IEEE P802.11
Wireless LANs

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| Framework of Technical Report onFull Duplex for 802.11  |
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Abstract

This document outlines the potential framework of Technical Report on Full Duplex for IEEE 802.11.

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# ****Introduction****

**Wi-Fi products have been being widespread deployed around world with the facts of more than** three billion Wi-Fi device estimated to be shipped in 2017 and more than eight billion Wi-Fi devices currently in use [1] 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, aircraft, train (stations), shopping centers and meetings, etc.), Augmented/Virtual Reality (AR/VR) and Internet of Things (IoT), and so on. **Dense deployment of Wi-Fi devices and potential high demands on data throughputs per device require the advanced Wi-Fi systems to operate with high spectrum efficiency and good performance.**

**Full Duplex (FD) is a technology to allow a device to simultaneously transmit and receive signals using the same time-frequency resource. FD can significantly increase the throughput for each allocated channel and furthermore improve the total system capacity. In addition, the inherent capability of FD can provide an opportunity to reduce round-trip latency for data transmission, which is due to transmission of ACK or feedback information and to implement an in-band relay system. Standardization of FD technology for 802.11 is considered in [2].**

This technical report on FD for IEEE 802.11 presents some key discussion results achieved in the FD TIG, which include FD use cases, FD functional requirements, technical feasibility of FD for 802.11, architecture of FD for 802.11, key FD metrics, and benefits of FD deployment.

# FD use cases

*Note: In this report, a few FD use cases such as multi-channel AP, FD mesh and multi-RAT presented in [2] and/or others should be justified as the appropriate applications of FD to satisfy the high-demanding requirements of the future 802.11.*

# FD functional requirements

## Bands and bandwidths of FD operations

*Note: The bands and the bandwidths for FD operations should be investigated in FD TIG and reported in the FD TIG technical report.*

## Maximum throughput over an allocated bandwidth

*Note: FD technology allows simultaneous transmit and receive over the same frequency spectrum. Compared to the existing Wi-Fi systems, theoretically FD can double the data throughput per channel over the same time and frequency resource. The FD TIG technical report should identify the practical maximum throughput over an allocated bandwidth. Furthermore, the FD TIG technical report should identify practical maximum system throughput to justify the advantages of FD deployment in dense scenarios.*

## Latency enhancement

*Note: FD provides an opportunity to reduce the latency in the link level or the system level. Latency enhancement should be investigated in the FD TIG and reported in the FD TIG technical report.*

## FD capability of AP and STA

*Note: FD capability of AP and STA should be discussed in the FD TIG and reported in the FD TIG technical report.*

## Backward compatibility and co-existence with legacy 802.11 devices

*Note: As an amendment, the issues of backward compatibility and co-existence with legacy 802.11 devices should be taken into account in FD-capable 802.11.*

# FD Technical Feasibility

## Technical survey

## FD operations within a BSS

### Self-interference cancellation level

### Potential techniques for self-interference cancellation

*Note: Potential techniques are to be discussed in order to achieve the desired self-interference cancellation level.*

### Scheduling in FD for 802.11

## FD operations over overlapping BSS (OBSS)

## Impacts on the 802.11 standard

# Architecture of FD for 802.11

## Asymmetric FD for 802.11

*Note: APs are FD-capable; STAs are half-duplex devices.*

## Symmetric FD for 802.11

*Note: Both APs and STAs are FD-capable.*

# Key FD Metrics

## Throughput (channel/system)

*Note: Both channel-level and system-level throughputs should be investigated.*

## Latency

*Note: Both STA-level and network-level latency should be investigated.*

# FD Benefits

*Note: Some of benefits listed below are considered in the FD TIG contribution [3].*

## Throughput gain

## Lower latency

## Collision reduction

## Mitigation of hidden node issue

# Conclusions

# References

[1] Wi-Fi Alliance press, January 2017.

[2] IEEE 802.11: 11-18-0191-01-0wng-full-duplex-for-802-11.

[3] IEEE 802.11: 11-18-0448-00-00fd-full-duplex-benefits-and-challenges.