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Abstract: This document SafeScale Software V1 to provide a description of the SnapEarth SafeScale Software, related to the Deliverable 3.4.

*** Dissemination Level:** *PU= Public, RE= Restricted to a group specified by the Consortium, PP= Restricted to other program participants (including the Commission services), CO= Confidential, only for members of the Consortium (including the Commission services)*

**** Nature of the Deliverable:** *R= Report, DEM= Demonstrator, Pilot, Prototype, DEC= Websites, patent filings, videos, etc., OTHER= Other, ETHICS= Ethics requirement, ORDP= Open Research Data Pilot, DATA= datasets, microdata, etc.*

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Glossary

API	Application Programming Interface
ARD	Analysis Ready Data
AWS	Amazon Web Services
CLI	Command Line Interface
CPU	Computing Power Unit
DDOS	Distributed Denial Of Service
DIAS	Data and Information Access Service
EO	Earth Observation
IaaS	Infrastructure as a Service
IAM	Identity Access Management
ICT	Information and Communication Technologies
KaaS	Kubernetes as a Service
KPI	Key Parameter Indicator
PaaS	Platform as a Service
RAM	Random Access Memory
SaaS	Software as a Service
SSO	Single Sign On
TRL	Technology Readiness Level
URL	Uniform Resource Locator
VM	Virtual Machine
Waas	Workflow as a Service
WP	Work Package

Executive Summary

This document presents the Deliverable 3.4 “SafeScale Software V1” which is a deliverable of Work Package 3 “SnapEarth Platform Development”.

This deliverable details the features of the software in its first version. A global overview of the SafeScale software is provided: with a description, the currently available features, the building instructions, the usage and finally some information about the license. This explain also how SafeScale was used by the EarthSelf team to deploy EarthSelf service on the OVH cloud.

This version of the SafeScale Software is the first one (M12) and will serve as a basis for the development of the final and complete version of the software (D3.5) due for M30 and M34.

Link with the other deliverables

The following table explains how SafeScale is linked to the other deliverables.

Table 1: Link with the other deliverables

Deliverable	status	Explanation	Link to the deliverable
D3.1 SnapEarth Design Dossier	submitted	This document presents the definition of the hardware and software architecture of the platform that best meets the users’ requirements. The document explains the design factors and architectural choices that have been made in the design to meet business and technical requirements.	<i>The reader can refer to this deliverable to situate the SafeScale component in relation to the other modules of the platform and all exposed interfaces.</i>
D3.5 SafeScale Software V2	Pending M30 & M34 for an update	The deliverable represents the second version of the software by adding the detail about how it is used in the frame of SnapEarth to deploy the 4 pilots clusters on different cloud/DIAS provider of their choice.	<i>The reader can refer to this deliverable to know about the general use of SafeScale to manage the cloud infrastructure and how it was used by the EarthSelf team to deploy both EarthSelf on OVH cloud and the 4 Pilots on the cloud provider of their choice.</i>

Link with the KPI

SO3: Build a cloud costs and performance evaluation service – WP 3

This objective, aiming to the user to evaluate the costs and the performance of logical infrastructures over several Cloud providers (DIAS, public Cloud) before provisioning resources, is on good progress as it was developed (and still ongoing) in SafeScale - Solution. It is defined by CS Romania within the new service called Suggest Engine. Indeed, a Cloud benchmarking service via the Suggest Engine is responsible for computing the scores for each cloud provider according to the user preferences in order to help him to select the best cloud provider that fits his needs. During this period, 3 Cloud/Dias providers were reached (Creaodias, OVH and Mundi).

SO4: Build a user-friendly micro service orchestration platform – WP 3

This objective is on good progress as the designed technical architecture solution allows multi-level of integration, so allows good flexibility to the host service providers. During this period, we have fully achieved one microservice orchestration through Kubernetes (one container = one microservice) done on the OVH cloud provider.

SO5: Build a self-service AI ready high performance and big data computing platform – WP 3

This objective deals with 2 aspects:

1. **“Create a High Performance and Bigdata ready computing platform.”**

This objective was to be done thanks to SafeScale deploying both a K8s cluster and a workflow engine.

2. **“A SnapEarth service capable to create on-demand platforms allowing using in parallel and in synergy at least 5 of the most popular Deep Learning framework (TensorFlow, Caffe, PyTorch, MXNet, Keras...)”**

This development is planned to start from October 2021. Thanks to the web portal of EarthSelf (based on SafeSacle), any service developers can configure, customize and deploy AI and EO-ready cloud environments on any of the major European cloud providers’ infrastructure.

These environments can be “battery-included” virtual research environments (VRE to explore EO and other data and develop new algorithms or it can be production environments that easily scale up and down along the workload variations. A continuum between VRE and production environment is ensured to maximize the POC-to-production success rate.

