Accelerating React applications with Server-Side React Frameworks

With a look at Next.js, Remix.run and React 18

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Who am I?

Ken Rimple

Director of Training/Mentoring, Chariot Solutions,
Consultant for 30+ years
Have seen a lot of tools come and go...

I wrestle JS to the ground, then it hits me with a lawn chair when I get up and walk away...

Another framework? That's it, I'm gonna skydive!

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Attendee assumptions...

Maximum enjoyment potential if you have:

- Understanding of functional React and hooks
- Understanding of Promises with then() and async/await
- Experience using React and client-side APIs to fetch data

When is vanilla React not enough?

Do any of these scenarios fit?

- Static or close-to-static content but need React activity
- Existing app sluggish - data loading issues / initialization complexity, monolith
- Clients with slow networks, high latency

?

The probability of bounce increases 32% as page load time goes from 1 second to 3 seconds.

source: https://www.thinkwithgoogle.com/marketing-strategies/app-and-mobile/page-load-time-statistics/

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The platforms we'll discuss today

Next.js and Remix.run...

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What is Next.js?

Next.js is a React-driven Framework

...with a focus on performance. Features:

- Server Side Rendering (SSR) - executing data fetches on the server before rendering the component
- Static Site Generation (SSG) - pre-renders static content to serve based on data APIs
- Incremental Static Regeneration (ISR) - update view of generated data once it becomes "stale"
- SWR - a query library for client caching, reloading of data after the page loads
- next/router - a file-based router supports both server and client-side routing

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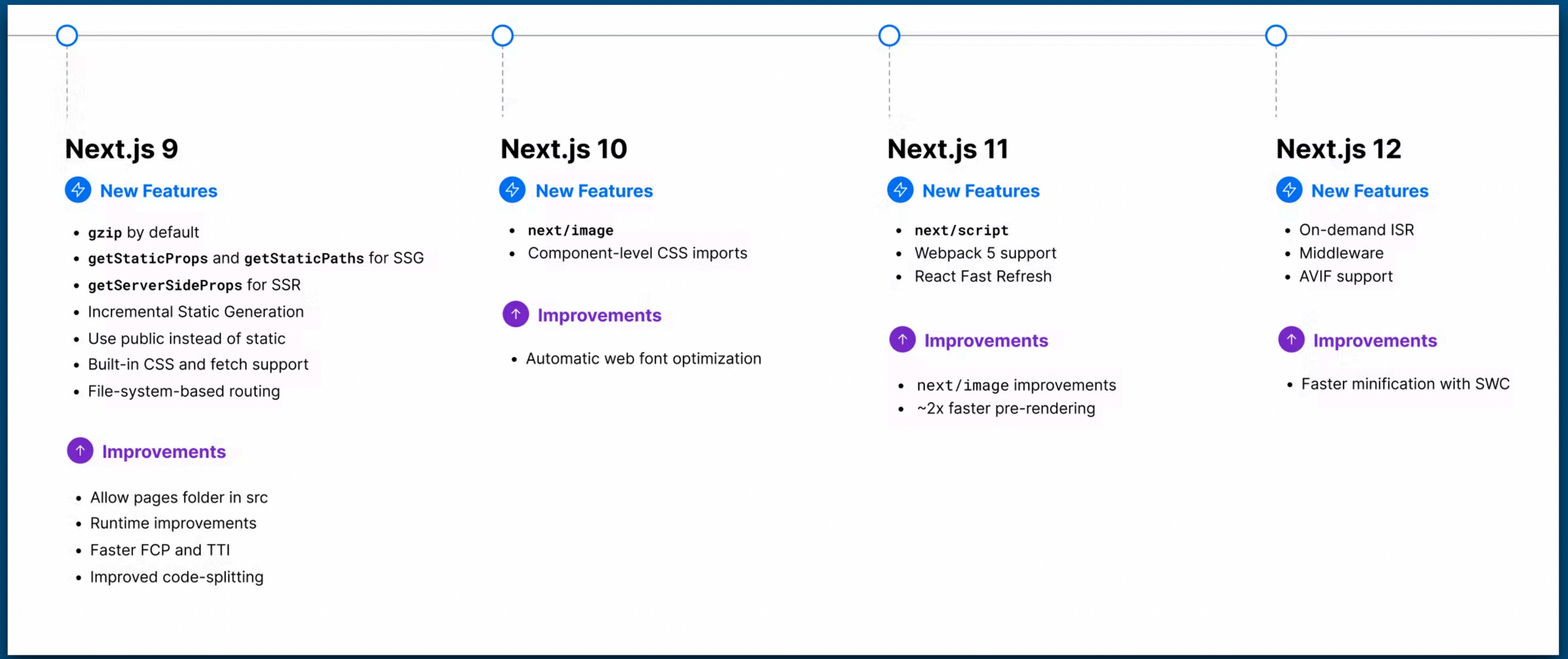
Next.js Version History



