AWS re:Invent

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

GPS309

Creating interoperable real-time clinical applications

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AWS

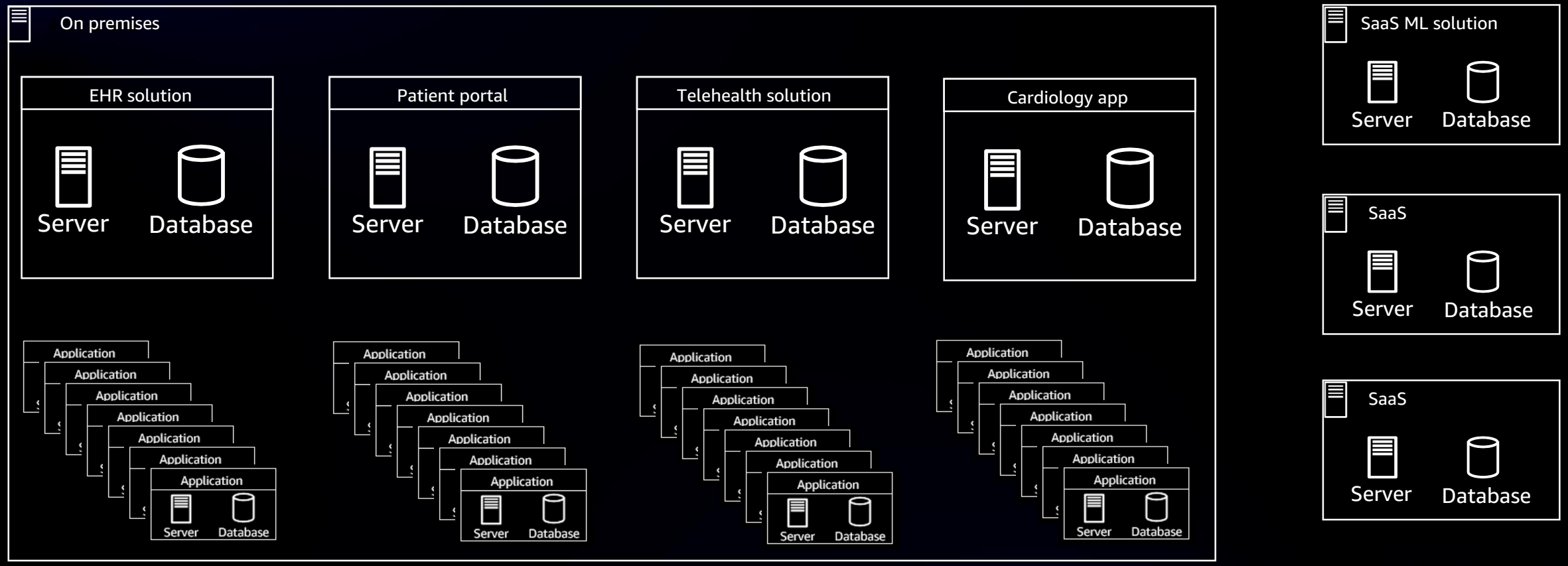
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Senior Partner Solutions Architect, HCLS
AWS

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Silos in healthcare

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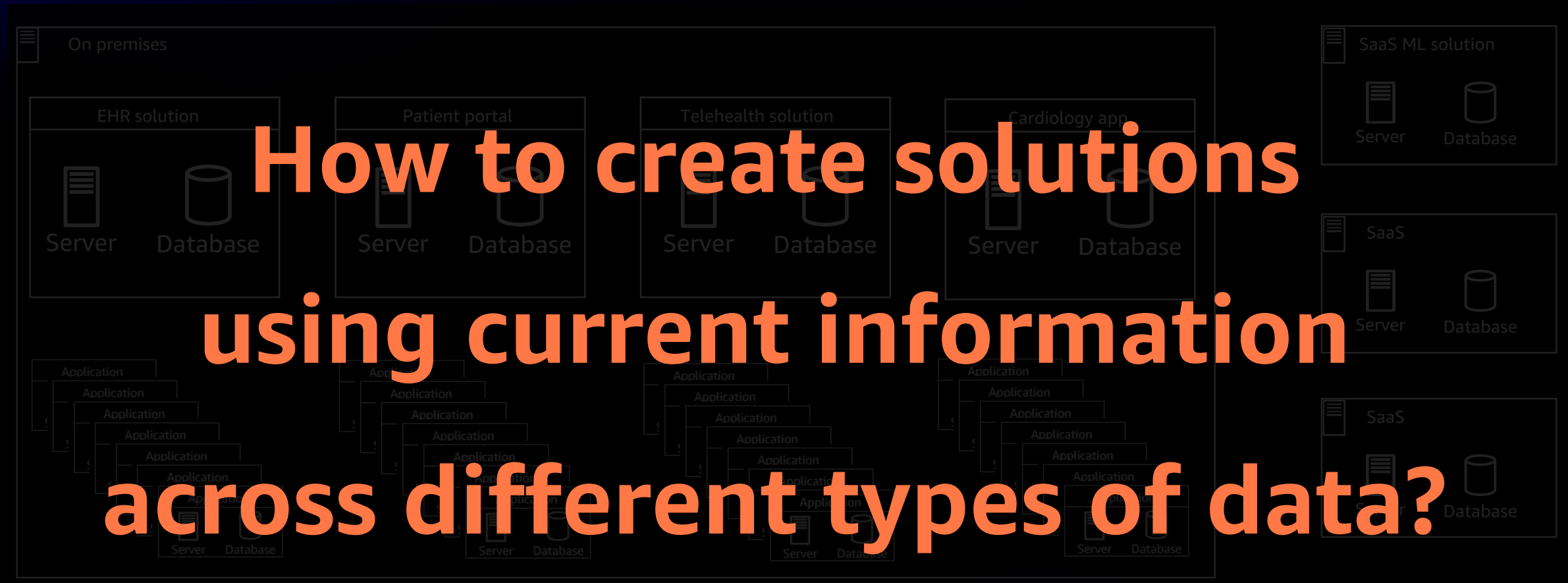
The problem: Current silos in healthcare



