Reference Implementation - SUSE Rancher

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Contents

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Preface

The purpose of this document is to provide an overview and procedure for implementing 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 the 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]) compliant, 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 [3] certified [4] Kubernetes distributions or installers

and deployed across various supported [5] infrastructure elements.

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1 https://kubernetes.io/

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

3 https://www.cncf.io/

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

5 https://rancher.com/support-maintenance-terms/all-supported-versions/rancher-v2.5.7/

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1.2 Scope

The scope of this document is to provide a reference implementation () of SUSE Rancher. This can be done in a variety of solution stack, architectural scenarios as a fundamental component of a managing overall 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. You should 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

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

Cluster Operations

Improved DevOps efficiencies with simplified cluster usage and 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 then how it can be used.

3.1 Solution architecture

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

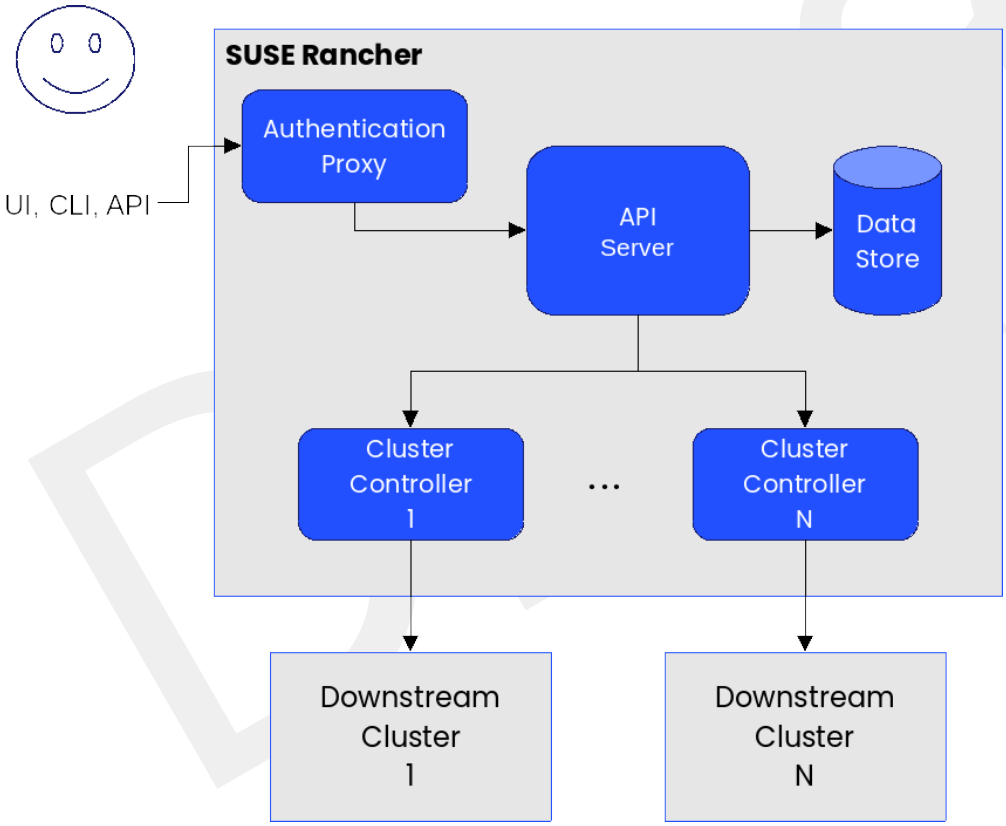

FIGURE 3.1: ARCHITECTURE OVERVIEW - SUSE RANCHER

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 user, 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 a dedicated Kubernetes cluster for the Rancher management server. Running user workloads on this cluster is not advised. After deploying 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 cluster 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, as shown in the following figure:

4.1 Component overview

By utilizing:

- Multi-cluster Management Server - SUSE Rancher
- Kubernetes Platform - K3s
- Operating System - SUSE Linux Enterprise Micro
- Compute Platform

one can create the necessary infrastructure and services to administer and manage multiple Kubernetes clusters. Further details for these components are described in the following sections.

