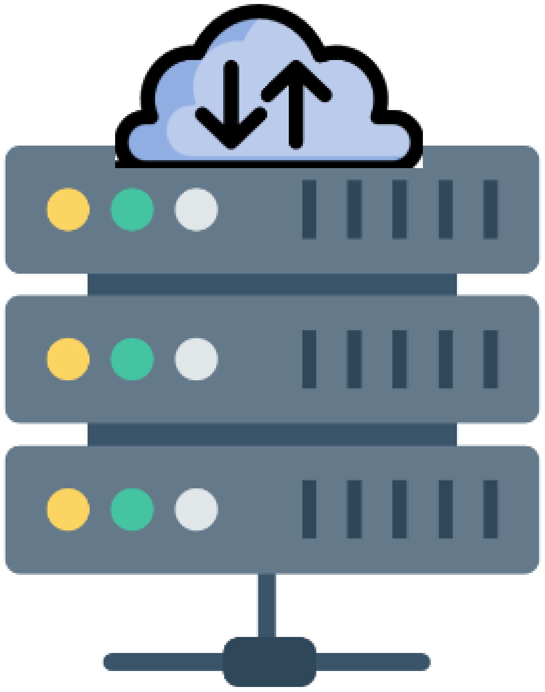
NEXT.JS

Server Actions
Data Fetching & Caching

Server Actions



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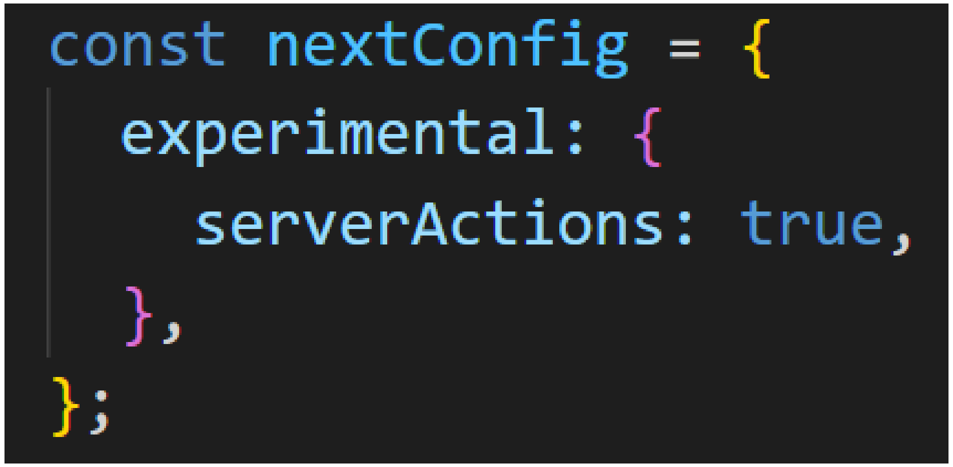
Server Actions

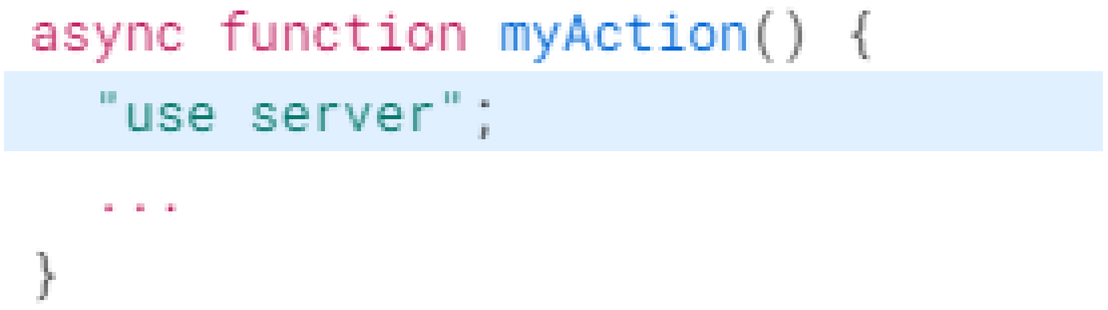
- Server Actions allow us to create functions that run on the server and can be called directly from pages/components **without needing to create an in-between Web API layer**
  - Simpler alternative to using client-side `fetch` and API routes for data mutations
  - Reduce client-side JavaScript
- Server Actions are not fully-stable yet, so you must opt-in via the **`next.config.js`** file



```
const nextConfig = {
  experimental: {
    serverActions: true,
  },
};
```

