PanDA analysis queue: GOOGLE100

- Autoscaled, preemptible cluster: 2 to 10 n2-standard-8 nodes (8 core, 32 GB mem, 375GB local SSD)
- Nikolai already ran few small test tasks
- Currently empty
  - Would be good to have a rough schedule for testing and ramp up to optimize budget
  - Note: I never understood GCE autoscaling and why it doesn’t scale in
- Others can use the queue as well
  - You need to ask Rucio to enable your account and provide a quota in order to use the associated Rucio Storage Element GOOGLE_EU

Dask Gateway + JupyterHub

- GKE cluster with 3 e2-standard-8 nodes (8 core, 32 GB mem, 100 GB disk)
- Rough installation available
- JupyterHub
  - Password authentication (one password for all users)
    - Theoretically it’s possible to setup OAuth using gcp4hep.org
  - Jupyter accounts currently have 10 GB disk
- Dask Gateway
  - Users can create their own Dask Cluster through python and JupyterHub
  - Possible to customize worker corecount, memory, image
    - Image needs to fulfill few conditions (e.g. have dask-gateway installed)
- Nikolai and Lukas have access to start providing feedback
- I can provide others access
  - Potentially unstable at times if we decide to add any functionalities

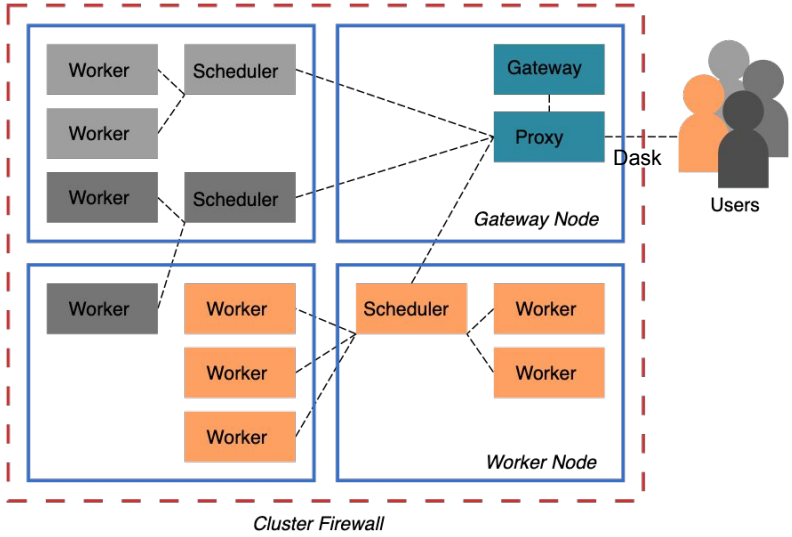
Suggestions and questions

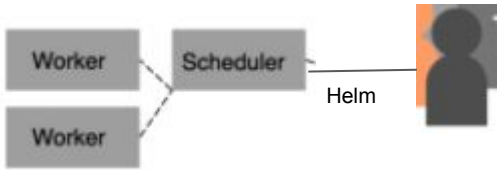
- Other capabilities can potentially be added based on feedback

Backup

Dask-Kubernetes

- Dask Gateway for multi user cluster
  - User only has access to Dask
  - Daskhub helm: (**rest of slides refer to this**)
    - Bundles Dask gateway + Jupyterhub
    - Available since August
      - I think this will be the favoured chart
  - Dask gateway helm:
    - Independent installation of Dask Gateway
- Dask single user
  - User interacts with Kubernetes cluster and creates his own Dask clusters

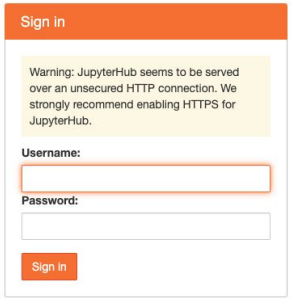




JupyterHub users and basics

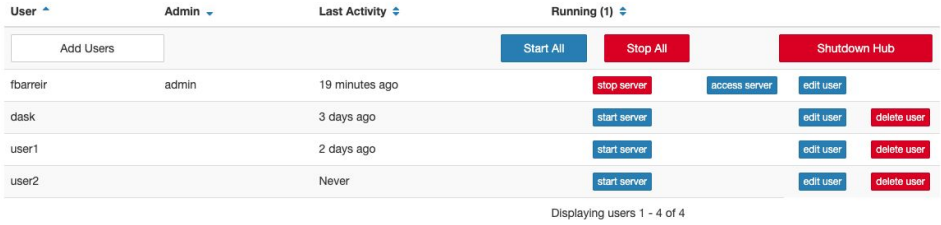
- Password authentication
  - Can add different users + JupyterHub admins through helm config file
  - All share the same password
  - OAuth integration using gcp4hep.org could be possible, but not first priority
- Each user runs in a separate pod
  - 10GB disk assigned
  - If it fills up, JH account stops working
    - Can be solved by resizing disk
- Running as http, not https

