HPE Reference Architecture for SAP automation with HPE Morpheus Enterprise Software on Predefined Configuration and VMware virtualization

Contents

Executive summary

Hewlett Packard Enterprise is a leading provider for SAP solutions. With an extensive global footprint of solutions deployed at thousands of SAP customer sites, our solutions are ubiquitous across the application and database tier, including scale-up and scale-out configurations for all HANA database workloads. We provide fully integrated Certified SAP HANA Appliances, Tailored Datacenter Integration (TDI), ECC, SAP BW/4HANA, and SAP S/4HANA solutions.

Our infrastructure portfolio for SAP HANA offers a comprehensive solution to a wide spectrum of customer requirements. From small and medium-sized businesses to the largest global enterprises, HPE delivers professional tailored experiences with solutions of all sizes that encompass both the application and database tiers.

HPE Morpheus Enterprise Software is a powerful self-service engine that provides customers with choice and flexibility for managing and orchestrating their virtualized workloads across hybrid environments. This solution simplifies management by integrating existing virtualized workloads and providing a powerful platform to enable consistent and well-governed self-service application provisioning. HPE Morpheus Enterprise Software supports your existing automation stack, many public and private cloud types, leading backup solutions, common storage protocols, and more.

This Reference Architecture demonstrates how HPE Compute Scale-up Server 3200 for SAP HANA Solutions with SAN Storage predefined configuration, based on HPE Alletra Storage MP B10000, combined with the automation capabilities of HPE Morpheus Enterprise, enable fast, reliable, and repeatable SAP deployments in a hybrid cloud environment. By leveraging automation, the traditionally complex and time-consuming SAP installation process, including operating system preparation, media provisioning, and installation execution, can be reduced from several days to less than two hours. This approach maximizes efficiency and minimizes manual intervention, allowing IT teams to focus on higher-value tasks.

The Reference Architecture highlights the benefits of a hybrid environment, where SAP HANA runs on a high-performance bare metal system for maximum reliability and throughput, while SAP application servers operate in a flexible and scalable virtualized environment. This combination delivers both the performance required for demanding workloads and the agility needed for rapid scaling and resource optimization.

This document provides detailed guidance on integrating vCenter and a pre-configured HPE Compute Scale-up Server 3200 into HPE Morpheus Enterprise, incorporating Ansible playbooks, and importing workflows. It also includes step-by-step instructions for creating App Blueprints that streamline SAP deployments in hybrid cloud scenarios.

The following deployment scenarios are covered in this Reference Architecture:

- Installation of SAP HANA database
- Installation of SAP application S/4HANA or BW/4HANA in a single host or 2-tier hybrid scenario
- System Copy of SAP S/4HANA or BW/4HANA
- Installation of SAP additional application servers

Target audience: The target audience for this Reference Architecture are data center managers and deployment engineers and others wishing to learn more about this Reference Architecture from Hewlett Packard Enterprise. A working knowledge of server architecture, networking architecture, storage design, VMware vCenter administration and SAP sizing and deployment is recommended.

Document purpose: The purpose of this document is to describe the integration of a pre-configured HPE Compute Scale-up Server 3200 and VMware vCenter into HPE Morpheus Enterprise Software and the configuration of HPE Morpheus Enterprise Software to enable SAP automation tasks.

This Reference Architecture describes solution testing performed in July 2025.

Introduction

Hewlett Packard Enterprise (HPE) provides customers with a range of flexible hardware options for deploying SAP HANA in their data centers. Customers can choose between SAP HANA Certified Appliances, which offer a fully certified stack defined by the vendor with limited choice and flexibility, and SAP HANA Tailored Datacenter Integration (TDI), which provides certified or supported solution blocks, maximum choice through multi-vendor support, and the highest level of flexibility. These options allow organizations to select the deployment model that best fits their business and technical requirements.

HPE Predefined Configurations combine the best aspects of both the SAP HANA Appliance and TDI approaches. It offers customers the choice of both SAP delivery options, providing the flexibility of TDI with the simplicity and assurance of a fully engineered, ready-to-order solution. This approach delivers several key benefits:

- Faster Time to Value: Predefined configurations are fully integrated and turn-key, enabling rapid deployment and reducing the time required to realize business value.
- Reduced Risk: As a fully engineered solution, HPE Predefined Configurations minimize integration risks and ensures compatibility across the stack.
- Flexibility and Modularity: The modular architecture supports both scale-up and scale-out scenarios, allowing organizations to adapt their infrastructure as their needs evolve.
- Integrated SAP Application Tier: Customers have the option to integrate the SAP application tier, further simplifying the deployment and management of their SAP landscape.

HPE Predefined Configuration based on HPE Compute Scale-up Server with SAN storage enable consolidation of SAP landscapes running on up to 24 compute nodes together with up to 192TB of memory in a single Predefined Configuration. The maximum SAP HANA supported and certified memory capacity is 32TB per HPE Compute Scale-up Server 3200 16 socket.

The HPE Compute Scale-up Server 3200 is the newest model in the HPE Compute Scale-up family of servers. This highly reliable, scalable and secure server starts at 4 and scales up to 16 powerful 4th generation Intel® Xeon® Scalable Processors, in 4 socket increments. Its modular architecture scales cost-efficiently to meet your data growth needs. To support growth of in-memory databases and data-intensive workload, it utilizes ultra-fast DDR5 DIMMs with speeds up to 4800 MT/s and 16 DIMM slots per processor, delivering twice the memory bandwidth compared to prior generations. Its flexible I/O subsystem, based on PCIe5.0, delivers 4x I/O bandwidth compared to prior models.

Extreme RAS (Reliability, Availability, Serviceability) features including advanced memory resiliency, “firmware first”, analysis engine, and auto self-healing ensure the highest reliability for mission critical applications. Superior security, including HPE Silicon Root of Trust and two TPM modules, protects your workloads and data against firmware attacks and malware. Optional deployment with HPE GreenLake provides flexible as-a-service consumption while maintaining on-premises control.

Some noteworthy characteristics of the platform include:

- Modular architecture that scales seamlessly from 4- to 16-sockets in 4-socket increments in a single system image
- Memory capacity from 2 TiB (4-socket) up to 32 TiB (16-socket)
- Features 4th Generation Intel® Xeon® Scalable processors
- Proven end-to-end RAS capabilities not available on other standard platforms
- Best-in-class predictive fault-handling built-in analysis engine, predicts hardware faults and initiates self-repair without operator assistance
- Firmware-first approach to log analysis ensures error containment at the firmware level, including memory errors, before any interruption can occur at the OS layer
- Mission-critical resiliency from end-to-end implementation of processor RAS features to redundancy of key system components to advanced system software

While it is possible to have the SAP HANA database installed as part of the HPE Predefined Configuration, the system will not come with a pre-installed SAP application. This can be done with HPE services or using automation capabilities of HPE Morpheus Enterprise.

HPE Morpheus Enterprise is an enterprise-grade cloud management platform (CMP) designed to help organizations manage, automate, and orchestrate hybrid IT environments. It provides a unified interface for provisioning, managing, and governing resources across private clouds, public clouds, and on-premises infrastructure.

Key features of Morpheus Enterprise:

- **Self-service provisioning:** Enables users to deploy VMs, containers, and applications through a self-service portal.
- **Multi-cloud management:** Supports integration with major public clouds (AWS, Azure, Google Cloud, and more) and private clouds (VMware, OpenStack, Nutanix, etc.).
- **Automation and orchestration:** Offers workflow automation, configuration management, and integration with tools like Ansible, Chef, Puppet, and Terraform.
- **Cost management:** Provides visibility into cloud usage and spending, with tools for budgeting and chargeback.
- **Governance and policy:** Includes role-based access control, approval workflows, and compliance features.
- **DevOps integration:** Supports CI/CD pipelines and integrates with popular DevOps tools.

Use cases:

- Hybrid and multi-cloud management
- Self-service IT and DevOps automation
- Cloud cost optimization
- Application lifecycle management

This Reference Architecture explains how to use HPE Morpheus Enterprise to deploy SAP applications in a hybrid cloud environment. In this setup, the SAP HANA database runs on an HPE Compute Scale-up Server 3200 with HPE Alletra Storage MP, while the SAP application runs in a virtualized environment on VMware ESXi and vCenter vSphere.

The Reference Architecture also includes a GitHub repository with SAP Ansible playbooks and an import script for creating workflows in an existing HPE Morpheus Enterprise system.

Solution overview

Figure 1 shows an example of a HPE Compute Scale-up Server 3200 for SAP HANA Solutions with SAN Storage predefined configuration, based on HPE Alletra Storage MP B10000 . Four HPE ProLiant DL360 Gen 11 servers are used as virtual hosts for virtual SAP application server and for HPE Morpheus Enterprise. Other HPE Predefined Configurations are also possible.

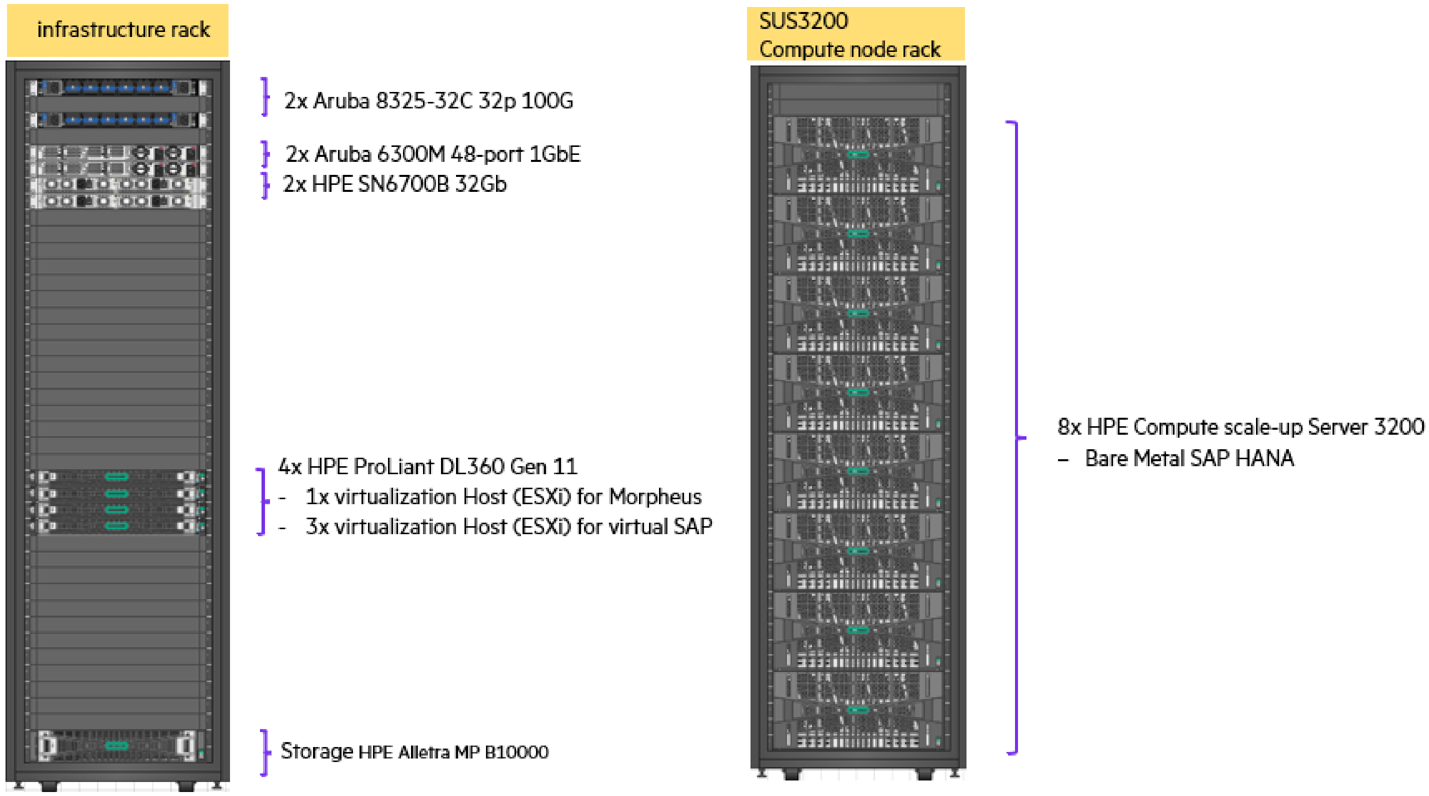

Figure 1. Two Racks for infrastructure and HPE Compute Scale-up Server 3200 compute server

The HPE Compute Scale-up Server 3200 for SAP HANA is preconfigured with SAP HANA databases. Predefined Configurations from HPE can include SAP HANA databases that are fully installed and configured at the factory. However, SAP applications are not installed as part of the standard factory process.

SAP Application like SAP S/4HANA or BW/4HANA can be installed on VMs. In the test landscape for this Reference Architecture, four HPE ProLiant DL360 Gen11 hosts are used for virtual SAP systems for administrative VMs, like HPE Morpheus Enterprise.

HPE Morpheus Enterprise can be used to deploy VMs and run automation tasks for SAP, as shown in **Figure 2** .

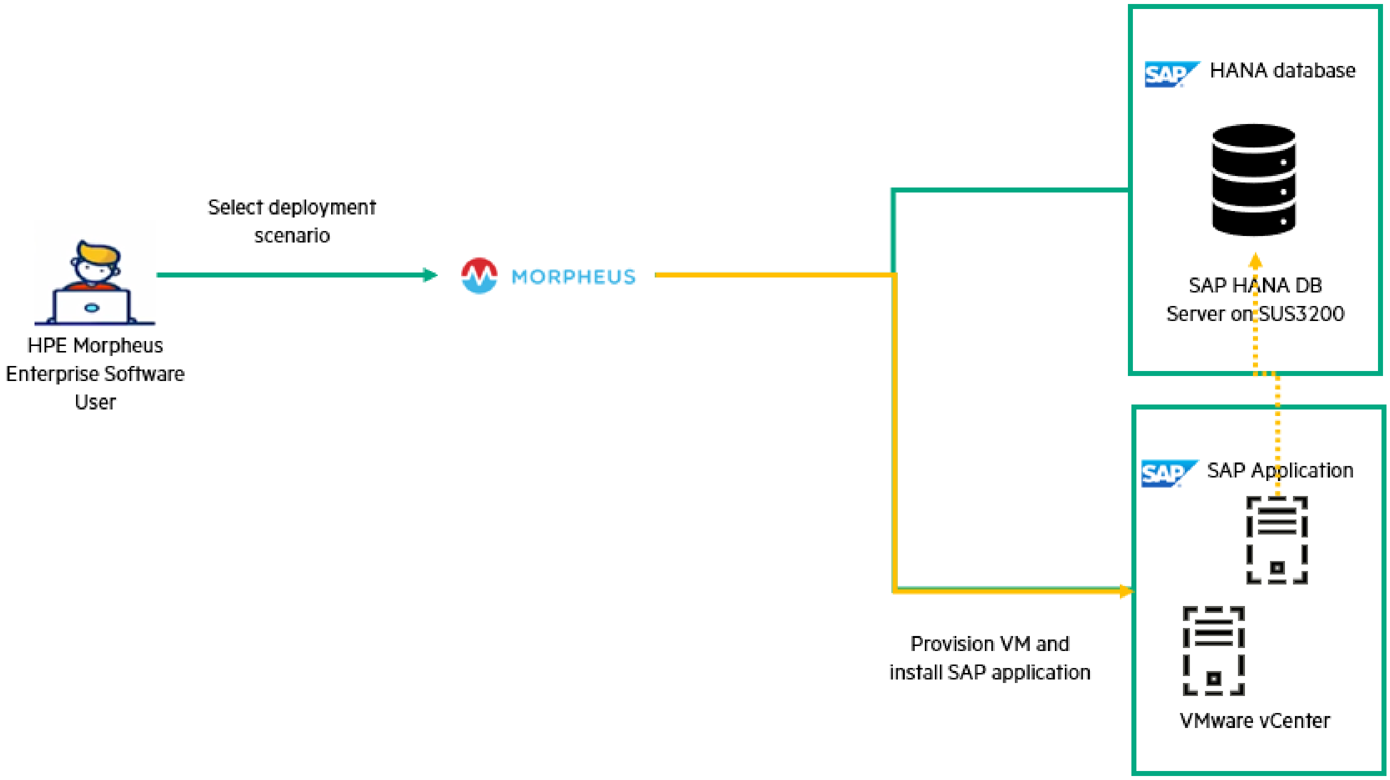

Figure 2. Deployment scenario for SAP Application server with Morpheus Enterprise

This document outlines the process for integrating HPE Compute Scale-up Server 3200 instances and VMware vCenter into HPE Morpheus Enterprise. It details the prerequisites for both HPE Morpheus Enterprise and SAP automation. Step-by-step instructions are provided for integrating SAP automation into HPE Morpheus Enterprise, as well as for creating user-friendly deployment App Blueprints within HPE Morpheus Enterprise.

