ONEedge.io

A Software-defined Edge Computing Solution

D4.4. Deployment of Validation Cases and Demonstrations - a

Deployment of Validation Cases and Demonstrations Report v.1.0

31 July 2020

Abstract

This report, delivered at the end of the first First Innovation Cycle (M4-M9) summarizes the work done to generate actual demonstrations of the project's capabilities in real life situations and to deploy validation cases for different scenarios.

This project has received funding from the European Union's Horizon 2020 Research and Innovation Programme under Grant Agreement No 880412.

Deliverable Metadata

Project Title:	A Software-defined Edge Computing Solution
Project Acronym:	ONEedge
Call:	H2020-SMEInst-2018-2020-2
Grant Agreement:	880412
WP number and Title:	WP4. Demo and Operational Infrastructure
Nature:	R: Report
Dissemination Level:	PU: Public
Version:	1.0
Contractual Date of Delivery:	31/7/2020
Actual Date of Delivery:	31/7/2020
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Status:	Submitted

Document History

Version	Issue Date	Status[1]	Content and changes
1.0	31/7/2020	Submitted	First final version of the report

[1] A deliverable can be in one of these stages: Draft, Peer-Reviewed, Submitted and Approved.

Executive Summary

A lot of the work carried out within the last several months has been focused, not only on developing a sophisticated edge computing software solution to innovatively address the needs for lower latency and provide a simple, distributed infrastructure management, but also to generate actual demonstrations of its capabilities in real life situations, as well as to get some of these capabilities in the hands of users to put them to the test on their own.

These exercises are the beginning of our getting validation and confirmation of the utility and usefulness of our product. As this is an open source project, a great deal of our work managing the project is not simply producing code, deliverables, and informational material, but also coordinating the creation of these items and publishing them to the broader public. Since a good portion of the content material is publicly available, we decided to include easily referenced links to the pertinent material, as opposed to recopying all of the text.

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1. Sandboxed Environments

During this cycle we created several tools to simplify the process of getting OpenNebula in the hands of users, and to be able to create and deploy functioning, multi-tenant clouds using various types of virtualization technologies and resources both on-premises and publicly hosted. These sandbox environments allow for quick and easy evaluation of the software and some of the key features and capabilities, before planning and designing more strategic implementations.

1.1. miniONE Edge for KVM and LXD

We developed the miniONE tool to create an easy-to-use deployment tool that facilitates building an evaluation OpenNebula edge cloud utilizing public bare metal resource providers along the edge. In this case, we deployed miniONE with all of the necessary components to manage and run KVM virtual machines or LXD system containers. These edge nodes are able to be installed and configured within one's system with just a single command execution.

