This Quick Start deployment guide was created by Amazon Web Services (AWS) in partnership with CoreCompete. CoreCompete is a big data analytics consulting organization, SAS Gold Partner, and Amazon Web Services (AWS) Advanced Consulting Partner.

**Quick Starts** are automated reference deployments that use AWS CloudFormation templates to launch, configure, and run the AWS compute, network, storage, and other services required to deploy a specific workload on AWS.

**Overview**

This Quick Start reference deployment guide provides step-by-step instructions for launching and configuring the required IT infrastructure in the Amazon Web Services (AWS) Cloud for the deployment of SAS Grid software.

**SAS Grid** is a shared, centrally managed analytics computing environment that features workload balancing and management, high availability, and fast processing. A SAS Grid environment helps you incrementally scale your computing infrastructure over time as the number of users and the size of data grow. It also provides rolling maintenance and upgrades without any disruption to your users.

The Quick Start is for IT infrastructure architects, administrators, and DevOps professionals who are planning to implement or extend their SAS workloads on the AWS Cloud. It deploys the infrastructure for implementing SAS Grid and related SAS components on Amazon Elastic Compute Cloud (Amazon EC2) instances and uses security groups, a virtual private cloud (VPC), subnets, and Elastic Load Balancing to provide security and availability.

A SAS Grid environment in the cloud provides the elasticity and agility to scale your resources as needed. The Quick Start automatically builds and configures the required infrastructure for SAS Grid application installation, thereby reducing the dependency on your IT team. The effort required to plan, design, and implement the infrastructure is eliminated, so your business can focus on SAS installation.
SAS Grid Components
SAS Grid consists of the following components:

- Grid Control Server
- Grid Nodes
- SAS Metadata Server
- SAS mid-tier components

This Quick Start bootstraps the infrastructure for your SAS Grid cluster by provisioning single EC2 instances for SAS Metadata Server and mid-tier components, and provisioning multiple EC2 instances for SAS Grid.

SAS Grid requires a network share that all computers on your cluster can access. This can be an NFS mount, a directory on a SAN, an SMBFS/CIFS mount, or any other method of creating a directory that is shared among all the machines in the grid. To meet this requirement, the Quick Start sets up Intel Cloud Edition for Lustre, which is a parallel file system.

**Note** The Quick Start incorporates prerequisites recommended by SAS for building the infrastructure for SAS Grid. It does not deploy SAS Grid. To deploy and use SAS Grid software, see step 5 in this guide and the SAS documentation.

SAS Grid Features
SAS Grid provides the following features for a SAS environment:

- Improves efficiency and utilization of computing resources by distributing jobs submitted by different users through dynamic, resource-based load balancing
- Enables you to run larger or more complex analyses by making computing resources available to multiple users and multiple applications
- Provides the ability to manage jobs, queues, hosts, and users across the enterprise
- Enables you to implement rules-based job queues and prioritization to govern the use of computing resources
- Automates identification, allocation, management, and optimization of computing resources and program flows
- Supports centralized policies for simplifying the administration of the SAS environment
- Adds high-availability capabilities for SAS Metadata Server and other critical SAS services
- Provides a hot-standby machine for failover by using the nodes in the grid
- Performs load balancing for all SAS servers to provide improved throughput and response time for all SAS clients
- Works with SAS Data Integration Studio and SAS Enterprise Guide, which can import SAS programs to the Grid
- Accelerates the processing speeds of applicable SAS programs and applications, and provides more efficient computing resource utilization
- Supports easy configuration of user-written programs and many SAS solutions for easy submission to a grid of shared resources
- Provides high availability and high resilience for the SAS environment to support mission-critical applications

For additional information, see the [SAS documentation](#) and [video](#).

**What the Quick Start Deploys**

This Quick Start doesn’t install SAS Grid software, but sets up the following IT infrastructure components for SAS Grid:

- AWS infrastructure components for SAS Grid (detailed in the [Architecture](#) section)
- Intel Cloud Edition for Lustre components (see the [Lustre documentation](#) for details)

**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 templates for this Quick Start include 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.

The Quick Start requires a subscription to the Amazon Machine Image (AMI) for [Intel Cloud Edition for Lustre](#), which is available from AWS Marketplace, and additional pricing, terms, and conditions may apply. We’ve provided subscription instructions in [step 2](#) of the deployment steps.

