



ONEedge.io

A Software-defined Edge Computing Solution

D3.6. Software Source - c

Software Source

Version1.0

3 November 2021

Abstract

This report summarizes the technical implementation of each of the software requirements associated with the technology components that have been addressed during the Third Innovation Cycle (M17-M23). For each Software Requirement, this document provides a brief description, the license that applies to the source code, the OpenNebula version, a reference to the relevant section in D3.3. "Software Report", a link to OpenNebula's public code repositories and user guides, and references to the relevant sections in D4.3. "Infrastructure Report".



Copyright © 2021 OpenNebula Systems SL. All rights reserved.



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



This work is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License.

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:	WP3. Product Innovation
Nature:	R: Report
Dissemination Level:	PU: Public
Version:	1.0
Contractual Date of Delivery:	30/9/2021
Actual Date of Delivery:	3/11/2021
Lead Authors:	Vlastimil Holer, Rubén S. Montero and Constantino Vázquez
Authors:	Sergio Betanzos, Pavel Czerny, Ricardo Díaz, Jim Freeman, Christian González, Alejandro Huertas and Jorge M. Lobo
Status:	Submitted

Document History

Version	Issue Date	Status ¹	Content and changes
1.0	3/11/2021	Submitted	First final version of the D3.6 report

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



Executive Summary

The purpose of deliverable D3.6 is to offer a summary of the technical implementation of each of the software requirements associated with the technology components that have been addressed during the Third Innovation Cycle (M17-M23).

For each Software Requirement, this document provides a brief description, the license that applies to the source code, the OpenNebula version, a reference to the relevant section in D3.3. "Software Report", a link to OpenNebula's public code repositories and user guides, and references to the relevant sections in D4.3. "Infrastructure Report".

During the Third Innovation Cycle (M17-M23), the project mostly focused on those software requirements needed to achieve the third milestone in M23, which is the base functionality needed to meet networking & storage integration, and mostly its release as a standalone managed service (On-demand Edge Cloud Service). The work carried out during this Third Innovation Cycle involved software requirements from components CPNT1, CPNT3, CPNT4 and CPNT5, with a special focus on the completion and integration of all components to release a first version of the On-demand Edge Cloud Platform service (CPNT1) and the deployment and provision of edge infrastructures (CPNT4). During the Third Innovation Cycle, we have developed campaigns that are specific to the ONEedge hosted service (standalone commercial solution) and not to be incorporated into OpenNebula.



Table of Contents

1. Edge Instance Manager (CPNT1)	5
2. Edge Workload Orchestration and Management (CPNT2)	7
3. Edge Provider Selection (CPNT3)	8
4. Edge Infrastructure Provision and Deployment (CPNT4)	9
5. Edge Apps Marketplace (CPNT5)	11



1. Edge Instance Manager (CPNT1)

SR1.1. Simple Product Deployment

Description	The software developed in SR1.1 automates the provision and installation of ONEedge hosted instances and defines key performance indicators, 24/7 health monitoring and alerts.
License	OpenNebula Software License
Version	OpenNebula 6.2
Design	D3.3 - [SR1.1] Simple Product Deployment
Code	Private — Part of infrastructure image build descriptors/tools
User Guide	Private — Part of internal wiki
Testing	D4.3 - Edge Instance Manager (CPNT1)
Verification	D4.3 - Edge Instance Manager (CPNT1)

SR1.3. Instance Management

Description	This software requirement has been focused on the life-cycle management of the ONEedge instances. In particular we have defined a detailed workflow for the instance life-cycle implemented as GitHub actions. The code of the actions is in the ONEedge hosted repository.
License	OpenNebula Software License
Version	OpenNebula 6.2
Design	D3.3 - [SR1.3] Instance Management
Code	Private — Part of infrastructure image build descriptors/tools
User Guide	Private — Part of internal wiki
Testing	D4.3 - Edge Instance Manager (CPNT1)
Verification	D4.3 - Edge Instance Manager (CPNT1)

SR1.4. Subscription Management

Description	The provision and configuration tools of ONEedge instances have been integrated with our customer portal and business logic using the customer portal API to automatically create/tag users.
-------------	--



