Running Nightwatch at NERSC with Rancher2

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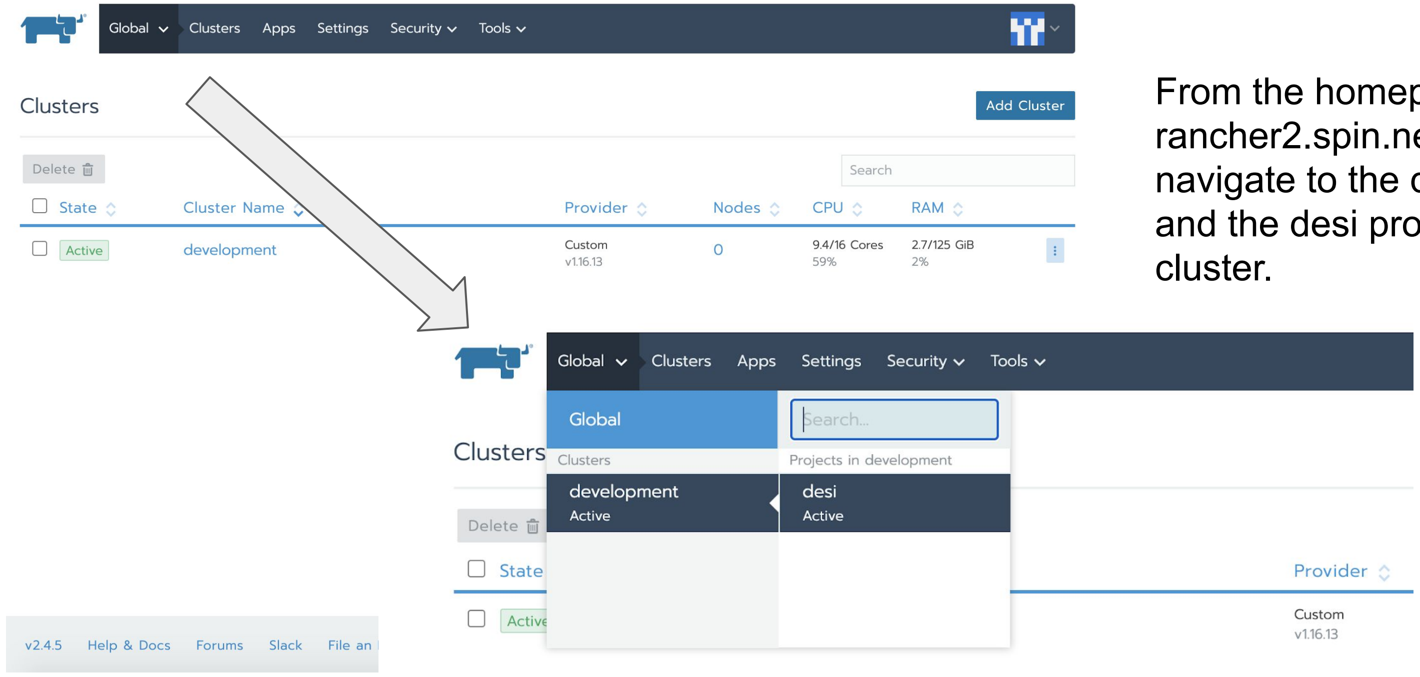
Structure

Rancher2 uses Kubernetes instead of Docker, so the structure of the web app is slightly different than previously;

Instead of writing a docker-compose.yml file to specify the interaction between a uWSGI-flask container and a nginx container, we will write a kubernetes deployment yaml file that configures one container/workload, and a separate yaml file to configure a load-balancer/ingress, which will act in the same way our nginx docker container did.

We can do much of this “writing” through the rancher2 GUI.

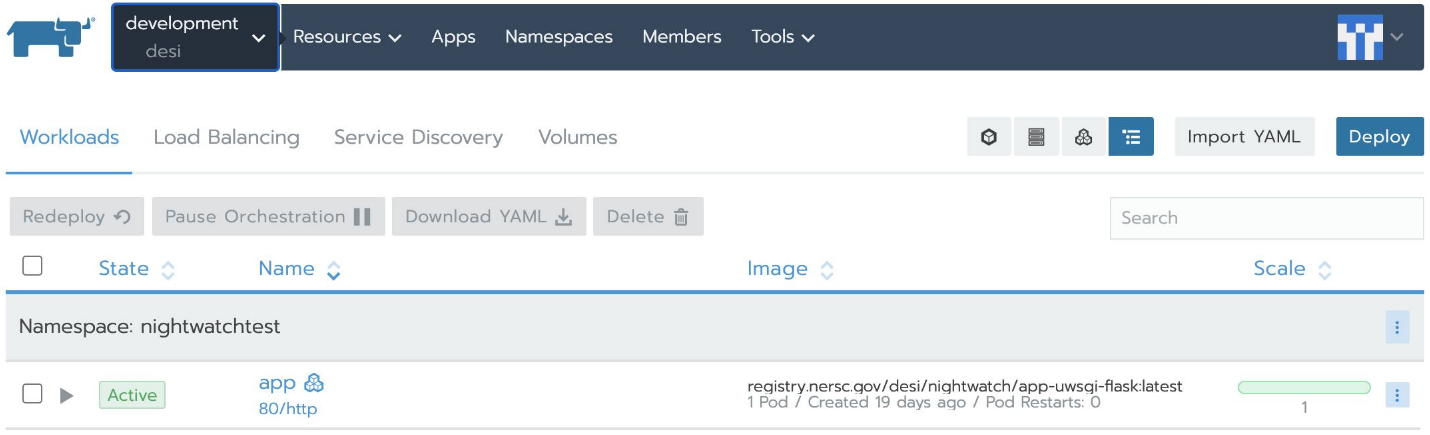
Rancher 2 at Spin



State	Cluster Name	Provider	Nodes	CPU	RAM
Active	development	Custom v1.16.13	0	9.4/16 Cores 59%	2.7/125 GiB 2%

