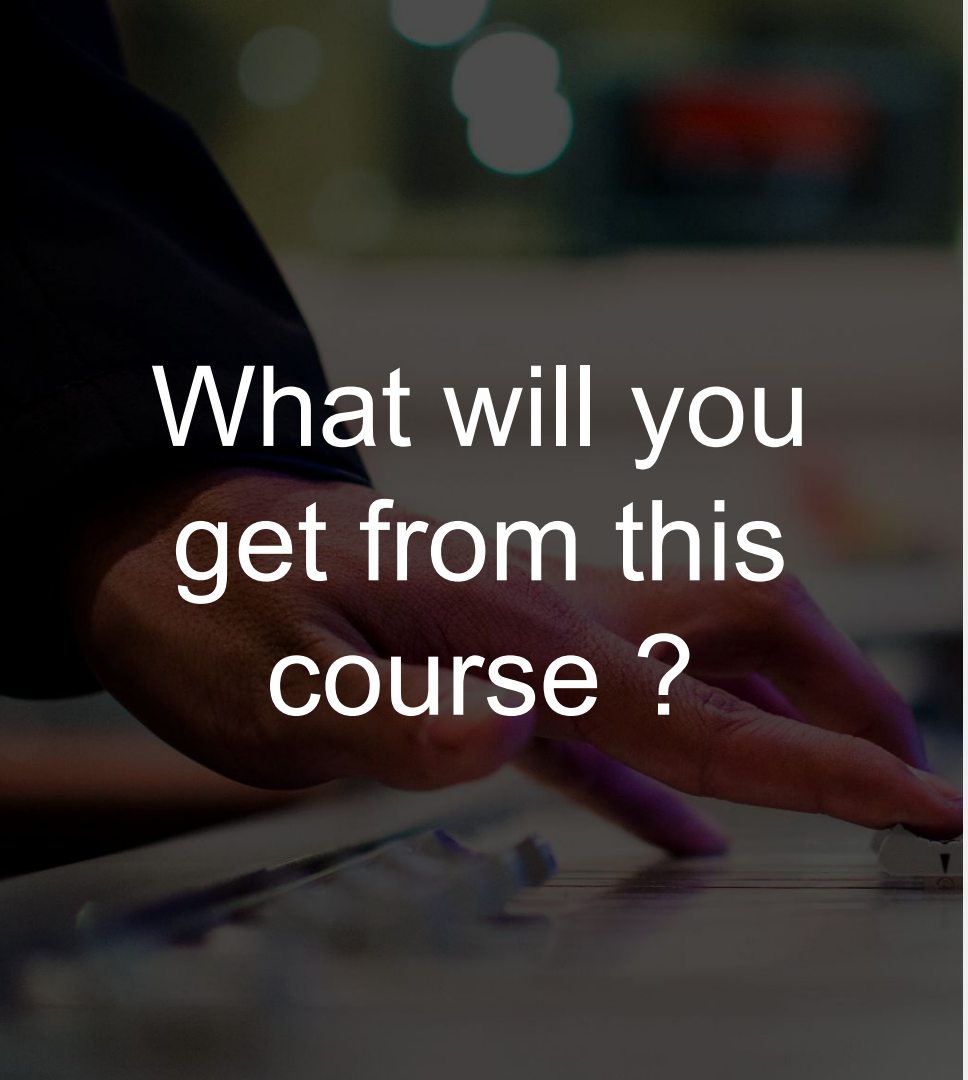
Fullstack Developer

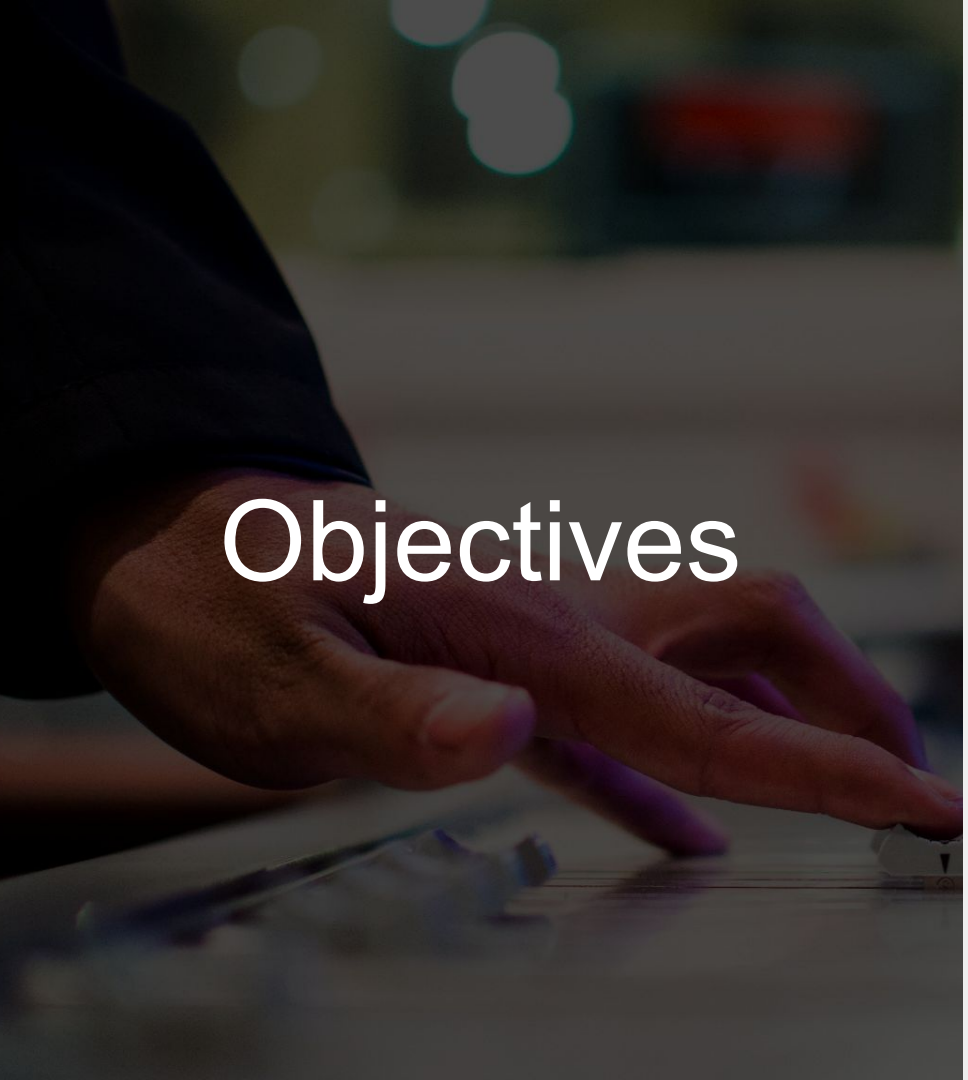
A pragmatic course in Fullstack Development
~ FOUNDATION LEVEL ~

M. Yauri M. Attamimi
https://yauritux.link



What will you get from this course ?

- Who is Fullstack Developer ?
- How to become a Fullstack Developer ?
- Gain a pragmatic experience through building a mini project as a Fullstack Developer.



Objectives

By the end of this course, you will be able to:

- Building a good enough production app as a Fullstack Developer.

About the Speaker

M. Yauri M. Attamimi

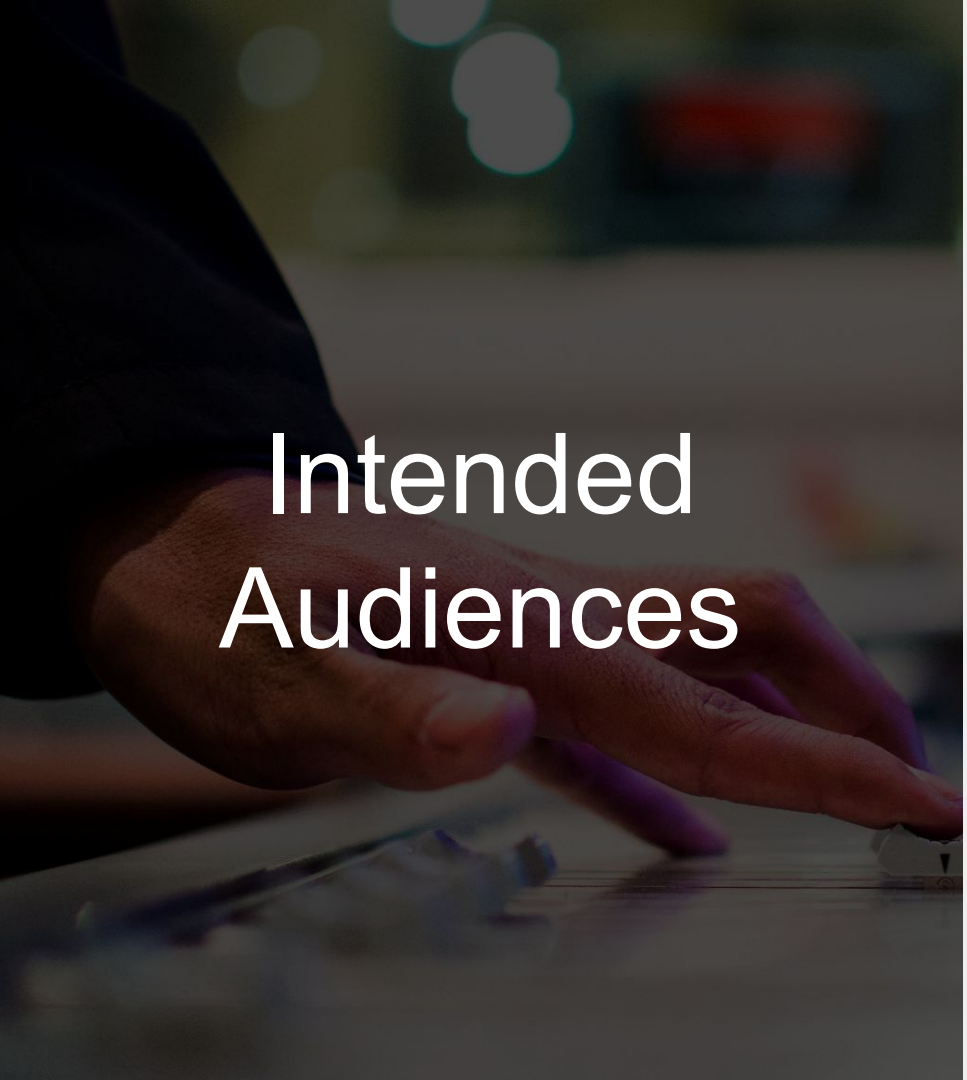
- 18 years (or so) in Software Engineering
- LOTS of project experience
- Java, Kotlin, Python, NodeJS, Golang, etc
- A Software Craftsman
- Enterprise Architect Certified (TOGAF 9.2)
- Event-Sourcing and Reactive System Provocateur
- AI Enthusiast
- TDD and Clean Code Evangelist
- Founder and CEO of bisnisin.asia
- Lead Software Architect for DSS PropertyGuru

