Terraform Scenario-Based Interview Q&A (AWS Focus)

1. Scenario: Setting up Infrastructure for a Web Application

Q: You are asked to deploy a highly available web application on AWS using Terraform. How would you approach it?

A:

- I would first design the architecture (VPC, subnets, EC2/ECS/EKS, ALB, RDS, S3).
- In Terraform, I'd create reusable **modules** (e.g., VPC module, EC2 module, RDS module).
- Example:
  - **VPC module** → defines subnets, route tables, gateways.
  - **EC2 module** → launches app servers.
  - **RDS module** → sets up the database.
- I'd use **terraform.tfvars** to parameterize environment differences (dev, staging, prod).
- Finally, use `terraform plan` → review changes → `terraform apply`.

Day-to-day activity example: Updating instance size in `variables.tf` and running `terraform apply` to scale up production.

2. Scenario: Managing State

Q: Your team is working on the same Terraform project. How do you handle state file conflicts?

A:

- I use **Terraform remote state backend** (S3 + DynamoDB for state locking).
- Example:

```
  "s3" ">backend "s3" {
   bucket         = "terraform-states"
   key            = "prod/vpc/terraform.tfstate"
   region         = "us-east-1"
   dynamodb_table = "terraform-lock"
 }
```

- This ensures only one person can run `terraform apply` at a time.

Day-to-day activity example: When two developers try to apply changes, DynamoDB prevents conflicts by locking the state.

3. Scenario: Infrastructure Drift

Q: Someone modified an AWS resource manually (outside Terraform). How do you detect and fix it?

A:

- I run `terraform plan`. It will show **drift** (difference between Terraform state and AWS actual infra).
- Then I either:
  - Import the resource using `terraform import` if I want to bring it under Terraform.
  - Or, if it's unwanted, re-apply Terraform to bring it back to the desired state.

Example: A security group rule was added manually in AWS console → Terraform plan shows drift → I either add it to code or remove it via Terraform.

4. Scenario: CI/CD Pipeline

Q: How do you integrate Terraform into a CI/CD pipeline for AWS?

A:

- I use **GitHub Actions** or **Jenkins** to automate Terraform.
- Typical flow:
  i. `terraform init`
  ii. `terraform validate`
  iii. `terraform plan` → save plan as artifact
  iv. Manual approval
  v. `terraform apply`
- This ensures infra changes are reviewed before applying.

Day-to-day activity example: Developer raises PR → pipeline runs Terraform plan → team reviews → approved → pipeline applies infra changes in AWS.

5. Scenario: Cost Optimization

Q: Your AWS bill is high. How do you use Terraform to optimize costs?

A:

- Use variables to **define instance types, auto-scaling, and lifecycle policies**.
- Example: Move from `m5.large` to `t3.medium`.
- Use `aws_s3_bucket_lifecycle_configuration` to transition old logs to Glacier.

Example: In project, we reduced costs by defining `count` on EC2 instances and enabling `ASG` with Terraform.

6. Scenario: Multi-Environment Setup

Q: How do you manage dev, staging, and prod environments in Terraform?

A:

- I use **workspaces** (`terraform workspace new dev`) OR directory structure (`/env/dev` , `/env/prod`).
- Example:
  - `variables-dev.tfvars` → small instance sizes
  - `variables-prod.tfvars` → large instance sizes
- Pipeline picks the correct tfvars file for each environment.

Day-to-day activity example: Deploy new Lambda function in dev first, test it, then apply same Terraform in prod.

7. Scenario: Rolling Back Changes

Q: What if a Terraform apply breaks production? How do you roll back?

A:

- Since Terraform is declarative, rollback means applying **previous known working version**.
- I use version control (Git) to checkout last commit and re-apply.
- If state is corrupted → restore from **S3 state backup**.

Example: After deploying wrong security group rule, users lost access → rolled back to previous Git commit → `terraform apply` restored access.

8. Scenario: Sensitive Data Handling

Q: How do you handle secrets like DB passwords in Terraform?

