



Kubeflow Deployment

NetApp Solutions

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Kubeflow Deployment

This section describes the tasks that you must complete to deploy Kubeflow in your Kubernetes cluster.

Prerequisites

Before you perform the deployment exercise that is outlined in this section, we assume that you have already performed the following tasks:

1. You already have a working Kubernetes cluster, and you are running a version of Kubernetes that is supported by Kubeflow. For a list of supported versions, see the [official Kubeflow documentation](#).
2. You have already installed and configured NetApp Trident in your Kubernetes cluster as outlined in [Trident Deployment and Configuration](#).

Set Default Kubernetes StorageClass

Before you deploy Kubeflow, you must designate a default StorageClass within your Kubernetes cluster. The Kubeflow deployment process attempts to provision new persistent volumes using the default StorageClass. If no StorageClass is designated as the default StorageClass, then the deployment fails. To designate a default StorageClass within your cluster, perform the following task from the deployment jump host. If you have already designated a default StorageClass within your cluster, then you can skip this step.

1. Designate one of your existing StorageClasses as the default StorageClass. The example commands that follow show the designation of a StorageClass named `ontap-ai-flexvols-retain` as the default StorageClass.



The `ontap-nas-flexgroup` Trident Backend type has a minimum PVC size that is fairly large. By default, Kubeflow attempts to provision PVCs that are only a few GBs in size. Therefore, you should not designate a StorageClass that utilizes the `ontap-nas-flexgroup` Backend type as the default StorageClass for the purposes of Kubeflow deployment.

```
$ kubectl get sc
NAME                                     PROVISIONER                AGE
ontap-ai-flexgroups-retain              csi.trident.netapp.io      25h
ontap-ai-flexgroups-retain-iface1       csi.trident.netapp.io      25h
ontap-ai-flexgroups-retain-iface2       csi.trident.netapp.io      25h
ontap-ai-flexvols-retain                 csi.trident.netapp.io      3s
$ kubectl patch storageclass ontap-ai-flexvols-retain -p '{"metadata":
{"annotations":{"storageclass.kubernetes.io/is-default-class":"true"}}}'
storageclass.storage.k8s.io/ontap-ai-flexvols-retain patched
$ kubectl get sc
NAME                                     PROVISIONER                AGE
ontap-ai-flexgroups-retain              csi.trident.netapp.io      25h
ontap-ai-flexgroups-retain-iface1       csi.trident.netapp.io      25h
ontap-ai-flexgroups-retain-iface2       csi.trident.netapp.io      25h
ontap-ai-flexvols-retain (default)      csi.trident.netapp.io      54s
```

Use NVIDIA DeepOps to Deploy Kubeflow

NetApp recommends using the Kubeflow deployment tool that is provided by NVIDIA DeepOps. To deploy Kubeflow in your Kubernetes cluster using the DeepOps deployment tool, perform the following tasks from the deployment jump host.



Alternatively, you can deploy Kubeflow manually by following the [installation instructions](#) in the official Kubeflow documentation

1. Deploy Kubeflow in your cluster by following the [Kubeflow deployment instructions](#) on the NVIDIA DeepOps GitHub site.
2. Note down the Kubeflow Dashboard URL that the DeepOps Kubeflow deployment tool outputs.

```
$ ./scripts/k8s/deploy_kubeflow.sh -x
...
INFO[0007] Applied the configuration Successfully!
filename="cmd/apply.go:72"
Kubeflow app installed to: /home/ai/kubeflow
It may take several minutes for all services to start. Run 'kubectl get
pods -n kubeflow' to verify
To remove (excluding CRDs, istio, auth, and cert-manager), run:
./scripts/k8s_deploy_kubeflow.sh -d
To perform a full uninstall : ./scripts/k8s_deploy_kubeflow.sh -D
Kubeflow Dashboard (HTTP NodePort): http://10.61.188.111:31380
```

3. Confirm that all pods deployed within the Kubeflow namespace show a STATUS of Running and confirm that no components deployed within the namespace are in an error state. It may take several minutes for all pods to start.

```
$ kubectl get all -n kubeflow
```

