AWS re:Invent

NOV. 29 – DEC. 3, 2021 | LAS VEGAS, NV

DEV201-L

Abstractions: Creating the best developer experience

Ken Exner (he/him)
Director, AWS Dev Tools
Amazon Web Services

Emily Freeman (she/her)
Head of Community Engagement
Amazon Web Services

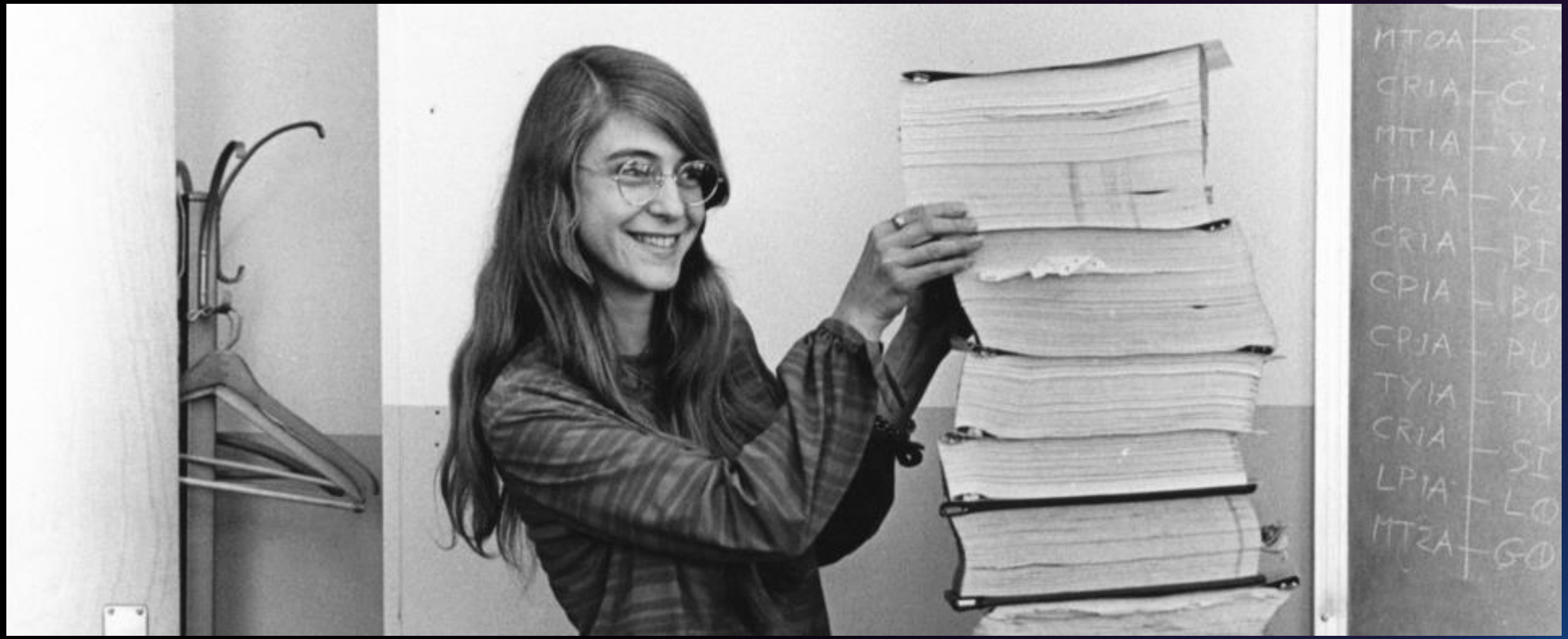
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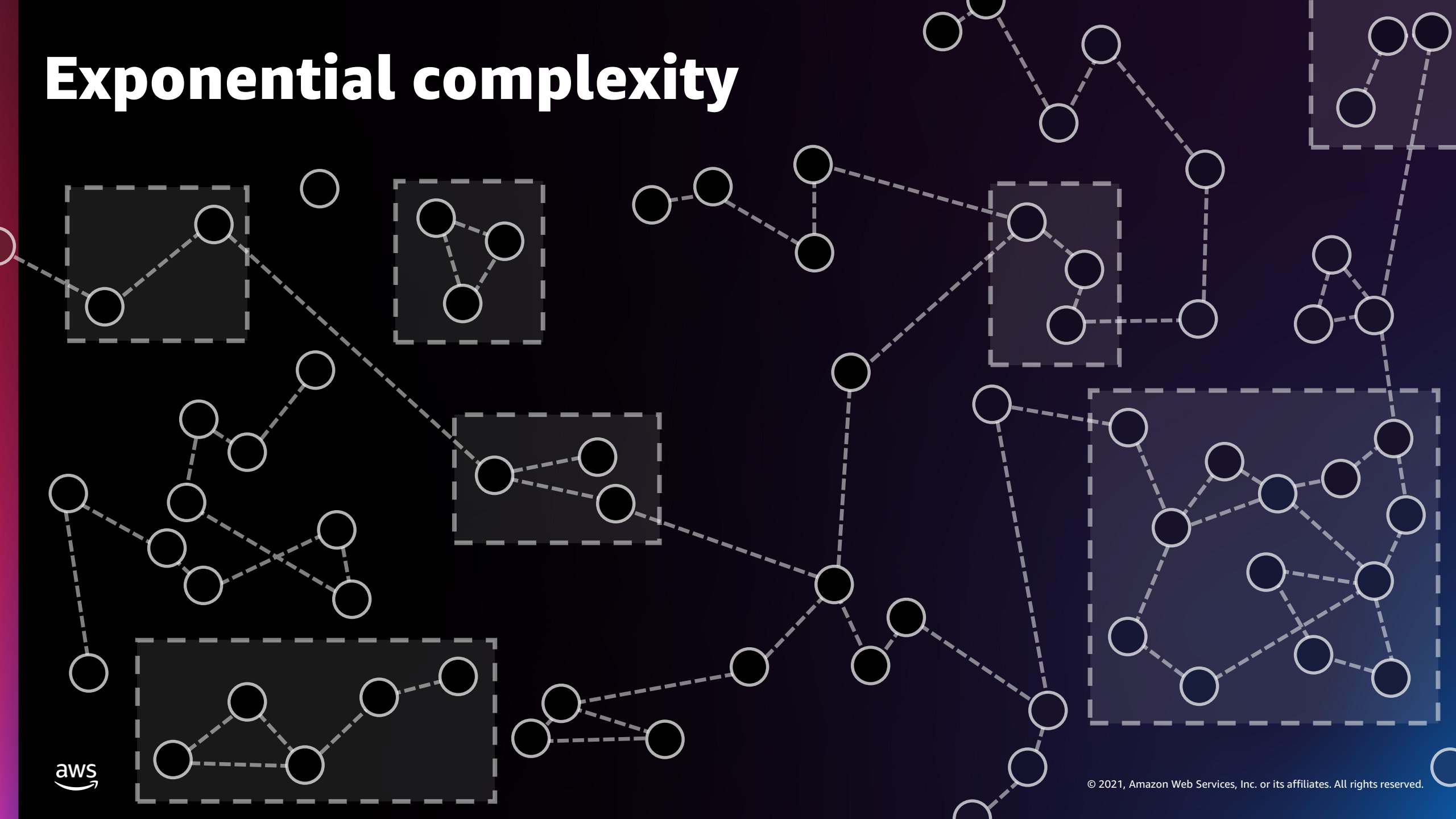
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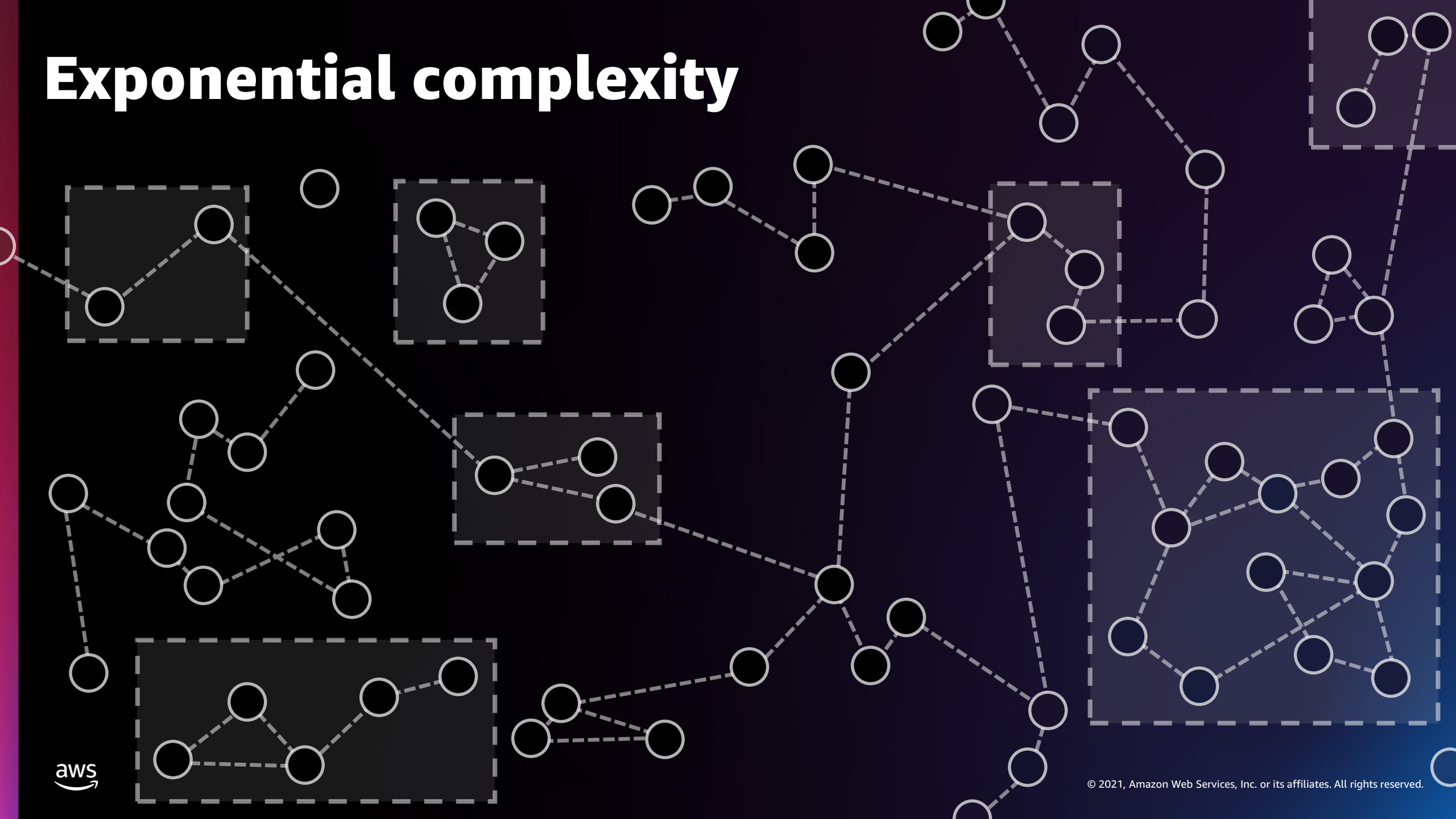


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OVER 700 LANGUAGES

ABAP	Boo	D	Go	Ladder Logic	Oz	Ring	Turing
ABC	Bourne shell	Dart	Groovy	Lasso	Paradox	RPG	TypeScript
ActionScript	C	DCL	Hack	Lisp	Pascal	Ruby	Vala
Ada	C shell	Delphi	Harbour	LiveCode	Perl	Rust	VB.NET
Alice	C#	Dylan	Haskell	Logo	PHP	S	VBScript
Apex	C++	Eiffel	HCL	Lua	Pike	SAS	Verilog
APL	Ceylon	Elixir	HTML	Maple	PL/I	Scala	VHDL
Arc	Clipper	Emacs Lisp	Icon	MATLAB	PL/SQL	Scheme	Visual Basic
ASP	Clojure	Erlang	IDL	Mercury	PostScript	Scratch	Visual FoxPro
AspectJ	**COBOL**	Euphoria	Inform	ML	PowerShell	Shell	Whitespace
Assembly	CoffeeScript	Euphoria	Io	MQL4	Prolog	Smalltalk	xBase
AutoLISP	ColdFusion	F#	Java	NATURAL	Python	SPARK	XML
AWK	Common Lisp	Factor	JavaScript	NXT-G	Q	SQL	Xquery
Bash	Crystal	Forth	Julia	Objective-C	R	Stata	Yorick
Basic	CSS	**Fortran**	Korn shell	OCaml	Racket	Swift	Z shell
bc	cT	Gambas	Kotlin	OpenCL	REBOL	Tcl	Zig
BCPL	Curl	Genie	LabVIEW	OpenEdge ABL	Red	Transact-SQL	

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Arc	Clipper	Emacs Lisp	Icon	MATLAB	PL/SQL	Scheme	Visual Basic
ASP	Clojure	Erlang	IDL	Mercury	PostScript	Scratch	Visual FoxPro
AspectJ	**COBOL**	Euphoria	Inform	ML	PowerShell	Shell	Whitespace
Assembly	CoffeeScript	Euphoria	Io	MQL4	Prolog	Smalltalk	xBase
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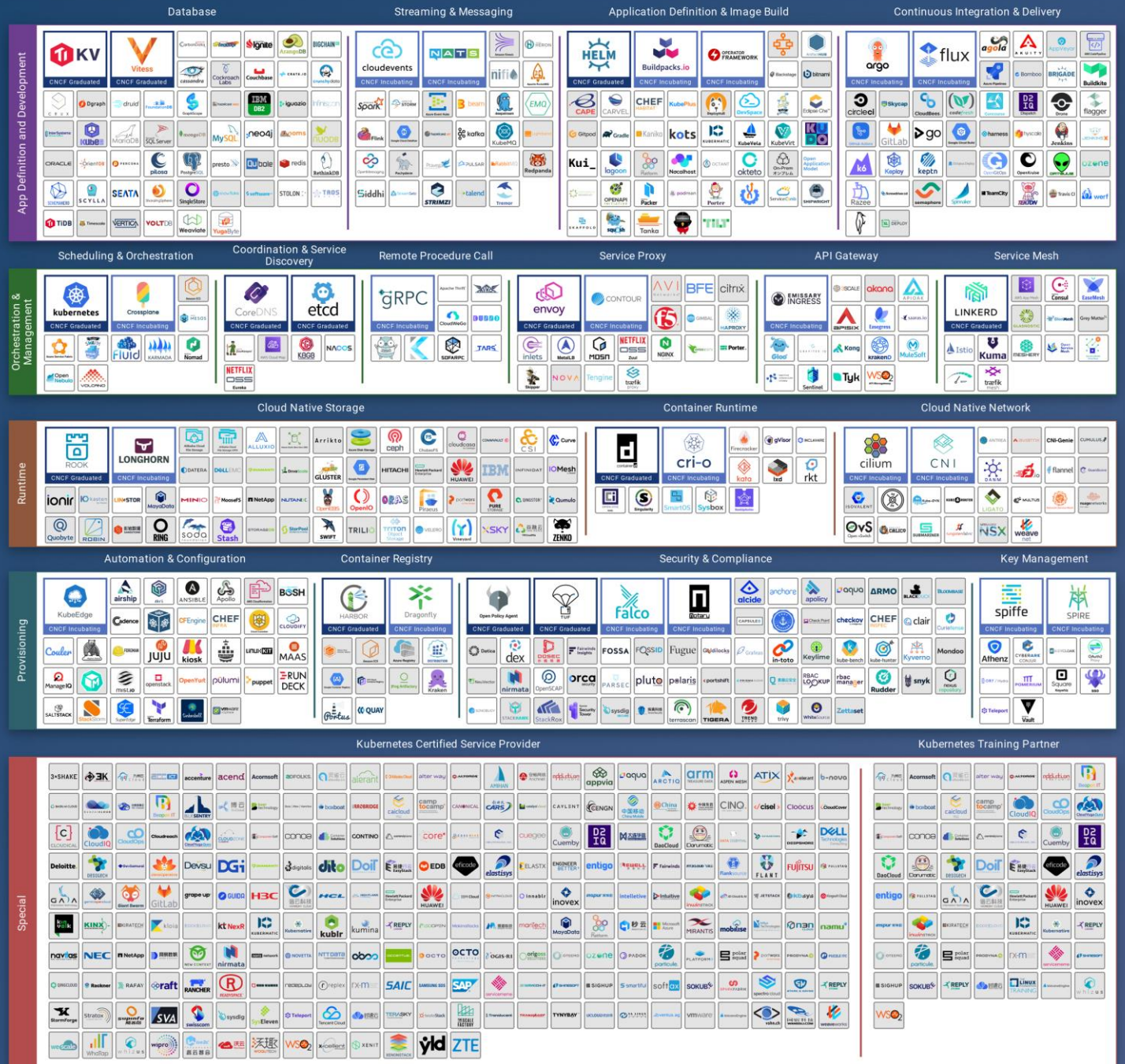
OVERWHELMED YET?

