

UV aided ad hoc wireless networking using mobile backbones

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Abstract

Architectures, protocols and algorithms are developed for the operation of mobile ad hoc wireless networks through the dynamic formation of backbone networks. Backbone capable nodes (BCNs) are elected to act as backbone nodes (BNs). The latter form a backbone network (Bnet) and manage access networks (Anets) that provide wireless access to client entities, including energy resource limited sensor devices and communications terminals. Our developments of such mobile backbone networks (MBNs) include the following elements: a. Efficient and distributed topology synthesis algorithms that provide for the dynamic formation of the backbone network; b. On-demand routing algorithms that use congestion and flow control schemes to ensure the support of multimedia flows at high quality-of-service levels; c. Cross layer and adaptive rate and coding operations; d. Use of multiple radio modules in forming mesh backbones for the operation of interconnected wireless local area networks (WLANs); e. Energy aware MBN based routing operations; f. Power control spatial reuse cross-layer medium access control (MAC) algorithms; g. Directional antennas based MAC schemes; h. Use of autonomous unmanned vehicles (UUVs and UGVs) to aid the construction, repair and operation of a multi-tier MBN based wireless network system that includes C4ISR elements.