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Auto Negotiation



Definition - What does *Auto Negotiation* mean?

Auto negotiation is an Ethernet procedure that permits devices to exchange information about their abilities over line segments.

They allow devices to perform automatic configuration to achieve best modes of operations over links and provide automatic speed matching for multi-speed devices at each end of links.



Techopedia explains *Auto Negotiation*

Auto negotiation is an Ethernet procedure enabling two connected devices to choose common transmission parameters including duplex mode, speed and flow control. It was first defined in 1995 as an optional feature for 10 and 100 Mbps twisted-pair Ethernet media systems. The first step in the process is sharing capabilities such as the parameters by the connected devices and choosing the highest performance transmission mode supported by the devices. Auto negotiation in the OSI model resides in the physical layer. It was initially defined as an optional component in the fast Ethernet standard and is backward compatible with 10BASE-T. Later, the protocol was also extended in the gigabit Ethernet standard, which is necessary for 1000BASE-T gigabit Ethernet.

Auto negotiation protocol includes automatic sensing for a variety of applications and is based on pulses similar to those in 10BASE-T. The pulses detect connections to other devices and are transmitted by the devices when they are not sending or receiving data. These unipolar (positive-only) electrical pulses have durations of 100 ns with maximum pulse width of 200 ns generated at an interval of 16 ms and are referred to as normal link pulses.

Auto negotiation is performed using modified link integrity pulse so that no packet or upper protocol overhead is added. Every device capable of auto negotiation issues FLP (Fast Link Pulse) bursts during power up as per the command received from MAC, or due to user interaction. The basis for auto negotiation functionality is fast link pulses. The FLP burst is a sequence of 10Base-T normal link pulse, also referred to as link test pulses in 10Base-T systems. The pulses arrive together to form a word or message. Every FLP is composed of 33 pulse positions with 17 odd positions corresponding to clock pulse and 16 even numbered positions dealing with data pulse. Every clock position is essential to form a link pulse. The time between FLP burst is 16 /± 8 microseconds.

A successful auto negotiation process is as summarized below:

- Two link partners transmit Fast link pulse burst enclosing link code words without acknowledge bit set.
- Station identifying one another as auto negotiation able within 6 to 17 pulses of initial received FLP burst.
- After the able identification, the station waits to receive 3 consistent, complete and consecutive FLP bursts.
- Station enters acknowledge detect state and starts transmitting FLP bursts holding link code words within acknowledge bit set.
- After receiving 3 complete, consecutive and consistent FLP bursts holding a set of acknowledge bit, the station further enters complete acknowledge state and transmits 6 to 8 FLP bursts enclosing link code words within acknowledge bit set.
- After the transmission of 6 to 8 FLP burst, the station then participates in next page exchange, which is optional.
- After completion of next page exchange, stations resolve HCD.

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After completion of next page exchange, stations receive TDS technology and negotiate to the link if it is supported. On the contrary, if no common technology is shared, no links are established.

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