Source: https://vercel.com/blog/upgrading-nextjs-for-instant-performance-improvements

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Remix.run, the newcomer

Remix Philosophy - use the web!

Focusing on HTTP-based standards:

- Server-Side Rendering - standard browser Web Fetch APIs!
- A file-based router - file-based routes similar to Next.js
- Remix supports progressive enhancement
  - This means JS can be disabled and forms can be completely server-driven

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Remix.run Philosophy

> The Remix philosophy can be summed up in four points:
>
> 1. Embrace the server/client model, including separation of source code from content/data.
> 2. Work with, not against, the foundations of the web: Browsers, HTTP, and HTML. It's always been good and it's gotten *really good* in the last few years.
> 3. Use JavaScript to augment the user experience by emulating browser behavior.
> 4. Don't over-abstract the underlying technologies

Source: https://remix.run/docs/en/v1.3.4/pages/philosophy

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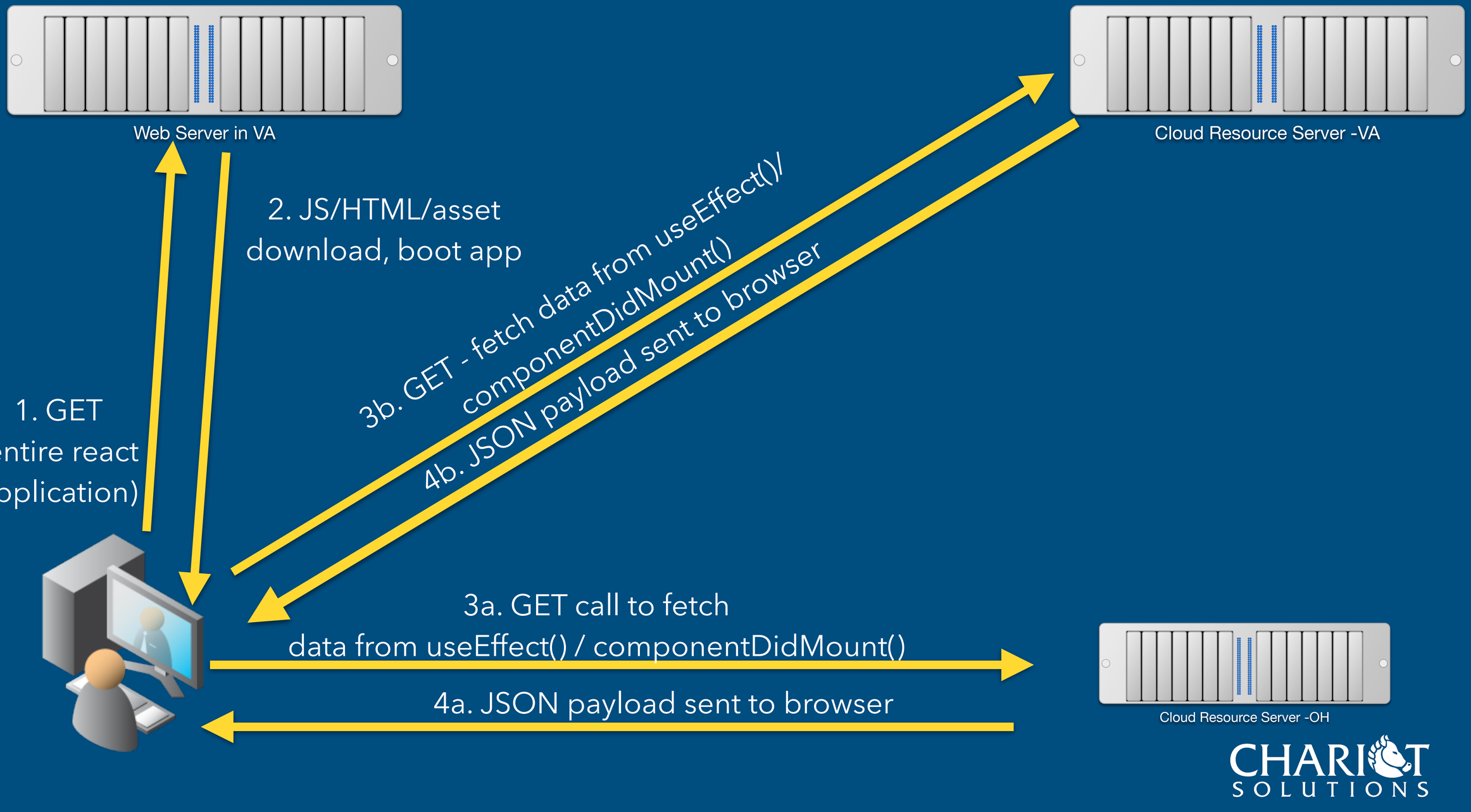
Client Fetching with React - onus on client



