IaC;
Infrastructure as a Code

+CloudFormation과 SAM 실습

Agenda

발표자 소개

주재빈

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2019년 차세대분산시스템 수강
2021학년도 건국대학교 컴퓨터공학과 졸업

졸업 후 소프트웨어 QA에 임하다가
클라우드 및 솔루션 아키텍트 쪽 직무 기회를 찾아가는 중입니다.

현재 한 카카오톡 챗봇 서비스를 개발&운영하고 있습니다.

binchoo

카카오톡 챗봇, 여행 비서 페이몬!

1. 코드형 인프라
- IaC 개요
- CloudFormation 소개
- CloudFormation 자원 생성 흐름
- 데모1: S3 버킷 만들기

2. CloudFormation Template
- 템플릿 파일의 구조
- 데모2: SNS 연동 람다 만들기

3. CloudFormation & SAM 실습
- AWS SAM 소개
- 데모3: SAM 활용 SNS 연동 람다 만들기
- DIY: 유입경로 분석 파이프라인 만들기

1. 코드형 인프라

Power of the console

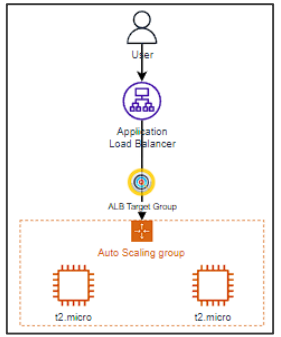
콘솔 홈 정보

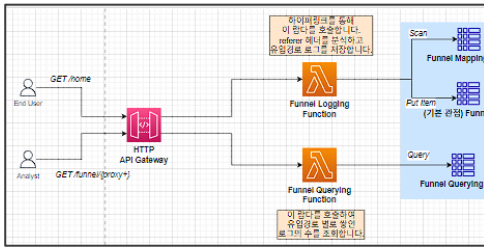
기본 레이아웃으로 재설정 | + 위젯 추가

새 위젯 애플리케이션을(를) 소개합니다. 콘솔 홈의 하단에서 찾을 수 있습니다.

최근에 방문한 서비스 정보

- CloudWatch
- API Gateway
- Lambda
- IAM
- Trusted Advisor
- Elastic Beanstalk
- EC2
- S3
- AWS Budgets
- CloudFormation
- AWS Cost Explorer
- Route 53
- DynamoDB
- Certificate Manager

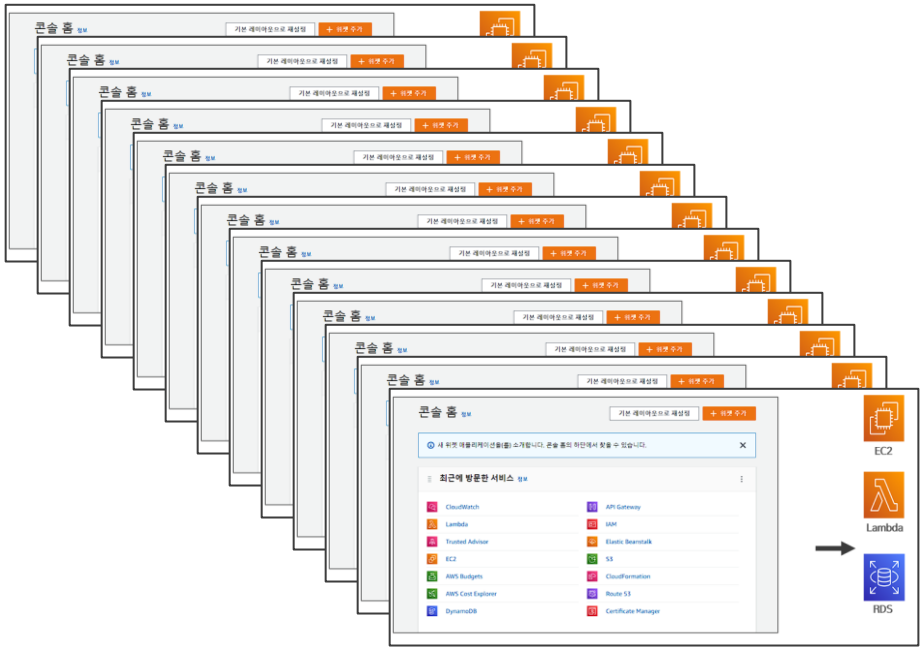




Shall I repeat??

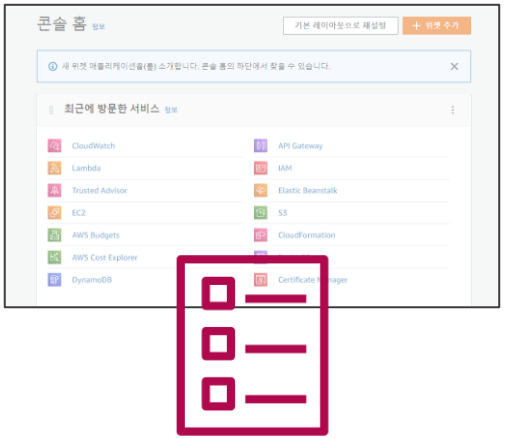
“100개의 계정에
똑같은 환경을 구축해야 해.”

(eg. 다중 리전 구축)



수작업으로 반복 구축하기 어렵습니다!

Infrastructure as a Code(1)



인프라를
명세하는 코드

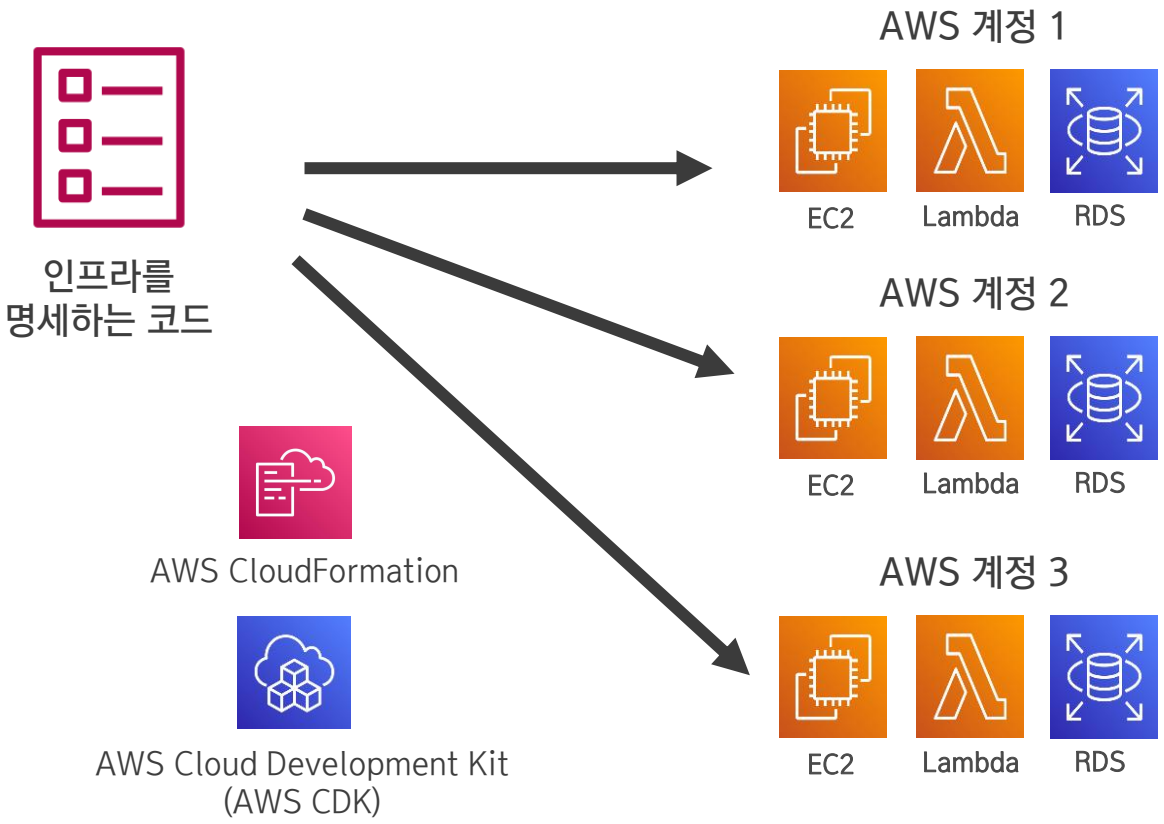
EC2

Lambda

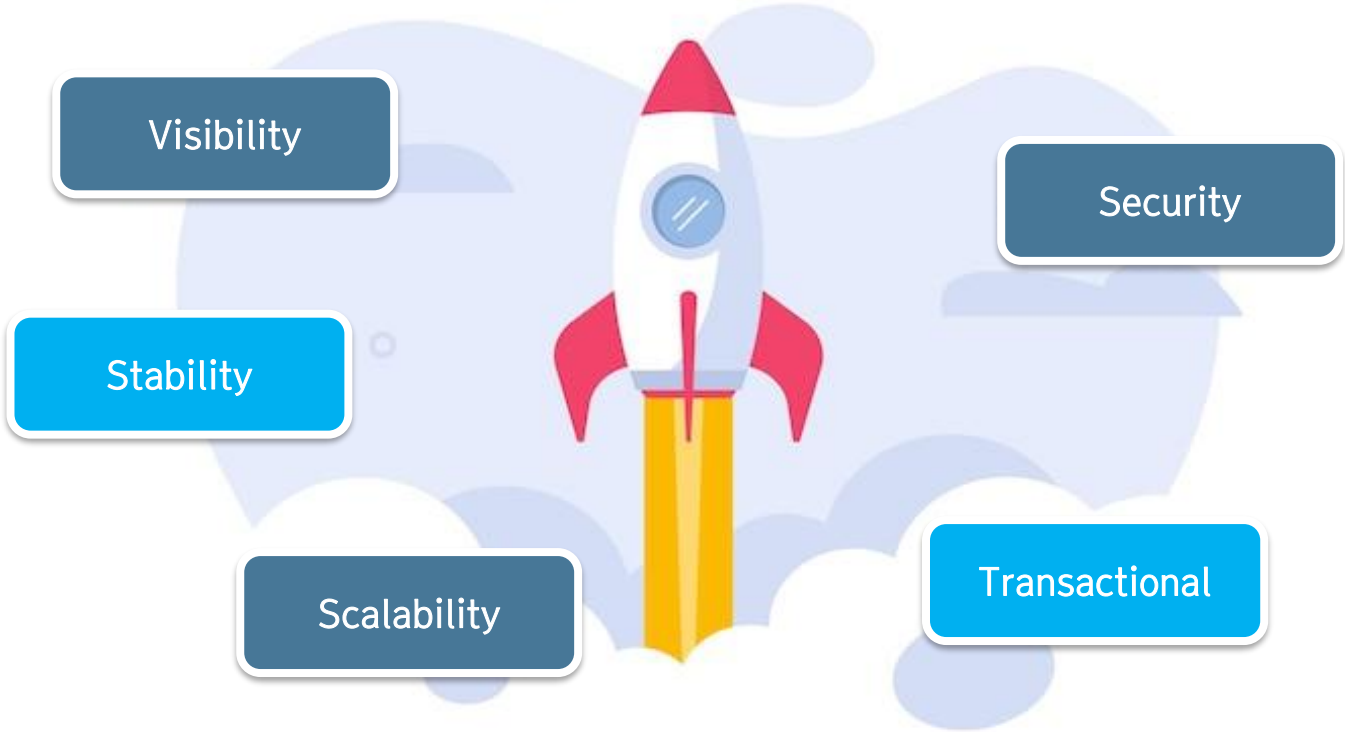
RDS

- 코드를 통한 인프라 할당과 관리
- 사람이 읽기 좋고, 머신이 해석할 수 있는 파일

Infrastructure as a Code(2)



IaC Benefits



AWS CloudFormation

- IaC service for AWS
- Free of charge
  - Pay for the provisioned infrastructures
- **Template** to spin up AWS infrastructure
  - Written in JSON or YAML
  - Quickly replicate your infrastructure
    - Multiple accounts
    - Dev, stage, prod environments
    - Disaster recovery
    - etc.

...

AWS CloudFormation

Concepts

- **Template**
  - Blueprints for AWS resources
  - JSON or YAML format

Template

Stack

Change set

- **Stack**
  - created by submitting templates
  - can be created, updated and deleted

- **Change set**
  - summary of proposed changes in stack by submitting a template
  - how the change will impact resources

Sample Template(1) – S3 Bucket

```yaml
AWSTemplateFormatVersion: '2019-09-09'
Resources:
  S3Bucket:
    Type: AWS::S3::Bucket
Outputs:
  BucketName:
    Value: !Ref S3Bucket
    Description: Name of the sample Amazon S3 bucket.
```

A single bucket is not a big deal.

