

# **Blue Gene/L and Petaflop Supercomputing**

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The Blue Gene/L is the fastest supercomputer in the world. In November 2004, a 16-rack, 16,384-node Blue Gene/L supercomputer was crowned as the fastest on the 24th TOP500 list (<http://www.top500.org>). However, Blue Gene/L computers are available in a broad range of sizes, allowing the architecture to scale down as well as up.

A key objective in Blue Gene/L design is to achieve cost/performance comparable to the COTS (Commodity Off-The-Shelf) approach, while at the same time incorporating a processor and network combination so powerful that it revolutionizes the performance of supercomputer systems. Most scientific problems, using the domain decomposition technique, rely heavily on the three-dimensional nearest-neighbor communication which is fulfilled by this network. For collective communication such as reduction and broadcast, a separate network known as the collective network is provided.

The full Blue Gene/L consists of 64 racks containing 65,536 high-performance compute nodes; each node contains two embedded PowerPC processors. The same chip is also used for the I/O nodes. A three-dimensional torus network and a collective network are used to interconnect all nodes. The full system contains 33 terabytes of main memory; it is designed to achieve 183.5 teraflops peak performance using one of the processors of each node for computation and the other processor for communication, and 367 teraflops using both processors for computation. A key differentiator of the Blue Gene family is its low power design that allows for a compact system with about 2,000 processors in a rack of 2 ft x 3 ft x 6ft.

Actual performance of different types of applications, including applications of relevance for the Health Care and Life Sciences industry, will be described.

Blue Gene/L is the first supercomputer in the Blue Gene family. The likely evolution of that family will be discussed.

## **Carl G. Tengwall**

Carl G. Tengwall is responsible for Blue Gene Solutions within IBM Engineering & Technology Services in NE&SW Europe. Prior to joining the Blue Gene team, Carl recruited and helped start the IBM Life Sciences organization in Europe. Before that he has held various positions within IBM with responsibility for Scientific & Technical Computing and the use of IT in R&D. Carl has a degree in Engineering Physics from Chalmers University of Technology and is a member of ACM and the IEEE Computer Society.