Deployment Guide

Target OpenNebula Architecture

This section provides a detailed description of the target architecture based on OpenNebula, specifically deployed on Scaleway Elastic Metal instances. The architecture is designed to leverage the robust capabilities of bare-metal servers to deliver a comprehensive Infrastructure-as-a-Service (IaaS) solution.

Objectives

The primary objective is to deliver a full-fledged IaaS infrastructure on bare-metal servers, ensuring high performance, reliability, and scalability.

Core Components

OpenNebula Front-end (with KVM):

- **Functionality:** Manages the entire lifecycle of virtual machines (VMs), including networking and storage. It also provides the OpenNebula frontend interface for user interaction.

- **Additional Role:** Runs local virtual machines, effectively acting as a compute node within the infrastructure.

Hypervisor Nodes:

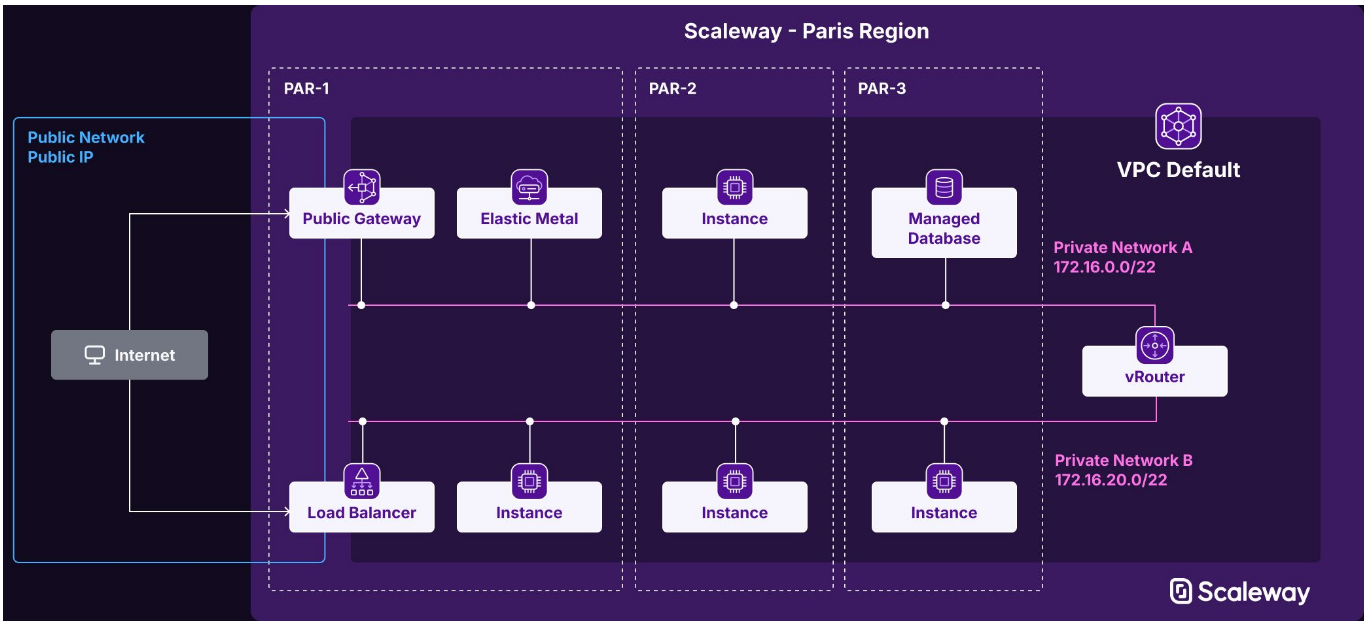
- **Instance Type:** EM-A610R-NVMe instances running KVM.
- **Networking:** Connected to a private network for secure internal communication.
- **Public Access:** Can be attached to a Public IP to provide external access to VMs.

