



SUSE CaaS Platform 4.2.0 Release Notes

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SUSE CaaS Platform is an enterprise-ready Kubernetes-based container management solution.

1 About the Release Notes

The most recent version of the Release Notes is available online at <https://www.suse.com/releasesnotes> or <https://documentation.suse.com/suse-caasp/4/>.

Entries can be listed multiple times if they are important and belong to multiple sections.

Release notes usually only list changes that happened between two subsequent releases. Certain important entries from the release notes documents of previous product versions may be repeated. To make such entries easier to identify, they contain a note to that effect.

2 Changes in 4.2.0

2.1 Deprecations in 4.2.0

- The hyperkube image, combining multiple Kubernetes binaries, is planned for removal in 4.3.0, due to upstream deprecations. If running SUSE CaaS Platform in an airgapped environment, please ensure that all our images are mirrored.
- Remove ability to re-enable serving deprecated APIs types:
 - [extensions/v1beta1](#)
 - [apps/v1beta1](#)
 - [apps/v1beta2](#)

For more information check: <https://github.com/kubernetes/kubernetes/issues/43214>

2.2 Kubernetes Update

4.2.0 brings in a Kubernetes update, precisely to 1.17. The list of features and bug fixes is long, see:

<https://github.com/kubernetes/kubernetes/blob/master/CHANGELOG/CHANGELOG-1.17.md>

2.3 Addon Customization Persistence

This release introduces `kustomize` to persist addon configuration changes across updates and reboots.

2.4 Skuba: Disabling `firewalld`

Skuba should disable `firewalld` when bootstrapping/joining a node, so it adds a startup step to check whether `firewalld` is disabled. This was done using cloud init, which however does not work on bare metal deployments. So in order to ensure that `firewalld` is disabled, this check was introduced into `skuba`.

2.5 Datastore for VMware

VMware Terraform config now supports setting a datastore cluster as the storage backend. Please refer to the [Deployment Instructions \(https://documentation.suse.com/suse-caasp/4.2/html/caasp-deployment/_deployment_instructions.html#_deploying_vms_from_the_template\)](https://documentation.suse.com/suse-caasp/4.2/html/caasp-deployment/_deployment_instructions.html#_deploying_vms_from_the_template) for more information.

2.6 Required Actions

2.6.1 Kubernetes 1.17

In order to update to Kubernetes 1.17, follow the instructions in the [Admin Guide \(https://documentation.suse.com/suse-caasp/4.2/html/caasp-admin/_cluster_updates.html#_updating_kubernetes_components\)](https://documentation.suse.com/suse-caasp/4.2/html/caasp-admin/_cluster_updates.html#_updating_kubernetes_components).

If your cluster is not on the latest Kubernetes version prior to applying the update, you will encounter an issue when `skuba-update` tries to update your nodes. See the [Section 2.9, “Known Issues”](#) section for instructions on how to proceed.

2.6.2 Conmon and CRI-O

Conmon and CRI-O will be updated by `skuba-update`. No action is required from your side. For more info see the [Cluster Updates section in the Admin Guide \(https://documentation.suse.com/suse-caasp/4.2/html/caasp-admin/_cluster_updates.html#_base_os_updates\)](https://documentation.suse.com/suse-caasp/4.2/html/caasp-admin/_cluster_updates.html#_base_os_updates).

2.6.3 Skuba

In order to update skuba, you also need to update the admin workstation. For detailed instructions, see [this section in the Admin Guide \(https://documentation.suse.com/suse-caasp/4.1/html/caasp-admin/_cluster_updates.html#_update_management_workstation\)](https://documentation.suse.com/suse-caasp/4.1/html/caasp-admin/_cluster_updates.html#_update_management_workstation).

2.6.4 Generate the kustomize Style Addon Configurations

You must convert your addon manifests to the new kustomize aware file structure and formats. To do so please run the following commands from your management workstation.

Replace MASTER-NODE-IP with an IP address/FQDN of one of your master nodes. Replace CLUSTER-DEFINITION-PATH with the path to your existing cluster definition files that were generated during the initial bootstrap/deployment.

```
skuba cluster init --control-plane MASTER-NODE-IP /tmp/new-cluster-init
mv CLUSTER-DEFINITION-PATH/addons CLUSTER-DEFINITION-PATH/addons-old
cp -r /tmp/new-cluster-init/addons CLUSTER-DEFINITION-PATH/
```

This will generate the existing addon configurations in the new format so you can amend them.




2.7 Bugs Fixed in 4.2.0 since 4.1.2

- [bsc#1161056 \(https://bugzilla.suse.com/show_bug.cgi?id=1161056\)](https://bugzilla.suse.com/show_bug.cgi?id=1161056) [cri-o] - Fix upgrade from 4.0.3 to 4.1.0 - skuba node upgrade - fails due to crio-wipe.service not starting
- [bsc#1159108 \(https://bugzilla.suse.com/show_bug.cgi?id=1159108\)](https://bugzilla.suse.com/show_bug.cgi?id=1159108) [admin-guide] grafana helm chart version newer than upstream but older image version / grafana version!
- [bsc#1157337 \(https://bugzilla.suse.com/show_bug.cgi?id=1157337\)](https://bugzilla.suse.com/show_bug.cgi?id=1157337) [skuba] After cluster creation all DEX and all GANGWAY pods run on the first master
- [bsc#1152334 \(https://bugzilla.suse.com/show_bug.cgi?id=1152334\)](https://bugzilla.suse.com/show_bug.cgi?id=1152334) [skuba] skuba update management - HAS-UPDATES HAS-DISRUPTIVE-UPDATES → no vs none
- [bsc#1160460 \(https://bugzilla.suse.com/show_bug.cgi?id=1160460\)](https://bugzilla.suse.com/show_bug.cgi?id=1160460) [podman] Update podman to 1.8.0
- [bsc#1164390 \(https://bugzilla.suse.com/show_bug.cgi?id=1164390\)](https://bugzilla.suse.com/show_bug.cgi?id=1164390) [common] Add common to SLE15 Containers Module

- [bsc#1162093 \(https://bugzilla.suse.com/show_bug.cgi?id=1162093\)](https://bugzilla.suse.com/show_bug.cgi?id=1162093) [kubernetes] kubelet referenced wrong volume-plugin dir after upgrade
- [bsc#1121353 \(https://bugzilla.suse.com/show_bug.cgi?id=1121353\)](https://bugzilla.suse.com/show_bug.cgi?id=1121353) [kubernetes] Kubernetes – Master node pod configured with Privileged PSP

