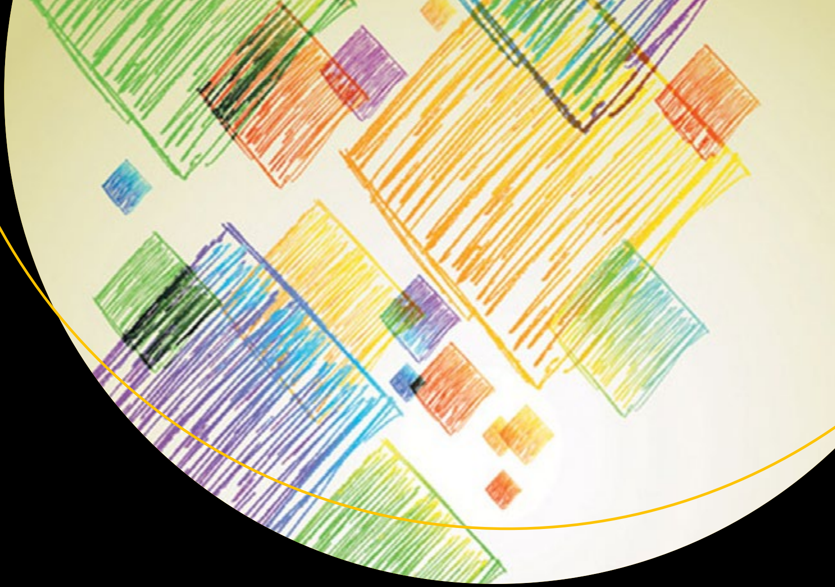

Practical Amazon EC2, SQS, Kinesis, and S3

A Hands-On Approach to AWS

Sunil Gulabani

Apress®

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Ahmedabad, Gujarat, India

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The completion of this undertaking could not have been possible without the participation and motivation of so many people I cannot possibly name them all. However, I would like to express deep appreciation and gratitude to the following people:

—My parents for their endless support and love.

—My wife, Priya, for being my constant pillar of strength and for her understanding spirit.

—My family and friends who, in one way or another, shared their support.

Also, I am thankful to the Apress team for giving me the opportunity to author this book.

Above all, I am grateful to the Great Almighty for my well-being, which was necessary to complete this book.

Contents at a Glance

Contents

About the Author

Sunil Gulabani is a software engineer based in India and the author of *Developing RESTFul Web Services with Jersey 2.0* and *Amazon S3 Essentials*. He completed his graduation in commerce from S. M. Patel Institute of Commerce (SMPIC) and obtained his master's degree in computer applications from AES Institute of Computer Studies (AESICS). Sunil presented a paper entitled "Effective Label Matching for Automated Evaluation of Use Case Diagrams" at an IEEE conference on Technology for Education (T4E) held at IIIT Hyderabad, along with Dr. Vinay Vachharajani and Dr. Jyoti Pareek.

Since 2011, Sunil has been working as a software engineer, and he considers himself a cloud-savvy person. He is experienced in developing enterprise solutions using Java Enterprise Edition. He has a keen interest in system architecture and integration, data modeling, relational databases, and mapping with NoSQL for high throughput.

Sunil is interested in writing tech blogs, and he is actively involved in knowledge-sharing communities. You can visit him online at `www.sunilgulabani.com` and follow him on Twitter at `twitter.com/sunil_gulabani`. You can also reach Sunil directly at `sunil_gulabani@yahoo.com` or on LinkedIn at `www.linkedin.com/in/sunilgulabani`.

About the Technical Reviewer

Unmesh Gundecha has a master's degree in software engineering and over 15 years of experience in Agile software development, cloud computing, test automation, and technical QA. He is an Agile, open source, and DevOps evangelist with a rich experience in a diverse set of tools and technologies. Presently, he is working as an automation architect for a multinational company in Pune, India. Unmesh has also authored *Selenium Testing Tools Cookbook* and *Learning Selenium Testing Tools with Python* (Packt Publishing).

Acknowledgments

First and foremost, I would like to thank God for the good health and knowledge that was necessary to complete this book. In the process of putting this book together, I realized how true this gift of writing is for me.

My wife, Priya. Thanks for not just believing but knowing that I could do this. Because of your constant motivation and love throughout the writing of the book, you have helped me in more ways than anyone else.

Introduction

Practical Amazon EC2, SQS, Kinesis, and S3 introduces Amazon Web Services. It explains how to implement EC2 to run applications, how to use SQS for messaging queuing data from one computer to another, and how to process large streams of data using Kinesis. In this book, I also show how to store files on S3 and access them from anywhere.

First, in the introduction to Amazon Web Services, I will discuss prerequisite setups, such as IAM user and key pair, and local machine setups with tools that will help to implement EC2, SQS, Kinesis, and S3.

Next, I will explain the basics of EC2 and different types of EC2 instances. I will demonstrate how to create EC2 and connect EC2. Furthermore, I will explain SQS and how it is different from traditional MQs. Then I will demonstrate file storage using AWS S3. Finally, I will look at how to process large streams of data using Kinesis.

There are different ways to implement AWS EC2 instances, SQS, Kinesis, and S3. Users can use the method that best suits their project requirements.

I will explore the following:

- **AWS Management Console:** I will focus on the implementation of AWS EC2, SQS, Kinesis, and S3 using the AWS Management Console. I also cover how to configure the attributes from the UI.
- **AWS CLI:** I will explain how to use AWS CLI to implement AWS EC2, SQS, Kinesis, and S3. For using AWS CLI, I will also explain the installation and configuration of AWS CLI on local machines. In addition, I will discuss how to configure the attributes from the AWS CLI.
- **AWS Java SDK:** I will demonstrate how to consume AWS SDK for Java for implementing AWS EC2, SQS, Kinesis, and S3. There are different APIs provided by AWS to perform different actions on the AWS EC2, SQS, Kinesis, and S3. Also, I will provide code snippets and their execution effects on AWS EC2, SQS, Kinesis, and S3, which can be seen on UI.

Furthermore, you will learn how to implement AWS CloudWatch for AWS EC2, SQS, Kinesis, and S3. You will learn how to raise an alarm for EC2, SQS, Kinesis, and S3 when thresholds are reached. (This is used in production environments where services are continuously monitored to see whether they are performing well and that there are no side effects going on pertaining to the services.)

Who Should Read This Book

This book is intended for cloud engineers or developers, software architects, project managers, and users who want to explore Amazon EC2, SQS, Kinesis, and S3. Basic knowledge of Java programming is expected.

CHAPTER 1

Getting Started with AWS

In recent years, IT professionals have frequently used the term c*loud computing* to refer to the practice of using remote services to store, manage, and process data. However, the most common term is *Amazon Web Services* (*AWS*). AWS has changed the working methodology of the application/system by providing various services that can be integrated into our applications and systems. It allows developers to focus on the core business logic while services such as infrastructure management, database administration, server management, high availability, cost minimization, and so on, are being handled by AWS.

In this chapter, I will introduce the basics of Amazon Web Services and the prerequisite configurations that will be needed for subsequent chapters.

What Is Amazon Web Services?

Amazon Web Services is a cloud service provider that allows a user to consume different services to ease the application management. AWS provides infrastructure, security, storage, networking, and other services that are useful for application life cycle.

AWS is being exposed as Web Services. This makes it very simple and easy for users to manage the services. It provides services as an on-demand basis. In other words, users can enroll for services according to their requirements or demands for the applications and terminate the services when they are no longer needed.

AWS is located at various geographical locations, also known as *regions*. Users have the choice to select from any of these available geographical locations that they feel will be the most useful in terms of serving the application latency time.

Note For more information on latency, see `https://en.wikipedia.org/wiki/Latency_(engineering)`.

As AWS is an on-demand service, it uses pay-as-you-go pricing. As a result, you will be charged only for the services you use. AWS also provides detailed monthly billing that helps users to know which services they are consuming the most.

S. Gulabani, *Practical Amazon EC2, SQS, Kinesis, and S3*,
DOI 10.1007/978-1-4842-2841-8_1

Sign Up for Amazon Web Services

To have access to AWS, you first need to create an account in Amazon Web Services.

1. Open the URL `http://aws.amazon.com` in any browser and click Sign In to the Console, as shown in Figure 1-1.

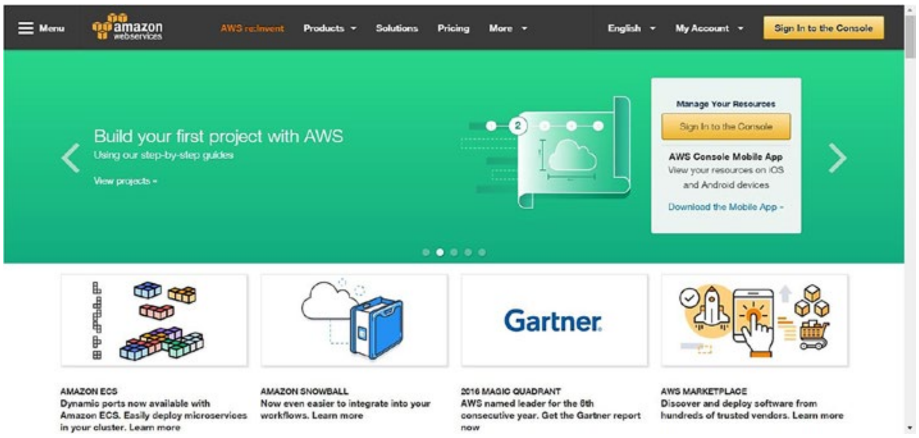
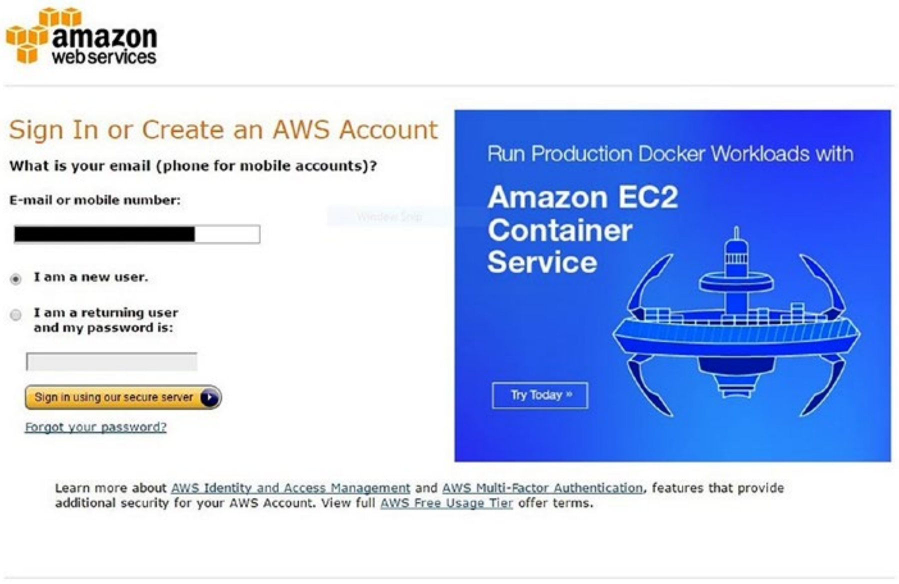

Menu
amazon webservices
AWS re:Invent
Products
Solutions
Pricing
More
English
My Account
Sign In to the Console
Build your first project with AWS
Using our step-by-step guides
View projects
Manage Your Resources
Sign In to the Console
AWS Console Mobile App
View your resources on iOS and Android devices
Download the Mobile App
Gartner
AMAZON ECS
Dynamic ports now available with Amazon ECS. Easily deploy microservices in your cluster. Learn more
AMAZON SNOWBALL
Now even easier to integrate into your workflows. Learn more
2016 MAGIC QUADRANT
AWS named leader for the 6th consecutive year. Get the Gartner report now
AWS MARKETPLACE
Discover and deploy software from hundreds of trusted vendors. Learn more

Figure 1-1. *Amazon Web Services landing page*

2. The next page you will see is the sign-in page, where you will select I am a new user. and provide an e-mail address. Then you will click the Sign in using our secure server button, as shown in Figure 1-2.


amazon web services
Run Production Docker Workloads with
Amazon EC2 Container Service
Try Today »

Sign In or Create an AWS Account

What is your email (phone for mobile accounts)?

E-mail or mobile number: [redacted]

[✓ I am a new user.]

I am a returning user and my password is:

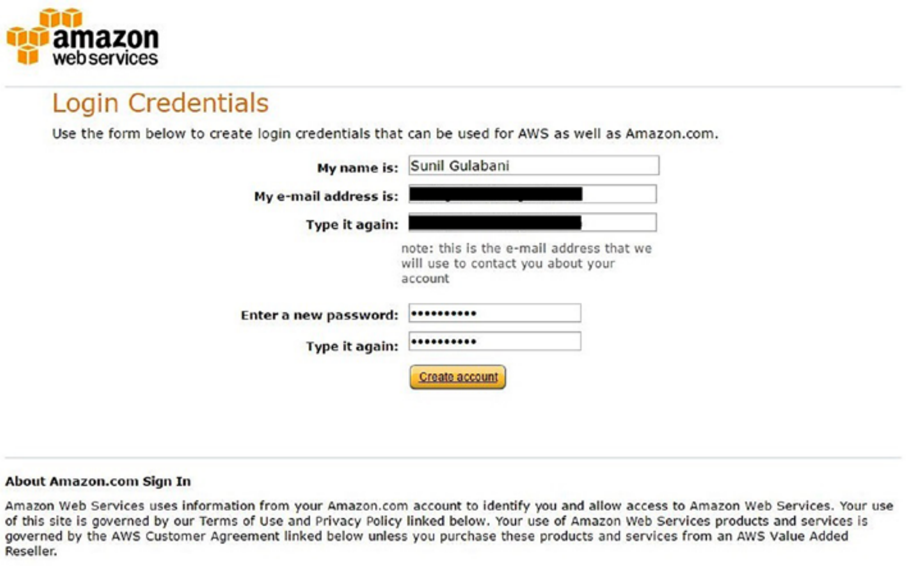
Sign in using our secure server

Forgot your password?

Learn more about AWS Identity and Access Management and AWS Multi-Factor Authentication, features that provide additional security for your AWS Account. View full AWS Free Usage Tier offer terms.

Figure 1-2. *Create an AWS account*

3. In the next step, shown in Figure 1-3, you will provide login credentials that include your name, e-mail address, and password. Using this e-mail address and password, you will be able to log in to the AWS Management Console, so make sure you remember to save this information in a secure place.


Login Credentials

Use the form below to create login credentials that can be used for AWS as well as Amazon.com.

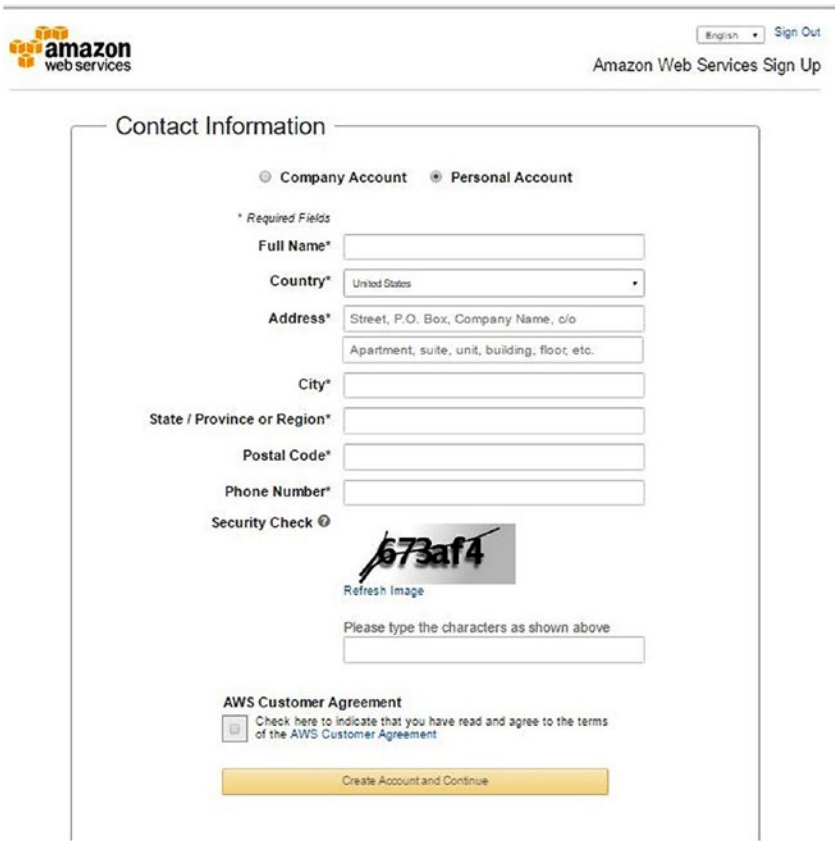
My name is:	Sunil Gulabani
My e-mail address is:	[redacted]
Type it again:	[redacted]
	note: this is the e-mail address that we will use to contact you about your account
Enter a new password:	•••••••••••
Type it again:	•••••••••••

About Amazon.com Sign In

Amazon Web Services uses information from your Amazon.com account to identify you and allow access to Amazon Web Services. Your use of this site is governed by our Terms of Use and Privacy Policy linked below. Your use of Amazon Web Services products and services is governed by the AWS Customer Agreement linked below unless you purchase these products and services from an AWS Value Added Reseller.

Figure 1-3. *Login credentials*

4. The next step is to provide contact information to AWS since AWS will generate bills with this name and address, as shown in Figure 1-4.


English Sign Out

Amazon Web Services Sign Up

Contact Information

Company Account [✓ Personal Account]

* Required Fields

Full Name*	
Country*	United States
Address*	Street, P.O. Box, Company Name, c/o
	Apartment, suite, unit, building, floor, etc.
City*	
State / Province or Region*	
Postal Code*	
Phone Number*	
Security Check	673af4

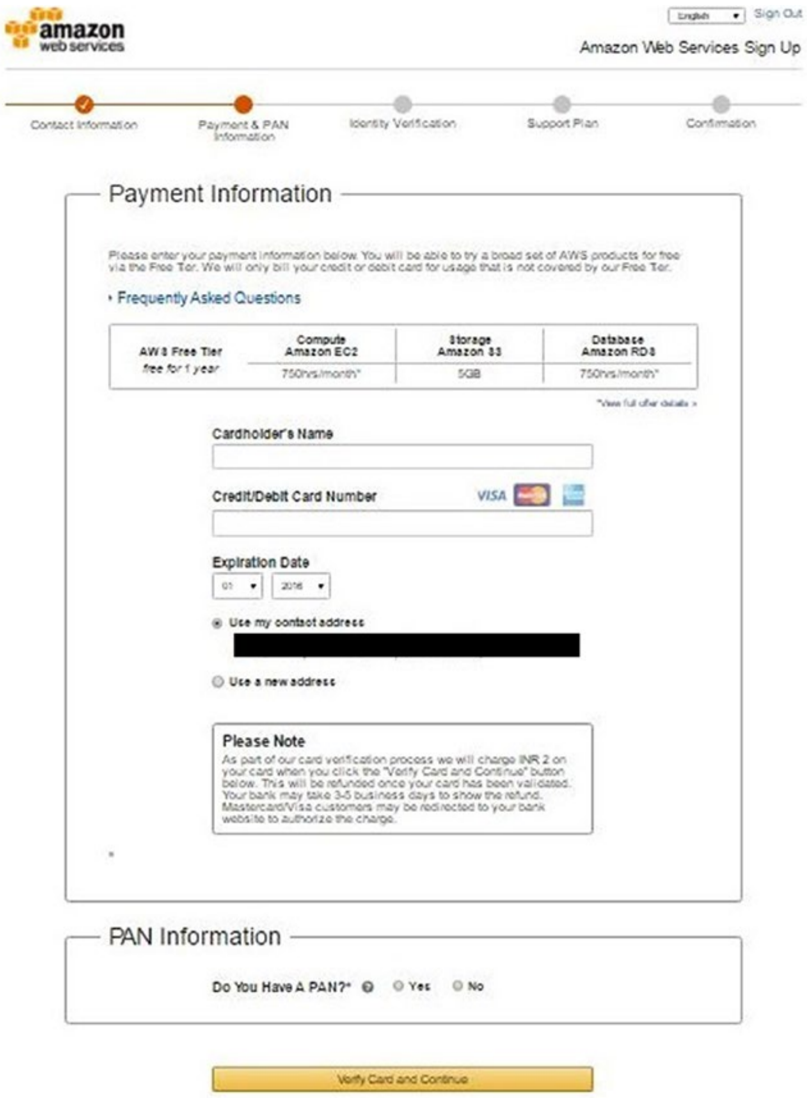
Please type the characters as shown above

AWS Customer Agreement

Check here to indicate that you have read and agree to the terms of the AWS Customer Agreement

Figure 1-4. *Providing contact information*

5. In the next step, shown in Figure 1-5, you will provide payment information (that is, credit card details) so that AWS can directly charge the monthly billing amount to your credit card account. It is critical to provide this information because without this payment information, users won't be able to consume any services on the AWS Management Console.



Payment Information

Please enter your payment information below. You will be able to try a broad set of AWS products for free via the Free Tier. We will only bill your credit or debit card for usage that is not covered by our Free Tier.

› Frequently Asked Questions

AWS Free Tier *free for 1 year*	Compute Amazon EC2	Storage Amazon S3	Database Amazon RDS
	750hrs/month*	5GB	750hrs/month*

*View full offer details »

Cardholder's Name:

Credit/Debit Card Number:

Expiration Date: 01 / 2016

(●) Use my contact address

[redacted]

( ) Use a new address

Please Note
As part of our card verification process we will charge INR 2 on your card when you click the "Verify Card and Continue" button below. This will be refunded once your card has been validated. Your bank may take 3-5 business days to show the refund. Mastercard/Visa customers may be redirected to your bank website to authorize the charge.

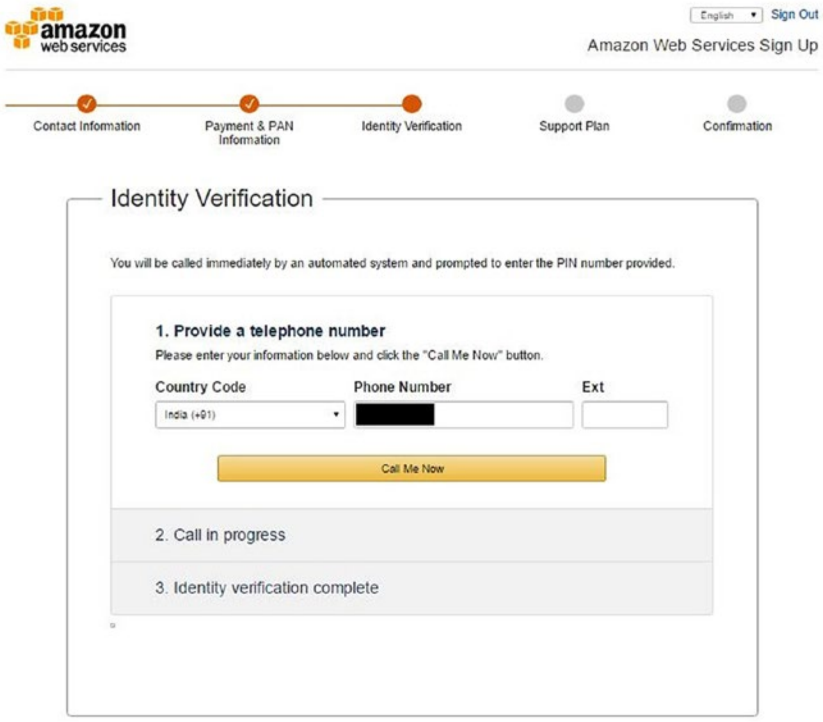
PAN Information

Do You Have A PAN?* ( ) Yes ( ) No

Figure 1-5. *Payment information*

Under Frequently Asked Questions, AWS free tier information is provided. For new users, AWS provides a free usage tier so those users can experiment with AWS services. Only some of the services are available for free by AWS. For more details, please visit https://aws.amazon.com/free.

6. The next step is to verify your identity, as shown in Figure 1-6. Here, you will be providing your contact number. When you click the Call Me Now button, an automated call is triggered to your contact number. Simultaneously, a PIN number will be provided to the automated call received.



Identity Verification

You will be called immediately by an automated system and prompted to enter the PIN number provided.

1. Provide a telephone number

Please enter your information below and click the "Call Me Now" button.

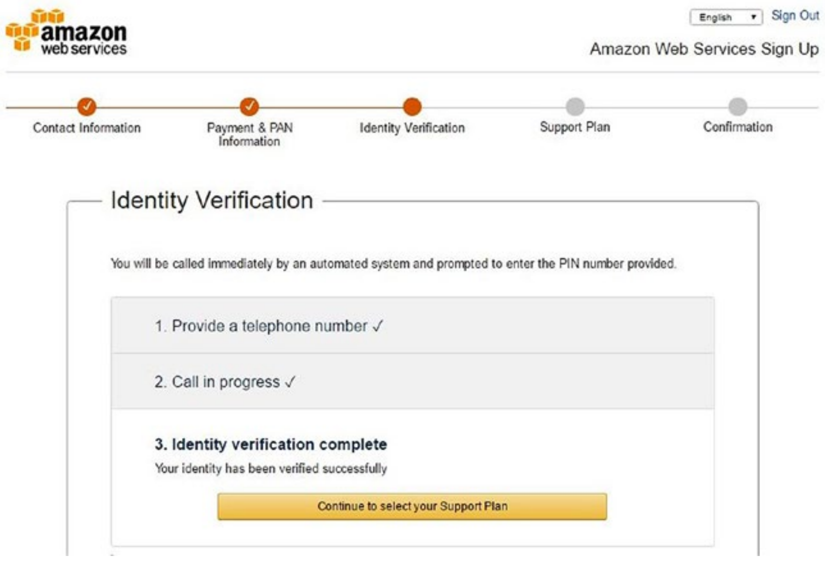
Country Code	Phone Number	Ext
India (+91)	[redacted]	

2. Call in progress

3. Identity verification complete

Figure 1-6. *Identity verification*

7. Once you verify the PIN number via the automated call, you can see that your identity verification is complete, as shown in Figure 1-7.



Identity Verification

You will be called immediately by an automated system and prompted to enter the PIN number provided.

1. Provide a telephone number ✓

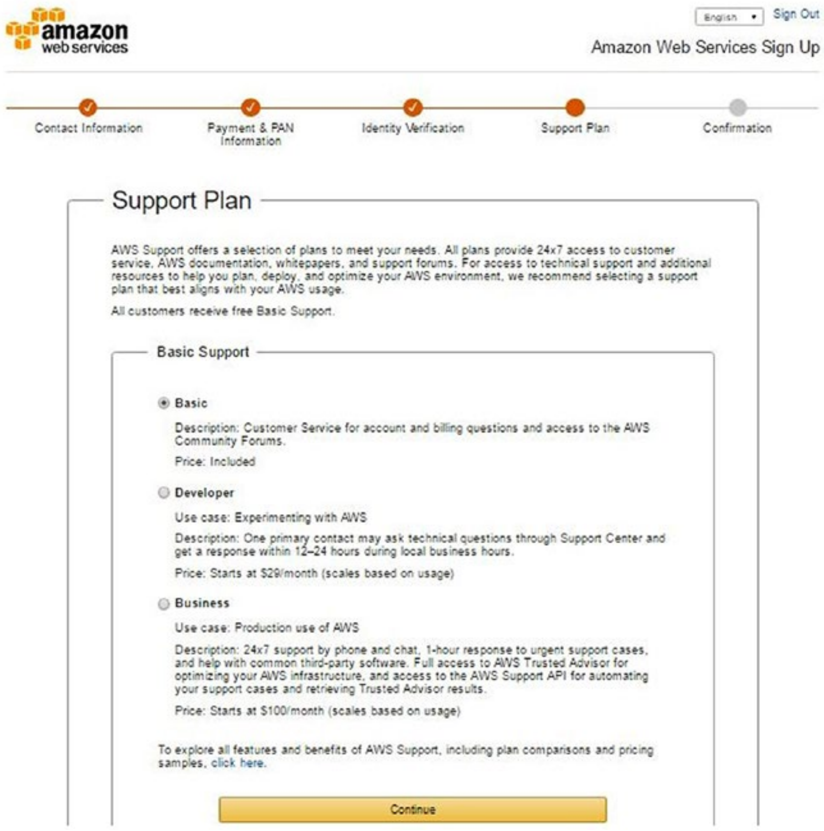
2. Call in progress ✓

3. Identity verification complete

Your identity has been verified successfully

Figure 1-7. *Identity verification complete*

8. The final step is to choose Support Plan, as shown in Figure 1-8. Users have the right to select the plan they are willing to subscribe to. In our case, we will choose the basic free plan. You can either choose the developer or business support plan if your work requires either of these type of AWS support.



Support Plan

AWS Support offers a selection of plans to meet your needs. All plans provide 24x7 access to customer service, AWS documentation, whitepapers, and support forums. For access to technical support and additional resources to help you plan, deploy, and optimize your AWS environment, we recommend selecting a support plan that best aligns with your AWS usage.

All customers receive free Basic Support.

Basic Support

[✓ Basic]

Description: Customer Service for account and billing questions and access to the AWS Community Forums.

Price: Included

Developer

Use case: Experimenting with AWS

Description: One primary contact may ask technical questions through Support Center and get a response within 12–24 hours during local business hours.

Price: Starts at $29/month (scales based on usage)

Business

Use case: Production use of AWS

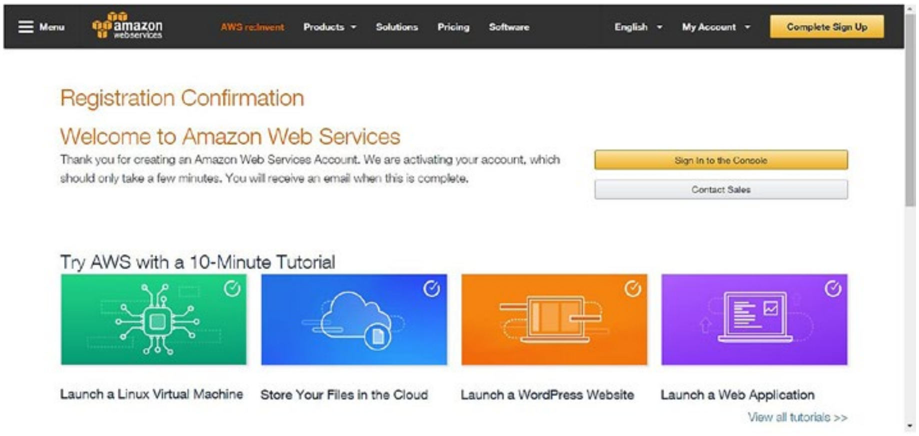
Description: 24x7 support by phone and chat, 1-hour response to urgent support cases, and help with common third-party software. Full access to AWS Trusted Advisor for optimizing your AWS infrastructure, and access to the AWS Support API for automating your support cases and retrieving Trusted Advisor results.

Price: Starts at $100/month (scales based on usage)

To explore all features and benefits of AWS Support, including plan comparisons and pricing samples, click here.

Figure 1-8. *Choose support plan*

As shown in Figure 1-9, you will receive a registration confirmation, which completes the registration process.



Registration Confirmation

Welcome to Amazon Web Services

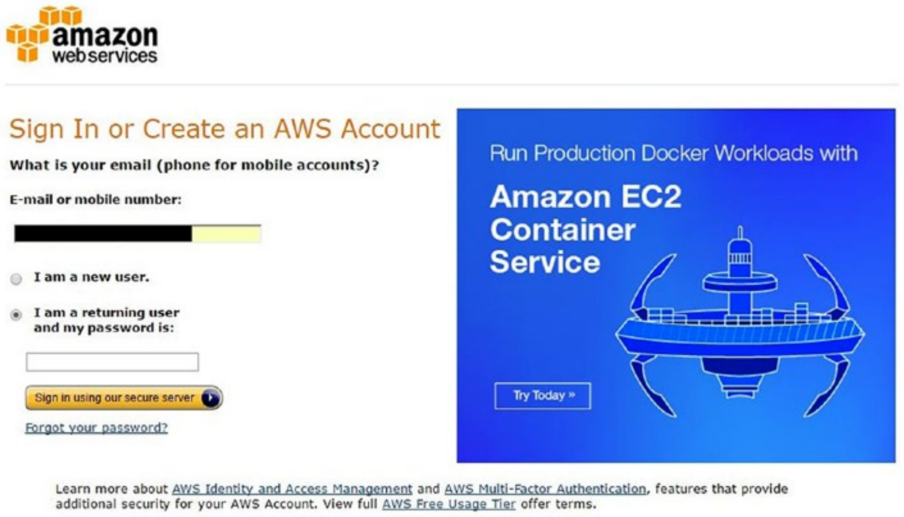
Thank you for creating an Amazon Web Services Account. We are activating your account, which should only take a few minutes. You will receive an email when this is complete.

Try AWS with a 10-Minute Tutorial

Launch a Linux Virtual Machine
Store Your Files in the Cloud
Launch a WordPress Website
Launch a Web Application
View all tutorials >>

Figure 1-9. *Registration confirmation*

9. Now that you have created an account on AWS, you will sign in using the credentials that you provided while creating the account. You can see in Figure 1-10 that this time you will click the radio button for I am a returning user and my password is:. This allows you to provide your password. Once you have provided your e-mail and password, click the Sign in using our secure server button.



Sign In or Create an AWS Account

What is your email (phone for mobile accounts)?

E-mail or mobile number:

[redacted]

○ I am a new user.

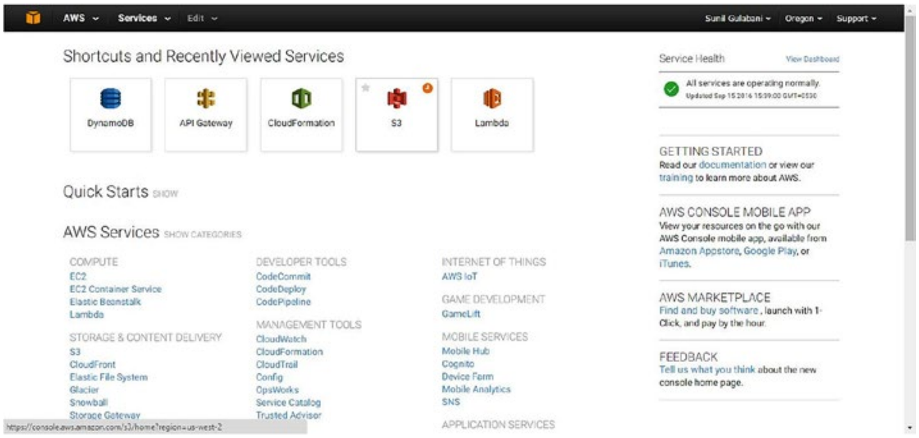
● I am a returning user and my password is:

Sign in using our secure server
Forgot your password?
Run Production Docker Workloads with
Amazon EC2 Container Service
Try Today »

Learn more about AWS Identity and Access Management and AWS Multi-Factor Authentication, features that provide additional security for your AWS Account. View full AWS Free Usage Tier offer terms.

Figure 1-10. *Sign-in page for AWS*

10. Once AWS verifies your credentials, you will be redirected to the AWS Management Console landing page. (See Figure 1-11.)



All services are operating normally.
Updated Sep 15 2016 15:39:00 GMT+0530

GETTING STARTED
Read our documentation or view our training to learn more about AWS.

AWS CONSOLE MOBILE APP
View your resources on the go with our AWS Console mobile app, available from Amazon Appstore, Google Play, or iTunes.

AWS MARKETPLACE
Find and buy software , launch with 1-Click, and pay by the hour.

FEEDBACK
Tell us what you think about the new console home page.

https://console.aws.amazon.com/s3/home?region=us-west-2

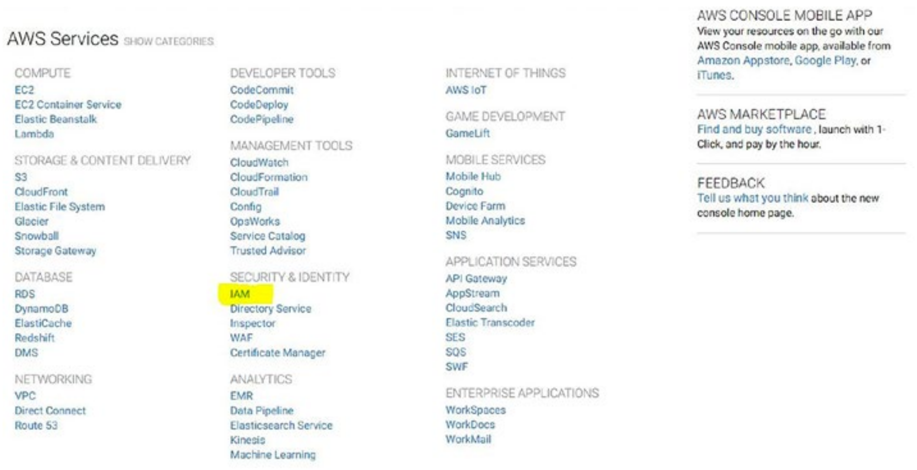
Figure 1-11. *AWS Management Console landing page*

This concludes our explanation of the sign-up and sign-up processes.

Create User and Groups

AWS IAM (Identity and Access Management) helps to control the number of users under this account that will consume the AWS resources. You can provide authentication and authorization for new users, which allows them to access AWS limited resources. In subsequent chapters, we will interact with AWS EC2, SQS, Kinesis, and S3 using SDK. In order to interact with SDK, we need IAM users' access keys and secret keys.

1. To create IAM, sign in at `http://aws.amazon.com` and click IAM under Security and Identity, as highlighted in Figure 1-12.



AWS Services SHOW CATEGORIES

COMPUTE
EC2
EC2 Container Service
Elastic Beanstalk
Lambda

STORAGE & CONTENT DELIVERY
S3
CloudFront
Elastic File System
Glacier
Snowball
Storage Gateway

DATABASE
RDS
DynamoDB
ElastiCache
Redshift
DMS

NETWORKING
VPC
Direct Connect
Route 53

DEVELOPER TOOLS
CodeCommit
CodeDeploy
CodePipeline

MANAGEMENT TOOLS
CloudWatch
CloudFormation
CloudTrail
Config
OpsWorks
Service Catalog
Trusted Advisor

SECURITY & IDENTITY
IAM
Directory Service
Inspector
WAF
Certificate Manager

ANALYTICS
EMR
Data Pipeline
Elasticsearch Service
Kinesis
Machine Learning

INTERNET OF THINGS
AWS IoT

GAME DEVELOPMENT
GameLift

MOBILE SERVICES
Mobile Hub
Cognito
Device Farm
Mobile Analytics
SNS

APPLICATION SERVICES
API Gateway
AppStream
CloudSearch
Elastic Transcoder
SES
SQS
SWF

ENTERPRISE APPLICATIONS
WorkSpaces
WorkDocs
WorkMail

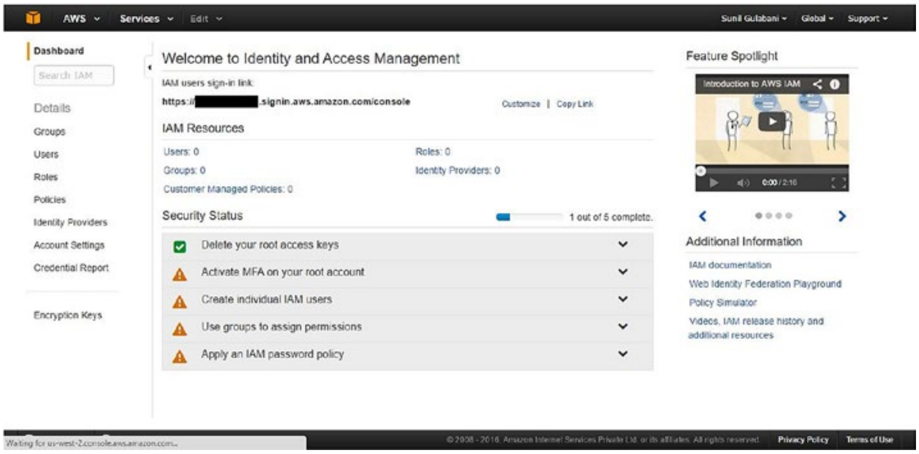
AWS CONSOLE MOBILE APP
View your resources on the go with our AWS Console mobile app, available from Amazon Appstore, Google Play, or iTunes.

AWS MARKETPLACE
Find and buy software, launch with 1-Click, and pay by the hour.

FEEDBACK
Tell us what you think about the new console home page.

Figure 1-12. *AWS Management Console, IAM services*

2. The IAM services page will open and allow you to create users, groups, roles, policies, and so on, as shown in Figure 1-13. This enables authorization to access AWS resources.



Welcome to Identity and Access Management

IAM users sign-in link:
https://[redacted].signin.aws.amazon.com/console Customize | Copy Link

IAM Resources

Users: 0 Roles: 0
Groups: 0 Identity Providers: 0
Customer Managed Policies: 0

Security Status 1 out of 5 complete.

✓ Delete your root access keys
⚠ Activate MFA on your root account
⚠ Create individual IAM users
⚠ Use groups to assign permissions
⚠ Apply an IAM password policy

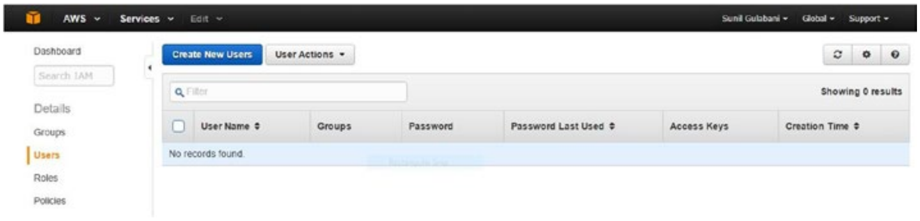
Feature Spotlight
Introduction to AWS IAM
0:00 / 2:16

Additional Information
IAM documentation
Web Identity Federation Playground
Policy Simulator
Videos, IAM release history and additional resources

Waiting for us-west-2.console.aws.amazon.com...
© 2008 - 2016, Amazon Internet Services Private Ltd. or its affiliates. All rights reserved. Privacy Policy Terms of Use

Figure 1-13. *IAM services*

3. Click Users in the menu shown under IAM Resources in Figure 1-13. This will direct you to a page where you can create a new user and display an existing users' list. As of now, we don't have any users created, so it's showing No records found. (See Figure 1-14.)

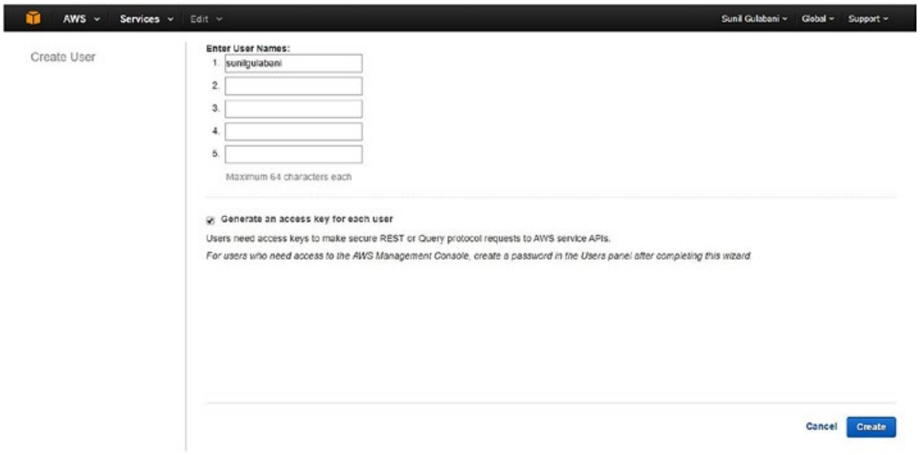


Showing 0 results

User Name	Groups	Password	Password Last Used	Access Keys	Creation Time
No records found.					

Figure 1-14. *IAM users screen*

4. The next step is to click the Create New Users button, which will ask you to provide user names and whether you want to generate an access key for each user. This check box should be selected so as to generate an access key and secret key for the user. See Figure 1-15.



Enter User Names:

1. sunilgulabani
2.
3.
4.
5.

Maximum 64 characters each

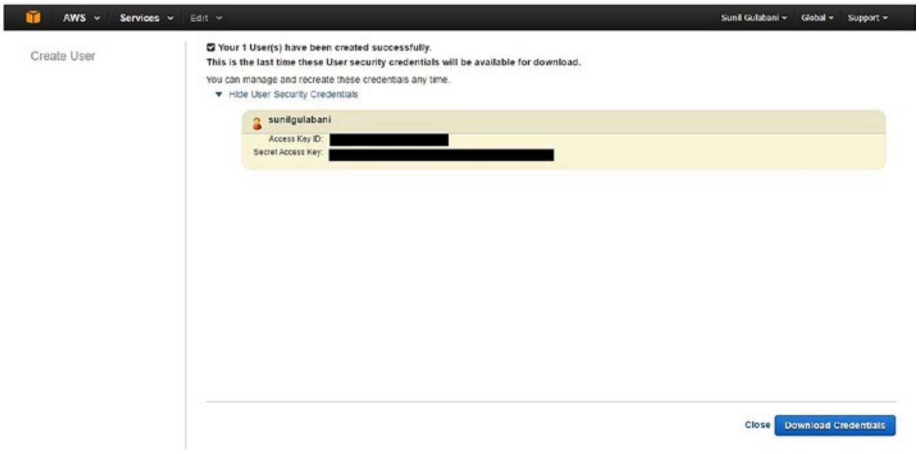
[✓] Generate an access key for each user

Users need access keys to make secure REST or Query protocol requests to AWS service APIs.

For users who need access to the AWS Management Console, create a password in the Users panel after completing this wizard.

Figure 1-15. *Create user*

5. Clicking the Create User button will create a user and also create security credentials, which have Access Key ID and Secret Access Key (as the check box is selected). See Figure 1-16.



Your 1 User(s) have been created successfully.
This is the last time these User security credentials will be available for download.
You can manage and recreate these credentials any time.

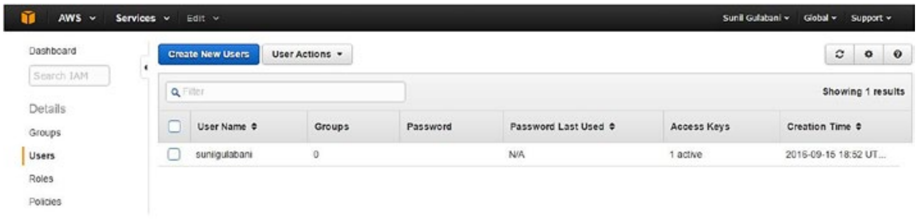
sunilgulabani
Access Key ID: [redacted]
Secret Access Key: [redacted]

Figure 1-16. User created

■ **Note** You can download these credentials and save them in a secure location so that others do not misuse them. You can't download or get credentials once you are off this screen. Be mindful and store the credentials at a secure location.

---

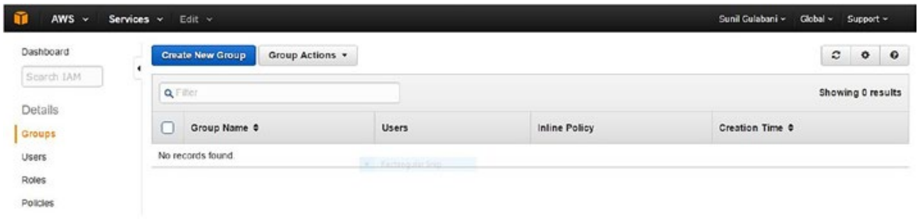
6. You can see on the users screen that new user sunilgulabani has been created. See Figure 1-17.



User Name	Groups	Password	Password Last Used	Access Keys	Creation Time
sunilgulabani	0		N/A	1 active	2016-09-15 18:52 UT...

Figure 1-17. User listing

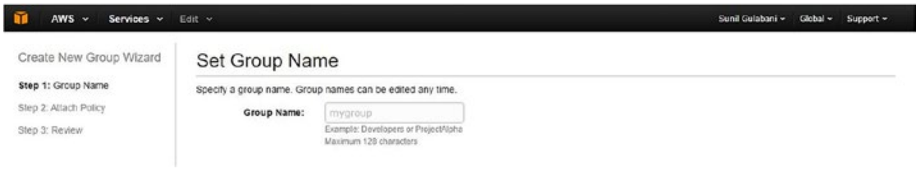
7. Now you will create a group that will have full access for AWS EC2, S3, Kinesis, and SQS. To create such a group, click the Groups button in the menu, as shown in Figure 1-18. This will open the Groups screen where you can create new groups and view the list of existing groups.



No records found.

Figure 1-18. *Groups screen*

8. Click the Create New Group button shown in Figure 1-18. This will open a dialog box for creating a new group, as shown in Figure 1-19.



Set Group Name

Specify a group name. Group names can be edited any time.

Group Name: mygroup

Example: Developers or ProjectAlpha
Maximum 128 characters

Figure 1-19. *Create new group*

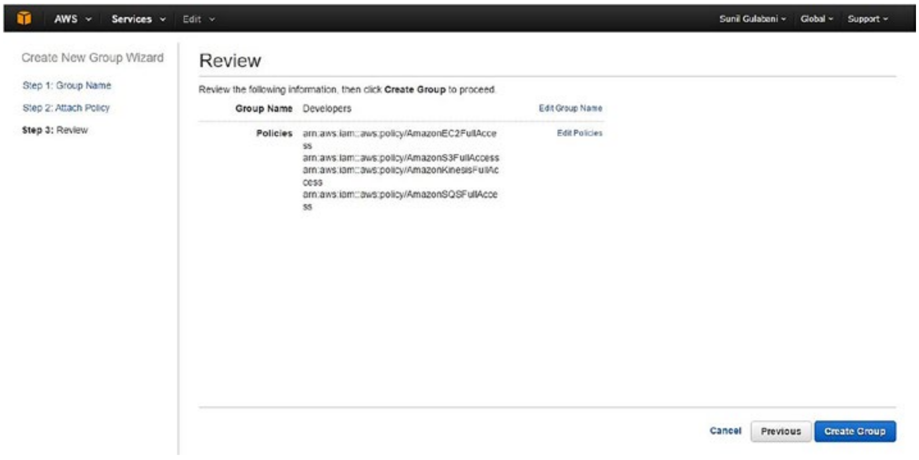
Creating a new group consists of three steps:

a. Step 1: Group Name. In this step, we will set the group name as “Developers” for our example.

b. Step 2: Attach Policy. Following are a list of policies, and we will select the policies that need to be attached with the group.

- AmazonEC2FullAccess
- AmazonS3FullAccess
- AmazonKinesisFullAccess
- AmazonSQSFullAccess

c. Step 3: Review. In this step, we will review the group name, attach policies, and proceed with creating a group by clicking the Create Group button. See Figure 1-20.



Review

Review the following information, then click **Create Group** to proceed.

Group Name Developers

Policies
arn:aws:iam::aws:policy/AmazonEC2FullAccess
arn:aws:iam::aws:policy/AmazonS3FullAccess
arn:aws:iam::aws:policy/AmazonKinesisFullAccess
arn:aws:iam::aws:policy/AmazonSQSFullAccess

Figure 1-20. *Create group*

9. In Figure 1-20, you can see the listing of the newly created group. Now, we will add users to this group. Select the Developers group and under the Group Actions drop-down list, click the Add Users to Group option. See Figure 1-21.

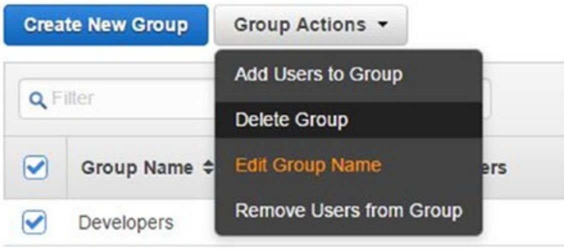
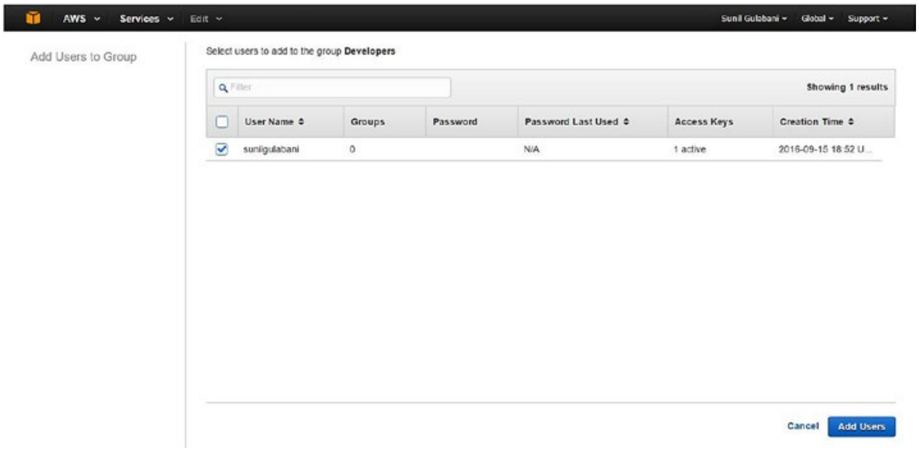


Figure 1-21. *Add Users to Group menu*

10. Clicking the Add Users to Group button will open the dialog box where we can select the users that are to be added. Select the sunilgulabani user and click the Add Users button. See Figure 1-22.



Select users to add to the group **Developers**

Showing 1 results

	User Name	Groups	Password	Password Last Used	Access Keys	Creation Time
✓	sunilgulabani	0		N/A	1 active	2016-09-15 18:52 U...

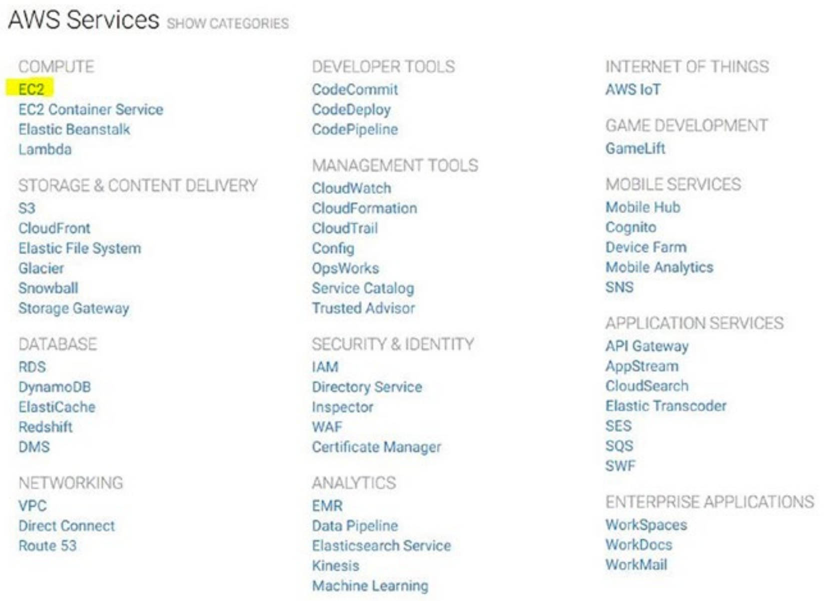
Figure 1-22. *Add users to group*

Now we have finished creating IAM.

Create Key Pairs

In this section, we will create key pairs that will be used to access the EC2 instance, which will be created in subsequent chapters. This is just a prerequisite so that we have this key pair ready when we need it in the upcoming chapters.

1. To create a key pair, click EC2, as highlighted in Figure 1-23.



AWS Services SHOW CATEGORIES

COMPUTE
EC2
EC2 Container Service
Elastic Beanstalk
Lambda

STORAGE & CONTENT DELIVERY
S3
CloudFront
Elastic File System
Glacier
Snowball
Storage Gateway

DATABASE
RDS
DynamoDB
ElastiCache
Redshift
DMS

NETWORKING
VPC
Direct Connect
Route 53

DEVELOPER TOOLS
CodeCommit
CodeDeploy
CodePipeline

MANAGEMENT TOOLS
CloudWatch
CloudFormation
CloudTrail
Config
OpsWorks
Service Catalog
Trusted Advisor

SECURITY & IDENTITY
IAM
Directory Service
Inspector
WAF
Certificate Manager

ANALYTICS
EMR
Data Pipeline
Elasticsearch Service
Kinesis
Machine Learning

INTERNET OF THINGS
AWS IoT

GAME DEVELOPMENT
GameLift

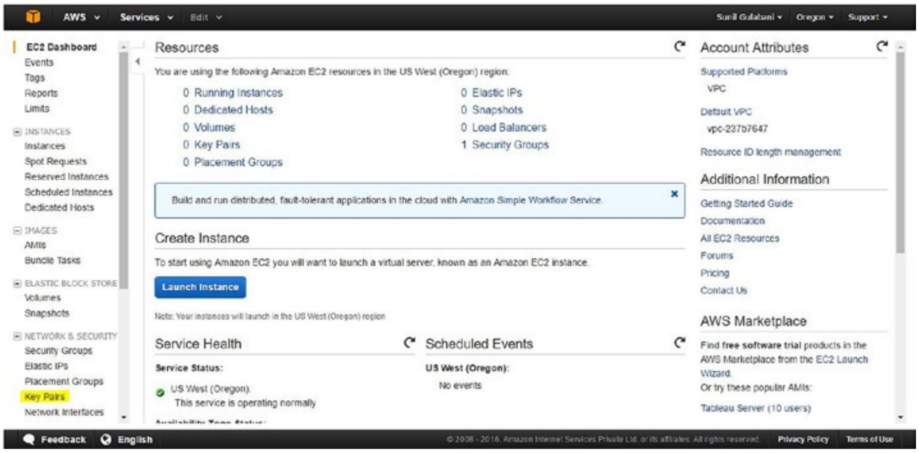
MOBILE SERVICES
Mobile Hub
Cognito
Device Farm
Mobile Analytics
SNS

APPLICATION SERVICES
API Gateway
AppStream
CloudSearch
Elastic Transcoder
SES
SQS
SWF

ENTERPRISE APPLICATIONS
WorkSpaces
WorkDocs
WorkMail

Figure 1-23. *Amazon Management Console (EC2)*

2. This step will direct us to the EC2 dashboard. Here we click Key Pairs, which is highlighted in Figure 1-24.



Resources

You are using the following Amazon EC2 resources in the US West (Oregon) region:

0 Running Instances
0 Dedicated Hosts
0 Volumes
0 Key Pairs
0 Placement Groups
0 Elastic IPs
0 Snapshots
0 Load Balancers
1 Security Groups

Build and run distributed, fault-tolerant applications in the cloud with Amazon Simple Workflow Service.

Create Instance

To start using Amazon EC2 you will want to launch a virtual server, known as an Amazon EC2 instance.

Note: Your instances will launch in the US West (Oregon) region

Service Health

Service Status:

US West (Oregon):
This service is operating normally

Scheduled Events

US West (Oregon):
No events

Account Attributes

Supported Platforms
VPC
Default VPC
vpc-237b7647
Resource ID length management

Additional Information

Getting Started Guide
Documentation
All EC2 Resources
Forums
Pricing
Contact Us

AWS Marketplace

Find free software trial products in the AWS Marketplace from the EC2 Launch Wizard.
Or try these popular AMIs:
Tableau Server (10 users)

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Figure 1-24. *EC2 dashboard (key pairs)*

3. On the key pairs screen, click Create Key Pair, which will ask you for the key pair name. Enter the name and click the Create button to create a key pair, as shown in Figure 1-25.

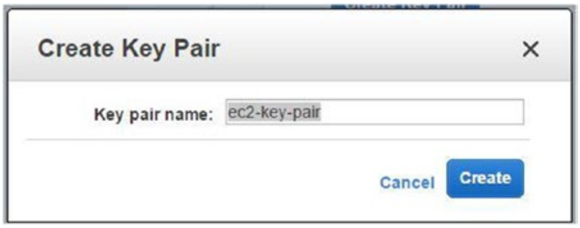


Figure 1-25. *Create Key Pair*

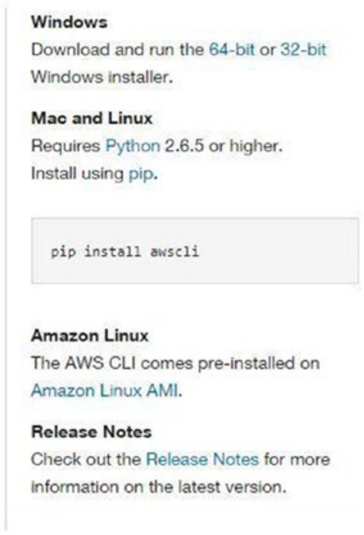
4. Once you click the Create button, a key pair is generated and a pem file will be downloaded automatically.

5. Save this pem file in a secure location, as this will be used for creating an EC2 instance. You will then log in to the EC2 instance from our machine.

Install AWS CLI

AWS Command Line Interface (CLI) is one of the ways to access AWS resources. It allows users to interact with the AWS resources by command prompts, and they can execute the AWS commands in scripts. We will first install AWS CLI on our (Windows) machine.

1. Go to `https://aws.amazon.com/cli/` and find the suitable installation file. See Figure 1-26.



Windows
Download and run the 64-bit or 32-bit Windows installer.

Mac and Linux
Requires Python 2.6.5 or higher.
Install using pip.

```
pip install awscli
```

Amazon Linux
The AWS CLI comes pre-installed on Amazon Linux AMI.

Release Notes
Check out the Release Notes for more information on the latest version.

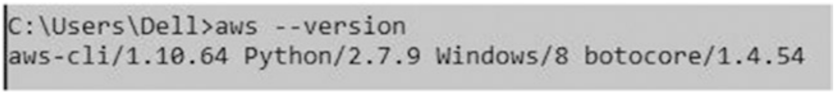
Figure 1-26. *AWS CLI download*

2. In our case, we downloaded and installed Windows 64-bit. For other OS AWS CLI Installation, see `http://docs.aws.amazon.com/cli/latest/userguide/installing.html`.

3. Once we have installed AWS CLI, we will verify that AWS CLI is installed properly. To verify, open the command prompt and type the following command:

   ```
   aws --version
   ```

This command should return the version of the AWS CLI, as shown in Figure 1-27.



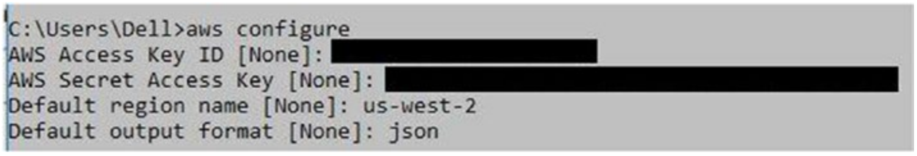
```
C:\Users\Dell>aws --version
aws-cli/1.10.64 Python/2.7.9 Windows/8 botocore/1.4.54
```

Figure 1-27. *AWS CLI version*

The next step is to configure AWS CLI. Open the command prompt and type the following command:

```
aws configure
```

You will be asked for the access key ID, secret access key, default region, and default output format, as shown in Figure 1-28.



```
C:\Users\Dell>aws configure
AWS Access Key ID [None]: [redacted]
AWS Secret Access Key [None]: [redacted]
Default region name [None]: us-west-2
Default output format [None]: json
```

Figure 1-28. *AWS CLI configure*

4. You can copy and paste the access key ID and secret access key from the credentials downloaded from the IAM section. Regarding the default region name, you need to set the region name where you want to access AWS resources. For the default output format, the values can be any one of following: JSON, table, or text. The default format is JSON if you don't provide a preference.

Download SSH Client

In subsequent chapter(s), I will use PuTTy SSH Client to connect to the EC2 instances. You can use your choice of SSH Client if you want. To install Putty SSH Client, and PuTTYgen, download the file from `www.chiark.greenend.org.uk/~sgtatham/putty/download.html`.

or `www.putty.org/`.

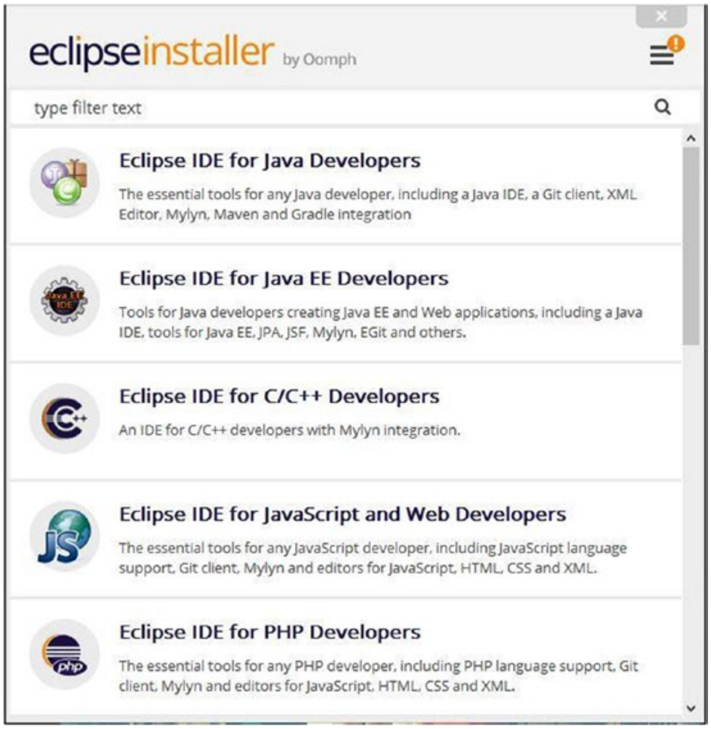
PuTTYgen is used to convert the pem file (which was downloaded after creating key pairs) to a public/private key (ppk) file.

Setup Eclipse

We will use Eclipse software tools to create our application in subsequent chapters.

1. You can download the eclipse software from `https://eclipse.org/home/index.php`.

2. Once you download the Eclipse Installer, you need to select Eclipse IDE for Java EE Developers, as shown in Figure 1-29, and follow the steps to install it.



Eclipse IDE for Java Developers
The essential tools for any Java developer, including a Java IDE, a Git client, XML Editor, Mylyn, Maven and Gradle integration

Eclipse IDE for Java EE Developers
Tools for Java developers creating Java EE and Web applications, including a Java IDE, tools for Java EE, JPA, JSF, Mylyn, EGit and others.

Eclipse IDE for C/C++ Developers
An IDE for C/C++ developers with Mylyn integration.

Eclipse IDE for JavaScript and Web Developers
The essential tools for any JavaScript developer, including JavaScript language support, Git client, Mylyn and editors for JavaScript, HTML, CSS and XML.

Eclipse IDE for PHP Developers
The essential tools for any PHP developer, including PHP language support, Git client, Mylyn and editors for JavaScript, HTML, CSS and XML.

Figure 1-29. *Eclipse Installer*

Summary

Amazon Web Services is one of the leading cloud providers. I have demonstrated how to create IAM, which allows access to AWS resources using SDK or CLI. Also, I have shown how to configure a system to have pre-install software packages.

In Chapter 2, I will guide you through an Elastic Compute Cloud (EC2) instance with AWS Management Console, AWS SDK, and AWS CLI. Also, I will show you how to create a cloud watch alarm on EC2.

CHAPTER 2

Hands-on Elastic Compute Cloud

Amazon Elastic Compute Cloud (EC2) provides virtual computing. EC2 can be used for various purposes such as running custom applications, storing files, and so on. Users have a wide variety of operating systems to launch EC2 instances.

In this chapter, we will cover the following topics:

- Introduction to EC2
- Features of EC2
- EC2 Instance Types
- Managing EC2 Using Management Console
- Managing EC2 Using AWS CLI
- Managing EC2 Using AWS SDK (Java)
- Monitoring Using CloudWatch

Introduction to EC2

Amazon EC2 is an elastic virtual server that resides under the AWS cloud environment. It provides scalable computing power for an application. It provides great flexibility for operating systems, memory, CPUs, storage, and so on. Amazon provides EC2 instances for rent to users at a nominal rate. Users can then deploy their software on the EC2 instance.

Amazon has given control to the users to create, start, stop, and terminate the instance at their convenience. Amazon has a variety of Amazon Machine Images (AMIs) available that can be used to create new servers in the cloud. Users can even create their own AMIs from their EC2 instance. EC2 also has the capability to auto-scale the servers up and down based on the load of existing servers in just a few minutes.

Amazon provides different regions to launch the different services. As a result, you can create instances to handle failures at different geographical regions or you can utilize multiregion deployment strategies for your application. Amazon uses the pay-as-you-go concept, which means you only pay for the number of Amazon services you have used.

S. Gulabani, *Practical Amazon EC2, SQS, Kinesis, and S3*,
DOI 10.1007/978-1-4842-2841-8_2

Features of EC2

The main features of EC2 that play a significant role while using applications include the large number of possible operating systems, elasticity, fault tolerance and latency, pricing, security, and service commitment.

Operating System

Amazon EC2 provides a wide variety of operating systems that can be used to boot the server. Amazon Linux, Debian, SUSE, FreeBSD, CentOS, Red Hat Enterprise Linux, SUSE Linux Enterprise Server, Ubuntu, Windows, and other Linux operating systems are among them.

Elasticity

Amazon EC2 infrastructure is elastic in nature. *Elasticity* means the system manages its resources by provisioning and de-provisioning them without manual intervention and, therefore, manages load dynamically. It has the capability to auto-scale the resources based on the load and configuration created. You can configure the threshold limit when a new EC2 instance needs to be created based on the load on EC2 and terminate EC2 when the load on EC2 is below the threshold limit.

Fault Tolerance and Latency

Amazon EC2 provides flexibility to auto-scale the servers on an as-needed basis. If one instance fails, another instance can be added to serve the purpose. Amazon also provides different availability zones where system architecture is designed in such a way that if a zone in a (region) is down, another zone in the same (region) can serve the request. Moreover, elastic IP can be seamlessly mapped within minutes so that routing to newly created EC2 instances are complete.

Pricing

As previously mentioned, Amazon charges only for the hours consumed. There may be different pricing options available for different capacity instances. Along with EC2, if we also opt for storage, pricing is based on storage type and the amount of data that is being stored in it.

■ **Note** Amazon provides AWS Free Tier so that you can experiment with certain services at no charge. For more details, visit `https://aws.amazon.com/free/`.

Security

Security is the major concern people have about the cloud. The security provided by EC2 is similar to the traditional firewall. It allows users to manage the accessibility of AWS resources to provide client information such as IP addresses or subnet groups. It is an effective way to manage security on EC2.

Service Commitment

AWS provides the service commitment for its uptime of 99.95%. This means EC2 instances will be up and running for 99.95% of your monthly billing cycle. If this service commitment is not met, users will receive the service credit based on the criteria defined by AWS. For more information, go to `https://aws.amazon.com/ec2/sla/`.

EC2 Instance Types

AWS provides a long list of instance types that users can choose based on their needs. Users' needs vary based on their CPU, memory, storage, and networking capacity. Users choose a specific instance type that suits their application requirement. All instances have a specific price tag that users need to consider while selecting their instance type. In addition, users can configure the scaling behavior to support the instances.

■ **Note** For more information on instances, see `https://aws.amazon.com/ec2/instance-types/`.

Managing EC2 Using Management Console

AWS Management Console is the simplest way to configure AWS resources. All the services have their configuration available on the management console, which makes it easy to manage.

After logging in to the AWS account, click EC2 under the Compute category, as shown in Figure 2-1.

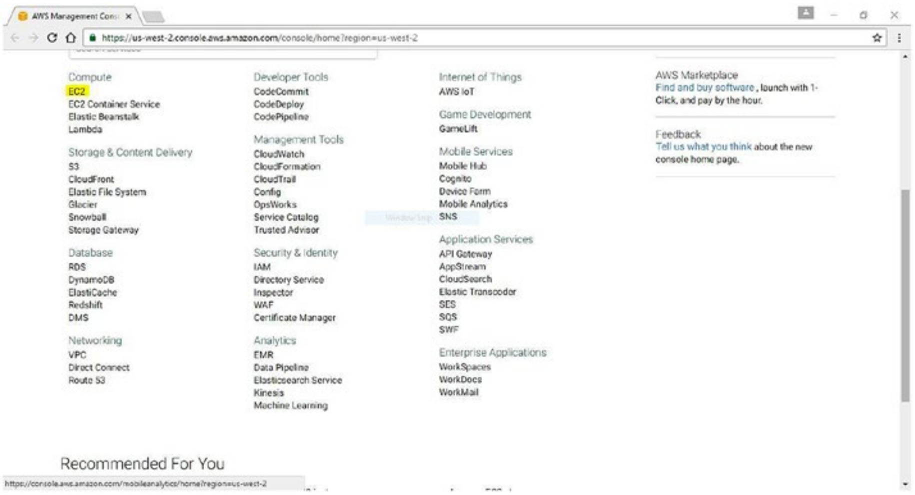
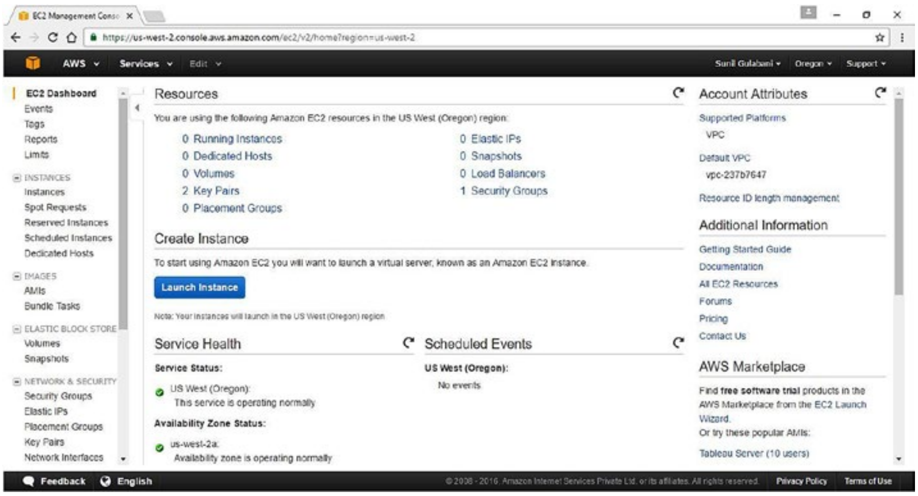


Figure 2-1. *AWS Management Console*

Once you click EC2, you will be navigated to the EC2 dashboard page, as shown in Figure 2-2.



You are using the following Amazon EC2 resources in the US West (Oregon) region:

0 Running Instances
0 Dedicated Hosts
0 Volumes
2 Key Pairs
0 Placement Groups
0 Elastic IPs
0 Snapshots
0 Load Balancers
1 Security Groups

Create Instance

To start using Amazon EC2 you will want to launch a virtual server, known as an Amazon EC2 instance.

Note: Your instances will launch in the US West (Oregon) region

Service Status:
US West (Oregon):
This service is operating normally

Availability Zone Status:
us-west-2a:
Availability zone is operating normally

US West (Oregon):
No events

Supported Platforms: VPC
Default VPC: vpc-237b7647

Find free software trial products in the AWS Marketplace from the EC2 Launch Wizard.
Or try these popular AMIs:

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Figure 2-2. *EC2 dashboard page*

The EC2 dashboard page summarizes the services that are used with EC2.

Let's try to achieve the following:

1. Create a virtual remote Linux machine.
2. Log in to a virtual remote Linux machine using SSH client (See Figure 2-3).

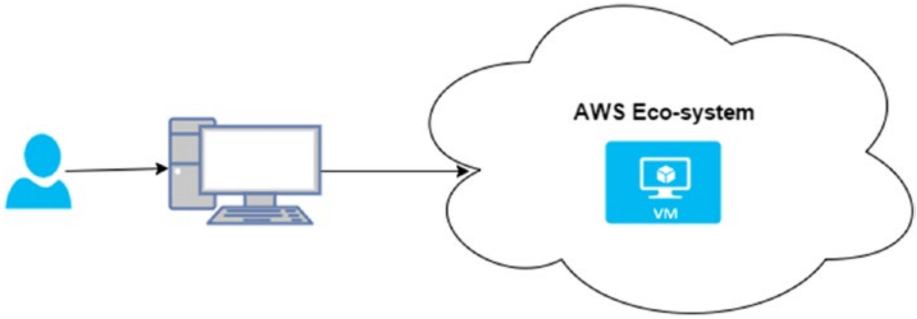


Figure 2-3. *Output*

Now, let's create an EC2 instance. The major steps involved to create an EC2 instance are as follows:

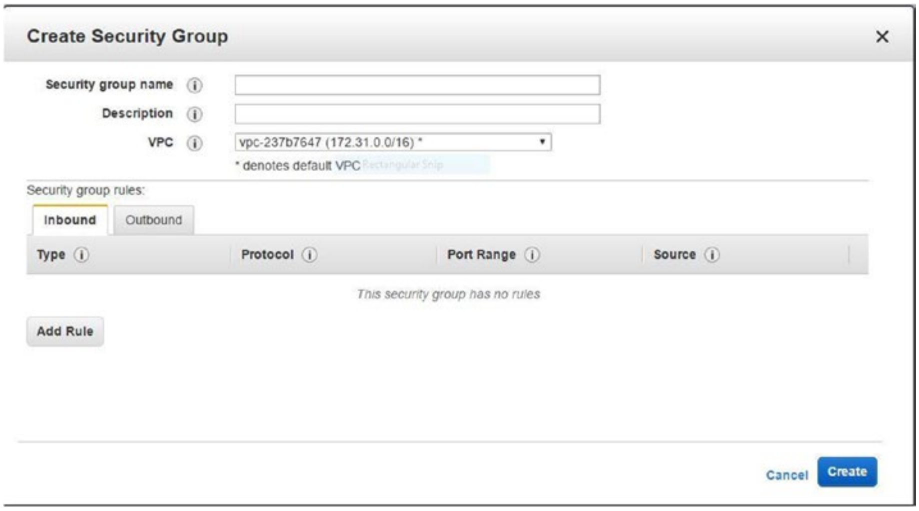
1. Create security group
2. Create key pair
3. Create EC2 instance
4. Connect to EC2 instance

Let's look at these steps in detail.

1. Create a Security Group

Security groups work as firewalls for our EC2 instance. They determine what ingress and egress ports need to be exposed to specific IP addresses so that our application can be accessible from those IP addresses.

1. Click Security Groups under the NETWORK & SECURITY category on the left-side menu of the EC2 dashboard page.
2. Click Create Security Group, which opens a window where the user will fill in security information, as shown in Figure 2-4.



Create Security Group

Security group name	
Description	
VPC	vpc-237b7647 (172.31.0.0/16) *

* denotes default VPC

Security group rules:

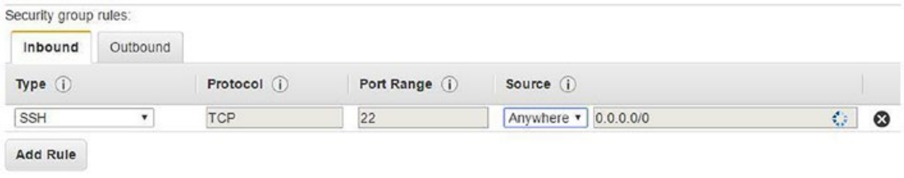
Inbound | Outbound

Type	Protocol	Port Range	Source

This security group has no rules

Figure 2-4. *Create security group*

3. Add an inbound rule for the SSH port. This will be used to connect to the machine from anywhere on Port 22. You can select the source of connection as Custom, Anywhere, or My IP Address from the drop-down list. See Figure 2-5.



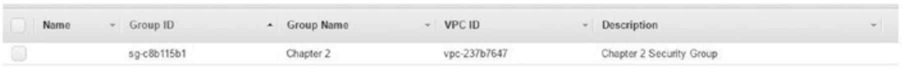
Security group rules:

Inbound | Outbound

Type	Protocol	Port Range	Source
SSH	TCP	22	Anywhere 0.0.0.0/0

Figure 2-5. *Add inbound rule for SSH*

4. Once you have filled in the details, click the Create button. This will create the security group having the SSH port exposed. See Figure 2-6.



Name	Group ID	Group Name	VPC ID	Description
	sg-c8b115b1	Chapter 2	vpc-237b7647	Chapter 2 Security Group

Figure 2-6. *Security group created*

2. Create a Key Pair

Key pairs are used for connecting to EC2 instances. Key pairs need to be stored at a secure location. If key pairs are lost, you won't be able to connect to EC2 instances or recover the key pairs.

1. Click Key Pairs under the NETWORK & SECURITY category in the left-side menu of the EC2 dashboard page.

2. Click the Create Key Pair button, which opens a window where the user has to enter the key pair name, as shown in Figure 2-7.

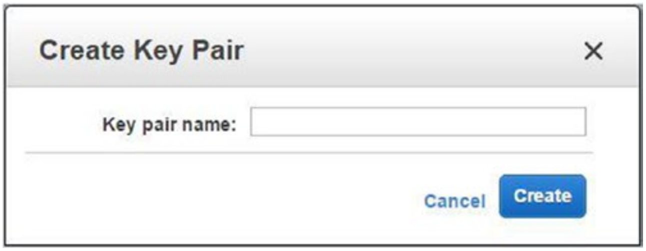
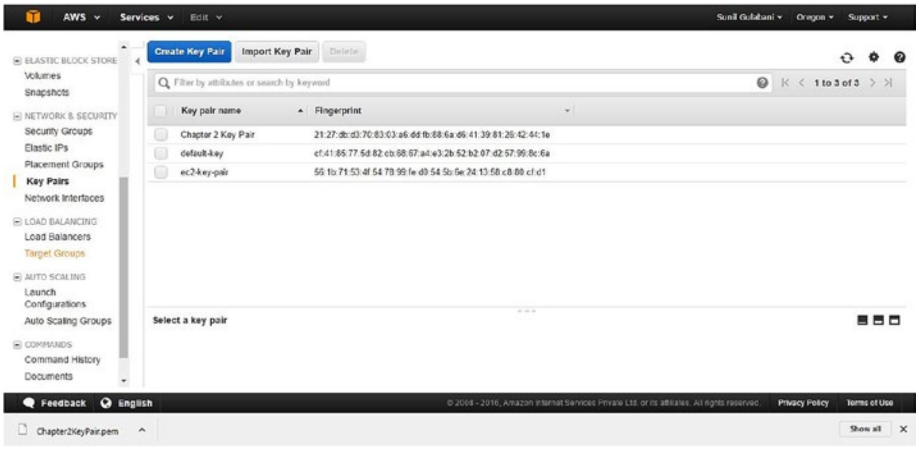


Figure 2-7. *Create key pair*

3. Click the Create button to create the new key pair. This will automatically download a pem file, which can be used to log in to the EC2 instance to which we will assign this key pair in the next step. See Figure 2-8.



Key pair name	Fingerprint
Chapter 2 Key Pair	21:27:db:d3:70:83:03:a6:dd:fb:88:6a:d6:41:39:81:26:42:44:1e
default-key	cf:41:86:77:5d:82:cb:68:67:a4:e3:2b:52:b2:07:d2:57:99:8c:6a
ec2-key-pair	56:1b:71:53:4f:54:78:99:fe:d0:54:5b:6e:24:13:58:c8:80:cf:d1

© 2008 - 2016, Amazon Internet Services Private Ltd. or its affiliates. All rights reserved.

Figure 2-8. *Key pair listing and downloaded pem file*

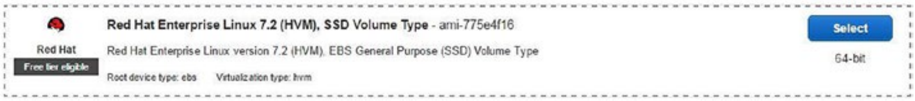
3. Create an EC2 Instance

In the following steps, we will configure parameters to launch an EC2 instance:

1. Click Instances under the INSTANCES category in the left-side menu of the EC2 dashboard page.

2. Click Launch Instance on the next page and you will be navigated to the Create Instance Steps page.

    a. Step 1: Choose AMI. Select the AMI from the list that fits your application requirement. For our case, we will select “Red Hat Enterprise Linux 7.2 (HVM), SSD Volume Type - ami-775e4f16,” which is eligible for AWS Free Tier. See Figure 2-9.


Red Hat
Free tier eligible

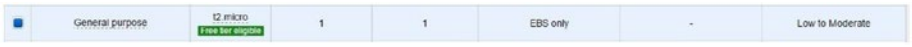
Red Hat Enterprise Linux 7.2 (HVM), SSD Volume Type - ami-775e4f16
Red Hat Enterprise Linux version 7.2 (HVM), EBS General Purpose (SSD) Volume Type
Root device type: ebs   Virtualization type: hvm

Figure 2-9. *Choose AMI*

■ **Note** Make sure to select the correct AMI for your application requirement since you will be charged. If you are eligible for AWS Free Tier, use the free-tier AMIs for this.

---

b. Step 2: Choose Instance Type. Select the instance type from the list for your application requirements. For our case, we select the General Purpose t2.micro, as shown in Figure 2-10.



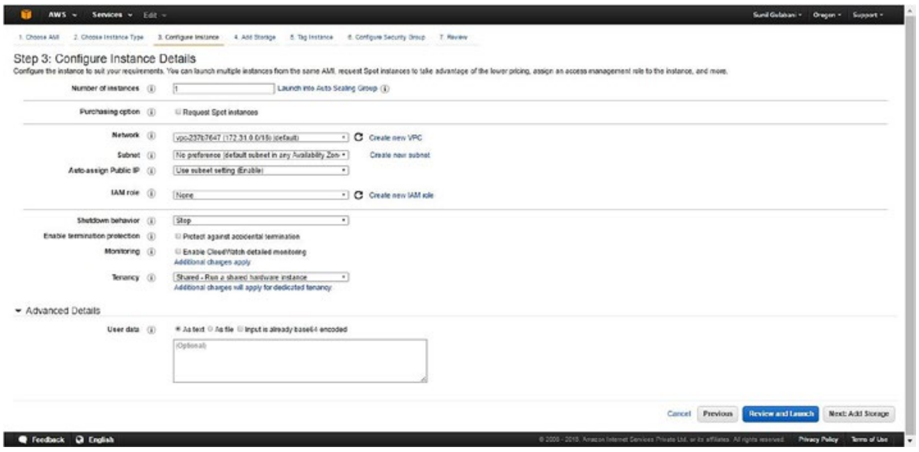
■	General purpose	t2.micro Free tier eligible	1	1	EBS only	-	Low to Moderate

Figure 2-10. *Choose instance type*

c. Step 3: Configure Instance. On this page, we will set the parameters shown in Figure 2-11.

- Number of instances to be created
- Determining if it is a Spot instance
- VPC/subnetting configuration

- IAM role to be assigned to the EC2, which will have access to different AWS resources
- Shutdown behavior—whether to shut down the instance or to terminate the instance
- Enabling termination protection, which will not allow you to terminate the instance unless you disable this property
- Enabling CloudWatch to monitor EC2
- Defining tenancy—determining if location is on shared hardware, dedicated instance, or an instance on a dedicated host
- Executing the shell script command, which is used to pre-initialize some of the software on the machine



Step 3: Configure Instance Details

Configure the instance to suit your requirements. You can launch multiple instances from the same AMI, request Spot instances to take advantage of the lower pricing, assign an access management role to the instance, and more.

Number of instances	1
Purchasing option	☐ Request Spot instances
Network	vpc-237b7647 (172.31.0.0/16) (default)
Subnet	No preference (default subnet in any Availability Zon
Auto-assign Public IP	Use subnet setting (Enable)
IAM role	None
Shutdown behavior	Stop
Enable termination protection	☐ Protect against accidental termination
Monitoring	☐ Enable CloudWatch detailed monitoring
Tenancy	Shared - Run a shared hardware instance

Advanced Details

User data	● As text ○ As file ☐ Input is already base64 encoded
	(Optional)

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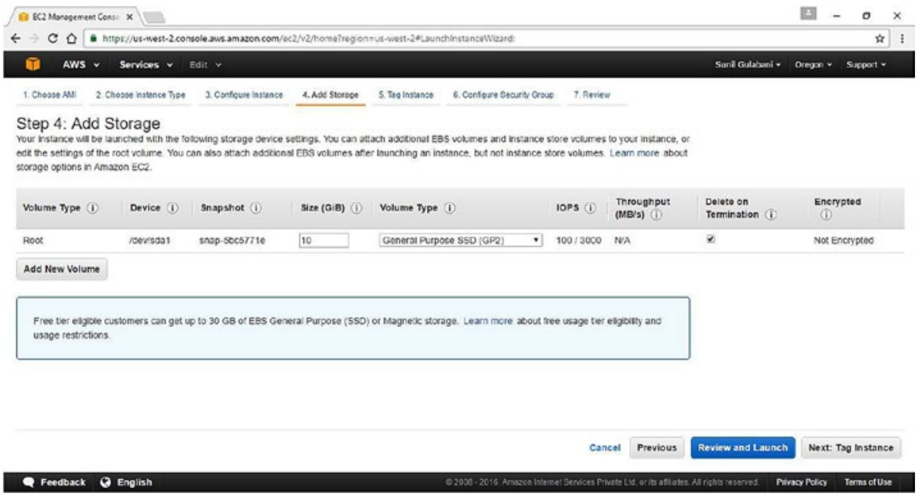
Figure 2-11. *Configure instance details*

d. Step 4: Add Storage. You can add the EBS volumes that will be attached to our EC2 instance, as shown in Figure 2-12. One of the most useful parameters here is Delete on Termination. This denotes whether the EBS volume needs to be deleted when the instance gets terminated.



Step 4: Add Storage

Your instance will be launched with the following storage device settings. You can attach additional EBS volumes and instance store volumes to your instance, or edit the settings of the root volume. You can also attach additional EBS volumes after launching an instance, but not instance store volumes. Learn more about storage options in Amazon EC2.

Volume Type	Device	Snapshot	Size (GiB)	Volume Type	IOPS	Throughput (MB/s)	Delete on Termination	Encrypted
Root	/dev/sda1	snap-5bc5771e	10	General Purpose SSD (GP2)	100 / 3000	N/A	✓	Not Encrypted

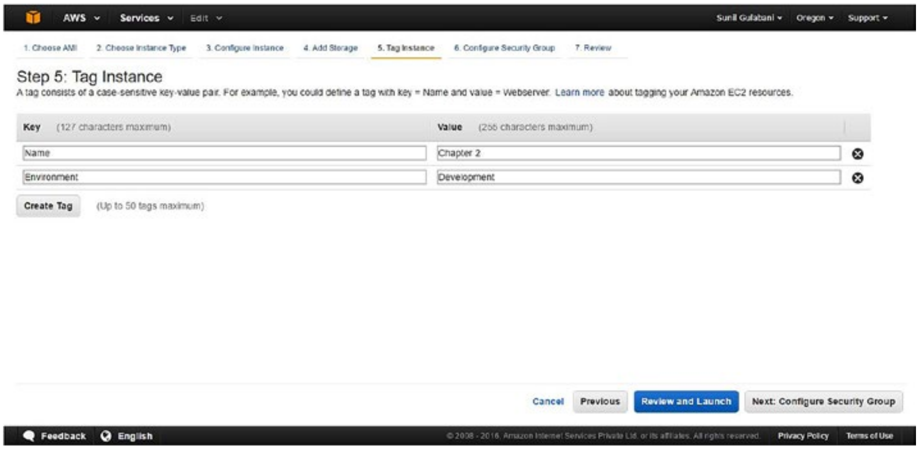
Free tier eligible customers can get up to 30 GB of EBS General Purpose (SSD) or Magnetic storage. Learn more about free usage tier eligibility and usage restrictions.

***Figure 2-12.** Add storage*

■ **Note** If you have files that get persisted on the EBS volume by your application, you should uncheck the check box.

---

e. Step 5: Tag Instance. As Figure 2-13 shows, you can assign tags to the EC2 instances that are used to categorize the AWS resources based on environment or property. This will help us to group AWS resources based on specified tags.



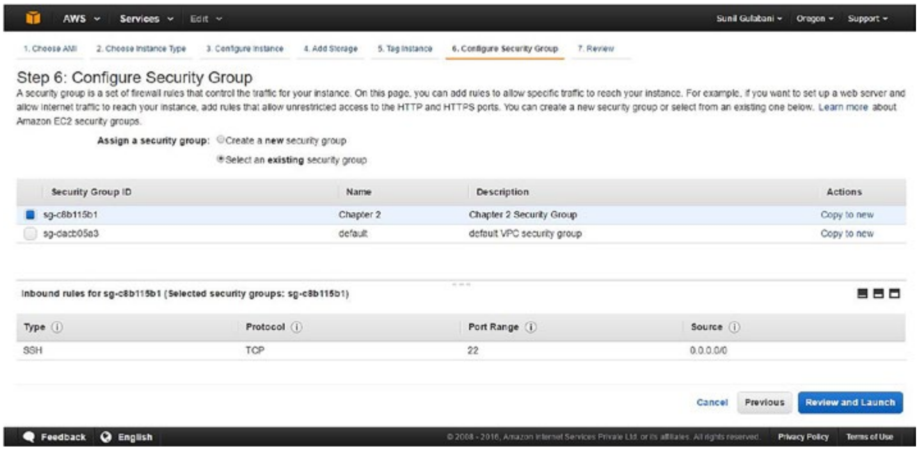
Step 5: Tag Instance

A tag consists of a case-sensitive key-value pair. For example, you could define a tag with key = Name and value = Webserver. Learn more about tagging your Amazon EC2 resources.

Key (127 characters maximum)	Value (255 characters maximum)
Name	Chapter 2
Environment	Development

***Figure 2-13.** Tag instance*

f. Step 6: Configure Security Group. This will set the firewall rules used to expose the EC2 instance ports. As Figure 2-14 shows, you can either create a new security group or select from existing security groups. In our case, we will select from the existing security group that we created earlier with name “Chapter 2.”



Step 6: Configure Security Group

A security group is a set of firewall rules that control the traffic for your instance. On this page, you can add rules to allow specific traffic to reach your instance. For example, if you want to set up a web server and allow internet traffic to reach your instance, add rules that allow unrestricted access to the HTTP and HTTPS ports. You can create a new security group or select from an existing one below. Learn more about Amazon EC2 security groups.

Assign a security group: Create a new security group [✓ Select an existing security group]

	Security Group ID	Name	Description	Actions
✓	sg-c8b115b1	Chapter 2	Chapter 2 Security Group	Copy to new
	sg-dacb05a3	default	default VPC security group	Copy to new

Inbound rules for sg-c8b115b1 (Selected security groups: sg-c8b115b1)

Type	Protocol	Port Range	Source
SSH	TCP	22	0.0.0.0/0

Cancel
Previous
Review and Launch
Feedback
English
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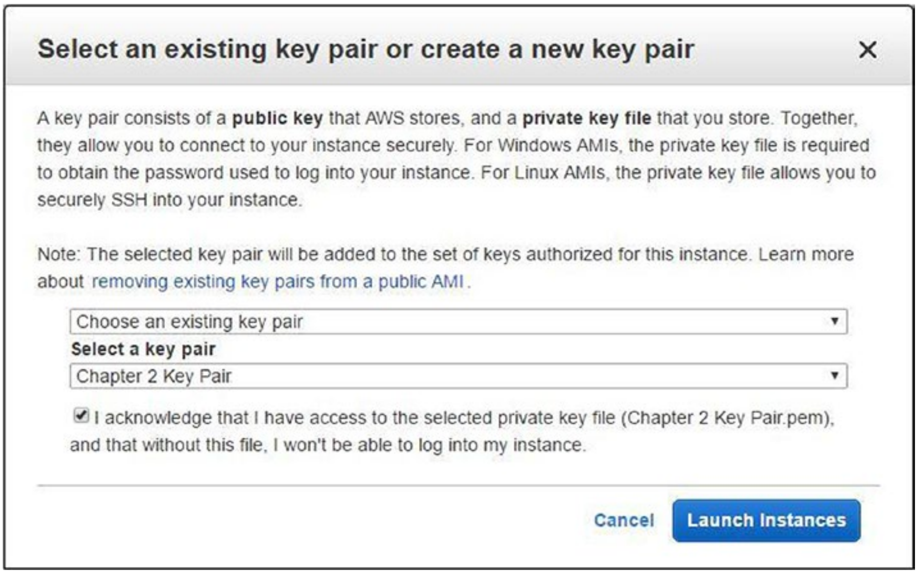
Privacy Policy
Terms of Use

Figure 2-14. *Configure security group*

g. Step 7: Review. In this step, we will review the configuration and, once we have verified it, click the Launch button. This will ask us to select the key pair. You can either select an existing key pair or create a new one. We will select the key pair we created in the previous section with the name “Chapter 2 Key Pair,” as shown in Figure 2-15. After selecting the key pair, acknowledge it by selecting the check box and click the Launch Instances button.



Select an existing key pair or create a new key pair

A key pair consists of a **public key** that AWS stores, and a **private key file** that you store. Together, they allow you to connect to your instance securely. For Windows AMIs, the private key file is required to obtain the password used to log into your instance. For Linux AMIs, the private key file allows you to securely SSH into your instance.

Note: The selected key pair will be added to the set of keys authorized for this instance. Learn more about removing existing key pairs from a public AMI.

Choose an existing key pair

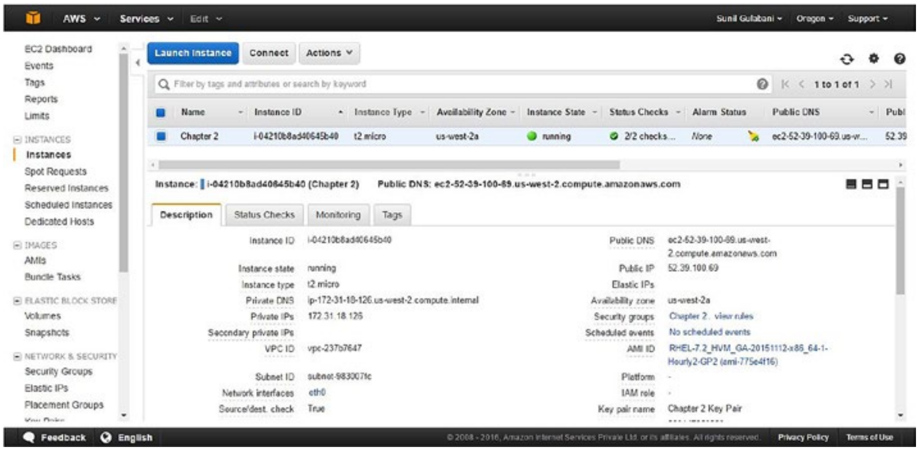
Select a key pair

Chapter 2 Key Pair

[✓] I acknowledge that I have access to the selected private key file (Chapter 2 Key Pair.pem), and that without this file, I won't be able to log into my instance.

Figure 2-15. *Select key pair*

Step 7 completes the required configuration. You can view the instance status on the Instance page, as shown in Figure 2-16.



Name	Instance ID	Instance Type	Availability Zone	Instance State	Status Checks	Alarm Status	Public DNS	Publ
Chapter 2	i-04210b8ad40645b40	t2.micro	us-west-2a	● running	✓ 2/2 checks...	None	ec2-52-39-100-69.us-w...	52.39

Instance: i-04210b8ad40645b40 (Chapter 2) **Public DNS:** ec2-52-39-100-69.us-west-2.compute.amazonaws.com

Instance ID	i-04210b8ad40645b40	Public DNS	ec2-52-39-100-69.us-west-2.compute.amazonaws.com
Instance state	running	Public IP	52.39.100.69
Instance type	t2.micro	Elastic IPs	
Private DNS	ip-172-31-18-126.us-west-2.compute.internal	Availability zone	us-west-2a
Private IPs	172.31.18.126	Security groups	Chapter 2. view rules
Secondary private IPs		Scheduled events	No scheduled events
VPC ID	vpc-237b7647	AMI ID	RHEL-7.2_HVM_GA-20151112-x86_64-1-Hourly2-GP2 (ami-775e4f16)
Subnet ID	subnet-983007fc	Platform	-
Network interfaces	eth0	IAM role	-
Source/dest. check	True	Key pair name	Chapter 2 Key Pair

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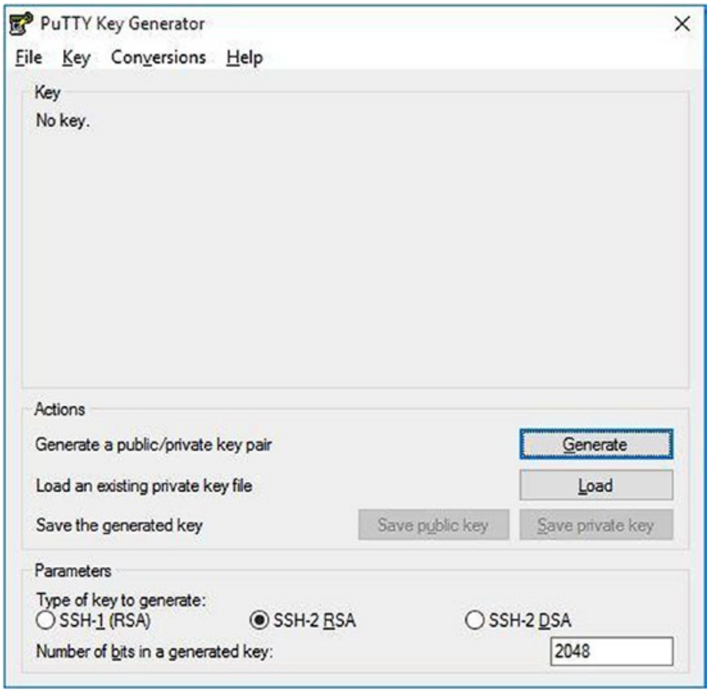
Figure 2-16. *Instance status*

4. Verify by Connecting to EC2 Instance

In this step, we will verify connection to EC2 instance by doing the following:

1. Convert EC2 pem file to ppk file. For this, we will use the `puttygen.exe`, which we installed in Chapter 1.

2. Click the Load button and select the pem file that was downloaded when we created the key pair, as shown in Figure 2-17.



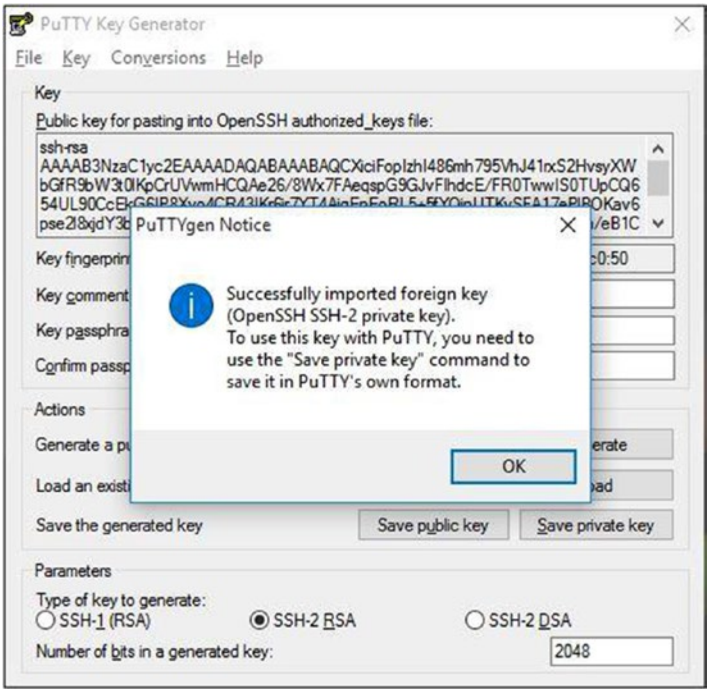
Key
No key.

Actions
Generate a public/private key pair
Load an existing private key file
Save the generated key

Parameters
Type of key to generate:
SSH-1 (RSA) [✓ SSH-2 RSA] SSH-2 DSA
Number of bits in a generated key: 2048

Figure 2-17. *PuTTy Key Generator*

3. Once selected, you can see the private key file is loaded. We will save this using the Save private key option. See Figure 2-18.



```
ssh-rsa
AAAAB3NzaC1yc2EAAAADAQABAAABAQCXiciFoplzhl486mh795VhJ41rxS2HvsyXW
bGfR9bW3t0lKpCrUVwmHCQAe26/8Wx7FAeqspG9GJvFlhdcE/FR0TwwlS0TUpCQ6
54UL90CcE
pse2l8xjdY3
```

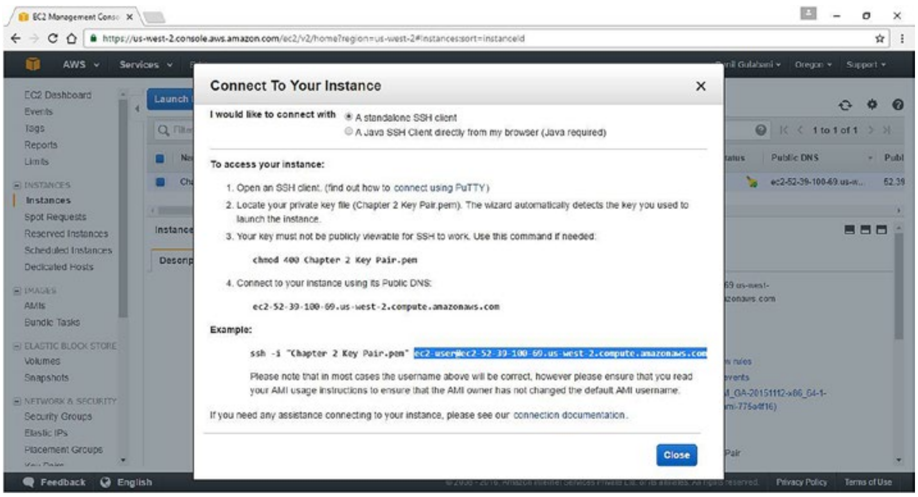
Successfully imported foreign key (OpenSSH SSH-2 private key).
To use this key with PuTTY, you need to use the "Save private key" command to save it in PuTTY's own format.

__Figure 2-18.__ Pem file loaded

5. Connect to EC2 Instance

For Windows Users:

1. On the Instance Status page, find the EC2 instance username by clicking the Connect button, as shown in Figure 2-19. In our case, "ec2-user" is the username.



Connect To Your Instance

I would like to connect with [✓ A standalone SSH client] A Java SSH Client directly from my browser (Java required)

To access your instance:

1. Open an SSH client. (find out how to connect using PuTTY)
2. Locate your private key file (Chapter 2 Key Pair.pem). The wizard automatically detects the key you used to launch the instance.
3. Your key must not be publicly viewable for SSH to work. Use this command if needed:

```
chmod 400 Chapter 2 Key Pair.pem
```

4. Connect to your instance using its Public DNS:

```
ec2-52-39-100-69.us-west-2.compute.amazonaws.com
```

Example:

```
ssh -i "Chapter 2 Key Pair.pem" ec2-user@ec2-52-39-100-69.us-west-2.compute.amazonaws.com
```

Please note that in most cases the username above will be correct, however please ensure that you read your AMI usage instructions to ensure that the AMI owner has not changed the default AMI username.

If you need any assistance connecting to your instance, please see our connection documentation.

Figure 2-19. *Connect to your instance*

2. Find the public IP for our EC2 instance on the EC2 Instance Details page.

3. We will form the hostname, which has the following format:

```
USERNAME@INSTANCE_HOST_NAME_OR_PUBLIC_DNS_NAME
```

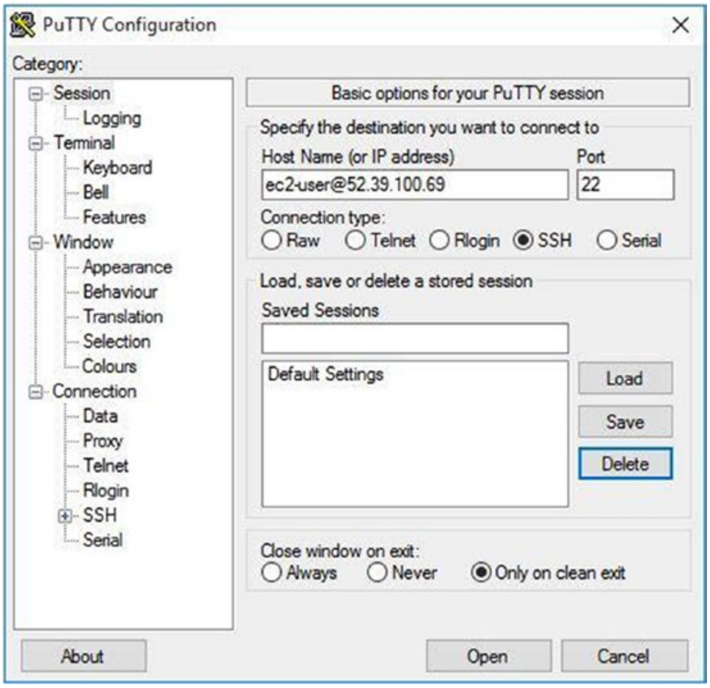
So, we have the following for our instance:

```
ec2-user@52.39.100.69
```

or

```
ec2-user@ec2-52-39-100-69.us-west-2.compute.amazonaws.com
```

4. Open `Putty.exe`, which we installed in Chapter 1, on your machine. Add the hostname or IP address by pasting the hostname that we formed in the previous step, as shown in Figure 2-20.


PuTTY Configuration

Category:

Basic options for your PuTTY session

Specify the destination you want to connect to

Host Name (or IP address): ec2-user@52.39.100.69

Port: 22

Connection type: Raw Telnet Rlogin [✓ SSH] Serial

Load, save or delete a stored session

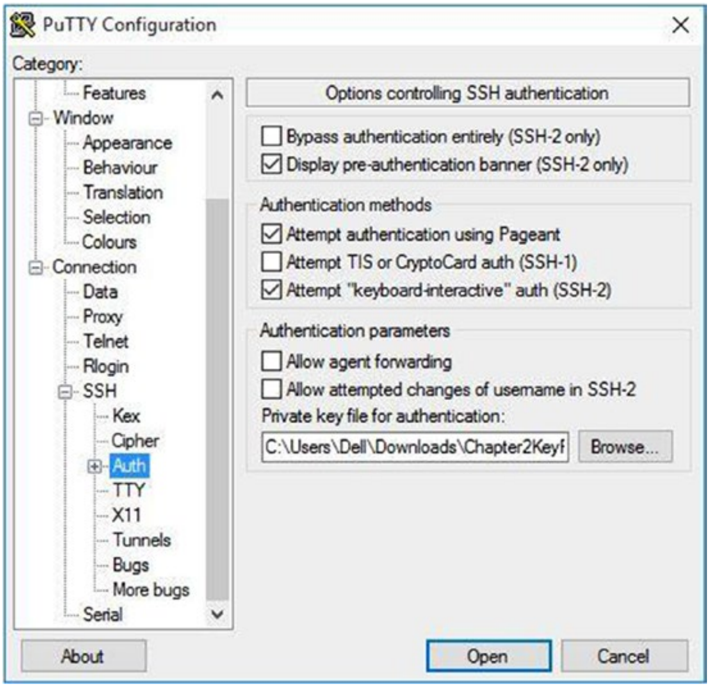
Saved Sessions

Default Settings

Close window on exit: Always Never [✓ Only on clean exit]

Figure 2-20. *PuTTy configuration—hostname*

5. Add the ppk file to the PuTTy SSH client, which we created in the previous section, as shown in Figure 2-21.


PuTTY Configuration

Category:

Options controlling SSH authentication

- [ ] Bypass authentication entirely (SSH-2 only)
- [x] Display pre-authentication banner (SSH-2 only)

Authentication methods

- [x] Attempt authentication using Pageant
- [ ] Attempt TIS or CryptoCard auth (SSH-1)
- [x] Attempt "keyboard-interactive" auth (SSH-2)

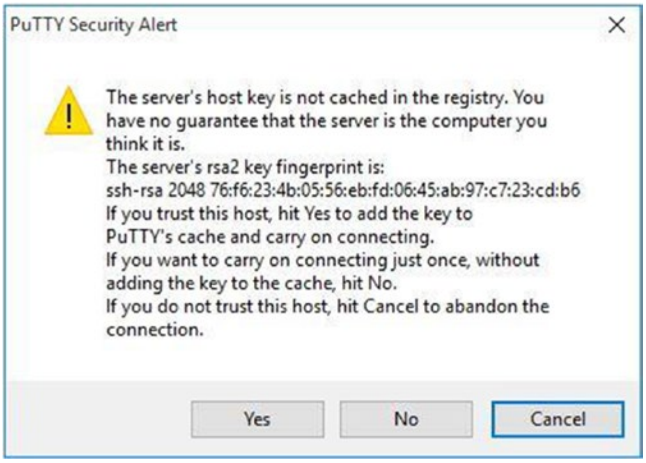
Authentication parameters

- [ ] Allow agent forwarding
- [ ] Allow attempted changes of username in SSH-2

Private key file for authentication: C:\Users\Dell\Downloads\Chapter2Keyf

Figure 2-21. *PuTTy configuration—ppk file*

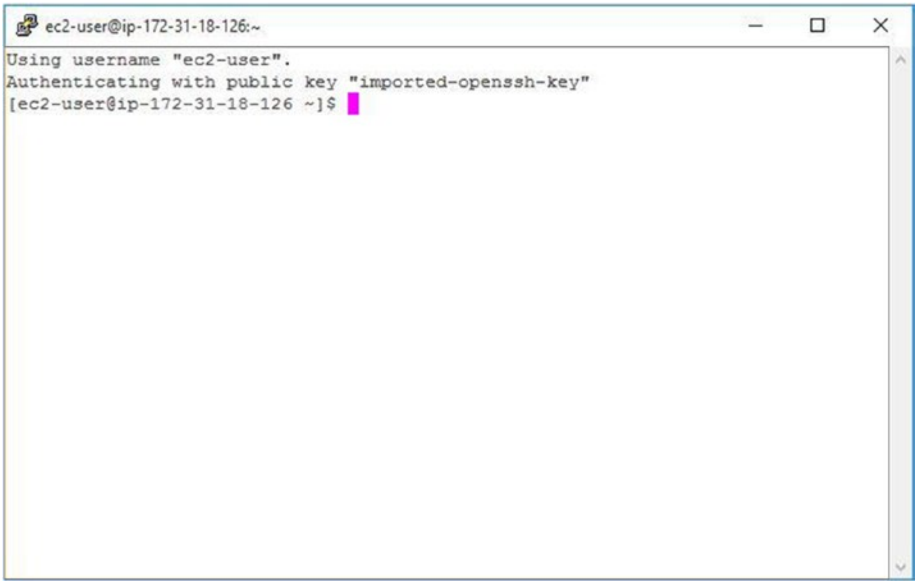
6. Once the configuration is complete, click the Open button. This will authenticate the key pair with your provided hostname. Once authentication is finished, we will get a security alert to cache the host key in the registry, as shown in Figure 2-22.



The server's host key is not cached in the registry. You have no guarantee that the server is the computer you think it is.
The server's rsa2 key fingerprint is:
ssh-rsa 2048 76:f6:23:4b:05:56:eb:fd:06:45:ab:97:c7:23:cd:b6
If you trust this host, hit Yes to add the key to PuTTY's cache and carry on connecting.
If you want to carry on connecting just once, without adding the key to the cache, hit No.
If you do not trust this host, hit Cancel to abandon the connection.

Figure 2-22. *PuTTy security alert*

7. Click Yes to authorize the server's host key to cache in the registry. This will then connect to our EC2 instance. The console is shown in Figure 2-23.



```
Using username "ec2-user".
Authenticating with public key "imported-openssh-key"
[ec2-user@ip-172-31-18-126 ~]$ 
```

Figure 2-23. *EC2 instance terminal*

We have successfully verified by connecting to the EC2 instance terminal.

■ **Note** To connect to Linux, refer to `http://docs.aws.amazon.com/AWSEC2/latest/UserGuide/AccessingInstancesLinux.html`.

Managing EC2 Using AWS CLI

In Chapter 1, I demonstrated how to install AWS CLI. Now I will show how to use the AWS CLI to manage AWS EC2 instance resources. I will also explain how to create, list, and delete an EC2 instance resource. Following are the services needed to create an EC2 instance:

- Security group
- Key pair
- EC2 instance

To execute the AWS CLI commands, we need to open the command prompt.

Security Group

In this section, we will create, attach an inbound rule to, list, and delete security groups.

1. Create a Security Group

To create a security group, we will execute the following command:

```
>aws ec2 create-security-group --group-name EC2CreationViaAWSCLI
--description "EC2 creation via AWS CLI"
```

■ **Note** For more parameters, see `http://docs.aws.amazon.com/cli/latest/reference/ec2/create-security-group.html`.

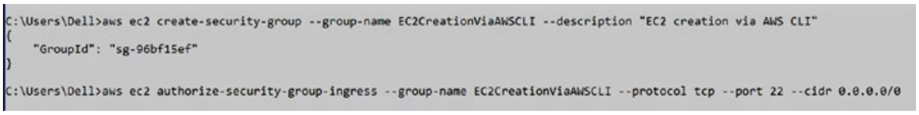
---

2. Attach an Inbound Rule to Security Group

Once the security group is created, we will attach the CIDR and port to this newly created security group. In our case, we will attach SSH port (22) and the IP address as 0.0.0.0/0, which means you can access it from anywhere.

