# Red Hat OpenShift Container Platform on the AWS Cloud

## Quick Start Reference Deployment

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*Amazon Web Services (AWS)*

**AWS can provide you with AWS credits for this deployment. Please fill out our form and we will reach out to you.**

## Contents

Quick Starts are automated reference deployments for key technologies on the Amazon Web Services (AWS) Cloud, based on AWS best practices for security and high availability.

## Overview

This Quick Start reference deployment guide provides step-by-step instructions for deploying Red Hat OpenShift Container Platform on the AWS Cloud.

Red Hat OpenShift Container Platform is based on Docker-formatted Linux containers, Google Kubernetes orchestration, and Red Hat Enterprise Linux (RHEL) 7.

Red Hat OpenShift Container Platform gives application development and IT operations teams the ability to accelerate application delivery. It provides the following features:

- Support for standardized containers through the Red Hat APIs for Docker
- Container orchestration, scheduling, and management at scale with Kubernetes
- Integration with container-optimized RHEL 7 operating system
- Extensive selection of programming languages, frameworks, and services
- Rich set of tools and interfaces, including a web console and collaboration features, for development and operations
- Distributed application platform with container networking, streamlined deployment, and administration

For more information about Red Hat OpenShift Container Platform, see the OpenShift documentation.

This Quick Start is primarily for developers, engineers, architects, or DevOps or systems engineering staff who want to deploy OpenShift on the AWS Cloud. As an optional feature, the Quick Start also allows deployments using the upstream version of Ansible Playbook, for development purposes only.

## OpenShift Container Platform on AWS

The Quick Start includes AWS CloudFormation templates that build the AWS infrastructure using AWS best practices, and then pass that environment to Ansible playbooks to build out the OpenShift environment. The AWS CloudFormation templates use AWS Lambda to generate a dynamic SSH key pair that is loaded into an Auto Scaling group. The Ansible inventory file is auto-generated accordingly. The combination of AWS CloudFormation and Ansible enables you to deploy and tear down your OpenShift environment by using CloudFormation stacks.

## OpenShift Components

The Quick Start deploys the following OpenShift Container Platform components:

- **Master** provides master components such as the following:
  - API server (responsible for handling requests from clients, including nodes, users, administrators, and other infrastructure systems deployed to OpenShift)
  - Controller manager server (includes the scheduler and replication controller)
  - OpenShift client tools (`oc` and `oadm`).
- **`etcd`** stores the persistent master state while other components watch `etcd` for changes to bring themselves into the desired state.
- **Nodes** provide the runtime environments for containers.

## 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.

This Quick Start requires a Red Hat subscription.

# Architecture

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

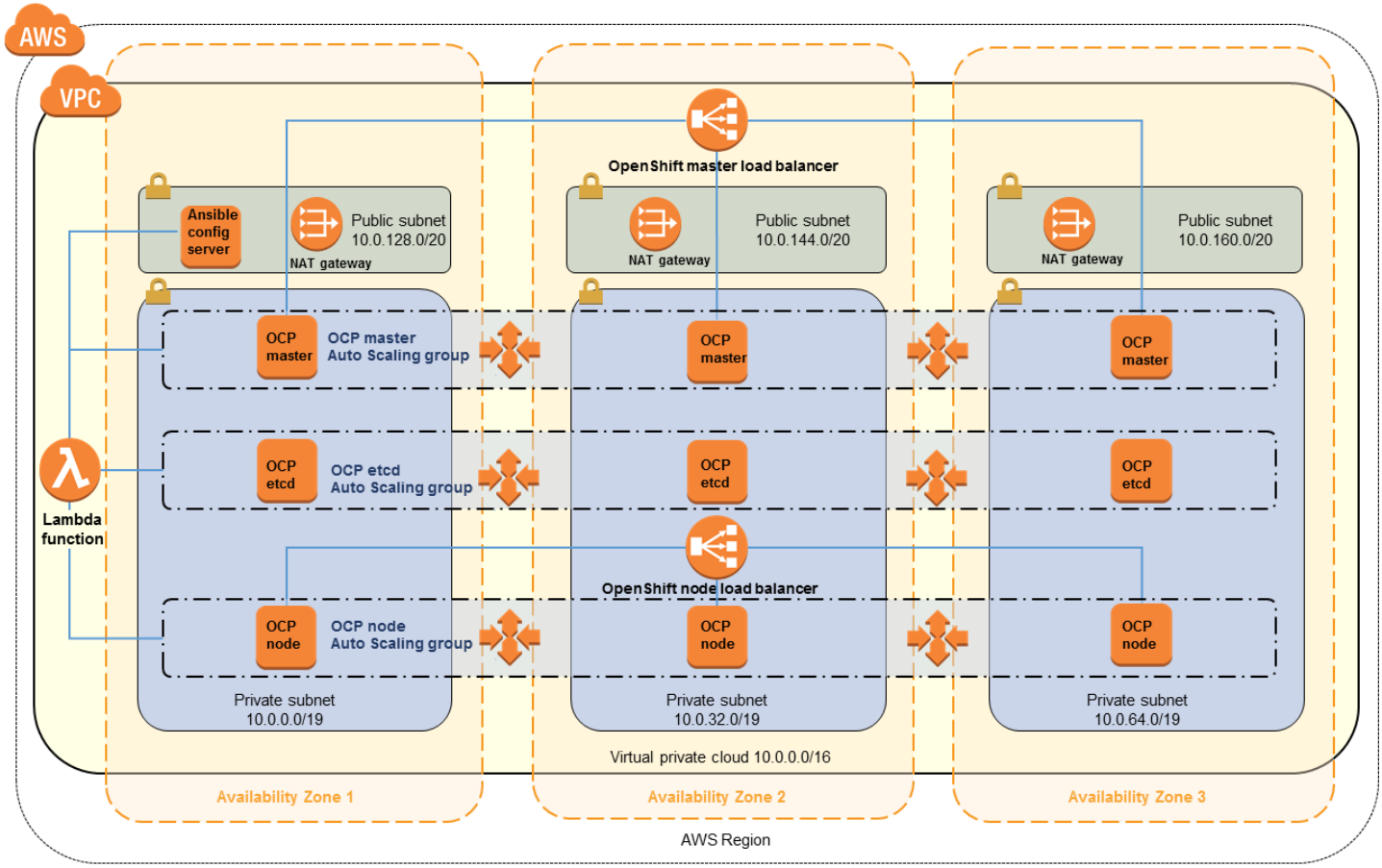



**Figure 1: Quick Start architecture for OpenShift Container Platform on AWS**

The Quick Start sets up the following:

- A single virtual private cloud (VPC) that spans three Availability Zones, with one private and one public subnet in each Availability Zone.*
- An Internet gateway to provide Internet access to each subnet.*
- In one of the public subnets, an Ansible config server instance.
- In the private subnets:
  - Three OpenShift master instances in an Auto Scaling group
  - Three OpenShift `etcd` instances in an Auto Scaling group
  - A variable number of OpenShift node instances in an Auto Scaling group

> **Note** The template that deploys the Quick Start into an existing VPC skips the tasks marked by asterisks.

