


AWS Application Programming Interface (API)

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What is an Application Programming Interface (API)?

An API is software that allows two applications/services to talk to each other.

The most common type of API is via HTTP/S requests.


AWS API is an HTTP API and you can interact by sending HTTPS requests, using an application interacting with APIs like **Postman**. 



Each AWS Service has its own **Service Endpoint** which you send requests

↓

```
GET / HTTP/1.1
host: monitoring.us-east-1.amazonaws.com
x-amz-target: GraniteServiceVersion20100801.GetMetricData
x-amz-date: 20180112T092034Z
Authorization: AWS4-HMAC-SHA256 Credential=REDACTEDREDACTED/20180411/.....
Content-Type: application/json
Accept: application/json
Content-Encoding: amz-1.0
Content-Length: 45
Connection: keep-alive
```



To authorize use you will need generate a **signed request**
You make a separate request with your AWS credentials and get back a token.

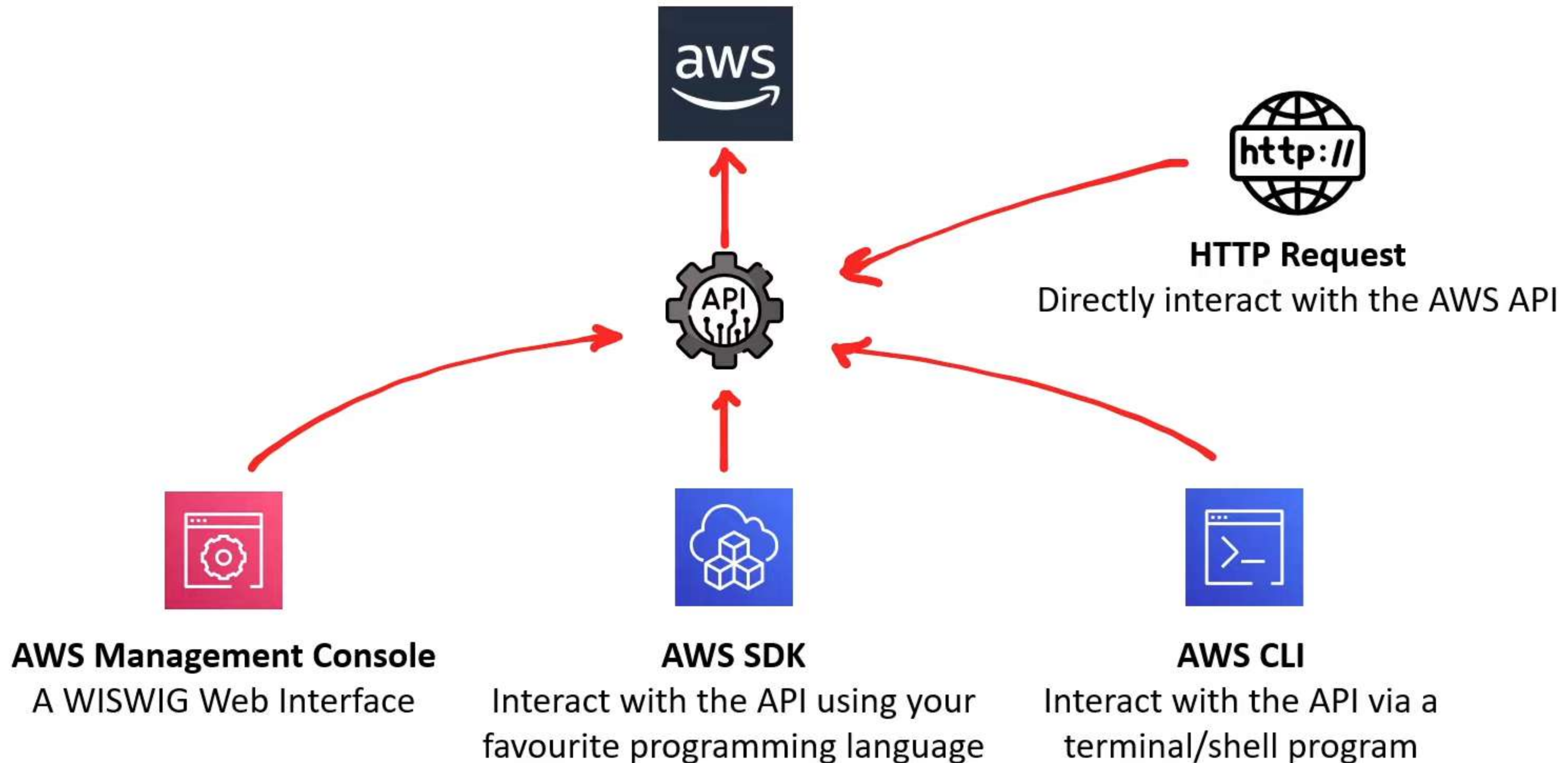
You need to also provide an **ACTION**
and accompanying **parameters** as the payload



