
AWS
re:Invent

WPS304

Achieving healthcare interoperability with FHIR Works on AWS

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Following on from Session WPS211

An introduction to healthcare interoperability and FHIR Works on AWS

Introduction to:

- The FHIR standard
- The open source toolkit: FHIR Works on AWS
- Use case categories commonly observed for FHIR



Agenda: What you'll be learning today

Logical architecture for use case categories from WPS211

Getting started with the toolkit

Technical architecture of the toolkit

How Black Pear Software adopted FHIR Works on AWS

Resources



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Logical architecture for use case categories from WPS211

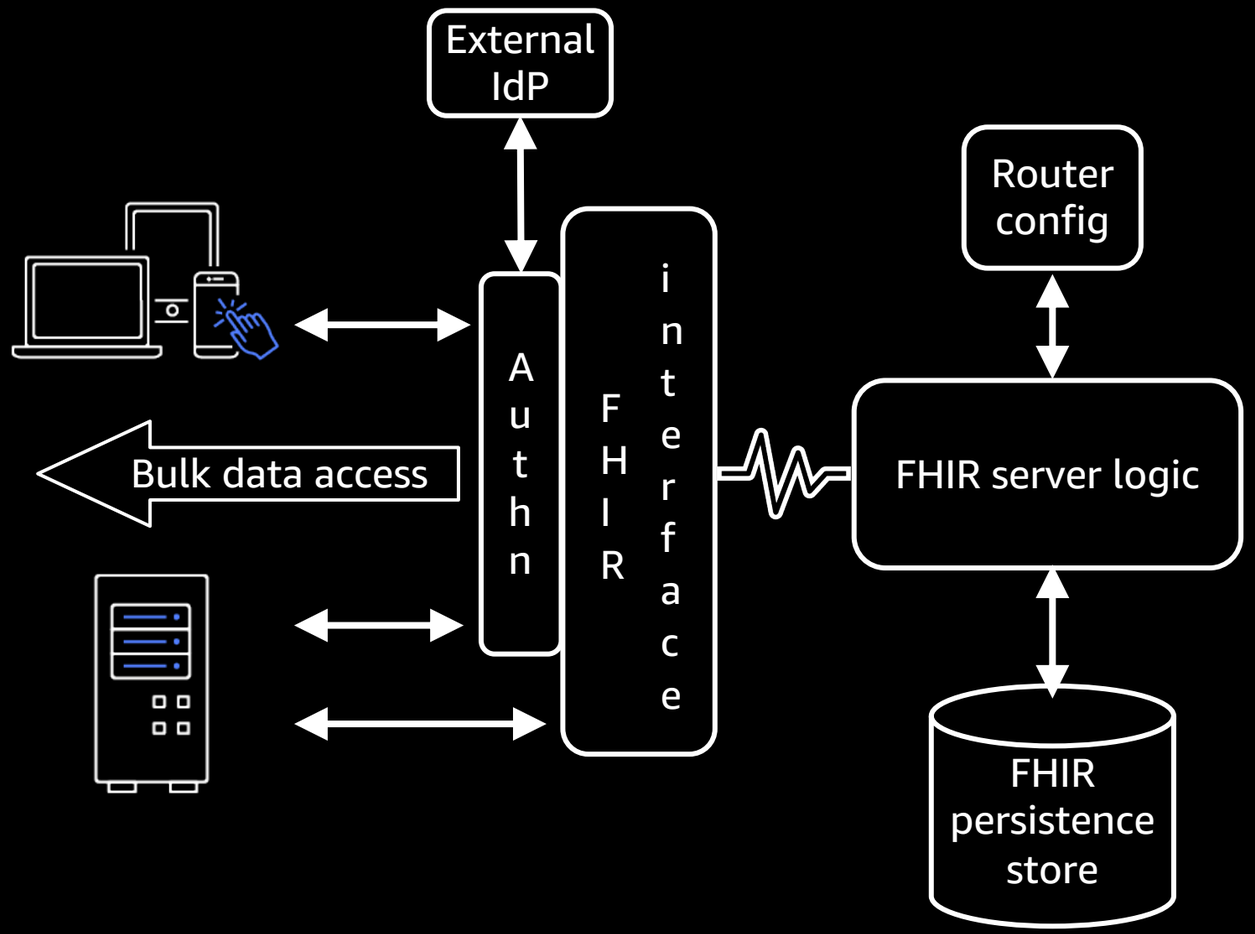


