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SAS® QUICKSTART ON MICROSOFT® AZURE

SAS® 9.4 & SAS® Viya® 3.5 QuickStart Deployment Guide

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1. Introduction

This QuickStart is intended to help SAS® customers deploy a cloud-native environment that provides both SAS 9.4 platform and the SAS® Viya® 3.5 platform in an integrated environment. It is intended to provide an easy way for customers to get a comprehensive SAS environment, that will likely result in faster migrations and deployments into the Microsoft® Azure environment. The SAS ecosystem is deployed on the Azure platform, leveraging Azure native deployment approaches. As part of the deployment, you get all the powerful data management, analytics, and visualization capabilities of SAS, deployed on a high-performance infrastructure.

1.1. Objective

The SAS 9 & Viya QuickStart for Azure will take a SAS provided license package for SAS 9, Viya and deploy a well-architected SAS platform into the customer's Azure subscription. The deployment creates a virtual network and other required infrastructure. After the deployment process completes, you will have the necessary details for the endpoints and connection details to log in to the new SAS Ecosystem. By default, QuickStart deployments enable Transport Layer Security (TLS) for secure communication.

Azure Resource Manager templates are included with the QuickStart to automate the following:

- Deploying SAS 9 (Non-Grid) and SAS Viya
- Deploying SAS® Grid and SAS Viya

1.2. Architecture Overview

The QuickStart will setup the following environment on Microsoft Azure:

- A Virtual Network (VNet) configured with public and private subnets. This provides the network infrastructure for your SAS 94 and SAS Viya deployments.
- In the public subnet, a Linux bastion host acting as an Ansible Controller Host.
- In the private subnet, a Remote Desktop instance acting as a Client Machine.
- In the Application subnet (private subnet), Virtual Machines for:
  - SAS 9.4 – Metadata, Compute, and Mid-Tier Servers
  - SAS Grid – Metadata, Grid Controller, Grid Nodes, and Mid-Tier Servers
  - SAS Viya – Microservices, SPRE, Cloud Analytic Services (CAS) Controller, and CAS Workers Servers
- Disks required for SAS Binaries, Configuration, and Data will be provisioned using Premium Disks in Azure.
- Security groups for Virtual Machines and Subnets.
- Accelerated Networking is enabled on all the network interfaces.
- All the servers are placed in the same proximity placement group.

1.3. Architecture Diagram

Below are the architecture diagrams for both deployments covered in our templates:

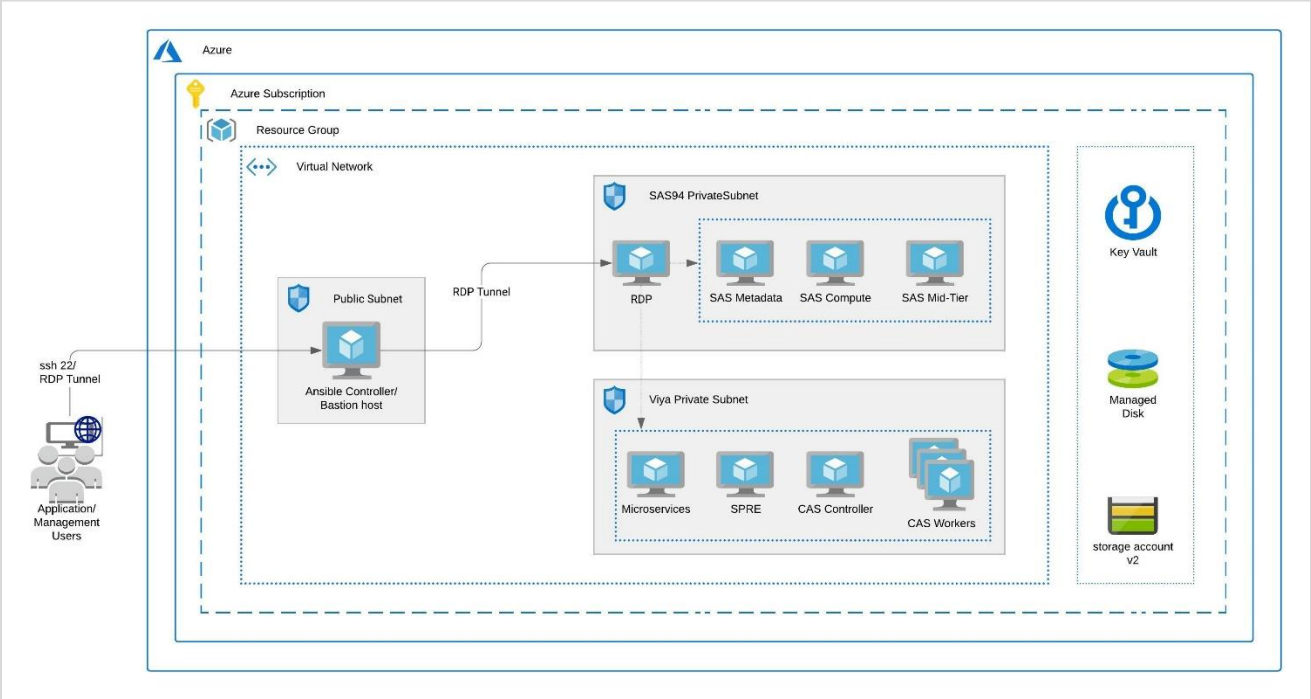

Figure 1: SAS 9 and SAS Viya Architecture Diagram

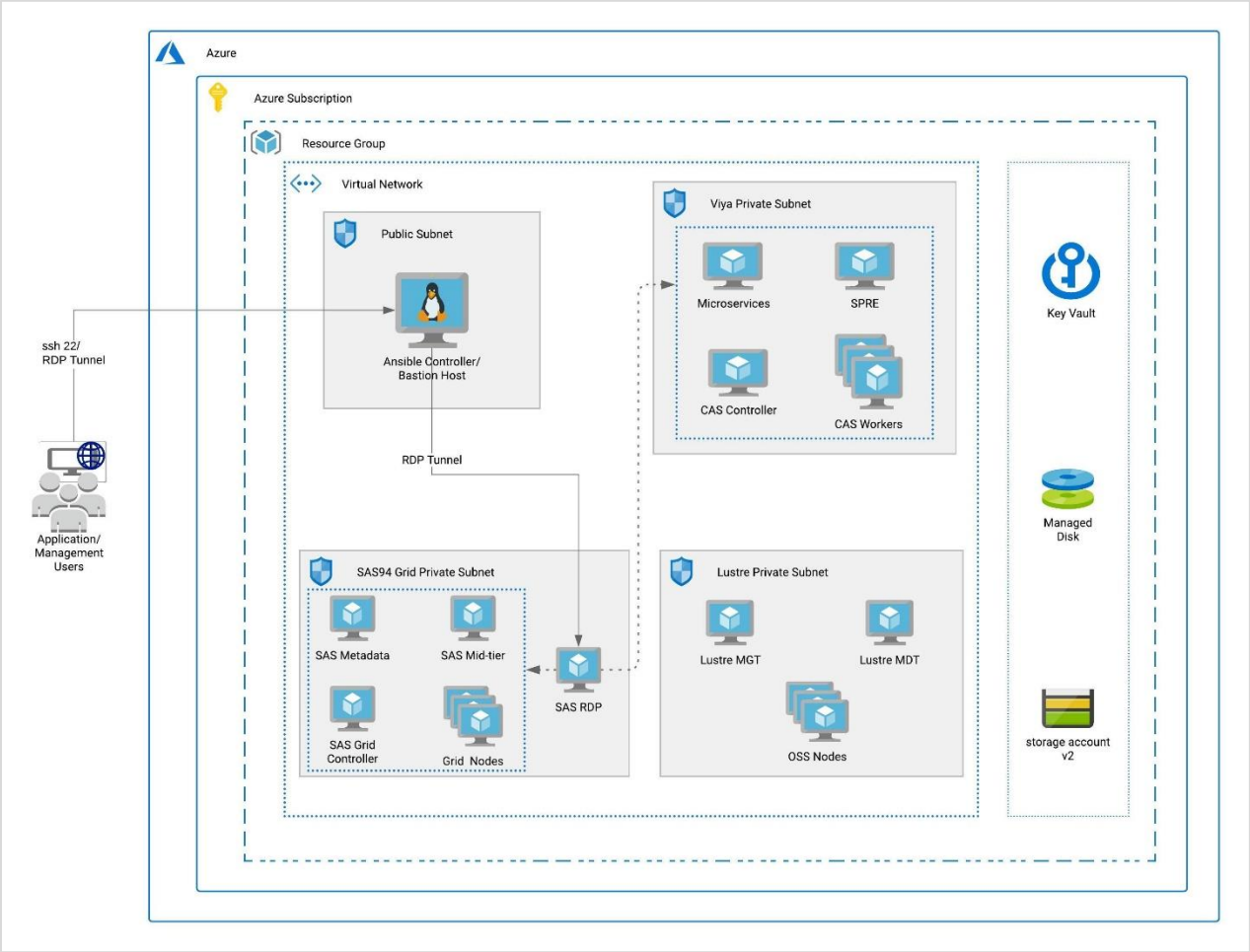

Figure 2: SAS Grid and SAS Viya Architecture Diagram

1.4. SAS 9 Components

SAS 9 QuickStart bootstraps the infrastructure for a 3 machine SAS 9 environment consisting of:

- 1 x SAS Metadata Server
- 1 x SAS Compute Server
- 1 x SAS Mid-Tier Server
- 1 x Windows RDP Machine (For accessing thick clients)

It also deploys the SAS Software stack in the machines and performs post-installation steps to validate and secure the mid-tier for encrypted communication. The template will also install SAS desktop clients like SAS® Enterprise Guide®, SAS® Enterprise Miner™, SAS® Data Integration Studio, and SAS® Management Console on the Windows RDP Machine.

1.5. SAS Grid Components

Grid QuickStart bootstraps the infrastructure for a SAS Grid cluster by provisioning Azure Virtual Machines for:

- 1 x SAS Metadata Server
- 1 x SAS Grid Controller
- n x Grid Nodes (number to be specified by user while launching QuickStart)
- 1 x SAS Mid-Tier Server
- 1 x Windows RDP Machine (for accessing thick clients)

The QuickStart deploys SAS Grid into this SAS Server infrastructure. The template will also install SAS Thick Clients like SAS Enterprise Guide, SAS Enterprise Miner, SAS Data Integration Studio, and SAS Management Console on the Windows RDP Machine. The template sets up the Lustre File system, which provides a shared directory for the grid. The Virtual machines provisioned for Lustre File System include:

- 1 x MGT
- 1 x MDT
- n x OSS Nodes (Number to be specified by user while launching Quick Start)

1.6. SAS Viya Components

SAS Viya Quick Start bootstraps the infrastructure required for SAS Viya MPP system consisting of:

- 1 x Ansible Controller (acts as Bastion Host)
- 1 x Microservices
- 1 x CAS Controller
- n x CAS Worker Nodes (Number to be specified by user while launching Quick Start)

The template will run with pre-requisites to install SAS Viya on these servers and then deploy SAS Viya on the system.

2. Costs & Licenses

The user is responsible for the cost of the Azure Cloud services used while running this QuickStart deployment. There is no additional cost for using the QuickStart. You will need a SAS license (emailed from SAS for SAS 9 and SAS Viya) to launch this QuickStart. Your SAS account team can advise on the appropriate software licensing and sizing to meet the workload and performance needs. SAS software is typically licensed on maximum number of physical cores for the computational engine.

In Azure, instance sizes are based on virtual CPUs (vcpus) which equates to 2 vcpus per physical core. We provide recommended instance types and sizes, based on physical cores, as a starting point for this deployment. It is important to use server types that support Accelerated Networking and Premium Storage features. You may choose to use larger instances as recommended by SAS sizing guidelines, but we recommend using the instance series noted.

2.1. SAS 9 Sizing

Here are some recommended Machine Types for SAS 9 environment. Please make sure the server types support Accelerated Networking and Premium Storage features.

For **Metadata Server**, we recommend this instance type:

- Standard_D8s_v3 – 4 physical cores, 8 vcpu, 32GB RAM, 200 GB temp storage SSD

For **Compute Server**, choose from this list, based on the number of physical cores you have licensed:

Licensed Cores	Virtual Machine	Memory (RAM)	Temporary Storage
4	Standard_E8s_v3	64 GB	128 GB
8	Standard_E16s_v3	128 GB	256 GB
16	Standard_E32s_v3	256 GB	512 GB
32	Standard_E64s_v3	432 GB	864 GB

For the **Mid-Tier server**, start with 4 physical cores with sufficient memory (minimum 40 GB) to support Web Application JVMs. We recommend:

- Standard_E8s_v3, or Standard_D8s_v3.

2.2. SAS Grid Sizing

Here are some recommended Machine Types for SAS 9.4 Grid environment. Please make sure the server types support Accelerated Networking and Premium Storage features.

