<WA/>
2024

Deployment

How/where to put the app in the “cloud”

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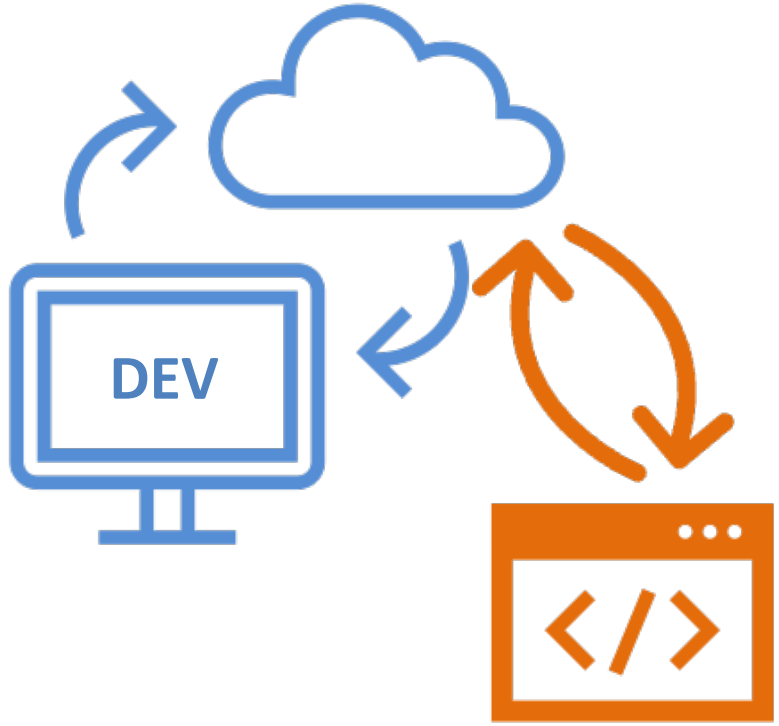


Deployment to Cloud Servers

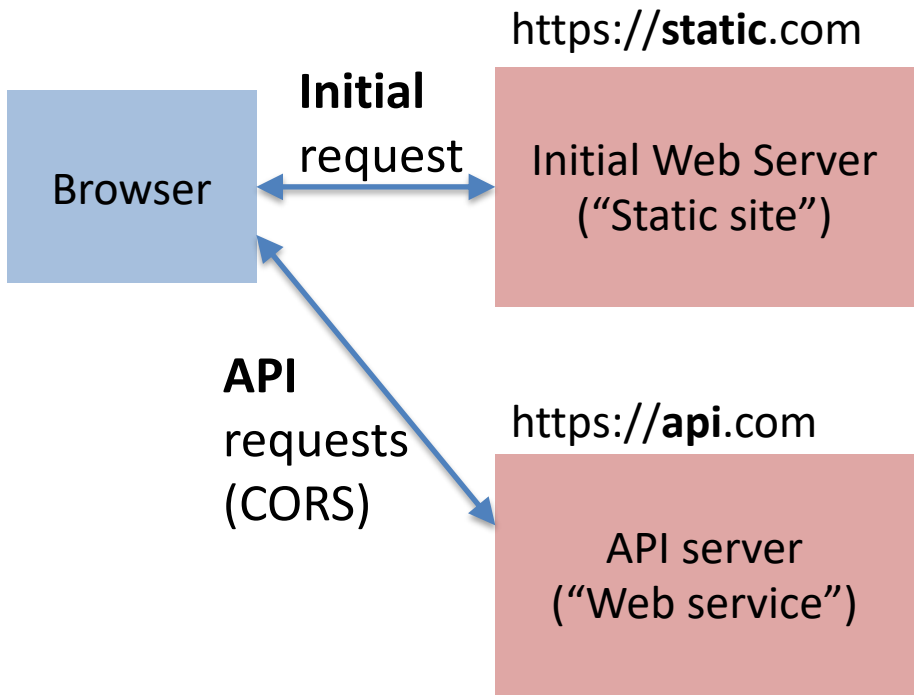
- Real applications are accessible by anybody connected to the Internet
- Need to set up a web server to
  - Serve the static files of the React client application (“landing page”)
  - Provide the API services used by the client
- Configuring servers from scratch, starting from bare virtual machines, is difficult, error prone, and requires expertise in system administration
  - Selecting the best web server software (Apache, nginx, …)
  - Configuring it
  - Configure the security part (HTTPS, certificates, private keys, algorithms, etc.)

Deployment to Cloud Servers

- Most of the activity is mechanical and the same for many cases
- Some online services offer the possibility to simplify deployment
  - **Pre-configured static or API servers**
  - Possibility to run node.js as backend server
  - Possibility to use a database instance
- Platform-as-a-Service approach (PaaS)
  - Many (paid) services exists
  - Very few free ones, especially for the API server (require computational resources)
    - Mostly oriented to become familiar with the system by deploying a toy project, then upgrade to a paid profile

Deployment Architecture

- Use two servers, configured with CORS
- The server runs as-is
- Client: create a “build” with vite
  - `npm run build`
- The build will be put in the `/dist` folder
  - These are all the files for the static web server
  - Note: keep the original files!
    From the build you cannot go back
    to the original sources