Server Actions

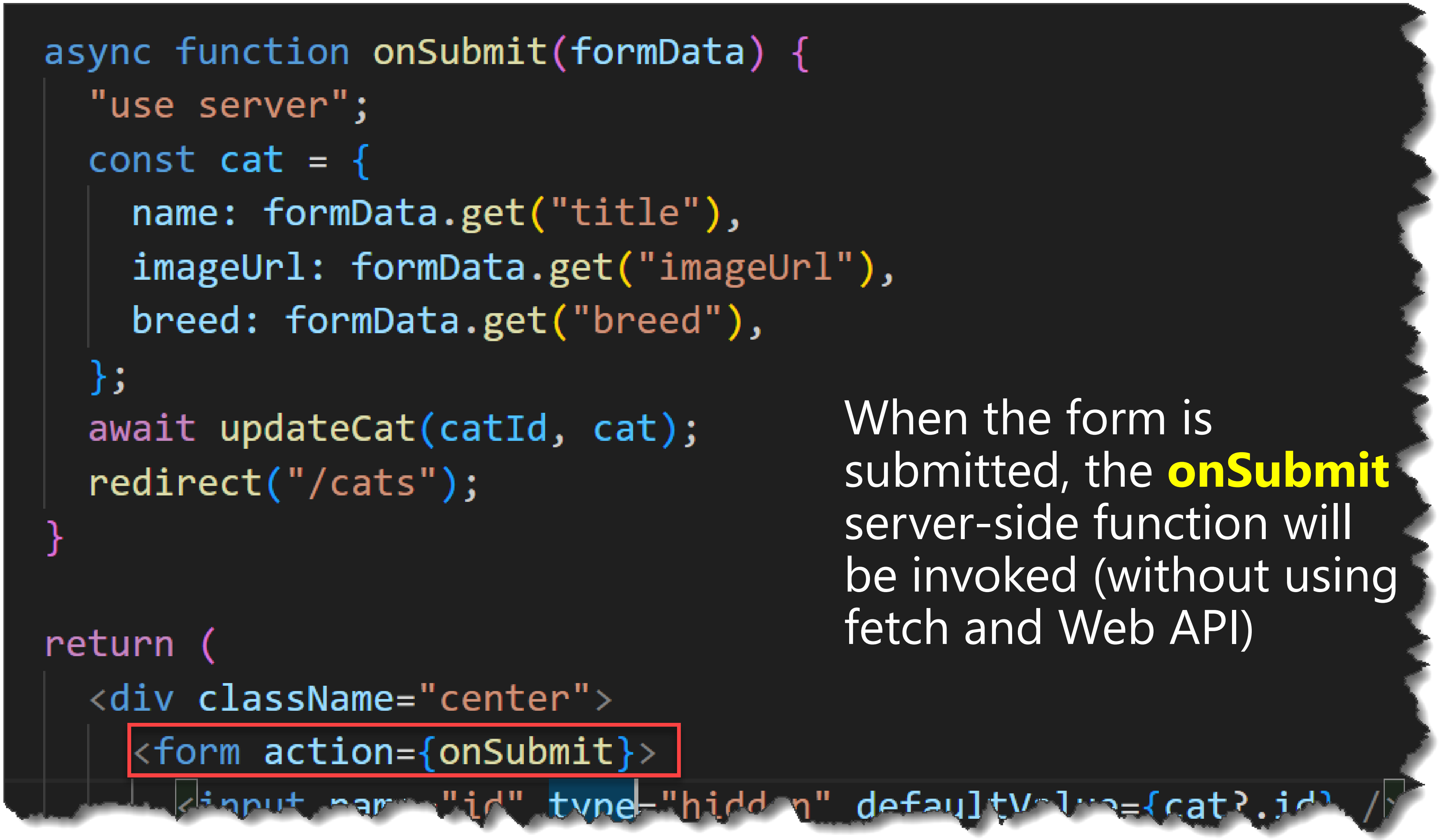
- Create a Server Action in a server-side component/page by defining an asynchronous function with the `"use server"` directive at the top of the function body



```
async function myAction() {
  "use server";
  ...
}
```

- To invoke a Server Action either:
  - Assign it to a form `action` attribute to handle the form submission
  - Pass it to a child client-side component to directly invoke it to handle an event such as button click

Example - Handle Form Submission



```
async function onSubmit(formData) {
  "use server";
  const cat = {
    name: formData.get("title"),
    imageUrl: formData.get("imageUrl"),
    breed: formData.get("breed"),
  };
  await updateCat(catId, cat);
  redirect("/cats");
}

return (
  <div className="center">
    <form action={onSubmit}>
      <input name="id" type="hidden" defaultValue={cat?.id} /
```

When the form is submitted, the **onSubmit** server-side function will be invoked (without using fetch and Web API)

After the update, the user is **redirected** to /cats

Calling Server Action function from a client-side component

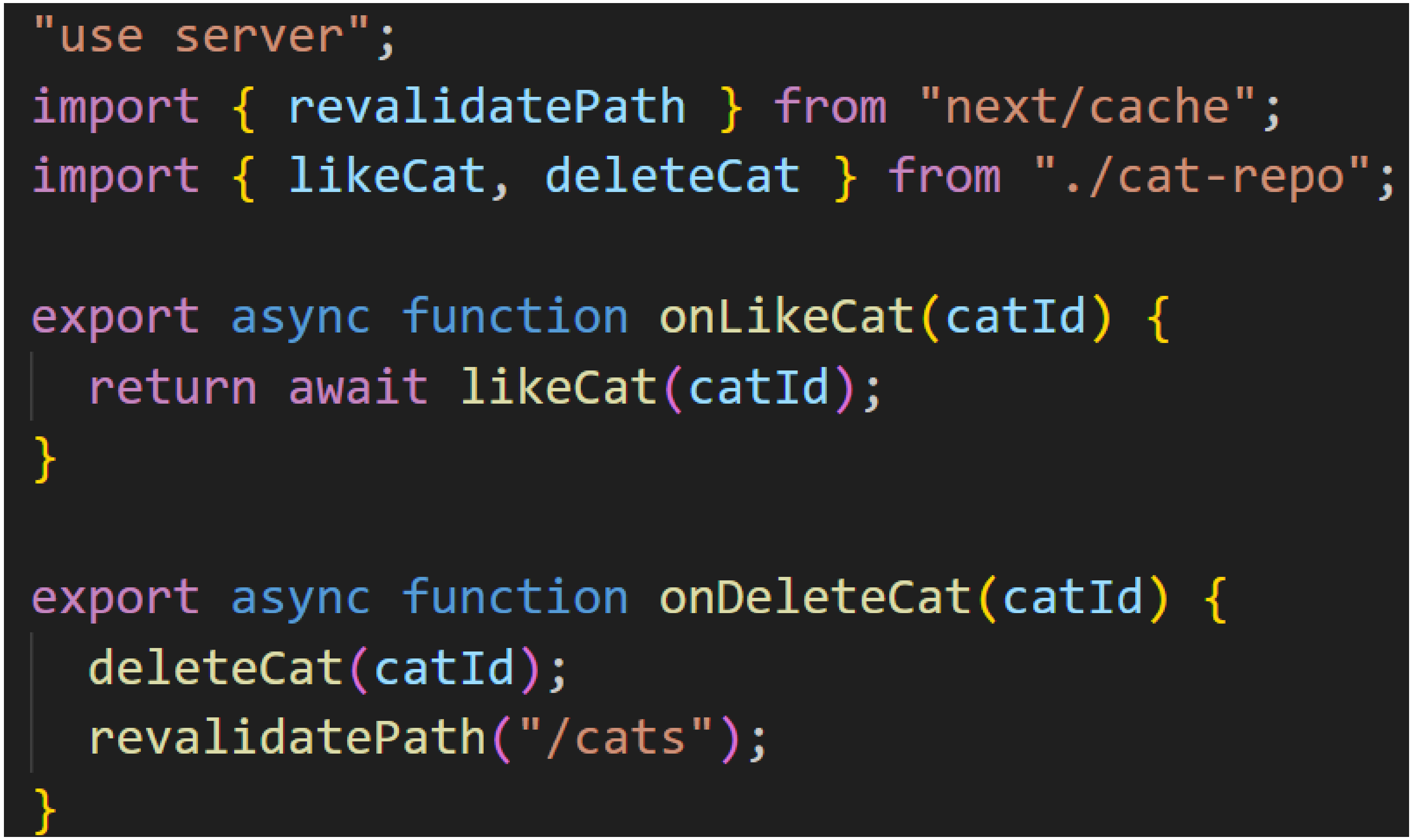
```
import { getCats } from "./cat-repo";
import DeleteButton from "./delete-button";
import { onDeleteCat } from "./actions";

export default async function CatsPage() {
  const cats = await getCats();
  return (<div>
      <ul>
        {cats.map((cat) => (
          <li key={cat.id}>
            <a href={`/cats/${cat.id}`}>{cat.name}</a> ({cat.breed})
            <DeleteButton id={cat.id} onDeleteClicked={onDeleteCat} />
          </li>
        ))}
      </ul>
    </div>
  );
}
```

```
"use client";
export default function DeleteButton({ id, onDeleteClicked }) {
  return (
    <button onClick={async () => {
        if (confirm("Confirm delete?")) onDeleteClicked(id);
      }}
    >
      ❌
    </button>
  );
}
```