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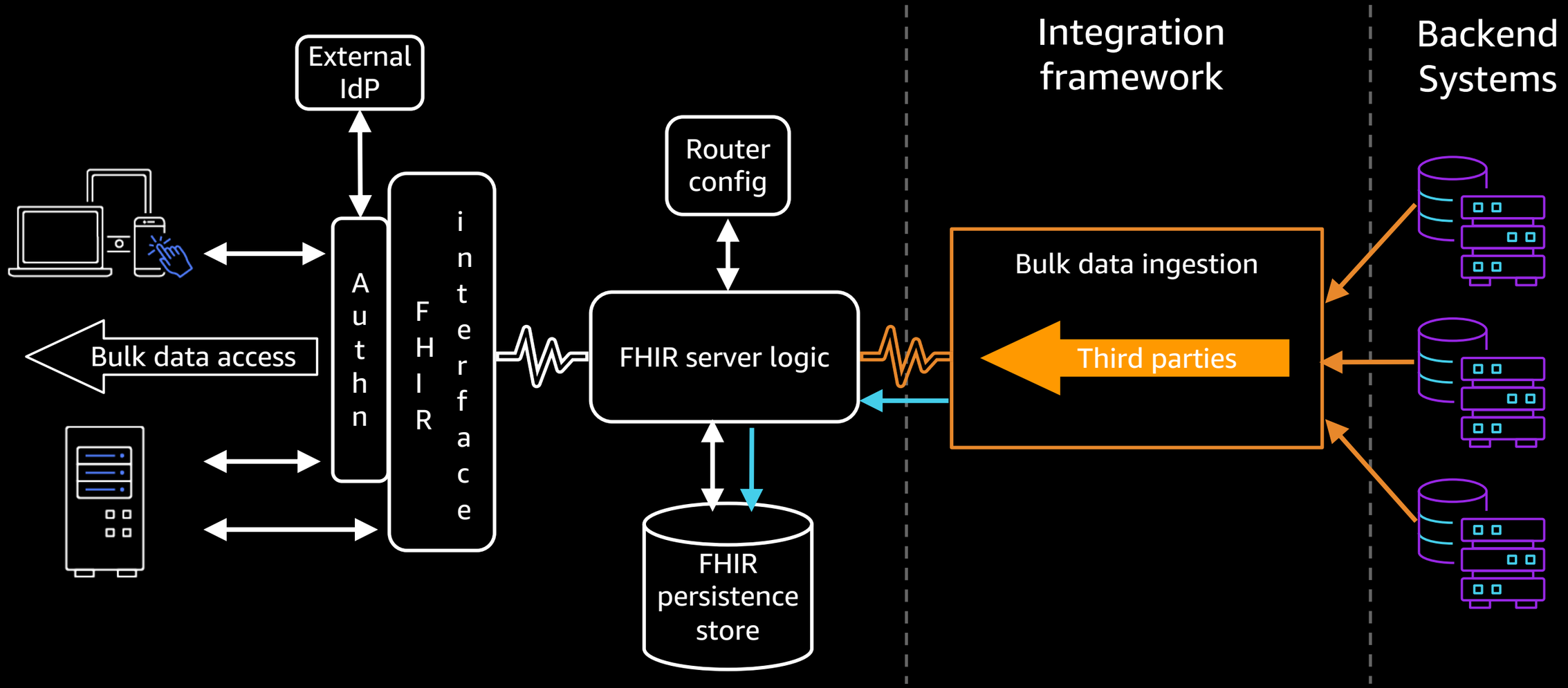
Logical architecture

USE CASE CATEGORY 1 – STANDARD FHIR SERVER



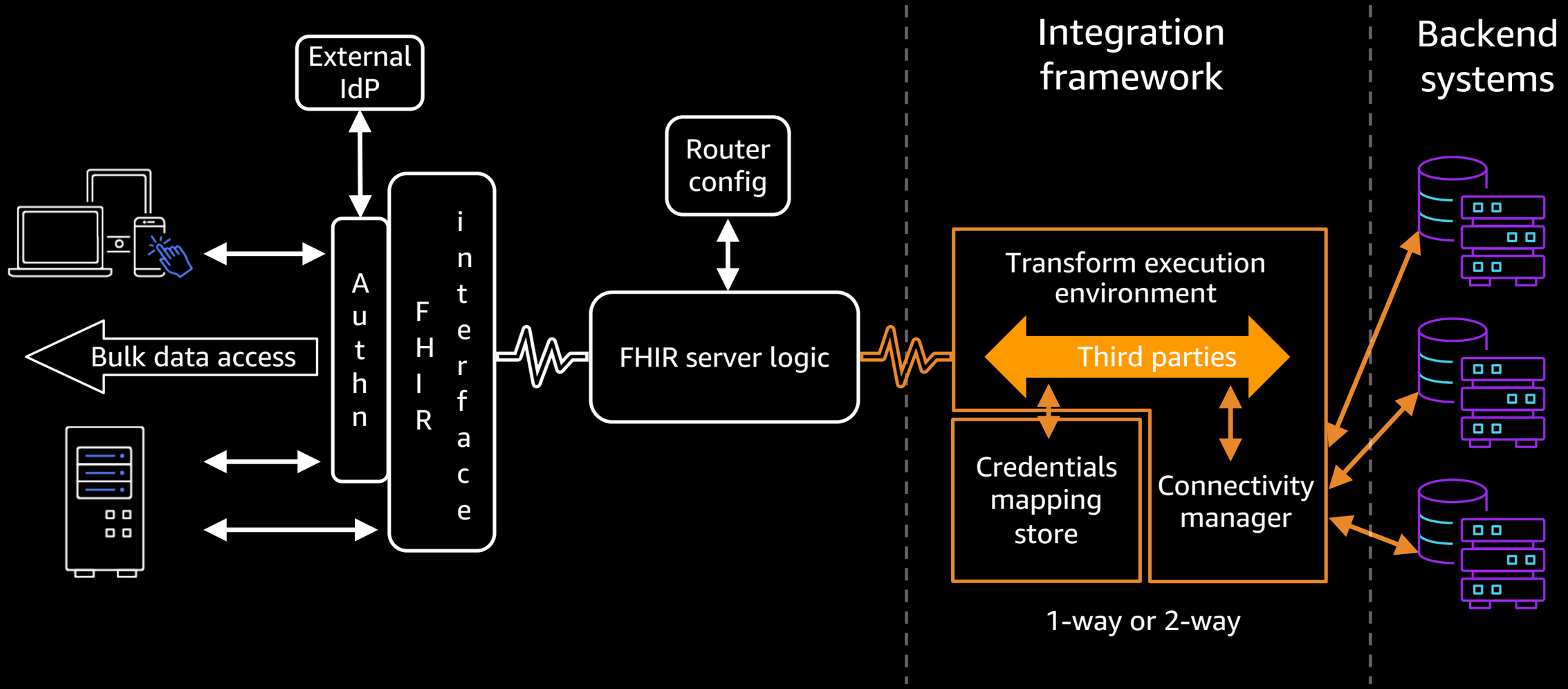
Logical architecture

USE CASE CATEGORY 2 – DATA AGGREGATION



Logical architecture

USE CASE CATEGORY 3 – DATA EXCHANGE



Getting started with the toolkit



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Getting started

REVIEW THE GITHUB REPOSITORY AND CHECK THE PREREQUISITES



Review the GitHub repository



Check prerequisites

- AWS account
- AWS Identity and Access Management (IAM) user with sufficient permissions (IAM policy supplied on GitHub)
- Installation resource RAM requirement (>1GB RAM needed, >4GB recommended)
- AWS CLI (Linux and macOS only)
- Windows PowerShell for AWS (Windows Only)
- Homebrew (macOS Only)

