A NOVEL FULL-DUPLEX PROTOCOL FOR HIGH PERFORMANCE WLANs

Abstract

Wi-Fi products have been widely deployed around world with the facts of more than three billion Wi-Fi devices estimated to be shipped in 2017 and more than eight billion Wi-Fi devices currently in use in order to satisfy the fast growth in user demands on data communications through, for example, home/enterprise networks, services for the public (e.g., airports, aircrafts, train stations, shopping centers etc.), augmented/virtual reality (AR/VR) and IoT, and so on. Dense deployment of Wi-Fi devices and potential high demands on data throughputs per device as well as short latency require advanced Wi-Fi systems to operate with high spectrum efficiency and good performance.

Full Duplex (FD) for wireless systems is a technology that allows a device to simultaneously transmit and receive wireless signals. FD can significantly increase the throughput for each allocated channel and furthermore improve the total system capacity. But only half of the physical bandwidth is available for one way wireless communication, since the channel needs to be partitioned for transmitting and receive operations either in the frequency or time domain. This is because a wireless node cannot transmit and receive over the same frequency band at the same time. The reason that FD communication has not yet been possible in wireless systems is the significant amount of self-interference.

This technology is developed for improving the performance of wireless networks. It is a method of and system (synchronized contention window (S-CW) full duplex (FD) protocol) to enable FD communication in wireless local area networks (WLANs) for improving the performance of WLANs by using S-CW FD protocol as a MAC scheme.

CONTACT: INDUSTRY COLLABORATION AND TECHNOLOGY LICENSING OFFICE

📞 0090 216 4839654
✉ fml@sabanciuniv.edu

Sabancı Üniversitesi

Technology Overview

The S-CW FD protocol according to this invention can be applied to different FD scenarios (bidirectional or relaying) via the same access mechanism, and it can work together with IEEE 802.11 legacy nodes. Hence, S-CW FD is not only flexible, but also it can be easily implemented by making use of the off-the-shelf WLAN hardware and firmware.

S-CW FD protocol is therefore presented as a generic, easy to implement MAC protocol, which enables FD in WLANs, while supporting legacy HD IEEE 802.11 nodes, which is named as one of the challenges that FD MAC protocols face in the future. A contention window synchronization mechanism is proposed to adjust the backoff slots of the communicating nodes in order to enable simultaneous transmissions.

Technology Features & Specifications
- This technology proposes a synchronized contention window (S-CW) full duplex MAC as a protocol for enabling FD in WLANs for enhanced throughput.
- Synchronized contention window full duplex protocol of the invention doubles the throughput of HD WLANs, but this gain decreases with increasing number of nodes in the network.
- This technology proposes Synchronized Contention Window Full Duplex protocol as a modified form of IEEE 802.11 MAC with mechanisms to support the FD operation, so as to synchronize the involved nodes with minimal overhead.
- The main advantage of S-CW FD is its simplicity, due to easy implementation on off-the-shelf 802.11 equipment.
- The S-CW FD of the this technology provides 1.5-2 times higher throughput in comparison to HD legacy WLANs, in the case there are no hidden nodes in the network.
- RTS/CTS is no longer necessary for FD, since by nature FD solves the hidden terminal problem.
- S-CW FD works in bi-directional scenarios where two nodes communicate simultaneously with each other.

Potential Applications
- WLAN devices
- Wireless chipsets
- WLAN adapters

Customer Benefits
- Enabling FD in WLANs for enhanced throughput.
- Providing 1.5-2 times higher throughput in comparison to HD legacy WLANs.
- Improving the performance of WLANs.
- Easy implementation.

Market Trends & Opportunities

The major driving factor of the WLAN market is the increase in the adoption of cloud computing and growth of telecommunication, residential and commercial sector. However, rise in privacy and security issues in the age of IoT restrains the market growth. On the contrary, development of 5G technology is expected to create lucrative growth opportunities in future. The requirement for smartphones, tablets, laptops, and media-intensive applications in business environments is putting greater, and different demands on high performance WLANs.