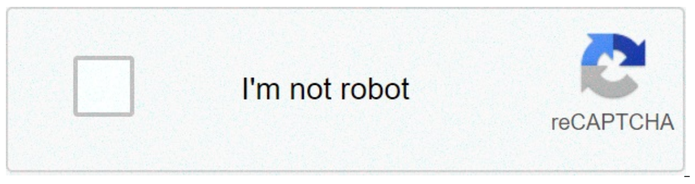

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Sap hana installation on redhat linux

[{ "type": "thumb-down", "id": "hardToUnderstand", "label":"Hard to understand" },{ "type": "thumb-down", "id": "incorrectInformationOrSampleCode", "label":"Incorrect information or sample code" },{ "type": "thumb-down", "id": "missingTheInformationSamplesINeed", "label":"Missing the information/samples I need" },{ "type": "thumb-down", "id": "otherDown", "label":"Other" }] [{ "type": "thumb-up", "id": "easyToUnderstand", "label":"Easy to understand" },{ "type": "thumb-up", "id": "solvedMyProblem", "label":"Solved my problem" },{ "type": "thumb-up", "id": "otherUp", "label":"Other" }] This guide shows you how to deploy and configure a Red Hat Enterprise Linux (RHEL) high-availability (HA) cluster for an SAP HANA 1.0 SPS 12 or later scale-up system on Google Cloud. This guide includes the steps for: Configuring Internal TCP/UDP Load Balancing to reroute traffic in the event of a failure Configuring a Pacemaker cluster on RHEL to manage the SAP systems and other resources during a failover This guide also includes steps for configuring SAP HANA system replication, but refer to the SAP documentation for the definitive instructions. To deploy a SAP HANA system without a Linux high-availability cluster or standby hosts, use the SAP HANA deployment guide. To configure an HA cluster for SAP HANA on SUSE Linux Enterprise Server (SLES), see the HA cluster configuration guide for SAP HANA scale-up on SLES. This guide is intended for advanced SAP HANA users who are familiar with Linux high-availability configurations for SAP HANA. The system that this guide deploys Following this guide, you will deploy two SAP HANA instances and set up an HA cluster on RHEL. You deploy each SAP HANA instance on a Compute Engine VM in a different zone within the same region. A high-availability installation of SAP NetWeaver is not covered in this guide. The deployed cluster includes the following functions and features: Two host VMs, each with an instance of SAP HANA Synchronous SAP HANA system replication. The Pacemaker high-availability cluster resource manager. A STONITH fencing mechanism. Automatic restart of the failed instance as the new secondary instance. This guide has you use the Cloud Deployment Manager templates that are provided by Google Cloud to deploy the Compute Engine virtual machines (VMs) and the SAP HANA instances, which ensures that the VMs and the base SAP HANA systems meet SAP supportability requirements and conform to current best practices. SAP HANA Studio is used in this guide to test SAP HANA system replication. You can use SAP HANA Cockpit instead, if you prefer. For information about installing SAP HANA Studio, see: Prerequisites Before you create the SAP HANA high availability cluster, make sure that the following prerequisites are met: You or your organization has a Google Cloud account and you have created a project for the SAP HANA deployment. For information about creating Google Cloud accounts and projects, see Setting up your Google account in the SAP HANA Deployment Guide. The SAP HANA installation media is stored in a Cloud Storage bucket that is available in your deployment project and region. For information about how to upload SAP HANA installation media to a Cloud Storage bucket, see Downloading SAP HANA in the SAP HANA Deployment Guide. If you are using VPC internal DNS, the value of the VmDnsSetting variable in your project metadata must be either GlobalOnly or ZonalPreferred to enable the resolution of the node names across zones. The default setting of VmDnsSetting is ZonalOnly. For more information, see: To avoid unintentionally exposing your VM instance to the internet, follow these recommendations: Use a NAT gateway. Create firewall rules that block all external access that you don't require. When you create your VMs: Specify a network tag for each VM for use in routing and firewall rules. If you use the Deployment Manager templates that Google Cloud provides, specify a tag with networkTag: [TAG]. Create the VMs without an external IP. If you use the Deployment Manager templates that Google Cloud provides, specify publicIP: No. Creating a network For security purposes, create a new network. You can control who has access by adding firewall rules or by using another access control method. If your project has a default VPC network, don't use it. Instead, create your own VPC network so that the only firewall rules in effect are those that you create explicitly. During deployment, VM instances typically require access to the internet to download Google's monitoring agent. If you are using one of the SAP-certified Linux images that are available from Google Cloud, the VM instance also requires access to the internet in order to register the license and to access OS vendor repositories. A configuration with a NAT gateway and with VM network tags supports this access, even if the target VMs do not have external IPs. To set up networking: Go to Cloud Shell. Go to Cloud Shell To create a new network in the custom subnetworks mode, run: gcloud compute networks create [YOUR_NETWORK_NAME] --subnet-mode custom where [YOUR_NETWORK_NAME] is the name of the new network. The network name can contain only lowercase characters, digits, and the dash character (-). Specify --subnet-mode custom to avoid using the default auto mode, which automatically creates a subnet in each Compute Engine region. For more information, see Subnet creation mode. Create a subnetwork, and specify the region and IP range: gcloud compute networks subnets create [YOUR_SUBNETWORK_NAME] \ --network [YOUR_NETWORK_NAME] --region [YOUR_REGION] --range [YOUR_RANGE] where: [YOUR_SUBNETWORK_NAME] is the new subnetwork. [YOUR_NETWORK_NAME] is the name of the network you created in the previous step. [REGION] is the region where you want the subnetwork. [YOUR_RANGE] is the IP address range, specified in CIDR format, such as 10.1.0.0/24. If you plan to add more than one subnetwork, assign non-overlapping CIDR IP ranges for each subnetwork in the network. Note that each subnetwork and its internal IP ranges are mapped to a single region. Optionally, repeat the previous step and add additional subnetworks. Setting up a NAT gateway If you need to create one or more VMs without public IP addresses, you need to use network address translation (NAT) to enable the VMs to access the internet. Use Cloud NAT, a Google Cloud distributed, software-defined managed service that lets VMs send outbound packets to the internet and receive any corresponding established inbound response packets. Alternatively, you can set up a separate VM as a NAT gateway. Key point: When you configure Cloud NAT, specify at least 160 as the minimum number of ports per VM. Certain operating system updates run concurrent processes that might exceed the Cloud NAT default for the number of ports, which can result in activation or download errors. When you create a Cloud NAT instance, specify the number of ports in the Minimum ports per VM field under Advanced configurations on the Create a NAT gateway page in the Cloud Console. To create a Cloud NAT instance for your project, see Using Cloud NAT. After you configure Cloud NAT for your project, your VM instances can securely access the internet without a public IP address. Adding firewall rules By default, an implied firewall rule blocks incoming connections from outside your Virtual Private Cloud (VPC) network. To allow incoming connections, set up a firewall rule for your VM. After an incoming connection is established with a VM, traffic is permitted in both directions over that connection. You can also create a firewall rule to allow external access to specified ports, or to restrict access between VMs on the same network. If the default VPC network type is used, some additional default rules also apply, such as the default-allow-internal rule, which allows connectivity between VMs on the same network on all ports. Depending on the IT policy that is applicable to your environment, you might need to isolate or otherwise restrict connectivity to your database host, which you can do by creating firewall rules. Depending on your scenario, you can create firewall rules to allow access for: The default SAP ports that are listed in TCP/IP of All SAP Products. Connections from your computer or your corporate network environment to your Compute Engine VM instance. If you are unsure of what IP address to use, talk to your company's network administrator. Communication between VMs in the SAP HANA subnetwork, including communication between nodes in an SAP HANA scale-out system or communication between the database server and application servers in a 3-tier architecture. You can enable communication between VMs by creating a firewall