Enhancement on Sleep Mode operation in 802.16e

IEEE 802.16 Presentation Submission Template (Rev. 8.3)

Document Number:

IEEE S802.16e-03/45

Date Submitted:

2003-09-08

Source:

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Venue:

802.16e Session #27

Base Document:

IEEE C802.16e-03/45) and URL <http://ieee802.org/16/C80216e-03_45.pdf>

Purpose:

The document is submitted for review by Handoff/Sleep Mode Ad Hoc Group and/or by 802.16 Working Group Members

Proposal descriptions

- Propose to change the concept of listening interval as the listening (only Rx) period in the sleep interval.
- Introducing the DSS (Data to the Sleep Mode SSs) bit field in the DL_Frame_Prefix in OFDMA-PHY using the reserved bit field to indicate the presence of TRF-IND messages to the corresponding MSSs in this frame.
- Listening interval should be determined by the BS and applied equally to every MSS in sleep-mode.

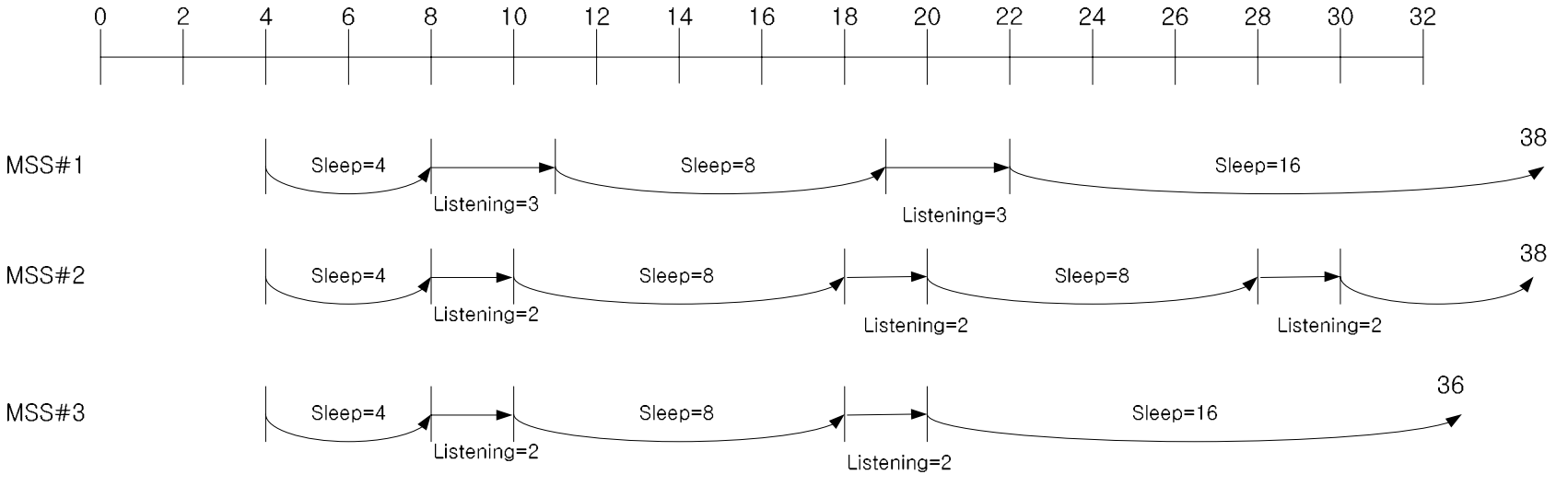
- **How to see the listening interval**
  - **Half-Sleep, Half-Awake State (Rx-On, Tx-Off)**
  - **Not negotiable btn. BS and MSSs, but designated by the BS under circumstances.**
  - **Listening interval is the period of frames having TRF-IND messages to be checked by the MSSs in sleep mode.**

- **How to announce the listening interval?**
  - **Fixed and predefined.**
  - **Negotiate between BS and MSSs as a explicit parameter.**
  - **DSS (Data to the Sleep Mode SSs) indicator or the Traffic Indication with/without CIDs.**

Suggest to change the concept of Listening Interval:

802.16e original concept of the Listening Interval (Example)

