SolidFire Stats Collection with Grafana and the Netapp Docker Volume Plugin

All Your Graphs Are Belong to Us

High level steps

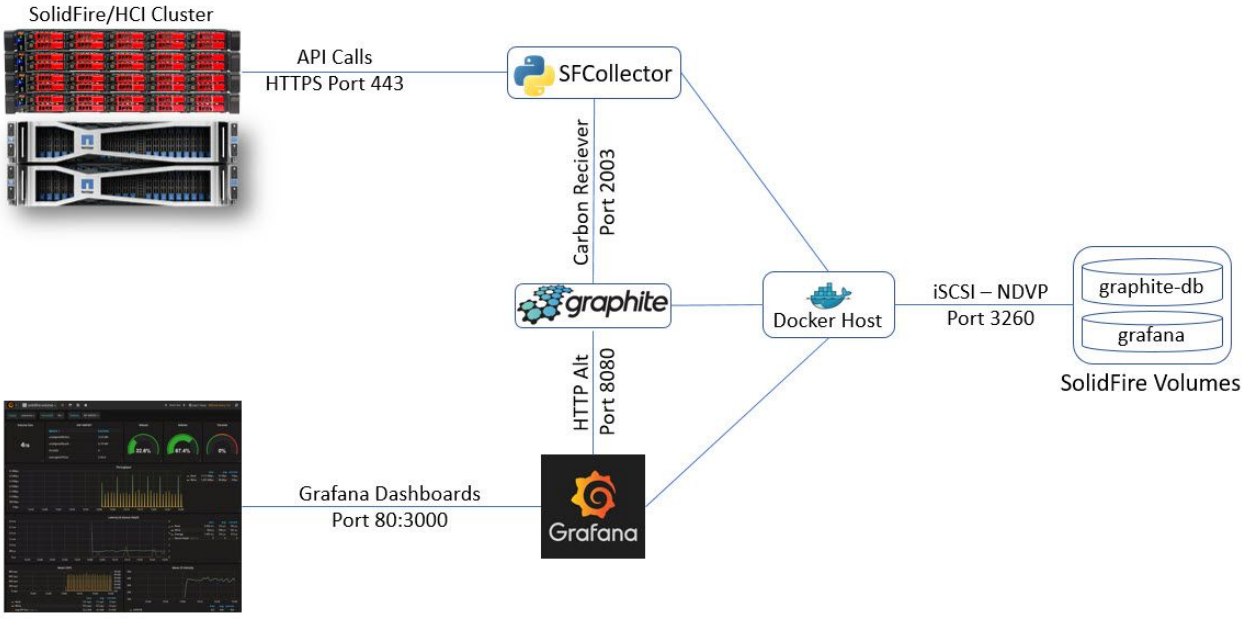
1. (optional) Install and configure NDVP for persistent storage
2. Clone the jedimt/sfcollector repository
3. Setup and run the collector

Overview

The SolidFire collector is a fully packaged metrics collection and graphing solution for Element OS 8+ and is based on four Docker containers.

- SFCollector-> runs a python script to scrape results from SolidFire clusters
- Graphite database -> keeps all time series data from the SFCollector
- vsphere-graphite -> Pulls in vCenter metrics
- Grafana -> Graphing engine

The collector stores metrics in graphite and presents those metrics through a set of pre-configured Grafana dashboards. Optionally, the Netapp Docker Volume Plugin (NDVP) can be used for persistent storage of metrics on a NetApp system.



NetApp Docker Volume Plugin

Prerequisites

Operating System	• Debian • Ubuntu 14.04+ if not using iSCSI multipathing • Ubuntu 15.10+ with iSCSI multipathing. • CentOS, 7.0+ • RHEL, 7.0+
Element OS Version	8.0+
Docker Version	17.03+

Note: Ubuntu 16.04.1 LTS is used in a multipath configuration for this example.