Server action function (**onDeleteCat**) is passed from CatsPage to the DeleteButton client-side component. It is called when the delete button is clicked.

Server Actions in actions.js file

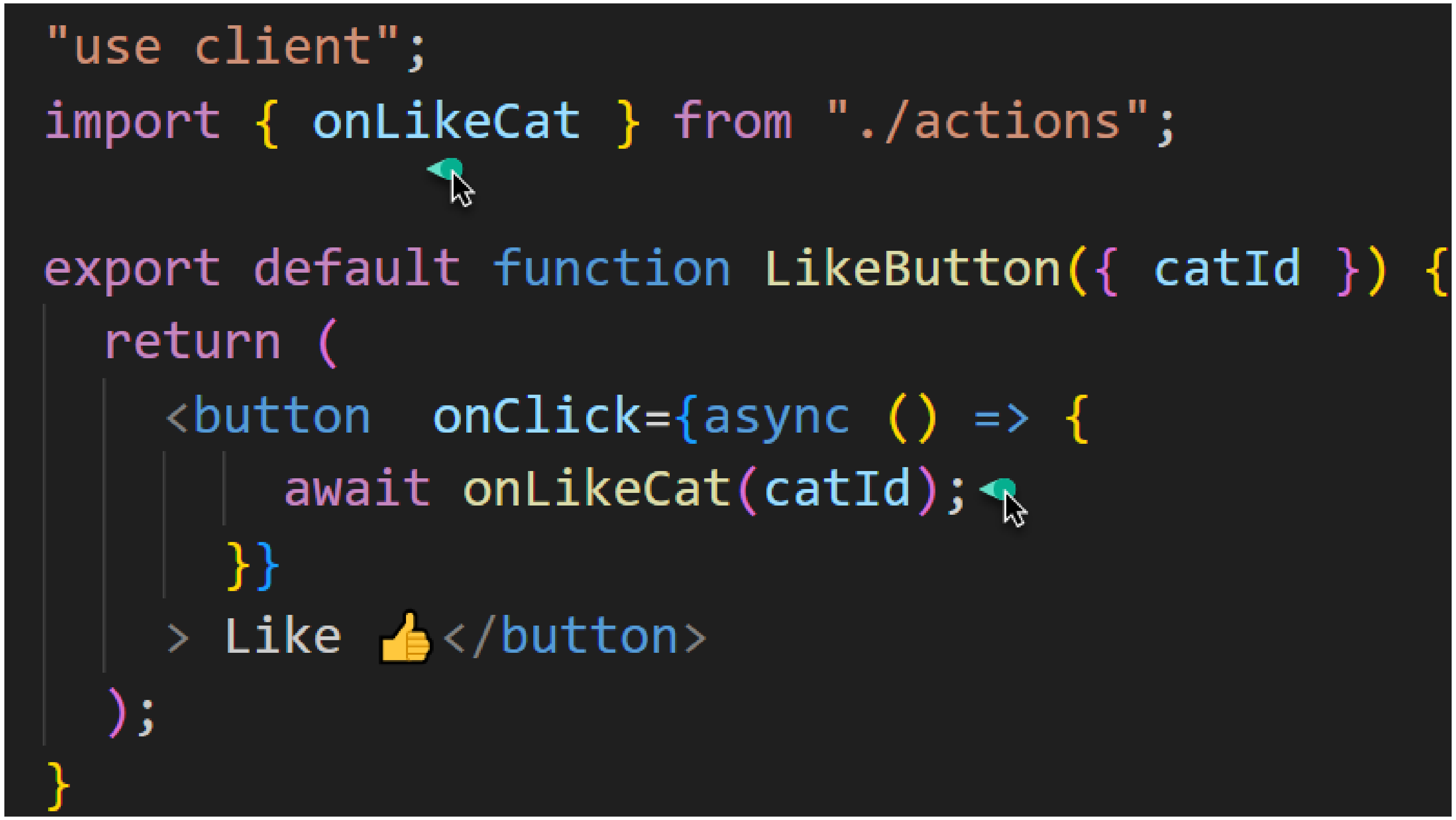
- Server Action asynchronous functions could be defined in a separate js file (such as `actions.js`) with the **`"use server"`** directive at the top of the file



```js
"use server";
import { revalidatePath } from "next/cache";
import { likeCat, deleteCat } from "./cat-repo";

export async function onLikeCat(catId) {
  return await likeCat(catId);
}

export async function onDeleteCat(catId) {
  deleteCat(catId);
  revalidatePath("/cats");
}
```

Components can import and call server action functions

- Components (including client-side ones) can **import** and **call** server action functions



```
"use client";
import { onLikeCat } from "./actions";

export default function LikeButton({ catId }) {
  return (
    <button  onClick={async () => {
        await onLikeCat(catId);
      }}
    > Like 👍</button>
  );
}
```