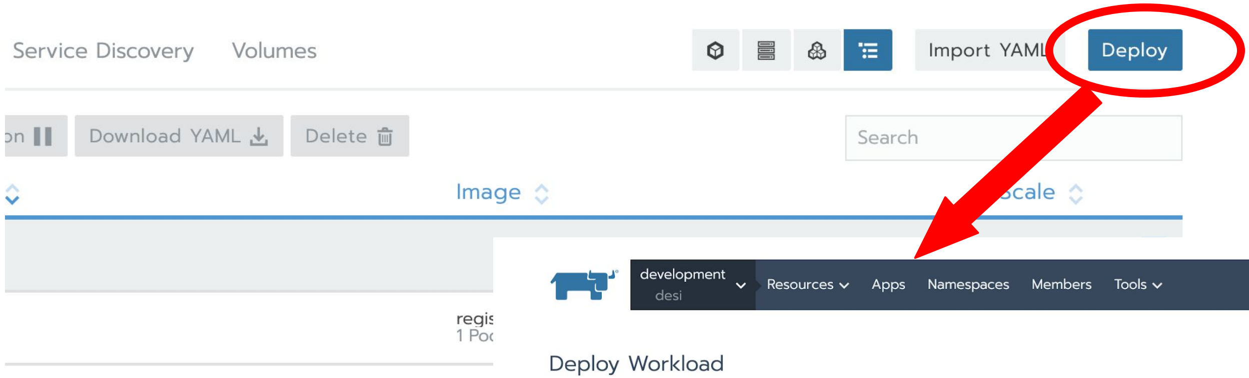
From the homepage, rancher2.spin.nersc.gov, we want to navigate to the development cluster, and the desi project inside that cluster.

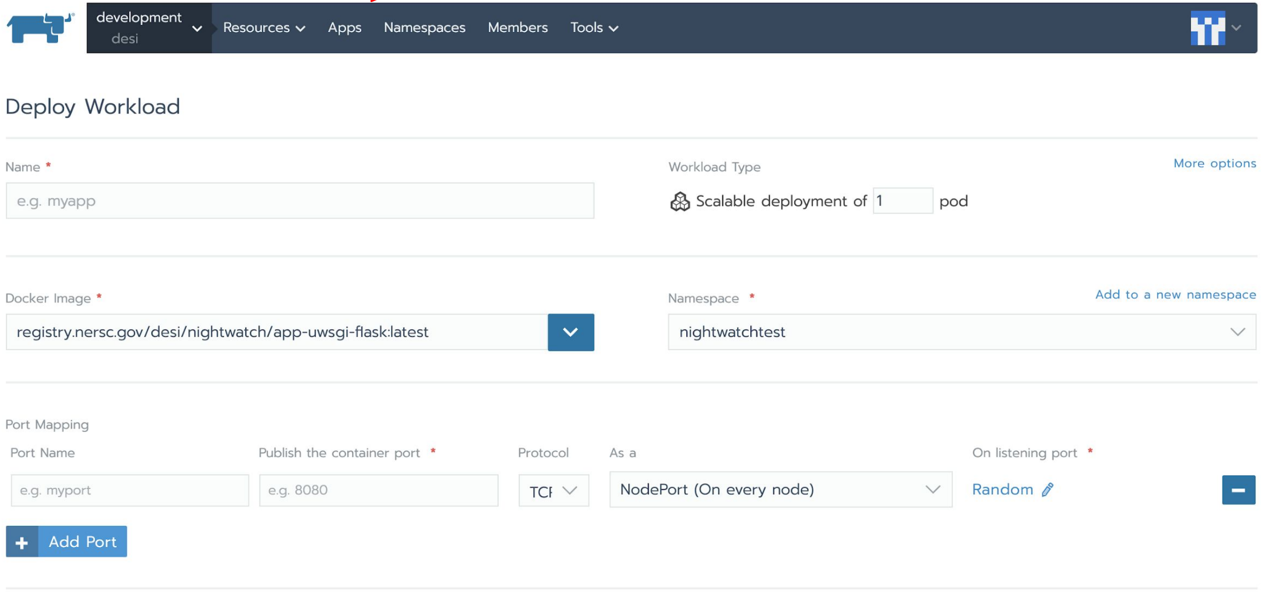
This is what the desi project homepage looks like- there is a list of all the workloads running in each “namespace” (sub-projects of the desi project). We can work in the nightwatchtest namespace, or create our own when we start creating a new workload.



	State	Name	Image	Scale
Namespace: nightwatchtest				
	Active	app 80/http	registry.nersc.gov/desi/nightwatch/app-uwsgi-flask:latest 1 Pod / Created 19 days ago / Pod Restarts: 0	1