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Server-side Rendering

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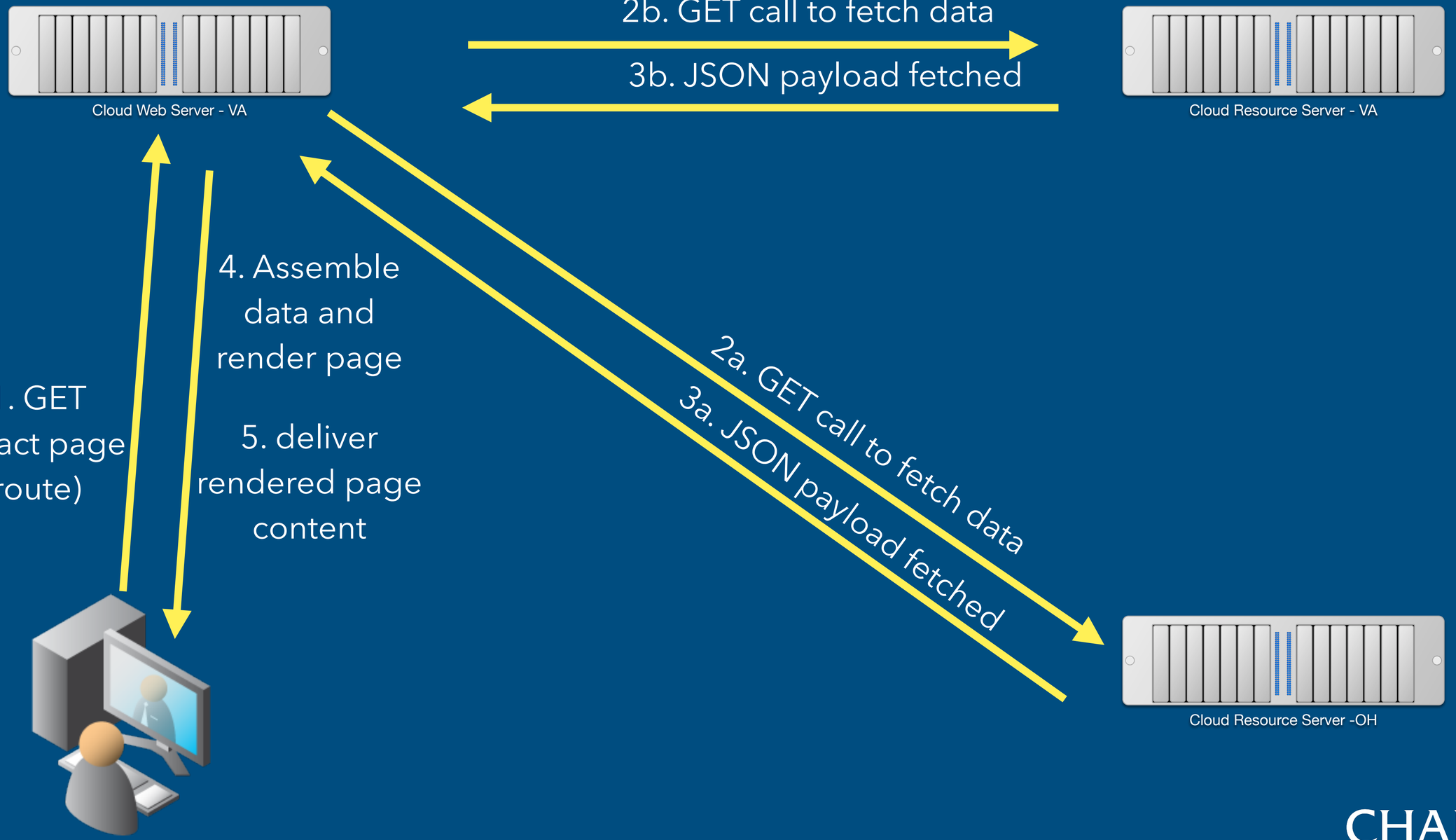
Server-side Rendering - same topology...