For **Grid Controller Server**, we recommend this instance type:

- Standard_E8s_v3 – 4 physical cores, 8 vcpu, 64GB RAM, 128 GB temp storage SSD

For **Grid Nodes**, choose from this list, based on the number of cores you have licensed and the number of grid nodes you want:

Physical Cores	Virtual Machine	Memory (RAM)	Temporary Storage
4	Standard_E8s_v3	64 GB	128 GB
8	Standard_E16s_v3	128 GB	256 GB
16	Standard_E32s_v3	256 GB	512 GB

For **Metadata Server**, we recommend this instance type:

- Standard_D8s_v3 – 4 physical cores, 8 vcpu, 32GB RAM, 200 GB temp storage SSD

For the **Mid-Tier server**, start with 4 physical cores with sufficient memory (minimum 40 GB) to support Web Application JVMs. The recommended instance type is:

- Standard_E8s_v3 or Standard_D8s_v3.

For **Management Service (MGT)**, we recommend the default VM size:

- Standard_F4s_v2 – 2 physical cores, 4 vcpu, 8 GB RAM, 32 GB temp storage SSD

For **Metadata Service (MDT)**, we recommend the default VM size

- Standard_F4s_v2

For **Object Storage Service (OSS)**, start with 4 physical cores with higher memory capacity. The recommended instance type is:

- Standard_E8s_v3

2.3. SAS Viya Sizing

For SAS Viya, here are the recommendations:

Microservices
Choose a machine with minimum 4 physical cores and 60 GB memory. The recommended instance type is:

- Standard_E8s_v3

SPRE Server
SPRE Server is responsible for the computational actions in the Viya environment. Choose a machine

with a minimum of 8 v-cores. In general, you should choose the same instance type as you use for the CAS worker below. The recommended instance types are:

- Standard_E8s_v3 (or E16s_v3/E32s_v3)
- Standard_D8s_v3 (or D16s_v3/D32s_v3)

Cloud Analytic Services (CAS) Controller and Workers

Here are some recommended example VM sizes based on the number of licensed cores:

Licensed Cores	Virtual Machine	Memory (RAM)	Temporary Storage
4	Standard_E8s_v3	64 GB	128 GB
8	Standard_E16s_v3	128 GB	256 GB
16	Standard_E32s_v3	256 GB	512 GB

3. Pre-Requisites

Before deploying SAS 9 and SAS Viya QuickStart template for Azure, you must have the following:

- An Azure user account with Owner permission or Contributor and custom roles with below permissions:
  - Microsoft.Authorization/roleAssignments/write
  - */read
  - Microsoft.Authorization/*/read
  - Microsoft.KeyVault/locations/*/read
  - Microsoft.KeyVault/vaults/*/read
- Sufficient quota for the number of Cores in Azure Account to accommodate all the servers in the SAS 9 and SAS Viya ecosystem. Please check your subscription limits before launching the QuickStart. You can request an increase in standard vCPU quota limits per VM series from Microsoft support.
- A SAS Software Order Confirmation email that contains supported QuickStart products:
  - **SAS 9.4 Products**:
    - SAS Enterprise BI Server 9.4,
    - SAS Enterprise Miner 15.1,
    - SAS Enterprise Guide 8.2,
    - SAS Data Integration Server 9.4,
    - SAS Office Analytics 7.4
  - **SAS 9.4 Grid Products**:
    - SAS Enterprise BI Server 9.4,
    - SAS Enterprise Miner 15.1,
    - SAS Enterprise Guide 8.2,

        - SAS Data Integration Server 9.4,
        - SAS Grid Manager for Platform 9.44,
        - SAS Office Analytics 7.4,
        - Platform Suite for SAS 10.11
    - **SAS Viya 3.5 Products**:
        - SAS/ACCESS®
        - SAS/CONNECT®
        - SAS/IML®
        - SAS/QC®
        - SAS® Add-In for Microsoft Office
        - SAS® Data Preparation
        - SAS® SAS Intelligent Decisioning
        - SAS® Econometrics
        - SAS® Event Stream Processing
        - SAS® Model Manager (on SAS Viya)
        - SAS® Optimization
        - SAS® Studio
        - SAS® Visual Analytics (on SAS Viya)
        - SAS® Visual Data Mining and Machine Learning
        - SAS® Visual Forecasting
        - SAS® Visual Statistics (on SAS Viya and SAS 9.4)
        - SAS® Visual Text Analytics
        - Select SAS In-Database Technologies

- The license files (emailed from SAS for SAS 9 and SAS Viya), which contains the licensed product information, should be uploaded to the Azure File Share.
- All the Server types you select must support Accelerated Networking and Premium Storage features.

3.1. Upload SAS Depot to Azure File Share

The QuickStart deployment requires parameters related to the license file and SAS Depot Location, which will be available once you upload the SAS Depot and License files to Azure File Share.

1. Download the SAS Depot (see SAS Email for instructions) to your system.
2. Log in to the Azure Account from which you would launch the templates.
3. Create a new Storage Account and create a new File Share with premium options. Follow the Microsoft Azure instructions to Create a Premium File Share.
4. Create new directories – "**sasdepot" & "viyarepo."**
5. Upload SAS 9 Depot files to Azure File Share under the **sasdepot** directory.

3.2. Upload SAS 9 License File to File Share

Check your SAS 9 license files under the sid_files directory in the SASDepot folder to see if the necessary SAS 9 license files are present. If not, please upload the SAS 9 License files into that directory (*e.g. <storageaccountName>/<fileshare>/<sasdepot>/sid_files/SAS94_xxxxxx_xxxxxxxx_LINUX_X86-64.txt)*. The license file will be named like SAS94_xxxxxx_xxxxxxxx_LINUX_X86-64.txt.

3.3. Upload SAS Viya License File to File Share

1. Download the SAS Viya Mirror repository.
2. Login to Azure Account, upload the mirror repo to the viyarepo directory created in *Section 3.1* - *step 4*.
3. Also, upload the SAS_Viya_deployment_data.zip to the same directory(viyarepo).

4. Deployment Options

You can choose one of the following options to launch the template:

Deploy SAS 9 and SAS Viya

Deploy SAS Grid and SAS Viya

The deployment takes between 2 and 3 hours, depending on the quantity of software licensed and the size of machines chosen to deploy the SAS software. Below are the parameters required to fill in each of the templates:

SAS Parameters	Default	Description
Storage Account Name	*Required Input*	The storage account name in Azure where SAS depot has been uploaded.
Storage Account Key	*Required Input*	Storage Account Key for the respective Storage Account.
File Share Name	*Required Input*	Name of the file share in which SAS Depot and Mirror repo have been uploaded.
SAS Depot Folder	*Required Input*	Directory Name in the File Share where SAS Depot has been placed.

