Deploy hybrid AI training with Union.ai and NetApp FlexCache

NetApp artificial intelligence solutions

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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.

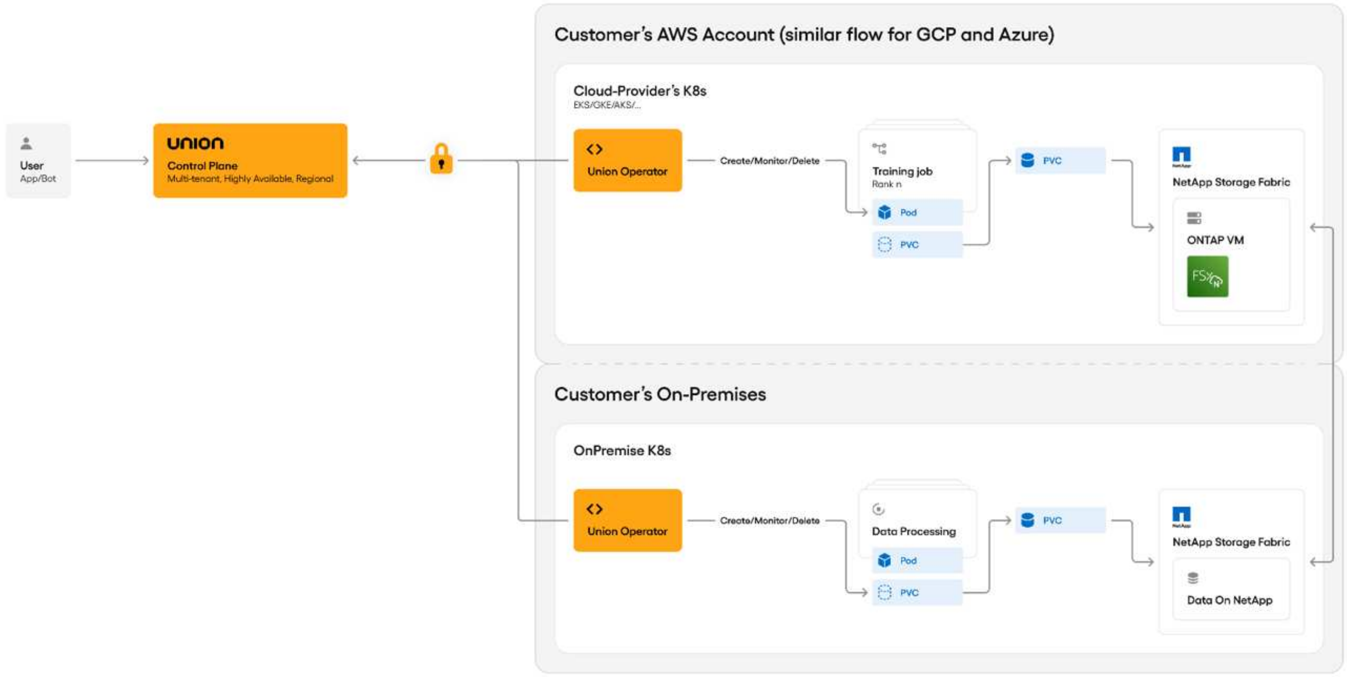
Enabling the Plugin – Prerequisites

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

Issue	*Resolution*
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
- 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