

Step 1 - Backends in Next.js

Next.js is a full stack framework

Step 2 - Recap of Data fetching in React

Let's do a quick recap of how data fetching works in React



We're not building backend yet

Assume you already have this backend route - <https://week-13-offline.kirattechnologies.workers.dev/api/v1/user/details>

Code - <https://github.com/100xdevs-cohort-2/week-14-2.1>

Website - <https://week-14-2-1.vercel.app/>

User card website

Build a website that let's a user see their name and email from the given endpoint

Name: Harkirat
harkirat@gmail.com

UserCard component

```

export const UserCard = () => {
  const [userData, setUserData] = useState<User>();
  const [loading, setLoading] = useState(true);

  useEffect(() => {
    axios.get("https://week-13-offline.kirattechnologies.workers.dev/api/v1/user/details")
      .then(response => {
        setUserData(response.data);
        setLoading(false);
      })
  }, []);

  if (loading) {
    return <Spinner />
  }

  return <div className="flex flex-col justify-center h-screen">
    <div className="flex justify-center">
      <div className="border p-8 rounded">
        <div>
          Name: {userData?.name}
        </div>

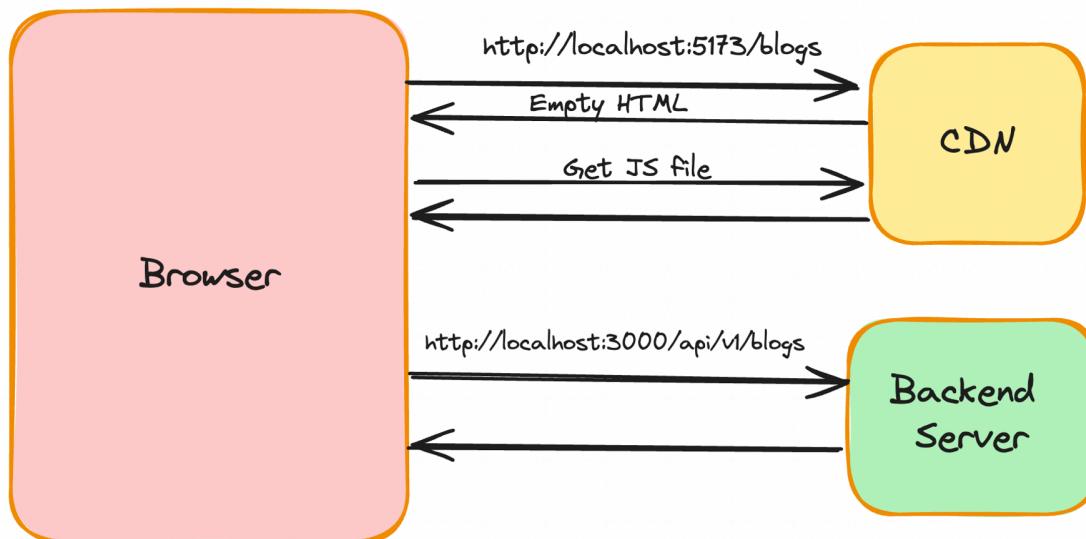
        {userData?.email}
      </div>
    </div>
  </div>
}

```

Annotations:

- Red box around the state variables: `const [userData, setUserData] = useState<User>();` and `const [loading, setLoading] = useState(true);` with the label "State variables".
- Red box around the `useEffect` hook with the label "Data fetching".
- Red box around the spinner rendering code with the label "Rendering a spinner".
- Red box around the card rendering code with the label "Rendering the card".

