

ДОДАТОК А
ГРАФІЧНИЙ МАТЕРІАЛ КВАЛІФІКАЦІЙНОЇ РОБОТИ

Кафедра ЕОМ

Комп'ютерна інженерія та управління

Автоматизація інфраструктури за допомогою Terraform та Ansible

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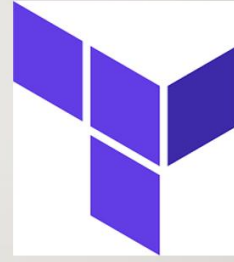
2025

МЕТА ТА ЗАВДАННЯ РОБОТИ

- **Мета**
Розробити методику автоматизованого розгортання Kubernetes-кластера в хмарному середовищі AWS з використанням технологій Infrastructure as Code.
- **Завдання**
 - Аналіз інструментів автоматизації IaC.
 - Розгортання інфраструктури з використанням Terraform.
 - Налаштування Kubernetes з використанням Ansible.
 - Тестування та перевірка масштабованості системи.



СТЕК ТЕХНОЛОГІЙ



OpenTofu 

- Інструменти IaaS



ОСНОВНІ МОДУЛІ TERRAFORM

Модуль `controller`

Модуль `workers`

Модуль `ssh_key_pair`

Модуль `security_group`

`main.tf`, `variables.tf`,
`outputs.tf`

РОЛІ ANSIBLE

`kube-prerequisites` – встановлення залежностей

`containerd` – налаштування `containerd`

`kubelet-kubeadm-kubectl` – основні компоненти Kubernetes

`init-cluster` – ініціалізація кластеру

Налаштування доступу в aws

Modify IAM role info

Attach an IAM role to your instance.

Instance ID

I-06588582552b1d008 (Dev)

IAM role

Select an IAM role to attach to your instance or create a new role if you haven't created any. The role

