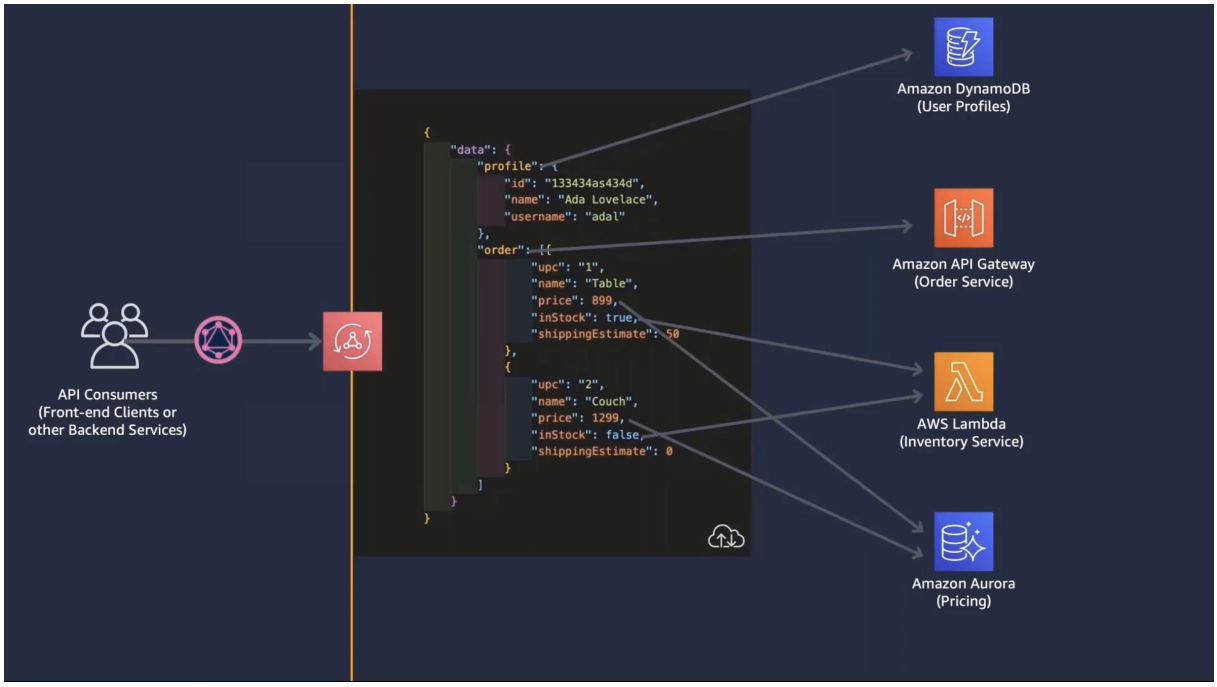
Lecture 10 - AppSync, Amplify, other services (1h)

AppSync

- Fully managed serverless GraphQL service
  - resolves underfetch or overfetch problems (having too much or not sufficient data in API response)
  - retrieve data from multiple backends with a single API call, even if backends are different technologies
    Full demo → https://youtu.be/Cs5e9vbjNdU



- a really advanced GraphQL proxy for other AWS services or HTTP API
- Business use cases
  - realtime data broadcasting
  - live location as a service
  - online documents collaboration
  - IoT
  - data lakes
- Technical and collaborative pros
  - Can be used as a connector between different microservices
  - Resolves collaboration issues between isolated backend dev teams in a different accounts/departments
  - Simplifies work on org-wide APIs
  - Supports local mocking
  - Supports multi-auth mode with

