Cloud@CNAF Management and Evolution: placeholder

C. Duma[1], A. Costantini[1], D. Michelotto[1] and D. Salomoni[1]

[1]INFN Division CNAF, Bologna, Italy

E-mail: `ds@cnaf.infn.it`

Abstract.
Cloud@CNAF is a project aiming to offer a production quality Cloud Infrastructure, based on open source solutions to serve the different CNAF use cases. The project is the resultof the collaboration of a transverse group of people from all CNAF departments: network, storage, farming, national services, distributed systems. If 2016 was for the Cloud@CNAF IaaS (Infrastructure as a Service) based on OpenStack [1], a period of consolidation and improvement, 2017 was the year of the flood, when an aqueduct pipe located inthe street nearby CNAF, went broke causing the down of the entire datacenter. This paper presents the activity carried out throughout the year in the migration of the Cloud@CNAF core services from CNAF-Tier1 to INFN-Ferrara - starting to the re-design of the entire infrastructure to the physical migration of the racks - to providing services for our users and communities.

1. Introduction

The main goal of Cloud@CNAF [1] project is to provide a production quality Cloud Infrastructure for CNAF internal activities as well as national and international projects hosted at CNAF:

- Internal activities
  - Provisioning VM for CNAF departments and staff members
  - Provisioning of VM for CNAF staff members
  - Tutorial and courses
- National and international projects
  - Providing VMs for experiments hosted at CNAF, like CMS, ATLAS, EEE
  - testbeds for testing the services developed by projects like the OpenCityPlatform & INDIGO-DataCloud

The infrastructure made available is based on OpenStack [2], version Mitaka, with all the services deployed using a High-Availability (HA) setup or in a clustered manner (for ex. for the DBs used). During 2016 the infrastructure has been enhanced, by adding new resources, compute and network, and its operation has been improved and guaranteed by adding the monitoring part, improving the support, automating the maintenance activities.

Thanks to this enhancement, Cloud@CNAF was able to offer high reliable services to the users and communities who rely on such infrastructure.

At the end of 2017, on November 9th early at morning, an aqueduct pipe located inthe street nearby CNAF, broke as documented in Ref. [3]. As a result, a river of water and mud flowed towards the Tier1 data center. The level of the water did not exceeded the threshold of safety of thewaterproof doors but, due to the porosity of the external walls and the floor, it couldfind a way into the data center. Both electric lines failed at about 7.10AM CET. Access to the data center was possibile only in the afternoon, after all the water had been pumped out. As a result, the entire Tier1 data center went down, included the Cloud@CNAF infrastructure.

2. The migration to INFN-Ferrara

Some weeks after the flooding, we decided to move the Cloud@CNAF core services in a different location in order to recover the services we pvovided for community and experiements. Thanks to a strong relationship, both University of Parma/INFN-Parma and INFN-Ferrara proposed to host our core machinery and related services. Due to the geograpical proximity and the presence of POP GARR, we decided to move the Cloud@CNAF core machineries to the INFN-Ferrara location.

Unfortunately, INFN-Ferrara was not able to host all the Cloud@CNAF resources due to a limited power availability. For such reason, we decided to carry on an important activity aimed at re-designing the new infrastructure. In order to do that, we selected the services and the related machinery to move to the new - temporary - location to fit the maximum power consumption and weight estimated for each of the two rooms devoted to host our services (see Table 1 for details).

3. Re-design the new infrastructure

Due to the limitations decribed in Table1 we were push to re-desig the Cloud@CNAF infrastructure by using (only) three racks in order to host our core services (see Table 1 for the list os services). Among this three racks, the first hosted the storage resources, the second hosted the sotage, Openstack controller and network services, together with the GPFS cluster and other services. The third rack hosted Ovirt and Openstack nodes and some other services. Rack1 and 2 have been coonected by 2x40Gbps through our VDX and Rack 1 and 3 have been connectd by 2x10Gbps Moreover, Rack1 is connected to POP GARR with 1x1Gbps fiber connection. A complete overview of the new infrastrucure and related resource location is shown in Figure 1. As depicted by Figure 1 and taking into account the limitations described in Table 1, we were able to limit the power conumption up to 13,79kW in respect to Room1 (limit 15kW) and up to 5.8kW (limit 7kW) in respect to Room2.

The whole migration process (from the design to the reconfiguration of the new infrastructure) took almost a business week and after that the Cloud@CNAF and related services where up and running able to serve again different projects and communities.