Re-rendering after Data Mutation

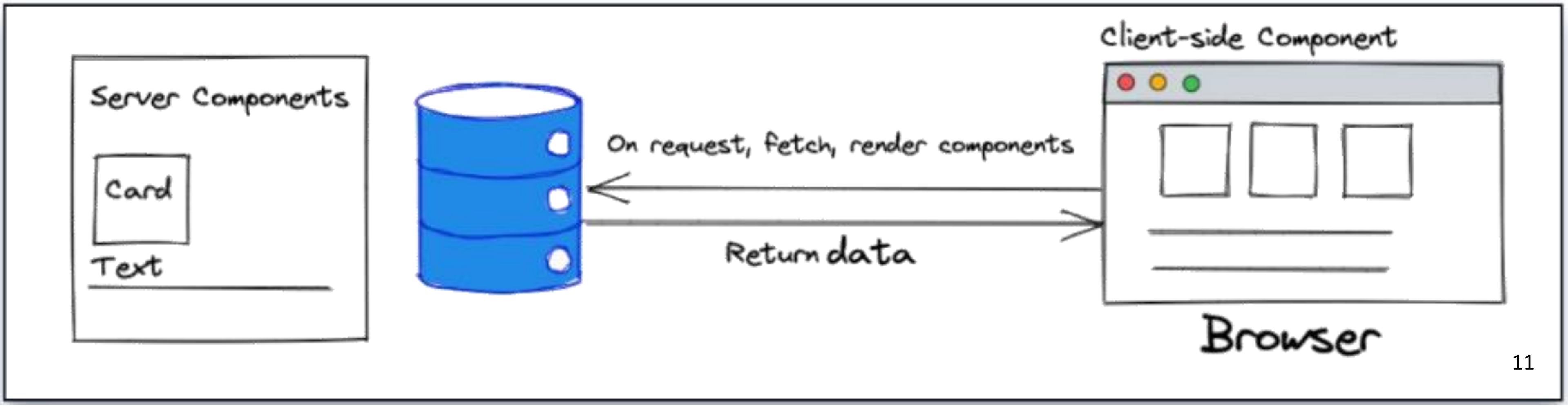
- After data mutation (e.g., handling the form submission to update a cat), you can re-render the UI to `ensure` the correct data is displayed on the client using:
  - **`revalidatePath`** function (from `"next/cache"` library) allows revalidating a Url to refresh the data
    - e.g., after deleting a cat `revalidatePath("/cats")` is called to refresh the list of cats
  - **`redirect`** function (from `"next/navigation"` library) allows redirecting to another page
    - e.g., after adding a cat `redirect("/cats")` is called to redirect to the cats page

Data Fetching & Caching

Back

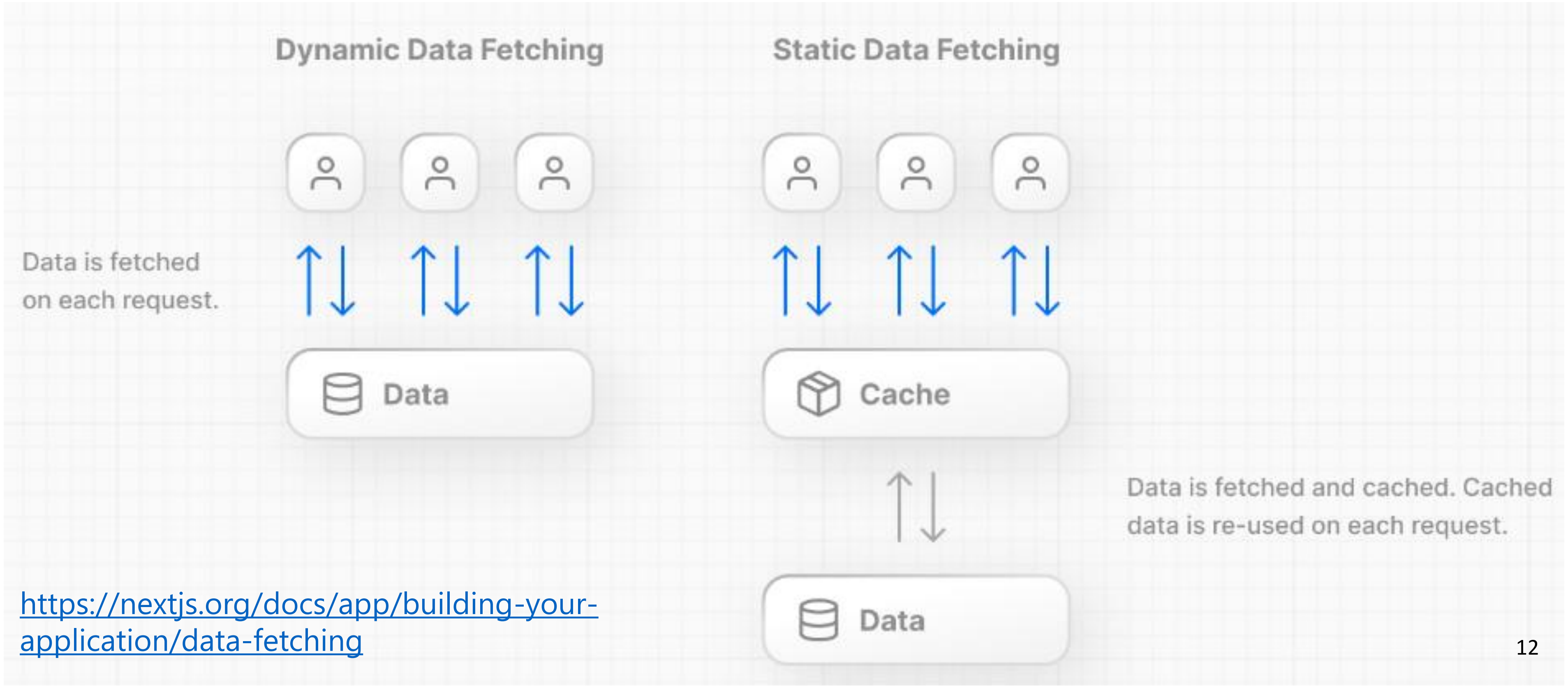
Component-level Client and Server Rendering

- You can choose the rendering environment at the component level
  - Client-side rendering: the browser runs the JavaScript to render the interface the user can interact with. It can fetch data from the server using Web API
  - Server-side rendering: by default, the app router uses Server Components and renders components on the server
    - **Do NOT include interactivity** such as onClick handlers
    - Reduces the amount of JavaScript sent to the client



