

World Community Grid

Accelerating research, tackling global issues

Overview

The Need

Vital humanitarian research is not being undertaken due to lack of access to essential computational power.

The Solution

World Community Grid harvests the unused computing capacity of volunteer PCs around the world, creating a secure virtual supercomputer available at no charge to scientists engaged in not-for-profit humanitarian research.

What Makes it Smarter

Pioneering scientific research into disease, climate change, hunger and social science is made possible and accelerated by removing constraints of access and affordability.

The Result

To date, 300,000 years of computer run-time which has processed over 350 million results for scientists free of charge.

For decades, scientists have conducted laborious trial and error research to address humanitarian issues such as virulent disease, hunger and the impacts of climate change. New approaches, which can dramatically accelerate this research, rely on modelling complex interactions or finding patterns in large sets of data or images but have largely gone untried due to the lack of affordable supercomputing capacity.

World Community Grid helps address this constraint by harvesting the unused capacity of PCs volunteered by organisations and individuals around the world, making it available without charge to scientists engaged in not-for-profit, humanitarian research. IBM created and operates World Community Grid as a philanthropic programme, using IBM technology and expertise to address several challenges.

- Security – the data, connected devices and systems of volunteers and organisations need strong security, as do IBM's servers and networks.
- User loyalty – contributing to World Community Grid is not the primary purpose of volunteers' PCs, so participation must be easy and unobtrusive to gain and maintain support.
- Serving research partners – World Community Grid must be easy for research partners too, providing high quality results that allow them to focus on science and not technology.

World Community Grid also needs global scale to harvest sufficient computing capacity, must avoid consuming significant additional energy, and has to operate within a budget consistent with a philanthropic investment.

Very secure, high-volume virtual computing

The stability and performance of IBM software and servers hosted at an IBM high availability facility – together with IBM expertise in virtual computing, security, data management and scientific research – enables a team of just seven people to manage this complex virtual environment.

Recent innovations include piloting the contribution of spare capacity from IBM's internal cloud. IBM plans to offer this service to those clients of IBM cloud computing services who want to contribute to humanitarian research.



Benefits

- Enables and vastly accelerates important humanitarian scientific research.
 - Provides a virtual supercomputer that is low cost, flexible and with robust security that protects users
 - Makes good use of energy normally wasted when PCs are idle.
 - Careful design enhances security, and together with social software, fosters awareness and user loyalty. Around half a million current members are engaged with humanitarian issues.
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“...when in use, most PCs are idle for around 80% of the time. Rather than let that energy go to waste, World Community Grid uses it productively.”

– Robin Willner, VP Global Community Initiatives, IBM

Robust security features are built into World Community Grid's client software and host environment. In addition to scanning, audits are carried out on any major software update or new research project. IBM security consultants also regularly test for vulnerabilities. These precautions are augmented through the design of the application itself. Every packet of work is either validated with a result checking program or is sent to multiple PCs so that returned results can be compared. This continually helps guard against hacking as well as maintaining high levels of data integrity. Separation of data and user information adds further protection.

Powerful IBM information management tools reliably handle many gigabytes of traffic daily, at low network cost to volunteers, which is fully backed up to guard against data loss.

Open and supportive

World Community Grid exemplifies IBM's principles of collaboration. IBM partners with the University of California at Berkeley, using its BOINC software (Berkeley Open Infrastructure for Network Computing) to run the grid. In turn, IBM contributes to BOINC's improvement, particularly in security and ease of use.

The World Community Grid team helps scientists prepare research projects for grid computing, process results and reconfigure work for further computation. In return, research partners must commit to open publication of their results.

To encourage growth of the grid, IBM works with hundreds of organisations to help promote the issues addressed by the research. World Community Grid is itself a large social network with networking tools provided through the grid's web site as well as through applications on Facebook and Twitter. Media and social network activity leads to around 200 new volunteers joining the grid daily.