My Professional Mission :

Guiding individuals and organizations to commercial success through the application of modern technologies

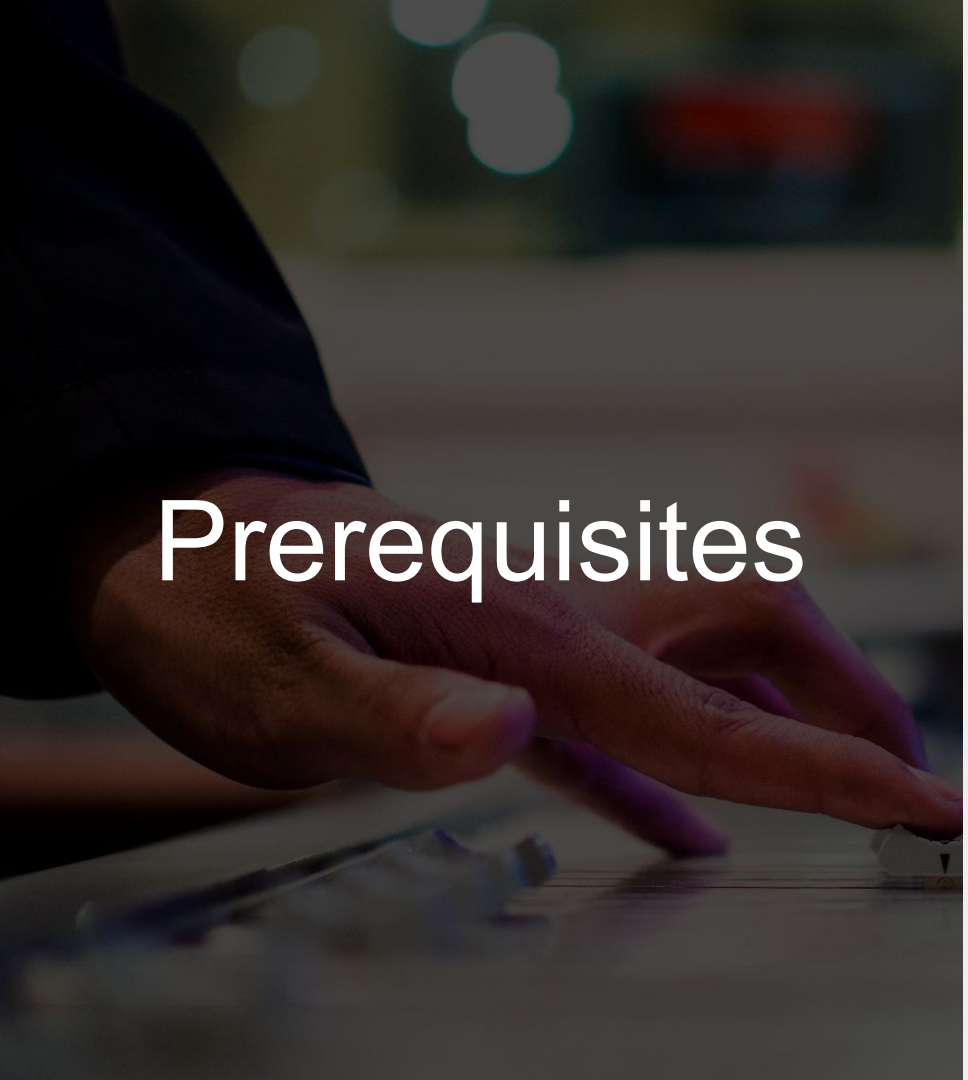
https://github.com/yauritux

https://yauritux.link



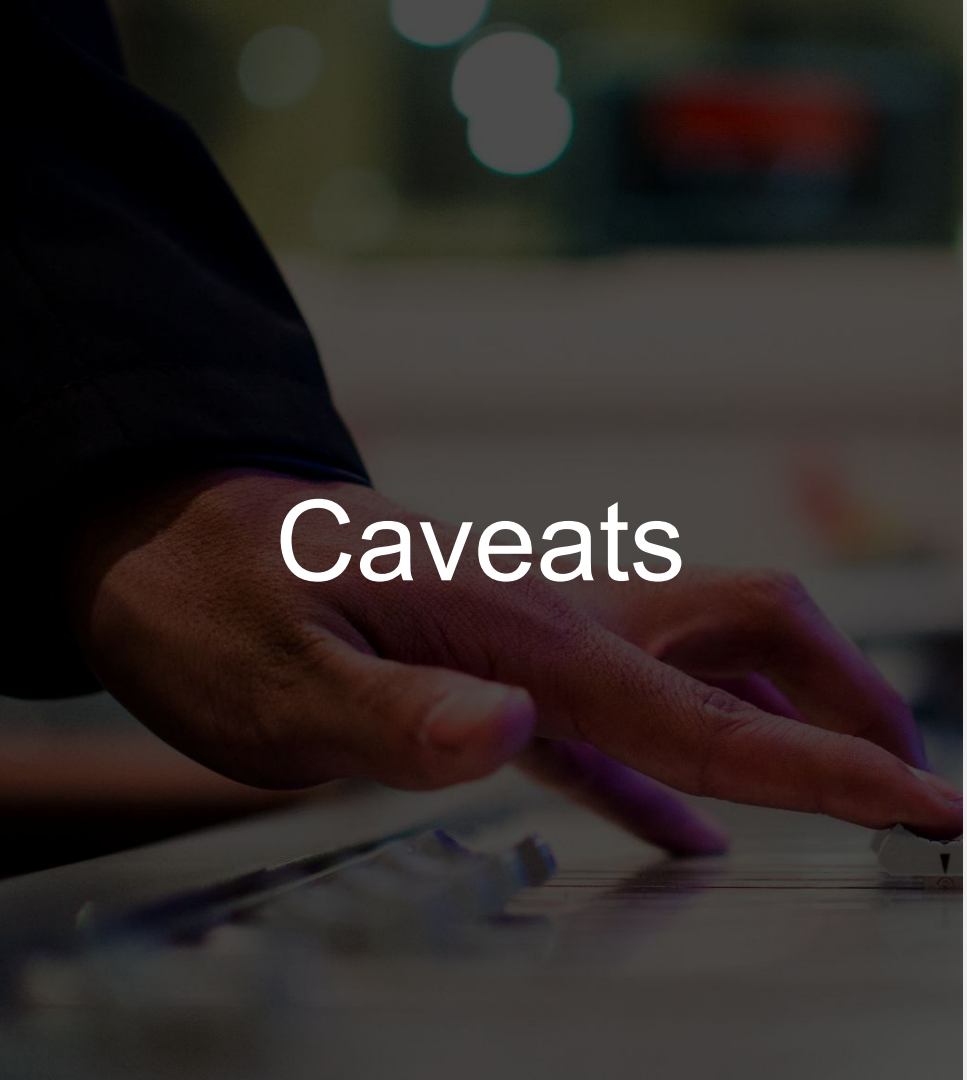
Intended Audiences

- Someone whom passionate with programming
- Someone who’s looking for a career transition
- Someone who’s looking to become a Fullstack Developer



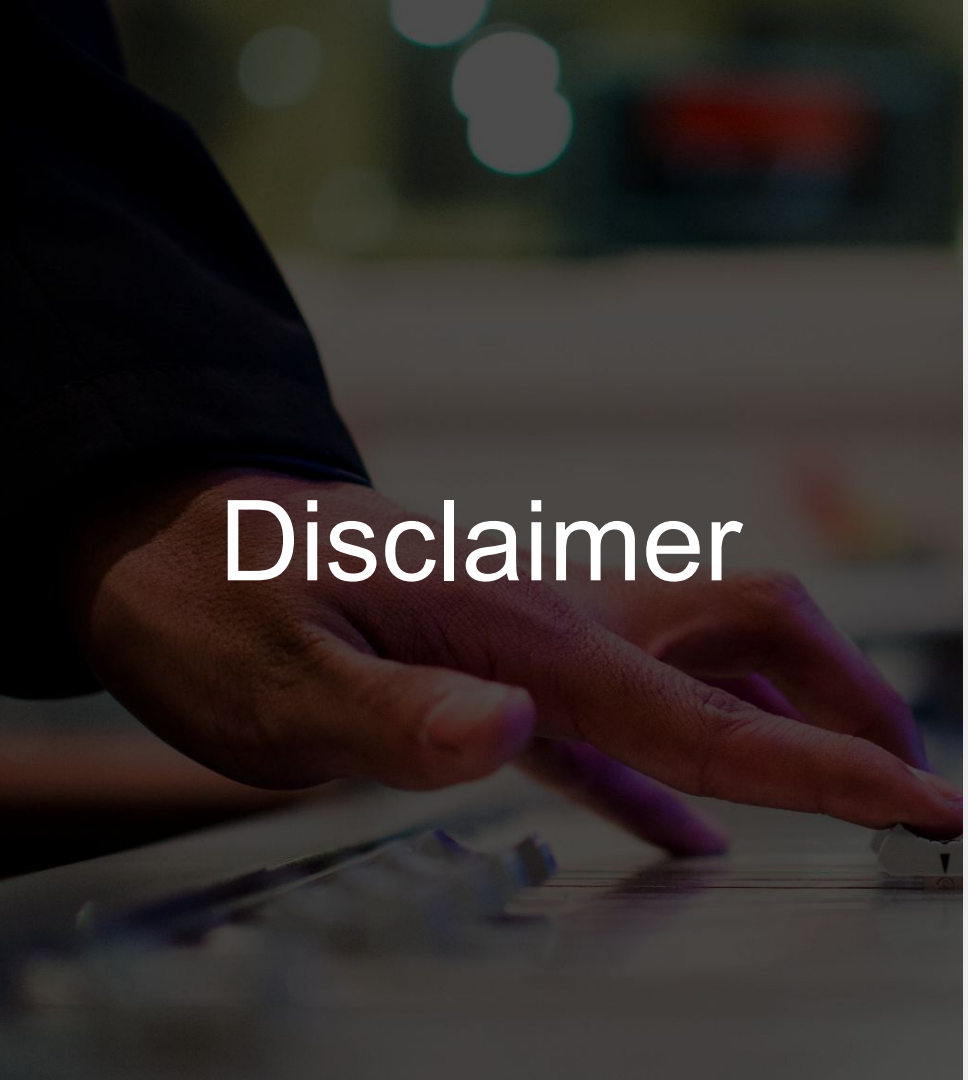
Prerequisites

- Knows how to perform basic computer operations and software installation.
- Good logical thinking (i.e., algorithms)
- Knows how to use and find information on the internet (would be nice to has a knowledge of Web protocols, etc)
- Not afraid on using a “Dark Screen”.
- **Optionally** has the basic knowledge of HTML, CSS, and JavaScript (Prior knowledge on Typescript and React will be helpful)
- **Optionally** has the basic knowledge on Git.