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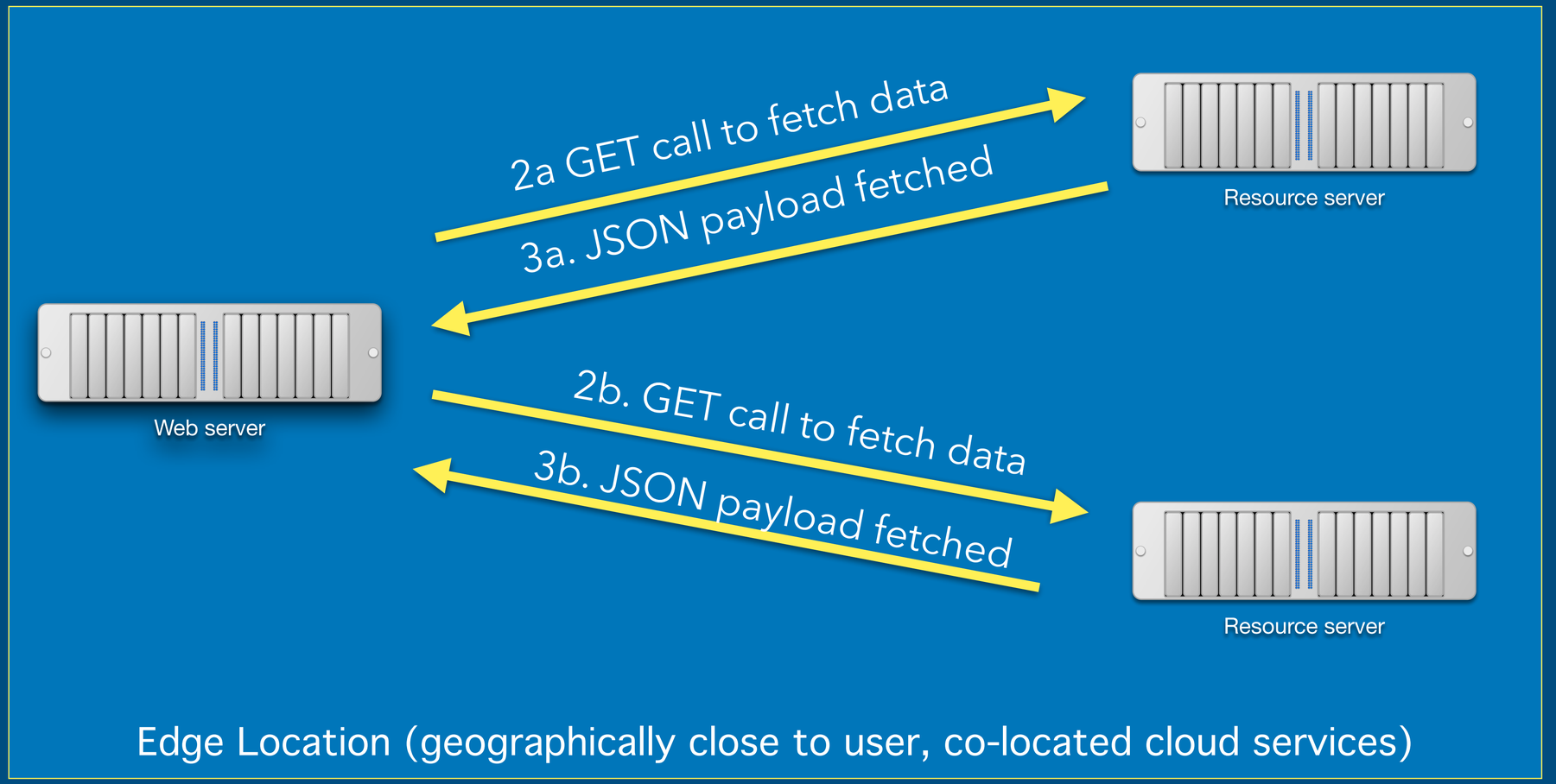
Server-side Rendering - using edge computing