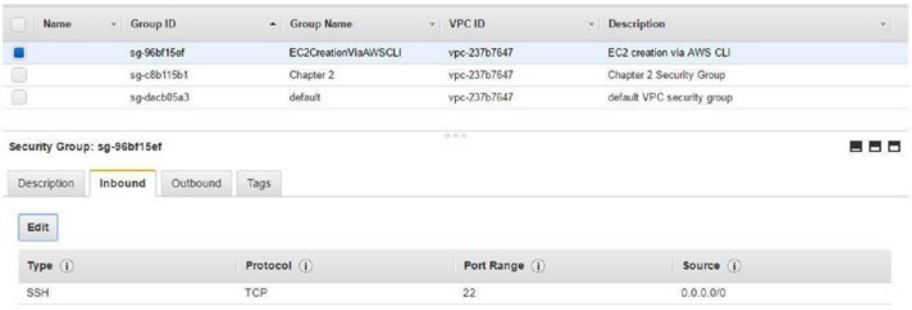
■ **Note** *CIDR* is the acronym for *Classless Inter-Domain Routing*, which is used for assigning IP addresses and IP routing.

```
>aws ec2 authorize-security-group-ingress --group-name EC2CreationViaAWSCLI
--protocol tcp --port 22 --cidr 0.0.0.0/0
```



```
C:\Users\Dell>aws ec2 create-security-group --group-name EC2CreationViaAWSCLI --description "EC2 creation via AWS CLI"
{
    "GroupId": "sg-96bf15ef"
}
C:\Users\Dell>aws ec2 authorize-security-group-ingress --group-name EC2CreationViaAWSCLI --protocol tcp --port 22 --cidr 0.0.0.0/0
```

You can verify the details of the security group on the AWS Management Console, as shown in Figure 2-24.



Name	Group ID	Group Name	VPC ID	Description
	sg-96bf15ef	EC2CreationViaAWSCLI	vpc-237b7647	EC2 creation via AWS CLI
	sg-c8b115b1	Chapter 2	vpc-237b7647	Chapter 2 Security Group
	sg-dacb05a3	default	vpc-237b7647	default VPC security group

Security Group: sg-96bf15ef

Type	Protocol	Port Range	Source
SSH	TCP	22	0.0.0.0/0

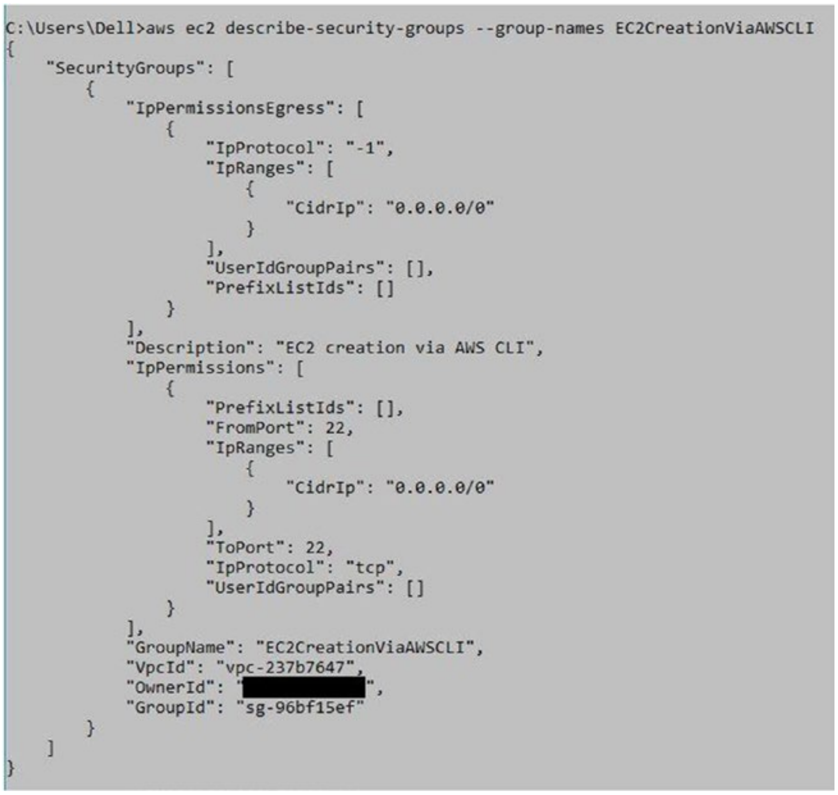
Figure 2-24. *Security group listing on AWS Management Console*

■ **Note** For more parameters, see `http://docs.aws.amazon.com/cli/latest/reference/ec2/authorize-security-group-ingress.html`.

3. List the Security Group

To list the security group that we created, we will execute the following command:

```
>aws ec2 describe-security-groups --group-names EC2CreationViaAWSCLI
```



```
C:\Users\Dell>aws ec2 describe-security-groups --group-names EC2CreationViaAWSCLI
{
    "SecurityGroups": [
        {
            "IpPermissionsEgress": [
                {
                    "IpProtocol": "-1",
                    "IpRanges": [
                        {
                            "CidrIp": "0.0.0.0/0"
                        }
                    ],
                    "UserIdGroupPairs": [],
                    "PrefixListIds": []
                }
            ],
            "Description": "EC2 creation via AWS CLI",
            "IpPermissions": [
                {
                    "PrefixListIds": [],
                    "FromPort": 22,
                    "IpRanges": [
                        {
                            "CidrIp": "0.0.0.0/0"
                        }
                    ],
                    "ToPort": 22,
                    "IpProtocol": "tcp",
                    "UserIdGroupPairs": []
                }
            ],
            "GroupName": "EC2CreationViaAWSCLI",
            "VpcId": "vpc-237b7647",
            "OwnerId": "[redacted]",
            "GroupId": "sg-96bf15ef"
        }
    ]
}
```

To list all the security groups, we will execute the following command:

```
>aws ec2 describe-security-groups
```

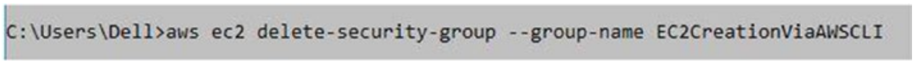
■ **Note** For more parameters, see http://docs.aws.amazon.com/cli/latest/reference/ec2/describe-security-groups.html.

---

4. Delete Security Group

To delete the security group, execute the following command:

```
>aws ec2 delete-security-group --group-name EC2CreationViaAWSCLI
```



```
C:\Users\Dell>aws ec2 delete-security-group --group-name EC2CreationViaAWSCLI
```

You can also delete the security group based on group id by the following command:

```
>aws ec2 delete-security-group --group-id sg-96bf15ef
```

■ **Note** For more parameters, see http://docs.aws.amazon.com/cli/latest/reference/ec2/delete-security-group.html.

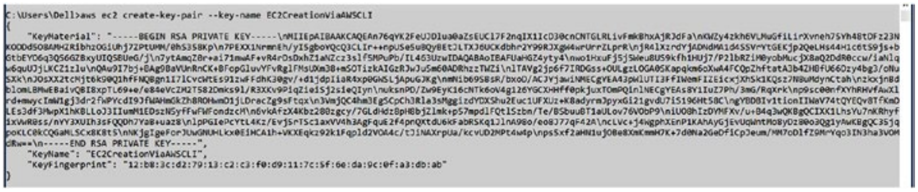
Key Pair

In this section, we will create, list, delete, and import a key pair.

1. Create a Key Pair

To create a key pair, we will execute the following command:

```
>aws ec2 create-key-pair --key-name EC2CreationViaAWSCLI
```



```
C:\Users\Dell>aws ec2 create-key-pair --key-name EC2CreationViaAWSCLI
{
    "KeyMaterial": "-----BEGIN RSA PRIVATE KEY-----\nMIIEpAIBAAKCAQEAn76qVK2FeUJDlua0aZsEUCl7F2nqIX1IcD30cnCNTGLRLivFmkBhxAjRJdFa\nKWZy4zkh6VLMuGfiLirXvneh7SYh48tDFz23N
KOODdSO8AMHZRibhzOGiUhj7ZPtUMM/0hS35BKp\n7PEXX1NrmnEh/yISgboVQcQ3CLIr++npUSeSuBQyBEtJLTXJ6UCKdbhr2Y99RJXgW4wrUrrZLprR\njR4lXzrdYjADNdMA1d4SSVrYtGEKjp2QeLHs44H1c6tS9js+b
GtbEYD6q3Q56GZBxyUIQSBUeG/j\n7ytAmqZ8r+ai71mwAF+vR4rDsDxhZ1aNZcz3slf5MPuPb/IL463UzwIDAQABAoIBAFUaHGZ4yty4\nwo1HxuFj5jSWeu8US9kfh1HUj7/P2lbRZiM0yobMucjX8aQ2DdR0ccw/iaNlq
w6quUJjLKCZ1zlu\nQAu9I7bj+8Ag9BaVUnRnCK+8FopGluvYFvRglFMsUXm3B+mSOTizkAIGzRJwJu5m60ADRhzzTWZi\nlTAVg2jp6f7IRDGss+OULgzLOGA05Kapqkm6oXwA4FCQpZhftatA3b4ZH0fU66Dzy4bg3/oNu
SXk\nJOsXX2tcMjt6kS0Q1hfFNQ8gn1I7lCvcWtEs91zwFFdhK30gv/+d1jdpIiaR4xp0GWSLjApuGJKg\nmNib69S8sR/bxoD/ACJYjawiNMECgYEA43pWlUTI3FfIWemFIZEicxjXhSk1KQsz7N8uMdynCtah\nzkxjn8d
blomLBMwEBaivQBI8xpTL69+e/e84eVcZM2T582Dmks9l/R3XKv9P1qZie1Sj2sieQIyn\nuksnPD/Zw9EyK16cNTk6oV4g126YGCXHHff0pkjuxTOmPQlnlNECgYEAs8Y1IuZ7Ph/3mG/RqXrk\np9sc00nfXYhRHVfAwX1
rd+mwycImW1gj3dr2fWPYcdI9JfWAHmGkZh8ROHwmD1jLDracZg9sFtqx\n3VmjQC4hm3Eg5CpCh3Rla3sMggizdYDXShu2Euc1UFXUz+K8adyrmJpyxGi21gvdU7iS196Ht58C\ngYBD8Iv1tionIIWaV74tQYEQv8TfKmD
LEs3df3MwpX1hKBLLoJ3IIumM1EDszN5yfFwFWFondzcM\n6vkAfzX4Kbz280zgcy/7GLdHdz8pH8bjZlmk+p57mpdlFQtlSzbm/Te/BSbuuBT1aULov76VObP9\niUO8hIzDYMFXv/u+B4q3wQKBgQCIXK1LhsYu7nKRhyf
ixVwR0ss/nYY3XUIh3sFQQDh7YaB+uaz8\nlpPGIePcYtL4Kz/EvjSrTSc1axVV4h3AgFquE2f4pnQKtdU6kFabRSKq1JlnA98o/eo8J77qF42A\ncLVc+j4WgphXEnP1KAhAyGjEvUqWntMoByDz80o3Qg1yAwKBgQC35jq
poKLC0kCQGaMLSCx8K8tS\nNKjgIgeForJUwGNUHLkx0EiHCA1h+VKXEqkz92k1Fqpld2VOA4c/tJiNAXrpUa/kcvUD2MPt4w4p\nps5xf2aHN1ujO8e8XmKmmH7K+7d0Na2GeDfiCpJeum/MM7oDlfZ9MrYqo3IN3ha3VOM
dRw==\n-----END RSA PRIVATE KEY-----",
    "KeyName": "EC2CreationViaAWSCLI",
    "KeyFingerprint": "12:b8:3c:d2:79:13:c2:c3:f0:d9:11:7c:5f:6e:da:9c:0f:a3:db:ab"
}
```

You can see the response having the “KeyMaterial” element, which we need to store at a secure location in a pem file. You can name this pem file `{KeyName}.pem i.e. EC2CreationViaAWSCLI.pem`.

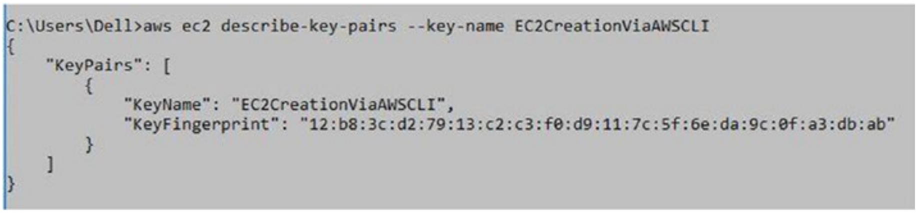
■ **Note** For more parameters, see http://docs.aws.amazon.com/cli/latest/reference/ec2/create-key-pair.html.

---

2. List a Key Pair

To list the key pair that we created, we will execute the following command:

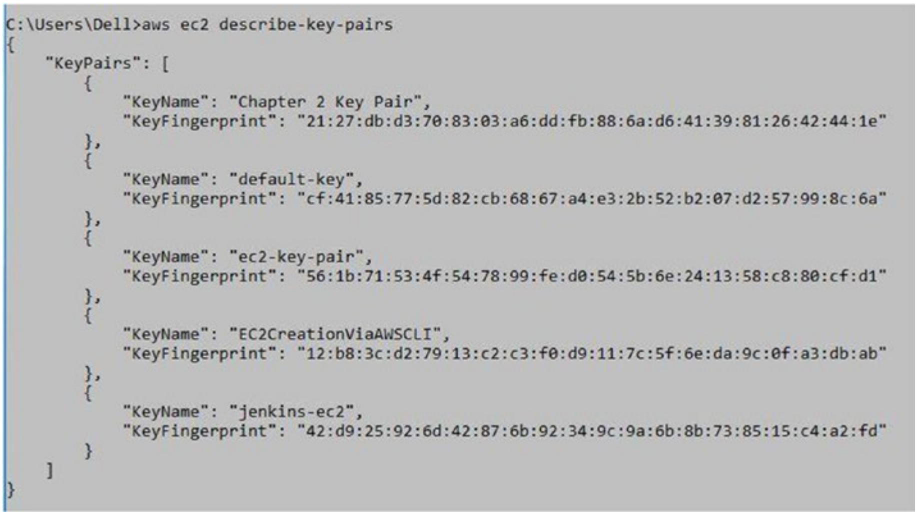
```
>aws ec2 describe-key-pairs --key-name EC2CreationViaAWSCLI
```



```
C:\Users\Dell>aws ec2 describe-key-pairs --key-name EC2CreationViaAWSCLI
{
    "KeyPairs": [
        {
            "KeyName": "EC2CreationViaAWSCLI",
            "KeyFingerprint": "12:b8:3c:d2:79:13:c2:c3:f0:d9:11:7c:5f:6e:da:9c:0f:a3:db:ab"
        }
    ]
}
```

You can also list all the key pairs with following command:

```
>aws ec2 describe-key-pairs
```



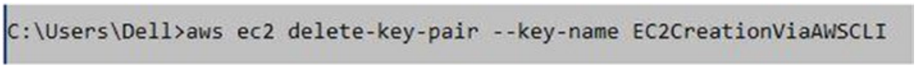
```
C:\Users\Dell>aws ec2 describe-key-pairs
{
    "KeyPairs": [
        {
            "KeyName": "Chapter 2 Key Pair",
            "KeyFingerprint": "21:27:db:d3:70:83:03:a6:dd:fb:88:6a:d6:41:39:81:26:42:44:1e"
        },
        {
            "KeyName": "default-key",
            "KeyFingerprint": "cf:41:85:77:5d:82:cb:68:67:a4:e3:2b:52:b2:07:d2:57:99:8c:6a"
        },
        {
            "KeyName": "ec2-key-pair",
            "KeyFingerprint": "56:1b:71:53:4f:54:78:99:fe:d0:54:5b:6e:24:13:58:c8:80:cf:d1"
        },
        {
            "KeyName": "EC2CreationViaAWSCLI",
            "KeyFingerprint": "12:b8:3c:d2:79:13:c2:c3:f0:d9:11:7c:5f:6e:da:9c:0f:a3:db:ab"
        },
        {
            "KeyName": "jenkins-ec2",
            "KeyFingerprint": "42:d9:25:92:6d:42:87:6b:92:34:9c:9a:6b:8b:73:85:15:c4:a2:fd"
        }
    ]
}
```

■ **Note** For more parameters, see http://docs.aws.amazon.com/cli/latest/reference/ec2/describe-key-pairs.html.

3. Delete a Key Pair

To delete the key pair, we will execute following command:

```
>aws ec2 delete-key-pair --key-name EC2CreationViaAWSCLI
```



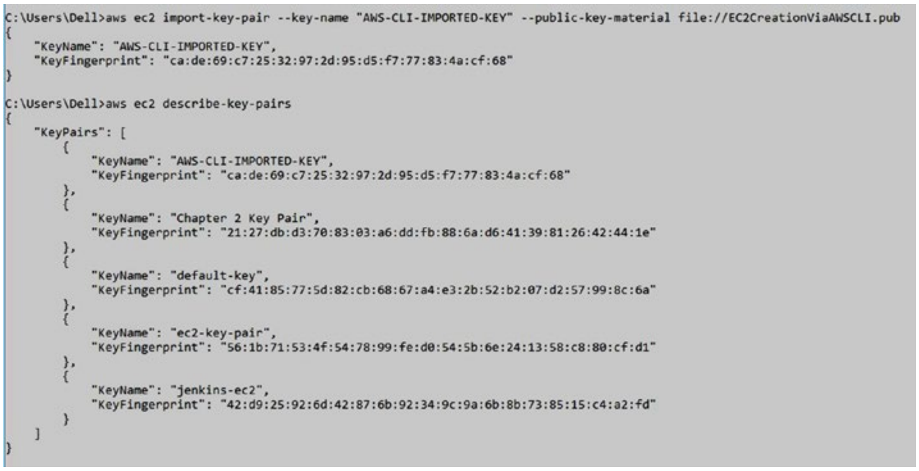
```
C:\Users\Dell>aws ec2 delete-key-pair --key-name EC2CreationViaAWSCLI
```

■ **Note** For more parameters, see `http://docs.aws.amazon.com/cli/latest/reference/ec2/delete-key-pair.html`.

4. Import a Key Pair

There may be cases where you create the SSH key using the RSA encryption technique. This allows you to provide the public key to AWS instead of AWS providing you the private key over the network while creating it. This assumes that you have already created the SSH key and have the public key on your machine. To import the existing public key, we will execute the following command:

```
>aws ec2 import-key-pair --key-name "AWS-CLI-IMPORTED-KEY" --public-key-
material file://EC2CreationViaAWSCLI.pub
```



```
C:\Users\Dell>aws ec2 import-key-pair --key-name "AWS-CLI-IMPORTED-KEY" --public-key-material file://EC2CreationViaAWSCLI.pub
{
    "KeyName": "AWS-CLI-IMPORTED-KEY",
    "KeyFingerprint": "ca:de:69:c7:25:32:97:2d:95:d5:f7:77:83:4a:cf:68"
}

C:\Users\Dell>aws ec2 describe-key-pairs
{
    "KeyPairs": [
        {
            "KeyName": "AWS-CLI-IMPORTED-KEY",
            "KeyFingerprint": "ca:de:69:c7:25:32:97:2d:95:d5:f7:77:83:4a:cf:68"
        },
        {
            "KeyName": "Chapter 2 Key Pair",
            "KeyFingerprint": "21:27:db:d3:70:83:03:a6:dd:fb:88:6a:d6:41:39:81:26:42:44:1e"
        },
        {
            "KeyName": "default-key",
            "KeyFingerprint": "cf:41:85:77:5d:82:cb:68:67:a4:e3:2b:52:b2:07:d2:57:99:8c:6a"
        },
        {
            "KeyName": "ec2-key-pair",
            "KeyFingerprint": "56:1b:71:53:4f:54:78:99:fe:d0:54:5b:6e:24:13:58:c8:80:cf:d1"
        },
        {
            "KeyName": "jenkins-ec2",
            "KeyFingerprint": "42:d9:25:92:6d:42:87:6b:92:34:9c:9a:6b:8b:73:85:15:c4:a2:fd"
        }
    ]
}
```

■ **Note** For more parameters, see `http://docs.aws.amazon.com/cli/latest/reference/ec2/import-key-pair.html`.

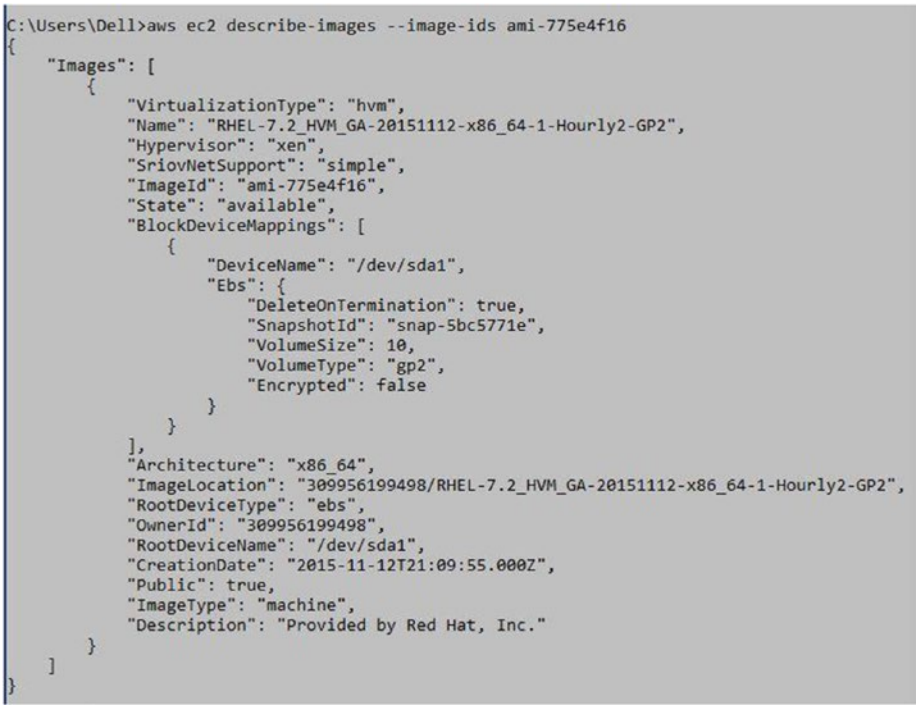
EC2 Instance

Next, I will explain how to describe images, select instance types, launch EC2, list EC2 instances, get instance status, create instance tags, and start-stop-terminate instances.

1. Describe Images

To get the AMI ID, we will describe images. This will return the public images and private images that are available. For our case, we will check if redhat linux server image i.e. ami-775e4f16 is available:

```
>aws ec2 describe-images --image-ids ami-775e4f16
```



```
C:\Users\Dell>aws ec2 describe-images --image-ids ami-775e4f16
{
    "Images": [
        {
            "VirtualizationType": "hvm",
            "Name": "RHEL-7.2_HVM_GA-20151112-x86_64-1-Hourly2-GP2",
            "Hypervisor": "xen",
            "SriovNetSupport": "simple",
            "ImageId": "ami-775e4f16",
            "State": "available",
            "BlockDeviceMappings": [
                {
                    "DeviceName": "/dev/sda1",
                    "Ebs": {
                        "DeleteOnTermination": true,
                        "SnapshotId": "snap-5bc5771e",
                        "VolumeSize": 10,
                        "VolumeType": "gp2",
                        "Encrypted": false
                    }
                }
            ],
            "Architecture": "x86_64",
            "ImageLocation": "309956199498/RHEL-7.2_HVM_GA-20151112-x86_64-1-Hourly2-GP2",
            "RootDeviceType": "ebs",
            "OwnerId": "309956199498",
            "RootDeviceName": "/dev/sda1",
            "CreationDate": "2015-11-12T21:09:55.000Z",
            "Public": true,
            "ImageType": "machine",
            "Description": "Provided by Red Hat, Inc."
        }
    ]
}
```

■ **Note** For more parameters, see http://docs.aws.amazon.com/cli/latest/reference/ec2/describe-images.html.

2. Select an Instance Type

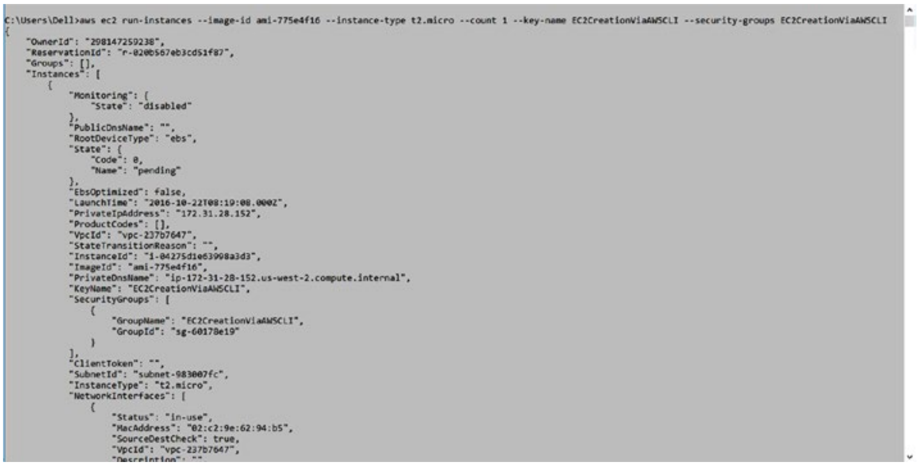
To select an instance type, you need to find out which instance type suits your application requirements. You can find all the instance types at http://aws.amazon.com/ec2/instance-types.

For our example, we will use the t2.micro instance type.

3. Launch EC2

Now we will launch a new EC2 instance that has one instance count, “EC2CreationViaAWSCLI” key pair, and “EC2CreationViaAWSCLI” security group. First, verify that the key pair and security group are created. If not, execute the command for creating a key pair and security group. Let's launch EC2 instance by executing this command:

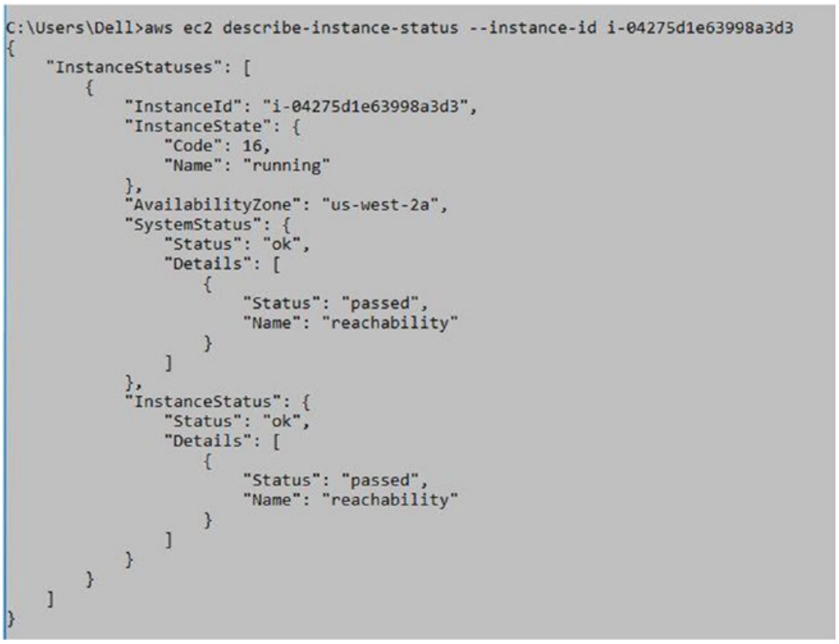
```
>aws ec2 run-instances --image-id ami-775e4f16 --instance-type
t2.micro --count 1 --key-name EC2CreationViaAWSCLI --security-groups
EC2CreationViaAWSCLI
```



```
C:\Users\Dell>aws ec2 run-instances --image-id ami-775e4f16 --instance-type t2.micro --count 1 --key-name EC2CreationViaAWSCLI --security-groups EC2CreationViaAWSCLI
{
    "OwnerId": "298147259238",
    "ReservationId": "r-020b567eb3cd51f87",
    "Groups": [],
    "Instances": [
        {
            "Monitoring": {
                "State": "disabled"
            },
            "PublicDnsName": "",
            "RootDeviceType": "ebs",
            "State": {
                "Code": 0,
                "Name": "pending"
            },
            "EbsOptimized": false,
            "LaunchTime": "2016-10-22T08:19:08.000Z",
            "PrivateIpAddress": "172.31.28.152",
            "ProductCodes": [],
            "VpcId": "vpc-237b7647",
            "StateTransitionReason": "",
            "InstanceId": "i-04275d1e63998a3d3",
            "ImageId": "ami-775e4f16",
            "PrivateDnsName": "ip-172-31-28-152.us-west-2.compute.internal",
            "KeyName": "EC2CreationViaAWSCLI",
            "SecurityGroups": [
                {
                    "GroupName": "EC2CreationViaAWSCLI",
                    "GroupId": "sg-60178e19"
                }
            ],
            "ClientToken": "",
            "SubnetId": "subnet-983007fc",
            "InstanceType": "t2.micro",
            "NetworkInterfaces": [
                {
                    "Status": "in-use",
                    "MacAddress": "02:c2:9e:62:94:b5",
                    "SourceDestCheck": true,
                    "VpcId": "vpc-237b7647",
                    "Description": "",
```

Executing this run-instance command will initiate the request to launch a new instance with specified configurations. To check if the instance is ready to connect, we will use describer-instance-status along with the instanceId that is generated via run-instances:

```
>aws ec2 describe-instance-status --instance-id i-04275d1e63998a3d3
```



```
C:\Users\Dell>aws ec2 describe-instance-status --instance-id i-04275d1e63998a3d3
{
    "InstanceStatuses": [
        {
            "InstanceId": "i-04275d1e63998a3d3",
            "InstanceState": {
                "Code": 16,
                "Name": "running"
            },
            "AvailabilityZone": "us-west-2a",
            "SystemStatus": {
                "Status": "ok",
                "Details": [
                    {
                        "Status": "passed",
                        "Name": "reachability"
                    }
                ]
            },
            "InstanceStatus": {
                "Status": "ok",
                "Details": [
                    {
                        "Status": "passed",
                        "Name": "reachability"
                    }
                ]
            }
        }
    ]
}
```

You can see that InstanceStatus shows “running” value. Possible values for this include the following:

- pending
- running
- shutting down
- terminated
- stopping
- stopped

To list all instances status, use the following command:

```
>aws ec2 describe-instance-status
```

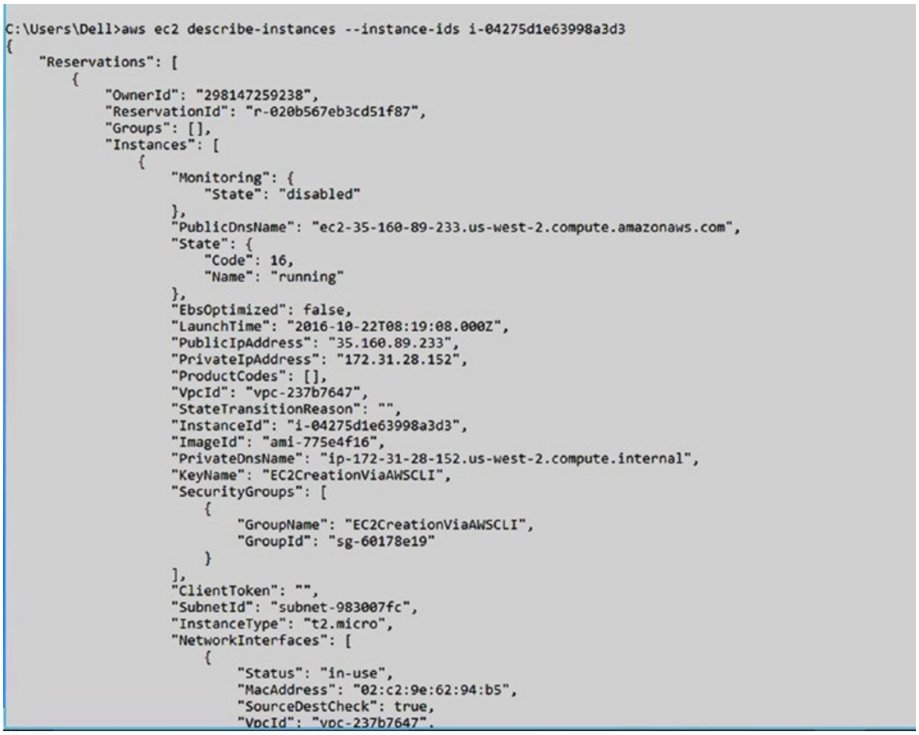
Once the instance state is running, you can verify that you are able to connect to EC2 instance using the SSH client. Refer to the “Verify by Connecting to EC2 Instance” section.

■ **Note** For more parameters, see http://docs.aws.amazon.com/cli/latest/reference/ec2/describe-instance-status.html.

4. List EC2 Instances

To get the EC2 instance details based on the instanceId, use describe-instances:

```
>aws ec2 describe-instances --instance-ids i-04275d1e63998a3d3
```



```
C:\Users\Dell>aws ec2 describe-instances --instance-ids i-04275d1e63998a3d3
{
    "Reservations": [
        {
            "OwnerId": "298147259238",
            "ReservationId": "r-020b567eb3cd51f87",
            "Groups": [],
            "Instances": [
                {
                    "Monitoring": {
                        "State": "disabled"
                    },
                    "PublicDnsName": "ec2-35-160-89-233.us-west-2.compute.amazonaws.com",
                    "State": {
                        "Code": 16,
                        "Name": "running"
                    },
                    "EbsOptimized": false,
                    "LaunchTime": "2016-10-22T08:19:08.000Z",
                    "PublicIpAddress": "35.160.89.233",
                    "PrivateIpAddress": "172.31.28.152",
                    "ProductCodes": [],
                    "VpcId": "vpc-237b7647",
                    "StateTransitionReason": "",
                    "InstanceId": "i-04275d1e63998a3d3",
                    "ImageId": "ami-775e4f16",
                    "PrivateDnsName": "ip-172-31-28-152.us-west-2.compute.internal",
                    "KeyName": "EC2CreationViaAWSCLI",
                    "SecurityGroups": [
                        {
                            "GroupName": "EC2CreationViaAWSCLI",
                            "GroupId": "sg-60178e19"
                        }
                    ],
                    "ClientToken": "",
                    "SubnetId": "subnet-983007fc",
                    "InstanceType": "t2.micro",
                    "NetworkInterfaces": [
                        {
                            "Status": "in-use",
                            "MacAddress": "02:c2:9e:62:94:b5",
                            "SourceDestCheck": true,
                            "VpcId": "vpc-237b7647",
```

To get all EC2 instances details, use describe-instances without providing any filters:

```
>aws ec2 describe-instances
```

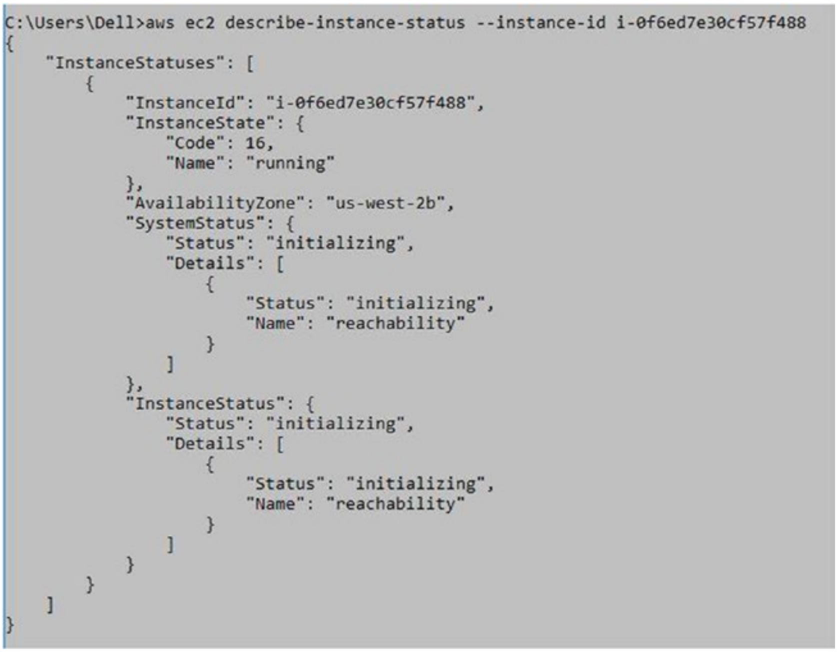
■ **Note** For more parameters, see http://docs.aws.amazon.com/cli/latest/reference/ec2/describe-instances.html.

---

5. Get Instance Status

To get the instance status that we created, execute the following command:

```
>aws ec2 describe-instance-status --instance-id i-0f6ed7e30cf57f488
```



```
C:\Users\Dell>aws ec2 describe-instance-status --instance-id i-0f6ed7e30cf57f488
{
    "InstanceStatuses": [
        {
            "InstanceId": "i-0f6ed7e30cf57f488",
            "InstanceState": {
                "Code": 16,
                "Name": "running"
            },
            "AvailabilityZone": "us-west-2b",
            "SystemStatus": {
                "Status": "initializing",
                "Details": [
                    {
                        "Status": "initializing",
                        "Name": "reachability"
                    }
                ]
            },
            "InstanceStatus": {
                "Status": "initializing",
                "Details": [
                    {
                        "Status": "initializing",
                        "Name": "reachability"
                    }
                ]
            }
        }
    ]
}
```

You can see that the InstanceStatus tag has the value “initializing,” which denotes that the instance is created but it is initializing. Once the initialization process is complete, the instance status will be reflected as “ok.” Now, the instance has been initialized successfully.

To get the instance status of all the EC2 instances available under the user account, use the following command:

```
>aws ec2 describe-instance-status
```

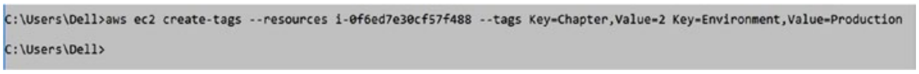
■ **Note** For more parameters, see `http://docs.aws.amazon.com/cli/latest/reference/ec2/describe-instance-status.html`.

---

6. Assign Instance Tags

To assign tags to EC2 instances, execute the following command:

```
>aws ec2 create-tags --resources i-0f6ed7e30cf57f488 --tags
Key=Chapter,Value=2 Key=Environment,Value=Production
```

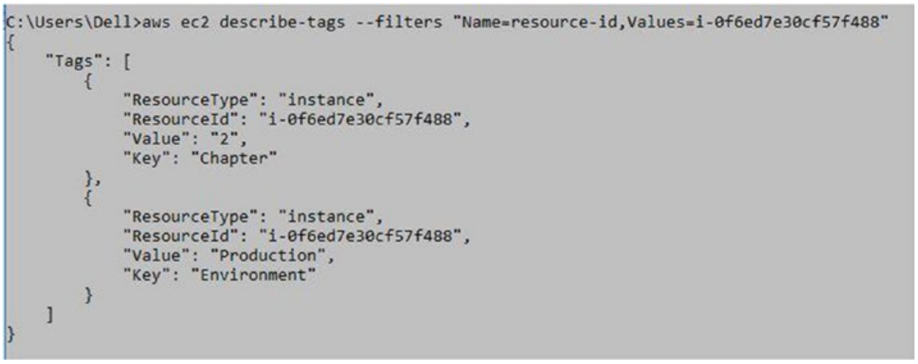


```
C:\Users\Dell>aws ec2 create-tags --resources i-0f6ed7e30cf57f488 --tags Key=Chapter,Value=2 Key=Environment,Value=Production

C:\Users\Dell>
```

■ **Note** For more parameters, see `http://docs.aws.amazon.com/cli/latest/reference/ec2/create-tags.html`.

To describe the tags that are assigned to an EC2 instance, execute the following command:

```
>aws ec2 describe-tags --filters "Name=resource-id,Values=i-
0f6ed7e30cf57f488"
```

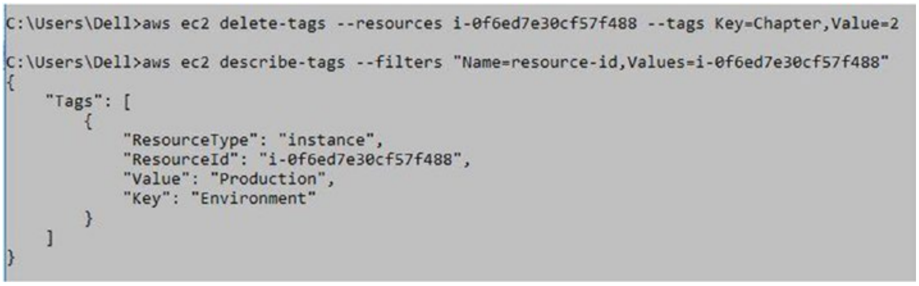


```
C:\Users\Dell>aws ec2 describe-tags --filters "Name=resource-id,Values=i-0f6ed7e30cf57f488"
{
    "Tags": [
        {
            "ResourceType": "instance",
            "ResourceId": "i-0f6ed7e30cf57f488",
            "Value": "2",
            "Key": "Chapter"
        },
        {
            "ResourceType": "instance",
            "ResourceId": "i-0f6ed7e30cf57f488",
            "Value": "Production",
            "Key": "Environment"
        }
    ]
}
```

■ **Note** For more parameters, see `http://docs.aws.amazon.com/cli/latest/reference/ec2/describe-tags.html`.

To delete the tags for an EC2 instance, execute the following command:

```
>aws ec2 delete-tags --resources i-0f6ed7e30cf57f488 --tags
Key=Chapter,Value=2
```



```
C:\Users\Dell>aws ec2 delete-tags --resources i-0f6ed7e30cf57f488 --tags Key=Chapter,Value=2

C:\Users\Dell>aws ec2 describe-tags --filters "Name=resource-id,Values=i-0f6ed7e30cf57f488"
{
    "Tags": [
        {
            "ResourceType": "instance",
            "ResourceId": "i-0f6ed7e30cf57f488",
            "Value": "Production",
            "Key": "Environment"
        }
    ]
}
```

Here, in delete-tags, we have provided both the key and value. However, it's optional to provide value for the `Value` element. If we provide the value, it becomes mandatory that both the key and value should match the actual tags and only then can it delete the tags. The following command can be used when to delete the tag based only on the key:

```
>aws ec2 delete-tags --resources i-0f6ed7e30cf57f488 --tags
Key=Chapter,Value=
```

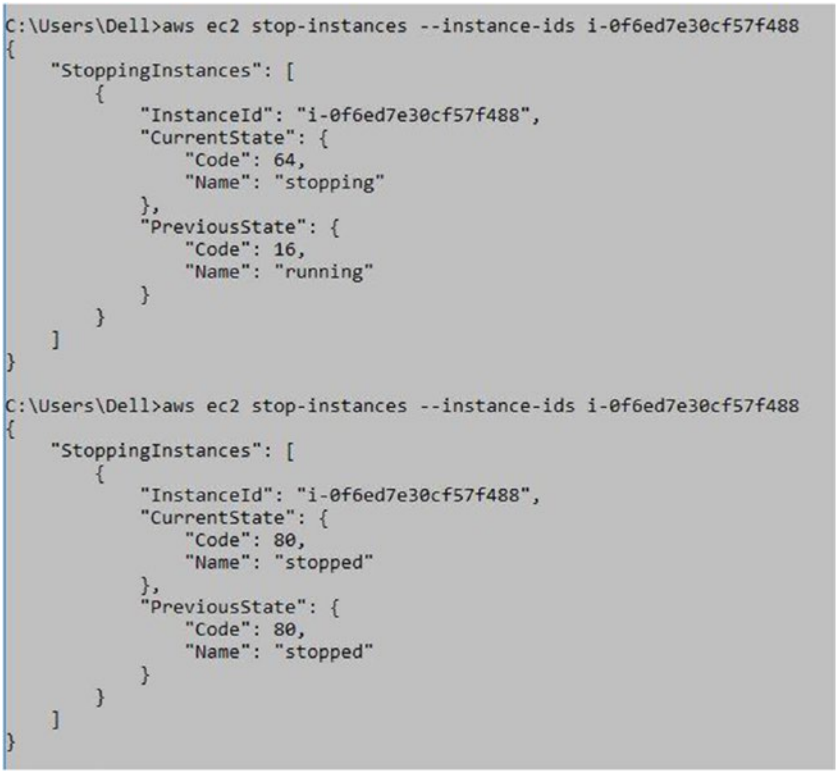
■ **Note** For more parameters, see http://docs.aws.amazon.com/cli/latest/reference/ec2/delete-tags.html.

---

7. Start-Stop-Terminate Instance

You may require your instance to start-stop manually. First of all, stop your instance using the following command:

```
>aws ec2 stop-instances --instance-ids i-0f6ed7e30cf57f488
```



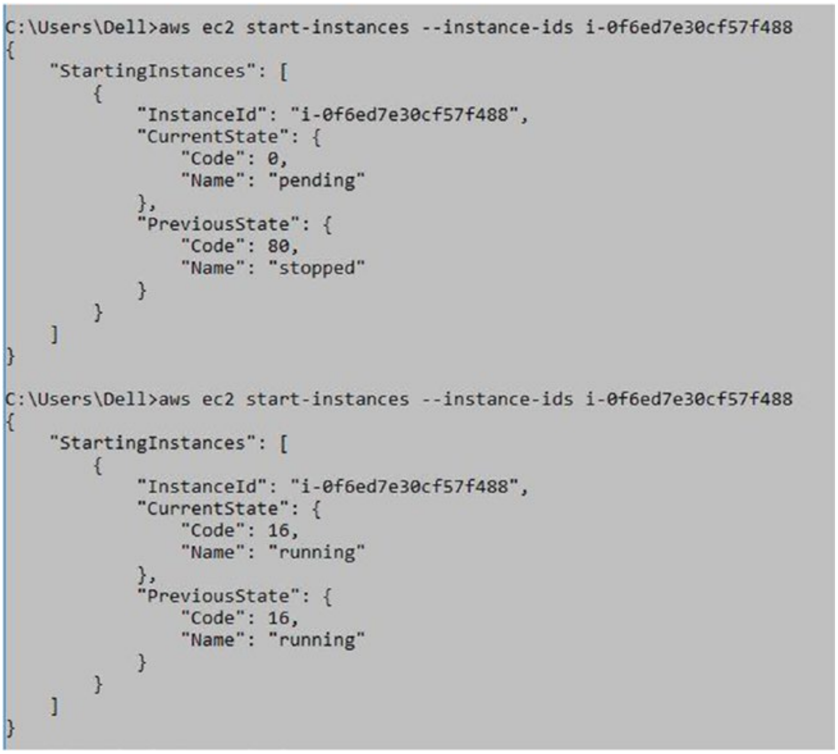
```
C:\Users\Dell>aws ec2 stop-instances --instance-ids i-0f6ed7e30cf57f488
{
    "StoppingInstances": [
        {
            "InstanceId": "i-0f6ed7e30cf57f488",
            "CurrentState": {
                "Code": 64,
                "Name": "stopping"
            },
            "PreviousState": {
                "Code": 16,
                "Name": "running"
            }
        }
    ]
}

C:\Users\Dell>aws ec2 stop-instances --instance-ids i-0f6ed7e30cf57f488
{
    "StoppingInstances": [
        {
            "InstanceId": "i-0f6ed7e30cf57f488",
            "CurrentState": {
                "Code": 80,
                "Name": "stopped"
            },
            "PreviousState": {
                "Code": 80,
                "Name": "stopped"
            }
        }
    ]
}
```

You can see that CurrentState is stopped now. The time it takes to stop the instances may vary depending on the processes that are running on the EC2 instances.

■ **Note** For more parameters, see `http://docs.aws.amazon.com/cli/latest/reference/ec2/stop-instances.html`.

To start the instance, execute the following command:

```
>aws ec2 start-instances --instance-ids i-0f6ed7e30cf57f488
```



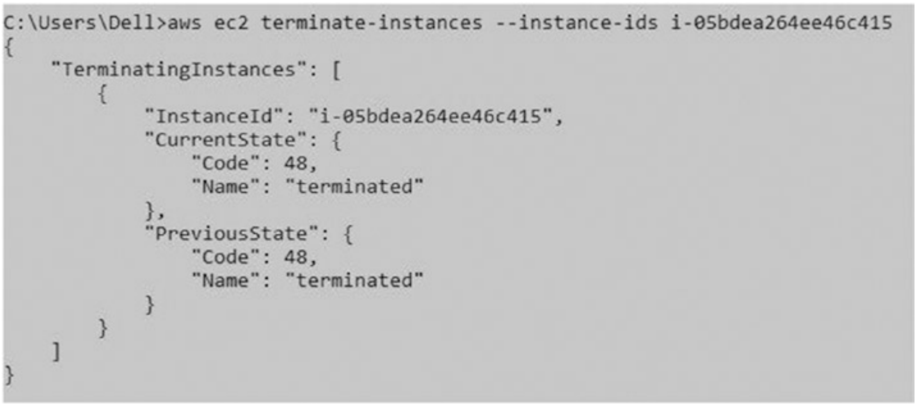
```
C:\Users\Dell>aws ec2 start-instances --instance-ids i-0f6ed7e30cf57f488
{
    "StartingInstances": [
        {
            "InstanceId": "i-0f6ed7e30cf57f488",
            "CurrentState": {
                "Code": 0,
                "Name": "pending"
            },
            "PreviousState": {
                "Code": 80,
                "Name": "stopped"
            }
        }
    ]
}

C:\Users\Dell>aws ec2 start-instances --instance-ids i-0f6ed7e30cf57f488
{
    "StartingInstances": [
        {
            "InstanceId": "i-0f6ed7e30cf57f488",
            "CurrentState": {
                "Code": 16,
                "Name": "running"
            },
            "PreviousState": {
                "Code": 16,
                "Name": "running"
            }
        }
    ]
}
```

In this case, the CurrentState should be running.

■ **Note** For more parameters, see `http://docs.aws.amazon.com/cli/latest/reference/ec2/start-instances.html`.

To terminate the instance, execute the following command:

```
>aws ec2 terminate-instances --instance-ids i-05bdea264ee46c415
```



```
C:\Users\Dell>aws ec2 terminate-instances --instance-ids i-05bdea264ee46c415
{
    "TerminatingInstances": [
        {
            "InstanceId": "i-05bdea264ee46c415",
            "CurrentState": {
                "Code": 48,
                "Name": "terminated"
            },
            "PreviousState": {
                "Code": 48,
                "Name": "terminated"
            }
        }
    ]
}
```

You can provide multiple Instance IDs that you need to terminate. In this case, the CurrentState should be terminated.

■ **Note** For more parameters, see `http://docs.aws.amazon.com/cli/latest/reference/ec2/terminate-instances.html`.

Managing EC2 Using AWS SDK (Java)

AWS SDK helps to manage the AWS resources using different platform APIs. For our case, I will discuss Java APIs to manage AWS resources. I will show how to create, list, and delete an EC2 instance resource:

- Create AWSCredentials object
- Security group
- Key pair
- EC2 instance

Create AWSCredentials Object

To connect with AWS for Java using SDK, you need to provide the AWS credentials. There are various ways to provide AWS credentials: Default Credential Provider, Specify Credential Provider or Provider Chain, Provide Access Key, and Secret Key.

1. Default Credential Provider

This is the default provider when we don't provide any parameters while creating an AWS service client. `DefaultAWSCredentialsProviderChain` is the class that will be used to create the AWS credentials. This class will find the credentials in the following order:

- **Environment Variables:** This technique uses the `EnvironmentVariableCredentialsProvider` class that fetches values for `AWS_ACCESS_KEY_ID and AWS_SECRET_ACCESS_KEY`.
- **System Properties:** This technique is used to find the values for `aws.accessKeyId` and `aws.secretKey` in Java system properties.
- **Credentials Property File:** A default credentials property file can be loaded to get these credentials. This property file resides under `C:\Users\{USER}\.aws\credentials` or `~/.aws/credentials`. This path differs based on the operating system.
- **Instance Profile Credentials:** Instance profile credentials are attached with the EC2. When your application is deployed on EC2 and wants to interact with the AWS resources, you can assign the instance role to our EC2. This way you eradicate the need to manage the AWS credentials explicitly. While creating the service client, you will use the `InstanceProfileCredentialsProvider` class.

For our case, we will use `ProfileCredentialsProvider`, which comes under the "Configuration Property File" topic. In the credentials file, there may be different profiles that have `aws_access_key_id` and `aws_secret_access_key`. We have added the sunilgulabani profile under the credentials file. So, to create AWSCredentials object, you will use the following:

```
AWSCredentials credentials =
    new ProfileCredentialsProvider("sunilgulabani").getCredentials();
```

2. Specify Credential Provider or Provider Chain

There are different providers you can use to create the AWSCredentials object. You can use any of the provider classes that are mentioned under the "All Known Implementing Class" at `http://docs.aws.amazon.com/AWSJavaSDK/latest/javadoc/com/amazonaws/auth/AWSCredentialsProvider.html`.

You can even create your own class by doing the following:

- Implementing `AWSCredentialsProvider` interface
- Sub-classing the `AWSCredentialsProviderChain` class

3. Provide Access Key and Secret Key Explicitly

There may be cases when we need to explicitly pass the access key ID and secret access key to create an `AWSCredentials` object. To create an `AWSCredentials` object, we will use the following:

```
AWSCredentials credentials =
    new BasicAWSCredentials("access_key_id", "secret_access_key");
```

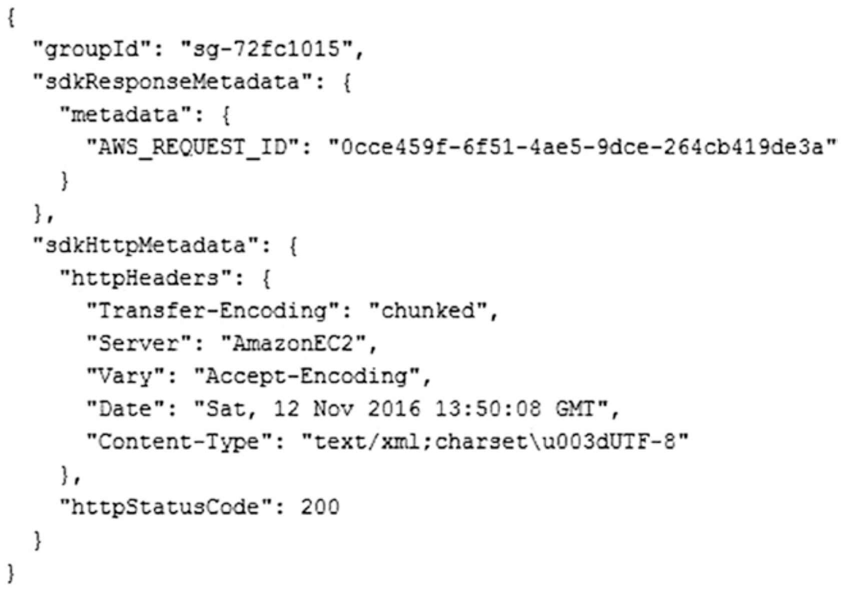
Security Groups

This section covers the following topics: creating a security group, attaching an inbound rule to a security group, listing a security group, and deleting a security group.

1. Create a Security Group

To create a security group, use the `createSecurityGroup` method under the `AmazonEC2Client` class:

```
private final static String SECURITY_GROUP_NAME =
    "EC2CreationViaAWSJavaSDK";
private final static String SECURITY_GROUP_DESCRIPTION =
    "EC2 creation via AWS java sdk";

createSecurityGroup(SECURITY_GROUP_NAME, SECURITY_GROUP_DESCRIPTION);

public String createSecurityGroup(String groupName, String groupDescription) {
    CreateSecurityGroupRequest securityGroupRequest =
        new CreateSecurityGroupRequest();

    securityGroupRequest.withGroupName(groupName);

    securityGroupRequest.withDescription(groupDescription);

    CreateSecurityGroupResult response =
        amazonEC2Client.createSecurityGroup(securityGroupRequest);

    return response.getGroupId();
}
```



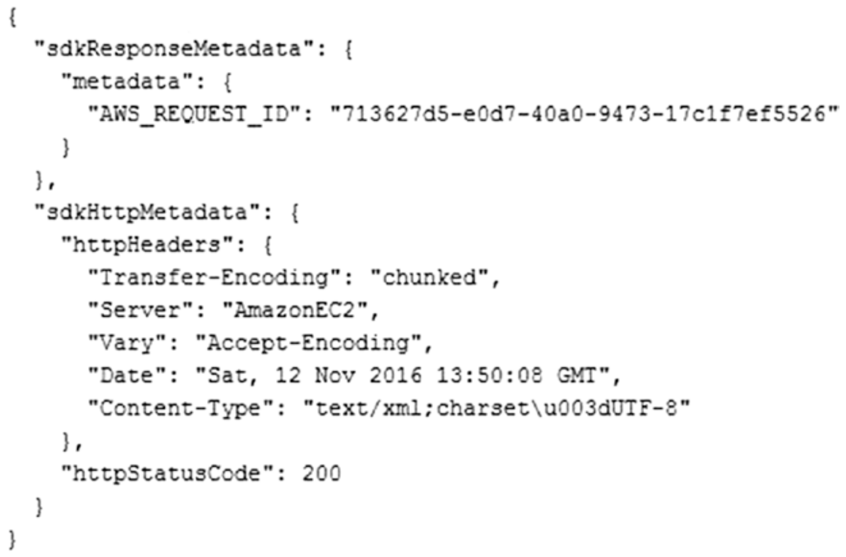
```
{
  "groupId": "sg-72fc1015",
  "sdkResponseMetadata": {
    "metadata": {
      "AWS_REQUEST_ID": "0cce459f-6f51-4ae5-9dce-264cb419de3a"
    }
  },
  "sdkHttpMetadata": {
    "httpHeaders": {
      "Transfer-Encoding": "chunked",
      "Server": "AmazonEC2",
      "Vary": "Accept-Encoding",
      "Date": "Sat, 12 Nov 2016 13:50:08 GMT",
      "Content-Type": "text/xml;charset\u003dUTF-8"
    },
    "httpStatusCode": 200
  }
}
```

2. Attach an Inbound Rule to Security Group

To assign an inbound rule, use the `authorizeSecurityGroupIngress` method under the `AmazonEC2Client` class:

assignSSHConnectionAccessToSecurityGroup(SECURITY_GROUP_NAME);

```
public void assignSSHConnectionAccessToSecurityGroup(String groupName) {
    AuthorizeSecurityGroupIngressRequest request =
        new AuthorizeSecurityGroupIngressRequest();

    request.withGroupName(groupName);

    IpPermission ipPermission = createIpPermission();

    request.withIpPermissions(ipPermission);

    AuthorizeSecurityGroupIngressResult response =
        amazonEC2Client.authorizeSecurityGroupIngress(request);
}

private IpPermission createIpPermission() {
    IpPermission ipPermission = new IpPermission();

    ipPermission.withIpProtocol("tcp");
    ipPermission.withFromPort(22);

    ipPermission.withToPort(22);

    ipPermission.withIpRanges("0.0.0.0/0");

    return ipPermission;
}
```



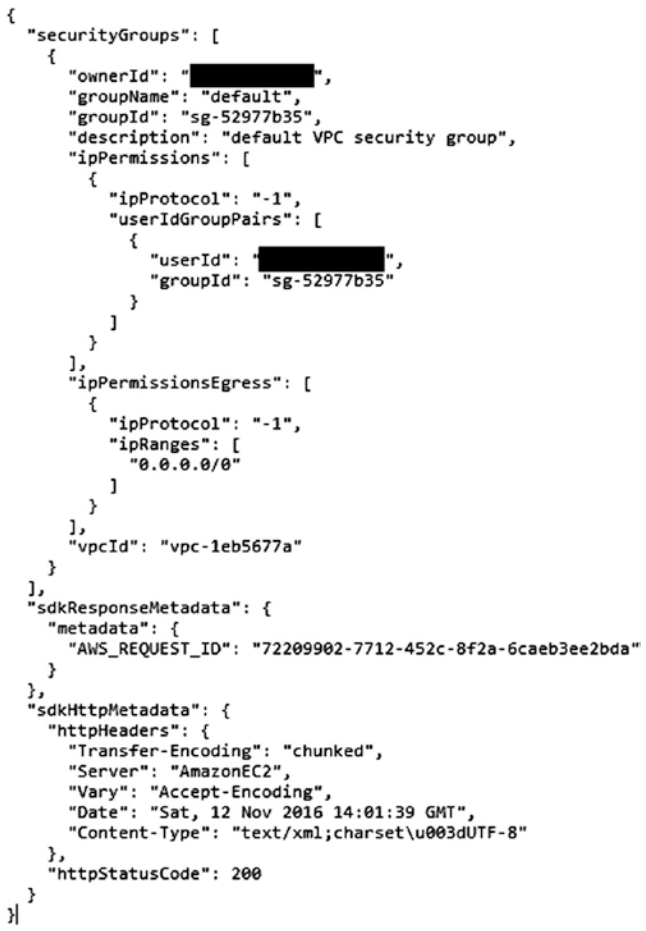
```
{
  "sdkResponseMetadata": {
    "metadata": {
      "AWS_REQUEST_ID": "713627d5-e0d7-40a0-9473-17c1f7ef5526"
    }
  },
  "sdkHttpMetadata": {
    "httpHeaders": {
      "Transfer-Encoding": "chunked",
      "Server": "AmazonEC2",
      "Vary": "Accept-Encoding",
      "Date": "Sat, 12 Nov 2016 13:50:08 GMT",
      "Content-Type": "text/xml;charset\u003dUTF-8"
    },
    "httpStatusCode": 200
  }
}
```

3. List a Security Group

To list a security group, use the `describeSecurityGroups` method under the `AmazonEC2Client` class:

`describeSecurityGroups(securityGroupId)``;`

```
public void describeSecurityGroups(String securityGroupId) {
    DescribeSecurityGroupsRequest request =
        new DescribeSecurityGroupsRequest();

    request.setGroupIds(Arrays.asList(securityGroupId));

    DescribeSecurityGroupsResult response =
        amazonEC2Client.describeSecurityGroups();
}
```

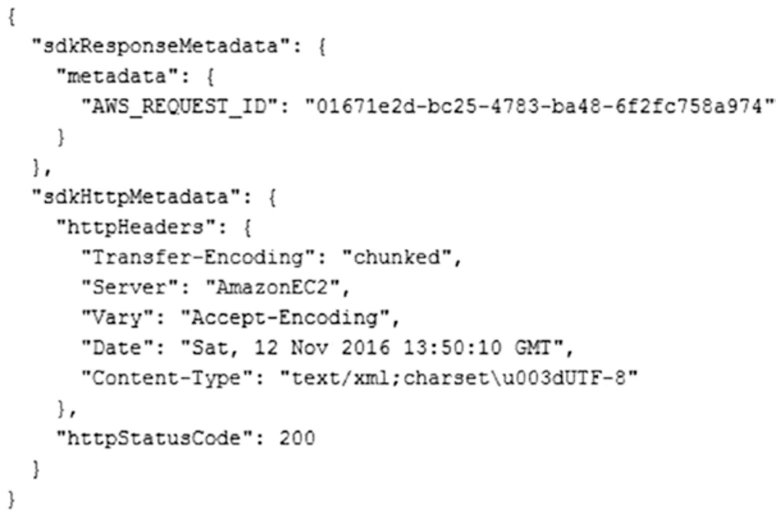


```
{
  "securityGroups": [
    {
      "ownerId": "[redacted]",
      "groupName": "default",
      "groupId": "sg-52977b35",
      "description": "default VPC security group",
      "ipPermissions": [
        {
          "ipProtocol": "-1",
          "userIdGroupPairs": [
            {
              "userId": "[redacted]",
              "groupId": "sg-52977b35"
            }
          ]
        }
      ],
      "ipPermissionsEgress": [
        {
          "ipProtocol": "-1",
          "ipRanges": [
            "0.0.0.0/0"
          ]
        }
      ],
      "vpcId": "vpc-1eb5677a"
    }
  ],
  "sdkResponseMetadata": {
    "metadata": {
      "AWS_REQUEST_ID": "72209902-7712-452c-8f2a-6caeb3ee2bda"
    }
  },
  "sdkHttpMetadata": {
    "httpHeaders": {
      "Transfer-Encoding": "chunked",
      "Server": "AmazonEC2",
      "Vary": "Accept-Encoding",
      "Date": "Sat, 12 Nov 2016 14:01:39 GMT",
      "Content-Type": "text/xml;charset\u003dUTF-8"
    },
    "httpStatusCode": 200
  }
}
```

4. Delete a Security Group

To delete a security group, use the `deleteSecurityGroup` method under the `AmazonEC2Client` class:

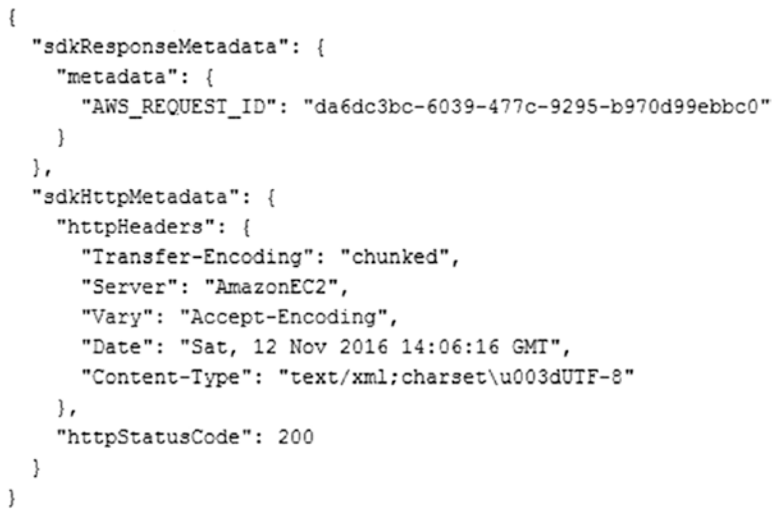
```
deleteSecurityGroupBasedOnGroupName(SECURITY_GROUP_NAME);

public void deleteSecurityGroupBasedOnGroupName(String groupName) {

    DeleteSecurityGroupRequest request = new DeleteSecurityGroupRequest();

    request.setGroupName(groupName);

    DeleteSecurityGroupResult response =
        amazonEC2Client.deleteSecurityGroup(request);
}
```



```
{
  "sdkResponseMetadata": {
    "metadata": {
      "AWS_REQUEST_ID": "01671e2d-bc25-4783-ba48-6f2fc758a974"
    }
  },
  "sdkHttpMetadata": {
    "httpHeaders": {
      "Transfer-Encoding": "chunked",
      "Server": "AmazonEC2",
      "Vary": "Accept-Encoding",
      "Date": "Sat, 12 Nov 2016 13:50:10 GMT",
      "Content-Type": "text/xml;charset\u003dUTF-8"
    },
    "httpStatusCode": 200
  }
}
```

You can delete a security group based on groupId:

```
deleteSecurityGroupBasedOnGroupId(securityGroupId);

public void deleteSecurityGroupBasedOnGroupId(String groupId) {
    DeleteSecurityGroupRequest request = new DeleteSecurityGroupRequest();

    request.setGroupId(groupId);

    DeleteSecurityGroupResult response =
        amazonEC2Client.deleteSecurityGroup(request);
}
```



```
{
  "sdkResponseMetadata": {
    "metadata": {
      "AWS_REQUEST_ID": "da6dc3bc-6039-477c-9295-b970d99ebbc0"
    }
  },
  "sdkHttpMetadata": {
    "httpHeaders": {
      "Transfer-Encoding": "chunked",
      "Server": "AmazonEC2",
      "Vary": "Accept-Encoding",
      "Date": "Sat, 12 Nov 2016 14:06:16 GMT",
      "Content-Type": "text/xml;charset\u003dUTF-8"
    },
    "httpStatusCode": 200
  }
}
```

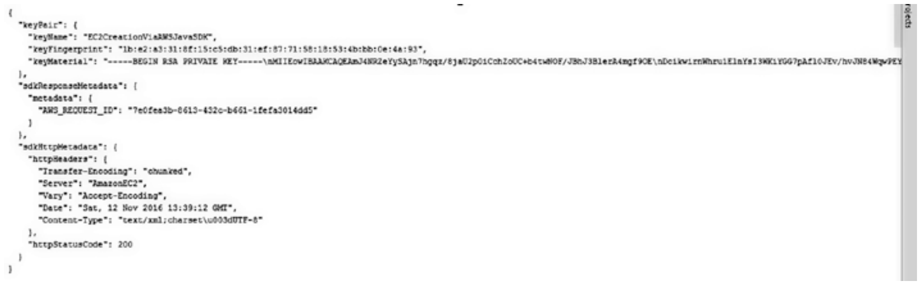
Key Pair

In this section, I will discuss how to create a key pair, list a key pair, delete a key pair, and import a key pair.

1. Create a Key Pair

To create a key pair, use `createKeyPair` under the `AmazonEC2Client` class:

```
private final static String KEY_PAIR_NAME = "EC2CreationViaAWSJavaSDK";

createKeyPair(KEY_PAIR_NAME);

public void createKeyPair(String keyName) {
    CreateKeyPairRequest request = new CreateKeyPairRequest();

    request.withKeyName(keyName);

    CreateKeyPairResult response = amazonEC2Client.createKeyPair(request);

    KeyPair keyPair = response.getKeyPair();

    String privateKey = keyPair.getKeyMaterial();

    fileOperations.saveFile(keyName + "_keypair.pem", privateKey);
}
```

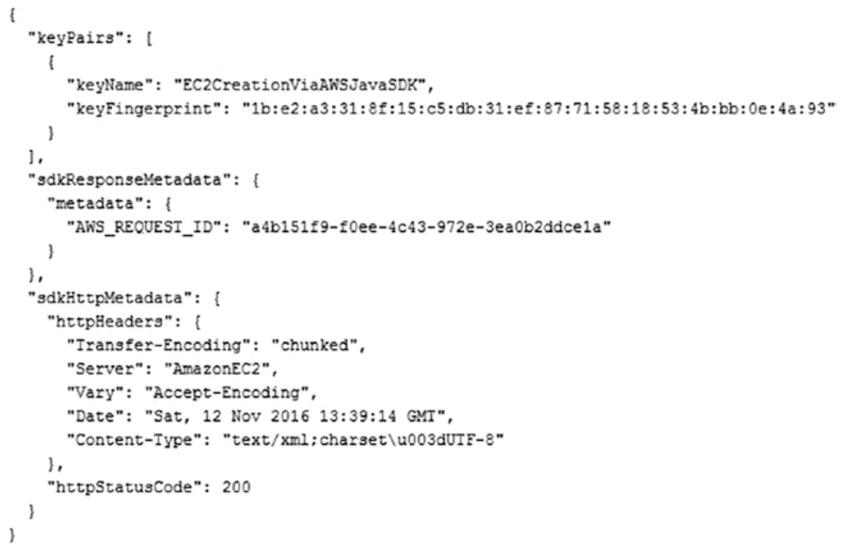


```
{
  "keyPair": {
    "keyName": "EC2CreationViaAWSJavaSDK",
    "keyFingerprint": "1b:e2:a3:31:8f:15:c5:db:31:ef:87:71:58:18:53:4b:bb:0e:4a:93",
    "keyMaterial": "-----BEGIN RSA PRIVATE KEY-----\nMIIEowIBAAKCAQEAmJ4NR2eYySAjn7hgqz/8jaU2pO1CchZoUC+b4twNOF/JBhJ3BlerA4mgf9OE\nDcikwirnWhruiElnYsI3WKiYGG7pAfl0JEv/hvJN84WqwPEY
  },
  "sdkResponseMetadata": {
    "metadata": {
      "AWS_REQUEST_ID": "7e0fea3b-8613-432c-b661-1fefa3014dd5"
    }
  },
  "sdkHttpMetadata": {
    "httpHeaders": {
      "Transfer-Encoding": "chunked",
      "Server": "AmazonEC2",
      "Vary": "Accept-Encoding",
      "Date": "Sat, 12 Nov 2016 13:39:12 GMT",
      "Content-Type": "text/xml;charset\u003dUTF-8"
    },
    "httpStatusCode": 200
  }
}
```

2. List a Key Pair

To list a key pair, use the describeKeyPairs method under the AmazonEC2Client class:

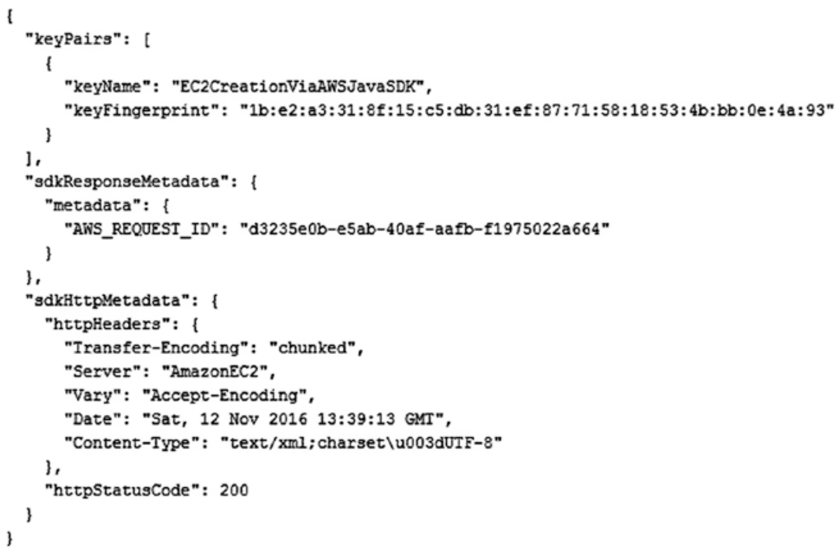
```
describeKeyPairs(KEY_PAIR_NAME);

public void describeKeyPairs(String keyName) {
   DescribeKeyPairsRequest request = new DescribeKeyPairsRequest();

   if(!StringUtils.isNullOrEmpty(keyName)) {
      List<String> searchCriteria = new ArrayList<String>();
      searchCriteria.add(keyName);
      request.setKeyNames(searchCriteria);
   }

   DescribeKeyPairsResult response = amazonEC2Client.describeKeyPairs(request);
}
```



```
{
  "keyPairs": [
    {
      "keyName": "EC2CreationViaAWSJavaSDK",
      "keyFingerprint": "1b:e2:a3:31:8f:15:c5:db:31:ef:87:71:58:18:53:4b:bb:0e:4a:93"
    }
  ],
  "sdkResponseMetadata": {
    "metadata": {
      "AWS_REQUEST_ID": "a4b151f9-f0ee-4c43-972e-3ea0b2ddce1a"
    }
  },
  "sdkHttpMetadata": {
    "httpHeaders": {
      "Transfer-Encoding": "chunked",
      "Server": "AmazonEC2",
      "Vary": "Accept-Encoding",
      "Date": "Sat, 12 Nov 2016 13:39:14 GMT",
      "Content-Type": "text/xml;charset\u003dUTF-8"
    },
    "httpStatusCode": 200
  }
}
```

To list all key pairs, we use the following code:

```
describeKeyPairs(null);
```

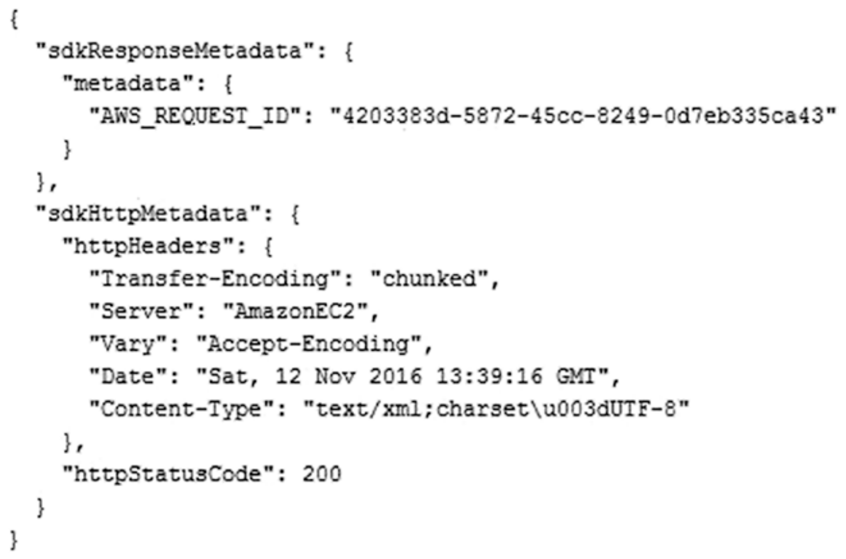


```
{
  "keyPairs": [
    {
      "keyName": "EC2CreationViaAWSJavaSDK",
      "keyFingerprint": "1b:e2:a3:31:8f:15:c5:db:31:ef:87:71:58:18:53:4b:bb:0e:4a:93"
    }
  ],
  "sdkResponseMetadata": {
    "metadata": {
      "AWS_REQUEST_ID": "d3235e0b-e5ab-40af-aafb-f1975022a664"
    }
  },
  "sdkHttpMetadata": {
    "httpHeaders": {
      "Transfer-Encoding": "chunked",
      "Server": "AmazonEC2",
      "Vary": "Accept-Encoding",
      "Date": "Sat, 12 Nov 2016 13:39:13 GMT",
      "Content-Type": "text/xml;charset\u003dUTF-8"
    },
    "httpStatusCode": 200
  }
}
```

3. Delete a Key Pair

To delete a key pair, use the `deleteKeyPair` method under the `AmazonEC2Client` class:

```
deleteKeyPair(KEY_PAIR_NAME);

public void deleteKeyPair(String keyName) {

    DeleteKeyPairRequest request = new DeleteKeyPairRequest();

    request.setKeyName(keyName);

    DeleteKeyPairResult response = amazonEC2Client.deleteKeyPair(request);
}
```

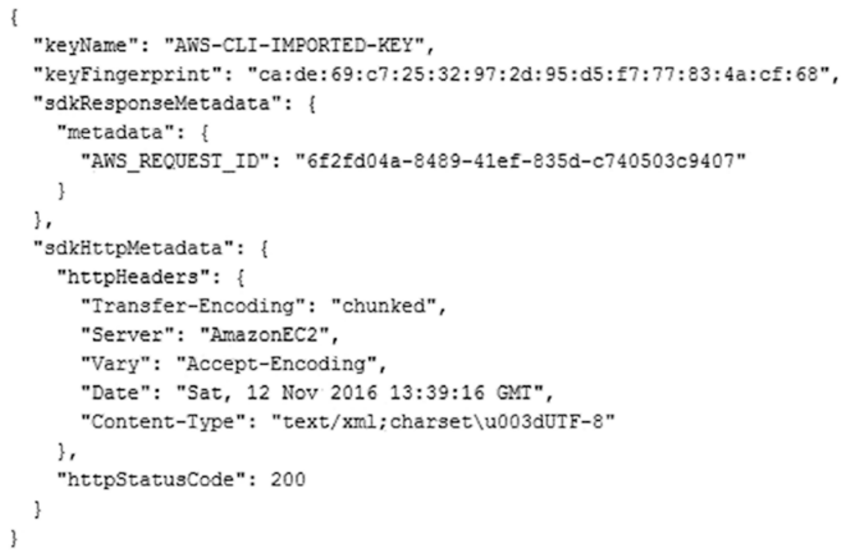


```
{
  "sdkResponseMetadata": {
    "metadata": {
      "AWS_REQUEST_ID": "4203383d-5872-45cc-8249-0d7eb335ca43"
    }
  },
  "sdkHttpMetadata": {
    "httpHeaders": {
      "Transfer-Encoding": "chunked",
      "Server": "AmazonEC2",
      "Vary": "Accept-Encoding",
      "Date": "Sat, 12 Nov 2016 13:39:16 GMT",
      "Content-Type": "text/xml;charset\u003dUTF-8"
    },
    "httpStatusCode": 200
  }
}
```

4. Import a Key Pair

To import a key pair to AWS, use the `importKeyPair` method under the `AmazonEC2Client` class:

```
importKeyPair(
        "AWS-JAVA-SDK-IMPORTED-KEY",
        "C:\\Users\\Dell\\EC2CreationViaAWSCLI.pub");

public void importKeyPair(String keyName, String publicKeyFilePath) {

   ImportKeyPairRequest request = new ImportKeyPairRequest();

   request.setKeyName(keyName);

   request.setPublicKeyMaterial(fileOperations.readFile(publicKeyFilePath));

   ImportKeyPairResult response = amazonEC2Client.importKeyPair(request);
}
```



```
{
  "keyName": "AWS-CLI-IMPORTED-KEY",
  "keyFingerprint": "ca:de:69:c7:25:32:97:2d:95:d5:f7:77:83:4a:cf:68",
  "sdkResponseMetadata": {
    "metadata": {
      "AWS_REQUEST_ID": "6f2fd04a-8489-41ef-835d-c740503c9407"
    }
  },
  "sdkHttpMetadata": {
    "httpHeaders": {
      "Transfer-Encoding": "chunked",
      "Server": "AmazonEC2",
      "Vary": "Accept-Encoding",
      "Date": "Sat, 12 Nov 2016 13:39:16 GMT",
      "Content-Type": "text/xml;charset\u003dUTF-8"
    },
    "httpStatusCode": 200
  }
}
```

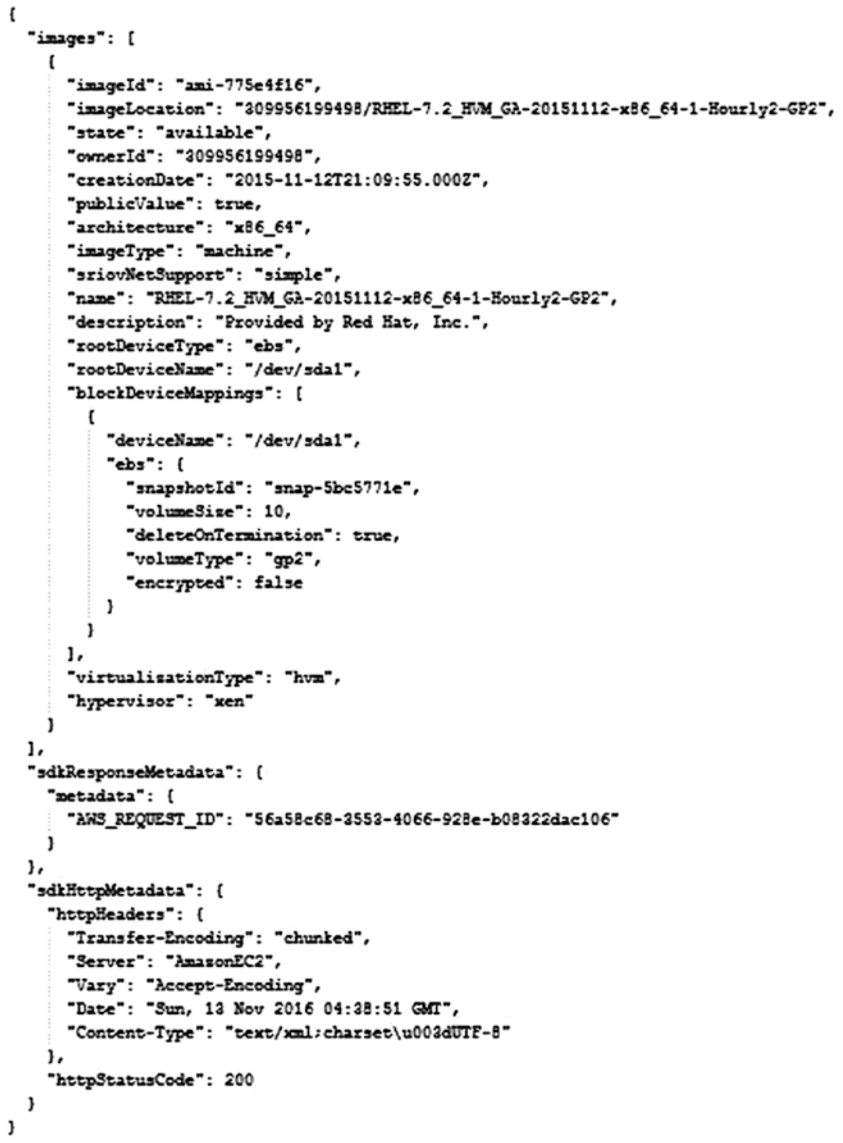
EC2 Instance

In this section, I will explain how to get the AMI ID, select an instance type, launch EC2, list EC2 instances, get instance status, assign instance tags, and start-stop-terminate an instance.

1. Get the AMI ID

To get the AMI ID, we will describe the image. This will return the public images and private images that are available to us. We will check that redhatlinux server image, that is, ami-775e4f16 is available:

```
describeImageIds("ami-775e4f16");

public void describeImageIds(String imageId) {
    DescribeImagesRequest request = new DescribeImagesRequest();
    if(!StringUtils.isNullOrEmpty(imageId)) {
        request.withImageIds(imageId);
    }
    DescribeImagesResult response = amazonEC2Client.describeImages(request);
}
```



```
{
  "images": [
    {
      "imageId": "ami-775e4f16",
      "imageLocation": "309956199498/RHEL-7.2_HVM_GA-20151112-x86_64-1-Hourly2-GP2",
      "state": "available",
      "ownerId": "309956199498",
      "creationDate": "2015-11-12T21:09:55.000Z",
      "publicValue": true,
      "architecture": "x86_64",
      "imageType": "machine",
      "sriovNetSupport": "simple",
      "name": "RHEL-7.2_HVM_GA-20151112-x86_64-1-Hourly2-GP2",
      "description": "Provided by Red Hat, Inc.",
      "rootDeviceType": "ebs",
      "rootDeviceName": "/dev/sda1",
      "blockDeviceMappings": [
        {
          "deviceName": "/dev/sda1",
          "ebs": {
            "snapshotId": "snap-5bc5771e",
            "volumeSize": 10,
            "deleteOnTermination": true,
            "volumeType": "gp2",
            "encrypted": false
          }
        }
      ],
      "virtualizationType": "hvm",
      "hypervisor": "xen"
    }
  ],
  "sdkResponseMetadata": {
    "metadata": {
      "AWS_REQUEST_ID": "56a58c68-3553-4066-928e-b08322dac106"
    }
  },
  "sdkHttpMetadata": {
    "httpHeaders": {
      "Transfer-Encoding": "chunked",
      "Server": "AmazonEC2",
      "Vary": "Accept-Encoding",
      "Date": "Sun, 13 Nov 2016 04:38:51 GMT",
      "Content-Type": "text/xml;charset\u003dUTF-8"
    },
    "httpStatusCode": 200
  }
}
```

2. Select an Instance Type

To select the instance type, you need to find out which instance type suits your application requirements. You can find all the instance types at `http://aws.amazon.com/ec2/instance-types`.

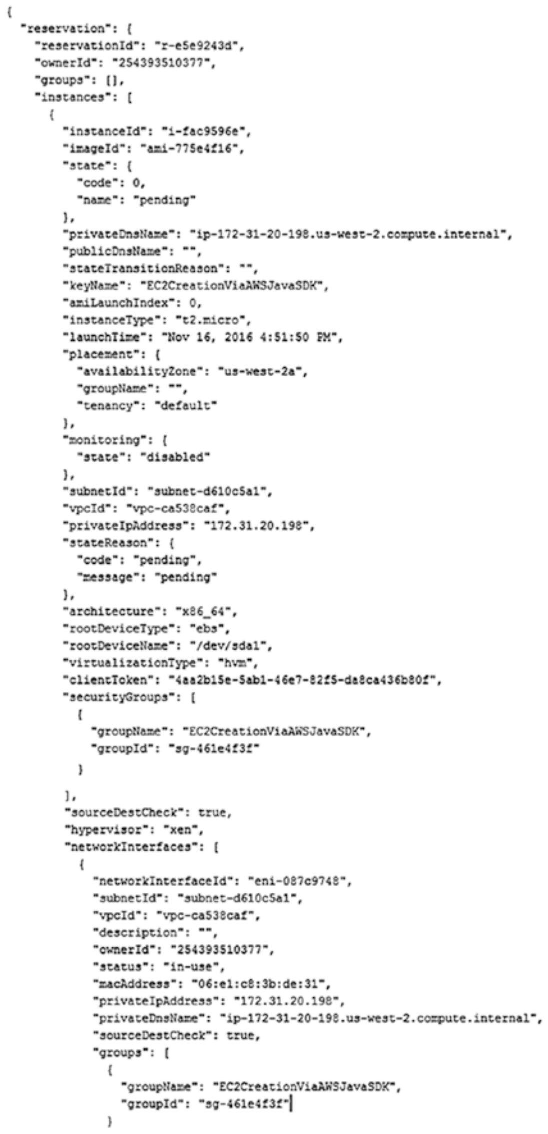
For our example, we will use the t2.micro instance type.

3. Launch EC2

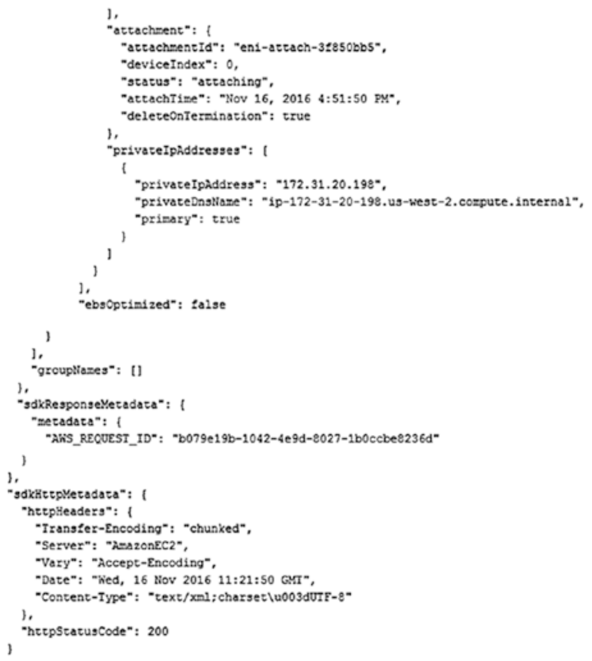
Now we will launch a new EC2 instance that has one instance count, “EC2CreationViaAWSJavaSDK” key pair, and “EC2CreationViaAWSJavaSDK” security group. First, verify that the key pair and security group are created. If not, you can execute the code for creating key pair and security group.

Use the following code to launch an EC2 instance:

```
private final static String AMI = "ami-775e4f16";
private final static InstanceType INSTANCE_TYPE = InstanceType.T2Micro;
private final static int MIN_INSTANCE_COUNT = 1;
private final static int MAX_INSTANCE_COUNT = 1;
private final static String KEY_PAIR_NAME = "EC2CreationViaAWSJavaSDK";
private final static String SECURITY_GROUP_NAME =
    "EC2CreationViaAWSJavaSDK";

String instanceId = launchInstance(AMI, INSTANCE_TYPE,
                                    MIN_INSTANCE_COUNT, MAX_INSTANCE_COUNT,
                                    KEY_PAIR_NAME, SECURITY_GROUP_NAME);
public String launchInstance(String ami, InstanceType instanceType,
                            int minInstanceCount, int maxInstanceCount,
                            String keyPairName, String securityGroupName) {

    RunInstancesRequest request = new RunInstancesRequest();

    request.setImageId(ami);

    request.setInstanceType(instanceType);

    request.setKeyName(keyPairName);

    List<String> securityGroups = new ArrayList<String>();

    securityGroups.add(securityGroupName);

    request.setSecurityGroups(securityGroups);

    request.setMinCount(minInstanceCount);

    request.setMaxCount(maxInstanceCount);

    RunInstancesResult response = amazonEC2Client.runInstances(request);

    return getInstanceId();
}
```



```
{
  "reservation": {
    "reservationId": "r-e5e9243d",
    "ownerId": "254393510377",
    "groups": [],
    "instances": [
      {
        "instanceId": "i-fac9596e",
        "imageId": "ami-775e4f16",
        "state": {
          "code": 0,
          "name": "pending"
        },
        "privateDnsName": "ip-172-31-20-198.us-west-2.compute.internal",
        "publicDnsName": "",
        "stateTransitionReason": "",
        "keyName": "EC2CreationViaAWSJavaSDK",
        "amiLaunchIndex": 0,
        "instanceType": "t2.micro",
        "launchTime": "Nov 16, 2016 4:51:50 PM",
        "placement": {
          "availabilityZone": "us-west-2a",
          "groupName": "",
          "tenancy": "default"
        },
        "monitoring": {
          "state": "disabled"
        },
        "subnetId": "subnet-d610c5a1",
        "vpcId": "vpc-ca538caf",
        "privateIpAddress": "172.31.20.198",
        "stateReason": {
          "code": "pending",
          "message": "pending"
        },
        "architecture": "x86_64",
        "rootDeviceType": "ebs",
        "rootDeviceName": "/dev/sda1",
        "virtualizationType": "hvm",
        "clientToken": "4aa2b15e-5ab1-46e7-82f5-da8ca436b80f",
        "securityGroups": [
          {
            "groupName": "EC2CreationViaAWSJavaSDK",
            "groupId": "sg-461e4f3f"
          }

        ],
        "sourceDestCheck": true,
        "hypervisor": "xen",
        "networkInterfaces": [
          {
            "networkInterfaceId": "eni-087c9748",
            "subnetId": "subnet-d610c5a1",
            "vpcId": "vpc-ca538caf",
            "description": "",
            "ownerId": "254393510377",
            "status": "in-use",
            "macAddress": "06:e1:c8:3b:de:31",
            "privateIpAddress": "172.31.20.198",
            "privateDnsName": "ip-172-31-20-198.us-west-2.compute.internal",
            "sourceDestCheck": true,
            "groups": [
              {
                "groupName": "EC2CreationViaAWSJavaSDK",
                "groupId": "sg-461e4f3f"
              }
```

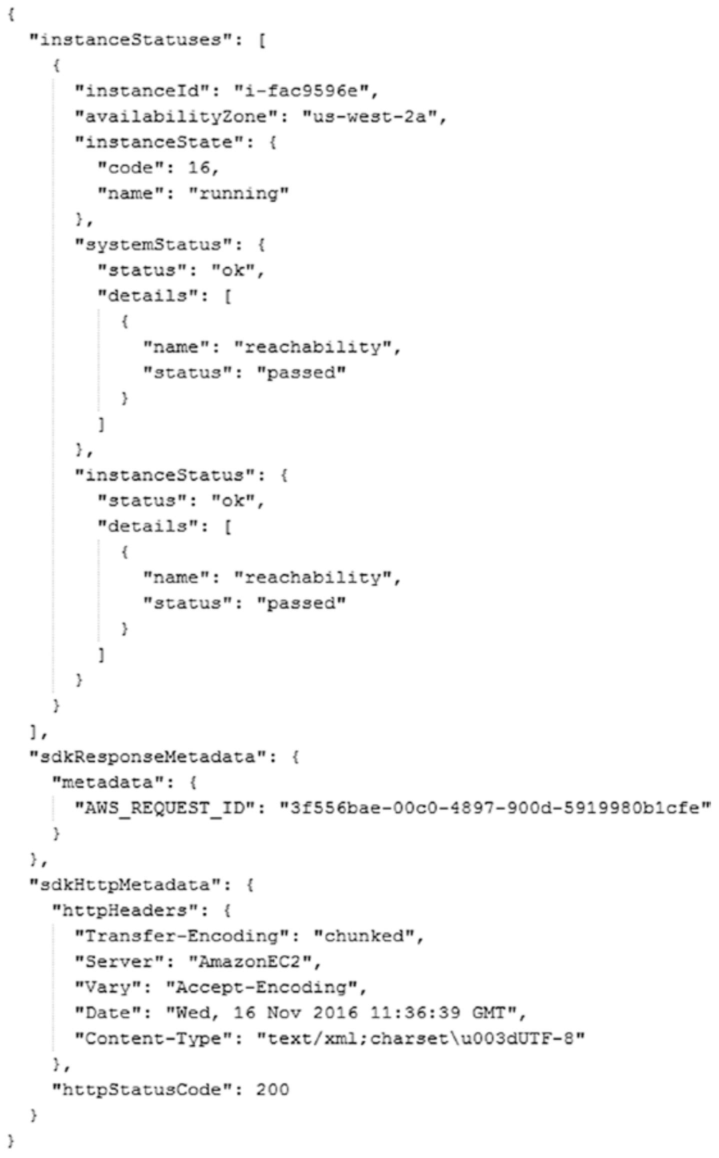


```
            ],
            "attachment": {
              "attachmentId": "eni-attach-3f850bb5",
              "deviceIndex": 0,
              "status": "attaching",
              "attachTime": "Nov 16, 2016 4:51:50 PM",
              "deleteOnTermination": true
            },
            "privateIpAddresses": [
              {
                "privateIpAddress": "172.31.20.198",
                "privateDnsName": "ip-172-31-20-198.us-west-2.compute.internal",
                "primary": true
              }
            ]
          }
        ],
        "ebsOptimized": false

      }
    ],
    "groupNames": []
  },
  "sdkResponseMetadata": {
    "metadata": {
      "AWS_REQUEST_ID": "b079e19b-1042-4e9d-8027-1b0ccbe8236d"
    }
  },
"sdkHttpMetadata": {
  "httpHeaders": {
    "Transfer-Encoding": "chunked",
    "Server": "AmazonEC2",
    "Vary": "Accept-Encoding",
    "Date": "Wed, 16 Nov 2016 11:21:50 GMT",
    "Content-Type": "text/xml;charset\u003dUTF-8"
  },
  "httpStatusCode": 200
}
```

Executing this run-instance command will initiate the request to launch a new instance with specified configurations. To check the status that the instance is ready to connect, we will use the `describeInstanceStatus` method along with the instance ID that is generated via `runInstances` method:

```
describeInstanceStatus(instanceId);

public void describeInstanceStatus(String instanceId) {

    DescribeInstanceStatusRequest request =
        new DescribeInstanceStatusRequest();

    request.setInstanceIds(Arrays.asList(instanceId));

    DescribeInstanceStatusResult response =
        amazonEC2Client.describeInstanceStatus(request);
}
```

You can now pass the instanceId parameter that we received from `launchInstance()` method:



```
{
  "instanceStatuses": [
    {
      "instanceId": "i-fac9596e",
      "availabilityZone": "us-west-2a",
      "instanceState": {
        "code": 16,
        "name": "running"
      },
      "systemStatus": {
        "status": "ok",
        "details": [
          {
            "name": "reachability",
            "status": "passed"
          }
        ]
      },
      "instanceStatus": {
        "status": "ok",
        "details": [
          {
            "name": "reachability",
            "status": "passed"
          }
        ]
      }
    }
  ],
  "sdkResponseMetadata": {
    "metadata": {
      "AWS_REQUEST_ID": "3f556bae-00c0-4897-900d-5919980b1cfe"
    }
  },
  "sdkHttpMetadata": {
    "httpHeaders": {
      "Transfer-Encoding": "chunked",
      "Server": "AmazonEC2",
      "Vary": "Accept-Encoding",
      "Date": "Wed, 16 Nov 2016 11:36:39 GMT",
      "Content-Type": "text/xml;charset\u003dUTF-8"
    },
    "httpStatusCode": 200
  }
}
```

You can see that InstanceStatus shows “running” value. Possible values for this are the following:

- pending
- running
- shutting down
- terminated
- stopping
- stopped

To list all instances status, use the following command:

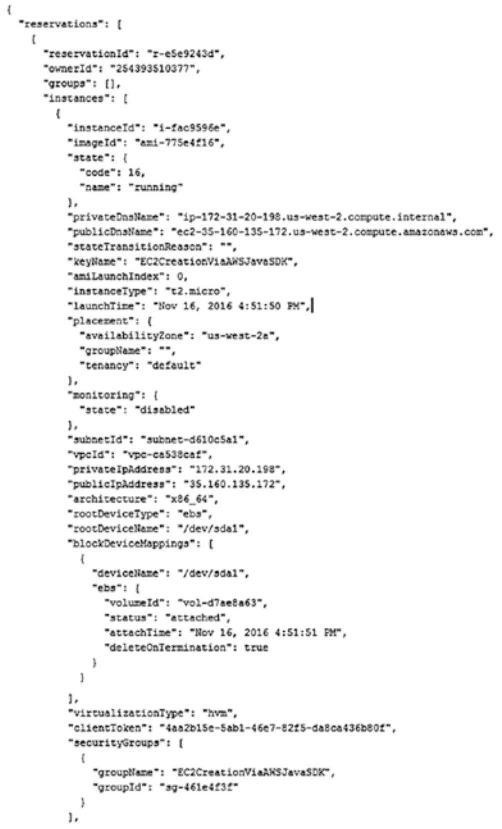
```
describeInstanceStatus(null);
```

Once the instance state is running, you can verify that you are able to connect to the EC2 instance using SSH client. Refer to the “Verify by Connecting to EC2 Instance” section.

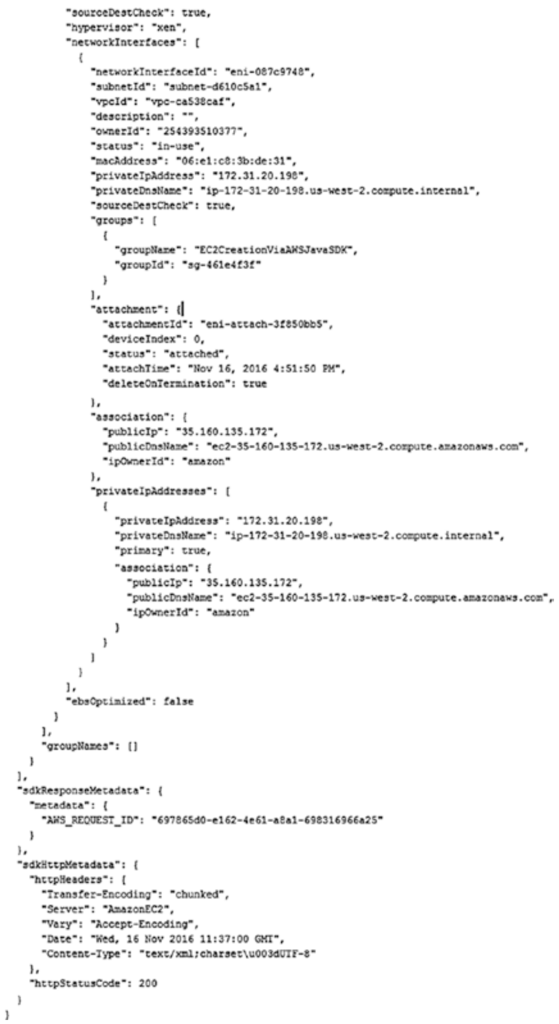
4. List EC2 Instances

To get the EC2 instance details based on the instanceId, use `describe-instances`:

```
describeInstances(instanceId);

public List<String> describeInstances(String instanceId) {
    List<String> instanceIdList = new ArrayList<String>();

    DescribeInstancesRequest request = new DescribeInstancesRequest();

    if(!StringUtils.isNullOrEmpty(instanceId)) {
        request.setInstanceIds(Arrays.asList(instanceId));
    }

    DescribeInstancesResult response =
        amazonEC2Client.describeInstances(request);

    if(response!=null && response.getReservations()!=null &&
        !response.getReservations().isEmpty()) {

        for(Reservation reservation: response.getReservations()) {

            List<Instance> instances = reservation.getInstances();
            if(instances!=null && !instances.isEmpty()) {
                for(Instance instance: instances) {
                    instanceIdList.add(instance.getInstanceId());
                }
            }
        }
    }
    return instanceIdList;
}
```



```
{
  "reservations": [
    {
      "reservationId": "r-e5e9243d",
      "ownerId": "254393510377",
      "groups": [],
      "instances": [
        {
          "instanceId": "i-fac9596e",
          "imageId": "ami-775e4f16",
          "state": {
            "code": 16,
            "name": "running"
          },
          "privateDnsName": "ip-172-31-20-198.us-west-2.compute.internal",
          "publicDnsName": "ec2-35-160-135-172.us-west-2.compute.amazonaws.com",
          "stateTransitionReason": "",
          "keyName": "EC2CreationViaAWSJavaSDK",
          "amiLaunchIndex": 0,
          "instanceType": "t2.micro",
          "launchTime": "Nov 16, 2016 4:51:50 PM",
          "placement": {
            "availabilityZone": "us-west-2a",
            "groupName": "",
            "tenancy": "default"
          },
          "monitoring": {
            "state": "disabled"
          },
          "subnetId": "subnet-d610c5a1",
          "vpcId": "vpc-ca538caf",
          "privateIpAddress": "172.31.20.198",
          "publicIpAddress": "35.160.135.172",
          "architecture": "x86_64",
          "rootDeviceType": "ebs",
          "rootDeviceName": "/dev/sda1",
          "blockDeviceMappings": [
            {
              "deviceName": "/dev/sda1",
              "ebs": {
                "volumeId": "vol-d7ae8a63",
                "status": "attached",
                "attachTime": "Nov 16, 2016 4:51:51 PM",
                "deleteOnTermination": true
              }
            }

          ],
          "virtualizationType": "hvm",
          "clientToken": "4aa2b15e-5ab1-46e7-82f5-da8ca436b80f",
          "securityGroups": [
            {
              "groupName": "EC2CreationViaAWSJavaSDK",
              "groupId": "sg-461e4f3f"
            }
          ],
```



```
          "sourceDestCheck": true,
          "hypervisor": "xen",
          "networkInterfaces": [
            {
              "networkInterfaceId": "eni-087c9748",
              "subnetId": "subnet-d610c5a1",
              "vpcId": "vpc-ca538caf",
              "description": "",
              "ownerId": "254393510377",
              "status": "in-use",
              "macAddress": "06:e1:c8:3b:de:31",
              "privateIpAddress": "172.31.20.198",
              "privateDnsName": "ip-172-31-20-198.us-west-2.compute.internal",
              "sourceDestCheck": true,
              "groups": [
                {
                  "groupName": "EC2CreationViaAWSJavaSDK",
                  "groupId": "sg-461e4f3f"
                }
              ],
              "attachment": {
                "attachmentId": "eni-attach-3f850bb5",
                "deviceIndex": 0,
                "status": "attached",
                "attachTime": "Nov 16, 2016 4:51:50 PM",
                "deleteOnTermination": true
              },
              "association": {
                "publicIp": "35.160.135.172",
                "publicDnsName": "ec2-35-160-135-172.us-west-2.compute.amazonaws.com",
                "ipOwnerId": "amazon"
              },
              "privateIpAddresses": [
                {
                  "privateIpAddress": "172.31.20.198",
                  "privateDnsName": "ip-172-31-20-198.us-west-2.compute.internal",
                  "primary": true,
                  "association": {
                    "publicIp": "35.160.135.172",
                    "publicDnsName": "ec2-35-160-135-172.us-west-2.compute.amazonaws.com",
                    "ipOwnerId": "amazon"
                  }
                }
              ]
            }
          ],
          "ebsOptimized": false
        }
      ],
      "groupNames": []
    }
  ],
  "sdkResponseMetadata": {
    "metadata": {
      "AWS_REQUEST_ID": "697865d0-e162-4e61-a8a1-698316966a25"
    }
  },
  "sdkHttpMetadata": {
    "httpHeaders": {
      "Transfer-Encoding": "chunked",
      "Server": "AmazonEC2",
      "Vary": "Accept-Encoding",
      "Date": "Wed, 16 Nov 2016 11:37:00 GMT",
      "Content-Type": "text/xml;charset\u003dUTF-8"
    },
    "httpStatusCode": 200
  }
}
```

To get all EC2 instances details, use `describeInstances` without providing any criteria:

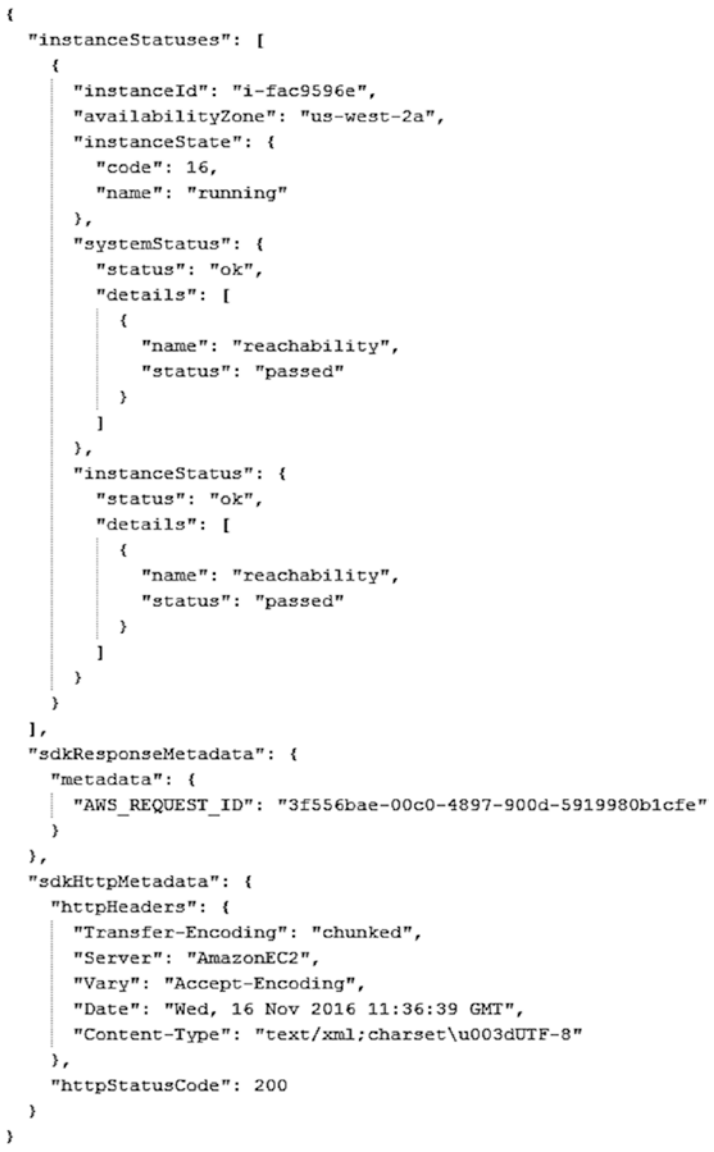
```
describeInstances(null);
```

5. Get an Instance Status

To get the instance status that we created, we will execute the following code:

```
describeInstanceStatus(instanceId);

public void describeInstanceStatus(String instanceId) {
    DescribeInstanceStatusRequest request =
        new DescribeInstanceStatusRequest();

    request.setInstanceIds(Arrays.asList(instanceId));

    DescribeInstanceStatusResult response =
        amazonEC2Client.describeInstanceStatus(request);
}
```

We will pass the `instanceId` parameter that we received from the `launchInstance()` method:



```
{
  "instanceStatuses": [
    {
      "instanceId": "i-fac9596e",
      "availabilityZone": "us-west-2a",
      "instanceState": {
        "code": 16,
        "name": "running"
      },
      "systemStatus": {
        "status": "ok",
        "details": [
          {
            "name": "reachability",
            "status": "passed"
          }
        ]
      },
      "instanceStatus": {
        "status": "ok",
        "details": [
          {
            "name": "reachability",
            "status": "passed"
          }
        ]
      }
    }
  ],
  "sdkResponseMetadata": {
    "metadata": {
      "AWS_REQUEST_ID": "3f556bae-00c0-4897-900d-5919980b1cfe"
    }
  },
  "sdkHttpMetadata": {
    "httpHeaders": {
      "Transfer-Encoding": "chunked",
      "Server": "AmazonEC2",
      "Vary": "Accept-Encoding",
      "Date": "Wed, 16 Nov 2016 11:36:39 GMT",
      "Content-Type": "text/xml;charset\u003dUTF-8"
    },
    "httpStatusCode": 200
  }
}
```

You can see that the InstanceStatus tag has the value “initializing,” which denotes that the instance is created but it is initializing. Once the initialization process is complete, the InstanceStatus will be reflected as “ok”; the instance has been initialized successfully.

