

ASK THE EXPERT

Can I Deploy SAS® Viya® On-Premises Using Red Hat OpenShift Container Platform?

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AGENDA

01



Why SAS Viya
on Red Hat OCP

02



Technical Insights

03



Deployment
Demo

04



Resources

05



Q&A

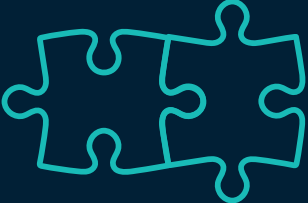
SAS Viya on Kubernetes

The SAS Analytics platform
reloaded

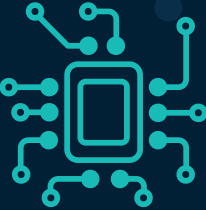


SAS® Viya in a Nutshell

It's a platform for integrating analytics, data management and dashboarding



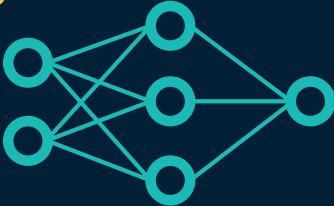
At its core there's a computation engine for distributed in-memory analytics



It contains state-of-the-art machine learning algorithms ...



... and deep learning algorithms as well



It offers a unified user experience



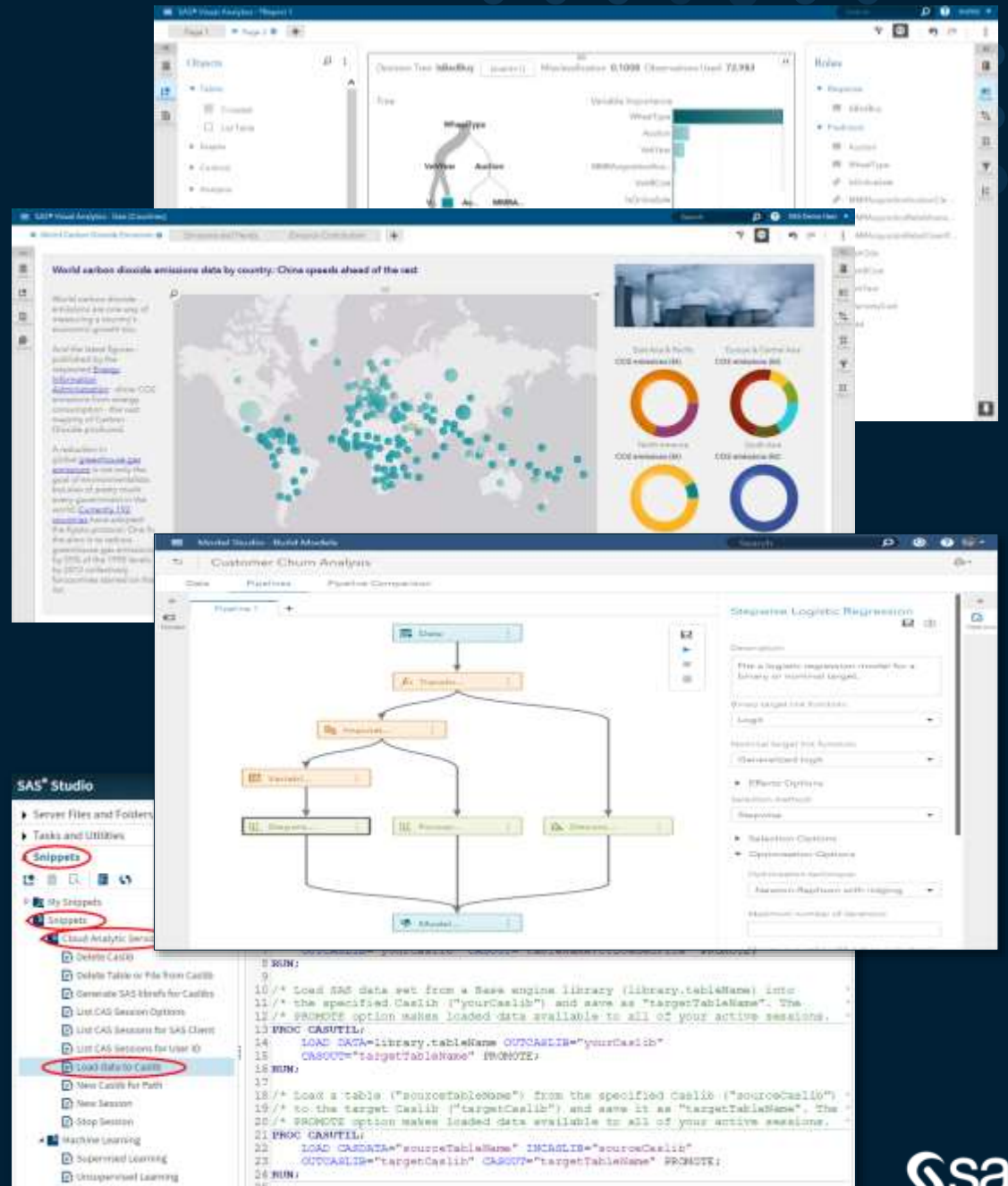
It's open (for integration with other languages and tools)



