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Deployment Guide

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1. Scaleway Hosted Cloud Overview

This repository delivers the Terraform, Ansible, and driver customizations required to build an OpenNebula Hosted Cloud on **Scaleway Elastic Metal**. It extends the upstream `one-deploy` and `one-deploy-validation` projects via git submodules and adds Scaleway-specific infrastructure modules, inventories, and Flexible IP (FIP) drivers.

Objectives

Deploy a full-featured IaaS environment on bare-metal servers with deterministic networking, managed inventories, and reusable automation so that OpenNebula can be repeatedly installed, validated, and extended on Scaleway.

Core Components

OpenNebula Front-end (with KVM):

- Manages the entire lifecycle of virtual machines (VMs) and doubles as a compute node.
- Provides the OpenNebula CLI/API and Sunstone UI for operators.

Hypervisor Nodes:

- EM-A610R-NVMe instances running KVM and attached to the same private network as the frontend.
- Can receive public connectivity via Flexible IPs (FIPs) or a Public Gateway.

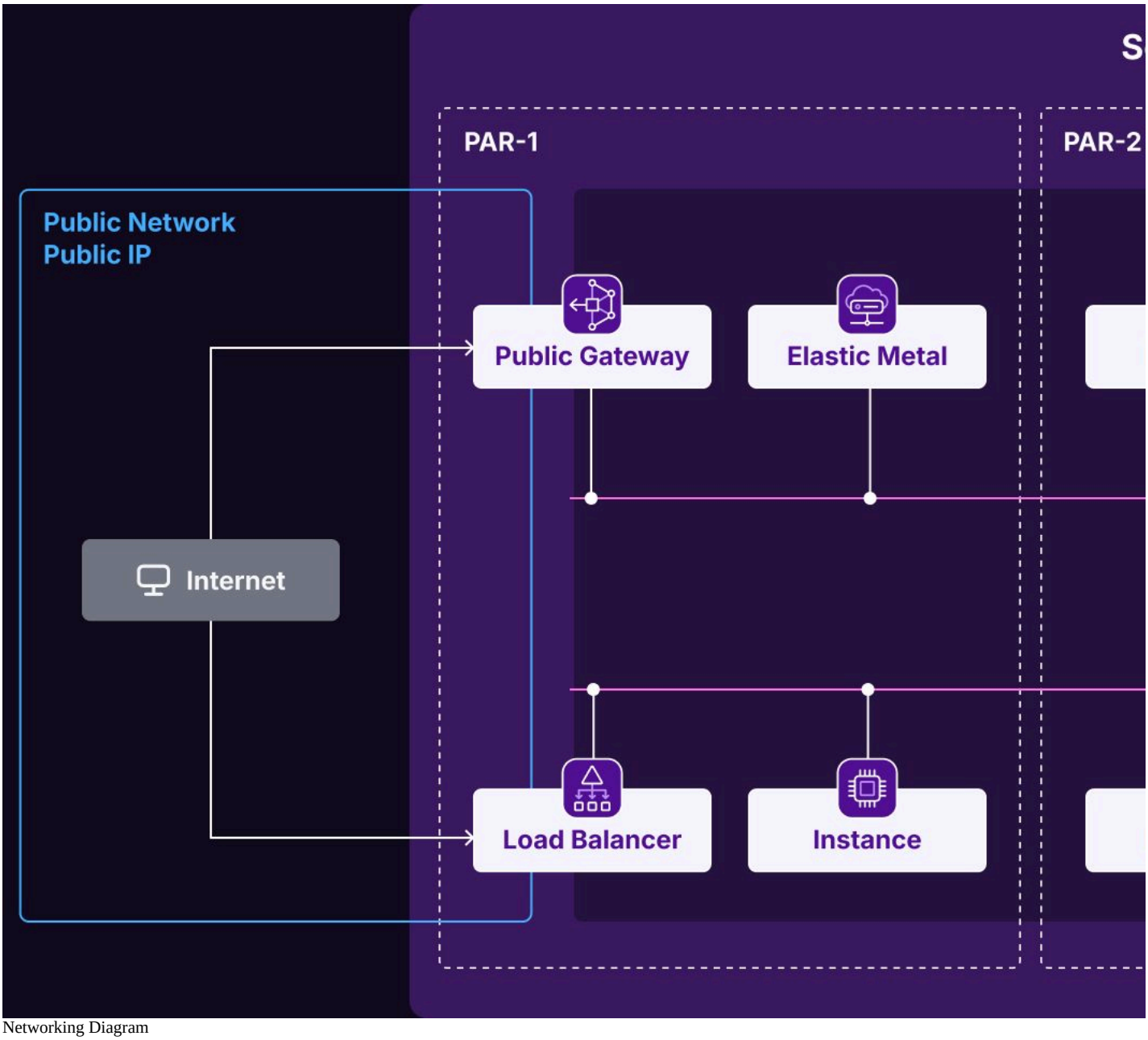
`roles/one-driver` ships a custom VNM bridge hook that attaches and detaches FIPs through the Scaleway APIs. Commits `967216f`, `4399aed`, and `a165376` added multi-NIC support and improved cleanup and logging under `/var/log/vnm`.

