Reference Implementation - SUSE Rancher

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Contents

Preface

The purpose of this document is to provide an overview and procedure of implementing SUSE (https://www.suse.com) ® offerings for SUSE Rancher (https://rancher.com/products/rancher/), as a multi-cluster container management platform for organizations that deploy containerized workloads, orchestrated by Kubernetes. SUSE Rancher makes it easy to deploy, manage, and use Kubernetes everywhere, meet IT requirements, and empower DevOps teams.

1 Introduction

On the digital transformation journey to a full cloud native landscape, utilization of microservices becomes the main approach with the dominant technology for such container orchestration being Kubernetes [1] With its large community of developers and abundant features and capabilities, Kubernetes has become the defacto standard and is included across most container-as-a-service platforms. With all of these technologies in place, both developer and operation teams can effectively deploy, manage and deliver functionality to their end users in a resilient and agile manner.

1.1 Motivation

While any developer or organization may simply start with a single, Kubernetes-based deployment, it is very common for that number of cluster instances to rapidly grow. While each of these may have specific focus areas, it becomes imperative to figure out how to use, manage, maintain and replicate all of these instances over time.

This is where SUSE Rancher leads the industry, being able to manage access, usage, infrastructure and applications across clusters, that are Cloud Native Computing Foundation (CNCF [2]) conformant [3], anywhere across edge, on-premise data centers, or cloud service providers. SUSE Rancher optimizes creating and managing Kubernetes clusters like:

- Rancher Kubernetes Engine (RKE (https://rancher.com/products/rke/))
- Lightweight edge-centric K3s (https://rancher.com/products/k3s/)
- other Kubernetes clusters that are based upon CNCF certified [4] Kubernetes distributions or installers

and deployed across various supported (https://rancher.com/support-maintenance-terms) infrastructure elements.

1 https://kubernetes.io/

2 https://www.cncf.io/

3 https://www.cncf.io/certification/software-conformance

4 https://www.cncf.io/certification/cka/

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1.2 Scope

The scope of this document is to provide a general *reference implementation* of SUSE Rancher. This can be done in a variety of solution stack, architectural scenarios as a fundamental component of a managing multiple Kubernetes ecosystems.

1.3 Audience

This document is intended for IT decision makers, architects, system administrators and technicians who are implementing a flexible, software-defined Kubernetes management platform. One should still be familiar with the traditional IT infrastructure pillars — networking, computing and storage — along with the local use cases for sizing, scaling and limitations within each pillars' environments.

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2 Business aspect

Agility is the name of the game in modern application development. This is driving developers toward more cloud native methodologies that focus on microservices architectures and streamlined workflows. Container technologies, like Kubernetes, embody this agile approach and help enable cloud native transformation.

By unifying IT operations with Kubernetes, organizations realize key benefits like increased reliability, improved security and greater efficiencies with standardized automation. Therefore, Kubernetes infrastructure platforms are adopted by enterprises to deliver:

Cluster Operations

Improved Production and DevOps efficiencies with simplified cluster usage and robust operations

Security Policy & User Management

Consistent security policy enforcement plus advanced user management on any Kubernetes infrastructure

Access to Shared Tools & Services

A high level of reliability with easy, consistent access to a broad set of tools and services

2.1 Business problem

Many organizations are deploying Kubernetes clusters everywhere – in the cloud, on-premises, and at the edge - to unify IT operations. Such organizations can realize dramatic benefits, including:

- Consistently deliver a high level of reliability on any infrastructure
- Improve DevOps efficiency with standardized automation
- Ensure enforcement of security policies on any infrastructure

However, simply relying on upstream Kubernetes alone can introduce overhead and risk because Kubernetes clusters are typically deployed:

- Without central visibility
- Without consistent security policies
- And must be managed independently

Deploying a scalable kubernetes requires consideration of a large ecosystem, encompassing many software and infrastructure components and providers. Further, the ability to continually address the needs and concerns of:

Developers

For those who just focus on writing code to build their apps securely using a preferred workflow, providing a simple, push-button deployment mechanism of their containerized workloads where needed.

IT Operators

General infrastructure requirements still rely upon traditional IT pillars are for the stacked, underlying infrastructure. Ease of deployment, availability, scalability, resiliency, performance, security and integrity are still core concerns to be addressed for administrative control and observability.

2.2 Business value

By allowing operation teams to focus on infrastructure and developers to deploy code the way they want too, SUSE and the Rancher offerings helps bring products to market faster and accelerate an organization's digital transformation.

SUSE Rancher is a fundamental part of the complete software stack for teams adopting containers. It provides DevOps teams with integrated tools for running containerized workloads while also addressing the operational and security challenges of managing multiple Kubernetes clusters across any targetedd infrastructure.

Developers

SUSE Rancher makes it easy for you to securely deploy containerized applications no matter where your Kubernetes infrastructure runs -– in the cloud, on-premises, or at the edge. Using Helm or the App Catalog to deploy and manage applications across any or all these environments, ensuring multi-cluster consistency with a single deployment process.