NAME	STATUS	RESTARTS	AGE	READY
pod/admission-webhook-bootstrap-stateful-set-0	Running	0	95s	1/1
pod/admission-webhook-deployment-6b89c84c98-vrtbh	Running	0	91s	1/1
pod/application-controller-stateful-set-0	Running	0	98s	1/1
pod/argo-ui-5dcf5d8b4f-m2wn4	Running	0	97s	1/1
pod/centraldashboard-cf4874ddc-7hcr8	Running	0	97s	1/1
pod/jupyter-web-app-deployment-685b455447-gjhh7	Running	0	96s	1/1
pod/katib-controller-88c97d85c-kgq66	Running	1	95s	1/1

pod/katib-db-8598468fd8-5jw2c	1/1
Running 0 95s	
pod/katib-manager-574c8c67f9-wtrf5	1/1
Running 1 95s	
pod/katib-manager-rest-778857c989-fjbzn	1/1
Running 0 95s	
pod/katib-suggestion-bayesianoptimization-65df4d7455-qthmw	1/1
Running 0 94s	
pod/katib-suggestion-grid-56bf69f597-98vwn	1/1
Running 0 94s	
pod/katib-suggestion-hyperband-7777b76cb9-9v6dq	1/1
Running 0 93s	
pod/katib-suggestion-nasrl-77f6f9458c-2qzxq	1/1
Running 0 93s	
pod/katib-suggestion-random-77b88b5c79-164j9	1/1
Running 0 93s	
pod/katib-ui-7587c5b967-nd629	1/1
Running 0 95s	
pod/metacontroller-0	1/1
Running 0 96s	
pod/metadata-db-5dd459cc-swzkm	1/1
Running 0 94s	
pod/metadata-deployment-6cf77db994-69fk7	1/1
Running 3 93s	
pod/metadata-deployment-6cf77db994-mpbjt	1/1
Running 3 93s	
pod/metadata-deployment-6cf77db994-xg7tz	1/1
Running 3 94s	
pod/metadata-ui-78f5b59b56-qb6kr	1/1
Running 0 94s	
pod/minio-758b769d67-1lvdr	1/1
Running 0 91s	
pod/ml-pipeline-5875b9db95-g8t2k	1/1
Running 0 91s	
pod/ml-pipeline-persistenceagent-9b69ddd46-bt9r9	1/1
Running 0 90s	
pod/ml-pipeline-scheduledworkflow-7b8d756c76-7x56s	1/1
Running 0 90s	
pod/ml-pipeline-ui-79ffd9c76-fcwpd	1/1
Running 0 90s	
pod/ml-pipeline-viewer-controller-deployment-5fdc87f58-b2t9r	1/1
Running 0 90s	
pod/mysql-657f87857d-15k9z	1/1
Running 0 91s	
pod/notebook-controller-deployment-56b4f59bbf-8bvnr	1/1
Running 0 92s	

```

pod/profiles-deployment-6bc745947-mrdkh                2/2
Running      0          90s
pod/pytorch-operator-77c97f4879-hmlrv                  1/1
Running      0          92s
pod/seldon-operator-controller-manager-0               1/1
Running      1          91s
pod/spartakus-volunteer-5fdfdb779-17qkm               1/1
Running      0          92s
pod/tensorboard-6544748d94-nh8b2                      1/1
Running      0          92s
pod/tf-job-dashboard-56f79c59dd-6w59t                 1/1
Running      0          92s
pod/tf-job-operator-79cbfd6dbc-rb58c                  1/1
Running      0          91s
pod/workflow-controller-db644d554-cwrnb               1/1
Running      0          97s
NAME                                                    TYPE
CLUSTER-IP      EXTERNAL-IP  PORT(S)          AGE
service/admission-webhook-service                    ClusterIP
10.233.51.169   <none>        443/TCP          97s
service/application-controller-service                ClusterIP
10.233.4.54     <none>        443/TCP          98s
service/argo-ui                                       NodePort
10.233.47.191  <none>        80:31799/TCP     97s
service/centraldashboard                             ClusterIP
10.233.8.36    <none>        80/TCP           97s
service/jupyter-web-app-service                      ClusterIP
10.233.1.42    <none>        80/TCP           97s
service/katib-controller                             ClusterIP
10.233.25.226  <none>        443/TCP          96s
service/katib-db                                     ClusterIP
10.233.33.151  <none>        3306/TCP         97s
service/katib-manager                                ClusterIP
10.233.46.239  <none>        6789/TCP         96s
service/katib-manager-rest                           ClusterIP
10.233.55.32   <none>        80/TCP           96s
service/katib-suggestion-bayesianoptimization         ClusterIP
10.233.49.191  <none>        6789/TCP         95s
service/katib-suggestion-grid                        ClusterIP
10.233.9.105   <none>        6789/TCP         95s
service/katib-suggestion-hyperband                   ClusterIP
10.233.22.2    <none>        6789/TCP         95s
service/katib-suggestion-nasrl                       ClusterIP
10.233.63.73   <none>        6789/TCP         95s
service/katib-suggestion-random                      ClusterIP
10.233.57.210  <none>        6789/TCP         95s

