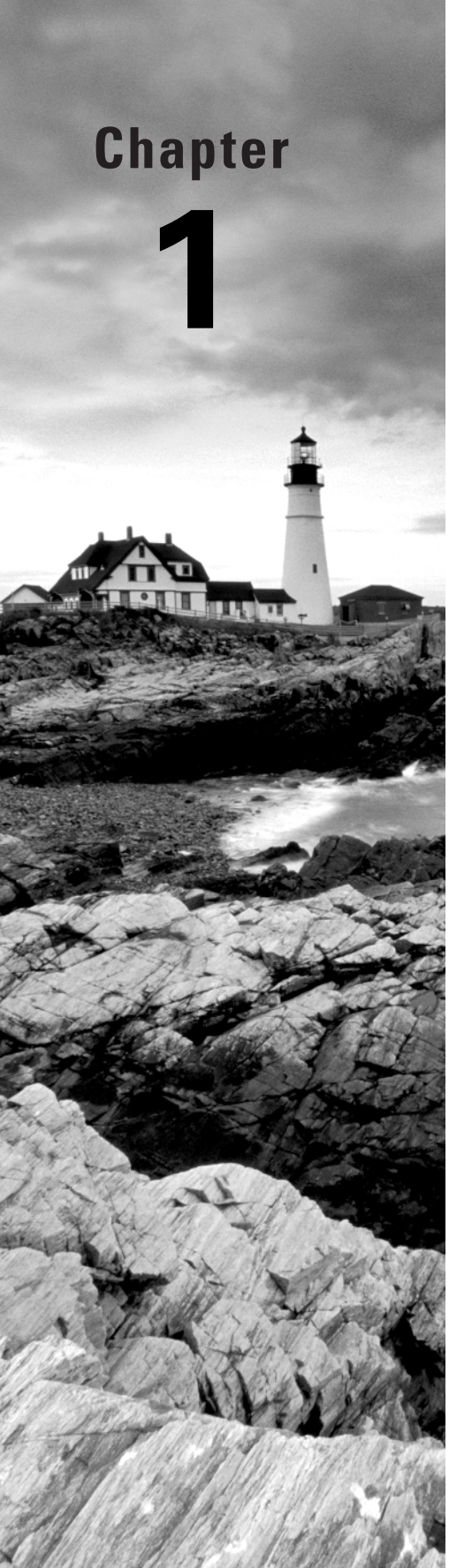
PART I

AWS Fundamentals



Chapter 1

Introduction to Systems Operations on AWS

THE AWS CERTIFIED SYSOPS ADMINISTRATOR – ASSOCIATE EXAM TOPICS COVERED IN THIS CHAPTER MAY INCLUDE, BUT ARE NOT LIMITED TO, THE FOLLOWING:

Domain 2.0: High Availability

✓ **2.1 Implement scalability and elasticity based on use case.**

✓ **2.2 Recognize and differentiate highly available and resilient environments on AWS.**

✓ **Content may include the following:**

- Selecting AWS services and best practices for building highly available and scalable architectures
- Identifying which services scale automatically and which require administrator intervention

Domain 3.0: Deployment and Provisioning

✓ **3.1 Identify and execute steps required to provision cloud resources.**

✓ **Content may include the following:**

- Familiarity with multi-tier architectures
- Where you can go for documentation and help with your AWS deployments

Domain 5.0: Security and Compliance

✓ **5.1 Implement and manage security policies on AWS.**

✓ **5.2 Implement access controls when using AWS.**

✓ **5.3 Differentiate between the roles and responsibility within the shared responsibility model.**

✓ **Content may include the following:**

- Advantages of a cloud model for security and access control
- How AWS clearly delineates the role of you, the SysOps Administrator, and AWS as maintainers of the cloud

Domain 6.0: Networking

✓ **6.1 Apply AWS networking features.**

✓ **Content may include the following:**

- What AWS provides in terms of networking and troubleshooting services
- The basics of Amazon Virtual Private Cloud (Amazon VPC)

Domain 7.0: Automation and Optimization

✓ **7.1 Use AWS services and features to manage and assess resource utilization.**

✓ **Content may include the following:**

- How AWS defines the cloud and provides a complete ecosystem for application hosting and operations
- What AWS provides in terms of managed services, and the basics of those managed services

You simply cannot claim to be a competent systems administrator without a working knowledge of the cloud. As the biggest cloud provider, learning the inner workings of the Amazon Web Services (AWS) cloud infrastructure and how to manage its resources and services is a competitive advantage. This book will advance your skills with AWS and ensure that you are prepared to both understand how AWS works and pass the AWS Certified SysOps Administrator – Associate exam.

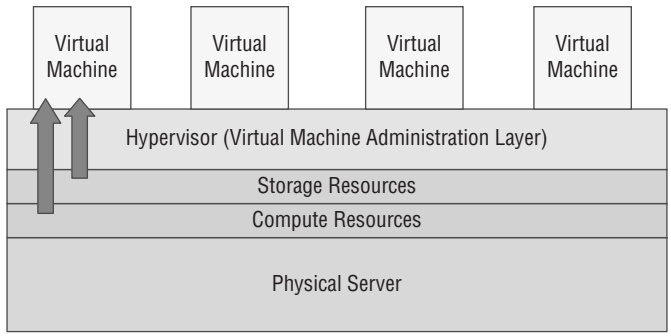
In this chapter, you will learn about AWS and its associated services, including:

- The available regions within AWS and their corresponding API endpoints
- Services available with the Amazon platform broken out by category of service
- What systems operations (SysOps) entail and how SysOps questions will appear on the exam
- The Shared Responsibility Model, which defines the responsibilities of AWS and of its customers
- The AWS Service Level Agreement and what you need to know about it for the exam
- How to interact with AWS and the services available to you
- What to do when you need support or additional resources with AWS

The AWS Ecosystem

AWS, at its heart, is a virtualization platform. Figure 1.1 shows a simple look at the AWS stack of resources, from the physical servers that AWS maintains to actual "servers in the cloud."