## Auto Scaling Use

In this release, the Quick Start places the OpenShift instances in Auto Scaling groups, but doesn't enable scaling. The number of master and `etcd` instances are fixed at three (one per Availability Zone). Nodes can be set to a variable number and will be distributed among the selected Availability Zones.

## Auto Scaling Workflow

The Auto Scaling components of the Quick Start use Amazon CloudWatch Events and AWS Systems Manager Run Command to call on-instance scripts to configure instances that have just launched within the OpenShift cluster.

When an Auto Scaling group increases or reduces its capacity, a CloudWatch Event is triggered, sending a signal to a specific Systems Manager target to execute a shell script. The target is the Ansible config server of the cluster, identified by its instance ID. The script executed within the Ansible config server is `/bin/aws-ose-qs-scale --scale-in-progress`.

This script queries the Amazon EC2 Auto Scaling APIs to determine whether any changes were made to the Auto Scaling groups within the cluster. If changes are found, the script takes appropriate action based on the events that have occurred:

- In the case of a scale-out event, the script generates cluster-related metadata for the new instances and adds it to the Ansible hosts inventory located at `/etc/ansible/hosts`. Next, the script verifies that each instance is reachable, and then triggers the appropriate Ansible Playbook(s).
- If instances have been removed from the cluster, the script removes their node definitions from the Ansible hosts inventory.

The Quick Start Auto Scaling scripts store workflow logs in `/var/log/openshift-quickstart-scaling.log`.

Ansible Playbook-specific logs are stored in `/var/log/aws-quickstart-openshift-scaling`.

## AWS Service Broker

AWS Service Broker, which is an open-source project, exposes native AWS services to application platforms and provides a seamless integration with applications running in the platform. AWS Service Broker integrations are natively available in Red Hat OpenShift.

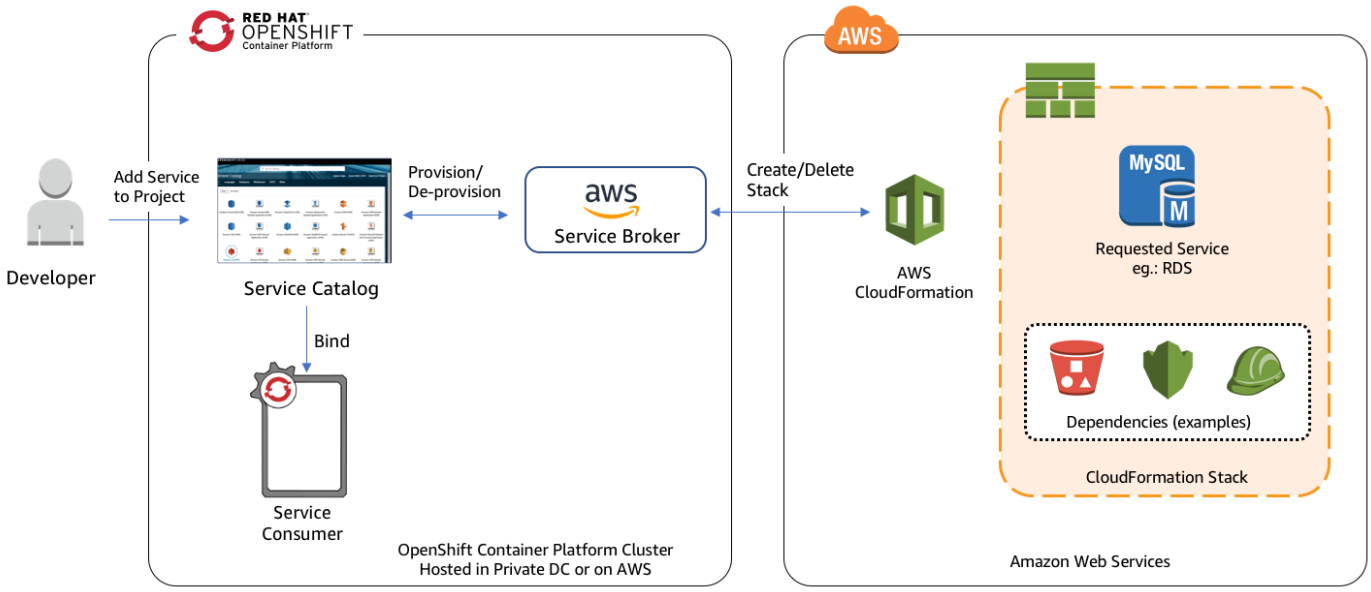



**Figure 2: AWS Service Broker**

AWS Service Broker is an implementation of the Open Service Broker API. On the OpenShift platform, the Kubernetes Service Catalog provides an intermediate layer that allows users to deploy services using native manifests and the OpenShift graphical UI.

AWS Service Broker supports a subset of AWS services, including Amazon Relational Database Service (Amazon RDS), Amazon EMR, Amazon DynamoDB, Amazon Simple Storage Service (Amazon S3), and Amazon Simple Queue Service (Amazon SQS); for a full list, see the AWS Service Broker documentation. The broker includes AWS CloudFormation templates that manage infrastructure, resources, and build logic. These templates contain both prescriptive and customizable parameter sets that provide best-practice implementations for production, test, and development environments.

Applications can consume or interact with these resources by using a set of values such as endpoints and credentials, which are stored as OpenShift secrets through a process calling binding. Binding allows developers to create microservices that consume AWS services without knowledge or insight into the underlying resources.

*Service Role for AWS Service Broker*

AWS Service Broker requires an AWS CloudFormation service role. This IAM role requires permissions to manage AWS services that you would like to deploy through AWS Service Broker. By default, the Quick Start creates a role with the `AdministratorAccess` IAM policy attached. If you want to limit cluster users to a subset of the available services, you can specify a custom role that allows access to only your subset of services by using the **ExistingAWSServiceBrokerRole** parameter during deployment.

# 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 VPC
- Amazon EC2
- Amazon EBS
- Amazon Lambda

# Deployment Options

This Quick Start provides two deployment options:

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

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

# Deployment Steps

## Step 1. Sign up for a Red Hat Subscription

This Quick Start requires a Red Hat account and valid Red Hat subscription. During the deployment of the Quick Start, you'll need to provide your Red Hat subscription user name, password, and pool ID. You can sign up for a subscription at https://www.redhat.com/wapps/ugc/register.html.

If you don't have an Red Hat account, you can register on the Red Hat website. (Note that registration may require a non-personal email address.)

Registrations and subscriptions are handled through the Red Hat Subscription Manager. If you do have a Red Hat account, but you don't have easy access to the Subscription Manager, you can launch a RHEL instance on AWS to determine whether your account includes the necessary subscription and associated pool ID.