Vite Build

- `npm run build` produces all the files needed for a static web server
  - A static `index.html` file that loads:
  - JS file (including all libraries, Bootstrap, …), CSS file,
  - other resources (icons, fonts, etc.)

```
> react-qa@0.0.0 build
> vite build

vite v5.2.9 building for production...
✓ 350 modules transformed.
dist/index.html                                  0.46 kB │ gzip:  0.30 kB
dist/assets/bootstrap-icons-BtvjY1KL.woff2     130.40 kB
dist/assets/bootstrap-icons-BOrJxbIo.woff      176.03 kB
dist/assets/index-CFLmWFf5.css                 307.59 kB │ gzip: 44.37 kB
dist/assets/index-BHo4gWFZ.js                  220.24 kB │ gzip: 72.33 kB
✓ built in 692ms
```

Static Build

- Any needed resource is put into static files, served by the static server
  - Libraries (e.g., Bootstrap etc.) are minified to save bandwidth
- No leak of information towards third-party servers (CDNs) due to css, fonts, etc.)
  - Might be important for legal reasons (privacy law disclosures, etc.)

index.html

```
<!doctype html>
<html lang="en">
  <head> <meta charset="UTF-8" />
    <link rel="icon" type="image/svg+xml" href="/vite.svg" />
    <meta name="viewport" content="width=device-width, initial-scale=1.0" />
    <title>Vite + React</title>
    <script type="module" crossorigin src="/assets/index-BHo4gWFZ.js"></script>
    <link rel="stylesheet" crossorigin href="/assets/index-CFLmWFf5.css">
  </head>
  <body><div id="root"></div></body>
</html>
```

index-BHo4gWFZ.js

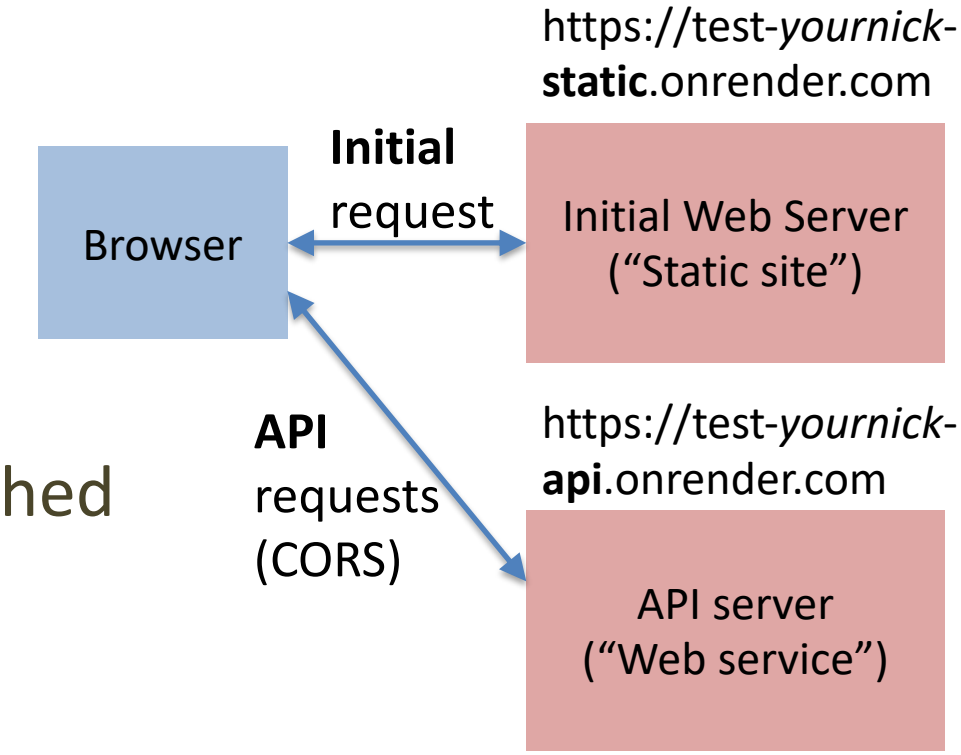
```
function gp(e,t){for(var
n=0;n<t.length;n++){const
r=t[n];if(typeof
r!="string"&&!Array.isArr
ay(r)){for(const l in
r)if(l!=="default"&&!(l
in e)){…
```

Suggested Deployment Approach

- Identify a free service that can support an API server running node.js
  - Example: https://render.com
- Create an account (free for basic, simple services)
- Make your projects (client & server) accessible to the service
  - Typically, via a git repository from which the service load the files
  - Git approach is easy to maintain and update: automatic deploy after commit/push
  - With render.com: create 1 GitHub repository (either private or public) with your code, in two separate folders (client and server)
    - If private, later you will have to grant permission to render.com to access it

