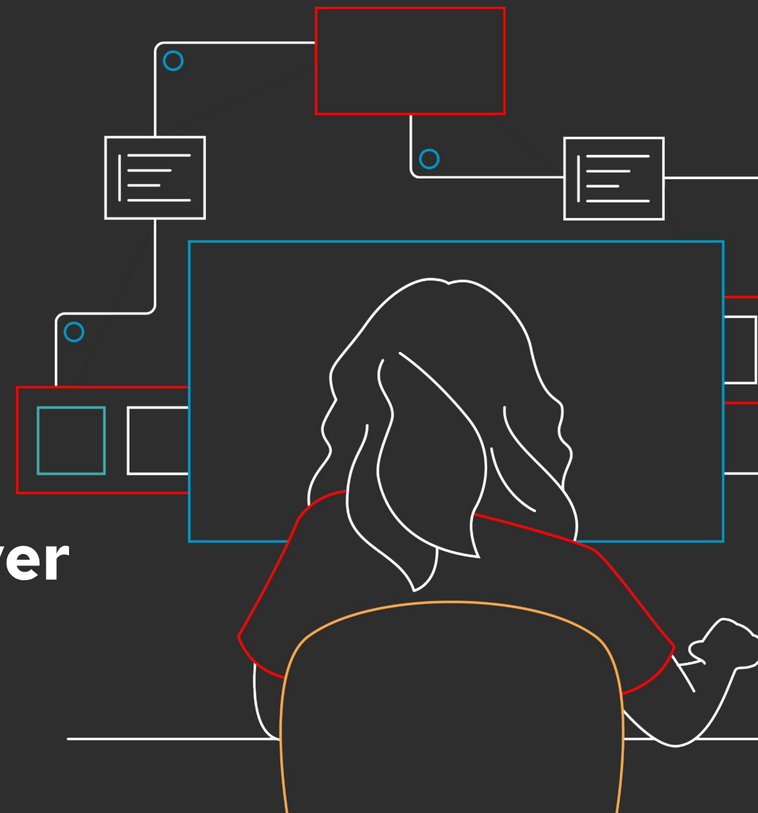
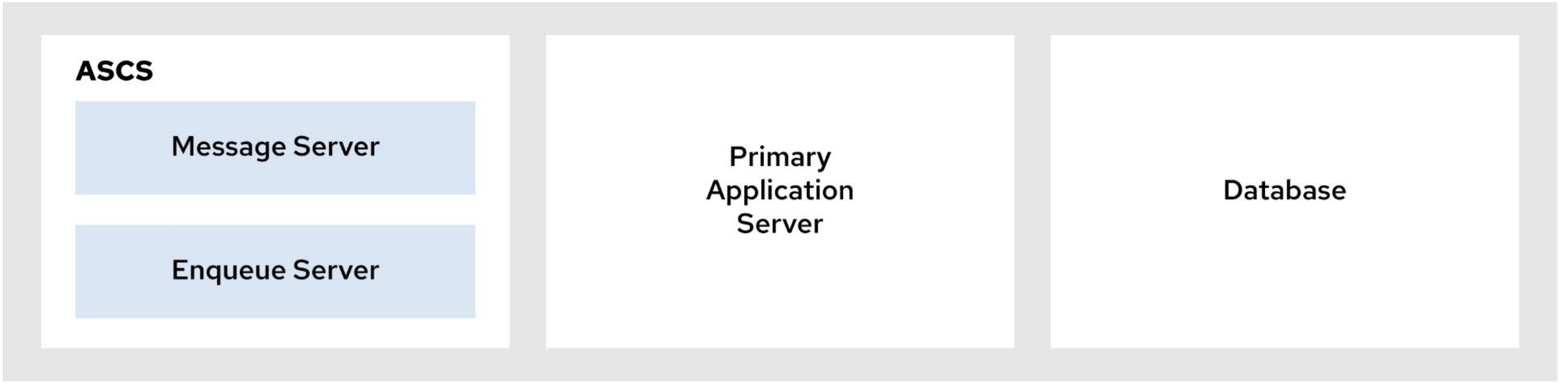
SAP NetWeaver and S/4HANA High Availability

