

Adding Network Measuring to Data Federation Caches



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CENTER FOR
HIGH THROUGHPUT
COMPUTING



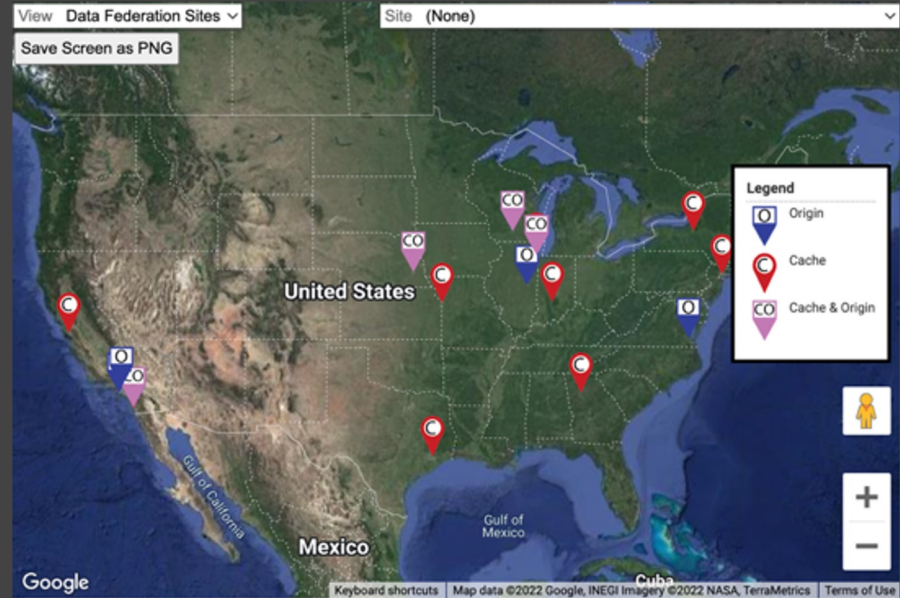
Project Goal

- set up two perfSONAR instances on two data caches.
- schedule network measuring tests between them.



Background: Data Federation

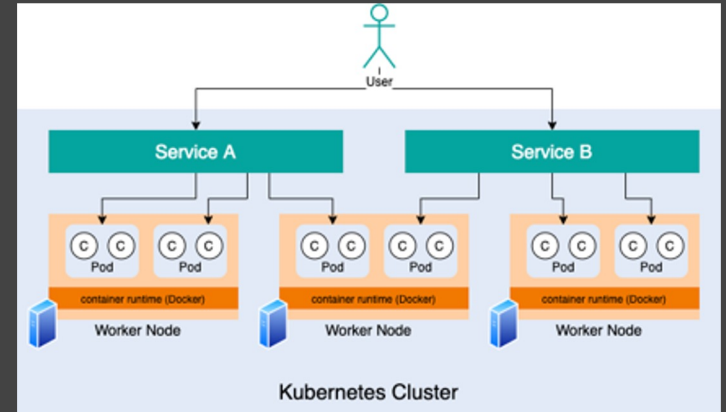
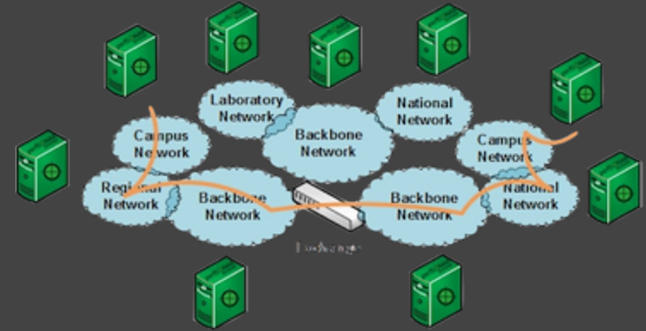
- it is provided by OSG.
- LHC experiments store data on origin servers.
- data is streamed from data origins to distributed data caches all over the world.



perfSONAR

Background: perfSONAR

- It is a performance Service-Oriented Network monitoring ARchitecture
- perfSONAR tests all nodes on the network path and looks for areas of low performance
- user can set different test types based on test purposes. (Latency tests, Throughput tests, etc)