http://<JH IP>



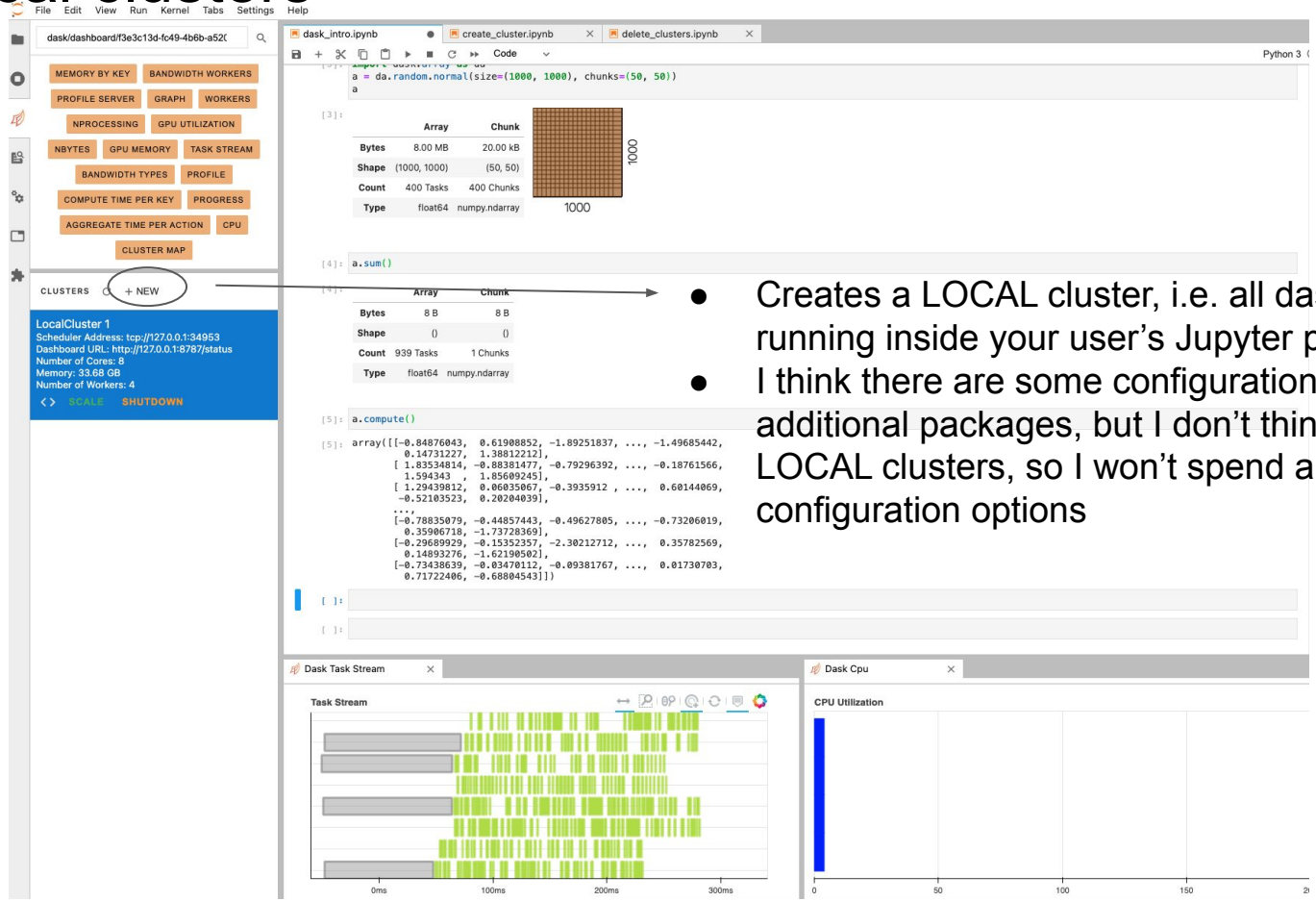
GW=GateWay;
JH=JupyterHub

http://<JH IP>/hub/admin




```
[root@aipanda185 ~]# kubectl get pods -o wide
NAME                                      READY   STATUS    RESTARTS   AGE
api-dhub-dask-gateway-cb84dd5d5-85mdc     1/1     Running   0          35h
continuous-image-puller-2z4fq             1/1     Running   0          2d15h
continuous-image-puller-fm2mh             1/1     Running   0          2d15h
continuous-image-puller-smj5f             1/1     Running   0          2d15h
controller-dhub-dask-gateway-66f57c96ff-nqxzg   1/1     Running   0          2d15h
hub-8f8c65b9f-fpncv                       1/1     Running   0          35h
jupyter-fbarreir                          1/1     Running   0          22h
proxy-d9699f6b-pldzm                      1/1     Running   0          35h
traefik-dhub-dask-gateway-cc4bd9759-qchkk   1/1     Running   0          2d15h
user-scheduler-76977c766-gvwvw            1/1     Running   0          2d15h
user-scheduler-76977c766-pcndn            1/1     Running   0          2d15h
```