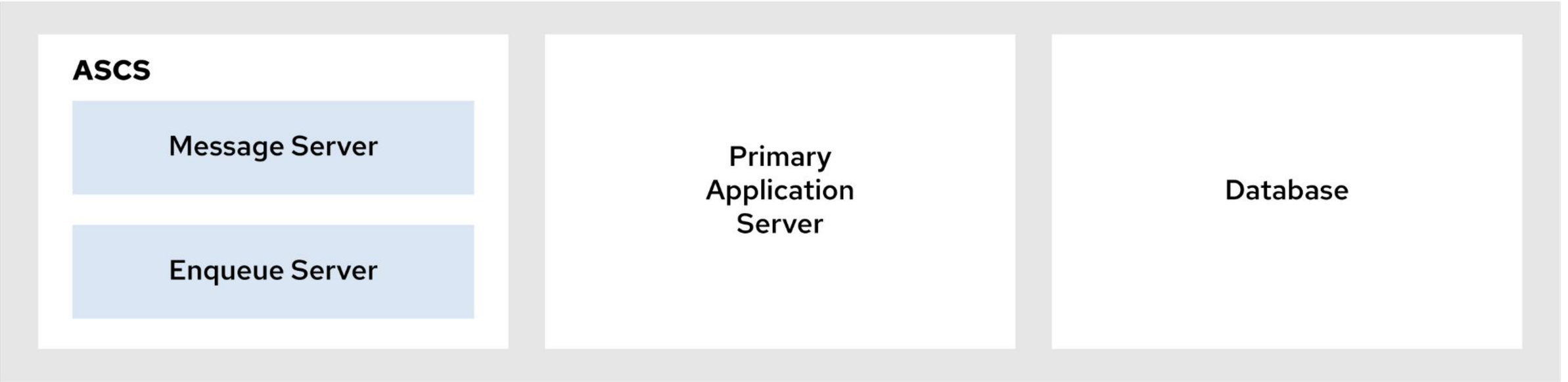


HA Concepts for SAP S/4 HANA and SAP NetWeaver

Netweaver Standalone System



Netweaver Standalone System

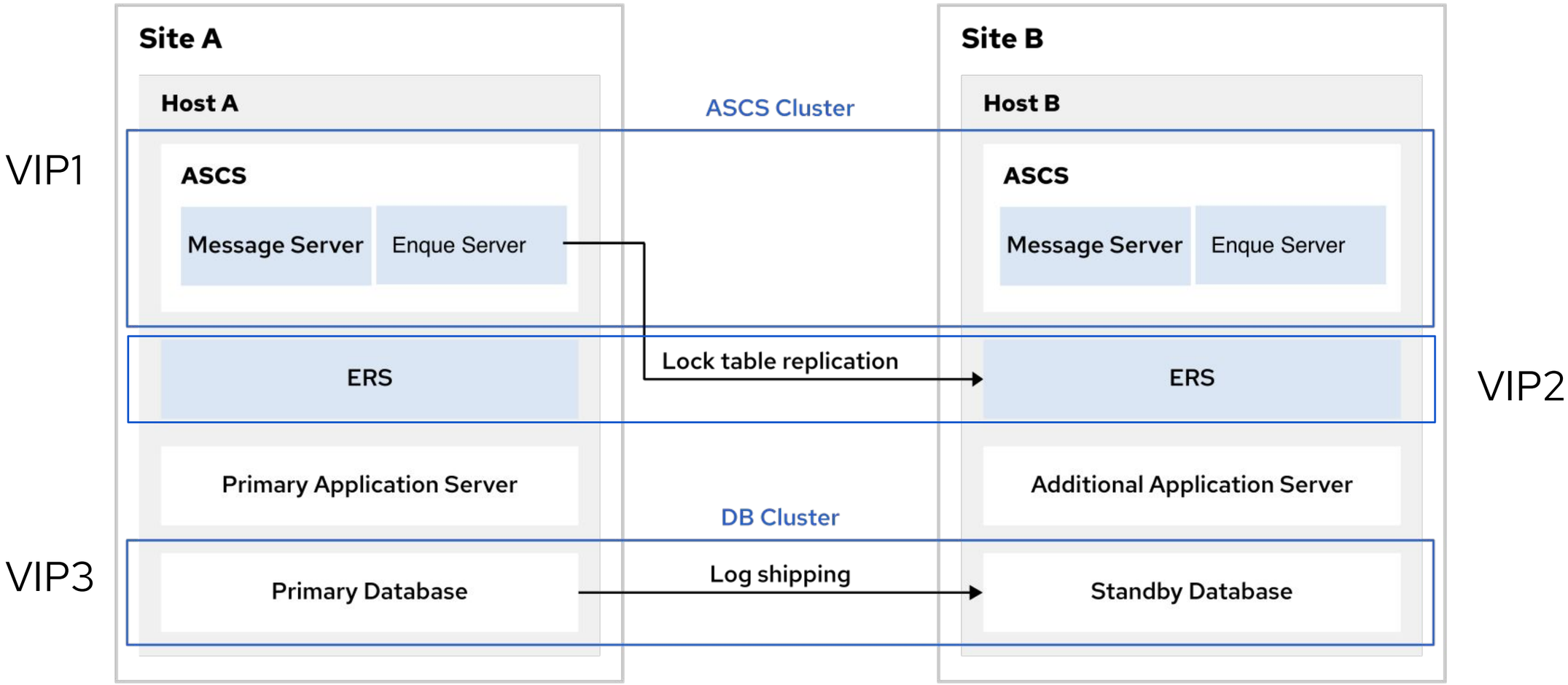


- Enqueue Replication Server
- shared disk install

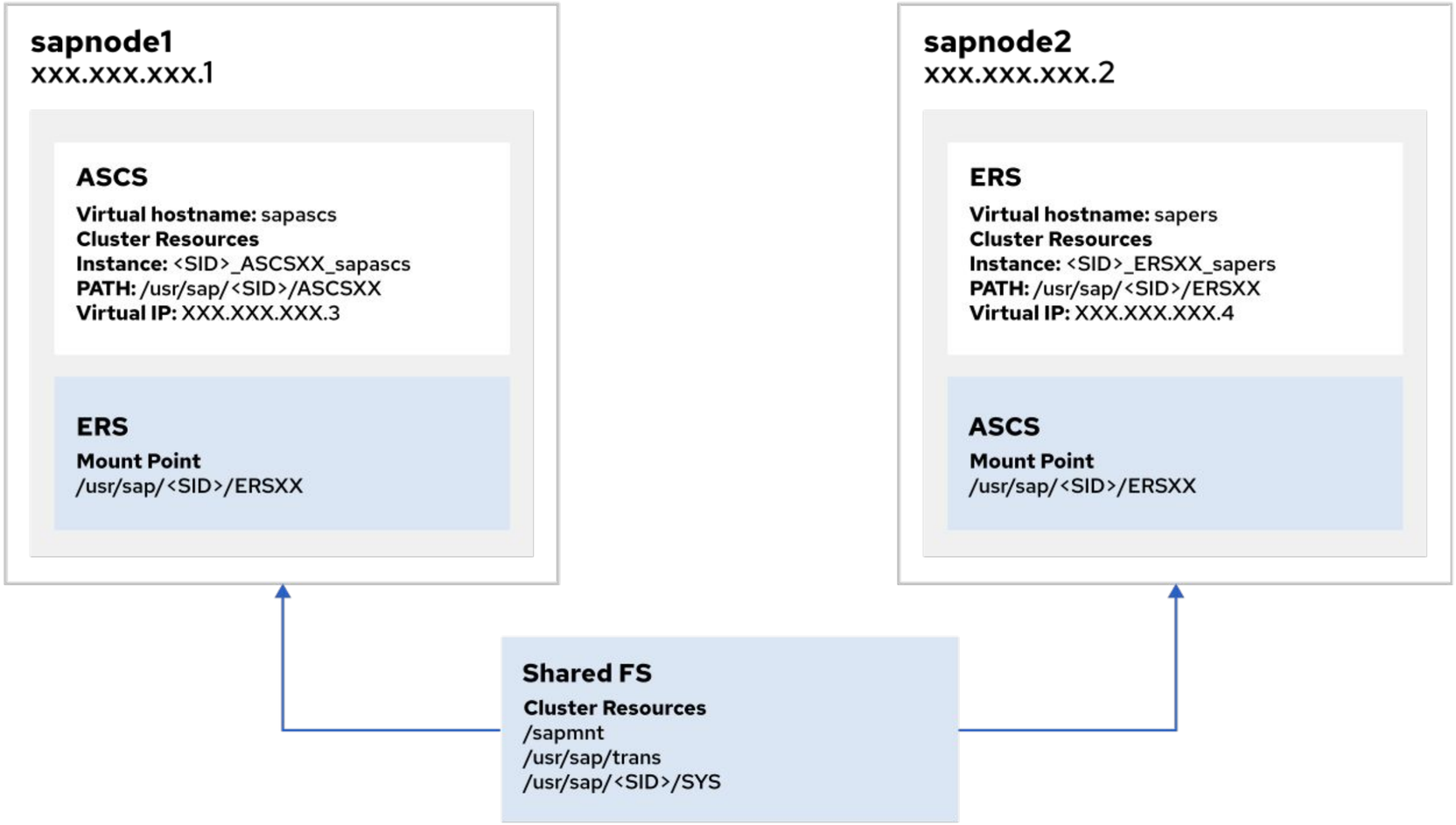
- horizontal scaling (AAS)
- can be included in pacemaker

- DB specific HA
- cluster maintains VIP to primary node

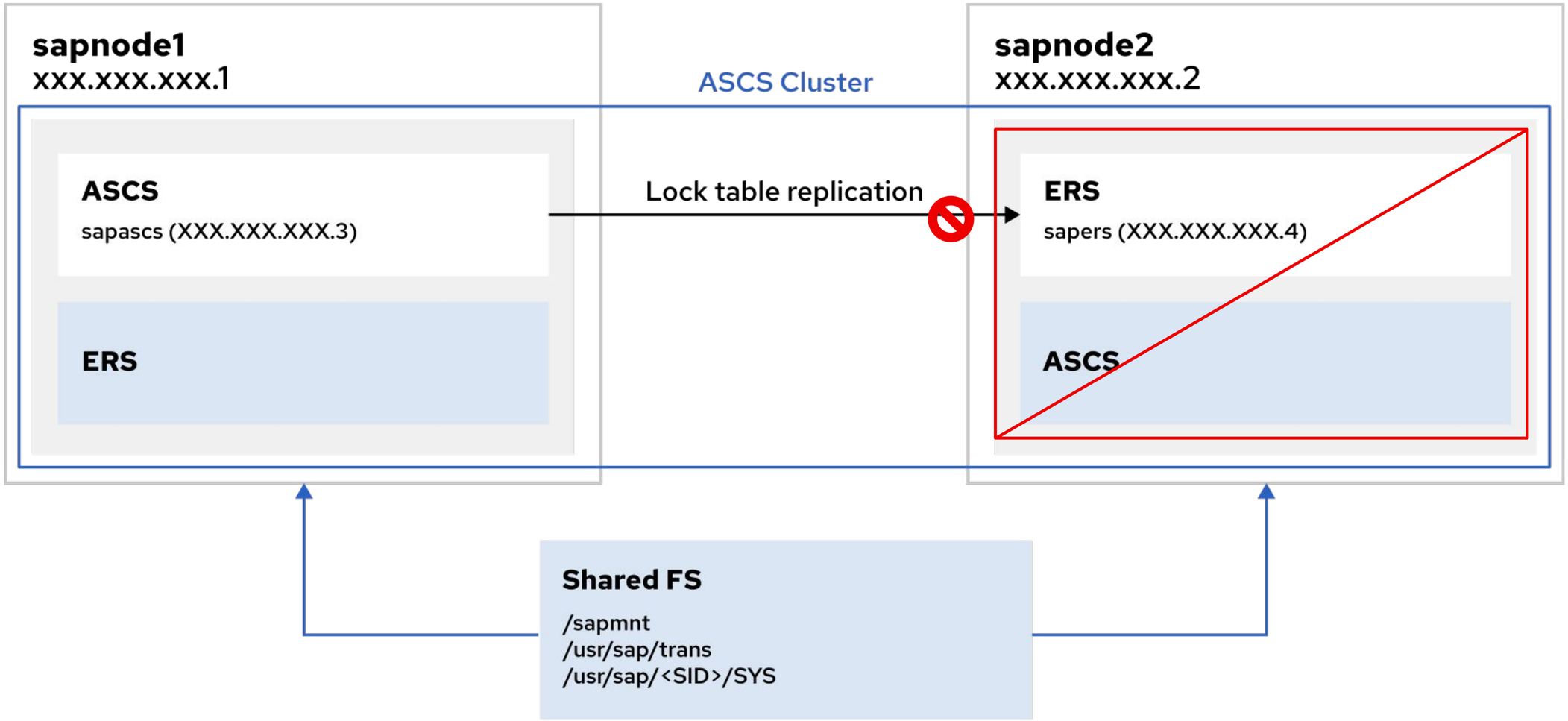
basic highly available cluster environment



