

# PrimeGrid's 321 Prime Search

On 11 August 2008 6:32 UTC, PrimeGrid's 321 Prime Search found its first prime:

$$3 \cdot 2^{2291610} + 1$$

The prime is 689,844 digits long and will enter Chris Caldwell's "The Largest Known Primes Database" (<http://primes.utm.edu/primes>) ranked 40<sup>th</sup> overall.

The discovery was made by Thomas Wolfram of Germany using an Intel Pentium M @ 1.6 GHz with 512 MB RAM running Windows 2000.

The prime was verified on 13 August 2008 12:06 UTC, by Dale Laluk of Canada using an Intel Pentium 4 @ 3.0 GHz with 512 MB RAM running Windows XP.

The credits for the discovery are as follows:

1. Thomas Wolfram (Germany), discoverer
2. PrimeGrid, et al.
3. Srsieve, sieving program developed by Geoff Reynolds
4. LLR, primality program developed by Jean Penné
5. PFGW, primality program developed by Chris Nash & Jim Fougeron

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

<http://primes.utm.edu/primes/page.php?id=85438>

Generalized and extended generalized Fermat Divisors discovered by Lennart Vogel are as follows:

$3 \cdot 2^{2291610} + 1$  is a Factor of GF(2291607,3)  
 $3 \cdot 2^{2291610} + 1$  is a Factor of GF(2291609,5)  
 $3 \cdot 2^{2291610} + 1$  is a Factor of xGF(2291609,5,3)  
 $3 \cdot 2^{2291610} + 1$  is a Factor of xGF(2291607,7,4)  
 $3 \cdot 2^{2291610} + 1$  is a Factor of GF(2291608,8)  
 $3 \cdot 2^{2291610} + 1$  is a Factor of xGF(2291608,8,3)  
 $3 \cdot 2^{2291610} + 1$  is a Factor of xGF(2291609,8,5)  
 $3 \cdot 2^{2291610} + 1$  is a Factor of xGF(2291609,9,5)

$3 \cdot 2^{2291610} + 1$  is a Factor of xGF(2291608,9,8)  
 $3 \cdot 2^{2291610} + 1$  is a Factor of GF(2291608,11)  
 $3 \cdot 2^{2291610} + 1$  is a Factor of xGF(2291608,11,3)  
 $3 \cdot 2^{2291610} + 1$  is a Factor of xGF(2291609,11,5)  
 $3 \cdot 2^{2291610} + 1$  is a Factor of xGF(2291607,11,8)  
 $3 \cdot 2^{2291610} + 1$  is a Factor of xGF(2291608,11,9)  
 $3 \cdot 2^{2291610} + 1$  is a Factor of xGF(2291604,12,7)

PrimeGrid's 321 Prime Search is an extension of Paul Underwood's 321 Search. PrimeGrid has added the  $3 \cdot 2^n + 1$  form to the search and will be testing both  $3 \cdot 2^n - 1$  and  $3 \cdot 2^n + 1$  forms beyond 5M.

Using a single PC would have taken years to find this prime. So this timely discovery would not have been possible without the thousands of volunteers who contributed their spare CPU cycles. A special thanks to everyone who contributed their advice and/or computing power to the search - especially Lennart Vogel for doing all the sieve work.

PrimeGrid's 321 Prime Search will continue to search for even larger primes. To join the search please visit PrimeGrid: <http://www.primegrid.com>

# PrimeGrid's 321 Prime Search

## **About PrimeGrid**

Rytis Slatkevicius, the developer of PerlBOINC - a Perl-language-based port of the BOINC platform, created PrimeGrid as a test project for PerlBOINC. PrimeGrid's first sub-project was in cryptography as it participated in the RSA Factoring Challenge. While it no longer participates in the challenge, PrimeGrid continues to expand its functionality. Currently the project is running the following sub-projects:

- Twin Prime Search: searching for gigantic twin primes of the form  $k*2^n + 1$  and  $k*2^n - 1$ .
- Cullen-Woodall Search: searching for mega primes of forms  $n*2^n + 1$  and  $n*2^n - 1$ .
- 321 Prime Search: searching for mega primes of the form  $3*2^n + 1$  and  $3*2^n - 1$ .
- Prime Sierpinski Project: helping Prime Sierpinski Project solve the Prime Sierpinski Problem.
- Proth Prime Search: searching for primes of the form  $k*2^n + 1$ .

For more information, please visit PrimeGrid: <http://www.primegrid.com>

## **About 321 Search**

321 Search began in February 2003 from a post by Paul Underwood seeking help from interested parties in a prime search attempt of the form  $3*2^n-1$ . The initial goal was to build upon the completed work at <http://www.prothsearch.net> and extend the list of known primes to an exponent of 1 million. Interests gathered quickly and by the time they reached  $n=1$  million, they had already pre-sieved further. Computer hardware advances allowed them to reach tests at 1 million digits or exponent of about 3.3 million within a few years, with stated aim of eventually finding a mega-prime.

321 Search successfully found a Mega Prime on 23 March 2008,  $3*2^{4235414}-1$ . They completed their search and stopped at  $n=5M$ . The project was archived on 22 September 2008 after a successful 5 ½ year run.

For more information, please visit 321 Search: <http://www.mersenneforum.org/321search/>

## **About BOINC**

BOINC (Berkeley Open Infrastructure for Network Computing) 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.

For more information, please visit BOINC: <http://boinc.berkeley.edu>