

SINGLE-NODE OPENSHIFT (SNO)

Objectives

- Single Node OpenShift
- Differences from HA OpenShift
- Installation Requirements and Process

Single Node OpenShift

- Cloud Native development and deployment are increasingly being adopted in the context of edge computing.
- Edge workloads and use cases cover lots of locations, requirements, restrictions and footprints
- Admins want to keep a consistent deployment and management solution across edge and datacentre locations.



Single Node OpenShift

- This means there are contexts in which a full OpenShift cluster is desired on a single node
 - Limited space, power, cooling
- Until OpenShift 4.9 a cluster had to have at least 3 nodes.
- Now SNO deploys both the control plane and worker node capabilities on a single node.
 - Small footprint, minimal to no dependence on a centralized management cluster.

Differences from High Availability Cluster Profile

- Many Operators are configured to reduce their footprint when running on SNO
- In environments requiring high availability, you need to have a failover plan.
 - Transition workloads to other sites or nodes while the impacted node is recovered.

Example: 5G mobile network

- In a 5G mobile network the 5G Distributed Units (DUs) need to be deployed very close to the Radio Units (RUs) for which they are responsible to reduce latency issues.
- In practice:
 - DUs could be run anywhere from the base of a cell tower to a more datacentre like environment serving several RUs.



<https://www.redhat.com/en/blog/meet-single-node-openshift-our-smallest-openshift-footprint-edge-architectures>

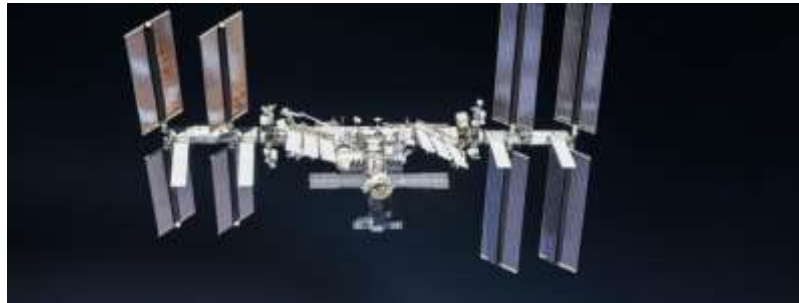
Example: 5G mobile network

- DUs are resource-intensive workloads
 - 6 dedicated cores per DU
 - 16-24 GB of RAM per DU (consumed as huge pages)
 - Multiple single rout I/O virtualization NICs
 - FPGA or GPU acceleration cards carrying several Gbps or traffic each.
- The workload needs to be autonomous so it can continue operating with its existing configuration even when any centralized management functionality is unavailable.

<https://www.redhat.com/en/blog/meet-single-node-openshift-our-smallest-openshift-footprint-edge-architectures>

Example: DNA Analysis on the ISS

- A second example is the ultimate edge computing location: space.
- The ISS has a SNO that does DNA sequencing onsite
 - Monitoring astronaut health
 - Discovering possible infections on the ISS



<https://www.somagnews.com/nasa-to-do-dna-analysis-directly-from-iss-with-ibm-edge-computing/>

