IEEE P802.11
Wireless LANs

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| Proposed Draft Text for SENS Procedure: Overview |
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Abstract

This document includes proposed draft text for the “SENS Procedure: Overview” sub-clause as defined in TGbf’s SFD.

Baseline documents: Rev. me (D1.0) and 11be (D1.4)

**Discussion**

The following text/motions comprise the “WLAN sensing procedure: Overview” section in TGbf’s SFD:

“A WLAN sensing procedure allows a STA to perform WLAN sensing and obtain measurement results (Motion 8, 20/1849r4).

A sensing initiator is a STA that initiates a WLAN sensing procedure. A sensing responder is a STA that participates in a WLAN sensing procedure initiated by a sensing initiator. A sensing transmitter is a STA that transmits PPDUs used for sensing measurements in a WLAN sensing procedure. A sensing receiver is a STA that receives PPDUs sent by a sensing transmitter and performs sensing measurements in a WLAN sensing procedure (Motion 9, 20/1849r4; Motion 29, 21/1543r1).

A STA can assume multiple roles in a WLAN sensing procedure (Motion 9, 20/1849r4; Motion 29, 21/1543r1). In a WLAN sensing procedure, a sensing initiator might be a sensing transmitter, a sensing receiver, both or neither (Motion 10c, 21/0147r3; Motion 29, 21/1543r1). In a WLAN sensing procedure, a sensing responder might be a sensing transmitter, a sensing receiver, or both (Motion 29, 21/1543r1).

A WLAN sensing procedure is composed of one or more of the following: sensing session setup, sensing measurement setup, sensing measurement instance, sensing measurement setup termination, and sensing session termination (Motion 15, 20/1851r4; Motion 29, 21/1543r1).

A WLAN sensing procedure may be comprised of multiple sensing measurement instances (Motion 14, 21/0145r4; Motion 29, 21/1543r1).

Examples of WLAN sensing procedures are shown in Figure 1 and Figure 2 (Motion 29, 21/1543r1; Motion 35, 21/1701r1).

More than one type of sensing measurement results may be defined (Motion 12, 21/0147r3).”

**Contribution**

*Insert the following definitions into 3.2 (Definitions specific to IEEE 802.11) in alphabetical order:*

**sensing initiator:** A station (STA) that initiates a WLAN sensing procedure.

**sensing responder:** A station (STA) that participates in a WLAN sensing procedure initiated by a sensing initiator.

**sensing transmitter:** A station (STA) that transmits PPDUs used for sensing measurements in a WLAN sensing procedure.

**sensing receiver:** A station (STA) that receives PPDUs sent by a sensing transmitter and performs sensing measurements in a WLAN sensing procedure.

*Insert the following new subclause at the end of subclause 11.21 (Wireless network management procedures):*

**11.21.18 WLAN sensing procedure**

**11.21.18.1 Overview**

A WLAN sensing procedure allows a STA to perform WLAN sensing. WLAN sensing is a service that enables a STA to obtain sensing measurements of the channel(s) between two or more STAs and/or the channel between a receive antenna and a transmit antenna of a STA.

A WLAN sensing procedure is composed of one or more of the following: Sensing session setup, sensing measurement setup, sensing measurement instances, sensing measurement setup termination, and sensing session termination. A WLAN sensing procedure may be comprised of multiple sensing measurement instances.

In the sensing session setup, a sensing session is established, and in the sensing measurement setup, operational attributes associated with a sensing measurement instance are set. One or more sensing measurement setups may be established between a sensing initiator and a sensing responder. A sensing measurement instance is a time interval when sensing measurements are obtained, and it can be one of two methods: TB sensing measurement instance or non-TB sensing measurement instance. A sensing measurement instance is active until terminated in a sensing measurement setup termination. In the sensing session termination, a sensing session is terminated.

A STA acting as a sensing initiator may participate in a sensing measurement instance as a sensing transmitter, a sensing receiver, both a sensing transmitter and a sensing receiver, or neither a sensing transmitter nor a sensing receiver. A STA acting as a sensing responder may participate in a sensing measurement instance as a sensing transmitter, a sensing receiver, or both a sensing transmitter and a sensing receiver.

NOTE – A sensing initiator may choose to not participate in a sensing measurement instance as a sensing transmitter nor sensing receiver but may still initiate the WLAN sensing procedure and optionally obtain sensing measurement reports.

As defined in 11.21.18.3 (Sensing measurement setup), the sensing transmitter and sensing receiver roles are determined during the sensing measurement setup. The set of operational attributes used in a sensing measurement instance are also determined in the sensing measurement setup.