IT Operators

SUSE Rancher not only deploys and manages production-grade Kubernetes clusters from datacenter to cloud to the edge, it also unites them with centralized authentication, access control and observability. Further, it streamlines cluster deployment on bare metal or virtual machines and maintains them using defined security policies.

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3 Architectural overview

This section outlines the overall elements of the SUSE Rancher solution, along with the suggested target platforms and components.

3.1 Solution architecture

The figure below illustrates the high-level architecture of the SUSE Rancher installation that manages multiple downstream Kubernetes clusters:

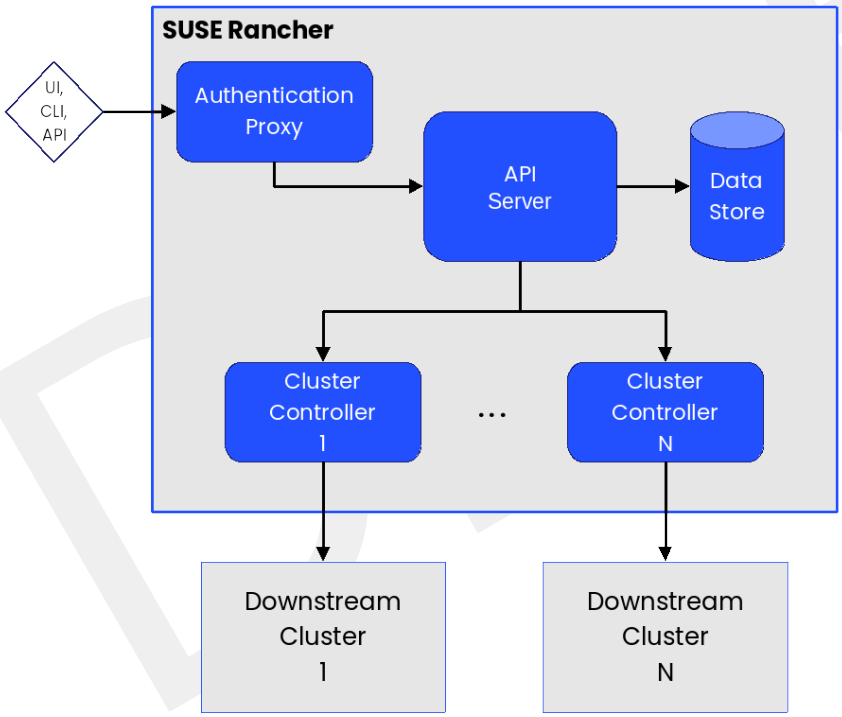

FIGURE 3.1: ARCHITECTURE OVERVIEW - SUSE RANCHER

Authentication Proxy

A user is authenticated via SUSE Rancher and then, if authorized, can access both the SUSE Rancher environment and the downstream clusters and workloads.

API Server

This provides the programmatic interface backend for a user, utilizing command-line interactions with SUSE Rancher and the managed clusters.

Data Store

The purpose of this service is to capture the configuration and state of SUSE Rancher and the managed clusters to aid in backup and recovery processes.

Cluster Controller

Interacting with a cluster agent on the downstream cluster, the cluster controller allows the communication path for users and services to leverage for workloads and cluster management.

Once setup, users can potentially interact with SUSE Rancher through the web-based user interface (UI), the command-line interface (CLI), and programatically through the application programming interface (API). Depending upon the assigned roles, group membership and privileges, a user could:

- manage all clusters, users, roles, projects
- deploy new clusters, import other clusters, or remove existing ones
- manage workloads across respective or labeled clusters
- simply view clusters or workloads, or just benefit from what is running

For the best performance and security, the recommended deployment of a dedicated Kubernetes cluster for the SUSE Rancher management server. Running user workloads on this cluster is not advised. After deploying SUSE Rancher, you can create or import clusters for running your workloads.

Note

Regardless of the deployment target, SUSE Rancher should always run on a node or cluster that is separate from the downstream clusters that it manages. Running user workloads on this SUSE Rancher cluster or nodes is not advised.

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4 Component model

This section describes the various components being used to create a SUSE Rancher deployment, in the perspective of top to bottom ordering. Once completed, the SUSE Rancher instance enables the management of multiple Kubernetes clusters.

4.1 Component overview

By utilizing:

- Software
  - Multi-cluster Management Server - SUSE Rancher
  - Kubernetes Platform - ifdef::iK3s[K3s]
  - Operating System - ifdef::iSLEMicro[SUSE Linux Enterprise Micro]
- Compute Platform

one can create the necessary infrastructure and services. Further details for these components are described in the following sections.

