

CloudStax FireCamp on the AWS Cloud

Quick Start Reference Deployment

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AWS Quick Start Team

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This Quick Start deployment guide was created by CloudStax, Inc. in partnership with Amazon Web Services (AWS).

[Quick Starts](#) are automated reference deployments that use AWS CloudFormation templates to deploy key technologies on AWS, following AWS best practices.

Overview

This Quick Start reference deployment guide provides step-by-step instructions for deploying CloudStax FireCamp on the AWS Cloud.

This Quick Start is for users who need an easily deployed and self-managed stateful service, such as Redis, Cassandra, MongoDB, Kafka, PostgreSQL, or Elasticsearch, on AWS. You can use this Quick Start to deploy a FireCamp cluster and then create the stateful service.

CloudStax FireCamp on AWS

[CloudStax FireCamp](#) is an open-source platform for managing stateful services in containers. FireCamp supports two container orchestration services: Amazon Elastic Container Service (Amazon ECS) and Docker Swarm. FireCamp makes it easy to set up, manage, and scale stateful services on AWS, using three Availability Zones for high availability. FireCamp integrates with many open-source stateful services, including Redis, Cassandra, MongoDB, Kafka, PostgreSQL, and Elasticsearch (see the [full list](#)), so you can easily run these services with no management overhead on AWS.

FireCamp assigns one Amazon Elastic Block Store (Amazon EBS) volume and one Amazon Route 53 DNS name for each service member. An application or AWS Lambda function can then simply access the service by using the DNS name.

The Multi-AZ FireCamp environment on AWS provides automatic failover support. If one node in the FireCamp cluster goes down, the AWS Auto Scaling group starts a new node, and the container service (Amazon ECS or Docker Swarm) automatically starts the service

container. FireCamp attaches the original EBS volume to the new node and updates the DNS name. The failover requires no data copy and is seamless to your application.

Costs and Licenses

You are responsible for the cost of the AWS services used while running this Quick Start reference deployment. There is no additional cost for using the Quick Start.

The AWS CloudFormation template for this Quick Start includes configuration parameters that you can customize. Some of these settings, such as instance type, will affect the cost of deployment. For cost estimates, see the pricing pages for each AWS service you will be using. Prices are subject to change.

CloudStax FireCamp and Apache Swarm are open-source software. They are distributed under the Apache 2.0 license and are free to use.

Architecture

Deploying this Quick Start for a new virtual private cloud (VPC) with **default parameters** builds the following FireCamp cluster environment in the AWS Cloud.