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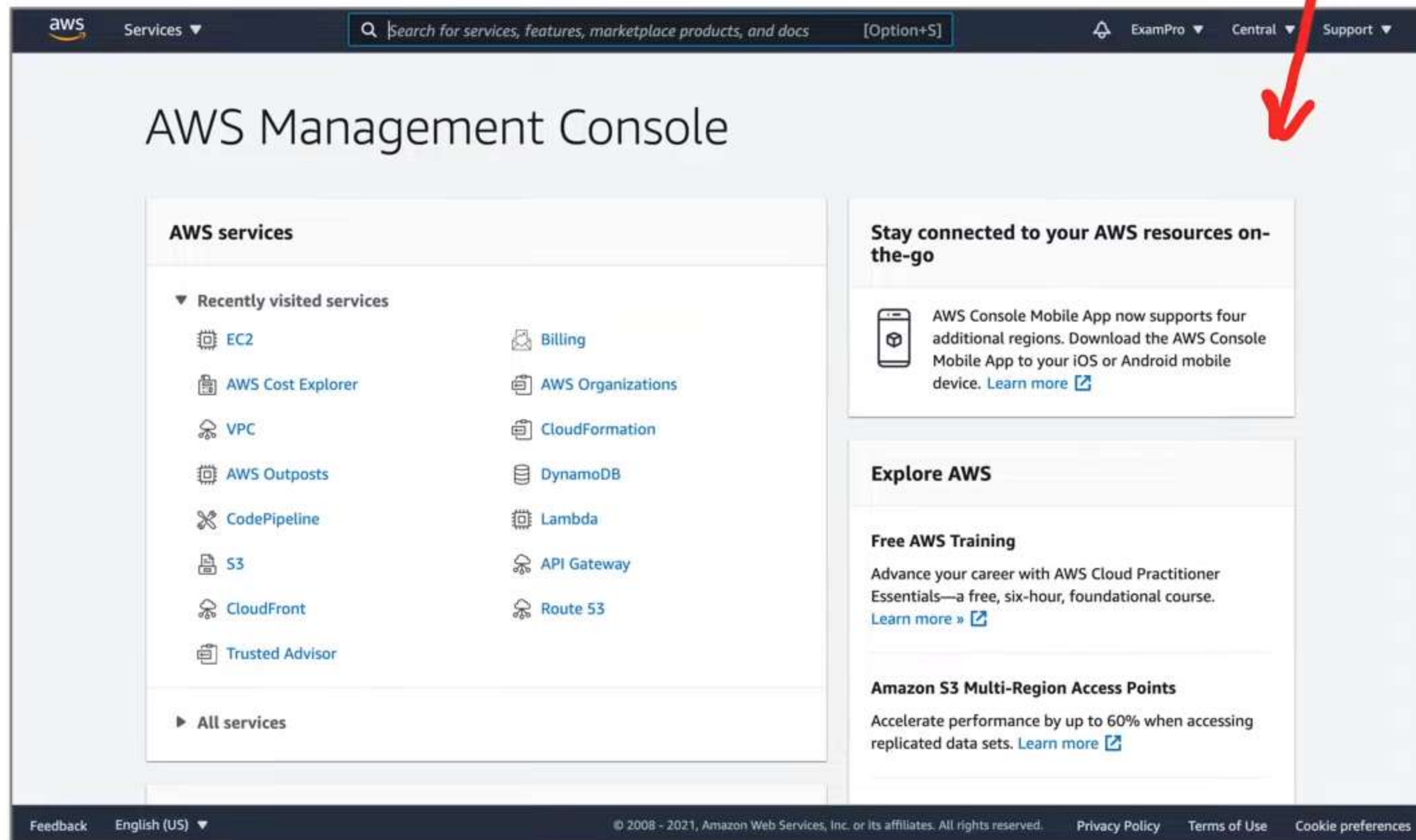
Rarely do users directly send HTTP requests directly to the AWS API.
It's much easier to interact with the API via a variety of Developer Tools



AWS Management Console

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The AWS Management Console is a **web-based** unified console
Build, manage, and monitor everything from simple web apps to complex cloud deployments.



Point and Click to manually launch and configure AWS resources with limited programming knowledge.

This is known as “**ClickOps**” since you can perform all your system operations via clicks.

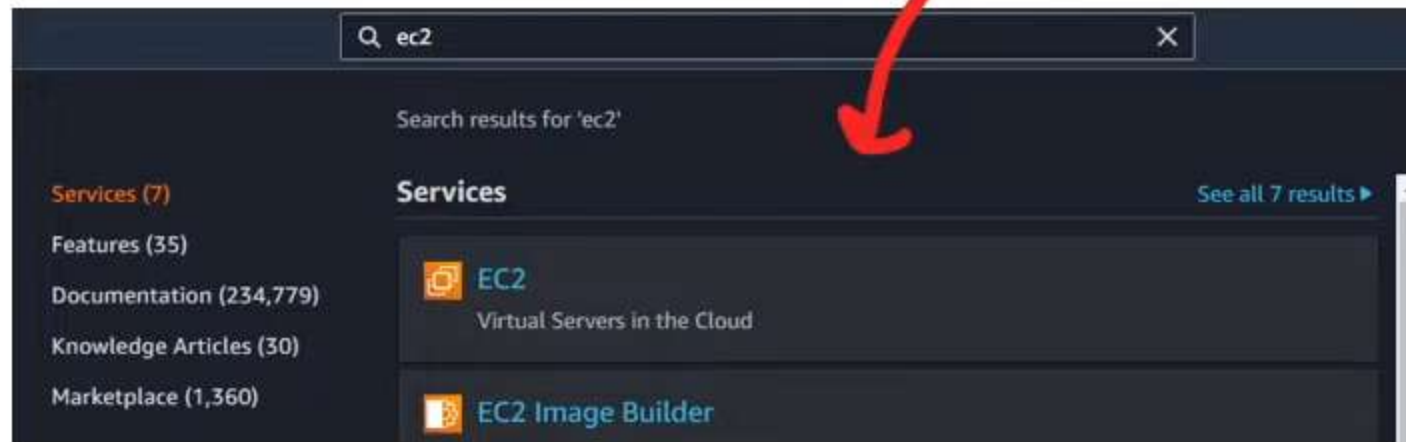
The AWS Management Console is located at: console.aws.amazon.com