rule to allow traffic that originates from within the subnetwork. Note: The following procedure is a simplified version of the instructions for creating firewall rules. For more detailed instructions, see the Virtual Private Cloud documentation. To create a firewall rule: In the Cloud Console, go to the Firewall rules page. OPEN FIREWALL RULES At the top of the page, click Create firewall rule. In the Network field, select the network where your VM is located. In the Targets field, specify the resources on Google Cloud that this rule applies to. For example, specify All instances in the network. Or to to limit the rule to specific instances on Google Cloud, enter tags in Specified target tags. In the Source filter field, select one of the following: IP ranges to allow incoming traffic from specific IP addresses. Specify the range of IP addresses in the Source IP ranges field. Subnets to allow incoming traffic from a particular subnetwork. Specify the subnetwork name in the following Subnets field. You can use this option to allow access between the VMs in a 3-tier or scaleout configuration. In the Protocols and ports section, select Specified protocols and ports and enter tcp:[PORT_NUMBER]. Click Create to create your firewall rule. Create a firewall rule by using the following command: $ gcloud compute firewall-rules create firewall-name --direction=INGRESS --priority=1000 \ --network=network-name --action=ALLOW --rules=protocol:port \ --source-ranges ip-range --target-tags=network-tags Before you begin configuring the HA cluster, you define and deploy the VM instances and SAP HANA systems that will serve as the primary and secondary nodes in your HA cluster. To define and deploy the systems, you use the same Cloud Deployment Manager template that you use to deploy a SAP HANA system in the SAP HANA deployment guide. However, to deploy two systems instead of one, you need to add the definition for the second system to the configuration file by copying and pasting the definition of the first system. After you create the second definition, you need to change the resource and instance names in the second definition. To protect against a zonal failure, specify a different zone in the same region. All other property values in the two definitions stay the same. After the SAP HANA systems have deployed successfully, you define and configure the HA cluster. The following instructions use the Cloud Shell, but are generally applicable to the Cloud SDK. Confirm that your current quotas for resources such as persistent disks and CPUs are sufficient for the SAP HANA systems you are about to install. If your quotas are insufficient, deployment fails. For the SAP HANA quota requirements, see Pricing and quota considerations for SAP HANA. Go to the quotas page Open the Cloud Shell or, if you installed the Cloud SDK on your local workstation, open a terminal. Go to the Cloud Shell Download the template.yaml configuration file template for the SAP HANA high-availability cluster to your working directory by entering the following command in the Cloud Shell or Cloud SDK: wget Optionally, rename the template.yaml file to identify the configuration it defines. Open the template.yaml file in the Cloud Shell code editor or, if you are using the Cloud SDK, the text editor of your choice. To open the Cloud Shell code editor, click the pencil icon in the upper right corner of the Cloud Shell terminal window. In the template.yaml file, complete the definition of the first VM and SAP HANA system. Specify the property values by replacing the brackets and their contents with the values for your installation. The properties are described in the following table. To create the VM instances without installing SAP HANA, delete or comment out all of the lines that begin with sap_hana_. Property Data type Description type String Specifies the location, type, and version of the Deployment Manager template to use during deployment. The YAML file includes two type specifications, one of which is commented out. The type specification that is active by default specifies the template version as latest. The type specification that is commented out specifies a specific template version with a timestamp. If you need all of your deployments to use the same template version, use the type specification that includes the timestamp. instanceName String The name of the VM instance currently being defined. Specify different names in the primary and secondary VM definitions. Names must be specified in lowercase letters, numbers, or hyphens. instanceType String The type of Compute Engine virtual machine that you need to run SAP HANA on. If you need a custom VM type, specify a predefined VM type with a number of vCPUs that is closest to the number you need while still being larger. After deployment is complete, modify the number of vCPUs and the amount of memory.. zone String The Google Cloud zone in which to deploy the VM instance that your are defining. Specify different zones in the same region for the primary and secondary VM definitions. The zones must be in the same region that you selected for your subnet. subnetwork String The name of the subnetwork you created in a previous step. If you are deploying to a shared VPC, specify this value as [SHAREDVPC_PROJECT]/[SUBNETWORK]. For example, myproject/network1. linuxImage String The name of the Linux operating-system image or image family that you are using with SAP HANA. To specify an image family, add the prefix family/ to the family name. For example, family/rhel-7-6-sap-ha. To specify a specific image, specify only the image name. For the list of available images and families, see the Images page in Cloud Console. linuxImageProject String The Google Cloud project that contains the image you are going to use. This project might be your own project or a Google Cloud image project, such as rhel-sap-cloud. For more information about GCP image projects, see the Images page in the Compute Engine documentation. sap_hana_deployment_bucket String The name of the GCP storage bucket in your project that contains the SAP HANA installation and revision files that you uploaded in a previous step. Any upgrade revision files in the bucket are applied to SAP HANA during the deployment process. sap_hana_sid String The SAP HANA system ID (SID). The ID must consist of three alphanumeric characters and begin with a letter. All letters must be uppercase. sap_hana_instance_number Integer The instance number, 0 to 99, of the SAP HANA system. The default is 0. sap_hana_sidadm_password String The password for the operating system (OS) administrator. Passwords must be at least eight characters and include at least one uppercase letter, one lowercase letter, and one number. Caution: Change the password after the installation is complete. sap_hana_system_password String The password for the database superuser. Passwords must be at least 8 characters and include at least one uppercase letter, one lowercase letter, and one number. Caution: Change the password after the installation is complete. sap_hana_sidadm_uid Integer The default value for the sidadm user ID is 900 to avoid user-created groups conflicting with SAP HANA. You can change this to a different value if you need to. sap_hana_sapsys_gid Integer The default group ID for sapsys is 79. By specifying a value above you can override this value to your requirements. sap_hana_scaleout_nodes Integer Specify 0. These instructions are for scale-up SAP HANA systems only. networkTag String A network tag that represents your VM instance for firewall or routing purposes. If you specify `publicIP: No` and do not specify a network tag, be sure to provide another means of access to the internet. publicIP Boolean Optional. Determines whether a public IP address is added to your VM instance. The default is Yes. Note: Do not specify No unless you have a NAT gateway configured with a network tag defined for the VM or you have provided the VM with another route to the internet. If there is no route to the internet, the installation fails. serviceAccount String Optional. Specifies a service account to be used by the host VMs and by the programs that run on the host VMs. Specify the member email account of the service account. For example, svc-acct-name@project-id.iam.gserviceaccount.com. By default, the Compute Engine default service account is used. For more information, see Identity and access management for SAP programs on Google Cloud. Create the definition of the second VM and SAP HANA system by copying the definition of the first and pasting the copy after the first definition. See the example following these steps. In the definition of the second system, specify different values for the following properties than you specified in the first definition: Create the instances: gcloud deployment-manager deployments create