Storage

- **Local Storage:** Each node is equipped with local NVMe SSDs to ensure high-speed data access and storage performance.
- **Capacity:** 2× NVMe 960 GB local storage per node, providing ample space for VM images and data.

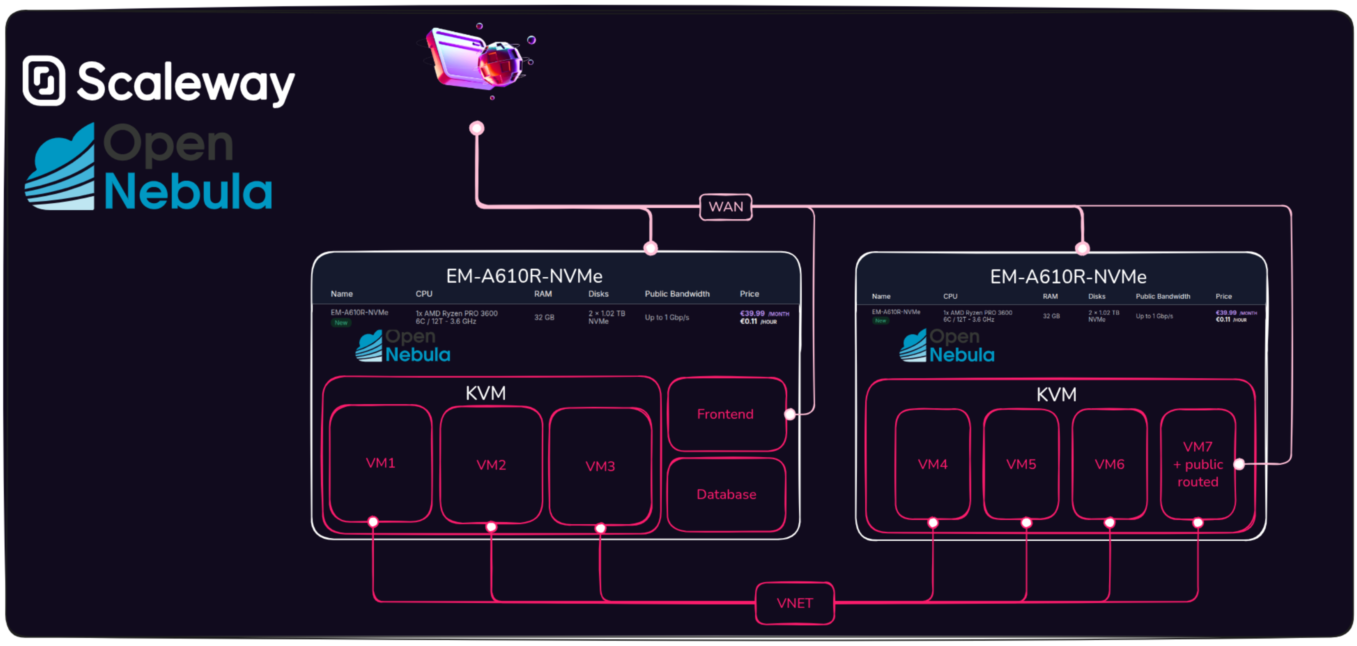
Networking

- **Virtual Network:** Utilizes Private Networks within a Virtual Private Cloud (VPC) to ensure secure and isolated communication between instances.
- **Public Gateway:** For high traffic scenarios, a Public Gateway is the preferred method. However, for initial deployment and Minimum Viable Product (MVP) phases, Public IPs can be directly attached to instances via Network Interface Cards (NIC).



High-Level Diagram

The high-level diagram below illustrates the overall architecture, including the interaction between the OpenNebula Front-end, hypervisor nodes, and networking components.



