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The CC1 project - Cloud Computing for Science

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Providing computer infrastructure to end-users in an efficient and user-friendly way was always a big challenge in the IT market. "Cloud computing"is an approach that addresses these issues and recently it has been gaining more and more popularity. A well designed Cloud Computing system gives elasticity in resources allocation and allows for efficient usage of computing infrastructure. The underlying virtualization technology and the self-service type of access are the two key features that make the software independent of the specific hardware and enable a significant decrease in system administration effort.
The growing popularity of cloud computing led to the appearance of many open source systems offering cloud computing environments, such as Eucalyptus, OpenNebula, Nimbus or OpenStack. These solutions make it possible to construct a computing cloud in a relatively short time and do not require a deep understanding of virtualization techniques and network administration. The main drawback of using this type of toolkits is a difficulty in customization to special needs. A significant effort is needed to implement some non standard features.
The CC1 Project started in 2009. The proposed solution is based on Libvirt, a lower level virtualization toolkit. It provides a full set of VM management actions on a single node. For the top layer the PYTHON programming language was chosen as it ensures fast development environment (interpreter) and offers a number of useful modules. At present most of the required features are being implemented:

- custom web-based user interface,
- automatic creation of virtual clusters ("farms") with preconfigured batch system,
- groups of users with the ability to share resources,
- permanent virtual storage volumes that can be mounted to a VM,
- distributed structure –federation of clusters running as a uniform cloud,
- quota for user resources,
- monitoring and accounting system.

The CC1 system consists of two main layers. The top element of the system is called Cloud Manager (CLM). It receives calls from user interfaces (web browser based interface or EC2 interface) and passes commands to Cluster Managers (CMs). Cluster Manager, running on each individual cluster, handles all low-level operations required to control virtual machines.
The project is close to reach its first milestone. The production quality system (Private Cloud) will be made available to researchers of IFJ PAN at the beginning of 2012. The next step is to build federated systems with universities that expressed their interest in the project.
The CC1 system will be described and the experience from the firsts months of its usage will be reported.

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