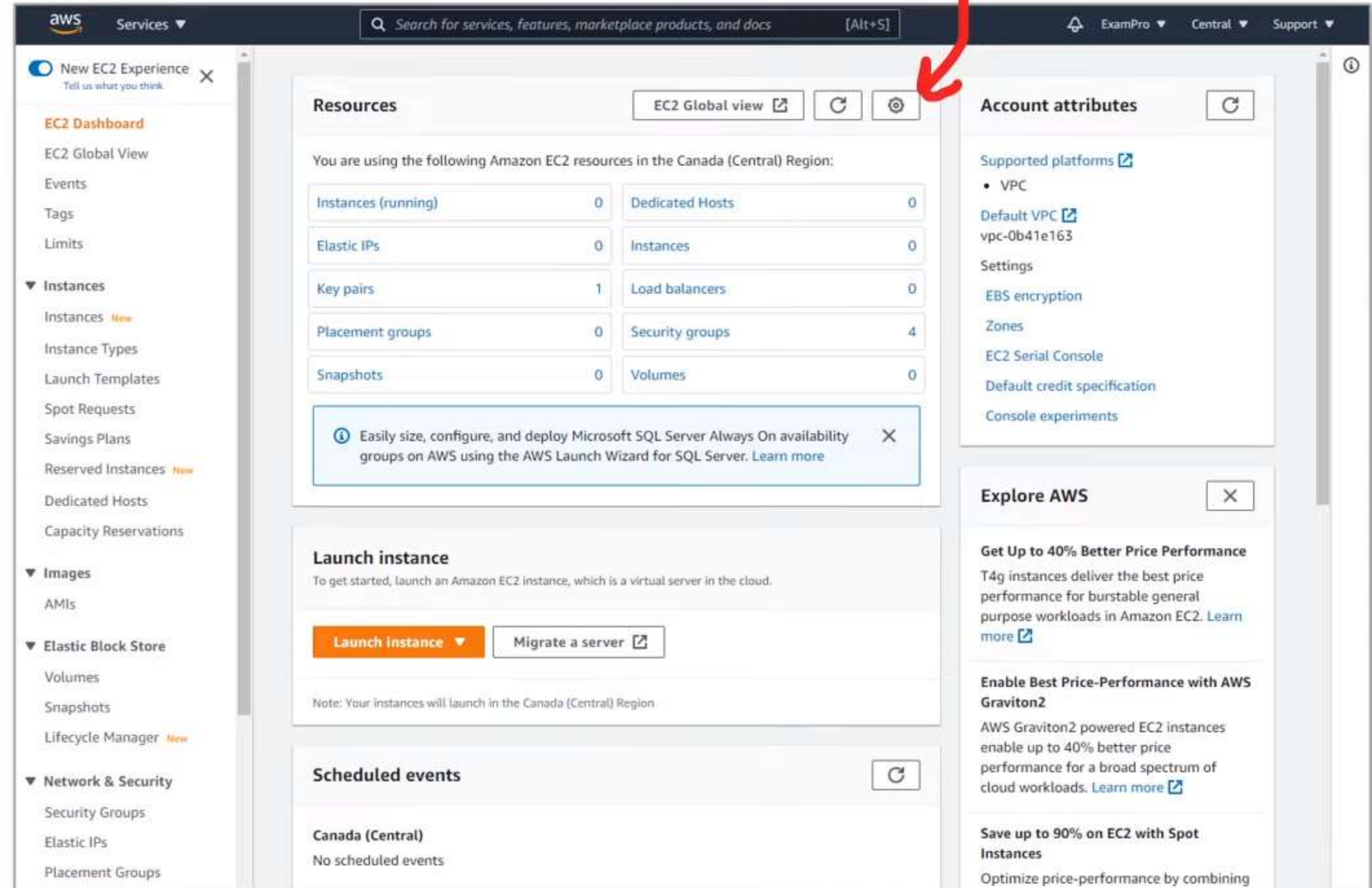
AWS Management Console – Service Console

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AWS Service each have their own customized console.
You can access these consoles by **searching** the service name.



The **EC2 Console**



Some AWS Services Console will act as an umbrella console containing many AWS Services: eg

- VPC Console
- EC2 Console
- Systems Manager Console
- SageMaker Console
- CloudWatch Console.

AWS Account ID

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Every AWS Account has a unique Account ID.

The **Account ID** can be easily found by dropping down the current user in the Global Navigation

The AWS Account ID is composed of 12 digits eg:

- 123456789012
- 121212121212
- 498241098510

The AWS Account ID is used

- when logging in with a non-root user account.
- Cross-account roles
- Support cases