Storage

- 2× NVMe 960 GB drives per node provide high IOPS local storage for VM images and context disks.

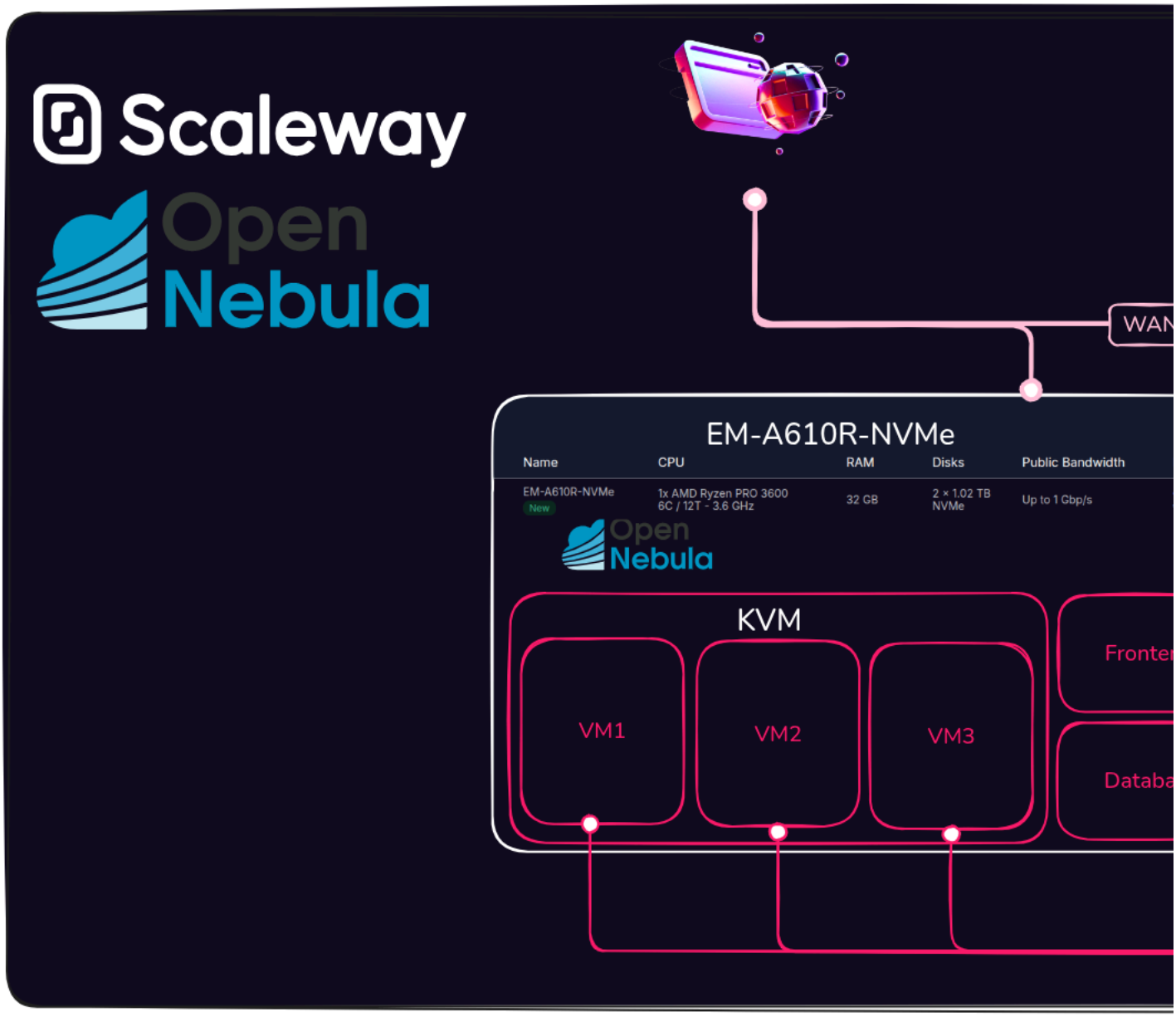
Networking

- Private connectivity is delivered through a VPC/VLAN mesh created by the Terraform modules under `scw/`.
- Public access can attach directly to instances in the MVP phase or via a Public Gateway for higher-scale deployments.
- The default netplan layout creates `br0` for public/FIP traffic, `brvmtovm` for host-to-host VXLAN, and VLAN-tagged subinterfaces for tenant networks.



