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#RahoAmbitious

Full-Stack Software Development

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Course: Advanced Frontend Development Using React

Lecture on: Introduction to React

Instructor: Mrigank Kaushik

Today's Agenda

1. Introduction to React
2. History of React
3. Advantages of React
4. React Environment
    a. Role of Babel, Webpack and ESLint
5. Single-Page and Multi-Page Applications and their advantages over each other

Introduction to React

So far, we have discussed a lot about JavaScript. We also covered the concepts of Advanced JavaScript and its application in performing various tasks dynamically.

Introduction to React

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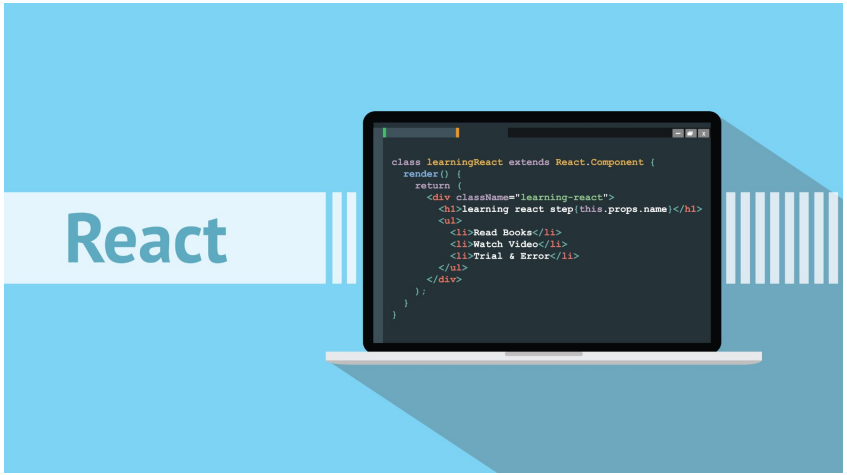
It is now time to learn about ReactJS, which is a popular JavaScript library. You will be introduced to ReactJS and the notion of it being a popular JavaScript library to build user interfaces.



Suppose you want to find a book in a library. What will you do?

You will log into the library computer system, enter the details of the book and find out the room number and shelf number where the book is kept.

You are not concerned about the functionalities of the system inside the computer, which was used to find the book shelf number, rather you simply want your output.

This is how React works.

Introduction to React

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- Before starting with React, let us see what library is in terms of computer science.
- Library is a collection of pre-written code in terms of subroutines, classes, values or type specifications, being reused by computer programs.
- So, React is a library that performs its task and you need not be concerned about its inner functionalities.

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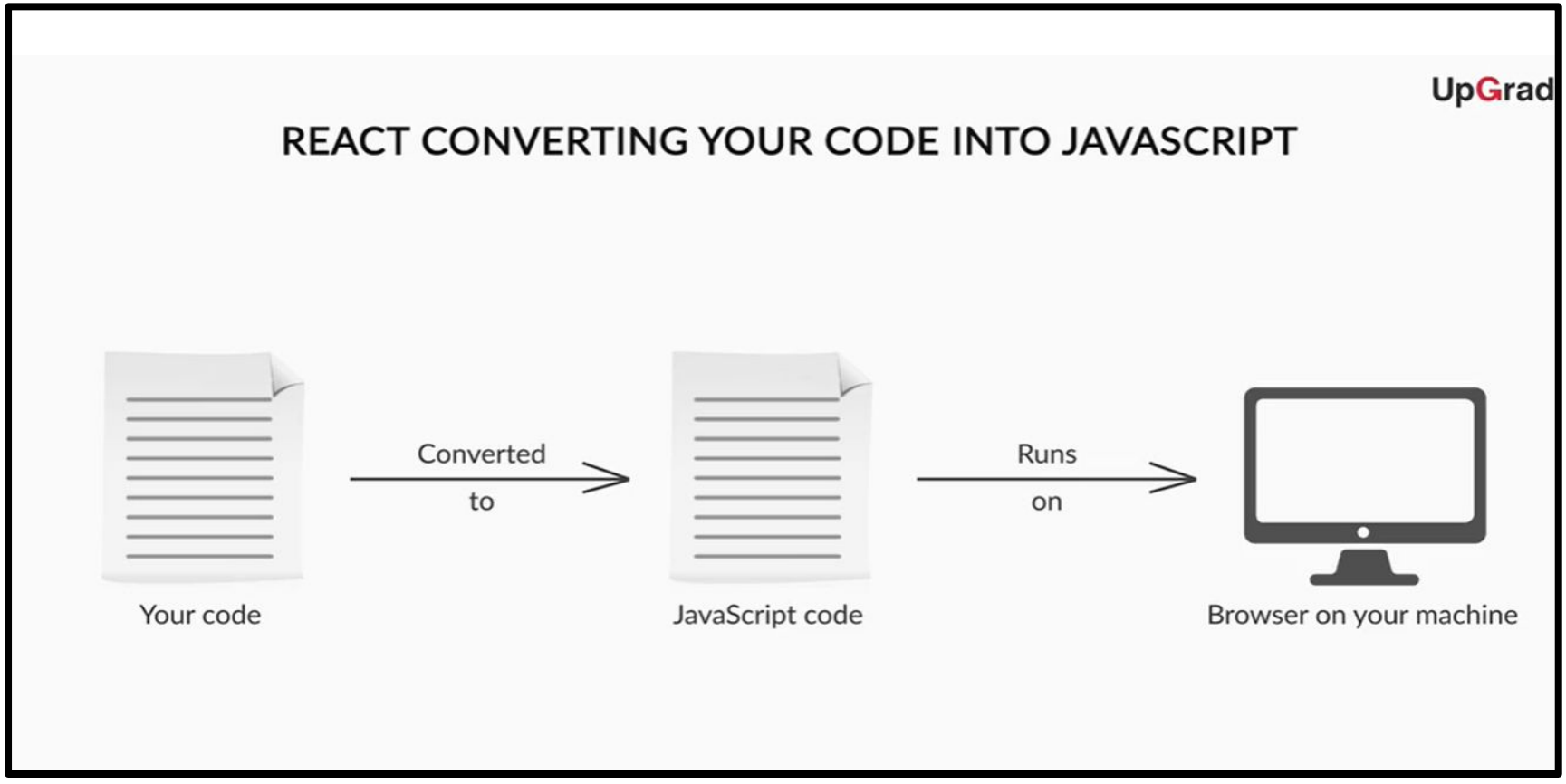
What is React?