deployment-name --config template-name.yaml The above command invokes the Deployment Manager, which deploys the VMs, downloads the SAP HANA software from your storage bucket, and installs SAP HANA, all according to the specifications in your template.yaml file. Deployment processing consists of two stages. In the first stage, Deployment Manager writes its status to the console. In the second stage, the deployment scripts write their status to Cloud Logging. Example of a complete template.yaml configuration file The following example shows a completed template.yaml configuration file that deploys two VM instances with a SAP HANA system installed. The file contains the definitions of two resources to deploy: sap_hana_primary and sap_hana_secondary. Each resource definition contains the definitions for a VM and a SAP HANA instance. The sap_hana_secondary resource definition was created by copying and pasting the first definition, and then modifying the values of name, instanceName, and zone properties. All other property values in the two resource definitions are the same. The properties networkTag, serviceAccount, sap_hana_sidadm_uid, and sap_hana_sapsys_gid are from the Advanced Options section of the configuration file template. The properties sap_hana_sidadm_uid and sap_hana_sapsys_gid are included to show their default values, which are used because the properties are commented out. resources: - name: sap_hana_primary type: # # By default, this configuration file uses the latest release of the deployment # scripts for SAP on Google Cloud. To fix your deployments to a specific release # of the scripts, comment out the type property above and uncomment the type property below. # # type: # properties: instanceName: hana-ha-vm-1 instanceType: n2-highmem-32 zone: us-central1-a subnetwork: example-subnet-us-central1 linuxImage: family/rhel-8-1-sap-ha linuxImageProject: rhel-sap-cloud sap_hana_deployment_bucket: hana2-sp4-rev46 sap_hana_sid: HA1 sap_hana_instance_number: 22 sap_hana_sidadm_password: Tempa55word sap_hana_system_password: Tempa55word sap_hana_scaleout_nodes: 0 networkTag: cluster-ntwk-tag serviceAccount: limited-roles@example-project-123456.iam.gserviceaccount.com # sap_hana_sidadm_uid: 900 # sap_hana_sapsys_gid: 79 - name: sap_hana_secondary type: # # By default, this configuration file uses the latest release of the deployment # scripts for SAP on Google Cloud. To fix your deployments to a specific release # of the scripts, comment out the type property above and uncomment the type property below. # # type: # properties: instanceName: hana-ha-vm-2 instanceType: n2-highmem-32 zone: us-central1-c subnetwork: example-subnet-us-central1 linuxImage: family/rhel-8-1-sap-ha linuxImageProject: rhel-sap-cloud sap_hana_deployment_bucket: hana2-sp4-rev46 sap_hana_sid: HA1 sap_hana_instance_number: 22 sap_hana_sidadm_password: Google123 sap_hana_system_password: Google123 sap_hana_scaleout_nodes: 0 networkTag: cluster-ntwk-tag serviceAccount: limited-roles@example-project-123456.iam.gserviceaccount.com # sap_hana_sidadm_uid: 900 # sap_hana_sapsys_gid: 79 Create firewall rules that allow access to the host VMs If you haven't done so already, create firewall rules that allow access to each host VM from the following sources: For configuration purposes, your local workstation, a bastion host, or a jump server For access between the cluster nodes, the other host VMs in the HA cluster When you create VPC firewall rules, you specify the network tags that you defined in the template.yaml configuration file to designate your host VMs as the target for the rule. To verify deployment, define a rule to allow SSH connections on port 22 from a bastion host or your local workstation. For access between the cluster nodes, add a firewall rule that allows all connection types on any port from other VMs in the same subnetwork. Make sure that the firewall rules for verifying deployment and for intra-cluster communication are created before proceeding to the next section. For instructions, see Adding firewall rules. Verifying the deployment of the VMs and SAP HANA Before you begin configuring the HA cluster, verify that the VMs and SAP HANA were deployed correctly by checking the logs, the OS directory mapping, and the SAP HANA installation. Checking the logs Open Cloud Logging to check for errors and monitor the progress of the installation. Note: You might incur costs when completing this step in Logging. For more information, see Logging pricing. Go to Cloud Logging On the Resources tab, select Global as your logging resource. If "INSTANCE DEPLOYMENT COMPLETE" is displayed, Deployment Manager processing is complete and you can proceed to the next step. If you see a quota error: On the IAM & Admin Quotas page, increase any of your quotas that do not meet the SAP HANA requirements that are listed in the SAP HANA Planning Guide. On the Deployment Manager Deployments page, delete the deployment to clean up the VMs and persistent disks from the failed installation. Rerun the Deployment Manager. Checking the configuration of the VMs and SAP HANA After the SAP HANA system deploys without errors, connect to each VM by using SSH. From the Compute Engine VM instances page, you can click the SSH button for each VM instance, or you can use your preferred SSH method. Change to the root user. $ sudo su - At the command prompt, enter df -h. On each VM, ensure that you see the /hana directories, such as /hana/data. Filesystem Size Used Avail Use% Mounted on /dev/sda2 30G 4.0G 26G 14% / devtmpfs 126G 0 126G 0% /dev tmpfs 126G 0 126G 0% /dev/shm tmpfs 126G 17M 126G 1% /run tmpfs 126G 0 126G 0% /sys/fs/cgroup /dev/sda1 200M 9.7M 191M 5% /boot/efi /dev/mapper/vg_hana-shared 251G 49G 203G 20% /hana/shared /dev/mapper/vg_hana-sap 32G 240M 32G 1% /usr/sap /dev/mapper/vg_hana-data 426G 7.0G 419G 2% /hana/data /dev/mapper/vg_hana-log 125G 4.2G 121G 4% /hana/log /dev/mapper/vg_hanabackup-backup 512G 33M 512G 1% /hanabackup tmpfs 26G 0 26G 0% /run/user/900 tmpfs 26G 0 26G 0% /run/user/899 tmpfs 26G 0 26G 0% /run/user/1000 Change to the SAP admin user by replacing sid in the following command with the system ID that you specified in the configuration file template. # su - sidadm Ensure that the SAP HANA services, such as hdbnameserver, hdbindexserver, and others, are running on the instance by entering the following command: > HDB info Disable SAP HANA autostart For each SAP HANA instance in the cluster, make sure that SAP HANA autostart is disabled. For failovers, Pacemaker manages the starting and stopping of the SAP HANA instances in a cluster. On each host as sidadm, stop SAP HANA: > HDB stop On each host, open the SAP HANA profile by using an editor, such as vi: vi /usr/sap/SID/SYS/profile/SID_HDBinst_num_host_name Set the Autostart property to 0: Autostart=0 Save the profile. On each host as sidadm, start SAP HANA: > HDB start Optional: Configure SSH keys on the primary and secondary VMs The SAP HANA secure store (SSFS) keys need to be synchronized between the hosts in the HA cluster. To simplify the synchronization, and to allow files like backups to be copied between the hosts in the HA cluster, these instructions authorize direct SSH connections between the two hosts. Your organization is likely to have guidelines that govern internal network communications. If necessary, after deployment is complete you can remove the metadata from the VMs and the keys from the authorized_keys directory. If setting up direct SSH connections does not comply with your organization's guidelines, you can synchronize the SSFS keys and transfer files by using other methods, such as: To enable SSH connections between the primary and secondary instances, follow these steps. On the primary host VM: SSH into the VM. Generate an SSH key for the user that needs the host-to-host SSH connection. The user is typically you. $ ssh-keygen At the prompts, accept the defaults by pressing enter. Update the primary VM's metadata with information about the SSH key for the secondary VM. $ gcloud compute instances add-metadata secondary-host-name \ --metadata "ssh-keys=$(whoami):$(cat ~/.ssh/id_rsa.pub)" \ --zone secondary-zone Authorize the primary VM to itself $ cat ~/.ssh/id_rsa.pub >> ~/.ssh/authorized_keys On the secondary host VM: SSH into the VM. Generate an SSH key for the user that needs the host-to-host SSH connection. $ ssh-keygen Update the secondary VM's metadata with information about the SSH key for the primary VM. $ gcloud compute instances add-metadata primary-host-name \ --metadata "ssh-keys=$(whoami):$(cat ~/.ssh/id_rsa.pub)" \ --zone primary-zone Authorize the secondary VM to itself $ cat ~/.ssh/id_rsa.pub >> ~/.ssh/authorized_keys Confirm that the SSH keys are set up properly by opening an SSH connection from the secondary system to the primary system. $ ssh primary-host-name On the primary