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4.2 Software - SUSE Rancher

SUSE Rancher is a complete cluster and container management platform built to reside on Kubernetes itself. It addresses these challenges by delivering the following key functions, as shown in the following figure:

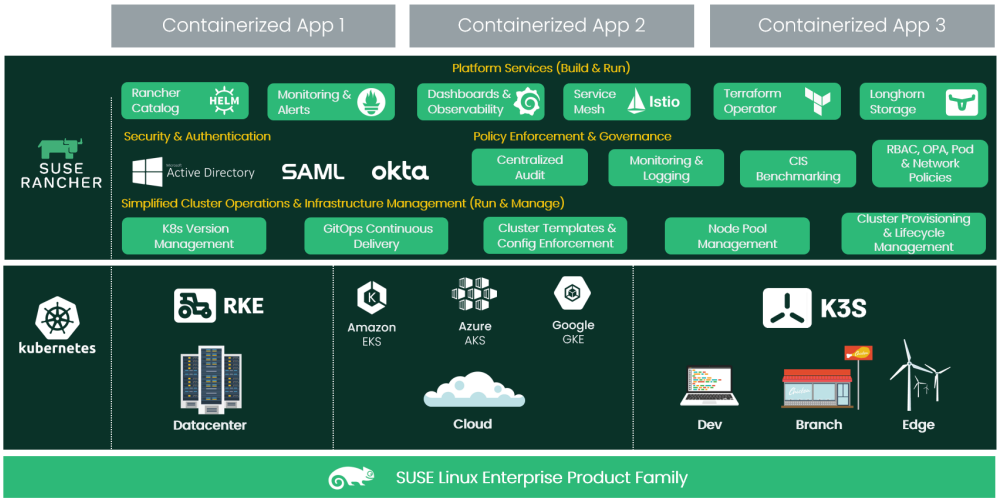

FIGURE 4.1: OVERVIEW OF SUSE RANCHER

Certified Kubernetes Distributions

SUSE Rancher supports management of any certified Kubernetes distribution. That includes:

- for on-premises workloads, a SUSE offering Rancher Kubernetes Engine (RKE (https://rancher.com/products/rke/)), a certified Kubernetes distribution for both bare-metal and virtualized servers
- for the public cloud, hosted Kubernetes services like

- Amazon Elastic Kubernetes Service (EKS [1]),
- Azure Kubernetes Service (AKS [2]) and
- Google Kubernetes Engine (GKE [3])

- for development, edge, branch workloads, SUSE offerings like K3s (https://rancher.com/products/k3s/), a certified lightweight distribution of Kubernetes.

Simplified Cluster Operations and Infrastructure Management

SUSE Rancher provides simple, consistent cluster operations including provisioning and templates, configuration and lifecycle version management, along with visibility and diagnostics.

Security and Authentication

SUSE Rancher incorporates and leverages various single-signon services, to automate processes and apply a consistent set of user access and security policies for all the managed clusters, no matter where they're running.

Policy Enforcement and Governance

SUSE Rancher includes audit and security guideline enforcement, monitoring and logging functions, along with user, network and workload policies distributed across all managed clusters.

Platform Services

SUSE Rancher also provides a rich catalog of services for building, deploying and scaling containerized applications, including app packaging, CI/CD, logging, monitoring and service mesh.

As SUSE Rancher relies upon being deployed on a Kubernetes platform, the next section describes such a suggested component layer.

1 https://aws.amazon.com/eks

2 https://azure.microsoft.com/en-us/overview/kubernetes-on-azure/

3 https://cloud.google.com/kubernetes-engine

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4.3 Software - K3s

K3s is packaged as a single binary, which is about 50 megabytes in size. Bundled in that single binary is everything needed to run Kubernetes anywhere, including low-powered IoT and Edge-based devices. The binary includes:

- the container runtime
- any important host utilities like
    - iptables, socat and du.

The only OS dependencies are the Linux kernel itself and a proper dev, proc and sysfs mounts (this is done automatically on all modern Linux distributions). K3s bundles the Kubernetes components:

- kube-apiserver,
- kube-controller-manager,
- kube-scheduler,
- kubelet and
- kube-proxy

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into combined processes that are presented as a simple server and agent model, as represented in the following figure:

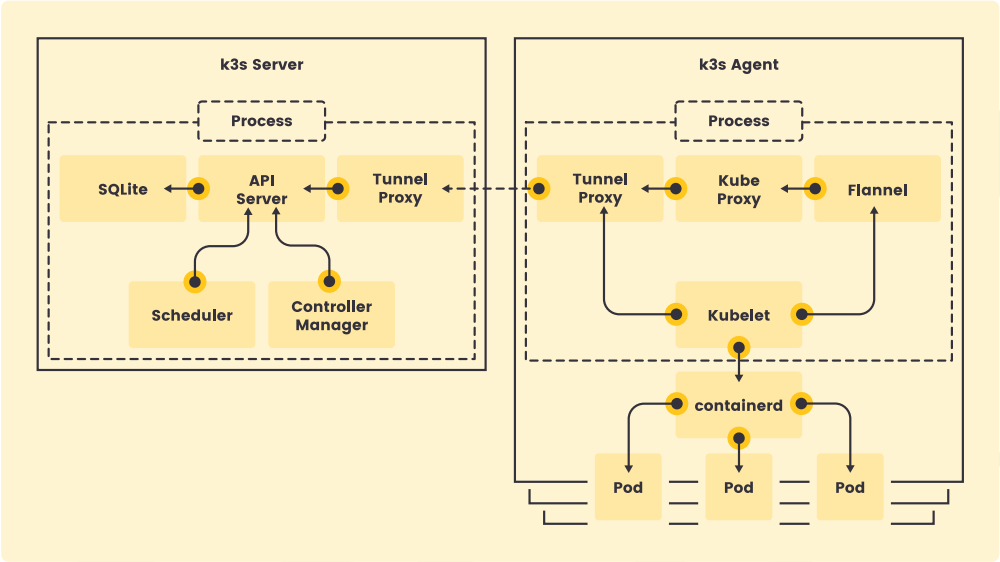

FIGURE 4.2: OVERVIEW OF K3S

K3s can run as a complete cluster on a single node or can be expanded into a multi-node cluster. Besides the core Kubernetes components, we also run

- containerd,
- Flannel,
- CoreDNS,
- ingress controller and
- a simple host port-based service load balancer.

All of these components are optional and can be swapped out for your implementation of choice. With these included components, you get a fully functional and CNCF-conformant cluster so you can start running apps right away. K3s is now a CNCF Sandbox project, being the first Kubernetes distribution ever to be adopted into sandbox.

Learn more information about K3s at https://k3s.io

Given that K3s relies upon being deployed on a Linux operating system, the next section describes that target component layer.

4.4 Software - SUSE Linux Enterprise Micro

SUSE Linux Enterprise Micro combines the assurance of enterprise-grade security and compliance with the immutability and portability of a modern, lightweight operating system. The top 4 features are:

Immutable OS

Immutable design ensures the OS is not altered during runtime and runs reliably every single time. Security signed and verified transactional updates are easy to rollback if things go wrong.

Security and Compliance

Fully open source and built using open standards, SUSE Linux Enterprise Micro leverages SUSE Linux Enterprise common code base, to provide FIPS 140-2, DISA SRG/STIG, integration with CIS and Common Criteria certified configurations. Includes fully supported security framework (SELinux) with policies.

Architectural Flexibility

Both Arm and x86-64 architectures are supported so you can deploy edge applications with confidence across multiple architectures.

Kubernetes-Ready

You can easily combine SUSE Linux Enterprise Micro with the latest cloud-native technologies including SUSE Rancher, Rancher Kubernetes Engine, Longhorn persistent block storage, and K3s, the world's most popular Kubernetes distribution for use in low resource, distributed edge locations.

As a result, you get an ultra-reliable infrastructure platform that is also simple to use and comes out-of-the-box with best-in-class compliance. Furthermore, SUSE's flexible subscription model ensures enterprise assurance for any edge, embedded or IoT deployment without vendor lock-

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in. A free, evaluation copy can be downloaded (https://www.suse.com/download/sle-micro/) or if the organization already has subscriptions, both install media and updates can be obtained from SUSE Customer Center (https://scc.suse.com/login).

With the flexibility of SUSE Linux Enterprise Micro, multiple compute platform variants can be considered, as outlined in the next section.

4.5 Compute Platform

Leveraging the enterprise grade functionality of the operating system mentioned in the previous section, many compute platforms can be the foundation of the deployment:

- Virtual machines on supported hypervisors or hosted on cloud service providers
- Physical, baremetal or single-board computers, either on-premise or hosted by cloud service providers

Tip

Any SUSE YES (https://www.suse.com/yessearch/) certified platform can be used for the nodes of this deployment, as long as the certification refers to the major version of the underlying SUSE operating system required by its release.

5 Deployment

This section describes the process steps to deploy each of the component layers needed to create the SUSE Rancher solution.

5.1 Deployment overview

For this documented deployment process, a single node is installed with the operating system supporting a single Kubernetes instance to host SUSE Rancher. For maximum flexibility, these layers are deployed in a manner that would allow expanding this single-node into a highly available, multi-node cluster, by following the steps in the deployment consideration sections.

The deployment stack is represented in the following figure:

