Volunteer computing with BOINC

Introduction to Volunteer Computing:

Volunteer computing is a type of distributed computing in wich people donate their computers' unused resources to a research oriented project. This, provides substantial procesing power to reserchers at minimal cost, wich makes research more affordable and efficient. This type of computing is made mostly using cloud distributed systems. In this systems a program is runing on a volunteer's computer and periodically contacts the research aplication to to request jobs and report results. The one in charge of the comunication between the volunteer program and the researchers' aplication is the Middleware.

What is BOINC

BOINC comes from Berkeley Open Infrastructure for Network Computing and is an open-source software that acts as a middleware system for volunteer computing and greed computing. It was originally developed to support the SETI@home project, which purpose was to analyze radio signals. Later it became generalized as a platform for other distributed applications. As we will see, now the applications reach from mathematics and medicine to climatology and astrophysics. BOINC has been ranked as the largest computing grid in the world. As a volunteer computing platform, the interoperability is crucial to be able to reach all the people, it supports various operating systems, including Windows, MacOS, Android and Linux.

Examples of Volunteer Compting with BOINC

- PrimeGrid : A Volunteer Cloud Computing Network dedicated to find new prime numbers.
- Minecraft@Home: A Volunteer Cloud Computing Network dedicated to understand the fundamental laws of Minecraft to answer unanswered questions regarding the features and true limits of the game.
- NumberFields@home: is a research project that uses Internet-connected computers to do research in number theory.
- GPUGrid.net: is a distributed computing infrastructure devoted to biomedical research. Thanks to the contribution of volunteers, GPUGRID scientists can perform molecular simulations to understand the function of proteins in health and disease.
- Einstein@Home: uses your computer's idle time to search for weak astrophysical signals from spinning neutron stars (often called pulsars) using data from the LIGO gravitational-wave detectors, the Arecibo radio telescope, and the Fermi gamma-ray satellite.
- Rosseta@Home: By running Rosetta@home on your computer you will speed up and extend our efforts to design new proteins and to predict their 3-dimensional shapes. Proteins are the molecular machines and building

blocks of life. ## Going deeper into an example We will go deep on the minecraft example, in a case studio of finding a seed of a random generated world starting from an image. We will focus on a project called the PackPNG project, that tries to find a seed starting from a photo of a place in the random world. This project is really a huge one, not only with computing complexity, also about mathematics. But we will go straight to the computing part, and where distributed computing is applied. They ended having 2ˆ48 seeds to check, so they thoght that runing this computing part in a single personal computer was imposible. In order to accelerate the computation they used BOINC to make a distributed volunteer computing system in wich 3500 people ended contribuing. After some months and the 95% of the 2ˆ48 seeds checked, they found the seed of the world that they were searching.