Demonstrating IBM's commitment to open computing, World Community Grid's host servers run on Linux™ and client software is available for Microsoft Windows™, Apple Macintosh and Linux.

Smarter Science:

Making pioneering humanitarian research affordable



Instrumented

World Community Grid senses in real-time when PCs are idle and makes productive use of this spare capacity to help accelerate research.



Interconnected

More than 1.4 million PCs in 220 countries, with around 200 volunteers joining each day. Careful design and social software fosters loyalty and engagement with humanitarian issues.



Intelligent

Turning around 300GB of data per day into scientific insight, helping identify over 40 drug candidates and mitigate climate change impacts.



Solution Components

Software

- IBM DB2™ v9
- IBM WebSphere™ Application Server
- IBM WebSphere MQ

Services

- IBM Global Business Services
 - Application Innovation Services
 - Application Management Services
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“World Community Grid gives us the computational power to undertake projects that are typically quite daunting.”

– Dr. Stan Watowich, Associate Professor of Biochemistry, University of Texas Medical Branch

Research supported by World Community Grid

- AfricanClimate@Home
 - Discovering Dengue Drugs – Together
 - FightAIDS@Home
 - Genome Comparison
 - Help Conquer Cancer
 - Help Cure Muscular Dystrophy
 - Help Defeat Cancer
 - Help Fight Childhood Cancer
 - Human Proteome Folding
 - Human Proteome Folding
 - Influenza Antiviral Drug Search
 - Nutritious Rice for the World
 - The Clean Energy Project
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Working smarter behind the scenes

Volunteers download a free, small software agent which requests work from grid servers, and which intelligently senses if the PC is idle and available to run calculations. Complex scientific problems, split into tiny pieces at the host are distributed to run on over 1.4 million volunteer PCs, shrinking research time from decades to months.

Unobtrusive operation is key to the design of World Community Grid. Calculations run at the lowest priority, taking place when the PC is idle – while volunteers are on the phone or taking a break – with no noticeable impact on the PC's performance or the volunteer's normal work.

For organisations wanting to offer World Community Grid to employees, a mass deployment capability simplifies installation and administration. World Community Grid's security precautions meet most security policies and a focus on power management reduces energy consumption. While greater use of processors can increase energy requirements, World Community Grid throttles usage to help reduce impact, and application check-pointing means PCs can be switched off then pick up their research calculations at the same point upon restart.

Reusing wasted energy to tackle climate change

Robin Willner, VP Global Community Initiatives at IBM says: “When PCs are not needed, IBM recommends that they be switched off to save energy. However, when in use, most PCs are idle for around 80% of the time. Rather than let that energy go to waste, World Community Grid uses it productively.”

World Community Grid also contributes to environmental challenges through two of its research projects – one designing more efficient solar cells, the other looking for ways to mitigate the local impacts of climate change in Africa.

Contributing to a new type of science

World Community Grid has delivered around 350 million results to scientists from 35 research centres in 6 countries. Without this donated computing capacity this research would not be affordable or would take too long to be of value. With it, new drug candidates have been identified for AIDS and tropical diseases, and new cancer diagnostic and therapeutic systems have been developed.

Dr. Stan Watowich, Associate Professor of Biochemistry at the University of Texas Medical Branch, employs the grid to tackle tropical diseases as well as the flu pandemic. He comments that: “World Community Grid gives us the computational power to undertake projects that are typically quite daunting. We can move from computer calculations into laboratory testing more quickly and with a sharper focus.”



Join in – benefit from something you don't need

By joining World Community Grid, organisations can contribute directly to research which aligns with their social responsibility agenda. The grid helps extend awareness to employees, organisation membership or external audiences, encouraging more people to volunteer. Anyone from a single individual to a global corporation can donate unused computer time, helping to make the world a smarter, better, place.

For more information

Join in! Go to www.worldcommunitygrid.org or contact your IBM representative.

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