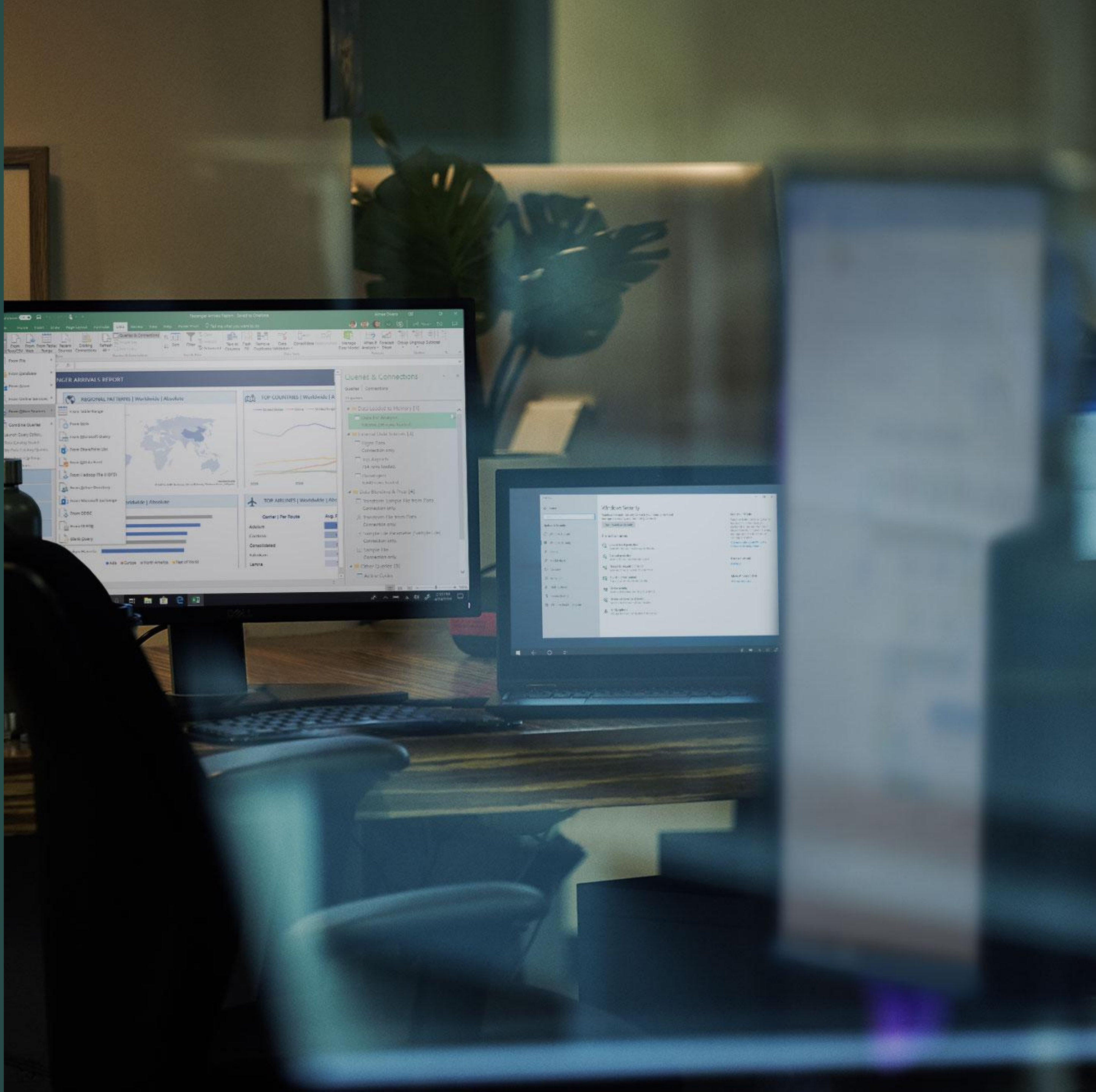
Microsoft

Resource Dependencies and Terraform Modules



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Dependencies

Resource Dependencies in Terraform

When Terraform changes infrastructure, many of the changes must be made in a specific order.
This order is determined by resource dependencies.

Implicit Dependencies

Terraform and the Azure provider determine automatically based on the configuration.

