



"When we find aliens, we'll tell everyone!"

Little over a year ago, on 17th May 1999, a remarkable project saw the light of day – an attempt to finally answer the question: Are we alone in the universe?

Traditionally, projects like the Search For Extraterrestrial Intelligence (SETI) have involved big budgets and bigger bureaucracies. But no longer. Swingeing financial constraints have meant that while data can still be collected, processing it to find signals associated with life has become prohibitively expensive.

Detecting the patterns amidst the static of naturally occurring sources of radio energy calls for massive computer power, and such power isn't cheap. But scientists David Anderson and Dan Werthimer of the University of California at Berkeley were struck by the thought that they could use the Internet to connect hundreds of thousands of computers to create one giant 'virtual' computer working on parcels of the detection problem in parallel.

There were precedents, too, although not on the scale that Anderson and Werthimer were thinking of. Two of the largest prime numbers known have, in fact, been found by thousands of Internet-linked computers working on parcels of the task in parallel. And although widespread publicity followed the breaking of a 56-bit encryption key in October 1997, less well publicised was the fact that this represented the work of some 4,000 active teams of volunteers, whose computers were collectively processing seven billion keys per second.

Hence SETI@home – which aims, over a two year period, to analyse chunks of radio signal data from the world's most sensitive radio telescope, the Arecibo Observatory in Puerto Rico, by distributing it in 350 kilobyte chunks to computers around the world for analysis.

Apart from the slightly awkward fact that the project hasn't yet found an alien, its success has been phenomenal. So far, 1.9 million users have

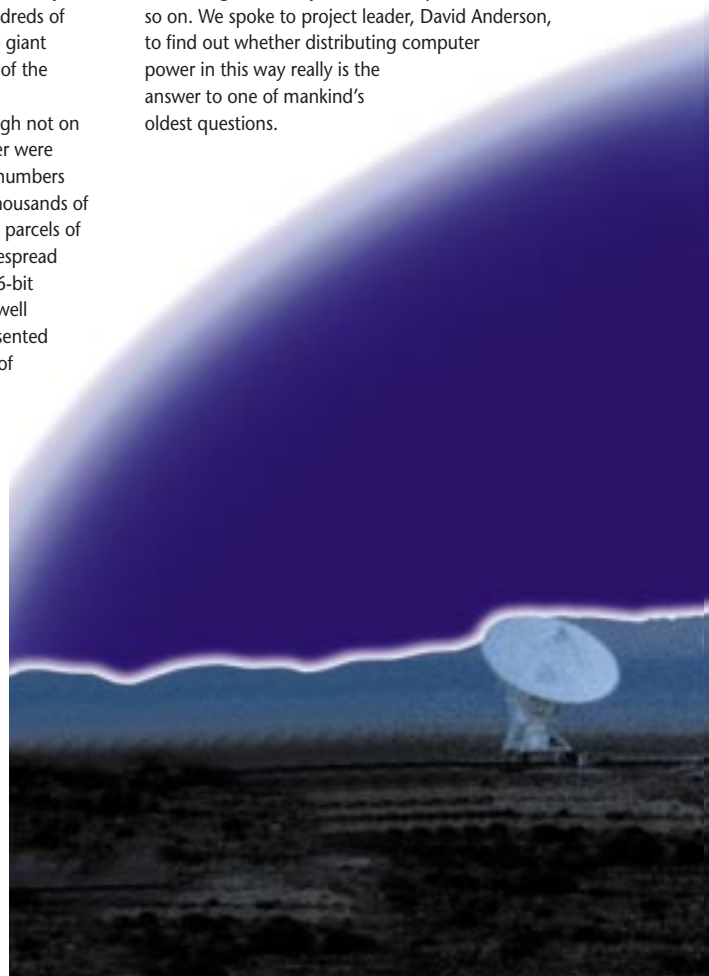
downloaded the software and begun working on alien-hunting, and the number increases every day.

110 million results have been received, representing 256,000 years of CPU time. The average CPU time per work unit is 20 hours 43 minutes, although this could be spread over many days if the software is used in screensaver – as opposed to background – mode.

Millions and millions

Although, predictably, the greatest proportion of signed-up SETI users comes from the US (925,000 of them), Germany and Canada are in second and third place respectively. The UK is in fourth place, with 147,000 users. (If you want to add yourself to the list, check out setiathome.berkeley.edu). But there have been rumours of problems: errors, data being mistakenly sent to multiple users, and so on. We spoke to project leader, David Anderson, to find out whether distributing computer power in this way really is the answer to one of mankind's oldest questions.

The SETI@home project has been a stunning success. Two million people have lent their PC's spare processing power to help researchers hunt for ET. But is there any real prospect of landing the Big One – actually detecting signals from another world, any time soon? Malcolm Wheatley met project leader **David Anderson** to find out





PC Plus

Q Have you been surprised at the level of interest and participation?

A When we were planning the project, we used some very pessimistic estimates of interest, in order to make sure that even if as few as 50,000 people used it, we'd still get some serious science done.

But when you factor in the widespread public fascination with SETI and UFOs, and the fact that this is the first project of its sort where you can actually use your computer for something useful all of the time, then I'm not really surprised at the two million users.

Q How many of those are 'useful' users who actively participate, as opposed to people who drop out after a couple of work units?