Leveraging the performance of HPE Compute Scale-up Server 3200 in HPE Predefined Configuration in conjunction with the automation capabilities of HPE Morpheus Enterprise offers a reliable and efficient method for deploying SAP application servers.

Solution components

Hardware

The following table describes the hardware of HPE Compute Scale-up Server 3200 for SAP HANA Solutions with SAN Storage used for this Reference Architecture.

Table 1. Used hardware for Reference Architecture

Qty	Component	Purpose
8	HPE Compute Scale-up Server 3200 for SAP HANA	Bare-metal host for SAP HANA
4	HPE ProLiant DL360 Gen11	virtualization host for HPE Morpheus Enterprise and SAP application
1	HPE Alletra Storage MP B100000	Storage
2	HPE Aruba Networking CX 8325-32C	Network Switch
2	HPE Aruba Networking CX 6300M	Network Switch
2	HPE Storage Fibre Channel Switch B-series SN6700B	SAN Switch

Software

The following table lists the Software used for this Reference Architecture.

Table 2. Software versions used for the Reference Architecture

Software	Version
HPE Morpheus Enterprise Software	8.0.4
VMware ESXi	8.0 U3
VMware vCenter	8.0.3.0050
Red Hat Enterprise Linux for SAP	8.8, 9.4
Ansible-core	2.16.x
Python	3.11 or higher

Other Red Hat Enterprise Linux versions can also be used, however they have not been tested as part of this Reference Architecture.

Application software

The following table lists the application software used for this Reference Architecture.

Table 3. Application software versions used for Reference Architecture

Software	Version
SAP HANA database	2.0 SPS07, 2.0 SPS08
SAP S/4HANA	2023
SAP BW/4HANA	2023

Other SAP HANA versions and SAP application versions are also possible. The existing workflows and inputs will have to be modified respectively.

Best practices and configuration guidance for the solution

Setting up Morpheus

HPE Morpheus Enterprise includes a variety of administrative integrations that make it well-suited for organizations of all sizes. Its built-in white label support and multitenancy features provide managed service providers with extensive options for managing customer accounts and users. The following section provides a high-level overview of the general setup and customization of HPE Morpheus Enterprise. For detailed configuration instructions, please refer to the linked documentation.

To install HPE Morpheus Enterprise, follow the installation instructions in the latest HPE Morpheus Enterprise installation guide.

For information on setting up HPE Morpheus Enterprise in a high-availability (HA) cluster Reference Architecture.

Install additional packages

Additional packages are required on the Morpheus host for the SAP Ansible integration:

- Python 3.10 or higher
- Python package manager - PIP
- Python SDK for the VMware vSphere API - pyvmomi
- Ansible core 2.14.14 or higher.

For installing Ansible, the Ansible installation guide can be used.

Integrating Ansible into Morpheus is described in the Automation integration section of the Morpheus documentation.

If the Ansible execution fails on a target node with an error, take a look at the troubleshooting section of the Morpheus documentation.

Customization steps

Login to HPE Morpheus Enterprise and follow the HPE Morpheus Enterprise documentation for the initial setup of an administrative user.

Pay special attention to the cloud-init customization steps, as these are essential for deployments later.

The following section provides a short summary of the customization steps. For details on the different sections, see the steps described in the Administration section of the HPE Morpheus Enterprise documentation.

In general, set up the system according to your business requirements.

In HPE Morpheus Enterprise, a Tenant is an isolated environment with its own users, workloads, and groups. The Master Tenant is created during installation and manages all Subtenants, which are created afterward. The Master Tenant can share resources with Subtenants, but Subtenants cannot share resources with each other or access non-assigned resources.

There are two types of roles: Tenant Roles, which set the maximum permissions for users within a Tenant, and User Roles, which define access to features and resources. Tenant Roles are managed by the Master Tenant and control what Subtenants can access. User Roles can be single-tenant (unique to one Tenant) or multi-tenant (created by the Master Tenant and propagated to Subtenants, unless edited locally).
For details on creating tenants and related roles, see the section Tenants in the Administration part of the HPE Morpheus Enterprise documentation.

HPE Morpheus Enterprise supports integration with popular identity sources like Active Directory and Okta. These integrations can be configured from the Identity Sources section on a Tenant detail page or the Users list page. These integrations map roles within these sign-on tools to equivalent roles in HPE Morpheus Enterprise so at first log in users are assigned the appropriate role. For details on integrating identity sources see the section Identity Sources in the Administration part of the HPE Morpheus Enterprise documentation.

Service Plans in HPE Morpheus Enterprise define the compute resources—such as CPU, memory, and storage—allocated to each instance. When provisioning or converting instances, users select a plan that matches the desired or existing configuration. Plans can restrict or allow resource adjustments at provisioning time and are linked to price sets, enabling cost calculations for both private and public clouds. Plans, price sets, and prices are managed in the Plans & Pricing section. While HPE Morpheus Enterprise provides default Service Plans for private and some public clouds, users can create or edit plans for private clouds but not for public cloud provision types. For general details on creating plans and pricing see the section **Plans & Pricing** in the **Administration** part of the HPE Morpheus Enterprise documentation.

See **Figure 3** for an example service plan for an SAP HANA VM.

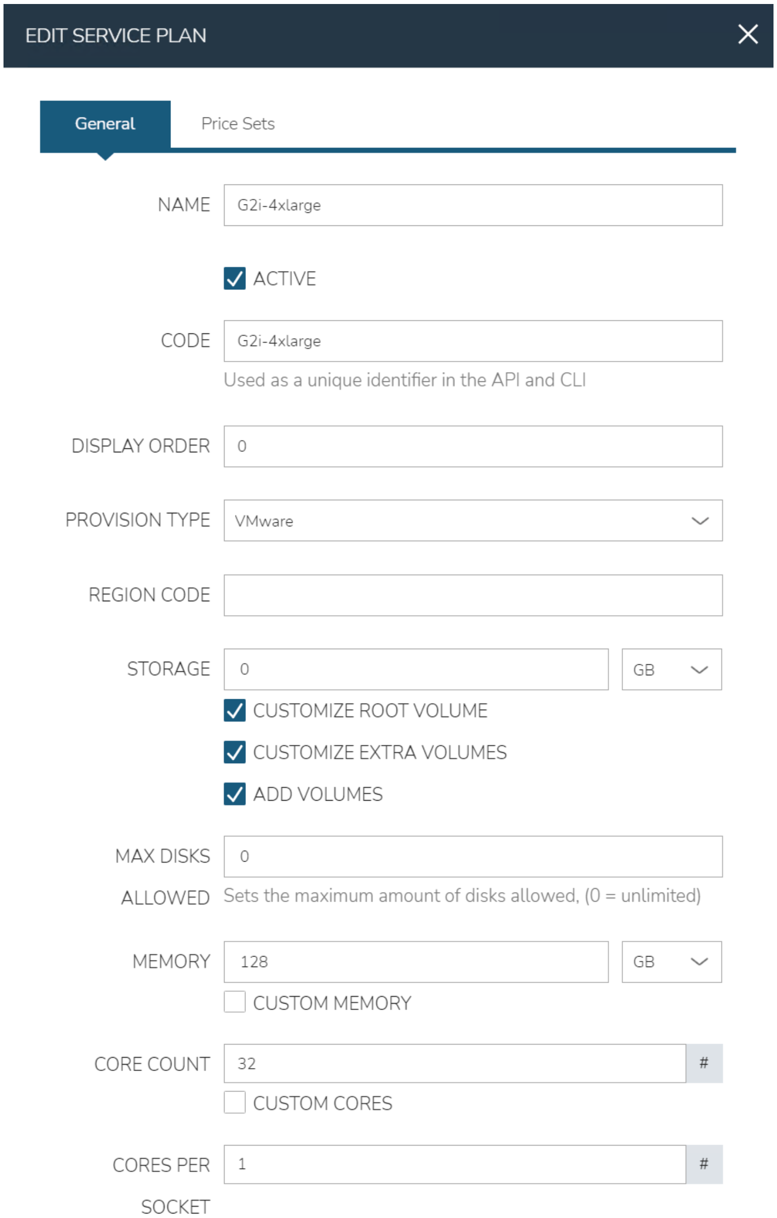

Figure 3. Add Service Plan

HPE Morpheus Enterprise offers robust role-based access control, allowing administrators to manage user permissions at both the feature and resource level through Tenant and User roles. Users can be assigned multiple roles, with the most permissive access applying. For details on creating roles see the section **Roles** in the **Administration** part of the HPE Morpheus Enterprise documentation.

In HPE Morpheus Enterprise, each user is assigned specific roles and permissions that determine what features and resources can be accessed. A user group combines a collection of users that can be managed together. User groups make it easier to assign permissions, roles, and access to resources to multiple users at once, ensuring consistent access control and simplifying administration. For details on users and user groups see the section Users & User Groups in the Administration part of the HPE Morpheus Enterprise documentation.

Policies in HPE Morpheus Enterprise provide governance, cost control, and auditing capabilities. They can be applied to various areas such as users, roles, groups, clouds, and tenants, giving administrators flexible control over their environments. The scope of each policy depends on its type. For details about the different policy types and the creation of policies see the section Policies in the Administration part of the HPE Morpheus Enterprise documentation.
For the provisioning of instances and host, naming policies can be applied. See the section Instance and Host Names in the policy type section of the HPE Morpheus Enterprise documentation.

General settings for the HPE Morpheus Enterprise appliance can be configured in the Administration and then Settings section. There, white labeling, provisioning, monitoring, backups, logging, proxy settings and licensing can be maintained. For details about the general settings see the section Settings in the Administration part of the HPE Morpheus Enterprise documentation.

Ansible integration
We recommend forking the GitHub repository at https://github.com/HewlettPackard/morpheus-sap-install and including personal repository into HPE Morpheus Enterprise.
This GitHub repository is based on the SAP Linuxlab community playbooks with additional enhancements for automated deployments in HPE Morpheus Enterprise.

The following additions were included:

- For the system copy installation option, additional parameters for the root key import have been added
- An option has been included to not change file permissions for a SAP HANA installation
- As this Reference Architecture works with a media share with already extracted installation software, the default settings for detecting and extracting media archives are set to false.
- Asynchronous tasks have been replaced by non-asynchronous tasks

Currently, there is one master password used for the SAP HANA database installation and a separate master password for the SAP application installation. In case individual passwords for different users are required, add additional input options in HPE Morpheus Enterprise, update the relevant playbook tasks, and adjust the password assignment in the GitHub repository.

Default parameter settings can be changed in the GitHub repository in the variable files referenced by the playbook. These variable files are in playbooks/vars.
Additionally, default parameter settings are set in the main.yml file in the defaults directory of the respective role. For SAP HANA installation, the file is located in roles/sap_hana_install/defaults/main.yml, For SAP Application, the file is located in roles/sap_swpm/defaults/main.yml.

To include an Ansible repository in HPE Morpheus Enterprise, navigate to Library and select Integrations.

1. Click + Add and select "Ansible" as the integration type.
2. Enter all required information for personal repository to complete the integration setup.
3. Make sure to select “Use Morpheus Agent Command Bus”.
4. “Enable Git Repository Caching”, if required.
5. Provide username and password for the selected git repository.

See **Figure 4** for an example of an Ansible integration.

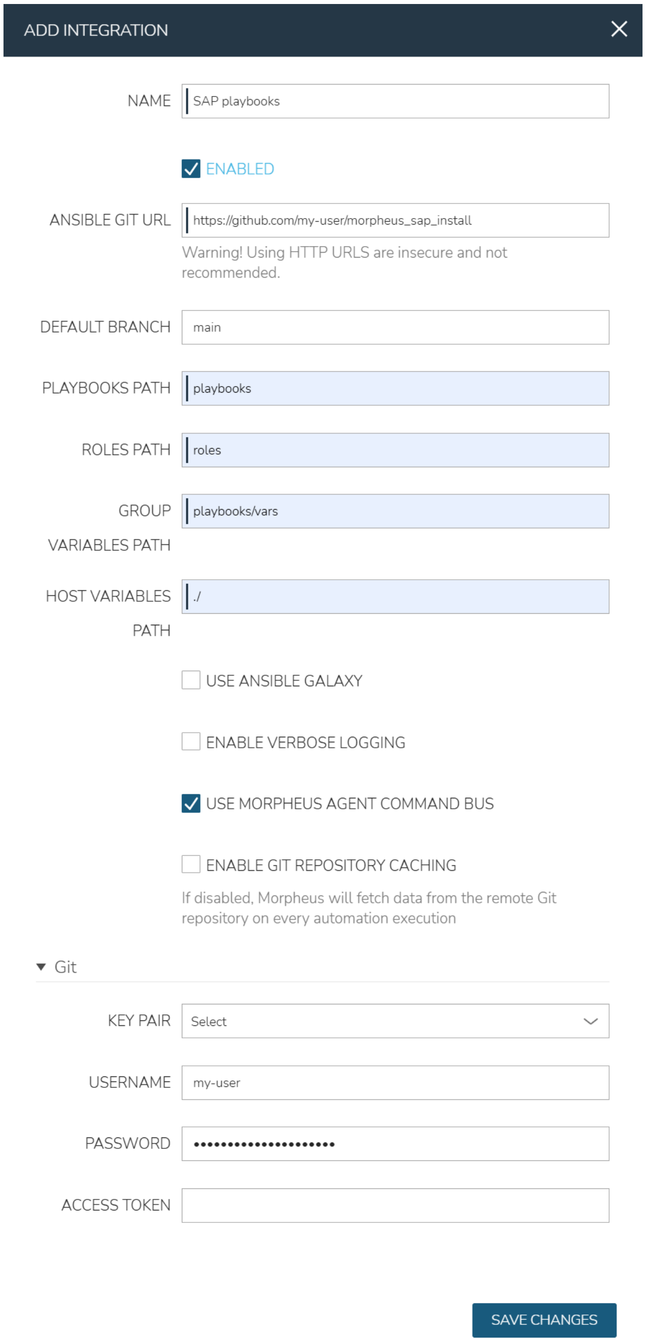

Figure 4. Ansible integration

Cloud Group creation

To set up a hybrid cloud scenario, use the HPE Compute Scale-up Server 3200 as the SAP HANA database host and virtual machines for the SAP primary application server.

Begin by creating a Group with two clouds.

1. Go to **Infrastructure** and select **Groups** to create the group.

2. Next, create one cloud for the bare metal server and another for the vCenter, both within the same group. Details on how to create the two clouds are shown in the next sections.

Bare Metal integration

Create a bare metal cloud

1. Select the “**MORPHEUS PRIVATE CLOUD**” type for bare metal servers.

2. Provide a name and additional information according to requirements and assign the cloud to the existing group.

Manual steps on the HPE Compute Scale-up 3200 server

Before adding the HPE Compute Scale-up Server 3200 server to the cloud some additional configurations on the server have to be performed.

1. Logon to the server and check if python is installed on the host. It is recommended to use the same python version on the bare metal server and the VMs hosting the SAP application. If different versions are used, it’s possible to create a logical link in the systems being automated with Ansible and provide this logical link in the input “option Ansible python interpreter”, which is required for the Ansible execution.

2. Make sure the correct version of the compat C++ library is installed on the server as recommended in SAP note 3449186.

3. Make sure the hostname of the HPE Morpheus Enterprise instance is resolvable.

Add the server to the cloud

In HPE Morpheus Enterprise, it is possible to add bare-metal servers to the Morpheus Private Cloud group.