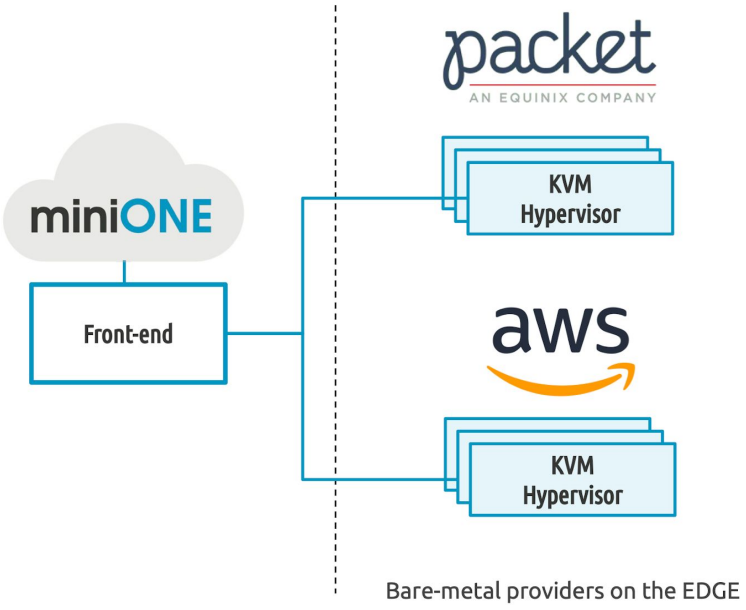


Figure 1.1. Architecture for miniONE Edge cloud using KVM Hypervisors

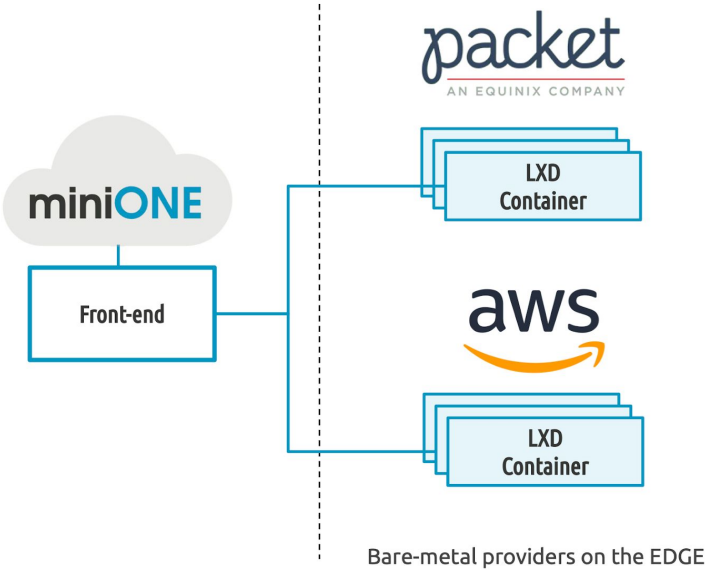
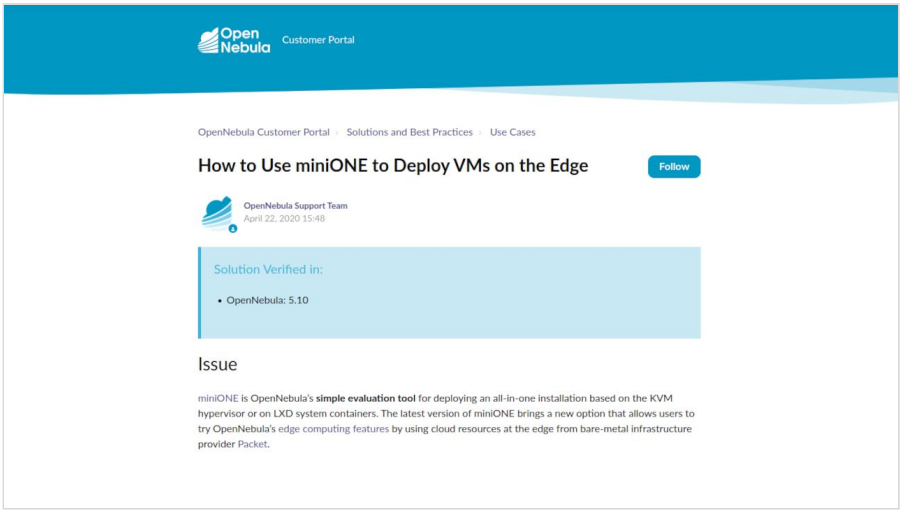
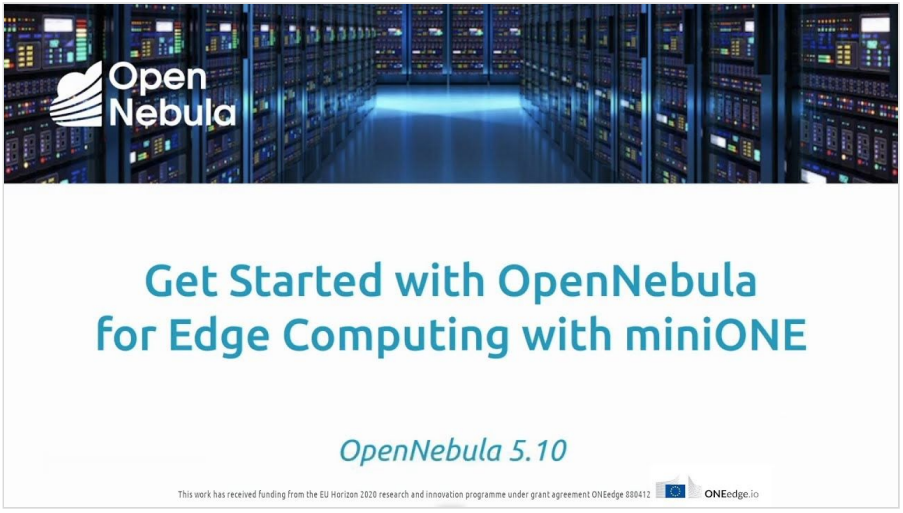