React is a JavaScript library and is used for building user interfaces.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REACT CONVERTING YOUR CODE INTO JAVASCRIPT
Converted
to
Runs
on
Your code
JavaScript code
Browser on your machine

Introduction to React

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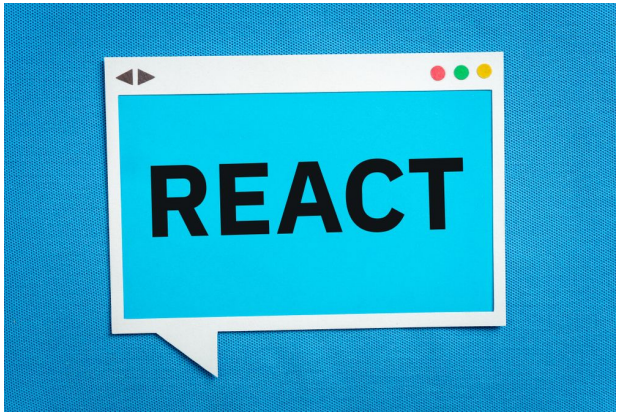
- React has been designed in such a way that it can be adopted gradually.
- You can freely use React in an application to the extent you require.
- You can use it as per your requirement and there is no upper or lower limit for its use.



To learn more about React, you can click **here** to go to its official website.

Poll 1

Which of the following statements is true for ReactJS?

A. React is a JavaScript Library.

B. React is a Java Library.

C. React is a JavaScript Framework.

D. React is a Java Framework.

Poll 1 (Answer)

Which of the following statements is true for ReactJS?

A. React is a JavaScript Library.

B. React is a Java Library.

C. React is a JavaScript Framework.

D. React is a Java Framework.

History of React

History of React

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- React was developed by engineers at **Facebook** when they started facing some issues with code maintenance with the increasing number of features.
- This is when Jordan Walke, a software engineer at Facebook, developed a prototype, which was later named ReactJS and, initially, used it in their *newsfeed*.
- Today, numerous features of Facebook and Instagram are backed by React.

History of React

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- With time, React grew and, in 2013, Facebook made it open-source to welcome other developers around the globe to use it and contribute to its growth.
- However, in 2017, Facebook moved React under the popular MIT licence. This licence also allows the React library to be used for commercial purposes with minimum restriction imposed on its usage.
- Apart from **Instagram**, many other applications popularly used React, such as Uber, Twitter, Pinterest, Paypal and Wix.

Read more about the latest versions of React **here**.

Poll 2

Which of the following statements is **NOT** correct with respect to React?

A. React's first prototype was developed by Jordan Walke, a software engineer at Facebook.

B. React is being used by Instagram.

C. React is an open-source library.

Poll 2 (Answer)

Which of the following statements is **NOT** correct with respect to React?

A. React's first prototype was developed by Jordan Walke, a software engineer at Facebook.

B. React is being used by Instagram.

C. React is an open-source library.

D. Facebook website does not use React

Advantages of React

Advantages of React

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- React helps in building interactive user interfaces. These user interfaces on web are called web applications. A web application is different from a website in that the web application is highly dynamic in nature, which enables it to primarily focus on interacting with users. These applications run on a browser.
- With React, you can use the latest features introduced in JavaScript language.
- React does not demand you to rewrite or ship your existing code in it.
- React follows the concept of Virtual DOM, which makes DOM manipulation superfast and easy.

Virtual DOM

It is a programming concept where the virtual representation of the UI is kept in memory and is synced with the real DOM.