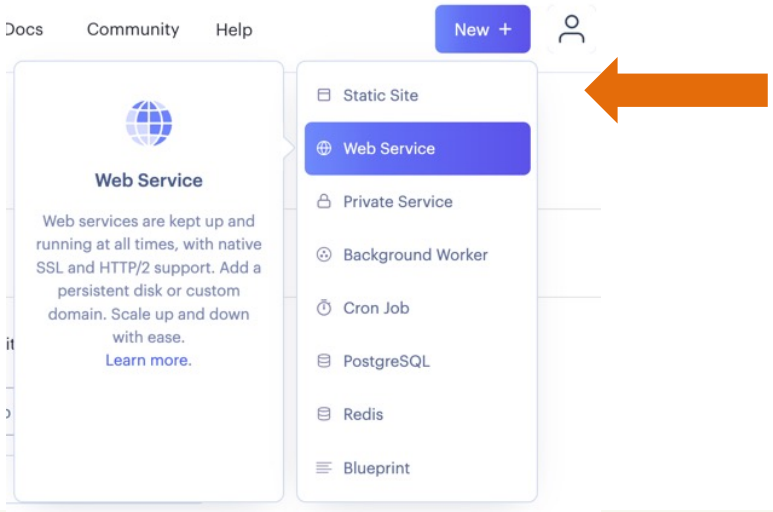
Implement the Architecture

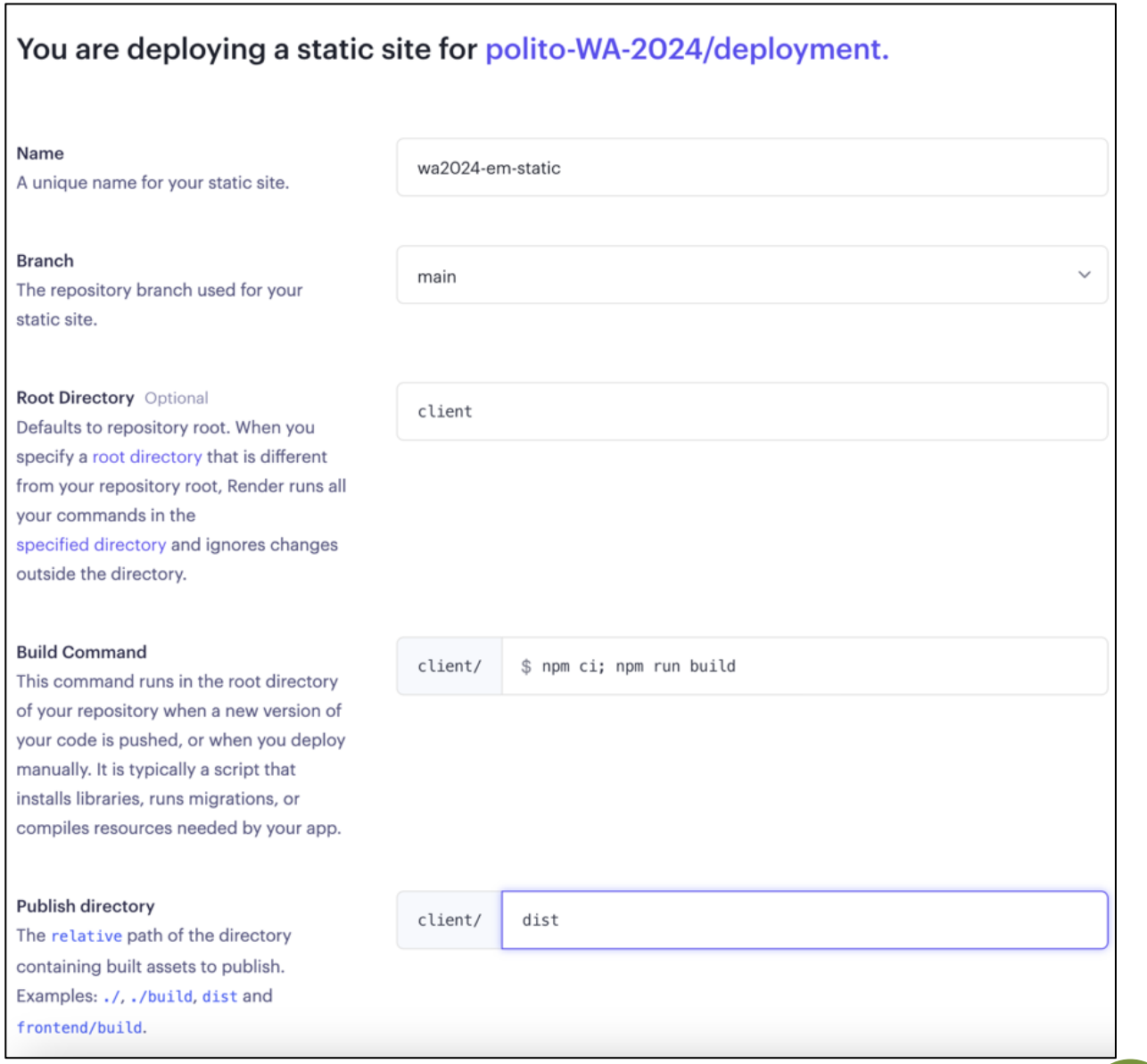
- Go to the https://render.com dashboard, create the following two services with names of your choice
  - **Static site**, e.g. test-*yournick*-static
  - **Web service**, e.g., test-*yournick*-api
- Note that the names will determine part of the URL at which the server can be reached
  - https://test-*yournick*-static.onrender.com
  - https://test-*yournick*-api.onrender.com



