

TF-CSMA/CA

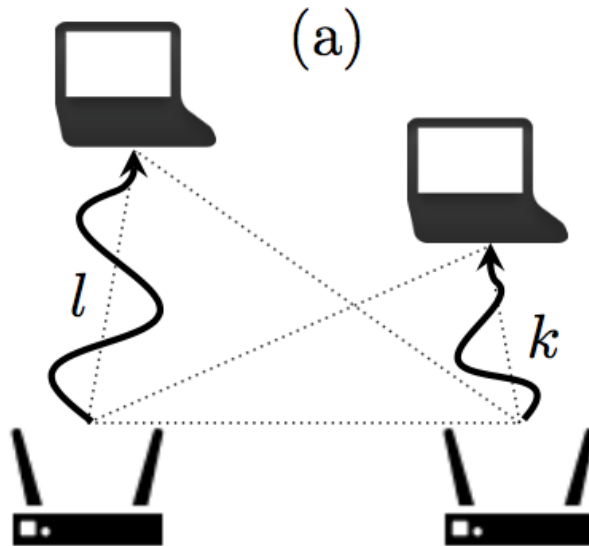


Figure 1: Decentralized scheduling algorithm that adjusts both time and frequency access intensities in a random-access fashion.

Description

It has been shown that flexible channelization, whereby wireless stations adapt their spectrum bands on a per-frame basis, is feasible in practice. We propose TF-CSMA/CA, an algorithm for flexible channelization that schedules packets in time and frequency domains. TFCSMA/CA is a simple extension of the CSMA/CA protocol used by IEEE 802.11. Contrary to previous channelization schemes, it is entirely distributed and it reacts only to packet collisions, successful transmissions and carrier sensing. With TF-CSMA/CA, when a station is involved in a collision, it performs backoff both in the time domain (increasing the durations between its packet transmissions) and the frequency domain (decreasing its frequency bandwidth and consuming less spectrum).

Advantages

TF-CSMA/CA is, to the best of our knowledge, the first system that provides self-organisation of spectrum access in time and frequency domains to the MAC layer. If deployed, it will result in higher frequency re-use and spatial re-use compared to current WiFi norms, resulting in better spectrum usage overall.

Furthermore, it maintains the delay and jitter incurred by CSMA/CA very small, maintaining good fairness of access across stations, not only in terms of throughput but also in terms of delay. We are convinced that solutions of this kind represent a clear way of further increasing the efficiency of future WiFi norms beyond WiFi 6.

Applications

- Local area wireless networks
Improvements of future WiFi norms
- Improvements of proprietary wireless access protocols
- Improvement of wireless networks with flexible channelization capabilities (e.g. SDRs).

Ref. Nr

6.1618

Keywords

WiFi Networks.
IEEE 801 channel access protocol.
Time-frequency Multiple Access.

Intellectual Property

US Patent [US10321488B2](#) granted

Publications

Herzen, Julien, et al.
"CSMA/CA in Time and Frequency Domains" 2015 IEEE ICNP, 2015.

Date

06/02/2023