1. Introduction

1.1 Overview

In the frame of the SnapEarth project, CS GROUP France offers the innovative solution SafeScale to provide a facilitated access to the Data and Information Access Services (DIAS) platforms to any service provider willing to deliver Copernicus data-based services to its customers¹. SafeScale is able to provide remote working environments tailored to the users' needs, and hosted into the most suitable DIAS platform. Such remote working environments will be scalable in terms of data storage and processing capability. SafeScale will act as a **cloud brokering solution** providing a performant, cost effective environment, also protecting users' investments in building own new services.

Thanks to SafeScale, Snapearth platform (via EarthSelf service WP4) will **allow service providers to create virtual infrastructures on any DIASs or any other Cloud platform to deploy their operational services**. Virtual infrastructures could be created using either a Command Line Interface (CLI) or self-service Web User Interface (WUI). Through these interfaces service providers user access to networking, computing and storage management services. Both from the CLI and the WUI a truly unified access to resources and services is provided to allow users to create equivalent virtual infrastructures without having any specific knowledge of the underlying Cloud services.

SafeScale is an open source (Apache License) Infrastructure and Platform as a Code tool.

SafeScale offers an APIs and a CLI (Command Line Interface) tools to deploy versatile computing clusters that span multiple Clouds. These APIs and CLIs are divided in 3 service layers:

- ✓ SafeScale Broker to manage Cloud infrastructure.
- ✓ SafeScale Perform to manage Cloud computing platforms.
- ✓ SafeScale Security to secure user environments.

SafeScale is the foundation of SnapEarth with high TRL. In fact, SafeScale is already deploying in several projects of CS GROUP, such as:

- ✓ Copernicus RUS (Research and User Support) service (for ESA/EC), allowing CS to deploy and move user computing environments over various Cloud platforms such as OVH, and Orange (CloudWatt, Flexible Engine).
- ✓ Geostorm (CS product) the Geospatial Platform, to store, process and distribute Geo-Information
- ✓ Demo CO3D (for the French Space Agency “CNES”), to adapt the S2P (Satellite Stereo Pipeline) processing chain to Big Data and Cloud technologies
- ✓ BIDS/RAF (BIG Data from Space – Reference Architecture Framework) (for ESA), to define reference architecture for space applications that want to benefit from Big Data technologies
- ✓ S1 PDGS (for Airbus Defense and Space) to migrating S1 Data & Payloads Digital Ground Segment Processing to cloud platforms

¹ <https://github.com/CS-SI/SafeScale>

- ✓ World Cover project (for ESA) to bring expertise in system architecture, Cloud & Big Data computing to produce, deliver and validate, as fast as possible, a global 10 meters land cover map of the whole world.
- ✓ AI4GEO (Bpifrance) to develop an automatic solution for producing 3D geospatial information and to create new value-added services

SafeScale is the mandatory brick that allows Earthself members to deploy infrastructure for service creators. During SnapEarth project, SafeScale will be enhanced with new features such as:

- ✓ A RESTful API
- ✓ A web-based UI plugged to the brand new RESTful API

Those features intend to offer an easy way to create clusters for Earthself support team and later on, automatize this process without any human intervention.

In the frame of this proposition a front-end to SafeScale APIs will be developed to offer to user self-service web portal to manage their computing infrastructure. The following diagram shows in yellow the part that will be developed to reach that objective.

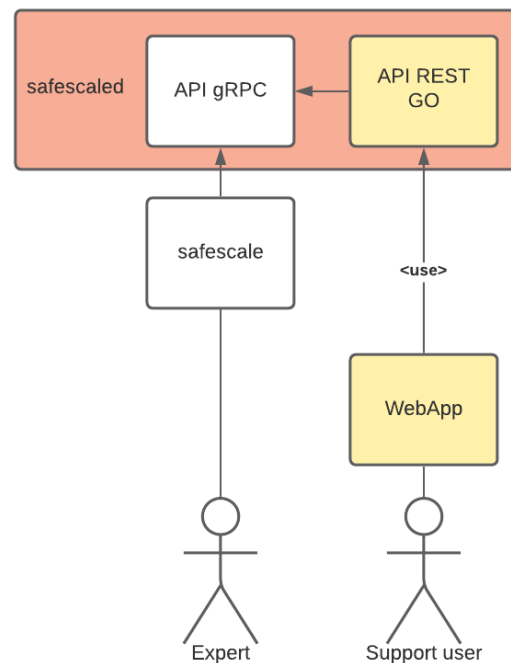


Figure 1: SafeScale new components

The diagram below shows a use case of the self-service web portal user, as an “Admin” user, which is responsible for the EarthSelf platform health.

