

# Set Up, Secure, And Support Your SAP Environments With SUSE Manager

SUP-1252

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# Agenda

1. Setting the stage: SUSE and SAP, SUSE Manager and SLES for SAP Applications (*Joe*)
2. Deployment (*Joe*)
3. Examples from real-life projects (*Cleber*)
4. Monitoring (*Joe*)
5. What the future will bring (*Joe*)

# SUSE: Underpinning Digital Transformation



Business-critical Applications



Machine Learning



Internet of Things



Business Analytics



High Performance Computing



Traditional IT & Applications

## Container and Application Platforms



**Container Management**  
SUSE CaaS Platform



**Platform as a Service**  
SUSE Cloud Application Platform

## Software-Defined Infrastructure



**Compute**  
Virtual Machine & Container



**Storage**  
SUSE Enterprise Storage



**Networking**  
SDN and NFV



**Public Cloud**

SUSE Cloud Service Provider Program



**Multimodal Operating System**  
SUSE Linux Enterprise Server

**Physical Infrastructure:** Multi-platform Servers, Switches, Storage

**Infrastructure & Lifecycle Management**  
SUSE Manager



**Services**

SUSE Global Services  
Consulting Services  
Select Services  
Premium Support Services

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## Software-Defined Infrastructure



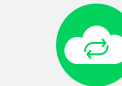
**Compute**  
Virtual Machine & Container



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# Run A Better **SAP** IT Infrastructure



Easy-to-use tools  
**reduce the time** and  
effort to keep  
business-critical  
applications available  
and secure



**Deploy, manage and  
scale** modern SAP  
application delivery  
and data integration  
to quickly adapt to  
new business  
requirements



**Deliver SAP  
services faster**, more  
efficiently and with  
less risk on premises  
and in the cloud



# : An 18+ Year Partnership

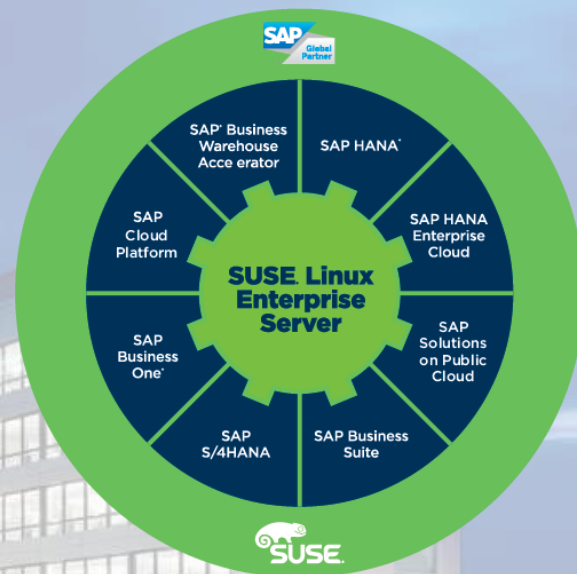
- **Front Runner Technologies**

- 1st Amazon EC2 OS for SAP
- 1st validated open source HA
- 1st validated virtualization
- 1st Linux for SAP HANA on x86-64 and IBM Power
- 1st Linux with HA clustering solution certified for NetWeaver

- **Strategic OS for many SAP products**

- SAP HANA and S/4HANA
- SAP BW
- SAP Business One for SAP HANA
- SAP Cloud Platform
- SAP Enterprise Cloud
- SAP Vora

- **Cloud Foundry collaboration**





*SUSE Manager  
and SUSE Linux  
Enterprise Server  
for SAP  
Applications are a  
great match!*

<https://www.suse.com/c/success/>

Guerbet



voestalpine group-IT GmbH



oxya



Daimler AG



HILLARYS





# dm-drogerie markt



## Migrated its **SAP** environment to **SUSE Linux Enterprise Server for SAP Applications**

A huge advantage, because SUSE Linux Enterprise Server is typically the first supported platform for new **SAP** offerings.

With support from **SUSE Consulting**, the company completed the migration three months earlier than planned.

**SAP** response times were cut by 40 percent on average.

*“We believe that our early adoption of SUSE Manager was one of the key reasons that we were able to complete the migration ahead of schedule.”*

CHRISTIAN STÄBLEIN | Head of IT Systems | dm-drogerie markt

# SUSE Manager In SAP Context

## SUSE Manager

*Reduce tools to learn and maintain*

- Configure and provision systems
- Identify systems that require updates
- Patch multiple systems automatically

## Preview: managed SAP HANA deployment incl HA

*Reduce time to set up*

- Deployed with SUSE Manager
- Fully-automated configuration
- Supported for selected hyperscalers



**SUSE Manager**

## Manage across platforms

*Maintain configuration compliance*

- Servers, VM and cloud resources
- Deploy on x86-64 and IBM POWER
- Manage multiple Linux distributions

# Setting The Stage

- I have no Linux experience
- Those HANA boxes are the only SUSE I have
- Nothing can go into production if I haven't staged and tested it before
- *“Follow the SAP Notes”, they said!*



# *SUSE Manager 4*



# SUSE Manager

Available  
on the Public  
Cloud

**Best-in-class open source infrastructure management solution** designed to help your enterprise DevOps and IT Operations teams to:

- Optimize operations while reducing **costs**
- Reduce **complexity** and regain control of IT assets
- Ensure **compliance** with internal security policies and external regulations



# SUSE Manager 4 Highlights

- **Content Lifecycle Management**
- **Monitoring**
- **SLES for SAP (HANA) formulas**
- **Virtual Machine Management**
- Extended managed OS support
- **SLE 15 Base Product**

# Content Lifecycle Management





Search page



- Home
- Systems
- Salt
- Images
- Patches
- Software
- Content Lifecycle
- Projects**
- Filters

## + Create a new Content Lifecycle Project

+ Create

### Project Properties

Label \*:

web\_servers

Name \*:

Web Servers

Description:

My web servers



- Search page
- Home
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- Salt
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- Patches
- Software
- Content Lifecycle
- Projects
- Filters
- Audit
- Configuration
- Schedule
- Users
- Admin

### Sources

Type:

New Base Channel

Choose the channel to be elected as the new base channel

Child Channels (8)

Search a channel

- Vendors
- Custom
- Clones

- SLE-Product-SLES15-SP1-Pool for x86\_64 (8)**
  - include recommended
  - SLE-Product-SLES15-SP1-Updates for x86\_64 **mandatory**
  - SLE-Module-Basesystem15-SP1-Updates for x86\_64 **recommended**
  - SLE-Module-Basesystem15-SP1-Pool for x86\_64 **recommended**
  - SLE-Manager-Tools15-Pool for x86\_64 SP1 **recommended**
  - SLE-Manager-Tools15-Updates for x86\_64 SP1 **recommended**
  - SLE-Module-Server-Applications15-SP1-Pool for x86\_64 **recommended**
  - SLE-Module-Server-Applications15-SP1-Updates for x86\_64 **recommended**
  - SLE-Module-Containers15-SP1-Updates for x86\_64
  - SLE-Module-Containers15-SP1-Pool for x86\_64
  - SLE-Module-Python2-15-SP1-Updates for x86\_64
  - SLE-Module-Python2-15-SP1-Pool for x86\_64

Cancel Save

Delete

+ Edit Properties

+ Attach/Detach Sources

+ Attach/Detach Filters

## Environment Lifecycle

[+ Add Environment](#)

dev

[+ Edit](#)

**Description:** Development Environment  
**Version:** Version 3: With emergency bug fixes from June 15  
**Status:** Generating repositories data 🔄



Promote



qa

[+ Edit](#)

**Description:** QA Environment  
**Version:** Version 2: Latest Build from June 11  
**Status:** Built



Promote



prod

[+ Edit](#)

**Description:** Production Environment  
**Version:** Version 1: Initial build ...  
**Status:** Built



0 systems selected

admin

SUSE PM



- Search page
- Home
- Systems
- Salt
- Images
- Patches
- Software
- Content Lifecycle
- Projects
- Filters

## Content Lifecycle Filters

[+ Create Filter](#)

Filter by any value

Items 1 - 2 of 2

15 items per page

| Name          | Projects in use |                             |
|---------------|-----------------|-----------------------------|
| MY filter     | web_servers     | <a href="#">Edit Filter</a> |
| Kernel Filter | web_servers     | <a href="#">Edit Filter</a> |

Page 1 of 1

# SUSE Linux Enterprise Server 15 Base Product

- **Consistent with other SLE-based products like SLES for SAP Applications**
- **One compact installation media for all**

# Language, Keyboard and Product Selection

Language

English (US)

Keyboard Layout

English (US)

Keyboard Test

Product to Install

- SUSE Linux Enterprise Server 15 SP1
- SUSE Linux Enterprise High Performance Computing 15 SP1
- SUSE Linux Enterprise Real Time 15 SP1
- SUSE Linux Enterprise Server for SAP Applications 15 SP1
- SUSE Linux Enterprise Desktop 15 SP1
- SUSE Manager Server 4.0
- SUSE Manager Proxy 4.0
- SUSE Manager Retail Branch Server 4.0

# Deployment Options On SUSE Linux Enterprise Server for SAP

SAP NetWeaver, SAP HANA, SAP S/4 HANA and DataHub

## BareMetal based

Intel, IBM Power LPAR, IBM Z/LinuxONE LPAR (NW)