Inconsistent data models. Multiple locations. Monolithic solutions.

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The challenge



How to create solutions using current information across different types of data?

Inconsistent data models. Multiple locations. Monolithic solutions.

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Interoperability on AWS

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What is interoperability?



It is the ability of different information systems, devices, and applications (systems) to access, exchange, integrate, and cooperatively use data in a coordinated manner, within and across organizational, regional, and national boundaries, **to provide timely and seamless portability of information** and optimize the health of individuals and populations globally.

https://www.himss.org/resources/interoperability-healthcare

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HL7 FHIR

Evolutionary development path from HL7 Version 2 and CDA

Easy to implement

Interoperability out of the box; human-readable

Eliminates guesswork of data formats

Follows web standards

JSON, HTTP, OAuth . . .

RESTful architecture

Allows seamless exchange of information using messages or documents

Flexible and free

Free to use with no restrictions; can be adapted for different needs

21st Century Cures Act adoption

Final Rule supports seamless and secure access, exchange, and use of electronic health information

aws

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FHIR on AWS

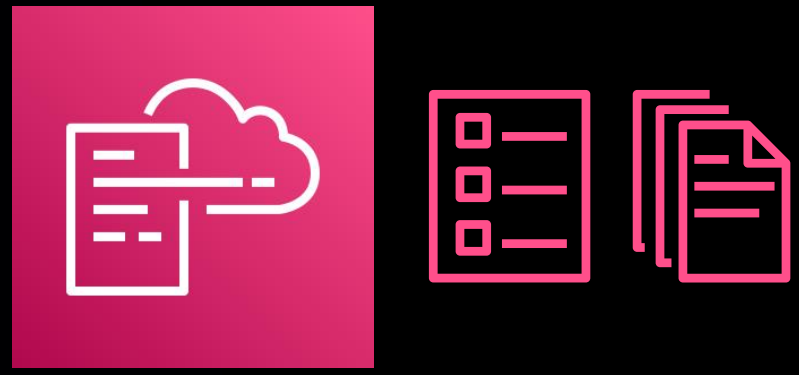


Amazon HealthLake

Health AI/ML service

Built-in medical NLP of FHIR data

Managed AWS service



FHIR Works on AWS

An AWS Solutions Implementation

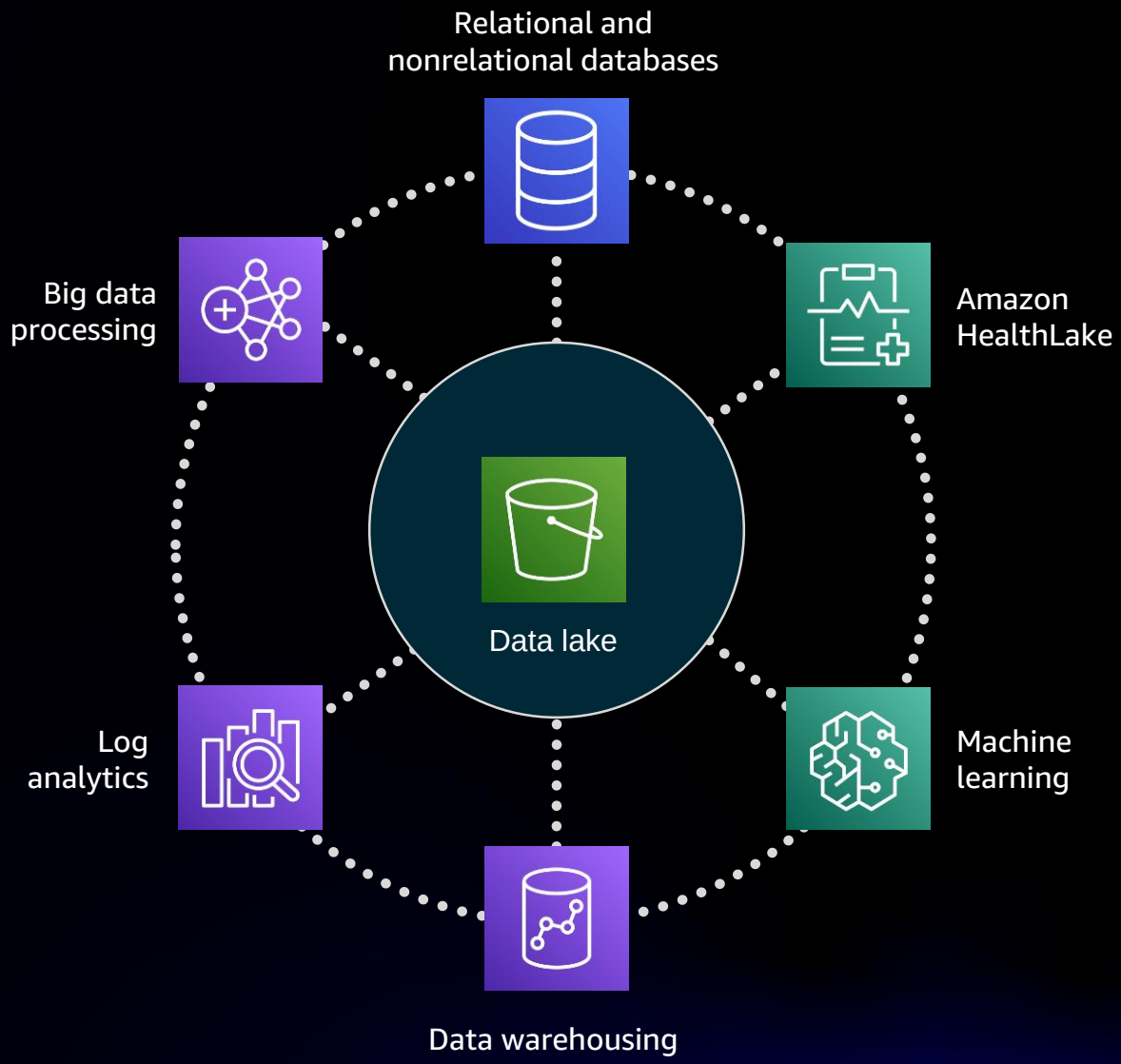
Open-source FHIR server

Customizable

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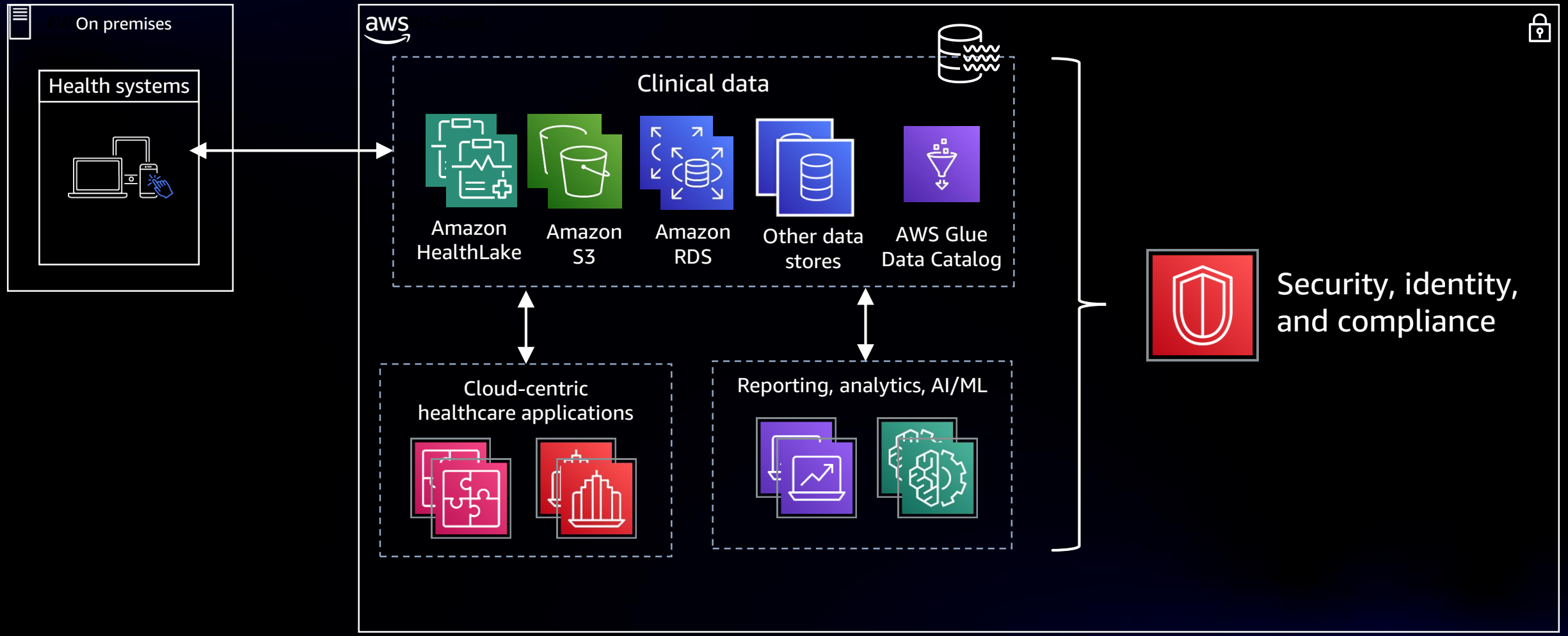
Break down your silos

- Data lake as a secure hub
- Standardize on common data models
- Data in one location



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Building with real-time data



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Protecting clinical data on AWS

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50+ global compliance certifications and accreditations