Sample Template(2) – SNS & Lambda

```yaml
AWSTemplateFormatVersion: '2010-09-09'
Description: >
  sns-lambda-template

  Example CloudFormation template to subscribe a lambda to an SNS topic.
Resources:
  PatientTopic:
    Type: AWS::SNS::Topic
    Properties:
      DisplayName: patient-topic
      TopicName: patient-topic
      Subscription:
        - Protocol: lambda
          Endpoint: !GetAtt PatientCheckoutFunction.Arn

  PatientTopicPolicy:
    Type: AWS::SNS::TopicPolicy
    Properties:
      Topics:
        - !Ref PatientTopic
      PolicyDocument:
        Version: '2012-10-17'
        Statement:
          - Effect: Allow
            Action: 'sns:Publish'
            Resource: !Ref PatientTopic
            Principal:
              AWS: '*'
            Condition:
              ArnLike:
                AWS:SourceArn: !Sub 'arn:aws:*:*:${AWS::AccountId}:*'
```

A lambda subscribing to an SNS topic

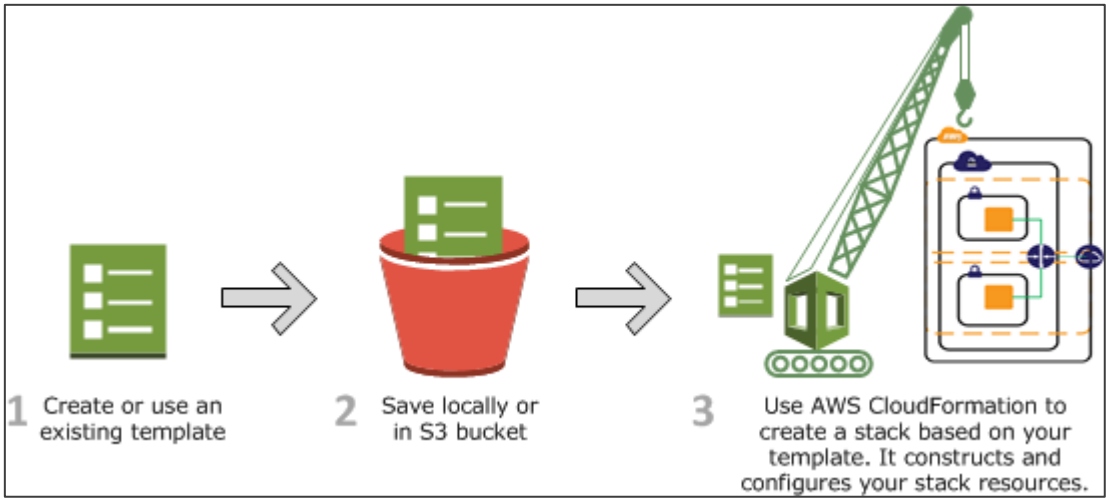
```yaml
PatientCheckoutFunction:
  Type: AWS::Lambda::Function
  Properties:
    Runtime: python3.8
    Handler: index.handler
    Code:
      ZipFile: |
        import json
        def handler(event, context):
          patients = [{'name': json.loads(record['Sns']['Message'])['name'], 'st
          print(patients)
    Role: !GetAtt PatientCheckoutFunctionExecutionRole.Arn

PatientCheckoutFunctionInvokePermission:
  Type: AWS::Lambda::Permission
  Properties:
    Action: 'lambda:InvokeFunction'
    FunctionName: !Ref PatientCheckoutFunction
    Principal: sns.amazonaws.com

PatientCheckoutFunctionExecutionRole:
  Type: AWS::IAM::Role
  Properties:
    AssumeRolePolicyDocument:
      Version: '2012-10-17'
      Statement:
        - Effect: Allow
          Principal:
            Service:
              - lambda.amazonaws.com
          Action:
            - sts:AssumeRole
    Path: "/"
    Policies:
      - PolicyName: root
        PolicyDocument:
          Version: '2012-10-17'
          Statement:
            - Effect: Allow
```

CloudFormation Flow

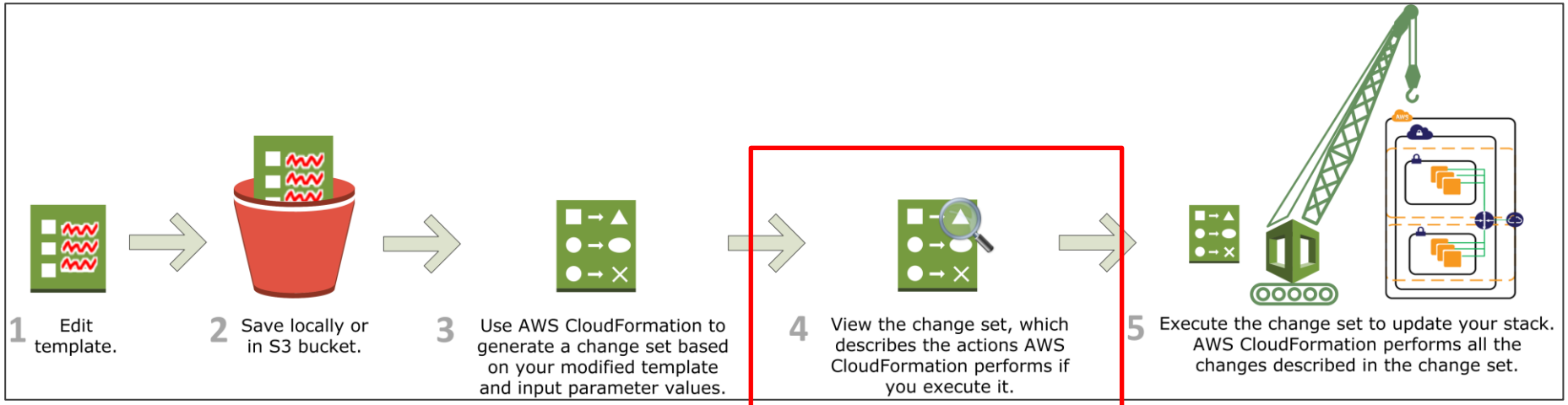
CFN의 자원 생성 흐름



1) 템플릿에 자원 명세를 작성하고
2) S3 버킷에 업로드하고
3) CloudFormation에 제출하면 CFN 스택이 만들어진다.

CloudFormation Flow

CFN의 자원 생성 흐름 – Change Sets 검토할 시

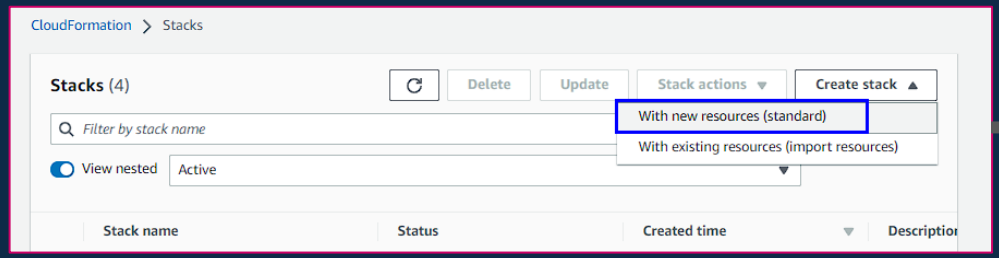


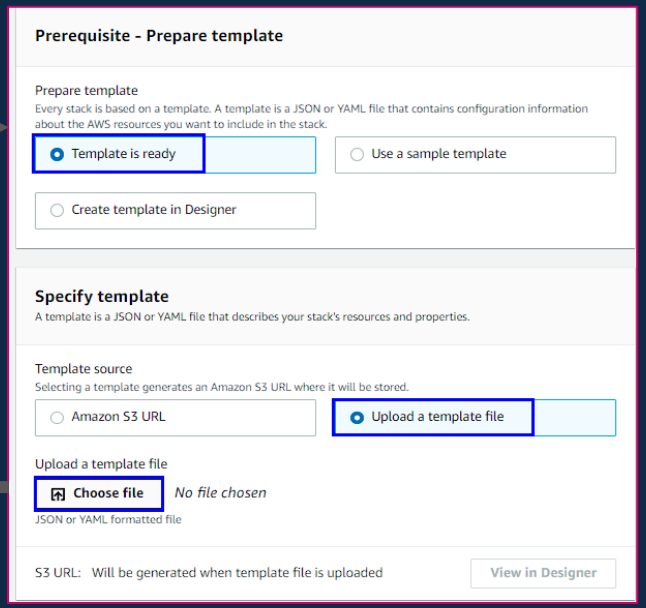
※관리자가 손수 Change Set을 검토하는 과정이 추가된다.

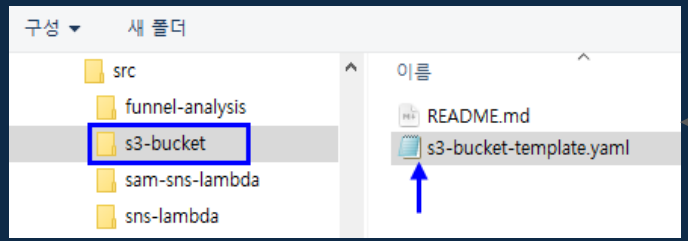
CloudFormation Demo①

Submitting a CFT that creates an s3 bucket via CFN console

1. Download the template @https://github.com/binchoo/2022-dms-iac/tree/master/src/s3-bucket
2. Submit the `s3-bucket-template.yaml` file via the AWS CloudFormation console.



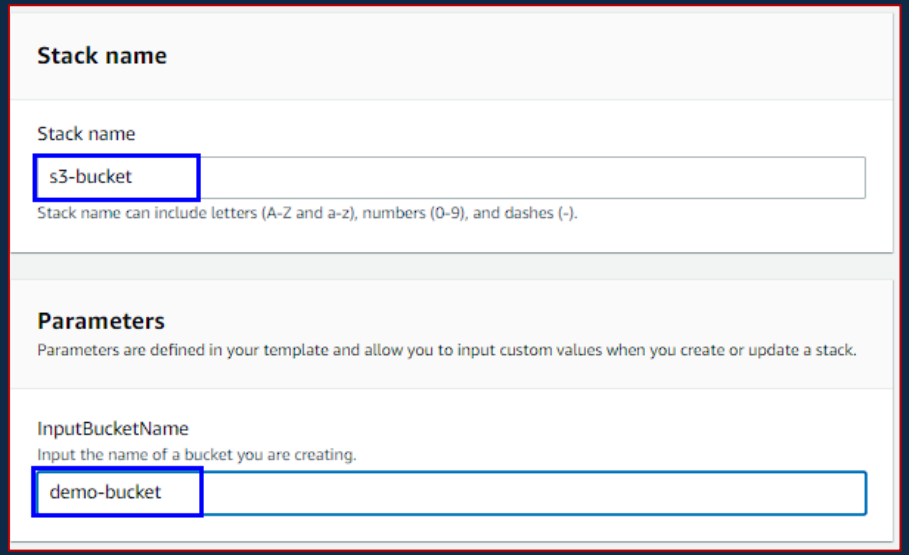




CloudFormation Demo①

Submitting a CFT that creates an s3 bucket via CFN console

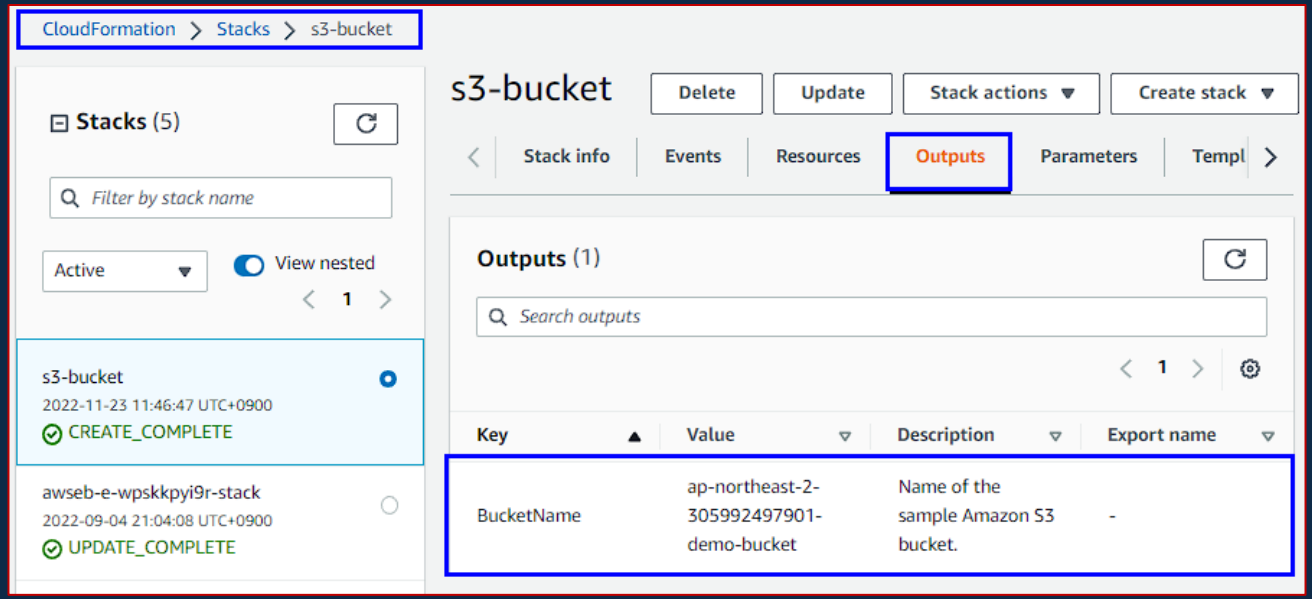
3. Set the name of the CloudFormation stack. I set it to `s3-bucket`.
4. You can change the name of the s3 bucket, if necessary, giving other values to the `InputBucketName` parameter.