FIGURE 1.1 AWS as a virtualization platform

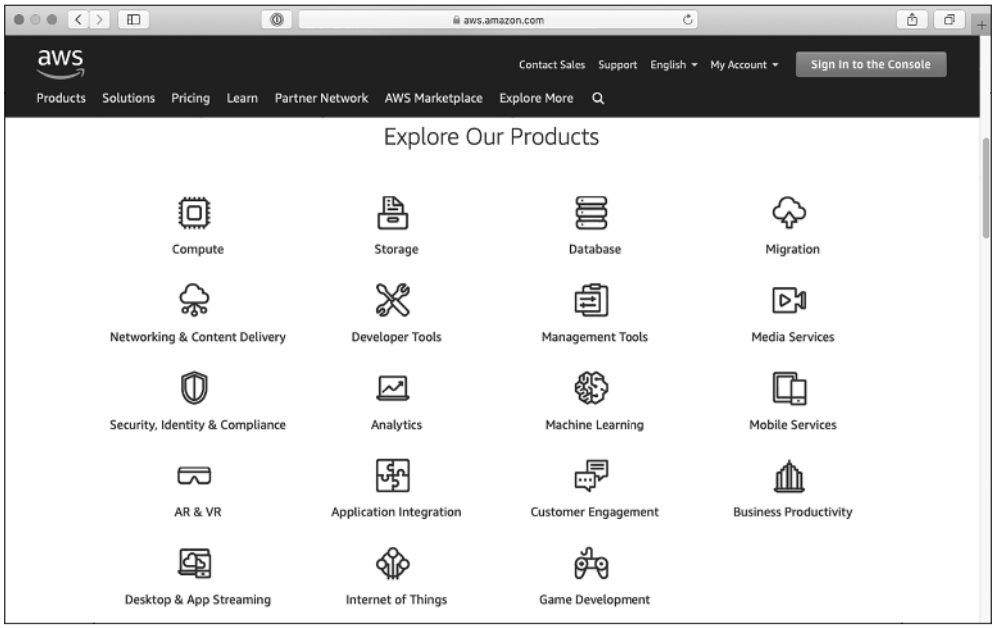


Although there is value in seeing AWS and the cloud, in general, as a translation of on-premises or physical hardware into a virtual model, that metaphor is incomplete. Many times, the cloud introduces new paradigms (such as spot instances) and supplements familiar concepts with new ones (network access control lists behave somewhat like firewalls, while not being a direct replacement). It is helpful to think of certain key resources as virtualized physical devices, but to hold that thought loosely and adapt it when needed to take advantage of cloud models.

The AWS Services Model

AWS does not merely provide computational power. This same *virtualization* takes place for storage, databases, analytics, networking, mobile and developer tools, administration of management of those services, and more. It is the sum of all of these services that comprise the AWS ecosystem. Figure 1.2 shows just the *categories* of services that AWS provides.

FIGURE 1.2 AWS provides a huge array of services, organized into categories.



Your job as a SysOps administrator will be to manage deployments of combinations of these services. That means you need to understand the core services and how they interrelate, as well as how they are deployed and how they run, scale, and eventually shut down (and possibly start up all over again). You're also responsible for more than just "getting things working," but to employ best practices in your decisions.

The core services will all be covered in the following chapters, particularly as they each relate to system administration and operation. However, AWS is always adding more services, and you'll often be tested on what these services do at a high level. It's a good idea to browse this list before taking an exam and at least read through descriptions of any services that are new to you.

The AWS Global Presence

AWS also maintains datacenters around the world. These datacenters are not directly available to you, but abstractions over them are via availability zones and regions. An *availability zone* (or AZ for short) is an AWS abstraction over a specific area, a sort of pseudo–datacenter. Availability zones are grouped into larger geographical *regions*.

There are always more regions than availability zones, and the number of both is constantly growing. You will want to carefully consider the regions and AZs you launch your instances into, as they are priced differently and also will affect latency from your customers based on their location. Table 1.1 shows a list of all current (nongovernment) regions, along with each region's name and endpoint addresses.

TABLE 1.1 Current publicly accessible AWS regions

Region name	Region	Endpoint
US East (Ohio)	us-east-2	apigateway.us-east-2.amazonaws.com
US East (N. Virginia)	us-east-1	apigateway.us-east-1.amazonaws.com
US West (N. California)	us-west-1	apigateway.us-west-1.amazonaws.com
US West (Oregon)	us-west-2	apigateway.us-west-2.amazonaws.com
Asia Pacific (Mumbai)	ap-south-1	apigateway.ap-south-1.amazonaws.com
Asia Pacific (Seoul)	ap-northeast-2	apigateway.ap-northeast-2.amazonaws.com
Asia Pacific (Osaka-Local)	ap-northeast-3	apigateway.ap-northeast-3.amazonaws.com
Asia Pacific (Singapore)	ap-southeast-1	apigateway.ap-southeast-1.amazonaws.com
Asia Pacific (Sydney)	ap-southeast-2	apigateway.ap-southeast-2.amazonaws.com
Asia Pacific (Tokyo)	ap-northeast-1	apigateway.ap-northeast-1.amazonaws.com

