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A HIGHLY EFFICIENT MULTIPLE ACCESS SYSTEM FOR SATELLITE INTER NETWORKING APPLICATIONS

Abstract

Geostationary communication satellites have the potential to provide massive amounts of information over large geographical areas. About 120 GHz of transponder capacity is already provided by some 35 satellite operators. Augmentation of existing satellite broadcast networks with return links from the individual users, allowing interactive communication, is the next step in the evolution of satellite networks. Consequently, the capacity of satellite networks will make another quantum leap. However, the capacity of a single satellite is limited by two fundamental facts: The available electromagnetic spectrum. The limitations on launch mass. The first factor is a natural resource, which must be used as efficiently as possible. The second is a function of technology and is under control (within certain limits) by humans.

Efficient use of the limited electromagnetic spectrum calls for a throughput approaching 100 % in the Multiple Access (MAC) uplink channel. It is known that the slotted Aloha-MAC scheme approaches 36.8 % throughput, but at this point the average delay approaches infinity. Some improvements in throughput are possible by applying the tree algorithm introduced by Capetanakis The throughput approaches 43 % (or 0.43 packets per slot).

The bottleneck in satellite communications is to provide efficient access towards the satellite from a very large customer population. Multiple access is the challenge in modern satellite communication and is a key-technology for a commercial success.

The subject of this paper is introduce a concept using satellite on-board processing techniques to achieve a very efficient multiple access system approaching a throughput of 100

After an initial discussion of multiple access techniques, network information theoretical results are reported to indicate the fundamental limits. A more detailed analysis of established multiple access, ALOHA, provides an understanding of the performance limits and ways for improvement. A discussion of implementation issues completes this paper.