Short Packet Transfer Performance in Local Area Ring Networks

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Abstract

The performance of various access control protocols for bit-serial local area computer network (LACN) rings is studied. Applications in which message packets are of fixed length and shorter than the total inherent propagation delay around the ring are the focus of attention. Token, slotted, and static and dynamic insertion rings are included in the study. In all cases, the transmitting station is responsible for removing its transmitted packet from the ring. Under this type of removal rule, it is possible for the stations of all types of ring structures to execute their access control algorithms with only a short fixed in-line delay in each station. The insertion rings dynamically switch longer delays (insertion registers) into the ring when they are transmitting a packet. The transmitter-remove rule operates in such a way that hogging of the ring transmission facility by a subset of stations cannot occur. Expressions that approximate average transfer time as a function of utilization are derived for all ring types and are check by simulation. The expressions are found to be quite accurate at low ring utilization levels, which is the case of most importance for LACN's; but some of them exhibit significant errors at high utilization levels. For the assumed short-packet environment, it is found that token rings exhibit the slowest transfer times, while dynamic insertion rings are fastest.