Advantages of React

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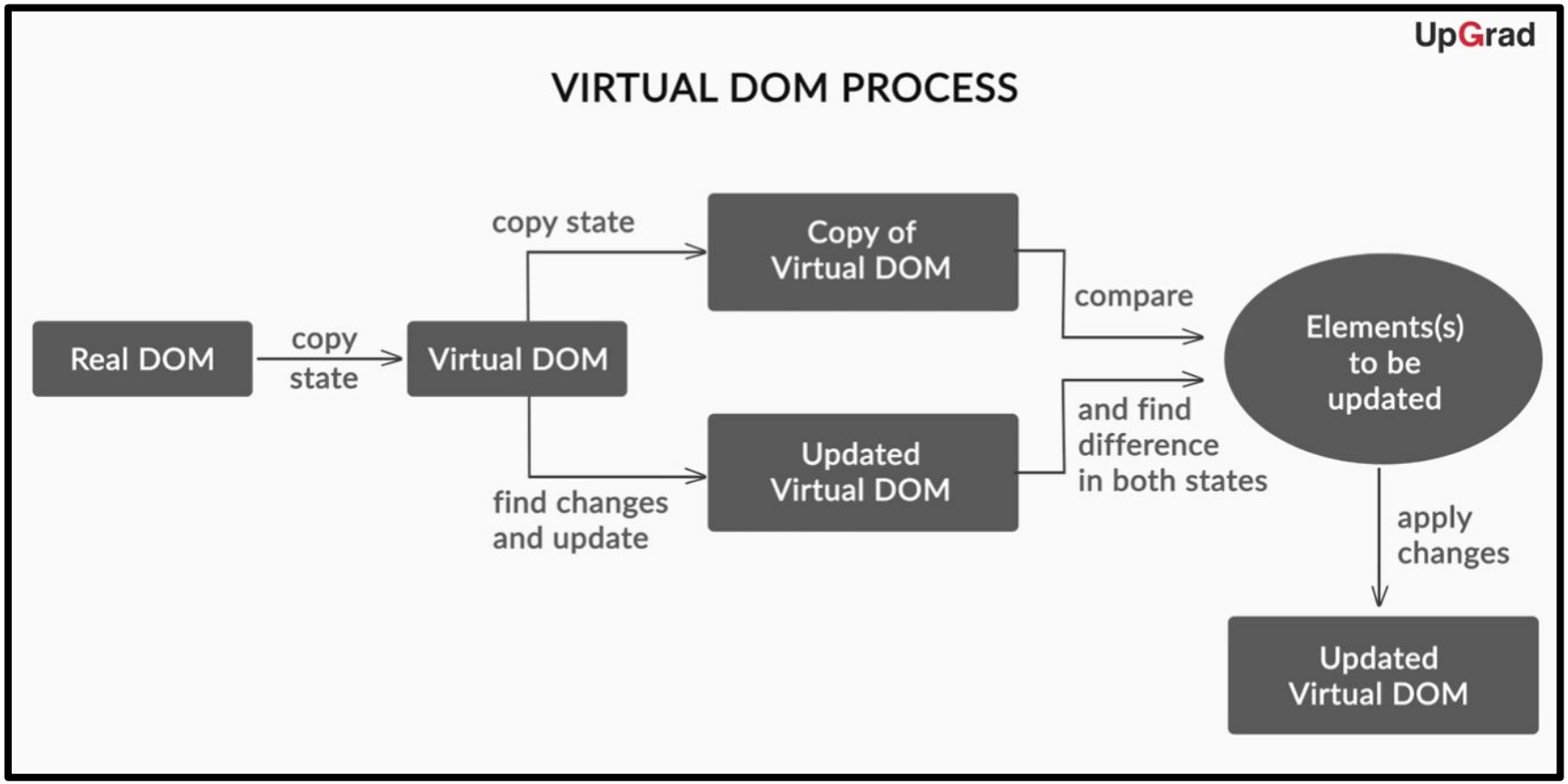
Virtual DOM



Advantages of React

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Virtual DOM

- Virtual DOM solves the problem of re-rendering the DOM again and finding the element to have changed while traversing a large DOM tree.
- Virtual DOM is not visible on the UI, whereas Real DOM is visible.

Advantages of React

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- React uses a huge ecosystem of open-source libraries, which can be used to perform relevant tasks.
- React can do server-side as well as client-side rendering.
- Also, React is used to make single-page applications.

Poll 3

Which of the following statements is FALSE with respect to web applications?

(Note: More than one option may be correct.)

A. A web application is another name for a website.

B. A web application runs on a browser.

C. A web application can run on mobile devices.

D. A web application can have different versions for different users.

Poll 3 (Answer)

Which of the following statements is FALSE with respect to web applications?

(Note: More than one option may be correct.)

A. A web application is another name for a website.

B. A web application runs on a browser.

C. A web application can run on mobile devices.

D. A web application can have different versions for different users.

Poll 4

Given below are three statements on the rendering of React applications.

Choose the most suitable correct statement.

A. React supports only client-side rendering in an application.

B. React supports only server-side rendering in an application.

C. React supports both client-side and server-side rendering in an application.

Poll 4 (Answer)

Given below are three statements on the rendering of React applications.

Choose the most suitable correct statement.

A. React supports only client-side rendering in an application.

B. React supports only server-side rendering in an application.

C. React supports both client-side and server-side rendering in an application.

React Environment

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Role of Babel

- React follows the **ECMAScript** specification following which it leverages the latest features of JavaScript.
- ECMAScript is a scripting language specification, which itself is inspired by JavaScript. However, it is not an implementation or a specification of JavaScript.
- This specification lays down some general rules and guidelines that a scripting language like JavaScript must conform to.
- It is majorly used for writing server applications and services.

Role of Babel

- Multiple editions of ECMAScript are available and you will be using the ES6 edition of ECMAScript specification while writing the React code. This is the 6th edition, also known as ECMAScript 2015.
- This edition has brought in important features and updates in JavaScript language, such as *let* statement, *const* statement, Arrow Functions and Classes.

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Role of Babel

- However, not all features of ES6 are supported by the majority of browsers.
- Most browsers still support ES5.
- Now, if you code in ES6, you can use the latest features, but all browsers will not support it.
- This is where Babel comes into the picture.
- Babel is a JavaScript compiler that converts ES6 code into ES5 code, which can be run on a browser.
- Thus, this helps you leverage all the latest features while not ignoring browser support for it.