And it offers an end-to-end approach for analytics, allowing a short time to market

User Interfaces in SAS Viya

- SAS Viya offers a complete set of web-based user interfaces for
 - Data Preparation
 - Reporting & Data Discovery
 - Data Mining & Machine Learning workflows, decisioning and programming
 - System Administration



How is SAS Viya different to previous SAS releases?

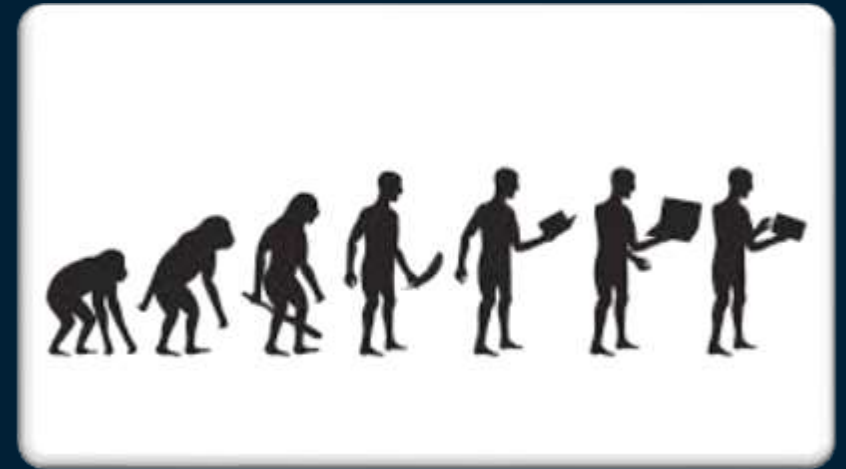
Architectural and operational changes

- Requires Kubernetes as SAS infrastructure
- Fully cloud-native
 - Provided as a collection of container images and deployment manifests (microservices and stateful services)
 - Integrates into the Kubernetes ecosystem
 - E.g. use native Kubernetes facilities for monitoring and logging (Grafana, Kibana)
 - E.g. leverage native Kubernetes capabilities for scaling in / scaling out
 - E.g. leverage CI/CD tools (Red Hat GitOps)
 - Extensively uses 3rd party and self-written Kubernetes operators for managing components

SAS® Viya in a Nutshell

Supported Kubernetes distributions (as of 05.2022)

- Public cloud (managed Kubernetes services)
 - Azure Cloud (AKS)
 - Amazon Web Services (EKS)
 - Google Cloud Platform
- Private cloud / on premise
 - Red Hat OpenShift Container Platform on VMWare (4.8, 4.9, 4.10)
- Open source Kubernetes



Red Hat OpenShift Container Platform

Overview



OpenShift Container Platform (OCP) is Kubernetes plus **enterprise-ready enhancements**:

- **Hybrid cloud** deployments.
 - Deploy OCP clusters to variety of cloud platforms or on-prem in the data center.
- Integrated **Red Hat** technology.
 - Major components from Red Hat Enterprise Linux (RHEL) and related technologies.
 - Intense testing and certification by Red Hat.
- **Commercial** product with **open-source** development model.
 - Source code is available from public software repositories.
- Platform management **tools** and **processes**.
 - Kubernetes does not specify or manage platform-level requirements or deployment processes.