terraform

Додавання і видалення ресурсів в terraform

```
resource "local_file" "ansible_inventory" {
  content = (known after apply)
  content_base64sha256 = (known after apply)
  content_md5 = (known after apply)
  content_sha1 = (known after apply)
  content_sha256 = (known after apply)
  content_sha512 = (known after apply)
  directory_permission = "0777"
  file_permission = "0777"
  filename = "ansible_inventory.ini"
  id = (known after apply)
}

# null_resource.execute-playbook will be created
resource "null_resource" "execute-playbook" {
  id = (known after apply)
}

# module.controller.aws_instance.controller will be created
resource "aws_instance" "controller" {
  ami = "ami-8c2a8ede9f7c3b37c"
  associate_public_ip_address = true
  availability_zone = (known after apply)
  disable_api_termination = (known after apply)
  disable_termination_protection = (known after apply)
  ebs_optimized = (known after apply)
  enable_primary_ipv6 = (known after apply)
  get_password_data = false
  host_id = (known after apply)
  host_resource_group_arn = (known after apply)
  iam_instance_profile = (known after apply)
  id = (known after apply)
  instance_initiated_shutdown_behavior = (known after apply)
  instance_lifecycle = (known after apply)
  instance_state = (known after apply)
  instance_type = "t3.medium"
  ipv6_address_count = (known after apply)
  ipv6_addresses = (known after apply)
  key_name = "cluster-key"
  monitoring = (known after apply)
  outpost_arn = (known after apply)
  password_data = (known after apply)
  placement_group = (known after apply)
  placement_partition_number = (known after apply)
  primary_network_interface_id = (known after apply)
  private_dns = (known after apply)
  private_ip = (known after apply)
  public_dns = (known after apply)
  public_ip = (known after apply)
  region = "eu-north-1"
}
```

```
# module.sg-create.aws_security_group.allow_tis_http_ssh will be destroyed
resource "aws_security_group" "allow_tis_http_ssh" {
  arn = "arn:aws:ec2:eu-north-1:669926049908:security-group/sg-04a9f6dc74284ae1a"
  description = "Allow all inbound traffic"
  egress = [
    {
      cidr_blocks = [
        "0.0.0.0/0",
      ]
      description = "Allow All for Egress"
      from_port = 0
      ipv6_cidr_blocks = [
        ":::/0",
      ]
      prefix_list_ids = []
      protocol = "-1"
      security_groups = []
      self = false
      to_port = 0
    },
  ]
  id = null
  ingress = [
    {
      cidr_blocks = [
        "0.0.0.0/0",
      ]
      description = "HTTP"
      from_port = 80
      ipv6_cidr_blocks = [
        ":::/0",
      ]
      prefix_list_ids = []
      protocol = "TCP"
      security_groups = []
      self = false
      to_port = 80
    },
  ]
  tags = {}
  }
  id = null
  ingress = [
    {
      cidr_blocks = [
        "0.0.0.0/0",
      ]
      description = "SSH"
      from_port = 22
      ipv6_cidr_blocks = [
        ":::/0",
      ]
      prefix_list_ids = []
      protocol = "TCP"
      security_groups = []
      self = false
      to_port = 22
    },
  ]
}
```

```

null_resource.execute-playbook (local-exec): net.bridge.bridge-nf-call-iptables = 1,
null_resource.execute-playbook (local-exec): "net.bridge.bridge-nf-call-iptables = 1",
null_resource.execute-playbook (local-exec): "net.ipv4.ip_forward = 1"
null_resource.execute-playbook (local-exec): }
null_resource.execute-playbook (local-exec): }

null_resource.execute-playbook (local-exec): TASK [kube-prerequisites : update apt cache] *****
null_resource.execute-playbook (local-exec): Still creating... (0m18s elapsed)
null_resource.execute-playbook (local-exec): changed: [kubeadm-controller]

null_resource.execute-playbook (local-exec): TASK [kube-prerequisites : install pip3] *****
null_resource.execute-playbook (local-exec): Still creating... (0m20s elapsed)
null_resource.execute-playbook (local-exec): Still creating... (0m30s elapsed)
null_resource.execute-playbook (local-exec): Still creating... (0m40s elapsed)
null_resource.execute-playbook (local-exec): changed: [kubeadm-controller]

null_resource.execute-playbook (local-exec): TASK [kube-prerequisites : install pre-requisites for python] *****
null_resource.execute-playbook (local-exec): Still creating... (0m50s elapsed)
null_resource.execute-playbook (local-exec): changed: [kubeadm-controller]

null_resource.execute-playbook (local-exec): PLAY [Install container] *****

null_resource.execute-playbook (local-exec): TASK [Gathering Facts] *****
null_resource.execute-playbook (local-exec): ok: [kubeadm-controller]

null_resource.execute-playbook (local-exec): TASK [containerd : Update repositories cache and install "foo" package] *****
null_resource.execute-playbook (local-exec): changed: [kubeadm-controller]

null_resource.execute-playbook (local-exec): TASK [containerd : create keyrings directory] *****
null_resource.execute-playbook (local-exec): changed: [kubeadm-controller]

null_resource.execute-playbook (local-exec): TASK [containerd : Add Docker GPG key] *****
null_resource.execute-playbook (local-exec): changed: [kubeadm-controller]

null_resource.execute-playbook (local-exec): TASK [containerd : Add Docker APT repository] *****
null_resource.execute-playbook (local-exec): Still creating... (01m00s elapsed)
null_resource.execute-playbook (local-exec): changed: [kubeadm-controller]

null_resource.execute-playbook (local-exec): TASK [containerd : install container] *****
null_resource.execute-playbook (local-exec): Still creating... (01m10s elapsed)
null_resource.execute-playbook (local-exec): changed: [kubeadm-controller]

null_resource.execute-playbook (local-exec): TASK [containerd : Apply the default configuration for the container] *****
null_resource.execute-playbook (local-exec): changed: [kubeadm-controller]

null_resource.execute-playbook (local-exec): TASK [containerd : replace line] *****
null_resource.execute-playbook (local-exec): changed: [kubeadm-controller]

null_resource.execute-playbook (local-exec): TASK [containerd : Restarting Container] *****
null_resource.execute-playbook (local-exec): changed: [kubeadm-controller]

null_resource.execute-playbook (local-exec): PLAY [Install kubeadm kubectl kubelet] *****
null_resource.execute-playbook (local-exec): TASK [Gathering Facts] *****
null_resource.execute-playbook (local-exec): ok: [kubeadm-controller]

```

Виконання Ansible-модулів

Результат виконання

```

null_resource.execute-playbook (local-exec): TASK [init-cluster : Copy admin.conf to home directory] *****
null_resource.execute-playbook (local-exec): changed: [kubeadm-controller]

null_resource.execute-playbook (local-exec): PLAY [copy token to workers] *****

null_resource.execute-playbook (local-exec): TASK [Gathering Facts] *****
null_resource.execute-playbook (local-exec): ok: [kubeadm-node-0]

null_resource.execute-playbook (local-exec): TASK [save join token to workers] *****
null_resource.execute-playbook (local-exec): changed: [kubeadm-node-0]

null_resource.execute-playbook (local-exec): TASK [execute join token] *****
null_resource.execute-playbook (local-exec): Still creating... (3m50s elapsed)
null_resource.execute-playbook (local-exec): changed: [kubeadm-node-0]

null_resource.execute-playbook (local-exec): PLAY RECAP *****
null_resource.execute-playbook (local-exec): kubeadm-controller : ok=48 changed=37 unreachable=0 failed=0 skipped=0 rescued=0 ignored=0
null_resource.execute-playbook (local-exec): kubeadm-node-0 : ok=36 changed=28 unreachable=0 failed=0 skipped=0 rescued=0 ignored=0
null_resource.execute-playbook (local-exec): Creation complete after 3m5s (id=79891492031117254)

Apply complete! Resources: 4 added, 0 changed, 4 destroyed.

```

```

buntu@ip-172-31-13-179:~$ kubectll get node
NAME STATUS ROLES AGE VERSION
p-172-31-12-164 Ready <none> 3m34s v1.28.15
p-172-31-13-179 Ready control-plane 3m59s v1.28.15
buntu@ip-172-31-13-179:~$

```