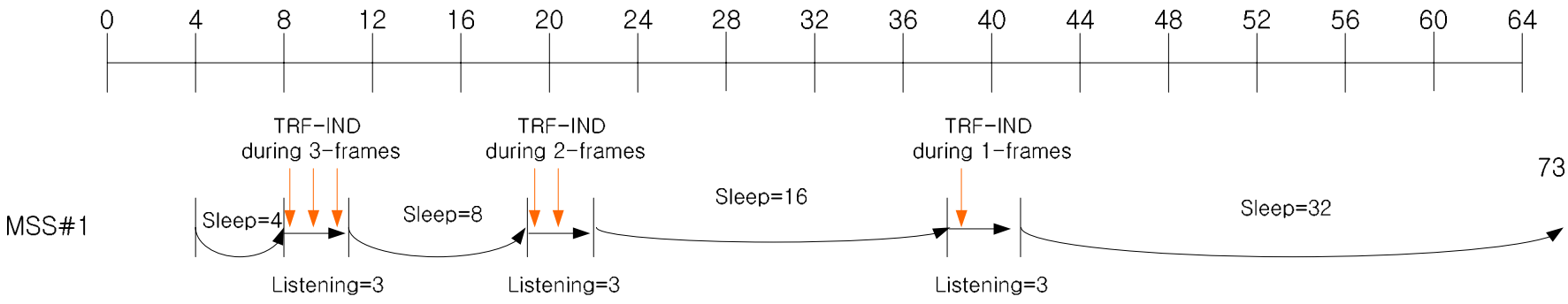
- **Example: MSS#1: Initial 4, Final 16, Listening 3; MSS#2: Initial 2, Final 8, Listening 3; MSS#3: Initial 4, Final 16, Listening 2**



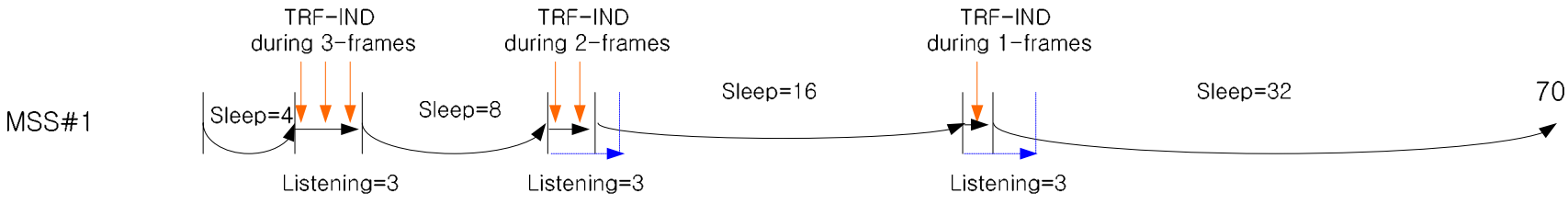
Suggest to change the concept of Listening Interval:

802.16e original concept of the Listening Interval (Example)

- **Example: Listening intervals are negotiated and fixed to each MSS, but going back to sleep mode as the negative indication before the listening interval timeout.**