2.8 Documentation Changes

- The QuickStart Guide has been removed pending review and rewrite. Please use the Deployment Guide (<https://documentation.suse.com/suse-caasp/4.2/single-html/caasp-deployment/>).
- Disaster Recovery with Velero (https://documentation.suse.com/suse-caasp/4.2/single-html/caasp-admin/#_backup_and_restore_with_velero) is now documented in the Admin Guide.
- A subchapter on Managing Replicas (https://documentation.suse.com/suse-caasp/4.2/single-html/caasp-deployment/#_replicas) has been added to Deployment Requirements.
- The list of required addon images (https://documentation.suse.com/suse-caasp/4.2/single-html/caasp-deployment/#airgap-container_registry-mirror) was updated.
- SUSE Cloud Application Platform integration was removed from the SUSE CaaS Platform Admin Guide. Please now refer to: Deploying SUSE Cloud Application Platform on SUSE CaaS Platform (<https://documentation.suse.com/suse-cap/1.5.2/single-html/cap-guides/#cha-cap-depl-caasp>).
- A note about using the `--non-interactive-include-reboot-patches` was added to the Admin Guide (<https://documentation.suse.com/suse-caasp/4.2/single-html/caasp-admin/#disabling-automatic-updates>).
- Instructions on how to update Dex have been enhanced. For details, see the Admin Guide (https://documentation.suse.com/suse-caasp/4.2/single-html/caasp-admin/#_sec.admin.security.rbac.update).
- We updated the air gapped deployment with a new diagram. See the Admin Guide (<https://documentation.suse.com/suse-caasp/4.2/single-html/caasp-deployment/#airgap-concepts>).
- We added an example on how to set up Prometheus Recording Rules (https://documentation.suse.com/suse-caasp/4.2/single-html/caasp-admin/#caasp-admin.html#recording_rules_configuration_example).

- Instructions on how to troubleshoot the ["cannot attach profile" error](https://documentation.suse.com/suse-caasp/4.2/single-html/caasp-admin/caasp-admin.html#_aws_deployment_fails_with_cannot_attach_profile_error) from AWS (https://documentation.suse.com/suse-caasp/4.2/single-html/caasp-admin/caasp-admin.html#_aws_deployment_fails_with_cannot_attach_profile_error)  have been added.
- The [Glossary](https://documentation.suse.com/suse-caasp/4.2/single-html/caasp-deployment/#_glossary) (https://documentation.suse.com/suse-caasp/4.2/single-html/caasp-deployment/#_glossary)  was reintroduced to all our guides.
- Various other fixes and improvements (Refer to: <https://github.com/SUSE/doc-caasp/releases> .

2.9 Known Issues

2.9.1 `skuba-update` Error: `patterns-caasp-Node` Conflicts with CRI-O Update

If your cluster is not up-to-date, meaning it is not in the latest Kubernetes version, `skuba-update` will try to install the latest version of CRI-O, which will create a conflict with the currently installed Kubernetes packages.

More precisely, you might encounter an error similar to this:

```
patterns-caasp-Node conflicts with CRI-O
```

In that case, the **recommended solution** is to upgrade the cluster to the latest Kubernetes version available, this can be done by running the regular SUSE CaaS Platform Kubernetes upgrade procedure based on the command `skuba node upgrade`, which is described in the [Admin Guide](https://documentation.suse.com/suse-caasp/4.2/single-html/caasp-admin/#_updating_kubernetes_components) (https://documentation.suse.com/suse-caasp/4.2/single-html/caasp-admin/#_updating_kubernetes_components) .

3 Changes in 4.1.2

3.1 Deployment on AWS as Technology Preview

Deployment of SUSE CaaS Platform on Amazon Web Services (AWS) has been tested and documented. Terraform is used to deploy the infrastructure and the `skuba` tool to bootstrap the Kubernetes cluster on top of it. For detailed instructions please

see the Deployment Guide (https://documentation.suse.com/suse-caasp/4.1/single-html/caasp-deployment/#_deployment_on_amazon_aws). Please note that SUSE CaaS Platform deployment on AWS may not be functionally complete, and is not intended for production use.

3.2 Terraform Upgrade

SUSE CaaS Platform can now be deployed with **Terraform 0.12**. All details of the new version can be found in the HashiCorp Documentation (<https://www.hashicorp.com/blog/terraform-0-1-2-preview/>). The official website for the Terraform 0.12 upgrade is <https://www.terraform.io/upgrade-guides/0-12.html>.

3.3 etcd Backup and Restore for Master Nodes Disaster Recovery

- Provide etcd backup process on-demand or on a schedule to prevent etcd data corruption.
- Provide etcd restore process to recover failed master node(s) to restore etcd quorum for cluster serving.

For detailed instructions please see link: the Administration Guide (https://documentation.suse.com/suse-caasp/4.1/single-html/caasp-admin/#_backup_etcd_cluster_data).

3.4 Velero for Disaster Recovery


- Provide Velero as a solution for data protection and data migration by backing up and migrating Kubernetes resources and persistent volumes to and from externally supported storage backend on demand or on a schedule.

For detailed instructions please see link: the Administration Guide (https://documentation.suse.com/suse-caasp/4.1/single-html/caasp-admin/#_disaster_recovery).

3.5 Required Actions

3.5.1 Upgrade Terraform Files and State

In order to seamlessly switch to Terraform 0.12 you need to make sure that:

- All files follow the new syntax for the [HashiCorp Configuration Language \(https://github.com/hashicorp/hcl\)](https://github.com/hashicorp/hcl)  included in Terraform 0.12
- All boolean values are `true` or `false` and **not** 0 or 1
- All variables are explicitly declared
- All dependencies are explicitly declared to reach the expected behavior

3.5.2 Recommended Procedure

Enter your Terraform files/state folder and:

- Install the latest version of Terraform using `zypper in terraform` (the installed version should be 0.12.19)
- Navigate to your Terraform root folder (e.g. `/usr/share/caasp/terraform/vmware`)
- Migrate Terraform files with the automatic migration tool by running `terraform 0.12upgrade`
 - For OpenStack, run the [Section 3.5.3, "Extra Operations for In-place Upgrade of OpenStack Terraform Files"](#) (see below)
 - Run `terraform apply` to update the Terraform definitions to the new format used by 0.12



Important

If you do not update the definitions before running Terraform again your output might contain `nil`/`null` strings when you run `terraform refresh` followed by `terraform output`. This can break automations that are based on the output. Please make sure you have updated/applied all definitions before running Terraform.

- Run `zypper up skuba`
- You can then run the `terraform init/plan/apply` commands as usual.