## Virtualized

VMWare, KVM, Open Stack, SUSE CAP

## Public Cloud

Azure, AWS, GCP, Alibaba, IBM Cloud

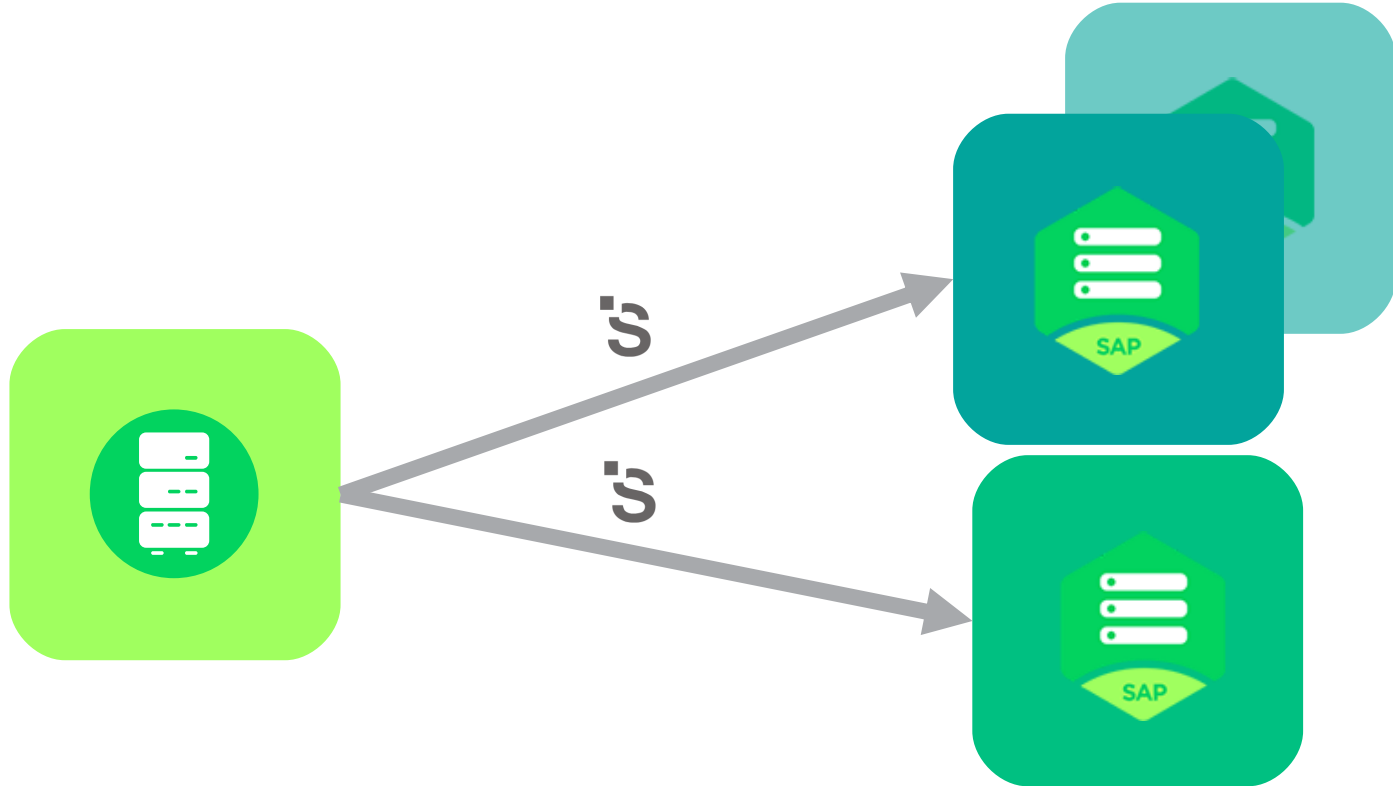
## Container based

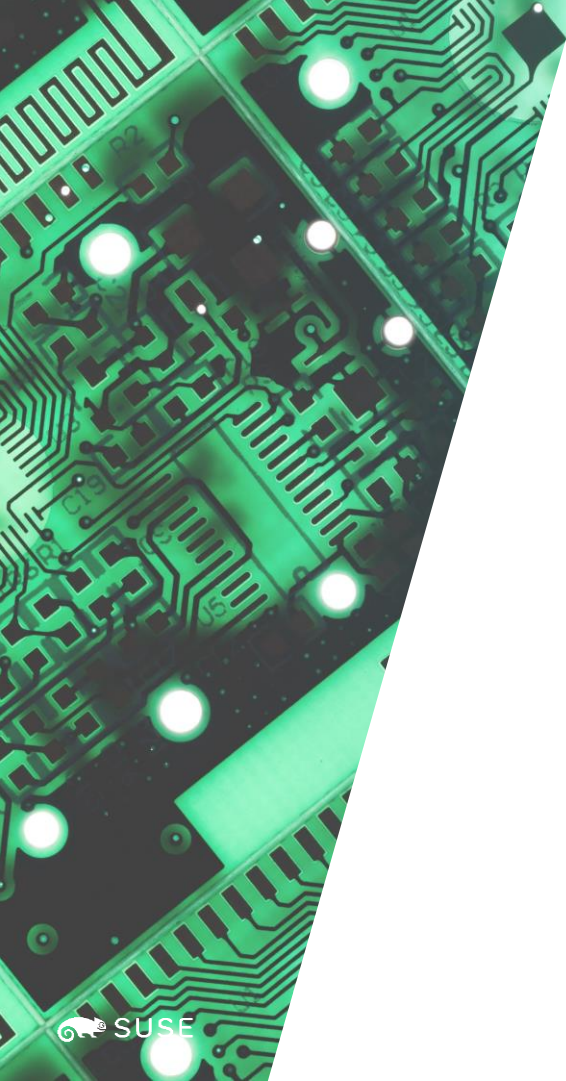
SUSE CaaS Platform, Gardenener, Kubernetes



|            |               |
|------------|---------------|
| Tuning     | HA Deployment |
| Automation | Monitoring    |

# SUSE Linux Enterprise Server for SAP (HANA)





# *Automation With Terraform And Salt*



# Terraform

Terraform is a tool for building, changing, and versioning infrastructure safely and efficiently

Can manage existing and popular service providers, like cloud, libvirt and many others

Terraform can manage low-level and high-level components such as instances, storage, networking, DNS entries, etc

Allow IaC, using a high-level configuration syntax. This allows versioning, sharing and reusing the infrastructure code





# Salt

Salt is a configuration management system, capable of maintaining remote nodes in defined states

It is a distributed remote execution system used to execute commands and query data on remote nodes

Has an extensive list of existing standard states and formulas for the many different purposes

# Combining Both, We Deliver...

Our engineering goal: Improved user experience for our SAP customers



Fast and secure way to deploy your SUSE SAP Clusters

Minutes or hours instead of days

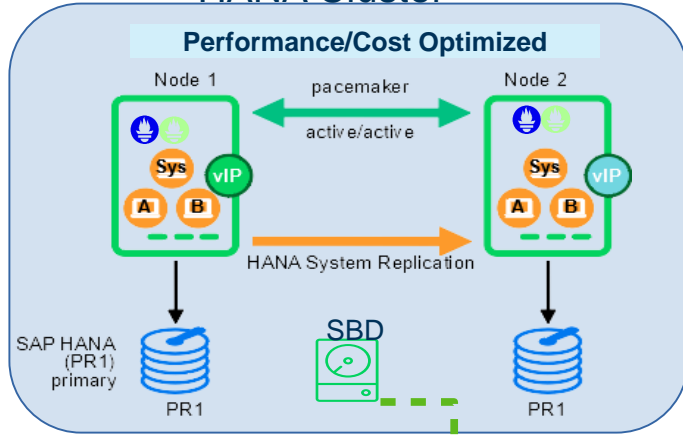
Idempotent States

Customizable and modular “blocks”, allowing customers to reuse it and adjust for their specific needs on premises, clouds or hybrid-clouds

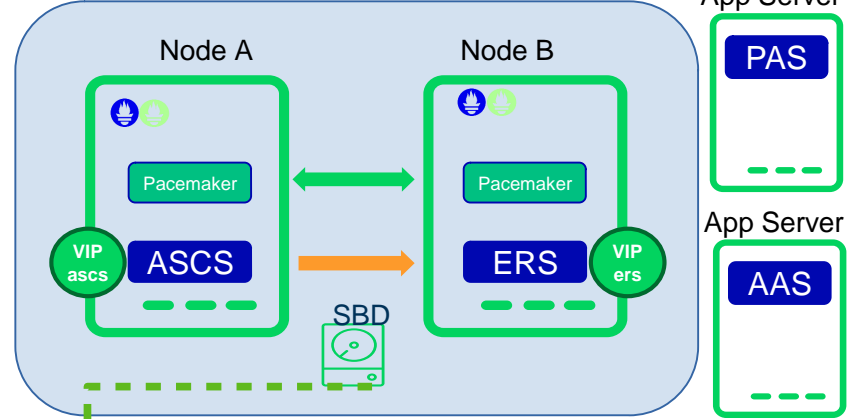
It can be integrated on existing solutions like SUSE Manager, or existing Terraform and Salt, + others...

# How It Looks Right Now...

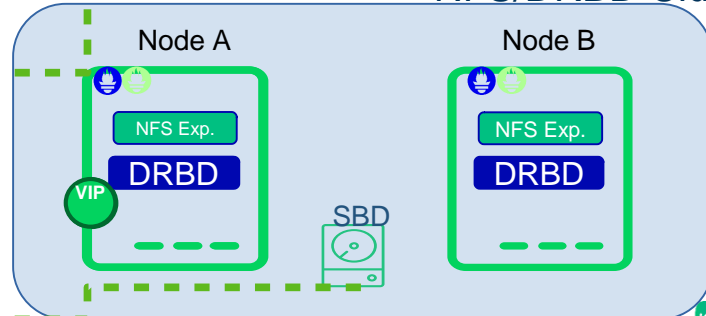
## HANA Cluster



## S/4 HANA / Netweaver Cluster



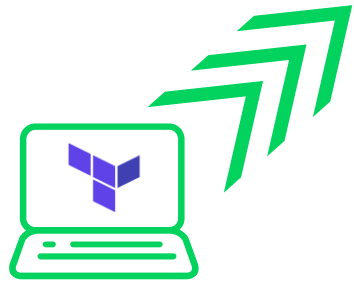
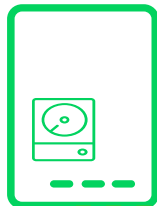
## NFS/DRBD Cluster



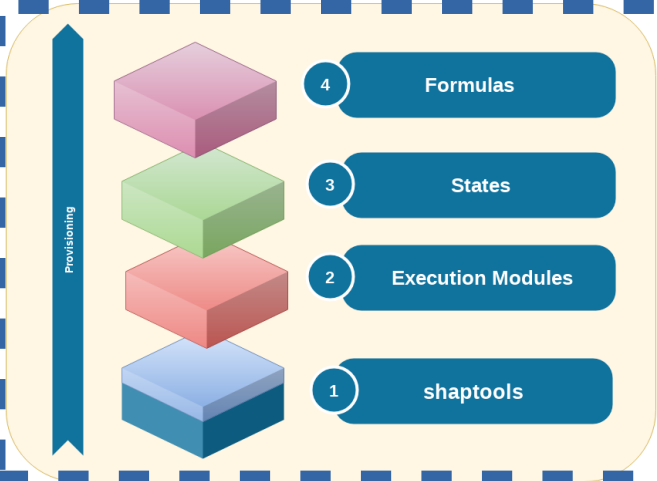
Monitoring Server



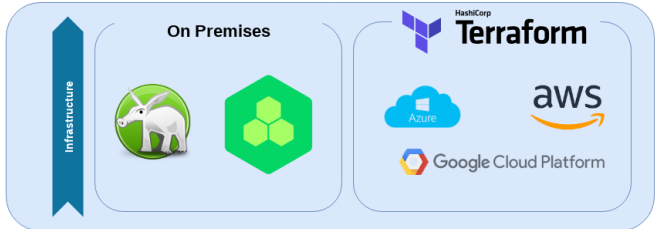
iSCSI Server



# Architecture



Modular and reusable to attend from single HANA to full cluster deployment.