Static vs. Dynamic Data Fetching

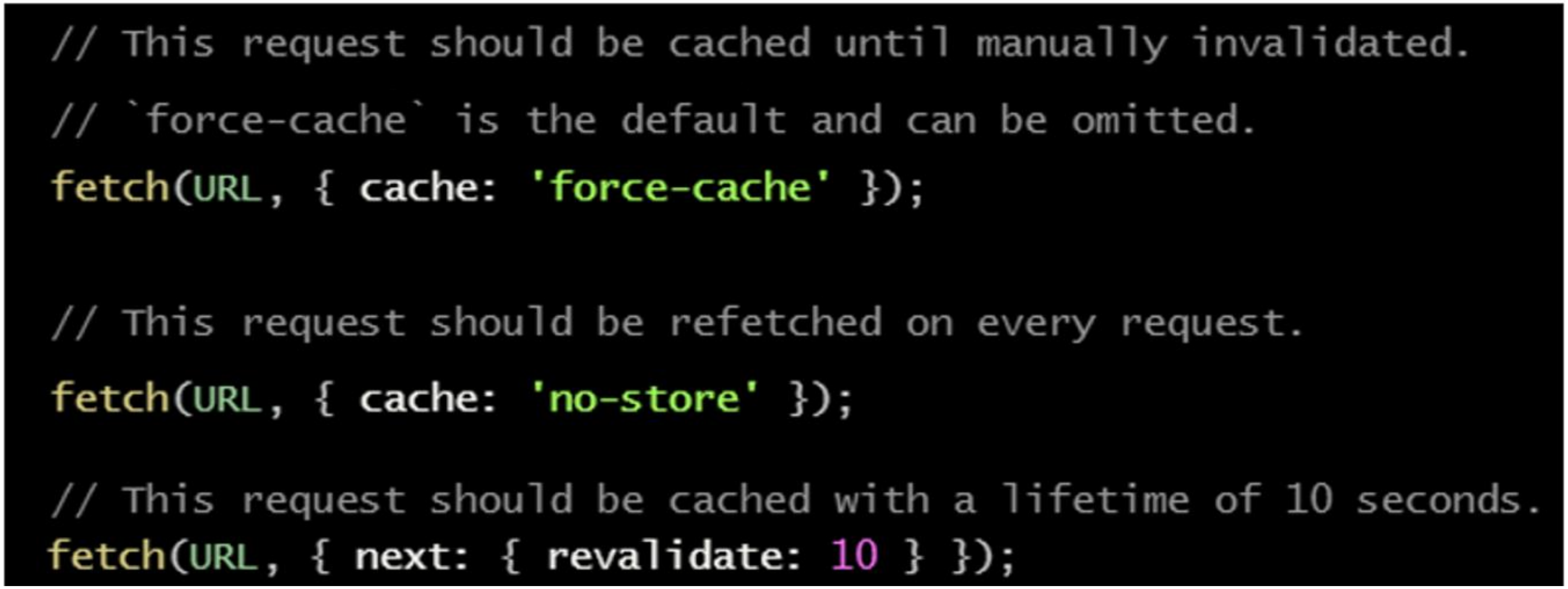
- Static Data is data that doesn't change often. E.g., a blog post
- Dynamic Data is data that changes often or can be specific to users. E.g., a shopping cart list


Dynamic Data Fetching
Static Data Fetching
Data is fetched on each request.
Data
Cache
Data
Data is fetched and cached. Cached data is re-used on each request.

https://nextjs.org/docs/app/building-your-application/data-fetching

Caching Fetched Data

- **cache** and **next** parameters of the `fetch` function can be used to set the caching strategy



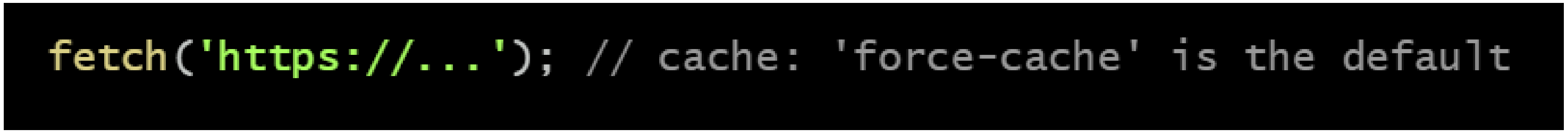
```
// This request should be cached until manually invalidated.
// `force-cache` is the default and can be omitted.
fetch(URL, { cache: 'force-cache' });

// This request should be refetched on every request.
fetch(URL, { cache: 'no-store' });

// This request should be cached with a lifetime of 10 seconds.
fetch(URL, { next: { revalidate: 10 } });
```

To see these in action you need to:

- Build the app using: **`npm run build`**
- Start the built app using: **`npm run start`**

Static Data Fetching

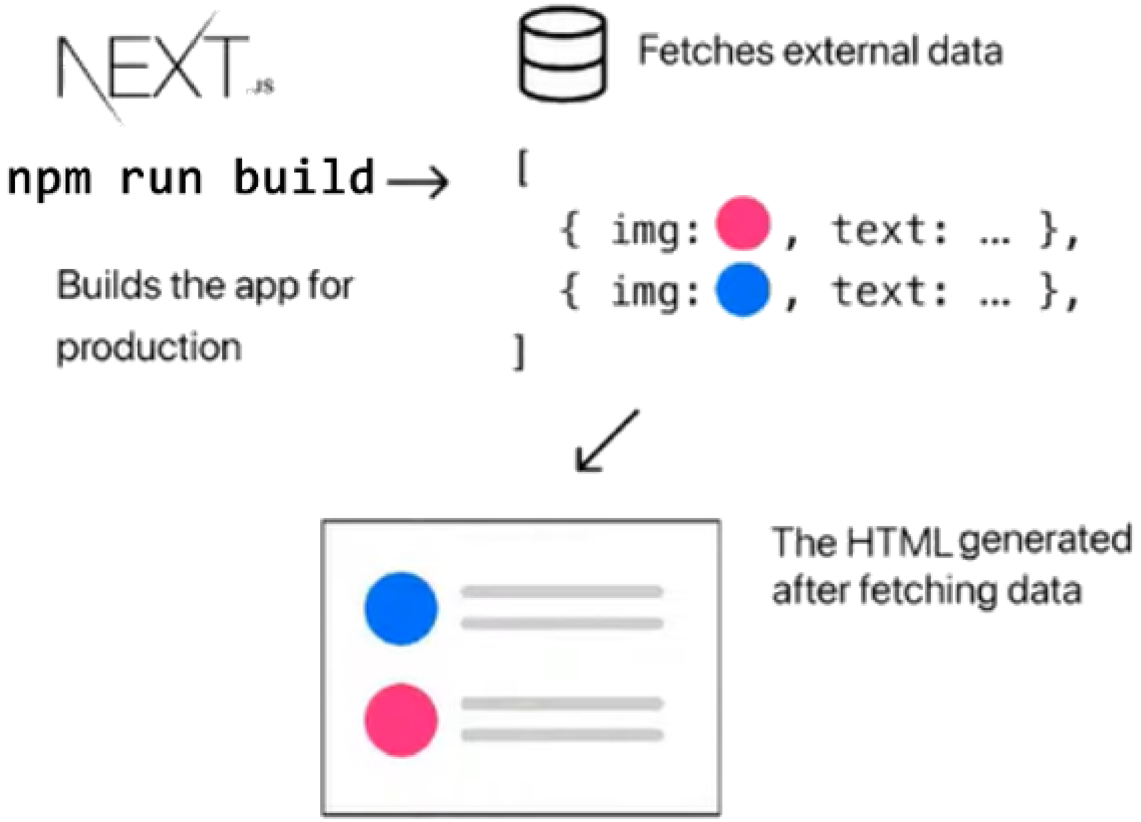
- By default, Next.js automatically does static data fetching. This means that the data will be fetched at build time, cached, and reused on each request
- There are two benefits to using static data:
  - It reduces the load on your database by minimizing the number of requests made
  - The data is automatically cached for improved loading performance