1. Install packages

```
sudo apt-get install -y open-iscsi lsscsi sg3-utils multipath-tools scsitools
```

2. Enable multipathing

```
sudo tee /etc/multipath.conf <<-'EOF'
defaults {
    user_friendly_names yes
    find_multipaths yes
}
EOF

sudo service multipath-tools restart
```

3. Start services

```
sudo service open-iscsi start
sudo service multipath-tools start
```

4. Create a location to store the NDVP configuration files

```
sudo mkdir -p /etc/netappdvp
```

5. Create the configuration file for SolidFire

```
cat << EOF > /etc/netappdvp/config.json
{
    "version": 1,
    "storageDriverName": "solidfire-san",
    "Endpoint": "https://admin:solidfire@172.27.40.200/json-rpc/9.0",
    "SVIP": "172.27.41.200:3260",
    "TenantName": "docker",
```

```
    "InitiatorIFace": "default",
    "Types": [
        {
            "Type": "docker-default",
            "Qos": {
                "minIOPS": 1000,
                "maxIOPS": 2000,
                "burstIOPS": 4000
            }
        },
        {
            "Type": "docker-app",
            "Qos": {
                "minIOPS": 4000,
                "maxIOPS": 6000,
                "burstIOPS": 8000
            }
        },
        {
            "Type": "docker-db",
            "Qos": {
                "minIOPS": 6000,
                "maxIOPS": 8000,
                "burstIOPS": 10000
            }
        }
    ]
}
EOF
```

6. Install the NDVP plugin

```
docker plugin install netapp/ndvp-plugin:17.04 --alias netapp
--grant-all-permissions
```

7. Create docker volumes to be used for Graphite and Grafana persistent storage. This example uses 100GB containers which should be more than sufficient for collecting long term stats for multiple clusters

```
# Create Graphite docker volume
docker volume create -d netapp --name graphite-db -o type=docker-db
-o size=100G

#Create Grafana docker volume
docker volume create -d netapp --name grafana -o type=docker-app -o
size=100G

#show volume
```

```
docker volume list
DRIVER              VOLUME NAME
netapp:latest       grafana
netapp:latest       graphite-db
```

Graphite and Collector Setup

Bringing Up the Containers

1. Install docker-compose if not installed

```
apt install docker-compose
```

2. Clone the jedimt/sfcollector repo from git

```
mkdir -p /opt/github/sfcollector
git clone https://github.com/jedimt/sfcollector
/opt/github/sfcollector
```

3. Run the bootstrap.sh file to create the password for basic_auth. This will be used to secure the nginx web component

```
/opt/github/sfcollector/bootstrap.sh
```

4. Edit the docker-compose.yml file and specify the persistent data volumes to use for graphite and grafana as well as the password to secure the Grafana web interface

```
version: "2"
services:
  graphite:
    build: ./graphiteconfig
    restart: always
    ports:
        - "8080:80"
        - "8125:8125/udp"
        - "8126:8126"
        - "2003:2003"
        - "2004:2004"
    volumes: #Point to NDVP or local volumes for persistent storage
        - "graphite-db:/opt/graphite/storage/whisper"
    networks:
        - net_sfcollector

  grafana:
    image: grafana/grafana
    restart: always
    ports:
        - "80:3000"
    volumes: #Point to NDVP or local volumes for persistent storage
        - "grafana:/var/lib/grafana"
    networks:
        - net_sfcollector
    environment: #Set password for Grafana web interface
        - GF_SECURITY_ADMIN_PASSWORD=<your password>
```

```
  sfcollector-alpine:
    build: ./collector-alpine
    restart: always
    networks:
        - net_sfcollector

  vsphere-collector:
    build: ./vsphere-graphite
    networks:
        - net_sfcollector
    depends_on:
        - graphite

networks:
  net_sfcollector:
    driver: bridge
```

5. Modify the `/opt/github/sfcollector/collector-alpine/wrapper.sh` script with the appropriate SolidFire cluster MVIP, username and password. If the graphite container name was changed, also specify the new hostname

```
#!/usr/bin/env bash
while true
do
/usr/bin/python /solidfire_graphite_collector_v3.py -s 172.27.40.200
-u admin -p solidfire -g graphite &

#To monitor additional clusters add another line
# /usr/bin/python /solidfire_graphite_collector_v3.py -s
172.27.40.205 -u admin -p solidfire -g graphite &
sleep 60
done
```

6. Edit the `/opt/github/sfcollector/graphiteconfig/storage-schemas.conf` file to adjust the retention period for the NetApp stats if desired. By default the following retention is set which keeps 1 minute stats for 7 days, 5 minute stats for 28 days and 10 minute stats for a year

```
[netapp]
pattern = ^netapp\.*$
retentions = 1m:7d,5m:28d,10m:1y
```

