

High Availability for SAP HANA database on Azure using SIOS Protection Suite



for RHEL & SUSE Linux

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Introduction

HANA System Replication is the only supported high availability solution on Azure virtual machines (VMs). SAP HANA Replication consists of one primary node and at least one secondary node. Changes to the data on the primary node are replicated to the secondary node synchronously or asynchronously.

Please refer SAP Note 1662610 Support details for SIOS Protection Suite for Linux

SIOS Protection Suite

SIOS Protection Suite (SPS) for Linux integrates high availability clustering with innovative data replication functionality in a single, enterprise-class solution.



Components of SIOS Protection Suite

SIOS LifeKeeper Core 1. Provides protection of specific resources on a server 2. Witness/Quorum Provides functionality in LifeKeeper to prevent multiple nodes from becoming active at the same time SAP HANA Recovery Kit 3. Provides a mechanism to perform takeover SAP HANA DB from a failed primary server onto a secondary server in a LifeKeeper environment and configure reverse replication IP Recovery Kit 4. provides a mechanism to recover an IP address from a failed primary server to a backup server in a LifeKeeper environment IP-Gen-App Provides a mechanism to move azure IP resource from one VM to another VM in a LifeKeeper environment

SIOS LifeKeeper

The LifeKeeper family of products includes software that allows you to provide failover protection for a range of system resources.

Witness/Quorum

The Quorum/Witness Server Support Package for LifeKeeper (steeleye-lkQWK, hereinafter "Quorum/Witness Package") combined with the existing failover process of the LifeKeeper core allows system failover to occur with a greater degree of confidence in situations where total network failure could be common. This effectively means that local site failovers and failovers to nodes across a WAN can be done while greatly reducing the risk of <u>split-brain</u> situations.

SAP HANA Recovery Kit

SAP HANA provides three different mechanisms to increase the availability.

Host Auto-Failover – At least one standby node added to a SAP HANA system. These nodes are configured to work in standby mode (SAP HANA scale-out)

Storage Replication – The storage used on the SAP HANA node replicates all data to another SAP HANA node. This replication works without a control process from the SAP HANA system. The Storage Replication is provided by hardware partners.

System Replication – SAP HANA replicates all data by using their own feature to a secondary SAP HANA node. Data is constantly pre-loaded on the secondary SAP HANA node. (SAP HANA scale-up)

With this SAP HANA Recovery Kit SAP HANA systems can be controlled through an activated system replication in SIOS LifeKeeper.

IP Recovery Kit

The SIOS Protection Suite for Linux Internet Protocol (IP) Recovery Kit provides a mechanism to recover an IP address from a failed primary server to a backup server in a LifeKeeper environment. The IP Recovery Kit can define an IP address that can be used to connect to a LifeKeeper-protected application. As with other LifeKeeper resources, IP resource switchovers can be initiated automatically as a result of a failure or manually by an administrative action.

IP-Gen-App (optional) Provided As-Is

The IP-Gen-App is a generic application recovery kit used in order to actively communicate with the Azure CLI. It is used to switch the Azure layer IP resource from one node to the other in a switchover or failover event.

Support

SAP Support

Support for SAP products is provided by the customer's SAP support agreement directly from SAP. SIOS does not replace the need for an SAP support agreement.

SIOS Support

As a SIOS Technology Corp. customer with a valid Support contract, you are eligible for support as outlined by the SIOS Technical Support Agreement. The SIOS Technical Support Agreement is provided to each customer with the software purchase.

Implementation

Note:

SLES 12 SP4 with SIOS Protection Suite for Linux 9.3.2 is used in this illustration.

Please refer SAP Note 1662610 for other supported operation systems on Azure

This section describes how to deploy and configure the virtual machines, install the cluster framework, and install and configure SAP HANA System Replication. In the example configurations, installation commands, instance number 00, and HANA System ID S4D are used.



The following list shows the configuration of the HANA & Witness Node IP addresses and Virtual Hostnames configured in DNS.

Components	hostname	IP address	VIP	VHOSTNAME
SAP DB Pool	azsuhana1	11.1.2.51	11.1.2.50	s4ddb
	azsuhana2	11.1.2.52		
SIOS Witness	azsusapwit2	11.1.2.66		

SAP HANA System Replication setup uses a dedicated virtual hostname and virtual IP addresses. On Azure, a load balancer is required to use a virtual IP address. The following list shows the configuration of the load balancer:

The IP address for the front-end configuration is 11.1.2.50 for s4ddb

For the back-end configuration, connect the load balancer to primary network interfaces of all virtual machines that should be part of HANA System Replication

Probe Port: Port 62503

Load-balancing rules: 30313 TCP, 30315 TCP, 30317 TCP

Deploy Infrastructure

Please refer corresponding azure docs to provision you infrastructure, Install HANA and configure HSR

<u>SLES</u>

<u>RHEL</u>

Install SIOS Protection Suite & Recovery Kits

The following SIOS components are installed in respective nodes.