Installing a SNO

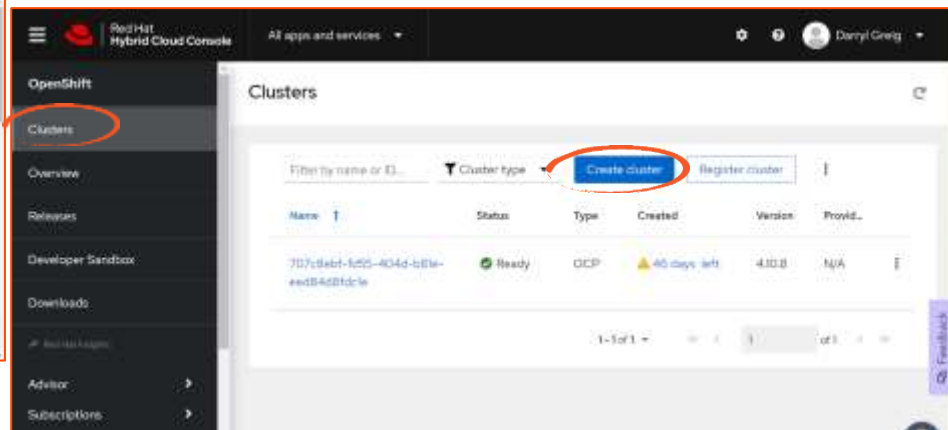
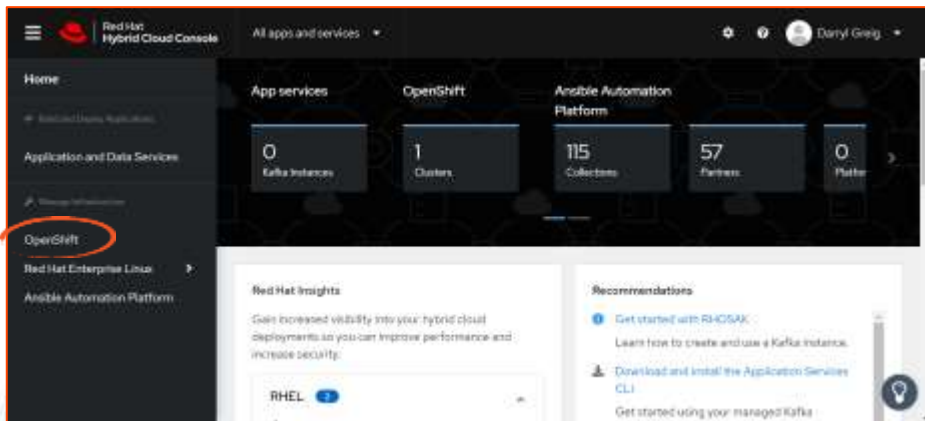
- The current set of tools are designed for installing on physical servers
 - SNO doesn't make much sense for virtual servers, although you can do it for a VM.
- We can at least track through the steps here (there is no supported install method for AWS available just yet).

SNO Requirements

- CPU: 8 cores (or 4 cores with hyperthreading enabled)
 - If you want to install with virtualization you need 12 cores
- RAM: 32 GB
- HDD: 120 GB
- Internet access

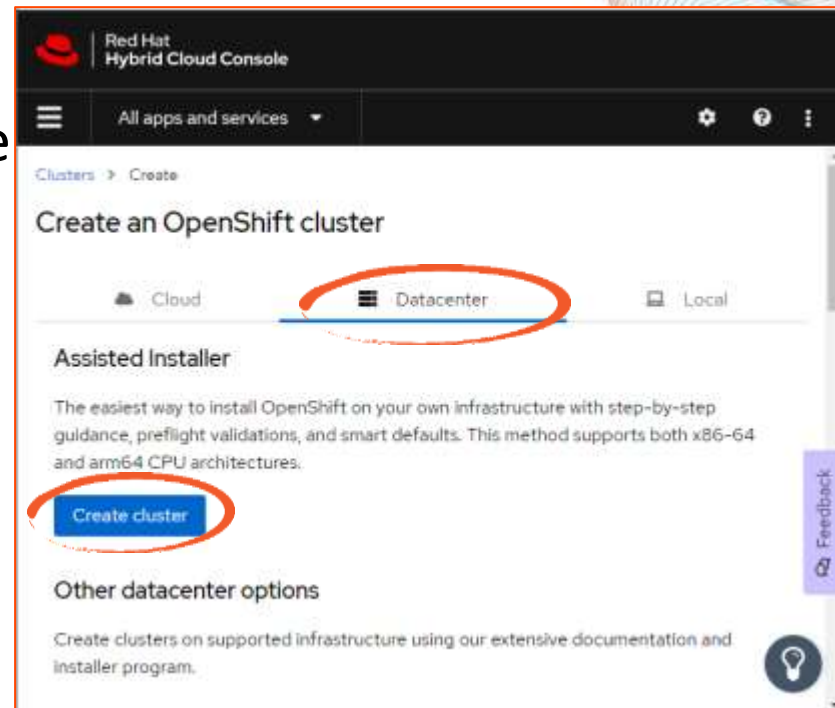
SNO Install

- Log on at <https://console.redhat.com> with your Red Hat account.



SNO Install

- Select the **Datacenter** tab
- Click on **Create Cluster** under the **Assisted Installer** section.



