SAP HANA on the Amazon Web Services Cloud: Quick Start Reference Deployment

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Supports SAP HANA SP 7–11

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Table of Contents

Table of Contents 2

Abstract 4

Before You Get Started 4

Implementing SAP Business One, Version for SAP HANA 4

What We'll Cover 4

End-to-end Deployment (Option 1) 5

Deploy SAP HANA into an Existing Amazon VPC (Option 2) 5

Overview of SAP HANA on AWS 5

Single-node Architecture 6

Multi-node Architecture 7

Storage Architecture 8

AWS Instance Type for SAP HANA 8

Memory Sizing for Deployment 8

End-to-end Deployment (Option 1) 9

Step 1: Prepare an AWS Account to Deploy the SAP HANA Solution 9

Step 2: Launch the Virtual Network and Configure AWS Services for SAP HANA Deployment 11

Template Customization 12

Step 3: Download SAP HANA Media 13

Connect to the RDP Instance 13

Download SAP HANA Media 13

Step 4: Launch and Configure the SAP HANA Servers 14

Track Deployment Progress 16

Additional Customizations 16

Accessing SAP HANA Nodes 17
Establish a Connection to the RDP Instance 17
Establish a Connection to SAP Nodes 18
Deploy SAP HANA into an Existing Amazon VPC (Option 2) 21
Step 1: Download SAP HANA Media 21
Create a New Amazon EBS Volume to Store SAP HANA Media 21
Download and Extract SAP HANA Media 21
Prepare a Media Volume Snapshot 21
Step 2: Deploy SAP HANA Nodes 23
Deploy SAP HANA Nodes with AWS CloudFormation 23
Enter Parameters for the Amazon VPC and SAP HANA Snapshot 24
Troubleshooting 24
Security 28
Network Security 28
Identity and Access Management (IAM) 28
OS Security 28
Security Groups 28
Additional Information 29
Appendix A: Security Group Specifics 30
Appendix B: Subscribing to Red Hat Enterprise Linux for SAP HANA 32
Appendix C: Finding the Right SLES or RHEL AMI for SAP HANA 34
Procedure for SLES 34
Procedure for RHEL 37
Send Us Your Feedback 39
Document Revisions 39

Abstract

This Quick Start Reference Deployment guide includes architectural considerations and configuration steps for deploying SAP HANA in the Amazon Web Services (AWS) cloud. We'll discuss best practices for deploying SAP HANA on AWS using services such as Amazon Elastic Compute Cloud (Amazon EC2) and Amazon Virtual Private Cloud (Amazon VPC). We also provide links to automated AWS CloudFormation templates that you can leverage for your deployment or launch directly into your AWS account.

Before You Get Started

Implementing SAP HANA in the AWS cloud is an advanced topic. If you are new to AWS, see the Getting Started section of the AWS documentation. In addition, familiarity with the following technologies is recommended:

- Amazon EC2
- Amazon VPC
- AWS CloudFormation

This deployment method uses a Bring Your Own License (BYOL) model for SAP HANA. You must already own a license for SAP HANA and you must have access to the SAP Software Download Center to download the software.

Note
In addition to your SAP HANA license, you are responsible for all costs related to your use of any AWS services used while running this Quick Start reference deployment. As of the date of publication, the cost for all the resources created by this Quick Start for a single SAP HANA node ranges from approximately $1.84 to $4.23 an hour, depending on which instance type you choose for the SAP HANA instance to fit your memory and compute requirements. Prices are subject to change and depend on the region and the billing option you choose. See the pricing pages for each AWS service you will be using or the AWS Simple Monthly Calculator for full details.

Implementing SAP Business One, Version for SAP HANA

If you are implementing SAP Business One, version for SAP HANA, follow the instructions in the SAP Business One, version for SAP HANA, Quick Start reference deployment guide, which builds on the SAP HANA Quick Start.

What We'll Cover

This guide serves as a reference for customers interested in deploying SAP HANA on AWS in a self-service fashion. The following section outlines the steps for two deployment options provided by this Quick Start:

- An end-to-end deployment that includes building the Amazon VPC, subnets, and an SAP HANA Server
- A deployment of SAP HANA into an existing Amazon VPC

This Quick Start supports the deployment of SAP HANA on two operating systems: You can choose either SUSE Linux Enterprise Server (SLES) or Red Hat Enterprise Linux (RHEL).

End-to-end Deployment (Option 1)

Step 1: Prepare an AWS Account to Deploy the SAP HANA Solution

- Sign up for an AWS account
- Review default account limits for Amazon EC2 instances and Amazon EBS volumes

Step 2: Launch the Virtual Network and Configure AWS Services for SAP HANA Deployment

- Set up the Amazon Virtual Private Cloud (Amazon VPC)
- Deploy a Microsoft Windows Server for the SAP software download and SAP HANA Studio functions
- Deploy a NAT instance
- Configure security to help ensure secure access to and from resources located within the Amazon VPC

Step 3: Download SAP HANA Media

Manually download SAP HANA media from the SAP Software Download Center (SAP Support Portal access required) to an Amazon EBS Volume on the Microsoft Windows Server provisioned in the previous step.

Step 4: Launch and Configure the SAP HANA Servers.

The Microsoft Windows instance launched in Step 2 includes all the necessary AWS CloudFormation and PowerShell scripts to initiate the SAP HANA deployment on AWS. These scripts will perform the following tasks:

- Create an Amazon EBS snapshot of the SAP Media Volume
- Provision Amazon EC2 instance(s) for SAP HANA deployment
- Provision Amazon EBS storage using the new General Purpose (SSD) volumes for SAP HANA servers
- Operating system-level tasks in support of SAP HANA Installation
- Perform SAP HANA Installation and post configuration steps

Deploy SAP HANA into an Existing Amazon VPC (Option 2)

Step 1: Download SAP HANA Media

- Manually download SAP HANA media from the SAP Software Download Center (SAP Support Portal access required) to an Amazon EBS Volume and extract the media
- Create a snapshot of the volume

Step 2: Deploy SAP HANA Nodes

- Use an AWS CloudFormation template to deploy SAP HANA nodes.
- Manually enter Amazon VPC parameters and other details.

Overview of SAP HANA on AWS

This deployment primarily uses AWS CloudFormation and AWS Tools for Windows PowerShell to deploy SAP HANA on AWS. AWS CloudFormation provides an easy way to create and manage a collection of related AWS resources, provisioning and updating them in an orderly and predictable fashion. AWS Tools for Windows PowerShell enables automation of operations on AWS resources from the PowerShell command line.

The following components are deployed and configured as part of the reference deployment:

- An Amazon Virtual Private Cloud (Amazon VPC) configured with two subnets, one public and the other private.
- A NAT instance deployed into the public subnet and configured with an Elastic IP address (EIP) for outbound Internet connectivity and inbound SSH (Secure Shell) access.
- A Windows Server instance deployed in the public subnet for downloading SAP HANA media as well as hosting the SAP HANA Studio application.
- An AWS Identity and Access Management (IAM) instance role with fine-grained permissions for access to AWS services necessary for the deployment process.
- An SAP HANA system installed with the proper Amazon Elastic Block Store (Amazon EBS based on the new General Purpose (SSD)) volumes configured for SAP HANA performance needs.
- Security Groups for each instance or function to restrict access to only necessary protocols and ports.
- Single-node or multi-node SAP HANA virtual appliances automatically configured according to SAP best practices on a supported operating system.

Single-node Architecture

This reference deployment includes options for either single-node or multi-node configurations of SAP HANA. The single-node deployment includes installation of the SAP HANA platform on a single instance. The reference deployment also follows security best practices by establishing an Amazon VPC designed to provide secure access to an SAP HANA server placed in a private subnet that is not directly accessible from the Internet. The SAP HANA Studio is installed on a separate Windows Server and SSH access to the SAP HANA server can be established by using SSH through the NAT instance or by using an SSH client on the Windows Server.

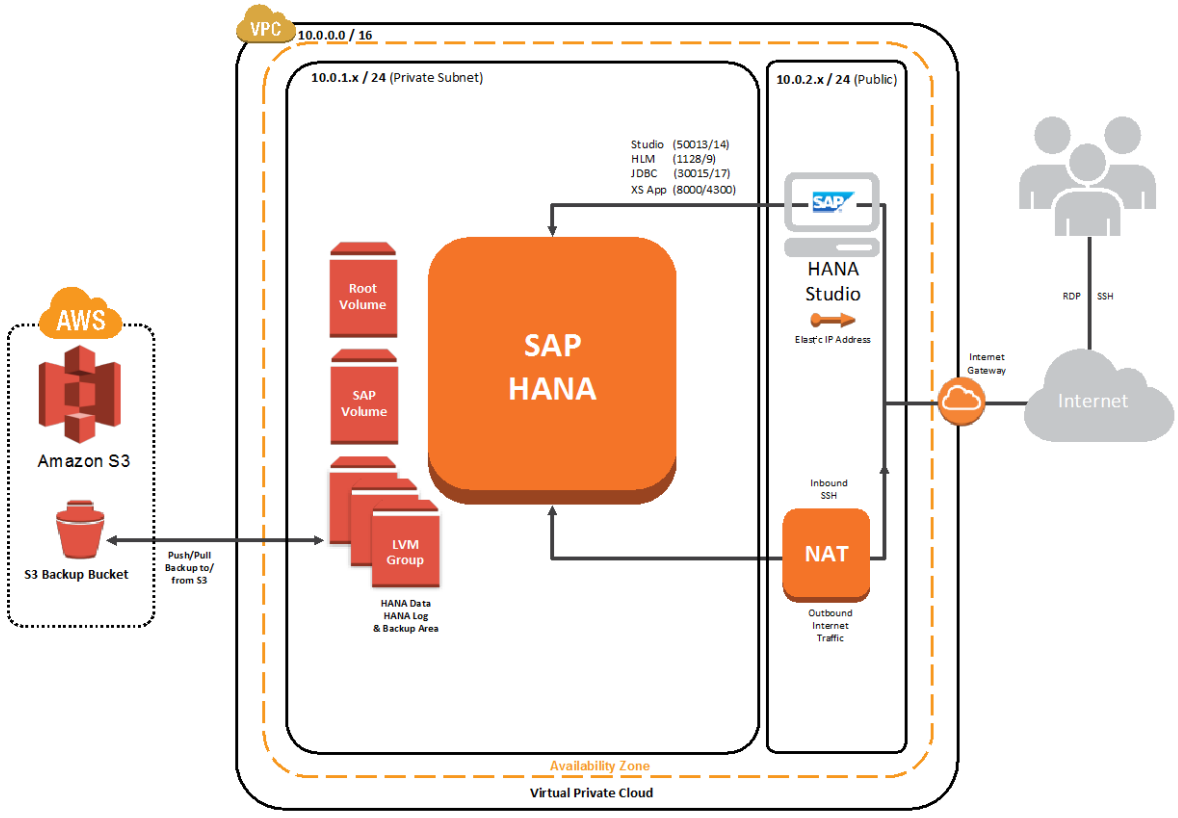

Figure 1: Single-node Architecture

Multi-node Architecture

The multi-node deployment includes installation of the SAP HANA platform on a cluster of servers and supports configurations of up to 17* nodes. Note that all the SAP HANA servers are deployed into the same subnet regardless of function, taking into consideration the security best practices previously mentioned.

As in the single-node installation, access to all of the SAP HANA servers is provided either by tunneling through the NAT instance or by using the Windows Server with an SSH client of your choice. The Security Group or firewall rules are extended to allow for internode communication over the appropriate ports and protocols. For more information, see Appendix A: Security Group Specifics.