Data fetching happens on the client



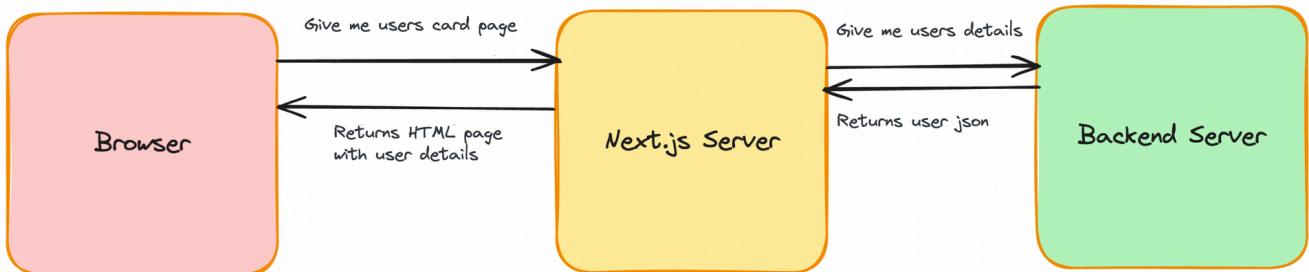
Step 3 - Data fetching in Next

Ref - <https://nextjs.org/docs/app/building-your-application/data-fetching/fetching-caching-and-revalidating>



You can do the same thing as the last slide in Next.js, but then you lose the benefits of `server side rendering`

You should fetch the user details on the server side and `pre-render` the page before returning it to the user.



Let's try to build this

1. Initialise an empty next project

```
npx create-next-app@latest
```

1. Install axios

```
npm i axios
```

1. Clean up `page.tsx`, `global.css`

2. In the root `page.tsx`, write a function to fetch the users details

```
async function getUserDetails() {
  const response = await axios.get("https://week-13-offline.kirattechnologies.workers...
```

```
    return response.data;
}
```

- Convert the default export to be an async function (yes, nextjs now supports `async` components)

```
import axios from "axios";

async function getUserDetails() {
  const response = await axios.get("https://week-13-offline.kirattechnologies.workers.dev");
  return response.data;
}

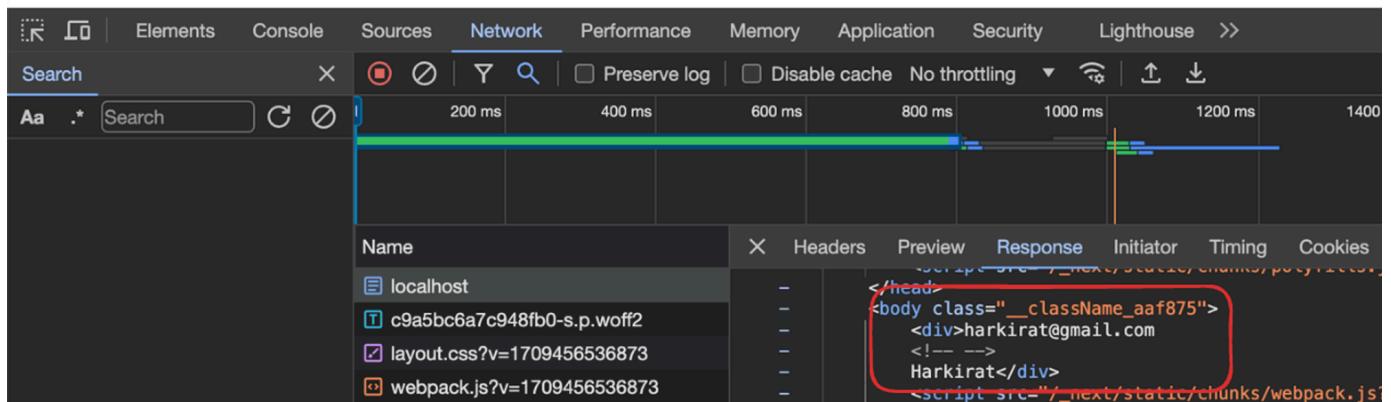
export default async function Home() {
  const userData = await getUserDetails();

  return (
    <div>
      {userData.email}
      {userData.name}
    </div>
  );
}
```

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- Check the network tab, make sure there is no waterfalling

harkirat@gmail.comHarkirat



- Prettify the UI

Copy

```
import axios from "axios";

async function getUserDetails() {
  const response = await axios.get("https://week-13-offline.kirattechnologies.workers.c
  return response.data;
}

export default async function Home() {
  const userData = await getUserDetails();

  return (
    <div className="flex flex-col justify-center h-screen">
      <div className="flex justify-center">
        <div className="border p-8 rounded">
          <div>
            Name: {userData?.name}
          </div>

            {userData?.email}
          </div>
        </div>
      </div>
    );
}
```

Good question to ask at this point - Where is the `loader` ?