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4.1.1 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:

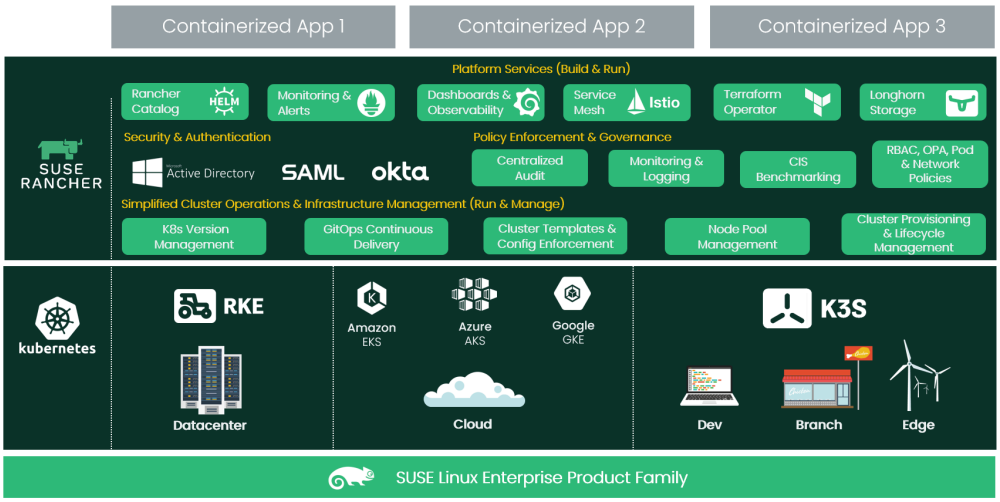

FIGURE 4.1: OVERVIEW OF SUSE RANCHER

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

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

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

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

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.

4.1.2 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

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- 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:

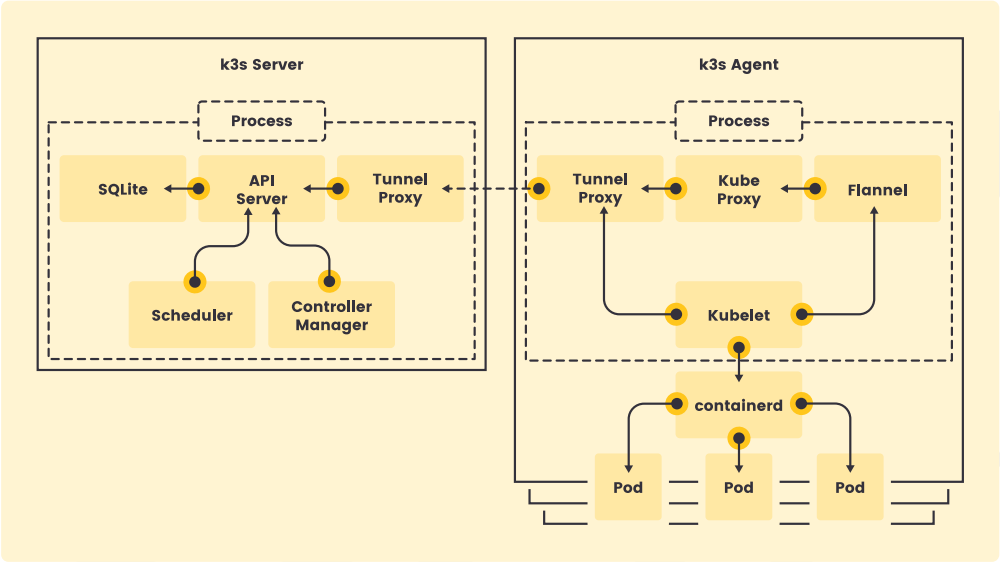

FIGURE 4.2: OVERVIEW OF K3S

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.

4.1.3 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.

4.1.4 Compute Platform Options

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

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5 Deployment

This section describes the process steps to deploy each of the components needed to create the SUSE Rancher solution. The content ordering is listed from the bottom layer upto the top.