3.5.3 Extra Operations for In-place Upgrade of OpenStack Terraform Files

- Replace any boolean values written as a number with `false/true`. For example, for the variables in `openstack/variables.tf` (and their equivalent in your `terraform.tfvars` file), replace `default = 0` with `default = false` in the variables `workers_vol_enabled` and `dnsentry`. Do the same for any extra boolean variable you might have added.

- Introduce a `depends_on` on the resource `"openstack_compute_floatingip_associate_v2" "master_ext_ip"` in `master-instance.tf`:

```
depends_on = [openstack_compute_instance_v2.master]
```

- Introduce a `depends_on` on the resource `"master_wait_cloudinit"` in `master-instance.tf`:

```
depends_on = [
  openstack_compute_instance_v2.master,
  openstack_compute_floatingip_associate_v2.master_ext_ip
]
```

- Introduce a `depends_on` on the resources `"openstack_compute_floatingip_associate_v2" "worker_ext_ip"` and `"null_resource" "worker_wait_cloudinit"` in `worker-instance.tf`, similarly to the ones for master. Replace `master` with `worker` in the examples above.

- Update the resources `resource "openstack_compute_instance_v2" "master"` and `resource "openstack_compute_instance_v2" "worker"` with `master-instance.tf` and `worker-instance.tf` respectively. Add the following resources:

```
lifecycle {
  ignore_changes = [user_data]
}
```



Note

The above option is needed because Terraform will detect all machines as new resources when user_data changes during the upgrade.

This will make it possible to update your cluster from a Terraform 0.11 state into a Terraform 0.12 state without tearing it down completely.



Warning

When adding `lifecycle { ignore_change = [user_data] }` in your master and worker instances, you will effectively prevent updates of nodes, should you or SUSE update the user_data. This should be removed as soon as possible after the migration to Terraform 0.12.

3.5.4 `etcdctl`

Run `zypper in etcdctl` in the management host to install etcdctl.

3.5.5 Update packages for general fixes

Update skuba package and patterns-caasp-Management on your management workstation as you would do with any other package.

Refer to: <https://documentation.suse.com/sles/15-SP1/single-html/SLES-admin/#sec-zypper-softup-update> ↗

Updating patterns-caasp-Management will install the new terraform providers for AWS.

Packages on your cluster nodes (cri-o) will be updated automatically by skuba-update link: https://documentation.suse.com/suse-caasp/4.1/html/caasp-admin/_cluster_updates.html#_base_os_updates

3.6 Bugs Fixed in 4.1.2 since 4.1.1

- bsc#1161056 (https://bugzilla.suse.com/show_bug.cgi?id=1161056)  [cri-o] - Fix upgrade from 4.0.3 to 4.1.0 - skuba node upgrade - fails due to crio-wipe.service not starting
- bsc#1161179 (https://bugzilla.suse.com/show_bug.cgi?id=1161179)  [cri-o] - Fix invalid apparmor profile
- bsc#1158440 (https://bugzilla.suse.com/show_bug.cgi?id=1158440)  [terraform] - Update in SLE-15 (bsc#1158440, CVE-2019-19316)
- bsc#1148092 (https://bugzilla.suse.com/show_bug.cgi?id=1148092)  [terraform] - Include in SLE-15 (bsc#1148092, jsc#ECO-134)
- bsc#1145003 (https://bugzilla.suse.com/show_bug.cgi?id=1145003)  [terraform-provider-openstack] - Update to version 1.19.0
- bsc#1159082 (https://bugzilla.suse.com/show_bug.cgi?id=1159082)  [grafana] - Fix some missing container images of grafana helm chart
- bsc#1161225 (https://bugzilla.suse.com/show_bug.cgi?id=1161225)  [grafana] - Fix grafana helm chart has app version 6.4.2 but version is 6.2.5
- bsc#1161110 (https://bugzilla.suse.com/show_bug.cgi?id=1161110)  [grafana] - Fix Grafana dashboard should not name "CaaS" but "SUSE (r) CaaS Platform"
- bsc#1162093 (https://bugzilla.suse.com/show_bug.cgi?id=1162093)  [kubelet] - Release fix for volume-plugin-dir in kubernetes packages
- bsc#1160463 (https://bugzilla.suse.com/show_bug.cgi?id=1160463)  [skuba] - Fix skuba-update --version always 0.0.0
- bsc#1157323 (https://bugzilla.suse.com/show_bug.cgi?id=1157323)  [skuba] - Fix need a way to report on current available CaaS version vs. installed version

3.7 Documentation Changes

- Added AWS deployment instructions (https://documentation.suse.com/suse-caasp/4.2/single-html/caasp-deployment/#_deployment_on_amazon_aws)  (Tech Preview)
- Added KVM deployment instructions (https://documentation.suse.com/suse-caasp/4.2/single-html/caasp-deployment/#deployment_bare_metal) 

- Improved instructions for Monitoring to deploy Grafana in a sub path (https://documentation.suse.com/suse-caasp/4.2/single-html/caasp-admin/#_monitoring_stack) and enhanced ingress settings
- Fix unspecific expression in AlertManager example (https://documentation.suse.com/suse-caasp/4.2/single-html/caasp-admin/#alertmanager_configuration_example)
- Added notes on certificate rotation for the control plane ([single-html/caasp-admin/#_control_plane_nodes_certificates_rotation](https://documentation.suse.com/suse-caasp/4.2/single-html/caasp-admin/#_control_plane_nodes_certificates_rotation))
- Various other fixes and improvements (Refer to: <https://github.com/SUSE/doc-caasp/releases>)

4 Changes in 4.1.1

- skuba fixes (see below)
- supportutils-plugin-suse-caasp fixes (see below)
- kubernetes and cri-o fixes (see below)
- caasp-release-notes fixes (see below)
- prometheus fixes (see below)
- CRI-O now uses the system proxy settings (see [Section 4.3, "Documentation Changes"](#))

4.1 Required Actions

4.1.1 Update packages for general fixes and added supportconfig plugin

Update skuba and kubernetes-client packages on your management workstation as you would do with any other package.

Refer to: <https://documentation.suse.com/sles/15-SP1/single-html/SLES-admin/#sec-zypper-softup-update>

Packages on your cluster nodes (cri-o, kubernetes, supportutils-plugin-suse-caasp) will be updated automatically by `skuba-update` link: https://documentation.suse.com/suse-caasp/4.1/html/caasp-admin/_cluster_updates.html#_base_os_updates

4.1.2 Fix Prometheus kube-state-metrics

Use `helm upgrade` command to fix the Prometheus `kube-state-metrics` image.