CloudFormation Demo①

Submitting a CFT that creates an s3 bucket via CFN console

5. Finally, submit your CFT.
6. Check that the stack outputs tap is displaying the bucket name of your new s3 bucket.



2. CloudFormation
템플릿

JSON vs. YAML

JSON

ECMAScript 3판이 정의한 JS 객체 리터럴 표현법

```json
{
  "AWSTemplateFormatVersion": "2010-09-09",
  "Parameters" : {
    "SNSEmail" : {
      "Type" : "String",
      "Description" : "Enter email for SNS notification"
    }
  },
  "Resources" : {
    "AlertSNSTopic" : {
      "Type" : "AWS::SNS::Topic",
      "Properties" : {
        "Subscription" : [{
          "Endpoint" : { "Ref" : "SNSEmail"},
          "Protocol" : "email"
        }]
      }
    }
  }
}
```

YAML

인간 친화적, 언어 무관, 유니코드 기반 직렬화 표현법

```yaml
AWSTemplateFormatVersion: '2010-09-09'
Parameters:
  SNSEmail:
    Type: String
    Description: Enter email for SNS notification
Resources:
  AlertSNSTopic:
    Type: 'AWS::SNS::Topic'
    Properties:
      Subscription:
        -
          Endpoint:
            Ref: SNSEmail
          Protocol: email
```

NOT A BIG DEAL

CFT Anatomy

```
AWSTemplateFormatVersion: "version date"

Description:
  String

Metadata:
  template metadata

Parameters:
  set of parameters

Rules:
  set of rules

Mappings:
  set of mappings

Conditions:
  set of conditions

Transform:
  set of transforms

Resources:
  set of resources

Outputs:
  set of outputs
```

- ①AWSTemplateFormatVersion
- ②Description
- Metadata
- ③Parameters
- Rules
- Mappings
- Conditions
- ④Resources *(required)*
- ⑤Outputs
- Transform

이 교안은 빨간색 영역들을 소개하지만
풍부한 표현의 CFT를 작성하려면 나머지 내용들도 알아야 합니다. 🙏

CFT Anatomy

①Template Version

```
{
  "AWSTemplateFormatVersion" : "2010-09-09",
  "Description" : "A simple EC2 instance",
  "Resources" : {
    "MyEC2Instance" : {
      "Type" : "AWS::EC2::Instance",
      "Properties" : {
        "ImageId" : "ami-0ff8a91507f77f867",
        "InstanceType" : "t1.micro"
      }
    }
  }
}
```

임의의 날짜를 적지 않습니다.
"2010-09-09"를 유효하게 사용 가능합니다.

CFT Anatomy

②Description

```
{
  "AWSTemplateFormatVersion" : "2010-09-09",
  "Description" : "A simple EC2 instance",
  "Resources" : {
    "MyEC2Instance" : {
      "Type" : "AWS::EC2::Instance",
      "Properties" : {
        "ImageId" : "ami-0ff8a91507f77f867",
        "InstanceType" : "t1.micro"
      }
    }
  }
}
```

템플릿이 명세하는 인프라에 대해 자유롭게 서술하면 됩니다.

CFT Anatomy

③Parameters

- Enables us to input custom values

```
{
  "AWSTemplateFormatVersion" : "2010-09-09",
  "Description" : "A simple EC2 instance",
  "Resources" : {
    "MyEC2Instance" : {
      "Type" : "AWS::EC2::Instance",
      "Properties" : {
        "ImageId" : "ami-0ff8a91507f77f867",
        "InstanceType" : "t1.micro"
      }
    }
  }
}
```

😕값을 외부에서 주입하면 더 유연해질텐데?

CFT Anatomy

Input an EC2 instance type

```
"Parameters" : {
  "InstanceTypeParameter" : {
    "Type" : "String",
    "Default" : "t2.micro",
    "AllowedValues" : ["t2.micro", "m1.small", "m1.large"],
    "Description" : "Enter t2.micro, m1.small, or m1.large. Default is t2.micro."
  }
}
```

```
"Ec2Instance" : {
  "Type" : "AWS::EC2::Instance",
  "Properties" : {
    "InstanceType" : { "Ref" : "InstanceTypeParameter" },
    "ImageId" : "ami-0ff8a91507f77f867"
  }
}
```

CFT Anatomy

Parameters – basics

- Enables us to input custom values
- Maximum 200 parameters in a template
- Alphanumeric and unique name
- Parameter Types
    - String
    - Number
    - List of number
    - Comma delimited list e.g) "test", "dev", "prod"
    - AWS-Specific Parameter Types

...

CFT Anatomy

Parameters – examples

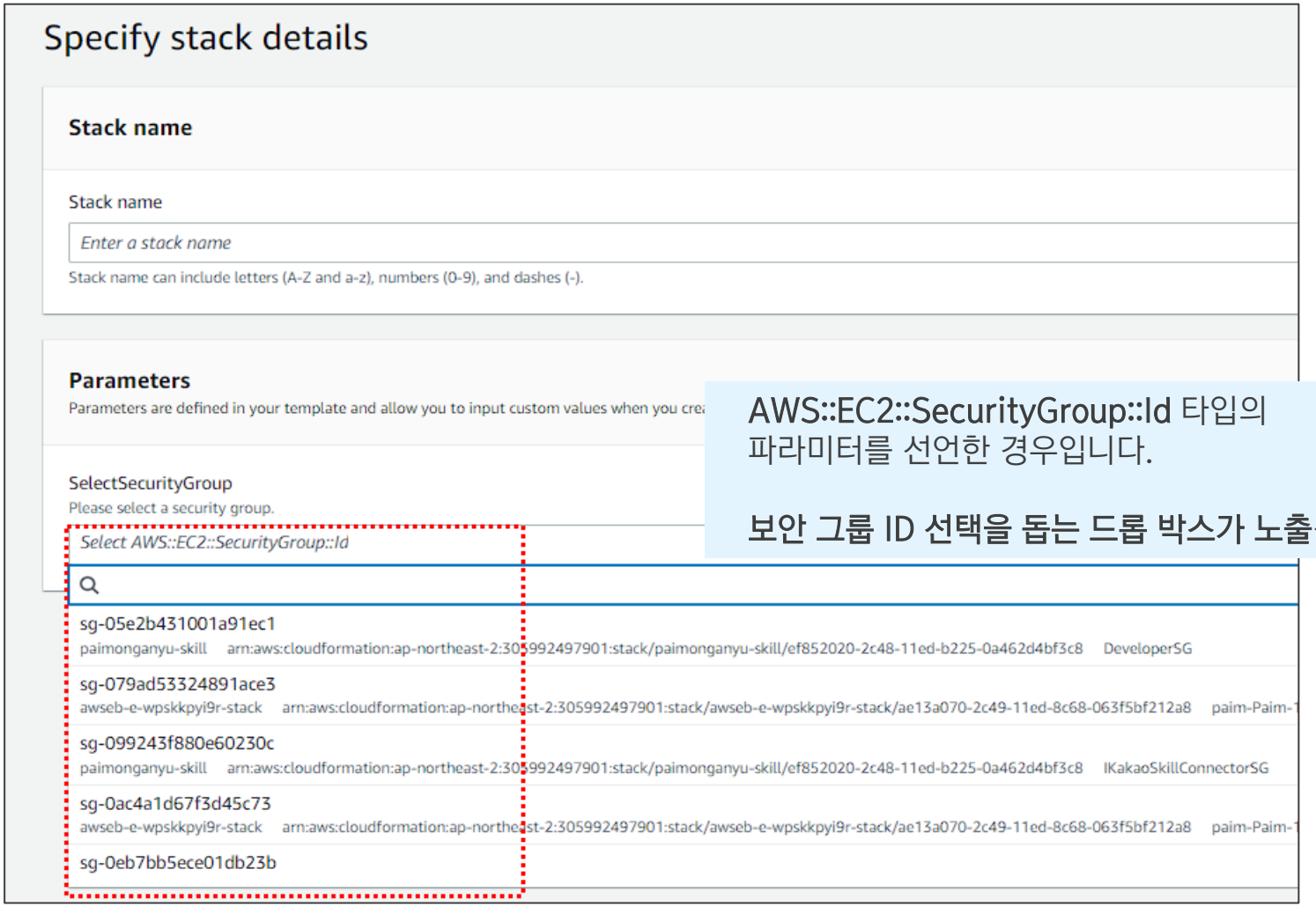
```
"Parameters" : {
  "DBPort" : {
    "Default" : "3306",
    "Description" : "TCP/IP port for the database",
    "Type" : "Number",
    "MinValue" : "1150",
    "MaxValue" : "65535"
  },
  "DBPwd" : {
    "NoEcho" : "true",
    "Description" : "The database admin account password",
    "Type" : "String",
    "MinLength" : "1",
    "MaxLength" : "41",
    "AllowedPattern" : "^[a-zA-Z0-9]*$"
  }
}
```

CFT Anatomy

Parameters – aws specific types

- Predefined parameters
- AWS console **will display you a drop-box** that lists up valid values.

- AWS::EC2::KeyPair::KeyName
- AWS::EC2::Subnet::Id
- AWS::EC2::VPC::Id
- AWS::EC2::Instance::Id
- AWS::EC2::Image::Id
- AWS::EC2::SecurityGroup::Id



AWS::EC2::SecurityGroup::Id 타입의
파라미터를 선언한 경우입니다.

보안 그룹 ID 선택을 돕는 드롭 박스가 노출됩니다.

CFT Anatomy

Pseudo parameters

- Predefined parameters by AWS CloudFormation
- Use intrinsic function **Ref** to retrieve values

- Popular pseudo parameters
  - AWS::Region
  - AWS::AccountId
  - AWS::StackId
  - AWS::StackName

CFT Anatomy

Pseudo parameters – an example

〈JSON〉

```
"Outputs": {
  "StackRegion": {"Value": {"Ref": "AWS::Region"}}
}
```

〈YAML〉

```
Outputs:
  StackRegion:
    Value: !Ref AWS::Region
```

알아서 정의되는 파라미터 AWS::Region의 값을
Ref 내재함수로 참조해 오는 모습입니다.

Intrinsic Functions(내재 함수)

Several built-in functions used in CFN template

- Fn::Base64
- Fn::Cidr
- Condition Functions
- Fn::FindInMap
- Fn::GetAtt – 자원의 특정 속성값을 참조함
- Fn::GetAZs
- Fn::ImportValue
- Fn::Join – 문자열 리스트를 delimeter로 조인함
- Fn::Select
- Fn::Split
- Fn::Sub – 문자열 플레이스 홀더를 치환함
- Fn::Transform
- Ref – 자원의 기본 속성값이나 파라미터의 값을 참조함

CFT Anatomy

④Resources

- Required section
- Defines the AWS resources such as EC2, SNS, S3, ⋯ etc.

〈JSON〉

```
"Resources" : {
    "Logical ID" : {
        "Type" : "Resource type",
        "Properties" : {
            Set of properties
        }
    }
}
```

〈YAML〉

```
Resources:
  Logical ID:
    Type: Resource type
    Properties:
      Set of properties
```

⋯

CFT Anatomy

Resources – an EC2 instance

```
"Resources" : {
    "MyEC2Instance" : {
      "Type" : "AWS::EC2::Instance",
      "Properties" : {
        "ImageId" : "ami-012abc124"
      }
    }
  }
```

CFT Anatomy

Resources – an S3 bucket

```
AWSTemplateFormatVersion: '2010-09-09'
Resources:
  S3Bucket:
    Type: AWS::S3::Bucket

Outputs:
  BucketName:
    Value: !Ref 'S3Bucket'
    Description: Name of the sample Amazon S3 bucket.
```

CFT Anatomy

Resources – how to describe a resource?

- When you write down a CFT,
  you **MUST** refer to the AWS CFN documents.

- You should note the required fields for the resources you want to create.
- You may learn a lot from example snippets at below of the documents.

- https://docs.aws.amazon.com/AWSCloudFormation/latest/UserGuide/aws-template-resource-type-ref.html

...

CFT Anatomy

⑤Outputs

- Outputs certain attributes of the resources to outside.
  eg) S3 bucket name, SNS topic name, … etc.

〈JSON〉

```
"Outputs" : {
  "Logical ID" : {
    "Description" : "Information about the value",
    "Value" : "Value to return",
    "Export" : {
      "Name" : "Name of resource to export"
    }
  }
}
```

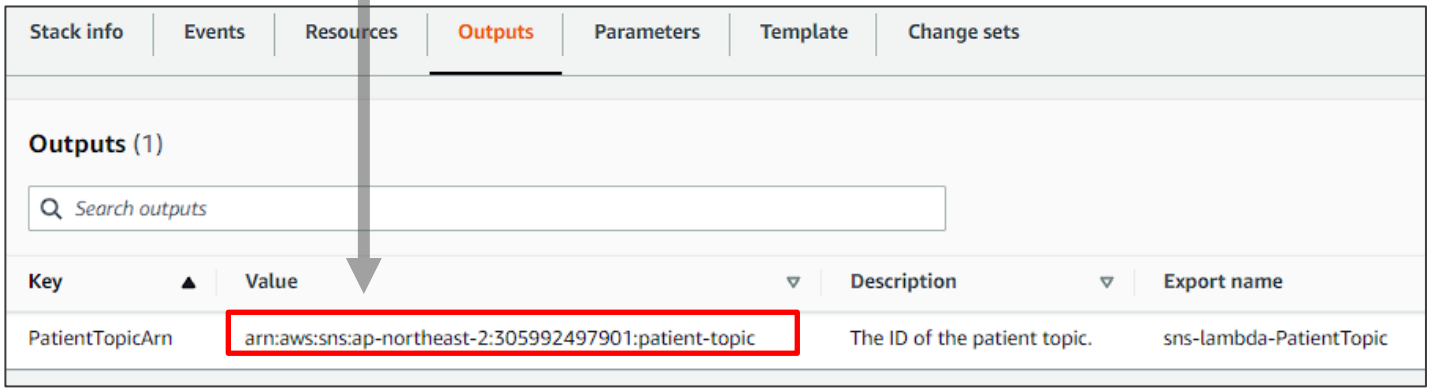
〈YAML〉

```
Outputs:
  Logical ID:
    Description: Information about the value
    Value: Value to return
    Export:
      Name: Name of resource to export
```

CFT Anatomy

Outputs – ARN of an SNS topic

```yaml
Outputs:
  PatientTopicArn:
    Description: The ID of the patient topic.
    Value: !Ref PatientTopic
    Export:
      Name: !Sub "${AWS::StackName}-PatientTopic"
```



Coding Any CloudFormation Template

1. 아키텍처 뷰를 그린다. 배치할 AWS 자원을 식별한다.