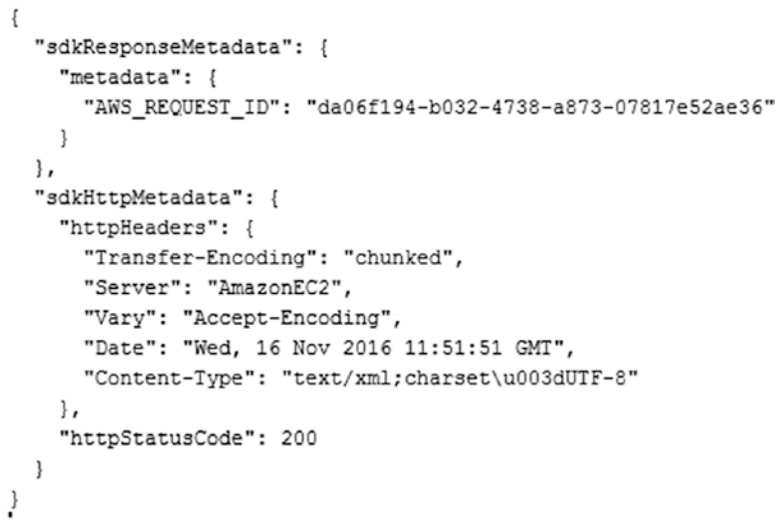
To get the instance status of all the EC2 instances available under the user account, use the following code:

```
describeInstanceStatus(null);
```

6. Instance Tags

To assign tags to an EC2 instance, execute the following code:

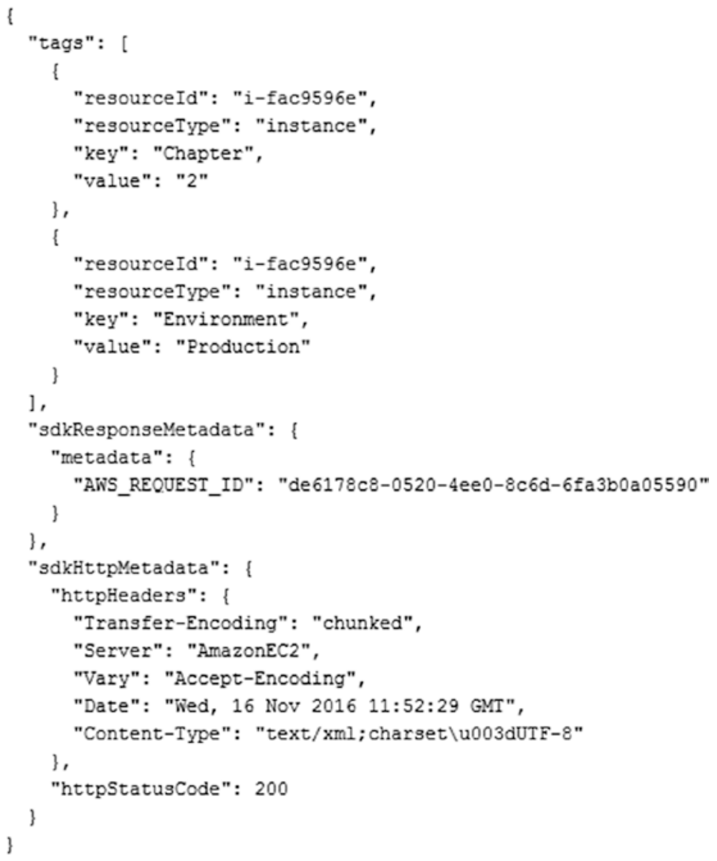
```
List<Tag> tags = new ArrayList<Tag>();
tags.add(createTag("Chapter", "2"));
tags.add(createTag("Environment", "Production"));

assignTagToEC2(instanceId, tags);

private static Tag createTag(String key, String value) {
    Tag tag = new Tag();

    tag.setKey(key);

    tag.setValue(value);

    return tag;
}

public void assignTagToEC2(String instanceId, List<Tag> tags) {
    CreateTagsRequest request = new CreateTagsRequest();

    request.setResources(Arrays.asList(instanceId));

    request.setTags(tags);

    CreateTagsResult response = amazonEC2Client.createTags(request);
}
```



```
{
  "sdkResponseMetadata": {
    "metadata": {
      "AWS_REQUEST_ID": "da06f194-b032-4738-a873-07817e52ae36"
    }
  },
  "sdkHttpMetadata": {
    "httpHeaders": {
      "Transfer-Encoding": "chunked",
      "Server": "AmazonEC2",
      "Vary": "Accept-Encoding",
      "Date": "Wed, 16 Nov 2016 11:51:51 GMT",
      "Content-Type": "text/xml;charset\u003dUTF-8"
    },
    "httpStatusCode": 200
  }
}
```

To describe the tags that are assigned to an EC2 instance, execute the following code:

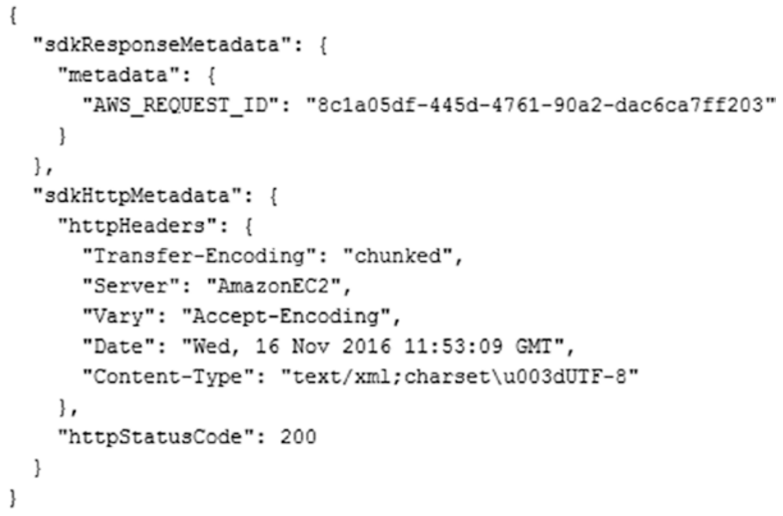
```
describeTags(instanceId);

public void describeTags(String instanceId) {
    DescribeTagsRequest request = new DescribeTagsRequest();

    Filter filter = new Filter("resource-id", Arrays.asList(instanceId));

    request.setFilters(Arrays.asList(filter));

    DescribeTagsResult response = amazonEC2Client.describeTags(request);
}
```



```
{
  "tags": [
    {
      "resourceId": "i-fac9596e",
      "resourceType": "instance",
      "key": "Chapter",
      "value": "2"
    },
    {
      "resourceId": "i-fac9596e",
      "resourceType": "instance",
      "key": "Environment",
      "value": "Production"
    }
  ],
  "sdkResponseMetadata": {
    "metadata": {
      "AWS_REQUEST_ID": "de6178c8-0520-4ee0-8c6d-6fa3b0a05590"
    }
  },
  "sdkHttpMetadata": {
    "httpHeaders": {
      "Transfer-Encoding": "chunked",
      "Server": "AmazonEC2",
      "Vary": "Accept-Encoding",
      "Date": "Wed, 16 Nov 2016 11:52:29 GMT",
      "Content-Type": "text/xml;charset\u003dUTF-8"
    },
    "httpStatusCode": 200
  }
}
```

To delete the tags for an EC2 Instance, execute the following code:

```
List<Tag> deleteTags = new ArrayList<Tag>();
deleteTags.add(createTag("Chapter", "2"));

deleteTags(instanceId, deleteTags);

public void deleteTags(String instanceId, List<Tag> tags) {
    DeleteTagsRequest request = new DeleteTagsRequest();

    request.setResources(Arrays.asList(instanceId));

    request.setTags(tags);

    DeleteTagsResult response = amazonEC2Client.deleteTags(request);
}
```



```
{
  "sdkResponseMetadata": {
    "metadata": {
      "AWS_REQUEST_ID": "8c1a05df-445d-4761-90a2-dac6ca7ff203"
    }
  },
  "sdkHttpMetadata": {
    "httpHeaders": {
      "Transfer-Encoding": "chunked",
      "Server": "AmazonEC2",
      "Vary": "Accept-Encoding",
      "Date": "Wed, 16 Nov 2016 11:53:09 GMT",
      "Content-Type": "text/xml;charset\u003dUTF-8"
    },
    "httpStatusCode": 200
  }
}
```

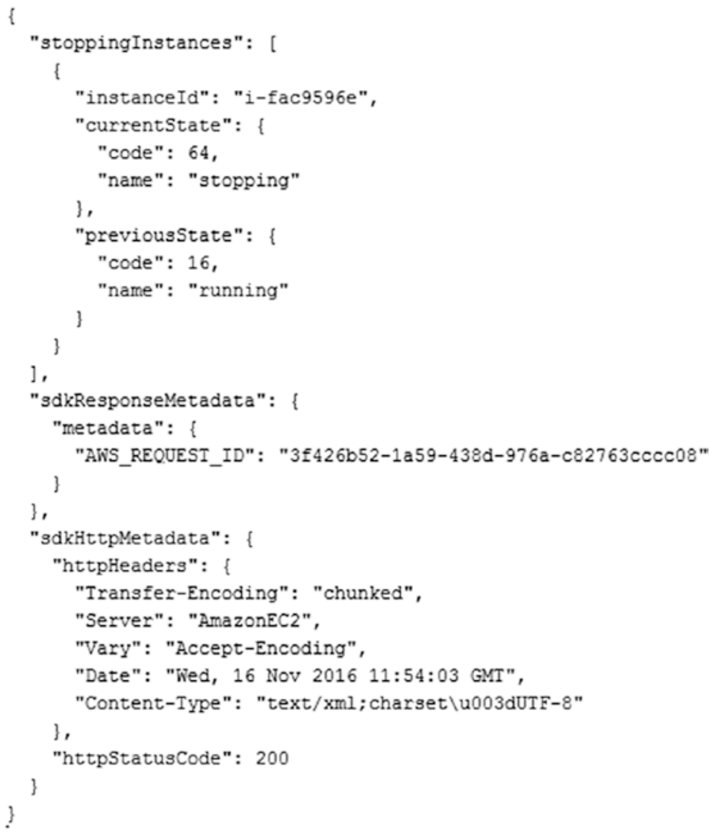
Here in `deleteTags`, we have provided the both the key and value. However, it's optional to provide the value for the `Value` element. If you provide the value, it becomes mandatory that both the key and value match the actual tags and only then can it delete the tags. The following code can be used when you want to delete tag based on the key only:

```
deleteTags.add(createTag("Chapter", ""));
```

7. Start-Stop-Terminate Instance

You may require your instance to start-stop-terminate manually. First of all, stop your instance using the following code:

```
stopInstance(instanceId);

public void stopInstance (String instanceId) {
    StopInstancesRequest request = new StopInstancesRequest();

    request.setInstanceIds(Arrays.asList(instanceId));

    StopInstancesResult response = amazonEC2Client.stopInstances(request);
}
```

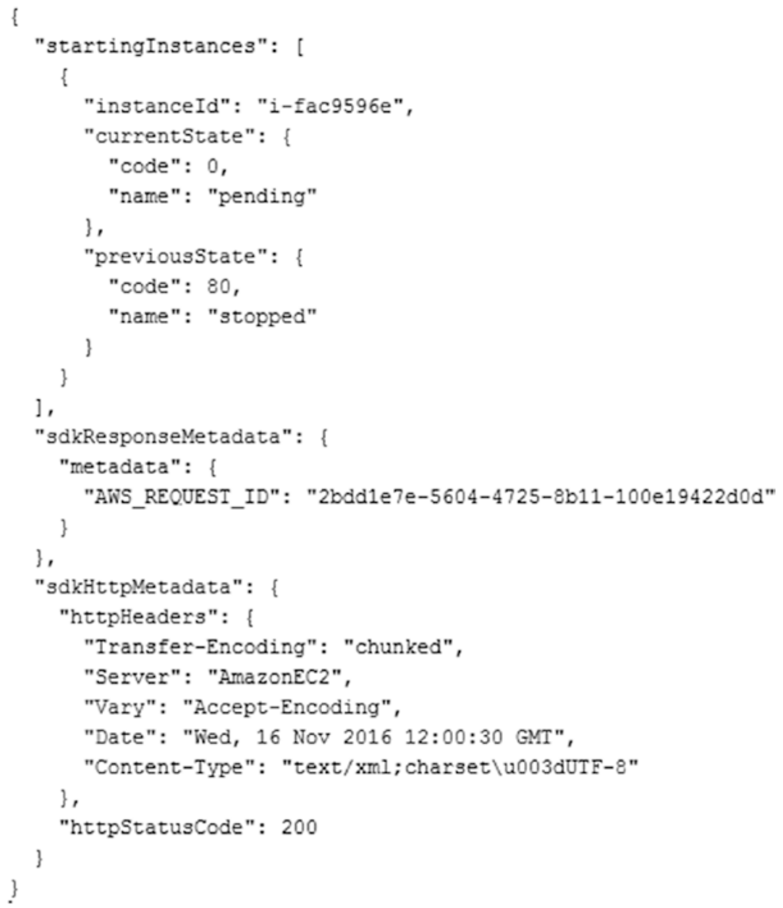


```
{
  "stoppingInstances": [
    {
      "instanceId": "i-fac9596e",
      "currentState": {
        "code": 64,
        "name": "stopping"
      },
      "previousState": {
        "code": 16,
        "name": "running"
      }
    }
  ],
  "sdkResponseMetadata": {
    "metadata": {
      "AWS_REQUEST_ID": "3f426b52-1a59-438d-976a-c82763cccc08"
    }
  },
  "sdkHttpMetadata": {
    "httpHeaders": {
      "Transfer-Encoding": "chunked",
      "Server": "AmazonEC2",
      "Vary": "Accept-Encoding",
      "Date": "Wed, 16 Nov 2016 11:54:03 GMT",
      "Content-Type": "text/xml;charset\u003dUTF-8"
    },
    "httpStatusCode": 200
  }
}
```

You can see that `currentState` is stopped now. The times to stop the instances may vary depending on the processes that are running on the EC2 instances.

To start the instance, execute the following code:

```
startInstance(instanceId);

public void startInstance(String instanceId) {

    StartInstancesRequest request = new StartInstancesRequest();

    request.setInstanceIds(Arrays.asList(instanceId));

    StartInstancesResult response = amazonEC2Client.startInstances(request);
}
```

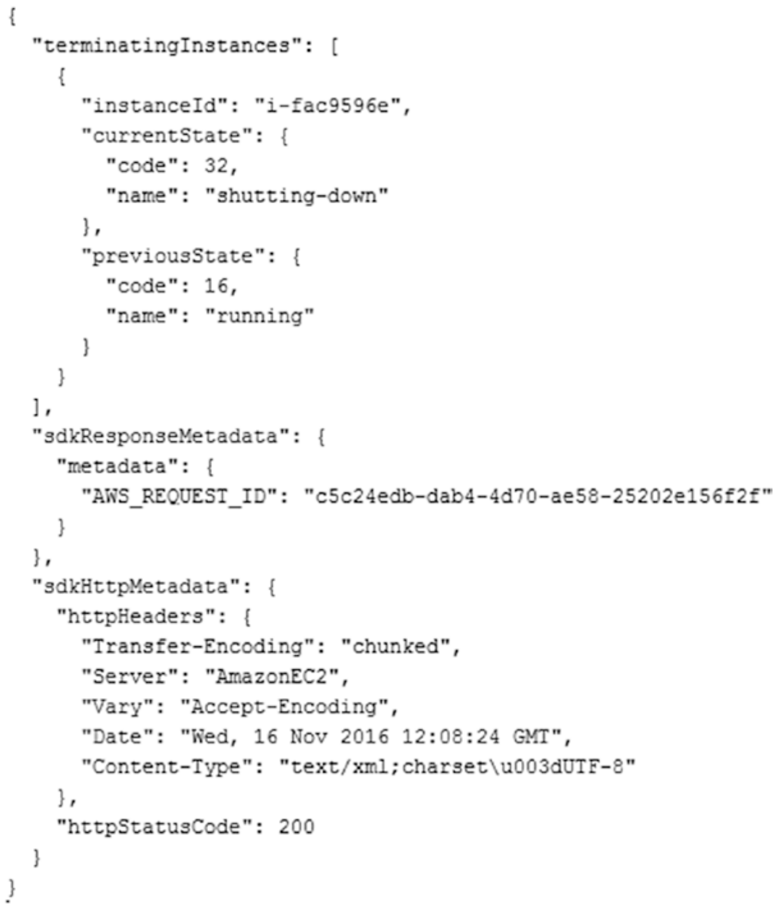


```
{
  "startingInstances": [
    {
      "instanceId": "i-fac9596e",
      "currentState": {
        "code": 0,
        "name": "pending"
      },
      "previousState": {
        "code": 80,
        "name": "stopped"
      }
    }
  ],
  "sdkResponseMetadata": {
    "metadata": {
      "AWS_REQUEST_ID": "2bdd1e7e-5604-4725-8b11-100e19422d0d"
    }
  },
  "sdkHttpMetadata": {
    "httpHeaders": {
      "Transfer-Encoding": "chunked",
      "Server": "AmazonEC2",
      "Vary": "Accept-Encoding",
      "Date": "Wed, 16 Nov 2016 12:00:30 GMT",
      "Content-Type": "text/xml;charset\u003dUTF-8"
    },
    "httpStatusCode": 200
  }
}
```

Once the process is completed successfully, the `currentState` should appear as running.

To terminate the instance, execute the following code:

```
terminateInstance(instanceId);

public void terminateInstance (String instanceId) {
    TerminateInstancesRequest request = new TerminateInstancesRequest();

    request.setInstanceIds(Arrays.asList(instanceId));

    TerminateInstancesResult response =
        amazonEC2Client.terminateInstances(request);
}
```



```
{
  "terminatingInstances": [
    {
      "instanceId": "i-fac9596e",
      "currentState": {
        "code": 32,
        "name": "shutting-down"
      },
      "previousState": {
        "code": 16,
        "name": "running"
      }
    }
  ],
  "sdkResponseMetadata": {
    "metadata": {
      "AWS_REQUEST_ID": "c5c24edb-dab4-4d70-ae58-25202e156f2f"
    }
  },
  "sdkHttpMetadata": {
    "httpHeaders": {
      "Transfer-Encoding": "chunked",
      "Server": "AmazonEC2",
      "Vary": "Accept-Encoding",
      "Date": "Wed, 16 Nov 2016 12:08:24 GMT",
      "Content-Type": "text/xml;charset\u003dUTF-8"
    },
    "httpStatusCode": 200
  }
}
```

Once the process is successfully completed, the `currentState` should be terminated.

Monitoring Using CloudWatch

Monitoring is an important aspect in software or application life cycle. CloudWatch enables us to automate the monitoring of the instances based on several metrics available. You can configure the metrics threshold limits for our instances. You can create the CloudWatch alarm either using the EC2 Management Console or the CloudWatch Console.

Create an Alarm Using the EC2 Management Console

You can create an alarm from the EC2 Management Console as follows:

1. Go to the EC2 Management Console and select "Instances" from the menu.
2. Select the instance for which you want to create alarm.
3. Select "Monitoring" tab.
4. Click the Create Alarm button (See Figure 2-25).

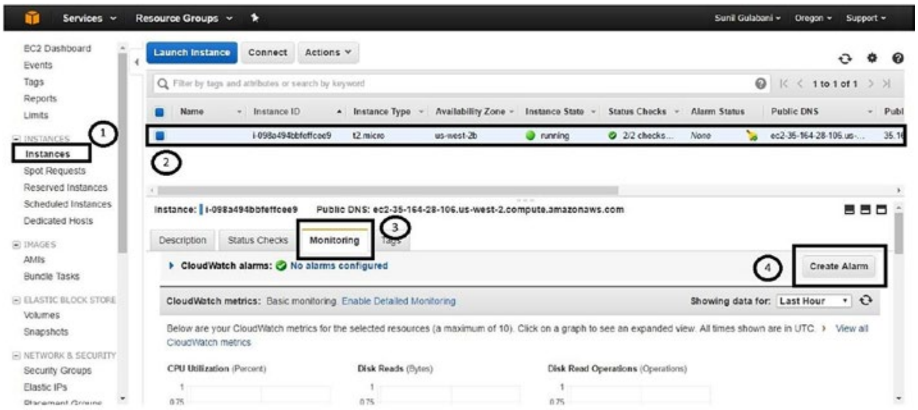
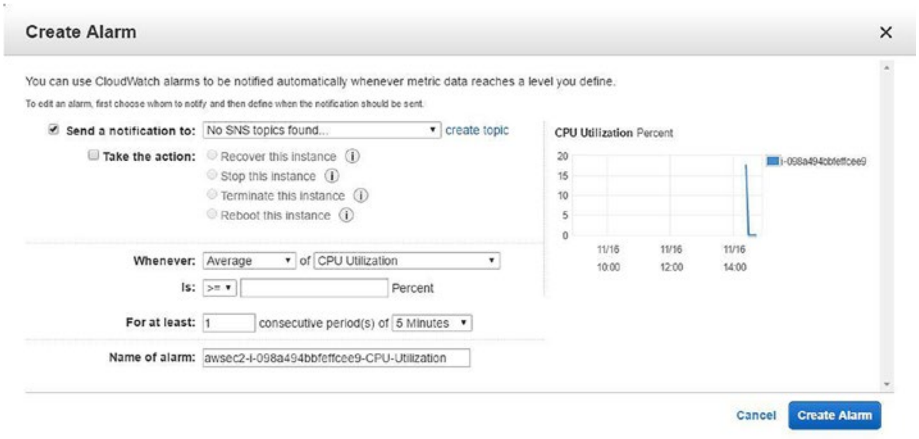


Figure 2-25. *CloudWatch alarm using EC2 Management Console*

5. The Create Alarm window will be displayed, as shown in Figure 2-26.


Create Alarm

You can use CloudWatch alarms to be notified automatically whenever metric data reaches a level you define.

To edit an alarm, first choose whom to notify and then define when the notification should be sent.

☑ Send a notification to: No SNS topics found... create topic

☐ Take the action: Recover this instance / Stop this instance / Terminate this instance / Reboot this instance

Whenever: Average of CPU Utilization

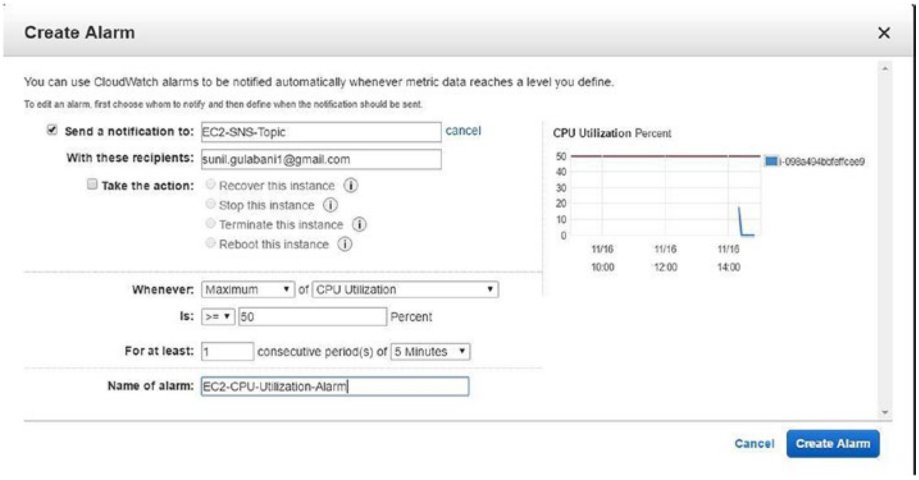
Is: >= Percent

For at least: 1 consecutive period(s) of 5 Minutes

Name of alarm: awsec2-i-098a494bbfeffcee9-CPU-Utilization

Figure 2-26. *Create alarm window*

6. Select from an existing SNS topic or create a new SNS topic. If you create a new SNS topic, you need to provide the e-mail ID when the alarm report will be notified.
7. Choose the metrics you want to configure for your instance and provide the alarm name.
8. Click the Create Alarm button (See Figure 2-27).


Create Alarm

You can use CloudWatch alarms to be notified automatically whenever metric data reaches a level you define.

To edit an alarm, first choose whom to notify and then define when the notification should be sent.

☑ Send a notification to: EC2-SNS-Topic cancel

With these recipients: sunil.gulabani1@gmail.com

☐ Take the action: Recover this instance / Stop this instance / Terminate this instance / Reboot this instance

Whenever: Maximum of CPU Utilization

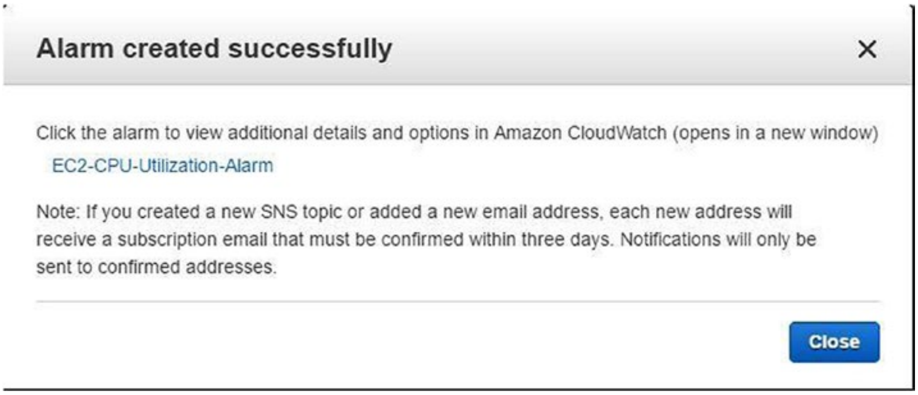
Is: >= 50 Percent

For at least: 1 consecutive period(s) of 5 Minutes

Name of alarm: EC2-CPU-Utilization-Alarm

Figure 2-27. *Create alarm with new SNS topic and metrics*

The alarm will be created successfully (See Figure 2-28).



Alarm created successfully

Click the alarm to view additional details and options in Amazon CloudWatch (opens in a new window)

EC2-CPU-Utilization-Alarm

Note: If you created a new SNS topic or added a new email address, each new address will receive a subscription email that must be confirmed within three days. Notifications will only be sent to confirmed addresses.

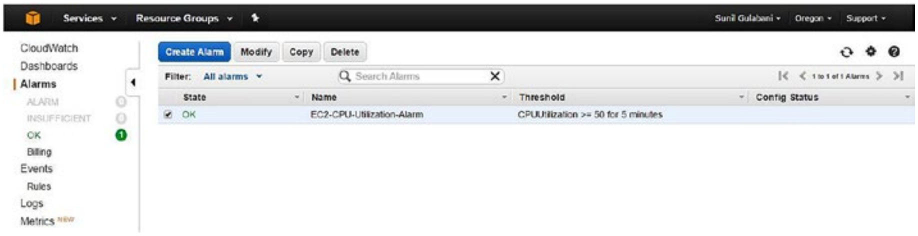
Figure 2-28. *Alarm created successfully*

Create an Alarm Using the CloudWatch Management Console

You can create an alarm from the CloudWatch Management Console using the following steps:

1. Go to the CloudWatch Management Console and select Alarms from the menu.

2. Click Create Alarm (See Figure 2-29).



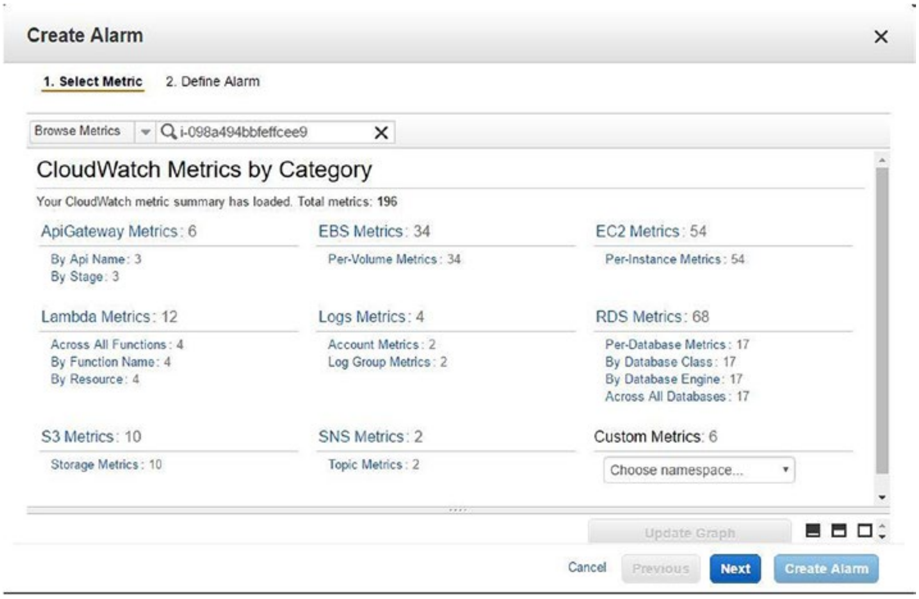
	State	Name	Threshold	Config Status
✓	OK	EC2-CPU-Utilization-Alarm	CPUUtilization >= 50 for 5 minutes	

Figure 2-29. *CloudWatch Console*

3. Create an alarm window to be displayed in two steps:

   a. Select metric.

   b. Select the Per-Instance Metrics under EC2 Metrics (See Figure 2-30).



CloudWatch Metrics by Category

Your CloudWatch metric summary has loaded. Total metrics: 196

ApiGateway Metrics: 6
- By Api Name: 3
- By Stage: 3

EBS Metrics: 34
- Per-Volume Metrics: 34

EC2 Metrics: 54
- Per-Instance Metrics: 54

Lambda Metrics: 12
- Across All Functions: 4
- By Function Name: 4
- By Resource: 4

Logs Metrics: 4
- Account Metrics: 2
- Log Group Metrics: 2

RDS Metrics: 68
- Per-Database Metrics: 17
- By Database Class: 17
- By Database Engine: 17
- Across All Databases: 17

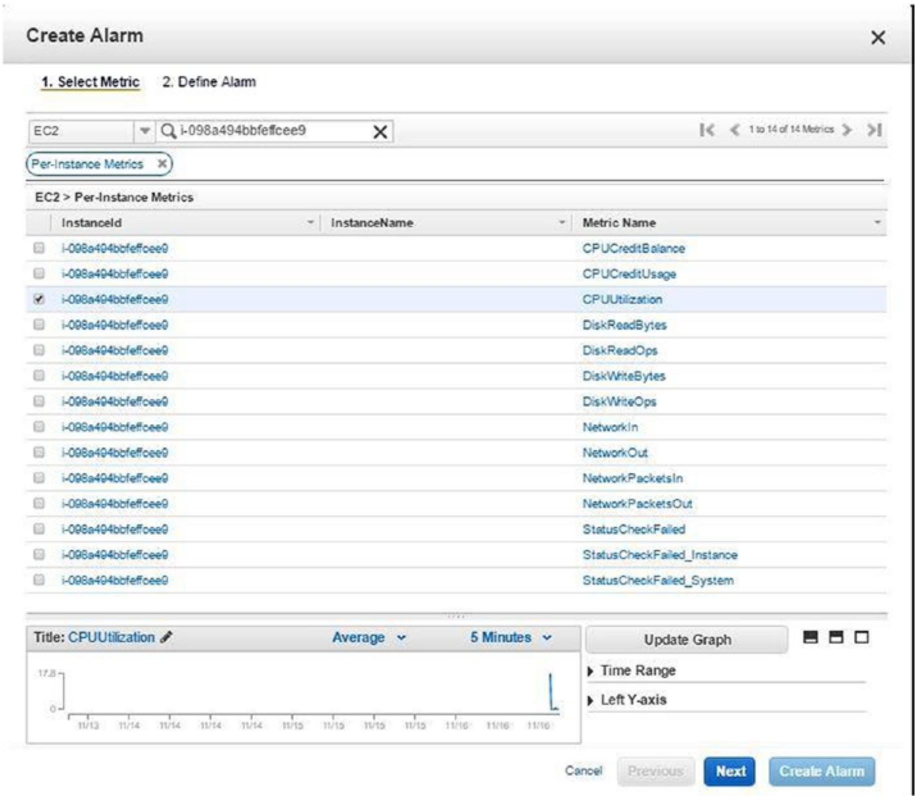
S3 Metrics: 10
- Storage Metrics: 10

SNS Metrics: 2
- Topic Metrics: 2

Custom Metrics: 6
- Choose namespace...

Figure 2-30. *Create an alarm using CloudWatch Console*

c. Search for the EC2 instance based on the instance ID and select the metrics. Click the Next button, as shown in Figure 2-31.


Create Alarm

1. Select Metric 2. Define Alarm

EC2 | i-098a494bbfeffcee9 | 1 to 14 of 14 Metrics

Per-Instance Metrics

EC2 > Per-Instance Metrics

	InstanceId	InstanceName	Metric Name
☐	i-098a494bbfeffcee9		CPUCreditBalance
☐	i-098a494bbfeffcee9		CPUCreditUsage
✓	i-098a494bbfeffcee9		CPUUtilization
☐	i-098a494bbfeffcee9		DiskReadBytes
☐	i-098a494bbfeffcee9		DiskReadOps
☐	i-098a494bbfeffcee9		DiskWriteBytes
☐	i-098a494bbfeffcee9		DiskWriteOps
☐	i-098a494bbfeffcee9		NetworkIn
☐	i-098a494bbfeffcee9		NetworkOut
☐	i-098a494bbfeffcee9		NetworkPacketsIn
☐	i-098a494bbfeffcee9		NetworkPacketsOut
☐	i-098a494bbfeffcee9		StatusCheckFailed
☐	i-098a494bbfeffcee9		StatusCheckFailed_Instance
☐	i-098a494bbfeffcee9		StatusCheckFailed_System

Title: CPUUtilization Average 5 Minutes

Figure 2-31. *Search EC2 instance for creating alarm*

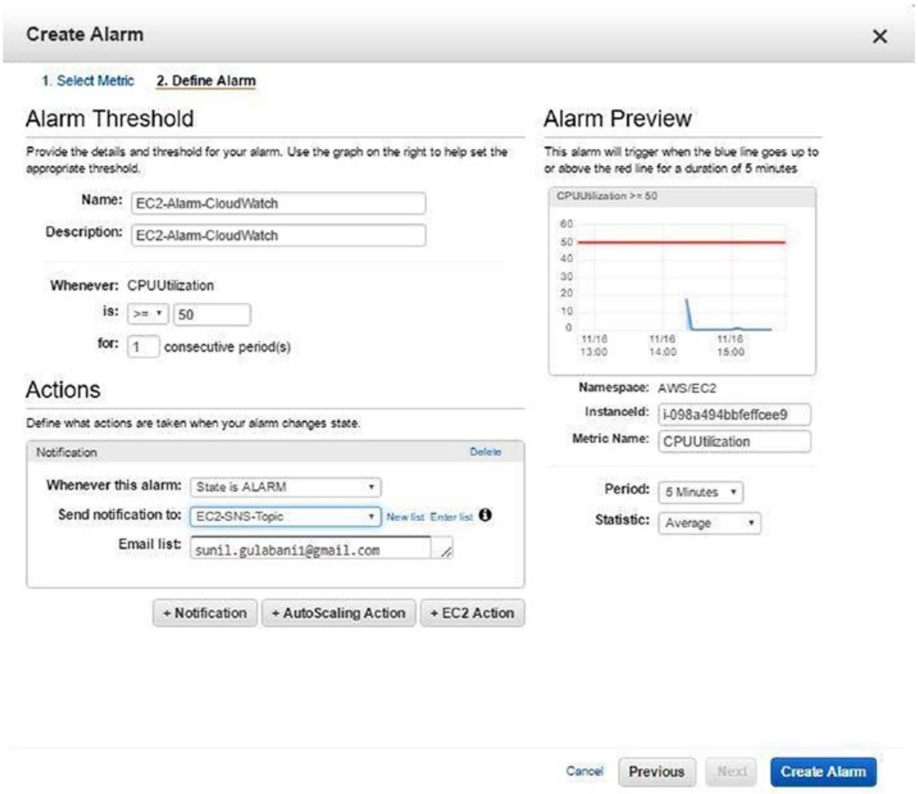
d. Define the alarm.

e. Provide the name and description for the alarm.

f. Provide threshold limits.

g. Select the appropriate actions and advance options for notification, auto-scaling action, and EC2 Action.

h. Click Create Alarm (See Figure 2-32).


Create Alarm

1. Select Metric 2. Define Alarm

Alarm Threshold

Provide the details and threshold for your alarm. Use the graph on the right to help set the appropriate threshold.

Name: EC2-Alarm-CloudWatch

Description: EC2-Alarm-CloudWatch

Whenever: CPUUtilization

is: >= 50

for: 1 consecutive period(s)

Actions

Define what actions are taken when your alarm changes state.

Notification

Whenever this alarm: State is ALARM

Send notification to: EC2-SNS-Topic

Email list: sunil.gulabani1@gmail.com

Alarm Preview

This alarm will trigger when the blue line goes up to or above the red line for a duration of 5 minutes

CPUUtilization >= 50

Namespace: AWS/EC2

InstanceId: i-098a494bbfeffcee9

Metric Name: CPUUtilization

Period: 5 Minutes

Statistic: Average

Figure 2-32. *Define alarm*

The alarm created successfully (See Figure 2-33).

Your alarm EC2-Alarm-CloudWatch has been saved.

Figure 2-33. *Alarm created successfully*

Finally, we have completed creating the alarm on our EC2 instance. Whenever the threshold limit on the EC2 instance is achieved, the receipt e-mail address will be notified.

Summary

In this chapter, I have discussed how to create EC2 instances and connect using the SSH client (PuTTy). Moreover, I explained how to configure a security group so that you can connect to an EC2 instance and key pair that is used to authorize login to the EC2 instance. Lastly, I demonstrated how to configure an alarm on an EC2 instance that will be triggered when the threshold limit is crossed.

In Chapter 3, I will show how to configure SQS and how to implement SQS producer and consumer applications.

CHAPTER 3

Hands-on Simple Queue Service (SQS)

Queuing service is communication among distributed applications. Generally, you have queuing service where you need asynchronous processes to be carried out. The purpose of queuing service is to transport data from origin applications and allow destination applications to read messages and process further.

In this chapter, I will cover the following topics:

- Messaging Queuing Service
- Introduction of AWS SQS
- Features of SQS
- Using AWS Management Console
- Using AWS CLI
- Using AWS SDK—Java
- Monitoring Using CloudWatch

What Is Messaging Queuing Service?

Messaging queuing service provides different applications to transfer messages. The queuing service follows the producer/consumer paradigm. Producer applications are responsible for sending messages to the queue and consumer applications are responsible for reading messages from the queue. Consumer applications can read messages from the queue at any time; it is not mandatory to have connection established to the queue when the producer sends messages. Whenever the consumer application is connected, it reads the messages from the queuing service. The queuing service will add the messages in sequential order.

Messaging queuing service is asynchronous communication. A queuing service is used when you don't have to respond back to the request immediately. Applications can add messages to the queuing service and the consumer application can process it at a later stage. There may be cases where the request is taking time to process, so the producer application will add the message to the queue. (See Figure 3-1.)

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S. Gulabani, *Practical Amazon EC2, SQS, Kinesis, and S3*,
DOI 10.1007/978-1-4842-2841-8_3

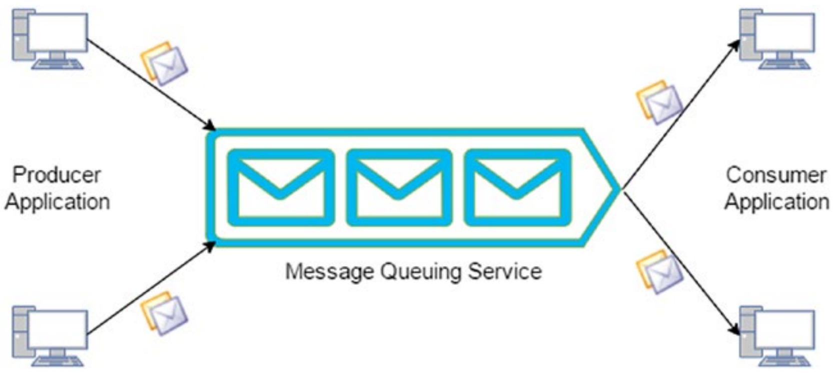


Figure 3-1. *Message queuing service*

Introduction of AWS SQS

AWS Simple Queue Service (SQS) is a distributed queuing service application where you can add and read messages over the Internet. Amazon manages AWS SQS and only charges users for what they have consumed. AWS SQS is a highly scalable solution that allows applications to add and read messages, which makes decoupling the application components efficient. AWS SQS can be accessed via Web Services API and AWS SDK, which is available for different programming languages.

AWS SQS provide two types of queues:

1. Standard Queue

Standard queue is the default queue type supported by AWS SQS. It doesn't restrict the number of transactions per second, and it ensures that messages are delivered at least once. This type of queue is used when there aren't any critical events that need to be processed by consumer applications since there may be duplicate messages that need to be handled in the application. (See Figure 3-2.)

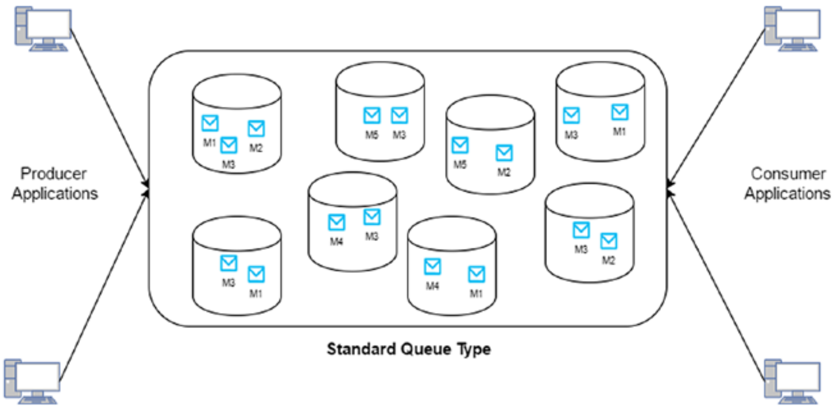


Figure 3-2. *Standard queue type*

2. FIFO Queue

A FIFO (first in, first out) queue maintains order for delivery of messages. The name of the queue should have the suffix "`.fifo`". It restricts 300 transactions per second and ensures that messages are delivered exactly once. This type of queue should be used when there is a defined series of steps to be performed so that unordered messages are not received for processing in consumer applications. (See Figure 3-3.)

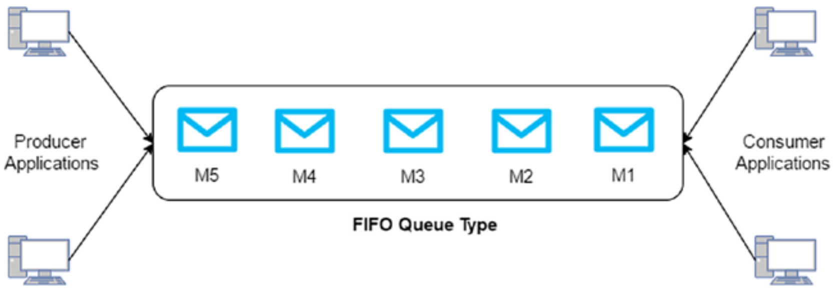


Figure 3-3. *FIFO queue type*

Features of SQS

Following are the main features of SQS that play a significant role in applications:

- High Availability: AWS SQS provides high availability for sending and receiving messages as they are stored on distributed servers.
- Authentication: To access the queue, permission is necessary at the queue level. The users can access the queue based on AWS IAM.
- Visible Timeout: When a consumer reads a message from the queue, it hides the message that is being processed so that no other consumer processes it.
- Delay Messages: Delay of messages can be configured at the queue level as well as at the message level while sending messages.
- Cost: AWS charges only for the API requests that are made to SQS so there are no fixed costs attached with AWS SQS.

Using AWS Management Console

AWS Management Console can be used to manage SQS. It provides an easy way to configure SQS. To configure SQS, log in to AWS Console. Under the All Services category, click SQS, as highlighted in Figure 3-4.

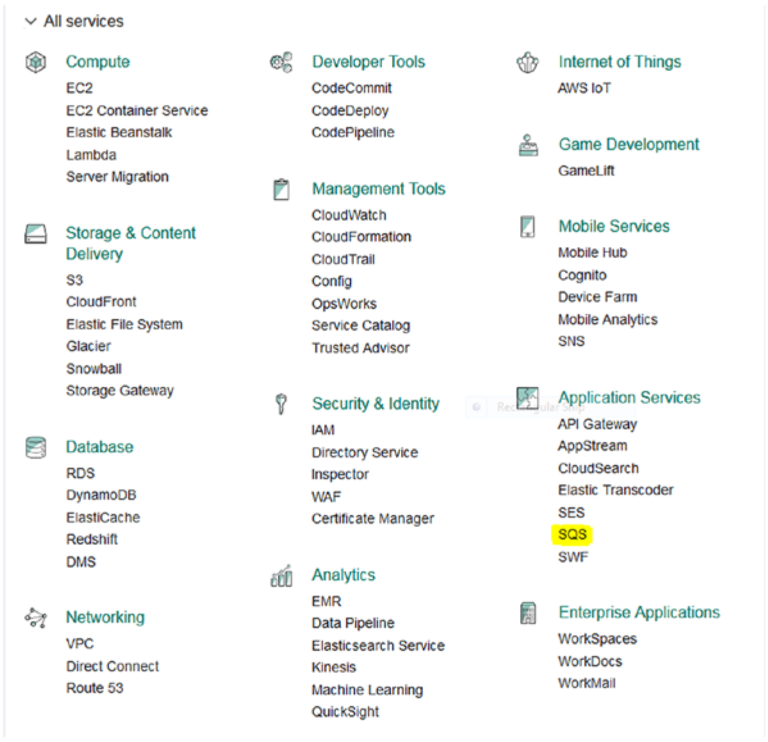
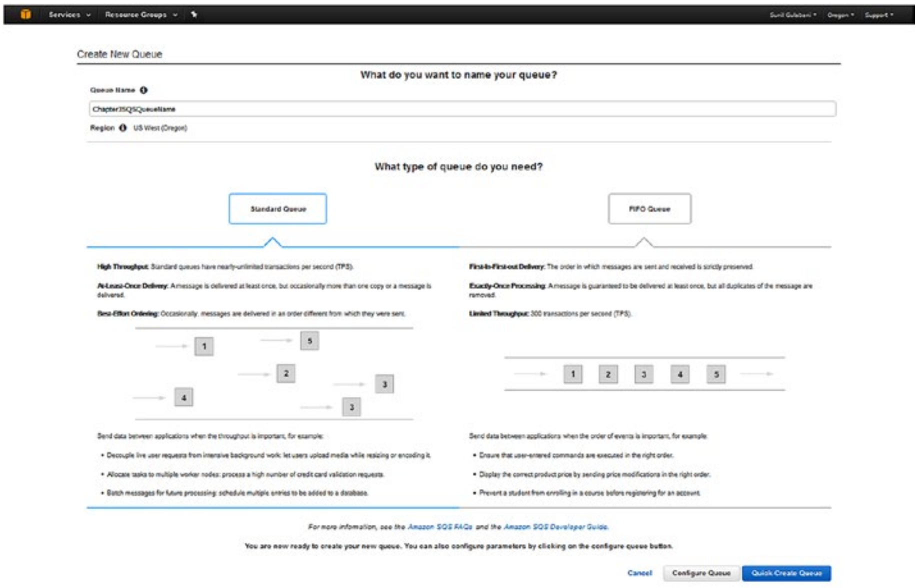


Figure 3-4. *AWS Management Console*

1. Create Queue

Creating a queue is the first step in using AWS SQS. When you open AWS SQS Console, you are redirected to the Create New Queue screen. If you aren't, click the Create New Queue button, which will redirect you to the screen shown in Figure 3-5.



Create New Queue

What do you want to name your queue?

Queue Name: Chapter3SQSQueueName

Region: US West (Oregon)

What type of queue do you need?

High Throughput: Standard queues have nearly-unlimited transactions per second (TPS).

At-Least-Once Delivery: A message is delivered at least once, but occasionally more than one copy of a message is delivered.

Best-Effort Ordering: Occasionally, messages are delivered in an order different from which they were sent.

Send data between applications when the throughput is important, for example:

- Decouple live user requests from intensive background work: let users upload media while resizing or encoding it.
- Allocate tasks to multiple worker nodes: process a high number of credit card validation requests.
- Batch messages for future processing: schedule multiple entries to be added to a database.

First-In-First-out Delivery: The order in which messages are sent and received is strictly preserved.

Exactly-Once Processing: A message is guaranteed to be delivered at least once, but all duplicates of the message are removed.

Limited Throughput: 300 transactions per second (TPS).

Send data between applications when the order of events is important, for example:

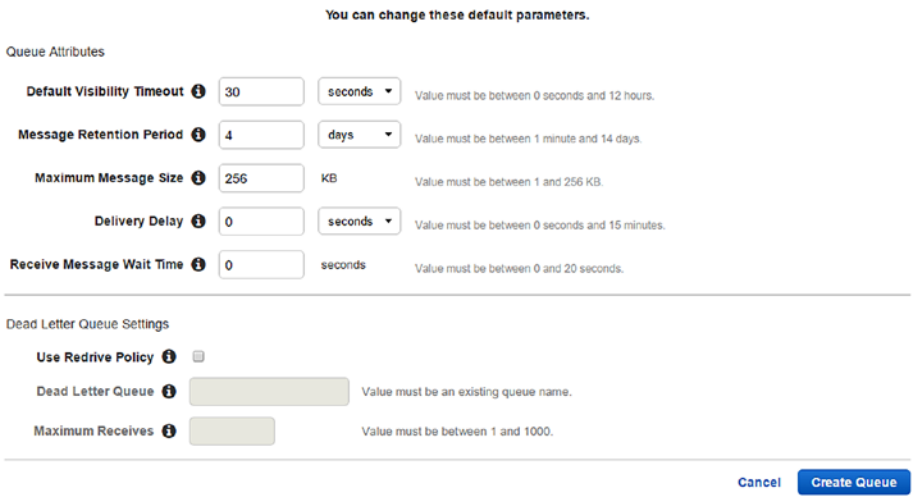
- Ensure that user-entered commands are executed in the right order.
- Display the correct product price by sending price modifications in the right order.
- Prevent a student from enrolling in a course before registering for an account.

For more information, see the Amazon SQS FAQs and the Amazon SQS Developer Guide.

You are now ready to create your new queue. You can also configure parameters by clicking on the configure queue button.

Figure 3-5. *Create queue*

You will provide the queue name and select the queue type that you prefer to use in your project. As previously mentioned, if you select "FIFO queue" as the queue type, you need to add the suffix "`.fifo`" to your queue name. If you want to create a queue with default parameters, you can click the Quick-Create Queue button. Otherwise, if you need to configure queue parameters, click the Configure Queue button. (See Figure 3-6.)



You can change these default parameters.

Queue Attributes

Default Visibility Timeout	30	seconds	Value must be between 0 seconds and 12 hours.
Message Retention Period	4	days	Value must be between 1 minute and 14 days.
Maximum Message Size	256	KB	Value must be between 1 and 256 KB.
Delivery Delay	0	seconds	Value must be between 0 seconds and 15 minutes.
Receive Message Wait Time	0	seconds	Value must be between 0 and 20 seconds.

Dead Letter Queue Settings

Use Redrive Policy	☐	
Dead Letter Queue		Value must be an existing queue name.
Maximum Receives		Value must be between 1 and 1000.

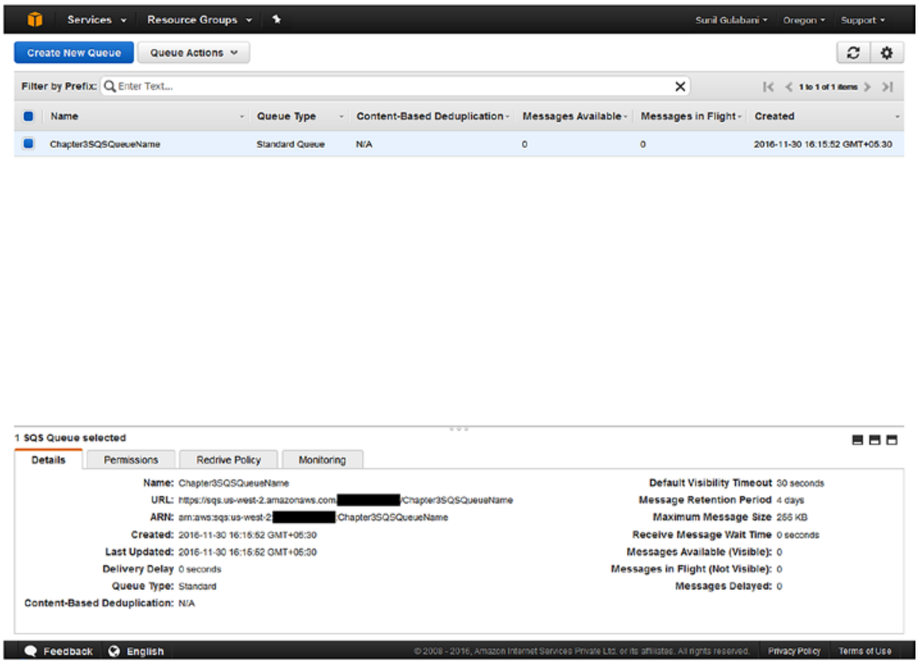
Figure 3-6. *Configure queue*

Following are the queue attributes:

- **Default Visibility Timeout:** This parameter is used when the consumer receives the message and processes it so that no other consumers have that same message. There are two possibilities:
    - Once the consumer processes the message successfully, the consumer deletes the message.
    - No delete call is been made until the visibility timeout expires, so the message will be available to receive a call.
- **Message Retention Period:** This parameter is used to retain the message in queue. After the message retention period configured has expired, the message will be deleted automatically. By default, the message retention period is 4 days and can be extended up to a maximum of 14 days.
- **Maximum Message Size:** This parameter refers to the message size that the queue will accept.
- **Delivery Delay:** This parameter refers to messages that are invisible to consumers for that specific time. The value can be between 0 and 15 minutes.
- **Receive Message Wait Time:** This parameter will be used for long polling. It will help to reduce the cost of using SQS. By default, the short polling is configured in AWS SQS. This will enable the receive message request to query all servers and provide respective responses.
- **Use Redrive Policy:** This parameter enables configuration of dead letter queue. Redrive policy will add messages to dead letter queue after the messages are not successfully processed when maximum received time is specified. The following parameters need to be configured when you want to enable redrive policy:
    - **Dead Letter Queue:** This parameter will contain the dead letter queue name.
    - **Maximum Receives:** This parameter will contain the count after which unsuccessful messages need to be added to the dead letter queue.

2. Queue Listing

Queues can be listed on the home page of AWS SQS. Using this listing page, you can operate on the AWS SQS and see the details of the queue that is configured. (See Figure 3-7.)



Name	Queue Type	Content-Based Deduplication	Messages Available	Messages in Flight	Created
Chapter3SQSQueueName	Standard Queue	N/A	0	0	2016-11-30 16:15:52 GMT+05:30

1 SQS Queue selected

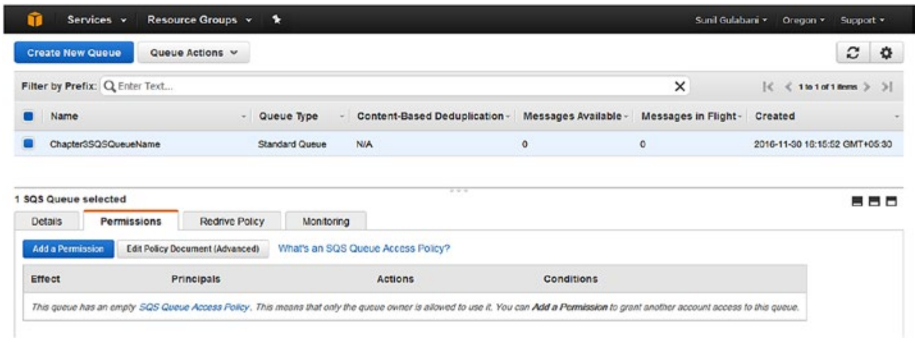
Name:	Chapter3SQSQueueName
URL:	https://sqs.us-west-2.amazonaws.com/[redacted]/Chapter3SQSQueueName
ARN:	arn:aws:sqs:us-west-2:[redacted]:Chapter3SQSQueueName
Created:	2016-11-30 16:15:52 GMT+05:30
Last Updated:	2016-11-30 16:15:52 GMT+05:30
Delivery Delay	0 seconds
Queue Type:	Standard
Content-Based Deduplication:	N/A
Default Visibility Timeout	30 seconds
Message Retention Period	4 days
Maximum Message Size	256 KB
Receive Message Wait Time	0 seconds
Messages Available (Visible):	0
Messages in Flight (Not Visible):	0
Messages Delayed:	0

Figure 3-7. *Queue listing*

3. Configure Queue Permission

When you create a queue, by default only the queue owner can have access to the queue. If you need to provide queue access to another user, you also need to provide the necessary permission.

1. Select the queue from the listing and click the Permissions tab. (See Figure 3-8.)



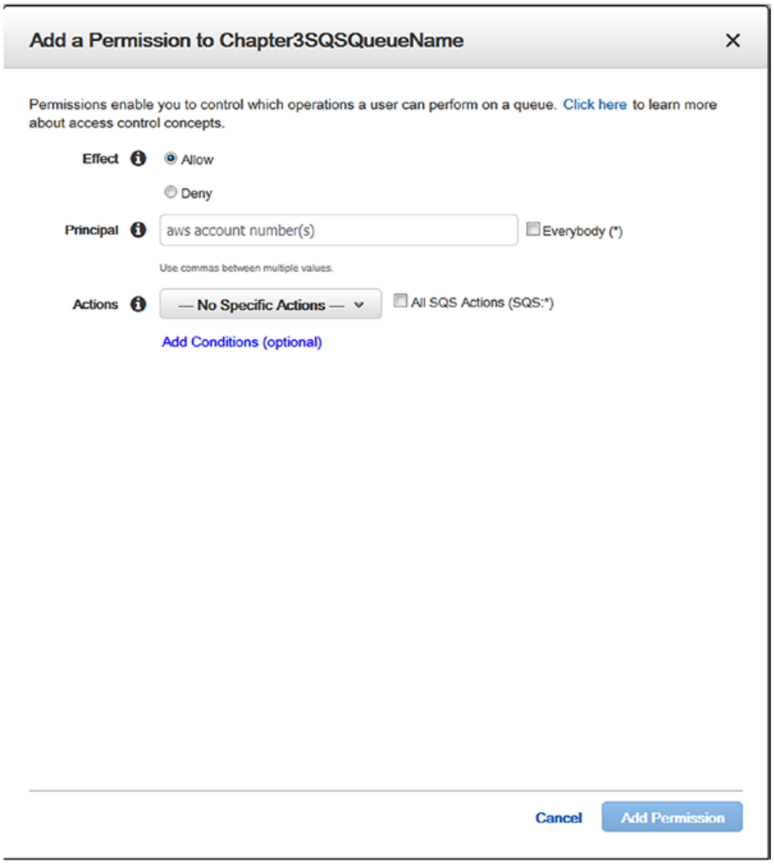
Name	Queue Type	Content-Based Deduplication	Messages Available	Messages in Flight	Created
Chapter3SQSQueueName	Standard Queue	N/A	0	0	2016-11-30 16:15:52 GMT+05:30

1 SQS Queue selected

Effect	Principals	Actions	Conditions
*This queue has an empty SQS Queue Access Policy. This means that only the queue owner is allowed to use it. You can **Add a Permission** to grant another account access to this queue.*			

Figure 3-8. *Queue permissions*

2. This will show the permissions provided to queue. To add permission, click the Add Permission button. (See Figure 3-9.)



Add a Permission to Chapter3SQSQueueName

Permissions enable you to control which operations a user can perform on a queue. Click here to learn more about access control concepts.

Effect: (● Allow) ○ Deny

Principal: aws account number(s) ☐ Everybody (*)

Use commas between multiple values.

Actions: — No Specific Actions — ☐ All SQS Actions (SQS:*)

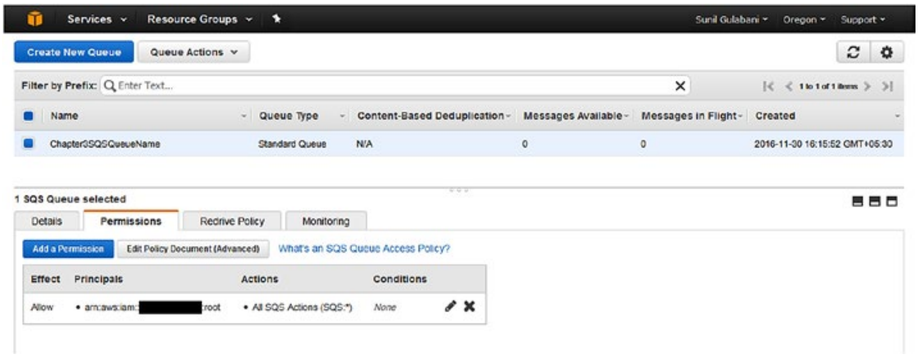
Figure 3-9. *Add queue permissions*

3. You can provide AWS account IDs of the users you want to allow or deny accessing the queue. Actions can include the following:

   - ***:** This will grant all actions on queue.
   - **SendMessage**: This will grant the send message action. This will by default grant SendMessageBatch action.
   - **ReceiveMessage**: This will grant the receive message action.
   - **GetQueueUrl**: This will grant the get queue URL action.

- **GetQueueAttributes**: This will grant the get queue attributes action.
- **DeleteMessage**: This will grant the delete message action. This will by default grant the DeleteMessageBatch action.
- **ChangeMessageVisibility**: This will grant the change message visibility action.

Once you have finished providing AWS account IDs and selected necessary actions, click the Add Permission button. This will create the permission as you can see in Figure 3-10.

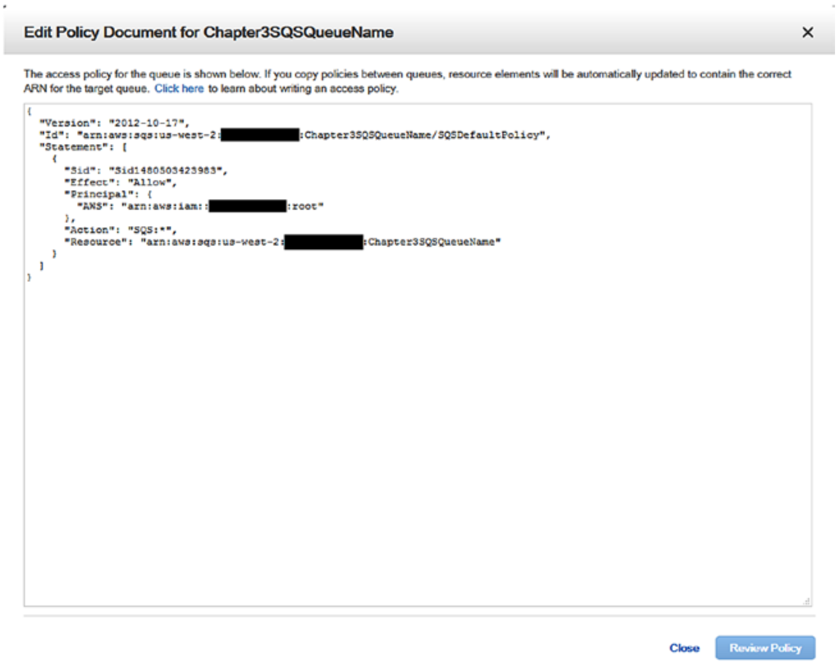


Name	Queue Type	Content-Based Deduplication	Messages Available	Messages in Flight	Created
Chapter3SQSQueueName	Standard Queue	N/A	0	0	2016-11-30 16:15:52 GMT+05:30

Effect	Principals	Actions	Conditions
Allow	• arn:aws:iam:[redacted]:root	• All SQS Actions (SQS:*)	None

Figure 3-10. *Queue permissions added*

4. If you want to edit the permission and edit using policy document, click the Edit Policy Document (Advanced) button. This will open the Edit Policy Document window showing policy for the permissions you provided in the last step. Here you can edit the policy to provide permissions to respective AWS user IDs, actions, and resources (SQS). (See Figure 3-11.)



The access policy for the queue is shown below. If you copy policies between queues, resource elements will be automatically updated to contain the correct ARN for the target queue. Click here to learn about writing an access policy.

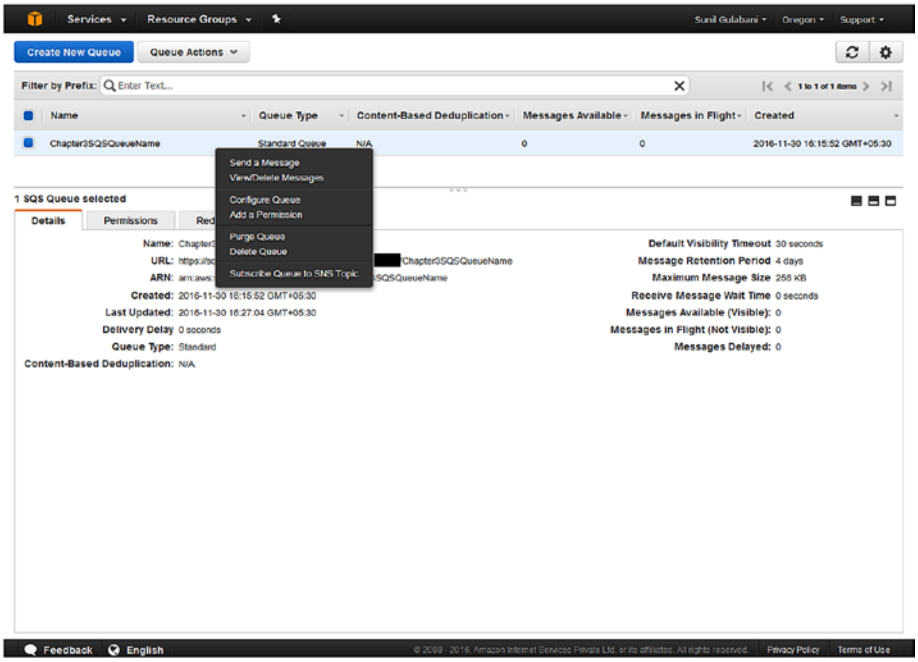
```
{
  "Version": "2012-10-17",
  "Id": "arn:aws:sqs:us-west-2:[redacted]:Chapter3SQSQueueName/SQSDefaultPolicy",
  "Statement": [
    {
      "Sid": "Sid1480503423983",
      "Effect": "Allow",
      "Principal": {
        "AWS": "arn:aws:iam::[redacted]:root"
      },
      "Action": "SQS:*",
      "Resource": "arn:aws:sqs:us-west-2:[redacted]:Chapter3SQSQueueName"
    }
  ]
}
```

Figure 3-11. *Edit queue permissions*

4. Configure Dead Letter Queue

A dead letter queue is used when messages from source queues have not been consumed successfully.

To configure a dead letter queue, select the queue from the listing and right-click it, which will show the options menu. You can also click Queue Actions and select the Configure Queue menu.(See Figure 3-12.)

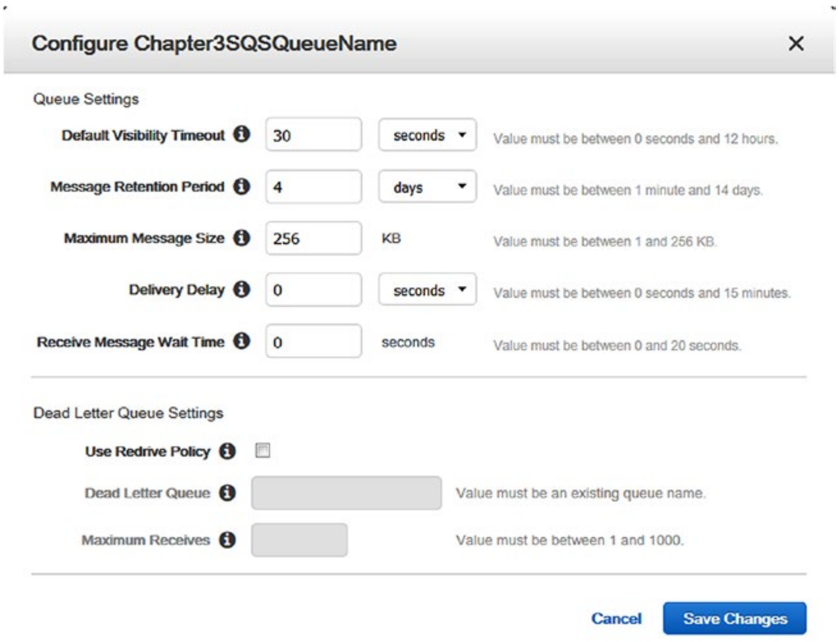


Name	Queue Type	Content-Based Deduplication	Messages Available	Messages in Flight	Created
Chapter3SQSQueueName	Standard Queue	N/A	0	0	2016-11-30 16:15:52 GMT+05:30

Name:	Chapter3
URL:	https://sq [redacted] /Chapter3SQSQueueName
ARN:	arn:aws: SQSQueueName
Created:	2016-11-30 16:15:52 GMT+05:30
Last Updated:	2016-11-30 16:27:04 GMT+05:30
Delivery Delay	0 seconds
Queue Type:	Standard
Content-Based Deduplication:	N/A
Default Visibility Timeout	30 seconds
Message Retention Period	4 days
Maximum Message Size	256 KB
Receive Message Wait Time	0 seconds
Messages Available (Visible):	0
Messages in Flight (Not Visible):	0
Messages Delayed:	0

Figure 3-12. *Queue options*

This will open the Configure Queue window, as shown in Figure 3-13.



Queue Settings

Default Visibility Timeout	30	seconds	Value must be between 0 seconds and 12 hours.
Message Retention Period	4	days	Value must be between 1 minute and 14 days.
Maximum Message Size	256	KB	Value must be between 1 and 256 KB.
Delivery Delay	0	seconds	Value must be between 0 seconds and 15 minutes.
Receive Message Wait Time	0	seconds	Value must be between 0 and 20 seconds.

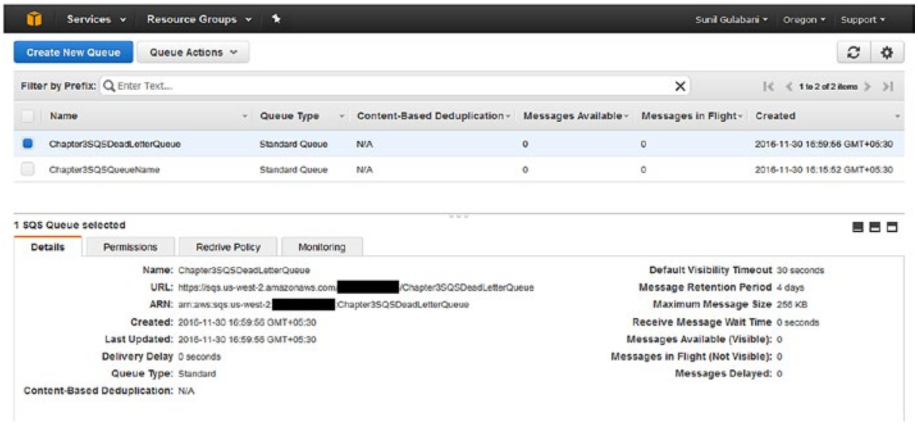
Dead Letter Queue Settings

Use Redrive Policy	☐	
Dead Letter Queue		Value must be an existing queue name.
Maximum Receives		Value must be between 1 and 1000.

Figure 3-13. *Configure queue*

Here you need to enable the check box for "Use Redrive Policy," and you need a dead letter queue that you will create first and then come back to this screen again.

Now you will create the queue that will be used as a dead letter queue. It is mandatory that the queue type for the source queue and the dead letter queue are the same. Figure 3-14 shows the queue that we created with the name "Chapter3SQSDeadLetterQueue."



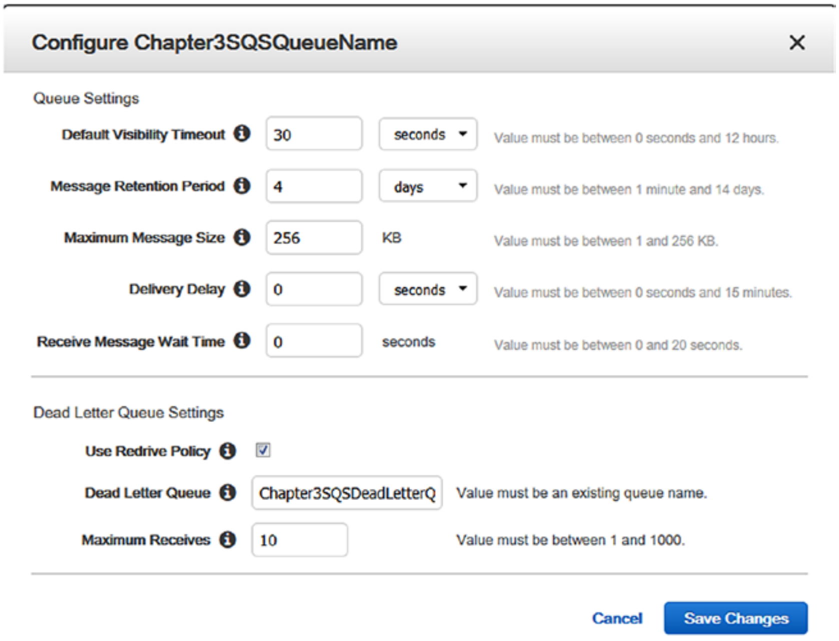
	Name	Queue Type	Content-Based Deduplication	Messages Available	Messages in Flight	Created
■	Chapter3SQSDeadLetterQueue	Standard Queue	N/A	0	0	2016-11-30 16:59:56 GMT+05:30
☐	Chapter3SQSQueueName	Standard Queue	N/A	0	0	2016-11-30 16:15:52 GMT+05:30

1 SQS Queue selected

Name:	Chapter3SQSDeadLetterQueue	Default Visibility Timeout	30 seconds
URL:	https://sqs.us-west-2.amazonaws.com/[redacted]/Chapter3SQSDeadLetterQueue	Message Retention Period	4 days
ARN:	arn:aws:sqs:us-west-2:[redacted]:Chapter3SQSDeadLetterQueue	Maximum Message Size	256 KB
Created:	2016-11-30 16:59:56 GMT+05:30	Receive Message Wait Time	0 seconds
Last Updated:	2016-11-30 16:59:56 GMT+05:30	Messages Available (Visible):	0
Delivery Delay	0 seconds	Messages in Flight (Not Visible):	0
Queue Type:	Standard	Messages Delayed:	0
Content-Based Deduplication:	N/A		

Figure 3-14. *Create dead letter queue*

Open the Configure Queue screen and select the check box for Use Redrive Policy. This will enable the input boxes for Dead Letter Queue and Maximum Receives fields. Enter the dead letter queue name as "Chapter3SQSDeadLetterQueue" and maximum receives as "10." After you have input this information, click the Save Changes button. (See Figure 3-15.)



Configure Chapter3SQSQueueName

Queue Settings

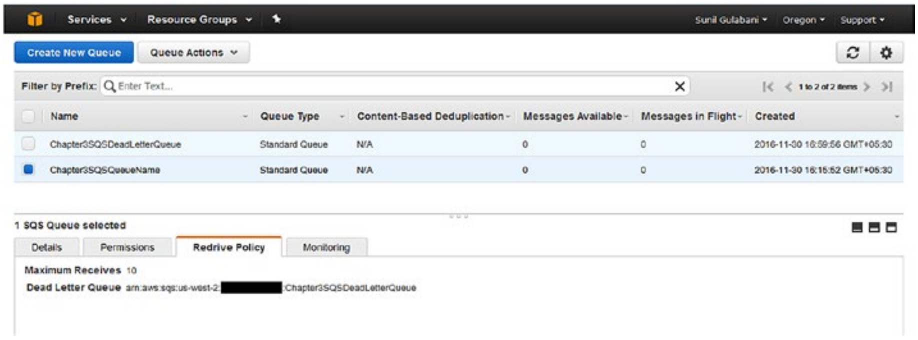
Default Visibility Timeout	30	seconds	Value must be between 0 seconds and 12 hours.
Message Retention Period	4	days	Value must be between 1 minute and 14 days.
Maximum Message Size	256	KB	Value must be between 1 and 256 KB.
Delivery Delay	0	seconds	Value must be between 0 seconds and 15 minutes.
Receive Message Wait Time	0	seconds	Value must be between 0 and 20 seconds.

Dead Letter Queue Settings

Use Redrive Policy	✓	
Dead Letter Queue	Chapter3SQSDeadLetterQ	Value must be an existing queue name.
Maximum Receives	10	Value must be between 1 and 1000.

Figure 3-15. *Configure dead letter queue to source queue*

The redrive policy that we configured can be viewed under the Redrive Policy tab, as shown in Figure 3-16.



	Name	Queue Type	Content-Based Deduplication	Messages Available	Messages in Flight	Created
☐	Chapter3SQSDeadLetterQueue	Standard Queue	N/A	0	0	2016-11-30 16:59:56 GMT+05:30
■	Chapter3SQSQueueName	Standard Queue	N/A	0	0	2016-11-30 16:15:52 GMT+05:30

1 SQS Queue selected

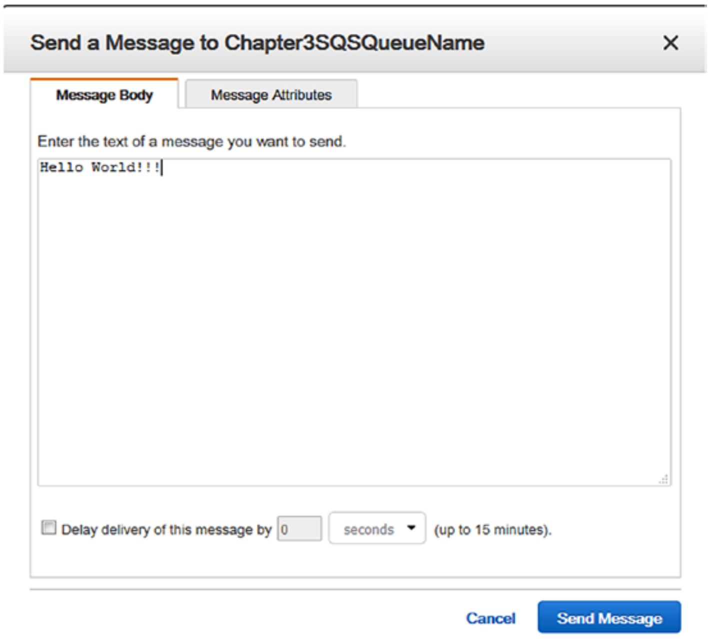
Maximum Receives 10
Dead Letter Queue arn:aws:sqs:us-west-2:[redacted]:Chapter3SQSDeadLetterQueue

Figure 3-16. *Redrive policy tab*

5. Send Message

The Send a Message button is used to deliver messages to the queue.

1. To send a message, choose the queue, right-click, and select Send a Message from menu. This will open the Send a Message screen, as shown in Figure 3-17.



Send a Message to Chapter3SQSQueueName

Message Body | Message Attributes

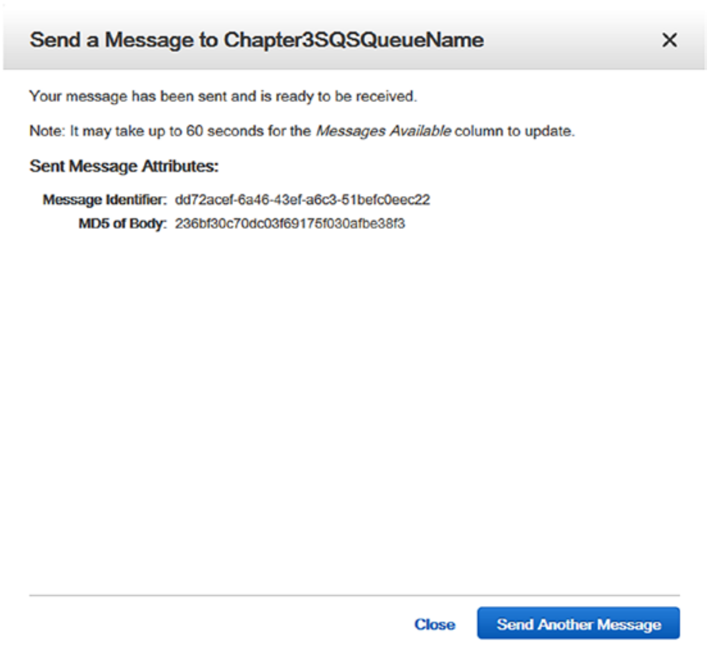
Enter the text of a message you want to send.

```
Hello World!!!
```

☐ Delay delivery of this message by 0 seconds (up to 15 minutes).

Figure 3-17. *Send a Message screen*

2. We added the message body “Hello World!!!” and clicked the Send Message button. (See Figure 3-18.)



Send a Message to Chapter3SQSQueueName

Your message has been sent and is ready to be received.

Note: It may take up to 60 seconds for the *Messages Available* column to update.

Sent Message Attributes:

Message Identifier: dd72acef-6a46-43ef-a6c3-51befc0eec22
MD5 of Body: 236bf30c70dc03f69175f030afbe38f3

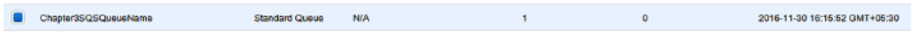
Figure 3-18. *Send message success*

3. The message is successfully sent and you can see the message identifier and MD5 of the body in the success screen.

■ **Note** For more details on MD5, see `https://en.wikipedia.org/wiki/MD5`.

---

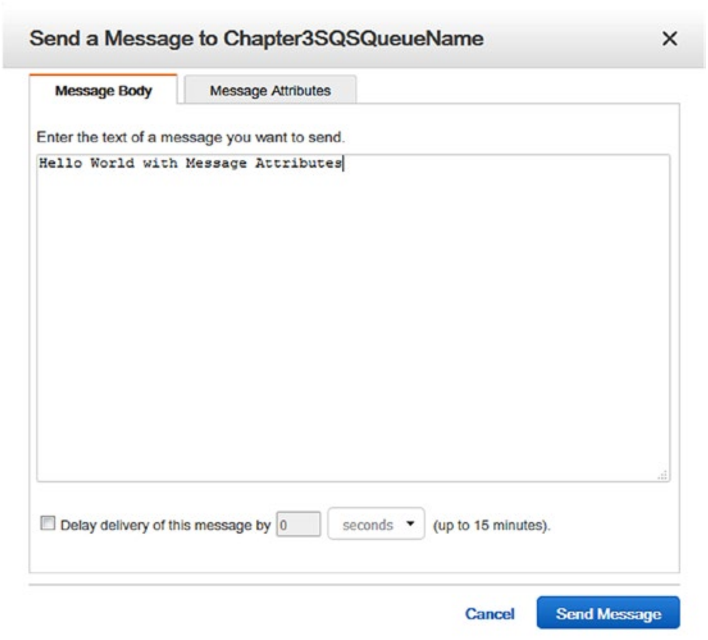
4. On closing the success screen, you can check on the queue listing that message is sent to and see that the "Messages Available" count is shown as 1, as shown in Figure 3-19. Once the message gets consumed, this count will decrease.



Chapter3SQSQueueName	Standard Queue	N/A	1	0	2016-11-30 16:15:52 GMT+05:30

Figure 3-19. *Queue listing with unread message*

5. To send a message along with the message attributes, select the queue, right-click it, and click Send a Message from the menu, as shown in Figure 3-20.

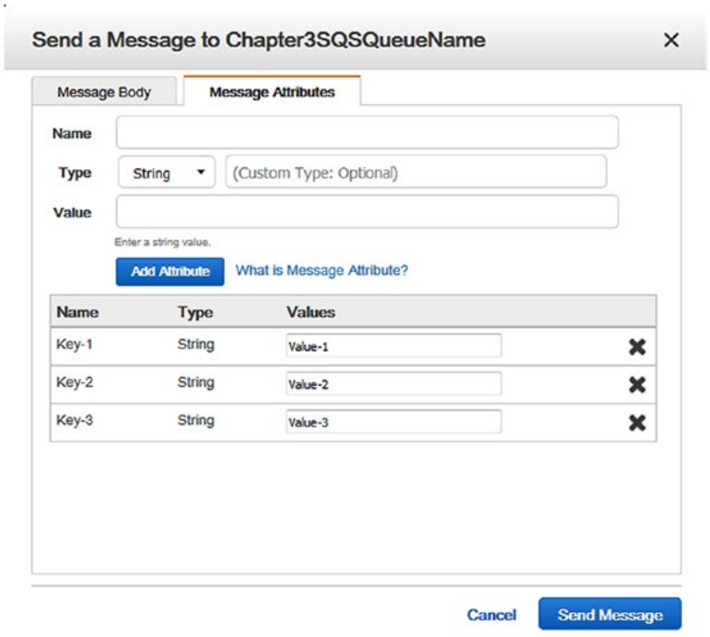

Send a Message to Chapter3SQSQueueName
Message Body
Message Attributes
Enter the text of a message you want to send.
Delay delivery of this message by
seconds
(up to 15 minutes).
Cancel
Send Message

```
Hello World with Message Attributes
```

Delay delivery of this message by 0 seconds (up to 15 minutes).

Figure 3-20. *Send a message with message attributes—1*

6. Add message body as "Hello World with Message Attributes" and click the Message Attributes tab. Now add name, type, and value and click the Add Attribute button. This will add to list of message attributes. Once done, click the Send Message button, as shown in Figure 3-21.



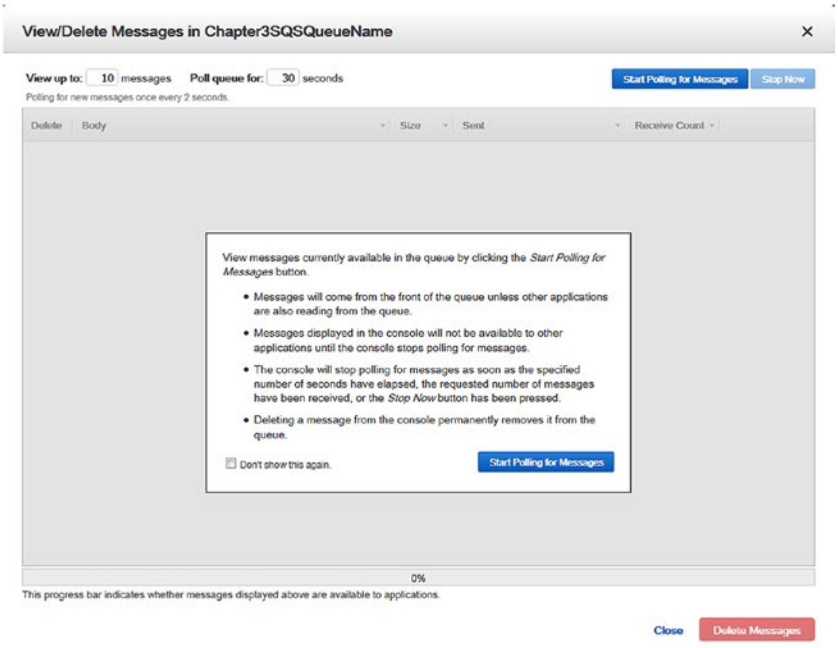
Name	Type	Values
Key-1	String	Value-1
Key-2	String	Value-2
Key-3	String	Value-3

Figure 3-21. *Send message with message attributes—2*

6. Receive Message

Receive Message will retrieve messages from the queue. You can provide the maximum number of messages to retrieve from the queue and the polling time in seconds to determine if any messages are available.

1. To receive messages, select the queue, right-click it, and click View/Delete Messages from the menu, as shown in Figure 3-22.


View/Delete Messages in Chapter3SQSQueueName

View up to: 10 messages Poll queue for: 30 seconds

Polling for new messages once every 2 seconds.

Delete	Body	Size	Sent	Receive Count

View messages currently available in the queue by clicking the *Start Polling for Messages* button.

- Messages will come from the front of the queue unless other applications are also reading from the queue.
- Messages displayed in the console will not be available to other applications until the console stops polling for messages.
- The console will stop polling for messages as soon as the specified number of seconds have elapsed, the requested number of messages have been received, or the *Stop Now* button has been pressed.
- Deleting a message from the console permanently removes it from the queue.

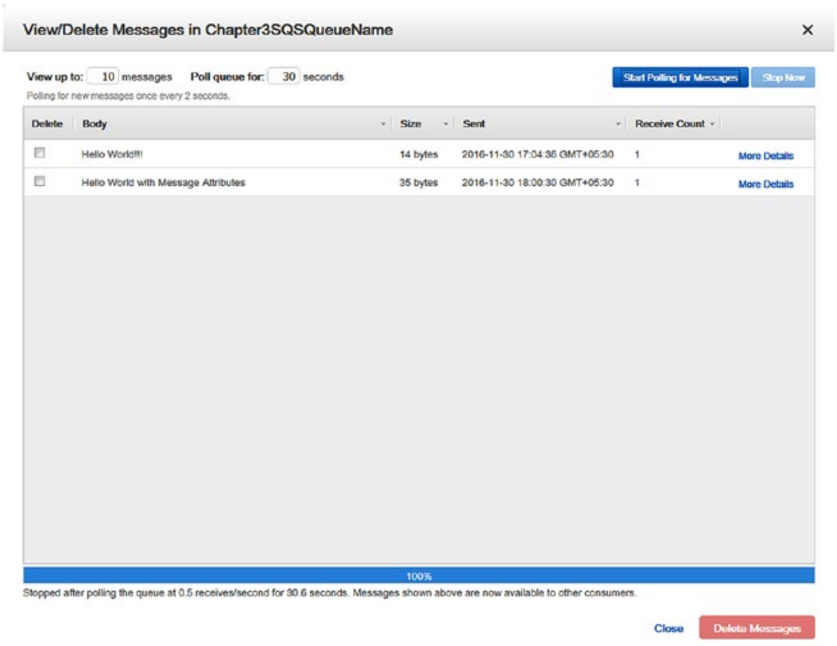
Don't show this again.

0%

This progress bar indicates whether messages displayed above are available to applications.

Figure 3-22. *Receive message*

2. Configure the parameters and click Start Polling for Messages. This action will retrieve messages from the queue. You can explicitly stop the polling or wait for the polling to complete. (See Figure 3-23.)


View/Delete Messages in Chapter3SQSQueueName

View up to: 10 messages Poll queue for: 30 seconds

Polling for new messages once every 2 seconds.

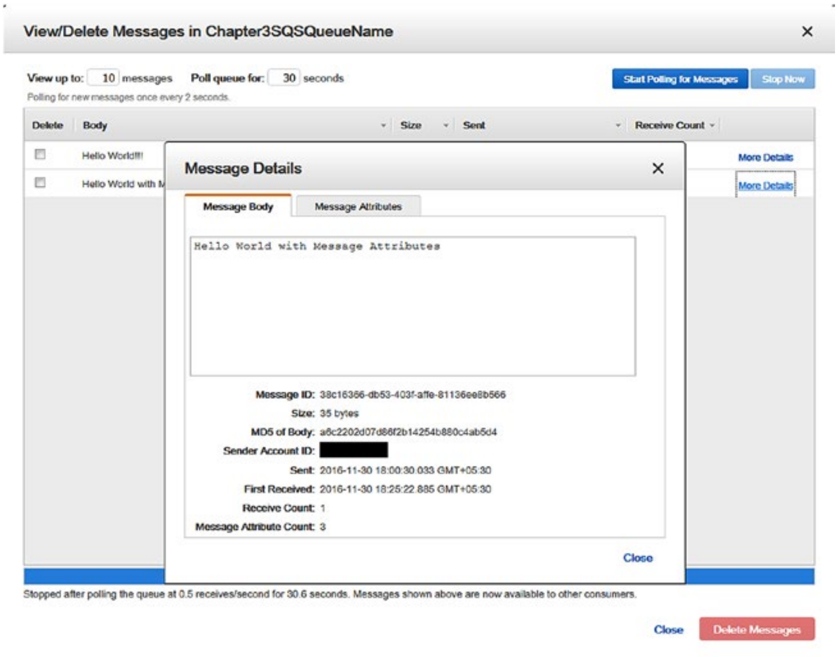
Delete	Body	Size	Sent	Receive Count	
☐	Hello World!!!	14 bytes	2016-11-30 17:04:36 GMT+05:30	1	More Details
☐	Hello World with Message Attributes	35 bytes	2016-11-30 18:00:30 GMT+05:30	1	More Details

100%

Stopped after polling the queue at 0.5 receives/second for 30.6 seconds. Messages shown above are now available to other consumers.

Figure 3-23. *Receive message listing*

3. You can see the two messages have been retrieved. These are the messages we sent in the Send Message section. To view the message attributes, click the More Details link on each message listed. (See Figure 3-24.)


View/Delete Messages in Chapter3SQSQueueName
View up to: 10 messages Poll queue for: 30 seconds
Polling for new messages once every 2 seconds.
Start Polling for Messages
Stop Now
Delete
Body
Size
Sent
Receive Count
Hello World!!!
Hello World with M
More Details
More Details
Message Details
Message Body
Message Attributes
Close
Close
Delete Messages

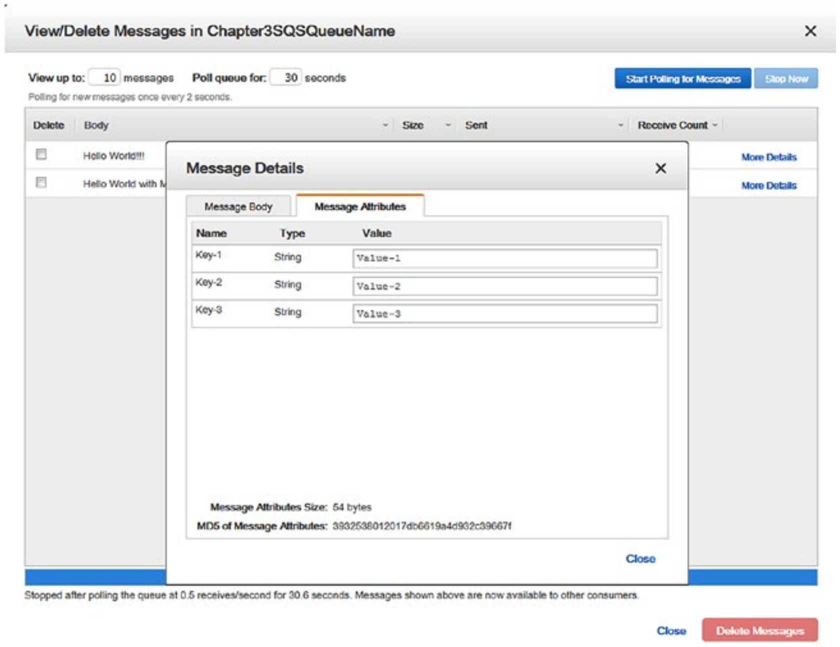
```
Hello World with Message Attributes
```

Message ID: 38c16366-db53-403f-affe-81136ee8b566
Size: 35 bytes
MD5 of Body: a8c2202d07d86f2b14254b880c4ab5d4
Sender Account ID: [redacted]
Sent: 2016-11-30 18:00:30.033 GMT+05:30
First Received: 2016-11-30 18:25:22.885 GMT+05:30
Receive Count: 1
Message Attribute Count: 3

Stopped after polling the queue at 0.5 receives/second for 30.6 seconds. Messages shown above are now available to other consumers.

Figure 3-24. *Received message—more details—1*

4. Find the message body that we have sent and click the Message Attributes tab to see the message attributes that we sent. (See Figure 3-25.)



Name	Type	Value
Key-1	String	Value-1
Key-2	String	Value-2
Key-3	String	Value-3

Message Attributes Size: 54 bytes
MD5 of Message Attributes: 3932538012017db6619a4d932c39667f

Stopped after polling the queue at 0.5 receives/second for 30.6 seconds. Messages shown above are now available to other consumers.

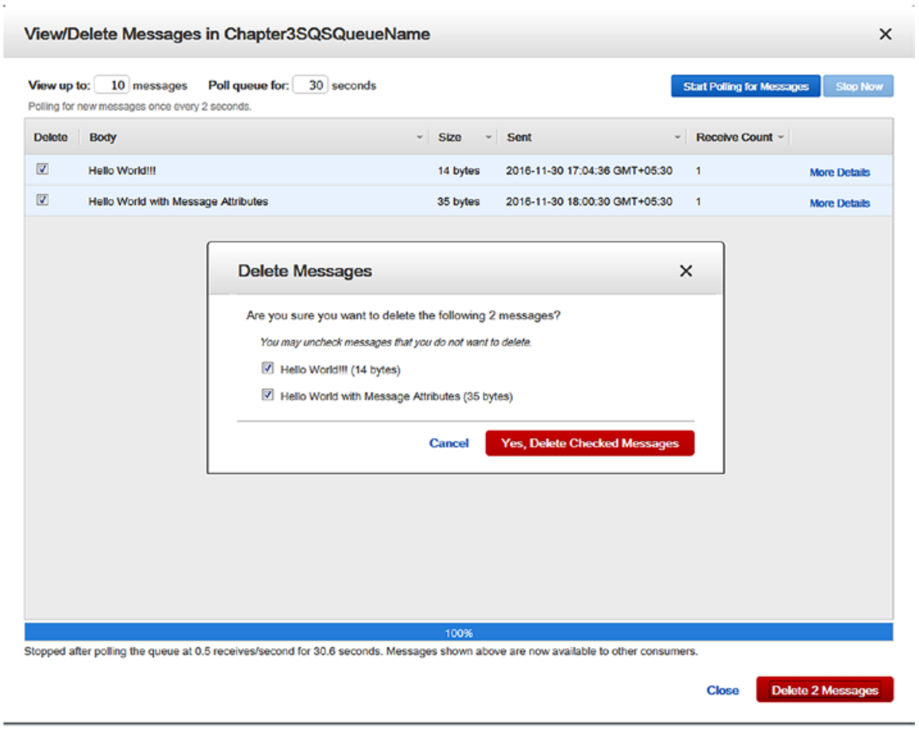
Figure 3-25. *Received message—more details—2*

7. Delete Message

Delete Message will remove messages from the queue. SQS doesn't remove messages automatically when you retrieve messages. You explicitly need to delete messages.

1. When you receive messages, select the check boxes of messages to delete and click the Delete Messages button. This will prompt for confirmation to delete the messages.

2. Click the Yes, Delete Checked Messages button. (See Figure 3-26.)



View/Delete Messages in Chapter3SQSQueueName

View up to: 10 messages Poll queue for: 30 seconds

Polling for new messages once every 2 seconds.

Delete	Body	Size	Sent	Receive Count	
☑	Hello World!!!	14 bytes	2016-11-30 17:04:36 GMT+05:30	1	More Details
☑	Hello World with Message Attributes	35 bytes	2016-11-30 18:00:30 GMT+05:30	1	More Details

Delete Messages

Are you sure you want to delete the following 2 messages?

You may uncheck messages that you do not want to delete.

☑ Hello World!!! (14 bytes)

☑ Hello World with Message Attributes (35 bytes)

100%

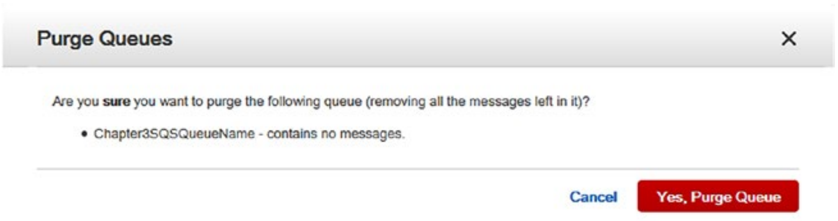
Stopped after polling the queue at 0.5 receives/second for 30.6 seconds. Messages shown above are now available to other consumers.

Figure 3-26. *Delete message*

8. Purge Queue

Purge Queue will delete all messages that are available in the queue. Once you purge the queue, deleted messages can't be retrieved. The deletion process takes nearly 60 seconds.

1. To purge the queue, select the queue, right-click it, and click "Purge Queue" from the menu. This will prompt for confirmation. (See Figure 3-27.)



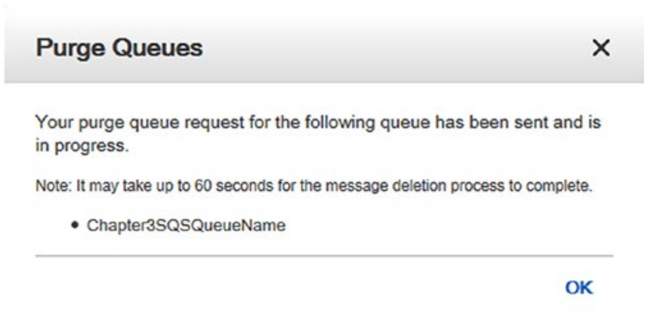
Purge Queues

Are you **sure** you want to purge the following queue (removing all the messages left in it)?

- Chapter3SQSQueueName - contains no messages.

Figure 3-27. *Purge queues*

2. Click the Yes, Purge Queue button, and this will purge the queued messages. You can see the success screen in Figure 3-28.



Your purge queue request for the following queue has been sent and is in progress.

Note: It may take up to 60 seconds for the message deletion process to complete.

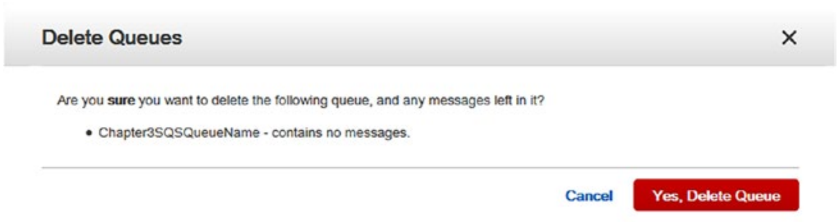
- Chapter3SQSQueueName

Figure 3-28. *Purge queues success*

9. Delete Queue

Delete Queue will delete the queue regardless if the queue is empty or not. The deletion process takes nearly 60 seconds.

1. Select the queue, right-click the queue you want to delete, and click Delete Queue from the menu.
2. Click the Yes, Delete Queue button, and it will delete the queue, as shown in Figure 3-29.



Are you **sure** you want to delete the following queue, and any messages left in it?

- Chapter3SQSQueueName - contains no messages.

Figure 3-29. *Delete queues*

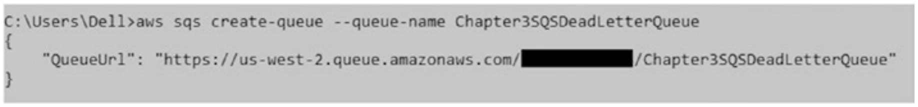
Using AWS CLI

In Chapter 1, I explained how to install AWS CLI. Now I will demonstrate how to use AWS CLI to manage AWS SQS.

create-queue

To create a queue, you need to pass the queue name. The queue name should be unique under the same account. You can create a FIFO queue by providing the `FifoQueue` attribute; otherwise, the queue will be created with standard queue type only. Use the following code to create a queue:

```
>aws sqs create-queue --queue-name Chapter3SQSDeadLetterQueue
```



```
C:\Users\Dell>aws sqs create-queue --queue-name Chapter3SQSDeadLetterQueue
{
    "QueueUrl": "https://us-west-2.queue.amazonaws.com/[redacted]/Chapter3SQSDeadLetterQueue"
}
```

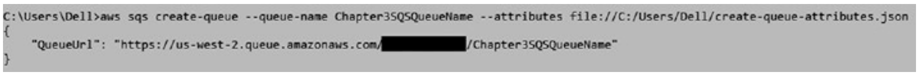
You can see that `"QueueUrl"` is returned for the command. You need to store this for our future use.

To create a queue with specific attributes, add `--attributes` to the command:

```
>aws sqs create-queue --queue-name Chapter3SQSQueueName --attributes
file://C:/Users/Dell/create-queue-attributes.json
```

The created file `create-queue-attributes.json` contains the attribute's name and value in JSON format:

```
{
    "DelaySeconds": "0",
    "MaximumMessageSize": "262144",
    "MessageRetentionPeriod": "1209600",
    "ReceiveMessageWaitTimeSeconds": "0",
    "VisibilityTimeout": "30",
    "Policy": "{\"Version\": \"2012-10-17\", \"Id\":
                \"arn:aws:sqs:us-west-2:YOUR_AWS_ACCOUNT_ID:Chapter3
                SQSQueueName/SQSDefaultPolicy\",
                \"Statement\": [{\"Sid\": \"Sid1465389499769\",
                \"Effect\": \"Allow\",\"Principal\": \"*\",\"Action\":
                \"SQS:*\",\"Resource\": \"arn:aws:sqs:us-west-2:
                YOUR_AWS_ACCOUNT_ID:Chapter3SQSQueueName\"}]}"

}
```



```
C:\Users\Dell>aws sqs create-queue --queue-name Chapter3SQSQueueName --attributes file://C:/Users/Dell/create-queue-attributes.json
{
    "QueueUrl": "https://us-west-2.queue.amazonaws.com/[redacted]/Chapter3SQSQueueName"
}
```

You can also pass the attributes in key-value pair form separated by a comma (,):

```
key1=value,key2=value2 ...
```

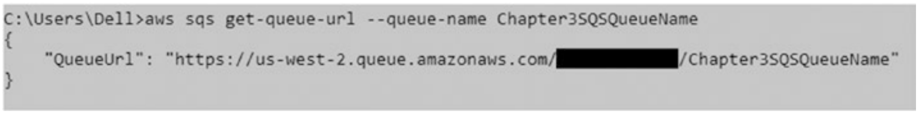
```
>aws sqs create-queue --queue-name Chapter3SQSQueueName --attributes
DelaySeconds=0,MaximumMessageSize=262144
```

■ **Note** For more parameters in detail, refer to `http://docs.amazonaws.cn/cli/latest/reference/sqs/create-queue.html`.

get-queue-url

Using the get-queue-url command, you will be able to get the URL of an existing queue:

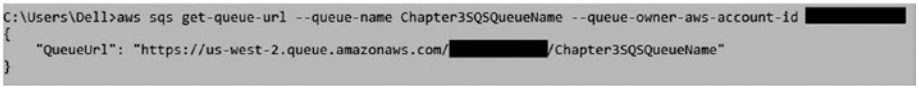
```
>aws sqs get-queue-url --queue-name Chapter3SQSQueueName
```



```
C:\Users\Dell>aws sqs get-queue-url --queue-name Chapter3SQSQueueName
{
    "QueueUrl": "https://us-west-2.queue.amazonaws.com/[redacted]/Chapter3SQSQueueName"
}
```

If you need a queue URL that was created using a different account, you can pass the account ID in the request:

```
>aws sqs get-queue-url --queue-name Chapter3SQSQueueName --queue-owner-aws-
account-id 1234567890
```



```
C:\Users\Dell>aws sqs get-queue-url --queue-name Chapter3SQSQueueName --queue-owner-aws-account-id [redacted]
{
    "QueueUrl": "https://us-west-2.queue.amazonaws.com/[redacted]/Chapter3SQSQueueName"
}
```

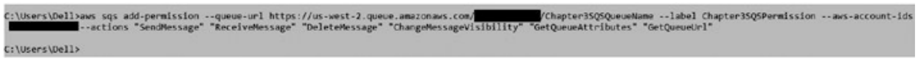
Replace the `1234567890` with an actual AWS account ID using the queue that was created. Make sure the queue has been granted the necessary permission to access it.

■ **Note** For more parameters in detail, refer to `http://docs.amazonaws.cn/cli/latest/reference/sqs/get-queue-url.html`.

add-permission

This command provides access to the queue. By default, the queue owner has all controls to a queue. If different users need to access the queue, permission must be provided to them.

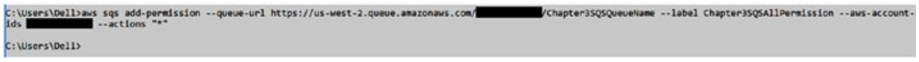
```
>aws sqs add-permission --queue-url https://us-west-2.queue.
amazonaws.com/YOUR_AWS_ACCOUNT_ID/Chapter3SQSQueueName --label
Chapter3SQSPermission --aws-account-ids YOUR_AWS_ACCOUNT_ID --actions
"SendMessage" "ReceiveMessage" "DeleteMessage" "ChangeMessageVisibility"
"GetQueueAttributes" "GetQueueUrl"
```



```
C:\Users\Dell>aws sqs add-permission --queue-url https://us-west-2.queue.amazonaws.com/[redacted]/Chapter3SQSQueueName --label Chapter3SQSPermission --aws-account-ids
[redacted]--actions "SendMessage" "ReceiveMessage" "DeleteMessage" "ChangeMessageVisibility" "GetQueueAttributes" "GetQueueUrl"

C:\Users\Dell>
```

You can provide a list of account IDs and different queue actions to grant access. There won't be any output for this request. To provide all actions available, you can also provide "*":

```
>aws sqs add-permission --queue-url https://us-west-2.queue.amazonaws.com/
YOUR_AWS_ACCOUNT_ID/Chapter3SQSQueueName --label Chapter3SQSAllPermission
--aws-account-ids YOUR_AWS_ACCOUNT_ID --actions "*"
```



```
C:\Users\Dell>aws sqs add-permission --queue-url https://us-west-2.queue.amazonaws.com/[redacted]/Chapter3SQSQueueName --label Chapter3SQSAllPermission --aws-account-
ids [redacted] --actions "*"

C:\Users\Dell>
```

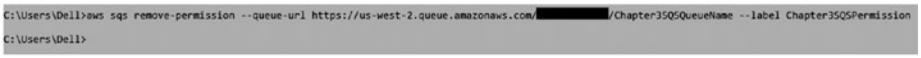
■ **Note** For more parameters in detail, refer to http://docs.amazonaws.cn/cli/latest/reference/sqs/add-permission.html.

---

remove-permission

This command will remove the permission from the queue based on the label provided in the request:

```
>aws sqs remove-permission --queue-url https://us-west-2.queue.amazonaws.
com/YOUR_AWS_ACCOUNT_ID/Chapter3SQSQueueName --label Chapter3SQSPermission
```



```
C:\Users\Dell>aws sqs remove-permission --queue-url https://us-west-2.queue.amazonaws.com/[redacted]/Chapter3SQSQueueName --label Chapter3SQSPermission

C:\Users\Dell>
```

There won't be any output for this request. The "get-queue-attributes" section shows how to get the list of permissions.

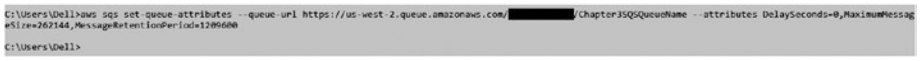
■ **Note** For more parameters in detail, refer to http://docs.amazonaws.cn/cli/latest/reference/sqs/remove-permission.html.

---

set-queue-attributes

The set-queue-attributes command sets the queue attributes values. You can provide attributes either in key value form separated by a comma (,) or in a JSON format:

```
>aws sqs set-queue-attributes --queue-url https://us-west-2.queue.amazonaws.
com/YOUR_AWS_ACCOUNT_ID/Chapter3SQSQueueName --attributes DelaySeconds=0,Max
imumMessageSize=262144,MessageRetentionPeriod=1209600
```



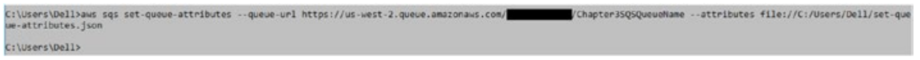
```
C:\Users\Dell>aws sqs set-queue-attributes --queue-url https://us-west-2.queue.amazonaws.com/[redacted]/Chapter3SQSQueueName --attributes DelaySeconds=0,MaximumMessag
eSize=262144,MessageRetentionPeriod=1209600

C:\Users\Dell>
```

When queue attributes are changed, it takes 60 seconds to go into effect. The `MessageRetentionPeriod` attribute may take 15 minutes to go into effect:

```
>aws sqs set-queue-attributes --queue-url https://us-west-2.queue.amazonaws.
com/YOUR_AWS_ACCOUNT_ID/Chapter3SQSQueueName --attributes file://C:/Users/
Dell/set-queue-attributes.json
```

File:set-queue-attributes.json

```
{
    "DelaySeconds": "0",
    "MaximumMessageSize": "262144",
    "MessageRetentionPeriod": "1209600",
    "ReceiveMessageWaitTimeSeconds": "0",
    "VisibilityTimeout": "30",
    "Policy": "{\"Version\": \"2012-10-17\", \"Id\":
                \"arn:aws:sqs:us-west-2:YOUR_AWS_ACCOUNT_
                ID:Chapter3SQSQueueName/SQSDefaultPolicy\",
                \"Statement\": [{\"Sid\": \"Sid1465389499769\",\"Effect\":
                \"Allow\",\"Principal\": \"*\",\"Action\":\"SQS:*\",
                \"Resource\": \"arn:aws:sqs:us-west-2:YOUR_AWS_ACCOUNT_
                ID:Chapter3SQSQueueName\"}]}",
     "RedrivePolicy": "{\"maxReceiveCount\":\"10\",
                        \"deadLetterTargetArn\":\"arn:aws:sqs:
                        us-west-2:YOUR_AWS_ACCOUNT_ID:Chapter3SQSDeadLetter
                        Queue\"}"
}
```



```
C:\Users\Dell>aws sqs set-queue-attributes --queue-url https://us-west-2.queue.amazonaws.com/[redacted]/Chapter3SQSQueueName --attributes file://C:/Users/Dell/set-que
ue-attributes.json

C:\Users\Dell>
```

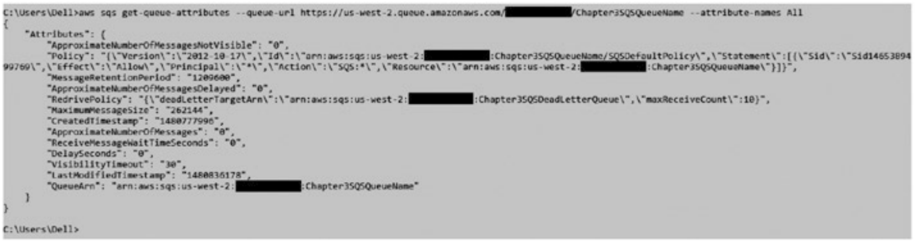
■ **Note** For more parameters in detail, refer to `http://docs.amazonaws.cn/cli/latest/reference/sqs/set-queue-attributes.html`.

---

get-queue-attributes

The get-queue-attributes command provides the queue attributes:

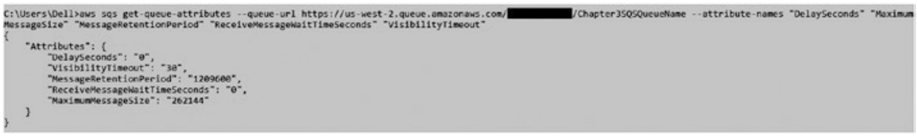
```
>aws sqs get-queue-attributes --queue-url https://us-west-2.queue.amazonaws.
com/YOUR_AWS_ACCOUNT_ID/Chapter3SQSQueueName --attribute-names All
```



```
C:\Users\Dell>aws sqs get-queue-attributes --queue-url https://us-west-2.queue.amazonaws.com/[redacted]/Chapter3SQSQueueName --attribute-names All
{
    "Attributes": {
        "ApproximateNumberOfMessagesNotVisible": "0",
        "Policy": "{\"Version\":\"2012-10-17\",\"Id\":\"arn:aws:sqs:us-west-2:[redacted]:Chapter3SQSQueueName/SQSDefaultPolicy\",\"Statement\":[{\"Sid\":\"Sid14653894
99769\",\"Effect\":\"Allow\",\"Principal\":\"*\",\"Action\":\"SQS:*\",\"Resource\":\"arn:aws:sqs:us-west-2:[redacted]:Chapter3SQSQueueName\"}]}",
        "MessageRetentionPeriod": "1209600",
        "ApproximateNumberOfMessagesDelayed": "0",
        "RedrivePolicy": "{\"deadLetterTargetArn\":\"arn:aws:sqs:us-west-2:[redacted]:Chapter3SQSDeadLetterQueue\",\"maxReceiveCount\":10}",
        "MaximumMessageSize": "262144",
        "CreatedTimestamp": "1480777996",
        "ApproximateNumberOfMessages": "0",
        "ReceiveMessageWaitTimeSeconds": "0",
        "DelaySeconds": "0",
        "VisibilityTimeout": "30",
        "LastModifiedTimestamp": "1480836178",
        "QueueArn": "arn:aws:sqs:us-west-2:[redacted]:Chapter3SQSQueueName"
    }
}

C:\Users\Dell>
```

To only get specific attributes, you can pass the attribute name in the request:

```
>aws sqs get-queue-attributes --queue-url https://us-west-2.queue.
amazonaws.com/YOUR_AWS_ACCOUNT_ID/Chapter3SQSQueueName --attribute-
names "DelaySeconds" "MaximumMessageSize" "MessageRetentionPeriod"
"ReceiveMessageWaitTimeSeconds" "VisibilityTimeout"
```



```
C:\Users\Dell>aws sqs get-queue-attributes --queue-url https://us-west-2.queue.amazonaws.com/[redacted]/Chapter3SQSQueueName --attribute-names "DelaySeconds" "Maximum
MessageSize" "MessageRetentionPeriod" "ReceiveMessageWaitTimeSeconds" "VisibilityTimeout"
{
    "Attributes": {
        "DelaySeconds": "0",
        "VisibilityTimeout": "30",
        "MessageRetentionPeriod": "1209600",
        "ReceiveMessageWaitTimeSeconds": "0",
        "MaximumMessageSize": "262144"
    }
}
```

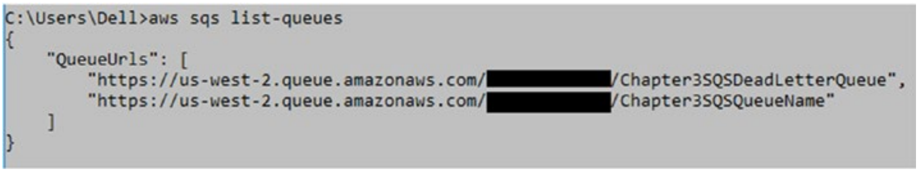
■ **Note** For more parameters in detail, refer to `http://docs.amazonaws.cn/cli/latest/reference/sqs/get-queue-attributes.html`.

---

list-queues

The list-queues command provides the list of all queues available:

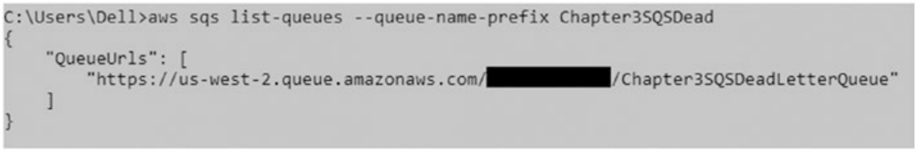
```
>aws sqs list-queues
```



```
C:\Users\Dell>aws sqs list-queues
{
    "QueueUrls": [
        "https://us-west-2.queue.amazonaws.com/[redacted]/Chapter3SQSDeadLetterQueue",
        "https://us-west-2.queue.amazonaws.com/[redacted]/Chapter3SQSQueueName"
    ]
}
```

The maximum number of queues returned is 1000. If you want to search a queue based on the prefix, use the following command:

```
>aws sqs list-queues --queue-name-prefix Chapter3SQSDead
```



```
C:\Users\Dell>aws sqs list-queues --queue-name-prefix Chapter3SQSDead
{
    "QueueUrls": [
        "https://us-west-2.queue.amazonaws.com/[redacted]/Chapter3SQSDeadLetterQueue"
    ]
}
```

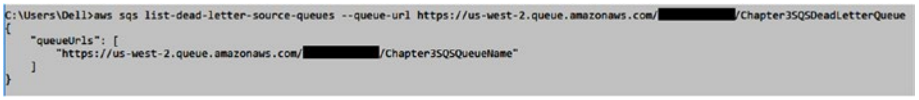
■ **Note** For more parameters in detail, refer to http://docs.amazonaws.cn/cli/latest/reference/sqs/list-queues.html.

---

list-dead-letter-source-queues

This command provides a list of source queues whose RedrivePolicy has been configured with this dead letter queue:

```
>aws sqs list-dead-letter-source-queues --queue-url https://us-west-2.queue.
amazonaws.com/YOUR_AWS_ACCOUNT_ID/Chapter3SQSDeadLetterQueue
```



```
C:\Users\Dell>aws sqs list-dead-letter-source-queues --queue-url https://us-west-2.queue.amazonaws.com/[redacted]/Chapter3SQSDeadLetterQueue
{
    "queueUrls": [
        "https://us-west-2.queue.amazonaws.com/[redacted]/Chapter3SQSQueueName"
    ]
}
```

Figure 3-30. List Dead Letter Source Queues

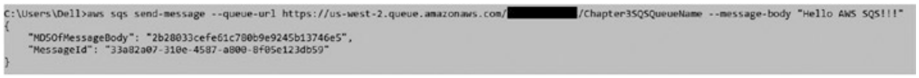
■ **Note** For more parameters in detail, refer to http://docs.amazonaws.cn/cli/latest/reference/sqs/list-dead-letter-source-queues.html.

---

send-message

This will send message to a queue.

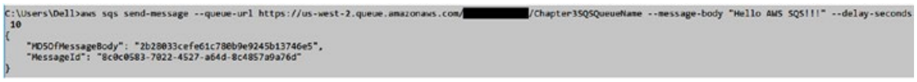
```
>aws sqs send-message --queue-url https://us-west-2.queue.amazonaws.com/
YOUR_AWS_ACCOUNT_ID/Chapter3SQSQueueName --message-body "Hello AWS SQS!!!"
```



```
C:\Users\Dell>aws sqs send-message --queue-url https://us-west-2.queue.amazonaws.com/[redacted]/Chapter3SQSQueueName --message-body "Hello AWS SQS!!!"
{
    "MD5OfMessageBody": "2b28033cefe61c780b9e9245b13746e5",
    "MessageId": "33a82a07-310e-4587-a800-8f05e123db59"
}
```

You can also delay the message by n seconds by using --delay-seconds parameter as:

```
>aws sqs send-message --queue-url https://us-west-2.queue.amazonaws.com/
YOUR_AWS_ACCOUNT_ID/Chapter3SQSQueueName --message-body "Hello AWS SQS!!!"
--delay-seconds 10
```



```
C:\Users\Dell>aws sqs send-message --queue-url https://us-west-2.queue.amazonaws.com/[redacted]/Chapter3SQSQueueName --message-body "Hello AWS SQS!!!" --delay-seconds
 10
{
    "MD5OfMessageBody": "2b28033cefe61c780b9e9245b13746e5",
    "MessageId": "8c0c0583-7022-4527-a64d-8c4857a9a76d"
}
```

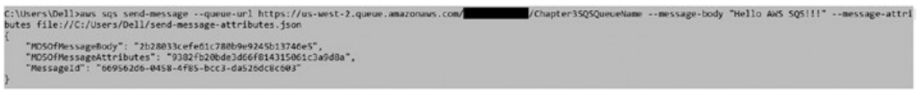
■ **Note** This delay second parameter won't be applicable on FIFO queue types. To apply delay, you need to configure it at queue level instead of at a message level.