Figure 1.2. Architecture for miniONE Edge cloud using LXD System Containers

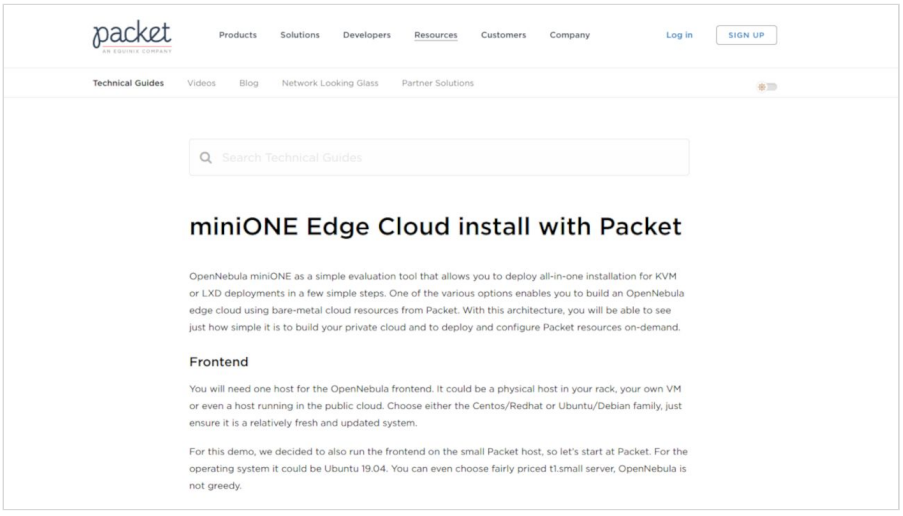
miniONE Edge for KVM and LXD	
Code	https://github.com/OpenNebula/minione
Documentation	https://docs.opennebula.io/minione/advanced/edge-deployment.html
Guide	https://support.opennebula.pro/hc/en-us/articles/360042187272-How-to-Use-miniONE-to-Deploy-VMs-on-the-Edge



Screencast	https://www.youtube.com/watch?v=wqV01ZmwtJc (May 13, 2020)



Partner Guide	https://www.packet.com/resources/guides/minione-edge-cloud/



1.2. miniONE Local for Firecracker

With our most recent software release, OpenNebula 5.12 “Firework”, we introduced the seamless integration with AWS Firecracker in support of innovative serverless and containerized cloud deployments. These types of deployments make infrastructure management even lighter and simpler. As a consequence, we extended our miniONE tool capability to include being able to build evaluation OpenNebula clouds with Firecracker microVMs using on-premises resources.