Getting started; creating a deployment





Deploy Workload

Name * e.g. myapp

Workload Type: Scalable deployment of 1 pod

More options

Docker Image * registry.nersc.gov/desi/nightwatch/app-uwsgi-flask:latest

Namespace * nightwatchtest

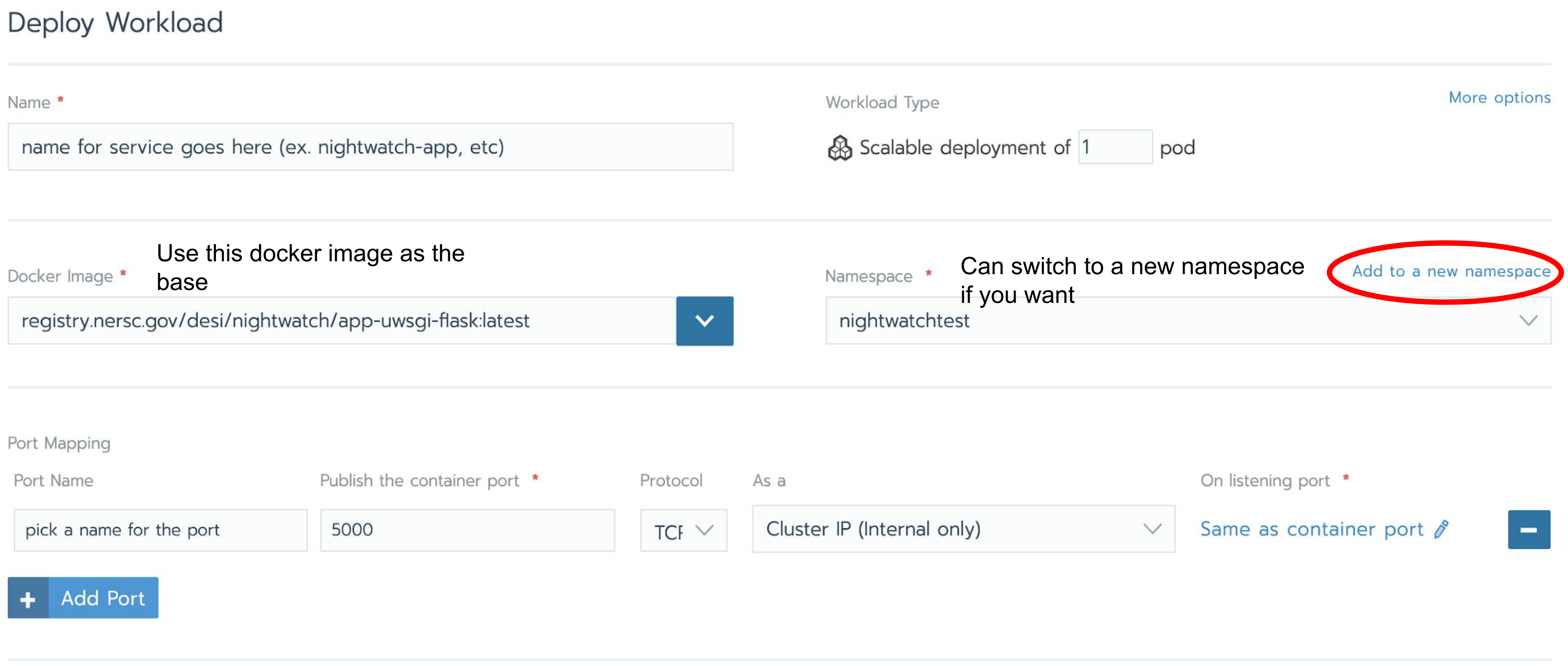
Add to a new namespace

Port Mapping

Port Name	Publish the container port *	Protocol	As a	On listening port *
e.g. myport	e.g. 8080	TCP	NodePort (On every node)	Random

Add Port

Base configurations



Deploy Workload

Name *

name for service goes here (ex. nightwatch-app, etc)

Workload Type

More options

Scalable deployment of 1 pod

Docker Image *

Use this docker image as the base

registry.nersc.gov/desi/nightwatch/app-uwsgi-flask:latest

Namespace *

Can switch to a new namespace if you want

Add to a new namespace

nightwatchtest

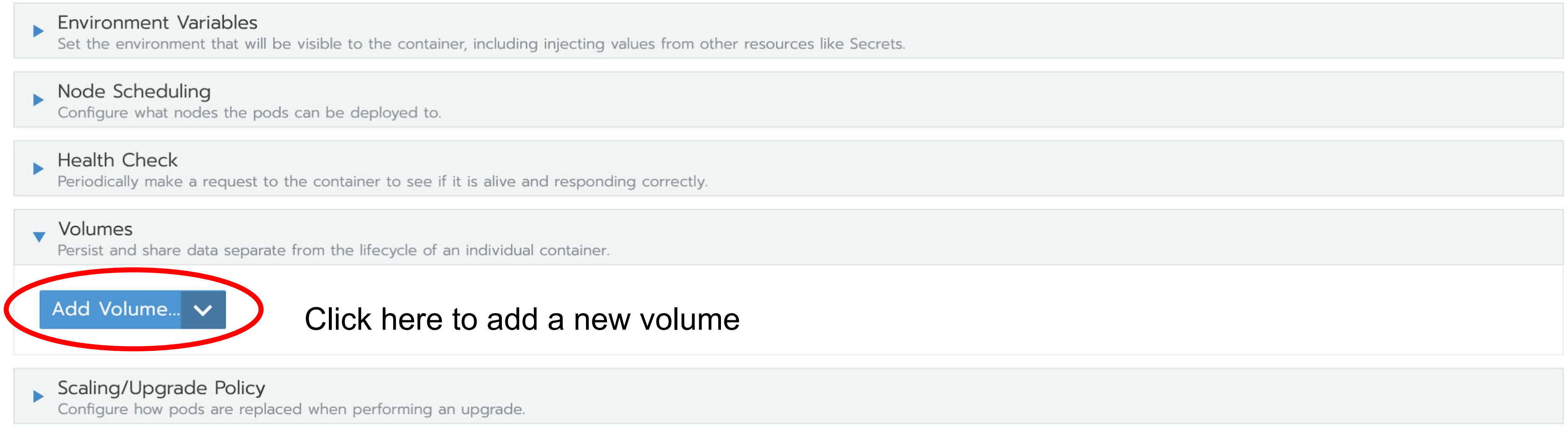
Port Mapping

Port Name	Publish the container port *	Protocol	As a	On listening port *
pick a name for the port	5000	TCP	Cluster IP (Internal only)	Same as container port

Add Port

Configuring options: mounting volumes

Below the base configurations, there are a bunch of dropdown menus containing all our other configuration options. First, we will deal with mounting volumes.



