

“ATM traffic management and multiple access in a wireless LMDS access network”

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In a context of deregulation of the telecommunication's market, numerous LMDS (*Local Multipoint Distribution Service*) wireless cordless systems are under deployment in Europe. Our paper refers to the specific case of the French market for which two frequency bands are considered: 3.5 GHz and 26 GHz. The former is dedicated to the residential or SOHO market whereas the latter is dedicated to SMEs. At the end of July 2000, the French Telecommunication regulation authority (ART) will attribute two national and 44 regional LMDS operator's license.

Two standards are under definition for LMDS: LMDS-DAVIC and LMDS-ETSI for the North American market and for the European market respectively. The LMDS radio interface is almost totally defined and common to these two draft standards. Thus, both approaches are based on a FDD (*Frequency Division Duplexing*) technique. Although both standards assume end-to-end ATM connections via the LMDS local loop, many aspects of the medium access control (MAC) layer remain open to discussion, some of them being let to the manufacturer's initiative. In the context of LMDS-DAVIC which is today the only approach really implemented in available equipment, we propose specific mechanisms within the MAC layer in order to satisfy QoS guarantees to different kinds of ATM connections.

The LMDS base station or AIU (*Air Interface Unit*) broadcasts ATM cells in MPEG2 frames in the downstream direction to the NIUs (*Network Interface Units*) located at the customer premises. In the upstream direction, a MAC protocol aims at a fair and efficient share of the available bandwidth between the active ATM connections. Essentially, two types of data slots are defined for the upstream frames: the CS (or contention) slots and the RS (or reserved) slots. CS slots may be accessed simultaneously by different NIUs by mean of a contention resolution (CRA) algorithm. A NIU may reserve RS slots by mean of a CS slot from the AIU. According to LMDS-DAVIC recommendations, bandwidth is reserved by a NIUs on the basis of the peak cell rate (PCR) of the considered connection. As soon as an RS slot is detected as unused by the AIU, the AIU interrupt the automatic generation of RS slots for that specific connection. We propose to use the same contention resolution algorithm as in the INMARSAT satellite network. In addition, we propose to eventually merge successive bursts belonging to a same connection in order to alleviate the use of the CRA algorithm. Two types of ATM connections are specifically considered for the performance evaluation of our protocol: RT-VBR (real time Variable Bit Rate) for voice traffic and GFR (Guaranteed Frame Rate) for TCP/IP flows. In a first step, we determine the efficiency of the CRA algorithm. We then investigate the capacity of an LMDS cell in terms of voice calls, and then in terms of TCP/IP connections. We conclude our paper by the analysis of the multiplexing of these both kinds of traffic within each NIU.