PROJECT-2

(Deploy a Static Website on AWS)

Note

The static website can be a traditional multi-page site or a Single Page Application (SPA). SPAs load a single HTML page and dynamically update content as users interact with the app. To determine if an SPA suits your needs, consider factors like user experience, performance requirements, and development complexity.

Topics Covered in This Guide

Create a NextJS static website

Deploy the website using AWS console, then destroy it

Redeploy the website using AWS CDK and then destroy it

Create a NextJs Webpage

First, lets create a NextJS project. Open a terminal and type:

```
mkdir frontend & cd frontend
npx create-next-app@latest
```

then you will be presented with several options, choose the options as you see in the page here:

```
Need to install the following packages:
create-next-app@14.2.5
Ok to proceed? (y) y

✓ What is your project named? … test-frontend
✓ Would you like to use TypeScript? … No / Yes
✓ Would you like to use ESLint? … No / Yes
✓ Would you like to use Tailwind CSS? … No / Yes
✓ Would you like to use `src/` directory? … No / Yes
✓ Would you like to use App Router? (recommended) … No / Yes
✓ Would you like to customize the default import alias (@/*)? … No / Yes
Creating a new Next.js app in /Users/~/tmp_frontend/test-frontend.
```

open the project in and editor or directly open the `next.config.mjs` file and set the output value to export, and set the distDir to dist:

```
/** @type {import('next').NextConfig} */
const nextConfig = {
  output: "export",
  distDir: "dist",
}

export default nextConfig
```

then open the terminal and go into the directory where NextJs code resides. Then run

```
npm run build
```

you should see the following text after building:

```
▲ Next.js 14.2.5

  Creating an optimized production build ...
✓ Compiled successfully
✓ Linting and checking validity of types
✓ Collecting page data
✓ Generating static pages (5/5)
✓ Collecting build traces
✓ Finalizing page optimization

Route (app)                                 Size     First Load JS
┌ ○ /                                       5.25 kB        92.4 kB
└ ○ /_not-found                             871 B            88 kB
+ First Load JS shared by all               87.1 kB
  ├ chunks/23-bc0704c1190bca24.js           31.6 kB
  ├ chunks/fd9d1056-2821b0f0cabcd8bd.js     53.6 kB
  └ other shared chunks (total)             1.86 kB


○  (Static)  pre-rendered as static content
```

this will generate a static version of the pages, you can actually do a quick text and run a webserver locally and server these files using **live-server**.

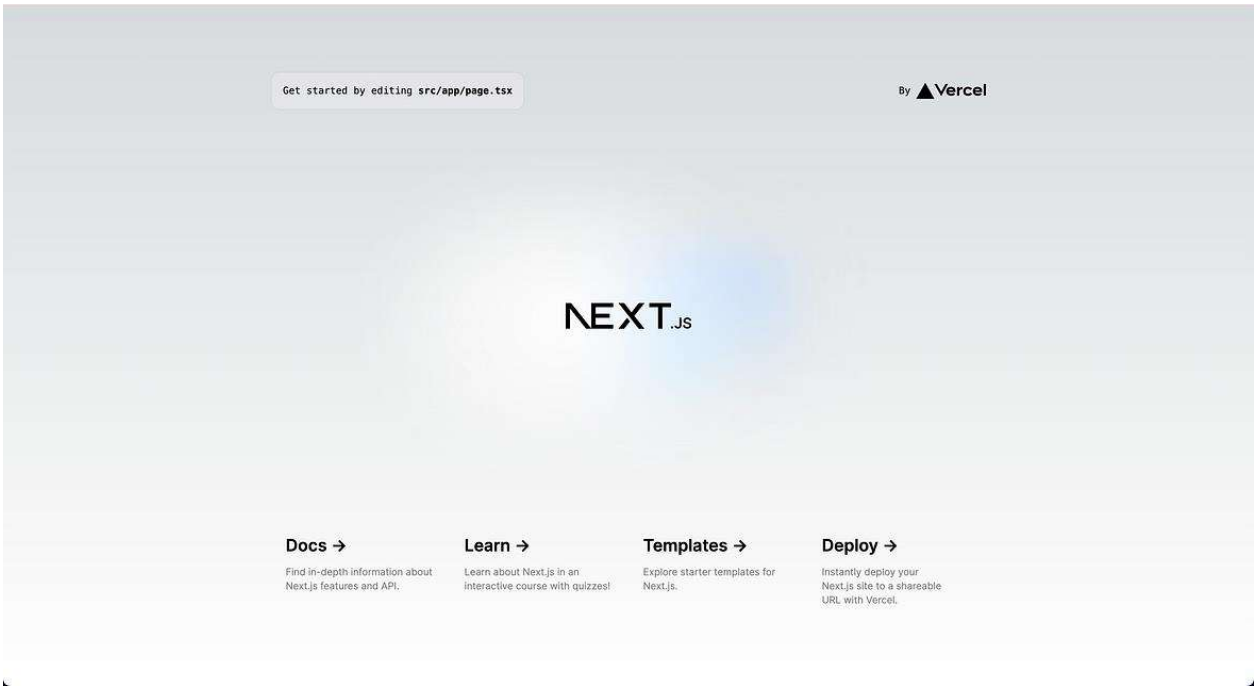
Note

If you don't have live-server install the package globally via ***`npm i live-server -g`***

Traverse inside the dist folder and run `live-server`.

```
cd dist
live-server .
```

if browser doesn't open up automatically, open a browser and go to http://127.0.0.1:8080/, then test the website make sure it runs. You should see this page in your browser:



Important

Although a basic HTML, CSS, and JavaScript website would have worked, we chose NextJs for their efficiency. Despite seeming more complex for this example, this approach actually simplified

development, reduced setup time, and offered advantages like automated builds, typechecking and etc.

