

# 20 petaflops: New supercomputer for Oak Ridge facility to regain speed lead over the Chinese

23 March 2011, by Bob Yirka

## ORNL's "Titan" 20 PF System Goals

- Initial 1 PF delivery in 2011, final 20 PF system in 2012
- Designed for science from the ground up
- Similar number of cabinets, cabinet design, and cooling as Jaguar
- Operating system upgrade of today's Linux Operating System
- Gemini Interconnect
  - 3-D Torus
  - Globally addressable memory
  - Advanced synchronization features
- New accelerated node design using GPUs
- 20 PF peak performance
  - 9x performance of today's XT5
- Larger memory
- 3x larger and 4x faster file system

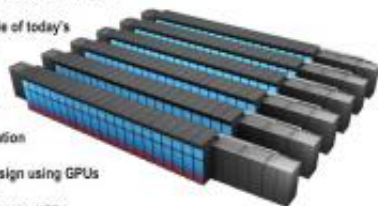


Image credit: ORNL presentation (see link below)

(PhysOrg.com) -- The Oak Ridge National Laboratory (ORNL) campus in Oak Ridge Tennessee will soon play host once again to the fastest computer in the world (barring any new sudden announcements by the Chinese). The computer, dubbed "Titan" has been commissioned by the U.S. Department of Energy, and is expected to achieve 20,000 trillion calculations (20 petaflops) per second.

It was only last October that [China's](#) National University of Defense team unveiled the Tianhe-1A, a machine capable of computing at 2.5 [petaflops](#).

The Titan, built by Cray Computer, will become part of a collection of some of the fastest computers in the world at the ORNL facility, joining NOAA's Gaea, the NSF's Kraken and the DOE's current workhorse, the Jaguar, though new space will have to be found, as the current structure has no room. Plans are in the works for an entirely new facility to be built over the next year, which should fit in well with the delivery date for the first stage of

the Titan expected to be by the end of this year, with the second stage slated for sometime next year.

The Titan architecture will rely on use of XT3, 4 and 5 processor boxes, but will use a "Gemini" XE interconnect, and it will be configured in a 3D torus topology, rather than as an array.

Supercomputers achieve their ability to process enormous amounts of data in very short amounts of time by in essence, hooking together a lot of processing boxes and then using a device to connect them all together, this is why the Gemini XE interconnect is so important; it's actually one of only two new pieces of proprietary hardware that will be added to create the new machine; the other is the Graphics Display Unit (GDU) co-processor (likely provided by Nvidia) that will help to perform calculations more quickly. This is also why computer scientists are so easily able to choose ahead of time just how fast a new computer will be; the more processor boxes you add, the faster the end result, so long as you have an interconnect that can handle them. The Titan will also use what is being described as "globally addressable memory," which means data won't have to slow down as it passes through I/O channels.

The Titan is expected to be used by the DOE to calculate complex energy systems and will cost the government somewhere in the neighborhood of \$100 million dollars.

### More information:

[computing.ornl.gov/SC10/docume ...](http://computing.ornl.gov/SC10/docume...)  
[Booth Talk Bland.pdf](#)

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APA citation: 20 petaflops: New supercomputer for Oak Ridge facility to regain speed lead over the Chinese (2011, March 23) retrieved 5 December 2021 from <https://phys.org/news/2011-03-petaflops-supercomputer-oak-ridge-facility.html>

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