Sign in as IAM user

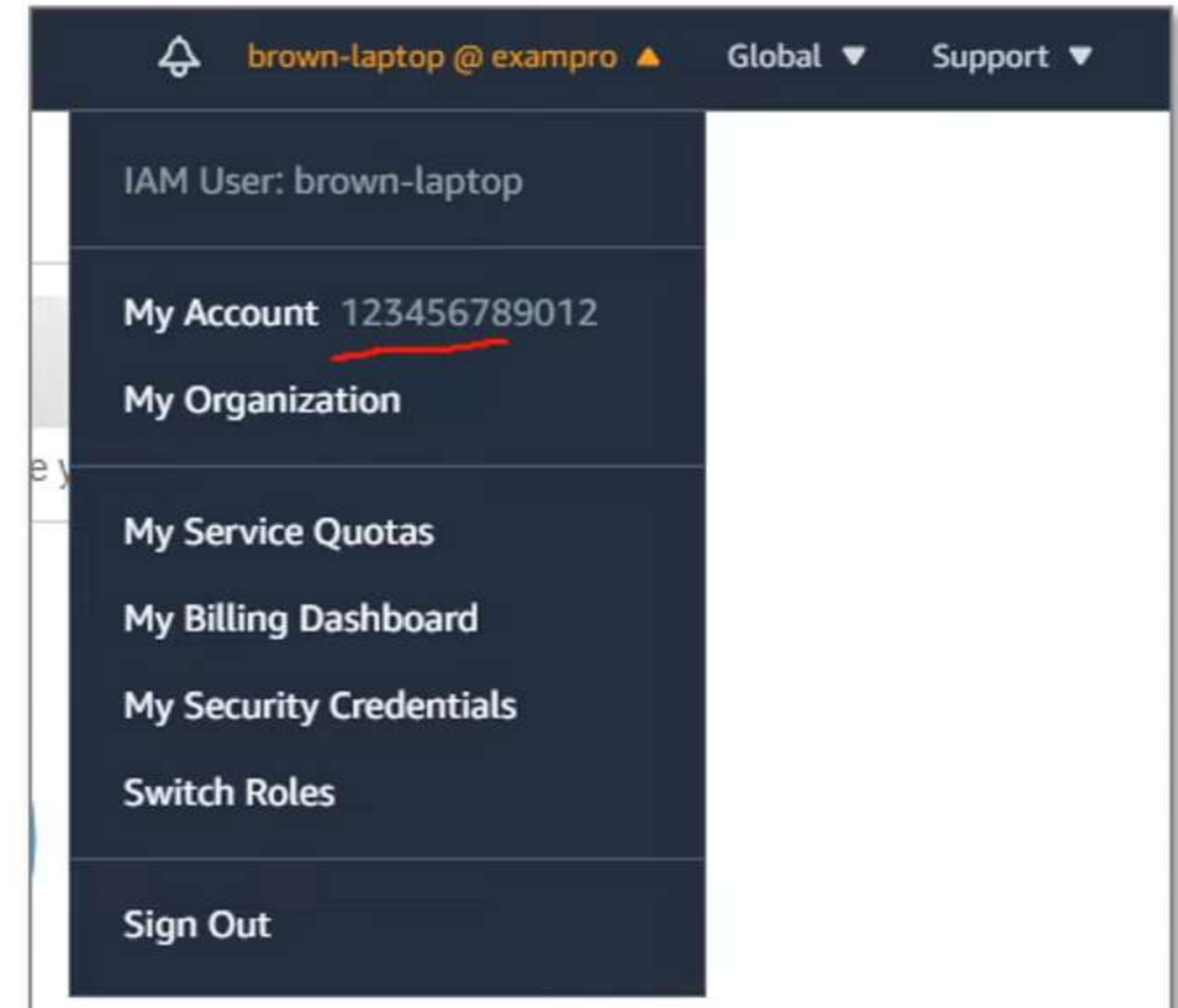
Account ID (12 digits) or account alias

121212121212

IAM user name

Password

☐ Remember this account



It is generally good to keep your Account ID private as it is one of many components used to identity an account for attack by a malicious actor.

AWS Tools for PowerShell

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What is PowerShell?

PowerShell is a task automation and configuration management framework.

A **command-line shell** and a **scripting language**.

Unlike most shells, which accept and return text, PowerShell is built on top of the .NET Common Language Runtime (CLR), and accepts and returns .NET objects.

```
Windows PowerShell

Link-local IPv6 Address . . . . . : fe80::541f:9e31:7df6:9847%22
IPv4 Address. . . . . : 10.0.75.1
Subnet Mask . . . . . : 255.255.255.0
Default Gateway . . . . . :

Ethernet adapter vEthernet (New Virtual Switch):

    Connection-specific DNS Suffix  . : 
    Link-local IPv6 Address . . . . . : fe80::2c0d:8306:9bcf:8247%14
    IPv4 Address. . . . . : 10.0.0.100
    Subnet Mask . . . . . : 255.255.255.0
    Default Gateway . . . . . : 10.0.0.254

Unknown adapter Local Area Connection:

    Media State . . . . . : Media disconnected
    Connection-specific DNS Suffix  . : 

Ethernet adapter Ethernet 4:

    Media State . . . . . : Media disconnected
    Connection-specific DNS Suffix  . : 
PS C:\Users\Andrew>
```

AWS Tools for PowerShell lets you interact with the AWS API via PowerShell Cmdlets

Cmdlet is a special type of command in PowerShell in the form of capitalized verb-and-noun *e.g. New-S3Bucket*

```
PS > New-S3Bucket -BucketName website-example -Region us-west-2

CreationDate      BucketName
-----
8/16/19 8:45:38 PM website-example
```


Amazon Resource Name (ARNs)

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Amazon Resource Names (ARNs) uniquely identify AWS resources.

ARNs are required to specify a resource unambiguously across all of AWS

The ARN has the following
format variations



arn:*partition:service:region:account-id:resource-id*

arn:*partition:service:region:account-id:resource-type/resource-id*

arn:*partition:service:region:account-id:resource-type_**resource-id*

Partition

- aws - AWS Regions
- aws-cn - China Regions
- aws-us-gov - AWS GovCloud (US) Regions

Resource ID

Could be a number name or path:

- user/Bob
- instance/i-1234567890abcdef0

Service – Identifies the service

- ec2
- s3
- iam

In the AWS Management Console its common to be able to copy the ARN to your clipboard



arn:aws:s3:::my-bucket

Region – which AWS resource

- us-east-1
- ca-central-1

Account ID

- 121212121212
- 123456789012

Name	my-webserver-alb
ARN	arn:aws:elasticloadbalancing:us-east-1:123456789012:loadbalancer/app/my-webserver-alb/31e9d2ce26643cd8  Copied

Paths in ARNs

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Resource ARNs can include a path

Paths can include a wildcard character, namely an asterisk (*)

IAM Policy ARN Path

arn:aws:iam::123456789012:user/Development/product_1234/*

S3 ARN Path

arn:aws:s3:::my_corporate_bucket/Development/*

AWS Command Line Interface (CLI)

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What is a CLI?

A Command Line Interface (CLI) **processes commands to a computer program in the form of lines of text.**

Operating systems implement a command-line interface in a shell.

What is a Terminal?

A terminal is a text only interface (input/output environment)