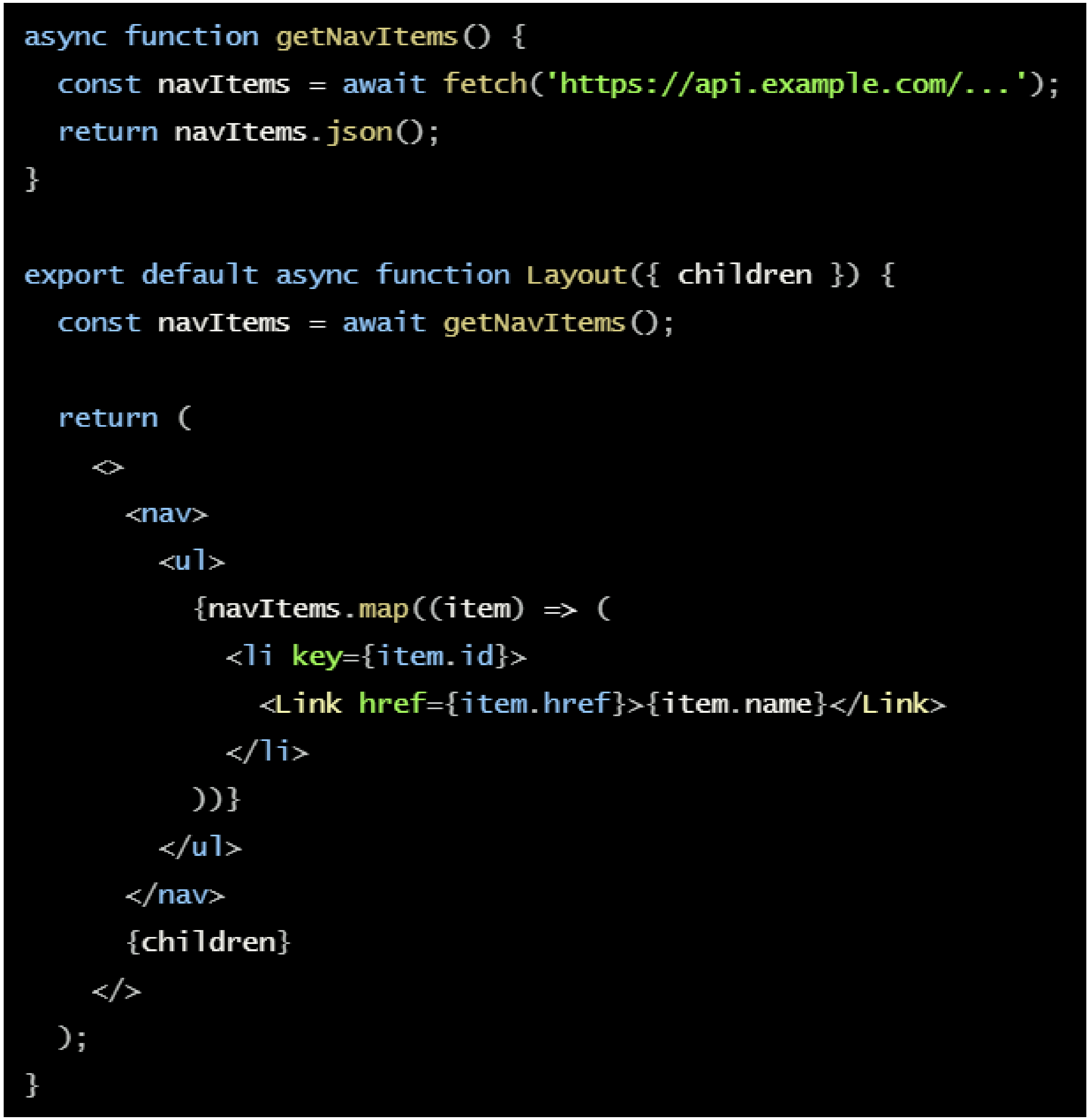


```
fetch('https://...'); // cache: 'force-cache' is the default
```

Static Rendering

By default, Next.js automatically does static data fetching then uses the fetched data to statically render the pages at **build time**