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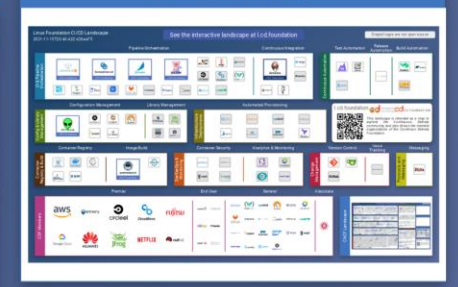
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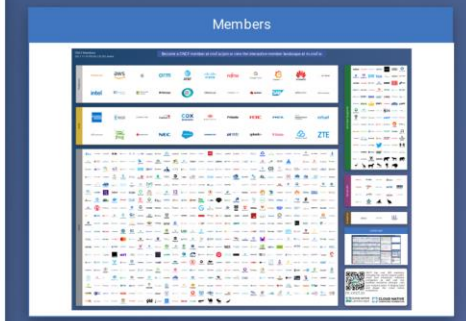
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CLOUD NATIVE Landscape

CLOUD NATIVE COMPUTING FOUNDATION
Redpoint Amplify

This landscape is intended as a map through the previously uncharted terrain of cloud native technologies. There are many routes to deploying a cloud native application, with CNCF Projects representing a particularly well-traveled path.

l.cncf.io

https://landscape.cncf.io

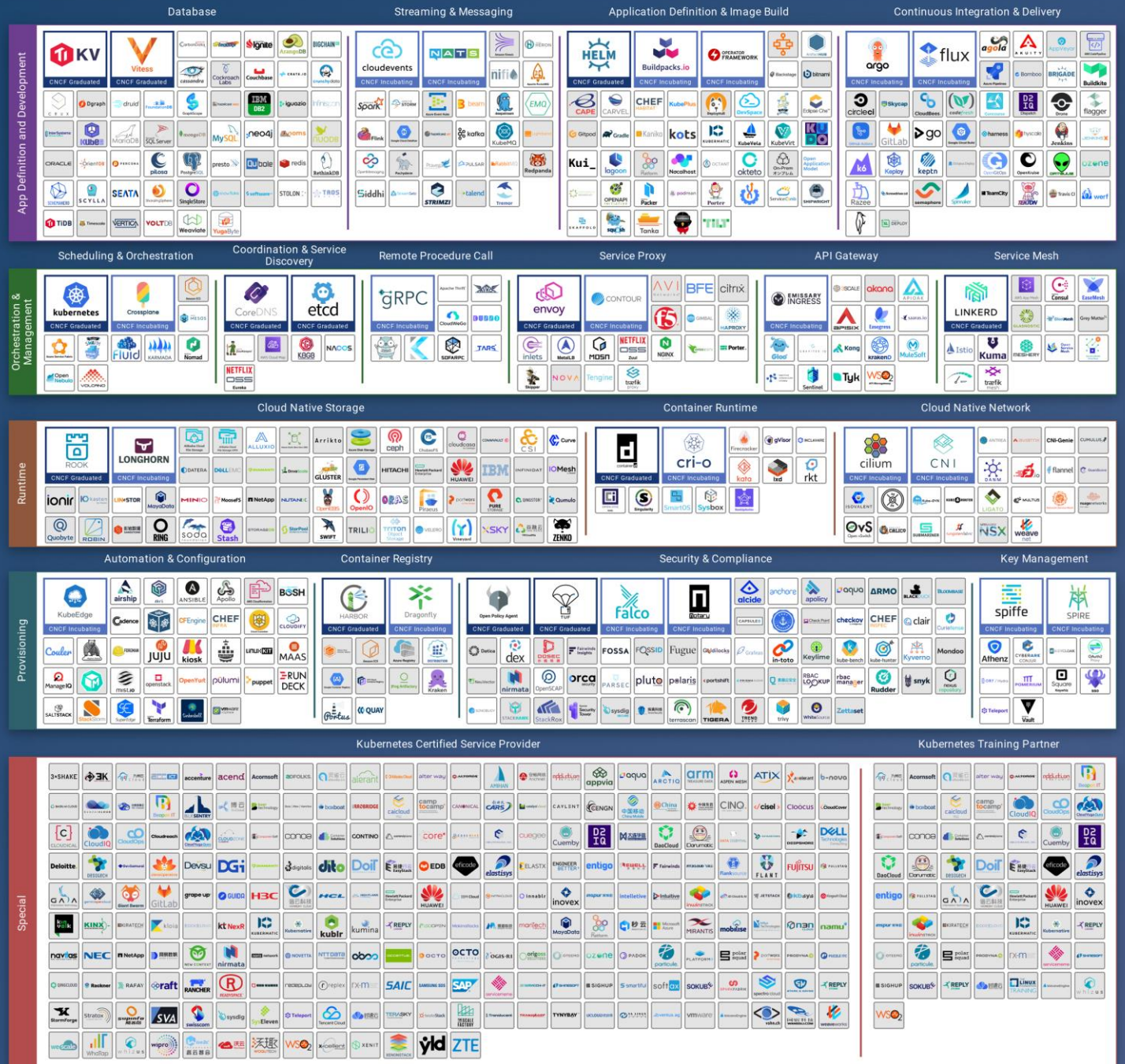
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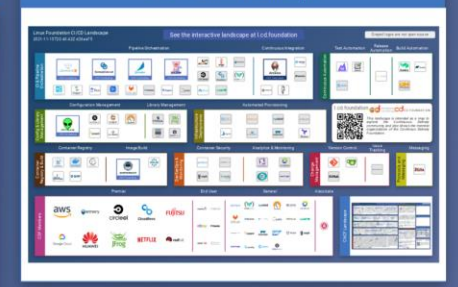
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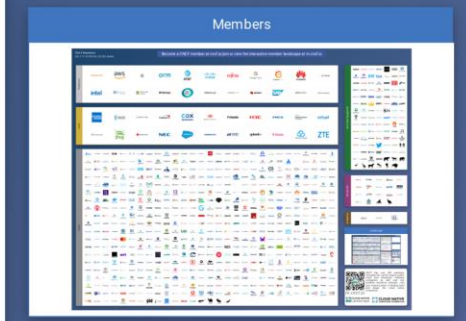
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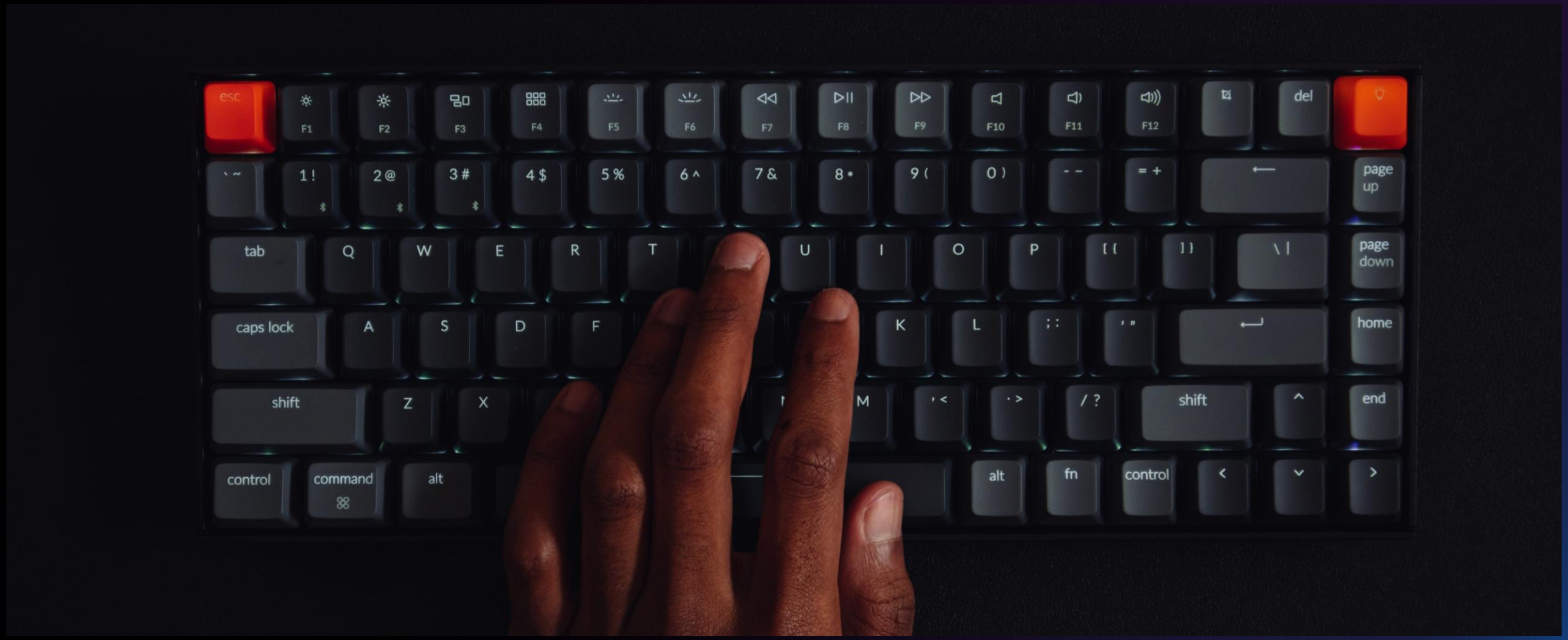
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> **"What we desire from an abstraction is a mechanism which permits the expression of relevant details and the suppression of irrelevant details."**

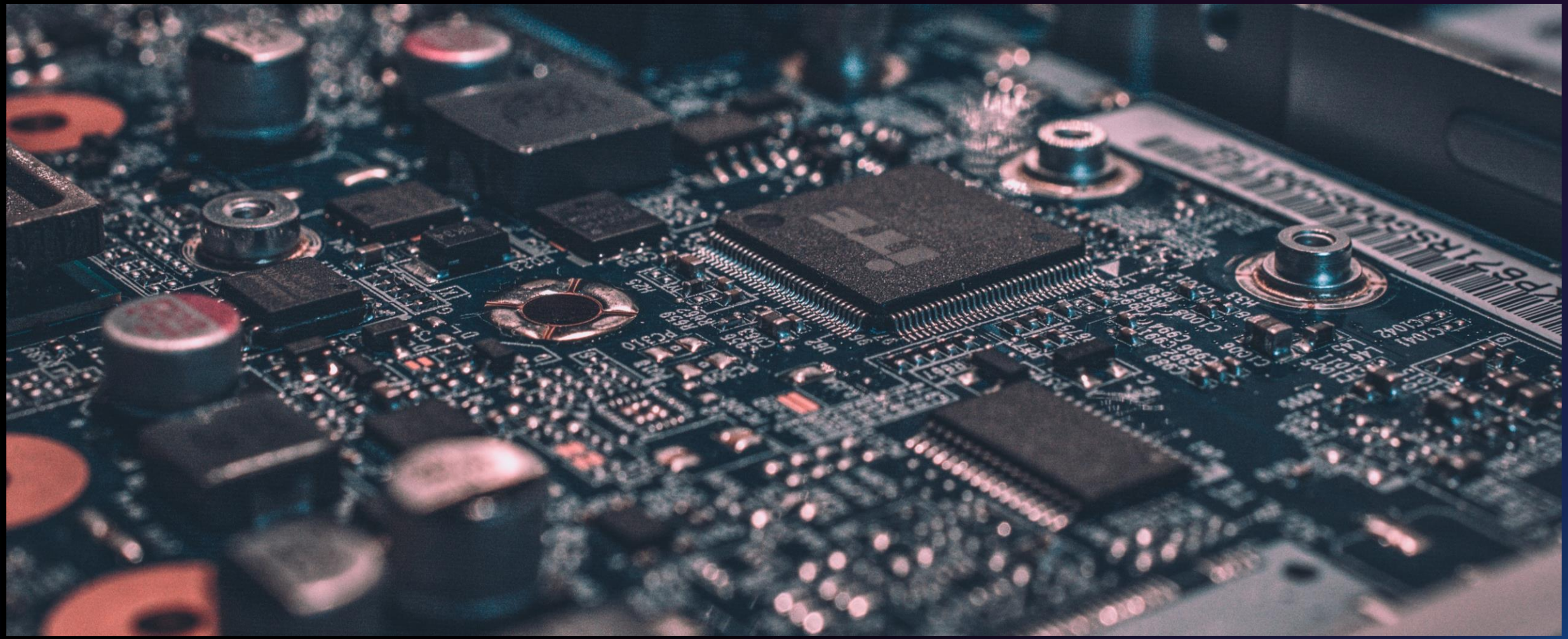
Barbara Liskov

Programming with Abstract Data Types

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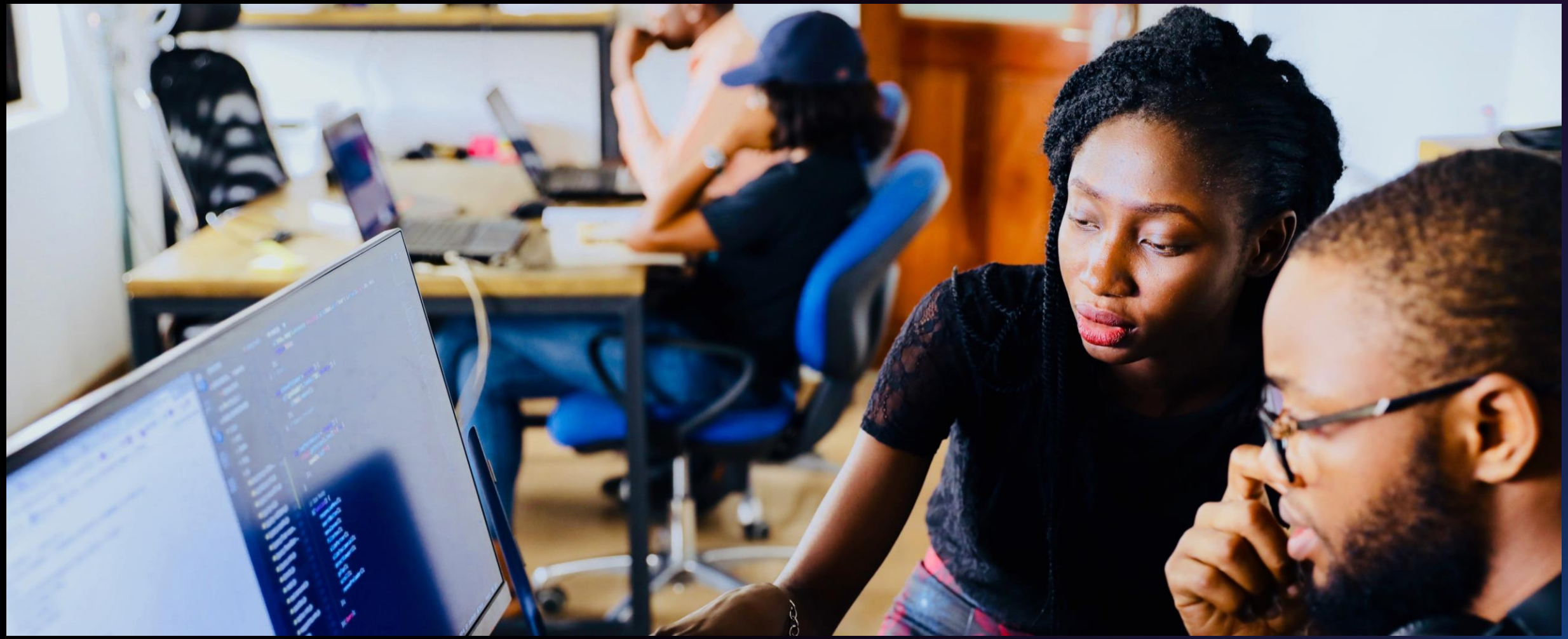


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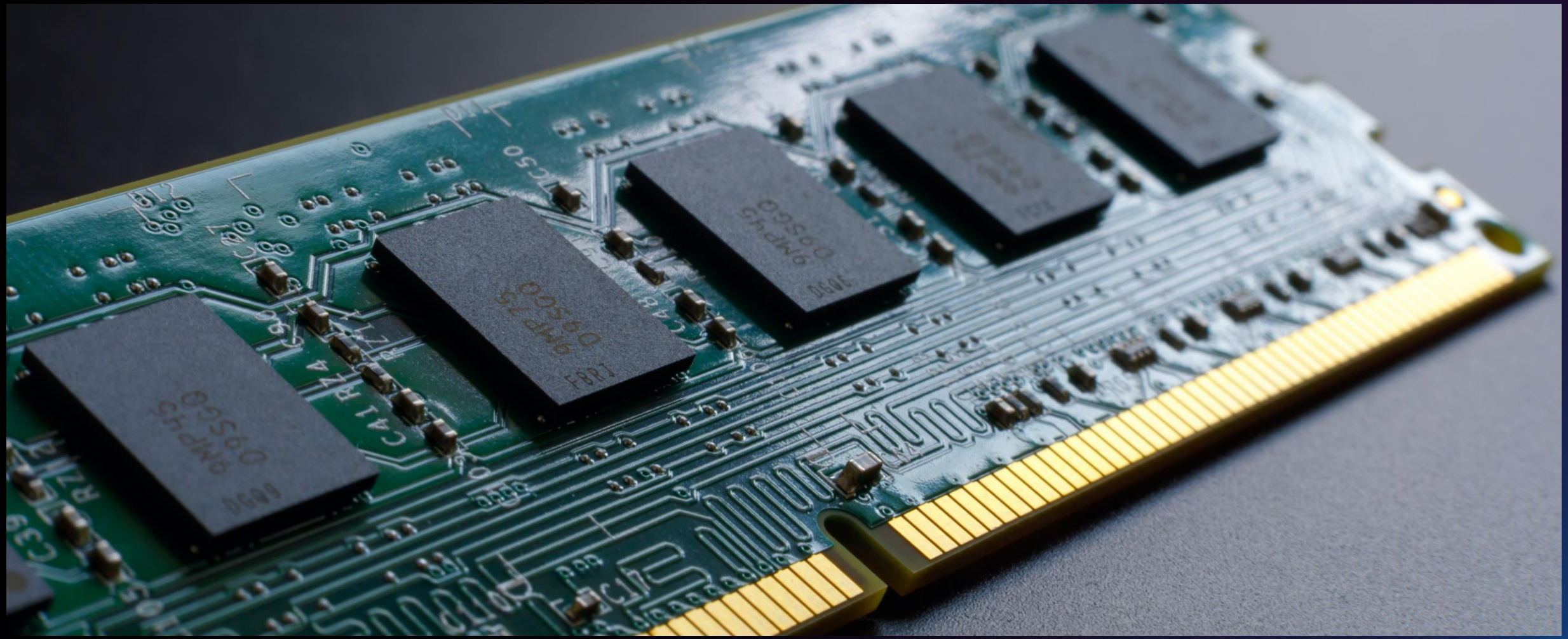
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Memory management

CODE

```
public class Main {
  static void heyThere() {
    System.out.println("Oh hey there, Vegas!");
  }

  public static void main(String[] args) {
    heyThere();
  }
}

// Outputs "Oh hey there, Vegas!"
```

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Memory management

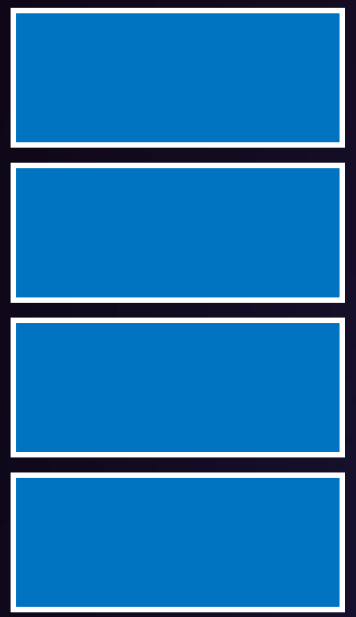
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STACK