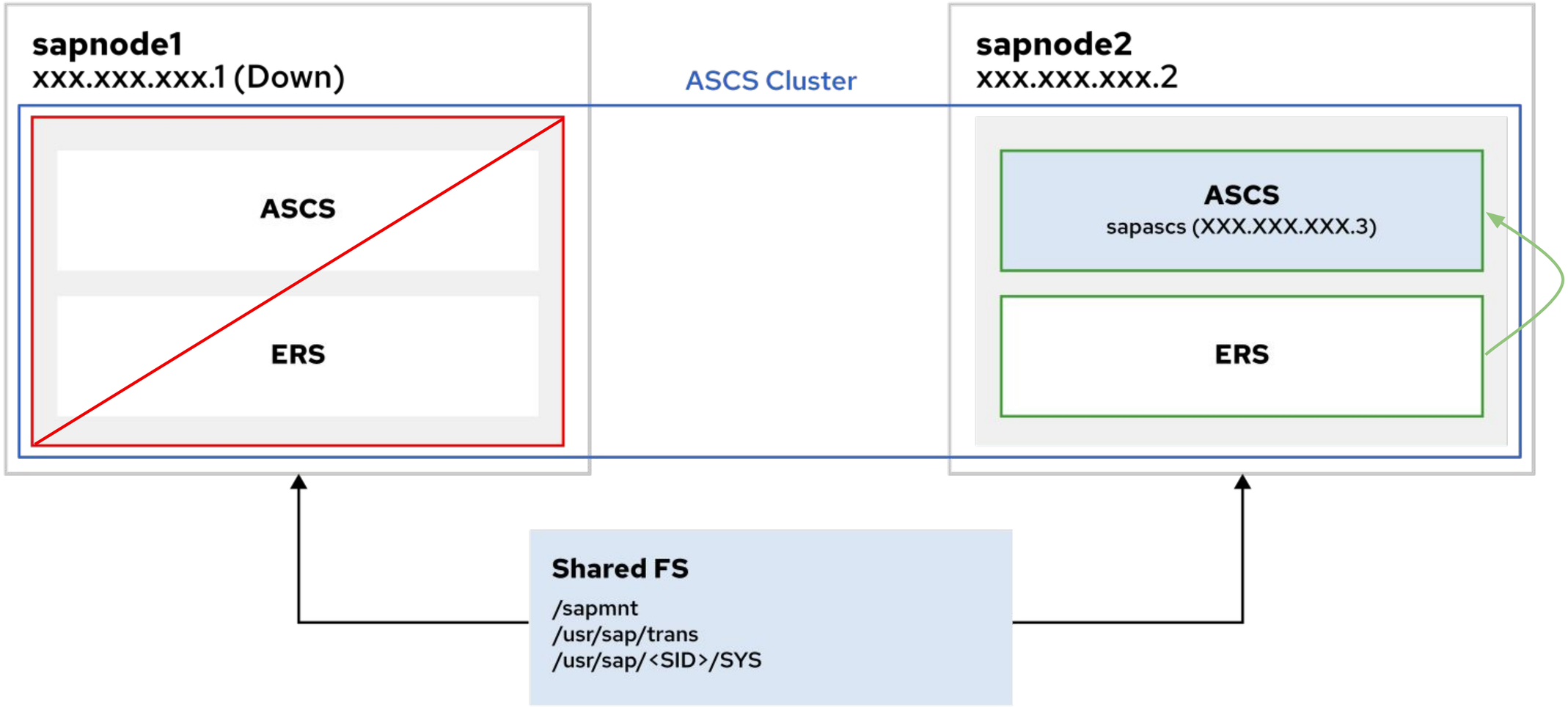
ASCS/ERS Failover Process



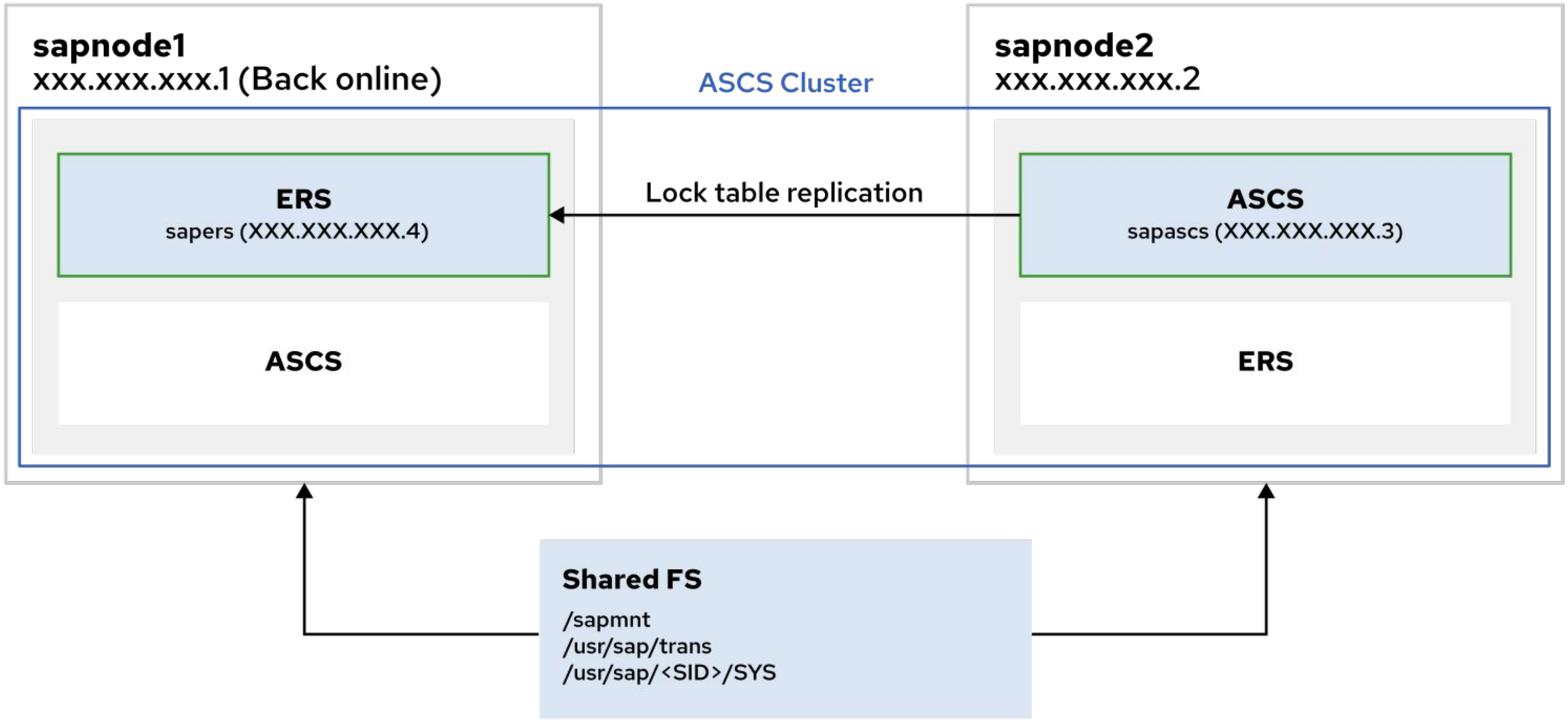
ASCS/ERS Failover Process



ASCS/ERS Failover Process

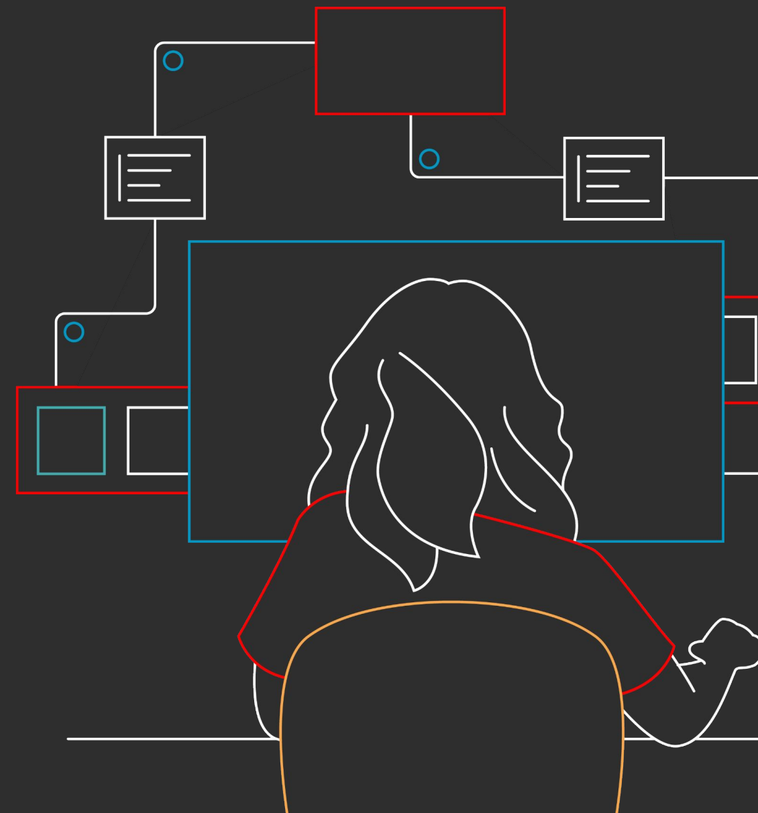