SNO Install: Cluster Details

- You need to enter a cluster name and a cluster base domain (which you need to have access privileges to).
- Then click the Install single node OpenShift (SNO) checkbox.

Red Hat Hybrid Cloud Console | All apps and services | Darryl Greig

Clusters > Assisted Clusters > New cluster

Install OpenShift with the Assisted Installer

1 Cluster details

Cluster details

Cluster name *

sno-example

Base domain *

openshift.conygre.com

All DNS records must be subdomains of this base and include the cluster name. This cannot be changed after cluster installation. The full cluster address will be: `sno-example.openshift.conygre.com`

OpenShift version *

OpenShift 4.10.11

☒ Install single node OpenShift (SNO)

SNO enables you to install OpenShift using only one host.

Limitations for using Single Node OpenShift

- Installing SNO will result in a non-highly available OpenShift deployment.
- Adding additional machines to your cluster is currently out of scope.

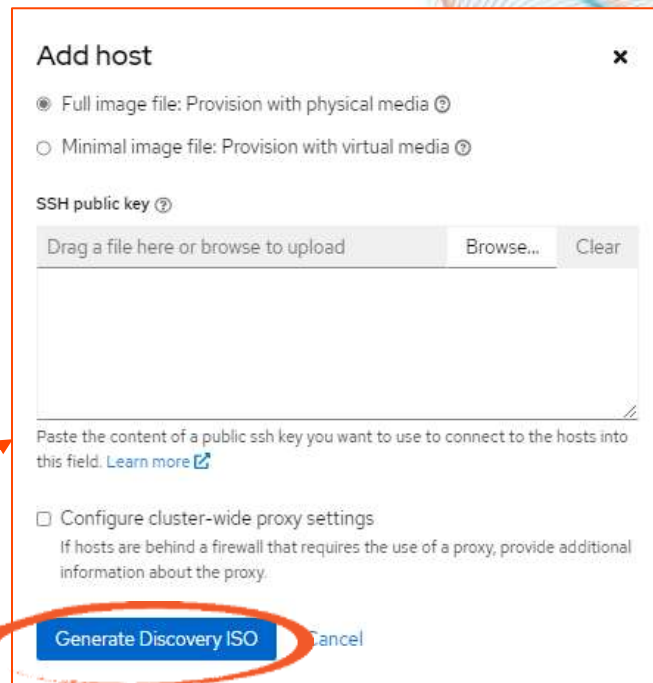
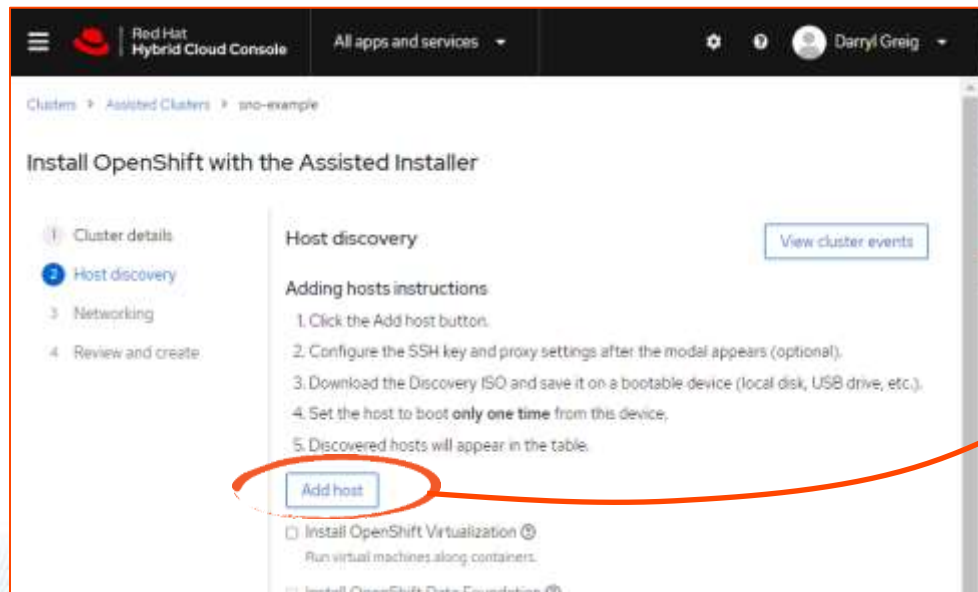
☐ Use arm64 CPU architecture ⓘ
Make sure all the hosts are using arm64 CPU architecture.