License	OpenNebula Software License
Version	OpenNebula 6.2
Design	D3.3 - [SR1.4] Subscription Management
Code	Private — Part of infrastructure image build descriptors/tools
User Guide	Private — Part of internal wiki
Testing	D4.3 - Edge Instance Manager (CPNT1)
Verification	D4.3 - Edge Instance Manager (CPNT1)

SR1.5. Web Control Interface (GUI)

Description	The ONEedge hosted framework has been developed following a GitOps paradigm and leveraging GitHub portal and tools. In this SR we have created specific issues, labels and other related GitHub objects so non-technical people can easily manage the hosted environment.
License	OpenNebula Software License
Version	OpenNebula 6.2
Design	D3.3 - [SR1.5] Web Control Interface (GUI)
Code	Private — Configurations and templates part of infrastructure GitHub repository
User Guide	Private — Part of internal wiki
Testing	D4.3 - Edge Instance Manager (CPNT1)
Verification	D4.3 - Edge Instance Manager (CPNT1)



2. Edge Workload Orchestration and Management (CPNT2)

No activity done during the cycle.



3. Edge Provider Selection (CPNT3)

SR3.1. Edge Provider Catalog Service

Description	The Edge Catalog Service is implemented as part of the OneProvision web interface (OneProvision GUI) delivered by the FireEdge server. The full functionality has been developed during this cycle by adding the ability to dynamically load providers into OneProvision.
License	Apache License, Version 2.0
Version	OpenNebula 6.2
Design	D3.3 - [SR3.1] Edge Provider Catalog Service
Code	Public—Part of the main OpenNebula distribution <ul style="list-style-type: none"> OpenNebula 6.2 Stable: https://github.com/OpenNebula/one/tree/release-6.2.0/src/fireedge
User Guide	<ul style="list-style-type: none"> OpenNebula 6.2 Stable: https://docs.opennebula.io/6.2/installation_and_configuration/opennebula_services/fireedge.html
Testing	D4.3 - Edge Provider Selection (CPNT3)
Verification	D4.3 - Edge Provider Selection (CPNT3)

SR3.4. Driver Maintenance Process

Description	In order to fully meet this requirement, a development guide describes how to create new providers that can be made dynamically available in the Edge Provider Catalog Service.
License	Apache License, Version 2.0
Version	OpenNebula 6.2
Design	D3.3 - [SR3.4] Driver Maintenance Process
Code	Public—Part of the main OpenNebula distribution. Examples referred to in the guide. <ul style="list-style-type: none"> OpenNebula 6.2 Stable: https://docs.opennebula.io/6.2/integration_and_development/edge_provider_drivers_development/provision_driver.html
User Guide	<ul style="list-style-type: none"> OpenNebula 6.2 Stable: http://docs.opennebula.io/6.2/
Testing	D4.3 - Edge Provider Selection (CPNT3)
Verification	D4.3 - Edge Provider Selection (CPNT3)



4. Edge Infrastructure Provision and Deployment (CPNT4)

SR4.4. Inter-edge Networking Deployment Scenario

Description	VMs running in edge locations communicate through public IPs. We have developed a new port-forwarding model that includes a new lease type to assign free ports to a VM, and a new driver set to automatically configure and remove DNAT and SNAT rules.
License	Apache License, Version 2.0
Version	OpenNebula 6.0
Design	D3.3 - [SR4.4] Inter-edge Networking Deployment Scenario
Code	Public—Part of the main OpenNebula distribution <ul style="list-style-type: none"> OpenNebula 6.2 Stable: https://github.com/OpenNebula/one/tree/release-6.2.0/src/vnm_mad/remotes/nodeport
User Guide	OpenNebula 6.2 Stable: <ul style="list-style-type: none"> https://docs.opennebula.io/6.0/management_and_operations/edge_cluster_management/do_cluster.html?highlight=port%20forward#step-4-connect-to-the-vm https://docs.opennebula.io/6.0/management_and_operations/edge_cluster_management/google_cluster.html?highlight=port%20forward#step-4-connect-to-the-vm
Testing	D4.3 - Edge Infrastructure Provision and Deployment (CPNT4)
Verification	D4.3 - Edge Infrastructure Provision and Deployment (CPNT4)