Finally, in order to use new Prometheus `pushgateway` image, enable the service in your `prometheus-config-values.yaml` config file:

```
pushgateway:
  enabled: true
```

Then run the `helm upgrade` command https://helm.sh/docs/intro/using_helm/#helm-upgrade-and-helm-rollback-upgrading-a-release-and-recovering-on-failure.

Afterwards you can deploy Prometheus as usual. Refer to: https://documentation.suse.com/suse-caasp/4.1/html/caasp-admin/_monitoring.html#_prometheus.

4.2 Bugs Fixed in 4.1.1 since 4.1.0

- [bsc#1161179](https://bugzilla.suse.com/show_bug.cgi?id=1161179) (https://bugzilla.suse.com/show_bug.cgi?id=1161179) [cri-o] - cilium crashes with "apparmor failed to apply profile: write /proc/self/attr/exec: no such file or directory"
- [bsc#1161056](https://bugzilla.suse.com/show_bug.cgi?id=1161056) (https://bugzilla.suse.com/show_bug.cgi?id=1161056) [cri-o] - upgrade from 4.0.3 to 4.1.0 - skuba node upgrade - fails due to crio-wipe.service not starting
- [bsc#1155323](https://bugzilla.suse.com/show_bug.cgi?id=1155323) (https://bugzilla.suse.com/show_bug.cgi?id=1155323) [cri-o] - Include system proxy settings in service if present
- [bsc#1159452](https://bugzilla.suse.com/show_bug.cgi?id=1159452) (https://bugzilla.suse.com/show_bug.cgi?id=1159452) [skuba] - Fixed do not panic when version is unknown
- [bsc#1157802](https://bugzilla.suse.com/show_bug.cgi?id=1157802) (https://bugzilla.suse.com/show_bug.cgi?id=1157802) [skuba] - Enhanced skuba auth login help/error message
- [bsc#1155810](https://bugzilla.suse.com/show_bug.cgi?id=1155810) (https://bugzilla.suse.com/show_bug.cgi?id=1155810) [skuba] - Refactored to fix CaaS SSL / PKI / CA Infrastructure unclear and probably inconsistent and wrong?
- [bsc#1157802](https://bugzilla.suse.com/show_bug.cgi?id=1157802) (https://bugzilla.suse.com/show_bug.cgi?id=1157802) [skuba] - skuba auth login help should mention the port that needs to be use (:32000)
- [bsc#1137337](https://bugzilla.suse.com/show_bug.cgi?id=1137337) (https://bugzilla.suse.com/show_bug.cgi?id=1137337) [skuba] - Skuba log level description is missing

- [bsc#1155593](https://bugzilla.suse.com/show_bug.cgi?id=1155593) (https://bugzilla.suse.com/show_bug.cgi?id=1155593)  [kubernetes] - second master join always fails
- [bsc#1160443](https://bugzilla.suse.com/show_bug.cgi?id=1160443) (https://bugzilla.suse.com/show_bug.cgi?id=1160443)  [supportutils-plugin-suse-caasp] - Extend supportconfig to check certificates expiration time
- [bsc#1152335](https://bugzilla.suse.com/show_bug.cgi?id=1152335) (https://bugzilla.suse.com/show_bug.cgi?id=1152335)  [supportutils-plugin-suse-caasp] - Add etcd logs for v4
- [bsc#1160600](https://bugzilla.suse.com/show_bug.cgi?id=1160600) (https://bugzilla.suse.com/show_bug.cgi?id=1160600)  [caasp-release-notes] - caasp-release package points to caasp-release-notes 4.0
- [bsc#1159074](https://bugzilla.suse.com/show_bug.cgi?id=1159074) (https://bugzilla.suse.com/show_bug.cgi?id=1159074)  [prometheus] - Prometheus pushgateway image v0.8.0 missing on registry.suse.com/caasp/v4
- [bsc#1161975](https://bugzilla.suse.com/show_bug.cgi?id=1161975) (https://bugzilla.suse.com/show_bug.cgi?id=1161975)  [prometheus] - kube-state-metrics - endless "Failed to list *v1beta1.ReplicaSet: the server could not find the requested resource" on 1.16.2

4.3 Documentation Changes

- Added instructions for Stratos Web Console (Tech Preview) (https://documentation.suse.com/suse-caasp/4.2/single-html/caasp-admin/#_stratos_web_console) 
- Added instructions for etcd storage performance testing (https://documentation.suse.com/suse-caasp/4.2/single-html/caasp-deployment/#_storage_performance) 
- Added instructions for etcd troubleshooting (<https://documentation.suse.com/suse-caasp/4.2/single-html/caasp-admin/#troubleshooting-etcd>) 
- Updated CRI-O proxy configuration instructions (https://documentation.suse.com/suse-caasp/4.2/single-html/caasp-admin/#_configuring_httphttps_proxy_for_cri_o) 
- Updated upgrade instructions with more information about manual upgrades and reboots (https://documentation.suse.com/suse-caasp/4.2//single-html/caasp-admin/#disabling_automatic_updates) 
- Various minor fixes and improvements (Refer to: <https://github.com/SUSE/doc-caasp/releases> )

5 Changes in 4.1.0

5.1 Kubernetes update

SUSE CaaS Platform now ships with Kubernetes 1.17.4. Most of the significant changes relate to this upgrade, as more than 31 enhancements were merged in the Kubernetes 1.17.4 release. You can read a short summary of the changes under *Section 9.1.7, “Changes to the Kubernetes Stack”*. Manual actions are required for 4.1.0 release.

5.2 Helm security update

Moreover, helm has been updated to fix a security issue (CVE-2019-18658 (<https://www.suse.com/security/cve/CVE-2019-18658/>) ↗).

5.3 Stratos, a web console for Kubernetes

Stratos is now available as tech preview for SUSE CaaS Platform. Stratos is a web console for Kubernetes and for Cloud Foundry. A single instance of Stratos can be used to monitor and interact with different Kubernetes clusters as long as their API endpoints are reachable by Stratos.

Stratos integrates with Prometheus: it can scrape metrics collected by Prometheus and show them using pre-built charts.

Finally Stratos can be used to interact with helm chart repositories. It can show the charts available and install them straight from its web interface. It can also show all the workloads that are running on a Kubernetes that have been created by helm chart.



Note

The helm chart integration is a tech preview feature of Stratos that must be enabled at deployment time.

5.4 Required Actions

5.4.1 Skuba and helm update Instructions

Update skuba and helm on your management workstation as you would do with any other package.