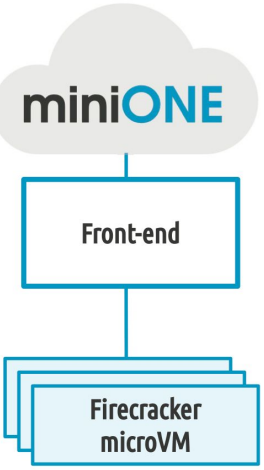
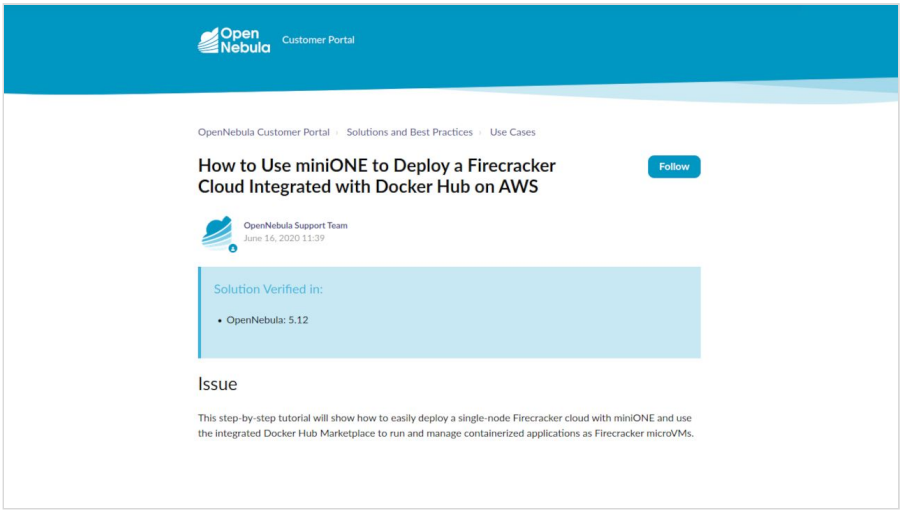
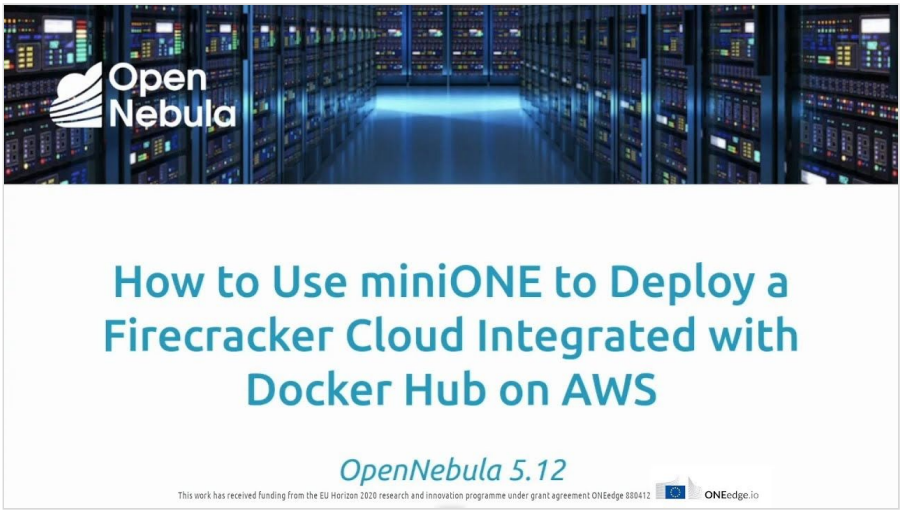


Figure 1.3. Architecture for on-premises miniONE cloud using Firecracker microVMs

miniONE Local for Firecracker	
Code	https://github.com/OpenNebula/minione
Documentation	https://docs.opennebula.io/minione/simple/deploy.html
Guide	https://support.opennebula.pro/hc/en-us/articles/360045029871-How-to-Use-miniONE-to-Deploy-a-Firecracker-Cloud-Integrated-with-Docker-Hub-on-AWS



Screencast https://www.youtube.com/watch?v=vocbkkJNkMQ (June 22, 2020)



1.3. miniONE Edge for Firecracker

Similar to what we were able to do with miniONE for KVM hypervisors and LXD system containers, we developed an updated version of miniONE to facilitate the creation of evaluation clouds along the edge, utilizing our latest actual release (as of July 2020) of software, OpenNebula 5.12 “Firework”. This tool allows a user to deploy a multi-tenant OpenNebula cloud using edge resources and deploying Firecracker microVMs.