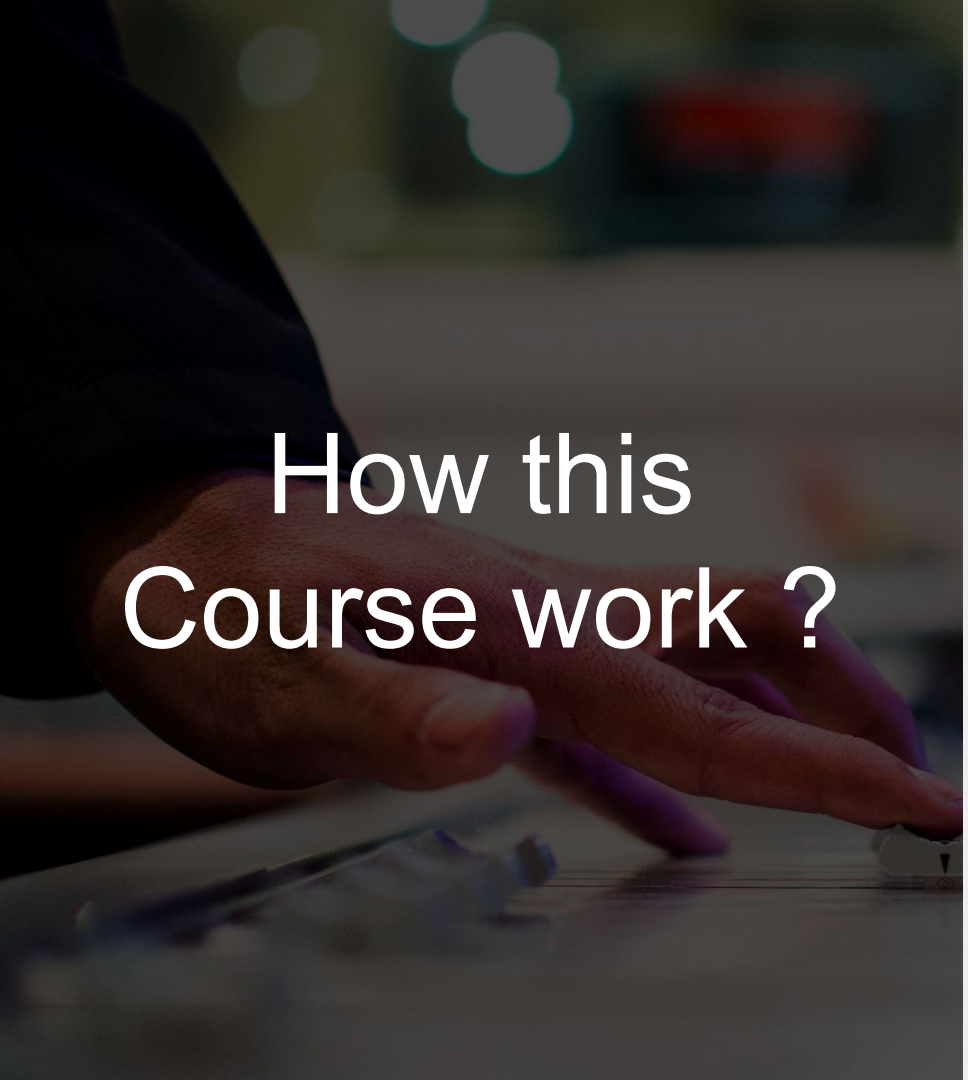
Caveats

- No “Shortcuts” !!!
- Unlikely to cover all topics in short amount of time
  - Goal is to be reasonably comprehensive
  - Enable you to develop your own production (web-based) applications
  - Enable you to fill in gaps yourself once you know what does it need to be a master



Disclaimer

The information provided here is designed to provide helpful information on the subjects discussed and just my own opinion based on my proven experiences (not represent any entities)



How this Course work ?

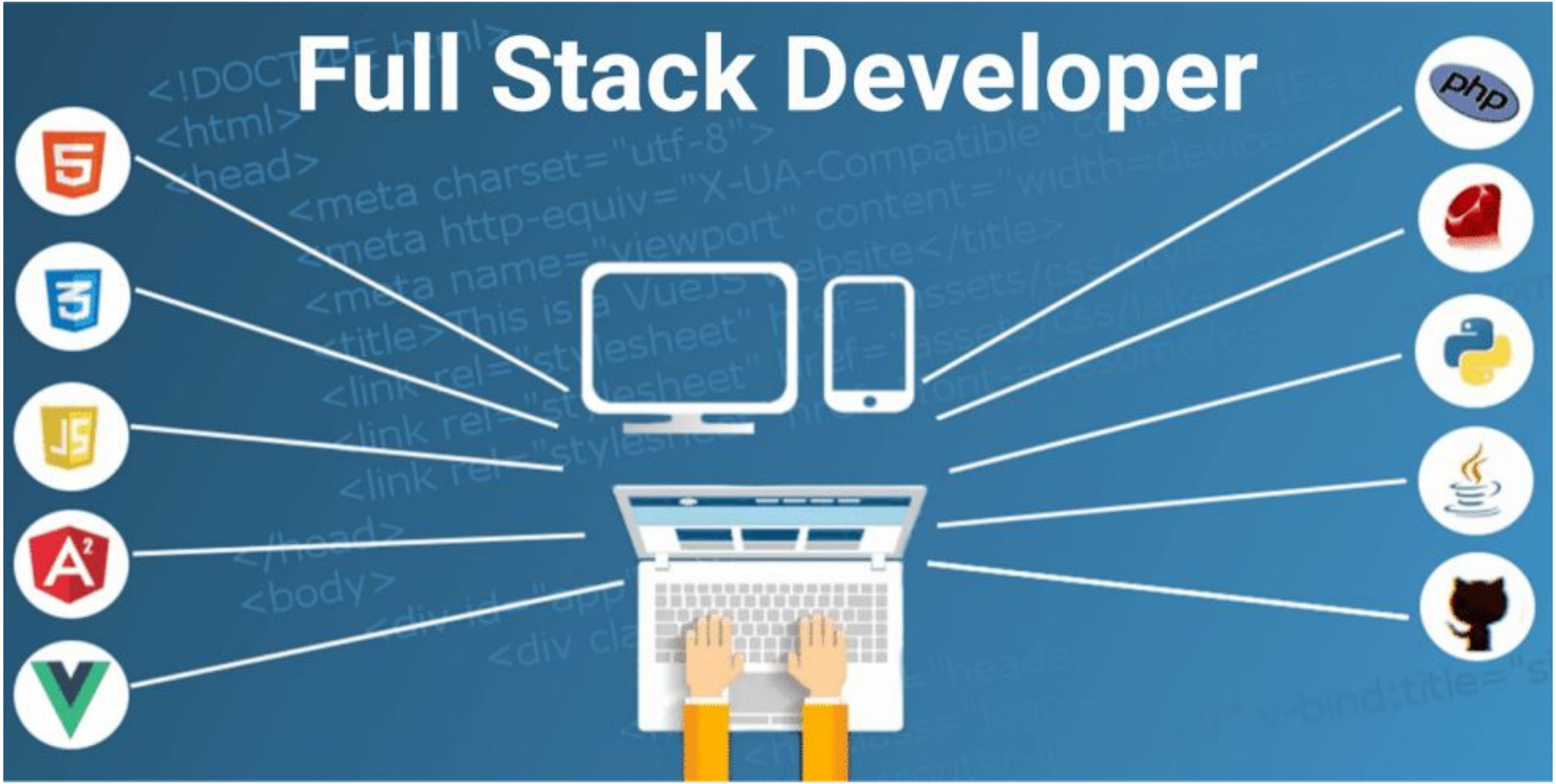
- Slide to explain concepts
- Exercises to reinforce concepts


DAY 1
FULL STACK
DEVELOPMENT

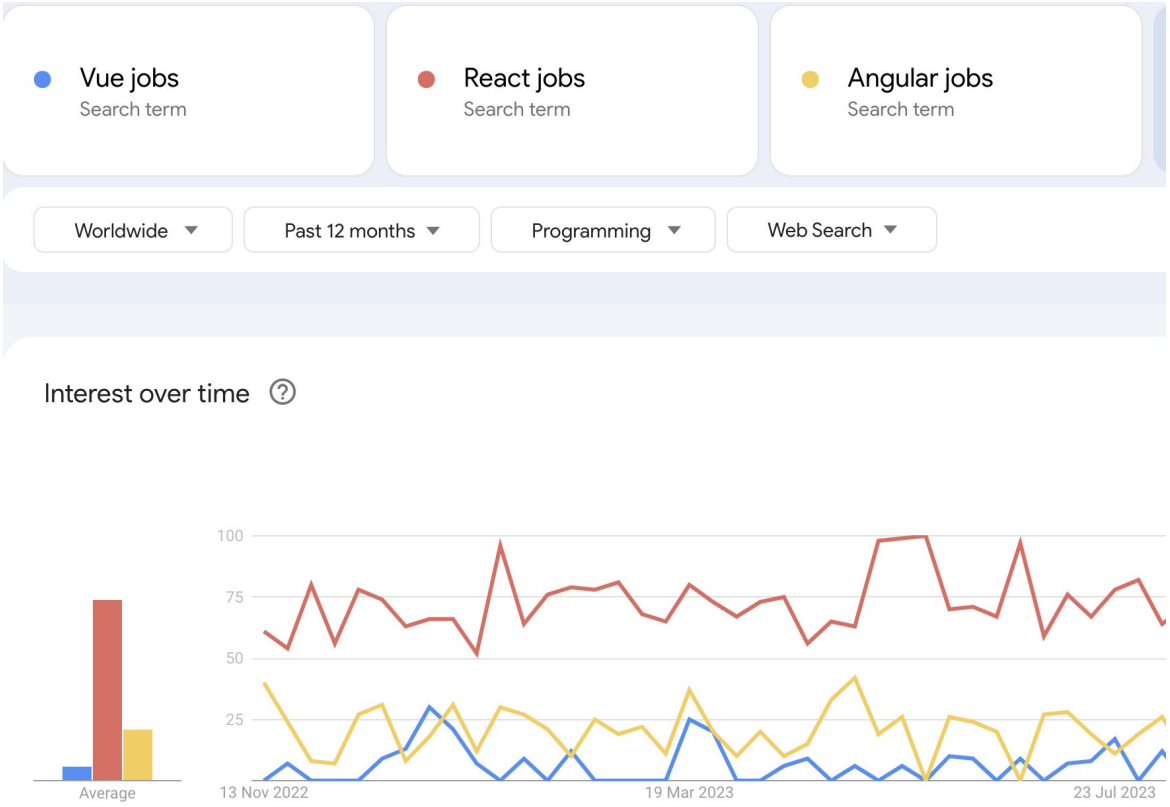
FULL STACK DEVELOPER

VS

SOFTWARE ENGINEER


Full Stack Developer
php

React Job Trends (Google)



https://trends.google.com/trends/explore?cat=31&q=Vue%20jobs,React%20jobs,Angular%20jobs