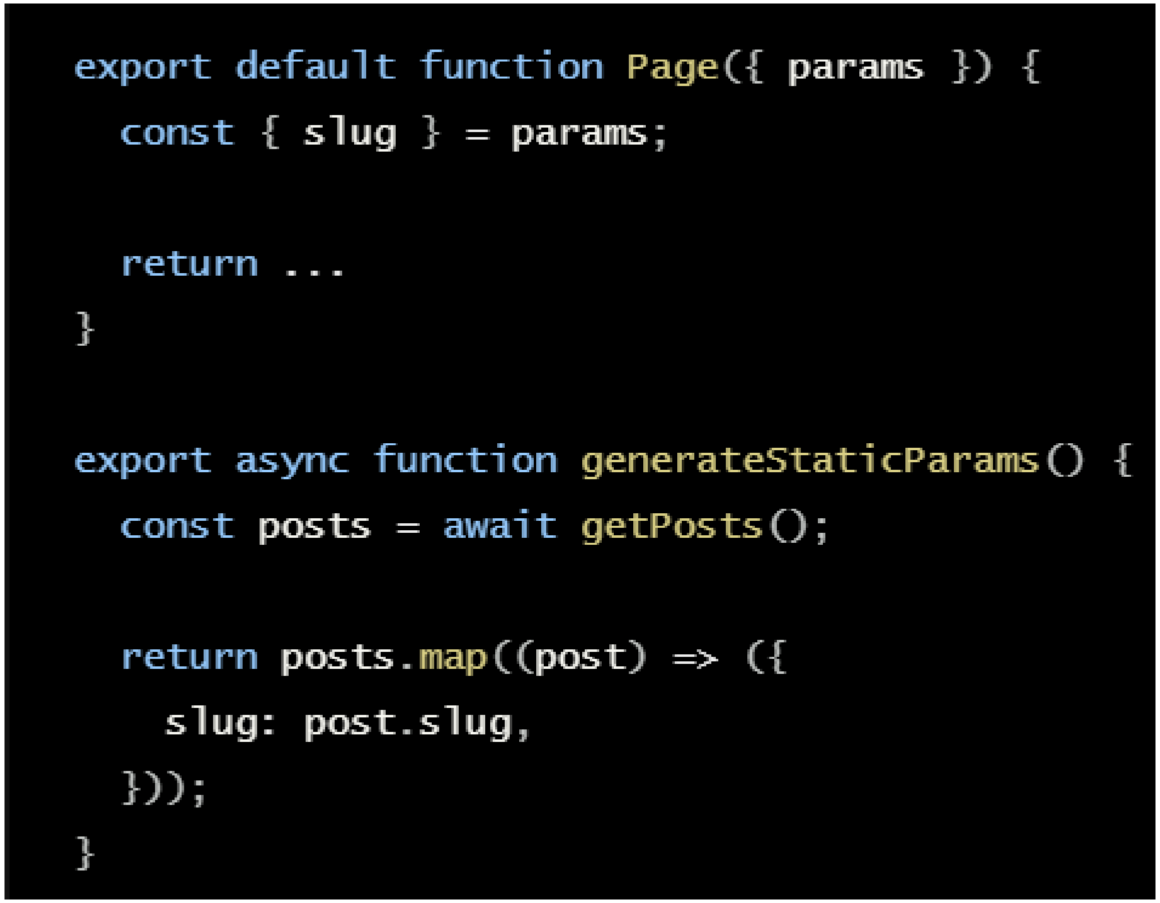


```
async function getNavItems() {
  const navItems = await fetch('https://api.example.com/...');
  return navItems.json();
}

export default async function Layout({ children }) {
  const navItems = await getNavItems();

  return (
    <>
      <nav>
        <ul>
          {navItems.map((item) => (
            <li key={item.id}>
              <Link href={item.href}>{item.name}</Link>
            </li>
          ))}
        </ul>
      </nav>
      {children}
    </>
  );
}
```

Static Rendering Example

Statically Generate Pages with Dynamic Routes

`generateStaticParams` function can be used in combination with dynamic route segments to define the list of route segment parameters that will be used for statically generating dynamic route pages at build time



```
export default function Page({ params }) {
  const { slug } = params;

  return ...
}

export async function generateStaticParams() {
  const posts = await getPosts();

  return posts.map((post) => ({
    slug: post.slug,
  }));
}
```

Dynamic Data Fetching

- Re-fetch data on every fetch() request using the `cache: 'no-store'` option

```
fetch('https://...', { cache: 'no-store' });
```

- Components are rendered on the server at request time. The result of the work is **not cached**

Revalidating Data

- Revalidation is the process of purging the cache and re-fetching the latest data
    - This ensures that the app shows the latest **data changes** without having to rebuild your entire app

Next.js provides two types of revalidation:

- Background: Revalidates the data at a specific time interval (**if someone visits the page after the configured time interval has passed**)
- On-demand: Revalidates the data whenever there is an update

Background Revalidation

- To revalidate cached data at a specific interval, you can use the next.revalidate option in fetch() to set the cache **lifetime** of a resource (in seconds)

```
fetch('https://...',
    { next: { revalidate: 60 } })
```

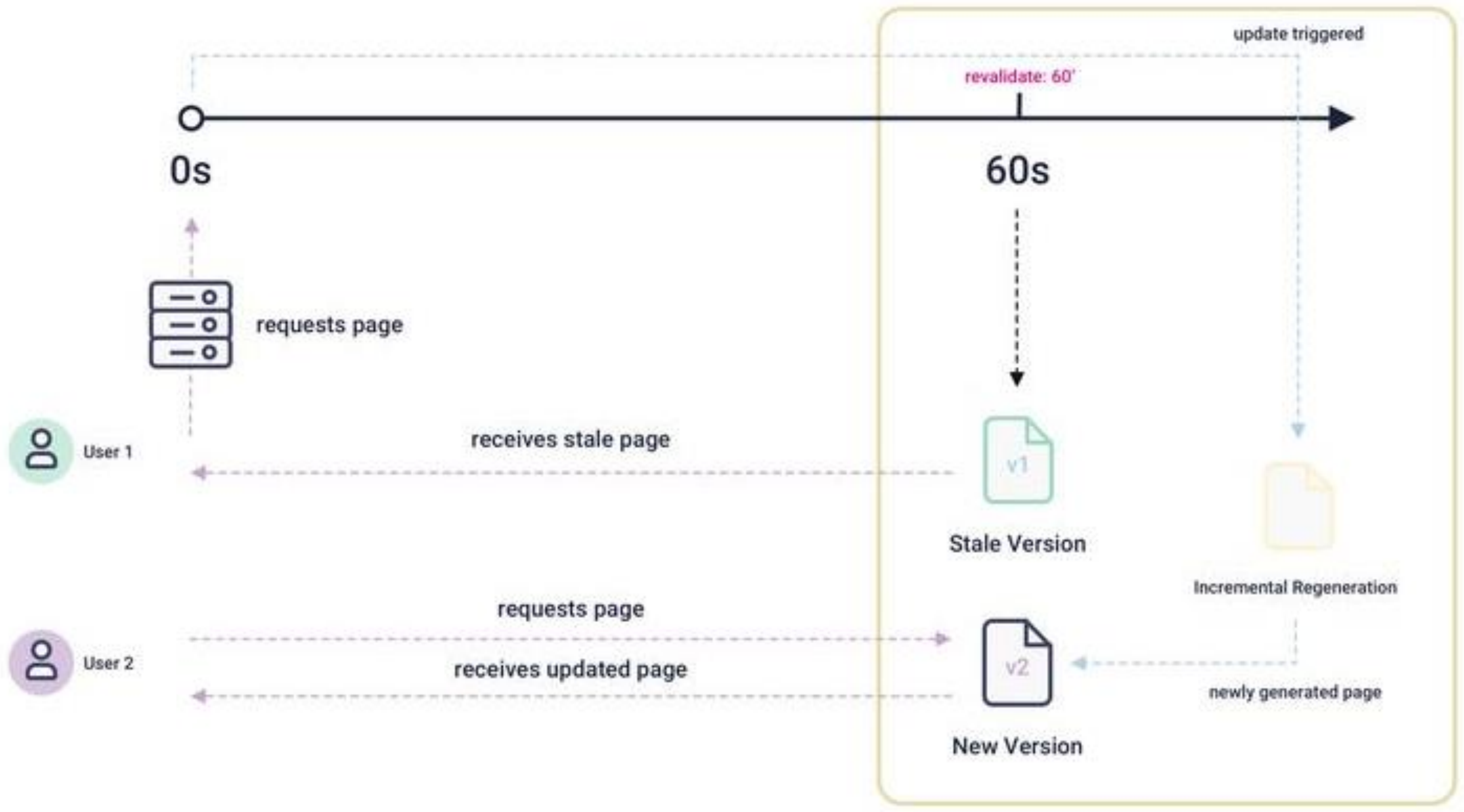
- To revalidate data that does not use fetch (e.g., getting data using a repo function that uses Prisma) simply export a **revalidate** value

```
// revalidate this page every 60 seconds
export const revalidate = 60
```