Viya Repo Folder	*Required Input*	Directory name in the File share where Mirror Repo for SAS Viya has been placed.
SAS Server license file	*Required Input*	Name of the SAS Server License file (SAS94_xxxxxx_xxxxxxxx_LINUX_X86-64.txt). Place the SAS Server License files into that directory. Make sure this file contains the licenses of all SAS94 Software Products for Linux.
SAS External Password	*Required Input*	Password for all external accounts in SAS Servers for SSH and SAS applications login.
SAS Internal Password	*Required Input*	This is an internal password in SAS Metadata and Web Infrastructure Platform database. The accounts with this password will have elevated privileges in the SAS estate.
Infra Parameters		
SAS94 Data Storage – SAS Data	Default:100 Min: 100 Max:32767	Storage Volume Size for SAS 9 Compute Server.
SAS Viya Data Storage	Default:100 Min: 100 Max:32767	Storage Volume Size for SAS Viya Cas Server.
Admin Ingress Location	*Required Input*	The CIDR block that can access the Ansible Controller/Bastion Host and Remote Desktop machine. 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.
VNet CIDR	Default: 10.10.0.0/16	The CIDR block for the Virtual Network.
Vnet Public Subnet CIDR	Default: 10.10.1.0/24	The CIDR block for the Ansible Controller/Bastion Host Public Subnet.
SAS 94 Parameters		
SAS94 Private Subnet CIDR	Default: 10.10.2.0/24	The CIDR block for the first private subnet where the SAS 9 and RDP machines will be deployed.

SAS94 Meta VM Size	*Required Input* Default: Standard_D8s_v3	VM Type for SAS Metadata Server.
SAS94 Mid VM Size	*Required Input* Default: Standard_E8s_v3	VM Type for SAS Mid VM Server.
SAS94 Compute VM Size	*Required Input* Default: Standard_E8s_v3	VM Type for SAS Compute Server.
SAS 94 Grid Parameters		
SAS94 Private Subnet CIDR	Default: 10.10.2.0/24	The CIDR block for the first private subnet where the SAS 9 and RDP machines will be deployed.
SAS94 Meta VM Size	*Required Input* Default: Standard_D8s_v3	VM Type for SAS Metadata Server.
SAS94 Mid VM Size	*Required Input* Default: Standard_E8s_v3	VM Type for SAS Compute Server.
SAS94 Grid VM Size	*Required Input* Default: Standard_E8s_v3	VM Type for SAS Grid Server.
SAS94 Grid Node VM Size	*Required Input* Default: Standard_E8s_v3	VM Type for SAS Grid Node Servers.
Number of SAS94 Grid Nodes	Default:1 Min: 1 Max:100	The number of SAS Grid Node Servers.
Lustre Private Subnet CIDR	10.10.3.0/24	The CIDR block for the Lustre private subnet where the Lustre machines will be deployed.
Lustre OSS Node VM Size	*Required Input* Default: Standard_E8s_v3	VM Type for the Lustre OSS Node Servers.
Number of Lustre OSS Nodes	Default: 1 Min: 1 Max:100	The number of Lustre OSS Node Servers.

SAS94 Lustre Data Storage	Default:100 Min: 100 Max:32767	The SAS data volume size for SAS 94 Gird. The total storage will be the multiple of OSS nodes and storage (i.e., Number of Lustre OSS Nodes * SAS94 Lustre Data Storage).
Viya Parameters		
Viya Private Subnet CIDR	10.10.3.0/24	The CIDR block for the second private subnet where the SAS Viya machines will be deployed.
Viya Microservices VM Size	*Required Input* Default: Standard_E8s_v3	VM Type for SAS Viya Microservices Server.
Viya SPRE VM Size	*Required Input* Default: Standard_E8s_v3	VM Type for SAS Viya SPRE Server.
Viya CAS Controller VM Size	*Required Input* Default: Standard_E8s_v3	VM Type for SAS Viya CAS Controller Server.
Viya CAS Worker VM Size	*Required Input* Default: Standard_E8s_v3	VM Type for SAS Viya CAS Worker Nodes.
Number of Viya CAS Nodes	*Required Input* Default: 1 Min: 1 Max: 100	Number of CAS Worker Nodes required for the deployment.
General Parameters		
Subscription	*Required Input*	Choose the Azure Subscription from which you wish to launch the resources for the QuickStart.
Resource Group Name	*Required Input*	Create New Resource Group or choose an existing Resource to launch the QuickStart resources. It is recommended to create a new resource group for each QuickStart deployment to maintain the resources.
Resource Group Location	*Required Input*	Choose an appropriate location where you would like to launch your Azure resources. Please note, the Storage account with SAS

		Depot and Mirror Repo should exist in the same Azure region.
SAS Application Name	*Required Input* String Input No spaces Length – Minimum 2 & Maximum 5.	Choose an Application name to the group and name your resources. We recommend using your company name or project name. This tag will be used as a prefix for the hostname of the SAS servers and Azure resources.
Key Vault Owner ID	*Required Input*	Key Vault Owner Object ID Specifies the object ID of a user, service principal in the Azure Active Directory tenant. Obtain it by using Get-AzADUser or Get-AzADServicePrincipal cmdlets. e.g., In Azure Cloud PowerShell type PS> Get-Az. It is recommended to give the used object id of whoever is deploying the QuickStart.
SSH Public key	*Required Input*	The SSH public key that will be added to all the servers.
Location	[resourceGroup().location]	Azure Resources location, where all the SAS 94 and Viya resources should be created. e.g., servers, disks, IP's etc. The default value will pick up the same location as where the resource group is created.
_artifacts Location	SAS 94 Non Grid – Viya: https://raw.githubusercontent.com/corecompete/sas94ng-viya/master/ SAS 94 Grid – Viya : https://raw.githubusercontent.com/corecompete/sas94grid-viya/master/	URL of the public repository where all the templates and dependant artifacts are located in.

5. Usage

5.1. Remote Desktop Login

1. SSH to the Ansible bastion host using the ***vmuser***.
2. Create an RDP tunnel through the bastion host. See the *Appendix section* for Tunneling instructions.

3. RDP to the Windows Server using the user(vmuser) and password (SAS External Password parameter value).

5.2. Accessing SAS 9 Applications

The SAS 9.4 clients such as SAS Enterprise Guide, DI Studio, SAS Enterprise Miner, and SAS Management Console are installed on the Windows RDP. Log in to these applications using the ***sasdemo*** user. The password would be the one you specified in the template under the "***SAS External Password parameter value***."

5.3. Accessing SAS Viya Applications

The SAS Viya Web applications can be accessed through the Web Brower on the RDP and directly through your browser via SSH Tunnel. See the *Appendix section* for Tunneling instructions.