TABLE 1.1 Current publicly accessible AWS regions *(continued)*

Region name	Region	Endpoint
Canada (Central)	ca-central-1	apigateway.ca-central-1.amazonaws.com
China (Beijing)	cn-north-1	apigateway.cn-north-1.amazonaws.com.cn
China (Ningxia)	cn-northwest-1	apigateway.cn-northwest-1.amazonaws.com.cn
EU (Frankfurt)	eu-central-1	apigateway.eu-central-1.amazonaws.com
EU (Ireland)	eu-west-1	apigateway.eu-west-1.amazonaws.com
EU (London)	eu-west-2	apigateway.eu-west-2.amazonaws.com
EU (Paris)	eu-west-3	apigateway.eu-west-3.amazonaws.com
South America (São Paulo)	sa-east-1	apigateway.sa-east-1.amazonaws.com

There might be a half a dozen availability zones within each of these regions, identified by using names like `us-east-1a` (a number and letter suffix appended to each region name).

Many AWS services have specific details regarding how they function (and *if* they function) across availability zones and regions. An important role of the SysOps administrator is to provision resources correctly so that they are highly available and redundant. You should pay special attention whenever you come across instructions or details about setting up a service across AZs or regions.

Additionally, this is one of the more popular areas for the AWS exam to question you. You'll be asked multiple times about setting up the Amazon Relational Database Service (Amazon RDS) and Amazon Simple Storage Service (Amazon S3) across regions, DynamoDB across availability zones, and how Amazon Virtual Private Clouds (VPCs) are allocated within a region. Pay special attention to these topics!

AWS Managed Services

AWS is as much a service provider as it is a cloud provider. In addition to the infrastructure it provides, AWS offers a number of managed services. These services are a core part of the job of the SysOps admin to understand, configure, operate, and optimize. Table 1.2 offers a quick overview look at the various AWS service categories, and Table 1.3 shows the (current) managed services within those categories.

TABLE 1.2 AWS service categories

Category	Function
Compute	Compute services are, essentially, the computers in the cloud. Anything that is primarily aimed at providing CPU cycles to your application is a compute service: instances, containers, and all other services that provide processing power. You'll find Amazon Elastic Compute Cloud (Amazon EC2) instances, Amazon Elastic Container Service (Amazon ECS) containers, and Lambda here, among others.
Networking & Content Delivery	This should be self-evident: networking services such as Amazon VPC and Route 53 (for DNS) are in this category.
Storage	AWS provides a variety of storage services with numerous subcategories. Probably most notable here are S3 for object storage and Amazon Elastic File System (Amazon EFS) for network-attached storage (NAS)-style storage. Note that storage does *not* include database services.
Database	AWS provides data solutions in a variety of flavors: DynamoDB (the AWS NoSQL engine), and RDS, the AWS relational database service, are the most popular.
Migration	This is a new but growing category. It includes tools for moving from on-premises environments to AWS.
Management Tools	This is an ever-growing category and includes monitoring, logging, scaling, configuration, and anything else you might use to manage your applications and AWS account.
Security, Identity, & Compliance	This category contains services for managing authentication and authorization, encrypting data, and handling interactions between services.
Developer Tools	AWS is increasing their efforts to provide AWS-centric developer tools, including editors, version control, and deployment.
Media Services	This category is the AWS home for anything you might use to process media and serve it to clients on various platforms, including transcoding and format conversion.
Analytics	Analytics is the AWS response to the growing data sets on their platform. This category contains tools for business intelligence, offline processing, and search.
And more...	The list of categories is growing just as the services themselves are growing. There are a number of additional small categories that are often being reshuffled: media services, game development, Internet of Things, etc.

Within each of these categories are a number of services, as shown in Table 1.3. Note that this table is *not* exhaustive, and even if it were, it would be outdated in the months between this writing and your reading!

Don't worry too much about the categories themselves. AWS sometimes changes or adds categories, and services often move from one category to another as that service's usage and purpose slightly shifts.

TABLE 1.3 Core AWS services (by category)

Category	Service	Function
Compute	Elastic Compute Cloud (EC2)	EC2 is the basic building block of most applications. EC2 instances are virtual servers that have CPU, memory, storage, and network interfaces, in a variety of sizes. You'll run your web servers and application processes on EC2 instances.
	Elastic Container Service (ECS)	ECS is the AWS solution to the management and servicing of containers, and in particular, Docker. Containers can be created and uploaded, run at scale, set to grow and shrink, and generally are more optimized than full EC2 instances.
	Lambda	Lambda is the serverless architecture at AWS that has become one of the core components of modern web applications. Lambda can run code without you having to provision servers or compute power, and can be attached to events generated by services like CloudWatch.
	Elastic Load Balancing	Incoming network traffic can be directed between multiple web servers to ensure that a single web server isn't overwhelmed while other servers are underused or that traffic isn't directed to failed servers.
	Elastic Beanstalk	Beanstalk is a managed service that abstracts the provisioning of AWS compute and networking infrastructure. You are required to do nothing more than push your application code, and Beanstalk automatically launches and manages all the necessary services in the background.
Networking & Content Delivery	Virtual Private Cloud (VPC)	VPC is another core component of AWS. As you build out your own AWS environment, your VPCs contain your subnets, have Internet gateways attached, provide a layer of security through network ACLs (NACLs), and are key to understanding how AWS handles networking.