Set up perfSONAR



- build a perfSONAR image that pulls test configs from psconfig web admin
- deploy perfSONAR on docker container using the image

| CONTAINER ID | IMAGE | COMMAND | CREATED | STATUS | PORTS | NAMES |
|--------------|---------------------|--------------------------|--------------------|-------------------|-------|--------------------------|
| 9de9a70b186d | perfsonar/testpoint | "/bin/sh -c '/usr/bi..." | About a minute ago | Up About a minute | | test_perfsonar_testpoint |

```
=== pScheduler Agent ===  
Added remote configuration http://psconfig.opensciencegrid.org/pub/config/osg-xache  
=== pScheduler Agent ===  
[  
  {  
    "url" : "http://psconfig.opensciencegrid.org/pub/config/osg-xache"  
  }  
]
```



Set up perfSONAR on Tiger cluster

- deploy the container alongside the data cache deployment on Tiger cluster.
- set up public ip
- set up ports needed for perfSONAR to communicate with other nodes

```
Name:          stash-cache-perfsonar
Namespace:    osgdev
CreationTimestamp: Tue, 30 Aug 2022 12:22:03 -0500
Labels:       app=stash-cache
              fluxcd.io/sync-gc-mark=sha256.aS6WV9pdAEu6MRRZldNoBI3amV1XAdoAtnMkb1zbwDE
Annotations:  deployment.kubernetes.io/revision: 1
              fluxcd.io/sync-checksum: 4375b56732986344710472fc574ecd59770ab572
Selector:     app=stash-cache
Replicas:    1 desired | 1 updated | 1 total | 1 available | 0 unavailable
StrategyType: Recreate
MinReadySeconds: 0
Pod Template:
  Labels:  app=stash-cache
  Init Containers:
    chown-xrootd-log-dir:
      Image:  hub.opensciencegrid.org/library/alpine:3
      Port:   <none>
      Host Port: <none>
      Command:
        chown
        -R
        10940:10940
        /var/log/xrootd
      Environment: <none>
      Mounts:
        /var/log/xrootd from stash-cache-xrootd-logs (rw)
  Containers:
    perfsonar-container:
      Image:  zye298/perfsonar-container:v5.0
      Ports:  443/TCP, 5001/TCP, 5201/TCP, 5000/TCP, 5101/TCP, 8090/TCP, 80/TCP
      Host Ports: 443/TCP, 5001/TCP, 5201/TCP, 5000/TCP, 5101/TCP, 8090/TCP, 80/TCP
      Environment: <none>
      Mounts:      <none>
    stash-cache:
      Image:  hub.opensciencegrid.org/opensciencegrid/stash-cache:3.6-development
      Ports:  1094/TCP, 8000/TCP, 8443/TCP
      Host Ports: 1094/TCP, 8000/TCP, 8443/TCP
      Limits:
        cpu: 4
        memory: 16Gi
      Requests:
        cpu: 1
        memory: 8Gi
      Environment:
        XC_RESOURCENAME: RESOURCE_NAME_IN_TOPOLOGY
        CACHE_FQDN:      FQDN.IN.TOPOLOGY
      Mounts:
        /etc/grid-security/hostcert.pem from stash-cache-cert (rw,path="hostcert.pem")
        /etc/grid-security/hostkey.pem from stash-cache-cert (rw,path="hostkey.pem")
        /var/log/xrootd from stash-cache-xrootd-logs (rw)
        /xcache from stash-cache-cache (rw)
  Volumes:
    stash-cache-cache:
      Type:      PersistentVolumeClaim (a reference to a PersistentVolumeClaim in the same namespace)
      ClaimName: stash-cache-cache-perfsonar
      ReadOnly:  false
    stash-cache-xrootd-logs:
      Type:      PersistentVolumeClaim (a reference to a PersistentVolumeClaim in the same namespace)
      ClaimName: stash-cache-xrootd-logs-perfsonar
      ReadOnly:  false
    stash-cache-cert:
      Type:      Secret (a volume populated by a Secret)
      SecretName: stash-cache-cert
      Optional:  false
```