1. Go to Infrastructure and select Clouds.

2. Choose the bare metal group that was created for the bare-metal server.

3. Navigate to the Bare Metal section.

4. In the +BARE METAL drop-down menu, select Linux Server as shown in **Figure 5.**

5. Add bare metal server.

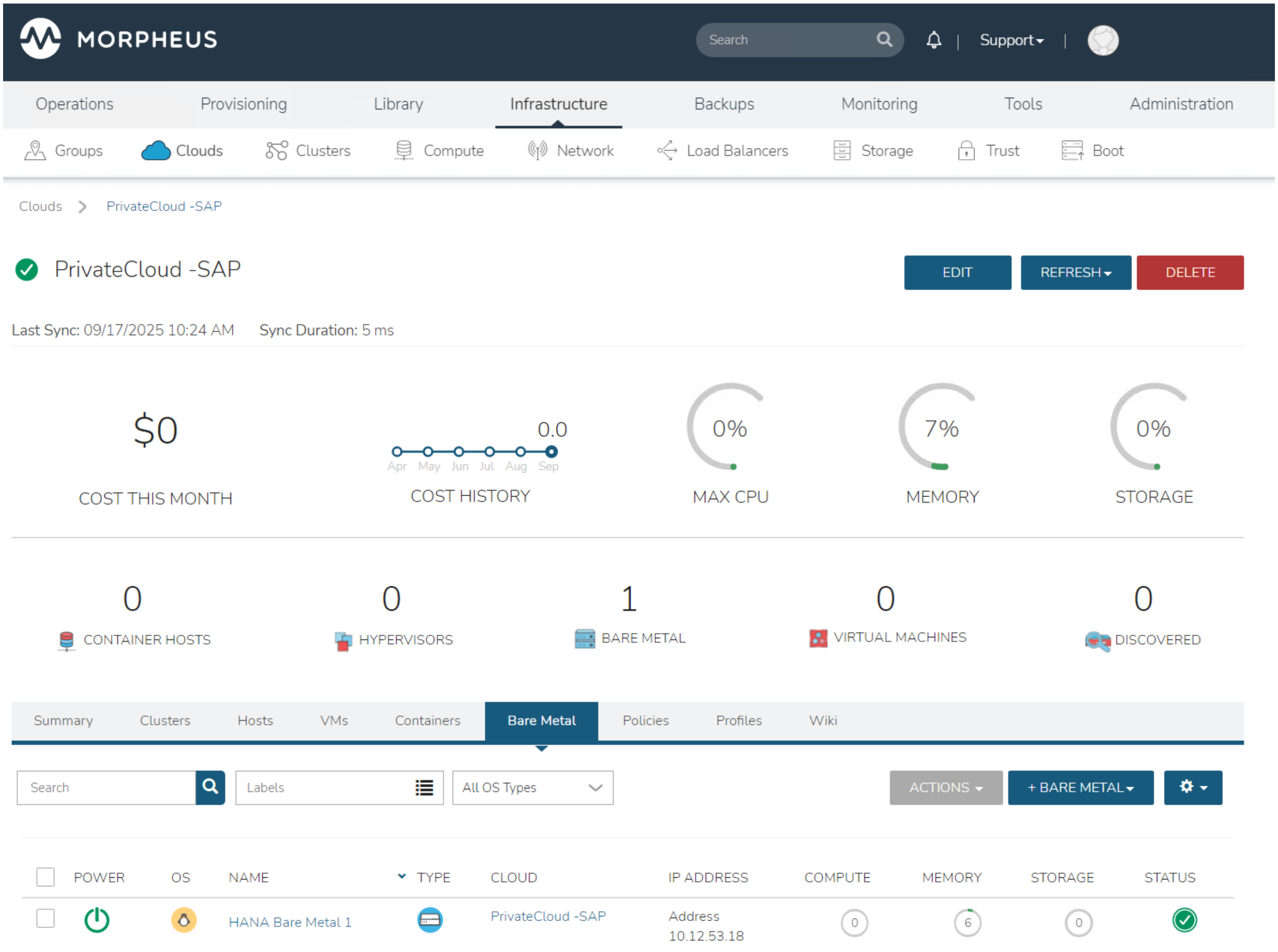

Figure 5. Add bare metal server

6. Set the visibility as required for deployments.
7. In the next step, provide the SSH credentials needed to establish an initial connection to the host.
8. Copy the displayed SSH key to the HPE Compute Scale-up Server 3200 and complete the setup process. Once the server is successfully integrated into HPE Morpheus Enterprise, click on the server entry, open the ACTIONS drop-down menu, and select Install Agent to install the Morpheus agent. This agent is necessary for executing automation tasks in later steps. The installing of the agent may take up to 30 minutes.
9. To enable SAP landscape installation tasks on this system, set specific environment parameters manually. In HPE Morpheus Enterprise, go to Provisioning - Instances and select the appropriate server. Navigate to the Runtime section and make the following changes: set "SAP_HANA" as the Environment Prefix and assign values to the parameters "SAP_HANA_SID," "SAP_HANA_INSTANCE_NUMBER," and "SAP_HANA_HOSTNAME" according to system configuration. See **Figure 6** for an example setting.

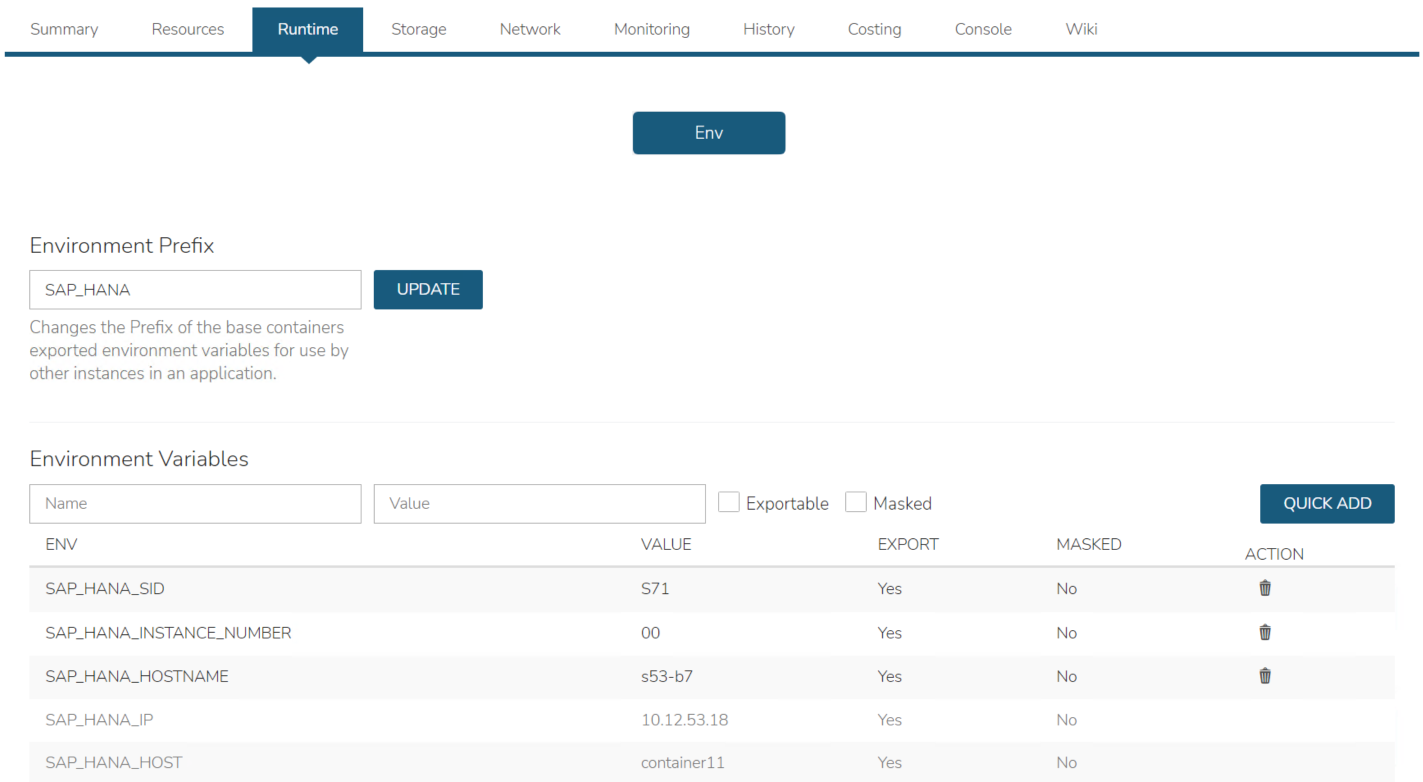

Figure 6. Add environment variables

Note
SAP_HANA_SID must match the storage and filesystem configuration.

VMware vCenter integration

Create a VMware cloud for the VMware vCenter integration

Select the “vmware VMWARE VCENTER” type for the vCenter integration. Provide a name and additional information according to requirements and assign the cloud to the existing group.

For a more detailed explanation see the steps described in the HPE Morpheus Enterprise guide and the HPE Morpheus Enterprise VMware integration guide.

If no DHCP server is configured for the networks, make sure to follow the section “Configuring Network for Provisioning”.

VM template

Prepare VM image

Connect to vCenter and create a VM with minimum root disk size. Example. 10 GB. This will be the minimum disk size requirement to deploy the VM using Morpheus Enterprise.

Install the required Red Hat Enterprise Linux for SAP OS version into the VM. Make sure to comply with the following SAP and Morpheus Enterprise requirements.

- SAP requirements
- SAP note 3108316 for Red Hat Enterprise Linux 9.x: Installation and Configuration
- SAP note 3108302 for SAP HANA DB: Recommended OS Settings for RHEL 9

- SAP note 2772999 for Red Hat Enterprise Linux 8.x: Installation and Configuration
- SAP note 2777782 for SAP HANA DB: Recommended OS Settings for RHEL 8
- SAP note 3119751 - Linux Requirements for SAP Kernel 754 and for SAP Kernel 788 and higher to avoid installation errors during SAP application installation.
- SAP note 3057467 which compat-sap-c++ package do I need for SAP on RHEL?

Ansible Automation

For Ansible automation make sure python version >=3.10 is installed.

From an automation perspective it is recommended to use the same python version in the virtualized systems and the bare metal systems.

HPE Morpheus Enterprise requirements

See the documentation of Morpheus Enterprise for details about required packages and network setup for a RHEL image.

After having prepared the OS, make sure no ISO image is connected to the VM and create a template out of this VM.

Include VM template in HPE Morpheus Enterprise

HPE Morpheus Enterprise automatically detects existing templates in vCenter. Modify these templates in the Library section under Virtual Images, if required. If the template is not visible change filter setting from “User” to “Synced”. Ensure that Red Hat with the correct version is selected as the operating system, and that the checkboxes for cloud-init enablement and agent installation are both checked. In case using cloud-init settings in HPE Morpheus Enterprise, do not provide a username. See **Figure 7** for an example configuration.

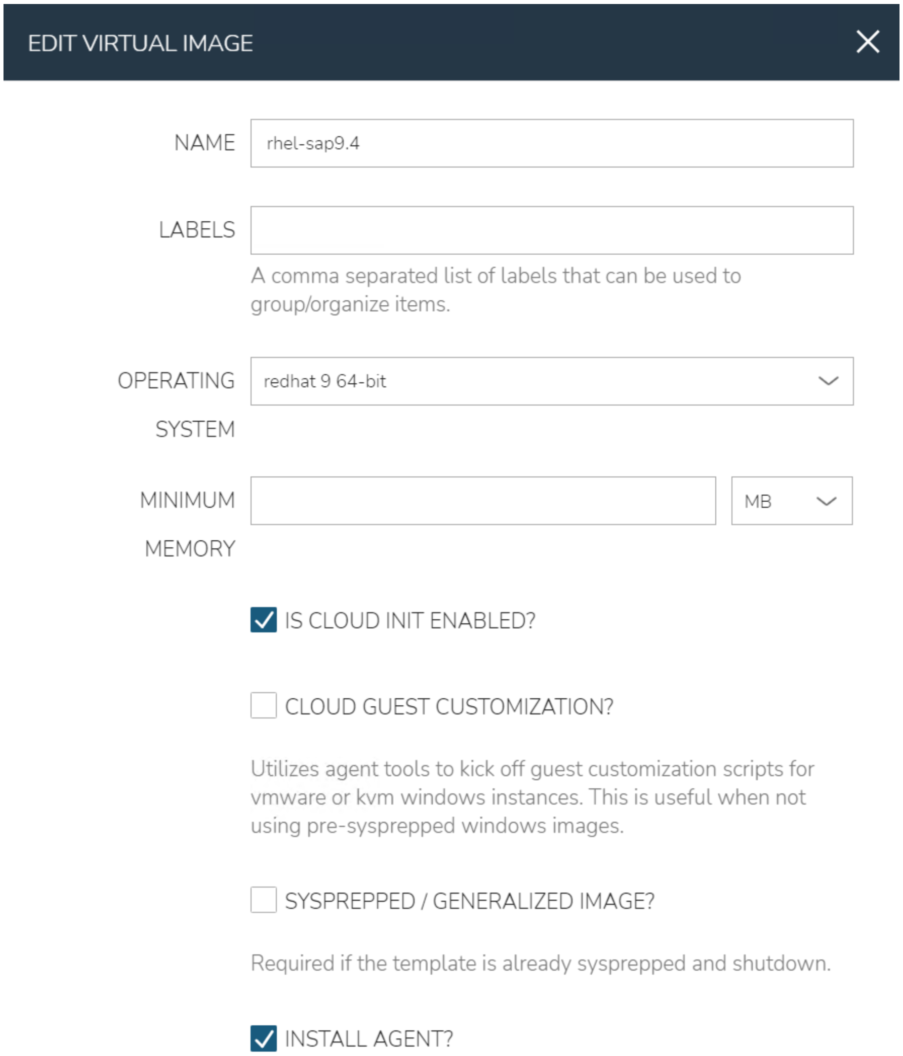

Figure 7. Modify a virtual image

SAP Media server preparation

SAP media server provides the installation media e.g. for SAP Application server installation to the environment. It can be realized as an NFS server providing an NFS share or as a webdav, cifs or sshfs share.

We recommend creating a shared directory that contains all installation media required for SAP HANA and SAP application installation. HPE Alletra Storage MP Unified File service can be used to create an NFS share providing any installation media. The automation expects some directories containing the SAP installation media. These directories will be entered in input parameters and option lists specific for each installation type.

See the following tables for a detailed description of the input parameters. Some “Inputs” are optional when associated task is not used, see column “Optional” The column “Defining DEFAULT VALUE required” shows which input options requires to define a default value. Be sure to update the field “DEFAULT VALUE” for these input options to ensure correct operation. Also, check the settings for input option lists, as default values are required there as well.

To modify the imported input options, navigate to Library, then select Options, and choose Inputs.

Table 4, **Table 5** and **Table 6** list the option lists that define the location of installation media.

- Extracted SAP HANA installation media:
  Download and extract the IMDB_SERVER20* and IMDB_CLIENT20* packages into the same directory. Use the option -manifest SIGNATURE.SMF when extracting. Ensure to extract IMDB_SERVER20 as the final package.
- Extracted SWPM directory:
  This directory contains the extracted SAP Software Provisioning Manager software, including sapinst.
- SAP media directory:
  It is advisable to create a separate directory for each SAP product. This directory should contain all media required for the SAP application installation. The most convenient way to obtain a consistent set of installation packages is to use the SAP Maintenance Planner.
- SAP HANA backup directory
  This directory can contain subdirectories for different.

If the target host does not have access to external websites and cannot download the latest crlbag.ps7 file, the automation scripts will copy this file to the target host if it is available in the SAP media directory. For more information on obtaining this file, see SAP note 3594353 SAP note 3594353.

Ensure that all executable files have the correct execution permissions.

Importing Workflows

The import script "import_script.py" is a Python-based utility designed to simplify the integration of operational and provisioning workflows into the HPE Morpheus Enterprise platform. By automating the import process, the script ensures consistency, reduces manual effort, and prevents duplication by detecting and reusing existing tasks and workflows.

Specifically, the script checks whether a workflow or its dependencies already exist in the target instance by comparing key attributes such as name, description, field name, and code. If a matching item is found, it reuses the existing one; otherwise, it creates a new resource. This helps prevent duplicates and keeps the system organized by reusing existing items instead of creating new ones unnecessarily.

For operational workflows, the script imports option lists, input parameters, tasks, and sub-workflows. In the case of provisioning workflows, it focuses on importing tasks and sub-workflows. This distinction allows the script to handle different workflow types efficiently, catering to diverse use cases.

Additionally, the script provides detailed error messages and troubleshooting recommendations to assist users in resolving issues during the import process. With user-friendly logging, it displays clear messages to enhance visibility and understanding, making it easier for users to track the progress of their imports.

The import script is available on https://github.com/HewlettPackard/morpheus-sap-install.

Prerequisites

The following prerequisites and setup steps are required to use the import script. The script can be executed from any system that has network access to the HPE Morpheus Enterprise API endpoints, or directly on the HPE Morpheus Enterprise server.

Supported Operating Systems

The script has been tested and validated on the following operating systems:

- Windows 10 Enterprise (Build 19045)
- Ubuntu 22.04.5 LTS

Prepare the environment

Extract the files:

Download the zip file Morpheus_import_package.zip from https://github.com/HewlettPackard/morpheus-sap-install and extract the contents to a directory of your choice. Please note that network access to the HPE Morpheus Enterprise appliance host is required to execute the script.

Python Environment

- Ensure Python 3.10 or later is installed on the system.

```
python3 --version
```

- Ensure pip (python package manager) is installed to manage dependencies
  Check if pip is installed using
  `python3 -m pip -version`
  If pip is not installed, follow the official pip installation guide: https://pip.pypa.io/en/stable/installation/

Morpheus API Credentials

To configure the API connection, open the config.json file located in the extracted directory Morpheus_Import_Package and update it with Morpheus API credentials.