Environment Variables
Set the environment that will be visible to the container, including injecting values from other resources like Secrets.

Node Scheduling
Configure what nodes the pods can be deployed to.

Health Check
Periodically make a request to the container to see if it is alive and responding correctly.

Volumes
Persist and share data separate from the lifecycle of an individual container.

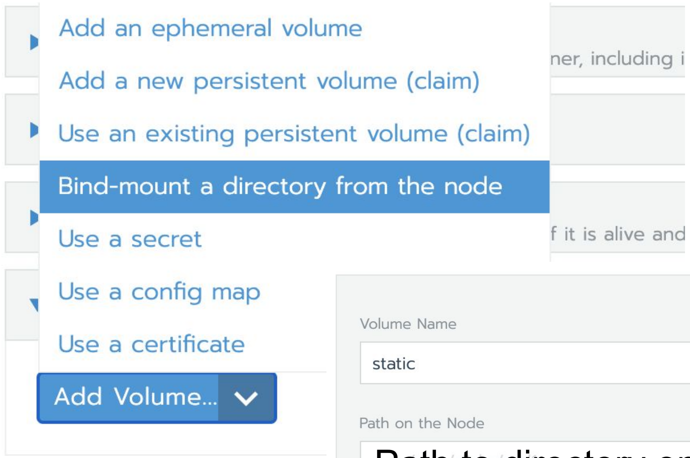
Click here to add a new volume

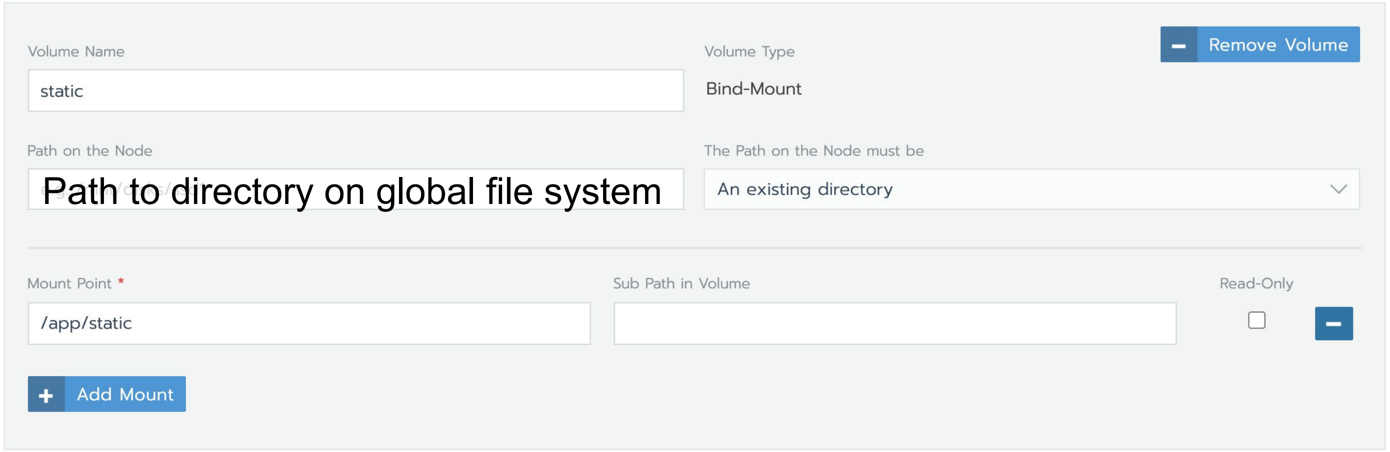
Scaling/Upgrade Policy
Configure how pods are replaced when performing an upgrade.

Adding a volume

We want a bind-mount volume, as we will be mounting files from the global file system

Need to name the volume, specify a mount point inside the container, and specify exactly what directory on the global file system is being mounted. Pick “an existing directory” to make sure Rancher verifies the directory exists.
For most volumes, we will want the read-only option, as well.





