

What are Terraform Workspaces? Overview with Examples — Spacelift

Why Local State Breaks Multi-Engineer ML Teams

When three engineers share a local terraform.tfstate committed to git, concurrent applies are a silent data race.

Priya

Local state has two structural problems: no locking and no single source of truth. A remote backend solves both.

The sta

Remote Backend Configuration: S3 and GCS

AWS S3 backend. Terraform 1.x recommends S3 native locking via `use_lockfile = true`, which creates `.tflock` files

in the s

```
terraform {  
  backend "s3" {  
    bucket = "ml-infra-tfstate-prod"  
    key = "training-cluster/terraform.tfstate"  
    region = "ap-south-1"  
    use_lockfile = true
```

Migrating Existing State to a Remote Backend

Adding a backend block to an existing config requires a one-time migration. The terraform init -migrate-state command re

```
terraform init -migrate-state
```

```
aws s3 ls s3://ml-infra-tfstate-prod/training-cluster/terraform.tfstate
```

The counterpart flag is -reconfigure, which silently discards the old state and configures the backend as if starting fr

One bootstrapping trap: the S3 bucket must exist before init -migrate-state can use it as a backend. Don't declare the b

How State Locking Works in Practice

When Karan runs terraform apply, Terraform acquires a lock on the state file before writing a single byte. If Priya
atte

Error: Error acquiring the state lock

ID: 0071b31e-4d15-17dd-78b2-d24f117a2c35

Operation: OperationTypeApply

Who: karan@ml-team (terraform 1.15.0 on linux_amd64)

Created: 2026-06-11T07:42:10.123Z

Locking is automatic for all write operations — plan, apply, destroy. Priya's only action is to wait; when Karan's
apply

Workspace vs. Directory-per-Environment Isolation

CLI workspaces create named state isolation units within a single Terraform directory. The team creates dev, staging, an

```
instance_type = terraform.workspace == "prod" ? "p4d.24xlarge" : "g4dn.xlarge"
```

The hard limit: all workspaces in a directory share the same backend configuration and the same IAM credentials. Selecti

The directory-per-environment pattern solves this. Each environment gets its own root module directory (envs/dev/, envs/

Use workspaces for short-lived feature branches and ephemeral test environments. Use directories for long-lived, credent

<KnowledgeCheck

question="Which is the strongest reason to use directory-per-environment instead of CLI workspaces for ML prod/staging/d

Detecting and Recovering from State Drift

State drift occurs when infrastructure changes outside Terraform — an engineer scales a training cluster from the AWS co

The modern drift-detection workflow replaces the deprecated terraform refresh command:

```
terraform plan -refresh-only
```

plan -refresh-only is non-destructive and safe to run at any cadence. The standalone terraform refresh command is deprec

After reviewing drift, choose one of two paths. Accept the drift (the change was intentional): run terraform apply -refr

Hands-on exercise: migrate local state and simulate a lock conflict

1. Create an S3 bucket with object versioning using a separate bootstrap config with local state.

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