Poll 5

Which of the following statements BEST describes Babel?

A. Babel is a compiler.

B. Babel is a transpiler.

C. Babel can be considered as a compiler as well as a transpiler.

Poll 5 (Answer)

Which of the following statements BEST describes Babel?

A. Babel is a compiler.

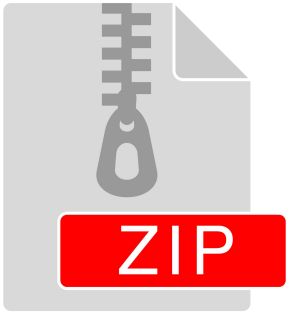
B. Babel is a transpiler.

C. Babel can be considered as a compiler as well as a transpiler.

Role of Webpack

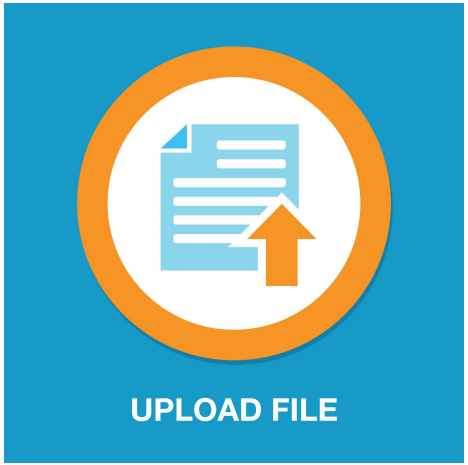
Have you ever zipped all your files and folders into a single file? Why do you do that?

A simple answer can be to bundle them together.



Role of Webpack

Have you ever encountered some places on web where you need to upload a file (let's say your passport-sized photograph) and you are given a size limit that the uploaded file should not exceed, let's say 2MB?



Role of Webpack

What do you do in case your file is larger than the given size limit?

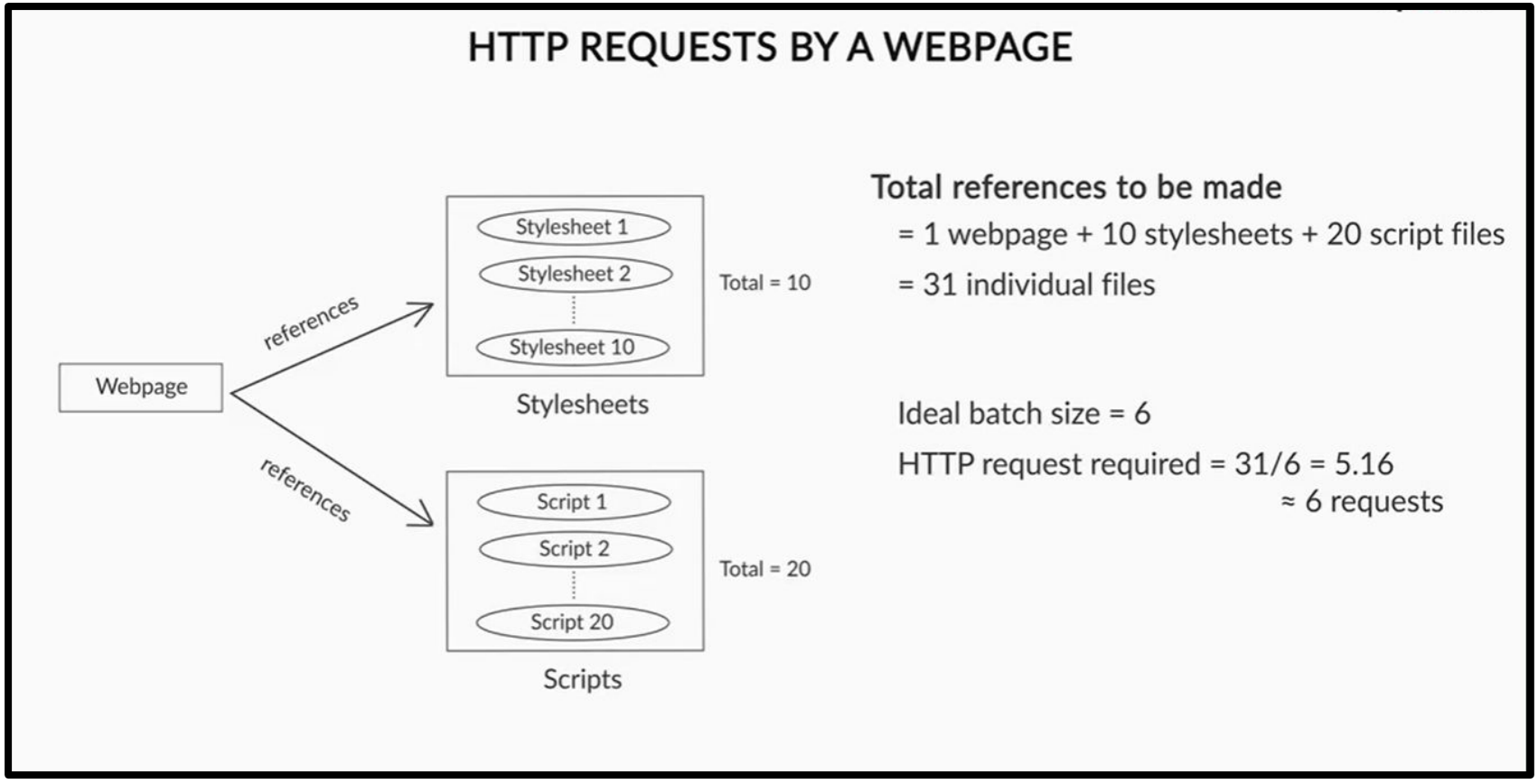
You reduce its size, do you not?