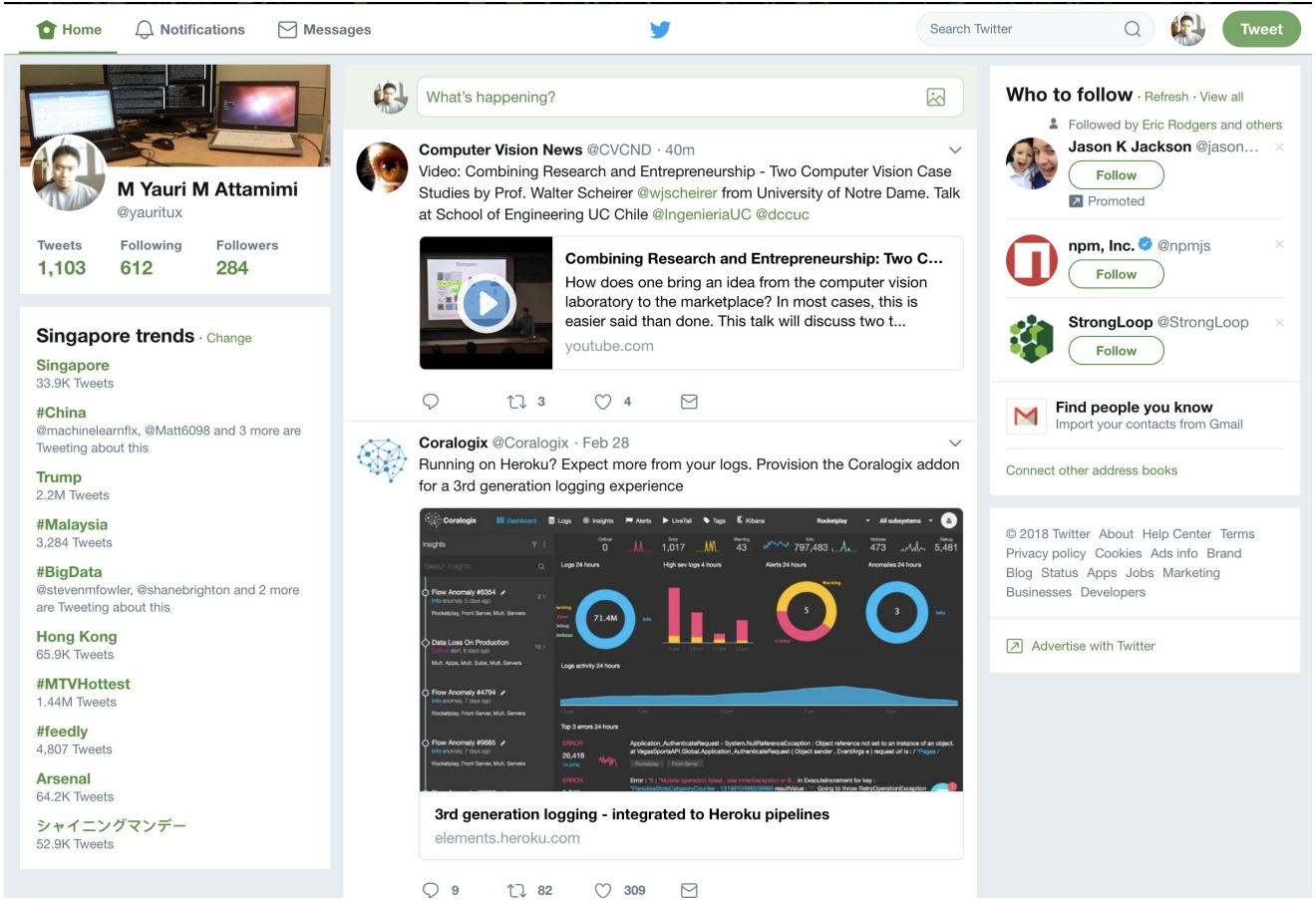
What is React ?

- React is a JavaScript library for building fast and interactive user interfaces.
- React was developed on Facebook in 2011 and currently is the most popular JavaScript library for building interfaces

React Component (I)

- Component is the heart of all React applications
- Component essentially is a piece of the user interface
- When building a React app, we build a bunch of independent, isolated, and reusable components…, then compose them to build complex user interfaces.
- Every React application has at least one component which we refer to as the “Root” component.
- “Root” component represents the entire application and contains other children components.
- Every React application essentially is a tree of components.

React Component (II) - Example



Comprises of these following components:

- Navbar
- Profile
- Trends
- Feed
    - Tweet
        - Like

And so forth.

As we can see, each component is a piece of UI.

React vs Angular ?

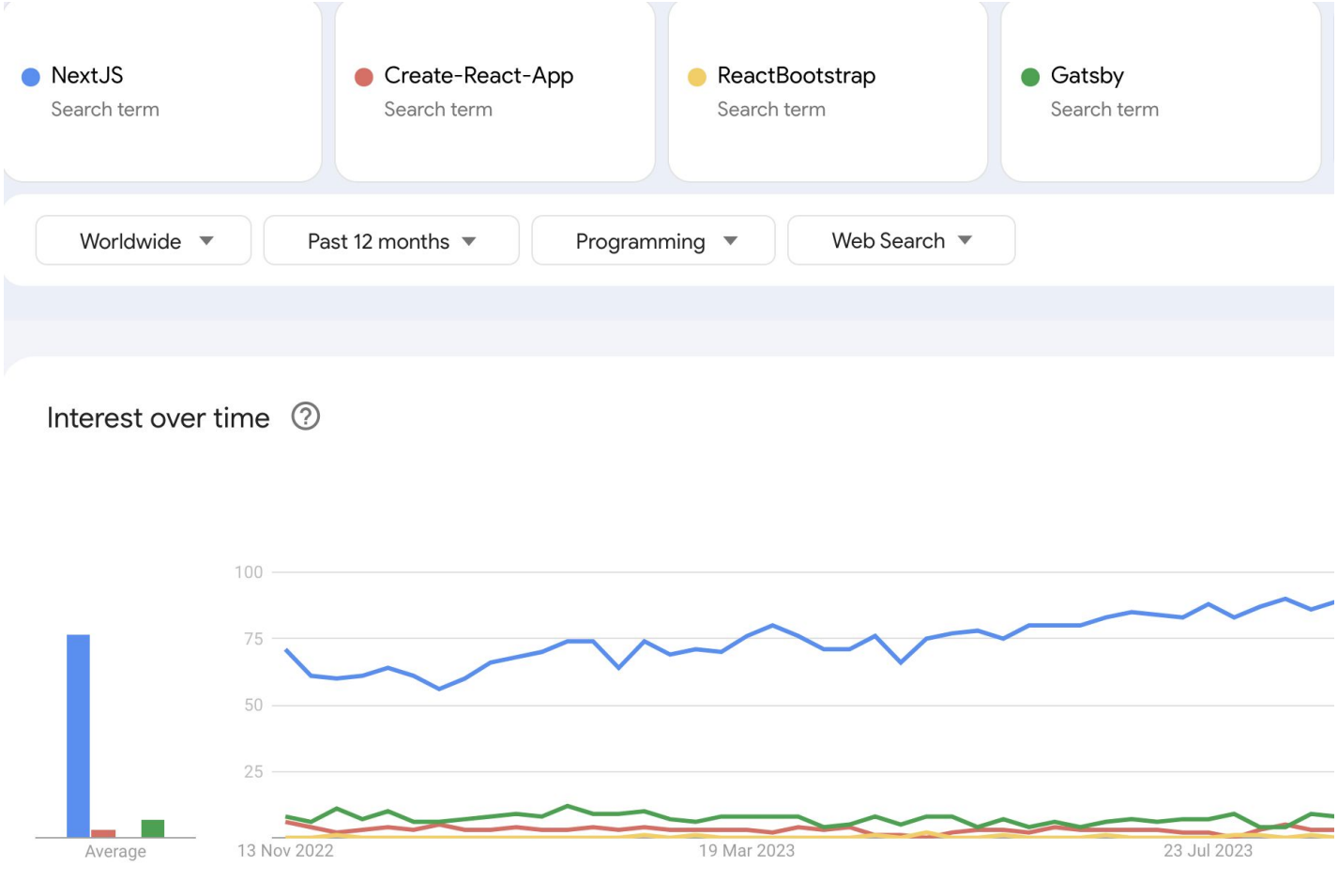
- Both is similar in terms of Component-Based Architecture.
- Angular is a framework with complete solution, while React is a frontend (view) library.
- React is much simpler than angular (i.e. short learning curve)


NEXT
.JS

Some NextJS Features

- File-based Routing over Code-based Routing
  - **Page** Based
  - **App** Based
- SSR (pre-rendering) and CSR
- Static Side Generation (pre-build / server pre-generated)
- Fullstack Framework

React Framework Trends (Google)



Lab Setup

1. Download and install the latest stable version of NodeJS.
2. Optionally install `nvm`.
3. Install Code Editor (e.g. Visual Studio Code / VSCode).
4. Install these 2 extensions within your installed VSCode:
   a. **Simple React Snippets** → developed by Burke Holland
   b. **Prettier** → developed by Esben Petersen
5. Settings to trigger prettier on file saved.
   a. **Accessing menu Code > Preferences > Settings**
   b. Under **User Settings** tab, add a new pair of key-values: `"editor.formatOnSave": true`
6. Install Git.

Lab 1

First Next App

1. Open terminal.
2. Execute command:

```
pnpx create-next-app@latest
```

1. Go to the created folder.
2. Run the program.

```
pnpm run dev
```

1. Pay attention to the generated project skeleton.
2. Change the display with your own custom JSX (e.g. trying to display “Hello Next World!” on the browser page)

Lab 1.1

Static / Name Based Routing

Create a new “About” page.