Static Site

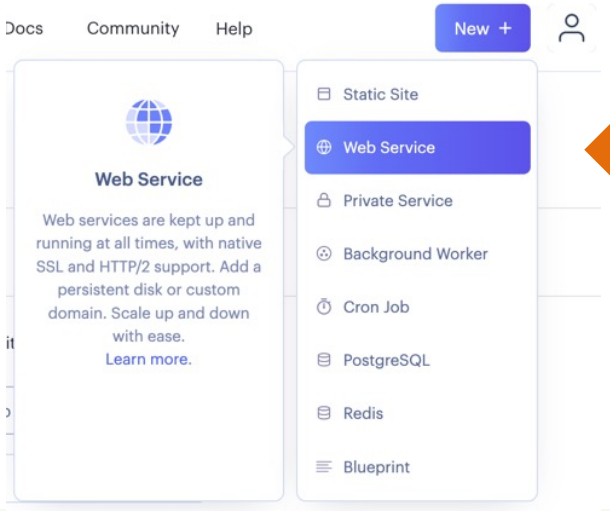
- Root Directory: `client`
- Build command:
  `npm ci; npm run build`
- Publish directory: `dist`

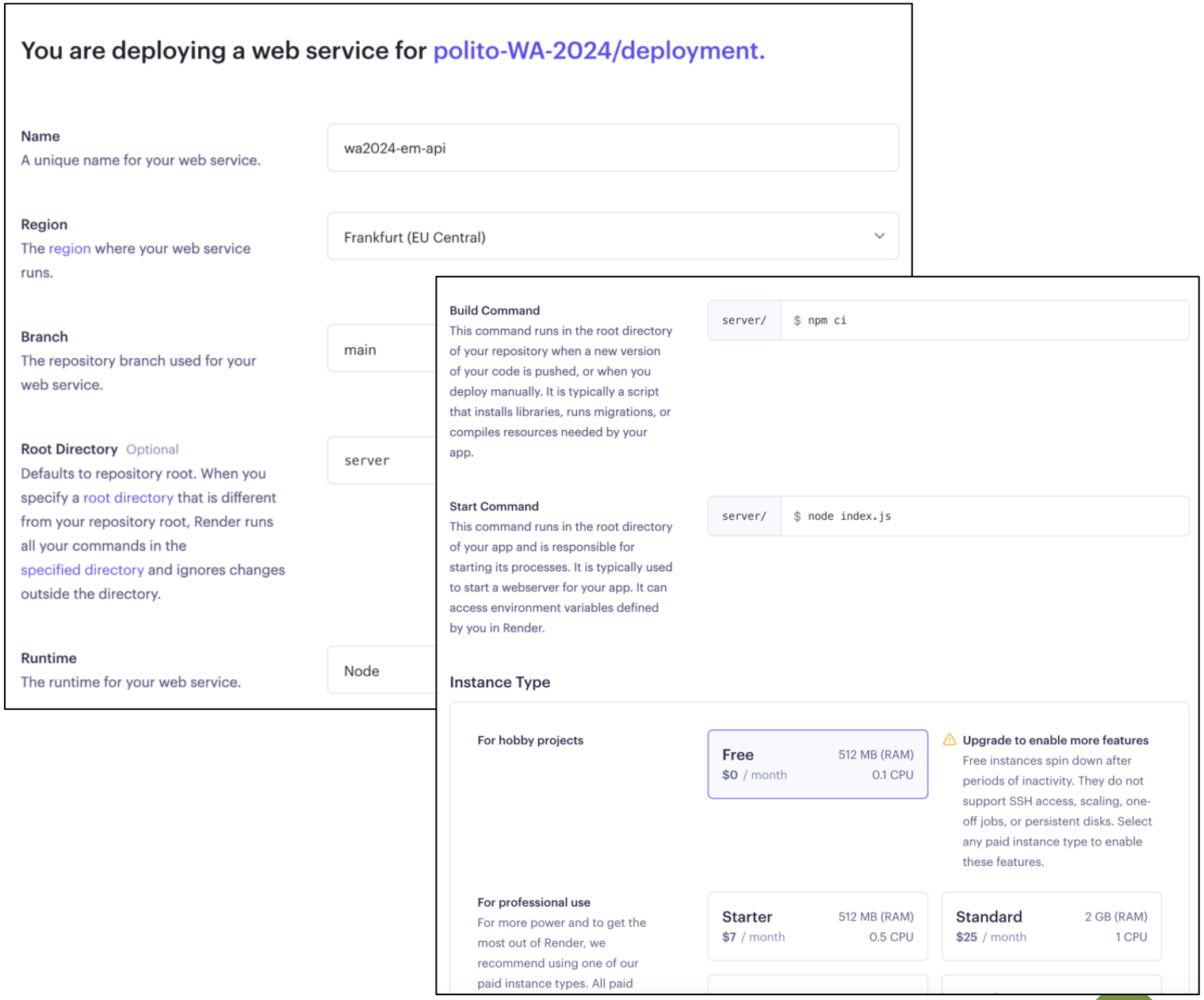




Web Service

- Root Directory: `server`
- Build command: `npm ci`
- Start command: `node index.js`





Preparing the Project for Deployment

- Configure CORS and HTTP requests correctly
  - The server must allow requests from https://test-*yournick*-static.onrender.com
  - The client must send API requests to https://test-*yournick*-api.onrender.com
- Make sure that the serve runs on the correct port
  - The render.com system requires the server to listen on localhost, port 10000
  - The port will be exposed to the public internet via a reverse-proxy server mechanism, that will also provide the TLS certificate for HTTPS
- Configure the use of the secure option in cookies
  - Modify the express-session configuration