☐ Edit pull secret ⓘ

☐ Enable encryption of installation disk

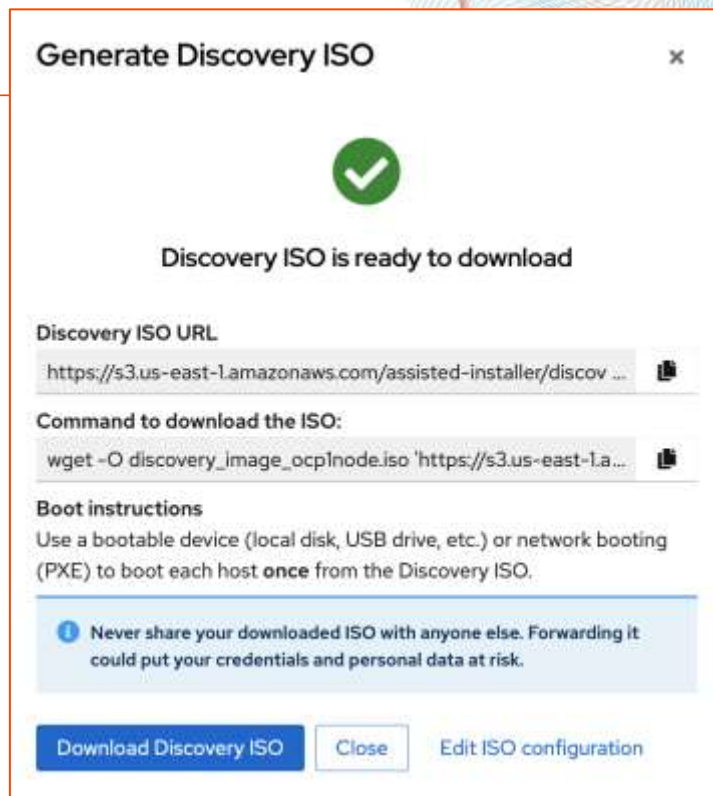
Next Cancel

SNO Install: Add host



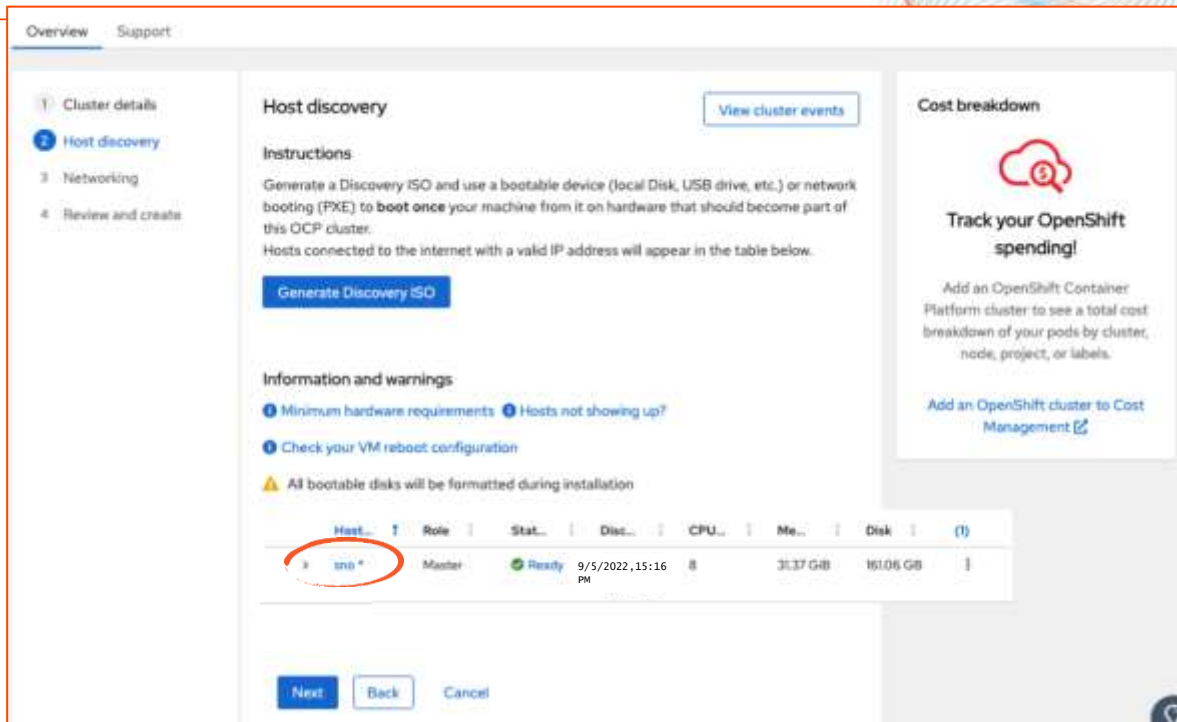
SNO Install: ISO image

- Once you have the ISO you need to copy it to media from which your machine can boot (bootable USB etc)



SNO Install

- After the target has booted successfully it will show up in the host list of your browser as “localhost”.
- Give it a more suitable name like **sno**.



The screenshot displays the OpenShift Host Discovery interface. On the left, a sidebar shows the progress: 1. Cluster details, 2. Host discovery (active), 3. Networking, and 4. Review and create. The main content area is titled 'Host discovery' and includes instructions on generating a Discovery ISO