```

service/katib-ui			ClusterIP	
10.233.6.116	<none>	80/TCP	96s	
service/metadata-db			ClusterIP	
10.233.31.2	<none>	3306/TCP	96s	
service/metadata-service			ClusterIP	
10.233.27.104	<none>	8080/TCP	96s	
service/metadata-ui			ClusterIP	
10.233.57.177	<none>	80/TCP	96s	
service/minio-service			ClusterIP	
10.233.44.90	<none>	9000/TCP	94s	
service/ml-pipeline			ClusterIP	
10.233.41.201	<none>	8888/TCP,8887/TCP	94s	
service/ml-pipeline-tensorboard-ui			ClusterIP	
10.233.36.207	<none>	80/TCP	93s	
service/ml-pipeline-ui			ClusterIP	
10.233.61.150	<none>	80/TCP	93s	
service/mysql			ClusterIP	
10.233.55.117	<none>	3306/TCP	94s	
service/notebook-controller-service			ClusterIP	
10.233.10.166	<none>	443/TCP	95s	
service/profiles-kfam			ClusterIP	
10.233.33.79	<none>	8081/TCP	92s	
service/pytorch-operator			ClusterIP	
10.233.37.112	<none>	8443/TCP	95s	
service/seldon-operator-controller-manager-service			ClusterIP	
10.233.30.178	<none>	443/TCP	92s	
service/tensorboard			ClusterIP	
10.233.58.151	<none>	9000/TCP	94s	
service/tf-job-dashboard			ClusterIP	
10.233.4.17	<none>	80/TCP	94s	
service/tf-job-operator			ClusterIP	
10.233.60.32	<none>	8443/TCP	94s	
service/webhook-server-service			ClusterIP	
10.233.32.167	<none>	443/TCP	87s	
NAME			READY	UP-
TO-DATE	AVAILABLE	AGE		
deployment.apps/admission-webhook-deployment			1/1	1
1	97s			
deployment.apps/argo-ui			1/1	1
1	97s			
deployment.apps/centraldashboard			1/1	1
1	97s			
deployment.apps/jupyter-web-app-deployment			1/1	1
1	97s			
deployment.apps/katib-controller			1/1	1
1	96s			

