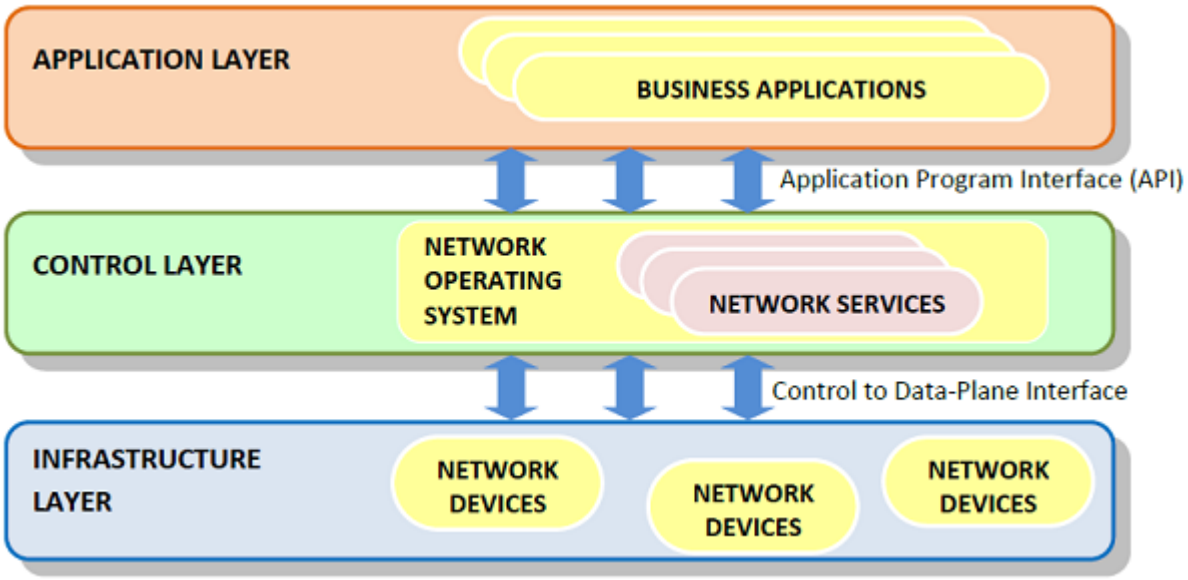
Network software, Performance

Network software:

- Helps to set up and install computer networks
- Enables users to have access to network resources in a seamless manner
- Allows administrations to add or remove users from the network
- Helps to define locations of data storage and allows users to access that data
- Helps administrators and security system to protect the network from data breaches, unauthorized access and attacks on a network
- Enables network virtualizations

SDN Framework

The Software Defined Networking framework has three layers as depicted in the following diagram −



- **APPLICATION LAYER** − SDN applications reside in the Application Layer. The applications convey their needs for resources and services to the control layer through APIs.
- **CONTROL LAYER** − The Network Control Software, bundled into the Network Operating System, lies in this layer. It provides an abstract view of the underlying network infrastructure. It receives the requirements of the SDN applications and relays them to the network components.
- **INFRASTRUCTURE LAYER** − Also called the Data Plane Layer, this layer contains the actual network components. The network devices reside in this layer that shows their network capabilities through the Control to data-Plane Interface.

Performance:

Performance of a network pertains to the measure of service quality of a network as perceived by the user. There are different ways to measure the performance of a network, depending upon the nature and design of the network. The characteristics that measure the performance of a network are :

- Bandwidth

- Throughput
- Latency (Delay)
- Bandwidth – Delay Product
- Jitter

BANDWIDTH

One of the most essential conditions of a website's performance is the amount of bandwidth allocated to the network. Bandwidth determines how rapidly the webserver is able to upload the requested information. While there are different factors to consider with respect to a site's performance, bandwidth is every now and again the restricting element.

Bandwidth is characterized as the measure of data or information that can be transmitted in a fixed measure of time. The term can be used in two different contexts with two distinctive estimating values. In the case of digital devices, the bandwidth is measured in bits per second(bps) or bytes per second. In the case of analogue devices, the bandwidth is measured in cycles per second, or Hertz (Hz).

Bandwidth is only one component of what an individual sees as the speed of a network. People frequently mistake bandwidth with internet speed in light of the fact that internet service providers (ISPs) tend to claim that they have a fast "40Mbps connection" in their advertising campaigns. True internet speed is actually the amount of data you receive every second and that has a lot to do with latency too.

"Bandwidth" means "Capacity" and "Speed" means "Transfer rate".

More bandwidth does not mean more speed. Let us take a case where we have double the width of the tap pipe, but the water rate is still the same as it was when the tap pipe was half the width. Hence, there will be no improvement in speed. When we consider WAN links, we mostly mean bandwidth but when we consider LAN, we mostly mean speed. This is on the grounds that we are generally constrained by expensive cable bandwidth over WAN rather than hardware and interface data transfer rates (or speed) over LAN.

Bandwidth in Hertz: It is the range of frequencies contained in a composite signal or the range of frequencies a channel can pass. For example, let us consider the bandwidth of a subscriber telephone line as 4 kHz.

Bandwidth in Bits per Seconds: It refers to the number of bits per second that a channel, a link, or rather a network can transmit. For example, we can say the bandwidth of a Fast Ethernet network is a maximum of 100 Mbps, which means that the network can send 100 Mbps of data.

Note: There exists an explicit relationship between the bandwidth in hertz and the bandwidth in bits per second. An increase in bandwidth in hertz means an increase in bandwidth in bits per second. The relationship depends upon whether we have baseband transmission or transmission with modulation.

THROUGHPUT

Throughput is the number of messages successfully transmitted per unit time. It is controlled by available bandwidth, the available signal-to-noise ratio and hardware limitations. The maximum throughput of a network may be consequently higher than the actual throughput achieved in everyday consumption. The terms 'throughput' and 'bandwidth' are often thought of as the same, yet they are different. Bandwidth is the potential measurement of a link, whereas throughput is an actual measurement of how fast we can send data.

Throughput is measured by tabulating the amount of data transferred between multiple locations during a specific period of time, usually resulting in the unit of bits per second(bps), which has evolved to bytes per second(Bps), kilobytes per second(KBps), megabytes per second(MBps) and gigabytes per second(GBps). Throughput may be affected by numerous factors, such as the hindrance of the underlying analogue physical medium, the available processing power of the system components, and end-user behaviour. When numerous protocol expenses are taken into account, the use rate of the transferred data can be significantly lower than the maximum achievable throughput.

Let us consider: A highway which has a capacity of moving, say, 200 vehicles at a time. But at a random time, someone notices only, say, 150 vehicles moving through it due to some congestion on the road. As a result, the capacity is likely to be 200 vehicles per unit time and the throughput is 150 vehicles at a time.

Example:

Input: A network with bandwidth of 10 Mbps can pass only an average of 12, 000 frames per minute where each frame carries an average of 10, 000 bits. What will be the throughput for this network?

Output: We can calculate the throughput as-
Throughput = (12, 000 x 10, 000) / 60 = 2 Mbps
The throughput is nearly equal to one-fifth of the bandwidth in this case.