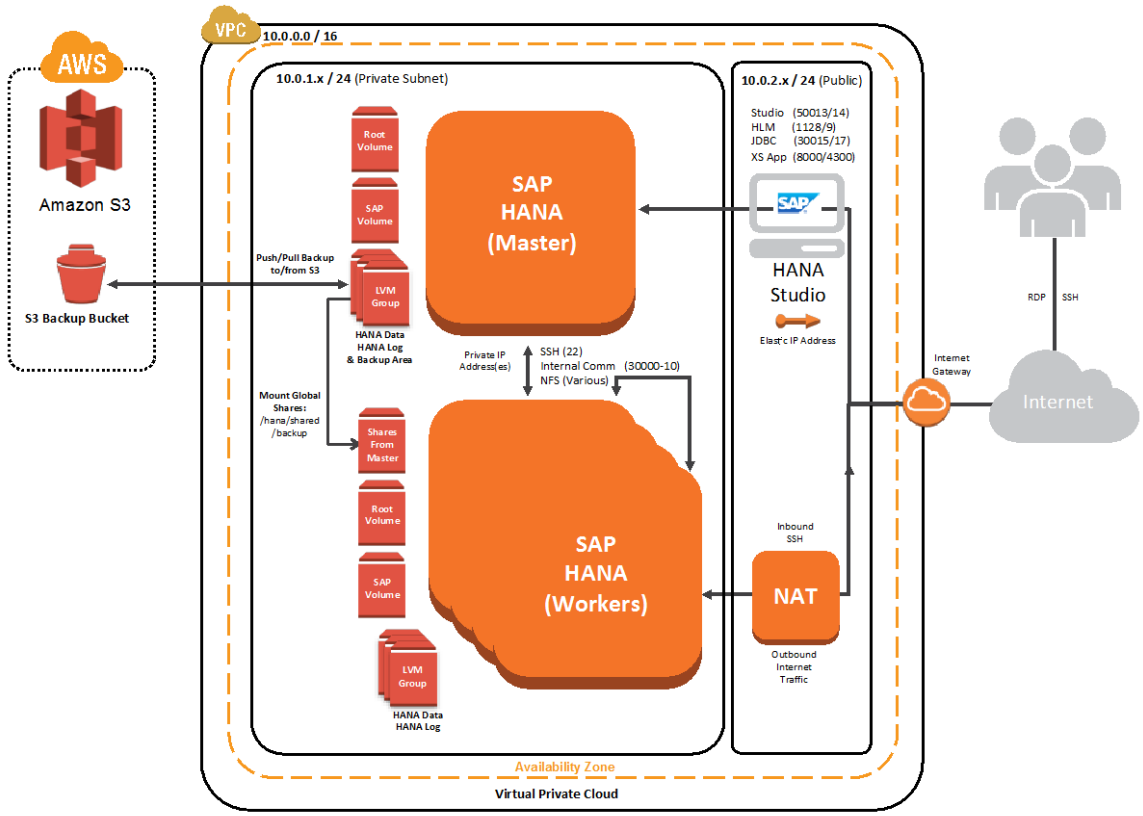

Figure 2: Multi-node Architecture

* HANA scale-out clusters that are larger than 5 nodes are currently in controlled availability. SAP will need to verify your BW sizing report result before you implement a HANA scale-out cluster that is larger than 5 nodes on AWS. Please contact SAP at HWC@sap.com and AWS at sap-on-aws@amazon.com before you implement HANA scale-out clusters of this size. Refer to SAP OSS Note 1964437 – SAP HANA on AWS: Supported AWS EC2 Products for details.

Storage Architecture

The storage configuration for this deployment is based on Amazon Elastic Block Store (Amazon EBS) General Purpose (SSD) volumes. General Purpose (SSD) volumes take advantage of the increasing cost-effectiveness of SSD storage to offer customers 10x more IOPS, 1/10th the latency, and more bandwidth and consistent performance than offerings based on magnetic storage. With a simple pricing structure, you only pay for the storage provisioned with no need to provision IOPS or to factor in the cost of I/O operations.

These volumes predictably burst up to 3,000 IOPS and reliably deliver three sustained IOPS for every GB of configured storage. The volumes are designed to deliver the configured level of IOPS performance with 99% consistency. For more information about the new General Purpose volumes, please refer to http://aws.amazon.com/blogs/aws/new-ssd-backed-elastic-block-storage/.

We support the following volume configurations in this reference. We recommend using r3.8xlarge (SAP supported) for production use and the other instance types for development and testing.

Instance Type	RAM (GiB)	General Purpose (SSD) Storage HANA Data, Log, and Shared Volumes	General Purpose (SSD) Storage HANA Backup Volumes[†]	Total SAP HANA Volume Size (GiB)
c3.8xlarge	60	3 x 400 GiB	2 x 250 GiB x number of nodes	1,700
r3.2xlarge	61	3 x 400 GiB	2 x 250 GiB x number of nodes	1,700
r3.4xlarge	122	3 x 400 GiB	2 x 250 GiB x number of nodes	1,700
r3.8xlarge	244	3 x 400 GiB	2 x 250 GiB x number of nodes	1,700

AWS Instance Type for SAP HANA

We support four instance types (c3.8xlarge, r3.2xlarge, r3.4xlarge, r3.8xlarge), which are customizable during deployment. For more information about different instance types and their use cases, see the Amazon EC2 Instances webpage. The r3.8xlarge instance type is officially supported by SAP for production use.

By default this reference deployment leverages the m3.xlarge instance type for the Windows Server where SAP HANA Studio is installed. However, you can customize this parameter during the deployment.

Memory Sizing for Deployment

Before you begin deployment, please consult the SAP documentation referenced below to determine memory sizing for your needs. This evaluation will inform your choice of Amazon EC2 instances during deployment.

- To obtain sizing information for a system that has not yet been implemented, use the SAP QuickSizer. The SAP QuickSizer provides information on both the SAP HANA in-memory database and the SAP NetWeaver application server where applicable.

[†] The HANA backup volume is provisioned only for the master node. In a scale-out scenario, all worker nodes will access backup volumes via NFS.

- To migrate an existing SAP NetWeaver BW system from any database platform to SAP HANA, SAP strongly recommends the new ABAP sizing report for SAP NetWeaver BW described in SAP note 1736976.

  Further sizing information is also available in the SAP HANA Administration Guide and in the following SAP HANA Notes:

SAP Note #	Description
1736976	Sizing Report for BW on SAP HANA
1637145	SAP BW on SAP HANA: Sizing SAP In-Memory Database
1702409	HANA DB: Optimal number of scale-out nodes for BW on SAP HANA
1855041	Sizing Recommendation for Master Node in BW-on-HANA
1793345	Sizing for SAP Business Suite on SAP HANA
1872170	Business Suite on SAP HANA memory sizing

Note
In addition to your SAP HANA license, you are responsible for all costs related to your use of any AWS services used while running this Quick Start Reference Deployment. The cost for launching the reference deployment for a single SAP HANA node ranges from approximately $1.84 to $4.23 per hour depending on which instance type you choose for the SAP HANA instance to fit your memory and compute requirements. Other factors that influence the cost are billing options (All Upfront, Partial Upfront, No Upfront, or On-Demand) and the region in which the AWS resources are launched.

AWS Instance for SAP HANA	vCPU	RAM (GiB)	Approximate Hourly Cost (RHEL)*	Approximate Hourly Cost (SLES)*
r3.2xlarge	8	61	$1.88	$1.84
r3.4xlarge	16	122	$2.66	$2.62
c3.8xlarge	32	60	$2.98	$2.94
r3.8xlarge	32	244	$4.23	$4.19

*The approximate cost is based on the On-Demand billing option for the US East (N. Virginia) region as of June 5, 2015. See the pricing pages of the AWS services you will be using for full details.

End-to-end Deployment (Option 1)

The following sections guide you through deployment of SAP HANA on AWS primarily through the use of AWS CloudFormation templates. This deployment includes building the Amazon VPC, subnets, and an SAP HANA Server. We also walk through any manual steps required for the deployment.

Step 1: Prepare an AWS Account to Deploy the SAP HANA Solution

This section describes preparation steps that may be necessary for this reference deployment. Prerequisites for deployment include creating a key pair for deployment and requesting Amazon EC2 or Amazon EBS limit increases if applicable.

Note
These limit increases are not needed for non-production deployment scenarios.

1. If needed, create an AWS account at http://aws.amazon.com and follow the on-screen instructions. Part of the sign-up process involves receiving a phone call and entering a PIN using the phone keypad.

2. Choose the Amazon EC2 region where you want to deploy SAP HANA on AWS.

   Amazon EC2 locations are composed of regions and Availability Zones. Regions are dispersed and located in separate geographic areas. As previously discussed, we are leveraging the R3 instance type for the SAP HANA portion of the deployment. R3 instances are currently available in all AWS regions except China (Beijing) and South America (São Paulo).

   Tip
   Consider choosing a region closest to your data center or corporate network to reduce network latency between systems running on AWS and systems and users on your corporate network.

3. Create a key pair in your preferred region.

   Amazon EC2 uses public-key cryptography to encrypt and decrypt login information. To be able to log into your instances, you must create a key pair. With Windows instances, we use the key pair to obtain the administrator password via the Amazon EC2 console and then log in using Remote Desktop Protocol (RDP) as explained in the step-by-step instructions in the *Amazon Elastic Compute Cloud User Guide*. On Linux, we use the key pair to authenticate SSH login.

4. If necessary request a limit increase for the Amazon EC2 r3.8xlarge instance type. The current default limit for the r3.8xlarge instance type is 5. If you already have an existing deployments leveraging this instance type and plan on exceeding this default with this reference deployment you will need to request an Amazon EC2 Instance service limit increase.

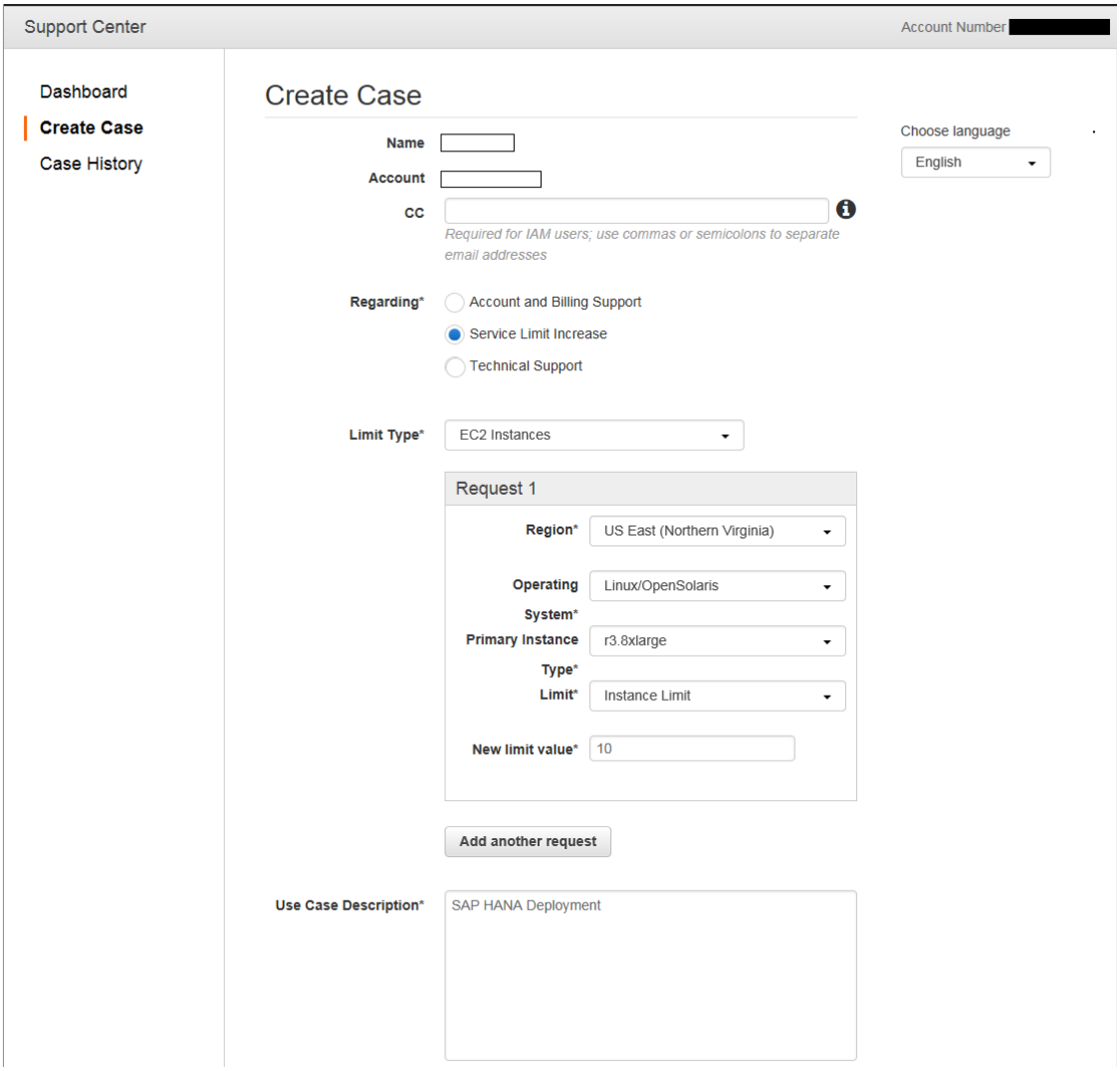

Figure 3: Sample Amazon EC2 Limit Increase Request

5. Verify access to the SAP HANA Platform Edition media by logging in to the SAP Software Download Center and navigating to the Installation site following the steps in the Download SAP HANA Media section of this document. You will download media in a later step.

   Tip
   If your SAP Support Portal account doesn't allow access to the software and you believe that you should already be entitled to the software, contact SAP's Global Support Customer Interaction Center through the web form available at http://support.sap.com/contactus .

Step 2: Launch the Virtual Network and Configure AWS Services for SAP HANA Deployment

In this step, you will launch an AWS CloudFormation template that configures the Virtual Network that provides the base AWS infrastructure for your deployment. The only mandatory input expected by the template is *KeyName*, which is the name of the key pair you created during step 1.

A successful launch of this template creates the necessary infrastructure needed to launch additional SAP HANA nodes. Specifically, an Amazon VPC is built taking security best practices into consideration, and a NAT instance is created

within the public subnet of your Amazon VPC to establish connectivity to all the SAP HANA nodes. An Amazon EC2 instance running Windows is also launched into the public subnet of your Amazon VPC where SAP HANA Studio is subsequently installed.