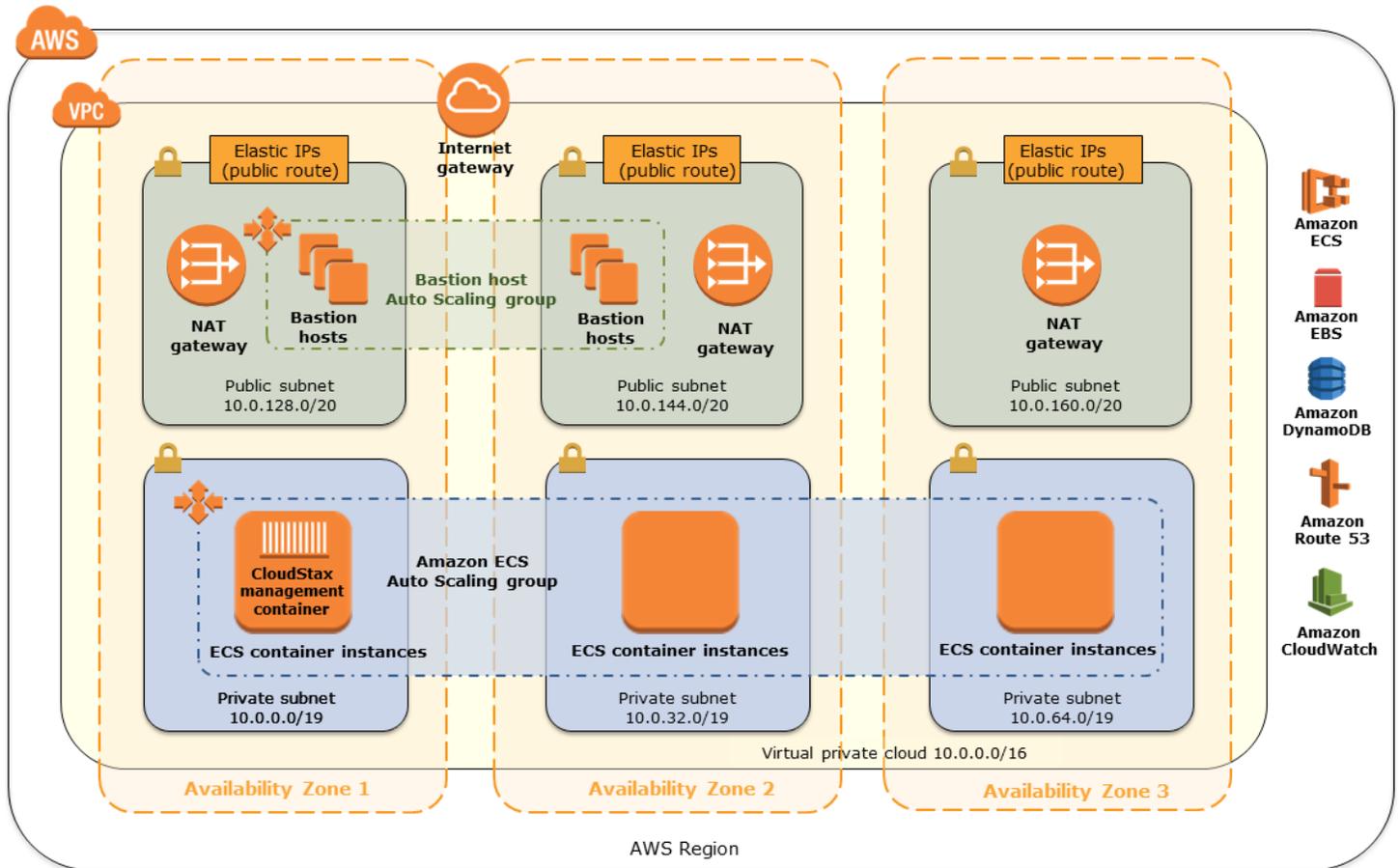


Figure 1: Quick Start architecture for CloudStax FireCamp on AWS

The Quick Start sets up the following:

- A highly available architecture that spans three Availability Zones.*
- A VPC configured with public and private subnets according to AWS best practices. This provides the network infrastructure for your deployment.*
- An internet gateway to allow access to the internet. This gateway is used by the bastion hosts to send and receive traffic.*
- In the public subnets, NAT gateways to allow outbound internet connectivity for resources (the container instances) in the private subnets. (For more information, see the [Amazon VPC Quick Start](#).)*
- In the public subnets, bastion hosts in an Auto Scaling group with Elastic IP addresses to allow inbound Secure Shell (SSH) access. Two bastion hosts are deployed by default, but this number is configurable. (For more information, see the [Linux Bastion Quick Start](#).)*

- An AWS Identity and Access Management (IAM) instance role with fine-grained permissions for access to AWS services.
- In the private subnets, one Amazon ECS or Docker Swarm cluster with CloudStax FireCamp software. For Docker Swarm, the Quick Start automatically creates three Swarm master nodes across three Availability Zones. If you choose an AWS Region that provides only two Availability Zones, the Quick Start reuses one of the zones to create the third master node.
- One Amazon DynamoDB table to persist FireCamp data.
- One Amazon Route 53 hosted zone for the DNS names of the stateful service, and an EBS volume for each stateful service member.

* The template that deploys the Quick Start into an existing VPC skips the tasks marked by asterisks and prompts you for your existing VPC configuration.

The Quick Start launches all the container nodes in the private subnets, so you can access the nodes by using SSH to connect to the bastion hosts. Instead of using a remote access CIDR for each instance, the deployment requires a security group ID of the bastion hosts so remote access can be centrally controlled. If you launch the Quick Start for a new VPC, the bastion security group is created for you. If you launch the Quick Start in an existing VPC, you must create a security group for your bastion hosts or use a security group that already exists.

Prerequisites

Specialized Knowledge

Before you deploy this Quick Start, we recommend that you become familiar with the following AWS services. (If you are new to AWS, see [Getting Started with AWS](#).)