LifeKeeper Core

- azsuhana1
- azsuhana2
- azsusapwit2

Witness/Quorum

• azsusapwit2

Note: - recommended to use 1 witness/cluster

SAP HANA 2.0 Application Recovery Kit & IP Recovery Kit

- azsuhana1
- azsuhana2

Install SIOS Protection Suite

See http://docs.us.sios.com/spslinux/9.3.2/en/topic/installing-the-software

Preparing Installation Media

- download the following media from the FTP link sent by SIOS
- download the SIOS Protection Suite's sps.img

- download the HANA Application Recovery Kit based on your HANA version HANA2-ARK.run
- download the Azure IP Recovery kit SIOS_enhancedAzure_gen_app-02.02.00.tgz

PLEASE NOTE: The file name may vary based on the version

Mount the Installation Media

mkdir -p /DVD

mount /sapmedia/SIOS931/sps.img /DVD -t iso9660 -o loop

mount: /dev/loop0 is write-protected, mounting read-only

Install SIOS Protection Suite - Witness Nodes

 $\mathsf{cd}\,/\mathsf{DVD}$

./setup

Please proceed with the installation steps as shown below:

-Nain configuration Arrow keys navigate the menu. <enter> selects submenus> (or empty submenus). Highlighted letters are hotkeys. Pressing <y> Installs features, <n> Ru Press <esc><to <?="" exit,=""> for Help, for Search.</to></esc></n></y></enter>	emoves features.
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Please repeat the steps for all witness nodes.

Install SIOS Protection Suite - SAP Recovery Kit

a a an

Install SAP Recovery Kit in HANA Nodes change directory to SIOS installation media which was mounted as /DVD

cd /DVD
./setup



FIGURE 1 - SELECT "INSTALL LICENSE KEY"

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SIOS Protection Suite for Linux 9.3.1-6750 setup		
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	it.	
	/sapmedia/90dayMSFT.lic	
	< Ok > <cancel> < Help ></cancel>	
		-

FIGURE 2 - ENTER THE LICENSE PATH & CLICK "OK"

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FIGURE 3 - SELECT "RECOVERY KIT SELECTION MENU"

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FIGURE 4 - SELECT "APPLICATION SUITE"

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FIGURE 5 - SELECT "LIFEKEEPER SAP RECOVERY KIT"

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<pre><select> < Done > < Help > < Save > < Load ></select></pre>

FIGURE 6 - SELECT "LIFEKEEPER STARTUP AFTER INSTALL" & SELECT "DONE"



FIGURE 7 - SELECT "YES" & PRESS "ENTER"



FIGURE 8 - INSTALLATION COMPLETED



FIGURE 9 - LICENSE CHECK MESSAGE

Please repeat the steps on all cluster nodes

Install SAP HANA Application Recovery Kit

Install the rpm downloaded into the /tmp directory.

rpm -ivh /tmp/steeleye-lkHOTFIX-HANA-SP1-9.1.0-6538.noarch.rpm

See http://docs.us.sios.com/spslinux/9.4.0/en/topic/sap-hana-installation-and-configuration

Install SIOS Enhanced Azure IP Gen Application (Optional) *Provided as is You will receive the FTP link to download the tgz file.

- Use gunzip to unzip the tar file.
- Use command "tar -xvf" to untar the file.
- Run the setup program.
- NOTE: Make sure you put the files in a folder that is safe to execute. On some installations, programs need to be authorized to execute from certain folders. You can make sure that the setup program has execute permission (chmod +x setup.)
- Repeat these steps on the other node.
- Note the folder where the files are stored (e.g. /root/folder)

Configure HANA System Replication

Backup HANA Database

Back up the databases as <hanasid>adm:

hdbsql -d SYSTEMDB -u SYSTEM -p "passwd" -i 00 "BACKUP DATA USING FILE ('initialbackupSYS')" hdbsql -d S4D -u SYSTEM -p "passwd" -i 00 "BACKUP DATA USING FILE ('initialbackupS4D')"

Copy the system PKI files to the secondary site:

scp /usr/sap/S4D/SYS/global/security/rsecssfs/data/SSFS_S4D.DAT azsuhana2:/usr/sap/S4D/SYS/global/security/rsecssfs/data/ scp /usr/sap/S4D/SYS/global/security/rsecssfs/key/SSFS_S4D.KEY azsuhana2:/usr/sap/S4D/SYS/global/security/rsecssfs/key/

Create the primary site:

hdbnsutil -sr_enable --name=left

Configure System Replication on the second node:

Register the second node to start the system replication. Run the following command as <hanasid>adm :

sapcontrol -nr 00 -function StopWait 600 10 hdbnsutil -sr_register --remoteName=left --remoteHost=azsuhana1 --remoteInstance=00 -replicationMode=syncmem --operationMode=logreplay --name=right

Create HANA Cluster Resource

Create Communication Path between Cluster Nodes and Witness

A communication path or comm path is a key part of the SIOS Protection Suite fault detection mechanism. The comm path defines the path over which SIOS sends periodic heartbeat signals between servers. This regular heartbeat signal tells each connected server, as defined by the comm paths, that the other server is still alive and active. Comm paths can be tuned via parameters to increase the heartbeat interval or detection interval, see the <u>SIOS Parameters documentation</u>.

