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Strengthening Real Time Communication Support In Wireless Networks

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Overview

In a distributed real-time wireless communication system the timely delivery of data in the presence of interference and competition for the medium is a key requirement. Typically this is addressed by employing time division multiple access style approaches.

The modification of a transmission schedule in such a system – to support an additional transmission e.g. a retransmission or a sporadic message requires the consensus of participating hosts.

Reaching this consensus may in turn require the exchange of a number of messages, resulting in high latency for messages of failed transmission and may result in the missing of real-time deadlines.

Real-Time Communication

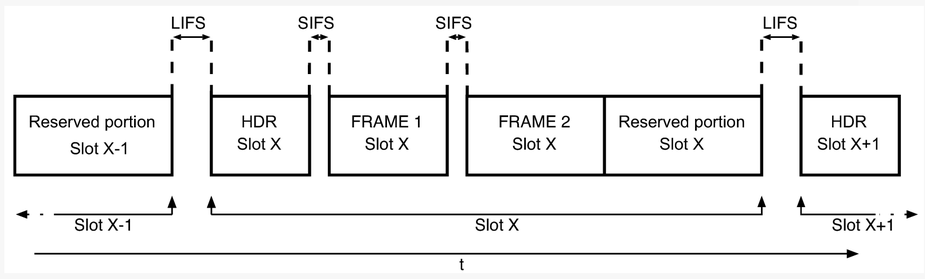
The wireless environment is fundamentally different in characteristics to a wired network, where we can assume a high level of link and device reliability. These differences require a fresh approach to access control to the medium.

Issues we seek to address include dealing with effects of interference as well as issues of dynamic membership as a result of mobility of stations and support for sporadic messages.

With these issues in mind we propose a new approach to medium access control based on a hierarchical control of medium access.

Slot Arrangement

Individual slots are separated by a long interframe space (LIFS) in order to allow for variations in clock synchronisation. Transmissions originating from individual hosts only need to separated by the short interframe space (SIFS). This minimises idle time on the medium.



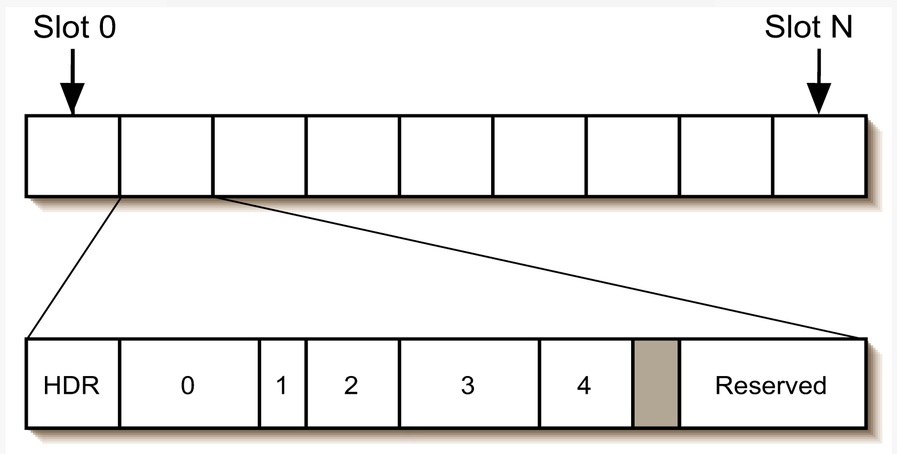
Hierarchal Distributed TDMA

We propose a TDMA-style medium access control with decentralised slot management. This slot management may be based on group communication and involve consensus among hosts.

Individual slots are subdivided into three portions: A header used to disseminate state information and membership requests, a set of data transmissions, and an unallocated portion that may accommodate possible retransmissions or sporadic messages.

In summary:

- Multiple transmissions within a slot
- Variable number of transmissions of varying length
- Mix of acknowledged/unacknowledged transmissions
- Contents of each slot is locally managed



Localised Decisions

By considering links to neighbouring hosts to be statistically independent, we exploit the ability to schedule and reorder the transmission queue locally.

Under bursty error channel conditions, it is better to defer transmissions to an effected host. With this knowledge, the transmission queue can be reordered, postponing transmissions to effected hosts while continuing transmission to others. This maximises the success of transmissions and minimises the number of retransmissions.

Retransmissions and sporadic messages can be accommodated by using the small recovery portion of the slot.

Further Information

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