# Architecture

Included on SLES for SAP

Provided via SUSE terraform open-source project

HA Cluster Configuration

Configuration of the cluster services (Pacemaker, Corosync, SBD, etc) and the resources to be managed (vIP, SAPHanaSR, SapInstance). Templates are provided and can be adjusted for special needs. Optionally configures monitoring.

SAP Installation

SAP Product automated installation. For HANA include installation and system replication enablement (optional). For S/4HANA and Netweaver, it includes ERS, ASCS, PAS and AAS. Optionally configures the monitoring.

OS Preparation

Salt-minion installation, partitioning, mounting points, basic RPM packages installation, SCC Registration, repositories configuration. Everything needed before starting the SAP installation.

Operating System

OS installation. For public clouds, it is usually skipped since images are provided.

Infrastructure

Provisioning of the Machines, network connections, Load Balancers, Storage, etc. Can be done using Terraform, **SUSE Manager**, AutoYast or even manually.

# ha-sap-terraform-deployment

*Watch*

TUT-1092

**Bootstrapping SLES for SAP HANA & NetWeaver clusters with Terraform & Salt on public clouds**

# Our Future Plans...

This is subject to change at any time.

- **Enable more SAP Applications Scenarios**
  - **HANA Scale-out**
  - **Datahub**
  - **Others...**
- **Include integration tests after the deployment to “certify” the cluster**
- **New integrations. E.g.: SUSE Enterprise Storage, CaaSP, others...**



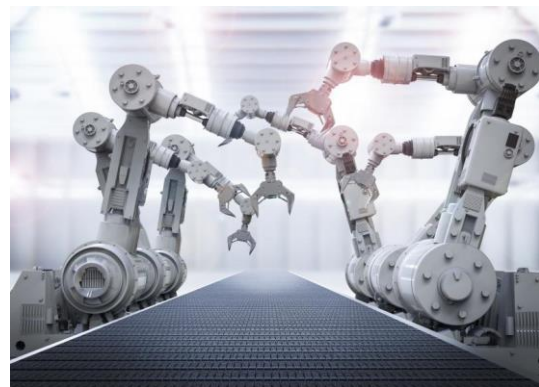
# Deployment Automation

the past, the present, the future

The past: YaST modules / AutoYaST

The present: rework with SALT based recipes

- Integration on CLI, YaST and SUSE Manager
- Multiple recipes - partly or fully automated deployments (like LEGO)
- Initial set of SAP HANA deployment scripts on SUSE Package Hub (Preview!)  
<https://packagehub.suse.com/packages/saphanabootstrap-formula/>  
<https://github.com/SUSE/saphanabootstrap-formula>
- Deploys
  - single node and clustered HANA instances
  - NetWeaver cluster
  - Next up: S/4 HANA deployment
- Planned to be available in SLES 15 SP2 timeframe as part of SLES for SAP applications
- **Project initiated with Microsoft Azure**



# Challenges On SAP Environments

- Servers standardization
  - base software
  - monitoring
  - backup tools
- Active Directory authentication integration
- Security and compliance enforcement
- Password vaulting
- Security and compliance auditing
- Documentation

# SAP Servers Standardization

- Usage of Salt automation to install base software and tools
- Applying of security and compliance enforcement
- Make usage of **SUSE Manager State Channel** to deploy custom states managed by **SUSE Manager Web UI**.
- Apply Salt Highstate or Configuration Channel to run custom states from **SUSE Manager State Channel**

# SUSE Manager State Channel

The screenshot shows the SUSE Manager Configuration page for a channel named 'sap-state-channel'. The page is divided into several sections:

- Channel Properties:**
  - Name: sap-state-channel
  - Label: sap-state-channel
  - Description: sap-state-channel
- Channel Information:**
  - Number of Files: 1 sls, 0 files (1 total)
  - Systems: 1 system subscribed
  - Most-Recently Subscribed System: 192.168.10.121 (14 minutes ago)
  - Most-Recently Modified File: /init.sls (by admin 3 minutes ago)
- Configuration Actions:**
  - State File
  - View/Edit 'init.sls' File
  - Add/Create Files
  - Create configuration file
  - Upload Configuration Files
  - Import a File from Another Channel or System

The screenshot shows the SUSE Manager Configuration page for a specific revision of a file. The page title is 'Revision 2 of /init.sls from channel sap-state-channel'. The page is divided into several sections:

- Details:**
  - Configuration Channel: sap-state-channel
  - Revision: 2 (view other revisions)
  - Creation Date: 24 minutes ago
  - Last Modified: 12 minutes ago by admin
  - File Type: SLS
  - Next revision number: 3
- File Properties:**
  - Filename/Path: /init.sls
  - Salt Filesystem Path: salt://manager\_org\_1/sap-state-channel/init.sls
- Additional File Details:**
  - Checksum: sha256:b42efb95526cc917112e29ab173eb565c1a19d3529063a331bcd24980fa27f
- File Contents:**

```
1- test:
2- test.nop
3
4- create_tmp_file:
5- file.managed:
6-   - name: /tmp/salt-test.txt
7-   - contents: "test file"
8-   - mode: "0644"
9-   - user: root
10-   - group: root
11
```

# SUSE Manager Formulas With Forms

- **Salt formulas:** Are collections of states that contain generic parameters fields obtained generally from pillars.
- **Formula with forms:** A set of SUSE Manager specific configurations that allows management of Salt formula parameters in SUSE Manager UI.

| State location                         | Forms location                           |
|--|--|
| /srv/salt                              | /srv/formula_metadata                    |
| /usr/share/susemanager/formulas/states | /usr/share/susemanager/formulas/metadata |

- SUSE Manager 4 standardized path to **/usr/share/salt-formulas**.
- Resulting pillar data are saved in **/srv/susemanager/formula\_data/pillar**.

# SUSE Manager Formulas With Forms structure

- **metadata.yml:** Description of Formula and grouping information for SUSE Manager.
- **form.yml:** SUSE Manager form design. Definition of groups, fields, properties, validations and dependences of data and groups inside SUSE Manager Forms.
- **Salt states:** Salt states with all logic of actions and usage of pillar data from form. Must include an init.sls to start all logic.

# SUMA Formulas With Forms development

```
timezone:  
  $type: group  
  
name:  
  $type: select  
  $values: ["CET",  
           "CST6CDT",  
           "EET",  
           "EST",  
           "EST5EDT",  
           "GMT",  
           "GMT+0",  
           ...]  
  
hardware_clock_set_to_utc:  
  $type: boolean  
  $default: True  
...
```

The screenshot displays the SUMA web interface with the 'Formulas' tab selected. The 'Locale' sub-tab is active, showing configuration options for language, keyboard, and timezone. The 'Timezone' section includes a dropdown menu for 'Name' (set to 'Etc/GMT-3') and a checked checkbox for 'Hardware Clock Set To Utc'. The 'Keyboard And Language' section includes dropdown menus for 'Language' (set to 'English (US)') and 'Keyboard Layout' (set to 'English (US)').

Details Software Configuration Provisioning Groups Audit States **Formulas** Events

Formulas **Locale** Suma Deepsec Suma Sudoers

On this page you can configure [Salt Formulas](#) to automatically install and configure software.

← Prev Next → Save Formula Clear values

### Locale

Settings for language, keyboard, and timezone

Timezone

Name: Etc/GMT-3

Hardware Clock Set To Utc:

Keyboard And Language

Language: English (US)

Keyboard Layout: English (US)

# SUMA Formula for Active Directory Integration

```
suma_sssd_ad:
  $name: "SSSD Active Directory integration"
  $type: "group"
  $scope: "system"

options:
  $type: group
  $scope: system
  $name: "SSSD Active Directory Options"

install_packages:
  $name: "Install required packages"
  $type: boolean
  $default: true
  $required: false

check_ntp:
  $name: "Check NTP"
  $type: boolean
  $default: true
  $required: false

change_nsswitch:
  $name: "Change /etc/nsswitch.conf file"
  $type: boolean
  $default: true
  $required: false
```

...

