## SSH

### Introduction

SSH( Secure Shell) is a protocol to communicate machine with one another over the internet. It allows users to share files as well as control and modify remote computers over the internet and also everything is encrypted.

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### Use of SSH

1. SSH connection in GitHub.
2. Remote connection in another device.

Command : ssh root@<machinename || ipaddress>

### Techniques used in SSH

There are three technique used in SSH. These technique used when we works with Https, block chain etc.

#### Symmetrical Encryption.

It uses one secret key for both encryption and decryption. Disadvantage is if anyone has the key can decrypt the message.

The disadvantage can be solved by Key Exchange Algorithm (Secure way exchange the key with our bad person intercepting it.

#### Asymmetrical Encryption.

It uses two separate keys for encryption and decryption. And it will have public and private key for both the machine which will be communicate. Public key can be shared to outside but the private key should not be share to anybody.

Message that encrypted by machine public key can only be decrypted by the same machine private key.

**Difiie Hellman key exchange algorithm**

**It uses the information of public and private key information of two machines two generate without exchanging the keys. Each machine on its computer can generate asymmetrical key**

#### Hashing

It is another form of cryptography used in secure shell connection. They are never meant to decrypt anything, it simply generate a unique value of a fixed length for each input that it gets (but for the generate key we can’t get the input string its one way)

Using hash function each message that it transmitted must contain a mac and this mac is a hashed generated from the symmetric key.

## Performance

### 3 Keys to increase the performance

1. Front End Side
2. Transfer of file over the wire (network latency)
3. Back End Side

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### Network Performance

#### Minimize Files:-

##### Minimize Text (CSS, Html, JavaScript) – Very easy to do using Web-Pack while build the project files.

##### Minimize Images

Image File Formats:-

JPG: - Usually used for photos, images and things with many colors. And also we cannot change the background of the image with this format.

GIF: - Usually used for small animation. And it usually limit the color counts we can use in it (2- 256) and reducing the color leads to file saving.

PNG: - Usually used in logo and limits the color counts we can use and it tends to lot smaller in size than JPG. We can add transparency to that (means changing the background color).

SVG:- It’s an Extensible Markup Language (XML)-based vector image format for two-dimensional graphics with support for interactivity and animation. And also we can customize it using CSS.

**All remember to pick the right format of images and compress them as much as we can without minimize the quality.**

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|  | Category | Palette | Use for |
| JPG | Lossy | Millions of colors | Still Images Photography |
| GIF | Lossless | Maximum 256 colors | Simple animations Graphics with flat colors Graphics without gradients |
| PNG-8 | Lossless | Maximum 256 colors | Similar to GIF Better transparency but no animation Great for icons |
| PNG-24 | Lossless | Unlimited colors | Similar to PNG-8 Handles still images and transparency |
| SVG | Vector/lossless | Unlimited colors | Graphics/logos for web Retina/high-dpi screens |

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**Display Different sized images for different backgrounds:** Using **@media** we can do that

<https://gist.github.com/bartholomej/8415655>

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**Use CDN like imigx:** It says give us all the images no matter how big they are or un-optimized, just upload on to their website and they will give a URL, which we can plugin in our website. And they also do it via CDN (content delivery network)

<https://www.imgix.com/>

**Remove image metadata: -** Meta data means which device it clicked, when it clicked etc. Use the below url to remove it.

<https://www.verexif.com/en/>

#### Minimize Deliveries

Reducing the download frequency, reducing the no of component a page requires proportionally reduces the no of http request has to make.

Think like that instead of using bootstrap we can use flexbox or CSS grid as for bootstrap we need to download the massive file all the time.

Same apply for JavaScript libraries. So if we want to use libraries always pick the library which is light weight.

**Http protocol has limit to the size of the file and also no of requests it handle**.

So always remember to minimize the file and also limit the trips that the http request makes. So perhaps we can combine the CSS files or JavaScript files.