1. GET
(React page route)

4. Assemble data and render page

5. deliver rendered page content



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Next.js - Support for SSR

```
export async function getServerSideProps() {
  const data = await getFeeds();
  return { props: { feeds: [...data]}};
}

export default function Podcasts({feeds}) {
  const cards = feeds.map((p:FeedDetails) =>
    <ImageCard
      key={p.slug}
      image={p.imageUrl}>
      <div
        className="
          p-6 py-4 h-auto
          overflow-clip"
        dangerouslySetInnerHTML={{__html: p.description}} />
```

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Next.js - SSR w/path (/pages/podcasts/[slug].tsx)

```
export async function getServerSideProps(context) {
  // get route param for slug
  const slug = context.params.slug;
  const data = await getFeedAndEpisodesBySlug(slug);
  return {
    props: data
  };
}

export default function PodcastEpisodes({ feedDetails, episodes}) {
    let episodeCards = episodes.map((e:FeedItem) => (
        <Card
          key={e.guid}
          title={e.title}>
          <div className="grid grid-cols-2 gap-4">
```

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Remix - Support for SSR

```
export const loader = async () => {
  return await getFeeds();
};
```

```
export default function Podcasts() {
  const feedData = useLoaderData();

  const cards = feedData.map((p: FeedDetails) => (
    <ImageCard
      key={p.slug}
      image={p.imageUrl}>
      <div className="...
      <button className="...
      <Link to={`/podcast/${p.slug}`}>Show Details</Link></button>
    </ImageCard>
  ));
  return (
    <CardContainer title="Your podcasts..." cards={ cards }/>
  )
};
```

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Remix - SSR w/path (/routes/podcasts/$slug.tsx)

```
export const loader = async ({params}) => {
  // get route param for slug
  return await getFeedAndEpisodesBySlug(params.slug);
}

export default function PodcastEpisodes() {
  const loader = useLoaderData();
  const { feedDetails, episodes } = loader;
  const episodeCards = episodes.map((e:any) => (
      <Card
        key={e.guid}
        title={e.title}>
        <div className="grid grid-cols-2 gap-4">…
        </div>
```

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Server-side Rendering Tips

SSR is not a magic bullet, so...

"Did I leave the iron on?"

- You could be shifting a distributed performance problem into a shared services bottleneck!
- You can use Node.js Database APIs to directly access database resources
- Monitor server CPU metrics and scale appropriately for load

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Static Site Generation

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Static-Site Generated Pages

Pre-render content at build time

- Generates statically rendered content during application build
- Rendered page downloads quickly (not accounting for location)
- React then bootstraps asynchronously

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SSG in Next.js - single render for URL

```
export async function getStaticProps() {
  const feeds = await getFeeds();
  return { props: { feeds } };
}

export default function Podcasts({feeds}) {
  const cards = feeds.map((p:FeedDetails) =>
    (
      <ImageCard
        key={p.slug}
        image={p.imageUrl}>
        <div
          className="
            p-6 py-4 h-auto
            overflow-clip"
          dangerouslySetInnerHTML={{__html: p.description}} />
```