- [Amazon DynamoDB](#)
- [Amazon EBS](#)
- [Amazon EC2](#)
- [Amazon ECS](#)
- [Amazon Route 53](#)
- [Amazon VPC](#)
- [AWS Auto Scaling](#)
- [AWS CloudFormation](#)

We also recommend that you become familiar with the features and configuration of [CloudStax FireCamp](#).

Technical Requirements

This Quick Start uses the Amazon Linux AMI for EC2 instances, and creates an Amazon ECS or Docker Swarm cluster, EBS volumes, a DynamoDB table, and a Route 53 hosted zone. The EC2 instances are included in an Auto Scaling group. The FireCamp service logs are sent to Amazon CloudWatch. The AWS account you use to run this Quick Start must have authorization to create these resources.

Deployment Options

This Quick Start provides two deployment options:

- **Deploy CloudStax FireCamp into a new VPC** (end-to-end deployment). This option builds a new AWS environment consisting of the VPC, subnets, NAT gateways, security groups, bastion hosts, and other infrastructure components, and then deploys CloudStax FireCamp into this new VPC.
- **Deploy CloudStax FireCamp into an existing VPC**. This option provisions CloudStax FireCamp in your existing AWS infrastructure.

The Quick Start provides separate templates for these options. It also lets you configure CIDR blocks, instance types, and FireCamp settings, as discussed later in this guide.

Deployment Steps

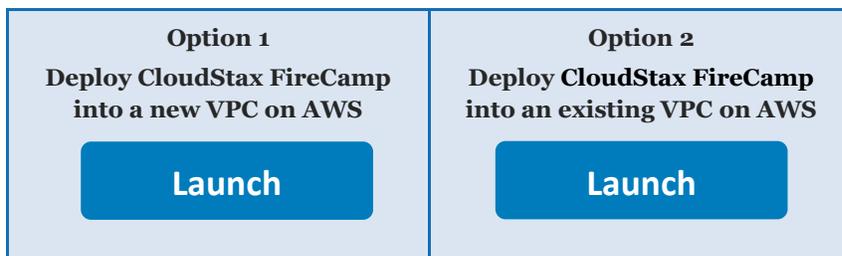
Step 1. Prepare Your AWS Account

1. If you don't already have an AWS account, create one at <https://aws.amazon.com> by following the on-screen instructions.
2. Use the region selector in the navigation bar to choose the AWS Region where you want to deploy CloudStax FireCamp on AWS.
3. Create a [key pair](#) in your preferred region.
4. If necessary, [request a service limit increase](#) for the Amazon EC2 **m4.large** instance type. You might need to do this if you already have an existing deployment that uses this instance type, and you think you might exceed the [default limit](#) with this deployment.

Step 2. Launch the Quick Start

Note You are responsible for the cost of the AWS services used while running this Quick Start reference deployment. There is no additional cost for using this Quick Start. For full details, see the pricing pages for each AWS service you will be using in this Quick Start. Prices are subject to change.

1. Choose one of the following options to launch the AWS CloudFormation template into your AWS account. For help choosing an option, see [deployment options](#) earlier in this guide.



Important If you're deploying CloudStax FireCamp into an existing VPC, make sure that your VPC has two or three private subnets in different Availability Zones for the container instances. These subnets require NAT gateways or NAT instances in their route tables, to allow the instances to download packages and software without exposing them to the internet. You will also need the domain name option configured in the DHCP options as explained in the [Amazon VPC documentation](#). You will be prompted for your VPC settings when you launch the Quick Start.

Each deployment takes about 20-30 minutes to complete.

2. Check the region that's displayed in the upper-right corner of the navigation bar, and change it if necessary. This is where the network infrastructure for CloudStax FireCamp will be built. The template is launched in the US East (Ohio) Region by default.
3. On the **Select Template** page, keep the default setting for the template URL, and then choose **Next**.
4. On the **Specify Details** page, change the stack name if needed. Review the parameters for the template. Provide values for the parameters that require input. For all other parameters, review the default settings and customize them as necessary. When you finish reviewing and customizing the parameters, choose **Next**.