SR4.5. Drivers for Host Provision

Description	We have created a new driver set including terraform templates, and provision files and runtime support for Google Compute Engine, Digital Ocean, and Vultr.
License	Apache License, Version 2.0
Version	OpenNebula 6.0
Design	D3.3 - [SR4.5] Drivers for Host Provision
Code	Public—Part of the main OpenNebula distribution <ul style="list-style-type: none"> OpenNebula 6.2 Stable: https://github.com/OpenNebula/one/releases/tag/release-6.2.0/src/one_provision/lib/terraform/providers
User Guide	<ul style="list-style-type: none"> OpenNebula 6.2 Stable: https://docs.opennebula.io/6.2/management_and_operations/edge_cluster_management/index.html



Testing	D4.3 - Edge Infrastructure Provision and Deployment (CPNT4)
Verification	D4.3 - Edge Infrastructure Provision and Deployment (CPNT4)

SR4.9. Support On-Premises Far-Edge for Resource Provisioning

Description	We have extended the provision engine to support on-premises provisions, which consists of a set of pre-configured resources. The on-premises provision includes configuration recipes for common storage and network solutions.
License	Apache License, Version 2.0
Version	OpenNebula 6.0
Design	D3.3 - [SR4.7] Support on-Premises far-Edge for Resource Provisioning
Code	Public—Part of the main OpenNebula distribution <ul style="list-style-type: none"> OpenNebula 6.2 Stable: https://github.com/OpenNebula/one/releases/tag/release-6.2.0/src/one-provision
User Guide	<ul style="list-style-type: none"> OpenNebula 6.2 Stable: https://docs.opennebula.io/6.0/management-and-operations/edge-cluster-management/onprem-cluster.html
Testing	D4.3 - Edge Infrastructure Provision and Deployment (CPNT4)
Verification	D4.3 - Edge Infrastructure Provision and Deployment (CPNT4)

SR4.10. Support ARM for Resource Provisioning

Description	We have added ARM (aarch64) packages to the ONEedge release. Apart from updating the package templates, we have extended the building infrastructure to support the new architecture.
License	Apache License, Version 2.0
Version	OpenNebula 6.2
Design	D3.3 - [SR4.10] Support ARM for Resource Provisioning
Code	Private — Part of infrastructure image build descriptors/tools
User Guide	Not applicable
Testing	D4.3 - Edge Infrastructure Provision and Deployment (CPNT4)
Verification	D4.3 - Edge Infrastructure Provision and Deployment (CPNT4)

5. Edge Apps Marketplace (CPNT5)

SR5.2. Built-in Management of Application Containers Engine

Description	New versions of the Kubernetes (K8s) appliances run over KVM instead of over containers and add MetalLB (load balancer) capabilities.
License	Apache License, Version 2.0
Version	OpenNebula 6.2
Design	D3.3 - [SR5.2] Built-in Management of Application Containers Engine
Code	Public—Part of the OpenNebula Public Marketplace <ul style="list-style-type: none"> https://marketplace.opennebula.io/appliance/07520eee-6552-11eb-85e7-98fa9bde1a93
User Guide	<ul style="list-style-type: none"> https://docs.opennebula.io/appliances/service/kubernetes.html#features
Testing	D4.3 - Edge Apps Marketplace (CPNT5)
Verification	D4.3 - Edge Apps Marketplace (CPNT5)

SR5.5. Edge Market GUI Developments

Description	Enhanced FireEdge components and Beta version of the new Sunstone interface, built using React/Redux and covering the functionality of Virtual Machines and Virtual Machine Templates.
License	Apache License, Version 2.0
Version	OpenNebula 6.2
Design	D3.3 - [SR5.5] Edge Market GUI Developments
Code	Public—Part of the main OpenNebula distribution <ul style="list-style-type: none"> https://github.com/OpenNebula/one/tree/release-6.2.0/src/fireedge/src/client
User Guide	<ul style="list-style-type: none"> OpenNebula 6.2 Stable: http://docs.opennebula.io/6.2/
Testing	D4.3 - Edge Apps Marketplace (CPNT5)
Verification	D4.3 - Edge Apps Marketplace (CPNT5)