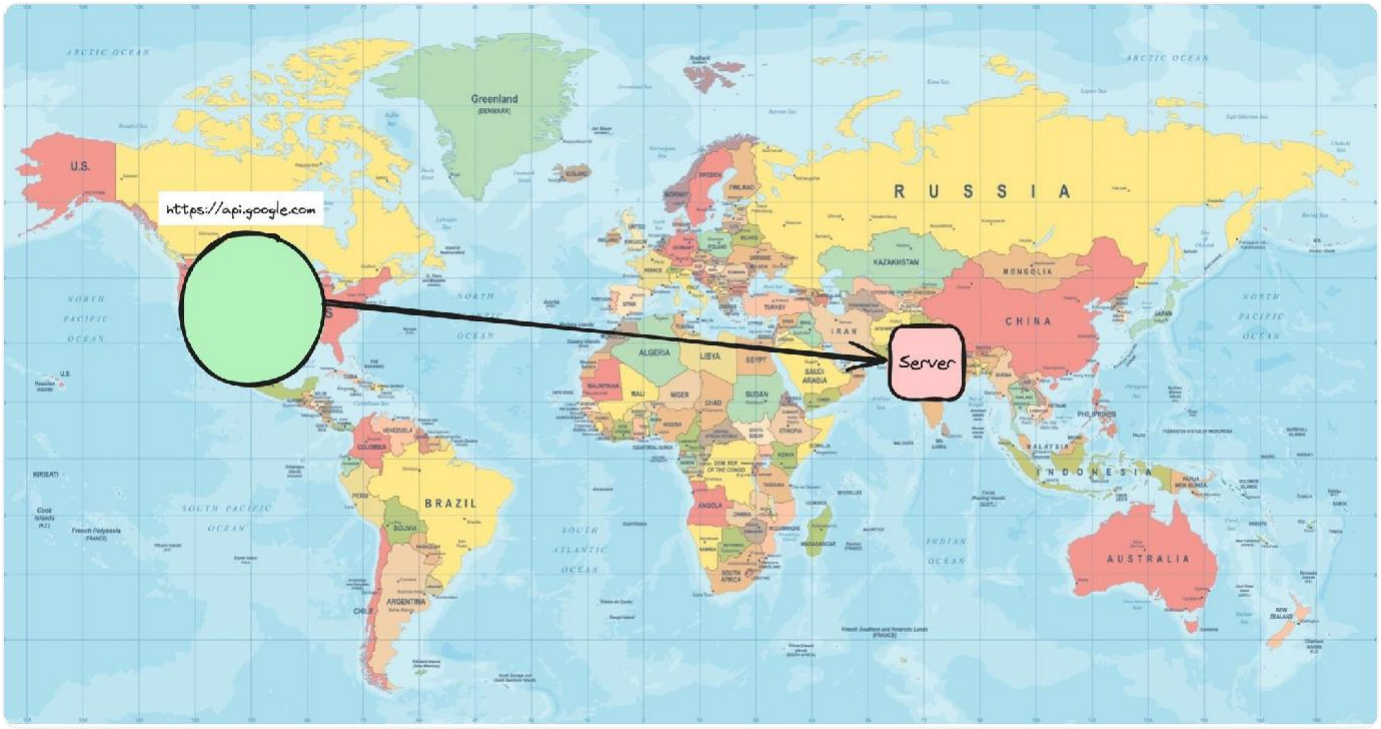
What are backends servers?



You might've used `express` to create a Backend server.

The way to run it usually is `node index.js` which starts a process on a certain port (3000 for example)

When you have to deploy it on the internet, there are a few ways -

1. Go to aws, GCP, Azure, Cloudflare
    1. Rent a VM (Virtual Machine) and deploy your app
    2. Put it in an Auto scaling group
    3. Deploy it in a Kubernetes cluster

There are a few downsides to doing this -

1. Taking care of how/when to scale
2. Base cost even if no one is visiting your website
3. Monitoring various servers to make sure no server is down

What if, you could just write the code and someone else could take care of all of these problems?

What are serverless Backends

"Serverless" is a backend deployment in which the cloud provider dynamically manages the allocation and provisioning of servers. The term "serverless" doesn't mean there are no servers involved. Instead, it means that developers and operators do not have to worry about the servers.

Easier defination

What if you could just write your express routes and run a command. The app would automatically