    - IAM
    - Cognito
    - OpenID
    - API Keys

Amplify

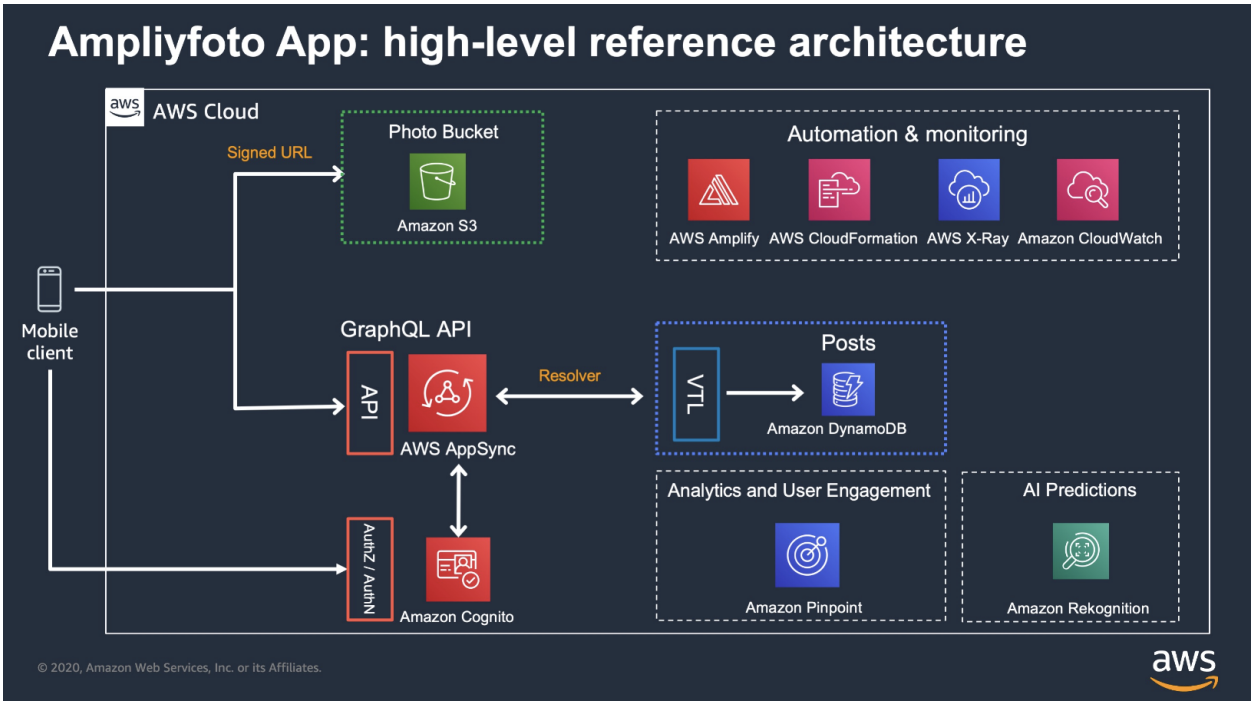
- Start effortlessly

```
amplify configure
# walkthrough with aws profile setup

amplify init # init your new project
# this handles initial infra creation (roles, users, s3 buckets)

amplify add auth
# add auth capabilities to your app (creates cognito user pools and dynamodb tables)

amplify status
# check what changes to be added

amplify push
# push your changes to the undelying AWS infrastructure managed by amplify

amplify add api
# deploy your graphql or rest api

amplify console
# open your Amplify or AWS ui in the browser

amplify update api
# redeploy your api with new settings

###
amplify delete
# seamples AWS resources cleanup
```

- Business value
    - Scale as you grow
    - handles offline and realtime workloads
    - Focuses on Front-End developers and provides a set of tools to easily integrate with backends in the cloud
    - abstracts a lots of core AWS services into a simpler concepts for the developer
- Closely integrates with AppSync (basically it manages the AppSync GraphQL APIs)
- own cli to bootstrap the apps and provision resources seamlessly
- Amplify Studio - IDE for Amplify workflows. Combines lots of services under one UI
- Amplify Hosting - provisions infrastructure for Web app hosting
- Device Farm - for testing the mobile applications on real mobile devices or desktops
- Amplify UI Components
    - Data - creates DynamoDB table
    - Authentication - Creates cognito User Pools
    - Storage - Sets up S3
    - Functions - Lambda Integration
    - GraphQL - AppSync
    - Rest API - Lambda + DynamoDB

- Analytics - Kinesis
- Ui Library - for storing UI elements (supports Figma designs)

- Amplify DataStore is capable of resolving data conflicts when the client goes offline for a while, and update that when client is back online
- Workshop → https://catalog.us-east-1.prod.workshops.aws/workshops/84db0afb-0279-4d29-ae26-1609043d5bfd/en-US



Cognito

User pools

- Serverless database of users for mobile or web app
- handles sign-up and login features
- supports external identity providers or SAML - *Federated Identities* (sign-in with google, facebook etc)
- returns JWT on login
- Integrates natively into the serverless applications in AWS