A Every user is useful! Even if they just send back a couple of results, that is a couple less for us to do. Sure, some people contribute more, and some less – but we're grateful for every piece of data processed. The only folks who aren't useful are the people who send in fraudulent results. But with a programme this big, you've got to expect a few bad apples.

Q I see references in the various SETI-related newsgroups and Internet

forums about SETI@home sending duplicate data to people. Why do you do this? Is it a fraud-trapping device?

A There is some confusion about this, and it really isn't very much to do with security. Clearly, if a positive result shows up, we're going to re-analyse it ourselves, and spot a fraud pretty quickly. But currently, we're sending each piece of data to two users, as this helps us to trap genuine mistakes. When you use this many computers, on this many calculations, you get authentic errors creeping in through electromagnetic phenomena – and 'overclocking' the computer dramatically increases the frequency of these. A bit becomes a one instead of a zero, and a number then becomes two or four times as big as it should have been. And that's obviously a concern.

Q And there's been quite an industry of people building various add-on programs to augment SETI@home – programs such as SETI Spy, for example, a freeware download that helps people monitor the performance and efficiency of their computer and its processor while they are crunching SETI data. How do you feel about this sort of thing?

A In general, we're extremely positive about it – particularly if it helps you get

more work units done! My favourite example, though, is the 'Distant Suns' desktop planetarium program, which displays the sky at particular points or times. The author created a special version for SETI@home, which you can download from our Web site, and which reads your SETI data file, and shows you where in the sky the data that your computer is analysing actually came from.

Q Version 2.04 is now available for download from your site. How does it differ from earlier versions? Faster, better or what?

A Better security, for a start. And slightly faster than very early versions – so if you've got one of those, then upgrade. Fancier graphics, too, that show the curve-fitting process dynamically on screen. The real increase in processing power will come with version 3, which uses new Fast Fourier transform routine that's significantly quicker. However, we're also incorporating a whole new analysis into version 3, which will analyse the data for pulsed signals instead of continuous ones – and looking for pulsed signals is exciting, because no SETI project has ever done that before.

But the combination of two – the improved Fast Fourier Transform routine, and the additional search – will mean that the program is slightly slower overall. On





Download SETI@home

The SETI@home program is a special kind of screensaver. Use other screensavers when you want your computer to do other work, and SETI@home will do yours for you when it needs. When it does, the program is getting coffee, listening to music, or anything you want, but helping the Search for Extraterrestrial Intelligence by analyzing data directly supplied by the world's largest radio telescope.

- [Download version 3.0.0 of SETI@home for Windows OS](#)
- [Download version 3.0.0 of SETI@home for Mac OS](#)
- [Download a Linux/Ubuntu version for AMD, Intel, PPC, SGI, Sparc, Sun, etc.](#)

Read the [SETI@home 3.0.0 Frequently Asked Questions](#)

compelling examples – and some of these will excite the public, and capture their imagination, and some won't. But creating and communicating that excitement will be a part of every project that comes afterwards.

A Oh, sure. The Arecibo telescope that we use is the best bet today, but there's a lot of the sky – and a lot of the Milky Way – that it can't see. So there's a lot of work to do looking at different parts of the sky, and with different telescopes: telescopes in Australia, for example, see a quite different piece of the sky to what we see in the northern hemisphere. And the SETI Institute is building a telescope in northern California, for example, that will be used exclusively for SETI.

A Oh, it could take 50 years. Longer term, we could be talking about SETI telescopes in space – the back side of the moon, for example, or in the outer reaches of the solar system. But that's a long way off, and events such as the Mars failures put that even further off. For now, we're stuck with telescopes here. **PCP**

A Well, that's not what the Protocol says. But you've got to keep a sense of perspective: those signals, if and when they're found, will have likely been travelling for between 10 and 1,000 years – or even further,

A SETI@home is just the beginning. In future, there could be 20 or 30 projects competing for your computer cycles. Almost every area of science has research that involves simulation on a large scale. Protein formation at the genetic level, for example. Weather simulations, and predicting the effect of things like global warming on the ecology of the planet. And drug design. There are dozens of

SETI@home Client Version 2.0.5
<http://setihome.berkeley.edu>

The Search for Extraterrestrial Intelligence at HOME

Data Analysis
 Computing Fast Fourier Transform 100%
 Input: 411K file: 1.8261 Kbytes Resolution: 8.148 Hz
 Gaussian prior: 0.96, fit 5.142

Data Info
 From: 15 hr 50' 36" RA, + 10 deg 1' 12" Dec
 Recorded on: Fri Dec 22 12:37:20 1999 Grif
 Source: Jansky Radio Observatory
 Base Frequency: 1.418769529 GHz

User Info
 Name: Mirek
 Data units completed: 312
 Total computer time: 5:430 for 85 min 40.5 sec

Overall: 14.6758 dec CPU time: 2 hr 11 min 29.6 sec

3D Spectrogram
 The 3D spectrogram displays Power (vertical axis), Frequency (Hz) (horizontal axis, ranging from 8.0 to 9765.620), and Time (sec) (depth axis, ranging from 0 to 107.4). The plot shows a dense field of data points with a prominent vertical structure, indicating a strong signal or noise component.

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