and connecting hosts. A 'Generate Discovery ISO' button is present. Below, under 'Information and warnings', there are links for minimum hardware requirements and VM reboot configuration, along with a warning that bootable disks will be formatted. A table lists discovered hosts. The first host, 'sno', is highlighted with a red circle and is in a 'Ready' state. The right sidebar features a 'Cost breakdown' section with a 'Track your OpenShift spending!' link.

Host	Role	Status	Disc	CPU	Mem	Disk
sno	Master	Ready		8	31.37 GiB	161.06 GiB

SNO Install: Networking

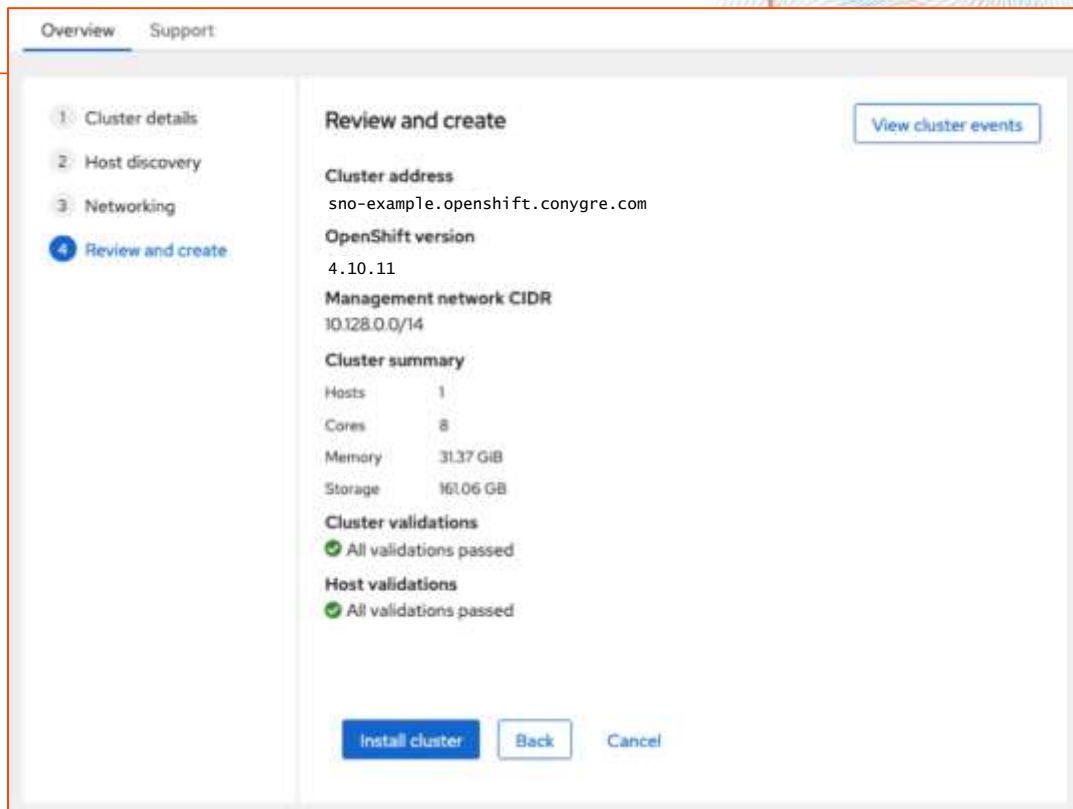
- This is a simple networking example, you can enter advanced settings if you want to customize further.
- It's a good idea to reuse the same SSH key you used before (default)