Role of Webpack

Well, there is a similar process known as the process of **bundling and minification**.

Bundling reduces the number of HTTP requests sent by the client to the server.

Role of Webpack



Role of Webpack

- Take a look at this example where a webpage references 10 stylesheets and 20 script files.
- This makes a total of 31 files (= 1 webpage + 10 stylesheets + 20 scripts) to be referenced.
- A batch size is the number of files that a browser can reference in parallel.
- Considering this batch size to be 6, you need to make a total of 31/6, which is equal to 6 (ceil of 5.17) HTTP requests.

Role of Webpack

- If you use the bundling technique, you can bundle all the stylesheets into one file and all the scripts into one file.
- Thus, after bundling, you will need to reference 3 files, which is equal to the sum of 1 webpage + 1 bundled stylesheet (containing all 10 stylesheets) + 1 bundled script (containing all 20 scripts).
- Now, with an ideal batch size of 6, you need to make only 3/6, which is equal to 1 (ceil of 0.5) HTTP request.
- Thus, as you saw in this example, bundling reduces the number of HTTP requests from 6 to 1.

React Environment

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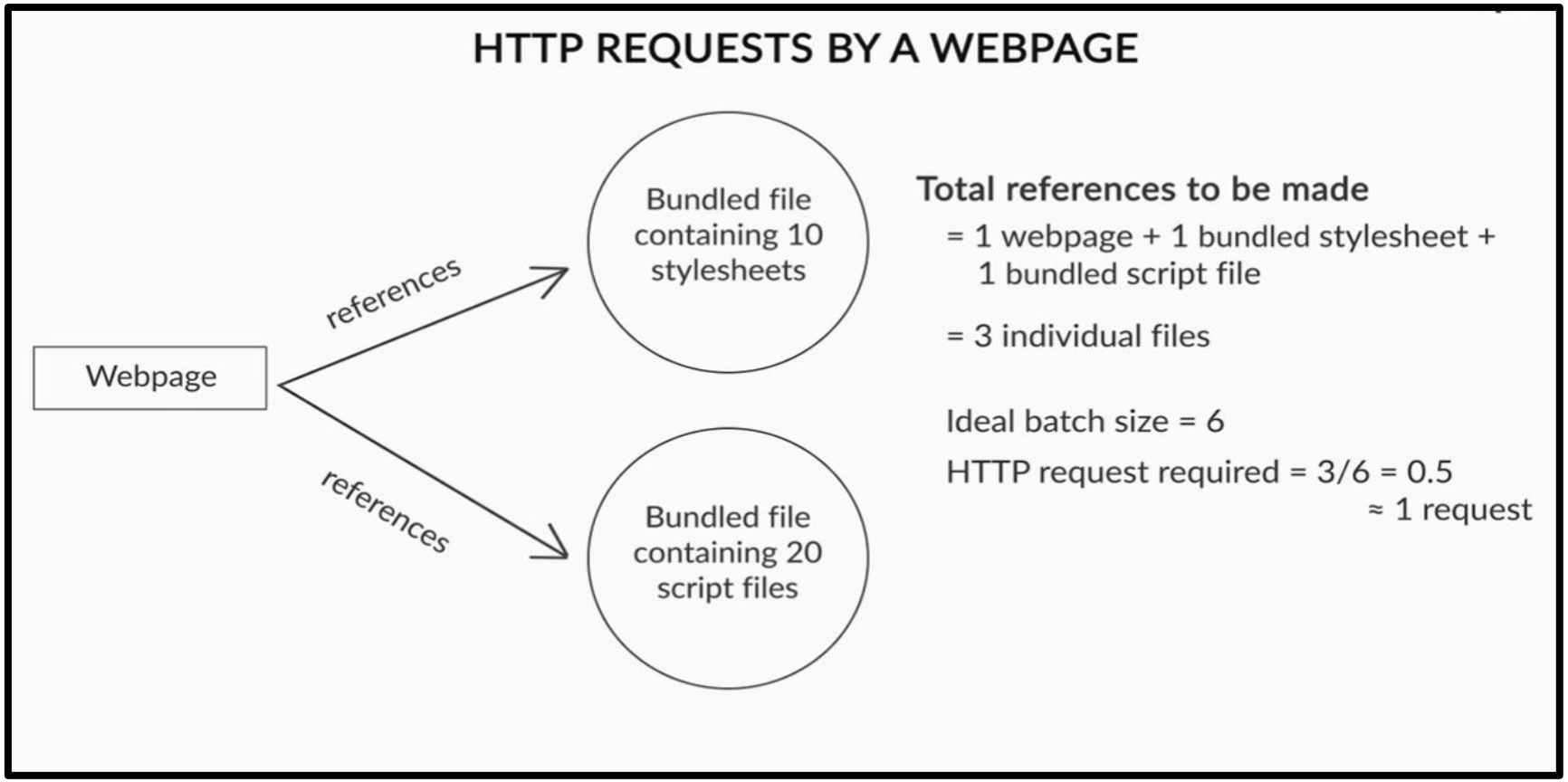
Role of Webpack



Role of Webpack

- The next step that you can take is minifying your files; this step strips your code of all data that is not required for executing the file.
- In short, **minification** shortens a file's contents without changing its meaning.
- This reduces the overall file size, resulting in faster response times and lower bandwidth costs.