Category	Service	Function
	CloudFront	CloudFront is Amazon's distributed global content delivery network (CDN). CloudFront provides edge locations around the world that store cached content and serve that content without requiring trips all the way back to the servers that originated that content.
	Route 53	AWS now provides a complete DNS service, which also acts as a domain registrar. Route 53 offers a number of routing policies that can control how traffic flows from the Internet to your AWS resources.
	Direct Connect	You can use Direct Connect to establish a direct tunnel between your on-premises datacenter and your AWS-based VPCs. You'll need special hardware, but the benefits are significant.
Storage	Simple Storage Service (S3)	S3 is one of the most basic AWS services, along with EC2. S3 provides object storage in a variety of flavors, focusing on durability and availability. You can customize S3 with lifecycle policies to handle hot, warm, and cold data, and make that data available to the Internet easily and securely. You can also host static websites on S3.
	Glacier	Glacier is a pseudo-category of S3 and is focused on archival storage. Glacier retrieval times are slower, but the overall cost of Glacier is very low, making it an ideal long-term storage solution.
	Elastic Block Store (EBS)	EBS is a virtual hard drive. EBS volumes are attached to your EC2 instances and provide storage. This storage is not intended to be long-lived or to replace S3, but it does allow for quick reading and writing of data that does not need to be stored in S3 or a database.
	Storage Gateway	Storage Gateway is a fairly complex service that provides a variety of hybrid storage solutions, typically aimed at migration of data to the cloud over time. Storage Gateways have devices on-premises and can be configured to emulate tape libraries and NAS systems, and can locally store and/or cache data that is also copied into S3.
Database	Relational Database Service (RDS)	RDS is the AWS service for managing your relational databases. You can run a number of SQL database engines on RDS: MySQL, Microsoft SQL Server, Oracle, Amazon's own Aurora, PostgreSQL, and MariaDB. Although you can still install a database on EC2 instances, RDS is a better choice when possible.

TABLE 1.3 Core AWS services (by category) *(continued)*

Category	Service	Function
	DynamoDB	DynamoDB is the AWS offering for NoSQL, and it is fast, entirely scalable without user configuration, and ideal for storing JavaScript Object Notation (JSON) files, object metadata, or anything that does not require table joins or relationships.
	ElastiCache	ElastiCache provides data caching and is typically positioned in front of databases to improve performance. With support for both redis and memcached as caching engines, ElastiCache is also highly configurable.
	Redshift	Amazon Redshift is a solution for online analytical processing (OLAP). It's also ideal for business intelligence and queries against large data sets, ideally run without a user waiting on results.
Migration	Snowball	The most notable migration tool is Snowball. Snowball is a physical device that allows no-hassle transfer of very large data (anything over 5–10 TB, generally) into S3. Amazon sends you the device, you load data onto it and send it back, and that data is loaded into your S3 buckets.
	Database/Server Migration Service	These two services allow for relatively straightforward migration of existing databases or virtual machines into AWS-managed resources.
Management Tools	CloudWatch	CloudWatch provides a fully functional and integrated monitoring solution for AWS services. You can easily group your resources and monitor them from a single dashboard, as well as trigger events when certain thresholds are met.
	CloudFormation	CloudFormation is one of the most important but underused tools in AWS. It allows for templated deployments of a full stack of AWS resources, easily repeatable and stored in version control.
	CloudTrail	CloudTrail is an API tracking service. It logs events and API calls for easy analysis, in real time or after the fact.
	Config	AWS Config adds change management into your environment. This is the AWS analog to services like Puppet or Chef, and it ensures that nothing changes without you knowing about it.

Category	Service	Function
	Auto Scaling	EC2 instances can easily be grouped and set to increase in number (or *scaled up*) when demand can't be met by currently running instances. As requests decrease, unused instances can be terminated (or *scaled down*).
	Trusted Advisor	Trusted Advisor is a service that provides recommendations of basic but key improvements to make to your AWS environment. It often catches security holes and best practices that should be implemented.
Security, Identity, & Compliance	Identity and Access Management (IAM)	If EC2 and S3 are the basic building blocks of your applications, IAM is the building block for your account itself. IAM provides for user, group, permission, and role definitions that your developers, admins, managers, financial auditors, and even AWS resources will all use.
	Cognito	Cognito is a relatively new but very popular service for providing single sign-on (SSO) to your AWS applications Through user pools and identity pools, you can group and manage millions of users.
	AWS Organizations	Another recent addition to AWS, Organizations provides multi-account management and offers a number of consolidated billing features.
Media Services	Elastic Transcoder	Elastic Transcoder offers easy transcoding of media files so that they are appropriately played on a variety of media players across the ever-growing number of user devices.
	Kinesis	Kinesis provides managed processing and capture of streaming data. Still a new discipline, Kinesis can take in data from smartphones, security cameras, and anything else that is "always on" and providing high data volumes through streaming.
Analytics	Athena	Athena is a tool that is focused solely on fast querying of data, typically in large data sets. Because of its singular focus, it's almost always faster and cheaper than broader-functioned tools like relational databases.
	Elastic MapReduce (EMR)	EMR is a web service that makes processing huge data sources possible through sharding, clustering, and careful configuration.

Let's face it: you probably just skipped that entire table. It's a lot of information, it's pretty boring to read, and it's something you can always look up… except on the AWS certification exams. AWS is infamous for asking a few questions in each exam on services that aren't core to the topic (for example, a question about Kinesis on the SysOps exam or a question on SageMaker on the Solutions Architect exam). These questions aren't deep, but they do require a familiarity with the AWS services. Read over the list in the hopes that you'll recognize these services when they come up.

What Is Systems Operations?