The screenshot displays the SUSE Manager web interface for configuring the 'Suma Sssd Ad' formula. The interface includes a navigation bar with tabs for Details, Software, Configuration, Provisioning, Groups, Audit, States, Formulas, and Events. The 'Formulas' tab is active, and the 'Suma Sssd Ad' formula is selected. A blue banner at the top states: 'On this page you can configure Salt Formulas to automatically install and configure software.' Below this, there are navigation buttons for 'Prev' and 'Next', and a 'Save Formula' button. The main content area is titled 'Suma Sssd Ad' and contains the following configuration sections:

- SSSD AD integration Formula for SUSE Manager:**
  - SSSD Active Directory integration**
    - SSSD Active Directory Options**
      - SSSD Active Directory Options**
        - Install required packages:**
        - Check NTP:**
        - Change /etc/nsswitch.conf file:**
        - Change PAM to make use of SSSD:**
      - Kerberos configuration**
        - Kerberos configuration**
          - FQDN Domain:** LABS.LOCAL
          - Domain Controller:** ad01.labs.local
          - Domain Controller IP Address:** 192.168.122.200
        - Authentication configuration**
          - Authentication configuration**
            - Username:** Administrator
            - Password:** [masked]



# SUMA States for Active Directory Integration

- Based on work from <https://www.suse.com/c/the-sssd-active-directory-and-sles-12-and-15/>
- Make it easier integrate SUSE to an Active Directory domains using SSSD
- Could be extended or generalized for other use cases

include:

- .packages
- .ntp
- .kerberos
- .samba
- .hosts
- .resolv
- .join
- .sssd
- .ldap
- .nss
- .pam

# States for Active Directory Integration

```
# packages.sls
{% if grains['os'] == 'SUSE' and
   (grains['osmajorrelease']|int == 12 or
    grains['osmajorrelease']|int == 15) %}

{%- set p = salt['pillar.get']('suma_sssd_ad') %}
{%- if p is defined and
   p.options is defined %}
{%- set options = p.options %}
{%- if options.install_packages is sameas True %}
suma_sssd_ad_install_required_packages:
  pkg.installed:
    - pkgs:
      - krb5-client
      - samba-client
      - openldap2-client
      - sssd
      - sssd-ad
{%- endif %}
{%- endif %}

{%- endif %}
```

Complete code available at Github:

[https://github.com/s-sys/suma\\_formulas](https://github.com/s-sys/suma_formulas)

```
# ntp.sls
{% if grains['os'] == 'SUSE' %}

{%- set p = salt['pillar.get']('suma_sssd_ad') %}
{%- if p is defined and
   p.options is defined %}
{%- set options = p.options %}
{%- if grains['osmajorrelease']|int == 12 and
   options.check_ntp is sameas True %}
suma_sssd_ad_check_ntpd_is_working:
  cmd.run:
    - name: ntpstat | LC_ALL=C grep -i -e "^synchronised.*"
    - failhard: True

{%- elif grains['osmajorrelease']|int == 15 and
   options.check_ntp is sameas True %}
suma_sssd_ad_check_ntpd_is_working:
  cmd.run:
    - name: chronyc tracking | grep -i -e "^leap
status.*normal"
    - failhard: True
{%- endif %}
{%- endif %}

{%- endif %}
```

# SUMA Formula For Deep Security Software

```
suma-deepsec:
  $name: "Deep Security Agent"
  $type: "group"
  $scope: "system"

options:
  $type: group
  $scope: system
  $name: "Deep Security Options"

activation_url:
  $name: "Activation URL"
  $type: text
  $default: ""
  $required: true
  $match: "^(dsm)+:\\\\\/\\\\\/[A-Za-z0-9_\\-:.\\/]+$"

force_registration:
  $name: "Force registration even if
already installed"
  $type: boolean
  $default: false
  $required: false
```

192.168.10.121

[Delete System](#)

Details Software Configuration Provisioning Groups Audit States **Formulas** Events

Formulas Locale **Suma Deepsec** Suma Sudoers

On this page you can configure [Salt Formulas](#) to automatically install and configure software.

[← Prev](#) [Next →](#) [Save Formula](#) [Clear values](#)

### Suma Deepsec

Deep Security Formula for SUSE Manager. Install Deep Security Agent on SUSE systems.

- ^ Deep Security Agent
  - Deep Security Agent
- ^ Deep Security Options
  - Deep Security Options
    - Activation URL \***:
    - Force registration even if already installed:**

# SUMA States For Deep Security Software

```
{% if grains['os'] == 'SUSE' and
    (grains['osmajorrelease'] == 12 or
     grains['osmajorrelease'] == 15) %}

{%- set p = salt['pillar.get']('suma-deepsec') %}
{%- set package_name = "ds_agent" %}

{%- if p is defined %}
{%- set options = p["options"] %}
{%- if options["force_registration"] is sameas True %}
remove_deep_security_control_file:
  file.absent:
    - name: /opt/ds_agent/setup.OK
    - require_in:
      - id: install_deep_security_agent
{%- endif %}

{# Install Deep Security agent #}
install_deep_security_agent:
  pkg.installed:
    - name: {{ package_name }}

{%- if options is defined %}
register_deep_security_step1:
  cmd.run:
    - name: /opt/ds_agent/dsa_control -r
    - require:
      - pkg: {{ package_name }}
    - onlyif:
      - rpm -q {{ package_name }}
      - test ! -f /opt/ds_agent/setup.OK
```

```
register_deep_security_step2:
  cmd.run:
    - name: /opt/ds_agent/dsa_control -a {{
options["activation_url"] }}
    - require:
      - id: register_deep_security_step1
    - onlyif:
      - rpm -qa {{ package_name }}

register_deep_security_step3:
  file.managed:
    - name: /opt/ds_agent/setup.OK
    - contents: ""
    - user: root
    - group: root
    - mode: "0640"
    - require:
      - id: register_deep_security_step2
{%- endif %}

{%- endif %}

{%- endif %}

{%- endif %}
```

# SUMA Formula For sudoers

```
suma_sudoers:
  $name: "Sudoers"
  $type: "group"
  $scope: "system"

# https://www.sudo.ws/man/1.7.10/sudoers.man.html
sudoers_types:
  $type: group
  $scope: system
  $name: "Sudoers Aliases Configuration"

checkbox_user_aliases:
  $type: boolean
  $name: "User aliases"
  $default: false
  $help: "Enable/Disable user aliases"

checkbox_command_aliases:
  $type: boolean
  $name: "Command aliases"
  $default: false
  $help: "Enable/Disable command aliases"

checkbox_host_aliases:
  $type: boolean
  $name: "Host aliases"
  $default: false
  $help: "Enable/Disable host aliases"

checkbox_runas_aliases:
  $type: boolean
  $name: "RunAs aliases"
  $default: false
  $help: "Enable/Disable runas aliases"

$default:
  - checkbox_user_aliases: false
  - checkbox_command_aliases: false
  - checkbox_host_aliases: false
  - checkbox_runas_aliases: false
  ...

user_aliases:
  $name: "User Aliases"
  $type: edit-group
  $scope: system
  $minItems: 0
  $itemName: "User Alias $(name)"
  $visible:
    "formValues.suma_sudoers.sudoers_types.checkbox_user_
    "

$prototype:
  name:
    $name: "User alias name"
    $type: text
    $default: ""
    $required: true
    $match: "^[A-Z][A-Z0-9_]+$"

  users:
    $name: "List of usernames and groups. Groups
    prefixed by % and exclusions by !."
    $type: edit-group
    $scope: system
    $minItems: 1

  $prototype:
    user:
      $name: "User / Group"
      $type: text
      $default: ""
      $required: true
      $match: "^[#%+!]{0,3}([0-9a-zA-Z_-]\.@"

  command_aliases:
    $name: "Command Aliases"
    $type: edit-group
    $scope: system
    $minItems: 0
    $itemName: "Command Alias $(name)"
    $visible:
      "formValues.suma_sudoers.sudoers_types.checkbox_com_
      ias"
    ...
```

Suma Sudoers

Sudoers Formula for SUSE Manager. Sets up configuration in sudoers include file.

^ Sudoers

Sudoers

^ Sudoers Aliases Configuration

Sudoers Aliases Configuration

User aliases:

Command aliases:

Host aliases:

RunAs aliases:

^ User Aliases

User Aliases

^ Command Aliases

Command Aliases

^ Command Alias REBOOT

Command alias name \*: REBOOT

^ List of commands.

List of commands.

^ Item 1

Command \*: /sbin/halt

^ Item 2

Command \*: /sbin/reboot

^ Item 3

Command \*: /sbin/poweroff

# SUMA Formula For SAP HANA

- States available in SUSE Manager
  - saphanabootstrap-formula
- Supports standalone, system replication and cost optimized scenarios (with High Availability)
- SAP HANA download packages must be available

The screenshot displays the SUSE Manager web interface for configuring the SAP HANA deployment formula. At the top, the IP address 192.168.10.121 is shown. The navigation menu includes Details, Software, Configuration, Provisioning, Groups, Audit, States, Formulas, and Events. The 'Formulas' section is active, and the 'Hana' formula is selected. A blue banner at the top states: "On this page you can configure [Salt Formulas](#) to automatically install and configure software." The main content area is titled "Hana" and "SAP HANA deployment formula". It features a tree view on the left with "HANA" expanded to show "Nodes". The configuration fields include: "Install required packages" (checked), "Hostname to install HANA:" (snp-vm01), "HANA system identifier (SID):" (HDB), "HANA instance number:" (00), "SAP user password:" (masked), "HANA scenario type:" (performance-optimized), "Install HANA:" (checked), "Downloaded HANA software path:" (/opt/hana), "Machine root user:" (root), "Machine root password:" (masked), "Use configuration file:" (unchecked), "SAP admin password (csld-admin):" (masked), "SAP SYSTEM user password:" (masked), "Installation extra options" (Optional configuration parameters), "System Replication" section with "System replication options:" (None), and "Add SAP HANA database metrics exporter:" (unchecked).

# SUMA Formula For SAP Application

- Salt states available in <https://github.com/SUSE/sapnwbootstrap-formula>
- Support for ACSC, ERS, PAS, AAS instances
- Only SAP HANA as database
- SUSE Manager Formula in development

# Summary

- Business challenges on SAP environments
- Using SUSE Manager to deploy business automation via SUSE Manager Channel Configuration
- Using SUSE Manager Formulas as Form to automate custom changes on servers
- Using SUSE Manager Formulas as Form to install SAP software
- All Formulas available at [https://github.com/s-sys/suma\\_formulas](https://github.com/s-sys/suma_formulas)





# Monitoring



# SAP HANA Monitoring Project

## Open Source projects part of SLES for SAP:

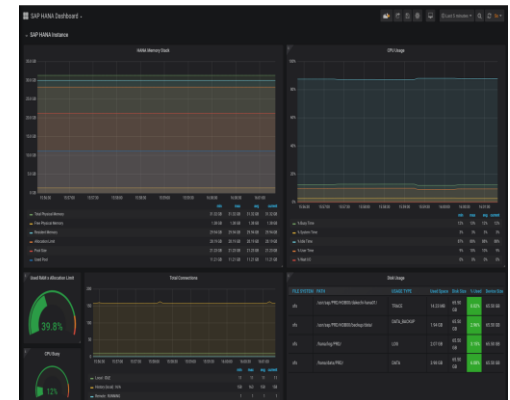
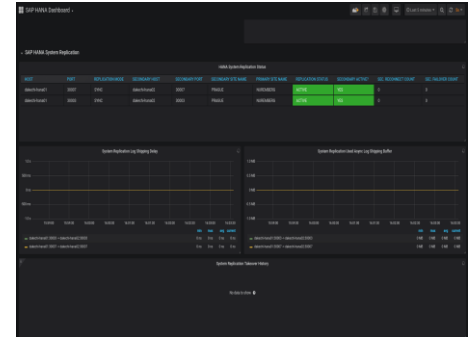
- Prometheus to collect data
- Grafana to render and aggregate collected data

