Issues in Information Systems
Volume 22, Issue 1, pp. 246-254, 2021

https://doi.org/10.48009/1_iis_2021_246-254

Awareness of volunteer computing on the grid: Content within it texts

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Abstract

The health pandemic is a pressing time where research on the virus is needed worldwide to end the pandemic. One major contributing resource that many researchers around the world have utilized is the World's Community Grid. Governments, organizations, and individuals around the world are contributing their idle computing resources to collect and compute data for the OpenPandemic project on the World's Community Grid. As a result, researcher's data collection time decreases, and the size of data collected increases. However, the problem is that more volunteer computing resources are needed, and many are unaware of this need. Thus, educational institutions can aid in the awareness by addressing grid and volunteer computing concepts within their technology courses. This research examined the academic technology texts for grid and volunteer computing content. Results revealed that volunteer computing on the grid is not addressed within principal level texts. Moreover, a recommendation of exploring volunteer computing on the grid is provided with a step-by-step guide on how to encourage students to sign up on the World's Community Grid to help with needed COVID-19 research.

Keywords: Grid computing, volunteer computing, World's Community Grid, BOINC, OpenPandemic, COVID-19 High Performance Computing, and text content

Introduction

The fight to tame or end COVID-19 requires vast amounts research, data collection, and computing power to harness and compute the data to make sensible outcomes (e COVID-19 High Performance Computing (HPC), n.d.). As a result, the e COVID-19 HPC consortium was established by industry and government to aid in the fight via volunteer computing resources on the World Community Grid. Together, organizations, governments, and individuals donate their computing idle computing resources to collect and compute COVID-19 related tasks on the Grid. The Grid is simply a cloud repository where the results of the data collected from millions of volunteer devices are stored for scholars. Researchers receive the results in a short time instead of trying to collect the data on their own, which could take years to complete. Hence, valuable information and discoveries about important issues can be quickly assessed and publicly reported (Hindo, 2020; Nainwal, 2020).

Today, volunteer computing on the grid has the potential to have profound impacts on the world. Amstrong (2020) explained that volunteer computing projects like the OpenPandemic, COVID Tracking Project on the World Community Grid, which yields valuable scholarly results from the data collected

and computed by civic dedication. Moreover, the data on the World Community Grid is freely available to the public, usable and transparent.

As of March 7, 2020, there are approximately 798,000 volunteers on the World Community Grid (https://www.worldcommunitygrid.org/discover.action). Considering the size of the world's population, this is a very small number. The more volunteers on the Grid, the faster problems can be solved (Gillcash, 2020). However, the problem is that awareness and of volunteer computing on the grid is limited. Thus, many potential volunteers don't even know that the World Community Grid exist or how to get started volunteering their computing resources. One would assume that volunteer computing on the grid is explained within the IT curriculum. In an effort to provide more awareness of volunteer computing on the grid, this paper examines the number of academic information technology (IT) texts for a principal level IT course which include content on volunteer computing. This work has practical implications for IT programs, faculty, and future IT publishers and authors. The remainder of this paper is structured as follows: review of literature, purpose, methodology, results, recommendations, and conclusion

Literature review

Grid Computing

Grid computing offers a way to research difficult problems such as predictive models for finance, earthquakes, health outcomes, and climate/weather modeling (Kertcher, Venkatraman, & Coslor, 2020). A grid is a system that is designed to leverage distributed, often geographically, computers to accomplish joint tasks (Lie, Chen, Lee, Cao, & Chen, 2020). The system functions by using a software manager to prioritize and coordinate tasks throughout the system. Grid computing helps fill the niche where large computational work is required, but the existing on-site computer systems are not powerful enough and outsourcing to a server farm is not viable. For this reason, grids are most commonly seen among research institutions because they benefit from having additional computing power when running simulations in exchange for offering their computers when they would otherwise be idle.