In the following tables, parameters are listed by category and described separately for the two deployment options:

- [Parameters for deploying CloudStax FireCamp into a new VPC](#)
- [Parameters for deploying CloudStax FireCamp into an existing VPC](#)

- **Option 1: Parameters for deploying FireCamp into a new VPC**

[View template](#)

Network Configuration:

Parameter label (name)	Default	Description
Availability Zones (AvailabilityZones)	<i>Requires input</i>	The list of Availability Zones to use for the subnets in the VPC. This field displays the available zones within your selected region. You can choose two or three Availability Zones from this list. The logical order of your selections is preserved in your deployment. After you make your selections, make sure that the value of the Number of Availability Zones parameter matches the number of selections.
Number of Availability Zones (NumberOfAZs)	3	The number of Availability Zones (2 or 3) you want to use in your deployment. This count must match the number of selections in the Availability Zones parameter; otherwise, your deployment will fail with an AWS CloudFormation template validation error. (Note that some AWS Regions provide only two Availability Zones.) For a production environment, we recommend that you use three Availability Zones.
VPC CIDR (VPCCIDR)	10.0.0.0/16	The CIDR block for the VPC.
Private Subnet 1 CIDR (PrivateSubnet1CIDR)	10.0.0.0/19	The CIDR block for the private subnet located in Availability Zone 1.
Private Subnet 2 CIDR (PrivateSubnet2CIDR)	10.0.32.0/19	The CIDR block for the private subnet located in Availability Zone 2.
Private Subnet 3 CIDR (PrivateSubnet3CIDR)	10.0.64.0/19	The CIDR block for the private subnet located in Availability Zone 3.
Public Subnet 1 CIDR (PublicSubnet1CIDR)	10.0.128.0/20	The CIDR block for the public (DMZ) subnet located in Availability Zone 1.
Public Subnet 2 CIDR (PublicSubnet2CIDR)	10.0.144.0/20	The CIDR block for the public (DMZ) subnet located in Availability Zone 2.
Public Subnet 3 CIDR (PublicSubnet3CIDR)	10.0.160.0/20	The CIDR block for the public (DMZ) subnet located in Availability Zone 3.

Parameter label (name)	Default	Description
Allowed Bastion External Access CIDR (RemoteAccessCIDR)	<i>Requires input</i>	The CIDR IP range that is allowed external SSH access to the bastion host instances. We recommend that you set this value to a trusted IP range. For example, you might want to grant only your corporate network access to the software. The range you specify must be in the form <i>x.x.x.x/x</i> (for example, 10.2.0.0/24).

Security Configuration:

Parameter label (name)	Default	Description
Key Pair Name (KeyPairName)	<i>Requires input</i>	An existing public/private key pair, which allows you to connect securely to the bastion hosts and cluster nodes. When you created an AWS account, this is the key pair you created in your preferred region.

Linux Bastion Amazon EC2 Configuration:

Parameter label (name)	Default	Description
Bastion AMI Operating System (BastionAMIOS)	Amazon-Linux-HVM	The Linux distribution for the AMI to be used for the bastion host instances. If you choose CentOS, make sure that you have a subscription to the CentOS AMI in AWS Marketplace .
Bastion Instance Type (BastionInstanceType)	t2.micro	The EC2 instance type for the bastion host instances.
Number of Bastion Hosts (NumBastionHosts)	2	The number of Linux bastion hosts to run. Auto Scaling will ensure that you always have this number of bastion hosts running. The maximum is 4 bastion hosts.

FireCamp Cluster Configuration:

Parameter label (name)	Default	Description
Container Platform (ContainerPlatform)	ecs	The container orchestration platform. Choose ecs to use Amazon ECS, or swarm to use Docker Swarm.
Cluster Name (ClusterName)	<i>Requires input</i>	The name of the Amazon ECS or Docker Swarm cluster. This string consists of 1-54 characters (letters, numbers, or hyphens) and must start with a letter. This string could be the same as the stack name.
CloudStax FireCamp Release Version (Release)	0.9.6	The version of FireCamp to deploy. For information about each release, see the Releases section of the GitHub repository for CloudStax FireCamp.