### Front End

**Some extra information how front end work**: - when a browser sends a URL to a server, the server sends a response as HTML file. As soon as HTML arrives in browser it start creating the DOM, and when the browser parses and read the HTML it incrementally generates the tree model of the html tag we need to build of the website.

While reading the HTML page it encounters a style link to grab the CSS file and then started working on the DOM. Once it grabs all the CSS files it will create the CSSOM (CSS object model).

Then it grabs all the JavaScript file, and then this JS files read by the browser and execute any changes that it might want on to the DOM and the CSSOM.

Once all the things done, the browser combines the DOM and the COM into a render tree. So it knows exactly what to render on the page and now the browser uses the render tree to figure out the layout.

#### Critical Render Path

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How to optimize the steps?

##### HTML

Always render the CSS as soon as possible, because JS needs to runs after the CSS and HTML parsing is finished. **That’s means always mentioned the JS files at the button instead of declaring to head. But some cases we need to put the JS files at the top (for example google analytics which will be script tag, when we want to execute first).**

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##### CSS

CSS is render blocking as for creating render tree we need to wait for CSS. So for that CSS should be light weight, we can do it following below steps:-

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* + 1. **Only load whenever it is needed.**

**Sometime we can do using internal CSS and inline CSS. But it has limitation like we are limited one html page or one element**

* + 1. **Above the fold loading** :- eg **If we want to load css after the page load**

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| <script type="text/javascript">  const loadStyleSheet = src => {  if(document.createStylesheet) {  document.createStylesheet(src);  } else {  const stylesheet = document.createElement('link');  stylesheet.href = src;  stylesheet.type = 'text/css';  stylesheet.rel ='stylesheet';  document.getElementsByTagName('head')[0].appendChild(stylesheet);  }  window.onload = () => {  loadStyleSheet('./style3.css')  }  }  </script> |

* + 1. **Media attributes**

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| <link rel="stylesheet" href="./script2.js" media="only screen and (min-width:500px)"> |

* + 1. **Less specificity**

As for the first one will take more byte as we send more information with respect to second one

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##### JavaScript

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1. **Load Scripts asynchronously**

By using async we can tell the browser, go ahead and download the JavaScript file with another thread. **But remember we should add them that don’t affect the DOM or CSSOM. Like google analytics script or tracking script we can use.**

1. **Defer loading of Script**

Defer is same as async while will not block loading of the html page, but however. And it will execute after the html is parsed and will execute in order of appearance.

**If a core functionality require JavaScript then async is best and if not require then use defer.**

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1. **Minimize DOM manipulation**

For the below example first it will print “this is script 1 ” as there is no DOM manipulation just printing but the two will change after the page is render as it has DOM manipulation

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1. **Avoid long running JavaScript**

These we will talk more in part 2 we will discuss about optimize the code.

Remember delivery of JavaScript will lead to fast render tree.

##### Module Bundlers

As our application bigger and bigger as especially for single page application, we have more JavaScript files. So have a need for bundler (to bundle all the JS file to one or more depending on the requirement).

As of now in the react app, atomically handle the bundling using something called webpack. There are many bundlers in the market.

* + - * **WebPack**: - If we have a large project, we mostly use webpack. This is mostly setup in the beginning of the project by Team lead or senior developer.
      * **Parcel**: - Use parcel when it is small project. It super easy to use with zero configurations.
      * **Rollup.js** :- Use it when we rolling up our own npm packages

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###### WebPack

<https://webpack.js.org/>

It bundle all our files into static assets. Webpack has four main ideas:-

1. Entry: - is usually the JS file and entry means where webpack enters into the project. Usually this is index.js
2. Output: - Where should webpack output all the files. Usually have a build folder.
3. Loader: - Tools that compiles the code.
4. Plugins:- Play a vital role in output the code and we can do different things using different sort of plugin based on how we want to output the code.