Grid computing continues to receive support today, despite the modern development of server farms and cloud computing (AWS Financial Services, 2020). In order for grids to remain relevant, they must remain effective which is limited by the power of the computers networked and the effectiveness of the software manager. Currently, the software manager is the limiting factor since its role is responsible for any inefficiencies or waste in the system (Pujiyanta, Nugroho, & Widyawan, 2020). New strategies are be developed to combat inefficiencies in the system **(**Wided & Okba, 2019).

Another new growing concern that is helping grid computing is the growing demands for eco-friendly or green computing. With the increasing number of data centers and their massive energy consumption has attracted the attention researchers (Jeevitha & Athisha 2020; Shrimali & Patel, 2020). Grids overcome this obstacle by utilizing existing hardware which may exist in different power-grid regions (Shrestha & Lin, 2020). Additional research is being compiled into the feasibility of creating a grid by reusing old electronics to ease off the production of new electronics and use of high-performance computers (Pramanik, Pal, & Choudhury, 2019). Smartphones are specifically popular for this idea given their modern performance and refresh cycle.

Two prominent distributed computing projects Folding@Home and Rosetta@Home have helped in the fight against COVID-19 (Institute for Protein Design, n.d). In their fight, six planetariums have joined their network to share their clusters of high-performance computing machines to (COVID-19, 2020).

Volunteer Computing

Volunteer computing is another type of distributed computing, but the computing power is donated by regular people (Mengistu & Dunren, 2019). The process of volunteering a device is a simple as downloading and installing free software. The benefits are cheaper and greener computing infrastructure compared to data centers. Similar to grid computing, volunteer computing is still predominantly used by research organizations. The projects Folding@Home and Rosetta@Home both tap into volunteer computing and saw an increase in volunteers from the COVID-19 pandemic (News 12 Staff, 2020; Peckham, 2020). This has also drawn the attention that volunteer computing has not received the same resource sharing optimization as cloud computing throughout the last ten years (Kratzke, 2020). Even with the inferior optimization, volunteering has been observed to reduce power consumption by 35% compared to cloud servers (Periola & Falowo, 2020).

A recent study by Raabe and Powell (2020) provided an exploratory case study grid and volunteer computing. Specially, they donated their computing resources to the World Community Grid for three subprojects named Africa Rainfall Project, Microbiome Immunity Project, and Help Stop TB. Over the period of four weeks, they also collected the daily results returned and daily computing runtimes. Results indicated striking similarities between runtimes and daily results. More importantly, their work served as a reference for IT educators to explore Grid and volunteer computing within the IT classroom. Additionally, while their research did not focus on COVID-19, they did indicate the need for grid and volunteer computing topics to be addressed with an undergraduate IT curriculum.
The health pandemic has impacted every organization, individual, and everyday life. Steps taken to better understand the virus and further pandemics research are currently explored on the World Community Grid. Palmer (2020) indicates that volunteer computing on the grid is needed to help researchers end the health pandemic.

Purpose of this study

The goal of this research is to better understand the degree of information centered around grid and volunteer computing topics are addressed volunteer computing on the grid within an undergraduate principals of IT level course. Specifically, the contents of undergraduate academic IT texts were examined via a content analysis for grid and volunteer computing topics.

Methodology

Using O'Reilley (https://www.oreilly.com), this study evaluated undergraduate level academic texts for undergraduate level principals of information systems. O'Reilley was used because it is a popular knowledge sharing website for IT professionals. This free website provides online training and materials including books, videos, interactive events, and learning paths (O'Reilley Media Inc., 2021).

Over a one-month period, Feb 1, 2021 to March 1, 2021, the authors conducted a content analysis of the O'Reilly website for grid and volunteer computing content. These dates were selected as it allowed for new 2021 publishing of materials to be updated within the website and an extensive evaluation of the online materials found.

Using the search box on the O'Reilley website, the authors conducted a content analysis for academic texts regarding the following keyword criteria: principals of Information systems, grid computing, and volunteer. Data was collected, analyzed and evaluated for those keywords, and compiled via a statistical report detailing the findings.