Parameter label (name)	Default	Description
Number of Docker Swarm Managers (NumberOfManagers)	3	The number of Docker Swarm manager instances to deploy. This parameter is ignored if you choose Amazon ECS as your container platform.
Number of Container Worker Nodes (NumberOfNodes)	3	The number of container instances to launch in the cluster. Make sure that this number is greater than or equal to the number of Availability Zones you're using.
Node AMI Type (NodeAMIOS)	Amazon-Linux-HVM	The Linux distribution for the AMI to be used for the FireCamp cluster instances.
Node Instance Type (NodeInstanceType)	m4.large	The EC2 instance type for the FireCamp cluster instances.

AWS Quick Start Configuration:

Parameter label (name)	Default	Description
Quick Start S3 Bucket Name (QSS3BucketName)	aws-quickstart	The S3 bucket you have created for your copy of Quick Start assets, if you decide to customize or extend the Quick Start for your own use. The bucket name can include numbers, lowercase letters, uppercase letters, and hyphens, but should not start or end with a hyphen.
Quick Start S3 Key Prefix (QSS3KeyPrefix)	quickstart-cloudstax-firecamp/	The S3 key name prefix used to simulate a folder for your copy of Quick Start assets, if you decide to customize or extend the Quick Start for your own use. This prefix can include numbers, lowercase letters, uppercase letters, hyphens, and forward slashes.

- **Option 2: Parameters for deploying FireCamp into an existing VPC**

[View template](#)

Network Configuration:

Parameter label (name)	Default	Description
Availability Zones (AvailabilityZones)	<i>Requires input</i>	The list of Availability Zones to use for the subnets in the VPC. This field displays the available zones within your selected region. You can choose two or three Availability Zones from this list. The logical order of your selections is preserved in your deployment. After you make your selections, make sure that the value of the Number of Availability Zones parameter matches the number of selections.
Number of Availability Zones (NumberOfAZs)	3	The number of Availability Zones (2 or 3) you want to use in your deployment. This count must match the number of selections in the Availability Zones parameter; otherwise,

Parameter label (name)	Default	Description
		your deployment will fail with an AWS CloudFormation template validation error. (Note that some AWS Regions provide only two Availability Zones.) For a production environment, we recommend that you use three Availability Zones.
VPC ID (VPCID)	<i>Requires input</i>	The ID of your existing VPC (e.g., vpc-0343606e).
Private Subnet 1 ID (PrivateSubnet1ID)	<i>Requires input</i>	The ID of the private subnet in Availability Zone 1 in your existing VPC (e.g., subnet-a0246dcd).
Private Subnet 2 ID (PrivateSubnet2ID)	<i>Requires input</i>	The ID of the private subnet in Availability Zone 2 in your existing VPC.
Private Subnet 3 ID (PrivateSubnet3ID)	<i>Requires input</i>	The ID of the private subnet in Availability Zone 3 in your existing VPC.
Bastion Security Group ID (BastionSecurityGroupID)	<i>Requires input</i>	The ID of the bastion host security group for accessing the cluster nodes through SSH.

Security Configuration:

Parameter label (name)	Default	Description
Key Pair Name (KeyPairName)	<i>Requires input</i>	A public/private key pair, which allows you to connect securely to your instance after it launches. When you created an AWS account, this is the key pair you created in your preferred region.

FireCamp Cluster Configuration:

Parameter label (name)	Default	Description
Container Platform (ContainerPlatform)	ecs	The container orchestration platform. Choose ecs to use Amazon ECS, or swarm to use Docker Swarm.
Cluster Name (ClusterName)	<i>Requires input</i>	The name of the Amazon ECS or Docker Swarm cluster. This string consists of 1-54 characters (letters, numbers, or hyphens) and must start with a letter. This string could be the same as the stack name.
CloudStax FireCamp Release Version (Release)	0.9.6	The version of FireCamp to deploy. For information about each release, see the Releases section of the GitHub repository for CloudStax FireCamp.
Number of Docker Swarm Managers (NumberOfManagers)	3	The number of Docker Swarm manager instances to deploy. This parameter is ignored if you choose Amazon ECS as your container platform.

Parameter label (name)	Default	Description
Number of Container Worker Nodes (NumberOfNodes)	3	The number of container instances to launch in the cluster. Make sure that this number is greater than or equal to the number of Availability Zones you're using.
Node AMI Type (NodeAMIOS)	Amazon-Linux-HVM	The Linux distribution for the AMI to be used for the FireCamp cluster instances.
Node Instance Type (NodeInstanceType)	m4.large	The EC2 instance type for the FireCamp cluster instances.