2. (필요하다면 AWS 콘솔에서 아키텍처 배치를 직접 연습해 보자.)

3. 각 자원을 CFT 신택스로 표현하는 법을 구글링한다. ("SQS Queue CloudFormation")

4. AWS 공식 문서에 당도한다.

5. 자원의 필수 속성 위주로 잘 확인한다. (문서에서 CTRL + F → 'yes', 'conditional' 검색)

6. 예제 템플릿을 꼭 참고한다. 복사하여 템플릿 작성에 활용한다.

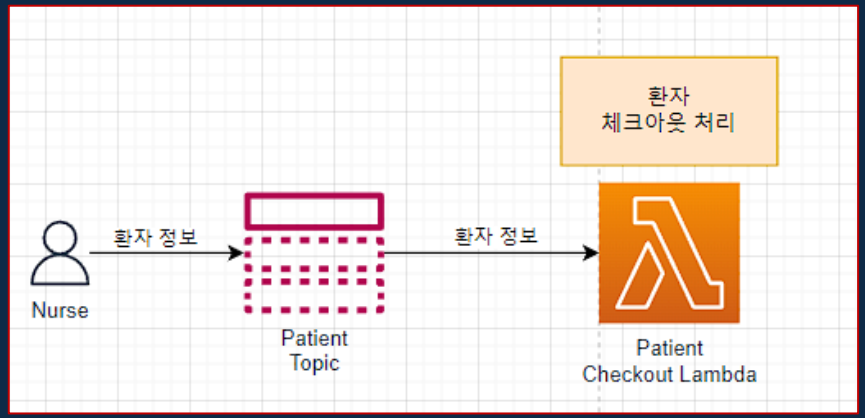
정확한 정보 소스를 일관적으로 활용하시면 리서치 속도를 높일 수 있습니다. 🙏
→공식 문서, 공식 블로그
→그 시스템을 만드는 사람들과 질답하기 @깃허브, @이슈트래커

CloudFormation Demo②

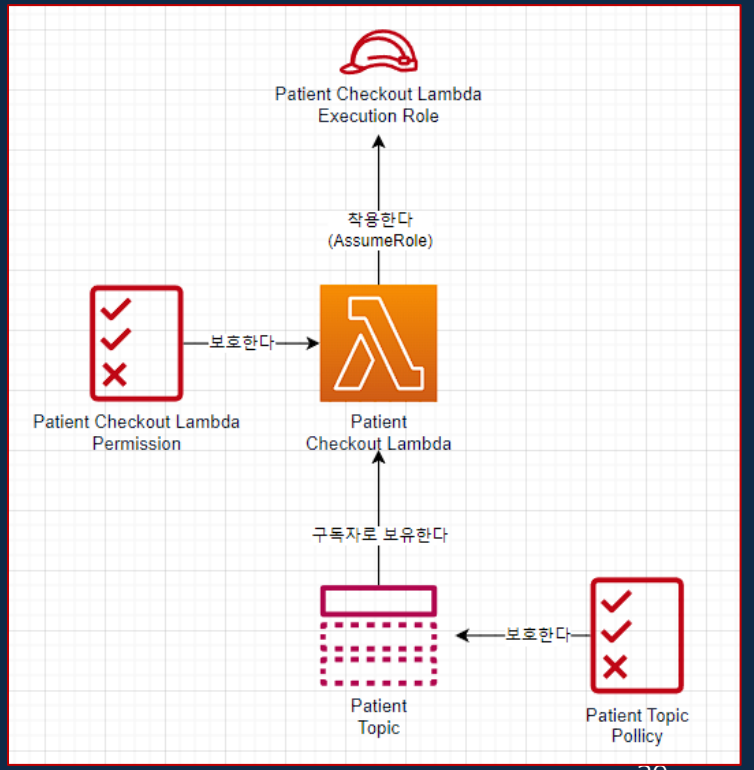
Subscribing a lambda to an SNS topic

1. Review the reference architecture views.

⟨Use case⟩



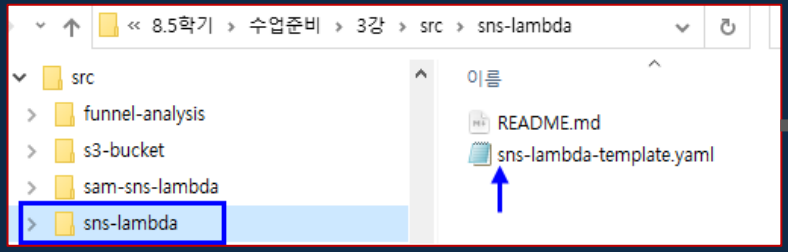
⟨Deployment & Knowing Responsibilities⟩

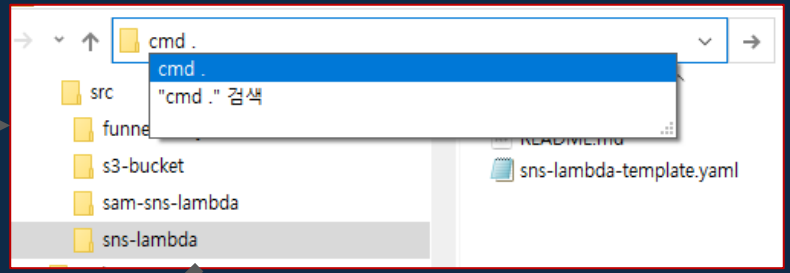


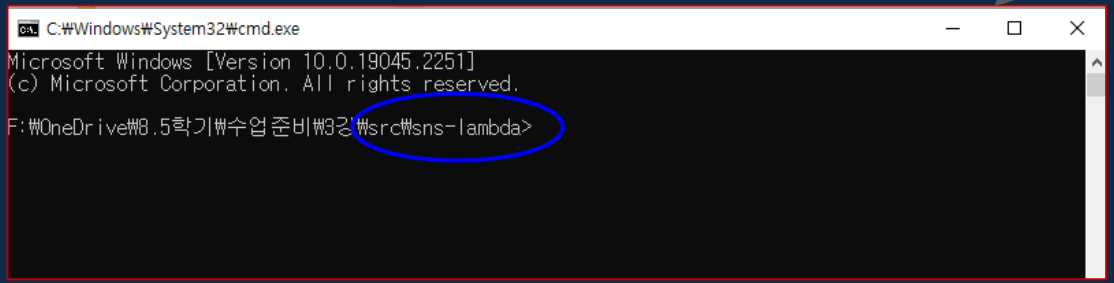
CloudFormation Demo②

Subscribing a lambda to an SNS topic

2. Download the template code @https://github.com/binchoo/2022-dms-iac/tree/master/src/sns-lambda
3. Open your cmd or bash at the directory where the `sns-lambda-template.yaml` file is visible.







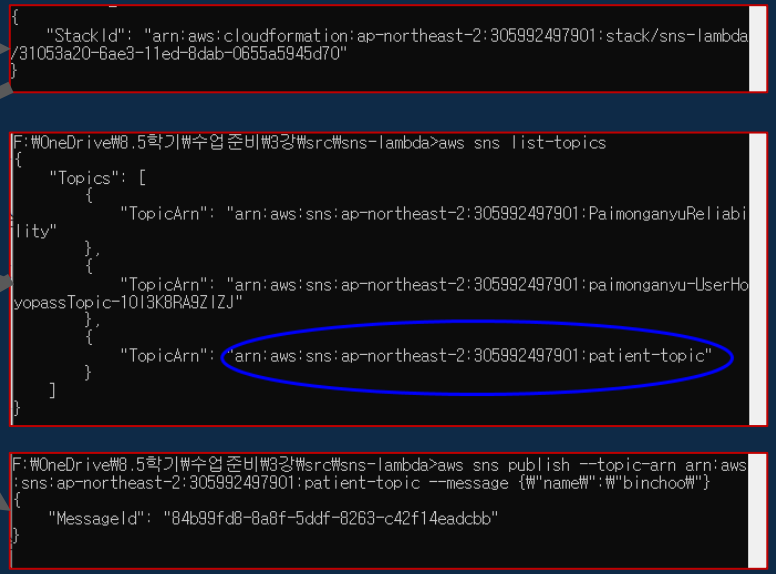
CloudFormation Demo②

Subscribing a lambda to an SNS topic

4. Submit the `sns-lambda-template.yaml` via your AWS CLI.
5. Send a test message to the SNS topic that has been created.

```
aws cloudformation create-stack \
--stack-name sns-lambda \
--template-body file://sns-lambda-template.yaml \
--capabilities CAPABILITY_IAM
```

```
aws sns list-topics
aws sns publish --topic-arn <topic-arn> \
--message {\"name\":\"binchoo\"}
```

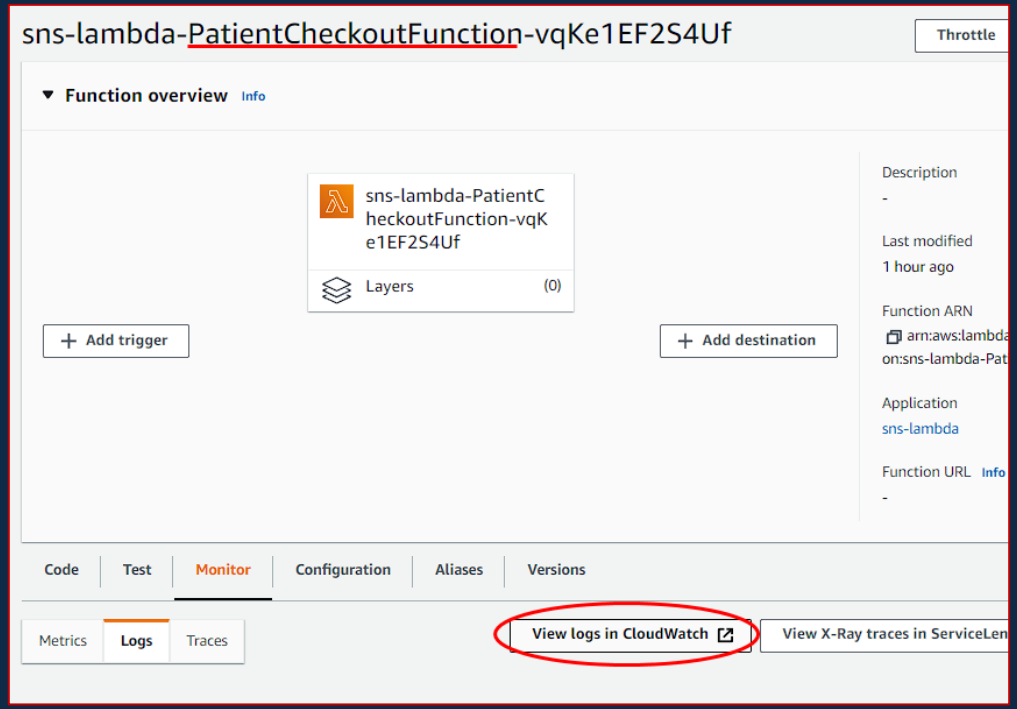


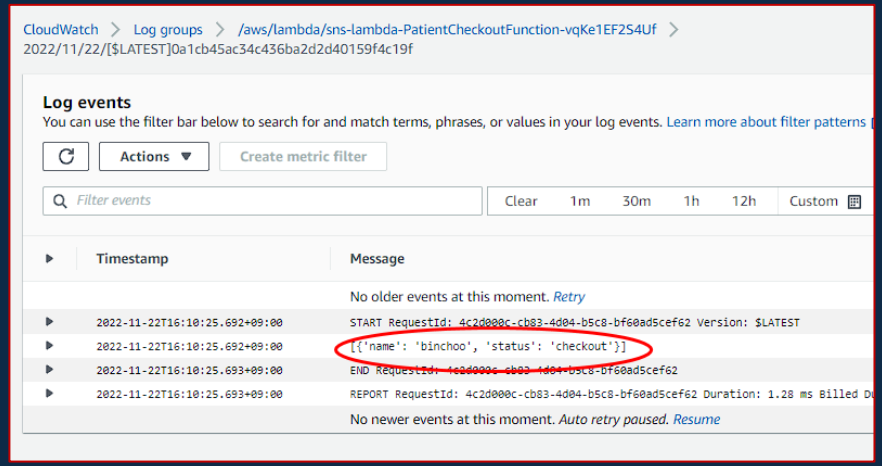
CLI Document - https://docs.aws.amazon.com/cli/latest/index.html

CloudFormation Demo②

Subscribing a lambda to an SNS topic

6. Verify that `PatientCheckoutFunction` is responding to the messages and generating patient checkout logs.





3. CloudFormation & SAM 실습

Sample Template(2) – SNS & Lambda

```yaml
AWSTemplateFormatVersion: '2010-09-09'
Description: >
  sns-lambda-template

  Example CloudFormation template to subscribe a lambda to an SNS topic.
Resources:
  PatientTopic:
    Type: AWS::SNS::Topic
    Properties:
      DisplayName: patient-topic
      TopicName: patient-topic
      Subscription:
        - Protocol: lambda
          Endpoint: !GetAtt PatientCheckoutFunction.Arn

  PatientTopicPolicy:
    Type: AWS::SNS::TopicPolicy
    Properties:
      Topics:
        - !Ref PatientTopic
      PolicyDocument:
        Version: '2012-10-17'
        Statement:
          - Effect: Allow
            Action: 'sns:Publish'
            Resource: !Ref PatientTopic
            Principal:
              AWS: '*'
            Condition:
              ArnLike:
                AWS:SourceArn: !Sub 'arn:aws:*:*:${AWS::AccountId}:*'
```

```yaml
PatientCheckoutFunction:
  Type: AWS::Lambda::Function
  Properties:
    Runtime: python3.8
    Handler: index.handler
    Code:
      ZipFile: |
        import json
        def handler(event, context):
          patients = [{'name': json.loads(record['Sns']['Message'])['name'], 'st
          print(patients)
    Role: !GetAtt PatientCheckoutFunctionExecutionRole.Arn

PatientCheckoutFunctionInvokePermission:
  Type: AWS::Lambda::Permission
  Properties:
    Action: 'lambda:InvokeFunction'
    FunctionName: !Ref PatientCheckoutFunction
    Principal: sns.amazonaws.com

PatientCheckoutFunctionExecutionRole:
  Type: AWS::IAM::Role
  Properties:
    AssumeRolePolicyDocument:
      Version: '2012-10-17'
      Statement:
        - Effect: Allow
          Principal:
            Service: lambda.amazonaws.com
          Action: sts:AssumeRole
    Path: "/"
    Policies:
      - PolicyName: root
        PolicyDocument:
          Version: '2012-10-17'
          Statement:
            - Effect: Allow
```

구독 설정, 보안 설정, …
너무 장황하다!