A:

- Never hardcode passwords in `.tf` files.
- Use AWS Secrets Manager / SSM Parameter Store with Terraform.
- Example:

```
"aws_ssm_parameter"">data "aws_ssm_parameter" "db_password" {
  name = "/prod/db/password"
  with_decryption = true
}
```

- Reference: `password = data.aws_ssm_parameter.db_password.value`

Day-to-day activity example: Updating DB password in SSM, Terraform automatically fetches latest password.

9. Scenario: Module Reusability

Q: How do you reuse infrastructure code in Terraform across multiple projects?

A:

- I create **Terraform modules**. Example:
  - `modules/vpc`
  - `modules/ec2`
- Then call them in different projects:

```
 "app_vpc" ">module "app_vpc" {
  source = "../modules/vpc"
  cidr_block = "10.0.0.0/16"
}
```

Day-to-day activity example: Same VPC module used across dev/stage/prod, only variables differ.

10. Scenario: Real-World Example (Patient + Appointment Microservices on AWS Lambda – like your project)

Q: Can you explain a real-time project where you used Terraform with AWS?

A:

- Project: Healthcare system with **Patient-service** and **Appointment-service** using AWS Lambda.
- Used Terraform to:
  - Deploy Lambda functions (Node.js containers).
  - API Gateway for routing requests.
  - DynamoDB for patient records.
  - S3 for static files (medical reports).
  - CloudWatch for monitoring.

- Automated deployment using GitHub Actions (Terraform in pipeline).

Day-to-day activity example: Updated Lambda memory from 256 MB → 512 MB in `variables.tf` and applied it, improving performance.

Terraform Scenario Q&A (AWS)

A. Basics & Core Workflow

1) Q: How do you structure a new Terraform project for an AWS app?

A:

- Create `/modules` for reusable parts (vpc, sg, ec2, rds), `/envs/{dev,prod}` for per-env.
- Keep providers and backends in root; variables/outputs in each module.

```
# providers.tf
terraform { required_version = ">= 1.6.0" }
 "aws" ">provider "aws" { region = var.region }
```

2) Q: What's a typical init→plan→apply flow and why?

A:

- `init` downloads providers & configures backend, `plan` shows delta, `apply` enforces desired state.
- Commit code; never apply from untracked local changes.

3) Q: How do you pass environment-specific values?

A:

- Use `*.tfvars` per env or workspaces.

```
terraform apply -var-file=envs/dev.tfvars
```

4) Q: How do you avoid hardcoding AMI IDs?

A:

- Use `aws_ami` data source with filters.

```
"aws_ami"">data "aws_ami" "linux" {
  most_recent = true
  owners = ["amazon"]
  filter { name = "name"; values = ["al2023-ami-*-x86_64"] }
}
```

5) Q: How do you share variables across modules?

A:

- Input vars in module; outputs from module to root.

```
 "vpc" ">module "vpc" { source = "./modules/vpc" cidr_block = var.vpc_cidr }
 "vpc_id" ">output "vpc_id" { value = module.vpc.vpc_id }
```

B. State Management & Drift

6) Q: How do you set up remote state with locking?

A:

- S3 backend + DynamoDB table.

```
terraform {
   "s3" ">backend "s3" {
    bucket="tf-states" key="prod/network.tfstate" region="us-east-1" dynamodb_table="tf-locks"
  }
}
```

7) Q: You see a state lock error. What do you do?

A:

- Check if another apply is running; if not, remove stale lock from DynamoDB cautiously (or `force-unlock`).

8) Q: How do you import an existing, manually-created resource?

A:

- Define resource in code, then `terraform import`.

```
terraform import aws_s3_bucket.logs my-logs-bucket
```

9) Q: How do you detect & fix drift?

A:

- `terraform plan` highlights drift; either codify missing config or re-apply to overwrite manual changes.

10) Q: How do you split state for big stacks?

A:

- Use multiple root modules/workspaces per domain (network, data, app) to reduce blast radius.

C. Modules & Reuse

11) Q: What makes a good Terraform module?

A:

- Single responsibility, minimal required inputs, clear outputs, sensible defaults, versioned releases.

12) Q: How do you version internal modules?

A:

- Use Git tags and `source = "git::ssh://...//modules/vpc?ref=v1.3.0"` to pin versions.

13) Q: How do you publish reusable modules for your org?

A:

- Private registry or Git monorepo with clear docs, examples, semantic versioning.