SAS Viya on the Red Hat OpenShift Container Platform

- OpenShift – a very appealing choice in highly regulated and safety-conscious industries where SAS has a strong footprint
 - E.g. banking, insurance, pharmaceuticals ...
- An exclusive option for running SAS Viya on enterprise-grade infrastructure when cloud is not an option

SAS Viya on the Red Hat OpenShift Container Platform

Technical Insights



SAS® Viya in a Nutshell

Different types of workload

Stateless apps

- Majority of services
- Microservices (12-factor-apps)
- Also includes Web applications

Stateful commodity services

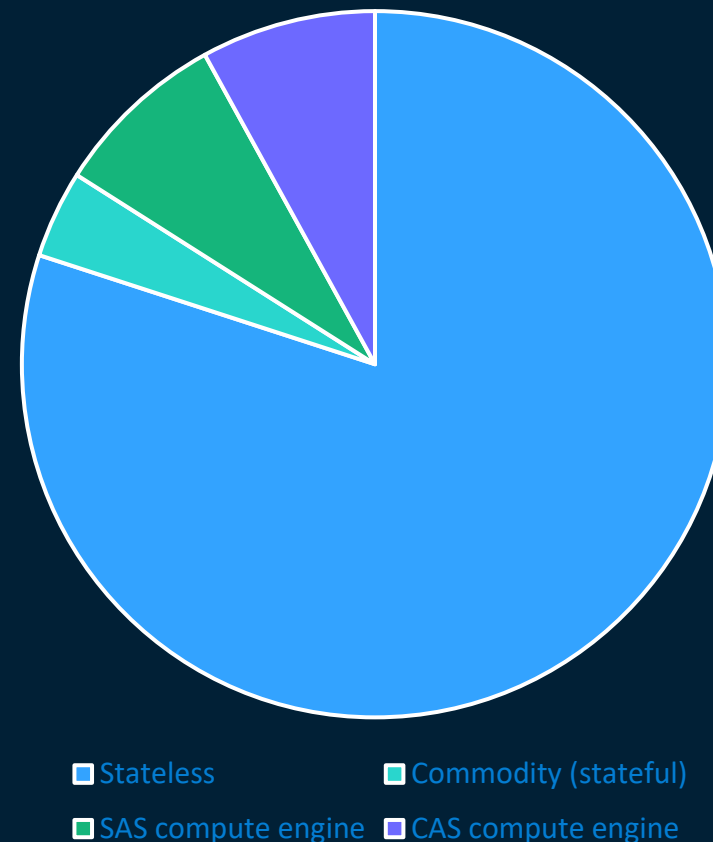
- Metadata stores for Viya
- Message Queue for pod-to-pod communication
- Consul, PostGRES, RabbitMQ, OpenDistro

SAS compute engine

- SAS 9.x kernel, used for traditional SAS computing
- Sessions launched as individual pods, owned by user

CAS compute engine

- Distributed in-memory computing engine for analytical workloads
- Each “worker node” is a separate pod



 **SAS Microservices & Web Apps**

Service A₁ Service B₁ Service C₁

Service A₂ Service B₂ Service C₂


Web App Web App

 **SAS Compute Services**

SAS Compute SAS Compute SAS Compute

Commodity Services

Postgres Consul RabbitMQ

 **SAS Cloud Analytic Services**


CAS Controller


CAS Worker CAS Worker CAS Worker


CAS Worker CAS Worker CAS Worker


 OpenShift Routes


Monitoring & Logging

 Prometheus


 Grafana


 kibana

 fluentbit

 elastic

Automation

 OPERATOR LIFECYCLE MANAGER

 **kubernetes**

 **Red Hat GitOps**  **Red Hat Pipelines** **RED HAT CODEREADY** **Developer Tools**

 **Red Hat** Enterprise Linux
CoreOS

 podman  skopeo  buildah  cri-o



Deploying SAS Viya on Red Hat OpenShift

Security considerations

SAS Viya security requirements for deployment

- Namespace-admin account as default but elevated privileges needed for deploying Viya
- Support from OpenShift admins needed during deployment
- Using the SAS Deployment Operator as a more sustainable approach



SAS Viya security requirements during runtime

- Default security designed for microservices but some components need more privileges (SAS, CAS, Crunchy Data, OpenDistro)
- Might not comply with existing security policies (concerns about potential impact for other projects on the same cluster)
 - Dedicated cluster as an alternative?

