Project Acronym: STORM CLOUDS

Grant Agreement number: 621089

Project Title: STORM CLOUDS – Surfing Towards the Opportunity of Real Migration to CLOUD-based public Services

D2.3.2
Storm Clouds Platform – Implementation Status Report

Work Package: WP2

Version: 1.0

Date: 11/02/2015

Status: Project Coordinator Accepted

Dissemination Level: Public

Authoring

Role	Name	Organisation
Edited by	Marco Consonni	Hewlett Packard
Reviewed by	Agustín González-Quel	Ariadna

Version Control

Modified by	Date	Version	Comments
Marco Consonni	10/02/2015	0.1	First Draft
Andrea Milani	10/02/2015	0.2	Ready for review
Marco Consonni	11/02/2015	1.0	Reviewed

Project Presentation

Surfing Towards the Opportunity of Real Migration to Cloud-based public Services (STORM CLOUDS) is a project partially funded by the European Commission within the 7th Framework Program in the context of the Capital Improvement Plan (CIP) project (Grant Agreement No. 621089).

The project has the objective of exploring the shift to a cloud-based paradigm for deploying services that Public Authorities (PAs) currently provide using more traditional Information Technology (IT) deployment models. In this context, the term "services" refers to applications, usually made available through Internet, that citizens and/or public servants use for accomplishing some valuable task.

The project aims to define useful guidelines on how to implement the process of moving application to cloud computing and is based on direct experimentation with pilot projects conducted in, at least, the cities participating to the consortium.

STORM CLOUDS will also deliver a consolidated a portfolio of cloud-based services validated by citizens and Public Authorities in different cities and, at the same time, general and interoperable enough to be transferred and deployed in other European cities not taking part in the project. This portfolio will be mainly created from applications and technologies delivered by other CIP Policy Support Program (CIP-PSP) and Framework Program 7 (FP7) projects, as well as resulting from innovation efforts from Small and Medium Enterprises (SMEs).

The project is lead by the following consortium:

Member	Role/Responsibilities	Short Name	Country
Ariadna Servicios Informáticos, S.L.	Co-ordinator	ASI	Spain
Hewlett Packard Italiana S.r.l.	Participant	HP	Italy
EUROPEAN DYNAMICS Advanced Systems of Telecommunications, Informatics and Telematics	Participant	ED	Greece
Research, Technology Development and Innovation, S.L	Participant	RTDI	Spain
Aristotelio Panepistimio Thessaloniki	Participant	AUTH	Greece
Alfamicro Sistemas de Computadores LDA	Participant	Alfamicro	Portugal
Manchester City Council	Participant	Manchester	United Kingdom
Ayuntamiento de Valladolid	Participant	Valladolid	Spain
City of Thessaloniki	Participant	Thessaloniki	Greece
Câmara Municipal de Águeda	Participant	Águeda	Portugal

For more information on the scope and objectives of the project, please refer to the Description of Work (DOW) of the project [1].

Table of Contents

Abbreviations

Acronym	Description
CIP	Capital Improvement Plan
CIP-PSP	*See CIP and PSP*
DOW	Description of Work
FP7	Framework Program 7
IaaS	Infrastructure as a Service
IT	Information Technology
N/A	Not Available or Not Applicable
PA	Public Authority
PDF	Portable Document Format
PSP	Policy Support Program
SME	Small and Medium Enterprise
TBD	To Be Defined
TBW	To Be Written
URL	Uniform Resource Locator
WP	Work Package

1   Introduction

The implementation of the pilots uses a common centralized infrastructure that provides the computing resources. Computing resources are made available on an "as-a-Service" paradigm, meaning that resources are activated and de-activated on an on-demand basis. For this reason, in addition to providing the physical equipment used for running applications (i.e. server machines, mass storage and network connections), the project requires the implementation of a cloud computing platform that actually implements the "as-a-Service" paradigm.

Storm Clouds Platform (SCP) is the cloud computing platform designed and implemented for the Storm Clouds Project and this document reports the current implementation status.

According to [2], an actual implementation of the SCP shall be provided to the project participants in order to allow the migration of applications to a cloud infrastructure and, once the migration is complete, the applications shall be available on Internet to the end-users (e.g. citizens, public servants).

2   Current Implementation Status

As anticipated in [1], HP decided to take advantage of a public cloud operator for hosting the migrated applications. The public cloud operator provides computing resources like servers, connectivity, storage, Internet access, etc; HP uses such resources for implementing the SCP.

In addition, HP has implemented an in-house SCP instance at its own premises with the main purpose of providing all the partners with a testing and staging environment.