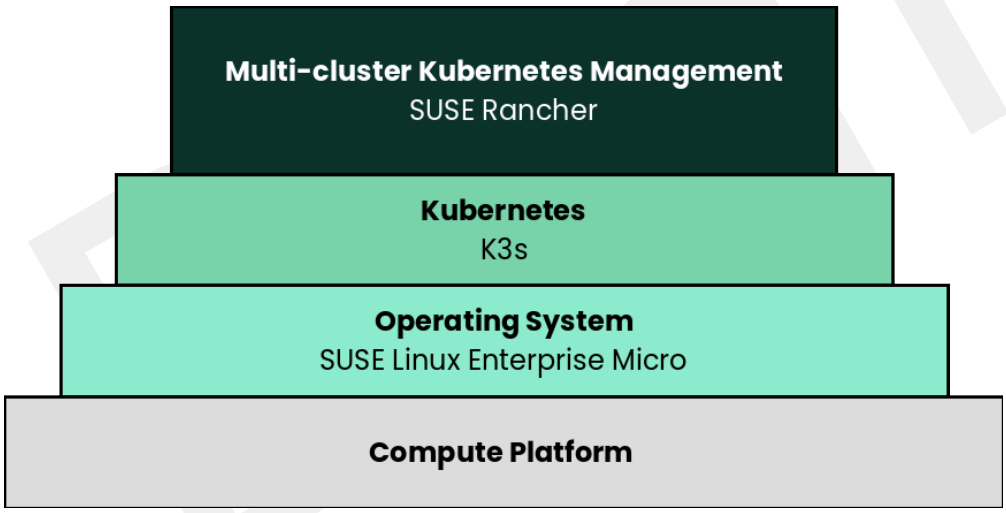

FIGURE 5.1: SUSE RANCHER DEPLOYMENT STACK

and details are covered for each layer in the following sections.

Note

The content is ordered and described from the bottom layer up to the top.

5.2 Compute Platform

Preparation(s)

For each node used in the deployment:

- Validate the necessary CPU, memory, disk capacity, and network interconnect quantity and type are present for each node and its intended role. Refer to the recommended CPU/Memory/Disk/Networking requirements as noted in the SUSE Rancher Hardware Requirements (https://rancher.com/docs/rancher/v2.x/en/installation/requirements/#hardware-requirements).
- Further suggestions
  - Disk : Use a pair of local, direct attached, mirrored disk drives is present on each node (SSDs are preferred); these will become the target for the operating system installation.
  - Network : Prepare an IP addressing scheme and optionally create both a public and private network, along with the respective subnets and desired VLAN designations for the target environment.
    - Baseboard Management Controller : If present, consider using a distinct management network for controlled access.
  - Boot Settings : BIOS/uEFI reset to defaults for a known baseline, consistent state or perhaps with desired, localized values.
  - Firmware : Use consistent and up-to-date versions for BIOS/uEFI/device firmware to reduce potential troubleshooting issues later

5.3 SUSE Linux Enterprise Micro

Utilize an enterprise-grade Linux operating system , like SUSE Linux Enterprise Micro, as the base software layer.

Preparation(s)

Plan on leveraging and utilizing the following core infrastructure components and services:

- Domain Name Service (DNS) - an external network-accessible service to map IP Addresses to hostnames
- Network Time Protocol (NTP) - an external network-accessible service to obtain and synchronize system times to aid in timestamp consistency
- Software Update Service - access to a network-based repository for software update packages. This can be accessed directly from each node via registration to
  - the general, internet-based SUSE Customer Center (https://scc.suse.com/login) (SCC) or
  - an organization's SUSE Manager (https://www.suse.com/products/suse-manager/) or
  - a local server running an instance of Repository Mirroring Tool (https://documentation.suse.com/sles/15-SP2/single-html/SLES-rmt/#book-rmt) (RMT)

Note

During the installation, the node can be pointed to the respective update service. This can also be accomplished post-installation with the command-line tool, SUSEConnect (https://documentation.suse.com/sle-micro/5.0/single-html/SLE-Micro-installation/#article-installation).

Deployment Process

On the compute platform node, install the noted SUSE operating system, by following these steps:

1. Download the SUSE Linux Enterprise Micro (https://www.suse.com/download/sle-micro/) product (either for the ISO or Virtual Machine image)
2. The installation process is described and can be performed with default values by following steps from the SUSE Linux Enterprise Micro product documentation, see Installation Quick Start (https://documentation.suse.com/sle-micro/5.0/single-html/SLE-Micro-installation/#article-installation)

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Tip

Adjust both the password and the local network addressing setup to comply with your environment guidelines and requirements.

Deployment Consideration(s)

To further optimize deployment factors, leverage the following practices:

- *Automation*
  - To reduce user intervention, unattended deployments of SUSE Linux Enterprise Micro can be automated
    - for ISO-based installations, by referring to the AutoYaST Guide (https://documentation.suse.com/sle-micro/5.0/single-html/SLE-Micro-autoyast/#book-autoyast)
    - for raw-image based installation, by configuring the Ignition and Combustion tooling as described in the Installation Quick Start (https://documentation.suse.com/sle-micro/5.0/single-html/SLE-Micro-installation/#article-installation)

5.4 K3s

While it is highly recommended that Kubernetes workloads are isolated from the Kubernetes control-plane and data-plane, this design will maintain all functions, including the SUSE Rancher, on this node. The SUSE Rancher workload is a known quantity and no other workloads will be run on this Kubernetes cluster. For this reason the SUSE Rancher deployment is more closely aligned with appliance-based approach.

Preparation(s)

To meet the SUSE Rancher prerequisites and requirements on supported Kubernetes instances, K3s (https://rancher.com/products/k3s/) can be utilized, and as desired later scaled out to a production cluster.

1. Identify the appropriate, supported version of the K3s binary, by reviewing the "Rancher Support Matrix" on the Support and Maintenance Terms of Service (https://rancher.com/support-maintenance-terms) web page.

