CloudLab-BR: Testbed for experimentation on Cloud Computing

cloudlab_BR

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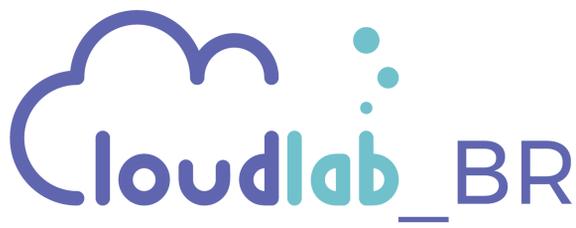
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Objectives

The Project goal is to provide an experimentation environment through a cloud computing distributed infrastructure, so that Information and Communication Technology (ICT) researchers can develop and test new cloud computing architectures, technologies, platforms and applications in a controlled environment, but with realistic scale.

This infrastructure, when idle, can also be used by researchers from others scientific domains to run High-Throughput Computing applications.

Target Services

The project lasts for two years, with due date of july 2019. At the end of the Project, two services will be delivered:
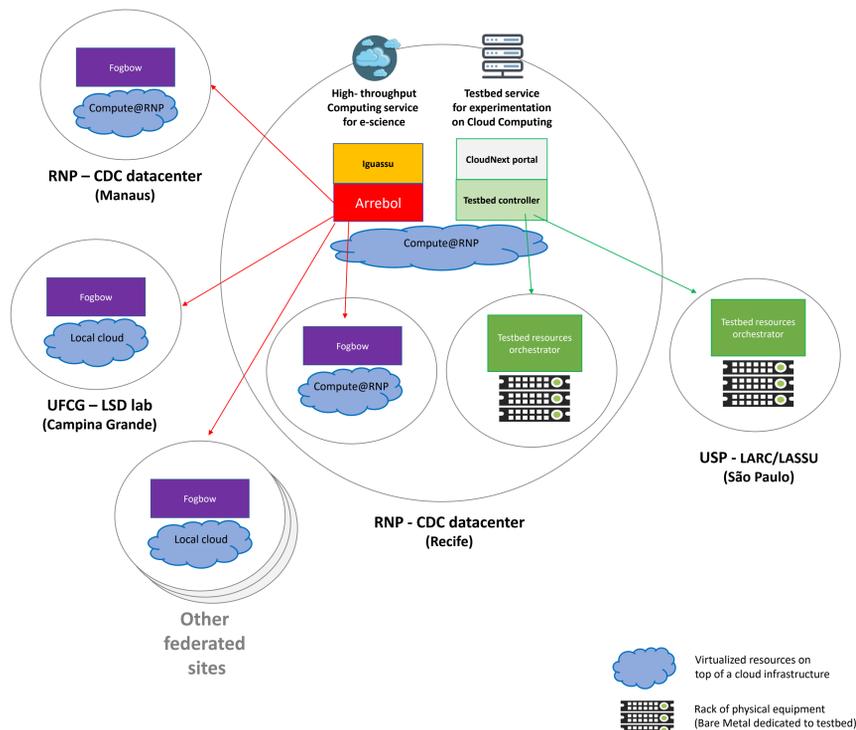
CloudNext: a **testbed** for experimentation on cloud computing technologies and applications, featuring automation and provisioning of physical infrastructure resources (computing servers, network switches and specialized hardware such as netFPGAs boards).

Iguassu: a **high-throughput computing service** to support e-Science applications, that will be executed over a federation of public and private clouds.

Proposed Architecture

High-throughput Computing service for e-science

Testbed service for experimentation on Cloud Computing

Iguassu
Arrebol
Compute@RNP

CloudNext portal
Testbed controller
Compute@RNP

Testbed resources orchestrator

RNP – CDC datacenter (Manaus)
Fogbow
Compute@RNP

UFCG – LSD lab (Campina Grande)
Fogbow
Local cloud

RNP - CDC datacenter (Recife)
Fogbow
Compute@RNP

USP - LARC/LASSU (São Paulo)
Testbed resources orchestrator

Other federated sites
Fogbow
Local cloud

Virtualized resources on top of a cloud infrastructure

Rack of physical equipment (Bare Metal dedicated to testbed)

Experiments that can be performed

There are many use cases that demand a specialized testbed with direct access to infrastructure hardware (a.k.a. bare metal), such as:

- **Cloud services modification:** some experiments aims at developing or customizing existing cloud services (e.g. Openstack), which may require that certain portions of the experiments have privileged access to testbed infrastructure, such as a separated control network or access to the physical hardware;

- **Tests with cloud resources allocation heuristics:** these tests can demand a total control of a physical network resource;

- **High dependability tests:** some experiments on dependability of cloud infrastructures may require migrating and synchronizing virtual machines among different physical servers located in different sites;

- **Traffic description in cloud environments:** it is desirable that the testbed can capture traffic packages, to determine the traffic control profile of a cloud environment, for security and traffic engineering research;

- **Control network attacks:** for cloud security experiments, it is desirable that the control networks and servers can be isolated, so that security and attack tests do not interfere in the testbed operation;

- **Energy efficiency:** some cloud experiments focused on energy efficiency need to monitor some physical resources to analyze the energy consumption associated to a set of operations, and to determine allocation heuristics based on energy efficiency;

- **Controlling geographically distributed clouds:** it is desirable that the environment can allocate resources in different geographic areas, allowing tests of allocation strategies for distributed resources;

- **Usage of specialized hardware:** it is difficult to have access to some hardware resources in Brazil. It is desirable that the environment can be able to provide access to some specialized hardware resources, such as netFPGA boards and GPUs.

- **High precision performance tests:** some experiments demand exclusive access to infrastructure resources to ensure precision and reproducibility, specially tests involving latency or load measurement;

- **Comparative tests**: a common situation is the need of comparing two distinct solutions on the same hardware infrastructure, not only to determine which is the better solution, but also so analyze the performance and overheads of each solution.

Other international initiatives

CloudLab
cloudlab.us

Chameleon
www.chameleoncloud.org

Grid'5000
www.grid5000.fr

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