Deploying SAS Viya on Red Hat OpenShift

SAS Viya security requirements for deployment

- SAS Viya uses Kubernetes operators for some components
 - Requires some privileges not granted to a „namespace admin“, e.g.
 - Creating custom API groups and custom resources (CRD)
 - Requiring limited permissions to access OCP API groups
- Single build manifest (YAML file) used for deployment
 - Label selectors used to identify resources requiring cluster-admin privileges

```
# deploy resources requiring cluster-admin privileges
$ kubectl apply --selector="sas.com/admin-level=cluster-wide" -f site.yaml

# deploy namespaced resources (e.g. with "admin" or "edit" cluster role)
$ kubectl apply --selector="!sas.com/admin-level" -f site.yaml
```

SAS Viya Container Security

Overview

- SAS Viya is designed to comply with the following container security guidance:
 - [NIST SP 800-190 Application Container Security Guide](#)
 - [CIS Docker Benchmark](#)
 - [CIS Kubernetes Benchmark](#)
- SAS Viya includes a limited set of containers that require additional runtime privileges to support specific capabilities
 - On Red Hat OpenShift, these additional privileges are generally enabled through the use of custom "security context constraints" (SCCs)
 - Most SAS Viya pods are deployed using the default restricted SCC, which applies the highest level of security

SAS Viya Custom SCCs on Red Hat OpenShift

Applying Custom SCCs

- Deployment assets contain YAML manifests with all custom SCC definitions
- Prior to Viya deployment:
 - OpenShift administrator needs to submit the desired custom SCC manifests
 - OpenShift administrator needs to attach the SCCs to the service accounts used by SAS Viya
- For example:

```
# deploy SCC for CAS
$ kubectl apply -f ./sas-bases/examples/cas/configure/cas-server-scc.yaml

# assign this SCC to CAS service account
$ oc adm policy add-scc-to-user sas-cas-server system:serviceaccount:sasviya4:sas-cas-server
```

SAS Viya Custom SCCs on Red Hat OpenShift

Optional and non-optional SCCs

SAS Programming Environment

- Uses **anyuid** or **hostmount-anyuid**

Watchdog sidecar

OPTIONAL: Extra security for **LOCKDOWN** mode

- Privileged container
- runAsUser: RunAsAny

MAS with PyMAS via NFS

OPTIONAL: When using the **MAS** service for serving models

- Run as a specific user
- Mount NFS volumes

NOTE: Drops ALL capabilities

CAS without host launch (CASCLLOUDNATIVE)

- Run as a specific user and group
- Mount NFS volumes

- or -

CAS with host launch

- Privilege escalation required
- Allow SETUID, SETGID, CHOWN

OpenDistro (ElasticSearch)