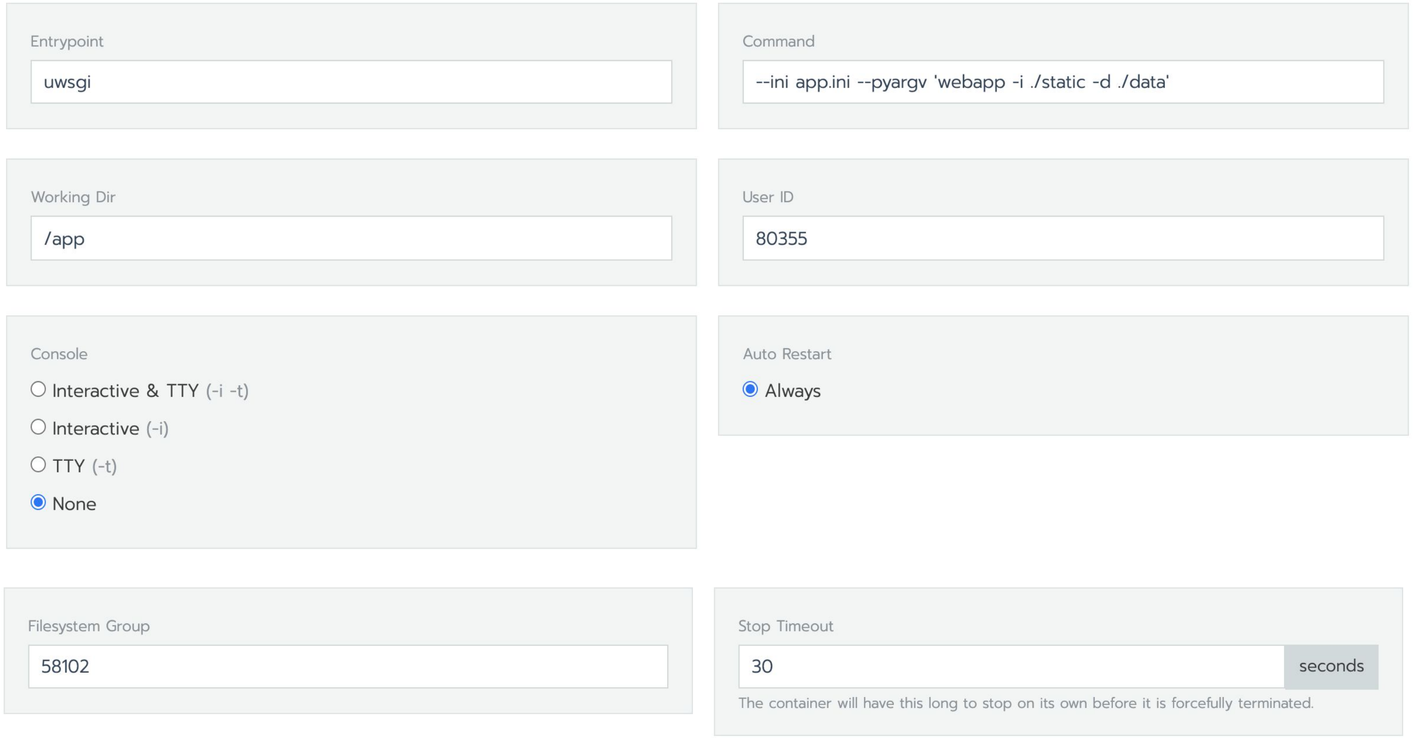
Volume Name	static
Volume Type	Bind-Mount
Path on the Node	Path to directory on global file system
The Path on the Node must be	An existing directory
Mount Point *	/app/static
Sub Path in Volume	
Read-Only	☐

Next slide details what volumes we need for a Nightwatch deployment.

Volumes for Nightwatch

- “Static”- mounted to /app/static in the container. This directory contains static nightwatch html files. Read only is false, as we need to be able to write new html files to this folder when the user interacts with the spectra plotting functionality, for instance.
- “Data”- mounted to /app/data in the container. Directory contains qa-*.fits, qproc-*.log, preproc-*.fits files for use in dynamic nightwatch features. Read only.
- “Nightwatch”- mounted to /app/nightwatch in the container. Directory containing nightwatch code. Read only.
- “Desiutil”- mounted to /app/desiutil in the container. Directory containing desiutil code. Read only.
- “Desimodel”- mounted to /app/desimodel in the container. Directory containing desimodel code.

Entrypoint command configurations



Entrypoint

```
uwsgi
```

Command

```
--ini app.ini --pyargv 'webapp -i ./static -d ./data'
```

Working Dir

```
/app
```

User ID

```
80355
```

Console

- ○ Interactive & TTY (-i -t)
- ○ Interactive (-i)
- ○ TTY (-t)
- ● None

Auto Restart

- ● Always

Filesystem Group

```
58102
```

Stop Timeout

```
30 seconds
```

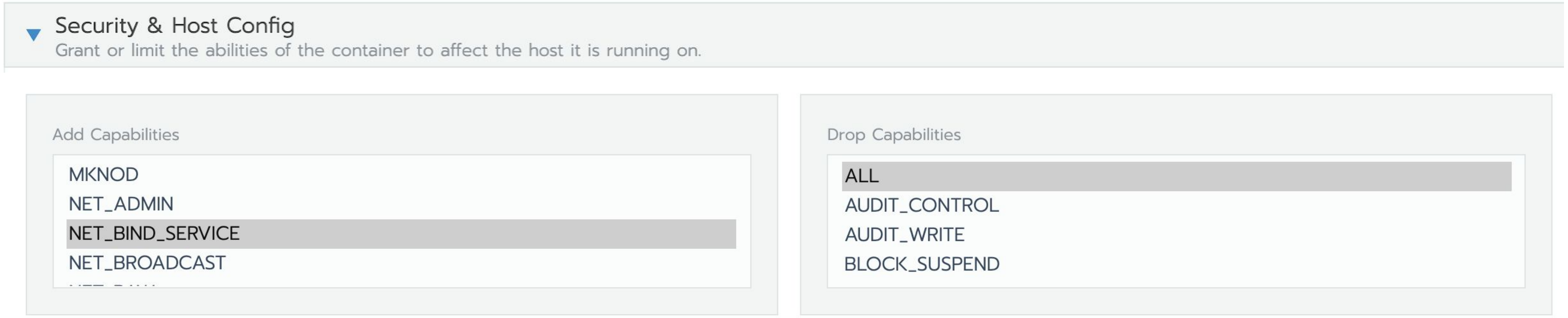
The container will have this long to stop on its own before it is forcefully terminated.

Fill out the configuration options so they match the ones to the left

Note: the entrypoint command differs slightly from the one used with docker/rancher1; we don't specifiy the group id or user id in the command because of how finicky uWSGI is with when UID and GID get assigned.

Security configurations

Need to drop all capabilities except for NET_BIND_SERVICE; otherwise service will not run (it's a NERSC security requirement)



Security & Host Config

Grant or limit the abilities of the container to affect the host it is running on.