ASCS/ERS Failover Process

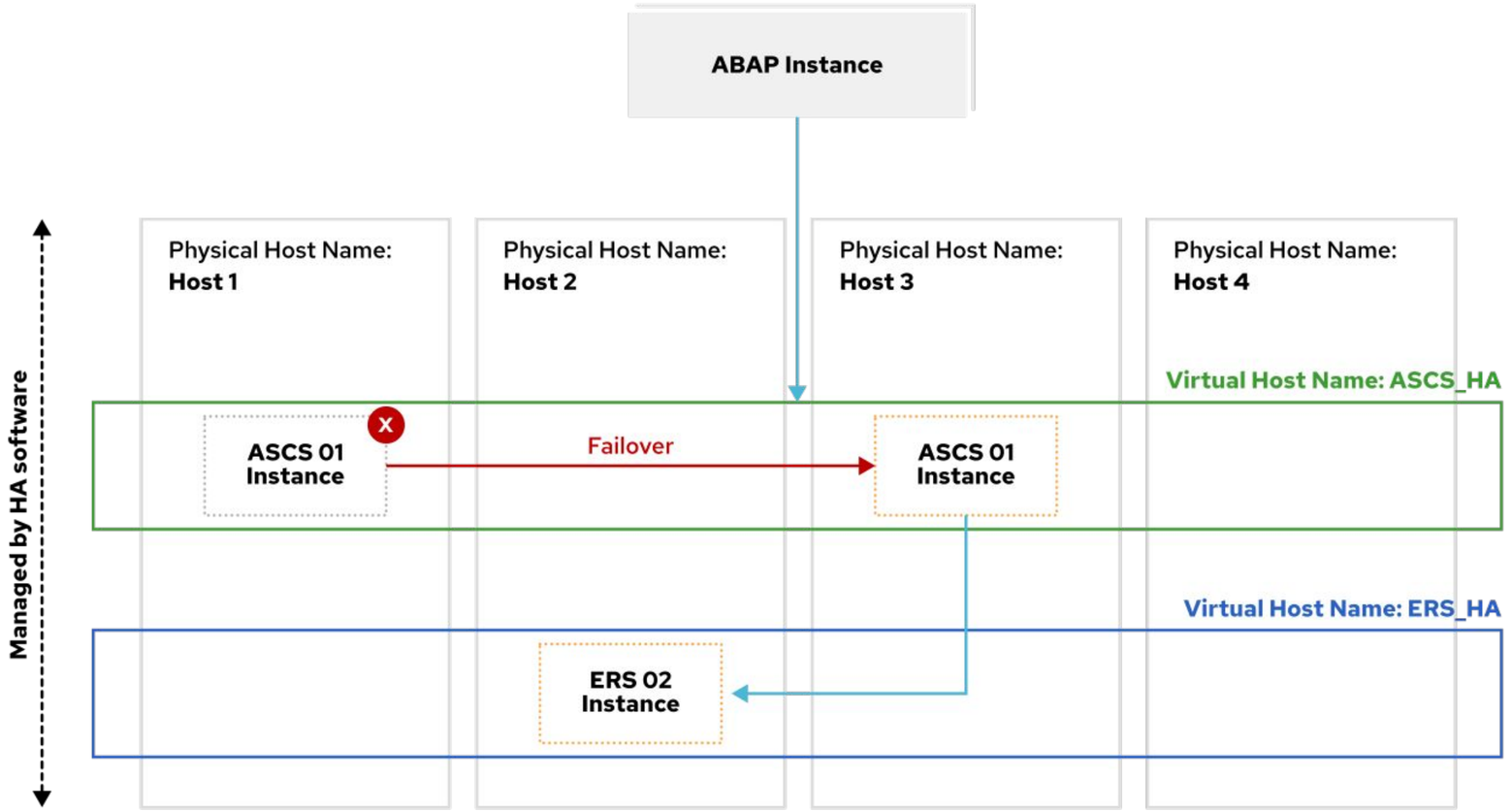


SAP NetWeaver and S/4HANA High Availability

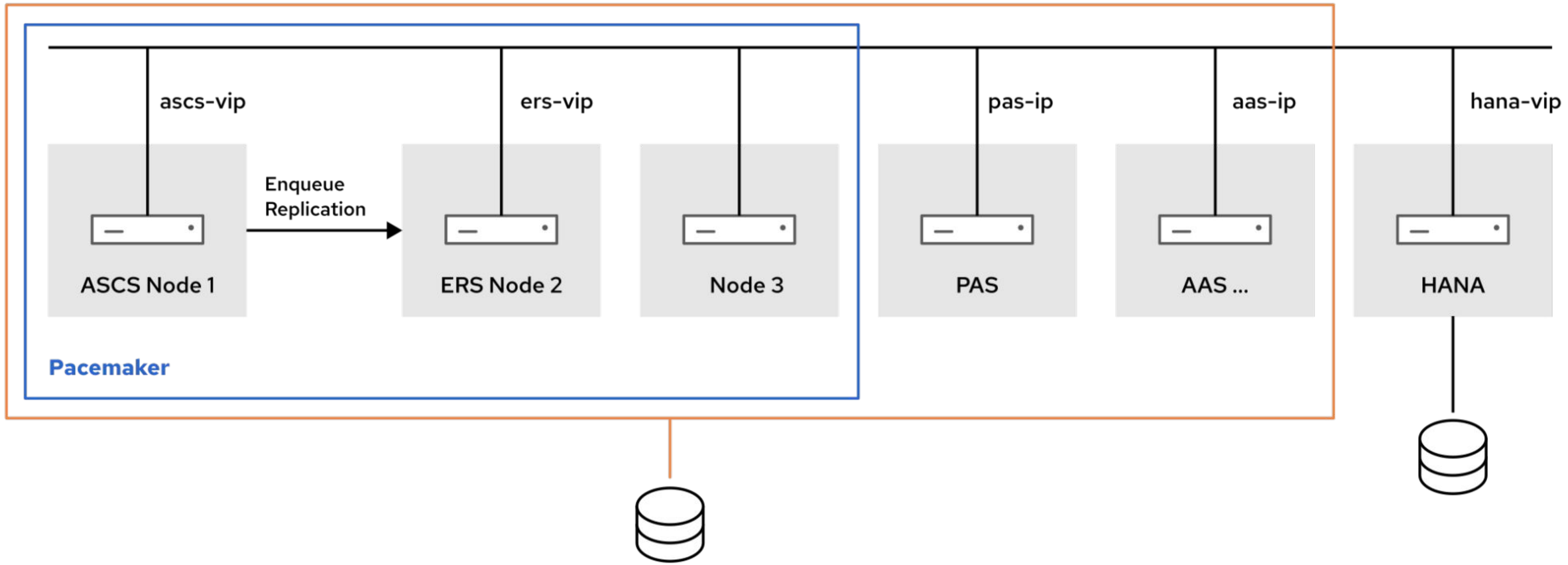
Installing SAP S/4 HANA and SAP NetWeaver Resource Agent