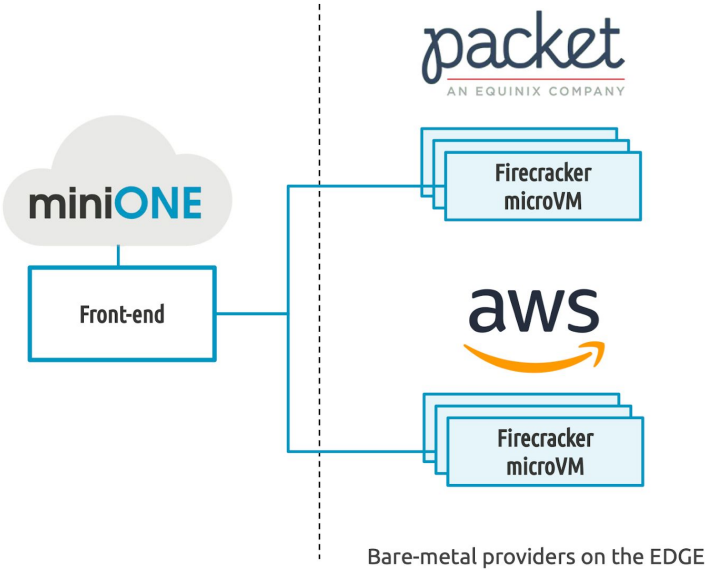
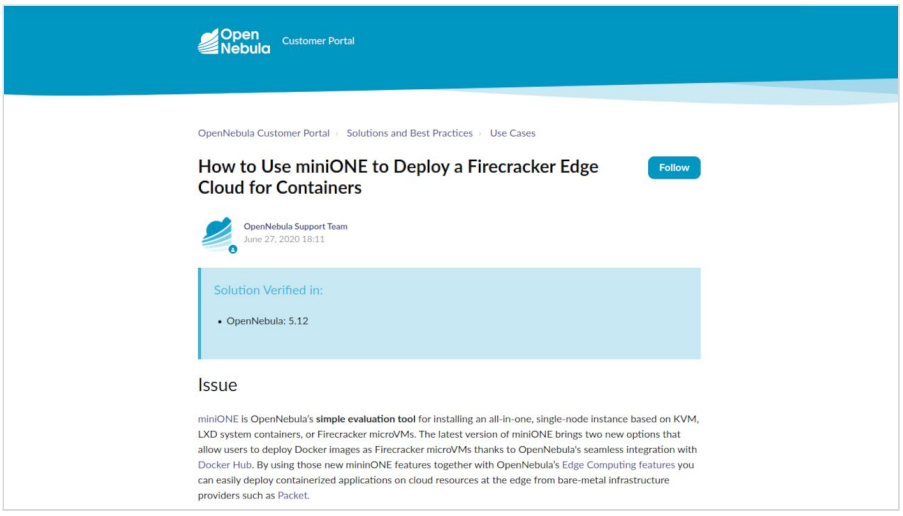


Figure 1.4. Architecture for miniONE Edge cloud using Firecracker micro-VMs

miniONE Edge for Firecracker	
Code	https://github.com/OpenNebula/minione
Documentation	https://docs.opennebula.io/minione/advanced/edge-fc-deployment.html
Guide	https://support.opennebula.pro/hc/en-us/articles/360045122532-How-to-Use-miniONE-to-Deploy-a-Firecracker-Edge-Cloud-for-Containers