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SSG in Next.js - dynamic rendering by path

how do we deal with pages/podcasts/[slug].tsx in SSG?

```
export async function getStaticPaths(context) {
  const slugs = await getPodcastSlugs();
  const slugPaths = slugs.map(s => ({ params: {slug: s.slug}}));

  return {
    paths: slugPaths,
    fallback: false
  }
}

export async function getStaticProps(context) {
  const slug = context.params.slug;
  const response = await getFeedAndEpisodesBySlug(slug);
  return {
    props: {feedDetails: response.feedDetails, episodes: response.episodes}
  }
}
```

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SSG with path - the component

The component is the same as before, receives the path props

```
export async function getStaticProps(context) {
  const slug = context.params.slug;
  const response = await getFeedAndEpisodesBySlug(slug);
  return {
    props: {feedDetails: response.feedDetails, episodes: response.episodes}
  }
}

export default function PodcastEpisodes({episodes, feedDetails}) {
  let episodeCards = episodes.map((e:FeedItem) => (
    <Card
      key = {e.guid}
      title={e.title}
    >
      <div className="grid grid-cols-2 gap-4">
```

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Next.js Server-Side Generation (SSG) Tips

- With dynamic routes: don't build millions of SSG pages, limit them with getStaticPaths
- Use Next's Incremental Static Regeneration feature to allow for runtime caching once fetched for other pages
- Use SSG to provide SEO-crawlable content, then replace with fresh data after loading (see SWR coming up)
- Don't use SSG on time-sensitive data unless truly shared without user details

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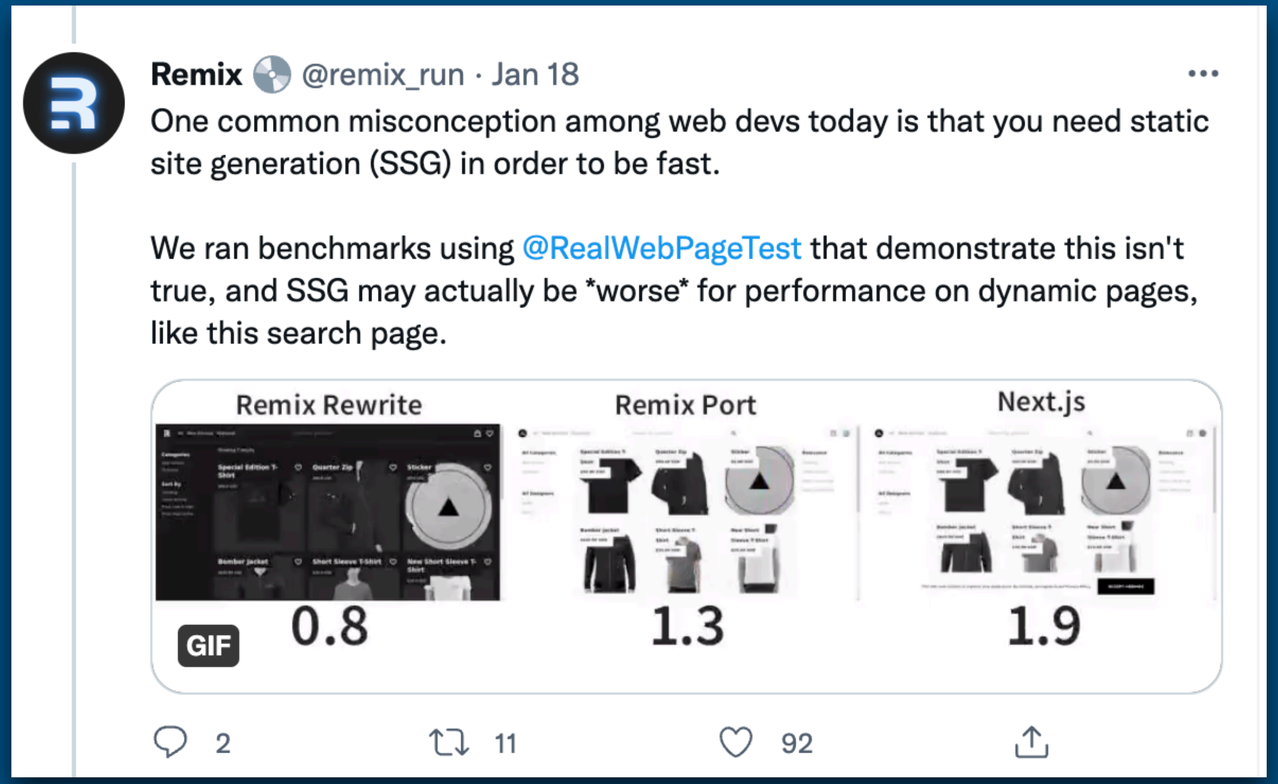
Remix team postulates SSG isn't always faster



