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How to use Terraform Variables - Locals,Input,Output

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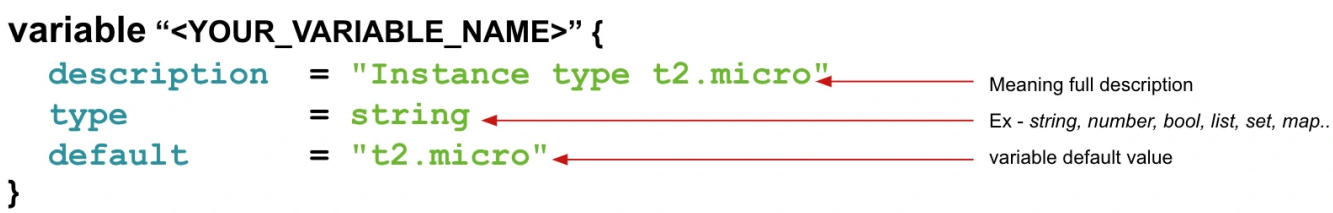
Terraform variables are a way to store values that can be reused throughout your Terraform configuration.

They allow you to define a value once and reference it in multiple places throughout your configuration, making it easier to manage and update your infrastructure.

1. Variables are defined in the variables block in your Terraform configuration file, where you can give a name and a default value. Please refer to the following screenshot exaplaining how variables are defined inside terraform-



terraform variables string, bool, number, list, set, map

2. Terraform variables can have various type such as ***string, number, boolean, list, map*** etc.
3. Variables can be set in the command line when running Terraform commands using the `-var` flag.
4. Variables can also be set using a separate file, called a variable file, using the `-var-file` flag.
5. Variables can be accessed in Terraform configuration files using the var function, for example `var.example_variable`

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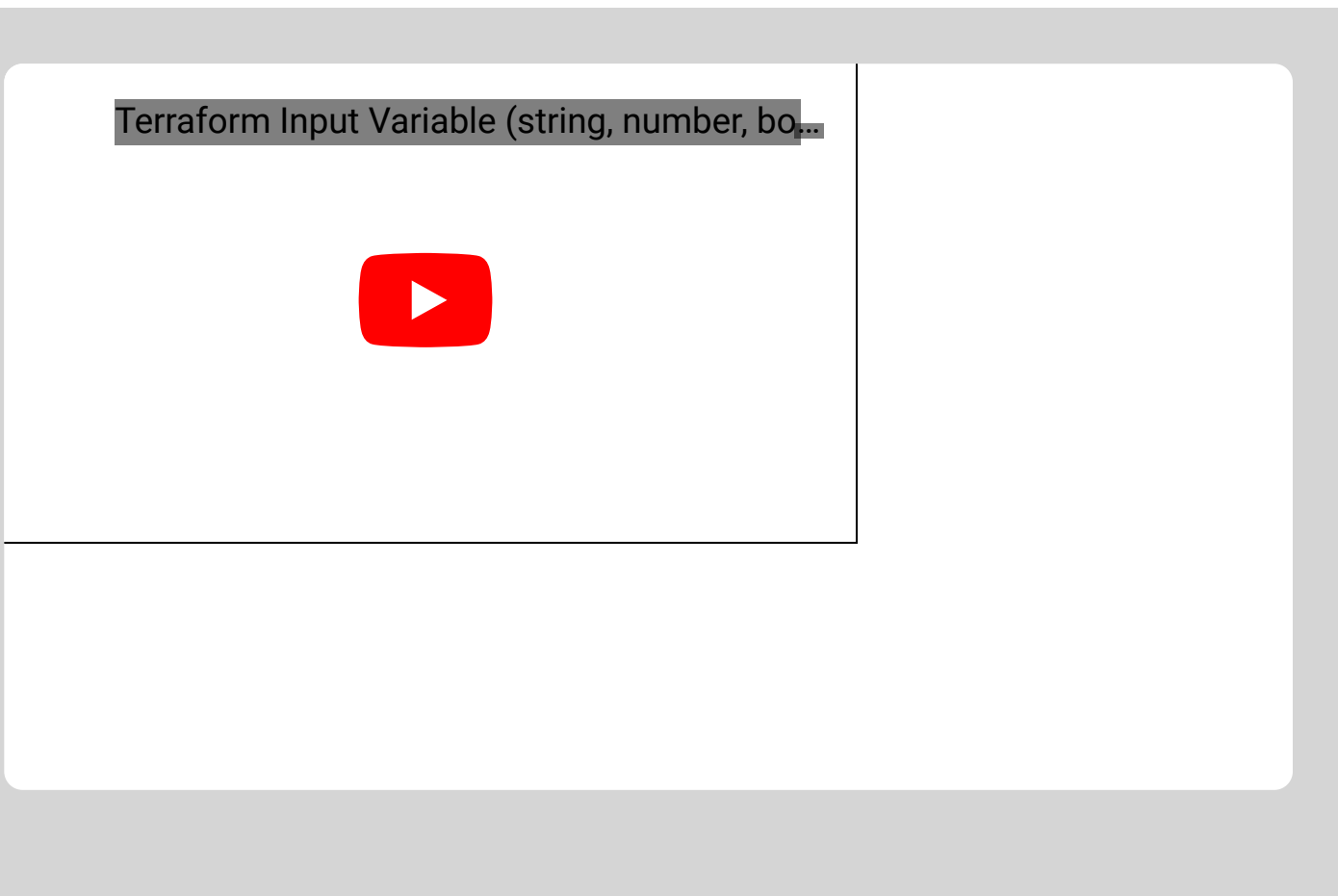