AWS Quick Start Configuration:

Parameter label (name)	Default	Description
Quick Start S3 Bucket Name (QSS3BucketName)	aws-quickstart	The S3 bucket you have created for your copy of Quick Start assets, if you decide to customize or extend the Quick Start for your own use. The bucket name can include numbers, lowercase letters, uppercase letters, and hyphens, but should not start or end with a hyphen.
Quick Start S3 Key Prefix (QSS3KeyPrefix)	quickstart-cloudstax-firecamp/	The S3 key name prefix used to simulate a folder for your copy of Quick Start assets, if you decide to customize or extend the Quick Start for your own use. This prefix can include numbers, lowercase letters, uppercase letters, hyphens, and forward slashes.

- On the **Options** page, you can [specify tags](#) (key-value pairs) for resources in your stack and [set advanced options](#). When you're done, choose **Next**.
- On the **Review** page, review and confirm the template settings. Under **Capabilities**, select the check box to acknowledge that the template will create IAM resources.
- Choose **Create** to deploy the stack.
- Monitor the status of the stack. When the status is **CREATE_COMPLETE**, the CloudStax FireCamp cluster is ready.
- Use the information displayed in the **Outputs** tab for the stack to view the resources that were created, as shown in Figure 2.

Overview		Outputs	Resources	Events	Template
Key					Value
VPCID					vpc-233d3d5a
AppAccessSecurityGroup					sg-8bfde7fb

Figure 2: CloudStax FireCamp stack outputs

Step 3. Test the Deployment

After you deploy the FireCamp cluster, you can check the status of the cluster.

1. Open the Amazon ECS console at <https://console.aws.amazon.com/ecs/>.

You should see the CloudStax FireCamp management service running. For example, if you set the **Cluster Name** parameter to **t1**, the Amazon ECS console displays a screen similar to Figure 3.

The screenshot shows the Amazon ECS console interface for a cluster named 't1'. At the top, there are navigation tabs for 'Overview', 'Outputs', 'Resources', 'Events', and 'Template'. Below these is a table with two columns: 'Key' and 'Value'. The table contains two rows: 'VPCID' with value 'vpc-233d3d5a' and 'AppAccessSecurityGroup' with value 'sg-8bfde7fb'. Below the table, there is a section for 'Cluster : t1' with a 'Delete Cluster' button. Underneath, it says 'Get a detailed view of the resources on your cluster.' and shows the cluster status as 'ACTIVE'. There are statistics for 'Registered container instances' (3), 'Pending tasks count' (0 Fargate, 0 EC2), 'Running tasks count' (0 Fargate, 1 EC2), 'Active service count' (0 Fargate, 1 EC2), and 'Draining service count' (0 Fargate, 0 EC2). Below this is a section for 'Services' with tabs for 'Tasks', 'ECS Instances', 'Metrics', and 'Scheduled Tasks'. There are buttons for 'Create', 'Update', and 'Delete'. A 'Last updated' timestamp is shown as 'January 14, 2018 7:10:15 PM (0m ago)'. A filter box and a 'Launch type' dropdown are also present. At the bottom, a table lists services with columns for 'Service Name', 'Status', 'Task D...', 'Desired...', 'Runnin...', 'Launch...', and 'Platfor...'. One service is listed: 'firecamp-manageserver' with status 'ACTIVE', task ID 't1-fireca...', desired count '1', running count '1', launch type 'EC2', and platform '--'.

Figure 3: Checking the status of the FireCamp cluster in the Amazon ECS console

2. Connect to the bastion host nodes by using SSH, and download the FireCamp CLI (`firecamp-service-cli`) as follows:

```
$ wget
https://s3.amazonaws.com/cloudstax/firecamp/releases/0.9.3/packages/
firecamp-service-cli.tgz
$ tar zxf firecamp-service-cli.tgz
```

3. Deploy a stateful service with `firecamp-service-cli`. For details, see `firecamp-service-cli` command-line help and the Readme file for each service in the [FireCamp Catalog directory](#).