Networking Diagram

High-Level Diagram



High-Level Diagram

Hardware Specification

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..N	Up to 1 Gbps

Provisioning Strategies

Prerequisites

- Ubuntu 22.04 or 24.04 with Netplan ≥ 0.105 on provisioned nodes.
- Password-less SSH from the frontend to hypervisors.
- Ability to sudo to root on all nodes.
- A pool of free IP addresses on the management network.

Capabilities

- Utilization of OneDeploy roles/tags and the OneHook driver.
- Automated inventories rendered from Terraform outputs.
- Re-runnable Ansible plays to keep hooks and packages up to date.

2. Requirements

Component	Version / Notes
OpenTofu	≥ 1.5.0 (used by the `scw/*` modules)
Python / pip	Needed for hatch and Ansible tooling
Hatch	Manages the `scaleway-default` execution environment
Ansible	Driven via the Makefile targets
Scaleway Credentials	API access key, secret key, organization/project IDs, Flexible IP token

Install the local tooling:

```
pip install hatch
make submodule-requirements     # installs Ansible collection deps
```

3. Repository Setup

```
git clone https://github.com/OpenNebula/hosted-cloud-scaleway.git
cd hosted-cloud-scaleway
git submodule update --init --remote --merge
```

The Makefile shortcuts (`deployment`, `validation`, `specifics`, `submodule-requirements`) proxy into the submodules with the Scaleway inventories pre-selected. Run commands from the repo root so relative paths (for keys, inventories, etc.) resolve correctly.

4. Secrets and Environment Variables

1. Copy the template and populate credentials:

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

2. Edit `.secret` with the Terraform (`TF_VAR_*`) values, Scaleway credentials (`SCW_*`), AWS-compatible aliases (used by OpenTofu backends), Flexible IP token, and OpenNebula password.

3. Source the file before running any `tofu` or `make` commands:

   ```
   source .secret
   ```

Key inputs:

- `TF_VAR_customer_name`, `TF_VAR_project_name`, `TF_VAR_project_fullname` for resource naming.
- `TF_VAR_private_subnet`, `TF_VAR_worker_count`, and netplan-related CIDRs consumed by `scw/003` and `scw/004`.
- `SCW_ACCESS_KEY`, `SCW_SECRET_KEY`, `SCW_DEFAULT_ORGANIZATION_ID`, `SCW_DEFAULT_REGION`, `SCW_DEFAULT_ZONE`.
- `scw_flexible_ip_*` defaults referenced by `roles/one-driver/defaults/main.yaml`.

`.secret` is ignored by git; never commit credential material.

5. Infrastructure Provisioning (OpenTofu Modules)

Modules live under `scw/` and must be executed sequentially with OpenTofu (or Terraform). Each directory contains its own state and variables.

Order	Module	Purpose
001	`terraform_state_management`	Bootstrap state bucket/project metadata
002	`vpc`	Create the VPC, VLANs, and subnet layout
003	`opennebula_instances`	Provision the frontend and KVM nodes + cloud-init assets
004	`opennebula_instances_net`	Configure netplan, VLAN tags, and Ethernet aliases
005	`opennebula_inventories`	Render `inventory/scaleway.yml` and helper artifacts

Example run:

```
cd scw/002.vpc
tofu init
tofu plan
tofu apply
cd ../..
```

Review `deployment_guide.md#7-networking-configuration` for the expected netplan outputs and `deployment_guide.md#6-inventory-and-parameter-management` for generated files.

6. Inventory and Parameter Management

`inventory/scaleway.yml` is auto-generated by module `005` but can be edited for PoCs. Supplementary values live in `inventory/group_vars/all.yml`.

Description	Variable(s)	Files / Templates
SSH user and key path	`ansible_user`, `ansible_ssh_private_key_file`	`inventory/group_vars/all.yml`
Frontend + node metadata	`frontend.hosts.*`, `node.hosts.*`	`inventory/scaleway.yml`
Scaleway project/FIP identifiers	`scw_project_id`, `scw_server_id`, `scw_flexible_ip_token`, `scw_flexible_ip_zone`	`inventory/scaleway.yml`, `roles/one-driver/defaults/main.yaml`
OpenNebula credentials	`one_pass`, `one_version`	`inventory/scaleway.yml`, `.secret`

Description	Variable(s)	Files / Templates
VNM templates	`vn.pubridge.template.*`, `vn.vxlan.template.*`	`inventory/scaleway.yml`
Validation knobs	`validation.*`	`inventory/group_vars/all.yml`

Verify reachability once Terraform module `005` completes:

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

Successful output resembles:

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

Ensure the SSH key path (default `scw/003.opennebula_instances/opennebula.pem`) and hostnames match what Terraform produced.