2. Log into the node's operating system, either as root or as a user with sudo privileges.

Deployment Process

The primary steps for deploying this K3s Kubernetes layer are:

1. Set the following variable with the noted version of K3s, as found during the preparation steps.

```
K3s_VERSION=""
```

2. Install the version of K3s with embedded etcd enabled:

```
curl -sfL https://get.k3s.io | INSTALL_K3S_VERSION=${K3s_VERSION}
 INSTALL_K3S_EXEC='server --cluster-init --write-kubeconfig-mode=644' sh -s -
```

Tip

To address possible scaling to a multiple node cluster, etcd is enabled instead of using the default sqlite datastore.

- Monitor the progress of the installation: `watch -c "kubectl get deployments -A"`
  - The deployment is complete when all deployments elements (coredns, local-path-provisioner, metrics-server, and traefik) show at least "1" as "AVAILABLE"
  - Then use Ctrl+c to exit the watch loop after all deployment pods are running

Deployment Consideration(s)

To further optimize deployment factors, leverage the following practices:

- *Availability*

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- While a single K3s node works perfectly fine, a full high-availability K3s cluster is recommended for production workloads. The etcd key/value store (aka database) requires an odd number of nodes be allocated to the K3s plane (aka master nodes). In this case, two additional control-plane nodes will be added; for a total of three.

    1. Deploy the same operating system on the new compute platform nodes, then log into the new nodes as root or as a user with sudo privileges.

    2. Execute the following sets of commands on each of the remaining control-plane nodes:

    ```
    FIRST_SERVER_IP=""      # Private IP preferred, if available
    NODE_TOKEN=""           # From the /var/lib/rancher/k3s/server/node-
    token file on the first server
    K3s_VERSION=""          # Match the first of the first server
    ```

    ```
    curl -sfL https://get.k3s.io | INSTALL_K3S_VERSION=${K3s_VERSION}
     K3S_URL=https://${FIRST_SERVER_IP}:6443 K3S_TOKEN=${NODE_TOKEN}
     K3S_KUBECONFIG_MODE="644" INSTALL_K3S_EXEC='server' sh -
    ```

    By default, the K3s server nodes are available to run non-control-plane workloads. In this case, the K3s default behavior is perfect for the SUSE Rancher server cluster as it doesn't require additional agent (aka worker) nodes to maintain a highly available SUSE Rancher server application.

    

    Note

    This can be changed to the normal Kubernetes default by adding a taint to each server node. See the official Kubernetes documentation for more information on how to do that.

    3. (Optional) In cases where agent nodes are desired, execute the following sets of commands on each of the agent nodes to add it to the K3s cluster:

    ```
    FIRST_SERVER_IP=""      # Private IP preferred, if available
    NODE_TOKEN=""           # From the /var/lib/rancher/k3s/server/node-
    token file on the first server
    K3s_VERSION=""          # Match the first of the first server
    ```

```
curl -sfL https://get.k3s.io | INSTALL_K3S_VERSION=${K3s_VERSION}
 K3S_URL=https://${FIRST_SERVER_IP}:6443 K3S_TOKEN=${NODE_TOKEN}
 K3S_KUBECONFIG_MODE="644" sh -
```

5.5 SUSE Rancher

As SUSE Rancher is a native Kubernetes application, it will run on this single-node K3s deployment.

Preparation(s)

To complete the process of this solution's deployment layer, the remaining steps, while specific to K3s, can actually be executed directly on the K3s node or from any system that has the kubectl [1] command-line tool plus the KUBECONFIG file for the K3s instance (see "Cluster Access" on K3s product documentation (https://rancher.com/docs/k3s/latest/en/)).

Deployment Process

The following steps for deploying SUSE Rancher are:

1. Create the Helm Chart custom resource for cert-manager:

   - Set the following variable with the desired version of cert-manager

     ```
     CERT_MANAGER_VERSION=""
     ```

     

     Note

     At this time, the most current, supported version of cert-manager is v1.0.4

   - Create the cert-manager Helm Chart custom resource manifest

     ```
     cat <<EOF> cert-manager-helm-crd.yaml
     apiVersion: helm.cattle.io/v1
     kind: HelmChart
     metadata:
       name: cert-manager
     ```

1 https://kubernetes.io/docs/reference/kubectl/overview/

```
  namespace: kube-system
spec:
  chart: cert-manager
  targetNamespace: cert-manager
  version: ${CERT_MANAGER_VERSION}
  repo: https://charts.jetstack.io
EOF
```

- Create the cert-manager CRDs and apply the Helm Chart resource manifest:

```
kubectl create namespace cert-manager
kubectl apply --validate=false -f https://github.com/jetstack/cert-
manager/releases/download/${CERT_MANAGER_VERSION}/cert-manager.crds.yaml
sudo mv cert-manager-helm-crd.yaml /var/lib/rancher/k3s/server/manifests/
```

  - Monitor the progress of the installation: `watch -c "kubectl get deployments -A"`

    - The deployment is complete when all deployments (cert-manager, cert-manager-cainjector, cert-manager-webhook) show at least "1" as "AVAILABLE"

    - Use Ctrl + c to exit the watch loop after all pods are running

2. Create the Helm Chart custom resource for SUSE Rancher:

- Set the following variable to the hostname of the SUSE Rancher server instance

```
HOSTNAME=""
```

Note

This hostname should be resolvable to an IP address of the K3s host, or a load balancer/proxy server that supports this installation of SUSE Rancher.