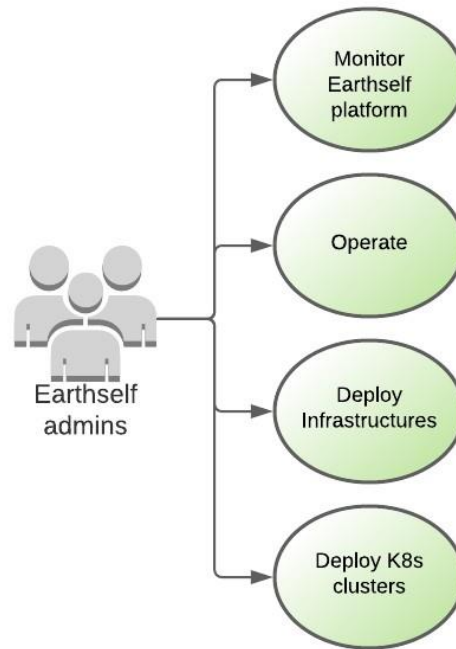


Figure 2: use cases diagram

1.2 Purpose of the Document

This document, entitled “SafeScale Software V1” provides a description of the SnapEarth SafeScale Software. The objective of this document is to provide a description of the software and the currently available features.

1.3 Structure of the Document

The deliverable is organized as follows:

- 1) Current chapter
- 2) The global overview of the software: to provide a description of the software and the currently available features, the building instructions for SafeScale, the usage and finally some information about the license.

2. Safescale Software overview

2.1 Description

SafeScale offers an API and a CLI tools to deploy versatile computing clusters that span multiple Clouds. These APIs and CLIs are divided in 3 service layers:

- ✓ SafeScale Infra to manage Cloud infrastructure
- ✓ SafeScale Platform to manage Cloud computing platforms (aka clusters)
- ✓ SafeScale Security to secure user environments

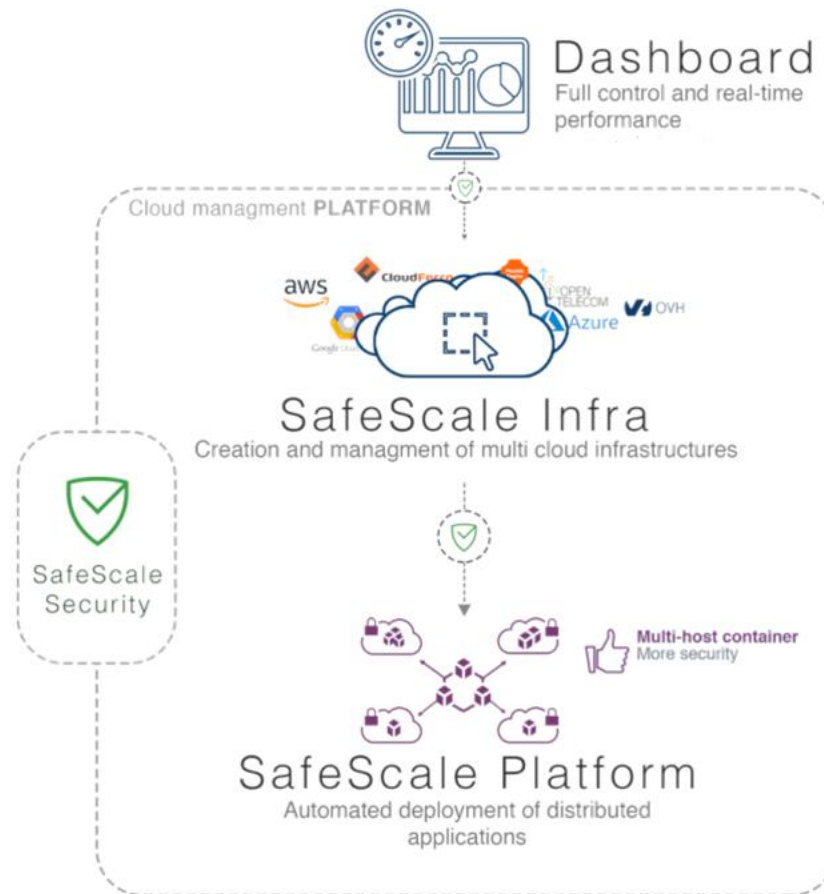


Figure 3: SafeScale components

2.1.1 SafeScale Infra

SafeScale Infra offers an API to completely abstract the IaaS services offered by Cloud platforms providers. It allows to:

- ✓ Create / Destroy private networks, Create routers

- ✓ Create / Destroy hosts,
- ✓ Create / Destroy block and object storage,
- ✓ Mount / Unmount object storage as file system,
- ✓ Create / Destroy shares, Connect / Disconnect host to/from shares,
- ✓ Create / Destroy clusters
- ✓ Add / Remove "features" (software components) on hosts and clusters