Launch the first template into your AWS account using AWS CloudFormation: Launch the Quick Start

As described previously, this template also creates an RDP Instance running Microsoft Windows Server and a NAT Instance to help provide secure internet access. An Amazon EBS volume is automatically mounted as D:\ in the RDP instance; you will download the SAP HANA media to this volume in a later step. AWS Tools and PowerShell scripts are also auto-downloaded to the RDP Instance to aid in the deployment process.

Template Customization

Template1 allows for customization of a number of parameters at template launch. You can modify those parameters or change the default values. The template parameters include the following default values:

Parameters	Default	Description
DMZCIDR	10.0.2.0/24	CIDR block for the public DMZ subnet located in the new Amazon VPC
KeyName	*user-provided*	Name of an existing Amazon EC2 key pair
NATInstanceType	t2.small	Amazon EC2 instance type for the NAT instances
PrivSubCIDR	10.0.1.0/24	CIDR block for the private subnet where SAP HANA will be deployed
RDPInstanceType	m3.xlarge	Amazon EC2 instance type for the Remote Desktop instance
RemoteAccessCIDR	0.0.0.0/0	IP CIDR from which you are likely to RDP into the instance
VPCCIDR	10.0.0.0/16	CIDR block for the Amazon VPC you are creating

Once the AWS CloudFormation status indicates “CREATE_COMPLETE” and the RDP Instance has been launched successfully as shown below, you can continue on to the next step, which is to download the SAP HANA media.

Figure 4: Template 1 Complete Example

Step 3: Download SAP HANA Media

In this step, you will download SAP HANA media from the SAP Software Download Center (SAP Support Portal access required) to an Amazon EBS Volume on the Windows Server provisioned in the previous step.

Connect to the RDP Instance

Get the password to the RDP Instance by clicking the Connect button and using the key pair file used during launch. Connect to the RDP Instance with the password decrypted and IP via Remote Desktop.

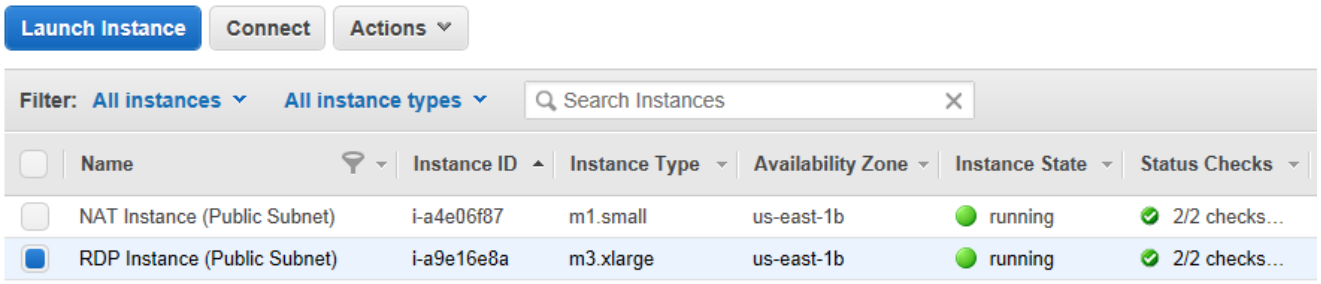

Figure 5: NAT and RDP Instance

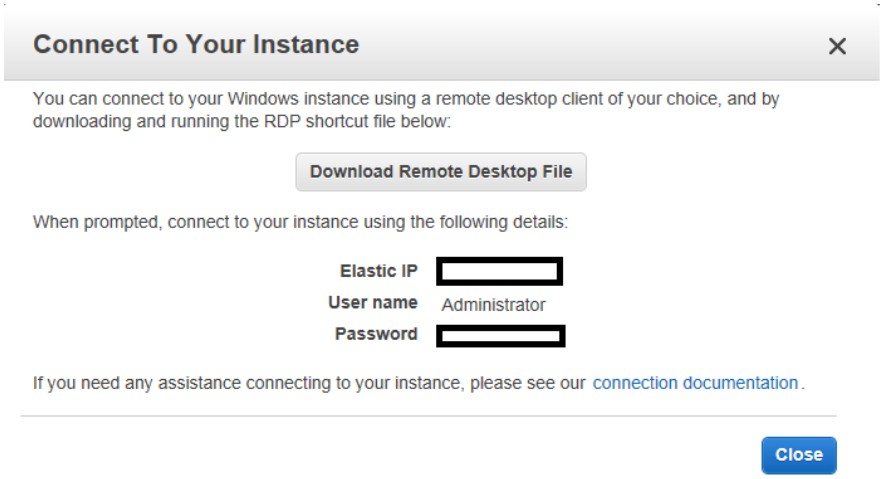

Figure 6: Connecting to the RDP Instance

Download SAP HANA Media

The RDP Instance includes a 16-GB Amazon EBS Volume mounted as D:\ as follows.

Figure 7: Windows Server Volume Layout

Download the SAP HANA Platform Edition media to D:\ from the SAP Software Download Center:

- Go to http://support.sap.com/swdc and log in.
- Select Installation and Upgrades in the left navigation pane, and then select A – Z index.
- In the **Installations and Upgrades** window, select **H**, and then select **SAP HANA Platform Edition** from the list.
- Click **SAP HANA Platform Edit. 1.0**, and then click **Installation**.
- In the Downloads windows, find the revision you wish to download and download each file directly to the D:\ drive. Note that this reference deployment currently supports deployment of SAP HANA SP 7–11.
- The first file of the set is packaged to extract the contents of all the files pertaining to the revision you have downloaded. Double-click the first file to start the extraction process and make sure that the contents are extracted into drive D:\.

Step 4: Launch and Configure the SAP HANA Servers

Important
With this reference deployment, you have an option to choose between SUSE Linux Enterprise Server (SLES) and Red Hat Enterprise Linux (RHEL) as the operating system for SAP HANA. If you decide to use RHEL, you must first subscribe to the Red Hat Enterprise Linux for SAP HANA AMI in the AWS Marketplace. Follow the instructions in Appendix B to complete the subscription before proceeding with the instructions in this section. If you decide to choose SLES as the operating system for SAP HANA, no subscriptions are required.

We are now ready for deployment. The RDP Instance that you launched in Step 3 includes AWS tools and PowerShell scripts necessary for SAP HANA deployment.

Open a PowerShell Terminal and navigate to C:\Users\Administrator\SAP and notice that the following PowerShell scripts have been auto-downloaded:

```
PS C:\Users\Administrator> cd sap
PS C:\Users\Administrator\sap> dir


    Directory: C:\Users\Administrator\sap


Mode                LastWriteTime     Length Name
----                -------------     ------ ----
d----         4/10/2014   4:48 PM            Generic
-a---         4/10/2014   4:48 PM       1468 CustomParameters.ps1
-a---         4/10/2014   4:48 PM       5558 SAP_AWS_Helper.ps1
-a---         4/10/2014   4:48 PM       6179 SAP_HANA_Deploy.ps1


PS C:\Users\Administrator\sap> _
```

Figure 8: PowerShell Scripts

The deployment is initiated by the SAP_HANA_Deploy.ps1 PowerShell script. Most input parameters are automatically inherited from the CustomParameters.ps1 file, which is generated during the deployment of Template 1.

The following inputs are required during deployment:

- Specify the number of SAP HANA nodes based on your memory requirements. See the sizing section earlier in this document for more information.
- Select the instance type for the SAP HANA nodes. The r3.8xlarge instances are supported by SAP for production use.
- Specify the operating system for the SAP HANA node. You can choose SUSE Linux Enterprise Server or Red Hat Enterprise Linux for SAP HANA.
- Enter the System ID for your SAP HANA DB.
- Enter a Master password. This password is read as a secure input and is used to set the passwords during installation for the SAP HANA System DB, <sid>adm, and sapadm user accounts. Ensure that the password has a minimum of 8 characters and includes uppercase, lowercase, and numeric values.

During the deployment process, the script automatically takes an Amazon EBS snapshot of the SAP HANA Media in the D:\ drive for subsequent installation of SAP HANA master or worker nodes. SAP HANA Studio is also installed for you directly on Windows Server for later use.

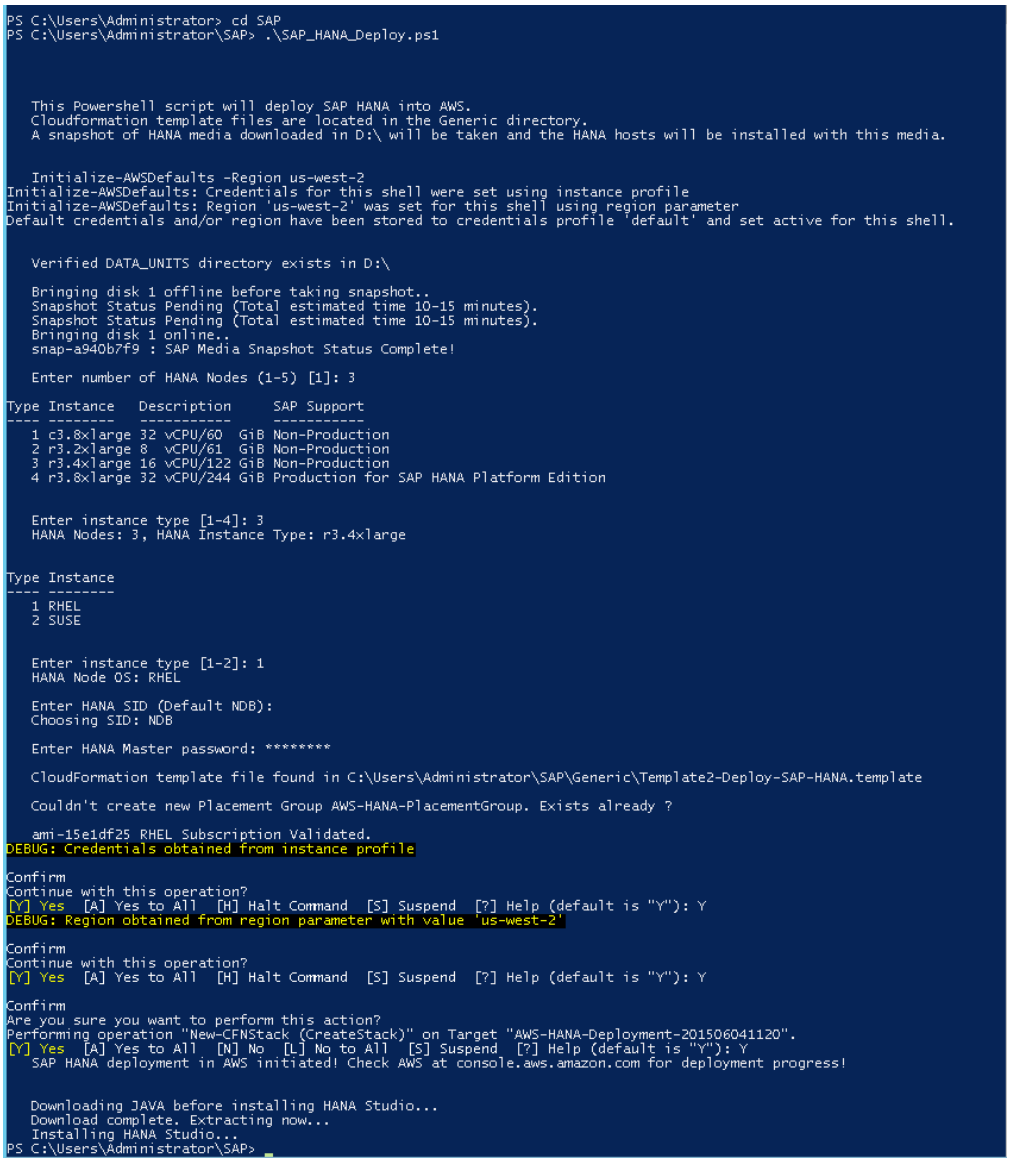

Figure 9: Sample Deployment

Track Deployment Progress

The deployment process uses AWS CloudFormation scripts to provision Amazon EC2 instances and to install SAP HANA from the snapshot taken of the volume where you downloaded and extracted the SAP HANA software. The SAP HANA installation scripts are automatically downloaded from an Amazon S3 bucket during the launch of master and worker nodes. The prerequisite operating system packages required by SAP HANA are also automatically downloaded and installed per SAP requirements on each master or worker node.

A typical single-node SAP HANA deployment takes about 25 minutes, and multimode deployment takes from 35 minutes to one hour. In a multi-node scenario, the master node is deployed first and then worker nodes are deployed concurrently.

You can track the deployment process is in the AWS CloudFormation console window. The following image shows a successful deployment as CREATE_COMPLETE.

