

A Highly Distributed Cloud Architecture for Telco NFV Deployments

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Agenda

- Introducing OpenNebula
- Virtualizing Infrastructure for the Most Complex Telecom Use Cases
- Features Validation
- Backup Slides







Introducing OpenNebula

OpenNebula Systems

Developing & Supporting OpenNebula since 2010





- European open source technology vendor.
- HQ in Madrid (Spain), with offices in Brussels (BE), Brno (CZ) & USA.
- The only European open source IaaS solution, born in 2008.
- A success story emerged from EU innovation programs.
- Leader of several innovation projects in Cognitive Cloud and Advanced 5G.
- Playing a key role at the NexusForum CSA.
- Chairing the EU Cloud Alliance and the IPCEI-CIS Industry Facilitation Group.







What is OpenNebula?

The Open Source Cloud & Edge Computing Platform







✓ Virtualization layer

- Simplicity and light profile
- Extensible architecture
- Multi-tenancy & Multi-VM
- DevOps friendly
- ✓ OneKE (Kubernetes)
 - Virtual appliances CaaS
 - Different "add-ons"
- Cloud-Edge Continuum Apps

Enterprise Cloud OpenNebula Benefits

Simplicity and Agility of Public Cloud + Performance and Security of Private Cloud



Power of Simplicity A single control panel that unifies management across the hybrid multi-cloud continuum



Lightweight and Easy to Maintain

Single enterprise-ready product, with small footprint, and a one-stop long-term commercial support



Elastic and Fully Automated

Automated operations with deployment of clusters on-prem and on-cloud in < 5 minutes



Vendor Neutral Flexibility Infrastructure agnostic to build an enterprise cloud that meets your needs on-prem and on-cloud



Proven and Scalable Many large scale production deployments with thousands of distributed nodes



Cost-effective In 10-node cloud, reduce TCO by up to 75% compared to VMware and Red Hat OpenStack

Your Cloud Your Rules

Our Mission is to Bring Real Freedom to your Enterprise Cloud 🚀





Enterprise Hybrid OpenNebula Features



OpenNebula Solves the Toughest Cloud Challenges



Any Application

Deploy, manage and provision Kubernetes and Virtual Machines



Any Infrastructure

Compute, storage and networking are virtualized and driven by software



Any Cloud

From on-premises and hybrid cloud to the multi-cloud edge



Virtualizing Infrastructure for the Most Complex Telecom Use Cases

OpenNebula Top Priorities

"Intelligence and Automation for the Operation of Distributed Edge Systems on B5G Infrastructures"

Satisfying the demand for open European tech for B5G



Integrating the functionality of B5G to improve the cloud-continuum





Making use of open solutions to manage the deployment of private B5G



Application Providers

Expanding the cloud-edge continuum through new B5G infrastructures



Facilitating the distributed management of the cloud-edge continuum for businesses and users



Creating an ecosystem of research and innovation in B5G for next generation cloud-edge

Project Coordinator: OpenNebula Systems | More Information: ONEedge5G.EU

ONEedge5G (TSI-064200-2023-1) is supported by the Spanish Ministry for Digital Transformation and Civil Service through the UNICO I+D 6G Program, co-funded by the European Union – NextGenerationEU through the Recovery and Resilience Facility (RRF).









OpenNebula Top Priorities

Enabling EU's target to have 10,000 climate-neutral highly secure edge nodes



- Multi-country large-scale projects
 - Data infrastructure
 - B5G communications
 - High-performance computing
 - Al Farms
 - Public administration
 - Digital innovation hubs

• 75% of cloud uptake by EU enterprises in 2030

Jpen

• Support for European SMEs willing to explore innovative business models

Highly Distributed Cloud Architecture



An exercise with one of the global services providers



- It delivers world-class services and platforms to wholesalers, carriers, fixed and mobile operators, OTTs, service providers, aggregators and multinational companies
- Target architecture should support the most challenging VM-based workloads such as firewalls, load balancers, routers and other non-generic compute services