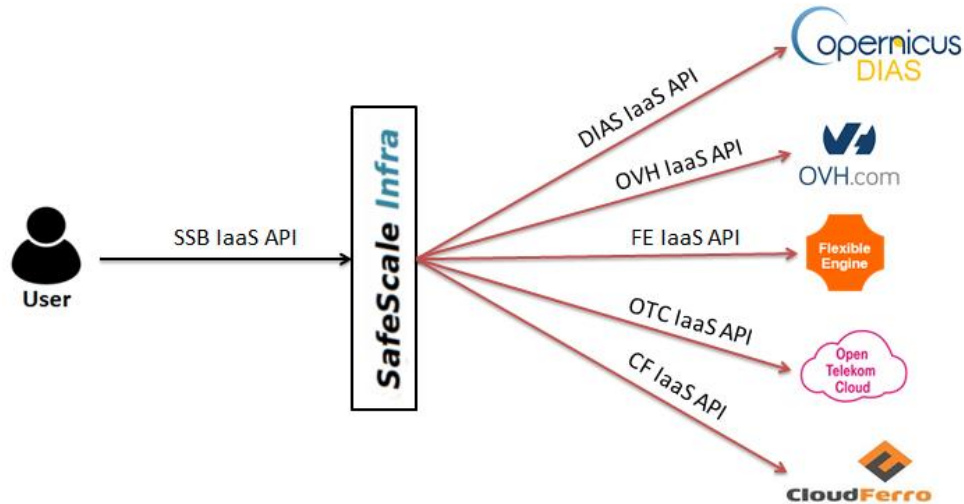


Figure 4: SafeScale Infra layer

SafeScale Infra provides a complete abstraction overlay over underlying IaaS APIs to mask their heterogeneity.

2.1.2 SafeScale Platform

The concept of SafeScale Platform revolves around the offer of an API to create on-demand computing platforms. These platforms are built to be highly versatile providing all necessary building blocks to create a cutting-edge, production grade, scalable and highly available services: Micro service orchestration, Big Data and HPC computing frameworks, large scale data management, AI training and inference frameworks.

The innovative aspects of the platforms lies in their capacity to offer a combined usage of a large variety of frameworks and technologies without having to manage resources allocation (Node, RAM, CPU, and GPU), and allows the combined usage of various computing and service management frameworks which greatly simplifies the porting of in-house applications to the Cloud. It is also important to precise that platforms are not static, they can be scaled up and down on-demand or automatically to adapt to load fluctuations and thus to optimize IT costs.

2.1.3 SafeScale Security

SafeScale Security ensures that no unapproved external access is granted:

- On network level, SafeScale Security relies on Kong², an open source generic proxy, to be put in between user and service. Kong intercepts user requests and service responses and executes plugins to empower any API. In the current state, SafeScale Security proxy relies on 3 Kong plugins:
 - Dynamic SSL plugin to encrypt traffic between the user and the protected service
 - Open ID plugin to connect the Identity and Access Management server, Keycloak³
 - UDP Log plugin to connect the Log management system, Logstash⁴
- On service level, SafeScale Security proposes an optional use of Keycloak, an Open Source Identity and Access Management (IAM), that can provide access control by itself or using third-party directories.

The hosts acting as gateways are secured using firewalld with a default rule being "DENY EVERYTHING" from Internet. Only SSH access are allowed by default, and HTTPS port (443) if Kong is not disabled. At the time being, there is no firewall rule for the hosts inside the subnet of the platform, but firewalld is installed, just in case.

2.2 Currently available features

SafeScale is currently under active development and does not yet offer all the features planned. However, we are already publishing it with the following features:

- SafeScale Infra:
 - Create / Destroy private networks
 - Create / Destroy hosts,
 - Create / Destroy block and object storage,
 - Mount object storage on file system,
 - Create Shares, Connect/disconnect host to share,
 - Add / Remove "features" on host
 - Support Cloud providers:
 - OVH Public Cloud
 - FlexibleEngine
 - OpenTelekom
 - CloudFerro
 - Generic OpenStack
 - local provider (unstable, not compiled by default)
 - GCP (Google Cloud Platform)
 - AWS: under development
- Safescale Platform:
 - Create / Destroy clusters composed of a network, servers and services cluster management layer currently supported:
 - Kubernetes cluster
 - Swarm cluster
 - BOH = Bunch Of Hosts (without any cluster management layer)
 - Install default services (everything being deactivated):
 - remote desktop based on Guacamole (available from Web browser)
 - reverse proxy to control Internet access

² <https://konghq.com/kong/>

³ <https://www.keycloak.org>

⁴ <https://www.elastic.co/logstash/>

- ntp servers and clients
 - Add / Remove "features" on host and clusters
 - Expand/Shrink the "size" of the cluster (number of workers)
- SafeScale Security:
 - Secured gateways using Kong
 - IAM using Keycloak (optional)
 - Kubernetes Hardening (by default but deactivable)
 - firewalld everywhere (regardless of the chosen Linux distribution)