`“morpheus_url”:` The base URL of the Morpheus Instance.
`“username”:` Morpheus username.
`“password”:` Morpheus password.
`“client_id”:` Set to “morph-api” (default value).
`“client_secret”:` Set to empty string (“”) unless otherwise specified.

Note

Storing sensitive data like credentials in plain text is not recommended, especially in production environments or shared systems.

Secure Configuration Recommendation

By default, the script currently uses a config.json file to manage credentials. It is strongly recommended to use a secure method to handle credentials in production or enterprise setups.

Morpheus offers support for integrating with Hashicorp Vault through an official plugin available via the Morpheus Exchange. This integration allows credentials to be stored securely outside Morpheus in Vault, aligning with best practices and enterprise IT policies.

Once configured, users can store and retrieve secrets via Vault for cloud integrations, option lists, and automation tasks.

Note that this integration requires downloading and installing the Vault plugin manually.

Available Import Options

The import script offers two modes of operation:

Import All Workflows (Required initial step):

- Importing all workflows ensures that all input parameters required by provisioning workflows are available for layout creation.
- This approach helps avoid missing input options during layout setup and ensures consistency across provisioning scenarios.

Import Specific Workflow:

- Intended for maintenance or re-importing a workflow that was deleted or modified.
- Can be run after the initial full import to update or recover a specific workflow without disrupting others.

Start import

To start the import script, open a terminal or command prompt and navigate to the directory where “import_script.py” is located. Use the following commands:

```
cd <base_directory>/scripts
python3 import_script.py
```

The script will guide through the process with on-screen prompts to help select and import workflows. For the first import, it is required to import all workflows to ensure the environment is fully configured. This is done by selecting the option “All Workflows”.

Enabling debug mode by passing the –debug flag when running the script, provides more detailed output for troubleshooting,

```
python3 import_script.py --debug
```

Troubleshooting

The following are common issues encountered while using the script and their corresponding solutions:

- Error: Workflow File Not Found
  Ensure the workflow configuration file exists in the import folder. Verify that the file name matches the expected format: workflow_<workflow_name>_import.json
  Suggested Solution:
    - Check if the workflow file is missing or incorrectly named.
    - If the file is missing, re-extract the zip file containing the workflow configurations to ensure all files are present.
    - If the file is incorrectly named, rename it to match the expected format.

- Error: Missing Option Lists of Input Parameters
  For operation workflows, ensure the options and input_parameters directories contain all required files.
  Suggested Solution:
    - Verify that the options and input_parameters directories exist in the import/<workflow_name> folder.
    - If the directories or files are missing, re-extract the zip file containing the workflow configurations.
    - Ensure that the files in these directories are correctly named and formatted.

- Error: Invalid Credentials
  Check that the config.json file contains the correct Morpheus API credentials. Ensure these credentials have the necessary permissions to import workflows.
  Suggested Solution:
    - Open the config.json file and verify the morpheus_url, username,. password, client_id, and client_secret fields are correctly populated.
    - If the credentials are incorrect, update them with valid values and save the file.
    - If the issue persists, contact your Morpheus administrator to confirm the credentials and permissions.

- Error: Sub-Workflow Configuration File Not Found
  Confirm that the sub-workflow configuration file exists in the sub-workflows directory under the import folder. The file name should follow the format: workflow_<subworkflow_name>_import.json
  Suggested Solution:
    - Check if the sub-workflow configuration file is missing or incorrectly named.
    - If the file is missing, re-extract the zip file containing the workflow configurations.
    - If the file is incorrectly named, rename it to match the expected format.
- Debugging
  To display detailed information in the terminal, including API requests, responses, and internal processing steps, enable debug mode by running the script with the –debug flag:
  ```
  python3 import_script.py --debug
  ```

Customizing SAP automation in Morpheus data

After importing the Workflows, several customizations must be performed in the system.

Perform the following instructions given to customize input options for the actual deployment environment.

Input Options

Input Options are used to manage input parameters in tasks. They can be set to be visible or hidden during deployment. In some cases, an input option becomes visible only if another input is selected with a specific value. For example, the SAP HANA backup password input options are shown only when an SAP restore option is selected. Visibility settings can be adjusted to meet individual deployment requirements. Additionally, App Blueprints provide further options to control input visibility at deployment time or to set an default value.

See the tables for a detailed description of the input parameters. Some “Inputs” are optional when associated task is not used, see column “Optional” The column “Defining DEFAULT VALUE required” shows which input options requires to define an default value . Be sure to update the field “DEFAULT VALUE” for these input options to ensure correct operation. *Default options are also required in input options lists. Please check the respective settings as well*

To modify the imported input options, navigate to Library, then select Options, and choose Inputs.

Table 4. Input option that needs customization for mounting the SAP media share used in all installation scenarios

Name	Possible Value	Defining “DEFAULT VALUE” required	Visibility	Optional	Description
Ansible python interpreter	/usr/bin/python3	Yes	Hidden		Directory of the python executable on the target host.
HTTPs proxy	https://proxy.example.com:8080	Yes	Hidden	Yes	used for webdav mount and for setting a system proxy permanently
HTTP proxy	http://proxy.example.com:8080	Yes	Hidden	Yes	used for webdav mount and for setting a system proxy permanently
Morpheus hostname	Morpheus.localdomain	Yes	Hidden	Yes	FQDN Morpheus hostname, required to ensure the hostname resolution
Morpheus IP	172.16.0.18	Yes	Hidden		Optional: IP address of the Morpheus host
Mounting SAP media server					
SAP media server type	nfs, sshfs, cifs, webdav	Yes	Hidden		The default connection type can be set. E.g. nfs. Set the preferred mount option as default value.
SAP media server IP	172.16.0.1	Yes	Hidden		IP of the server that hosts the SAP installation media
SAP media server share	/mnt/export	Yes	Hidden		Directory on the media server that was exported
SAP media folder mountpoint	/mnt/software	Yes	Hidden		Mount point directory on the target host.
SAP media server user	Administrator	Yes	Hidden, required if type is set to cifs or webdav	Yes	The user required for cifs or webdav mount
SAP media server user password	***	Yes	Hidden, required if type is set to cifs or webdav	Yes	Password for the media server user required for cifs or webdav mount
SAP HANA installation					
SAP HANA SID	HD1	No	Visible		SAP HANA system ID

Name	Possible Value	Defining “DEFAULT VALUE” required	Visibility	Optional	Description
SAP HANA instancenumber	00	No	Visible		SAP HANA instance number
SAP HANA Master Password	***	No	Visible		Master password for the SAP HANA database
SAP HANA database version for RHEL9	List	Yes	Visible		Select list of the input option “SAP HANA Version for RHEL9”. Modify the input option list. For details, see **Table 5**
SAP HANA database version for RHEL8	List	Yes	Visible		Select list of the input option “SAP HANA Version for RHEL8”. Modify the input option list. For details, see **Table 5**
SAP HANA sizing option	List	No	Visible		Select list of sizing options. Possible selections are: “Default”: will size /hana/data to 3*memory, log and shared to 1*memory “Dual_purpose”: will size data, log and shared to 1*memory. “Custom”: offers customization fields for the SAP HANA specific directories
SAP HANA volume size for /hana/data	384	No	Hidden, visible if sizing option custom is selected		Individual size for /hana/data/<sid> directory in GB
SAP HANA volume size for /hana/log	128	No	Hidden, visible if sizing option custom is selected		Individual size for /hana/log/<sid> directory in GB
SAP HANA volume size for /hana/shared	128	No	Hidden, visible if sizing option custom is selected		Individual size for /hana/shared/<sid> directory in GB
SAP Primary Application server					
SAP APP PAS Product ID input list	List	Yes	Visible		The list of available SAP products to be installed. Modify the input option list ”SAP PAS Product ID with media directories”. For details see **Table 6**
SAP HANA Database Backup Location List	Radio list	Yes	Hidden, visible only if an SAP product ID for system copy is selected	Yes	Required for system restore. Modify the input option list “SAP HANA database backups”. For details see **Table 6**
SAP APP SID	S41	No	Visible		SAP system ID
SAP APP master password	***	No	Visible		Master password for SAP application server
SAP APP ASCS instance number	10	No	Visible		Instance number for the SAP ASCS instance
SAP APP PAS instance number	11	No	Visible		Instance number for the SAP PAS instance

Name	Possible Value	Defining "DEFAULT VALUE" required	Visibility	Optional	Description
SAP APP parallel installation jobs	23	No	Hidden	Yes	Can be used in slow network environment to reduce the amount of parallel import jobs during the database load. If nothing is customized, the default 23 will be used.
SAP HANA Database Backup Source System Password	***	No	Hidden, visible only if an SAP product ID for system copy is selected	Yes	Required for System restore. Password of the System user of the source SAP HANA system, where the backup was created.
SAP HANA DB Root Key Backup Password	***	No	Hidden, visible only if a SAP product ID for system copy is selected	Yes	Required for System restore. Password used for the root key encryption of the source SAP HANA system
SAP HANA database schema	SAPHANADB	Yes	Hidden	Yes	The database schema used for system restore. If a custom value is used for installation, the field visibility must be changed to visible. If the field is empty, SAPHANADB will be assumed to be the SAP HANA database schema.
SAP Additional application server					
SAP APP AAS Product ID input list	List	Yes	Visible		The list of available SAP products to be installed. Modify the option list "SAP AAS Product ID with media directories". For details see **Table 7**.
SAP APP PAS hostname or IP	sid52pas	No	Visible		Required if the additional application server is not installed in a Morpheus APP with environment variables

Input Option lists

Table 5, **Table 6**, **Table 7** list the input options lists that need customization after the workflow import. To modify the imported option lists, navigate to Library, then select Options, and choose Option Lists.

Table 5. Option list that needs customization for SAP HANA installation

Name	Possible Value "DATASET"	Description
SAP HANA Version for RHEL9	[{"name": "SAP HANA 2.0 SPS 08 rev 82 for RHEL 9", "value": "/mnt/software/BW4HANA2023/SAP_HANA"}]	"name:" is the display name shown during deployment. "value:" is the absolute path to the directory on the target host containing the extracted SAP HANA installation media. Multiple entries can be specified by listing them in this format, separated by commas.
SAP HANA Version for RHEL8	[{"name": "SAP HANA 2.0 SPS 06 rev 73 for SAP S/4HANA2023", "value": "/mnt/S4HANA2023/SAP_HANA/"}, {"name": "SAP HANA 2.0 SPS 07 rev 79", "value": "/mnt/SAP_HANA_PLATFORM_20_SPS07_rev79"}]	"name:" is the display name shown during deployment. "value:" is the absolute path to the directory on the target host containing the extracted SAP HANA installation media. Multiple entries can be specified by listing them in this format, separated by commas.

Table 6. Option list that needs customization for SAP Application installation

Name	Possible Value	Description
SAP PAS Product ID with media directories	[{"name":"SAP BW4HANA2023 PAS","value":"NW_ABAP_OneHost:BW4HANA2023.CORE.HDB.ABAP|/mnt/software/BW4HANA2023|/mnt/software/BW4HANA2023/SWPM"}]	name:" is the display name shown during deployment. "value:" There are three sections for the value, separated by |. The first value is the product ID, as required by the SAP installer. The second value is the absolute path to the directory on the target host containing the extracted SAP application media. The third value is the absolute path to the directory on the target host containing the extracted SWPM installation media. Multiple entries can be specified by listing them in this format, separated by commas.
SAP HANA database backups	[{"name":"Backup BW/4HANA2023 B41","value":"/mnt/backups/new"}, {"name":"Backup BW/4HANA2023 B42","value":"/mnt/backups/BW4HANA2023"}, {"name":"Backup S/4HANA2023 S41","value":"/mnt/backups/S4HANA2023"}]	name:" is the display name shown during deployment. "value:" The absolute path to the directory containing the backup files, including the root key file. This list is not required, if the restore functionality is not used

Table 7. Option list that needs customization for SAP additional application server installation

Name	Possible Value	Description
SAP AAS Product ID with media directories	[{"name":"SAP BW4HANA2023 AAS","value":"NW_DI:BW4HANA2023.CORE.HDB.PD|/mnt/BW4HANA2023|/swdepot/BW4HANA2023/SWPM"}, {"name":"SAP S4HANA2023 AAS","value":"NW_DI:S4HANA2023.CORE.HDB.PD|/mnt/S4HANA2023|/swdepot/S4HANA2023/SWPM"}]	name:" is the display name shown during deployment. "value:" There are three sections for the value, separated by |. The first value is the product ID, as required by the SAP installer. The second value is the absolute path to the directory on the target host containing the extracted SAP application media. The third value is the absolute path to the directory on the target host containing the extracted SWPM installation media. Multiple entries can be specified by listing them in this format, separated by commas.

Tasks

1. Edit each Ansible task and select the Ansible Repository that refers to the GitHub repository containing the SAP Ansible playbooks.
2. Navigate to Library, then Automation and select Tasks.
3. Choose filter “Ansible Playbook” as the task type.
4. Edit each SAP task and assign the appropriate Ansible repository “ANSIBLE REPO”.

Workflows

In Morpheus Enterprise there are two different types of workflows: Operational and Provisioning. Workflows define the sequence of the execution of tasks.

Operational workflows can be executed on existing instances and include input parameters.

Provisioning workflows define tasks that will be automatically executed at different life cycle phases of a server. Provisioning workflows do not include the input options definitions. They are assigned during the creation of a layout or at provision time.

This Reference Architecture describes the usage of operational workflows for SAP HANA and SAP application installation in existing bare-metal or virtualized instances and the usage of provisioning workflows used at the VM provisioning time.

The delivered workflows include several tasks, but not all of them may be needed. This chapter lists the optional tasks and their related inputs. Remove the ones that are not required.

Optional tasks and input for all workflows

- "Set morpheus hostname resolution"
  In environments without a DNS server, Morpheus hostname resolution is required on the target instance. This task will add the hostname to the hosts file of the target instance if it is not already present. If this task is not required, remove the "Morpheus hostname" and "Morpheus IP" inputs from the workflow too.
- "Set proxy"
  This task will set the HTTP and HTTPS proxy in the target environment if they are not already configured. If this task is not used, remove the "HTTP proxy" and "HTTPS proxy" inputs from the workflow too.
  Before deciding to generally set the proxy on the systems, make sure that the Morpheus host still can be reached, even when using the proxy.
- "Copy crlbag file"
  This task copies the crlbag.p7s file from the SAP media directory to /root/.sapinst/crlbag.p7s on the target instance. It is recommended for new SWPM versions, especially if no proxy is available to download the crlbag file during SAP installation.

Workflows for SAP HANA installation

There are three workflows available for installing the SAP HANA database:

- SAP HANA Installation for RHEL8 – operational
- SAP HANA Installation for RHEL9 - operational
- SAP HANA installation – provisioning

All Workflows use the same tasks. The operational workflow includes input options.

The difference between the operational workflows of the two Red Hat Enterprise versions is the input option for the installation media. The workflow will include either "SAP HANA database version for RHEL8" or "SAP HANA database version for RHEL9," depending on the version used.

To use the provisioning workflow, input options are assigned during the creation of a layout.

Table 8. Workflow for SAP HANA installation

Task name	Type	Description
Set morpheus hostname resolution	Script	Optional: Set the Morpheus hostname resolution
Set proxy	Script	Optional: Set the proxy in the host environment
Provide SAP installation media script	Script	Mounts the media server share that contains the SAP installation media. Supported mount options are nfs, sshfs, webdav and cifs
Create SAP HANA directories	Script	According to the selected sizing option, the volumes and directories for /hana/data/<sid>, /hana/log/<sid> and /hana/shared/<sid> are created.
SAP HANA database task	Ansible	Installs the SAP HANA database using an Ansible playbook.

Workflows for SAP Application installation

There are two workflows available for installing the SAP Application instance without SAP HANA database installation. To use one of these playbooks, the SAP HANA database already must be available, either on the same or a separate host.

- SAP PAS installation - operational

- SAP PAS installation – provisioning

Both Workflows use the same tasks. The operational workflow includes input Options.
To use the provisioning workflow, input options are defined in a layout.