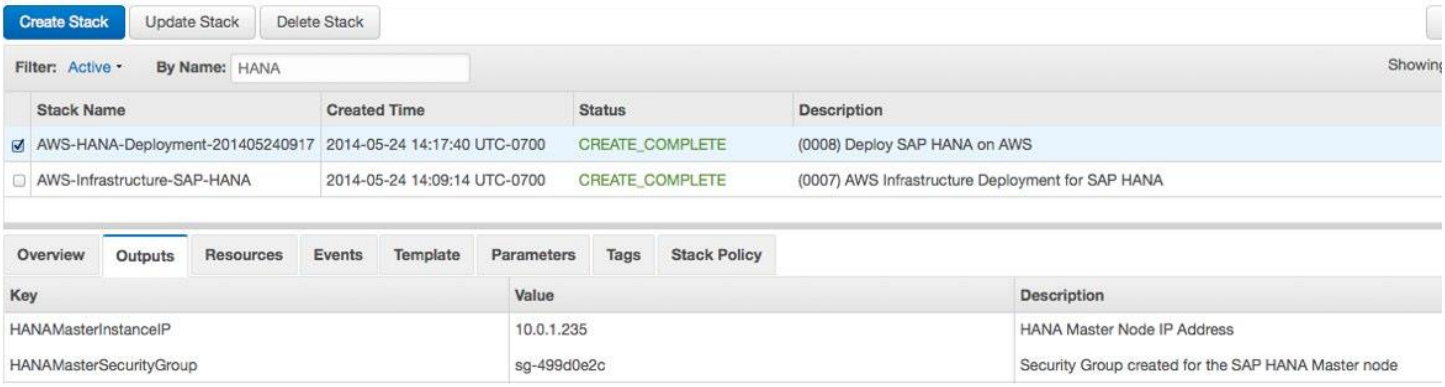

Figure 10: SAP HANA Deployment: Create Complete

During the deployment process, an Amazon DynamoDB table is created to track the status of deployment. You can also view the status of your deployment by looking at the content of the Amazon DynamoDB table from the AWS Management Console.

Additional Customizations

Here are a few additional tips, based on feedback we've received from customers:

- This Quick Start supports a maximum capacity of 244 GiB per instance. If you need additional capacity, you can split the load across multiple instances.
- If you want to use encrypted EBS volumes, you can modify the template to do that. Add a `BlockDeviceMappings` section to the template. In the `Ebs` property, set `Encrypted` to `true`. For more information, see the AWS documentation.
- If you want to change the hostname of the SAP HANA instance, you must use the option to deploy SAP HANA into an existing Amazon VPC, discussed later in this document.

Accessing SAP HANA Nodes

The default network security setup for this solution follows AWS security best practices. The provisioning logic creates the solution architecture described in the Overview of SAP HANA on AWS section, with the SAP HANA instances in a private subnet to restrict direct exposure to the Internet. As such, the SAP HANA instances can only be accessed through instances placed in the public subnet or DMZ layer.

Through this DMZ layer, two methods of access are available:

- **SAP HANA Studio Access**: Using a remote desktop client, connect to the Windows instance where SAP HANA Studio has been preloaded.
- **OS Level Access:** SSH to the NAT instance and then to the SAP HANA instance(s) using an SSH client of your choice.

Tip
To connect directly to the SAP HANA systems from a corporate network, you can provision an encrypted IPSec hardware VPN connection between your corporate data center and your Amazon VPC. For more details, see the Amazon Virtual Private Cloud page.

You can also set up AWS Direct Connect between your data center and AWS to gain direct access to your AWS resources. See the Amazon Direct Connect web pages for details.

Establish a Connection to the RDP Instance

Before you access SAP HANA Studio, establish a Connection to the RDP Instance.

1. Open the Amazon EC2 console at https://console.aws.amazon.com/ec2/.

2. From the console dashboard, click **Running Instances**.

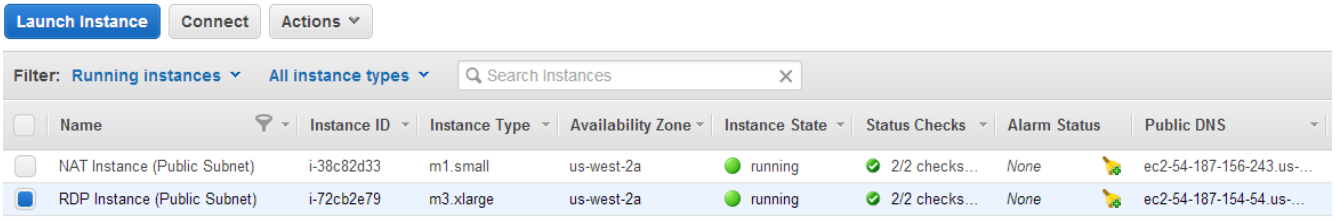

Figure 11: Amazon EC2 Running Instances with RDP Instance Selected

3. Get the Windows administrator password from the Amazon EC2 console:
   a. Select your RDP instance and click **Connect**.
   b. In the **Connect To Your Instance** dialog box, click **Get Password**.
   c. Either paste the contents of your private key in the space provided or click **Browse** and navigate to your private key file, select the file, and click **Open** to copy the entire contents of the file into contents box.

   The password will be decrypted and displayed.

4. In the **Connect To Your Instance** dialog box, click **Download Remote Desktop File** or connect via an RDP client of your choice.

5. Start SAP HANA Studio and add a system with the following parameters:

- IP address master node
- Instance Number: 00
- User: SYSTEM
- Password: *<enter password>* (This will be the same as the Master password you entered during Step 4)

Note
We recommend that you make a backup of your newly installed SAP HANA instance using SAP HANA Studio at this point. You can also use the Amazon EC2 console to make a complete system image (Amazon Machine Image) that can be used for recovery or for addition system builds. Keep in mind that this image is only a point-in-time snapshot.

Establish a Connection to SAP Nodes

You can also connect to the NAT instance to establish a remote SSH connection to any of the SAP HANA master or worker nodes.

1. On the Amazon EC2 console, click **Running Instances**.
2. Select your NAT instance and note the public Elastic IP address displayed below your running instances.

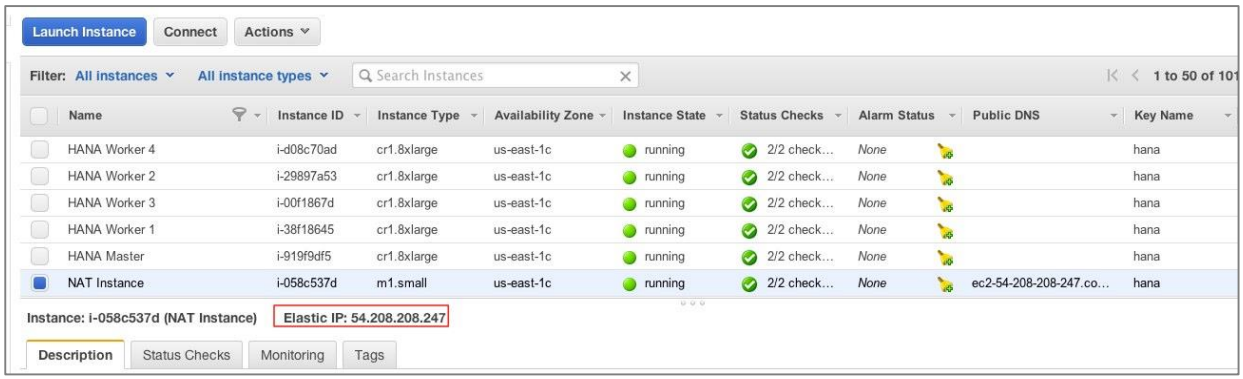

Figure 12: NAT – Elastic IP Address

3. Using an SSH client of your choice (for example, Putty or ITerm), SSH into the NAT instance and use the key pair specified during the deployment process.

Note
If your connection times out, you may need to adjust the security group rules for the NAT instance to allow access from your computer's IP address or proxy server. For more information, see Security Group Rules in the *Amazon Elastic Compute Cloud User Guide*.

ITerm Example:

a. Add private key to authentication agent (`ssh-add`)
b. SSH to the NAT instance with `-A` option to forward the key, specifying the username ec2-user.
c. SSH to the SAP HANA server by IP address. Specify either root as the destination user for SUSE.

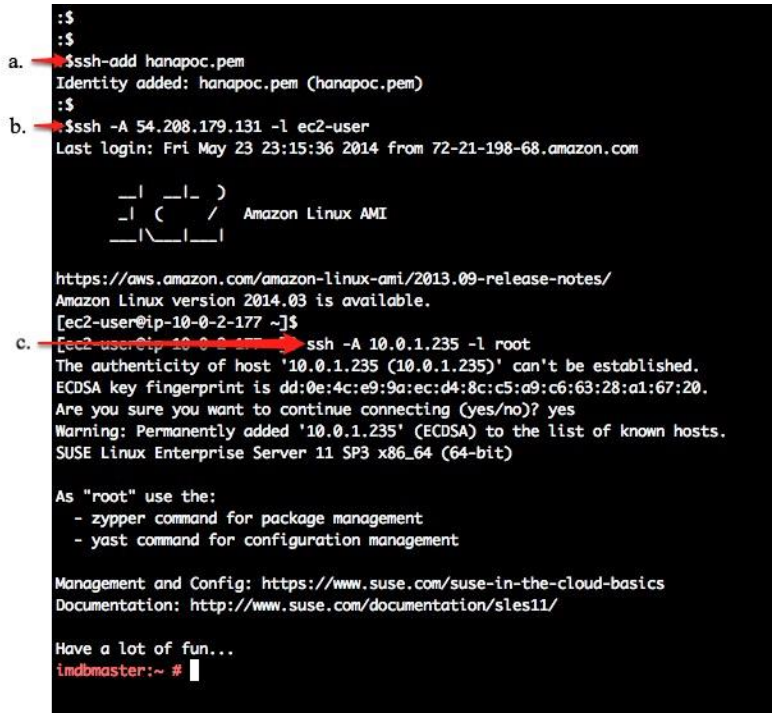

Figure 13: SSH – ITERM Example

Putty Example:

a. Download PuTTY (`putty.exe`), PuTTY Key Generator (`puttygen.exe`), and Pageant (`pageant.exe`).
b. Load your private key into PuTTY Key Generator and save as a `.ppk` file that PuTTY can use.
c. Execute `Pageant.exe`, and add your new `.ppk` key. The Pageant process must be running in order for agent forwarding to work.
d. Configure PuTTY with the private key and select **Allow agent forwarding**.

Figure 14: SSH – Putty Example

e. Save the configuration.
f. Open up the connection to SSH to the NAT instance.
g. Subsequently SSH to the SAP HANA server.

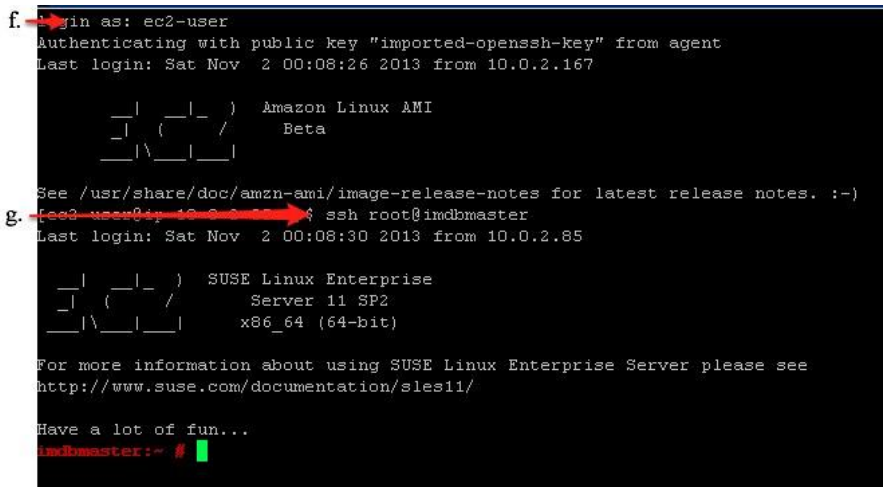

Figure 15: SSH – Putty Example Continued

Deploy SAP HANA into an Existing Amazon VPC (Option 2)

This section guides you through deployment of SAP HANA into an existing Amazon VPC using AWS CloudFormation templates.

Step 1: Download SAP HANA Media

In this step, you will download SAP HANA media from the SAP Software Download Center (SAP Support Portal access required) to an Amazon EBS Volume and create a snapshot of the volume.

Create a New Amazon EBS Volume to Store SAP HANA Media

To attach a new volume to store SAP HANA media, follow the instructions on these pages of the *Amazon EC2 User Guide for Microsoft Windows*:

- Creating a New Amazon EBS Volume
- Attaching an Amazon EBS Volume to an Instance
- Making an Amazon EBS Volume Available for Use

Download and Extract SAP HANA Media

Download the SAP HANA Platform Edition media from the SAP Software Download Center to the drive to which the EBS volume has been mapped:

- Go to http://support.sap.com/swdc and log in.
- Select Installation and Upgrades in the left navigation pane, and then select A – Z index.
- In the **Installations and Upgrades** window, select **H**, and then select **SAP HANA Platform Edition** from the list.
- Click **SAP HANA Platform Edit. 1.0**, and then click **Installation**.
- In the Downloads windows, find the revision you wish to download and download each file directly to the drive to which the EBS volume has been mapped. Note that this reference deployment currently supports deployment of SAP HANA Platform Edition 1.0 SP 7–11.
- The first file of the set is packaged to extract the contents of all the files pertaining to the revision you have downloaded. Double-click the first file to start the extraction process and make sure that the contents are extracted into the drive to which the EBS volume has been mapped.

