

# What are backends servers?



# 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\\_kwid=AL!4422!3!651612776783!e!!g!!aws-lambda!19828229697!143940519541](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_kwid=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/>

## You write code. We handle the rest.

Deploy serverless code instantly across the globe to give it exceptional performance, reliability, and scale.

Start building

Read docs

- From signup to globally deployed in <5min
- Your code runs within **milliseconds** of your users worldwide
- Say goodbye to cold starts—support for **0ms worldwide**

```
~/ $ npm create cloudflare -- my-app
~/ $ cd my-app
~/my-app $ npx wrangler deploy
Published https://my-app.world.workers.dev
```

# When should you use a serverless architecture?

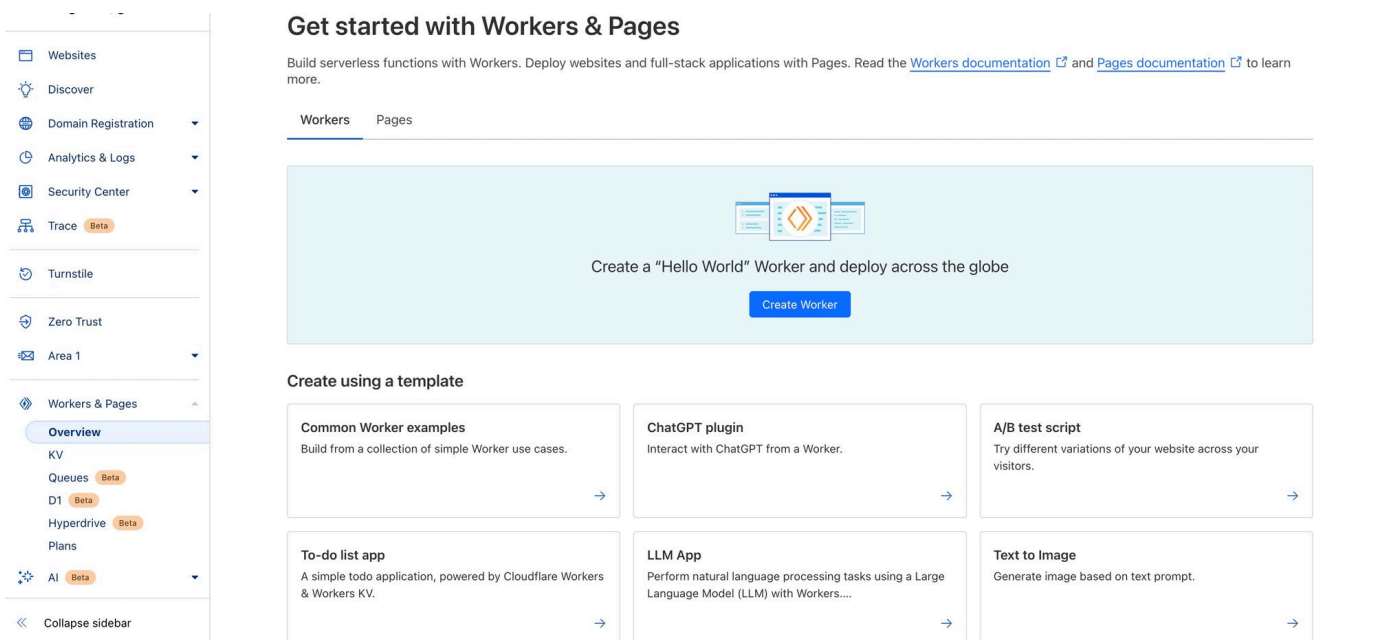
1. When you have to get off the ground fast and don't want to worry about deployments
2. When you can't anticipate the traffic and don't want to worry about autoscaling
3. If you have very low traffic and want to optimise for costs