1. Deploy
2. AutoScale
3. Charge you on a per request basis (rather than you paying for VMs)

Problems with this approach

1. More expensive at scale
2. Cold start problem

Famous serverless providers

There are many famous backend serverless providers -

- AWS Lambda

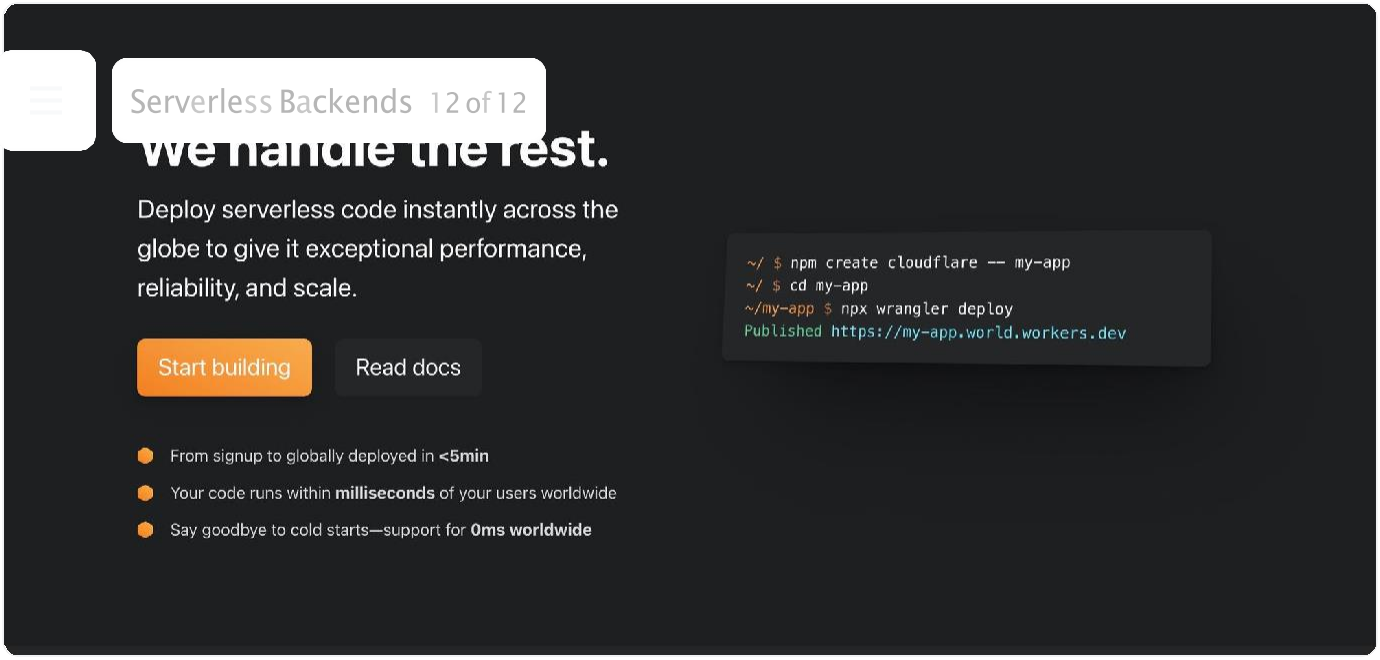
  https://aws.amazon.com/pm/lambda/?trk=5cc83e4b-8a6e-4976-92ff-7a6198f2fe76&sc_channel=ps&ef_id=CjwKCAiAt5euBhB9EiwAdkXWO-i-th4J3onX9ji-tPt_JmsBAQJLWYN4hzTF0Zxb084EkUBxSCK5vhoC-1wQAvD_BwE:G:s&s_kwcid=AL!4422!3!651612776783!e!!g!!aws lambda!19828229697!143940519541

- Google Cloud Functions

  https://firebase.google.com/docs/functions

- Cloudflare Workers

  https://workers.cloudflare.com/



When should you use a serverless architecture?

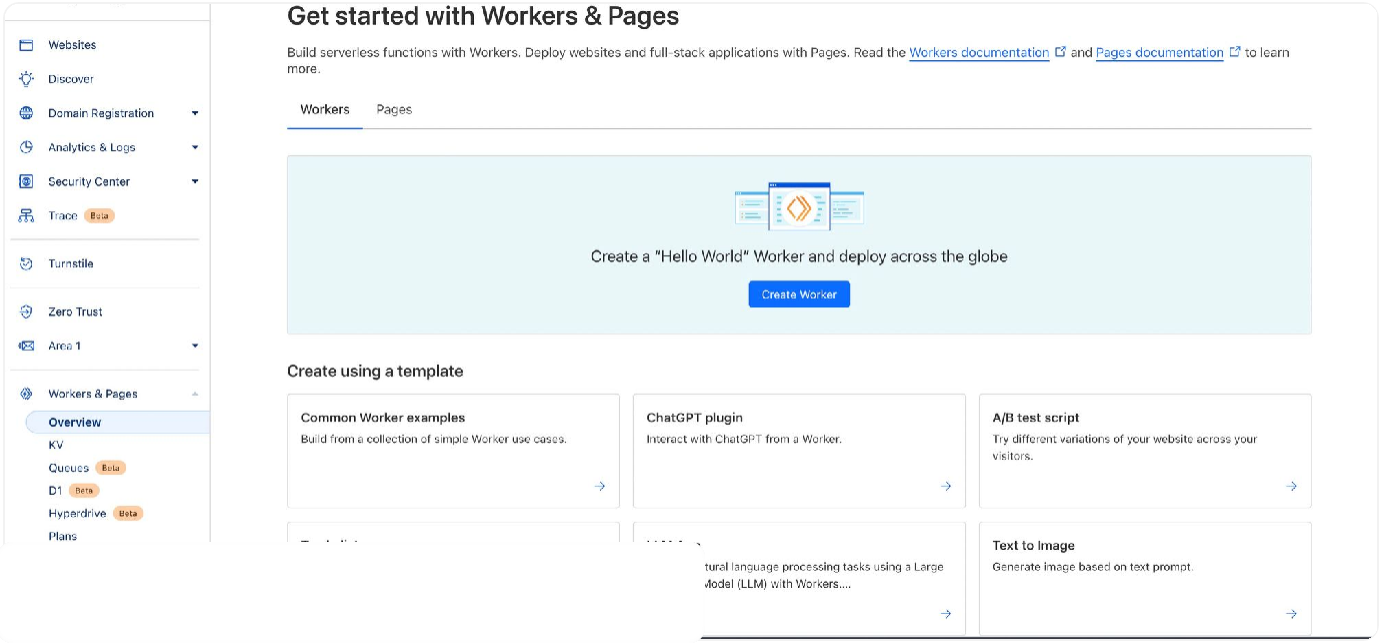
1. When you have to get off the ground fast and don't want to worry about deployments
2. When you can't anticipate the traffic and don't want to worry about autoscaling
3. If you have very low traffic and want to optimise for costs

Cloudflare workers setup

We'll be understanding cloudflare workers today.