SysOps is simply an abbreviation for systems operations, and SysOps administrator is basically an operator of cloud services, at least in AWS parlance. This means that you'll need to understand and be able to answer in-depth questions on getting an application from a codebase into AWS, turning that code into a running application across various custom and AWS-provided services, managing the running application at scale, and then cleaning the whole thing up when needed.

The key principles that the AWS exam focuses on include the following:

- Deploying services, especially using AWS-provided tools such as CloudFormation.
- Building in scalability, high availability, and redundancy. This will differ from service to service, and you'll need to understand these differences and know how to scale a cluster of EC2 instances just as much as how to properly use an auto scaling group and a multi-AZ RDS configuration. (Don't worry if that doesn't make sense yet; it will soon.)
- Selecting the right service for a particular use case, including factoring in reliability, functionality, and especially cost.
- Migrating existing on-premises installations of resources and applications into the cloud.

Nearly a full 75 percent of the SysOps Administrator – Associate exam will likely be scenario-driven, rather than selecting a term's definition or choosing an AWS limit or policy name. This mirrors reality: Your most important job as a practicing SysOps administrator will be to understand a particular situation and identify the correct AWS tools and technologies for scalability, high availability, and cost.

Because of the scenario-driven nature of the exam, your best preparation for taking the exam is practical experience. Often, you'll be unfamiliar with a specific scenario but able to reason through the solutions using what you've learned on the job. Studying this book and taking practice exams is essential, but so is actually working in AWS as much as possible.

Two helpful mechanisms in understanding your responsibilities as a SysOps administrator are the AWS Shared Responsibility Model and the AWS Service Level Agreement.

The AWS Shared Responsibility Model

If you were truly responsible for 100 percent of the cloud, you'd have a real problem. AWS doesn't make a lot of things available to its customers. For instance, while you can upgrade the operating system on an EC2 instance, you can't upgrade the operating system of DynamoDB instances. You can't directly rip out pieces of a VPC and replace them, although a bad route is absolutely your problem to fix.

The *AWS Shared Responsibility Model* is how AWS delineates what is your issue, and what is AWS' issue. Obviously, many problems will span AWS and your domain, but knowing where the lines are is essential to effective troubleshooting.

At its simplest, the shared responsibility model states that AWS guarantees the secure and uninterrupted operation of the cloud itself. Physical hardware, storage, networking, and managed services are necessary for AWS to keep running and for you to use. What you put into that cloud, though, is your responsibility. This means operating systems that you install, data, movement of that data across networks, and security of that data is all for you to figure out. Figure 1.3 summarizes the model, the numbers represent availability zones in each region.

FIGURE 1.3 The AWS Shared Responsibility Model

One way to remember this—and a common exam question—is to memorize that AWS is responsible for operation and security *of* the cloud, whereas you are responsible for operation and security *in* the cloud.

The AWS Service Level Agreement

AWS provides *service level agreements* (SLAs) for most of their services. These SLAs are generally available at `https://aws.amazon.com/[servicename]/sla/`, so for example, the S3 SLA is at `https://aws.amazon.com/s3/sla/` and the Lambda SLA is at `https://aws.amazon.com/lambda/sla/`.

More important than memorizing the details of the various SLAs, you should familiarize yourself with the idea put forth in the Shared Responsibility Model: AWS guarantees that services act in a certain way and that they act that way some percentage of time. It is your job as a SysOps administrator to know when a problem resides with you and the application, and when AWS should be called because the problem falls under the SLA for the affected services.

The only SLA that you should take time to memorize is the SLA for S3. There are routinely exam questions on the various S3 storage classes related to durability and availability. S3 is discussed in a lot more detail in Chapter 10, "Amazon Simple Storage Service (S3)."

The Seven Domains

Finally, you should keep in mind the seven domains that the SysOps Administrator – Associate exam covers. While these are an exam construct, they're also a helpful checklist when ensuring that you've covered all your bases in preparing and operating cloud applications.

- Domain 1: Monitoring and Reporting
- Domain 2: High Availability
- Domain 3: Deployment and Provisioning
- Domain 4: Storage and Data Management
- Domain 5: Security and Compliance
- Domain 6: Networking
- Domain 7: Automation and Optimization

This book is organized along these lines via parts, where each part aside from Part I (which contains this chapter) corresponds to a domain, and the chapters in that part relate to that domain.