Table 9. Workflow for SAP PAS installation

Task name	Type	Descripion
Set morpheus hostname resolution	Script	Optional: Set the Morpheus hostname resolution
Set proxy	Script	Optional: Set the proxy in the host environment
Provide SAP installation media script	Script	Mounts the media server share that contains the SAP installation media. Supported mount options are nfs, sshfs, webdav and cifs
Prepare hosts file	Script	Updates /etc/hosts and the system hostname to ensure correct hostname and IP mappings, and adds additional host entries for additional hosts in a landscape.
Create SAP APP directories	Script	The directories /usr/sap and /sapmnt/<sap_sid> are created
Get SAP HANA parameter for SAP APP installation	Script	Detect input parameter for the SAP HANA database required for the SAP PAS installation. Possible inputs are directly attached input options to the workflow or environment variables for: SAP Hostname (optional if the database is on the same host or an App Blueprint is used), SAP HANA SID SAP HANA instance number.
Get SWPM input	Script	Detect the values for the SAP product ID, SAP media directory and SWPM path from the input option “SAP APP PAS Product ID input list”
Copy crlbag file	Script	Optional: Recommended if no proxy is used to download the crlbag file during the SAP runtime. Copies the crlbag.p7s file from the SAP media directory to /root/.sapinst/crlbag.p7s on the target instance
Conditional Workflow SAP SWPM PAS	Conditional Workflow	Depending on the selected option of “SAP APP PAS Product ID input list”, the workflow for SAP PAS installation or SAP restore is executed. CAUTION: do select other workflows than the ones attached during the import. Changing to a different workflow might result in errors!
SAP PAS post installation	Script	Configures an NFS export for /sapmnt/<sap_sid>

Workflows for SAP single host installation

There are two workflows available for installing the SAP Application instance and SAP HANA database in one single instance.

- SAP Single node RHEL9 installation – operational
- SAP Single node RHEL8 installation - operational
- SAP Single node installation – provisioning

Both Workflows use the same tasks. The operational workflow includes input Options.

The difference between the operational workflows for Rhel8 and Rhel9 is the different input option for the available installation media. Either “SAP HANA database version for RHEL8” or “SAP HANA database version for RHEL9” is added to the workflow.

To use the provisioning workflow, input options are defined in a layout.

Table 10. Workflow for SAP single host installation

Task name	Type	Description
Set morpheus hostname resolution	Script	Optional: Set the Morpheus hostname resolution

Task name	Type	Description
Set proxy	Script	Optional: Set the proxy in the host environment
Provide SAP installation media script	Script	Mounts the media server share that contains the SAP installation media. Supported mount options are nfs, sshfs, webdav and cifs
Prepare hosts file	Script	Updates /etc/hosts and the system hostname to ensure correct hostname and IP mappings, and adds additional host entries for additional hosts in a landscape.
Create SAP HANA directories	Script	According to the selected sizing option, the volumes and directories for /hana/data/<sid>, /hana/log/<sid> and /hana/shared/<sid> are created.
SAP HANA database task	Ansible	Installs the SAP HANA database using an Ansible playbook.
Get SWPM input	Script	Detect the values for the SAP product ID, SAP media directory and SWPM path from the input option "SAP APP PAS Product ID input list"
Get SAP HANA parameter for SAP APP installation	Script	Detect input parameter for the SAP HANA database required for the SAP PAS installation. Possible inputs are directly attached input options to the workflow or environment variables fo: SAP Hostname (optional if the database is on the same host or an App Blueprint is used), SAP HANA SID SAP HANA instance number.
Create SAP APP directories	Script	The directories /usr/sap and /sapmnt/<sap_sid> are created
Copy crlbag file	Script	Optional: Recommended if no proxy is used to download the crlbag file during the SAP runtime. Copy the crlbag.p7s file from the SAP media directory to /root/.sapinst/crlbag.p7s on the target instance
Conditional Workflow SAP SWPM PAS	Conditional Workflow	Depending on the selected option of "SAP APP PAS Product ID input list", the workflow for SAP PAS installation or SAP restore is executed. CAUTION: do select other workflows than the ones attached during the import. Changing to a different workflow might result in errors.
SAP PAS post installation	Script	Configures an NFS export for /sapmnt/<sap_sid>

Workflows used in the conditional workflow

There are two workflows that are referenced in "Conditional Workflow SAP SWPM PAS":

- SAP SWPM workflow for PAS installation
  This workflow will start the installation the SAP primary application server
- SAP SWPM workflow for PAS restore
  This workflow will start the restore of the SAP primary application server

NOTE

Do not change the connected workflows in the conditional workflow. This might lead to errors.

Table 11. Workflow SAP SWPM workflow for PAS restore used for SAP PAS restore condition

Task name	Type	Description
Get SAP HANA backup parameter	Script	Detect backup parameter using the input option SAP HANA Database Backup Location List
SAP HANA root key import	Script	Imports the SAP HANA root key. The SAP HANA database host needs access to the backup directory location. The root key must be located in the backup directory.
SAP PAS restore	Ansible	Configures an NFS export for an SAP system by determining the local IP and network, verifying required directories, updating /etc/exports if needed, and restarting NFS services with error handling.

Table 12. Workflow SAP SWPM workflow for PAS installation used for SAP PAS restore condition

Task name	Type	Description
SAP PAS restore	Ansible	Runs the SAP SWPM for a fresh SAP application installation option

Workflows for SAP additional application server installation

There are two workflows available for installing the SAP additional application server. To use one of these playbooks, the SAP primary application instance (PAS) as to be up and running.

- SAP AAS installation – operational
- SAP AAS installation landscape – operational

Both Workflows use the same tasks.
The workflow "SAP AAS installation landscape – operational" uses landscape environment variables to detect several required installation parameters and can only be used when adding an instance to an APP.

Table 13. Workflow for SAP AAS installation

Task name	Type	Description
Set morpheus hostname resolution	Script	Optional: Set the Morpheus hostname resolution
Set proxy	Script	Optional: Set the proxy in the host environment
Provide SAP installation media script	Script	Mounts the media server share that contains the SAP installation media. Supported mount options are nfs, sshfs, webdav and cifs
Prepare hosts file	Script	Updates /etc/hosts and the system hostname to ensure correct hostname and IP mappings and adds additional host entries for additional hosts in a landscape.
Get SAP HANA parameter for SAP APP installation	Script	Detect input parameter for the SAP HANA database required for the SAP PAS installation. Possible inputs are directly attached input options to the workflow or environment variables for: SAP Hostname (optional if the database is on the same host or an App Blueprint is used), SAP HANA SID SAP HANA instance number.
Get SAP parameter for SAP AAS installation	Script	Get parameter of the SAP Primary application server used for the SAP AAS installation
SAP AAS pre installation	Script	Mount the /sapmnt/<SID> directory of the SAP primary application server
Get SWPM input	Script	Detect the values for the SAP product ID, SAP media directory and SWPM path from the input option "SAP APP PAS Product ID input list"
Copy crlbag file	Script	Optional: Recommended if no proxy is used to download the crlbag file during the SAP runtime.

Task name	Type	Description
		Copies the crlbag.p7s file from the SAP media directory to /root/.sapinst/crlbag.p7s on the target instance
SAP AAS installation	Ansible	Perform the SWPM installation

App Blueprints

Please see the Morpheus Enterprise App Blueprint documentation for a general understanding on how to create App Blueprints.

Figure 8 shows a high-level understanding of instance types, layouts and node types. The following section describes the necessary steps to create an App Blueprint with the example of a 2-tier hybrid cloud App Blueprint. Other scenarios, like a single host App Blueprint, can be created in a similar way.

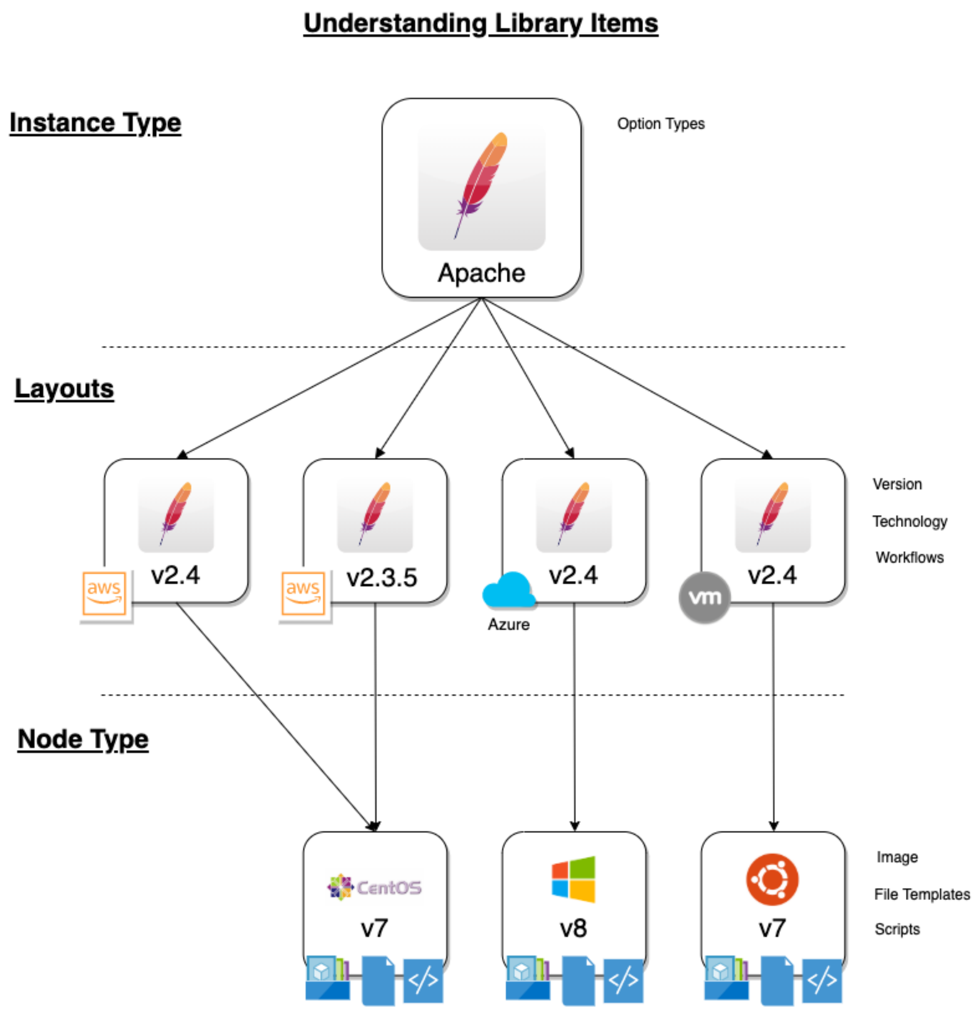

Figure 8. Understanding library items

Instance Type

For the hybrid cloud scenario covered in this Reference Architecture, two instance types are required. One for the VMs for the SAP application, the other for the bare-metal server hosting the SAP HANA database.

Navigate to Library, then select Blueprints and Instance Types. Create one instance type for the bare metal instance. In a second step create one instance type for the virtualized instance. See **Figure 9** for the minimum setting of an instance type.

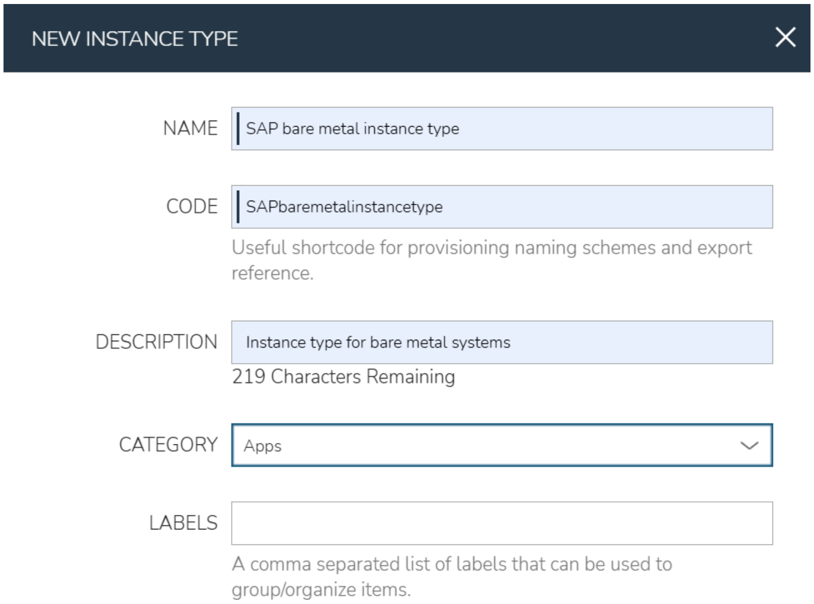

Figure 9. Adding an instance type

Node types

For provisioning a VM within an APP, a node type is required. The node type defines the VM template to be used during provisioning and some general settings.

Navigate to Library, then select Blueprints and Node Types. Create a node type for each virtual template that shall be provisioned using the APP feature. See **Figure 10** for the minimum required setting for a VMware node type.

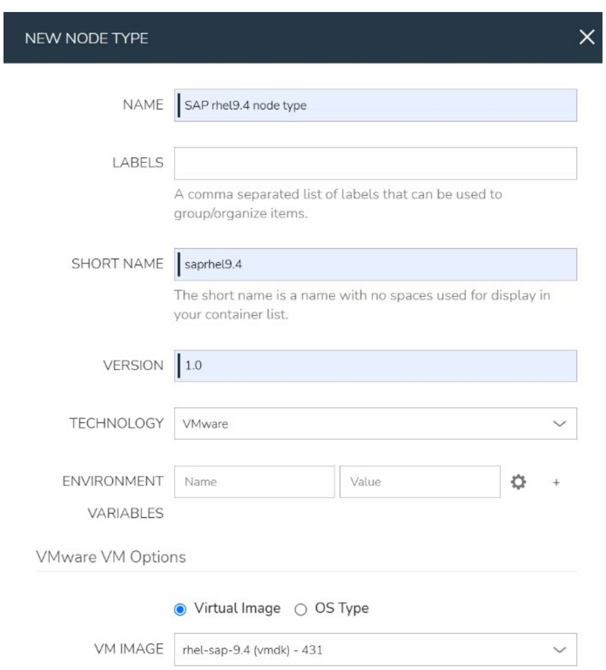

Figure 10. Create Node type

Layout

Create a layout for each combination of Provisional workflow and Node type.

For a 2-tier deployment in a hybrid environment two layouts are required. One for the bare-metal SAP HANA host, the other for the VM provisioning and SAP Application deployment.
The required input parameters must be added to the respective layout. See **Figure 11** for the list of required input parameters for the SAP HANA deployment on a bare metal instance. Make sure to select Workflow as the Technology type.

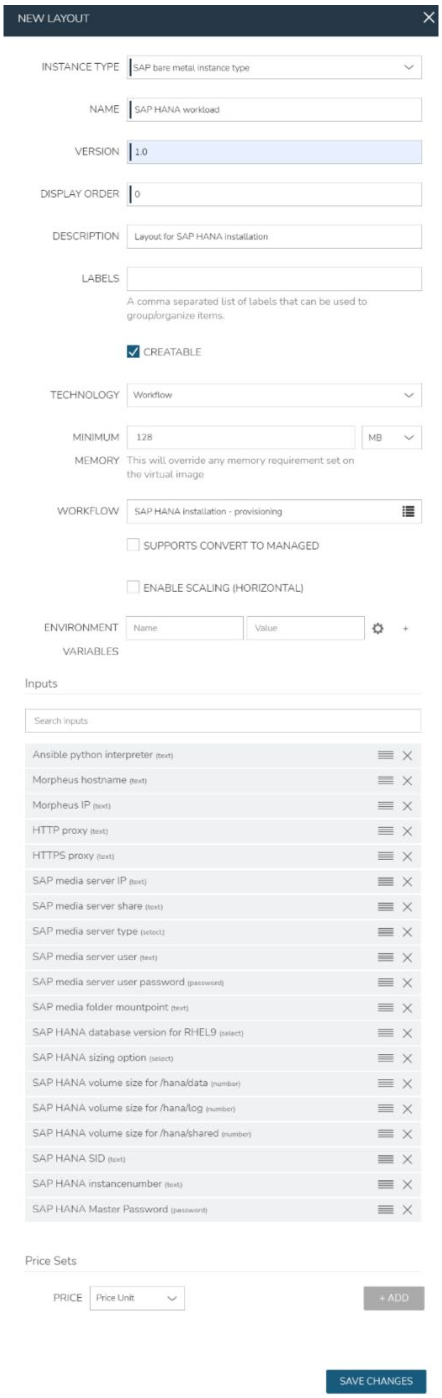

Figure 11. SAP HANA layout

Similarly, another layout must be created for the SAP application server. Select the instance type created for the virtual instances here and provide the input shown in Figure 12.