This document should be considered a new version of D2.3.1-D2.4.1 that illustrates the status of the platform and the catalogue at M6. For this reason, the document reports what was implemented till M6 plus what has been implemented in the M6–M12 timeframe. The reason for this approach is to deliver a unified, self-consistent view of the SCP status regardless of the timeframe when new components and/or functionality has been addedd or modified. In order to show the evolution of the platform throughout the project phases, the following table briefly reports the relevant information of what was implemented in the milestones:

MILESTONE	TITLE	NOTES
M6	IaaS and Basic DBaaS	SCP@HP • IaaS, Object Storage Excluded • DBaaS - Basic Functionality (no HA) SCP@Enter • IaaS Fully Implemented
M12	Backup and Basic Monitoring	SCP@HP • IaaS - Object Storage Implemented • Monitoring – Basic Functionality (no HA) SCP@Enter • Monitoring – Basic Functionality (no HA)

Table 2-1 Storm Clouds Platform Evolution

The table reads as follows:

- **MILESTONE**: delivery date;
- **TITLE**: brief title summarizing the implementation stage
- **NOTES**: more detailed description of the implementation status for the two SCP instances.

The table will be updated on the upcoming project phases.

2.1   Storm Cloud Platform at Enter (SCP@Enter)

Some public operators have been evaluated taking into account functional, budget and regulatory requirements; specifically, being based in the EU territory was an important criterion. The selected operator, Enter S.r.l. [3], is a public cloud provider based in Milan (Italy) with data centres in Italy (Milan), Germany (Frankfurt) and the Netherlands (Amsterdam). Enter provides Infrastructure as a Service (IaaS) functions implemented using technologies compliant to the SCP architecture described in [4] and [5]. As reported in [6], the cloud services are hosted on computing nodes (i.e. physical servers) equipped with Intel Xeon E5 CPUs, 64 or 128 GB of RAM and SATA/SSD drives. They are connected to the network with blazing fast 10/40 GbE redundant links. The nodes are equipped with Linux Ubuntu Operating system and the IaaS layer is implemented with OpenStack.

2.2   Storm Cloud Platform at HP (SCP@HP)

The consortium participants can access the HP's SCP through a Virtual Private Network (VPN) connection. Functionally speaking, the HP platform is equivalent to the one implemented at the public operator; the main difference between the two is that the migrated applications running in the former platform can't be accessed from Internet by other project stakeholders (i.e. citizens). This is not an issue because when the applications are ready for being used they are simply "moved" from the HP's SCP to the SCP at Enter.

As described in [4] and summarized in the following picture, the IaaS Layer (i.e. OpenStack) is at the basis of the SCP architecture and all the other components are deployed on top of it as virtual machines[1]:
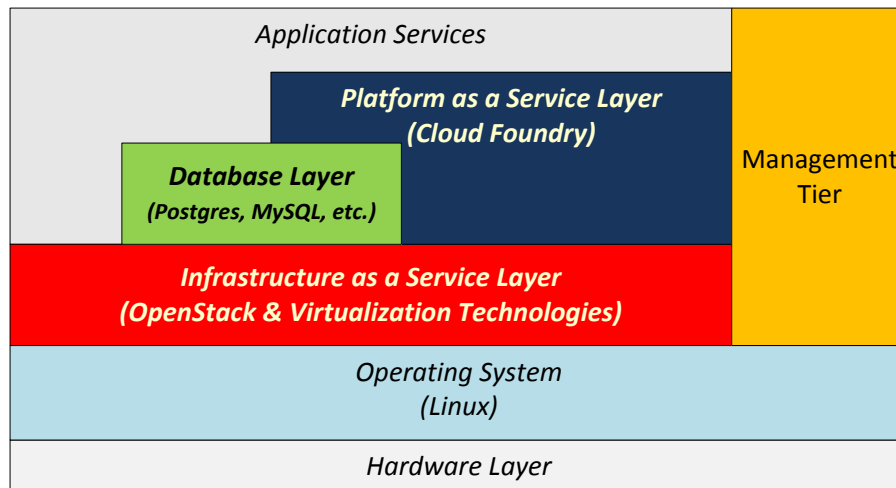

Figure 2-1 - Storm Clouds Platform Overall Architecture

In order to fully describe the current SCP deployment, it is fundamental to provide:

- the list of servers used to run the SCP;
- the network connections;
- the software components of the IaaS platform (i.e. OpenStack and Virtualization Technology) installed on each node.