Lab 1.2

Nested Paths & Routes

Create Portfolio pages grouped under a folder named “portfolio”.

Lab 1.3

Dynamic Paths & Routes

1. Create several portfolio pages (e.g., index, list, and project specific page) grouped under a folder named “portfolio”.
2. Extracting dynamic path segment data.
3. Setup dynamic path folder(s) for different Client(s).
4. Navigating with “Link” component.
5. Programmable (Imperative) Navigation.

Lab 1.4

Catch All Routes

Purpose:

Used to handle different segment naming variations regardless of the number of nested paths

(e.g., blog/[article-id], blog/[year]/[article-id], blog/[year]/[month]/[article-id], etc)

Lab 1.5

Change Default 404

- **NextJS** comes with a default 404 page to represent a “Not Found” page.
- In most cases, you would like to override this particular 404 page with your own (e.g., a standard 404 page that represent your company, etc).

Lab 1.6

Module (Component-Scoped) CSS

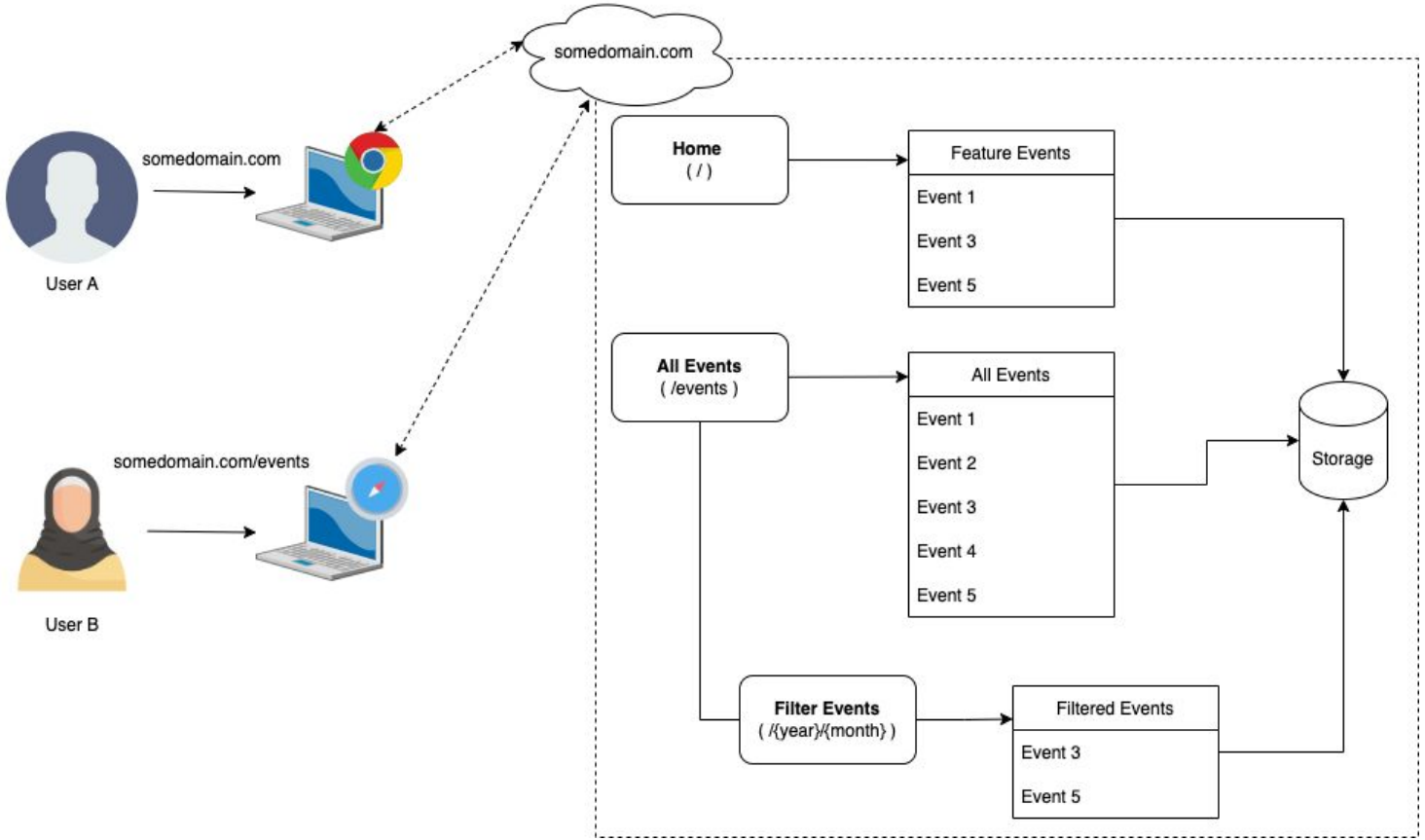
- CSS should has extension of `*.module.css`.
- Place it under the same package with your component.


Q & A


DAY 2
FULL STACK
DEVELOPMENT

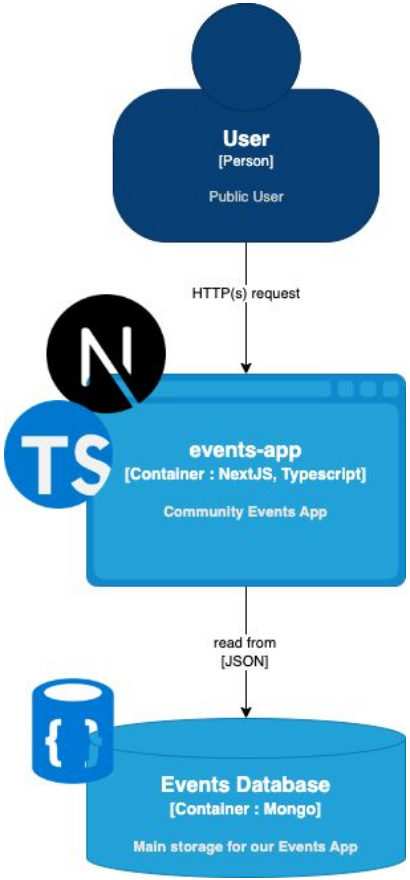
Lab 2

Community Events App (User Story Board)



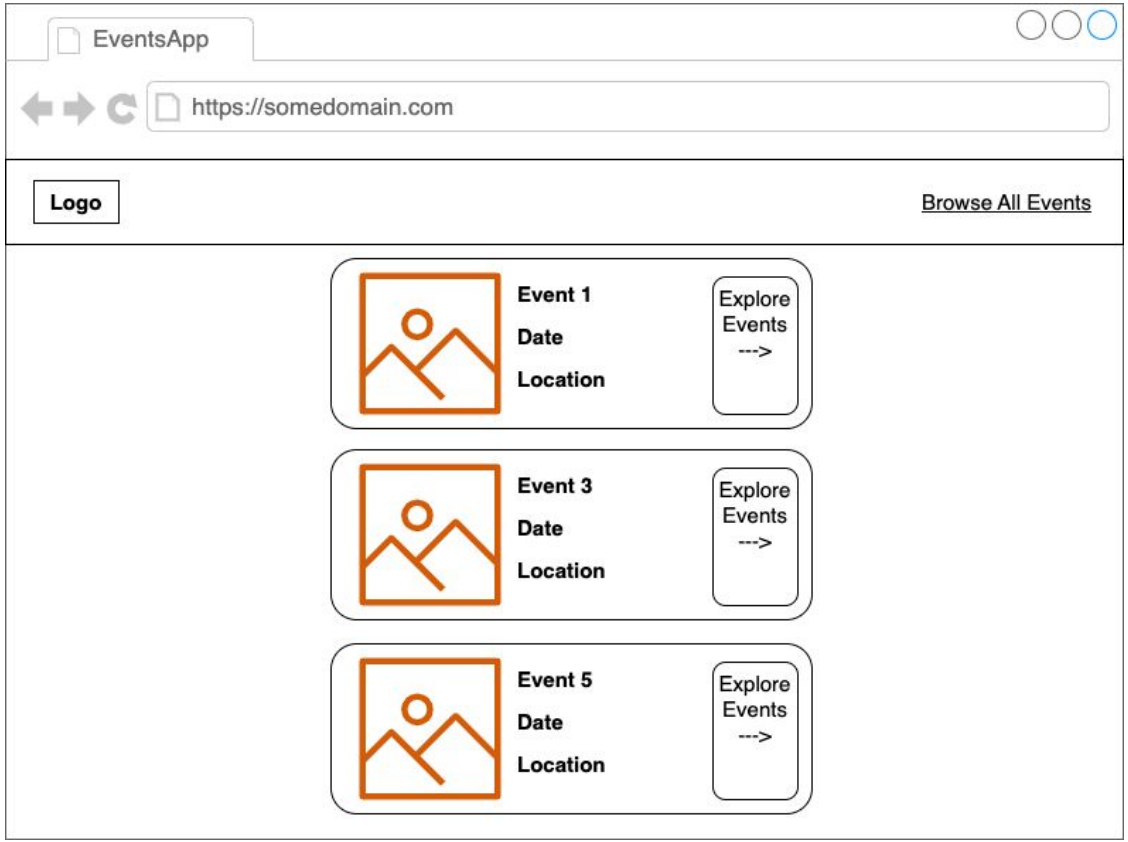
Lab 2

Community Events App (Container Level Diagram)