ASCS/ERS Failover in multinode cluster



Multi-node cluster architecture for S/4HANA



`SAPInstance` Resoure Agent

- for ASCS and ERS resources
- uses `sapstartsrv` framework
- separate SAN LUN or NFS share for
  - `ASCS: /usr/sap/`***`SID`***`/ASCS`***`##`***
  - `ERS:  /usr/sap/`***`SID`***`/ERS`***`##`***
  - `AS:  /usr/sap/`***`SID`***`/D`***`##`***
- shared directories for all nodes:
  - `/sapmnt` => this one also on HANA node
  - `/usr/sap/trans`
  - `/usr/sap/`***`SID`***`/SYS`

Installation Parameters for S/4HANA

example 2-node cluster

Nodename 1	s4node1
nodename 2	s4node2
SID	S4H
ASCS Instancenumber	20
ASCS virtual hostname	s4ascs
ERS Instance number	29
ERS virtual hostname	s4ers
PAS Instance number	21
AAS Instance number	22
HANA Database SID	S4D
HANA Instance number	00
HANA virtual hostname	s4db

Server Preparation for High Available S/4HANA

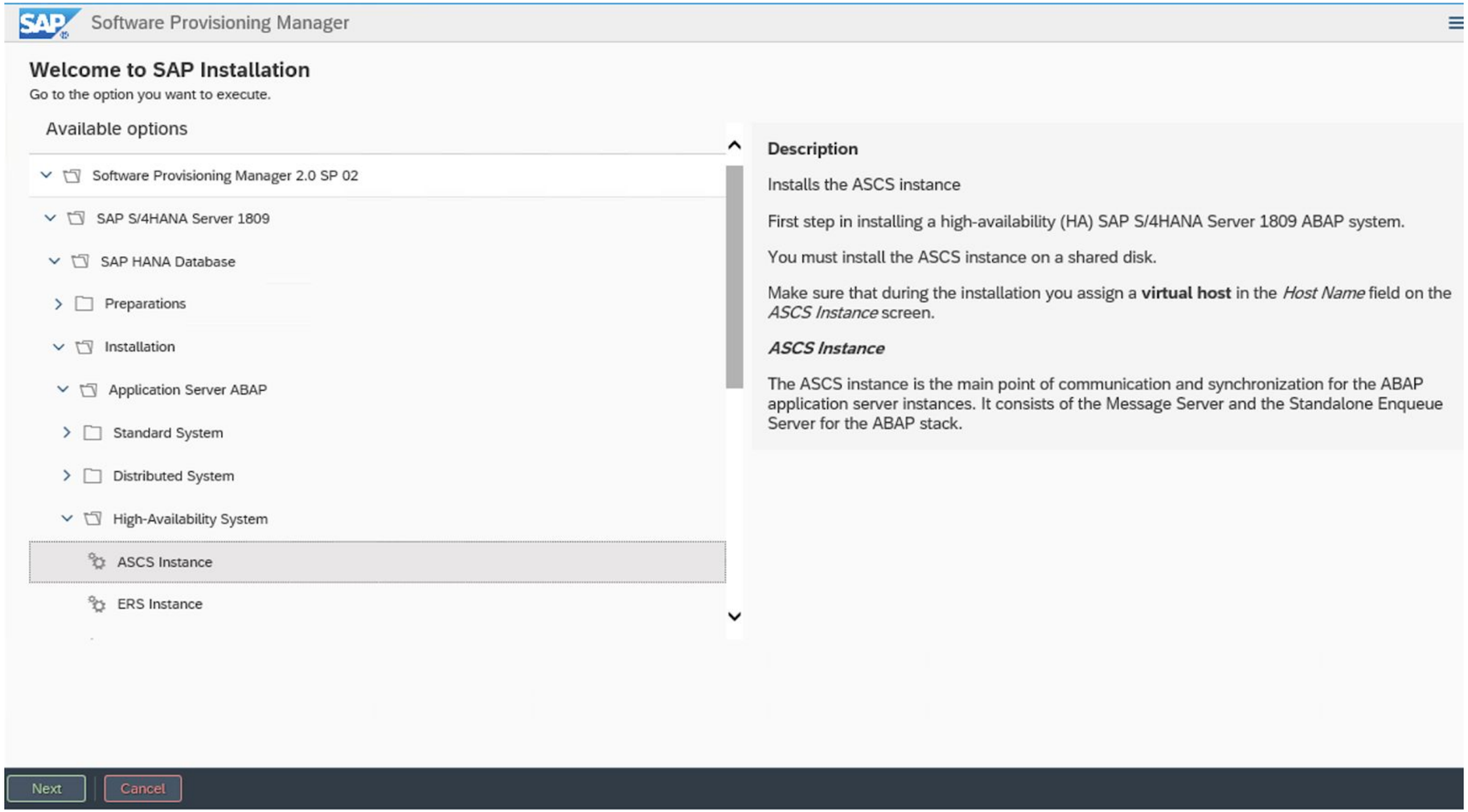
manual installation steps

1. Prepare server nodes with RHEL 7.6 or later
2. Register systems and enable repositories
   a. RHEL for SAP Applications
   b. RHEL HA
3. Ensure shared storage is created, available and mounted correctly
4. Ensure VIPs are configured and reachable
5. hostname resolution is working on all nodes
6. SAP installation media is available
7. system is prepared according SAP Notes for Netweaver (e.g. with ansible role)

Installing S/4 - steps

1. create the following storage volumes and mount them on s4node1 (nodea)
   a. `/usr/sap/S4H/ASCS20`
   b. `/usr/sap/S4H/SYS`
   c. `/usr/sap/trans`
   d. `/sapmnt`
2. enable virtual IP for s4ascs on all nodes by adding to /etc/hosts
3. configure the virtual IPs manually on the nodes
4. run '`./sapinst SAPINST_USE_HOSTNAME=s4ascs`'
   a. select SAP S/4HANA Server Foundation ... ASCS Instance
   b. SID S4D, Instance 20
5. repeat step 1-3 for ERS instance with appropriate directories
6. install HANA CLIENT using `./sapinst SAPINST_USE_HOSTNAME=s4db (vip from previous inst)`
7. repeat step 1-3 for PAS and AAS with appropriate directories and hostnames