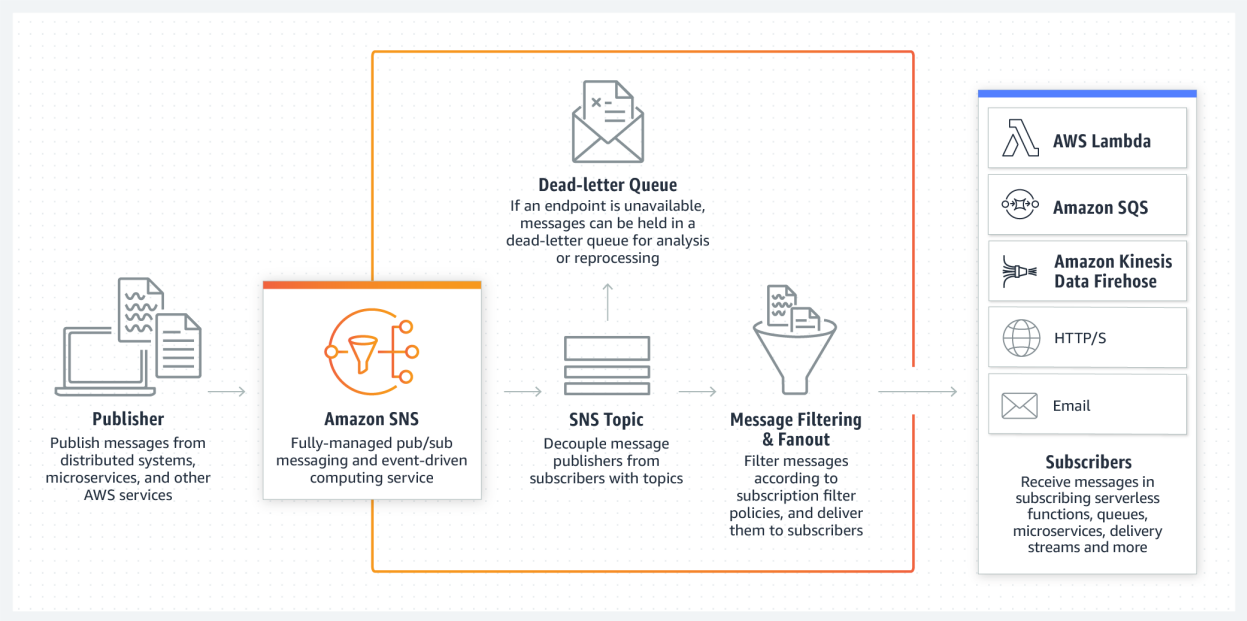
Identity pools

- Identity pools can have IAM access to the AWS resources with roles and policies
- users can login with OIDC, SAML, UserPools or *guests*

SNS

FAQ → https://aws.amazon.com/sns/faqs/

- Pub/sub
- SMS
- Mobile Push delivery

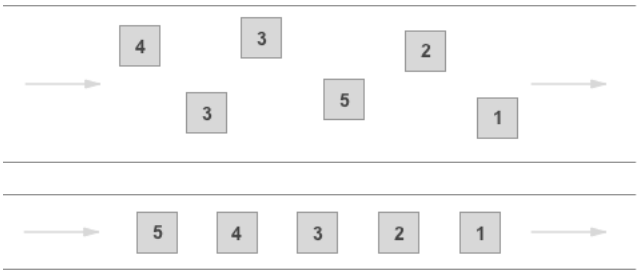


- supports multiple subscribers
- Standard topics and FIFO topics
- often seen in pair with SQS an Lambda for fanouts

SQS

FAQ → https://aws.amazon.com/sqs/faqs/

- fully managed message queue service
- serverless
- standard and FIFO queues (both have pros and cons)



- Features → https://aws.amazon.com/sqs/features/
- Not a replacement for Kafka or RabbitMQ, however cover some of the use-cases