2.3 Build

The following links describes the building instructions for SafeScale:

- [How to build SafeScale on Ubuntu⁵](#)
- [How to build SafeScale on Debian⁶](#)
- [How to build SafeScale on Centos⁷](#)

The following binaries will be produced:

- ✓ **safescale** in SafeScale/lib/cli/safescale/: CLI to deal with daemon safescaled. Available commands are described in the following link: <https://github.com/CS-SI/SafeScale/blob/master/doc/USAGE.md#safescale>
- ✓ **safescaled** in SafeScale/lib/cli/safescaled/: daemon in charge of executing requests from SafeScale on providers. Usage is described in the following link: <https://github.com/CS-SI/SafeScale/blob/master/doc/USAGE.md#safescaled>
- ✓ **scanner** in SafeScale/lib/cli/scanner/: CLI to discover host templates. Available commands are described in the following link: <https://github.com/CS-SI/SafeScale/blob/master/doc/SCANNER.md>

For each previous binary a cover version is produced: binaries that also generate code coverage reports and are therefore only intended for developers.

- **safescale-cover** in SafeScale/lib/cli/safescale/
- **safescaled-cover** in SafeScale/lib/cli/safescaled/
- **scanner-cover** in SafeScale/lib/cli/scanner/

2.4 Usage

SafeScale is composed of 2 parts:

- a daemon working in background, called [safescaled \(https://github.com/CS-SI/SafeScale/blob/master/doc/USAGE.md#safescaled\)](https://github.com/CS-SI/SafeScale/blob/master/doc/USAGE.md#safescaled).

⁵ https://github.com/CS-SI/SafeScale/blob/master/doc/build/UBUNTU_BUILD.md

⁶ https://github.com/CS-SI/SafeScale/blob/master/doc/build/DEBIAN_BUILD.md

⁷ https://github.com/CS-SI/SafeScale/blob/master/doc/build/CENTOS_BUILD.md

- a client interacting with the daemon, called [safescale \(https://github.com/CS-SI/SafeScale/blob/master/doc/USAGE.md#safescale\)](https://github.com/CS-SI/SafeScale/blob/master/doc/USAGE.md#safescale).

A full description of these 2 components can be finding in the following links contents:

- [SafeScale usage⁸](#)
 - [Content](#)
 - [safescaled](#)
 - [Configuration](#)
 - [Usage](#)
 - [safescale](#)
 - [Global options](#)
 - [Commands](#)
 - [tenant](#)
 - [network](#)
 - [host](#)
 - [volume](#)
 - [share](#)
 - [bucket](#)
 - [ssh](#)
 - [cluster](#)

For more details, please refer to this link: [See Usage file⁹](#).

2.5 License

SafeScale is distributed by CS GROUP under the [Apache License, Version 2.0¹⁰](#). Please see the [third-party notices¹¹](#) file for additional copyright notices and license terms applicable to portions of the software.

⁸ <https://github.com/CS-SI/SafeScale/blob/master/doc/USAGE.md#safescale-usage>

⁹ <https://github.com/CS-SI/SafeScale/blob/master/doc/USAGE.md>

¹⁰ <https://github.com/CS-SI/SafeScale/blob/master/LICENSE>

¹¹ <https://github.com/CS-SI/SafeScale/blob/master/NOTICE>

3. SafeScale in SnapEarth context

This chapter explain the use of SafeScale to manage the cloud infrastructure by the EarthSelf team in order to deploy EarthSelf service on the cloud.

SafeScale is compatible with several cloud/Dias providers. For the deployment of EarthSelf on the cloud, we chose the OVH cloud provider, which offers the following advantages:

- European cloud
- Data governance (guarantee to have the data stored only in France and in Europe)
- More reasonable costs than its competitors
- Uses OpenStack, a technology that is compatible with SafeScale

The SafeScale cloud agnostic capabilities serves to two distinct purposes in the SnapEarth context:

- Provide the SnapEarth cloud architecture by creating a Kubernetes enabled cluster that will serve the client interface, as well as all the background services needed to run an instance of SnapEarth.
- Allow to fulfil client’s demands by providing cloud resources on behalf the SnapEarth client interface.