Environment Variables

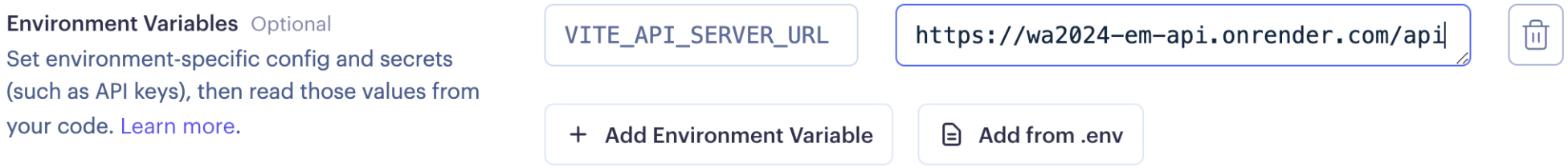
- In production environments, many configuration parameters are made available as environment variables
  - Accessible by the "`process.env`" Javascript special variable
  - **Very convenient to change configuration without changing files!**
    - Also, without having to commit/push such files to the git repository!
  - In render.com such values can be set/changed externally, using the dashboard
- Note: a manual re-deployment may be needed for changes to environment variables to take effect

Client Config

- For the client build with Vite, use
  - "`import.meta.env`" JS variable
  - Every variable name **must start** with **`VITE_`**...
  - This is to avoid accidentally exposing other environment variables

```
// API.js file
//const URL = 'http://localhost:3001/api';
const URL = import.meta.env.VITE_API_SERVER_URL;
```

Value to be set after starting the "Web Service" from the Dashboard



Server Config

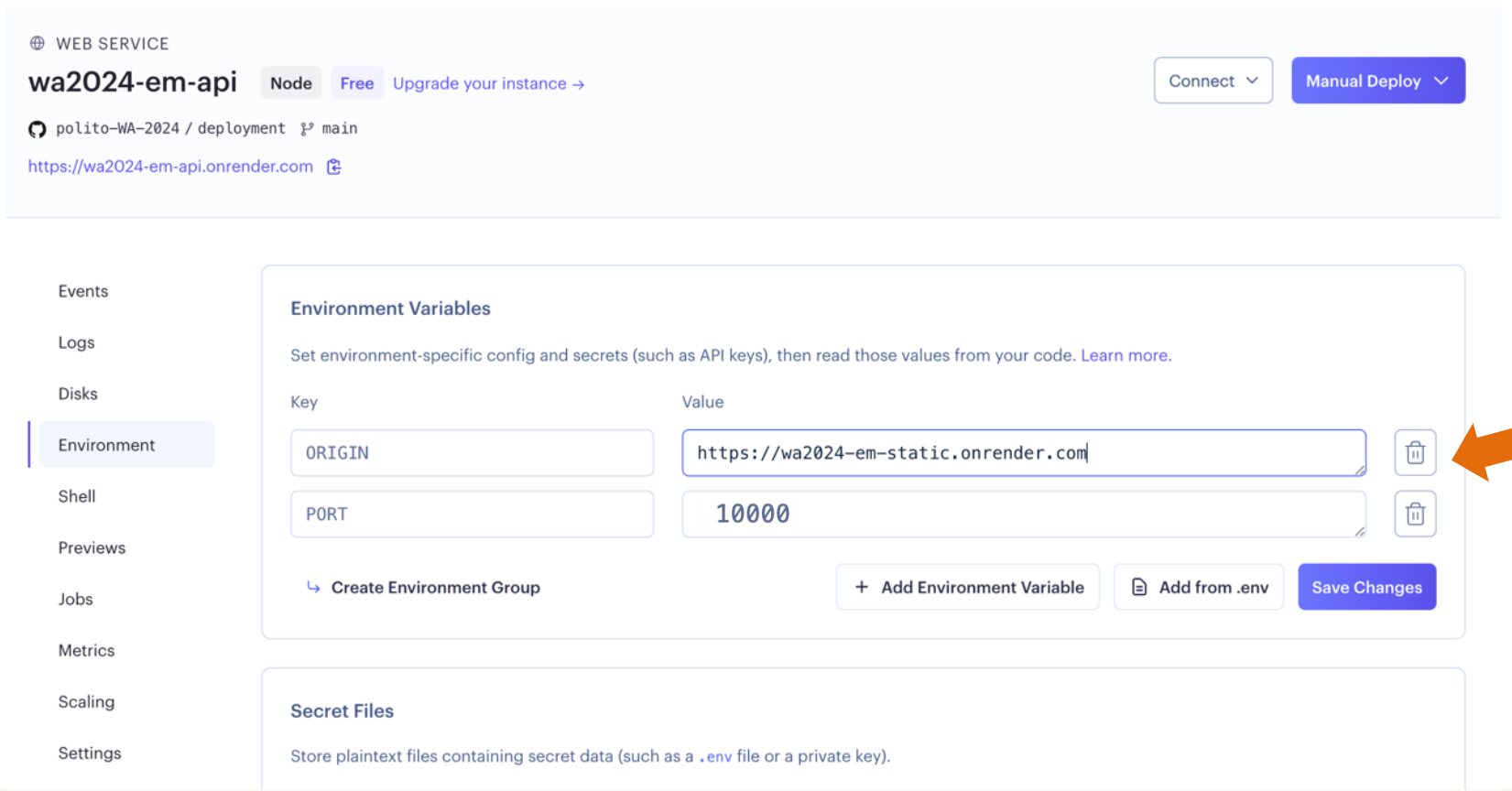
- Use two environment runtime variables, PORT and ORIGIN

```
const app = express();
//const port = 3001;
const port = process.env.PORT || 3001;

const corsOptions = {
  //origin: 'http://localhost:5173',
  origin: process.env.ORIGIN || 'http://localhost:5173',
  credentials: true,
};
```