The screenshot shows the 'Networking' configuration page in the OpenShift SNO installer. The page is divided into several sections: 'Cluster details' (with steps 1-4), 'Networking', 'Security', and 'Host inventory'. In the 'Networking' section, 'User-Managed Networking' is selected. A red circle highlights the 'Available subnets' dropdown menu, which currently shows '192.168.0.0/24 (192.168.0.0 - 192.168.0.255)'. Another red circle highlights the 'Use the same host discovery SSH key' checkbox under the 'Security' section, which is checked. The 'Host inventory' table at the bottom shows a single host with the role 'Master' and status 'Ready'.

Host	Role	Status	API...	IP v4 ad...	IP v6...	MAC ad...
mc1	Master	Ready	enc82	192.168.0.193/24		00:0c:29:f3:38:17

SNO Install: Review

- Press Install Cluster when you are ready
- It will normally take around 45mins



The screenshot shows the 'Review and create' step of the OpenShift SNO installation process. On the left, a progress bar indicates the current step is 'Review and create' (step 4), with previous steps being 'Cluster details', 'Host discovery', and 'Networking'. The main area displays the following configuration details:

- Cluster address:** sno-example.openshift.conygre.com
- OpenShift version:** 4.10.11
- Management network CIDR:** 10.128.0.0/14
- Cluster summary:**
 - Hosts: 1
 - Cores: 8
 - Memory: 31.37 GiB
 - Storage: 161.06 GB
- Cluster validations:** All validations passed (indicated by a green checkmark)
- Host validations:** All validations passed (indicated by a green checkmark)

At the bottom, there are three buttons: 'Install cluster' (highlighted in blue), 'Back', and 'Cancel'. A 'View cluster events' link is located in the top right corner.

SNO Install Progress

[Overview](#) [Support](#)

Installation progress

Started on
9/5/2022, 15:41 PM

Status
Installing 38%

Control Plane (1 master)

Initialization

Abort Installation

Download kubeconfig

Download Installation Logs

View Cluster Events

Host...	Role	Status	Discover...	CPU...	Me...	Disk	(I)
> sno *	Master (bootstrap)	Installing 5/10	9/5/2022, 15:16 PM	8	31.37 GiB	161.06 GB	

SNO Install Complete

Installation progress

Started on

8/30/2021, 1:29:51 PM

Status

Installed on 8/30/2021, 2:15:15 PM



✓ Control Plane (1 master) ✓ Initialization

Web Console URL

<https://console-openshift-console.apps.sno-example.openshift.conygre.com>

Not able to access the Web Console?

Username

kubeadmin

Password

.....



[Download kubeconfig](#)

Before you Login

- Do you have a working DNS resolving to the host?
- The simplest solution is to just add this to your local hosts file:

```
192.168.0.193    api.sno-example.openshift.conygre.com
192.168.0.193    oauth-openshift.apps.sno-example.openshift.conygre.com
192.168.0.193    console-openshift-console.apps.sno-example.openshift.conygre.com
192.168.0.193    grafana-openshift-monitoring.apps.sno-example.openshift.conygre.com
192.168.0.193    thanos-querier-openshift-monitoring.apps.sno-example.openshift.conygre.com
192.168.0.193    prometheus-k8s-openshift-monitoring.apps.sno-example.openshift.conygre.com
192.168.0.193    alertmanager-main-openshift-monitoring.apps.sno-example.openshift.conygre.com
```

- Then you can login just as we have done all week!

Conclusions

- SNO is usually the best solution where it is the only solution.
- You trade High Availability for proximity.
- You may find some Operators also have diminished functionality.

Summary

- Single Node OpenShift
- Differences from HA OpenShift
- Installation Requirements and Process

Questions and Comments?