Fully open to provide collected data via Rest Interface into other monitoring solutions (via Rest Interfaces)

## SUSE monitoring packages will include:

- HANA monitoring
- Cluster monitoring
- OS monitoring

Integrated in previously mentioned deployment automation





# Technology Architecture:

## **Prometheus and Grafana (also available with SUSE Manager):**

Flexible and easy to use

Easy to Integrate

Prometheus provides a time series database

Grafana renders and visualize data, with easy to modify and adapt dashboards

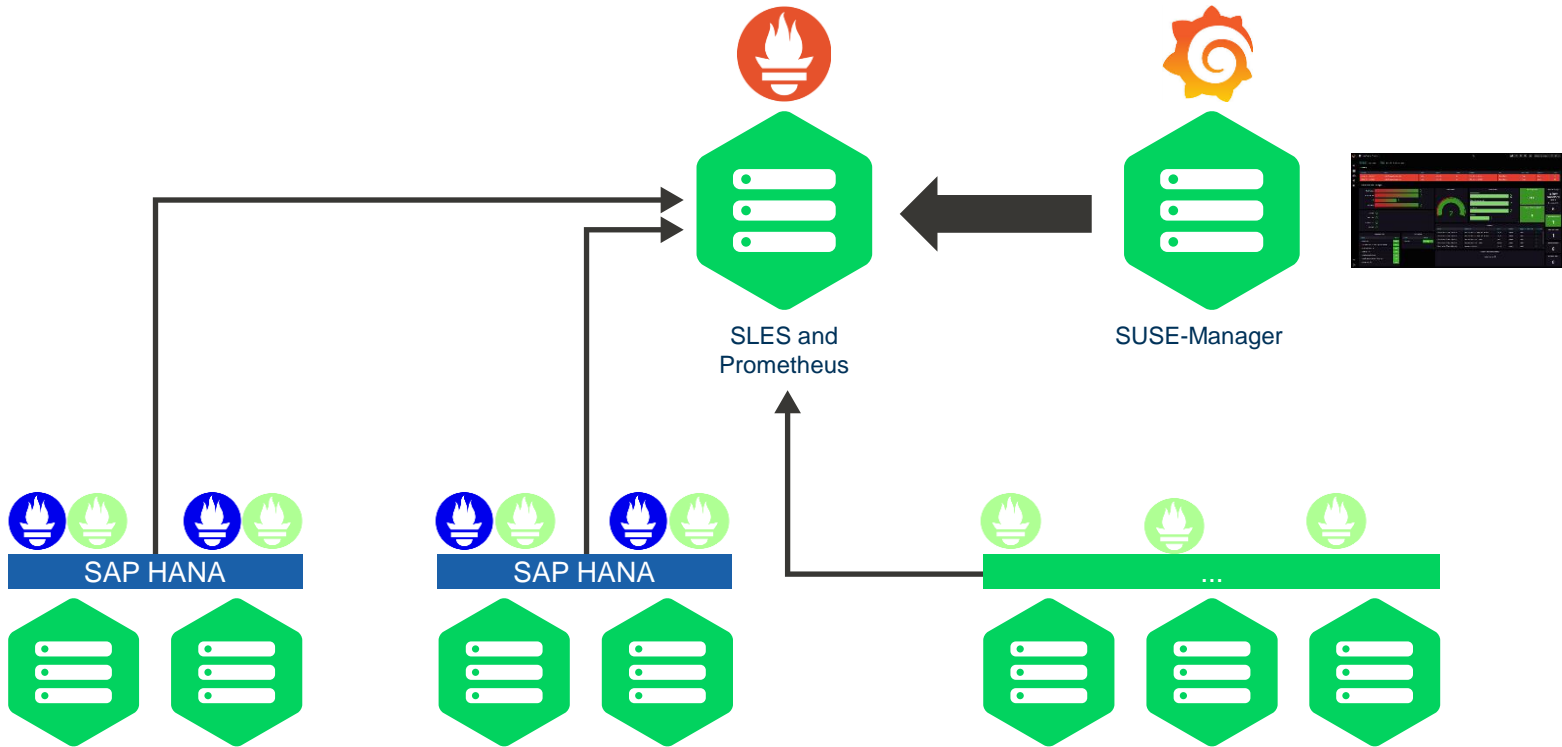
## **Prometheus Exporters:**

Node\_exporter - node metrics (CPU, disk, NFS ....)

Hacluster\_exporter – cluster stack (pacemaker, drbd, corosync ....)

Hanadb\_exporter – internal metrics from SAP HANA

# Architecture Overview

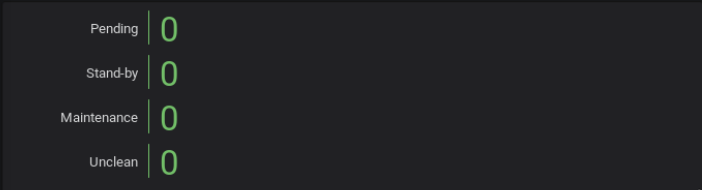
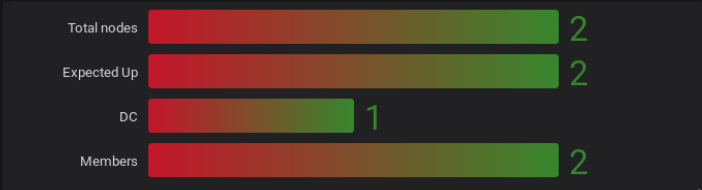


HA Cluster hana-cluster Node h-hana02

Alerts

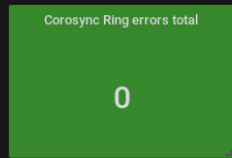
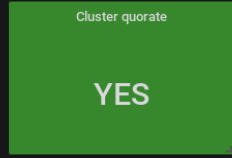
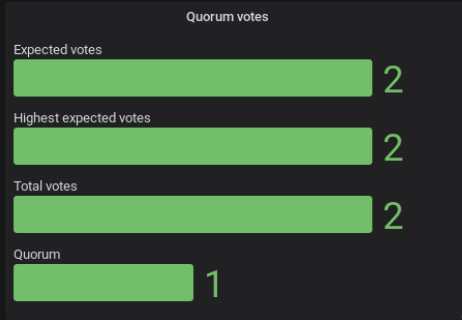
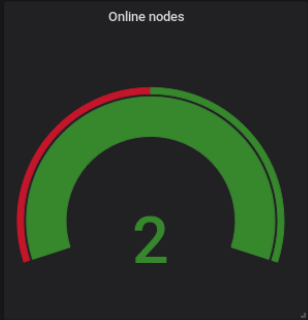
| Time                | Name                         | State  | Instance            | Job          | name                           | severity | state  | type   | Value |
|---------------------|------------------------------|--------|---------------------|--------------|--------------------------------|----------|--------|--------|-------|
| 2020-01-29 11:27:34 | service-down-hanadb-exporter | firing | 192.168.110.19:9100 | hana-cluster | hanadb_exporter@prd_00.service | page     | active | simple | 1.00  |

Pacemaker and Corosync



| systemd units                          |        |
|--|--------|
| name                                   | Active |
| sbd.service                            | Yes    |
| prometheus-ha_cluster_exporter.service | Yes    |
| pacemaker.service                      | Yes    |
| hawk.service                           | Yes    |
| hawk-backend.service                   | Yes    |
| corosync.service                       | Yes    |

| SBD Devices |         |
|-------------|---------|
| Device      | Status  |
| /dev/vdc    | Healthy |



| Resources |                               |         |        |                     |            |
|-----------|-------------------------------|---------|--------|---------------------|------------|
| Node      | Resource                      | Role    | Status | Migration threshold | Fail count |
| h-hana01  | rsc_SAPHanaTopology_PRD_HDB00 | started | active | 5000                | 0          |
| h-hana02  | rsc_SAPHanaTopology_PRD_HDB00 | started | active | 5000                | 0          |
| h-hana02  | rsc_SAPHana_PRD_HDB00         | master  | active | 5000                | 0          |
| h-hana01  | rsc_SAPHana_PRD_HDB00         | -       | -      | 5000                | NaN        |
| h-hana02  | rsc_io_PRD_HDB00              | started | active | 5000                | 0          |

Resource location constraints  
No data to show

Last CIB change  
a few seconds

Resources confi...  
5

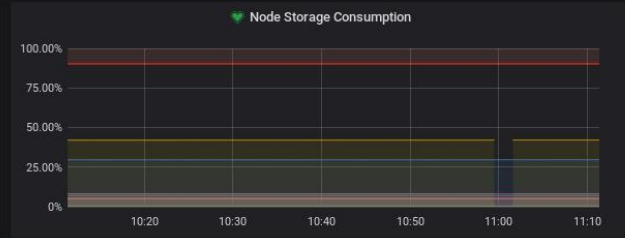
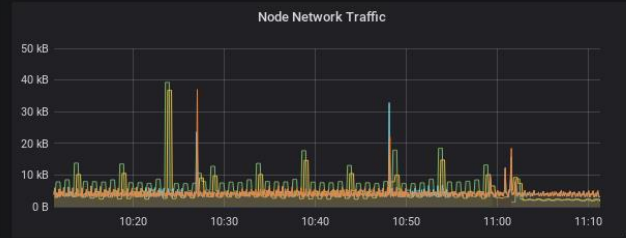
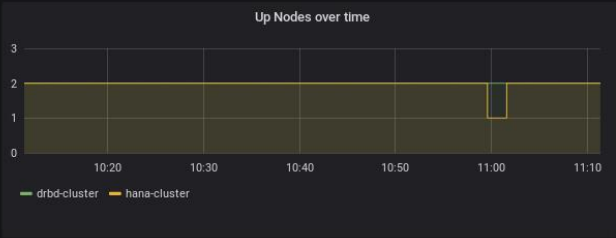
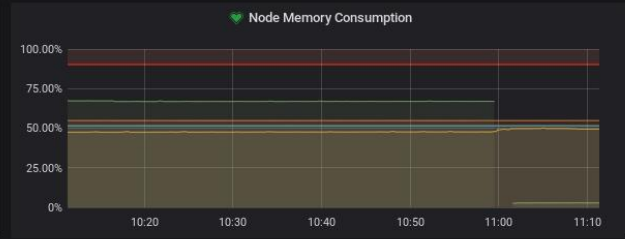
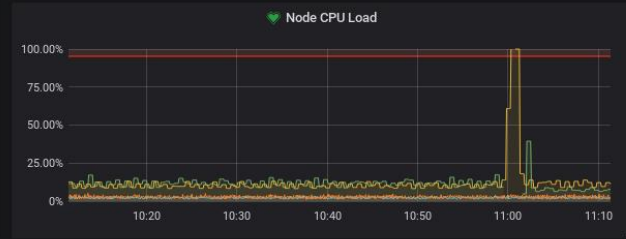
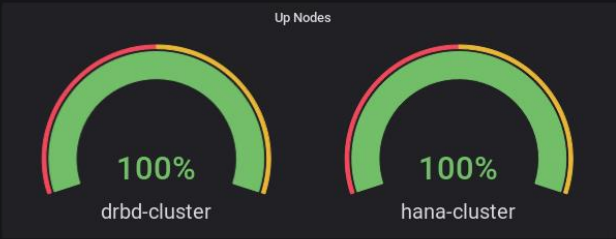
Master resources  
1