Add Capabilities

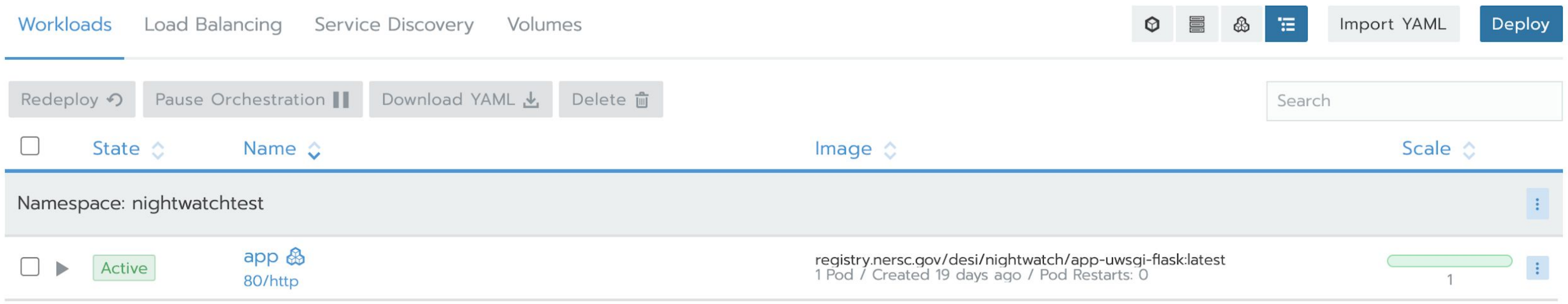
- MKNOD
- NET_ADMIN
- NET_BIND_SERVICE
- NET_BROADCAST

Drop Capabilities

- ALL
- AUDIT_CONTROL
- AUDIT_WRITE
- BLOCK_SUSPEND

Now the app pod should be ready to launch...

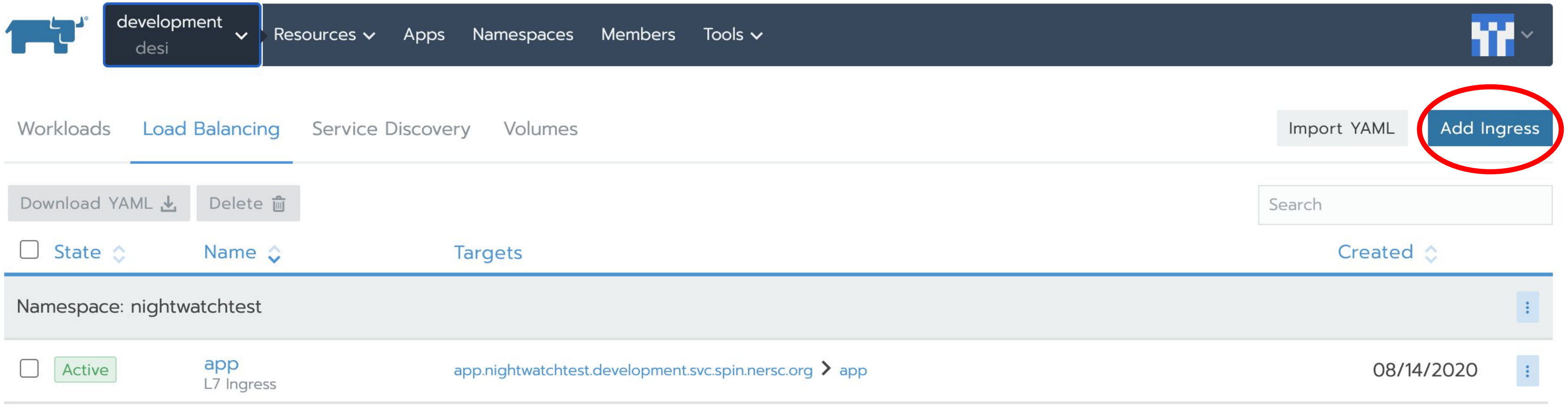
If everything worked...



State	Name	Image	Scale
Namespace: nightwatchtest			
Active	app 80/http	registry.nersc.gov/desi/nightwatch/app-uwsgi-flask:latest 1 Pod / Created 19 days ago / Pod Restarts: 0	1