HIPAA on AWS

Over 130+ HIPAA-eligible services



HITRUST on AWS

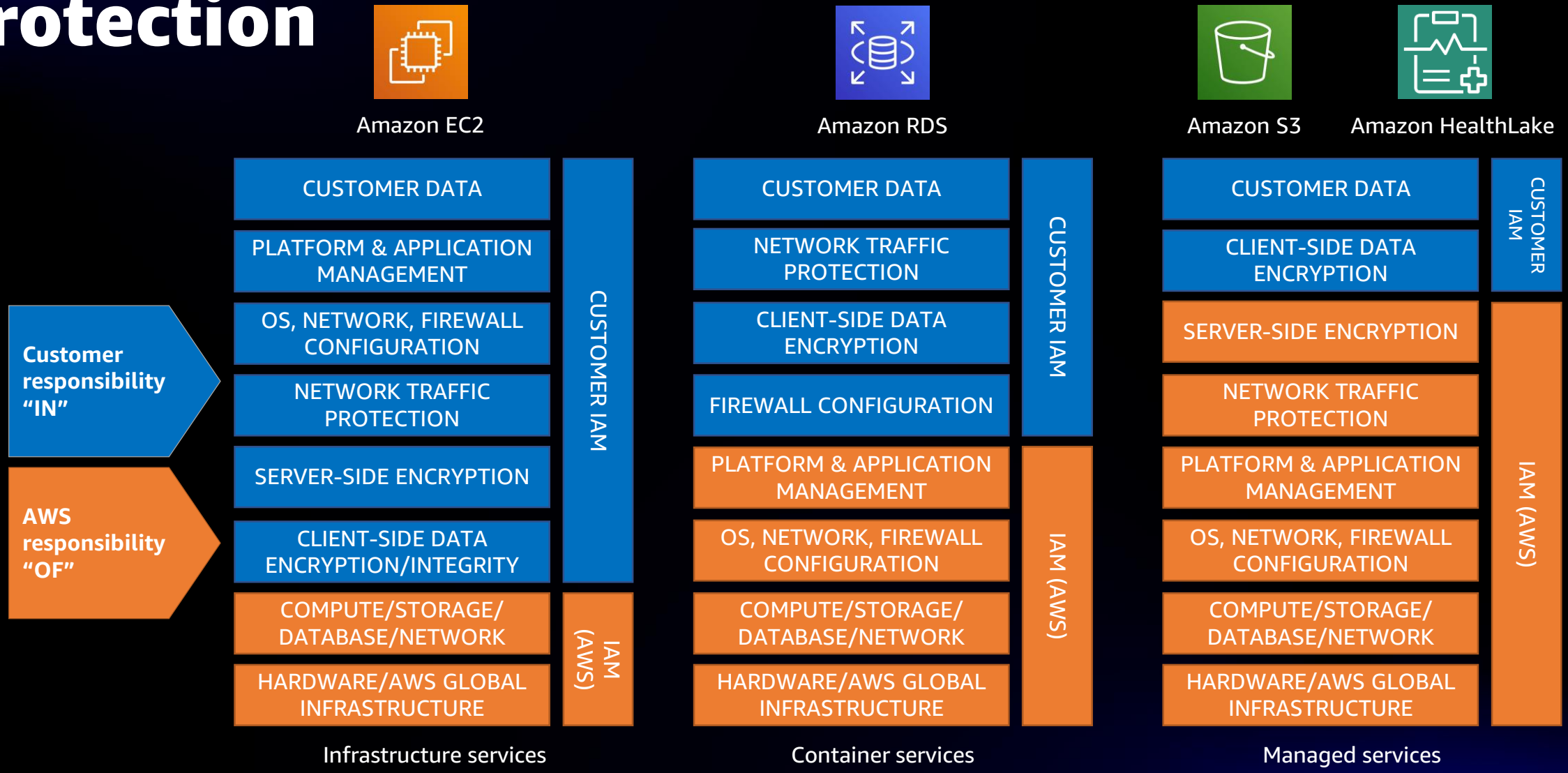
Over 60+ HITRUST certified services



GDPR on AWS

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Leverage higher-level services for data protection



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Highest standards for privacy and data security



Meet data residency requirements

Choose an AWS Region, and AWS will not replicate it elsewhere unless you choose to do so



Encryption at scale

Keys managed by AWS Key Management Service (AWS KMS) or managing your own encryption keys with AWS CloudHSM using FIPS 140-2 Level 3 validated HSMs



Comply with local data privacy laws

by controlling who can access content, its lifecycle, and its disposal



Build compliant infrastructure

on AWS using services and tools

aws

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Full breadth of security, identity, and compliance services



Identity and access management

- AWS Identity and Access Management (IAM)
- AWS Single Sign-On
- AWS Organizations
- AWS Directory Service
- Amazon Cognito
- AWS Resource Access Manager (AWS RAM)



Detective controls

- AWS Security Hub
- Amazon GuardDuty
- Amazon Inspector
- Amazon CloudWatch
- AWS Config
- AWS CloudTrail
- VPC Flow Logs
- AWS IoT Device Defender



Infrastructure protection

- AWS Firewall Manager
- AWS Network Firewall
- AWS Shield
- AWS WAF – web application firewall
- Amazon Virtual Private Cloud (Amazon VPC)
- AWS PrivateLink
- AWS Systems Manager



Data protection

- Amazon Macie
- AWS Key Management Service (AWS KMS)
- AWS CloudHSM
- AWS Certificate Manager (ACM)
- AWS Secrets Manager
- AWS VPN
- Server-side encryption



Incident response

- Amazon Detective
- CloudEndure DR
- AWS Config rules
- AWS Lambda



Compliance

- AWS Artifact
- AWS Audit Manager

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Storing petabytes of PHI to the cloud

- Philips set up Attunity CloudBeam for Amazon Redshift in less than one minute to upload 37 million health records to the AWS Cloud in 90 minutes
- Store and optimize any size dataset within 2 hours, allowing consultants and analysts to provide solutions quickly to customers
- Philips HealthSuite Data Platform on AWS houses over 40+ petabytes of PHI, and growing at ~1 PB a month



"Thanks to AWS, our business was able to upload over 37 million records into Amazon Redshift in 90 minutes."

