



# **Deploy hybrid AI training with Union.ai and NetApp FlexCache**

NetApp artificial intelligence solutions

NetApp  
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# Deploy hybrid AI training with Union.ai and NetApp FlexCache

Learn how to deploy a hybrid AI training environment using Union.ai orchestration with NetApp FlexCache and Trident for Kubernetes storage provisioning.

David Espejo, Union.ai  
Sathish Thyagarajan, NetApp

## Overview

Union.ai's hybrid orchestration platform integrates seamlessly with NetApp ONTAP and FlexCache to accelerate AI/ML training workflows. This solution allows data to remain securely on-premises while leveraging cloud-based GPU compute for AI training workloads. NetApp FlexCache ensures only necessary data is cached in the cloud, enabling efficient, secure, and scalable hybrid AI/ML pipelines.

## Customer Use Case: Hybrid Cloud AI Training

- On-premises data: Stored on NetApp ONTAP for compliance and security.
- Cloud compute: Scalable GPU training on EKS/GKE/AKS.
- AI/ML orchestration: Union.ai coordinates data processing and training across environments.
- Storage provisioning: NetApp Trident automates PVC/PV provisioning.

## Customer Value

- Run AI workloads on massive datasets using NetApp ONTAP's scale-out capabilities.
- Move and sync data across on-prem and cloud using NetApp's hybrid cloud features.
- Quickly cache on-prem data in the cloud using FlexCache.
- Union.ai simplifies orchestration across environments with versioning, lineage tracking, and artifact management.
- Execute training in the cloud while keeping sensitive data on-premises.

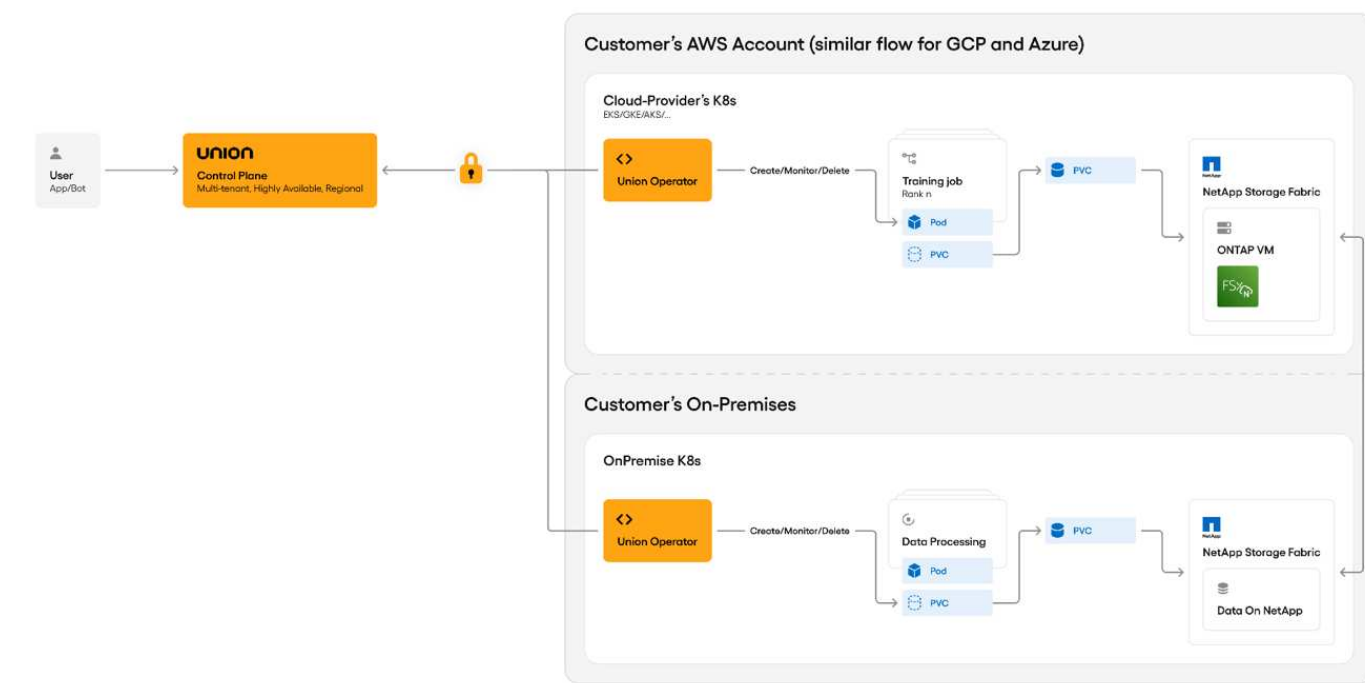
## Enabling the Plugin – Prerequisites

Requirement	Details
ONTAP Version	ONTAP 9.7+ (FlexCache license not required)
FlexCache License	Required on ONTAP 9.6 and earlier
Kubernetes	On-prem and cloud clusters (EKS/GKE/AKS)
Trident	Installed on both on-prem and cloud clusters

Union.ai	Control plane deployed (Union Cloud or self-hosted)
Networking	Inter-cluster connectivity (if ONTAP clusters are separate)
Permissions	Admin access to ONTAP and Kubernetes clusters.  ❑ Use correct ONTAP credentials (e.g., vsadmin)
New to Union.ai?	See the companion guide at the end of this doc

## Reference Architecture

The following figure shows the Union.ai control plane integrated with NetApp storage for hybrid AI training.



- Union.ai Control Plane: Orchestrates workflows, manages data movement, and integrates with NetApp APIs.
- NetApp ONTAP + FlexCache: Provides efficient data caching from on-prem to cloud.
- Hybrid Training Clusters: Training jobs run in cloud K8s clusters (e.g., EKS) with data cached from on-prem.