Explicit Dependencies

User defines using **depends_on** *meta argument*

This is done when terraform can’t detect a dependency and user wants to override the default execution plan

Implicit Dependency example

```
resource "azurerm_resource_group" "demo" {
    name     = "${var.prefix}_rg"
    location = var.region
    tags     = var.tags
}

resource "azurerm_virtual_network" "demo" {
    name                =  "${var.prefix}_rg"
    address_space       = ["10.0.0.0/16"]
    location            = var.region
    resource_group_name = azurerm_resource_group.demo.name
}
```

Explicit Dependency example

```
resource "azurerm_resource_group" "demo" {
    name     = "${var.prefix}_rg"
    location = var.region
    tags     = var.tags
}

resource "azurerm_virtual_network" "demo" {
    name                = "${var.prefix}_rg"
    address_space       = ["10.0.0.0/16"]
    location            = var.region
    resource_group_name = "${var.prefix}_rg"
    depends_on          = [
      azurerm_resource_group.demo
    ]
}
```

Only do this is you can’t build an implicit dependency

Dependencies

Lab 5

Modules

Modules

Root Module vs **Sub Module**

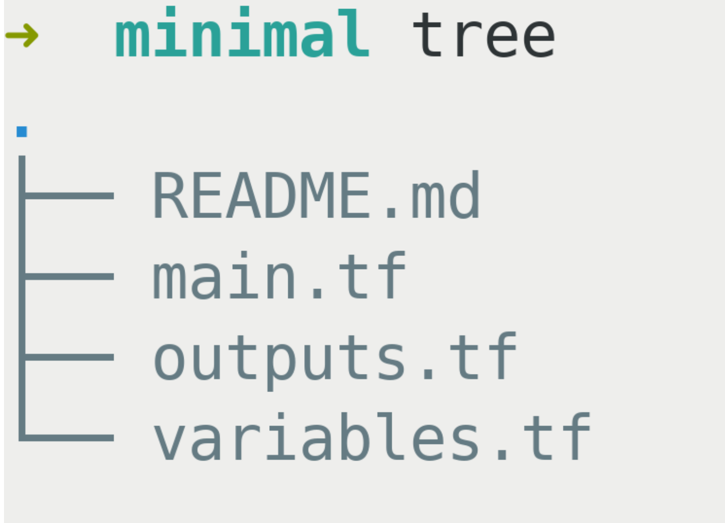
```
/terraform-project/
 │ ──── main.tf        # Root module's main file
 │ ──── variables.tf   # Variable definitions
 │ ──── outputs.tf     # Output values
 │ ──── modules/       # Directory containing submodules
 │     ├──── network/
 │     ├──── compute/
 │     └──── storage/
```

Modules

A *module* is a container for multiple resources that are used together.

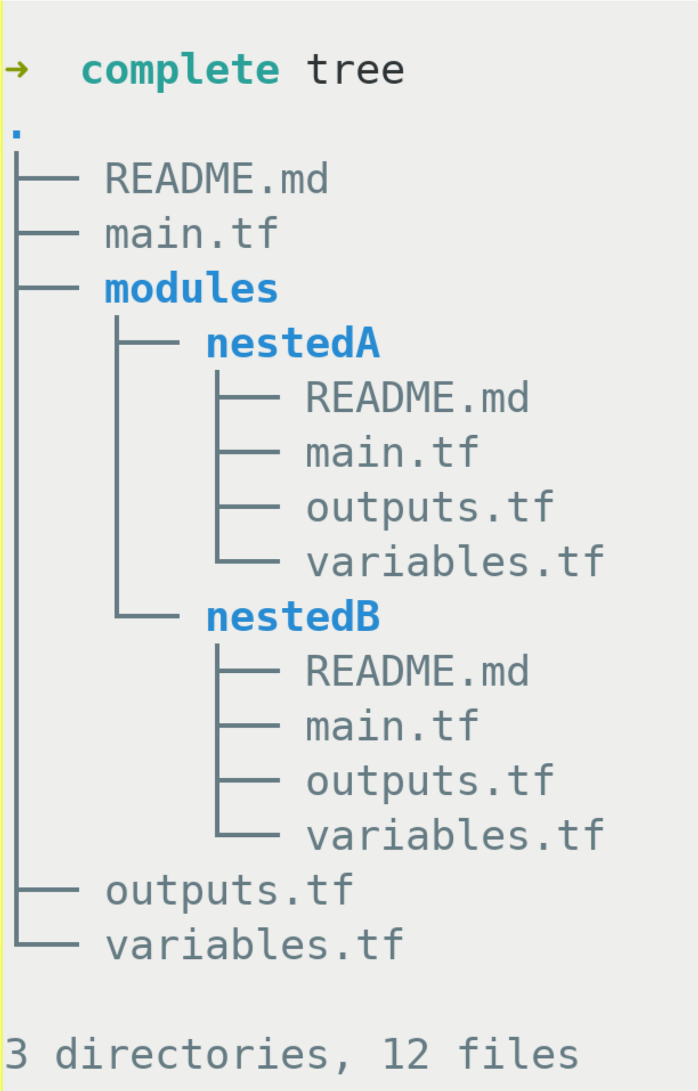
- Ligthtweight abstractions
- Better Organization
- Encapsulation
- Reusability
- Local or Remote
- Distributable
- Can be Nested
- Composable

