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NEW ALGORITHM FOR ADAPTIVE RETURN CHANNEL IN VSAT NETWORKS

Abstract

A VSAT (Very Small Aperture Terminal) network is a point to multipoint communications network over Satellite, connecting a central earth station (hub) to multiplicity of remote terminals (VSATs). Since the introduction of the Ka-band to satellite communications, adaptive transmission has become a basic requirement. Both the hub and the VSAT are required to change their ModCod (Modulation and Code rate), and, in case of the VSAT, transmitted symbol-rate too, when link condition (SNR) changes. However, there is a fundamental difference between common implementations of adaptive forward channel (hub to VSATs) and those of adaptive return channel (VSATs to hub). The forward channel, e.g. the DVB-S2 standard, is flexible in the sense that it could be adjusted to the commutative distribution of optimal ModCods over the whole VSAT population. Thus not only each unicast transmission to any specific VSAT is adaptive, but also the whole forward channel is. In contrast, in common TDMA VSAT systems, e.g. the DVB-RCS standard, each specific VSAT transmission could be adaptive, but the whole return channel is not. Reason for this is that in order to minimize signaling traffic in the forward channel, the hub pre-signals to the VSATs a periodic structure, called time-frequency plan, which defines a fixed set of time-slots for potential VSAT transmissions, each time-slot of certain Symbol-rate and ModCod, and in real-time, it only signals the index of one or more pre-defined time-slots for each VSAT transmission. Consequently, when large portion of the links experience SNR changes, the pre-defined time-slots distribution may not fit to the commutative demand, part of the return channel becomes over-utilized, while another becomes under-utilized. Thus network utilization is degraded unless the whole return channel is adaptive.

In this paper we describe few developments in this area, including the recently published DVB-RCS2 standard, which attempt, and achieve to some degree adaptive return channel. Then we present a new algorithm that achieves adaptive return channel in full, in a sense well-defined. A special variant of the algorithm, which adapts symbol-rates onlyt, but not ModCods, provides additional advantage: Total throughput of the return channel remains fixed, under any SNR distribution. The algorithm, which is patented in the USA (US Patent 8,897,207 "Method for Fade Mitigation in a Satellite Communication Network") and patent pending in Europe (EU patent application 10250486.7), was developed by Gilat Satellite Networks, and as such is unique in today's VSAT industry.