Results

Using O'Reilley https://www.oreilly.com a content analysis was conducted for principal level (Level 1) Information Systems (IS) text content. The search initially yielded 8606 search results for "information systems. Among the results, 8,412 texts were found. Among them 680 were published within the last two years. However, upon further examination, majority of the IS texts pulled were not at the Principal of IT level. Thus, the search was reduced to 9 texts. None of the 9 identified IS principal level texts contained grid or volunteer computing within their table of contents.

Using the O'Reilley website again, Grid Computing was searched. A total of 868 results showed for Grid computing. Out of the 868 results, 860 were published texts. Among the published texts, only 43 were published within the last 2 years. It is also important to note that all of these texts were not principal /Introductory level but rather they contained a specific focus based for distributed computing grid computing.

Similarly, volunteer computing was also searched. Results revealed only 2,647 resources, with 2,623 being texts for volunteer computing. Only 270 texts were published within the last two years. Again, it is important to note that all of the texts were not principal /introductory level. Instead, they tended to contain specific focuses on cloud computing or Big data.

These results indicate that grid and volunteer computing are not addressed within principal level IS texts. However, it is addressed within upper-level specific content areas focusing on Cloud and Big data topics. The authors argue that due to the simplistic nature and need for volunteer computing on the grid, it should be addressed at the principal/introduction level as students are required to take one technology course throughout their undergraduate curriculum. Most students which are not IT majors or minors will not take additional IT courses. Hence, students will not be made aware of volunteer computing on the grid.

Recommendation

Based upon the results, the author's recommend supplementing principal/introduction level IT/IS texts with information explaining and demonstrating how to sign up for volunteer computing on the World Community Grid. Signing up to be a volunteer on the Word's Community Grid is easy and free. The following directions have been adapted from Gillcash (2020).

First, go to the World's Community Grid's website (www.worldcommunitygrid.org) (Figure 1) and click join.

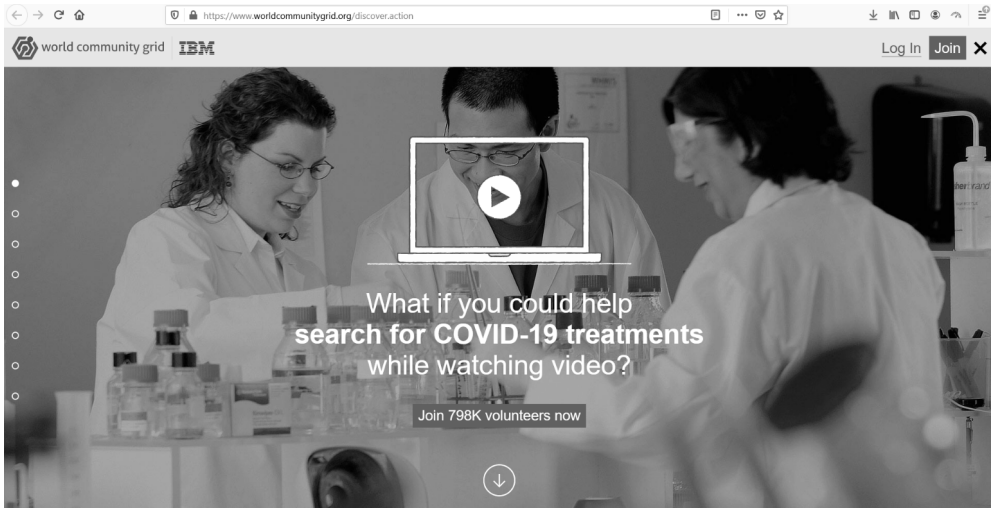

Figure 1. World's Community Grid Website

Enter an e-mail address and password for use on the World's Community Grid. Next, Read and check the box for accepting the end user license agreement (Figure 2).

