Chapter No 1
"An Introduction to Amazon Web Services"
In this package, you will find:

The author’s biography

A preview chapter from the book, Chapter no.1 "An Introduction to Amazon Web Services"

A synopsis of the book’s content

Information on where to buy this book

About the Authors

Prabhakaran Kuppusamy is a Hadoop ecosystem specialist and cloud enthusiast who is currently working as a senior systems engineer and developer, Cloud and Infrastructure Services unit, at Infosys Limited. He is passionate about teaching and writing. He loves to play cricket during his leisure time. He joined Education & Research at Global Education Centre, Infosys, where he trained and evaluated thousands of freshmen in Java, Big Data, and cloud technologies. During his tenure in the Education & Research department, he provided training to students from Coventry University and to professionals from Costa Rica on Big Data and cloud technologies, such as Hadoop, MapReduce, Hive, Elastic MapReduce, Google App Engine, DynamoDB, and CloudStack.

Prabhakaran has a Bachelor of Engineering degree in Instrumentation and Control Engineering from Anna University. After completing his degree, he started providing workshops and training sessions on Big Data and cloud to several engineering colleges. He is an IBM Certified Cloud Computing Architect. He has more affinity towards private clouds and a greater working knowledge about them. Currently, he is working on MarkLogic, Storm, and XQuery. He keeps on trying new things, even if it burns his fingers. He loves to interact with students and teachers, and his Twitter handle is @prabhakar28dec.

For More Information:
www.packtpub.com/virtualization-and-cloud/aws-development-essentials
Prabhakaran has also authored *DynamoDB Applied Design Patterns, Packt Publishing*. I dedicate this book to my niece, Harrsatha Sri, and my sister, Kalaiselvi Sathishkumar. I would like to thank Sarika Gaware, Abhishek Kumar Sharma, and Bhupendra Bajpayi for providing favorable conditions to write this book. Also, I would like to thank my GEC colleagues, Krishna Prasad, Uchit Vyas, Sureesh Joseph, and Ravindran Balachandran, for shepherding me technically and personally. Special thanks to Kshitiz Jain, my manager and friend, who has always been there to help me.

**Uchit Vyas** is an IT industry veteran, a cloud technologist at heart, and a hands-on Lead DevOps at Clogeny Technologies for cloud automation. He is responsible for the delivery of solutions and services as well as product development. He explores new open source technologies and the defining architecture, roadmaps, and best practices for enterprises. He has consulted and provided training on various open source technologies, including cloud computing (AWS Cloud, Rackspace, Azure, CloudStack, OpenStack, and Eucalyptus), Mule ESB, Chef, Puppet, Liferay Portal, Alfresco ECM, and JBoss to corporations around the world.

Uchit has done his engineering in Computer Science from Gujarat University. He was in the Education & Research Team as a senior associate at Infosys Limited; during this time, he has worked on private clouds, cloud security, and virtualization.

Uchit has also authored books on Mule ESB and AWS DynamoDB, and he continuously writes books on open source technologies such as Storm, Python, and so on.

He hosts a blog named Cloud Magic World ([http://cloudbyuchit.blogspot.com](http://cloudbyuchit.blogspot.com)), where he posts tips and phenomena on open source technologies mostly relating to cloud. His Twitter handle is @uchit_vyas.

I would like to thank my better half for helping me a lot in writing this book and providing me with continuous support throughout the period of writing this book. I would also like to thank my Infocian colleague, Prabhakaran Kuppusamy, for his help.

For More Information:
AWS Development Essentials

*AWS Development Essentials* is a single place where you can find solutions for all of your issues with Amazon Web Services. This book will explain how to begin and manage eight different services using the AWS SDKs and APIs as well as the AWS Management Console, a browser-based graphical user interface to interact with the services. It will include a significant number of examples that can be used by anyone, from a newbie to an expert. Using the examples of this book, users can perform advanced-level programming and gain the advantages of AWS SQL and NoSQL databases in their application at significantly lower costs. The final chapter of this book is purely dedicated to how you can create an application having EC2, VPC, RDS, SNS, and S3 services as the backbone of the application and how you can deploy and manage this application using Elastic Beanstalk.

**What This Book Covers**

*Chapter 1, An Introduction to Amazon Web Services*, helps you to start accessing AWS through the Management Console and shows the steps required to set up and configure the IDE and SDK tools.