- Create the SUSE Rancher Helm Chart custom resource manifest

```
cat <<EOF> suse-rancher-helm-crd.yaml
apiVersion: helm.cattle.io/v1
kind: HelmChart
metadata:
  name: rancher
```

```
  namespace: kube-system
spec:
  chart: rancher
  targetNamespace: cattle-system
  repo: https://releases.rancher.com/server-charts/stable
  set:
    hostname: ${HOSTNAME}
EOF
```

- Apply the Helm Chart resource manifest:

```
kubectl create namespace cattle-system
sudo mv suse-rancher-helm-crd.yaml /var/lib/rancher/k3s/server/manifests/
```

  - Monitor the progress of the installation: `watch -c "kubectl get pods -n cattle-system"`

    - The installation is complete when all pods have a status of "Completed" or a status of "Running" with the number of "READY" pods being "1/1", "2/2", etc.

    - Use Ctrl + c to exit the watch loop after all pods are running

3. (Optional) Create an SSH tunnel to access SUSE Rancher:

Note

This optional step is useful in cases where NAT routers and/or firewalls prevent the client web browser from reaching the exposed SUSE Rancher server IP address and/or port. This step requires that a Linux host is accessible through SSH from the client system and that the Linux host can reach the exposed SUSE Rancher service. The SUSE Rancher hostname should be resolvable to the appropriate IP address by the local workstation.

- Create an SSH tunnel through the Linux host to the IP address of the SUSE Rancher server on the NodePort, as noted in Step 3:

```
ssh -N -D 8080 user@Linux-host
```

- On the local workstation web browser, change the SOCKS Host settings to "127.0.0.1" and port "8080"

Note

This will route all traffic from this web browser through the remote Linux host. Be sure to close the tunnel and revert the SOCKS Host settings when you're done.

4. Connect to the SUSE Rancher web UI and configure SUSE Rancher:

   - On the client system, use a web browser to connect to the SUSE Rancher service
     - e.g., `https://suse-rancher.sandbox.local`
   - Provide a new Admin password

Important

On the second configuration page, ensure the "Rancher Server URL" is set to the hostname specified when creating the SUSE Rancher HelmChart custom resource and the port is 443.

     - e.g., `suse-rancher.sandbox.local:443`

Deployment Consideration(s)

To further optimize deployment factors, leverage the following practices

- *Availability*
  - In instances where a load balancer is used to access a K3s cluster, deploying two additional K3s cluster nodes will automatically make SUSE Rancher highly available.
- *Security*
  - The basic deployment steps described above are for deploying SUSE Rancher with automatically generated, self-signed security certificates. Other options are to have SUSE Rancher create public certificates via Let's Encrypt associated with with a publicly resolvable hostname for the SUSE Rancher server, or

to provide preconfigured, private certificates. See SUSE Rancher product documentation (https://rancher.com/docs/rancher/v2.x/en/installation/install-rancher-on-k8s/#3-choose-your-ssl-configuration) for more information.

- *Integrity*

  - This deployment of SUSE Rancher uses the K3s etcd key/value store to persist its data and configuration, which offers several advantages. With a multi-node cluster and this resiliency through replication, having to provide highly-available storage isn't needed. In addition, backing up the K3s etcd store protects the cluster as well as the installation of SUSE Rancher and permits restoration of a given state.

Now other Kubernetes clusters can be deployed, imported and managed from this SUSE Rancher instance.

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6 Summary

Using components and offerings from SUSE and the Rancher portfolio streamlines your ability to quickly and effectively engage in a digital transformation, taking advantage of cloud native resources and disciplines. Using such technology approaches lets you deploy and leverage transformations of your infrastructure into a durable, reliable enterprise-grade environment.

Simplify

Simplify and optimize your existing IT environments

- Using SUSE Rancher enables you to simplify Kubernetes cluster deployment and management of the the infrastructure components.

Modernize

Bring applications and data into modern computing

- With SUSE Rancher, the digital transformation to containerized applications can benefit from the ability both to manage many target clusters, for each of the respective user bases and to facilitate the actual workload deployments.

Accelerate

Accelerate business transformation through the power of open source software

- Given the open source nature of SUSE Rancher and the underlying software components, you can simplify management and make significant IT savings as you scale orchestrated, microservice deployments anywhere you need to and for whatever use cases are needed in an agile and innovative way.