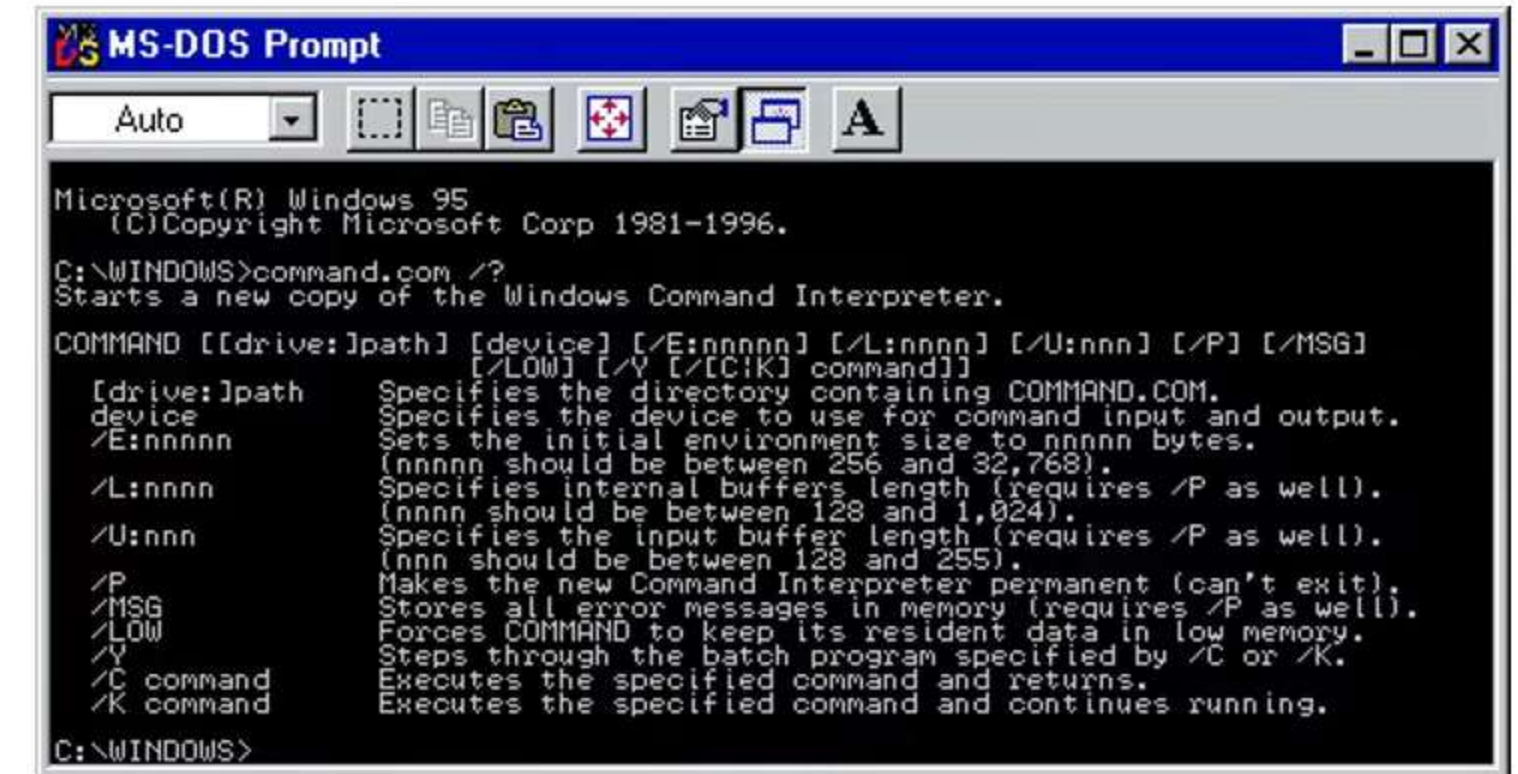
What is a Console?

A console is a physical computer to physically input information into a terminal

What is a Shell?

A shell is the command line program that users interact with to input commands. Popular shell programs:

- **Bash**
- Zsh
- PowerShell



```
MS-DOS Prompt
Auto
Microsoft(R) Windows 95
(C)Copyright Microsoft Corp 1981-1996.
C:\WINDOWS>command.com /?
Starts a new copy of the Windows Command Interpreter.
COMMAND [[drive:]path] [device] [/E:nnnnn] [/L:nnnn] [/U:nnn] [/P] [/MSG]
[/LOW] [/Y [/C] command]
[drive:]path Specifies the directory containing COMMAND.COM.
device Specifies the device to use for command input and output.
/E:nnnnn Sets the initial environment size to nnnnn bytes.
(nnnnn should be between 256 and 32,768).
/L:nnnn Specifies internal buffers length (requires /P as well).
(nnnn should be between 128 and 1,024).
/U:nnn Specifies the input buffer length (requires /P as well).
(nnn should be between 128 and 255).
/P Makes the new Command Interpreter permanent (can't exit).
/MSG Stores all error messages in memory (requires /P as well).
/LOW Forces COMMAND to keep its resident data in low memory.
/Y Steps through the batch program specified by /C or /K.
/C command Executes the specified command and returns.
/K command Executes the specified command and continues running.
C:\WINDOWS>
```

People commonly (erroneously) use **Terminal, Shell or Console** to generally describe interacting with a Shell.

AWS Command Line Interface (CLI)

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AWS Command Line Interface (CLI) allows users to programmatically interact with the AWS API via entering **single or multi-line commands** into a shell or terminal

```
aws ec2 describe-instances \
--filters Name=tag-key,Values=Name \
--query 'Reservations[*].Instances[*].
{Instance:InstanceId,AZ:Placement.AvailabilityZone,Name:Tags[?
Key=='Name' ]|[0].Value}' \
--output table
```

DescribeInstances		
AZ	Instance	Name
us-east-2b	i-057750d42936e468a	my-prod-server
us-east-2a	i-001efd250faaa6ffa	test-server-1
us-east-2a	i-027552a73f021f3bd	test-server-2



The AWS CLI is a Python executable program.

- Python is required to install AWS CLI

The AWS CLI can be installed on Windows, Mac or Linux/Unix

The name of the CLI program is **aws**

AWS Software Development Kit (SDK)

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A Software Development Kit (SDK) is **a collection of software development tools** in **one installable package**.



You can use the **AWS SDK** to programmatically create, modify, delete or interact with AWS resources.

AWS SDK is offered in various programming languages:

- Java
- Python
- Node.js
- **Ruby**
- Go
- .NET
- PHP
- JavaScript
- C++



```
s3 = Aws::S3::Resource.new({
  region: aws_default_region,
  credentials: Aws::Credentials.new(
    aws_access_key_id,
    aws_secret_access_key
  )
})
bucket = s3.bucket s3_bucket
file = File.open file_path
md5 = Digest::MD5.hexdigest file.read
md5 = Base64.encode64([md5].pack("H*")).strip

attrs = {
  key: data["path"],
  body: IO.read(file),
  content_md5: md5
}
resp = bucket.put_object(attrs)
```


AWS CloudShell

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AWS CloudShell is a **browser-based shell** built into the AWS Management Console.

AWS CloudShell is scoped per region, Same credentials as logged in user. Free Service!

