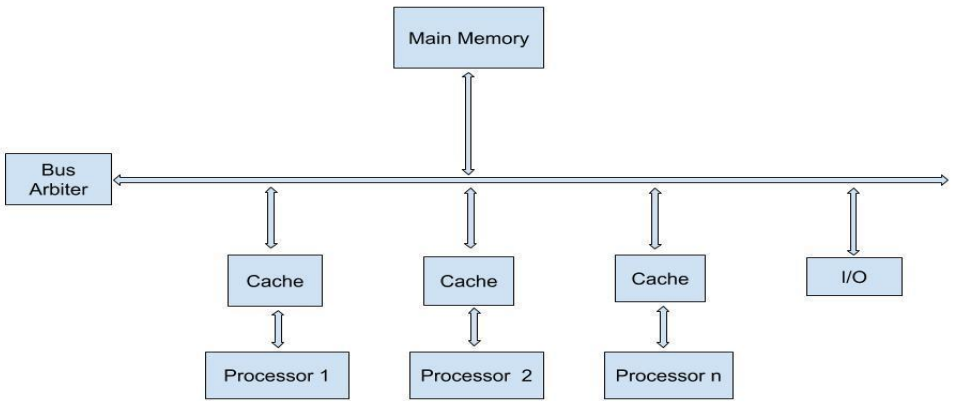
What is SMP (Symmetric Multi-Processing)?

Multiprocessing(MP), involves computer hardware and software architecture where there are multiple(two or more) processing units executing programs for the single operating(computer) system.
SMP i.e. symmetric multiprocessing, refers to the computer architecture where multiple identical processors are interconnected to a single shared main memory, with full accessibility to all the I/O devices. In other words, all the processors have common shared(common) memory and same data path or I/O bus as shown in the figure.



Main memory and data bus or I/O bus being shared among multiple processors in SMP

Characteristics of SMP

Identical: All the processors are treated equally i.e. all are identical.
Communication: Shared memory is the mode of communication among processors.
Complexity: Are complex in design, as all units share same memory and data bus.
Expensive: They are costlier in nature.

Applications

This concept finds its application in parallel processing, where time-sharing systems(TSS) have assigned tasks to different processors running in parallel to each other, also in TSS that uses multi-threading i.e. multiple threads running simultaneously.

Advantages

Throughput: Since tasks can be run by all the processors unlike in asymmetric, hence increased degree of throughput(processes executed in unit time).
Reliability: Failing a processor doesn't fail whole system, as all are equally capable processors, though throughput do fail a little.

Disadvantages

Complex design: Since all the processors are treated equally by OS, so designing and management of such OS become difficult.

Costlier: As all the processors share the common main memory, on account of which size of memory required is larger implying more expensive.

What is AMP/ASMP (Asymmetric Multi-Processing)?

An asymmetric multiprocessing (AMP or ASMP) system is
a multiprocessor computer system where not all of the multiple interconnected central processing units (CPU's) are treated equally. For example, a system might allow (either at the hardware or operating system level) only one CPU to execute operating system code or might allow only one CPU to perform I/O operations. Other AMP systems might allow any CPU to execute operating system code and perform I/O operations, so that they were symmetric with regard to processor roles, but attached some or all peripherals to particular CPU's, so that they were asymmetric with respect to the peripheral attachment. Asymmetric multiprocessing was the only method for handling multiple CPU's before symmetric multiprocessing (SMP) was available.