Launch an RHEL instance and run the following on the instance to access your account:

```
$ sudo subscription-manager register
```

You'll be prompted for your account name and password.

Now you can get a list of your available subscriptions:

```
$ sudo subscription-manager list --available --all
```

The output may include a number of sections. If it includes something like `Red Hat OpenShift Enterprise`, look for a pool ID (`Pool ID: xxx`) after that string, and make a note of the ID. You'll need to specify that value during deployment in step 3.

You also need to confirm that you have entitlements available. If the `Entitlements Available` value is zero or doesn't appear at all, you might not be able to use the Quick Start.

After you determine what you need, you can unregister the host:

```
$ sudo subscription-manager unregister
```

and then terminate the RHEL instance.

> **Important** This Quick Start will allocate from your subscription entitlements. Before you use the Quick Start, make sure that you will not be taking entitlements away from a pool that needs to be available for your company's usage.
>
> We recommend that you go to your Red Hat account portal and ensure that your hosts and subscription entitlements have been removed after you are finished with Subscription Manager and your instances have been terminated.

## Step 2. 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 OpenShift Container Platform on AWS.
3. Create a key pair in your preferred region.
4. If necessary, request a service limit increase for the Amazon EC2 **M4** 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 reference deployment.

## Step 3. 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.

| Option 1 | Option 2 |
|---|---|
| **Deploy OpenShift Container Platform into a new VPC** | **Deploy OpenShift Container Platform into an existing VPC** |
| Launch | Launch |

> **Important** If you're deploying OpenShift into an existing VPC, make sure that your VPC has three private subnets in different Availability Zones for the OpenShift 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'll also need the domain name option configured in the DHCP options as explained in the Amazon VPC documentation. You'll be prompted for your VPC settings when you launch the Quick Start.

Each deployment takes about 1.5 hours 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 OpenShift 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 OpenShift Container Platform into a new VPC

   – Parameters for deploying OpenShift Container Platform into an existing VPC

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

  View template

  *VPC Network Configuration:*

| Parameter label (name) | Default | Description |
|---|---|---|
| **Availability Zones** (AvailabilityZones) | *Requires input* | The list of Availability Zones to use for the subnets in the VPC. The Quick Start uses three Availability Zones from your list and preserves the logical order you specify. |
| **VPC CIDR** (VPCCIDR) | 10.0.0.0/16 | CIDR block for the VPC. |
| **Private Subnet 1 CIDR** (PrivateSubnet1CIDR) | 10.0.0.0/19 | CIDR block for the private subnet located in Availability Zone 1. |
| **Private Subnet 2 CIDR** (PrivateSubnet2CIDR) | 10.0.32.0/19 | CIDR block for the private subnet located in Availability Zone 2. |
| **Private Subnet 3 CIDR** (PrivateSubnet3CIDR) | 10.0.64.0/19 | CIDR block for the private subnet located in Availability Zone 3. |
| **Public Subnet 1 CIDR** (PublicSubnet1CIDR) | 10.0.128.0/20 | CIDR block for the public (DMZ) subnet located in Availability Zone 1. |
| **Public Subnet 2 CIDR** (PublicSubnet2CIDR) | 10.0.144.0/20 | CIDR block for the public (DMZ) subnet located in Availability Zone 2. |
| **Public Subnet 3 CIDR** (PublicSubnet3CIDR) | 10.0.160.0/20 | CIDR block for the public (DMZ) subnet located in Availability Zone 3. |

| Parameter label (name) | Default | Description |
|---|---|---|
| **Allowed External Access CIDR (OCP UI)** (RemoteAccessCIDR) | *Requires input* | The CIDR IP range that is permitted to access the OpenShift Container Platform (OCP) user interface. 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. |
| **Allowed External Access CIDR (OCP Router)** (ContainerAccessCIDR) | *Requires input* | The CIDR IP range that is permitted to access applications hosted in OpenShift. 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. |

*DNS Configuration:*

| Parameter label (name) | Default | Description |
|---|---|---|
| **Domain Name** (DomainName) | *Requires input* | The domain name to use for the cluster. |
| **Route 53 Hosted Zone ID** (HostedZoneID) | *Optional* | The Amazon Route 53 hosted zone ID to use. If you leave this parameter blank, the Quick Start will not configure Route 53, and you must set up the Domain Name System (DNS) manually, as described in step 4. |
| **Subdomain Prefix** (SubDomainPrefix) | *Optional* | The subdomain to use for the cluster master and application wildcard records. If you leave this parameter blank, the domain name will be used without a prefix. |

*Amazon EC2 Configuration:*

| Parameter label (name) | Default | Description |
|---|---|---|
| **SSH Key Name** (KeyPairName) | *Requires input* | 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. All instances will launch with this key pair. |

*OpenShift Nodes Configuration:*

| Parameter label (name) | Default | Description |
|---|---|---|
| **Number of Masters** (NumberOfMaster) | 3 | The number of OpenShift master instances to provision. This deployment requires three OpenShift master instances. |
| **Number of Etcds** (NumberOfEtcd) | 3 | The number of OpenShift `etcd` instances to provision. This deployment requires three OpenShift `etcd` instances. |

| Parameter label (name) | Default | Description |
|---|---|---|
| **Number of Nodes** (NumberOfNodes) | 3 | The number of OpenShift node instances to provision. You can choose any number of instances.<br>**Warning** If the number of node instances exceeds your Red Hat entitlement limits or AWS instance limits, the stack will fail. Choose a number that is within your limits. |
| **Master Instance Type** (MasterInstanceType) | m4.xlarge | EC2 instance type for the OpenShift master instances. |
| **Etcd Instance Type** (EtcdInstanceType) | m4.xlarge | EC2 instance type for the OpenShift `etcd` instances. |
| **Nodes Instance Type** (NodesInstanceType) | m4.xlarge | EC2 instance type for the OpenShift node instances. |
| **OpenShift UI Password** (OpenShiftAdmin Password) | *Requires input* | The password for the OpenShift Administration UI. The password must contain at least 8 characters, including letters (with a minimum of one capital letter), numbers, and symbols. |

### *OpenShift Feature Configuration:*

| Parameter label (name) | Default | Description |
|---|---|---|
| **AWS Service Broker** (AWSServiceBroker) | Enabled | Set this parameter to **Disabled** if you don't want to use AWS Service Broker, which provides a seamless integration with applications running in OpenShift. For more information, see AWS Service Broker earlier in this guide. |
| **Existing AWS Service Broker Role ARN** (ExistingAWSService BrokerRole) | *Optional* | Specify an existing role ARN for AWS Service Broker to use when deploying AWS resources. If you leave this parameter blank, the Quick Start will create an IAM role with `AdministratorAccess` policy attached. For more information, see AWS Service Broker earlier in this guide. |
| **Hawkular Metrics** (HawkularMetrics) | Enabled | Set this parameter to **Disabled** to disable cluster metrics provided by Hawkular. |