Reason - No credit card required to deploy one

Please sign up on https://cloudflare.com/



Try creating a test worker from the UI (Common worker examples) and try hitting the URL at which it is deployed

How cloudflare workers work?

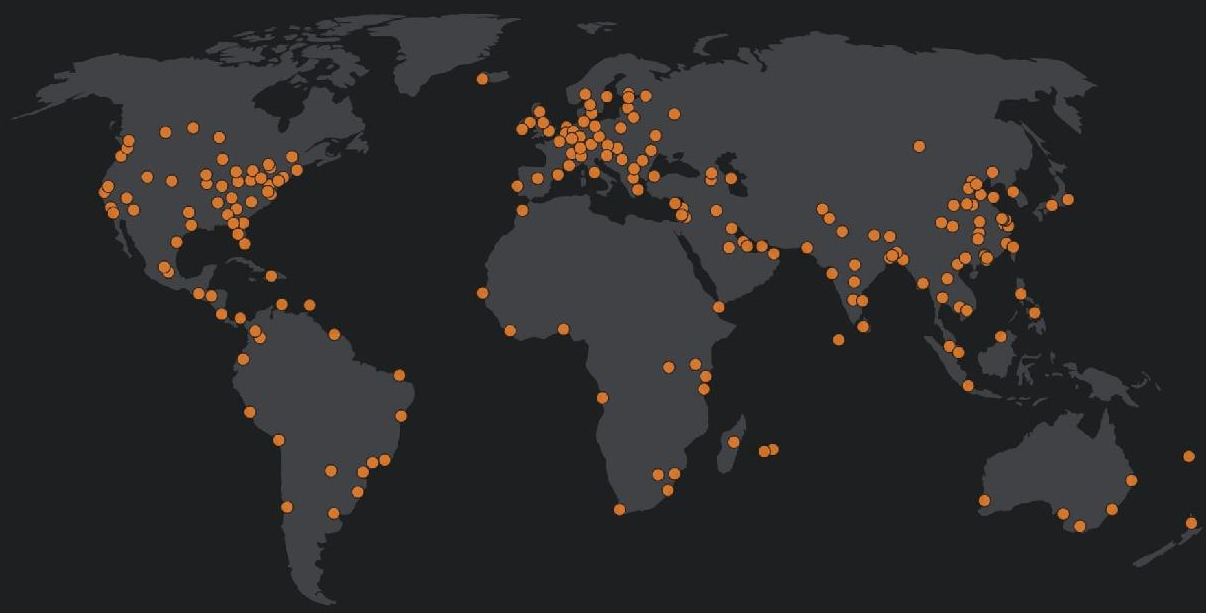
Detailed blog post - https://developers.cloudflare.com/workers/reference/how-workers-works/#:~:text=Though Cloudflare Workers behave similarly,used by C hromium and Node.

> Cloudflare workers DONT use the Node.js runtime. They have created their own runtime. There are a lot of things that Node.js has

How Workers works

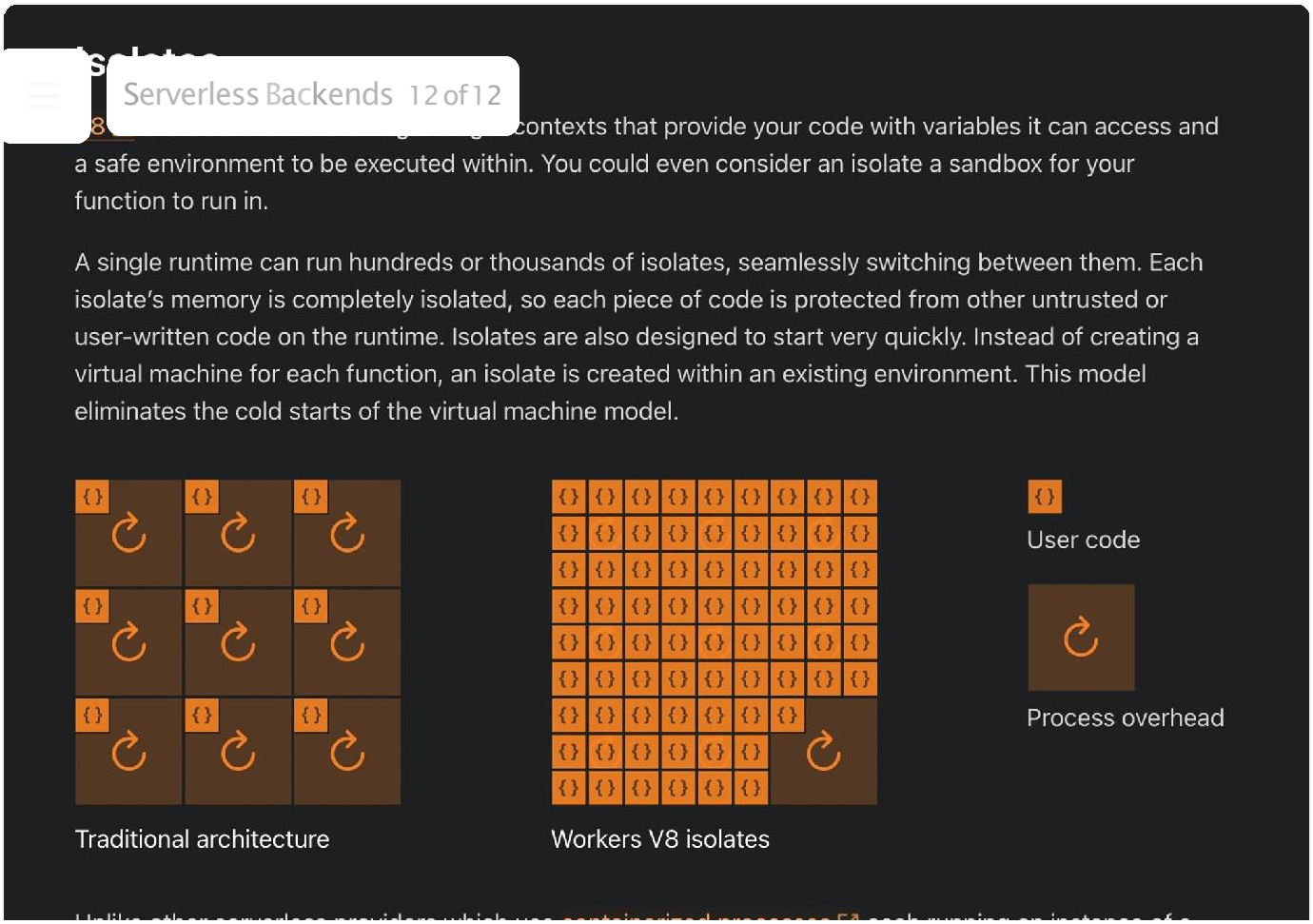
Though Cloudflare Workers behave similarly to JavaScript in the browser or in Node.js, there are a few differences in how you have to think about your code. Under the hood, the Workers runtime uses the V8 engine — the same engine used by Chromium and Node.js. The Workers runtime also implements many of the standard APIs available in most modern browsers.