Installer Screenshot



Red Hat

Installation steps for S/4HANA

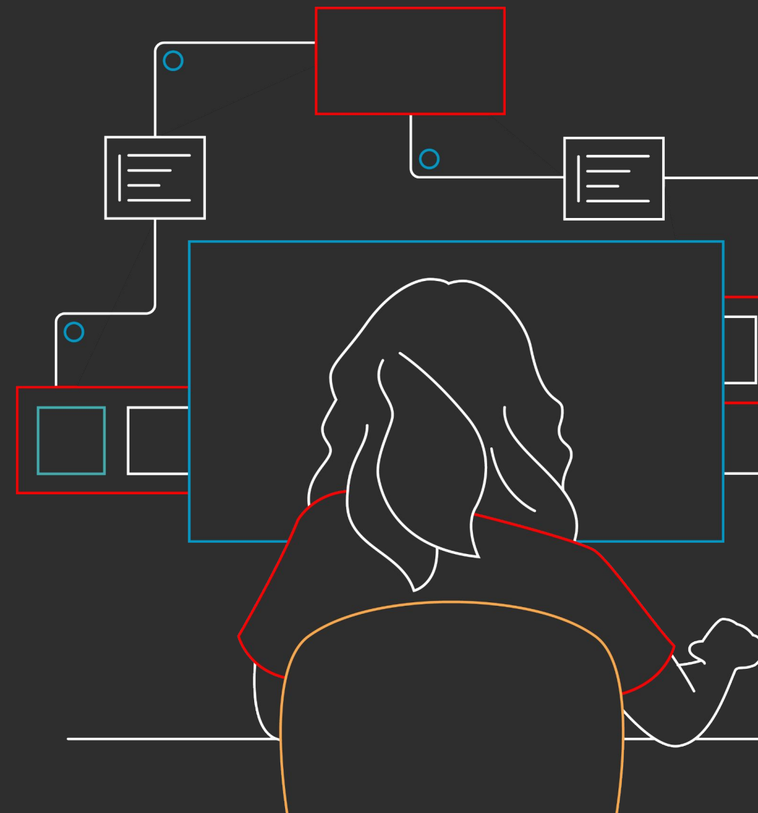
manual installation steps

Install the following software components with SWPM

1. ASCS
2. ERS
3. Hana DB (Client)
4. PAS
5. AAS

Operation, Update, and Monitoring

Configuring Pacemaker Cluster HA for SAP HANA and SAP Netweaver



Overview

step by step installation instructions - cluster framework

1. Install the cluster software on **all** nodes

```
[root@node ~]# yum install pcs fence-agents-all
```

Overview

step by step installation instructions - cluster framework

1. Install the cluster software on **all** nodes
2. Disable or configure the firewall for cluster communication

```
[root@node ~]# firewall-cmd --permanent --add-service=high-availability
[root@node ~]# firewall-cmd --reload
```

Overview

step by step installation instructions - cluster framework

1. Install the cluster software on **all** nodes
2. Disable or configure the firewall for cluster communication on **all** nodes
3. Enable pacemaker and corosync on the **all** nodes

```
[root@node ~]# systemctl enable --now pcsd
```

Overview

step by step installation instructions - cluster framework

1. Install the cluster software on **all** nodes
2. Disable or configure the firewall for cluster communication on **all** nodes
3. Enable pacemaker and corosync on the **all** nodes

```
[root@node ~]# systemctl enable --now pcsd
```

```
[root@node ~]# echo redhat | passwd --stdin hacluster
```

Overview

step by step installation instructions - cluster framework

1. Install the cluster software on **all** nodes
2. Disable or configure the firewall for cluster communication on **all** nodes
3. Enable pacemaker and corosync on the **all** nodes
4. Authenticate the cluster nodes on **one** node

```
[root@node ~]# pcs host auth node1.example.com node2.example.com
Username: hacluster
Password: redhat
node1.example.com: Authorized
node2.example.com: Authorized
```

Overview

step by step installation instructions - configure basic cluster communication

1. Set up the cluster

```
[root@node ~]# pcs cluster setup mycluster --start \
> node1.example.com \
> node2.example.com
```

Overview

step by step installation instructions - configure basic cluster communication

1. Set up the cluster
2. Enable auto rejoin after reboot

```
[root@node ~]# pcs cluster enable --all
```

Overview

step by step installation instructions - configure basic cluster communication

1. Set up the cluster
2. Enable auto rejoin after reboot
3. Verify the cluster status

```
[root@node ~]# pcs cluster status
Cluster Status:
 Cluster Summary:
   * Stack: corosync
   * Current DC: node2.example.com (version 2.0.4-6.el8-2deceaa3ae) - partition
 with quorum
   * Last updated: Fri Mar  5 12:23:08 2021
   * Last change:  Fri Mar  5 12:22:57 2021 by root via cibadmin on
 node1.example.com
   * 2 nodes configured
   * 0 resource instances configured
 Node List:
   * Online: [ node1.example.com node2.example.com ]
PCSD Status:
  node1.example.com: Online
  node2.example.com: Online
```

Overview

step by step installation instructions - configure fencing

1. Select and test proper fence device and fencing method
   a. supported fence devices: https://access.redhat.com/articles/2881341
   b. how to test a fence device: https://access.redhat.com/solutions/18803

Overview

step by step installation instructions - configure fencing

1. Select and test proper fence device and fencing method
2. Configure fencing device

```
[root@node ~]# pcs stonith create fence_device_name fence_ipmilan \
> pcmk_host_list=node_private_fqdn \
> ip=node_IP_BMC \
> username=username \
> password=password
```

Overview

step by step installation instructions - configure fencing

1. Select and test proper fence device and fencing method
2. Configure fencing device
3. Display Status of fencing device

```
[root@node ~]# pcs stonith status
* fence_nodea (stonith:fence_ipmilan): Started node1.example.com
* fence_nodeb (stonith:fence_ipmilan): Started node2.example.com
```

Overview

step by step installation instructions - setting up HA for SAP HANA

1. Ensure HANA DB is configured and working properly (e.g. in a cluster)

Overview

step by step installation instructions - setting up HA for SAP Netweaver ASCS

1. Create a resource for ASCS instance (ENSA1)

```
[root@node ~]# pcs resource create <sid>_ascs<InstanceNumber> SAPInstance \
> InstanceName="<SID>_ASCS<InstanceNumber>_rhascs" \
> START_PROFILE=/sapmnt/<SID>/profile/<SID>_ASCS<InstanceNumber>_rhascs \
> AUTOMATIC_RECOVER=false meta resource-stickiness=5000 \
> migration-threshold=1 failure-timeout=60 \
> --group <sid>_ASCS<InstanceNumber>_group \
> op monitor interval=20 on-fail=restart timeout=60 \
> op start interval=0 timeout=600 \
> op stop interval=0 timeout=600
```

Overview

step by step installation instructions - setting up HA for SAP Netweaver ASCS

1. Create a resource for ASCS instance (ENSA2)

```
[root@node ~]# pcs resource create <sid>_ascs<InstanceNumber> SAPInstance \
> InstanceName="<SID>_ASCS<InstanceNumber>_s4ascs" \
> START_PROFILE=/sapmnt/<SID>/profile/<SID>_ASCS<InstanceNumber>_s4ascs \
> AUTOMATIC_RECOVER=false meta resource-stickiness=5000 \
> --group <sid>_ASCS<InstanceNumber>_group \
> op monitor interval=20 on-fail=restart timeout=60 \
> op start interval=0 timeout=600 \
> op stop interval=0 timeout=600
```

Overview

step by step installation instructions - setting up HA for SAP Netweaver ASCS

1. Create a resource for ASCS instance (ENSA2)
2. Add a resource stickiness value to the group

```
[root@node ~]# pcs resource meta <sid>_ASCS<InstanceNumber>_group \
> resource-stickiness=3000
```

Overview

step by step installation instructions - setting up HA for SAP Netweaver ERS

1. Create a resource for ERS instance (ENSA1)

```
[root@node ~]# pcs resource create <sid>_ers<InstanceNumber> SAPInstance \
> InstanceName="<SID>_ERS<InstanceNumber>_rhers" \
> START_PROFILE=/sapmnt/<SID>/profile/<SID>_ERS<InstanceNumber>_rhers \
> AUTOMATIC_RECOVER=false IS_ERS=true \
> --group <SID>_ERS<InstanceNumber>_group \
> op monitor interval=20 on-fail=restart timeout=60 \
> op start interval=0 timeout=600 \
> op stop interval=0 timeout=600
```

Overview

step by step installation instructions - setting up HA for SAP Netweaver ERS

1. Create a resource for ERS instance (ENSA2)

```
[root@node ~]# pcs resource create <sid>_ers<InstanceNumber> SAPInstance \
> InstanceName="<SID>_ERS<InstanceNumber>_s4ers" \
> START_PROFILE=/sapmnt/<SID>/profile/<SID>_ERS<InstanceNumber>_s4ers \
> AUTOMATIC_RECOVER=false \
> --group <SID>_ERS<InstanceNumber>_group \
> op monitor interval=20 on-fail=restart timeout=60 \
> op start interval=0 timeout=600 \
> op stop interval=0 timeout=600
```