Doug Ranaham
Manager, Philips Healthcare

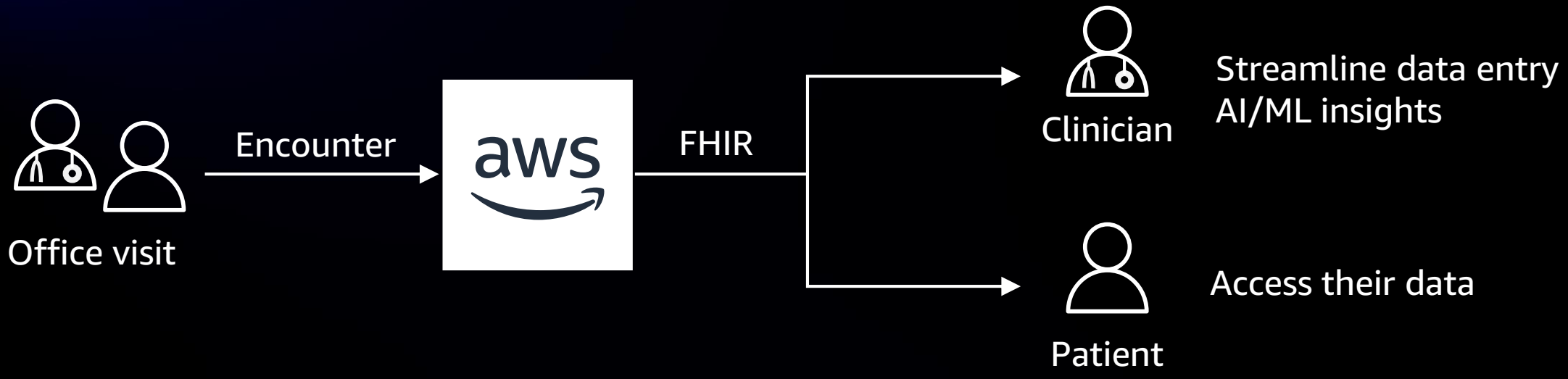
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Building an interoperable and real-time clinical application

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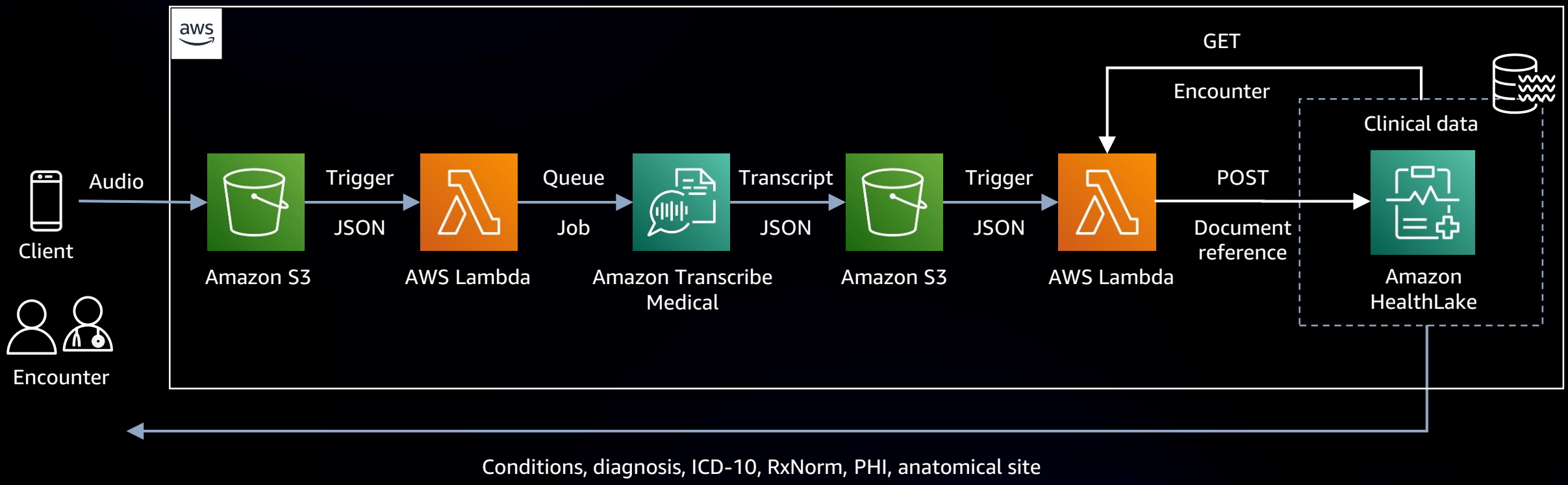
Use case



