expected to be part of the WLAN Sensing eco system for a good number of years. Support of 802.11bf on low complexity 802.11 devices (with/without legacy PHYs) will encourage earlier and wider adoption of standardized WLAN Sensing.

[0005] In a recent 802.11bf meeting, it is proposed that 11bf shall ensure at least one mode of operation in which 11bf can be supported on devices with legacy physical layers (PHYs) such as 802.11n or 802.11ac, and that they can participate in WLAN Sensing. While 802.11n and 802.11ac have been cited as example of legacy PHYs here, it is not meant to preclude other 802.11 PHYs such as 802.11a, 802.11b, 802.11g, 802.11ax, which could also be considered as legacy PHYs if the host device did not support 802.11bf natively.

[0006] However, there has been no discussion so far concerning low complexity WLAN sensing related to support of low complexity (IOT type) devices (with/without legacy PHYs).

[0007] There is thus a need for communication apparatuses and methods that can solve the above mentioned issue. Furthermore, other desirable features and characteristics will become apparent from the subsequent detailed description and the appended claims, taken in conjunction with the accompanying drawings and this background of the disclosure.

SUMMARY

[0008] Non-limiting and exemplary embodiments facilitate providing communication apparatuses and communication methods for low complexity WLAN sensing.

[0008a] In an aspect, the present disclosure refers to a first communication apparatus comprising:

a transmitter configured to:

during a setup phase of a sensing session with a second communication apparatus, transmit a request frame to the second communication apparatus to request scheduling of one or more time windows in which a sensing measurement is to be performed,

wherein the request frame comprises information indicating a Minimum Service Interval desired by the first communication apparatus, and

wherein the one or more time windows are scheduled as a Scheduled Automatic Power Save Delivery, S-APSD, service period or a Target Wake Time, TWT, service period.

[0009] According to an example of the present disclosure, there is provided a first communication apparatus comprising: a receiver, which in operation, receives a

measurement request frame from a second communication apparatus, the measurement request frame carrying a delayed response field indicating whether a delayed response is allowed; and a transmitter, which in operation, transmits a measurement Physical Protocol Data Unit (PPDU) to be used for channel measurements in response to the measurement request frame.

[0010] According to another example of the present disclosure, there is provided a second communication apparatus, comprising: a receiver, which in operation, receives information relating to a first communication apparatus; circuitry, which in operation, generates a measurement request frame based on the information, the measurement request frame carrying a delayed response field indicating whether a delayed response is allowed; and a transmitter, which in operation, transmits a measurement request frame to the first communication apparatus.

[0011] According to another example of the present disclosure, there is provided a communication method comprising: receiving a measurement request frame from a communication apparatus, the measurement request frame carrying a delayed response field indicating whether a delayed response is allowed; and transmitting a measurement Physical Protocol Data Unit (PPDU) to be used for channel measurements in response to the measurement request frame.

[0012] It should be noted that general or specific embodiments may be implemented as a system, a method, an integrated circuit, a computer program, a storage medium, or any selective combination thereof. Additional benefits and advantages of the disclosed embodiments will become apparent from the specification and drawings. The benefits and/or advantages may be individually obtained by the various embodiments and features of the specification and drawings, which need not all be provided in order to obtain one or more of such benefits and/or advantages.

CLAIMS

1. A first communication apparatus comprising:

a transmitter configured to:

during a setup phase of a sensing session with a second communication apparatus, transmit a request frame to the second communication apparatus to request scheduling of one or more time windows in which a sensing measurement is to be performed,

wherein the request frame comprises information indicating a Minimum Service Interval desired by the first communication apparatus, and

wherein the one or more time windows are scheduled as a Scheduled Automatic Power Save Delivery, S-APSD, service period or a Target Wake Time, TWT, service period.

2. The first communication apparatus according to claim 1,

wherein the one or more time windows are scheduled as the S-APSD service period, and

wherein the request frame comprises a traffic specification (TSPEC), element that includes the information indicating the Minimum Service Interval.

3. The first communication apparatus according to claim 2, further comprising:

a receiver configured to receive a response frame from the second communication apparatus,

wherein the response frame indicates acceptance of the request and comprises a schedule element indicating a service start time and a service interval for the S-APSD service period.

4. The first communication apparatus according to claim 1,

wherein the one or more time windows are scheduled as the TWT service period, and

wherein the request frame is a TWT setup frame comprising a TWT element for negotiating the TWT service period.

5. The first communication apparatus according to claim 1, further configured to:

advertise to the second communication apparatus a Response Delay, wherein the Response Delay is set to zero to indicate that the first communication apparatus is able to transmit a measurement Physical Protocol Data Unit (PPDU), within a short interframe space (SIFS), of receiving a measurement request frame, or set to a non-zero value otherwise.

6. The first communication apparatus according to claim 1, wherein the transmitter is further configured to transmit a measurement Physical Protocol Data Unit (PPDU), as one of a Null Data Packet (NDP), or an 802.11 PPDU carrying a Data frame in response to a measurement request frame during the one or more time windows.