7. Edit the /opt/github/sfcollector/vsphere-graphite/vsphere-graphite.json file and add your vCenter details.

```
 "Domain": ".<your domain FQDN>",
 "Interval": 60,
 "FlushSize": 100,
 "VCenters": [
```

```
   { "Username": "administrator@sflab.local", "Password": "<your password>",
"Hostname": "<vcenter host name>.<your domain FQDN>" }
 ],
 "Backend": {
  "Type": "graphite",
  "Hostname": "graphite",
  "Port": 2003
 },
 "Metrics": [
  { … <removed for brevity>
```

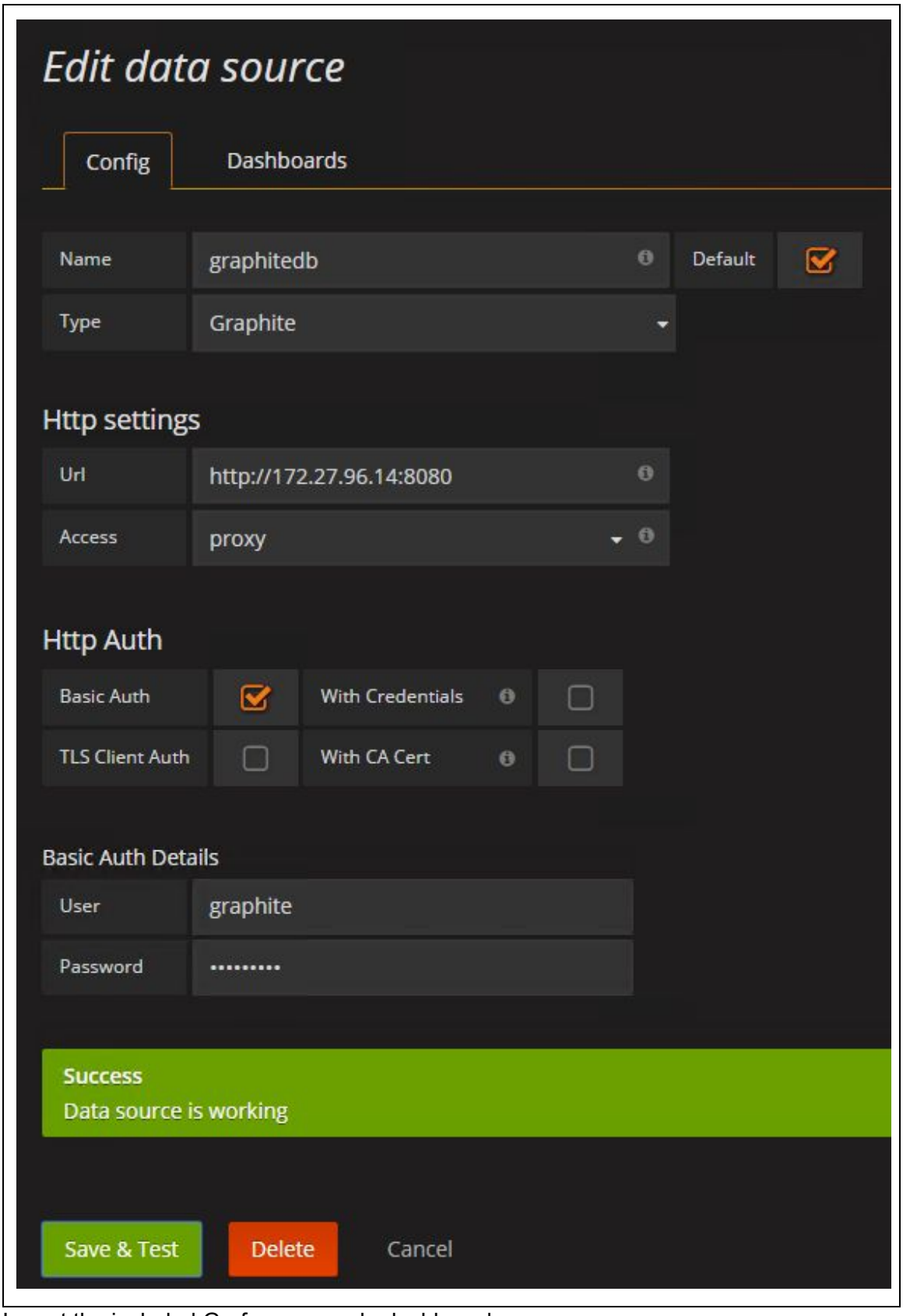
8. Bring up the containers using docker-compose. This will take several moments to complete.
   TIP: The containers can be brought up the first time with the (-d) flag ommited so the logs can be viewed.

```
docker-compose -f /opt/github/sfcollector/docker-compose.yml up -d
```