Local clusters



- Creates a LOCAL cluster, i.e. all dask components running inside your user's Jupyter pod
- I think there are some configuration possibilities for additional packages, but I don't think we care about LOCAL clusters, so I won't spend any time looking at configuration options

Distributed clusters

```
[1]: from dask_gateway import GatewayCluster
     cluster = GatewayCluster()
     client = cluster.get_client()
     cluster
```

GatewayCluster

Workers	2
Cores	2
Memory	4.29 GB

▾ Manual Scaling

Workers 2 Scale

▸ Adaptive Scaling

Name: default.27275746289242509 6bbfeafa321c41c

Dashboard: /services/dask-gateway/clusters/default.27275746289242509 6bbfeafa321c41c/status

Copy this link into the Dask lab extension to enable fancy monitoring

```
[2]: import dask.array as da
     a = da.random.normal(size=(1000, 1000), chunks=(500, 500))
     a.mean().compute()
```

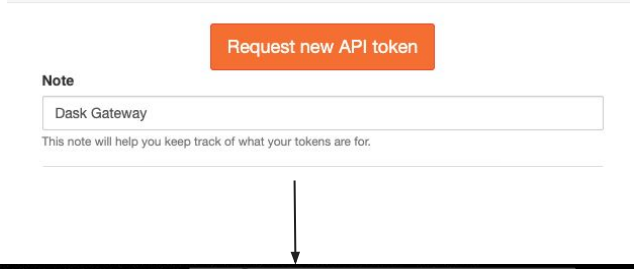
```
[2]: -0.00012254271380655166
```

- No button to create cluster(AFAIK), need to do it through python - preconfigured

```
[root@aipanda185 ~]# kubectl get pods -o wide
NAME                                                READY   STATUS    RESTARTS   AGE
api-dhub-dask-gateway-cb84dd5d5-85mdc               1/1     Running   0          35h
continuous-image-puller-2z4fq                       1/1     Running   0          2d15h
continuous-image-puller-fm2mh                       1/1     Running   0          2d15h
continuous-image-puller-smj5f                       1/1     Running   0          2d15h
controller-dhub-dask-gateway-66f57c96ff-nqxzg       1/1     Running   0          2d15h
dask-scheduler-27275746289242509 6bbfeafa321c41c    1/1     Running   0          44s
dask-worker-27275746289242509 6bbfeafa321c41c-6vrdr 1/1     Running   0          12s
dask-worker-27275746289242509 6bbfeafa321c41c-tzpwc 1/1     Running   0          12s
hub-8f8c65b9f-fpncv                                 1/1     Running   0          35h
jupyter-fbarreir                                    1/1     Running   0          23h
proxy-d9699f6b-pldzm                                1/1     Running   0          35h
traefik-dhub-dask-gateway-cc4bd9759-qchkk           1/1     Running   0          2d15h
user-scheduler-76977c766-gvwvw                      1/1     Running   0          2d15h
user-scheduler-76977c766-pcndn                      1/1     Running   0          2d15h
```

Direct python interaction with GW

http://<JH IP>/hub/token




```
[root@aipanda185 gke-dask]# export JUPYTERHUB_API_TOKEN=[redacted] TOKEN
[root@aipanda185 gke-dask]# python3
Python 3.6.8 (default, Nov 16 2020, 16:55:22)
[GCC 4.8.5 20150623 (Red Hat 4.8.5-44)] on linux
Type "help", "copyright", "credits" or "license" for more information.
>>> from dask_gateway import Gateway
^R
>>> gateway = Gateway("http://[redacted] GW IP [redacted]2/services/dask-gateway", auth="jupyterhub")
>>> cluster = gateway.new_cluster()
>>> cluster.scale(2)
>>> client = cluster.get_client()
/usr/local/lib/python3.6/site-packages/distributed/client.py:1129: VersionMismatchWarning: Mismatched versions found

+---------+---------------+---------------+---------------+
| Package | client        | scheduler     | workers       |
+---------+---------------+---------------+---------------+
| msgpack | 1.0.2         | 1.0.0         | 1.0.0         |
| numpy   | 1.19.5        | 1.19.2        | 1.19.2        |
| python  | 3.6.8.final.0 | 3.8.3.final.0 | 3.8.3.final.0 |
+---------+---------------+---------------+---------------+
Notes:
-  msgpack: Variation is ok, as long as everything is above 0.6
  warnings.warn(version_module.VersionMismatchWarning(msg[0]["warning"]))
>>> import dask.array as da
>>> a = da.random.normal(size=(1000, 1000), chunks=(500, 500))
>>> a.mean().compute()
0.000992059770998904
```

To customize workers in your cluster:

```
gateway.new_cluster(image='fbarreir/daskgateway
:latest', worker_cores=2, worker_memory=4)
```