Getting started

GET THE CODE AND DEPLOY IT TO YOUR AWS ACCOUNT



Clone the repository

```
$ git clone https://github.com/awslabs/fhir-works-on-aws-deployment.git
```



Deploy using scripted install or manual instructions

- Package uses Serverless for deployment
- Linux / macOS, Windows, and Docker scripted installation provided
- Manual installation steps for macOS provided, other OS will be similar

Getting started

SCRIPTED INSTALLATION – LINUX / MACOS EXAMPLE



Deploy in your account

1. Configure your AWS credentials

```
$ aws configure
```

2. Install into your AWS account in a few simple commands

Choose your Region (e.g., eu-west-1) and stage (e.g., dev, prod, test)

```
$ cd fhir-works-on-aws-deployment
$ chmod +x ./scripts/install.sh
$ sudo ./scripts/install.sh --region <REGION> --stage <STAGE>
```

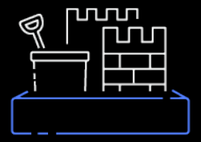
Getting started

SEE WHAT IS DEPLOYED AND TEST THE DEPLOYMENT



Observe Serverless output and AWS CloudFormation output to see resources deployed

These include: Amazon ES endpoint, Kibana endpoint, Amazon Cognito user pool details, Amazon S3 buckets for binary and deployment, and Amazon API Gateway endpoint



Test deployment using included Postman collection

GET / metadata capability statement

Example patient and binary queries included for create (POST), read (GET), vread (GET), update (PUT), delete (DELETE), and search (GET)

