

Placement constraints for a better QoS in clouds

Extending BtrPlace to support typing

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- **Virtual Machine**, hardware simulated in software
- **Hypervisor**, software monitoring a set of virtual machines
- **Node**, physical server running an hypervisor
- **Cloud**, set of physical servers running various softwares, providing services to users
- **QoS** (Quality Of Service), availability of the services provided by a Cloud

Clouds in business

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Large firms delegates their IT infrastructure to specialized companies

- Reduction of the costs (less hardware to buy and manage, less software to write, etc.)
- Augmentation of the QoS

However, by doing so, those firms:

- Lose control over their data
- Become dependent of another company

Different types of services

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Acronym	Service provided	Description	Exemple
SaaS	Software	Accses to software	Gmail ¹
PaaS	Platform	Software stack for development	Google Apps ²
IaaS	Infrastructure	Access to physical ressources	Amazon EC2 ³
DaaS	Data	Access to data	Dropbox ⁴

¹<https://gmail.com>

²<https://www.google.com/enterprise/apps/business/>

³<https://aws.amazon.com/ec2/>

⁴<https://www.dropbox.com/>

Why virtualization in clouds?

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Virtualization may augment QoS by allowing to:

- Launch and stop services on the fly
- Replicates easily VMs running those services
- Facilitate administration
- Somehow reduce security issue

Also, when QoS is non-critical, it can help reducing energy consumption.

How is it done?

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Companies hosting clouds using virtualization pay licence to use hypervisor. Those licences contains restrictions on the usability of ressources, such as

- CPU, RAM
- number of virtual machines
- number of NIC and other hardware components

Hypervisors come with software which helps manage **their** VMs.

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BtrPlace is a software written in Java (GPL) by Fabien Hermenier (OASIS team). It extensively use the Choco framework (BSD) developped at the "École des mines de Nantes". Choco gives the programmer tools to build Java applications modeling CSP⁵, or using CP⁶.

⁵Constraint Satisfaction Problem

⁶Constraint Programming

Goal

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BtrPlace aims to solve the problem of distributing a set of VMs on a set of nodes efficiently, by following some constraints. The latter can be :

- imposed by the hardware, such as available resources
- given by the user, following his needs (eg. replication of VMs)
- imposed by hypervisors licences

One may think of BtrPlace as a hypervisor's monitor.

BtrPlace and similar solutions

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Actually, BtrPlace model is unique and is the only one who scales enough to be usable in real life.

As its competitors, it doesn't support (yet) correctly the typing of nodes and VMs.

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- **Type**, integer associated to each hypervisor
- **Deployment**, operation of rebooting a node and eventually changing its hypervisor
- **Reconfiguration**, operation during which BtrPlace change the placement of VMs on nodes following constraints
- **Slices**, finite period of time representing ressources usages. Two types of slices, distinguished by using the ressources at the
 - **Consuming slice** beginning of the reconfiguration
 - **Demanding slice** end of the reconfiguration

Proceeding of the work

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We worked incrementally by

- 1 modeling and implementing a special case of the typing
- 2 modeling and implementing (partially) the general case
- 3 implementing (partially) some constraints

Model

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- choco
- solves an other problem

Timing management

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Missing models and partial implementation

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Possible usage of the typing

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