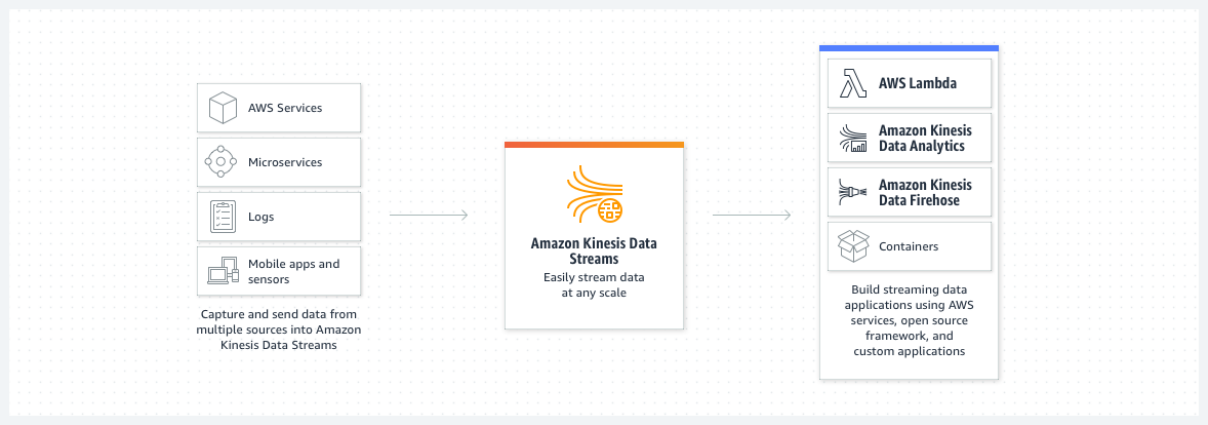
Kinesis

Data Streams

FAQ → https://aws.amazon.com/kinesis/data-streams/faqs/?nc=sn&loc=6

- high performant serverless data streaming service

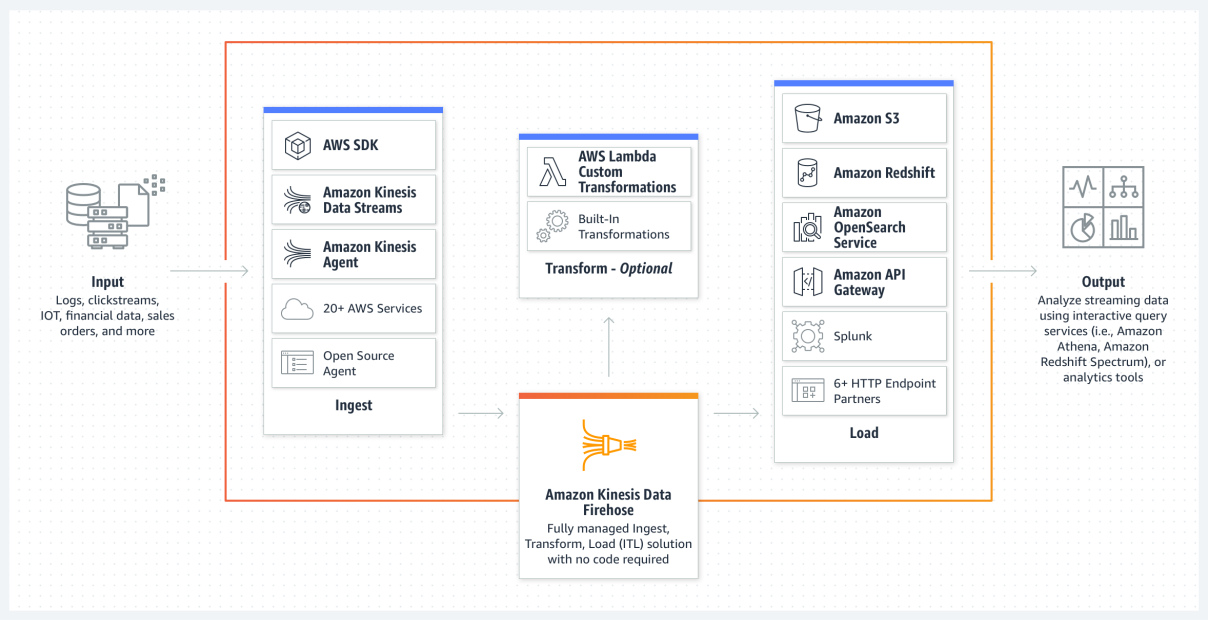
- supports lambda integration for additional data processing
- mainly used for logs and events streaming, real-time analytics or event-driven architectures
- output to lambda, kinesis firehose etc



Data Firehose

FAQ → https://aws.amazon.com/kinesis/data-firehose/faqs/?nc=sn&loc=5

- data streaming into the data lakes/warehouses
- ETL jobs
- can be used with ML
- output to Redshift/S3/Splunk