OPTIONAL: Only when using **sas-opendistro-sysctl** init container

- Privilege escalation required
- Privileged container
- runAsUser: RunAsAny

NOTE: Runtime uses restricted SCC

Crunchy Data

- Privilege escalation required
- Run as a specific user

NOTE: Drops KILL, MKNOD, SETUID, SETGID capabilities

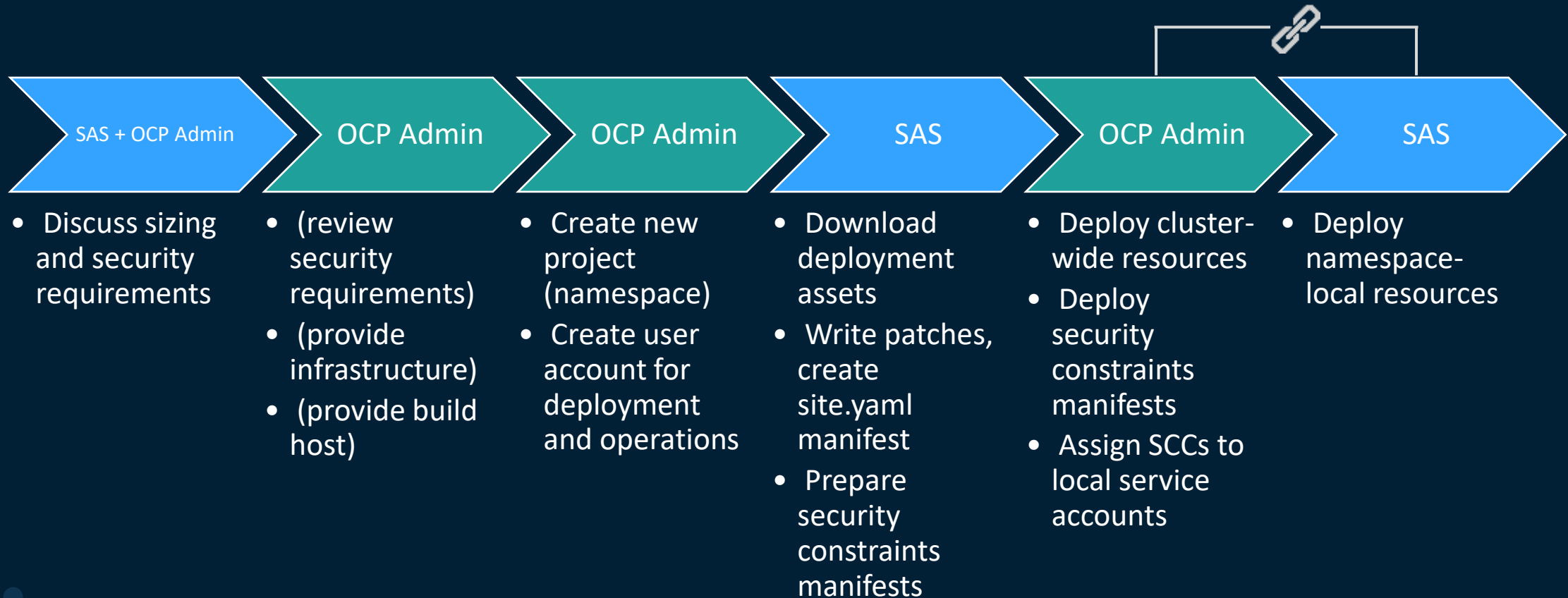
Model Manager

OPTIONAL: When publishing model containers using **Kaniko**

- Uses **anyuid** SCC

Deploying SAS Viya on Red Hat OpenShift

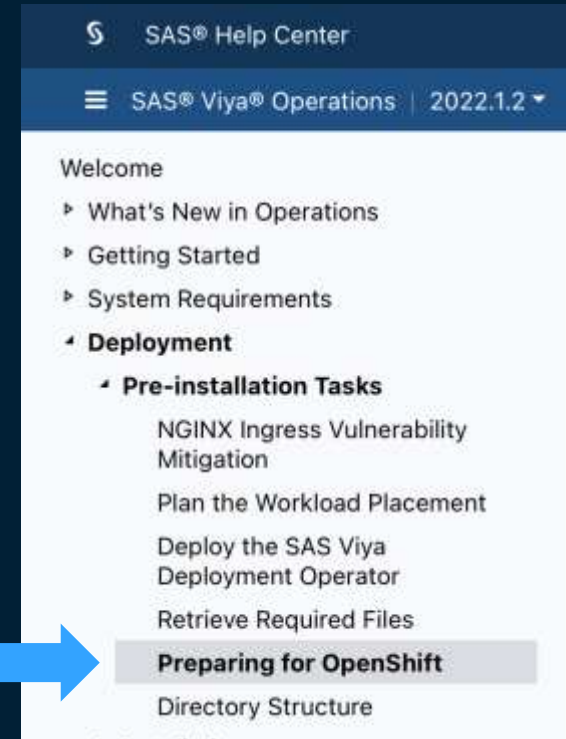
A “typical” workflow (simplified)



Deploying SAS Viya on OpenShift

How to get started?

- Check the SAS Viya Operations Guide for
 - System Requirements
 - Sizing recommendations
 - Common customizations
- https://go.documentation.sas.com/doc/en/itopscdc/v_029/itopswlcm/home.htm



Deployment Demo

Deploying SAS Viya on Red Hat OpenShift using GitOps



SAS Deployment Operator

What is it – how it works

Operators are *software extensions* to Kubernetes that make use of *custom resources* to manage applications and their components. (...) The Operator pattern aims to capture the key aim of a human operator who is *managing a service or set of services*.