You can also add attributes having different data type while sending messages:

```
>aws sqs send-message --queue-url https://us-west-2.queue.amazonaws.com/
YOUR_AWS_ACCOUNT_ID/Chapter3SQSQueueName --message-body "Hello AWS SQS!!!"
--message-attributes file://C:/Users/Dell/send-message-attributes.json
```

File: send-message-attributes.json

```
{
    "Chapter": {
            "DataType": "String",
            "StringValue": "2"
    },
    "Environment": {
            "DataType": "Binary",
            "BinaryValue": "Production!"
    }
}
```



```
C:\Users\Dell>aws sqs send-message --queue-url https://us-west-2.queue.amazonaws.com/[redacted]/Chapter3SQSQueueName --message-body "Hello AWS SQS!!!" --message-attri
butes file://C:/Users/Dell/send-message-attributes.json
{
    "MD5OfMessageBody": "2b28033cefe61c780b9e9245b13746e5",
    "MD5OfMessageAttributes": "9382fb20bde3d66f814315061c3a9d8a",
    "MessageId": "669562d6-0458-4f85-bcc3-da526dc8c603"
}
```

■ **Note** For more parameters in detail, refer to `http://docs.amazonaws.cn/cli/latest/reference/sqs/send-message.html`.

---

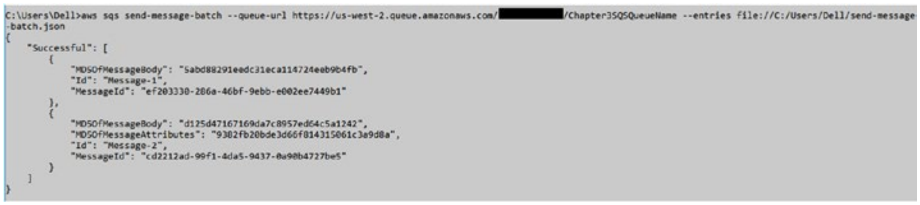
send-message-batch

This command enables sending messages in batches. The maximum number of messages that can be sent is 10 messages per batch:

```
>aws sqs send-message-batch --queue-url https://us-west-2.queue.amazonaws.
com/YOUR_AWS_ACCOUNT_ID/Chapter3SQSQueueName --entries file://C:/Users/Dell/
send-message-batch.json
```

File: send-message-batch.json

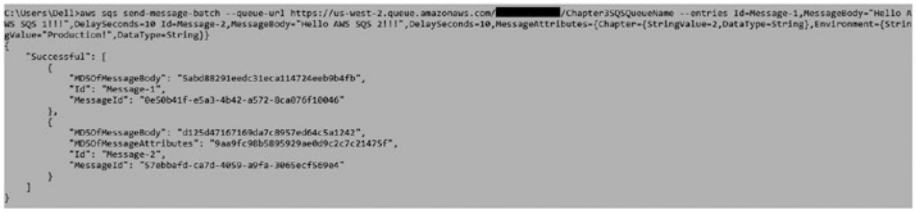
```
[{
        "Id": "Message-1",
        "MessageBody": "Hello AWS SQS 1!!!",
        "DelaySeconds": 10
}, {
        "Id": "Message-2",
        "MessageBody": "Hello AWS SQS 2!!!",
        "DelaySeconds": 10,
        "MessageAttributes": {
                "Chapter": {
                        "DataType": "String",
                        "StringValue": "2"
                },
                "Environment": {
                        "DataType": "Binary",
                        "BinaryValue": "Production!"
                }
        }
}]
```



```
C:\Users\Dell>aws sqs send-message-batch --queue-url https://us-west-2.queue.amazonaws.com/[redacted]/Chapter3SQSQueueName --entries file://C:/Users/Dell/send-message
-batch.json
{
    "Successful": [
        {
            "MD5OfMessageBody": "5abd88291eedc31eca114724eeb9b4fb",
            "Id": "Message-1",
            "MessageId": "ef203330-286a-46bf-9ebb-e002ee7449b1"
        },
        {
            "MD5OfMessageBody": "d125d47167169da7c8957ed64c5a1242",
            "MD5OfMessageAttributes": "9382fb20bde3d66f814315061c3a9d8a",
            "Id": "Message-2",
            "MessageId": "cd2212ad-99f1-4da5-9437-0a98b4727be5"
        }
    ]
}
```

You can also pass message lists inline. Different messages are separated by a space, and each message has several properties such as `Id`, `MessageBody`, `DelaySeconds`, and `MessageAttributes`:

```
>aws sqs send-message-batch --queue-url https://us-west-2.queue.amazonaws.com/
YOUR_AWS_ACCOUNT_ID/Chapter3SQSQueueName --entries Id=Message-1,MessageBody=
"Hello AWS SQS 1!!!",DelaySeconds=10 Id=Message-2,MessageBody="Hello AWS SQS
2!!!",DelaySeconds=10,MessageAttributes={Chapter={StringValue=2,DataType=String},
Environment={StringValue="Production!",DataType=String}
```



```
C:\Users\Dell>aws sqs send-message-batch --queue-url https://us-west-2.queue.amazonaws.com/[redacted]/Chapter3SQSQueueName --entries Id=Message-1,MessageBody="Hello A
WS SQS 1!!!",DelaySeconds=10 Id=Message-2,MessageBody="Hello AWS SQS 2!!!",DelaySeconds=10,MessageAttributes={Chapter={StringValue=2,DataType=String},Environment={Strin
gValue="Production!",DataType=String}}
{
    "Successful": [
        {
            "MD5OfMessageBody": "5abd88291eedc31eca114724eeb9b4fb",
            "Id": "Message-1",
            "MessageId": "0e50b41f-e5a3-4b42-a572-8ca076f10046"
        },
        {
            "MD5OfMessageBody": "d125d47167169da7c8957ed64c5a1242",
            "MD5OfMessageAttributes": "9aa9fc98b5895929ae0d9c2c7c21475f",
            "Id": "Message-2",
            "MessageId": "57ebbafd-ca7d-4059-a9fa-3065ecf56904"
        }
    ]
}
```

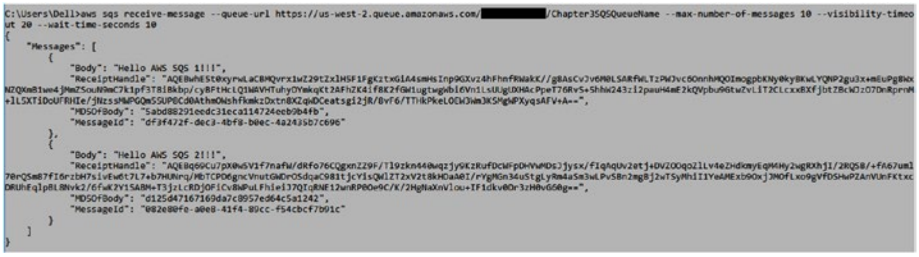
■ **Note** For more parameters in detail, refer to http://docs.amazonaws.cn/cli/latest/reference/sqs/send-message-batch.html.

---

receive-message

This command receives messages from a queue. The maximum number of messages that can be received per request is 10 and the maximum number of default messages is 1:

```
>aws sqs receive-message --queue-url https://us-west-2.queue.amazonaws.
com/YOUR_AWS_ACCOUNT_ID/Chapter3SQSQueueName --max-number-of-messages 10
--visibility-timeout 20 --wait-time-seconds 10
```



```
C:\Users\Dell>aws sqs receive-message --queue-url https://us-west-2.queue.amazonaws.com/[redacted]/Chapter3SQSQueueName --max-number-of-messages 10 --visibility-timeo
ut 20 --wait-time-seconds 10
{
    "Messages": [
        {
            "Body": "Hello AWS SQS 1!!!",
            "ReceiptHandle": "AQEBwhESt0xyrwLaCBMQvrx1wZ29tZxlHSF1FgKztxGlA4smHsInp9GXvz4hFhnfRWakK//g8AsCvJv6M0LSARfWLTzPWJvc6OnnhMQOImogpbKNy0kyBKwLYQNP2gu3x+mEuPg8Wx
NZQXm81we4jMmZSouN9mC7k1pf3T8iBkbp/cyBFtHcLQ1WAVHTuhyDYmkqKt2AFhZK4if8K2fGW1ugtwgWbl6Vn1LsUUgUXHAcPpeT76RvS+5hhW243zi2pauH4mE2kQVpbu96twZvLiT2CLcxxBXfjbtZBcWJzO7DnRprnM
+lL5XTiDoUFRHIe/jNzssMWPGQm5SUP0Cd0AthmOWshfkmkzDxtn8XZqWDCeatsgi2jR/8vF6/TTHkPkeLOCWJWmJKSMgWPXyqsAFV+A==",
            "MD5OfBody": "5abd88291eedc31eca114724eeb9b4fb",
            "MessageId": "df3f472f-dec3-4bf8-b0ec-4a2435b7c696"
        },
        {
            "Body": "Hello AWS SQS 2!!!",
            "ReceiptHandle": "AQEBq69Cu7pX0w5V1f7nafW/dRfo76CQgxnZ29F/Tl9zkn440wqzjy9KzRufDcWFpDHVwMDsJjysx/fIqAqUv2etj+DVZOOqo2lLv4eZHdkmyEqMHy2wgRXhjI/2RQS8/+fA67uml
70rQSm87fI6rzbH7sivEw6t7L7+b7HUNrq/MbTCPD6gncVnutGWDrOSdqaC981tjcYisQWlZT2xV2t8kHDaA0I/rYgMGn34uStgLyRm4aSm3wLPvSBn2mgBj2wTSyMhiI1YeAMExb9OxjJMOfLxo9gVfDSHwPZAnVUnFKtxc
DRUhFqlp8L8Nvk2/6fwK2Y15ABM+T3jzLcRDjOFiCv8WPuLFhieiJ7QIqRNF12wnRP0Oe9C/K/2HgNaXnVlou+IF1dkv0Or3zH0vG60g==",
            "MD5OfBody": "d125d47167169da7c8957ed64c5a1242",
            "MessageId": "082e80fe-a0e8-41f4-89cc-f54cbcf7b91c"
        }
    ]
}
```

The visibility timeout parameter hides the message for a number of seconds specified by other requests. The wait-time seconds parameter waits for the specified time to receive messages from the queue.

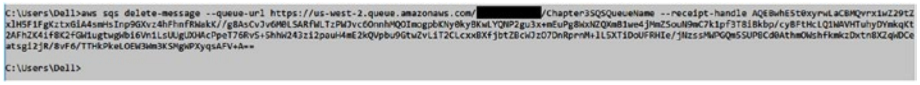
■ **Note** For more parameters in detail, refer to http://docs.amazonaws.cn/cli/latest/reference/sqs/receive-message.html.

---

delete-message

This command deletes messages from the queue. You need to pass the receipt handle of the message received:

```
>aws sqs delete-message --queue-url https://us-west-2.queue.amazonaws.
com/YOUR_AWS_ACCOUNT_ID/Chapter3SQSQueueName --receipt-handle
AQEBwhE5tOxyrwLaCBMQv......gWPXyqsAFV+A==
```



```
C:\Users\Dell>aws sqs delete-message --queue-url https://us-west-2.queue.amazonaws.com/[redacted]/Chapter3SQSQueueName --receipt-handle AQEBwhE5t0xyrwLaCBMQvrx1wZ29tZ
xlHSF1FgKztxGlA4smHsInp9GXvz4hFhnfRWakK//g8AsCvJv6M0LSARfWLTzPWJvc6OnnhMQOImogpbKNy0kyBKwLYQNP2gu3x+mEuPg8WxNZQXmB1we4jMmZSouN9mC7k1pf3T8lBkbp/cyBFtHcLQ1WAVHTuhyDYmkqKt
2AFhZK4if8K2fGW1ugtwgWbi6Vn1LsUUgUXHAcPpeT76RvS+ShhW243zi2pauH4mE2kQVpbu9GtwZvLiT2CLcxxBXfjbtZBcWJzO7DnRprnM+lL5XTiDoUFRHIe/jNzssMWPGQm5SUP8Cd0AthmOWshfkmkzDxtn8XZqWDCe
atsgi2jR/8vF6/TTHkPkeLOEW3Wm3KSMgWPXyqsAFV+A==

C:\Users\Dell>
```

There won't be any output for this request.

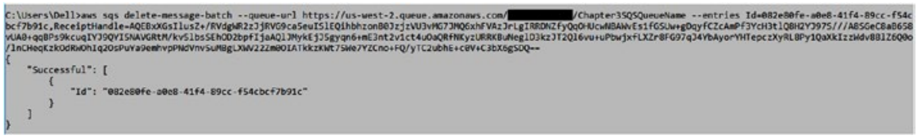
■ **Note** For more parameters in detail, refer to `http://docs.amazonaws.cn/cli/latest/reference/sqs/delete-message.html`.

---

delete-message-batch

The delete-message-batch command deletes the messages in a batch of 10 messages. Each deleted message will have a response in output:

```
>aws sqs delete-message-batch --queue-url https://us-west-2.queue.amazonaws.
com/YOUR_AWS_ACCOUNT_ID/Chapter3SQSQueueName --entries Id=082e80fe-a0e8-
41f4-89cc-f54cbcf7b91c,ReceiptHandle=AQEBxXGsIlusZ.....C3bX6gSDQ==
```



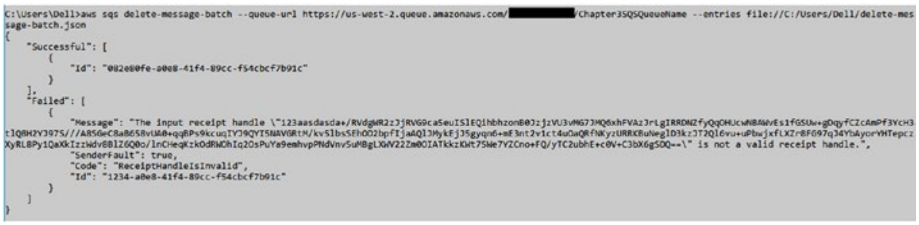
```
C:\Users\Dell>aws sqs delete-message-batch --queue-url https://us-west-2.queue.amazonaws.com/[redacted]/Chapter3SQSQueueName --entries Id=082e80fe-a0e8-41f4-89cc-f54c
bcf7b91c,ReceiptHandle=AQEBxXGsIlusZ+/RVdgWR2zJjRVG9ca5euIS1EQihbhzonB0JzjzVU3vMG7JMQ6xhFVAzJrLgIRRDNZfyQqOHUcwNBAWvEs1fGSUw+gDqyfCZcAmPf3YcH3tlQ8H2YJ97S///A8SGeC8aB658
vUA8+qqBPs9kcuqIYJ9QYISNAVGRtM/kvSlbsSEhOD2bpfIjaAQlJMykEjJ5gyqn6+mE3nt2v1ct4uOaQRfNKyzURRKBuNeglD3kzJT2Ql6vu+uPbwjxfLXZr8FG97qJ4YbAyorYHTepczXyRL8Py1QaXkIzzWdv88lZ6Q0o
/lnCHeqKzkOdRwOhIq2OsPuYa9emhvpPNdVnvSuMBgLXWV22Zm8OIATkkzKWt75We7YZCno+FQ/yTC2ubhE+c8V+C3bX6gSDQ==
{
    "Successful": [
        {
            "Id": "082e80fe-a0e8-41f4-89cc-f54cbcf7b91c"
        }
    ]
}
```

You can also pass the entries in JSON format:

```
>aws sqs delete-message-batch --queue-url https://us-west-2.queue.amazonaws.
com/YOUR_AWS_ACCOUNT_ID/Chapter3SQSQueueName --entries file://C:/Users/Dell/
delete-message-batch.json
```

File: delete-message-batch.json

```
[{
        "Id": "082e80fe-a0e8-41f4-89cc-f54cbcf7b91c",
        "ReceiptHandle": "AQEBxXGsIlusZ........+C3bX6gSDQ=="
},
{
        "Id": "1234-a0e8-41f4-89cc-f54cbcf7b91c",
        "ReceiptHandle": "123aasdasda........+C3bX6gSDQ=="
}]
```



```
C:\Users\Dell>aws sqs delete-message-batch --queue-url https://us-west-2.queue.amazonaws.com/[redacted]/Chapter3SQSQueueName --entries file://C:/Users/Dell/delete-mes
sage-batch.json
{
    "Successful": [
        {
            "Id": "082e80fe-a0e8-41f4-89cc-f54cbcf7b91c"
        }
    ],
    "Failed": [
        {
            "Message": "The input receipt handle \"123aasdasda+/RVdgWR2zJjRVG9caSeuISlEQihbhzonB0JzjzVU3vMG7JMQ6xhFVAzJrLgIRRDNZfyQqOHUcwNBAWvEs1fGSUw+gDqyfCZcAmPf3YcH3
t1Q8H2YJ97S///A8SGeC8aB658vUA0+qqBPs9kcuqIYJ9QYI5NAVGRtM/kvSlbsSFhOO2bpfIjaAQ1JMykFjJ5gyqn6+mF3nt2v1ct4uOaQRfNKyzURRKBuNeglD3kzJT2Ql6vu+uPbwjxfLXZr8FG97qJ4YbAyorYHTepcz
XyRL8Py1QaXkIzzWdv8BlZ6Q0o/lnCHeqKzkOdRWOhIq2OsPuYa9emhvpPNdVnvSuMBgLXWV22Zm0OIATkkzKWt7SWe7YZCno+FQ/yTC2ubhE+c0V+C3bX6gSDQ==\" is not a valid receipt handle.",
            "SenderFault": true,
            "Code": "ReceiptHandleIsInvalid",
            "Id": "1234-a0e8-41f4-89cc-f54cbcf7b91c"
        }
    ]
}
```

In the previous command, we provided one valid and one invalid message ID and receipt handle in JSON file, so in output we received one successful and one failed message.

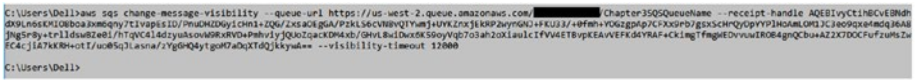
■ **Note** For more parameters in detail refer: http://docs.amazonaws.cn/cli/latest/reference/sqs/delete-message-batch.html.

---

change-message-visibility

This command will change the message's visibility timeout for a specified number of seconds. The maximum timeout you can configure is 0 to 43,200 seconds (that is, 12 hours).

```
>aws sqs change-message-visibility --queue-url https://us-west-2.queue.
amazonaws.com/YOUR_AWS_ACCOUNT_ID/Chapter3SQSQueueName --receipt-handle
AQEBIvyCtihBCvEBNdhd........zYgGHQ4ytgoM7aDqXTdQjkkywA== --visibility-
timeout 12000
```



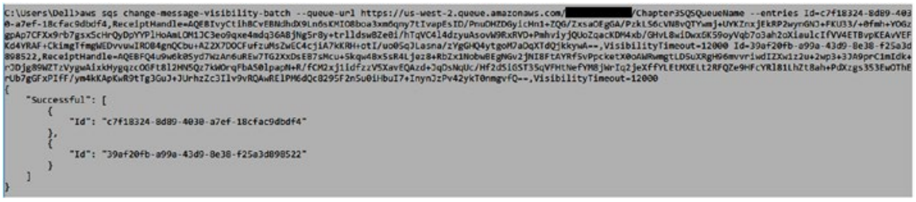
```
C:\Users\Dell>aws sqs change-message-visibility --queue-url https://us-west-2.queue.amazonaws.com/[redacted]/Chapter3SQSQueueName --receipt-handle AQEBIvyCtihBCvEBNdh
dX9Ln6sKMIOBboa3xm6qny7tIvapEsID/PnuDHZDGy1cHn1+ZQG/ZxsaOEgGA/PzkLS6cVN8vQTYwmj+UYKZnxjEkRP2wynGNJ+FKU33/+0fmh+YDGzgpAp7CFXx9rb7gsXScHrQyOpVYPlHoAmLOM1JC3eo9qxe4mdq36AB
jNg5r8y+trlldsw8Ze0i/hTqVC4l4dzyuAsovW9RxRVD+PmhviyjQUoZqacKDM4xb/GHvL8w1Dwx6K59oyVqb7o3ah2oXiaulcIfVV4ETBvpKEAvVEFKd4YRAF+CkimgTfmgWEDvvuwIROB4gnQCbu+AZ2X7DOCFufzuMsZw
FC4cjiA7kKRH+otI/uo05qJLasna/zYgGHQ4ytgoM7aDqXTdQjkkywA== --visibility-timeout 12000

C:\Users\Dell>
```

■ **Note** For more parameters in detail, refer to `http://docs.amazonaws.cn/cli/latest/reference/sqs/change-message-visibility.html`.

change-message-visibility-batch

The change-message-visibility-batch command changes the message's visibility in a batch of 10 messages. Each change visibility message will have a response in output:

```
>aws sqs change-message-visibility-batch --queue-url https://us-west-2.
queue.amazonaws.com/YOUR_AWS_ACCOUNT_ID/Chapter3SQSQueueName --entries
Id=c7f18324-8d89-4030-a7ef-18cfac9dbdf4,ReceiptHandle=AQEBIvyCtihBCvE
BN......../zYgGHQ4ytgoM7aDqXTdQjkkywA==,VisibilityTimeout=12000 Id=39af20fb-
a99a-43d9-8e38-f25a3d898522,ReceiptHandle=AQEBFQ4u9w6k0Syd7WzAn........+Inyn
JzPv42ykT0nmgvfQ==,VisibilityTimeout=12000
```



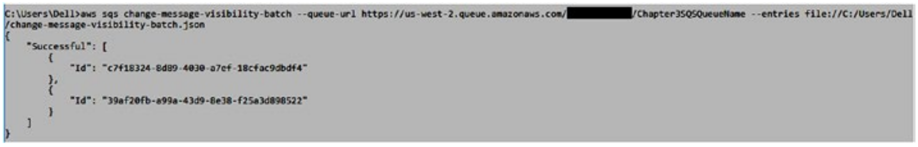
```
C:\Users\Dell>aws sqs change-message-visibility-batch --queue-url https://us-west-2.queue.amazonaws.com/[redacted]/Chapter3SQSQueueName --entries Id=c7f18324-8d89-403
0-a7ef-18cfac9dbdf4,ReceiptHandle=AQEBIvyCtihBCvEBNdhdX9Ln6sKMIO8boa3xm6qny7tIvapEsID/PnuOHZDGyicHn1+ZQG/ZxsaOEgGA/PzkLS6cVN8vQTYwmj+UYKZnxjEkRP2wynGNJ+FKU33/+0fmh+YOGz
gpAp7CFXx9rb7gsxScHrQyDpYYPlHoAmLOM1JC3eo9qxe4mdq36ABjNg5r8y+trlldswBZe8i/hTqVC4l4dzyuAsovW9RxRVD+PmhviyjQUoZqacKDM4xb/GHvL8wiDwx6K59oyVqb7o3ah2oXiaulcIfVV4ETBvpKEAvVEF
Kd4VRAF+CkimgTfmgWEDvvuwIRO84gnQCbu+AZ2X7DOCFufzuMsZwEC4cjiA7kKRH+otI/uo0SqJLasna/zYgGHQ4ytgoM7aDqXTdQjkkywA==,VisibilityTimeout=12000 Id=39af20fb-a99a-43d9-8e38-f25a3d
898522,ReceiptHandle=AQEBFQ4u9w6k0Syd7WzAn6uREw7TG2XxDsEB7sMcu+Skqw4Bx5sR4Ljez8+RbZx1NobwBEgNGv2jNI8FtAYRf5vPpcketX0oAWRwmgtLDSuXRgH96mvvriwdIZXw1z2u+2wp3+3JA9prC1mIdk+
rJDjg89WZTzVygwAixkHygqzcO6Ft8l2HN5Qz7kWOrqFbAS0lpapN+R/fCM2xj1idfzzV5XavEQAzd+JqDsNqUc/Hf2d5i6ST35qVFHtNefYM8jWrIq2jeXffYLEtMXELt2RFQZe9HFcYRl81LhZt8ah+PdXzgs353EwOThE
rUb7gGFxPIfF/ym4kKApKwR9tTg3GuJ+JUrhzZc3Ilv9vRQAwRElPM6dQc8295F2nSu0iHbuI7+InynJzPv42ykT0nmgvfQ==,VisibilityTimeout=12000
{
    "Successful": [
        {
            "Id": "c7f18324-8d89-4030-a7ef-18cfac9dbdf4"
        },
        {
            "Id": "39af20fb-a99a-43d9-8e38-f25a3d898522"
        }
    ]
}
```

You can also pass the entries in JSON format:

```
>aws sqs change-message-visibility-batch --queue-url https://us-west-2.
queue.amazonaws.com/YOUR_AWS_ACCOUNT_ID/Chapter3SQSQueueName --entries
file://C:/Users/Dell/change-message-visibility-batch.json
```

File: change-message-visibility-batch.json

```
[{
        "Id": "c7f18324-8d89-4030-a7ef-18cfac9dbdf4",
        "ReceiptHandle": "AQEBIvyCtihBCvEB........4ytgoM7aDqXTdQjkkywA==",
        "VisibilityTimeout": 12000
}, {
        "Id": "39af20fb-a99a-43d9-8e38-f25a3d898522",
        "ReceiptHandle": "AQEBFQ4u9w6k0V7........InynJzPv42ykT0nmgvfQ==",
        "VisibilityTimeout": 12000
}]
```



```
C:\Users\Dell>aws sqs change-message-visibility-batch --queue-url https://us-west-2.queue.amazonaws.com/[redacted]/Chapter3SQSQueueName --entries file://C:/Users/Dell
/change-message-visibility-batch.json
{
    "Successful": [
        {
            "Id": "c7f18324-8d89-4030-a7ef-18cfac9dbdf4"
        },
        {
            "Id": "39af20fb-a99a-43d9-8e38-f25a3d898522"
        }
    ]
}
```

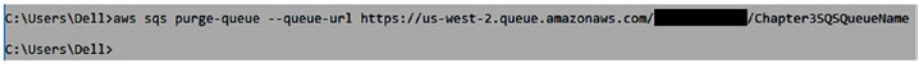
■ **Note** For more parameters in detail, refer to `http://docs.amazonaws.cn/cli/latest/reference/sqs/change-message-visibility-batch.html`.

---

purge-queue

This command deletes all the messages available in the queue. Once messages are deleted, they can't be recalled back. The delete process may take 60 seconds:

```
>aws sqs purge-queue --queue-urlhttps://us-west-2.queue.amazonaws.com/YOUR_
AWS_ACCOUNT_ID/Chapter3SQSQueueName
```



```
C:\Users\Dell>aws sqs purge-queue --queue-url https://us-west-2.queue.amazonaws.com/[redacted]/Chapter3SQSQueueName

C:\Users\Dell>
```

There won't be any output for this request.

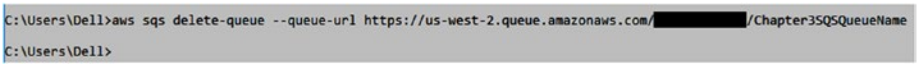
■ **Note** For more parameters in detail, refer to `http://docs.amazonaws.cn/cli/latest/reference/sqs/purge-queue.html`.

---

delete-queue

The delete-queue command deletes the queue whether the queue contains messages or not. You can't recall messages after they have been deleted. The delete process may take 60 seconds.

```
>aws sqs delete-queue --queue-url https://us-west-2.queue.amazonaws.com/
YOUR_AWS_ACCOUNT_ID/Chapter3SQSQueueName
```



```
C:\Users\Dell>aws sqs delete-queue --queue-url https://us-west-2.queue.amazonaws.com/[redacted]/Chapter3SQSQueueName

C:\Users\Dell>
```

There won't be any output for this request.

■ **Note** For more parameters in detail, refer to http://docs.amazonaws.cn/cli/latest/reference/sqs/delete-queue.html.

Using AWS SDK—Java

In this section, I will discuss how to use AWS Java SDK to manage AWS SQS. First, you will need to create AmazonSQSClient.

To create AmazonSQSClient, you first need to create the AWSCredentials using either of the credential provider mechanisms. In our case, we will use `ProfileCredentialsProvider`:

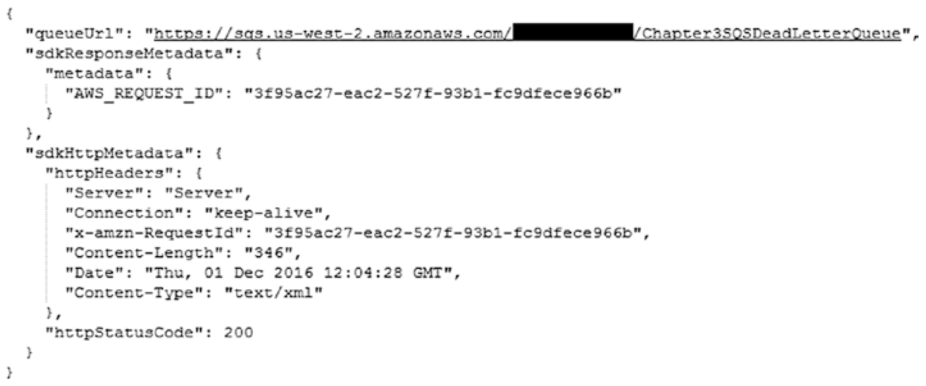
```
AWSCredentials credentials =
    new ProfileCredentialsProvider("sunilgulabani").getCredentials();

AmazonSQS amazonSQSClient = new AmazonSQSClient(credentials);
```

This will load the `sunilgulabani` profile's access key and secret key via the credentials file.

Create Queue

To create a queue using SDK, call the `createQueue` method of AmazonSQSClient:

```
private static final String DEAD_LETTER_QUEUE_NAME =
    "Chapter3SQSDeadLetterQueue";

createQueue(DEAD_LETTER_QUEUE_NAME);

public String createQueue(String queueName) {
    CreateQueueRequest request = new CreateQueueRequest(queueName);

    CreateQueueResult response = amazonSQSClient.createQueue(request);

    return response.getQueueUrl();
}
```



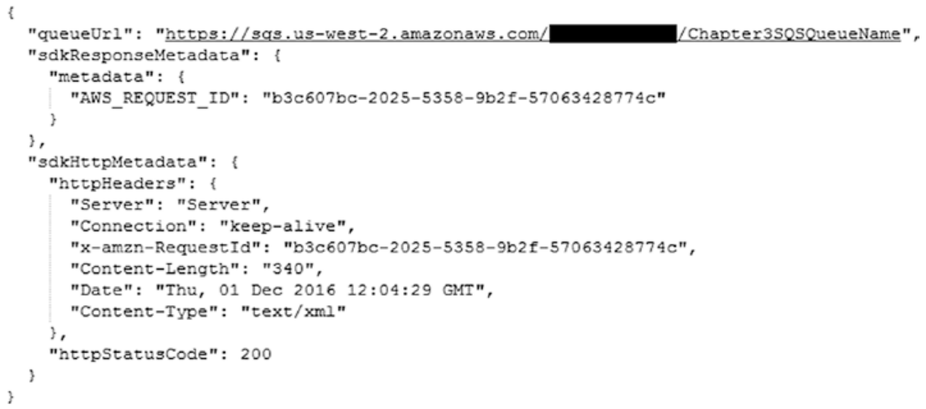
```
{
  "queueUrl": "https://sqs.us-west-2.amazonaws.com/[redacted]/Chapter3SQSDeadLetterQueue",
  "sdkResponseMetadata": {
    "metadata": {
      "AWS_REQUEST_ID": "3f95ac27-eac2-527f-93b1-fc9dfece966b"
    }
  },
  "sdkHttpMetadata": {
    "httpHeaders": {
      "Server": "Server",
      "Connection": "keep-alive",
      "x-amzn-RequestId": "3f95ac27-eac2-527f-93b1-fc9dfece966b",
      "Content-Length": "346",
      "Date": "Thu, 01 Dec 2016 12:04:28 GMT",
      "Content-Type": "text/xml"
    },
    "httpStatusCode": 200
  }
}
```

In response, you will get "queueUrl".

Create Queue with Attributes

To create a queue with attributes, add the attributes using CreateQueueRequest's addAttributesEntry method:

```
private static final String QUEUE_NAME = "Chapter3SQSQueueName";

createQueueWithAttributes(QUEUE_NAME);

public String createQueueWithAttributes(String queueName) {
    String queueNameTargetARN = "arn:aws:sqs:" + region.getName() + ":" +
                                    awsUserAccountId + ":" + queueName;

    String queueNameDefaultPolicyId =
        queueNameTargetARN + "/SQSDefaultPolicy";

    CreateQueueRequest request = new CreateQueueRequest(queueName);

    request.addAttributesEntry("DelaySeconds", "0");

    request.addAttributesEntry("MaximumMessageSize", "262144");

    request.addAttributesEntry("MessageRetentionPeriod", "1209600");

    request.addAttributesEntry("ReceiveMessageWaitTimeSeconds", "0");

    request.addAttributesEntry("VisibilityTimeout", "30");

    request.addAttributesEntry("Policy", "{" +
                      "\"Version\": \"2012-10-17\"," +
                      "\"Id\": \"" + queueNameDefaultPolicyId + "\"," +
                      "\"Statement\": [" +
                      " {" +
                      " \"Sid\": \"Sid1465389499769\"," +
                      " \"Effect\": \"Allow\"," +
                      " \"Principal\": \"*\"," +
                      " \"Action\": \"SQS:*\"," +
                      " \"Resource\": \"" + queueNameTargetARN + "\"" +
                      " }" +
                      "]}");

    CreateQueueResult response = amazonSQSClient.createQueue(request);

    return response.getQueueUrl();
}
```



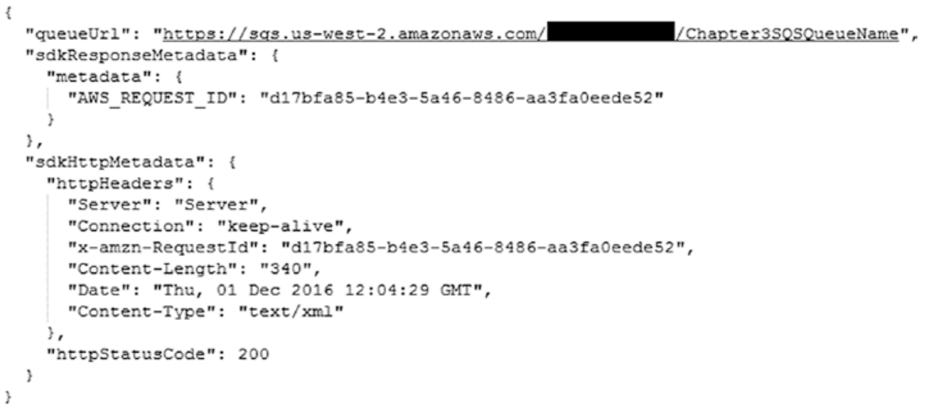
```
{
  "queueUrl": "https://sqs.us-west-2.amazonaws.com/[redacted]/Chapter3SQSQueueName",
  "sdkResponseMetadata": {
    "metadata": {
      "AWS_REQUEST_ID": "b3c607bc-2025-5358-9b2f-57063428774c"
    }
  },
  "sdkHttpMetadata": {
    "httpHeaders": {
      "Server": "Server",
      "Connection": "keep-alive",
      "x-amzn-RequestId": "b3c607bc-2025-5358-9b2f-57063428774c",
      "Content-Length": "340",
      "Date": "Thu, 01 Dec 2016 12:04:29 GMT",
      "Content-Type": "text/xml"
    },
    "httpStatusCode": 200
  }
}
```

In response, you will get "queueUrl".

Get Queue URL

To get the queue URL, use the getQueueUrl method of AmazonSQSClient:

```
getQueueUrl(QUEUE_NAME);

public String getQueueUrl(String queueName) {

    GetQueueUrlResult response = amazonSQSClient.getQueueUrl(queueName);

    return response.getQueueUrl();
}
```



```
{
  "queueUrl": "https://sqs.us-west-2.amazonaws.com/[redacted]/Chapter3SQSQueueName",
  "sdkResponseMetadata": {
    "metadata": {
      "AWS_REQUEST_ID": "d17bfa85-b4e3-5a46-8486-aa3fa0eede52"
    }
  },
  "sdkHttpMetadata": {
    "httpHeaders": {
      "Server": "Server",
      "Connection": "keep-alive",
      "x-amzn-RequestId": "d17bfa85-b4e3-5a46-8486-aa3fa0eede52",
      "Content-Length": "340",
      "Date": "Thu, 01 Dec 2016 12:04:29 GMT",
      "Content-Type": "text/xml"
    },
    "httpStatusCode": 200
  }
}
```

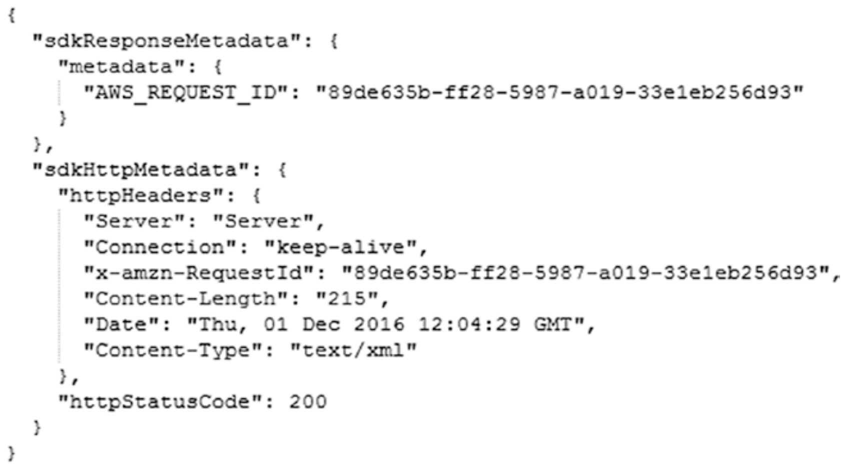
In response, you will get "queueUrl".

Add Permissions

To add permissions, use the addPermission method of AmazonSQSClient:

```
addPermission(queueUrl);

public void addPermission(String queueUrl) {

    AddPermissionRequest request = new AddPermissionRequest();

    request.setQueueUrl(queueUrl);

    request.setActions(getActions());

    request.setAWSAccountIds(getAWSAccountIds());

    request.setLabel("Chapter3SQSPermission");

    AddPermissionResult response = amazonSQSClient.addPermission(request);

}

private List<String> getAWSAccountIds() {
    List<String> awsAccountIdsList = new ArrayList<String>();

    awsAccountIdsList.add(awsUserAccountId);

    return awsAccountIdsList;
}

private List<String> getActions() {
    List<String> actionsList = new ArrayList<String>();
    //  actionsList.add("*");
        actionsList.add("SendMessage");
        actionsList.add("ReceiveMessage");
        actionsList.add("DeleteMessage");
        actionsList.add("ChangeMessageVisibility");
        actionsList.add("GetQueueAttributes");
        actionsList.add("GetQueueUrl");

    return actionsList;
}
```

Along with the queue URL, you also need to provide a permission label name (AWS User ID) to whomever you want to assign permissions as well as what actions (permissions) you need to assign. These will be added to the `AddPermissionRequest` object:



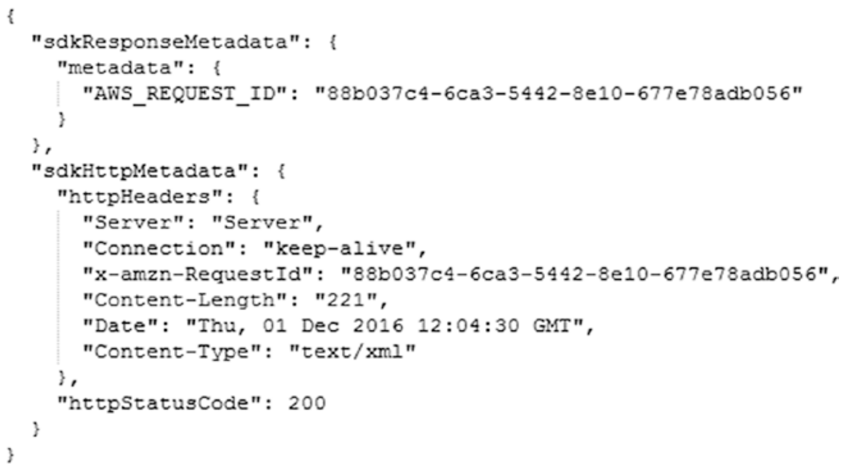
```
{
  "sdkResponseMetadata": {
    "metadata": {
      "AWS_REQUEST_ID": "89de635b-ff28-5987-a019-33e1eb256d93"
    }
  },
  "sdkHttpMetadata": {
    "httpHeaders": {
      "Server": "Server",
      "Connection": "keep-alive",
      "x-amzn-RequestId": "89de635b-ff28-5987-a019-33e1eb256d93",
      "Content-Length": "215",
      "Date": "Thu, 01 Dec 2016 12:04:29 GMT",
      "Content-Type": "text/xml"
    },
    "httpStatusCode": 200
  }
}
```

There won't be any parameter in response specific to adding permission apart from `httpStatusCode`, which will be used to identify whether the request was successful or not.

Remove Permissions

To remove permissions from the queue, you need the label name of permission, which is assigned on queue. To remove permissions, use the `removePermission` method of AmazonSQSClient:

```
removePermission(queueUrl);

public void removePermission(String queueUrl) {

    RemovePermissionRequest request =
        new RemovePermissionRequest(queueUrl, "Chapter3SQSPermission");
    RemovePermissionResult response =
        amazonSQSClient.removePermission(request);
}
```



```
{
  "sdkResponseMetadata": {
    "metadata": {
      "AWS_REQUEST_ID": "88b037c4-6ca3-5442-8e10-677e78adb056"
    }
  },
  "sdkHttpMetadata": {
    "httpHeaders": {
      "Server": "Server",
      "Connection": "keep-alive",
      "x-amzn-RequestId": "88b037c4-6ca3-5442-8e10-677e78adb056",
      "Content-Length": "221",
      "Date": "Thu, 01 Dec 2016 12:04:30 GMT",
      "Content-Type": "text/xml"
    },
    "httpStatusCode": 200
  }
}
```

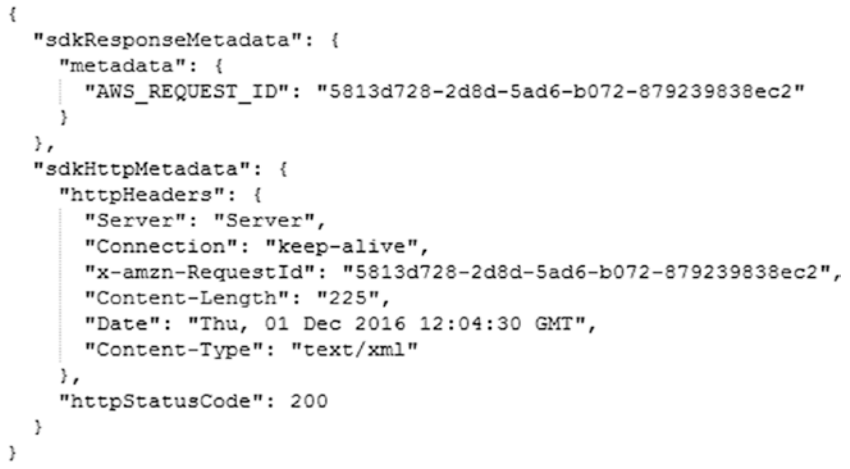
There won't be any parameters in response specific to removing permissions apart from httpStatusCode, which will be used to identify whether the request was successful or not.

Set Queue Attributes

To set queue attributes, you need to create queue attributes first, which will be in the form of a key-value pair. Using the setQueueAttributes method of AmazonSQSClient, set the queue attributes:

```
setQueueAttributes(queueUrl, DEAD_LETTER_QUEUE_NAME);

public void setQueueAttributes(String queueUrl, String deadLetterQueueName) {
    SetQueueAttributesRequest request = new SetQueueAttributesRequest(
                                        queueUrl,
                                        createQueueAttributes(
                                            getNameFromUrl(queueUrl),
                                            deadLetterQueueName));

    SetQueueAttributesResult response =
        amazonSQSClient.setQueueAttributes(request);
}
```

```
private Map<String, String> createQueueAttributes(
                            String queueName, String deadLetterQueueName) {

    Map<String, String> attributes = new HashMap<String, String>();

    String queueNameTargetARN = "arn:aws:sqs:" + region.getName() + ":" +
                                            awsUserAccountId + ":" + queueName;

    String queueNameDefaultPolicyId =
        queueNameTargetARN + "/SQSDefaultPolicy";

    String deadLetterTargetARN = "arn:aws:sqs:" + region.getName() + ":" +
                                     awsUserAccountId + ":" + deadLetterQueueName;

    attributes.put("DelaySeconds", "0");

    attributes.put("MaximumMessageSize", "262144");

    attributes.put("MessageRetentionPeriod", "1209600");

    attributes.put("ReceiveMessageWaitTimeSeconds", "0");

    attributes.put("VisibilityTimeout", "30");

    attributes.put("Policy", "{" +
                         "\"Version\": \"2012-10-17\"," +
                         "\"Id\": \"" + queueNameDefaultPolicyId + "\"," +
                         "\"Statement\": [" +
                         " {" +
                         " \"Sid\": \"Sid1465389499769\"," +
                         " \"Effect\": \"Allow\"," +
                         " \"Principal\": \"*\"," +
                         " \"Action\": \"SQS:*\"," +
                         " \"Resource\": \"" + queueNameTargetARN + "\"" +
                         " }" +
                         "]}");

    attributes.put("RedrivePolicy",
            "{\"maxReceiveCount\":\"10\", \"deadLetterTargetArn\":\"" +
            deadLetterTargetARN + "\"}");

    return attributes;
}
```



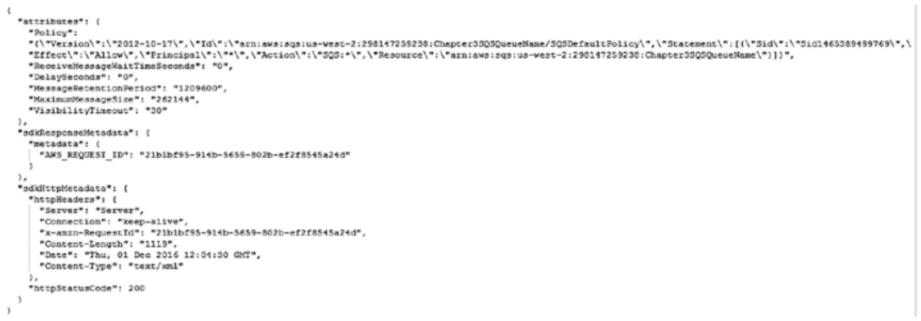
```
{
  "sdkResponseMetadata": {
    "metadata": {
      "AWS_REQUEST_ID": "5813d728-2d8d-5ad6-b072-879239838ec2"
    }
  },
  "sdkHttpMetadata": {
    "httpHeaders": {
      "Server": "Server",
      "Connection": "keep-alive",
      "x-amzn-RequestId": "5813d728-2d8d-5ad6-b072-879239838ec2",
      "Content-Length": "225",
      "Date": "Thu, 01 Dec 2016 12:04:30 GMT",
      "Content-Type": "text/xml"
    },
    "httpStatusCode": 200
  }
}
```

There won't be any parameters in response specific to setting queue attributes apart from `httpStatusCode`, which will be used to identify whether the request was successful or not.

Get Queue Attributes

To get the queue attributes, you need to provide the attributes you need in return for the specific `queueUrl` using the `getQueueAttributes` method:

```
getQueueAttributes(queueUrl);

public void getQueueAttributes(String queueUrl) {
    GetQueueAttributesRequest request = new GetQueueAttributesRequest();

    request.setQueueUrl(queueUrl);

    request.setAttributeNames(getAttributeNames());

    GetQueueAttributesResult response =
        amazonSQSClient.getQueueAttributes(request);
}

private List<String> getAttributeNames() {
    List<String> attributeNames = new ArrayList<String>();

    attributeNames.add("DelaySeconds");

    attributeNames.add("MaximumMessageSize");

    attributeNames.add("MessageRetentionPeriod");

    attributeNames.add("ReceiveMessageWaitTimeSeconds");

    attributeNames.add("VisibilityTimeout");
    attributeNames.add("Policy");

    return attributeNames;
}
```



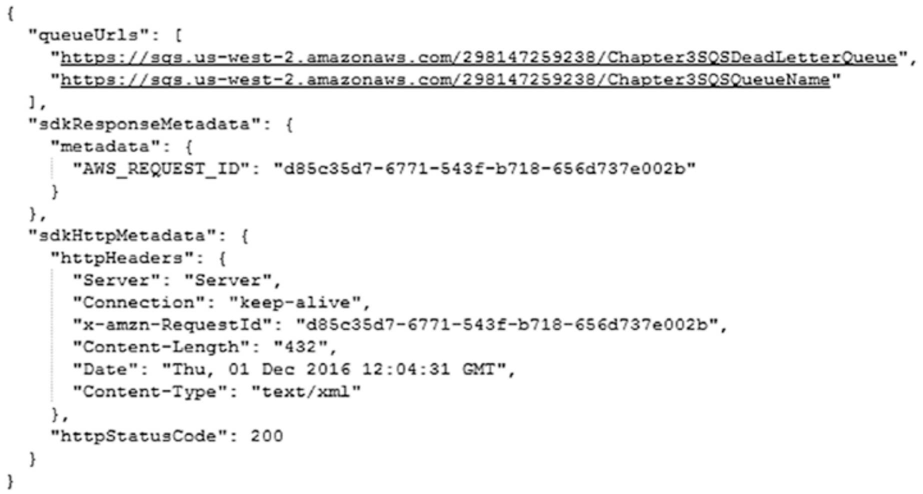
```
{
  "attributes": {
    "Policy":
    "{\"Version\":\"2012-10-17\",\"Id\":\"arn:aws:sqs:us-west-2:298147259238:Chapter3SQSQueueName/SQSDefaultPolicy\",\"Statement\":[{\"Sid\":\"Sid1465389499769\",\
    "Effect\":\"Allow\",\"Principal\":\"*\",\"Action\":\"SQS:*\",\"Resource\":\"arn:aws:sqs:us-west-2:298147259238:Chapter3SQSQueueName\"}]}",
    "ReceiveMessageWaitTimeSeconds": "0",
    "DelaySeconds": "0",
    "MessageRetentionPeriod": "1209600",
    "MaximumMessageSize": "262144",
    "VisibilityTimeout": "30"
  },
  "sdkResponseMetadata": {
    "metadata": {
      "AWS_REQUEST_ID": "21b1bf95-914b-5659-802b-ef2f8545a24d"
    }
  },
  "sdkHttpMetadata": {
    "httpHeaders": {
      "Server": "Server",
      "Connection": "keep-alive",
      "x-amzn-RequestId": "21b1bf95-914b-5659-802b-ef2f8545a24d",
      "Content-Length": "1119",
      "Date": "Thu, 01 Dec 2016 12:04:30 GMT",
      "Content-Type": "text/xml"
    },
    "httpStatusCode": 200
  }
}
```

In response, you can see that under "`attributes`", all requested attributes values are returned.

List Queues

To list all queues, use the `listQueues` method:

```
listQueues();

public void listQueues() {

    ListQueuesResult response = amazonSQSClient.listQueues();

}
```



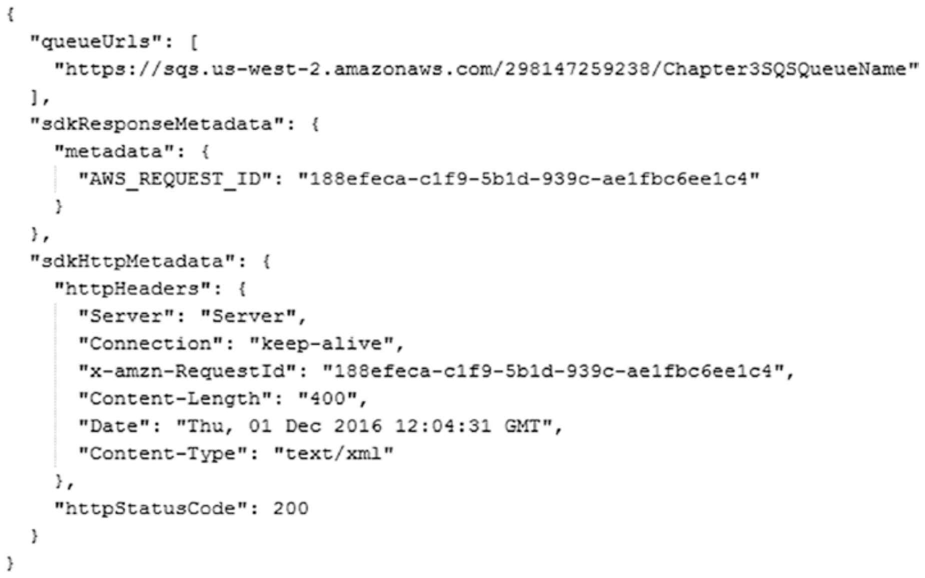
```
{
  "queueUrls": [
    "https://sqs.us-west-2.amazonaws.com/298147259238/Chapter3SQSDeadLetterQueue",
    "https://sqs.us-west-2.amazonaws.com/298147259238/Chapter3SQSQueueName"
  ],
  "sdkResponseMetadata": {
    "metadata": {
      "AWS_REQUEST_ID": "d85c35d7-6771-543f-b718-656d737e002b"
    }
  },
  "sdkHttpMetadata": {
    "httpHeaders": {
      "Server": "Server",
      "Connection": "keep-alive",
      "x-amzn-RequestId": "d85c35d7-6771-543f-b718-656d737e002b",
      "Content-Length": "432",
      "Date": "Thu, 01 Dec 2016 12:04:31 GMT",
      "Content-Type": "text/xml"
    },
    "httpStatusCode": 200
  }
}
```

In response, you can see the queueUrls of all the queues available to the current user.

List Dead Letter Source Queues

To get a list of the dead letter's source queues that are assigned, use the listDeadLetterSourceQueues method:

```
listDeadLetterSourceQueues(deadLetterQueueUrl);

public void listDeadLetterSourceQueues(String queueUrl) {

    ListDeadLetterSourceQueuesRequest request =
        new ListDeadLetterSourceQueuesRequest();

    request.setQueueUrl(queueUrl);

    ListDeadLetterSourceQueuesResult response =
        amazonSQSClient.listDeadLetterSourceQueues(request);
}
```



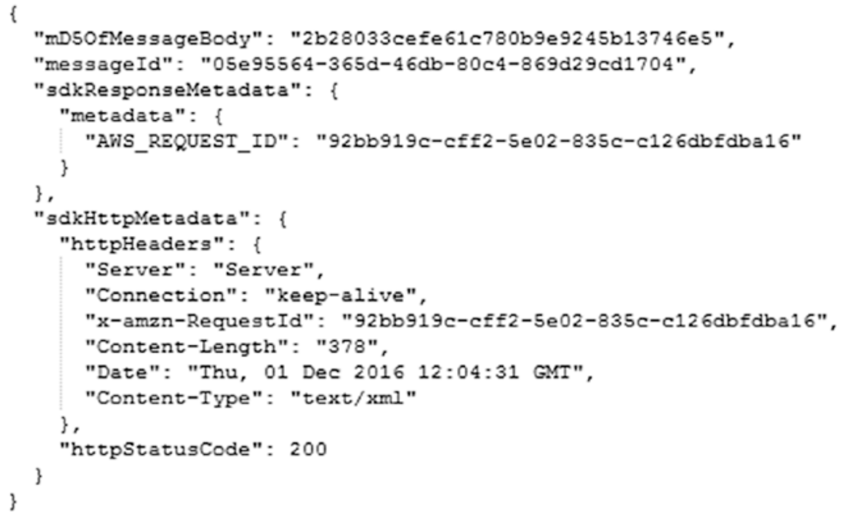
```
{
  "queueUrls": [
    "https://sqs.us-west-2.amazonaws.com/298147259238/Chapter3SQSQueueName"
  ],
  "sdkResponseMetadata": {
    "metadata": {
      "AWS_REQUEST_ID": "188efeca-c1f9-5b1d-939c-ae1fbc6ee1c4"
    }
  },
  "sdkHttpMetadata": {
    "httpHeaders": {
      "Server": "Server",
      "Connection": "keep-alive",
      "x-amzn-RequestId": "188efeca-c1f9-5b1d-939c-ae1fbc6ee1c4",
      "Content-Length": "400",
      "Date": "Thu, 01 Dec 2016 12:04:31 GMT",
      "Content-Type": "text/xml"
    },
    "httpStatusCode": 200
  }
}
```

In response, you can see the queueUrls of source queues that have this requested dead letter queue.

Send Message

To send a message, use the sendMessage method:

```
private static final String MESSAGE_BODY = "Hello AWS SQS!!!";

sendMessage(queueUrl, MESSAGE_BODY);

public void sendMessage(String queueUrl, String body) {

    SendMessageRequest request = new SendMessageRequest(queueUrl, body);

    SendMessageResult response = amazonSQSClient.sendMessage(request);
}
```



```
{
  "mD5OfMessageBody": "2b28033cefe61c780b9e9245b13746e5",
  "messageId": "05e95564-365d-46db-80c4-869d29cd1704",
  "sdkResponseMetadata": {
    "metadata": {
      "AWS_REQUEST_ID": "92bb919c-cff2-5e02-835c-c126dbfdba16"
    }
  },
  "sdkHttpMetadata": {
    "httpHeaders": {
      "Server": "Server",
      "Connection": "keep-alive",
      "x-amzn-RequestId": "92bb919c-cff2-5e02-835c-c126dbfdba16",
      "Content-Length": "378",
      "Date": "Thu, 01 Dec 2016 12:04:31 GMT",
      "Content-Type": "text/xml"
    },
    "httpStatusCode": 200
  }
}
```

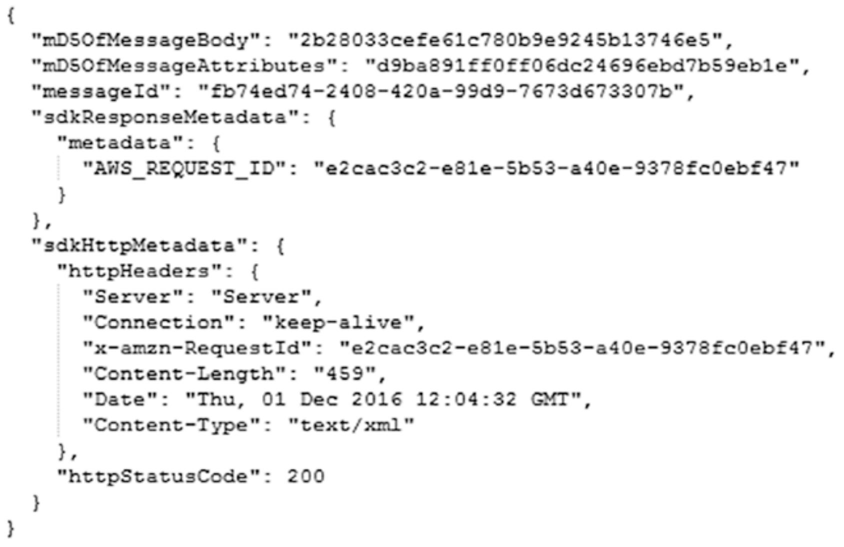
In response, the "mD5OfMessageBody" and "messageId" parameters are received.

Send Message with Add Message Attributes

To send a message with message attributes, you need to add message attributes along with key, value, and the value's datatype to the request and then call the sendMessage method:

```
sendMessageWithAddMessageAttributes(queueUrl, MESSAGE_BODY);

public void sendMessageWithAddMessageAttributes(String queueUrl, String body) {
    SendMessageRequest request = new SendMessageRequest(queueUrl, body);

    for(int i = 0 ; i < 5 ; i++) {
        request.addMessageAttributesEntry(
                              "Key-" + i,
                              createMessageAttributeValue("Value-" + i));
    }
    SendMessageResult response = amazonSQSClient.sendMessage(request);
}

private MessageAttributeValue createMessageAttributeValue(String value) {

    MessageAttributeValue messageAttributeValue =
        new MessageAttributeValue();

    messageAttributeValue.setStringValue(value);

    messageAttributeValue.setDataType("String");

    return messageAttributeValue;
}
```

For example we used a loop that will create 5 messsage attributes. This is just to demonstrate the adding of message attributes.



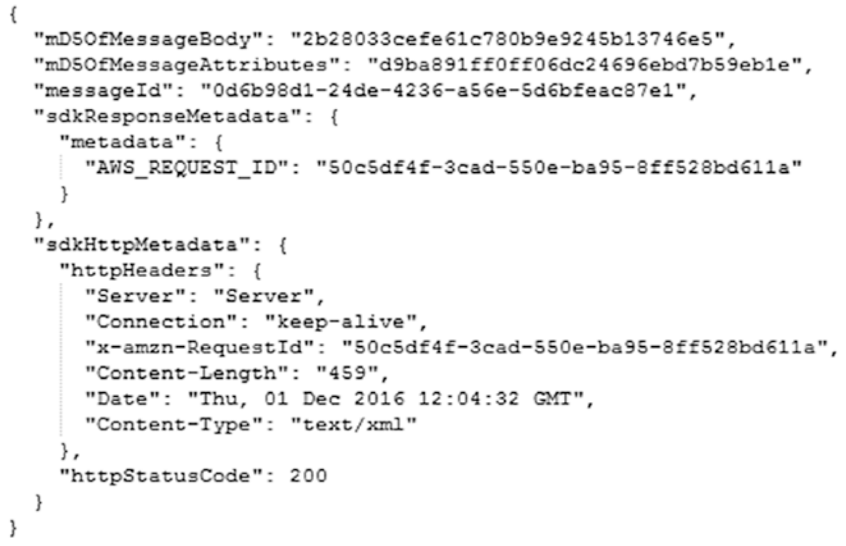
```
{
  "mD5OfMessageBody": "2b28033cefe61c780b9e9245b13746e5",
  "mD5OfMessageAttributes": "d9ba891ff0ff06dc24696ebd7b59eb1e",
  "messageId": "fb74ed74-2408-420a-99d9-7673d673307b",
  "sdkResponseMetadata": {
    "metadata": {
      "AWS_REQUEST_ID": "e2cac3c2-e81e-5b53-a40e-9378fc0ebf47"
    }
  },
  "sdkHttpMetadata": {
    "httpHeaders": {
      "Server": "Server",
      "Connection": "keep-alive",
      "x-amzn-RequestId": "e2cac3c2-e81e-5b53-a40e-9378fc0ebf47",
      "Content-Length": "459",
      "Date": "Thu, 01 Dec 2016 12:04:32 GMT",
      "Content-Type": "text/xml"
    },
    "httpStatusCode": 200
  }
}
```

In response, the "mD5OfMessageBody", "mD5OfMessageAttributes", and "messageId" parameters are received.

Send Message with Set Message Attributes

In addition to adding message attributes, you can also use the `setMessageAttributes` method of the `SendMessageRequest` object. To set message attributes, you need to create `Map<String, MessageAttributeValue>`:

```
sendMessageWithSetMessageAttributes(queueUrl, MESSAGE_BODY);

public void sendMessageWithSetMessageAttributes(String queueUrl, String body) {
    SendMessageRequest request = new SendMessageRequest(queueUrl, body);

    request.setMessageAttributes(createMessageAttributeValuesMap());

    SendMessageResult response = amazonSQSClient.sendMessage(request);
}

private Map<String, MessageAttributeValue> createMessageAttributeValuesMap() {
    Map<String, MessageAttributeValue> messageAttributeValuesMap =
        new HashMap<String, MessageAttributeValue>();

    for(int i = 0 ; i < 5 ; i++) {
        messageAttributeValuesMap.put(
                              "Key-" + i,
                              createMessageAttributeValue("Value-" + i));
    }

    return messageAttributeValuesMap;
}
```



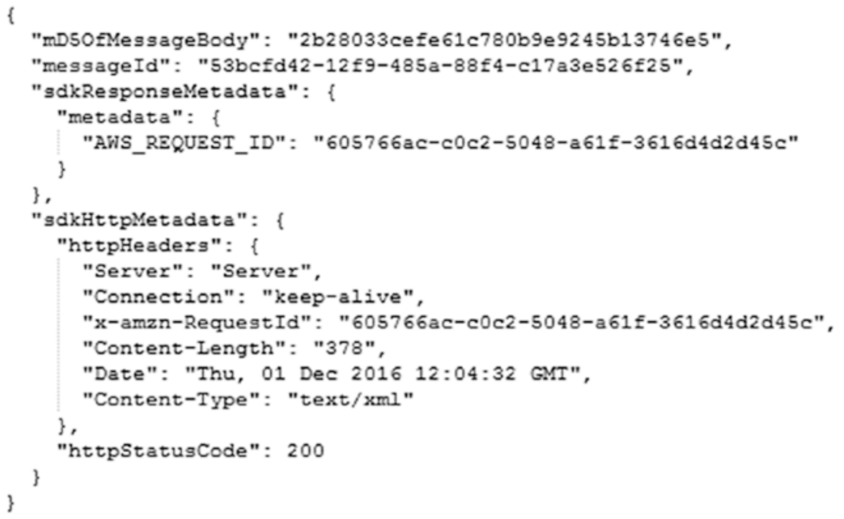
```
{
  "mD5OfMessageBody": "2b28033cefe61c780b9e9245b13746e5",
  "mD5OfMessageAttributes": "d9ba891ff0ff06dc24696ebd7b59eb1e",
  "messageId": "0d6b98d1-24de-4236-a56e-5d6bfeac87e1",
  "sdkResponseMetadata": {
    "metadata": {
      "AWS_REQUEST_ID": "50c5df4f-3cad-550e-ba95-8ff528bd611a"
    }
  },
  "sdkHttpMetadata": {
    "httpHeaders": {
      "Server": "Server",
      "Connection": "keep-alive",
      "x-amzn-RequestId": "50c5df4f-3cad-550e-ba95-8ff528bd611a",
      "Content-Length": "459",
      "Date": "Thu, 01 Dec 2016 12:04:32 GMT",
      "Content-Type": "text/xml"
    },
    "httpStatusCode": 200
  }
}
```

In response, "mD5OfMessageBody", "mD5OfMessageAttributes", and "messageId" parameters are received.

Send Message with Timer

To send a message with a delay, use the setDelaySeconds method:

```
sendMessageWithTimer(queueUrl, MESSAGE_BODY);

public void sendMessageWithTimer(String queueUrl, String body) {

    SendMessageRequest request = new SendMessageRequest(queueUrl, body);

    request.setDelaySeconds(30);

    SendMessageResult response = amazonSQSClient.sendMessage(request);
}
```



```
{
  "mD5OfMessageBody": "2b28033cefe61c780b9e9245b13746e5",
  "messageId": "53bcfd42-12f9-485a-88f4-c17a3e526f25",
  "sdkResponseMetadata": {
    "metadata": {
      "AWS_REQUEST_ID": "605766ac-c0c2-5048-a61f-3616d4d2d45c"
    }
  },
  "sdkHttpMetadata": {
    "httpHeaders": {
      "Server": "Server",
      "Connection": "keep-alive",
      "x-amzn-RequestId": "605766ac-c0c2-5048-a61f-3616d4d2d45c",
      "Content-Length": "378",
      "Date": "Thu, 01 Dec 2016 12:04:32 GMT",
      "Content-Type": "text/xml"
    },
    "httpStatusCode": 200
  }
}
```

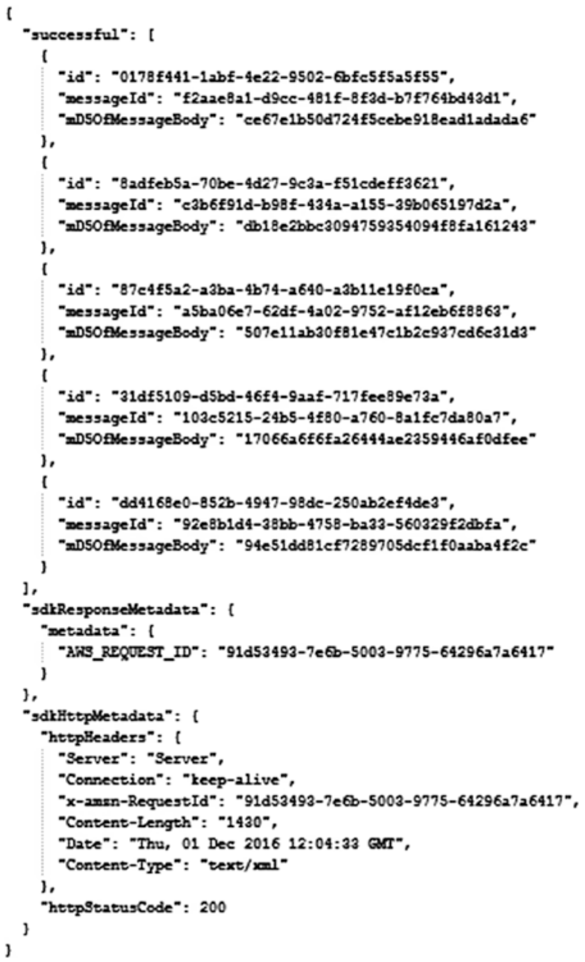
In response, "mD5OfMessageBody" and "messageId" parameters are received.

Send Message Batch

To send messages in batches, use the sendMessageBatch method:

```
sendMessageBatch(queueUrl, MESSAGE_BODY);

public void sendMessageBatch(String queueUrl, String body) {
    SendMessageBatchRequest request = new SendMessageBatchRequest(queueUrl);
    request.setEntries(createSendMessageBatchRequestEntry(body));

    SendMessageBatchResult response =
        amazonSQSClient.sendMessageBatch(request);
}

private List<SendMessageBatchRequestEntry>
    createSendMessageBatchRequestEntry(String body) {

    List<SendMessageBatchRequestEntry> entries =
        new ArrayList<SendMessageBatchRequestEntry>();

    SendMessageBatchRequestEntry sendMessageBatchRequestEntry;

    for(int i = 0; i < 5; i++) {
        sendMessageBatchRequestEntry = new SendMessageBatchRequestEntry();

        sendMessageBatchRequestEntry.setId(UUID.randomUUID().toString());

        sendMessageBatchRequestEntry.setMessageBody(body + "-" + i);

    //  sendMessageBatchRequestEntry.setDelaySeconds(30);

        entries.add(sendMessageBatchRequestEntry);
    }

    return entries;
}
```

By doing this, you will have created SendMessageBatchRequestEntry in a loop of 5 to demonstrate adding sample messages:



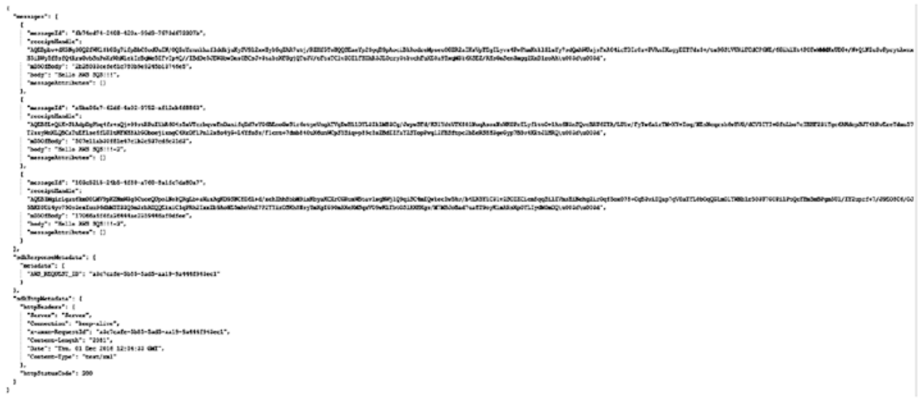
```
{
  "successful": [
    {
      "id": "0178f441-1abf-4e22-9502-6bfc5f5a5f55",
      "messageId": "f2aae8a1-d9cc-481f-8f3d-b7f764bd43d1",
      "mD5OfMessageBody": "ce67e1b50d724f5cebe918ead1adada6"
    },
    {
      "id": "8adfeb5a-70be-4d27-9c3a-f51cdeff3621",
      "messageId": "c3b6f91d-b98f-434a-a155-39b065197d2a",
      "mD5OfMessageBody": "db18e2bbc3094759354094f8fa161243"
    },
    {
      "id": "87c4f5a2-a3ba-4b74-a640-a3b11e19f0ca",
      "messageId": "a5ba06e7-62df-4a02-9752-af12eb6f8863",
      "mD5OfMessageBody": "507e11ab30f81e47c1b2c937cd6c31d3"
    },
    {
      "id": "31df5109-d5bd-46f4-9aaf-717fee89e73a",
      "messageId": "103c5215-24b5-4f80-a760-8a1fc7da80a7",
      "mD5OfMessageBody": "17066a6f6fa26444ae2359446af0dfee"
    },
    {
      "id": "dd4168e0-852b-4947-98dc-250ab2ef4de3",
      "messageId": "92e8b1d4-38bb-4758-ba33-560329f2dbfa",
      "mD5OfMessageBody": "94e51dd81cf7289705dcf1f0aaba4f2c"
    }
  ],
  "sdkResponseMetadata": {
    "metadata": {
      "AWS_REQUEST_ID": "91d53493-7e6b-5003-9775-64296a7a6417"
    }
  },
  "sdkHttpMetadata": {
    "httpHeaders": {
      "Server": "Server",
      "Connection": "keep-alive",
      "x-amzn-RequestId": "91d53493-7e6b-5003-9775-64296a7a6417",
      "Content-Length": "1430",
      "Date": "Thu, 01 Dec 2016 12:04:33 GMT",
      "Content-Type": "text/xml"
    },
    "httpStatusCode": 200
  }
}
```

In response, you have received an individual message's response parameters.

Receive Message with Acknowledgement

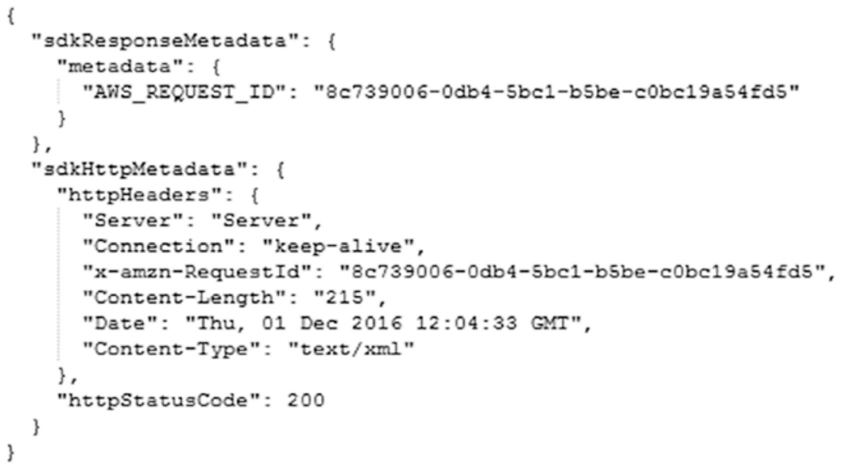
You need to acknowledge (delete) the messages to queue that the consumer has successfully received it. To do this, first receive the messages:

```
receiveMessageWithAck(queueUrl);

public void receiveMessageWithAck(String queueUrl) {
    List<Message> messages = receiveMessage(queueUrl, "receiveMessageWithAck");
    for (Message message : messages) {
        acknowledgeMessageReceivedToQueue(message, queueUrl);
    }
}

private List<Message> receiveMessage(String queueUrl, String operationType) {
    ReceiveMessageRequest request = new ReceiveMessageRequest(queueUrl);

    request.withMaxNumberOfMessages(10);

    ReceiveMessageResult response = amazonSQSClient.receiveMessage(request);

    return response.getMessages();
}

private void acknowledgeMessageReceivedToQueue(Message message,
                                                         String queueUrl) {
    String receiptHandle = message.getReceiptHandle();

    DeleteMessageRequest deleteMessageRequest =
        new DeleteMessageRequest(queueUrl, receiptHandle);

    DeleteMessageResult response =
        amazonSQSClient.deleteMessage(deleteMessageRequest);
}
```



```
{
  "messages": [
    {
      "messageId": "[illegible]",
      "receiptHandle":
      "[illegible]",
      "mD5OfBody": "[illegible]",
      "body": "Hello AWS SQS!!!",
      "messageAttributes": {}
    },
    {
      "messageId": "[illegible]",
      "receiptHandle":
      "[illegible]",
      "mD5OfBody": "[illegible]",
      "body": "Hello AWS SQS!!!-2",
      "messageAttributes": {}
    },
    {
      "messageId": "[illegible]",
      "receiptHandle":
      "[illegible]",
      "mD5OfBody": "[illegible]",
      "body": "Hello AWS SQS!!!-3",
      "messageAttributes": {}
    }
  ],
  "sdkResponseMetadata": {
    "metadata": {
      "AWS_REQUEST_ID": "[illegible]"
    }
  },
  "sdkHttpMetadata": {
    "httpHeaders": {
      "Server": "Server",
      "Connection": "keep-alive",
      "x-amzn-RequestId": "[illegible]",
      "Content-Length": "2081",
      "Date": "Thu, 01 Dec 2016 12:24:22 GMT",
      "Content-Type": "text/xml"
    },
    "httpStatusCode": 200
  }
}
```

Once the messages are received, you will iterate over the messages and invoke the `deleteMessage` method that has the message's `receiptHandle` parameter:



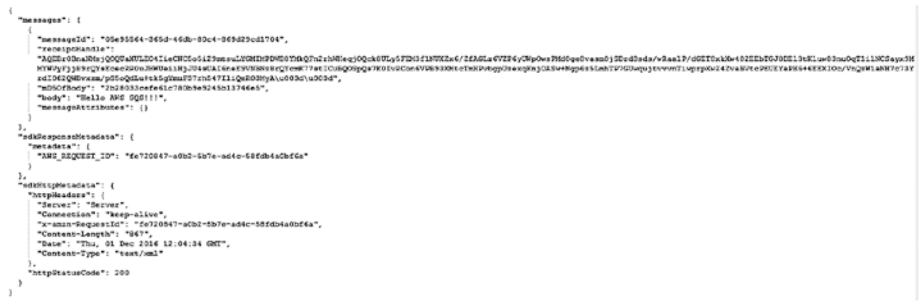
```
{
  "sdkResponseMetadata": {
    "metadata": {
      "AWS_REQUEST_ID": "8c739006-0db4-5bc1-b5be-c0bc19a54fd5"
    }
  },
  "sdkHttpMetadata": {
    "httpHeaders": {
      "Server": "Server",
      "Connection": "keep-alive",
      "x-amzn-RequestId": "8c739006-0db4-5bc1-b5be-c0bc19a54fd5",
      "Content-Length": "215",
      "Date": "Thu, 01 Dec 2016 12:04:33 GMT",
      "Content-Type": "text/xml"
    },
    "httpStatusCode": 200
  }
}
```

There won't be any parameters in response specific to deleting message apart from "`httpStatusCode`", which will be used to identify whether the request was successful or not.

Receive Message with Change Visibility

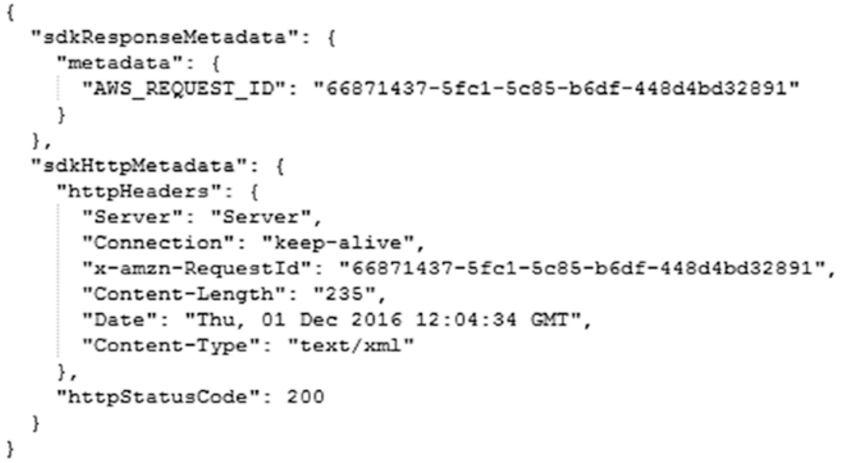
To change the visibility of received messages, first retrieve the messages from the queue and then invoke the `changeMessageVisibility` method:

```
receiveMessageWithChangeVisibility(queueUrl);

public void receiveMessageWithChangeVisibility(String queueUrl) {
    List<Message> messages =
        receiveMessage(queueUrl, "receiveMessageWithChangeVisibility");

    for (Message message : messages) {
        changeMessageVisibility(queueUrl, message.getReceiptHandle(), 10);
    }
}

private void changeMessageVisibility(String queueUrl, String receiptHandle,
                                                Integer visibilityTimeout) {
    ChangeMessageVisibilityRequest request =
                                        new ChangeMessageVisibilityRequest(
                                            queueUrl,
                                            receiptHandle,
                                            visibilityTimeout);
    ChangeMessageVisibilityResult response =
        amazonSQSClient.changeMessageVisibility(request);
}
```



```
{
  "messages": [
    {
      "messageId": "05e95564-365d-46db-80c4-869d29cd1704",
      "receiptHandle":
      "AQEBr0BnaNMsjQOQUaNULZO4ILeCNC5o5i29mnsuLYGMIMPDWS0YMkQTn2rhNNeqjOQck0ULy5FIM3f1NUXZx6/ZfAGLa[illegible]
      [illegible]
      rdID62QHDvxzm/pG5oQdLu#tk5gYmuF57rh547IliQeR03MyA\u003d\u003d",
      "mD5OfBody": "2b28033cefe61c780b9e9245b13746e5",
      "body": "Hello AWS SQS!!!",
      "messageAttributes": {}
    }
  ],
  "sdkResponseMetadata": {
    "metadata": {
      "AWS_REQUEST_ID": "fe720847-a0b2-5b7e-ad4c-58fdb4a0bf6a"
    }
  },
  "sdkHttpMetadata": {
    "httpHeaders": {
      "Server": "Server",
      "Connection": "keep-alive",
      "x-amzn-RequestId": "fe720847-a0b2-5b7e-ad4c-58fdb4a0bf6a",
      "Content-Length": "867",
      "Date": "Thu, 01 Dec 2016 12:04:34 GMT",
      "Content-Type": "text/xml"
    },
    "httpStatusCode": 200
  }
}
```

Once the messages are received, you will iterate over them and invoke the `changeMessageVisibility` method by passing the message's `recieptHandle` parameters.



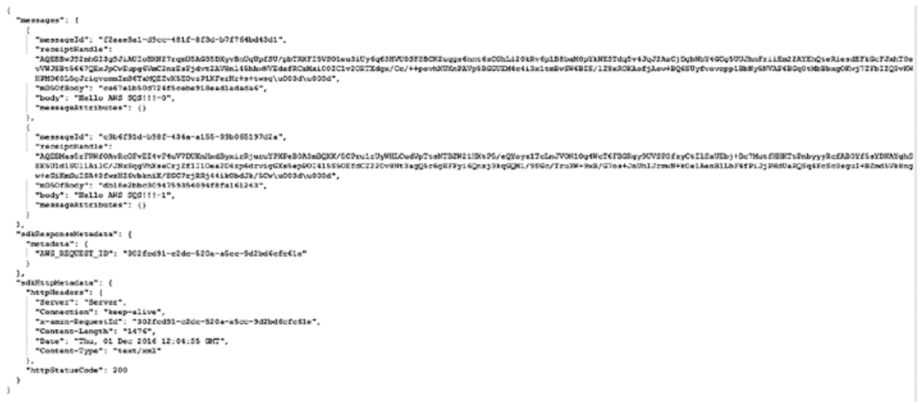
```
{
  "sdkResponseMetadata": {
    "metadata": {
      "AWS_REQUEST_ID": "66871437-5fc1-5c85-b6df-448d4bd32891"
    }
  },
  "sdkHttpMetadata": {
    "httpHeaders": {
      "Server": "Server",
      "Connection": "keep-alive",
      "x-amzn-RequestId": "66871437-5fc1-5c85-b6df-448d4bd32891",
      "Content-Length": "235",
      "Date": "Thu, 01 Dec 2016 12:04:34 GMT",
      "Content-Type": "text/xml"
    },
    "httpStatusCode": 200
  }
}
```

There won't be any parameters in response specific to changing a message visibility apart from `"httpStatusCode"`, which will be used to identify whether the request was successful or not.

Receive Message with Change Visibility Batch

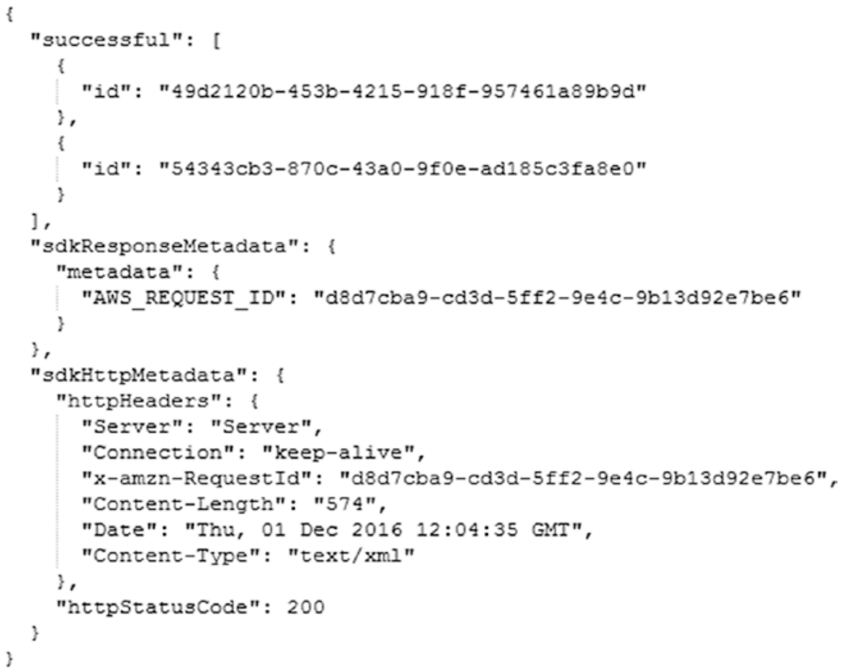
To change the visibility in the batch of received messages, you will first retrieve the messages from the queue and then invoke the changeMessageVisibilityBatch method:

```
receiveMessageWithChangeVisibilityBatch(queueUrl);

public void receiveMessageWithChangeVisibilityBatch(String queueUrl) {
    List<Message> messages = receiveMessage(
                                queueUrl,
                                "receiveMessageWithChangeVisibilityBatch");

    changeMessageVisibilityBatch(queueUrl, messages);
}

private void changeMessageVisibilityBatch(String queueUrl,
                                                  List<Message> messages) {
    ChangeMessageVisibilityBatchRequest request =
        new ChangeMessageVisibilityBatchRequest();

    request.setQueueUrl(queueUrl);

    List<ChangeMessageVisibilityBatchRequestEntry> entries =
        new ArrayList<ChangeMessageVisibilityBatchRequestEntry>();

    ChangeMessageVisibilityBatchRequestEntry entry;

    for(Message message: messages) {
        entry = new ChangeMessageVisibilityBatchRequestEntry(
                                            UUID.randomUUID().toString(),
                                            message.getReceiptHandle());

        entry.setVisibilityTimeout(10);

        entries.add(entry);
    }

    request.setEntries(entries);

    ChangeMessageVisibilityBatchResult response =
        amazonSQSClient.changeMessageVisibilityBatch(request);
}
```



```
{
  "messages": [
    {
      "messageId": "f2eee8a1-d5cc-481f-8f3d-b7f764bd43d1",
      "receiptHandle":
      "AQEBBwJ52mbGI3g5JiAUIoBXN27rqmU5AG35DKyvBnOqUpf3U/pbTRKFI5VD01eu3iUy6q63HVU03F3BCKZuqgs6nnt4sOGhLi20kRv6plB8baM0pYkNE3Tdq5v4JqJ2AsCjDgbNbY4GOg5UUJhnFziiEm22AYEhQteRiesdEFkGcFJahT0e
      vVWJSBt5667QExJpCvEupg6VmC2nsZsFjdvtZAVRnl45hhu6VZdafRCaMxiO0ZClv2CGTXdgx/Co/++povhXUKnPAVp6RGGUEM4c4iSx1tmBvSW6BIS/1Z9xRCKAofjAov+BQ6SUyfvovcpp1BbNyGNVAF6BGq0tMbBbxgOKrj72FbI2QSvKW
      HPMD60LSqJriqvommIm86YaMQEZvX5ZOvzP1XFerHr+s+twsq\u003d\u003d",
      "mD5OfBody": "ca67e1b50d724f5cebe918ead1adada6",
      "body": "Hello AWS SQS!!!-0",
      "messageAttributes": {}
    },
    {
      "messageId": "c3b6f91d-b58f-434a-a155-33b065197d2a",
      "receiptHandle":
      "AQEBMas6rPRWf0AvRcOFvZI4vP4uV7DUKnlbdBymizRjucuYPXPeB0A3mBQXK/5CPru1rUyWHLOudVpTsaNTBZW21BKsP5/eQYoys1TcLnJVOH10g4WcT6FBGRqy9UVSP0fzyCsIlSxUEbj+Dc7MutfHBKTtPnbyyyRcfAB0Yf5sYDWAYghS
      HK5U1d1SU11Ai1C/JNxSqgVhXeeCrjZf1I1Oea2D4zp6drvigGXe5ep9OI415S9OKfdCZ22Ov8Nt3agQ5r6gHFFyi6Qnxj3kqGQM1/9SGn/TruRW+9xR/G7os+JmUhIJrmdN+kCelAenH1LbF4fPiJjPWdUaRQSq4FcScSegu1+BZmd5VkRng
      w+eGiKmDuISA+3fwzHZ0vbkniX/EGC7rjRRj44ikObdJk/5Cw\u003d\u003d",
      "mD5OfBody": "db18e2bbc3094759354094f8fa161243",
      "body": "Hello AWS SQS!!!-1",
      "messageAttributes": {}
    }
  ],
  "sdkResponseMetadata": {
    "metadata": {
      "AWS_REQUEST_ID": "302fcd91-c2dc-520a-a5cc-9d2bd6cfc61e"
    }
  },
  "sdkHttpMetadata": {
    "httpHeaders": {
      "Server": "Server",
      "Connection": "keep-alive",
      "x-amzn-RequestId": "302fcd91-c2dc-520a-a5cc-9d2bd6cfc61e",
      "Content-Length": "1476",
      "Date": "Thu, 01 Dec 2016 12:04:35 GMT",
      "Content-Type": "text/xml"
    },
    "httpStatusCode": 200
  }
}
```

In response, you can see the messages are received with `"messageId"`, `"receiptHandle"`, `"mD5OfBody"`, `"body"`, and `"messageAttributes"` parameters.



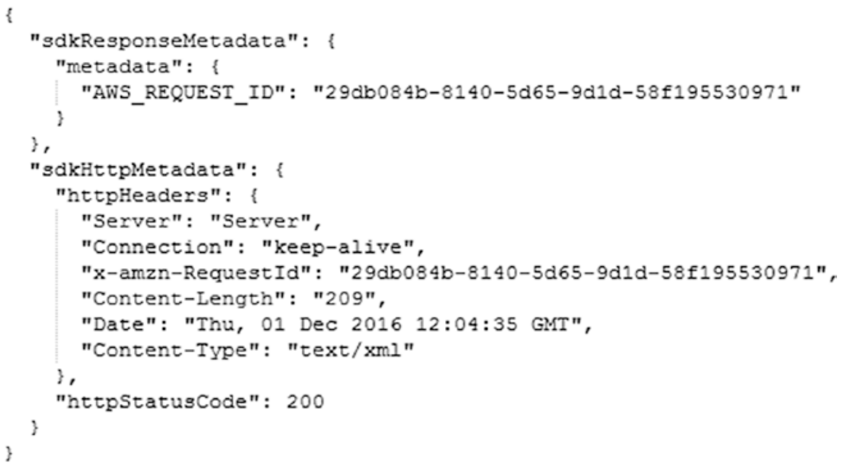
```
{
  "successful": [
    {
      "id": "49d2120b-453b-4215-918f-957461a89b9d"
    },
    {
      "id": "54343cb3-870c-43a0-9f0e-ad185c3fa8e0"
    }
  ],
  "sdkResponseMetadata": {
    "metadata": {
      "AWS_REQUEST_ID": "d8d7cba9-cd3d-5ff2-9e4c-9b13d92e7be6"
    }
  },
  "sdkHttpMetadata": {
    "httpHeaders": {
      "Server": "Server",
      "Connection": "keep-alive",
      "x-amzn-RequestId": "d8d7cba9-cd3d-5ff2-9e4c-9b13d92e7be6",
      "Content-Length": "574",
      "Date": "Thu, 01 Dec 2016 12:04:35 GMT",
      "Content-Type": "text/xml"
    },
    "httpStatusCode": 200
  }
}
```

In response, you can see that the change visibility status for each message is provided.

Purge Queue

To purge the queue, use the purgeQueue method:

```
purgeQueue(queueUrl);

public void purgeQueue(String queueUrl) {

    PurgeQueueRequest request = new PurgeQueueRequest(queueUrl);

    PurgeQueueResult response = amazonSQSClient.purgeQueue(request);
}
```



```
{
  "sdkResponseMetadata": {
    "metadata": {
      "AWS_REQUEST_ID": "29db084b-8140-5d65-9d1d-58f195530971"
    }
  },
  "sdkHttpMetadata": {
    "httpHeaders": {
      "Server": "Server",
      "Connection": "keep-alive",
      "x-amzn-RequestId": "29db084b-8140-5d65-9d1d-58f195530971",
      "Content-Length": "209",
      "Date": "Thu, 01 Dec 2016 12:04:35 GMT",
      "Content-Type": "text/xml"
    },
    "httpStatusCode": 200
  }
}
```

There won't be any parameters in response specific to purging the queue apart from "httpStatusCode", which will be used to identify whether the request was successful or not.

Delete Queue

To delete a queue, use the deleteQueue method:

```
deleteQueue(queueUrl);

public void deleteQueue(String queueUrl) {
    DeleteQueueRequest request = new DeleteQueueRequest(queueUrl);

    DeleteQueueResult response = amazonSQSClient.deleteQueue(request);

}
```

```
{
  "sdkResponseMetadata": {
    "metadata": {
      "AWS_REQUEST_ID": "0959b8cf-5285-5cce-94d5-e8754691f8da"
    }
  },
  "sdkHttpMetadata": {
    "httpHeaders": {
      "Server": "Server",
      "Connection": "keep-alive",
      "x-amzn-RequestId": "0959b8cf-5285-5cce-94d5-e8754691f8da",
      "Content-Length": "211",
      "Date": "Thu, 01 Dec 2016 12:04:36 GMT",
      "Content-Type": "text/xml"
    },
    "httpStatusCode": 200
  }
}
```

There won't be any parameters in response specific to deleting the queue apart from `"httpStatusCode"`, which will be used to identify whether the request was successful or not.

Monitor Using CloudWatch

CloudWatch allows monitoring the SQS using different metrics. It will trigger an alarm when a threshold is exceeded on specific metrics. The following steps, shown in Figure 3-31, can be used to create an alarm:

1. Go to the CloudWatch Management Console and click the Alarms button.

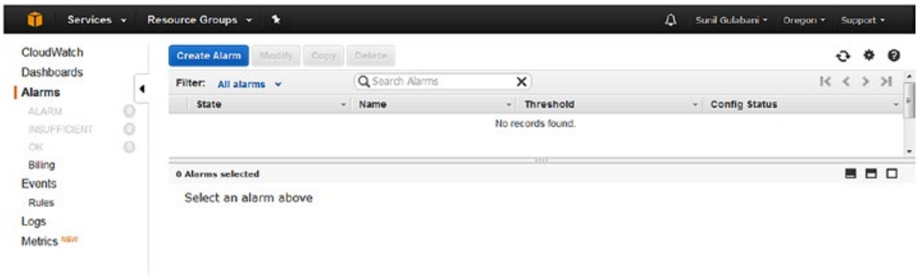
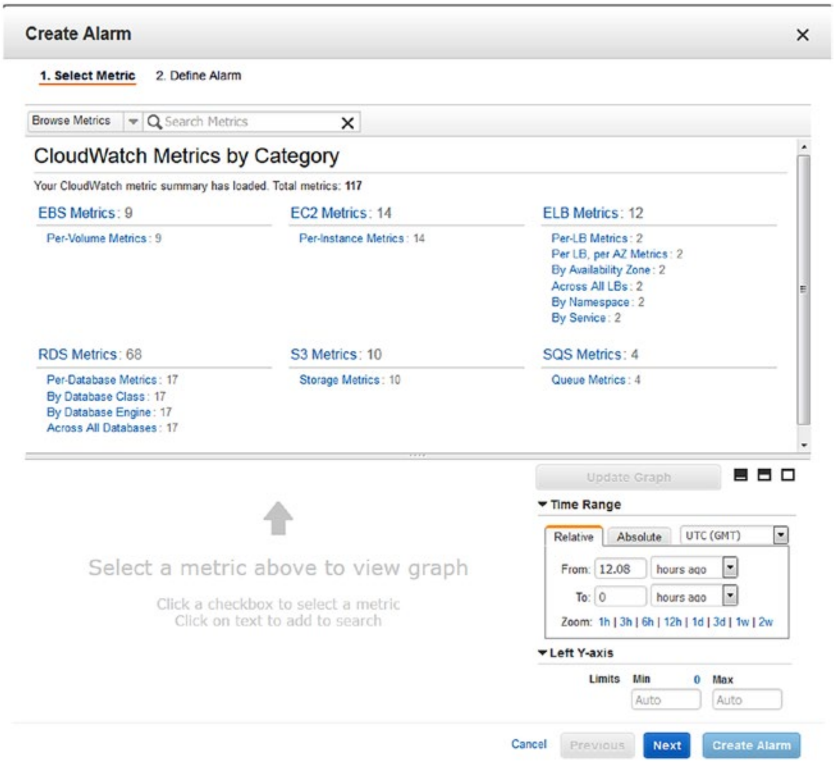


Figure 3-31. CloudWatch Alarm

Click the Create Alarm button.

The Create Alarm screen, which is shown in Figure 3-32, will be displayed where you will do the next two steps:

- Select metric
- Define alarm



Create Alarm

1. Select Metric 2. Define Alarm

Browse Metrics | Search Metrics

CloudWatch Metrics by Category

Your CloudWatch metric summary has loaded. Total metrics: 117

EBS Metrics: 9
- Per-Volume Metrics: 9

EC2 Metrics: 14
- Per-Instance Metrics: 14

ELB Metrics: 12
- Per-LB Metrics: 2
- Per LB, per AZ Metrics: 2
- By Availability Zone: 2
- Across All LBs: 2
- By Namespace: 2
- By Service: 2

RDS Metrics: 68
- Per-Database Metrics: 17
- By Database Class: 17
- By Database Engine: 17
- Across All Databases: 17

S3 Metrics: 10
- Storage Metrics: 10

SQS Metrics: 4
- Queue Metrics: 4

Select a metric above to view graph

Click a checkbox to select a metric
Click on text to add to search

Update Graph

Time Range: Relative | Absolute | UTC (GMT)

From: 12.08 hours ago

To: 0 hours ago

Zoom: 1h | 3h | 6h | 12h | 1d | 3d | 1w | 2w

Left Y-axis

Limits Min 0 Max

Auto Auto

Cancel | Previous | Next | Create Alarm

Figure 3-32. Create Alarm screen

2. First, select the metric for SQS. Click the Browse Metrics button and select SQS in the drop-down list, as shown in Figure 3-33.

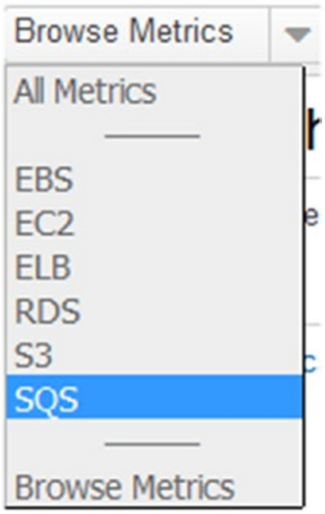
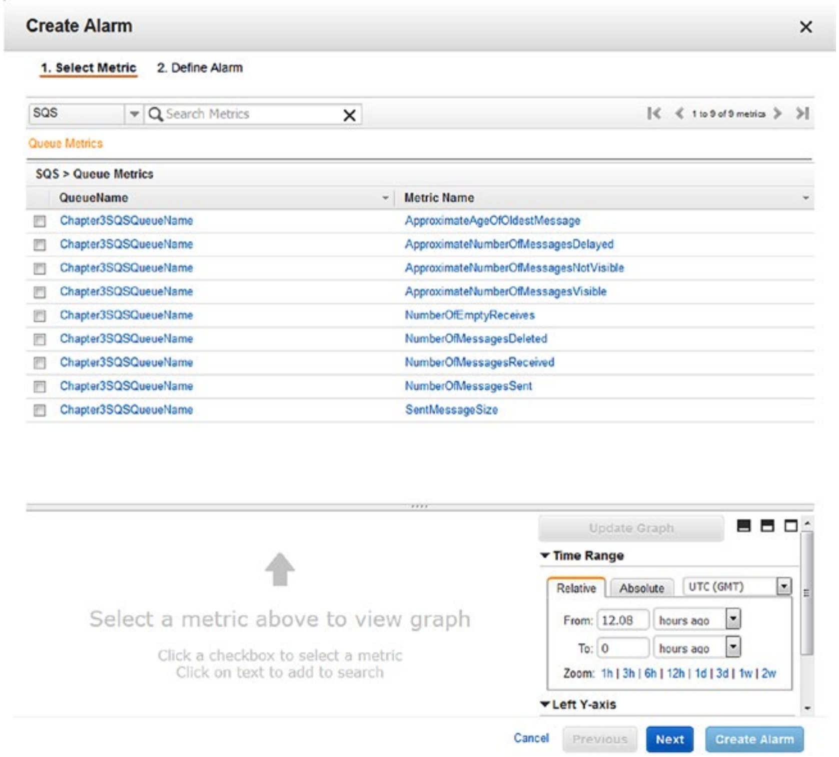


Figure 3-33. *Browse Metrics screen*

You can see all the metrics that can be configured on SQS in Figure 3-34.



QueueName	Metric Name
Chapter3SQSQueueName	ApproximateAgeOfOldestMessage
Chapter3SQSQueueName	ApproximateNumberOfMessagesDelayed
Chapter3SQSQueueName	ApproximateNumberOfMessagesNotVisible
Chapter3SQSQueueName	ApproximateNumberOfMessagesVisible
Chapter3SQSQueueName	NumberOfEmptyReceives
Chapter3SQSQueueName	NumberOfMessagesDeleted
Chapter3SQSQueueName	NumberOfMessagesReceived
Chapter3SQSQueueName	NumberOfMessagesSent
Chapter3SQSQueueName	SentMessageSize

Figure 3-34. *SQS Metric Listing screen*

3. For our case, select ApproximateNumberOfMessagesVisible metrics. Then click the Next button. (See Figure 3-35.)

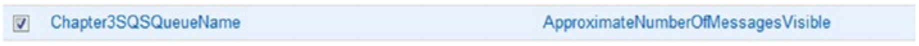
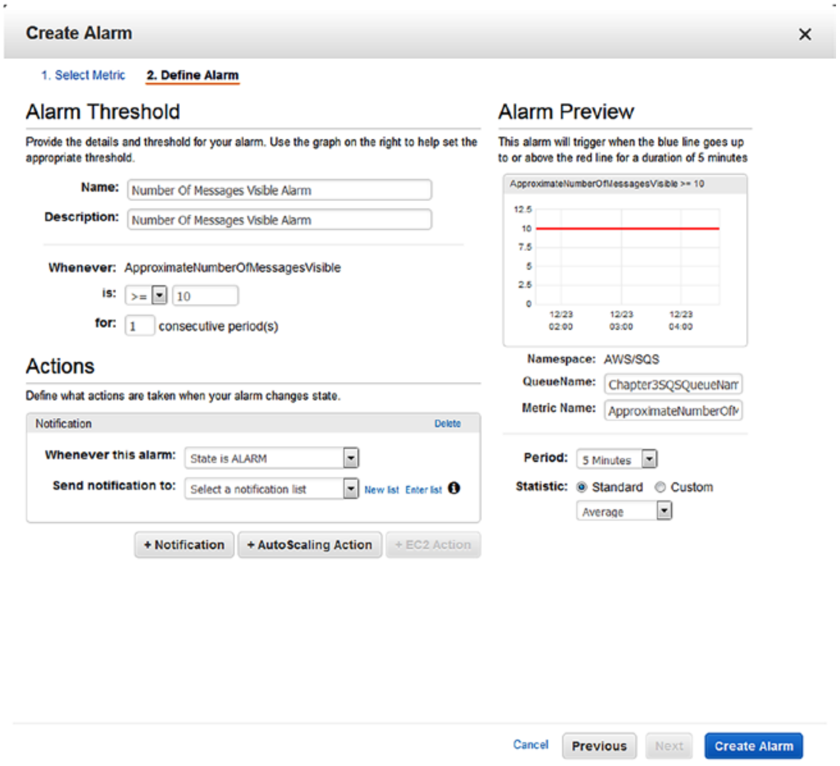

☑ Chapter3SQSQueueName ApproximateNumberOfMessagesVisible

Figure 3-35. *SQS metric selected*

4. Define the alarm settings by providing a name, description, and threshold values on the defined alarm. You will use "greater than" or "equal to" operations on messages being visible. (See Figure 3-36.)


Create Alarm

1. Select Metric 2. Define Alarm

Alarm Threshold

Provide the details and threshold for your alarm. Use the graph on the right to help set the appropriate threshold.

Name: Number Of Messages Visible Alarm
Description: Number Of Messages Visible Alarm

Whenever: ApproximateNumberOfMessagesVisible
is: >= 10
for: 1 consecutive period(s)

Actions

Define what actions are taken when your alarm changes state.

Notification Delete
Whenever this alarm: State is ALARM
Send notification to: Select a notification list New list Enter list

Alarm Preview

This alarm will trigger when the blue line goes up to or above the red line for a duration of 5 minutes

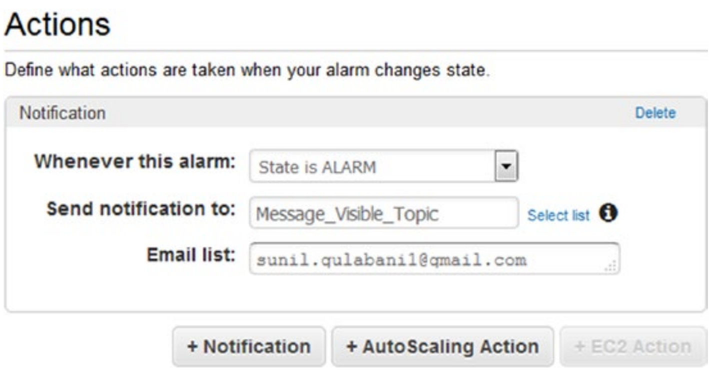
ApproximateNumberOfMessagesVisible >= 10

Namespace: AWS/SQS
QueueName: Chapter3SQSQueueNam
Metric Name: ApproximateNumberOfM

Period: 5 Minutes
Statistic: [✓ Standard] Custom
Average

Figure 3-36. *Define alarm*

5. You will also define actions to trigger notification when the alarm state is "ALARM." To configure the action, select the value Send notification to: or create a new notification by clicking the New List button. Enter the topic name and the e-mail address where notifications need to be sent. (See Figure 3-37.)



Actions

Define what actions are taken when your alarm changes state.

Notification

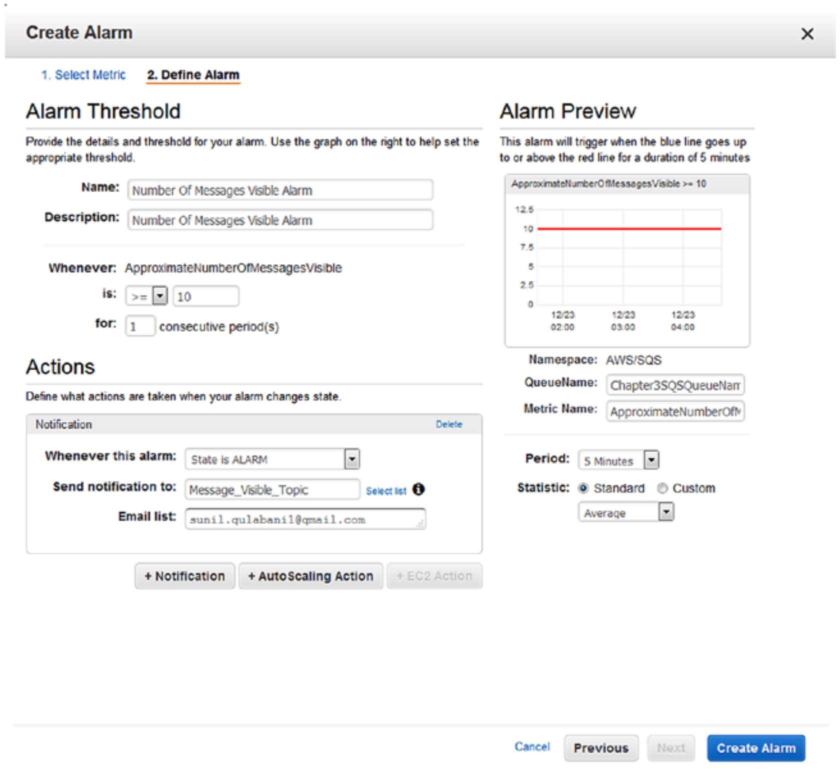
Whenever this alarm: State is ALARM

Send notification to: Message_Visible_Topic

Email list: sunil.gulabani1@gmail.com

Figure 3-37. *Define actions*

6. Click the Create Alarm button, as shown in Figure 3-38.



Create Alarm

1. Select Metric 2. Define Alarm

Alarm Threshold

Provide the details and threshold for your alarm. Use the graph on the right to help set the appropriate threshold.

Name: Number Of Messages Visible Alarm

Description: Number Of Messages Visible Alarm

Whenever: ApproximateNumberOfMessagesVisible

is: >= 10

for: 1 consecutive period(s)

Actions

Define what actions are taken when your alarm changes state.

Notification

Whenever this alarm: State is ALARM

Send notification to: Message_Visible_Topic

Email list: sunil.gulabani1@gmail.com

Alarm Preview

This alarm will trigger when the blue line goes up to or above the red line for a duration of 5 minutes

Namespace: AWS/SQS

QueueName: Chapter3SQSQueueNam

Metric Name: ApproximateNumberOfM

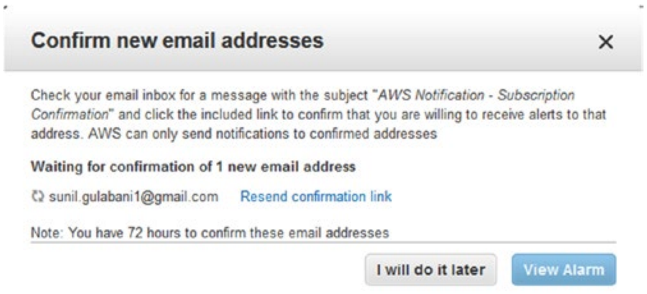
Period: 5 Minutes

Statistic: [✓ Standard] Custom

Average

Figure 3-38. *Create Alarm screen*

7. If you have added a new e-mail that is not subscribed to SNS, you will be asked to confirm the e-mail address by opening the link sent to that address. (See Figure 3-39.)



Confirm new email addresses

Check your email inbox for a message with the subject "*AWS Notification - Subscription Confirmation*" and click the included link to confirm that you are willing to receive alerts to that address. AWS can only send notifications to confirmed addresses

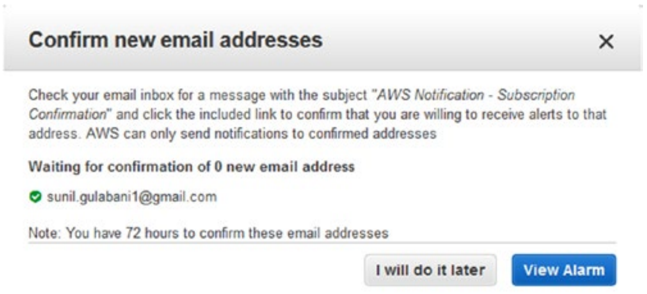
Waiting for confirmation of 1 new email address

sunil.gulabani1@gmail.com Resend confirmation link

Note: You have 72 hours to confirm these email addresses

Figure 3-39. *Confirm new e-mail address*

8. Once you confirm the subscription, as shown in Figure 3-40), you will be able to get e-mails when alarm is triggered.



Confirm new email addresses

Check your email inbox for a message with the subject "*AWS Notification - Subscription Confirmation*" and click the included link to confirm that you are willing to receive alerts to that address. AWS can only send notifications to confirmed addresses

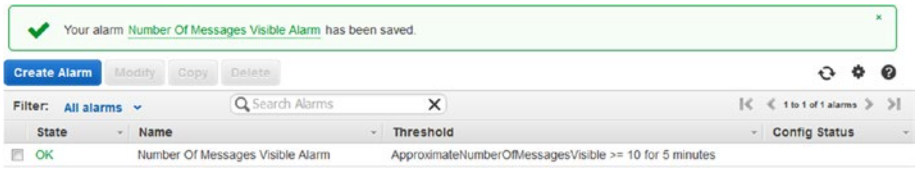
Waiting for confirmation of 0 new email address

sunil.gulabani1@gmail.com

Note: You have 72 hours to confirm these email addresses

Figure 3-40. *Confirm new e-mail address*

You can see that alarm has been created in Figure 3-41.

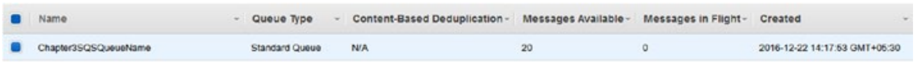


Your alarm Number Of Messages Visible Alarm has been saved.

State	Name	Threshold	Config Status
OK	Number Of Messages Visible Alarm	ApproximateNumberOfMessagesVisible >= 10 for 5 minutes	

Figure 3-41. *Alarm listing*

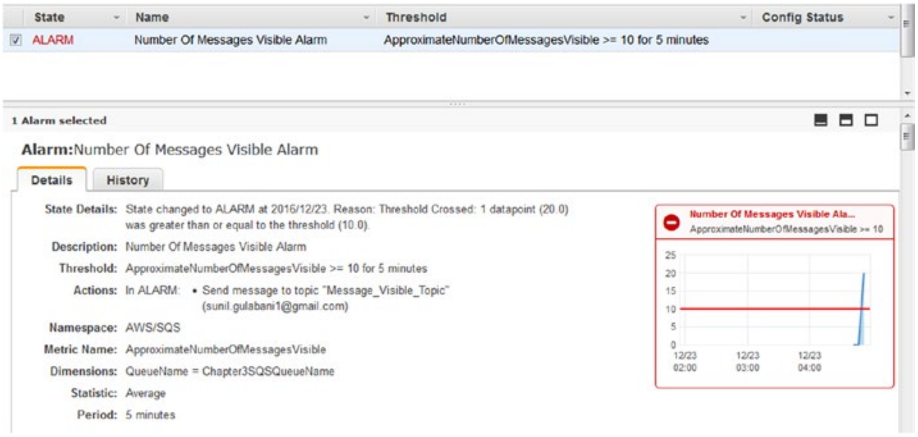
9. To test that the alarm has been generated, add 20 messages to the queue. (See Figure 3-42.)