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Properties Panel	Properties Panel
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azsusapwit2: Only one comm path defined to server. azsuhana2: Only one comm path defined to server.	azsusapwi2: Only one comm path defined to server. azsuhana1: Only one comm path defined to server.
OK Apply Cancel Help	OK Apply Cancel Help
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Server: azsusapwit2	
General CommPaths Resources	
Server Priority State Type Address/Device azsuhana1 1 ALIVE TCP 11.1.2.66(11.1.2.57) azsuhana2 1 ALIVE TCP 11.1.2.66(11.1.2.57) azsuhana2 1 ALIVE TCP 11.1.2.66(11.1.2.57) azsuhana2: Only one comm path defined to server. azsuhana1: Only one comm path defined to server.	
OK Apply Cancel Help	

Create Azure IP Gen App for HANA (Optional)

Install Azure CLI

Install Azure CLI on the (A)SCS cluster nodes which is a pre-requisite for SIOS Enhanced Azure IP GenApp. Please refer to the installation procedure respective to OS

- <u>RHEL</u>
- <u>SLES</u>

Please login to portal.azure.com from the server.

```
az login --use-device-code
```

To sign in, use a web browser to open the page https://microsoft.com/devicelogin and enter the code "B3D42JUFD" to authenticate

Create Azure IP Gen App

🛓 LifeKeeper GUI@azsuhana1	
Eile Edit Yiew Help Server Disconnect Resource Befresh	
▲ View Logs	
Hierarchies Create Resource Hierarchy	
None Defined Greate Comm Path azsuhana1	
Delete Comm Path	
<u>ropenes</u>	
📓 Create Resource Wizard@azsuhana1 X	Create Resource Wizard@azsuhana1 X
Please Select Recovery Kit Generic Application	Switchback Type intelligent 🔻
Kack	_ <back cancel<="" next:="" th=""></back>
🛃 Create Resource Wizard@azsuhana1 X	🔬 Create gen/app Resource@azsuhana1 X
Server azsuhanal 💌	Restore Script [optLifeKeeper/ip_genapp/restore] Enter the pathname for the shell script or object program which starts the application. The restore script is responsible for bringing a protected application resource in-service. The restore script should not impact an active resource application where invoked. Valid characters allowed in the script pathname are letters, digits, and the following special characters: -1./ A copy of this script or program will be saved under: /pvfLifeKeeper/subsysters/specific/mones/specificms Whenever this resource is extended to a new server, the copy will be passed to that server.
<back next=""> Cancel Help</back>	<back next=""> Cancel Help</back>
Create gen/app Resource@azsuhana1 X Remove Script //opt/LifeKeeper//p_genapp/remove	Create gen/app Resource@azsuhana1 X QuickCheck Script [optional] /opt/LifeKeeper/ip_genapp/quickCheck v
Enter the pathname for the shell script or object program which stops the application. The remove script is responsible for stopping a protected application resource and putting it in the out-of-service state. Valid characters allowed in the script pathname are letters, digits, and the following special characters: 1./ A copy of this script or program will be saved under: /opt).If a Keeper/subsys/gen/resources/app/actions Whenever this resource is extended to a new server, the copy will be passed to that server.	Enter the pathname for the shell script or object program which monitors the application. The quickCheck script is called periodically, and is responsible for performing a health check of the protected application. The quickCheck script is optional. If one is not provided it will always be assumed that the application is in an OK state. Valid characters allowed in the script pathname are letters, digits, and the following special characters: l./ A copy of this script or program will be saved under: /pyt/letKeepet/subsys/gen/resources/appl/actions Whenever this resource is extended to a new server, the copy will be passed to that server.
-SBack Next> Cancel Help	-SBack Nexts Cancel Help