Deploying Website using AWS Console

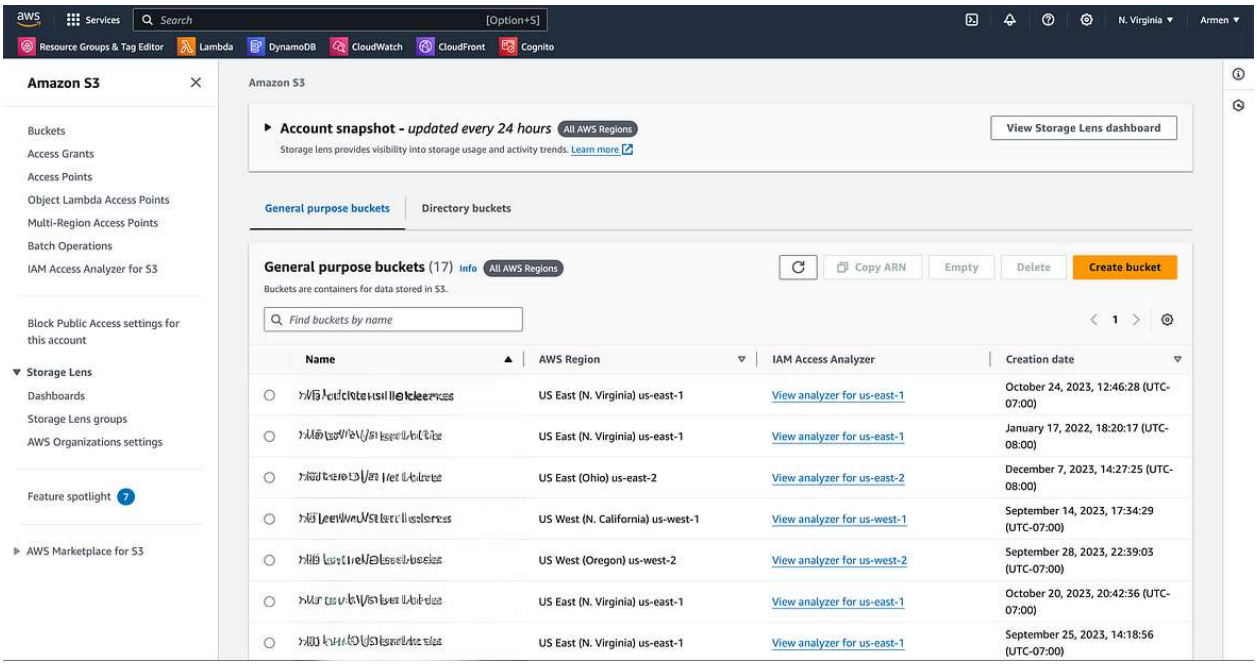
This section covers deploying the website using the AWS Console. While not the recommended method, it's might be useful for understanding core concepts. Also this method doesn't require you to know any coding knowledge.

Prerequisites

An AWS account

Configure the S3 bucket

Open a browser and go to the AWS console, and login.



Navigate to the Amazon S3 Service.

Click on the **Create New Bucket** option.

In the Create Bucket page, under General configuration, select **General purpose** from the bucket options.

Name your bucket something that you will remember, I have named it *“temp-console-website”*, you could name it the same things to make following steps easier.

In the **Object Ownership** section, select ACLs disabled.

In the **Block Public Access settings for this bucket** section, uncheck the **Block all pubic access**, and make sure all the other four checkboxes have been unchecked as well. You will notice a yellow alert box popping up with the following message: *Turning off block all*

public access might result in this bucket and the objects within becoming public

Select or check the **I acknowledge that the current settings might result in this bucket and the objects within becoming public** box.

In the **Bucket Versioning** select Disable versioning.

everything else should be set to default, select **Create bucket**

This is an optional step, but to make things simple for us at the end where we need to destroy all resource, add a tag. Scroll down to the **Tags** section and add a tag by click on edit, and adding a new tag with the key value of *temp-project*.

Note

The name is crucial to remember, as we'll use it again when specifying the bucket Resource value in the next section. This ensures correct resource linking in later steps.

Upload the files to S3

Select the newly created bucket from the bucket list page. If you set the name to be *“temp-console-website”* then that will show up in the list.

Click on the **Upload** button

Select **add files**, then select all the files in the *dist* folder from the NextJs folder, and then click the **Upload** button to upload all the files.

a progress bar will be displayed showing the upload progression. Once upload to the next step.

Go to the **Properties** tab, then scroll down to the **Static website hosting** section and click Edit.

Under the **Static website hosting** section select *Enable*.

For the **Hosting type** select *Host a static website*

There is an input field under **Index document**, enter `index.html` in that field.

enter `error.html` for the **Error document** but this is optional.