Refer to: <https://documentation.suse.com/sles/15-SP1/single-html/SLES-admin/#sec-zypper-softup-update> ↗



Warning

When running helm-init you may hit a [known bug on the certificate validation](https://bugzilla.suse.com/show_bug.cgi?id=1159047) (https://bugzilla.suse.com/show_bug.cgi?id=1159047) ↗:

```
https://kubernetes-charts.storage.googleapis.com is not a valid chart repository
or cannot be reached: Get https://kubernetes-charts.storage.googleapis.com/
index.yaml: x509: certificate signed by unknown authority
```

In order to fix this, run:

```
sudo update-ca-certificates
```

After updating helm to latest version on the management host, you have to also upgrade the helm-tiller image in the cluster, by running:

```
helm init \
  --tiller-image registry.suse.com/caasp/v4/helm-tiller:2.16.1 \
  --service-account tiller --upgrade
```

5.4.2 Upgrade Your Kubernetes Cluster

Use skuba to upgrade your Kubernetes cluster as [documented in the Administration guide](https://documentation.suse.com/suse-caasp/4.1/single-html/caasp-admin/#handling_updates) (https://documentation.suse.com/suse-caasp/4.1/single-html/caasp-admin/#handling_updates) ↗.



Warning

Please, do not run `zypper patch` manually on your nodes. If you do, you will see an error about a conflict when patching CRI-O. This is expected, because the patch is not supposed to be installed this way.

Instead, cluster updates are being handled by skuba as documented in the Administration guide (https://documentation.suse.com/suse-caasp/4.2//single-html/caasp-admin/#handling_updates)⁷.

5.4.3 Update Your Kubernetes Manifests for Kubernetes 1.17.4:

Some API resources are moved to stable, while others have been moved to different groups or deprecated.

The following will impact your deployment manifests:

- `DaemonSet`, `Deployment`, `StatefulSet`, and `ReplicaSet` in `extensions/` (both `v1beta1` and `v1beta2`) is deprecated. Migrate to `apps/v1` group instead for all those objects. Please note that `kubectl convert` can help you migrate all the necessary fields.
- `PodSecurityPolicy` in `extensions/v1beta1` is deprecated. Migrate to `policy/v1beta1` group for `PodSecurityPolicy`. Please note that `kubectl convert` can help you migrate all the necessary fields.
- `NetworkPolicy` in `extensions/v1beta1` is deprecated. Migrate to `networking.k8s.io/v1` group for `NetworkPolicy`. Please note that `kubectl convert` can help you migrate all the necessary fields.
- `Ingress` in `extensions/v1beta1` is being phased out. Migrate to `networking.k8s.io/v1beta1` as soon as possible. This new API does not need to update other API fields and therefore only a path change is necessary.
- Custom resource definitions have moved from `apiextensions.k8s.io/v1beta1` to `apiextensions.k8s.io/v1`.

Please also see <https://kubernetes.io/blog/2019/07/18/api-deprecations-in-1-16/>⁷ for more details.

5.5 Bugs Fixed in 4.1.0 since 4.0.3

- bsc#1144065 (https://bugzilla.suse.com/show_bug.cgi?id=1144065) [cri-o] - (CVE-2019-10214 (<https://www.suse.com/security/cve/CVE-2019-10214>)) VUL-0: CVE-2019-10214: libcontainers-common: library does not enforce TLS connections
- bsc#1118898 (https://bugzilla.suse.com/show_bug.cgi?id=1118898) [cri-o] - (CVE-2018-16874 (<https://www.suse.com/security/cve/CVE-2018-16874>)) VUL-0: CVE-2018-16874: go: cmd/go: directory traversal
- bsc#1100838 (https://bugzilla.suse.com/show_bug.cgi?id=1100838) [cri-o] - cri-o does not block /proc/acpi pathnames (i.e., also affected by (CVE-2018-10892 (<https://www.suse.com/security/cve/CVE-2018-10892>)))
- bsc#1118897 (https://bugzilla.suse.com/show_bug.cgi?id=1118897) [etcd] - (CVE-2018-16873 (<https://www.suse.com/security/cve/CVE-2018-16873>)) VUL-0: CVE-2018-16873: go: cmd/go: remote command execution
- bsc#1118899 (https://bugzilla.suse.com/show_bug.cgi?id=1118899) [etcd] - (CVE-2018-16875 (<https://www.suse.com/security/cve/CVE-2018-16875>)) VUL-0: CVE-2018-16875: go: crypto/x509: CPU denial of service
- bsc#1156646 (https://bugzilla.suse.com/show_bug.cgi?id=1156646) [helm] - (CVE-2019-18658 (<https://www.suse.com/security/cve/CVE-2019-18658>)) VUL-0: CVE-2019-18658: helm: commands that deal with loading a chart as a directory or packaging a chart provide an opportunity for a maliciously designed chart to include sensitive content such as /etc/passwd
- bsc#1152861 (https://bugzilla.suse.com/show_bug.cgi?id=1152861) [kubernetes] - (CVE-2019-11253 (<https://www.suse.com/security/cve/CVE-2019-11253>)) VUL-0: CVE-2019-11253: kubernetes: YAML parsing vulnerable to "Billion Laughs" attack, allowing for remote denial of service
- bsc#1146991 (https://bugzilla.suse.com/show_bug.cgi?id=1146991) [kubernetes] - BPF filesystem is not mounted, possible downtime when cilium pods are restarted
- bsc#1147142 (https://bugzilla.suse.com/show_bug.cgi?id=1147142) [kubernetes] - Update golang/x/net dependency to bring in fixes for (CVE-2019-9512 (<https://www.suse.com/security/cve/CVE-2019-9512>)), (CVE-2019-9514 (<https://www.suse.com/security/cve/CVE-2019-9514>))

- [bsc#1143813 \(https://bugzilla.suse.com/show_bug.cgi?id=1143813\)](https://bugzilla.suse.com/show_bug.cgi?id=1143813) [kubernetes] - kubelet sometimes starting too fast
- [bsc#1143813 \(https://bugzilla.suse.com/show_bug.cgi?id=1143813\)](https://bugzilla.suse.com/show_bug.cgi?id=1143813) [skuba] - CaaSP SSL / PKI / CA Infrastructure unclear and probably inconsistent and wrong?
- [bsc#1152335 \(https://bugzilla.suse.com/show_bug.cgi?id=1152335\)](https://bugzilla.suse.com/show_bug.cgi?id=1152335) [supportutils-plugin-suse-caasp] - supportconfig adjustments for CaaSP v4 missing