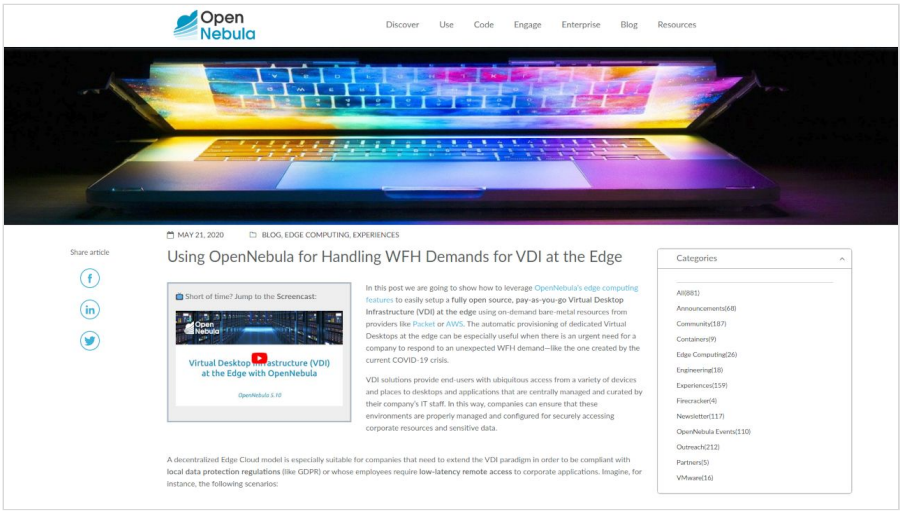
Screencast	https://www.youtube.com/watch?v=JbNzwXz0xHc (July 7, 2020)

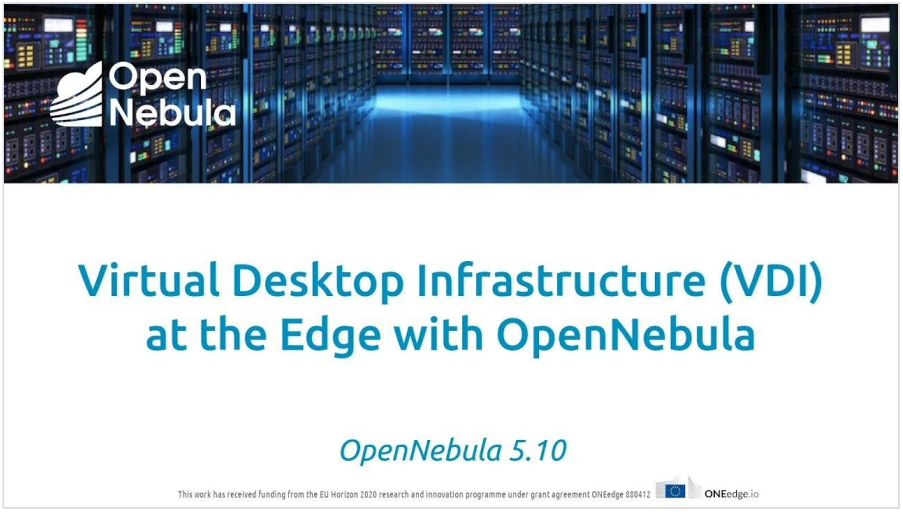
2. Demonstrations

2.1. Virtual Desktop Infrastructure (VDI) at the Edge with OpenNebula

This was an exercise where we outlined how to leverage OpenNebula's edge computing features to easily setup a fully open source, pay-as-you-go Virtual Desktop Infrastructure (VDI) at the edge using on-demand bare-metal resources from providers like Packet or AWS. The automatic provisioning capabilities of dedicated Virtual Desktops at the edge can be especially useful when there is an urgent need for a company to respond to an unexpected WFH demand, like the one generated by the COVID-19 crisis.