*Chapter 2, Working with AWS Storage Services*, makes you aware of the different storage techniques available in AWS and how to access them through the IDE.

*Chapter 3, Computing and Networking Services*, teaches you about the creation and management of EC2 instances in different regions and VPCs.

*Chapter 4, Managed Services and the Databases*, makes you familiar with the Relational Database Service and DynamoDB, a NoSQL database service.

*Chapter 5, Deployment and Management*, teaches you how to use Amazon IAM for identity management and how to deploy an application using Elastic Beanstalk.

*Chapter 6, Working with the AWS Simple Notification Service – SNS*, helps you to dive deep into different notification and messaging options, explaining the challenges and troubleshooting in detail.

*Chapter 7, Working with AWS SQS*, helps you to explore different queuing options, explaining the challenges and troubleshooting in detail.

*Chapter 8, Building an Application Using AWS*, teaches you how to create, deploy, and manage an application that uses multiple AWS services.

For More Information:
www.packtpub.com/virtualization-and-cloud/aws-development-essentials
Amazon Web Services (AWS) is a leading public cloud provider. One good thing with AWS is the abundant number of services and tools offered, which helps the programmer to use them in an easy and customized way. There are different tools and methods available to perform the same operation with different, varying complexities. Various options are available, depending on the user's level of experience. In this book, we will start with an overview of each service, learn about the various tools available for programmer interaction, and finally see the troubleshooting and best practices to be followed while using these services. In the final chapter, you will learn how to develop an application using AWS services. AWS provides a handful of services in every area. A separate book can be written for each service. For this reason, we will discuss one service in each section and learn how to use it.

In this chapter, we will cover the following topics:

- Navigate through the AWS Management Console
- Describe the security measures that AWS provides
- AWS interaction through the SDK and IDE tools

For More Information:
www.packtpub.com/virtualization-and-cloud/aws-development-essentials
A background of AWS and its needs

AWS is based on an idea presented by Chris Pinkham and Benjamin Black with a vision toward Amazon's retail computing infrastructure. The first Amazon offering was SQS, in 2004. Officially, AWS was launched and made available online in 2006, and within a year, 200,000 developers had signed up for these services. Later, due to a natural disaster (June 29, 2012 storm in North Virginia, which brought down most of the servers residing at this location) and technical events, AWS faced a lot of challenges. A similar event happened in December 2012, after which AWS has been providing services as stated. AWS learned from these events and made sure that the same kind of outage wouldn't occur even if the same event occurred again. AWS is an idea born in a single room, but the idea is now made available and used by almost all the cloud developers and IT giants.

AWS is greatly loved by all kinds of technology admirers. Irrespective of the user's expertise, AWS has something for various types of users. For an expert programmer, AWS has SDKs for each service. Using these SDKs, the programmer can perform operations by entering commands in the command-line interface. However, an end user with limited knowledge of programming can still perform similar operations using the graphical user interface of the AWS Management Console, which is accessible through a web browser. If programmers need interactions between a low-level (SDK) and a high-level (Management Console), they can go for the integrated development environment (IDE) tools, for which AWS provides plugins and add-ons. One such commonly used IDE for which AWS has provided add-ons is the Eclipse IDE. You will learn about the AWS plugin for the Eclipse IDE in the last section of this chapter. As of now, we will start with the AWS Management Console.

The AWS Management Console

The most popular method of accessing AWS is via the Management Console because of its simplicity of usage and power. Another reason why the end user prefers the Management Console is that it doesn't require any software to start with; having an Internet connection and a browser is sufficient. As the name suggests, the Management Console is a place where administrative and advanced operations can be performed on your AWS account details or AWS services. The Management Console mainly focuses on the following features:

- One-click access to AWS services
- AWS account administration
- AWS management using handheld devices
- AWS infrastructure management across the globe

For More Information:
www.packtpub.com/virtualization-and-cloud/aws-development-essentials
One-click access to the AWS services

To access the Management Console, all you need to do is first sign up with AWS. Once done, the Management Console will be available at https://console.aws.amazon.com/. Once you have signed up, you will be directed to the following page:

Each and every icon on this page is an Amazon web service. Two or more services will be grouped under a category. For example, in the Analytics category, you can see three services: Data Pipeline, Elastic MapReduce, and Kinesis. Starting with any of these services is very easy. Have a look at the description of the service at the bottom of the service icon. As soon as you click on the service icon, it will take you to the Getting started page of the corresponding service, where brief as well as detailed guidelines are available. To start with any of the services, only two things are required. The first one is an AWS account and the second one is the supported browser. The Getting started section usually will have a video, which explains the specialty and use cases of the service that you selected. Once you finish reading the Getting started section, optionally you can go through the DOC files specific to the service to know more about the syntaxes and usage of the service operations.

