Considerations Regarding Medium Characteristics and Capture Effect

Submitted by: Larry Van Der Jagt
Knowledge Implementations, Inc.
32 Conklin Road
Warwick, NY 10990
Voice: 914-986-3492    Fax: 914-986-6441

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A considerable body of work has recently been published [1-4] that updates the
historical performance projections for Slotted ALOHA access control methods
taking into account capture effect. The results of these papers in conjunction with
the work on channel characterization that has been already presented to the
committee by variety of contributors (Maslied, Van Der Jagt, Mckown, Aschatz,
Tuch, and to IEEE 802.4.L Rappaport) make a strong case for seriously evaluating
Slotted ALOHA as an important alternative in any contention based portion of any
access control proposal currently before IEEE 802.11.

In particular, it is has been well documented that signal strength will vary
significantly over distances on the order of inches in the indoor environment. This
means that signal level (or any other locally derived indicator that the medium is
being used) at a station is not a reliable indicator of either:

1) The probability that the station desiring access to the medium will not be able to
successfully transfer a PDU to its destination

or,

2) That by using the medium the station will interfere with the transmissions that
are already in progress.

In the presence of strong capture effect in a PHY layer that will enhance the
probability of successful PDU transmission possibly even in the presence of small or
negative signal to interference ratios, and adaptive power control among
participating stations, the usefulness of the above two statements is further
enhanced.

A laymans example of this is the "cocktail party" scenario. At a cocktail party many
groups of individuals are typically involved in simultaneous conversations that are
made possible by local capture effect and the adaptation of individual voice levels to the surrounding noise environment. If in this situation if a particular individual or group of individuals waited for silence (or anything reasonably close to silence) prior to attempting to communicate it is clear that opportunities for communication that could have been successful would be lost.

Given that any allocation of spectrum to our efforts is contingent on our using that spectrum as efficiently as possible (with efficiency denoted in Megabits/second/cubic hectare/Hz) the content and conclusions of these references should be carefully considered in our work.