Technical architecture of the toolkit

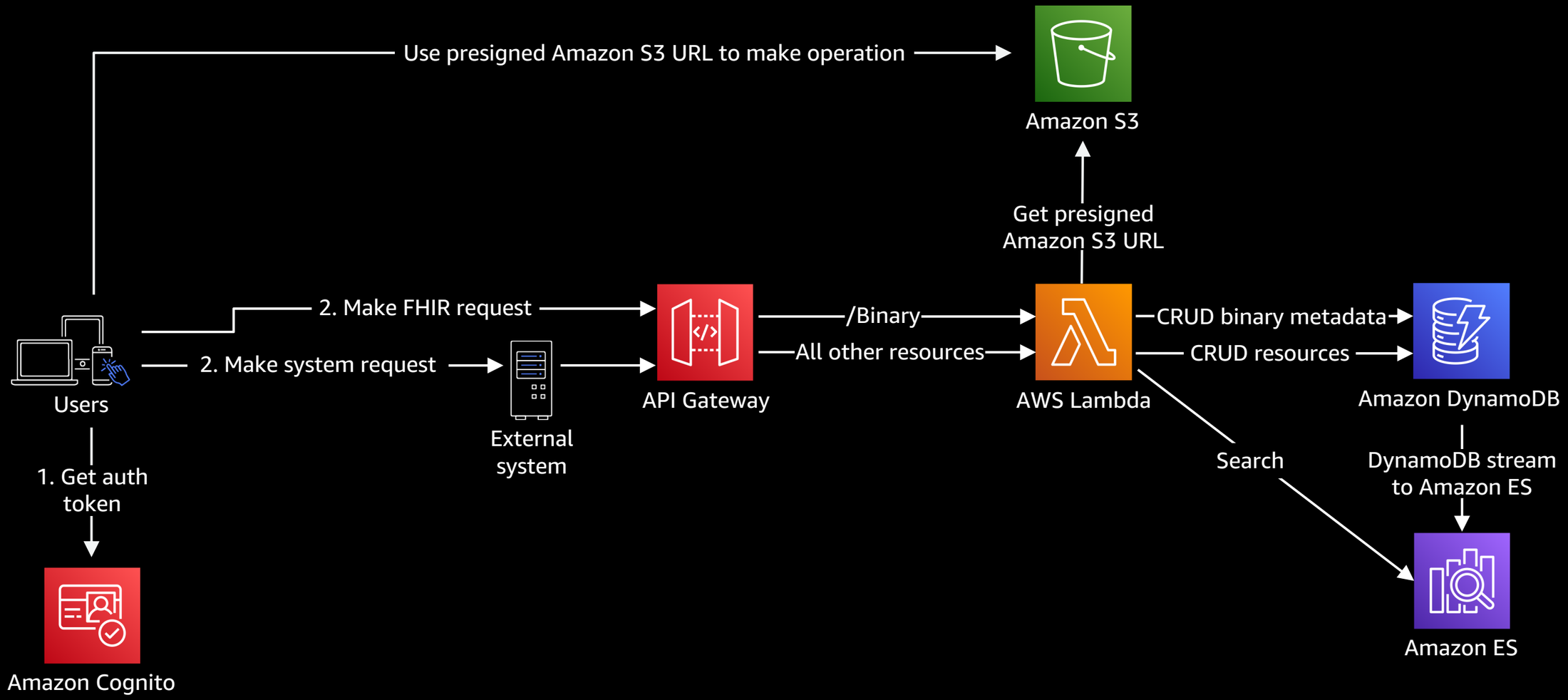


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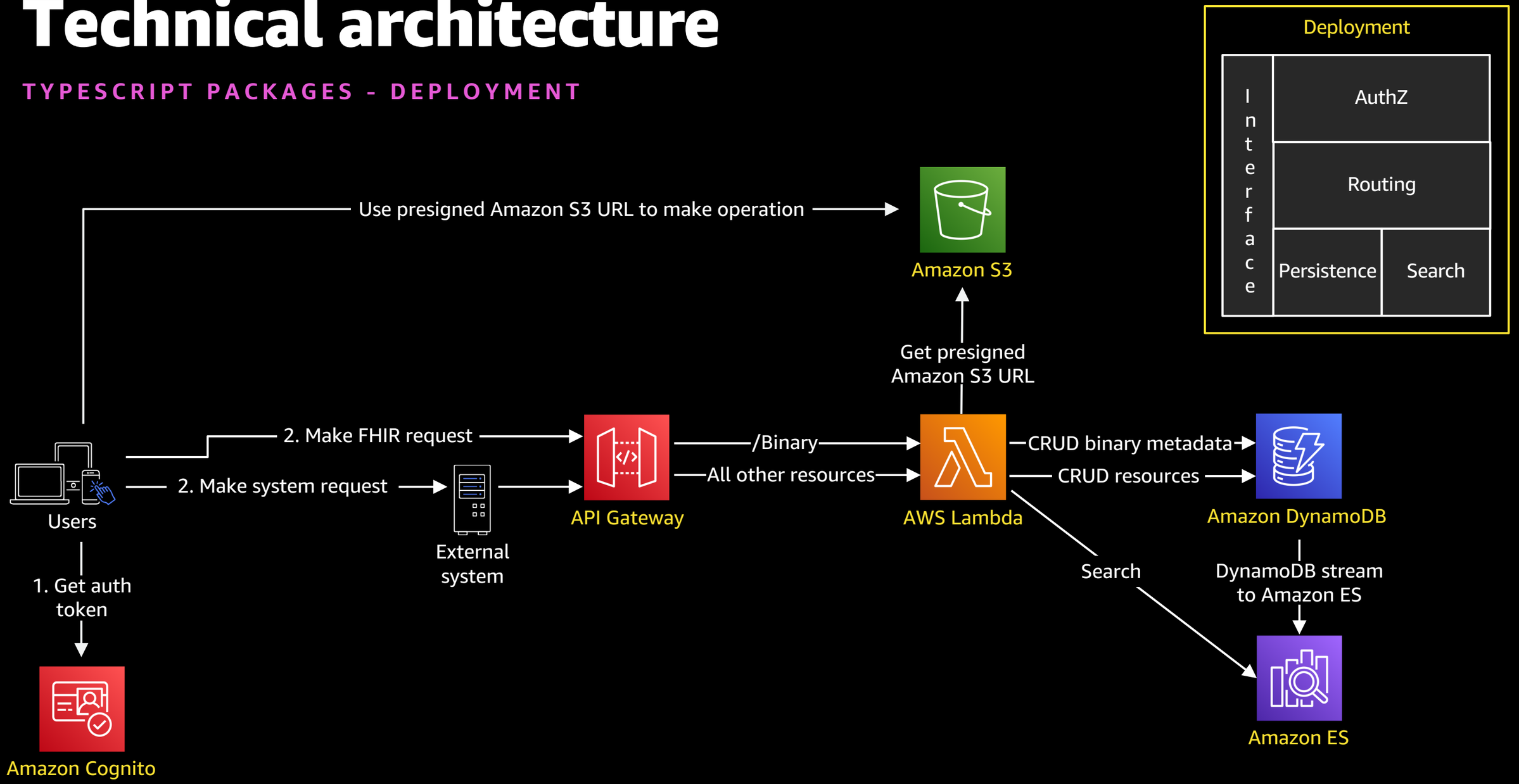
Technical architecture