The differences between JavaScript written for the browser or Node.js happen at runtime. Rather than running on an individual's machine (for example, a browser application or on a centralized server), Workers functions run on Cloudflare's Edge Network - a growing global network of thousands of machines distributed across hundreds of locations.



Each of these machines hosts an instance of the Workers runtime, and each of those runtimes is capable of running thousands of user-defined applications. This guide will review some of those differences.

Isolates vs containers



Initializing a worker

To create and deploy your application, you can take the following steps –

▼ Initialize a worker

```
npm create cloudflare -- my-app
```

Select `no` for `Do you want to deploy your application`

▼ Explore `package.json` dependencies

```
"wrangler": "^3.0.0"
```

Notice `express` is not a dependency there

▼ Start the worker locally


```
npm run dev
```

▼ How to return json?

```
export default {
  async fetch(request: Request, env: Env, ctx: ExecutionContext): Promise<Res
    return Response.json({
      message: "hi"
    });
  },
};
```

Question - Where is the express code? HTTP Server?

Cloudflare expects you to just write the logic to handle a request.
Creating an HTTP server on top is handled by cloudflare

Question - How can I do **routing** ?

In express, routing is done as follows -

```
import express from "express"
const app = express();

app.get("/route", (req, res) => {
  // handles a get request to /route
});
```

How can you do the same in the Cloudflare environment?

```
export default {
  async fetch(request: Request, env: Env, ctx: ExecutionContext): Promise<Respo
    console.log(request.body);
    console.log(request.headers);

    if (request.method === "GET") {
      return Response.json({
        message: "you sent a get request"
      });
    } else {
      return Response.json({
        message: "you did not send a get request"
      });
    }
  },
};
```

How to get query params - https://community.cloudflare.com/t/parse-url-query-strings-with-cloudflare-workers/90286

Cloudflare does not expect a routing library/http server out of the box. You can write a full application with just the constructs available above.

We will eventually see how you can use other HTTP frameworks (like express) in cloudflare workers.

Deploying a worker

Now that you have written a basic HTTP server, let's get to the most interesting bit — Deploying it on the internet

We use wrangler for this (Ref https://developers.cloudflare.com/workers/wrangler/)

Wrangler (command line)

Wrangler, the Cloudflare Developer Platform command-line interface (CLI), allows you to manage Worker projects.

- Install/Update Wrangler: Get started by installing Wrangler, and update to newer versions by following this guide.
- API: An experimental API to programmatically manage your Cloudflare Workers.
- Bundling: Review Wrangler's default bundling.
- Commands: Create, develop, and deploy your Cloudflare Workers with Wrangler commands.
- Configuration: Use a `wrangler.toml` configuration file to customize the development and deployment setup for your Worker project and other Developer Platform products.
- Custom builds: Customize how your code is compiled, before being processed by Wrangler.
- Deprecations: The differences between Wrangler versions, specifically deprecations and breaking changes.
- Environments: Deploy the same Worker application with different configuration for each environment.
- Migrations: Review migration guides for specific versions of Wrangler.
- Run in CI/CD: Deploy your Workers within a CI/CD environment.
- System environment variables: Local environment variables that can change Wrangler's behavior.