Server Config

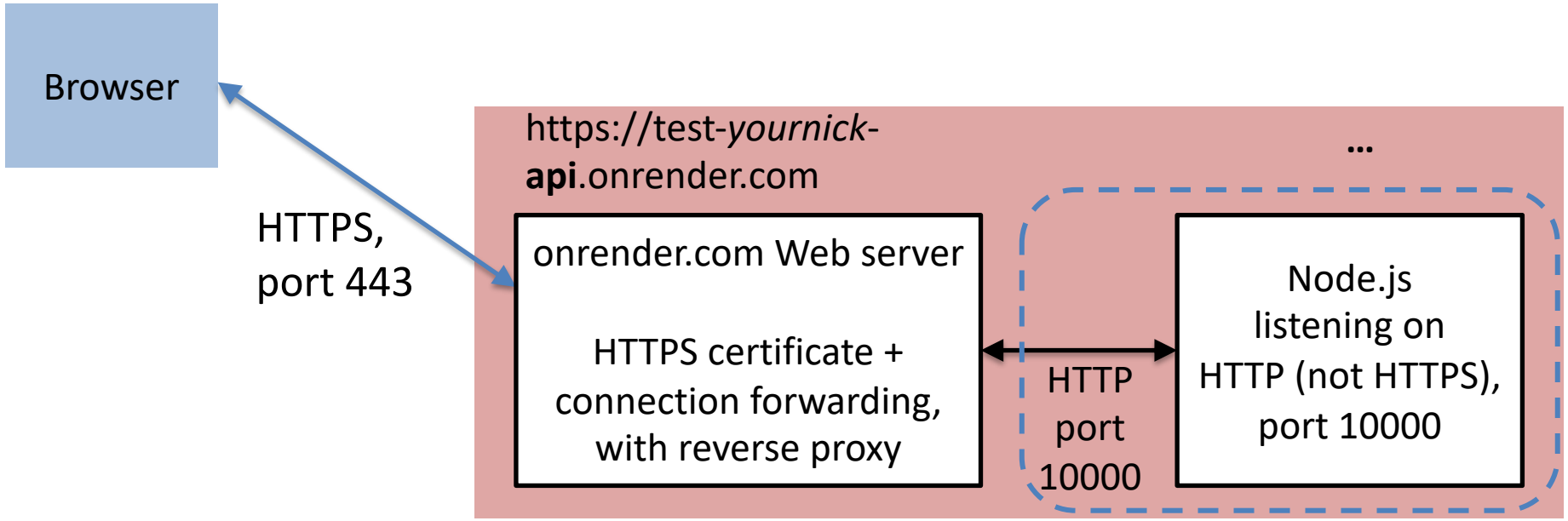
- Set the environment variables depending on the public URL of “Static Site”



Value to be set by looking at the “Static Site” URL from the Dashboard

Server Config: HTTPS management

- Node.js must be informed that it is sending a secure cookie on an insecure connection because it is behind a reverse proxy that will handle the HTTPS
  - Otherwise, it will silently refuse to do it