AWS SAM

Serverless Application Model

- Framework for building and deploying serverless apps
- Resources are configurable with YAML using simple syntax
  - Lambda functions
  - DynamoDB tables
  - API Gateway
  - Cognito user pools
- SAM helps you to test Lambda, API Gateway, DynamoDB locally

AWS SAM 템플릿

Transform 영역

- AWS SAM 매크로 이용을 지시한다.
- `AWS::Serverless-2016-10-31`

AWS::Serverless::Function

- 람다를 나타내는 SAM의 자원 타입
- 서버리스 자원을 짧은 신택스로 명세할 수 있음.

Events 속성

- 람다와 다양한 이벤트 소스 연동을 단순한 스니펫으로 명세

24줄만으로 Lambda와 SNS 토픽을 만들고 연동시켰습니다.

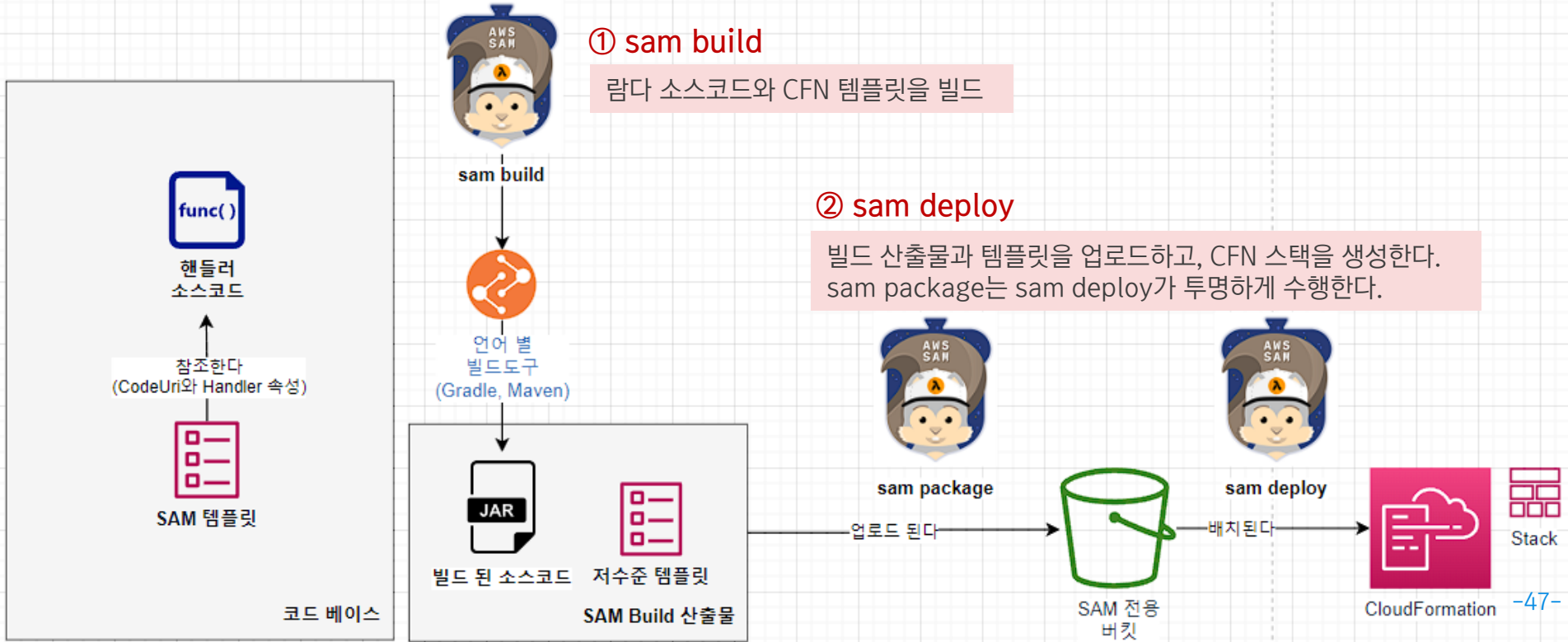
```yaml
AWSTemplateFormatVersion: '2010-09-09'
Transform: AWS::Serverless-2016-10-31
Description: >
  sam-sns-lambda-template

  Example AWS SAM template to subscribe a lambda to an SNS topic.
Resources:
  SamPatientTopic:
    Type: AWS::SNS::Topic
    Properties:
      DisplayName: sam-patient-topic
      TopicName: sam-patient-topic

  SamPatientCheckoutFunction:
    Type: AWS::Serverless::Function
    Properties:
      Runtime: python3.7
      CodeUri: .
      Handler: index.handler
      Events:
        NewPatient:
          Type: SNS
          Properties:
            Topic: !Ref SamPatientTopic
```

AWS SAM Flow

SAM을 통한 람다 소스코드 빌드 및 인프라 배포 흐름



AWS Hands-On (3)

- Subscribing a lambda to an SNS topic -

Covered Services

AWS CloudFormation

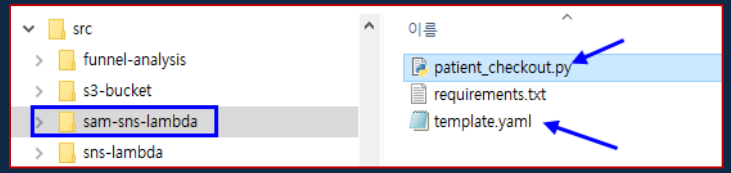
AWS SAM

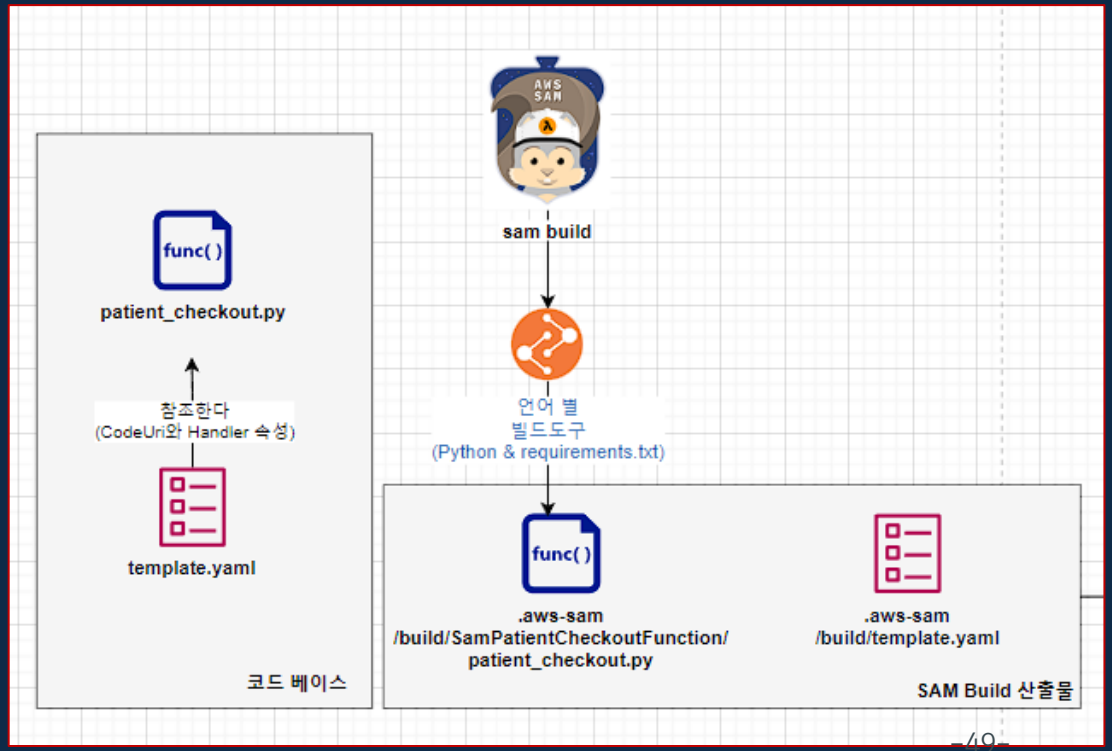
Amazon SNS

Reference Architecture View

(예상 소요 시간: 15분)

로컬 환경

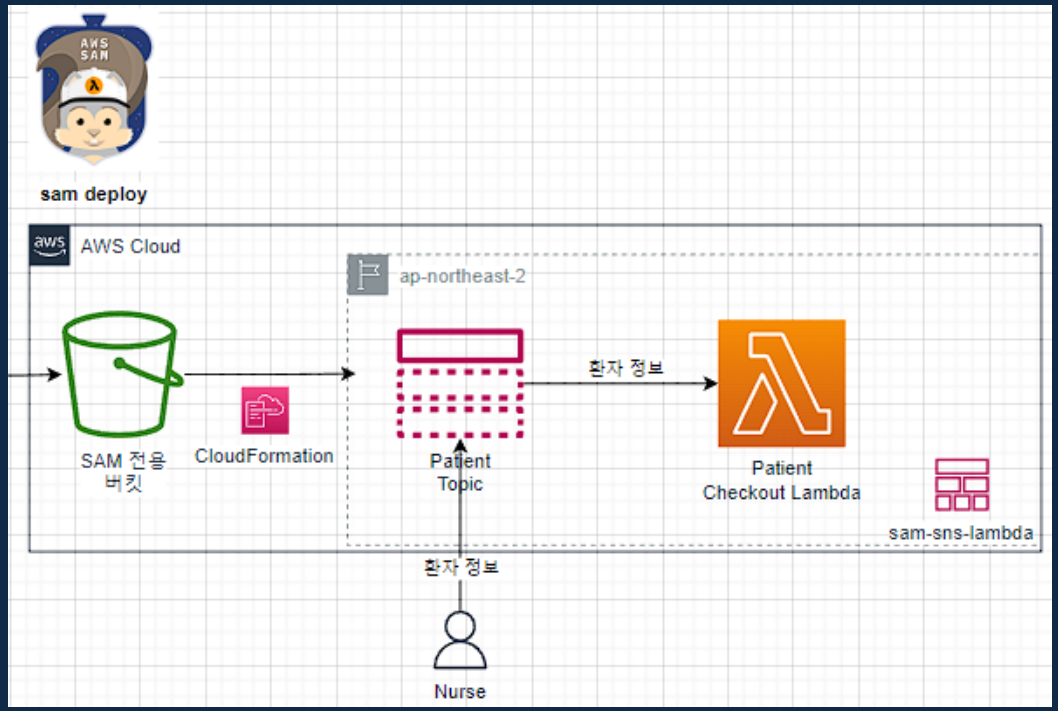




Reference Architecture View

(예상 소요 시간: 15분)

