IMPACT OF SATELLITE TECHNOLOGY ON TRANSMISSION PROTOCOLS

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ABSTRACT

Satellite links offer interesting possibilities: broadcasting and very high data-rate. However, they also have a long propagation delay, and "not very well known" error rate characteristics.

Theoretical studies and simulations have shown that "classic" protocols like HDLC are not convenient for high speed transmission through a satellite link. They have very large CPU load and buffering requirements, while having, under some circumstances, a poor efficiency.

Guidelines for the design of protocols adapted to this communication media are then presented.
1 - INTRODUCTION

A transmission protocol aims at ensuring a "safe" exchange of Data Units (e.g. messages, frames,...), in an efficient way.

A safe exchange means that D.U. are delivered without errors, in the right order, at the right speed. An error detection/correction procedure allows to recover any transmission error. A flow-control procedure allows the receiver to slow down, if necessary, the production of D.U. by the sender.

An efficient protocol will not make any undue consumption of ressources (e.g. transmission bandwidth, CPU, memory size). It will keep the delivery delay as short as possible.

When using a local area network, very simple protocols, based on positive acknowledgments, can be designed. More sophisticated protocols, such as ISO HDLC, have been designed to be used on long haul ground lines.

We will discuss HDLC error control and flow control mechanisms, compute their efficiency in terms of bandwidth consumption, memory size needed and mean delivery time, then try to suggest, when necessary, new solutions.

2 - HDLC

HDLC is the standard line-level protocol defined by ISO. It is bit-oriented and flags are used for frame delimitation. A 16 bit CRC transmitted along with each frame is used for error detection. Frames in error are ignored by the receiver.

Information frames are numbered, either modulo 8, or modulo 128 [extended numbering]. The sender can transmit up to X unacknowledged frames, X being a number called the "frame-window", (X is less than 8 or than 128, depending on the numbering space).

The receiver can detect lost frames if the difference between the number of two frames received consecutively is not equal to 1.