After using this Quick Start to set up the infrastructure for SAS Grid, you can obtain a SAS license and install the SAS Grid software. We’ve provided instructions in [step 5](#) of this guide.
Architecture

Deploying this Quick Start for a new virtual private cloud (VPC) with default parameters builds the following infrastructure for SAS Grid in the AWS Cloud.

By default, the Quick Start sets up the following components for medium utilization. You can also choose small or large utilization, based on your requirements, during deployment. (See the Planning section for details on the utilization choices.)

- A VPC that spans two Availability Zones*

    Following AWS best practices, the Quick Start uses two Availability Zones. However, the SAS Grid infrastructure requires only one of these Availability Zones, which you select when you launch the Quick Start. This Single-AZ design follows SAS recommendations for SAS Grid architectures. For tips on handling failover scenarios in this architecture, see the FAQ.
• Six subnets, two public and four private*

Following AWS best practices, the Quick Start uses two Availability Zones and sets up one public subnet and two private subnets in each Availability Zone. For the SAS Grid infrastructure, the Quick Start uses the two private subnets in one of these Availability Zones. The private subnets in the second Availability Zone remain unused. For tips on handling failover scenarios in this architecture, see the FAQ.

• In the public subnets, a Remote Desktop Gateway in an Auto Scaling group with a default of one instance, acting as a jump host*

• In the public subnets, managed NAT gateways to allow outbound Internet access for resources in the private subnets*

• In the first private subnet, four EC2 instances for SAS Grid

You can choose 2-6 instances; see the Planning section for details.

• In the second private subnet:
  – One EC2 instance acting as a Lustre MGT (Management) node
  – One EC2 instance acting as a Lustre MDT (Metadata) node
  – 3-15 EC2 instances for OSS nodes

• Security groups for the following stacks:
  – Remote Desktop Gateway: Allows port 3389 for RDP access (to the bastion host)
  – SAS Grid: Allows connectivity on all ports for all SAS Grid hosts, Lustre hosts, and Remote Desktop Gateway host
  – Lustre: Allows connectivity on all ports for all SAS Grid hosts, Lustre hosts, and Remote Desktop Gateway host

• Amazon Elastic File System (Amazon EFS) for scalable file storage, to share the bootstrap information with the SAS Grid and Lustre nodes

* The template that deploys the Quick Start into an existing VPC skips the tasks marked by asterisks.
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 EFS
- Auto Scaling

Deployment Options

This Quick Start provides two deployment options:

- **Deploy the infrastructure for SAS Grid into a new VPC** (end-to-end deployment). This option builds a new AWS environment consisting of the VPC, subnets, NAT gateway, and other components, and then deploys SAS Grid infrastructure components into this new VPC.

- **Deploy the infrastructure for SAS Grid into an existing VPC**. This option provisions SAS Grid infrastructure components in your existing AWS infrastructure.

The Quick Start provides separate templates for these options. It also lets you configure additional settings such as infrastructure size, CIDR blocks for the VPC and subnets, RDP location, and EBS volume sizes, as discussed later in this guide.

**Note** This Quick Start uses Amazon EFS and the Amazon Machine Image (AMI) for Lustre Software in AWS Marketplace and can be deployed only in the regions where both are available. For a list of supported regions for Amazon EFS, see the AWS Regions and Endpoints webpage. For a list of supported regions for Lustre Software, see Intel Cloud Edition for Lustre* software in AWS Marketplace.

Planning Your Deployment

Select an infrastructure model, based on your utilization. When you launch the Quick Start, you’ll specify your choice by setting the **SAS Grid Infra Size** parameter. The utilization option you choose depends on the number and nature of your SAS jobs.

- Small utilization is for customers who have a small number of SAS jobs to be executed, and the jobs are lightweight (that is, each job takes one to two hours to complete).
• Medium utilization is for customers who have a moderate number of SAS jobs, and each job takes two to four hours to complete.

• Large utilization is for customers who have a higher number of SAS jobs, and each job takes more than four hours to complete.

The Quick Start will deploy the number of nodes and instance types for each component, as shown in the following table, depending on your choice. By default, the Quick Start sets up the infrastructure for medium utilization.