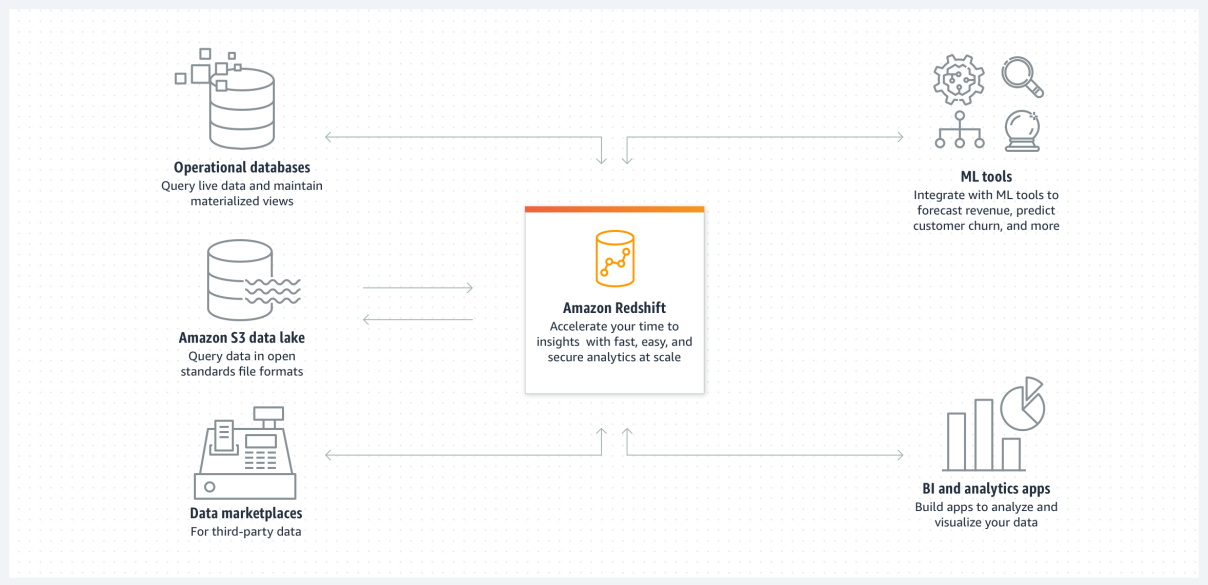


Redshift

FAQ → https://www.amazonaws.cn/en/redshift/faqs/

- OLAP engine in AWS
- built on Postgres

- data stored in columns
- super high performance - can handle petabyte scale data warehouses
- Redshift Spectrum → run queries against data lakes in S3 (not be confused with Athena which lacks the performance)



Batch

FAQ → https://aws.amazon.com/batch/faqs/?nc=sn&loc=5

- Running batch compute jobs at scale
- Spins up lots of EC2s or ECS containers to run the processing jobs