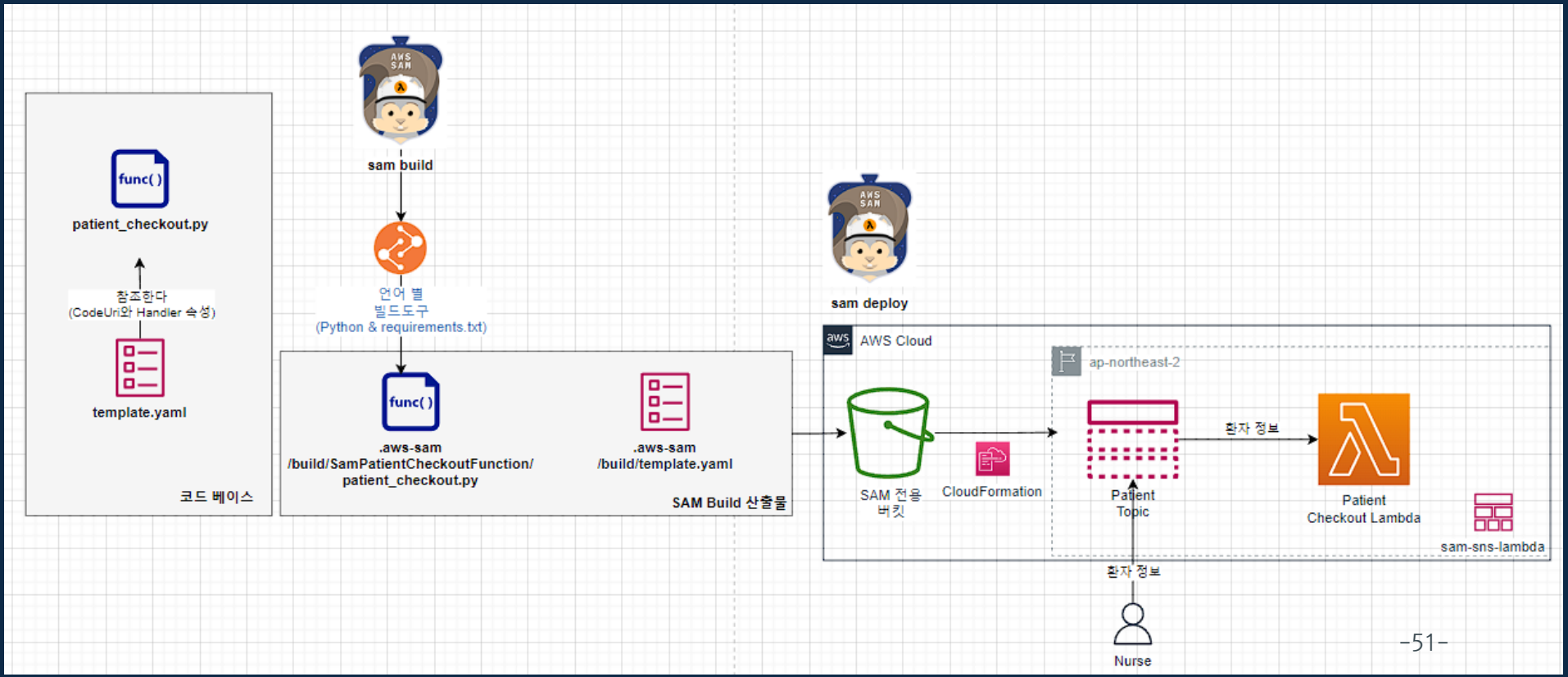
SAM 배포 이후 AWS 클라우드 환경



Reference Architecture View

(예상 소요 시간: 15분)

전체 뷰



SAM Template

```yaml
AWSTemplateFormatVersion: '2010-09-09'
Transform: AWS::Serverless-2016-10-31
Description: 'sam-sns-lambda-template

  Example AWS SAM template to subscribe a lambda to an SNS topic.

  '
Resources:
  SamPatientTopic:
    Type: AWS::SNS::Topic
    Properties:
      DisplayName: sam-patient-topic
      TopicName: sam-patient-topic
  SamPatientCheckoutFunction:
    Type: AWS::Serverless::Function
    Properties:
      Runtime: python3.7 # 자기 환경의 Python 버전을 명시하세요 (python3.7, python3.8, python3.9
      CodeUri: SamPatientCheckoutFunction
      Handler: patient_checkout.handler
      Events:
        NewPatient:
          Type: SNS
          Properties:
            Topic:
              Ref: SamPatientTopic
    Metadata:
      SamResourceId: SamPatientCheckoutFunction
```

template.yaml 파일

CloudFormation Demo③

Subscribing a lambda to an SNS topic with SAM

1. Download the source code @https://github.com/binchoo/2022-dms-iac/tree/master/src/sam-sns-lambda
2. Open your cmd or bash.
3. Your python version must be the same with the `SamPatientCheckoutFunction`'s runtime.

```
(base) F:₩OneDrive₩8.5학기₩수업준비₩3강₩src₩sam-sns-lambda>python --version
Python 3.7.4
```

```
14    SamPatientCheckoutFunction:
15      Type: AWS::Serverless::Function
16      Properties:
17        Runtime: python3.7 # 자기 환경의 Python 버전을 명시하세요 (python3.7, python3.8, python3.9
18        CodeUri: SamPatientCheckoutFunction
19        Handler: patient_checkout.handler
20        Events:
21          NewPatient:
22            Type: SNS
23            Properties:
24              Topic:
25                Ref: SamPatientTopic
```

CloudFormation Demo③

Subscribing a lambda to an SNS topic with SAM

4. Do `sam build`

5. A new directory `.aws-sam` should have been created
and contain artifacts like lambda codes, sam templates, …etc.

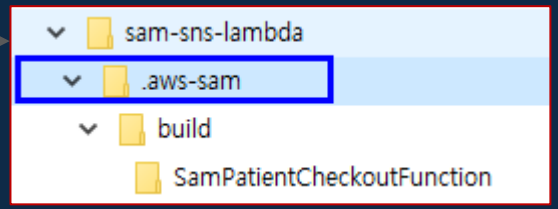
```
(base) F:₩OneDrive₩8.5학기₩수업준비₩3강₩src₩sam-sns-lambda>sam build
Building codeuri: F:₩OneDrive₩8.5학기₩수업준비₩3강₩src₩sam-sns-lambda runtime: python3.7
hitecture: x86_64 functions: SamPatientCheckoutFunction
Running PythonPipBuilder:ResolveDependencies
Running PythonPipBuilder:CopySource

Build Succeeded

Built Artifacts  : .aws-sam₩build
Built Template   : .aws-sam₩build₩template.yaml

Commands you can use next
=========================
[*] Validate SAM template: sam validate
[*] Invoke Function: sam local invoke
[*] Test Function in the Cloud: sam sync --stack-name {{stack-name}} --watch
[*] Deploy: sam deploy --guided
```

It's new!!



CloudFormation Demo③

Subscribing a lambda to an SNS topic with SAM

6. Do `sam deploy --guided`
7. Input some configuration values for the CFN stack.

8. Sam Deploy will display you the change-set.
9. Sam Deploy will deploy the resources into the CFN stack. You may see the realtime logs of the deployment.

```
(base) F:₩OneDrive₩8.5학기₩수업준비₩3강₩src₩sam-sns-lambda>sam deploy --guided

Configuring SAM deploy
======================

        Looking for config file [samconfig.toml] :  Not found

        Setting default arguments for 'sam deploy'
        =========================================
        Stack Name [sam-app]: sam-sns-lambda
        AWS Region [ap-northeast-2]: ap-northeast-2
        #Shows you resources changes to be deployed and require a 'Y' to initiate deploy
        Confirm changes before deploy [y/N]: 엔터
        #SAM needs permission to be able to create roles to connect to the resources in your t
emplate
        Allow SAM CLI IAM role creation [Y/n]: 엔터
        #Preserves the state of previously provisioned resources when an operation fails
        Disable rollback [y/N]: 엔터
        Save arguments to configuration file [Y/n]: 엔터
        SAM configuration file [samconfig.toml]: 엔터
        SAM configuration environment [default]: 엔터
```

스택 이름을 뭐로 할까요? sam-sns-lambda
어느 리전에 배포할까요? 서울이요

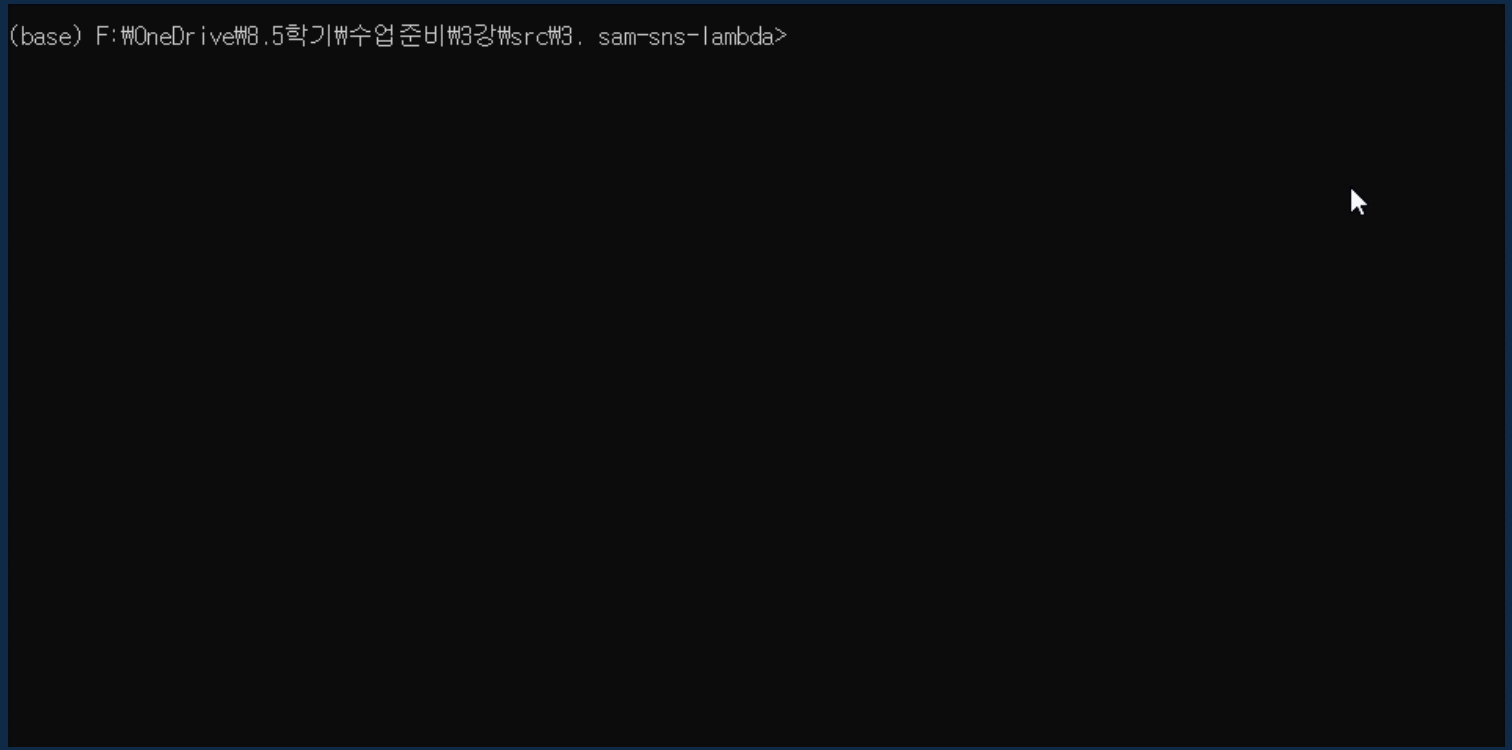
ChangeSet 검수할래요? 아뇨

IAM 롤 생성을 허용할래요? 네

배포 중 오류시 롤백합니까? 네
지금 설정하신 값들 로컬에 저장할래요? 네
어느 파일에 저장하나요? samconfig.toml
지금 설정하신 값들을 어떤 묶음으로 관리할래요? default

CloudFormation Demo③

Sam deploy 과정 GIF 이미지



CloudFormation Demo③

Change set 출력 예

```
Waiting for changeset to be created..
CloudFormation stack changeset
-----------------------------------------------------------------------------------------------------------------
Operation                 LogicalResourceId                 ResourceType                  Replacement
-----------------------------------------------------------------------------------------------------------------
+ Add                     SamPatientCheckoutFunctionN       AWS::Lambda::Permission       N/A
                          ewPatientPermission
+ Add                     SamPatientCheckoutFunctionN       AWS::SNS::Subscription        N/A
                          ewPatient
+ Add                     SamPatientCheckoutFunctionR       AWS::IAM::Role                N/A
                          ole
+ Add                     SamPatientCheckoutFunction        AWS::Lambda::Function         N/A
+ Add                     SamPatientTopic                   AWS::SNS::Topic               N/A
-----------------------------------------------------------------------------------------------------------------

Changeset created successfully. arn:aws:cloudformation:ap-northeast-2:305992497901:changeSet/samcli-deploy1669115286/4c3
facef-2294-4cfe-8c70-5f7b6348202a
```