Pre-requisite

Before we start working with Terraform variables, here are the pre-requisites -

1. You must install terraform (*click here on how to install terraform*)

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1.Types of Terraform Variables

There are two types of variables in Terraform -

1. **Simple values**
2. **Collection Variable**

1.1 Simple Values variables

As the name suggests *Simple Values* variables are which hold only a single value. Here the types of *Simple Value* variables -

1. string
2. number
3. bool

1.2 Collection Variable

In the collection variable, it consists of -

1. List
2. Map
3. Set

2.Terraform Variables - *string, number, bool*

Let's take a simple example in which we are going to set up an EC2 instance on AWS.

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1. provider

Here is the `main.tf` which we are going to parameterized using terraform variables.

```bash
provider "aws" {
   region     = "eu-central-1"
   access_key = "<INSERT_YOUR_ACCESS_KEY>"
   secret_key = "<INSERT_YOUR_SECRET_KEY>"
}

resource "aws_instance" "ec2_example" {

   ami           = "ami-0767046d1677be5a0"
   instance_type = "t2.micro"

   tags = {
           Name = "Terraform EC2"
   }
}
```

2.1 string variable type - We are going parameterized *instance_type = "t2.micro"*

The first rule to create a parameter in terraform file is by defining *variable block*

Example -

```bash
variable "instance_type" {
   description = "Instance type t2.micro"
   type        = string
```

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For defining *variable block* **you need**

1. *description* : Small or short description about the purpose of the variable
2. *type* : What type of variable it is going to be ex - `string`, `bool`, `number` ...
3. *default* : What would be the default value of the variable

Let's replace the hardcoded value of instance_type with variable

BASH

```
instance_type = var.instance_type
```

Here is our final terraform file after replacing the hardcoded value of a variable -

BASH

```
provider "aws" {
   region     = "eu-central-1"
   access_key = "<INSERT_YOUR_ACCESS_KEY>"
   secret_key = "<INSERT_YOUR_SECRET_KEY>"
}

resource "aws_instance" "ec2_example" {

   ami           = "ami-0767046d1677be5a0"
   instance_type =  var.instance_type

   tags = {
           Name = "Terraform EC2"
   }
}

variable "instance_type" {
   description = "Instance type t2.micro"
   type        = string
   default     = "t2.micro"
}
```

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BASH

```
rm apply
```

2.2 number variable type - We are going parameterized *instance_count = 2*

The next variable type we are going to take is `number`.