14) Q: How do you conditionally create resources in a module?

A:

- Use `count` or `for_each`.

```
"aws_eip"">resource "aws_eip" "nat" { count = var.enable_nat ? 1 : 0 }
```

15) Q: How do you avoid cyclic dependencies between modules?

A:

- Keep cross-module outputs minimal, or separate stacks (e.g., network first, then app consumes outputs).

D. Multi-Env & Workspaces

16) Q: Workspaces vs separate folders?

A:

- Workspaces are simple for parameter changes; folders are clearer when infra differs per env or teams.

17) Q: How to use workspaces cleanly?

A:

```
terraform workspace new staging
terraform apply -var="env=staging"
```

- Reference with `terraform.workspace` in naming.

18) Q: How do you prevent prod mis-applies with workspaces?

A:

- CI gates: allow `apply` to prod only on tagged releases + manual approval; validate `terraform.workspace == "prod"`.

19) Q: Different regions per env?

A:

- Parameterize provider region via tfvars/workspaces; avoid multiple providers in one workspace unless needed.

20) Q: Share VPC outputs from `network` stack to `app` stack?

A:

- Use remote state data source.

```
"terraform_remote_state"">data "terraform_remote_state" "net" {
  backend="s3"
  config={ bucket="tf-states" key="prod/network.tfstate" region="us-east-1" }
}
```

E. CI/CD Integration

21) Q: Typical GitHub Actions pipeline for Terraform?

A:

- Jobs: fmt→validate→tflint→plan (PR) → apply (main, with approval).

```
- run: terraform fmt -check
- run: terraform validate
- run: terraform plan -out=plan.out
```

22) Q: How do you store plan artifacts for approval?

A:

- Upload `plan.out` as artifact; require “Environment Protection Rules” for `apply` .

23) Q: Canary infra changes?

A:

- Apply to `dev` first from same code; run integration tests; promote tag → `staging` → `prod` .

24) Q: Secrets in CI?

A:

- Use OIDC federated role to AWS (no long-lived keys). Limit permissions by repo & env.

25) Q: Auto-destroy ephemeral environments for PRs?

A:

- On PR open → create workspace & apply; on close/merge → destroy & delete workspace.

F. Security & Compliance

26) Q: How do you manage secrets?

A:

- AWS SSM/Secrets Manager; `with_decryption = true`. Never commit secrets.

```
"aws_ssm_parameter"">data "aws_ssm_parameter" "db_pwd" { name="/prod/db/pwd" with_decryption=tru
```

27) Q: Enforce encryption at rest for S3?

A:

```
"aws_s3_bucket_server_side_encryption_configuration"">resource "aws_s3_bucket_server_side_encryp
  bucket = aws_s3_bucket.b.id
  rule { apply_server_side_encryption_by_default { sse_algorithm = "AES256" } }
}
```

28) Q: Restrict security groups to least privilege?

A:

- Parameterize allowed CIDRs/ports; deny all by default; review via `tflint` & policy as code.

29) Q: How to enforce org policies automatically?

A:

- OPA/Conftest or Terraform Cloud/Enterprise Sentinel policies (e.g., disallow public S3, require tags).

30) Q: Rotate access keys with Terraform?

A:

- Prefer roles; if keys necessary, manage lifecycle and alerting outside state (avoid storing secrets in state).

G. Cost Optimization & Scaling

31) Q: Cut EC2 costs via Terraform?

A:

- Right-size instance types, ASG min/max, Spot where appropriate, turn off non-prod by schedules (EventBridge + Lambda).

32) Q: Optimize S3 storage?

A:

- Lifecycle rules to IA/Glacier, intelligent-tiering for logs.

```
"aws_s3_bucket_lifecycle_configuration"">resource "aws_s3_bucket_lifecycle_configuration" "logs'
  bucket = aws_s3_bucket.logs.id
  rule {
    id="log-tier"
    filter {}
    transition { days=30 storage_class="STANDARD_IA" }
    transition { days=90 storage_class="GLACIER" }
    status="Enabled"
  }
}
```

33) Q: EKS cost levers via Terraform?

A:

- Managed node groups with right instance mix, cluster-autoscaler, Spot pools, HPA at app layer (helm_release).

34) Q: RDS savings?