For development of webpack install the below 3 packages:-

npm install --save-dev **webpack** **webpack-dev-server** **webpack-cli**

To check the webpack and worked on use **npm run eject**

#### Code Optimizing

* + - Keep your JavaScript parse and compile time low.
    - Time to first meaningful paint
    - Time to interactive.

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Browser does JIT (just in time compilation) as the JavaScript file loaded on to the browser.

Angular team has come up with AOT (Ahead of Time compilation)

One of the biggest performance culprits is triggering animation during scroll the event

##### Code Splitting

Code Splitting or progressive bootstrapping, where we send minimally functional page compose of HTML, CSS and JavaScript need of the current route (homepage) as more resource arrive, the app can lazy load or unlock more feature. Suppose click on another page it load different JS file. By splitting this up in each compartment, we give browser less work to do.

Lazy load means just load after the page becomes interactive. So that user can fill like the app is fast.

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By using import we automatically tell to code split

###### Manual

Let see the below example of code splitting in react app, we just removing from the top and importing only when they them

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| import React, { Component } from 'react';  import './App.css';  import Page1 from './Components/Page1';  //import Page2 from './Components/Page2';  //import Page3 from './Components/Page3';  class App extends Component {  constructor() {  super();  this.state ={  route: 'page1',  component : ''  }  }  onRouteChange = (route) => {  //on code splitting  //this.setState({route: route});  //with code splitting  if (route === 'page1') {  this.setState({route: route});  } else if (route === 'page2') {  //it will work if we use webpack  import('./Components/Page2').then((Page2) => {  this.setState({route:route, component:Page2.default})  })  } else if (route === 'page3') {  import('./Components/Page3').then((Page3) => {  this.setState({route:route, component:Page3.default})  })  }  }  render() {  /\*if (this.state.route === 'page1') {  return <Page1 onRouteChange={this.onRouteChange}/>  }  else if (this.state.route === 'page2') {  return <Page2 onRouteChange={this.onRouteChange}/>  }  else if (this.state.route === 'page3') {  return <Page3 onRouteChange={this.onRouteChange}/>  }\*/  if(this.state.route === 'page1') {  return <Page1 onRouteChange={this.onRouteChange} />  }  else {  return <this.state.component onRouteChange={this.onRouteChange} />  }        }  }  export default App; |

###### Using Asynchronous Component

Second way using asynchronous component

1. Asynchronous component and also we use higher order component.

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| import React, { Component } from 'react';  export default function asyncComponet(importComponent) {  class AsyncComponent extends Component {  constructor(props) {  super(props);  this.state = {  component: null  }  }    async componentDidMount(){  const {default: component} = await importComponent();  this.setState({  component: component  })  }  render(){  const Component = this.state.component;  return Component ? <Component {...this.props} /> : null;  }  }  return AsyncComponent;  } |

1. In app.js using the Asynchronous function

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| import React, { Component } from 'react';  import './App.css';  import Page1 from './Components/Page1';  //import Page2 from './Components/Page2';  //import Page3 from './Components/Page3';  import AsyncComponent from './Components/AsyncComponent';  class App extends Component {  constructor() {  super();  this.state ={  route: 'page1',  component : null  }  }  onRouteChange = (route) => {  //on code splitting  this.setState({route: route});  //with code splitting  /\* if (route === 'page1') {  this.setState({route: route});  } else if (route === 'page2') {  //it will work if we use webpack  import('./Components/Page2').then((Page2) => {  this.setState({route:route, component:Page2.default})  })  } else if (route === 'page3') {  import('./Components/Page3').then((Page3) => {  this.setState({route:route, component:Page3.default})  })  }\*/  }  render() {  if (this.state.route === 'page1') {  return <Page1 onRouteChange={this.onRouteChange}/>  }  else if (this.state.route === 'page2') {  const AsyncPage2 = AsyncComponent(() => import('./Components/Page2'));  return <AsyncPage2 onRouteChange={this.onRouteChange}/>  }  else if (this.state.route === 'page3') {  const AsyncPage3 = AsyncComponent(() => import('./Components/Page3'));  return <AsyncPage3 onRouteChange={this.onRouteChange}/>  }  /\*if(this.state.route === 'page1') {  return <Page1 onRouteChange={this.onRouteChange} />  }  else {  return <this.state.component onRouteChange={this.onRouteChange} />  }\*/  }  }  export default App; |

As our App gets bigger and bigger, we should think of route based and component based code splitting.