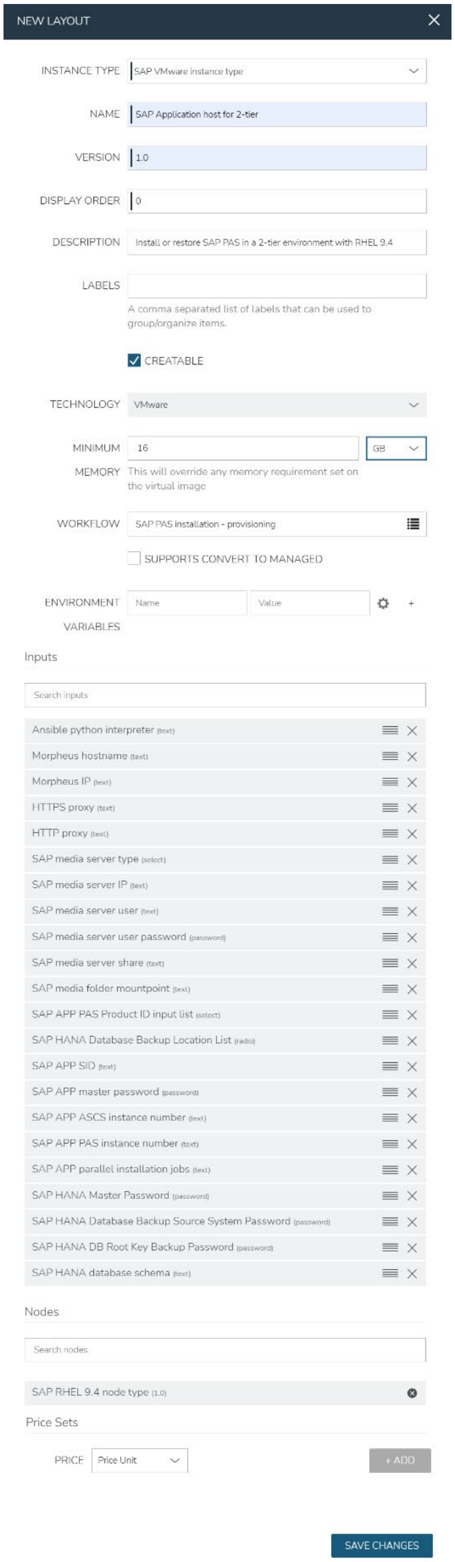

Figure 12. Layout for SAP Application server in a VM

Similarly, other layouts can be created also for a single host VM. In that case, the workflow "SAP Single Node – provisioning" and the following input options have to be included:

- Ansible python interpreter
- HTTP proxy (if the task "Set proxy" is used)
- HTTPS proxy (if the task "Set proxy" is used)
- Morpheus hostname (if the task "Set morpheus hostname resolution" is used)
- Morpheus IP (if the task "Set morpheus hostname resolution" is used)
- SAP media server type
- SAP media server IP
- SAP media server user password
- SAP media server share
- SAP media server user
- SAP media folder mountpoint
- SAP APP PAS Product ID input list
- SAP HANA Database Backup Location List
- SAP HANA database version for RHEL9
- SAP HANA SID
- SAP HANA instancenumber
- SAP HANA Master Password
- SAP HANA sizing option
- SAP HANA volume size for /hana/data
- SAP HANA volume size for /hana/log
- SAP HANA volume size for /hana/shared
- SAP APP SID
- SAP APP master password
- SAP APP ASCS instance number
- SAP APP PAS instance number
- SAP APP parallel installation jobs
- SAP HANA Database Backup Source System Password (not required, if no restore option is included in the SAP PAS product ID list)
- SAP HANA DB Root Key Backup Password (not required, if no restore option is included in the SAP PAS product ID list)
- SAP HANA database schema (not required, if no restore option is included in the SAP PAS product ID list)

App Blueprint creation

An App Blueprint defines the landscape for application provisioning. It specifies which clouds are used by default and determines the layout, including the workflows and input options that will be executed.

To create an App Blueprint, go to **Library**, then select **Blueprints** and choose **App Blueprints**. Click on **Add** to start a new App Blueprint creation. Enter a name for the App Blueprint, such as "SAP hybrid cloud App," and ensure the type is set to Morpheus.

Add a more detailed description to the App Blueprint in the next step. On the left side, click the “+” symbol to create the first tier. You may provide a custom name for this tier, for example, “SAP HANA database tier,” and set the boot order to 0.

Within this tier, click the “+” symbol to add an instance and select the SAP bare metal instance. In the instance, click the “+” symbol again to configure this instance. Choose the group that contains the bare-metal cloud with the bare-metal server HPE Compute Scale-up Server 3200. Selecting an environment is optional. See **Figure 13** for an example.

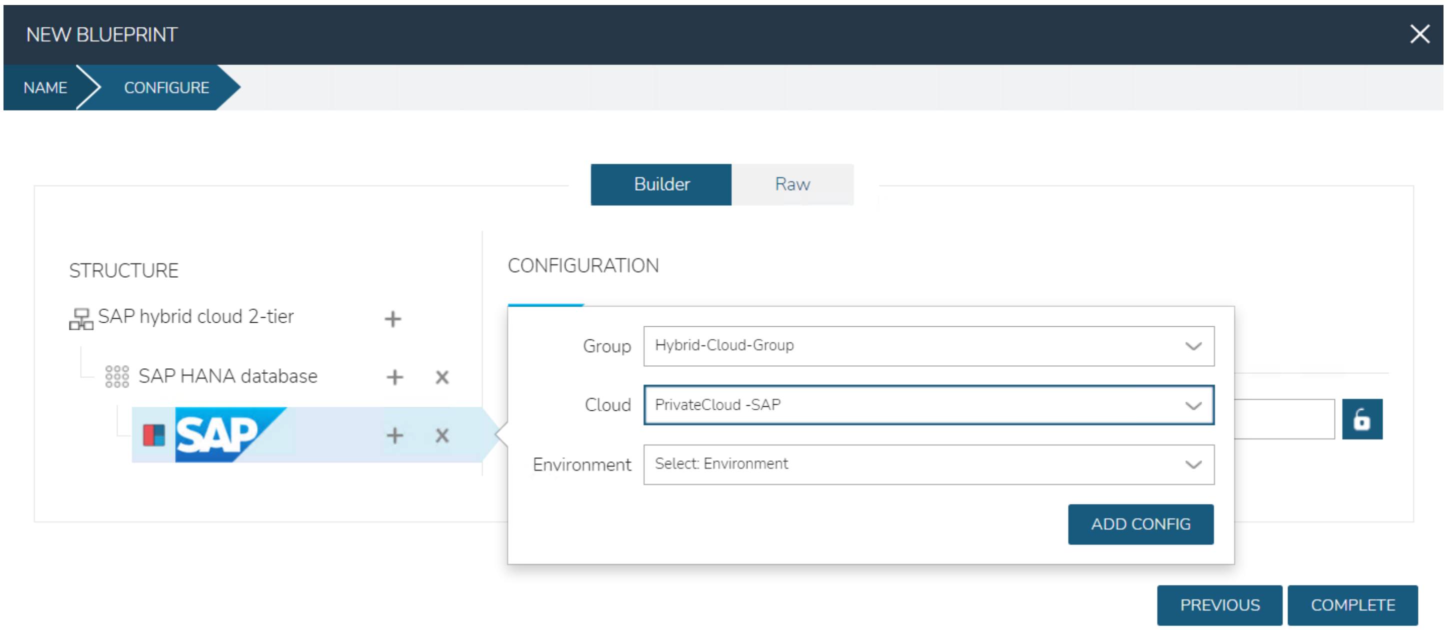

Figure 13. Create new App Blueprint

On the left side, click on the created configuration. Select “Allow existing instances” and choose the SAP HANA bare metal layout. You can hide certain settings during deployment, which is recommended for the layout and plan options. See **Figure 14** for an example.

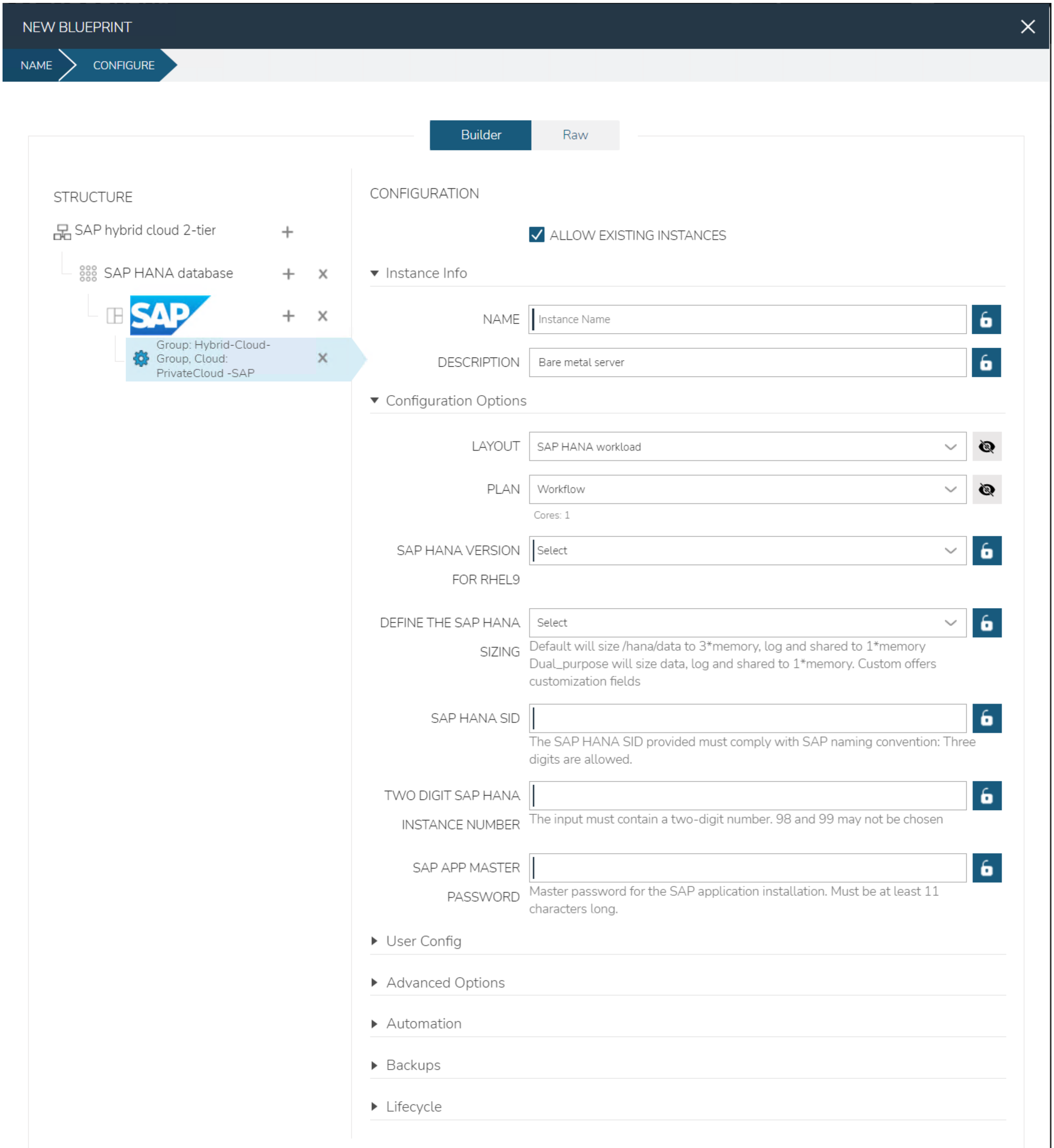

Figure 14. SAP HANA bare metal configuration

Now add the SAP Application instance by adding a second tier. See **Figure 15** for an example.

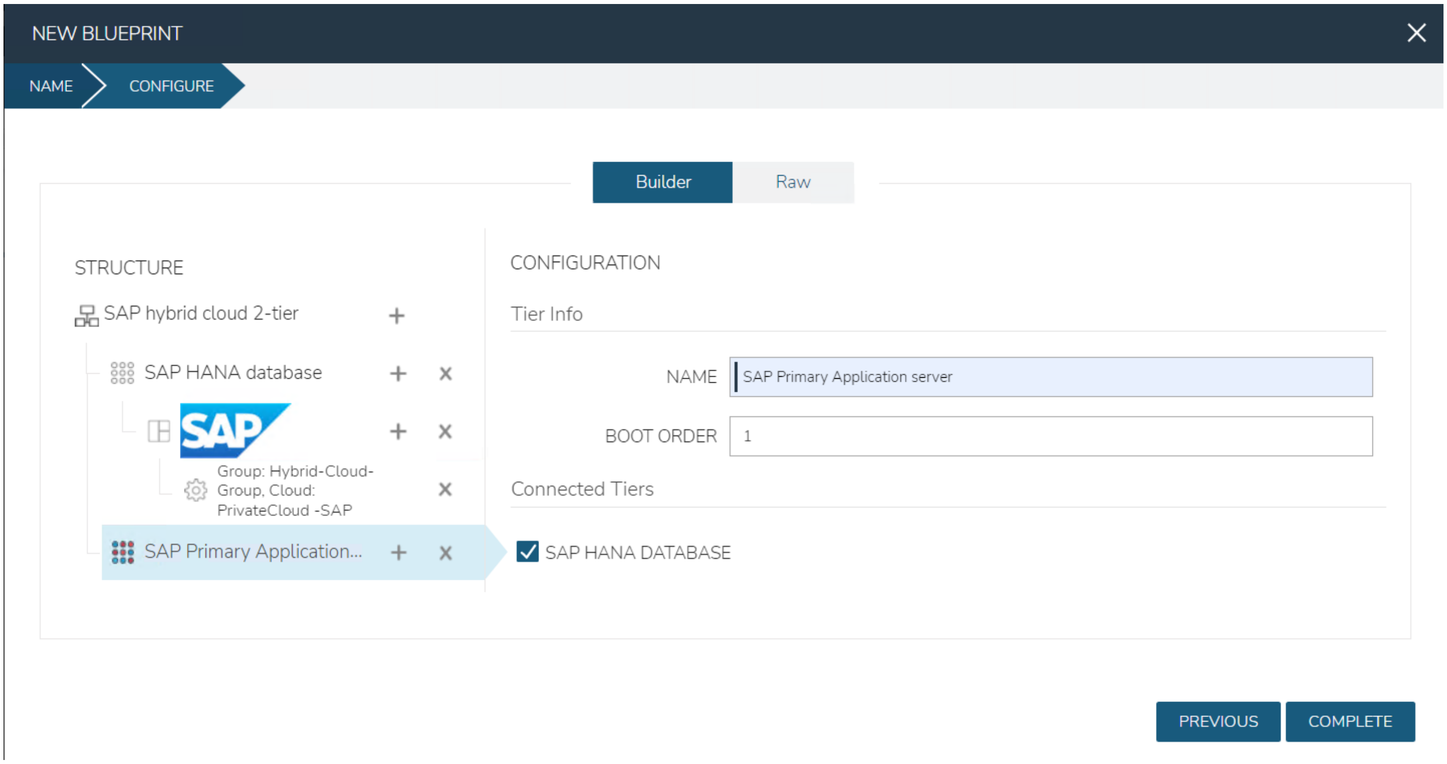

Figure 15. Add SAP application tier

Make sure to set the boot order to 1 and check the box to connect the SAP HANA database tier. Next, add the instance and select the VM instance, this time choosing the vCenter cloud.

For VM creation, you can make several additional selections. Choose the appropriate layout for provisioning and consider hiding it during deployment. Specify the storage and network configurations for each VM deployment and hide any options that should not be modified. See **Figure 16** for an example.

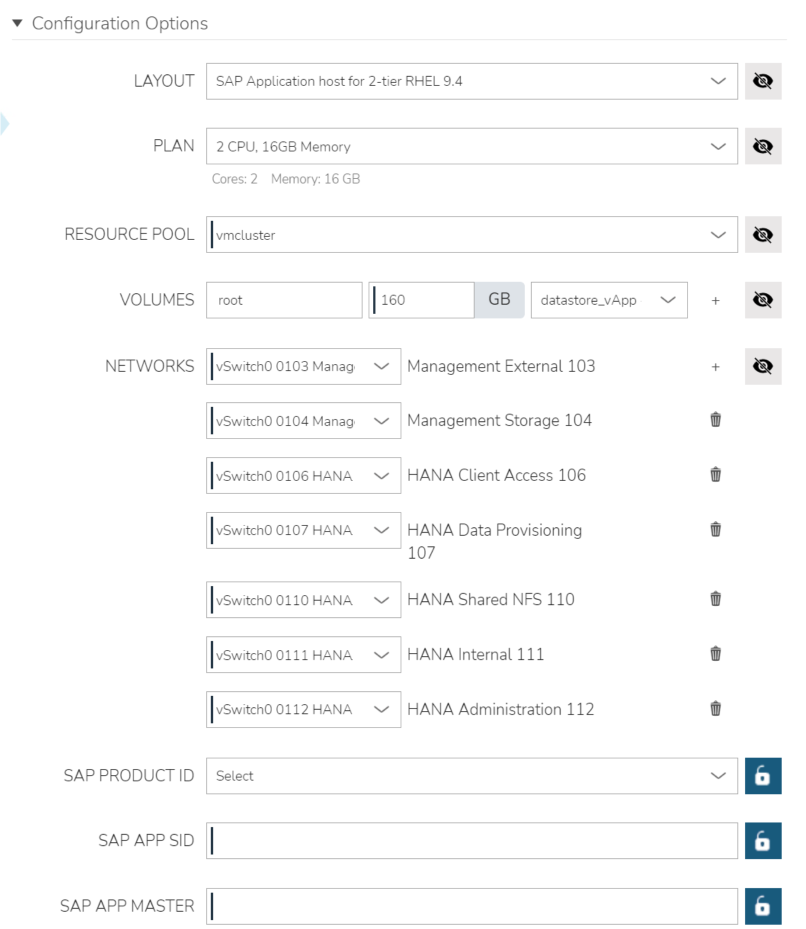

Figure 16. Configuration options for VM instance

For the naming of the instance and the hostname, naming policies can be used. See the Morpheus documentation for policies for details.