Now we need to configure a load-balancer to handle traffic from outside the pod

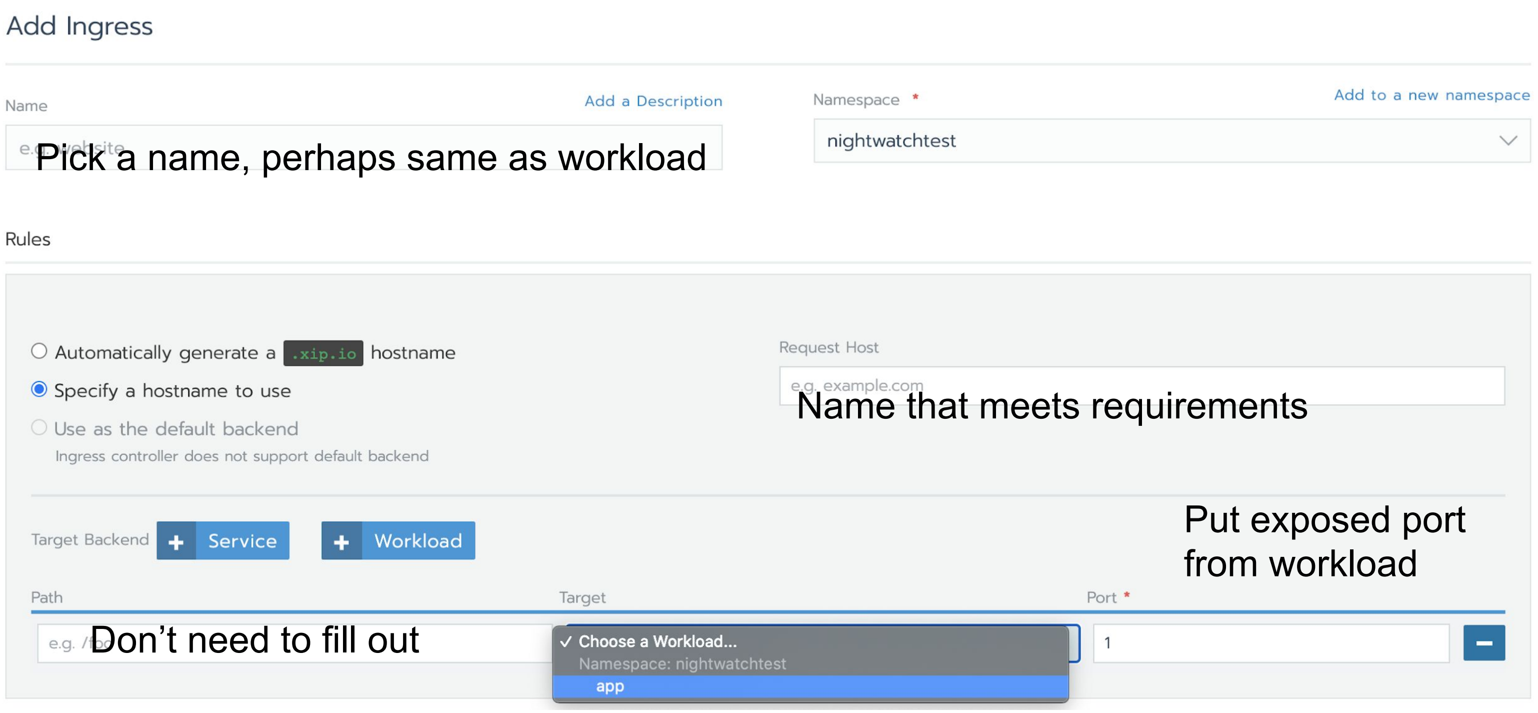
Configuring a load-balancer



State	Name	Targets	Created
Namespace: nightwatchtest			
Active	app L7 Ingress	app.nightwatchtest.development.svc.spin.nersc.org > app	08/14/2020

Click on the load balancing tab on the homepage, and click add ingress to configure a new one

Configuring ingress


Add Ingress

Name: e.g. website — Add a Description

Pick a name, perhaps same as workload

Namespace *: nightwatchtest — Add to a new namespace

Rules

- Automatically generate a `.xip.io` hostname
- [✓ Specify a hostname to use]
- Use as the default backend
  Ingress controller does not support default backend

Request Host: e.g. example.com

Name that meets requirements

Target Backend: + Service, + Workload

Put exposed port from workload

Path: e.g. /foo — Don't need to fill out

Target: ✓ Choose a Workload... / Namespace: nightwatchtest / app

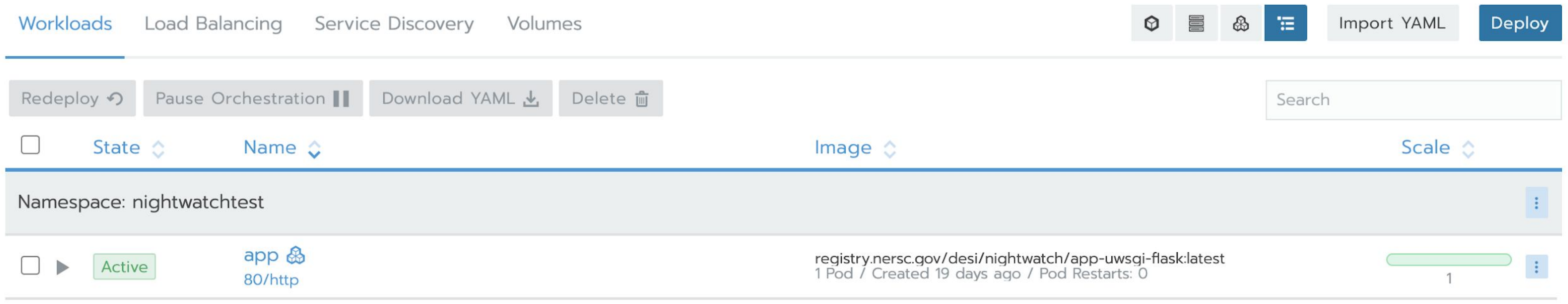
Port *: 1

Can specify a hostname to use, but hostname needs to meet the NERSC naming requirements

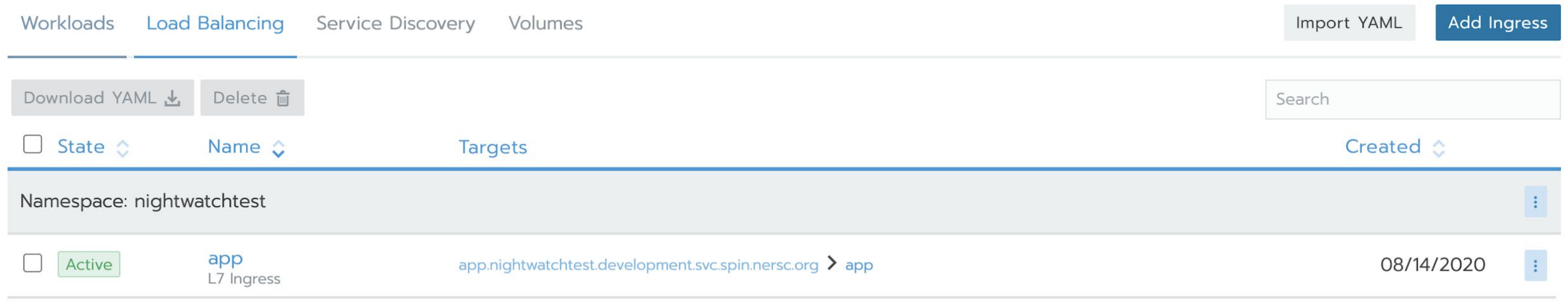
Example hostname: app.nightwatchtest.development.svc.spin.nersc.org
Template: [name].[namespace].[cluster (development)].svc.spin.nersc.org

Success! Hopefully...