Fully isolated from other deployments in render.com

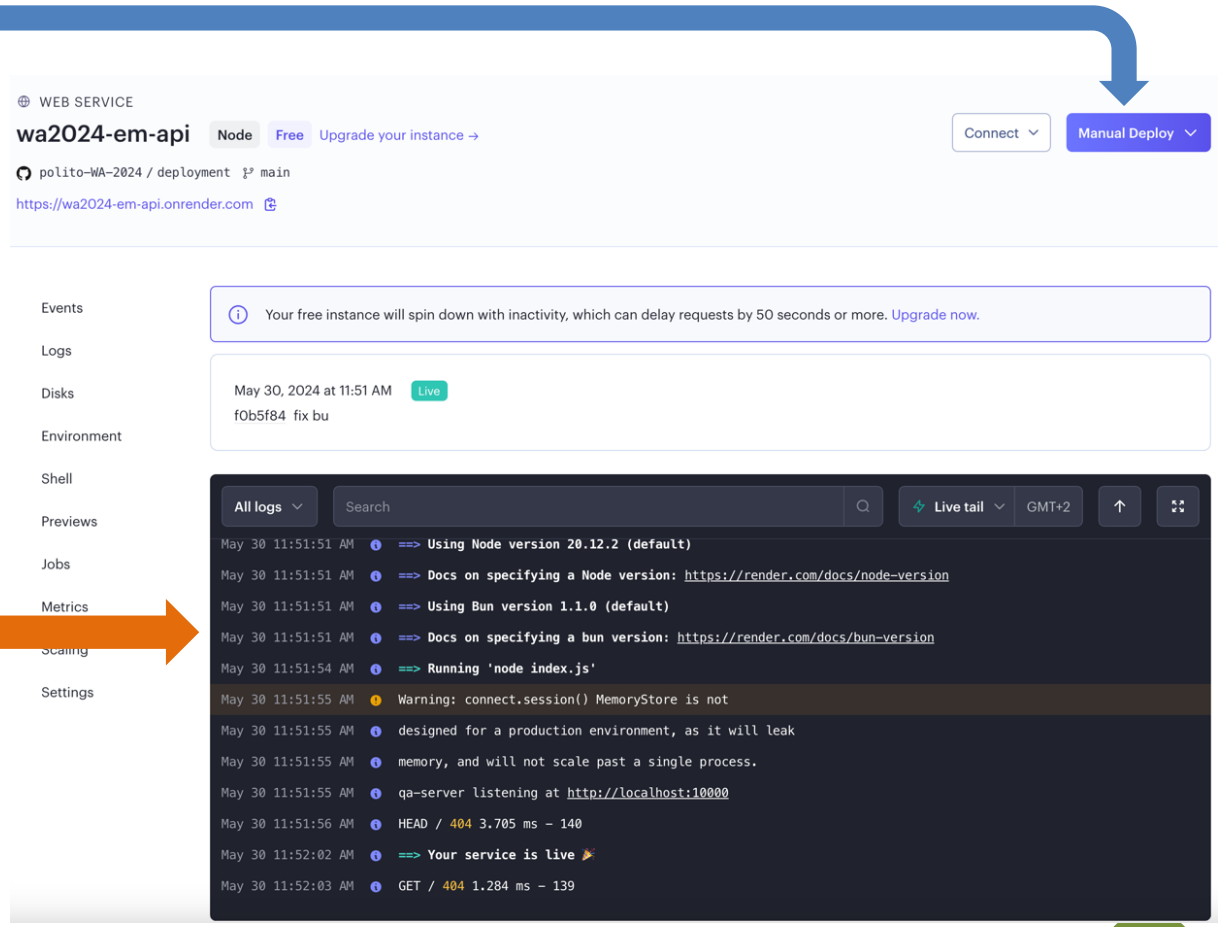
Server Config: HTTPS & Proxy Configuration

- Check if node is running in production mode
- Use the built-in NODE_ENV variable (already set by render.com)

```
if (process.env.NODE_ENV === 'production')
  app.set('trust proxy', 1);  // To work behind reverse-proxy
  // NB: Without this setting, “secure” cookies will not work
…
app.use(session({
  secret: '……', // this could also be an env variable if desired
  resave: false, saveUninitialized: false,
  cookie: { httpOnly: true,
    secure: (process.env.NODE_ENV==='production’? true : false) },
}));
```

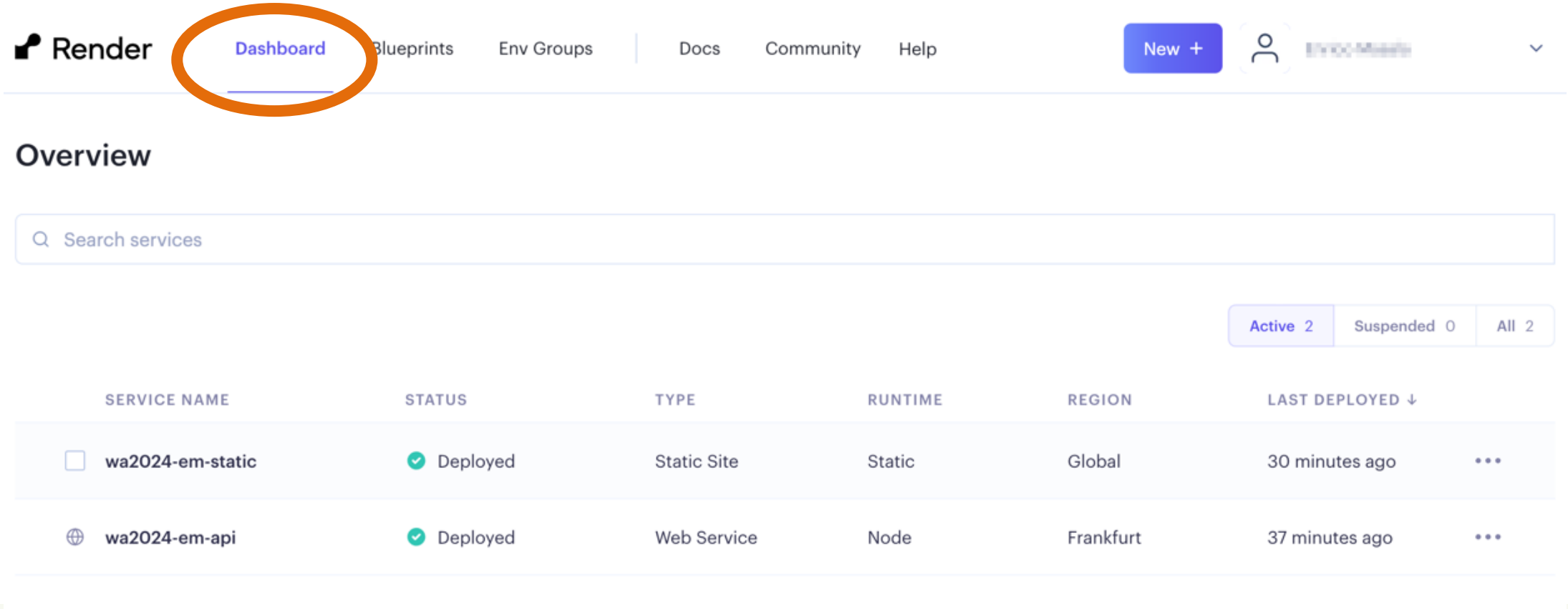
Actual Deployment

- From the dashboard, deploy both the “Static Site” and the “Web Service”
  - The first time you configure the service, deployment is automatically started
- You can check the result and errors by looking at the console which is integrated into the page