Name	Queue Type	Content-Based Deduplication	Messages Available	Messages in Flight	Created
Chapter3SQSQueueName	Standard Queue	N/A	20	0	2016-12-22 14:17:53 GMT+05:30

Figure 3-42. *Queue listing*

10. You can see that alarm state has changed to "ALARM" in Figure 3-43.



State	Name	Threshold	Config Status
ALARM	Number Of Messages Visible Alarm	ApproximateNumberOfMessagesVisible >= 10 for 5 minutes	

1 Alarm selected

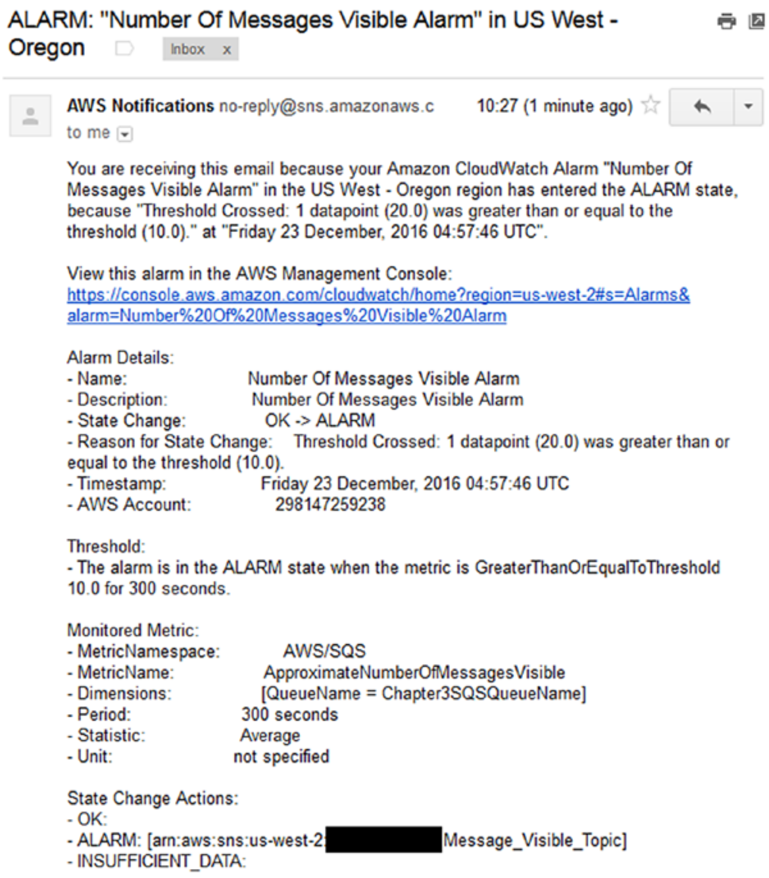
Alarm:Number Of Messages Visible Alarm

State Details: State changed to ALARM at 2016/12/23. Reason: Threshold Crossed: 1 datapoint (20.0) was greater than or equal to the threshold (10.0).
Description: Number Of Messages Visible Alarm
Threshold: ApproximateNumberOfMessagesVisible >= 10 for 5 minutes
Actions: In ALARM: • Send message to topic "Message_Visible_Topic" (sunil.gulabani1@gmail.com)
Namespace: AWS/SQS
Metric Name: ApproximateNumberOfMessagesVisible
Dimensions: QueueName = Chapter3SQSQueueName
Statistic: Average
Period: 5 minutes

Number Of Messages Visible Ala...
ApproximateNumberOfMessagesVisible >= 10
25
20
15
10
5
0
12/23 02:00
12/23 03:00
12/23 04:00

Figure 3-43. *Alarm generated*

11. The e-mail has also been triggered, as shown in Figure 3-44.



ALARM: "Number Of Messages Visible Alarm" in US West - Oregon Inbox x

AWS Notifications no-reply@sns.amazonaws.c 10:27 (1 minute ago)
to me

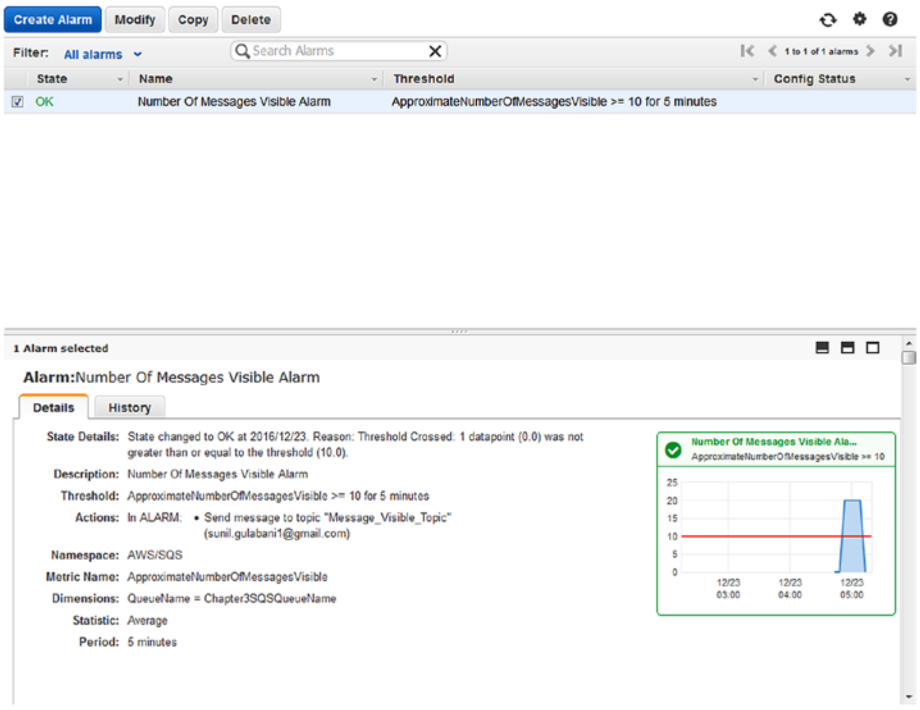
You are receiving this email because your Amazon CloudWatch Alarm "Number Of Messages Visible Alarm" in the US West - Oregon region has entered the ALARM state, because "Threshold Crossed: 1 datapoint (20.0) was greater than or equal to the threshold (10.0)." at "Friday 23 December, 2016 04:57:46 UTC".

View this alarm in the AWS Management Console:
https://console.aws.amazon.com/cloudwatch/home?region=us-west-2#s=Alarms&alarm=Number%20Of%20Messages%20Visible%20Alarm

```
Alarm Details:
- Name:                     Number Of Messages Visible Alarm
- Description:              Number Of Messages Visible Alarm
- State Change:             OK -> ALARM
- Reason for State Change:  Threshold Crossed: 1 datapoint (20.0) was greater than or
equal to the threshold (10.0).
- Timestamp:                Friday 23 December, 2016 04:57:46 UTC
- AWS Account:              298147259238

Threshold:
- The alarm is in the ALARM state when the metric is GreaterThanOrEqualToThreshold
10.0 for 300 seconds.

Monitored Metric:
- MetricNamespace:          AWS/SQS
- MetricName:               ApproximateNumberOfMessagesVisible
- Dimensions:               [QueueName = Chapter3SQSQueueName]
- Period:                   300 seconds
- Statistic:                Average
- Unit:                     not specified

State Change Actions:
- OK:
- ALARM: [arn:aws:sns:us-west-2[redacted]Message_Visible_Topic]
- INSUFFICIENT_DATA:
```

Figure 3-44. *Alarm e-mail*

12. After the messages are read and deleted from the queue, the alarm state will go back to "OK," as shown in Figure 3-45.



State	Name	Threshold	Config Status
OK	Number Of Messages Visible Alarm	ApproximateNumberOfMessagesVisible >= 10 for 5 minutes	

Alarm: Number Of Messages Visible Alarm

State Details: State changed to OK at 2016/12/23. Reason: Threshold Crossed: 1 datapoint (0.0) was not greater than or equal to the threshold (10.0).
Description: Number Of Messages Visible Alarm
Threshold: ApproximateNumberOfMessagesVisible >= 10 for 5 minutes
Actions: In ALARM: • Send message to topic "Message_Visible_Topic" (sunil.gulabani1@gmail.com)
Namespace: AWS/SQS
Metric Name: ApproximateNumberOfMessagesVisible
Dimensions: QueueName = Chapter3SQSQueueName
Statistic: Average
Period: 5 minutes

Number Of Messages Visible Ala...
ApproximateNumberOfMessagesVisible >= 10
25
20
15
10
5
0
12/23 03:00
12/23 04:00
12/23 05:00

Figure 3-45. *Alarm state "OK"*

Summary

In this chapter, I have demonstrated how to create a queue and configure the queue attributes using AWS Management Console, AWS CLI, and AWS Java SDK. I have also explained how to authorize the queue to grant access to a specific AWS Account ID so that users can access the queue. Lastly, I discussed how to configure a CloudWatch alarm in your queue, which is invoked once the threshold value has been crossed.

In Chapter 4, I will explain how to create and configure Kinesis Streams and how to implement producer and consumer applications.

CHAPTER 4

Hands-on Kinesis

Amazon Kinesis is used for data streaming. It can handle heavy loads and provide performance in real-time processing. Kinesis data can be offloaded to Amazon S3 for future look-up on data. Amazon Kinesis captures data records using streams, delivers data records to other AWS services using Firehose, and can analyze captured data using Kinesis analytics.

In this chapter, I will cover the following topics:

- Introduction to AWS Kinesis Stream and Firehose
- Features
- Using AWS Management Console
- Using AWS CLI
- Using AWS SDK—Java
- Monitoring Using CloudWatch

Introduction to AWS Kinesis Stream and Firehose

AWS Kinesis Stream is a stream of data records used for real-time data transfer. AWS Kinesis Stream follows the pattern of producer and consumer to push and read data respectively from streams. Kinesis Stream can be used to process and aggregate data by integrating different AWS resources such as S3, Redshift, Elastic Search, and so on. For example, to analyze the call data records of telecommunication network, which are enormous records, the processing needs to be in real time. Whenever call data records are generated, applications will push data to Kinesis Stream, and the consumer application will read data from the stream and process it. This generates reports and billing for specific call data records. Simultaneously, Kinesis Stream also invokes events to store raw data to S3 as per configuration. This makes it possible for an application to serve high throughput, reliability, and durability.

AWS Kinesis Firehose is a delivery system for Kinesis stream. You don't need a separate application for AWS Kinesis Firehose; it is the configuration-based mechanism that triggers events to deliver data records when Kinesis receives data records. You can also transform this data before pushing it to other resources. With this, you can integrate several AWS resources such as Simple Storage Services (S3), Redshift, Elastic Search (ES), and so on. In this chapter, I will focus on the Amazon Kinesis Stream.

S. Gulabani, *Practical Amazon EC2, SQS, Kinesis, and S3*,
DOI 10.1007/978-1-4842-2841-8_4

Features

Following are the main features of Kinesis Stream:

Real-Time Data Streaming and Processing

Kinesis provides real-time data streaming. Producer applications can add data records to the stream and consumers can read the data after it is added. Data streaming between the producer, who is adding records, and the consumer, who is reading the record, is less than one second.

Durability and Elasticity

Kinesis Stream provides high availability and durability of the data stream. This ensures that data is not lost and real-time complex processing can be achieved. Kinesis Stream can scale based on the traffic flow of data records.

Managed Service

Kinesis is a fully AWS-managed service. You don't need to look after the Kinesis infrastructure to manage it; you just need to configure Kinesis Streams during its creation.

Concurrent Consumers

AWS Kinesis doesn't restrict the consumer applications to read data records. Multiple consumer applications can read the same record and process it. For example, you can achieve two tasks on data records—store raw data on S3 and process data records. You can have two consumer applications where one application will store raw data to S3 and the second application will process the data. In addition to this, you can also use Kinesis Client Library (KCL) to have multiple consumer workers to process data records.

Using AWS Management Console

AWS Management Console can be used to manage Kinesis Streams. It provides an easy way to configure Kinesis Streams. The following section shows how to configure Kinesis Streams.

Create Streams

Streams are an important part of Kinesis. Streams have the capability to capture data records. Streams follow the publisher and subscriber model. The following steps will lead to the creation of Kinesis Streams:

1. Sign in to the AWS console and click Kinesis under All Services ➤ Analytics category, as shown in Figure 4-1.

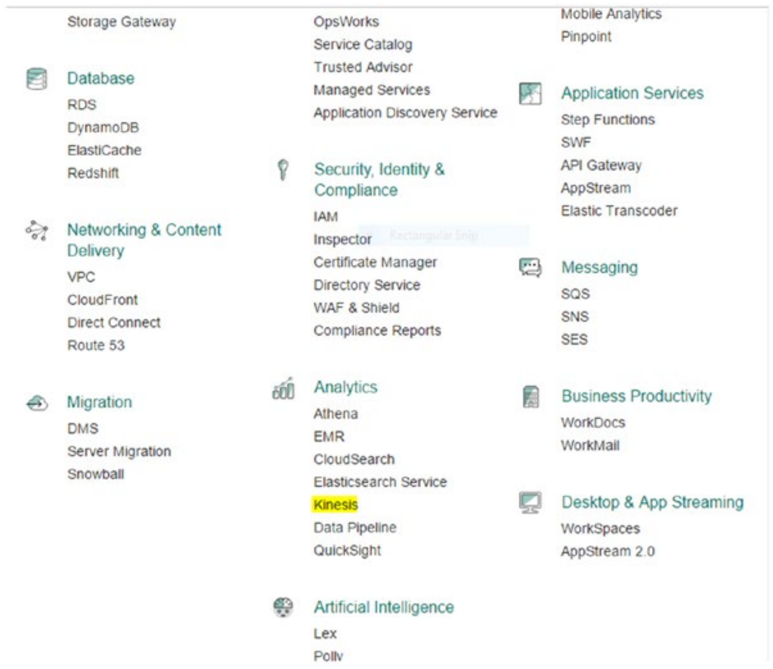


Figure 4-1. *AWS Management Console—Kinesis*

This will take you to the Kinesis screen, as shown in Figure 4-2, where you can see three different types of services:

- Amazon Kinesis Firehose
- Amazon Kinesis Analytics
- Amazon Kinesis Streams

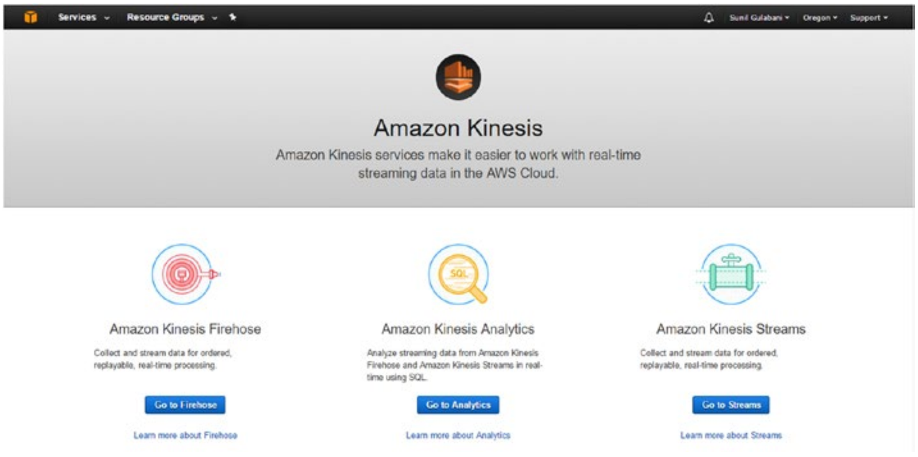

Services
Resource Groups
Sunil Gulabani
Oregon
Support
Amazon Kinesis
Amazon Kinesis services make it easier to work with real-time streaming data in the AWS Cloud.
Amazon Kinesis Firehose
Collect and stream data for ordered, replayable, real-time processing.
Go to Firehose
Learn more about Firehose
Amazon Kinesis Analytics
Analyze streaming data from Amazon Kinesis Firehose and Amazon Kinesis Streams in real-time using SQL
Go to Analytics
Learn more about Analytics
Amazon Kinesis Streams
Collect and stream data for ordered, replayable, real-time processing.
Go to Streams
Learn more about Streams

Figure 4-2. *Amazon Kinesis screen*

2. In this chapter, we will focus on Amazon Kinesis Streams. Click the Go to Streams button.

3. Here you can see the already-created streams. Otherwise, if no streams have been created, you will see the Create Stream button and click it, as shown in Figure 4-3.

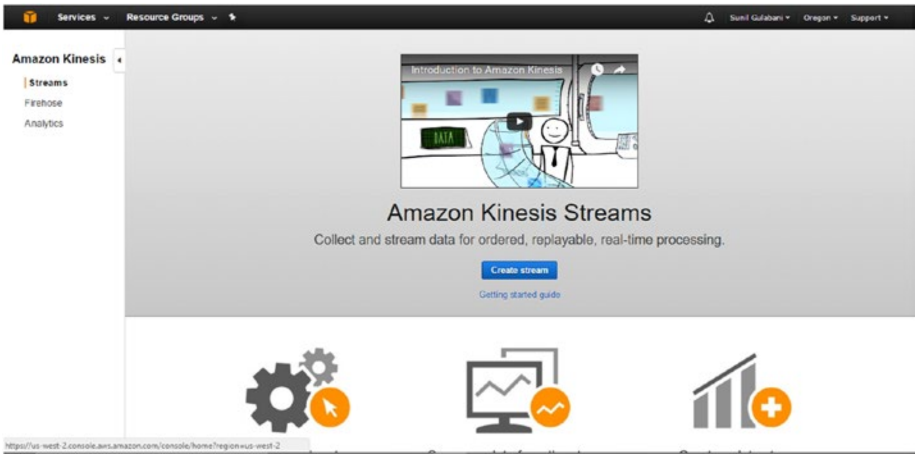
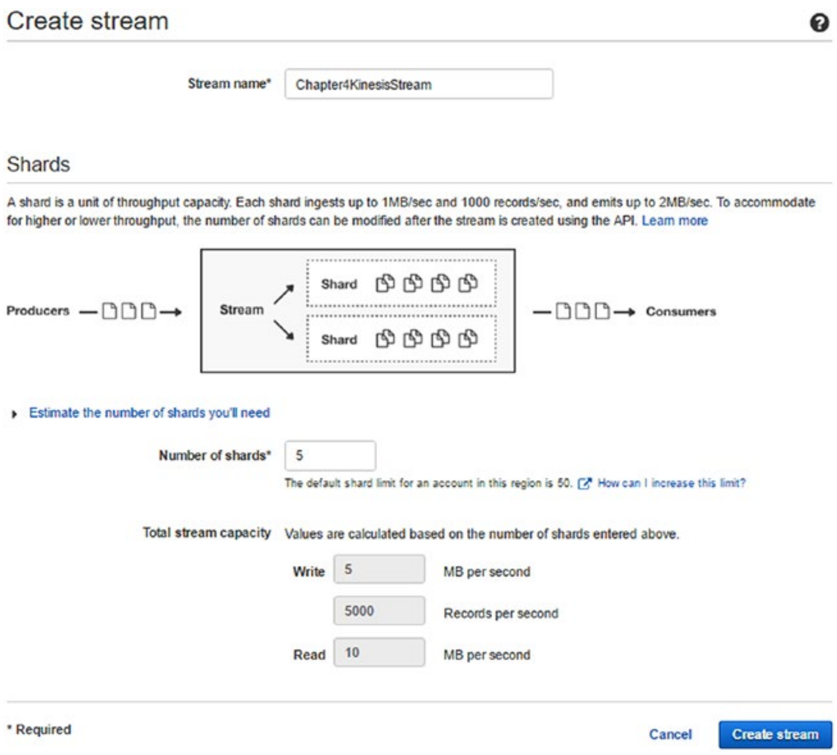


Figure 4-3. *Amazon Kinesis Stream screen*

4. Next, you will be filling up the stream name and shard count for creating a new stream, as shown in Figure 4-4.

■ **Note** Shards are created under a stream, which are uniquely identified as group of data records. You can have multiple shards under a stream, which will help to distribute load on shards.



Create stream

Stream name* Chapter4KinesisStream

Shards

A shard is a unit of throughput capacity. Each shard ingests up to 1MB/sec and 1000 records/sec, and emits up to 2MB/sec. To accommodate for higher or lower throughput, the number of shards can be modified after the stream is created using the API. Learn more

Number of shards* 5

The default shard limit for an account in this region is 50. How can I increase this limit?

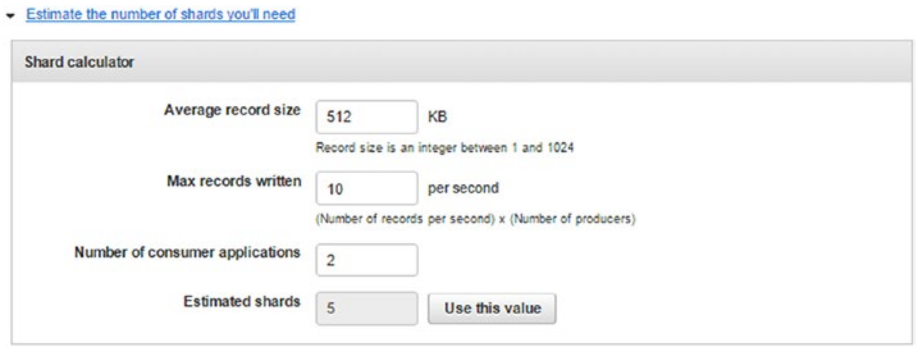
Total stream capacity Values are calculated based on the number of shards entered above.

Write	5	MB per second
	5000	Records per second
Read	10	MB per second

* Required

Figure 4-4. *Create Kinesis Stream screen*

5. Using the Estimate the number of shards you'll need link, you can predict how many shards you will need based on record size, records written per second, and number of consumer applications that will subscribe to stream. (See Figure 4-5.)



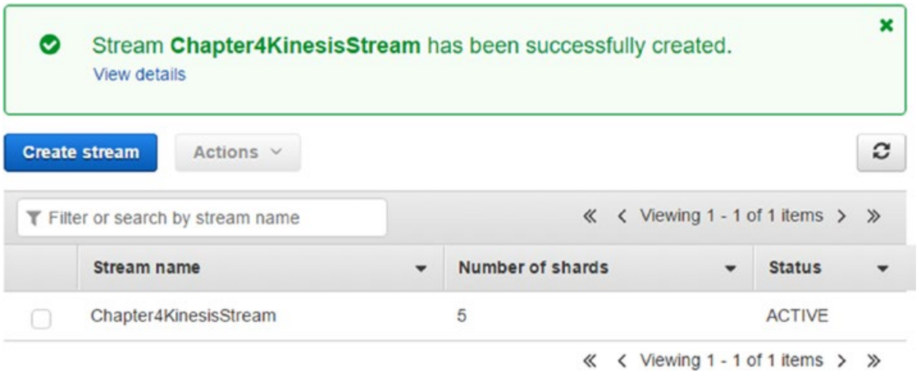
Estimate the number of shards you'll need

Shard calculator

Average record size	512 KB (Record size is an integer between 1 and 1024)
Max records written	10 per second ((Number of records per second) x (Number of producers))
Number of consumer applications	2
Estimated shards	5

Figure 4-5. *Estimate the number of shards*

6. Once all the details are filled in, click the Create stream button. You can see that stream has been created in Figure 4-6.



Stream **Chapter4KinesisStream** has been successfully created.

View details

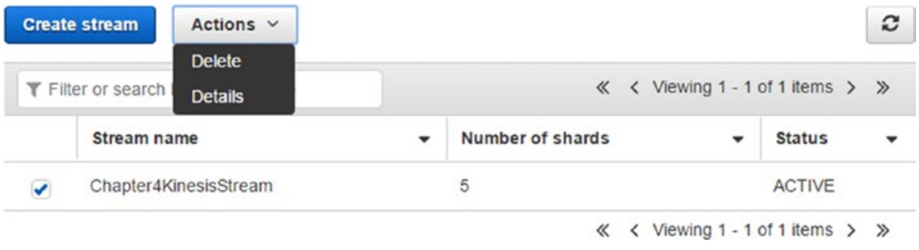
Stream name	Number of shards	Status
Chapter4KinesisStream	5	ACTIVE

Figure 4-6. *Kinesis Stream listing*

Edit Shards

At times, you will want to scale up or scale down the Kinesis shards because of data traffic that is going on in the Kinesis Stream. If this is the case, you need to increase or decrease the shard count.

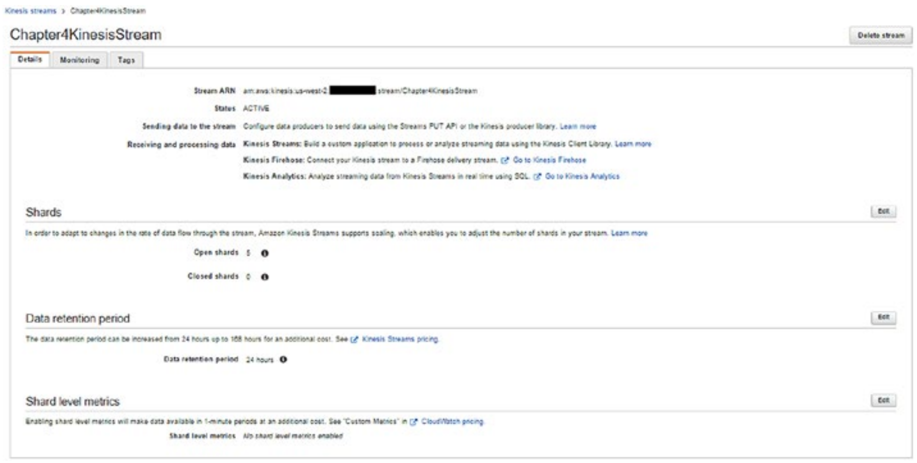
1. To edit the shard count, click the Kinesis Stream or select the Kinesis Stream and click the Actions ➤ Details menu, as shown in Figure 4-7.



	Stream name	Number of shards	Status
✓	Chapter4KinesisStream	5	ACTIVE

Figure 4-7. *Kinesis Stream action menu*

2. You will land on the Kinesis Stream's details page, shown in Figure 4-8, where you can configure different parameters.



Chapter4KinesisStream

Stream ARN arn:aws:kinesis:us-west-2:[redacted]:stream/Chapter4KinesisStream
Status ACTIVE
Sending data to the stream Configure data producers to send data using the Streams PUT API or the Kinesis producer library. Learn more
Receiving and processing data Kinesis Streams: Build a custom application to process or analyze streaming data using the Kinesis Client Library. Learn more
Kinesis Firehose: Connect your Kinesis stream to a Firehose delivery stream. Go to Kinesis Firehose
Kinesis Analytics: Analyze streaming data from Kinesis Streams in real time using SQL. Go to Kinesis Analytics

Shards

In order to adapt to changes in the rate of data flow through the stream, Amazon Kinesis Streams supports scaling, which enables you to adjust the number of shards in your stream. Learn more

Open shards 5
Closed shards 0

Data retention period

The data retention period can be increased from 24 hours up to 168 hours for an additional cost. See Kinesis Streams pricing.

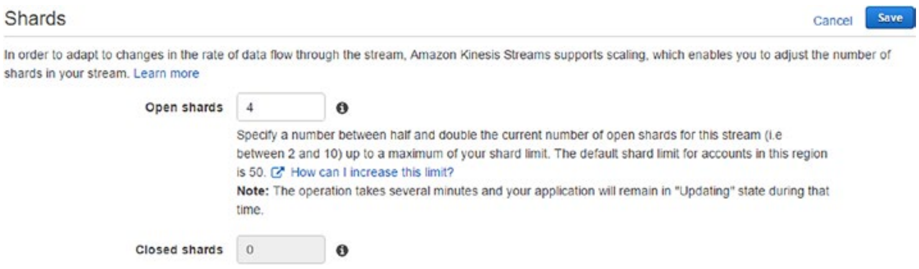
Data retention period 24 hours

Shard level metrics

Enabling shard level metrics will make data available in 1-minute periods at an additional cost. See "Custom Metrics" in CloudWatch pricing.
Shard level metrics No shard level metrics enabled

Figure 4-8. *Kinesis Stream details*

3. To edit the shard count, click the Edit button of Shards section. This will enable the "Open shards" input box to change count. (See Figure 4-9.)



Shards

In order to adapt to changes in the rate of data flow through the stream, Amazon Kinesis Streams supports scaling, which enables you to adjust the number of shards in your stream. Learn more

Open shards 4

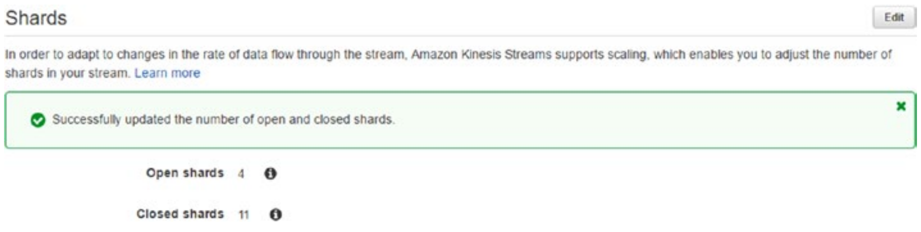
Specify a number between half and double the current number of open shards for this stream (i.e between 2 and 10) up to a maximum of your shard limit. The default shard limit for accounts in this region is 50. How can I increase this limit?

Note: The operation takes several minutes and your application will remain in "Updating" state during that time.

Closed shards 0

Figure 4-9. *Edit shards*

4. Here you can define the number of shards between half and double the current number of open shards. Once you have finished the changes, click the Save button. Updating shard count takes time. (See Figure 4-10.)



Shards

In order to adapt to changes in the rate of data flow through the stream, Amazon Kinesis Streams supports scaling, which enables you to adjust the number of shards in your stream. Learn more

Successfully updated the number of open and closed shards.

Open shards 4

Closed shards 11

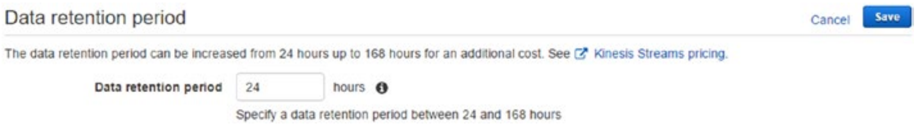
Figure 4-10. *Edited shards successfully*

■ **Note** If there are any messages on stream that are in closed shards, they will be available for consumers until the retention period is completed.

Configure Data Retention Period

The data retention period defines the time for a message to be retained on stream. For example, if we configured 24 hours as the data retention period, the stream will keep the message for 24 hours so that consumer applications can read the message within the specified duration.

1. To configure the data retention period for messages on stream, click the Edit button. (See Figure 4-11.)



Data retention period

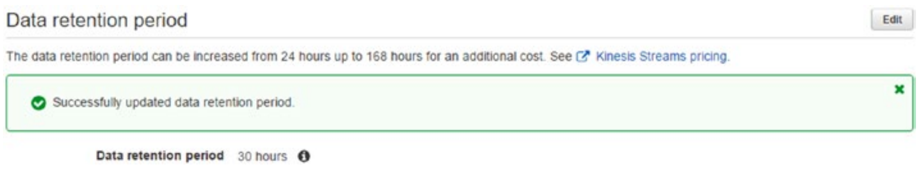
The data retention period can be increased from 24 hours up to 168 hours for an additional cost. See Kinesis Streams pricing.

Data retention period 24 hours

Specify a data retention period between 24 and 168 hours

Figure 4-11. *Configure data retention period*

2. Change the value and click the Save button. Changes may take up to 30 seconds to go into effect. (See Figure 4-12.)


Data retention period

Edit

The data retention period can be increased from 24 hours up to 168 hours for an additional cost. See Kinesis Streams pricing.

Successfully updated data retention period.

Data retention period 30 hours

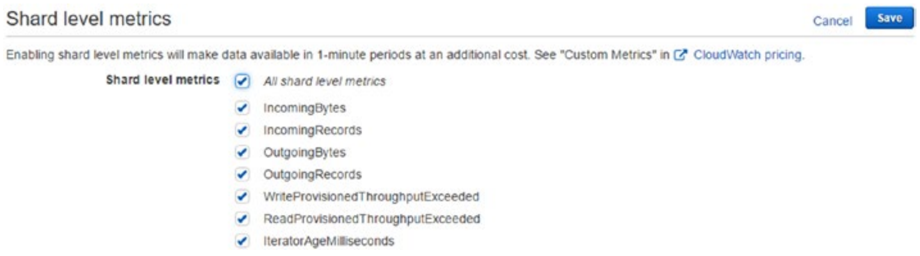
Figure 4-12. *Configured data retention period successfully*

■ **Note** The minimum and maximum data retention periods can be 24 hours and 168 hours, respectively.

Configure Shard Level Metrics

Shard level metrics help to identify the performance of shards. Using these metrics, you can determine if you need resharding.

1. By default, no shard level metrics are enabled. To enable the shard level metrics, click the Edit button and select the metrics you want to enable. (See Figure 4-13.)


Shard level metrics

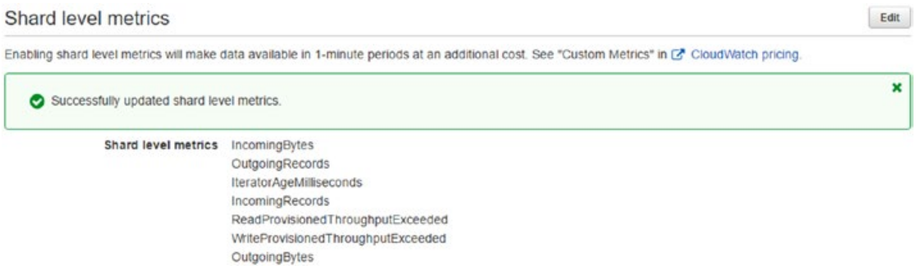
Cancel Save

Enabling shard level metrics will make data available in 1-minute periods at an additional cost. See "Custom Metrics" in CloudWatch pricing.

Shard level metrics ✓ All shard level metrics
- ✓ IncomingBytes
- ✓ IncomingRecords
- ✓ OutgoingBytes
- ✓ OutgoingRecords
- ✓ WriteProvisionedThroughputExceeded
- ✓ ReadProvisionedThroughputExceeded
- ✓ IteratorAgeMilliseconds

Figure 4-13. *Configure shard level metrics*

2. Once you select the metrics, click the Save button. Changes may take up to 70 seconds to go into effect. (See Figure 4-14.)


Shard level metrics

Enabling shard level metrics will make data available in 1-minute periods at an additional cost. See "Custom Metrics" in CloudWatch pricing.

Successfully updated shard level metrics.

Shard level metrics	IncomingBytes
	OutgoingRecords
	IteratorAgeMilliseconds
	IncomingRecords
	ReadProvisionedThroughputExceeded
	WriteProvisionedThroughputExceeded
	OutgoingBytes

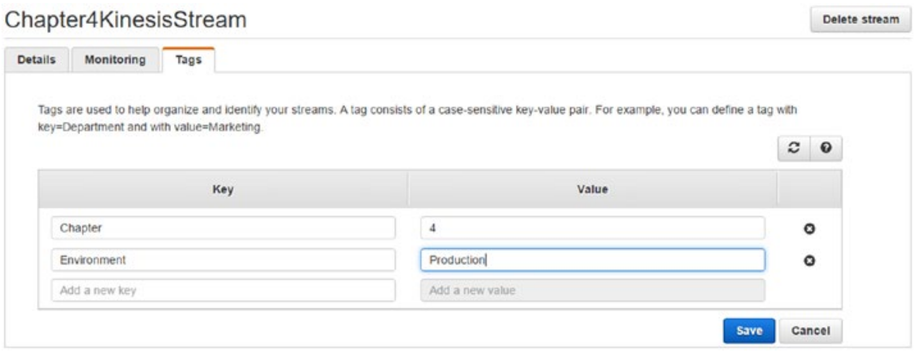
Figure 4-14. *Configured shard level metrics successfully*

Configure Tags

Tags are logical names and values that are assigned to AWS services. Tags are used to aggregate AWS resources and find out costs by grouping similar tags.

1. Click the Tags tab on the Kinesis Stream detail page, shown in Figure 4-15. Here you can see the tag listing, add new tags, edit existing tags, and remove tags.

2. To add tags, add key and value and click the Save button.

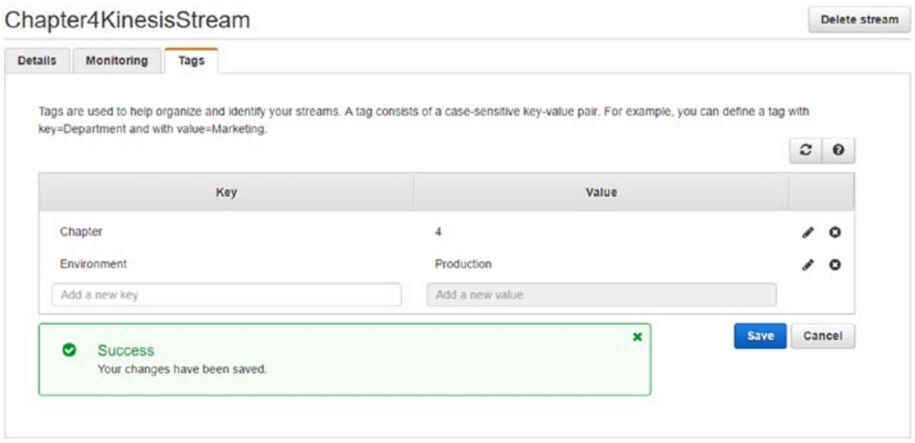

Chapter4KinesisStream

Tags are used to help organize and identify your streams. A tag consists of a case-sensitive key-value pair. For example, you can define a tag with key=Department and with value=Marketing.

Key	Value
Chapter	4
Environment	Production
Add a new key	Add a new value

Figure 4-15. *Add tags*

3. You can also edit the existing created tags by clicking the edit icon of each tag. (See Figure 4-16.)



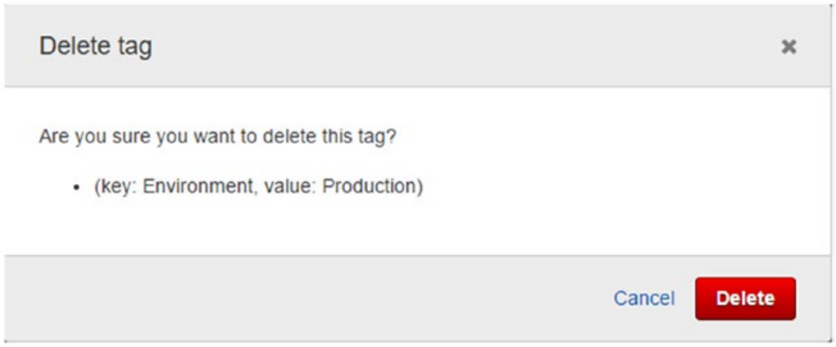
Tags are used to help organize and identify your streams. A tag consists of a case-sensitive key-value pair. For example, you can define a tag with key=Department and with value=Marketing.

Key	Value
Chapter	4
Environment	Production
Add a new key	Add a new value

Success
Your changes have been saved.

Figure 4-16. *Added tags successfully and edited tags*

4. To delete tags, click the delete (cross) icon shown for each tag. Clicking the delete icon will prompt users to confirm deletion. (See Figure 4-17.)

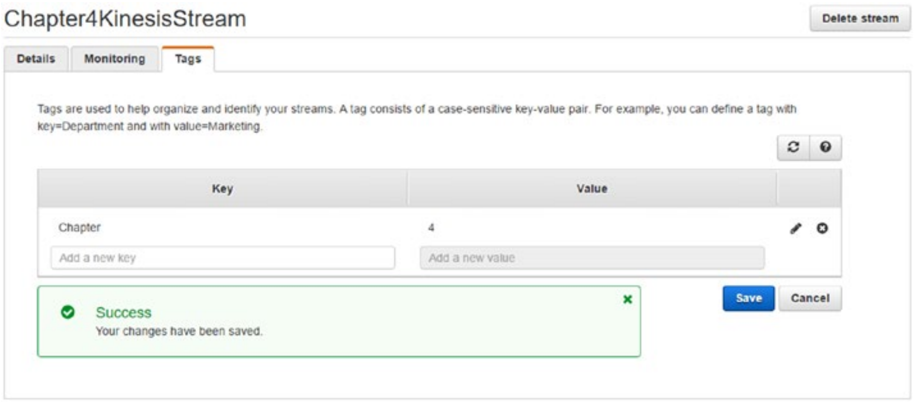

Delete tag

Are you sure you want to delete this tag?

- (key: Environment, value: Production)

Figure 4-17. *Delete tag confirmation*

5. Changes will be saved by clicking the Delete button, as shown in Figure 4-18.


Chapter4KinesisStream

Tags are used to help organize and identify your streams. A tag consists of a case-sensitive key-value pair. For example, you can define a tag with key=Department and with value=Marketing.

Key	Value
Chapter	4
Add a new key	Add a new value

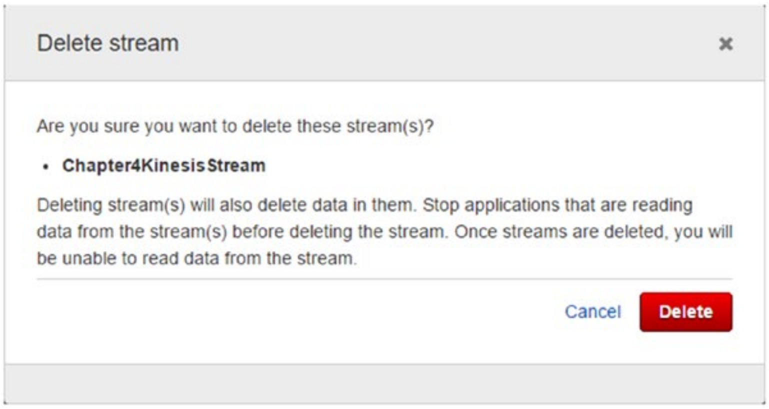
Success
Your changes have been saved.

Figure 4-18. *Deleted tag successfully*

Delete Stream

The delete stream command deletes the stream permanently. Data records that are present on Kinesis Stream are removed and can't be recovered once deleted.

1. To delete a stream, first select the Kinesis Stream from the Kinesis Stream listing page and then select the Actions ➤ Delete menu or go to the detail page of the Kinesis Stream and then click the Delete Stream button, as shown in Figure 4-19.


Delete stream

Are you sure you want to delete these stream(s)?

- **Chapter4KinesisStream**

Deleting stream(s) will also delete data in them. Stop applications that are reading data from the stream(s) before deleting the stream. Once streams are deleted, you will be unable to read data from the stream.

Figure 4-19. *Delete stream confirmation*

2. Click the Delete button to delete the stream. The deleting process may take time.

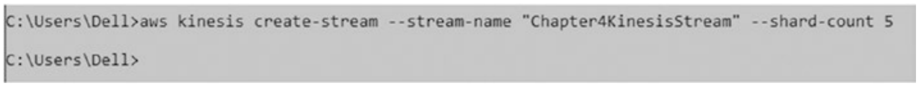
Using AWS CLI

In Chapter 1, I explained how to install AWS CLI. In this section, I will show how to use AWS CLI to manage AWS Kinesis.

create-stream

To create stream using AWS CLI, you need to provide the stream name and shard count in a command:

```
>aws kinesis create-stream --stream-name "Chapter4KinesisStream"
--shard-count 5
```



```
C:\Users\Dell>aws kinesis create-stream --stream-name "Chapter4KinesisStream" --shard-count 5

C:\Users\Dell>
```

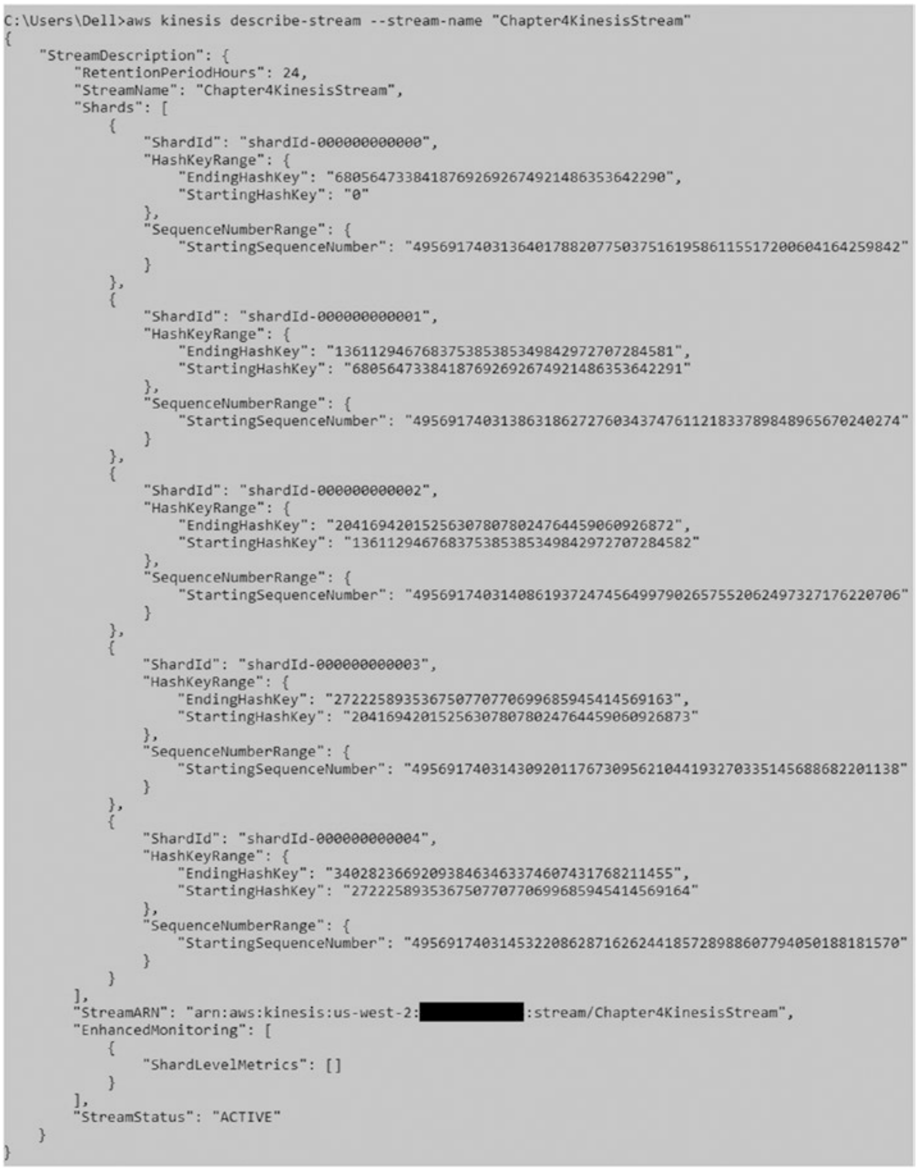
There won’t be any output for this request. create-stream has a limitation where it only supports 5 transactions per second per account.

■ **Note** For more parameters in detail, refer to http://docs.amazonaws.cn/cli/latest/reference/kinesis/create-stream.html.

describe-stream

The describe-stream command will provide details of the stream. You need to pass the stream name to get the details:

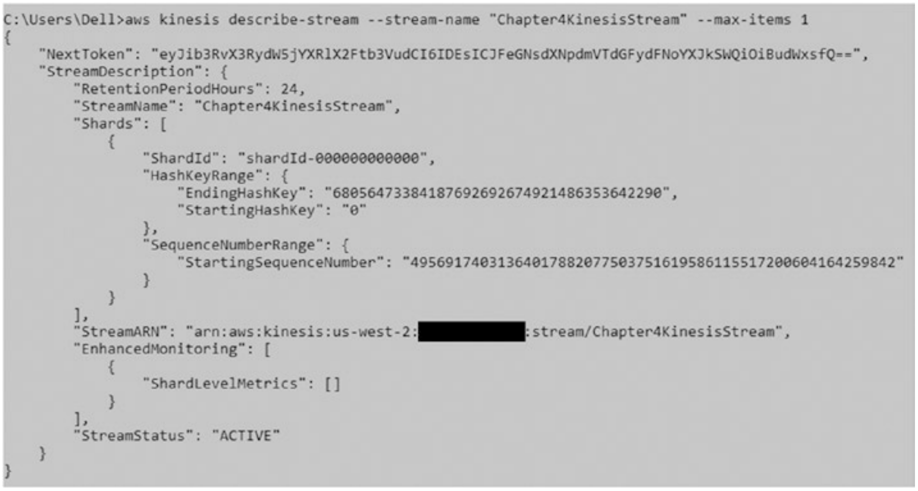
```
>aws kinesis describe-stream --stream-name "Chapter4KinesisStream"
```



```
C:\Users\Dell>aws kinesis describe-stream --stream-name "Chapter4KinesisStream"
{
    "StreamDescription": {
        "RetentionPeriodHours": 24,
        "StreamName": "Chapter4KinesisStream",
        "Shards": [
            {
                "ShardId": "shardId-000000000000",
                "HashKeyRange": {
                    "EndingHashKey": "68056473384187692692674921486353642290",
                    "StartingHashKey": "0"
                },
                "SequenceNumberRange": {
                    "StartingSequenceNumber": "49569174031364017882077503751619586115517200604164259842"
                }
            },
            {
                "ShardId": "shardId-000000000001",
                "HashKeyRange": {
                    "EndingHashKey": "136112946768375385385349842972707284581",
                    "StartingHashKey": "68056473384187692692674921486353642291"
                },
                "SequenceNumberRange": {
                    "StartingSequenceNumber": "49569174031386318627276034374761121833789848965670240274"
                }
            },
            {
                "ShardId": "shardId-000000000002",
                "HashKeyRange": {
                    "EndingHashKey": "204169420152563078078024764459060926872",
                    "StartingHashKey": "136112946768375385385349842972707284582"
                },
                "SequenceNumberRange": {
                    "StartingSequenceNumber": "49569174031408619372474564997902657552062497327176220706"
                }
            },
            {
                "ShardId": "shardId-000000000003",
                "HashKeyRange": {
                    "EndingHashKey": "272225893536750770770699685945414569163",
                    "StartingHashKey": "204169420152563078078024764459060926873"
                },
                "SequenceNumberRange": {
                    "StartingSequenceNumber": "49569174031430920117673095621044193270335145688682201138"
                }
            },
            {
                "ShardId": "shardId-000000000004",
                "HashKeyRange": {
                    "EndingHashKey": "340282366920938463463374607431768211455",
                    "StartingHashKey": "272225893536750770770699685945414569164"
                },
                "SequenceNumberRange": {
                    "StartingSequenceNumber": "49569174031453220862871626244185728988607794050188181570"
                }
            }
        ],
        "StreamARN": "arn:aws:kinesis:us-west-2:[redacted]:stream/Chapter4KinesisStream",
        "EnhancedMonitoring": [
            {
                "ShardLevelMetrics": []
            }
        ],
        "StreamStatus": "ACTIVE"
    }
}
```

By default, all shards details will be provided. To get a paginated response, you need to pass the "`max-items`" parameter in a request:

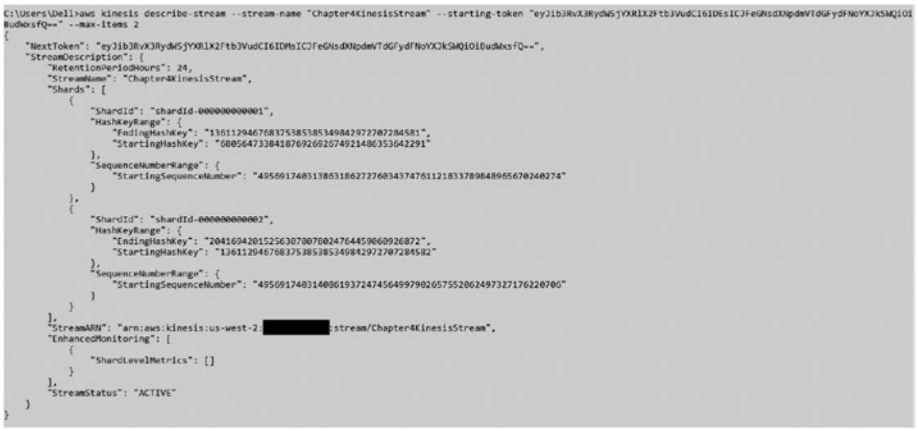
```
>aws kinesis describe-stream --stream-name "Chapter4KinesisStream"
--max-items 1
```



```
C:\Users\Dell>aws kinesis describe-stream --stream-name "Chapter4KinesisStream" --max-items 1
{
    "NextToken": "eyJib3RvX3RydW5jYXRlX2Ftb3VudCI6IDEsICJFeGNsdXNpdmVTdGFydFNoYXJkSWQiOiBudWxsfQ==",
    "StreamDescription": {
        "RetentionPeriodHours": 24,
        "StreamName": "Chapter4KinesisStream",
        "Shards": [
            {
                "ShardId": "shardId-000000000000",
                "HashKeyRange": {
                    "EndingHashKey": "68056473384187692692674921486353642290",
                    "StartingHashKey": "0"
                },
                "SequenceNumberRange": {
                    "StartingSequenceNumber": "49569174031364017882077503751619586115517200604164259842"
                }
            }
        ],
        "StreamARN": "arn:aws:kinesis:us-west-2:[redacted]:stream/Chapter4KinesisStream",
        "EnhancedMonitoring": [
            {
                "ShardLevelMetrics": []
            }
        ],
        "StreamStatus": "ACTIVE"
    }
}
```

In the output, you can see the "`NextToken`" parameter is returned. This means that you still have records to be fetched. To fetch the next set of records, pass the "`NextToken`" parameter value as "`starting-token`":

```
>aws kinesis describe-stream --stream-name "Chapter4KinesisStream"
--starting-token "eyJib3RvX3RydW5jYXRlX2Ftb3VudCI6IDEsICJFeGNsdXNpdm
VTdGFydFNoYXJkSWQiOiBudWxsfQ==" --max-items 2
```



```
C:\Users\Dell>aws kinesis describe-stream --stream-name "Chapter4KinesisStream" --starting-token "eyJib3RvX3RydW5jYXRlX2Ftb3VudCI6IDEsICJFeGNsdXNpdmVTdGFydFNoYXJkSWQiOi
BudWxsfQ==" --max-items 2
{
    "NextToken": "eyJib3RvX3RydW5jYXRlX2Ftb3VudCI6IDMsICJFeGNsdXNpdmVTdGFydFNoYXJkSWQiOiBudWxsfQ==",
    "StreamDescription": {
        "RetentionPeriodHours": 24,
        "StreamName": "Chapter4KinesisStream",
        "Shards": [
            {
                "ShardId": "shardId-000000000001",
                "HashKeyRange": {
                    "EndingHashKey": "136112946768375385385349842972707284581",
                    "StartingHashKey": "68056473384187692692674921486353642291"
                },
                "SequenceNumberRange": {
                    "StartingSequenceNumber": "49569174031386318627276034374761121833789848965670240274"
                }
            },
            {
                "ShardId": "shardId-000000000002",
                "HashKeyRange": {
                    "EndingHashKey": "204169420152563078078024764459060926872",
                    "StartingHashKey": "136112946768375385385349842972707284582"
                },
                "SequenceNumberRange": {
                    "StartingSequenceNumber": "49569174031408619372474564997902657552062497327176220706"
                }
            }
        ],
        "StreamARN": "arn:aws:kinesis:us-west-2:[redacted]:stream/Chapter4KinesisStream",
        "EnhancedMonitoring": [
            {
                "ShardLevelMetrics": []
            }
        ],
        "StreamStatus": "ACTIVE"
    }
}
```

The describe-stream command has a limitation in that it only supports 10 transactions per second per account.

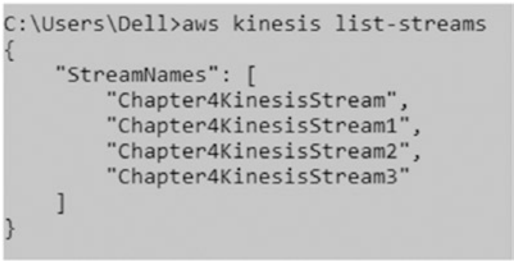
■ **Note** For more parameters in detail, refer to http://docs.amazonaws.cn/cli/latest/reference/kinesis/describe-stream.html.

---

list-streams

To list your Kinesis Streams, execute the following command:

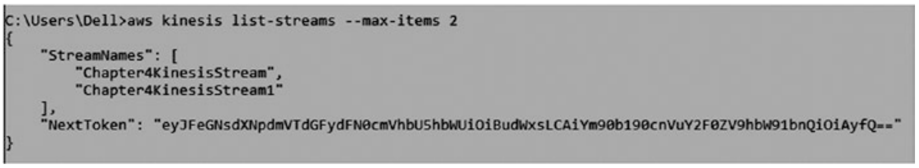
```
>aws kinesis list-streams
```



```
C:\Users\Dell>aws kinesis list-streams
{
    "StreamNames": [
        "Chapter4KinesisStream",
        "Chapter4KinesisStream1",
        "Chapter4KinesisStream2",
        "Chapter4KinesisStream3"
    ]
}
```

By default, the total number of streams returned is 10. To pass the limit, you can use "`max-items`" in the request:

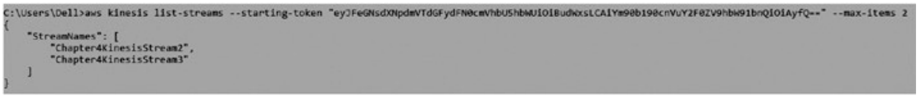
```
>aws kinesis list-streams --max-items 2
```



```
C:\Users\Dell>aws kinesis list-streams --max-items 2
{
    "StreamNames": [
        "Chapter4KinesisStream",
        "Chapter4KinesisStream1"
    ],
    "NextToken": "eyJFeGNsdXNpdmVTdGFydFN0cmVhbU5hbWUiOiBudWxsLCAiYm90b190cnVuY2F0ZV9hbW91bnQiOiAyfQ=="
}
```

Using the "`NextToken`" parameter value, you can get the next set of records by passing a value for "`starting-token`" in the request:

```
>aws kinesis list-streams --starting-token "eyJFeGNsdXNpdmVTdGFydFNOcmVhbU5h
bWUiOiBudWxsLCAiYm9Ob19OcnVuY2FOZV9hbW91bnQiOiAyfQ==" --max-items 2
```



```
C:\Users\Dell>aws kinesis list-streams --starting-token "eyJFeGNsdXNpdmVTdGFydFN0cmVhbU5hbWUiOiBudWxsLCAiYm90b190cnVuY2F0ZV9hbW91bnQiOiAyfQ==" --max-items 2
{
    "StreamNames": [
        "Chapter4KinesisStream2",
        "Chapter4KinesisStream3"
    ]
}
```

The list-stream command has the limitation of only supporting 5 transactions per second per account.

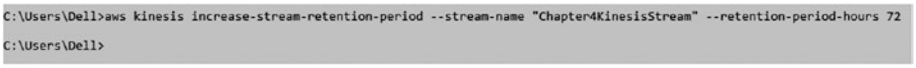
■ **Note** For more parameters in detail, refer to http://docs.amazonaws.cn/cli/latest/reference/kinesis/list-streams.html.

---

increase-stream-retention-period

The increase-stream-retention period refers to the time period that data will be retained in a Kinesis Stream after adding messages to stream. You need to provide `"retention-period-hours"` parameter in hours:

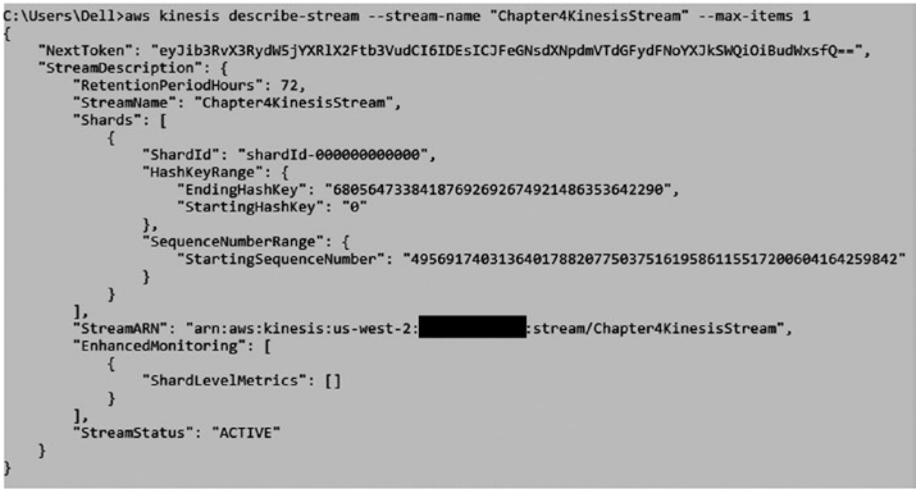
```
>aws kinesis increase-stream-retention-period --stream-name
"Chapter4KinesisStream" --retention-period-hours 72
```



```
C:\Users\Dell>aws kinesis increase-stream-retention-period --stream-name "Chapter4KinesisStream" --retention-period-hours 72

C:\Users\Dell>
```

By default, the retention period is 24 hours. You can provide any value between 24 hours (1 day) and 168 hours (7 days). To check if the retention period is set properly, you can use the describe-stream command:

```
>aws kinesis describe-stream --stream-name "Chapter4KinesisStream"
--max-items 1
```



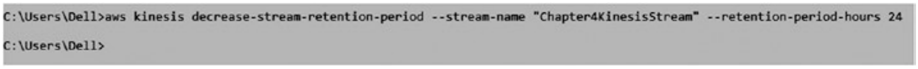
```
C:\Users\Dell>aws kinesis describe-stream --stream-name "Chapter4KinesisStream" --max-items 1
{
    "NextToken": "eyJib3RvX3RydW5jYXRlX2Ftb3VudCI6IDEsICJFeGNsdXNpdmVTdGFydFNoYXJkSWQiOiBudWxsfQ==",
    "StreamDescription": {
        "RetentionPeriodHours": 72,
        "StreamName": "Chapter4KinesisStream",
        "Shards": [
            {
                "ShardId": "shardId-000000000000",
                "HashKeyRange": {
                    "EndingHashKey": "68056473384187692692674921486353642290",
                    "StartingHashKey": "0"
                },
                "SequenceNumberRange": {
                    "StartingSequenceNumber": "49569174031364017882077503751619586115517200604164259842"
                }
            }
        ],
        "StreamARN": "arn:aws:kinesis:us-west-2:[redacted]:stream/Chapter4KinesisStream",
        "EnhancedMonitoring": [
            {
                "ShardLevelMetrics": []
            }
        ],
        "StreamStatus": "ACTIVE"
    }
}
```

■ **Note** For more parameters in detail, refer to http://docs.amazonaws.cn/cli/latest/reference/kinesis/increase-stream-retention-period.html.

decrease-stream-retention-period

This command decreases the stream-retention period for data after they are added to the stream:

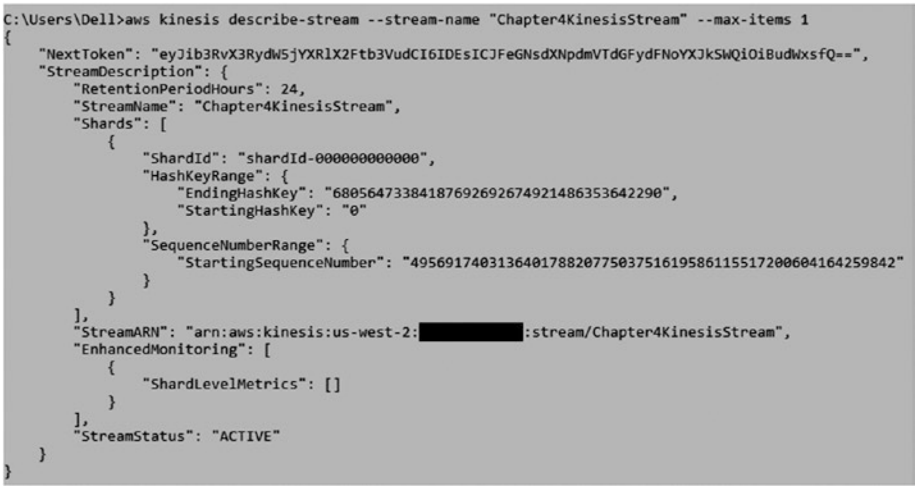
```
>aws kinesis decrease-stream-retention-period --stream-name
"Chapter4KinesisStream" --retention-period-hours 24
```



```
C:\Users\Dell>aws kinesis decrease-stream-retention-period --stream-name "Chapter4KinesisStream" --retention-period-hours 24

C:\Users\Dell>
```

To check if the retention period is set properly, use the describe-stream command:

```
>aws kinesis describe-stream --stream-name "Chapter4KinesisStream"
--max-items 1
```



```
C:\Users\Dell>aws kinesis describe-stream --stream-name "Chapter4KinesisStream" --max-items 1
{
    "NextToken": "eyJib3RvX3RydW5jYXRlX2Ftb3VudCI6IDEsICJFeGNsdXNpdmVTdGFydFNoYXJkSWQiOiBudWxsfQ==",
    "StreamDescription": {
        "RetentionPeriodHours": 24,
        "StreamName": "Chapter4KinesisStream",
        "Shards": [
            {
                "ShardId": "shardId-000000000000",
                "HashKeyRange": {
                    "EndingHashKey": "68056473384187692692674921486353642290",
                    "StartingHashKey": "0"
                },
                "SequenceNumberRange": {
                    "StartingSequenceNumber": "49569174031364017882077503751619586115517200604164259842"
                }
            }
        ],
        "StreamARN": "arn:aws:kinesis:us-west-2:[redacted]:stream/Chapter4KinesisStream",
        "EnhancedMonitoring": [
            {
                "ShardLevelMetrics": []
            }
        ],
        "StreamStatus": "ACTIVE"
    }
}
```

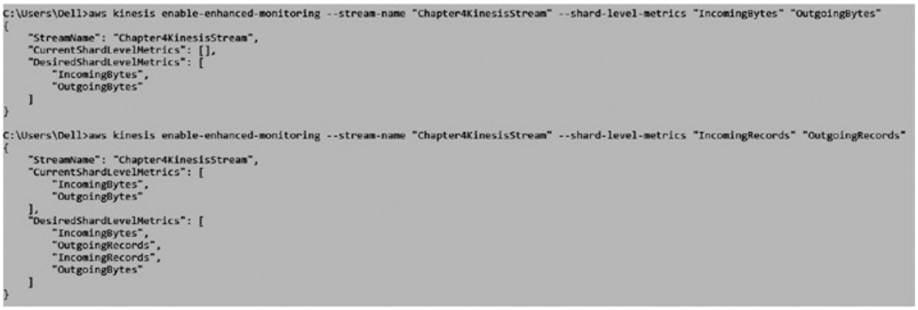
The minimum retention period you can set is 24 hours (1 day).

■ **Note** For more parameters in detail, refer to http://docs.amazonaws.cn/cli/latest/reference/kinesis/decrease-stream-retention-period.html.

enable-enhanced-monitoring

The enable-enhanced-monitoring command enables shard level metrics:

```
>aws kinesis enable-enhanced-monitoring --stream-name
"Chapter4KinesisStream" --shard-level-metrics "IncomingBytes"
"OutgoingBytes"

>aws kinesis enable-enhanced-monitoring --stream-name
"Chapter4KinesisStream" --shard-level-metrics "IncomingRecords"
"OutgoingRecords"
```



```
C:\Users\Dell>aws kinesis enable-enhanced-monitoring --stream-name "Chapter4KinesisStream" --shard-level-metrics "IncomingBytes" "OutgoingBytes"
{
    "StreamName": "Chapter4KinesisStream",
    "CurrentShardLevelMetrics": [],
    "DesiredShardLevelMetrics": [
        "IncomingBytes",
        "OutgoingBytes"
    ]
}

C:\Users\Dell>aws kinesis enable-enhanced-monitoring --stream-name "Chapter4KinesisStream" --shard-level-metrics "IncomingRecords" "OutgoingRecords"
{
    "StreamName": "Chapter4KinesisStream",
    "CurrentShardLevelMetrics": [
        "IncomingBytes",
        "OutgoingBytes"
    ],
    "DesiredShardLevelMetrics": [
        "IncomingBytes",
        "OutgoingRecords",
        "IncomingRecords",
        "OutgoingBytes"
    ]
}
```

The following shard level metric values are valid:

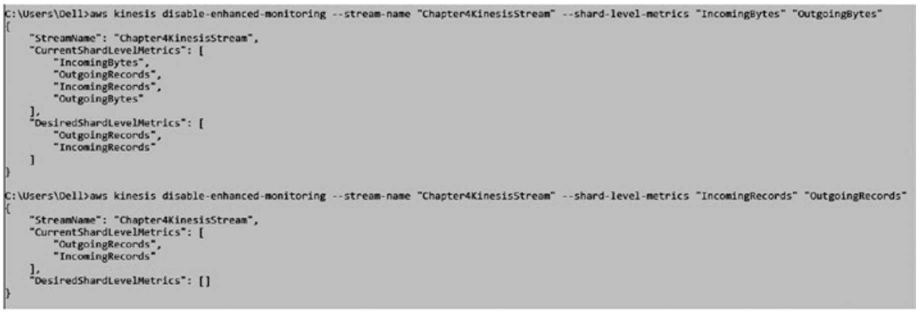
- IncomingBytes: Number of bytes put on the shard
- IncomingRecords: Number of records put on the shard
- OutgoingBytes: Number of bytes fetched from the shard
- OutgoingRecords: Number of records fetched from the shard
- WriteProvisionedThroughputExceeded: Number of PutRecord and PutRecords failed due to throttling for the shard
- ReadProvisionedThroughputExceeded: Number of GetRecords failed due to throttling for the shard
- IteratorAgeMilliseconds: Age of last record in all GetRecords calls made on the shard
- ALL

■ **Note** For more parameters in detail, refer to http://docs.amazonaws.cn/cli/latest/reference/kinesis/enable-enhanced-monitoring.html.

disable-enhanced-monitoring

The disable-enhanced-monitoring command disables shard level metrics:

```
>aws kinesis disable-enhanced-monitoring --stream-name
"Chapter4KinesisStream" --shard-level-metrics "IncomingBytes"
"OutgoingBytes"

>aws kinesis disable-enhanced-monitoring --stream-name
"Chapter4KinesisStream" --shard-level-metrics "IncomingRecords"
"OutgoingRecords"
```



```
C:\Users\Dell>aws kinesis disable-enhanced-monitoring --stream-name "Chapter4KinesisStream" --shard-level-metrics "IncomingBytes" "OutgoingBytes"
{
    "StreamName": "Chapter4KinesisStream",
    "CurrentShardLevelMetrics": [
        "IncomingBytes",
        "OutgoingRecords",
        "IncomingRecords",
        "OutgoingBytes"
    ],
    "DesiredShardLevelMetrics": [
        "OutgoingRecords",
        "IncomingRecords"
    ]
}

C:\Users\Dell>aws kinesis disable-enhanced-monitoring --stream-name "Chapter4KinesisStream" --shard-level-metrics "IncomingRecords" "OutgoingRecords"
{
    "StreamName": "Chapter4KinesisStream",
    "CurrentShardLevelMetrics": [
        "OutgoingRecords",
        "IncomingRecords"
    ],
    "DesiredShardLevelMetrics": []
}
```

The following shard level metric values are valid:

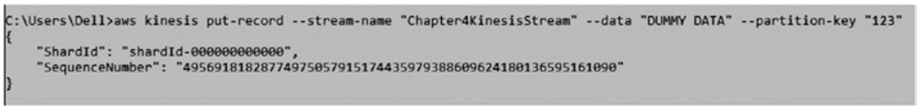
- IncomingBytes
- IncomingRecords
- OutgoingBytes
- OutgoingRecords
- WriteProvisionedThroughputExceeded
- ReadProvisionedThroughputExceeded
- IteratorAgeMilliseconds
- ALL

■ **Note** For more parameters in detail, refer to http://docs.amazonaws.cn/cli/latest/reference/kinesis/disable-enhanced-monitoring.html.

put-record

To send a single data record to a Kinesis Stream, use the put-record command. You need to provide the stream name, partition key, and data blob. Based on the partition key, the shard is chosen and then data will be transported to that shard:

```
>aws kinesis put-record --stream-name "Chapter4KinesisStream" --data "DUMMY
DATA" --partition-key "123"
```

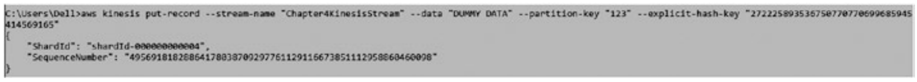


```
C:\Users\Dell>aws kinesis put-record --stream-name "Chapter4KinesisStream" --data "DUMMY DATA" --partition-key "123"
{
    "ShardId": "shardId-000000000000",
    "SequenceNumber": "49569181828774975057915174435979388609624180136595161090"
}
```

In response, you get the shard ID, where data is stored, and the sequence number of the data for that shard.

If you need to store the data on a specific shard, you can also pass the hash key, which will override the partition key hash. To demonstrate the explicit-hash-key command, you will get the starting hash key and ending hash key for the shard ID `"shardId-000000000004"` using the describe-stream command. Then select any value between the starting hash key and ending hash key:

```
>aws kinesis put-record --stream-name "Chapter4KinesisStream" --data "DUMMY
DATA" --partition-key "123" --explicit-hash-key "27222589353675077077069968
5945414569165"
```



```
C:\Users\Dell>aws kinesis put-record --stream-name "Chapter4KinesisStream" --data "DUMMY DATA" --partition-key "123" --explicit-hash-key "2722258935367507707706996859 45
414569165"
{
    "ShardId": "shardId-000000000004",
    "SequenceNumber": "49569181828864178038709297761129116673851112958860460098"
}
```

In response, you can see that data is stored on the shard ID `"shardId-000000000004"`. The data blob size should be equal to or less than 1MB. The partition key can have a maximum length of 256 characters.

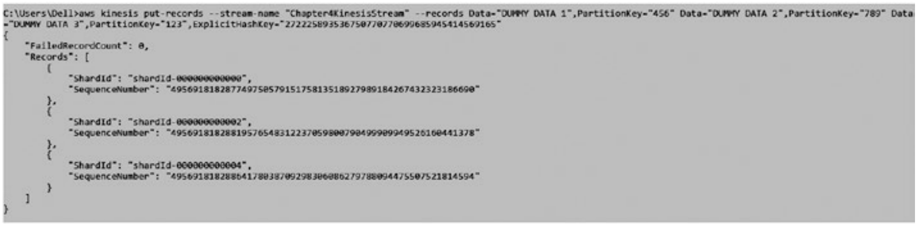
■ **Note** For more parameters in detail, refer to `http://docs.amazonaws.cn/cli/latest/reference/kinesis/put-record.html`.

---

put-records

To send multiple data records to a Kinesis Stream, use the put-records command. You need to provide the stream name, an array of records that have the partition key, and the data blob for each record:

```
>aws kinesis put-records --stream-name "Chapter4KinesisStream"
--records Data="DUMMY DATA 1",PartitionKey="456" Data="DUMMY DATA
2",PartitionKey="789" Data="DUMMY DATA 3",PartitionKey="123",ExplicitHashK
ey="272225893536750770770699685945414569165"
```

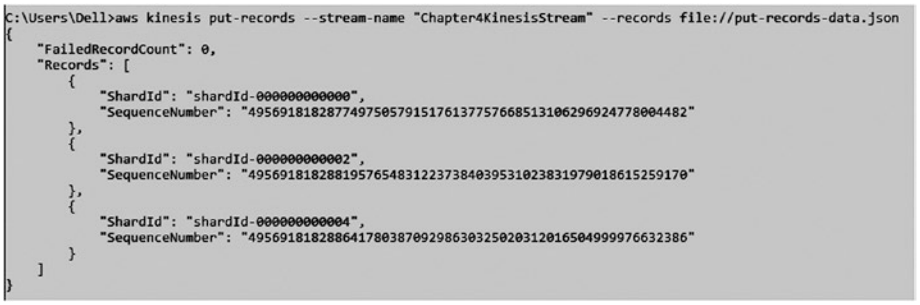


```
C:\Users\Dell>aws kinesis put-records --stream-name "Chapter4KinesisStream" --records Data="DUMMY DATA 1",PartitionKey="456" Data="DUMMY DATA 2",PartitionKey="789" Data
="DUMMY DATA 3",PartitionKey="123",ExplicitHashKey="272225893536750770770699685945414569165"
{
    "FailedRecordCount": 0,
    "Records": [
        {
            "ShardId": "shardId-000000000000",
            "SequenceNumber": "49569181828774975057915175813518927989184267432323186690"
        },
        {
            "ShardId": "shardId-000000000002",
            "SequenceNumber": "49569181828819576548312237059800798499909949526160441378"
        },
        {
            "ShardId": "shardId-000000000004",
            "SequenceNumber": "49569181828864178038709298306086279788094475507521814594"
        }
    ]
}
```

In response, you can see successful and unsuccessful records. Any data record failure won't affect the processing of other data records.

You can also add your data records in a JSON file:

```
>aws kinesis put-records --stream-name "Chapter4KinesisStream" --records
file://put-records-data.json

put-records-data.json
[
  {
    "Data": "DUMMY DATA 1",
    "PartitionKey": "456"
  },
  {
    "Data": "DUMMY DATA 2",
    "PartitionKey": "789"
  },
  {
    "Data": "DUMMY DATA 3",
    "PartitionKey": "123",
"ExplicitHashKey": "272225893536750770770699685945414569165"
  }
]
```



```
C:\Users\Dell>aws kinesis put-records --stream-name "Chapter4KinesisStream" --records file://put-records-data.json
{
    "FailedRecordCount": 0,
    "Records": [
        {
            "ShardId": "shardId-000000000000",
            "SequenceNumber": "49569181828774975057915176137757668513106296924778004482"
        },
        {
            "ShardId": "shardId-000000000002",
            "SequenceNumber": "49569181828819576548312237384039531023831979018615259170"
        },
        {
            "ShardId": "shardId-000000000004",
            "SequenceNumber": "49569181828864178038709298630325020312016504999976632386"
        }
    ]
}
```

The put-records command can contain a maximum of 500 data records. The maximum data record size can be 1MB. For an entire batch of records, the size should not exceed 5MB, including partition keys.

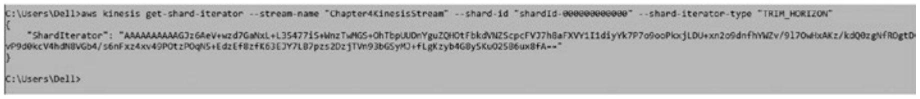
■ **Note** For more parameters in detail, refer to `http://docs.amazonaws.cn/cli/latest/reference/kinesis/put-records.html`.

---

get-shard-iterator

This command provides the Kinesis shard iterator. The shard iterator identifies from which position you need to start reading data records. The shard iterator provided from this command expires in five minutes. You need to provide the shard-iterator-type to determine how data will be read from the shard:

```
>aws kinesis get-shard-iterator --stream-name "Chapter4KinesisStream"
--shard-id "shardId-000000000000" --shard-iterator-type "TRIM_HORIZON"
```



```
C:\Users\Dell>aws kinesis get-shard-iterator --stream-name "Chapter4KinesisStream" --shard-id "shardId-000000000000" --shard-iterator-type "TRIM_HORIZON"
{
    "ShardIterator": "AAAAAAAAAAGJz6AeV+wzd7GaNxL+L35477iS+WnzTwMGS+OhTbpUUDnYguZQHOtFbkdVNZScpcFVJ7h8aFXVY1I1diyYk7P7o9ooPkxjLDU+xn2o9dnfhYWZv/9l7OwHxAKz/kdQ0zgNfRDgtD+
vP9d0kcV4hdN8VGb4/s6nFxz4xv49POtzPOqNS+EdzEf8zfK63EJY7L87pzs2DzjTVn93bGSyMJ+fLgKzyb4G8y5KuO25B6ux8fA--"
}

C:\Users\Dell>
```

The following are valid values for shard-iterator-type:

- `AT_SEQUENCE_NUMBER`: You need to pass the `starting-sequence-number` parameter, which says to read the record from the mentioned sequence number.
- `AFTER_SEQUENCE_NUMBER`: You need to pass the `starting-sequence-number` parameter, which says to read the record after the mentioned sequence number.
- `TRIM_HORIZON`: This value is used to read from the oldest data record available in the shard.

- `LATEST`: This value allows you to read from the latest record available in the shard.
- `AT_TIMESTAMP`: You need to pass the `timestamp` parameter, which says to read the data records after the specified timestamp.

The get-shard-iterator command only supports 5 transactions per second per account per open shard.

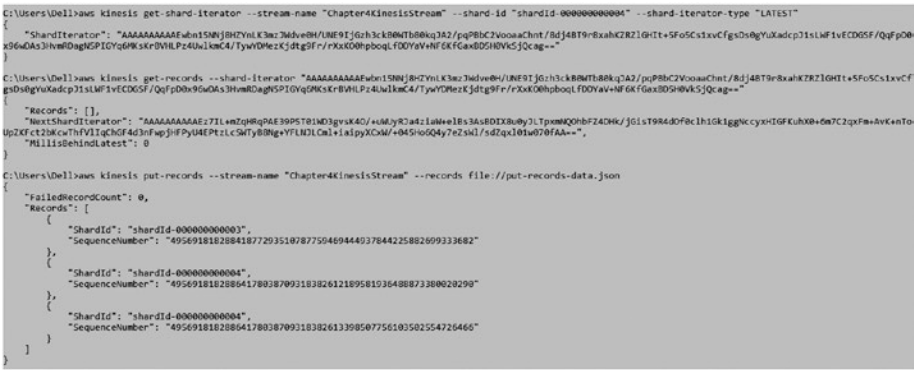
■ **Note** For more parameters in detail, refer to http://docs.amazonaws.cn/cli/latest/reference/kinesis/get-shard-iterator.html.

---

get-records

The get-records command helps to read data records from the stream's shard. You need to provide the shard iterator to specify from which location the data records need to be read. For the first time, the shard iterator can be fetched using the get-shard-iterator command. For the next request, use the `"NextShardIterator"` response parameter of the get-records request. For our case, we will use the shard ID `"shardId-000000000004"` to read data records:

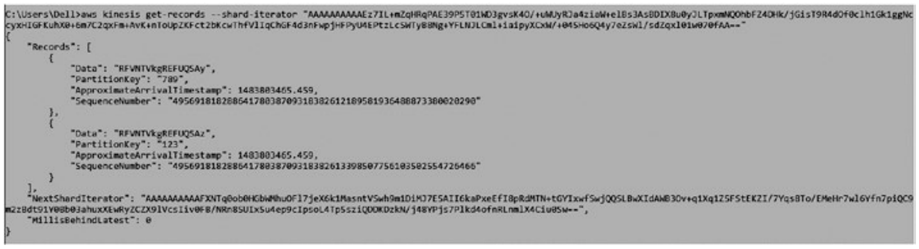
```
>aws kinesis get-shard-iterator --stream-name "Chapter4KinesisStream"
--shard-id "shardId-000000000004" --shard-iterator-type "LATEST"

>aws kinesis get-records --shard-iterator "AAAAAAAAAAEwbn15NNj8HZYnLK3mzJ
WdveOH/UNE9IjGzh3ckBOWTb8OkqJA2/pqPBbC2VooaaChnt/8dj4BT9r8xahKZRZlGHIt+
5Fo5Cs1xvCfgsDsOgYuXadcpJ1sLWF1vECDGSF/QqFpDOx96wDAs3HvmRDagN5PIGYq6MKs
KrBVHLPz4UwlkmC4/TywYDMezKjdtg9Fr/rXxKOOhpboqLfDDYaV+NF6KfGaxBD5HOVk
SjQcag=="

>aws kinesis put-records --stream-name "Chapter4KinesisStream"
--records file://put-records-data.json
```



```
C:\Users\Dell>aws kinesis get-shard-iterator --stream-name "Chapter4KinesisStream" --shard-id "shardId-000000000004" --shard-iterator-type "LATEST"
{
    "ShardIterator": "AAAAAAAAAAEwbn15NNj8HZYnLK3mzJWdve0H/UNE9IjGzh3ckB0WTb80kqJA2/pqPBbC2VooaaChnt/8dj4BT9r8xahKZRZlGHIt+5Fo5Cs1xvCfgsDs0gYuXadcpJ1sLWF1vECDGSF/QqFpD0
x96wDAs3HvmRDagN5PIGYq6MKsKrBVHLPz4UwlkmC4/TywYDMezKjdtg9Fr/rXxKO0hpboqLfDDYaV+NF6KfGaxBD5H0VkSjQcag=="
}

C:\Users\Dell>aws kinesis get-records --shard-iterator "AAAAAAAAAAEwbn15NNj8HZYnLK3mzJWdve0H/UNE9IjGzh3ckB0WTb80kqJA2/pqPBbC2VooaaChnt/8dj4BT9r8xahKZRZlGHIt+5Fo5Cs1xvCf
gsDs0gYuXadcpJ1sLWF1vECDGSF/QqFpD0x96wDAs3HvmRDagN5PIGYq6MKsKrBVHLPz4UwlkmC4/TywYDMezKjdtg9Fr/rXxKO0hpboqLfDDYaV+NF6KfGaxBD5H0VkSjQcag=="
{
    "Records": [],
    "NextShardIterator": "AAAAAAAAAAEz7IL+mZqHRqPAE39PST01WD3gvsK40/+uWUyRJa4ziaW+elBs3AsBDIX8u0yJLTpxmNQOhbFZ4DHk/jGisT9R4dOf0clh1Gk1ggNccyxHIGFKuhX0+6m7C2qxFm+AvK+nTo
UpZKFct2bKcwThfVlIqChGF4d3nFwpjHFPyU4EPtzLcSWTyB8Ng+YFLNJLCml+iaipyXCxW/+045Ho6Q4y7eZsWl/sdZqxl01w070fAA==",
    "MillisBehindLatest": 0
}

C:\Users\Dell>aws kinesis put-records --stream-name "Chapter4KinesisStream" --records file://put-records-data.json
{
    "FailedRecordCount": 0,
    "Records": [
        {
            "ShardId": "shardId-000000000003",
            "SequenceNumber": "49569181828841877293510787759469444937844225882699333682"
        },
        {
            "ShardId": "shardId-000000000004",
            "SequenceNumber": "49569181828864178038709318382612189581936488873380020290"
        },
        {
            "ShardId": "shardId-000000000004",
            "SequenceNumber": "49569181828864178038709318382613398507756103502554726466"
        }
    ]
}
```

You can use the "NextShardInterator" value in the get-records call:

```
>aws kinesis get-records --shard-iterator "AAAAAAAAAAEz7IL+mZqHRqPAE39P5
T01WD3gvsK4O/+uWUyRJa4ziaW+elBs3AsBDIX8u0yJLTpxmNQOhbFZ4DHk/jGisT9R4dO
f0clh1Gk1ggNccyxHIGFKuhX0+6m7C2qxFm+AvK+nToUpZKFct2bKcwThfVlIqChGF4d3n
FwpjHFPyU4EPtzLcSWTyB8Ng+YFLNJLCml+iaipyXCxW/+045Ho6Q4y7eZsWl/
sdZqxl01w070fAA=="
```



```
C:\Users\Dell>aws kinesis get-records --shard-iterator "AAAAAAAAAAEz7IL+mZqHRqPAE39P5T01WD3gvsK4O/+uWUyRJa4ziaW+elBs3AsBDIX8u0yJLTpxmNQOhbFZ4DHk/jGisT9R4dOf0clh1Gk1ggNc
cyxHIGFKuhX0+6m7C2qxFm+AvK+nToUpZKFct2bKcwThfVlIqChGF4d3nFwpjHFPyU4EPtzLcSWTyB8Ng+YFLNJLCml+iaipyXCxW/+045Ho6Q4y7eZsWl/sdZqxl01w070fAA=="
{
    "Records": [
        {
            "Data": "RFVNTVkgREFUQSAy",
            "PartitionKey": "789",
            "ApproximateArrivalTimestamp": 1483803465.459,
            "SequenceNumber": "49569181828864178038709318382612189581936488873380020290"
        },
        {
            "Data": "RFVNTVkgREFUQSAz",
            "PartitionKey": "123",
            "ApproximateArrivalTimestamp": 1483803465.459,
            "SequenceNumber": "49569181828864178038709318382613398507756103502554726466"
        }
    ],
    "NextShardIterator": "AAAAAAAAAAFXNTq0ob0HGbWMhuOFl7jeX6k1MasntVSwh9m1DiMJ7ESAII6kaPxeEfI8pRdMTN+tGYIxwfSwjQQSLBwXIdAWB3Ov+q1Xq1Z5FStEKZI/7YqsBTo/EMeHr7wl6Yfn7piQC9
m2zBdt91V08b0JahuxXEwRyZCZX9lVcsIiv0FB/NRn8SUIxSu4ep9cIpsoL4Tp5sziQDOKDzkN/j48YPjs7Plkd4ofnRLnmlX4Ciu0Sw==",
    "MillisBehindLatest": 0
}
```

You can see that the "Data" parameter has Base64, so you need to decode it to see what the actual readable data is. You can use any online Base64 decoder. To limit the records to be fetched, provide the "limit" parameter in request. The maximum number of records returned is 10,000.

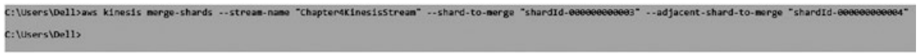
■ **Note** For more parameters in detail, refer to http://docs.amazonaws.cn/cli/latest/reference/kinesis/get-records.html.

---

merge-shards

Based on the historic data, we have shards that are not used frequently or shards that are not used to their full capacity. So we came to a decision to merge two adjacent shards to make use of shards' capacity at their fullest. The merge shard operation can only be processed on ACTIVE streams:

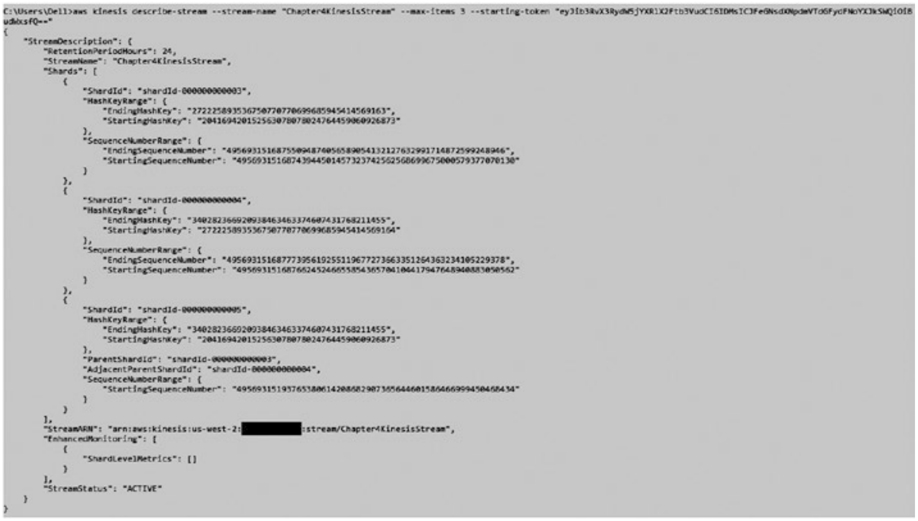
```
>aws kinesis merge-shards --stream-name "Chapter4KinesisStream"
--shard-to-merge "shardId-000000000003" --adjacent-shard-to-merge
"shardId-000000000004"
```



```
C:\Users\Dell>aws kinesis merge-shards --stream-name "Chapter4KinesisStream" --shard-to-merge "shardId-000000000003" --adjacent-shard-to-merge "shardId-000000000004"

C:\Users\Dell>
```

There won't be any output for this request. To check if the merge-shards operation executed successfully or not, invoke the describe-stream command:

```
>aws kinesis describe-stream --stream-name "Chapter4KinesisStream"
--max-items 3 --starting-token "eyJib3RvX3RydW5jYXRlX2Ftb3VudCI6ID
MsICJFeGNsdXNpdmVTdGFydFNoYXJkSWQiOiBudWxsfQ=="
```



```
C:\Users\Dell>aws kinesis describe-stream --stream-name "Chapter4KinesisStream" --max-items 3 --starting-token "eyJib3RvX3RydW5jYXRlX2Ftb3VudCI6IDMsICJFeGNsdXNpdmVTdGFydFNoYXJkSWQiOiB
udWxsfQ=="
{
    "StreamDescription": {
        "RetentionPeriodHours": 24,
        "StreamName": "Chapter4KinesisStream",
        "Shards": [
            {
                "ShardId": "shardId-000000000003",
                "HashKeyRange": {
                    "EndingHashKey": "272225893536750770770699685945414569163",
                    "StartingHashKey": "204169420152563078078024764459060926873"
                },
                "SequenceNumberRange": {
                    "EndingSequenceNumber": "49569315168755094874056589054132127632991714872599248946",
                    "StartingSequenceNumber": "49569315168743944501457323742562568699675000579377070130"
                }
            },
            {
                "ShardId": "shardId-000000000004",
                "HashKeyRange": {
                    "EndingHashKey": "340282366920938463463374607431768211455",
                    "StartingHashKey": "272225893536750770770699685945414569164"
                },
                "SequenceNumberRange": {
                    "EndingSequenceNumber": "49569315168777395619255119677273663351264363234105229378",
                    "StartingSequenceNumber": "49569315168766245246655854365704104417947648940883050562"
                }
            },
            {
                "ShardId": "shardId-000000000005",
                "HashKeyRange": {
                    "EndingHashKey": "340282366920938463463374607431768211455",
                    "StartingHashKey": "204169420152563078078024764459060926873"
                },
                "ParentShardId": "shardId-000000000003",
                "AdjacentParentShardId": "shardId-000000000004",
                "SequenceNumberRange": {
                    "StartingSequenceNumber": "49569315193765380614208682907365644601586466999450468434"
                }
            }
        ],
        "StreamARN": "arn:aws:kinesis:us-west-2:[redacted]:stream/Chapter4KinesisStream",
        "EnhancedMonitoring": [
            {
                "ShardLevelMetrics": []
            }
        ],
        "StreamStatus": "ACTIVE"
    }
}
```

The merge-shards command only supports 5 transactions per second per account.

■ **Note** For more parameters in detail, refer to `http://docs.amazonaws.cn/cli/latest/reference/kinesis/merge-shards.html`.

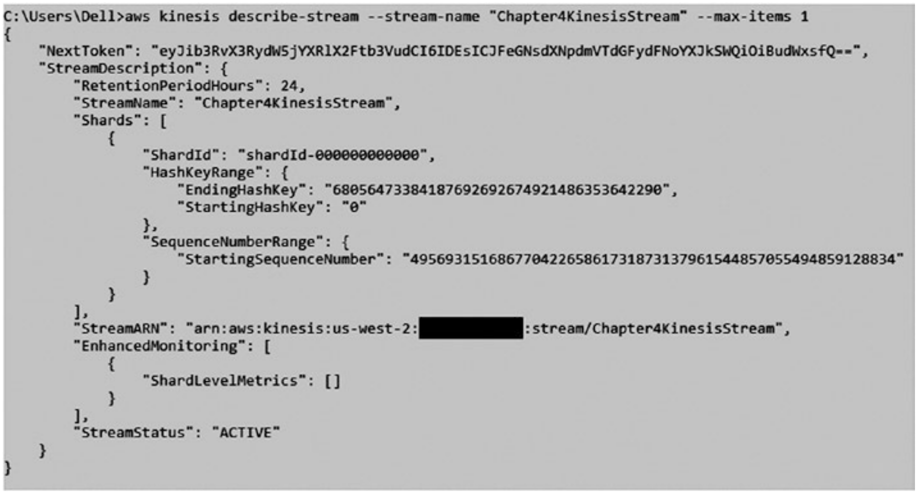
---

split-shard

To increase the shard capacity, you can use the split-shard operation. This will split a single shard into two new shards. To split a shard, you need to provide the shard ID and a new starting hash key. A new hash key can be calculated by averaging the starting and ending hash keys of the current shard, or you can choose any hash key that is between the starting and ending hash keys.

First, choose a shard to split and then get the starting and ending hash keys using the describe-stream command:

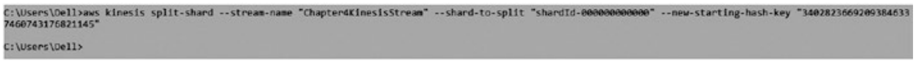
```
>aws kinesis describe-stream --stream-name "Chapter4KinesisStream"
--max-items 1
```



```
C:\Users\Dell>aws kinesis describe-stream --stream-name "Chapter4KinesisStream" --max-items 1
{
    "NextToken": "eyJib3RvX3RydW5jYXRlX2Ftb3VudCI6IDEsICJFeGNsdXNpdmVTdGFydFNoYXJkSWQiOiBudWxsfQ==",
    "StreamDescription": {
        "RetentionPeriodHours": 24,
        "StreamName": "Chapter4KinesisStream",
        "Shards": [
            {
                "ShardId": "shardId-000000000000",
                "HashKeyRange": {
                    "EndingHashKey": "680564733841876926926749214863536422290",
                    "StartingHashKey": "0"
                },
                "SequenceNumberRange": {
                    "StartingSequenceNumber": "49569315168677042265861731873137961544857055494859128834"
                }
            }
        ],
        "StreamARN": "arn:aws:kinesis:us-west-2:[redacted]:stream/Chapter4KinesisStream",
        "EnhancedMonitoring": [
            {
                "ShardLevelMetrics": []
            }
        ],
        "StreamStatus": "ACTIVE"
    }
}
```

Calculate the new hash key by averaging the starting and ending hash keys:

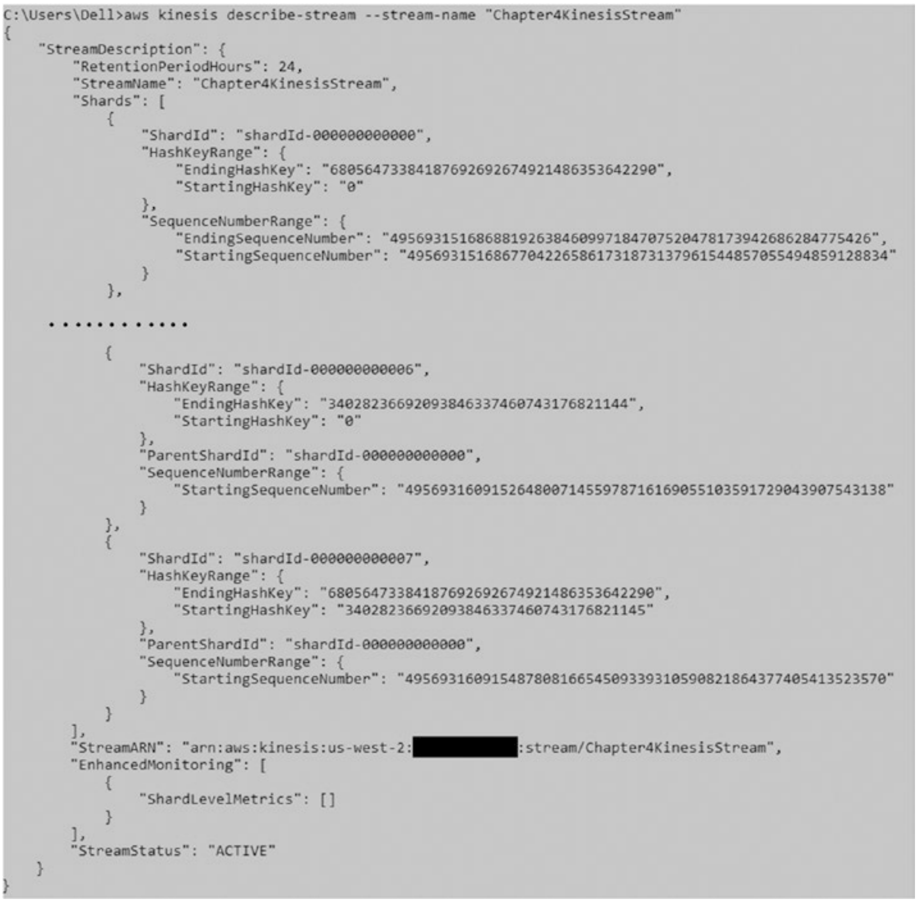
```
NewHashKey = (StartingHashKey + EndingHashKey) / 2

NewHashKey = (0 + 680564733841876926926749214863536422290) / 2

NewHashKey = 340282366920938463374607431768211145

>aws kinesis split-shard --stream-name "Chapter4KinesisStream" --shard-to-
split "shardId-000000000000" --new-starting-hash-key "340282366920938463374
60743176821145"
```



```
C:\Users\Dell>aws kinesis split-shard --stream-name "Chapter4KinesisStream" --shard-to-split "shardId-000000000000" --new-starting-hash-key "3402823669209384633
7460743176821145"

C:\Users\Dell>
```

To check that the shard has been split properly, invoke the describe-stream command:

```
>aws kinesis describe-stream --stream-name "Chapter4KinesisStream"
```



```
C:\Users\Dell>aws kinesis describe-stream --stream-name "Chapter4KinesisStream"
{
    "StreamDescription": {
        "RetentionPeriodHours": 24,
        "StreamName": "Chapter4KinesisStream",
        "Shards": [
            {
                "ShardId": "shardId-000000000000",
                "HashKeyRange": {
                    "EndingHashKey": "68056473384187692692674921486353642290",
                    "StartingHashKey": "0"
                },
                "SequenceNumberRange": {
                    "EndingSequenceNumber": "49569315168688192638460997184707520478173942686284775426",
                    "StartingSequenceNumber": "49569315168677042265861731873137961544857055494859128834"
                }
            },

     .............

            {
                "ShardId": "shardId-000000000006",
                "HashKeyRange": {
                    "EndingHashKey": "34028236692093846337460743176821144",
                    "StartingHashKey": "0"
                },
                "ParentShardId": "shardId-000000000000",
                "SequenceNumberRange": {
                    "StartingSequenceNumber": "49569316091526480071455978716169055103591729043907543138"
                }
            },
            {
                "ShardId": "shardId-000000000007",
                "HashKeyRange": {
                    "EndingHashKey": "68056473384187692692674921486353642290",
                    "StartingHashKey": "34028236692093846337460743176821145"
                },
                "ParentShardId": "shardId-000000000000",
                "SequenceNumberRange": {
                    "StartingSequenceNumber": "49569316091548780816654509339310590821864377405413523570"
                }
            }
        ],
        "StreamARN": "arn:aws:kinesis:us-west-2:[redacted]:stream/Chapter4KinesisStream",
        "EnhancedMonitoring": [
            {
                "ShardLevelMetrics": []
            }
        ],
        "StreamStatus": "ACTIVE"
    }
}
```

The split-shard operation only supports 5 transactions per second per account.

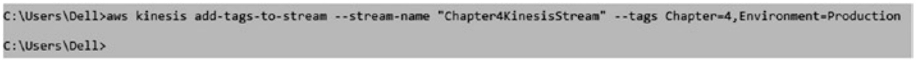
■ **Note** For more parameters in detail, refer to `http://docs.amazonaws.cn/cli/latest/reference/kinesis/split-shard.html`.

---

add-tags-to-stream

This command will add or update tags to the Kinesis Stream. Each stream can have up to 10 tags. If an existing tag is requested to add, it will overwrite the existing one:

```
>aws kinesis add-tags-to-stream --stream-name "Chapter4KinesisStream" --tags
Chapter=4,Environment=Production
```



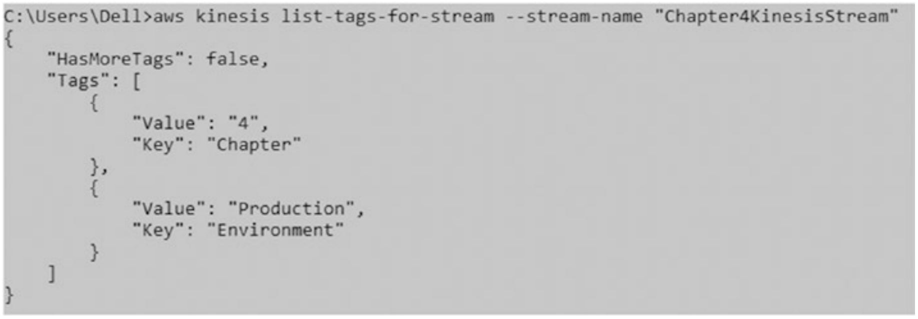
```
C:\Users\Dell>aws kinesis add-tags-to-stream --stream-name "Chapter4KinesisStream" --tags Chapter=4,Environment=Production

C:\Users\Dell>
```

■ **Note** For more parameters in detail, refer to http://docs.amazonaws.cn/cli/latest/reference/kinesis/add-tags-to-stream.html.

list-tags-for-stream

This command lists the tags of the Kinesis Stream:

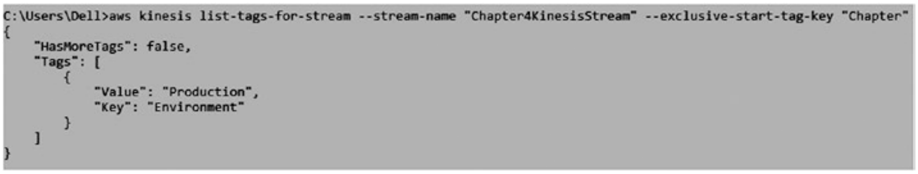
```
>aws kinesis list-tags-for-stream --stream-name "Chapter4KinesisStream"
```



```
C:\Users\Dell>aws kinesis list-tags-for-stream --stream-name "Chapter4KinesisStream"
{
    "HasMoreTags": false,
    "Tags": [
        {
            "Value": "4",
            "Key": "Chapter"
        },
        {
            "Value": "Production",
            "Key": "Environment"
        }
    ]
}
```

To get the tags after a specific key, use "exclusive-start-tag-key":

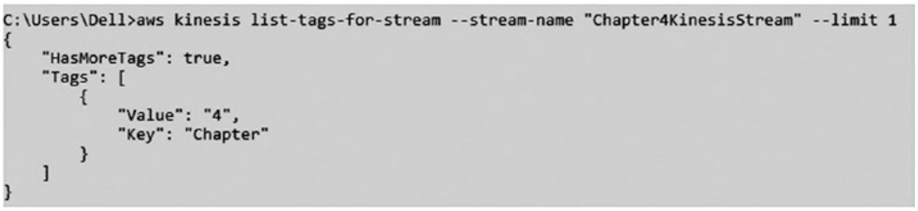
```
>aws kinesis list-tags-for-stream --stream-name "Chapter4KinesisStream"
--exclusive-start-tag-key "Chapter"
```



```
C:\Users\Dell>aws kinesis list-tags-for-stream --stream-name "Chapter4KinesisStream" --exclusive-start-tag-key "Chapter"
{
    "HasMoreTags": false,
    "Tags": [
        {
            "Value": "Production",
            "Key": "Environment"
        }
    ]
}
```

You can also set the limit of tags returned using the "limit" tag:

```
>aws kinesis list-tags-for-stream --stream-name "Chapter4KinesisStream"
--limit 1
```



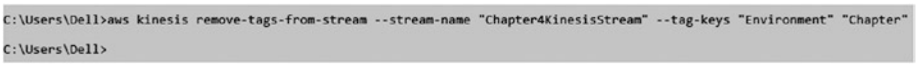
```
C:\Users\Dell>aws kinesis list-tags-for-stream --stream-name "Chapter4KinesisStream" --limit 1
{
    "HasMoreTags": true,
    "Tags": [
        {
            "Value": "4",
            "Key": "Chapter"
        }
    ]
}
```

■ **Note** For more parameters in detail, refer to http://docs.amazonaws.cn/cli/latest/reference/kinesis/list-tags-for-stream.html.

remove-tags-from-stream

This command deletes the tag from the Kinesis Stream:

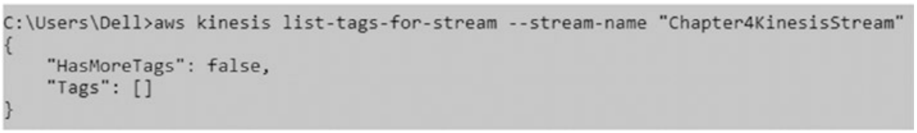
```
>aws kinesis remove-tags-from-stream --stream-name "Chapter4KinesisStream"
--tag-keys "Environment" "Chapter"
```



```
C:\Users\Dell>aws kinesis remove-tags-from-stream --stream-name "Chapter4KinesisStream" --tag-keys "Environment" "Chapter"

C:\Users\Dell>
```

To check whether the tags are removed or not, use the list-tags-for-stream command:

```
>aws kinesis list-tags-for-stream --stream-name "Chapter4KinesisStream"
```



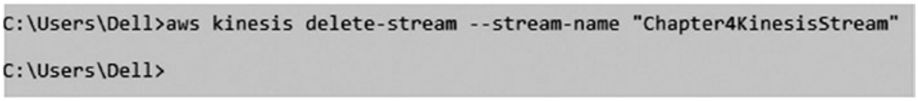
```
C:\Users\Dell>aws kinesis list-tags-for-stream --stream-name "Chapter4KinesisStream"
{
    "HasMoreTags": false,
    "Tags": []
}
```

■ **Note** For more parameters in detail, refer to http://docs.amazonaws.cn/cli/latest/reference/kinesis/remove-tags-from-stream.html.

delete-stream

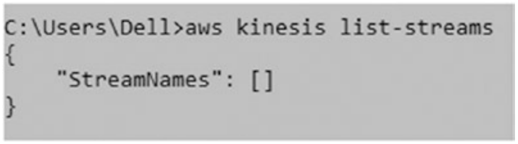
The delete-stream command deletes the stream along with all its shard and data records. Once the stream has been deleted, you cannot recover it. Only ACTIVE streams can be deleted:

```
>aws kinesis delete-stream --stream-name "Chapter4KinesisStream"
```


```
C:\Users\Dell>aws kinesis delete-stream --stream-name "Chapter4KinesisStream"

C:\Users\Dell>
```

To verify that the stream has been deleted, use the list-streams command:

```
>aws kinesis list-streams
```


```
C:\Users\Dell>aws kinesis list-streams
{
    "StreamNames": []
}
```

The delete-stream operation only supports 5 transactions per second per account.

■ **Note** For more parameters in detail, refer to http://docs.amazonaws.cn/cli/latest/reference/kinesis/delete-stream.html.

Using AWS SDK—Java

In this section, I will explain how to use AWS Java SDK to manage AWS Kinesis.

Create AmazonKinesisClient

To create AmazonKinesisClient, first create the AWSCredentials using any of the credential provider mechanisms. In our case, we will use ProfileCredentialsProvider:

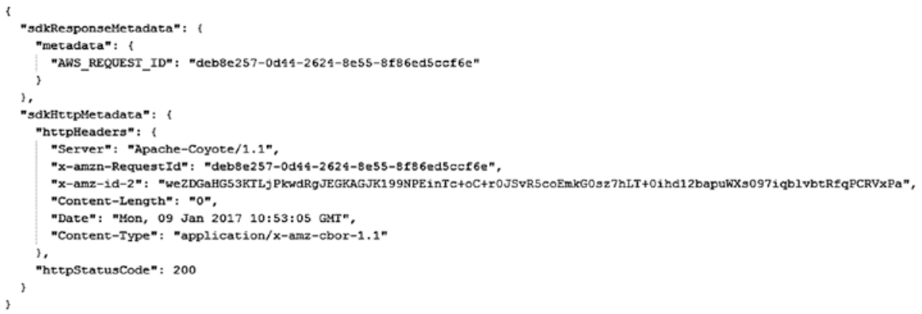
```
AWSCredentials credentials =
    new ProfileCredentialsProvider("sunilgulabani").getCredentials();

AmazonKinesisClient amazonKinesisClient = new AmazonKinesisClient(credentials);
```

This process will load the sunilgulabani profile's access key and secret key via the credentials file.