### *Red Hat Subscription Information:*

| Parameter label (name) | Default | Description |
|---|---|---|
| **Red Hat Subscription User Name** (RedhatSubscription UserName) | *Requires input* | Your Red Hat (RHN) user name, from step 1. |
| **Red Hat Subscription Password** | *Requires input* | Your Red Hat (RHN) password, from step 1. |

| Parameter label (name) | Default | Description |
|---|---|---|
| (RedhatSubscription Password) | | |
| **Red Hat Pool ID** (RedhatSubscription PoolID) | *Requires input* | Your Red Hat (RHN) subscription pool ID, from step 1. |

*Ansible Playbook Configuration:*

| Parameter label (name) | Default | Description |
|---|---|---|
| **Ansible Playbook Mode** (AnsiblePlayBookType) | Subscription-Version | The Ansible Playbook version to use. If you're using this deployment for production, keep the default setting. If you're using this deployment for development purposes, you can choose **OpenSource-Version**. |
| **Git Repo Release Version** (AnsiblePlayBookGitRepoTag) | 3.7.23-1 | This parameter is used only if you choose **OpenSource-Version** for the **Ansible Playbook Mode** parameter. You can specify one of the development releases available at https://github.com/openshift/openshift-ansible/releases. (For more information, see the Ansible Playbook Releases section.) |

*AWS Quick Start Configuration:*

| Parameter label (name) | Default | Description |
|---|---|---|
| **Quick Start S3 Bucket Name** (QSS3BucketName) | aws-quickstart | S3 bucket where the Quick Start templates and scripts are installed. You can specify the S3 bucket name you've 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 or uppercase letters, and hyphens, but should not start or end with a hyphen. |
| **Quick Start S3 Key Prefix** (QSS3KeyPrefix) | quickstart-redhat-openshift/ | 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. |
| **Output S3 Bucket Name** (OutputBucketName) | *Optional* | The name of the S3 bucket to place the zip files for all Lambda functions included in this Quick Start. If you leave this parameter blank, the Quick Start will auto-generate a bucket name. |

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

View template

*Network Configuration:*

| Parameter label (name) | Default | Description |
|---|---|---|
| **VPC ID** (VPCID) | *Requires input* | ID of your existing VPC (e.g., vpc-0343606e). |
| **VPC CIDR** (VPCCIDR) | 10.0.0.0/16 | CIDR block for the VPC. |
| **Private Subnet 1 ID** (PrivateSubnet1ID) | *Requires input* | ID of the private subnet in Availability Zone 1 in your existing VPC (e.g., subnet-a0246dcd). |
| **Private Subnet 2 ID** (PrivateSubnet2ID) | *Requires input* | ID of the private subnet in Availability Zone 2 in your existing VPC (e.g., subnet-b58c3d67). |
| **Private Subnet 3 ID** (PrivateSubnet3ID) | *Requires input* | ID of the private subnet in Availability Zone 3 in your existing VPC (e.g., subnet-b1f4a2cd). |
| **Public Subnet 1 ID** (PublicSubnet1ID) | *Requires input* | ID of the public subnet in Availability Zone 1 in your existing VPC (e.g., subnet-9bc642ac). |
| **Public Subnet 2 ID** (PublicSubnet2ID) | *Requires input* | ID of the public subnet in Availability Zone 2 in your existing VPC (e.g., subnet-e3246d8e). |
| **Public Subnet 3 ID** (PublicSubnet3ID) | *Requires input* | ID of the public subnet in Availability Zone 3 in your existing VPC (e.g., subnet-e3246d7f). |
| **Allowed External Access CIDR (OCP UI)** (RemoteAccessCIDR) | *Requires input* | The CIDR IP range that is permitted to access the OpenShift Container Platform (OCP) user interface. 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. |
| **Allowed External Access CIDR (OCP Router)** (ContainerAccessCIDR) | *Requires input* | The CIDR IP range that is permitted to access applications hosted in OpenShift. 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. |

*DNS Configuration:*

| Parameter label (name) | Default | Description |
|---|---|---|
| **Domain Name** (DomainName) | *Requires input* | The domain name to use for the cluster. |
| **Route 53 Hosted Zone ID** (HostedZoneID) | *Optional* | The Amazon Route 53 hosted zone ID to use. If you leave this parameter blank, the Quick Start will not configure Route 53, and you must set up the Domain Name System (DNS) manually, as described in step 4. |

| Parameter label (name) | Default | Description |
|---|---|---|
| **Subdomain Prefix** (SubDomainPrefix) | *Optional* | The subdomain to use for the cluster master and application wildcard records. If you leave this parameter blank, the domain name will be used without a prefix. |

*Amazon EC2 Configuration:*

| Parameter label (name) | Default | Description |
|---|---|---|
| **SSH Key Name** (KeyPairName) | *Requires input* | 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. All instances will launch with this key pair. |

*OpenShift Nodes Configuration:*

| Parameter label (name) | Default | Description |
|---|---|---|
| **Number of Masters** (NumberOfMaster) | 3 | The number of OpenShift master instances to provision. This deployment requires three OpenShift master instances. |
| **Number of Etcds** (NumberOfEtcd) | 3 | The number of OpenShift `etcd` instances to provision. This deployment requires three OpenShift `etcd` instances. |
| **Number of Nodes** (NumberOfNodes) | 3 | The number of OpenShift node instances to provision. You can choose any number of instances.<br>**Warning** If the number of node instances exceeds your Red Hat entitlement limits or AWS instance limits, the stack will fail. Choose a number that is within your limits. |
| **Master Instance Type** (MasterInstanceType) | m4.xlarge | EC2 instance type for the OpenShift master nodes. |
| **Etcd Instance Type** (EtcdInstanceType) | m4.xlarge | EC2 instance type for the OpenShift etcd nodes. |
| **Nodes Instance Type** (NodesInstanceType) | m4.xlarge | EC2 instance type for the OpenShift nodes. |
| **OpenShift UI Password** (OpenShiftAdmin Password) | *Requires input* | The password for the OpenShift Administration UI. The password must contain at least 8 characters, including letters (with a minimum of one capital letter), numbers, and symbols. |

*OpenShift Feature Configuration:*

| Parameter label (name) | Default | Description |
|---|---|---|
| **AWS Service Broker** (AWSServiceBroker) | Enabled | Set this parameter to **Disabled** if you don't want to use AWS Service Broker, which provides a seamless integration with applications running in OpenShift. For more information, see AWS Service Broker earlier in this guide. |
| **Existing AWS Service Broker Role ARN** (ExistingAWSService BrokerRole) | *Optional* | Specify an existing role ARN for the AWS Service Broker to use when deploying AWS resources. If you leave this parameter blank, the Quick Start will create an IAM role with `AdministratorAccess` policy attached. For more information, see AWS Service Broker earlier in this guide. |
| **Hawkular Metrics** (HawkularMetrics) | Enabled | Set this parameter to **Disabled** to disable cluster metrics provided by Hawkular. |