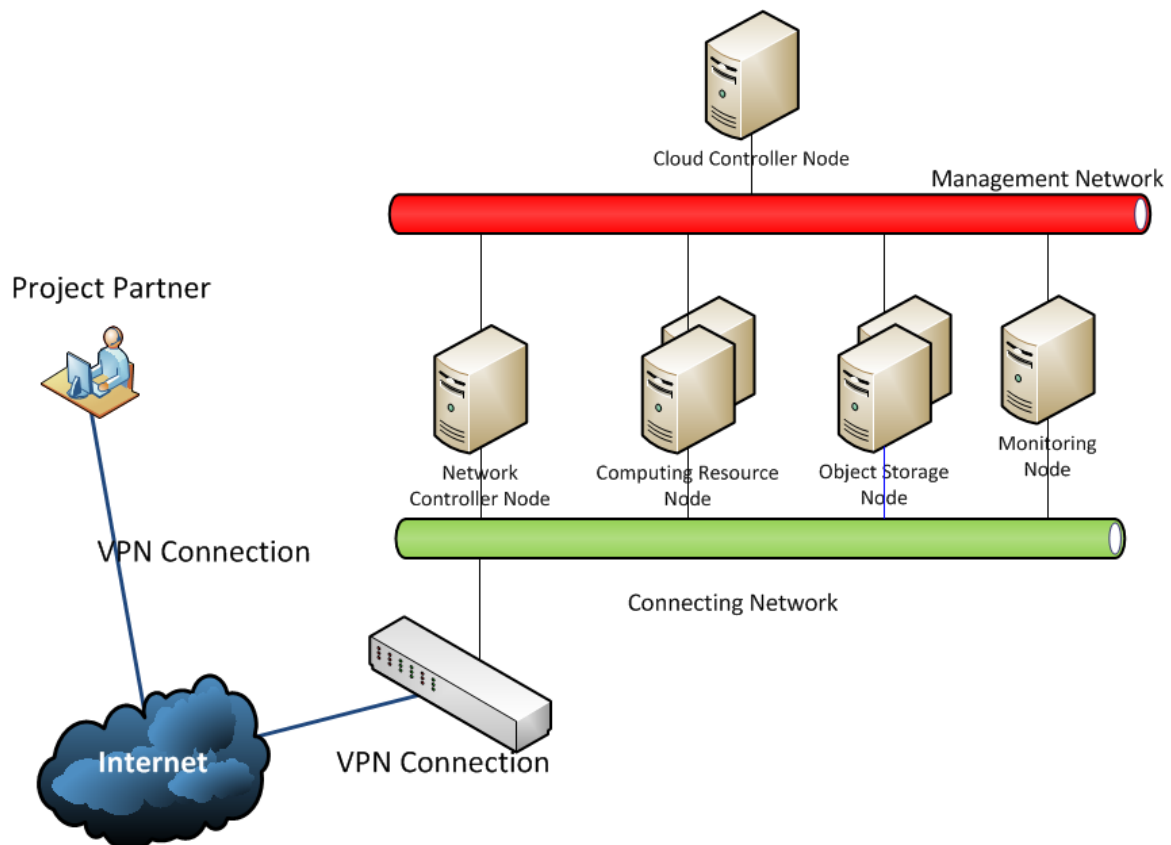The SCP installation at HP's premises is described by the following picture:

Figure 2-2 - Storm Clouds Platform at HP's Premises

---

[1] With the exception of the Management Tier that it is currently not implemented.

The installation is similar to the OpenStack deployment detailed in [4] (basic deployment), but in a smaller expansion state:

- Cloud Controller Node and Network Controller Node are implemented by two virtual machines running on a HP blade server;

- Computing Resource Node play both the role of Computing Node and Storage Node;

- Object Storage Node stores objects (files) for the OpenStack Object Storage Service (implemented by Swift);

- Monitoring Node hosts Zabbix monitoring server and the related Web Server;

- Connecting Network collapses the Data Network, the External Network and the API Network in a single network trunk.

The following table lists the most relevant information about the software and hardware configuration:

Node	HW Configuration	SW Configuration
Cloud Controller	**CPU**: 1 Intel(R) Xeon(R) E5506 @ 2.13GHz **RAM**: 12GB **Storage**: 1 Disk 107GB	*Operating System* • Ubuntu 14.04 LTS *OpenStack Deployment* • MySQL Ver. 5.5 • RabbitMQ Ver. 3.2.4 • Apache2 Ver. 2.4.7 • keystone-all • glance-api • glance-registry • nova-api • nova-conductor • nova-consoleauth • nova-novncproxy • nova-scheduler • cinder-api • cinder-scheduler • neutron-server • heat-api • heat-api-cfn • heat-engine • swift-proxy-server
Network Controller	**CPU**: 1 Intel(R) Xeon(R) E5506 @ 2.13GHz **RAM**: 5GB **Storage**: 1 Disk 5GB	*Operating System* • Ubuntu 14.04 LTS *OpenStack Deployment* • neutron-dhcp-agent • neutron-l3-agent • neutron-metadata-agent • neutron-ns-metadata-proxy • neutron-openvswitch-agent
Computing Resources	**CPU**: 32 Intel(R) Xeon(R) CPU E5-2670 0 @ 2.60GHz **RAM**: 126GB **Storage**: 2 Disk 900GB	*Operating System* • Ubuntu 14.04 LTS *Virtualization Layer* *Hypervisor* • QEMU (KVM) 2.0.0 *Storage Virtualization* • iSCSI target tgt • LVM version: 2.02.98(2) (2012-10-15) *Network Virtualization* • ovs-vswitchd (Open vSwitch) 2.0.1 • Compiled Feb 23 2014 14:42:34