Overview

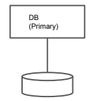
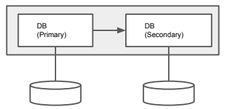
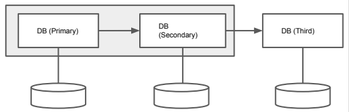
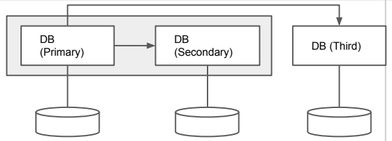
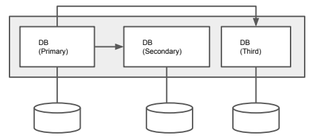
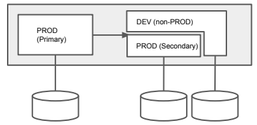
step by step installation instructions - setting up HA for SAP Netweaver ERS

1. Create a resource for ERS instance
2. Create the required constraints

```
[root@node ~]# pcs constraint colocation add SID_ERSXX_group with \
> SID_ASCSXX_group -5000
```

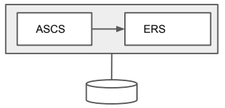
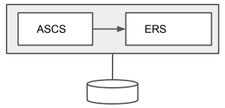
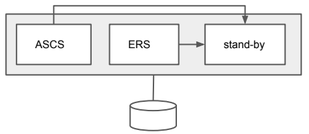
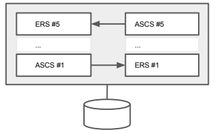
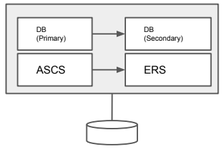
RHEL High Availability Solutions for SAP

SAP HANA

	HDB hdbindexserver crash restart	**2-node HA cluster** with HANA System Replication (HSR)	**2-node HA cluster** with multi-tier HSR and manual failover	**2-node HA cluster** with multi-target HSR and manual failover	**3+ node HA cluster** with multi-target HSR and auto-failover	**cost-optimized HA** with auto-evac & failover (multi-SID)	**cost-optimized HA** with S/4HANA ASCS/ERS/HDB/WD
							
SAP HANA scale-up	**Supported** [1]	**Supported** [1]	**Supported** [3]	**Supported** [3]	planned [4]	**Supported** [1]	**SAP HANA** scale-up: **Supported** [1]
SAP HANA scale-out	**Supported** [1]	**Supported** [1]	**Supported** [3]	**Supported** [3]	**Supported** [1]	planned [4]	**SAP HANA** scale-out n/A

SAP NetWeaver™

SAP S/4 HANA

	2-node HA cluster with Master/Slave Resources	**2-node HA cluster** with Standalone Resources	**multi-node HA cluster** with Standalone Resources	**cost-optimized HA** with Standalone (multi-SID)	
					
ENSA v1.0 (NetWeaver)	**Supported** [2,4]	**Supported** [2,4]	n/A	n/A	**ENSA v1.0** (NetWeaver) n/A
ENSA v2.0 (S/4 + NW7.5)	n/A	**Supported** [2]	**Supported** [2]	**Supported** [2]	**ENSA v2.0** (S/4 + NW7.5) **Supported** [2]

1,2) See 3397471, 3569681 and 3974941 for further details on Support Policies for RHEL HA Cluster Management of SAP HANA, SAP NetWeaver and S/4HANA.

3) RHEL for SAP Solutions provides HA resource agents to automate the takeover from a primary to secondary SAP HANA instance. Customers may also configure multi-target and multi-tier SAP HANA system replication in conjunction with RHEL HA solutions for SAP. In such scenario, the RHEL HA solution will remain functional & supported within its defined scope, whereas failover to such additional targets are not taken care of by the HA cluster solution.

4) Current planning. Actual timelines / scope may change.

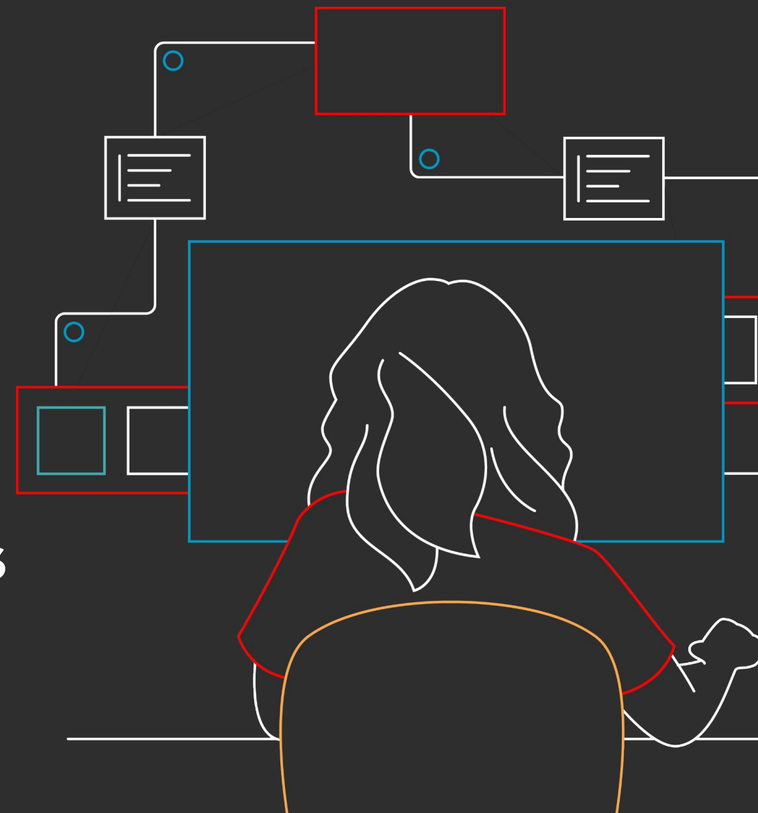
Red Hat

RHEL High Availability Solutions for SAP

- RTO (recovery time objective), RPO (recovery point objective)
- cluster support guidelines:
  https://access.redhat.com/articles/2912891
  https://access.redhat.com/articles/3397471
- ENSA1: https://access.redhat.com/articles/3569681
- ENSA2: https://access.redhat.com/articles/3974941

Automating SAP Deployments with Ansible

Introducing a Role for SAP S/4HANA Deployments



Role details: install SAP S/4HANA

redhat.sap_install.sap_swpm

The role automatically unpacks the SAP software and runs the swpm installer with a preconfigured configuration file.

In this example we prepare a single node SAP S/4HANA instance.

For more options, see the README.

```
# Software
sap_swpm_software_path: /sap-software
sap_swpm_product_catalog_id: NW_ABAP_OneHost:S4HANA2020.CORE.HDB.ABAP
sap_swpm_sapcar_path: "{{ sap_swpm_software_path }}"
sap_swpm_swpm_path: "{{ sap_swpm_software_path }}"

# NW Passwords
sap_swpm_master_password: "*******"
sap_swpm_ddic_000_password: "{{ sap_swpm_master_password }}"

# HDB Passwords
sap_swpm_db_system_password: "{{ sap_swpm_master_password }}"
sap_swpm_db_systemdb_password: "{{ sap_swpm_master_password }}"
sap_swpm_db_schema_abap_password: "{{ sap_swpm_master_password }}"
sap_swpm_db_sidadm_password: "{{ sap_swpm_master_password }}"

# NW Instance Parameters
sap_swpm_sid: S4H
sap_swpm_pas_instance_nr: "01"
sap_swpm_ascs_instance_nr: "02"
sap_swpm_ascs_instance_hostname: "{{ ansible_hostname }}"
sap_swpm_fqdn: "{{ ansible_domain }}"

# HDB Instance Parameters
sap_swpm_db_host: "rha-hana"
sap_swpm_db_sid: RHA
sap_swpm_db_instance_nr: "00"
```

