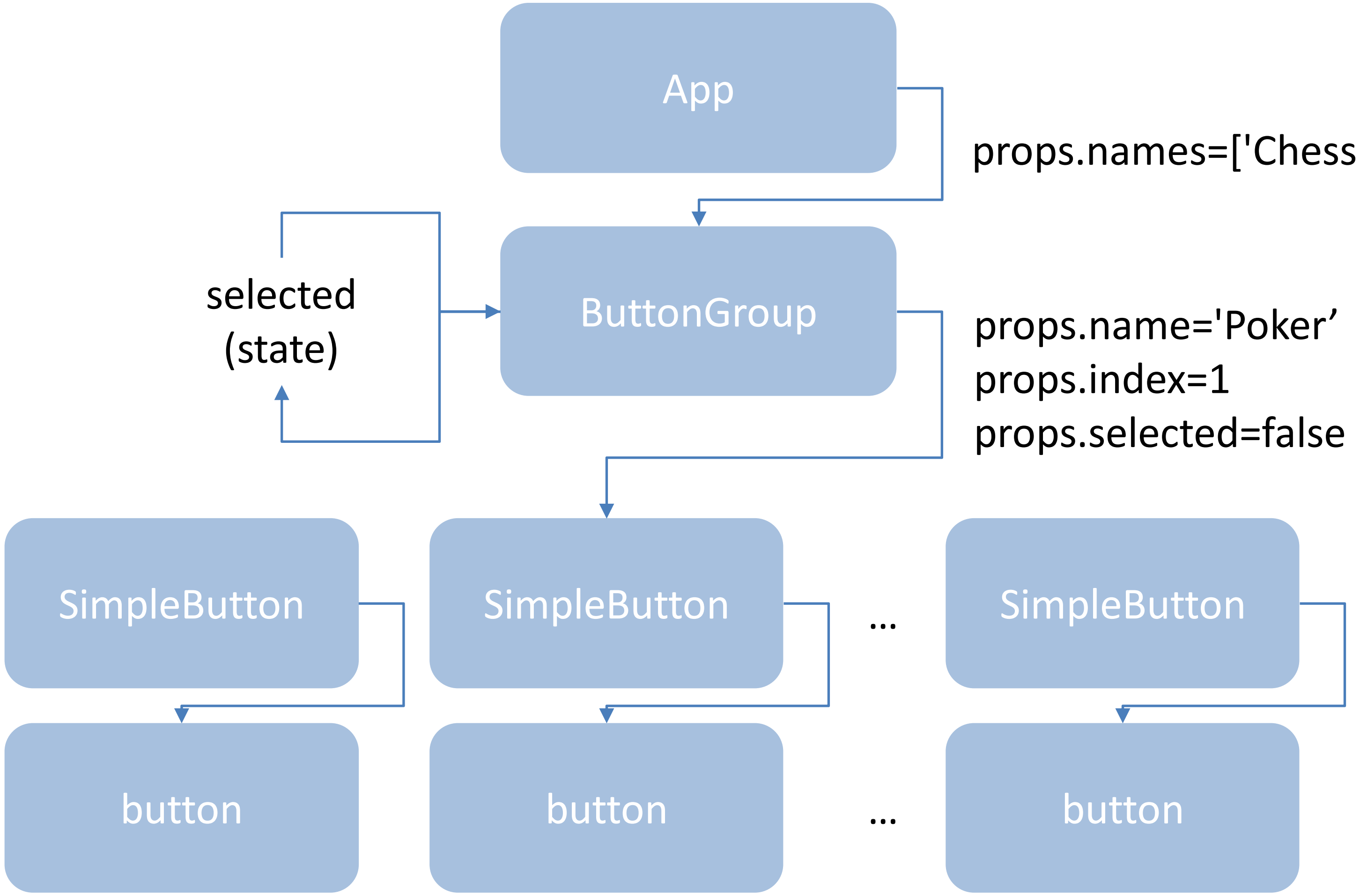


Choose Your Game

# Analysis



Choose Your Game



App

props.names=['Chess', 'Poker', 'Black Jack', 'Go']

selected
(state)