- ✓ Capture the conversation
- ✓ Make it interoperable
- ✓ Extract key elements

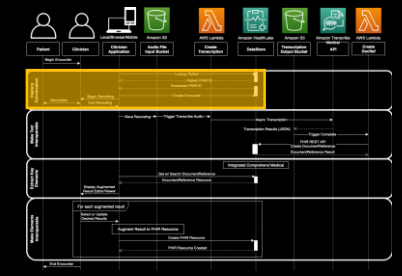
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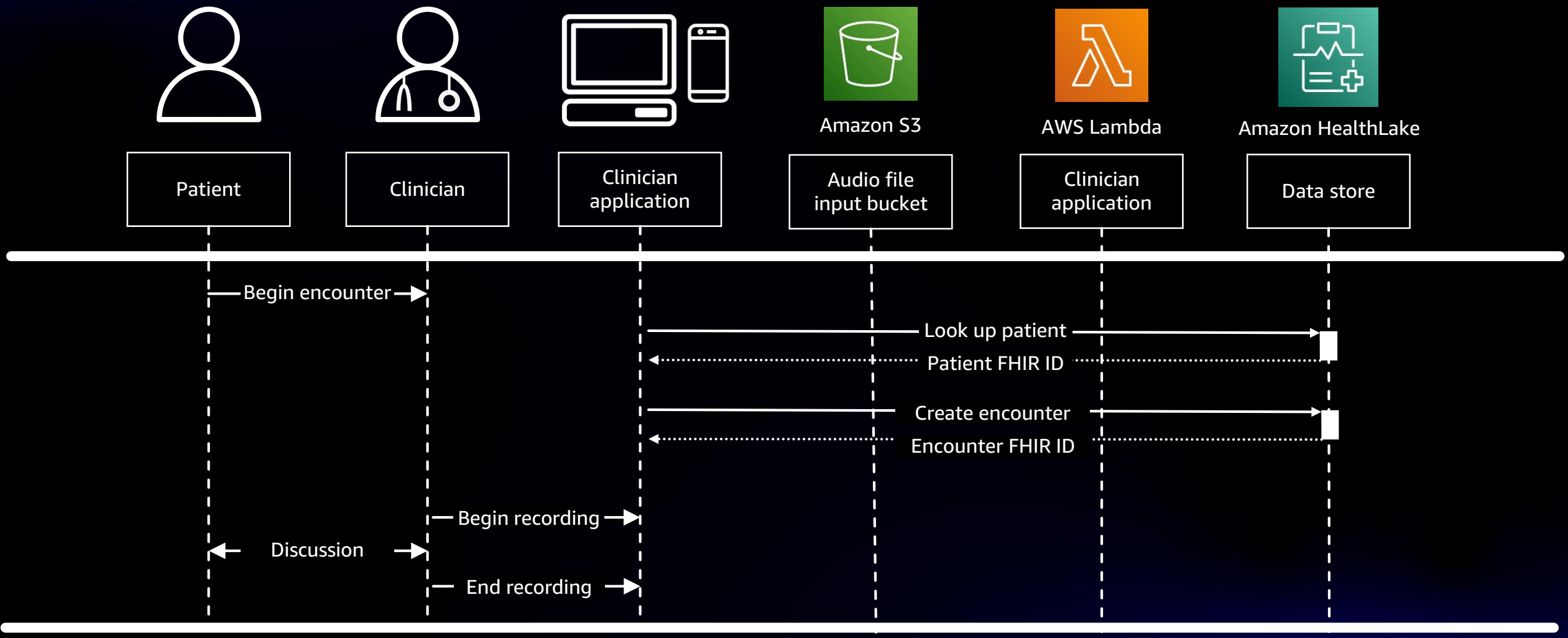
Demo overview



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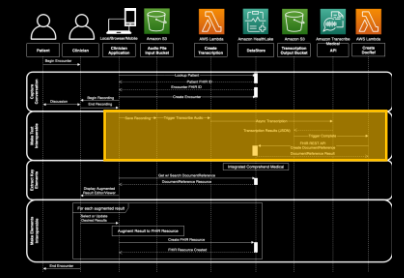
Capture the conversation





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Make text interoperable



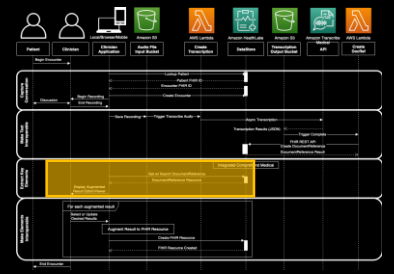
Amazon S3
AWS Lambda
Amazon HealthLake
Amazon S3
Amazon Transcribe Medical
AWS Lambda

Clinician application
Audio file input bucket
Clinician application
Data store
Transcription output bucket
API
Create DocRef

End recording
Save recording
Trigger audio transcription
Async transcription
Transcription result (JSON)
Trigger process transcribed audio
FHIR REST API create DocumentReference
DocumentReference result

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Extract key conversation elements



Patient

Clinician

Clinician application

Amazon S3

Audio file input bucket

AWS Lambda

Clinician application

Amazon HealthLake

Data store

FHIR REST API create …

DocumentReference result

Integrated comprehend medical

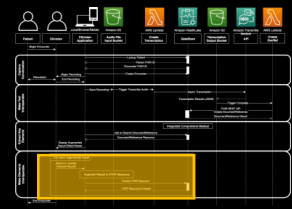
Get with Search DocumentReference(Encounter ID)

DocumentReference resource

Display/edit augmented entities

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Make each element interoperable