*Ansible Playbook Configuration:*

| Parameter label (name) | Default | Description |
|---|---|---|
| **Ansible Playbook Mode** (AnsiblePlayBookType) | Subscription-Version | The Ansible Playbook version to use. If you're using this deployment for production, keep the default setting. If you're using this deployment for development purposes, you can choose **OpenSource-Version**. |
| **Git Repo Release Version** (AnsiblePlayBookGitRepo Tag) | 3.7.23-1 | This parameter is used only if you choose **OpenSource-Version** for the **Ansible Playbook Mode** parameter. You can specify one of the development releases available at https://github.com/openshift/openshift-ansible/releases. (For more information, see the Ansible Playbook Releases section.) |

*Red Hat Subscription Information:*

| Parameter label (name) | Default | Description |
|---|---|---|
| **Red Hat Subscription User Name** (RedhatSubscription UserName) | *Requires input* | Your Red Hat (RHN) user name, from step 1. |
| **Red Hat Subscription Password** (RedhatSubscription Password) | *Requires input* | Your Red Hat (RHN) password, from step 1. |
| **Red Hat Pool ID** (RedhatSubscription PoolID) | *Requires input* | Your Red Hat (RHN) subscription pool ID, from step 1. |

*AWS Quick Start Configuration:*

| Parameter label (name) | Default | Description |
|---|---|---|
| **Quick Start S3 Bucket Name** (QSS3BucketName) | aws-quickstart | S3 bucket where the Quick Start templates and scripts are installed. You can specify the S3 bucket name you've 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 or uppercase letters, and hyphens, but should not start or end with a hyphen. |
| **Quick Start S3 Key Prefix** (QSS3KeyPrefix) | quickstart-redhat-openshift/ | 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. |
| **Output S3 Bucket Name** (OutputBucketName) | *Optional* | The name of the S3 bucket to place the zip files for all Lambda functions included in this Quick Start. If you leave this parameter blank, the Quick Start will auto-generate a bucket name. |

5. 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**.
6. 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.
7. Choose **Create** to deploy the stack.
8. Monitor the status of the stack. When the status is **CREATE_COMPLETE**, the OpenShift Container Platform cluster is ready.
9. Use the URLs displayed in the **Outputs** tab for the stack to view the resources that were created.

## Step 4. Set up DNS

> **Note** Skip this step if you provided a Route 53 hosted zone ID by using the **HostedZoneID** parameter in step 3.

If you are managing your DNS with a DNS service other than Route 53, or if you opted to set up DNS manually, you must create the following DNS records:

```
<SubDomainPrefix>.<DomainName>   CNAME  <OpenShiftMasterELB-DNSName>
*.<SubDomainPrefix>.<DomainName> CNAME  <ContainerAccessELB-DNSName>
```

where *SubDomainPrefix* and *DomainName* refer to the settings of those parameters in step 3. To retrieve the DNS names for **OpenShiftMasterELB** and **ContainerAccessELB**, open the Amazon EC2 console at https://console.aws.amazon.com/ec2/, choose **Load Balancers**, and then select the load balancer from the list.

If you left the **SubDomainPrefix** parameter blank during deployment, the record names must be created using only the value provided for the **DomainName** parameter.

## Step 5. Test the Deployment

*Verify that OpenShift services are running*

OpenShift components are deployed into multiple private subnets. You can access the OpenShift web console by using the `OpenShiftMasterELB` on port 8443. You can also connect to one of the OpenShift master nodes and use the OpenShift command line interface (CLI). To log in, you'll use SSH agent forwarding to hop from the Ansible config server to the master node. (The SSH agent will provide your private key on connection.)

> **Important** Do not copy your private key to the Ansible config server.

For more information on SSH agents, see the GitHub documentation.

1. Use an SSH agent to access the Ansible config server environment on MacOS or Linux, by using the command:

```
ssh-add ~/.ssh/id_rsa
```

2. At the prompt, type your passphrase or press **Enter** for no passphrase.

```
Enter passphrase (empty for no passphrase): [Press Enter again or type
passphrase]
Enter same passphrase again: [Press Enter again or type passphrase]
```

3. Open the Amazon EC2 console at https://console.aws.amazon.com/ec2/, select the instance tagged `ansible-configserver`, and note its public address.

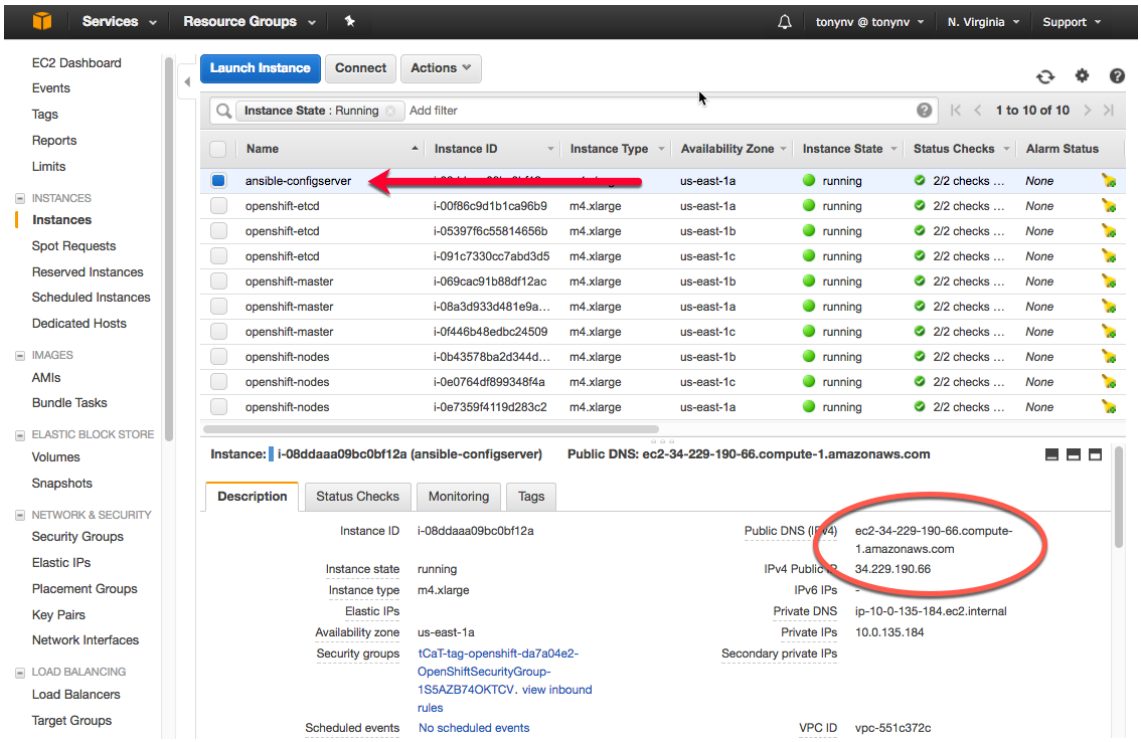
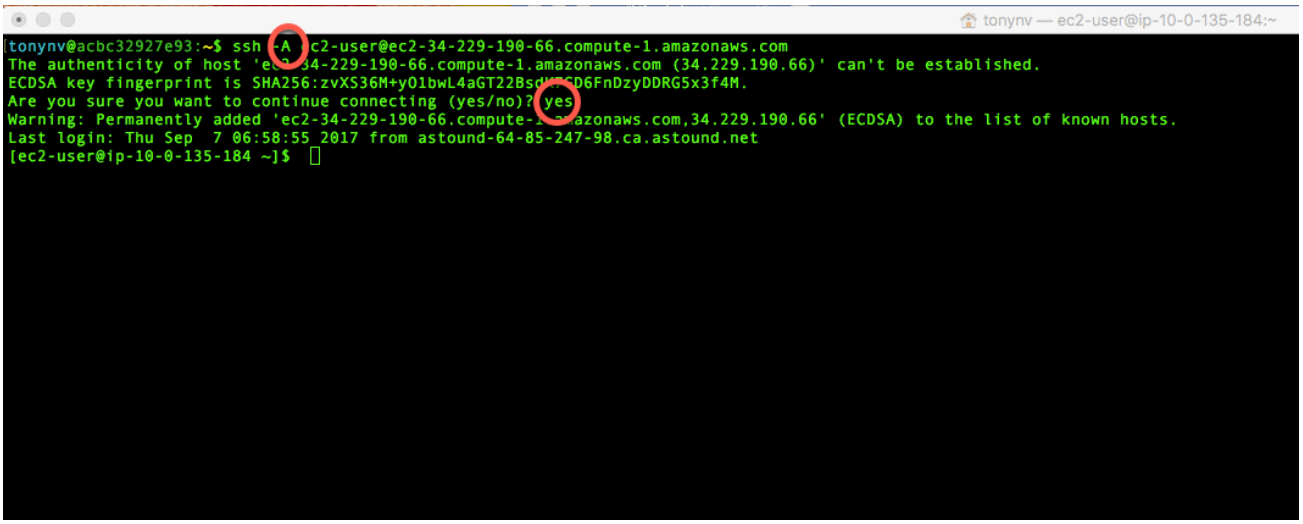