ButtonGroup

props.name='Poker’
props.index=1
props.selected=false

SimpleButton

SimpleButton

…

SimpleButton

<button> attributes
Bootstrap classes

button

button

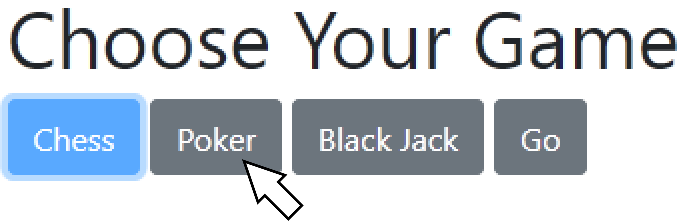
…

button

# How To Change The Chosen Button?

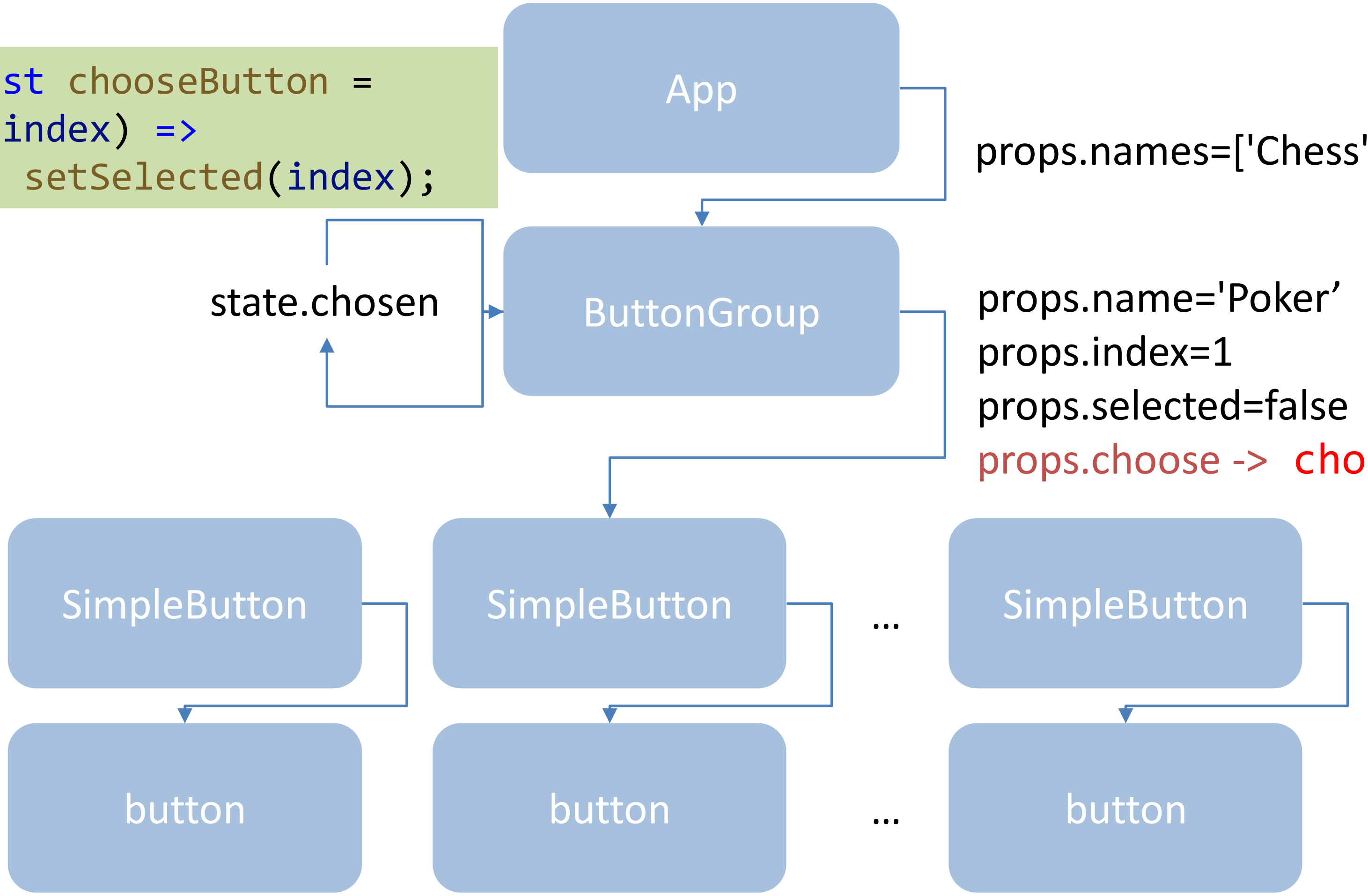
- Handle `onClick` event from the button
- ButtonGroup must offer a method for changing the chosen option
  - will call `setSelected()`
- The method reference must be passed down to SimpleButton, with all other props

# Solution



Choose Your Game

```
const chooseButton =
  (index) =>
    setSelected(index);
```



props.names=['Chess', 'Poker', 'Black Jack', 'Go']

props.name='Poker’
props.index=1
props.selected=false
props.choose -> `choose={chooseButton}`

<button> attributes
Bootstrap classes

```
onClick={() =>
  props.choose(props.index)}
```

# React Design Hints

- Try to implement *stateless* components instead of *stateful* ones
  - Stateless components are more reusable
  - Stateless components are faster to execute
  - Stateless components may be declared as a pure function
- Move *state* to common ancestors (“state lifting”)
- Pass *state* down to the children using *props*
- Allow children to ask for state updates, by passing down callback functions

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