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Memory management

A FANCY EVERYTHING DRAWER



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Memory management

PRECURSOR TO GARBAGE COLLECTION



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Garbage collection

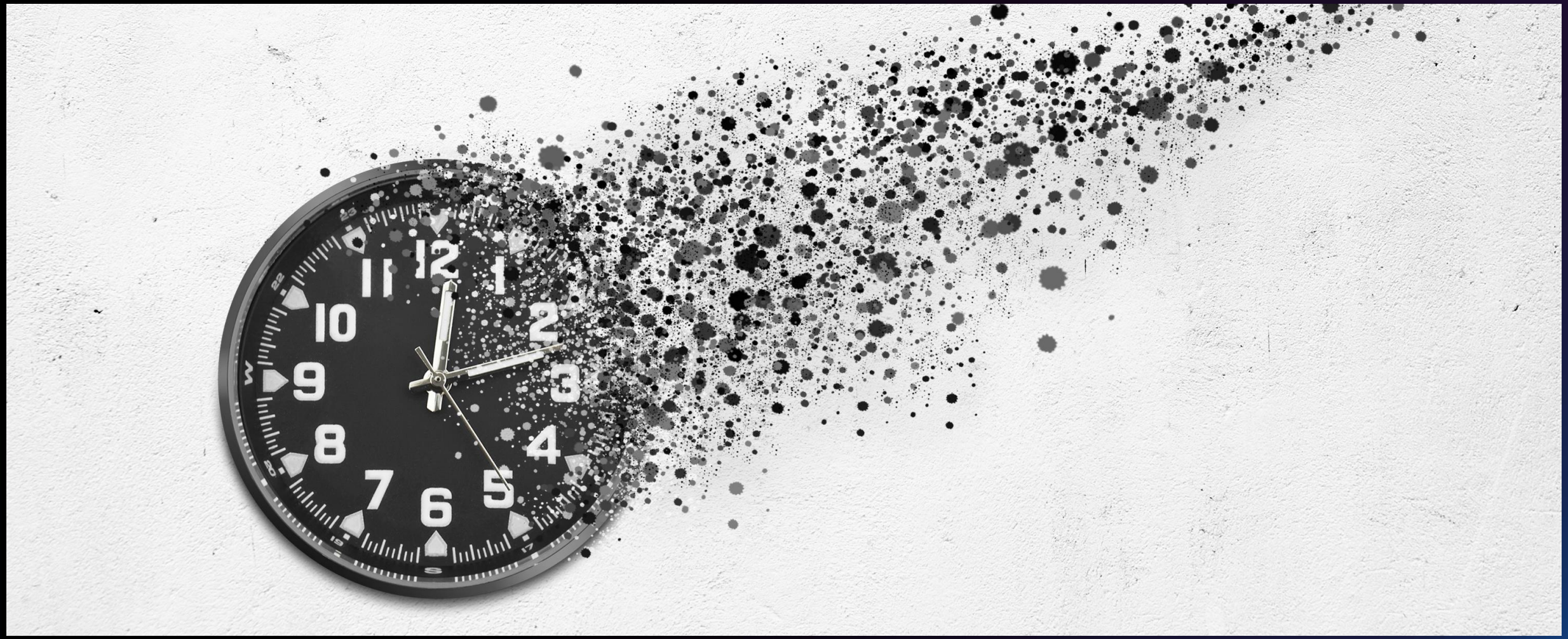
INVENTED BY JOHN MCCARTHY



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Garbage collection

CHALLENGES OF TAKING OUT THE TRASH



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Garbage collection

MARK AND SWEEP



BEFORE MARK AND SWEEP

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MARK AND SWEEP



DURING MARKING

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MARK AND SWEEP



BEFORE MARK AND SWEEP



AFTER MARK AND SWEEP

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MARK AND SWEEP



BEFORE MARK AND SWEEP



AFTER MARK AND SWEEP



AFTER COMPACTING

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A GENERATIONAL APPROACH



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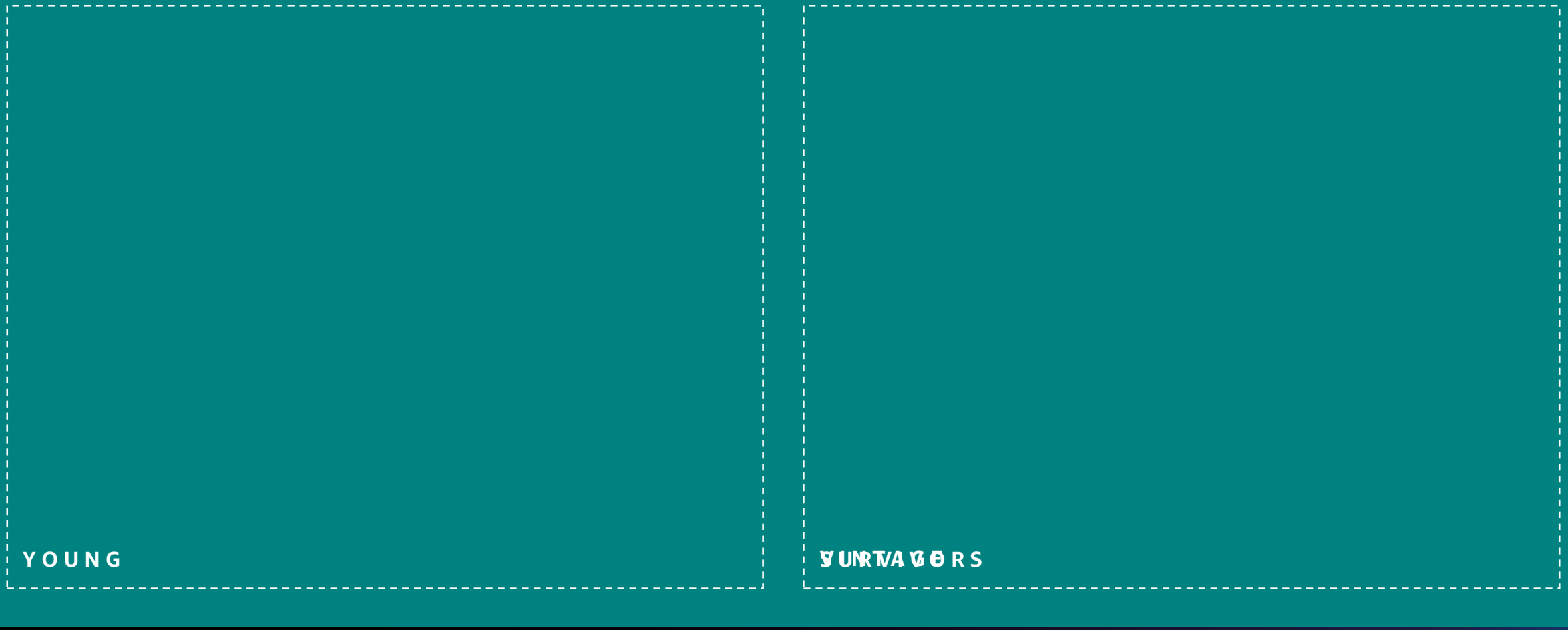
YOUNG

OLD

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Garbage collection

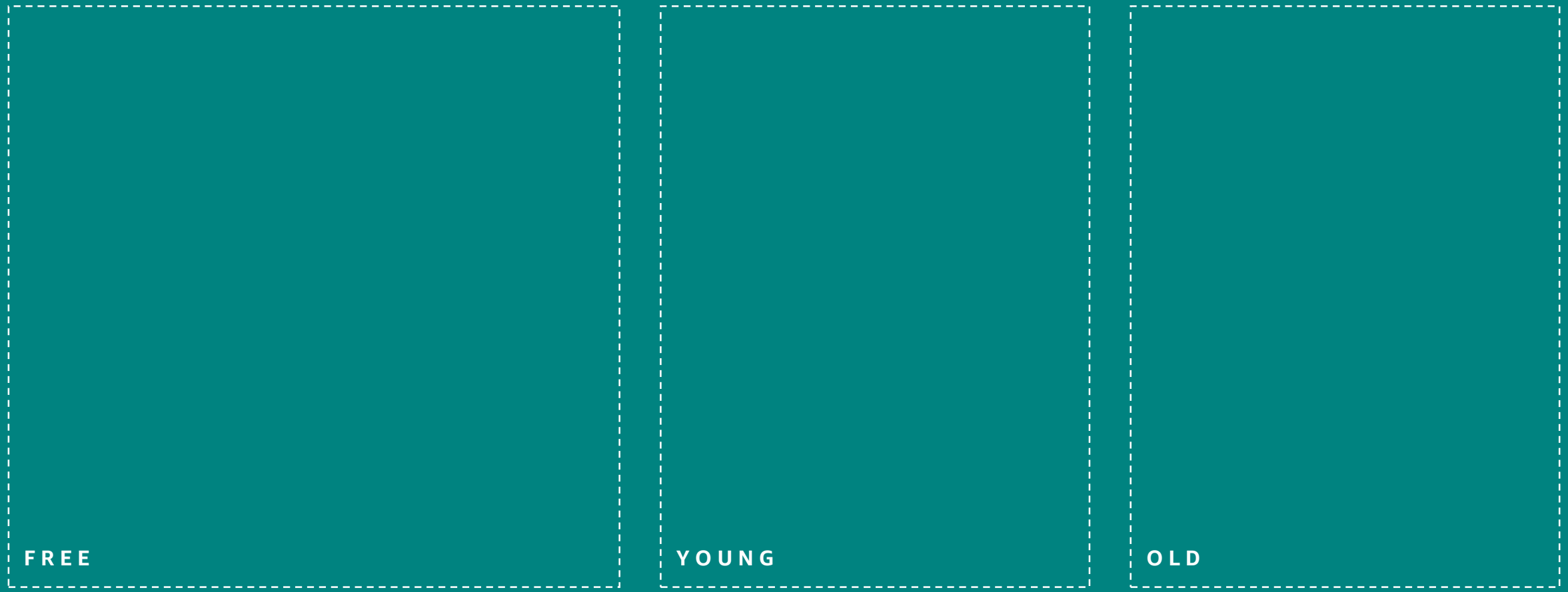
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Garbage collection

A GENERATIONAL APPROACH



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RUST



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RUST

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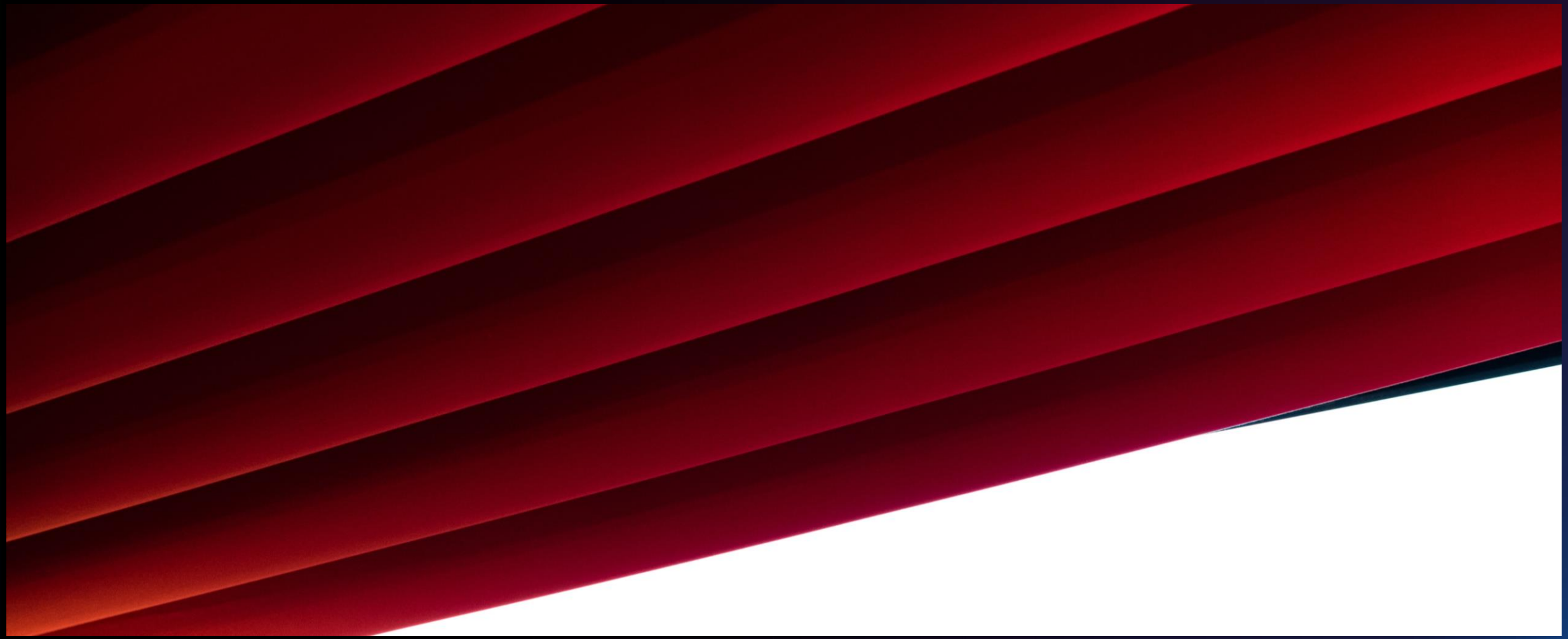
Abstractions

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Abstractions



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AWS SDKs



JavaScript



Python



PHP



.NET



Ruby



Java



Go



Node.js



Embedded C



C++



Objective C



Android



Arduino Yún

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Kotlin, Rust, and Swift SDKs







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New SDKs: Kotlin

HTTPS://GITHUB.COM/AWSLABS/AWS-SDK-KOTLIN

```kotlin
package sdk.test.lambda

import aws.sdk.kotlin.services.s3.S3Client

suspend fun main(args: Array<String>) {
    val bucketName = args.firstOrNull() ?: return

    S3Client.fromEnvironment().use { s3 ->
        s3.createBucket {
            bucket = bucketName
        }
    }

    println("$bucketName is ready")
}
```

aws

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New SDKs: Rust

HTTPS://GITHUB.COM/AWSLABS/AWS-SDK-RUST

```rust
use std::env;

#[tokio::main]
async fn main() -> Result<(), aws_sdk_s3::Error> {
    let bucket_name =
        env::var("BUCKET_NAME").expect("bucket name must be specified");
    // load region, credentials and SDK configuration via the default chain
    let config = aws_config::load_from_env().await;
    let s3_client = aws_sdk_s3::Client::new(&config);
    let rsp = s3_client.create_bucket().bucket(bucket_name).send().await?;
    println!("bucket created in {location:?}", location = rsp.location());
    Ok(())
}
```

aws

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New SDKs: Swift

HTTPS://GITHUB.COM/AWSLABS/AWS-SDK-SWIFT

```
import AWSCognitoIdentity

func createIdentityPool() async throws -> CreateIdentityPoolOutputResponse {
  let cognitoIdentityClient = try CognitoIdentityClient(region: "us-east-1")
  let cognitoInputCall      = CreateIdentityPoolInput(
                                developerProviderName: "com.amazonaws.mytestapplication",
                                identityPoolName:      "identityPoolMadeWithSwiftSDK”
                              )

  let result = try await cognitoIdentityClient.createIdentityPool(input: cognitoInputCall)
  return result
}
```

aws

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Kotlin, Rust, and Swift SDKs







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Model-first design

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Smithy

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Smithy

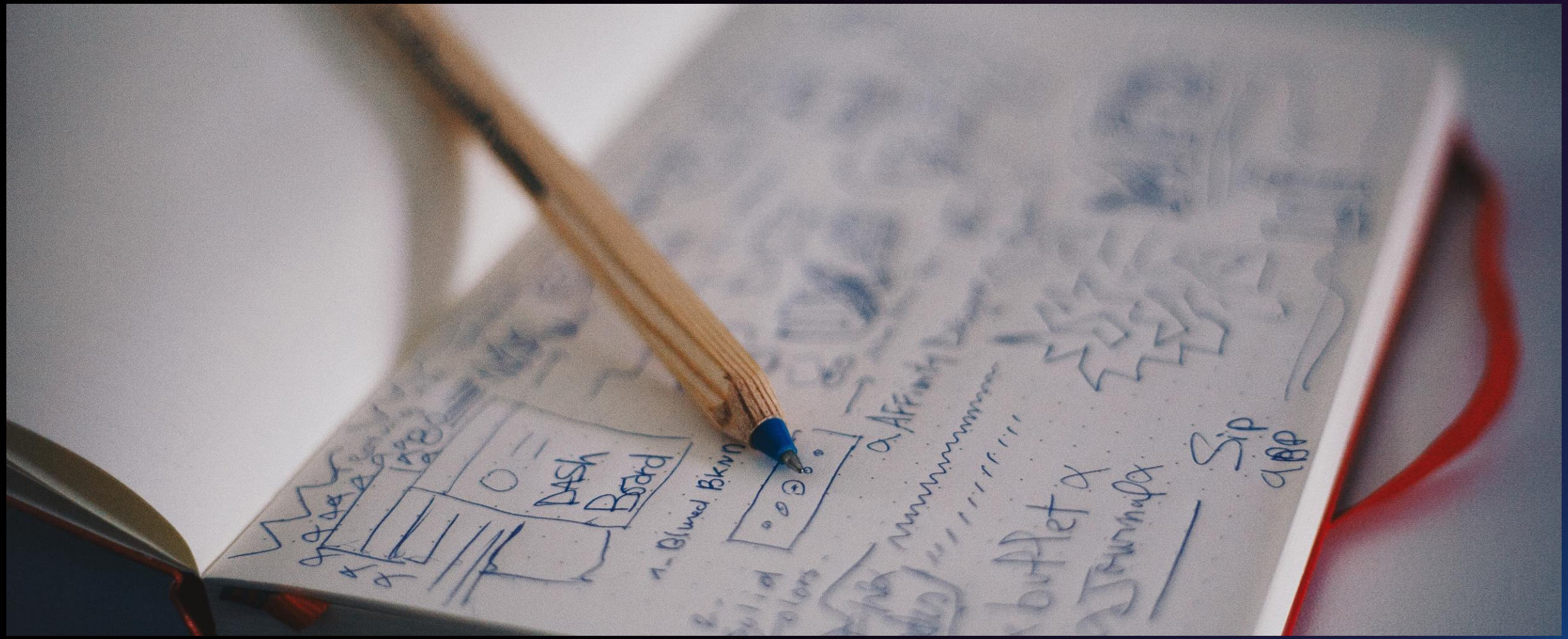
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Infrastructure-as-code



AWS Cloud Development Kit (CDK)



AWS CloudFormation

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AWS CloudFormation

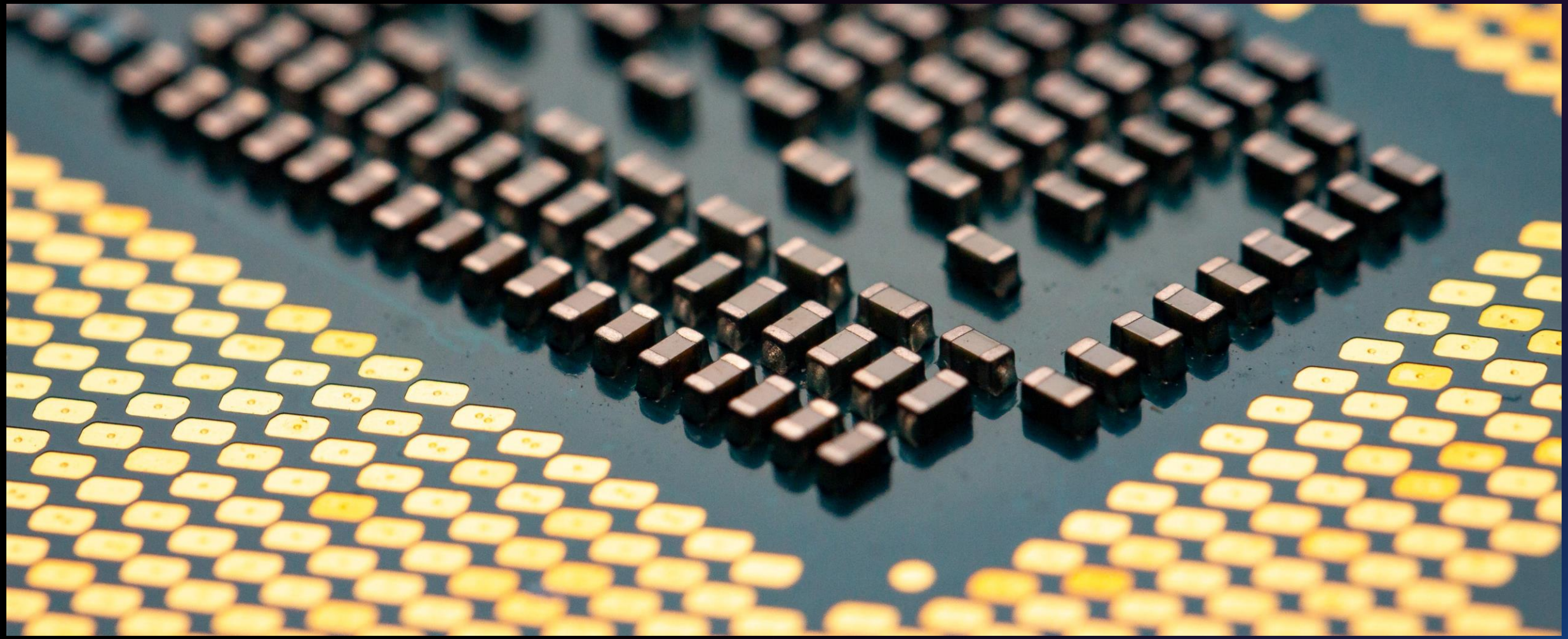
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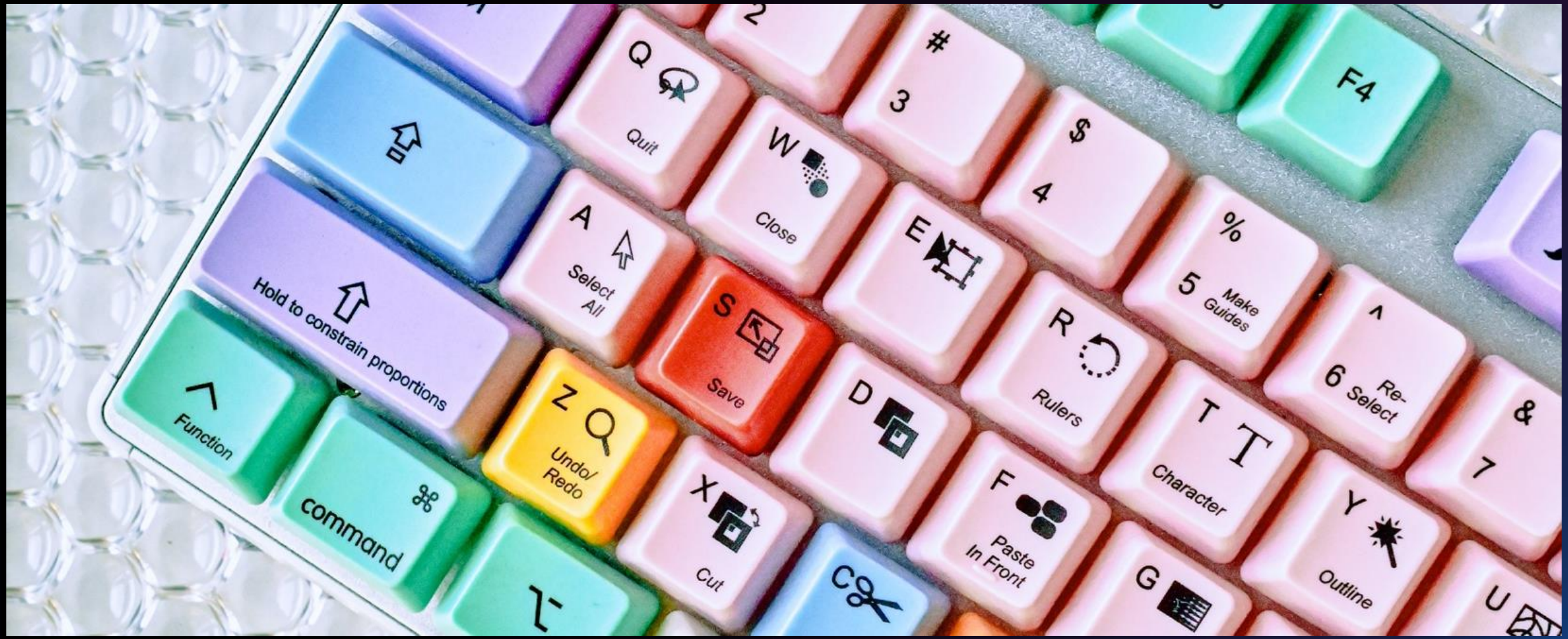
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AWS CloudFormation