Create Stream

To create a stream using SDK, invoke the createStream method:

```
private static final String STREAM_NAME = "Chapter4KinesisStream";
private static final Integer SHARD_COUNT = 5;

createStream(STREAM_NAME, SHARD_COUNT);

public void createStream(String streamName, Integer shardCount) {
    // CreateStreamResult response =
    //    amazonKinesisClient.createStream(streamName, shardCount);

    CreateStreamRequest request = new CreateStreamRequest();

    request.setStreamName(streamName);

    request.setShardCount(shardCount);

    CreateStreamResult response = amazonKinesisClient.createStream(request);
}
```



```
{
  "sdkResponseMetadata": {
    "metadata": {
      "AWS_REQUEST_ID": "deb8e257-0d44-2624-8e55-8f86ed5ccf6e"
    }
  },
  "sdkHttpMetadata": {
    "httpHeaders": {
      "Server": "Apache-Coyote/1.1",
      "x-amzn-RequestId": "deb8e257-0d44-2624-8e55-8f86ed5ccf6e",
      "x-amz-id-2": "weZDGaHG53KTLjPkwdRgJEGKAGJK199NPEinTc+oC+r0JSvR5coEmkG0sz7hLT+0ihd12bapuWXs097iqblvbtRfqPCRVxPa",
      "Content-Length": "0",
      "Date": "Mon, 09 Jan 2017 10:53:05 GMT",
      "Content-Type": "application/x-amz-cbor-1.1"
    },
    "httpStatusCode": 200
  }
}
```

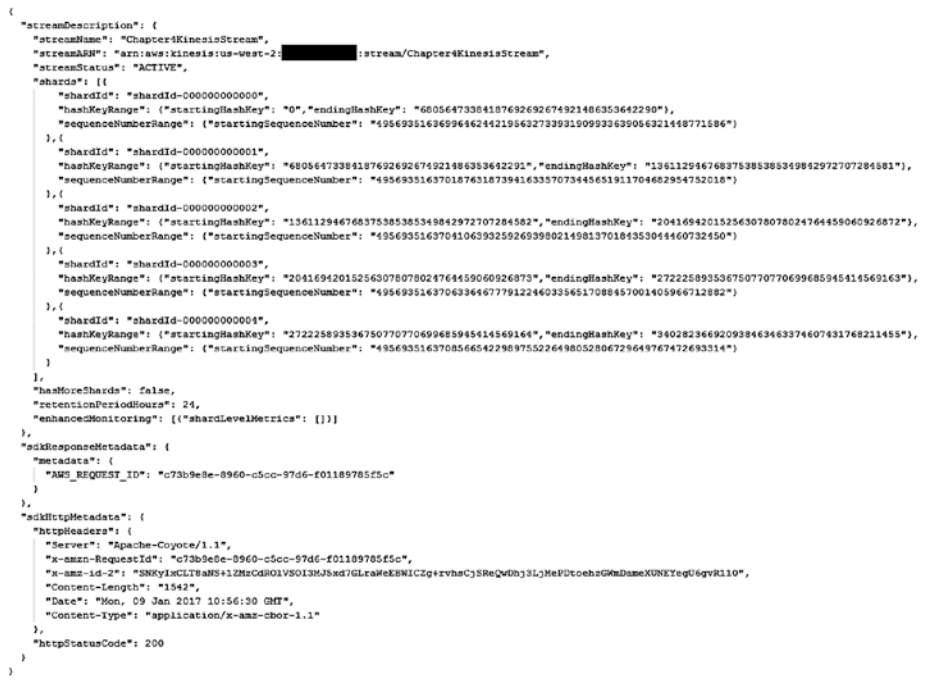
Describe Stream

To get details of the stream, invoke the describeStream method:

```
Integer shardListingLimit = null;
String exclusiveStartShardId = null;

describeStream(STREAM_NAME, shardListingLimit, exclusiveStartShardId);

publicDescribeStreamResultdescribeStream(
    String streamName, Integer limit, String exclusiveStartShardId) {
```

```
    // DescribeStreamResult response =
    //    amazonKinesisClient.describeStream(streamName);

    DescribeStreamRequest request = new DescribeStreamRequest();

    request.setStreamName(streamName);

    if(limit != null) {
        request.setLimit(limit);
    }

    if(!StringUtils.isNullOrEmpty(exclusiveStartShardId)) {
        request.setExclusiveStartShardId(exclusiveStartShardId);
    }

    DescribeStreamResult response =
        amazonKinesisClient.describeStream(request);

    return response;
}
```

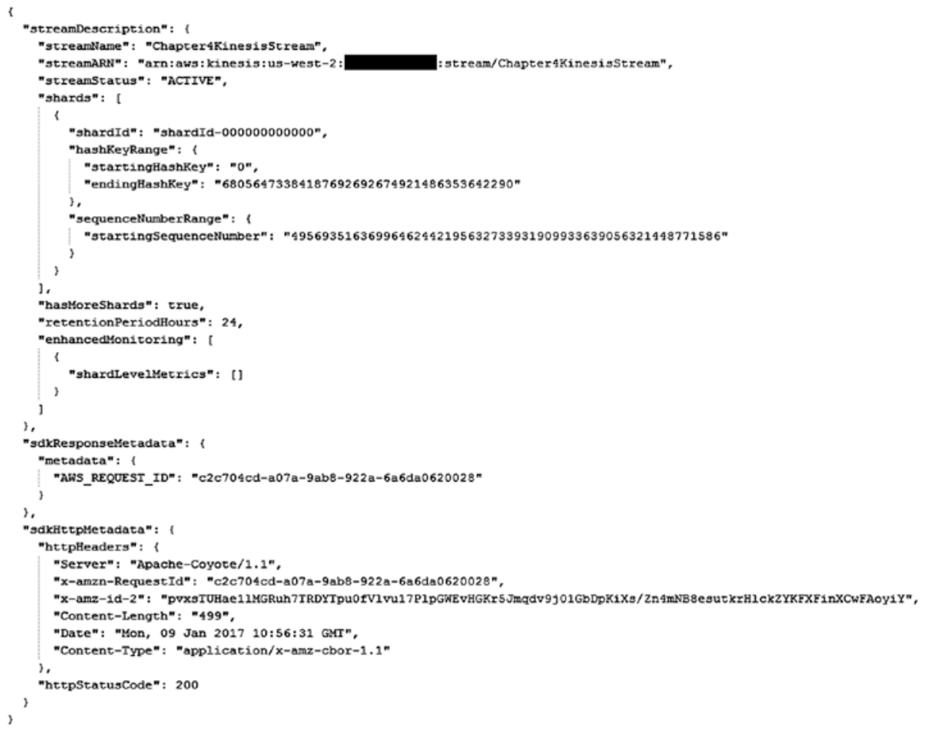
You can see that we are passing `null` in `shardListingLimit` and `exclusiveStartShardId` parameters to get all shards listed:



```
{
  "streamDescription": {
    "streamName": "Chapter4KinesisStream",
    "streamARN": "arn:aws:kinesis:us-west-2:[redacted]:stream/Chapter4KinesisStream",
    "streamStatus": "ACTIVE",
    "shards": [{
        "shardId": "shardId-000000000000",
        "hashKeyRange": {"startingHashKey": "0","endingHashKey": "68056473384187692692674921486353642290"},
        "sequenceNumberRange": {"startingSequenceNumber": "49569351636996462442195632733931909933639056321448771586"}
      },{
        "shardId": "shardId-000000000001",
        "hashKeyRange": {"startingHashKey": "68056473384187692692674921486353642291","endingHashKey": "136112946768375385385349842972707284581"},
        "sequenceNumberRange": {"startingSequenceNumber": "49569351637018763187394163357073445651911704682954752018"}
      },{
        "shardId": "shardId-000000000002",
        "hashKeyRange": {"startingHashKey": "136112946768375385385349842972707284582","endingHashKey": "204169420152563078078024764459060926872"},
        "sequenceNumberRange": {"startingSequenceNumber": "49569351637041063932592693980214981370184353044460732450"}
      },{
        "shardId": "shardId-000000000003",
        "hashKeyRange": {"startingHashKey": "204169420152563078078024764459060926873","endingHashKey": "272225893536750770770699685945414569163"},
        "sequenceNumberRange": {"startingSequenceNumber": "49569351637063364677791224603356517088457001405966712882"}
      },{
        "shardId": "shardId-000000000004",
        "hashKeyRange": {"startingHashKey": "272225893536750770770699685945414569164","endingHashKey": "340282366920938463463374607431768211455"},
        "sequenceNumberRange": {"startingSequenceNumber": "49569351637085665422989755226498052806729649767472693314"}
      }
    ],
    "hasMoreShards": false,
    "retentionPeriodHours": 24,
    "enhancedMonitoring": [{"shardLevelMetrics": []}]
  },
  "sdkResponseMetadata": {
    "metadata": {
      "AWS_REQUEST_ID": "c73b9e8e-8960-c5cc-97d6-f01189785f5c"
    }
  },
  "sdkHttpMetadata": {
    "httpHeaders": {
      "Server": "Apache-Coyote/1.1",
      "x-amzn-RequestId": "c73b9e8e-8960-c5cc-97d6-f01189785f5c",
      "x-amz-id-2": "SNKyIxCLT8aNS+1ZMzCdRO1VSOI3MJ5xd7GLraWeEBWICZg+rvhsCjSReQwDhj3LjMePDtoehzGWmDameXUNEYegU6gvR110",
      "Content-Length": "1542",
      "Date": "Mon, 09 Jan 2017 10:56:30 GMT",
      "Content-Type": "application/x-amz-cbor-1.1"
    },
    "httpStatusCode": 200
  }
}
```

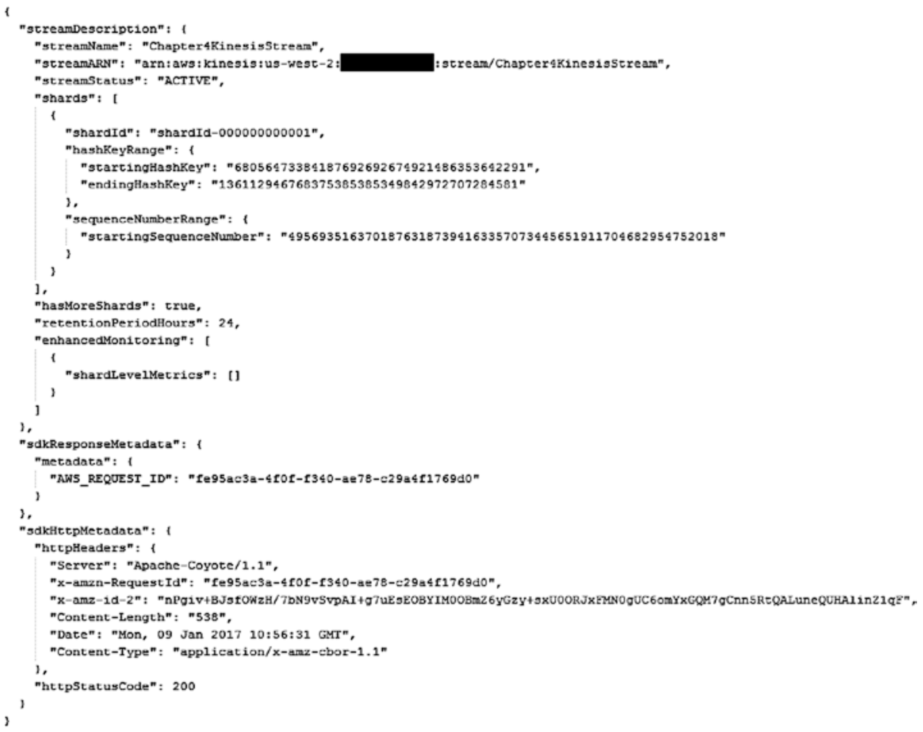
To get a paginated shard listing, pass values for `limit` and `exlusiveStartShardId` as `null` for first request:

```
Integer shardListingLimit = 1;
String exclusiveStartShardId = null;

DescribeStreamResultdescribeStreamResult =
    describeStream(STREAM_NAME,
                                 shardListingLimit,
                                 exclusiveStartShardId);

StreamDescriptionstreamDescription =
    describeStreamResult.getStreamDescription();

List<Shard> shards = streamDescription.getShards();

booleanhasMoreShards = streamDescription.getHasMoreShards();

while(hasMoreShards) {
    exclusiveStartShardId = shards.get(shards.size()-1).getShardId();
    describeStreamResult = describeStream(
                                              STREAM_NAME,
                                              shardListingLimit,
                                              exclusiveStartShardId);

    streamDescription = describeStreamResult.getStreamDescription();

    shards = streamDescription.getShards();

    hasMoreShards = streamDescription.getHasMoreShards();
}
```



```
{
  "streamDescription": {
    "streamName": "Chapter4KinesisStream",
    "streamARN": "arn:aws:kinesis:us-west-2:[redacted]:stream/Chapter4KinesisStream",
    "streamStatus": "ACTIVE",
    "shards": [
      {
        "shardId": "shardId-000000000000",
        "hashKeyRange": {
          "startingHashKey": "0",
          "endingHashKey": "68056473384187692692674921486353642290"
        },
        "sequenceNumberRange": {
          "startingSequenceNumber": "49569351636996462442195632733931909933639056321448771586"
        }
      }
    ],
    "hasMoreShards": true,
    "retentionPeriodHours": 24,
    "enhancedMonitoring": [
      {
        "shardLevelMetrics": []
      }
    ]
  },
  "sdkResponseMetadata": {
    "metadata": {
      "AWS_REQUEST_ID": "c2c704cd-a07a-9ab8-922a-6a6da0620028"
    }
  },
  "sdkHttpMetadata": {
    "httpHeaders": {
      "Server": "Apache-Coyote/1.1",
      "x-amzn-RequestId": "c2c704cd-a07a-9ab8-922a-6a6da0620028",
      "x-amz-id-2": "pvxsTUHae1lMGRuh7TRDYTpu0fVlvu17PlpGWEvHGKr5Jmqdv9j01GbDpKiXs/Zn4mNB8esutkrHlckZYKFXFinXCwFAoyiY",
      "Content-Length": "499",
      "Date": "Mon, 09 Jan 2017 10:56:31 GMT",
      "Content-Type": "application/x-amz-cbor-1.1"
    },
    "httpStatusCode": 200
  }
}
```

To get to the next page, pass the last shard ID obtained from the previous request:



```
{
  "streamDescription": {
    "streamName": "Chapter4KinesisStream",
    "streamARN": "arn:aws:kinesis:us-west-2:[redacted]:stream/Chapter4KinesisStream",
    "streamStatus": "ACTIVE",
    "shards": [
      {
        "shardId": "shardId-000000000001",
        "hashKeyRange": {
          "startingHashKey": "68056473384187692692674921486353642291",
          "endingHashKey": "136112946768375385385349842972707284581"
        },
        "sequenceNumberRange": {
          "startingSequenceNumber": "49569351637018763187394163357073445651911704682954752018"
        }
      }
    ],
    "hasMoreShards": true,
    "retentionPeriodHours": 24,
    "enhancedMonitoring": [
      {
        "shardLevelMetrics": []
      }
    ]
  },
  "sdkResponseMetadata": {
    "metadata": {
      "AWS_REQUEST_ID": "fe95ac3a-4f0f-f340-ae78-c29a4f1769d0"
    }
  },
  "sdkHttpMetadata": {
    "httpHeaders": {
      "Server": "Apache-Coyote/1.1",
      "x-amzn-RequestId": "fe95ac3a-4f0f-f340-ae78-c29a4f1769d0",
      "x-amz-id-2": "nPgiv+BJsfOWzH/7bN9vSvpAI+g7uEsEOBYIM0OBmZ6yGzy+sxU0ORJxFMN0gUC6omYxGQM7gCnn5RtQALuneQUHAlinZ1qF",
      "Content-Length": "538",
      "Date": "Mon, 09 Jan 2017 10:56:31 GMT",
      "Content-Type": "application/x-amz-cbor-1.1"
    },
    "httpStatusCode": 200
  }
}
```

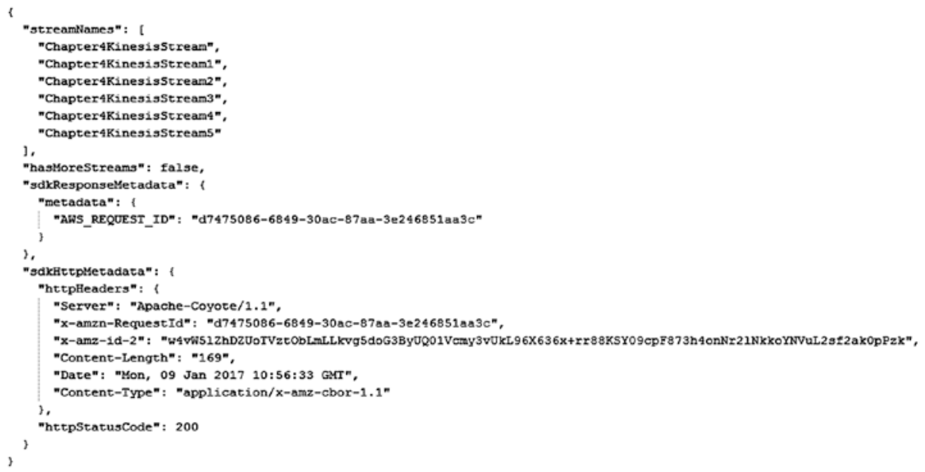
Similarly you can get the result for the next page.

List Stream

To get all streams available under the AWS account, invoke the `listStreams` method:

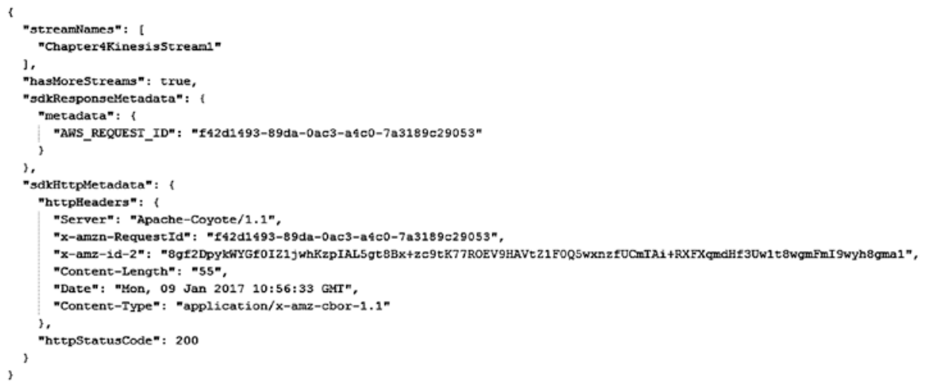
```
Integer streamListingLimit = null;

String exclusiveStartStreamName = null;

listStreams(exclusiveStartStreamName, streamListingLimit);

public void listStreams(String exclusiveStartStreamName,
                                              Integer streamListingLimit) {

    // ListStreamsResult response = amazonKinesisClient.listStreams();

    ListStreamsRequest request = new ListStreamsRequest();

    if(!StringUtils.isNullOrEmpty(exclusiveStartStreamName)) {
        request.setExclusiveStartStreamName(exclusiveStartStreamName);
    }
    if(streamListingLimit != null) {
        request.setLimit(streamListingLimit);
    }

    ListStreamsResult response = amazonKinesisClient.listStreams(request);
}
```

Here we are passing a `null` value for `exclusiveStartStreamName` and `streamListingLimit` to get all streams:



```
{
  "streamNames": [
    "Chapter4KinesisStream",
    "Chapter4KinesisStream1",
    "Chapter4KinesisStream2",
    "Chapter4KinesisStream3",
    "Chapter4KinesisStream4",
    "Chapter4KinesisStream5"
  ],
  "hasMoreStreams": false,
  "sdkResponseMetadata": {
    "metadata": {
      "AWS_REQUEST_ID": "d7475086-6849-30ac-87aa-3e246851aa3c"
    }
  },
  "sdkHttpMetadata": {
    "httpHeaders": {
      "Server": "Apache-Coyote/1.1",
      "x-amzn-RequestId": "d7475086-6849-30ac-87aa-3e246851aa3c",
      "x-amz-id-2": "w4vW51ZhDZUoTVztObLmLLkvg5doG3ByUQ01Vcmy3vUkL96X636x+rr88KSY09cpF873h4onNr21NkkoYNVuL2sf2ak0pPzk",
      "Content-Length": "169",
      "Date": "Mon, 09 Jan 2017 10:56:33 GMT",
      "Content-Type": "application/x-amz-cbor-1.1"
    },
    "httpStatusCode": 200
  }
}
```

To get a paginated stream listing, pass the `streamListingLimit` parameter to get the number of streams in a single request and `exclusiveStartStreamName` as `null` for the first request. For subsequent requests, pass the last stream name returned by the previous request:



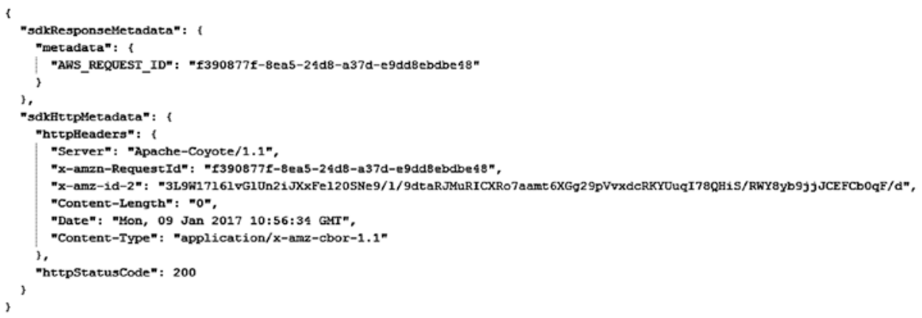
```
{
  "streamNames": [
    "Chapter4KinesisStream1"
  ],
  "hasMoreStreams": true,
  "sdkResponseMetadata": {
    "metadata": {
      "AWS_REQUEST_ID": "f42d1493-89da-0ac3-a4c0-7a3189c29053"
    }
  },
  "sdkHttpMetadata": {
    "httpHeaders": {
      "Server": "Apache-Coyote/1.1",
      "x-amzn-RequestId": "f42d1493-89da-0ac3-a4c0-7a3189c29053",
      "x-amz-id-2": "8gf2DpykWYGf0IZ1jwhKzpIAL5gt8Bx+zc9tK77ROEV9HAVtZ1F0Q5wxnzfUCmTAi+RXFXqmdHf3Uw1t8wgmFmI9wyh8gma1",
      "Content-Length": "55",
      "Date": "Mon, 09 Jan 2017 10:56:33 GMT",
      "Content-Type": "application/x-amz-cbor-1.1"
    },
    "httpStatusCode": 200
  }
}
```

Similarly, you can get the result for the next page.

Increase Stream Retention Period

The stream retention period will retain the message to read in Kinesis. This period can be increased using the `increaseStreamRetentionPeriod` method:

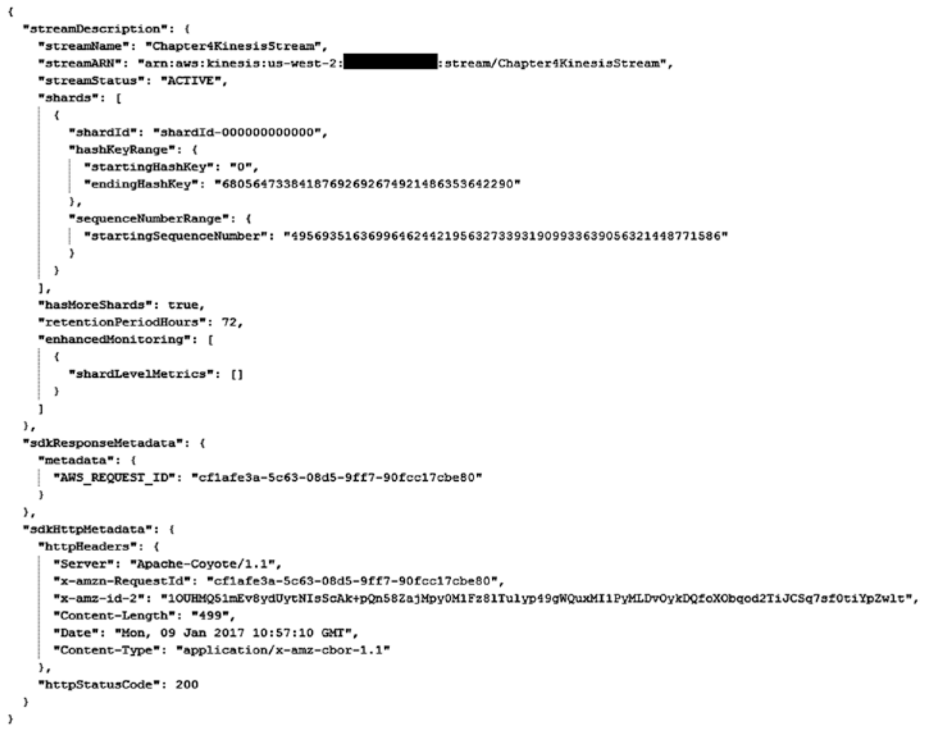
```
increaseStreamRetentionPeriod(STREAM_NAME, 72);

public void increaseStreamRetentionPeriod(String streamName,
                                            Integer retentionPeriodHours) {

    IncreaseStreamRetentionPeriodRequest request =
        new IncreaseStreamRetentionPeriodRequest();

    request.setStreamName(streamName);

    request.setRetentionPeriodHours(retentionPeriodHours);

    IncreaseStreamRetentionPeriodResult response =
        amazonKinesisClient.increaseStreamRetentionPeriod(request);
}
```



```
{
  "sdkResponseMetadata": {
    "metadata": {
      "AWS_REQUEST_ID": "f390877f-8ea5-24d8-a37d-e9dd8ebdbe48"
    }
  },
  "sdkHttpMetadata": {
    "httpHeaders": {
      "Server": "Apache-Coyote/1.1",
      "x-amzn-RequestId": "f390877f-8ea5-24d8-a37d-e9dd8ebdbe48",
      "x-amz-id-2": "3L9W1716lvGlUn2iJXxFel20SNe9/1/9dtaRJMuRICXRo7aamt6XGg29pVvxdcRKYUuqI78QHiS/RWY8yb9jjJCEFCb0qF/d",
      "Content-Length": "0",
      "Date": "Mon, 09 Jan 2017 10:56:34 GMT",
      "Content-Type": "application/x-amz-cbor-1.1"
    },
    "httpStatusCode": 200
  }
}
```

To verify that the stream retention period is being updated, use the describe stream operation:

```
describeStream(STREAM_NAME, 1, null);
```

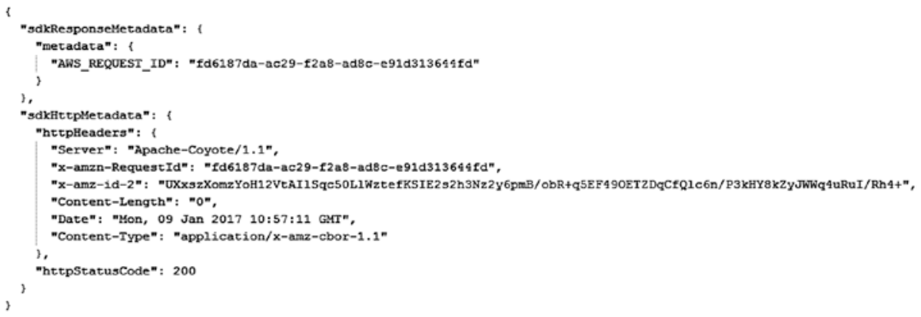


```
{
  "streamDescription": {
    "streamName": "Chapter4KinesisStream",
    "streamARN": "arn:aws:kinesis:us-west-2:[redacted]:stream/Chapter4KinesisStream",
    "streamStatus": "ACTIVE",
    "shards": [
      {
        "shardId": "shardId-000000000000",
        "hashKeyRange": {
          "startingHashKey": "0",
          "endingHashKey": "68056473384187692692674921486353642290"
        },
        "sequenceNumberRange": {
          "startingSequenceNumber": "49569351636996462442195632733931909933639056321448771586"
        }
      }
    ],
    "hasMoreShards": true,
    "retentionPeriodHours": 72,
    "enhancedMonitoring": [
      {
        "shardLevelMetrics": []
      }
    ]
  },
  "sdkResponseMetadata": {
    "metadata": {
      "AWS_REQUEST_ID": "cf1afe3a-5c63-08d5-9ff7-90fcc17cbe80"
    }
  },
  "sdkHttpMetadata": {
    "httpHeaders": {
      "Server": "Apache-Coyote/1.1",
      "x-amzn-RequestId": "cf1afe3a-5c63-08d5-9ff7-90fcc17cbe80",
      "x-amz-id-2": "1OUHMQ51mEv8ydUytNIsScAk+pQn58ZajMpy0M1Fz81Tulyp49gWQuxMI1PyMLDvOykDQfoXObqod2TiJCSq7sf0tiYpZwlt",
      "Content-Length": "499",
      "Date": "Mon, 09 Jan 2017 10:57:10 GMT",
      "Content-Type": "application/x-amz-cbor-1.1"
    },
    "httpStatusCode": 200
  }
}
```

Decrease Stream Retention Period

The stream retention period will retain the message to read in Kinesis. This period can be decreased using the decreaseStreamRetentionPeriod method:

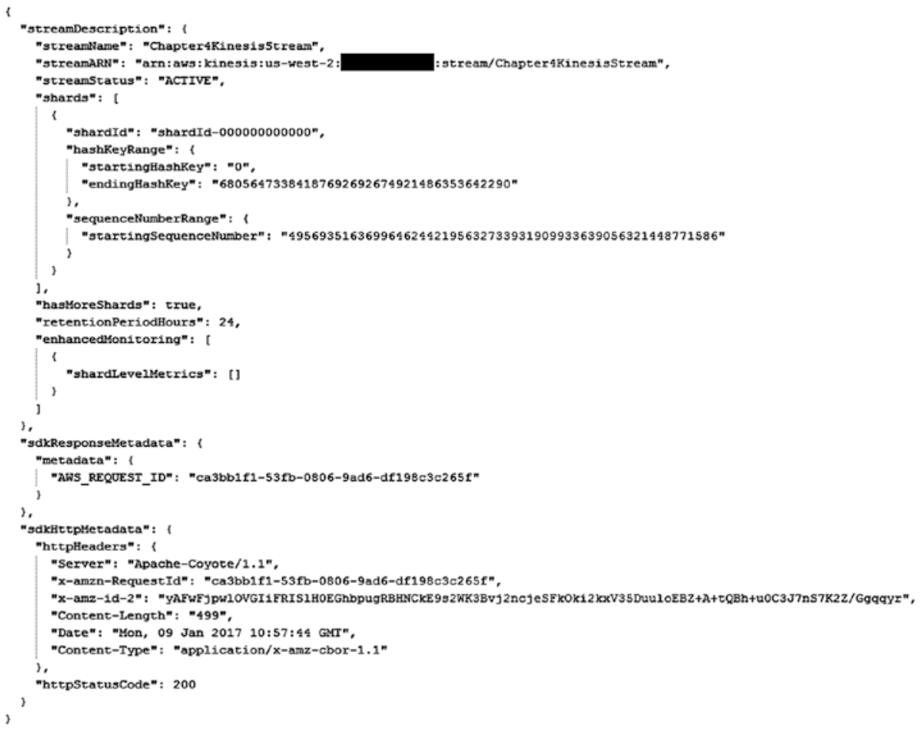
```
decreaseStreamRetentionPeriod(STREAM_NAME, 24);

public void decreaseStreamRetentionPeriod(String streamName,
                                            Integer retentionPeriodHours) {

    DecreaseStreamRetentionPeriodRequest request =
        new DecreaseStreamRetentionPeriodRequest();

    request.setStreamName(streamName);

    request.setRetentionPeriodHours(retentionPeriodHours);

    DecreaseStreamRetentionPeriodResult response =
        amazonKinesisClient.decreaseStreamRetentionPeriod(request);
}
```



```
{
  "sdkResponseMetadata": {
    "metadata": {
      "AWS_REQUEST_ID": "fd6187da-ac29-f2a8-ad8c-e91d313644fd"
    }
  },
  "sdkHttpMetadata": {
    "httpHeaders": {
      "Server": "Apache-Coyote/1.1",
      "x-amzn-RequestId": "fd6187da-ac29-f2a8-ad8c-e91d313644fd",
      "x-amz-id-2": "UXxszXomzYoH12VtAI1Sqc50L1WztefKSIE2s2h3Nz2y6pmB/obR+q5EF49OETZDqCfQ1c6n/P3kHY8kZyJWWq4uRuI/Rh4+",
      "Content-Length": "0",
      "Date": "Mon, 09 Jan 2017 10:57:11 GMT",
      "Content-Type": "application/x-amz-cbor-1.1"
    },
    "httpStatusCode": 200
  }
}
```

To verify that the stream retention period is being updated, use the describe stream operation:

```
describeStream(STREAM_NAME, 1, null);
```

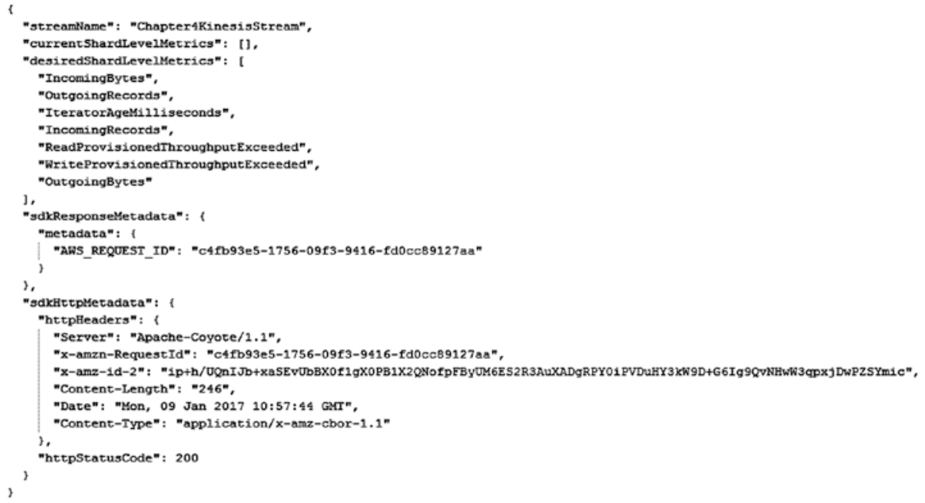


```
{
  "streamDescription": {
    "streamName": "Chapter4KinesisStream",
    "streamARN": "arn:aws:kinesis:us-west-2:[redacted]:stream/Chapter4KinesisStream",
    "streamStatus": "ACTIVE",
    "shards": [
      {
        "shardId": "shardId-000000000000",
        "hashKeyRange": {
          "startingHashKey": "0",
          "endingHashKey": "68056473384187692692674921486353642290"
        },
        "sequenceNumberRange": {
          "startingSequenceNumber": "49569351636996462442195632733931909933639056321448771586"
        }
      }
    ],
    "hasMoreShards": true,
    "retentionPeriodHours": 24,
    "enhancedMonitoring": [
      {
        "shardLevelMetrics": []
      }
    ]
  },
  "sdkResponseMetadata": {
    "metadata": {
      "AWS_REQUEST_ID": "ca3bb1f1-53fb-0806-9ad6-df198c3c265f"
    }
  },
  "sdkHttpMetadata": {
    "httpHeaders": {
      "Server": "Apache-Coyote/1.1",
      "x-amzn-RequestId": "ca3bb1f1-53fb-0806-9ad6-df198c3c265f",
      "x-amz-id-2": "yAFwFjpwlOVGIiFRISlH0EGhbpugRBHNCkE9s2WK3Bvj2ncjeSFkOki2kxV35DuuloEBZ+A+tQBh+u0C3J7nS7K2Z/Ggqqyr",
      "Content-Length": "499",
      "Date": "Mon, 09 Jan 2017 10:57:44 GMT",
      "Content-Type": "application/x-amz-cbor-1.1"
    },
    "httpStatusCode": 200
  }
}
```

Enable Enhanced Monitoring

Enable enhanced monitoring will enable shard level metrics. To enable enhanced monitoring, invoke the `enableEnhancedMonitoring` method:

```
enableEnhancedMonitoring(STREAM_NAME);

public void enableEnhancedMonitoring(String streamName) {
    EnableEnhancedMonitoringRequest request =
        new EnableEnhancedMonitoringRequest();

    request.setStreamName(streamName);

    request.setShardLevelMetrics(getShardLevelMetrics());

    EnableEnhancedMonitoringResult response =
        amazonKinesisClient.enableEnhancedMonitoring(request);
}
```

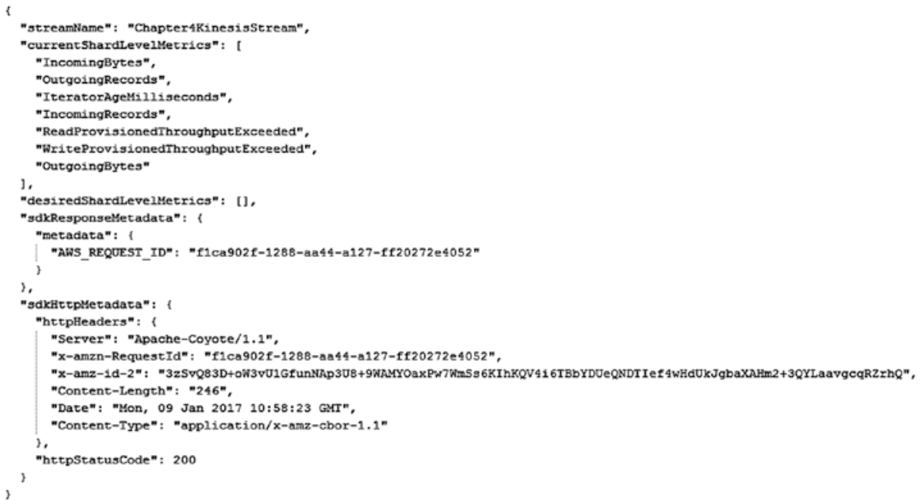


```
{
  "streamName": "Chapter4KinesisStream",
  "currentShardLevelMetrics": [],
  "desiredShardLevelMetrics": [
    "IncomingBytes",
    "OutgoingRecords",
    "IteratorAgeMilliseconds",
    "IncomingRecords",
    "ReadProvisionedThroughputExceeded",
    "WriteProvisionedThroughputExceeded",
    "OutgoingBytes"
  ],
  "sdkResponseMetadata": {
    "metadata": {
      "AWS_REQUEST_ID": "c4fb93e5-1756-09f3-9416-fd0cc89127aa"
    }
  },
  "sdkHttpMetadata": {
    "httpHeaders": {
      "Server": "Apache-Coyote/1.1",
      "x-amzn-RequestId": "c4fb93e5-1756-09f3-9416-fd0cc89127aa",
      "x-amz-id-2": "ip+h/UQnIJb+xaSEvUbBX0f1gX0PB1X2QNofpFByUM6ES2R3AuXADgRPY0iPVDuHY3kW9D+G6Ig9QvNHwW3qpxjDwPZSYmic",
      "Content-Length": "246",
      "Date": "Mon, 09 Jan 2017 10:57:44 GMT",
      "Content-Type": "application/x-amz-cbor-1.1"
    },
    "httpStatusCode": 200
  }
}
```

Disable Enhanced Monitoring

Disable enhanced monitoring will disable shard level metrics. To disable enhanced monitoring, invoke `disableEnhancedMonitoring` method:

```
disableEnhancedMonitoring(STREAM_NAME);

public void disableEnhancedMonitoring(String streamName) {
    DisableEnhancedMonitoringRequest request =
        new DisableEnhancedMonitoringRequest();
    request.setStreamName(streamName);

    request.setShardLevelMetrics(getShardLevelMetrics());

    DisableEnhancedMonitoringResult response =
        amazonKinesisClient.disableEnhancedMonitoring(request);
}
```



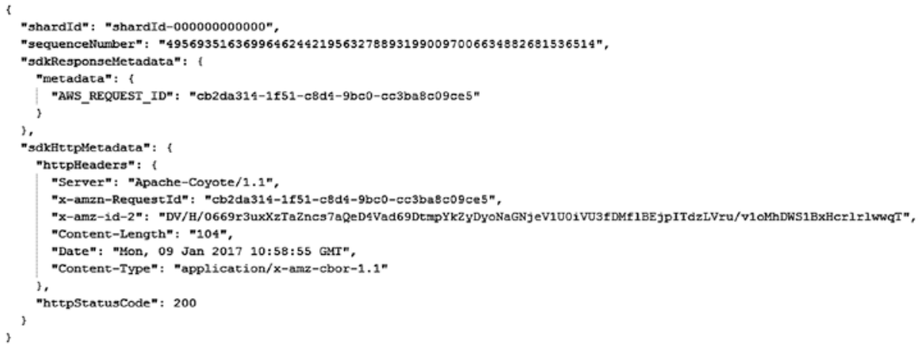
```
{
  "streamName": "Chapter4KinesisStream",
  "currentShardLevelMetrics": [
    "IncomingBytes",
    "OutgoingRecords",
    "IteratorAgeMilliseconds",
    "IncomingRecords",
    "ReadProvisionedThroughputExceeded",
    "WriteProvisionedThroughputExceeded",
    "OutgoingBytes"
  ],
  "desiredShardLevelMetrics": [],
  "sdkResponseMetadata": {
    "metadata": {
      "AWS_REQUEST_ID": "f1ca902f-1288-aa44-a127-ff20272e4052"
    }
  },
  "sdkHttpMetadata": {
    "httpHeaders": {
      "Server": "Apache-Coyote/1.1",
      "x-amzn-RequestId": "f1ca902f-1288-aa44-a127-ff20272e4052",
      "x-amz-id-2": "3zSvQ83D+oW3vU1GfunNAp3U8+9WAMYOaxPw7WmSs6KIhKQV4i6TBbYDUeQNDTIef4wHdUkJgbaXAHm2+3QYLaavgcqRZrhQ",
      "Content-Length": "246",
      "Date": "Mon, 09 Jan 2017 10:58:23 GMT",
      "Content-Type": "application/x-amz-cbor-1.1"
    },
    "httpStatusCode": 200
  }
}
```

Put Record

To add data records to the stream, invoke the putRecord method:

```
String explicitHashKey = null;
String partitionKey = "123";
String data = "Hello World Kinesis!!!";

putRecord(STREAM_NAME, partitionKey, data.getBytes(), explicitHashKey);

public void putRecord(String streamName, String partitionKey,
                                     byte[] data, String explicitHashKey) {
    // PutRecordResult response = amazonKinesisClient.putRecord(streamName,
    //                                                  ByteBuffer.wrap(data),
    //                                                  partitionKey);

    PutRecordRequest request = new PutRecordRequest();

    request.setStreamName(streamName);
    request.setPartitionKey(partitionKey);
    request.setData(ByteBuffer.wrap(data));

    if(!StringUtils.isNullOrEmpty(explicitHashKey)) {
        request.setExplicitHashKey(explicitHashKey);
    }

    PutRecordResult response = amazonKinesisClient.putRecord(request);
}
```

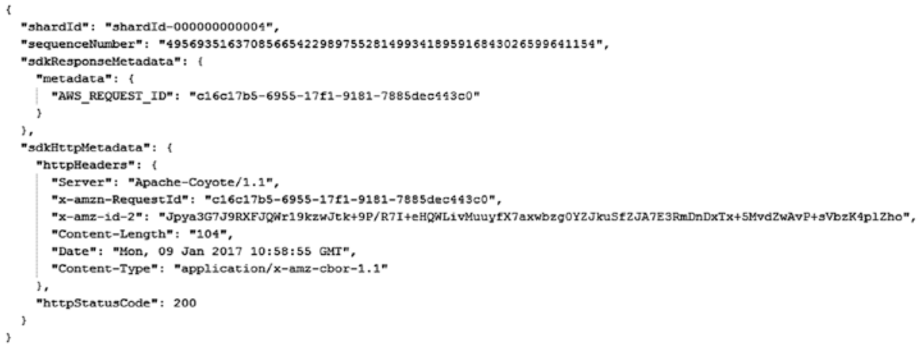
Here we are passing values for `partitionKey` and data, but, for now, the `exclusiveHashKey` parameter value is `null`. The partition key is used to identify to which shard data record needs to be added and the `exclusiveHashKey` parameter signifies to which shard we want to explicitly send data records:



```
{
  "shardId": "shardId-000000000000",
  "sequenceNumber": "49569351636996462442195632788931990097006634882681536514",
  "sdkResponseMetadata": {
    "metadata": {
      "AWS_REQUEST_ID": "cb2da314-1f51-c8d4-9bc0-cc3ba8c09ce5"
    }
  },
  "sdkHttpMetadata": {
    "httpHeaders": {
      "Server": "Apache-Coyote/1.1",
      "x-amzn-RequestId": "cb2da314-1f51-c8d4-9bc0-cc3ba8c09ce5",
      "x-amz-id-2": "DV/H/0669r3uxXzTaZncs7aQeD4Vad69DtmpYkZyDyoNaGNjeV1U0iVU3fDMf1BEjpITdzLVru/v1oMhDWS1BxHcrlrlwwqT",
      "Content-Length": "104",
      "Date": "Mon, 09 Jan 2017 10:58:55 GMT",
      "Content-Type": "application/x-amz-cbor-1.1"
    },
    "httpStatusCode": 200
  }
}
```

To send data records to an explicit shard, pass the `exclusiveHashKey` parameter:

```
explicitHashKey = "272225893536750770770699685945414569165";

putRecord(STREAM_NAME, partitionKey, data.getBytes(), explicitHashKey);
```



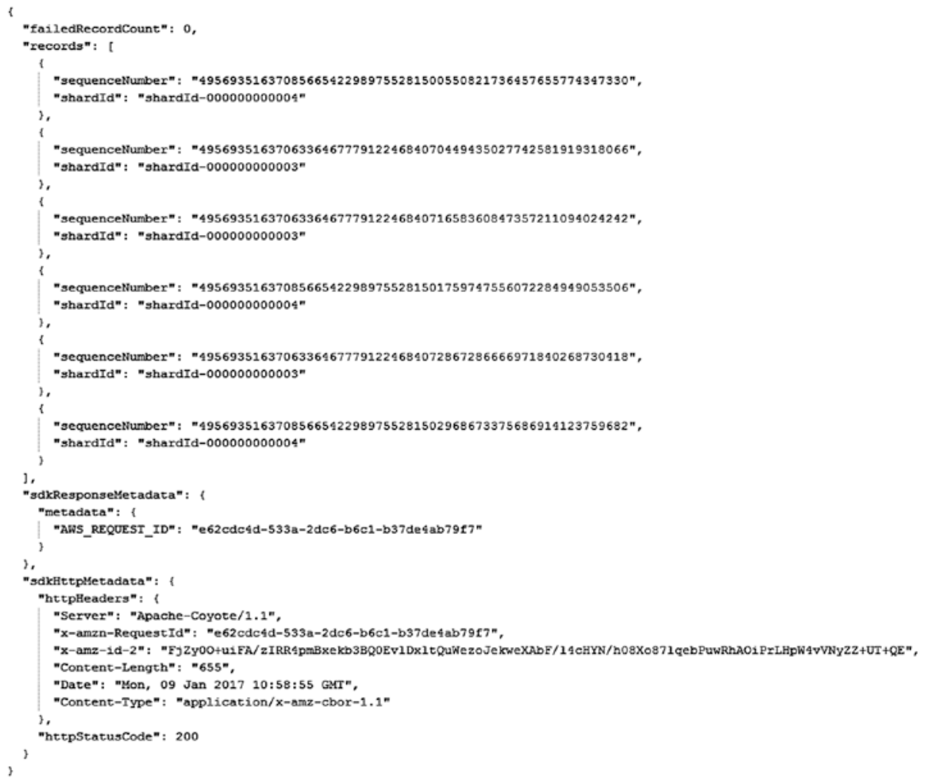
```
{
  "shardId": "shardId-000000000004",
  "sequenceNumber": "49569351637085665422989755281499341895916843026599641154",
  "sdkResponseMetadata": {
    "metadata": {
      "AWS_REQUEST_ID": "c16c17b5-6955-17f1-9181-7885dec443c0"
    }
  },
  "sdkHttpMetadata": {
    "httpHeaders": {
      "Server": "Apache-Coyote/1.1",
      "x-amzn-RequestId": "c16c17b5-6955-17f1-9181-7885dec443c0",
      "x-amz-id-2": "Jpya3G7J9RXFJQWr19kzwJtk+9P/R7I+eHQWLivMuuyfX7axwbzg0YZJkuSfZJA7E3RmDnDxTx+5MvdZwAvP+sVbzK4plZho",
      "Content-Length": "104",
      "Date": "Mon, 09 Jan 2017 10:58:55 GMT",
      "Content-Type": "application/x-amz-cbor-1.1"
    },
    "httpStatusCode": 200
  }
}
```

Put Records

To send multiple data records to a stream in a single request, invoke the putRecords method:

```
List<PutRecordsRequestEntry> records = new ArrayList<>();
PutRecordsRequestEntry record = null;
explicitHashKey = null;

for(inti=0;i<5;i++) {
    record = createPutRecordsRequestEntry(
                                          String.valueOf(i),
                                          data + "-" + i,
                                          explicitHashKey);

    records.add(record);
}

explicitHashKey = "272225893536750770770699685945414569165";

record = createPutRecordsRequestEntry(
                                          String.valueOf(5),
                                          data + "-" + 5,
                                          explicitHashKey);

records.add(record);

putRecords(STREAM_NAME, records);

public void putRecords(String streamName,
                                    List<PutRecordsRequestEntry> records) {
    PutRecordsRequest request = new PutRecordsRequest();

    request.setStreamName(streamName);

    request.setRecords(records);

    PutRecordsResult response = amazonKinesisClient.putRecords(request);
}
```

Here you can see that first we created multiple PutRecordsRequestEntry instances that have partition key, data, and exclusive hash key (optional). We then passed the list of PutRecordsRequestEntry to the putRecords method;



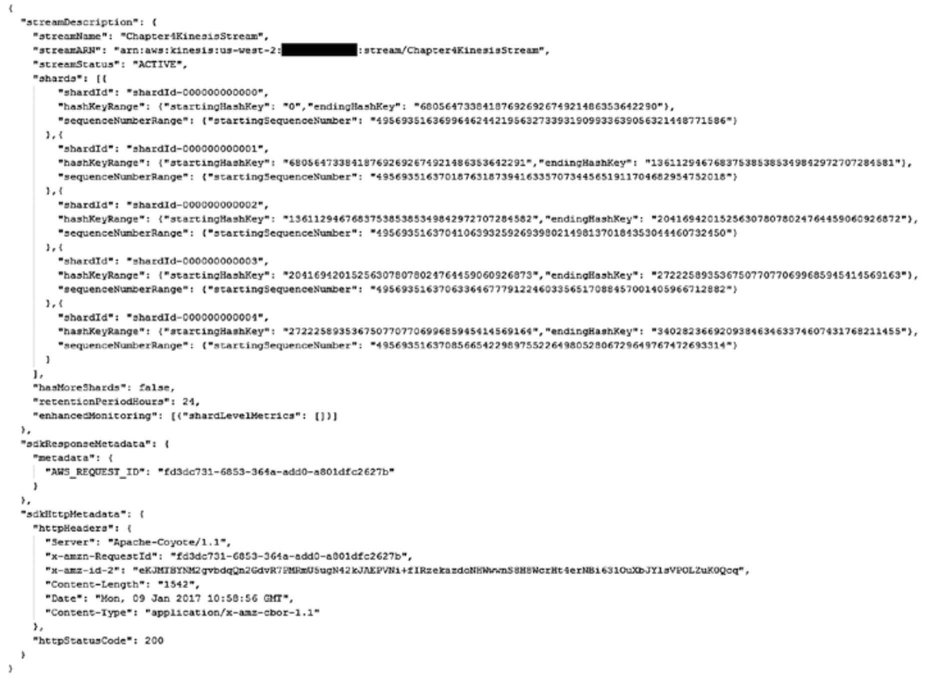
```
{
  "failedRecordCount": 0,
  "records": [
    {
      "sequenceNumber": "49569351637085665422989755281500550821736457655774347330",
      "shardId": "shardId-000000000004"
    },
    {
      "sequenceNumber": "49569351637063364677791224684070449435027742581919318066",
      "shardId": "shardId-000000000003"
    },
    {
      "sequenceNumber": "49569351637063364677791224684071658360847357211094024242",
      "shardId": "shardId-000000000003"
    },
    {
      "sequenceNumber": "49569351637085665422989755281501759747556072284949053506",
      "shardId": "shardId-000000000004"
    },
    {
      "sequenceNumber": "49569351637063364677791224684072867286666971840268730418",
      "shardId": "shardId-000000000003"
    },
    {
      "sequenceNumber": "49569351637085665422989755281502968673375686914123759682",
      "shardId": "shardId-000000000004"
    }
  ],
  "sdkResponseMetadata": {
    "metadata": {
      "AWS_REQUEST_ID": "e62cdc4d-533a-2dc6-b6c1-b37de4ab79f7"
    }
  },
  "sdkHttpMetadata": {
    "httpHeaders": {
      "Server": "Apache-Coyote/1.1",
      "x-amzn-RequestId": "e62cdc4d-533a-2dc6-b6c1-b37de4ab79f7",
      "x-amz-id-2": "FjZyOO+uiFA/zIRR4pmBxekb3BQ0EvlDxltQuWezoJekweXAbF/l4cHYN/h08Xo87lqebPuwRhAOiPrLHpW4vVNyZZ+UT+QE",
      "Content-Length": "655",
      "Date": "Mon, 09 Jan 2017 10:58:55 GMT",
      "Content-Type": "application/x-amz-cbor-1.1"
    },
    "httpStatusCode": 200
  }
}
```

In response, we get failed and successful added data records individually.

Get Records

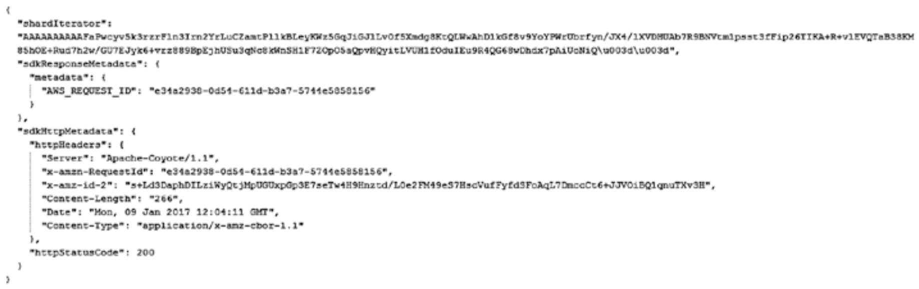
To read data records from Kinesis Streams, invoke the getRecords method. You need the shard iterator to read a data record from individual shards:

```
getRecords(STREAM_NAME);

public void getRecords(String streamName)
    throws UnsupportedEncodingException {

    GetRecordsRequest request = new GetRecordsRequest();

    request.setLimit(100);

    List<String>shardIterators = getShardIterators(
                                            streamName,
                                            ShardIteratorType.TRIM_HORIZON);
    List<GetRecordsResult> response = new ArrayList<GetRecordsResult>();

    shardIterators.forEach(shardIterator -> {
        request.setShardIterator(shardIterator);

        GetRecordsResultgetRecordsResult =
            amazonKinesisClient.getRecords(request);

        response.add(getRecordsResult);
    });

    System.out.println("-------------");

    for(GetRecordsResult result: response) {
        for(Record record: result.getRecords()) {
            String data = new String(record.getData().array(), "UTF-8");

            System.out.println(data);
        }
    }
}

private List<String> getShardIterators(String streamName,
                                      ShardIteratorTypeshardIteratorType) {
    List<String> shardIteratorList = new ArrayList<>();

    List<Shard>shardList = getShards(streamName);

    shardList.forEach(shard -> {
        GetShardIteratorResultshardIteratorResult =
            getShardIteratorResult(streamName, shardIteratorType, shard);

        shardIteratorList.add(shardIteratorResult.getShardIterator());
    });

    return shardIteratorList;
}

private GetShardIteratorResultgetShardIteratorResult(
                                        String streamName,
                                        ShardIteratorTypeshardIteratorType,
                                        Shard shard) {

    // return amazonKinesisClient.getShardIterator(streamName,
    //                     shard.getShardId(), shardIteratorType.toString());
            GetShardIteratorRequestshardIteratorRequest =
                new GetShardIteratorRequest();

            shardIteratorRequest.setShardId(shard.getShardId());

            shardIteratorRequest.setShardIteratorType(shardIteratorType);

            shardIteratorRequest.setStreamName(streamName);

            return amazonKinesisClient.getShardIterator(shardIteratorRequest);
        }

        public List<Shard> getShards(String streamName) {
            DescribeStreamResultdescribeStreamResult =
                describeStream(streamName, null, null);

            return describeStreamResult.getStreamDescription().getShards();
        }
```



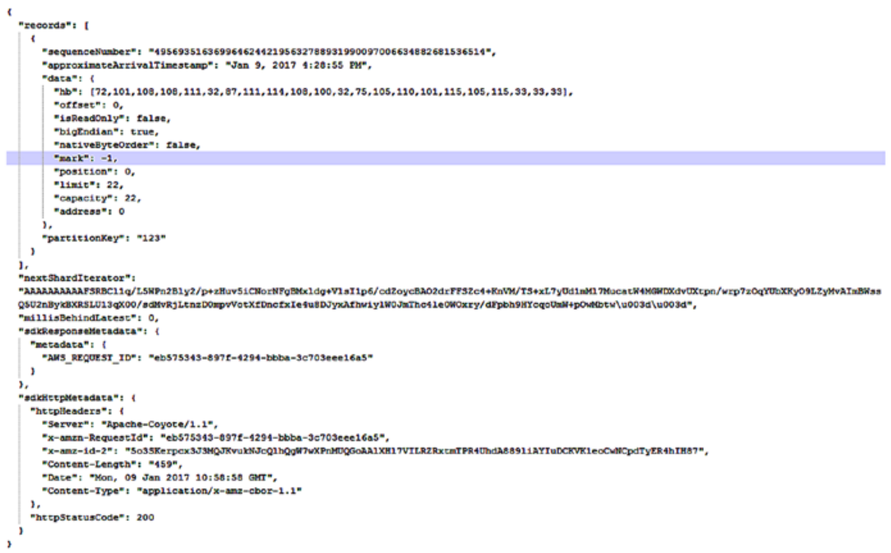
```
{
  "streamDescription": {
    "streamName": "Chapter4KinesisStream",
    "streamARN": "arn:aws:kinesis:us-west-2:[redacted]:stream/Chapter4KinesisStream",
    "streamStatus": "ACTIVE",
    "shards": [{
        "shardId": "shardId-000000000000",
        "hashKeyRange": {"startingHashKey": "0","endingHashKey": "68056473384187692692674921486353642290"},
        "sequenceNumberRange": {"startingSequenceNumber": "49569351636996462442195632733931909933639056321448771586"}
      },{
        "shardId": "shardId-000000000001",
        "hashKeyRange": {"startingHashKey": "68056473384187692692674921486353642291","endingHashKey": "136112946768375385385349842972707284581"},
        "sequenceNumberRange": {"startingSequenceNumber": "49569351637018763187394163357073445651911704682954752018"}
      },{
        "shardId": "shardId-000000000002",
        "hashKeyRange": {"startingHashKey": "136112946768375385385349842972707284582","endingHashKey": "204169420152563078078024764459060926872"},
        "sequenceNumberRange": {"startingSequenceNumber": "49569351637041063932592693980214981370184353044460732450"}
      },{
        "shardId": "shardId-000000000003",
        "hashKeyRange": {"startingHashKey": "204169420152563078078024764459060926873","endingHashKey": "272225893536750770770699685945414569163"},
        "sequenceNumberRange": {"startingSequenceNumber": "49569351637063364677791224603356517088457001405966712882"}
      },{
        "shardId": "shardId-000000000004",
        "hashKeyRange": {"startingHashKey": "272225893536750770770699685945414569164","endingHashKey": "340282366920938463463374607431768211455"},
        "sequenceNumberRange": {"startingSequenceNumber": "49569351637085665422989755226498052806729649767472693314"}
      }
    ],
    "hasMoreShards": false,
    "retentionPeriodHours": 24,
    "enhancedMonitoring": [{"shardLevelMetrics": []}]
  },
  "sdkResponseMetadata": {
    "metadata": {
      "AWS_REQUEST_ID": "fd3dc731-6853-364a-add0-a801dfc2627b"
    }
  },
  "sdkHttpMetadata": {
    "httpHeaders": {
      "Server": "Apache-Coyote/1.1",
      "x-amzn-RequestId": "fd3dc731-6853-364a-add0-a801dfc2627b",
      "x-amz-id-2": "eKJMTBYNM2gvbdqQn2GdvR7PMRmU5ugN42kJAEPVNi+fIRzekazdoNHWwwnS8H8WcrHt4erNBi631OuXbJYlsVPOLZuK0Qcq",
      "Content-Length": "1542",
      "Date": "Mon, 09 Jan 2017 10:58:56 GMT",
      "Content-Type": "application/x-amz-cbor-1.1"
    },
    "httpStatusCode": 200
  }
}
```

Once shard IDs have been collected, get the shard iterator for each shard ID.



```
{
  "shardIterator":
  "AAAAAAAAAAFaPwcyv5k3rzrFln3Irn2YrLuCZamtPllkBLeyKWz5GqJiGJlLvOf5Xmdg8KtQLWwAhDlkGf8v9YoYPWrUbrfyn/JX4/1XVDHUAb7R9BNVtmlpsst3fFip26TIKA+R+vlEVQTaB38KM
  85hOE+Rud7h2w/GU7EJyk6+vrz889BpEjhUSu3qNc8kWnSH1F72Op05aQpvHQyitLVUHlfOduIEu9R4QG68wDhdx7pAiUcNiQ\u003d\u003d",
  "sdkResponseMetadata": {
    "metadata": {
      "AWS_REQUEST_ID": "e34a2938-0d54-611d-b3a7-5744e5858156"
    }
  },
  "sdkHttpMetadata": {
    "httpHeaders": {
      "Server": "Apache-Coyote/1.1",
      "x-amzn-RequestId": "e34a2938-0d54-611d-b3a7-5744e5858156",
      "x-amz-id-2": "s+Ld3DaphDILziWyQtjMpUGUxpGp3E7seTw4H9Hnztd/L0e2FM49eS7HscVufFyfdSFoAqL7DmccCt6+JJVOiBQ1qnuTXv3H",
      "Content-Length": "266",
      "Date": "Mon, 09 Jan 2017 12:04:11 GMT",
      "Content-Type": "application/x-amz-cbor-1.1"
    },
    "httpStatusCode": 200
  }
}
```

Using the shard iterator, invoke the `getRecords` method. For subsequent get records request from the same shard, use the "`nextShardIterator`" parameter value received in response:



```
{
  "records": [
    {
      "sequenceNumber": "49569351636996462442195632788931990097006634882681536514",
      "approximateArrivalTimestamp": "Jan 9, 2017 4:28:55 PM",
      "data": {
        "hb": [72,101,108,108,111,32,87,111,114,108,100,32,75,105,110,101,115,105,115,33,33,33],
        "offset": 0,
        "isReadOnly": false,
        "bigEndian": true,
        "nativeByteOrder": false,
        "mark": -1,
        "position": 0,
        "limit": 22,
        "capacity": 22,
        "address": 0
      },
      "partitionKey": "123"
    }
  ],
  "nextShardIterator":
  "AAAAAAAAAAFSRBCl1q/L5NPn2Bly2/p+zHuv5iCNorNFgBMxldg+VlsI1p6/cdZoycBAO2drFFSZc4+KnVM/TS+xL7yUd1mMl7MucatW4MGWDXdvUXtpn/wrp7zOqYUbXKyO9LZyMvAImBWss
  Q5U2nBykBXRSLU13qX00/sdMvRjLtnzD0mpvVotXfDncfxIe4u8DJyxAfhwiy1W0JmThc4le0WOxry/dFpbh9HYcqoUmN+pOwMbtw\u003d\u003d",
  "millisBehindLatest": 0,
  "sdkResponseMetadata": {
    "metadata": {
      "AWS_REQUEST_ID": "eb575343-897f-4294-bbba-3c703eee16a5"
    }
  },
  "sdkHttpMetadata": {
    "httpHeaders": {
      "Server": "Apache-Coyote/1.1",
      "x-amzn-RequestId": "eb575343-897f-4294-bbba-3c703eee16a5",
      "x-amz-id-2": "5o35Kerpcx3J3MQJKvukNJcQ1hQgW7wXPnMUQGoAA1XH17VILRZRxtmTPR4UhdA8891iAYIuDCKVKleoCwNCpdTyER4hIH87",
      "Content-Length": "459",
      "Date": "Mon, 09 Jan 2017 10:58:58 GMT",
      "Content-Type": "application/x-amz-cbor-1.1"
    },
    "httpStatusCode": 200
  }
}
```

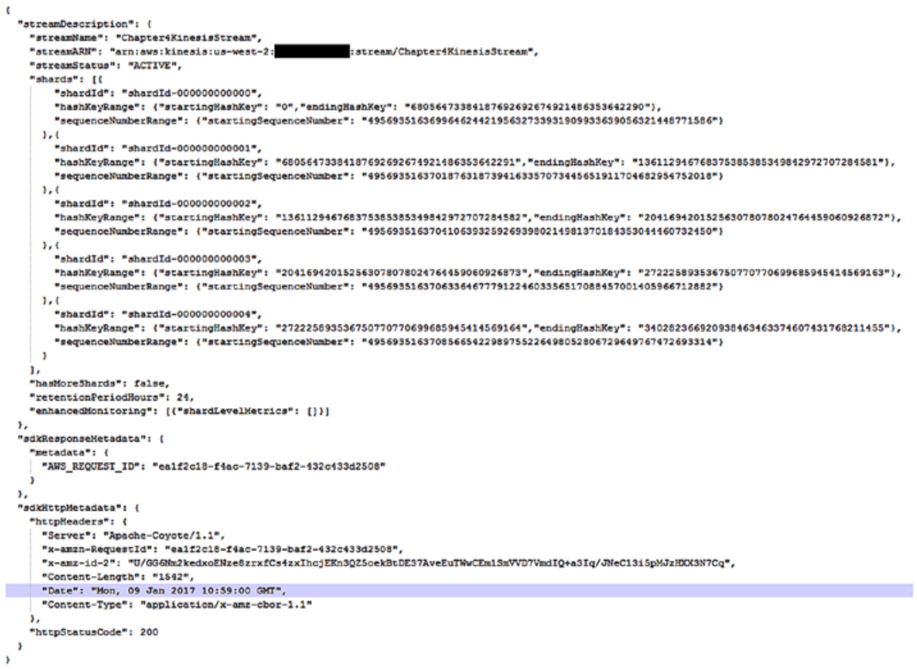
Merge Shards

When a Kinesis Stream's shard is not effectively being used and you can merge two adjacent shards into a single shard, invoke the `mergeShards` method:

```
List<Shard>shardList = getShards(STREAM_NAME);
mergeShards(
    STREAM_NAME,
    shardList.get(3).getShardId(),
    shardList.get(4).getShardId());
```

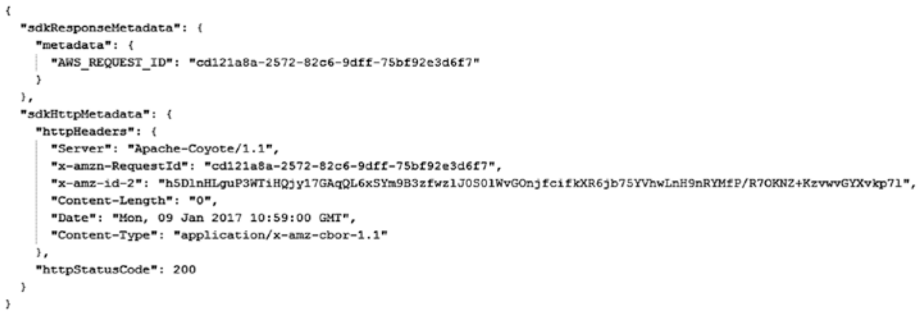
```
public void mergeShards(String streamName,
                                           String shardIdToMerger,
                                           String adjacentShardIdToMerge) {

    // MergeShardsResult response = amazonKinesisClient.mergeShards(
    //                                        streamName,
    //                                        shardIdToMerger,
    //                                        adjacentShardIdToMerge);

    MergeShardsRequest request = new MergeShardsRequest();

    request.setStreamName(streamName);

    request.setShardToMerge(shardIdToMerger);

    request.setAdjacentShardToMerge(adjacentShardIdToMerge);

    MergeShardsResult response = amazonKinesisClient.mergeShards(request);
}
```

Here we are merging "shardId-000000000003" and "shardId-000000000004" into a single shard. To merge the shards first, you need the shard ID that can be obtained using describe stream:



```
{
  "streamDescription": {
    "streamName": "Chapter4KinesisStream",
    "streamARN": "arn:aws:kinesis:us-west-2:[redacted]:stream/Chapter4KinesisStream",
    "streamStatus": "ACTIVE",
    "shards": [{
      "shardId": "shardId-000000000000",
      "hashKeyRange": {"startingHashKey": "0","endingHashKey": "68056473384187692692674921486353642290"},
      "sequenceNumberRange": {"startingSequenceNumber": "49569351636996462442195632733931909933639056321448771586"}
    },{
      "shardId": "shardId-000000000001",
      "hashKeyRange": {"startingHashKey": "68056473384187692692674921486353642291","endingHashKey": "136112946768375385385349842972707284581"},
      "sequenceNumberRange": {"startingSequenceNumber": "49569351637018763187394163357073445651911704682954752018"}
    },{
      "shardId": "shardId-000000000002",
      "hashKeyRange": {"startingHashKey": "136112946768375385385349842972707284582","endingHashKey": "204169420152563078078024764459060926872"},
      "sequenceNumberRange": {"startingSequenceNumber": "49569351637041063932592693980214981370184353044460732450"}
    },{
      "shardId": "shardId-000000000003",
      "hashKeyRange": {"startingHashKey": "204169420152563078078024764459060926873","endingHashKey": "272225893536750770770699685945414569163"},
      "sequenceNumberRange": {"startingSequenceNumber": "49569351637063364677791224603356517088457001405966712882"}
    },{
      "shardId": "shardId-000000000004",
      "hashKeyRange": {"startingHashKey": "272225893536750770770699685945414569164","endingHashKey": "340282366920938463463374607431768211455"},
      "sequenceNumberRange": {"startingSequenceNumber": "49569351637085665422989755226498052806729649767472693314"}
    }
  ],
  "hasMoreShards": false,
  "retentionPeriodHours": 24,
  "enhancedMonitoring": [{"shardLevelMetrics": []}]
},
"sdkResponseMetadata": {
  "metadata": {
    "AWS_REQUEST_ID": "ea1f2c18-f4ac-7139-baf2-432c433d2508"
  }
},
"sdkHttpMetadata": {
  "httpHeaders": {
    "Server": "Apache-Coyote/1.1",
    "x-amzn-RequestId": "ea1f2c18-f4ac-7139-baf2-432c433d2508",
    "x-amz-id-2": "U/GG6Nm2kedxoENze8zrxfCs4zxIhcjEKn3QZ5oekBtDE37AveEuTWwCEm1SmVVD7VmdIQ+a3Iq/JNeC13i5pMJzHXX3N7Cq",
    "Content-Length": "1542",
    "Date": "Mon, 09 Jan 2017 10:59:00 GMT",
    "Content-Type": "application/x-amz-cbor-1.1"
  },
  "httpStatusCode": 200
 }
}
```

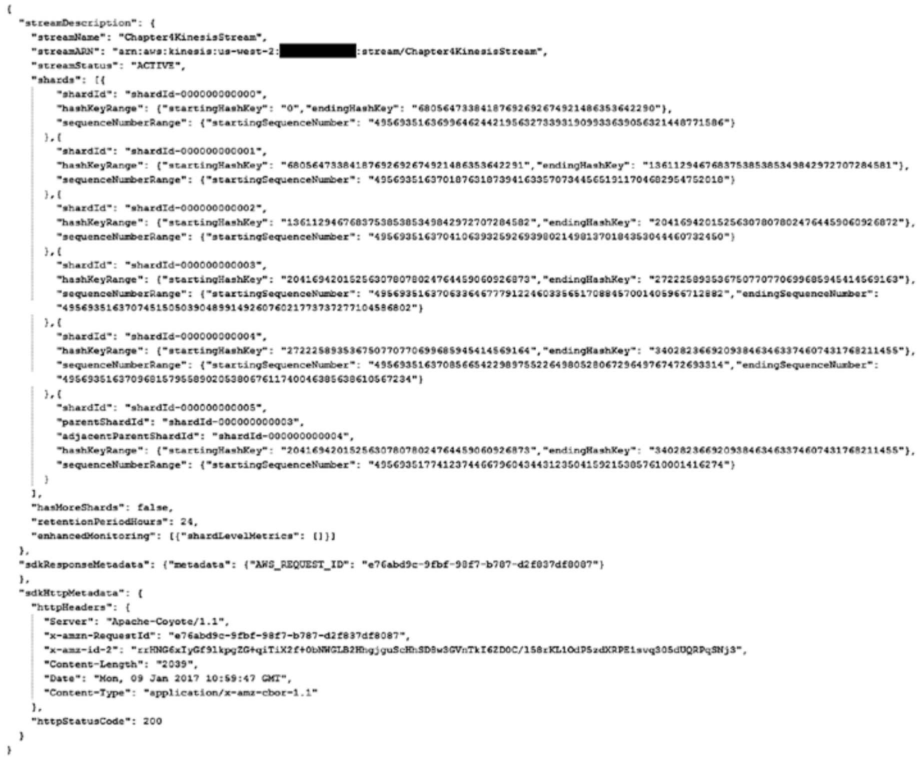
Once shard IDs are obtained, invoke the `mergeShards` operation by setting the shard to merge and the adjacent shard to merge:



```
{
  "sdkResponseMetadata": {
    "metadata": {
      "AWS_REQUEST_ID": "cd121a8a-2572-82c6-9dff-75bf92e3d6f7"
    }
  },
  "sdkHttpMetadata": {
    "httpHeaders": {
      "Server": "Apache-Coyote/1.1",
      "x-amzn-RequestId": "cd121a8a-2572-82c6-9dff-75bf92e3d6f7",
      "x-amz-id-2": "h5DlnHLguP3WTiHQjy17GAqQL6xSYm9B3zfwzlJ0S0lWvGOnjfcifkXR6jb75YVhwLnH9nRYMfP/R7OKNZ+KzvwvGYXvkp71",
      "Content-Length": "0",
      "Date": "Mon, 09 Jan 2017 10:59:00 GMT",
      "Content-Type": "application/x-amz-cbor-1.1"
    },
    "httpStatusCode": 200
  }
}
```

To verify that the `mergeShards` operation is being carried out, invoke describe stream:

```
describeStream(STREAM_NAME, null, null);
```



```
{
  "streamDescription": {
    "streamName": "Chapter4KinesisStream",
    "streamARN": "arn:aws:kinesis:us-west-2:[redacted]:stream/Chapter4KinesisStream",
    "streamStatus": "ACTIVE",
    "shards": [{
        "shardId": "shardId-000000000000",
        "hashKeyRange": {"startingHashKey": "0","endingHashKey": "68056473384187692692674921486353642290"},
        "sequenceNumberRange": {"startingSequenceNumber": "49569351636996462442195632733931909933639056321448771586"}
      },{
        "shardId": "shardId-000000000001",
        "hashKeyRange": {"startingHashKey": "68056473384187692692674921486353642291","endingHashKey": "136112946768375385385349842972707284581"},
        "sequenceNumberRange": {"startingSequenceNumber": "49569351637018763187394163357073445651911704682954752018"}
      },{
        "shardId": "shardId-000000000002",
        "hashKeyRange": {"startingHashKey": "136112946768375385385349842972707284582","endingHashKey": "204169420152563078078024764459060926872"},
        "sequenceNumberRange": {"startingSequenceNumber": "49569351637041063932592693980214981370184353044460732450"}
      },{
        "shardId": "shardId-000000000003",
        "hashKeyRange": {"startingHashKey": "204169420152563078078024764459060926873","endingHashKey": "272225893536750770770699685945414569163"},
        "sequenceNumberRange": {"startingSequenceNumber": "49569351637063364677791224603356517088457001405966712882","endingSequenceNumber":
        "49569351637074515050390489914926076021773737277104586802"}
      },{
        "shardId": "shardId-000000000004",
        "hashKeyRange": {"startingHashKey": "272225893536750770770699685945414569164","endingHashKey": "340282366920938463463374607431768211455"},
        "sequenceNumberRange": {"startingSequenceNumber": "49569351637085665422989755226498052806729649767472693314","endingSequenceNumber":
        "49569351637096815795589020538067611740046385638610567234"}
      },{
        "shardId": "shardId-000000000005",
        "parentShardId": "shardId-000000000003",
        "adjacentParentShardId": "shardId-000000000004",
        "hashKeyRange": {"startingHashKey": "204169420152563078078024764459060926873","endingHashKey": "340282366920938463463374607431768211455"},
        "sequenceNumberRange": {"startingSequenceNumber": "49569351774123744667960434431235041592153857610001416274"}
      }
    ],
    "hasMoreShards": false,
    "retentionPeriodHours": 24,
    "enhancedMonitoring": [{"shardLevelMetrics": []}]
  },
  "sdkResponseMetadata": {"metadata": {"AWS_REQUEST_ID": "e76abd9c-9fbf-98f7-b787-d2f837df8087"}
  },
  "sdkHttpMetadata": {
    "httpHeaders": {
      "Server": "Apache-Coyote/1.1",
      "x-amzn-RequestId": "e76abd9c-9fbf-98f7-b787-d2f837df8087",
      "x-amz-id-2": "rrHNG6xIyGf9lkpgZG+qiTiX2f+0bNWGLB2HhgjguScHhSD8w3GVnTkI62D0C/158rKL1OdP5zdXRPE1svq305dUQRPqSNj3",
      "Content-Length": "2039",
      "Date": "Mon, 09 Jan 2017 10:59:47 GMT",
      "Content-Type": "application/x-amz-cbor-1.1"
    },
    "httpStatusCode": 200
  }
}
```

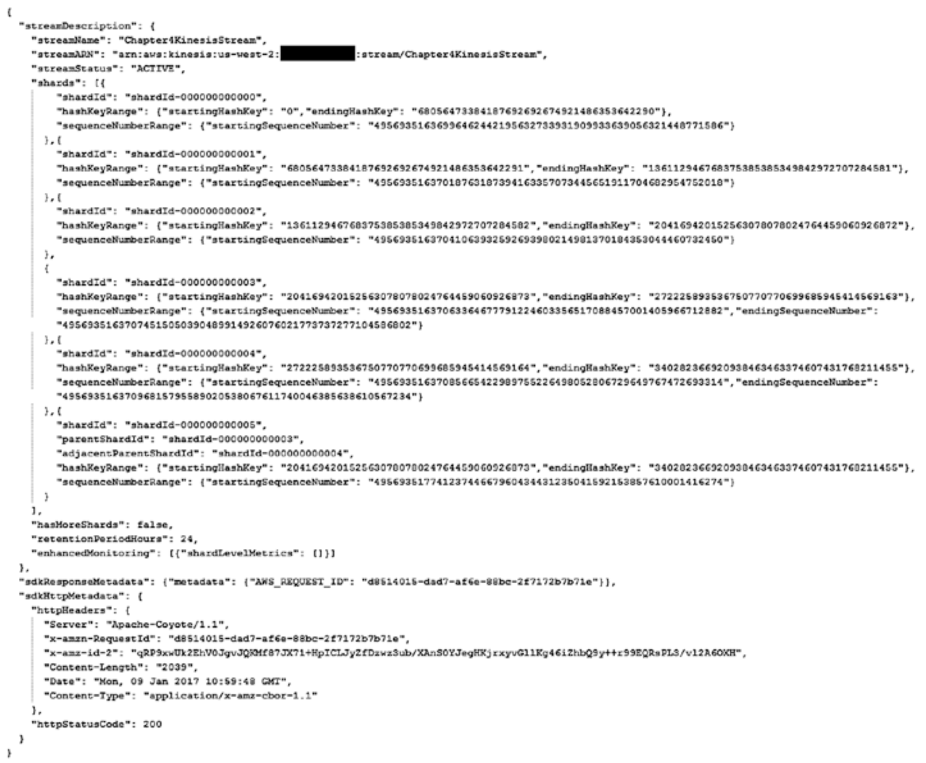
In response to describe stream, you can see that the new shard ID `"shardId-000000000005"` has been created.

Split Shard

A split shard will split a single shard into two shards. The decision to split a shard should be made when there is heavy traffic on a single shard and it can be divided into different shards. This will make it faster for consumer applications to read data records:

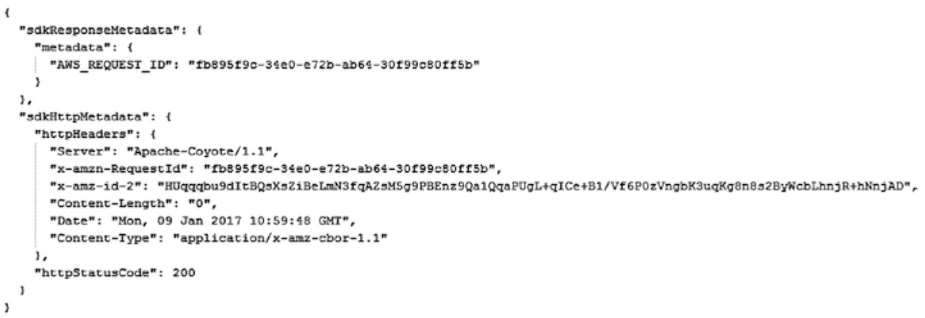
```
List<Shard>shardList = getShards(STREAM_NAME);

splitShard(STREAM_NAME, shardList.get(0));

public void splitShard(String streamName, Shard shard) {
    SplitShardRequest request = new SplitShardRequest();

    request.setStreamName(streamName);

    request.setShardToSplit(shard.getShardId());

    String startHashKey = shard.getHashKeyRange().getStartingHashKey();

    String endHashKey = shard.getHashKeyRange().getEndingHashKey();

    BigIntegertempHashKey =
        new BigInteger(startHashKey).add(new BigInteger(endHashKey));

    String childHashKey =
        tempHashKey.divide(new BigInteger("2")).toString();

    request.setNewStartingHashKey(childHashKey);

    SplitShardResult response = amazonKinesisClient.splitShard(request);
}
```

Here we have calculated the average of the starting and ending hash keys of the shard to be split to get the child's new starting hash key. You can have any algorithm to choose a child's new starting hash key. To invoke `splitShard`, first you need the shard `ID` to be split, which can be obtained by using describe stream and choosing the shard `ID`.



```
{
  "streamDescription": {
    "streamName": "Chapter4KinesisStream",
    "streamARN": "arn:aws:kinesis:us-west-2:[redacted]:stream/Chapter4KinesisStream",
    "streamStatus": "ACTIVE",
    "shards": [{
        "shardId": "shardId-000000000000",
        "hashKeyRange": {"startingHashKey": "0","endingHashKey": "68056473384187692692674921486353642290"},
        "sequenceNumberRange": {"startingSequenceNumber": "49569351636996462442195632733931909933639056321448771586"}
      },{
        "shardId": "shardId-000000000001",
        "hashKeyRange": {"startingHashKey": "68056473384187692692674921486353642291","endingHashKey": "136112946768375385385349842972707284581"},
        "sequenceNumberRange": {"startingSequenceNumber": "49569351637018763187394163357073445651911704682954752018"}
      },{
        "shardId": "shardId-000000000002",
        "hashKeyRange": {"startingHashKey": "136112946768375385385349842972707284582","endingHashKey": "204169420152563078078024764459060926872"},
        "sequenceNumberRange": {"startingSequenceNumber": "49569351637041063932592693980214981370184353044460732450"}
      },
      {
        "shardId": "shardId-000000000003",
        "hashKeyRange": {"startingHashKey": "204169420152563078078024764459060926873","endingHashKey": "272225893536750770770699685945414569163"},
        "sequenceNumberRange": {"startingSequenceNumber": "49569351637063364677791224603356517088457001405966712882","endingSequenceNumber":
        "49569351637074515050390489914926076021773737277104586802"}
      },{
        "shardId": "shardId-000000000004",
        "hashKeyRange": {"startingHashKey": "272225893536750770770699685945414569164","endingHashKey": "340282366920938463463374607431768211455"},
        "sequenceNumberRange": {"startingSequenceNumber": "49569351637085665422989755226498052806729649767472693314","endingSequenceNumber":
        "49569351637096815795589020538067611740046385638610567234"}
      },{
        "shardId": "shardId-000000000005",
        "parentShardId": "shardId-000000000003",
        "adjacentParentShardId": "shardId-000000000004",
        "hashKeyRange": {"startingHashKey": "204169420152563078078024764459060926873","endingHashKey": "340282366920938463463374607431768211455"},
        "sequenceNumberRange": {"startingSequenceNumber": "49569351774123744667960434431235041592153857610001416274"}
      }
    ],
    "hasMoreShards": false,
    "retentionPeriodHours": 24,
    "enhancedMonitoring": [{"shardLevelMetrics": []}]
  },
  "sdkResponseMetadata": {"metadata": {"AWS_REQUEST_ID": "d8514015-dad7-af6e-88bc-2f7172b7b71e"}},
  "sdkHttpMetadata": {
    "httpHeaders": {
      "Server": "Apache-Coyote/1.1",
      "x-amzn-RequestId": "d8514015-dad7-af6e-88bc-2f7172b7b71e",
      "x-amz-id-2": "qRP9xwUk2EhV0JgvJQKMf87JX71+HpICLJyZfDzwz3ub/XAnS0YJegHKjrxyvG11Kg46iZhbQ9y++r99EQRsPL3/v12A6OXH",
      "Content-Length": "2039",
      "Date": "Mon, 09 Jan 2017 10:59:48 GMT",
      "Content-Type": "application/x-amz-cbor-1.1"
    },
    "httpStatusCode": 200
  }
}
```

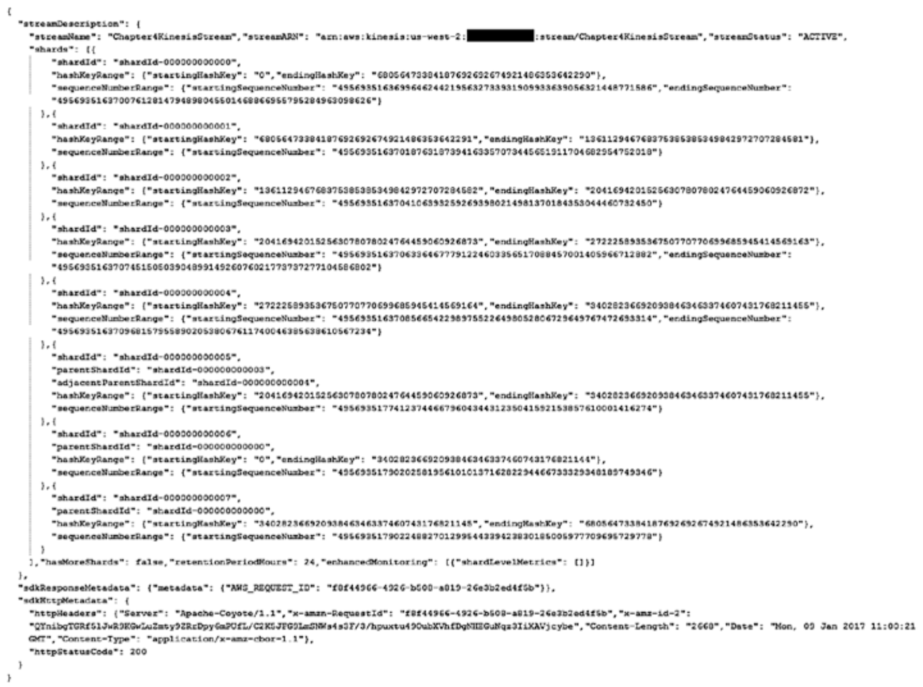
Once the shard ID is obtained, invoke the `splitShard` method:



```
{
  "sdkResponseMetadata": {
    "metadata": {
      "AWS_REQUEST_ID": "fb895f9c-34e0-e72b-ab64-30f99c80ff5b"
    }
  },
  "sdkHttpMetadata": {
    "httpHeaders": {
      "Server": "Apache-Coyote/1.1",
      "x-amzn-RequestId": "fb895f9c-34e0-e72b-ab64-30f99c80ff5b",
      "x-amz-id-2": "HUqqqbu9dItBQsXsZiBeLmN3fqAZsM5g9PBEnz9Qa1QqaPUgL+qICe+B1/Vf6P0zVngbK3uqKg8n8s2ByWcbLhnjR+hNnjAD",
      "Content-Length": "0",
      "Date": "Mon, 09 Jan 2017 10:59:48 GMT",
      "Content-Type": "application/x-amz-cbor-1.1"
    },
    "httpStatusCode": 200
  }
}
```

To verify that the shard is being split, invoke describe stream:

```
describeStream(STREAM_NAME, null, null);
```

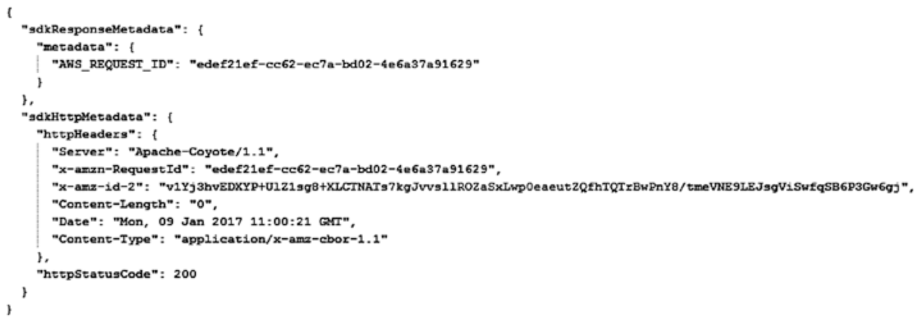


```
{
  "streamDescription": {
    "streamName": "Chapter4KinesisStream","streamARN": "arn:aws:kinesis:us-west-2:[redacted]:stream/Chapter4KinesisStream","streamStatus": "ACTIVE",
    "shards": [{
        "shardId": "shardId-000000000000",
        "hashKeyRange": {"startingHashKey": "0","endingHashKey": "68056473384187692692674921486353642290"},
        "sequenceNumberRange": {"startingSequenceNumber": "49569351636996462442195632733931909933639056321448771586","endingSequenceNumber":
        "49569351637007612814794898045501468866955795284963098626"}
      },{
        "shardId": "shardId-000000000001",
        "hashKeyRange": {"startingHashKey": "68056473384187692692674921486353642291","endingHashKey": "136112946768375385385349842972707284581"},
        "sequenceNumberRange": {"startingSequenceNumber": "49569351637018763187394163357073445651911704682954752018"}
      },{
        "shardId": "shardId-000000000002",
        "hashKeyRange": {"startingHashKey": "136112946768375385385349842972707284582","endingHashKey": "204169420152563078078024764459060926872"},
        "sequenceNumberRange": {"startingSequenceNumber": "49569351637041063932592693980214981370184353044460732450"}
      },{
        "shardId": "shardId-000000000003",
        "hashKeyRange": {"startingHashKey": "204169420152563078078024764459060926873","endingHashKey": "272225893536750770770699685945414569163"},
        "sequenceNumberRange": {"startingSequenceNumber": "49569351637063364677791224603356517088457001405966712882","endingSequenceNumber":
        "49569351637074515050390489914926076021773737277104586802"}
      },{
        "shardId": "shardId-000000000004",
        "hashKeyRange": {"startingHashKey": "272225893536750770770699685945414569164","endingHashKey": "340282366920938463463374607431768211455"},
        "sequenceNumberRange": {"startingSequenceNumber": "49569351637085665422989755226498052806729649767472693314","endingSequenceNumber":
        "49569351637096815795589020538067611740046385638610567234"}
      },{
        "shardId": "shardId-000000000005",
        "parentShardId": "shardId-000000000003",
        "adjacentParentShardId": "shardId-000000000004",
        "hashKeyRange": {"startingHashKey": "204169420152563078078024764459060926873","endingHashKey": "340282366920938463463374607431768211455"},
        "sequenceNumberRange": {"startingSequenceNumber": "49569351774123744667960434431235041592153857610001416274"}
      },{
        "shardId": "shardId-000000000006",
        "parentShardId": "shardId-000000000000",
        "hashKeyRange": {"startingHashKey": "0","endingHashKey": "34028236692093846346337460743176821144"},
        "sequenceNumberRange": {"startingSequenceNumber": "49569351790202581956101013716282294466733329348185749346"}
      },{
        "shardId": "shardId-000000000007",
        "parentShardId": "shardId-000000000000",
        "hashKeyRange": {"startingHashKey": "34028236692093846346337460743176821145","endingHashKey": "68056473384187692692674921486353642290"},
        "sequenceNumberRange": {"startingSequenceNumber": "49569351790224882701299544339423830185005977709695729778"}
      }
    ],"hasMoreShards": false,"retentionPeriodHours": 24,"enhancedMonitoring": [{"shardLevelMetrics": []}]
  },
  "sdkResponseMetadata": {"metadata": {"AWS_REQUEST_ID": "f0f44966-4926-b500-a019-26e3b2ed4f5b"}},
  "sdkHttpMetadata": {
    "httpHeaders": {"Server": "Apache-Coyote/1.1","x-amzn-RequestId": "f8f44966-4926-b508-a819-26e3b2ed4f5b","x-amz-id-2":
    "QYnibgTGRf51JwR9KGwLuZmty9ZRcDpyGmPUfL/C2K5JFG9LmSNWs4s3F/3/hpuxtu49OubXVhfDgNHEGuNqz3IiXAVjcybe","Content-Length": "2660","Date": "Mon, 09 Jan 2017 11:00:21
    GMT","Content-Type": "application/x-amz-cbor-1.1"},
    "httpStatusCode": 200
  }
}
```

Add Tags to Stream

This process adds or updates tags to the Kinesis Stream. You can add up to 10 tags for each stream. To add or update tags, invoke the addTagsToStream method:

```java
Map<String, String> tags = new HashMap<>();

tags.put("Environment", "Production");

tags.put("Chapter", "4");

addTagsToStream(STREAM_NAME, tags);

public void addTagsToStream(String streamName, Map<String, String> tags) {
    AddTagsToStreamRequest request = new AddTagsToStreamRequest();

    request.setStreamName(streamName);

    request.setTags(tags);

    AddTagsToStreamResult response =
        amazonKinesisClient.addTagsToStream(request);
}
```

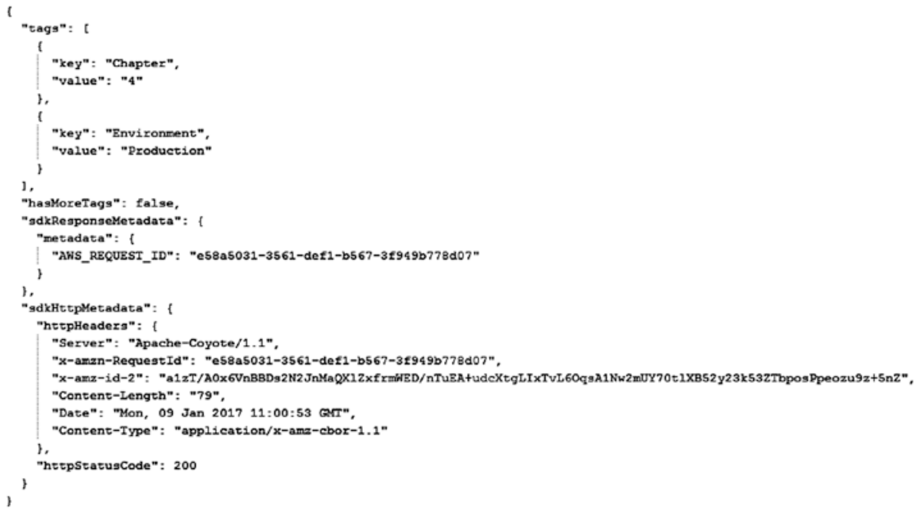


```
{
  "sdkResponseMetadata": {
    "metadata": {
      "AWS_REQUEST_ID": "edef21ef-cc62-ec7a-bd02-4e6a37a91629"
    }
  },
  "sdkHttpMetadata": {
    "httpHeaders": {
      "Server": "Apache-Coyote/1.1",
      "x-amzn-RequestId": "edef21ef-cc62-ec7a-bd02-4e6a37a91629",
      "x-amz-id-2": "v1Yj3hvEDXYP+U1Z1sg8+XLCTNATs7kgJvvs11ROZaSxLwp0eaeutZQfhTQTrBwPnY8/tmeVNE9LEJsgViSwfqSB6P3Gw6gj",
      "Content-Length": "0",
      "Date": "Mon, 09 Jan 2017 11:00:21 GMT",
      "Content-Type": "application/x-amz-cbor-1.1"
    },
    "httpStatusCode": 200
  }
}
```

List Tags for Stream

To get the list of tags attached to a stream, invoke the `listTagsForStream` method:

```
listTagsForStream(STREAM_NAME);

public void listTagsForStream(String streamName) {
    ListTagsForStreamRequest request = new ListTagsForStreamRequest();

    request.setStreamName(streamName);

    ListTagsForStreamResult response =
        amazonKinesisClient.listTagsForStream(request);
}
```

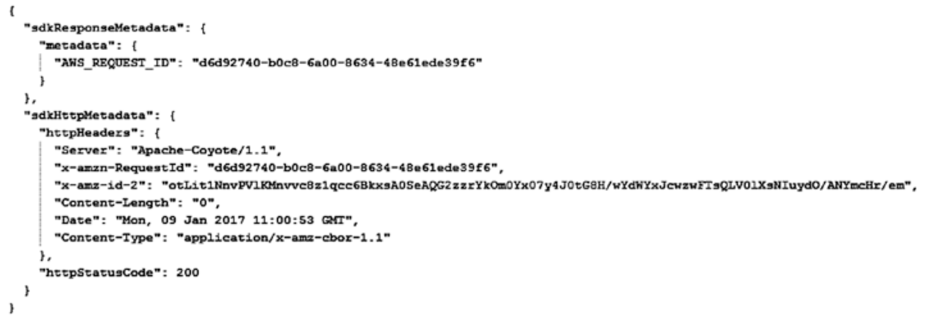


```
{
  "tags": [
    {
      "key": "Chapter",
      "value": "4"
    },
    {
      "key": "Environment",
      "value": "Production"
    }
  ],
  "hasMoreTags": false,
  "sdkResponseMetadata": {
    "metadata": {
      "AWS_REQUEST_ID": "e58a5031-3561-def1-b567-3f949b778d07"
    }
  },
  "sdkHttpMetadata": {
    "httpHeaders": {
      "Server": "Apache-Coyote/1.1",
      "x-amzn-RequestId": "e58a5031-3561-def1-b567-3f949b778d07",
      "x-amz-id-2": "a1zT/A0x6VnBBDs2N2JnMaQX1ZxfrmWED/nTuEA+udcXtgLIxTvL6OqsA1Nw2mUY70tlXB52y23k53ZTbposPpeozu9z+5nZ",
      "Content-Length": "79",
      "Date": "Mon, 09 Jan 2017 11:00:53 GMT",
      "Content-Type": "application/x-amz-cbor-1.1"
    },
    "httpStatusCode": 200
  }
}
```

Remove Tags from Stream

To remove tags from a stream, invoke the `removeTagsFromStream` method:

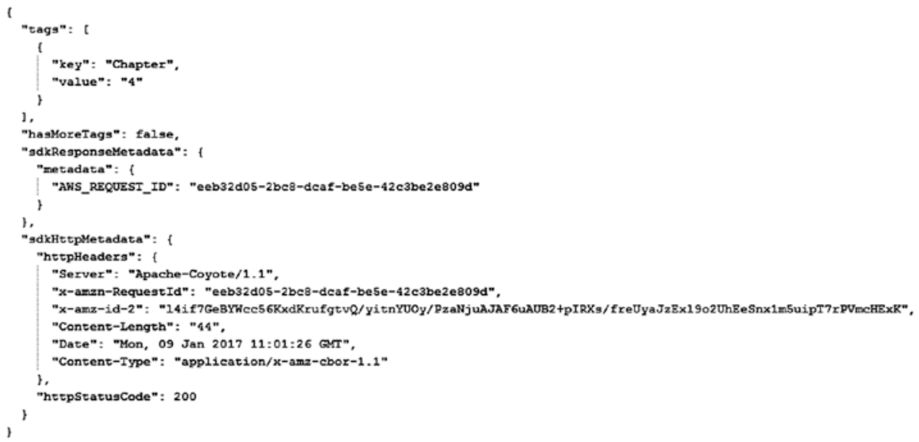
```
List<String>tagKeys = new ArrayList<>();

tagKeys.add("Environment");

removeTagsFromStream(STREAM_NAME, tagKeys);

public void removeTagsFromStream(String streamName, List<String>tagKeys) {
    RemoveTagsFromStreamRequest request = new RemoveTagsFromStreamRequest();

    request.setStreamName(streamName);

    request.setTagKeys(tagKeys);

    RemoveTagsFromStreamResult response =
        amazonKinesisClient.removeTagsFromStream(request);
}
```



```
{
  "sdkResponseMetadata": {
    "metadata": {
      "AWS_REQUEST_ID": "d6d92740-b0c8-6a00-8634-48e61ede39f6"
    }
  },
  "sdkHttpMetadata": {
    "httpHeaders": {
      "Server": "Apache-Coyote/1.1",
      "x-amzn-RequestId": "d6d92740-b0c8-6a00-8634-48e61ede39f6",
      "x-amz-id-2": "otLit1NnvPVlKMnvvc8z1qcc6BkxsA0SeAQG2zzrYkOm0Yx07y4J0tG8H/wYdWYxJcwzwFTsQLV01XsNIuydO/ANYmcHr/em",
      "Content-Length": "0",
      "Date": "Mon, 09 Jan 2017 11:00:53 GMT",
      "Content-Type": "application/x-amz-cbor-1.1"
    },
    "httpStatusCode": 200
  }
}
```

To verify that the tag is being removed, invoke the list stream operation:

```
listTagsForStream(STREAM_NAME);
```

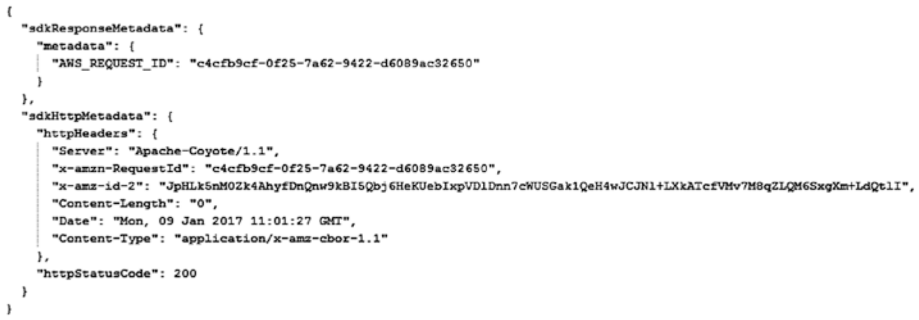


```
{
  "tags": [
    {
      "key": "Chapter",
      "value": "4"
    }
  ],
  "hasMoreTags": false,
  "sdkResponseMetadata": {
    "metadata": {
      "AWS_REQUEST_ID": "eeb32d05-2bc8-dcaf-be5e-42c3be2e809d"
    }
  },
  "sdkHttpMetadata": {
    "httpHeaders": {
      "Server": "Apache-Coyote/1.1",
      "x-amzn-RequestId": "eeb32d05-2bc8-dcaf-be5e-42c3be2e809d",
      "x-amz-id-2": "14if7GeBYWcc56KxdKrufgtvQ/yitnYUOy/PzaNjuAJAF6uAUB2+pIRXs/freUyaJzEx19o2UhEeSnx1m5uipT7rPVmcHExK",
      "Content-Length": "44",
      "Date": "Mon, 09 Jan 2017 11:01:26 GMT",
      "Content-Type": "application/x-amz-cbor-1.1"
    },
    "httpStatusCode": 200
  }
}
```

Delete Stream

To delete a stream permanently, invoke the `deleteStream` method:

```
deleteStream(STREAM_NAME);

public void deleteStream(String streamName) {
    // DeleteStreamResult response =
    // amazonKinesisClient.deleteStream(streamName);

    DeleteStreamRequest request = new DeleteStreamRequest();

    request.setStreamName(streamName);

    DeleteStreamResult response =
       amazonKinesisClient.deleteStream(request);
}
```



```
{
  "sdkResponseMetadata": {
    "metadata": {
      "AWS_REQUEST_ID": "c4cfb9cf-0f25-7a62-9422-d6089ac32650"
    }
  },
  "sdkHttpMetadata": {
    "httpHeaders": {
      "Server": "Apache-Coyote/1.1",
      "x-amzn-RequestId": "c4cfb9cf-0f25-7a62-9422-d6089ac32650",
      "x-amz-id-2": "JpHLk5nM0Zk4AhyfDnQnw9kBI5Qbj6HeKUebIxpVDlDnn7cWUSGak1QeH4wJCJN1+LXkATcfVMv7M8qZLQM6SxgXm+LdQtlI",
      "Content-Length": "0",
      "Date": "Mon, 09 Jan 2017 11:01:27 GMT",
      "Content-Type": "application/x-amz-cbor-1.1"
    },
    "httpStatusCode": 200
  }
}
```

To verify that the stream has been deleted, invoke list stream operation:

```
listStreams(null, null);
```

```
{
  "streamNames": [
    "Chapter4KinesisStream1",
    "Chapter4KinesisStream2",
    "Chapter4KinesisStream3",
    "Chapter4KinesisStream4",
    "Chapter4KinesisStream5"
  ],
  "hasMoreStreams": false,
  "sdkResponseMetadata": {
    "metadata": {
      "AWS_REQUEST_ID": "edca6b15-4ab7-b9b3-bd27-1bb4ad459947"
    }
  },
  "sdkHttpMetadata": {
    "httpHeaders": {
      "Server": "Apache-Coyote/1.1",
      "x-amzn-RequestId": "edca6b15-4ab7-b9b3-bd27-1bb4ad459947",
      "x-amz-id-2": "rVKIEH1w+WElLwGhnfB1ph7DfXRmDSV49JnAQN724o/OXb1Xw+5KTw/nNKRiI2IpFY1UWXV54CJDABHZjPnRfwca39x/HSKR",
      "Content-Length": "147",
      "Date": "Mon, 09 Jan 2017 11:05:05 GMT",
      "Content-Type": "application/x-amz-cbor-1.1"
    },
    "httpStatusCode": 200
  }
}
```

Monitor Using CloudWatch

CloudWatch allows monitoring the Kinesis having different metrics. It will trigger an alarm when a threshold is exceeded on specific metrics. The following steps will guide you to create an alarm:

1. Go to the CloudWatch Management Console and click Alarms from left navigation, as shown in Figure 4-20.

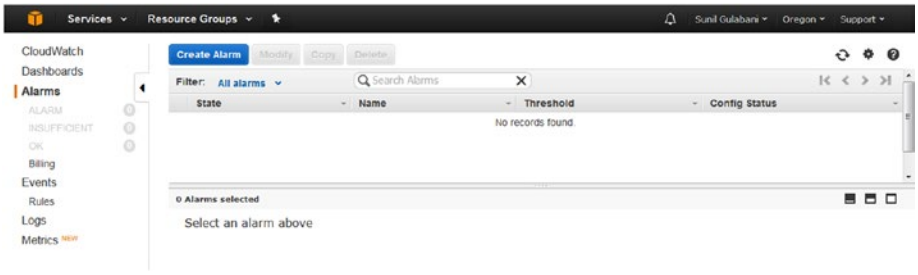


Figure 4-20. *CloudWatch alarm*

2. Click Create Alarm.

3. The Create Alarm screen will be displayed, which has two steps, as shown in Figure 4-21:

   - Select Metric
   - Define Alarm

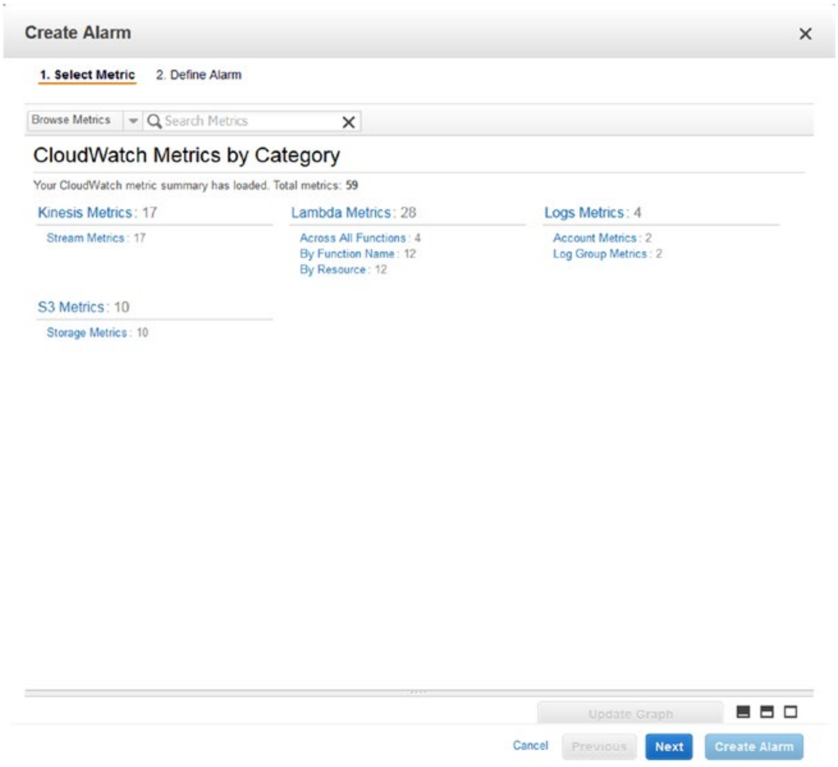


Figure 4-21. *Create Alarm screen*

4. First of all, select the metric for Kinesis. Click Browse Metrics and select Kinesis, as shown in Figure 4-22.

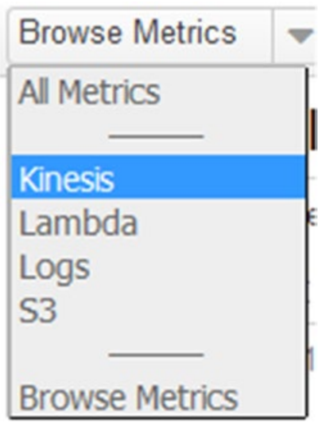
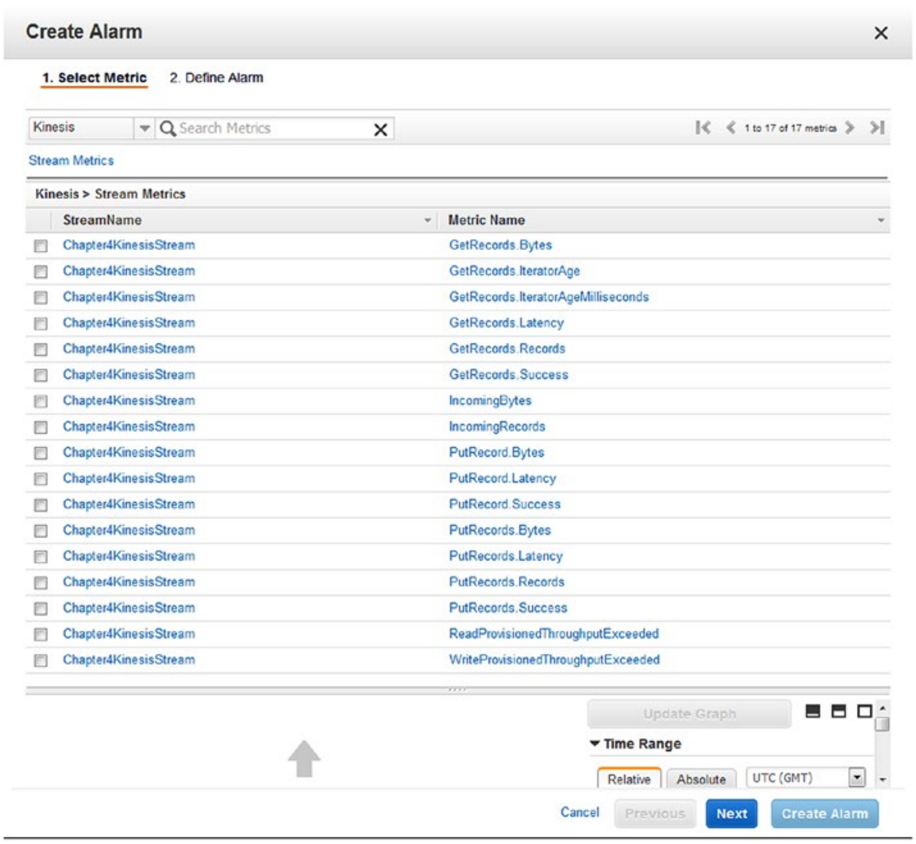


Figure 4-22. *Browse Metrics screen*

5. You can see all the metrics that can be configured on Kinesis in Figure 4-23.

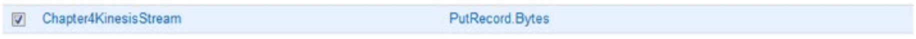


Kinesis > Stream Metrics

StreamName	Metric Name
Chapter4KinesisStream	GetRecords.Bytes
Chapter4KinesisStream	GetRecords.IteratorAge
Chapter4KinesisStream	GetRecords.IteratorAgeMilliseconds
Chapter4KinesisStream	GetRecords.Latency
Chapter4KinesisStream	GetRecords.Records
Chapter4KinesisStream	GetRecords.Success
Chapter4KinesisStream	IncomingBytes
Chapter4KinesisStream	IncomingRecords
Chapter4KinesisStream	PutRecord.Bytes
Chapter4KinesisStream	PutRecord.Latency
Chapter4KinesisStream	PutRecord.Success
Chapter4KinesisStream	PutRecords.Bytes
Chapter4KinesisStream	PutRecords.Latency
Chapter4KinesisStream	PutRecords.Records
Chapter4KinesisStream	PutRecords.Success
Chapter4KinesisStream	ReadProvisionedThroughputExceeded
Chapter4KinesisStream	WriteProvisionedThroughputExceeded

Figure 4-23. *Kinesis metric listing*

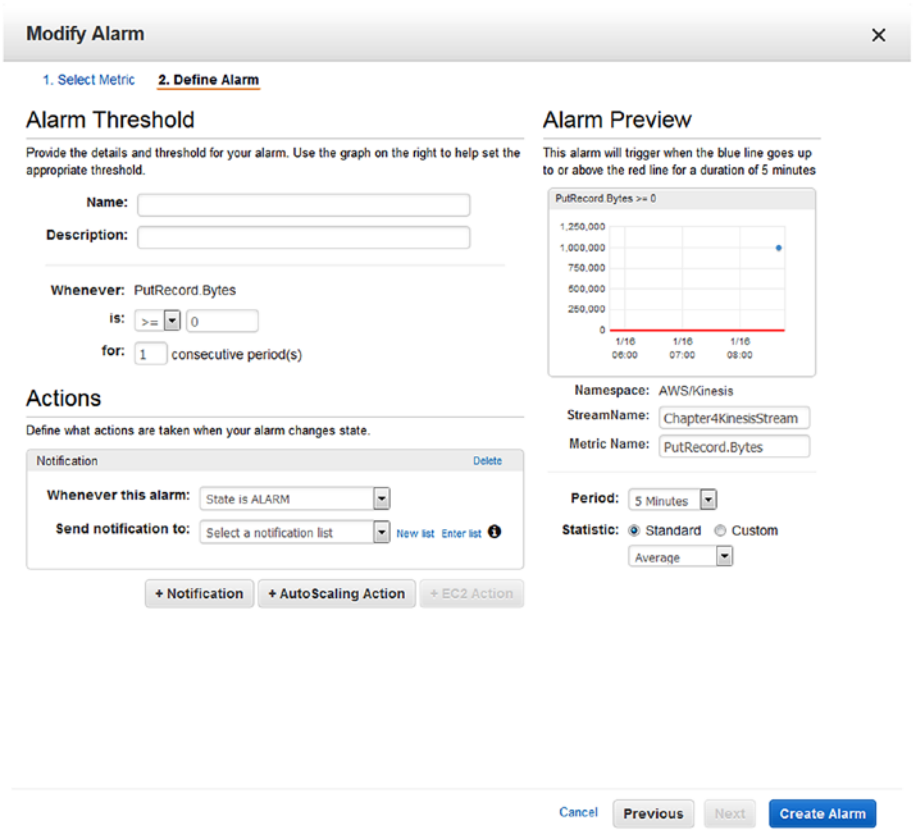
6. For our case, select the PutRecord.Bytes metric. Click the Next button. (See Figure 4-24.)



✓ Chapter4KinesisStream	PutRecord.Bytes

Figure 4-24. *Kinesis metric selected*

7. Define the alarm settings by providing the name, a description, and threshold values on the alarm to be generated. Use the sum of data records that should be greater than or equal to operation during a one-minute interval. (See Figure 4-25.)



Modify Alarm

1. Select Metric 2. Define Alarm

Alarm Threshold

Provide the details and threshold for your alarm. Use the graph on the right to help set the appropriate threshold.

Name:

Description:

Whenever: PutRecord.Bytes

is: >= 0

for: 1 consecutive period(s)

Actions

Define what actions are taken when your alarm changes state.

Notification Delete

Whenever this alarm: State is ALARM

Send notification to: Select a notification list New list Enter list

+ Notification + AutoScaling Action + EC2 Action

Alarm Preview

This alarm will trigger when the blue line goes up to or above the red line for a duration of 5 minutes

Namespace: AWS/Kinesis

StreamName: Chapter4KinesisStream

Metric Name: PutRecord.Bytes

Period: 5 Minutes

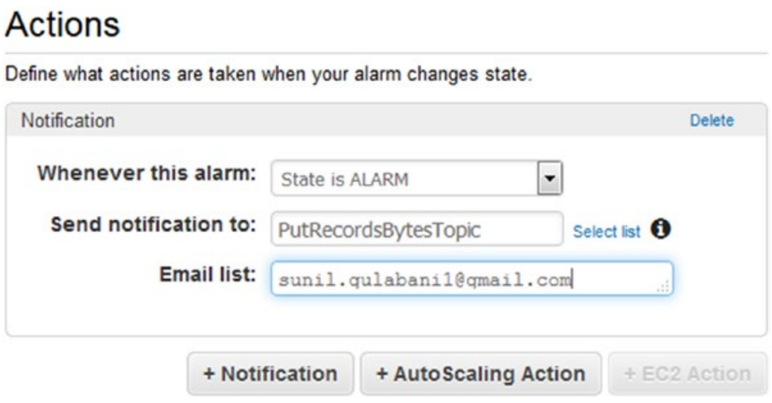
Statistic: (●) Standard ( ) Custom

Average

Cancel Previous Next Create Alarm

Figure 4-25. *Define alarm*

8. You can also configure Actions to trigger notification when the alarm state is "ALARM." To configure it, select from the drop-down list "Send notification to" or create a new notification by clicking New List. Enter the topic name and the e-mail address where notifications need to be sent. (See Figure 4-26.)


Actions

Define what actions are taken when your alarm changes state.

Notification

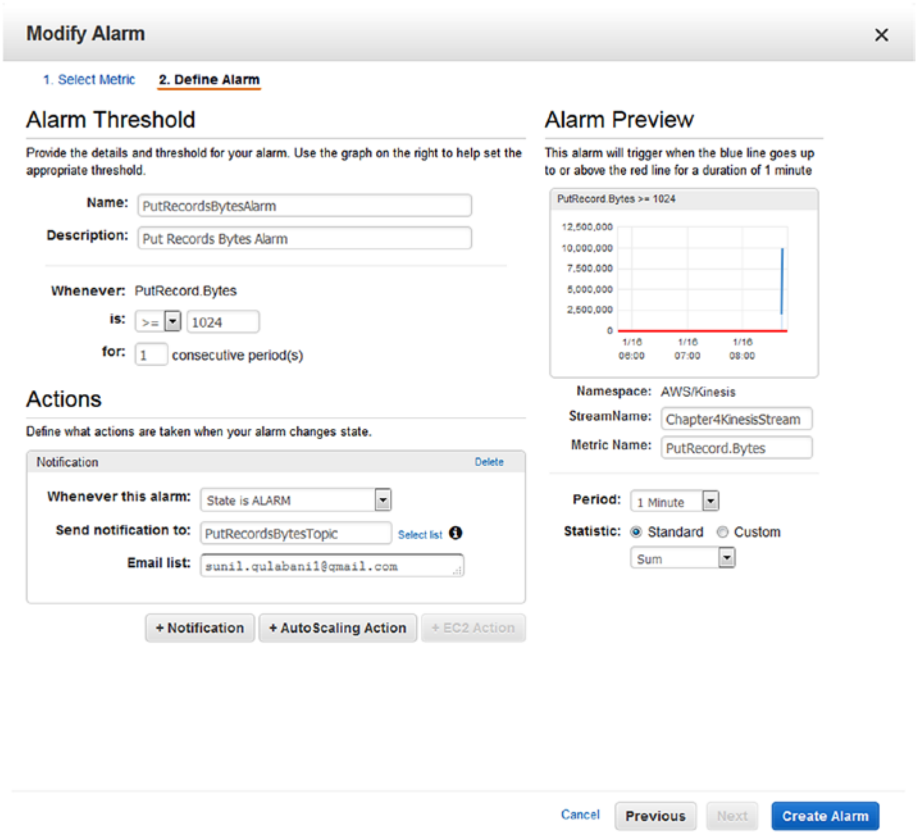
Whenever this alarm: State is ALARM

Send notification to: PutRecordsBytesTopic

Email list: sunil.gulabani1@gmail.com

Figure 4-26. *Define actions*

9. Click the Create Alarm button, as shown in Figure 4-27.


Modify Alarm

Alarm Threshold

Provide the details and threshold for your alarm. Use the graph on the right to help set the appropriate threshold.

Name: PutRecordsBytesAlarm

Description: Put Records Bytes Alarm

Whenever: PutRecord.Bytes

is: >= 1024

for: 1 consecutive period(s)

Actions

Define what actions are taken when your alarm changes state.

Notification

Whenever this alarm: State is ALARM

Send notification to: PutRecordsBytesTopic

Email list: sunil.gulabani1@gmail.com

Alarm Preview

This alarm will trigger when the blue line goes up to or above the red line for a duration of 1 minute

Namespace: AWS/Kinesis

StreamName: Chapter4KinesisStream

Metric Name: PutRecord.Bytes

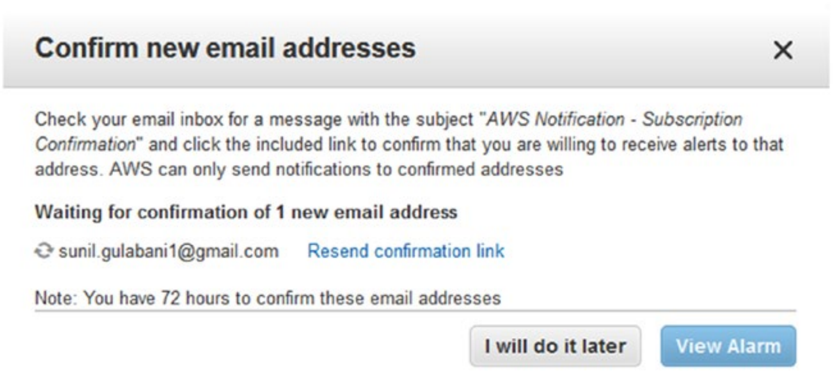
Period: 1 Minute

Statistic: [✓ Standard] Custom

Sum

Figure 4-27. *Create alarm*

10. If you have added a new e-mail that is not subscribed to SNS, you will be asked to confirm the e-mail address by opening the link sent to that address, as shown in Figure 4-28.