Minimal Structure



```
➜  minimal tree
.
├── README.md
├── main.tf
├── outputs.tf
└── variables.tf
```

Nested Example

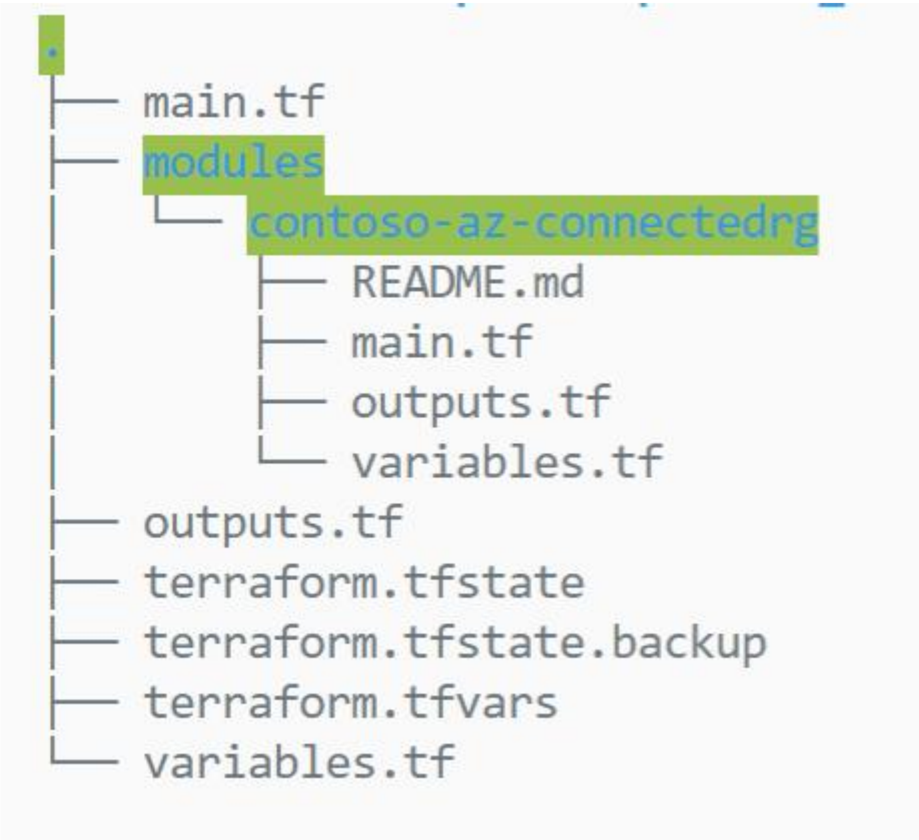


```
➜  complete tree
.
├── README.md
├── main.tf
├── modules
│   ├── nestedA
│   │   ├── README.md
│   │   ├── main.tf
│   │   ├── outputs.tf
│   │   └── variables.tf
│   └── nestedB
│       ├── README.md
│       ├── main.tf
│       ├── outputs.tf
│       └── variables.tf
├── outputs.tf
└── variables.tf

3 directories, 12 files
```

Root Module is the only requirement and acts as the entry point.

Module block to call a module



```
.
├── main.tf
├── modules
│   └── contoso-az-connectedrg
│       ├── README.md
│       ├── main.tf
│       ├── outputs.tf
│       └── variables.tf
├── outputs.tf
├── terraform.tfstate
├── terraform.tfstate.backup
├── terraform.tfvars
└── variables.tf
```