5.6 Documentation Updates

- Switched examples to use SUSE supported helm, Prometheus, nginx-ingress and Grafana charts and images
- Added instructions on how to replace Kubernetes certificates with custom CA certificate (https://documentation.suse.com/suse-caasp/4.2/caasp-admin/single-html/_security.html#_deployment_with_a_custom_ca_certificate)
- Added instructions to configure custom certificates for gangway and dex (https://documentation.suse.com/suse-caasp/4.2/caasp-admin/single-html/_security.html#_replace_server_certificate_signed_by_a_trusted_ca_certificate)
- Added instructions for secured Tiller deployment (https://documentation.suse.com/suse-caasp/4.2/caasp-admin/single-html/_software_management.html#_installing_tiller)
- Added notes about unique machine-id requirement (<https://documentation.suse.com/suse-caasp/4.2/caasp-deployment/single-html/#machine-id>)
- Added timezone configuration example for AutoYaST (https://documentation.suse.com/suse-caasp/4.2/caasp-deployment/single-html/#_autoyast_preparation)
- Various minor bugfixes and improvements (<https://github.com/SUSE/doc-caasp/pulls?q=is%3Apr+is%3Aclosed+sort%3Aupdated-desc>)

5.7 Known Issues

5.7.1 Skuba-upgrade could not parse "Unknown" as version

Running "skuba node upgrade plan" might fail with the error "could not parse "Unknown" as version" when a worker, after running "skuba node upgrade apply", had not fully started yet.

If you are running into this issue, please add some delay after running "skuba node upgrade apply" and prior to running "skuba node upgrade plan".

This is tracked in [bsc#1159452](https://bugzilla.suse.com/show_bug.cgi?id=1159452) (https://bugzilla.suse.com/show_bug.cgi?id=1159452) ↗

6 Changes in 4.0.3

- Prometheus and Grafana: official monitoring solution for SUSE CaaS Platform
- Airgap: format change of <https://documentation.suse.com/external-tree/en-us/suse-caasp/4/skuba-cluster-images.txt> ↗
- 389-ds fixes (see below)
- skuba fixes (see below)

6.1 Prometheus and Grafana: official monitoring solution for SUSE CaaS Platform

Prometheus and Grafana were already documented (https://documentation.suse.com/suse-caasp/4.0/html/caasp-admin/_monitoring.html#_monitoring_stack) ↗ but based on upstream helm charts and containers.

In version 4.2.0, official SUSE helm carts and containers are now available in the helm chart repository (kubernetes-charts.suse.com) and the container registry (registry.suse.com).

6.2 Airgap: Format Change

The format of <https://documentation.suse.com/external-tree/en-us/suse-caasp/4/skuba-cluster-images.txt> was changed to be able to express more data. Specifically to add skuba and SUSE CaaS Platform versions, so that one can match the images that should be pulled with the respective version.

This way, you can run air gapped production and staging clusters with different SUSE CaaS Platform versions.

6.3 Required Actions

6.3.1 Skuba Update Instructions

Update skuba on your management workstation as you would do with any other package.

Refer to: [SUSE Linux Enterprise Server 15 SP1 Admin Guide: Updating Software with Zypper](https://documentation.suse.com/sles/15-SP1/single-html/SLES-admin/#sec-zypper-softup) (<https://documentation.suse.com/sles/15-SP1/single-html/SLES-admin/#sec-zypper-softup>)

6.3.2 Prometheus and Grafana Installation Instructions

You will need to use `helm` and `kubectl` to deploy Prometheus and Grafana. Refer to: [Monitoring chapter in the SUSE CaaS Platform admin guide](https://documentation.suse.com/suse-caasp/4.0/html/caasp-admin/_monitoring.html#_monitoring_stack) (https://documentation.suse.com/suse-caasp/4.0/html/caasp-admin/_monitoring.html#_monitoring_stack)

6.3.3 389-ds Update Instructions

`389-ds` containers have been updated in registry.suse.com (see Bugs fixed below). In order to deploy your `389-ds` container, see [Configuring and external ldap server at the SUSE CaaS Platform admin guide](https://susedoc.github.io/doc-caasp/master/caasp-admin/single-html/#_configuring_an_external_ldap_server) (https://susedoc.github.io/doc-caasp/master/caasp-admin/single-html/#_configuring_an_external_ldap_server)

6.4 Documentation Changes

- Updated monitoring documentation in the admin guide to reflect official charts/containers for monitoring stack (https://documentation.suse.com/suse-caasp/4.0/single-html/caasp-admin/#_monitoring_stack) ↗
- Added/Updated information about 389-ds deployment and configuration (https://documentation.suse.com/suse-caasp/4.0/single-html/caasp-admin#_deploying_an_external_389_directory_server) ↗
- Added information about subnet sizing to deployment guide system requirements (https://documentation.suse.com/suse-caasp/4.0/single-html/caasp-deployment/#_networking) ↗
- Added information on using a cluster wide root CA to admin guide (https://documentation.suse.com/suse-caasp/4.0/single-html/caasp-admin/#_deployment_with_a_custom_ca_certificate) ↗
- Add note about NTP client requirement for management workstation (https://documentation.suse.com/suse-caasp/4.0/single-html/caasp-deployment/#_management_workstation) ↗
- Added less aggressive nginx timeout values to examples (https://documentation.suse.com/suse-caasp/4.0/single-html/caasp-deployment/#_configuring_the_load_balancer) ↗
- Unified use of placeholders in code examples to <PLACEHOLDER> format
- Various minor formatting and wording fixes

6.5 Bugs Fixed in 4.0.3 since 4.0.2

- bsc#1156667 (https://bugzilla.suse.com/show_bug.cgi?id=1156667) ↗ [Prometheus and Grafana] - User "system:serviceaccount:monitoring:prometheus-kube-state-metrics" cannot list resource
- bsc#1140533 (https://bugzilla.suse.com/show_bug.cgi?id=1140533) ↗ [Prometheus and Grafana] - Prometheus and grafana images and helm charts on registry.suse.com
- bsc#1155173 (https://bugzilla.suse.com/show_bug.cgi?id=1155173) ↗ [skuba] - skuba node upgrade does not really upgrade node successfully

- [bsc#1151689](https://bugzilla.suse.com/show_bug.cgi?id=1151689) [skuba] - Default verbosity hides most errors
- [bsc#1151340](https://bugzilla.suse.com/show_bug.cgi?id=1151340) [389-ds] - ERR - add_new_slapd_process - Unable to start slapd because it is already running as process 8
- [bsc#1151343](https://bugzilla.suse.com/show_bug.cgi?id=1151343) [389-ds] - The config / etc/dirsrv/slapd-*/dse.ldif can not be accessed. Attempting restore
- [bsc#1151414](https://bugzilla.suse.com/show_bug.cgi?id=1151414) [389-ds] - NOTICE - dblayer_start - Detected Disorderly Shutdown last time Directory Server was running, recovering database.
- [bsc#1157332](https://bugzilla.suse.com/show_bug.cgi?id=1157332) [patterns-caasp] - caasp-release rpm not installed - probably should be included in the patterns?