Image: Create gen/app Resource@azsuhana1 >	📓 Create gen/app Resource@azsuhana1 🛛 🗙
Local Recovery Script [optional] [optiLifeKeeper/ip_genapp/recover 🗸	
Enter the pathname for the shell script or object program which will attempt to recover a failed application on the local server. This may require stopping and restarting the application.	Application Info [optional] C_APP-azsuhana2 11.1.2.52 11.1.2.50 eth0 S4DDB
The local recovery script is optional - if you do not want to provide one, simply clear the entry field. If no local recovery script is provided, the protected application will always fail over to the target when a quickCheck error occurs.	
Valid characters allowed in the script pathname are letters, digits, and the following special characters:1./	Enter any optional data for the application resource instance that may be needed by the restore and remove scripts.
A copy of this script or program will be saved under: /op/(LifeKceper/subsys/gen/resources/app/actions Whenever this resource is extended to a new server, the copy will be passed to that server.	remove scripts. The valid characters allowed for the data field are letters, digits, and the following special characters:/=[space]
<back next=""> Cancel Help</back>	Kelp
Greate gen/app Resource@azsuhana1	Create gen/app Resource@azsuhana1 X
Bring Resource In Service Yes This field allows the user to specify if the resource should be brought in-service following a successful create. • A user may want to select No if the dependent resources have not been created and the restore command would fail. If No is selected, the resource will be created but will not be brought in-service. The resource cannot be extended until the hierarchy has been placed in-service. • Selecting Yes will cause the user provided restore script to be invoked after the resource has been created.	Creating gen/app resource az-ip-11.1.2.50 on azsuhana1 /opt/LifeKeeper/kadm/SubsySgen/App/bin/Creapphire azsuhana1 /opt/LifeKeeper/kp_genapp/restore /opt/LifeKeeper/kp_genapp/remove az-ip-11.1.2.50 StOS-SUSE NIC_APP-azsuhana1 11.1.2.51 NIC_APP-azsuhana2 11.1.2.52 11.1.2.50 eth0 S4DDB intelligent /opt/LifeKeeper/kp_genapp/quickCheck /opt/LifeKeeper/kp_genapp/recover Yes BEGIN create of "az-ip-11.1.2.50" creating resource "az-ip-11.1.2.50" resource "az-ip-11.1.2.50" BEGIN restore of "az-ip-11.1.2.50" INFORMATION: BEGIN restore of az-ip-11.1.2.50" INFORMATION: BEGIN restore of az-ip-11.1.2.50 on azsuhana1 Note: This process could take up to 2 minutes Messages produced while creating az-ip-11.1.2.50 will be displayed in this dialog and the output panel (if
<back next=""> Cancel Help</back>	open), and logged on <i>azschana1</i> .
Create gen/app Resource@azsuhana1	
Creating gen/app resource az.ip-11.12.50 on azsuhana1 NIC_APP-azsuhana21.12.51 int.2.50 on azsuhana1 NIC_APP-azsuhana21.12.52 int.2.7.50 eth0 S4UDB intelligent /opt1/iFk/ceper/ip_genapp/quick/Check /opt1/iFk/ceper/ip_genapp/recover Yes BEGIN resource "az-ip-11.1.2.50" resource "az-ip-11.1.2.50" INFORMATION: BEGIN restore of az-ip-11.1.2.50 INFORMATION: END successful restore of az-ip-11.1.2.50" INFORMATION: END successful restore of az-ip-11.1.2.50" INFORMATION: END successful restore of az-ip-11.1.2.50" Resource "az-ip-11.1.2.50" INFORMATION: END successful restore of az-ip-11.1.2.50" INFORMATION: END successful restore of az-ip-11.1.2.50" Resource "az-ip-11.2.50" INFORMATION: END successful restore of az-ip-11.1.2.50" Resource "az-ip-11.1.2.50" Resource "az-ip-11.1.2.50" Resource "az-ip-11.2.50"	Target Server
END successful create of "az-ip-11.1.2.50"	You have successfully created the resource hierarchy az-ip-11.1.2.50 on azsuhana1. Select a target server to which the hierarchy will be extended.
Messages produced while creating az-ip-11.1.2.50 will be displayed in this dialog and the output panel (if open), and logged on azsuhana1 .	If you cancel before extending az-ip-11.1.2.50 to at least one other server, LifeKeeper will provide no protection for the applications in the hierarchy.
-Back Cancel Help	<back next=""> Accept Defaults Cancel Help</back>
🔬 Pre-Extend Wizard@azsuhana1 X	🕵 Pre-Extend Wizard@azsuhana1 🛛 🕹
Switchback Type intelligent 💌	Template Priority 1
<back next=""> Accept Defaults Cancel Help</back>	<back next=""> Accept Defaults Cancel Help</back>