Slave resources  
N/A

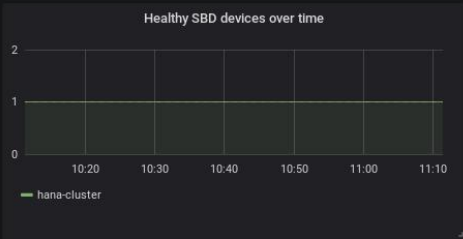
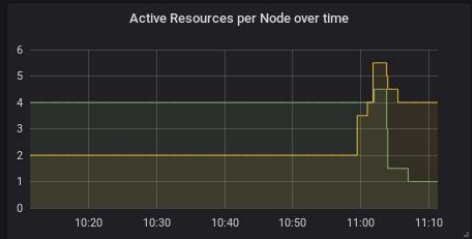
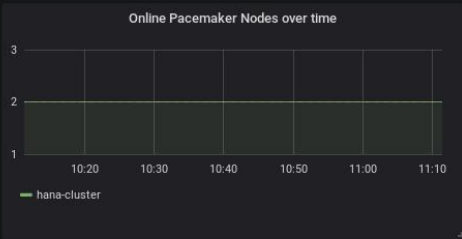
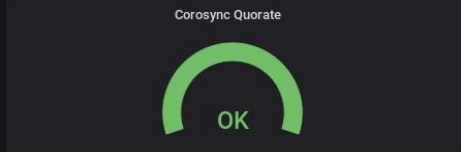
Resources failed  
0

Resources disa...  
0

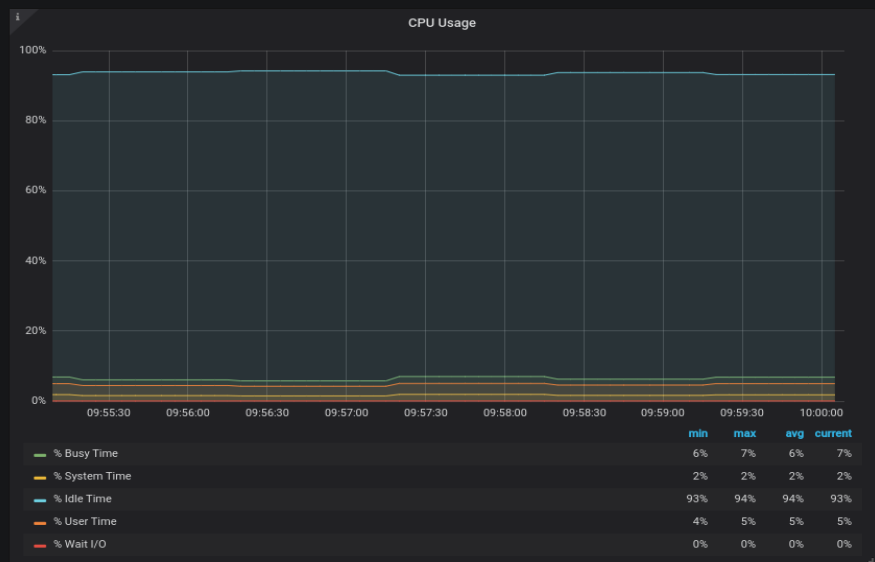
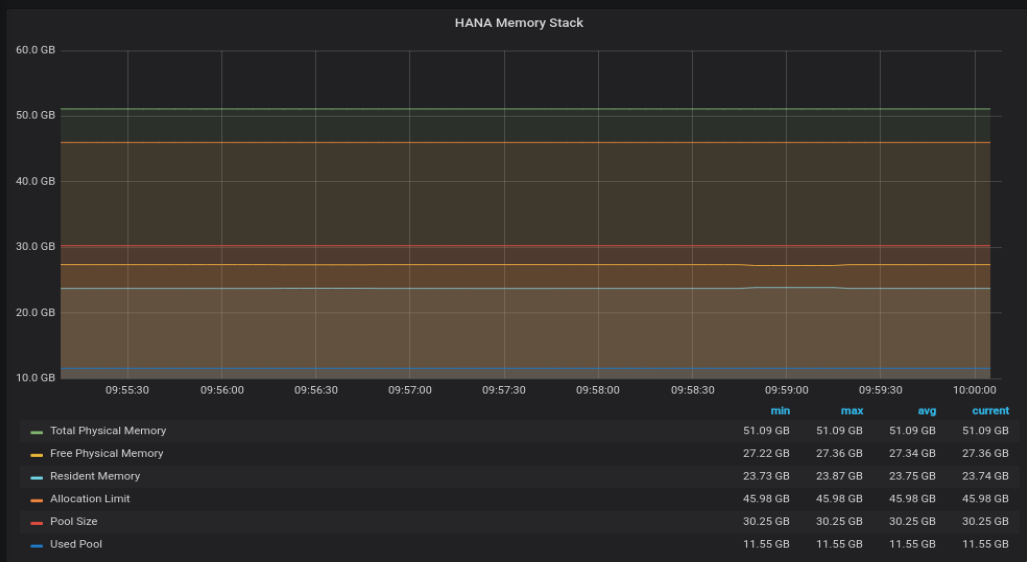
Nodes



Pacemaker & Corosync



▼ SAP HANA Instance



#### Used RAM x Allocation Limit

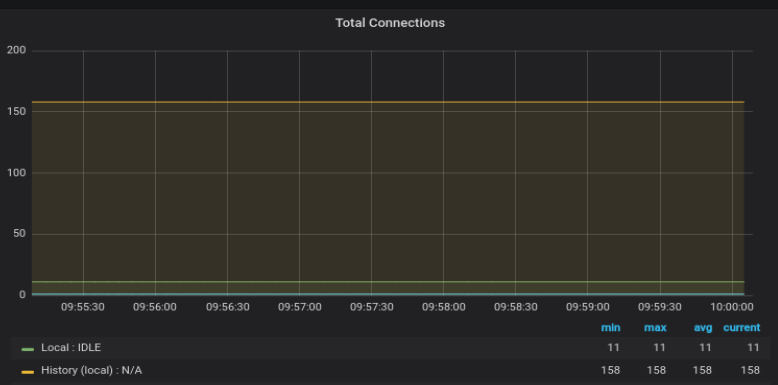
25.1%

#### CPU Busy

7%

#### Number of Cores

Local: IDLE  
History (local): N/A



### Disk usage

| Device    | Filesystem type | Mount point | Used Space | Disk Size | % Used |
|-----------|-----------------|-------------|------------|-----------|--------|
| /dev/sda2 | vfat            | /boot/efi   | 2.24 MiB   | 19.94 MiB | 11.25% |
| /dev/sda3 | xfss            | /           | 2.58 GiB   | 9.97 GiB  | 25.84% |
| /dev/sdb1 | xfss            | /hana       | 23.82 GiB  | 59.97 GiB | 39.73% |

### HANA filesystem usage

| Path                               | Usage type  | Used Space | % Used |
|------------------------------------|-------------|------------|--------|
| /hana/data/PRD/                    | DATA        | 3.83 GiB   | 6.38%  |
| /hana/log/PRD/                     | LOG         | 2.02 GiB   | 3.37%  |
| /usr/sap/PRD/HDB00/backup/data/    | DATA_BACKUP | 1.91 GiB   | 3.18%  |
| /usr/sap/PRD/HDB00/dakechi-hana01/ | TRACE       | 4.48 MiB   | 0.01%  |



▼ SAP HANA System Replication

HANA System Replication Status

| HOST   | PORT  | REPLICATION MODE | SECONDARY HOST | SECONDARY PORT | SECONDARY SITE NAME | PRIMARY SITE NAME | REPLICATION STATUS | SECONDARY ACTIVE? | SEC. RECONNECT COUNT | SEC. FAILOVER COUNT |
|--------|-------|------------------|----------------|----------------|---------------------|-------------------|--------------------|-------------------|----------------------|---------------------|
| hana01 | 30007 | SYNC             | hana02         | 30007          | PRAGUE              | NUREMBERG         | ACTIVE             | YES               | 0                    | 0                   |
| hana01 | 30003 | SYNC             | hana02         | 30003          | PRAGUE              | NUREMBERG         | ACTIVE             | YES               | 0                    | 0                   |

System Replication Log Shipping Delay



|                              | min  | max  | avg  | current |
|------------------------------|------|------|------|---------|
| hana01:30003 -> hana02:30003 | 0 ns | 0 ns | 0 ns | 0 ns    |
| hana01:30007 -> hana02:30007 | 0 ns | 0 ns | 0 ns | 0 ns    |

System Replication Used Async Log Shipping Buffer



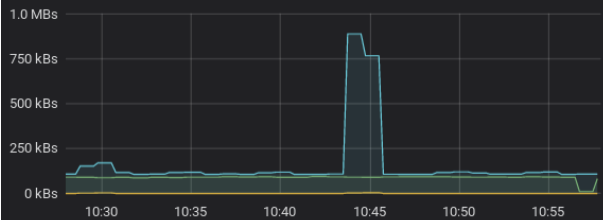
|                              | min  | max  | avg  | current |
|------------------------------|------|------|------|---------|
| hana01:30003 -> hana02:30003 | 0 MB | 0 MB | 0 MB | 0 MB    |
| hana01:30007 -> hana02:30007 | 0 MB | 0 MB | 0 MB | 0 MB    |