RESOURCE REGISTRY



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Resource abstractions

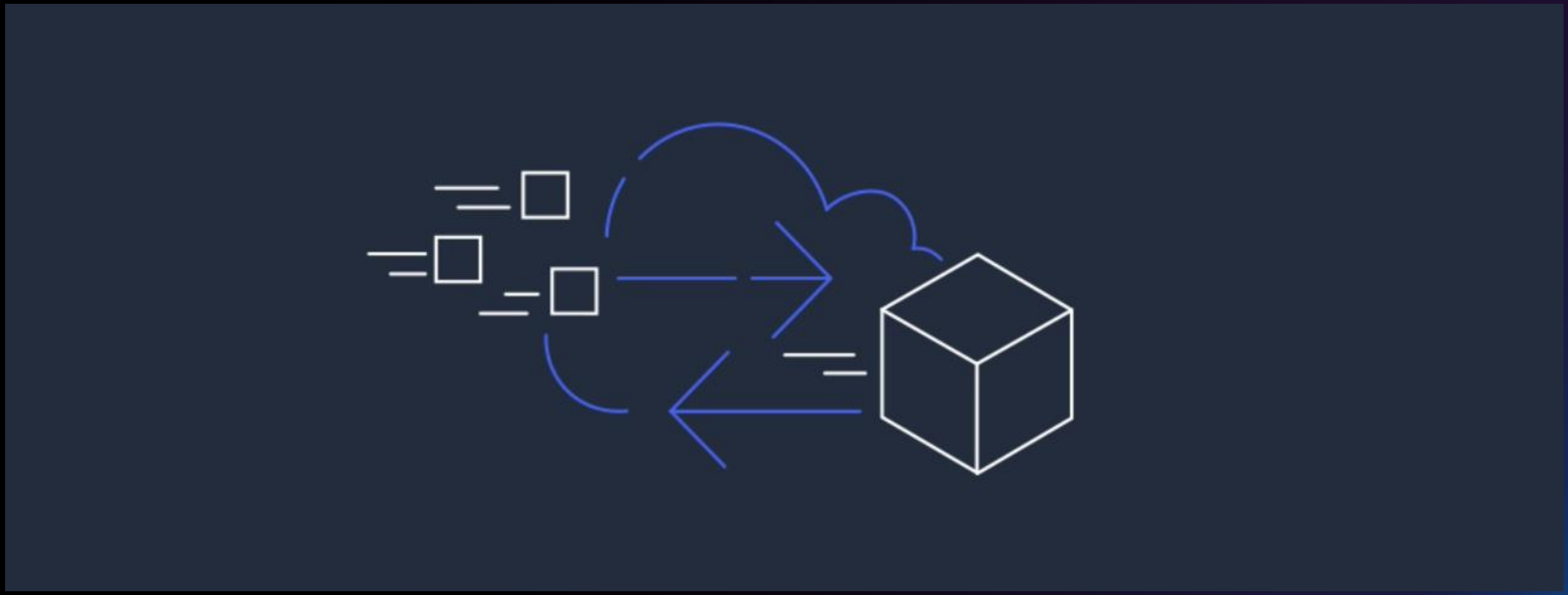
BEYOND CLOUDFORMATION



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AWS Cloud Control API

ONE API FOR EVERYTHING



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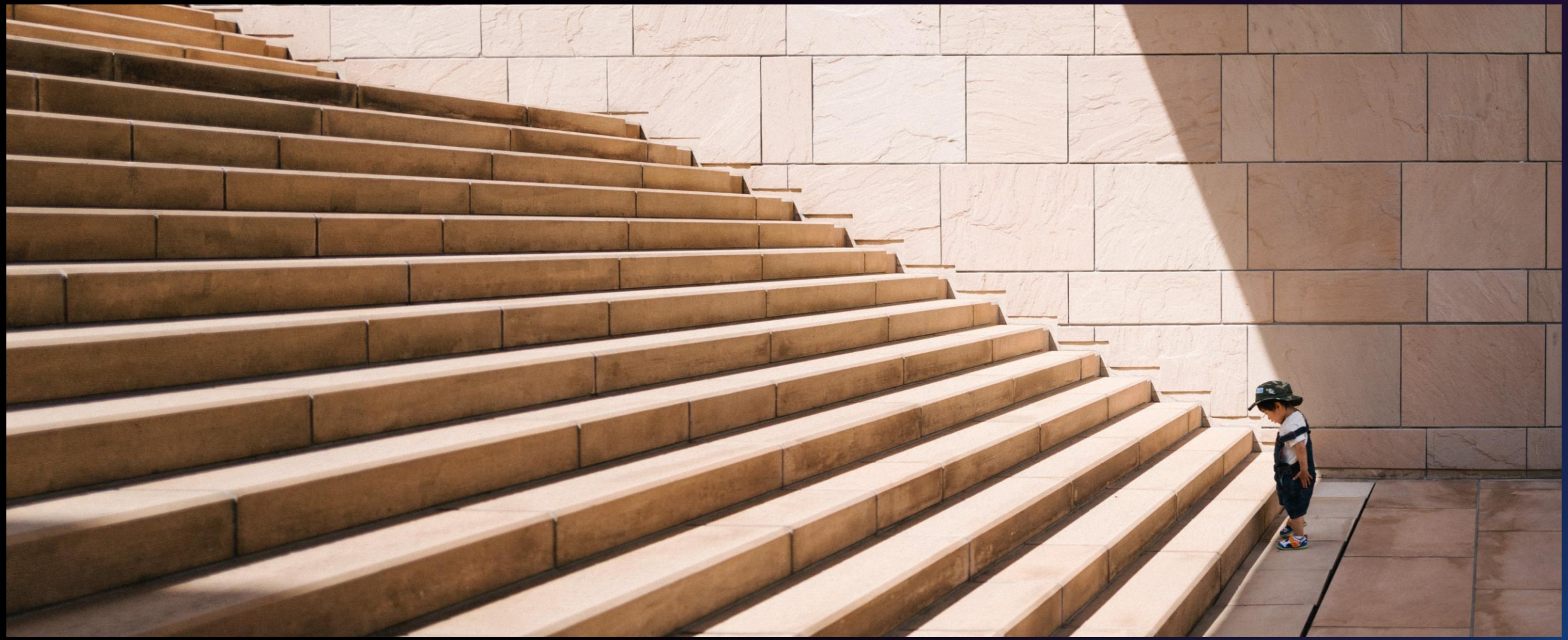
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Imperatively

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Declaratively

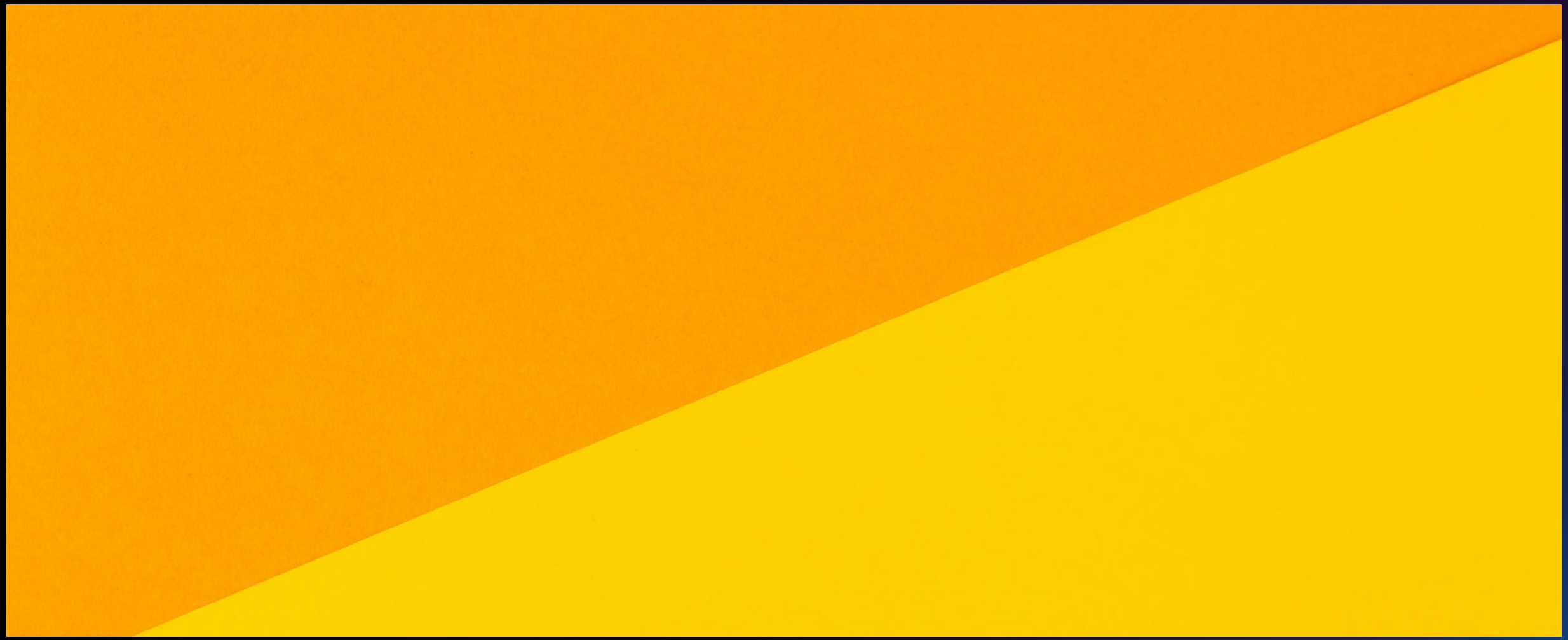
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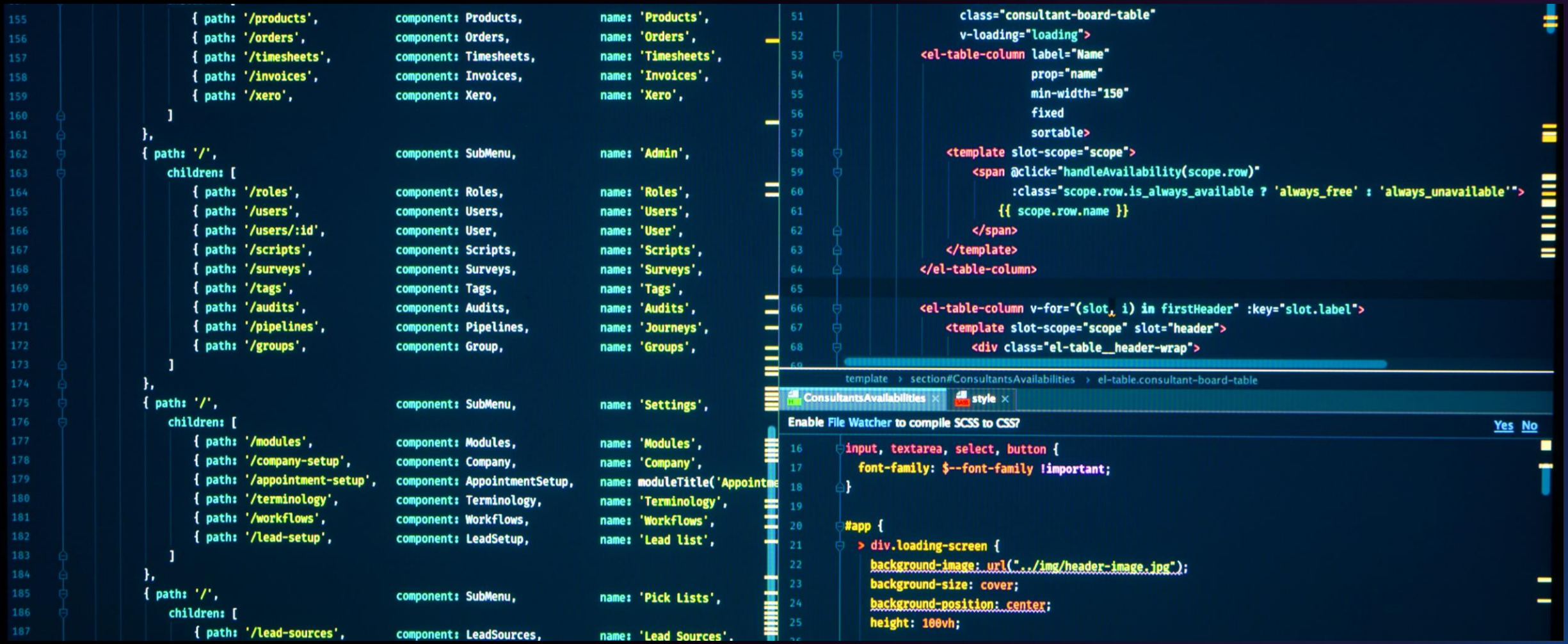
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```
{ path: '/products',      component: Products,      name: 'Products',
{ path: '/orders',        component: Orders,        name: 'Orders',
{ path: '/timesheets',    component: Timesheets,    name: 'Timesheets',
{ path: '/invoices',      component: Invoices,      name: 'Invoices',
{ path: '/xero',          component: Xero,          name: 'Xero',
]
},
{ path: '/',             component: SubMenu,       name: 'Admin',
children: [
{ path: '/roles',       component: Roles,         name: 'Roles',
{ path: '/users',       component: Users,         name: 'Users',
{ path: '/users/:id',    component: User,          name: 'User',
{ path: '/scripts',     component: Scripts,       name: 'Scripts',
{ path: '/surveys',     component: Surveys,       name: 'Surveys',
{ path: '/tags',        component: Tags,          name: 'Tags',
{ path: '/audits',      component: Audits,        name: 'Audits',
{ path: '/pipelines',   component: Pipelines,     name: 'Journeys',
{ path: '/groups',      component: Group,         name: 'Groups',
]
},
{ path: '/',             component: SubMenu,       name: 'Settings',
children: [
{ path: '/modules',     component: Modules,       name: 'Modules',
{ path: '/company-setup', component: Company,     name: 'Company',
{ path: '/appointment-setup', component: AppointmentSetup, name: moduleTitle('Appointme
{ path: '/terminology', component: Terminology,   name: 'Terminology',
{ path: '/workflows',   component: Workflows,     name: 'Workflows',
{ path: '/lead-setup',  component: LeadSetup,     name: 'Lead list',
]
},
{ path: '/',             component: SubMenu,       name: 'Pick Lists',
children: [
{ path: '/lead-sources', component: LeadSources,  name: 'Lead Sources',
```

```
class="consultant-board-table"
v-loading="loading">
<el-table-column label="Name"
prop="name"
min-width="150"
fixed
sortable>
<template slot-scope="scope">
<span @click="handleAvailability(scope.row)"
:class="scope.row.is_always_available ? 'always_free' : 'always_unavailable'">
{{ scope.row.name }}
</span>
</template>
</el-table-column>

<el-table-column v-for="(slot, i) in firstHeader" :key="slot.label">
<template slot-scope="scope" slot="header">
<div class="el-table__header-wrap">
```

template › section#ConsultantsAvailabilities › el-table.consultant-board-table

ConsultantsAvailabilities | style

Enable File Watcher to compile SCSS to CSS? Yes No

```
input, textarea, select, button {
  font-family: $--font-family !important;
}