REFERENCE GITHUB DEPLOYMENT: USE CASE CATEGORY 1 – STANDARD FHIR SERVER



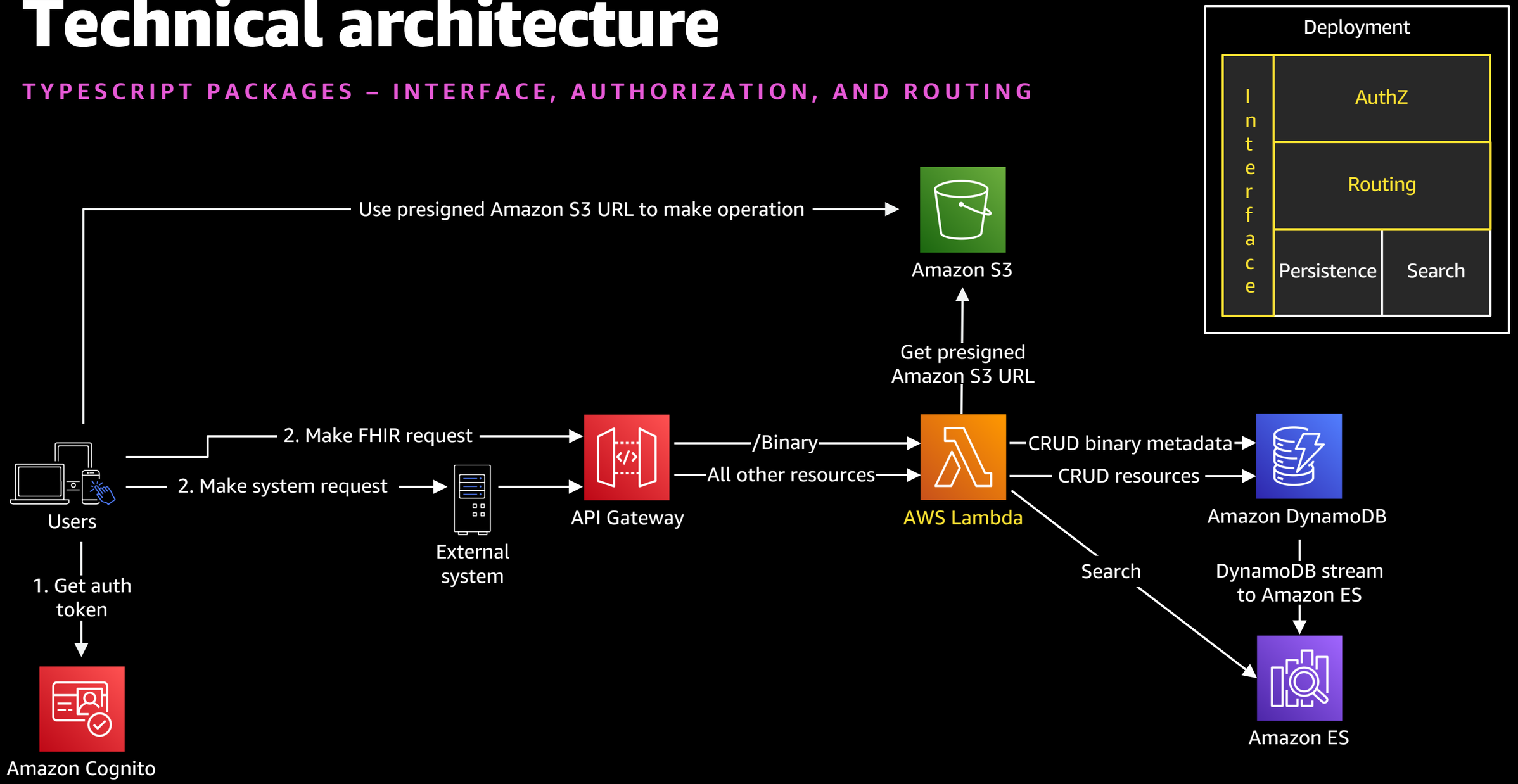
Technical architecture

TYPESCRIPT PACKAGES - DEPLOYMENT



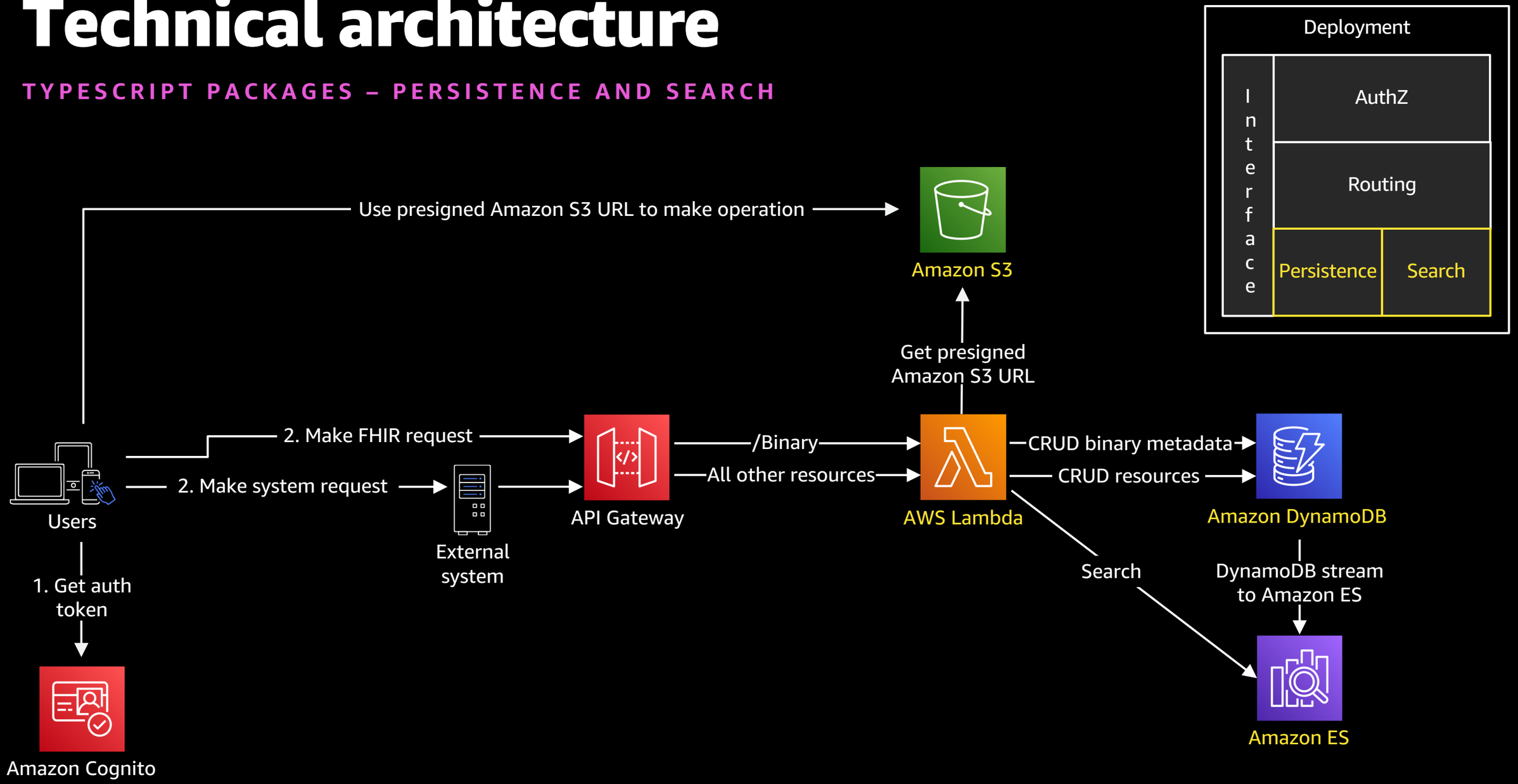
Technical architecture

TYPESCRIPT PACKAGES – INTERFACE, AUTHORIZATION, AND ROUTING



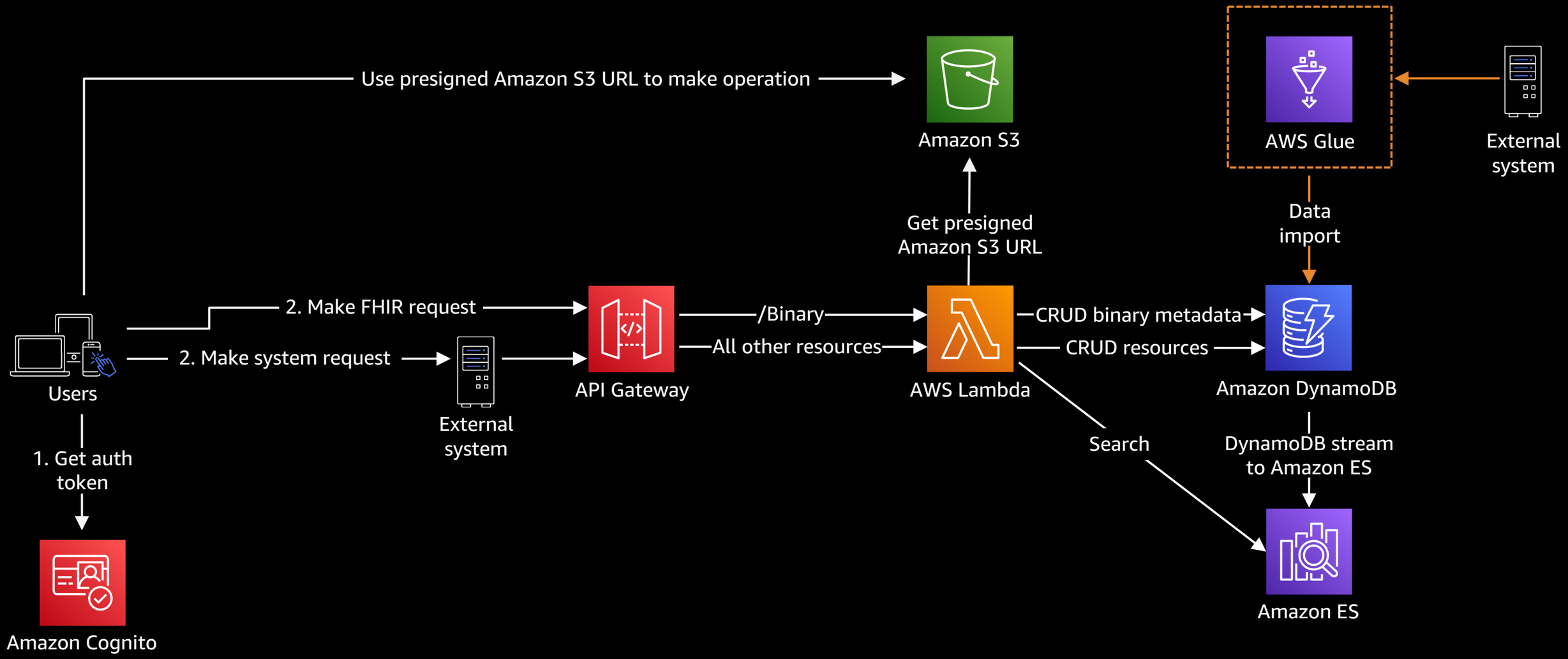
Technical architecture

TYPESCRIPT PACKAGES – PERSISTENCE AND SEARCH



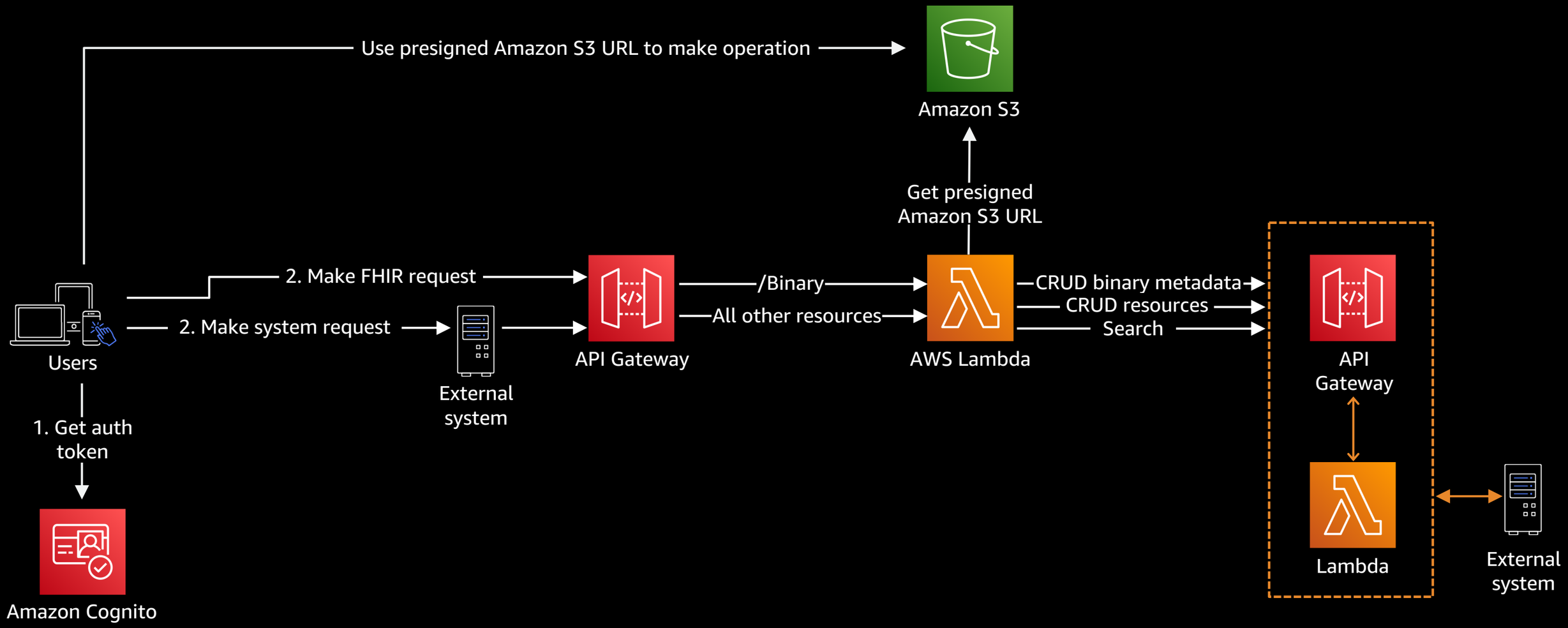