Virtual Desktop Infrastructure (VDI) at the Edge with OpenNebula	
Name	"Using OpenNebula for Handling WFH Demands for VDI at the Edge"
Post	https://opennebula.io/opennebula-for-vdi-at-the-edge (May 21, 2020)
Screencast	https://www.youtube.com/watch?v=oR8bjx-nEqc (May 20, 2020)





2.2. OpenNebula Elastic Private Media Cloud

This was a demonstration to address the Over-the-top (OTT) media market, a model that is revolutionizing the entertainment industry. We are seeing traditional HTTP streaming formats gain wide acceptance, facilitating the ability to reach viewers at a global scale on almost any device. Live events are being broadcast directly over the internet, allowing for immediate and widespread participation. The technology infrastructure that a broadcasting service company chooses has direct influence on its degree of success in the market. This article discusses on-premises and public cloud-based approaches to creating live and on-demand OTT video workflows, and introduces OpenNebula's solution, bringing the benefits of both worlds.

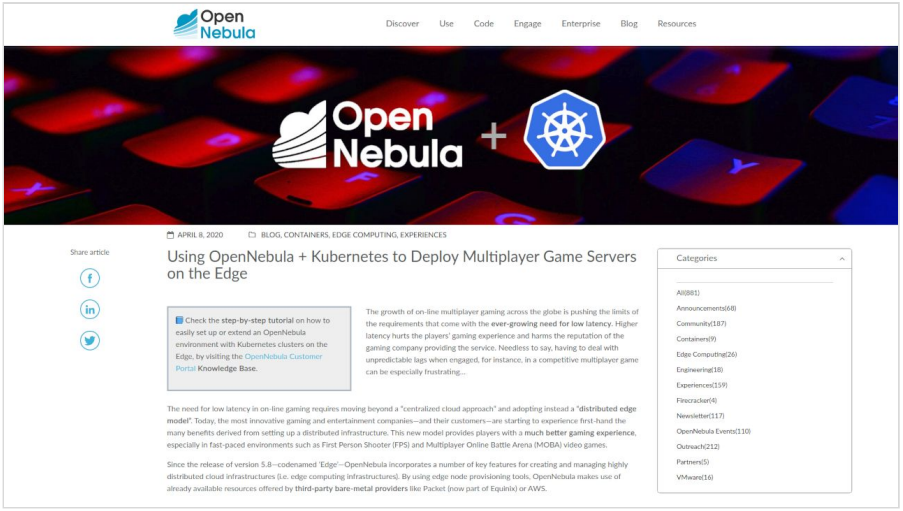
OpenNebula Elastic Private Media Cloud	
Name	"An Elastic Private Cloud: OpenNebula's Solution for Media Services"
Post	https://opennebula.io/an-elastic-private-cloud-opennebulas-solution-for-media-services (April 27, 2020)
Screencast	https://www.youtube.com/watch?v=70K-DJvhSiE (April 27, 2020)

2.3. OpenNebula and Kubernetes - Deploying Multiplayer Gaming Servers at the Edge

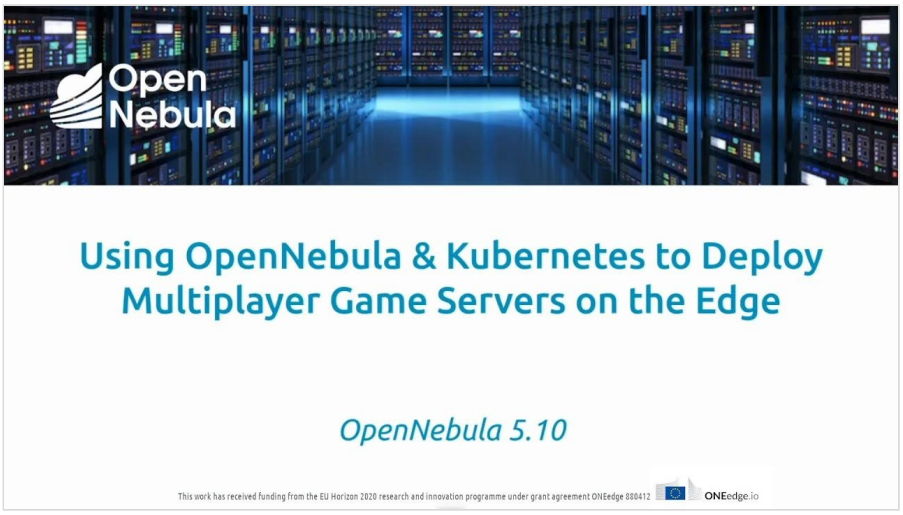
The growth of on-line multiplayer gaming across the globe has been pushing the limits of the requirements that come with the ever-growing need for low latency. Higher latency hurts the players' gaming experience and harms the reputation of the gaming company providing the service. Needless to say, having to deal with unpredictable lags when engaged, for instance, in a competitive multiplayer game can be especially frustrating. The need for low latency in on-line gaming requires moving beyond a "centralized cloud approach" and adopting instead a "distributed edge model".