### Step 1: Create a FlexCache Volume

Using ONTAP System Manager

1. Navigate to Storage > Volumes.
2. Click Add.
3. Select More Options.
4. Enable Add as cache for a remote volume.

5. Choose your source (on-prem) and destination (cloud) volumes.
6. Define QoS or performance level (optional).
7. Click Create.

□ If the NetApp DataOps Toolkit is not working due to permission or aggregate issues, create the FlexCache volume directly using ONTAP System Manager or CLI.

## Step 2: Configure Trident

Install Trident on both clusters:

□

[Trident Installation Guide](#)

### Create Trident Backend

```
apiVersion: trident.netapp.io/v1
kind: TridentBackendConfig
metadata:
  name: ontap-flexcache
spec:
  version: 1
  storageDriverName: ontap-nas
  managementLIF: <ONTAP-MGMT-IP>
  dataLIF: <ONTAP-DATA-IP>
  svm: <SVM-NAME>
  username: vsadmin
  password: <password>

Apply: kubectl apply -f backend-flexcache.yaml
```

If you receive a 401 Unauthorized error, verify that the ONTAP user has sufficient API permissions and that the correct username (vsadmin) and password are used.

### Define StorageClass

```
apiVersion: storage.k8s.io/v1
kind: StorageClass
metadata:
  name: flexcache-sc
provisioner: csi.trident.netapp.io
parameters:
  backendType: "ontap-nas"
Apply:
  kubectl apply -f storageclass-flexcache.yaml
```

### Step 3: Deploy Union.ai Workflows

Union uses PVCs to mount FlexCache volumes into training jobs.

#### Example PodTemplate

```
apiVersion: v1
kind: PodTemplate
metadata:
  name: netapp-podtemplate
  namespace: flytesnacks-development
template:
  metadata:
    labels:
      default-storage: netapp
  spec:
    containers:
      - name: primary
    volumeMounts:
      - name: flexcache-storage
        mountPath: /data/flexcache
    volumes:
      - name: flexcache-storage
        persistentVolumeClaim:
          claimName: flexcache-pvc
```

#### Example Workflow

```
from union import task, workflow
```

```
@task(pod_template="netapp-podtemplate")

def train_model(pvc_path: str):
```

# Load and train on data from the PVC

```
@workflow

def training_pipeline():

    train_model(pvc_path="/data/flexcache")
```

Union Operator will:

- Create the PVC
- Mount the FlexCache volume
- Schedule the job in the cloud K8s cluster

## Step 4: Validate Integration\_

Task	Validation
PVC Mount	Training pods should mount /data/flexcache successfully
Data Access	Training jobs can read/write from FlexCache
Cache Behavior	Monitor cache hit/miss in ONTAP. Ensure aggregates support FlexCache
Performance	Validate latency and throughput for training workloads

Use NetApp BlueXP or ONTAP CLI to monitor performance.

## Security Considerations

- Use VPC endpoints for FSx for NetApp ONTAP
- Enable encryption in transit and at rest
- Apply RBAC/IAM for ONTAP access
- Union.ai does not access or store customer data

## Monitoring and Optimization

Tool	Purpose
NetApp BlueXP	Monitor FlexCache usage and performance
Union.ai UI	Track pipeline status and metrics
Trident Logs	Debug PVC or backend issues

### Optional Enhancements

- Automate FlexCache creation using BlueXP APIs

- Use Union SDK to warm up cache before training
- Add batch inference or model serving pipelines post-training
- If DataOps Toolkit fails, fall back to manual FlexCache creation via System Manager

## Troubleshooting

<i>Issue</i>	<i>Resolution</i>
PVC stuck in Pending	Check Trident logs and backend config
401 Unauthorized from ONTAP API	Use vsadmin and verify permissions
Job failed: No suitable storage	Ensure ONTAP aggregate supports FlexCache/FabricPool
Slow training performance	Check cache hit ratio and network latency
Data not syncing	Validate FlexCache relationship health in ONTAP

## Next Steps

1. Validate FlexCache with test data
2. Deploy Union.ai training pipelines
3. Monitor and optimize performance
4. Document customer-specific setup

## Related Links

- [Union.ai Docs](#)
- [NetApp FlexCache Overview](#)
- [Trident CSI Driver](#)
- [FSx for NetApp ONTAP](#)

## Conclusion

You now have a validated hybrid AI training environment using Union.ai and NetApp FlexCache. Training jobs can run in the cloud while accessing on-premises data securely and efficiently—without replicating entire datasets or compromising governance.

## Union.ai - Companion Guide

### Step 1: Choose Deployment Model

#### Option A: Union Cloud

- Visit: [console.union.ai](https://console.union.ai)
- Create org → Create project

#### Option B: Self-hosted



- Follow:  
[Self-Hosted Guide](#)
- Deploy via Helm:

helm repo add unionai <https://unionai.github.io/helm-charts/>

helm install union unionai/union -n union-system -f values.yaml

## Step 2: Install Union Operator

☐ kubectl apply -f  
<https://raw.githubusercontent.com/unionai/operator/main/deploy/operator.yaml>

kubectl get pods -n union-system

☐

## Step 3: Install Union CLI

☐ pip install unionai

union login

☐

## Step 4: Register Workflow

☐ union project create hybrid-ai

union register training\_pipeline.py --project hybrid-ai

☐

## Step 5: Run & Monitor

☐ union run training\_pipeline --project hybrid-ai

union watch training\_pipeline

☐ View logs in the [Union UI](#)

## Step 6: Register Compute Cluster (Optional)

☐ union cluster register --name cloud-k8s --kubeconfig ~/.kube/config

## Step 7: Track Artifacts & Lineage

Union automatically tracks:

- Input/output parameters
- Data versions
- Logs and metrics
- Execution lineage

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