Grafana Configuration

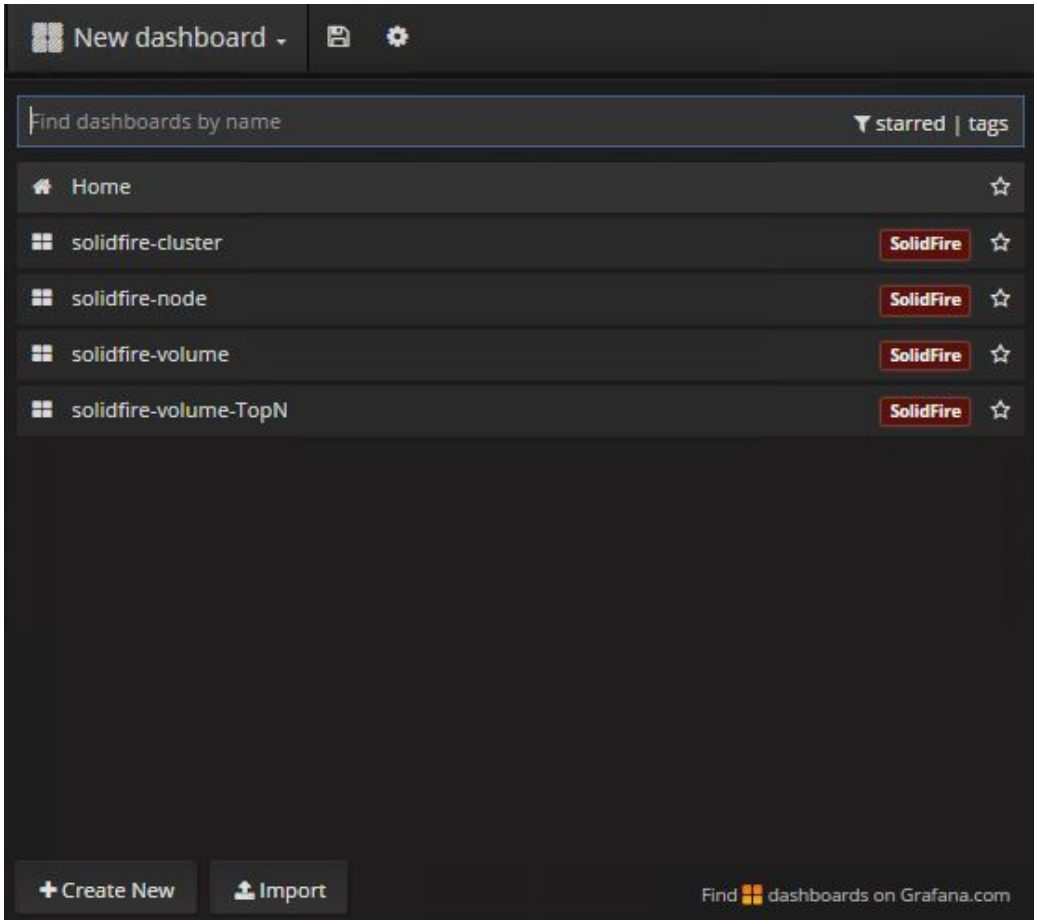
1. When the compose process finishes, launch a web browser to http://<VM IP Addr> The Grafana web interface should appear. Log in with the admin account and password configured in the docker-compose.yml file
2. From the home dashboard, add the Graphite database as a datastore for Grafana

   A. Click the **Add data source** button
   B. In the Name field, create a name for the data source
   C. In the Type field, select Graphite
   D. In the URL field, enter “http://<VM IP>:8080”
   E. In the Access field. select proxy
   F. Check the Basic Auth checkbox
   G. In the User field, enter ‘graphite’
   H. In the Password field, enter the configured password from the basic_auth file