▼ Step 1 - Login to cloudflare via the wrangler cli

```
npx wrangler login
```

```
→ my-app git:(master) ✗ npx wrangler login
  ⛅ wrangler 3.1
  ------------------
  Attempting to login via OAuth...
  Opening a link in your default browser: https://das
  ee7&redirect_uri=http%3A%2F%2Flocalhost%3A8976%2Foa
  workers_routes%3Awrite%20workers_scripts%3Awrite%20
  llation%3Awrite%20ai%3Aread%20offline_access&state=
  &code_challenge_method=S256
  Successfully logged in.
```

▼ Step 2 – Deploy your worker

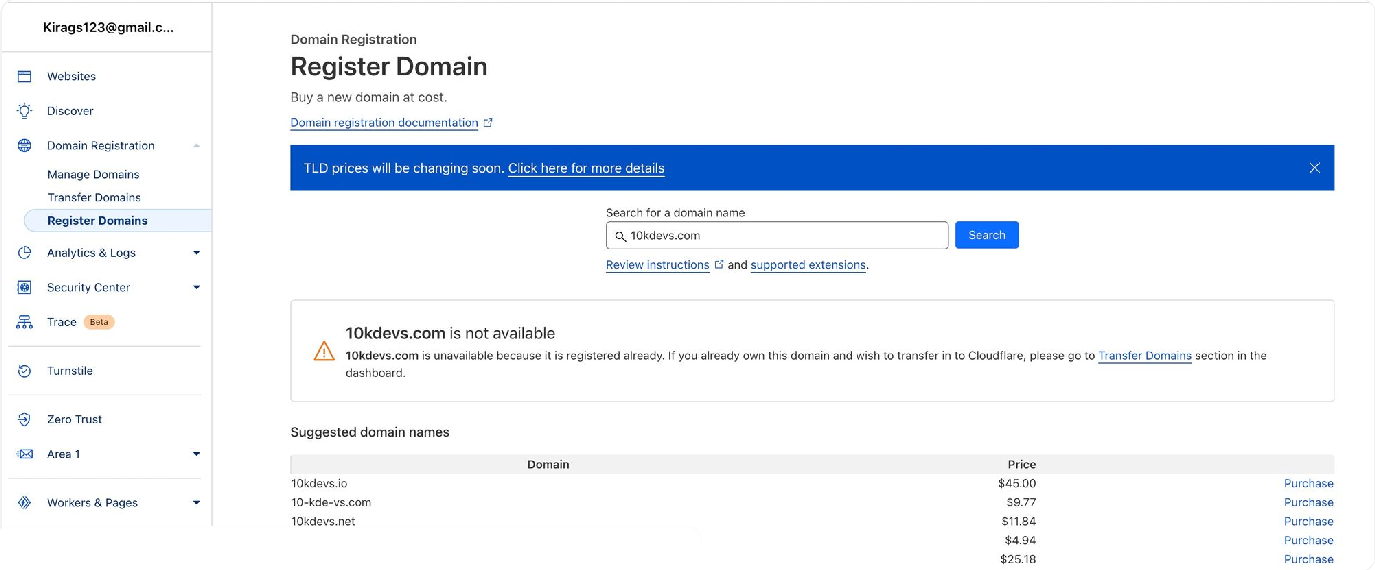
```
npm run deploy
```

If all goes well, you should see the app up and running

Assigning a custom domain

You have to buy a plan to be able to do this

You also need to buy the domain on cloudflare/transfer the domain to cloudflare



Adding express to it

Why can't we use express? Why does it cloudflare doesn't start off with a simple express boiler plate?

Reason 1 - Express heavily relies on Node.js

https://community.cloudflare.com/t/express-support-for-workers/390844

1 **123testcoding** Jun '22

Being a developer, I really love Cloudflare Pages for hosting static apps! But, frontend apps usually need API to get dynamic data. I have existing Express apps that I would like to transfer to Workers, in addition to transferring my frontend app to Cloudflare Pages.

Is it known whether Express support will be added for Cloudflare Workers?

2

created	last reply	3	6.9k	2	6
1 Jun '22	Jun '22	replies	views	users	likes

cherryjimbo MVP '23 Jun '22

It's unlikely you'll see specifically `express` on Workers due to its deep Node.js dependencies, however there are a lot of options that you'll probably feel right at home with, and have very similar APIs to something like Express. To name just a few:

- GitHub - honojs/hono: Ultrafast web framework for Cloudflare Workers, Deno, Bun, and Node.js. Fast, but not only fast. 818
- GitHub - lukeed/worktop: The next generation web framework for Cloudflare Workers 343
- GitHub - kwhitley/itty-router: A little router. 287

In addition, if you're running the frontend app in Pages, you may even be able to run your backend in Pages too, using Functions: Functions · Cloudflare Pages docs 140

https://github.com/honojs/hono

You can split all your handlers in a file

Create a generic handler that you can forward requests to from either express or hono or native cloudflare handler