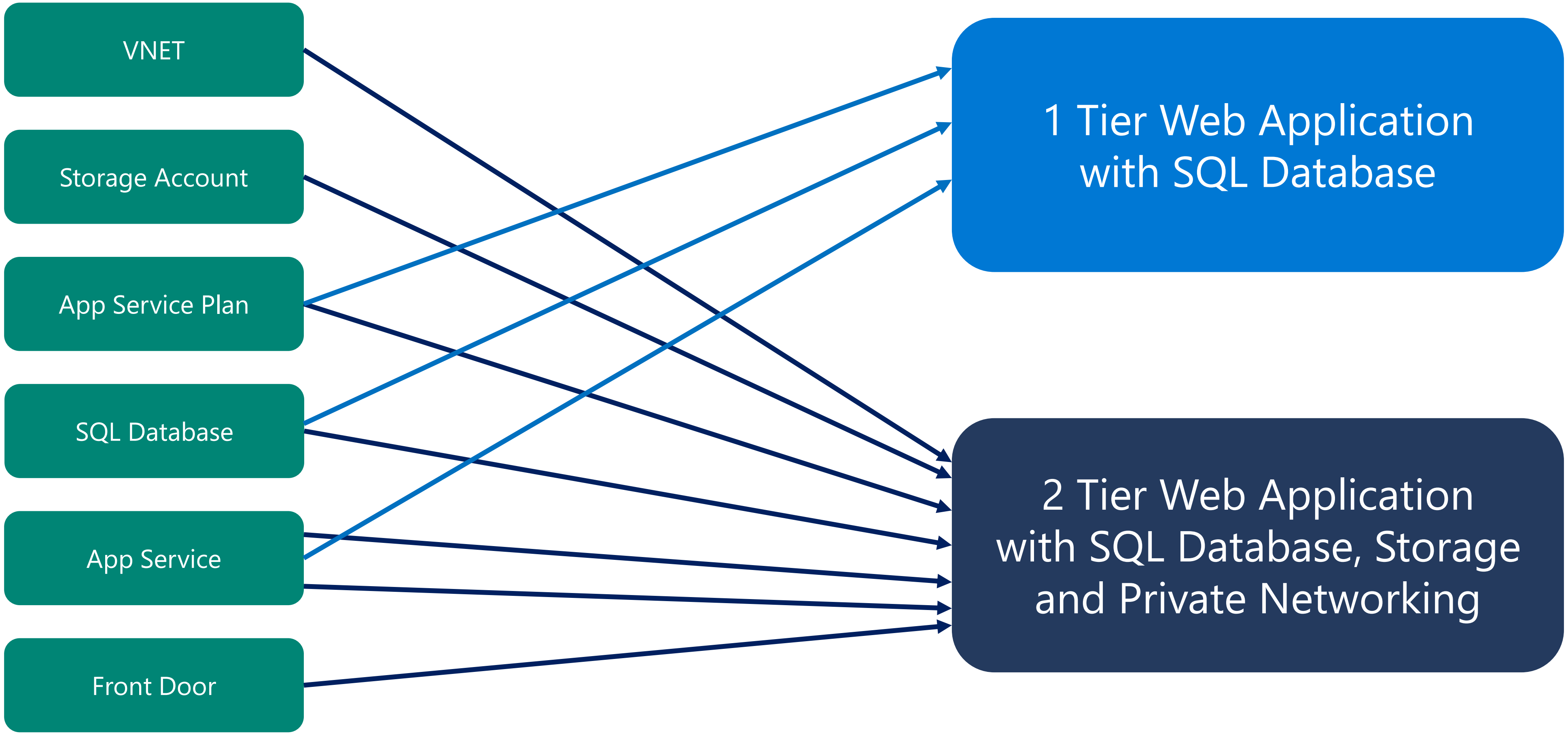
```
# main.tf from calling module
provider "azurerm" {
    version = "~>2.0.0"
    features {}
}

module "connectedrg" {
    # or remote git repo with ?ref=version
    source = "./modules/contoso-az-connectedrg"
    rg_names = var.rg_names
    vnets = var.vnets
}
```