If everything goes as it should, on the main page you should see:



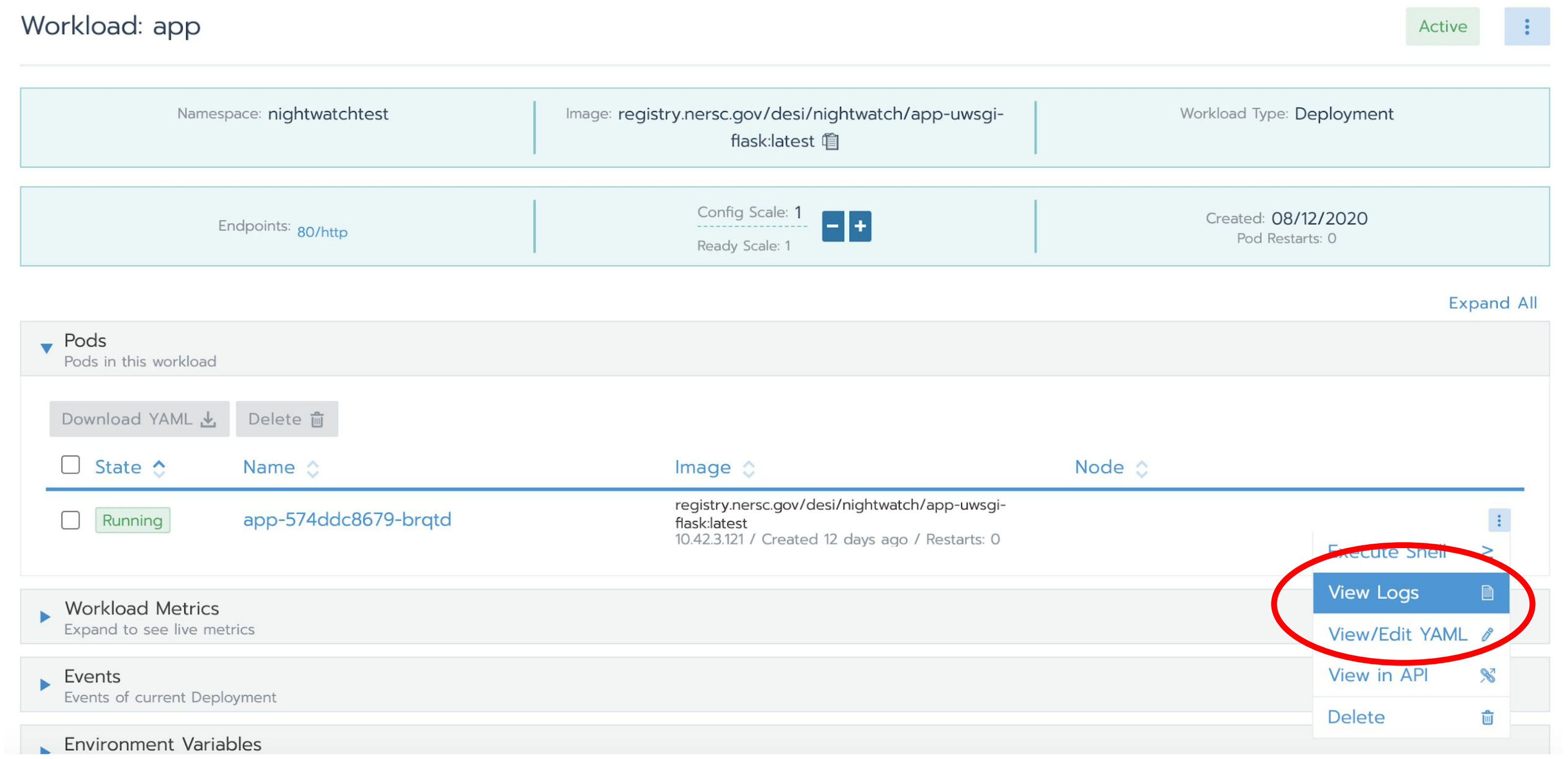
State	Name	Image	Scale
Namespace: nightwatchtest			
Active	app 80/http	registry.nersc.gov/desi/nightwatch/app-uwsgi-flask:latest 1 Pod / Created 19 days ago / Pod Restarts: 0	1



State	Name	Targets	Created
Namespace: nightwatchtest			
Active	app L7 Ingress	app.nightwatchtest.development.svc.spin.nersc.org > app	08/14/2020

Troubleshooting

If there is a problem with your deployment, you can click on it on the workload homepage and be brought to this page; you can view the logs, and see other metrics of the pod performance.



Workload: app

Active

Namespace: nightwatchtest

Image: registry.nersc.gov/desi/nightwatch/app-uwsgi-flask:latest

Workload Type: Deployment

Endpoints: 80/http

Config Scale: 1

Ready Scale: 1

Created: 08/12/2020

Pod Restarts: 0

Expand All

Pods

Pods in this workload

Download YAML

Delete

State	Name	Image	Node
Running	app-574ddc8679-brqtd	registry.nersc.gov/desi/nightwatch/app-uwsgi-flask:latest 10.42.3.121 / Created 12 days ago / Restarts: 0	

Execute Shell

View Logs

View/Edit YAML

View in API

Delete

Workload Metrics

Expand to see live metrics

Events

Events of current Deployment

Environment Variables