Do we even need a `loader` ?

Step 4 - Loaders in Next

What if the `getUserDetails` call takes 5s to finish (lets say the backend is slow). You should show the user a `loader` during this time

```

import axios from "axios";

async function getUserDetails() {
  const response = await axios.get("https://week-13-offline.kirattechnologies.workers.dev/api/v1/user/details")
  return response.data;
}

export default async function Home() {
  const userData = await getUserDetails(); → 5 seconds

  return (
    <div className="flex flex-col justify-center h-screen">
      <div className="flex justify-center">
        <div className="border p-8 rounded">
          <div>
            Name: {userData?.name}
          </div>

            {userData?.email}
          </div>
        </div>
      );
}

```

loading.tsx file

Just like `page.tsx` and `layout.tsx`, you can define a `skeleton.tsx` file that will render until all the async operations finish

1. Create a `loading.tsx` file in the root folder
2. Add a custom loader inside

```

export default function Loading() {
  return <div className="flex flex-col justify-center h-screen">
    <div className="flex justify-center">
      Loading...
    </div>
  </div>
}

```

Step 5 - Introducing api routes in Next.js

NextJS lets you write backend routes, just like express does.

This is why Next is considered to be a **full stack** framework.

The benefits of using NextJS for backend includes -

1. Code in a single repo
2. All standard things you get in a backend framework like express
3. Server components can directly talk to the backend

Step 6 - Let's move the backend into our own app

We want to introduce a route that returns **hardcoded** values for a user's details (email, name, id)

1. Introduce a new folder called **api**
2. Add a folder inside called **user**
3. Add a file inside called **route.ts**
4. Initialize a **GET** route inside it

```
export async function GET() {
  return Response.json({ username: "harkirat", email: "harkirat@gmail.com" })
}
```

Copy

1. Try replacing the api call in **page.tsx** to hit this URL

```
async function getUserDetails() {
  try {
    const response = await axios.get("http://localhost:3000/api/user")
    return response.data;
  } catch(e) {
    console.log(e);
  }
}
```

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This isn't the best way to fetch data from the backend. We'll make this better as time goes by

Step 7 - Frontend for Signing up

1. Create **app/signup/page.tsx**
2. Create a simple Page

```
import { Signup } from "@/components/Signup"

export default function() {
    return <Signup />
}
```

Copy

1. Create `components/Signup.tsx`

▼ Code

```
import axios from "axios";
import { ChangeEventHandler, useState } from "react";

export function Signup() {
    const [username, setUsername] = useState("");
    const [password, setPassword] = useState("");

    return <div className="h-screen flex justify-center flex-col">
        <div className="flex justify-center">
            <a href="#" className="block max-w-sm p-6 bg-white border border-gray-200 rounded-lg shadow-md">
                <div>
                    <div className="px-10">
                        <div className="text-3xl font-extrabold">
                            Sign up
                        </div>
                    </div>
                    <div className="pt-2">
                        <LabelledInput onChange={(e) => {
                            setUsername(e.target.value);
                        }} label="Username" placeholder="harkirat@gmail.com" />
                        <LabelledInput onChange={(e) => {
                            setPassword(e.target.value)
                        }} label="Password" type={"password"} placeholder="123456" />
                        <button type="button" className="mt-8 w-full text-white bg-gray-900 py-2 px-4 rounded-lg">
                            Sign up
                        </button>
                    </div>
                </a>
            </div>
        </div>
    </div>

    function LabelledInput({ label, placeholder, type, onChange }: LabelledInputType) {
        return <div>
            <label className="block mb-2 text-sm text-black font-semibold pt-4">{label}</label>
            <input type={type} value={placeholder} onChange={onChange} />
        </div>
    }
}
```

Copy

```

        </input onChange={onChange} type={type || "text"} id="first_name" className='
    </div>
}

interface LabeledInputType {
    label: string;
    placeholder: string;
    type?: string;
    onChange: ChangeEventHandler<HTMLInputElement>
}