Patient

Clinician

Clinician application

Amazon S3

Audio file input bucket

AWS Lambda

Clinician application

Amazon HealthLake

Data store

Display/edit augmented entities

For each augmented result

Select/update entity results

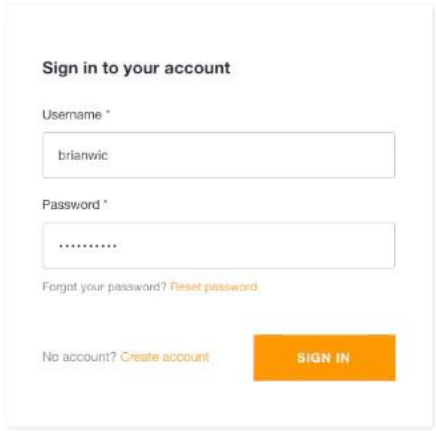
Construct FHIR resource

Create FHIR resource

FHIR resource result

Not included in demo

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CloudFormation

- Stacks
- Stack details
- Drifts
- StackSets
- Exports
- Designer
- Registry
- Public extensions
- Activated extensions
- Publisher

Feedback

CloudFormation > Stacks > Compliance-HIPAA

Stacks (16)

Filter by stack name

Active | View nested | 1

NESTED
amplify-encounterdemo-dev-171255-APIGatewayAuthStack-11N06AACICQ6Q
2021-10-22 09:18:09 UTC-0500
CREATE_COMPLETE

NESTED
amplify-encounterdemo-dev-171255-apiGetAHLDocRefResults-KSHIX3MOMQLH
2021-10-22 09:17:31 UTC-0500
CREATE_COMPLETE

NESTED
amplify-encounterdemo-dev-171255-functionGetAHLDocRefResults-1G684W3DWBH9C
2021-10-22 09:16:26 UTC-0500
UPDATE_COMPLETE

NESTED
amplify-encounterdemo-dev-171255-storageencounterdemomedia-13AUQLVR521WW
2021-10-19 17:09:40 UTC-0500
CREATE_COMPLETE

NESTED
amplify-encounterdemo-dev-171255-hostingamplifyhosting-9ORZRMTJZWD0
2021-10-18 17:30:54 UTC-0500
CREATE_COMPLETE

NESTED
amplify-encounterdemo-dev-171

Compliance-HIPAA

Delete | Update | Stack actions | Create stack

Stack info | Events | Resources | Outputs | Parameters | Template | Change sets

Overview

Stack ID
arn:aws:cloudformation:us-east-1:054854643022:stack/Compliance-HIPAA/8bc616e0-21f2-11ec-8fa5-12b6e64cdc09

Description
Provisions HIPAA Ready Environment in AWS (qs-1qtukbnsl)