**Figure 3: Finding the public DNS of the `ansible-configserver` instance**

4. SSH as `ec2-user` with your key pair to the config server, and then enter **yes** to connect.




5. From the config server, connect to a master node:
   a. From the EC2 console select one of the instances tagged `openshift-master` and note the private DNS name or IP of the node.

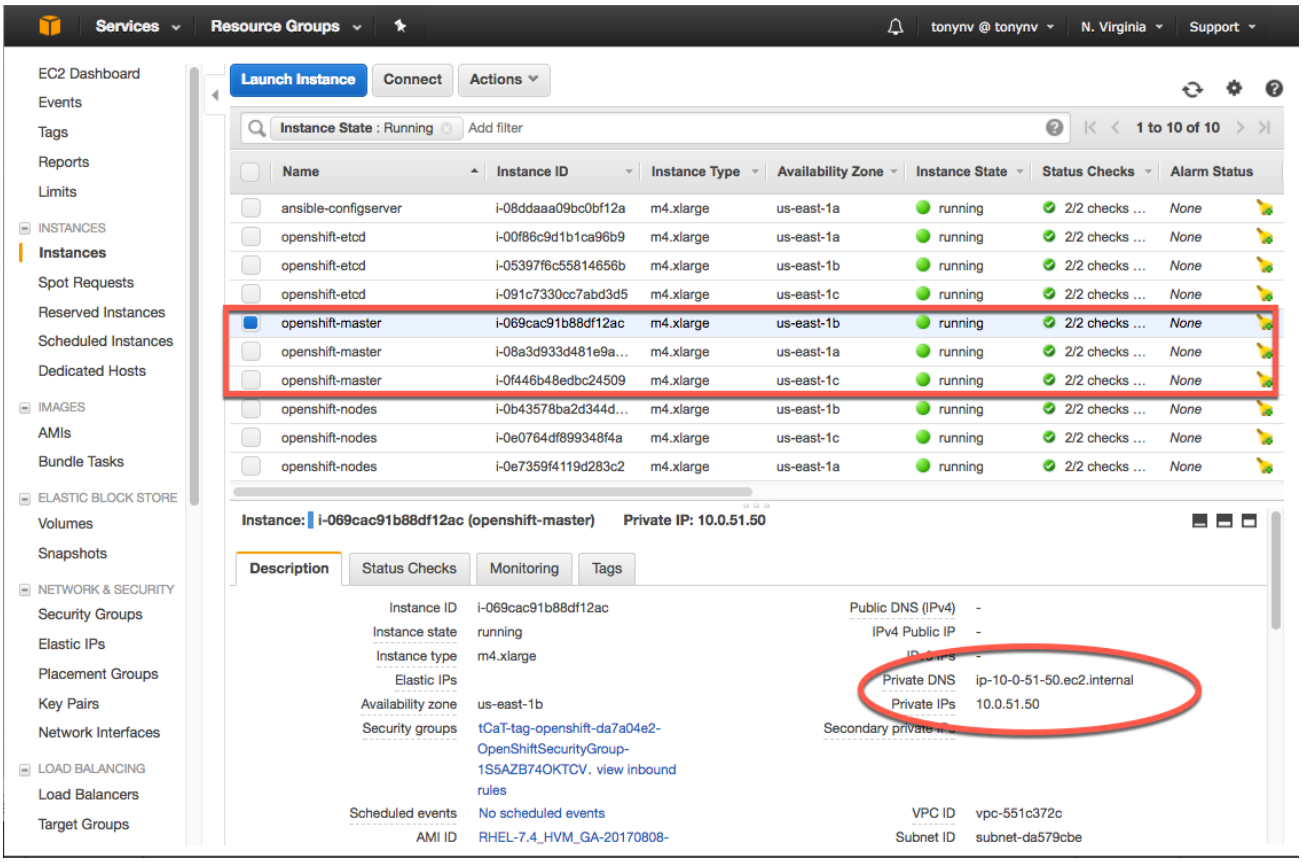



**Figure 4: OpenShift master nodes**

b. Connect to the OpenShift master node's private DNS name or IP address and **sudo** to become `root`:

```
$ sudo -s
```

```
[tonynv@acbc32927e93:~$ ssh -A ec2-user@ec2-34-229-190-66.compute-1.amazonaws.com
The authenticity of host 'ec2-34-229-190-66.compute-1.amazonaws.com (34.229.190.66)' can't be established.
ECDSA key fingerprint is SHA256:zvXS36M+yO1bwL4aGT22BsdK7GD6FnDzyDDRG5x3f4M.
Are you sure you want to continue connecting (yes/no)? yes
Warning: Permanently added 'ec2-34-229-190-66.compute-1.amazonaws.com,34.229.190.66' (ECDSA) to the list of known hosts.
Last login: Thu Sep  7 06:58:55 2017 from astound-64-85-247-98.ca.astound.net
[[ec2-user@ip-10-0-135-184 ~]$
[[ec2-user@ip-10-0-135-184 ~]$
[[ec2-user@ip-10-0-135-184 ~]$
 [ec2-user@ip-10-0-135-184 ~]$ ssh ip-10-0-51-50.ec2.internal
The authenticity of host 'ip-10-0-51-50.ec2.internal (10.0.51.50)' can't be established.
ECDSA key fingerprint is SHA256:NnmuXaU0C6gocYtye67cyDauFbbEJ960XtwYSP6rv20.