<https://kubernetes.io/docs/concepts/extend-kubernetes/operator/>

- Simply put: operators are pods that look after other pods
- The aim of the SAS Deployment Operator is to **automate the lifecycle of a SAS Viya deployment**: deploy, re-deploy, update ...
- **Recommended approach** for deploying SAS Viya since 2020.1.4 (March 2021)
 - Manual approach still available as an alternative

SAS Deployment Operator

What is it – how it works

- Uses a **custom resource** (CR) called “**SASDeployment**” as input
 - Think of a “config file” that tells the operator what it should do
 - Contains all information needed for the deployment, e.g. the cadence to deploy, the license, the location where to find the YAML manifests ...
- The CR can either **link** to the Viya deployment manifests (remote URL) or **include** these as part of the object
 - Retrieving the Viya deployment manifests from a **Git repository** is an obvious choice
- Create the CR manifest using the **sas-orchestration** utility
 - Docker image, executed on build host (“docker run”)

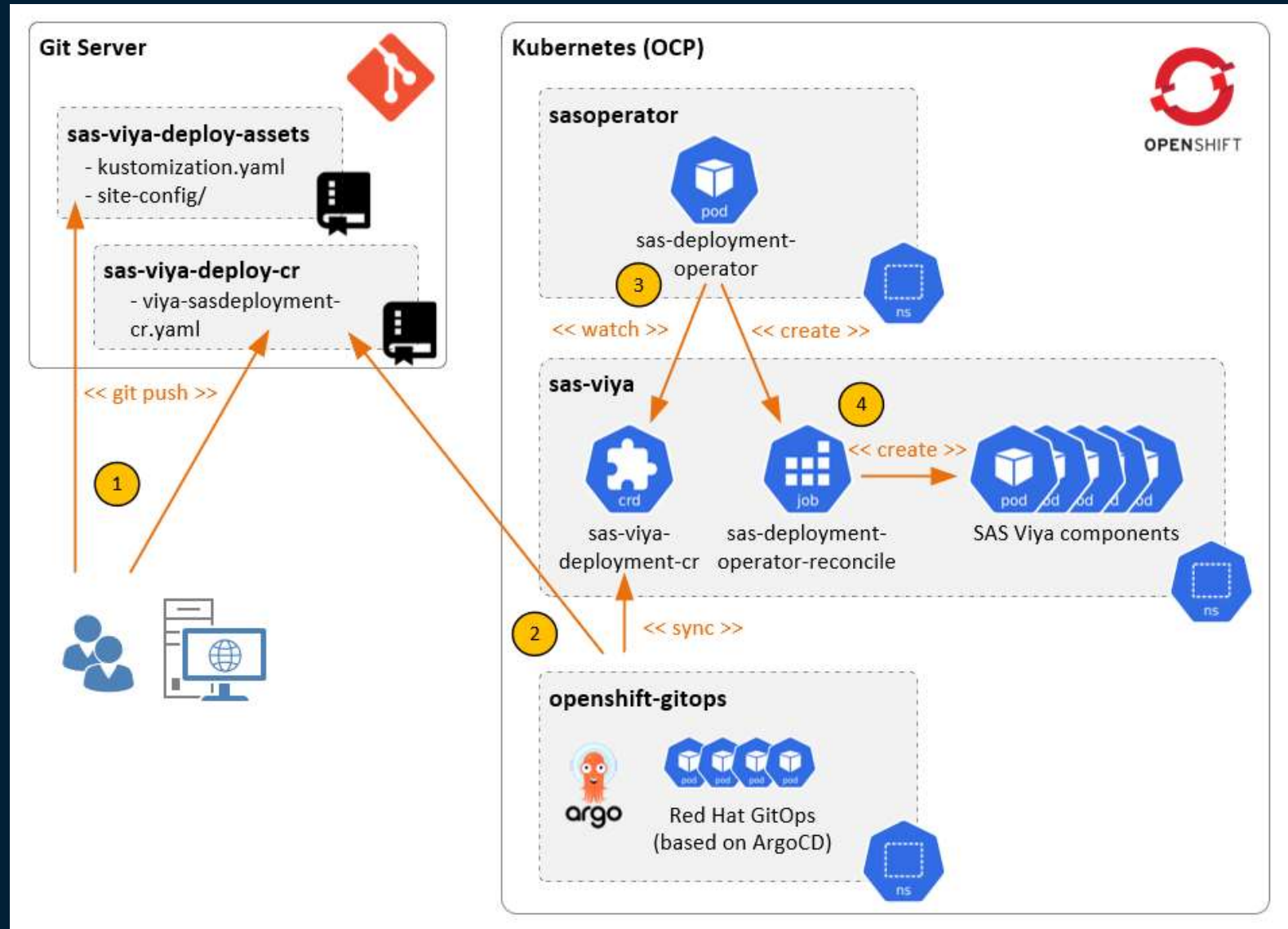
Setting the scene

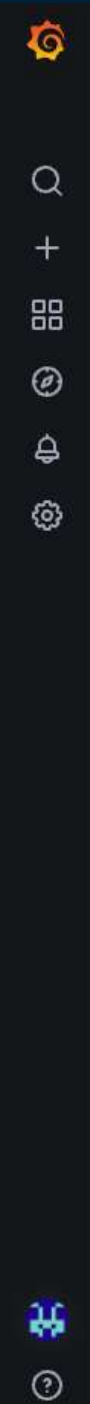
Red Hat OpenShift GitOps

- Integrated add-on of OpenShift
- Easy to install using the built-in OperatorHub
- Used for automating continuous delivery (CD) tasks
- Based on the open-source tool ArgoCD

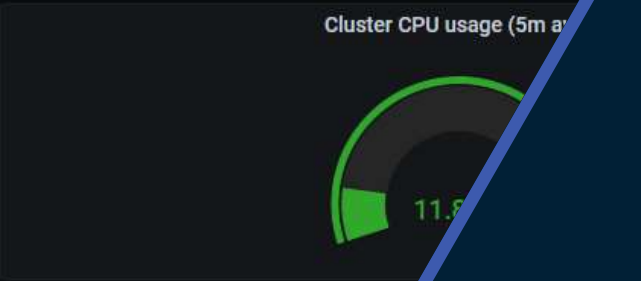
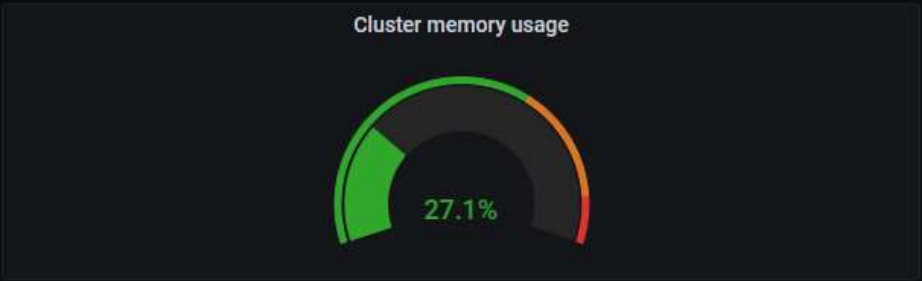
SAS Deployment Operator