	hy az-ip-11.1.2.50 to ser ces for az-ip-11.1.2.50 1.2.50" "az-ip-11.1.2.50" rhierarchy z-ip-11.1.2.50) Released ended	i ItsFinish	Help		
 	ial ihy az-ip-11.1.2.50 to ser ces for az-ip-11.1.2.50 "az-ip-11.1.2.50" rhierarchy z-ip-11.1.2.50) Released ended ver	ver azsuhana2	×	<back< th=""> Nextb Accept Defaults Cancel Iterarchy Integrity Verification@azsuhana1 Verifying Integrity of Extended Hierarchy Examining hierarchy on azsuhana2 Hierarchy Verification Finished</back<>	Help
<back nexts<="" td=""><td>a1 hy az-ip-11.1.2.50 to ser ces for az-ip-11.1.2.50 "az-ip-11.1.2.50" rhierarchy z-ip-11.1.2.50) Released ended</td><td>ver azsuhana2</td><td>×</td><td><back< th=""> Nextb Accept Defaults Cancel Iterarchy Integrity Verification@azsuhana1 Verifying Integrity of Extended Hierarchy Examining hierarchy on azsuhana2 Hierarchy Verification Finished</back<></td><td>Help</td></back>	a1 hy az-ip-11.1.2.50 to ser ces for az-ip-11.1.2.50 "az-ip-11.1.2.50" rhierarchy z-ip-11.1.2.50) Released ended	ver azsuhana2	×	<back< th=""> Nextb Accept Defaults Cancel Iterarchy Integrity Verification@azsuhana1 Verifying Integrity of Extended Hierarchy Examining hierarchy on azsuhana2 Hierarchy Verification Finished</back<>	Help
<back nexts<="" td=""><td>a1 hy az-ip-11.1.2.50 to ser ces for az-ip-11.1.2.50 "az-ip-11.1.2.50" rhierarchy z-ip-11.1.2.50) Released ended</td><td>ver azsuhana2</td><td>×</td><td><back< th=""> Nextb Accept Defaults Cancel Iterarchy Integrity Verification@azsuhana1 Verifying Integrity of Extended Hierarchy Examining hierarchy on azsuhana2 Hierarchy Verification Finished</back<></td><td>X</td></back>	a1 hy az-ip-11.1.2.50 to ser ces for az-ip-11.1.2.50 "az-ip-11.1.2.50" rhierarchy z-ip-11.1.2.50) Released ended	ver azsuhana2	×	<back< th=""> Nextb Accept Defaults Cancel Iterarchy Integrity Verification@azsuhana1 Verifying Integrity of Extended Hierarchy Examining hierarchy on azsuhana2 Hierarchy Verification Finished</back<>	X
<back nexts<br="">Extend Wizard@azsuhar Extending resource hierarc Extending resource instan BEGIN extend of "az-ip-1 BEGIN extend of "az-ip-1 Creating dependencies Setting switchback type fo Creating equivalencies LifeKeeper Admin Lock (arbit</back>	ial ihy az-ip-11.1.2.50 to ser ces for az-ip-11.1.2.50 1.2.50" "az-ip-11.1.2.50" r hierarchy z-ip-11.1.2.50) Released	ver azsuhana2			Help
	Accept Defaults	Cancel	Help		
/				/=[space]	in characters.
		azsuhana2. digits, and the following special cl	haracters:	Enter any optional data for az-ip-11.1.2.50 that may be needed by the restore and remo azsuthana2 The valid characters allowed for the data field are letters, digits, and the following specia	
	Resource Ta,	g az-ip-11.1.2.50		Application Info [optional] SIOS-SUSE NIC_APP-azsuhana1	11.1.2.51 NIC_AP
Extend gen/app Resource Template Server: azsuhana Tag to Extend: az-ip-11.1.2 Target Server: azsuhana2	-		×	Extend gen/app Resource Hierarchy@azsuhana1 Template Server: azsuhana1 Tag to Extend: az-ip-111.2.50 Target Server: azsuhana2	×
<back nexts<="" td=""><td>Accept Defaults</td><td>Cancel</td><td>Help</td><td>-<back accept="" cancel<="" defaults="" nexts="" td=""><td>Help</td></back></td></back>	Accept Defaults	Cancel	Help	- <back accept="" cancel<="" defaults="" nexts="" td=""><td>Help</td></back>	Help
	Target Priori	ty 10	•		
				Pre Extend checks were successful	
			×	Pre-Extend Wizard@azsuhana1 Executing the pre-extend script Building independent resource list Checking existence of extend and camextend scripts]

Create IP Resource for HANA

lierarchies O Active Protected		azsuhanal		azsuhana2		azsusapwir2
🔗 az-ip-11.1.2.50		Active	1 😍	StandBy	10	activity of the
🤹 Create Resource Wiz	ard@azsuhana1		×	͡ Create Resource Wizard€	₽azsuhana1	×
	Please Select Recovery	/Kit IP	v		Switchback Type intelligent	
 	Cancel		Help X	<back nexte<="" td=""><td>Cancel</td><td>HelpX</td></back>	Cancel	HelpX
	Ser	ver azsuhanal	•		IP Resource 11.1.2.50	
				to login into the parent app exist in the local /etc/hosts entrγ, including aliases, is use, it will be rejected. If a	nbolic name to be switched by LifeKeeper lication over a specific network interface. I file or be accessible via a Domain Name S acceptable. If the address cannot be deter symbolic name is given, it is used for trans th IPv4 and IPv6 style addresses are supp	f a symbolic name is used, it must Server (DNS). Any valid hosts file mined or if it is found to be already in lation to an IP address and is not
<back next=""></back>	Cancel		Help	<back next=""></back>	Cancel	Help
🛓 Create comm/ip Res		ask 255.255.255.0	×	🔄 Create comm/ip Resourc	e@azsuhana1 Network Interface eth0	×
specified IP resource a Note: The choice of ne	ddress is valid (IPv4 or IP).	address, determines the subne		protection. The network inte style addresses). The defai server that supports the cla	interface that will be used for the IP resou rface must support the class of the IP add It value is the first valid retework interface so of the address being protected. Valid c he values chosen for the IP resource addr	ress being protected (IPv4 or IPv6 hat LifeKeeper finds on the target loices will depend on the existing

