Deploying a hyper-converged infrastructure with Ceph across the Cloud-Edge Continuum

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Let’s Start with some Theory 😎
What is the **Cloud-Edge Continuum**?

How to manage the emerging Datacenter-Cloud-Edge continuum?

- **Deploy Low-Latency Applications**
- **Improve User Experience**
- **Reduce Energy Consumption**
- **Expand Service Availability**
- **Minimize Vendor Dependency**
- **Reduce Data Transfers and Security Risks**
Edge Computing
How to manage the emerging Datacenter-Cloud-Edge continuum?

- Clusters (PoPs) of bare-metal servers running KVM hypervisor.
- Uniform management layer for multiple locations and private clouds.
- Interconnected through high latency links.
- Multi-tenancy environment.
Looking Inside a Cloud-Edge site

An example deployment of 5G networks

- Small number of servers
- Runs virtualized services to consolidate workloads (e.g. virtual k8s clusters)
- Sites as autonomous as possible
- Simple network model (e.g. VLAN)
- Run some specialized workloads (e.g. VNF) that requires SR IOV
Bringing these Ideas to Life 😐
Deploying a **Cloud-Edge Node**

*The Open Source Join Forces* 💪

**One platform to rule them all** 🚀

**Open Nebula** + **One Provision**

**Cloud-Edge Deployment in an Instant** ⚡

**Automated Host Configuration**

**Automated Resources Deployment**

**Cloud-Edge Deployment**

**HashiCorp Terraform**

**Ansible**
What is OpenNebula?

The open source Cloud & Edge Computing Platform bringing real freedom to your Enterprise Cloud.

- Application Containers
- Kubernetes Clusters
- Virtual Machines

Virtual Infrastructure Management, Cloud Management Provisioning & Cloud Federation

- CORE DATA CENTER
- PUBLIC CLOUD
- EDGE

✓ Avoids “Vendor Lock-in”
✓ Reduces resource consumption
✓ Minimizes complexity
✓ Slashes operating costs
Building Your Cloud

A comprehensive solution offering flexibility, scalability, simplicity, and vendor independence

- Multi-Tenancy
- Self-Service
- Elasticity
- Multi-Tier Apps
- High Availability
- Federation
- Provisioning
- Multi-Cloud
- VMs + Containers
Expanding to the **Multi-Cloud**

Single control panel to avoid vendor lock-in, reduce costs, and ensure workload portability

1. **Any Infrastructure**
   Automatic provision of resources from cloud providers

2. **Uniform Management**
   Homogeneous layer for user and workload management and operation

3. **Any Application**
   VMs, multi-VM services, containers, and k8s clusters on a shared environment

https://opennebula.io/multi-cloud/
Ceph as Storage Solution

Hyper-converged Infrastructure Architecture Based on Ceph Open Source Storage Solution

Ceph at the Edge
- Small number of nodes (~3)
- Dedicated to store VM disk images
- Low storage requirements & density of OSD
- Run in a HCI configuration

Ceph at OpenNebula
- Ceph based Datastores: simple configuration & multiple Ceph clusters / pools.
- Shared storage with consistency & replication
- Features: Thin provisioning, snapshot, clone, compression, encryption…
The HCI cluster consists of three different type of servers:

- **Full nodes**, run Ceph OSD and Monitor daemons as well as KVM. In order to get a fault tolerant cluster a number of 3 nodes of this type is recommended.
- **OSD nodes**, run Ceph OSD daemon.
- **Hypervisor-only nodes**, run the KVM and the Ceph client tools.
Demo Time!
Demo Environment
Deploying a Cloud-Edge Ceph Cluster

1. Provider Catalog
   Add AWS and Equinix Metal as new public cloud/edge infra providers in the US.

2. Automatic provision
   Provision OpenNebula Edge Ceph Clusters on the bare-metal locations of choice.

3. Access Marketplace
   Download the VM templates or Docker images for the services to deploy.

4. Deploy Applications
   Instantiate new VMs in the remote cloud/edge locations.

VM Templates + Container Marketplaces
- AWS
- Equinix Metal
- K8s cluster
- Virtual Machines
- KVM Node
- Private On-prem Edge (Madrid, ES)
- AWS Metal (Frankfurt, Germany)
- Equinix Metal (Paris, France)
Closing Thoughts
Next Steps & Challenges
Contribute to the next generation of Cloud-Edge Computing!

Ceph & OpenNebula Roadmap

- Support for Ceph namespaces
- Support for incremental backup in Ceph
- Adopt Ceph Image live-migration (e.g. edge import..)
- Improve HCI configurations
- Integrate with the new one-deploy project

Contribute to the repo on Github!
OpenNebula/one
OpenNebula Community Forum
Join the OpenNebula Community where Exploration and Collaboration Unite!

🚀
🔗
forum.opennebula.io
A Cognitive Serverless Framework for the Cloud-Edge Continuum

COGNIT.SovereignEdge.EU

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Thank you very much for your attention!