Click **Save changes**

Go into the **Permissions** tab

Scroll down until you see the **Bucket Policy** section. Click on the **Edit** button, then paste the following policy in there

```
{
  "Version": "2012-10-17",
  "Statement": [
    {
      "Effect": "Allow",
      "Principal": "*",
      "Action": "s3:GetObject",
      "Resource": "arn:aws:s3:::temp-console-website/*"
    }
  ]
}
```

12. Click **Save changes**

Critical

the "temp-console-website" is the name I chose, if you have chosen a different name, then replace this value in the JSON object.

We've completed the S3 configuration. To view the website directly from S3, go to the **Properties** tab and scroll to **Static website hosting**. At the bottom, you'll find a URL under "Bucket website endpoint". The URL should look similar to this:

http://temp-console-website.s3-website-us-east-1.amazonaws.com

you should see the same NextJs page we saw when we ran locally.

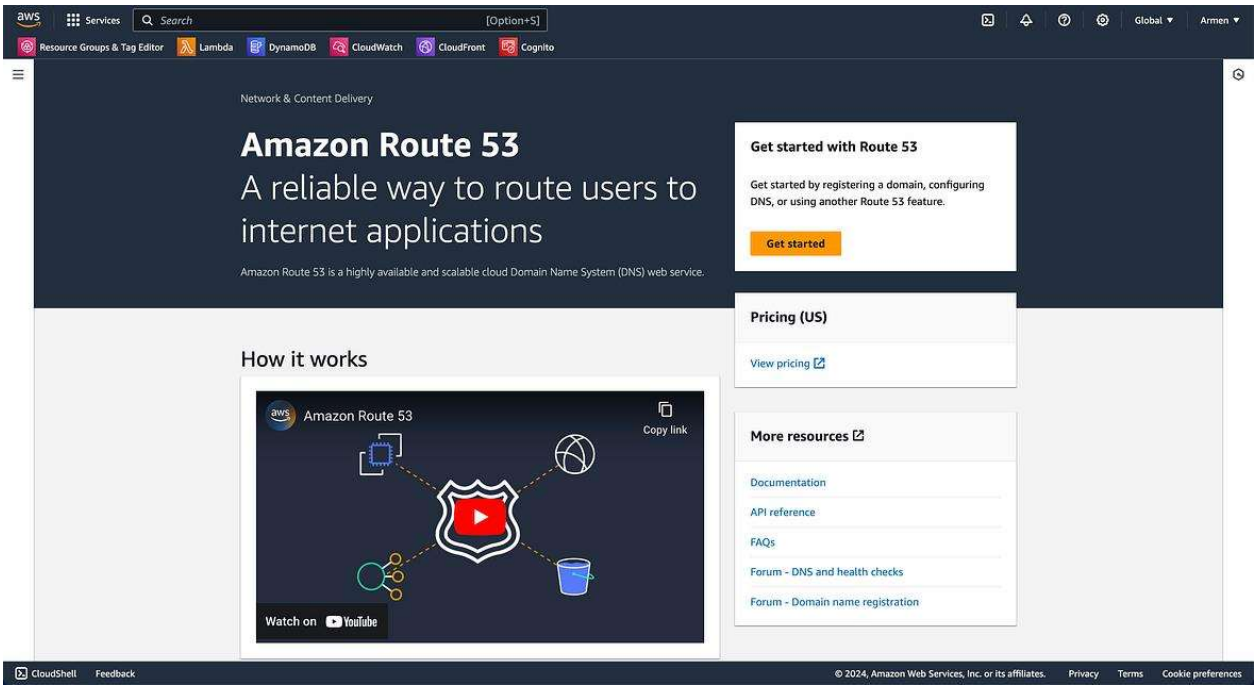
Configuring DNS

In this section we will configure to point a domain name to this CloudFront distribution or our website. If you already have a domain you purchased from a third party domain provider like GoDaddy, Namecheap, Google domain etc you have to login and change some of the settings.

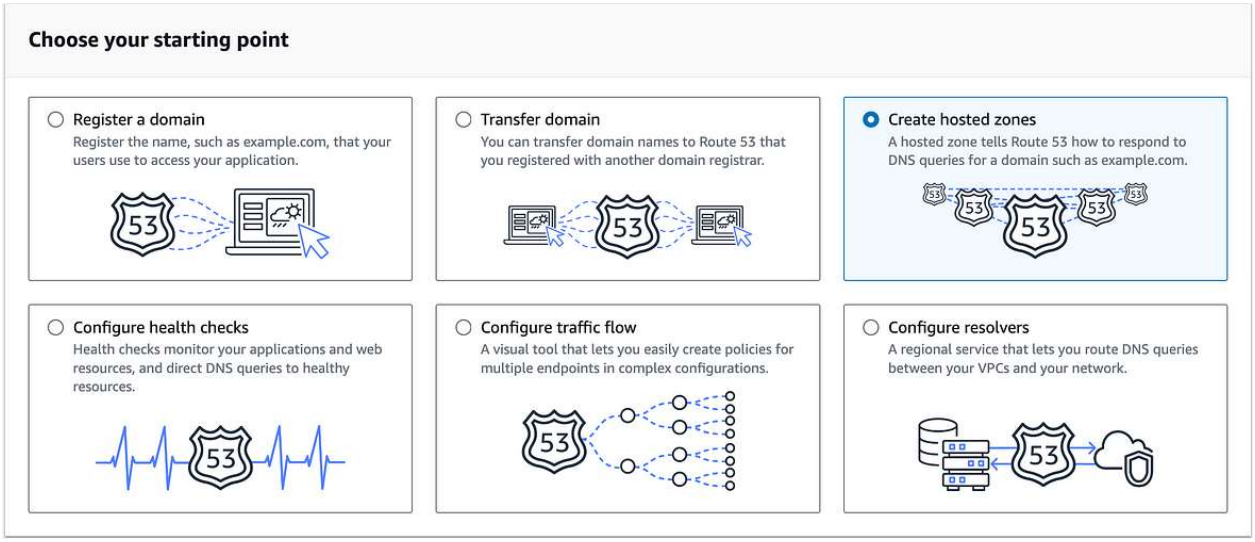
We will be moving back and forth between DNS, CloudFront and Certificate Manager in order to get this configured