Prepare a Media Volume Snapshot

To create a snapshot of the volume containing extracted media, follow these steps. The snapshot will be used to create a media volume, which will be mounted on the Linux SAP HANA instance under the **/media** folder to install the SAP HANA software.

1. Detach the volume from the instance to ensure that there is no I/O activity during the snapshot. Follow the steps in the Amazon EC2 User Guide to detach a volume from an instance. Alternatively, you can take the disk offline from Windows before you take the snapshot.

2. In the Amazon EC2 console, navigate to **Elastic Block Store** > **Volumes** and select the volume containing SAP HANA media.

3. From the **Actions** drop down menu select **Create Snapshot**. Provide a Name and Description for the snapshot and click **Create**. Snapshot creation may take from 15 to 30 minutes.

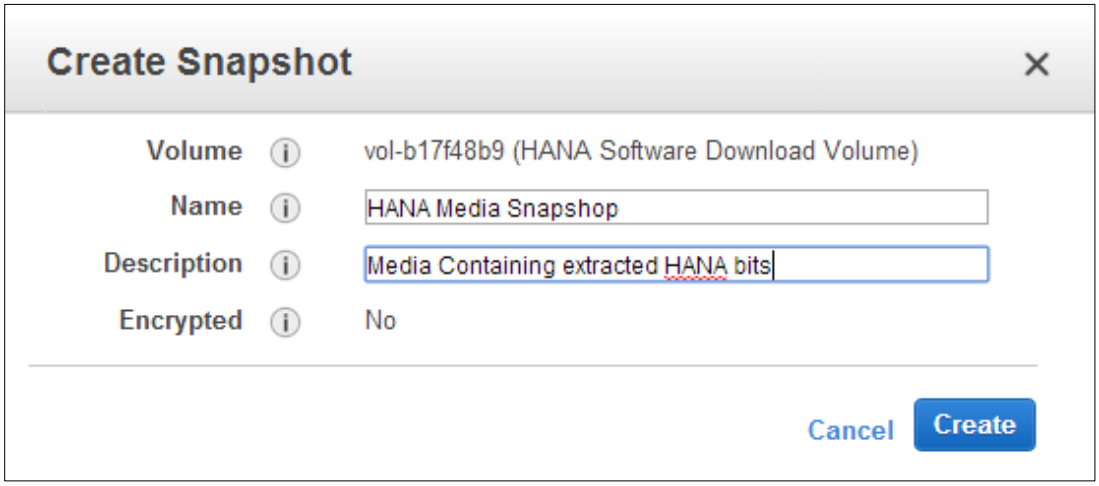

Figure 16: Creating an Amazon EBS Snapshot

After the snapshot is created, navigate to Elastic Block Store > Snapshots and make a note of the Snapshot ID, which will be required input when you launch the AWS CloudFormation template.

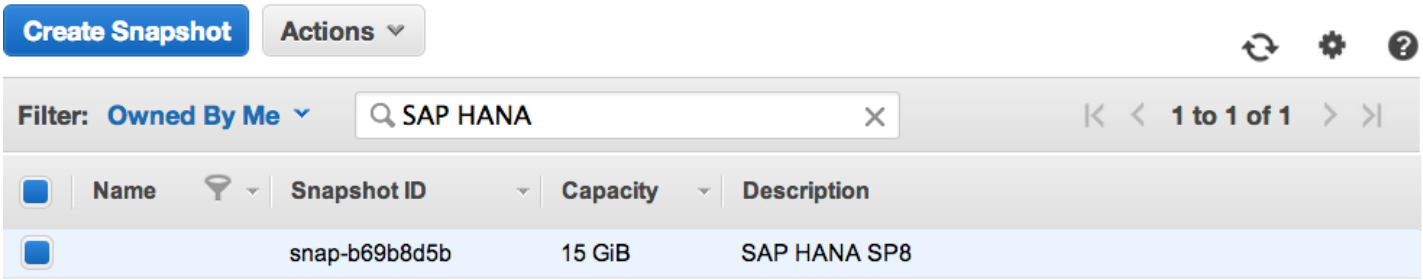

Figure 17: Amazon EBS Snapshot ID

You will also need the Amazon VPC ID and Subnet ID to launch the AWS CloudFormation template. To locate the VPC ID, open the Amazon VPC console at https://console.aws.amazon.com/vpc/and click **Your VPCs**. Make a note of the VPC ID where you want to deploy your SAP HANA instance(s).

Figure 18: Amazon VPC ID

Next, click **Subnets** and make a note of the Subnet ID where you want to create your Amazon EC2 resources.

Figure 19: Subnet ID

Step 2: Deploy SAP HANA Nodes

Important
With this reference deployment, you have an option to choose between SUSE Linux Enterprise Server (SLES) and Red Hat Enterprise Linux (RHEL) as the operating system for SAP HANA. If you decide to use RHEL, you must first subscribe to the Red Hat Enterprise Linux for for SAP HANA AMI in the AWS Marketplace. Follow the instructions in Appendix B to complete the subscription before proceeding with this steps in this section. If you decide to choose SLES as the operating system for SAP HANA, no subscriptions are required.

Deploy SAP HANA Nodes with AWS CloudFormation

This automated AWS CloudFormation template deploys SAP HANA nodes into an Amazon VPC. Please make sure that you have created your media snapshot as explained in the previous section before launching the stack.

To launch the AWS CloudFormation template in the US-West (Oregon) region, launch the Quick Start.

This stack takes approximately one hour to create.

Note
You are responsible for the cost of AWS services used while running this Quick Start Reference Deployment. The cost for running the template with default settings is between $1.78 and $4.35 an hour, depending on the instance size you select. See the pricing pages of the AWS services you will be using for full details.

You can also download the template directly from https://s3.amazonaws.com/quickstart-reference/sap/hana/latest/templates/Template2-Deploy-SAP-HANA.template.

Enter Parameters for the Amazon VPC and SAP HANA Snapshot

You will need to input the following parameters manually for deployment.

Parameter	Default	Description
DMZCIDR	10.0.2.0/24	CIDR block for the public DMZ subnet located in the new Amazon VPC
DomainName	local	Domain name to be used for fully qualified domain names
HANAMasterHostname	imdbmaster	Hostname to be used for SAP HANA Master Nodes (DNS Shortname)
HANAMasterPass	*user-provided*	SAP HANA master password. Must be at least 8 characters containing upper case, lower case, and numeric values.
HANASubnet	subnet-xxxxxxxx	Subnet-ID of the existing subnet in your Amazon VPC where you want to deploy SAP HANA
HostCount	1	Number of SAP HANA hosts in the cluster
KeyName	*user-provided*	Name of an existing Amazon EC2 key pair. All instances will launch with this key pair.
MyInstanceType	r3.8xlarge	Instance type of SAP HANA host (r3.8xlarge/r3.4xlarge/r3.2xlarge/c3.8xlarge)
MyOS	*user-provided*	Operating system of the SAP HANA host (SUSE or RHEL)
MyRegionAMI	ami-xxxxxxxx	Region-specific AMI containing the operating system image for master/worker nodes (currently, SUSE 11.3 or RHEL 6.6 for SAP HANA). See Appendix C to find the right AMI for SLES and RHEL.
PlacementGroupName	*user-provided*	Name of existing Placement Group where SAP HANA should be deployed
PrivSubCIDR	10.0.1.0/24	(Optional) CIDR block for private subnet where SAP HANA should be deployed
SAPInstanceNum	00	SAP HANA instance number. This instance number will also impact the open ports for the SAP HANA security group. The instance number value must be two digits; the first number must be between 0 and 9, the second digit must be between 0 and 7.
SID	NDB	SAP HANA SID
SpanShotID	snap-xxxxxxxx	SnapShot-ID for your SAP HANA installation media volume (requires DATA_UNITS Directory)
VPCID	vpc-xxxxxxxx	VPC-ID of the existing Amazon VPC where you want to deploy SAP HANA

You can create optional placement groups to participate in a low-latency, 10 Gbps network. For information about creating placement groups, see Placement Groups in the AWS documentation. The deployment typically takes between 30 and 45 minutes.

Troubleshooting

If you run into a problem running this Quick Start reference deployment, first make sure that the version of the SAP HANA Platform Edition you've downloaded is supported by this Quick Start, and that you don't have multiple versions of SAP HANA staged on your system. **This Quick Start currently supports SAP HANA SP 7–11.**

Most deployment issues stem from problems downloading and extracting the SAP HANA media, or from problems creating the snapshot. If you run into problems during deployment, check the **/media** folder on the Linux SAP HANA instance. If the **/media** folder doesn't exist or doesn't contain any files, the problem might be caused by one of the following:

- Internet traffic isn't flowing through the Internet gateway and NAT instance, or the SAP HANA instance was launched in the public subnet but no public IP was assigned. If there's an issue with Internet access, the installation of the ntfs-3g package might fail. This package is required to access the NTFS volume on the Linux SAP HANA instance.
  To resolve: Choose a subnet that has Internet access over the Internet gateway and NAT instance, and then relaunch the Quick Start.

- Media files weren't extracted at all, or were extracted improperly.
  To resolve: Repeat the process for downloading and extracting the SAP HANA media (see step 3 for end-to-end deployment, or step 1 when deploying into an existing Amazon VPC). After the extraction is complete, check the contents of the **/media** folder to make sure it contains files.

- The media volume snapshot is not usable.
  To resolve: Follow the instructions to take a new snapshot, making sure that the drive is detached first, and then relaunch the Quick Start.

The following diagram illustrates where issues might arise, and steps you can take to fix them.

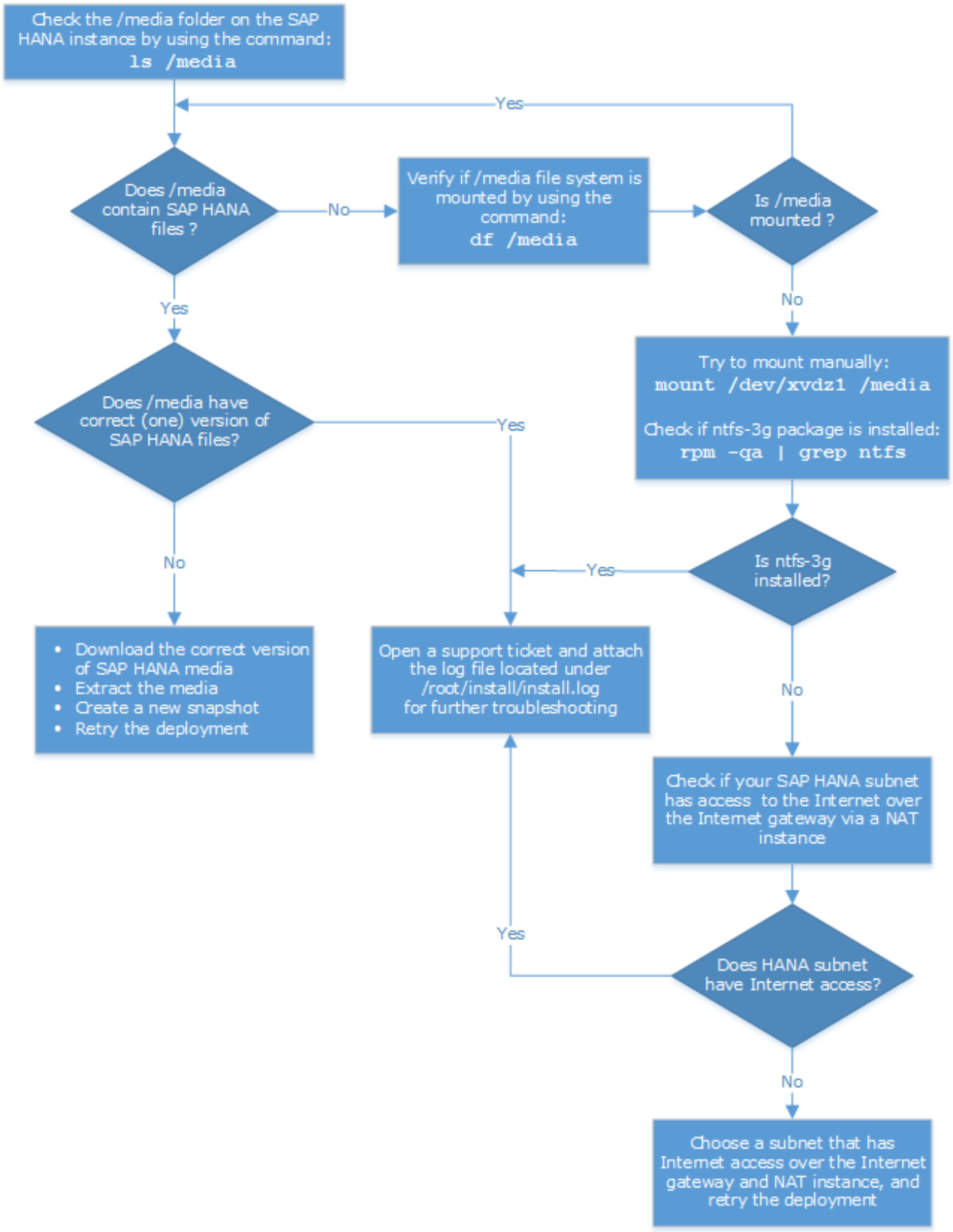

Figure 20: Troubleshooting the SAP HANA Deployment

If you encounter a CREATE_FAILED error, 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.

