

Virtual market for trustworthy peer-to-peer computing systems

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Abstract Paper presents idea of distributed, decentralized, based on desktop computers system commonly referred as a volunteer computing. Aspects related with economical and sociological background of the system, as well as technical methods of its implementation will be discussed. Authors propose solution where owners of computational power can easily join the network on non-volunteer basis and sell spare machine time. Prototype implementation is based on light virtual machines distributed using BitTorrent protocol.

Keywords Decentralized systems, volunteer computing, virtual machines

I. INTRODUCTION

Today, it seems to be already determined that the future of computing is in the parallel processing. However there is not one approach to parallelization. Well established systems with structured architecture, such as clusters and grids are dominating datacenters all around the world. Their outstanding performance and efficiency can't be overestimated. On the other side we have unstructured systems with extremely flexible, self-scaling, virtually indestructible peer-to-peer models.

There are many well known projects making benefits from unstructured, distributed computing model. SETI@home, Folding@home, Climateprediction.net were able to attract thousands of volunteers and successfully build system with petaflop power. Above systems were designed to solve specific problems, but BOINC is a general platform which allows to take advantages from decentralized volunteer computing [1]. It has been proved that wide range of satisfiability problems (SAT) could be efficiently solved using this architecture [2].

Volunteer computing is a method of performing distributed computing, in which a large number of resources (as in CPU time and/or disk space) are provided by volunteers all over the world. People with spare computing power are willing to donate their idle CPU cycles.

Question raised by the authors of this paper is whether ordinary people could monetize their computing power using the same schema. Success of Bitcoin currency [3] suggests that it is worth to consider.

II. COMPUTATION MARKET

We propose a system that serves as a market for computing resources. Sellers that are willing to offer their resources are matched with Buyers that want to perform (or outsource) a computation work. Buyers are charged per work unit and Sellers are compensated for their work according to market rules. Buyers may choose what price they are going to pay for the work. The price then affects priority of how Sellers are choosing what to work on next, and is directly related to how quickly Buyer is going to receive results.

The system deals with dishonest nodes by measuring trust and performing redundant computing of work units. Trust points are collected by randomly re-computing jobs verified by other computing nodes. When node is found dishonest, all its work has to be redone in order to preserve consistency of results.

III. IMPLEMENTATION

To provide maximum flexibility of defining computing problems, virtualization technology is used [4]. Buyers provide virtual machines with programs implemented with their technologies of choice. The machine images are then distributed to all peers willing to participate in computation. BitTorrent protocol is used in order to minimize bandwidth needed.

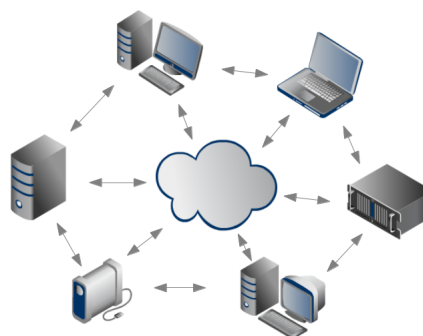


Fig. 1. Idea of decentralized, heterogeneous computing system. Resources are spread over randomly located machines which implements peer-to-peer model for direct communication.

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