Preinstalled Tools

AWS CLI, Python, Node.js git, make, pip, sudo, tar, tmux, vim, wget, and zip and more

Storage included

1 GB of storage free per AWS region

Saved files and settings

Files saved in your home directory are available in future sessions for the same AWS region

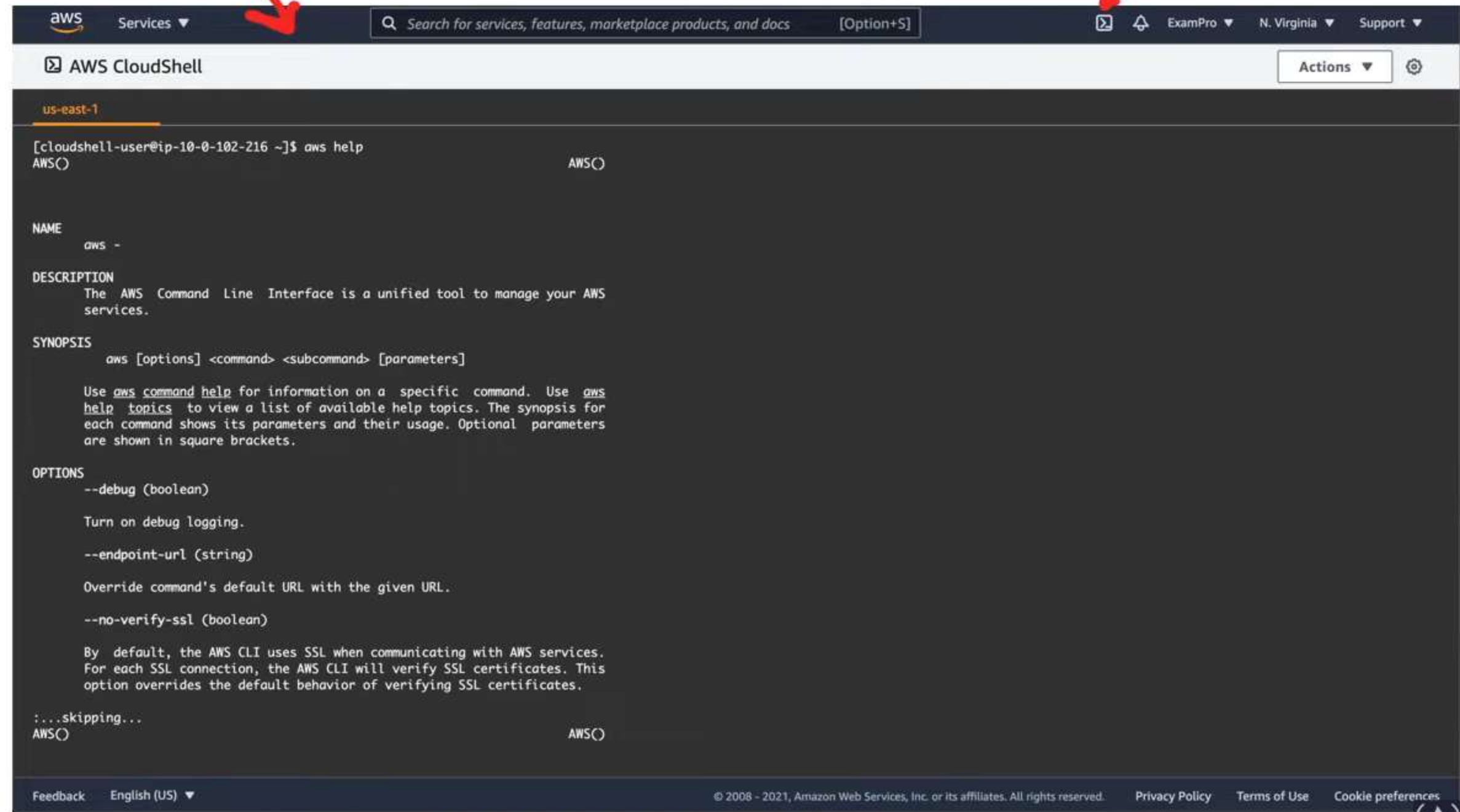
Shell Environments

Seamlessly switch between

- Bash
- PowerShell
- Zsh

AWS CloudShell is available in select regions

Click the **shell icon**



Infrastructure as Code (IaC)

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Infrastructure as Code (IaC)

You write a configuration script to **automate** **creating, updating or destroying** cloud infrastructure.

- IaC is a **blueprint** of your infrastructure.
- IaC allows you to easily **share, version or inventory** your cloud infrastructure.

AWS has two offerings for writing Infrastructure as Code.



AWS CloudFormation (CFN)

CFN is a Declarative IaC tool

Declarative

- What you see is what you get. **Explicit**
- More verbose, but zero chance of mis-configuration
- Uses scripting languages eg. JSON, YAML, XML



AWS Cloud Development Kit (CDK)

CDK is an Imperative IaC tool.

Imperative

- You say what you want, and the rest is filled in. **Implicit**
- Less verbose, you could end up with misconfiguration
- Does more than Declarative
- Uses programming languages eg. Python, Ruby, JavaScript

CloudFormation

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AWS CloudFormation allows you to write Infrastructure as Code (IaC) as either a JSON or **YAML** file. 

CloudFormation is simple but it can lead to large files or is limited in some regard to creating dynamic or repeatable infrastructure compared to CDK.

CloudFormation can be easier for DevOps Engineers who do not have a background in web programming languages.

Since CDK generates out CloudFormation its still important to be able to read and understand CloudFormation in order to debug IaC stacks.

```
Ec2Instance:
  Type: AWS::EC2::Instance
  Properties:
    ImageId:
      Fn::FindInMap:
        - "RegionMap"
        - Ref: "AWS::Region"
        - "AMI"
    KeyName:
      Ref: "KeyName"
    NetworkInterfaces:
      - AssociatePublicIpAddress: "true"
        DeviceIndex: "0"
        GroupSet:
          - Ref: "myVPCEC2SecurityGroup"
        SubnetId:
          Ref: "PublicSubnet"
```


Cloud Development Kit

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AWS CDK allows you to use your favorite programming language to write Infrastructure as Code (IaC)



```
const bucket = new Bucket(this, 'MyBucket');
const result = bucket.addToResourcePolicy(new iam.PolicyStatement({
  actions: ['s3:GetObject'],
  resources: [bucket.arnForObjects('file.txt')],
  principals: [new iam.AccountRootPrincipal()],
}));
```

- CDK is powered by CloudFormation (it generates out CloudFormation templates)
- CDK has a large library of reusable cloud components called CDK Construct <https://constructs.dev>
- CDK comes with its own CLI
- CDK Pipelines to quickly setup CI/CD pipelines for CDK projects
- CDK has a testing framework for Unit and Integration Testing

AWS SDK looks similar, but the key difference is CDK ensures Idempotent of your Infrastructure

