

# PrimeGrid's The Riesel Problem

On 14 Jan 2011 9:03:07 UTC, PrimeGrid's The Riesel Problem project eliminated  $k=428639$  by finding the Mega prime:

$$428639 \cdot 2^{3506452} - 1$$

The prime is 1,055,553 digits long and enters Chris Caldwell's "The Largest Known Primes Database" (<http://primes.utm.edu/primes>) ranked 29<sup>th</sup> overall. This is the 2nd largest prime found in The Riesel Problem and PrimeGrid's second elimination in 2 months. 62  $k$ 's now remain.

The discovery was made by Brett Melvold of Australia using an Intel i7 920 @ 2.67GHz with 6GB RAM, running Windows 7. This computer took 11 hours and 13 minutes to complete the primality test using LLR. Brett is a member of the BOINC@AUSTRALIA team.

The prime was verified on 18 Jan 2011 10:16:52, by Jason Sarley of the United States using an Intel Core2 Duo P8700 @ 2.53GHz with 4 GB RAM, running Darwin 10.6. This computer took a little over 8 hours 17 minutes to complete the primality test using LLR. Jason is a member of the NullGrid team.

The credits for the discovery are as follows:

1. Brett Melvold (Australia), discoverer
2. PrimeGrid, et al.
3. Srsieve, sieving program developed by Geoff Reynolds
4. LLR, primality program developed by Jean Penné

Entry in "The Largest Known Primes Database" can be found here:

<http://primes.utm.edu/primes/page.php?id=97496>

Hans Ivar Riesel, a Swedish mathematician, showed in 1956 that there are an infinite number of positive odd integer  $k$ 's such that  $k \cdot 2^n - 1$  is composite (not prime) for every integer  $n \geq 1$ . These numbers are now called Riesel numbers. He further showed that  $k=509203$  was such one.

It is conjectured that 509203 is the smallest Riesel number. The Riesel Problem consists in determining that 509203 is the smallest Riesel number. To show that it is the smallest, a prime of the form  $k \cdot 2^n - 1$  must be found for each of the positive integer  $k$ 's less than 509203. For more information about The Riesel Problem, please visit Wilfrid Keller's **The Riesel Problem: Definition and Status** (<http://www.prothsearch.net/rieselprob.html>).

Using a single PC would have taken years to find this prime. So this timely discovery would not have been possible without the hundreds of volunteers who contributed their spare CPU cycles. A special thanks to everyone who offered their advice and/or computing power to the search - especially Sean Faith and Brian Carpenter who provided support information from the previous Riesel Sieve effort.

The Riesel Problem project will continue to seek primes for the 62 remaining  $k$ 's. To join the search please visit PrimeGrid: <http://www.primegrid.com>

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## About PrimeGrid

PrimeGrid is a distributed computing project, developed by Rytis Slatkevičius, which utilizes BOINC and PRPNet to search for primes. PrimeGrid's primary goal is to bring the excitement of prime finding to the "everyday" computer user. Simply download the software and let your computer do the rest. Participants can choose from a variety of prime forms to search. With a little patience, you may find a large or even record breaking prime.

### BOINC

The Berkeley Open Infrastructure for Network Computing (BOINC) is a software platform for distributed computing using volunteered computer resources. It allows users to participate in multiple distributed computing projects through a single program. Currently BOINC is being developed by a team based at the University of California, Berkeley led by David Anderson.

This platform currently supports projects from biology to math to astronomy. For more information, please visit BOINC: <http://boinc.berkeley.edu>

### PRPNet

PRPNet is a client/server application written by Mark Rodenkirch that is specifically designed to help find prime numbers of various forms. It is easily ported between various OS/hardware combinations. PRPNet does not run each PRP test itself, but relies on helper programs, such as LLR, PFGW, phrot, and genefer to do the work.

For more information, please visit PrimeGrid's PRPNet forum thread: [http://www.primegrid.com/forum\\_thread.php?id=1215](http://www.primegrid.com/forum_thread.php?id=1215)

For more information about PrimeGrid and a complete list of available prime search projects, please visit: <http://www.primegrid.com>