Spectrum Scale And Containers

IBM

Agenda

- Introduction
- Persistent Storage For Containers
- IBM Spectrum Connect
- Spectrum Scale Plugin
- What next in Scale for Containers

Introduction

Containers

- Lightweight, portable virtualization layer
- Standalone executable package of software
- No overhead of OS
- Types of containers
  - Docker, Singularity, OpenVZ, Shifter
- Benefits of containers
  - Workload Isolation (less CPU/memory overhead and faster deployment than VMs)
  - Resource limitations (cgroups can constrain containers' memory and CPU usage)
  - Layered image architecture such that each change to the package is tracked
  - Build once/ Run anywhere

Kubernetes

- Open-source system for automating deployment, scaling, and management of containerized applications.
- Originally from Google, now maintained by the Cloud Native computing Foundation
- Gives the freedom to take advantage of on-premise, hybrid, or public cloud infrastructure, letting you effortlessly move workloads to where it matters to you.
- Current version is 1.13
- Some other container orchestrators
  - Docker Swarm, Apache Mesos

Can Spectrum Scale be containerized?
Not today.

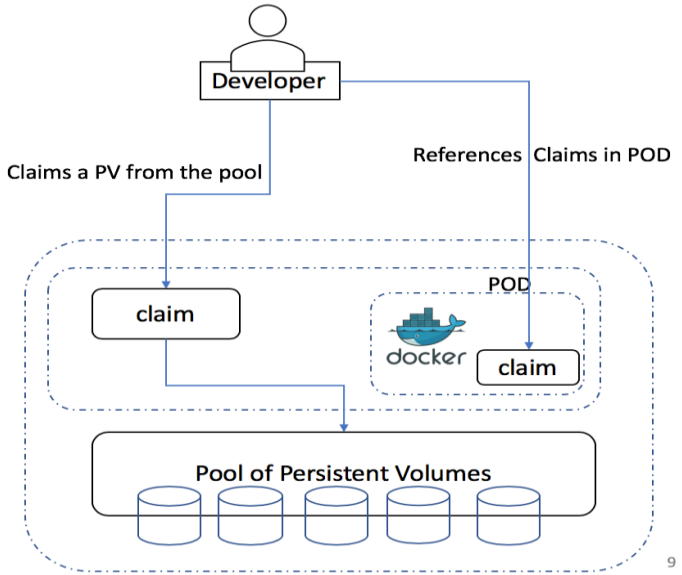
Persistent Storage For Containers

Stateful Containers: *Persistent data with high availability and data protection is one of the biggest barriers for container adoption in the enterprise for production workloads*

- Storage volume plug-ins are required to enable external storage to containers
- Each orchestrator has its own provisioning API for integrating storage

Concepts

- *Persistent Volume (PV):* Unit of storage in the cluster that has been provisioned by an administrator or dynamically provisioned via a storage driver/plug-in
- *Persistent Volume Claim (PVC):* Is a request for storage by a user.
- *Static Volume Provisioning*
  - PVs created upfront
  - Storage requirements to be known upfront
- *Dynamic Volume Provisioning*
  - Volumes created on-demand
  - No need to pre-provision storage
  - Based on StorageClass



Volume Provisioning

Static Provisioning

- Administrator creates a number of PVs upfront. PV carry the details of the real storage which is available for use by cluster users.
- Administrator has to know the storage requirements upfront.

Dynamic Provisioning

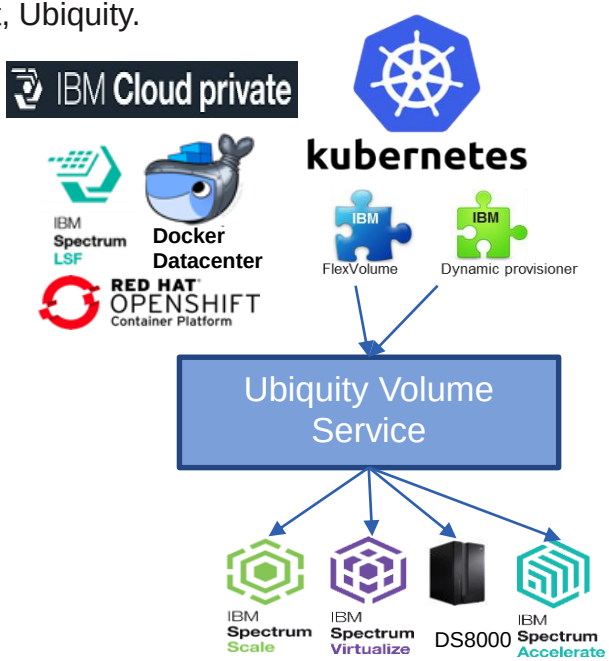
- Allows storage volumes to be created **on-demand**.
- Eliminates the need for cluster administrators to **pre-provision storage**.
- The implementation of dynamic volume provisioning is based on the **StorageClass**
  - A cluster administrator can define as many StorageClass objects as needed, each specifying a *volume plugin* (aka *provisioner*) that provisions a volume and the set of parameters to pass to that provisioner when provisioning.
  - A cluster administrator can define and expose multiple flavors of storage (from the same or different storage systems) within a cluster, each with a custom set of parameters