6. Troubleshooting

6.1. Key Directories and Locations

Below are some key locations and files which are important for troubleshooting and maintenance tasks:

SAS 9 Environment

Directory Name	Description/Purpose	Location
RESPONSEFILES	Location of Response files involved in SAS Deployment.	/opt/sas/resources/responsefiles
SASDEPLOYMENT	Location of SAS deployment. SAS Home and SAS Config directories reside here.	/opt/sas/
SASDEPOT	Location of SAS Depot.	/sasdepot (mounted as Azure file share in all Servers)
SASDATA	Location of SAS data, projects, source code, and applications.	/sasdata
SASWORK/SASUTIL	Location of SAS workspace and temporary scratch area. This area will predominantly be used for transient and volatile data and	*Compute Server:* /saswork

	technically emptied after the completion of job processing.	
SASBACKUP	Location for SAS Backup and Recovery Tool backup vault.	/opt/sas/backups
DEPLOYMENTLOGS	Location for Deployment Logs. Contains the logs for all phase-wise execution of Pre-Reqs, Install, Config, and Post Deployment scripts.	/var/log/sas/install/

SAS GRID Environment

Directory Name	Description/Purpose	Location/Size
LSFINSTALL	Install Directory for LSF Components.	/opt/sas/platform
GRIDSHARE	Location of SAS Grid Shared Directory.	/opt/sas/gridshare
SASGRIDDEPLOYMENT	Location of SAS deployment. SAS Home and SAS Config directories reside here.	Metadata/Mid-Tier Server: */opt/sas/sashome* Grid Servers: */opt/sas/grid*
DEPLOYMENTLOGS	Location for Deployment Logs. Contains the logs for all phase-wise execution of Pre-Reqs, Install, Config, and Post Deployment scripts.	/var/logs/sas/install

SAS Viya Environment

Directory Name	Description/Purpose	Location/Size
PLAYBOOKS	Location of Ansible playbooks. The Ansible controller contains the main SAS deployment playbook, whereas the rest of the servers contain the Viya-ARK playbook required for Pre and Post Deployment tasks.	*Ansible controller:* /sas/install/sas_viya_playbook *MicroServices, SPRE, CAS Servers, worker nodes:* /opt/viya-ark
SASDEPLOYMENT	Location of SAS deployment.	/opt/sas

SASREPO	Location of a local mirror of the SAS repository (if a mirror is used).	*Visual VM:* /sasdepot/viyarepo (mounted shared directory on an Azure file share)
SASDATA	Location of SAS data, projects, source code, and applications.	*CASController VM:* /sasdata
SASWORK/SASUTIL	Location of SAS workspace and temporary scratch area. This area will predominantly be used for transient and volatile data and technically emptied after the completion of job processing.	*SPRE VM:* /saswork
SASCACHE	Location of CAS disk cache.	*CAS Servers:* /cascache
SASLOGS	Location of the SAS application log files.	/opt/sas/viya/config/var/log (also at /var/log/sas/viya)
SASBACKUP	Location for SAS Backup and Recovery Tool backup vault.	/backup
DEPLOYMENTLOGS	Location for Deployment Logs. Contains the logs for all phase-wise execution of Pre-Reqs, Install, Config, and Post Deployment scripts.	/var/logs/sas/install or /sas/install/sas_viya_playbook/deployment.log

6.2. Review ARM Outputs

The following outputs will be provided after the successful execution of the ARM template. Please note the output for both templates will be similar since the end-user interaction for both systems will be the same.

Output	Default	Description
Bastion Host Connection String	vmuser@x.x.x.x	Use this connection string to connect to Bastion Host/Ansible Controller form your local machine.
RDP Server IP	x.x.x.x	You can use Remote Desktop Connection from your local system to this IP Address through SSH

		Tunneling to access the RDP server from where SAS Clients and Web Applications can be accessed.
SAS Metadata Connection String	*<sasmetahostname>* 8561	Use this connection string (Hostname and Port Number) in SAS Thick Clients like EG, DI Studio, SMC to connect to the Metadata Server.
SAS 9 Install User	*sasinst*	The account is used to install and configure SAS 94 Applications. The password for this account will be the one you chose in the deployment under "SAS External Password."
SASStudio MidTier	https://<mid-tier-hostname>:8343/SASStudio	SAS Studio URL – Web version of Enterprise Guide.
SAS 9 Logon	https://<mid-tier-hostname>:8343/SASLogon	SAS Application Logon URL.
SAS Grid Manager	https://<mid-tier-hostname>:8343/SASGridManager	SAS Grid Manager Application URL
Viya SASStudio	https://<microservices>/SASStudioV	URL to access Viya SAS Studio.
SAS Viya Admin Password Reset URL	https://<microservices>/SASLogon/reset_password?code=<token>	URL to reset the sasboot password.
Viya SASDrive	https://<microservices>/SASDrive	URL to access SAS Environment Manager.

6.3. Review SAS 9 Services Log Files

The SAS 9 Services Log files are in this parent directory: /opt/sas/config/Lev1.

The location for each SAS 9 Service can be computed from here: https://documentation.sas.com/?docsetId=bisag&docsetTarget=p1ausbmrrybuynn1xnxb6jmdfarz.htm&docsetVersion=9.4&locale=en

Refer to this SAS Note for locating SAS Log files in SAS 9.4 environment: https://support.sas.com/kb/55/426.html

6.4. Review SAS Grid Services Log Files

The Platform LSF and Process Manager logs can be found in the below directories:

/opt/sas/platform/lsf/log

/opt/sas/platform/pm/log

The SAS 9 Services Log files are in this parent directory: /opt/sas/config/Lev1.

The location for each SAS 9 Service can be computed from here:
https://documentation.sas.com/?docsetId=bisag&docsetTarget=p1ausbmrrybuynn1xnxb6jmdfarz.htm&docsetVersion=9.4&locale=en

Refer to this SAS Note for locating SAS Log files in SAS 9.4 environment:

https://support.sas.com/kb/55/426.html

6.5. Review SAS Viya Service Log Files

The SAS Viya log files are located under /var/log/sas/viya.

6.6. Restart SAS 9 Services

The SAS Services on the SAS 9 environment can be restarted using the following command:

```
opt/sas/config/Lev1/sas.services restart
```

6.7. Restart SAS Grid Services

The SAS Services on each server can be restarted using the following command:

```
/opt/sas/config/Lev1/sas.services restart
```

To restart the Platform services, run the following commands on the Grid Nodes:

```
source /opt/sas/platform/lsf/conf/profile.lsf
source /opt/sas/platform/pm/profile.js
lsadmin limrestart
lsadmin resrestart
```

```
badmin hrestart
jadmin stop
jadmin start
gaadmin stop
gaadmin start
```

6.8. Restart SAS Viya Services

The SAS Services on each server can be restarted using the following command:

```
systemctl sas-viya-all-services restart
```

7. Appendix

7.1. Appendix A: Configuring Identities Service

Verify Security Settings

Ensure that the correct port on your Lightweight Directory Access Protocol (LDAP) or secure LDAP (LDAPS) machine can be accessed by the SAS Viya machines:

- Port 389 if using LDAP
- Port 636 if using secure LDAP (LDAPS).