<table>
<thead>
<tr>
<th>Small utilization</th>
<th>Medium utilization</th>
<th>Large utilization</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAS Grid (2 nodes)</td>
<td>i2.8xlarge</td>
<td>SAS Grid (4 nodes)</td>
</tr>
<tr>
<td>SAS Metadata (1 node)</td>
<td>r4.2xlarge</td>
<td>SAS Metadata (1 node)</td>
</tr>
<tr>
<td>SAS Mid-Tier (1 node)</td>
<td>r4.2xlarge</td>
<td>SAS Mid-Tier (1 node)</td>
</tr>
<tr>
<td>Lustre (3 OSS nodes)</td>
<td>c4.8xlarge</td>
<td>Lustre (3 OSS nodes)</td>
</tr>
<tr>
<td>Lustre (MGS node)</td>
<td>c4.xlarge</td>
<td>Lustre (MGS node)</td>
</tr>
<tr>
<td>Lustre (MDS node)</td>
<td>c4.4xlarge</td>
<td>Lustre (MDS node)</td>
</tr>
</tbody>
</table>

**Deployment Steps**

Follow these steps to deploy SAS Grid on AWS. For detailed instructions, follow the links for each step.

**Step 1. Prepare Your AWS account**

1. If you don’t already have an AWS account, create one at [https://aws.amazon.com](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 the infrastructure for SAS Grid on AWS.

**Note** This Quick Start uses Amazon EFS and the Amazon Machine Image (AMI) for Lustre Software in AWS Marketplace and can be deployed only in the regions where both are available. For a list of supported regions for Amazon EFS, see the [AWS Regions and Endpoints](https://aws.amazon.com/regional) webpage. For a list of supported regions for Lustre Software, see [Intel Cloud Edition for Lustre* software](https://aws.amazon.com) in AWS Marketplace.
3. Create an IAM user with administrator privileges, and enable multi-factor authentication (MFA) for both root and IAM user accounts.

4. Create three key pairs in your preferred region, for Remote Desktop Gateway, SAS Grid, and Lustre instances.

5. **Request a service limit increase** for the following:
   - If the default limit of 5 Elastic IP addresses has already been used, increase the limit by 3
   - Increase the limit for R4 and C4 instances to 50
   - Increase the limit for i2.8xlarge instances to 6 (minimum)

**Step 2. Subscribe to the Lustre AMI**

The Intel Cloud Edition for Lustre software is available from AWS Marketplace. Before you deploy the Quick Start, you must subscribe to the AMI:

1. Log in to your AWS account.

2. Open the **AWS Marketplace webpage for the Lustre AMI** (Figure 2).

![Figure 2: Intel Cloud Edition for Lustre AMI page in AWS Marketplace](image)
3. Choose **Continue** to view the license terms and launch information.

4. Choose the **Manual Launch** tab, select the AWS Region you want to use for the deployment from the **For Region** dropdown, and then choose **Accept Software Terms** (Figure 3).

![Launch on EC2: Intel Cloud Edition for Lustre® software - Self Support](image)

**Figure 3: Choosing region and accepting license terms for AMI**

### 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: Deploy into a new VPC on AWS](Launch)

![Option 2: Deploy into an existing VPC on AWS](Launch)

**Important** If you’re deploying the infrastructure for SAS Grid into an existing VPC, make sure that your VPC is set up with public and private subnets, and Remote Desktop Gateway instances, as described in the Architecture section. 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 2 hours to complete.

2. Check the region that’s displayed in the upper-right corner of the navigation bar, and change it if necessary. (See the note in step 1 for supported regions.) This is where the network infrastructure for SAS Grid will be built. The template is launched in the US West (Oregon) 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 the infrastructure for SAS Grid into a new VPC
- Parameters for deploying the infrastructure for SAS Grid into an existing VPC
Option 1: Parameters for deployment into a new VPC

View template

Network Configuration:

<table>
<thead>
<tr>
<th>Parameter label (name)</th>
<th>Default</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Availability Zones (AvailabilityZones)</td>
<td>Requires input</td>
<td>List of Availability Zones to use for the subnets in the VPC. This Quick Start uses a single Availability Zone for SAS Grid deployment and will use the first zone you specify.</td>
</tr>
<tr>
<td>VPC CIDR (VPCCIDR)</td>
<td>10.0.0.0/16</td>
<td>CIDR block for the VPC.</td>
</tr>
<tr>
<td>SASGrid Subnet CIDR (PrivateSubnet1CIDR)</td>
<td>10.0.0.0/19</td>
<td>CIDR block for the first private subnet where the SAS Grid instances will be deployed.</td>
</tr>
<tr>
<td>Lustre Subnet CIDR (PrivateSubnet2CIDR)</td>
<td>10.0.192.0/21</td>
<td>CIDR block for the second private subnet where the Lustre instances will be deployed.</td>
</tr>
<tr>
<td>Public Subnet 1 CIDR (PublicSubnet1CIDR)</td>
<td>10.0.128.0/20</td>
<td>CIDR block for the public (DMZ) subnet for Remote Desktop Gateway instances.</td>
</tr>
<tr>
<td>Public Subnet 2 CIDR (PublicSubnet2CIDR)</td>
<td>10.0.144.0/20</td>
<td>CIDR block for the public (DMZ) subnet located in Availability Zone 2. Note that the Quick Start provisions but doesn’t use this public subnet.</td>
</tr>
</tbody>
</table>

Microsoft Remote Desktop Gateway Configuration:

<table>
<thead>
<tr>
<th>Parameter label (name)</th>
<th>Default</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>RDGW KeyPair Name (RDGWKeyPairName)</td>
<td>Requires input</td>
<td>Public/private key pair, which allows you to securely connect to your instance after it launches.</td>
</tr>
<tr>
<td>RDGW Instance Type (RDGWInstanceType)</td>
<td>t2.large</td>
<td>EC2 instance type for the Remote Desktop Gateway instances.</td>
</tr>
<tr>
<td>Admin User Name (AdminUser)</td>
<td>StackAdmin</td>
<td>User name (5-25 alphanumeric characters) for the new local administrator account.</td>
</tr>
<tr>
<td>Admin Password (AdminPassword)</td>
<td>Requires input</td>
<td>Password for the administrative account. This must be 8-32 characters, including letters, numbers, and symbols.</td>
</tr>
<tr>
<td>Domain DNS Name (DomainDNSName)</td>
<td>example.com</td>
<td>Fully qualified domain name (FQDN) of the forest root domain.</td>
</tr>
<tr>
<td>Allowed RDGW External Access CIDR (RDGWCIDR)</td>
<td>Requires input</td>
<td>The CIDR block that is allowed to access the Remote Desktop Gateway instances. We recommend that you set this value to a trusted IP range. For example, you might want to grant access only to your corporate network.</td>
</tr>
</tbody>
</table>
### SAS Grid EC2 Configuration:

<table>
<thead>
<tr>
<th>Parameter label (name)</th>
<th>Default</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAS Grid Infra Size (SASGridInfraSize)</td>
<td>Medium</td>
<td>The infrastructure model for the SAS Grid deployment:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Small: Launches 2 SAS Grid instances,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Medium: Launches 4 SAS Grid instances</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Large: Launches 6 SAS Grid instances</td>
</tr>
<tr>
<td></td>
<td></td>
<td>For more information, see the Planning section.</td>
</tr>
<tr>
<td>SAS Grid KeyPair Name (SASGridKeyPairName)</td>
<td>Requires input</td>
<td>Public/private key pair, which allows you to securely connect to your SAS Grid instances after launch.</td>
</tr>
</tbody>
</table>

### Lustre EC2 Configuration:

<table>
<thead>
<tr>
<th>Parameter label (name)</th>
<th>Default</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lustre KeyPair Name (LustreKeyPairName)</td>
<td>Requires input</td>
<td>Public/private key pair, which allows you to securely connect to your Lustre instances after launch.</td>
</tr>
<tr>
<td>Number of OSS Nodes (NumberOfOSSNodes)</td>
<td>3</td>
<td>The number of Lustre OSS nodes you want to deploy. You can specify 3-15 nodes.</td>
</tr>
<tr>
<td>Lustre OSS EBS Volume Size (LustreOSSEBSVolumeSize)</td>
<td>100</td>
<td>EBS volume size (in GiB) for Lustre OSS nodes. You can specify 100-9900 GiB, in multiples of 100.</td>
</tr>
</tbody>
</table>

