AWS State, Local, and Education Learning Days

Building Serverless Architectures

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Agenda

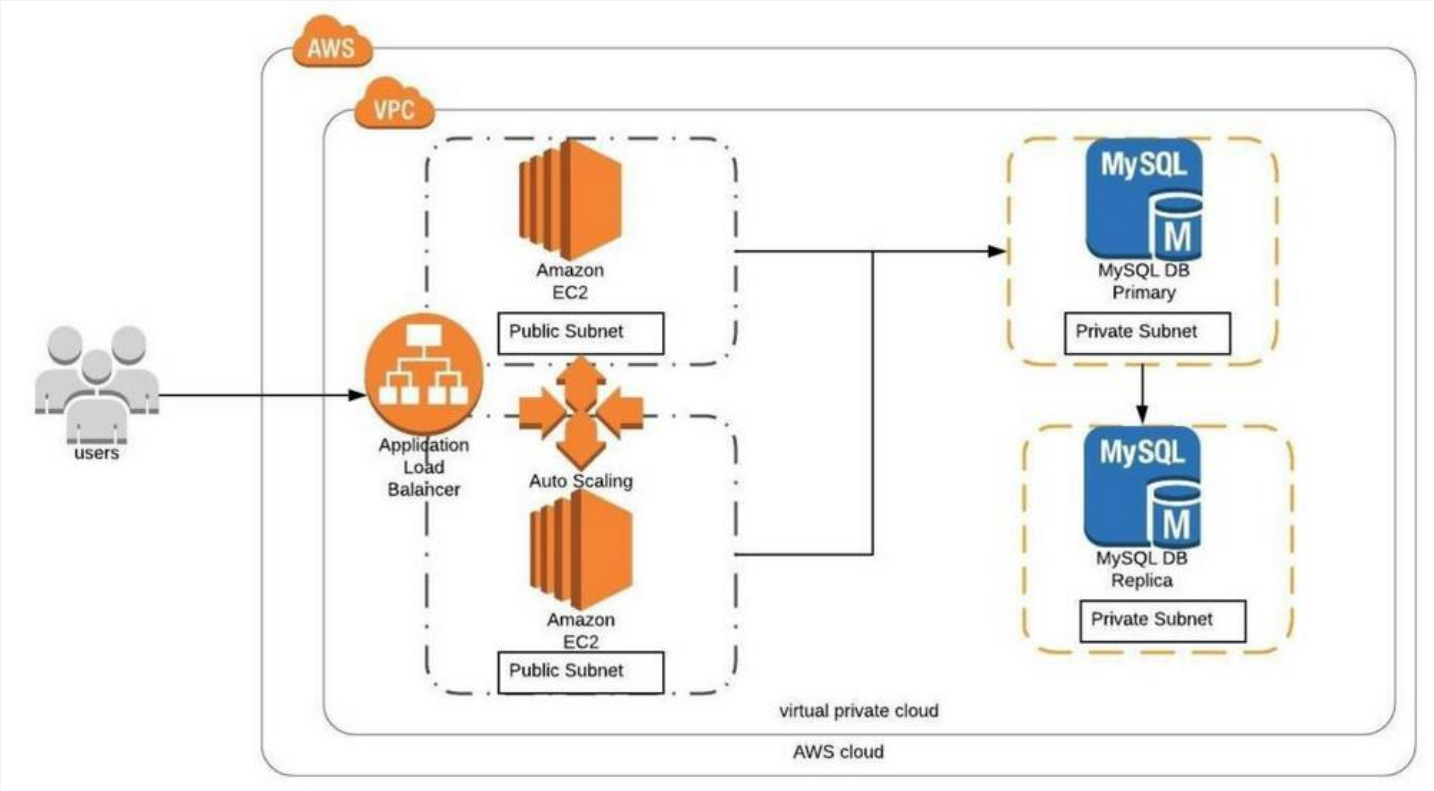
- Where we have come from – servers
- Where to start with Serverless
- Sample Serverless Architecture
- City and County of Denver – Application Modernization Journey

Servers

How do we use servers?

- State management
- Monolithic container for functionality
- One version, one server
- Server is an atomic unit of thinking
- The challenges of this model

In the good old days there was one way (EC2)



Today there are more choices!