You can also run an application in the **AppAccessSecurityGroup** security group in the same VPC. The application could be an EC2 instance for a traditional application, a container in Amazon ECS, or a Lambda function. To access **AppAccessSecurityGroup** and the VPC, look in the **Outputs** tab for the stack in the AWS CloudFormation console, as shown previously in Figure 2.

Best Practices Using CloudStax FireCamp on AWS

High Availability

To help ensure high availability, choose three Availability Zones when you deploy the Quick Start. CloudStax FireCamp distributes the stateful service members to all Availability Zones, so if one Availability Zone goes down, the stateful service remains accessible.

Operating System Parameters

FireCamp follows the requirements of the stateful services and sets the system parameters accordingly. For example, **SOMAXCONN** and **tcp_max_syn_backlog** are increased to 512, and **vm.swappiness** and **vm.overcommit_memory** are set to 1. For more information, see the [Readme file](#) in the GitHub repository for CloudStax FireCamp.

Security

The AWS Cloud provides scalable and highly reliable services that help customers deploy applications and data quickly and securely.

Operating System Security

The root user on cluster nodes can be accessed only by using the SSH key specified during the deployment process. AWS doesn't store these SSH keys, so if you lose your SSH key you can lose access to these instances.

Operating system patches are your responsibility and should be performed on a periodic basis.

Network Security

The default network security setup of this solution follows AWS security best practices. The provisioned FireCamp instances are deployed in private subnets and can be accessed in two ways:

- By connecting to the bastion host instance by using an SSH terminal.
- From AWS resources (such as Amazon EC2) that you might have in the **AppAccessSecurityGroup** security group, or that you might launch by using the security group. You may include your application instance in this security group.

Troubleshooting

Q. I encountered a `CREATE_FAILED` error when I launched the Quick Start.

A. If AWS CloudFormation fails to create the stack, we recommend that you relaunch the template with **Rollback on failure** set to **No**. (This setting is under **Advanced** in the AWS CloudFormation console, **Options** page.) With this setting, the stack's state will be retained and the instance will be left running, so you can troubleshoot the issue. (Look at the log files in `%ProgramFiles%\Amazon\EC2ConfigService` and `C:\cfn\log`.)

Important When you set **Rollback on failure** to **No**, you will continue to incur AWS charges for this stack. Please make sure to delete the stack when you finish troubleshooting.

For additional information, see [Troubleshooting AWS CloudFormation](#) on the AWS website.

Q. I encountered a size limitation error when I deployed the AWS Cloudformation templates.

A. We recommend that you launch the Quick Start templates from the links in this guide or from another S3 bucket. If you deploy the templates from a local copy on your computer or from a non-S3 location, you might encounter template size limitations when you create the stack. For more information about AWS CloudFormation limits, see the [AWS documentation](#).

Q. I need help using CloudStax FireCamp.

A. For questions about using CloudStax FireCamp, use the **Issues** section of the [GitHub repository for CloudStax FireCamp](#) or the [FireCamp mailing list](#). If the issue is associated with a stateful service, get help from the support channel of that stateful service.

GitHub Repository

You can visit our [GitHub repository](#) to download the templates and scripts for this Quick Start, to post your comments, and to share your customizations with others.

Additional Resources

AWS services

- Amazon DynamoDB
<https://aws.amazon.com/documentation/dynamodb/>
- Amazon EBS
<https://docs.aws.amazon.com/AWSEC2/latest/UserGuide/AmazonEBS.html>
- Amazon EC2
<https://aws.amazon.com/documentation/ec2/>
- Amazon ECS
<https://aws.amazon.com/documentation/ecs/>
- Amazon Route 53
<https://aws.amazon.com/documentation/route53/>
- Amazon VPC
<https://aws.amazon.com/documentation/vpc/>
- AWS Auto Scaling
<https://aws.amazon.com/documentation/autoscaling/>
- AWS CloudFormation
<https://aws.amazon.com/documentation/cloudformation/>

CloudStax FireCamp

- FireCamp home page
<https://github.com/cloudstax/firecamp>

Docker Swarm

- Docker documentation
<https://docs.docker.com/engine/swarm/>

Quick Start reference deployments

- AWS Quick Start home page
<https://aws.amazon.com/quickstart/>

Document Revisions

Date	Change	In sections
February 2018	Initial publication	—

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