A:

- Use `storage_autoscaling` , `multi_az` only where needed, right engine versions, and reserved instances where stable.

35) Q: Showback tags for cost allocation?

A:

- Enforce common tags in modules: `Environment` , `Owner` , `CostCenter` . Fail plan if missing.

H. Real-World AWS Project Scenarios

36) Q: API Gateway + Lambda (Node.js) microservices?

A:

- One module per service; deploy via container images (ECR).

```
"aws_lambda_function"">resource "aws_lambda_function" "svc" {
  function_name = "patient-svc"
  package_type  = "Image"
  image_uri     = "${aws_ecr_repository.repo.repository_url}:v1.2.0"
  role          = aws_iam_role.lambda.arn
  memory_size   = 512
}
```

37) Q: Event-driven pipeline S3→Lambda→DynamoDB?

A:

- S3 event notification to Lambda; Lambda writes to DynamoDB; permissions via IAM policy attachments.

38) Q: Blue/Green for ECS?

A:

- Use CodeDeploy with ECS; Terraform defines `aws_codedeploy_app` + `deployment_group` .

39) Q: Multi-AZ ALB + ASG web tier with HTTPS?

A:

- ACM cert + ALB listener 443; ASG spread across subnets; SGs restrict 80→443 only from ALB.

40) Q: Centralized logging?

A:

- VPC flow logs to CloudWatch/S3, ALB access logs to S3, Lambda logs to CW; bucket lifecycle rules.

41) Q: CloudFront + S3 static SPA with OAC?

A:

- Lock bucket public access; use Origin Access Control; cache policies via Terraform.

42) Q: VPC with Private Subnets + NAT?

A:

- One NAT per AZ (cost ↑) or shared NAT (cost ↓, resiliency ↓). Parameterize.

43) Q: Private RDS with app in ECS?

A:

- Place RDS in private subnets; SG allow from ECS SG only; no public access; secrets via SSM.

44) Q: Batch ETL with Step Functions?

A:

- Terraform `aws_sfn_state_machine` + Lambda/ECS tasks; IAM roles per state.

45) Q: KMS strategy?

A:

- Customer managed keys per domain; key policies least privilege; enable rotation; alias naming standard.

I. Day-to-Day Ops

46) Q: Safe parameter change (e.g., instance size) in prod?

A:

- PR → plan in staging → integration tests → approval → apply to prod; monitor CloudWatch.

47) Q: Add a new intra-VPC SG rule urgently?

A:

- Temporary change via PR with expiry note; add ticket to revert; avoid console-only changes.

48) Q: Rollback after bad apply?

A:

- Revert to last known good commit; `plan` & `apply`; use S3 state versioning if state corruption suspected.

49) Q: How to document infra automatically?

A:

- `terraform graph` + tools; keep README per module with inputs/outputs; tag resources consistently.

50) Q: Handle provider upgrades?

A:

- Pin versions, test in dev; read provider CHANGELOG; run `terraform state mv` / `migrate` if resources renamed.

J. Troubleshooting & Best Practices

51) Q: `Error acquiring state lock` keeps happening.

A:

- Ensure CI isn't running parallel applies; consolidate pipelines; check DynamoDB TTL & lock table capacity.

52) Q: Terraform wants to replace an RDS in plan unexpectedly.

A:

- Inspect attributes marked `ForceNew` (e.g., storage type/engine). Split to separate change windows or use snapshot + restore plan.

53) Q: Prevent accidental destroy of critical resources.

A:

- `lifecycle { prevent_destroy = true }` and Sentinel/OPA policies.

```
"aws_kms_key"">resource "aws_kms_key" "cmk" {
  description="prod-cmk"
  lifecycle { prevent_destroy = true }
}
```

54) Q: Speed up slow plans on big stacks.

A:

- Break into smaller root modules; cache provider plugins in CI; use `-refresh=false` if safe for quick diffs.