#app {
  > div.loading-screen {
    background-image: url("../img/header-image.jpg");
    background-size: cover;
    background-position: center;
    height: 100vh;
```

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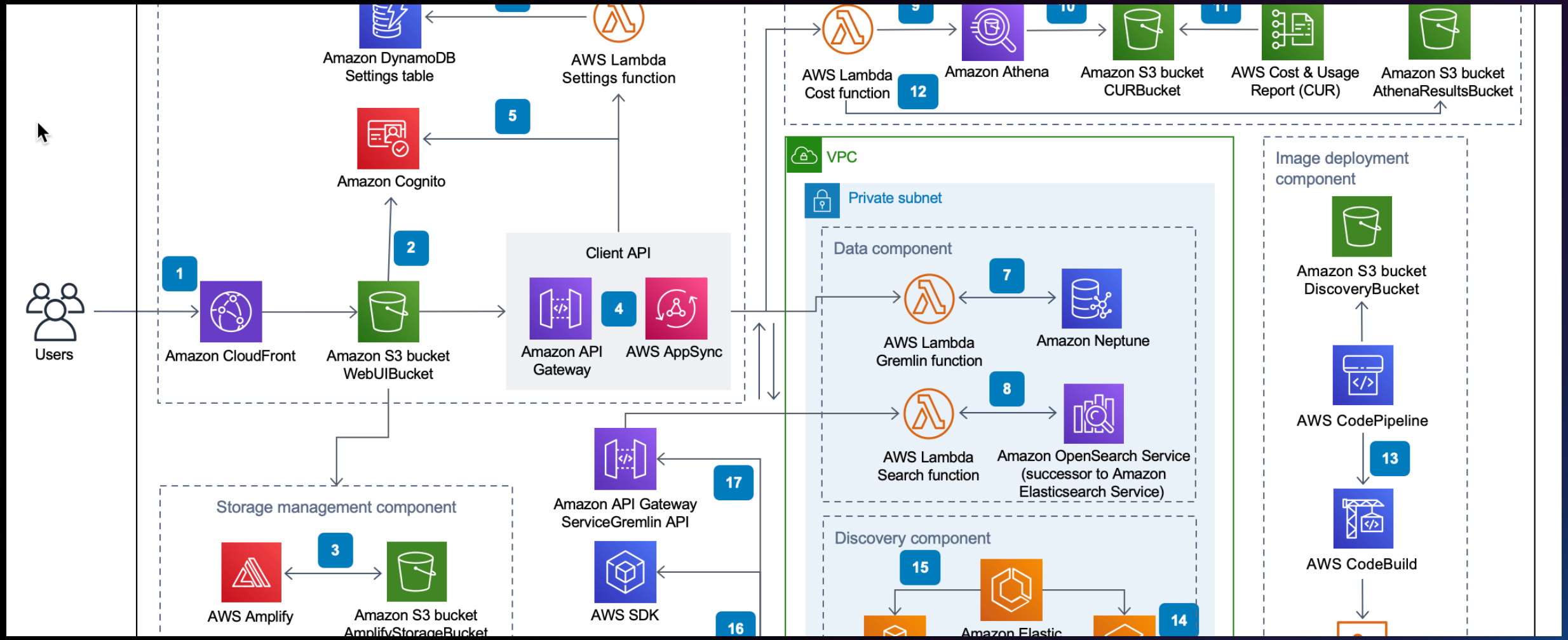
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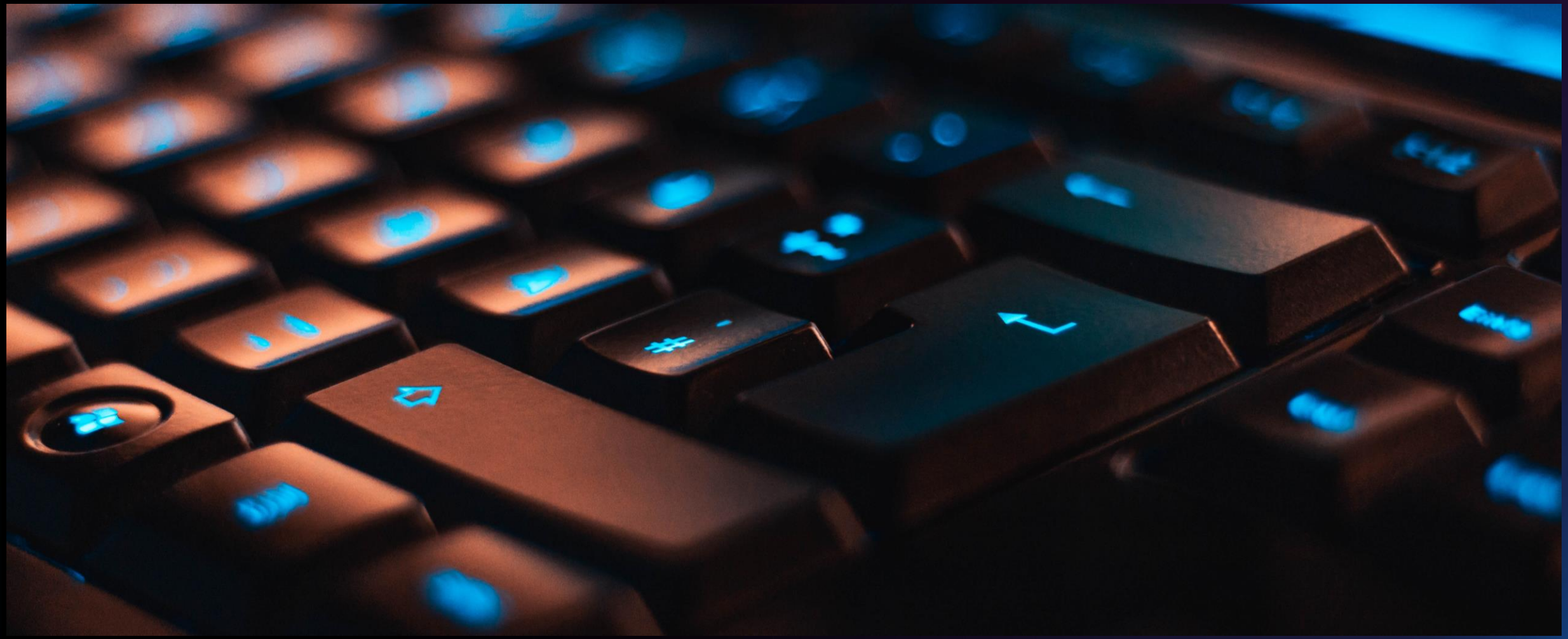
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APPROACHES TO PROVISIONING RESOURCES

TypeScript | JavaScript | Python | Java | C#

```typescript
export class MyEcsConstructStack extends core.Stack {
  constructor(scope: core.App, id: string, props?: core.StackProps) {
    super(scope, id, props);

    const vpc = new ec2.Vpc(this, "MyVpc", {
      maxAzs: 3 // Default is all AZs in region
    });

    const cluster = new ecs.Cluster(this, "MyCluster", {
      vpc: vpc
    });

    // Create a load-balanced Fargate service and make it public
    new ecs_patterns.ApplicationLoadBalancedFargateService(this, "MyFargateService", {
      cluster: cluster, // Required
      cpu: 512, // Default is 256
```

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L1: Cfn resources

```
@aws-cdk/aws-s3 » CfnBucket

new CfnBucket(scope: Construct, id: string, props?: CfnBucketProps)
```

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L2: Representation of resources

```
@aws-cdk/aws-s3

const bucket = new s3.Bucket(this, 'MyBucket’);
const result = bucket.addToResourcePolicy(new iam.PolicyStatement({
       actions: ['s3:GetObject'],
       resources: [bucket.arnForObjects('file.txt')],
       principals: [new iam.AccountRootPrincipal()],
       })
);
```

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L3: Patterns



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L3: Patterns

L3: Thumbnail Image Resizing

L2: Bucket triggers Lambda event

L1: CfnBucket

Resource: s3.bucket

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L3: Patterns



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AWS CDK

```
export class MyEcsConstructStack extends core.Stack {
  constructor(scope: core.App, id: string, props?: core.StackProps) {
    super(scope, id, props);

    const vpc = new ec2.Vpc(this, "MyVpc", {
      maxAzs: 3 // Default is all AZs in region
    });

    const cluster = new ecs.Cluster(this, "MyCluster", {
      vpc: vpc
    });