In the Advanced section, set the following environment parameters:

SAP_APP_SID must be set to <%=customOptions.sap_swpm_sid%>

SAP_APP_ASCS_NR must be set to <%=customOptions.sap_swpm_ascs_instance_nr%>

SAP_APP_HOSTNAME must be set to <%=instance.hostname%>

See **Figure 17** for an example.

Figure 17. Environment setting for SAP application instance

Now save the settings. The App Blueprint you created is now available for provisioning under Provisioning, then Apps.

With the same approach other App Blueprints, e.g. for a single host scenario or a virtualized 2-tier scenario can be created.
In case of a provisioned SAP HANA database in a VM, the following environment variables must be set in the SAP HANA tier configuration's advanced options section:

SAP_HANA_SID must be set to <%=customOptions.sap_hana_install_sid%>

SAP_HANA_INSTANCE_NUMBER must be set to <%=customOptions.sap_hana_install_instance_number%>

SAP_HANA_HOSTNAME must be set to <%= instance.hostname %>

See **Figure 18** for an example

Figure 18. SAP HANA environment

In case of a single node App Blueprint, the prefix must be set to SAP_APP and all the SAP HANA and SAP APP environment parameters must be set.

SAP_APP_SID must be set to <%=customOptions.sap_swpm_sid%>

SAP_APP_ASCS_NR must be set to <%=customOptions.sap_swpm_ascs_instance_nr%>

SAP_APP_HOSTNAME must be set to <%=instance.hostname%>

SAP_HANA_SID must be set to <%=customOptions.sap_hana_install_sid%>

SAP_HANA_INSTANCE_NUMBER must be set to <%=customOptions.sap_hana_install_instance_number%>

SAP_HANA_HOSTNAME must be set to <%= instance.hostname %>

Capacity and sizing

Workload description

Automating SAP installations with HPE Morpheus Enterprise significantly reduces installation times and increases efficiency. The installation of an SAP HANA database on a HPE Compute Scale-up Server 3200 can be completed in just 34 minutes. Installing an SAP primary application server on a virtual machine, including VM provisioning, takes only 90 minutes. Additional application servers can be installed within 15 minutes.

Automation ensures that recurring tasks are performed in a consistent and standardized manner. This approach minimizes the risk of errors, saves time, and improves overall efficiency. It also makes it easier to scale operations and maintain high quality, as automated processes are both repeatable and reliable.

This Reference Architecture supports various deployment scenarios. The following scenarios are covered in this chapter:

This chapter will cover the following scenarios:

- Install SAP HANA to a pre-configured HPE Compute Scale-up Server 3200
- Provision hybrid 2-tier landscape
- Install an additional SAP application server

Install SAP HANA database

In HPE Morpheus Enterprise, navigate to Provisioning and select Instances. Choose the previously integrated HPE Compute Scale-up Server 3200 from the list.

If SAP HANA is not yet installed, go to Actions and select Execute Workflow. Then, choose the appropriate workflow, such as “SAP HANA Installation for RHEL9.

1. Enter the required parameters for the database. For HPE Predefined systems, the necessary volumes and directories for the SAP HANA database are already in place. The sizing script will not modify the existing configuration, so you can select the default sizing.
2. Ensure that you provide the correct SAP HANA SID and instance number.
3. After all information is entered, press Execute to start the installation.

   See **Figure 19** for an example of the operational workflow execution.

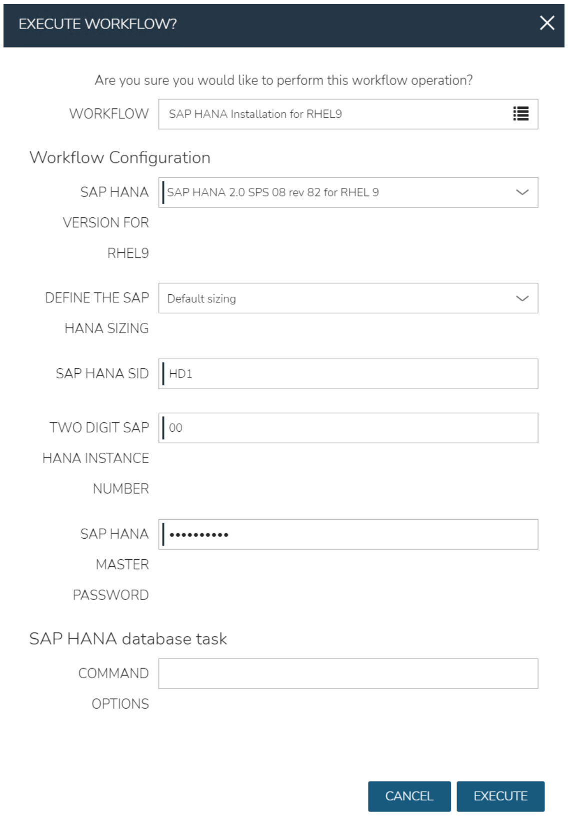

Figure 19. Execute SAP HANA installation

Provision hybrid 2-tier landscape

To provision an application landscape with a virtual machine for automated SAP application installation, using a Scale-up Server 3200 with a preinstalled SAP HANA database, follow these steps:

1. Start by navigating to **Provisioning** and then select **App**. Click **Add** to begin the process. Choose the App Blueprint designed for the hybrid cloud scenario and enter a name for the App.
2. Next, select the group that contains both the bare metal cloud and the vCenter cloud.
3. Begin by modifying the SAP HANA tier. Ensure that the selected cloud is the bare metal cloud. Choose "**Use Existing Instance**" and select the appropriate server.
4. Proceed to modify the SAP application tier. Confirm that the selected cloud is the vCenter cloud. Enter all required parameters for the installation, including the master password for the SAP HANA database. Once all information is provided, press **Execute** to start the deployment.

If you need to perform a system restore, select the appropriate option from the drop-down menu for the SAP release. You will then be prompted to enter additional database passwords for the source system.

Install additional application server

To create a virtual machine for the SAP additional application installation, go to **Provisioning** and select **Instances**. Choose the VM image that is prepared for SAP installations.

After the VM is available, you have two options for installing an additional application server: with or without a landscape environment.

Install using landscape environment

1. To install using the landscape environment, navigate to **Provisioning** and select **Apps**. Choose the application to which you want to add the SAP additional application server. Select **Actions** and then **Add Instances**. You can create a new tier, such as SAP AAS, and select the previously created VM from the instance selection. This ensures the VM shares the same environment as the SAP HANA database and the primary application server.

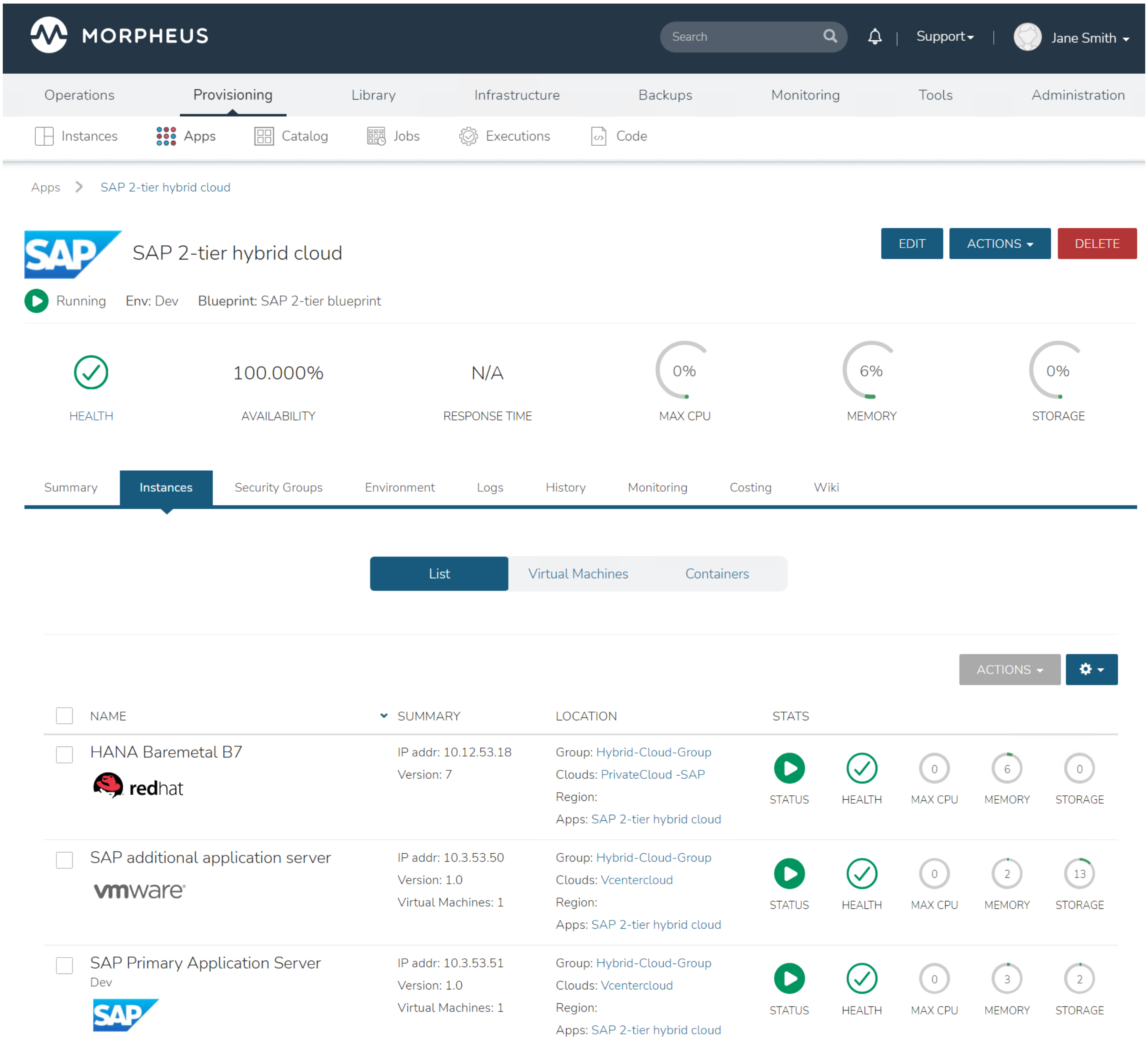

Figure 20. Landscape with additional application server

2. Next, select the instance for the additional application server.

3. Go to **Actions** and choose **Run Workflow**.

4. Select the workflow “SAP AAS installation landscape – operational.”
5. Enter the product version to be installed and the master passwords for both SAP HANA and the SAP application, then start the workflow.

Install without landscape environment

To install without the landscape environment, first make sure that the hostnames of the SAP HANA database and the SAP primary application server are resolvable from the host where you will install the additional application server. In HPE Morpheus Enterprise, select the respective instance, go to Actions, and choose Run Workflow. Select the workflow “SAP AAS installation – operational,” provide the necessary information, and click Execute to begin the installation.

Analysis and recommendations

This Reference Architecture describes a predefined configuration. Other sizing options for the HPE Scale-up Server 3200 with SAN storage are also available. For guidance on selecting the right configuration for your needs, consult the HPE Services team.

Please note that, in the current version of the Reference Architecture, only one database per Scale-up Server has been tested for landscape deployment. If you need to use more SAP HANA databases for SAP HANA applications, use operational workflows to install the SAP HANA application.

This Reference Architecture has been tested with VM templates for Red Hat Enterprise Linux for SAP 8.8 and 9.4. If it is the plan to use other Red Hat Enterprise Linux for SAP versions for deployments, a new VM template must be created. For each new VM template, a corresponding layout must also be created. For details, refer to the Layout chapter in this Reference Architecture.

The Reference Architecture includes two input options and option lists for SAP HANA versions, each dedicated to specific OS releases to make sure, only supported SAP HANA versions are installed on the respective OS version. To add additional SAP HANA versions to these lists, modify the existing linked option list by adding a new line using the same syntax.

If you want to create an additional SAP HANA version selection option for a specific OS version, first create a new option list (for example, “SAP HANA Version for RHEL9.6”). Then, create a new input option (for example, “SAP HANA database version for RHEL9.6”). The field name must be “sap_hana_install_software_extract_directory.” Once created, add the new option to an operational workflow or a layout. Please note that only one input option for the SAP HANA version can be used in a single workflow or layout.

Password fields are used for password input in this Reference Architecture. If you want to use Morpheus Cypher password capabilities, refer to the Morpheus Cypher documentation. After setting up Cypher passwords, update the assignment of the extra_vars in the SAP Ansible tasks to use the respective Cypher password. Using a Cypher password for the root key import, modification of the “SAP HANA root key import” is required.

Troubleshooting

This chapter lists some common issues and how they can be resolved.

The logfile of HPE Morpheus Enterprise can be checked to get further information about failed activities. The logfile is /var/log/morpheus/morpheus-ui/current.

- Network is not assigned during VM provisioning:

  Check the attached network configuration.

  DHCP should only be enabled if a DHCP server is available.

  If cloud-init settings are defined in Morpheus Enterprise, ensure that no user is specified in the VM template.

- Connection to target host does not work:

  Verify hostname resolution between the target host and the Morpheus instance. The Morpheus hostname has to be resolvable on the target host.

  Ensure the Morpheus agent is installed on the target host.

- A task is failing:

  Review the information section of the task for error details.

If no helpful information is found, check the Morpheus Enterprise log files. See the documentation: Morpheus Logs.

- Ansible task is failing:

  Refer to the troubleshooting section of the Morpheus documentation for guidance.

- Ansible task is failing in Gathering Facts
  The error output is something like:
  FAILED! => {"ansible_facts": {}, "changed": false, "failed_modules": {"ansible.legacy.setup": {"failed": true, "module_stderr": "", "module_stdout": "", "msg": "MODULE FAILURE\nSee stdout/stderr for the exact error", "rc": 0}}, "msg": "The following modules failed to execute: ansible.legacy.setup\n"}

  Possible solutions

  Ansible Python Interpreter
  Check that the input option Ansible python interpreter is set to the right value. The path provided in the option must exist on the managed node.

  Morpheus Hostname resolution
  Check that the Morpheus hostname is resolvable on the managed node.

  Morpheus Agent
  Check that the Morpheus Agent is installed on the managed node. If the installation fails, ensure, a wget to your Morpheus host is working.
  `wget https://morpheus.local/`

- SAP HANA installation is failing:

  Check the log file at /tmp/hdblcm.log for detailed error information.

  If this log is empty, it indicates that the hdblcm execution has not yet started. Check the hdblcm logfiles in /var/tmp/hdblcm*. If there are no obvious errors visible, retry the failed Ansible task in HPE Morpheus Enterprise.

- SAP Application installation is failing:

  On the target node, check the file /tmp/sapinst_instdir/.lastInstallationLocation to find the latest installation log file.

  Common issues include missing OS packages, incorrect permissions on the media server path, invalid input during parameter entry, or an outdated crlbag.ps7 file.

  If incorrect input was provided during parameter entry, the provisioning or installation must be restarted from the beginning.

  For other errors, you can retry the task after resolving the issue.

Summary

HPE Predefined Scale-up Server 3200 comes with a preconfigured operating system, network and storage setup. The system will be delivered being ready for an SAP HANA database installation or with the SAP HANA database already installed.

Using HPE Morpheus Enterprise SAP application installation can be performed in an automated, repeatable and fast way for initial SAP primary application server installation and SAP additional application server. Installation times for SAP applications is reducing from several hours to less than an hour. Thus, the automation capabilities of HPE Morpheus Enterprise offer self service options to customers to have a ready to use SAP environment in a short and secure timeline.

Using the System Copy functionality of the workflows provided, creating a development or test environment can be performed withing a short time.