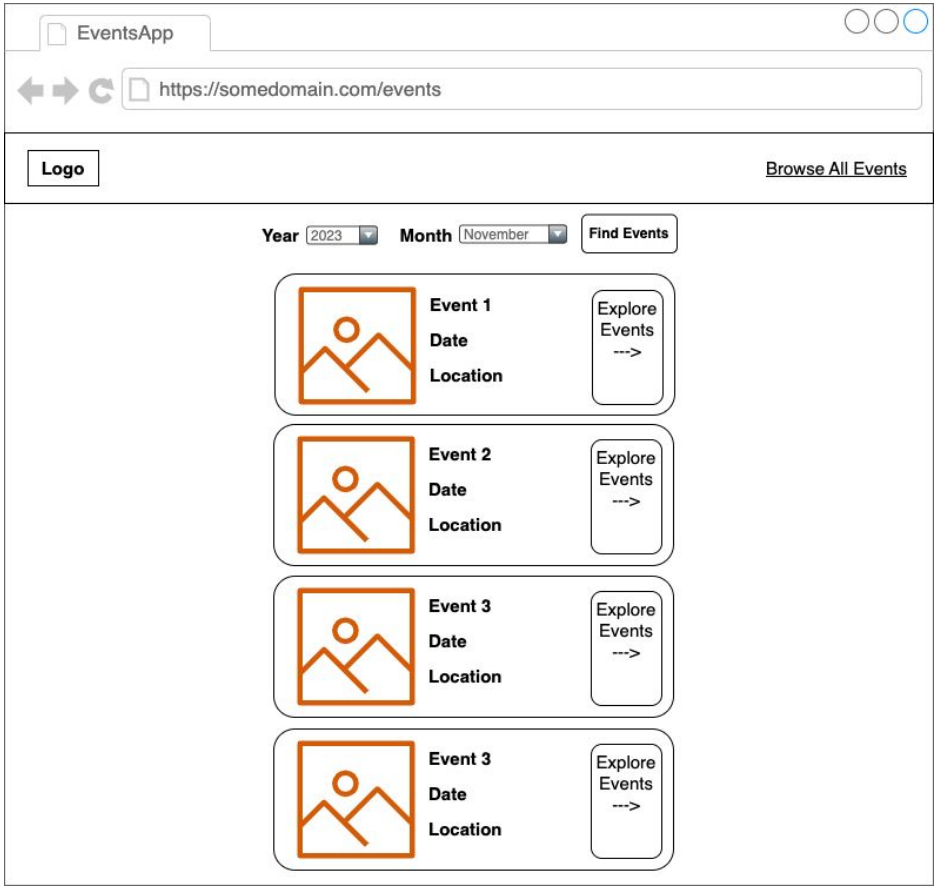
Lab 2

Wireframe (Home / Index)



Lab 2

Wireframe (All Events)



Lab 2.1

Project Setup

1. Open terminal.
2. Execute command:

```
pnpx create-next-app@latest
```

1. Name your project with “events-app”

Lab 2.2

Setup Dummy Data

1. Open your terminal.
2. Create a JSON file contains some dummy data with these following structure:
    a. **Event ID** (attribute type: `string`, attribute name: `id`)
    b. **Event Name** (attribute type: `string`, attribute name: `title`)
    c. **Event Description** (attribute type: `string`, attribute name: `description`)
    d. **Venue** (attribute type: `string`, attribute name: `location`)
    e. **Date of Event** (attribute type: `string`, attribute name: `date`)
    f. **Event Picture** (attribute type: `string`, attribute name: `image`)
    g. **Event Feature Flag** (attribute type: `boolean`, attribute name: `isFeatured`)
3. Some Tips
    a. get your free images from unsplash.
    b. get your free icons from heroicons.

Lab 2.3

Data Fetching

1. Put all images you have downloaded under the `public/images` folder.
2. Create one folder named `providers` under the project root directory.
3. Create a new file and give it a name `EventRepository.ts` and place it directly under `providers` folder
4. Write few functions into this particular file to retrieve some events data from the JSON file you had prepared earlier.
5. Display only featured events on the Home (index) page.

Lab 2.4

Separation of Concerns (EventList Component)

1. Create one folder named `components` under the project root directory (i.e., at the same level as `providers` and `pages`).
2. Create one subfolder named `events` under the aforementioned `components` folder.
3. Create a new file named `EventList.tsx` and place it under the `events` folder.
4. Return a function component that responsible to render the events. This function-based component is supposed to receive events data from its props.
5. Call this `EventList` component from your `index.tsx`.

Lab 2.5

More Separation of Concerns (EventItem Component)

1. Create a new file named `EventItem.tsx` and place it under the `events` folder (i.e., same level as `EventList.tsx`).
2. Return a function component that responsible to render the event item. This function-based component is supposed to receive all details about the event from its props.
3. Call (embed) this `EventItem` component from within your `EventList` component.

Lab 2.6

Module / Component Scoped Stylings

1. Copy these following css files under the same folder as `EventList` and `EventItem` components (i.e., `components/events` folder):
   a. event-list.module.tsx
   b. event-item.module.tsx
2. Apply the stylings respectively for the `EventList` and `EventItem` components.

Caveats:

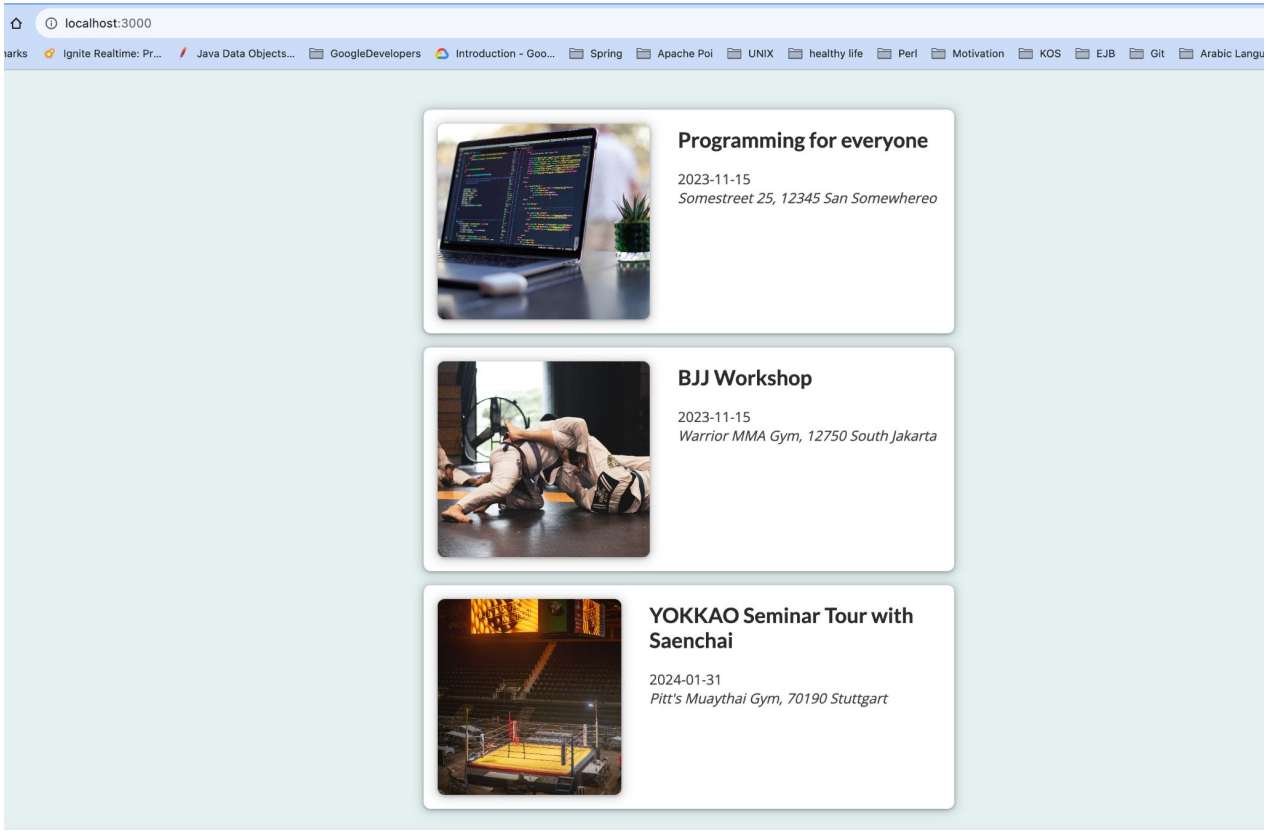
Module / Component scoped styling file should have a suffix of `*.module` after it's filename. Hence, makesure that you include that suffix.


Q & A


DAY 3
FULL STACK
DEVELOPMENT

Lab 3

Our Events App So Far..



Lab 3.1

Adding a Base Layout

1. Create a new folder named `layout` under the `components` folder.
2. Copy `main-header.module.css` file into this particular layout folder.
3. Create a new component for `MainHeader` (i.e., `MainHeader.tsx`) and write all the necessary logics to display your common header as what depicted on the wireframe.
4. Create a new “wrapper” component named `Layout` (`Layout.tsx`). This component will be used as a main layout for binding the `MainHeader` component and all contents together, i.e. all components those are bound within the `main` section.
5. Use the aforementioned `Layout` component as a parent for the `<Component>`’s tag defined in the base `_app.tsx` file.


Q & A


DAY 4
FULL STACK
DEVELOPMENT

Lab 4.1

“/events” Page

1. Create a new page to display all events (“`/events`”).
2. Reuse the `EventList` component for displaying all events.

Tips:

there are 2 ways for creating this page. Choose which one suits you best.

Lab 4.2

Catch All Routes (/events/{year}/{month})

1. Create a new Page for filtering events based on the selected year and month. (**hint:** use “catch all routes” method for creating this page)
2. Reuse the `EventList` component for displaying all of the filtered events.

Lab 4.3

Searching for Event(s)

1. Adding a “searching box” that is useful for finding any event based on your selected filter / searching criteria.
2. User should be able to filter event based on the year and month.
3. As usual, you are highly encouraged to build this particular “searching box” as a component.
   (copy the `events-search.module.css` as we have provided for you and put it in the same directory as your “searching box” component’s file).

Lab 4.4

Exercise 1

1. Adding a “result title” component to display the searching result’s title. This particular `ResultsTitle` component should also contain a Link with title of “Show All Events” that links to the `/events` page when it’s clicked.
2. As before, utilize the `EventList` component to display all events matched your searching criteria.
3. copy the `results-title.module.css` as we have provided for you and put it in the same directory as your `ResultsTitle` component’s file).

Lab 4.5

Exercise 2

1. Replace `Link` in the `ResultsTitle` with a button.
2. Build a reusable `Button` component that can be used to handle these following functions within your page:
   a. Searching for Event(s)
   b. Browse All Events (the one that defined in the `MainHeader` component)
   c. Show All Events (the one that defined in the `ResultsTitle` component)
3. Format all events date into a human readable format, for instance: “November 25, 2023” instead of “2023-11-25”.

Hint:

Put this `Button` component in the `` `components/ui` `` package or folder.

Lab 4.6

Exercise 3

1. Add “Explore Event” button on each `EventItem`. Once clicked, user will be redirected to a page showing all details of the selected event.

Hint: Please utilize as much as possible all of the provided css files.