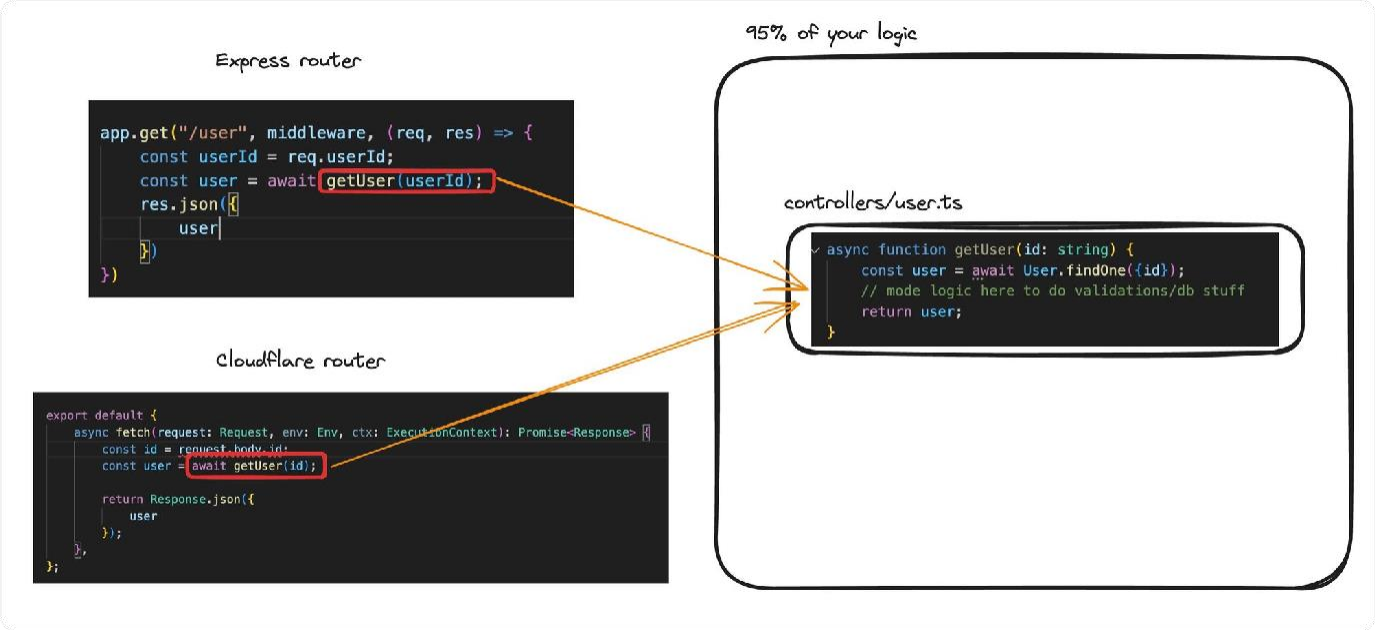
Serverless Backends 12 of 12

jsmrcaga Jul '23

I can link the Node.js compatibility docs for Workers
https://developers.cloudflare.com/workers/runtime-apis/nodejs/#nodejs-compatibility 244

It is important to know that workers run on a different runtime built by Cloudflare (not Node.js). I don't expect compatibility for `worker_threads` to be arriving aytime soon.

If you really need to deploy a Node.js app I would search more for a classic serverless option. If you can split your app into small components and don't need to rely heavily on Node.js, Cloudflare Workers are an amazing option and there are routing libraries for them as well (ie: to replace express).



Using hono

What is Hono

https://hono.dev/concepts/motivation

Serverless Backends 12 of 12

At first, I just wanted to create a web application on Cloudflare Workers. But, there was no good framework that works on Cloudflare Workers, so I started building Hono and thought it would be a good opportunity to learn how to build a router using Trie trees.

Then a friend showed up with ultra crazy fast router called "RegExpRouter". And, I also had a friend who created the Basic authentication middleware.

Thanks to using only Web Standard APIs, we could make it work on Deno and Bun. "No Express for Bun?" we could answer, "No, but there is Hono" though Express works on Bun now.

We also have friends who make GraphQL servers, Firebase authentication, and Sentry middleware. And there is also a Node.js adapter. An ecosystem has been created.

In other words, Hono is damn fast, makes a lot of things possible, and works anywhere. You can look that Hono will become **Standard for Web Standard**.

What runtimes does it support?

Working with cloudflare workers -

1. Initialize a new app

```
npm create hono@latest my-app
```

1. Move to `my-app` and install the dependencies.

```
cd my-app
npm i
```

1. Hello World

```
import { Hono } from 'hono'
const app = new Hono()

app.get('/', (c) => c.text('Hello Cloudflare Workers!'))

export default app
```

Getting inputs from user

```
import { Hono } from 'hono'

const app = new Hono()

app.get('/', async (c) => {
```

```
const body = await c.req.json()
```

```
  console.log(body);
  console.log(c.req.header("Authorization"));
  console.log(c.req.query("param"));

  return c.text('Hello Hono!')
})

export default app
```


Middlewares

https://hono.dev/guides/middleware

Creating a simple auth middleware

```
import { Hono, Next } from 'hono'
import { Context } from 'hono/jsx';

const app = new Hono()

app.use(async (c, next) => {
  if (c.req.header("Authorization")) {
    // Do validation
    await next()
  } else {
    return c.text("You dont have acces");
  }
})

app.get('/', async (c) => {
  const body = await c.req.parseBody()
  console.log(body);
```

```
  console.log(c.req.header("Authorization"));
  console.log(c.req.query("param"));

  return c.json({msg: "as"})
})

export default app
```