*

7 References

WHITE PAPERS

- A Buyer's Guide to Enterprise Kubernetes Management Platforms - https://info.rancher.com/enterprise-kubernetes-management-buyers-guide
- How to Build an Enterprise Kubernetes Strategy - https://info.rancher.com/how-to-build-enterprise-kubernetes-strategy

BOOKS

- Kubernetes Management - https://info.rancher.com/kubernetes-management-for-dummies-rancher-and-suse-0-0

TRAINING

- SUSE - https://training.suse.com/
  - Rancher - https://rancher.com/training/

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    - SUSE Rancher - https://rancher.com/products/rancher/ (documentation (https://rancher.com/docs/rancher/v2.x/en/))
    - Rancher Kubernetes Engine (RKE) - https://rancher.com/products/rke/ (documentation (https://rancher.com/docs/rke/latest/en/))
    - K3s - https://rancher.com/products/k3s/ (documentation (https://rancher.com/docs/k3s/latest/en/))
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    - SUSE Linux Enterprise Server (SLES) - https://www.suse.com/products/server/ (documentation (https://documentation.suse.com/sles/15-SP2/))

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    - SUSE Manager - https://www.suse.com/products/suse-manager/ (documentation (https://documentation.suse.com/suma/4.1/))
    - SUSE Repository Mirroring Tool (RMT) - https://www.suse.com/products/server/ (documentation (https://documentation.suse.com/sles/15-SP2/single-html/SLES-rmt/#book-rmt))
- Projects
    - Rancher Kubernetes Engine Government (RKE2) - https://github.com/rancher/rke2 (documentation (https://docs.rke2.io/))

*

Glossary

- Document Scope

  Reference Implementation

  A guide with the basic steps to deploy the highlighted components of the SUSE portfolio, including generalized pointers to other layers and elements. This is considered an introductory approach and a basis for other tested variations.

  Reference Architectures [1]

  A guide with the general steps to deploy and validate the structured solution components from both the SUSE and partner portfolios. This provides a shareable template of consistency for consumers to leverage for similar production ready solutions, including design considerations, implementation suggestions and best practices.

  Best Practice

  Information that can overlap both the SUSE and partner space. It can either be provided as a standalone guide that provides reliable technical information not covered in other product documentation, based on real-life installation and implementation experiences from subject matter experts or complementary, embedded sections within any of the above documentation types describing considerations and possible steps forward.

- Factor(s)

  Automation [2]

  Infrastructure automation enables speed through faster execution when configuring your infrastructure and aims at providing visibility to help other teams across the enterprise work quickly and more efficiently. Automation removes the risk associated with human error, like manual misconfiguration; removing this can decrease downtime and increase reliability. These outcomes and attributes help the enterprise move towards implementing a culture of DevOps, the combined working of development and operations.

---

1 link: Reference Architecture (https://en.wikipedia.org/wiki/Reference_architecture)

2 link: Infrastructure-as-Code (https://en.wikipedia.org/wiki/Infrastructure_as_code)

*

Availability [3]

The probability that an item operates satisfactorily, without failures or downtimes, under stated conditions as a function of its reliability, redundancy and maintainability attributes. Some major objectives to achieve a desired service level objectives are:

- Preventing or reducing the likelihood and frequency of failures via design decisions within the allowed cost of ownership
- Correcting or coping with possible component failures via resiliency, automated failover and disaster-recovery processes
- Estimating and analyzing current conditions to prevent unexpected failures via predictive maintenance

Integrity [4]

Integrity is the maintenance of, and the insurance of the accuracy and consistency of a specific element over its entire lifecycle. Both physical and logical aspects must be managed to ensure stability, performance, re-usability and maintainability.

Security [5]

Security is about ensuring freedom from or resilience against potential harm, including protection from destructive or hostile forces. To minimize risks, one mus manage governance to avoid tampering, maintain access controls to prevent unauthorized usage and integrate layers of defense, reporting and recovery tactics.

3 link: Availability (https://en.wikipedia.org/wiki/Minimum_viable_product)

4 link: Data Integrity (https://en.wikipedia.org/wiki/Data_integrity)

5 link: Security (https://en.wikipedia.org/wiki/Security)

*

A Appendix

The following sections provide a bill of materials listing for each component layer.

A.1 Compute Platform Bill of Materials

Role	Qty	SKU	Component	Notes
System	1-3	n/a	• Virtual Machine, • Single Board Computer (SBC) or • Industry Standard Server	Configuration • see installation resource requirements (https://rancher.com/docs/rancher/v2.x/en/installation/requirements/#cpu-and-memory-for-

*

Role	Qty	SKU	Component	Notes
				ranch-er-be-fore-v2-4-0)

A.2 Software Bill of Materials

Role	Qty	SKU	Component	Notes
Operating System	1-3	874-007864	SUSE Linux Enterprise Micro, • x86_64, • Priority Subscription, • 1 Year	Configuration: • per node (up to 16 cores, stackable)
Kubernetes Management	1	R-0001-PS1	SUSE Rancher, • x86-64, • Priority Subscription, • 1 Year	Configuration: • per instance, includes up to 3 Kubernetes nodes

Note

For the software components, other durations of support terms are also available.

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