7 Changes in 4.0.2



Note

Core addons are addons deployed automatically by skuba when you bootstrap a cluster. Namely:

- Cilium
 - Dex
 - Gangway
 - Kured
 - Default Pod Security Policies (PSP's)
- skuba addon command has been introduced to handle core addons




- `skuba addon upgrade plan` will inform about what core addons will be upgraded
- `skuba addon upgrade apply` will upgrade core addons in the current cluster

7.1 Required Actions

- When using `skuba addon upgrade apply`, all settings of all addons will be reverted to the defaults. Make sure to reapply your changes after running `skuba addon upgrade apply`, had you modified the default settings of core addons.

7.2 Bugs fixed in 4.0.2 since 4.0.1

- bsc#1145568 (https://bugzilla.suse.com/show_bug.cgi?id=1145568) [remove-node] failed disarming kubelet due to 63 character limitation
- bsc#1145907 (https://bugzilla.suse.com/show_bug.cgi?id=1145907) LB dies when removing a master node in VMWare
- bsc#1146774 (https://bugzilla.suse.com/show_bug.cgi?id=1146774) AWS: pod to service connectivity broken in certain cases
- bsc#1148090 (https://bugzilla.suse.com/show_bug.cgi?id=1148090) Multinode cluster upgrade fails on 2nd master due to TLS handshake timeout
- bsc#1148412 (https://bugzilla.suse.com/show_bug.cgi?id=1148412) Gangway uses CSS stylesheet from cloudflare.com
- bsc#1148524 (https://bugzilla.suse.com/show_bug.cgi?id=1148524) Allow easy recovery from bootstrap failed during add-ons deployment phase
- bsc#1148700 (https://bugzilla.suse.com/show_bug.cgi?id=1148700) worker node upgrade needs to use kubeletVersion in nodeVersionInfoUpdate type
- bsc#1149637 (https://bugzilla.suse.com/show_bug.cgi?id=1149637) Misspelling of bootstrapping in a common error message
- bsc#1153913 (https://bugzilla.suse.com/show_bug.cgi?id=1153913) Can not bootstrap a new cluster if a valid `kubect1` config is present

- [bsc#1153928](https://bugzilla.suse.com/show_bug.cgi?id=1153928) (https://bugzilla.suse.com/show_bug.cgi?id=1153928)  Reboot can be triggered before skuba-update finishes
- [bsc#1154085](https://bugzilla.suse.com/show_bug.cgi?id=1154085) (https://bugzilla.suse.com/show_bug.cgi?id=1154085)  skuba node upgrade shows component downgrade
- [bsc#1154754](https://bugzilla.suse.com/show_bug.cgi?id=1154754) (https://bugzilla.suse.com/show_bug.cgi?id=1154754)  oauth2: cannot fetch token after 24 hours

8 Changes in 4.0.1

- Updated Gangway container image (see *Section 8.1, “Required Actions”*)
- Added air gap deployment instructions (https://documentation.suse.com/suse-caasp/4/single-html/caasp-deployment/#_airgapped_deployment) 
- Various bug fixes and improvements

8.1 Required Actions

8.1.1 Update the Gangway Image

The gangway image that shipped with SUSE CaaS Platform 4.0 must be updated manually by performing the following step:

```
kubectl set image deployment/oidc-gangway oidc-gangway=registry.suse.com/caasp/v4/gangway:3.1.0-rev4 --namespace kube-system
```

8.2 Known Issues


You must update the gangway container image manually after update (see *Section 8.1, “Required Actions”*).

For a full list of Known Issues refer to: Bugzilla (https://bugzilla.suse.com/buglist.cgi?bug_status=__open__&list_id=12463857&order=Importance&product=SUSE%20CaaS%20Platform%204&query_format=specific) .

8.3 Supported Platforms

This release supports deployment on:

- SUSE OpenStack Cloud 8
- VMWare ESXi 6.7
- KVM
- Bare metal

(SUSE CaaS Platform 4.2.0 supports hardware that is certified for SLES through the YES certification program. You will find a database of certified hardware at <https://www.suse.com/yessearch/>. )

9 Changes in 4.0.0

9.1 What Is New

9.1.1 Base Operating System Is Now SLES 15 SP1

The previous version used a minimal OS image called MicroOS. SUSE CaaS Platform 4 uses standard SLES 15 SP1 as the base platform OS. SUSE CaaS Platform can be installed as an extension on top of that. Because SLES 15 is designed to address both cloud-native and legacy workloads, these changes make it easier for customers who want to modernize their infrastructure by moving existing workloads to a Kubernetes framework.

Transactional updates are available in SLES 15 SP1 as a technical preview but SUSE CaaS Platform 4 will initially ship without the transactional-update mechanism enabled. The regular zypper workflow allows use of interruption-free node reboot. The SLES update process should help customers integrate a Kubernetes platform into their existing operational infrastructure more easily, nevertheless transactional updates are still the preferred process for some customers, which is why we provide both options.

9.1.2 Software Now Shipped as Packages Instead of Disk Image

In the previous version, the deployment of the software was done by downloading and installing a disk image with a pre-baked version of the product. In SUSE CaaS Platform 4, the software is distributed as RPM packages from an extension module in SLES 15 SP1. This adaptation towards containers and SUSE Linux Enterprise Server mainly gives customers more deployment flexibility.

9.1.3 More Containerized Components

We moved more of the components into containers, namely all the control plane components: etcd, kube-apiserver, kube-controller-manager, and kube-scheduler. The only pieces that are now running uncontainerized are CRI-O, kubelet and kubeadm.

9.1.4 New Deployment Methods

We are using a combination of skuba (custom wrapper around kubeadm) and HashiCorp Terraform to deploy SUSE CaaS Platform machines and clusters. We provide Terraform state examples that you can modify to roll out clusters.