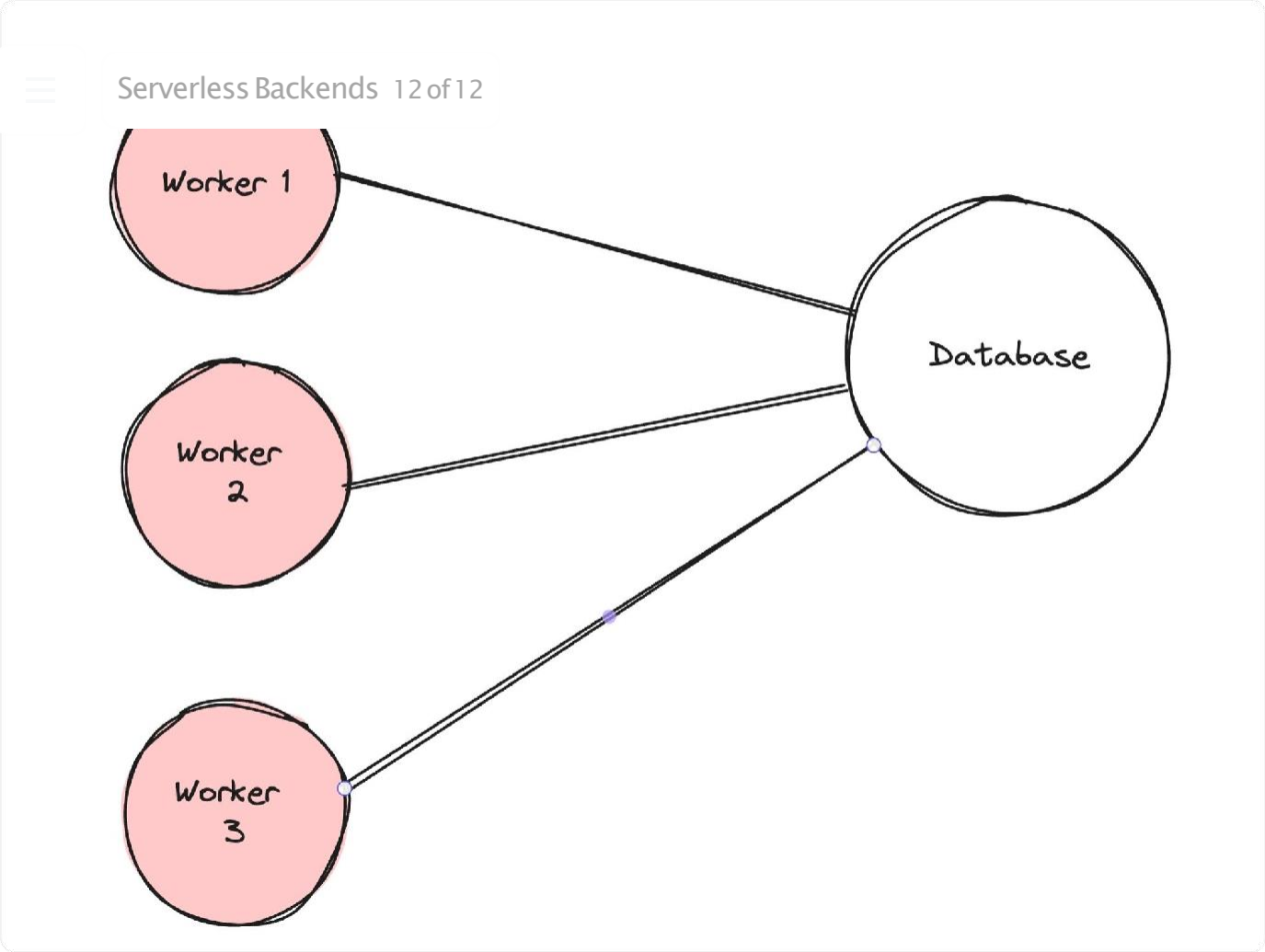

Notice you have to return the `c.text`

Connecting to DB

https://www.prisma.io/docs/orm/prisma-client/deployment/edge/deploy-to-cloudflare-workers

Serverless environments have one big problem when dealing with databases.

1. There can be many connections open to the DB since there can be multiple workers open in various regions



1. Prisma the library has dependencies that the cloudflare runtime doesn't understand.

Connection pooling in prisma for serverless env

https://www.prisma.io/docs/accelerate
https://www.prisma.io/docs/orm/prisma-client/deployment/edge/deploy-to-cloudflare-workers

1. Install prisma in your project

```
npm install --save-dev prisma
```


2. Init Prisma

```
npx prisma init
```

3. Create a basic schema

```
generator client {
  provider = "prisma-client-js"
}

datasource db {
  provider = "postgresql"
  url      = env("DATABASE_URL")
}

model User {
  id       Int    @id @default(autoincrement())
  name     String
  email    String
  password String
}
```

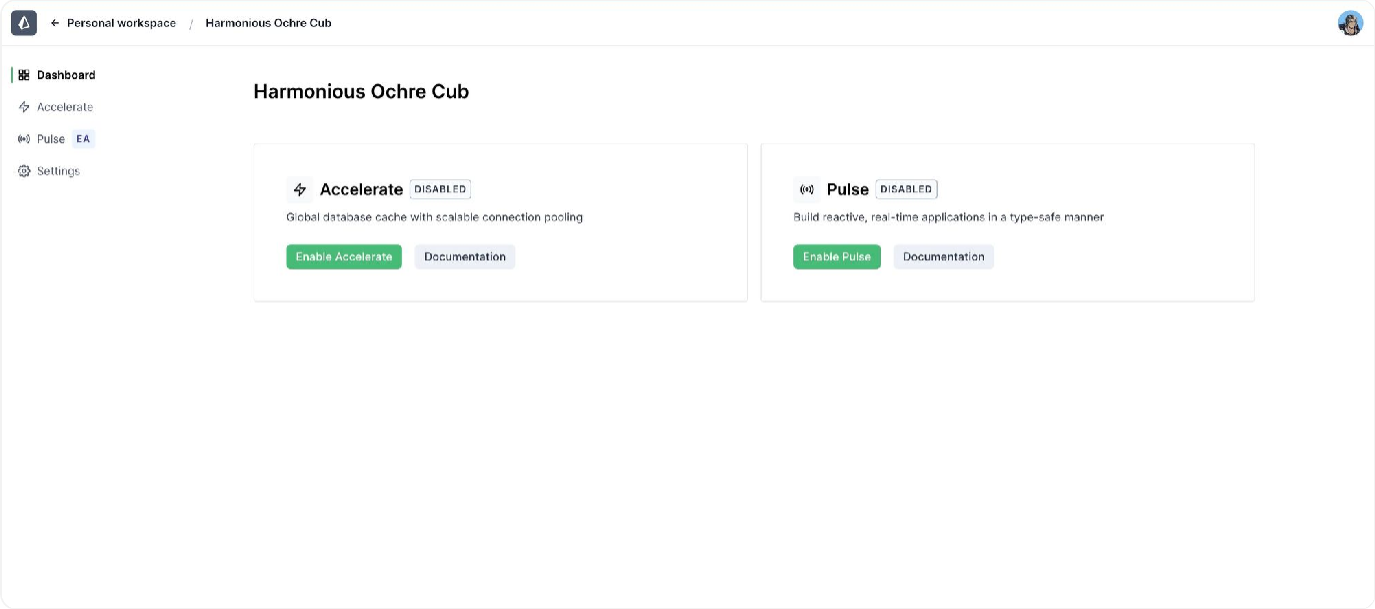
4. Create migrations

```
npx prisma migrate dev --name init
```