Confirm new email addresses

Check your email inbox for a message with the subject "*AWS Notification - Subscription Confirmation*" and click the included link to confirm that you are willing to receive alerts to that address. AWS can only send notifications to confirmed addresses

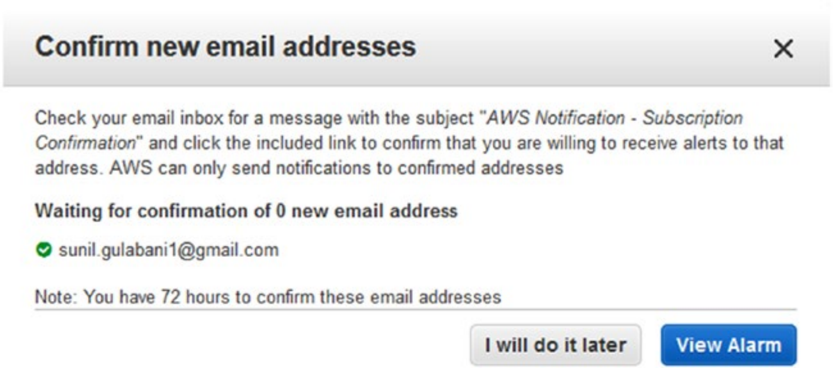
Waiting for confirmation of 1 new email address

sunil.gulabani1@gmail.com Resend confirmation link

Note: You have 72 hours to confirm these email addresses

Figure 4-28. *Confirm new e-mail address*

11. Once you confirm the subscription, you will be able to get messages when the alarm is triggered. (See Figure 4-29.)


Confirm new email addresses

Check your email inbox for a message with the subject "*AWS Notification - Subscription Confirmation*" and click the included link to confirm that you are willing to receive alerts to that address. AWS can only send notifications to confirmed addresses

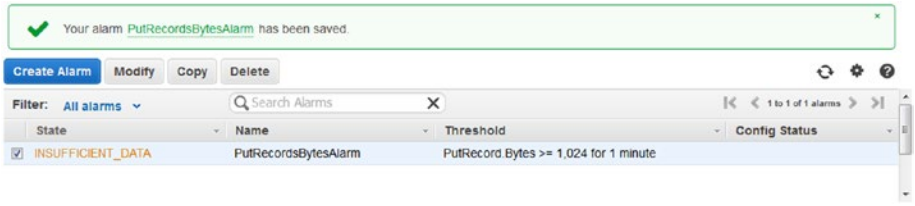
Waiting for confirmation of 0 new email address

sunil.gulabani1@gmail.com

Note: You have 72 hours to confirm these email addresses

Figure 4-29. *Confirm new e-mail address*

You can see that alarm has been created in Figure 4-30.

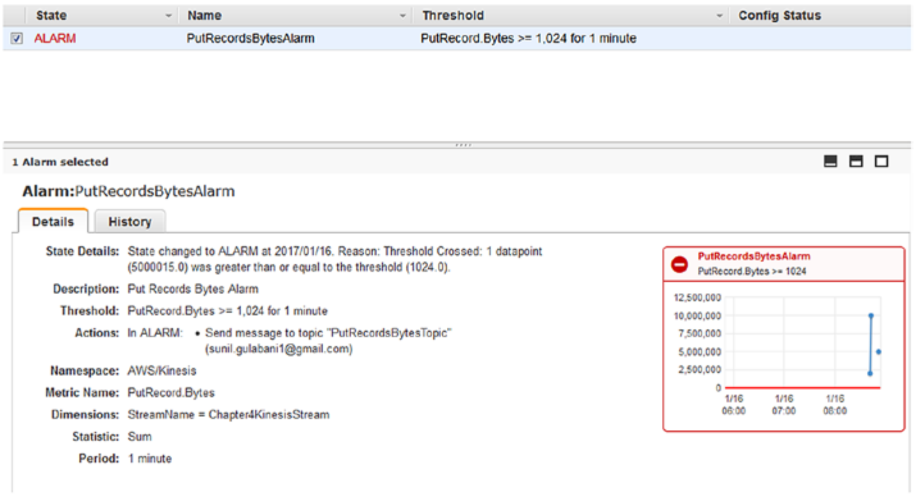

Your alarm PutRecordsBytesAlarm has been saved.

State	Name	Threshold	Config Status
INSUFFICIENT_DATA	PutRecordsBytesAlarm	PutRecord.Bytes >= 1,024 for 1 minute	

Figure 4-30. *Alarm listing*

12. To test that the alarm has been generated, we added multiple data records to the stream with 1MB of data for each record.

13. You can see that alarm state is changed to "ALARM" in Figure 4-31.



State	Name	Threshold	Config Status
ALARM	PutRecordsBytesAlarm	PutRecord.Bytes >= 1,024 for 1 minute	

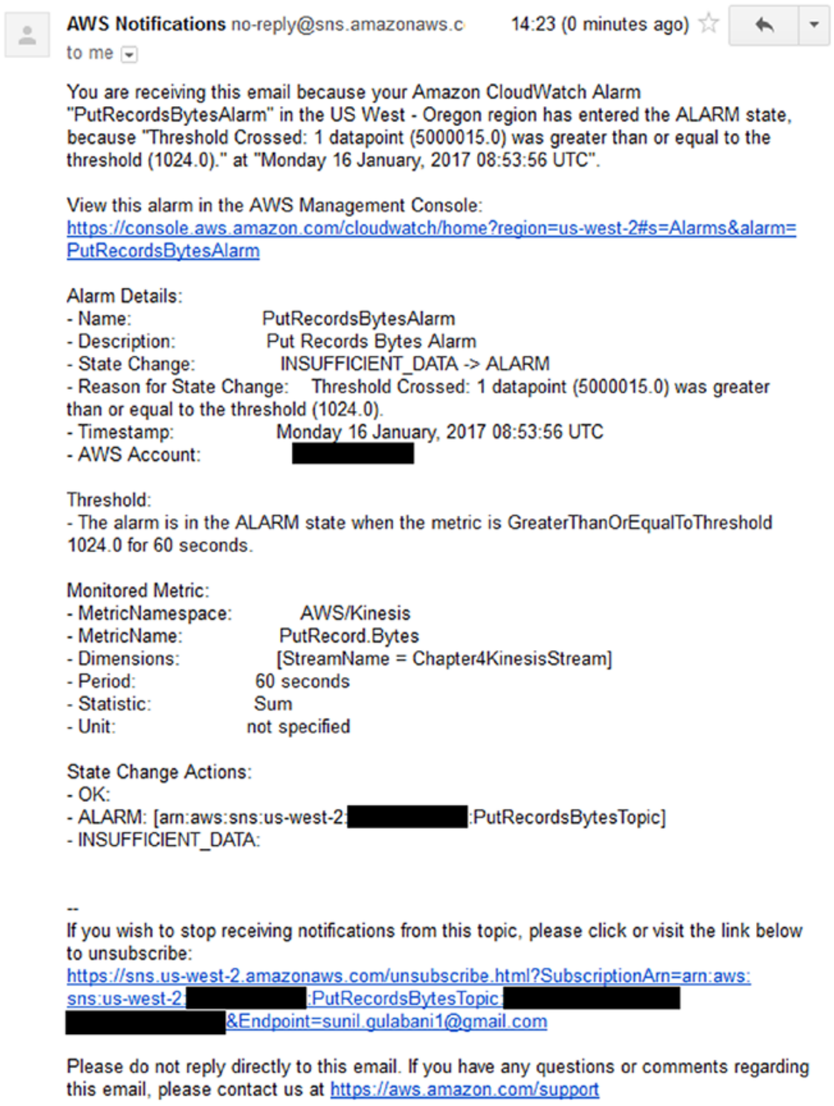
1 Alarm selected

Alarm:PutRecordsBytesAlarm

State Details:	State changed to ALARM at 2017/01/16. Reason: Threshold Crossed: 1 datapoint (5000015.0) was greater than or equal to the threshold (1024.0).
Description:	Put Records Bytes Alarm
Threshold:	PutRecord.Bytes >= 1,024 for 1 minute
Actions:	In ALARM: • Send message to topic "PutRecordsBytesTopic" (sunil.gulabani1@gmail.com)
Namespace:	AWS/Kinesis
Metric Name:	PutRecord.Bytes
Dimensions:	StreamName = Chapter4KinesisStream
Statistic:	Sum
Period:	1 minute

Figure 4-31. *Alarm status changed*

14. An e-mail has also been triggered, as shown in Figure 4-32.



AWS Notifications no-reply@sns.amazonaws.c 14:23 (0 minutes ago)
to me

You are receiving this email because your Amazon CloudWatch Alarm "PutRecordsBytesAlarm" in the US West - Oregon region has entered the ALARM state, because "Threshold Crossed: 1 datapoint (5000015.0) was greater than or equal to the threshold (1024.0)." at "Monday 16 January, 2017 08:53:56 UTC".

View this alarm in the AWS Management Console:
https://console.aws.amazon.com/cloudwatch/home?region=us-west-2#s=Alarms&alarm=PutRecordsBytesAlarm

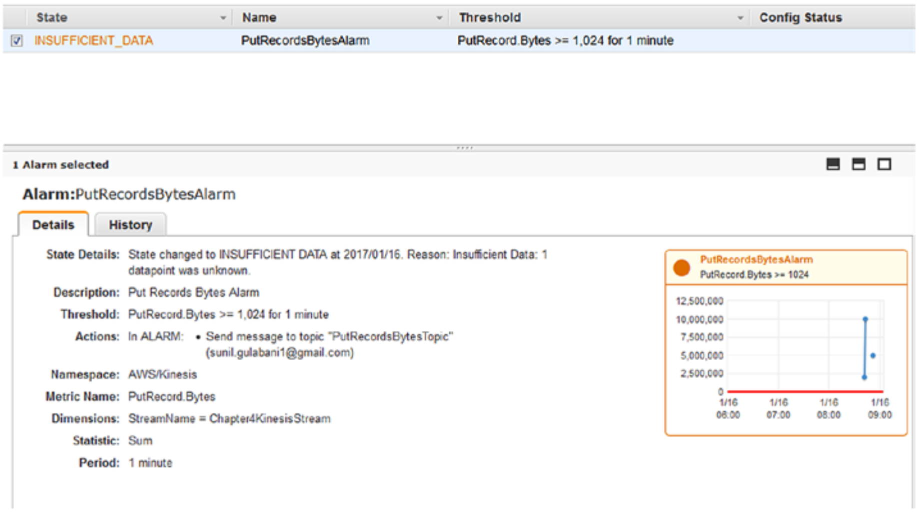
```
Alarm Details:
- Name:                      PutRecordsBytesAlarm
- Description:               Put Records Bytes Alarm
- State Change:              INSUFFICIENT_DATA -> ALARM
- Reason for State Change:   Threshold Crossed: 1 datapoint (5000015.0) was greater
than or equal to the threshold (1024.0).
- Timestamp:                 Monday 16 January, 2017 08:53:56 UTC
- AWS Account:               [redacted]

Threshold:
- The alarm is in the ALARM state when the metric is GreaterThanOrEqualToThreshold
1024.0 for 60 seconds.

Monitored Metric:
- MetricNamespace:           AWS/Kinesis
- MetricName:                PutRecord.Bytes
- Dimensions:                [StreamName = Chapter4KinesisStream]
- Period:                    60 seconds
- Statistic:                 Sum
- Unit:                      not specified

State Change Actions:
- OK:
- ALARM: [arn:aws:sns:us-west-2:[redacted]:PutRecordsBytesTopic]
- INSUFFICIENT_DATA:
```

--
If you wish to stop receiving notifications from this topic, please click or visit the link below to unsubscribe:
https://sns.us-west-2.amazonaws.com/unsubscribe.html?SubscriptionArn=arn:aws:sns:us-west-2:[redacted]:PutRecordsBytesTopic:[redacted]
[redacted]&Endpoint=sunil.gulabani1@gmail.com

Please do not reply directly to this email. If you have any questions or comments regarding this email, please contact us at https://aws.amazon.com/support

Figure 4-32. *Alarm e-mail*

15. After messages are read from the stream, the alarm state will go back to "OK" if the data record sizes that are continuously sent are less than 1024 bytes. The alarm state will be "INSUFFICIENT_DATA" when there are no put record activity on the stream. (See Figure 4-33.)



State	Name	Threshold	Config Status
INSUFFICIENT_DATA	PutRecordsBytesAlarm	PutRecord.Bytes >= 1,024 for 1 minute	

1 Alarm selected

Alarm:PutRecordsBytesAlarm

Details | History

State Details: State changed to INSUFFICIENT DATA at 2017/01/16. Reason: Insufficient Data: 1 datapoint was unknown.
Description: Put Records Bytes Alarm
Threshold: PutRecord.Bytes >= 1,024 for 1 minute
Actions: In ALARM: • Send message to topic "PutRecordsBytesTopic" (sunil.gulabani1@gmail.com)
Namespace: AWS/Kinesis
Metric Name: PutRecord.Bytes
Dimensions: StreamName = Chapter4KinesisStream
Statistic: Sum
Period: 1 minute

Figure 4-33. *Alarm status changed—Insufficient Data*

Summary

In this chapter, I discussed how to create a Kinesis Stream and configure the shards to efficiently meet your requirements. I also explained how to use AWS Management Console, AWS CLI, and AWS Java SDK to manage Kinesis Streams. Furthermore, I covered how to create a CloudWatch alarm on Kinesis Streams, which is invoked once the threshold value is crossed.

In Chapter 5, I will guide you in creating and configuring S3 buckets and uploading objects.

CHAPTER 5

Hands-on Simple Storage Service (S3)

Amazon S3 provides a storage service where you can store files. You can also use S3 for serving static data to web sites or applications, host a static web site on S3, and stream photos and videos to different web sites along with AWS CloudFront.

In this chapter, I will cover the following topics:

- Introduction to S3
- Features of S3
- Using AWS Management Console
- Using AWS CLI
- Using AWS SDK—Java
- Monitoring using CloudWatch

Introduction to AWS S3

AWS Simple Storage Service (S3) is a web service exposed over the Internet to store and retrieve data. It provides infrastructure that is reliable, scalable, and cost-efficient. Amazon uses AWS S3 to serve its global network of web sites. You can even host static web sites over AWS S3.

AWS S3 stores data objects in buckets. A bucket is simply a logical container that is used to identify the namespace of data objects. Each AWS user account can create up to 100 buckets. You can also create folders under the bucket, and inside folders you can store data objects. Consequently, it becomes easier to separate the logical storage of data objects. Each data object has a unique key within a bucket. You can access the data objects using the following URL: `http://BUCKET_NAME.s3.amazonaws.com/DATA_OBJECT_KEY`.

Here `BUCKET_NAME` will be the actual bucket name in which `DATA_OBJECT_KEY` resides. (See Figure 5-1.)

S. Gulabani, *Practical Amazon EC2, SQS, Kinesis, and S3*,
DOI 10.1007/978-1-4842-2841-8_5

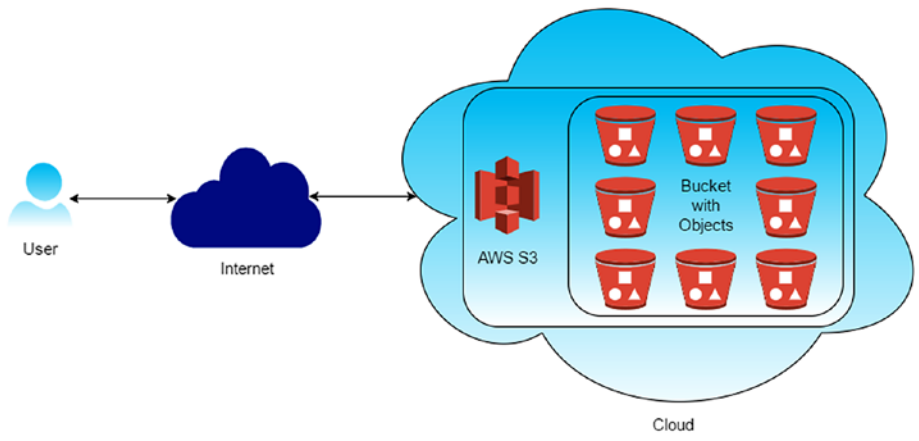


Figure 5-1. *AWS S3*

AWS S3 allows users to store an unlimited number of data objects, and the data objects' size can be up to 5GB. Each data object has metadata associated with it. You can assign permissions for those who can access the data objects. Permissions will enforce security for unauthorized access to our data objects. Data objects can also be made public that can be accessible over HTTP or BitTorrent.

Features

The main features of S3 are discussed in the sections that follow.

Scalability

AWS S3 provides infrastructure to store and retrieve data objects based on configuration. It scales automatically when we store a large number of data objects. There won't be any configuration changes from the user's end.

Availability

AWS S3 ensures that data objects are available at all times. You don't need to manage anything if you have heavy traffic overnight.

■ **Note** For more details on AWS S3 SLA, please visit `https://aws.amazon.com/s3/sla/`.

Cost Efficiency

AWS S3 follows the pay-as-you-go strategy, meaning you only have to pay for the data objects you have stored and retrieved on AWS S3. For startups and small-scale companies, it becomes inexpensive to use data storage infrastructure.

Static Web Hosting

AWS S3 provides static web site hosting that can be mapped. When you have static HTML web sites, you can opt for hosting on S3 rather than purchasing the hosting space.

■ **Note** Amazon's global network of web sites is hosted on AWS S3.

Using AWS Management Console

AWS Management Console can be used to manage S3. It provides an easy way to configure the S3. The following explanation shows how to configure S3.

Create Bucket

Buckets are a core part of S3. Buckets are used to stores objects that have content and metadata describing for the object. The following steps show how to create a bucket:

1. Sign in to AWS Management Console and click S3 under the All Services ➤ Storage category. (See Figure 5-2.)

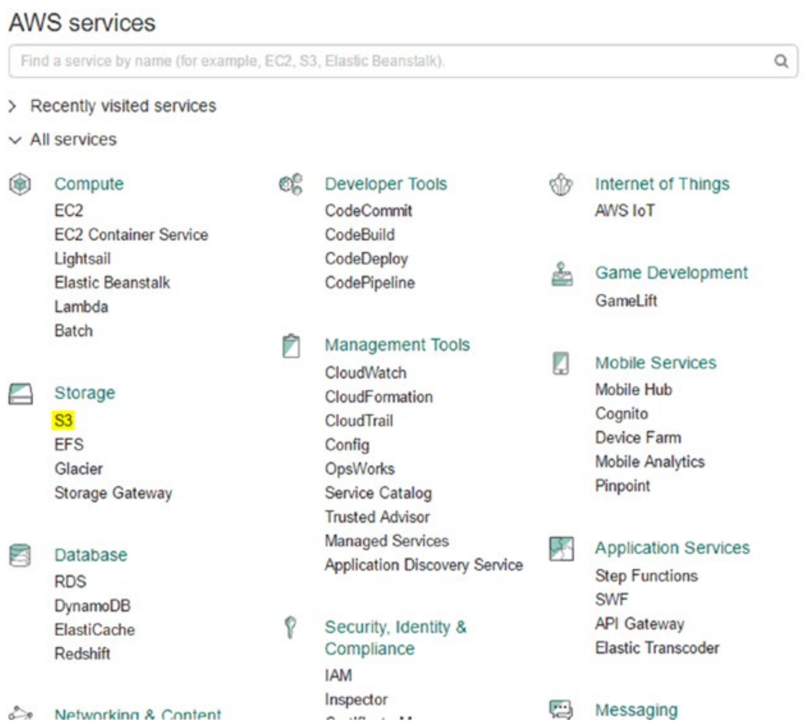
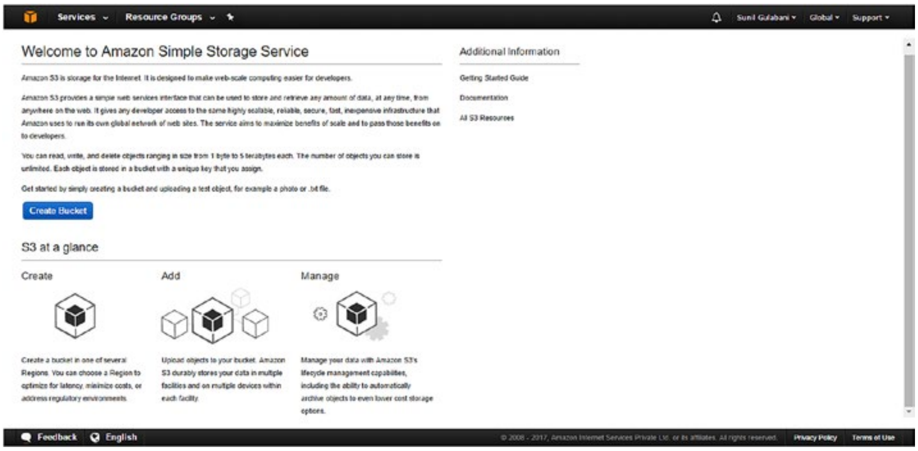


Figure 5-2. *AWS Management Console—S3*

2. This will take you to the S3 screen shown in Figure 5-3.



Welcome to Amazon Simple Storage Service

Amazon S3 is storage for the Internet. It is designed to make web-scale computing easier for developers.

Amazon S3 provides a simple web services interface that can be used to store and retrieve any amount of data, at any time, from anywhere on the web. It gives any developer access to the same highly scalable, reliable, secure, fast, inexpensive infrastructure that Amazon uses to run its own global network of web sites. The service aims to maximize benefits of scale and to pass those benefits on to developers.

You can read, write, and delete objects ranging in size from 1 byte to 5 terabytes each. The number of objects you can store is unlimited. Each object is stored in a bucket with a unique key that you assign.

Get started by simply creating a bucket and uploading a test object, for example a photo or .txt file.

S3 at a glance

Create a bucket in one of several Regions. You can choose a Region to optimize for latency, minimize costs, or address regulatory environments.

Upload objects to your bucket. Amazon S3 durably stores your data in multiple facilities and on multiple devices within each facility.

Manage your data with Amazon S3's lifecycle management capabilities, including the ability to automatically archive objects to even lower cost storage options.

Additional Information

Getting Started Guide

Documentation

All S3 Resources

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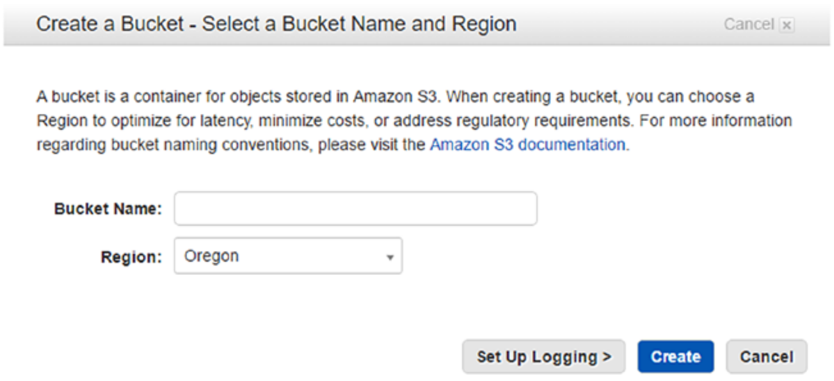
Figure 5-3. *S3 landing screen*

3. Click the Create Bucket button to create a bucket. This will open the Create a Bucket window shown in Figure 5-4.



Create a Bucket - Select a Bucket Name and Region

A bucket is a container for objects stored in Amazon S3. When creating a bucket, you can choose a Region to optimize for latency, minimize costs, or address regulatory requirements. For more information regarding bucket naming conventions, please visit the Amazon S3 documentation.

Bucket Name:

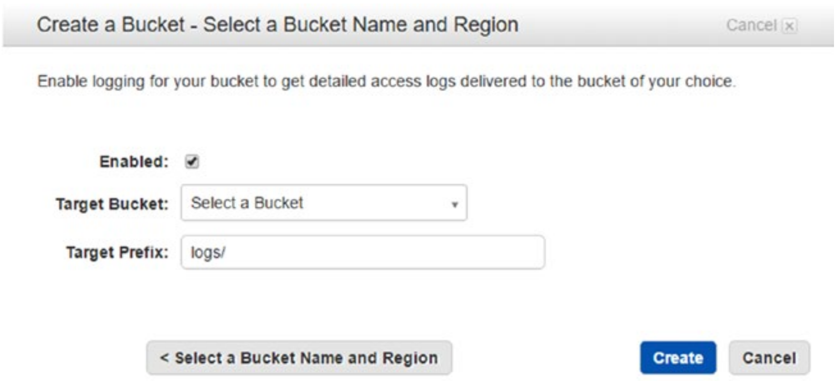
Region: Oregon

Figure 5-4. *Create a Bucket screen*

4. Fill in the bucket name as "chapter5-s3-bucket" and select the region as "Oregon" where the bucket will be located. The bucket name should be unique across all buckets in Amazon S3. Choose a bucket name carefully as this bucket name will be reflected in the URL of the data object.

■ **Note** Bucket naming conventions can be found at `http://docs.aws.amazon.com/AmazonS3/latest/UG/CreatingaBucket.html`.

5. You can also set up logging for the activities carried on in the newly created bucket. To enable logging, click the Set Up Logging button and enable the logging check box. Select the target bucket and target prefix in which logs will be dumped. (See Figure 5-5.)


Create a Bucket - Select a Bucket Name and Region

Enable logging for your bucket to get detailed access logs delivered to the bucket of your choice.

Enabled: ✓

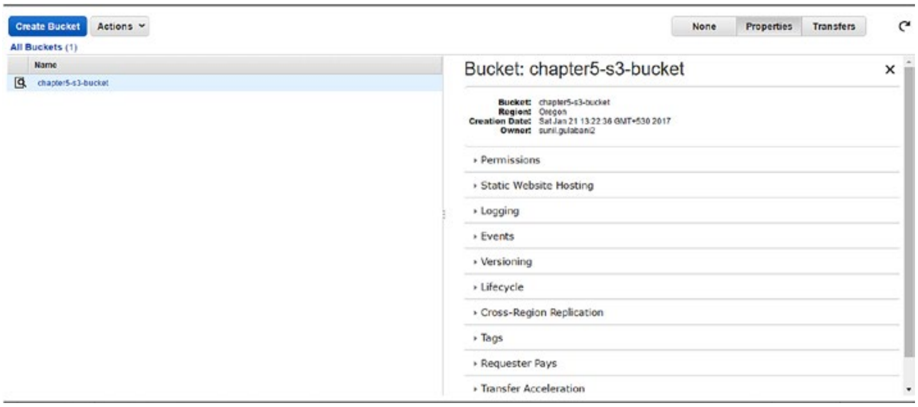
Target Bucket: Select a Bucket

Target Prefix: logs/

Figure 5-5. *Create bucket; set up logging*

6. Once the bucket name and region has been determined and the logging has been set up (optional), click the Create button.

7. Figure 5-6 shows the bucket listing.



chapter5-s3-bucket

Bucket: chapter5-s3-bucket

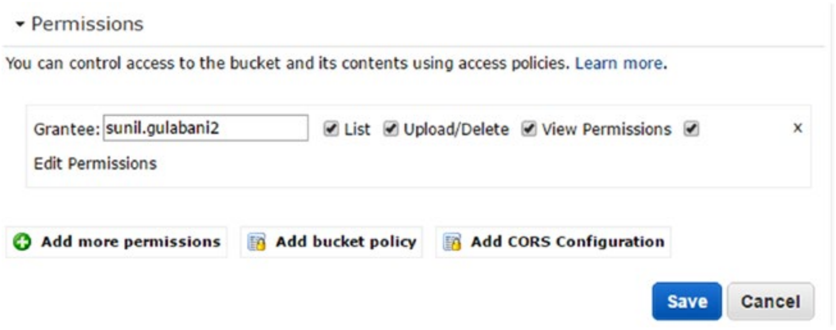
Bucket: chapter5-s3-bucket
Region: Oregon
Creation Date: Sat Jan 21 13:22:36 GMT+530 2017
Owner: sunil.gulabani2

Figure 5-6. *Bucket listing*

Bucket Permissions

Bucket permissions authorize users to access the data objects stored under the bucket. You can grant permissions on bucket.

1. By default, the owner of the bucket has all rights. To add permissions, click Add more permissions. (See Figure 5-7.)

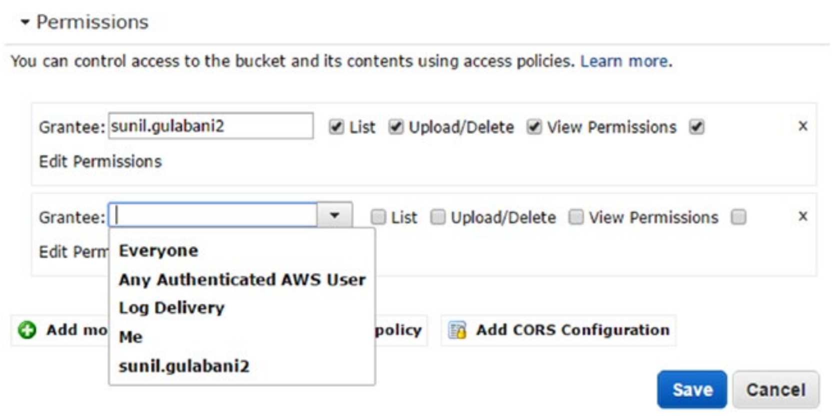

Permissions

You can control access to the bucket and its contents using access policies. Learn more.

Grantee: sunil.gulabani2 ✓ List ✓ Upload/Delete ✓ View Permissions ✓ Edit Permissions

Figure 5-7. *Bucket permissions*

2. The grantee slot should be filled in with the user's name or group to which permissions will be given. The name should be associated with an e-mail of an AWS account. Select the permissions check boxes that need to be granted, as shown in Figure 5-8.


Permissions

You can control access to the bucket and its contents using access policies. Learn more.

Grantee: sunil.gulabani2 ✓ List ✓ Upload/Delete ✓ View Permissions ✓ Edit Permissions

Grantee: List Upload/Delete View Permissions Edit Perm

Figure 5-8. *Add more permissions*

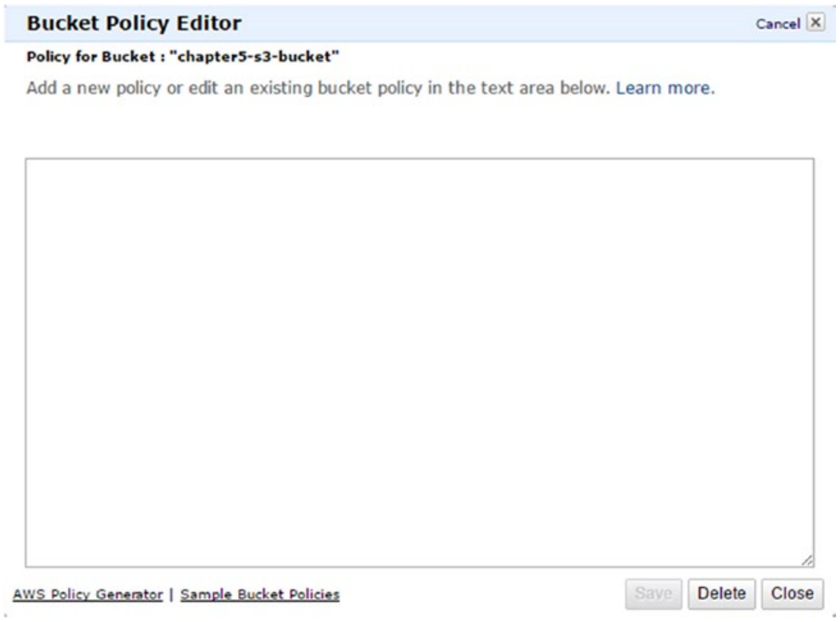
3. Once the grantee's name has been given and the permissions have been selected, click the Save button.

■ **Note** For more details on grantees, see `http://docs.aws.amazon.com/AmazonS3/latest/dev/acl-overview.html#SpecifyingGrantee`.

---

4. To remove any permissions, click the "x" icon displayed in each permission box.

5. To add a bucket policy, click the Add bucket policy link. This will open the window shown in Figure 5-9.



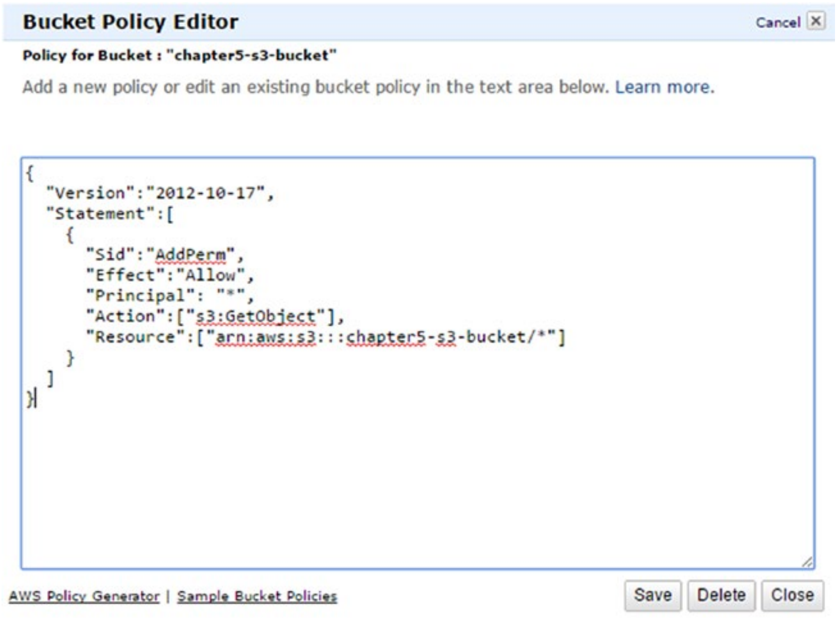
Bucket Policy Editor

Policy for Bucket : "chapter5-s3-bucket"

Add a new policy or edit an existing bucket policy in the text area below. Learn more.

Figure 5-9. *Add Bucket Policy screen*

6. You can use the AWS policy generator or sample bucket policies to create a bucket policy. I created a bucket policy for reading bucket data objects to public, as shown in Figure 5-10.



Policy for Bucket : "chapter5-s3-bucket"

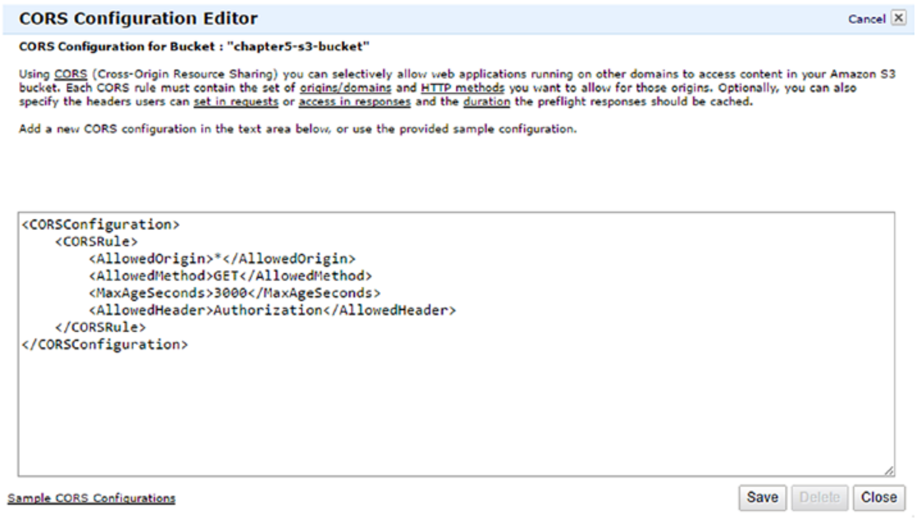
Add a new policy or edit an existing bucket policy in the text area below. Learn more.

```
{
  "Version":"2012-10-17",
  "Statement":[
    {
      "Sid":"AddPerm",
      "Effect":"Allow",
      "Principal": "*",
      "Action":["s3:GetObject"],
      "Resource":["arn:aws:s3:::chapter5-s3-bucket/*"]
    }
  ]
}
```

Figure 5-10. *Add a bucket policy—GetObject to Public*

7. Once the bucket policy is created, click the Save button.

8. You can add Cross-Origin Resource Sharing (CORS), which will grant certain web sites to access the resources. This helps to provide access to all requests coming from the mentioned web site. To add a CORS configuration, click the Add CORS Configuration link. This will open window in Figure 5-11.



CORS Configuration for Bucket : "chapter5-s3-bucket"

Using CORS (Cross-Origin Resource Sharing) you can selectively allow web applications running on other domains to access content in your Amazon S3 bucket. Each CORS rule must contain the set of origins/domains and HTTP methods you want to allow for those origins. Optionally, you can also specify the headers users can set in requests or access in responses and the duration the preflight responses should be cached.

Add a new CORS configuration in the text area below, or use the provided sample configuration.

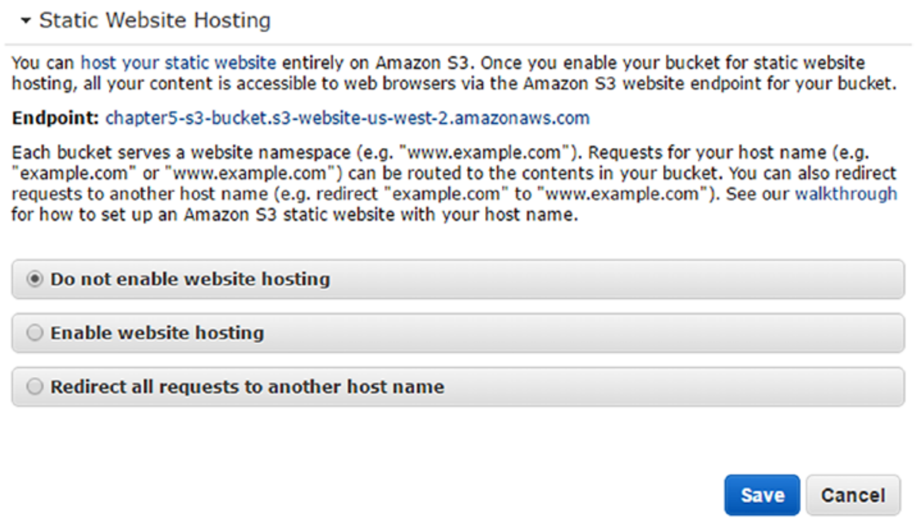
```
<CORSConfiguration>
    <CORSRule>
        <AllowedOrigin>*</AllowedOrigin>
        <AllowedMethod>GET</AllowedMethod>
        <MaxAgeSeconds>3000</MaxAgeSeconds>
        <AllowedHeader>Authorization</AllowedHeader>
    </CORSRule>
</CORSConfiguration>
```

Figure 5-11. *Add CORS configuration*

Static Web Site Hosting

You can host a web site having static content on AWS S3.

1. To enable the static web site hosting, click Static Website Hosting. (See Figure 5-12.)



You can host your static website entirely on Amazon S3. Once you enable your bucket for static website hosting, all your content is accessible to web browsers via the Amazon S3 website endpoint for your bucket.

Endpoint: chapter5-s3-bucket.s3-website-us-west-2.amazonaws.com

Each bucket serves a website namespace (e.g. "www.example.com"). Requests for your host name (e.g. "example.com" or "www.example.com") can be routed to the contents in your bucket. You can also redirect requests to another host name (e.g. redirect "example.com" to "www.example.com"). See our walkthrough for how to set up an Amazon S3 static website with your host name.

[✓ Do not enable website hosting]
Enable website hosting
Redirect all requests to another host name

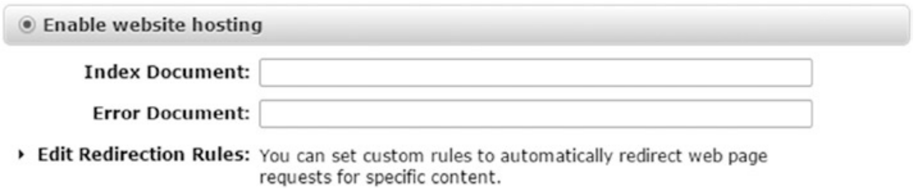
Figure 5-12. *Static web site hosting*

The web site can be access using following endpoint format:

`http://BUCKET_NAME.s3-website-REGION_NAME.amazonaws.com`.

Here `BUCKET_NAME` and `REGION_NAME` will be replaced with actual values.

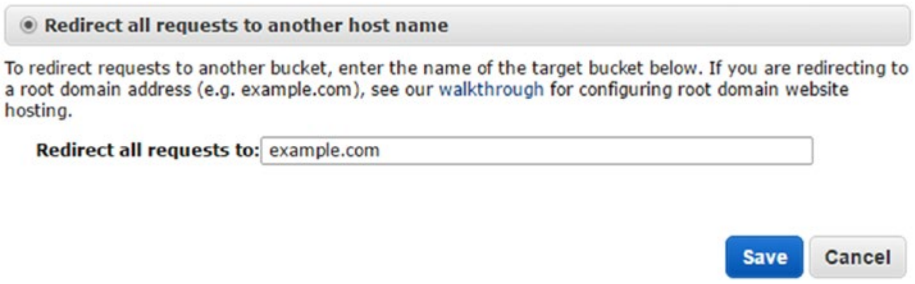
2. To enable web site hosting, click Enable website hosting. Here you need to add the index document and error document (optional) and also upload the respective files to the bucket. The index document will be the landing page of the web site. You can also set custom rules to redirect requests on specific content. (See Figure 5-13.)



You can set custom rules to automatically redirect web page requests for specific content.

Figure 5-13. *Enable web site hosting*

3. If you need to redirect the request to a specific URL, you can click Redirect all requests to another host name. Add your URL in the Redirect all requests to input box where redirection needs to happen. You can specify the URL with HTTP or HTTPS protocol. If you don't provide a URL with protocol, it will consider the original request's protocol. (See Figure 5-14.)



To redirect requests to another bucket, enter the name of the target bucket below. If you are redirecting to a root domain address (e.g. example.com), see our walkthrough for configuring root domain website hosting.

Redirect all requests to: example.com

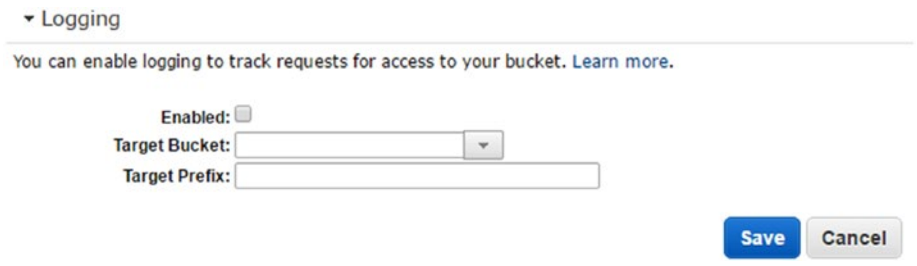
Figure 5-14. *Redirect all requests to another hostname*

4. Once the configuration is complete, click the Save button. In addition to this configuration, you also need to provide public read permission on buckets or objects so that it is accessible to the public.

■ **Note** To map an AWS S3 web site to custom domain, please see `http://docs.aws.amazon.com/AmazonS3/latest/dev/website-hosting-custom-domain-walkthrough.html`.

Logging

You can enable the logging on your bucket activity. To enable logging, click the Enabled check box and provide the target bucket and prefix where you need to store the logs, as shown in Figure 5-15.


▾ Logging

You can enable logging to track requests for access to your bucket. Learn more.

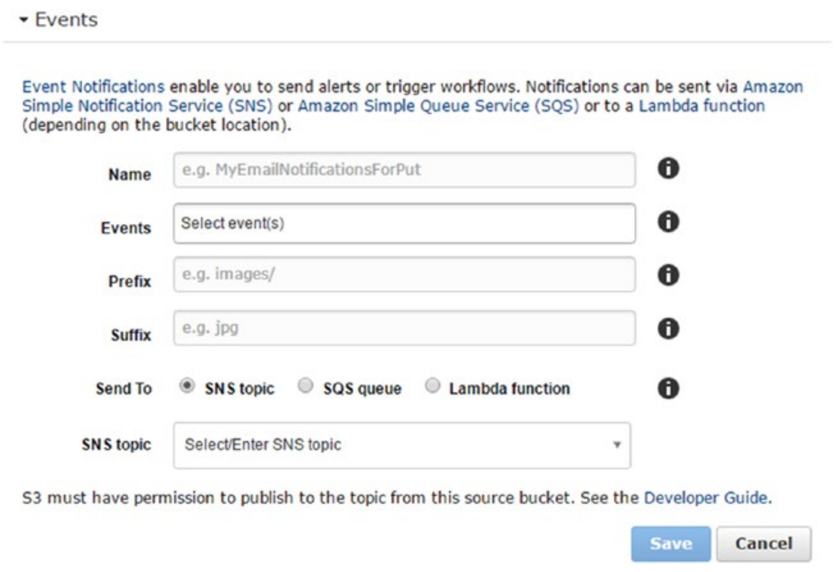
Enabled: ☐
Target Bucket:
Target Prefix:

Figure 5-15. *Bucket logging*

Events

You can configure the events on the bucket activities. When a new object is added to the bucket, notification should be sent to SNS or SQS or trigger the lambda function to carry out some processing. For example, logs are being added to the bucket. You want to filter out logs so you can configure an event that will trigger whenever a log file is added to the bucket.

1. To create an event, click Events, as shown in Figure 5-16.



▾ Events

Event Notifications enable you to send alerts or trigger workflows. Notifications can be sent via Amazon Simple Notification Service (SNS) or Amazon Simple Queue Service (SQS) or to a Lambda function (depending on the bucket location).

Name	e.g. MyEmailNotificationsForPut
Events	Select event(s)
Prefix	e.g. images/
Suffix	e.g. jpg
Send To	[✓ SNS topic] SQS queue Lambda function
SNS topic	Select/Enter SNS topic

S3 must have permission to publish to the topic from this source bucket. See the Developer Guide.

Figure 5-16. *Bucket events*

2. Provide the required details. The prefix and suffix can be provided to filter out objects from a large number of objects. Select the type of event(s) to which event should be triggered, as shown in Figure 5-17.

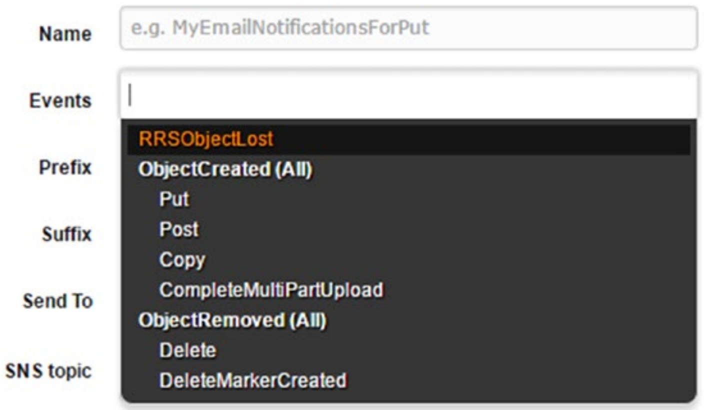


Figure 5-17. *Events types*

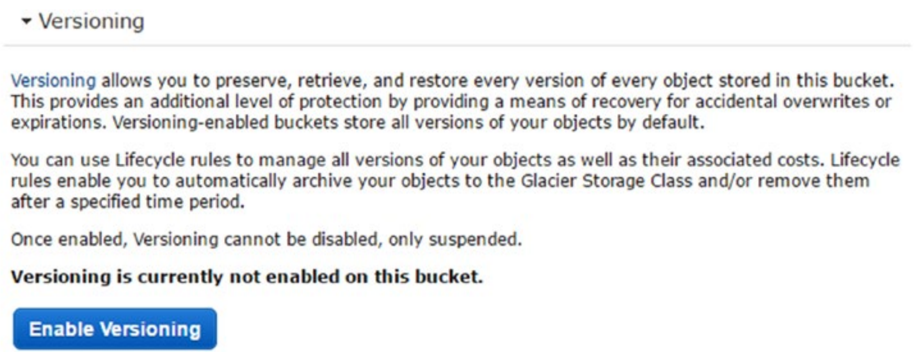
3. Select the destination where the event needs to be triggered:
    - SNS topic
    - SQS queue
    - Lambda function
4. Once all details are filled in, click the Save button.

■ **Note** Please provide necessary permissions on SNS, SQS, or lambda function to be used by events configured on S3.

Versioning

Versioning helps to store every version of objects. Versioned objects can be used to recover the accidental override or expiration of an object. If bucket versioning is enabled, then it can't be disabled. It can only be suspended.

1. To enable versioning, click the Enable Versioning button, as shown in Figure 5-18.



▾ Versioning

Versioning allows you to preserve, retrieve, and restore every version of every object stored in this bucket. This provides an additional level of protection by providing a means of recovery for accidental overwrites or expirations. Versioning-enabled buckets store all versions of your objects by default.

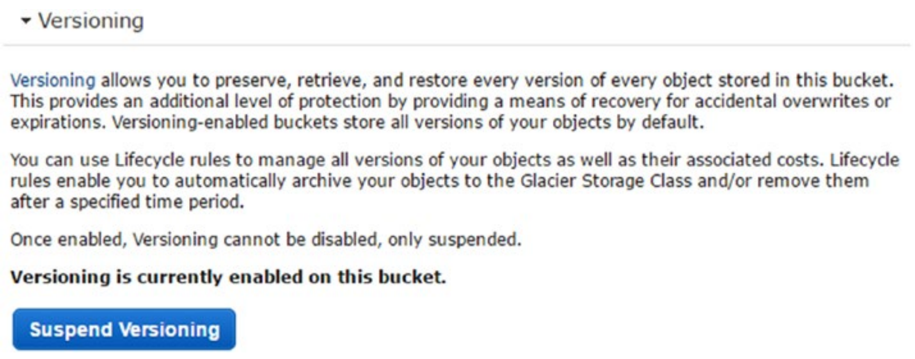
You can use Lifecycle rules to manage all versions of your objects as well as their associated costs. Lifecycle rules enable you to automatically archive your objects to the Glacier Storage Class and/or remove them after a specified time period.

Once enabled, Versioning cannot be disabled, only suspended.

Versioning is currently not enabled on this bucket.

Figure 5-18. *Enable versioning*

2. Now the bucket will store all versions of the object under the bucket. Maintaining every version of object is costly. To avoid this expense, you can have a life-cycle rule on the bucket that can help to archive objects to Glacier storage or delete them.
3. To suspend the versioning that is already enabled, click the Suspend Versioning button, as shown in Figure 5-19.



Versioning allows you to preserve, retrieve, and restore every version of every object stored in this bucket. This provides an additional level of protection by providing a means of recovery for accidental overwrites or expirations. Versioning-enabled buckets store all versions of your objects by default.

You can use Lifecycle rules to manage all versions of your objects as well as their associated costs. Lifecycle rules enable you to automatically archive your objects to the Glacier Storage Class and/or remove them after a specified time period.

Once enabled, Versioning cannot be disabled, only suspended.

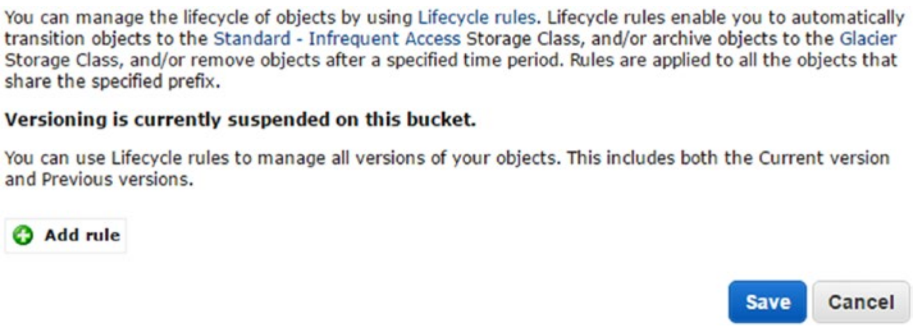
Versioning is currently enabled on this bucket.

Figure 5-19. *Suspend versioning*

Life Cycle

The life cycle of objects can be managed by creating life-cycle rules. You can create rules to move objects to other storage locations where objects are not accessed frequently, or you can move objects to Glacier storage or even set an expiry date for the object. (See Figure 5-20.)

■ **Note** Glacier is a service provided by Amazon for archiving and backup at a low cost.

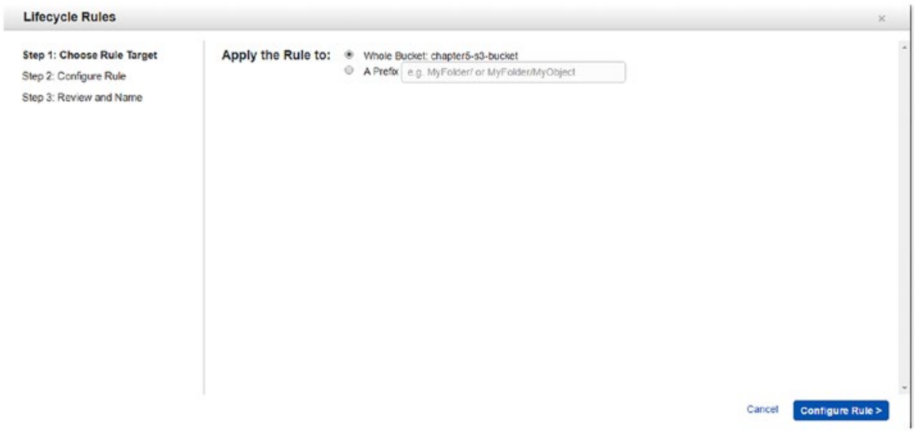

You can manage the lifecycle of objects by using Lifecycle rules. Lifecycle rules enable you to automatically transition objects to the Standard - Infrequent Access Storage Class, and/or archive objects to the Glacier Storage Class, and/or remove objects after a specified time period. Rules are applied to all the objects that share the specified prefix.

Versioning is currently suspended on this bucket.

You can use Lifecycle rules to manage all versions of your objects. This includes both the Current version and Previous versions.

Figure 5-20. *Life cycle configuration*

1. Clicking the Add rule button will open the Lifecycle Rules window, as shown in Figure 5-21.



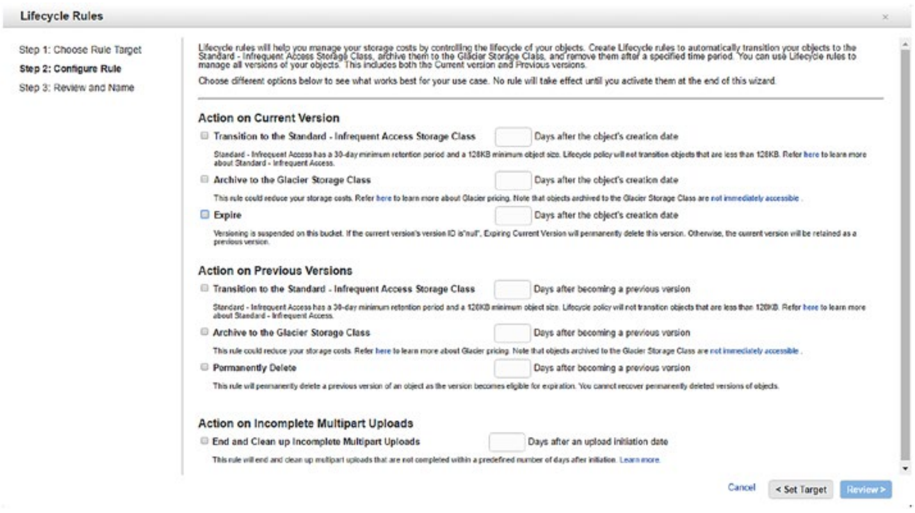
Lifecycle Rules

Step 1: Choose Rule Target
Step 2: Configure Rule
Step 3: Review and Name

Apply the Rule to: ● Whole Bucket: chapter5-s3-bucket
○ A Prefix e.g. MyFolder/ or MyFolder/MyObject

Figure 5-21. *Lifecycle Rules screen*

2. Here you can select a rule that will be applicable on the bucket level or you can set the prefix of the objects. Click the Configure Rule button, as shown in Figure 5-22.



Lifecycle Rules

Step 1: Choose Rule Target
Step 2: Configure Rule
Step 3: Review and Name

Lifecycle rules will help you manage your storage costs by controlling the lifecycle of your objects. Create Lifecycle rules to automatically transition your objects to the Standard - Infrequent Access Storage Class, archive them to the Glacier Storage Class, and remove them after a specified time period. You can use Lifecycle rules to manage all versions of your objects. This includes both the Current version and Previous versions.

Choose different options below to see what works best for your use case. No rule will take effect until you activate them at the end of this wizard.

Action on Current Version

☐ Transition to the Standard - Infrequent Access Storage Class — Days after the object's creation date

Standard - Infrequent Access has a 30-day minimum retention period and a 128KB minimum object size. Lifecycle policy will not transition objects that are less than 128KB. Refer here to learn more about Standard - Infrequent Access.

☐ Archive to the Glacier Storage Class — Days after the object's creation date

This rule could reduce your storage costs. Refer here to learn more about Glacier pricing. Note that objects archived to the Glacier Storage Class are not immediately accessible .

☐ Expire — Days after the object's creation date

Versioning is suspended on this bucket. If the current version's version ID is"null", Expiring Current Version will permanently delete this version. Otherwise, the current version will be retained as a previous version.

Action on Previous Versions

☐ Transition to the Standard - Infrequent Access Storage Class — Days after becoming a previous version

Standard - Infrequent Access has a 30-day minimum retention period and a 128KB minimum object size. Lifecycle policy will not transition objects that are less than 128KB. Refer here to learn more about Standard - Infrequent Access.

☐ Archive to the Glacier Storage Class — Days after becoming a previous version

This rule could reduce your storage costs. Refer here to learn more about Glacier pricing. Note that objects archived to the Glacier Storage Class are not immediately accessible .

☐ Permanently Delete — Days after becoming a previous version

This rule will permanently delete a previous version of an object as the version becomes eligible for expiration. You cannot recover permanently deleted versions of objects.

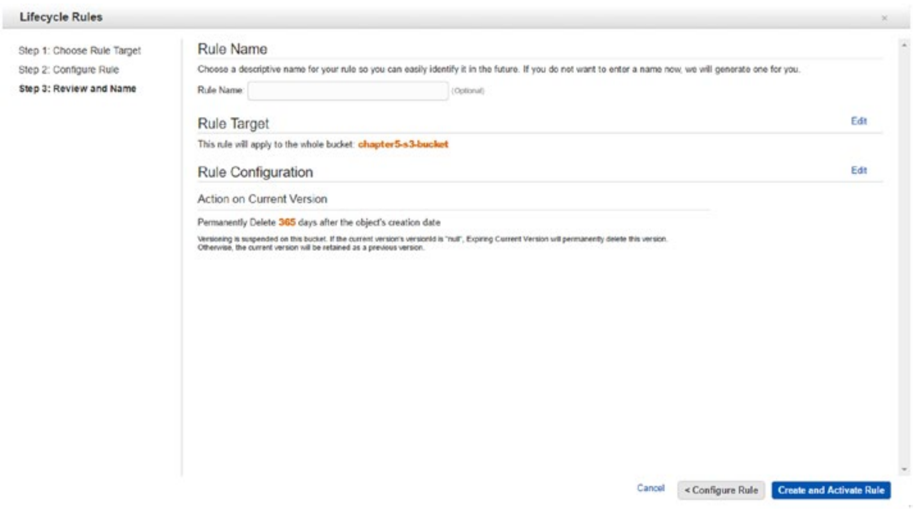
Action on Incomplete Multipart Uploads

☐ End and Clean up Incomplete Multipart Uploads — Days after an upload initiation date

This rule will end and clean up multipart uploads that are not completed within a predefined number of days after initiation. Learn more.

Figure 5-22. *Configure Rule button*

3. Select the check box based on the type of action you want to apply on objects. For this example, select Action on Current Version ➤ Expire in 365 days. This means the object will be deleted permanently after 365 days. Once the action is configured, click the Review button, as shown in Figure 5-23.



Rule Name

Choose a descriptive name for your rule so you can easily identify it in the future. If you do not want to enter a name now, we will generate one for you.

Rule Name: (Optional)

Rule Target

This rule will apply to the whole bucket: chapter5-s3-bucket

Rule Configuration

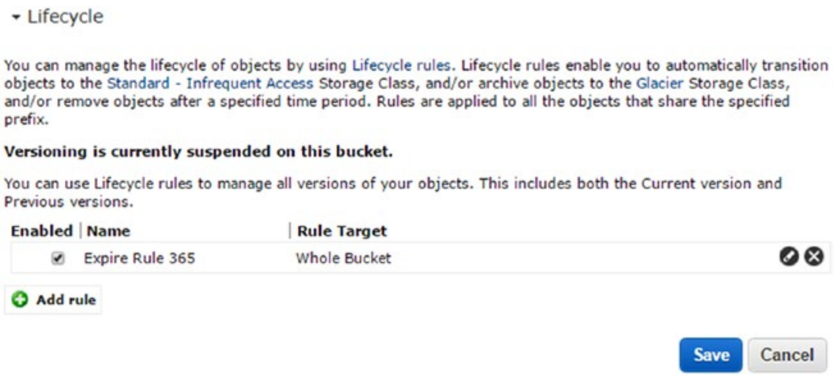
Action on Current Version

Permanently Delete 365 days after the object's creation date

Versioning is suspended on this bucket. If the current version's versionId is "null", Expiring Current Version will permanently delete this version. Otherwise, the current version will be retained as a previous version.

Figure 5-23. *Review rule*

4. Here you will provide the name to your rule (optional) and review the configuration. Once the configuration is verified, click the Create and Activate Rule button, as shown in Figure 5-24.



You can manage the lifecycle of objects by using Lifecycle rules. Lifecycle rules enable you to automatically transition objects to the Standard - Infrequent Access Storage Class, and/or archive objects to the Glacier Storage Class, and/or remove objects after a specified time period. Rules are applied to all the objects that share the specified prefix.

Versioning is currently suspended on this bucket.

You can use Lifecycle rules to manage all versions of your objects. This includes both the Current version and Previous versions.

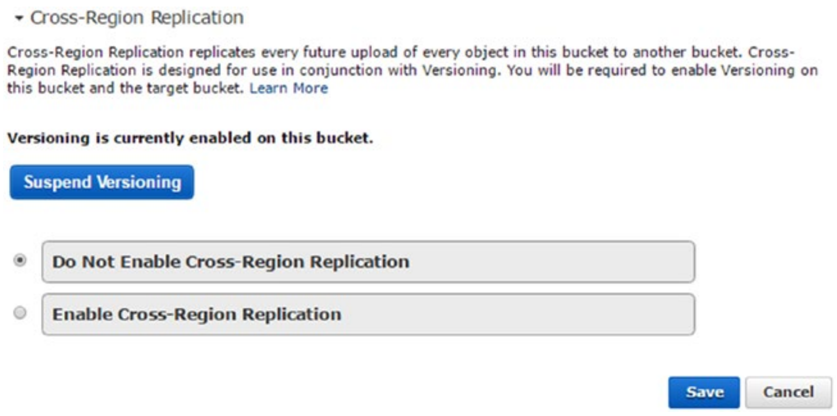
Enabled	Name	Rule Target
✓	Expire Rule 365	Whole Bucket

Figure 5-24. *Life cycle rule added*

5. To remove any rule, click the “x” icon and click the Save button.

Cross-Region Replication

Cross-region replication will replicate the bucket with objects to another region. To enable cross-region replication, you need to enable versioning. (See Figure 5-25.)



▾ Cross-Region Replication

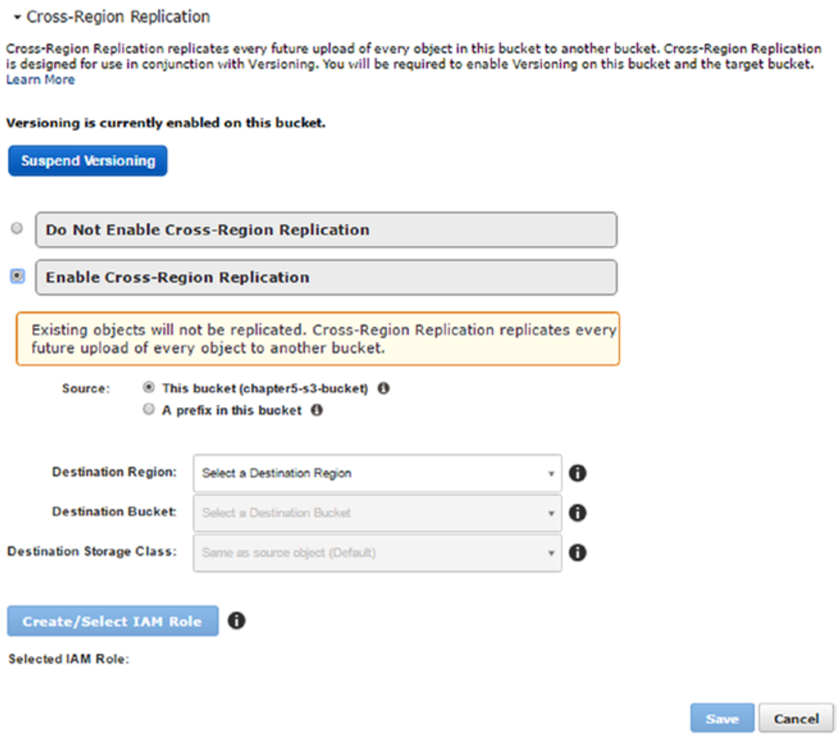
Cross-Region Replication replicates every future upload of every object in this bucket to another bucket. Cross-Region Replication is designed for use in conjunction with Versioning. You will be required to enable Versioning on this bucket and the target bucket. Learn More

Versioning is currently enabled on this bucket.

Suspend Versioning
[✓ Do Not Enable Cross-Region Replication]
Enable Cross-Region Replication
Save
Cancel

Figure 5-25. *Cross-region replication*

1. Click Enable Cross-Region Replication to replicate the bucket with objects to a different region, as shown in Figure 5-26.



▾ Cross-Region Replication

Cross-Region Replication replicates every future upload of every object in this bucket to another bucket. Cross-Region Replication is designed for use in conjunction with Versioning. You will be required to enable Versioning on this bucket and the target bucket. Learn More

Versioning is currently enabled on this bucket.

Suspend Versioning
Do Not Enable Cross-Region Replication
[✓ Enable Cross-Region Replication]

Existing objects will not be replicated. Cross-Region Replication replicates every future upload of every object to another bucket.

Source: [✓ This bucket (chapter5-s3-bucket)] A prefix in this bucket

Destination Region: Select a Destination Region

Destination Bucket: Select a Destination Bucket

Destination Storage Class: Same as source object (Default)

Selected IAM Role:

Figure 5-26. *Enable cross-region replication*

2. Select the source to replicate all objects or provide a prefix for the object. The destination region should be a different region from the source region where the objects will be replicated. The destination bucket will be used to store replicated objects of source bucket. The destination storage class can be any of the following:

    - Same as source object (default)
    - S3 Standard
    - S3 Standard - Infrequent Access
    - Reduced Redundancy Storage (RSS)

3. After selecting the destination storage class, create or select the IAM role that will have the required access to replicate objects. After all configurations are complete, click the Save button. (See Figure 5-27.)

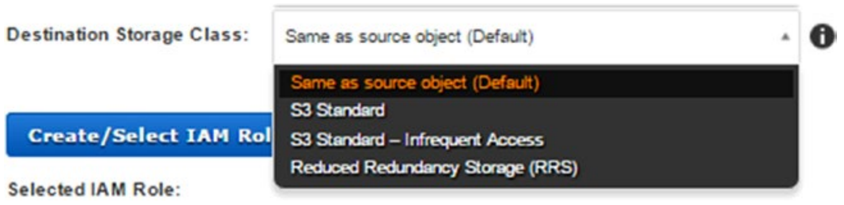
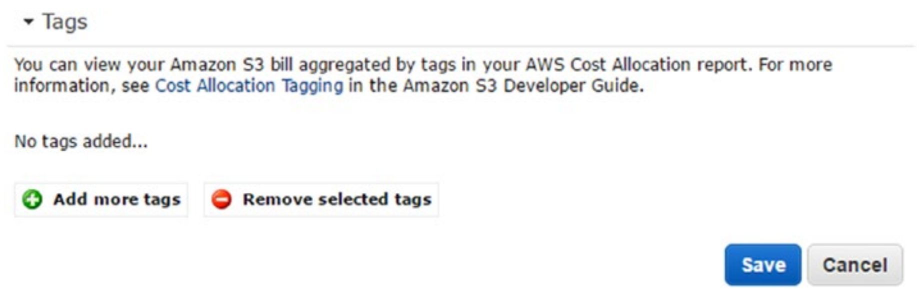

Destination Storage Class:
Same as source object (Default)
Same as source object (Default)
S3 Standard
S3 Standard – Infrequent Access
Reduced Redundancy Storage (RRS)
Create/Select IAM Rol
Selected IAM Role:

Figure 5-27. *Destination storage class*

Tags

Tags are used to provide a logical key value that will identify what a resource is being used for, who created the resource, or which project this resource belongs to. Also, tags are used to view aggregated billing. Cost allocation tagging helps to differentiate the cost of AWS S3 buckets used by specific projects. You can set 10 tags under each bucket. (See Figure 5-28.)



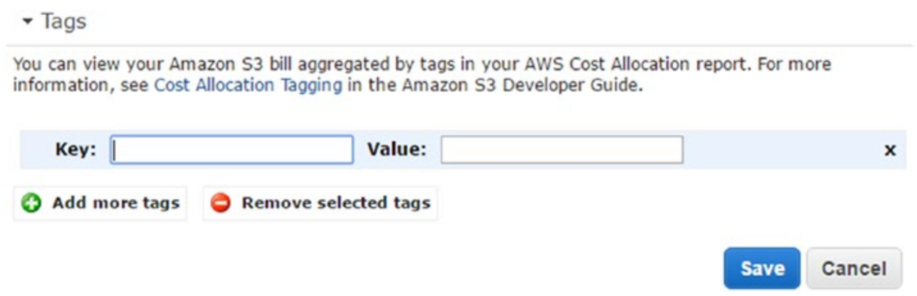
Tags

You can view your Amazon S3 bill aggregated by tags in your AWS Cost Allocation report. For more information, see Cost Allocation Tagging in the Amazon S3 Developer Guide.

No tags added...

Figure 5-28. *Tags*

1. To add a tag, click “Add more tags.” (See Figure 5-29.)

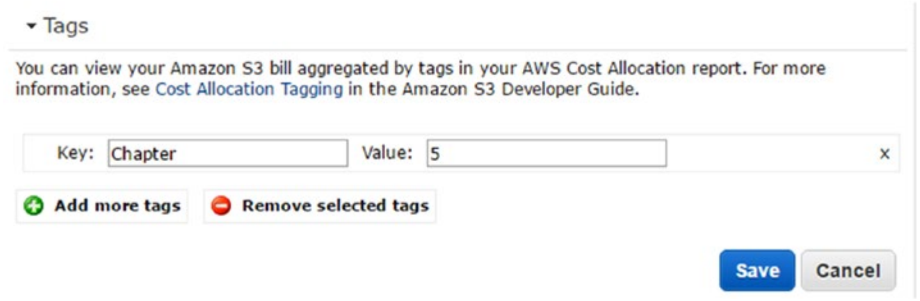

▾ Tags

You can view your Amazon S3 bill aggregated by tags in your AWS Cost Allocation report. For more information, see Cost Allocation Tagging in the Amazon S3 Developer Guide.

Key: | Value: ×

Figure 5-29. *Add more tags*

2. Once the tag’s key and value have been added, click the Save button, as shown in Figure 5-30.


▾ Tags

You can view your Amazon S3 bill aggregated by tags in your AWS Cost Allocation report. For more information, see Cost Allocation Tagging in the Amazon S3 Developer Guide.

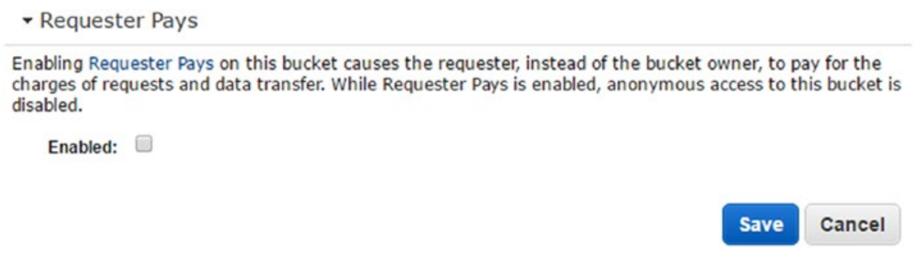
Key: Chapter Value: 5 ×

Figure 5-30. *Tag added*

3. To remove the tag, click “x” and then the Save button.

Requester Pays

Amazon S3 owners pay for the storage, data transfer, and requests made. If the AWS S3 bucket owner wants the requesters of the bucket to pay for data transfer and requests, the owner can configure the settings so this is possible. To enable the requester to pay, click the Enable check box and the Save button, as shown in Figure 5-31.



▾ Requester Pays

Enabling Requester Pays on this bucket causes the requester, instead of the bucket owner, to pay for the charges of requests and data transfer. While Requester Pays is enabled, anonymous access to this bucket is disabled.

Enabled: ☐

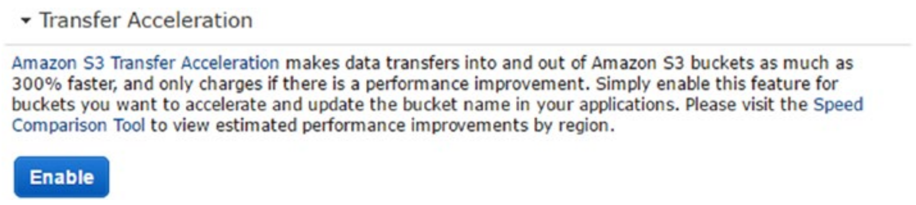
Figure 5-31. *Requester pays*

■ **Note** Enabling requester pays will disable anonymous access to the bucket.

Transfer Acceleration

Transfer acceleration will help to transfer data fast, easily, and securely between the client applications and the S3 bucket. Transfer acceleration will charge an additional cost. As the objects are put in the S3 bucket, transfer acceleration will distribute them to all global delivery edge locations.

1. To enable transfer acceleration, click the Enable button, as shown in Figure 5-32.



▾ Transfer Acceleration

Amazon S3 Transfer Acceleration makes data transfers into and out of Amazon S3 buckets as much as 300% faster, and only charges if there is a performance improvement. Simply enable this feature for buckets you want to accelerate and update the bucket name in your applications. Please visit the Speed Comparison Tool to view estimated performance improvements by region.

Figure 5-32. *Transfer acceleration*

Empty Bucket

When you want to delete all the objects from the bucket, you can use the Empty Bucket action.

1. To delete all objects from the bucket, select the bucket and click the Actions menu option, as shown in Figure 5-33.

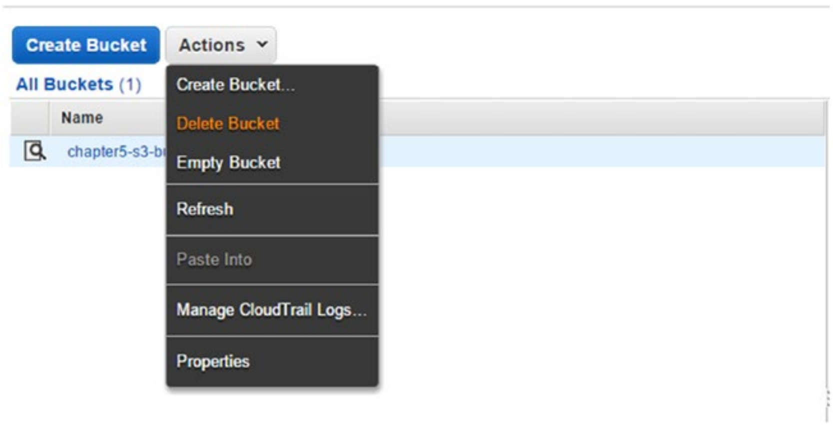
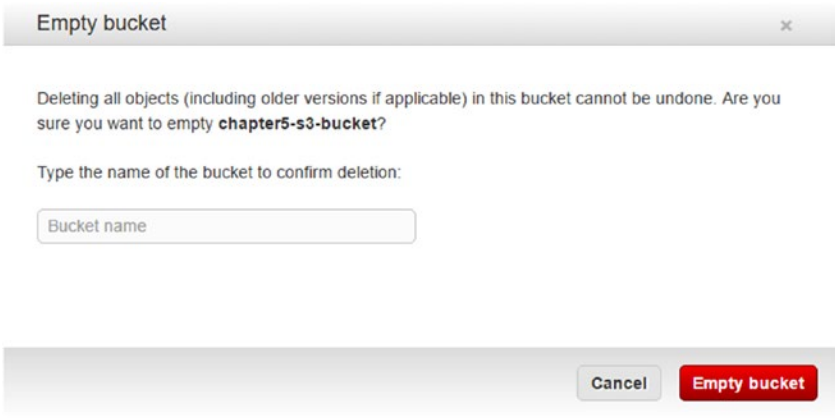


Figure 5-33. *Action menu*

2. Click the Empty Bucket option, as shown in Figure 5-34. This will open the confirmation window to empty the bucket.


Empty bucket

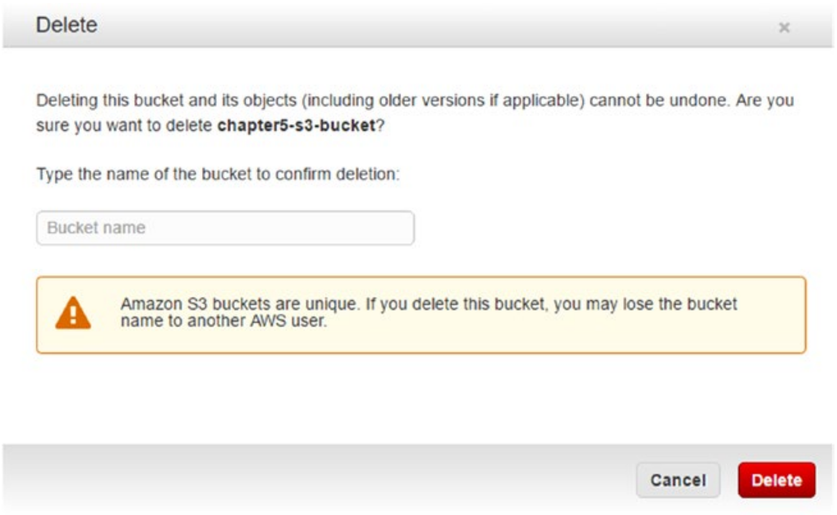
Deleting all objects (including older versions if applicable) in this bucket cannot be undone. Are you sure you want to empty **chapter5-s3-bucket**?

Type the name of the bucket to confirm deletion:

Figure 5-34. *Empty bucket*

Delete Bucket

To delete the bucket, select the bucket and click the Delete Bucket option under the Actions menu. (See Figure 5-35.)



Deleting this bucket and its objects (including older versions if applicable) cannot be undone. Are you sure you want to delete **chapter5-s3-bucket**?

Type the name of the bucket to confirm deletion:

Bucket name

Amazon S3 buckets are unique. If you delete this bucket, you may lose the bucket name to another AWS user.

Figure 5-35. *Delete bucket*

■ **Note** As bucket names are unique across AWS S3, deleting a bucket allows another AWS user to take up the bucket name.

Create Folder

AWS S3 has a flat structure to store objects under the bucket. It doesn't have a hierarchical structure that you have in file systems. To enable organized storage, AWS S3 provides folder creation where you can create folders under the bucket and then store objects in the folders. Creating folders is just a logical entity for AWS S3. The folder name is treated as the object's key prefix. For example, we created a folder with name "apress" and stored the object `chapter5.txt`. The object key, then, is `apress/chapter5.txt`.

You can create nested folders under the bucket. Once folders are named, they can't be renamed.

1. Click the Create Folder button that is available on the bar at the top of the screen, as shown on Figure 5-36.

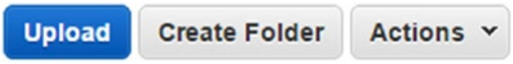


Figure 5-36. *Create Folder top bar*

2. You can also click the Actions ➤ Create Folder... menu option, as shown in Figure 5-37.

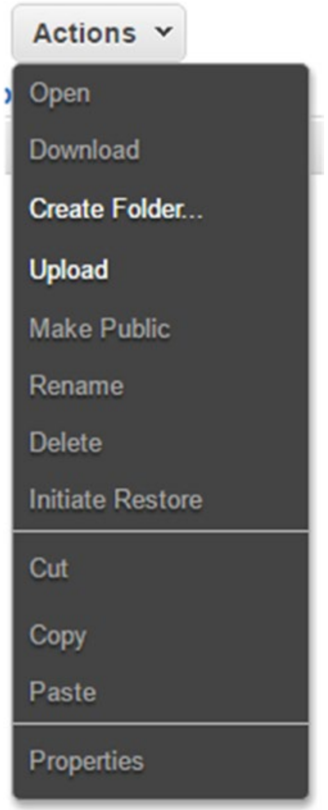


Figure 5-37. *Create Folder in the Actions menu*

3. Open the Context (right-click) menu and click Create Folder..., as shown in Figure 5-38.

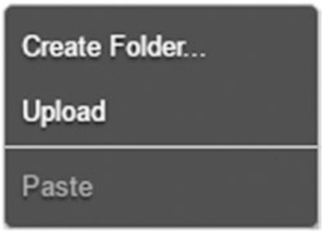
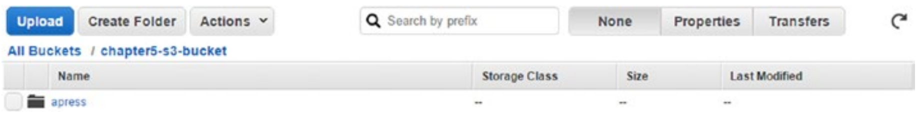


Figure 5-38. *Create Folder... in the Context menu*

4. We have created a folder with the name “apress,” as shown in Figure 5-39.



Name	Storage Class	Size	Last Modified
apress	--	--	--

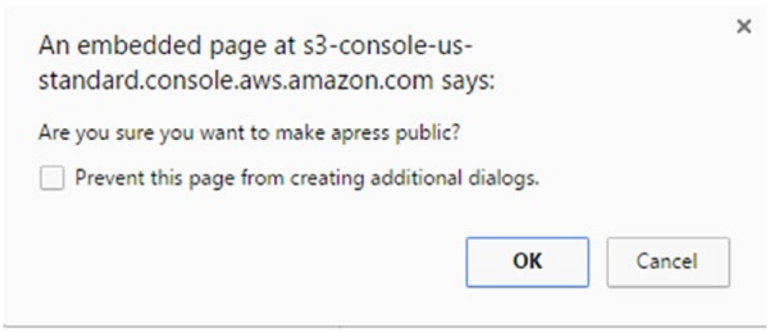
Figure 5-39. *Folder created*

Public Folder

You can make the folder publicly available for viewing and downloading. Once the folder is made public, you cannot make it private. As a folder is just a logical entity, you need to update permissions of each object under that public folder to make it private.

You can make folder public by performing the following steps:

1. Select the folder and click the Actions ➤ Make Public menu option. OR
2. Select the folder, open the Context (right-click) menu, and click Make Public.
3. After you click Make Public, a confirmation dialog will pop up. Click the OK button, as shown in Figure 5-40.


An embedded page at s3-console-us-standard.console.aws.amazon.com says:

Are you sure you want to make apress public?

Prevent this page from creating additional dialogs.

Figure 5-40. *Making a folder public*

Deleting Folders

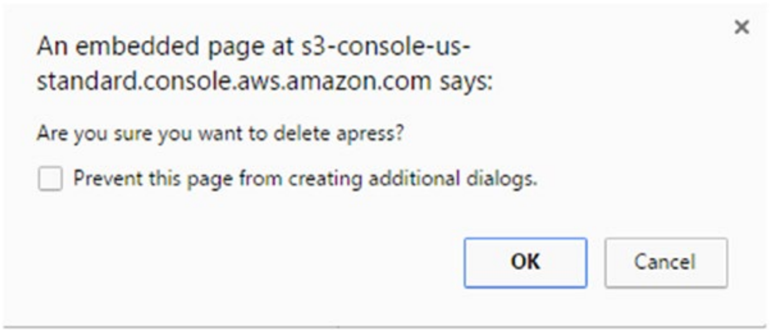
Deleting a folder deletes all the objects automatically under it. Before deleting a folder, you may want to make a backup for the objects. If so, you can copy the objects to another bucket or folder. There are two ways to delete a folder:

Select the folder and click the Actions ➤ Delete menu option.

OR

Select the folder and open the Context (right-click) menu and click Delete.

After you click "Delete," a confirmation dialog box will pop up. Click the OK button, as shown in Figure 5-41.


An embedded page at s3-console-us-standard.console.aws.amazon.com says:

Are you sure you want to delete apress?

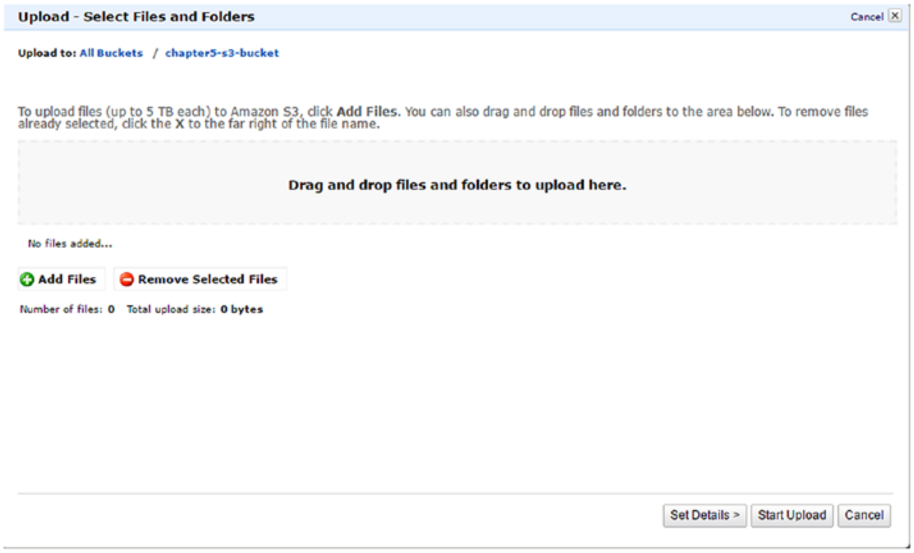
☐ Prevent this page from creating additional dialogs.

Figure 5-41. *Delete folder*

Uploading Objects

You can upload any type of files to AWS S3. All files are treated as objects in AWS S3. The object may be a text file, word document, audio or video files, photos, and so on. It is mandatory to store objects within a bucket or folder. You can store an object of a size up to 5TB, and you can have an unlimited number of objects.

1. To upload an object, click Upload from the "Actions" menu or Context (right-click) menu, as shown in Figure 5-42.


Upload - Select Files and Folders

Upload to: All Buckets / chapter5-s3-bucket

To upload files (up to 5 TB each) to Amazon S3, click **Add Files**. You can also drag and drop files and folders to the area below. To remove files already selected, click the **X** to the far right of the file name.

Drag and drop files and folders to upload here.

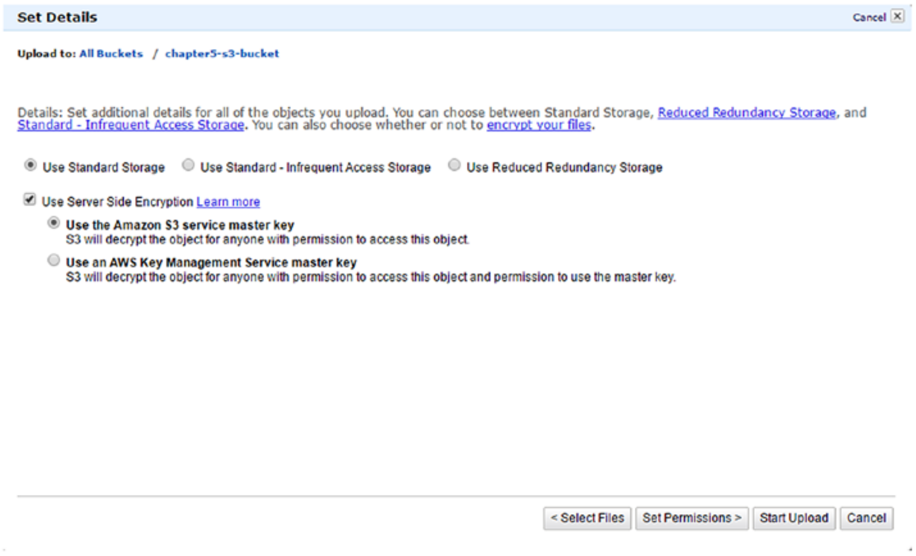
No files added...

Number of files: 0 Total upload size: 0 bytes

Figure 5-42. *Upload - Select Files and Folder screen*

2. Drag and drop files and folders or click Add Files. Here you can add multiple files and folders. Once the files and folders selection is complete, click Set Details (optional) or the Start Upload button. You will set details for the objects.

3. Here you will select the storage class for the type of S3 storage you need. Every storage class is associated with a cost. Also you can configure the server side encryption, as shown in Figure 5-43.



Set Details

Upload to: All Buckets / chapter5-s3-bucket

Details: Set additional details for all of the objects you upload. You can choose between Standard Storage, Reduced Redundancy Storage, and Standard - Infrequent Access Storage. You can also choose whether or not to encrypt your files.

[✓ Use Standard Storage] Use Standard - Infrequent Access Storage Use Reduced Redundancy Storage

[✓ Use Server Side Encryption] Learn more

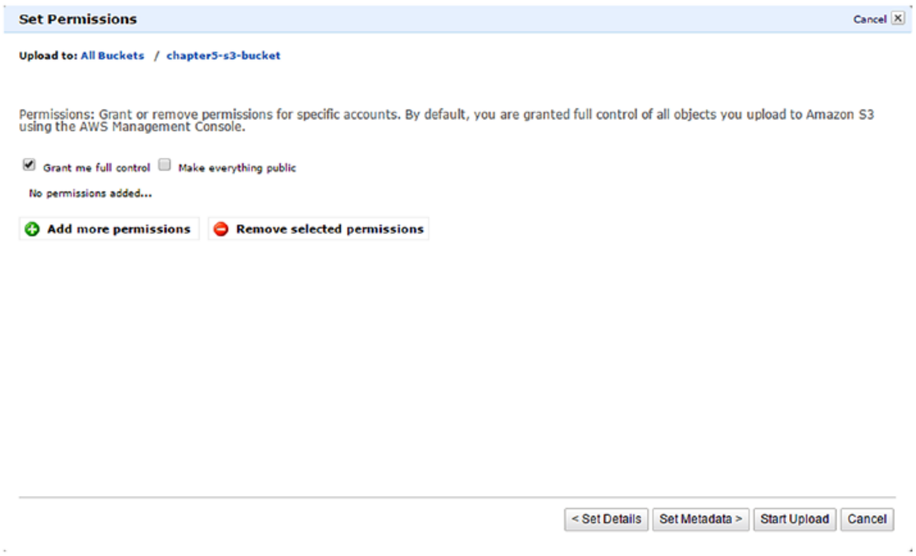
[✓ Use the Amazon S3 service master key]
S3 will decrypt the object for anyone with permission to access this object.

Use an AWS Key Management Service master key
S3 will decrypt the object for anyone with permission to access this object and permission to use the master key.

Figure 5-43. *Set Details screen*

4. Once the selection is complete, click Set Permissions (optional) or the Start Upload button. You will set the permissions for the objects.

5. To add more permissions, click Add more permissions and grant permissions, as shown in Figure 5-44.


Set Permissions

Upload to: All Buckets / chapter5-s3-bucket

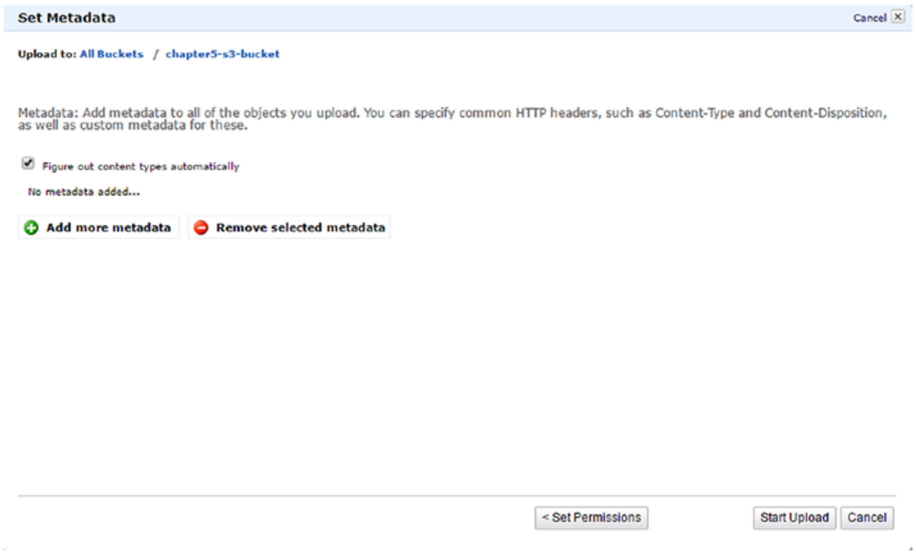
Permissions: Grant or remove permissions for specific accounts. By default, you are granted full control of all objects you upload to Amazon S3 using the AWS Management Console.

[✓] Grant me full control [ ] Make everything public

No permissions added...

Figure 5-44. *Set Permissions screen*

6. Once permissions are granted, click Set Metadata (optional) or the Start Upload button. Next, you will set metadata. You can add metadata by clicking Add more metadata, as shown in Figure 5-45.


Set Metadata

Upload to: All Buckets / chapter5-s3-bucket

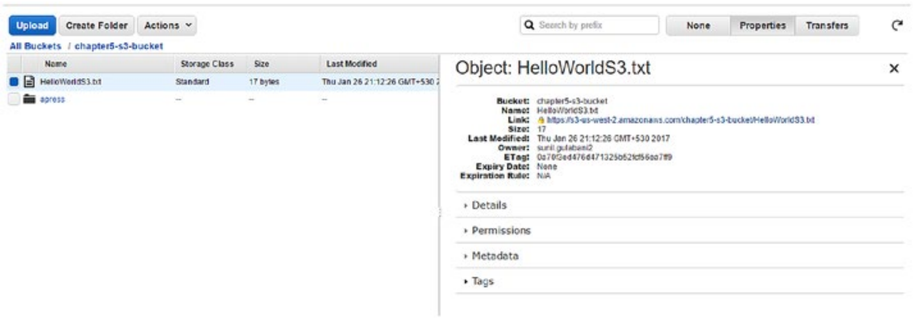
Metadata: Add metadata to all of the objects you upload. You can specify common HTTP headers, such as Content-Type and Content-Disposition, as well as custom metadata for these.

[✓] Figure out content types automatically

No metadata added...

Figure 5-45. *Set Metadata screen*

7. Once metadata have been added, click the Start Upload button. This will upload the object to the S3 bucket. (See Figure 5-46.)



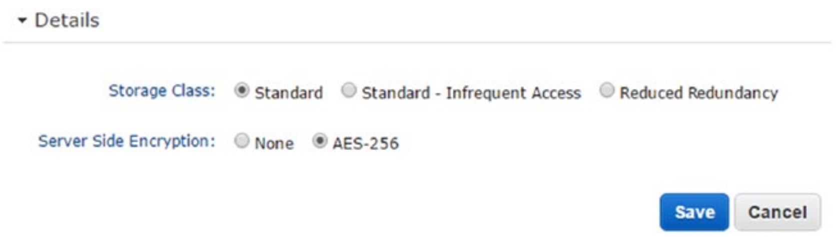
Name	Storage Class	Size	Last Modified
HelloWorldS3.txt	Standard	17 bytes	Thu Jan 26 21:12:26 GMT+530
apress	--	--	--

Object: HelloWorldS3.txt

Bucket:	chapter5-s3-bucket
Name:	HelloWorldS3.txt
Link:	https://s3-us-west-2.amazonaws.com/chapter5-s3-bucket/HelloWorldS3.txt
Size:	17
Last Modified:	Thu Jan 26 21:12:26 GMT+530 2017
Owner:	sunil.gulabani2
ETag:	0a70f3ed476d471325b52fdf56aa7ff9
Expiry Date:	None
Expiration Rule:	N/A

Figure 5-46. *Object listing*

8. You can set the object storage class and server side encryption from the Properties section under Details, as shown in Figure 5-47.

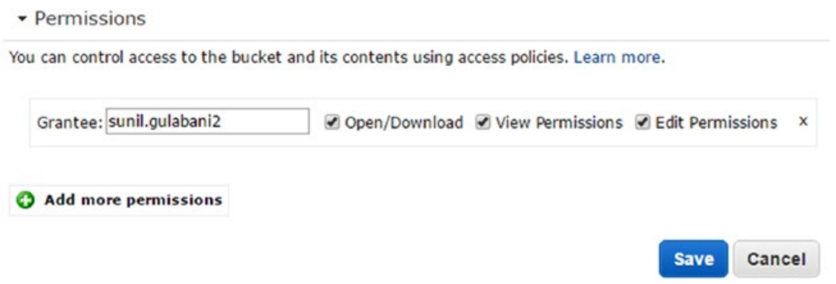


Storage Class: [✓ Standard] Standard - Infrequent Access Reduced Redundancy

Server Side Encryption: None [✓ AES-256]

Figure 5-47. *Object's details*

9. You can configure permissions from the Properties section under Permissions, as shown in Figure 5-48.

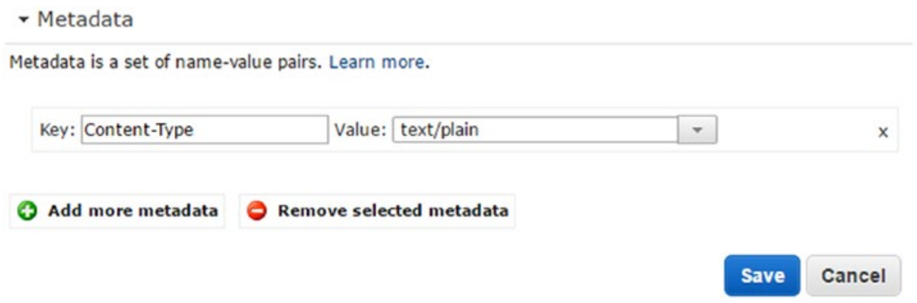


You can control access to the bucket and its contents using access policies. Learn more.

Grantee: sunil.gulabani2 [✓ Open/Download] [✓ View Permissions] [✓ Edit Permissions]

Figure 5-48. *Object permissions*

10. You can configure metadata from the Properties section under Metadata, as shown in Figure 5-49.



Metadata is a set of name-value pairs. Learn more.

Key: Content-Type Value: text/plain

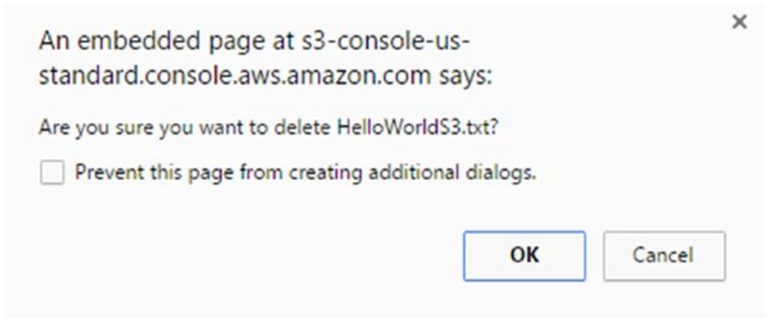
Figure 5-49. *Object metadata*

Deleting Objects

Deleting an object will remove the object from the bucket. There are two ways to delete an object:

1. Select the object, open the Context (right-click) menu, and click Delete. OR
2. Select the object and click Delete.

The screen in Figure 5-50 will appear, asking for confirmation to delete the object.



An embedded page at s3-console-us-standard.console.aws.amazon.com says:

Are you sure you want to delete HelloWorldS3.txt?

☐ Prevent this page from creating additional dialogs.

Figure 5-50. *Delete object*

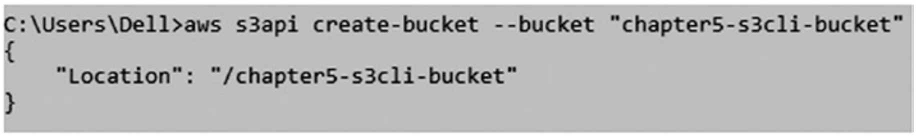
Using AWS CLI

In Chapter 1, you saw how to install AWS CLI. Now you will learn how to use AWS CLI to manage AWS S3.

Create Bucket

The create-bucket command helps to create a new bucket in AWS S3:

```
>aws s3api create-bucket --bucket "chapter5-s3cli-bucket"
```

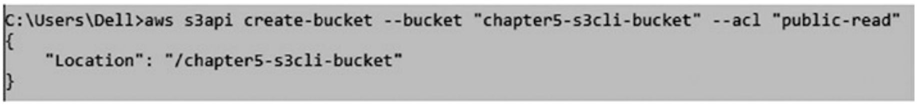


```
C:\Users\Dell>aws s3api create-bucket --bucket "chapter5-s3cli-bucket"
{
    "Location": "/chapter5-s3cli-bucket"
}
```

You can assign an access control list (ACL) to the bucket while creating. The following are valid values:

- private
- public-read
- public-read-write
- authenticated-read

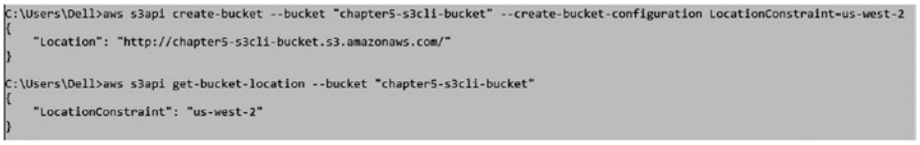
```
>aws s3api create-bucket --bucket "chapter5-s3cli-bucket" --acl
"public-read"
```



```
C:\Users\Dell>aws s3api create-bucket --bucket "chapter5-s3cli-bucket" --acl "public-read"
{
    "Location": "/chapter5-s3cli-bucket"
}
```

You can add the bucket location to be created in a specific region. By default, the bucket will be created in "US Standard" region:

```
>aws s3api create-bucket --bucket "chapter5-s3cli-bucket" --create-bucket-
configuration LocationConstraint=us-west-2

>aws s3api get-bucket-location --bucket "chapter5-s3cli-bucket"
```



```
C:\Users\Dell>aws s3api create-bucket --bucket "chapter5-s3cli-bucket" --create-bucket-configuration LocationConstraint=us-west-2
{
    "Location": "http://chapter5-s3cli-bucket.s3.amazonaws.com/"
}

C:\Users\Dell>aws s3api get-bucket-location --bucket "chapter5-s3cli-bucket"
{
    "LocationConstraint": "us-west-2"
}
```

The following are valid values for `LocationConstraint`:

- us-west-1
- us-west-2
- ca-central-1
- EU or eu-west-1
- eu-west-2
- eu-central-1
- ap-south-1
- ap-southeast-1
- ap-southeast-2
- ap-northeast-1
- ap-northeast-2
- sa-east-1
- " "empty string - US East region (N. Virginia)
- us-east-2

To grant access to grantee for `READ`, `WRITE`, `READ_ACP`, and `WRITE_ACP` on any objects in the bucket, we have the following:

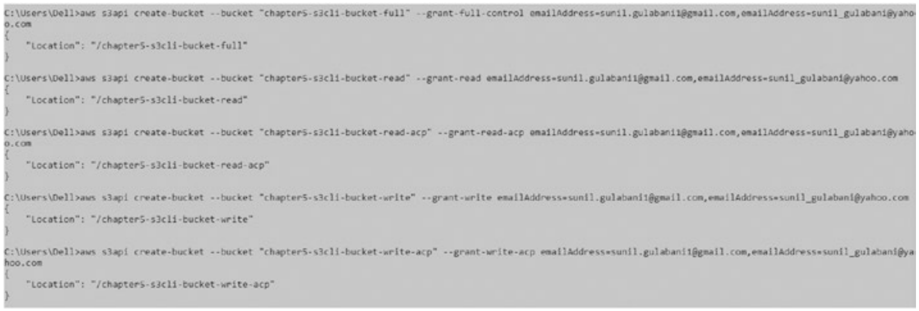
- grant-full-control
- grant-read
- grant-read-acp
- grant-write
- grant-write-acp

The grantee can be provided in any of the following key-pair forms:

- emailAddress - Email address of AWS account
- id - AWS account's canonical ID
- uri - prefined group

```
>aws s3api create-bucket --bucket "chapter5-s3cli-bucket-full" --grant-full-
control emailAddress=sunil.gulabani1@gmail.com,emailAddress=sunil_gulabani@
yahoo.com
```

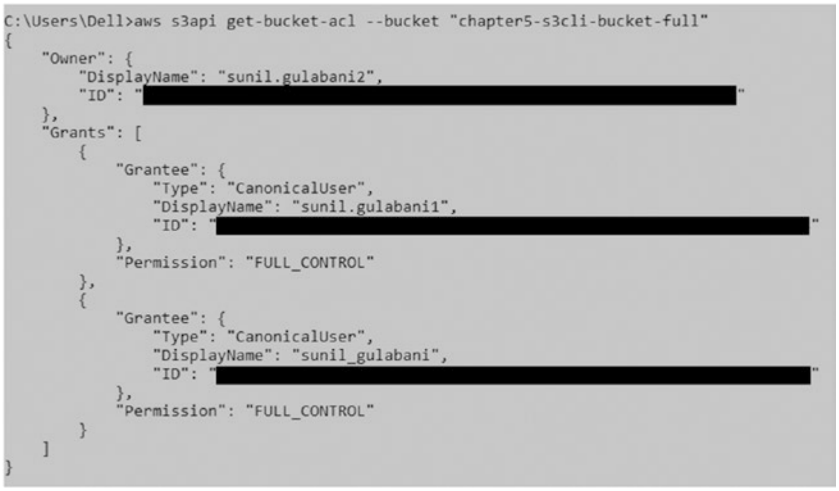
```
>aws s3api create-bucket --bucket "chapter5-s3cli-bucket-read" --grant-read
emailAddress=sunil.gulabani1@gmail.com,emailAddress=sunil_gulabani@yahoo.com

>aws s3api create-bucket --bucket "chapter5-s3cli-bucket-read-acp" --grant-
read-acp emailAddress=sunil.gulabani1@gmail.com,emailAddress=sunil_gulabani@
yahoo.com

>aws s3api create-bucket --bucket "chapter5-s3cli-bucket-write" --grant-
write emailAddress=sunil.gulabani1@gmail.com,emailAddress=sunil_gulabani@
yahoo.com

>aws s3api create-bucket --bucket "chapter5-s3cli-bucket-write-acp" --grant-
write-acp emailAddress=sunil.gulabani1@gmail.com,emailAddress=sunil_
gulabani@yahoo.com
```



```
C:\Users\Dell>aws s3api create-bucket --bucket "chapter5-s3cli-bucket-full" --grant-full-control emailAddress=sunil.gulabani1@gmail.com,emailAddress=sunil_gulabani@yaho
o.com
{
    "Location": "/chapter5-s3cli-bucket-full"
}

C:\Users\Dell>aws s3api create-bucket --bucket "chapter5-s3cli-bucket-read" --grant-read emailAddress=sunil.gulabani1@gmail.com,emailAddress=sunil_gulabani@yahoo.com
{
    "Location": "/chapter5-s3cli-bucket-read"
}

C:\Users\Dell>aws s3api create-bucket --bucket "chapter5-s3cli-bucket-read-acp" --grant-read-acp emailAddress=sunil.gulabani1@gmail.com,emailAddress=sunil_gulabani@yaho
o.com
{
    "Location": "/chapter5-s3cli-bucket-read-acp"
}

C:\Users\Dell>aws s3api create-bucket --bucket "chapter5-s3cli-bucket-write" --grant-write emailAddress=sunil.gulabani1@gmail.com,emailAddress=sunil_gulabani@yahoo.com
{
    "Location": "/chapter5-s3cli-bucket-write"
}

C:\Users\Dell>aws s3api create-bucket --bucket "chapter5-s3cli-bucket-write-acp" --grant-write-acp emailAddress=sunil.gulabani1@gmail.com,emailAddress=sunil_gulabani@ya
hoo.com
{
    "Location": "/chapter5-s3cli-bucket-write-acp"
}
```

To get the ACL for specific bucket, use get-bucket-acl:

```
>aws s3api get-bucket-acl --bucket "chapter5-s3cli-bucket-full"
```



```
C:\Users\Dell>aws s3api get-bucket-acl --bucket "chapter5-s3cli-bucket-full"
{
    "Owner": {
        "DisplayName": "sunil.gulabani2",
        "ID": "[redacted]"
    },
    "Grants": [
        {
            "Grantee": {
                "Type": "CanonicalUser",
                "DisplayName": "sunil.gulabani1",
                "ID": "[redacted]"
            },
            "Permission": "FULL_CONTROL"
        },
        {
            "Grantee": {
                "Type": "CanonicalUser",
                "DisplayName": "sunil_gulabani",
                "ID": "[redacted]"
            },
            "Permission": "FULL_CONTROL"
        }
    ]
}
```

Bucket Permissions

Bucket permission can also be added after the bucket is created. You can add bucket policy in multiple ways:

```
>aws s3api put-bucket-acl --bucket "chapter5-s3cli-bucket-full" --acl
private
```

Valid values for `--acl` are as follows:

- private
- public-read
- public-read-write
- authenticated-read

You can also provide the JSON format that has different grants to users:

```
>aws s3api put-bucket-acl --bucket "chapter5-s3cli-bucket-full" --access-
control-policy file://C:/Users/Dell/access-control-policy.json

access-control-policy.json
{
  "Grants": [
        {
      "Grantee": {
        "ID": "99r85d7ty258cf63e108d306ea1b4xxxxxxxxxxxxxxxxxxxx
               AWSCanonicalUserID",
        "Type": "CanonicalUser"
      },
      "Permission": "FULL_CONTROL"
    }, {
      "Grantee": {
        "EmailAddress": "sunil.gulabani1@gmail.com",
        "Type": "AmazonCustomerByEmail"
      },
      "Permission": "WRITE"
    }
  ],
  "Owner": {
    "DisplayName": "sunil.gulabani2@gmail.com",
    "ID": "99r85d7ty258cf63e108d306ea1b4xxxxxxxxxxxxxxxxxxxx
           AWSCanonicalUserID"
  }
}
```

■ **Note** To get the Canonical User ID, go to https://console.aws.amazon.com/iam/home?#/security_credential. Under the Account Identifiers section, you can get the Canonical User ID.

Valid values for grantee types are as follows:

- CanonicalUser
- AmazonCustomerByEmail
- Group

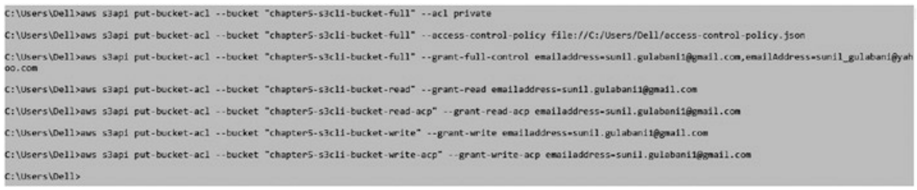
The following are valid values for permission:

- FULL_CONTROL
- WRITE
- WRITE_ACP
- READ
- READ_ACP

There are also specific grant commands that can have commas separating grantees. Grantees can be defined in key-value form. Keys can have the following forms:

- emailAddress
- id
- url

```
> aws s3api put-bucket-acl --bucket "chapter5-s3cli-bucket-full"
--grant-full-control emailaddress=sunil.gulabani1@gmail.com,emailAddress=
sunil_gulabani@yahoo.com

> aws s3api put-bucket-acl --bucket "chapter5-s3cli-bucket-read"
--grant-read emailaddress=sunil.gulabani1@gmail.com

> aws s3api put-bucket-acl --bucket "chapter5-s3cli-bucket-read-acp"
--grant-read-acp emailaddress=sunil.gulabani1@gmail.com

> aws s3api put-bucket-acl --bucket "chapter5-s3cli-bucket-write"
--grant-write emailaddress=sunil.gulabani1@gmail.com

> aws s3api put-bucket-acl --bucket "chapter5-s3cli-bucket-write-acp"
--grant-write-acp emailaddress=sunil.gulabani1@gmail.com
```



```
C:\Users\Dell>aws s3api put-bucket-acl --bucket "chapter5-s3cli-bucket-full" --acl private

C:\Users\Dell>aws s3api put-bucket-acl --bucket "chapter5-s3cli-bucket-full" --access-control-policy file://C:/Users/Dell/access-control-policy.json

C:\Users\Dell>aws s3api put-bucket-acl --bucket "chapter5-s3cli-bucket-full" --grant-full-control emailaddress=sunil.gulabani1@gmail.com,emailAddress=sunil_gulabani@yah
oo.com

C:\Users\Dell>aws s3api put-bucket-acl --bucket "chapter5-s3cli-bucket-read" --grant-read emailaddress=sunil.gulabani1@gmail.com

C:\Users\Dell>aws s3api put-bucket-acl --bucket "chapter5-s3cli-bucket-read-acp" --grant-read-acp emailaddress=sunil.gulabani1@gmail.com

C:\Users\Dell>aws s3api put-bucket-acl --bucket "chapter5-s3cli-bucket-write" --grant-write emailaddress=sunil.gulabani1@gmail.com

C:\Users\Dell>aws s3api put-bucket-acl --bucket "chapter5-s3cli-bucket-write-acp" --grant-write-acp emailaddress=sunil.gulabani1@gmail.com

C:\Users\Dell>
```

The put-bucket-acl command doesn't provide any response.

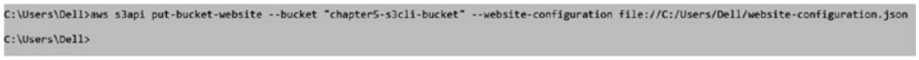
Static Website Hosting

You can host static web sites on AWS S3. You need to create a bucket and then configure the bucket:

```
>aws s3api put-bucket-website --bucket "chapter5-s3cli-bucket"
--website-configuration file://C:/Users/Dell/website-configuration.json
```

website-configuration.json

```
{
  "ErrorDocument": {
    "Key": "error.html"
  },
  "IndexDocument": {
    "Suffix": "index.html"
  }
}
```



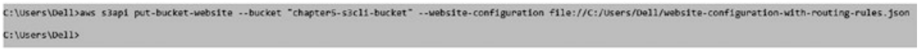
```
C:\Users\Dell>aws s3api put-bucket-website --bucket "chapter5-s3cli-bucket" --website-configuration file://C:/Users/Dell/website-configuration.json

C:\Users\Dell>
```

You can also add custom rules to redirect requests to other hosts or replace some keys:

```
>aws s3api put-bucket-website --bucket "chapter5-s3cli-bucket"
--website-configuration file://C:/Users/Dell/website-configuration-with-
routing-rules.json
```

website-configuration-with-routing-rules.json

```
{
  "ErrorDocument": {
    "Key": "error.html"
  },
  "IndexDocument": {
    "Suffix": "index.html"
  },
  "RoutingRules": [
    {
      "Condition": {
        "KeyPrefixEquals": "chapter5"
      },
      "Redirect": {
        "ReplaceKeyPrefixWith": "chapter"
      }
    }
  ]
}
```



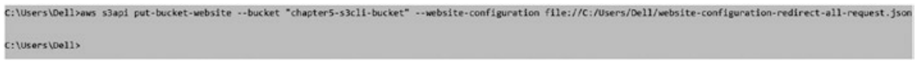
```
C:\Users\Dell>aws s3api put-bucket-website --bucket "chapter5-s3cli-bucket" --website-configuration file://C:/Users/Dell/website-configuration-with-routing-rules.json

C:\Users\Dell>
```

The above-mentioned rules will replace the “chapter5” key with a “chapter” value. You can have other parameters that can be configured in routing rules:

```
"RoutingRules": [
    {
      "Condition": {
        "HttpErrorCodeReturnedEquals": "string",
        "KeyPrefixEquals": "string"
      },
      "Redirect": {
        "HostName": "string",
        "HttpRedirectCode": "string",
        "Protocol": "http"|"https",
        "ReplaceKeyPrefixWith": "string",
        "ReplaceKeyWith": "string"
      }
    }
  ]
```

You can also redirect all requests to a specific host:

```
>aws s3api put-bucket-website --bucket "chapter5-s3cli-bucket"
--website-configuration file://C:/Users/Dell/website-configuration-redirect-
all-request.json

website-configuration-redirect-all-request.json

{
  "RedirectAllRequestsTo": {
    "HostName": "sunilgulabani.com",
    "Protocol": "http"
  }
}
```

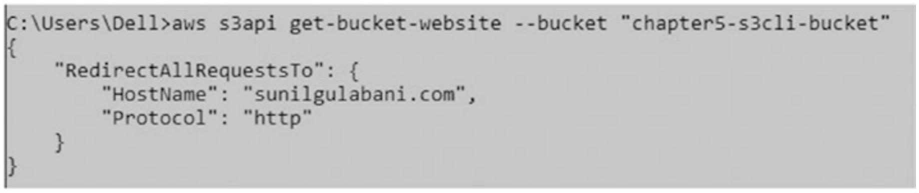


```
C:\Users\Dell>aws s3api put-bucket-website --bucket "chapter5-s3cli-bucket" --website-configuration file://C:/Users/Dell/website-configuration-redirect-all-request.json

C:\Users\Dell>
```

Valid values for “Protocol” are: HTTP and HTTPS.