    // Create a load-balanced Fargate service and make it public
    new ecs_patterns.ApplicationLoadBalancedFargateService(this, "MyFargateService", {
      cluster: cluster, // Required
      cpu: 512, // Default is 256
      desiredCount: 6, // Default is 1
      taskImageOptions: { image: ecs.ContainerImage.fromRegistry("amazon/amazon-ecs-sample") },
      memoryLimitMiB: 2048, // Default is 512
      publicLoadBalancer: true // Default is false
    });
  }
}
```



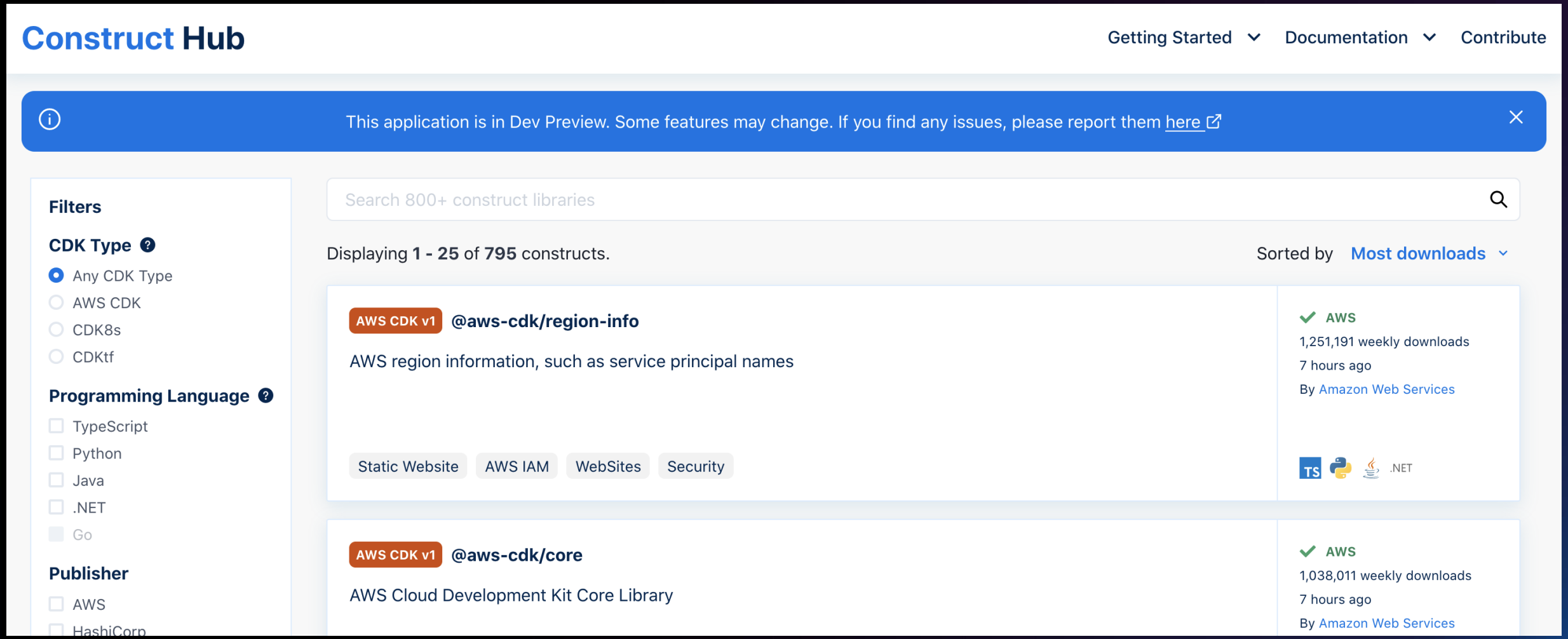
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Construct Hub

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Construct Hub

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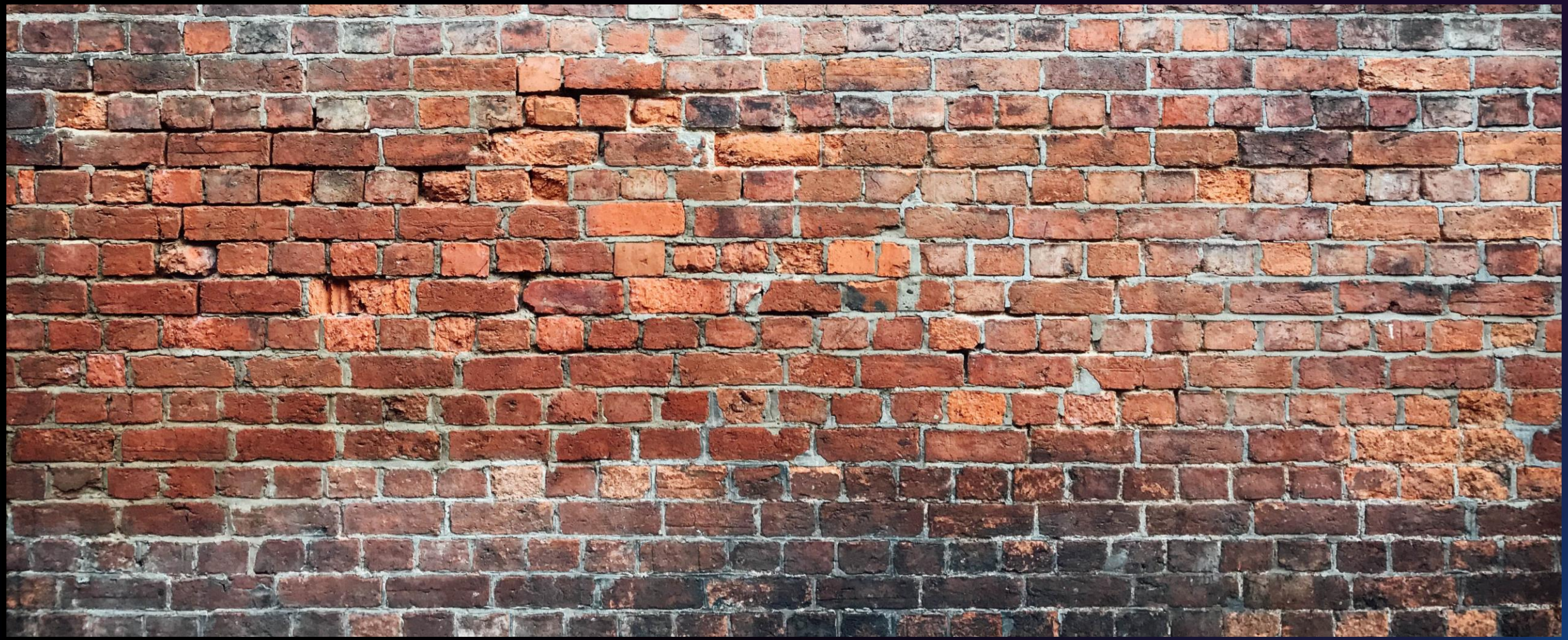
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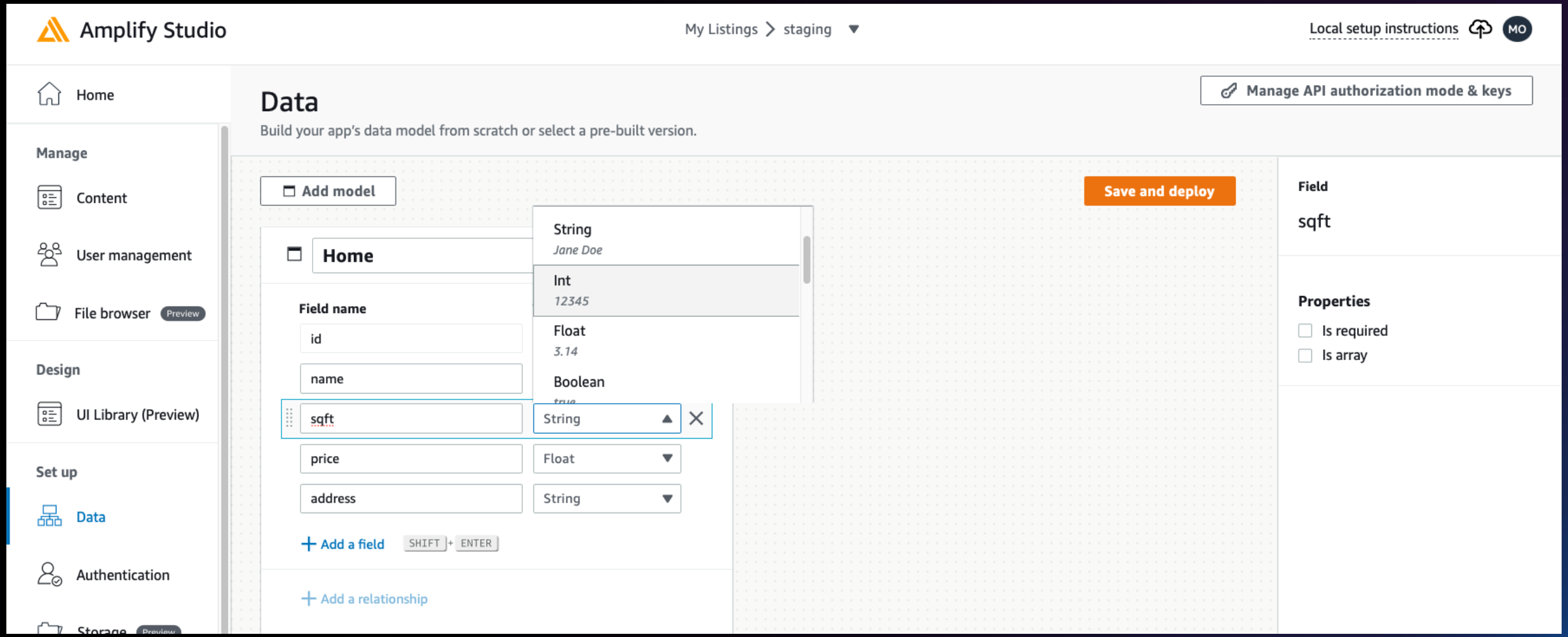
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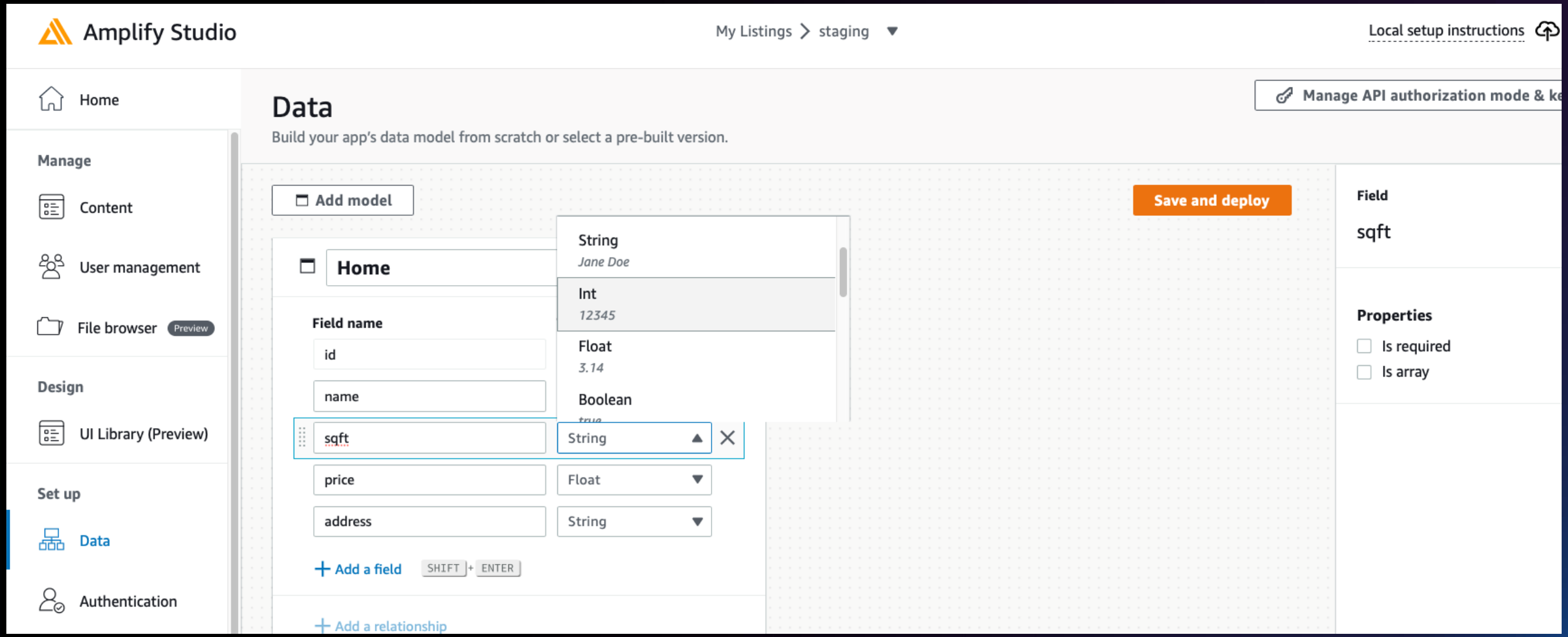
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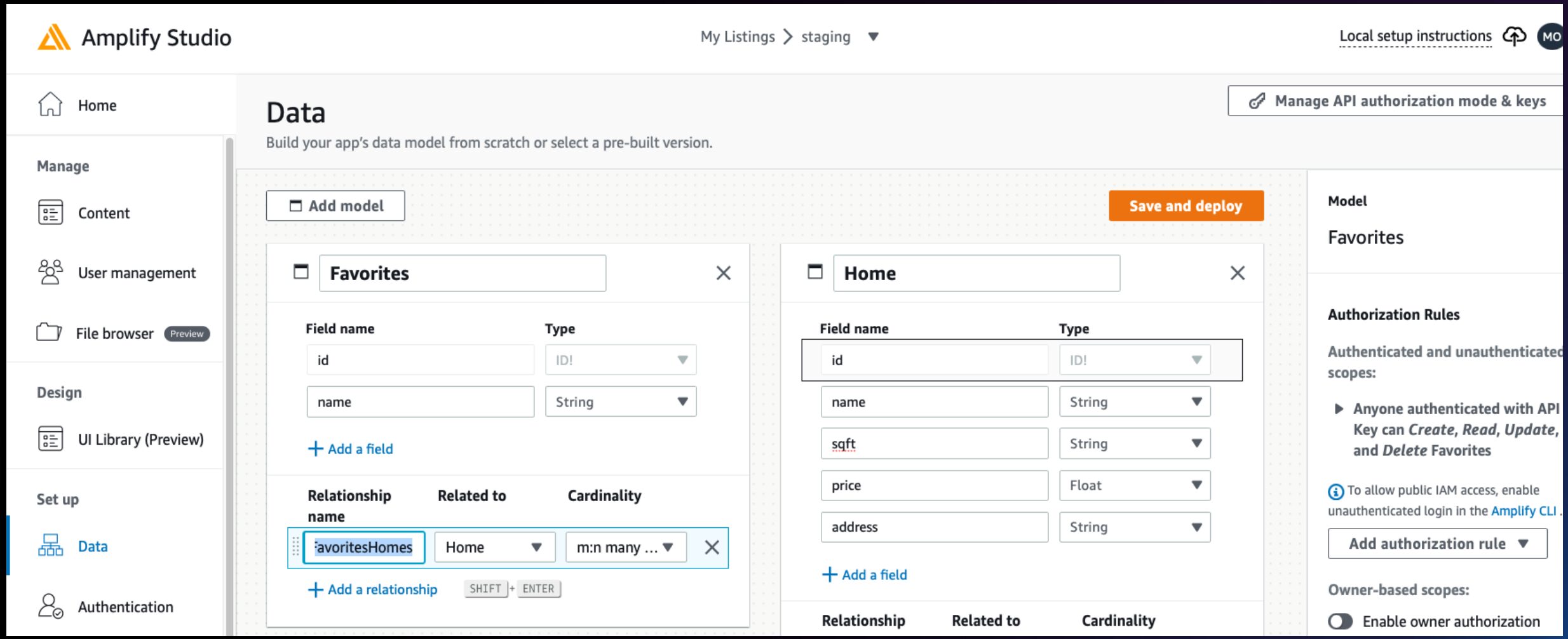
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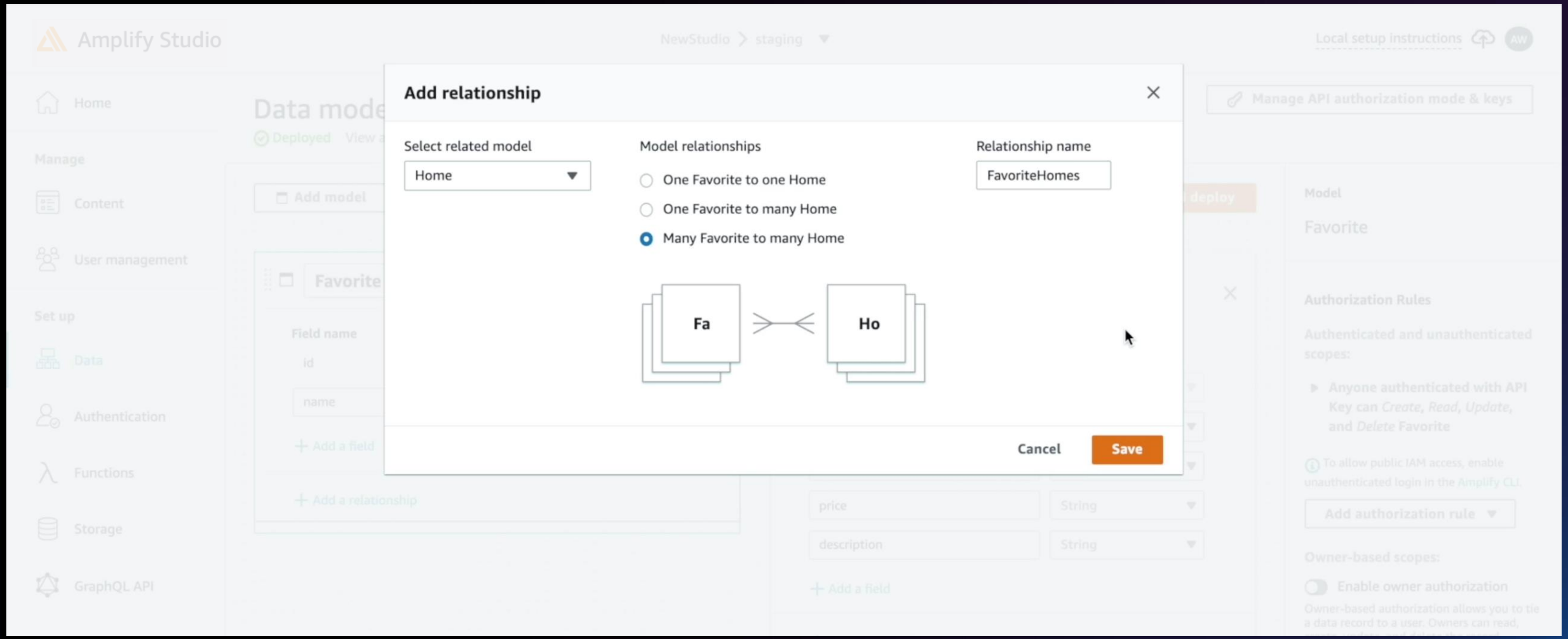
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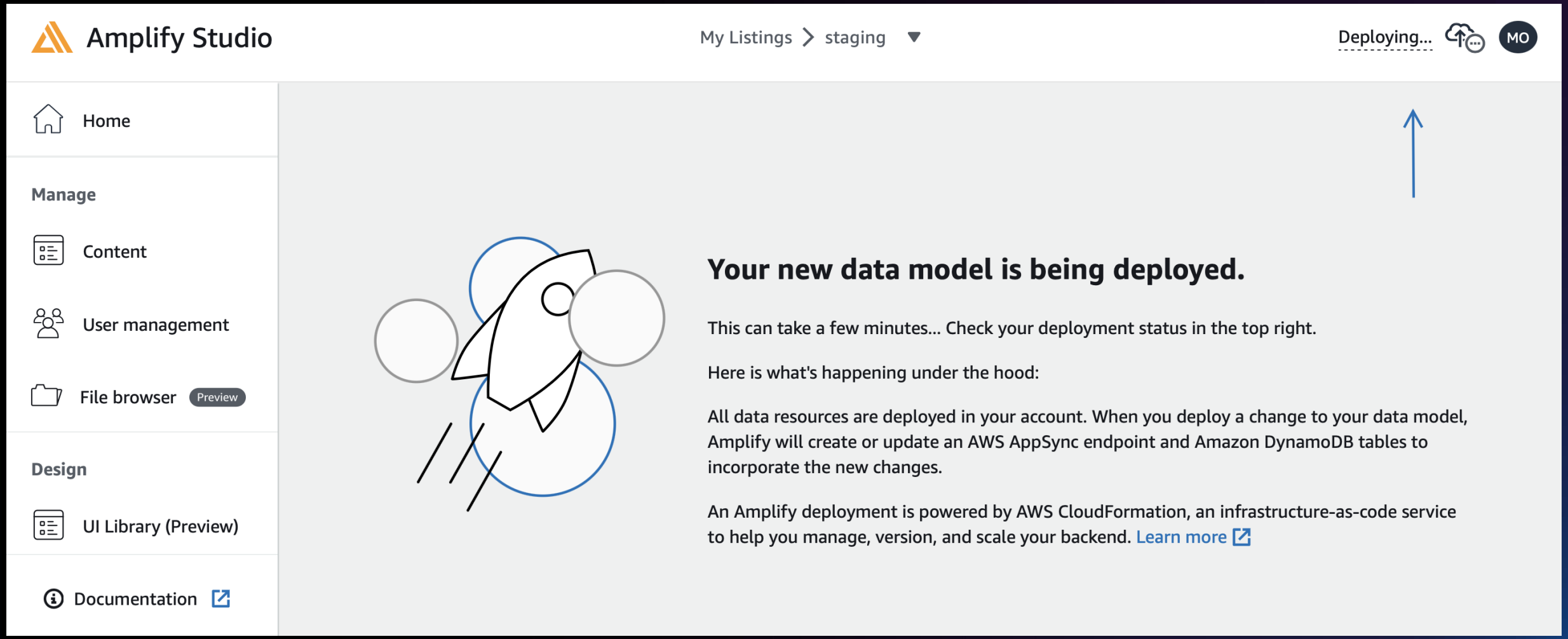
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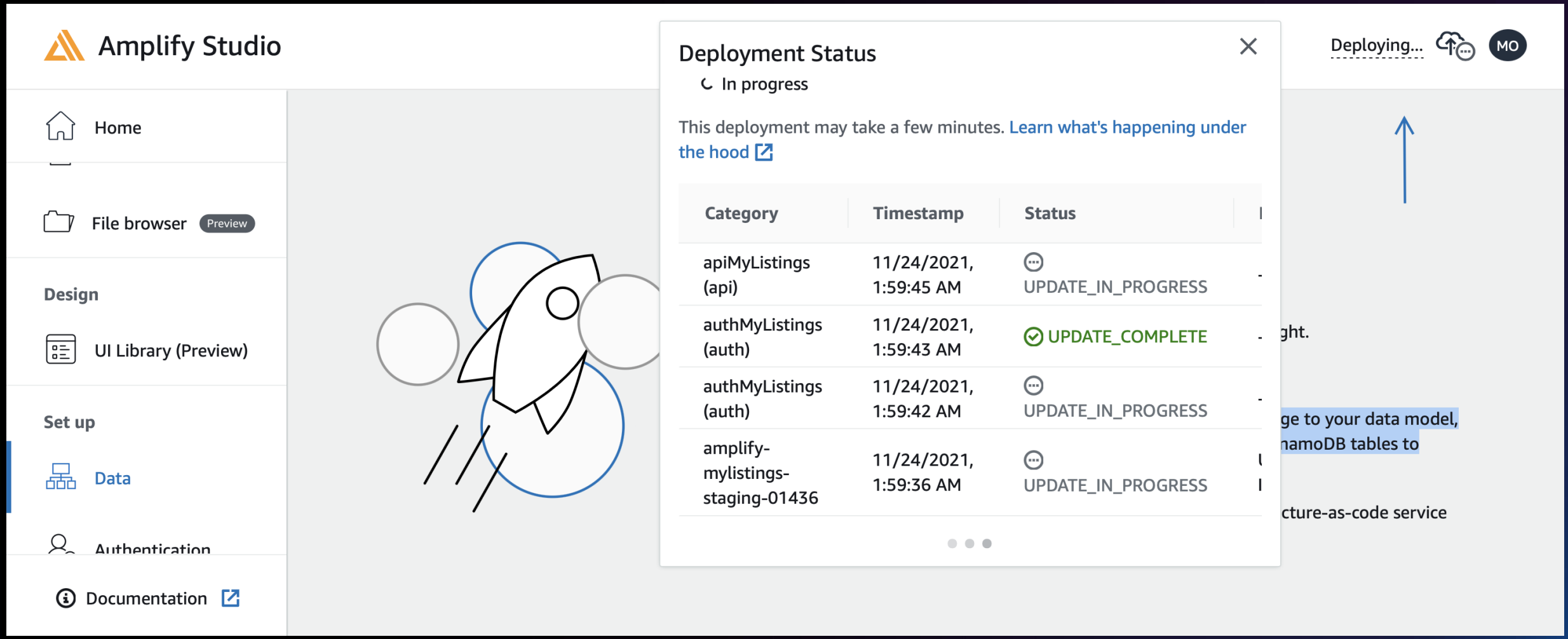
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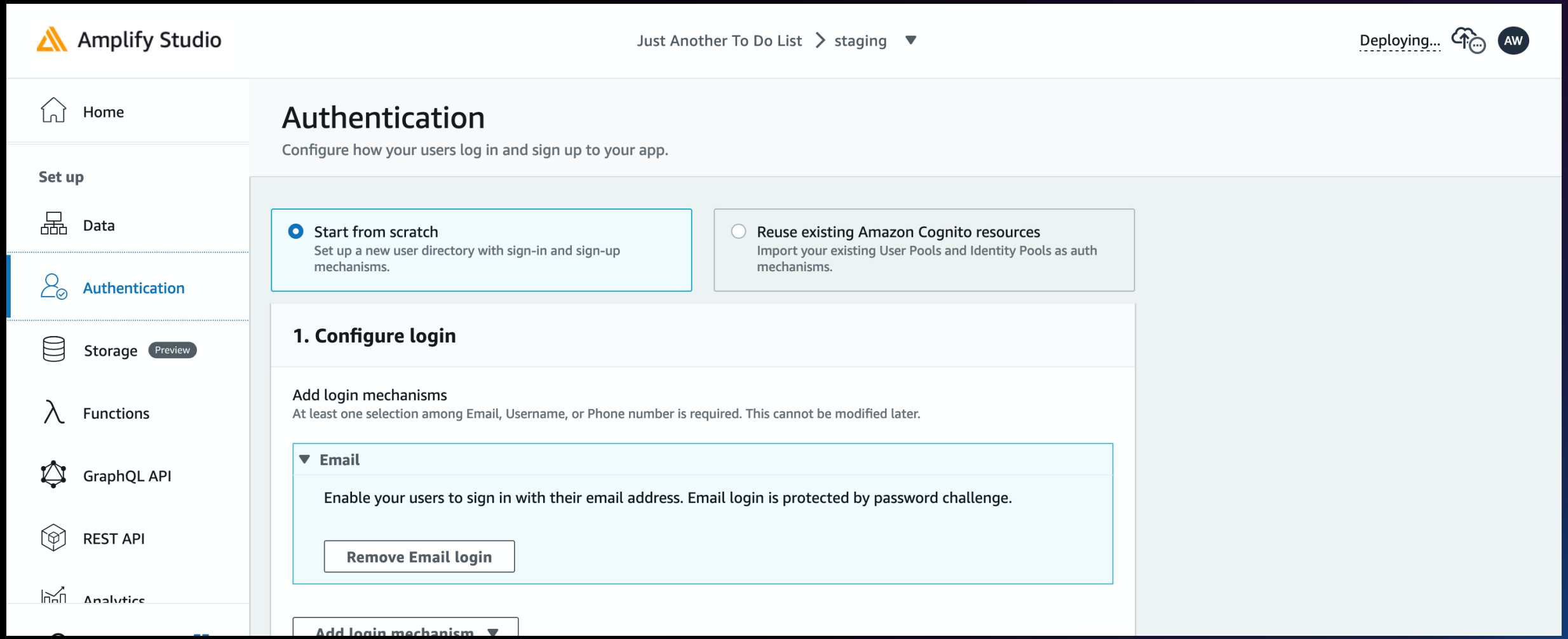
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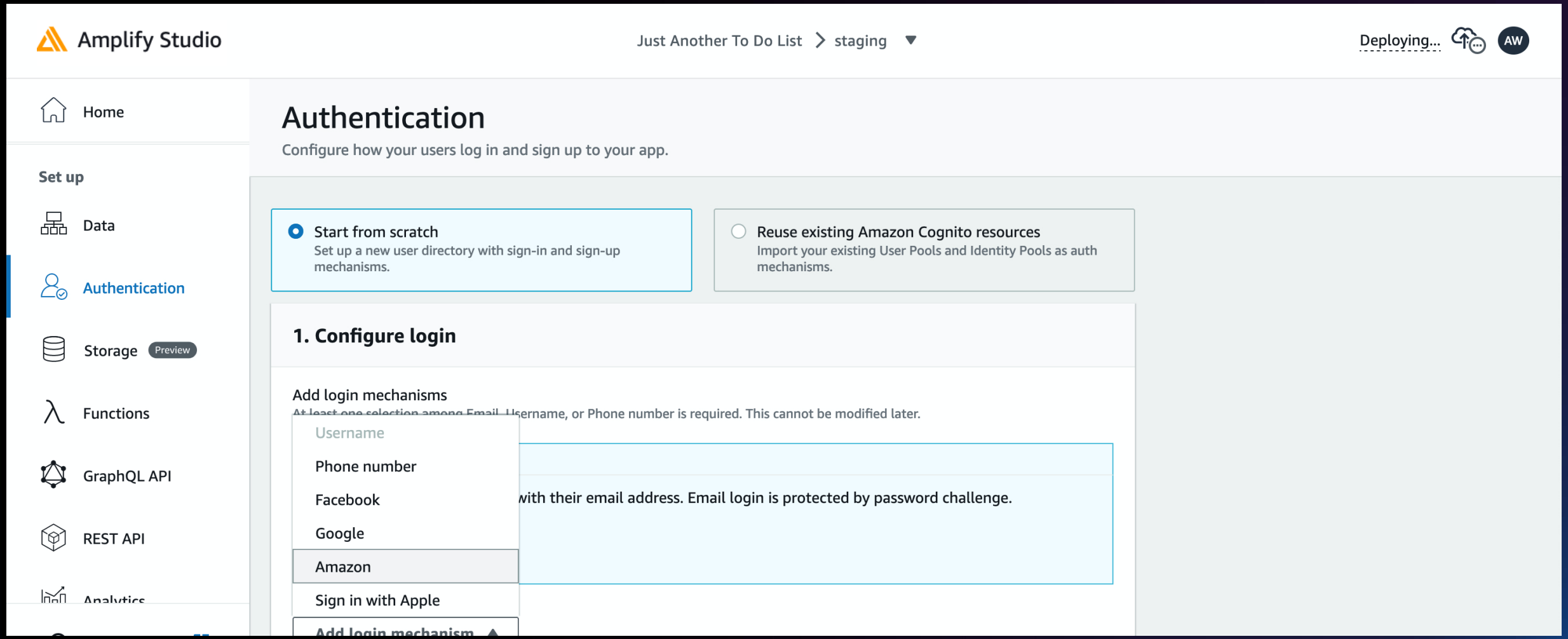
