Overview of Supercomputer

**History of Supercomputer**

The term supercomputer refers to a computer that is leading the world in terms of processing capacity, particularly speed of calculation. Supercomputing started to take off in the 1960s, these were mainly developed by Seymour Cray at Control Data Corporation (CDC), and CDC led the market through the 1970s until Cray left to form his own company, Cray Research. Cray started to dominate the supercomputer market with new designs, holding the top spot in supercomputing for 5 years (1985–1990). In the 1980s a large number of smaller competitors entered the market. In a parallel to the creation of the minicomputer market a decade earlier, but many of these disappeared in the mid-1990s "supercomputer market crash". Today, supercomputers are typically one of a kind custom designs produced by traditional companies such as IBM and HP, who had purchased many of the 1980s companies to gain their experience.

**Modern architecture**

The top ten supercomputers on the Top500 list have the same top-level architecture. Each of them is a cluster of MIMD (Multiple **I**nstruction, Multiple Data) multiprocessors, each processor of which is SIMD (Single Instruction Multiple Data). The supercomputers vary radically with respect to the number of multiprocessors per cluster, the number of processors per multiprocessor, and the number of simultaneous instructions per SIMD processor.

**Challenges**

1. A supercomputer generates large amounts of heat and must be cooled. Cooling most supercomputers is a major HVAC (Heating, Ventilating, and Air Conditioning) problem.

2. A supercomputer that is many meters across must have latencies between its components measured at least in the tens of nanoseconds. In modern supercomputers built of many conventional CPUs running in parallel, latencies of 1-5 microseconds to send a message between CPUs are typical.

3. Supercomputers consume and produce massive amounts of data in a very short period of time. Much work on external storage bandwidth is needed to ensure that this information can be transferred quickly and stored/retrieved correctly.

**Common uses**

Supercomputers are used for highly calculation-intensive tasks such as problems involving quantum mechanical physics, weather forecasting, climate research, molecular modeling, and physical simulations.

**Future Development**

IBM is developing the Cyclops64 architecture, intended to create a "supercomputer on a chip". Meanwhile, IBM is constructing a 20 PFLOPs supercomputer at Lawrence Livermore National Laboratory, named **Sequoia**, which is scheduled to go online in 2011.

**References**

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