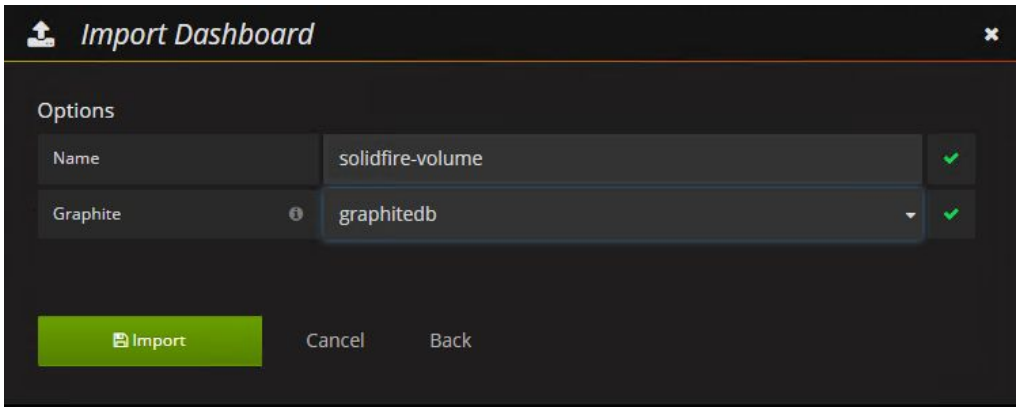


3. Import the included Grafana example dashboards.

A. Log into Grafana
B. From the Home screen, click the Import button



C. Select the Graphite database instance and click import



D. Repeat for the other included example dashboards

Troubleshooting

This blog has some exellent troubleshooting steps for a graphite+Grafana configuration and well worth the time to read through.
http://dieter.plaetinck.be/post/25-graphite-grafana-statsd-gotchas/

Graphing a datapoint from the Graphite database to validate metrics

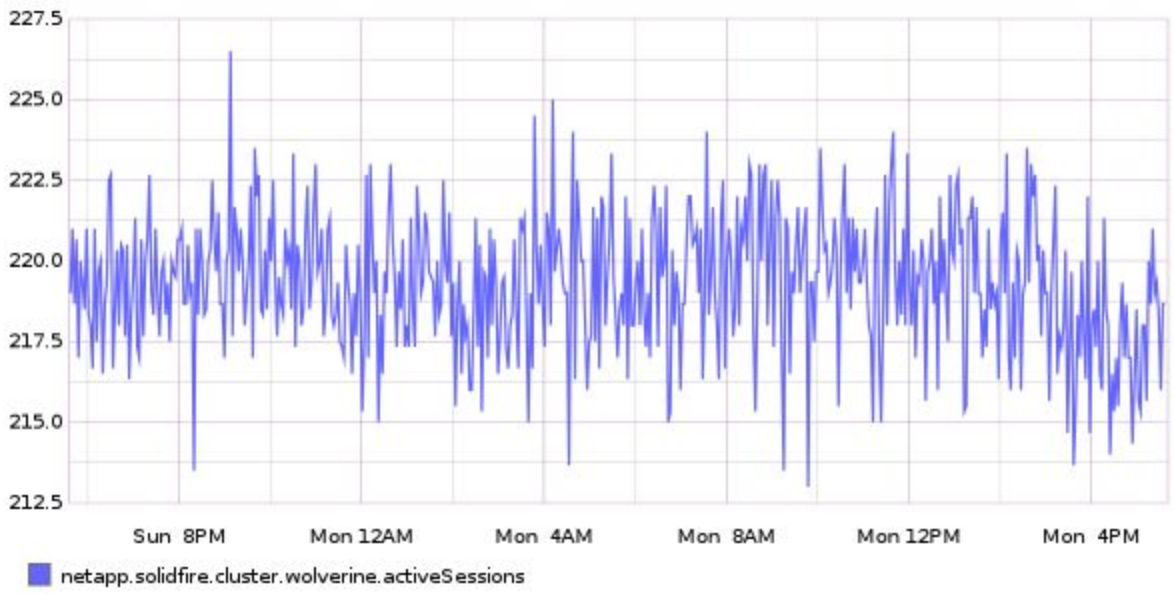
The Graphite API used in this project does not include the graphical front end for Graphite so the render API for Graphite can be used to verify that metrics are being pushed into the graphite database.