**At end idea is how we can shift the least amount of JavaScript to the user.**

###### React.lazy

Using react.lazy is says only load the component when we use it in the render function

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| import React, { Component, Suspense } from 'react';  import './App.css';  import Page1 from './Components/Page1';  const Page2Lazy = React.lazy(() => import('./Components/Page2'));  const Page3Lazy = React.lazy(() => import('./Components/Page3'));  class App extends Component {  constructor() {  super();  this.state ={  route: 'page1',  component : null  }  }  onRouteChange = (route) => {  //on code splitting  this.setState({route: route});  }  render() {  if (this.state.route === 'page1') {  return <Page1 onRouteChange={this.onRouteChange}/>  }  else if (this.state.route === 'page2') {  return (  <Suspense fallback={<div>Loading...</div>}>  <Page2Lazy onRouteChange={this.onRouteChange}/>  </Suspense>  );  }  else if (this.state.route === 'page3') {  return (  <Suspense fallback={<div>Loading...</div>}>  <Page3Lazy onRouteChange={this.onRouteChange}/>  </Suspense>  );  }  }  }  export default App; |

How to check performance of a react website?

Ans:- url?**react\_perf**

###### React code optimization

* + How to stop any component to update other than render?

Using **shouldComponentUpdate()** life cycle hooks we can stop it by returning false.

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| import React, { Component } from 'react';  class Header extends Component {  shouldComponentUpdate(nextProps, nextState){  return false;  }  render() {  return <h1 className="f2">RoboFriends</h1>  }  }  export default Header; |

#### Progressive Web Apps

A web Apps is a website that allows users to interact with the webpage in many ways, whether it is games, twitter, facebook it is inside of a browser window (such as chrome, safari, firebox etc.).

And native apps on the other are an app that is on a mobile phone like an iphone or samsumg.

Progressive web Apps helps to behave web apps as native app.

Create react app already setup the progressive web apps. Using light house we can check the website is supported or not.

<https://developers.google.com/web/tools/lighthouse>

Check List for Progressive Web Apps:-

<https://developers.google.com/web/progressive-web-apps/checklist>

Progressive needs to below things:-

##### HTTPS

Https is basically encrypted the data that we send to the server.

How to make a website https:-

To do that we need a certificate: - <https://letsencrypt.org/>

##### App Manifest

All use the Meta tag for viewport, which optimize the app for multiple devices.

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| <!DOCTYPE html>  <html lang="en">  <head>  <meta charset="utf-8" />  <link rel="icon" href="%PUBLIC\_URL%/favicon.ico" />  <meta name="viewport" content="width=device-width, initial-scale=1" />  <meta name="theme-color" content="#000000" />  <meta  name="description"  content="Web site created using create-react-app"  />  <link rel="apple-touch-icon" href="%PUBLIC\_URL%/logo192.png" /> |

In create-react-app we already have the manifest.json file present public folder.

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| --- |
| {  "short\_name": "React App",  "name": "Create React App Sample",  "icons": [  {  "src": "favicon.ico",  "sizes": "64x64 32x32 24x24 16x16",  "type": "image/x-icon"  },  {  "src": "logo192.png",  "type": "image/png",  "sizes": "192x192"  },  {  "src": "logo512.png",  "type": "image/png",  "sizes": "512x512"  }  ],  "start\_url": ".",  "display": "standalone",  "theme\_color": "#000000",  "background\_color": "#ffffff"  } |

For checking the manifest in the browser just got to Application tab in chrome developer tool.