First lets add the domain to AWS Route 53. Route 53 is a DNS service provided by Amazon. Lets add our domain. For this example I have a test domain named `redrobotexample.com`. This is a domain I use to try and test different applications.

Go to the Route 53 page:

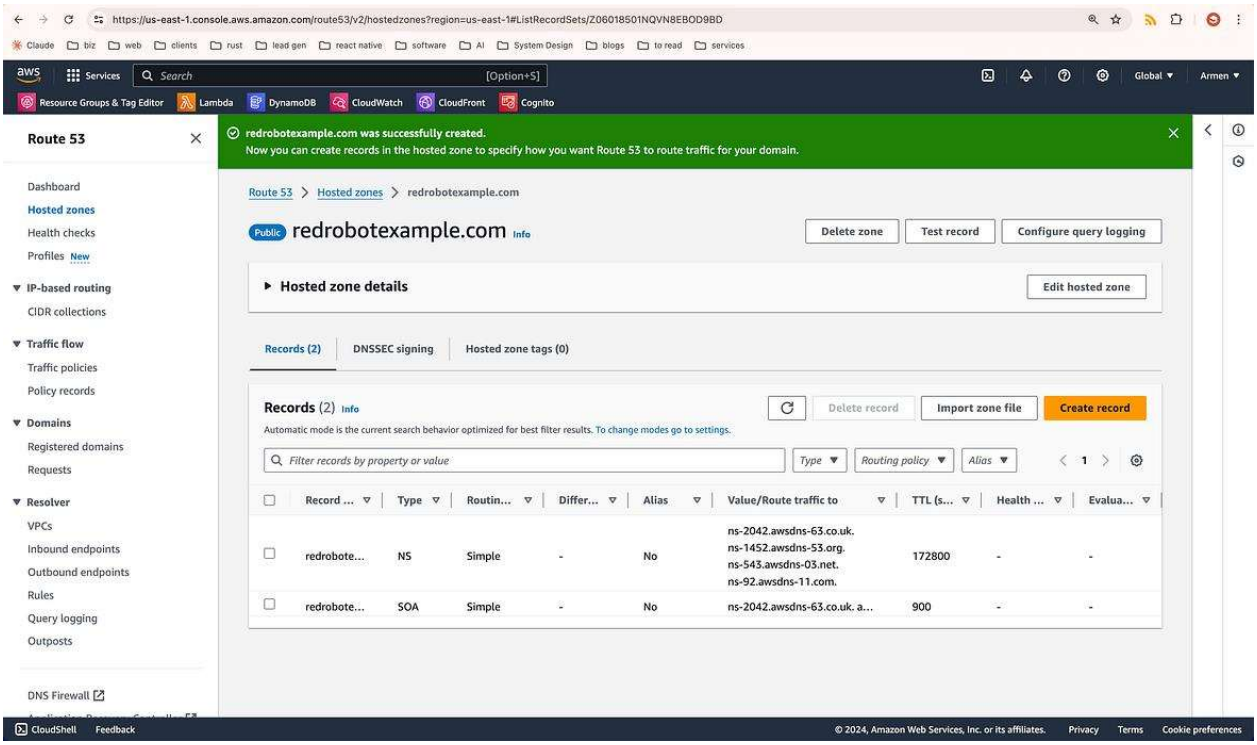


Click on the **Get started** button, and you will be presented with the following view:



Select the **Create hosted zones** option and click **Get started**

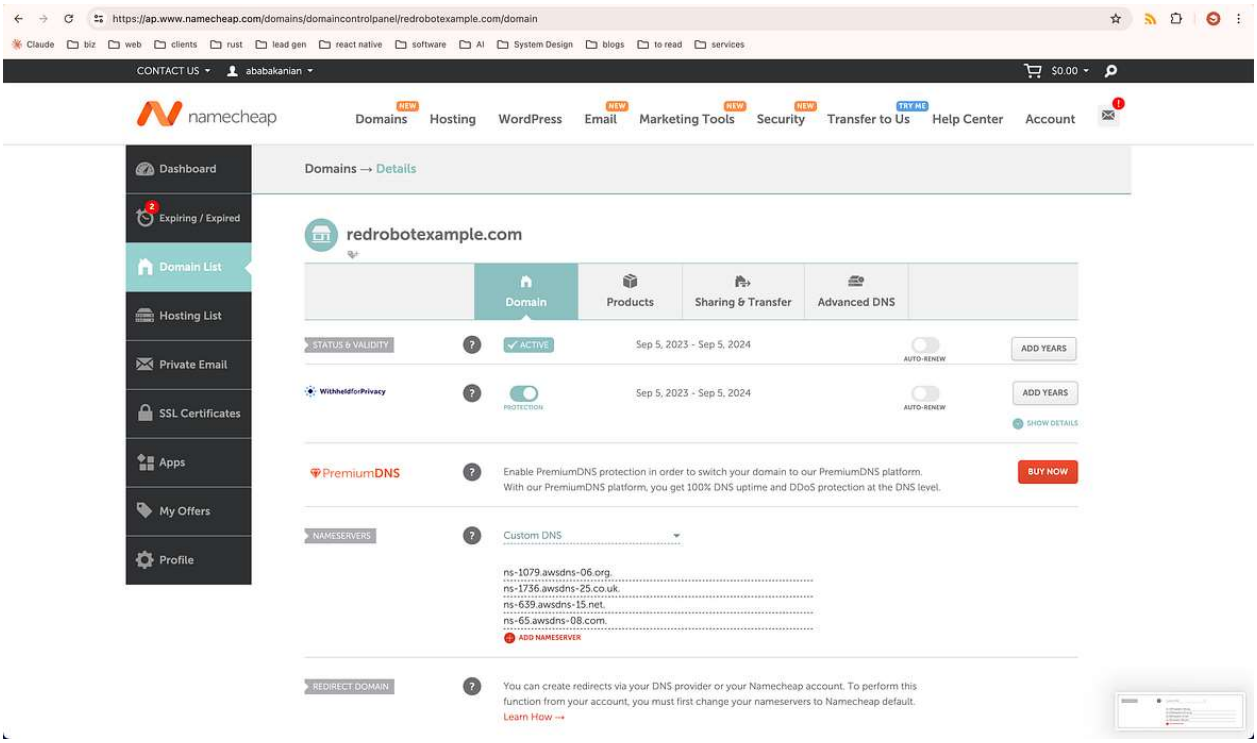
In the Domain name field enter your domain name, ie `redrobotexample.com`, and then click **Create hosted zone**. Once done you will be presented with this page:



4. Expand the **Hosted zone details** area by clicking on the triangle next to it. you will be presented with a few details. From that list, you need to copy the **Name servers** value and paste them in your 3rd party domain provider DNS provider. In your 3rd party domain provider, find where you can define custom dns servers and paste the values, which should look like this:

```
ns-2042.awsdns-63.co.uk
ns-1452.awsdns-53.org
ns-543.awsdns-03.net
ns-92.awsdns-11.com
```

For example, in namecheap this is the section where you define custom DNS values:



5. Scroll down to the **Tags** section and add a tag and select the *temp-project* value.

Creating a Certificates

Open a new tab or browser windows, and go to the AWS Certificate Manager or (ACM)

Click on **Request certificate**,

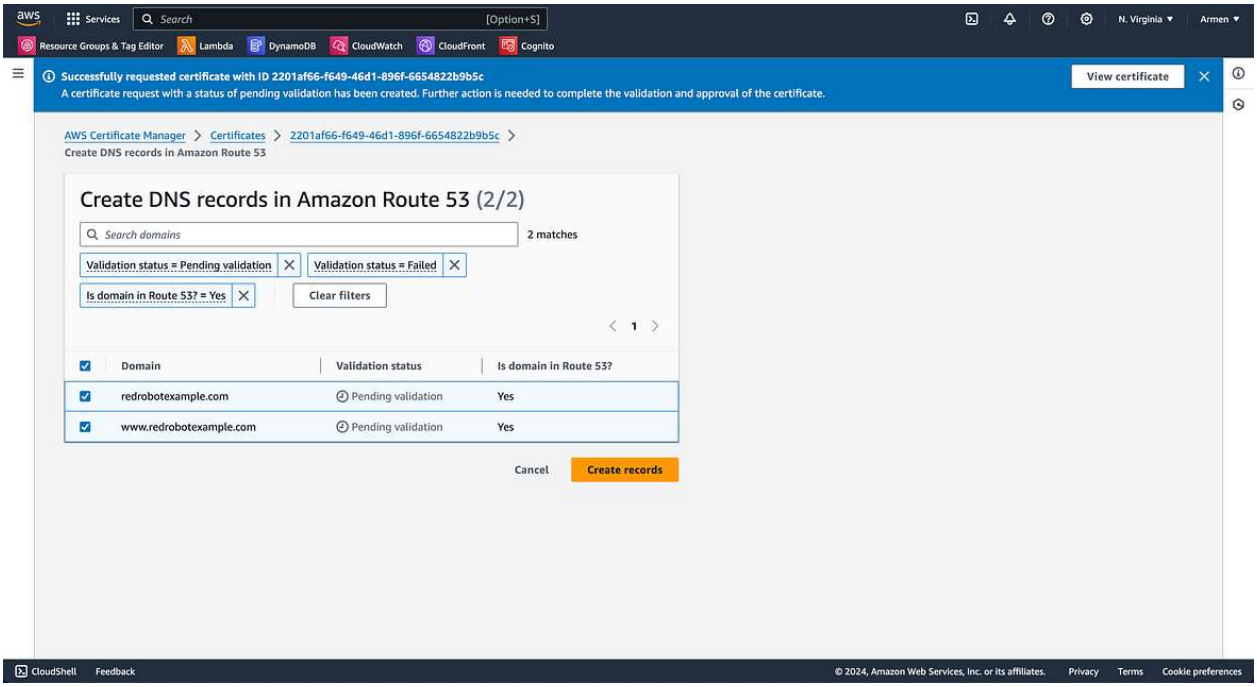
In the next page select **Request a public certificate**