For More Information:
www.packtpub.com/virtualization-and-cloud/aws-development-essentials
AWS account administration

The account administration is one of the most important things to make note of. To do this, click on your displayed name (in this case, Prabhakar) at the top of the page, and then click on the My Account option, as shown in the preceding screenshot. At the beginning of every month, you don't want AWS to deduct all of your salary by stating that you have used these many services costing this much money; hence, all this management information is available in the Management Console. Using the Management Console, you can infer the following information:

- The monthly billing in brief as well as the detailed manner (cost split-up of each service) along with a provision to view VAT and tax exemption
- Account details, such as the display name and contact information
- Provision to close the AWS account

All the preceding operations and much more are possible.

AWS management using handheld devices

Managing and accessing the AWS services is through (but not limited to) a PC. AWS provides a handful of applications for almost all or most of the mobile platforms, such as Android, iOS, and so on. Using these applications, you can perform all the AWS operations on the move. You won't believe that having a 7-inch Android tablet with the installed AWS Console application from Google Play will enable you to ask for any Elastic Compute Cloud (EC2) instance from Amazon and control it (start, stop, and terminate) very easily. You can install an SSH client in the tablet and connect to the Linux terminal. However, if you wish to make use of the Windows instance from EC2, you might use the Graphics User Interface (GUI) more frequently than a command line. A few more sophisticated software and hardware might be needed, for example, you should have a VNC viewer or remote desktop connection software to get the GUI of the EC2 instance borrowed. As you are making use of the GUI in addition to the keyboard, you will need a pointer device, such as a mouse. As a result, you will almost get addicted to the concept of cloud computing going mobile.

For More Information:

www.packtpub.com/virtualization-and-cloud/aws-development-essentials
AWS infrastructure management across the globe

At this point, you might be aware that you can get all of these AWS services from servers residing at any of the following locations. To control these services used by you in different regions, you don't have to go anywhere else. You can control it right here in the same Management Console. Using the same Management Console, just by clicking on N. Virginia and choosing the location (at the top of the Management Console), you can make the service available in that region, as shown in the following screenshot:

You can choose the server location at which you want the service (data and machine) to be made available based on the following two factors:

- The first factor is the distance between the server's location and the client's location. For example, if you have deployed a web application for a client from North California at a Tokyo location, obviously the latency will be high while accessing the application. Therefore, choosing the optimum service location is the primary factor.

- The second factor is the charge for the service in a specific location. AWS charges more for certain crowded servers. Just for illustration, assume that the server for North California is used by many critical companies. So this might cost you twice if you create your servers at North California compared to the other locations. Hence, you should always consider the trade-off between the location and cost and then decide on the server location.

For More Information:
www.packtpub.com/virtualization-and-cloud/aws-development-essentials
Whenever you click on any of the services, AWS will always select the location that costs you less money as the default.

AWS security measures
Whenever you think of moving your data center to a public cloud, the first question that should arise is about data security. In a public cloud, through virtualization technology, multiple users might be using the same hardware (server) in which your data is available. You will learn in detail about how AWS ensures data security.

Instance isolation
Before learning about instance isolation, you must know how AWS EC2 provisions the instances to the user. This service allows you to rent virtual machines (AWS calls it instances) with whatever configurations you ask. We will discuss EC2 in detail in Chapter 3, Computing Services and Networking.