SSM

FAQ → https://aws.amazon.com/systems-manager/faq/

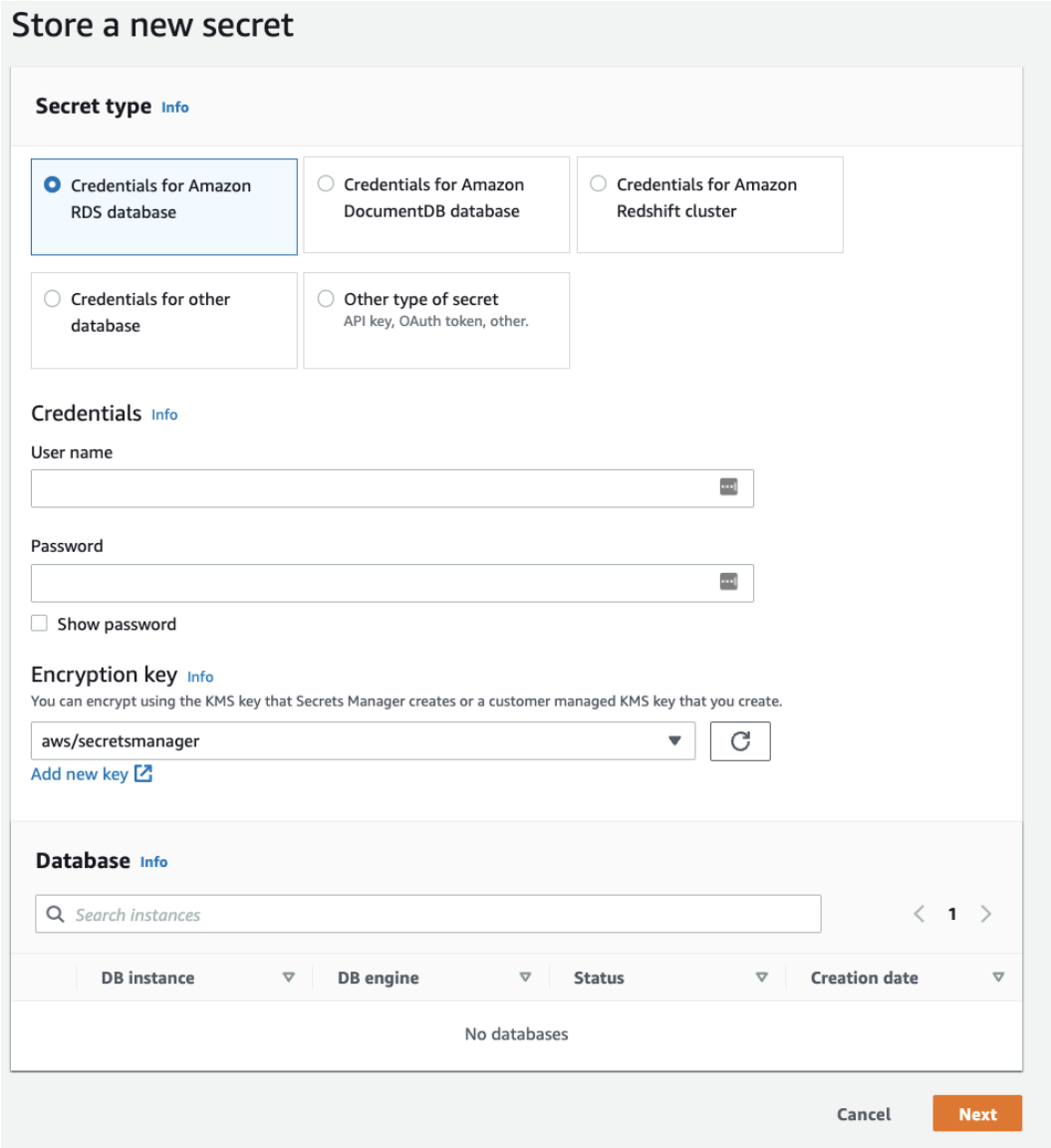
- allows to operate EC2s at scale
- resource grouping, maintenance windows, os patching …
- RunCommand - to run a command on thousands of EC2 at once
- **SessionsManager** - log in to the private instance via browser or CLI
- supports running ansible playbooks
- ParamererStore - simple credentials storage (if you don't need all the features of Secrets Manager)

Secrets Manager

FAQ → https://aws.amazon.com/secrets-manager/faqs/

- a password manager in AWS
- automatic credentials rotation
- secrets are encrypted at rest with KMS
- IAM-granted access to the secrets
- good place to store secrets
- slightly expensive (compared to parameters store)