Validating SolidFire metrics are being pushed to Graphite

The format for displaying cluster metrics is:

```
http://<docker VM IP>:8080/render?target=netapp.solidfire.cluster.<cluster name>.<metric>
```

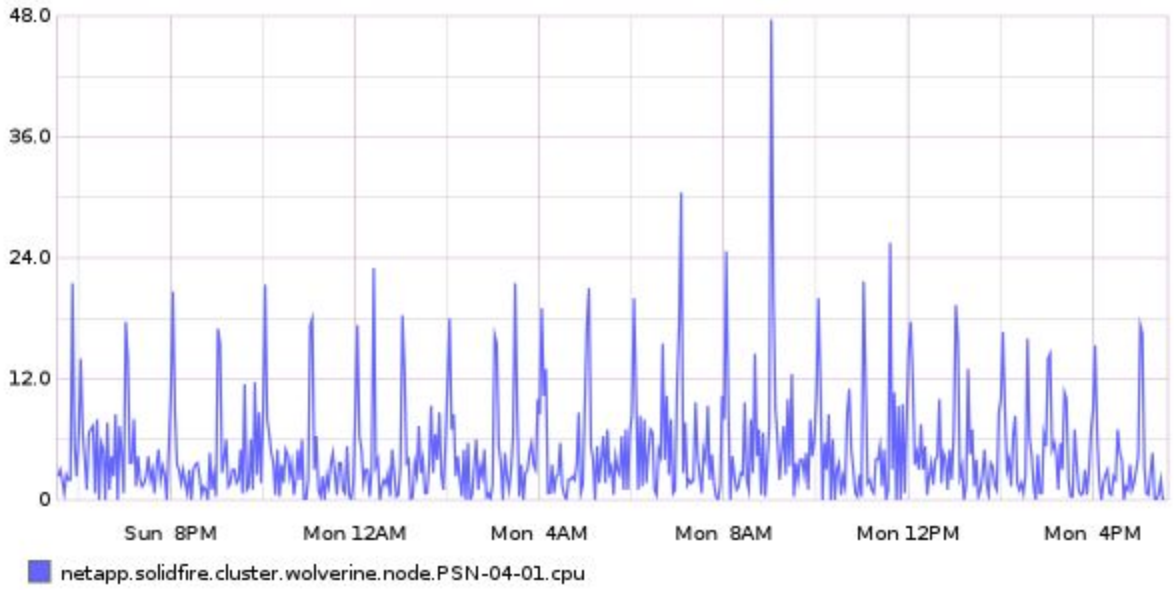
For example, to see cluster activeSessions:
http://172.27.96.14:8080/render?target=netapp.solidfire.cluster.wolverine.activeSessions



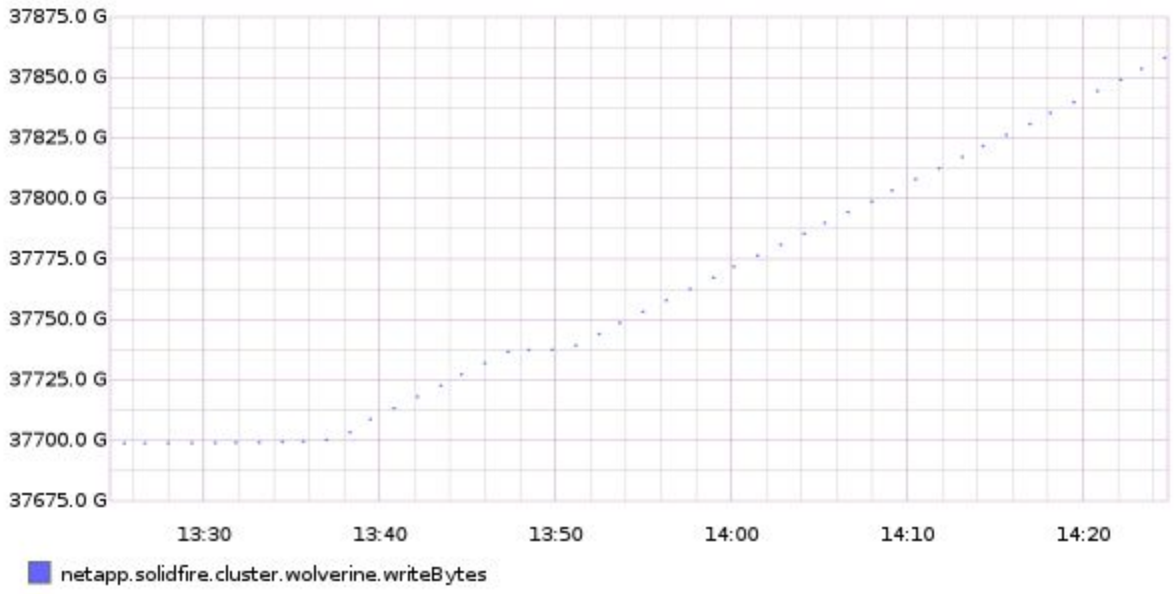
To display node metrics:

```
http://<docker VM IP>:8080/render?target=netapp.solidfire.cluster.<cluster name>.node.<node name>.<metric>
```

