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A SIMULATION STUDY ON A SINGLE-LINK, MULTIPLE-LAP PROTOCOL

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Within the recent study period a large amount of work has been done by CCITT in developping the recommendations for the Integrated Services Digital Network (ISDN) [1].

One of the most essential items of the ISDN is the specification of the user-network interface which is represented either by the basic access consisting of two B-channels with a transmission speed of 64 kbit/s each and a D-channel with 16 kbit/s or the primary rate access consisting of n B-channels (64 kbit/s each; in general n=30) and a D-channel with 64 kbit/s. Partitioning of the overall bandwidth of the transmission line into channels is achieved by time division multiplexing. The B-channels are used for the transmission of voice and data either separately and independently or in combination to achieve a larger bandwidth while the D-channel's main task is the transport of signalling information for the use of the B-channels. Besides this main task and in consideration of the relatively small amount of signalling information in the average of time, slow packetized data transfer will be done via the D-channel.

This paper deals with a simulation study of the layer 2 of the D-channel protocol. We shall concentrate on the basic access as the protocol for the primary rate access is only a subset of the former one. The reference configuration for the protocol is shown by Fig. 1.

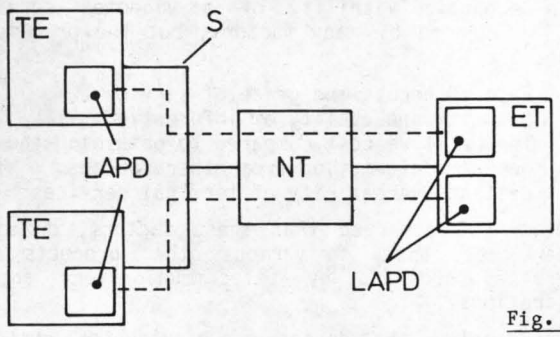

Fig. 1

A number of terminals (TE, Terminal Equipment) are connected to the network termination unit (NT) via the S-interface. Contention resolution is achieved by a CSMA/CD mechanism on the D-channel. This mechanism is controlled by the NT via a D-echo-channel.

For the case of basic access being considered here NT is transparent for the layers above layer 1. So signalling connections will exist between the terminals and the local exchange (ET, Exchange Termination).

Each signalling connection in layer 2 consists of a pair of LAPD processes in TE and ET respectively. LAPD is specified similarly as LAPB in X.25 level 2 [2] with a window size of 1. In general in every active TE only one LAPD process exists which implies that in ET there are as many LAPD processes as there are active TEs. All these connections are multiplexed onto a single D-channel. If they would produce a stationary load, results from throughput investigations for X.25 level 3 could be used [3] as multiplexing mechanisms are quite similar there.

What is essential in the D-channel protocol is not maximum throughput for signalling messages but short call setup times.

For each incoming or outgoing call a signalling connection has to be established before signalling message transfer is achieved. Especially in the case of an incoming call every terminal being able to accept that call will establish a logical link nearly at the same time before responding by means of signalling packets. So a very dynamic behaviour can be observed which is controlled by the layer 3.

The simulation study will concentrate on investigations of the call setup time which is influenced by

- number of TEs responding
- basic load of low-rate packetized data
- transmission speed of the D-channel
- processing delays
- error rate in the channel

References:

[1] CCITT, Draft Recommendations I.110 .. I.464 (1984)

[2] CCITT, Recommendation X.25 Yellow Book (1980)

[3] W.Dieterle, A Simulation Study of CCITT X.25 ...; Proceedings 10th ITC (1983)