For example, we are going to increase the `instance_count` of the `ec2_instances`.

Let's create the variable first -

BASH

```
variable "instance_count" {
  description = "EC2 instance count"
  type        = number
  default     = 2
}
```

Here is the final terraform file with instance count -

BASH

```
provider "aws" {
   region     = "eu-central-1"
   access_key = "<INSERT_YOUR_ACCESS_KEY>"
   secret_key = "<INSERT_YOUR_SECRET_KEY>"
}

resource "aws_instance" "ec2_example" {

   ami           = "ami-0767046d1677be5a0"
   instance_type =  "t2.micro"
   count = var.instance_count
```

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```
variable "instance_count" {
  description = "EC2 instance count"
  type        = number
  default     = 2
}
```

2.3 boolean variable type - We are going parameterized *enable_vpn_gateway = false*

The next variable type which we are going to discuss is `bool`.

The `bool` variable can be used to set `true` or `false` values inside your terraform fi

Here is an example to create your `bool` variable -

BASH

```
variable "enable_public_ip" {
  description = "Enable public IP address"
  type        = bool
  default     = true
}
```

Let's create a complete terraform file with `bool` variable -

BASH

```
provider "aws" {
   region     = "eu-central-1"
   access_key = "<INSERT_YOUR_ACCESS_KEY>"
   secret_key = "<INSERT_YOUR_SECRET_KEY>"
}
```

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```
    ami           = "ami-0767046d1677be5a0"
    instance_type =  "t2.micro"
    count = 1
    associate_public_ip_address = var.enable_public_ip

     tags = {
            Name = "Terraform EC2"
     }

}

variable "enable_public_ip" {
  description = "Enable public IP address"
  type        = bool
  default     = true
}
```

3. Terraform Variables - *list, set, map*

When it comes to `collection input variables` then we are talking about -

1. List
2. Map
3. Set

3.1 List variable type

As the name suggests we are going to define a `list` that will contain more than one element in it.

Let's define our first List variable -

Here is the list of IAM users

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```
  type        = list(string)
  default     = ["user1", "user2", "user3s"]
```

Here is our final terraform file with List variables -

BASH

```
provider "aws" {
   region     = "eu-central-1"
   access_key = "<INSERT_YOUR_ACCESS_KEY>"
   secret_key = "<INSERT_YOUR_SECRET_KEY>"
}
resource "aws_instance" "ec2_example" {

   ami           = "ami-0767046d1677be5a0"
   instance_type =  "t2.micro"
   count = 1

   tags = {
           Name = "Terraform EC2"
   }

}

resource "aws_iam_user" "example" {
  count = length(var.user_names)
  name  = var.user_names[count.index]
}

variable "user_names" {
  description = "IAM usernames"
  type        = list(string)
  default     = ["user1", "user2", "user3s"]
}
```

3.2 Map variable type

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an example where we need to define `project` and `environment`, so we can use the `map` variable to achieve that.

Here is an example of `map` variable -

```bash
variable "project_environment" {
  description = "project name and environment"
  type        = map(string)
  default     = {
    project     = "project-alpha",
    environment = "dev"
  }
}
```

Let's create a Terraform file

```bash
provider "aws" {
   region     = "eu-central-1"
   access_key = "<INSERT_YOUR_ACCESS_KEY>"
   secret_key = "<INSERT_YOUR_SECRET_KEY>"
}
resource "aws_instance" "ec2_example" {

   ami           = "ami-0767046d1677be5a0"
   instance_type =  "t2.micro"

   tags = var.project_environment

}


variable "project_environment" {
  description = "project name and environment"
  type        = map(string)
  default     = {
    project     = "project-alpha",
```

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4. Terraform Output Variables

In Terraform, output variables allow you to easily extract information about the resources that were created by Terraform. They allow you to easily reference th values of resources after Terraform has finished running.

Output variables are defined in the `outputs` block in the Terraform configuration Here's an example of an output variable that references the IP address of an EC instance:

TERRAFORM

