Throughput Encyclopedia Article

Throughput

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Throughput

Throughput refers either to (1) the number of operations that a computer or component of a computer can perform in a given period of time or (2) the speed with which **data** can be passed through a communications **channel**. There is no single, precise definition of throughput; rather, a range of definitions is adjusted to different uses.

First consider computer throughput. To give a precise meaning to "the number of operations which a computer or component of a computer can perform in a given period of time" one must first specify what is meant by an "operation." At the **hardware** level, this may be a single floating-point **operation** (i.e., the multiplication of two floating-point numbers); at the system level, it may be the completion of an entire program. Regardless of the sort of "operation" under consideration, computer throughput has units of operations per second. For a processor, millions of floating-point operations performed per second (MFlops) or millions of instructions executed per second (MIPS) are common measures of throughput. Throughput for entire systems is often measured by running benchmark programs (standard computing tasks). The complement of throughput is latency, the time that elapses from commencement of an operation (however defined) to the availability of its result. Shorter average latency means faster net throughput. In computer science, throughput is also referred to as bandwidth.

The throughput of a digital communications channel is the number of bits, characters, or words passing through that channel per second. Common units are millions of bits per second (megabits per second or Mbps) and billions of bits per second (gigabits per second or Gbps). Channel throughput has also been defined as the number of meaningful bits or other data units passing through a channel per second; in this usage, non-informative bits such as those used solely for framing purposes would not be counted.

It should be noted that in communications, in contrast to computer science, throughput and bandwidth are not equivalent. In communications, bandwidth is a frequency interval having units of cycles per second (Hertz)--a measure of the range of frequencies which a channel uses to communicate--whereas throughput is an performance measure having units of, say, bits per second. Bandwidth may be "wide" or "narrow"; throughput may be "low" or "high." A wide-bandwidth channel will often have high throughput, but not always. In spread-spectrum radio, for instance, a very-wide-bandwidth channel might have fairly low throughput (see entry for **Long-Distance Communication**).