Let's assume that you requested AWS to provision 2 GB RAM, a 100 GB HDD, and an Ubuntu instance. Within a minute, you will be given the instance's connection details (public DNS, private IP, and so on), and the instance starts running. Does this mean that AWS assembled 2*1 GB RAM and 100 GB HDD into a CPU cabinet and then installed Ubuntu OS in it and gave you the access? The answer is no. The provisioned instance is not a single PC (or bare metal) with an OS installed in it. The instance is the outcome of a virtual machine provisioned by Amazon's private cloud. The following diagram shows how a virtual machine can be provisioned by a private cloud:

Let's examine the diagram from bottom to top. First, we will start with the underlying Hardware/Host. Hardware is the server, which usually has a very high specification. Here, assume that your hardware has the following configuration: 99 GB RAM, a 450 TB HDD, and a few other elements, such as NIC, which you need not consider now. The next component in your sights is the Hypervisor.

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A hypervisor or virtual machine monitor (VMM) is used to create and run virtual machines on the hardware. In private cloud terms, whichever machine runs a hypervisor on it is called the host machine. Three users can request each of them need instances with 33 GB RAM and 150 TB HDD space. This request goes to the hypervisor and it then starts creating those VMs.

After creating the VMs, a notification about the connection parameters will be sent to each user. In the preceding diagram, you can see the three virtual machines (VMs) created by the hypervisor. All the three VMs are running on different operating systems. Even if all the three virtual machines are used by different users, each will feel that only he/she has access to the single piece of hardware, which is only used by them; user 1 might not know that the same hardware is also being used by user 2, and so on. The process of creating a virtual version of a machine or storage or network is called virtualization. The funny thing is that none of the virtual machines knows that it is being virtualized (that is, all the VMs are created on the same host). After getting this information about your instances, some users may feel deceived, and some will be even disappointed and say, has your instance been created on a shared disk or resource? Even though the disk (or hardware) is shared, one instance (or owner of the instance) is isolated from the other instances on the same disk through a firewall. This concept is termed as instance isolation. The following diagram demonstrates instance isolation in AWS:
An Introduction to Amazon Web Services

The preceding diagram clearly demonstrates how EC2 provides instances to every user. Even though all the instances are lying in the same disk, they are isolated by the hypervisor. The hypervisor has a firewall that does this isolation. So, the physical interface will not interact with the underlying hardware (machine or disk where instances are available) or virtual interface directly. All these interactions will be through the hypervisor's firewall. This way, AWS ensures that no user can directly access the disk, and no instance can directly interact with another instance even if both instances are running on the same hardware. In addition to the firewall, during the creation of the EC2 instance, the user can specify the permitted and denied security groups of the instance. These two ideologies provide instance isolation.

In the preceding diagram, Customer 1, Customer 2, and so on are virtualized disks since the customer instances have no access to raw or actual disk devices. As an added security measure, the user can encrypt his/her disk so that other users cannot access the disk content (even if someone gets in contact with the disk).

Isolated GovCloud

Similar to North California or Asia Pacific, GovCloud is also a location where you can get your AWS services. This location is specifically designed only for government and agencies whose data is very confidential and valuable, and disclosing this data might result in disaster. By default, this location will not be available to the user. If you want access to this location, then you need to raise a compliance request at http://aws.amazon.com/compliance/contact/ and submit the FedRAMP Package Request Form downloadable at http://cloud cio.gov/document/fedramp-package-request-form. From these two URLs, you can understand how secure the cloud location really is.

CloudTrail

CloudTrail is an AWS service that performs user activity and changes tracking. Enabling CloudTrail will log all the API request information into your S3 bucket, which you have created solely for this purpose. CloudTrail also allows you to create an SNS topic as soon as a new log file is created by CloudTrail. CloudTrail, in conjunction with SNS, provides real-time user activity as messages to the user.

For More Information:
www.packtpub.com/virtualization-and-cloud/aws-development-essentials
Simple Storage Service (S3) allows AWS users to store files. S3 will be discussed in Chapter 2, Working with AWS Storage Services. Similarly, Simple Notification Service (SNS) permits the AWS user to be notified (by an e-mail or SMS) when a condition occurs. You will learn more about SNS in Chapter 6, Working with the AWS Notification Service – SNS.

Password
This might sound funny. After looking at CloudTrail, if you feel that someone else is accessing your account, the best option is to change the password. Never let anyone look at your password, as this could easily compromise an entire account. Sharing the password is like leaving your treasury door open.