Hardware Specification

The hardware specifications for the Elastic Metal Instances – EM-A610R-NVMe are as follows:

Role	Instance Type	CPU	RAM	Disks	KVM	Count	Bandwidth
Front-end + KVM	EM-A610R-NVMe	AMD Ryzen PRO 3600 (6C / 12T)	16 GB	2× NVMe 960 GB	Yes	1	Up to 1 Gbps
Hypervisor(s)	EM-A610R-NVMe	AMD Ryzen PRO 3600 (6C / 12T)	16 GB	2× NVMe 960 GB	Yes	1 to any	Up to 1 Gbps

This setup ensures that the infrastructure is capable of handling a wide range of workloads, providing both the computational power and storage capacity necessary for demanding applications.

Provisioning Strategies

Prerequisites and Capabilities

Prerequisites:

- Ubuntu 22.04 or 24.04 with Netplan version 0.105 or higher.
- Passwordless SSH login as root from the Front-end node to the Hypervisor nodes.
- The user performing the installation must have the ability to sudo to the root account.
- A range of free IP addresses available on the same network connecting the Front-end and Hypervisors.

Capabilities:

- Utilization of OneDeploy roles and tags.
- Integration of the OneHook driver in Ansible.

Got it! Here’s the **final version of the `deployment_guide.md` in English**, merging your current deployment structure, `.secret.skel` variables, original repository instructions, and OpenNebula feedback adjustments:

Deployment Guide for Scaleway Hosted Cloud with OpenNebula

1. Prerequisites

- OpenTofu >= v1.5.0
- Scaleway API credentials
- OpenNebula CLI tools (optional)
- Ansible

Requirements

1. Install `hatch`

   ```
   pip install hatch
   ```

2. Repository Setup

Clone the Repository

```
git clone https://github.com/OpenNebula/hosted-cloud-scaleway.git
cd hosted-cloud-scaleway
```

Initialize Submodules

```
git submodule update --init --remote --merge
```

Install Ansible Collections

```
make submodule-requirements
```

---

3. Initialize Secrets File

Copy the skeleton secrets file and configure environment variables:

```
cp .secret.skel .secret
```

Edit `.secret` and populate:

```
export TF_VAR_customer_name='opennebula'
export TF_VAR_project_name='opennebula-scw'

export SCW_ACCESS_KEY='<Your Scaleway Access Key>'
export SCW_SECRET_KEY='<Your Scaleway Secret Key>'

export AWS_ACCESS_KEY_ID=$SCW_ACCESS_KEY
export AWS_SECRET_ACCESS_KEY=$SCW_SECRET_KEY

export SCW_DEFAULT_ORGANIZATION_ID='<Your Scaleway Organization ID>'
export SCW_DEFAULT_REGION='fr-par'
export SCW_DEFAULT_ZONE='fr-par-2'

export TF_VAR_state_infrastructure_information='{
scw_infrastructure_project_name = "string" }'
export TF_VAR_region=$SCW_DEFAULT_REGION
export TF_VAR_zone=$SCW_DEFAULT_ZONE
export TF_VAR_tfstate='any-state-name-tfstates'
export TF_VAR_project_fullname='projectname-scw-infra'
export TF_VAR_private_subnet="10.16.0.0/20"
export TF_VAR_worker_count="1"
```

Source the file:

```
source .secret
```

> **Note:** `.secret` is in `.gitignore` and **must never be committed**.

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4. Infrastructure Deployment (Tofu Modules)

The infrastructure is organized into modular directories that must be applied sequentially:

Module Execution Order:

1. `001.terraform_state_management`
2. `002.vpc`
3. `003.opennebula_instances`
4. `004.opennebula_inventories`

Execute Each Module:

```
cd <module_directory>
tofu init
tofu plan
tofu apply
cd ..
```

Example:

```
cd 001.terraform_state_management/
tofu init
tofu apply
cd ..
```

Repeat for all modules in order.

