Supercomputer basics

The most powerful computers used for research computing are known as “supercomputers”.

Supercomputers are made of...

- Today’s supercomputers are extremely large computer systems that are built out of many smaller computer processors, each of which is similar to the processor in a personal computer (PC) or laptop.

Beskow, PDC's Cray XC40

Supercomputing in Sweden

- The Swedish National Infrastructure for Computing (SNIC) coordinates academic supercomputers in Sweden.
- There are six academic supercomputer centres in Sweden - they are all members of SNIC.

SNIC Swedish National Infrastructure for Computing

Beskow vs PC

	Beskow	PC
Nodes	2060	1
Cores	67,456	4
Peak speed	2438 TFLOPS	0.15 TFLOPS
Memory	156,416 GB	16 GB
Energy consumption	775,000 W	200 W

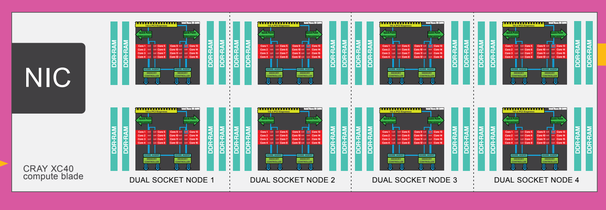
How supercomputers work

- All the processors in a supercomputer can work (doing computations) at the same time - this is known as parallel computing. By doing many calculations in parallel, a supercomputer can do things that require large numbers of computations much faster than a single-processor computer.
- Programs and code designed for single processor computers need to be modified so the calculations done by the program code can be run in parallel to take advantage of the large number of processors in a supercomputer.

Anatomy of a supercomputer

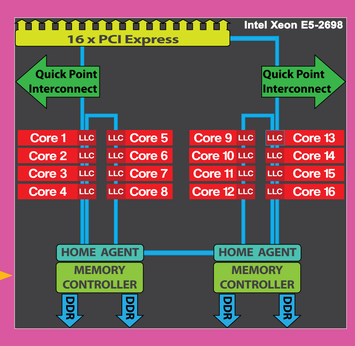
supercomputer system or cluster

cabinet or rack



blade

This blade has 4 nodes side by side. Nodes are individual computers that consist of one or more CPUs together with memory; in this particular case there are two CPUs in each node.



CPU

Individual processors are known as cores. Central Processing Units (CPUs) used to have a single core, so “core” and “CPU” were used interchangeably. Now CPU means the CPU chip which may contain several cores; in this example the CPU has 16 cores.

PDC Center for High Performance Computing SNIC