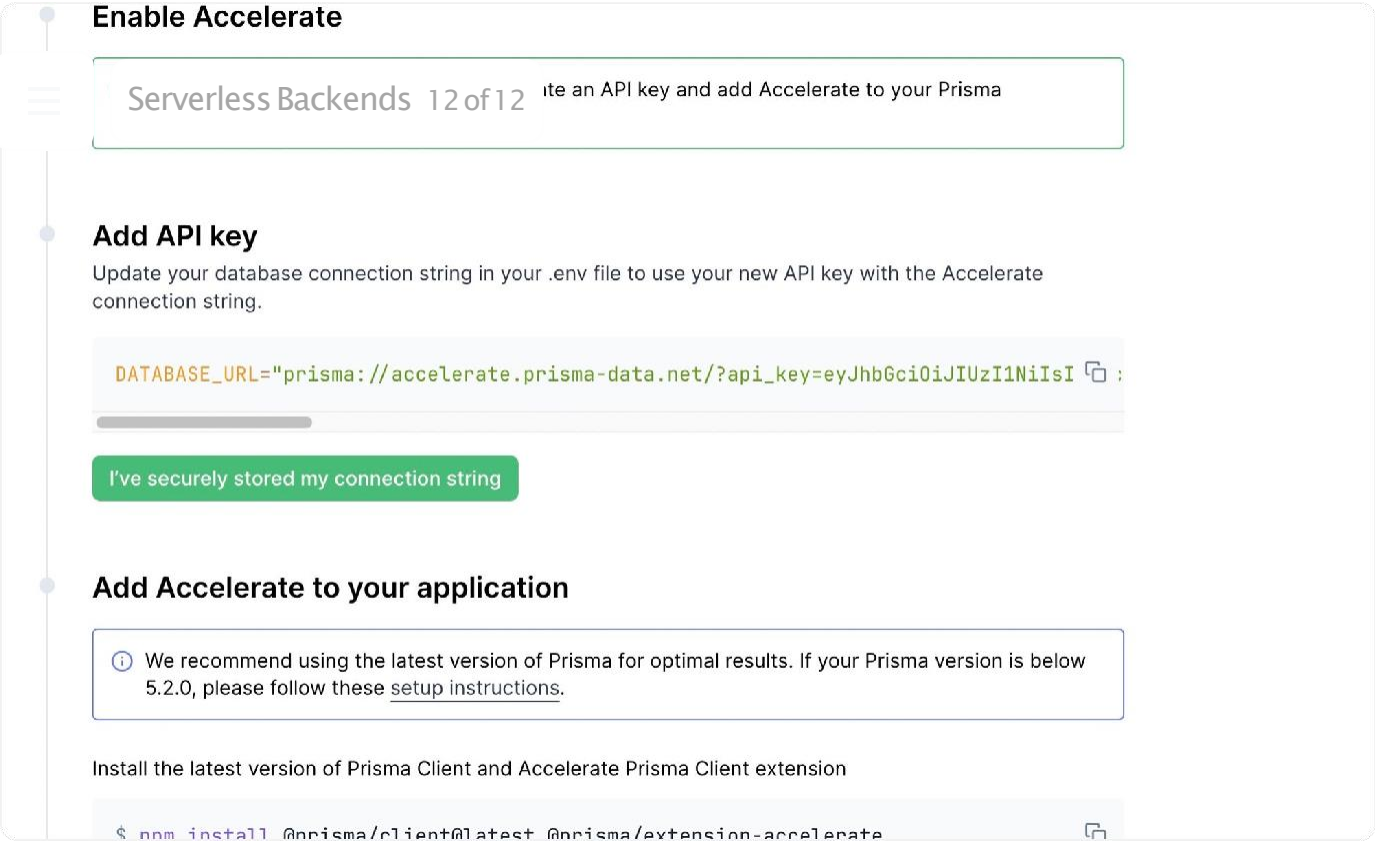
5. Signup to Prisma accelerate

https://console.prisma.io/login

Enable accelerate



Generate an API key



Replace it in .env

```
DATABASE_URL="prisma://accelerate.prisma-data.net/?api_key=your_key"
```

5. Add accelerate as a dependency

```
npm install @prisma/extension-accelerate
```

6. Generate the prisma client

```
npx prisma generate --no-engine
```

7. Setup your code

```
import { Hono, Next } from 'hono'
import { PrismaClient } from '@prisma/client/edge'
import { withAccelerate } from '@prisma/extension-accelerate'
import { env } from 'hono/adapter'

const app = new Hono()

app.post('/', async (c) => {
  // Todo add zod validation here
  const body: {
    name: string;
    email: string;
    password: string
  } = await c.req.json()
  const { DATABASE_URL } = env<{ DATABASE_URL: string }>(c)

  const prisma = new PrismaClient({
      datasourceUrl: DATABASE_URL,
  }).$extends(withAccelerate())

  console.log(body)

  await prisma.user.create({
    data: {
      name: body.name,
      email: body.email,
      password: body.password
    }
  })

  return c.json({msg: "as"})
})

export default app
```