> **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.

The following table provides a list of specific CREATE_FAILED error messages you might encounter.

CREATE_FAILED error message	Possible cause	What to do
API: ec2: RunInstances Not authorized for images: *ami-ID*	The template is referencing an AMI that has expired	We refresh AMIs on a regular basis, but our schedule isn't always synchronized with AWS AMI updates. If you get this error message, notify us, and we'll update the template with the new AMI ID. If you'd like to fix the template yourself, you can download it and update the `Mappings` section with the latest AMI ID for your region.
We currently do not have sufficient m1.small capacity in the AZ you requested	NAT or RDP instance requires larger instance type	Switch to an instance type that supports higher capacity, or complete the request form in the AWS Support Center to increase the Amazon EC2 limit for the instance type or region. Limit increases are tied to the region they were requested for.
Instance *ID* did not stabilize	You have exceeded your IOPS for the region	Request a limit increase by completing the request form in the AWS Support Center.
WaitCondition timed out. Received 0 conditions when expecting 1	Internet access or SAP HANA installation issues	Check the **/media** folder. If the folder doesn't exist or doesn't contain any files, follow the troubleshooting process illustrated in Figure 20. You might also get this timeout error if you have an existing DynamoDB table from a previous Quick Start deployment. In this case, the table might contain duplicate entries with the same hostname but different IP addresses, and the deployment script might fail to read it properly. Delete the table and retry the deployment.
WaitCondition received failed message: 'The HANA installation did not succeed. Please check installation media.' for uniqueId: HANAMaster…"	SAP HANA installation issues	Check the **/media** folder. If the folder doesn't exist or doesn't contain any files, follow the troubleshooting process illustrated in Figure 20.
System Administrator password must contain at least 8 characters	The SAP HANA master password contains $ or	Change the SAP HANA master password (**HANAMasterPass** parameter in the second template), and then relaunch the Quick Start.

CREATE_FAILED error message	Possible cause	What to do
	other special characters	The password must be at least 8 characters, consisting of uppercase and lowercase letters and numbers. Avoid using special characters such as @ or $.

For additional information, see Troubleshooting AWS CloudFormation on the AWS website. If the problem you encounter isn't covered on that page or in the table, please visit the AWS Support Center. If you're filing a support ticket, please attach the install.log file from the SAP HANA master instance (this is the log file that is located in the /root/install folder) to the ticket.

Security

The AWS cloud provides a scalable, highly reliable platform that helps enable customers to deploy applications and data quickly and securely.

When you build systems on the AWS infrastructure, security responsibilities are shared between you and AWS. This shared model can reduce your operational burden as AWS operates, manages, and controls the components from the host operating system and virtualization layer down to the physical security of the facilities in which the services operate. In turn, you assume responsibility and management of the guest operating system (including updates and security patches), other associated application software such as SAP HANA, as well as the configuration of the AWS-provided security group firewall. For more information about security on AWS, visit the AWS Security Center.

Network Security

The default network security setup of this solution follows security best practices of AWS. The provisioned SAP HANA instances can only be accessed in three ways:

- By connecting to either the SAP HANA Studio Windows instance using Remote Desktop Client or the NAT Linux instance using SSH.
- From the CIDR block specified as `RemoteAccessCIDR` during the provisioning process.
- Alternatively, access can be restricted to a known CIDR block if there exists a provisioned VPN tunnel between your own data center and AWS.

Identity and Access Management (IAM)

This solution leverages an IAM role with least privileged access. It is not necessary or recommended to store SSH keys or secret keys or access keys on the provisioned instances.

OS Security

The root user on Linux or the administrator on the Windows RDP instance can only be accessed using the SSH key specified during the deployment process. Amazon Web Services does not 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.

Security Groups

A security group acts as a firewall that controls the traffic for one or more instances. When you launch an instance, you associate one or more security groups with the instance. You add rules to each security group that allow traffic to or

from its associated instances. You can modify the rules for a security group at any time. The new rules are automatically applied to all instances that are associated with the security group.

The security groups created and assigned to the individual instances as part of this solution are restricted as much as possible while allowing access to the various functions of SAP HANA. See Appendix A for a complete list of ports and protocols configured as part of this solution.

Additional Information

This guide is meant primarily for the deployment of the SAP HANA Solution on AWS. Additional administration and operations topics can be found in the SAP HANA On AWS Implementation and Operations Guide. More general documentation for operating SAP solutions on AWS can be found at http://aws.amazon.com/sap/whitepapers.

Appendix A: Security Group Specifics

The following are the configured inbound and outbound protocols and ports allowed for the various instances deployed as part of this solution:

RDP Security Group			
Inbound			
Source	**Protocol**	**Port Range (Service)**	**Comments**
Restricted to CIDR block specified during deployment	TCP	3389 (RDP)	Allow inbound RDP access to Windows instance from your network (over the Internet gateway)
Outbound			
Destination	**Protocol**	**Port Range**	**Comments**
0.0.0.0/0	TCP	1 - 65535	Allow outbound access from RDP server to anywhere

NAT Security Group			
Inbound			
Source	**Protocol**	**Port Range (Service)**	**Comments**
Restricted to CIDR block specified during deployment	TCP	22 (SSH)	Allow inbound SSH access to Linux instance from your network (over the internet gateway)
10.0.0.0/16	TCP	80 (HTTP)	Allow inbound HTTP access only from instances deployed in the VPC
10.0.0.0/16	TCP	443 (HTTPS)	Allow inbound HTTPS access from only instances deployed in the VPC
Outbound			
Destination	**Protocol**	**Port Range**	**Comments**
10.0.1.0/24	TCP	22 (SSH)	Allow SSH access from NAT instance to 10.0.1.0 subnet
0.0.0.0/0	TCP	80 (HTTP)	Allow outbound HTTP access from instances deployed in the VPC to anywhere.
0.0.0.0/0	TCP	443 (HTTPS)	Allow outbound HTTPS access from instances deployed in the VPC to anywhere.

SAP HANA Master & Worker Security Groups**			
Inbound *(## corresponds to the SAP Instance Number)*			
Source	**Protocol**	**Port Range (Service)**	**Comments**
10.0.1.0/24	TCP	1 - 65535	Communication between instances within private subnet
10.0.1.0/24	TCP/UDP	111,2049, 4000-4002	Ports used for NFS communication
10.0.1.0/24	TCP	3##00 – 3##10	Database Internal Communication & SAP Support Access
**10.0.1.0/24	TCP	22 (SSH)	Allow SSH access from other SAP HANA nodes
10.0.2.0/24	TCP	22 (SSH)	Allow SSH access from NAT instance
10.0.2.0/24	TCP	1128 - 1129	Host Agent Access
10.0.2.0/24	TCP	43##	Access to XSEngine (HTTPS) from 10.0.2.0 subnet
10.0.2.0/24	TCP	80##	Access to XSEngine (HTTP) from 10.0.2.0 subnet
10.0.2.0/24	TCP	8080 (HTTP*)	Software Update Manager (SUM) access (HTTP)
10.0.2.0/24	TCP	8443 (HTTPS*)	Software Update Manager (SUM) access (HTTPS)
10.0.2.0/24	TCP	3##15	DB Client Access
10.0.2.0/24	TCP	3##17	DB Client Access
10.0.2.0/24	TCP	5##13 – 5##14	Allow access for HANA Studio from RDP instance
Outbound			
0.0.0.0/0	TCP	1 - 65535	Outbound access from SAP HANA Master allowed to anywhere