Role details: parameters for S/4HANA software installation

Parameter	Description
`sap_swpm_product_catalog_id`	The mandatory parameter that defines which software SWPM installs. **Examples**: Single host installation of S4HANA 2021 Foundation: `NW_ABAP_OneHost:S4HANA2021.FNDN.HDB.ABAP` Single host installation of S4HANA 2021 full ERP system: `NW_ABAP_OneHost:S4HANA2021.CORE.HDB.ABAP`
`sap_swpm_update_etchosts`	Whether to update the `/etc/hosts` file (default: true)
`sap_swpm_software_path`	Path to the downloaded software bundle (currently must be writable, because the bundle files are unpacked here)
`sap_swpm_sapcar_path`	Path to the directory that contains the sapcar utility (looks for the SAPCAR*.EXE pattern)
`sap_swpm_swpm_path`	Path to the directory that contains SWPM*.SAR

NOTE: role is currently in Tech Preview, so parameters may change

Role details: passwords for S/4HANA software installation

Parameter	Description
`sap_swpm_master_password`	Master password: Must contain uppercase, lowercase, numbers, and special characters (must not contain !)
`sap_swpm_ddic_000_password`	DDIC password: Must contain uppercase, lowercase, numbers, and special characters (must not contain !)
`sap_swpm_db_system_password`	SAP HANA System password
`sap_swpm_db_systemdb_password`	SAP HANA System Database password
`sap_swpm_db_schema_abap_password`	SAP HANA System Database ABAP Schema password
`sap_swpm_db_sidadm_password`	SAP HANA sidadm password

NOTE: role is currently in Tech Preview, so parameters may change

Role details: Netweaver instance parameters

Parameter	Description
`sap_swpm_sid`	SID of the NetWeaver instance (such as `RHE`)
`sap_swpm_pas_instance_nr`	Instance number of the primary application server (such as `01`)
`sap_swpm_ascs_instance_nr`	Instance number of the central services (such as `02`)
`sap_swpm_ascs_instance_hostname`	Hostname where the ASCS runs (set to `{{ ansible_hostname }}` on single-node installations)
`sap_swpm_fqdn`	Domain name of the SAP installation, such as `{{ sap_domain }}`. **Note** that SAP uses the fqdn abbreviation for the domain name only.

NOTE: role is currently in Tech Preview, so parameters may change

Role details: HANA database instance parameters

Parameter	Description
`sap_swpm_db_host`	Short hostname of your HANA instance. It must be defined in the `/etc/hosts` file, or be properly resolved by DNS.
`sap_swpm_db_sid`	SAP HANA SID (such as `RHE`)
`sap_swpm_db_instance_nr`	SAP HANA instance number (such as `00`)

NOTE: role is currently in Tech Preview, so parameters may change

Role details: Advanced Installation methods

Parameter	Description
`sap_swpm_ansible_role_mode`	Installation mode of this role. Possible values are *default, default_templates, advanced, advanced_templates, inifile_reuse*
`sap_swpm_inifile_custom_values_dictionary`	When setting `sap_swpm_ansible_role_mode` to advanced, this variable must contain the configuration file and the product ID in the third line as the last value.

For more parameters for *_templates, see role documentation

NOTE: role is currently in Tech Preview, so parameters may change

Role details: install SAP S/4HANA 2019

redhat.sap_install.sap_swpm

```
# Software
sap_swpm_ansible_role_mode: advanced
sap_swpm_sapcar_path: "/software/SAPCAR"
sap_swpm_software_path: "/software/S4HANA_installation"
sap_swpm_swpm_path: "/software/S4HANA_installation"
sap_swpm_update_etchosts: false
# Passwords
sap_swpm_master_password: "R3dh4t$123"
# ini-file parameter
sap_swpm_inifile_custom_values_dictionary:
   '# Custom Config file created for SAP Workshop': ''
   '# Product catalog ID': ''
   '# NW_ABAP_OneHost:S4HANA1909.CORE.HDB.ABAP': ''
   HDB_Schema_Check_Dialogs.schemaPassword:  "{{ sap_swpm_master_password }}"
   HDB_Schema_Check_Dialogs.validateSchemaName:  "false"
   NW_CI_Instance.ascsInstanceNumber:  ""
   NW_CI_Instance.ascsVirtualHostname :  ""
   NW_CI_Instance.ciInstanceNumber :  ""
   NW_CI_Instance.ciVirtualHostname :  ""
   NW_CI_Instance.scsVirtualHostname :  ""
   NW_DDIC_Password.ddic000Password :  ""
   NW_Delete_Sapinst_Users.removeUsers :  "true"
   NW_GetMasterPassword.masterPwd : "{{ sap_swpm_master_password }}"
```

Role details: install SAP S/4HANA 2019

redhat.sap_install.sap_swpm

```
NW_GetSidNoProfiles.sid :  RHE
NW_HDB_DB.abapSchemaName :  ""
NW_HDB_DB.abapSchemaPassword :  "{{ sap_swpm_master_password }}"
NW_HDB_DB.javaSchemaName :  ""
NW_HDB_DB.javaSchemaPassword :  ""
NW_HDB_getDBInfo.dbhost : "hana-{{ guid }}1.example.com"
NW_HDB_getDBInfo.dbsid :  RHE
NW_HDB_getDBInfo.instanceNumber :  '00'
NW_HDB_getDBInfo.systemDbPassword :  "{{ sap_swpm_master_password }}"
NW_HDB_getDBInfo.systemPassword :  "{{ sap_swpm_master_password }}"
NW_HDB_getDBInfo.systemid :  RHE
NW_Recovery_Install_HDB.extractLocation :  /usr/sap/RHE/HDB00/backup/data/DB_RHE
NW_Recovery_Install_HDB.extractParallelJobs :  '30'
NW_Recovery_Install_HDB.sidAdmName :  rheadm
NW_Recovery_Install_HDB.sidAdmPassword :  "{{ sap_swpm_master_password }}"
NW_SAPCrypto.SAPCryptoFile :  '{{ sap_swpm_software_path }}'
NW_getFQDN.FQDN : ''
NW_getFQDN.setFQDN :  "true"
NW_getLoadType.loadType :  SAP
archives.downloadBasket :  '{{ sap_swpm_software_path }}'
hdb.create.dbacockpit.user :  "true"
hostAgent.sapAdmPassword :  "{{ sap_swpm_master_password }}"
nwUsers.sidadmPassword :  "{{ sap_swpm_master_password }}"
```

LAB: Install S/4HANA Foundation

Red Hat

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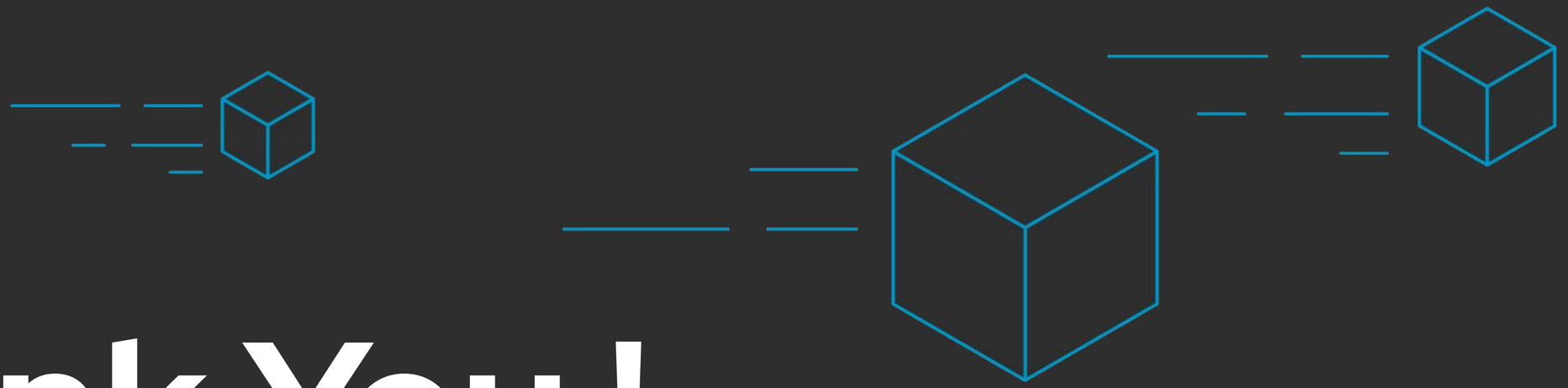

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