Role of Webpack

- Next comes a bigger question - How do you bundle these files?
- There is a module bundler called **Webpack**, which is used in modern JavaScript applications.
- It can be used to bundle images, styles and scripts in your application.

React Environment

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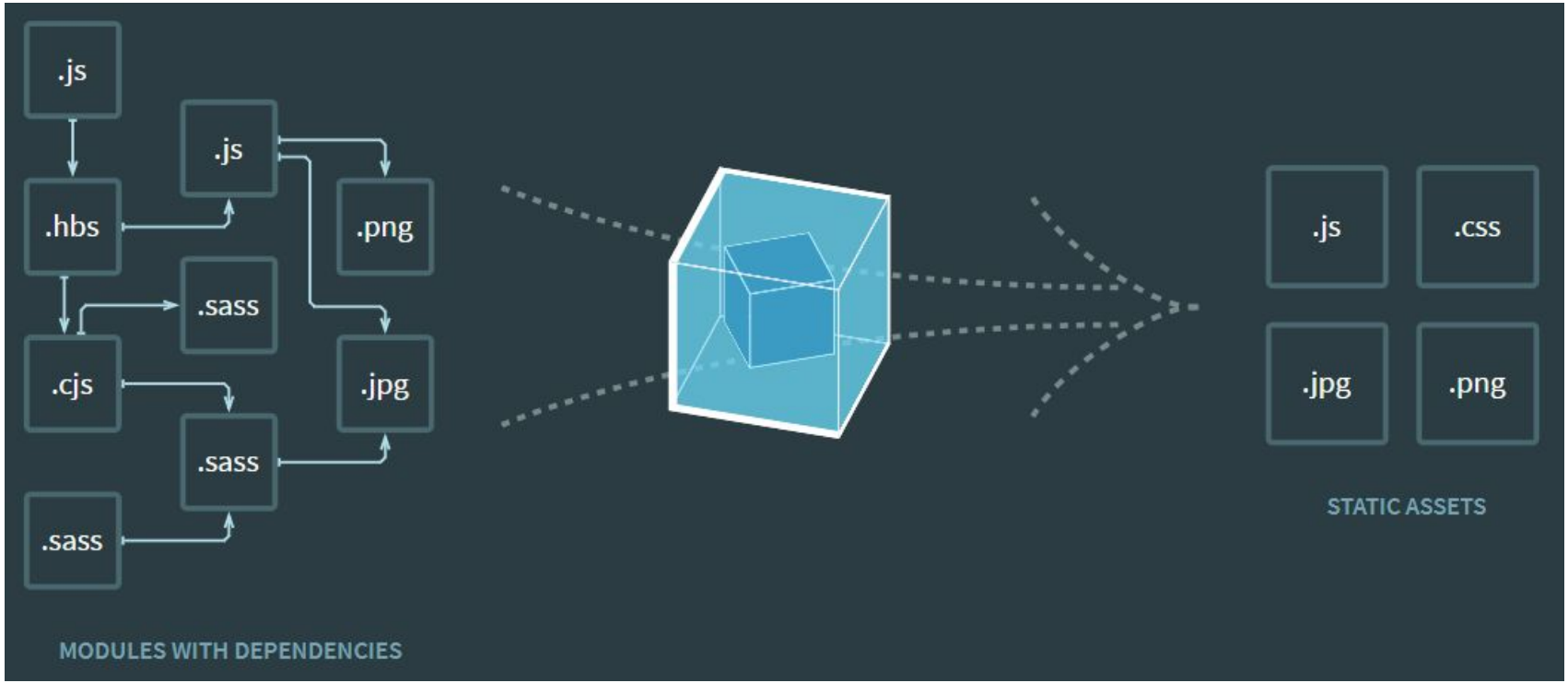
Role of Webpack



Role of Webpack

- While processing your application, Webpack internally builds a dependency graph.
- This dependency graph keeps track of every module that your application needs and its corresponding bundle generated by Webpack.
- There are other module bundlers too such as Browserify, but Webpack has become the first choice for many React developers in a very short time.
- Webpack also packs in some more magic under the hood, making it a great tool for building larger full-stack applications.

Read more about Webpack and how it works **here**.

Poll 6

Consider a webpage referencing 17 stylesheets and 25 script files. Considering the batch size to be 6, how many HTTP requests does the server need to make after bundling is used?

A. 2 HTTP requests

B. 3 HTTP requests

C. 7 HTTP requests

D. 1 HTTP request

Poll 6 (Answer)

Consider a webpage referencing 17 stylesheets and 25 script files. Considering the batch size to be 6, how many HTTP requests does the server need to make after bundling is used?