Today, the most innovative gaming and entertainment companies—and their customers—are starting to experience first-hand the many benefits derived from setting up a distributed infrastructure. This new model provides players with a much better gaming experience, especially in fast-paced environments such as First Person Shooter (FPS) and Multiplayer Online Battle Arena (MOBA) video games. Here we have clearly shown how to address these low latency needs by easily creating a distributed edge gaming environment using OpenNebula and Kubernetes.

OpenNebula and Kubernetes - Deploy Multiplayer Gaming Servers at the Edge	
Name	"Using OpenNebula + Kubernetes to Deploy Multiplayer Game Servers on the Edge"
Post	https://opennebula.io/using-opennebula-and-kubernetes-to-deploy-multiplayer-game-servers-on-the-edge (April 8, 2020)



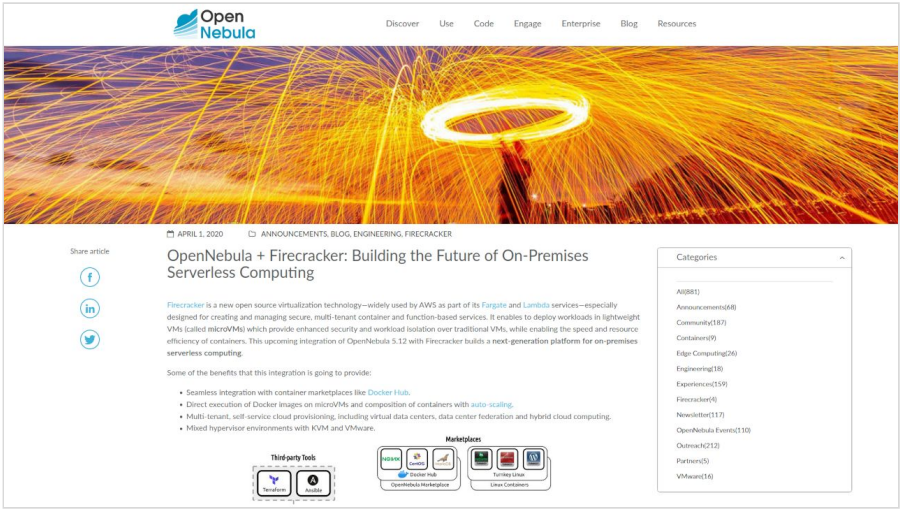
Screencast	https://www.youtube.com/watch?v=2boo_vPFxO8 (April 3, 2020)



2.4. OpenNebula - Deploying Docker Images with Firecracker

Firecracker is a new open source virtualization technology developed by AWS and especially designed for creating and managing secure, multi-tenant container and function-based services. It enables to deploy workloads in microVMs, which provide enhanced security and workload isolation over traditional VMs, while enabling the speed and resource efficiency of containers. This specific integration in OpenNebula 5.12 with Firecracker builds a next-generation platform for serverless computing deployments.

OpenNebula - Deploying Docker Images with Firecracker	
Name	"OpenNebula plus Firecracker: Building the Future of On-Premises Serverless Computing"
Post	https://opennebula.io/opennebula-firecracker/ (April 1, 2020)



Screencast	https://www.youtube.com/watch?v=sC4URavJdEU (April 1, 2020)