Create a Service Account

Create a service account in your LDAP system. The service account must have permission to read the users and groups that will log on to the system.

Configure the Identities Service

See Configure the Connection to Your Identity Provider in the SAS Viya for Linux: Deployment Guide for more information about configuring the identities service.

In the *SAS Environment Manager*, on the *Configuration* tab, select the *Identities* service. There are three sections to configure: connection, user, and group.

Connection:

host - the DNS address or IP address of your LDAP machine.

password - the password of the service account that SAS Viya will use to connect to your LDAP machine.

port - the port your LDAP server uses.

userDN - the DN of the LDAP service account.

User:

accountID - the parameter used for the username. This can be uid, samAccountName, or name depending on your system.

baseDN - DN to search for users under.

Group:

accountID - the parameter used for the name of the group.

baseDN - DN to search for groups under Set the default values to work with a standard Microsoft Active Directory system.

Verify the Configuration

Log in to SAS Viya with your LDAP accounts. You might need to restart SAS Viya for the LDAP changes to take effect.

Run the ldapsearch command from one of the SAS Viya machines.

```
ldapsearch -x -h <YOUR LDAP HOST> -b <YOUR DN> -D <YOUR LDAP SERVICE ACCOUNT> -W
```

Enter the password to your LDAP service account. If verification is successful, the list of your users and groups is displayed.

Configure PAM for SAS Studio

Because SAS Studio does not use the SAS Logon Manager, it has different requirements for integration with an LDAP system. SAS Studio manages authentication through a pluggable authentication module (PAM). You can use System Security Services Daemon (SSSD) to integrate the PAM configuration on your services machine with your LDAP system. To access SAS Studio, the following conditions must be met:

The user must exist locally on the system, and the user must have an accessible home directory.

7.2. Appendix B: SSH Tunneling

Step 1: In your PuTTY configuration, configure the Public IP address and Port of your Ansible-Controller/Bastion Host Server. Ansible Controller IP and user details will be available in deployment output in the Azure portal.

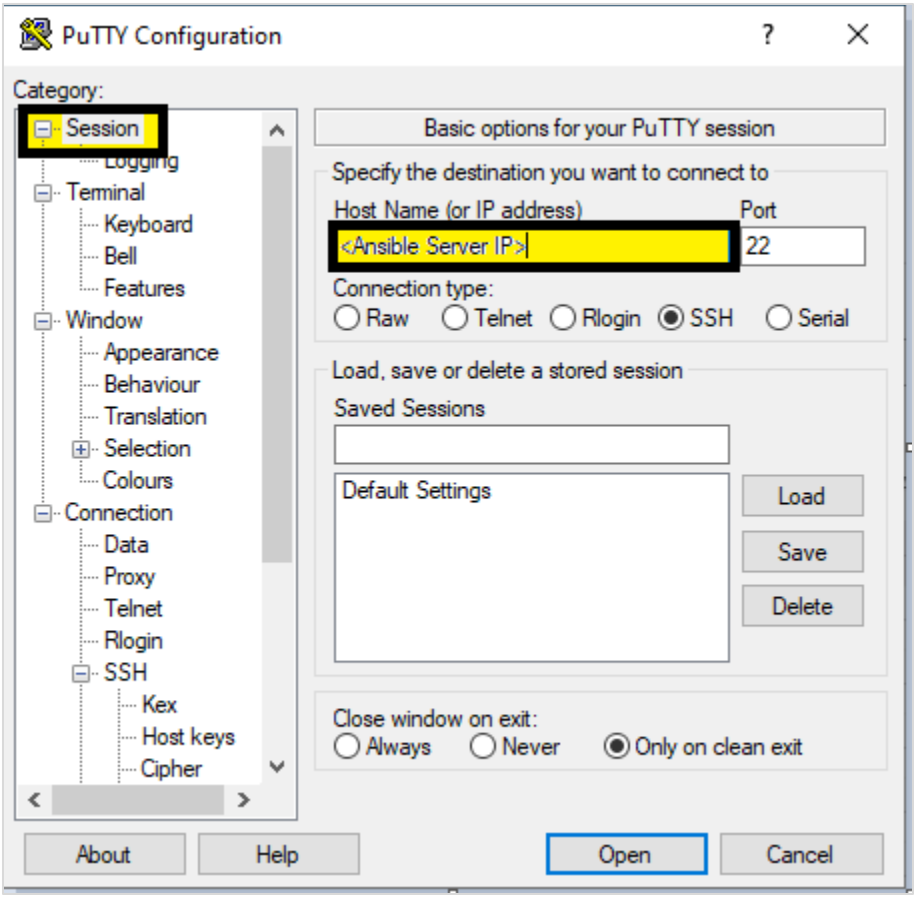

Figure 3: Configure the public IP address and Port

Step 2: In the *SSH* section, browse and select the vmuser private key.

