

# Terraform Quick Reference

Providers, resources, variables, state, modules

## Basics

### Core Workflow

```
terraform init # install providers & modules
terraform plan # preview changes
terraform apply # apply changes
terraform destroy # tear down all resources
```

### Essential Commands

<b>terraform init</b>	Initialize working directory, download providers
<b>terraform plan</b>	Show execution plan without applying
<b>terraform apply</b>	Apply changes to infrastructure
<b>terraform destroy</b>	Destroy all managed resources
<b>terraform fmt</b>	Format <code>.tf</code> files to canonical style
<b>terraform validate</b>	Check configuration syntax
<b>terraform show</b>	Display current state or plan
<b>terraform output</b>	Print output values

## Providers

### Provider Configuration

```
terraform {
  required_providers {
    aws = { source = "hashicorp/aws", version = "~> 5.0" }
  }
}
provider "aws" {
  region = "us-east-1"
}
```

### Provider Notes

<b>source</b>	Registry address ( <b>hashicorp/aws</b> , <b>hashicorp/google</b> )
<b>version</b>	Version constraint ( <b>~&gt; 5.0, &gt;= 3.0, &lt; 4.0</b> )
<b>.terraform.lock.hcl</b>	Lock file — commit to version control
<b>alias</b>	Use multiple configs for the same provider

## Resources

### Resource Blocks

```
resource "aws_instance" "web" {
  ami           = "ami-0c55b159cbf9e1f0"
  instance_type = "t3.micro"
  tags = { Name = "web-server" }
}
```

### Resource Meta-Arguments

<b>depends_on</b>	Explicit dependency on another resource
<b>count</b>	Create multiple instances ( <b>count = 3</b> )
<b>for_each</b>	Create instances from a map or set
<b>provider</b>	Select a non-default provider alias
<b>lifecycle</b>	Customize create/update/destroy behavior

### Referencing Resources

```
# type.name.attribute
aws_instance.web.id
aws_instance.web.public_ip
aws_vpc.main.cidr_block
```

## Variables

### Declaring Variables

```
variable "region" {
  type = string
  default = "us-east-1"
}
variable "instance_count" {
  type = number
  description = "Number of instances"
}
```

### Setting Variable Values

<b>-var 'region=us-west-2'</b>	CLI flag
<b>-var-file=prod.tfvars</b>	Load from a <code>.tfvars</code> file
<b>terraform.tfvars</b>	Auto-loaded if present
<b>TF_VAR_region</b>	Environment variable
<b>Interactive prompt</b>	Asked at plan/apply if no default

### Variable Types

<b>string</b>	"us-east-1"
<b>number</b>	42
<b>bool</b>	true / false
<b>list(string)</b>	["a", "b"]
<b>map(string)</b>	{ key = "val" }
<b>object({...})</b>	Structured type with named attributes

## Outputs

### Defining Outputs

```
output "instance_ip" {
  value = aws_instance.web.public_ip
  description = "Public IP of the web server"
}
output "db_password" {
  value = random_password.db.result
  sensitive = true
}
```

### Output Commands

<b>terraform output</b>	Print all outputs
<b>terraform output instance_ip</b>	Print a specific output
<b>terraform output -json</b>	JSON format for scripting
<b>sensitive = true</b>	Hide value from CLI output
<b>module.vpc.vpc_id</b>	Access child module outputs

## State

### Remote Backend

```
terraform {
  backend "s3" {
    bucket = "my-tf-state"
    key = "prod/terraform.tfstate"
    region = "us-east-1"
  }
}
```

### State Commands

<b>terraform state list</b>	List all resources in state
<b>terraform state show &lt;addr&gt;</b>	Show attributes of a resource
<b>terraform state mv &lt;src&gt; &lt;dst&gt;</b>	Rename / move a resource in state
<b>terraform state rm &lt;addr&gt;</b>	Remove resource from state (keep infra)
<b>terraform state pull</b>	Download remote state to stdout
<b>terraform import &lt;addr&gt; &lt;id&gt;</b>	Import existing infra into state

## Modules

### Using Modules

```
module "vpc" {
  source = "terraform-aws-modules/vpc/aws"
  version = "~> 5.0"
  cidr = "10.0.0.0/16"
}
```

### Module Sources

<b>"/modules/vpc"</b>	Local path
<b>"terraform-aws-modules/vpc/aws"</b>	Terraform Registry
<b>"github.com/org/repo/module"</b>	GitHub repository
<b>"s3::https://bucket/module.zip"</b>	S3 bucket

### Module Structure

modules/vpc/	
main.tf	# resources
variables.tf	# input variables
outputs.tf	# output values

## Data Sources

### Reading Existing Resources

```
data "aws_ami" "ubuntu" {
  most_recent = true
  filter {
    name = "name"
    values = ["ubuntu/images/hvm-ssd/**"]
  }
  owners = ["099720109477"]
}
```

### Common Data Sources

<b>data.aws_ami</b>	Look up an AMI by filters
<b>data.aws_vpc</b>	Look up existing VPC
<b>data.aws_caller_identity</b>	Current AWS account ID
<b>data.aws_region</b>	Current AWS region
<b>data.terraform_remote_state</b>	Read outputs from another state file
<b>data.external</b>	Run an external program for data

## Lifecycle

### Lifecycle Rules

```
resource "aws_instance" "web" {
  lifecycle {
    create_before_destroy = true
    prevent_destroy = true
    ignore_changes = [tags]
  }
}
```

### Lifecycle Options

<b>create_before_destroy</b>	Create replacement before destroying old
<b>prevent_destroy</b>	Error if <b>terraform destroy</b> targets this
<b>ignore_changes</b>	Don't detect drift on listed attributes
<b>replace_triggered_by</b>	Force replacement when referenced resource changes
<b>precondition</b>	Validate assumptions before apply
<b>postcondition</b>	Validate results after apply

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## Common Patterns

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### Loops & Conditionals

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```
# for_each with a map
resource "aws_iam_user" "users" {
  for_each = toset(["alice", "bob"])
  name     = each.value
}
# conditional resource
count = var.create_db ? 1 : 0
```

### Useful Functions

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<b>file("key.pub")</b>	Read file contents
<b>join(", ", list)</b>	Join list into string
<b>lookup(map, key, default)</b>	Map lookup with fallback
<b>length(list)</b>	Number of elements
<b>toset(["a", "b"])</b>	Convert list to set (for for_each)
<b>try(expr, fallback)</b>	Return fallback if expr errors
<b>templatefile(path, vars)</b>	Render a template file