Red Hat OpenShift GitOps

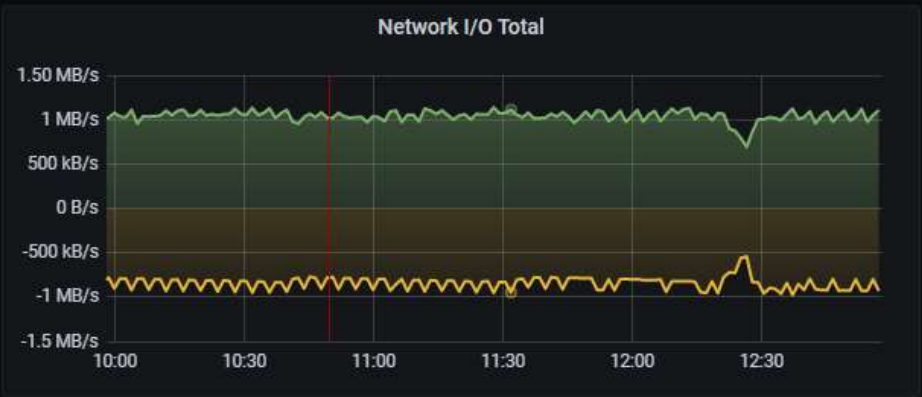




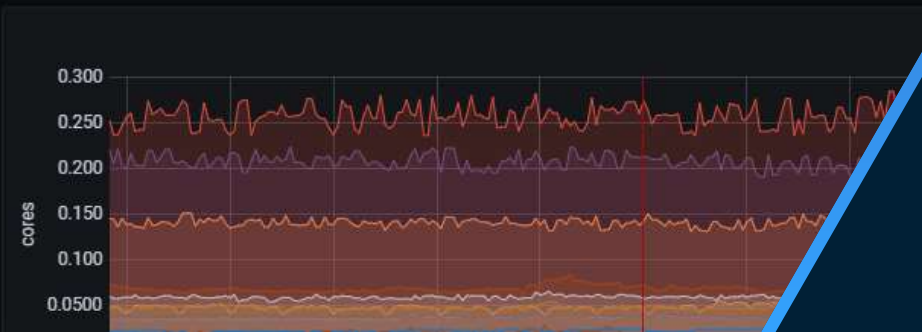
Cluster Total



Selection Total



Pods CPU usage



Demo:

Deploying SAS Viya on Red Hat OpenShift using the SAS Deployment Operator and Red Hat Openshift GitOps



Not seeing the demo?
Click on the Media Player icon.



Administrator

Home

Overview

Projects

Search

API Explorer

Events

Operators

Workloads

Networking

Storage

Builds

Monitoring

Overview

Cluster

Getting started resources

Set up your cluster

Finish setting up your cluster with recommended configurations.

[Configure alert receivers](#)

[View all steps in documentation](#)

Build with guided documentation

Follow guided documentation to build applications and familiarize yourself with key features.

[Monitor your sample application](#)

[Get started with Quarkus using a Helm Chart](#)

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Explore new admin features

Explore new features and resources within the admin perspective.

[API Explorer](#)

[OperatorHub](#)

[See what's new in OpenShift 4.8](#)

Status

[View alerts](#)

Cluster

Control Plane

Operators

Insights
Not available

Quick connect...

36. OpenShift Bastion Host (Azure)

```
[azureuser@openshift-bastion sasoperator]$
```

- Sessions
- Tools
- Macros
- Scp



- APP DETAILS
- APP DIFF
- SYNC
- SYNC STATUS
- HISTORY AND ROLLBACK
- DELETE
- REFRESH



APP HEALTH ⓘ
Healthy

CURRENT SYNC STATUS ⓘ MORE
Synced To HEAD (76287fb)

Author: SAS User <sas@localhost> -
 Comment: Committed Viya4 deployment CR - STABLE 2...

LAST SYNC RESULT ⓘ MORE
Sync OK To 76287fb

Succeeded 10 minutes ago (Tue Nov 30 2021 19:50:31 GMT+0100)
 Author: SAS User <sas@localhost> -
 Comment: Clean Up Viya4 deployment CR at Tue Nov 30 ...



sas-viya-cr-gitops

2 hours



More resources to take a look at ...

Articles, documentation and more ...

- TRUSTED DECISIONS ON RED HAT OPENSIFT, THE MOST WIDELY DEPLOYED MULTICLOUD PLATFORM
https://www.sas.com/en_us/solutions/cloud/red-hat-openshift.html
- Red Hat and SAS collaborate to bring advanced analytic capabilities to the hybrid cloud
<https://www.redhat.com/en/blog/red-hat-and-sas-collaborate-bring-advanced-analytic-capabilities-hybrid-cloud>
- SAS Viya Operations Guide - 2022.1.2
https://go.documentation.sas.com/doc/en/itopscdc/v_029/itopswlcm/home.htm
- Blog “Deploying SAS Viya using Red Hat OpenShift GitOps”
<https://communities.sas.com/t5/SAS-Communities-Library/Deploying-SAS-Viya-using-Red-Hat-OpenShift-GitOps/ta-p/780616>
- Blog “SAS Viya 4 on OpenShift - old dogs and new tricks”
<https://blogs.sas.com/content/hiddeninsights/2021/10/25/sas-viya-4-on-openshift-old-dogs-and-new-tricks/>



Thank you for your time!

sas.com



Q&A

Please submit your questions using the Q&A icon located in the menu at the bottom of your screen



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Thank you
for joining us for
this SAS webinar