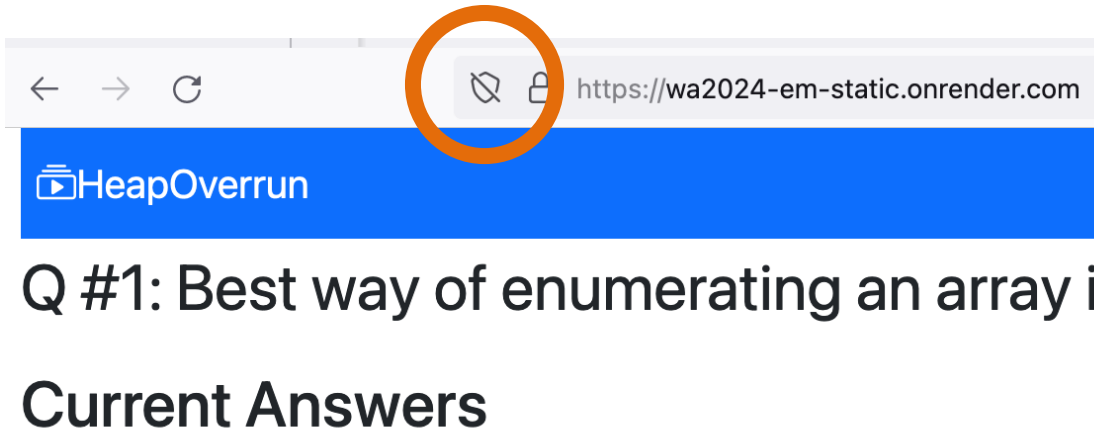
Active Services

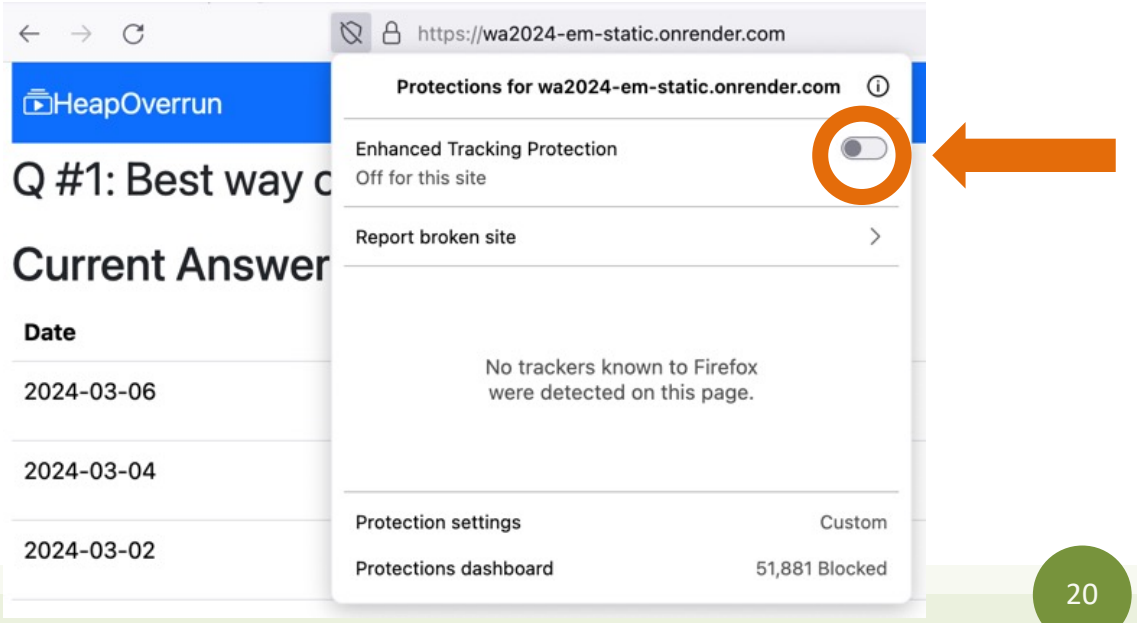
- Also look at the dashboard to check the status of your services



Test the App!

- Open a browser, go to https://test-*yournick*-static.onrender.com and test!
- **IMPORTANT: DISABLE** browser cross-site "Tracking Protection", e.g. in Firefox, click on the Shield Icon on the left side of the URL box
  - This is needed because you are using a public, shared domain name (onrender.com)





Beware: Notes

- In the free “Web Service”, files will be often deleted, after few minutes of inactivity (in particular, the sqlite3 file)
  - This limitation can only be removed by subscribing to non-free tiers
  - In any case, useful to test “toy” examples and become familiar with the system before paying for one
- Browsers are extremely careful when sharing information on domains where anybody can register subdomains for free (e.g., onrender.com)
  - Registering your own domain name is possible but not free
  - Remember: in this case you need to handle/provide your own HTTPS certificate

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