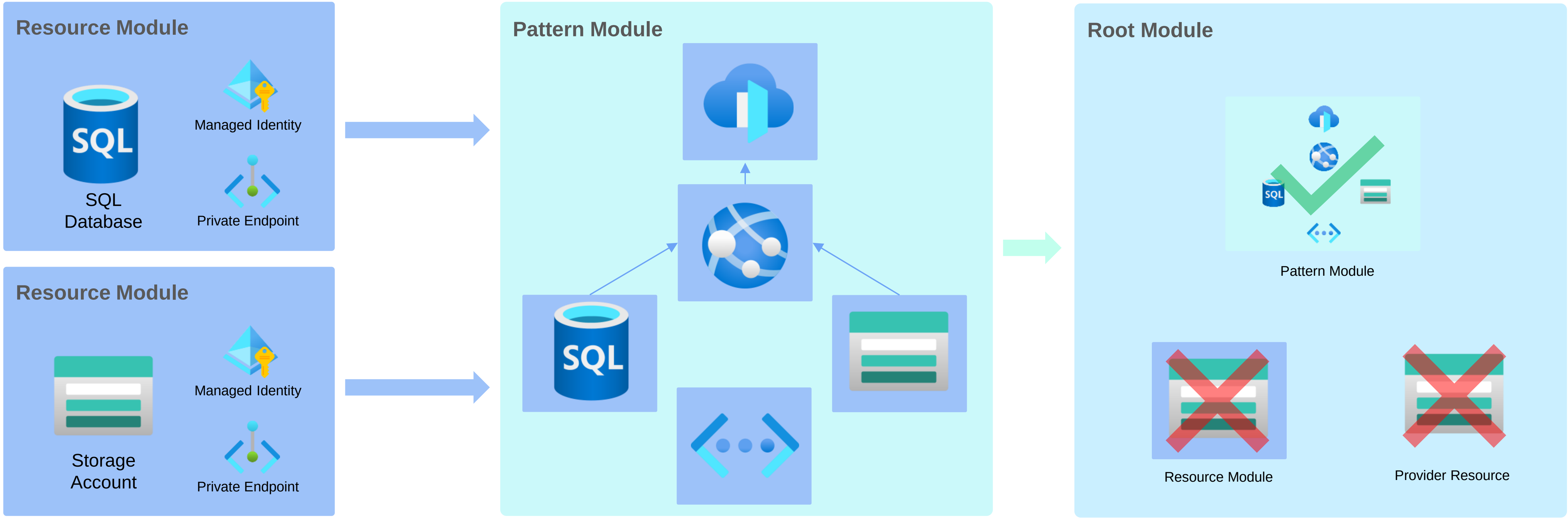
Module structuring – Common pattern

Resource Modules
(Opinionated encapsulated wrapper with minimal variables and sensible defaults)

Pattern Modules
(Composed of Resource Modules Only)


VNET
Storage Account
App Service Plan
SQL Database
App Service
Front Door
1 Tier Web Application with SQL Database
2 Tier Web Application with SQL Database, Storage and Private Networking

Modules Structuring - Pattern and Policy



Private Module Sharing Options

git repository

- Can be public or private
- Private requires an access token
- Versioning is static via `ref` on url
- Documentation in read me

http server

- Serve a zip or tar
- Versioning would require custom coding
- Authentication would be custom and basic
- Documentation separate