Storage Class

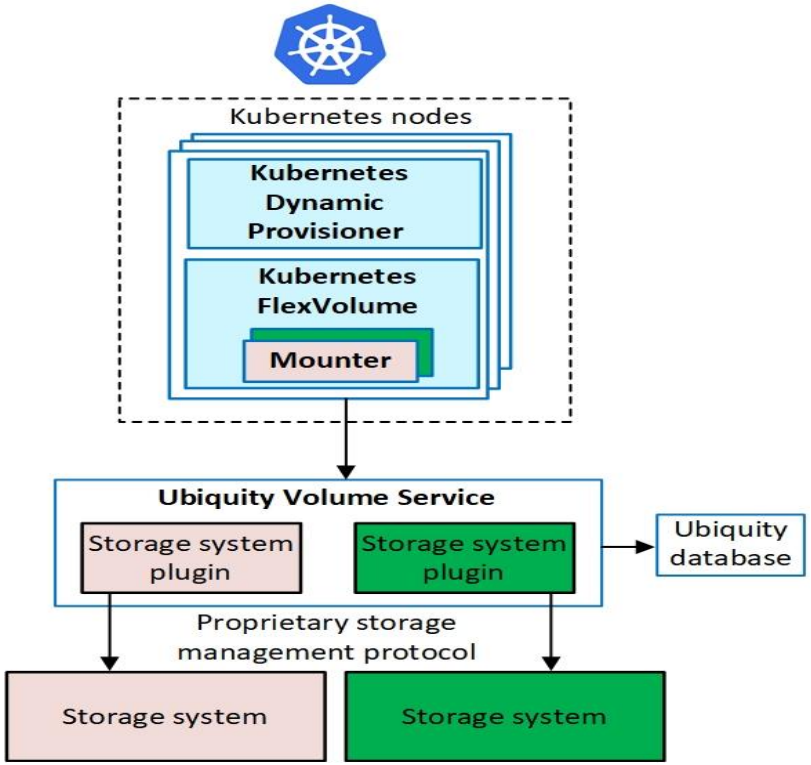
```
# This is an IBM Storage Enabler for Containers Storage
Class template.
kind: StorageClass
apiVersion: storage.k8s.io/v1
metadata:
  name: "<NAME>"
  labels:
    product: ibm-storage-enabler-for-containers
#reclaimPolicy: "Retain"
#Optional, Values: Delete[default] or Retain
provisioner: "ubiquity/flex"
parameters:
  backend: "spectrum-scale"
  filesystem: "<filesystem name>"
  type: "fileset”
#  fileset-type: "<filesettype>"
# Optional, Values: Independent[default] or dependent
#  uid: "<uidnumber>"
# Optional
#  gid: "<gidnumber>"
# Optional
#  inode-limit: "<no of inodes to be preallocated>"
# Optional
# isPreexisting: true|false
# Optional, Values: false[default] or true
```

IBM Spectrum Connect

- IBM Spectrum Connect allows IBM storage systems to be used as persistent volumes for stateful application running on Kubernetes clusters.
- It provides persistent volume support for both block and file (IBM Spectrum Scale) using code from the IBM open-source project, Ubiquity.



Volume Plugin Architecture



Spectrum Scale Dynamic Volume Provisioner

Create Volume:

- Create Fileset based on parameter specified in the storage class.
- Set quota on fileset. Quota = Storage requested
- Set owner[group] on Fileset if specified
- Mount path for dynamically created fileset is always <filesystem mountpoint>/<pvname>
- Ubiquity-db volume is created as dependent fileset and is kept in in-memory database.

Delete Volume:

- Fileset must be linked
- Delete fileset on spectrum scale forcefully
- Data will be deleted if any
- Use ReclaimPolicy=retain if fileset needed to preserved.
- All pvc should be deleted before deleting ubiquity-db-pvc.