A. 2 HTTP requests

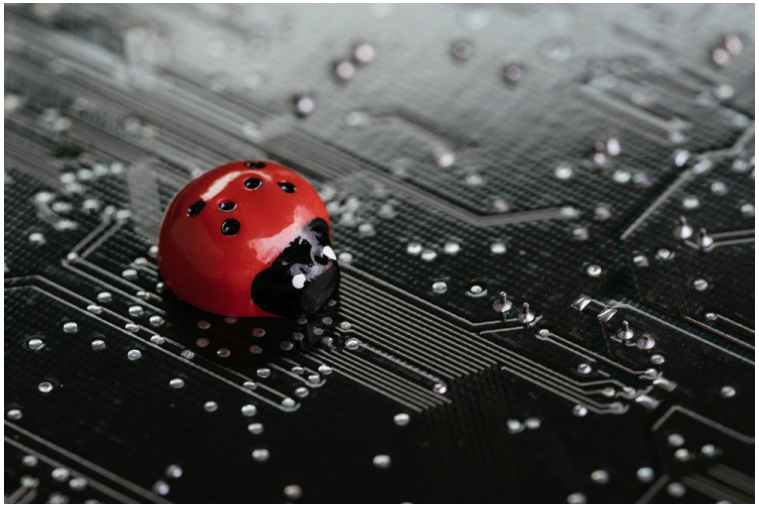
B. 3 HTTP requests

C. 7 HTTP requests

D. 1 HTTP request

Role of ESLint

- Let’s learn the importance of debugging your application beforehand and how ESLint is being popularly used in React applications.



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Role of ESLint

- When applications are too large to manually debug, a Linter, or also called a Lint, comes to the rescue.
- A lint is a set of tools that analyse your source code to flag programming errors, poor coding styles, stylistic errors and bugs.
- Even though modern compilers have evolved to include many of lint's historical functions, some lint-like tools have also evolved to detect even a wider variety of suspicious constructs.

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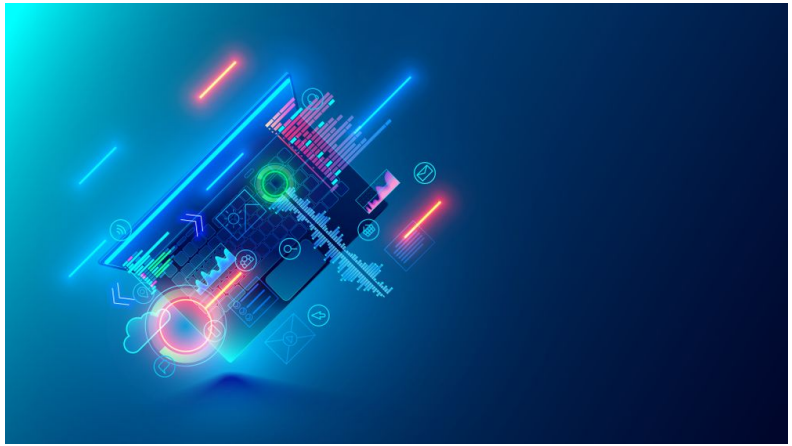
Role of ESLint

- ESLint is one such lint that provides linting utility for JavaScript and is being commonly used by React developers.
- ESLint helps you to follow the coding guidelines and principles such that you make fewer errors and mistakes.

Role of ESLint

For instance, consider a code snippet given below.

```
var name = "UpGrad";
var name = "UpGrad Education";
console.log(name);
```



Role of ESLint

- When this is written in a React application that has ESLint configured in its environment, then you can see the following message:

  `'name'` is already defined no-redeclare.

- ***no-redeclare*** is one of the **ESLint rules**. Such rules are applied to many different code style use cases.

See the list of all available rules provided by ESLint **here**.

Role of ESLint

- If you do not want to specify your own set of rules every time, there are plenty of recommendations out there.
- One such recommendation is provided by **Airbnb Style Guide.**

Role of ESLint

- Airbnb provides a bunch of ESLint presets that cover ES6, JSX, etc., making it a great choice for React projects.
- It also helps by providing performance tips. Airbnb open-sourced its own ESLint configuration so that it can be used by anyone.

Check out **this** link to learn more about Airbnb JavaScript Style Guide.

Example:

```
//  not preferred
var abc = 2;
if (true) {
abc += 1;
}
```

```
// preferred, use the let
let abc = 2;
if (true) {
abc += 1;
}
```

This is because *let* is block-scoped.

Example:

// not preferred

```
var x = 5;
var y = 8;
```

// preferred, use const

```
const x = 5;
const y = 8;
```

This is because *const* cannot be reassigned, as it leads to fewer bugs.

Poll 7

Which of the following is not one of the ESLint rules?

A. no-redeclare

B. no-duplicates

C. no-self-compare

D. no-unreachable

Poll 7 (Answer)

Which of the following is not one of the ESLint rules?

A. no-redeclare

B. no-duplicates

C. no-self-compare

D. no-unreachable

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Single-Page and Multi-Page Applications

SPA vs MPA

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- Finally, it is time to study about Single-Page and Multi-Page Applications.
- Each architecture has its pros and cons and is well suited to a particular type of project and specific business goals. It is recommended that you choose the architecture according to your needs.

SPA vs MPA

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Multi-Page Application

- An MPA, which stands for Multi-Page Application, consists of several pages with embedded navigation to other pages.
- When you move from one page to another, the browser reloads the contents of the new page completely and downloads all the resources again even if the components are being repeated through all the pages.
- One such example can be the header of an application. In most applications that you see, the header remains constant across all the webpages.
    - If you build a multi-page application, this header would be re-rendered in all the pages, which, ideally, is not required.

SPA vs MPA

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Single-Page Application

- An SPA or a single-page application works on the browser and does not require a page to be reloaded while being used. Some notable examples of an SPA are Gmail, Google Maps, Facebook, Github, etc.
- SPA is lighter and faster than an MPA because most of the resources are being loaded at once throughout the lifespan of the application. Only the data is transmitted back and forth.
- Single-page web applications fit perfectly for building dynamic platforms with small data volumes.
- An SPA is excellent for social networks and closed communities that require good application performance, dynamic nature and user experience.
- Coming back to React, it is a popular library for building SPAs and, in this course, you will be building one such application.