Status
CREATE_COMPLETE

Status reason
-

Root stack
-

Parent stack
-

Created time
2021-09-30 08:30:15 UTC-0500

Deleted time
-

Updated time
-

Drift status
NOT_CHECKED

Last drift check time
-

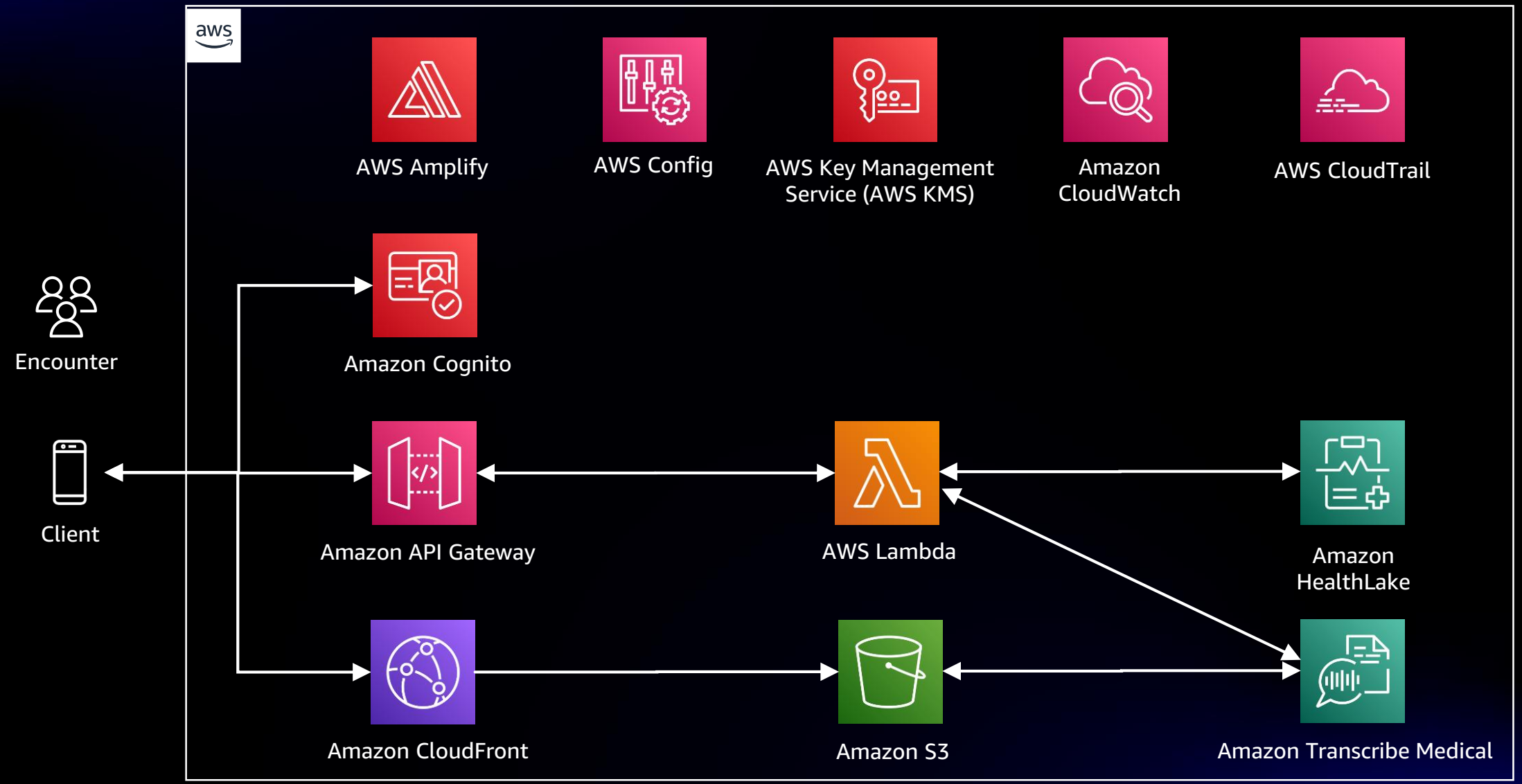
Termination protection
Disabled

IAM role
-

Tags (0)

Stack-level tags will apply to all supported resources in your stack. You can add up to 200 unique tags for each stack.

Architecture



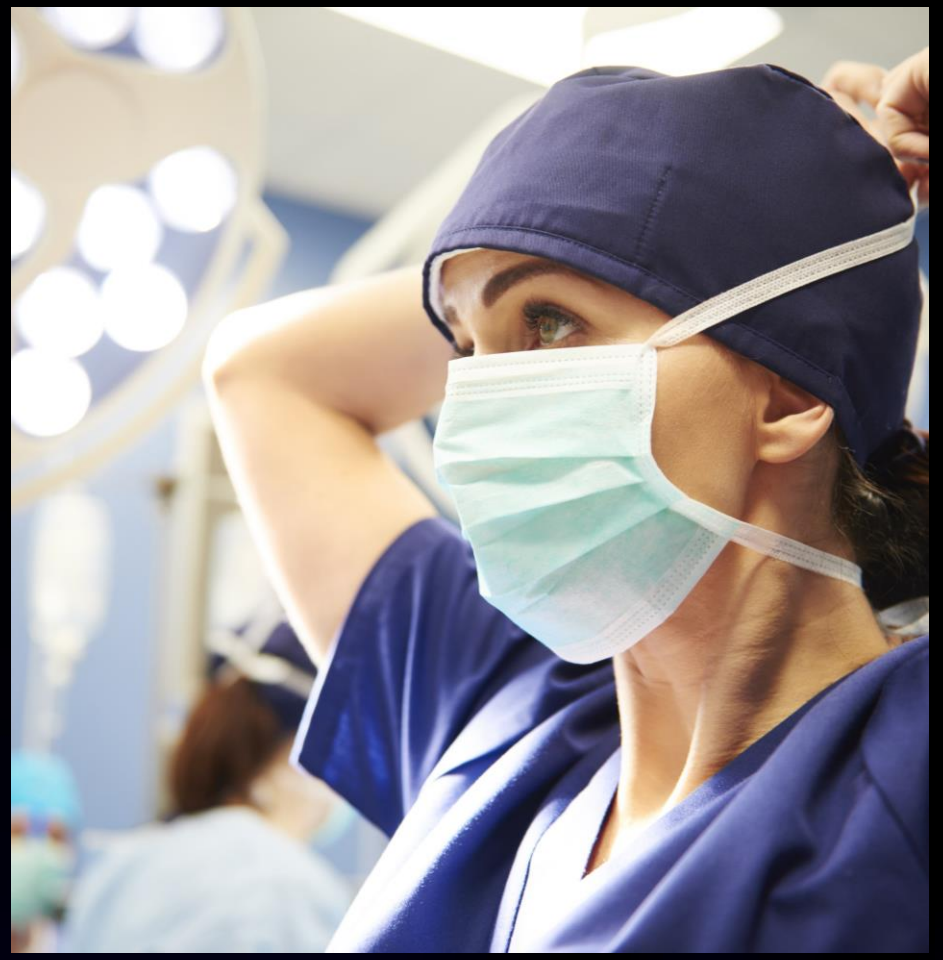
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Houston Methodist

Using voice to simplify tasks

- Voice-activated solution presents information and completes tasks during surgeries
- Ambient listening to capture conversations, create notes, and complete documentation during patient visits

> "Houston Methodist will continue to break down barriers using resources like those provided by AWS and Pariveda Solutions, and it will improve the way healthcare technology is consumed."
>
> Roberta Schwartz
> Executive Vice President and Chief Innovation Officer
> Houston Methodist



https://aws.amazon.com/blogs/industries/creating-a-hands-free-voice-assistant-at-houston-methodist-with-aws/

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Closing thoughts

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Break down silos

Be strategic and interoperable

Design with the future in mind

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Thank you!

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