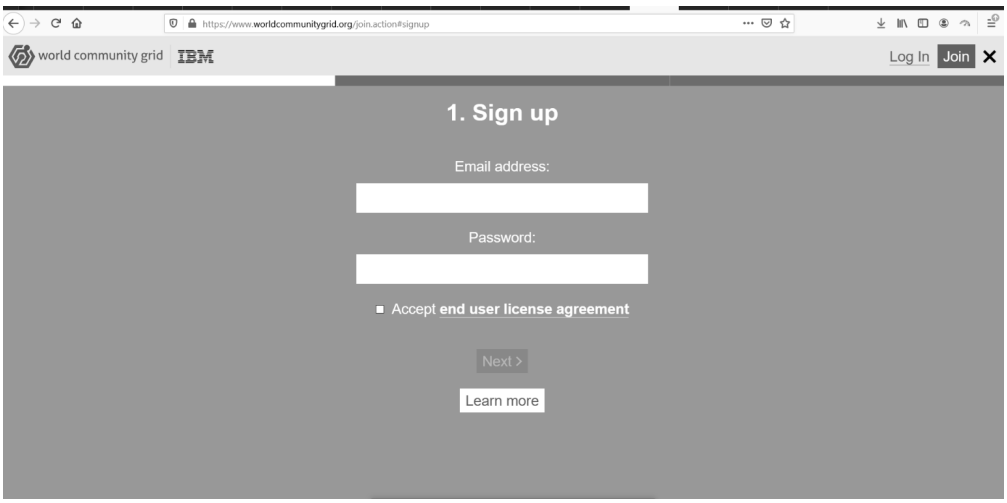

Figure 2. Sign Up Website

Next, select a project (Figure 3) and click next. Your device will be immediately prompted to download and install the free software (Figure 4). BOINC is the name of the software that will be installed. BOINC was developed and is maintained by the University of California. The software is designed to automatically runs specified projects and tasks selected by the end user during the devices idle or selected time (Gillcash, 2020).