```

1. Convert `components/Signup.tsx` to a client component

`"use client"`

1. Add a `onClick` handler that sends a `POST` request to `/user`

```

<button onClick={async () => {
    const response = await axios.post("http://localhost:3000/api/user", {
        username,
        password
    });

}} type="button" className="mt-8 w-full text-white bg-gray-800 focus:ring-4 focus:ring-

```

1. Route the user to landing page if the signup succeeded

Ref `useRouter` hook - <https://nextjs.org/docs/app/building-your-application/routing/linking-and-navigating#userouter-hook>

▼ Final `signup.tsx`

```

import axios from "axios";
import { useRouter } from "next/router";
import { ChangeEventHandler, useState } from "react";

export function Signup() {
    const [username, setUsername] = useState("");
    const [password, setPassword] = useState("");
    const router = useRouter();

    return <div className="h-screen flex justify-center flex-col">
        <div className="flex justify-center">
            <a href="#" className="block max-w-sm p-6 bg-white border border-gray-200 r

```

```
<div>
  <div className="px-10">
    <div className="text-3xl font-extrabold">
      Sign up
    </div>
  </div>
  <div className="pt-2">
    <LabelledInput onChange={(e) => {
      setUsername(e.target.value);
    }} label="Username" placeholder="harkirat@gmail.com" />
    <LabelledInput onChange={(e) => {
      setPassword(e.target.value)
    }} label="Password" type={"password"} placeholder="123456" />
    <button onClick={async () => {
      const response = await axios.post("http://localhost:3000/auth/sign-up", {
        username,
        password
      });
      router.push("/")
    }} type="button" className="mt-8 w-full text-white bg-gray-800 py-2 px-4 rounded-md hover:bg-gray-700 transition">
      Sign up
    </button>
  </div>
</div>
</div>
</div>
```

}

```
function LabelledInput({ label, placeholder, type, onChange }: LabelledInputType) {
  return <div>
    <label className="block mb-2 text-sm text-black font-semibold pt-4">{label}</label>
    <input onChange={onChange} type={type || "text"} id="first_name" className="w-full border border-gray-300 p-2" placeholder={placeholder}>
  </div>
}

interface LabelledInputType {
  label: string;
  placeholder: string;
  type?: string;
  onChange: ChangeEventHandler<HTMLInputElement>
}
```



We still have to implement the backend route, lets do that in the next slide

Step 8 - Backend for signing up

Add a `POST` route that takes the users email and password and for now just returns them back

1. Navigate to `app/api/user/route.ts`

2. Initialize a POST endpoint inside it

```
import { NextRequest, NextResponse } from 'next/server';

export async function POST(req: NextRequest) {
  const body = await req.json();

  return NextResponse.json({ username: body.username, password: body.password })
}
```

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Ref - <https://nextjs.org/docs/app/api-reference/functions/next-response>

Step 9 - Databases!

We have a bunch of dummy routes, we need to add a database layer to persist data.

Adding prisma to a Next.js project is straightforward.



Please get a free Postgres DB from either neon or aiven

The screenshot shows the Aiven PostgreSQL service management interface. At the top, there's a summary bar for the service 'pg-35339ab4' which includes the PostgreSQL version (15.5), EOL status (OK), and node count (1). Below this, a 'Get started with Aiven for PostgreSQL®' section provides a step-by-step guide to setup, secure, and integrate the service. On the right, there's a cartoon illustration of an elephant. The main part of the screen displays the 'Connection information' for the service, listing details such as the Service URI (postgres://CLICK_TO REVEAL_PASSWORD@pg-35339ab4-harkirat-d1b9.a.aivencloud.com:25579/defaultdb?sslmode=require), Database name (defaultdb), Host (pg-35339ab4-harkirat-d1b9.a.aivencloud.com), Port (25579), and other configuration options. A red box highlights the Service URI field, and a red arrow points to the 'Copy' button next to it.