Appendix B: Subscribing to Red Hat Enterprise Linux for SAP HANA

1. Log in to the AWS Marketplace at http://aws.amazon.com/marketplace.

2. Type **RHEL for SAP HANA** in the search box, and choose **Red Hat Enterprise Linux for SAP HANA** from the results.

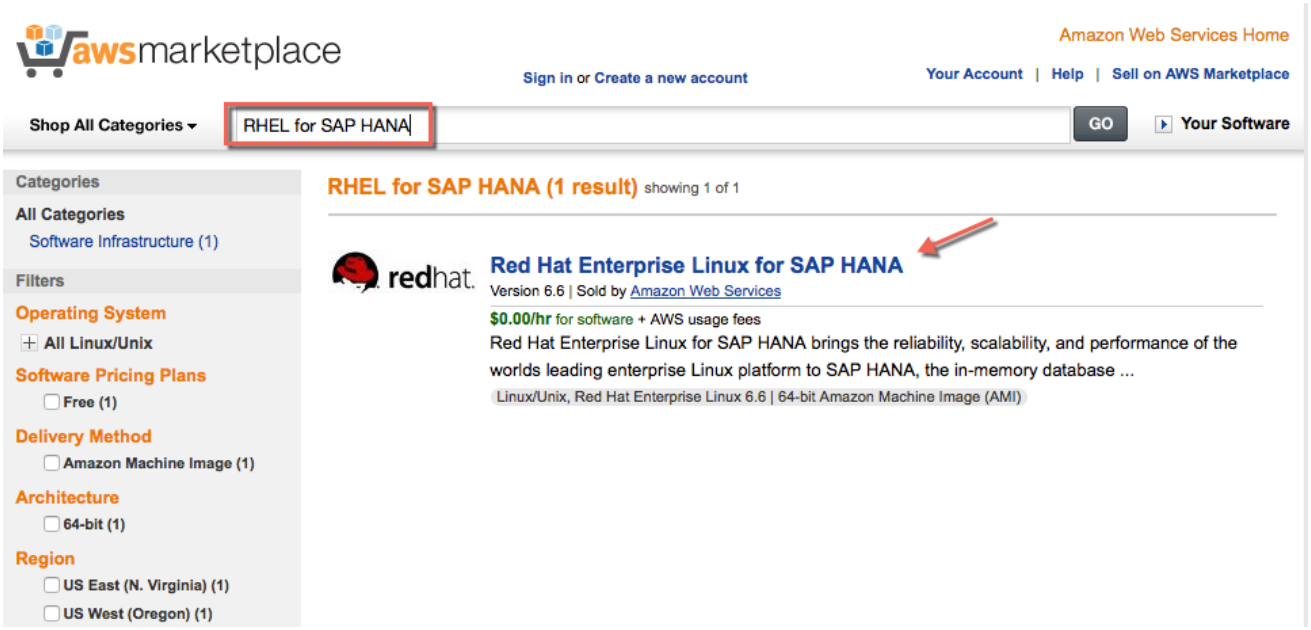

Figure 21: RHEL for SAP HANA in the AWS Marketplace

3. From the **Red Hat Enterprise Linux for SAP HANA** page, choose **Continue**.

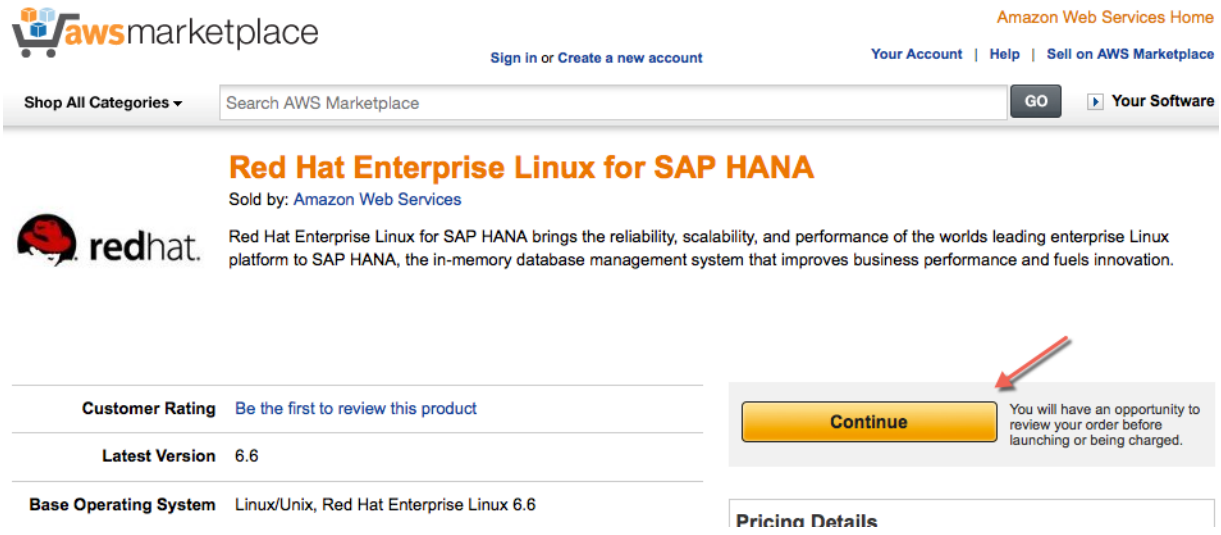

Figure 22: Choosing RHEL for SAP HANA

4. Choose the **Manual Launch** tab. Read the terms and conditions of software usage, and then choose **Accept Terms**.

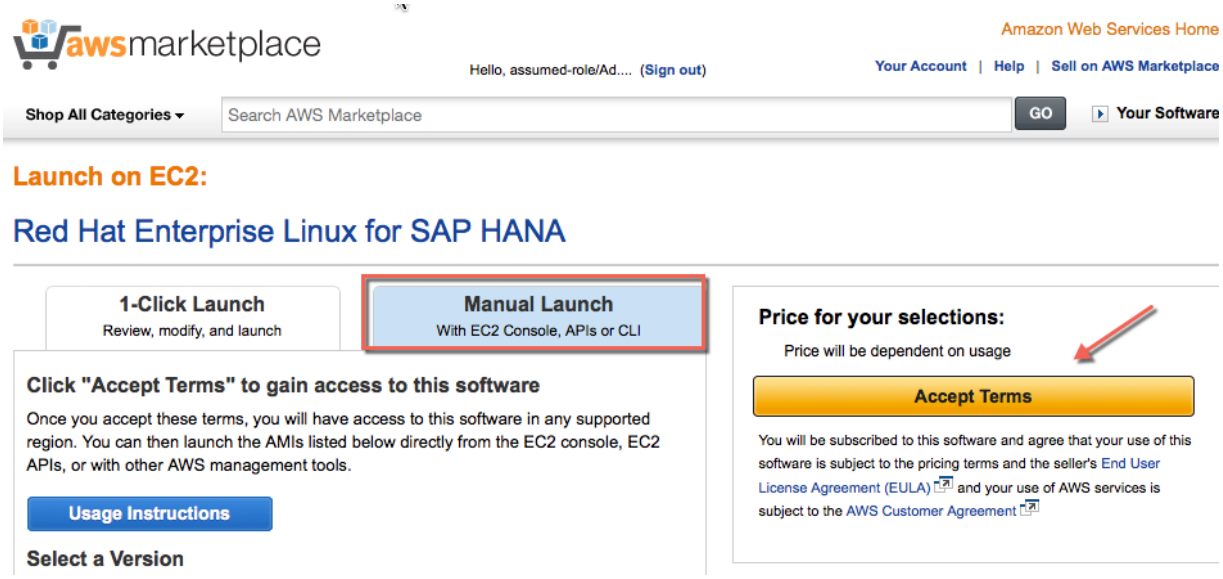

Figure 23: Reviewing the Terms of the License Agreement

You will get a confirmation page confirming your subscription, and an email confirmation will be sent to the account owner.

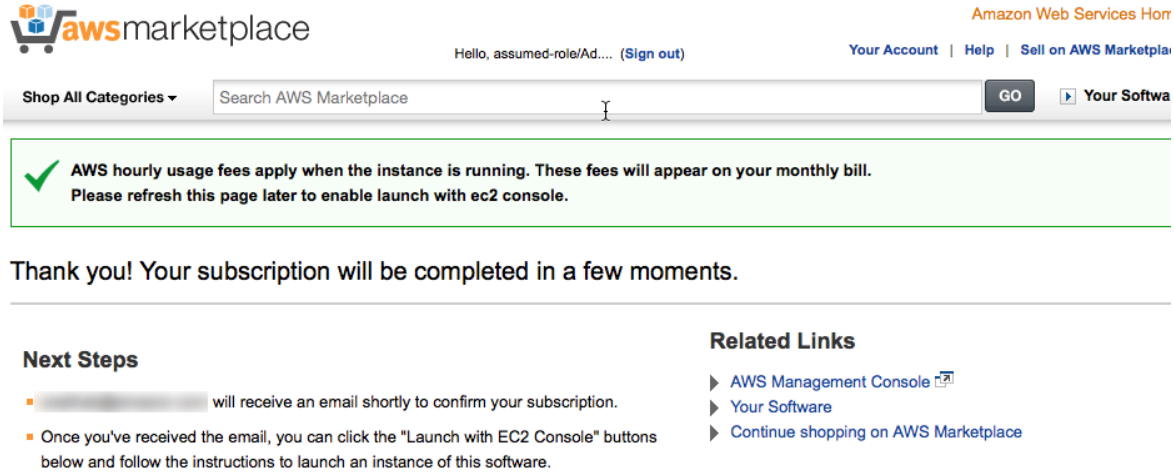

Figure 24: Completing the Subscription Request

5. When you receive the confirmation email for your subscription, proceed with the SAP HANA reference deployment.

Appendix C: Finding the Right SLES or RHEL AMI for SAP HANA

Procedure for SLES

1. Open the Amazon EC2 console.
2. In the navigation pane, choose **AMIs**.
3. To filter the list of AMI IDs, choose **Public Images**, and then type **SUSE-SLES-11-SP3** in the search box.

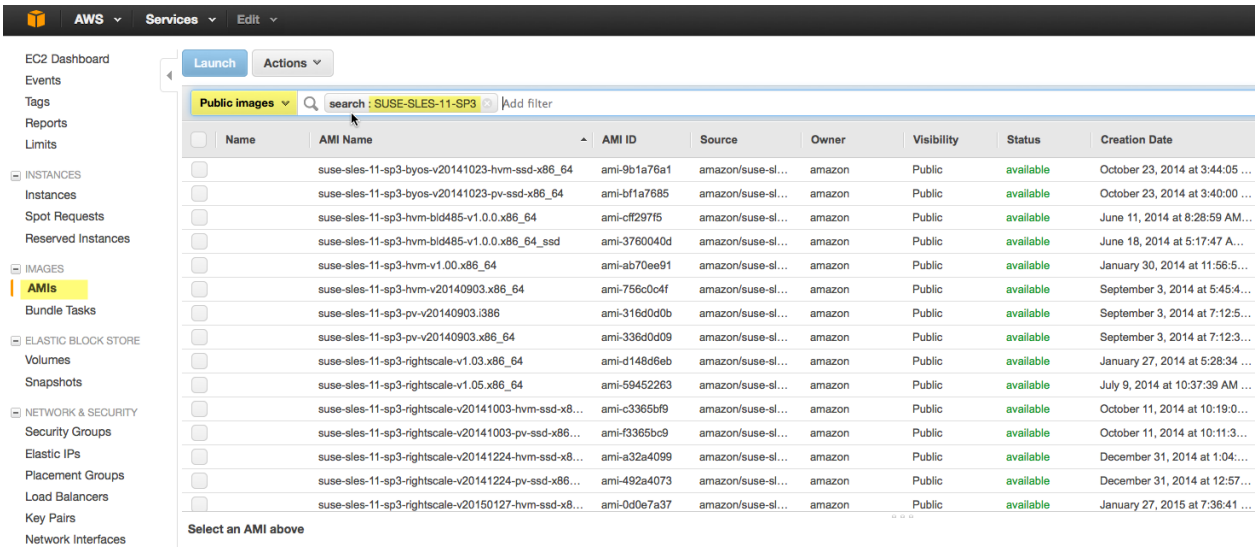

Figure 25: Filtering AMIs for SLES

4. To scope the list by virtualization type, click the search bar, choose **Virtualization type**, and then choose **HVM**.

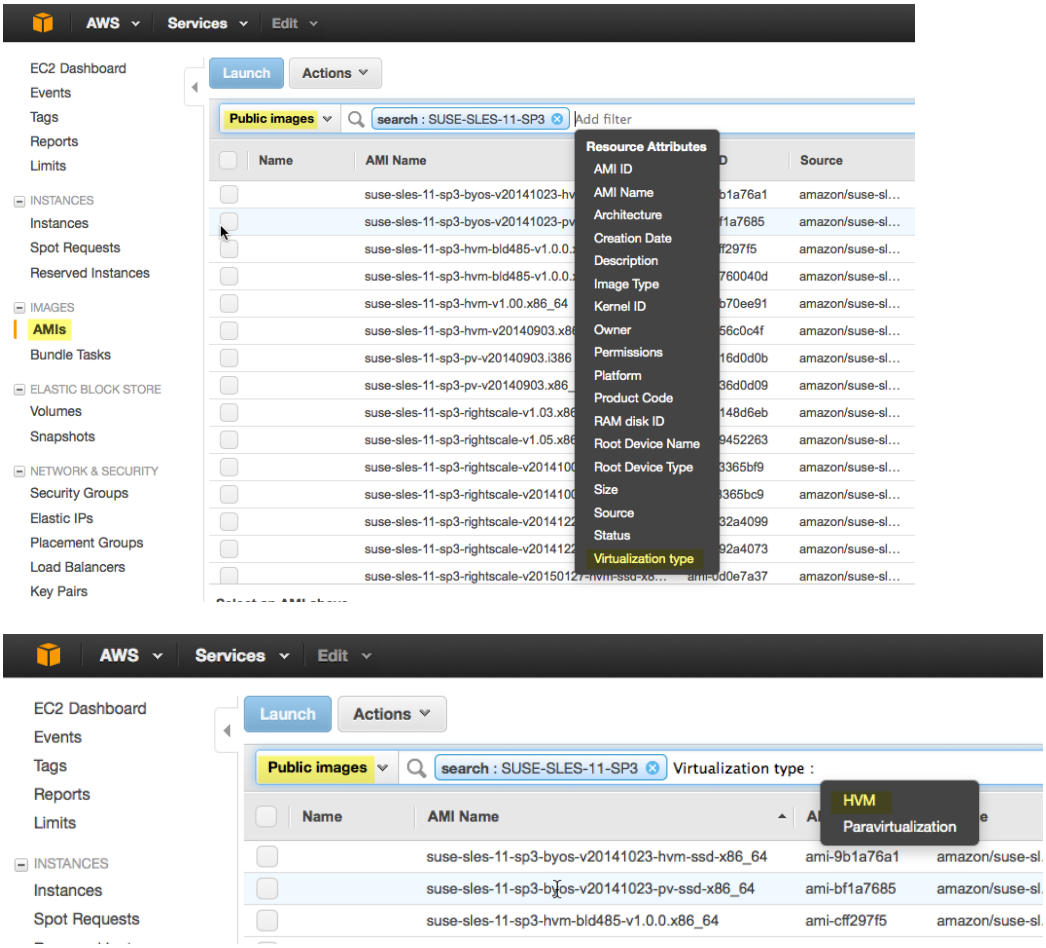

Figure 26: Filtering SLES AMIs by Virtualization Type

5. To filter the list by creation date, click the search bar, choose **Creation Date**, and search for AMIs that were created in the last few months.

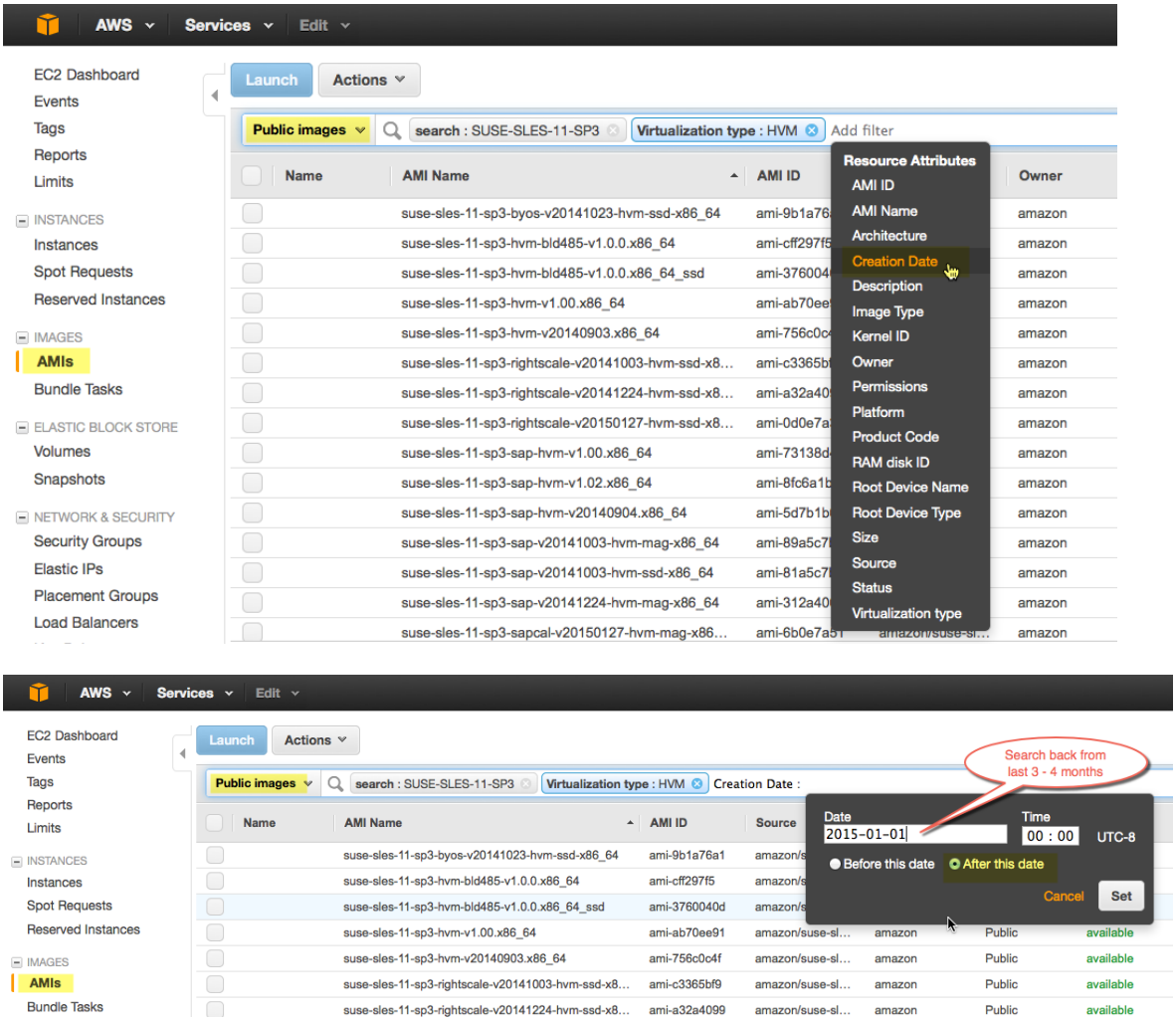

Figure 27: Filtering SLES AMIs by Creation Date

6. You should now have a small result set of AMIs. Choose the AMI whose name follows the pattern **suse-sles-sp3-vYYYYMMDD-hvm-ssd-x86_64**, and note its ID.