Technical architecture

USE CASE CATEGORY 2 – DATA AGGREGATION WITH INTEGRATION FRAMEWORK



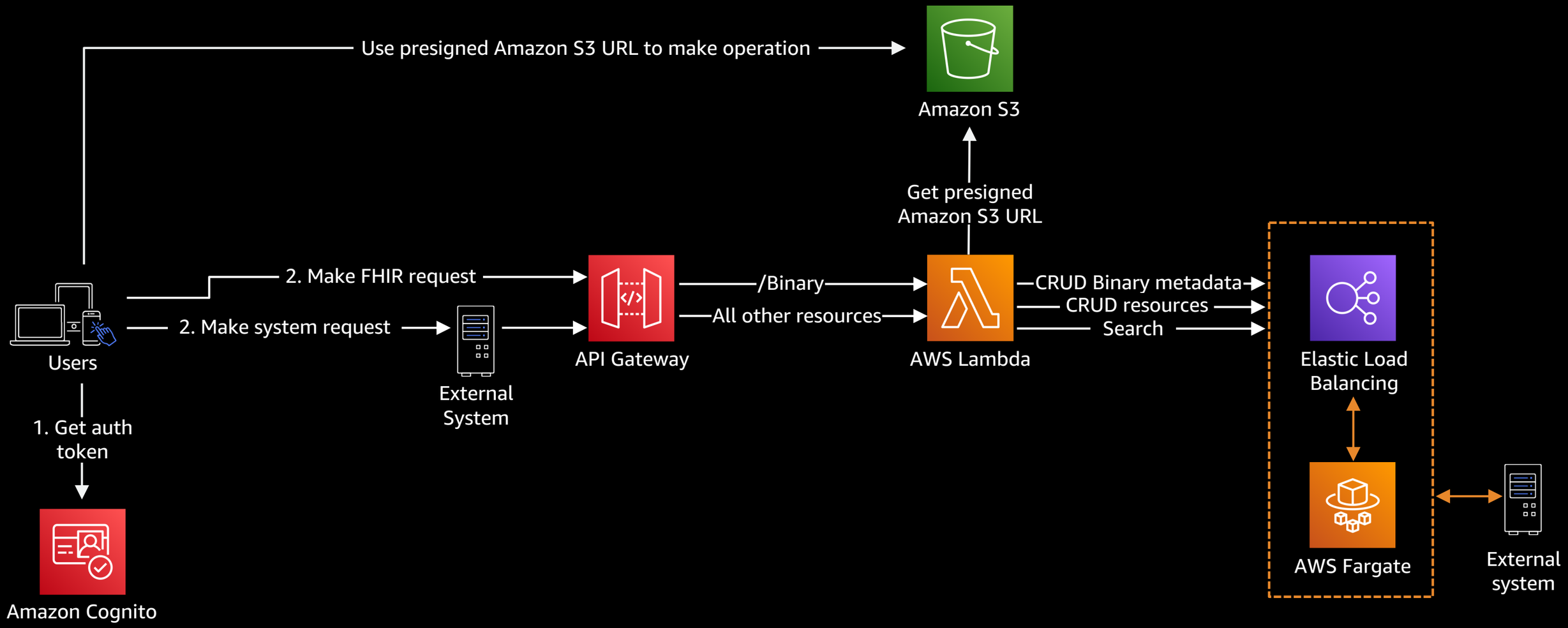
Technical architecture

USE CASE CATEGORY 3 – DATA EXCHANGE WITH INTEGRATION FRAMEWORK



Technical architecture

USE CASE CATEGORY 3 – DATA EXCHANGE WITH INTEGRATION FRAMEWORK



How Black Pear Software adopted FHIR Works on AWS



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Who are our customers?

Health system providers wanting to share data with others

App and service builders wanting to use health record data

Adapter pattern

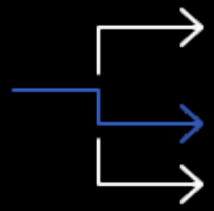


Components of a FHIR Adapter



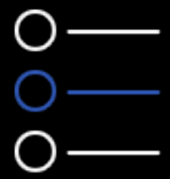
Standards

Formal specification for how the API must work



Router

Common capabilities needed by all FHIR APIs



Interfaces

Simple interfaces for each FHIR API interaction



Transform

Convert data from native to FHIR format (and vice versa)