SPA vs MPA

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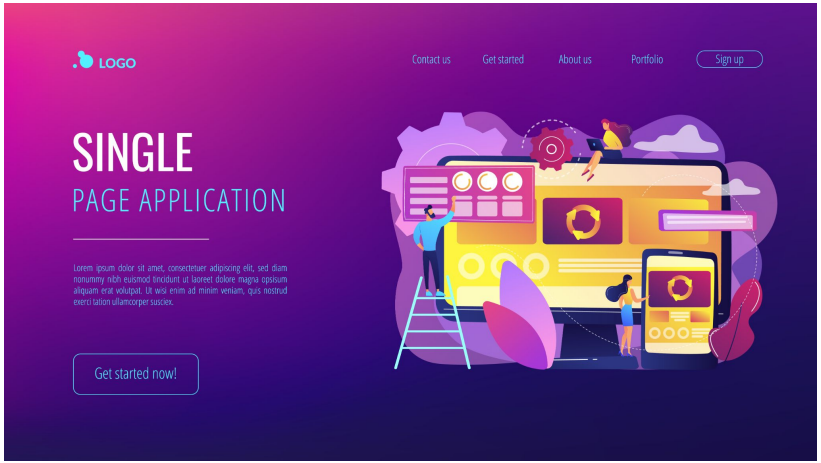
Advantages of SPAs over MPAs

- Faster loading of page; no need to download resources all over again
- Effective caching; easy local data storage
- Easy debugging; technologies provide their own debugging tools



SPA vs MPA

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Advantages of SPAs over MPAs

- Decoupling of front end and back end
- Simplified mobile development - Same back end can be used for web applications as well as native mobile applications
- Rich in responsiveness; better user experience
- JavaScript is mandatory in SPA.

(**Note:** Theoretically, it is possible to have an SPA without having JavaScript enabled. If the app uses server-side or isomorphic rendering, the initial render on the server can be cached. Although this approach will come with some bottlenecks, you would have an SPA without JavaScript.)

SPA vs MPA

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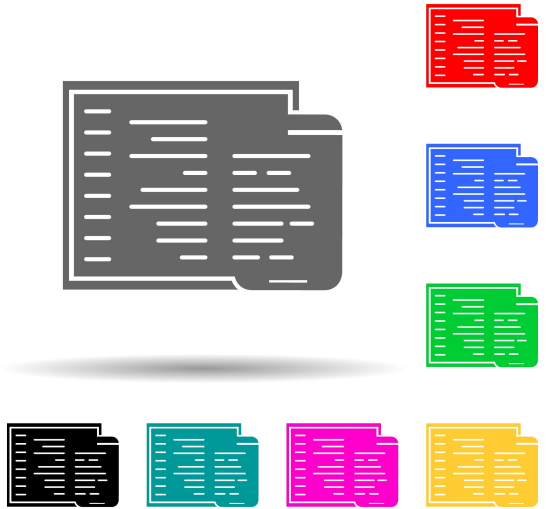
Advantages of MPAs over SPAs

- Better Search Engine Optimization (SEO); architecture native to search engine crawlers; flexibility to add meta tags to each page
- Better in terms of analytics
- Unlimited scalability; new features can be added easily
- JavaScript not mandatory
- Better security; access control at a functional level



Poll 8

Which of the following is an advantage of MPA over SPA?

(Note: More than one option may be correct.)

A. Simplified mobile development

B. New features can be added easily

C. Faster loading of page

D. Better security

Poll 8 (Answer)

Which of the following is an advantage of MPA over SPA?

(Note: More than one option may be correct.)

A. Simplified mobile development

B. New features can be added easily

C. Faster loading of page

D. Better security

Doubt Clearance (5 mins)

The following task is to be completed after today's session:

MCQs

Key Takeaways

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“React is a JavaScript library for building user interfaces.”

You also looked at the following facts about React:

- React was introduced by Facebook in 2011.
- React helps to build interactive user interfaces called web applications.
- React does not demand that you rewrite or ship your existing code in it.
- React follows the concept of Virtual DOM, which makes DOM manipulation superfast and easy.
- React uses a huge ecosystem of open-source libraries, which can be used to perform relevant tasks.

Key Takeaways

- React follows ECMAScript specification and uses the ES6 edition of this specification, which uses the latest features of JavaScript.
- Babel helps in converting the ES6 code into ES5 code, and this helps in getting support from a majority of browsers that do not support ES6 completely and still support ES5.
- Bundling is the process that reduces the number of HTTP requests sent by the client to the server.
- Minification is the process that helps to condense a file's contents, resulting in faster response time and lower bandwidth cost.
- ESLint is a popular lint used in React, which flags programming errors, poor coding styles, stylistic errors and bugs.

Key Takeaways

- A Single-Page Application (SPA) works on the browser and does not require a page to be reloaded completely. React helps you build dynamic SPAs.
- A Multi-Page Applications (MPA) is an application that consists of multiple pages while embedding links to other pages in it. When moving from one page to another, the browser reloads the contents of the page completely and downloads all the resources again.

In the next class, we will discuss...

1. Overview of Phone Directory Application
2. How to set up the Code?
3. Folder Structure and Code Cleanup
4. Introduction to JSX and how it is different from HTML
5. Injecting data using curly braces {} in React
6. React.createElement() method
7. Rendering Components in Root Node
8. Rendering elements into DOM in React

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Thank You!