1. Install prisma

```
npm install prisma
```

Copy

1. Initialize prisma schema

```
npx prisma generate
```

Copy

1. Create a simple user schema

```
model User {  
    id      Int      @id  @default(autoincrement())  
    username String  @unique  
    password String  
}
```

Copy

1. Replace `.env` with your own Postgres URL

```
DATABASE_URL="postgresql://johndoe:randompassword@localhost:5432/mydb?schema=public"
```

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1. Migrate the database

```
npx prisma migrate dev --name init_schema
```

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1. Generate the client

```
npx prisma generate
```

Copy

1. Finish the `signup` route

```
export async function POST(req: NextRequest) {  
    const body = await req.json();  
    // should add zod validation here  
    const user = await client.user.create({  
        data: {  
            username: body.username,  
            password: body.password  
        }  
    });  
  
    console.log(user.id);  
  
    return NextResponse.json({ message: "Signed up" });  
}
```

Copy

1. Update the `GET` endpoint

```
export async function GET() {
    const user = await client.user.findFirst({});
    return Response.json({ name: user?.username, email: user?.username })
}
```

Copy

We're not doing any authentication yet. Which is why we're not returning a jwt (or setting a cookie) here

Step 10 - Better fetches

For the root page, we are fetching the details of the user by hitting an HTTP endpoint in `getUserDetails`

Current solution

```
import axios from "axios";

async function getUserDetails() {
    try {
        const response = await axios.get("http://localhost:3000/api/user")
        return response.data;
    } catch(e) {
        console.log(e);
    }
}

export default async function Home() {
    const userData = await getUserDetails();

    return (
        <div className="flex flex-col justify-center h-screen">
            <div className="flex justify-center">
                <div className="border p-8 rounded">
                    <div>
                        Name: {userData?.name}
                    </div>
                </div>
            </div>
        </div>
    )
}
```

Copy

```

        {userData?.email}
    </div>
</div>
</div>
);
}

```

`getUserDetails` runs on the server. This means you're sending a request from a server back to the server



Better solution

```

import { PrismaClient } from "@prisma/client";

const client = new PrismaClient();

async function getUserDetails() {
  try {
    const user = await client.user.findFirst({});
    return {
      name: user?.username,
      email: user?.username
    }
  } catch(e) {
    console.log(e);
  }
}

```

[Copy](#)

```

        }
    }

export default async function Home() {
    const userData = await getUserDetails();

    return (
        <div className="flex flex-col justify-center h-screen">
            <div className="flex justify-center">
                <div className="border p-8 rounded">
                    <div>
                        Name: {userData?.name}
                    </div>

                        {userData?.email}
                    </div>
                </div>
            </div>
        );
    }
}

```

Step 11 - Singleton prisma client

Ref - <https://www.prisma.io/docs/orm/more/help-and-troubleshooting/help-articles/nextjs-prisma-client-dev-practices>

1. Create `db/index.ts`

2. Add a prisma client singleton inside it

```

import { PrismaClient } from '@prisma/client'

const prismaClientSingleton = () => {
    return new PrismaClient()
}

```

Copy

```
declare global {  
  var prisma: undefined | ReturnType<typeof prismaClientSingleton>  
}  
  
const prisma = globalThis.prisma ?? prismaClientSingleton()  
  
export default prisma  
  
if (process.env.NODE_ENV !== 'production') globalThis.prisma = prisma
```

1. Update imports of prisma everywhere

```
import client from "@prisma/client"
```

Copy

Step 12 - Server Actions

Ref - <https://nextjs.org/docs/app/building-your-application/data-fetching/server-actions-and-mutations>

Right now, we wrote an **API endpoint** that let's the user sign up

```
export async function POST(req: NextRequest) {  
  const body = await req.json();  
  // should add zod validation here  
  const user = await client.user.create({  
    data: {  
      username: body.username,  
      password: body.password  
    }  
  });
```

Copy

```
    console.log(user.id);

    return NextResponse.json({ message: "Signed up" });
}
```

What if you could do a simple function call (even on a **client component** that would run on the server?) (similar to **RPC**)



Under the hood, still an HTTP request would go out. But you would feel like you're making a function call

Steps to follow

1. Create **actions/user.ts** file (you can create it in a different folder)
2. Write a function that takes **username** and **password** as input and stores it in the DB

```
"use server"

import client from "@/db"

export async function signup(username: string, password: string) {
    // should add zod validation here
    const user = await client.user.create({
        data: {
            username: username,
            password: password
        }
    });

    console.log(user.id);

    return "Signed up!"
}
```