- Why?
  - Too much content to render in time
  - For dynamic pages, still must boot React and do async work anyway
  - Speed depends on how close you are to the resource as well, so edge functions can be faster

see thread at https://twitter.com/remix_run/status/1483512990741659656

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Remix.run - nested routes avoids waterfalls

`/customers/$customerId/orders/$orderId`

- With Remix.run, nested routes can
  - Live in a hierarchy in /routes
  - Nest within each other with Router <Outlet /> components
  - Load in parallel via SSR based on data from their route variables
  - Have their own loading states / fallback views

https://remix.run/docs/en/v1/guides/routing#what-is-nested-routing

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Client-Side Rendering (SWR)

Next.js's special client-side data management hook and HOC

- Will automatically fetch and refresh in a React client based on:
  - Visibility of web page in Chrome tabs
  - Invalidation after a period of time
  - Network connectivity loss
- This can be configured via a HOC - <SWRConfig />

From RFC-5861

> The stale-while-revalidate HTTP Cache-Control extension allows a cache to immediately return a stale response while it revalidates it in the background, thereby hiding latency (both in the network and on the server) from clients.

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SWR Example

```
export default function Podcasts() {
  const [numRows, setNumRows] = useState();
  const {data, error, isValidating, mutate} = useSWR(
    `http://localhost:3010/podcasts/feeds?numRows=${numRows}`, fetcher);

  if (error) { return <pre>{ JSON.stringify(error) }</pre>; }

  if (isValidating) { return <Spinner/>; }

  const cards = data?.map((p:any) =>
    <ImageCard
      key={p.slug}
      image={p.image_url}>
      <div ···
      <button className=" ···
      ">
        <Link href={`/standard/podcast/${p.slug}`}>Show Details</Link>
      </button>
    </ImageCard>);
  return (
    <>
      <select
```

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SWR Demo

Using Next.js

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Comparing the two frameworks

Feature	Next.js	Remix.run
Server-side Rendering	Yes	Yes
Static Site Generation/Regeneration	Yes	No (use infra cache?)
Page-based Routing	Yes	Yes
Client-side Smart Fetch Library	Yes, SWR	Use 3rd party (SWR?)
Streaming Results	Yes	Yes
Image optimization	Via <Image> component	No
Script loading optimization	Via <Script> component	No

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React Server Components and Suspense

In preview for Next.js, see https://nextjs.org/docs/advanced-features/react-18/streaming

```
import { Suspense } from 'react'
import Note from '../../components/Note.server'
import NoteSkeleton from '../../components/NoteSkeleton'
import Page from '../../components/Page.server'
```

```
return (
  <Page login={login} searchText={searchText}>
    <Suspense fallback={<NoteSkeleton isEditing={false} />}>
      <Note login={login} selectedId={id} isEditing={false} />
    </Suspense>
  </Page>
)
```

From: https://github.com/vercel/server-components-notes-demo/blob/main/pages/note/%5Bid%5D.server.js

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Wrap-up

Next.js and Remix.run are extending React to the server

- To decrease latency
- To provide a great Backend-for-Frontend server solution for SPAs
- To break up monolithic React applications into page-based routes
- To support deployment to edge servers, static generation of content (Next.js) and server-side rendering (both)
- Beware of vendor lock-in by embracing these frameworks without considering all of the angles (hosting fees, target platforms and topologies, data usage patterns, etc.)

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Questions? and Thank You!

My sample code and slides:
https://github.com/chariotsolutions/ken-rimple-ptw-2022-next-and-remix

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