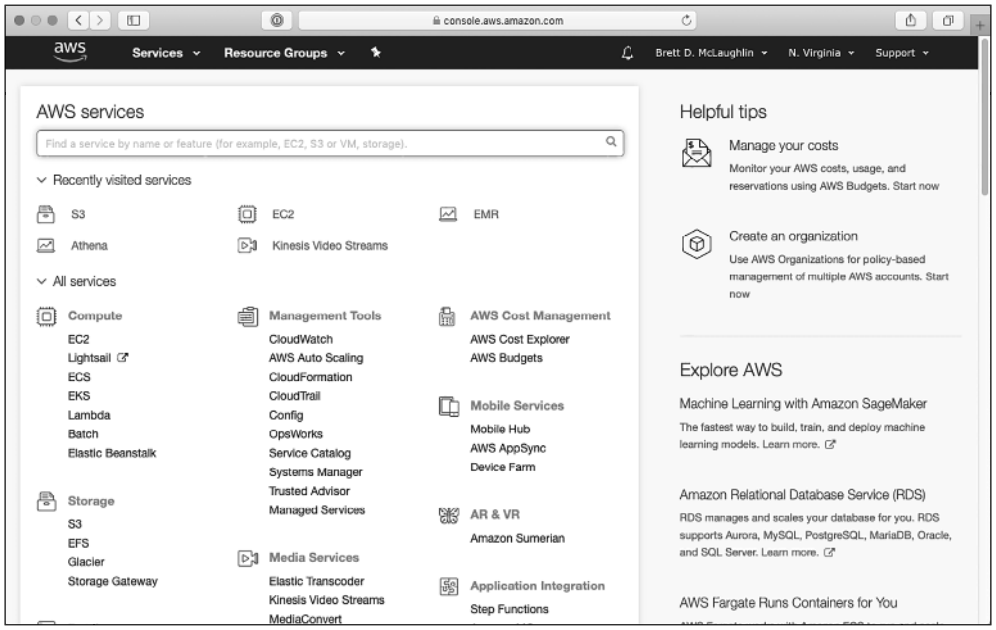
Working with AWS

Fortunately, AWS takes great pride in backstopping their systems. This means that you will always have multiple tools and layers of support for both managing running AWS systems and troubleshooting when problems aren't immediately apparent in their causes. You'll need to be familiar with all available resources, as there is simply no "one size fits all" tool in working with AWS environments.

The AWS Management Console

Your best friend when it comes to working with AWS will always be your web browser. AWS provides a command-line interface and programmatic access and several support channels, but much of your time will be spent in the *AWS Management Console*, a web-accessible interface for doing nearly everything there is to do within AWS. Figure 1.4 shows the basic console at initial sign-in.

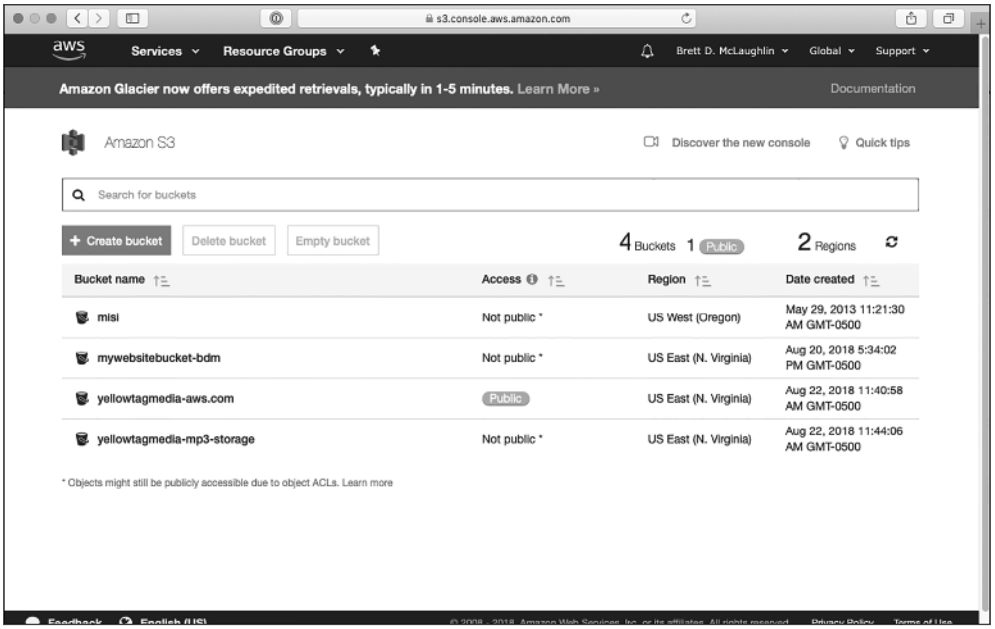
FIGURE 1.4 AWS provides web access to all its services.



Be careful with the term "console," as it's overloaded (has multiple meanings) among programmers and AWS developers. The AWS Management Console is actually a web-based application; that makes it almost the exact opposite of the usual meaning of "console" for developers: a command-line interface such as a UNIX shell or macOS or Windows terminal. There's no reason to not use the term console, but just be aware that its meaning can sometimes be confusing without context (such as "AWS console" or "AWS Management Console").

You can drill down into each service; for example, Figure 1.5 shows the S3 section with a few already-created S3 buckets. (Note that a production example would likely have many, many more S3 buckets than this.)

FIGURE 1.5 You can create, delete, and view S3 buckets from the service screen of the AWS console.



Eventually, you'll build up a suite of your own bookmarked dashboard on CloudWatch and frequently used commands and scripts. For the majority of things, though, nothing beats web-based console access.

The AWS CLI

As your applications are deployed, you'll often want to interact with them quickly. You'll also eventually have a common set of tasks you perform outside of what tools like CloudWatch give you. This is where the *AWS CLI* (command-line interface) comes into play.

You should take a few moments now and install the AWS CLI on your system. Visit `https://docs.aws.amazon.com/cli/latest/userguide/installing.html` for current instructions. Link this with your AWS account, and you'll be ready to follow along with the frequent examples throughout this book.

It may come as a surprise, but AWS does not ask a lot of questions regarding the CLI on its various exams, particularly at the Associate level. In fact, there's not as much specific "How would you do this particular thing in the console or on the command line?" as you might think. The questions are a little more theoretical, ensuring that you have a correct understanding of how AWS works. The assumption seems to be that if you know *what* you want to do, using a search engine to find the exact command to execute that "what" is relatively simple.

You should still work through the examples using the CLI, though, as the understanding of how to interact with various AWS services will very much help your overall AWS knowledge base.

AWS SDKs

Although much of the work you'll do with the console and CLI is operational management, there are times you or your developers may need to interact with AWS programmatically. This is where the *AWS SDK* (software development kit) comes in. AWS offers an SDK in nine languages, from Java to .NET to Python, among others. You can get access to this and other AWS developer tools at `https://aws.amazon.com/tools/`.