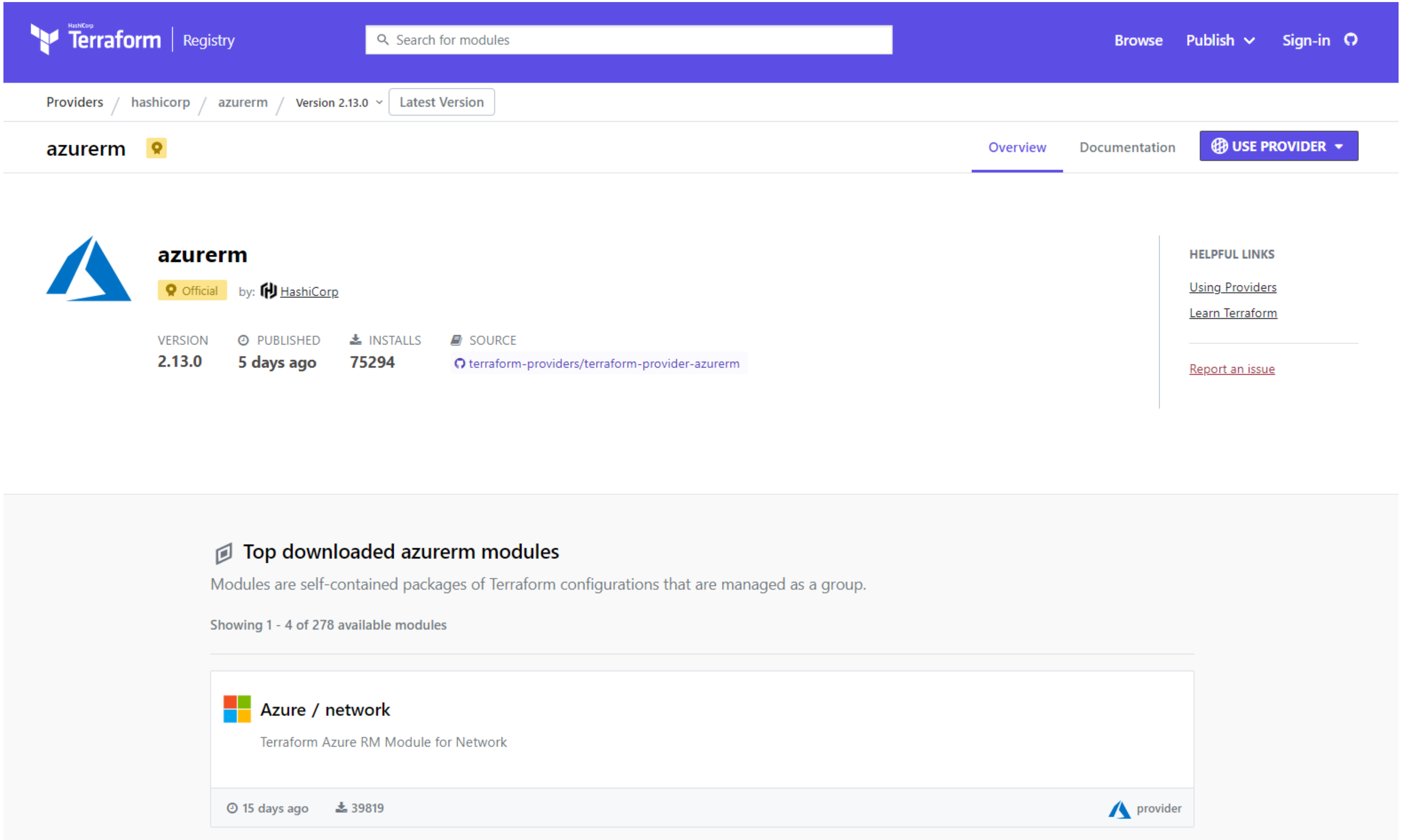
cloud blob storage

- Only supports AWS and GCP
- Versioning static via url
- Token / credentials required
- Documentation separate

private registry in Terraform Cloud / Ent

- Authentication built in
- Dynamic versioning via `version` attribute
- Documentation in registry
- Supports providers
- Supports authz for admins

Terraform public registry



Providers / hashicorp / azurerm / Version 2.13.0 Latest Version

azurerm

azurerm

Official by: HashiCorp

VERSION	PUBLISHED	INSTALLS	SOURCE
2.13.0	5 days ago	75294	terraform-providers/terraform-provider-azurerm

HELPFUL LINKS

Using Providers

Learn Terraform

Report an issue

Top downloaded azurerm modules

Modules are self-contained packages of Terraform configurations that are managed as a group.