Set up perfSONAR on River cluster

- deploy the container alongside the data cache deployment on River cluster.
- set up public ip
- set up ports needed for perfSONAR to communicate with other nodes

```
Name: stash-cache-perfsonar
Namespace: osg-dev
CreationTimestamp: Tue, 19 Jul 2022 16:29:59 -0500
Labels: app=stash-cache
        kustomize.toolkit.fluxcd.io/name=osg-dev
        kustomize.toolkit.fluxcd.io/namespace=osg-dev
Annotations: deployment.kubernetes.io/revision: 5
Selector: app=stash-cache
Replicas: 1 desired | 1 updated | 1 total | 1 available | 0 unavailable
StrategyType: Recreate
MinReadySeconds: 0
Pod Template:
  Labels: app=stash-cache
  Init Containers:
    chown-xrootd-log-dir:
      Image: hub.opensciencegrid.org/library/alpine:3
      Port: <none>
      Host Port: <none>
      Command:
        chown
        -R
        10940:10940
        /var/log/xrootd
      Environment: <none>
      Mounts:
        /var/log/xrootd from stash-cache-xrootd-logs (rw)
  Containers:
    perfsonar-container:
      Image: zye298/perfsonar-container:v5.0
      Ports: 443/TCP, 5001/TCP, 5201/TCP, 5000/TCP, 5101/TCP, 8090/TCP, 80/TCP
      Host Ports: 443/TCP, 5001/TCP, 5201/TCP, 5000/TCP, 5101/TCP, 8090/TCP, 80/TCP
      Environment: <none>
      Mounts: <none>
    stash-cache:
      Image: hub.opensciencegrid.org/opensciencegrid/stash-cache:3.6-development
      Ports: 1094/TCP, 8000/TCP, 8443/TCP
      Host Ports: 1094/TCP, 8000/TCP, 8443/TCP
      Limits:
        cpu: 4
        memory: 16Gi
      Requests:
        cpu: 1
        memory: 8Gi
      Environment:
        XC_RESOURCE_NAME: RESOURCE_NAME_IN_TOPOLOGY
        CACHE_FQDN: FQDN.IN.TOPOLOGY
      Mounts:
        /etc/grid-security/hostcert.pem from stash-cache-cert (rw,path="hostcert.pem")
        /etc/grid-security/hostkey.pem from stash-cache-cert (rw,path="hostkey.pem")
        /var/log/xrootd from stash-cache-xrootd-logs (rw)
        /xcache from stash-cache-cache (rw)
  Volumes:
    stash-cache-cache:
      Type: PersistentVolumeClaim (a reference to a PersistentVolumeClaim in the same namespace)
      ClaimName: stash-cache-cache-perfsonar
      ReadOnly: false
    stash-cache-xrootd-logs:
      Type: PersistentVolumeClaim (a reference to a PersistentVolumeClaim in the same namespace)
      ClaimName: stash-cache-xrootd-logs-perfsonar
      ReadOnly: false
    stash-cache-cert:
      Type: Secret (a volume populated by a Secret)
      SecretName: stash-cache-cert
      Optional: false
```

Schedule network measuring tests

- set up test configs on pconfig web admin at <https://psconfig.opensciencegrid.org/>

The screenshot displays the pconfig web admin interface for configuring a network test. At the top, the 'Config URL' is set to 'http://psconfig.opensciencegrid.org/pub/config/' and the configuration name is 'osg-xcache'. Below this, there is a section for 'Central MA URLs' which is currently empty. A note indicates that providing Measurement Archive URLs will allow test results to be sent to one or more central measurement archives. The 'Force endpoint MAs' section has an unchecked checkbox for 'Force archiving to the MA on each endpoint', with a note explaining that enabling this option will force all test results to be stored in the individual MA for each host. The main 'Tests' section shows a configuration for a test named 'osg-xcache-throughput'. This test is 'Enabled (include in mesh config)'. Its 'Service Type' is 'Throughput' and its 'Topology' is 'Mesh'. The 'Host Group A' is 'osg-xcache-bw (2 Hosts)', with two host directives listed: 'perfonar-cache.osgdev.chtc.io' and 'perfonar-cache.osg-dev.river.chtc.io'. There is a field for 'No Agent Hosts (Optional)' labeled 'Enter Hostnames'. The 'Testspec' is 'osg-xcache-bw', and a list of test parameters is shown at the bottom: 'tool bwctl/perf3', 'protocol tcp', 'interval 60', 'duration 20', 'random_start_percentage 10', 'omit_interval 5', and 'ipv4_only true'. At the bottom of the interface, there are two buttons: 'Add New Test' and 'Import from existing Config'.