AWS App Runner
Build and run production web applications at scale

Batch
Fully managed batch processing at any scale

EC2
Virtual Servers in the Cloud

EC2 Image Builder
A managed service to automate build, customize and deploy OS images

Elastic Beanstalk
Run and Manage Web Apps

Lambda
Run Code without Thinking about Servers

Lightsail
Launch and Manage Virtual Private Servers

AWS Outposts
Run AWS Services On Premises

Serverless Application Repository
Assemble, deploy, and share serverless applications within teams or publicly

Elastic Container Registry
Fully-managed Docker container registry : Share and deploy container software, publicly or privately

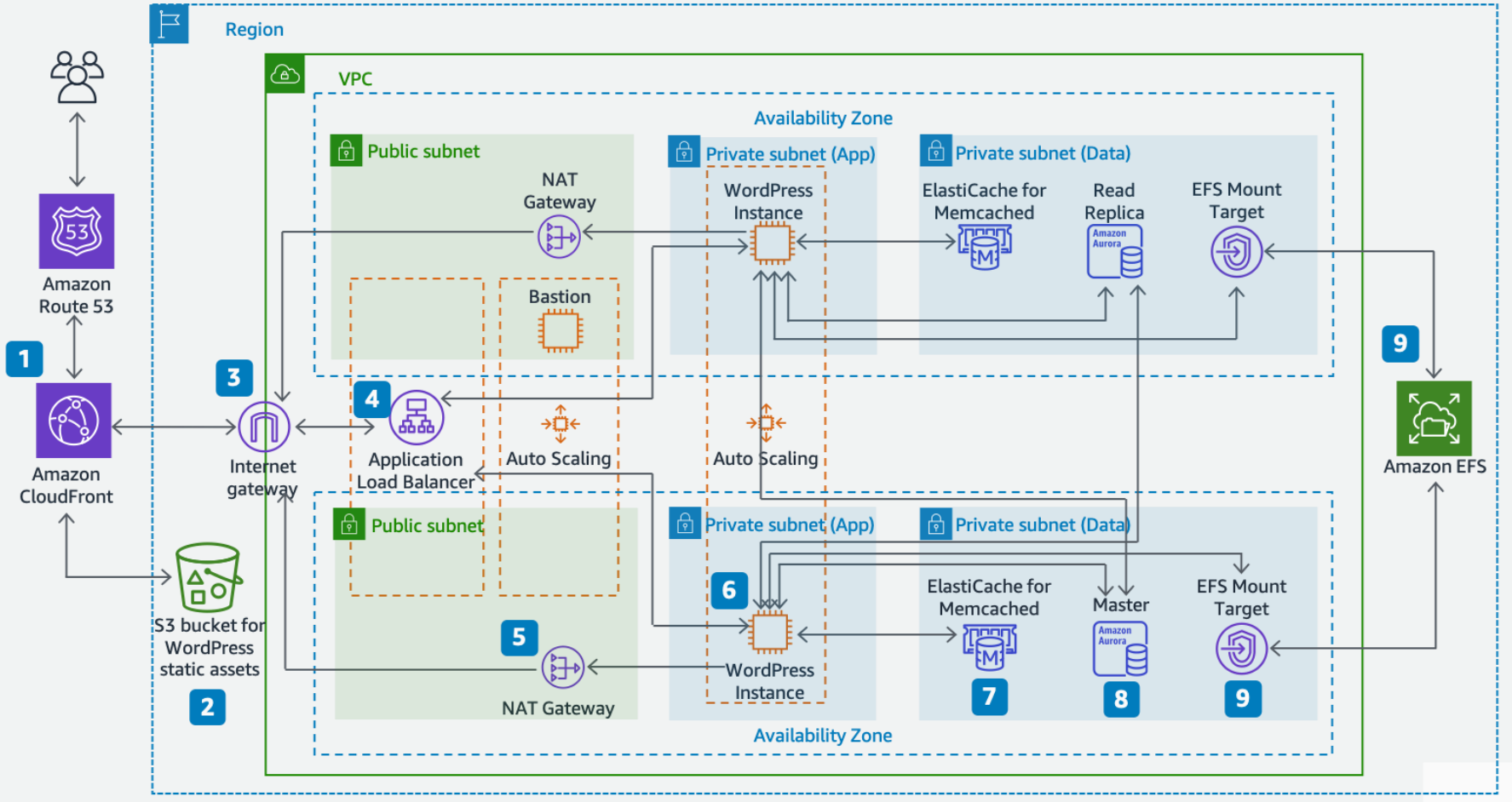
Elastic Container Service
Highly secure, reliable, and scalable way to run containers

Elastic Kubernetes Service
The most trusted way to start, run, and scale Kubernetes

Red Hat OpenShift Service on AWS
Fully managed Red Hat OpenShift service on AWS

Customers love that they can pick the right tool for the job but that comes with some decision fatigue

Example: WordPress hosting on Amazon Web Services



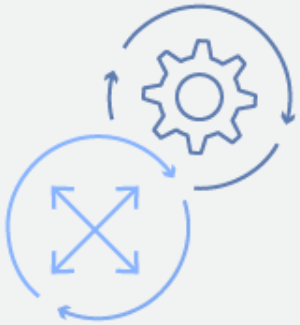
https://docs.aws.amazon.com/whitepapers/latest/best-practices-wordpress/reference-architecture.html

Where to start with serverless

General approach to thinking serverlessly

Features first

Avoid monolithic thinking



Focus on events

Events are triggers that cause action

Statelessness

The key to scaling effectively

Data flow

Make data decisions early on

Use the services

Don’t reinvent the wheel

What are serverless services?