ECDSA key fingerprint is MD5:3f:90:dc:37:3e:d3:92:b5:79:fd:f7:0f:40:0d:e1:1c.
[Are you sure you want to continue connecting (yes/no)? yes
Warning: Permanently added 'ip-10-0-51-50.ec2.internal,10.0.51.50' (ECDSA) to the list of known hosts.
[[ec2-user@ip-10-0-51-50 ~]$
[[ec2-user@ip-10-0-51-50 ~]$ sudo -s
 [root@ip-10-0-51-50 ec2-user]#
```

c. On the Master node **as root**, run `oc get pods` and verify that services are in the running state:

```
$ oc get pods
```

```
[root@ip-10-0-51-50 ec2-user]# oc get pods
NAME                       READY     STATUS    RESTARTS   AGE
docker-registry-1-crd7z    1/1       Running   0          2h
registry-console-1-99n23   1/1       Running   0          2h
router-1-051bt             1/1       Running   0          2h
router-1-6vlpm             1/1       Running   0          2h
router-1-qgm1k             1/1       Running   0          2h
[root@ip-10-0-51-50 ec2-user]#
```

*Connect to the OpenShift Web Console*

1. Open the AWS CloudFormation console at https://console.aws.amazon.com/cloudformation/, and then select the OpenShift stack.

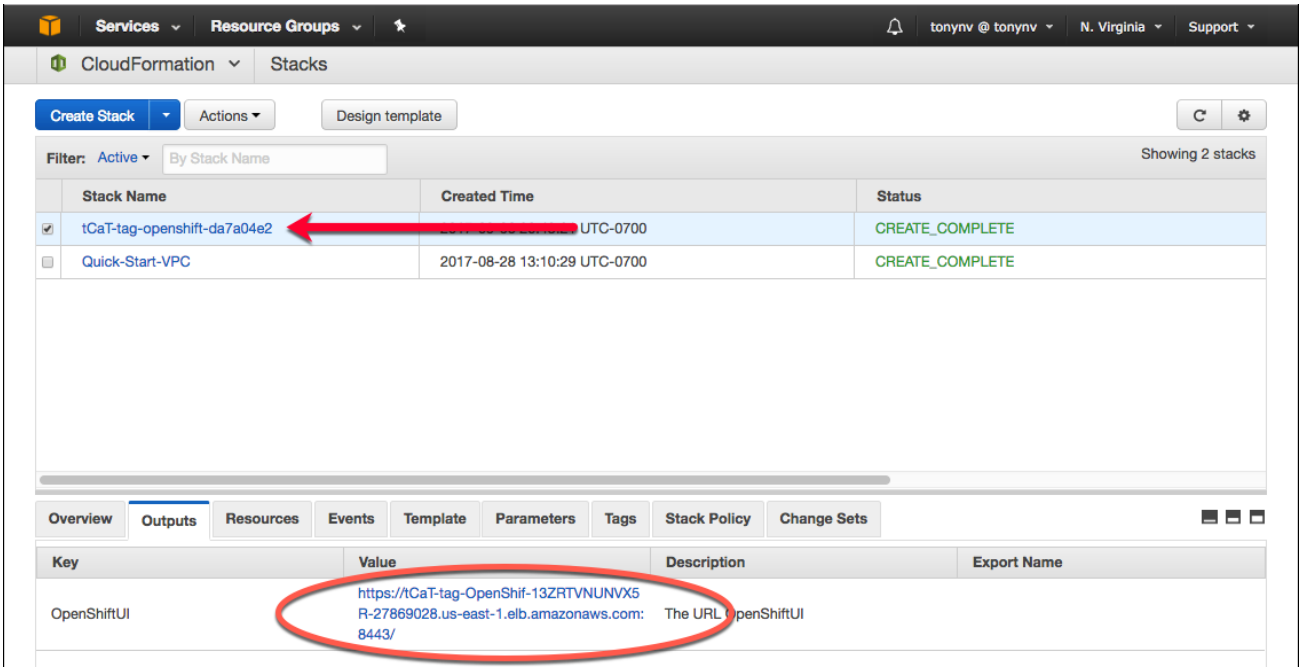



**Figure 5: OpenShift stack and console link**

2. Point your browser to the value for the `OpenShiftUI` key to connect to the console.
3. Accept the self-signed certificate warnings (there will be a few redirects on the initial connection) to reach the OpenShift user interface.