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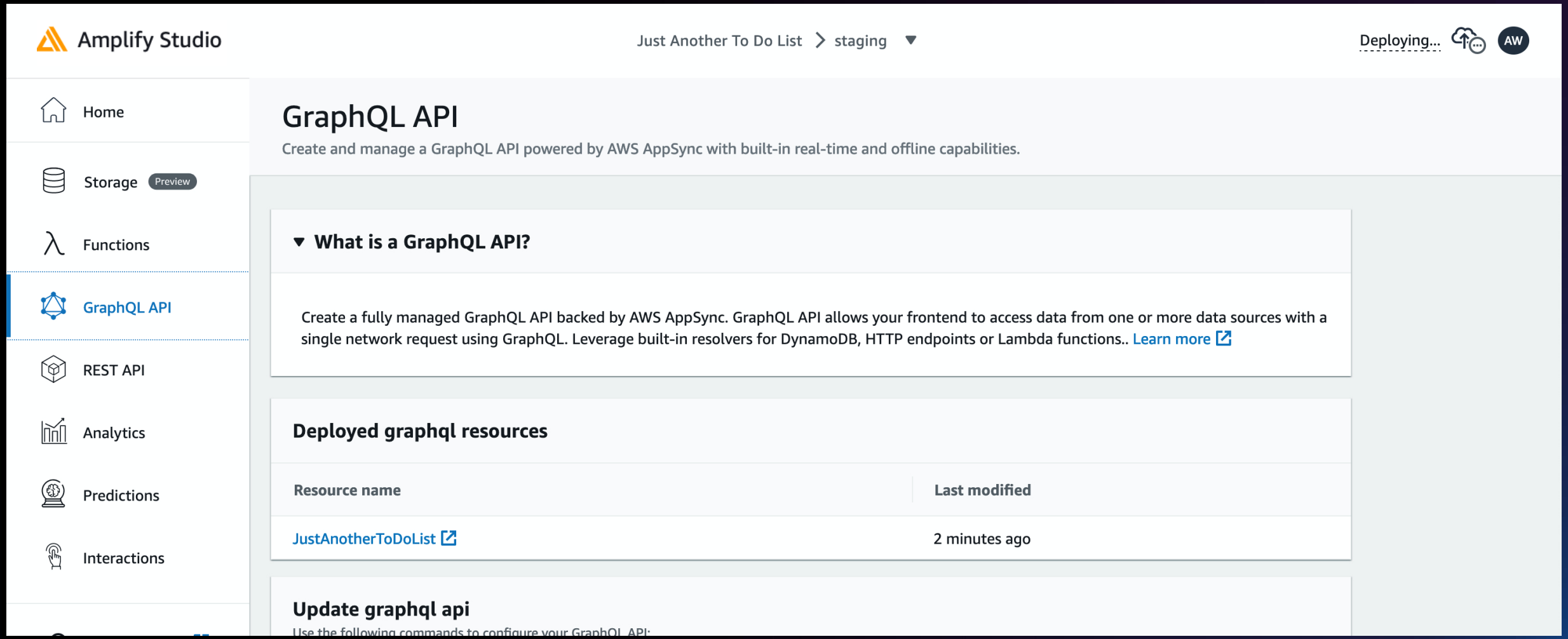
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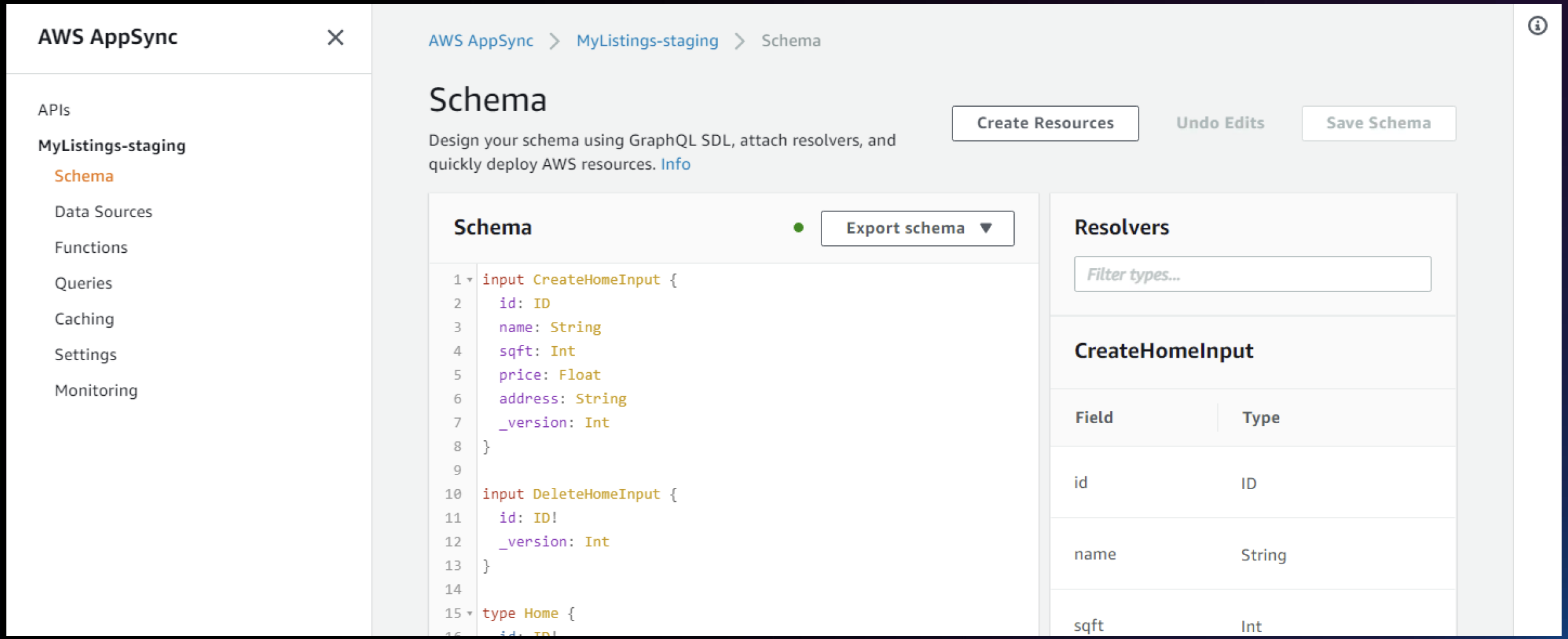
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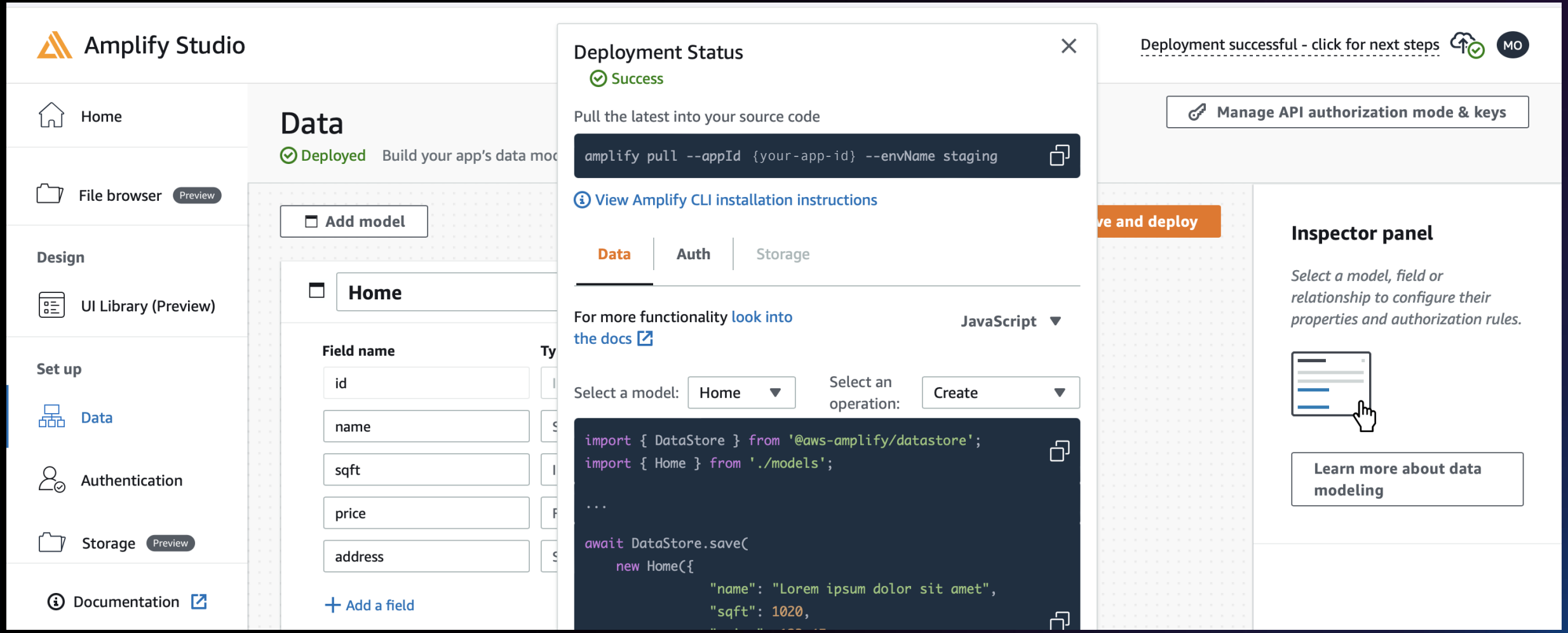
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```
emfree@emily amplify-backup % amplify pull --appId d1n0ogd6bc7vq2 --envName staging
Opening link: https://us-east-2.admin.amplifyapp.com/admin/d1n0ogd6bc7vq2/staging/verify/
✔ Successfully received Amplify Admin tokens.
Amplify AppID found: d1n0ogd6bc7vq2. Amplify App name is: Just Another To Do List
Backend environment staging found in Amplify Console app: Just Another To Do List
? Choose your default editor: Visual Studio Code
? Choose the type of app that you're building javascript
Please tell us about your project
? What javascript framework are you using vue
? Source Directory Path:  src
? Distribution Directory Path: dist
? Build Command:  npm run-script build
? Start Command: npm run-script serve
GraphQL schema compiled successfully.

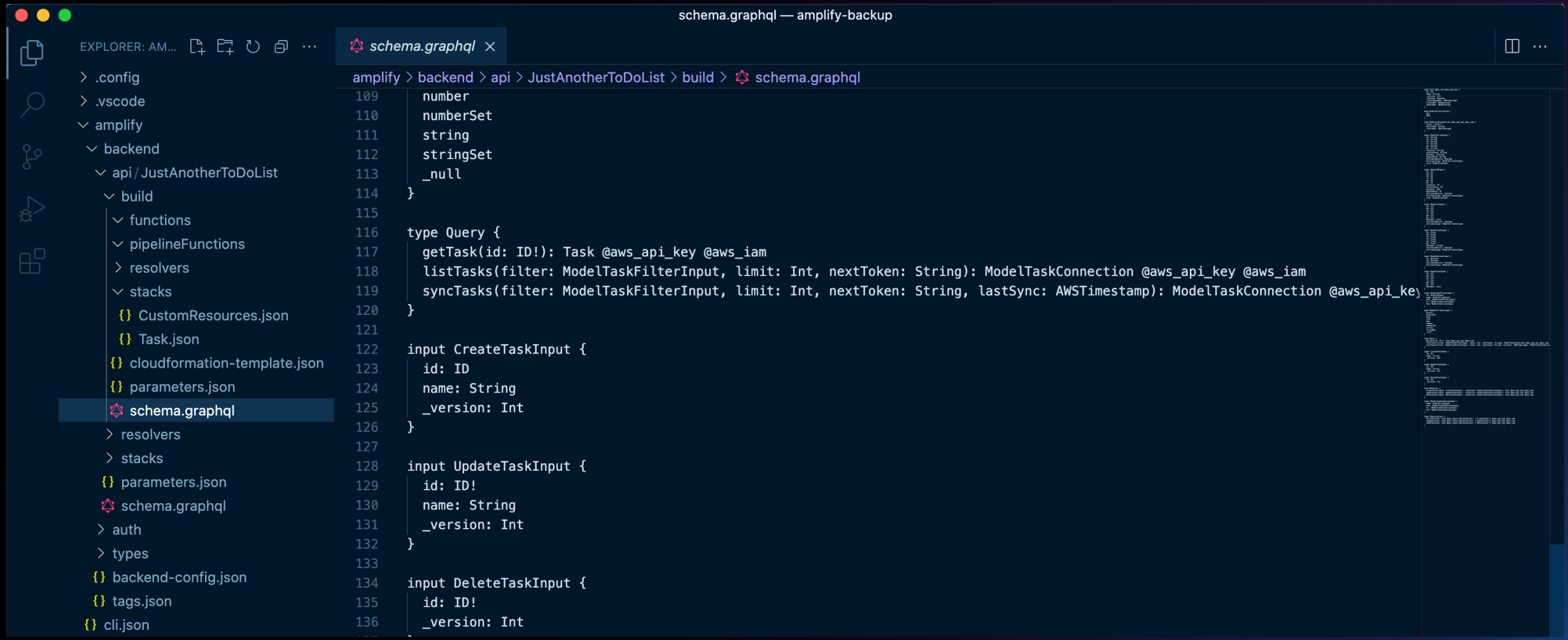
Edit your schema at /Users/emfree/amplify-backup/amplify-backend/api/MyListings/schema.graphql or place
.graphql files in a directory at /Users/emfree/amplify-backup/amplify/backend/api/MyListings/schema

Successfully generated models. Generated models can be found in /Users/emfree/amplify-backup/src
? Do you plan on modifying this backend? (Y/n)
```