```
output "instance_ip" {
   value = aws_instance.example.public_ip
}
```

In this example, the output variable is named "instance_ip" and its value is set to the public IP of an EC2 instance named "example" that is defined in the Terraform configuration.

What is terraform output command?

You can use the terraform output command to access the value of an output variable:

BASH

```
 terraform output instance_ip
52.11.222.33
```

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t function. For example:

TERRAFORM

```
resource "aws_security_group_rule" "example" {
   ...
cidr_blocks = [output.instance_ip]
}
```

Output variables are especially useful when you need to pass information about the infrastructure that Terraform has created to other systems or scripts. They also enable you to access the values of resources that are not directly visible in the Terraform state, such as the IP address of an EC2 instance.

It's worth noting that you can also set the output variable to be sensitive, in that case, Terraform will mask the output value when it appears in output, making it more secure.

5. How to pass variable as `tfvars` file as command-line arguments using the `-var-file` flag?

In Terraform, you can pass variables from a `tfvars` file as command-line arguments using the `-var-file` flag. The `-var-file` flag allows you to specify a file containing variable values, which will be used when running Terraform commands.

Here is an example of one my terraform project where I have created `terraform.tfvars` file -

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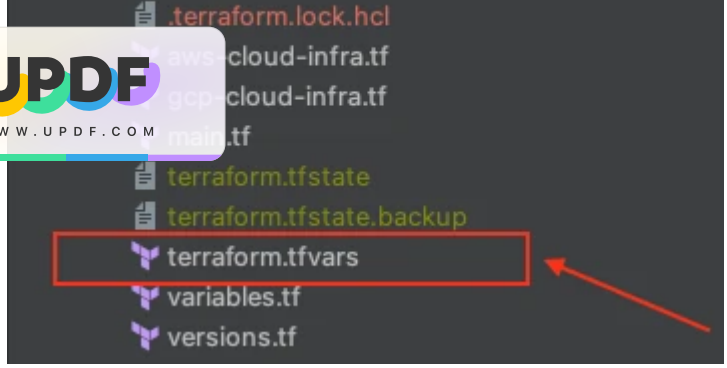

terraform.tfvars file inside the terraform project

Here's an example of how you might use the `-var-file` flag to pass variables from a `tfvars` file named `terraform.tfvars`.

BASH

```
# You need to supply variable during the terraform init
terraform init -var-file=terraform.tfvars

# You need to supply variable during the terraform plan
terraform plan -var-file=terraform.tfvars

# You need to supply variable during the terraform apply
terraform apply -var-file=terraform.tfvars
```

What tfvars file should contain?

A typical `tfvars` file should contain the variables that you want to pass to Terraform. Each variable should be in the form of `variable_name = value`. For example

TERRAFORM

```
project_id = "gcp-terraform-307119"
location   = "europe-central2"
```

But you should also create a `variable.tf` file also to define the variable type -

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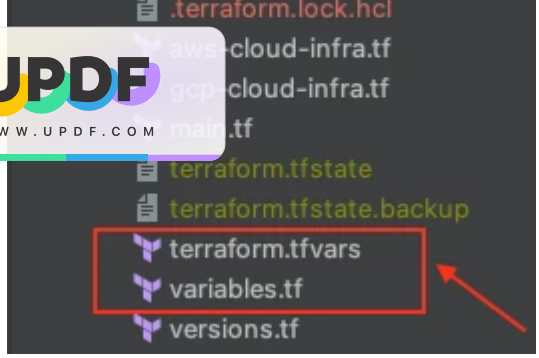

variables.tf and terraform.tfvars file containing the variables

TERRAFORM

```
variable "project_id" {
  type        = string
  description = "The Project ID"
}

variable "location" {
   description = "Region for project"
   default     = "europe-central2"
   type        = string
}
```

How to pass multiple variables files using `-var-file`?

You can also specify multiple variable files by using the -var-file flag multiple times on the command line. For example:

BASH

```
terraform apply -var-file=myvars-1.tfvars -var-file=myvars-2.tfvars
```

It's worth noting that variables defined in the command line options will have higher priority than the variables defined in the tfvars files.