Showing 1 - 4 of 278 available modules

Azure / network

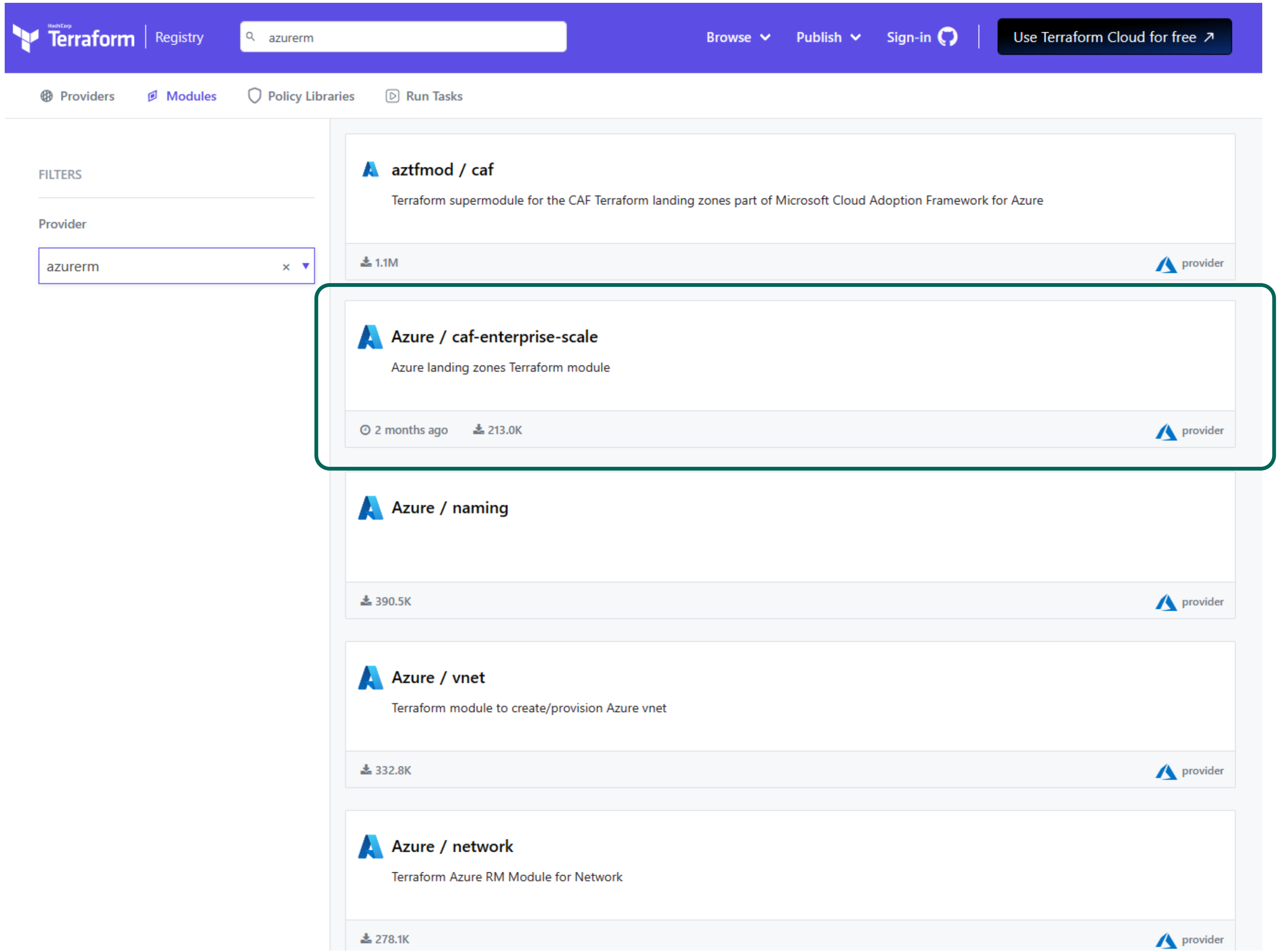
Terraform Azure RM Module for Network

15 days ago 39819 provider

Public Modules and Providers

Terraform public registry

- Curated by Microsoft
- Reusable best practice
- Landing zones



aztfmod / caf
Terraform supermodule for the CAF Terraform landing zones part of Microsoft Cloud Adoption Framework for Azure
1.1M — provider

Azure / caf-enterprise-scale
Azure landing zones Terraform module
2 months ago — 213.0K — provider

Azure / naming
390.5K — provider

Azure / vnet
Terraform module to create/provision Azure vnet
332.8K — provider

Azure / network
Terraform Azure RM Module for Network
278.1K — provider

Azure Verified Modules

What are they

- Microsoft owned, maintained and supported
- Resource, Pattern and Utility
- Standard interfaces
- Aligned to Well Architected Framework
- Check them out at aka.ms/avm

Module and Provider Versioning

- Module and Provider version pinning allows teams to work with confidence
- Follow SemVer
  - Major: Incompatible API changes
  - Minor: New functionality added in a backwards compatible manner
  - Patch: Backward compatible bug fixes
- Use version patterns to accept patch or minor releases
  - `~> 1.1.3`
    - Allows all 1.1.* >=1.1.3
    - Does not allow >=1.2.0
  - `≥ 1.1.3, <2.0.0`
    - Allows all 1.*.* versions >=1.1.3
    - does not allow >=2.00

Root Module Sizing

- Number of resources managed
    - Refresh time grows linearly
    - Blast radius
    - Maintainability
    - Size of state file
- Memory usage
    - Graph generation
    - Agent sizing
- Plan Time
- Plan ahead or refactor later
    - Split vertical or horizontal
- Share outputs or use data sources

Module Testing

Unit testing

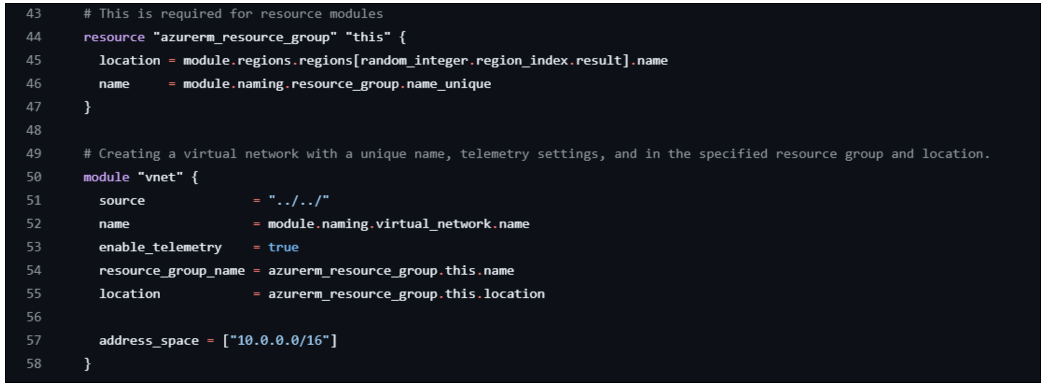
- Use terraform test with provider mocking