deployment.apps/katib-db	1/1	1
1 97s		
deployment.apps/katib-manager	1/1	1
1 96s		
deployment.apps/katib-manager-rest	1/1	1
1 96s		
deployment.apps/katib-suggestion-bayesianoptimization	1/1	1
1 95s		
deployment.apps/katib-suggestion-grid	1/1	1
1 95s		
deployment.apps/katib-suggestion-hyperband	1/1	1
1 95s		
deployment.apps/katib-suggestion-nasrl	1/1	1
1 95s		
deployment.apps/katib-suggestion-random	1/1	1
1 95s		
deployment.apps/katib-ui	1/1	1
1 96s		
deployment.apps/metadata-db	1/1	1
1 96s		
deployment.apps/metadata-deployment	3/3	3
3 96s		
deployment.apps/metadata-ui	1/1	1
1 96s		
deployment.apps/minio	1/1	1
1 94s		
deployment.apps/ml-pipeline	1/1	1
1 94s		
deployment.apps/ml-pipeline-persistenceagent	1/1	1
1 93s		
deployment.apps/ml-pipeline-scheduledworkflow	1/1	1
1 93s		
deployment.apps/ml-pipeline-ui	1/1	1
1 93s		
deployment.apps/ml-pipeline-viewer-controller-deployment	1/1	1
1 93s		
deployment.apps/mysql	1/1	1
1 94s		
deployment.apps/notebook-controller-deployment	1/1	1
1 95s		
deployment.apps/profiles-deployment	1/1	1
1 92s		
deployment.apps/pytorch-operator	1/1	1
1 95s		
deployment.apps/spartakus-volunteer	1/1	1
1 94s		


```

deployment.apps/tensorboard              1/1      1
1          94s
deployment.apps/tf-job-dashboard          1/1      1
1          94s
deployment.apps/tf-job-operator           1/1      1
1          94s
deployment.apps/workflow-controller       1/1      1
1          97s
NAME
DESIRED   CURRENT   READY   AGE
replicaset.apps/admission-webhook-deployment-6b89c84c98      1
1          1        97s
replicaset.apps/argo-ui-5dcf5d8b4f                          1
1          1        97s
replicaset.apps/centraldashboard-cf4874ddc                  1
1          1        97s
replicaset.apps/jupyter-web-app-deployment-685b455447        1
1          1        97s
replicaset.apps/katib-controller-88c97d85c                  1
1          1        96s
replicaset.apps/katib-db-8598468fd8                          1
1          1        97s
replicaset.apps/katib-manager-574c8c67f9                     1
1          1        96s
replicaset.apps/katib-manager-rest-778857c989                1
1          1        96s
replicaset.apps/katib-suggestion-bayesianoptimization-65df4d7455  1
1          1        95s
replicaset.apps/katib-suggestion-grid-56bf69f597             1
1          1        95s
replicaset.apps/katib-suggestion-hyperband-7777b76cb9        1
1          1        95s
replicaset.apps/katib-suggestion-nasrl-77f6f9458c            1
1          1        95s
replicaset.apps/katib-suggestion-random-77b88b5c79           1
1          1        95s
replicaset.apps/katib-ui-7587c5b967                          1
1          1        96s
replicaset.apps/metadata-db-5dd459cc                          1
1          1        96s
replicaset.apps/metadata-deployment-6cf77db994               3
3          3        96s
replicaset.apps/metadata-ui-78f5b59b56                       1
1          1        96s
replicaset.apps/minio-758b769d67                             1
1          1        93s