In the next page, for the **Fully qualified domain name** enter your domain name, ie `redrobotexample.com` in our example,

In the same section click on **add another name** for the certificate and enter the same domain but add the the `www` subdomain to it. So for our example it would be `www.redrobotexample.com` then click **Request**

In the next page, scroll down to where it says **Domains**, you will notice two CNAME values are presented — these need to be added ro your DNS entry so AWS certificate Manager can verify that the domain belongs to us. S we need to add those to the Route 53 entries and we can do that by clicking on the **Create records in Route 53** in that same view (you can do this manually but AWS made things simple for us)

In the next page, since we have been using the same domain name for our DNS values, AWS will filter the right DNS entries for us to select.



Click the **Create Records in Route53**

8. In the other tab, that has the Route 53 page open, verify the two new Route53 entries have been added to the record list

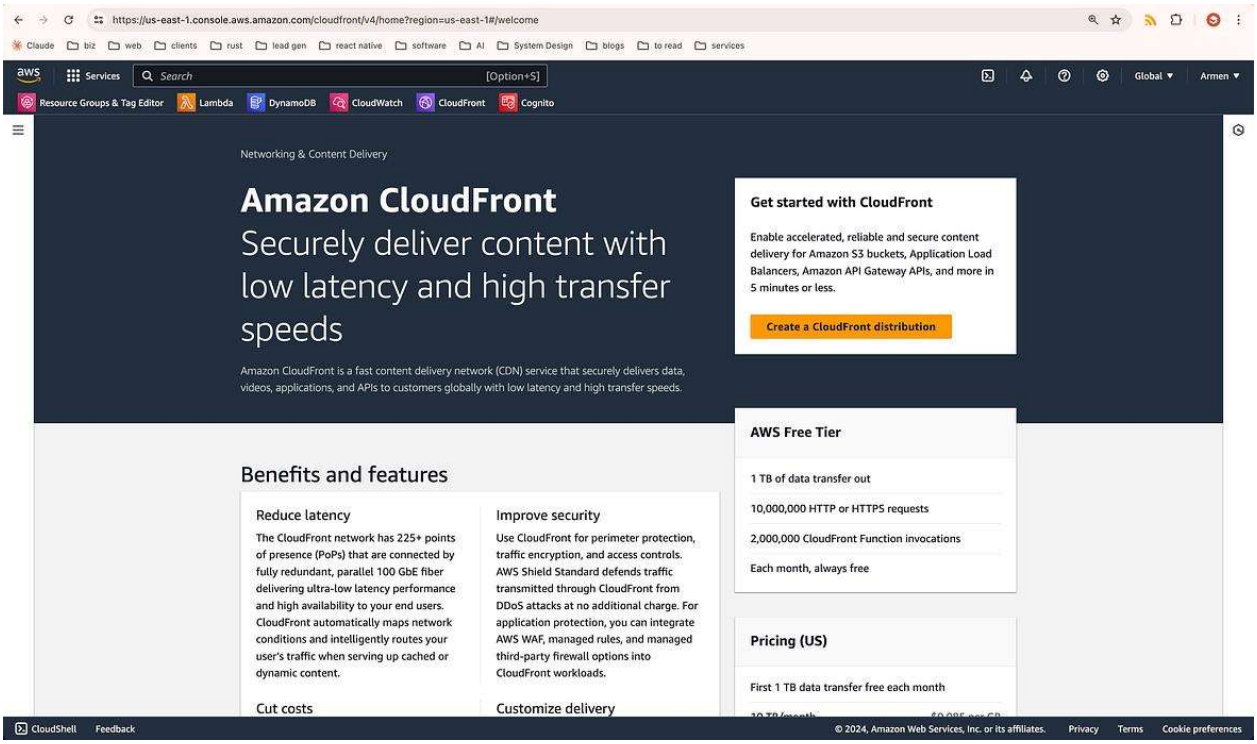
9. After this, we need to wait for the status of this certificate to change from “pending validation” to validated. In the Certificate Manager page, check the value of **Status**. Once the status changes to “Issued” move to the next step.

10. Scroll down to the **Tags** section and add a tag by click on edit, and adding a new tag with the key value of *temp-project*.

Configuring CloudFront

We have defined our DNS records and created our certificates, we would like to update the page so it points to a domain instead of the S3 generated URL. For that we need to setup a AWS CloudFront entry. CloudFront is a CDN service provided by AWS.