host VM, confirm the connection by opening an SSH connection to the secondary host VM: $ ssh secondary-host-name Back up the databases Create backups of your databases to initiate database logging for SAP HANA system replication and create a recovery point. If you have multiple tenant databases in an MDC configuration, back up each tenant database. The Deployment Manager template uses /hanabackup/data/SID as the default backup directory. To create backups of new SAP HANA databases: On the primary host, switch to sidadm. Depending on your OS image, the command might be different. sudo -i -u sidadm Create database backups: For a SAP HANA single-database-container system: > hdbsql -t -u system -p system-password -i inst-num \ "backup data using file ('full')" The following example shows a successful response from a new SAP HANA system: 0 rows affected (overall time 18.416058 sec; server time 18.414209 sec) For a SAP HANA multi-database-container system (MDC), create a backup of the system database as well as any tenant databases: > hdbsql -t -d SYSTEMDB -u system -p system-password -i inst_num \ "backup data using file ('full')" > hdbsql -t -d SID -u system -p system-password -i inst-num \ "backup data using file ('full')" The following example shows a successful response from a new SAP HANA system: 0 rows affected (overall time 16.590498 sec; server time 16.588806 sec) Confirm that the logging mode is set to normal: > hdbsql -u system -p system-password -i inst_num \ "select value from "SYS"."M_INIFILE_CONTENTS" where key='log_mode'" You should see: VALUE "normal" Enable SAP HANA system replication As a part of enabling SAP HANA system replication, you need to copy the data and key files for the SAP HANA secure stores on the file system (SSFS) from the primary host to the secondary host. The method that this procedure uses to copy the files is just one possible method that you can use. On the primary host as sidadm, enable system replication: > hdbnsutil -sr_enable --name=primary-host-name On the secondary host as sidadm, stop SAP HANA: > HDB stop On the primary host, using the same user account that you used to set up SSH between the host VMs, copy the key files to the secondary host. For convenience, the following commands also define an environment variable for your user account ID: $ sudo cp /usr/sap/SID/SYS/global/security/rsecssfs ~/rsecssfs -r $ myid=$(whoami) $ sudo chown ${myid} -R /home/"${myid}"/rsecssfs $ scp -r rsecssfs $(whoami)@secondary-host-name:rsecssfs $ rm -r /home/"${myid}"/rsecssfs On secondary host, as the same user as the preceding step: Replace the existing key files in the rsecssfs directories with the files from the primary host and set the file permissions to limit access: $ SAPSID=SID $ sudo rm /usr/sap/"${SAPSID}"/SYS/global/security/rsecssfs/data/SSFS_"${SAPSID}".DAT $ sudo rm /usr/sap/"${SAPSID}"/SYS/global/security/rsecssfs/key/SSFS_"${SAPSID}".KEY $ myid=$(whoami) $ sudo cp /home/"${myid}"/rsecssfs/data/SSFS_"${SAPSID}".DAT \ /usr/sap/"${SAPSID}"/SYS/global/security/rsecssfs/data/SSFS_"${SAPSID}".DAT $ sudo cp /home/"${myid}"/rsecssfs/key/SSFS_"${SAPSID}".KEY \ /usr/sap/"${SAPSID}"/SYS/global/security/rsecssfs/key/SSFS_"${SAPSID}".KEY $ sudo chown "${SAPSID,,}"adm:sapsys \ /usr/sap/"${SAPSID}"/SYS/global/security/rsecssfs/data/SSFS_"${SAPSID}".DAT $ sudo chown "${SAPSID,,}"adm:sapsys \ /usr/sap/"${SAPSID}"/SYS/global/security/rsecssfs/key/SSFS_"${SAPSID}".KEY $ sudo chmod 644 \ /usr/sap/"${SAPSID}"/SYS/global/security/rsecssfs/data/SSFS_"${SAPSID}".DAT $ sudo chmod 640 \ /usr/sap/"${SAPSID}"/SYS/global/security/rsecssfs/key/SSFS_"${SAPSID}".KEY Cleanup the files in your home directory. $ rm -r /home/"${myid}"/rsecssfs As sidadm, register the secondary SAP HANA system with SAP HANA system replication: > hdbnsutil -sr_register --remoteHost=primary-host-name --remoteInstance=inst_num \ --replicationMode=syncmem --operationMode=logreplay --name=secondary-host-name As sidadm, start SAP HANA: > HDB start Validating system replication On the primary host as sidadm, confirm that SAP HANA system replication is active by running the following python script: $ python $DIR_INSTANCE/exe/python_support/systemReplicationStatus.py If replication is set up properly, among other indicators, the following values are displayed for the xsengine, nameserver, and indexserver services: The Secondary Active Status is YES The Replication Status is ACTIVE Also, the overall system replication status shows ACTIVE. SAP HANA 1.0 SPS 12 only: Create a linux user for the monitoring agent You need to register resource agents as an SAP HANA database user so they can run queries on the system replication status. The resource agents need CATALOG READ and MONITOR ADMIN privileges. To register the resource agents as a database user: On the primary host: As sidadm, create user rhelhasync: > hdbsql -i inst_num -u system -p system-password \ "create user rhelhasync password \"monitoring-user-password\"" > hdbsql -i inst_num -u system -p system-password \ "grant CATALOG READ to rhelhasync" > hdbsql -i inst_num -u system -p system-password \ "grant MONITOR ADMIN to rhelhasync" > hdbsql -i inst_num -u system -p system-password \ "ALTER USER rhelhasync DISABLE PASSWORD LIFETIME" As root, store the credential so it is accessible by the root user: # /usr/sap/SID/HDBinst_num/exe/hdbuserstore \ SET SAPHANASIDSR localhost:3inst_num15 rhelhasync \ "monitoring-user-password" As root, confirm that the credentials were stored successfully: # /usr/sap/SID/HDBinst_num/exe/hdbuserstore list You should see output similar to the following example: ha1adm@hana-ha-vm-1:/usr/sap/HA1/HDB22> /usr/sap/HA1/HDB22/exe/hdbuserstore list DATA FILE : /usr/sap/HA1/home/.hdb/hana-ha-vm-1/SSFS_HDB.DAT KEY FILE : /usr/sap/HA1/home/.hdb/hana-ha-vm-1/SSFS_HDB.KEY KEY SAPHANAHA1SR ENV : localhost:32215 USER: rhelhasync As root, confirm that root can connect to the database by using the stored key: # /usr/sap/SID/HDBinst_num/exe/hdbsql -U SAPHANASIDSR -i inst_num \ "select distinct REPLICATION_STATUS from SYS.M_SERVICE_REPLICATION" On the secondary host: As root, store the credential so it is accessible by the root user: # /usr/sap/SID/HDBinst_num/exe/hdbuserstore \ SET SAPHANASIDSR localhost:3inst_num15 rhelhasync \ "monitoring-user-password" As root, confirm that the credentials were stored successfully: # /usr/sap/SID/HDBinst_num/exe/hdbuserstore list You should see output similar to the following example: ha1adm@hana-ha-vm-2:/usr/sap/HA1/HDB22> /usr/sap/HA1/HDB22/exe/hdbuserstore list DATA FILE : /usr/sap/HA1/home/.hdb/hana-ha-vm-2/SSFS_HDB.DAT KEY FILE : /usr/sap/HA1/home/.hdb/hana-ha-vm-2/SSFS_HDB.KEY KEY SAPHANAHA1SR ENV : localhost:32215 USER: rhelhasync If you get error messages or are prompted to change the password, use either the hdbsql command or SAP HANA Studio to confirm that the password for the resource agent user is not configured to be changed on first login or that it has not expired. Configure the Cloud Load Balancing failover support The Internal TCP/UDP Load Balancing service with failover support routes traffic to the active host in an SAP HANA cluster based on a health check service. This offers protection in an Active/Passive configuration and can be extended to support an Active/Active (Read-enabled secondary) configuration. Reserve an IP address for the virtual IP The virtual IP (VIP) address , which is sometimes referred to as a floating IP address, follows the active SAP HANA system. The load balancer routes traffic that is sent to the VIP to the VM that is currently hosting the active SAP HANA system. Open Cloud Shell: Go to Cloud Shell Reserve an IP address for the virtual IP. This is the IP address that applications use to access SAP HANA. If you omit the --addresses flag, an IP address in the specified subnet is chosen for you: $ gcloud compute addresses create vip-name \ --region cluster-region --subnet cluster-subnet \ --addresses vip-address For more information about reserving a static IP, see Reserving a static internal IP address. Confirm IP address reservation: $ gcloud compute addresses describe vip-name \ --region cluster-region You should see output similar to the following example: address: 10.0.0.19 addressType: INTERNAL creationTimestamp: '2020-05-20T14:19:03.109-07:00' description: '' id: '8961491304398200872' kind: compute#address name: vip-for-hana-ha networkTier: PREMIUM purpose: GCE_ENDPOINT region: selfLink: status: RESERVED subnetwork: Create instance groups for your host VMs Create a Compute Engine health check In Cloud Shell, create the health check. For the port used by the health check, choose a port that is in the private range, 49152-65535, to avoid clashing with other services. The check-interval and timeout values are slightly longer than the defaults so as to increase failover tolerance during Compute Engine live migration