Node	HW Configuration	SW Configuration
		• OpenFlow versions 0x1:0x1 *OpenStack Deployment* • nova-compute • neutron-openvswitch-agent • cinder-volume
Object Storage	**CPU**: 1 Intel(R) Xeon(R) E5506 @ 2.13GHz **RAM**: 12GB **Storage**: 1 Disk 20GB	*Operating System* • Ubuntu 14.04 LTS *OpenStack Deployment* • swift-account-auditor • swift-account-reaper • swift-account-server • swift-container-auditor • swift-container-server • swift-object-auditor • swift-object-server
Monitoring Server	**CPU**: 1 Intel(R) Xeon(R) E5506 @ 2.13GHz **RAM**: 12GB **Storage**: 1 Disk 20GB	*Operating System* • Ubuntu 14.04 LTS *Software Packages* • MySQL Ver. 5.5 • Apache2 Ver. 2.4.7 • zabbix-server-mysql Ver. 2.2.2 • zabbix-frontend-php Ver. 2.2.2

Table 2-2 - SCP@HP Configuration

The reported information is:

- **Node**: the name of the node as reported in Figure 2-2;

- **HW Configuration**: information on the hardware resources the node is equipped with;

- **SW Configuration**: information on the software packages installed on the node:

  o **Operating System:** all the nodes install Ubuntu 14.04 LTS;

  o **Virtualization Layer:** software for implementing the server virtualization (hypervisor), the storage virtualization and the network virtualization (when applicable);

  o **OpenStack Deployment:** list of the software packages installed for implementing the OpenStack IaaS layer;

  o **Software Packages:** any additional/alternative software package installed for delivering the functionality (e.g. Monitoring Server installs Zabbix and MySQL for delivering monitoring).

3   Cloud Application Catalogue

According to the [1], HP has also implemented a library of artefacts used for facilitating the deployment of cloud based applications. They come as prefabricated virtual machines images that can be used both as the basis for implementing the migrated applications as well as for directly implementing general purpose functions of the Storm Cloud Platform.

The following table reports what has been made available:

Area	VM Image	Function
Virtual Server	ubuntu-lucid-10.04-amd64	It provides an Ubuntu virtual server VM (10.04 lucid version) for installing and running applications
	trusty-server-cloudimg-amd64	It provides an Ubuntu virtual server VM (10.04 lucid version) for installing and running applications
General Purpose Services	DNS-Ubuntu14.04	It provides a Domain Name Service for applications running in the Storm Cloud Platform

DBaaS	MySQL-5.5_Ubuntu-14.04-External-DB	It implements a MySQL DB engine
	PostgreSQL-9.3.5_Ubuntu-14.04-External-DB	It implements a PostgresSQL DB engine
Monitoring	Zabbix-2.2.2_Ubuntu-14.04-AIO	It implements an All-In-One Zabbix monitoring server

Table 3-1 - SCP Cloud Application Catalogue

References

[1] "Surfing Towards the Opportunity of Real Migration to CLOUD-based public Services," STORM CLOUDS Consortium, November 2013.

[2] Consonni, Marco;Panuccio, Pasquale, "Storm Clouds Project: D 2.1 - Storm Clouds Platform – Requirements and Specification," STORM CLOUDS Project, 2014.

[3] Enter S.r.l., [Online]. Available: http://www.enterpoint.it/. [Accessed October 2014].

[4] Consonni, Marco; Milani, Andrea, "Storm Clouds Project: D2.2.1 - Storm Clouds Platform - Architectural Design," STORM CLOUDS Project, 2014.

[5] M. C. A. M. C. Caimi, "Storm Clouds Project: D2.2.1 - Storm Clouds Platform - Architectural Design," STORM CLOUDS Project, 2015.

[6] Enter S.r.l., [Online]. Available: http://www.entercloudsuite.com/en/features/technology/. [Accessed October 2014].