IEEE 802.12 GIGABIT LAN

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INTRODUCTION

Two new 100 Mb/s LAN standards were ratified by the IEEE in July 1995, IEEE 802.3u and IEEE 802.12 [1,2]. These new 100 Mb/s standards were designed to provide an upgrade path for the many 10's of millions of 10BASE-T and Token Ring user's world wide. Both of the new standards support installed customer premises cabling, existing LAN management and application software.

During the development of IEEE 802.3u and IEEE 802.12 Ethernet switching also gained momentum as a method for increasing network capacity. Switched based LANs are now being standardized by the IEEE. The acceptance of the new 100 Mb/s shared media access LAN technologies is indicated by market estimates that during 1995, 25% of all network interface cards (NICs) were 100 Mb/s cards. International Data Corporation (IDC) has also estimated that 2 million Ethernet LAN switch ports were shipped during 1995.

IEEE 802.3 and IEEE 802.12 have both initiated projects to develop gigabit per second LANs initially as higher speed backbones for the 100 Mb/s systems. This paper will describe the status of the IEEE 802.12, gigabit per second LAN.

DEMAND PRIORITY SUMMARY

Demand priority is a new protocol that was developed for IEEE 802.12 [3]. It combines the best characteristics of Ethernet (simple, fast access) and Token Ring (strong control, collision avoidance, and deterministic delay). Control of a demand priority network is centered in the repeaters and is based on a request/grant handshake between the repeaters and their associated end nodes. Access to the network is granted by the repeater to requesting nodes in a cyclic round robin sequence. The round robin protocol has two levels of priority, normal and high priority. Within each priority level, selection of the next node to transmit is determined by its sequential location in the network rather than the time of its request. The demand priority protocol has been shown to be fair and deterministic. IEEE 802.12 transports IEEE 802.3, Ethernet and IEEE 802.5 frames.

CASCADED DEMAND PRIORITY NETWORKS

The basic topology of a Demand Priority network is a star configuration equivalent to 10BASE-T. Each repeater has at least two local ports and may have an optional cascade port for connection to a higher level repeater. A network can contain up to five levels of repeaters in a cascade. Network diameters of up to 4 km are easily supported.

Campus backbone links of up to 2 km in length incorporate multimode fibre and LED based optical transceivers operating at a wavelength of 1300 nm. Within buildings, backbone links with lengths of up to 500 m may use the 1300 nm, LED transceivers or lower cost LED transceivers operating at a wavelength of

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850 nm. UTP category 3,4 or 5 or STP links having lengths of at least 100 m are supported in for desktop connections. All 10BASE-T configurations are supported[2,4].

SCALABILITY OF DEMAND PRIORITY: BURST MODE

The Demand Priority MAC is not speed sensitive. As the data rate is increased the network topologies remain unchanged. However, since Ethernet or Token Ring frame formats are used the efficiency of the network would decrease with increased data rate. To counteract this a packet burst mode[5] has been introduced into the demand priority protocol. Burst mode allows an end node to transmit multiple packets for a single grant. The new packet burst mode may also be implemented at 100 megabits per second as it is backwards compatible with the original MAC. Analysis indicates that minimum efficiencies of 80% are possible at 1062.5 MBaud.

HIGHER SPEED REPEATER AND SWITCHED BASED NETWORKS

Higher speed IEEE 802.12 will support both shared media access networks and switched based networks. Repeater based networks offer simple low cost implementations. The higher speed repeaters could be used to connect IEEE 802.12 repeaters, switches or end nodes in a cascaded topology. However, the bandwidth of shared repeater based LANs must be distributed between all end nodes.

Switches can offer higher network capacity and full link rate bandwidth to each end node. However, the implementation cost is higher and system management more complex compared to a shared network.

HIGHER SPEED IEEE 802.12 PHYSICAL LAYERS

Higher speed IEEE 802.12 will leverage some of the physical layers and control signaling developed for Fiber Channel. The Fibre Channel baud rates leveraged by IEEE 802.3 are 531 MBaud and 1062.5 MBaud.

Multimode fibre and short wavelength laser transceivers will be used to connect repeaters or switches separated by less than 500m within buildings. Single mode fibre and laser transceivers operating at a wavelength of 1300 nm will be used for campus backbone links. It has been shown that FC-0 and FC-1 can be used to support an IEEE 802.12 MAC or switch port[6].

Desk top connections at 531 MBaud over 100m of UTP category 5 will be supported by a new physical layer under development in IEEE 802.12. The physical layer will utilize all pairs of a four pair cable. The proposed physical layer incorporates a new 8B3N code and provides a continuously available reverse channel for control. There is no requirement for echo cancellation which simplifies the implementation. Potential for class B radiated emissions compliance has been demonstrated[7].

CONCLUSION

The proposed Higher speed IEEE 802.12 LAN standard is well developed. Many of its key features have been proposed and verified. Simulations have shown that minimum efficiencies of 80% are possible in shared media implementations. GBaud shared or switch networks are based on multimode or single mode optical fibre physical layers. FC-0 and FC-1 are highly leveraged to support an IEEE 802.12 MAC or switch port at 1062.5 MBaud in a cost effective manner. A new UTP category 5 physical layer will support desk top connections of up to 100m length at a baud rate of 531 MBaud.

The first target application of higher speed IEEE 802.12 is as a higher speed backbone for the 100 megabit IEEE 802.12 systems.

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