Deployment on bare metal using AutoYaST has now also been tested and documented: https://documentation.suse.com/suse-caasp/4/single-html/caasp-deployment/#deployment_bare_metal ↗



Note

You must deploy a load balancer manually. This is currently not possible using Terraform. Find example load balancer configurations based on SUSE Linux Enterprise 15 SP1 and Nginx or HAProxy in the *SUSE CaaS Platform Deployment Guide*: https://documentation.suse.com/suse-caasp/4/single-html/caasp-deployment/#_load_balancer ↗

9.1.5 Updates Using Kured

Updates are implemented with skuba-update, that makes use of the kured tool and the SLE package manager. This is implemented in the skuba-update tool which glues zypper and the kured tool (<https://github.com/weaveworks/kured> ↗). Kured (KUBernetes REboot Daemon) is a

Kubernetes daemonset that performs safe automatic node reboots when the need to do so is indicated by the package management system of the underlying OS. Automatic updates can be manually disabled and configured: https://documentation.suse.com/suse-caasp/4/single-html/caasp-admin/#_cluster_updates ↗

9.1.6 Automatic Installation of Packages For Storage Backends Discontinued

In previous versions SUSE CaaS Platform would ship with packages to support all available storage backends. This negated the minimal install size approach and is discontinued. If you require a specific software package for your storage backend please install it using AutoYaST, Terraform or zypper. Refer to: https://documentation.suse.com/suse-caasp/4/single-html/caasp-admin/#_software_management ↗

9.1.7 Changes to the Kubernetes Stack

9.1.7.1 Updated Kubernetes

SUSE CaaS Platform 4.2.0 ships with Kubernetes 1.17.4.

Kubernetes version 1.16 contains the following notable changes:

- Custom Resources Definitions (CRD) are out of the beta version and are generally available in the apiextensions.k8s.io/v1 group.
- IPv4/IPv6 dual stack is officially in alpha. Read up about the details of the new features of Kubernetes 1.16 here: <https://kubernetes.io/blog/2019/09/18/kubernetes-1-16-release-announcement/> ↗.

Kubernetes version 1.15 mainly contains enhancements to core Kubernetes APIs:

- CustomResourceDefinitions Pruning, -Defaulting and -OpenAPI Publishing.
- cluster life cycle stability and usability has been enhanced (kubeadm init and kubeadm join can now be used to configure and deploy an HA control plane)
- new functionality of the Container Storage Interface (volume cloning) is available. Read up about the details of the new features of Kubernetes 1.15 here: <https://github.com/kubernetes/kubernetes/blob/master/CHANGELOG-1.15.md#115-whats-new> ↗

9.1.7.2 CRI-O Replaces Docker

SUSE CaaS Platform now uses CRI-O 1.16.1 as the default container runtime. CRI-O is a container runtime interface based on the OCI standard technology. The choice of CRI-O allows us to pursue our open-source agenda better than competing technologies.

CRI-O's simplified architecture is tailored explicitly for Kubernetes and has a reduced footprint but also guarantees full compatibility with existing customer images thanks to its adherence to OCI standards. Other than Docker, CRI-O allows to update the container runtime without stopping workloads; providing improved flexibility and maintainability to all SUSE CaaS Platform users.

We will strive to maintain SUSE CaaS Platform's compatibility with the Docker Engine in the future.

9.1.7.3 Cilium Replaces Flannel

SUSE CaaS Platform now uses Cilium 1.5.3 as the Container Networking Interface enabling networking policy support.

9.1.7.4 Centralized Logging

The deployment of a Centralized Logging node is now supported for the purpose of aggregating logs from all the nodes in the Kubernetes cluster. Centralized Logging forwards system and Kubernetes cluster logs to a specified external logging service, specifically the Rsyslog server, using Kubernetes Metadata Module - mmkubernetes.

9.1.8 Obsolete Components

9.1.8.1 Salt

Orchestration of the cluster no longer relies on Salt. Orchestration is instead achieved with kubeadm and skuba.

9.1.8.2 Admin Node / Velum

The admin node is no longer necessary. The cluster will now be controlled by the master nodes and through API with `skuba` on any SUSE Linux Enterprise system, such as a local workstation. This also means the Velum dashboard is no longer available.

9.2 Known Issues

9.2.1 Updating to SUSE CaaS Platform 4

In-place upgrades from earlier versions or from Beta 4 version to the generally available release is not supported. We recommend standing up a new cluster and redeploying workloads. For customers with production servers that cannot be redeployed, contact SUSE Consulting Services or your account team for further information.

9.2.2 Parallel Deployment

To avoid fails, avoid parallel deployment of nodes. Joining master or worker nodes to an existing cluster should be done serially, meaning the nodes have to be added separately one after another. This issue will be fixed in the next release.

10 Support and Life Cycle

SUSE CaaS Platform is backed by award-winning support from SUSE, an established technology leader with a proven history of delivering enterprise-quality support services.

SUSE CaaS Platform 4 has a two-year life cycle. Each version will receive updates while it is current, and will be subject to critical updates for the remainder of its life cycle.

For more information, check our Support Policy page <https://www.suse.com/support/policy.html>.

11 Support Statement for SUSE CaaS Platform

To receive support, you need an appropriate subscription with SUSE. For more information, see https://www.suse.com/support/programs/subscriptions/?id=SUSE_CaaS_Platform.

The following definitions apply:

L1

Problem determination, which means technical support designed to provide compatibility information, usage support, ongoing maintenance, information gathering and basic troubleshooting using available documentation.

L2

Problem isolation, which means technical support designed to analyze data, reproduce customer problems, isolate problem area and provide a resolution for problems not resolved by Level 1 or prepare for Level 3.

L3

Problem resolution, which means technical support designed to resolve problems by engaging engineering to resolve product defects which have been identified by Level 2 Support.

For contracted customers and partners, SUSE CaaS Platform 4 is delivered with L3 support for all packages, except for the following:

- Technology Previews
- Packages that require an additional customer contract
- Packages with names ending in `-devel` (containing header files and similar developer resources) will only be supported together with their main packages.

SUSE will only support the usage of original packages. That is, packages that are unchanged and not recompiled.

12 Documentation and Other Information

12.1 Available on the Product Media

Get the detailed change log information about a particular package from the RPM (where `FILENAME.rpm` is the name of the RPM):

```
rpm --changelog -qp FILENAME.rpm
```

12.2 Externally Provided Documentation

For the most up-to-date version of the documentation for SUSE CaaS Platform 4, see <https://documentation.suse.com/#suse-caasp> ↗

Find a collection of resources in the SUSE CaaS Platform Resource Library: <https://www.suse.com/products/caas-platform/#resources> ↗

13 Obtaining Source Code

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