Examples of WLAN sensing procedures are shown in Figure 11-41a and Figure 11-41b. Figure 11-41a illustrates the case when an AP performs WLAN sensing with three non-AP STAs, which are referred to as STA A, STA B, and STA C and have MAC addresses A, B, and C, respectively. Also, STA A has AID 1, STA B has UID 2, and STA C has AID 3. The scenario considered in Figure 11-41b is identical to that of Figure 11-41a except that STA C does not appear.

Both examples start with a sensing session setup procedure performed between the AP and STA A that establishes a sensing session identified by the AID of STA A (AID 1). A first sensing measurement setup procedure is then performed, which defines a set of operational attributes labelled with a Measurement Setup ID equal to 1. The concept of Measurement Setup ID is defined in 11.21.18.3. After the sensing measurement setup, sensing measurement instances are performed based on the defined operational attribute set (Measurement Setup ID equal to 1). Each measurement instance is labelled with a Measurement Instance ID (see 11.21.18.4). After some time, a second sensing measurement setup procedure is performed between the AP and STA A that defines a second operational attribute set that is labelled with a Measurement Setup ID of 2. After the second sensing measurement setup, any subsequent sensing measurement instances may be performed based on either the first (Measurement Setup ID equal to 1) or second (Measurement Setup ID equal to 2) operational attribute sets. An operational attribute set may be terminated by performing a sensing measurement setup termination procedure (for example, Measurement Setup ID equal to 1 is terminated for the sensing session between the AP and STA A in both figures).

Also in both figures, while the AP and STA A still have the first sensing session active, a new sensing session setup procedure is performed between the AP and STA B that establishes a sensing session identified by the UID of STA B (UID 2). In Figure 11-41a, a first sensing measurement setup procedure between the AP and STA B defines an attribute set that is identical to the one corresponding to Measurement Setup ID equal to 2 established between the AP and STA A and, therefore, shares the label of Measurement Setup ID equal to 2. Subsequent measurement instances associated with Measurement Setup ID equal to 2 may thus be associated with STA A, STA B, or both STA A and STA B. Each measurement instance may have one-to-many (including one-to-one) announcement and/or triggering, and may have either one-to-many or many-to-one (including one-to-one) sounding.As also illustrated in Figure 11-41a, after a measurement setup is terminated, its label (specifically, the Measurement Setup ID) becomes available for re-use when a new measurement setup is performed, potentially with a different corresponding operational attribute set.



**Figure 11-41a: Example of a WLAN sensing procedure.**



**Figure 11-41b: Example of a WLAN sensing procedure.**

**11.21.18.2 WLAN sensing dependencies**

Implementation of WLAN sensing is optional for a WNM STA. A STA in which dot11SensingMsmtImplemented is true is defined as a STA that supports WLAN sensing.

A STA in which dot11SensingMsmtImplemented is true shall set the WLAN Sensing field of the Extended Capabilities element to 1.

A STA in which dot11SensingMsmtImplemented is false shall set the WLAN Sensing field of the Extended Capabilities element to 0.

*Insert the following new rows into Table 9-190 (Extended Capabilities field)*

**Table 9-190—Extended Capabilities field**

|  |  |  |
| --- | --- | --- |
| Bits | Information | Notes |
| <Last assigned + 1> | WLAN Sensing | A STA sets the WLAN sensing field to 1 if dot11SensingMsmtImplemented is true, and sets it to 0 otherwise. See 11.21.18 (WLAN sensing procedure). |

*Modify the second and third paragraphs of 4.3.21.1 (Wireless network management: Overview) as follows*

In addition to providing information on network conditions, WNM also provides a means to exchange location information, provide support for the multiple BSSID capability on the same wireless infrastructure, support efficient delivery of group addressed frames, and enable a WNM sleep mode in which a STA can sleep for long periods of time without receiving frames from the AP. WNM also provides a means to obtain and exchange WLAN sensing information.

The WNM service includes the following:

— BSS max idle period management

...

— WNM sleep mode

— WLAN sensing

*Insert the following new subclause at the end of subclause 4.3.21 (Wireless network management)*

**4.3.21.24 WLAN sensing**

WLAN sensing enables a STA to obtain sensing measurements of the channel(s) between two or more STAs and/or the channel between a receive antenna and a transmit antenna of a STA. With the execution of the WLAN sensing procedure, it is possible for a STA to obtain sensing measurements useful for detecting and tracking changes in the environment.