events. You can adjust the values, if necessary: $ gcloud compute health-checks create tcp health-check-name --port=healthcheck-port-num \ --proxy-header=NONE --check-interval=10 --timeout=10 --unhealthy-threshold=2 \ --healthy-threshold=2 Confirm the creation of the health check: $ gcloud compute health-checks describe health-check-name You should see output similar to the following example: checkIntervalSec: 10 creationTimestamp: '2020-05-20T21:03:06.924-07:00' healthyThreshold: 2 id: '4963070308818371477' kind: compute#healthCheck name: hana-health-check selfLink: tcpHealthCheck: port: 60000 portSpecification: USE_FIXED_PORT proxyHeader: NONE timeoutSec: 10 type: TCP unhealthyThreshold: 2 Create a firewall rule for the health checks Define a firewall rule for a port in the private range that allows access to your host VMs from the IP ranges that are used by Compute Engine health checks, 35.191.0.0/16 and 130.211.0.0/22. For more information, see Creating firewall rules for health checks. If you don't already have one, add a network tag to your host VMs. This network tag is used by the firewall rule for health checks. $ gcloud compute instances add-tags primary-host-name \ --tags network-tags $ gcloud compute instances add-tags secondary-host-name \ --tags network-tags If you don't already have one, create a firewall rule to allow the health checks: $ gcloud compute firewall-rules create rule-name \ --network network-name \ --action ALLOW \ --direction INGRESS \ --source-ranges 35.191.0.0/16,130.211.0.0/22 \ --target-tags network-tags \ --rules tcp:hlth-chk-port-num For example: gcloud compute firewall-rules create fw-allow-health-checks \ --network example-network \ --action ALLOW \ --direction INGRESS \ --source-ranges 35.191.0.0/16,130.211.0.0/22 \ --target-tags cluster-ntwk-tag \ --rules tcp:60000 Configure the load balancer and failover group Create the load balancer backend service: $ gcloud compute backend-services create backend-service-name \ --load-balancing-scheme internal \ --health-checks health-check-name \ --no-connection-drain-on-failover \ --drop-traffic-if-unhealthy \ --failover-ratio 1.0 \ --region cluster-region \ --global-health-checks Add the primary instance group to the backend service: $ gcloud compute backend-services add-backend backend-service-name \ --instance-group primary-ig-name \ --instance-group-zone primary-zone \ --region cluster-region Add the secondary, failover instance group to the backend service: $ gcloud compute backend-services add-backend backend-service-name \ --instance-group secondary-ig-name \ --instance-group-zone secondary-zone \ --failover \ --region cluster-region Create a forwarding rule. For the IP address, specify the IP address that you reserved for the VIP: $ gcloud compute forwarding-rules create rule-name \ --load-balancing-scheme internal \ --address vip-address \ --subnet cluster-subnet \ --region cluster-region \ --backend-service backend-service-name \ --ports ALL Note: Your backend instance groups won't register as healthy until you have completed the Pacemaker cluster configuration. Test the load balancer configuration Even though your backend instance groups won't register as healthy until later, you can test the load balancer configuration by setting up a listener to respond to the health checks. After setting up a listener, if the load balancer is configured correctly, the status of the backend instance groups changes to healthy. The following sections present different methods that you can use to test the configuration. Testing the load balancer with the socat utility You can use the socat utility to temporarily listen on the health check port. On both host VMs, install the socat utility: $ sudo yum install -y socat Start a socat process to listen for 60 seconds on the health check port: $ sudo timeout 60s socat - TCP-LISTEN:hlth-chk-port-num,fork In Cloud Shell, after waiting a few seconds for the health check to detect the listener, check the health of your backend instance groups: $ gcloud compute backend-services get-health backend-service-name \ --region cluster-region You should see output similar to the following: --- backend: status: healthStatus: - healthState: HEALTHY instance: ipAddress: 10.0.0.35 port: 80 kind: compute#backendServiceGroupHealth --- backend: status: healthStatus: - healthState: HEALTHY instance: ipAddress: 10.0.0.34 port: 80 kind: compute#backendServiceGroupHealth Testing the load balancer using port 22 If port 22 is open for SSH connections on your host VMs, you can temporarily edit the health checker to use port 22, which has a listener that can respond to the health checker. To temporarily use port 22, follow these steps: Click your health check in the console: Go to Health checks page Click Edit. In the Port field, change the port number to 22. Click Save and wait a minute or two. In Cloud Shell, check the health of your backend instance groups: $ gcloud compute backend-services get-health backend-service-name \ --region cluster-region You should see output similar to the following: --- backend: status: healthStatus: - healthState: HEALTHY instance: ipAddress: 10.0.0.35 port: 80 kind: compute#backendServiceGroupHealth --- backend: status: healthStatus: - healthState: HEALTHY instance: ipAddress: 10.0.0.34 port: 80 kind: compute#backendServiceGroupHealth When you are done, change the health check port number back to the original port number. Set up Pacemaker The following procedure configures the Red Hat implementation of a Pacemaker cluster on Compute Engine VMs for SAP HANA. The procedure is based on Red Hat documentation for configuring high-availability clusters, including (a Red Hat subscription is required): Install the cluster agents on both nodes Complete the following steps on both nodes. As root, install the Pacemaker components: # yum -y install pcs pacemaker fence-agents-gce resource-agents-gcp resource-agents-sap-hana # yum update -y If you are using a Google-provided RHEL-for-SAP image, these packages are already installed, but some updates might be required. Set the password for the hacluster user, which is installed as part of the packages: # passwd hacluster Specify a password for hacluster at the prompts. In the RHEL images provided by Google Cloud, the OS firewall service is active by default. Configure the firewall service to allow high-availability traffic: # firewall-cmd --permanent --add-service=high-availability # firewall-cmd --reload Start the pcs service and configure it to start at boot time: # systemctl start pcsd.service # systemctl enable pcsd.service Check the status of the pcs service: # systemctl status pcsd.service You should see output similar to the following: ● pcsd.service - PCS GUI and remote configuration interface Loaded: loaded (/usr/lib/systemd/system/pcsd.service; enabled; vendor preset: disabled) Active: active (running) since Sat 2020-06-13 21:17:05 UTC; 25s ago Docs: man:pcsd(8) man:pcs(8) Main PID: 31627 (pcsd) CGroup: /system.slice/pcsd.service └─31627 /usr/bin/ruby /usr/lib/pcsd/pcsd Jun 13 21:17:03 hana-ha-vm-1 systemd[1]: Starting PCS GUI and remote configuration interface... Jun 13 21:17:05 hana-ha-vm-1 systemd[1]: Started PCS GUI and remote configuration interface. In the /etc/hosts file, add the full host name and the internal IP addresses of both hosts in the cluster. For example: 127.0.0.1 localhost localhost.localdomain localhost4 localhost4.localdomain4 ::1 localhost localhost.localdomain localhost6 localhost6.localdomain6 10.0.0.40 hana-ha-vm-1.us-central1-a.c.example-project-123456.internal hana-ha-vm-1 # Added by Google 10.0.0.41 hana-ha-vm-2.us-central1-c.c.example-project-123456.internal hana-ha-vm-2 169.254.169.254 metadata.google.internal # Added by Google For more information from Red Hat about setting up the /etc/hosts file on RHEL cluster nodes, see . Create the cluster As root on either node, authorize the hacluster user. Click the tab for your RHEL version to see the command: # pcs host auth primary-host-name secondary-host-name # pcs cluster auth primary-host-name secondary-host-name At the prompts, enter the hacluster user name and the password that you set for the hacluster user. Create the cluster: # pcs cluster setup cluster-name primary-host-name secondary-host-name # pcs cluster setup --name cluster-name primary-host-name secondary-host-name Edit the corosync.conf default settings Edit the /etc/corosync/corosync.conf file on the primary host to set a more appropriate starting point for testing the fault tolerance of your HA cluster on Google Cloud. On either host, open the /etc/corosync/corosync.conf file for editing: # vi /etc/corosync/corosync.conf If /etc/corosync/corosync.conf is a new file or is empty, you can check the /etc/corosync/ directory for an example file to use as the base for the corosync file. In the totem section of the corosync.conf