Architecture for Efficient Networking of Satellite and Terrestrial Networks

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Low earth orbit satellite systems are designed for specific applications in mind. For example, Iridium services mobile phone users and Teledesic is being designed for high-speed data communications using small (even mobile) earth and air/sea-borne terminals. Inevitably, in the future, they will be interconnected with other terrestrially-based networks to form a multi-purpose integrated heterogeneous network of global extent. This paper addresses architecture designs for efficient data communications over such LEOS, MEO and GEO systems and especially when they are interconnected with terrestrial fiber and wireless systems to form a heterogeneous global Internet. There are three main components to this research:

1. Adaptive power and rate control techniques for the LEOS systems over time-varying satellite channels to achieve greatly improved (an order of magnitude) data throughputs.

2. Efficient routing algorithms over a time-varying integrated and heterogeneous global network for maximum resource utilization, especially the space segments.

3. Efficient congestion control algorithms at the transport and network layers for an integrated satellite/terrestrial network