For example, to see a cluster node CPU usage:
http://172.27.96.14:8080/render?target=netapp.solidfire.cluster.wolverine.node.PSN-04-01.cpu



To display only the metrics from the last hour, add the $from=-<time window> argument
http://172.27.96.26:8080/render?target=netapp.solidfire.cluster.wolverine.writeBytes&from=-1hour



Checking sfcollector logs

If it becomes necessary to connect to the sfcollector to troubleshoot, the ENTRYPOINT for the container will need to be overriden

```
docker run --entrypoint "/bin/bash" -it sfcollector_sfcollector
```

Logs for the collector are stored in the /tmp directory.

Rebuilding a Container

If you need to make a change to a single container in the docker-compose setup (for instance to change the collector wrapper script) that can be done without taking down all the containers.

```
#List the services
root@hci-grafana01:/opt/github/sfcollector# docker-compose config
--services
graphite
vsphere-collector
sfcollector-alpine
grafana

#Stop the service
docker-compose stop sfcollector-alpine #this is the service name
<make changes>

#Start the service
docker-compose up -d --no-deps --build sfcollector-alpine
```

This will take down only the container that needs to be edited, you can then make the changes, rebuild the container and run it.

Removing stale metrics from the Whisper database

If there are stale metrics in the Whisper database the corresponding metric files have to be removed from the graphite container persistent storage. If using storage allocated via the NDVP we must start the graphite container with the persistent volume attached and then make the required changes. For example, to remove all the metrics for the “ultron” cluster from graphite, do the following.

```
#Stop the sfcollector-alpine container
root@vmgrafana01-0:/opt/github/sfcollector/collector#
docker-compose down
Stopping sfcollector_sfcollector_1 ... done
Stopping sfcollector_grafana_1 ... done
Stopping sfcollector_graphite_1 ... done
Removing sfcollector_sfcollector_1 ... done
Removing sfcollector_grafana_1 ... done
Removing sfcollector_graphite_1 ... done
```

```
#Start the graphite container with persistent storage
docker run --rm -it --entrypoint "/bin/bash" --volume
graphite-db:/opt/graphite/storage/whisper sfcollector_graphite

#Remove old stats for the ultron cluster
root@ed7dbf28f424:/# ls
/opt/graphite/storage/whisper/netapp/solidfire/cluster/
ultron  wolverine

root@ed7dbf28f424:/# rm -rf
/opt/graphite/storage/whisper/netapp/solidfire/cluster/ultron
```

At this point, the collector can be restarted.

Cleaning Up

To remove all untagged (dangling) images

```
docker image prune
```

Appendix A - Source Material

#Install Docker
https://docs.docker.com/engine/installation/linux/ubuntu

#NDVP Quick Start
http://netappdvp.readthedocs.io/en/latest/quick_start.html

#Composing Graphite server w/Docker
https://thepracticalsysadmin.com/composing-a-graphite-server-with-docker/

#SolidFire Collector for Graphite
https://github.com/cbiebers/solidfire-graphite-collector

#vSphere Graphite collector
https://github.com/cblomart/vsphere-graphite