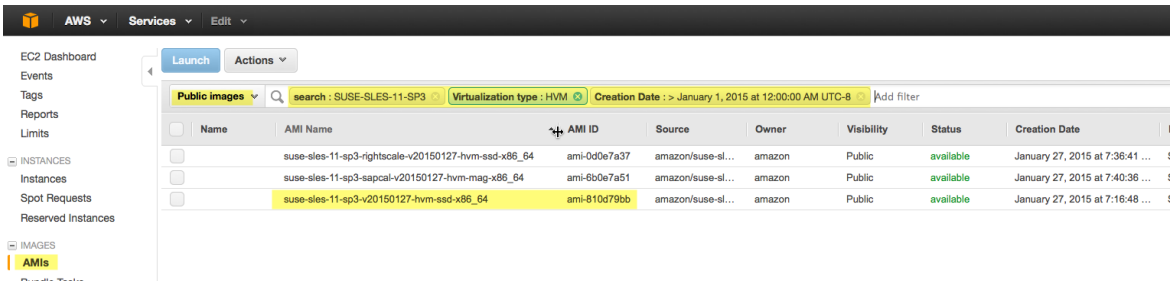

Figure 28: Choosing a SLES AMI

Procedure for RHEL

1. Go to the AWS Marketplace at http://aws.amazon.com/marketplace.

2. Type **RHEL for SAP HANA** in the search box, and choose **Red Hat Enterprise Linux for SAP HANA** from the results.

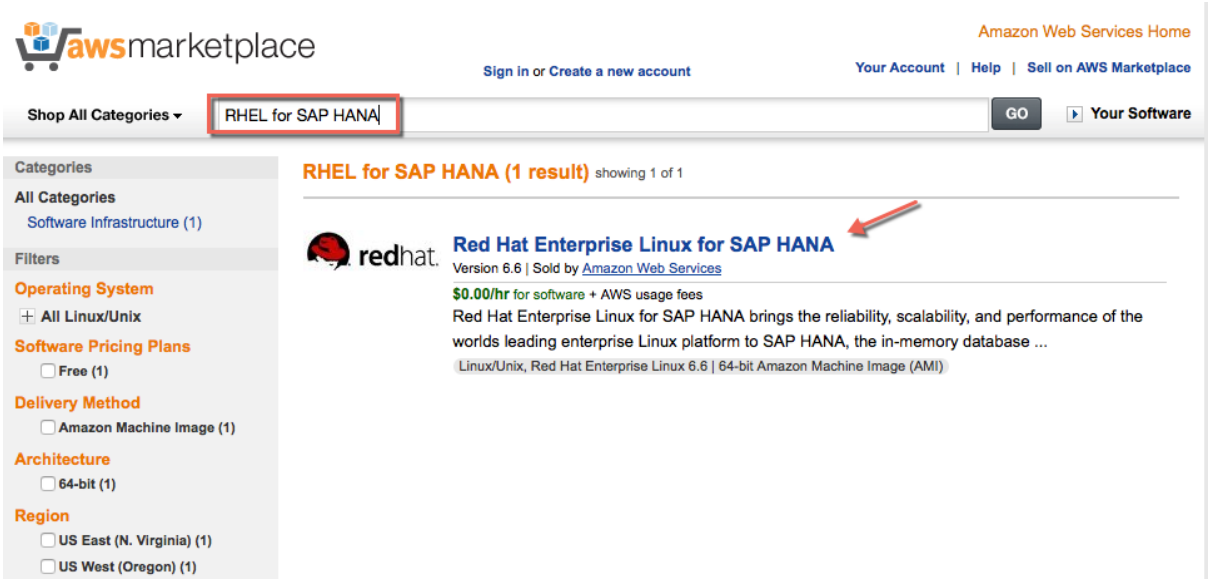

Figure 29: RHEL for SAP HANA in the AWS Marketplace

3. From the **Red Hat Enterprise Linux for SAP HANA** page, choose **Continue**.

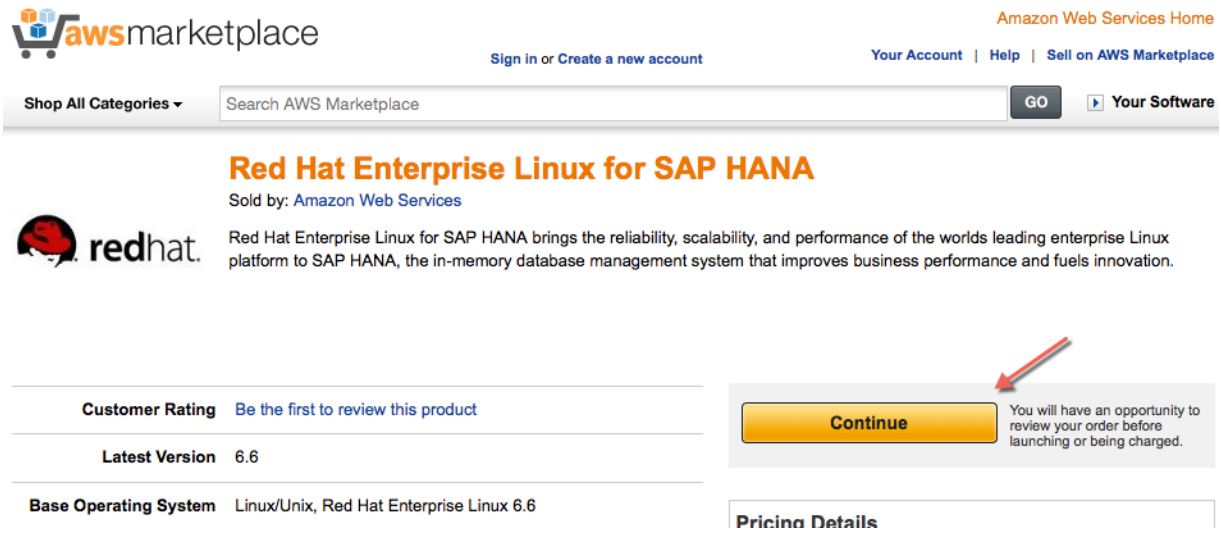

Figure 30: Choosing RHEL for SAP HANA

4. Choose the **Manual Launch** tab, and select the version of RHEL from the list. Note the AMI ID for your target region.

Note
Using Red Hat Enterprise Linux for SAP HANA requires a subscription. Follow the instructions in Appendix B to complete the subscription if you haven't already done so.

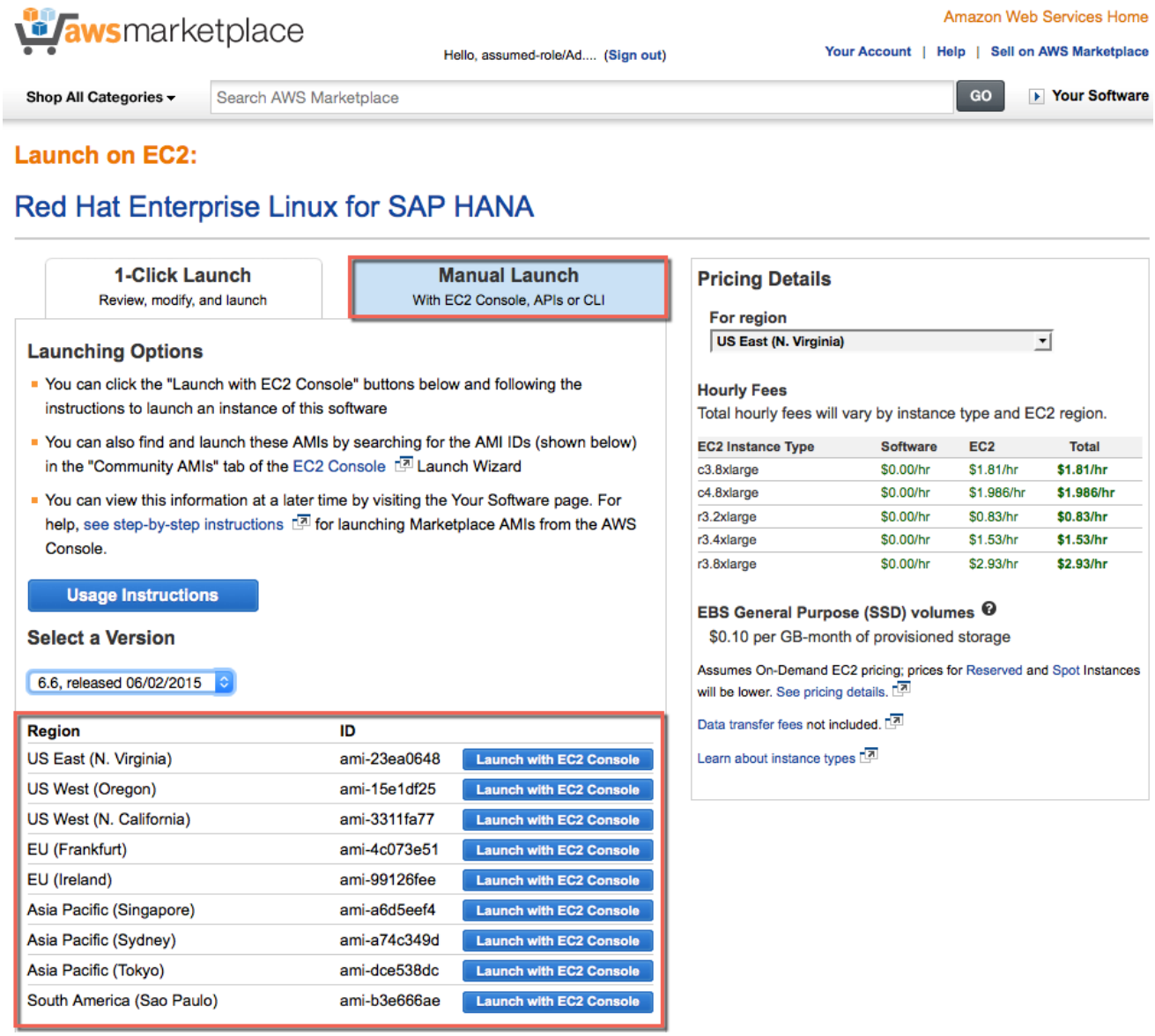

Figure 31: Selecting a RHEL for SAP HANA Version

Send Us Your Feedback

We welcome your questions and comments. Please post your feedback on the AWS Quick Start Discussion Forum.

You can visit our GitHub repository to download the templates and scripts for this Quick Start, and to share your customizations with others.

Document Revisions

Date	Changes	Location
December 2015	Added troubleshooting information.	Troubleshooting section
June 2015	• You can now choose between the RHEL and SLES operating systems for SAP HANA deployment. • The Quick Start now supports configurations of up to 17 nodes.	• New *MyOS* parameter in Step 2: Deploy SAP HANA Nodes, and other changes to reflect RHEL support throughout guide • New Appendix B and Appendix C • Adjustments to storage size of SAP HANA volumes • Updated pricing information
April 2015	Replaced SAP Business One notes with a link to the SAP Business One, version for SAP HANA, Quick Start deployment guide.	Implementing SAP Business One, Version for SAP HANA
December 2014	• Updated approximate pricing information. • In the first template, changed the default type for **NATInstanceType** to **t2.small** to support the EU (Frankfurt) region. • Added clarifications for deploying SAP Business One, version for SAP HANA.	Changes throughout guide
July 2014	Initial publication.	—

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