4. Conclusions

Due to a damage in the aqueduct pipe located inthe street nearby CNAF, a river of water and mud flowed towards the Tier1 data center causing the shutdown of the entire data center. For such reason, the services and related resources hosted by Cloud@CNAF went down. To cope with this problem, we decided to temporary migrate che core resources and services of Clud@CNAF to INFN-Ferrara and to do this a complete re-design of the entire infrastructure was needed to tackle the limitations in terms of power consumption and weight imposed by the new location. Due to the joint effort of all the CNAF people and the INFN-Ferrara colleagues we were able to re-design, migrate and make operational the new Cloud@CNAF infrastructure and related hosted services in less than a business week.

	Rack1	Rack2	Rack3	Room1 (Max)	Room2 (Max)	Tot
Power consumption (kW)	8,88	4,91	5,8	13,79 (15)	5,8 (7)	19,59
Weight (Kg)	201	151	92	352 (400Kg/mq)	92 (400Kg/mq)	444
Occupancy (U)	9	12	10	21	10	31

Table 1. Power consumption weight and occupancy for each Rack

Rack1	Rack2	Rack3
VDX	VDX	PowerConnect x2
EqualLogic	Cloud controllers	Ovirt nodes
Powervault	Cloud networks	Compute nodes
	Gridstore	DBs nodes
	Other services	Cloud UI

Table 2. List of resources and services hosted per Rack
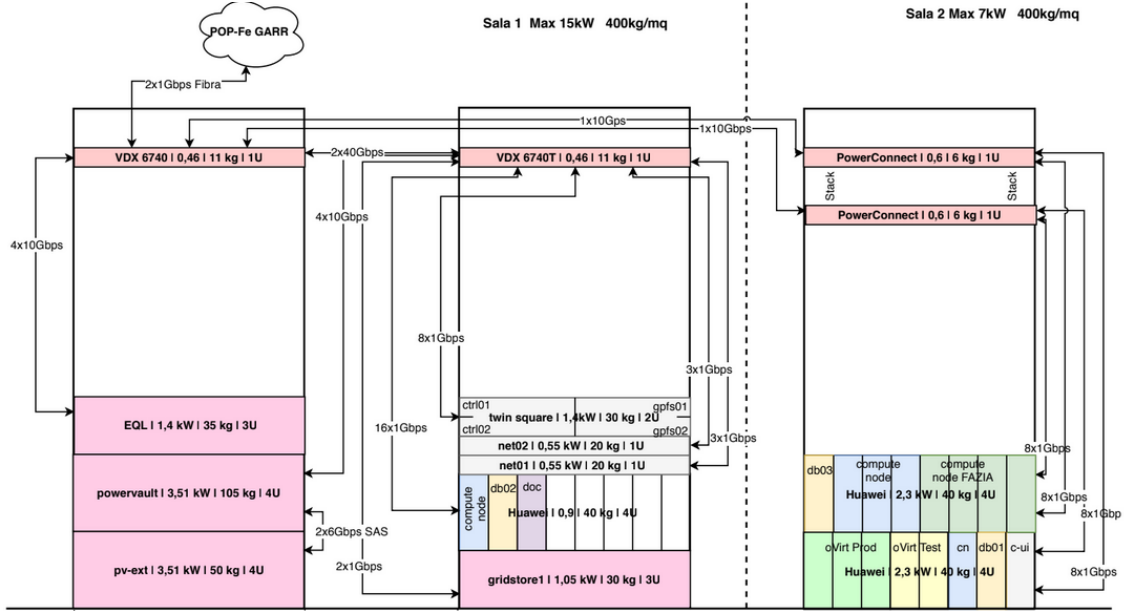

Figure 1. The new architecture of the Cloud@CNAF developed to cope the limitations at INFN-Ferrara.

5. References

[1] Cloud@CNAF - maintenance and operation, C. Duma, R. Bucchi, A. Costantini, D. Michelotto, M. Panella, D. Salomoni and G. Zizzi, CNAF Annual Report 2016, https://www.cnaf.infn.it/Annual-Report/annual-report-2016.pdf
[2] Web site: https://www.openstack.org/
[3] The flood, L. dell'Agnello, CNAF Annual Report 2017, https://www.cnaf.infn.it/wp-content/uploads/2018/09/cnaf-annual-report-2017.pdf