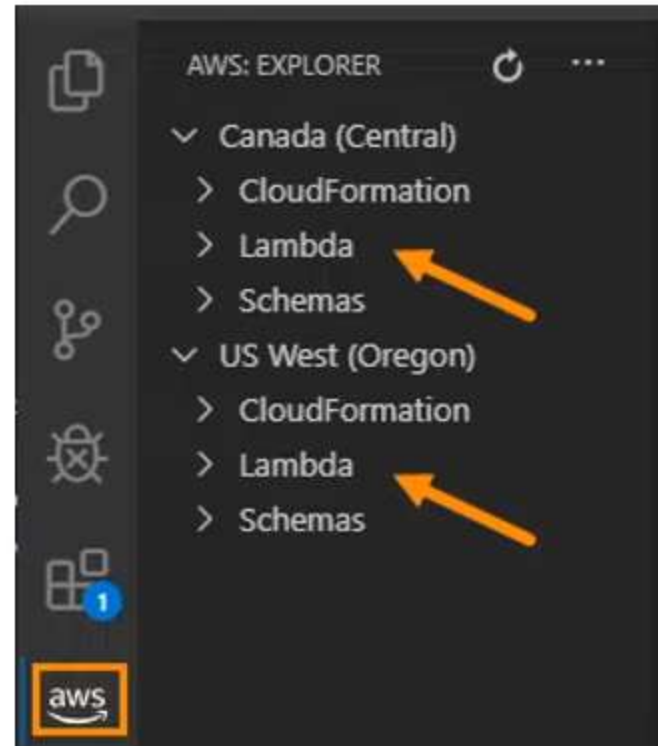
AWS Toolkit for VSCode

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AWS Toolkit is an open-source plugin for VSCode to create, debug, deploy AWS resources

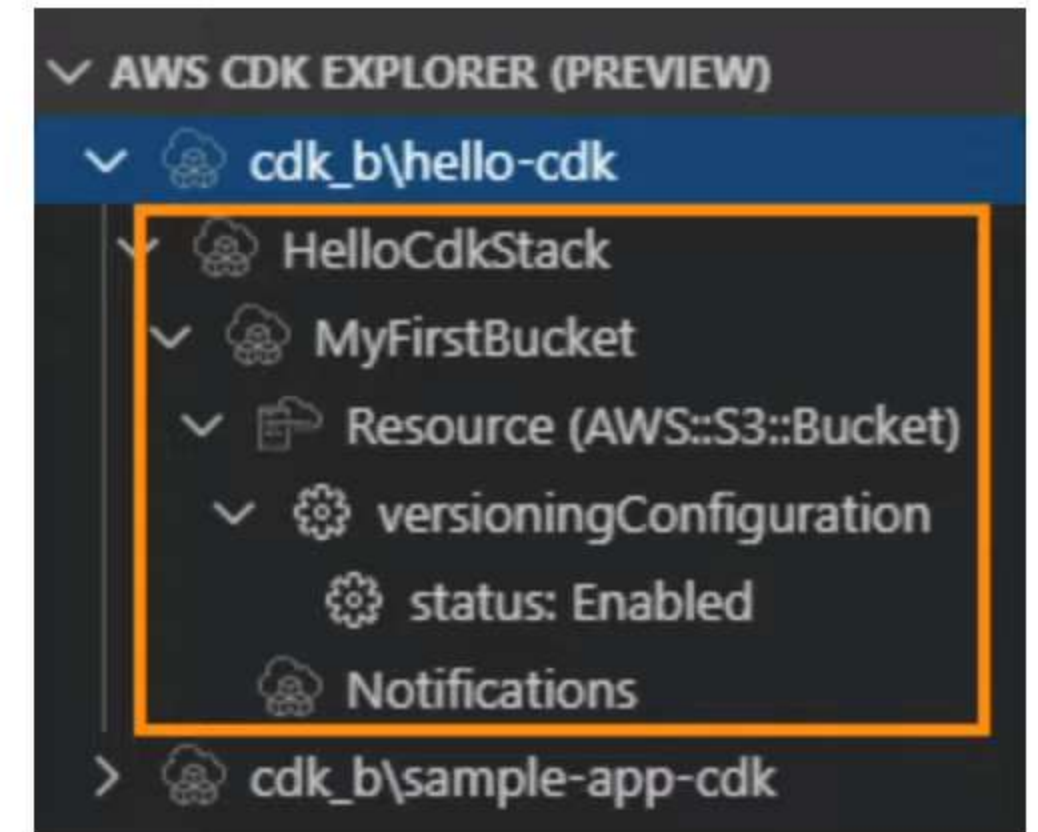
1. AWS Explorer

Explore a wide range of AWS resources to your linked AWS Account



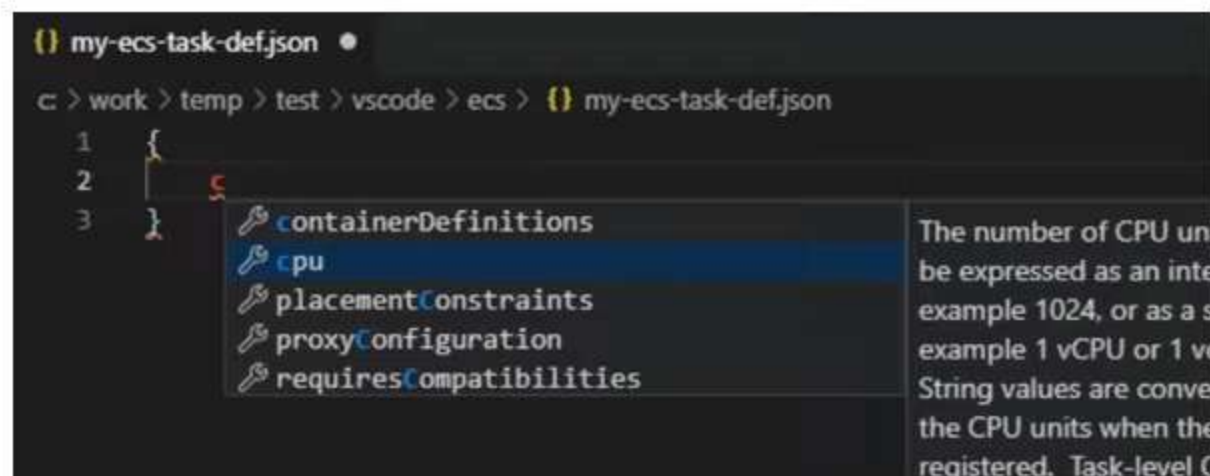
2. AWS CDK Explorer

Allows you to explore your stacks defined by CDK.