Go to the AWS CloudFront page



Then click on the **Create a CloudFront Distribution**, the **Create distribution** page will show up

In the **Origin domain** field or dropdown, click on the field and the dropdown list will appear. From that list select the S3 entry we created in the last part. If you picked the same name from this guide, it should look something like this: temp-console-website.s3.us-east-1.amazonaws.com

A pop should be displayed that says “This S3 bucket has static web hosting enabled. If you plan to use this distribution as a website, we recommend using the S3 website endpoint rather than the bucket endpoint.” Click on the **Use website endpoint** button to do this.

In the Web Application Firewall (WAF) section, select *Do not enable security protections*

Do not change any of the other configurations, we will come back here to update the config once we define our domain and certificates but for now, go ahead and click **Create distribution**.

Once distribution is done, you can copy the URL value under **Distribution domain name** and paste it in the browser. the value

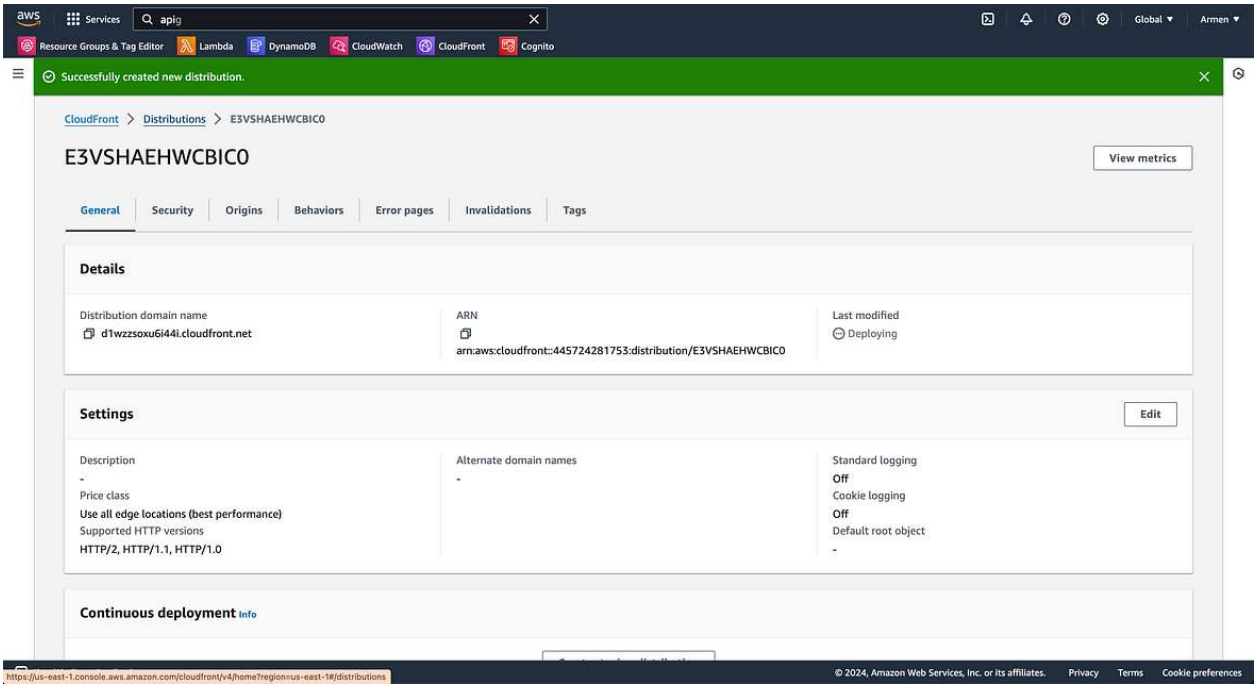
should look like something like this `d1wzzsoxu6i44i.cloudfront.net` You should see the same page now as before

In the **Custom SSL certificate — optional** field, select the certificate we just created.

In the Alternative Domain names, add your domain name with and without the www subdomain, so essentially we are adding two values. In this example it would be: redrobotexample.com, www.redrobotexample.com

Scroll down to the **Tags** section and add a tag by click on edit, and adding a new tag with the key value of *temp-project*.

click on **Create records**



Note

It might be easier to open a secondary tab, and go to the CloudFront page and check the name to make sure the value is the correct one.

Updating DNS

The last step is to update our DNS to point to the CloudFront CDN. With the certificates and CDN in place, we can add a record in our Route53 to our CloudFront dist.

In the same Route 53 page, under the Records section click on **Create record**.

For the **Record Type** select *A — Route TRaffic to an IPv4 address*

Enable the *Alias* toggle

For the **Route traffic to** select the *Alias to CloudFront Distribution* and then on the bottom selector, select the CloudFront distribution we created in the last step.

you can do the same once more but add the www subdomain as well.

We are done with out configuration, If you followed the steps exactly as described you should be able to go to your domain, (in our case redrobotexample.com) and view your website.

Destroying all resources

As you can see, the steps involved to get this up and running are tedious, and error prone and most importantly not repeatable. You will also notice that destroying these resources suffer from the same problem as we have to manually go to each service and destroy individual services.

Before doing thing using IaC, lets delete/destroy all the created resources.

Go to the **Resource groups** page

Click **Create resource group**

Select the **Tag based**

Under the **Grouping criteria** enter *temp-project* in the tag field

Click **Create group**

Then after creation, select the group

On the group's detail you will see each resource listed. The order of the resource might be different for you, so lets go over each resource by type and describe how to completely destroy them — the order which you need to destroy resource is important since we have created dependencies between resources.

