
ethernet Ethernet without hubs

Posted by Alex Holt - 2008/05/12 23:15

I know Ethernet is a shared media protocol, for example the original 10Base2 bus LAN's, but all modern implementations of ethernet LAN's use twisted pair cabling, and hubs/switches creating a star topology network. My question is: Is it possible to use twisted pair cabling to create an ethernet LAN without a hub? (of more than 2 devices, not just using Xover cable) Theoretically, the ethernet protocol can do this, but I'm wondering if there are limitations in the network adaptors that would stop this working. I'm asking as I'm thinking of using ethernet to connect some embedded devices, and being able to daisy-chain them using twisted pair would be ideal. Slightly obscure question, any theories welcome, especially if someone wants to massacre some network cards and cable and actually do it :)

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Posted by glen herrmannsfeldt - 2008/05/12 23:15

I know Ethernet is a shared media protocol, for example the original 10Base2 bus LAN's, but all modern implementations of ethernet LAN's use twisted pair cabling, and hubs/switches creating a star topology network. My question is: Is it possible to use twisted pair cabling to create an ethernet LAN without a hub? (of more than 2 devices, not just using Xover cable) Theoretically, the ethernet protocol can do this, (snip) The theory of UTP ethernet is different than of coaxial ethernet. It would be possible with the appropriate transceiver and for much more limited distances than coax, to run a shared ethernet over a single pair of a twisted pair cable. The resistance and impedance tolerances would be much tighter than 10baseT. Coaxial ethernet collision detect is very different from 10baseT, and it is that difference that prohibits what you want to do.

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Posted by Albert Manfredi - 2008/05/12 23:15

My question is: Is it possible to use twisted pair cabling to create an ethernet LAN without a hub? (of more than 2 devices, not just using Xover cable) Theoretically, the ethernet protocol can do this, but I'm wondering if there are limitations in the network adaptors that would stop this working. I'm asking as I'm thinking of using ethernet to connect some embedded devices, and being able to daisy-chain them using twisted pair would be ideal. So it follows from the above that for 10 and 100 Mb/s Ethernets, it's not so easy to create a bus system with twisted pair cabling. But maybe one possibility would be to design something that works like 10BASE-2 to run over twisted pair. Each transmitter would be a current source, so that a transmitting host would not create a low impedance drain on another host attempting to transmit at the same time. A collision would be detected by a higher than normal voltage on the line, as collisions are detected in 10BASE-2. I think the biggest problem with this approach is that cable impedance must be very predictable and very uniform throughout, or you'll end up with false collisions or undetected collisions and everything will fall apart. That's an advantage of coax over twisted pair. But regardless, this is *not* 10BASE-T, so it won't work with 10BASE-T or 100BASE-TX NICs. 10BASE-T and 100BASE-TX NICs expect the transmit and receive functions to be conducted on their own, separate copper pairs. I suppose you could use an entirely different approach, like RS-485. But what about 1000BASE-T? 1000BASE-T operates over 4 *bidirectional* twisted pair interfaces, using a 5-level AM scheme for each pulse (the equivalent of two bits of data transmitted over each pulse, over each of the twisted pairs). Reading through Clause 40 of IEEE 802.3, it would seem that at some superficial level, a shared bus might actually be possible. But the system is a master-slave design, with a lot of handshaking going on between master and slave, and the interface is never silent. So again, trying to force-fit this into a shared bus among multiple hosts is not going to be straightforward. Still, it's an intriguing question, now that 1000BASE-T has changed the way the twisted pair media in Ethernet work. Bert

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Posted by Rich Seifert - 2008/05/12 23:15

Still, it's an intriguing question, now that 1000BASE-T has changed the way the twisted pair media in Ethernet work. It hasn't changed the way twisted-pair media work for Ethernet. The only reason for combining transmit/receive onto the same pairs was to avoid requiring *eight* pairs (four in each direction), or having to use an even more complex coding scheme to get 1 Gb/s onto only two pairs.

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