Source

Health information system containing useful data

Example ‘search-type’ interaction

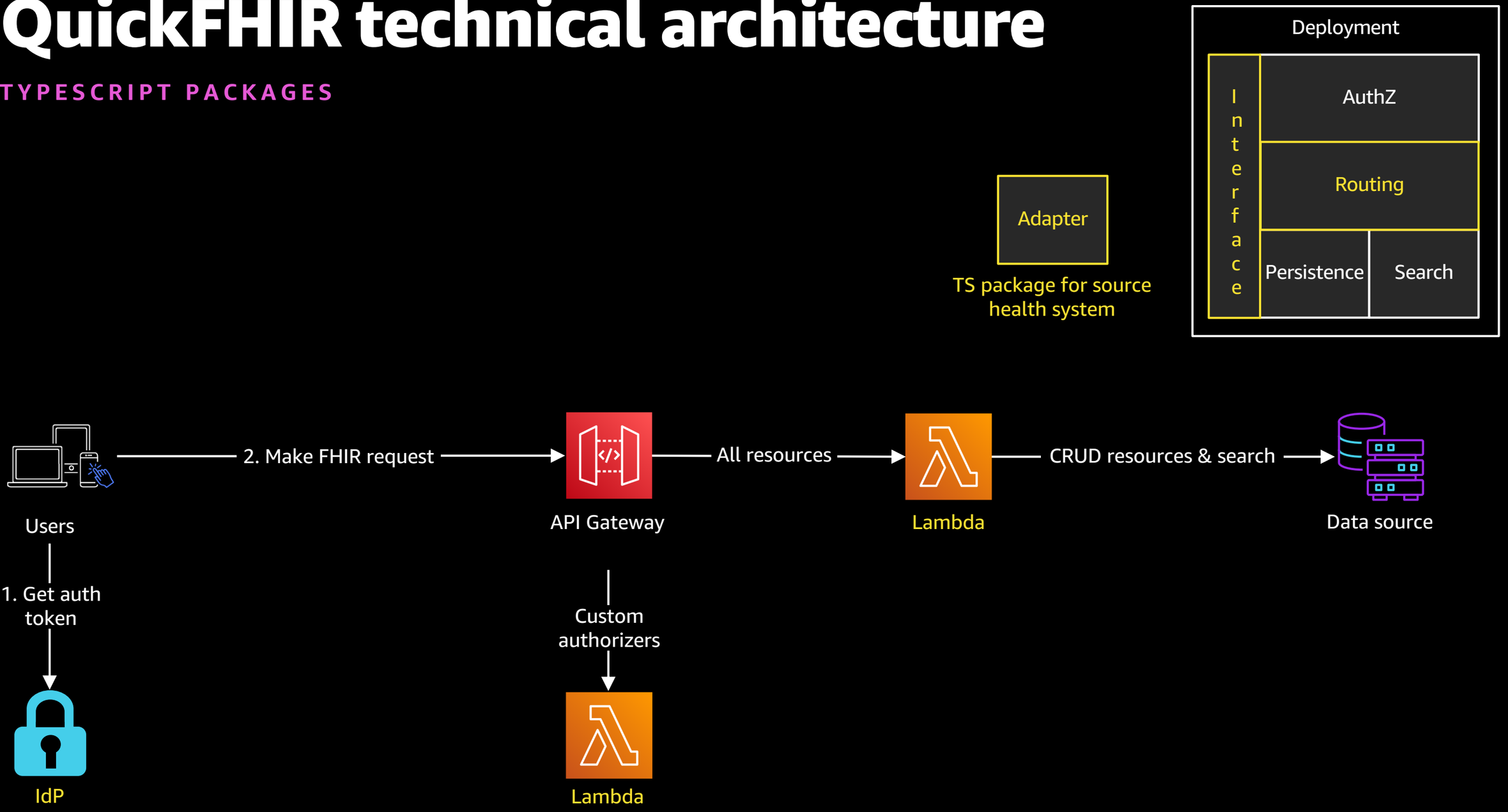
```
export class SearchService implements Search {
    async typeSearch(request: TypeSearchRequest): Promise<SearchResponse> {
       if (request.resourceType !== ‘Patient’)
           throw new Error('Method not implemented.');

       let sqlQuery: any = makeSqlQuery(request);
       let dbRecords: any = await db().exec(sqlQuery)
       let fhirResources: any = dbRecords.map(toFhirResource);
       let result: SearchResult = makeSearchResponse(fhirResources);
       let response: SearchResponse = {result};
       return response;
    }

    async globalSearch(request: GlobalSearchRequest): Promise<SearchResponse> {
        throw new Error('Method not implemented.');
    }
}
```

QuickFHIR technical architecture

TYPESCRIPT PACKAGES



In less than 15 minutes, a customer can:

- Choose an off-the-shelf FHIR API
- Launch it through AWS Marketplace
- Customize the API to their exact needs
- Start using the API



QuickFHIR

from Black Pear

HL7 FHIR®. Cloud scale.



Black Pear Software

Resources



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Resources

DEVELOPING AND CONTRIBUTING



Review GitHub documentation

- DEVELOPMENT.md
- CONTRIBUTING.md



Create pull requests



Create GitHub issues

Resources

Release blog – FHIR Works on AWS

https://aws.amazon.com/blogs/opensource/using-open-source-fhir-apis-with-fhir-works-on-aws/

GitHub repository – FHIR Works on AWS

https://github.com/awslabs/fhir-works-on-aws-deployment

Black Pear Software Ltd and QuickFHIR

https://blackpear.com/ and https://quickfhir.cloud/

Healthcare sessions at re:Invent 2020

ID	TITLE
HLC201	Healthcare executive outlook: Accelerating transformation
HLC202	Making healthcare more personal with MetroPlus Health
HLC203	Securing personal health information and high-risk data sets
HLC204	Accelerating the transition to telehealth with AWS
WPS202	Transform research environments with Service Workbench on AWS
WPS209	Reinventing medical imaging with machine learning on AWS
WPS211	An introduction to healthcare interoperability and FHIR Works on AWS
WPS304	Achieving healthcare interoperability with FHIR Works on AWS
AIM303	Using AI to automate clinical workflows
AIM310	Intelligent document processing for insurance industry
MKT206	Simplify healthcare compliance with third-party solutions
GPS211	AWS Partners driving innovation amidst COVID-19

Thank you!



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