📓 Create comm/ip Resource@azsuhana1 🛛 🗙	Screate comm/ip Resource@azsuhana1
IP Resource Tag vip-11.1.2.50	Creating comm/(presource BEGIN create of Vip-111.2.50" LifeKeeper application-common azsuhanal. LifeKeeper communications resource type= ip on azsuhanal. Creating resource instance with id IP-11.1.2.50 on machine azsuhanal Resource source instance ated on azsuhanal BEGIN restore of Vip-11.1.2.50" END successful create of Vip-11.1.2.50".
Enter a unique name that will be used to identify this IP resource instance on azsuhana1 . The default tag includes the protected IP address. The valid characters allowed for the tag are letters, digits, and the following special characters: (
_ <back cancelhelp<="" create="" td=""><td><back next=""> Cancel Help</back></td></back>	<back next=""> Cancel Help</back>
📓 Pre-Extend Wizard@azsuhana1 X	🛃 Pre-Extend Wizard@azsuhana1 X
Target Server azsuhana2 💌	Switchback Type intelligent
You have successfully created the resource hierarchy vip-11.1.2.50 on azsuhana1. Select a target server to which the hierarchy will be extended.	
If you cancel before extending vip-11.1.2.50 to at least one other server, LifeKeeper will provide no protection for the applications in the hierarchy.	
	<back next=""> Accept Defaults Cancel Help</back>
Fre-Extend Wizard@azsuhana1	Fre-Extend Wizard@azsuhana1 X
Template Priority 1	Target Priority 10 💌
<back next=""> Accept Defaults Cancel Help</back>	<back next=""> Accept Defaults Cancel Help</back>
Pre-Extend Wizard@azsuhana1 X	
Executing the pre-extend script Building independent resource list Checking existence of extend and canextend scripts	Template Server: azsuhanal Tag to Extend: vip:11.1.2.50 Target Server: azsuhana2
Checking existence of extend and carrecterio scripts Checking extendability for up: 11.1.2.50 Pre Extend checks were successful	
	IP Resource 11.1.2.50 The IP address or symbolic name to be protected by the IP resource on the target server. The same value that was used on the template server is used for the IP resource on the target server. Therefore, this value
<back next=""> Accept Defaults Cancel Help</back>	cannot be changed. The IP resource is used by client applications to login into the parent application over a specific network interface. If a symbolic name is used, it must estimin the local (Archosts file or be accessible via a Domain Name Server (DNS). Any valid hosts file entry, including aliases, is acceptable. If the address cannot be determined or if it is found to be already in use, it will be rejected. If a symbolic name is given, it is used for translation to an IP address and is not retained by LifeKeeper. Both IPv4 and IPv6 style addresses are supported. <back next=""> Accept Defaults Cancel Help</back>
Incip	The second care for the

🔬 Extend comm/ip Resource Hierarchy@azsuhana1 X	Extend comm/ip Resource Hierarchy@azsuhana1
Template Server: azsuhana1	Template Server: azsuhana1
Tag to Extend: vip-11.1.2.50 Target Server: azsuhana2	Tag to Extend: vip-11.1.2.50 Target Server: azsuhana2
Netmask 255.255.255.0	Network Interface eth0
	Select a network interface to be used by the IP resource on the target server. The network interface must
Enter or select a network mask for the IP resource. Any standard network mask for the class of the specified IP resource address is valid (IPv4 or IPv6 style addresses).	support the class of the IP address being protected (IPv4 or IPv6 style addresses). The default value is the first valid network interface that LifeKeeper finds on the target server that supports the class of the
Note: The choice of netmask, combined with the address, determines the subnet to be used by the IP	address being protected. Valid choices will depend on the existing network configuration and the values
resource and should be consistent with the network configuration.	chosen for the IP resource address and netmask.
<back next=""> Accept Defaults Cancel Help</back>	<back next=""> Accept Defaults Cancel Help</back>
🛃 Extend comm/ip Resource Hierarchy@azsuhana1 🛛 🕹	🛃 Extend Wizard@azsuhana1 🛛 🕹
Template Server: azsuhana1	Extending resource hierarchy vip-11.1.2.50 to server azsuhana2
Tag to Extend: vip-11.1.2.50	Extending resource instances for vip-11.1.2.50
Target Server: azsuhana2	Creating dependencies Setting switchback type for hierarchy
	Creating equivalencies
	LifeKeeper Admin Lock (vip-11.1.2.50) Released Hierarchy successfully extended
IP Resource Tag vip-11.1.2.50	
Enter a unique name that will be used to identify this IP resource instance on azsuhana2 . The valid	
characters allowed for the tag are letters, digits, and the following special characters:	
/	
<back accept="" cancel="" defaults="" extend="" help<="" th=""><th><back accept="" defaults="" finish="" help<="" next="" server="" th=""></back></th></back>	<back accept="" defaults="" finish="" help<="" next="" server="" th=""></back>
Hierarchy Integrity Verification@azsuhana1 X	
Verifying Integrity of Extended Hierarchy Examining hierarchy on azsuhana2	
Hierarchy Verification Finished	
<back accept="" cancel="" defaults="" done="" help<="" th=""><td></td></back>	