7. Networking Configuration

- Cloud-init templates under `scw/004.opennebula_instances_net/template/` apply deterministic interfaces: `br0` (public/FIP), `brvmtovm` (VXLAN), and VLAN-tagged subinterfaces for tenant networks.
- `cloud_init_custom.tmpl` wires in OpenTofu outputs (`base_public_ip`, `gateway`, VLAN assignments, IPAM ranges) and assumes the bare-metal NIC is `enp5s0`.
- `roles/one-driver/templates/vnm/bridge/{pre,clean}.d` hooks bring Flexible IPs online/offline and log to `/var/log/vnm`.
- After provisioning, run an Ansible ping and, if needed, re-apply module `004` whenever netplan drift occurs.

8. OpenNebula Deployment Workflow

1. Review the submodules (`submodule-one-deploy`, `submodule-one-deploy-validation`) and local overrides (`playbooks/scaleway.yml`, `roles/one-driver`).
2. Deploy the base OpenNebula stack (frontend, hypervisors, shared configs):

   ```
   make deployment
   ```

3. Apply Scaleway-specific driver hooks and Flexible IP sync:

   ```
   make specifics
   ```

4. Run the validation suite:

   ```
   make validation
   ```

All targets are idempotent; rerun them whenever roles or drivers change. SSH into the frontend if manual debugging is required:

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

9. Validation Suite

Defaults in `inventory/group_vars/all.yml` enable:

- Core service health checks (`oned`, `gate`, `flow`, `fireedge`).
- Storage benchmark VM instantiation on `pub3`.
- Network performance tests (iperf, ping) across hypervisors.
- Connectivity matrix across hosts and `brvmtovm`.
- Marketplace VM deploy & smoke tests (Alpine Linux 3.21 template, optional VNET creation).

Disable individual tests by toggling the corresponding `validation.run_*` flag. Reports land under `/tmp/cloud_verification_report.html` and directories documented in the inventory file.

10. Troubleshooting & Known Issues

- **Flexible IP attach/detach:** Hooks under `roles/one-driver/templates/vnm/bridge/{pre,clean}.d` keep logs in `/var/log/vnm`. Rerun `make specifics` after updating the scripts to ensure hosts sync the latest hooks.
- **Ubuntu gateway for Flexible IPs:** When a Flexible IP resides outside the VM gateway netmask, Ubuntu may stall outbound traffic. Until upstream fixes (`OpenNebula/one-apps#284`, `OpenNebula/one#7348`) land, add a manual route (`sudo ip route add 62.210.0.1/32 dev eth0`) or persist it via `ETH0_ROUTES`.
- **Host synchronization:** The driver role runs `onehost sync --force` for each host; investigate Ansible output if sync fails.
- **Networking drift:** Re-apply module `004.opennebula_instances_net` or netplan templates whenever manual edits break VLAN alt-names or `brvmtovm` routes.
- **Credentials:** Missing Flexible IP token (`scw_flexible_ip_token`) or project ID causes the driver role to abort via assertions.

11. CI/CD Roadmap

`deployment_guide.md#5-infrastructure-provisioning-opentofu-modules` and the sections above describe the manual workflow today. A future GitHub Actions pipeline (WIP) will:

1. Validate sensitive inputs (tokens, CIDRs, host IPs).
2. Run `tofu init`/`plan` and block until approved.
3. Require manual approval before `tofu apply`.
4. Configure Ansible, run `one-deploy-validation`, `one-deploy`, and eventually `tofu destroy`.

Sensitive inputs (Scaleway tokens, CIDRs, host IPs) should be stored as encrypted pipeline variables. A reference Mermaid diagram:

```
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];
```

12. Extending the Cloud

To onboard additional hypervisors or iterate on the deployment:

1. Increase `TF_VAR_worker_count` (and other necessary variables) and rerun modules `003` and `004`.
2. Regenerate inventories via module `005` and confirm SSH access.
3. Run `make deployment` followed by `make specifics` so hooks and metadata land on the new hosts.
4. Re-run `make validation` to ensure the expanded capacity integrates cleanly.

For deeper background, architecture diagrams, and screenshots, keep this guide close while executing the workflow end-to-end.