System Replication Takeover History

| END TIME | LOG POSITION                   | TIME | OPERATION MODE | SHIPPED LOG POS                | TIME | SOURCE HOST | SOURCE SITE NAME | START TIME                     | TARGET HOST | TARGET SITE NAME | SR STATUS | DURATION | TIME | MASTER LOG POSITION | MASTER LOG SHIPPED |
|----------|--------------------------------|------|----------------|--------------------------------|------|-------------|------------------|--------------------------------|-------------|------------------|-----------|----------|------|---------------------|--------------------|
| N/A      | 2019-06-27<br>17:20:19.7830910 |      | logreplay      | 2019-06-27<br>17:11:10.6302120 |      | hana02      | PRAGUE           | 2019-06-27<br>17:20:20.7459580 | hana01      | NUREMBERG        | ACTIVE    | -1.00 s  |      | 68992512            | 68992512           |
| N/A      | 2019-06-27<br>17:04:55.6115260 |      | logreplay      | 2019-06-27<br>17:03:02.4290370 |      | hana01      | NUREMBERG        | 2019-06-27<br>17:05:01.4300350 | hana02      | PRAGUE           | ACTIVE    | -1.00 s  |      | 68521216            | 68521216           |

▼ SAP HANA Network

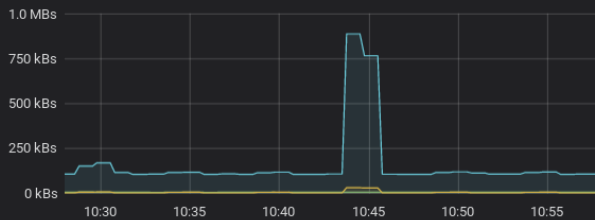
Receive Rate (KB/s)



|      | min      | max      | avg      | current  |
|------|----------|----------|----------|----------|
| eth0 | 12 kB/s  | 95 kB/s  | 89 kB/s  | 83 kB/s  |
| eth1 | 1 kB/s   | 6 kB/s   | 2 kB/s   | 1 kB/s   |
| lo   | 107 kB/s | 886 kB/s | 163 kB/s | 108 kB/s |

|      |          |          |          |          |
|------|----------|----------|----------|----------|
| eth0 | 12 kB/s  | 95 kB/s  | 89 kB/s  | 83 kB/s  |
| eth1 | 1 kB/s   | 6 kB/s   | 2 kB/s   | 1 kB/s   |
| lo   | 107 kB/s | 886 kB/s | 163 kB/s | 108 kB/s |

Transmission Rate (KB/s)



|      | min      | max      | avg      | current  |
|------|----------|----------|----------|----------|
| eth0 | 8 kB/s   | 10 kB/s  | 8 kB/s   | 8 kB/s   |
| eth1 | 5 kB/s   | 33 kB/s  | 8 kB/s   | 5 kB/s   |
| lo   | 107 kB/s | 886 kB/s | 163 kB/s | 108 kB/s |

|      |          |          |          |          |
|------|----------|----------|----------|----------|
| eth0 | 8 kB/s   | 10 kB/s  | 8 kB/s   | 8 kB/s   |
| eth1 | 5 kB/s   | 33 kB/s  | 8 kB/s   | 5 kB/s   |
| lo   | 107 kB/s | 886 kB/s | 163 kB/s | 108 kB/s |

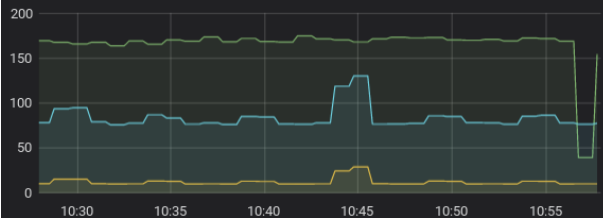
Receive/Transmission Errors per Second



|                  | min | max | avg | current |
|------------------|-----|-----|-----|---------|
| eth0 - Rec. rate | 0   | 0   | 0   | 0       |
| eth1 - Rec. rate | 0   | 0   | 0   | 0       |
| lo - Rec. rate   | 0   | 0   | 0   | 0       |

|                  |   |   |   |   |
|------------------|---|---|---|---|
| eth0 - Rec. rate | 0 | 0 | 0 | 0 |
| eth1 - Rec. rate | 0 | 0 | 0 | 0 |
| lo - Rec. rate   | 0 | 0 | 0 | 0 |

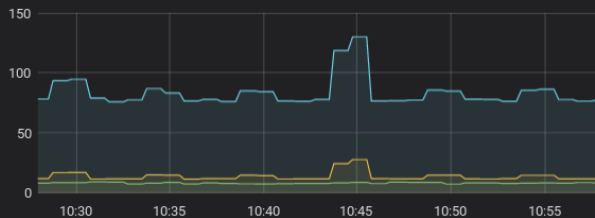
Received Requests per Second



|      | min  | max   | avg   | current |
|------|------|-------|-------|---------|
| eth0 | 39.4 | 174.5 | 165.2 | 154.3   |
| eth1 | 10.1 | 29.3  | 12.6  | 10.4    |
| lo   | 76.0 | 130.1 | 83.7  | 77.6    |

|      |      |       |       |       |
|------|------|-------|-------|-------|
| eth0 | 39.4 | 174.5 | 165.2 | 154.3 |
| eth1 | 10.1 | 29.3  | 12.6  | 10.4  |
| lo   | 76.0 | 130.1 | 83.7  | 77.6  |

Transmitted Requests per Second



|      | min  | max   | avg  | current |
|------|------|-------|------|---------|
| eth0 | 7.6  | 9.5   | 8.5  | 8.3     |
| eth1 | 11.7 | 28.0  | 14.0 | 12.0    |
| lo   | 76.0 | 130.1 | 83.7 | 77.6    |

|      |      |       |      |      |
|------|------|-------|------|------|
| eth0 | 7.6  | 9.5   | 8.5  | 8.3  |
| eth1 | 11.7 | 28.0  | 14.0 | 12.0 |
| lo   | 76.0 | 130.1 | 83.7 | 77.6 |

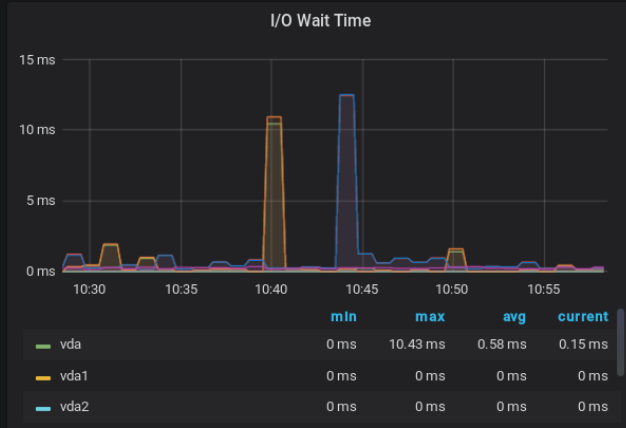
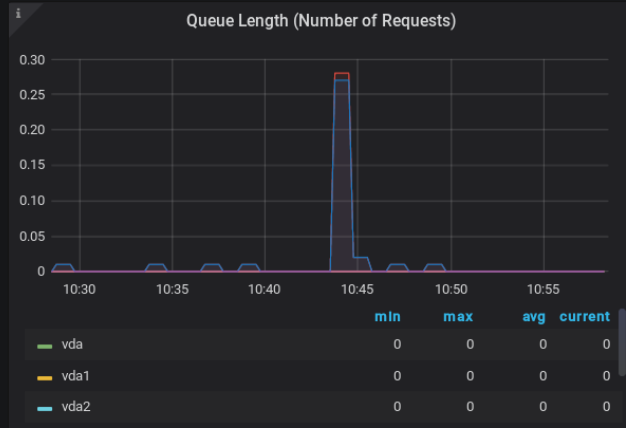
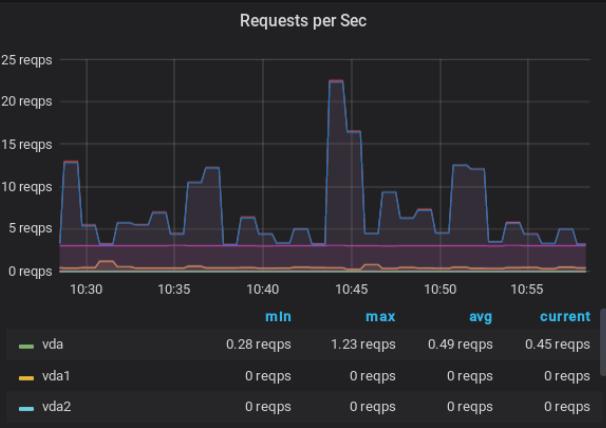
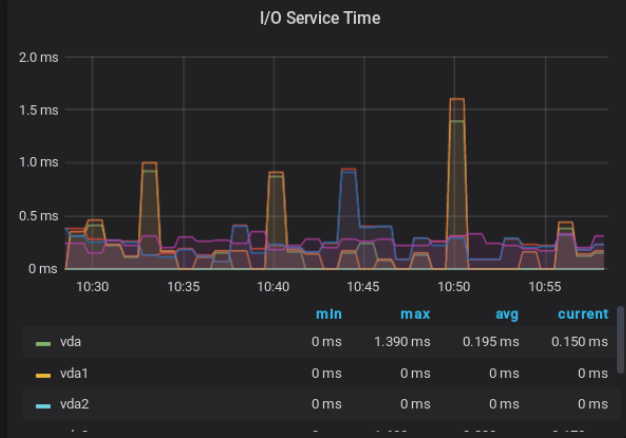
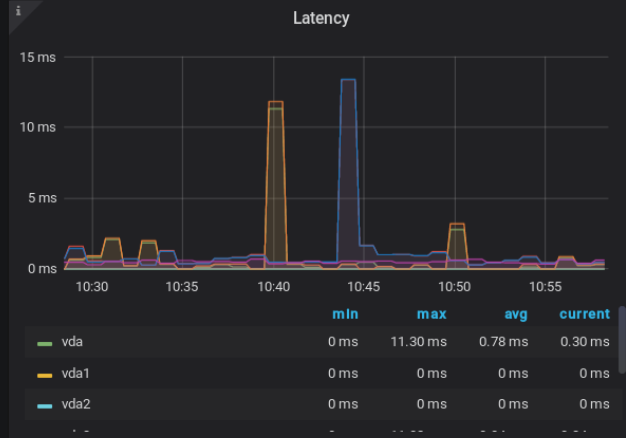
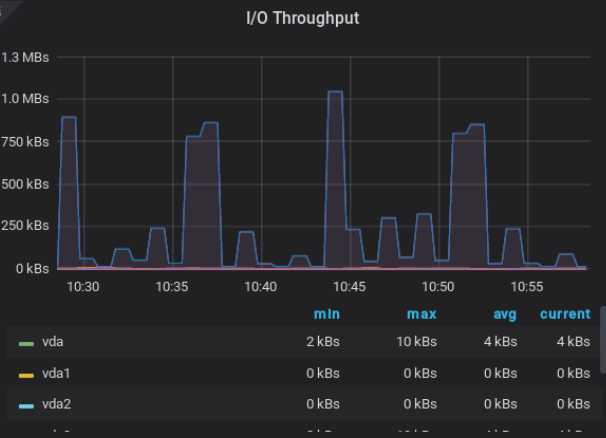
Collisions per Second