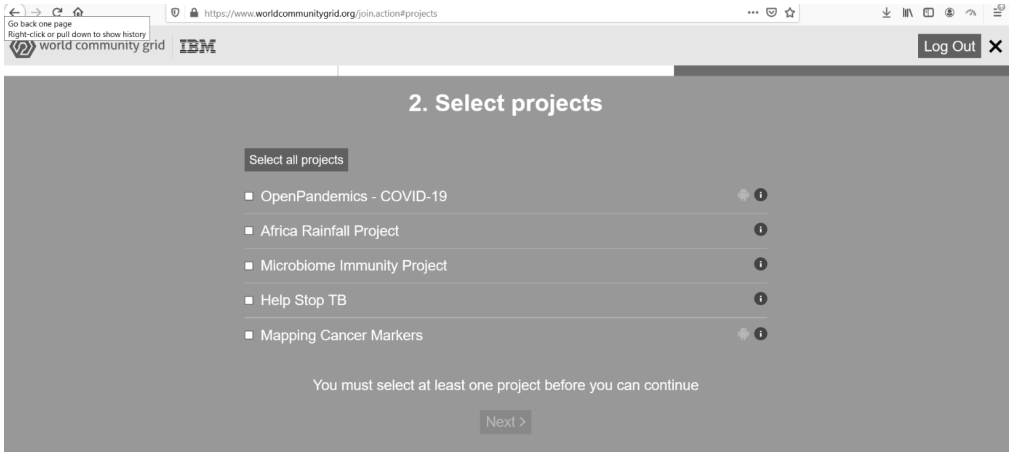

Figure 3. Select the OpenPandemic -COVID-19 Project on World's Community Grid

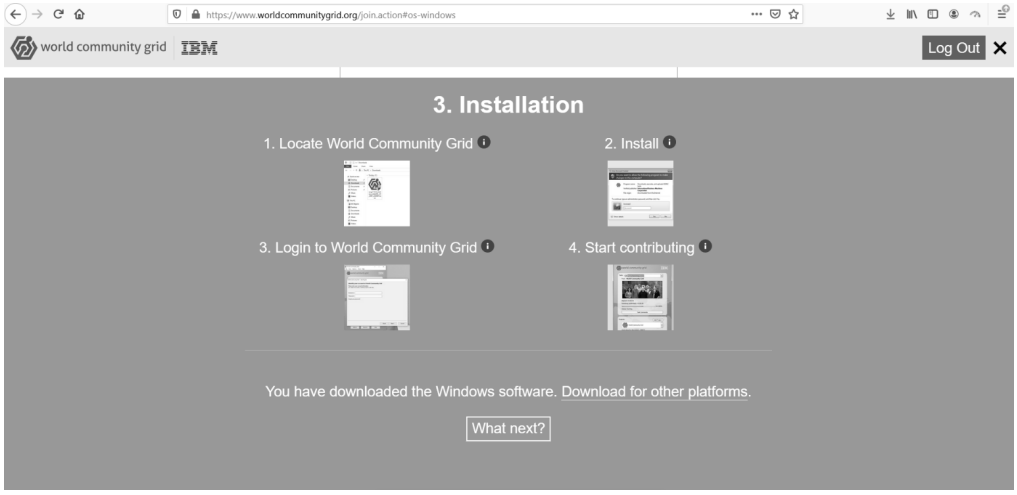

Figure 4. Downloading and Installing BOINC

After the installation is complete, the login screen for the World Community Grid will appear (Figure 5). The user will log in using the credentials previously established.

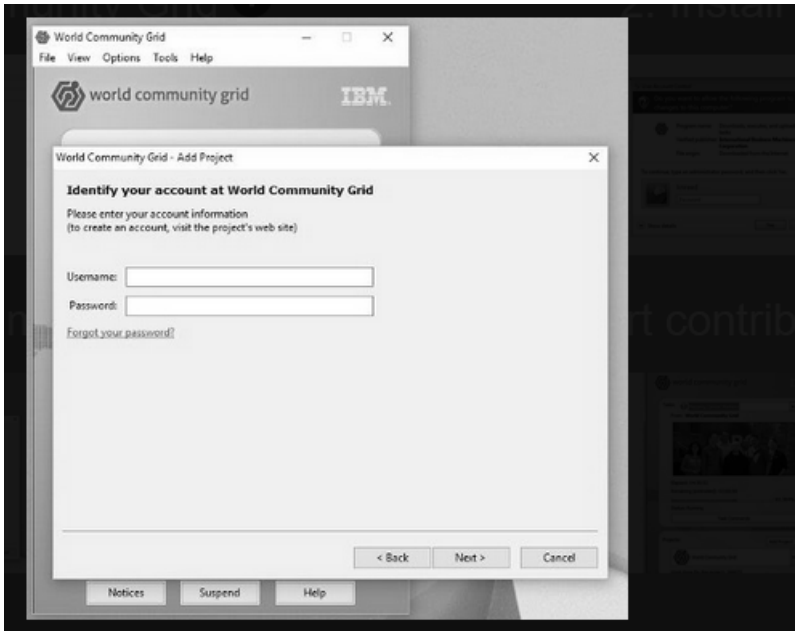

Figure 5. World's Community Grid BOINC Login

Figure 6. Running BOINC and Completing Tasks

Conclusion

Although grid and volunteer computing were not found among principal/introduction level IT texts, the authors do feel recommend the need to supplement the text with educational resources regarding volunteer computing on the grid. As a result, this research provided practical implications and a resource for IT programs and faculty wishing to incorporate understand grid and volunteer computing.

Finally, this research is not without limitations as it is limited to data found O'Reilley site. There may be text not updated or including on the site. Second, the recommendations to integrate volunteer computing on the grid stem from the current health pandemic and the need to assist with COVID-19 research. Finally, this research only focuses on using the BOINC software for volunteering resources on the World's Community Grid. Future research should address the limitations described as well as, reevaluate text content as the need for volunteer computing awareness increases during the health pandemic.

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