Config URL [psConfig](#)

Central MA URLs

Providing Measurement Archive URLs (one per line) will allow you to send test results for all tests in the config to one or more central measurement archives.

Force endpoint MAs Force archiving to the MA on each endpoint
Enabling this option will force the all test results to be stored in the individual MA for each host. This is useful if you don't have a central MA, or if you need to store at each endpoint for some other reason.

Tests

Enabled (include in mesh config) [Remove Test](#)

Test Name

Service Type Topology

Host Group A
[Add](#) perfonar-cache.osgdev.chtc.io [Add](#) perfonar-cache.osg-dev.river.chtc.io

No Agent Hosts (Optional)
Defines an address that will not initiate tests when used in this group. This will override the no_agent field specified in the host directive if defined. It is recommended you use the host directive to define this if a address cannot initiate tests for any group. Only use this form if you want a host to initiate tests when used in some groups but not others.

Testspec
[tool](#) bwctl/perf3 [protocol](#) tcp [interval](#) 60 [duration](#) 20 [random_start_percentage](#) 10 [omit_interval](#) 5 [ipv4_only](#) true

[Add New Test](#) or [Import from existing Config](#)

Major issues countered

- container does not run properly in kubernetes cluster (stuck in some failing states)
- container cannot receive test configs from web admin (container network fails, wrong ports opened)
- upstream perfsonar image does not provide full services for network tests

- perfSONAR on Tiger: has been stuck on pod initializing state.

Containers:

perfsonar-container:

Container ID:

Image: zye298/perfsonar-container:v4.0

Image ID:

Ports: 443/TCP, 5001/TCP, 5201/TCP, 5000/TCP, 5101/TCP, 8090/TCP, 80/TCP

Host Ports: 443/TCP, 5001/TCP, 5201/TCP, 5000/TCP, 5101/TCP, 8090/TCP, 80/TCP

State: Waiting

Reason: PodInitializing

- perfSONAR on River: multiple services are not running.

```
[root@stash-cache-perfsonar-fdbfc597b-pqhm perfsonar]# psconfig pscheduler-tasks
Unable to open /var/log/perfsonar/psconfig-pscheduler-agent.log: No such file or directory
[root@stash-cache-perfsonar-fdbfc597b-pqhm perfsonar]# pscheduler debug on scheduler
Warning: scheduler does not appear to be running.
[root@stash-cache-perfsonar-fdbfc597b-pqhm perfsonar]#
```

Schedule network measuring tests

- perfSONAR instance pulls test config from web admin and schedule the tests based on the config
- possible future work: a Central Measurement Archive to save test output is needed.

```
[root@stash-cache-perfsonar-69899966c7-r4ndf perfsonar]# psconfig pscheduler-tasks
{
  "tasks" : [
    {
      "archives" : [],
      "test" : {
        "spec" : {
          "source" : "perfsonar-cache.osgdev.chtc.io",
          "dest" : "perfsonar-cache.osg-dev.river.chtc.io",
          "duration" : "PT20S",
          "schema" : 1,
          "omit" : "PT5S",
          "ip-version" : 4
        },
        "type" : "throughput"
      },
      "reference" : {
        "psconfig" : {
          "created-by" : {
            "user-agent" : "psconfig-pscheduler-agent",
            "uuid" : "DE16479A-28A3-11E0-AD90-B3BD0D20D889"
          }
        }
      },
      "tools" : [
        "bwctliperf3",
        "iperf3"
      ],
      "schedule" : {
        "until" : "2022-08-31T23:18:56Z",
        "sliprand" : true,
        "repeat" : "PT1M",
        "slip" : "PT30S"
      }
    }
  ]
}
```

Thanks!

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