5.1 Deployment overview

The deployment stack is represented in the following figure:

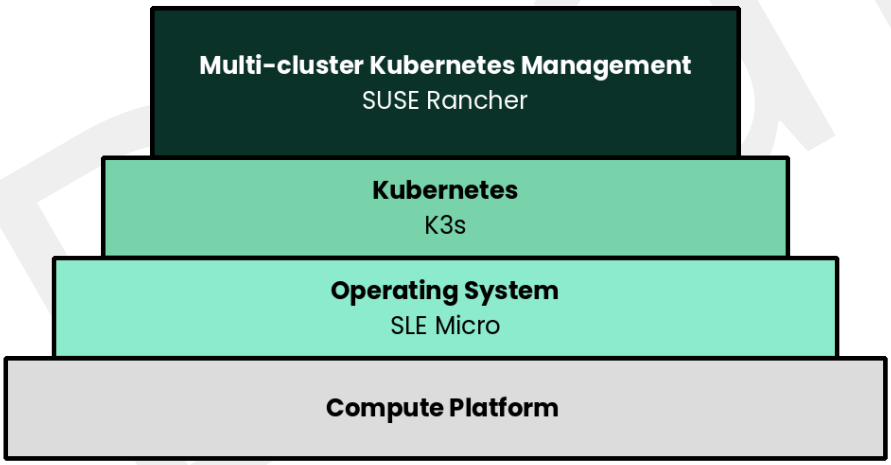

FIGURE 5.1: SUSE RANCHER DEPLOYMENT STACK

and details are covered in the following sections.

5.1.1 Compute platform deployment configuration

5.1.2 Operating System Deployment

On each compute platform node, install the noted SUSE operating system. 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

Follow these steps

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- Download the SUSE Linux Enterprise Micro (https://www.suse.com/download/sle-micro/) product (either for the ISO or Virtual Machine image)
- The installation process is described and can be performed with default values aside from your local network addressing, per the product documentation. Simply follow:
  - the Installation Quick Start (https://documentation.suse.com/sle-micro/5.0/single-html/SLE-Micro-installation/#article-installation) for
    - manual installation
    - raw image deployment
  - or AutoYaST Guide (https://documentation.suse.com/sle-micro/5.0/single-html/SLE-Micro-autoyast/#book-autoyast) for unatttended installations

Tip

An additional consideration is, for the first node deployed, to create an additional IP address on the host network interface card. This can be used for the SUSE Rancher access, which may also become managed by a load-balancer if a multi-node cluster becomes the base.

5.1.3 Kubernetes Deployment

For this deployment, a single server installed with the SUSE Linux Enterprise Micro immutable operating system will support a single instance of K3s. For maximum flexibility, K3s will be deployed in a manner that would allow expanding the single-node cluster into a highly available, three-node Kubernetes cluster at a later date.

While it is highly recommended that Kubernetes workloads (in this case the SUSE Rancher) be isolated from the Kubernetes control-plane and data-plane; this design will maintain all functions, including the SUSE Rancher, on this server node. In this specialized case, 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 cluster is more closely aligned with appliance model best practices.

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Deployment Process

The primary steps for deploying this single node K3s cluster are:

1. (Optional) Provide the server with one extra IP address that will be used as the primary address for accessing the K3s cluster API server. This will allow the cluster to scale beyond a single server node. It is not needed if there will be an external load balancer used to access the cluster, or if the cluster will never be expanded beyond a single server node.

   - If needed, use the `ip a` command to determine the interface name (i.e. eth0) and CIDR netmask notation (i.e. /24) of the network interface that will be configured with the extra IP address
   - Set the following variable with the IP address and CIDR notation that will be used to access the Kubernetes API server:

     ```
     SECOND_IP=""
     ```

     - e.g., `SECOND_IP="10.111.2.100/24"`

     

     Note

     If the target interface is not eth0, substitute the name of the interface in place of "eth0" in the commands below.

     ```
     sudo cp -np /etc/sysconfig/network/ifcfg-eth0 ~/ifcfg-eth0.`date
      +"%d.%b.%Y.%H.%M"`
     cp -p ~/ifcfg-eth0.`date +"%d.%b.%Y"`* ~/ifcfg-eth0
     echo "IPADDR_2=${SECOND_IP}" >> ~/ifcfg-eth0
     diff /etc/sysconfig/network/ifcfg-eth0 ~/ifcfg-eth0
     ```

     - Ensure the only difference between the original ifcfg-eth0 file and the updated ~/ifcfg-eth0 is the extra "IPADDR_2" line, then run the following commands:

       ```
       sudo mv ~/ifcfg-eth0 /etc/sysconfig/network/ifcfg-eth0
       sudo systemctl restart network.service
       ```

```
ip a
```

- The original server IP address and the additional IP address should be shown with the correct CIDR notation