Amazon EventBridge

Amazon Simple Notification Service

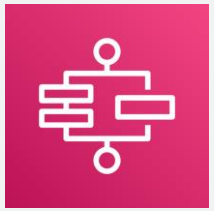
Amazon Simple Queue Service

Amazon API Gateway

Amazon DynamoDB

AWS Lambda

Amazon S3



AWS Step Functions

Amazon Kinesis

AWS IoT Core

Amazon Elastic Transcoder

Integrating with other AWS services

Amazon Rekognition

Amazon Comprehend

Amazon Textract

Amazon Transcribe

Amazon Translate

How AWS Lambda fits in

Attributes

- Runs on demand
- Supports many runtimes
- Responds to events
- Stateless
- Automatically scales

Best practices

- Avoid lifting-and-shifting
- 1 Lambda function per purpose
- Keep functions small
- Choose the right runtime
- Use functions for business logic and plumbing between services
- Include security

Hood serverless practices

- Infrastructure is disposable
- Asynchronous versus synchronous processing
- You can mix and match runtime
- Security still top priority
- Automation
  - AWS Serverless Application Model (AWS SAM)
  - Serverless framework

Introducing AWS SAM

AWS Serverless Application Model (AWS SAM)

- AWS CloudFormation extension optimized for serverless
- Serverless resource types: Functions, APIs, tables
- Supports anything CloudFormation supports
- Open specification (Apache 2.0)

To learn more, visit:
https://aws.amazon.com/serverless/sam/

Example AWS SAM template

```yaml
AWSTemplateFormatVersion: '2010-09-09'
Transform: AWS::Serverless-2016-10-31

Parameters:
  TargetLanguage:
    Type: String
    Default: 'fr es it'

Resources:
  TranslationBucket:
    Type: AWS::S3::Bucket

  TranslatorFunction:
    Type: AWS::Serverless::Function
    Properties:
      CodeUri: translatorFunction/
      Handler: app.handler
      Runtime: nodejs14.x
      MemorySize: 128
      Environment:
        Variables:
          targetLanguage: !Ref TargetLanguage
      Policies:
        - S3CrudPolicy:
            BucketName: !Ref TranslationBucketName
      Events:
        FileUpload:
          Type: S3
          Properties:
            Bucket: !Ref TranslationBucket
            Events: s3:ObjectCreated:*
            Filter:
```

Transforms YAML into infrastructure

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        Variables:
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      Policies:
        - S3CrudPolicy:
            BucketName: !Ref TranslationBucketName
      Events:
        FileUpload:
          Type: S3
          Properties:
            Bucket: !Ref TranslationBucket
            Events: s3:ObjectCreated:*
            Filter:
              S3Key:
                Rules:
                  - Name: suffix
                    Value: '.txt'
```

Whiteboarding

1. Form upload

Create a serverless application to support a student feedback form submitted from a webpage

- Incoming responses must be translated into English
- Allow user to upload image with a response
- Email any negative comments immediately
- Only allow signed-in students to post feedback

2. Lab room reservations

Create a serverless application to allow students to reserve a lab room by SMS text message

- Add a display showing upcoming reservations in real time
- Speak the name of a student when ready
- Send a daily reservation email report
- Alert a legacy application when reservations are made

3. Web application

Create a serverless web application to support a national outreach application

- Ensure fast performance for visitors in multiple Regions
- Allow users to create accounts (including social login)
- Support uploading and serving user videos
- Let users 'like' videos and receive updates

City and County of Denver

Application Modernization

Read Bierbach – Lifecycle
Management Program Manager

Problem

- Aging application codebase and infrastructure that needed updating
- Expanding application portfolio and limited resources to develop and maintain that portfolio
- Refactor and modernize a portfolio of 42 .NET applications serving Denver citizens
- Reduce our on-prem footprint and cost
- No clear breakdown of cost and no ability to turn off resources when not in use

Why We Chose AWS Containerization

- Simplicity of Management
  - Removes the orchestration of containers
- Expediency of application migration
- Easier and more flexible for .NET apps
  - Reduced our need for additional refactoring
- Moving to RDS reduced our reliance on internal DBA resources

Successes

- Completed refactoring and migration of 10 applications to AWS
  - Completed these migration in 10 months from inception to production deployment
- Reduced our time to deployment on refactored applications
- Reduced our application run costs by 18% from on-prem hosting
- Clear breakdown of costs and the ability to turn off environments.
  - We are already seeing cost savings of $7500 a month

Wrap up

Thank you!

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1. Application modernization and security Track
2. Serverless architectures - Why is everyone moving to serverless?

Please complete the session survey by scanning the QR code

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2. Serverless architectures - Why is everyone moving to serverless?