CloudFormation Demo③

스택 이벤트 출력 예

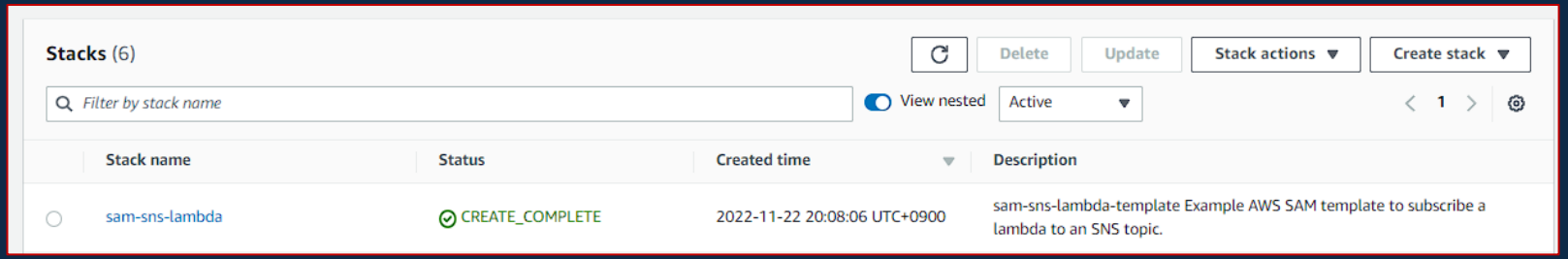
```
CloudFormation events from stack operations (refresh every 0.5 seconds)
---------------------------------------------------------------------------------------------------------------------------
ResourceStatus                  ResourceType                    LogicalResourceId               ResourceStatusReason
---------------------------------------------------------------------------------------------------------------------------
CREATE_IN_PROGRESS              AWS::IAM::Role                  SamPatientCheckoutFunctionR     -
                                                                ole
CREATE_IN_PROGRESS              AWS::SNS::Topic                 SamPatientTopic                 -
CREATE_IN_PROGRESS              AWS::IAM::Role                  SamPatientCheckoutFunctionR     Resource creation Initiated
                                                                ole
CREATE_IN_PROGRESS              AWS::SNS::Topic                 SamPatientTopic                 Resource creation Initiated
CREATE_COMPLETE                 AWS::SNS::Topic                 SamPatientTopic                 -
CREATE_COMPLETE                 AWS::IAM::Role                  SamPatientCheckoutFunctionR     -
                                                                ole
CREATE_IN_PROGRESS              AWS::Lambda::Function           SamPatientCheckoutFunction      -
CREATE_IN_PROGRESS              AWS::Lambda::Function           SamPatientCheckoutFunction      Resource creation Initiated
CREATE_COMPLETE                 AWS::Lambda::Function           SamPatientCheckoutFunction      -
CREATE_IN_PROGRESS              AWS::Lambda::Permission         SamPatientCheckoutFunctionN     -
                                                                ewPatientPermission
CREATE_IN_PROGRESS              AWS::SNS::Subscription          SamPatientCheckoutFunctionN     -
                                                                ewPatient
CREATE_IN_PROGRESS              AWS::Lambda::Permission         SamPatientCheckoutFunctionN     Resource creation Initiated
                                                                ewPatientPermission
CREATE_IN_PROGRESS              AWS::SNS::Subscription          SamPatientCheckoutFunctionN     Resource creation Initiated
                                                                ewPatient
CREATE_COMPLETE                 AWS::SNS::Subscription          SamPatientCheckoutFunctionN     -
                                                                ewPatient
CREATE_COMPLETE                 AWS::Lambda::Permission         SamPatientCheckoutFunctionN     -
                                                                ewPatientPermission
CREATE_COMPLETE                 AWS::CloudFormation::Stack      sam-sns-lambda                  -
---------------------------------------------------------------------------------------------------------------------------

Successfully created/updated stack - sam-sns-lambda in ap-northeast-2
```

CloudFormation Demo③

Subscribing a lambda to an SNS topic with SAM

10. Validate your CFN console has the `sam-sns-lambda` stack.

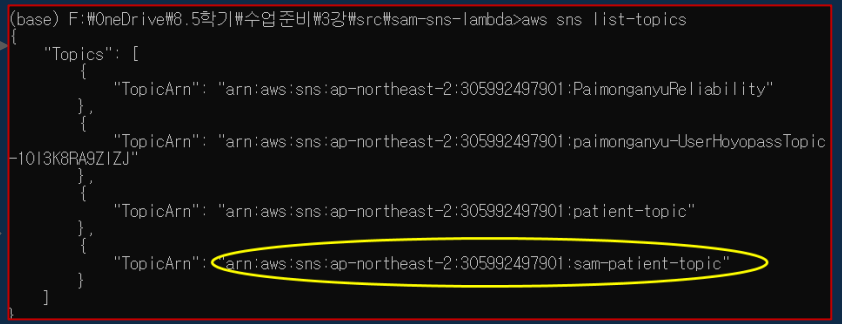


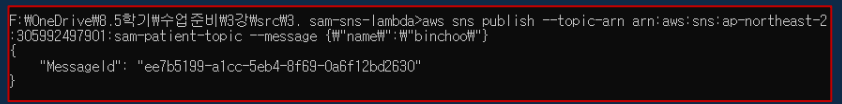
CloudFormation Demo③

Subscribing a lambda to an SNS topic with SAM

11. Send a test message to the SNS topic that has been created within your CFN stack.

```
aws sns list-topics
aws sns publish --topic-arn <topic-arn> \
--message {\"name\":\"binchoo\"}
```



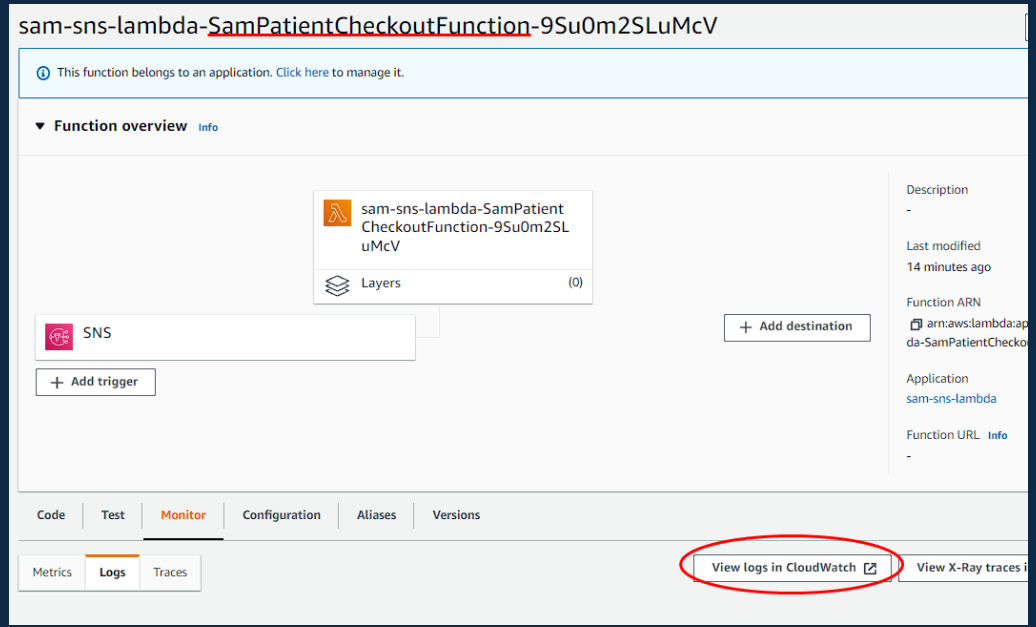


CLI Document - https://docs.aws.amazon.com/cli/latest/index.html

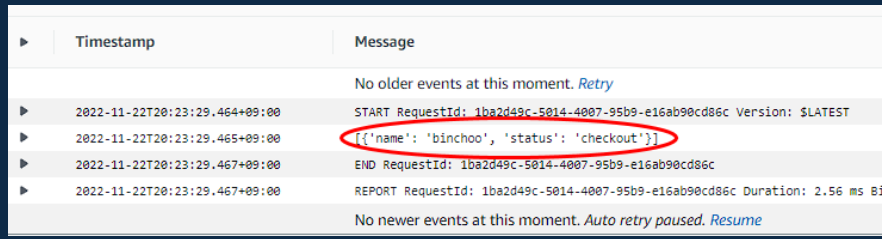
CloudFormation Demo③

Subscribing a lambda to an SNS topic with SAM

12. Verify that `SamPatientCheckoutFunction` is responding to the messages and generating patient checkout logs.



Lambda 콘솔〉 SamPatientCheckoutFunction〉 CloudWatch Logs 이동

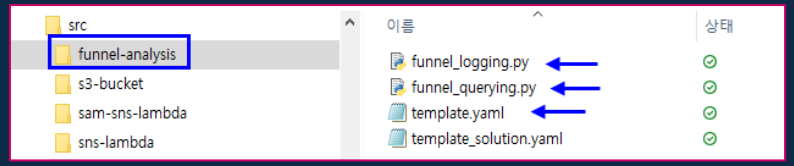


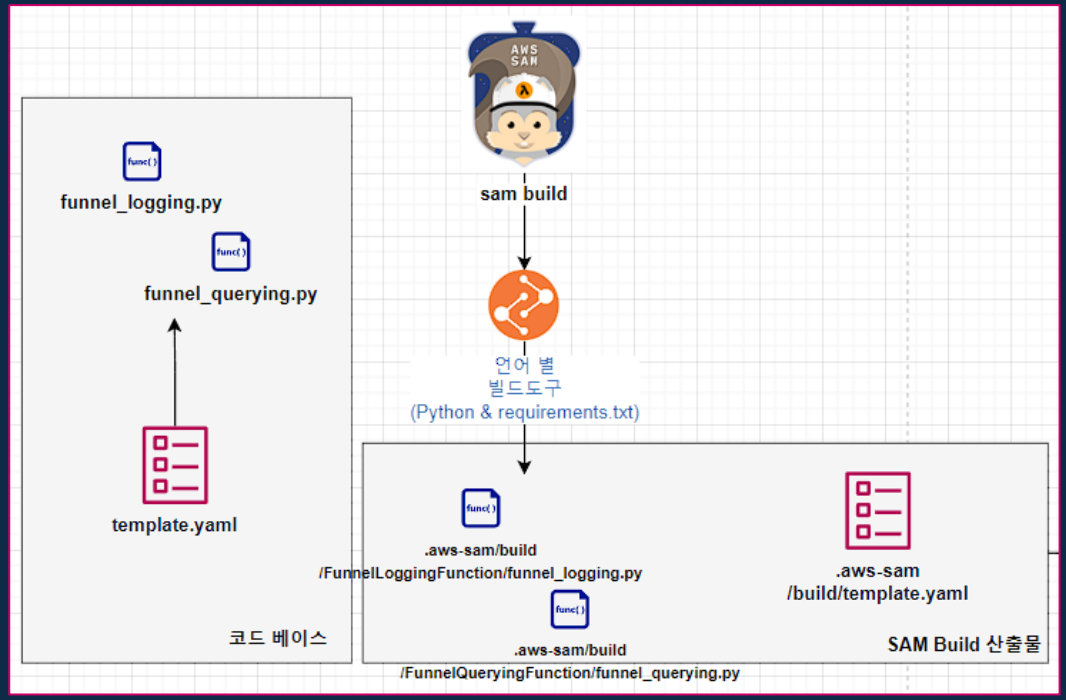
로그 스트림〉 환자 checkout 상태 확인

[DIY]
Building a Funnel Analysis Pipeline with AWS SAM

Reference Architecture View
(예상 소요 시간: 20분)

로컬 환경

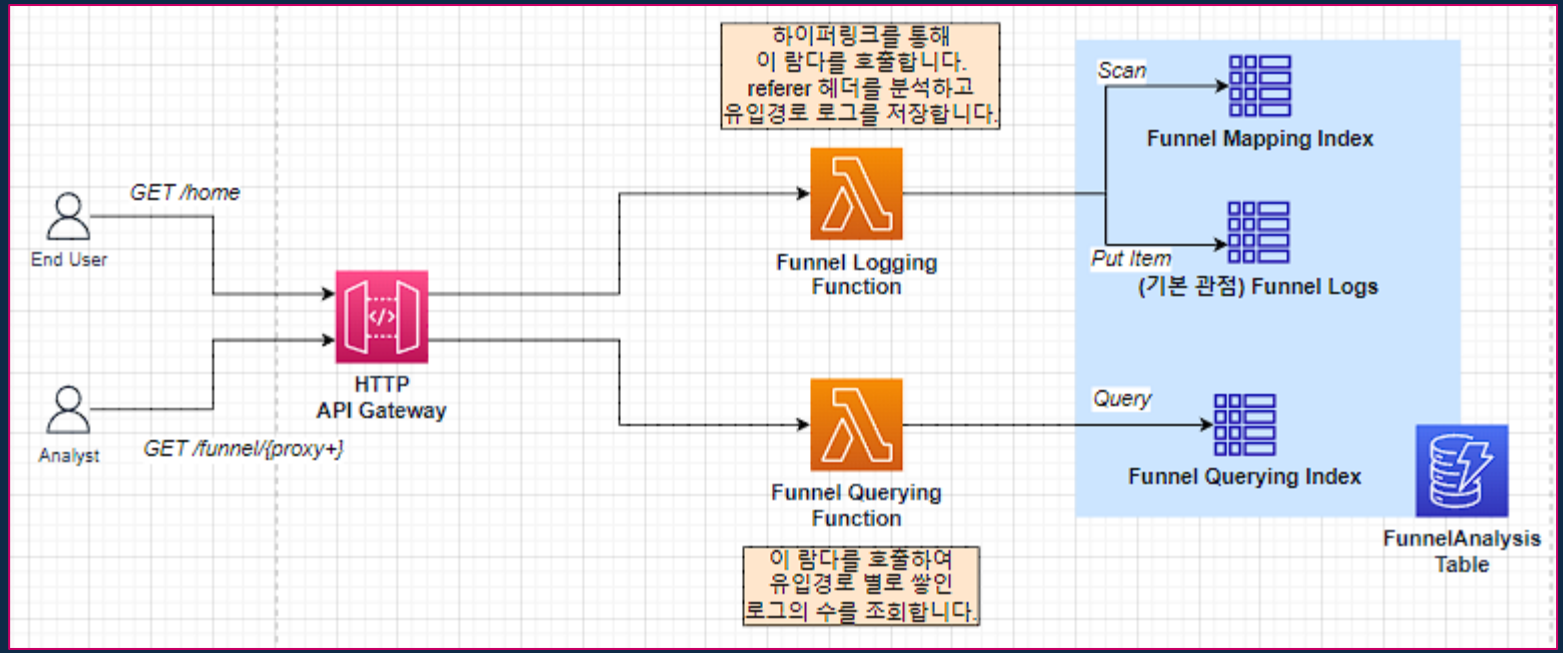




Reference Architecture View
(예상 소요 시간: 20분)

SAM 배포 이후 AWS 클라우드 환경

지난 실습 아키텍처와 별반 다르지 않습니다.

