Ensuring Prolonged Participation and Deterring Cheating Behaviors in a Collective

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UUCS-08-010

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September 25, 2008

Abstract

We are building a system that harnesses the idle resources (cpu, storage, and bandwidth) of nodes (e.g., home desktops) distributed across the Internet to build useful distributed services like content distribution or remote backup. Users are compensated in return for contributing their nodes' idle resources to the system. Collective managers bundle and manage the contributed resources and resell them to end customers.

For such a collective system to work, the system must discourage cheating (e.g., cheating users who lie about how many resources they have provided) and encourage nodes to stay in the collective for extended periods of time. To achieve these goals, we have designed an incentive system based on game theory and the economic theory behind law enforcement that motivates just these behaviors. In this paper we describe our incentive system and analyze its economic underpinnings to gain insight into how different players in the system will behave. We demonstrate how our incentive system motivates nodes to stay in the system for prolonged duration and deters cheating. For a typical system configuration, we show that even if we can only detect cheaters 4% of the time we can create sufficient economic deterrents to demotivate cheating.