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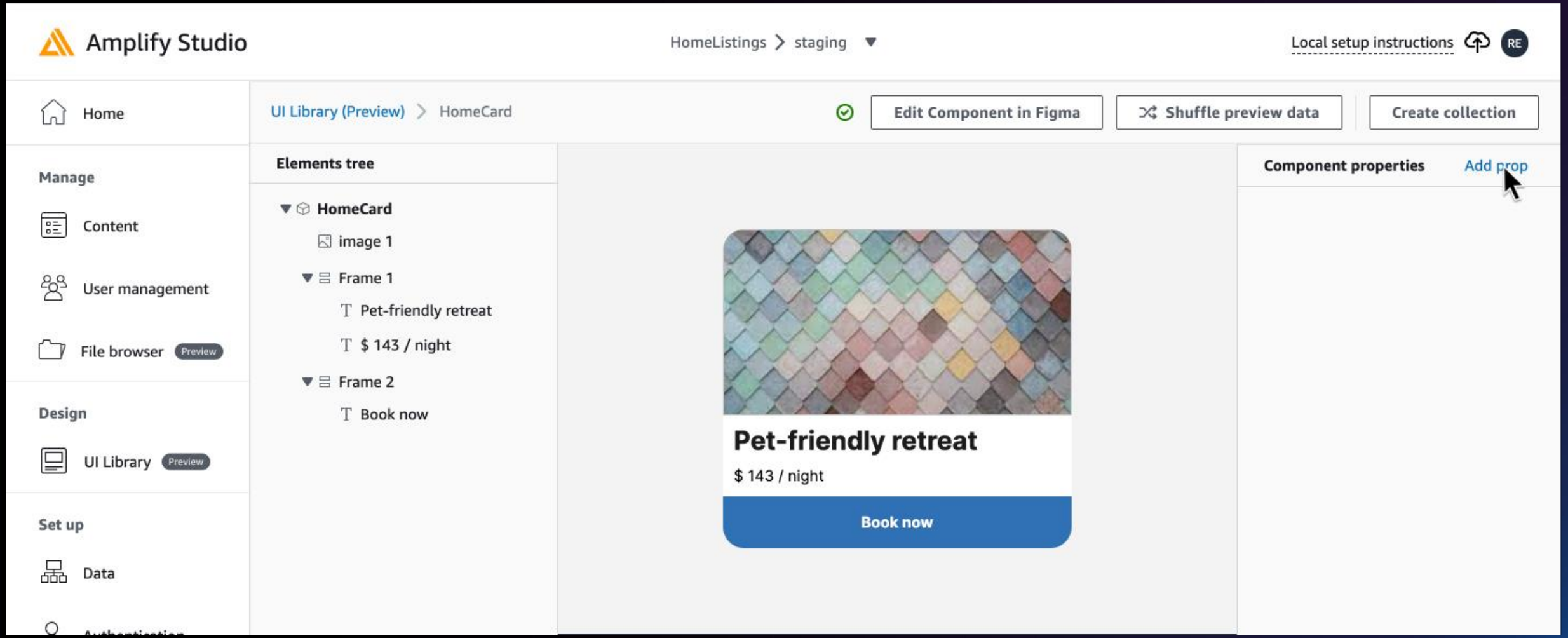
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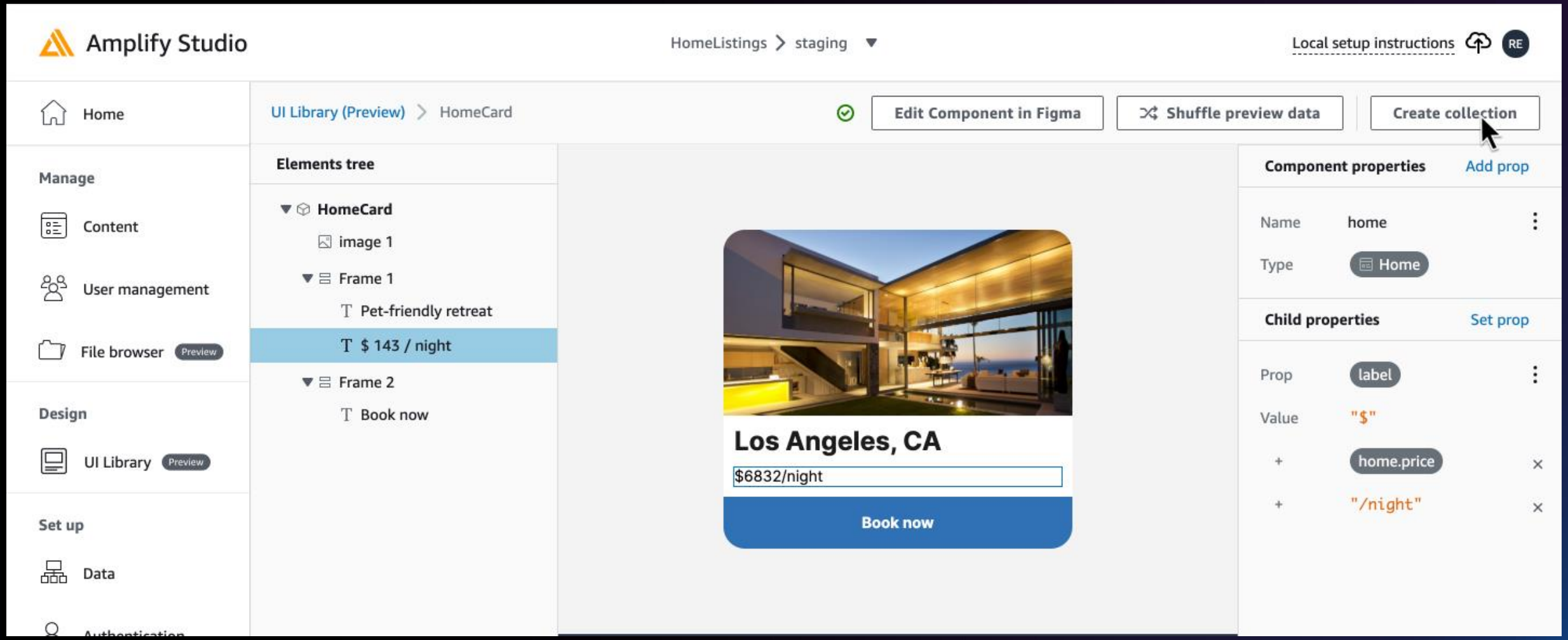
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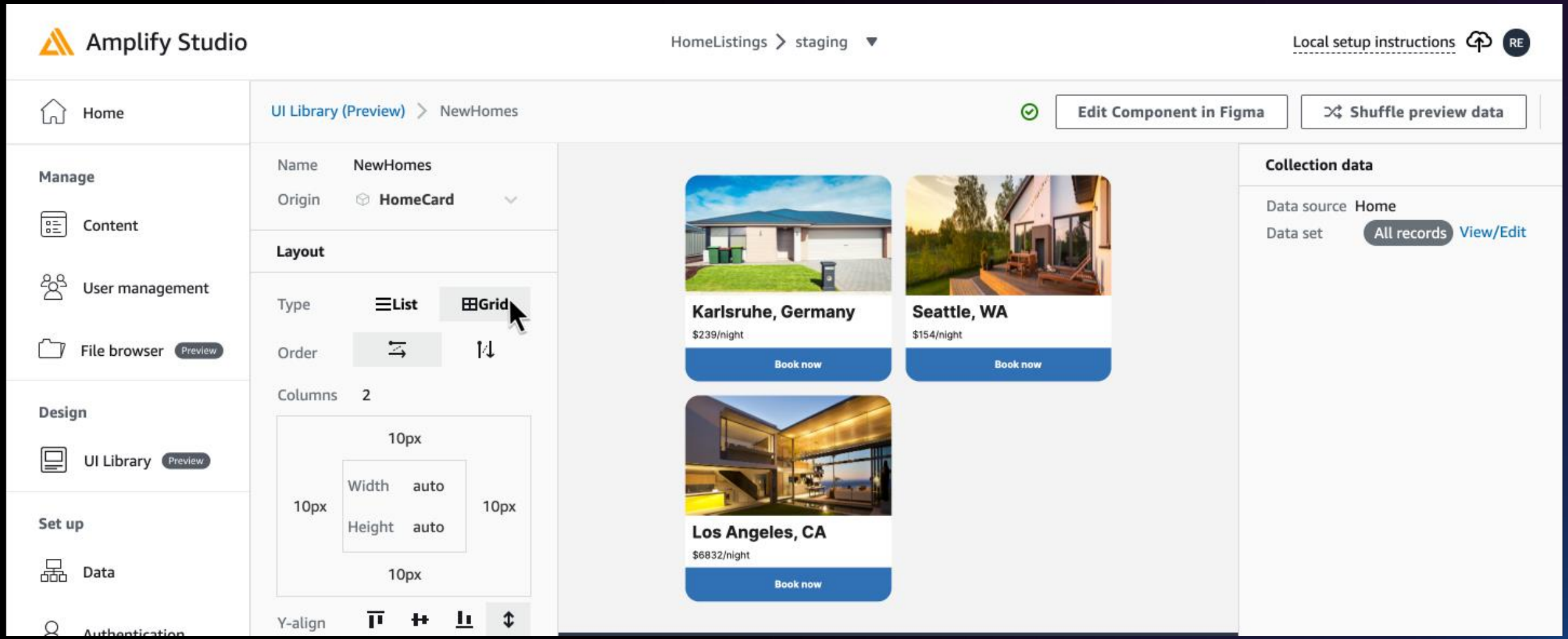
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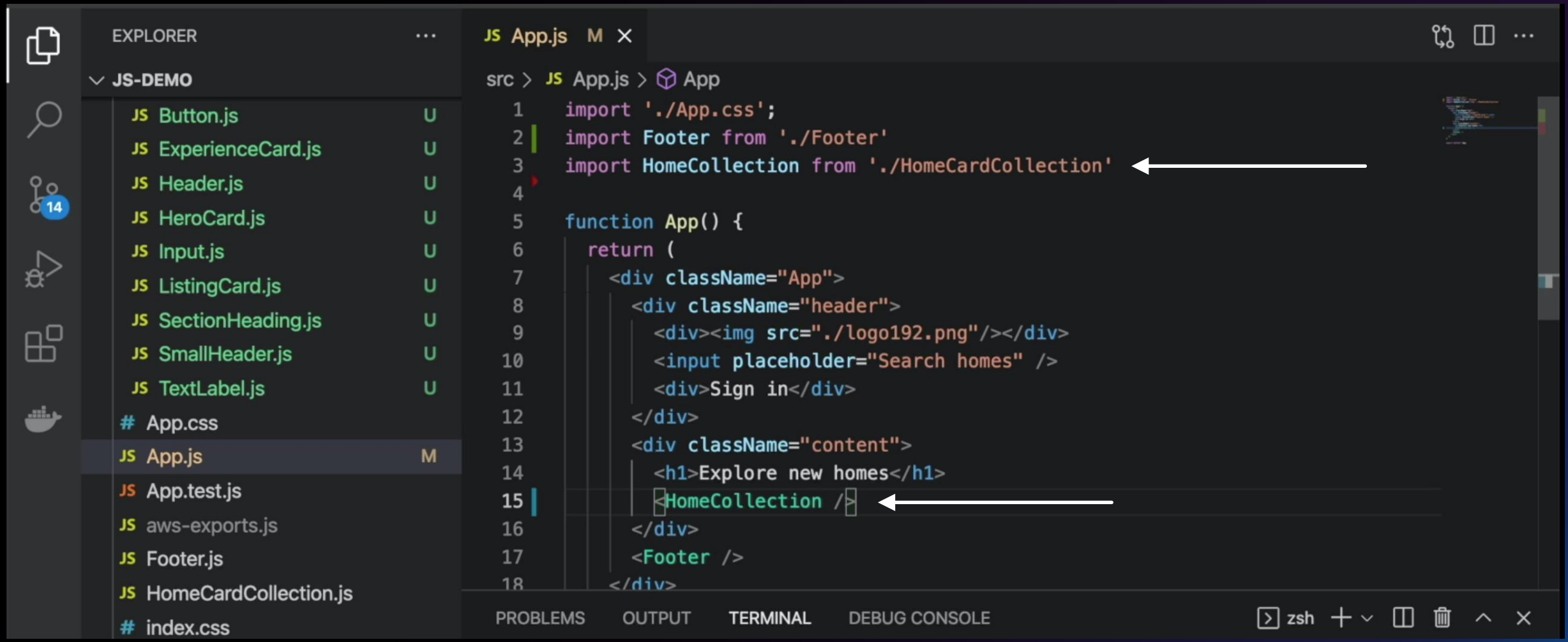
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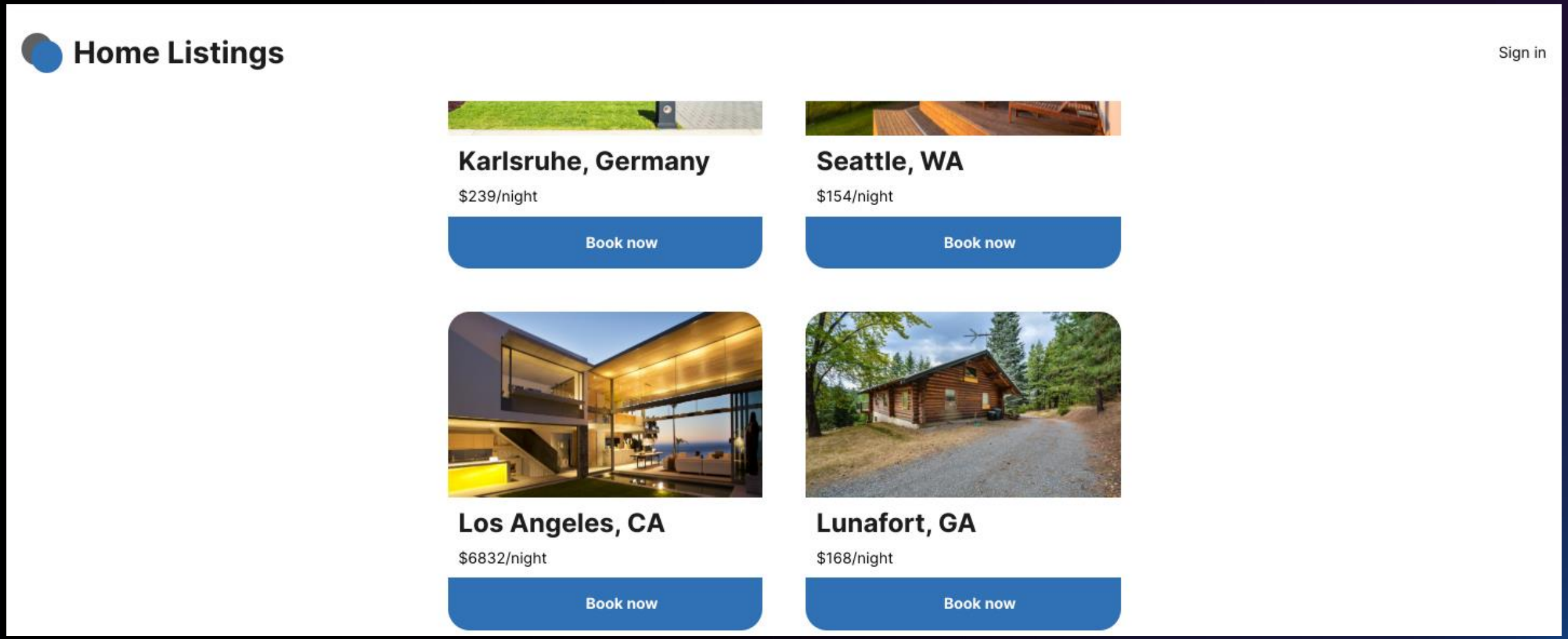
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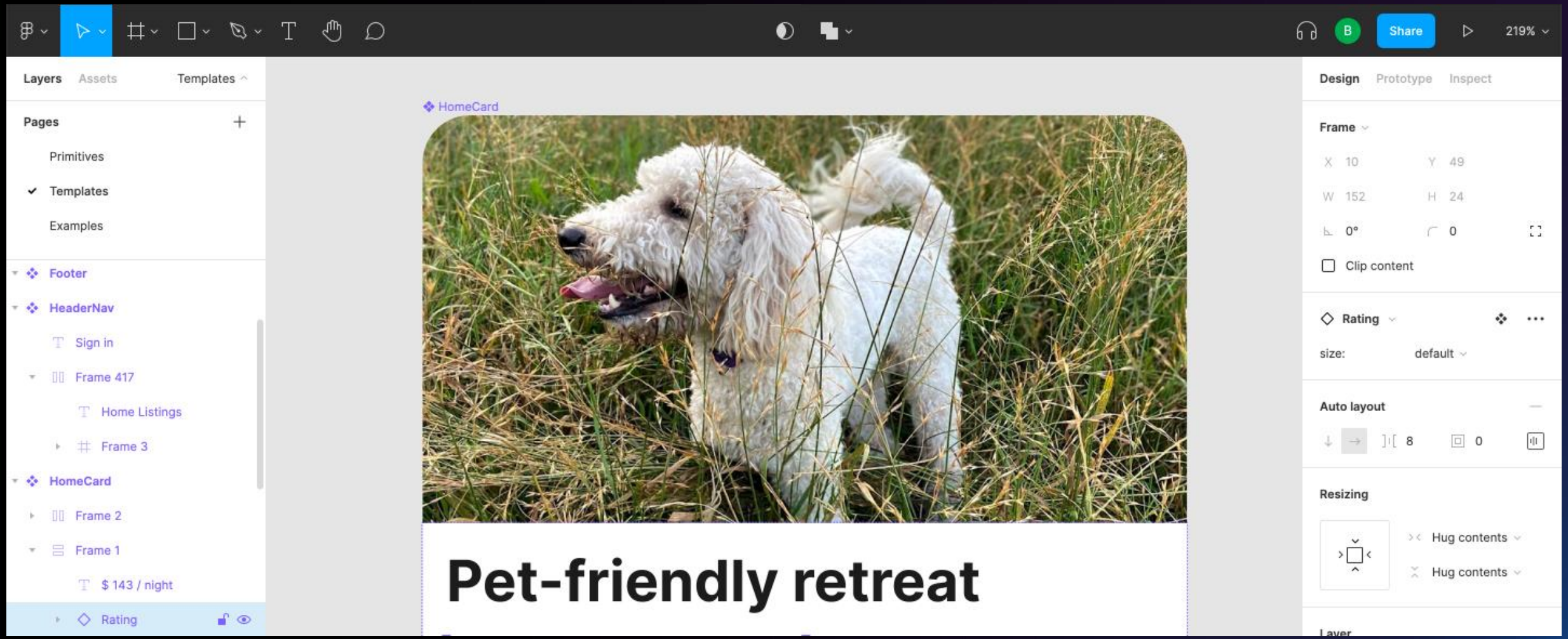
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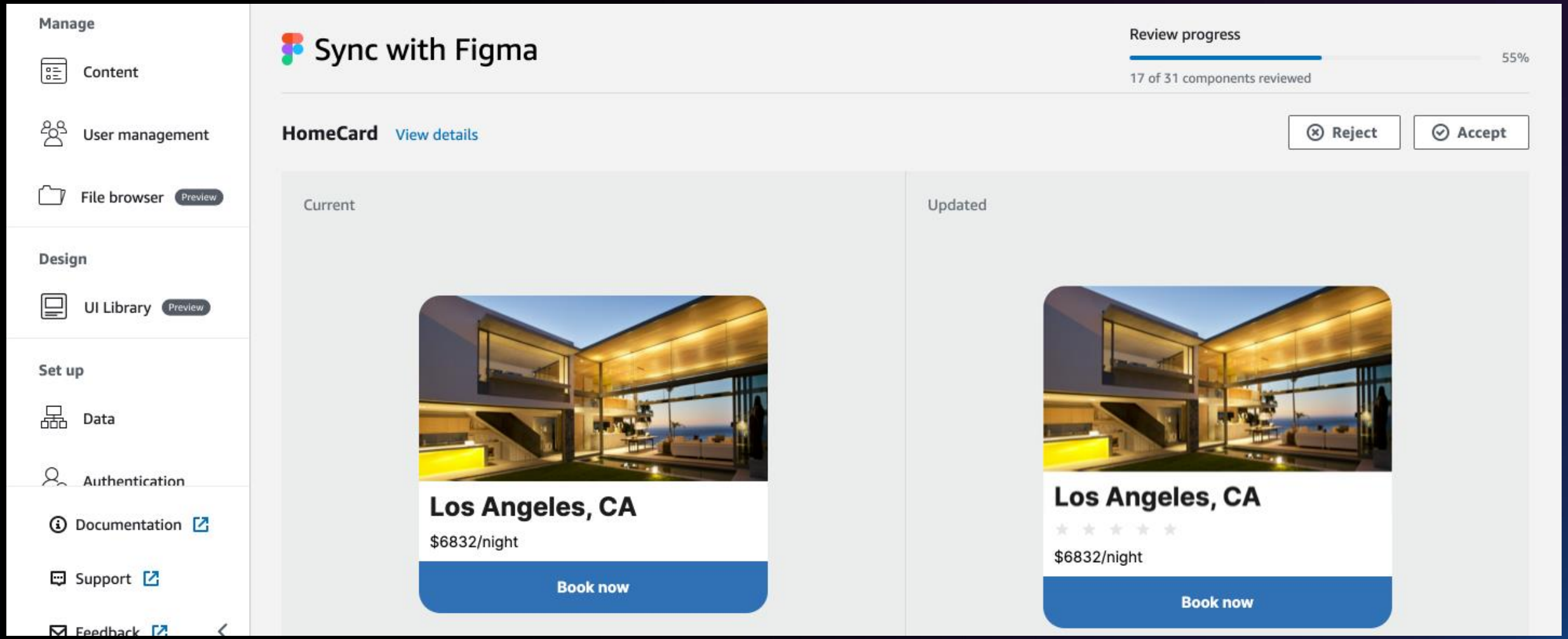
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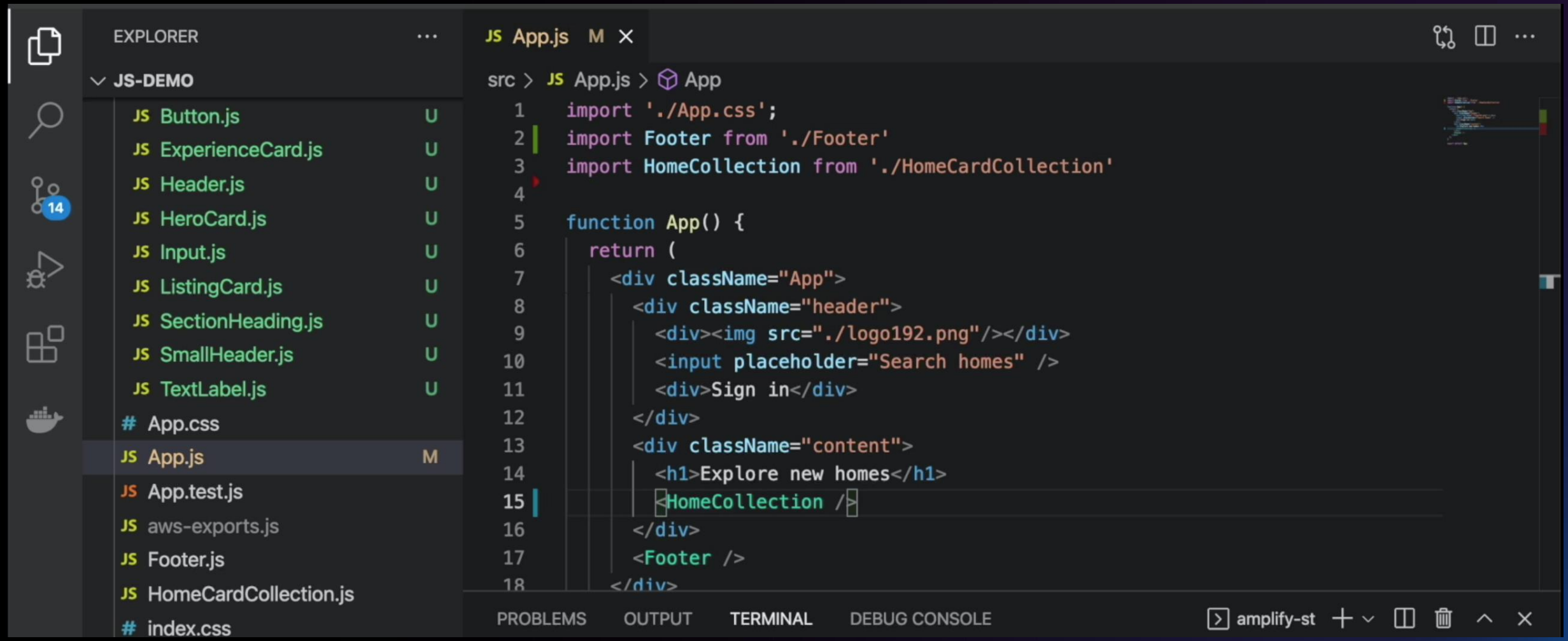
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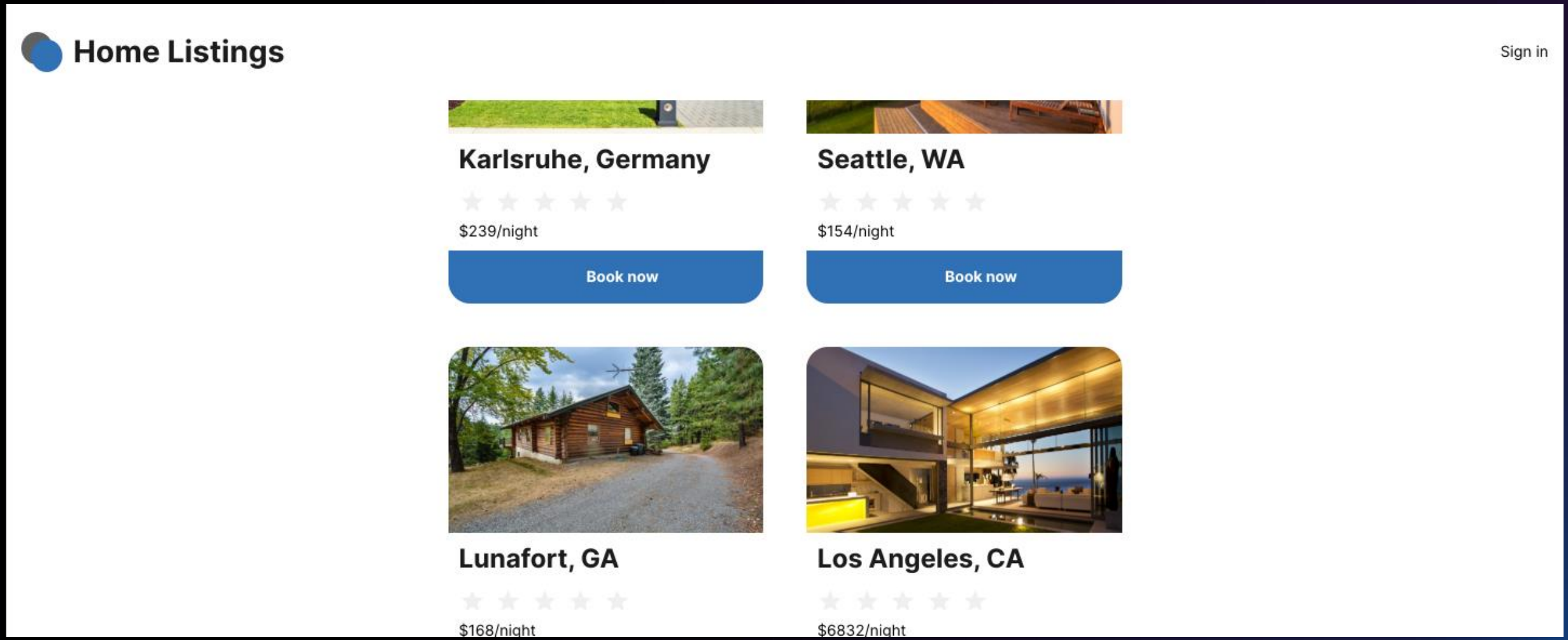
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Thank you!

Ken Exner

Emily Freeman

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