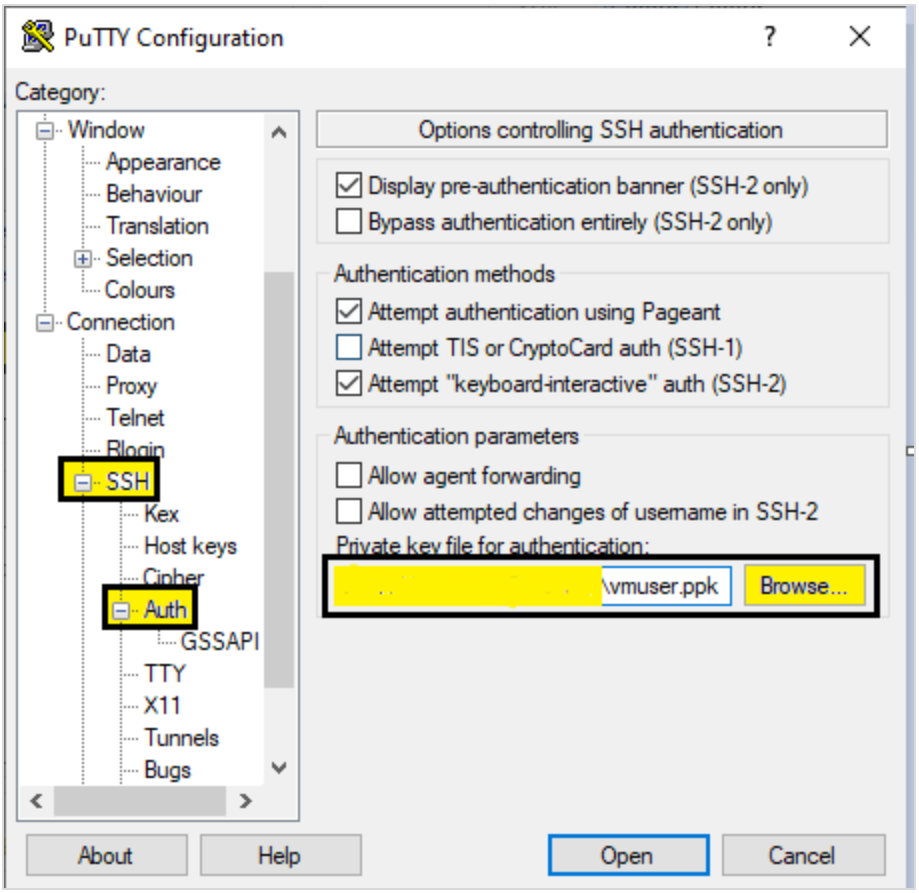

Figure 4: Browse and select the vmuser private key

Step 3: In the *SSH* section, select the Tunnels option and configure the RDP server private IP (ARM templates outputs) with 3389 port and source port as **50001**(Random port in between 50001-60001) and click on **Add**.

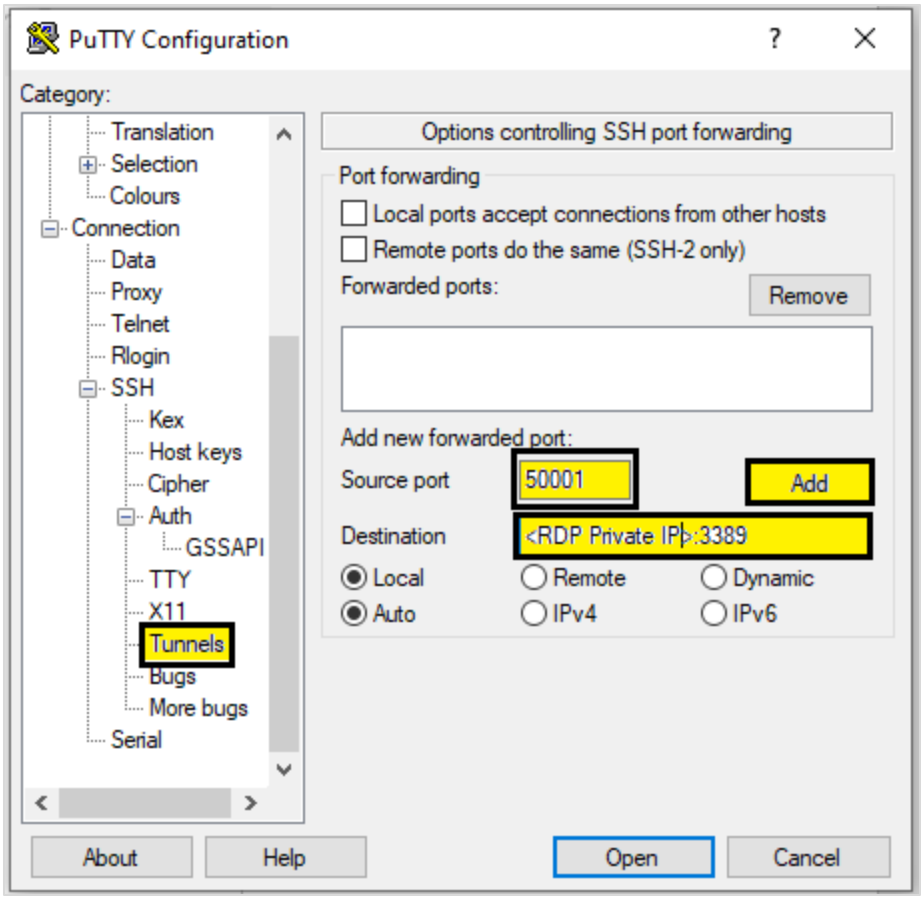

Figure 5: Select Source Port and Destination

Step 4: Make sure the entry has been correctly added, as shown below:

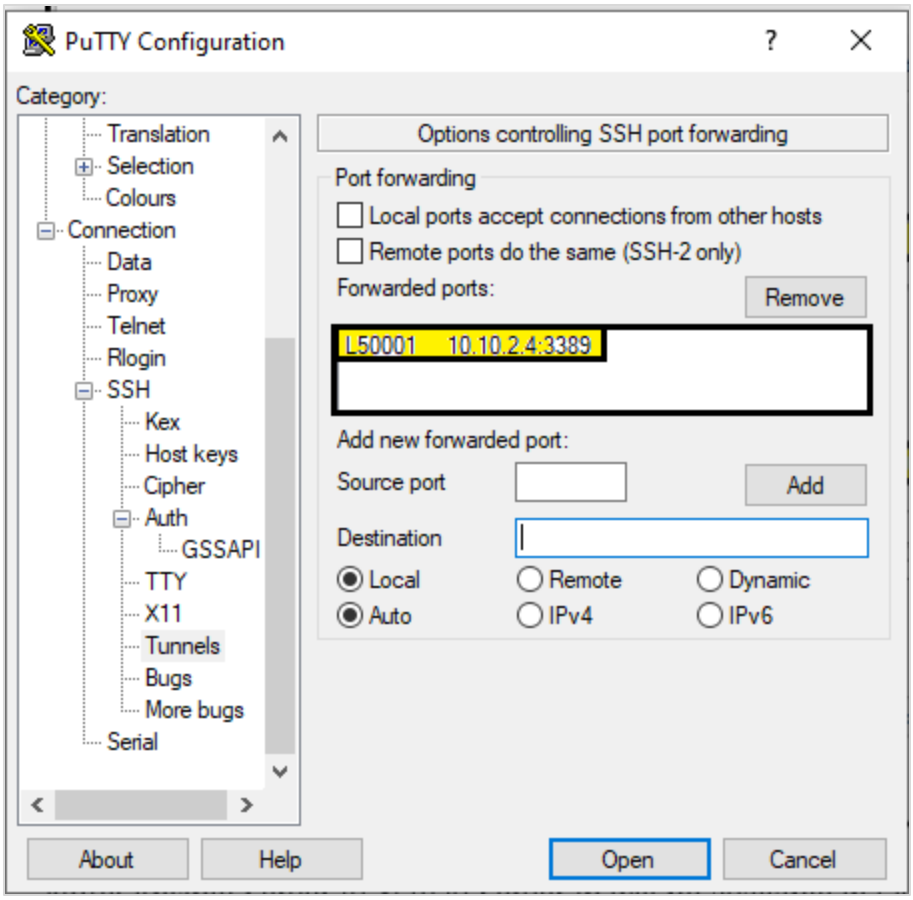

Figure 6: Check Forwarded Ports

Step 5: Once all the configuration is updated, save the configuration and click on **Open.**