To view the web site configuration, use the get-bucket-website command:

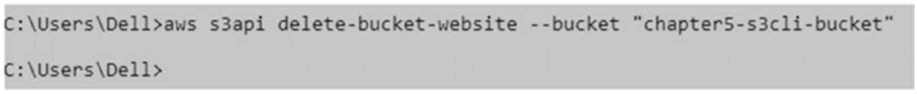
```
>aws s3api get-bucket-website --bucket "chapter5-s3cli-bucket"
```



```
C:\Users\Dell>aws s3api get-bucket-website --bucket "chapter5-s3cli-bucket"
{
    "RedirectAllRequestsTo": {
        "HostName": "sunilgulabani.com",
        "Protocol": "http"
    }
}
```

To delete the web site configuration, use the delete-bucket-website command:

```
>aws s3api delete-bucket-website --bucket "chapter5-s3cli-bucket"
```



```
C:\Users\Dell>aws s3api delete-bucket-website --bucket "chapter5-s3cli-bucket"

C:\Users\Dell>
```

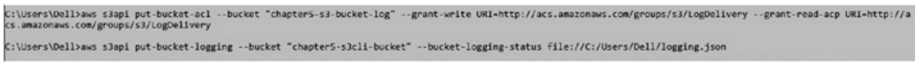
Logging

You can enable the logging on bucket activities. Buckets need to have write and read acp ACL for LogDelivery system:

```
>aws s3api put-bucket-acl --bucket "chapter5-s3cli-bucket"
--grant-write URI=http://acs.amazonaws.com/groups/s3/LogDelivery
--grant-read-acp URI=http://acs.amazonaws.com/groups/s3/LogDelivery

>aws s3api put-bucket-logging --bucket "chapter5-s3cli-bucket"
--bucket-logging-status file://C:/Users/Dell/logging.json
```

logging.json

```
{
  "LoggingEnabled": {
    "TargetBucket": "chapter5-s3-bucket-log",
    "TargetPrefix": "logs",
    "TargetGrants": [
      {
        "Grantee": {
          "EmailAddress": "sunil.gulabani2@gmail.com",
          "Type": "AmazonCustomerByEmail"
        },
        "Permission": "FULL_CONTROL"
      }
    ]
  }
}
```



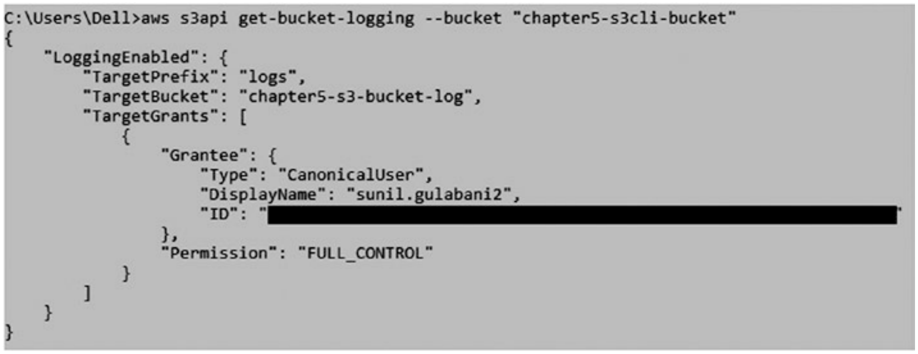
```
C:\Users\Dell>aws s3api put-bucket-acl --bucket "chapter5-s3-bucket-log" --grant-write URI=http://acs.amazonaws.com/groups/s3/LogDelivery --grant-read-acp URI=http://a
cs.amazonaws.com/groups/s3/LogDelivery

C:\Users\Dell>aws s3api put-bucket-logging --bucket "chapter5-s3cli-bucket" --bucket-logging-status file://C:/Users/Dell/logging.json
```

The “TargetGrants” tag can have multiple combinations:

```
{
    "Grantee": {
      "DisplayName": "DISPLAY_NAME",
      "EmailAddress": "EMAIL_ADDRESS",
      "ID": "CANONICAL_USER_ID",
      "Type": "CanonicalUser"|"AmazonCustomerByEmail"|"Group",
      "URI": "GROUP_ID"
    },
      "Permission": "FULL_CONTROL"|"READ"|"WRITE"
}
```

To view the bucket logging status, use the following:

```
>aws s3api get-bucket-logging --bucket "chapter5-s3cli-bucket"
```



```
C:\Users\Dell>aws s3api get-bucket-logging --bucket "chapter5-s3cli-bucket"
{
    "LoggingEnabled": {
        "TargetPrefix": "logs",
        "TargetBucket": "chapter5-s3-bucket-log",
        "TargetGrants": [
            {
                "Grantee": {
                    "Type": "CanonicalUser",
                    "DisplayName": "sunil.gulabani2",
                    "ID": "[redacted]"
                },
                "Permission": "FULL_CONTROL"
            }
        ]
    }
}
```

To disable logging, you can use the same put-bucket-logging command, but the JSON structure will have no data:

```
>aws s3api put-bucket-logging --bucket "chapter5-s3cli-bucket"
--bucket-logging-status file://C:/Users/Dell/logging.json
```

Logging.json

```
{
}
```

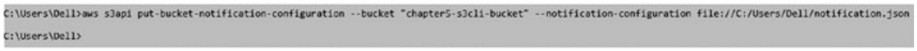
Events

You can trigger notifications over certain events on buckets.

```
>aws s3api put-bucket-notification-configuration --bucket "chapter5-s3cli-
bucket" --notification-configuration file://C:/Users/Dell/notification.json
```

notification.json

```
{
    "TopicConfigurations": [{
         "TopicArn": "arn:aws:sns:us-east-1:298147259238:objectCreated
          SNSTopic",
          "Events": [
              "s3:ObjectCreated:*"
          ]
    }],
    "QueueConfigurations": [{
        "QueueArn": "arn:aws:sqs:us-east-1:298147259238:objectCreatedQueue",
        "Events": [
            "s3:ObjectRemoved:*"
        ],
        "Filter": {
            "Key": {
                "FilterRules": [{
                    "Name": "prefix",
                    "Value": "chapter5"
             }, {
                    "Name": "suffix",
                    "Value": "log"
                }
                }]
        }
    }]
}
```



```
C:\Users\Dell>aws s3api put-bucket-notification-configuration --bucket "chapter5-s3cli-bucket" --notification-configuration file://C:/Users/Dell/notification.json
C:\Users\Dell>
```

You can also trigger events on SQS, SNS, and lambda function.
Valid values for events are the following:

- s3:ReducedRedundancyLostObject
- s3:ObjectCreated:*
- s3:ObjectCreated:Put
- s3:ObjectCreated:Post
- s3:ObjectCreated:Copy
- s3:ObjectCreated:CompleteMultipartUpload
- s3:ObjectRemoved:*
- s3:ObjectRemoved:Delete
- s3:ObjectRemoved:DeleteMarkerCreated

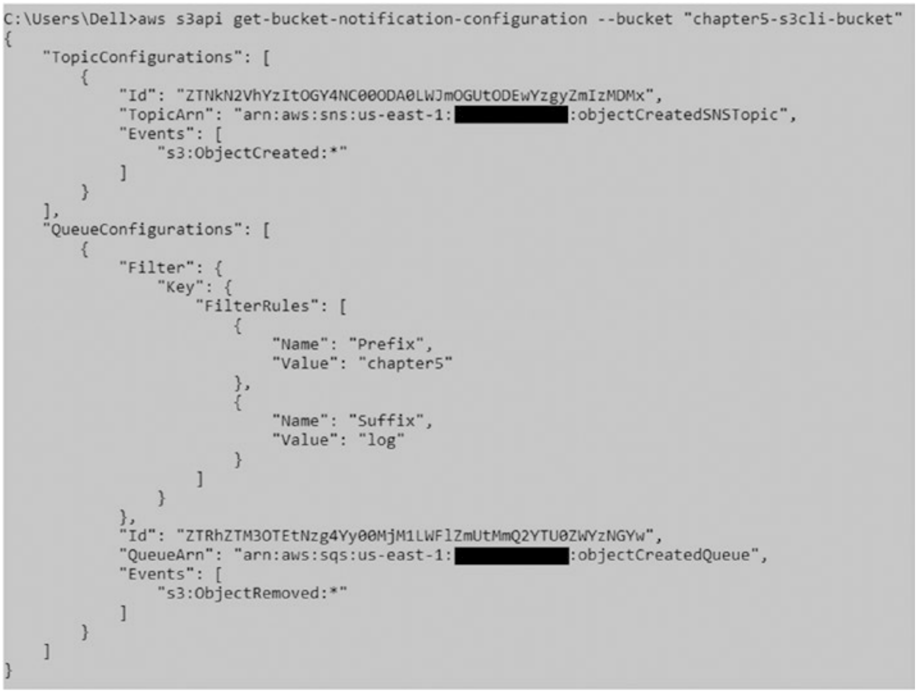
To add lambda function notification configuration, add the following tag:

```
"LambdaFunctionConfigurations": [{
    "LambdaFunctionArn": "arn:aws:lambda:us-east-1:298147259238:function:obj
     ectCreatedFunction",
    "Events": [
         "s3:ReducedRedundancyLostObject"
    ]
}]
```

■ **Note** SQS, SNS, and lambda function should have an IAM policy so that S3 can publish events before creating notifications.

To view the bucket notification configurations, use the following:

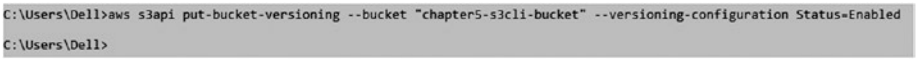
```
>aws s3api get-bucket-notification-configuration
--bucket "chapter5-s3cli-bucket"
```


```
C:\Users\Dell>aws s3api get-bucket-notification-configuration --bucket "chapter5-s3cli-bucket"
{
    "TopicConfigurations": [
        {
            "Id": "ZTNkN2VhYzItOGY4NC00ODA0LWJmOGUtODEwYzgyZmIzMDMx",
            "TopicArn": "arn:aws:sns:us-east-1:[redacted]:objectCreatedSNSTopic",
            "Events": [
                "s3:ObjectCreated:*"
            ]
        }
    ],
    "QueueConfigurations": [
        {
            "Filter": {
                "Key": {
                    "FilterRules": [
                        {
                            "Name": "Prefix",
                            "Value": "chapter5"
                        },
                        {
                            "Name": "Suffix",
                            "Value": "log"
                        }
                    ]
                }
            },
            "Id": "ZTRhZTM3OTEtNzg4Yy00MjM1LWFlZmUtMmQ2YTU0ZWYzNGYw",
            "QueueArn": "arn:aws:sqs:us-east-1:[redacted]:objectCreatedQueue",
            "Events": [
                "s3:ObjectRemoved:*"
            ]
        }
    ]
}
```

Versioning

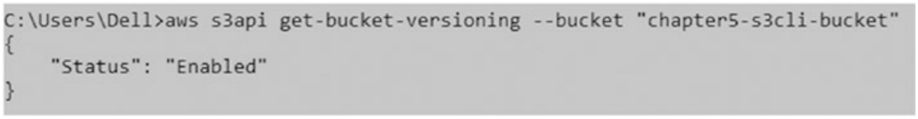
Versioning is used to maintain multiple versions of objects. It is used to restore the older objects:

```
>aws s3api put-bucket-versioning --bucket "chapter5-s3cli-bucket"
--versioning-configuration Status=Enabled
```


```
C:\Users\Dell>aws s3api put-bucket-versioning --bucket "chapter5-s3cli-bucket" --versioning-configuration Status=Enabled

C:\Users\Dell>
```

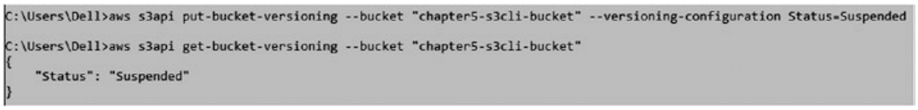
To get the versioning state, use the get-bucket-versioning command:

```
>aws s3api get-bucket-versioning --bucket "chapter5-s3cli-bucket"
```


```
C:\Users\Dell>aws s3api get-bucket-versioning --bucket "chapter5-s3cli-bucket"
{
    "Status": "Enabled"
}
```

Versioning can't be disabled; it can only be enabled or suspended. To suspend the versioning, we will use the same put-bucket-configuration:

```
>aws s3api put-bucket-versioning --bucket "chapter5-s3cli-bucket"
--versioning-configuration Status=Suspended

>aws s3api get-bucket-versioning --bucket "chapter5-s3cli-bucket"
```



```
C:\Users\Dell>aws s3api put-bucket-versioning --bucket "chapter5-s3cli-bucket" --versioning-configuration Status=Suspended

C:\Users\Dell>aws s3api get-bucket-versioning --bucket "chapter5-s3cli-bucket"
{
    "Status": "Suspended"
}
```

Life Cycle

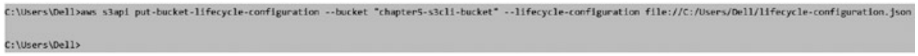
Object life cycle can be fined on the bucket level. Life-cycle management helps us to perform actions such as the following:

- Taking necessary steps for older versions of objects
- Applying specific rules on newly added objects
- Moving older objects to Glacier or Standard - Infrequent Access storage

```
>aws s3api put-bucket-lifecycle-configuration --bucket "chapter5-s3cli-
bucket" --lifecycle-configuration file://C:/Users/Dell/lifecycle-
configuration.json
```

lifecycle-configuration.json

```
{
    "Rules": [{
            "ID": "Expiration Action with Date",
            "Prefix": "chapter1",
            "Status": "Enabled",
            "Expiration": {
                    "Date": "2017-02-04T00:00:00.000Z"
            }
    }, {
            "ID": "Expiration Action with Days",
            "Prefix": "chapter2",
            "Status": "Enabled",
            "Expiration": {
                    "Days": 30
            }
    }, {
            "ID": "Move old objects to Glacier Action",
            "Prefix": "chapter3",
            "Status": "Enabled",
            "Transitions": [{
                    "Date": "2017-03-01T00:00:00.000Z",
                    "StorageClass": "GLACIER"
            }]
    }, {
            "ID": "Non-Current Versioned Object Actions",
            "Prefix": "chapter4",
            "Status": "Enabled",
            "NoncurrentVersionTransitions": [{
                    "NoncurrentDays": 30,
                    "StorageClass": "STANDARD_IA"
            }],
            "NoncurrentVersionExpiration": {
                    "NoncurrentDays": 40
            }
    }, {
            "ID": "Abort Incomplete Multipart Action",
            "Prefix": "chapter5",
            "Status": "Enabled",
            "AbortIncompleteMultipartUpload": {
                    "DaysAfterInitiation": 1
            }
    }]
}
```



```
C:\Users\Dell>aws s3api put-bucket-lifecycle-configuration --bucket "chapter5-s3cli-bucket" --lifecycle-configuration file://C:/Users/Dell/lifecycle-configuration.json

C:\Users\Dell>
```

The "Expiration" tag can contain the following:

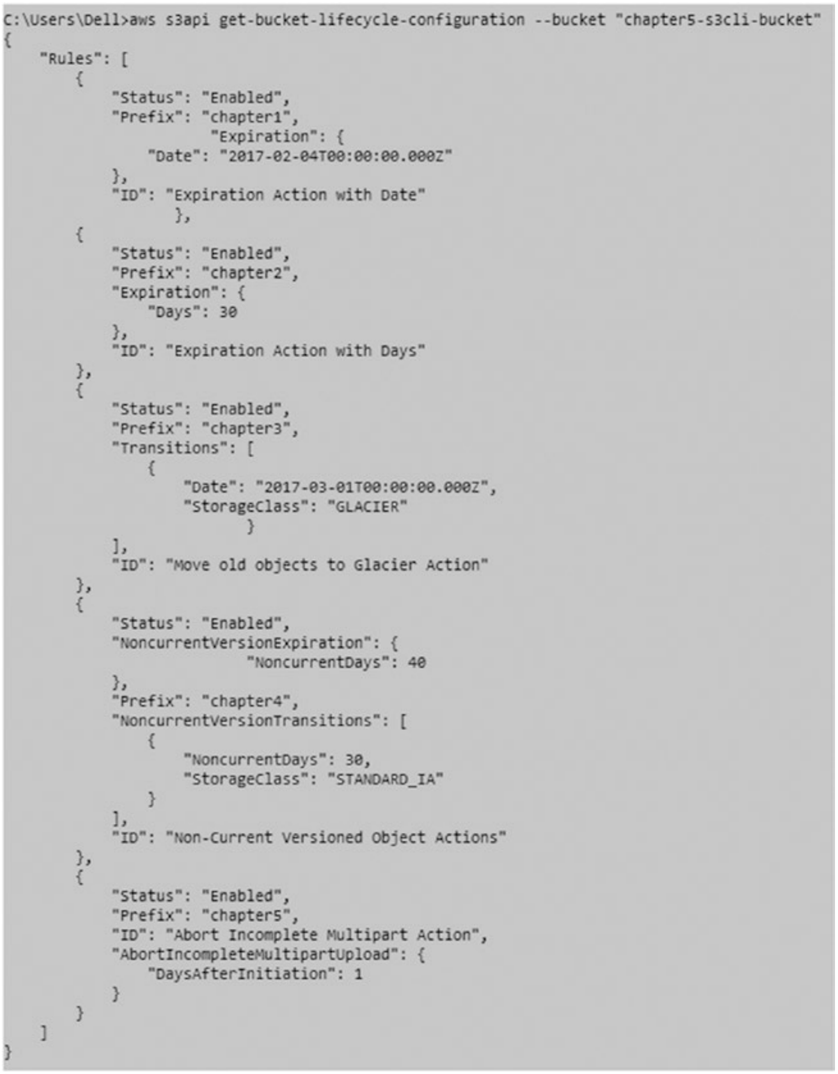
- "Date": It signifies to activate action to expire objects starting from the specified date.
- "Day": It signifies to expire objects after the specified days of object creation.

The "Status" tag can have two values: Enabled or Disabled.
The "StorageClass" tag can have the following values:

- GLACIER
- STANDARD_IA

To view the bucket life-cycle configuration, use the get-bucket-lifecycle-configuration command:

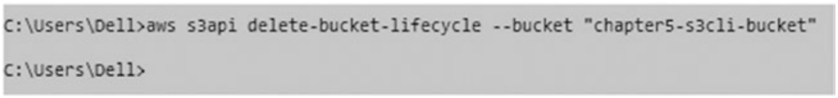
```
>aws s3api get-bucket-lifecycle-configuration
--bucket "chapter5-s3cli-bucket"
```



```
C:\Users\Dell>aws s3api get-bucket-lifecycle-configuration --bucket "chapter5-s3cli-bucket"
{
    "Rules": [
        {
            "Status": "Enabled",
            "Prefix": "chapter1",
                     "Expiration": {
                "Date": "2017-02-04T00:00:00.000Z"
            },
            "ID": "Expiration Action with Date"
                  },
        {
            "Status": "Enabled",
            "Prefix": "chapter2",
            "Expiration": {
                "Days": 30
            },
            "ID": "Expiration Action with Days"
        },
        {
            "Status": "Enabled",
            "Prefix": "chapter3",
            "Transitions": [
                {
                    "Date": "2017-03-01T00:00:00.000Z",
                    "StorageClass": "GLACIER"
                          }
            ],
            "ID": "Move old objects to Glacier Action"
        },
        {
            "Status": "Enabled",
            "NoncurrentVersionExpiration": {
                           "NoncurrentDays": 40
            },
            "Prefix": "chapter4",
            "NoncurrentVersionTransitions": [
                {
                    "NoncurrentDays": 30,
                    "StorageClass": "STANDARD_IA"
                }
            ],
            "ID": "Non-Current Versioned Object Actions"
        },
        {
            "Status": "Enabled",
            "Prefix": "chapter5",
            "ID": "Abort Incomplete Multipart Action",
            "AbortIncompleteMultipartUpload": {
                "DaysAfterInitiation": 1
            }
        }
    ]
}
```

To delete the bucket life cycle configuration, use the delete-bucket-lifecycle command:

```
>aws s3api delete-bucket-lifecycle --bucket "chapter5-s3cli-bucket"
```



```
C:\Users\Dell>aws s3api delete-bucket-lifecycle --bucket "chapter5-s3cli-bucket"

C:\Users\Dell>
```

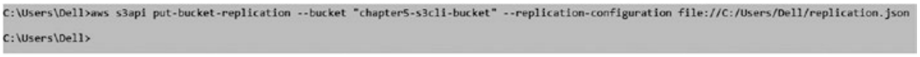
Cross-Region Replication

Buckets can be replicated to other regions for backup purposes or for faster availability to other regions' users. It is mandatory that versioning should be enabled on a bucket:

```
>aws s3api put-bucket-replication --bucket "chapter5-s3cli-bucket"
--replication-configuration file://C:/Users/Dell/replication.json
```

replication.json

```
{
    "Role": "arn:aws:iam::298147259238:role/s3-bucket-replication",
    "Rules": [
      {
          "ID": "S3 bucket replication",
          "Prefix": "",
          "Status": "Enabled",
          "Destination": {
              "Bucket": "arn:aws:s3:::chapter5-s3cli-bucket-backup",
              "StorageClass": "STANDARD"
           }
      }
    ]
}
```



```
C:\Users\Dell>aws s3api put-bucket-replication --bucket "chapter5-s3cli-bucket" --replication-configuration file://C:/Users/Dell/replication.json
C:\Users\Dell>
```

"Role" should have a policy to access S3 with all operations and a trust relationship for role should have the following:

Service Policy

```
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Effect": "Allow",
            "Action": "s3:*",
            "Resource": "*"
        }
    ]
}
```

Trust Relationships

```
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Effect": "Allow",
            "Principal": {
                "Service": "s3.amazonaws.com"
             },
            "Action": "sts:AssumeRole"
        }
     ]
}
```

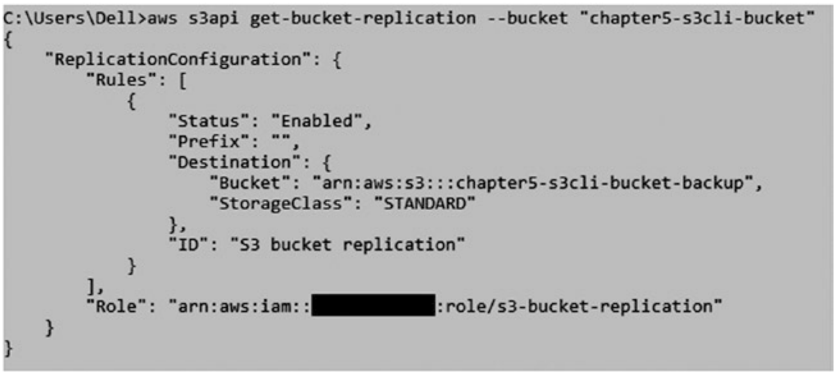
"Status" can have value: Enabled or Disabled.
"StorageClass" can have the following values:

- STANDARD
- REDUCED_REDUNDANCY
- STANDARD_IA

■ **Note** Versioning needs to be enabled for source and destination buckets.

To get the replication configuration, use the get-bucket-replication command:

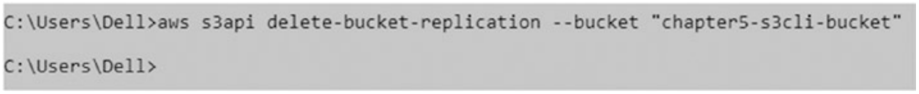
```
>aws s3api get-bucket-replication --bucket "chapter5-s3cli-bucket"
```



```
C:\Users\Dell>aws s3api get-bucket-replication --bucket "chapter5-s3cli-bucket"
{
    "ReplicationConfiguration": {
        "Rules": [
            {
                "Status": "Enabled",
                "Prefix": "",
                "Destination": {
                    "Bucket": "arn:aws:s3:::chapter5-s3cli-bucket-backup",
                    "StorageClass": "STANDARD"
                },
                "ID": "S3 bucket replication"
            }
        ],
        "Role": "arn:aws:iam::[redacted]:role/s3-bucket-replication"
    }
}
```

To delete the bucket replication configuration, use the delete-bucket-replication command:

```
>aws s3api delete-bucket-replication --bucket "chapter5-s3cli-bucket"
```



```
C:\Users\Dell>aws s3api delete-bucket-replication --bucket "chapter5-s3cli-bucket"

C:\Users\Dell>
```

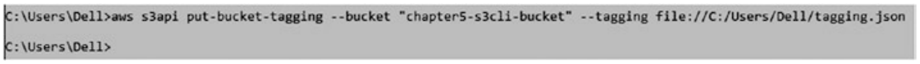
Tags

Tagging can be set on buckets. Tags can have a key-value format:

```
>aws s3api put-bucket-tagging --bucket "chapter5-s3cli-bucket" --tagging
file://C:/Users/Dell/tagging.json
```

tagging.json

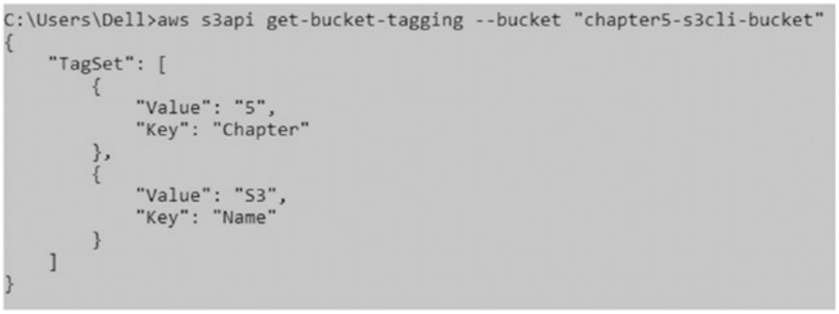
```
{
    "TagSet": [{
            "Key": "Chapter",
            "Value": "5"
    }, {
            "Key": "Name",
            "Value": "S3"
    }]
}
```



```
C:\Users\Dell>aws s3api put-bucket-tagging --bucket "chapter5-s3cli-bucket" --tagging file://C:/Users/Dell/tagging.json

C:\Users\Dell>
```

To get the tags associated with the bucket, use the get-bucket-tagging command:

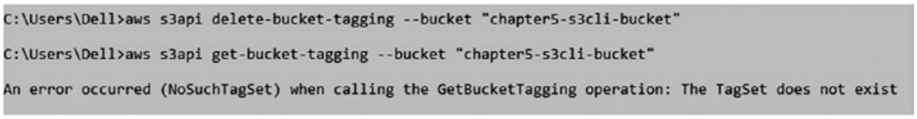
```
>aws s3api get-bucket-tagging --bucket "chapter5-s3cli-bucket"
```



```
C:\Users\Dell>aws s3api get-bucket-tagging --bucket "chapter5-s3cli-bucket"
{
    "TagSet": [
        {
            "Value": "5",
            "Key": "Chapter"
        },
        {
            "Value": "S3",
            "Key": "Name"
        }
    ]
}
```

To delete the bucket tagging, use the delete-bucket-tagging command:

```
> aws s3api delete-bucket-tagging --bucket "chapter5-s3cli-bucket"
```



```
C:\Users\Dell>aws s3api delete-bucket-tagging --bucket "chapter5-s3cli-bucket"

C:\Users\Dell>aws s3api get-bucket-tagging --bucket "chapter5-s3cli-bucket"

An error occurred (NoSuchTagSet) when calling the GetBucketTagging operation: The TagSet does not exist
```

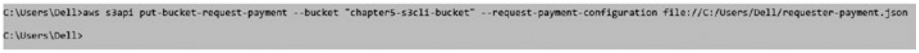
Requester Pays

The Requester Pays feature enables the bucket requestor to pay for the download of the objects instead of the bucket owner:

```
>aws s3api put-bucket-request-payment --bucket "chapter5-s3cli-bucket"
--request-payment-configuration file://C:/Users/Dell/requester-payment.json
```

requester-payment.json

```
{
    "Payer": "Requester"
}
```

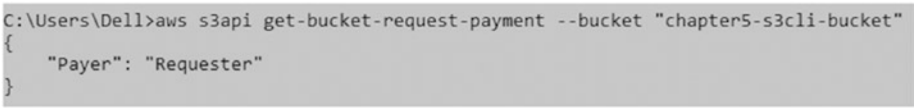


```
C:\Users\Dell>aws s3api put-bucket-request-payment --bucket "chapter5-s3cli-bucket" --request-payment-configuration file://C:/Users/Dell/requester-payment.json
C:\Users\Dell>
```

The “Payer” can have value: Requester or BucketOwner.

To get the requester’s payment, use the following command:

```
>aws s3api get-bucket-request-payment --bucket "chapter5-s3cli-bucket"
```

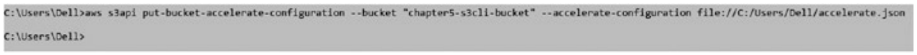


```
C:\Users\Dell>aws s3api get-bucket-request-payment --bucket "chapter5-s3cli-bucket"
{
    "Payer": "Requester"
}
```

Transferring Acceleration

Transferring acceleration makes retrieving the bucket objects much faster:

```
>aws s3api put-bucket-accelerate-configuration --bucket "chapter5-s3cli-
bucket" --accelerate-configuration file://C:/Users/Dell/accelerate.json
accelerate.json
{
    "Status": "Enabled"
}
```

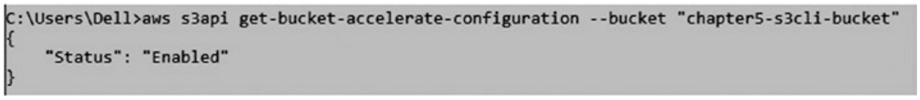


```
C:\Users\Dell>aws s3api put-bucket-accelerate-configuration --bucket "chapter5-s3cli-bucket" --accelerate-configuration file://C:/Users/Dell/accelerate.json

C:\Users\Dell>
```

"Status" can have value: Enabled or Suspended.

To get the transfer accelerate configuration, use the following command:

```
>aws s3api get-bucket-accelerate-configuration --bucket "chapter5-s3cli-
bucket"
```

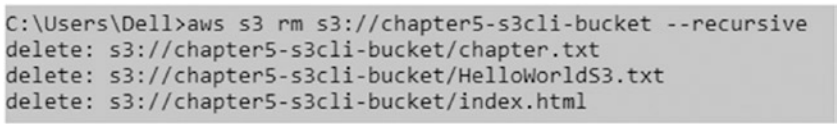


```
C:\Users\Dell>aws s3api get-bucket-accelerate-configuration --bucket "chapter5-s3cli-bucket"
{
    "Status": "Enabled"
}
```

Emptying Buckets

To delete all objects from the S3 bucket, use the high-level S3 command:

```
>aws s3 rm s3://chapter5-s3cli-bucket --recursive
```

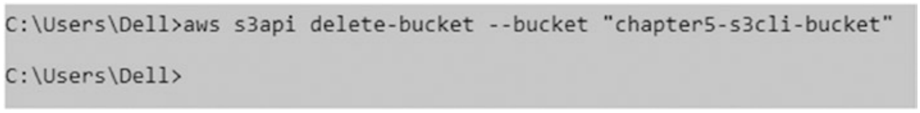


```
C:\Users\Dell>aws s3 rm s3://chapter5-s3cli-bucket --recursive
delete: s3://chapter5-s3cli-bucket/chapter.txt
delete: s3://chapter5-s3cli-bucket/HelloWorldS3.txt
delete: s3://chapter5-s3cli-bucket/index.html
```

Deleting Buckets

To delete a bucket permanently, use the delete-bucket command:

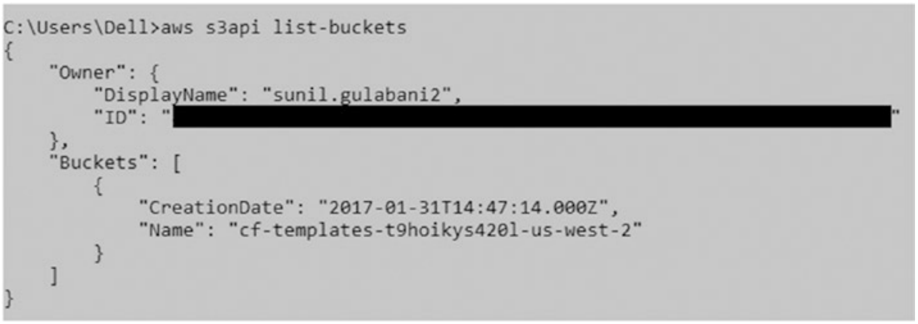
```
>aws s3api delete-bucket --bucket "chapter5-s3cli-bucket"
```



```
C:\Users\Dell>aws s3api delete-bucket --bucket "chapter5-s3cli-bucket"

C:\Users\Dell>
```

To verify that the bucket has been deleted, use the list-buckets command:

```
>aws s3api list-buckets
```

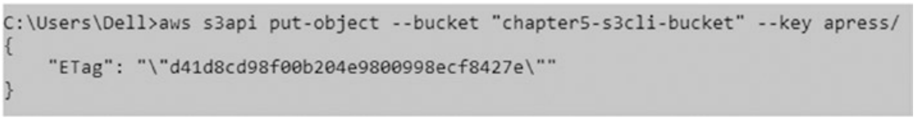


```
C:\Users\Dell>aws s3api list-buckets
{
    "Owner": {
        "DisplayName": "sunil.gulabani2",
        "ID": "[redacted]"
    },
    "Buckets": [
        {
            "CreationDate": "2017-01-31T14:47:14.000Z",
            "Name": "cf-templates-t9hoikys420l-us-west-2"
        }
    ]
}
```

Creating Folders

You can create folders under the bucket using the put-object command:

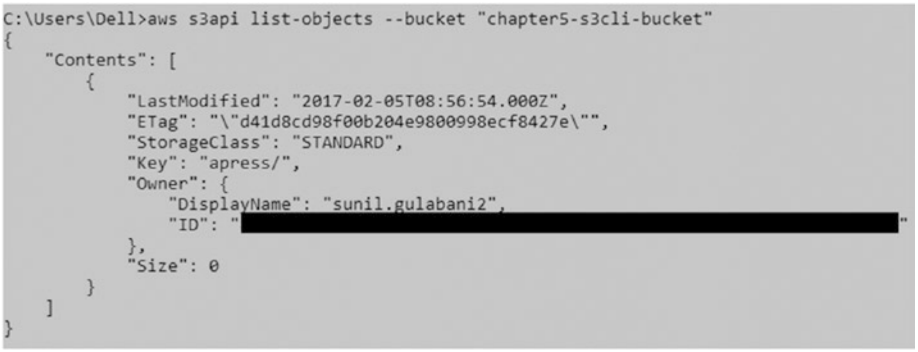
```
>aws s3api put-object --bucket "chapter5-s3cli-bucket" --key apress/
```



```
C:\Users\Dell>aws s3api put-object --bucket "chapter5-s3cli-bucket" --key apress/
{
    "ETag": "\"d41d8cd98f00b204e9800998ecf8427e\""
}
```

You can check that the folder has been created by using the list-objects command:

```
>aws s3api list-objects --bucket "chapter5-s3cli-bucket"
```

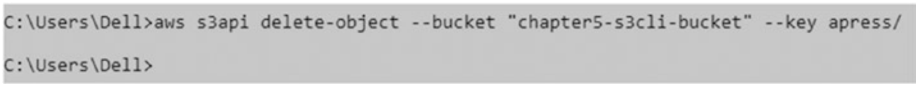


```
C:\Users\Dell>aws s3api list-objects --bucket "chapter5-s3cli-bucket"
{
    "Contents": [
        {
            "LastModified": "2017-02-05T08:56:54.000Z",
            "ETag": "\"d41d8cd98f00b204e9800998ecf8427e\"",
            "StorageClass": "STANDARD",
            "Key": "apress/",
            "Owner": {
                "DisplayName": "sunil.gulabani2",
                "ID": "[redacted]"
            },
            "Size": 0
        }
    ]
}
```

Deleting Folders

To delete a folder, use the delete-object command:

```
>aws s3api delete-object --bucket "chapter5-s3cli-bucket" --key apress/
```

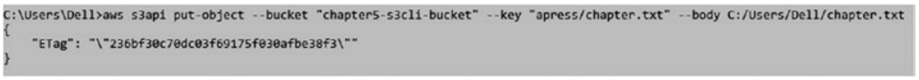


```
C:\Users\Dell>aws s3api delete-object --bucket "chapter5-s3cli-bucket" --key apress/

C:\Users\Dell>
```

Uploading Objects

Uploading an object will add an object to the S3 bucket:

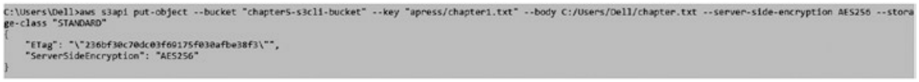
```
>aws s3api put-object --bucket "chapter5-s3cli-bucket" --key "apress/
chapter.txt" --body C:/Users/Dell/chapter.txt
```



```
C:\Users\Dell>aws s3api put-object --bucket "chapter5-s3cli-bucket" --key "apress/chapter.txt" --body C:/Users/Dell/chapter.txt
{
    "ETag": "\"236bf30c70dc03f69175f030afbe38f3\""
}
```

You can assign permissions and other object metadata while uploading the object. To assign server-side encryption and storage class, use the following command:

```
>aws s3api put-object --bucket "chapter5-s3cli-bucket" --key "apress/
chapter1.txt" --body file://C:/Users/Dell/chapter.txt --server-side-
encryption AES256 --storage-class "STANDARD"
```



```
C:\Users\Dell>aws s3api put-object --bucket "chapter5-s3cli-bucket" --key "apress/chapter1.txt" --body C:/Users/Dell/chapter.txt --server-side-encryption AES256 --stora
ge-class "STANDARD"
{
    "ETag": "\"236bf30c70dc03f69175f030afbe38f3\"",
    "ServerSideEncryption": "AES256"
}
```

Following are possible values for server-side encryption:

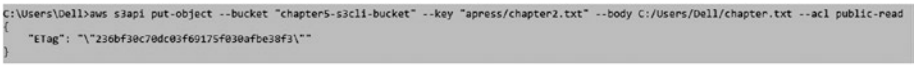
- AES256
- aws:kms

Possible values for storage class are as follows:

- STANDARD
- REDUCED_REDUNDANCY
- STANDARD_IA

To assign canned ACL to an object, use the following command:

```
>aws s3api put-object --bucket "chapter5-s3cli-bucket" --key "apress/
chapter2.txt" --body C:/Users/Dell/chapter.txt --acl public-read
```



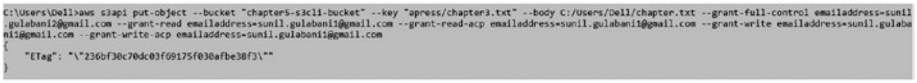
```
C:\Users\Dell>aws s3api put-object --bucket "chapter5-s3cli-bucket" --key "apress/chapter2.txt" --body C:/Users/Dell/chapter.txt --acl public-read
{
    "ETag": "\"236bf30c70dc03f69175f030afbe38f3\""
}
```

Following are possible canned ACL values:

- private
- public-read
- public-read-write
- authenticated-read
- aws-exec-read
- bucket-owner-read
- bucket-owner-full-control

To grant object permissions to individual users, use the following command:

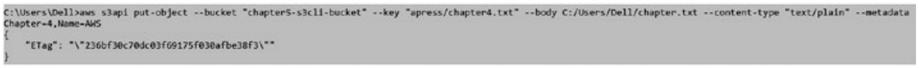
```
>aws s3api put-object --bucket "chapter5-s3cli-bucket" --key "apress/
chapter3.txt" --body C:/Users/Dell/chapter.txt --grant-full-control
emailaddress=sunil.gulabani2@gmail.com --grant-read emailaddress=sunil.
gulabani1@gmail.com --grant-read-acp emailaddress=sunil.gulabani1@gmail.
com --grant-write emailaddress=sunil.gulabani1@gmail.com --grant-write-acp
emailaddress=sunil.gulabani1@gmail.com
```



```
C:\Users\Dell>aws s3api put-object --bucket "chapter5-s3cli-bucket" --key "apress/chapter3.txt" --body C:/Users/Dell/chapter.txt --grant-full-control emailaddress=sunil
.gulabani2@gmail.com --grant-read emailaddress=sunil.gulabani1@gmail.com --grant-read-acp emailaddress=sunil.gulabani1@gmail.com --grant-write emailaddress=sunil.gulaba
ni1@gmail.com --grant-write-acp emailaddress=sunil.gulabani1@gmail.com
{
    "ETag": "\"236bf30c70dc03f69175f030afbe38f3\""
}
```

To add metadata to objects, use the following command:

```
>aws s3api put-object --bucket "chapter5-s3cli-bucket" --key "apress/
chapter4.txt" --body C:/Users/Dell/chapter.txt --content-type "text/plain"
--metadata Chapter=4,Name=AWS
```



```
C:\Users\Dell>aws s3api put-object --bucket "chapter5-s3cli-bucket" --key "apress/chapter4.txt" --body C:/Users/Dell/chapter.txt --content-type "text/plain" --metadata
Chapter=4,Name=AWS
{
    "ETag": "\"236bf30c70dc03f69175f030afbe38f3\""
}
```

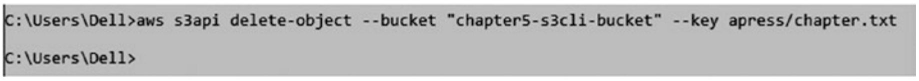
Metadata will have a key-value form that will be associated with objects. This metadata will have the prefix key “x-amz-meta-”.

■ **Note** For more metadata keys, see http://docs.aws.amazon.com/cli/latest/reference/s3api/put-object.html.

Deleting Objects

To delete object from an S3 bucket, use the following command:

```
>aws s3api delete-object --bucket "chapter5-s3cli-bucket"
--key apress/chapter.txt
```



```
C:\Users\Dell>aws s3api delete-object --bucket "chapter5-s3cli-bucket" --key apress/chapter.txt

C:\Users\Dell>
```

Using AWS SDK - Java

In this section, you will learn to use AWS Java SDK to manage AWS S3.

Creating Amazon S3 Client

To create AmazonS3Client, first create the AWSCredentials using either of the credential provider mechanisms. In our case, we will use ProfileCredentialsProvider:

```
AWSCredentials credentials =
    new ProfileCredentialsProvider("sunilgulabani").getCredentials();

AmazonS3Client amazonS3Client = new AmazonS3Client(credentials);
```

This will load the “sunilgulabani” profile’s access key and secret key via the credentials file.

Also you need to set the region, which tells the Amazon S3 Client to perform operations on a specific region:

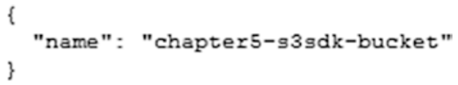
```
amazonS3Client.setRegion(Region.getRegion(Regions.US_WEST_2));
```

Creating Buckets

To create a bucket, invoke the createBucket method:

```
String BUCKET_NAME = "chapter5-s3sdk-bucket";

createBucket(BUCKET_NAME);
```

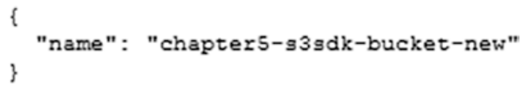
```
public void createBucket(String bucketName) {
    Bucket bucket = amazonS3Client.createBucket(bucketName);
}
```



```
{
  "name": "chapter5-s3sdk-bucket"
}
```

You can also create buckets along with access control limit (ACL) and canned ACL:

```
String BUCKET_NAME_2 = "chapter5-s3sdk-bucket-new";

String AWS_CANONICAL_ID =
    "87d32d7bd285c6f3e01d8360ae4b1ceaa8656b0a0e42e3b237c5be90c9ce487a";

String EMAIL_ID = "sunil.gulabani1@gmail.com";

AccessControlList accessControlList =
    createAccessControlList(AWS_CANONICAL_ID, EMAIL_ID);

createBucket(BUCKET_NAME_2,
                          accessControlList,
                          CannedAccessControlList.BucketOwnerFullControl);

public AccessControlList createAccessControlList(
                                                String awsMemberCanonicalId,
                                                String emailId) {
    AccessControlList accessControlList = new AccessControlList();

    accessControlList.grantPermission(GroupGrantee.AllUsers, Permission.Read);

    accessControlList.grantPermission(GroupGrantee.LogDelivery,
                                                        Permission.ReadAcp);

    accessControlList.grantPermission(GroupGrantee.LogDelivery,
                                                          Permission.Write);

    CanonicalGrantee canonicalGrantee =
        new CanonicalGrantee(awsMemberCanonicalId);

    accessControlList.grantPermission(canonicalGrantee,
                                                    Permission.FullControl);

    EmailAddressGrantee emailAddressGrantee =
        new EmailAddressGrantee(emailId);

    accessControlList.grantPermission(emailAddressGrantee, Permission.Write);
    Owner owner = new Owner();

    owner.setDisplayName("sunil.gulabani2@gmail.com");

    owner.setId(awsMemberCanonicalId);

    accessControlList.setOwner(owner);

    return accessControlList;
}

public void createBucket(String bucketName,
                                      AccessControlList accessControlList,
                                      CannedAccessControlList cannedAcl) {
    CreateBucketRequest request = new CreateBucketRequest(bucketName);

    request.setRegion(region.getName());

    if(accessControlList != null) {
        request.setAccessControlList(accessControlList);
    }

    if(cannedAcl != null) {
        request.setCannedAcl(cannedAcl);
    }

    Bucket bucket = amazonS3Client.createBucket(request);
}
```

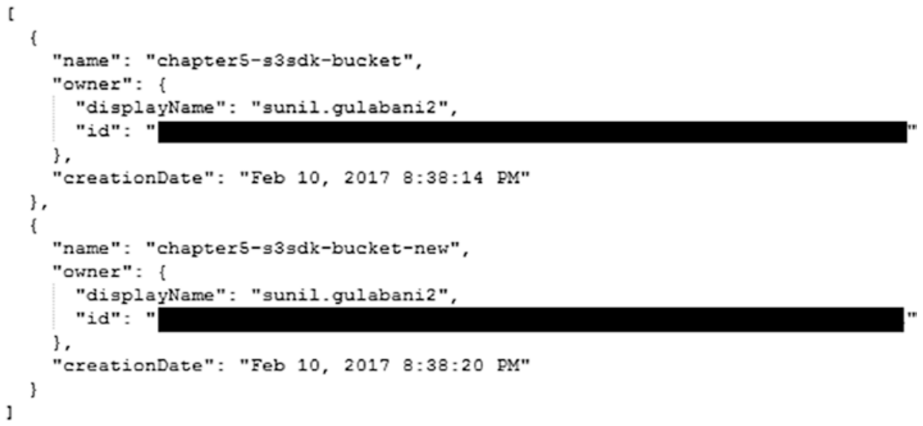


```
{
  "name": "chapter5-s3sdk-bucket-new"
}
```

Listing Buckets

To get a list of all buckets for which current the AWS account user is owner, invoke the `listBuckets` method:

```
listBuckets();

public void listBuckets() {
    List<Bucket> response = amazonS3Client.listBuckets();
}
```



```
[
  {
    "name": "chapter5-s3sdk-bucket",
    "owner": {
      "displayName": "sunil.gulabani2",
      "id": "[redacted]"
    },
    "creationDate": "Feb 10, 2017 8:38:14 PM"
  },
  {
    "name": "chapter5-s3sdk-bucket-new",
    "owner": {
      "displayName": "sunil.gulabani2",
      "id": "[redacted]"
    },
    "creationDate": "Feb 10, 2017 8:38:20 PM"
  }
]
```

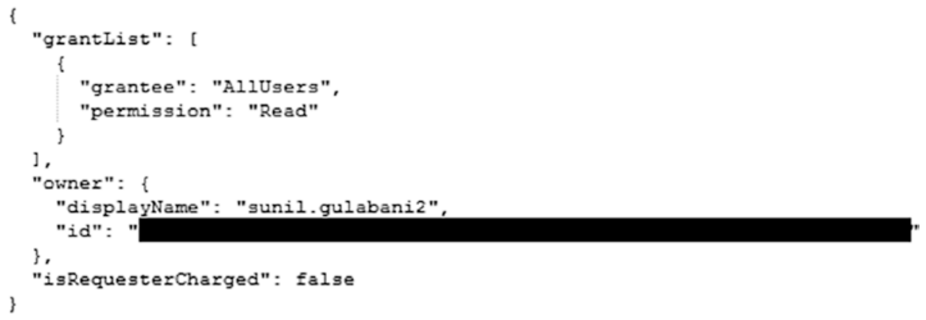
Configuring Bucket ACL

To configure the bucket access control limit (ACL) after the bucket has been created, invoke the setBucketAcl method:

```
setBucketAcl(BUCKET_NAME,
                    AWS_CANONICAL_ID,
                    GroupGrantee.AllUsers,
                    Permission.Read);

public void setBucketAcl(String bucketName,
                                  String awsMemberCanonicalId,
                                  Grantee grantee,
                                  Permission permission) {
    AccessControlList acl = new AccessControlList();

    acl.grantPermission(grantee, permission);

    Owner owner = new Owner();

    owner.setDisplayName("sunil.gulabani2@gmail.com");

    owner.setId(awsMemberCanonicalId);

    acl.setOwner(owner);

    amazonS3Client.setBucketAcl(bucketName, acl);
}
```

To check that the bucket ACL has been configured, invoke the `getBucketAcl` method:

```
getBucketAcl(BUCKET_NAME);

public void getBucketAcl(String bucketName) {
    AccessControlList response = amazonS3Client.getBucketAcl(bucketName);
}
```



```
{
  "grantList": [
    {
      "grantee": "AllUsers",
      "permission": "Read"
    }
  ],
  "owner": {
    "displayName": "sunil.gulabani2",
    "id": "[redacted]"
  },
  "isRequesterCharged": false
}
```

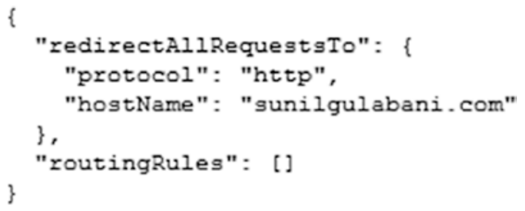
Bucket Web Site Configuration

To configure the web site hosting configuration in the bucket, invoke the `setBucketWebsiteConfiguration` method:

```
setBucketWebsiteConfiguration(BUCKET_NAME, "sunilgulabani.com");

public void setBucketWebsiteConfiguration(String bucketName,
                                                        String hostName) {
    BucketWebsiteConfiguration configuration =
        new BucketWebsiteConfiguration();

    RedirectRule redirectRule = new RedirectRule();

    redirectRule.setHostName(hostName);

    redirectRule.setProtocol("http");

    configuration.setRedirectAllRequestsTo(redirectRule);

    amazonS3Client.setBucketWebsiteConfiguration(bucketName, configuration);
}
```

The previous code will redirect all requests to a specific host when the bucket URL is executed. To check that the bucket web site configuration has been properly set, invoke the `getBucketWebsiteConfiguration`:

```
getBucketWebsiteConfiguration(BUCKET_NAME);

public void getBucketWebsiteConfiguration(String bucketName) {
    BucketWebsiteConfiguration response =
        amazonS3Client.getBucketWebsiteConfiguration(bucketName);
}
```



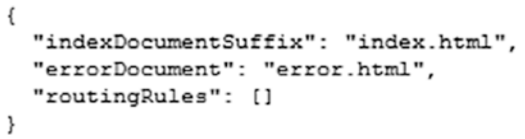
```
{
  "redirectAllRequestsTo": {
    "protocol": "http",
    "hostName": "sunilgulabani.com"
  },
  "routingRules": []
}
```

You can have an `index.html` and `error.html` page in your bucket and configure your bucket to display pages accordingly:

```
setBucketWebsiteConfiguration(BUCKET_NAME, "index.html", "error.html");

public void setBucketWebsiteConfiguration(String bucketName,
                                                    String indexDocument,
                                                    String errorDocument) {
    BucketWebsiteConfiguration configuration =
        new BucketWebsiteConfiguration();

    configuration.setIndexDocumentSuffix(indexDocument);

    configuration.setErrorDocument(errorDocument);

    amazonS3Client.setBucketWebsiteConfiguration(bucketName, configuration);
}
```

To check that the bucket web site configuration has been properly set, invoke the `getBucketWebsiteConfiguration`:

```
getBucketWebsiteConfiguration(BUCKET_NAME);
```



```
{
  "indexDocumentSuffix": "index.html",
  "errorDocument": "error.html",
  "routingRules": []
}
```

Additionally, you can also have routing rules on request coming in.

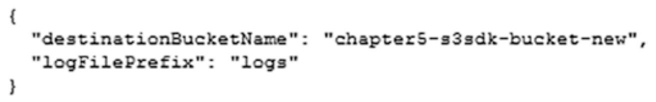
Bucket Logging Configuration

To log the bucket activities, invoke the `setBucketLoggingConfiguration` method:

```
String LOG_FILE_PREFIX = "logs";

setBucketLoggingConfiguration(BUCKET_NAME, BUCKET_NAME_2, LOG_FILE_PREFIX);

public void setBucketLoggingConfiguration(String bucketName,
                                              String destinationBucketName,
                                              String logFilePrefix) {
    BucketLoggingConfiguration loggingConfiguration =
        new BucketLoggingConfiguration();

    loggingConfiguration.setDestinationBucketName(destinationBucketName);

    loggingConfiguration.setLogFilePrefix(logFilePrefix);

    SetBucketLoggingConfigurationRequest request =
        new SetBucketLoggingConfigurationRequest(
                                                bucketName,
                                                loggingConfiguration);

    amazonS3Client.setBucketLoggingConfiguration(request);
}
```

To check if the bucket logging configuration has been set properly, invoke the `getBucketLoggingConfiguration` method:

```
getBucketLoggingConfiguration(BUCKET_NAME);

public void getBucketLoggingConfiguration(String bucketName) {
    BucketLoggingConfiguration response =
        amazonS3Client.getBucketLoggingConfiguration(bucketName);
}
```



```
{
  "destinationBucketName": "chapter5-s3sdk-bucket-new",
  "logFilePrefix": "logs"
}
```

Bucket Event Notification Configuration

You can trigger event notification to SNS, SQS, and lambda on bucket activities. To do that, invoke the `setBucketNotificationConfiguration` method:

```
setBucketNotificationConfiguration_SNS(
                                            BUCKET_NAME,
                                            S3Event.ObjectCreated,
                                            SNS_TOPIC_ARN,
                                            null,
                                            null);

public void setBucketNotificationConfiguration_SNS(
                                            String bucketName,
                                            S3Event s3Event,
                                            String topicARN,
                                            String prefixValue,
                                            String suffixValue) {

    BucketNotificationConfiguration bucketNotificationConfiguration =

    getBucketNotificationConfiguration(bucketName);

    TopicConfiguration topicConfiguration = new TopicConfiguration();

    topicConfiguration.addEvent(s3Event);

    topicConfiguration.setTopicARN(topicARN);

    topicConfiguration.setFilter(createFilters(prefixValue, suffixValue));

    bucketNotificationConfiguration.addConfiguration(
        "SNSS3Notification", topicConfiguration);

    amazonS3Client.setBucketNotificationConfiguration(
        bucketName, bucketNotificationConfiguration);
}
```

Here we will first get the bucket notification configuration in order to add new events using:

```
BucketNotificationConfiguration bucketNotificationConfiguration =
    getBucketNotificationConfiguration(bucketName);
```

Next is we will set the SQS event notification on bucket as:

```
setBucketNotificationConfiguration_SQS(
                                            BUCKET_NAME,
                                            S3Event.ObjectRemoved,
                                            SQS_ARN,
                                            null,
                                            null);
```

```
public void setBucketNotificationConfiguration_SQS(
                                         String bucketName,
                                         S3Event s3Event,
                                         String queueARN,
                                         String prefixValue,
                                         String suffixValue) {

    BucketNotificationConfiguration bucketNotificationConfiguration =
        getBucketNotificationConfiguration(bucketName);

    QueueConfiguration queueConfiguration = new QueueConfiguration();

    queueConfiguration.setQueueARN(queueARN);

    queueConfiguration.addEvent(s3Event);

    queueConfiguration.setFilter(createFilters(prefixValue, suffixValue));

    bucketNotificationConfiguration.addConfiguration(
                                 "SQSS3Notification", queueConfiguration);

    amazonS3Client.setBucketNotificationConfiguration(
                              bucketName, bucketNotificationConfiguration);
}
```

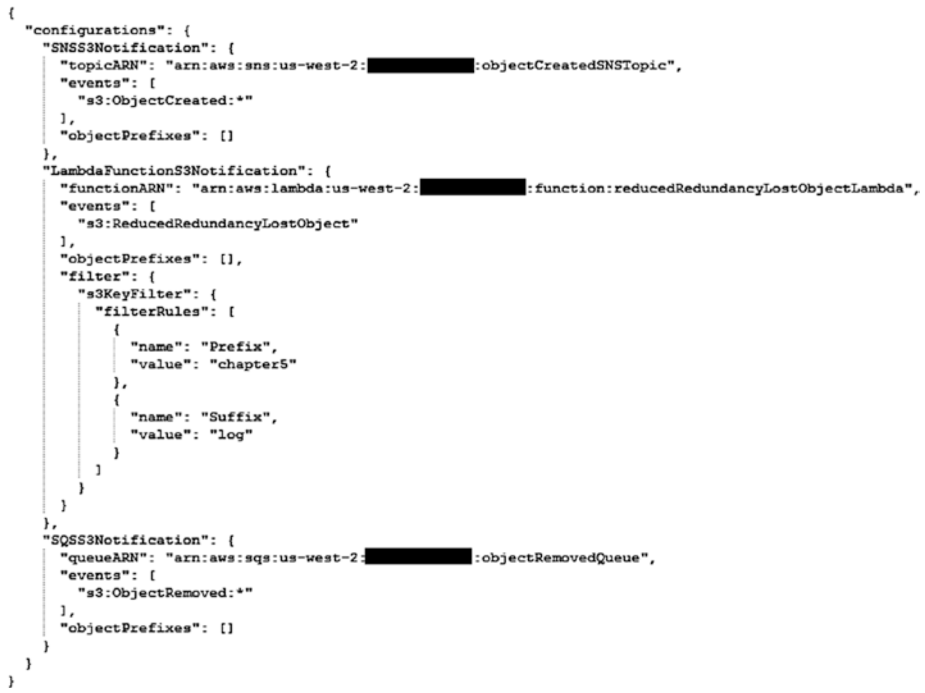
Next, you will set the lambda event notification on the bucket:

```
setBucketNotificationConfiguration_Lambda(
                                         BUCKET_NAME,
                                         S3Event.ReducedRedundancyLostObject,
                                         LAMBDA_TOPIC_ARN,
                                         "chapter5",
                                         "log");

public void setBucketNotificationConfiguration_Lambda(
                                         String bucketName,
                                         S3Event s3Event,
                                         String lambdaFunctionARN,
                                         String prefixValue,
                                         String suffixValue) {

    BucketNotificationConfiguration bucketNotificationConfiguration =
        getBucketNotificationConfiguration(bucketName);

    LambdaConfiguration lambdaConfiguration =
        new LambdaConfiguration(lambdaFunctionARN);
    lambdaConfiguration.addEvent(s3Event);

    lambdaConfiguration.setFilter(createFilters(prefixValue, suffixValue));

    bucketNotificationConfiguration.addConfiguration(
            "LambdaFunctionS3Notification", lambdaConfiguration);

    amazonS3Client.setBucketNotificationConfiguration(
            bucketName, bucketNotificationConfiguration);
}

private Filter createFilters(String prefixValue, String suffixValue) {
    Filter filter = null;

    if(!StringUtils.isNullOrEmpty(prefixValue) &&
        !StringUtils.isNullOrEmpty(suffixValue)) {
        List<FilterRule> filterRules = new ArrayList<>();
        if(!StringUtils.isNullOrEmpty(prefixValue)) {
            FilterRule prefixFilterRule = new FilterRule();

            prefixFilterRule.setName("prefix");

            prefixFilterRule.setValue(prefixValue);

            filterRules.add(prefixFilterRule);
        }

        if(!StringUtils.isNullOrEmpty(suffixValue)) {
            FilterRule suffixFilterRule = new FilterRule();

            suffixFilterRule.setName("suffix");

            suffixFilterRule.setValue(suffixValue);

            filterRules.add(suffixFilterRule);
        }

        S3KeyFilter s3KeyFilter = new S3KeyFilter();

        s3KeyFilter.setFilterRules(filterRules);

        filter = new Filter();

        filter.setS3KeyFilter(s3KeyFilter);
    }

    return filter;
}
```

In the lambda event notification, we added filters for events to be triggered where we provided prefix and suffix to the configuration.

To check if event notifications have been properly set, invoke the `getBucketNotificationConfiguration` method:

```
getBucketNotificationConfiguration(BUCKET_NAME);

public BucketNotificationConfiguration getBucketNotificationConfiguration(
                                                                  String bucketName) {
    BucketNotificationConfiguration response =
        amazonS3Client.getBucketNotificationConfiguration(bucketName);
    return response;
}
```



```
{
  "configurations": {
    "SNSS3Notification": {
      "topicARN": "arn:aws:sns:us-west-2:[redacted]:objectCreatedSNSTopic",
      "events": [
        "s3:ObjectCreated:*"
      ],
      "objectPrefixes": []
    },
    "LambdaFunctionS3Notification": {
      "functionARN": "arn:aws:lambda:us-west-2:[redacted]:function:reducedRedundancyLostObjectLambda",
      "events": [
        "s3:ReducedRedundancyLostObject"
      ],
      "objectPrefixes": [],
      "filter": {
        "s3KeyFilter": {
          "filterRules": [
            {
              "name": "Prefix",
              "value": "chapter5"
            },
            {
              "name": "Suffix",
              "value": "log"
            }
          ]
        }
      }
    },
    "SQSS3Notification": {
      "queueARN": "arn:aws:sqs:us-west-2[redacted]:objectRemovedQueue",
      "events": [
        "s3:ObjectRemoved:*"
      ],
      "objectPrefixes": []
    }
  }
}
```

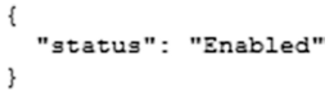
Bucket Versioning Configuration

You can maintain the object's version available under the bucket so that you can see the older versions for restoration or tracking purpose. To do so, invoke the `setBucketVersioningConfiguration` method:

```
setBucketVersioningConfiguration(BUCKET_NAME,
                                    BucketVersioningConfiguration.ENABLED);

public void setBucketVersioningConfiguration(
                                        String bucketName, String status) {

    BucketVersioningConfiguration configuration =
        new BucketVersioningConfiguration();

    configuration.setStatus(status);

    SetBucketVersioningConfigurationRequest request =
        new SetBucketVersioningConfigurationRequest(bucketName, configuration);

    amazonS3Client.setBucketVersioningConfiguration(request);
}
```

To check if versioning has been enabled, invoke the `getBucketVersioningConfiguration` method:

```
getBucketVersioningConfiguration(BUCKET_NAME);
```



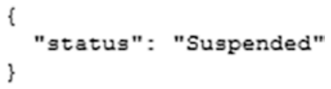
```
{
  "status": "Enabled"
}
```

To suspend the versioning, invoke the same `setBucketVersioningConfiguration` method with status:

```
setBucketVersioningConfiguration(BUCKET_NAME,
                                 BucketVersioningConfiguration.SUSPENDED);
```

To check if the versioning has been suspended, invoke the `getBucketVersioningConfiguration` method:

```
getBucketVersioningConfiguration(BUCKET_NAME);
```



```
{
  "status": "Suspended"
}
```

Bucket Life Cycle Configuration

You can configure the bucket life cycle, which is applicable on objects. You can also configure what actions need to be performed when specific criteria is met on an object. To do so, invoke the `setBucketLifecycleConfiguration` method:

```
setBucketLifecycleConfiguration(BUCKET_NAME);

public void setBucketLifecycleConfiguration(String bucketName) {
    BucketLifecycleConfiguration configuration =
        new BucketLifecycleConfiguration();

    List<BucketLifecycleConfiguration.Rule> rules = new ArrayList<>();

    rules.add(expirationRuleWithDate());

    rules.add(expirationRuleWithDays());

    rules.add(moveOldObjectsToGlacierRule());

    rules.add(nonCurrentVersionTransitionsAndExpirationRule());

    rules.add(abortIncompleteMultipartUploadRule());

    configuration.setRules(rules);

    SetBucketLifecycleConfigurationRequest request =
        new SetBucketLifecycleConfigurationRequest(bucketName, configuration);

    amazonS3Client.setBucketLifecycleConfiguration(request);
}
```

To add a rule with an expiration based on date, use the following code:

```
private BucketLifecycleConfiguration.Rule expirationRuleWithDate() {
    BucketLifecycleConfiguration.Rule rule =
        new BucketLifecycleConfiguration.Rule();

    rule.setId("Expiration Action with Date");

    rule.setPrefix("chapter1");

    rule.setStatus(BucketLifecycleConfiguration.ENABLED);

    rule.setExpirationDate(getDate());

    return rule;
}
```

To add a rule with an expiration based on days, use the following code:

```
private BucketLifecycleConfiguration.Rule expirationRuleWithDays() {
    BucketLifecycleConfiguration.Rule rule =
        new BucketLifecycleConfiguration.Rule();

    rule.setId("Expiration Action with Days");

    rule.setPrefix("chapter2");

    rule.setStatus(BucketLifecycleConfiguration.ENABLED);

    rule.setExpirationInDays(30);

    return rule;
}
```

The following code will allow you to add a rule with moving old objects to Glacier:,

```
private BucketLifecycleConfiguration.Rule moveOldObjectsToGlacierRule() {
    BucketLifecycleConfiguration.Rule rule =
        new BucketLifecycleConfiguration.Rule();

    rule.setId("Move old objects to Glacier Action");

    rule.setPrefix("chapter3");

    rule.setStatus(BucketLifecycleConfiguration.ENABLED);

    List<BucketLifecycleConfiguration.Transition> transitionList =
        new ArrayList<>();

    BucketLifecycleConfiguration.Transition transition =
        new BucketLifecycleConfiguration.Transition();

    transition.setDate(getDate());

    transition.setStorageClass(StorageClass.Glacier);

    transitionList.add(transition);

    rule.setTransitions(transitionList);

    return rule;
}
```

To add a rule for noncurrent versioned objects along with expiration of objects based on object creation days, use the following code:

```
private BucketLifecycleConfiguration.Rule
    nonCurrentVersionTransitionsAndExpirationRule() {

    BucketLifecycleConfiguration.Rule rule =
        new BucketLifecycleConfiguration.Rule();

    rule.setId("Non-Current Versioned Object Actions");

    rule.setPrefix("chapter4");

    rule.setStatus(BucketLifecycleConfiguration.ENABLED);

    BucketLifecycleConfiguration.NoncurrentVersionTransition
        nonCurrentVersionTransition =
            new BucketLifecycleConfiguration.NoncurrentVersionTransition();

    nonCurrentVersionTransition.setDays(30);

    nonCurrentVersionTransition.setStorageClass(
                                StorageClass.StandardInfrequentAccess);

    List<BucketLifecycleConfiguration.NoncurrentVersionTransition>
        nonCurrentVersionTransitionList = new ArrayList<>();

    nonCurrentVersionTransitionList.add(nonCurrentVersionTransition);

    rule.setNoncurrentVersionTransitions(nonCurrentVersionTransitionList);

    rule.setNoncurrentVersionExpirationInDays(40);

    return rule;
}
```

To add a rule to abort an incomplete multipart upload of objects, use the following code:

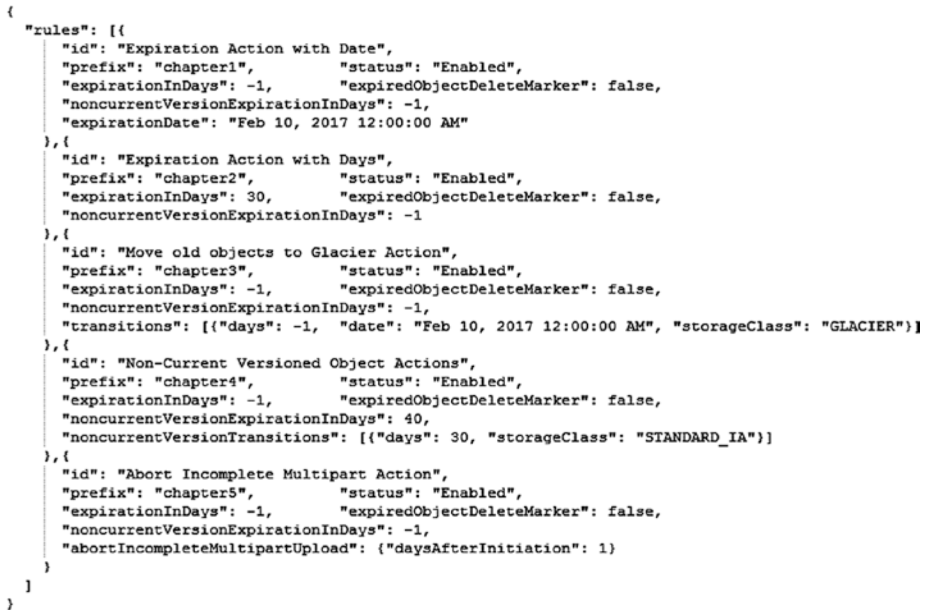
```
private BucketLifecycleConfiguration.Rule abortIncompleteMultipartUploadRule() {
    BucketLifecycleConfiguration.Rule rule =
        new BucketLifecycleConfiguration.Rule();

    rule.setId("Abort Incomplete Multipart Action");

    rule.setPrefix("chapter5");
    rule.setStatus(BucketLifecycleConfiguration.ENABLED);

    AbortIncompleteMultipartUpload abortIncompleteMultipartUpload =
        new AbortIncompleteMultipartUpload();

    abortIncompleteMultipartUpload.setDaysAfterInitiation(1);

    rule.setAbortIncompleteMultipartUpload(abortIncompleteMultipartUpload);

    return rule;
}
```

For adding dates in a rule, follow the GMT with only the date (without hours, minutes, seconds and milliseconds):

```
private Date getDate() {
   TimeZone.setDefault(TimeZone.getTimeZone("GMT"));
   Calendar gmt = Calendar.getInstance(TimeZone.getTimeZone("GMT"));
   gmt.set(Calendar.HOUR_OF_DAY, 0);
   gmt.set(Calendar.MINUTE, 0);
   gmt.set(Calendar.SECOND, 0);
   gmt.set(Calendar.MILLISECOND, 0);
   long millis = gmt.getTimeInMillis();
   return new Date(millis);
}
```

To check that the bucket life cycle has been configured, invoke the `getBucketLifecycleConfiguration` method:

```
getBucketLifecycleConfiguration(BUCKET_NAME);
```



```
{
  "rules": [{
      "id": "Expiration Action with Date",
      "prefix": "chapter1",          "status": "Enabled",
      "expirationInDays": -1,        "expiredObjectDeleteMarker": false,
      "noncurrentVersionExpirationInDays": -1,
      "expirationDate": "Feb 10, 2017 12:00:00 AM"
    },{
      "id": "Expiration Action with Days",
      "prefix": "chapter2",          "status": "Enabled",
      "expirationInDays": 30,        "expiredObjectDeleteMarker": false,
      "noncurrentVersionExpirationInDays": -1
    },{
      "id": "Move old objects to Glacier Action",
      "prefix": "chapter3",          "status": "Enabled",
      "expirationInDays": -1,        "expiredObjectDeleteMarker": false,
      "noncurrentVersionExpirationInDays": -1,
      "transitions": [{"days": -1,  "date": "Feb 10, 2017 12:00:00 AM", "storageClass": "GLACIER"}]
    },{
      "id": "Non-Current Versioned Object Actions",
      "prefix": "chapter4",          "status": "Enabled",
      "expirationInDays": -1,        "expiredObjectDeleteMarker": false,
      "noncurrentVersionExpirationInDays": 40,
      "noncurrentVersionTransitions": [{"days": 30, "storageClass": "STANDARD_IA"}]
    },{
      "id": "Abort Incomplete Multipart Action",
      "prefix": "chapter5",          "status": "Enabled",
      "expirationInDays": -1,        "expiredObjectDeleteMarker": false,
      "noncurrentVersionExpirationInDays": -1,
      "abortIncompleteMultipartUpload": {"daysAfterInitiation": 1}
    }
  ]
}
```

To delete the bucket life cycle configuration, invoke the `deleteBucketLifecycleConfiguration` method:

```
deleteBucketLifecycleConfiguration(BUCKET_NAME);

public void deleteBucketLifecycleConfiguration(String bucketName) {
    amazonS3Client.deleteBucketLifecycleConfiguration(bucketName);
}
```

Bucket Replication Configuration

To have a backup of a bucket's objects, you can replicate all objects to another bucket that should be created in a region other than the source bucket's region.

Use the following code to create a bucket in another region (Regions.AP_SOUTHEAST_1):

```
String BUCKET_NAME_BACKUP = "chapter5-s3cli-buckets-backups";
createBucket(BUCKET_NAME_BACKUP);
```

You also need the bucket versioning for the source and destination bucket enabled:

```
setBucketVersioningConfiguration(
                                    BUCKET_NAME,
                                    BucketVersioningConfiguration.ENABLED);
```

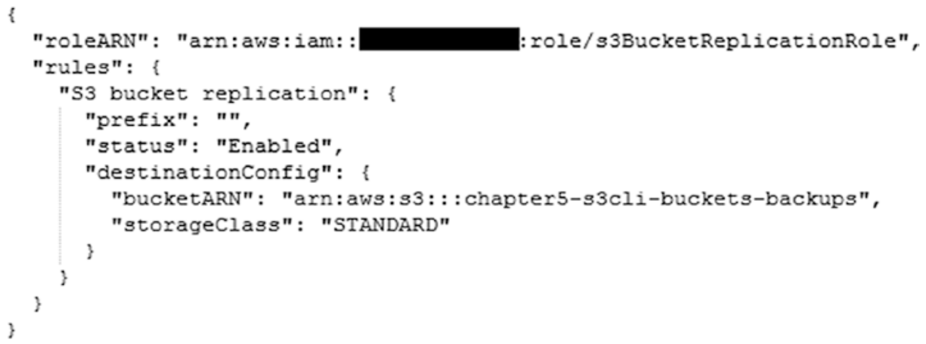
```
setBucketVersioningConfiguration(
                                    BUCKET_NAME_BACKUP,
                                    BucketVersioningConfiguration.ENABLED);
```

Next, invoke the `setBucketReplicationConfiguration` method:

```
String ROLE_ARN = "arn:aws:iam::298147259238:role/s3BucketReplicationRole";
String DESTINATION_BUCKET_ARN = "arn:aws:s3:::" + BUCKET_NAME_BACKUP;

setBucketReplicationConfiguration(
                                    BUCKET_NAME,
                                    ROLE_ARN,
                                    DESTINATION_BUCKET_ARN);

public void setBucketReplicationConfiguration(
                                    String bucketName,
                                    String roleARN,
                                    String destinationBucketARN) {

    BucketReplicationConfiguration configuration =
        new BucketReplicationConfiguration();

    configuration.setRoleARN(roleARN);
    ReplicationDestinationConfig destination =
        new ReplicationDestinationConfig();

    destination.setBucketARN(destinationBucketARN);

    destination.setStorageClass(StorageClass.Standard);

    ReplicationRule replicationRule = new ReplicationRule();

    replicationRule.setPrefix("");

    replicationRule.setStatus(ReplicationRuleStatus.Enabled);

    replicationRule.setDestinationConfig(destination);

    Map<String, ReplicationRule> rules = new HashMap<>();

    rules.put("S3 bucket replication", replicationRule);

    configuration.setRules(rules);

    amazonS3Client.setBucketReplicationConfiguration(bucketName, configuration);
}
```

Here Role ARN plays important role in providing access to S3 to replicate a bucket in another region. To get the bucket replication configuration, invoke the `getBucketReplicationConfiguration` method:

```
getBucketReplicationConfiguration(BUCKET_NAME);

public void getBucketReplicationConfiguration(String bucketName) {
    BucketReplicationConfiguration response =
        amazonS3Client.getBucketReplicationConfiguration(bucketName);
}
```



```
{
  "roleARN": "arn:aws:iam::[redacted]:role/s3BucketReplicationRole",
  "rules": {
    "S3 bucket replication": {
      "prefix": "",
      "status": "Enabled",
      "destinationConfig": {
        "bucketARN": "arn:aws:s3:::chapter5-s3cli-buckets-backups",
        "storageClass": "STANDARD"
      }
    }
  }
}
```

To delete the bucket replication configuration, invoke the `deleteBucketReplicationConfiguration` method:

```
deleteBucketReplicationConfiguration(BUCKET_NAME);
public void deleteBucketReplicationConfiguration(String bucketName) {
   amazonS3Client.deleteBucketReplicationConfiguration(bucketName);
}
```

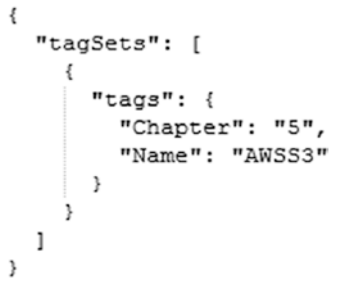
Bucket Tagging Configuration

You can add tags to the bucket, which can be used for report purposes. To do so, invoke the `setBucketTaggingConfiguration` method:

```
setBucketTaggingConfiguration(BUCKET_NAME);

public void setBucketTaggingConfiguration(String bucketName) {
    BucketTaggingConfiguration configuration =
        new BucketTaggingConfiguration();

    TagSet tagSet1 = new TagSet();

    tagSet1.setTag("Chapter", "5");

    tagSet1.setTag("Name", "AWSS3");
    List<TagSet> tagSets = new ArrayList<>();

    tagSets.add(tagSet1);

    configuration.setTagSets(tagSets);

    amazonS3Client.setBucketTaggingConfiguration(bucketName, configuration);
}
```

To get the bucket tagging configuration, invoke the `getBucketTaggingConfiguration` method:

```
getBucketTaggingConfiguration(BUCKET_NAME);

public void getBucketTaggingConfiguration(String bucketName) {
    BucketTaggingConfiguration response =
        amazonS3Client.getBucketTaggingConfiguration(bucketName);
}
```



```
{
  "tagSets": [
    {
      "tags": {
        "Chapter": "5",
        "Name": "AWSS3"
      }
    }
  ]
}
```

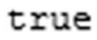
Configuring Requester Pay

Bucket owners can configure that the requester needs to pay for accessing the bucket. The requester only needs to pay for the reading and downloading portion of the bucket's object price; the bucket owner will pay the storage price. To make this possible, invoke the `enableRequesterPays` method:

```
enableRequesterPays(BUCKET_NAME);

public void enableRequesterPays(String bucketName) {
   amazonS3Client.enableRequesterPays(bucketName);
}
```

To check that Requester Pays has been enabled, invoke the `isRequesterPaysEnabled` method:

```
isRequesterPaysEnabled(BUCKET_NAME);

public void isRequesterPaysEnabled(String bucketName) {
    boolean isRequesterPaysEnabled =
        amazonS3Client.isRequesterPaysEnabled(bucketName);
}
```



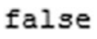
```
true
```

To disable Requester Pays, invoke the `disableRequesterPays` method:

```
disableRequesterPays(BUCKET_NAME);

public void disableRequesterPays(String bucketName) {
   amazonS3Client.disableRequesterPays(bucketName);
}
```

To check that Requester Pays has been enabled, invoke the `isRequesterPaysEnabled` method:

```
isRequesterPaysEnabled(BUCKET_NAME);
```



```
false
```

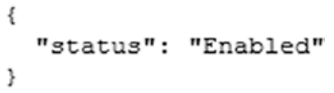
Bucket Transfer Accelerate Configuration

You can configure the bucket to perform quickly in terms of read and write. To do so, invoke the `setBucketAccelerateConfiguration` method:

```
setBucketAccelerateConfiguration(
                             BUCKET_NAME,
                             BucketAccelerateStatus.Enabled);

public void setBucketAccelerateConfiguration(
                             String bucketName,
                             BucketAccelerateStatus bucketAccelerateStatus) {
    BucketAccelerateConfiguration configuration =
        new BucketAccelerateConfiguration(bucketAccelerateStatus);

    amazonS3Client.setBucketAccelerateConfiguration(bucketName, configuration);
}
```

To get the bucket accelerate configuration, invoke the getBucketAccelerateConfiguration method:

```
getBucketAccelerateConfiguration(BUCKET_NAME);

public void getBucketAccelerateConfiguration(String bucketName) {
    BucketAccelerateConfiguration response =
        amazonS3Client.getBucketAccelerateConfiguration(bucketName);
}
```

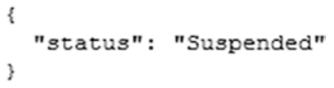


```
{
  "status": "Enabled"
}
```

To suspend the bucket transfer accelerate configuration, invoke the same setBucketAccelerateConfiguration method with “Suspend” status:

```
setBucketAccelerateConfiguration(BUCKET_NAME,
                                        BucketAccelerateStatus.Suspended);
```

To check that the bucket transfer accelerate configuration has been suspended, will invoke the getBucketAccelerateConfiguration method:



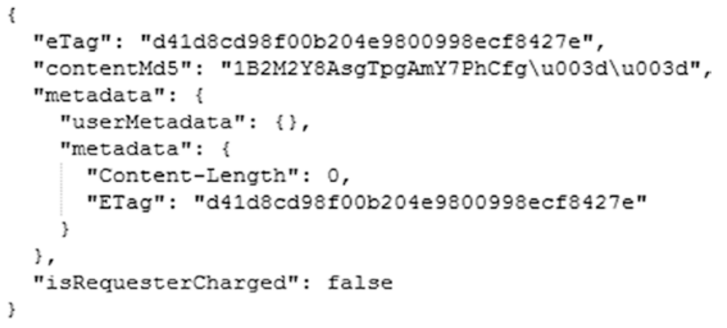
```
{
  "status": "Suspended"
}
```

Creating Folders

In S3, all data are considered in terms of bucket and objects. You can create logical folders that can ease your storage model. To do so, invoke the "" method:

```
String FOLDER_NAME = "apress";

createFolder(BUCKET_NAME, FOLDER_NAME);

public void createFolder(String bucketName, String folderName) {
    ObjectMetadata metadata = new ObjectMetadata();

    metadata.setContentLength(0);

    InputStream emptyContent = new ByteArrayInputStream(new byte[0]);

    PutObjectRequest request = new PutObjectRequest(
                                                    bucketName,
                                                    folderName + "/",
                                                    emptyContent,
                                                    metadata);

    PutObjectResult response = amazonS3Client.putObject(request);
}
```

To create a folder in a bucket, you need to set the object's metadata length to 0, empty content as part of InputStream, and follow the folder name with "/":



```
{
  "eTag": "d41d8cd98f00b204e9800998ecf8427e",
  "contentMd5": "1B2M2Y8AsgTpgAmY7PhCfg\u003d\u003d",
  "metadata": {
    "userMetadata": {},
    "metadata": {
      "Content-Length": 0,
      "ETag": "d41d8cd98f00b204e9800998ecf8427e"
    }
  },
  "isRequesterCharged": false
}
```

To delete a folder, invoke the `deleteObject` method:

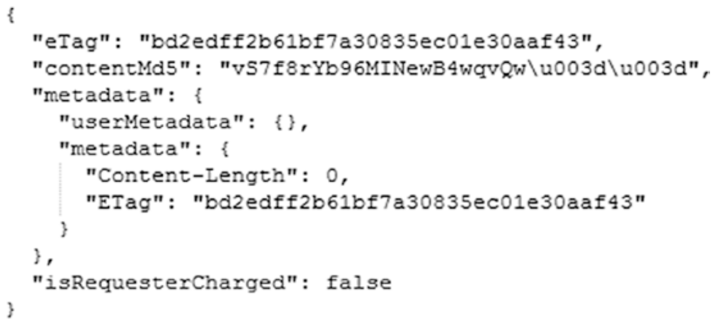
```
deleteFolder(BUCKET_NAME, FOLDER_NAME);

public void deleteFolder(String bucketName, String folderName) {
    DeleteObjectRequest request =
        new DeleteObjectRequest(bucketName, folderName + "/");

    amazonS3Client.deleteObject(request);
}
```

Uploading Objects

To upload objects under a specific bucket, invoke the `putObject` method:

```
Path tempFile = Files.createTempFile("chapter", ".tmp");

List<String> lines = Arrays.asList("Hello World!!!", "AWS S3");

Files.write(tempFile, lines,
            Charset.defaultCharset(), StandardOpenOption.WRITE);

putObject(BUCKET_NAME, "chapter.txt", tempFile.toFile());

public void putObject(String bucketName, String keyName, File file)
    throws IOException {

    PutObjectRequest request = new PutObjectRequest(bucketName, keyName, file);

    PutObjectResult response = amazonS3Client.putObject(request);
}
```

We have created a temporary file that we can upload in the bucket. The object's key name will be set to "chapter.txt":

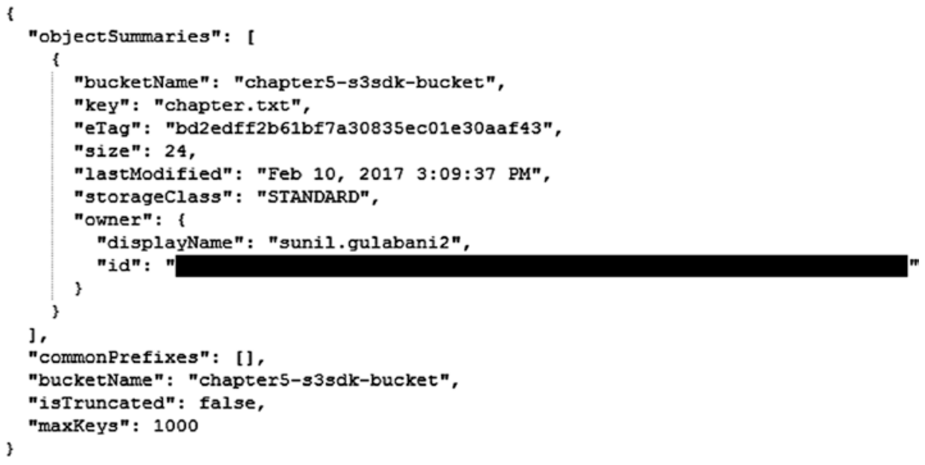


```
{
  "eTag": "bd2edff2b61bf7a30835ec01e30aaf43",
  "contentMd5": "vS7f8rYb96MINewB4wqvQw\u003d\u003d",
  "metadata": {
    "userMetadata": {},
    "metadata": {
      "Content-Length": 0,
      "ETag": "bd2edff2b61bf7a30835ec01e30aaf43"
    }
  },
  "isRequesterCharged": false
}
```

Listing Objects

To get a list of objects under the bucket, invoke the `listObjects` method:

```
listObjects(BUCKET_NAME);
public void listObjects(String bucketName) {
   ObjectListing response = amazonS3Client.listObjects(bucketName);
}
```



```
{
  "objectSummaries": [
    {
      "bucketName": "chapter5-s3sdk-bucket",
      "key": "chapter.txt",
      "eTag": "bd2edff2b61bf7a30835ec01e30aaf43",
      "size": 24,
      "lastModified": "Feb 10, 2017 3:09:37 PM",
      "storageClass": "STANDARD",
      "owner": {
        "displayName": "sunil.gulabani2",
        "id": "[redacted]"
      }
    }
  ],
  "commonPrefixes": [],
  "bucketName": "chapter5-s3sdk-bucket",
  "isTruncated": false,
  "maxKeys": 1000
}
```

Deleting Objects

To delete an object from the bucket permanently, invoke the `deleteObject` method:

```
deleteObject(BUCKET_NAME, "chapter.txt");

public void deleteObject(String bucketName, String keyName) {
    DeleteObjectRequest request = new DeleteObjectRequest(bucketName, keyName);

    amazonS3Client.deleteObject(request);
}
```

Emptying Buckets

To delete all objects from a bucket permanently, invoke the same `deleteObject` method after you fetched all objects:

```
deleteObjects(BUCKET_NAME);

public void deleteObjects(String bucketName) {
    S3Objects s3ObjectSummaries =
        S3Objects.inBucket(amazonS3Client, bucketName);

    s3ObjectSummaries.forEach(objectSummary -> {
        deleteObject(bucketName, objectSummary.getKey());
    });
}
```

Deleting Buckets

To delete a bucket permanently, invoke the `deleteBucket` method:

```
deleteBucket(BUCKET_NAME);

public void deleteBucket(String bucketName) {
    for (S3VersionSummary version :
            S3Versions.inBucket(amazonS3Client, bucketName)) {
        String key = version.getKey();

        String versionId = version.getVersionId();

        amazonS3Client.deleteVersion(bucketName, key, versionId);
    }

    DeleteBucketRequest request = new DeleteBucketRequest(bucketName);

    amazonS3Client.deleteBucket(request);
}
```

Before deleting a bucket, make sure the bucket is empty (including versioned objects). To check that the bucket has been deleted, invoke the `listBuckets` method:

```
listBuckets();
public void listBuckets() {
   List<Bucket> response = amazonS3Client.listBuckets();
}
```

```
[]
```

Monitoring Using CloudWatch

CloudWatch allows you to monitor the S3 having different metrics. It will trigger an alarm when a threshold is exceeded on specific metrics. The following steps are used to create an alarm:

1. Go to the CloudWatch Management Console and click Alarm from left navigation, as shown in Figure 5-51.

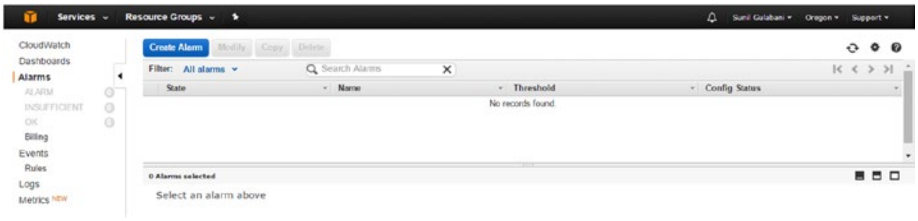
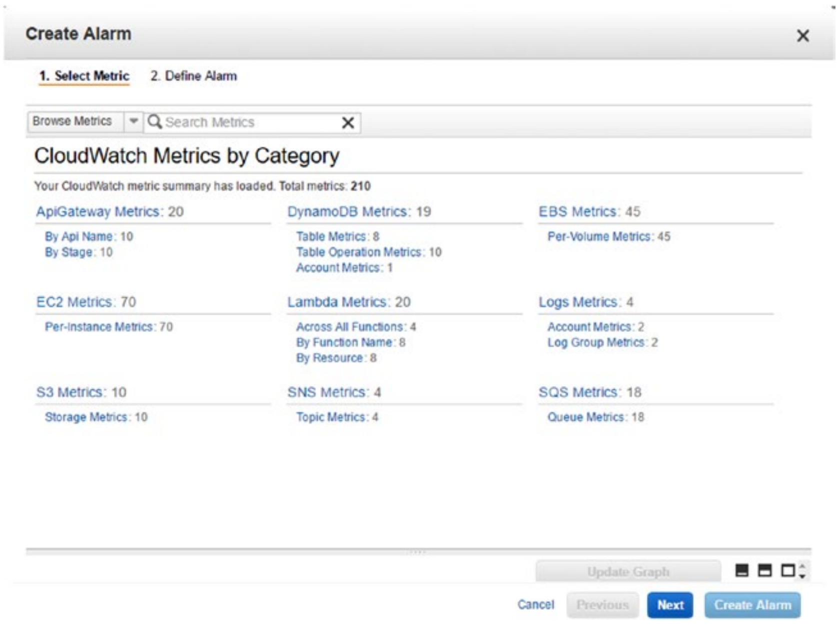


Figure 5-51. *CloudWatch alarm*

2. Click Create Alarm.

3. The Create Alarm screen shown in Figure 5-52 will be displayed, which has two steps:

   - Select Metric
   - Define Alarm



CloudWatch Metrics by Category

Your CloudWatch metric summary has loaded. Total metrics: 210

ApiGateway Metrics: 20
By Api Name: 10
By Stage: 10

DynamoDB Metrics: 19
Table Metrics: 8
Table Operation Metrics: 10
Account Metrics: 1

EBS Metrics: 45
Per-Volume Metrics: 45

EC2 Metrics: 70
Per-Instance Metrics: 70

Lambda Metrics: 20
Across All Functions: 4
By Function Name: 8
By Resource: 8

Logs Metrics: 4
Account Metrics: 2
Log Group Metrics: 2

S3 Metrics: 10
Storage Metrics: 10

SNS Metrics: 4
Topic Metrics: 4

SQS Metrics: 18
Queue Metrics: 18

Figure 5-52. *Create Alarm screen*

4. First, select the metric for S3. Click Browse Metrics and select "S3," as shown in Figure 5-53.

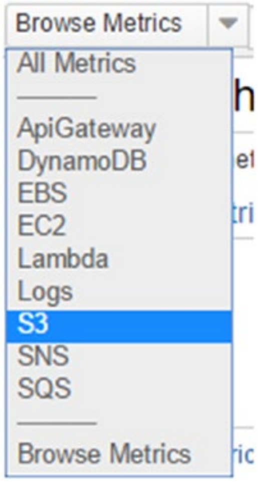
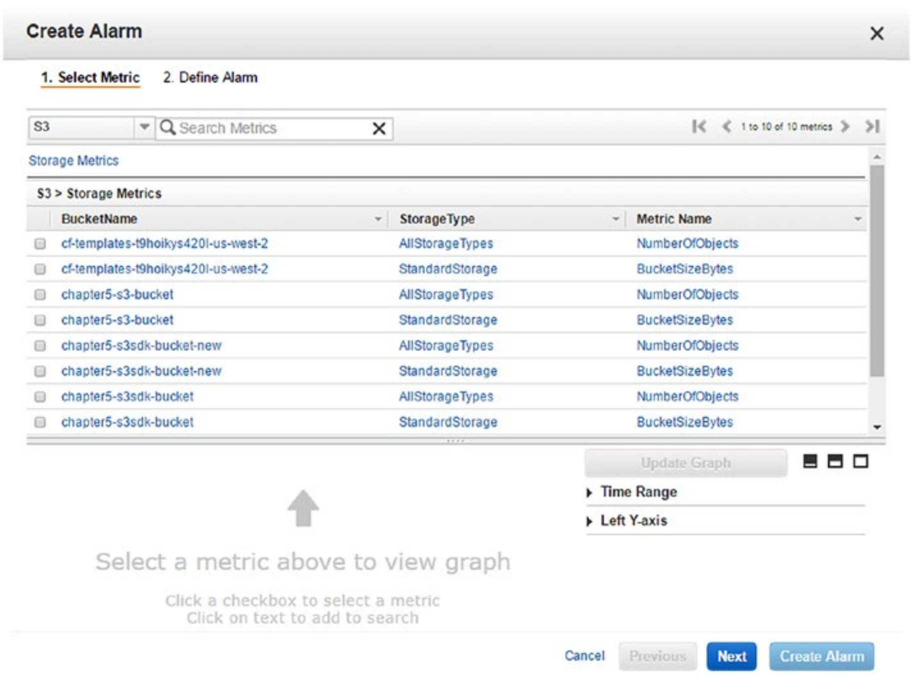


Figure 5-53. *Browse Metrics screen*

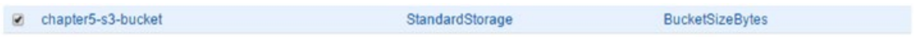
5. Figure 5-54 shows all the metrics that can be configured on S3.



BucketName	StorageType	Metric Name
cf-templates-t9hoikys420l-us-west-2	AllStorageTypes	NumberOfObjects
cf-templates-t9hoikys420l-us-west-2	StandardStorage	BucketSizeBytes
chapter5-s3-bucket	AllStorageTypes	NumberOfObjects
chapter5-s3-bucket	StandardStorage	BucketSizeBytes
chapter5-s3sdk-bucket-new	AllStorageTypes	NumberOfObjects
chapter5-s3sdk-bucket-new	StandardStorage	BucketSizeBytes
chapter5-s3sdk-bucket	AllStorageTypes	NumberOfObjects
chapter5-s3sdk-bucket	StandardStorage	BucketSizeBytes

Figure 5-54. *S3 metrics listing*

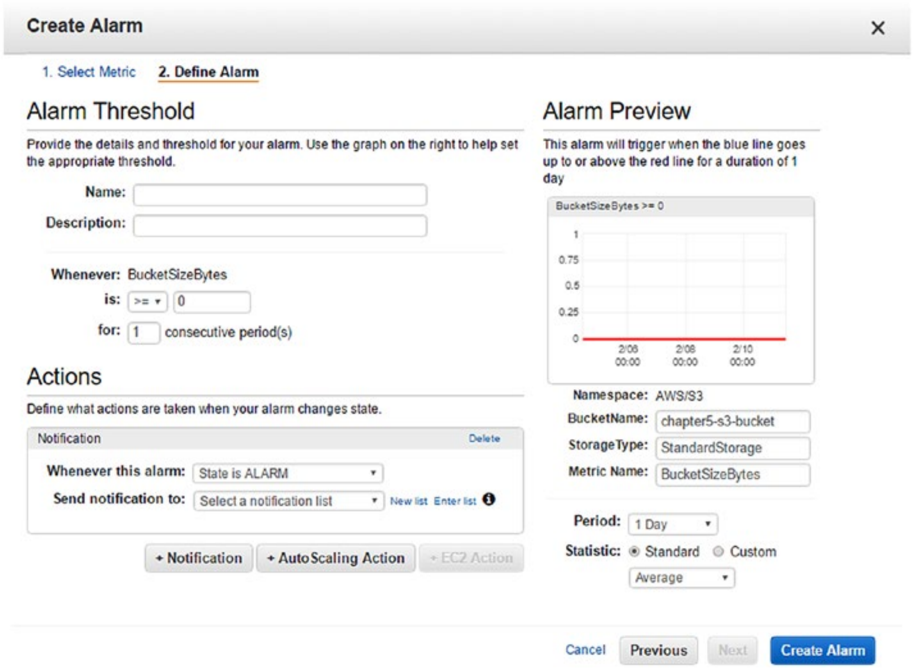
6. For our case, we will select the “BucketSizeBytes” metrics. Once you select, click the Next button, as shown in Figure 5-55.



☑ chapter5-s3-bucket	StandardStorage	BucketSizeBytes

Figure 5-55. *Metrics Selected*

7. Define the alarm settings by providing a name, description, and threshold values on which the alarm should be generated. You will use the average of the objects’ size, which should be greater than or equal to operation1048576 bytes (1MB) during one day of interval. (See Figure 5-56.)


Create Alarm

1. Select Metric 2. Define Alarm

Alarm Threshold

Provide the details and threshold for your alarm. Use the graph on the right to help set the appropriate threshold.

Name:

Description:

Whenever: BucketSizeBytes

is: >= 0

for: 1 consecutive period(s)

Actions

Define what actions are taken when your alarm changes state.

Notification

Whenever this alarm: State is ALARM

Send notification to: Select a notification list

Alarm Preview

This alarm will trigger when the blue line goes up to or above the red line for a duration of 1 day

Namespace: AWS/S3

BucketName: chapter5-s3-bucket

StorageType: StandardStorage

Metric Name: BucketSizeBytes

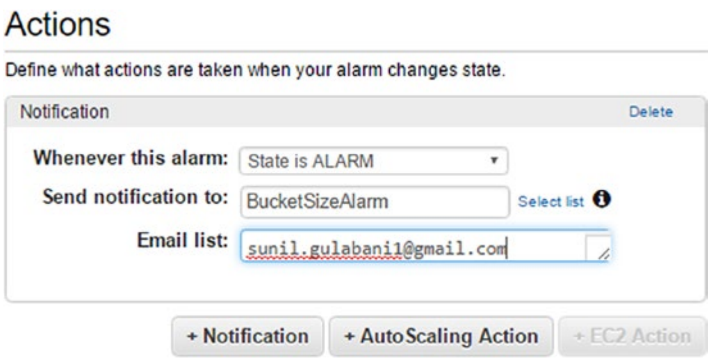
Period: 1 Day

Statistic: [✓ Standard] Custom

Average

Figure 5-56. *Define Alarm screen*

8. You will also configure Actions to trigger a notification when the alarm state is "ALARM." To configure this setting, select from the drop-down list the value "Send notification to" or create a new notification by clicking New List. Enter the topic's name and the e-mail address where notifications need to be sent. (See Figure 5-57.)


Actions

Define what actions are taken when your alarm changes state.

Notification

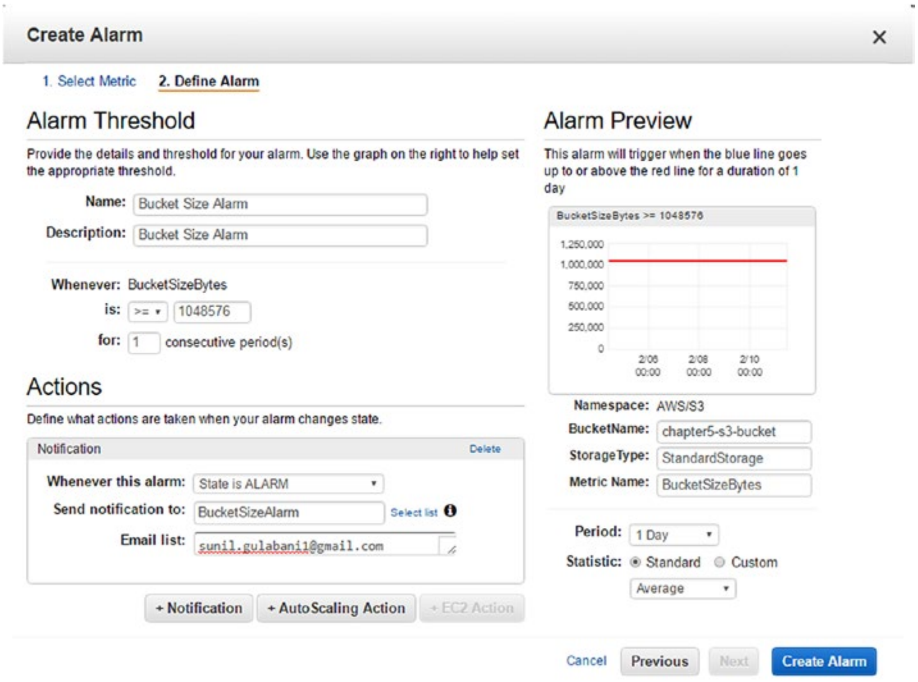
Whenever this alarm: State is ALARM

Send notification to: BucketSizeAlarm

Email list: sunil.gulabani1@gmail.com

Figure 5-57. *Define actions*

9. Click the Create Alarm button, as shown in Figure 5-58.


Create Alarm

1. Select Metric 2. Define Alarm

Alarm Threshold

Provide the details and threshold for your alarm. Use the graph on the right to help set the appropriate threshold.

Name: Bucket Size Alarm
Description: Bucket Size Alarm

Whenever: BucketSizeBytes
is: >= 1048576
for: 1 consecutive period(s)

Actions

Define what actions are taken when your alarm changes state.

Notification

Whenever this alarm: State is ALARM
Send notification to: BucketSizeAlarm
Email list: sunil.gulabani1@gmail.com

Alarm Preview

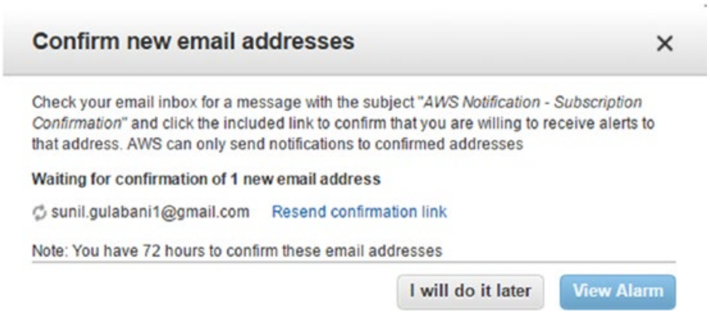
This alarm will trigger when the blue line goes up to or above the red line for a duration of 1 day

Namespace: AWS/S3
BucketName: chapter5-s3-bucket
StorageType: StandardStorage
Metric Name: BucketSizeBytes

Period: 1 Day
Statistic: [✓ Standard] Custom
Average

Figure 5-58. *Create Alarm screen*

10. If you have added a new e-mail that is not subscribed to SNS, you will be asked to confirm the e-mail address by opening the link sent in the e-mail, as shown in Figure 5-59.


Confirm new email addresses

Check your email inbox for a message with the subject "*AWS Notification - Subscription Confirmation*" and click the included link to confirm that you are willing to receive alerts to that address. AWS can only send notifications to confirmed addresses

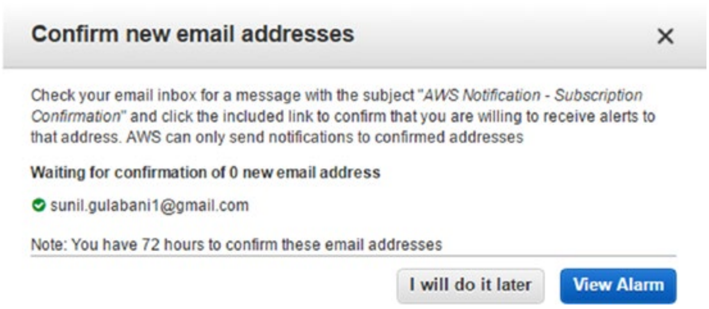
Waiting for confirmation of 1 new email address

sunil.gulabani1@gmail.com Resend confirmation link

Note: You have 72 hours to confirm these email addresses

Figure 5-59. *Confirm new e-mail address*

11. Once you confirm the subscription, you will be able to get e-mails when the alarm is triggered. (See Figure 5-60.)



Confirm new email addresses

Check your email inbox for a message with the subject "*AWS Notification - Subscription Confirmation*" and click the included link to confirm that you are willing to receive alerts to that address. AWS can only send notifications to confirmed addresses

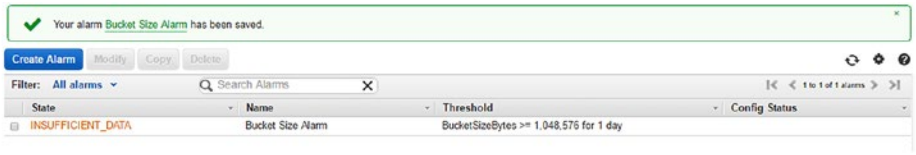
Waiting for confirmation of 0 new email address

sunil.gulabani1@gmail.com

Note: You have 72 hours to confirm these email addresses

Figure 5-60. *Confirm new e-mail address - 2*

You can see that the alarm has been created in Figure 5-61.



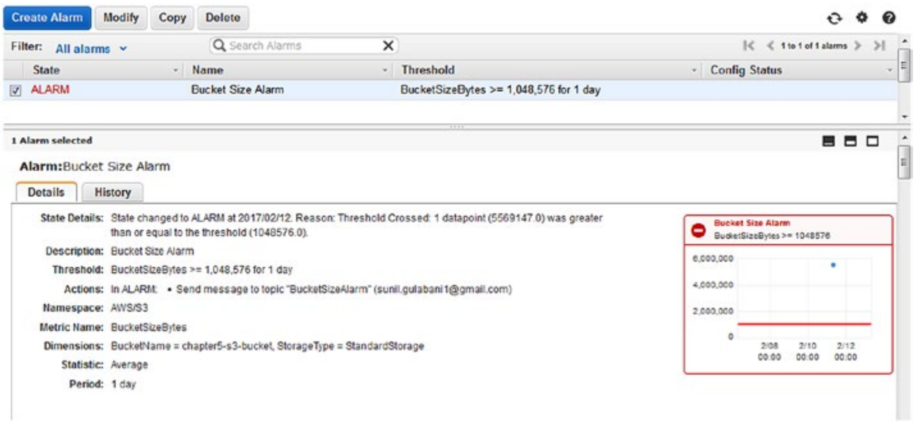
Your alarm Bucket Size Alarm has been saved.

State	Name	Threshold	Config Status
INSUFFICIENT_DATA	Bucket Size Alarm	BucketSizeBytes >= 1,048,576 for 1 day	

Figure 5-61. *Alarm listing*

12. To test that the alarm has being generated, uploaded multiple objects to the bucket whose average size exceeded 1MB.

13. You can see that the alarm state has been changed to "ALARM" in Figure 5-62.



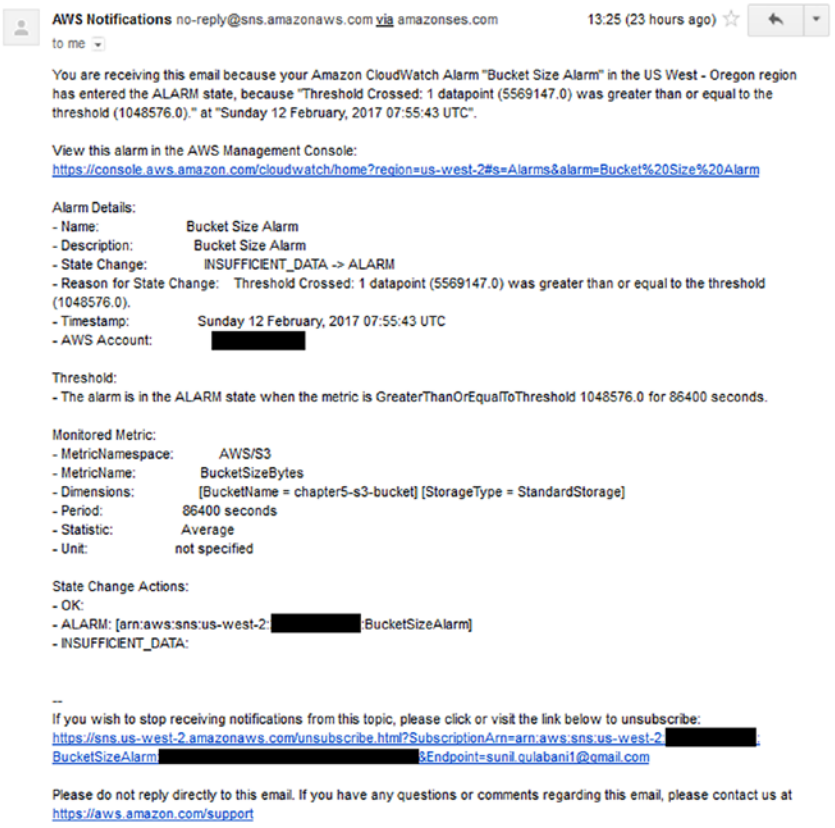
State	Name	Threshold	Config Status
ALARM	Bucket Size Alarm	BucketSizeBytes >= 1,048,576 for 1 day	

Alarm: Bucket Size Alarm

State Details:	State changed to ALARM at 2017/02/12. Reason: Threshold Crossed: 1 datapoint (5569147.0) was greater than or equal to the threshold (1048576.0).
Description:	Bucket Size Alarm
Threshold:	BucketSizeBytes >= 1,048,576 for 1 day
Actions:	In ALARM: • Send message to topic "BucketSizeAlarm" (sunil.gulabani1@gmail.com)
Namespace:	AWS/S3
Metric Name:	BucketSizeBytes
Dimensions:	BucketName = chapter5-s3-bucket, StorageType = StandardStorage
Statistic:	Average
Period:	1 day

Figure 5-62. *Alarm status changed*

An e-mail has also been triggered in Figure 5-63.



AWS Notifications no-reply@sns.amazonaws.com via amazonses.com 13:25 (23 hours ago)
to me

You are receiving this email because your Amazon CloudWatch Alarm "Bucket Size Alarm" in the US West - Oregon region has entered the ALARM state, because "Threshold Crossed: 1 datapoint (5569147.0) was greater than or equal to the threshold (1048576.0)." at "Sunday 12 February, 2017 07:55:43 UTC".

View this alarm in the AWS Management Console:
https://console.aws.amazon.com/cloudwatch/home?region=us-west-2#s=Alarms&alarm=Bucket%20Size%20Alarm

Alarm Details:
- Name: Bucket Size Alarm
- Description: Bucket Size Alarm
- State Change: INSUFFICIENT_DATA -> ALARM
- Reason for State Change: Threshold Crossed: 1 datapoint (5569147.0) was greater than or equal to the threshold (1048576.0).
- Timestamp: Sunday 12 February, 2017 07:55:43 UTC
- AWS Account: [redacted]

Threshold:
- The alarm is in the ALARM state when the metric is GreaterThanOrEqualToThreshold 1048576.0 for 86400 seconds.

Monitored Metric:
- MetricNamespace: AWS/S3
- MetricName: BucketSizeBytes
- Dimensions: [BucketName = chapter5-s3-bucket] [StorageType = StandardStorage]
- Period: 86400 seconds
- Statistic: Average
- Unit: not specified

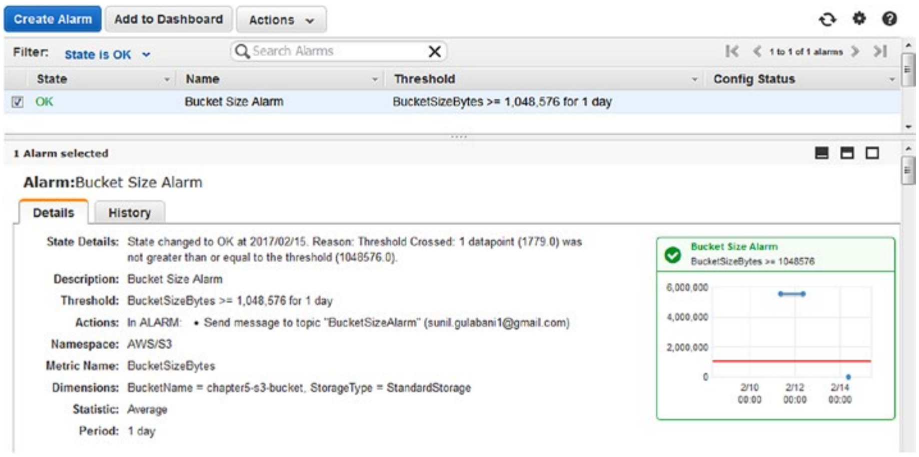
State Change Actions:
- OK:
- ALARM: [arn:aws:sns:us-west-2:[redacted]:BucketSizeAlarm]
- INSUFFICIENT_DATA:

--
If you wish to stop receiving notifications from this topic, please click or visit the link below to unsubscribe:
https://sns.us-west-2.amazonaws.com/unsubscribe.html?SubscriptionArn=arn:aws:sns:us-west-2:[redacted]:
BucketSizeAlarm:[redacted]&Endpoint=sunil.gulabani1@gmail.com

Please do not reply directly to this email. If you have any questions or comments regarding this email, please contact us at https://aws.amazon.com/support

Figure 5-63. *Alarm e-mail*

14. After objects are deleted or moved to another location from the bucket, the alarm state will be back to "OK" or "INSUFFICIENT_DATA," as shown in Figure 5-64.



State	Name	Threshold	Config Status
OK	Bucket Size Alarm	BucketSizeBytes >= 1,048,576 for 1 day	

1 Alarm selected

Alarm: Bucket Size Alarm

State Details: State changed to OK at 2017/02/15. Reason: Threshold Crossed: 1 datapoint (1779.0) was not greater than or equal to the threshold (1048576.0).
Description: Bucket Size Alarm
Threshold: BucketSizeBytes >= 1,048,576 for 1 day
Actions: In ALARM: • Send message to topic "BucketSizeAlarm" (sunil.gulabani1@gmail.com)
Namespace: AWS/S3
Metric Name: BucketSizeBytes
Dimensions: BucketName = chapter5-s3-bucket, StorageType = StandardStorage
Statistic: Average
Period: 1 day

Figure 5-64. *Alarm status changed - OK*

Summary

In this chapter, you have learned how to create a bucket and how to configure a bucket for versioning. You have also learned about the life cycle management of objects and how to host a static web site. Finally, you have learned how to create folders and upload objects using AWS Management Console, AWS CLI, and AWS Java SDK.

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