

Scalable Lunar Surface Networks and Adaptive Orbit Access

For wireless networks with intermittent links

Teranovi Technologies, Inc., has developed innovative network architecture, protocols, and algorithms for both lunar surface and orbit access networks. A key component of the overall architecture is a medium access control (MAC) protocol that includes a novel mechanism of overlaying time division multiple access (TDMA) and carrier sense multiple access with collision avoidance (CSMA/CA), ensuring scalable throughput and quality of service. The new MAC protocol is compatible with legacy Institute of Electrical and Electronics Engineers (IEEE) 802.11 networks. Advanced features include efficiency power management, adaptive channel width adjustment, and error control capability.

A hybrid routing protocol combines the advantages of ad hoc on-demand distance vector (AODV) routing and disruption/delay-tolerant network (DTN) routing. Performance is significantly better than AODV or DTN and will be particularly effective for wireless networks with intermittent links, such as lunar and planetary surface networks and orbit access networks.

Applications

NASA

- ▶ Lunar and planetary exploration
- ▶ Orbit access communications
- ▶ Satellite communications
- ▶ Deep-space communication networks

Commercial

- ▶ Long-distance networking
- ▶ Military battlefield communication networks
- ▶ Mesh networks (IEEE 802.11 and 802.16) and their integrated systems



Phase II Objectives

- ▶ Enhance IEEE 802.11 MAC on a reconfigurable radio
- ▶ Design and implement TDMA overlaying CSMA/CA
- ▶ Design and implement advanced MAC features, including power efficient scheduling, adaptive channel width adjustment, error control capability, and standard compatibility support
- ▶ Enhance and implement hybrid routing for AODV/DTN
- ▶ Integrate MAC and routing on an embedded PC and test the prototype system in field trials

Benefits

- ▶ Reconfigurable
- ▶ Adaptive
- ▶ Efficient
- ▶ Reliable

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