2. Find the appropriate version of the K3s binary

   - At the time of writing, the most current, supported version of K3s for SUSE Rancher is v1.20.4+k3s1. Verify the supported versions at: https://rancher.com/support-maintenance-terms/, under the "Rancher Support Matrix"

   - Set the following variable with the desired version of K3s

     ```
     K3s_VERSION=""
     ```

     - e.g., `K3s_VERSION="v1.20.4+k3s1"`

3. Install 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 -
   ```

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

     - The deployment is complete when all deployments (coredns, local-path-provisioner, metrics-server, and traefik) show at least "1" as "AVAILABLE"

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

5.1.4 SUSE Rancher Deployment

As SUSE Rancher server is a native Kubernetes application, it will run on the single-node K3s cluster. In instances where a load balancer is used to support the K3s cluster, deploying two additional K3s cluster nodes will automatically make SUSE Rancher highly available. SUSE Rancher uses the K3s etcd key/value store to persist its data, which offers several advantages. Providing highly-available storage isn't needed to make SUSE Rancher highly available. In addition, backing up the K3s etcd store protects the cluster as well as the installation of SUSE Rancher.

Note

These deployment steps are specific to K3s. They can be executed from any host or node that has the kubectl tool and the KUBECONFIG file for the K3s cluster.

The steps described here are for deploying SUSE Rancher with self-signed security certificates. Other options are to have SUSE Rancher create public certificates via Let's Encrypt (only with a publicly resolvable hostname for the SUSE Rancher server) and to provide preconfigured, private certificates. See https://rancher.com/docs/rancher/v2.x/en/installation/install-rancher-on-k8s/#3-choose-your-ssl-configuration for more information.

Deployment Process

The primary steps for deploying SUSE Rancher are:

1. Create the Helm Chart custom resource for cert-manager:
    - At the time of writing, the most current, supported version of cert-manager is v1.0.4
    - Set the following variable with the desired version of cert-manager

```
CERT_MANAGER_VERSION=""
```

        - e.g., `CERT_MANAGER_VERSION="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
  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=""
```

     - e.g., `HOSTNAME="suse-rancher.sandbox.local"`

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

- (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.

3. 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`

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6 Deployment considerations

FixMe - Elaborate further on best practices and day2 considerations for the deployments.

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7 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 softwware 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.

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8 References

WHITEPAPERS

- 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/

WEBSITES

- SUSE - https://www.suse.com
  - SUSE Customer Center (SCC) - https://scc.suse.com/login
  - Products
    - 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/))
    - SUSE Linux Enterprise Micro (SLE Micro) - https://www.suse.com/products/micro/ (documentation (https://documentation.suse.com/sle-micro/5.0/))
    - 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/))

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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 Architecture [1]

  A guide with the general steps to deploy and validate the structured solution components from both the SUSE and partner porfolios. This provides a shareable template of consistency for consumers to leverage.

- Deployment Flavor

  Proof-of-Concept [2]

  A partial or nearly complete prototype constructed to demonstrate functionality and feasibility for verifying specific aspects or concepts under consideration. This is often a starting point when evaluating a new, transitional technology. Sometimes it starts as a Minimum Viable Product (MVP [3]) that has just enough features to satisfy an initial set of requests. After such insights and feedback are obtained and potentially addressed, redeployments may be utilized to iteratively branch into other realms or to incorporate other known working functionality.

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

2 link: Proof of Concept (https://en.wikipedia.org/wiki/Proof_of_concept)

3 link: Minimum Viable Product (https://en.wikipedia.org/wiki/Minimum_viable_product)

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A Appendix

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A.1 Appendix A: Bill of Materials

Role	Qty	SKU	Component	Notes
Operating System	1-3	874-007864	SUSE Linux Enterprise Micro, • x86_64, • 1-16 Cores, • Priority Subscription, • 1 Year	Configuration: • 1x per node (up to 16 cores, stackable)
Kubernetes	1	R-0001-PS1	SUSE Rancher, • x86-64, • 1 Instance, • Priority Subscription, • 1 Year	Configuration: • includes up to 3 nodes of K3s • includes up to 3 nodes of Ranch-

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Role	Qty	SKU	Component	Notes
				er Kubernetes Engine • includes up to 3 nodes of Rancher Kubernetes Engine Government

Note

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

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