Multi-Factor Authentication
Until now, to access AWS through a browser, you had to log in at http://aws.amazon.com and enter your username and password. However, enabling Multi-Factor Authentication (MFA) will add another layer of security and ask you to provide an authentication code sent to the device configured with this account. In the security credential page at https://console.aws.amazon.com/iam/home?#security_credential, there is a provision to enable MFA. Clicking on Enable will display the following window:

Selecting the first option A virtual MFA device will not cost you money, but this requires a smartphone (with an Android OS), and you need to download an app from the App Store. After this, during every login, you need to look at your smartphone and enter the authentication token. More information is available at https://youtu.be/MWJtuthUs0w.

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Access Keys (Access Key ID and Secret Access Key)

In the same security credentials page, next to MFA, these access keys will be made available. AWS will not allow you to have more than two access keys. However, you can delete and create as many access keys as possible, as shown in the following screenshot:

This access key ID is used while accessing the service via the API and SDK. During this time, you must provide this ID. Otherwise, you won't be able to perform any operation. In other words, if someone else gets or knows this ID, they could pretend to be you through the SDK and API. In the preceding screenshot, the first key is inactive and the second key is active. The Create New Access Key button is disabled because I already have a maximum number of allowed access keys. As an added measure, I forged my actual IDs.

It is a very good practice to delete a key and create a new key every month using the Delete command link and toggle the active keys every week (by making it active and inactive) by clicking on the Make Active or Make Inactive command links. Never let anyone see these IDs. If you are ever in doubt, delete the ID and create a new one.

Clicking on the Create New Access Key button (assuming that you have less than two IDs) will display the following window, asking you to download the new access key ID as a CSV file:

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www.packtpub.com/virtualization-and-cloud/aws-development-essentials
The CloudFront key pairs

The CloudFront key pairs are very similar to the access-key IDs. Without these keys, you will not be able to perform any operation on CloudFront. Unlike the access key ID (which has only an access key ID and a secret access key), here you will have a private key and a public key along with the access key ID, as shown in the following screenshot:

If you lose these keys once, then you need to delete the key pair and create a new key pair. This is also an added security measure.

X.509 certificates

X.509 certificates are mandatory if you wish to make any SOAP requests on any AWS service. Clicking on Create new certificate will display the following window, which performs exactly the same function as discussed in the previous section:

Account identifiers

There are two IDs that are used to identify ourselves when accessing the service via the API or SDK. These are the AWS account ID and the canonical user ID. These two IDs are unique. Just as with the preceding parameters, never share these IDs or let anyone see them. If someone has your access ID or key pair, the best option is to generate a new one. But it is not possible to generate a new account ID or canonical user ID.
An Introduction to Amazon Web Services

**AWS interaction through the SDK and IDE tools**

As discussed, AWS has a bit for everyone with respect to the kind of knowledge or expertise that the user has. An end user might find the Management Console useful. From a programmer's point of view, the SDK will be helpful. AWS provides SDK for most of the commonly used languages, such as Java, Ruby, .NET, PHP, Node.js, and Python. More information about these tools is available at http://aws.amazon.com/tools. For an Eclipse IDE addict, IDE tools will be very supportive. Now that we have discussed enough about the Management Console, we can spend some time on the SDK and IDE tools.

**The first IDE tool – the Eclipse plugin**

Eclipse is one of the most commonly used open source IDEs, and it provides a plugin to work with AWS. Almost all the Java developers use Eclipse for application development. Eclipse can be downloaded from www.eclipse.org/downloads. Try to download the latest version. Throughout the book, you will see Eclipse Juno. To get started with Eclipse, visit www.eclipse.org/users.

To configure the AWS plugin in the Eclipse IDE, follow these steps:

1. Open Eclipse and select **Install New Software** from the **Help** menu, as shown in the following screenshot:

2. In the following screenshot, you need to enter http://aws.amazon.com/eclipse/ and press the **Enter** key. It will display all the available plugins for AWS. You can either install everything or only the necessary components (it's better to install everything because there will be dependency between these plugins).

For More Information:  
www.packtpub.com/virtualization-and-cloud/aws-development-essentials
3. The following page will display the components that will be installed on Eclipse. Confirm it and then proceed.
4. The following page will show the invalid components (in this case, **AWS SDK for Android**). If the component (not installed) does not cause any trouble, just proceed with the installation.