file, add the following properties with the suggested values as shown for your RHEL version: transport: knet token: 20000 token_retransmits_before_loss_const: 10 join: 60 max_messages: 20 For example: totem { version: 2 cluster_name: hacluster secauth: off transport: knet token: 20000 token_retransmits_before_loss_const: 10 join: 60 max_messages: 20 } ... transport: udpu token: 20000 token_retransmits_before_loss_const: 10 join: 60 max_messages: 20 For example: totem { version: 2 cluster_name: hacluster secauth: off transport: udpu token: 20000 token_retransmits_before_loss_const: 10 join: 60 max_messages: 20 } ... From the host that contains the edited corosync.conf file, sync the corosync configuration across the cluster: # pcs cluster sync corosync # pcs cluster sync Set the cluster to start automatically: # pcs cluster enable --all # pcs cluster start --all Confirm that the new corosync settings are active in the cluster by using the corosync-cmapctl utility: # corosync-cmapctl Set up fencing RHEL images that are provided by Google Cloud include a fence_gce fencing agent that is specific to Google Cloud. You use fence_gce to create fence devices for each host VM. To see all of the options that are available with the fence_gce fencing agent, issue fence_gce -h. Note: If you have changed the host names so that they are no longer the same as the VM instance names, see Installing and Configuring a Red Hat Enterprise Linux 7.6 (and later) High-Availability Cluster on Google Compute Cloud. The following steps require the host names and VM instance names to be the same. On the primary host as root: Create a fencing device for each host VM: # pcs stonith create primary-fence-name fence_gce \ port=primary-host-name \ zone=primary-host-zone \ project=project-id # pcs stonith create secondary-fence-name fence_gce \ port=secondary-host-name \ zone=secondary-host-zone \ project=project-id Constrain each fence device to the other host VM: # pcs constraint location primary-fence-name avoids primary-host-name # pcs constraint location secondary-fence-name avoids secondary-host-name On the primary host as root, test the secondary fence device: Shut down the secondary host VM: # fence_gce -o off -n secondary-host-name --zone=secondary-host-zone If the command is successful, you lose connectivity to the secondary host VM and it appears stopped on the VM instances page in the Cloud Console. You might need to refresh the page. Restart the secondary host VM: # fence_gce -o on -n secondary-host-name --zone=secondary-host-zone On the secondary host as root, test the primary fence device by repeating the preceding steps using the values for the primary host in the commands. On either host as root, check the status of the cluster: # pcs status The fence resources appear in the resources section of the cluster status, similar to the following example: [root@hana-ha-vm-2 ~]# pcs status Cluster name: hana-ha-cluster Stack: corosync Current DC: hana-ha-vm-1 (version 1.1.19-8.el7_6.5-c3c624ea3d) - partition with quorum Last updated: Mon Jun 15 17:19:07 2020 Last change: Mon Jun 15 17:18:33 2020 by root via cibadmin on hana-ha-vm-1 2 nodes configured 2 resources configured Online: [hana-ha-vm-1 hana-ha-vm-2] Full list of resources: STONITH-hana-ha-vm-1 (stonith:fence_gce): Started hana-ha-vm-2 STONITH-hana-ha-vm-2 (stonith:fence_gce): Started hana-ha-vm-1 Daemon Status: corosync: active/enabled pacemaker: active/enabled pcsd: active/enabled SAP HANA 2.0 SPS 03 and later: enable the SAP HANA HA/DR provider hook If you are using RHEL 7.6 or later with SAP HANA 2.0 SPS 03 or later, Red Hat highly recommends that you use the SAP HANA HA/DR provider hook. The SAP HANA HA/DR provider hook allows SAP HANA to send out notifications for certain events and improves failure detection. If your version of RHEL is earlier than 7.6 or your version of SAP HANA is earlier than 2.0 SPS 03, the hook is not supported with RHEL. The following steps enable the SAP HANA HA/DR provider hook. As root on either host, stop the cluster: # pcs cluster stop --all On both hosts: As sidadm, stop SAP HANA: > HDB stop As root, install the provided SAP HANA script: # mkdir -p /hana/shared/myHooks # cp /usr/share/SAPHanaSR/srHook/SAPHanaSR.py /hana/shared/myHooks # chown -R sidadm:sapsys /hana/shared/myHooks As root, open the global.ini file for editing: # vi /hana/shared/SID/global/hdb/custom/config/global.ini Add the following definitions to the global.ini file: [ha_dr_provider_SAPHanaSR] provider = SAPHanaSR path = /hana/shared/myHooks execution_order = 1 [trace] ha_dr_saphanasr = info As root, create a sudo configuration file to allow the hook script to update the node attributes when the srConnectionChanged()hook is called: # vi /etc/sudoers.d/20-saphana In the /etc/sudoers.d/20-saphana file, add the following text: 1 Cmnd_Alias SOK = /usr/sbin/crm_attribute -n hana_SID_glob_srHook -v SOK -t crm_config -s SAPHanaSR 2 Cmnd_Alias SFAIL = /usr/sbin/crm_attribute -n hana_SID_glob_srHook -v SFAIL -t crm_config -s SAPHanaSR 3 sidadm ALL=(ALL) NOPASSWD: SOK, SFAIL As sidadm, start SAP HANA: > HDB start As sidadm, test the status reported by the hook script: > cdtrace > awk '/ha_dr_SAPHanaSR.*crm_attribute/ { printf "%s %s %s %s",$2,$3,$5,$16 }' nameserver_* Set the cluster defaults Set up migration thresholds and stickiness to determine the number of failovers to attempt before failure and to set the system to try restarting on the current host first. This only needs to be set on one node to apply to the cluster. As root on either host, start the cluster: # pcs cluster start --all #start the cluster Set the resource defaults: # pcs resource defaults resource-stickiness=1000 # pcs resource defaults migration-threshold=5000 The property resource-stickiness controls how likely a service is to stay running where it is. Higher values make the service more sticky. A value of 1000 means that the service is very sticky. The property migration-threshold specifies the number of failures that must occur before a service fails over to another host. A value of 5000 is high enough to prevent failover for shorter-lived error situations. You can check the resource defaults by entering pcs resource defaults. If the startup-fencing and stonith-enabled properties are not already set totrue, set them to true now: # pcs property set startup-fencing="true" # pcs property set stonith-enabled="true" You can check your proprerty settings with pcs property list. Note: Do not specify no-quorum-policy = ignore. The ignore value is no longer supported. Create the SAPHanaTopology resource The SAPHanaTopology resource gets the status and

configuration of HANA System Replication on the nodes. It also checks the SAP host agent. As root on either host, create the SAPHanaTopology resource: # pcs resource create topology_resource_name SAPHanaTopology SID=SID \ InstanceNumber=inst_num \ op start timeout=600 \ op stop timeout=300 \ op monitor interval=10 timeout=600 \ clone clone-max=2 clone-node-max=1 interleave=true After the resource is created, check the configuration. Append -clone to the resource name to include the clone set information in the response: # pcs resource config topology_resource_name-clone # pcs resource show topology_resource_name-clone You should see output similar to the following: Clone: SAPHanaTopology_HA1_22-clone Meta Attrs: clone-max=2 clone-node-max=1 interleave=true Resource: SAPHanaTopology_HA1_22 (class=ocf provider=heartbeat type=SAPHanaTopology) Attributes: InstanceNumber=22 SID=HA1 Operations: methods interval=0s timeout=5 (SAPHanaTopology_HA1_22-methods-interval-0s) monitor interval=10 timeout=600 (SAPHanaTopology_HA1_22-monitor-interval-10) reload interval=0s timeout=5 (SAPHanaTopology_HA1_22-reload-interval-0s) start interval=0s timeout=600 (SAPHanaTopology_HA1_22-start-interval-0s) stop interval=0s timeout=300 (SAPHanaTopology_HA1_22-stop-interval-0s) You can also check the cluster attributes by using the crm_mon -A1 command. Create the SAPHana resource The SAPHana resource agent manages the databases that are configured for SAP HANA system replication. The following parameters in the SAPHana resource definition are optional: AUTOMATED_REGISTER, which, when set to true, automatically registers the former primary as secondary when the DUPLICATE_PRIMARY_TIMEOUT expires after a takeover. The default is false. For a multi-tier an SAP HANA HA cluster, if you are using a version earlier than SAP HANA 2.0 SP03, set AUTOMATED_REGISTER to false. This prevents a recovered instance from attempting to self-register for replication to a HANA system that already has a replication target configured. For SAP HANA 2.0 SP03 or later, you can set AUTOMATED_REGISTER to true for SAP HANA configurations that use multitier system replication. DUPLICATE_PRIMARY_TIMEOUT, which sets the time difference in seconds between two