Appendix

Some Useful References for your knowledge refreshment on React:

- https://www.freecodecamp.org/news/react-hooks-fundamentals/
- https://react.dev/learn/referencing-values-with-refs
- https://react.dev/learn/referencing-values-with-refs#refs-and-the-dom
- https://blog.logrocket.com/usestate-vs-useref/

Git References:

- https://www.conventionalcommits.org/en/v1.0.0/

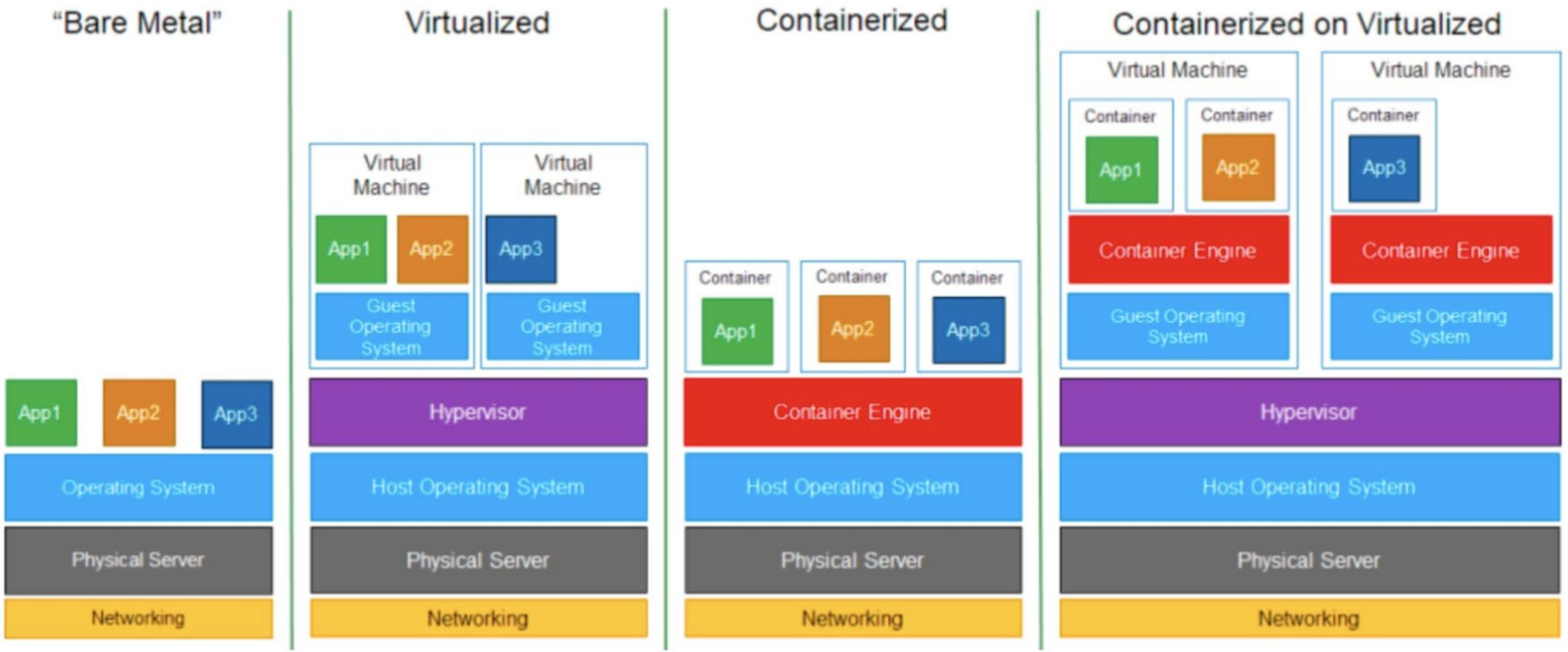
App Versioning:

- https://semver.org/

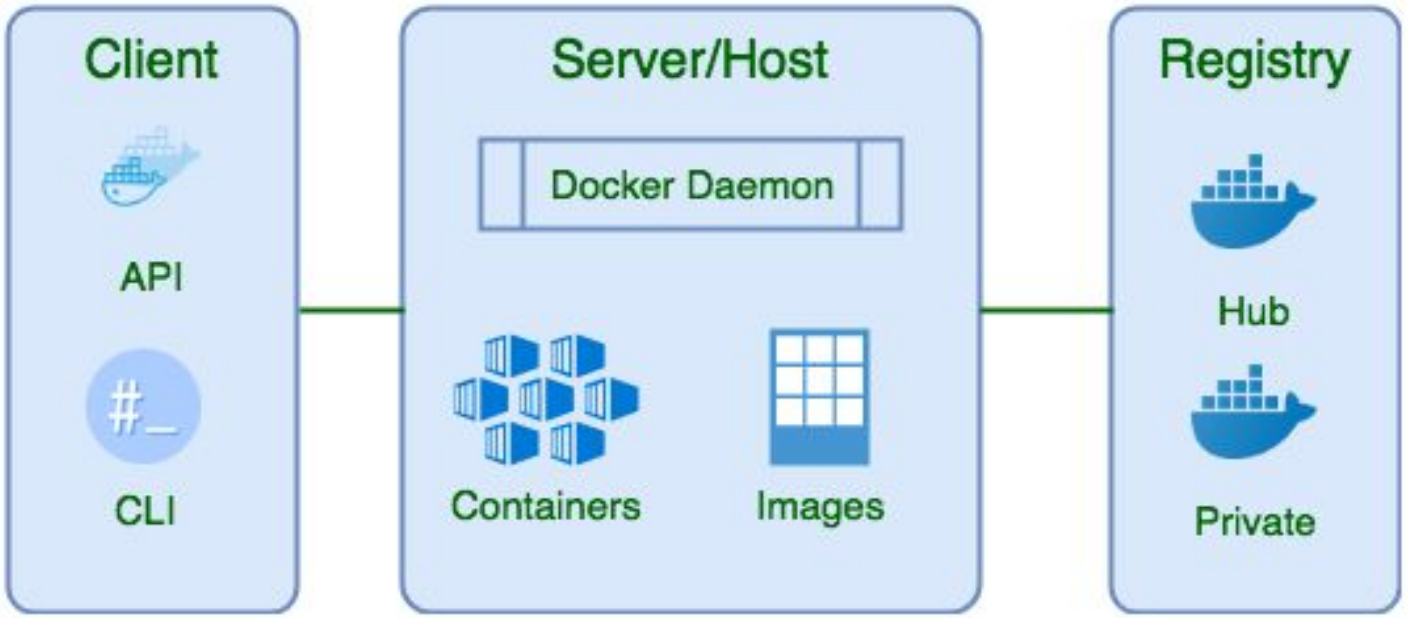

Q & A


DAY 5
FULL STACK
DEVELOPMENT

On-Premise vs Virtual Machine vs Container



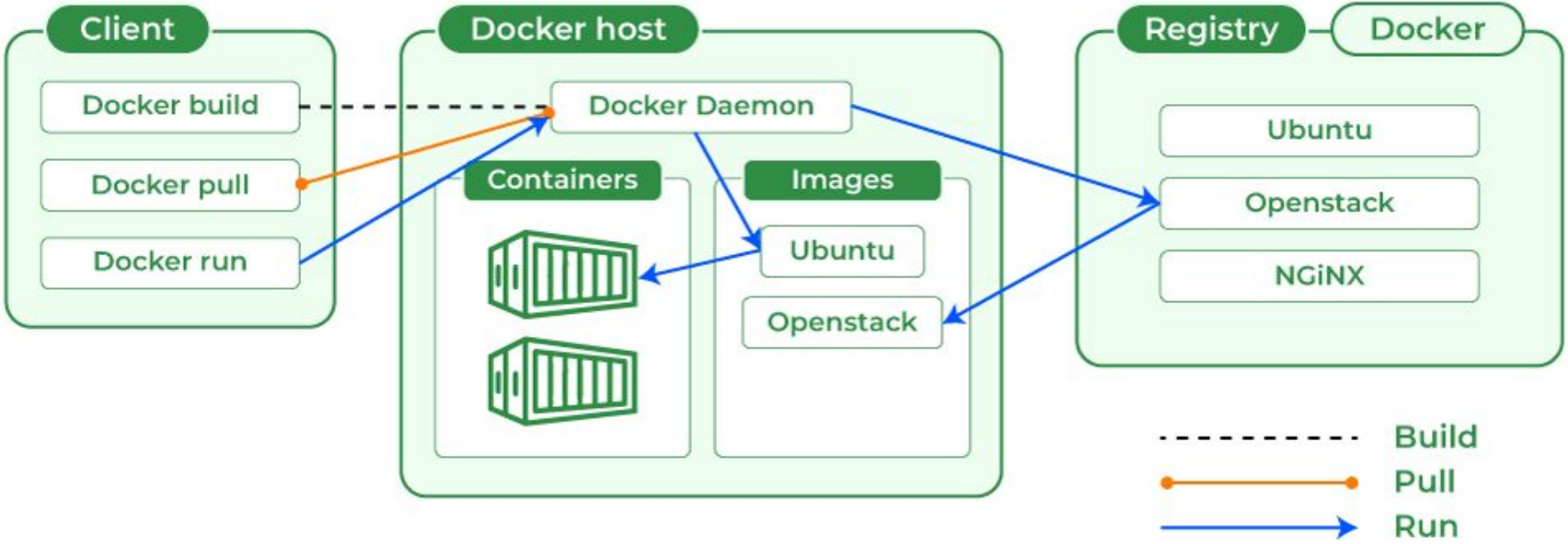
Docker Architecture



Lab Setup

1. Download and install Docker from : https://docs.docker.com/get-docker/

Docker Basic Commands



Other Useful Docker Commands

1. `docker image ls`
2. `docker container ls`
3. `docker container run / docker run`
4. `docker container exec <container_id>`
5. `docker container log <container_id>`

Tips:

Use `--help` flag to get more details for each command.


Q & A


DAY 6
FULL STACK
DEVELOPMENT

Lab 6.1

1. Run MongoDB container in your local environment.
2. Setup new database and name it as "`eventsdb`".
3. Create new collection called `events` with this following structure (a.k.a. **schema**) :
   a. **Event ID** (attribute type: `string`, attribute name: `id`)
   b. **Event Name** (attribute type: `string`, attribute name: `title`)
   c. **Event Description** (attribute type: `string`, attribute name: `description`)
   d. **Venue** (attribute type: `string`, attribute name: `location`)
   e. **Date of Event** (attribute type: `string`, attribute name: `date`)
   f. **Event Picture** (attribute type: `string`, attribute name: `image`)
   g. **Event Feature Flag** (attribute type: `boolean`, attribute name: `isFeatured`)
4. Insert some data into the events collection we've just created.

Ref:

https://www.mongodb.com/docs/manual/reference/method/db.createCollection/

Lab 6.2

Refactoring:: Use Mongo as Database

1. Refactor your **events-ap** project to get all events data from the database (mongo) you've created.

Lab 6.3

Exercise

1. Complete all remaining event repository functions (i.e, `Get Event By ID`, `Searching for Event`, etc).
2. Adding a new form that can be used to entry a new event !
3. Refactor your Event Database Repository to ensure there’s no hardcoded value anymore.