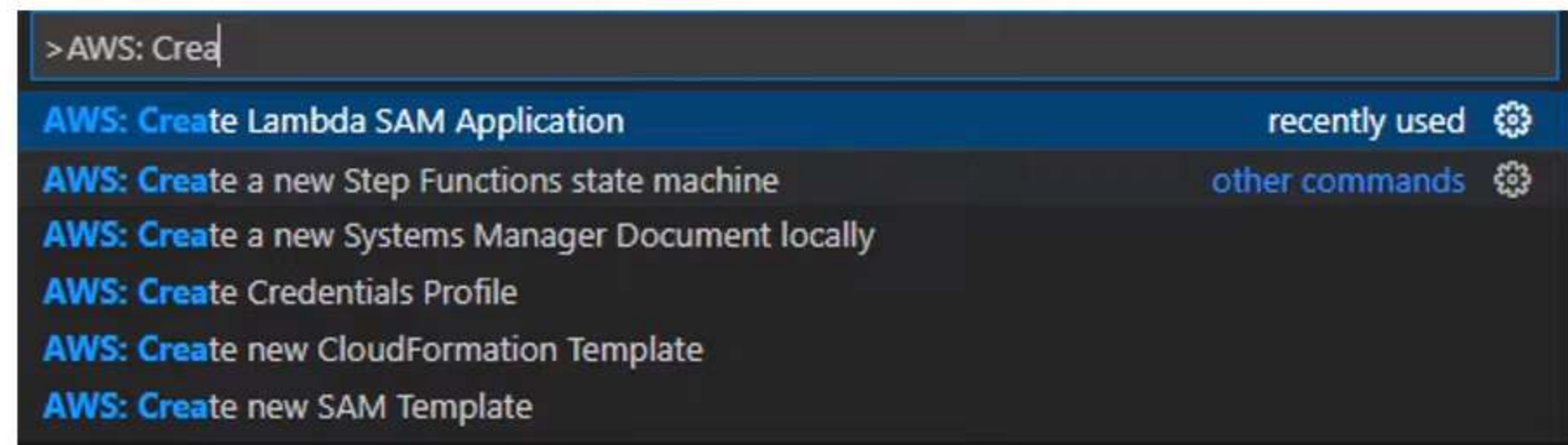
3. Amazon Elastic Container Service

Provides IntelliSense for ECS task-definitions files



4. Serverless Applications

Create, debug and deploy serverless applications via SAM and CFN



Access Keys

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Access Keys is a **key and secret** required to have programmatic access to AWS resources when interacting with the AWS API outside of the AWS Management Console



An Access Key is commonly referred to as **AWS Credentials**

A user must be **granted access** to use Access Keys

Select AWS credential type*

☒ **Access key - Programmatic access**
Enables an **access key ID** and **secret access key** for the AWS API, CLI, SDK, and other development tools.

☐ **Password - AWS Management Console access**
Enables a **password** that allows users to sign-in to the AWS Management Console.

- Never share your access keys
- Never commit access keys to a codebase
- You can have two active Access Keys
- You can deactivate Access Keys
- Access Keys have whatever access a user has to AWS resources.

Generate an Access Key and Secret

Access key ID	Secret access key
AKIAZRJIQN2ODG55TBXO	jzXt1gj1PE1f/y9k5JVI2TnwvQ6CSwanzg8aUP3O Hide

Access Keys

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Access Keys are to be store in ~/.aws/credentials and follow a TOML file format

Default will be the access key used when no profile is specified.

You can store multiple access keys by giving the **profile** names.

```
[default]
aws_access_key_id=AKIAIOSFODNN7EXAMPLE
aws_secret_access_key=wJalrXUtnFEMI/K7MDENG/bPxRfiCYEXAMPLEKEY
[exampro]
aws_access_key_id=AKIAIOSFODNN7EXAMPLE
aws_secret_access_key=wJalrXUtnFEMI/K7MDENG/bPxRfiCYEXAMPLEKEY
region=ca-central-1
```

You can use the **aws configure** CLI command to populate the credential file.

```
$ aws configure
AWS Access Key ID [None]: AKIAIOSFODNN7EXAMPLE
AWS Secret Access Key [None]: wJalrXUtnFEMI/K7MDENG/bPxRfiCYEXAMPLEKEY
Default region name [None]: us-west-2
Default output format [None]: json
```

The AWS SDK will automatically read from these environment variables.

This is the safe way of using an Access Key within your code.

```
$ export AWS_ACCESS_KEY_ID=AKIAIOSFODNN7EXAMPLE
$ export AWS_SECRET_ACCESS_KEY=wJalrXUtnFEMI/K7MDENG/bPxRfiCYEXAMPLEKEY
$ export AWS_DEFAULT_REGION=us-west-2
```


AWS Documentation

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AWS Documentation is a **large collection of technical documentation** on how to use AWS Services.

docs.aws.amazon.com

AWS is very good about providing detailed information about every AWS service.

The basis of this course and for any AWS Certification will derive mostly from the AWS Documentation

AWS Documentation
Find user guides, developer guides, API references, tutorials, and more.

Guides and API References

Compute	Containers	Storage
Amazon EC2	Amazon ECR	Amazon S3
AWS App Runner	Amazon ECS	AWS Backup
AWS Batch	Amazon EKS	Amazon EBS
AWS Elastic Beanstalk	AWS App2Container	Amazon EFS
Amazon EC2 Image Builder	AWS App Runner	Amazon FSx
AWS End-of-Support Migration Program (EMP) for Windows Server	Red Hat OpenShift Service on AWS	Amazon S3 Glacier
AWS Lambda		AWS Snow Family
AWS Launch Wizard		AWS Storage Gateway
Amazon Lightsail		
AWS Outposts		
AWS ParallelCluster		
AWS Serverless Application Model (AWS SAM)		
AWS Serverless Application Repository		
AWS Wavelength		

User Guide for Linux Instances

Describes key concepts of Amazon EC2 and provides instructions for using the features of Amazon EC2.

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