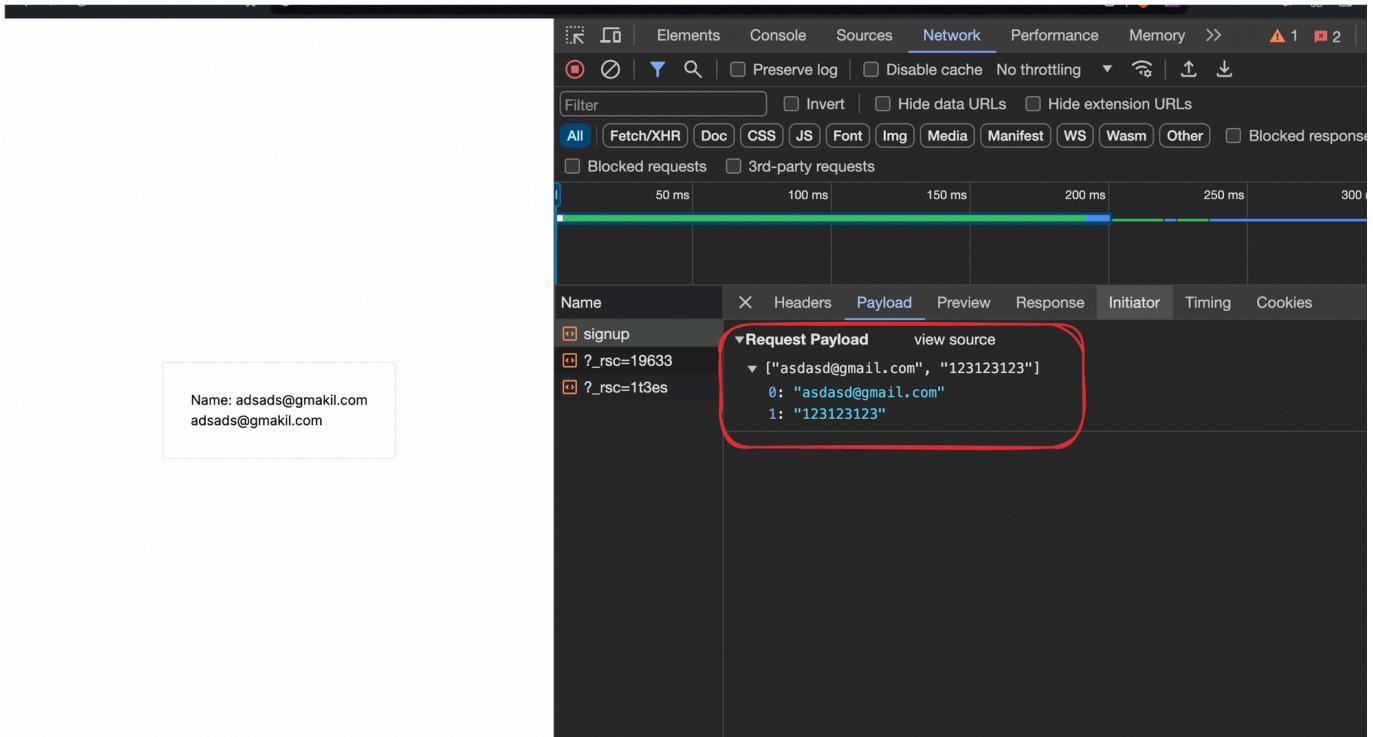
1. Update the **Signup.tsx** file to do the function call

```
import { signup } from "@actions/user";;

...
```

```
<button onClick={async () => {
  const response = await signup(username, password);
  localStorage.setItem("token", response);
  router.push("/")
}} type="button" className="mt-8 w-full text-white bg-gray-800 focus:ring-4 focus:ring-
```

Check the network tab



Benefits of server actions

1. Single function can be used in both client and server components
2. Gives you types of the function response on the frontend (very similar to trpc)
3. Can be integrated seamlessly with forms (ref <https://www.youtube.com/watch?v=dDpZfOQBMaU>)