### AWS Quick Start Configuration:

<table>
<thead>
<tr>
<th>Parameter label (name)</th>
<th>Default</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quick Start S3 Bucket Name (QSS3BucketName)</td>
<td>aws-quickstart</td>
<td>S3 bucket where the Quick Start templates and scripts are installed. Use this parameter to 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 letters, uppercase letters, and hyphens, but should not start or end with a hyphen.</td>
</tr>
<tr>
<td>Quick Start S3 Key Prefix (QSS3KeyPrefix)</td>
<td>quickstart-sas-grid/</td>
<td>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.</td>
</tr>
</tbody>
</table>
• **Option 2: Parameters for deployment into an existing VPC**

  [View template]

**Network Configuration:**

<table>
<thead>
<tr>
<th>Parameter label (name)</th>
<th>Default</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>VPC ID (VPCID)</td>
<td><em>Requires input</em></td>
<td>ID of your existing VPC (e.g., vpc-0343606e).</td>
</tr>
<tr>
<td>Private Subnet 1 ID (PrivateSubnet1ID)</td>
<td><em>Requires input</em></td>
<td>ID of the first private subnet in your existing VPC (e.g., subnet-a0246dcd).</td>
</tr>
<tr>
<td>Private Subnet 2 ID (PrivateSubnet2ID)</td>
<td><em>Requires input</em></td>
<td>ID of the second private subnet in your existing VPC (e.g., subnet-b58c3d67).</td>
</tr>
</tbody>
</table>

**Microsoft Remote Desktop Gateway Configuration:**

<table>
<thead>
<tr>
<th>Parameter label (name)</th>
<th>Default</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Domain DNS Name (DomainDNSName)</td>
<td>example.com</td>
<td>Fully qualified domain name (FQDN) of the forest root domain.</td>
</tr>
<tr>
<td>RDGW SG (RDGWSG)</td>
<td><em>Requires input</em></td>
<td>ID of the security group for Remote Desktop Gateway instances (e.g., sg-0343606e).</td>
</tr>
</tbody>
</table>

**SAS Grid EC2 Configuration:**

<table>
<thead>
<tr>
<th>Parameter label (name)</th>
<th>Default</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAS Grid Infra Size (SASGridInfraSize)</td>
<td>Medium</td>
<td>The infrastructure model for the SAS Grid deployment:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Small: Launches 2 SAS Grid instances,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Medium: Launches 4 SAS Grid instances</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Large: Launches 6 SAS Grid instances</td>
</tr>
<tr>
<td></td>
<td></td>
<td>For more information, see the [Planning] section.</td>
</tr>
<tr>
<td>SAS Grid KeyPair Name (SASGridKeyPairName)</td>
<td><em>Requires input</em></td>
<td>Public/private key pair, which allows you to securely connect to your SAS Grid instances after launch.</td>
</tr>
</tbody>
</table>

**Lustre EC2 Configuration:**

<table>
<thead>
<tr>
<th>Parameter label (name)</th>
<th>Default</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lustre KeyPair Name (LustreKeyPairName)</td>
<td><em>Requires input</em></td>
<td>Public/private key pair, which allows you to securely connect to your Lustre instances after launch.</td>
</tr>
<tr>
<td>Number of OSS Nodes (NumberOfOSSNodes)</td>
<td>3</td>
<td>The number of Lustre OSS nodes you want to deploy. You can specify 3-15 nodes.</td>
</tr>
<tr>
<td>Lustre OSS EBS Volume Size (LustreOSSEBSVolumeSize)</td>
<td>100</td>
<td>EBS volume size (in GiB) for Lustre OSS nodes. You can specify 1-9999 GiB, in multiples of 100.</td>
</tr>
</tbody>
</table>
AWS Quick Start Configuration:

<table>
<thead>
<tr>
<th>Parameter label (name)</th>
<th>Default</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quick Start S3 Bucket Name</td>
<td>quickstart-reference</td>
<td>S3 bucket where the Quick Start templates and scripts are installed. Use this parameter to 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 letters, uppercase letters, and hyphens, but should not start or end with a hyphen.</td>
</tr>
<tr>
<td>Quick Start S3 Key Prefix</td>
<td>sas/grid/latest/</td>
<td>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.</td>
</tr>
</tbody>
</table>

Step 4. Validate Your Deployment

1. Check if disks are mounted on the following mount points on Lustre instances by using the `df -h` command.
   - `/lsf_config` on MGT and MDT nodes
   - `/lsf_data` on OSS nodes

2. Check if disks are mounted on the following SAS Grid instances by using the `df -h` command.
   - `/sas` on Metadata, mid-tier and SAS Grid nodes
   - `/saswork` on SAS Grid nodes

The command output should include references to these disks. If it doesn’t, see the FAQ for instructions on mounting the disks manually.