**Note** The default login *(username/password)* is `admin/admin`.

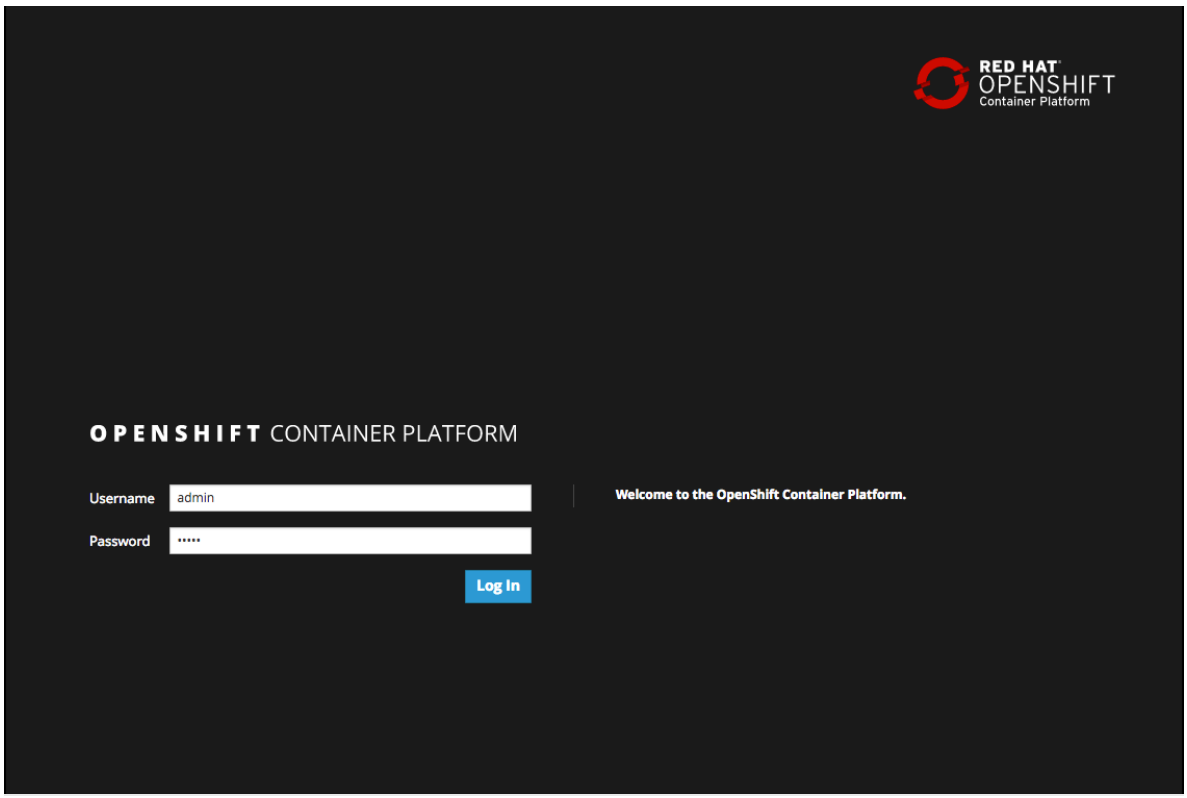



**Figure 6: OpenShift login screen**

**Important** Please change your password upon login. For more information, see Managing Users in the OpenShift documentation.

Upon login, you will reach the **Create Project** screen.

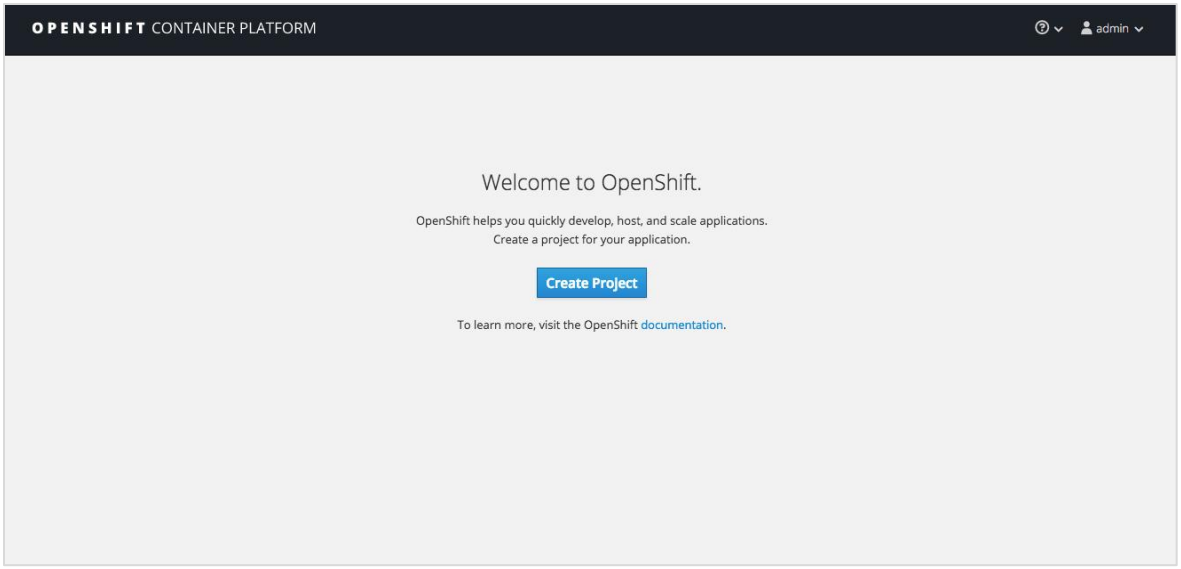



**Figure 7: OpenShift Create Project screen**

4. Follow the instructions in the OpenShift documentation to create projects and applications.

If you're using OpenShift Container Platform for production use, we recommend switching to a CA-signed certificate. For details, see Certificate Management in the OpenShift documentation.

For further customization and additional functionality, see the links in the Additional Resources section.

# Best Practices for Using OpenShift Container Platform on AWS

This Quick Start deploys the AWS infrastructure for OpenShift and generates Ansible inventory files based on your selected instance types and VPC configuration. The AWS CloudFormation templates follow Quick Start best practices for AWS resource management and the best practices dictated by Red Hat for Ansible Playbook and OpenShift.

## Security

By default, this Quick Start does not allow direct access to OpenShift nodes and limits access to ports 22 and 443. If you want to expose additional ports for added functionality, you can adjust the OpenShift security group and ELB load balancer accordingly.

### Ansible Playbook Releases

This Quick Start has been tested with the officially released version of Ansible Playbook for production environments, as specified by the default setting (**Subscription-Version**) of the **Ansible Playbook Mode** parameter. If you're using this deployment in a development environment, you can select **OpenSource-Version** for the **Ansible Playbook Mode** parameter, and specify a development release from https://github.com/openshift/openshift-ansible/releases. However, note that this Quick Start hasn't been tested with all development releases, which may include changes to core components.

## Troubleshooting

**Q.** I encountered a CREATE_FAILED error when I launched the Quick Start. What should I do?

**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. (You'll want to look at the log files in `%ProgramFiles%\Amazon\EC2ConfigService` and `C:\cfn\log`.)

> **Important** When you set **Rollback on failure** to **No**, you'll continue to incur AWS charges for this stack. Please make sure to delete the stack when you've finished 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 location we've provided 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 encountered an error using AWS Service Broker.

**A.** For detailed troubleshooting steps, see the troubleshooting section of the AWS Service Broker documentation. If the steps outlined in the documentation do not resolve your issue, contact the team using the Issues section of the AWS Service Broker GitHub repository.

# Additional Resources

## AWS services

- Amazon EC2
  https://docs.aws.amazon.com/AWSEC2/latest/WindowsGuide/
- AWS CloudFormation
  https://aws.amazon.com/documentation/cloudformation/
- Amazon VPC
  https://aws.amazon.com/documentation/vpc/
- AWS Service Broker
  https://github.com/awslabs/aws-servicebroker-documentation/wiki

## OpenShift Container Platform

- Getting Started with the CLI
  https://docs.openshift.com/container-platform/3.7/cli_reference/get_started_cli.html
- Web console walkthrough
  https://docs.openshift.com/container-platform/3.7/getting_started/developers_console.html

## Quick Start reference deployments

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

# 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.

# Document Revisions

| Date | Change | In sections |
|---|---|---|
| **March 2018** | Updated OpenShift version to 3.7; added AWS Service Broker for service access, Route 53 for DNS, Amazon EBS for persistent storage, and Hawkular for cluster metrics | Auto Scaling Workflow<br>AWS Service Broker<br>Step 3 (new parameters)<br>Step 4 |
| **November 2017** | Added information about checking Red Hat registrations, subscriptions, and entitlements | Step 1 |
| **September 2017** | Initial publication | — |

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