Open the Route 53 resource on a new tab or window.

Check the 3 Record that have the record Type A and the two CNAME's. **DO NOT DELETE** the NS and SOA records.

close the tab, now open the CloudFront resource in a new tab

Remember the distribution name, and go into the Distribution list view and select that item and click **Disable**

Once Disabled, then click **Delete**

Close the tab, now open the S3 resource

Select all files from the list and click **Delete**

A new page is presented, which will ask for your confirmation, enter the text *permanently delete* in the bottom text box then click **Delete objects**

Once deleted, click on the **Buckets** item to view the list of Buckets

Select the bucket (should be named temp-console-website) and click **Delete**

A similar confirmation page is shown, enter the bucket name in the text field to confirm bucket deletion and click **Delete bucket**

Close the tab, now open the certificate manager view

Click on the **Delete**. In the confirmation pop-up enter delete and then Delete again.

close the tab, verify that all resource have been deleted from the resource group view

If no other resource is left continue to the next section.

At the end of the next section you will see that destroying resources is a single command.

Using AWS CDK

By leveraging IaC, you can automate and replicate all the setup and configuration work typically done through the console. This approach significantly speeds up your website deployment process. It allows you to maintain both your website structure and content in code, enabling

quick redeployment when you need to add a blog post or change content.

A key advantage of this method is its elimination of the need for a database to store and retrieve website content, or a server to render it. Instead, your entire site can be managed and updated directly through code. This approach simplifies maintenance, reduces costs, and improves scalability and performance and you can use a code subversion system like git to track all changes including the content.

Lets automate all of the steps we took using AWS CDK, which is an IaC or Infrastructure as code framework. All the steps we performed manually it can be automated and also we can add logic as well so based on some condition, ie if it's a production deployment we can add a few other steps vs if it's a test deployment we can skip a few other steps.

Prerequisites

An AWS account

Node.js and npm installed

AWS cli and cdk setup and configured

Basic knowledge in Javascript and Typescript

Setup, Code and Deploy

Initialize a new CDK project:

```
mkdir temp-project && cd temp-project
mkdir infrastructure && cd infrastructure
cdk init app --language typescript
```

in addition, move the frontend folder we created from the first section of the guide into `temp-project` folder.

2. Replace the content of the file `lib/infrastructure-stack.ts` with:

```
import * as cdk from "aws-cdk-lib"
import { Construct } from "constructs"
import * as route53 from "aws-cdk-lib/aws-route53"
import * as acm from "aws-cdk-lib/aws-certificatemanager"
import * as s3 from "aws-cdk-lib/aws-s3"
import * as s3deploy from "aws-cdk-lib/aws-s3-deployment"
import * as cloudfront from "aws-cdk-lib/aws-cloudfront"
import * as route53Targets from "aws-cdk-lib/aws-route53-targets"

export class InfrastrucureStack extends cdk.Stack {
  constructor(scope: Construct, id: string, props?: cdk.StackProps) {
    super(scope, id, props)
    const domain = "redrobotexample.com"
    const subdomain = `www.${domain}`

   // fetch route53 zone
    const zone = route53.HostedZone.fromLookup(this, "zone", {
      domainName: domain,
    })
```

```
    // this will create a certificate
     const certificate = new acm.Certificate(this, "certificate", {
       domainName: domain,
       subjectAlternativeNames: [domain, subdomain],
       validation: acm.CertificateValidation.fromDns(zone),
     })

    // viewer certificate
     const viewerCertificate =
cloudfront.ViewerCertificate.fromAcmCertificate(
       certificate,
       {
         aliases: [domain, subdomain],
       }
     )

    // bucket where website dist will reside
     const bucket = new s3.Bucket(this, "WebsiteBucket", {
       websiteIndexDocument: "index.html",
       websiteErrorDocument: "404.html",
       publicReadAccess: true,
       blockPublicAccess: {
         blockPublicAcls: false,
         blockPublicPolicy: false,
         ignorePublicAcls: false,
         restrictPublicBuckets: false,
       },
       removalPolicy: cdk.RemovalPolicy.DESTROY,
       autoDeleteObjects: true,
     })

    const distro = new cloudfront.CloudFrontWebDistribution(
       this,
       "WebsiteCloudfrontDist",
       {
         viewerCertificate,
         originConfigs: [
           {
             s3OriginSource: {
               s3BucketSource: bucket,
             },
             behaviors: [
               {
                 isDefaultBehavior: true,
               },
```

```
            ],
          },
        ],
      }
    )

    // s3 construct to deploy the website dist content
     new s3deploy.BucketDeployment(this, "WebsiteDeploy", {
       destinationBucket: bucket,
       sources: [s3deploy.Source.asset("../frontend/dist")],
       distribution: distro,
       distributionPaths: ["/*"],
       memoryLimit: 512,
     })

    new route53.ARecord(this, "route53Domain", {
       zone,
       recordName: domain,
       target: route53.RecordTarget.fromAlias(
         new route53Targets.CloudFrontTarget(distro)
       ),
     })

    new route53.ARecord(this, "route53FullUrl", {
       zone,
       recordName: "www",
       target: route53.RecordTarget.fromAlias(
         new route53Targets.CloudFrontTarget(distro)
       ),
     })
  }
}
```