Flynn's classification of multiprocessors

Flynn proposed a simple model of categorizing all computers that is still useful today. He looked at the parallelism in the instruction and data streams called for by the instructions at the most constrained component of the multiprocessor,
and placed all computers in one of four categories:
1. ***Single instruction stream, single data stream*** (SISD)—This category is the uniprocessor.
2. ***Single instruction stream, multiple data streams*** (SIMD)—The same instruction is executed by multiple processors using different data streams. Each processor has its own data memory (hence multiple data), but there is a single instruction memory and control processor, which fetches and dispatches instructions. The multimedia extensions are a limited form of SIMD parallelism. Vector architectures are the largest class of processors of this type.
3. ***Multiple instruction streams, single data stream*** (MISD)—No commercial multiprocessor of this type has been built to date, but may be in the future. Some special purpose stream processors approximate a limited form of this (there is only a single data stream that is operated on by successive functional units).
4. ***Multiple instruction streams, multiple data streams*** (MIMD)—Each processor fetches its own instructions and operates on its own data. The processors are often off-the-shelf microprocessors. As discussed in the historical perspectives, many of the early multiprocessors were SIMD, and the SIMD model received renewed attention in the 1980s, and except for vector processors, was gone by the mid 1990s. MIMD has clearly
emerged as the architecture of choice for general-purpose multiprocessors.

Two factors are primarily responsible for the rise of the MIMD multiprocessors:
1. MIMDs offer flexibility. With the correct hardware and software support, MIMDs can function as single-user multiprocessors focusing on high performance for one application, as multiprogrammed multiprocessors running many tasks simultaneously, or as some combination of these functions.
2. MIMDs can build on the cost/performance advantages of off-the-shelf microprocessors. In fact, nearly all multiprocessors built today use the same microprocessors found in workstations and single-processor servers.