# 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/>



The screenshot shows the Cloudflare dashboard interface. On the left is a sidebar with navigation links: Websites, Discover, Domain Registration, Analytics & Logs, Security Center, Trace (Beta), Turnstile, Zero Trust, Area 1, and Workers & Pages. The 'Workers & Pages' section is expanded, showing 'Overview' as the selected option. The main content area is titled 'Get started with Workers & Pages' and includes a sub-header 'Build serverless functions with Workers. Deploy websites and full-stack applications with Pages. Read the [Workers documentation](#) and [Pages documentation](#) to learn more.' Below this, there are two tabs: 'Workers' and 'Pages'. The 'Workers' tab is active, displaying a large light blue box with the text 'Create a "Hello World" Worker and deploy across the globe' and a 'Create Worker' button. Below this, there is a section titled 'Create using a template' which contains six cards: 'Common Worker examples' (Build from a collection of simple Worker use cases), 'ChatGPT plugin' (Interact with ChatGPT from a Worker), 'A/B test script' (Try different variations of your website across your visitors), 'To-do list app' (A simple todo application, powered by Cloudflare Workers & Workers KV), 'LLM App' (Perform natural language processing tasks using a Large Language Model (LLM) with Workers...), and 'Text to Image' (Generate image based on text prompt). Each card has a right-pointing arrow.

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 Chromium and Node.>

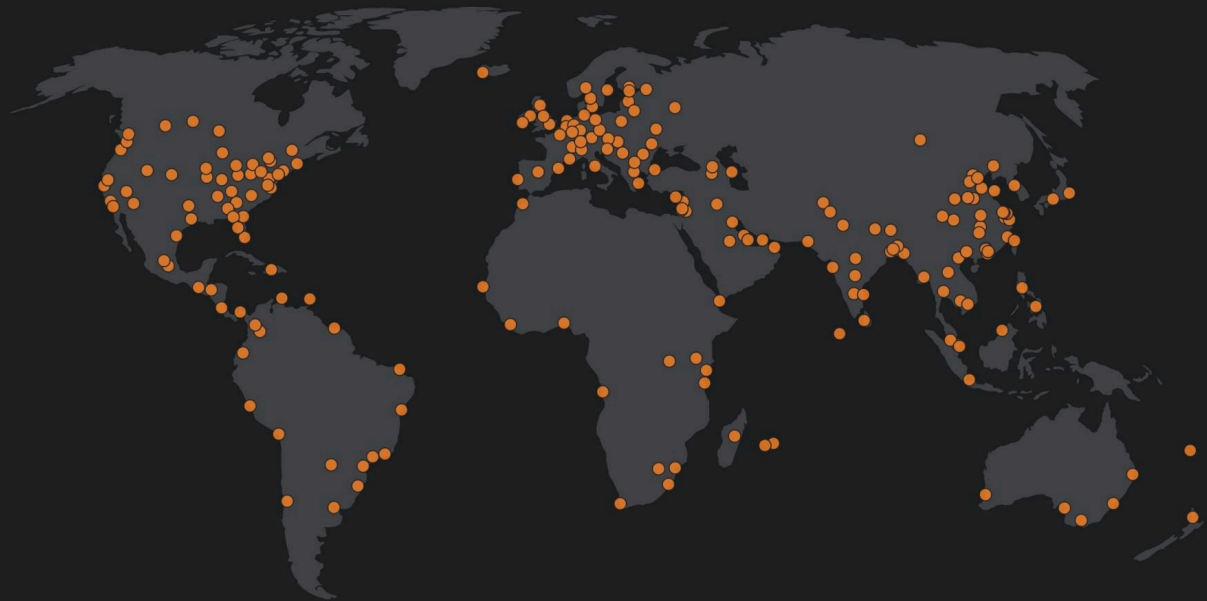


Cloudflare workers DONT use the Node.js runtime. They have created their own runtime. There are a lot of things that Node.js has

# 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

## Isolates

**V8**  orchestrates isolates: lightweight contexts that provide your code with variables it can access and a safe environment to be executed within. You could even consider an isolate a sandbox for your function to run in.

A single runtime can run hundreds or thousands of isolates, seamlessly switching between them. Each isolate's memory is completely isolated, so each piece of code is protected from other untrusted or user-written code on the runtime. Isolates are also designed to start very quickly. Instead of creating a virtual machine for each function, an isolate is created within an existing environment. This model

# Initializing a worker

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

### ▼ Initialize a worker

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

[Copy](#)

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

### ▼ Explore package.json dependencies

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

[Copy](#)

Notice **express** is not a dependency there

### ▼ Start the worker locally

```
npm run dev
```

[Copy](#)

### ▼ How to return json?

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

[Copy](#)



## 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
});
```

Copy

How can you do the same in the Cloudflare environment?