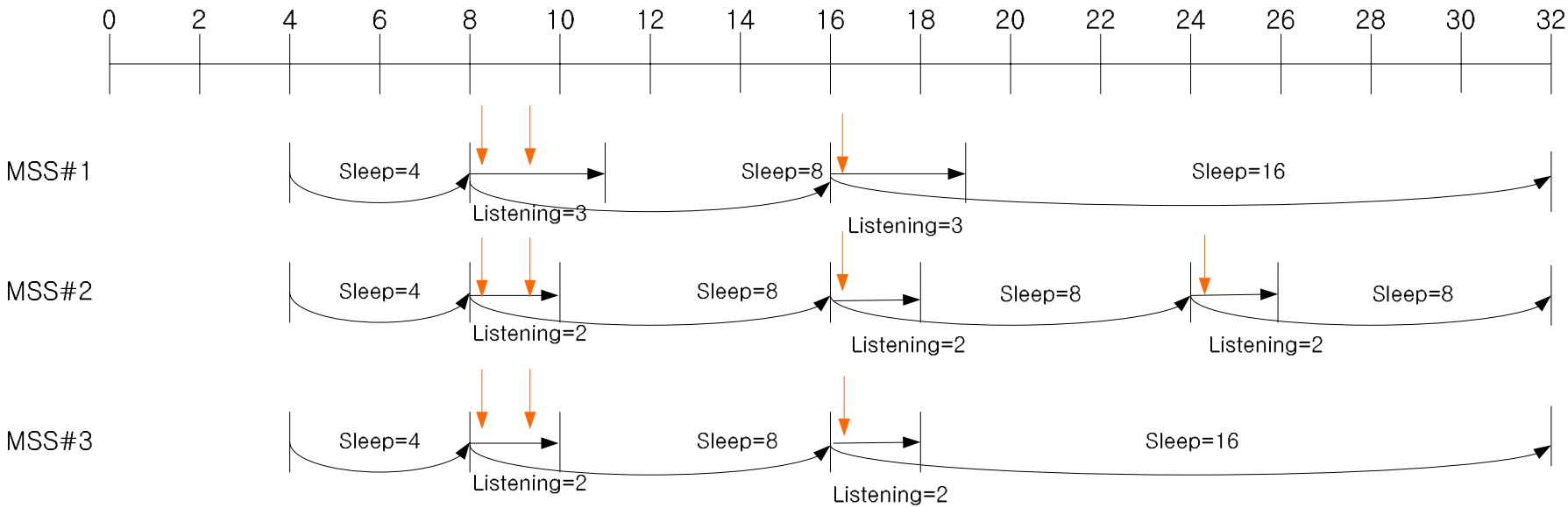
Or



Suggest to change the concept of Listening Interval:

Proposed concept of the Listening Interval (Example)

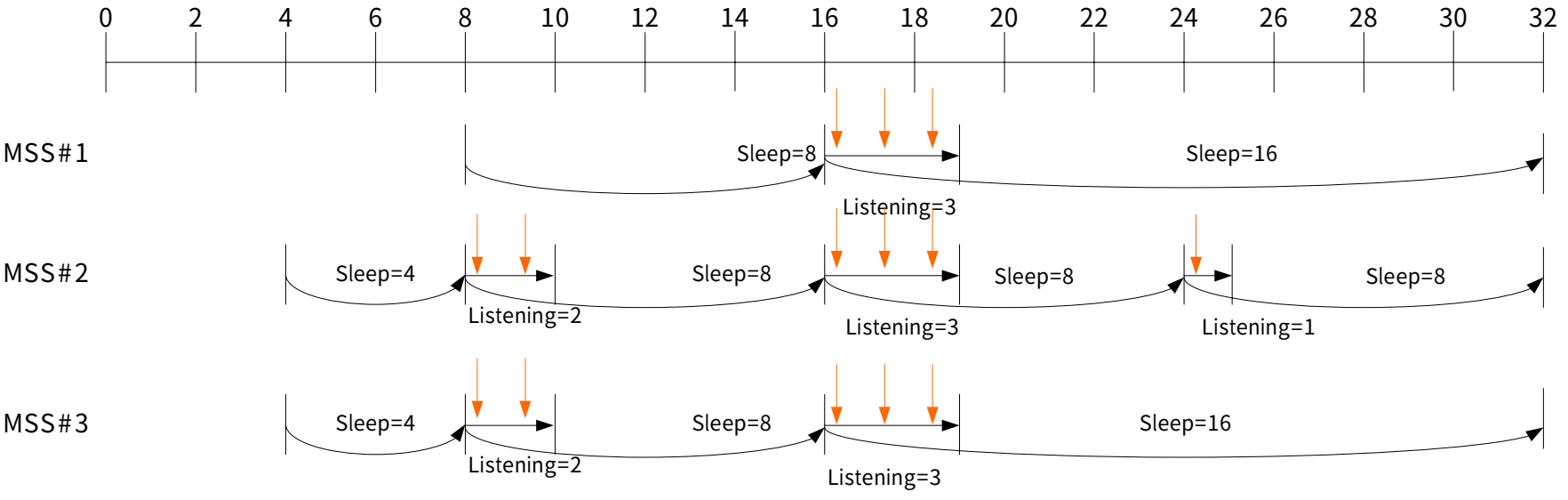
- **Example: MSS#1: Initial 4, Final 16, Listening 3; MSS#2: Initial 4, Final 8, Listening 3; MSS#3: Initial 4, Final 16, Listening 2**



Suggest to change the concept of Listening Interval:

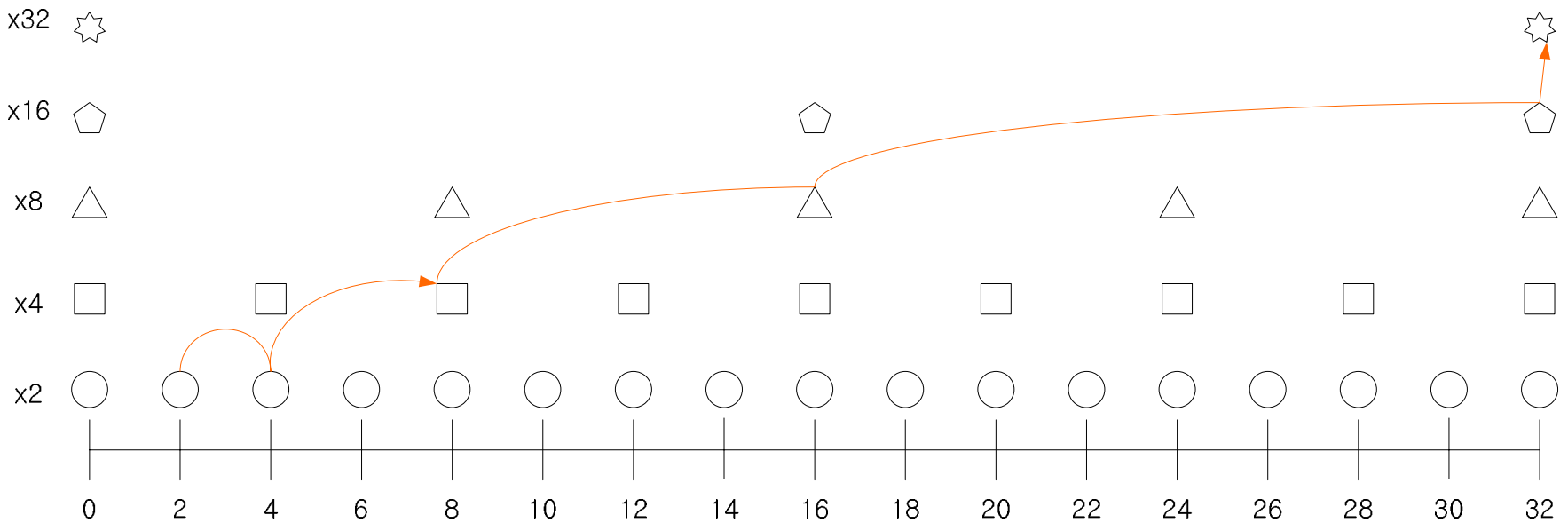
Proposed concept of the Listening Interval (Example)

- **Example: MSS#1: Initial 8, Final 32; MSS#2: Initial 4, Final 8; MSS#3: Initial 4, Final 16 → Listening intervals can be varied by determination of the BS.**



- **DSS (Data to the Sleep Mode SSs) Indicator bits**
  - **Using the 1-bit field of DSS (Data to the Sleep Mode SSs) indication, if the negative indication is detected, the MSS can fast return to the sleep mode.**
  - **DSS indication can be detected only by PHY-layer operation.**
  - **Especially for proposed DL_Frame_Prefix in the OFDMA-PHY, we can only check the DSS (Data to the Sleep Mode SSs) bits in DL_frame_prefix and return to the sleep mode immediately for negatively indicated MSSs since the DL_frame_prefix actually decoded primitively in PHY-layer.**
    - **For example, if the DSS field is set to “0”, that means Traffic Indication messages to the Sleep Mode terminals which are listening in this frame are not present. Then the MSSs listen in this frame shall return to the Sleep Mode immediately ignoring the following information.**
    - **If the DSS field is set to “1”, then the procedure is the same as the original one. And the DSS field of 1-bit which can be checked in the early stages of receiving has no overhead.**

❑ Aligning of Sleeping Intervals (Example)



- **Harmonization proposal between Contribution #52r1 and our contribution:**
  - **Listening interval parameter in the REG-RSP in Contribution #52r1 as the maximum listening interval provided by the BS. So the BS can send the TRF-IND message during this period.**
  - **Real listening interval (frames which have TRF-IND messages) are announced by DSS field or DL-MAP or TRF-IND messages based on the PHY-specifications.**
  - **Change the concept of listening intervals to be included in the Sleep Interval, provide the room for grouping application of the sleep intervals, but let the grouping concept as the implementation issues.**
  - **Then the Sleep Mode concept of the 802.16e + Contribution #52r1 will be the superset of the general sleeping group applications.**