

# Volunteer clouds to extend the resources of EMI middleware based VOs

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## Description of the work

The Generic BOINC Application Client (GBAC) is a virtualization based wrapper. It aims to be a generic framework providing virtualized environments for various distributed computing infrastructures (DCIs). GBAC is implemented using the DC-API Meta API and does not rely on any middleware specific functionalities, thus it is possible to use it on any DCIs that are supported by DC-API. In the talk we refer to the BOINC version of GBAC for demonstrating its concepts and internals.

Volunteer cloud is the term used for a cloud type infrastructure based on volunteer resources. Thanks to the combination of BOINC and virtualization, now it is possible to launch virtual machines on volunteer resources. BOINC primarily supports VirtualBox [9], which means any client machine having preinstalled VirtualBox can participate in executing virtual machines.

In this volatile and unreliable environment deploying an Infrastructure-as-a-Service cloud infrastructure faces several challenges. The first challenge is motivating donors not just to donate their CPU and GPU resources but to provide more access to their computers.

Second, volatility and availability problem of volunteer resources is another major challenge. Since any volunteer host may be shut down any time fault tolerance of appliances becomes a key challenge. In volunteer computing this is mitigated in two ways. First, redundancy is used, meaning more than one resource handles the same task and if one fails the other(s) are still able to produce the result. Second, applications periodically checkpoint themselves, in case of a restart the application can continue from the last checkpoint. Overall, checkpointing and redundancy has to be carefully designed and optimized for network bandwidth. Moreover, forecasting the availability of the volunteer hosts is also a key factor to increase the efficiency of the service migration.

Both the basic technical solutions as well as the challenges will be explained in the talk.

## Link for further information

<http://www.lpds.sztaki.hu/products>

<http://edgi-project.eu/>

## Wider impact of this work

The GBAC approach enables run any parameter sweep application on a BOINC project that registers the GBAC application. In this way volunteer BOINC systems can be used for a much wider set of applications than before without any application porting effort. This is particularly important in two scenarios.

The first scenario comes from the EDGI project where SG VOs can be extended with volunteer and local DG systems. If these DG systems register the GBAC application then any PS application running in the SG VO can be automatically transferred to and executed in the connected DG systems. No application porting effort is required. This opens new horizon for extending SG systems with large set of volunteer and local DG resources.

In the second scenario universities would like to set up volunteer DG systems for their researchers and students. In order to ensure the flexibility of these university DG systems the GBAC approach can be applied as we do in a Hungarian university DG program.

## Printable Summary

EMI middleware (ARC, gLite, UNICORE) based VOs can be extended with cheap and already available resources as volunteer clouds. The new GBAC (Generic BOINC Application Client) technology developed by MTA SZTAKI in the framework of the EU FP7 EDGI project enables that volunteer desktop machines can appear as a volunteer cloud resources for EMI-based VOs. The talk will explain the technical solution how to turn desktop machines into virtualized resources and use them as clouds. The talk will show how large-scale parameter sweep simulations can exploit this technology in a transparent way.

This solution shows many similarities with SaaS clouds in the sense that the SG systems are extended with new resources on demand. The main difference is that these additional resources are collected from a volunteer system and hence the users do not have to pay for the use of these resources.

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