## ABC Sieving Finder

**Challenge: '**ABC triples' are triples of integers a, b and c, such that a + b = c, all three have no common divisors, and c > rad(abc), the so-called 'radical', which are computationally expensive to find. They are most well-known in the context of the ABC conjecture, which, if true, has a large number of consequences in number theory, and it is hoped that the patterns in the triples will lead to insights about the conjecture, and about number theory in general.
The ABC@home project itself aims to produce a comprehensive list of these triples (up to a certain upper bound for c), by means of grid computing. The project was started as part of the Dutch project 'Reken mee met ABC', aimed at teachers and students, which was intended to increase the public interest in mathematical projects in the Netherlands.
The ABC sieving finder application was developed to improve the efficiency of this project, providing quicker and more wide-ranged results by using a better underlying algorithm; it uses a so-called “sieving” technique to generate a comprehensive list of triples in a certain `search area'.
Some details about the sieving algorithm used in the application can be read at http://abcathome.com/algorithm.php.
Since the search for valid triples can be divided up easily into different 'search spaces' with varied parameters (such as bounds on the radicals of the integers involved, and requirements on their factorizations), each of which are entirely independent, the project is a good candidate for running on a desktop grid, and the application was developed with the use of these parameters in mind.

**Solution:** Earlier versions of the application were developed and deployed before the start of IDGF-SP, first in standalone form, and then ported to the BOINC grid APIs. Checkpoint functionality was added, and automated tools were developed to automatically generate workunits covering large search areas, with appropriate parameters and a statistical approximation of the needed runtime for each job (something which is, unfortunately, extremely unreliable due to the nature of the work).
Further development has continued on a combined codebase which supports both use cases, allowing researchers to run the application stand-alone if necessary.
During IDGF-SP, the application has been extended to support efficient calculation of ABC triples involving larger numbers (beyond 63 bits), work has been started on improving performance further, and the grid-related code has been updated to work reliably with the latest versions of the BOINC grid software.