Coordinated Volunteer Computing

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**ABSTRACT**

Volunteer computing uses millions and potentially billions of consumer computing devices (desktop and laptop computers, tablets, phones, cars, domestic robots and other appliances) for high-throughput scientific computing. It can provide Exa-scale capacity, and it offers a scalable and sustainable alternative to data-center computing. Since its inception in 2004, BOINC-based volunteer computing has used a “free-market” model in which scientists create and promote projects, and volunteers choose from among these projects. Problems inherent in this model – notably the risk in creating a project – have limited the adoption of volunteer computing.

To move beyond these limits, we developed a model in which volunteers choose science areas rather than projects, and a central “coordinator” allocates computing resources to projects. In the coordinated model, projects no longer need to recruit volunteers or create a web site. New projects are assured a certain amount of computing power, depending on their science area. These factors reduce the barriers to entry for potential new projects.

We implemented the coordinated model in a system called Science United. Since its launch in 2017, Science United has allocated 2.7 million days of CPU time and 280,000 days of GPU time to 37 BOINC-based science projects. This paper presents the motivations for the coordinated model and describes the structure and implementation of Science United.