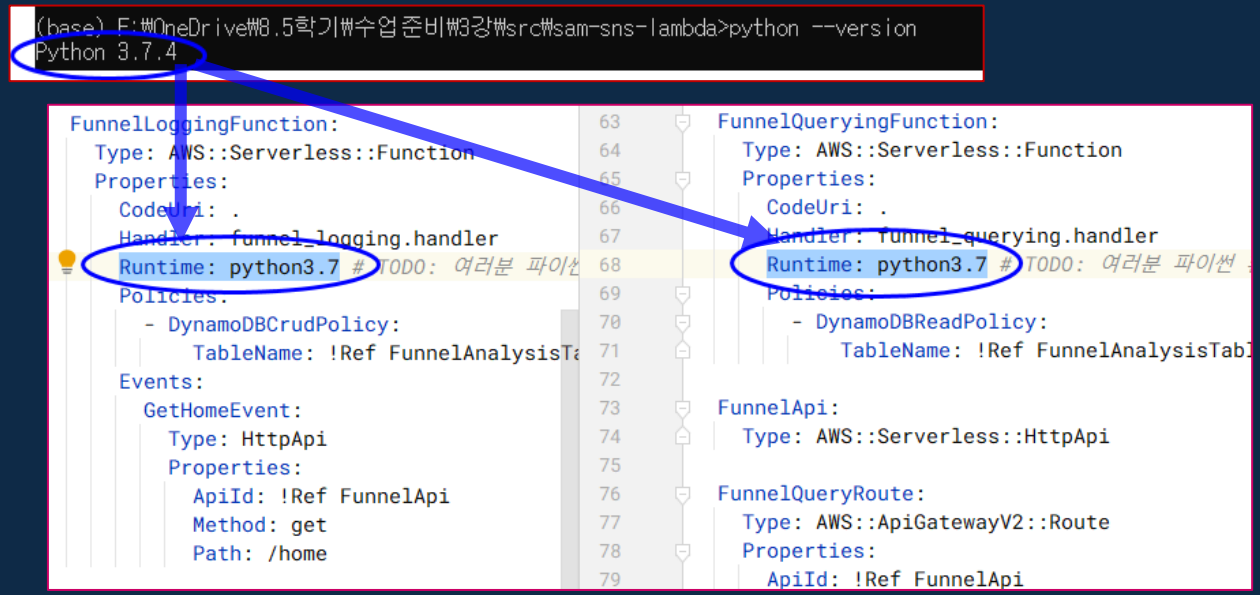


CloudFormation DIY

Funnel Analysis Pipeline

1. Download the source code from https://github.com/binchoo/2022-dms-iac/tree/master/src/funnel-analysis
2. Open your cmd or bash.

3. Inspect whether your python version is the same with the functions' runtime environments.
(`FunnelLoggingFunction, FunnelQueryingFunction`)



CloudFormation DIY

Funnel Analysis Pipeline

4. You specify that the `FunnelLoggingFunction` has the `GET /home` endpoint of `FunnelApi` as its trigger.
   You should fix some lines that are TODO annotated.

5. Also, make the `FunnelLoggingFunction` able to access the `FunnelAnalysisTable.`

```yaml
FunnelLoggingFunction:
  Type: AWS::Serverless::Function
  Properties:
    CodeUri: .
    Handler: ??? #TODO: 수정
    Runtime: python3.7 # TODO: 여러분 파이썬 환경으로 바꾸세요 (python3.7, python3.8, python3.9)
    Policies:
      - DynamoDBCrudPolicy:
          TableName: ??? #TODO: 수정
    Events:
      GetHomeEvent:
        Type: HttpApi
        Properties:
          ApiId: ??? #TODO: 수정
          Method: ??? #TODO: 수정
          Path: ??? #TODO: 수정
```

Conduct your research yourself!

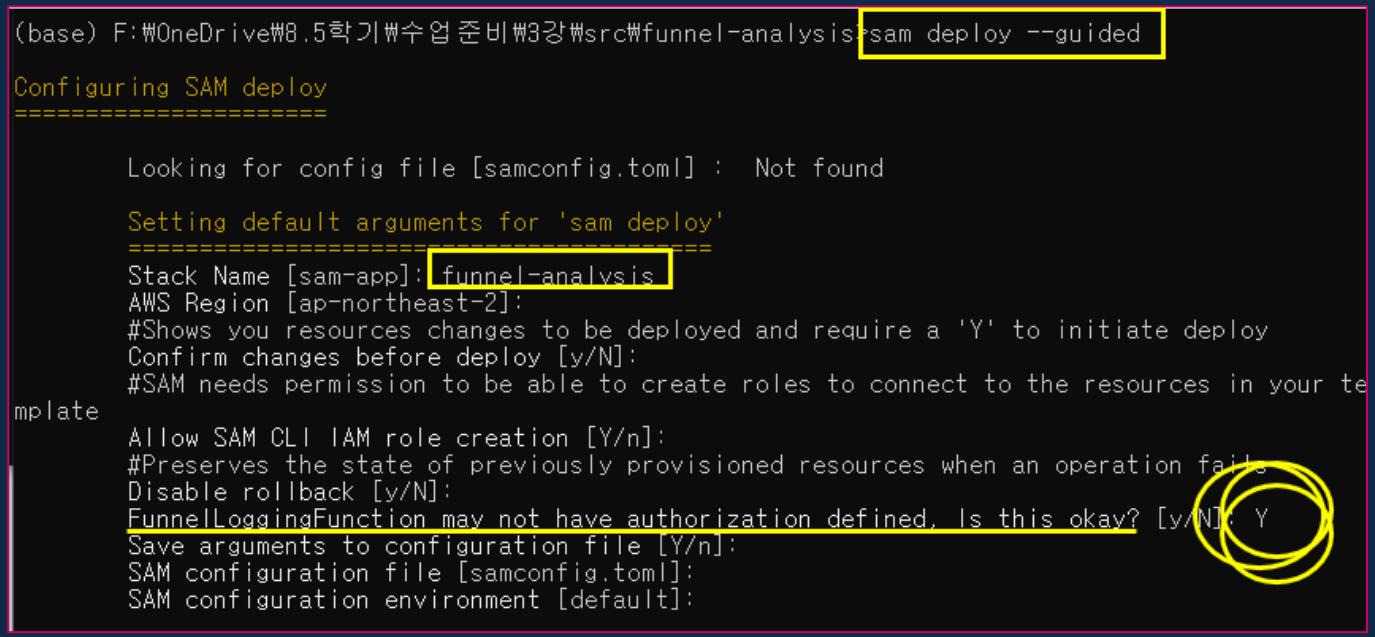
- aws sam function doc
- aws sam function predefined policies

CloudFormation DIY

Funnel Analysis Pipeline

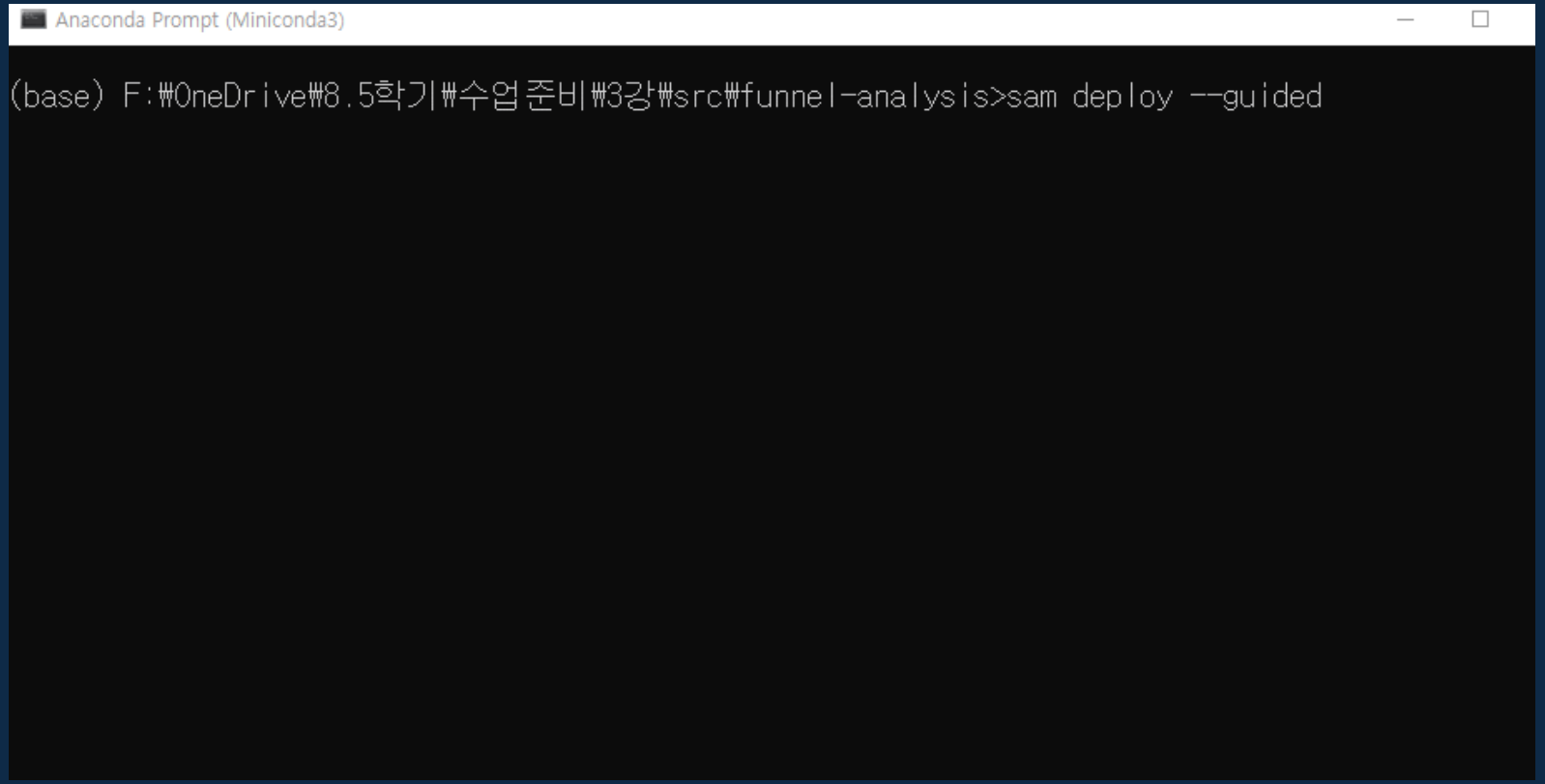
6. Do `sam build`

7. Do `sam deploy --guided`. The configuration values are shown in the image.



CloudFormation Demo③

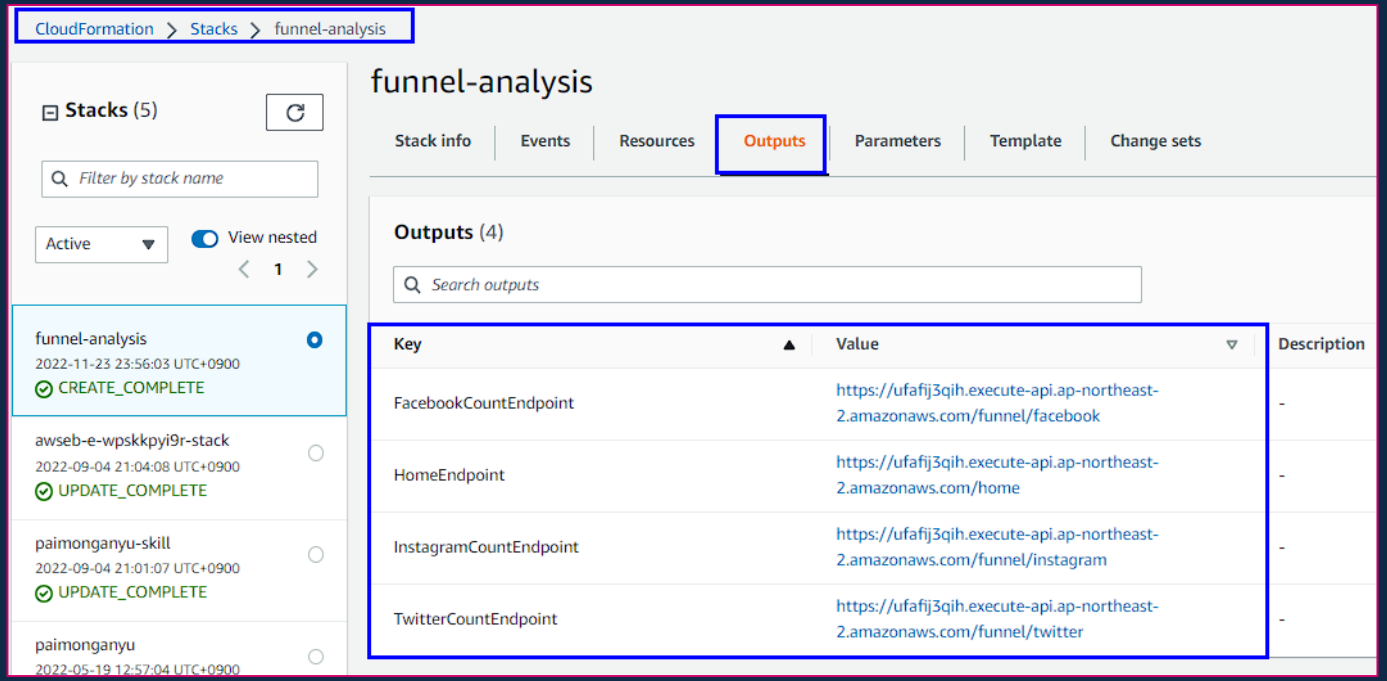
Sam deploy 과정 GIF 이미지



CloudFormation DIY

Funnel Analysis Pipeline

6. Go to **AWS CloudFormation Console**〉 Stack: `funnel-analysis`〉 Outputs
7. Play with the API endpoints.



THANK YOU