```
export default {
  async fetch(request: Request, env: Env, ctx: ExecutionContext): Promise<Response> {
    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"
      });
    }
  },
};
```

Copy



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
```

[Copy](#)

```
● → my-app git:(master) x npx wrangler login
  ☁ wrangler 3.28.1

-----
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
```

[Copy](#)

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

Kirags123@gmail.c...

Websites

Discover

Domain Registration

Manage Domains

Transfer Domains

Register Domains

Analytics & Logs

Domain Registration

Register Domain

Buy a new domain at cost.

[Domain registration documentation](#)

TLD prices will be changing soon. [Click here for more details](#)

Search for a domain name

Q, 10kdevs.com

Search

[Review instructions](#) and [supported extensions](#).

# 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

2

created

last reply

3

6.9k

2

6

2

1

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**



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 anytime 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).

Express router

```
app.get("/user", middleware, (req, res) => {
  const userId = req.userId;
  const user = await getUser(userId);
  res.json({
    user
  });
});
```

Cloudflare router

```
export default {
  async fetch(request: Request, env: Env, ctx: ExecutionContext): Promise<Response> {
    const id = request.body.id;
    const user = await getUser(id);

    return Response.json({
      user
    });
  },
};
```

95% of your logic

controllers/user.ts

```
async function getUser(id: string) {
  const user = await User.findOne({id});
  // more logic here to do validations/db stuff
  return user;
}
```

## Using hono

# What is Hono

<https://hono.dev/concepts/motivation>

## # Motivation

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?



## Getting Started



Basic

Cloudflare Workers

Cloudflare Pages

Deno

Bun

Fastly Compute

Vercel

Netlify

AWS Lambda

Lambda@Edge

Supabase Functions

Node.js

Others

# 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

Copy

```
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` value

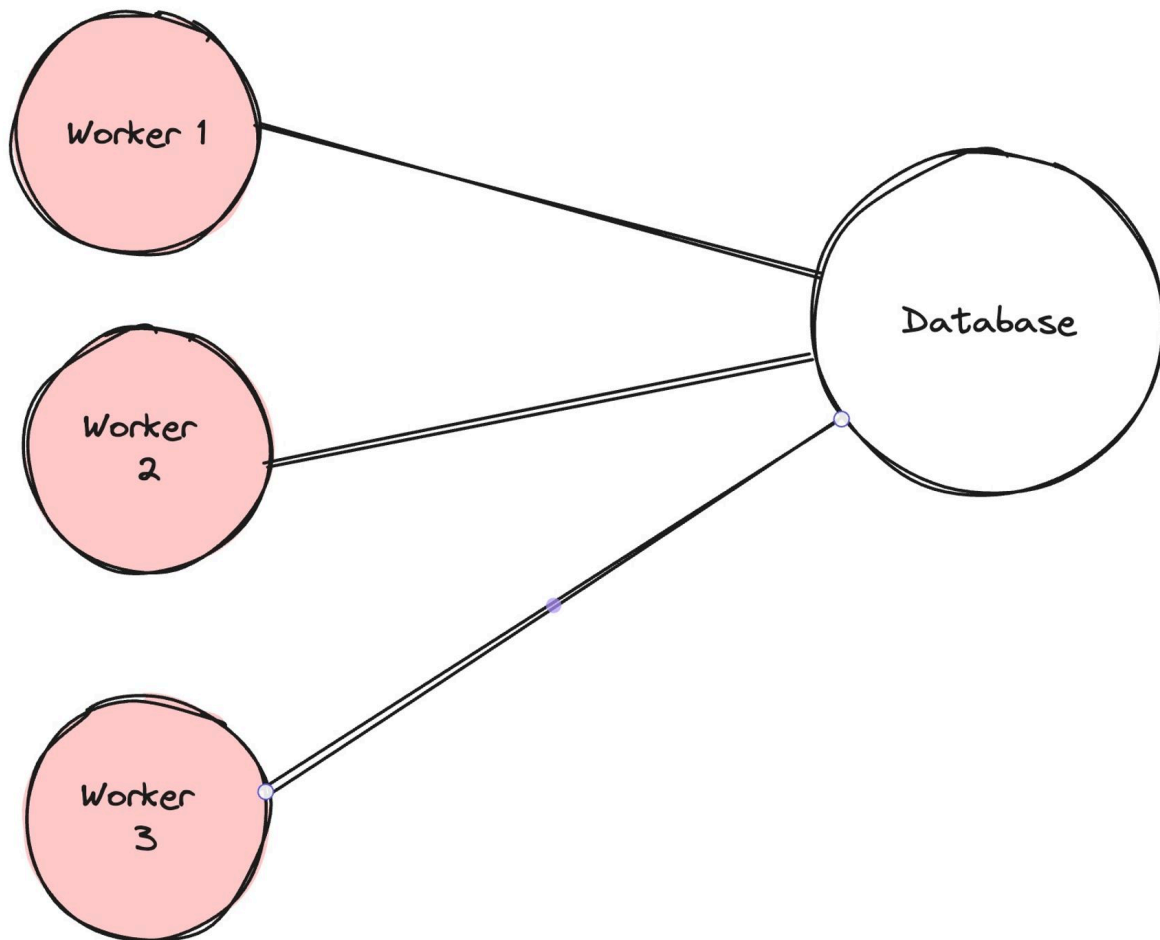
# Connecting to DB



<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
```