Dynamic Volume Provisioning For Existing Filesets

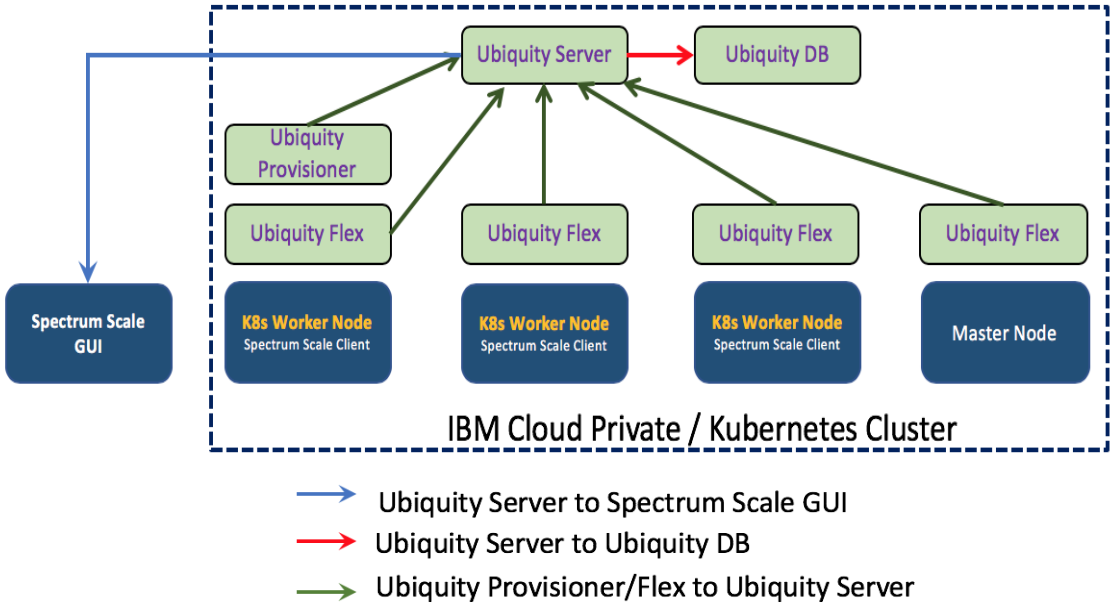
- Create StorageClass with parameter isPreexisting=true
- One StorageClass per filesystem is required if user want to use existing fileset as a persistent volume
- Different StorageClass will be needed if volume from same filesystem is expected to be created after creating pvc
- Create pvc with pv-name parameter
- pv-name must be the name of existing fileset
- Deleting pvc will not delete the fileset
- uid/gid/fileset-type/inode-limit parameter are not valid if isPreexisting=true

SSL Communication

Two possible configuration

- SSL-MODE = require (--insecure)
- SSL-MODE = verify-full

- ubiquity.crt
- ubiquity.key
- ubiquity-trusted-ca.crt
- ubiquity-db.crt
- ubiquity-db.key
- ubiquity-db-trusted-ca.crt
- spectrumscale-trusted-ca.crt

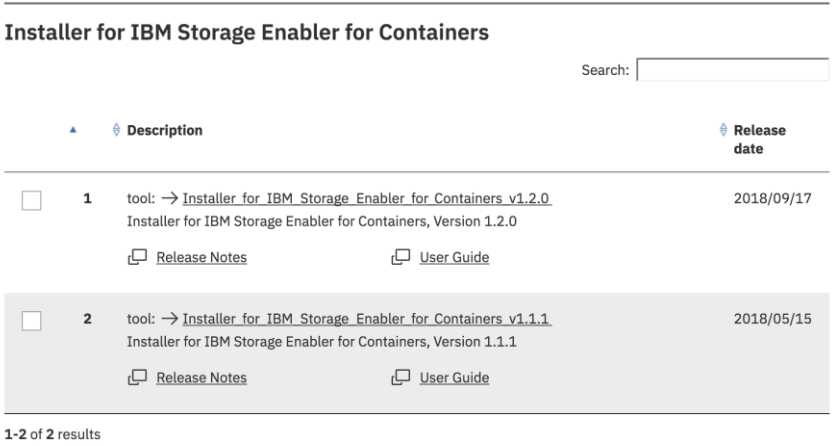


Downloading From Fix Central

- Spectrum Connect landing page:

https://www.ibm.com/us-en/marketplace/spectrum-connect

- Click the "Download Now" button to come to the Fix Central Page
- From the Fix Central download links for Spectrum Connect, select the "Installer for IBM Storage Enabler for Containers" link:



Installer for IBM Storage Enabler for Containers

Search:

		Description	Release date
☐	1	tool: → Installer_for_IBM_Storage_Enabler_for_Containers_v1.2.0 Installer for IBM Storage Enabler for Containers, Version 1.2.0 Release Notes User Guide	2018/09/17
☐	2	tool: → Installer_for_IBM_Storage_Enabler_for_Containers_v1.1.1 Installer for IBM Storage Enabler for Containers, Version 1.1.1 Release Notes User Guide	2018/05/15

1-2 of **2** results

tool:
Installer_for_IBM_Storage_Enabler_for_Containers_v1.2.0

Release Notes
User Guide

Installer for IBM Storage Enabler for Containers, Version 1.2.0

The following files implement this fix.

installer-for-ibm-storage-enabler-for-containers-1.2.0-92.tar.gz (20.86 KB)

IBM_Spectrum_Connect_3.5.0_RN.pdf (1.01 MB)

IBM_Spectrum_Connect_3.5.0_UG.pdf (12.1 MB)

What Next In Spectrum Scale For Containers

- RedHat OpenShift Support
- Currency
  - ICP 3.1.2
  - RHEL 7.6
  - Ubuntu 16.0.4 (new OS support)
  - Kubernetes 1.13
- CSI (Container Storage Interface) support

Thanks!