Background Revalidation - How it works?

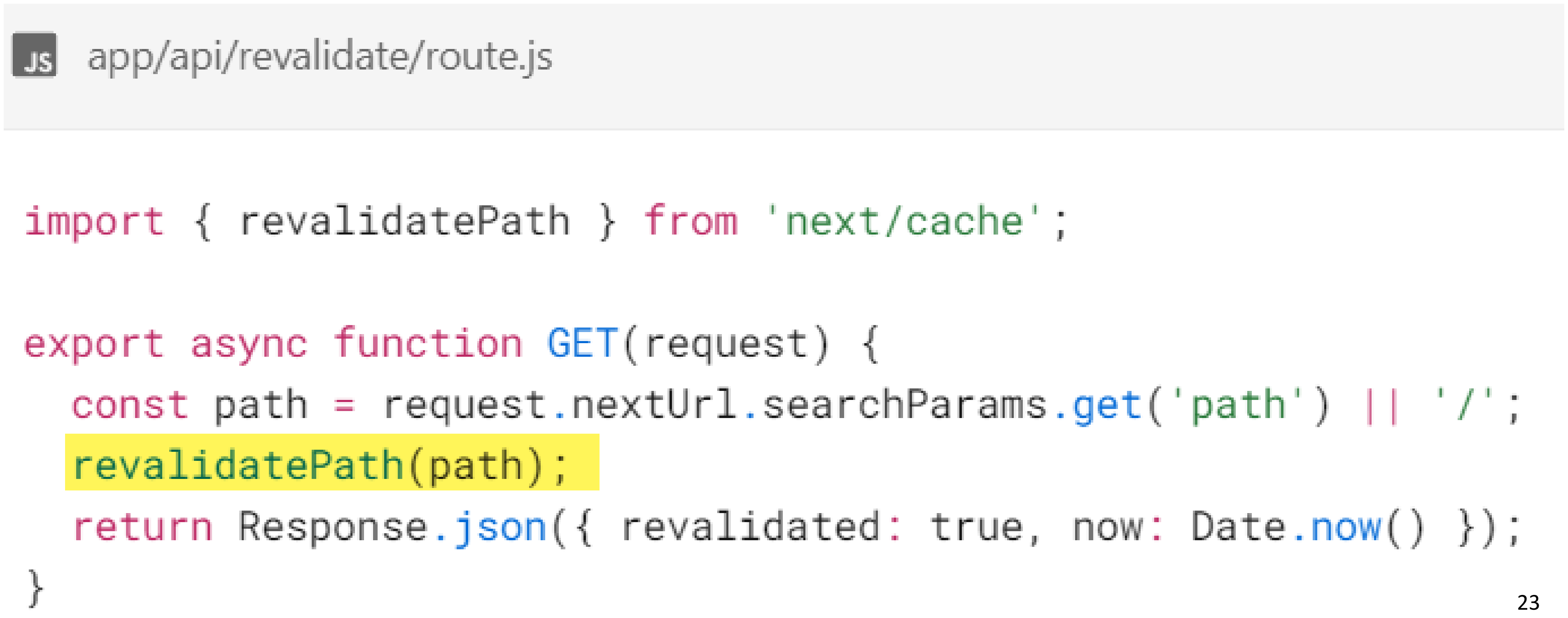
- When a request is made to the route that was statically rendered at build time, it will initially show the cached data
- Any requests to the route after the initial request and before 60 seconds are served from the cache
- After the 60-second window, the next request will still show the cached (stale) data
  - Next.js will trigger a regeneration of the data in the background.
  - Once the data generates successfully, Next.js will invalidate the cache and use the updated data

Background Revalidation



On-Demand Revalidation

- **revalidatePath** allows you to revalidate data associated with a specific path. It allows updating the cached data without waiting for a revalidation period to expire



app/api/revalidate/route.js

```
import { revalidatePath } from 'next/cache';

export async function GET(request) {
  const path = request.nextUrl.searchParams.get('path') || '/';
  revalidatePath(path);
  return Response.json({ revalidated: true, now: Date.now() });
}
```

Summary

- Server Actions allow us to create functions that run on the server and can be called directly from pages/components **without needing to create an in-between Web API layer**

- Next.js supports different data fetching and caching strategies: **Static Data Fetching**, **Dynamic Data Fetching**, and configurable **Data Revalidation** (Background or On-demand)

Resources

- Server Actions

  https://nextjs.org/docs/app/building-your-application/data-fetching/server-actions

- Data Fetching – Caching

  https://nextjs.org/docs/app/building-your-application/data-fetching