Create HANA Cluster Resource

🔬 LifeKeeper GU	I@azsuhana1						-	×
Eile Edit View								
Resource •	Disconnect Refresh							
•	View Logs							 •
Hierarchies	Create Resource Hierarchy							1
Active Prot	Delete Comm Path	azsuhanai		azsuhana2		azsusapwit2		
← 🔗 vip-11.1.3 L 🔗 az-ip-	Properties	Active	1 😍	StandBy	10			
L 🕜 az-ip-	11.1.2.50	Active	1 😍	StandBy	10			

Create Resource Wizard@azsuhana1	×
Please Select Recovery Kit Generic Application	-
	Help
Create Resource Wizard@azsuhana1	×

Marrie .

Switchback Type intelligent	•
-----------------------------	---

🛓 Create Resource Wizard@azsuhana1			×
	Server	azsuhanal	-
			I
<back next=""> Cancel</back>			Help
<back next=""> Cancel</back>	Server	azsuhana1	1

/opt/LifeKeeper/HANA2-ARK/restore.pl

/opt/LifeKeeper/HANA2-ARK/remove.pl

/opt/LifeKeeper/HANA2-ARK/quickCheck.pl

/opt/LifeKeeper/HANA2-ARK/recover.pl

🛓 Create ge	en/app Resource@azsuhana1	:
	Restore Script /opt/LifeKeeper/HANA2-ARK/restore.pl	•
is responsil impact an a	athname for the shell script or object program which starts the application. The rest ole for bringing a protected application resource in-service. The restore script shou ctive resource application when invoked.	uld not
1./	cters allowed in the script pathname are letters, digits, and the following special ch is script or program will be saved under:	aracters:
/opt/Life	Keeper/subsys/gen/resources/app/actions his resource is extended to a new server, the copy will be passed to that server.	
<back< td=""><td>Next> Cancel</td><td>Help</td></back<>	Next> Cancel	Help
🛓 Create ge	n/app Resource@azsuhana1	;
	Remove Script /opt/LifeKeeper/HANA2-ARK/remove.pl	•
	athname for the shell script or object program which stops the application. The rem alle for stopping a protected application resource and putting it in the out-of-service	
Valid chara 1./	cters allowed in the script pathname are letters, digits, and the following special ch	aracters:
/opt/Life	is script or program will be saved under: Keeper/subsys/gen/resources/app/actions his resource is extended to a new server, the copy will be passed to that server.	
<back< td=""><td>Next> Cancel</td><td>Help</td></back<>	Next> Cancel	Help

and the second

🔄 Create gen/app Resource@azsuhana1	×
QuickCheck Script [optional] /opt/LifeKeeper/HANA2-ARK/quickCl	neck.pl 🔻
Enter the pathname for the shell script or object program which monitors the application. The quickCheck script is called periodically, and is responsible for performing a health check of application.	
The quickCheck script is optional. If one is not provided it will always be assumed that the in an OK state.	application is
Valid characters allowed in the script pathname are letters, digits, and the following special1./	l characters:
A copy of this script or program will be saved under: / opt/LifeKeeper/subsys/gen/resources/app/actions Whenever this resource is extended to a new server, the copy will be passed to that server	
	Help
🔄 Create gen/app Resource@azsuhana1	×

Local Recovery Script [optional] /opt/LifeKeeper/HANA2-ARK/recover.pl 💌

Enter the pathname for the shell script or object program which will attempt to recover a failed application on the local server. This may require stopping and restarting the application.

The **local recovery** script is optional - if you do not want to provide one, simply clear the entry field. If no **local recovery** script is provided, the protected application will always fail over to the target when a **quickCheck** error occurs.

Valid characters allowed in the script pathname are letters, digits, and the following special characters: -_1./

A copy of this script or program will be saved under:

/opt/LifeKeeper/subsys/gen/resources/app/actions

Whenever this resource is extended to a new server, the copy will be passed to that server.

	_
--	---

🔄 Create gen/app Resource@azsuhana1	×
Application Info [optional] S4D 00 syncmem left logreplay	
Enter any optional data for the application resource instance that may be needed by the restore and remove scripts.	
The valid characters allowed for the data field are letters, digits, and the following special characters: /= [space]	
<pre> <back next=""> Cancel H</back></pre>	elp
🛓 Create gen/app Resource@azsuhana1	×
Bring Resource In Service Yes	-
This field allows the user to specify if the resource should be brought in-service following a successfuce create.	ıl
 A user may want to select No if the dependent resources have not been created and the rest command would fail. If No is selected, the resource will be created but will not be brought in-service. The resource cannot be extended until the hierarchy has been placed in-service. Selecting Yes will cause the user provided restore script to be invoked after the resource has been placed. 	
been created.	