Q & A


DAY 7
FULL STACK
DEVELOPMENT

Page Pre-Rendering & Data Fetching

1. Pre-Rendering Behavior

   This will be the default behavior for any NextJS App which comprises of:

   - **Static Site Generation (SSG)**
   - Server Side Rendering (SSR)

2. **getStaticProps** (`export async function getStaticProps(context) { … }`)
   - Add this function to pre-generate a page (*Static Site Generation / SSG*) with data prepared on the server-side during a build time.
   - a.k.a. AOT (Ahead Of Time) where pages are prepared ahead of time and can be cached by the server / CDN serving the app.
3. Benefits:
   - SEO Friendly
   - CDN Friendly

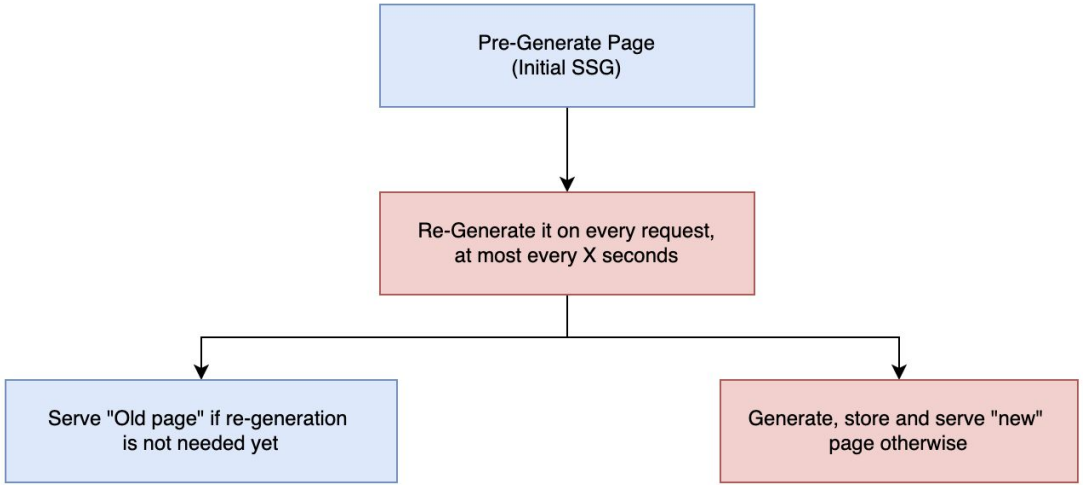
     Ref: https://www.techtarget.com/searchnetworking/definition/CDN-content-delivery-network
   - Low spec clients.
4. Drawbacks:
   - You have no access to the actual incoming request

Lab 7.1

1. Short demo on Static Site Generation (SSG).

Incremental Site Generation (ISR)

1. **getStaticProps** can also be utilized for what being known as **ISR** (*Incremental Site Rendering / Incremental Site Generation*).
2. **ISR** might occur several times for every incoming request, at most every X seconds, e.g. every 60 seconds (i.e., not limited to the build time).



Lab 7.2

1. Short demo on the ISR.

More “getStaticProps” Config Options

1. `notFound : boolean`

   e.g.

```
if (data.products.length === 0) {
   return { notFound: true };
}
```

2. `redirect : { destination: string, permanent: boolean }`

   e.g.

```
if (!data) {
   return {
      redirect: {
         destination: “/no-data”,
         permanent: false,
      }
   };
}
```

Working with Dynamic Page (Dynamic Path Param)

`useRouter` alternative

1. Leverage the `getStaticProps` context to extract the dynamic path

   E.g.

```
async function getStaticProps(context) {
   const { params } = context;
   const productId = params.pid
   // code to filter product based on the productId
}
```

2. Implement `getStaticPaths` since it's required for dealing with any dynamic SSG pages (i.e., page with dynamic path param).

   NB: By default, a dynamic page will be following JIT (Just In Time), i.e. page will be provided at runtime when it is requested which is different from the AOT (Ahead On Time) / Pre-generated Page as the default behavior for any NextJS app.

Ref: https://www.vitamindev.com/next-js/getstaticprops-getstaticpaths-typescript/

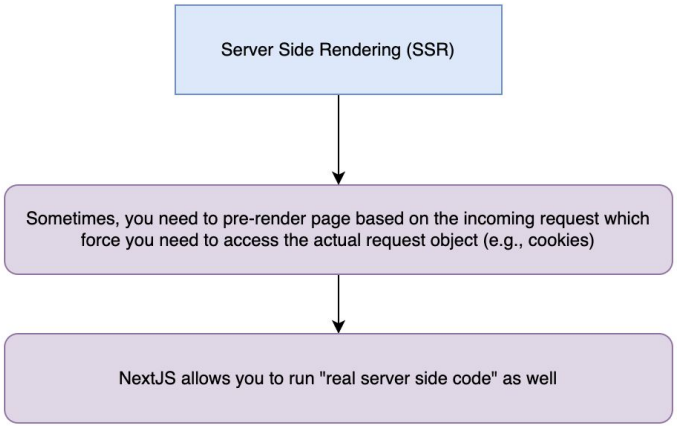
Lab 7.3

Working with Fallback Pages

1. Useful to postpone pre-rendered (pre-generated) page, particularly for some pages those are not frequently visited.
2. Enable by setting the fallback config to either “`true`” or “`blocking`”.
   Ref:
   https://stackoverflow.com/questions/67787456/what-is-the-difference-between-fallback-false-vs-true-vs-blocking-of-getstaticpa

Server Side Rendering (SSR)

1. Another form of pre-rendering (i.e., generated on the server side).
2. Has access to the actual request object (e.g., cookies). This is what make it different from the Static-Site Generation (SSG) / Incremental Side Generation (ISG / ISR)
3. Runs on every incoming request.
4. Implemented through an async function named `` `getServerSideProps` ``



“getServerSideProps” Context Object

1. We can extract valuable information the server side props Context object such as HTTP request object and HTTP response object for further process such as:
   - Get some details information about the user that triggered the request.
   - Adding more headers into the response object before it’s returned from the functional component object.

   Ref:

   - https://nodejs.org/api/http.html#http_class_http_incomingmessage
   - https://nodejs.org/api/http.html#http_class_http_serverresponse
2. **E.g.:**

```
export const getServerSideProps: GetServerSideProps =
  async (context) => {
    const { params, req, res } = context;
}
```

Lab 7.4

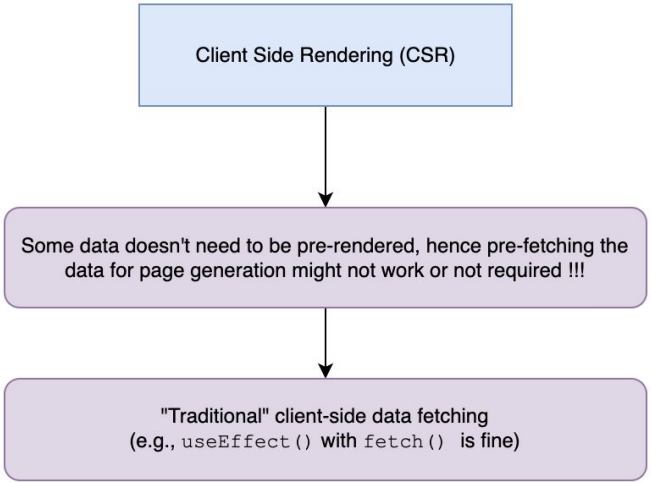
Working with “Server Side Rendering”

1. Short demo on the `` `getServerSideProps` `` usage.

Client Side Data Fetching

Client Side Rendering (CSR)

1. Happening on Client (Web) Browser, i.e. no server pre-rendering.
2. Suitable for any of these following type of applications:
   - Application with frequently changed data (e.g. Stock Data).
   - Application highly user-specific data (e.g. last orders in an online shop).
   - Application with partial data (e.g. data that's merely used on a part of a page such as dashboard).
3. Drawbacks :
   - Not SEO Friendly
   - Might depends on the client internet speed and device specs.



Ref: https://nextjs.org/docs/pages/building-your-application/rendering/client-side-rendering

Lab 7.5

CSR with “Traditional” approach

1. Short demo on CSR with `useEffect()` and `fetch()` methods.

CSR with SWR (“useSWR” hook)

1. Derived from “stale-while-revalidate”.
2. Similar like useEffect and fetch yet with better performance and some additional built-in features such as:
    - Caching
    - Automatic Revalidation (i.e. Optimistic update that ensure user gets the most updated data)
    - Retries on Error

Lab 7.6

CSR with “useSWR” hook

1. Short demo on CSR with `useSWR()` hook.


Q & A


DAY 8
FULL STACK
DEVELOPMENT

Deploying NextJS App

Deployment Options

1. **Standard Build** (i.e., `` `next build` ``)
    - Produces optimized production bundles and a server-side app (requires NodeJS server).
    - Pages are pre-rendered (if possible) but NodeJS server is required for API routes, server-side pages and page revalidations.
    - Re-deploy needed if code changes in case you don't use revalidations and need page updates.
2. **Full Static Build** (i.e., `` `next export` ``)
    - Produces 100% static app (HTML, CSS, JS). No NodeJS server required.
    - Doesn't work if your app uses API routes, server-side pages or wants to use page revalidations.
    - Re-deploy needed for all code and content changes.

Ref: https://nextjs.org/docs/pages/building-your-application/deploying

Deploying NextJS App

Deployment Steps & Considerations

1. Add page metadata, optimize code (e.g., image), remove unnecessary dependencies.
2. Use environment variables for variable data (e.g., database credentials, API keys, etc).
3. Do a test build and test the production-ready app locally or on a test server.
4. Deploy.

Optimizing Next App

1. Put any necessary meta tags in the “Head” section
   Ref : https://nextjs.org/docs/pages/api-reference/components/head
2. Optimize image
   Ref : https://nextjs.org/docs/pages/api-reference/components/image

NextJS Config

1. https://nextjs.org/docs/pages/api-reference/next-config-js

Deploy

1. https://vercel.com
2. https://netlify.com
3. Amazon Web Services (AWS)
    - EC2
    - ECS (Ref: https://aws.amazon.com/ecs/getting-started/?pg=ln&cp=bn)
    - EKS
    - Amplify (https://docs.aws.amazon.com/amplify/latest/userguide/deploy-nextjs-app.html)
4. Google Cloud Platform (GCP)
    - Compute Engine
    - GKE

Further References

1. Build as Docker container (Docker Template)
    - https://docs.docker.com/engine/reference/builder/
    - https://medium.com/@2018.itsuki/dockerize-a-next-js-app-4b03021e084d


Q & A