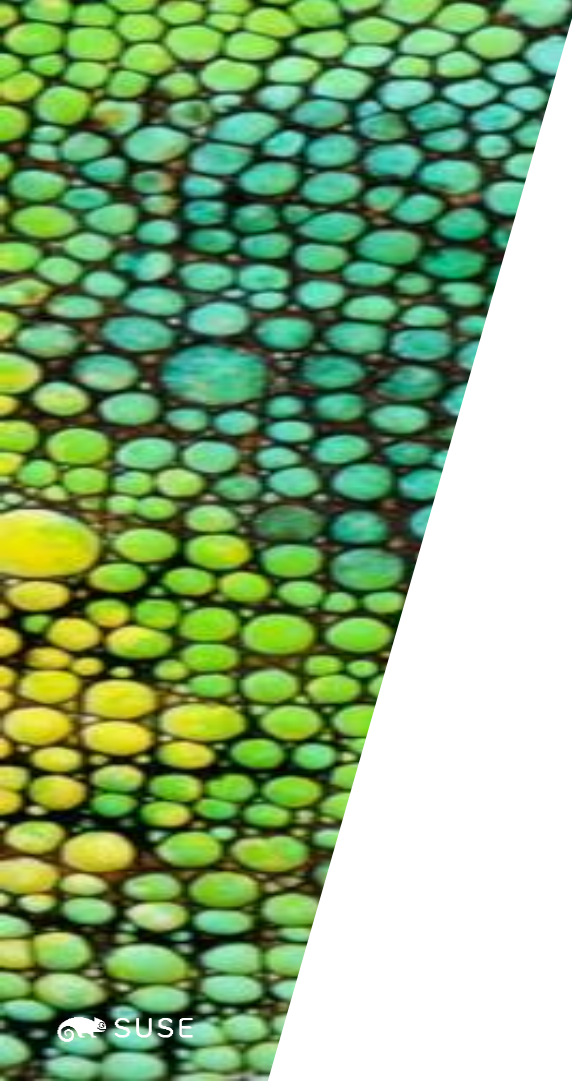


|      | min | max | avg | current |
|------|-----|-----|-----|---------|
| eth0 | 0   | 0   | 0   | 0       |
| eth1 | 0   | 0   | 0   | 0       |
| lo   | 0   | 0   | 0   | 0       |

|      |   |   |   |   |
|------|---|---|---|---|
| eth0 | 0 | 0 | 0 | 0 |
| eth1 | 0 | 0 | 0 | 0 |
| lo   | 0 | 0 | 0 | 0 |

▼ SAP HANA Disk I/O

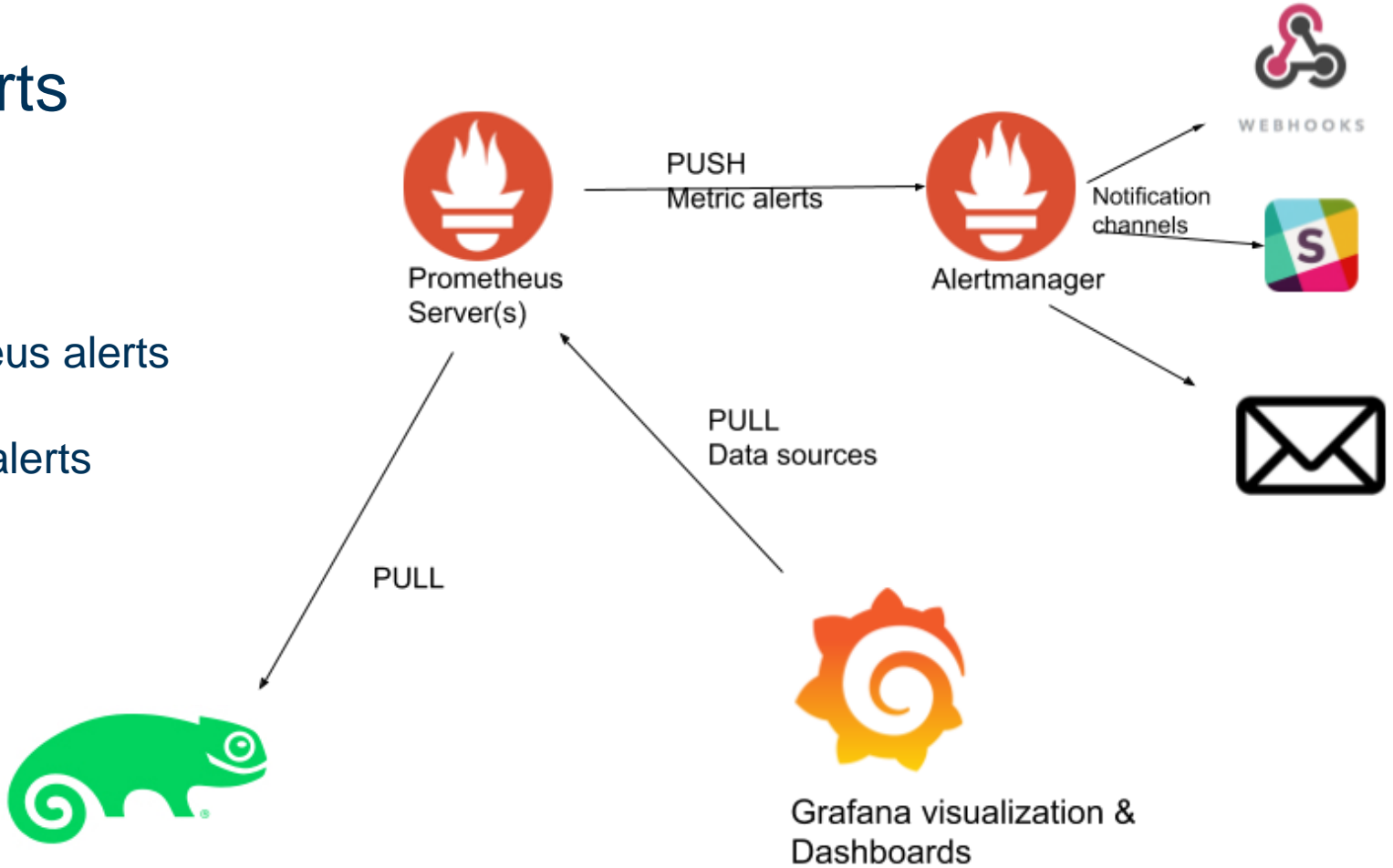




# Monitoring Alerts

# Alerts

- 1) Prometheus alerts
- 2) Grafana alerts



# Next future steps (\*):

- 1) Netweaver monitoring
- 2) log aggregation/parsing with Loki or Elastic

**(\*)This represents future plans and are subject to change at any time.**



# Virtualization Management



# Virtualization

**Traditional VM      Hardware Partitioning      Hyperconverged (HCI)      Public Cloud IaaS**

**SAP HANA certification**  
(single-VM, multi-VM, scale-out..)

**SAP Note 1788665**  
SAP HANA Support for virtualized...environments

**SAP HANA Hardware Directory**

**SAP HANA HA**

**SAP Note 1788665**  
SAP HANA Support for virtualized / partitioned (multi-tenant) environments

**SAP HANA Hardware Directory**

**Non-HANA**

**SAP Note 1122387**  
Linux: SAP Support in virtualized environments

**SAP Note 1380654**  
SAP support in IaaS

**Non-HANA HA**

**SAP Note 1552925**  
Linux: High Availability Cluster Solutions



# SUSE Manager 4.1

## July 2020



# Making The SAP Admin Happy ...

- SUSE Manager installation not just easy, but super-easy
- Best practices included: Salt Formulas for SAP HANA and HA Clusters!
- Staging of content without scripts and CLI commands
- Ready for the Public Cloud!
- Containers? Check!
- Aligned support lifecycle

# UI/UX Improvements

- **Focused on SUSE® Linux Enterprise for SAP & Public Cloud use cases**
- **Mass-onboarding of passwordless clients**
- **Quick Start guides**

# Cluster Awareness

- **Cluster awareness framework**
- **First integration: SUSE® Container as a Service Platform**

# Virtualization Management

- **Multi-tenancy distributed virtualization management Reference Architecture**
- **AutoYast booting, PXE support**
- **Advanced VM performance configuration for SUSE Linux Enterprise for SAP Applications**

# Patch Automation

- **Define Patch windows**
- **Automate patching**

# Beyond 4.1

- **Cluster awareness**
  - Additional clusters (SUSE® Enterprise Storage, SUSE® Linux Enterprise High Availability Extension, Virtualization)
  - Additional Functionality
- **Scalability (Hub functionality)**
- **Integrate with Terraform**
- **Fully containerized (5.0)**

A close-up, microscopic view of plant cells, showing a dense grid of green and yellowish-green cells with dark, thin walls. The cells are roughly circular and packed together, creating a textured, mosaic-like appearance. The lighting is bright, highlighting the individual cells and their boundaries.

*Remember:*

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The background is a solid green color with a white grid pattern that forms wavy, organic shapes. The grid lines are thin and create a mesh-like texture. The overall aesthetic is clean and modern.

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