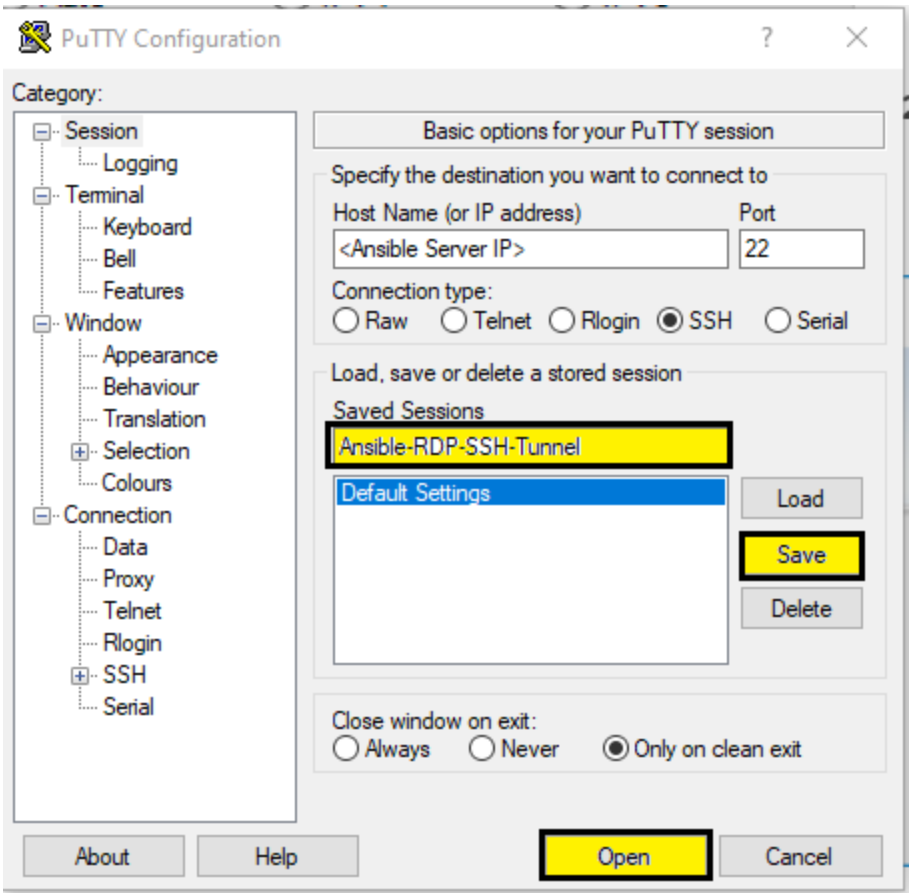

Figure 7: Save the Configuration

Step 6: Open an RDP connection and enter your local IP (127.0.0.1), along with the local port (i.e., Step3 Source Port) in PuTTY. The username will be (vmuser) and the password (SAS External Password Parameter Value).

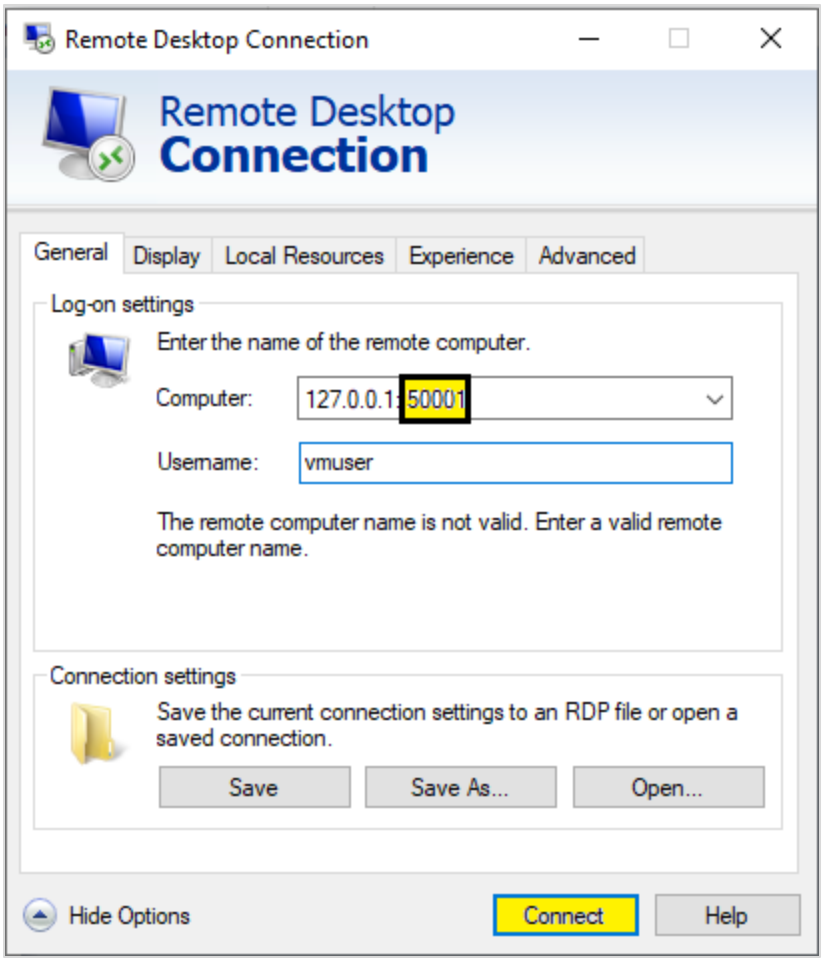

Figure 8: Open and connect an RDP connection

8. Additional Documentation

QuickStart Git Repository:

SAS 9.4 and Viya

SAS 9.4 Grid and Viya

SAS 9 Documentation: https://support.sas.com/documentation/94/

SAS Grid Documentation: https://support.sas.com/en/software/grid-manager-support.html

SAS Viya Documentation: https://support.sas.com/en/software/sas-viya.html#documentation

Azure Well Architected Framework: https://docs.microsoft.com/en-us/azure/architecture/framework/

9. Send us Feedback

Please reach out to Diane Hatcher(diane.hatcher@corecompete.com) or Rohit Shetty(rohit.shetty@corecompete.com) for any feedback or questions on the QuickStart.

10. Acknowledgments

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