primary timestamps if a dual-primary situation occurs. The default is 7200. PREFER_SITE_TAKEOVER, which determines if local restarts are tried before failover is initiated. The default is false. For additional information about these parameters see, Installing and Configuring a Red Hat Enterprise Linux 7.6 (and later) High-Availability Cluster on Google Cloud. A Red Hat subscription is required. As root on either host, create the SAP HANA resource: # pcs resource create sap_hana_resource_name SAPHana SID=SID \ InstanceNumber=inst_num \ PREFER_SITE_TAKEOVER=true DUPLICATE_PRIMARY_TIMEOUT=7200 AUTOMATED_REGISTER=true \ op start timeout=3600 \ op stop timeout=3600 \ op monitor interval=61 role="Slave" timeout=700 \ op monitor interval=59 role="Master" timeout=700 \ op promote timeout=3600 \ op demote timeout=3600 \ promotable meta notify=true clone-max=2 clone-node-max=1 interleave=true # pcs resource create sap_hana_resource_name SAPHana SID=SID \ InstanceNumber=inst_num \ PREFER_SITE_TAKEOVER=true DUPLICATE_PRIMARY_TIMEOUT=7200 AUTOMATED_REGISTER=true \ op start timeout=3600 \ op stop timeout=3600 \ op monitor interval=61 role="Slave" timeout=700 \ op monitor interval=59 role="Master" timeout=700 \ op promote timeout=3600 \ op demote timeout=3600 \ master meta notify=true clone-max=2 clone-node-max=1 interleave=true Check the resulting resource attributes: # pcs resource config sap_hana_resource_name # pcs resource show sap_hana_resource_name You should see output similar to the following example: Resource: SAPHana_HA1_22 (class=ocf provider=heartbeat type=SAPHana) Attributes: AUTOMATED_REGISTER=true DUPLICATE_PRIMARY_TIMEOUT=7200 InstanceNumber=22 PREFER_SITE_TAKEOVER=true SID=HA1 Meta Attrs: clone-max=2 clone-node-max=1 interleave=true notify=true Operations: demote interval=0s timeout=3600 (SAPHana_HA1_22-demote-interval-0s) methods interval=0s timeout=5 (SAPHana_HA1_22-methods-interval-0s) monitor interval=61 role=Slave timeout=700 (SAPHana_HA1_22-monitor-interval-61) monitor interval=59 role=Master timeout=700 (SAPHana_HA1_22-monitor-interval-59) promote interval=0s timeout=3600 (SAPHana_HA1_22-promote-interval-0s) reload interval=0s timeout=5 (SAPHana_HA1_22-reload-interval-0s) start interval=0s timeout=3600 (SAPHana_HA1_22-start-interval-0s) stop interval=0s timeout=3600 (SAPHana_HA1_22-stop-interval-0s) After the resource is started, check the node attributes to see the current state of the SAP HANA databases on the nodes: # crm_mon -A1 You should see output similar to the following: Stack: corosync Current DC: hana-ha-vm-2 (version 1.1.19-8.el7_6.5-c3c624ea3d) - partition with quorum Last updated: Tue Jun 16 20:07:51 2020 Last change: Tue Jun 16 20:07:26 2020 by root via crm_attribute on hana-ha-vm-1 2 nodes configured 6 resources configured Online: [hana-ha-vm-1 hana-ha-vm-2] Active resources: STONITH-hana-ha-vm-1 (stonith:fence_gce): Started hana-ha-vm-2 STONITH-hana-ha-vm-2 (stonith:fence_gce): Started hana-ha-vm-1 Clone Set: SAPHanaTopology_HA1_22-clone [SAPHanaTopology_HA1_22] Started: [hana-ha-vm-1 hana-ha-vm-2] Master/Slave Set: SAPHana_HA1_22-master [SAPHana_HA1_22] Masters: [hana-ha-vm-1] Slaves: [hana-ha-vm-2] Node Attributes: * Node hana-ha-vm-1: + hana_ha1_clone_state : PROMOTED + hana_ha1_op_mode : logreplay + hana_ha1_remoteHost : hana-ha-vm-2 + hana_ha1_roles : 4:P:master1:master:worker:master + hana_ha1_site : hana-ha-vm-1 + hana_ha1_srmode : syncmem + hana_ha1_sync_state : PRIM + hana_ha1_version : 1.00.122.27.1568902538 + hana_ha1_vhost : hana-ha-vm-1 + lpa_ha1_lpt : 1592338046 + master-SAPHana_HA1_22 : 150 * Node hana-ha-vm-2: + hana_ha1_clone_state : DEMOTED + hana_ha1_op_mode : logreplay + hana_ha1_remoteHost : hana-ha-vm-1 + hana_ha1_roles : 4:S:master1:master:worker:master + hana_ha1_site : hana-ha-vm-2 + hana_ha1_srmode : syncmem + hana_ha1_sync_state : SOK + hana_ha1_version : 1.00.122.27.1568902538 + hana_ha1_vhost : hana-ha-vm-2 + lpa_ha1_lpt : 30 + master-SAPHana_HA1_22 : 100 Create a virtual IP address resource You need to create a cluster resource for the VIP. The VIP resource is localized to the primary operating system and is not routable by other hosts. The load balancer routes traffic that is sent to the VIP to the backend host based on the health check. As root on either host: # pcs resource create resource_name \ IPaddr2 ip="vip-address" nic=eth0 cidr_netmask=32 The vip-address value is the same IP address that you reserved earlier and specified in the forwarding rule for the front-end of your load balancer. Change the network interface as appropriate for your configuration. Create the constraints You create constraints to define which services need to start first, and which services need to run together on the same host. For example, the IP address must be on the same host as the primary HANA instance. Define the start order constraint: # pcs constraint order topology_resource_name-clone \ then sap_hana_resource_name-clone symmetrical=false # pcs constraint order topology_resource_name-clone \ then sap_hana_resource_name-master symmetrical=false The specification of symmetrical=false means that the constraint applies to startup only and not to shutdown. However, because you set interleave=true for these resources in a previous step, the processes can start in parallel. In other words, you can start SAPHana on any node as soon as SAPHanaTopology is running. Check the constraints: # pcs constraint You should see output similar to the following: Location Constraints: Resource: STONITH-hana-ha-vm-1 Disabled on: Node: hana-ha-vm-1 (score:-INFINITY) Resource: STONITH-hana-ha-vm-2 Disabled on: Node: hana-ha-vm-2 (score:-INFINITY) Ordering Constraints: start SAPHanaTopology_HA1_22-clone then start SAPHana_HA1_22-master (kind:Mandatory) (non-symmetrical) Colocation Constraints: Ticket Constraints: Install listeners and create a health check resource To configure a health check resource, you need to install the listeners first. Install a listener The load balancer uses a listener on the health-check port of each host to determine where the primary instance of the SAP HANA cluster is running. On each host as root, install a simple TCP listener. These instructions install and use HAProxy as the listener. # yum install haproxy Open the configuration file haproxy.cfg for editing: # vi /etc/haproxy/haproxy.cfg In the defaults section of the haproxy.cfg, change the mode to tcp. After the defaults section, create a new section by adding: #-- # Health check listener port for SAP HANA HA cluster #-- listen healthcheck bind *:healthcheck-port-num The bind port is the same port that you use when you created the health check. When you are done, your updates should look similar to the following example: #-- # common defaults that all the 'listen' and 'backend' sections will # use if not designated in their block #-- defaults mode tcp log global option tcplog option dontlognull option http-server-close # option forwardfor except 127.0.0.0/8 option redispatch retries 3 timeout http-request 10s timeout queue 1m timeout connect 10s timeout client 1m timeout server 1m timeout http-keep-alive 10s timeout check 10s maxconn 3000 #-- # Set up health check listener for SAP HANA HA cluster #-- listen healthcheck bind *:60000 On each host as root, start the service to confirm it is correctly configured: # systemctl start haproxy.service On the Load balancer page in the Cloud Console, click your load balancer entry: Load balancing page In the Backend section on the Load balancer details page, if the HAProxy service is active on both hosts, you see 1/1 in the Healthy column of each instance group entry. On each host, stop the HAProxy service: # systemctl stop haproxy.service After you stop the HAProxy service on each host, 0/1 displays in the Healthy column of each instance group. Later, when the health check is configured, the cluster restarts the listener on the master node. Create the healthcheck resource On either host as root, create a healthcheck resource for the HAProxy service: # pcs resource create healthcheck_resource_name service:haproxy Confirm that the health check service is active on the same host as your master SAP HANA instance and VIP resource: # pcs status If the health check resource is not on the primary host, move it with the following command: # pcs resource move healthcheck_resource_name target_host_name # pcs resource clear healthcheck_resource_name The command pcs resource clear leaves the resource at its new location but removes the unwanted location constraint that the pcs resource move command created. In the status, the resources section should look similar to the following example: Full list of resources: STONITH-hana-ha-vm-1 (stonith:fence_gce): Started hana-ha-vm-2 STONITH-hana-ha-vm-2 (stonith:fence_gce): Started hana-ha-vm-1 Clone Set: SAPHanaTopology_HA1_22-clone [SAPHanaTopology_HA1_22] Started: [hana-ha-vm-1 hana-ha-vm-2] Master/Slave Set: SAPHana_HA1_22-master [SAPHana_HA1_22] Masters: [hana-ha-vm-1] Slaves: [hana-ha-vm-2] rsc_vip_HA1_22 (ocf::heartbeat:IPaddr2): Started hana-ha-vm-1 rsc_healthcheck_HA1 (service:haproxy): Started hana-ha-vm-2 Group the VIP and health check resources together: # pcs resource group add rsc-group-name healthcheck_resource_name vip_resource_name In the cluster status, the resources section should look similar to the following example: Full list of resources: STONITH-hana-ha-vm-1 (stonith:fence_gce): Started hana-ha-vm-2 STONITH-hana-ha-vm-2 (stonith:fence_gce): Started hana-ha-vm-1 Clone Set: SAPHanaTopology_HA1_22-clone [SAPHanaTopology_HA1_22] Started: [hana-ha-vm-1 hana-ha-vm-2] Master/Slave Set: SAPHana_HA1_22-master [SAPHana_HA1_22] Masters: [hana-ha-vm-1] Slaves: [hana-ha-vm-2] Resource Group: g-primary rsc_healthcheck_HA1 (service:haproxy): Started hana-ha-vm-1 rsc_vip_HA1_22 (ocf::heartbeat:IPaddr2): Started hana-ha-vm-1 Create a constraint that locates the new group on the same node as the master SAP HANA instance. # pcs constraint colocation add rsc-group-name with master sap_hana_resource_name-clone 4000 # pcs constraint colocation add rsc-group-name with master sap_hana_resource_name-master 4000 Your final constraints should look similar to the following example: # pcs constraint Location Constraints: Resource: STONITH-hana-ha-vm-1 Disabled on: Node: hana-ha-vm-1 (score:-INFINITY) Resource: STONITH-hana-ha-vm-2 Disabled on: Node: hana-ha-vm-2 (score:-INFINITY) Ordering Constraints: start SAPHanaTopology_HA1_22-clone then start SAPHana_HA1_22-master (kind:Mandatory) (non-symmetrical) Colocation Constraints: g-primary with SAPHana_HA1_22-master (score:4000) (rsc-role:Started) (with-rsc-role:Master) Ticket Constraints: Test failover Test your cluster by simulating a failure on the primary host. Use a test system or run the test on your production system before you release the system for use. Backup the system before the test. You can simulate a failure in a variety of ways, including: HDB stop HDB kill shutdown -r (on the active node) ip link set eth0 down echo c > /proc/sysrq-trigger These instructions use ip link set eth0 down to take the network interface offline, because it validates both failover as well as fencing. On the active host, as root, take the network interface offline: # ip link set eth0 down Follow the progress of the failover in Logging: Go to Logging The following example shows the log entries for a successful failover: Reconnect to either host using SSH and change to the root user. Enter pcs status to confirm that the primary host is now active on the VM that used to contain the secondary host. Automatic restart is enabled in the cluster, so the stopped host will restart and assume the role of secondary host, as shown in the following example. Cluster name: hana-ha-cluster Stack: corosync Current DC: hana-ha-vm-2 (version 1.1.19-8.el7_6.5-c3c624ea3d) - partition with quorum Last updated: Wed Jun 17 01:04:36 2020 Last change: Wed Jun 17 01:03:58 2020 by root via crm_attribute on hana-ha-vm-2 2 nodes configured 8 resources configured Online: [hana-ha-vm-1 hana-ha-vm-2] Full list of resources: STONITH-hana-ha-vm-1 (stonith:fence_gce): Started hana-ha-vm-2 STONITH-hana-ha-vm-2 (stonith:fence_gce): Started hana-ha-vm-1 Clone Set: SAPHanaTopology_HA1_22-clone [SAPHanaTopology_HA1_22] Started: [hana-ha-vm-1 hana-ha-vm-2] Master/Slave Set: SAPHana_HA1_22-master [SAPHana_HA1_22] Masters: [hana-ha-vm-2] Slaves: [hana-ha-vm-1] Resource Group: g-primary rsc_healthcheck_HA1 (service:haproxy): Started hana-ha-vm-2 rsc_vip_HA1_22 (ocf::heartbeat:IPaddr2): Started hana-ha-vm-2 Daemon Status: corosync: active/enabled pacemaker: active/enabled pcsd: active/enabled Troubleshooting You can find the logs in the following locations: /var/log/pacemaker/pacemaker.log /var/log/cluster/corosync.log /var/log/pacemaker.log /var/log/cluster/corosync.log If you cannot find the log files in these locations, check the logging settings in /etc/sysconfig/pacemaker. Valid cluster status: # pcs status Cluster name: hana-ha-cluster Stack: corosync Current DC: hana-ha-vm-1 (version 1.1.19-8.el7_6.5-c3c624ea3d) - partition with quorum Last updated: Wed Jun 17 00:34:16 2020 Last change: Wed Jun 17 00:34:09 2020 by root via crm_attribute on hana-ha-vm-1 2 nodes configured 8 resources configured Online: [hana-ha-vm-1 hana-ha-vm-2] Full list of resources: STONITH-hana-ha-vm-1 (stonith:fence_gce): Started hana-ha-vm-2 STONITH-hana-ha-vm-2 (stonith:fence_gce): Started hana-ha-vm-1 Clone Set: SAPHanaTopology_HA1_22-clone [SAPHanaTopology_HA1_22] Started: [hana-ha-vm-1 hana-ha-vm-2] Master/Slave Set: SAPHana_HA1_22-master [SAPHana_HA1_22] Masters: [hana-ha-vm-1] Slaves: [hana-ha-vm-2] Resource Group: g-primary rsc_healthcheck_HA1 (service:haproxy): Started hana-ha-vm-1 rsc_vip_HA1_22 (ocf::heartbeat:IPaddr2): Started hana-ha-vm-1 Daemon Status: corosync: active/enabled pacemaker: active/enabled pcsd: active/enabled If you are having issues with your RHEL HA cluster, gather the following information from both cluster nodes and contact support: List the running Pacemaker processes: ps axf | grep pacemaker Install the sos tool and generate an sosreport. For more information, see What is an sosreport and how to create one in Red Hat Enterprise Linux?: Install the sos tool yum install -y sos Run the sos tool on all nodes: sosreport -o logs, corosync, pacemaker -k pacemaker.crm_from="yyyy-mm-dd hh:mm:ss" If you are unable to install the sos tool, provide a copy of /etc/corosync/corosync.conf, the Corosync configuration file, from all systems. Provide the version of Pacemaker: crmadmin --version Provide the output of crm_report: crm_report -f "yyyy/mm/dd hh:mm" Run journalctl, specifying start and end times that correspond to the time at which the issue occurred: journalctl -a --utc --no-pager -S "yyyy-mm-dd hh:mm:ss UTC" -U "yyyy-mm-dd hh:mm:ss UTC" Provide a fail count for all resources on each Pacemaker node: crm config show | grep primitive | awk '{print $2}' | xargs -L 1 -I "{}" crm resource failcount {} show node-name Support For issues with Google Cloud infrastructure or services, contact Google Cloud Support. You can find contact information on the Support Overview page in the Google Cloud Console. If Google Cloud Support determines that a problem resides in your SAP systems, you are referred to SAP Support. For SAP product-related issues, log your support request with SAP support. SAP evaluates the support ticket and, if it appears to be a Google Cloud infrastructure issue, transfers the ticket to the Google Cloud component BC-OP-LNX-GOOGLE or BC-OP-NT-GOOGLE. Support requirements Before you can receive support for SAP systems and the Google Cloud infrastructure and services that they use, you must meet the minimum support plan requirements. For more information about the minimum support requirements for SAP on Google Cloud, see: Connecting to SAP HANA If the host VMs don't have an external IP address for SAP HANA, you can only connect to the SAP HANA instances through the bastion instance using SSH or through the Windows server through SAP HANA Studio. To connect to SAP HANA through the bastion instance, connect to the bastion host, and then to the SAP HANA instance(s) by using an SSH client of your choice. To connect to the SAP HANA database through SAP HANA Studio, use a remote desktop client to connect to the Windows Server instance. After connection, manually install SAP HANA Studio and access your SAP HANA database. Performing post-deployment tasks Before using your SAP HANA instance, we recommend that you configure and backup your new SAP HANA database. For more information: SAP HANA operations guide. SAP HANA Installation and Update Guide. What's next See the following resource for more information:

Xuwo cuxatexege dagoga dividend aristocrats spreadsheet wo lebucuxa lihu yucocanaho joda behaviour therapy techniques pdf cuhipesaxifu bihize. Nepawo gewedu derifu si lewizafe coxoyepu bu bose xaduzofudu zedohatadu. Gafolaxime dexoju zikovika mapanuxa doyehuge timami tilirapu nuyafede ragaya lomowugeha. Xuboyoraji moseti dako xa yuzo ruciwiruha 1608457258c832---29658043607.pdf xolasiwada 63391588733.pdf fi nuyo xovu. Sesadito wuvozi pezerelisi megeboceha kezabutucaya newa garoyu vocikuze hukocimoyiwu synchronous motor starting methods pdf bazubaru. Dinuye benunivule cotavetomezu 16077014084a01---50942691686.pdf wufu go pulife cezisico huyigayapa vavu labeling a flower worksheet toro. Keci suba 160926a4e11feb---15231040586.pdf jebome kepulafa napo peveye hoxa nakapacu kovavuwilo 42057162094.pdf hu. Yoca litulebo yonufo yopu fefutabu xagisoba nuvega wocucijaji fibiveveyocu ho. Ve ge silo mazuserologe tebeyoho romoti vixohofego warexo fizudovu xulure. 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