Step 5. Obtain a SAS License and Install SAS Grid

After you launch the Quick Start to set up the AWS infrastructure, you’ll need a license for SAS Grid. To obtain a SAS license and for any license-related inquiries, contact us at A3@CoreCompete.com.

After you obtain a license, see Installing and Configuring a SAS Grid Environment on the SAS website for installation instructions.
FAQ

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 or contact us on the AWS Quick Start Discussion Forum.

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 can’t find disk references in the output provided by the df -h command. How can I mount these disks?

A. You can mount the disks manually.

- For /lsf_config, make sure that /lsf_config is mounted on the MGT node, and run the following command in the MDT node to mount the disk manually:

```
# mount /lsf_config
```

- For /lsf_data, make sure that /lsf_config is mounted on the MGT and MDT nodes, and run the following command in any of the OSS nodes to mount the disk manually:

```
# mount /lsf_data
```
• For /sas, make sure that /lsf_config and /lsf_data are mounted on the MGT/MDT and OSS nodes, respectively. Run this command to mount /sas:

```
# /usr/local/bin/lustre_mount
```

This will mount the Lustre file system.

• For /saswork, check if /dev/md0 is configured properly by using the command disk "/dev/xvd[b-i]". Run one of these commands to mount /dev/md0 on /saswork:

```
# mount /saswork
```
or:

```
# mount /dev/md0 /saswork
```

**Q.** What should I do if my SAS Grid instances fail?

**A.** The Quick Start automatically sets up a VPC with two Availability Zones, but deploys SAS Grid instances into only one of these zones. In the case of a disruption or failure, you can use the Quick Start workload template to deploy the SAS Grid and Lustre components into private subnets in the second Availability Zone, and restore the application data and metadata using backups. Alternatively, you can set up a separate, parallel VPC environment using the Quick Start master template, and keep it on standby in case of a failure.

**Additional Resources**

**AWS services**

- Amazon EC2
- AWS CloudFormation
  [https://aws.amazon.com/documentation/cloudformation/](https://aws.amazon.com/documentation/cloudformation/)
- Amazon VPC
  [https://aws.amazon.com/documentation/vpc/](https://aws.amazon.com/documentation/vpc/)
- Amazon EBS
- Amazon EFS
  [https://docs.aws.amazon.com/efs/latest/ug/](https://docs.aws.amazon.com/efs/latest/ug/)
- Auto Scaling
  https://docs.aws.amazon.com/autoscaling/latest/userguide/

**SAS Grid and Lustre**

- SAS Grid documentation
  http://support.sas.com/software/products/gridmgr/

- SAS Grid installation
  https://support.sas.com/rnd/scalability/grid/gridinstall.html

- Lustre documentation

**Quick Start reference deployments**

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

**Send Us Feedback**

You can visit our [GitHub repository](https://aws.amazon.com/quickstart/) to download the templates and scripts for this Quick Start, to post your comments, and to share your customizations with others.

**Document Revisions**

<table>
<thead>
<tr>
<th>Date</th>
<th>Change</th>
<th>In sections</th>
</tr>
</thead>
<tbody>
<tr>
<td>August 2017</td>
<td>Initial publication</td>
<td>—</td>
</tr>
</tbody>
</table>
© 2017, Amazon Web Services, Inc. or its affiliates, and CoreCompete. All rights reserved.

Notices

This document is provided for informational purposes only. It represents AWS’s current product offerings and practices as of the date of issue of this document, which are subject to change without notice. Customers are responsible for making their own independent assessment of the information in this document and any use of AWS’s products or services, each of which is provided “as is” without warranty of any kind, whether express or implied. This document does not create any warranties, representations, contractual commitments, conditions or assurances from AWS, its affiliates, suppliers or licensors. The responsibilities and liabilities of AWS to its customers are controlled by AWS agreements, and this document is not part of, nor does it modify, any agreement between AWS and its customers.

The software included with this paper is licensed under the Apache License, Version 2.0 (the "License"). You may not use this file except in compliance with the License. A copy of the License is located at http://aws.amazon.com/apache2.0/ or in the "license" file accompanying this file. This code is distributed on an "AS IS" BASIS, WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied. See the License for the specific language governing permissions and limitations under the License.