Having the option to provision additional VMs and install SAP additional application servers increases flexibility in times of high activities in an SAP system.

Using this Reference Architecture will make SAP deployments faster and more stable.

Appendix A: Bill of materials

NOTE

Part numbers are at time of publication/testing and subject to change. The bill of materials does not include complete support options or other rack and power requirements. Furthermore the bill of materials shows the environment used for developing and testing and can vary depending on customer requirements. In case of further questions, consult Hewlett Packard Enterprise Reseller or Hewlett Packard Enterprise Sales Representative for more details. hpe.com/us/en/services/consulting.html.

Table A1. Bill of materials

Part number	Quantity	Description
Q7Y51A	1	HPE 42U 610mm x 1156mm D Rack
S0V51A	2	HPE ProLiant DL360 Gen11 for Data Solutions Server
S0V51A 0D1	2	Factory Integrated
P49614-B21	4	Intel Xeon-Gold 6430 2.1GHz 32-core 270W Processor for HPE
P49614-B21 0D1	4	Factory Integrated
P43331-B21	32	HPE 64GB (1x64GB) Dual Rank x4 DDR5-4800 CAS-40-39-39 EC8 Registered Smart Memory Kit
P43331-B21 0D1	32	Factory Integrated
P48903-B21	2	HPE ProLiant DL360 Gen11 x16 LP Riser Kit
P48903-B21 0D1	2	Factory Integrated
P42044-B21	2	Mellanox MCX631102AS-ADAT Ethernet 10/25Gb 2-port SFP28 Adapter for HPE
P42044-B21 0D1	2	Factory Integrated
R2E08A	4	HPE SN1610Q 32Gb 1-port Fibre Channel Host Bus Adapter
R2E08A 0D1	4	Factory Integrated
P08449-B21	2	Intel I350-T4 Ethernet 1Gb 4-port BASE-T OCP3 Adapter for HPE
P08449-B21 0D1	2	Factory Integrated
P42041-B21	2	Mellanox MCX631432AS-ADAI Ethernet 10/25Gb 2-port SFP28 OCP3 Adapter for HPE
P42041-B21 0D1	2	Factory Integrated
P48908-B21	2	HPE ProLiant DL3X0 Gen11 1U High Performance Fan Kit
P48908-B21 0D1	2	Factory Integrated
P44712-B21	4	HPE 1800W-2200W Flex Slot Titanium Hot Plug Power Supply Kit
P44712-B21 0D1	4	Factory Integrated
BD505A	2	HPE iLO Advanced 1-server License with 3yr Support on iLO Licensed Features
BD505A 0D1	2	Factory Integrated
S1A05A	2	HPE Compute Cloud Management Server FIO Enablement
P48830-B21	2	HPE ProLiant DL3XX Gen11 CPU2 to OCP2 x8 Enablement Kit
P48830-B21 0D1	2	Factory Integrated
P50450-B21	2	HPE ProLiant Gen11 1U Common Bezel Kit
P50450-B21 0D1	2	Factory Integrated
P48921-B21	2	HPE ProLiant DL36X Gen11 Rear Serial Port Cable Kit

Part number	Quantity	Description
P48921-B21 0D1	2	Factory Integrated
P26489-B21	2	HPE ProLiant DL300 Gen10 Plus 1U Cable Management Arm for Rail Kit
P26489-B21 0D1	2	Factory Integrated
P48905-B21	4	HPE ProLiant DL3XX/560 Gen11 High Performance Heat Sink Kit
P48905-B21 0D1	4	Factory Integrated
P52341-B21	2	HPE ProLiant DL3XX Gen11 Easy Install Rail 3 Kit
P52341-B21 0D1	2	Factory Integrated
R6B05A	2	HPE SN6700B 64Gb 56/24 24-port 32Gb Short Wave SFP28 Integrated Fibre Channel Switch
R6B05A 0D1	2	Factory Integrated
R9F63A	1	HPE Aruba Networking CX 6300M 48G Power-to-Port Airflow 2 Fans 1 Power Supply Unit Bundle
R9F63A 0D1	1	Factory Integrated
R9F63A B2B	1	HPE Aruba Networking CX 6300M 48G Power-to-Port Airflow 2 Fans 1 Power Supply Unit Bundle PDU
R9G06A	2	HPE Aruba Networking 50G SFP56 to SFP56 0.65m Direct Attach Copper Cable
R9G06A B01	2	HPE Aruba Networking 50G SFP56 to SFP56 0.65m Direct Attach Copper Cable
R9F61A	1	HPE Aruba Networking CX 6300M 12VDC 250W 100-240VAC Power-to-Port Airflow Power Supply Unit
R9F61A B2B	1	HPE Aruba Networking CX 6300M 12VDC 250W 100-240VAC Power-to-Port Airflow Power Supply Unit PDU
R9F61A 0D1	1	Factory Integrated
R9F57A	2	HPE Aruba Networking 1U Universal 4-post Rack Mount Kit
R9F57A 0D1	2	Factory Integrated
R9F59A	2	HPE Aruba Networking 4-post Rack Kit
R9F59A 0D1	2	Factory Integrated
R9F63A	1	HPE Aruba Networking CX 6300M 48G Power-to-Port Airflow 2 Fans 1 Power Supply Unit Bundle
R9F63A 0D1	1	Factory Integrated
R9F63A B2B	1	HPE Aruba Networking CX 6300M 48G Power-to-Port Airflow 2 Fans 1 Power Supply Unit Bundle PDU
R9F61A	1	HPE Aruba Networking CX 6300M 12VDC 250W 100-240VAC Power-to-Port Airflow Power Supply Unit
R9F61A B2B	1	HPE Aruba Networking CX 6300M 12VDC 250W 100-240VAC Power-to-Port Airflow Power Supply Unit PDU
R9F61A 0D1	1	Factory Integrated
R9F67A	1	HPE Aruba Networking CX 8325-32C Power-to-Port Airflow 6 Fans 2 Power Supply Units Bundle
R9F67A 0D1	1	Factory Integrated
R9F67A B2B	1	HPE Aruba Networking CX 8325-32C Power-to-Port Airflow 6 Fans 2 Power Supply Units Bundle PDU
R9F75A	1	HPE Aruba Networking 100G QSFP28 MPO SR4 MMF Transceiver
R9F75A 0D1	1	Factory Integrated
R9F77A	3	HPE Aruba Networking 100G QSFP28 to QSFP28 1m Direct Attach Copper Cable
R9F77A B01	3	HPE Aruba Networking 100G QSFP28 to QSFP28 1m Direct Attach Copper Cable
R9F67A	1	HPE Aruba Networking CX 8325-32C Power-to-Port Airflow 6 Fans 2 Power Supply Units Bundle

Part number	Quantity	Description
R9F67A 0D1	1	Factory Integrated
R9F67A B2B	1	HPE Aruba Networking CX 8325-32C Power-to-Port Airflow 6 Fans 2 Power Supply Units Bundle PDU
R9F75A	1	HPE Aruba Networking 100G QSFP28 MPO SR4 MMF Transceiver
R9F75A 0D1	1	Factory Integrated
S0B84A	1	HPE Alletra Storage MP B10100 Base Configuration
S0B84A 0D1	1	Factory Integrated
S0A99A	1	HPE Storage FIPS Data Encryption LTU
S0A99A 0D1	1	Factory Integrated
S3Q02A	1	HPE Alletra Storage ArcusOS per TB 5-year LTU
S3Q02A 0D1	1	Factory Integrated
581817-B21	1	HPE Configurator Defined Build Instruction Option
R7C75A	1	HPE Alletra Storage MP 10000 2U Chassis
R7C75A 0D1	1	Factory Integrated
S0R21A	2	HPE Alletra Storage MP B10130 Controller Node
S0R21A 0D1	2	Factory Integrated
S2S64A	2	HPE Alletra Storage MP 32Gb 4-port Fibre Channel OCP LPm37004 Host Bus Adapter
S2S64A 0D1	2	Factory Integrated
S3N85A	4	HPE 32Gb SFP28 Short Wave 1-pack LP Pull Tab Optical Transceiver
S3N85A 0D1	4	Factory Integrated
R7C76A	2	HPE Alletra Storage MP C14 1600W AC Power Supply
R7C76A 0D1	2	Factory Integrated
R9H71A	8	HPE Alletra Storage MP 3.84TB NVMe SFF FIPS Encrypted SSD
R9H71A 0D1	8	Factory Integrated
R9R52A	1	HPE C13 - C14 250V 10Amp Black 1.4m WW Power Cord
R9R52A 0D1	1	Factory Integrated
R9S00A	1	HPE C13 - C14 250V 10Amp Gray 1.4m WW Power Cord
R9S00A 0D1	1	Factory Integrated
845416-B21	4	HPE 100Gb QSFP28 to 4x25Gb SFP28 3m Direct Attach Copper Cable
845416-B21 0D1	4	Factory Integrated
C7533A	6	HPE 1.2m/4ft CAT5 RJ45 M/M Ethernet Cable
C7533A 0D1	6	Factory Integrated
C7536A	6	HPE 4.3m/14ft CAT5 RJ45 M/M Ethernet Cable
C7536A 0D1	6	Factory Integrated
C7537A	4	HPE 7.6m/25ft CAT5 RJ45 M/M Ethernet Cable
C7537A 0D1	4	Factory Integrated
QK729A	2	HPE Premier Flex MPO/MPO Multi-mode OM4 12 Fiber 10m Cable

Part number	Quantity	Description
QK729A 0D1	2	Factory Integrated
QK734A	4	HPE Premier Flex LC/LC Multi-mode OM4 2 Fiber 5m Cable
QK734A 0D1	4	Factory Integrated
H7C28A	4	HPE Destination Rack 21 x Outlets 3-phase 240V NA/JP PDU
H7C28A 0D1	4	Factory Integrated
Q8L45A	1	HPE D Rack Upgrade Kit
R9N71A	1	HPE Compute Scale-up Server 3200 Data Solutions 4-socket XNC Base Chassis
R9N71A 0D1	1	Factory Integrated
R9P62A	4	Intel Xeon-Platinum 8454H 2.1GHz 32-core 270W Processor Kit for HPE Compute Scale-up Server 3200
R9P62A 0D1	4	Factory Integrated
R9Q19A	32	HPE Compute Scale-up Server 3200 64GB (1x64GB) Dual Rank x4 DDR5-4800 Registered Standard Memory Kit
R9Q19A 0D1	32	Factory Integrated
R9N75A	1	HPE Compute Scale-up Server 3200 PCIe Full Height 12-slot Bulkhead with 1x 4-slot 2x8/2x16 Riser Kit1
R9N75A 0D1	1	Factory Integrated
R9N84A	1	HPE Compute Scale-up Server 3200 2x8/2x16 4-slot PCIe Secondary Riser for 2U PCIe 12-slot Bulkhead
R9N84A 0D1	1	Factory Integrated
R2E09A	2	HPE SN1610Q 32Gb 2-port Fibre Channel Host Bus Adapter
R2E09A 0D1	2	Factory Integrated
P08449-B21	1	Intel I350-T4 Ethernet 1Gb 4-port BASE-T OCP3 Adapter for HPE
P08449-B21 0D1	1	Factory Integrated
P13188-B21	2	Mellanox MCX512F-ACHT Ethernet 10/25Gb 2-port SFP28 Adapter for HPE
P13188-B21 0D1	2	Factory Integrated
R9P01A	2	HPE Compute Scale-up Server 3200 2x 2400W Titanium Hot Plug Power Supply Kit
R9P01A 0D1	2	Factory Integrated
R9X75A	4	HPE Compute Scale-up Server 3200 C19 - C20 250V 16Amp Black 1m Power Cord
R9X75A 0D1	4	Factory Integrated
R9N74A	1	HPE Compute Scale-up Server 3200 Chassis Bezel
R9N74A 0D1	1	Factory Integrated
R9Y98A	1	HPE Compute Scale-up Server 3200 Internal UPI Cable Kit
R9Y98A 0D1	1	Factory Integrated
S2A06A	1	HPE Compute Scale-up Server 3200 for SAP HANA with HPE Alletra Storage Server 9000 Tracking
S2A06A B01	1	Include with complete system
R9N71A	1	HPE Compute Scale-up Server 3200 Data Solutions 4-socket XNC Base Chassis
R9N71A 0D1	1	Factory Integrated
R9P62A	4	Intel Xeon-Platinum 8454H 2.1GHz 32-core 270W Processor Kit for HPE Compute Scale-up Server 3200

Part number	Quantity	Description
R9P62A 0D1	4	Factory Integrated
R9Q19A	32	HPE Compute Scale-up Server 3200 64GB (1x64GB) Dual Rank x4 DDR5-4800 Registered Standard Memory Kit
R9Q19A 0D1	32	Factory Integrated
R9N75A	1	HPE Compute Scale-up Server 3200 PCIe Full Height 12-slot Bulkhead with 1x 4-slot 2x8/2x16 Riser Kit
R9N75A 0D1	1	Factory Integrated
R9N84A	1	HPE Compute Scale-up Server 3200 2x8/2x16 4-slot PCIe Secondary Riser for 2U PCIe 12-slot Bulkhead
R9N84A 0D1	1	Factory Integrated
R2E09A	2	HPE SN1610Q 32Gb 2-port Fibre Channel Host Bus Adapter
R2E09A 0D1	2	Factory Integrated
P08449-B21	1	Intel I350-T4 Ethernet 1Gb 4-port BASE-T OCP3 Adapter for HPE
P08449-B21 0D1	1	Factory Integrated
P13188-B21	2	Mellanox MCX512F-ACHT Ethernet 10/25Gb 2-port SFP28 Adapter for HPE
P13188-B21 0D1	2	Factory Integrated
R9P01A	2	HPE Compute Scale-up Server 3200 2x 2400W Titanium Hot Plug Power Supply Kit
R9P01A 0D1	2	Factory Integrated
R9X75A	4	HPE Compute Scale-up Server 3200 C19 - C20 250V 16Amp Black 1m Power Cord
R9X75A 0D1	4	Factory Integrated
R9N74A	1	HPE Compute Scale-up Server 3200 Chassis Bezel
R9N74A 0D1	1	Factory Integrated
R9Y98A	1	HPE Compute Scale-up Server 3200 Internal UPI Cable Kit
R9Y98A 0D1	1	Factory Integrated
S2A06A	1	HPE Compute Scale-up Server 3200 for SAP HANA with HPE Alletra Storage Server 9000 Tracking
S2A06A B01	1	Include with complete system
R9P06A	2	HPE Compute Scale-up Server 3200 4-socket Scale Activation Kit
R9P06A 0D1	2	Factory Integrated
845420-B21	2	HPE QSFP28 to 4x25Gb SFP28 7m Active Optical Cable
845420-B21 0D1	2	Factory Integrated
C7537A	6	HPE 7.6m/25ft CAT5 RJ45 M/M Ethernet Cable
C7537A 0D1	6	Factory Integrated
QK734A	4	HPE Premier Flex LC/LC Multi-mode OM4 2 Fiber 5m Cable
QK734A 0D1	4	Factory Integrated
S0P01A	2	HPE Basic 3-phase 17.3kVA /60A/200-240V Outlets (6) C19 /6-breaker Vertical NA/JP PDU
S0P01A 0D1	2	Factory Integrated
R7A11AAE	2	HPE Compute Ops Management Standard 3-year Upfront ProLiant SaaS
S3Q02AAE	32	HPE Alletra Storage MP B10000 per TB 5-year Software and Support SaaS
Q7N11A	2	HPE Foundation Software 2 for Red Hat Enterprise Linux Media License RTU

Part number	Quantity	Description
Q7Y82A	2	HPE Foundation Software 2 for Red Hat Enterprise Linux Media

Resources and additional links

HPE Reference Architectures
hpe.com/info/ra

HPE Servers
hpe.com/servers

HPE Storage
hpe.com/storage

HPE Networking
hpe.com/networking

HPE GreenLake Advisory and Professional Services
https://www.hpe.com/us/en/services/consulting.html

HPE Morpheus Enterprise Software guide
https://support.hpe.com/hpesc/public/docDisplay?docId=sd00006453en_us&page=GUID-3CA39221-7A9A-4C51-B56D-D5D1A69876FE.html

HPE Morpheus Enterprise Software Ansible integration
https://support.hpe.com/hpesc/public/docDisplay?docId=sd00006453en_us&page=GUID-B47A4967-DCA3-45C4-B983-83CEB43711DC.html

HPE Morpheus Enterprise Software Ansible integration troubleshooting ansible installation
https://support.hpe.com/hpesc/public/docDisplay?docId=sd00006453en_us&page=GUID-014CB518-CCE4-449A-9BCC-241FF8FEA3C5.html

To help us improve our documents, please provide feedback at hpe.com/contact/feedback.

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