![Install Remediation Page](image)

5. To proceed with the installation, you must accept the Apache license and the Eclipse foundation agreement. Check the **I accept the terms of the license agreements** condition, and click on the **Finish** button to complete the installation, as shown here:

![Review Licenses](image)

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**For More Information:**
www.packtpub.com/virtualization-and-cloud/aws-development-essentials
Due to the dependency among packages, there might be some dependency errors thrown while setting up the plugin. In this case, select **Install New Software** from the **Help** menu, enter the URL `http://download.eclipse.org/datatools/updates/1.12`, select the following package, and repeat the installation of the AWS plugin, as shown in the following screenshot:

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www.packtpub.com/virtualization-and-cloud/aws-development-essentials
7. There's a possibility that you might see the following security warning. Make sure that you're installing from AWS and not from any third party. Once you know that the source is safe, only then proceed by clicking on OK.

![Security Warning]

8. The same security warning will be shown, and if you wish, you can trust Amazon and add it to your safe list. This can be done by checking the following option:

![Selection Needed]

9. After successful installation, Eclipse will ask you to restart for the changes to take effect, as shown in the following screenshot:

![Software Updates]

For More Information:
www.packtpub.com/virtualization-and-cloud/aws-development-essentials
10. After restarting Eclipse, you will see a new icon called AWS toolkit, and the default Eclipse perspective will be Java. To open the perspective to work with AWS, select the Open Perspective option from the Window menu. It will show the first two perspectives.

11. Double-click on AWS Management to begin your work, as shown in the following screenshot:

12. While working with the Management Console, you must log in with your AWS username and password. However, in the case of the Eclipse plugin, you need to specify a few more attributes for authentication. You can specify your account details by clicking on the AWS toolkit for the Eclipse icon, and select the Preferences option, as shown in the following screenshot:

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13. The following pop-up window will ask you for details, which you can fetch from the **Security** page in the Management Console:

![Security Page Screenshot]

14. Once the configuration is successful, all the AWS components will be loaded. You can right-click on the corresponding service and select **Refresh** to get the latest data. The icon in the top-right corner (with the US flag) is the region that we selected, as shown in the following screenshot:

![AWS Explorer Screenshot]

15. To change the region, click on the flag icon in the top-right corner of the page, and then select the region from the drop-down menu.

**Downloading the example code**

You can download the example code files for all Packt books you have purchased from your account at [http://www.packtpub.com](http://www.packtpub.com). If you purchased this book elsewhere, you can visit [http://www.packtpub.com/support](http://www.packtpub.com/support) and register to have the files e-mailed directly to you.

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**For More Information:**

The SDK tool

Working with AWS using the Software Development Kit (SDK) is a bit difficult compared to the Eclipse IDE. Even though both perform the same operation, the complexity is a little higher with SDK because of the SDK configuration. The SDK can be downloaded in a ZIP format from http://sdk-for-java.amazonwebservices.com/latest/aws-java-sdk.zip.

You can extract the downloaded ZIP file to any location of your choice. After this, in the case of Windows OS, you need to create a file named credentials at the C:\Users\<USERNAME>\aws\ location. The file should have the following details:

```
[Prabhakar]
aws_access_key_id=AKIOMODIFIEDAK3A
aws_secret_access_key=5W6jveTZ7PrabhakarHasModifiedwHpzM+hzOo
```

This file was created while configuring the Eclipse plugin. If this file or directory is not available, you need to create it and fill it with the access key ID and secret access key value. Apart from this, almost everything else is specific to the individual service. You will learn about this in detail in the upcoming chapters.

Summary

In this chapter, you learned the AWS Management Console and its commonly used SDKs and IDEs. You also learned how AWS secures your data. Then, you looked at the AWS plugin configuration on the Eclipse IDE.

The first section made the user familiar with the AWS Management Console. After that, you explored a few of the important security aspects of AWS and learned how AWS handles it. Finally, you learned about the different AWS tools available to the programmer to make his development work easier. In this last section, you examined the common SDKs and IDE tools of AWS. The service-specific SDK and IDE will be discussed separately in the upcoming chapters.

In the next chapter, you will learn about how to store and manage your data on AWS using Elastic Block Storage (EBS) and Simple Storage Service (S3).

For More Information:
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