- supports password generation and secrets retrieval via API/SDK



KMS

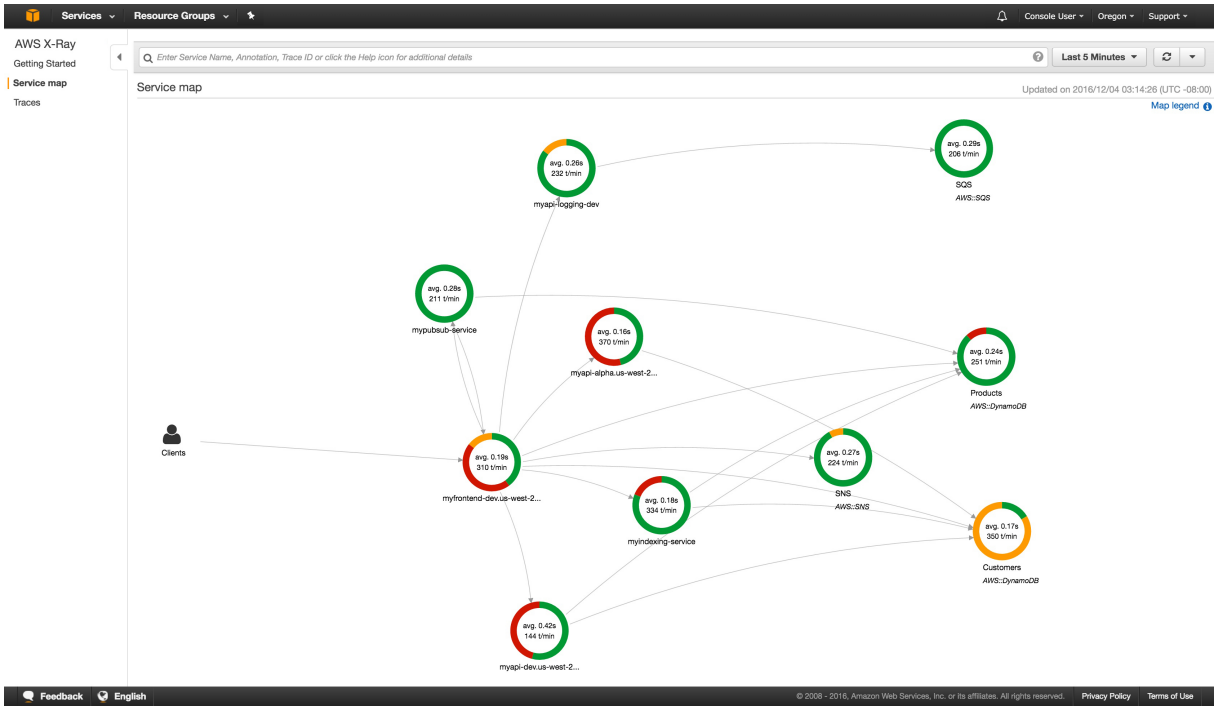
FAQ → https://aws.amazon.com/kms/faqs/

- fully managed key management service
- encrypts everything at rest, that can be encrypted (S3, RDS, EBS …)
- supports different encryption algorithms
- supports AWS managed and customer managed keys
- supports automatic keys rotation
- supports dedicated hardware with CloudHSM
- need-to-know service for the Security Specialty

X-Ray

FAQ → https://aws.amazon.com/xray/faqs/

- collects and visualises traces between applications

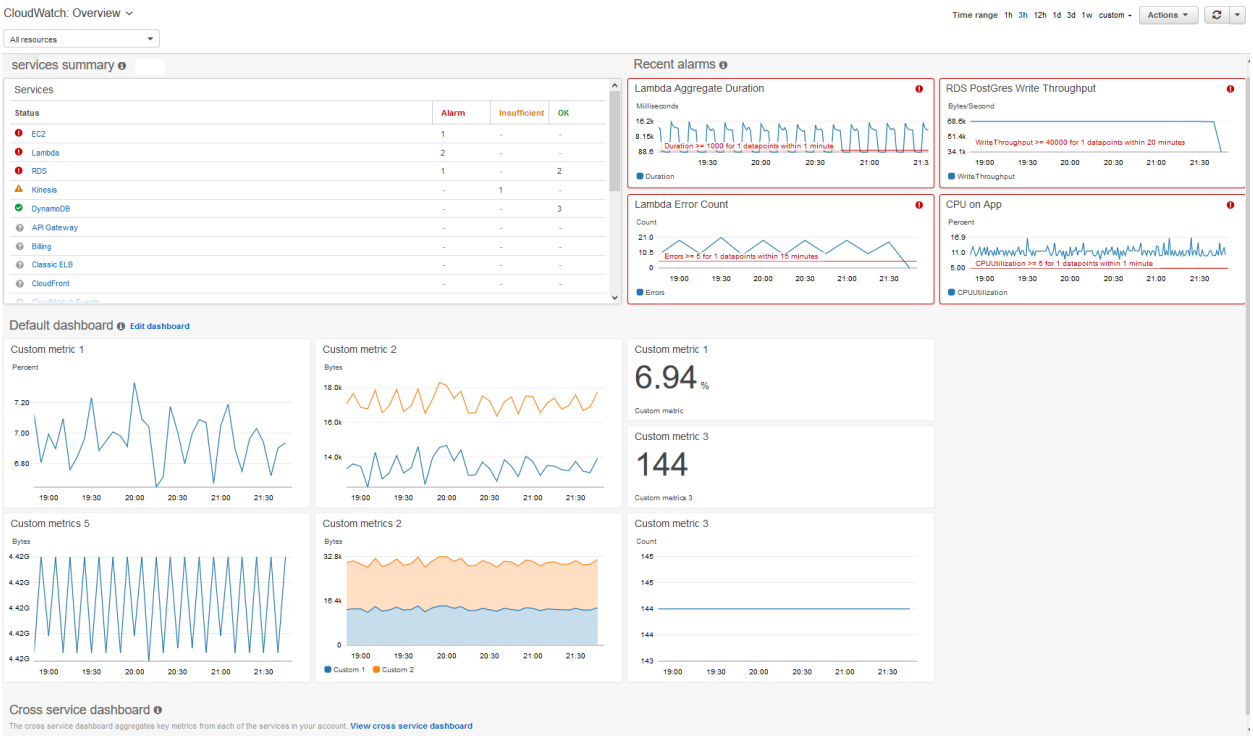


- integrates in AWS AppSync

CloudWatch

FAQ → https://aws.amazon.com/cloudwatch/faqs/

- fully managed alerting, logging and monitoring service
- supports detailed monitoring with up to 1sec refresh rate
- dashboards, logs insights with SQL
- first place to check for logs and metrics
- enabled for every service
- (usually replaced by some other solution)