Integration testing

- Use terraform test with provider auth

End to end testing

- Create a sub folder structure for your test scenarios
    - Folder structure example
    - Reference the parent module with `source = "../../"`
- Add more tests as customer scenarios emerge



```
# This is required for resource modules
resource "azurerm_resource_group" "this" {
  location = module.regions.regions[random_integer.region_index.result].name
  name     = module.naming.resource_group.name_unique
}

# Creating a virtual network with a unique name, telemetry settings, and in the specified resource group and location.
module "vnet" {
  source              = "../../"
  name                = module.naming.virtual_network.name
  enable_telemetry    = true
  resource_group_name = azurerm_resource_group.this.name
  location            = azurerm_resource_group.this.location

  address_space = ["10.0.0.0/16"]
}
```

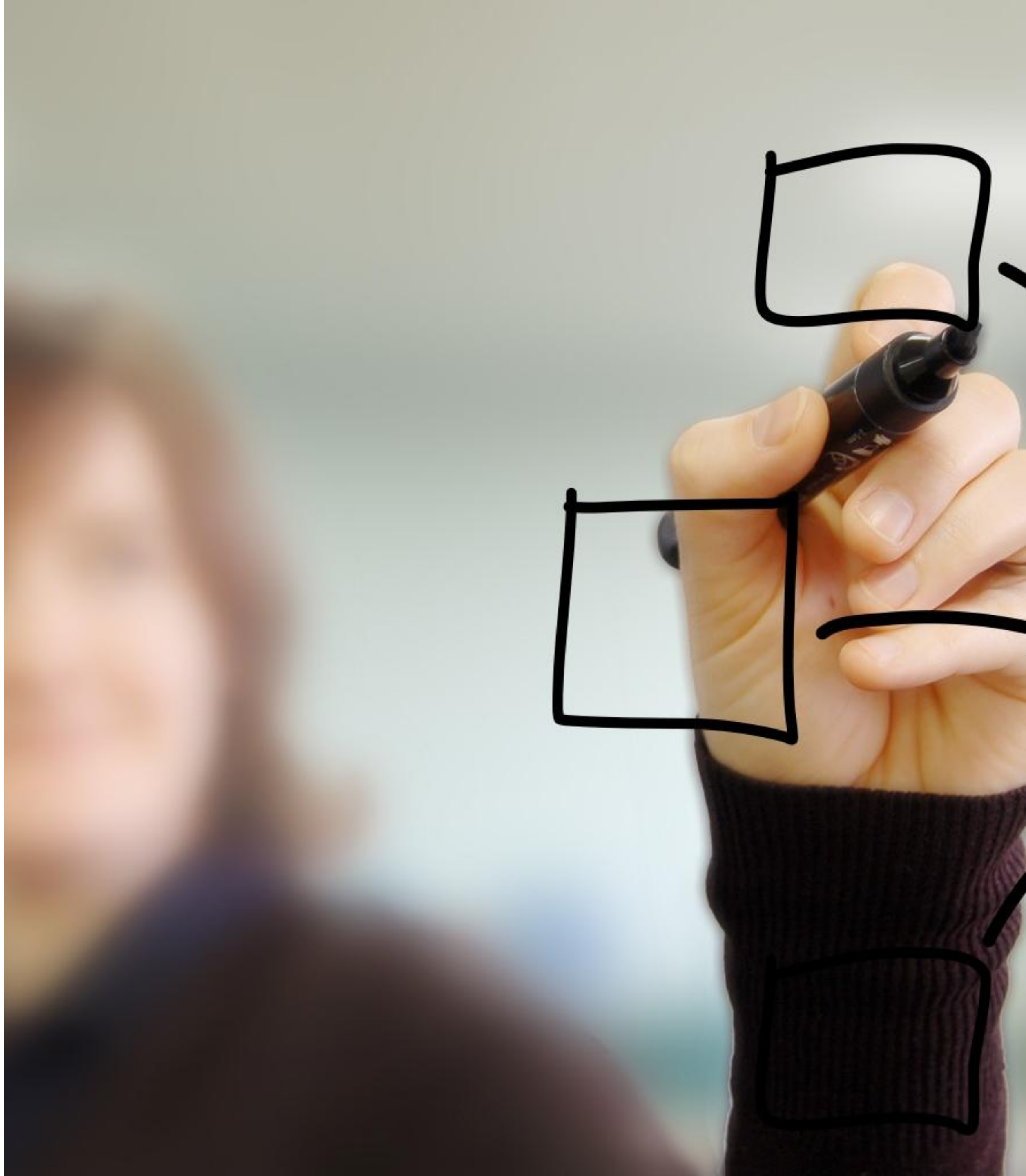
Modules

Lab 6

Ask

Discuss

Comment



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