Technical Support and Online Resources

AWS is ultimately a service organization. For both the exam and real AWS experiences, you should know how to reach AWS and what to expect as a response. AWS clearly defines what happens to various customers when they access support and how long they may wait for a reply.

AWS' first line of defense is their set of support plans. However, for customers who don't have high monthly budgets for support plans, a wealth of information is available online.

Support Plans

AWS provides four different support plans, and you'll often be asked about these plans on the exam, so this is more than just supplemental information.

Every account is enrolled in the Basic plan. This plan gives you access to customer service primarily through documentation, whitepapers, and the AWS support form. You can also submit tickets for billing and support issues.

One step up from Basic is the Developer plan, which is $29/month to get started. One account holder gets access (limited access, mind you) to a Cloud Support associate. In addition to the Basic plan, this gives you some help troubleshooting, although response times aren't blazing fast.

From Developer, you can spend $100/month (or a lot more!) and get into the Business plan. This plan gives you faster response times, unlimited users, personal help and troubleshooting, and a support API. For any nontrivial production system, this plan should be considered the minimal acceptable support level.

Last is the big plan, the Enterprise support plan. These are custom-bid and aren't useful for smaller companies. However, for large organizations you'll get very fast response times and access to AWS architects, a technical account manager (TAM), and a support concierge. You'll pay for it, though; this plan costs around $15,000 a month and grows from there.

You can read more about AWS support plans at `https://aws.amazon.com/premiumsupport/compare-plans/`.

Other Support Resources

You can find literally thousands of pages of resources online for AWS; here are a few:

- AWS provides forums and a community to its users, and you can often find great discussions (`https://forums.aws.amazon.com`).
- The home of all of AWS' documentation starts online at `https://aws.amazon.com/documentation/`.
- The FAQ pages for AWS products and services are available when an AWS product or service is selected. For example, S3 FAQs are located at `https://aws.amazon.com/s3/faqs`.

Key Exam Resources

You'll also want to bookmark a few important pages that will be critical to you passing the AWS SysOps Administrator – Associate exam.

- All things related to AWS and its Operations path is online at `https://aws.amazon.com/training/path-operations/`.
- You'll need to begin your certification journey (if you haven't already) by signing up for a free account at the AWS Certification page: `www.aws.training/certification?src=certification`.
- The main page for the AWS SysOps Administrator – Associate exam is housed online at `https://aws.amazon.com/certification/certified-sysops-admin-associate/`.

Summary

Hopefully you're starting to realize the scope of AWS if you weren't already aware, and you see that a good SysOps administrator has a *lot* of responsibility. You'll have plenty of management tools, support channels, and even AWS' SLAs, but you need to learn how to use all these resources in concert—and intelligently. People tend to be at their least patient when a system isn't operating correctly, and more often than not, that's the situation in which you'll be the most needed. Take your time through each chapter, though, and you'll quickly gain a handle for the various AWS services.

Exam Essentials

Recognize and define AWS managed services. AWS offers a dizzying number of managed services and facilities. You will be asked about these, so be familiar with the services and their basic functionality. It is best to review them often as well, because AWS is constantly adding new services to their library.

Be familiar with the AWS Shared Responsibility Model. AWS provides clear guidelines about who is responsible for what in the cloud. You will likely be asked about this, and in particular, which aspects of security are yours as the customer and which are up to AWS.

Differentiate between the various AWS support plans. You will be asked about the four support plans. You don't need to know the details as much as recognize those four support plan names and their basic use.

EXERCISE 1.1

Use the AWS CLI

Install and configure the AWS CLI on your local system using the instructions at `https://docs.aws.amazon.com/cli/latest/userguide/cli-chap-install.html`. You should verify that the CLI is working with the version option:

```
$ aws --version
aws-cli/1.16.78 Python/3.6.5 Darwin/18.2.0 botocore/1.12.68
```

Your response will likely vary slightly depending on the version of the CLI and your version of Python. The only requirement here is that you have Python 3.x installed. Although the CLI will work with Pythion 2.x, that version of Python is headed for deprecation. Your version of the CLI likely will be newer than the one shown, but AWS is pretty good about not removing earlier version features.

As long as you don't get an error from running this command, though, you're ready to use the CLI.

EXERCISE 1.2

Configure the AWS CLI for Your AWS Account

You need to supply your API key, secret key, and a region to the CLI to make use of it with actual AWS services. You'll need to log into the AWS console, click your username, and then choose My Security Credentials to retrieve or generate these. You can begin this process with the CLI using the `configure` command:

```
$ aws configure
AWS Access Key ID [None]: YOUR KEY HERE
AWS Secret Access Key [None]: YOUR SECRET KEY HERE
Default region name [None]: us-east-1
Default output format [None]:
```

You can leave the output format blank if you're unsure.

After configuration, you can list your choices:

```
$ aws configure list
      Name                    Value             Type    Location
      ----                    -----             ----    --------
   profile                <not set>             None    None
access_key     ****************QEBQ shared-credentials-file
secret_key     ****************TSxN shared-credentials-file
    region                us-east-1      config-file    ~/.aws/config
```

EXERCISE 1.3

List S3 Buckets Using the CLI

As a quick test of the CLI, you can list all your current S3 buckets using the `s3` command with `ls`:

```
$ aws s3 ls
2013-05-29 12:21:30 misi
2018-11-15 10:23:54 my-cloudtrial-account-logs
2018-08-20 18:34:02 mywebsitebucket-bdm
2018-11-14 10:33:02 yellowtagmedia-access
2018-11-12 10:19:30 yellowtagmedia-aws.com
2018-08-22 12:44:06 yellowtagmedia-mp3-storage
```

Your output will obviously vary with your own AWS environment.

