Wireless Technologies in DataCenter Networks

The Introduction of 60GHz technology

Nowadays,the frequency spectrum of the wireless communication is faced with a tention situation,and the rate of the data transmit is becoming more and more fast day by day.So,the demand of the data transmit is needed to improve to become more efficient.In the following,I would introduce the communication that based on a frequency of 60GHz MMV.

The 60GHz communication has some advantage such as wide spectral range,high resolution ratio,high performance that pierce plasma,high velocity sensitivity,etc. At the same time,there also disadvantage as the barrier such as wall have a high attenuation to the MMV,as well as it make the 60Ghz communication has a high quality in safety and anti-interference ability in short-haul communication.And because of the absorption of oxygen to the 60Ghz signal,some signal adjacent to the space could not interference each other.So,in a word,how to lengthen the range of its transmission or how to reduce the attenuation is a big challenge of this project.

Additional bandwidth increases the channel capacity, but is not sufficient to enable high-speed communications for practical applications. Interoperable systems that can exploit the wide bandwidth at low cost are necessary. A specific challenge for 60 GHz is overcoming the (often severe) path loss from transmitter to receiver. The Friis equation is used to compute this effect:

$$P_r = \frac{P_t G_t G_r \lambda^2}{(4\pi R)^2}$$

where Pr is the received power, Pt is the transmitted power, Gt is the transmitter antenna gain, Gr is the receiver antenna gain, l is the wavelength, and R is the range from transmitter to receiver. Typically, WiGig systems will operate at 10 dB higher received power than IEEE 802.11n systems because the total noise power from the wider bandwidth is much higher. Furthermore, there is a loss of about 21 to 28 dB relative to the 2.4 and 5 GHz bands because of the shorter wavelength at 60 GHz. Some of these losses can be offset by reducing the maximum operating range. The remaining loss must be compensated for by increasing the antenna gain.

Luckily, high antenna gains with small antenna sizes are feasible at 60 GHz because, for a given antenna aperture, gain scales inversely with the square of the wavelength. For a perfectly efficient antenna system,

$$G = \frac{4\pi A_e}{\lambda^2}$$

where Ae is the effective aperture area. The small wavelength (roughly 5 mm) means that a 16-element array with half wavelength spacing will occupy a space of about 20 mm ￥20 mm.

The size of the antenna would become smaller as well as the frequency’s increasing,it means the antenna for the 60GHz would be very small.In another hands,the communication of 60GHz has a high directivity so that it should use antenna phased array(天线相控阵列) to improve its directivity and power.

A wide spectral range and a demand of a fast transmission make the 60GHz communication be much accounted of.Maybe in the future,it would be generally used in medical,media,even in the interstellar communication.