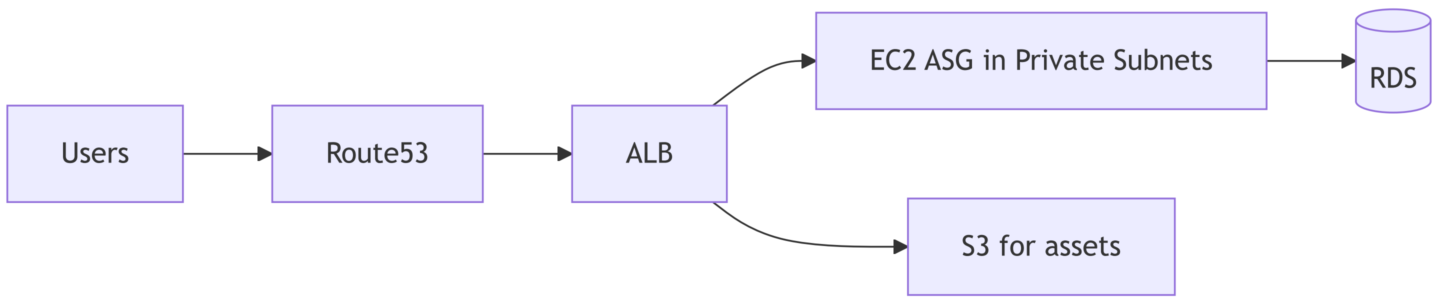
55) Q: Enforce tagging everywhere.

A:

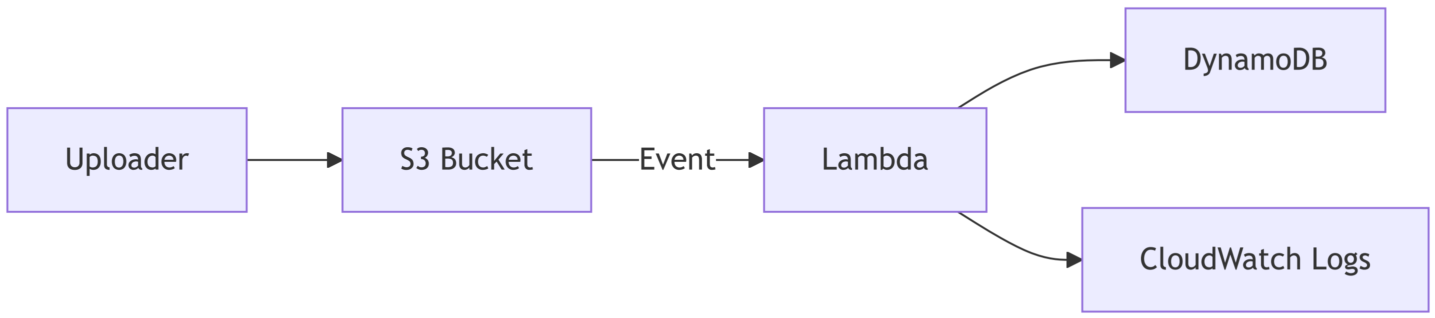
- Module wrapper with `merge(var.tags, { Environment = var.env })`; policy checks in CI to fail when tags missing.

Quick Diagrams (for mental model)

Web App (ALB → ASG → RDS)



Serverless Ingest (S3 → Lambda → DynamoDB)



Handy Snippet Pack

Common Tags Pattern

```
 "tags" ">variable "tags" { type = map(string) default = {} }
locals { common_tags = merge({ Project="HealthApp", ManagedBy="Terraform" }, var.tags) }
"aws_s3_bucket"">resource "aws_s3_bucket" "b" { bucket="app-${var.env}-assets" tags = local.comm
```

ALB + HTTPS Listener

```
"aws_lb_listener"">resource "aws_lb_listener" "https" {
  load_balancer_arn = aws_lb.app.arn
  port = 443
  protocol = "HTTPS"
  ssl_policy = "ELBSecurityPolicy-TLS13-1-2-2021-06"
  certificate_arn = aws_acm_certificate.cert.arn
  default_action { type="forward" target_group_arn = aws_lb_target_group.app.arn }
}
```

Remote State Consumption

```
"terraform_remote_state"">data "terraform_remote_state" "net" {
  backend = "s3"
  config  = { bucket = "tf-states", key = "prod/network.tfstate", region = "us-east-1" }
}
"aws_subnet"">resource "aws_subnet" "app" {
  vpc_id = data.terraform_remote_state.net.outputs.vpc_id
  # ...
}
```