3.1 Building SnapEarth architecture

SnapEarth is built around several components working together inside a Kubernetes cluster. Neither the way the Kubernetes cluster is instantiated, nor the cloud provider used to host it is important or mandatory.

```
{
  "result": null,
  "status": "success"
},
{
  "url": "https://git/safeescal/safeescal-tenant-test-ovh-snapearth",
  "command": "git/safeescal/safeescal-tenant-test-ovh-snapearth",
  "args": {
    "admin login": "cladm",
    "admin password": "gr6BP4_K_u.b.i.c",
    "cidr": "192.168.0.0/16",
    "complexity": "1",
    "complexity label": "Small",
    "default route ip": "192.168.1.70",
    "disabled features": {},
    "endpoint ip": "51.68.152",
    "flavor": "2",
    "flavor label": "K8S",
    "installed features": {},
    "last state": "1",
    "name": "snapearth-test",
    "network id": "476632ff-91af-4e0b-b33c-0915689f4b6f",
    "nodes": {
      "masters": {
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        "disk": 100,
        "id": "1a18fa0e-603e-4583-9ff1-e7a7f74f1af6",
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        "password": "1_X12j5_1(-7TKr)",
        "private ip": "192.168.3.168",
        "private key": "-----BEGIN RSA PRIVATE KEY-----\nMIIEoQIBAAKCAQEArs+H7RKApJL26XGw4bp/iaqas558G6BqR1jCQXwgQse52ccnBjnts5SpL8NEipeObtueGieAeAbK2fC4YlgkGjU365n1ZHKRc1A4G6GVz21Tt1r1d5r2syeatFh3jPTMXK2UHN9fWp/t2EAU/A+FKH0uq47hoo1jglXgcbuYtXoLx9kNMZZAaHMOjOxxtYhRjFmsK8HfPqjvbdnULels7yK75WZw/3mV84y4ltpatHcjPm2D8gZ2jyuggdgARcN9SnpEimipgphLuh8GuaeiainjV/ChZy7v5BUAJ5vHMW4d9/nZa2R1sweamSHtZjYk0sYum17p/76p1mijYvKwZDAQAABa0n0e2FKMsJ0n0dpBfCQXwRxmjlYtEUAxGSE0KXhVH4610t1VLVMOK12P0rJd0VnMOPtPh6nBPMQJ39nOhGUwU/eUnM21Z6wgK59TK8/wkqarRoUWHIcenvlVn/RS6p9d3K4XTL2j1cnC9KvCwE1Ld0KcYz4e/ab0oYnK2PArJdLKB3uXDMjNCRt1E9v8w8W9A+PZVnK0mZdyF0u8A05v9SxGoNpXpUwFM0NWJWJCj/1KwPdmnrwCq5tPXMQEicf1wU3n1VblRinz3TLMOcZ2fW8L5uClVieEBAW4p152n4Dn02mDwppmk5p5vFaXnaVd1+g95A0GBAMH5166p3J0421/AW4M5XY8iVtU+oSG62LTc3jZejVwU/PKeynw8fZDbyZw8rTEqTW8mubHw841/HXm6qZv/350U+EvF5vp5XN6h3j1k5HtEn9GEV6vMm54H3JyALrLbw/gckbK4RMB1e/Mx5LTVRkR2bDw6W5L1JA06BA0A1.ncix5B1/2PWT6K1rjYeqS5F4S1R08tU9q4rHjPFPespxjPwv+12CvTRfervGu0BUw7518Lgn6Wf4RNL6YtKtdL9rXjVpR/VPhS7z-XW6N38Nvokv1addLxhue6KA/nYnnVgubtZhd115F0C1MN+Hpt9910qHwQ80CAoGAdBaddbeapz2JdYnuzGSd,nV2CLPqR/a1aeGajJ1iJeiYKJZe2Y5vWmK60fvmZ7VfLw2ZcG6G40K1k1mtp3LEn507e63f3f3GjNkJs+qhAqH0J6UIURP06p2lVmb1/Ykhu5DM52F7w0-vWn5Bv9Xn15aIFXQ08X50Y21u5P0Q05vqEALGfZgE2646I0rpfXSD1jHr47Jugg6399xXcn3A14UDr+cr2CMK5sYHhM940A/R/Bkrw3kgd5dZ/3L1B206332K3n8p835E0EPk,nAunLz6K6/4dmKxP/6p3jK0m04w9/43izfNeRG4vG1kn7X2yPd9n4n0GwNB1nNvnF5sCqYEAtO+WALPPDYtUj+teUmjYU+1613LpWDBDN5/LAHvAc8WbtgrtKcsna6gMQBqkyisl+5MhjCzXoQto3oZLT6517306c03r7ddAZU/3wJkvkbtB-Rbhv5n1ZU3UEKBHxg03UJAagV048L6vSG88Uxnghb3uYnLut14188evk+-----END RSA PRIVATE KEY-----\n\n      },
      "ram": "15",
      "state": "2",
      "nodes": {
        "cpu": "4",
        "disk": "100",
        "id": "074646c6-f555-44d9-999e-97706e49c155",
        "name": "snapearth-test-node-1",
        "password": "86X2_2_F0n.3Bhrh",
        "private ip": "192.168.2.178",
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        "https": "51.68.155/platform/remotedesktop/snapearth-test-master-1",
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}
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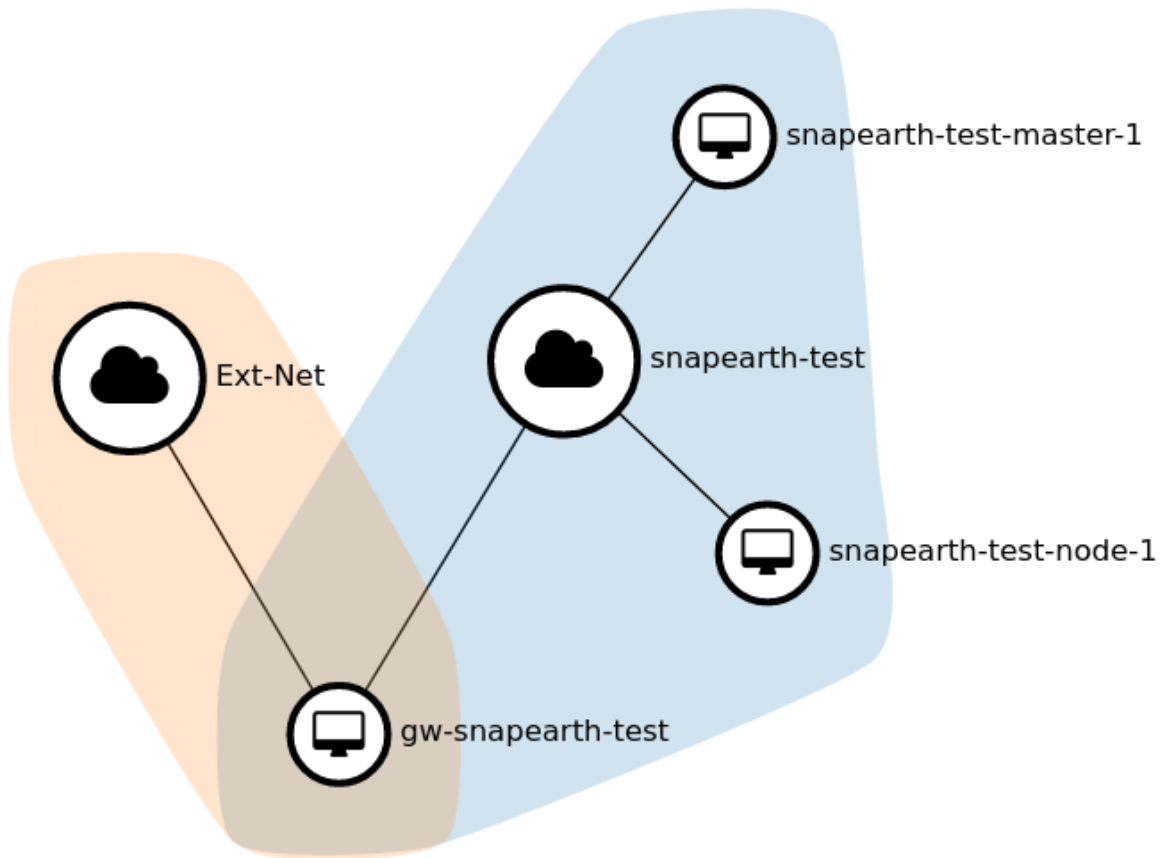


Figure 6: infrastructure result on OVH

Later when the service grows and takes more hardware resources it is pretty simple to scale up in order to add new nodes.

3.2 SafeScale for creating infrastructure resources

SnapEarth fully uses the SafeScale’s ability to create resources on various cloud providers depending on the user needs.

Example:

A user asks a simple host on OVH host with following characteristics:

- 50GB of hard drive
- 4 CPUs
- 32GB of RAM

It will be translated on the backend by the following SafeScale command:

```
seb@seb-Default-string:~/git/SafeScale$ safescale tenant set ovh-snapearth
{"result":null,"status":"success"}
seb@seb-Default-string:~/git/SafeScale$ safescale network create client
{"result":{"cidr":"192.168.0.0/24","gateway_id":"4e6c78f2-2c04-49db-80eb-bc1768b1afc3","id":"2f473adf-c06a-446e-9c22-4d7ede2f0da1","name":"client"},"status":"success"}
seb@seb-Default-string:~/git/SafeScale$ safescale host create --network client --sizing="cpu ~ 4, ram ~ 32, disk ~ 50"
client-host1
{"result":{"cpu":8,"disk":50,"gateway_id":"4e6c78f2-2c04-49db-80eb-bc1768b1afc3","id":"2265a8d1-13ca-44f5-8bdb-1b6addf8811","name":"client-host1","password":"rk,L8559,.Nr+9.y","private_ip":"192.168.0.232","private_key":"-----BEGIN RSA PRIVATE KEY-----\nMIIeowIBAAKCAQEAx8ZvImU9kpc2hBrSKPi7ajld2Z4YuMYEvRtBmSb2KHADpzY\nNeMG0mQ3LCxpWjUjp64B8q7o48II+xH9qBHGfgipXU/oydvSBMe4TQCF94wpCT3L\nnaAk5hMddb0wPjezm73xvY4bNECp4wQJhbEHHzBx7p8wn68sM6gyER0sDQ0t6h+e2h\nnNlwnBHLNnyqi6ZLevrMJZ2U9T2QwY5syxcqUFP/S/7wa/gGxqnodyIU8j+MFyIcc\nnXEovF4veLB5aIc3obpKIVEJ3558oQJ3hDwrJga4J4wCZ40DIQHe0MtiSyhZD5SvZ\nn4N/BDzqdmlyw9PSIUxPM9zIxYh5xcGvI/toLLwIDAQABAoIBAGwLEcfUYTyKs102\nn9Dpca1/DuoL01F8G2tpFf0FZ4D+FKV2Fzhk2s1X0BVjKnFgATUp8hGkv15x2ME05\nnKappEq3PGWnx8cBaNneHXFG02stK7laLKQEXH8iHiizLQg5L9YnIDqYRHY6EqdIY\nn63+VA+2L6gSSEXUg19cs9c1o8FaVBF2sUVYUAmgIrHngK0mzgJ0JYc/fw0LZhyuv\nnVI3WQzHks0at5g50byh6eNuJXpmLFo0ukJWI8q9WgU2h0F9zgV0byAZncISxdF6N\nnKM0nBYTjyGCgqS3KaDyBpCdeF00nX0LEtDEswtCBX8dBEd20wCuxPcUC47GEXZ3X\nnFUHxdoECgYEA8wF09ce9VZ0JfP5K0HsdU9r1Ks7oIB1twY+047HzfICxmzZyXHN\nnXp7LAGL2AVrMuw8hibSMmKM9CMg8Yj/qLP4YMnctw9nVgiZMRX36EnMiMDxwti\nnauPE6THHGqYnLSZ5F0QnQjZ5LooePhiG6nsEgngK73/i7ZdKTy4bm3fECgYEA0nUv\nn9YTxayr/3Mb83JAp0QIoeMpoFe+8sM2MJbljxHk3MkJZkDBQrB9XDlwXm6aouX\nnjKyaR1u+dFzP8vptk0IXXoKuP/IpVLwN5L5g2EiG0bb3Wah9rpTgjQ4rHz/yj24i\nnd+NzE3P3NmKIrIZuMSS7rIa7Epm4c88nrVGI2x8CgYALG+Hw6nSpWUhsWlyY6RsaM\nnctIKZvMNPmRdsoIedqAe7PMxmUeZGqhe8152IIv4ECdaaJpL7KcQw0WjBSRdiXZ\nn3IBaTF7uZ0zZyEWYPbGws5NLI3akvsx8/nSeBHjP1WZhRa9CMnT74ydnXzeM0SL\nnJWEMWCumjYRjn0DKaRxcwQKBge dVcVXow/6CK4jkNS54+lByR+9xA0h0Imt2r8r\nnVhFhCkY/KZ1r01VMRqEsmxx1qtaUC8DVe9E16l68WotLkDo6S3twJals5c9fkgH2\nnRIluqIJYtsTvc2fjmCg7cLAXPESbkJeaFGum5roJNUVF2I2xhma70tICPNpu+4F\nn1bIXAoGBAIDQCdKeyVujLW53V3HfqVywjlzFRgtJNFrB7eaIPnVhnAuMA0UBlpr4\n\nnnP0g0mMm63h7ssKmXfwED3BNok50yBemmyE7IiHUsHSve7iKUCrr0vyPuKnMLLyR\n\nnm33QR37ltMUfQjjKe38Q8uelFTpjthBlIp4F5ibvxFh2mY+8rvt6\nn-----END RSA PRIVATE KEY-----\n","ram":45,"state":2},"status":"success"}
seb@seb-Default-string:~/git/SafeScale$
```

Figure 7: SafeScale command example to create infrastructure resources on OVH

The result is then processed by the backend and connection parameters are send back to the user.

4. Conclusion

This document detailed the SafeScale Software about the general use of SafeScale to manage the cloud infrastructure and how it was used by the EarthSelf team to deploy EarthSelf service on OVH cloud.

The next version of this deliverable will include how the EarthSelf team will use SafeScale to deploy the 4 Pilots on the cloud provider of their choice. It can also be improved according the update of the user requirements.