[Copy](#)

## 2. Init Prisma

```
npx prisma init
```

[Copy](#)

## 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  
}
```

[Copy](#)

## 4. Create migrations

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

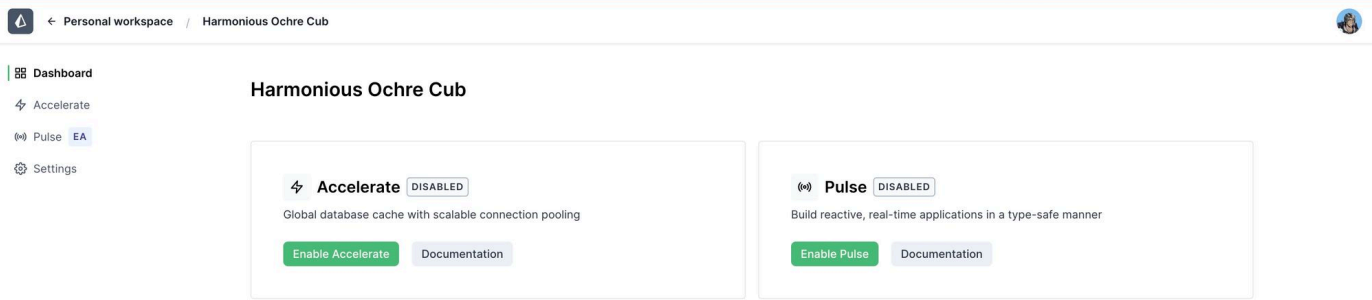
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## 5. Signup to Prisma accelerate

Copy

https://console.prisma.io/login

Enable accelerate



Generate an API key

Enable Accelerate

✓

Successfully enabled, you can now generate an API key and add Accelerate to your Prisma application.

Add API key

Update your database connection string in your .env file to use your new API key with the Accelerate connection string.

DATABASE\_URL="prisma://accelerate.prisma-data.net/?api\_key=eyJhbGciOiJIUzI1NiIsI

Copy

I've securely stored my connection string

Add Accelerate to your application

i

We recommend using the latest version of Prisma for optimal results. If your Prisma version is below 5.2.0, please follow these [setup instructions](#).

Install the latest version of Prisma Client and Accelerate Prisma Client extension

\$ npm install @prisma/client@latest @prisma/extension-accelerate

Copy

Replace it in .env

Copy

DATABASE\_URL="prisma://accelerate.prisma-data.net/?api\_key=your\_...,"

## 5. Add accelerate as a dependency

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

[Copy](#)

## 6. Generate the prisma client

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

[Copy](#)

## 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/adapters'

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"})
```

[Copy](#)

```
}))  
  
export default app
```