EXERCISE 1.4

Create a New S3 Bucket Using the CLI

Finally, make sure you can create an S3 bucket using the `s3api` command and the `create-bucket` subcommand:

```
$ aws s3api create-bucket --bucket created-with-cli
{
    "Location": "/created-with-cli"
}
```

You'll need to use your own bucket name, as S3 bucket names are global. However, you can verify that the bucket was created now using the `s3` command with the `ls` subcommand:

```
$ aws s3 ls
2018-12-19 10:46:21 created-with-cli
2013-05-29 12:21:30 misi
2018-11-15 10:23:54 my-cloudtrial-account-logs
2018-08-20 18:34:02 mywebsitebucket-bdm
2018-11-14 10:33:02 yellowtagmedia-access
2018-11-12 10:19:30 yellowtagmedia-aws.com
2018-08-22 12:44:06 yellowtagmedia-mp3-storage
```

Review Questions

You can find the answers in the Appendix.

1. You are tasked with managing multiple AWS accounts for a large organization. What AWS service provides bulk account management and consolidated billing?
   - **A.** AWS Identity and Access Management (IAM)
   - **B.** AWS Organizations
   - **C.** AWS Trusted Advisor
   - **D.** AWS Billing Manager
2. Which AWS service should you use to monitor applications and how they interact with your APIs?
   - **A.** CloudTrail
   - **B.** APIWatch
   - **C.** CloudWatch
   - **D.** APITrail
3. You are a new hire at a company with several cloud applications. They currently have no monitoring in place for their applications. What is the first service you'd look into adding to their cloud setup?
   - **A.** CloudTrail
   - **B.** CloudWatch
   - **C.** Trusted Advisor
   - **D.** System Monitor
4. Which of the following AWS facilities allows an application's resources to grow and shrink with demand?
   - **A.** Elastic Load Balancing
   - **B.** Elastic Compute
   - **C.** Auto Scaling
   - **D.** Route53
5. Which of the following AWS facilities are part of a scalable cluster of EC2 instances? (Choose two.)
   - **A.** Elastic load balancer
   - **B.** CloudFront
   - **C.** Auto Scaling groups
   - **D.** Lambda

6. Which of the following are AWS storage services? (Choose two.)
   - **A.** EBS
   - **B.** EC2
   - **C.** RDS
   - **D.** VPC

7. What AWS service provides users, groups, roles, and policies?
   - **A.** Identity and Authorization Management
   - **B.** Identity and Access Management
   - **C.** Information and Authorization Management
   - **D.** Identity and Authentication Management

8. Which of the following statements are true? (Choose all that apply.)
   - **A.** AWS is responsible for the security of the cloud.
   - **B.** AWS is responsible for security in the cloud.
   - **C.** You (the customer) are responsible for the security of the cloud.
   - **D.** You (the customer) are responsible for security in the cloud.

9. Who is responsible for the security of regions and availability zones?
   - **A.** AWS
   - **B.** The customer
   - **C.** The account owner
   - **D.** Responsibility is shared between the customer and AWS.

10. Which of the following is the basic networking component of AWS that contains subnets and instances?
    - **A.** VPC
    - **B.** VPN
    - **C.** CLI
    - **D.** Elastic Beanstalk

11. You are tasked with creating a uniform set of deployment scripts. What AWS facility would you use to standardize your application deployment and provisioning?
    - **A.** CloudFront
    - **B.** CloudFormation
    - **C.** JSON
    - **D.** CloudLaunch

12. Which of the following is not an AWS support plan?
    - **A.** Free
    - **B.** Basic
    - **C.** Developer
    - **D.** Enterprise

13. What AWS component acts as an analog to firewalls in on-premises applications?
    - **A.** Network ACLs
    - **B.** Internet Gateway
    - **C.** Amazon VPC
    - **D.** CloudFormation templates

14. What tool would you use to manage and interact with your AWS resources from a terminal or command prompt?
    - **A.** AWS console
    - **B.** AWS CLI
    - **C.** AWS TLI
    - **D.** AWS CloudFormation

15. You are tasked with creating a network environment for a company that is moving their web applications into AWS. Which of the following AWS services are most important to creating this environment? (Choose two.)
    - **A.** AWS CloudFormation
    - **B.** Amazon EC2
    - **C.** Amazon VPC
    - **D.** Amazon RDS

16. You are tasked with preparing a report on the advantages of AWS as compared to on-premises systems. As part of the report, you need to explain the responsiveness of AWS in dealing with services in the event of an outage. What would you need to consult to provide statistics and response times?
    - **A.** Amazon VPC
    - **B.** AWS Shared Responsibility Model
    - **C.** AWS CloudFormation
    - **D.** AWS Service Level Agreement

17. You are tasked with preparing a report on the advantages of AWS as compared to on-premises systems. As part of the report, you need to explain which parts of the current architecture will no longer be the responsibility of your company to maintain. What would you need to consult to provide statistics and response times?

A. Amazon VPC

B. AWS Shared Responsibility Model

C. AWS CloudFormation

D. AWS Service Level Agreement

18. Which of the following represents a separate geographic region in which AWS services run?

A. Availability zone

B. Region

C. Edge location

D. Compute center

19. How many availability zones does each AWS region have?

A. 2

B. 3

C. 5

D. It varies based on the region and AWS resource requirements.

20. Which of the following acts as a virtual datacenter within AWS?

A. Compute center

B. Region

C. Availability zone

D. Edge location