```

```

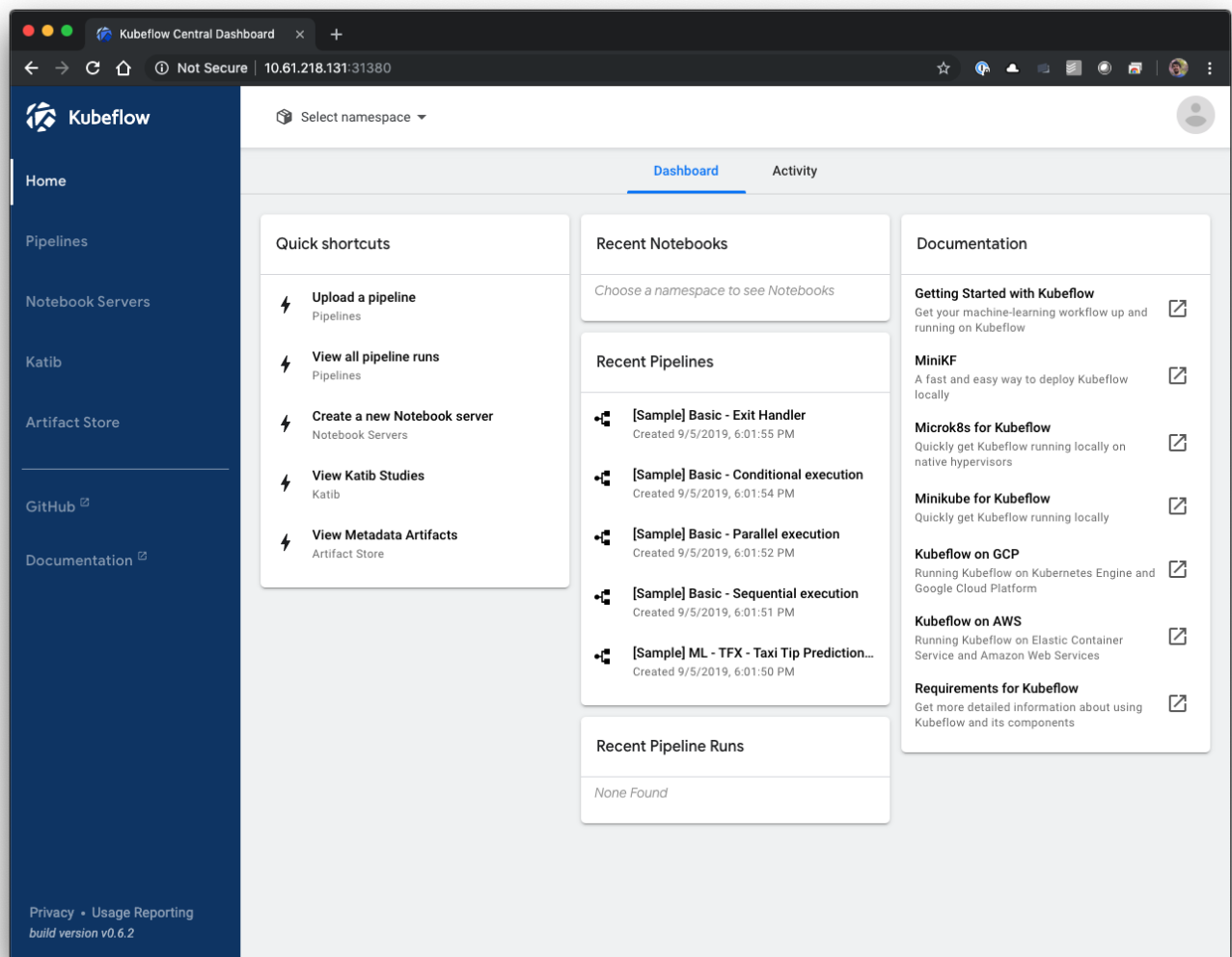
replicaset.apps/ml-pipeline-5875b9db95 1
1 1 93s
replicaset.apps/ml-pipeline-persistenceagent-9b69ddd46 1
1 1 92s
replicaset.apps/ml-pipeline-scheduledworkflow-7b8d756c76 1
1 1 91s
replicaset.apps/ml-pipeline-ui-79ffd9c76 1
1 1 91s
replicaset.apps/ml-pipeline-viewer-controller-deployment-5fdc87f58 1
1 1 91s
replicaset.apps/mysql-657f87857d 1
1 1 92s
replicaset.apps/notebook-controller-deployment-56b4f59bbf 1
1 1 94s
replicaset.apps/profiles-deployment-6bc745947 1
1 1 91s
replicaset.apps/pytorch-operator-77c97f4879 1
1 1 94s
replicaset.apps/spartakus-volunteer-5fdfd6b779 1
1 1 94s
replicaset.apps/tensorboard-6544748d94 1
1 1 93s
replicaset.apps/tf-job-dashboard-56f79c59dd 1
1 1 93s
replicaset.apps/tf-job-operator-79cbfd6dbc 1
1 1 93s
replicaset.apps/workflow-controller-db644d554 1
1 1 97s
NAME READY AGE
statefulset.apps/admission-webhook-bootstrap-stateful-set 1/1 97s
statefulset.apps/application-controller-stateful-set 1/1 98s
statefulset.apps/metacontroller 1/1 98s
statefulset.apps/seldon-operator-controller-manager 1/1 92s
$ kubectl get pvc -n kubeflow
NAME STATUS VOLUME
CAPACITY ACCESS MODES STORAGECLASS AGE
katib-mysql Bound pvc-b07f293e-d028-11e9-9b9d-00505681a82d
10Gi RWO ontap-ai-flexvols-retain 27m
metadata-mysql Bound pvc-b0f3f032-d028-11e9-9b9d-00505681a82d
10Gi RWO ontap-ai-flexvols-retain 27m
minio-pv-claim Bound pvc-b22727ee-d028-11e9-9b9d-00505681a82d
20Gi RWO ontap-ai-flexvols-retain 27m
mysql-pv-claim Bound pvc-b2429afd-d028-11e9-9b9d-00505681a82d
20Gi RWO ontap-ai-flexvols-retain 27m

```

4. In your web browser, access the Kubeflow central dashboard by navigating to the URL that you noted

down in step 2.

The default username is `admin@kubeflow.org`, and the default password is `12341234`. To create additional users, follow the instructions in the [official Kubeflow documentation](#).



Next: [Example Kubeflow Operations and Tasks](#)

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