CloudTrail

- Records API actions in the AWS account into “trails” and stores them in S3
- Think of it as a surveillance camera
- when enabled - can’t be disabled (only streaming to cloudwatch logs can be disabled)
- better be enabled and sent to the logging account

```
{
    "eventVersion": "1.05",
    "userIdentity": {
        "type": "IAMUser",
        "principalId": "AIDAJDPLRKLG7UEXAMPLE",
        "arn": "arn:aws:iam::123456789012:user/Mary_Major",
        "accountId": "123456789012",
        "accessKeyId": "AKIAIOSFODNN7EXAMPLE",
        "userName": "Mary_Major",
        "sessionContext": {
            "sessionIssuer": {},
            "webIdFederationData": {},
            "attributes": {
                "mfaAuthenticated": "false",
                "creationDate": "2019-06-18T22:28:31Z"
            }
        },
        "invokedBy": "signin.amazonaws.com"
    },
    "eventTime": "2019-06-19T00:18:31Z",
    "eventSource": "cloudtrail.amazonaws.com",
    "eventName": "StartLogging",
    "awsRegion": "us-east-2",
    "sourceIPAddress": "203.0.113.64",
    "userAgent": "signin.amazonaws.com",
    "requestParameters": {
        "name": "arn:aws:cloudtrail:us-east-2:123456789012:trail/My-First-Trail"
    },
    "responseElements": null,
    "requestID": "ddf5140f-EXAMPLE",
    "eventID": "7116c6a1-EXAMPLE",
    "readOnly": false,
```

```
    "eventType": "AwsApiCall",
    "recipientAccountId": "123456789012"
},
    ... additional entries ...
```

ECS, ECR

- ECS - for running containerized workflows in AWS
- Task definition example

```
{
   "containerDefinitions": [
      {
         "command": [
            "/bin/sh -c \"echo '<html> <head> <title>Amazon ECS Sample App</title> <style>body {margin-top: 40px; background-color: #33
         ],
         "entryPoint": [
            "sh",
            "-c"
         ],
         "essential": true,
         "image": "httpd:2.4",
         "logConfiguration": {
            "logDriver": "awslogs",
            "options": {
               "awslogs-group" : "/ecs/fargate-task-definition",
               "awslogs-region": "us-east-1",
               "awslogs-stream-prefix": "ecs"
            }
         },
         "name": "sample-fargate-app",
         "portMappings": [
            {
               "containerPort": 80,
               "hostPort": 80,
               "protocol": "tcp"
            }
         ]
      }
   ],
   "cpu": "256",
   "executionRoleArn": "arn:aws:iam::012345678910:role/ecsTaskExecutionRole",
   "family": "fargate-task-definition",
   "memory": "512",
   "networkMode": "awsvpc",
   "runtimePlatform": {
        "operatingSystemFamily": "LINUX"
    },
   "requiresCompatibilities": [
       "FARGATE"
    ]
}
```

- ECR - fully managed docker registry
  - lifecycle rules - delete old docker images
  - vulnerability scan on upload
  - IAM-access

Beanstalk

- generates environments and infrastructure based on templates (usually EC2 + ELB + ASG)
- uses Cloudformation inside
- good place to start if unfamilliar with AWS
- kinda big and old, better take a deep dive on it

EKS

- Kubernetes in AWS
- fully managed HA control plane out of the box
- pay for the control plane plus for the worker nodes
- cool to use with spot worker nodes (recommend spot.io)
- IAM OIDC integration - Pods can assume IAM roles to interact with other AWS resources
- supports Fargate worker nodes

Elasticsearch

- Fully managed Elasticsearch and Kibana in AWS
- it’s a fork of original Elastic called OpenDistro
- not all features are present, slightly lags behind the original Elastic
- supports IAM authentication and lots of other AWS stuff (services integration, HA, VPC placement)
- good for logs storage, easily enabled log streaming from CloudWatch by Lambda

Q&A session

- Topics discussion
- Sharing additional resources