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Lightweight Volunteer Computing Platform using Web Workers

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Abstract

Volunteer computing is a very appealing way of utilizing vast available resources in an efficient way. However currently available platforms supporting this computing style are either difficult to use or not available at all, being the results of e.g. finished scientific projects. In this paper a novel, lightweight volunteer computing platform is presented. In order to contribute the resources to this platform, only a web-browser is required without the need to install any additional plug-ins or other software. In this paper, besides general considerations and presentation of the platform structure and functionalities, selected results proving its efficiency are shown.

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Keywords: volunteer computing, lightweight framework, distributed computing

1 Introduction

Looking for efficient using of computing power of the available infrastructure, one can consider not only utilizing of multi, many-core systems, supercomputing facilities, grid and clouds but also a specific computing infrastructure, lined with socio-philosophical concept of voluntary service.

Volunteer computing is a type of distributed computing where people called volunteers donate computing resources of their devices to chosen projects. Thanks to volunteer computing various research projects can perform large-scale computations without spending funds on creating or renting computing infrastructure. The idea is also known as *public resource computing* [4, 3] and sometimes is also referenced to as *desktop grid computing* [14, 13] which seems to be a broader term.

A volunteer computing platform is a middle-ware that connects volunteers and people creating computational tasks. The main responsibility of volunteer computing platforms is scheduling tasks to volunteer devices. It has to be done in a way that fully utilizes donated computing power and provides results to project owners in a timely manner.

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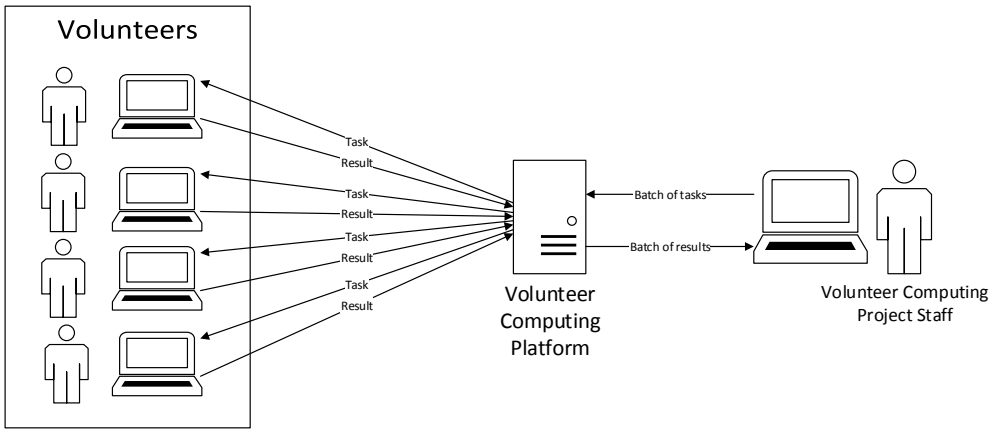

Figure 1: Simplified scheme of volunteer computing

The simplified schema of volunteer computing concept is shown on the figure 1. Volunteers' devices download tasks, perform computations and send back results. Project owners send batches of tasks to the platform servers and can download their results when they are ready. If a large number of devices is used to perform computations, the level of parallelism can significantly decrease total computation time.

One of the most popular volunteer computing systems, namely BOINC, though it is already 10 years old it is still able to follow the current trends and adjust to the needs of volunteers. One example of that is the fact that BOINC supports GPGPU. In December 2015 over 243 thousands of volunteers were active and the average computing power of the whole platform was around 158 000 Tera FLOPS [1] (which was a few times better than the best supercomputer on the Top500 list [20]).

The nowadays openly available volunteer computing platforms are either not mature, have lost community and support or even became closed. Moreover, browsing through their features and requirements for running, they are seldom easy-to-install and easy-to-use, often operational system dependent to name a few of their drawbacks.

Therefore a need arises for proposing a novel volunteer computing platform, free from such faults, that will be flexible and reliable, as portable as possible and not requiring any sophisticated components installed on the volunteer's operational system. It might be great, should only a web-browser be required to participate in the volunteer-computing tasks.

In this paper such volunteer computing platform is presented. Following the introductory section, a thorough look on the existing and past volunteer computing systems is presented. Based on this SOTA review, the concept of the proposed platform is sketched out along with some of its features. Later the platform is presented in action, applied to distributed Wikipedia search, showing the efficiency-related graphs and discussing them. In the end the paper is concluded.