OpenNebula as VIM



Efficiently using and managing the physical assets



• VIM Functionalities

- Robust, flexible and widely used
- Designed for heterogeneous infrastructure
- Software image management
- Virtualized resources allocation and management
- Infrastructure resource fault and performance management
- NFV acceleration capabilities management
- Orchestration of usage and provisioning of the virtual infrastructure
- NBI towards VNFM and NFVO
- SBI to the NFVI's elements
- WAN Infrastructure Manager

OpenNebula from VIM to IaaS



OpenNebula Systems is a general sponsor of LFE Sylva



• Unified IaaS

- support the deployment of 5G networks over cloud-edge continuum
- easily and efficiently scale the networking, computing capacity, servers and/or storage resources to their cloud tailored for every specific use case
- bridge the cloud-edge continuum to the Container-as-a-Service (CaaS) platform
- $\circ \quad$ deliver optimal performance for the services built on top
- **OneKE, as CaaS,** is offered to the telecom actors, benefiting from the control and orchestration done via CAPI

OpenNebula facilitating the re-virtualization



A concept at its peak, being applicable to 5-20% of companies



	Re-virtualization
	 virtual-to-virtual migration
	 to address a viability or commercial risk
	 OpenNebula's approach
	 Unified Management through a single
	control pane.
rconvergence	 Easy migration from VMware (including
-0	dedicated features and workflows)
nfiguration	 Enhanced security using open-source
	solutions for both VMs and containers.
	 Scalability, helping to adapt
	VM/container workloads to meet
	dynamic network demands.
	 Coexistence and seamless integration
As of June 20	with other platforms.
t ty	 Devirtualization



Features Validation

Testing configuration



Re-virtualize and expand the e2e architecture



- Focus on the functionality of VNFs
- Avoid putting too much effort into the underlying layer
- Coexistence of VM and containers
- Multi-tenancy in
 - resource-constrained environments
- Main components
 - PoPs
 - Central PoP included the OpenNebula control daemons
 - Storage
 - Networking
 - Management plane
 - APIs and WebGUI
- Long Fat Networks (100-1000 Mbps, latencies over 200 ms)

VIM features

Tailored test scenario to showcase OpenNebula's advantages



Networking and EPA Features

OVS-DPDK SR-IOV PCI-Passthrough NUMA Awareness IO-based NUMA Scheduling and NUMA IO Affinity CPU and NUMA Pinning CPU Threading Policies Hugepages Support

VIM Basic Features

Host Aggregation Capacity Planning and Optimal Resource Usage Redundancy, Resiliency, Fault Tolerance and Recovery Backup and Recovery Long Fat Networks support Capacity planning (30 API requests per second) Authentication Access Control Mechanism



- Use local storage, DPDK and SR-IOV for high performance
- Central multi-tenant, AI-driven NOC management
- Minimal hardware infrastructure at NOC and PoPs
- Avoid lock-in, increase **flexibility** and **minimize costs**







ONEedge5G

Intelligence and Automation for the Operation of Distributed Edge Systems on 5G Advanced Infrastructures

Initiative funded by the Spanish *Ministerio para la Transformación Digital y de la Función Pública* through the **ONEedge5G Project: Intelligence and Automation for the Operation of Distributed Edge Systems on 5G Advanced Infrastructures** (TSI-064200-2023-1) and through the UNICO I+D 6G Program, co-funded by the European Union's NextGenerationEU instrument through the Recovery and Resilience Facility (RRF).











OpenNebula.io/innovation/oneedge5g



Thank you very much



Backup slides

IPCEI-CIS

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VMs

Containers

Kubernete s

Fixing the EU Cloud Market

- IPCEI on Next Generation Cloud Infrastructure & Services
- Enable Multi-Provider Cloud-Edge Continuum
- Strengthening of EU digital industry
- Development of European Open-Source technologies
- The largest open source project in EU history!
 - Strategic co-investment programme approved by the EC in December 2023
 - 1,200 million EUR in State Aid + 1,400 million EUR in private funds.
 - 140 European companies from 12 Member States.

Datacenter-Cloud-Edge Continuum



Cloud-Edge Continuum



IPCEI-CIS

General Overview





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