Creating gen/app resource HANA-S4D on azsuhana1 /opt/LifeKeeper/HANA2-ARK/recover.pl Yes BEGIN create of "HANA-S4D" creating resource "HANA-S4D" resource "HANA-S4D" successfully created restoring resource "HANA-S4D" BEGIN restore of "HANA-S4D" BEGIN restore of "HANA-S4D" restore for HANA-S4D started SAP host agent is running on node azsuhana1 sapstartsrv for instance S4D_00 is running on node azsuhana1 The node azsuhana1 is already PRIMARY Master HANA-DB S4D_00 is already running on node azsuhana1 Restore for resorce HANA-S4D finished END successful restore of "HANA-S4D"	🔄 Create gen/app Resource@azsuhana1	2
are letters, digits, and the following special characters: / <back cancel="" create="" help<br="" instance="">Creating gen/app Resource@azsuhana1 Creating gen/app resource HANA-S4D on azsuhana1 /opt/LiteKeeper/HANA2-ARK/recover.pl Yes BEGIN create of "HANA-S4D" creating resource "HANA-S4D" resource "HANA-S4D" BEGIN restore of "HANA-S4D" BEGIN restore of "HANA-S4D" BEGIN restore of "HANA-S4D" restore for HANA-S4D started SAP host agent is running on node azsuhana1 The node azsuhana1 is already PRIMARY Master HANA-DB S4D_00 is already running on node azsuhana1 Restore for resorce HANA-S4D finished END successful restore of "HANA-S4D"</back>	Resource Tag HANA-S4D	
Creating gen/app resource HANA-S4D on azsuhana1 /opt/LifeKeeper/HANA2-ARK/recover.pl Yes BEGIN create of "HANA-S4D" creating resource "HANA-S4D" resource "HANA-S4D" successfully created restoring resource "HANA-S4D" BEGIN restore of "HANA-S4D" BEGIN restore of "HANA-S4D" restore for HANA-S4D started SAP host agent is running on node azsuhana1 sapstartsrv for instance S4D_00 is running on node azsuhana1 The node azsuhana1 is already PRIMARY Master HANA-DB S4D_00 is already running on node azsuhana1 Restore for resorce HANA-S4D finished END successful restore of "HANA-S4D"	are letters, digits, and the following special characters: /	_
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Operations

Cluster Failover Test Controlled failover

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Kernel Panic

Enter the following command

echo c > /proc/sysrq-trigger

Appendix

Important reads

Read the following SAP Notes and papers first: SAP Note <u>1662610</u> Support details for SIOS Protection Suite for Linux

SAP Note 1928533, which has:

The list of Azure VM sizes that are supported for the deployment of SAP software.

Important capacity information for Azure VM sizes.

The supported SAP software, and operating system (OS) and database combinations.

The required SAP kernel version for Windows and Linux on Microsoft Azure.

SAP Note 2015553 lists the prerequisites for SAP-supported SAP software deployments in Azure.

SAP Note <u>2205917</u> has recommended OS settings for SUSE Linux Enterprise Server for SAP Applications.

SAP Note 2009879 has SAP HANA Guidelines for Red Hat Enterprise Linux

SAP Note <u>1944799</u> has SAP HANA Guidelines for SUSE Linux Enterprise Server for SAP Applications.

SAP Note <u>2178632</u> has detailed information about all of the monitoring metrics that are reported for SAP in Azure.

SAP Note 2191498 has the required SAP Host Agent version for Linux in Azure.

SAP Note <u>2243692</u> has information about SAP licensing on Linux in Azure.

SAP Note <u>1984787</u> has general information about SUSE Linux Enterprise Server 12.

SAP Note <u>1999351</u> has additional troubleshooting information for the Azure Enhanced Monitoring Extension for SAP.

SAP Note <u>401162</u> has information on how to avoid "address already in use" when setting up HANA System Replication.

SAP Community WIKI has all the required SAP Notes for Linux.

SAP HANA Certified IaaS Platforms

Azure Virtual Machines planning and implementation for SAP on Linux guide.

Azure Virtual Machines deployment for SAP on Linux (this article).

Azure Virtual Machines DBMS deployment for SAP on Linux guide.

SUSE Linux Enterprise Server for SAP Applications 12 SP3 best practices guides

Setting up an SAP HANA SR Performance Optimized Infrastructure (SLES for SAP Applications 12 SP1). The guide contains all the required information to set up SAP HANA System Replication for on-premises development. Use this guide as a baseline.

Setting up an SAP HANA SR Cost Optimized Infrastructure (SLES for SAP Applications 12 SP1)