##### Service Worker

Is a script that the browser runs in the background, separate from the webpage web apps.

It is generally use for features that don’t need a webpage or user interaction. Think of service worker another worker that now we have in the browser a background worker. It acts as a programmable proxy. It is the reason that our progressive web apps work offline.

<https://jakearchibald.github.io/isserviceworkerready/>

**Service Worker is already implement in the create-react-app. Service Worker is implemented very easily into a react based project. You can see**[**this Git Diff**](https://github.com/jeffposnick/create-react-pwa/compare/starting-point...pwa)**to see what you would need to do to add service worker into an existing create react app project without the default service worker.**

<https://github.com/jeffposnick/create-react-pwa/compare/starting-point...pwa>

**Without a service worker** in an app our browser will send request to the network, we find the server and server respond with files a response.

**With a service worker** in an app our browser will communicate with the servicer worker and check to see if the app really need to communicate with the network (web server) because may the service worker has already have those files. And then service worker will try to access to **Cache Api** (nothing but the cache storage in the browse) and cache api contains the files such as js, css, images any static files. If the files not present then the browser will communicate with the server instead of service worker.

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## Testing

## Resources

### Digital Ocean

Cloud platform for hosting

<https://www.digitalocean.com/>

### Asymmetric Encryption

<https://www.youtube.com/watch?v=NmM9HA2MQGI>  
  
<https://www.youtube.com/watch?v=Yjrfm_oRO0w>  
  
<https://www.youtube.com/watch?v=vsXMMT2CqqE&t=>  
  
<https://www.youtube.com/watch?v=NF1pwjL9-DE>

### Set SSH for GitHub

<https://github.com/antonykidis/Setup-ssh-for-github/blob/master/Setup-ssh-on-github.pdf>

### Blog

<https://zerotomastery.io/blog/?tag=WDM>

### Image Types

<https://99designs.com/blog/tips/image-file-types/>

<https://pageweight.imgix.com/> (for analyze any website)

<https://www.sitepoint.com/gif-png-jpg-which-one-to-use/>

### JPG image optimizer

<http://jpeg-optimizer.com/>

### PNG image optimizer

<https://tinypng.com/>

### Media Queries for image optimization

<https://gist.github.com/bartholomej/8415655>

<https://css-tricks.com/snippets/css/media-queries-for-standard-devices/>

### Remove Meta tag of an image

<https://www.verexif.com/en/>

### Performance testing of a website

<https://www.webpagetest.org/>

<https://developers.google.com/speed/pagespeed/insights/>

### Prefetching, preloading, prebrowsing

<https://css-tricks.com/prefetching-preloading-prebrowsing/>

### http2

<https://developers.google.com/web/fundamentals/performance/http2/>

### Road Map of a developer

<https://i.udemycdn.com/redactor/raw/2020-01-18_15-55-19-320398734f15655bb65e6c7b288e0bf2.jpg>

### WebPack

<https://webpack.js.org/>

### WebPack Configuration

<http://web.jakoblind.no/webpack-config/>

### React code splitting

<https://reactjs.org/docs/code-splitting.html>

### What web can do today?

<https://whatwebcando.today/>

### Check List for Progressive Web Apps

<https://developers.google.com/web/progressive-web-apps/checklist>

### How to get certificate for HTTPS?

<https://letsencrypt.org/>

### Hosting a website that automatically gives https?

<https://www.cloudflare.com/en-in/>

### Generate Favicon

<https://realfavicongenerator.net/>

### Check which browser implements Service Worker

<https://jakearchibald.github.io/isserviceworkerready/>

### Implement service worker in create-react-app

<https://github.com/jeffposnick/create-react-pwa/compare/starting-point...pwa>

### Push notification in service worker

<https://auth0.com/blog/introduction-to-progressive-web-apps-push-notifications-part-3/>

### Improve Front End Performance of a website

<https://progressivetooling.com/>