5. Inventory Validation (Ansible)

** Needs module 004 to be applied **

Test connectivity to the provisioned hosts using:

```
ansible -i inventory/scaleway.yml all -m ping -b
```

Expected result:

```
fe | SUCCESS => { "changed": false, "ping": "pong" }
host01 | SUCCESS => { "changed": false, "ping": "pong" }
```

Ensure:

- SSH key path is correctly defined in `inventory/group_vars/all.yml`:

  ```
  ansible_ssh_private_key_file:
  scw/003.opennebula_instances/opennebula.pem
  ```

- Hosts are accurately defined in `inventory/scaleway.yml`.

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6. OpenNebula Post Installation

If you need to SSH into the frontend server:

```
ssh -i scw/003.opennebula_instances/opennebula.pem ubuntu@<frontend-server-ip>
```

1. Deploy OpenNebula:

   ```
   make deployment
   ```

2. Configure the deployment for the specifics of the Cloud Provider:

   ```
   make specifics
   ```

3. Test the deployment:

   ```
   make validation
   ```

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7. CI/CD Pipeline (WIP)

A GitHub Actions CI/CD pipeline is planned to:

- Automate bare-metal provisioning.
- Deploy OpenNebula.
- Handle post-deployment configurations.

> For now, CI/CD is a **Work In Progress (WIP)** and is not required for the minimal viable deployment.

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8. User Workflow Summary

After completing the infrastructure deployment:

- Users will access OpenNebula (via Sunstone UI or CLI).
- Manage Scaleway bare-metal servers.
- Orchestrate VMs and networking within OpenNebula.

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9. Known Limitations

- CI/CD pipeline is pending.

This guide reflects the current Scaleway integration and will be updated as CI/CD pipelines and automation workflows are developed.

Shall I now draft the **email/message to OpenNebula's Engineering Team** to summarize these changes and provide them this updated guide?

Optional CI/CD

Given that sensitive tokens are often required to set up an environment, we can create a CI/CD pipeline where user inputs are defined as sensitive variables. This approach ensures secure handling of critical information. The CI/CD pipeline would prompt for the following sensitive inputs:

- Scaleway token (scw token)
- CIDR blocks
- Host IP addresses

The CI/CD pipeline can then validate these IP addresses against the provided CIDR blocks. This setup allows for a seamless and effortless environment configuration to deploy this module. Below are the steps involved in the CI/CD pipeline:

1. **Input Validations:** Ensure all provided inputs are valid and correctly formatted.
2. **Terraform Initialization:** Execute `terraform init` to initialize the Terraform configuration.
3. **Terraform Plan:** Run `terraform plan` to create an execution plan (this step depends on the successful completion of `terraform init`).
4. **Manual Terraform Apply:** Manually trigger `terraform apply` to apply the changes required to reach the desired state (this step depends on the successful completion of `terraform plan`).
5. **Ansible Setup:** Configure Ansible for deployment (this step depends on the successful completion of `terraform apply`).
6. **Manual Ansible Playbook Validation:** Manually trigger the Ansible playbook `one-deploy-validation` to validate the deployment (this step depends on the successful completion of `terraform apply`).
7. **Manual Ansible Deployment:** Manually trigger the Ansible playbook `one-deploy` to execute the deployment (this step depends on the successful completion of `terraform apply`).
8. **Manual Terraform Plan for Destroy:** Manually trigger `terraform plan -destroy` to create a plan to destroy the infrastructure (this step depends on the successful completion of `terraform apply`).
9. **Manual Terraform Destroy:** Manually trigger `terraform destroy` to destroy the infrastructure (this step depends on the successful completion of `terraform plan -destroy`).

Here is a simple Mermaid diagram illustrating the CI/CD steps:

```
graph TD;
    A[Input Validations] --> B[terraform init];
    B --> C[terraform plan];
    C --> D[Manual terraform apply];
    D --> E[Ansible Setup];
    D --> F[Manual ansible playbook one-deploy-validation];
    D --> G[Manual ansible one-deploy];
    G --> H[Manual terraform plan destroy];
```

```
    F --> H;
    E --> H;
    H --> I[Manual terraform destroy];
```

This diagram provides a visual representation of the CI/CD pipeline steps and their dependencies.